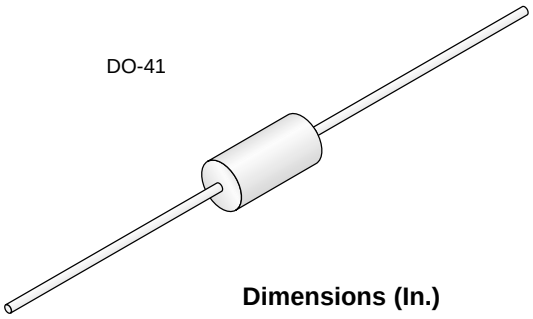
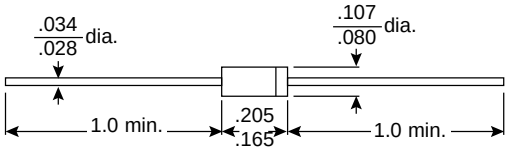
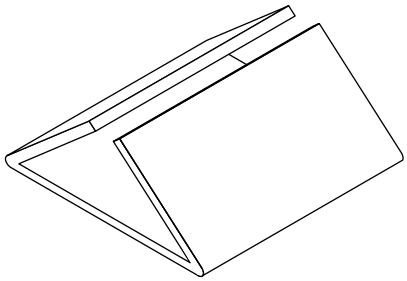
DO-41

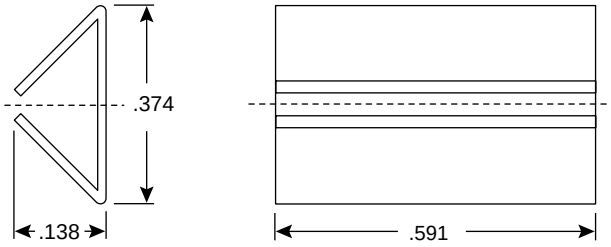


Dimensions (In.)



Mouser Stock No.	I (A)	VRRM (V)	I(FSM) (A)	IR @ PRV (mA)	VF @ IF (V)
333-1N5817	1.0	20	40	0.5	0.45
333-1N5818	1.0	30	40	0.5	0.55
333-1N5819	1.0	40	40	0.5	0.55



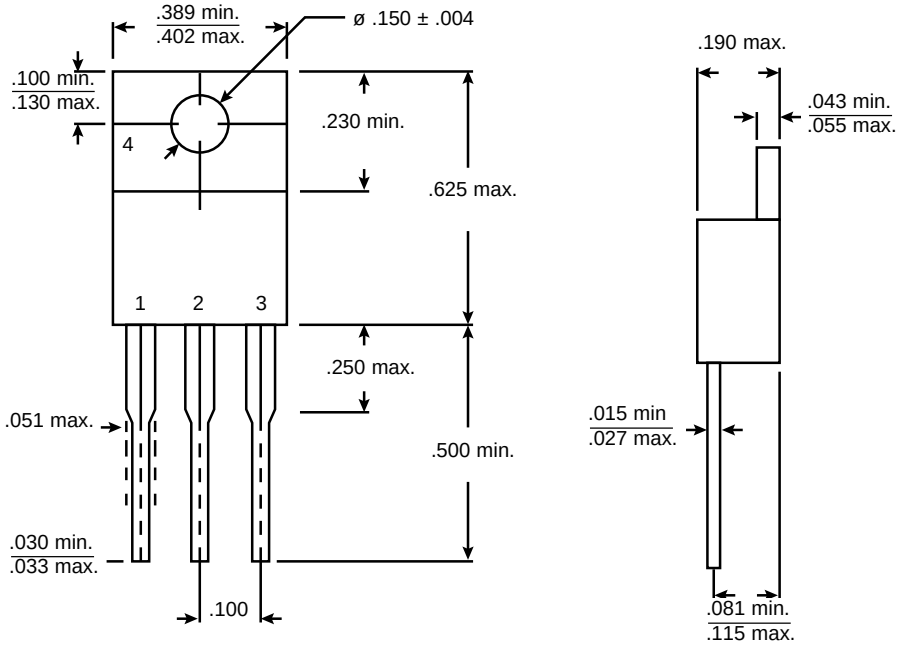


Dimensions (In.)

Specifications:

- Type: standard push-on clip for TO-92 case type
- Chemically blackened

Dimensions (In.)

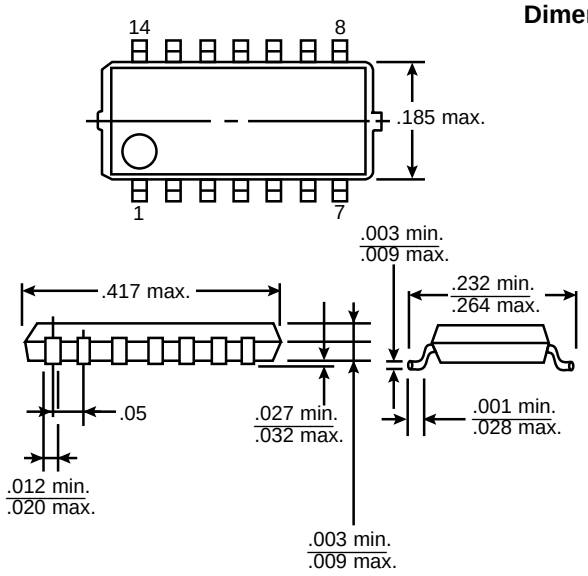


TO-220

1. Base
2. Collector
3. Emitter

Mouser Stock No.	I_C (A)	V_{CBO} (V)	V_{CEO} (V)	P_D (W)	H_{FE} (Min. / Max.)	I_C / V_{CE} (A / V)	$V_{CE(SAT)}$ (V)	I_C / I_B (A / mA)
333-TIP42	6	40	40	65	15 / 75	3.0 / 4	1.5	6.0 / 600
333-TIP42A	6	60	60	65	15 / 75	3.0 / 4	1.5	6.0 / 600
333-TIP42B	6	80	80	65	15 / 75	3.0 / 4	1.5	6.0 / 600
333-TIP42C	6	100	100	65	15 / 75	3.0 / 4	1.5	6.0 / 600

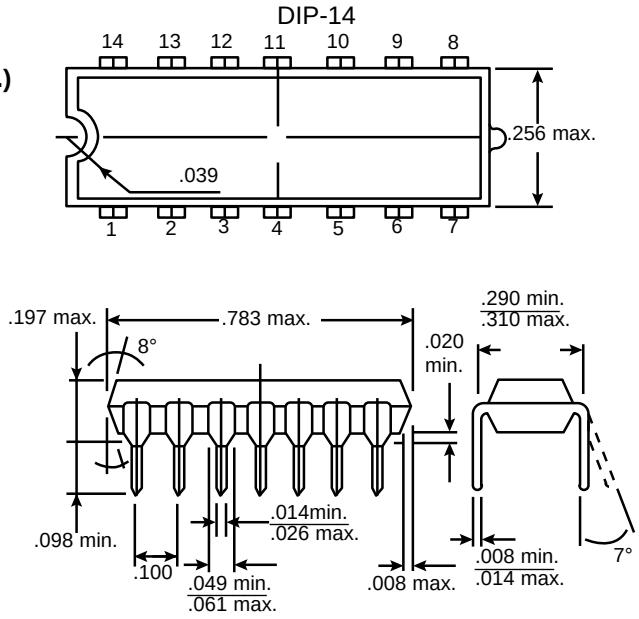
SO-14



333-KIA324F

Dimensions (In.)

DIP-14

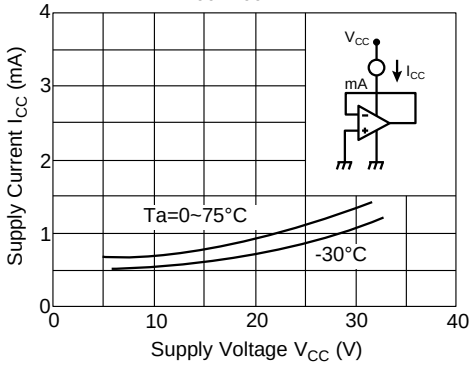


333-KIA324P

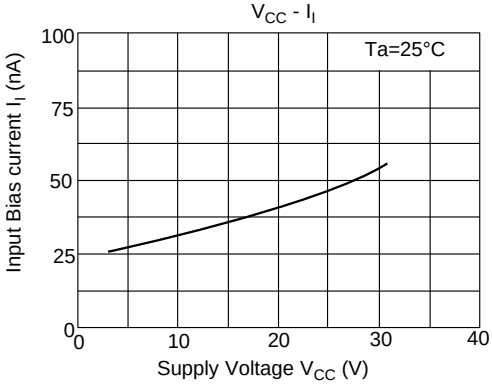
Specification:

- In the linear mode the input common mode voltage range includes ground
- Four internally compensated OP amps are in single package
- Low power dissipation and power drain suitable for battery operation.
- Differential input voltage range equal to the power supply voltage.
- Wide power supply voltage range and signal power
  Supply: single supply $3V_{DC}$ to $36V_{DC}$
  Dual supplies $\pm1.5V_{DC}$ to $\pm18V_{DC}$
- Large output voltage swing: $0V_{DC}$ to V_{CC}-$1.5V_{DC}$
- Low input biasing current: I_I=$45nA_{DC}$ (Typ.)

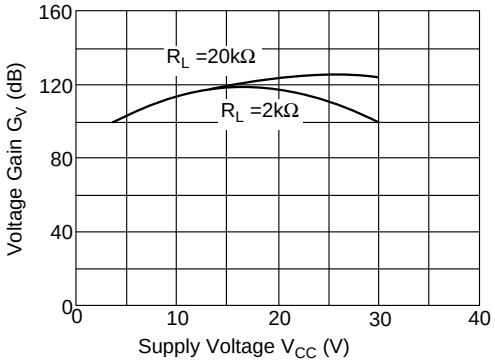
V_{CC} - I_{CC}



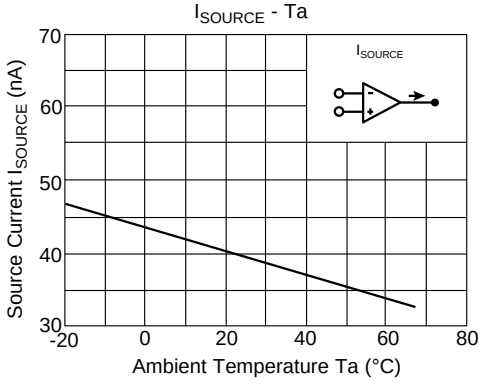
V_{CC} - I_I



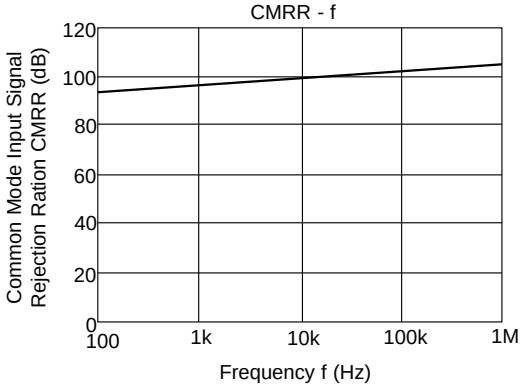
G_V- V_{CC}



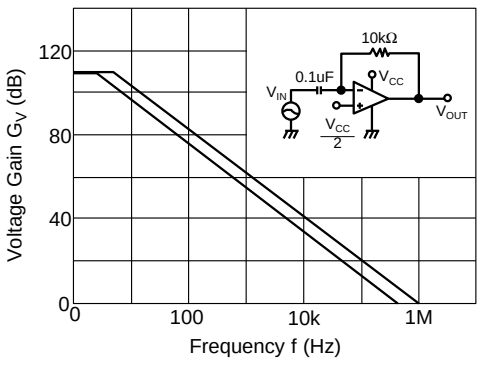
I_{SOURCE} - Ta

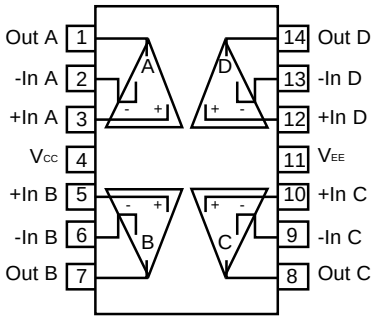


CMRR - f



G_V - f



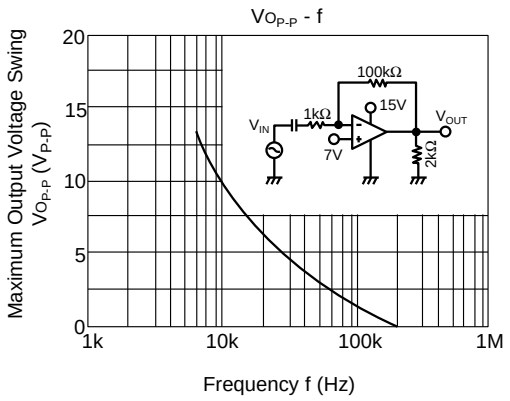


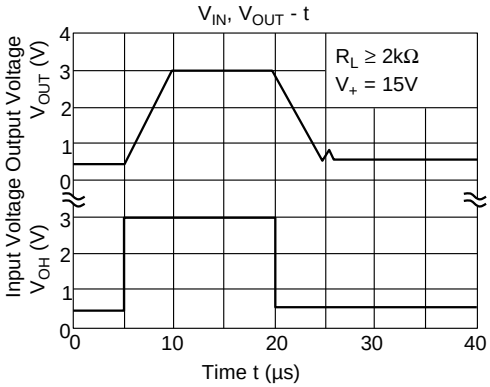
Maximum Rating (Ta=25°C)

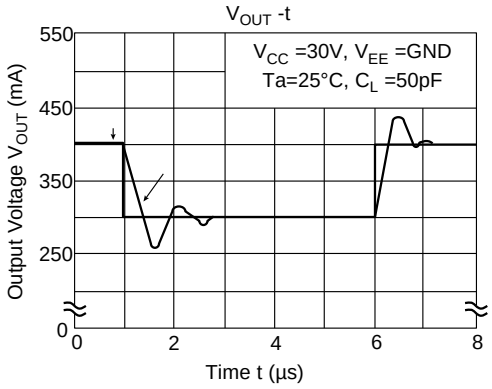
Characteristic		Symbol	Rating	Unit
Supply Voltage		V_{CC}	36,+18	V
		V_{EE}	0, -18	
Differential Input Voltage		DV_{IN}	±36	V
Input Voltage		V_{IN}	-.3~36	V
Power Dissipation	333-KIA324P	P_D	625	mW
	333-KIA324F		280	
Operating Temperature		T_{opr}	-40~85	°C
Storage Temperature		T_{stg}	-55~125	°C

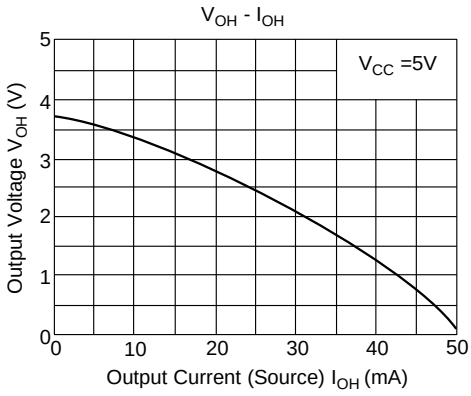
Electrical Characteristics (V_{CC}=5V, V_{EE}=GND, Ta=25°C)

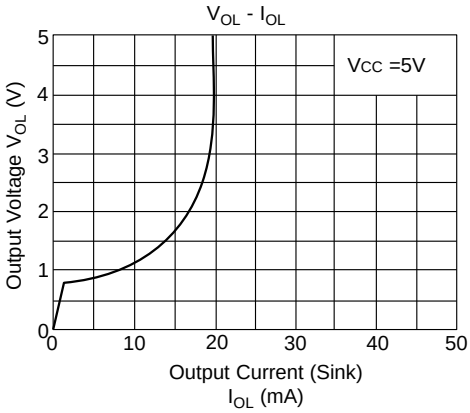
Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Input Offset Voltage	V_{IO}	Rg≤10kΩ	-	2	7	mV
Input Offset Current	I_{IO}	-	-	5	30	nA
Input Bias Current	I_I	-	-	45	150	nA
Common Mode Input Voltage	CMV_{IN}	V_{CC}=30V, V_{EE}=GND	0	-	V_{CC}-1.5	V
Supply Current	I_{CC}, I_{EE}	R_L=∞, All OP amps	-	0.7	1.2	mA
Voltage Gain	G_V	R_L≥2kΩ	86	100	-	dB
Maximum Output Voltage Swing	V_{Op-p}	R_L=2kΩ	0	-	V_{CC}-1.5	V
Common Mode Input Signal Rejection Ratio	CMRR	-	60	85	-	dB
Supply Voltage Rejection Ratio	SVRR	-55~125	60	100	-	dB
Source Current	I_{source}	-IN=0V_{DC}, -IN=1V_{DC}	20	40	-	mA
Sink Current	I_{sink}	-IN=1V_{DC}, -IN=0V_{DC}	10	20	-	mA

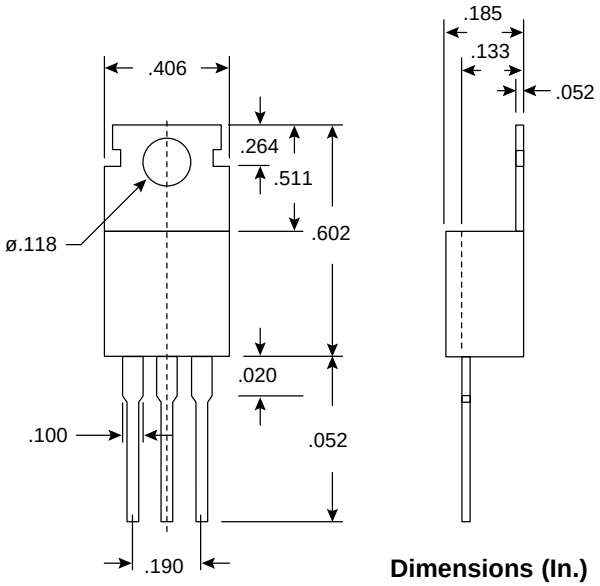

VOP-P - f
Maximum Output Voltage Swing VOP-P (VP-P)
20
15
10
5
0
1k
10k
100k
1M
Frequency f (Hz)
100kΩ
1kΩ
15V
VIN
VOUT
7V
2kΩ


VIN, VOUT - t
Input Voltage Output Voltage
VOUT (V)
VOH (V)
RL ≥ 2kΩ
V+ = 15V
0
10
20
30
40
Time t (µs)

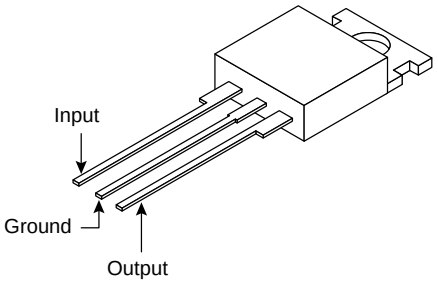

VOUT -t
Output Voltage VOUT (mA)
550
450
350
250
0
VCC =30V, VEE =GND
Ta=25°C, CL =50pF
0
2
4
6
8
Time t (µs)


VOH - IOH
Output Voltage VOH (V)
VCC =5V
0
10
20
30
40
50
Output Current (Source) IOH (mA)


VOL - IOL
Output Voltage VOL (V)
VCC =5V
0
10
20
30
40
50
Output Current (Sink)
IOL (mA)



Dimensions (In.)



Maximum Ratings (Ta=25°C)

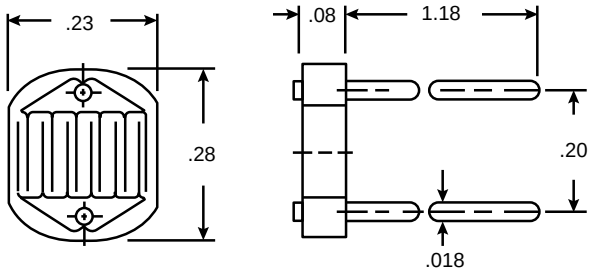
Specifications:

- Suitable for C-MOS, TTL, the other digital IC's power supply
- Internal thermal overload protection
- Internal short circuit current limiting
- Output current in excess of 1A
- Input Voltage (V_{IN}): 35V
- Power Dissipation (P_D): 20.8W (T_C=25°C)
- Operating Temperature (T_{opr}): -30~75˚C
- Storage Temperature (T_{stg}): -55~150˚C

Electrical Characteristics (V_{IN}=14V, I_{OUT}=500mA, 0°C≤T_j≤125°C)

Characteristic	Symbol	Test Conditions		Min.	Typ.	Max.	Unit
Output Voltage	V_{OUT}	T_j=25°C, I_{OUT}=100mA		7.7	8.0	8.3	V
Input Regulation	Reg. line	T_j=25°C	10.5V≤V_{IN}≤25V	-	6	160	mV
			11V≤V_{IN}≤17V	-	2	80	
Load Regulation	Reg. load	T_j=25°C	5mA≤I_{OUT}≤1.4A	-	12	160	mV
			250mA≤I_{OUT}≤750mA	-	4	80	
Output Voltage	V_{OUT}	10.5V≤V_{IN}≤23V 5.0mA≤I_{OUT}≤1.0A, P_O<15W		7.6	-	8.4	V
Quiescent Current	I_B	T_j=25°C, I_{OUT}=5mA		-	4.3	8.0	mA
Quiescent Current Change	I_B	10.5V≤V_{IN}≤25V		-	-	1.0	mA
Output Noise Voltage	V_{NO}	Ta=25°C,10Hz≤f≤100kHz I_{OUT}=50mA		-	70	-	µV
Ripple Rejection	RR	f=120Hz, 11.5V≤V_{IN}≤21.5V I_{OUT}=50mA, T_j=25°C		58	74	-	dB
Dropout Voltage	V_D	I_{OUT}=1.0A, T_j=25°C		-	2.0	-	V
Short Circuit Current Limit	I_{SC}	T_j=25°C		-	1.1	-	A
Average Temperature Coefficient of Output Voltage	T_{CVO}	I_{OUT}=5mA, 0°C≤T_j≤125°C		-	-1.0	-	mV/deg

Dimensions (In.)

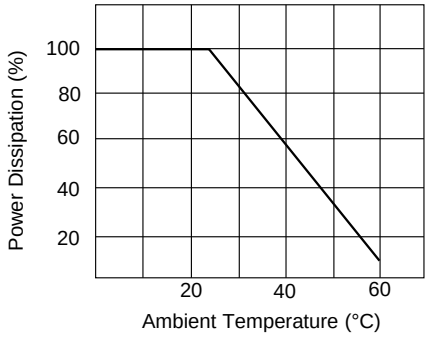


Specifications:

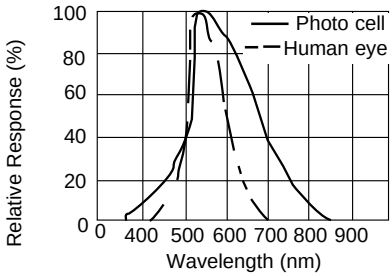
- Operating temperature : 30°C to +70°C
- Cadmium sulfide (CdS) construction
- Soldering: 230°C for 3 sec. (max) at 3mm from cell.
- High sensitivity, high stability
- 1 ft Candle: 10 Lux
- 10ft. Candle: 100 Lux

Mouser Stock No.	Voltage (Max.)	Light * Resistance (Ω)	Dark * * Resistance (Ω)	Peak Response Wavelength (nm)
338-76C348	150	3K - 20K	500K	560
338-76C569	200	20K - 100K	20M	550
338-76C59	200	20K - 50K	20M	550

* Light resistance measured at 10 Lux and 2856°K color temperature.
* * Dark resistance measured 10 seconds after removal of 100 Lux Illumination.

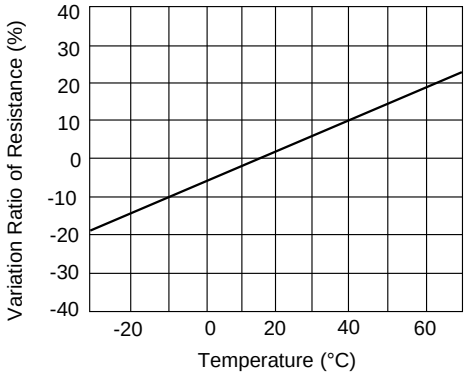


Tolerable power dissipation is the permissible amount of power the cell may dissipate when it is employed in a given circuit. This value is dependent on the characteristics of the photoconductive cell itself and is external covering in relation to ambient temperature and generated temperature all cells are measured at 25°C.

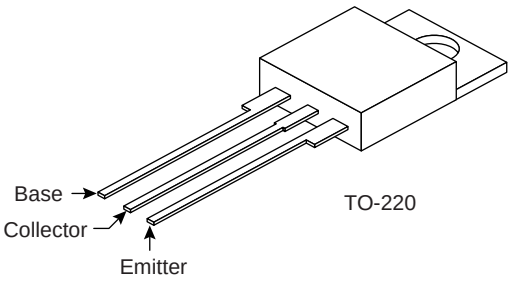


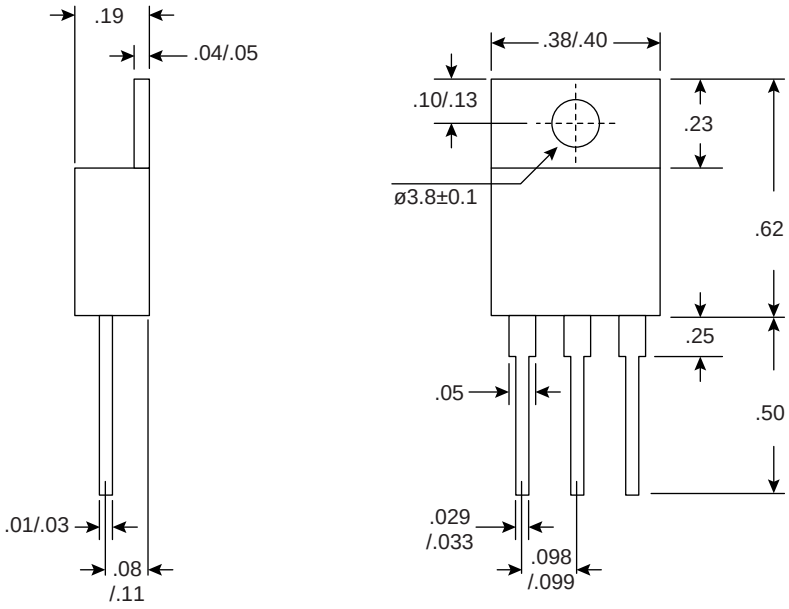
The spectral response characteristics of a cell indicates the ratio between the cells sensitivity to a light source of specific wavelength and the cells maximum sensitivity. Also color temperature error is given in the equation.

$$\Delta CE = -\log_{y_1^{10}} 2 \frac{R2856K}{R4874K}$$



The variation ratio of the temperature coefficient will be comparatively larger with weak measuring light. The resistance value will increase as the ambient temperature goes up.

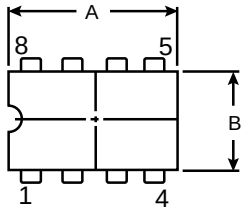




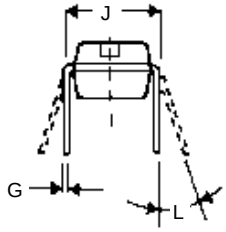
Dimensions (In.)
(min./max.)

Specifications:

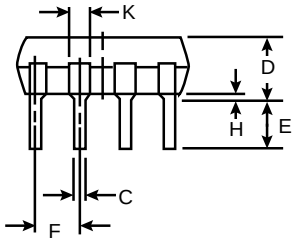
- Type: NPN power amp
- I_C: 7A
- V_{CBO}: 330V
- V_{CEO}: 150V
- P_D: 60W
- V_{CE} (sat): 1.0V (I_C = 5.0A, I_B = 500mA)

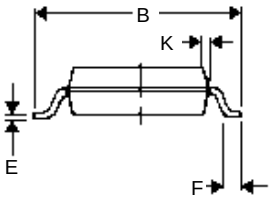


333-KIA555P (DIP-8)

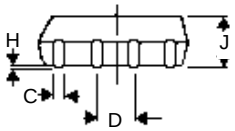


Dim.	Inches
A	.377±.007
B	.253±.007
C	.018±.003
D	.149±.011
E	.129±.011
F	.100
G	.009 + .003 - .001
H	.019 min.
J	.300
K	.059±.003
L	0 - 15°

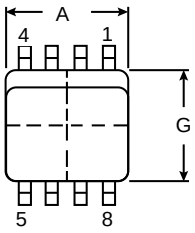




333-KIA555F (SO-8)



Dim.	Inches
A	.190 ± .007
B	.237 ± .011
C	.015 ± .003
D	.050
E	.007 + .003 - .001
F	.025 ± .007
G	.155 ± .007
H	.005 + .003 - .001
I	.064 ± .007
J	.012 ± .007



Timer

The KIA555P/F monolithic circuit is a highly stable device as producing accurate time delay or timing pulse. Additional terminals are provided for triggering or resetting if desired. In the time delay or monostable mode of operation, the time is precisely controlled by one external resistor and capacitor. In the a stable mode of operation, the frequency and duty cycle are accurately and

independently controlled with two external resistors and one capacitor. The circuit of the KIA555P/F may be triggered and reset on falling waveforms, and the output structure and source and sink up to 200mA or drive TTL circuit. Operation is specified for supplies of 5 to 15 volts.

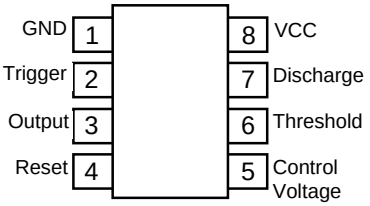
Specifications:

- Timing from microseconds through hours
- Operates in both a stable and monostable modes
- Output can source or sink 200mA
- Output TTL compatible
- Temperature stability or 0.005% / °C (typ.)
- Normally on or normally off output

Application:

- DC-DC Converter
- Linear Ramp Generator
- Pulse Generator
- Precision Timing
- Sequential Timing
- Timing Delay Generation
- Pulse Width Modulation
- Pulse

Pin Connection (Top View)



Maximum Ratings (Ta = 25°C)

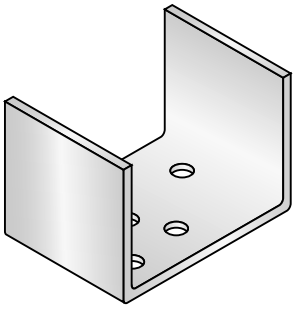
Characteristic		Symbol	Rating	Unit
Supply Voltage		V_{CC}	18	V
Power Dissipation	333-KIA555P	P_D	600	mW
	333-KIA555F		240	
Operating Temperature		T_{opr}	-40~-85	°C
Storage Temperature		T_{stg}	-55~125	°C

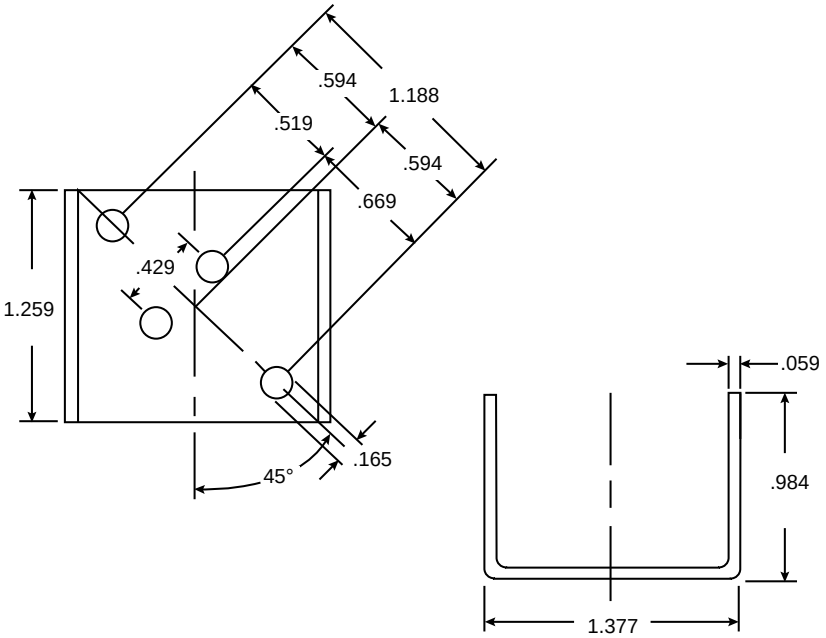
Electrical Characteristics (VCC=5V, VEE=GND, Ta=25°C)

Characteristic	Symbol	Test Condition		Min.	Typ.	Max.	Unit
Supply Voltage	V_{CC}	-		4.5	-	16	V
Supply Current	I_{CC}	V_{CC}=5V, R_L=∞, Low State		-	3	6	mA
		V_{CC}=15V, R_L=∞, Low State		-	10	15	
Control Voltage	V_{CT}	V_{CC}=5V		2.6	3.33	4	V
		V_{CC}=15V		9	10	11	
Threshold Voltage	V_{TH}	-		-	(2/3) V_{CC}	-	V
Threshold Current	I_{TH}	V_{CC}=5V, 15V		-	0.1	0.25	µA
Trigger Voltage	V_{TG}	V_{CC}=5V		-	1.67	-	V
		V_{CC}=15V		-	5	-	
Trigger Current	I_{TG}	-		-	0.5	-	µA
Reset Voltage	V_{RT}	-		0.4	0.7	1.0	V
Reset Current	I_{RT}	-		-	0.1	-	mA
Initial Accuracy	-	Monostable Mode R_A, R_B=1kΩ ~ 100kΩ C=0.1µF, V_{CC}+=15V		-	1	-	%
Drift with Temperature				-	50	-	ppm/°C
Drift with Supply Voltage				-	0.1	-	%/V
Output Voltage ("L" Level)	V_{OL}	V_{CC}=15V	I_{sink}=10mA	-	0.1	0.25	V
			I_{sink}=50mA	-	0.4	0.75	
			I_{sink}=100mA	-	2	2.5	
			I_{sink}=200mA	-	2.5	-	
		V_{CC}=5V	I_{sink}=5mA	-	0.25	0.35	V
			I_{sink}=8mA	-	-	-	
Output Voltage ("H" Level)	V_{OH}	V_{CC}=15V	I_{source}=100mA	12.75	13.3	-	V
			I_{source}=200mA	-	12.5	-	
		V_{CC}=5V	I_{source}=100mA	2.75	3.3	-	
Rise Time	T_r	-		-	100	-	ns
Fall Time	T_f			-	100	-	ns

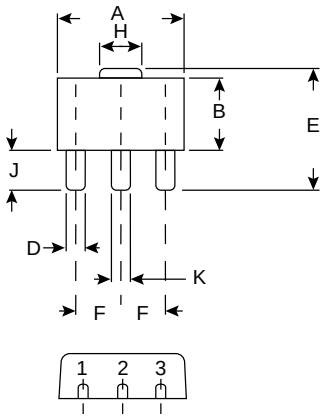
MOUSER® ELECTRONICS

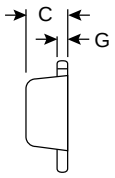
33HS301 Heat Sink for TO-3 Case Style





Description	Thermal Resistance (°C/W)	Dimensions (In)		Finish
		HT	W	
Economical U Style (with holes)	11	.99	1.38	Matte Etched





Dim.	Inches
A	.181 max.
B	.098±.004
C	.063 max.
D	.017±.003 .002
E	.165 max.
F	.059±.004
G	.016±.002
H	.070 max.
J	.031 min.
K	.018±.003 .002

1. Output
2. Common
3. Input

Specifications:

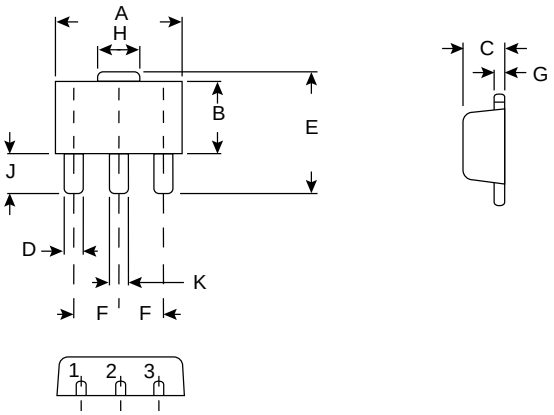
- Best suited to power supply for TTL/C^2 MOS
- No external part needed
- Built-in thermal protective circuit
- Max. output current 150mA. (Tj=25°C)

Maximum Ratings (Ta = 25°C)

Characteristic	Symbol	Rating	Unit
Input Voltage	V_{IN}	35	V
Power Dissipation	P_D	500	mW
Operating Temperature	T_{opr}	-30 ~ 75	°C
Storage Temperature	Tstg	-55 ~150	°C

333-78L12F
(Unless otherwise specified, V_{IN}=19V, I_{OUT}=40mA, C_{IN}=0.33µF, C_{OUT}=0.1µF, 0°C≤T_j≤125°C

Characteristic	Symbol	Test Condition		Min.	Typ.	Max.	Unit
Output Voltage	V_{OUT}	Tj=25°C		11.4	12	12.6	V
Input Regulation	Reg. Line	Tj=25°C	14.5V ≤ V_{IN} ≤ 27V	-	120	250	mV
			16V ≤ V_{IN} ≤ 27V	-	100	200	
Load Regulation	Reg. Load	Tj=25°C	1.0mA ≤ I_{OUT} ≤ 100mA	-	20	100	mV
			1.0mA ≤ I_{OUT} ≤ 40mA	-	10	50	
Output Voltage	V_{OUT}	14.5V ≤ V_{IN} ≤ 27V 1.0mA ≤ I_{OUT} ≤ 40mA		11.16	-	12.84	V
		V_{IN} ≤ 19V, 1.0mA ≤ I_{OUT} ≤ 70mA		11.16	-	12.84	
Quiescent Current	I_B	Tj=25°C		-	3.2	6.5	mA
		Tj=125°C		-	-	6.0	
Quiescent Current Change	ΔI_B	16V ≤ V_{IN} ≤ 27V		-	-	1.5	mA
		1.0mA ≤ I_{OUT} ≤ 40mA		-	-	0.1	
Output Noise Voltage	V_{NO}	Ta=25°C, 10Hz ≤ f ≤ 100kHz		-	80	-	µV
Long Term Stability	$\Delta V_{OUT}/\Delta t$			-	24	-	mV/ 1.0 KHrs
Ripple Rejection	RR	f=120Hz 15V ≤ V_{IN} ≤ 25V, Tj=25°C		36	41	-	dB
Dropout Voltage	V_{IN} V_{OUT}	Tj=25°C		-	1.7	-	V
Average Temperature Coefficient of Output Voltage	TC_{VO}	I_{OUT}=5mA		-	-1.0	-	mV/°C



Dim.	Inches
A	.181 max.
B	.098±.004
C	.063 max.
D	$.017^{+.003}_{-.002}$
E	.165 max.
F	.059±.004
G	.016±.002
H	.070 max.
J	.031 min.
K	$.018^{+.003}_{-.002}$

1. Output
2. Common
3. Input

Specifications:

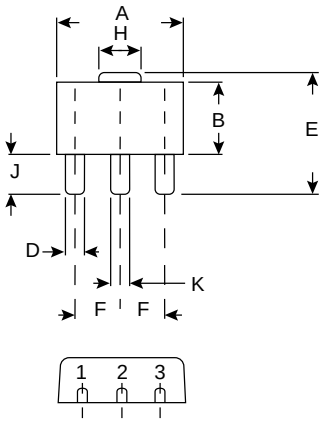
- Best suited to power supply for TTL/C^2 MOS
- No external part needed
- Built-in thermal protective circuit
- Max. output current 150mA. (T_j=25°C)

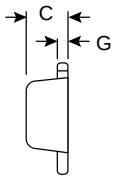
Maximum Ratings (Ta = 25°C)

Characteristic	Symbol	Rating	Unit
Input Voltage	V_{IN}	35	V
Power Dissipation	P_D	500	mW
Operating Temperature	T_{opr}	-30 ~ 75	°C
Storage Temperature	Tstg	-55 ~150	°C

333-78L15F
(Unless otherwise specified, V_{IN}=23V, I_{OUT}=40mA, C_{IN}=0.33µF, C_{OUT}=0.1µF, 0°C≤T_j≤125°C

Characteristic	Symbol	Test Condition		Min.	Typ.	Max.	Unit
Output Voltage	V_{OUT}	Tj=25°C		14.25	15	15.75	V
Input Regulation	Reg. Line	Tj=25°C	17.5V ≤ V_{IN} ≤ 30V	-	130	300	mV
			20V ≤ V_{IN} ≤ 30V	-	110	250	
Load Regulation	Reg. Load	Tj=25°C	1.0mA ≤ I_{OUT} ≤ 100mA	-	25	150	mV
			1.0mA ≤ I_{OUT} ≤ 40mA	-	12	75	
Output Voltage	V_{OUT}	17.5V ≤ V_{IN} ≤ 30V 1.0mA ≤ I_{OUT} ≤ 40mA		13.95	-	16.05	V
		V_{IN} ≤ 23V, 1.0mA ≤ I_{OUT} ≤ 70mA		13.95	-	16.05	
Quiescent Current	I_B	Tj=25°C		-	3.2	6.5	mA
		Tj=125°C		-	-	6.0	
Quiescent Current Change	ΔI_B	20V ≤ V_{IN} ≤ 30V		-	-	1.5	mA
		1.0mA ≤ I_{OUT} ≤ 40mA		-	-	0.1	
Output Noise Voltage	V_{NO}	Ta=25°C, 10Hz ≤ f ≤ 100kHz		-	90	-	µV
Long Term Stability	$\Delta V_{OUT}/\Delta t$			-	30	-	mV/ 1.0 KHrs
Ripple Rejection	RR	f=120Hz 18.5V ≤ V_{IN} ≤ 28.5V, Tj=25°C		34	40	-	dB
Dropout Voltage	V_{IN} V_{OUT}	Tj=25°C		-	1.7	-	V
Average Temperature Coefficient of Output Voltage	TC_{VO}	I_{OUT}=5mA		-	-1.3	-	mV/°C





Dim.	Inches
A	.181 max.
B	.098±.004
C	.063 max.
D	$.017^{+.003}_{-.002}$
E	.165 max.
F	.059±.004
G	.016±.002
H	.070 max.
J	.031 min.
K	$.018^{+.003}_{-.002}$

1. Output
2. Common
3. Input

Specifications:

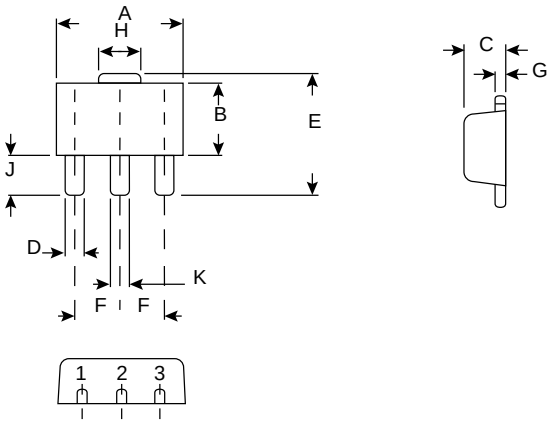
- Best suited to power supply for TTL/C^2 MOS
- No external part needed
- Built-in thermal protective circuit
- Max. output current 150mA. (Tj=25°C)

Maximum Ratings (Ta = 25°C)

Characteristic	Symbol	Rating	Unit
Input Voltage	V_{IN}	40	V
Power Dissipation	P_D	500	mW
Operating Temperature	T_{opr}	-30 ~ 75	°C
Storage Temperature	Tstg	-55 ~150	°C

333-78L18F
(Unless otherwise specified, V_{IN}=27V, I_{OUT}=40mA, C_{IN}=0.33µF, C_{OUT}=0.1µF, 0°C≤T_j≤125°C

Characteristic	Symbol	Test Condition		Min.	Typ.	Max.	Unit
Output Voltage	V_{OUT}	Tj=25°C		17.1	18	18.9	V
Input Regulation	Reg. Line	Tj=25°C	21.4V ≤ V_{IN} ≤ 33V	-	32	325	mV
			22V ≤ V_{IN} ≤ 33V	-	27	275	
Load Regulation	Reg. Load	Tj=25°C	1.0mA ≤ I_{OUT} ≤ 100mA	-	30	170	mV
			1.0mA ≤ I_{OUT} ≤ 40mA	-	15	75	
Output Voltage	V_{OUT}	21.4V ≤ V_{IN} ≤ 33V 1.0mA ≤ I_{OUT} ≤ 40mA		16.74	-	19.26	V
		V_{IN} ≤ 27V, 1.0mA ≤ I_{OUT} ≤ 70mA		16.74	-	19.26	
Quiescent Current	I_B	Tj=25°C		-	3.2	6.5	mA
		Tj=125°C		-	-	6.0	
Quiescent Current Change	ΔI_B	22V ≤ V_{IN} ≤ 33V		-	-	1.5	mA
		1.0mA ≤ I_{OUT} ≤ 40mA		-	-	0.1	
Output Noise Voltage	V_{NO}	Ta=25°C, 10Hz ≤ f ≤ 100kHz		-	150	-	µV
Long Term Stability	$\Delta V_{OUT}/\Delta t$			-	45	-	mV/ 1.0 KHrs
Ripple Rejection	RR	f=120Hz 23V ≤ V_{IN} ≤ 33V, Tj=25°C		32	38	-	dB
Dropout Voltage	V_{IN} V_{OUT}	Tj=25°C		-	1.7	-	V
Average Temperature Coefficient of Output Voltage	TC_{VO}	I_{OUT}=5mA		-	-1.5	-	mV/°C



Dim.	Inches
A	.181 max.
B	.098±.004
C	.063 max.
D	$.017^{+.003}_{-.002}$
E	.165 max.
F	.059±.004
G	.016±.002
H	.070 max.
J	.031 min.
K	$.018^{+.003}_{-.002}$

1. Output
2. Common
3. Input

Specifications:

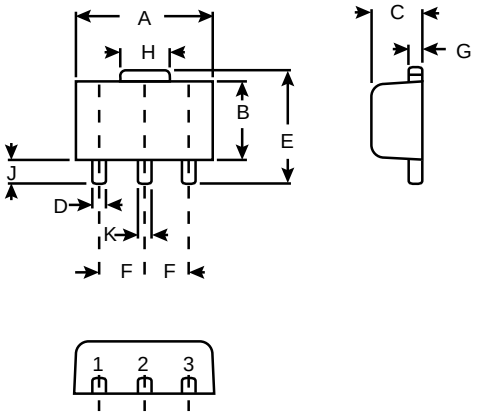
- Best suited to power supply for TTL/C^2 MOS
- No external part needed
- Built-in thermal protective circuit
- Max. output current 150mA. (Tj=25°C)

Maximum Ratings (Ta = 25°C)

Characteristic	Symbol	Rating	Unit
Input Voltage	V_{IN}	40	V
Power Dissipation	P_D	500	mW
Operating Temperature	T_{opr}	-30 ~ 75	°C
Storage Temperature	Tstg	-55 ~150	°C

333-78L20F
(Unless otherwise specified, V_{IN}=29V, I_{OUT}=40mA, C_{IN}=0.33µF, C_{OUT}=0.1µF, 0°C≤T_j≤125°C

Characteristic	Symbol	Test Condition		Min.	Typ.	Max.	Unit
Output Voltage	V_{OUT}	Tj=25°C		19.0	20	21.0	V
Input Regulation	Reg. Line	Tj=25°C	23.5V ≤ V_{IN} ≤ 35V	-	33	330	mV
			24V ≤ V_{IN} ≤ 35V	-	28	285	
Load Regulation	Reg. Load	Tj=25°C	1.0mA ≤ I_{OUT} ≤ 100mA	-	33	180	mV
			1.0mA ≤ I_{OUT} ≤ 40mA	-	17	90	
Output Voltage	V_{OUT}	23.5V ≤ V_{IN} ≤ 35V 1.0mA ≤ I_{OUT} ≤ 40mA		18.6	-	21.4	V
		V_{IN} ≤ 29V, 1.0mA ≤ I_{OUT} ≤ 70mA		18.6	-	21.4	
Quiescent Current	I_B	Tj=25°C		-	3.2	6.5	mA
		Tj=125°C		-	-	6.0	
Quiescent Current Change	ΔI_B	24V ≤ V_{IN} ≤ 35V		-	-	1.5	mA
		1.0mA ≤ I_{OUT} ≤ 40mA		-	-	0.1	
Output Noise Voltage	V_{NO}	Ta=25°C, 10Hz ≤ f ≤ 100kHz		-	170	-	µV
Long Term Stability	$\Delta V_{OUT}/\Delta t$			-	49	-	mV/ 1.0 KHrs
Ripple Rejection	RR	f=120Hz 25V ≤ V_{IN} ≤ 35V, Tj=25°C		31	37	-	dB
Dropout Voltage	V_{IN} V_{OUT}	Tj=25°C		-	1.7	-	V
Average Temperature Coefficient of Output Voltage	TC_{VO}	I_{OUT}=5mA		-	-1.7	-	mV/°C



Dim.	Inches
A	.181 max.
B	.098±.004
C	.063 max.
D	$.017^{+.003}_{-.002}$
E	.165 max.
F	.059±.004
G	.016±.002
H	.070 max.
J	.031 min.
K	$.018^{+.003}_{-.002}$

1. Output
2. Common
3. Input

Specifications:

- Best suited to power supply for TTL/C^2 MOS
- No external part needed
- Built-in thermal protective circuit
- Max. output current 150mA. (Tj=25°C)

Maximum Ratings (Ta = 25°C)

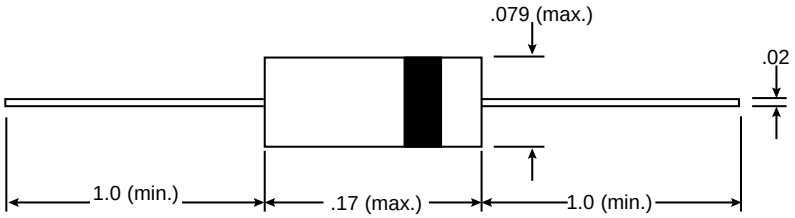
Characteristic	Symbol	Rating	Unit
Input Voltage	V_{IN}	40	V
Power Dissipation	P_D	500	mW
Operating Temperature	T_{opr}	-30 ~ 75	°C
Storage Temperature	Tstg	-55 ~150	°C

333-78L24F

(Unless otherwise specified, V_{IN}=33V, I_{OUT}=40mA, C_{IN}=0.33µF, C_{OUT}=0.1µF, 0°C≤T_j≤125°C

Characteristic	Symbol	Test Condition		Min.	Typ.	Max.	Unit
Output Voltage	V_{OUT}	Tj=25°C		22.8	24	25.2	V
Input Regulation	Reg. Line	Tj=25°C	27.5V ≤ V_{IN} ≤ 38V	-	35	350	mV
			28V ≤ V_{IN} ≤ 38V	-	30	300	
Load Regulation	Reg. Load	Tj=25°C	1.0mA ≤ I_{OUT} ≤ 100mA	-	40	200	mV
			1.0mA ≤ I_{OUT} ≤ 40mA	-	20	100	
Output Voltage	V_{OUT}	27.5V ≤ V_{IN} ≤ 38V 1.0mA ≤ I_{OUT} ≤ 40mA		22.32	-	25.68	V
		V_{IN} ≤ 33V, 1.0mA ≤ I_{OUT} ≤ 70mA		22.32	-	25.68	
Quiescent Current	I_B	Tj=25°C		-	3.2	6.5	mA
		Tj=125°C		-	-	6.0	
Quiescent Current Change	ΔI_B	28V ≤ V_{IN} ≤ 38V		-	-	1.5	mA
		1.0mA ≤ I_{OUT} ≤ 40mA		-	-	0.1	
Output Noise Voltage	V_{NO}	Ta=25°C, 10Hz ≤ f ≤ 100kHz		-	200	-	µV
Long Term Stability	$\Delta V_{OUT}/\Delta t$			-	56	-	mV/ 1.0 KHrs
Ripple Rejection	RR	f=120Hz 29V ≤ V_{IN} ≤ 39V, Tj=25°C		31	35	-	dB
Dropout Voltage	V_{IN} V_{OUT}	Tj=25°C		-	1.7	-	V
Average Temperature Coefficient of Output Voltage	TC_{VO}	I_{OUT}=5mA		-	-2.0	-	mV/°C

Dimensions (In.)



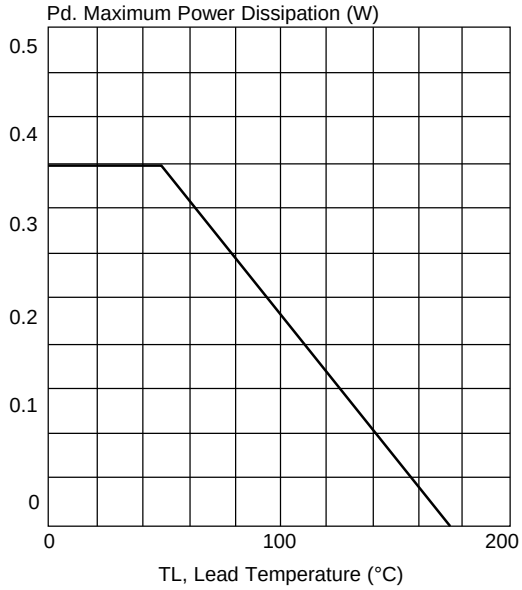
DO-35

A complete voltage series of JEDEC Zener Diodes in the popular 400mA power ratings. Excellent operating characteristic that reflect the superior capabilities of silicon diffused junctions with double heat sink construction. Standard voltage tolerance is ±5%. The devices are intended for general use as low power voltage regulators and high reliable voltage reference sources. Diodes are axial lead, hermetically sealed glass package offering protection from all environmental conditions.

Mechanical Characteristics:
- Marking: Cathode band plus 1N7XXA
- Case: Double slug, hermetically sealed
- Mounting position: Any

Vz Range 3.3V to 12V Current @ Izt
Maximum Ratings:

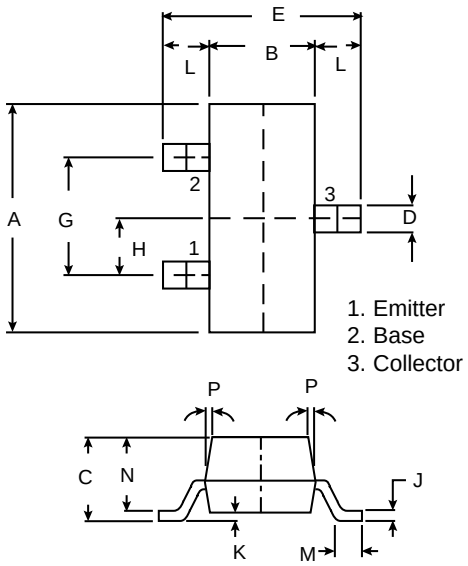
Item	Symbol	Absolute Maximum Value	Unit
Storage Temperature Range	Tstg	-65 to +175	C
Operating Junction Temp.	Tj	-65 to +175	C
DC Power Dissipation @ TL=50°C / Lead Length =3/8"	Pd	400	mW
Derating Power Dissipation @ TL=50°C Lead Length=3/8"		3.2	mW/C

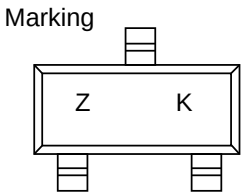


Device Type	Nominal Zener Voltage Vz @ Izt (V)	Test Current IZ (mA)	Max. Zener Impedance Zzt @ Izt (Ω)	Maximum Regulator Current Izm (mA)
1N746A	3.3	20	28	115
1N747A	3.6	20	24	105
1N748A	3.9	20	23	95
1N749A	4.3	20	22	90
1N750A	4.7	20	19	85
1N751A	5.1	20	17	75
1N752A	5.6	20	11	70
1N753A	6.2	20	7	64
1N754A	6.8	20	5	56
1N755A	7.5	20	6	51
1N756A	8.2	20	8	46
1N757A	9.1	20	10	42
1N758A	10	20	17	38
1N759A	12	20	30	31

MOUSER® ELECTRONICS

333-2N2369S
333-KTN2369AS NPN Fast Switch SS





SOT 23

Dim.	Inches
A	.115±.007
B	.051+.007 -.005
C	.051 Max.
D	.017+.005 -.001
E	.094+.011 -.007
G	.074
H	.037
J	.005+.003 -.001
K	0 - .003
L	.021
M	.007 Min.
N	.039+.007 -.003
P	7°

Maximum Rating (Ta=25°C)

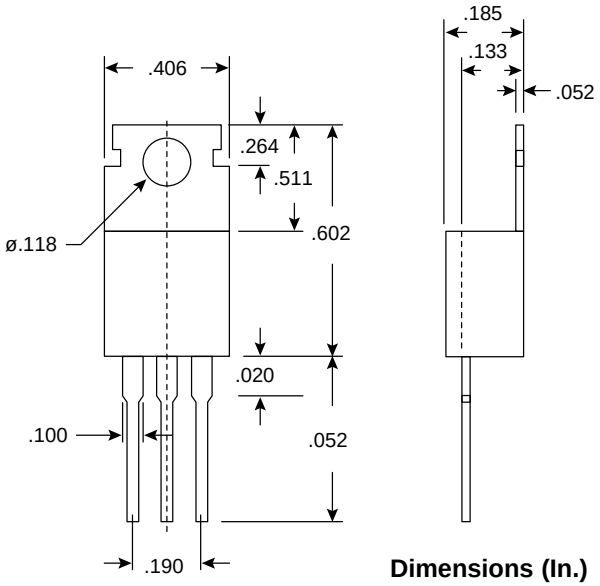
Characteristic	Symbol	Rating	Unit
Collector-Base Voltage	V_{CBO}	40	V
Collector-Emitter Voltage	V_{CEO}	15	V
Emitter-Base Voltage	V_{EBO}	4.5	V
Collector Current	I_C	500	mA
Collector Power Dissipation (Tc=25°C)	P_C*	350	mW
Junction Temperature	T_j	150	°C
Storage Temperature Range	T_{stg}	-55~150	°C

Pc*: Package mounted on 99.5% alumina 10x8x0.6mm

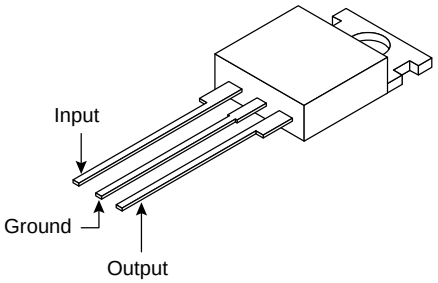
Electrical Characteristics (Ta=25°C)

Characteristic		Symbol	Test Condition	Min.	Max.	Unit
Collector Cut-off Current		I_{CBO}	V_{CB}=20V, I_E=0	-	0,4	µA
			V_{CB}=20V, IE=0, Ta=125°C	-	30	
Collector-Base Breakdown Voltage		$V_{(BR)CBO}$	I_C=10µA, I_E=0	40	-	V
Collector-Emitter Breakdown Voltage *		$V_{(BR)CEO}$	I_C=10ma, I_B=0	15	-	
Emitter-Base Breakdown Voltage		$V_{(BR)EBO}$	I_E=10µA, I_C=0	4.5	-	
DC Current Gain *	333-2N2369S	h_{FE}	I_C=10mA, V_{CE}=1.0V	40	120	
	333-KTN2369AS			-	120	
	333-2N2369S		I_C=10mA, V_{CE}=1.0V, Ta=-55°C	20	-	
	333-KTN2369AS		I_C=10mA, V_{CE}=0.35V, Ta=-55°C	20	-	
	333-KTN2369AS		I_C=100mA, V_{CE}=1.0V	20	-	
	333-2N2369S		I_C=100mA, V_{CE}=2.0V	20	-	
Collector-Emitter Saturation Voltage *		$V_{CE(sat)}$	I_C=10mA, I_B=1.0mA	-	0.25	V
Base-Emitter Saturation Voltage *		$V_{BE(sat)}$	I_C=10mA, I_B=1.0mA	0.70	0.85	V
Collector Output Capacitance		C_{ob}	V_{CB}=5.0V, I_E=0, f=1.0MHz	-	4.0	pF
Storage Time	333-KTN2369AS	t_{stg}	I_C=100mA, I_{B1}=I_{B2}=10mA, V_{CC}=10V	-	13	nS
Turn-On Time		t_{on}	I_C=10mA, I_{B1}=3.0mA, V_{CC}=3.0V I_{B2}=1.5mA	-	12	
Turn-Off Time	333-KTN2369AS	t_{off}	IC=10mA, I_{B1}=3.0mA, I_{B2}=1.5mA,V_{CC}=3.0V	-	15	

Note; *Pulse Test: Pulse Width ≤ 300µS, Duty Cycle ≤ 2.0%



Dimensions (In.)



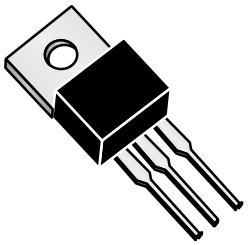
Maximum Ratings (Ta=25°C)

Specifications:

- Suitable for C-MOS, TTL, the other digital IC's power supply
- Internal thermal overload protection
- Internal short circuit current limiting
- Output current in excess of 1A
- Input Voltage (V_{IN}): 35V
- Power Dissipation (P_D): 20.8W (T_C=25°C)
- Operating Temperature (T_{opr}): -30~75˚C
- Storage Temperature (T_{stg}): -55~150˚C

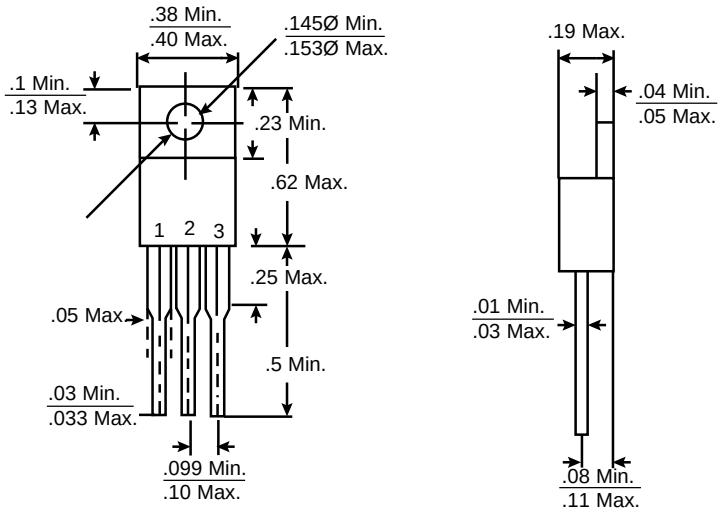
Electrical Characteristics (V_{IN}=15V, I_{OUT}=500mA, 0°C≤T_j≤125°C)

Characteristic	Symbol	Test Conditions		Min.	Typ.	Max.	Unit
Output Voltage	V_{OUT}	T_j=25°C, I_{OUT}=100mA		8.64	9.0	9.36	V
Input Regulation	Reg. line	T_j=25°C	11.5V≤V_{IN}≤26V	-	7.0	180	mV
			13V≤V_{IN}≤19V	-	2.5	90	
Load Regulation	Reg. load	T_j=25°C	5mA≤I_{OUT}≤1.4A	-	12	180	mV
			250mA≤I_{OUT}≤750mA	-	4.0	90	
Output Voltage	V_{OUT}	11.5V≤V_{IN}≤2.6V 5.0mA≤I_{OUT}≤1.0A, P_O<15W		8.55	-	9.45	V
Quiescent Current	I_B	T_j=25°C, I_{OUT}=5mA		-	4.3	8.0	mA
Quiescent Current Change	I_B	11.5V≤V_{IN}≤26V		-	-	1.0	mA
Output Noise Voltage	V_{NO}	Ta=25°C,10Hz≤f≤100kHz I_{OUT}=50mA		-	75	-	µV
Ripple Rejection	RR	f=120Hz, 12.5V≤V_{IN}≤22.5V I_{OUT}=50mA, T_j=25°C		56	72	-	dB
Dropout Voltage	V_D	I_{OUT}=1.0A, T_j=25°C		-	2.0	-	V
Short Circuit Current Limit	I_{SC}	T_j=25°C		-	1.0	-	A
Average Temperature Coefficient of Output Voltage	T_{CVO}	I_{OUT}=5mA, 0°C≤T_j≤125°C		-	-1.1	-	mV/deg



TO-220

Dimensions (In.)

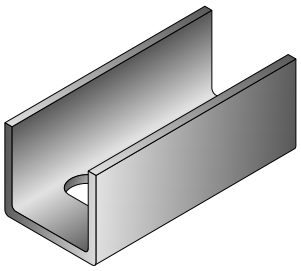


1. Gate 2. Drain 3. Source

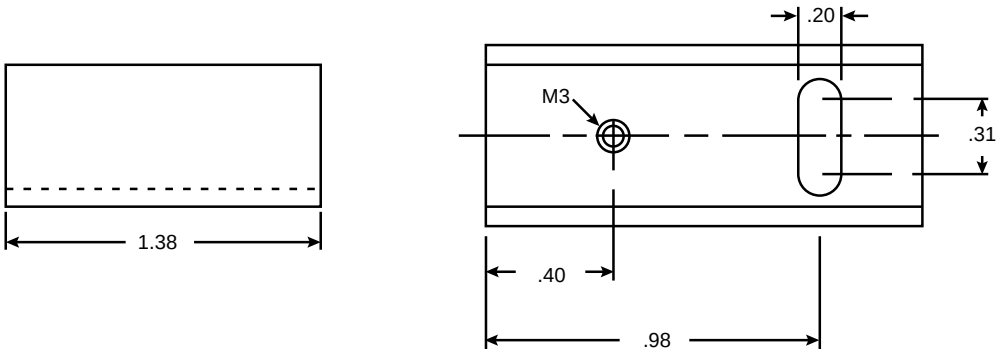
Mouser Stock No.	Drain Source Voltage (V)	On-state Resistance (Ω)	Continuous Drain Current (A)	Max Power Dissipation (watts)
333-IRF710	400	3.60	1.5	20
333-IRF711	350	3.60	1.5	20

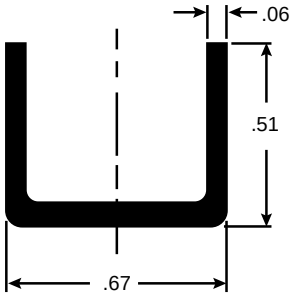
MOUSER® ELECTRONICS

ME332-4130 Heat Sink



Dimensions (In.)





Specifications:
- For TO-220 case types
- Standard U style (with holes)
- Thermal resistance (°C / W): 17°

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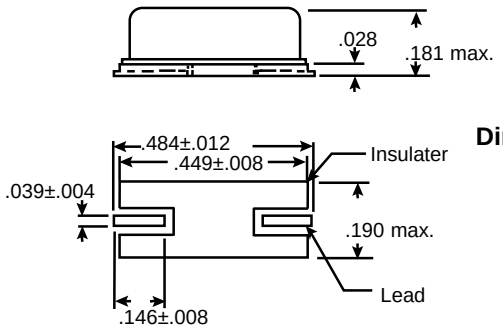
2-21-96



Dimensions (In.)

Specifications:

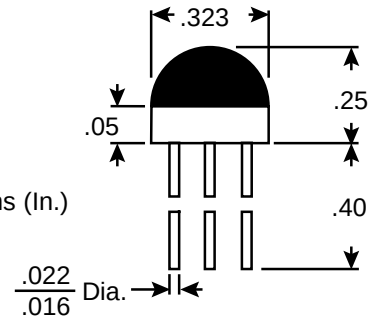
- Frequency range: 8.000MHz
- Calibration tolerance: ±50ppm (±0.005%) at +25°C
- Temperature stability tolerance: ±100ppm (±0.01%) over -20°C to + 70°C
- Shunt capacitance (Co): 5 pF max.
- Drive level (P): 1 mW max.
- Marking: AQL, part no., frequency
- Maximum effective series resistance: 60Ω

333-2N3567 is an NPN transistor used for small signal, general purpose amplifier applications.

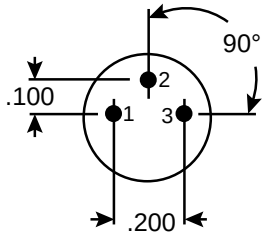
Absolute maximum ratings

Characteristics	Symbol	Value	Unit
Collector emitter voltage	V_{CEO}	40	V
Collector base voltage	V_{CBO}	80	V
Emitter base voltage	V_{EBO}	5	V
Collector current	I_{CM}	500	mA
Base current	I_B	100	mA
Power dissipation at Ta=25°C Tc=25°C	P_D	300 700	mW mW
Junction temperature	T_j	125	°C
Storage temperature	T_{stg}	-55 to +125	°C

Dimensions (In.)



1. Emitter
2. Base
3. Collector



Bottom View

Electrical characteristics (Ta=25°C unless otherwise specified)

Characteristics	Symbol	Test Conditions	Value		Unit
			Min.	Max.	
Collector emitter breakdown voltage	B_{VCEO}	IC=30mA, IB=0	40		V
Collector base breakdown voltage	B_{VCBO}	IC=0.1mA, IE=0	80		V
Base emitter ON voltage	$V_{BE\ (ON)}$	VCE=1V, IC=150mA		1.1	V
Collector leakage current	I_{CBO}	VCB=40V, IE=0 VCB=40V, IE=0, Ta=75°C		50 5	nA uA
Emitter base breakdown voltage	B_{VEBO}	IE=0.01mA, IC=0	5		V
Collector emitter saturation voltage *	$V_{CE(sat)}$	IC=150mA, IB=-15mA		0.25	V
DC current gain	h_{FE}	IC=150mA,VCE=1V IC=30mA,VCE=1V	40 40	120	
Emitter leakage current	I_{EBO}	VEB=4V, IC=0		25	nA
Output capacitance	C_{ob}	VCB=10V, IE=0, f=140 KHz		20	pF
High frequency current gain (same at fT)	h_{FE}	IC=50mA, VCE=10V, f=20MHz	3	30	
Input capacitance	C_{ib}	IC=0, VEB=0.5V, f=140KHz		80	pF

* Pulse characteristics: Pulse width = 300us, duty cycle = 1%

MOUSER® ELECTRONICS

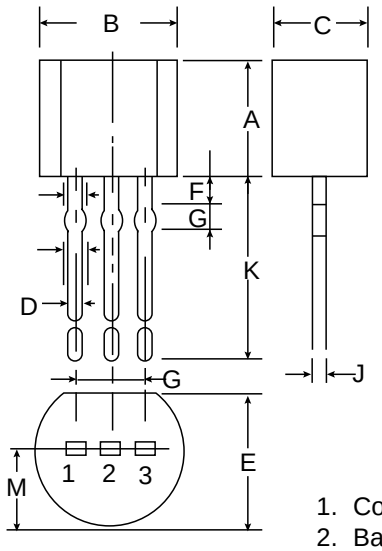
333-BC237
333-BC238
333-BC239

NPN Transistor

General Purpose Application.
Low Noise Amplifier Application (BC239)

Specifications:

- High voltage: BC237 V_{CEO}=45V
- Low noise: BC239 NF=0, 2dB (Typ.), 3dB (Max)
  (V_{CE}=6V, I_C=0, 1mA, f=1KHz)
- For Complementary with PNP type BC307/308/309.



Dim	Millimeters	
	Min.	Max.
A	4.45	4.55
B	4.55	4.65
C	3.45	3.55
D	0.40	0.52
E	3.45	3.55
F	0.90	1.10
G	1.20	1.35
H	0.80	0.90
I	0.35	0.55
K	13.5	14.5
L	-	0.50
M	2.25	2.35
N	-	0.05

1. Collector
2. Base
3. Emitter

Maximum Ratings						Electrical Characteristics (Ta=25°C)										
Mouser Stock No.	NPN or PNP	BVCB BVCES (V)	BVCEO BVCES (V)	I_C (mA)	P_P (mW)	ICBO ICES ICEX (nA)	Max VCS VCE +VCE (V)	hfe Typical Min.	hfe Typical Max.	I_C (mA)	VCE (mW)	Vcesat (V)	IC (mA)	Is (mA)	fr Min Typical (MHz)	Cob Max Typical (pF)
BC237	NPN	50	45	100	300	460	0.6	120	460	0.6	1.05	0.6	100	-100	150	4.5
BC238	NPN	30	20	100	300	800	0.6	120	800	0.6	1.05	0.6	100	-100	150	4.5
BC239	NPN	30	20	50	300	800	0.2	180	800	0.02	0.83	0.2	50	-50	150	4.5

Electrical Characteristics (Ta=25°C)

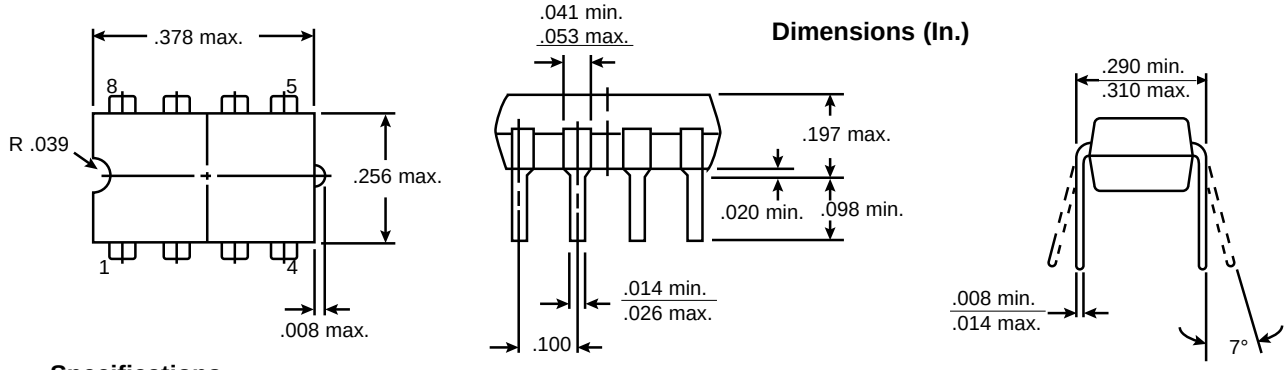
Characteristic		Symbol	Test Condition	Min.	Typ.	Max.	Unit
Collector Cut-off Current		I_{CBO}	VCE=50V, IE=0	-	-	15	nA
DC Current Gain (Note)	333-BC237	h_{FE}	VCE=5V, Ic=2mA	120	-	460	
	333-BC238			120	-	460	
	333-BC239			120	-	460	
Collector - Emitter Saturation Voltage	333-BC237	$V_{CE(sat)}$	IC=100mA, Is=5mA	-	-	0.6	V
	333-BC238			-	-	0.6	
	333-BC239		Ic=10mA, Is=mA	-	-	0.2	
Base - Emitter Saturation Voltage	333-BC237	$V_{BE(sat)}$	IC=100mA, Is=5mA	-	-	1.05	V
	333-BC238			-	-	1.05	
	333-BC239		Ic=10mA, Is=mA	-	-	0.83	
Basae - Emitter Voltage		$V_{BE(OK)}$	VCE=5V, Ic=2mA	0.55	-	0.7	V
Transition Frequency		f_r	VCE=5V, Ic=10mA, f=100MHz	150	250	-	MHz
Collector Output Capacitance		Cob	VCB=10V, F=1MHz	-	-	4.5	pF
Noise Figure	333-BC237	NF	VCE=6V, Ic=0,1mA Rg=10KΩ, f=1KHz	-	1	10	dB
	333-BC238			-	1	10	
	333-BC239			-	0.2	3	

Classification		A	B	C
h_{FE}	BC237	120~220	120~220	-
	BC238	120~220	120~220	300~800
	BC239	-	180~460	380~800

MOUSER® ELECTRONICS

333-KIA4559P Dual Operational Amplifier

Dimensions (In.)

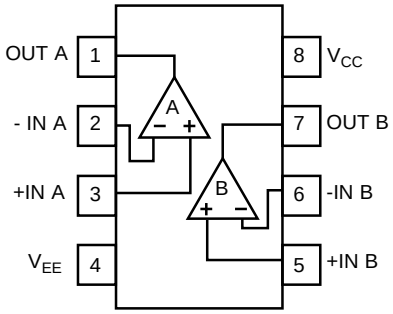


Specifications:

- Wide band decompensated (Av≥20dB)
- Wide band range: fT=5MHz (typ.)
- Suitable application for active filter, equalizer amp. and headphone amp.

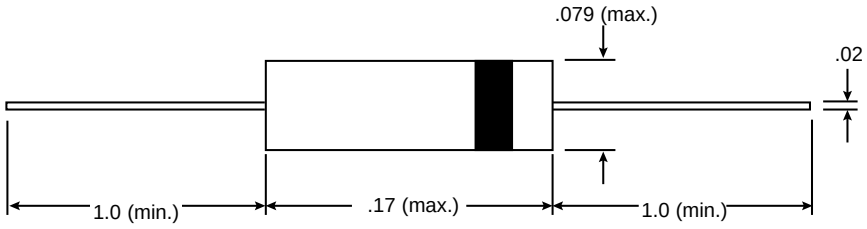
Maximum Ratings (Ta=25°C)

Characteristic	Symbol	Rating	Unit
Supply Voltage	V_{CC} V_{EE}	36 +18 0 or -18	V
Differential Input Voltage	DV_{IN}	±30	V
Input Voltage	V_{IN}	V_{CC}~V_{EE}	V
Power Dissipation	P_D	500	mW
Operating Temperature	T_{opr}	-40~85	°C
Storage Temperature	T_{stg}	-55~125	°C



Characteristics	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Input Offset Voltage	V_{IO}	Rg≤10kΩ	-	0.5	6	mV
Input Offset Current	I_{IO}	-	-	5	200	nA
Input Bias Current	I_I	-	-	60	500	nA
Common Mode Input Voltage	CMV_{IN}	-	±12	±14	-	V
	V_{OM}	R_L=10kΩ	±12	±14	-	
Maximum Output Voltage	V_{OMR}	R_L=2kΩ	±10	±13	-	V
Source Current	I_{source}	-	-	40	-	mA
Sink Current	I_{sink}	-	-	40	-	mA
Voltage Gain (Open Loop)	G_V	V_{OUT}=±10V, R_L=2kΩ	86	100	-	dB
Common Mode Input Signal Rejection Ratio	CMRR	Rg≤10kΩ	70	90	-	dB
Supply Voltage Rejection Ratio	SVRR	Rg≤10kΩ	-	30	150	μV/V
Slew Rate	SR	G_V=1, R_L=2kΩ	-	2.0	-	V/μs
Unity Gain Cross Frequency	f_T	Open Loop	-	5.0	-	MHz
Supply Current	I_{CC}, I_{EE}	-	-	4.0	6.0	mA
Equivalent Input Noise Voltage	V_{IN}	R_S=1kΩ, f=30Hz~30kHZ	-	2.5	-	μVrms

Dimensions (In.)



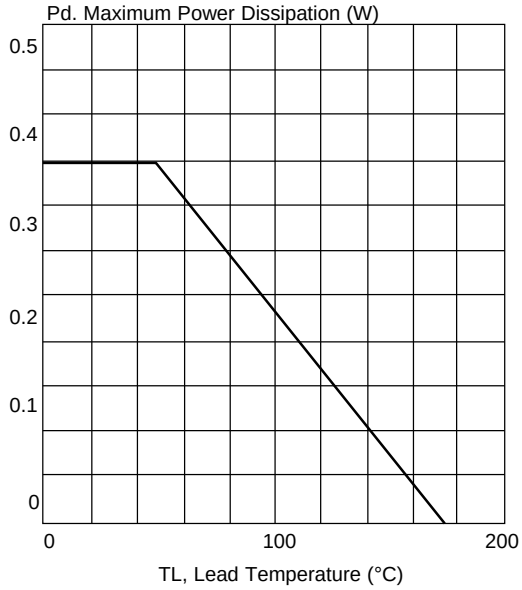
DO-35

A complete voltage series of JEDEC Zener Diodes in the popular 400mW power ratings. Excellent operating characteristic that reflect the superior capabilities of silicon diffused junctions with double heat sink construction. Standard voltage tolerance is ±5%. The devices are intended for general use as low power voltage regulators and high reliable voltage reference sources. Diodes are axial lead, hermetically sealed glass package offering protection from all environmental conditions.

Mechanical Characteristics:
- Marking: Cathode band plus 1N9XXB
- Case: Double slug, hermetically sealed.
- Mounting position: Any

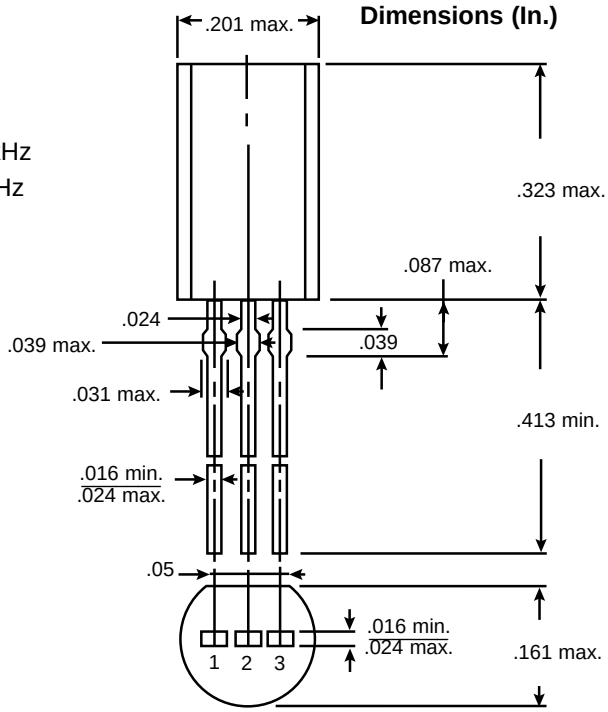
Vz Range 6.8V to 36V Current @ Izt
Maximum Ratings:

Item	Symbol	Absolute Maximum Value	Unit
Storage Temperature Range	Tstg	-65 to +175	C
Operating Junction Temp.	Tj	-65 to +175	C
DC Power Dissipation @ TL=50° C / Lead Length =3/8"	Pd	400	mW
Derating Power Dissipation @ TL=50° C Lead Length=3/8"		3.2	mW/C



Device Type	Nominal Zener Voltage Vz @ Izt (V)	Test Current IZ (mA)	Max. Zener Impedance Zzt @ Izt (Ω)	Maximum Regulator Current Izm (mA)
1N957B	6.8	18.5	4.5	47
1N958B	7.5	16.5	4.5	42
1N959B	8.2	15	6.5	38
1N960B	9.1	14	7.5	35
1N961B	10	12.5	8.5	32
1N962B	11	11.5	9.5	28
1N963B	12	10.5	11.5	26
1N964B	13	9.5	13	24
1N965B	15	8.5	16	21
1N966B	16	7.8	17	19
1N967B	18	7.0	21	17
1N968B	20	6.2	25	15
1N969B	22	5.6	29	14
1N970B	24	5.2	33	13
1N971B	27	4.6	41	11
1N972B	30	4.2	49	10
1N973B	33	3.8	58	9.2
1N974B	36	3.4	70	11

TO-92L



1. Emitter
2. Collector
3. Base

Specifications:

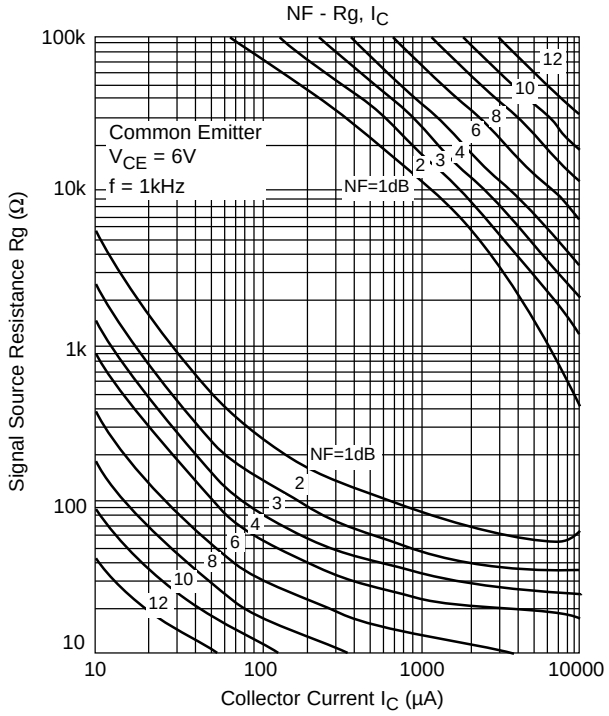
- Low noise: NF=4dB (typ), R_g=100Ω, V_{CE}=6V, I_C=100μA, f=1kHz
  NF=.5dB (typ), R_g=1kΩ, V_{CE}=6V, I_C=100μA, f=1kHz
- Low pulse noise: low 1/f noise
- High DC current gain: h_{FE} = 200~700
- High breakdown voltage: V_{CEO} = 120V

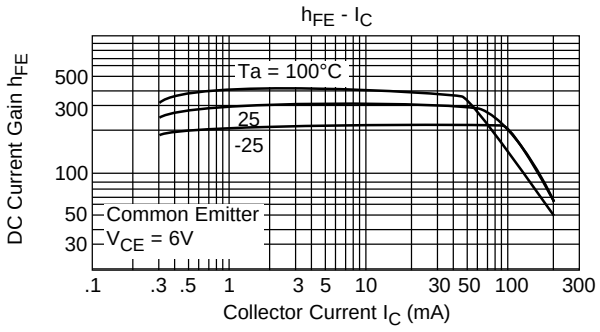
Maximum Ratings (Ta = 25°C)

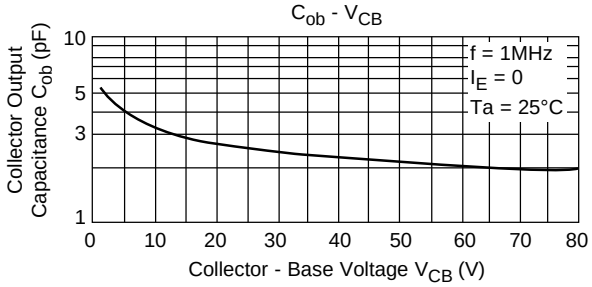
Characteristics	Symbol	Rating	Unit
Collector - Base Voltage	V_{CBO}	120	V
Collector - Emitter Voltage	V_{CEO}	120	V
Emitter - Base Voltage	V_{EBO}	5	V
Collector Current	I_C	100	mA
Emitter Current	I_E	-100	mA
Collector Power Dissipation	P_C	300	mW
Junction Temperature	T_j	125	°C
Storage Temperature Range	T_{stg}	-55~125	°C

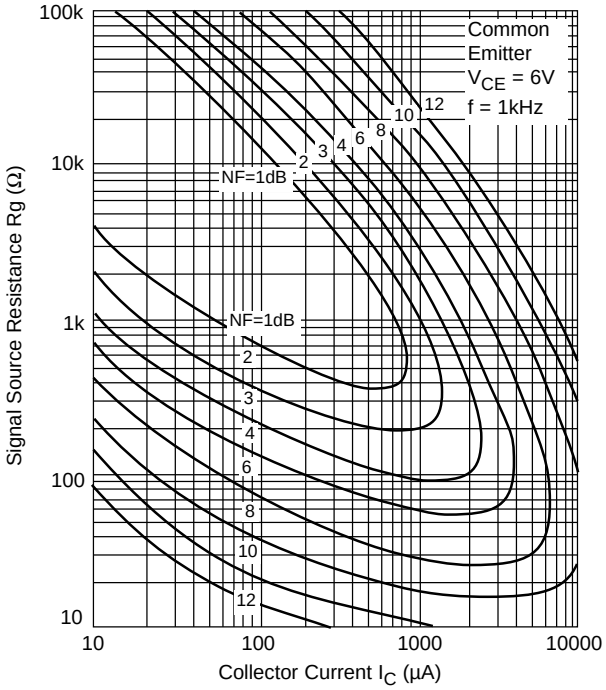
Electrical Characteristics (Ta = 25°C)

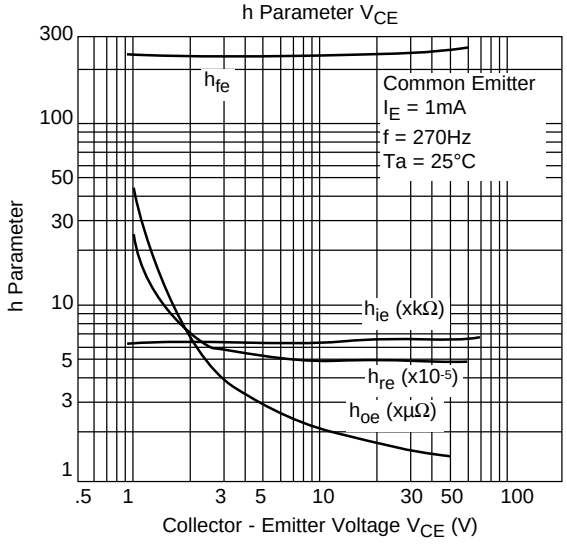
Characteristics	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Collector Cut-off Current	I_{CBO}	V_{CB}=120V, I_E=0	-	-	100	nA
Emitter Cut-off Current	I_{EBO}	V_{EB}=5V, I_C=0	-	-	100	nA
Collector-Emitter Breakdown Voltage	V_{CEO}	I_C=1mA, I_B=0	120	-	-	V
DC Current Gain	h_{FE}	V_{CE}=6V, I_C=2mA	200	-	700	
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	I_C=10mA, I_B=1mA	-	-	0.3	V
Base-Emitter Voltage	V_{BE}	V_{CE}=6V, I_C=2mA	-	0.65	-	V
Transition Frequency	f_T	V_{CE}=6V, I_C=1mA	-	100	-	MHz
Collector Output Capacitance	C_{ob}	V_{CB}=10V, I_E=0, f=1MHz	-	3.0	-	pF
Noise Figure	NF	V_{CE}=6V, I_C=100μA f=10Hz, Rg=10kΩ	-	-	6	dB
		V_{CE}=6V, I_C=100μA f=1kHz, Rg=10kΩ	-	-	2	
		V_{CE}=6V, I_C=100μA f=1kHz, Rg=100Ω	-	4	-	











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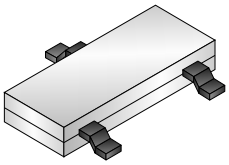
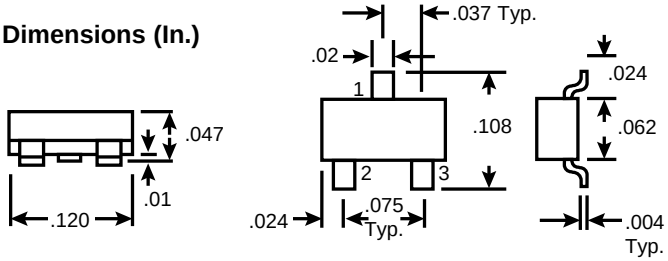


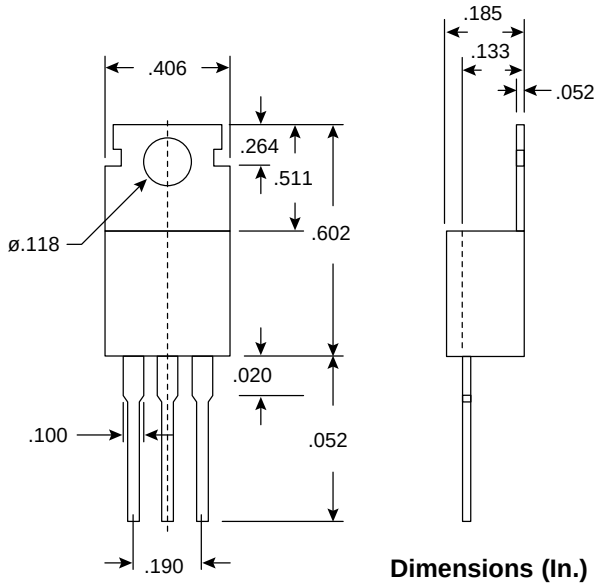
SOT-23

Dimensions (In.)

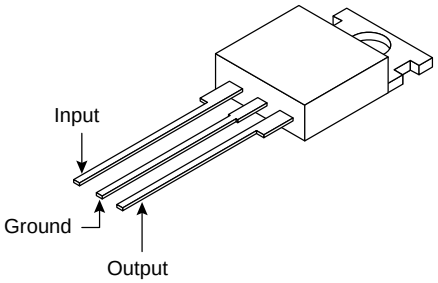


Pin	
1	Collector
2	Base
3	Emitter

Mouser Stock No.	V_{CEO}	I_C	Condition		h_{FE}		Condition		V_{CE}(sat)	V_{CE}(sat)	Condition		
			V_{CE}	I_C	Min.	Max.	I_C	I_B	Min.	Max.	V_{CE}	I_C	Min.
	(V)	(A)	(V)	(mA)			(mA)	(mA)	(V)	(V)	(V)	(mA)	(MHz)
333-MMBT3906	40	0.2	1	10	100	300	50	5	0.3	0.95	20	10	300



Dimensions (In.)



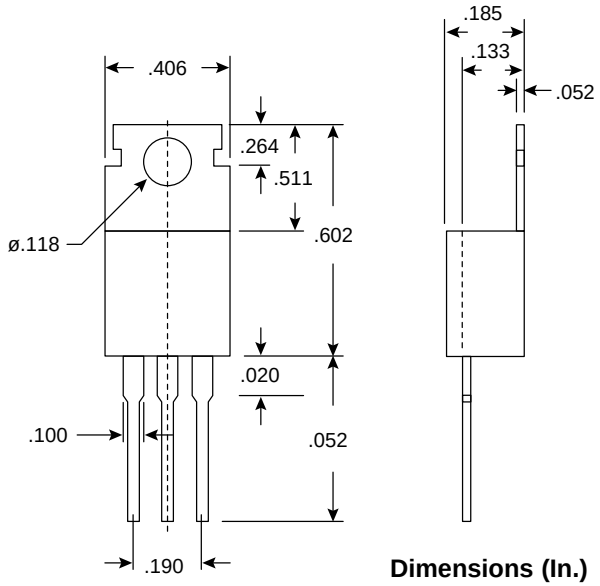
Maximum Ratings (Ta=25°C)

Specifications:

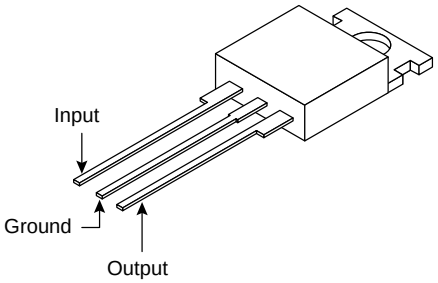
- Suitable for C-MOS, TTL, the other digital IC's power supply
- Internal thermal overload protection
- Internal short circuit current limiting
- Output current in excess of 1A
- Input Voltage (V_{IN}): 35V
- Power Dissipation (P_D): 20.8W (T_C=25°C)
- Operating Temperature (T_{opr}): -30~150˚C
- Storage Temperature (T_{stg}): -55~150˚C

Electrical Characteristics (V_{IN}=16V, I_{OUT}=500mA, 0°C≤T_j≤125°C)

Characteristic	Symbol	Test Conditions		Min.	Typ.	Max.	Unit
Output Voltage	V_{OUT}	T_j=25°C, I_{OUT}=100mA		9.6	10.0	10.4	V
Input Regulation	Reg. line	T_j=25°C	12.5V≤V_{IN}≤27V	-	8	200	mV
			14V≤V_{IN}≤20V	-	2.5	100	
Load Regulation	Reg. load	T_j=25°C	5mA≤I_{OUT}≤1.4A	-	12	200	mV
			250mA≤I_{OUT}≤750mA	-	4	100	
Output Voltage	V_{OUT}	12.5V≤V_{IN}≤25V 5.0mA≤I_{OUT}≤1.0A, P_O<15W		9.5	-	10.5	V
Quiescent Current	I_B	T_j=25°C, I_{OUT}=5mA		-	4.3	8.0	mA
Quiescent Current Change	I_B	12.5V≤V_{IN}≤27V		-	-	1.0	mA
Output Noise Voltage	V_{NO}	Ta=25°C,10Hz≤f≤100kHz I_{OUT}=50mA		-	8.0	-	µV
Ripple Rejection	RR	f=120Hz,13.5V≤V_{IN}≤23.5V I_{OUT}=50mA, T_j=25°C		5.5	72	-	dB
Dropout Voltage	V_D	I_{OUT}=1.0A, T_j=25°C		-	2.0	-	V
Short Circuit Current Limit	I_{SC}	T_j=25°C		-	0.9	-	A
Average Temperature Coefficient of Output Voltage	T_{CVO}	I_{OUT}=5mA, 0°C≤T_j≤25°C		-	-1.3	-	mV/deg



Dimensions (In.)



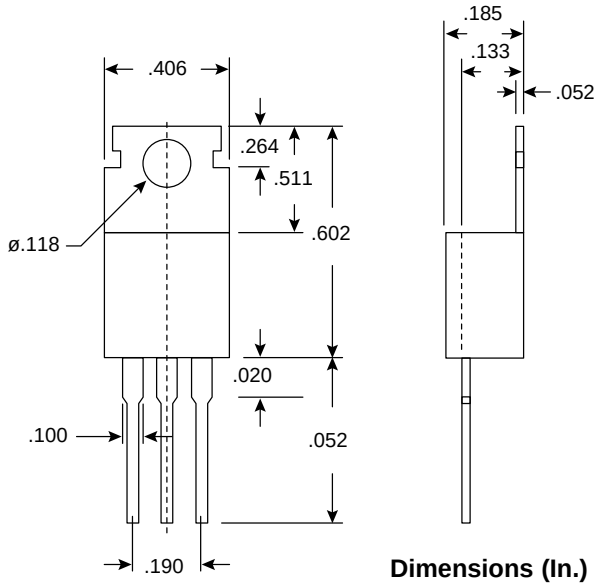
Maximum Ratings (Ta=25°C)

Specifications:

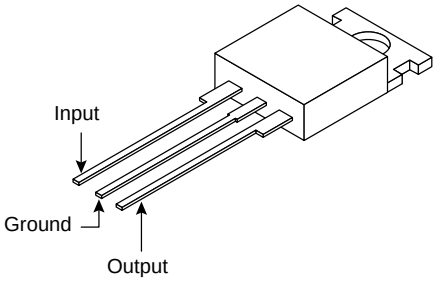
- Suitable for C-MOS, TTL, the other digital IC's power supply
- Internal thermal overload protection
- Internal short circuit current limiting
- Output current in excess of 1A
- Input Voltage (V_{IN}): 35V
- Power Dissipation (P_D): 20.8W (T_C=25°C)
- Operating Temperature (T_{opr}): -30~75˚C
- Storage Temperature (T_{stg}): -55~150˚C

Electrical Characteristics (V_{IN}=23V, I_{OUT}=500mA, 0°C≤T_j≤125°C)

Characteristic	Symbol	Test Conditions		Min.	Typ.	Max.	Unit
Output Voltage	V_{OUT}	T_j=25°C, I_{OUT}=100mA		14.4	15.0	15.6	V
Input Regulation	Reg. line	T_j=25°C	17.5V≤V_{IN}≤30V	-	11	300	mV
			20V≤V_{IN}≤26V	-	3	150	
Load Regulation	Reg. load	T_j=25°C	5mA≤I_{OUT}≤1.4A	-	12	200	mV
			250mA≤I_{OUT}≤750mA	-	4	150	
Output Voltage	V_{OUT}	17.5V≤V_{IN}≤30V 5.0mA≤I_{OUT}≤1.0A, P_O<15W		14.25	-	15.75	V
Quiescent Current	I_B	T_j=25°C, I_{OUT}=5mA		-	4.4	8.0	mA
Quiescent Current Change	I_B	17.5V≤V_{IN}≤30V		-	-	1.0	mA
Output Noise Voltage	V_{NO}	Ta=25°C,10Hz≤f≤100kHz I_{OUT}=50mA		-	110	-	µV
Ripple Rejection	RR	f=120Hz,18.5V≤V_{IN}≤28.5V I_{OUT}=50mA, T_j=25°C		54	70	-	dB
Dropout Voltage	V_D	I_{OUT}=1.0A, T_j=25°C		-	2.0	-	V
Short Circuit Current Limit	I_{SC}	T_j=25°C		-	0.5	-	A
Average Temperature Coefficient of Output Voltage	T_{CVO}	I_{OUT}=5mA, 0°C≤T_j≤125°C		-	-2.0	-	mV/deg



Dimensions (In.)



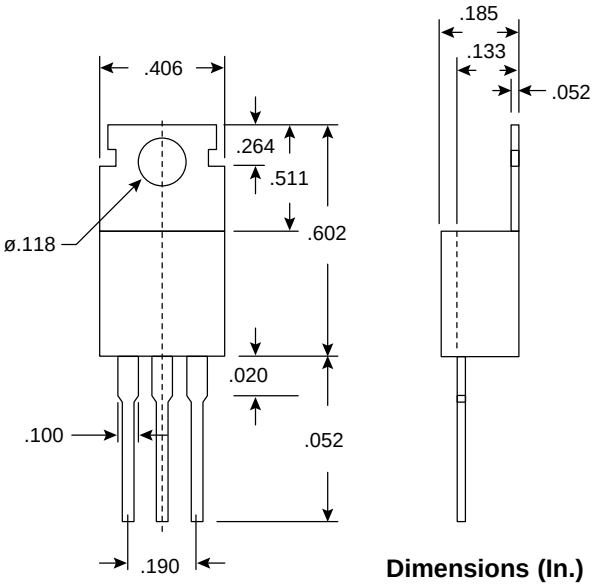
Maximum Ratings (Ta=25°C)

Specifications:

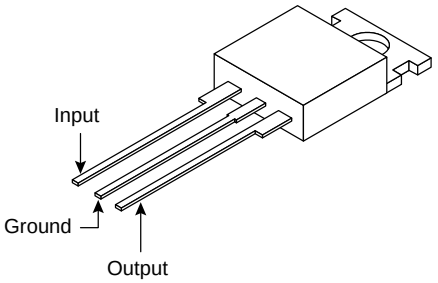
- Suitable for C-MOS, TTL, the other digital IC's power supply
- Internal thermal overload protection
- Internal short circuit current limiting
- Output current in excess of 1A
- Input Voltage (V_{IN}): 40V
- Power Dissipation (P_D): 20.8W (T_C=25°C)
- Operating Temperature (T_{opr}): -30~75˚C
- Storage Temperature (T_{stg}): -55~150˚C

Electrical Characteristics (V_{IN}=27V, I_{OUT}=500mA, 0°C≤T_j≤125°C)

Characteristic	Symbol	Test Conditions		Min.	Typ.	Max.	Unit
Output Voltage	V_{OUT}	T_j=25°C, I_{OUT}=100mA		17.3	18.0	18.7	V
Input Regulation	Reg. line	T_j=25°C	21V≤V_{IN}≤33V	-	13	360	mV
			24V≤V_{IN}≤30V	-	4	180	
Load Regulation	Reg. load	T_j=25°C	5mA≤I_{OUT}≤1.4A	-	12	360	mV
			250mA≤I_{OUT}≤750mA	-	4	180	
Output Voltage	V_{OUT}	21V≤V_{IN}≤33V 5.0mA≤I_{OUT}≤1.0A, P_O<15W		17.1	-	18.9	V
Quiescent Current	I_B	T_j=25°C, I_{OUT}=5mA		-	4.3	8.0	mA
Quiescent Current Change	I_B	21V≤V_{IN}≤33V		-	-	1.0	mA
Output Noise Voltage	V_{NO}	Ta=25°C,10Hz≤f≤100kHz I_{OUT}=50mA		-	125	-	µV
Ripple Rejection	RR	f=120Hz,18.5V≤V_{IN}≤28.5V I_{OUT}=50mA, T_j=25°C		52	68	-	dB
Dropout Voltage	V_D	I_{OUT}=1.0A, T_j=25°C		-	2.0	-	V
Short Circuit Current Limit	I_{SC}	T_j=25°C		-	0.4	-	A
Average Temperature Coefficient of Output Voltage	T_{CVO}	I_{OUT}=5mA, 0°C≤T_j≤125°C		-	-2.5	-	mV/deg



Dimensions (In.)



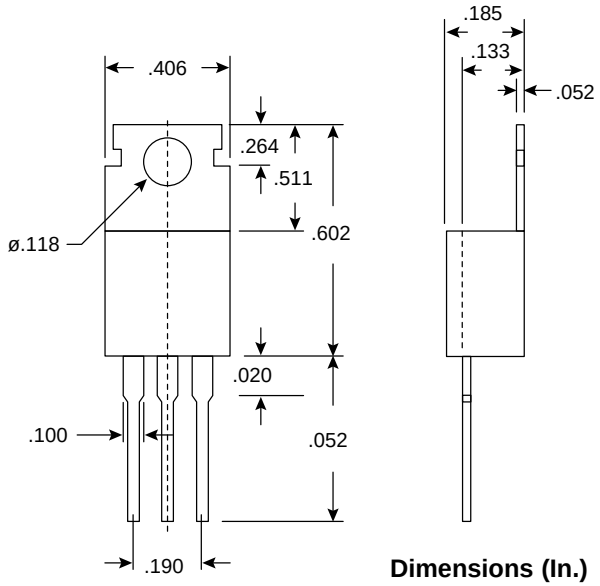
Maximum Ratings (Ta=25°C)

Specifications:

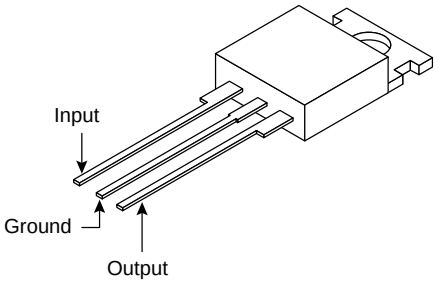
- Suitable for C-MOS, TTL, the other digital IC's power supply
- Internal thermal overload protection
- Internal short circuit current limiting
- Output current in excess of 1A
- Input Voltage (V_{IN}): 40V
- Power Dissipation (P_D): 20.8W (T_C=25°C)
- Operating Temperature (T_{opr}): -30~75˚C
- Storage Temperature (T_{stg}): -55~150˚C

Electrical Characteristics (V_{IN}=23V, I_{OUT}=500mA, 0°C≤T_j≤125°C)

Characteristic	Symbol	Test Conditions		Min.	Typ.	Max.	Unit
Output Voltage	V_{OUT}	T_j=25°C, I_{OUT}=100mA		19.2	20.0	20.8	V
Input Regulation	Reg. line	T_j=25°C	23V≤V_{IN}≤25V	-	15	400	mV
			26V≤V_{IN}≤32V	-	5	200	
Load Regulation	Reg. load	T_j=25°C	5mA≤I_{OUT}≤1.4A	-	12	400	mV
			250mA≤I_{OUT}≤750mA	-	4	200	
Output Voltage	V_{OUT}	23V≤V_{IN}≤35V 5.0mA≤I_{OUT}≤1.0A, P_O<15W		19.0	-	21.0	V
Quiescent Current	I_B	T_j=25°C, I_{OUT}=5mA		-	4.6	8.0	mA
Quiescent Current Change	I_B	23V≤V_{IN}≤35V		-	-	1.0	mA
Output Noise Voltage	V_{NO}	Ta=25°C,10Hz≤f≤100kHz I_{OUT}=50mA		-	135	-	µV
Ripple Rejection	RR	f=120Hz,24V≤V_{IN}≤34V I_{OUT}=50mA, T_j=25°C		50	66	-	dB
Dropout Voltage	V_D	I_{OUT}=1.0A, T_j=25°C		-	2.0	-	V
Short Circuit Current Limit	I_{SC}	T_j=25°C		-	0.4	-	A
Average Temperature Coefficient of Output Voltage	T_{CVO}	I_{OUT}=5mA, 0°C≤T_j≤125°C		-	-3.0	-	mV/deg



Dimensions (In.)



Maximum Ratings (Ta=25°C)

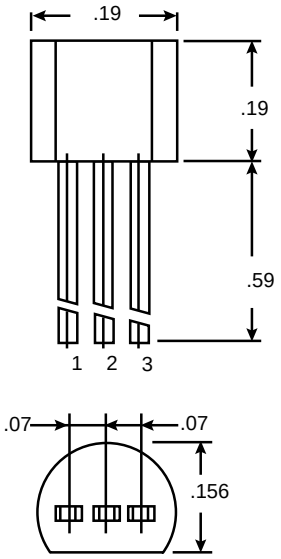
Specifications:

- Suitable for C-MOS, TTL, the other digital IC's power supply
- Internal thermal overload protection
- Internal short circuit current limiting
- Output current in excess of 1A
- Input Voltage (V_{IN}): 40V
- Power Dissipation (P_D): 20.8W (T_C=25°C)
- Operating Temperature (T_{opr}): -30~75˚C
- Storage Temperature (T_{stg}): -55~150˚C

Electrical Characteristics (V_{IN}=23V, I_{OUT}=500mA, 0°C≤T_j≤125°C)

Characteristic	Symbol	Test Conditions		Min.	Typ.	Max.	Unit
Output Voltage	V_{OUT}	T_j=25°C, I_{OUT}=100mA		23.0	24.0	25.0	V
Input Regulation	Reg. line	T_j=25°C	27V≤V_{IN}≤38V	-	18	480	mV
			30V≤V_{IN}≤36V	-	6	240	
Load Regulation	Reg. load	T_j=25°C	5mA≤I_{OUT}≤1.4A	-	12	480	mV
			250mA≤I_{OUT}≤750mA	-	4	240	
Output Voltage	V_{OUT}	27V≤V_{IN}≤38V 5.0mA≤I_{OUT}≤1.0A, P_O<15W		22.8	-	25.2	V
Quiescent Current	I_B	T_j=25°C, I_{OUT}=5mA		-	4.6	8.0	mA
Quiescent Current Change	I_B	27V≤V_{IN}≤38V		-	-	1.0	mA
Output Noise Voltage	V_{NO}	Ta=25°C,10Hz≤f≤100kHz I_{OUT}=50mA		-	150	-	µV
Ripple Rejection	RR	f=120Hz, 28V≤V_{IN}≤38V I_{OUT}=50mA, T_j=25°C		50	66	-	dB
Dropout Voltage	V_D	I_{OUT}=1.0A, T_j=25°C		-	2.0	-	V
Short Circuit Current Limit	I_{SC}	T_j=25°C		-	0.3	-	A
Average Temperature Coefficient of Output Voltage	T_{CVO}	I_{OUT}=5mA, 0°C≤T_j≤125°C		-	-3.5	-	mV/deg

Dimensions (In.)

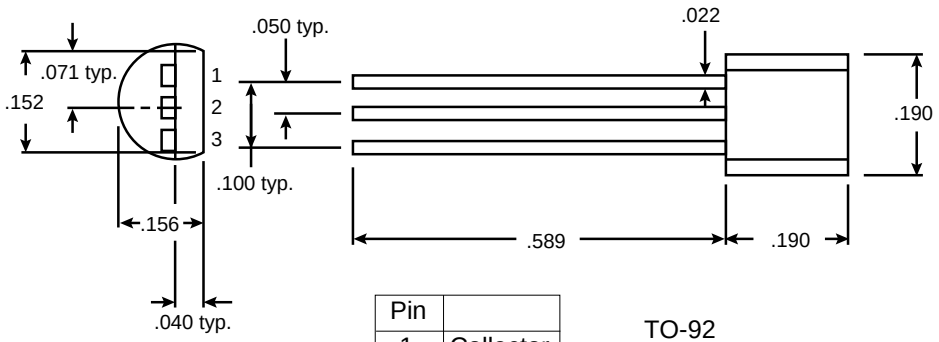


Pin Configuration
1. Emitter
2. Base
3. Collector

TO-92

V_{CE} (V)	I_C (A)	h_{FE}	V_{CE} (V)	I_C (mA)	V_{CE}(sat) max. (V)	V_{BE}(sat) max. (V)	I_C (mA)	I_B (mA)	f_T typ. (MHz)	V_{CE} (V)	I_C (mA)	Cob max. (pF)
45	0.1	110~220	5	2	0.65	0.9	100	5	150	5	10	4.5

Dimensions (In.)



Pin	
1	Collector
2	Base
3	Emitter

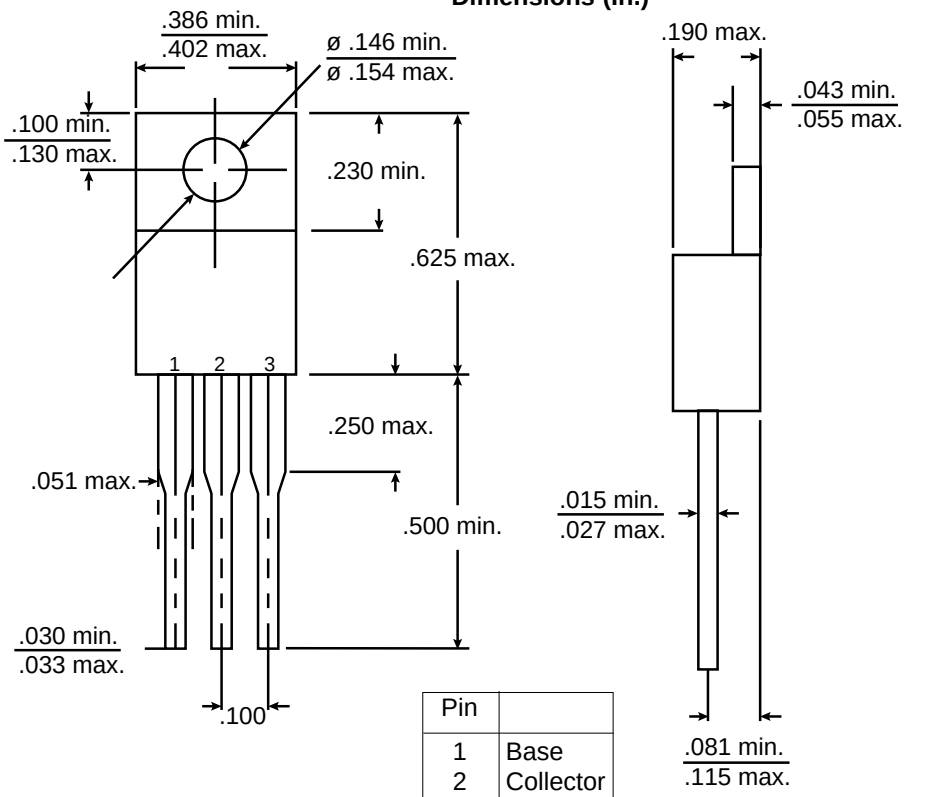
TO-92

Specifications:

• Operating temperature: -55°C to +150°C

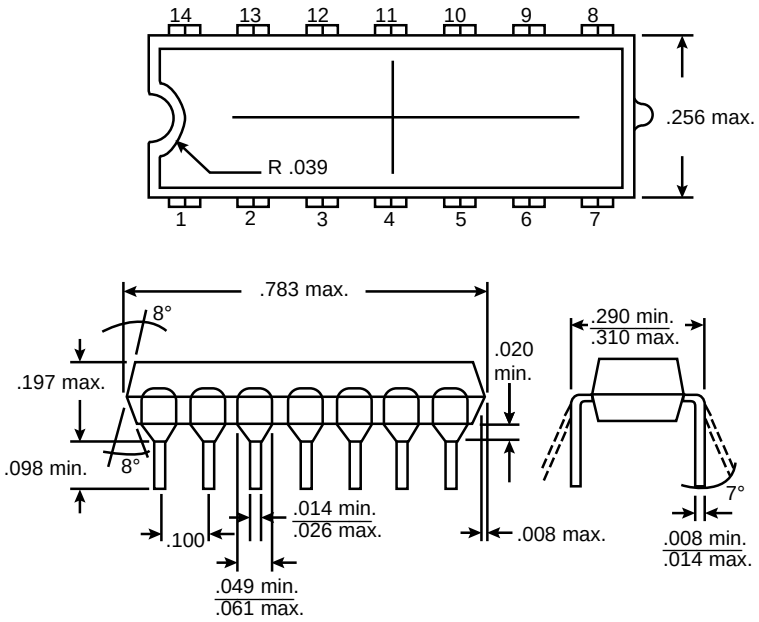
		Condition		hFE		Condition		$V_{CE(sat)}$	$V_{BE(sat)}$	Condition		f_T
V_{CEO}	I_C	V_{CE}	I_C	Min.	Max.	I_C	I_B	Max.	Max.	V_{CE}	I_C	Min.
(V)	(A)	(V)	(mA)			(mA)	(mA)	(V)	(V)	(V)	(mA)	(MHz)
40	0.20	1	10	100	300	50	5.0	0.30	0.95	20	10	300

Dimensions (In.) TO-220



Pin	
1	Base
2	Collector
3	Emitter

I_C (A)	V_{CBO} (V)	V_{CEO} (V)	P_D (W)	H_{FE} (Min./Max.)	I_C/V_{CE} (A/V)	$V_{CE(sat)}$ (V)	I_C/I_B (A/mA)
4	700	400	75	8.0/60	2.0/5	1.0	4.0/1000



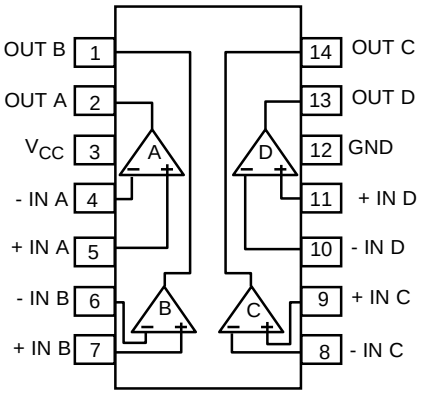
DIP - 14

Specifications:

This device consists of four independent voltage comparator that are designed to operate from a single power supply over a wide range of voltage. Normal operation from dual supplies are also to be guaranteed on voltage range from 2V to 36V. V_{CC} needs to be 1.5 volts more than the input common mode voltage. The output can be connected to other open collector outputs to achieve wired-OR relationship.

- Single supply voltage range or dual supplies: $2V_{DC}$ to $36V_{DC}$ or $\pm 18V_{DC}$
- Low supply current: 0.8mA (Typ.)
- Low input offset voltage: ±2mV (Typ.)
- Wide input common mode voltage range: $0V_{DC}$ to V_{CC}-$1.5V_{DC}$
- Output compatible with TTL, DTL, MOS sand CMOS logic system
- The output can be connected to achieve wired-OR relation

Pin Connection



Maximum Ratings (Ta = 25°C)

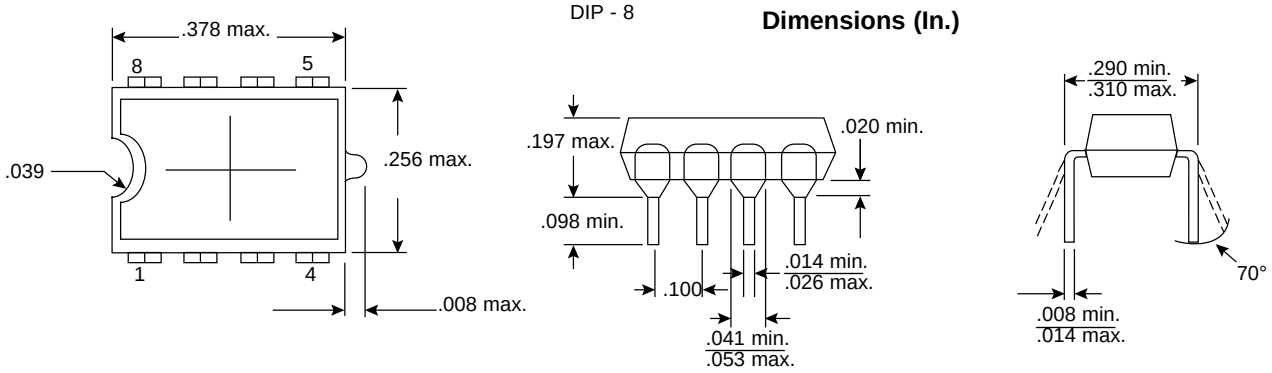
Characteristic		Symbol	Rating
Supply Voltage		V_{CC}	±18~36V
Differential Input Voltage		DV_{IN}	±36V
Common Mode Input Voltage		T_j	-0.3~V_{CC}V
Power Dissipation	KIA393P	T_j	625mW
			280mW
Operating Temperature		T_{opr}	-40°C ~ -85°C
Storage Temperature		T_{stg}	-55°C ~125°C

Electrical Characteristics (V_{CC}=56V,Ta = 25°C)

Characteristic	Symbol	Test Condition	Min.	Typ.	Max.
Input Offset Voltage	V_{IO}	V_O=1.4V	-	2mV	5mV
Input Bias Current	I_I	-	-	25nA	250nA
Input Offset Current	I_{IO}	-	-	5nA	50nA
Common Mode Input Voltage	CMV_{IN}	-	0	-	V_{CC}-1.5V
Voltage Gain	G_V	R_L=15KΩ	-	200V/mV	-
Supply Current	I_{CC}	No Load	-	0.8mA	2mA
Sink Current	I_{sink}	+IN=OV, -IN=1V V_{OL}=1.5V	6mA	16mA	-
Output Voltage ("L" Level)	V_{OL}	+IN=OV, -IN=1V I_{sunk}=3mA	-	0.2V	0.4V
Output Leak Current	I_{LEAK}	+IN=1V, -IN=OV, V_O=5V	-	0.1nA	-
Response Time	t_{rsp}	R_L=5.1kΩ, C_L=15pF	-	1.3µs	-

DIP - 8

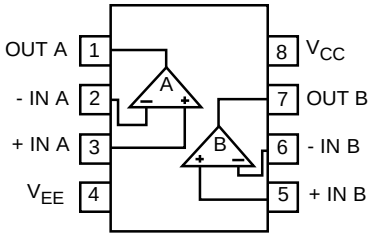
Dimensions (In.)



Specifications:

- Allows you to operate @ the wide range single or two supply voltage
- Low supply voltage
- Low supply current: I_{CC}=0.8mA (Typ.)
- Wide common mode input voltage: OV_{DC}~V_{CC}-1.5V_{DC}
- Output is compatible with TTL, DTL, MOS and C-MOS
- Output is open collector and wired-OR possible

Pin Connection



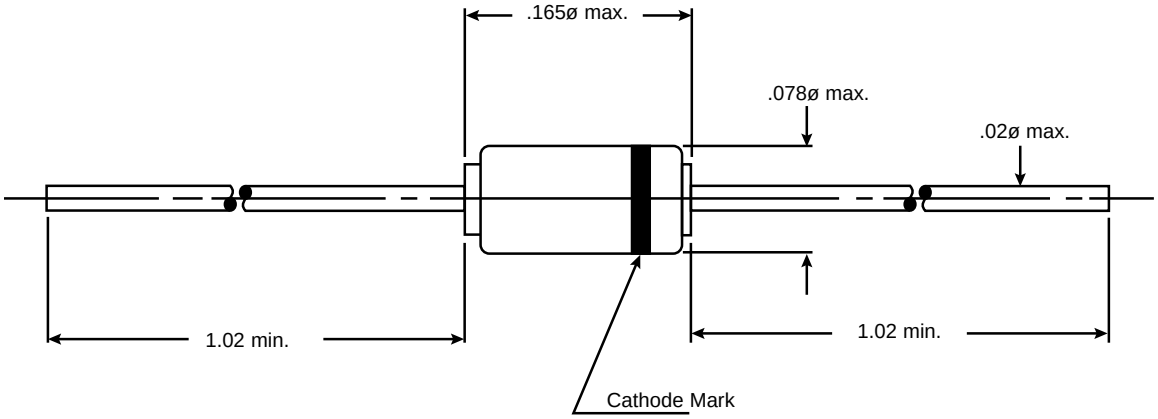
Maximum Ratings (Ta = 25°C)

Characteristic		Symbol	Rating
Supply Voltage		V_{CC}	36±18V
Differential Input Voltage		DV_{IN}	36±18V
Common Mode Input Voltage		CMV_{IN}	-0.3~V_{CC}V
Power Dissipation	KIA393P	PP	500mW
	KIA393F		240mW
Operating Temperature		T_{opr}	-40°C ~ 85°C
Storage Temperature		T_{stg}	-55°C ~125°C

Electrical Characteristics (V_{CC}=56V,Ta = 25°C)

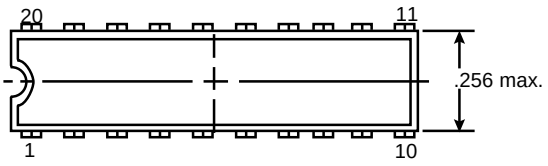
Characteristic	Symbol	Test Condition	Min.	Typ.	Max.
Input Offset Voltage	V_{IO}	V_O=1.4V	-	2mV	5mV
Input Bias Current	I_I	-	-	25nA	250nA
Input Offset Current	I_{IO}	-	-	5nA	50nA
Common Mode Input Voltage	CMV_{IN}	-	0	-	V_{CC}-1.5V
Voltage Gain	G_V	R_L=15KΩ	-	200V/mV	-
Supply Current	I_{CC}	No Load	-	0.8mA	2mA
Sink Current	I_{sink}	+IN=OV, -IN=1V V_{OL}=1.5V	6mA	16mA	-
Output Voltage ("L" Level)	V_{OL}	+IN=OV, -IN=1V I_{sunk}=3mA	-	0.2V	0.4V
Output Leak Current	I_{LEAK}	+IN=1V, -IN=OV, V_O=5V	-	0.1nA	-
Response Time	t_{rsp}	R_L=5.1kΩ, C_L=15pF	-	1.3µs	-

Dimensions (In.)



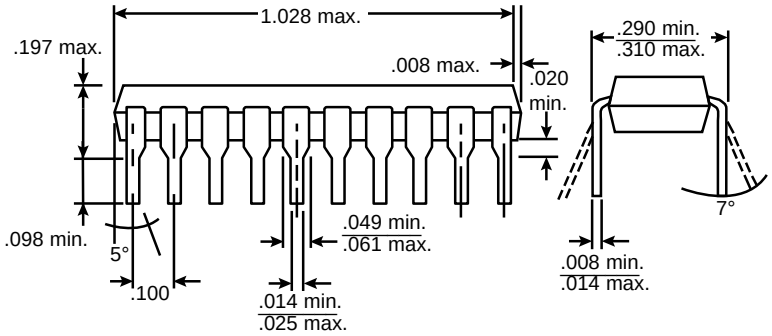
Specifications (Ta=25°C):

- Peak voltage V_{RM}: 100(V)
- Continuous reverse current I_R max V_R: 5000(nA), 75(V)
- Forward voltage V_F max @ I_F: 1.0(V), 10(mA)
- Capacitance C max: 4(pF)
- Reverse recovery time trr max: 4(nS)
- Power dissipation Pd: 250(mW)
- Operating & storage temperature: -65°C ~ +175°C



DIP - 20

Dimensions (In.)



The KIA6035P is a high performance AM electronic tuner IC that is greatly improved in cross modulation characteristic. It is especially suited for use in car radio and home stereo (antenna: loop) application.

Functions:

- Mix
- OSC (with ALC)
- IF amp
- Detector
- AGC (normal)
- RF wide band AGC
- Auto search stop signal (signal meter output)
- Local oscillation buffer output
- Others

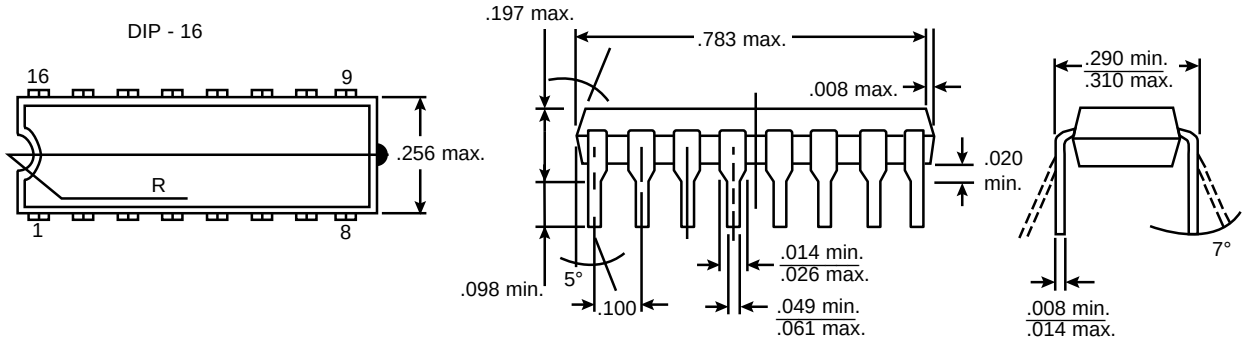
Specifications:

- Excellent cross modulation characteristic.
- The narrow-band signal meter output is usable as auto search stop signal.
- Local oscillation buffer output.
- The OSC with ALC improves tracking error.
- Double-balanced differential mix.
- Low noise: 56dB (Typ.)
- Usable sensitivity: 25dBμ (@ S/N=20dB)
- Wide supply voltage: V_{CC}=7.5V~12V

Maximum Ratings (Ta = 25°C)

Characteristic	Symbol	Rating	Unit
Supply Voltage	V_{CC}	16	V
Output Voltage	V_{out}	24	V
Input Voltage	V_{IN}	5.6	V
Supply Current	I_{CC}	41	mA
Flow-out Current	I_{18}	2	mA
	I_{20}	2	
Power Dissipation	P_D	730	mW
Operating Temperature	T_{opr}	-30~85	°C
Storage Temperature	T_{stg}	-55~150	°C

Dimensions (In.)



Specifications:

- Low supply current, AM: 7mA, FM: 10mA (Typ.)
- Few external parts
- Excellent tweet
- Low overload distortion
- Tuning indicator LED driving capability: I_{LAMP}=10mA (max.)
- Built-in AM/FM mode switch
- Common output for AM/FM
- Operating supply voltage range: $V_{CC(opr)}$=3~8V (Ta=25°C)

Maximum Ratings (Ta = 25°C)

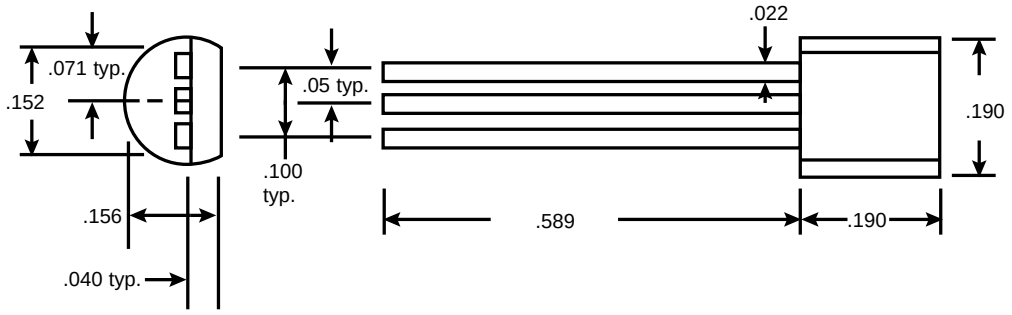
Characteristic	Symbol	Rating	Unit
Supply Voltage	V_{CC}	8	V
Lamp Current	I_{LAMP}	10	mA
Power Dissipation (Note)	P_D	750	mW
Operating Temperature	T_{opr}	-25~75	°C
Storage Temperature	T_{stg}	-55~150	°C

Electrical Characteristics

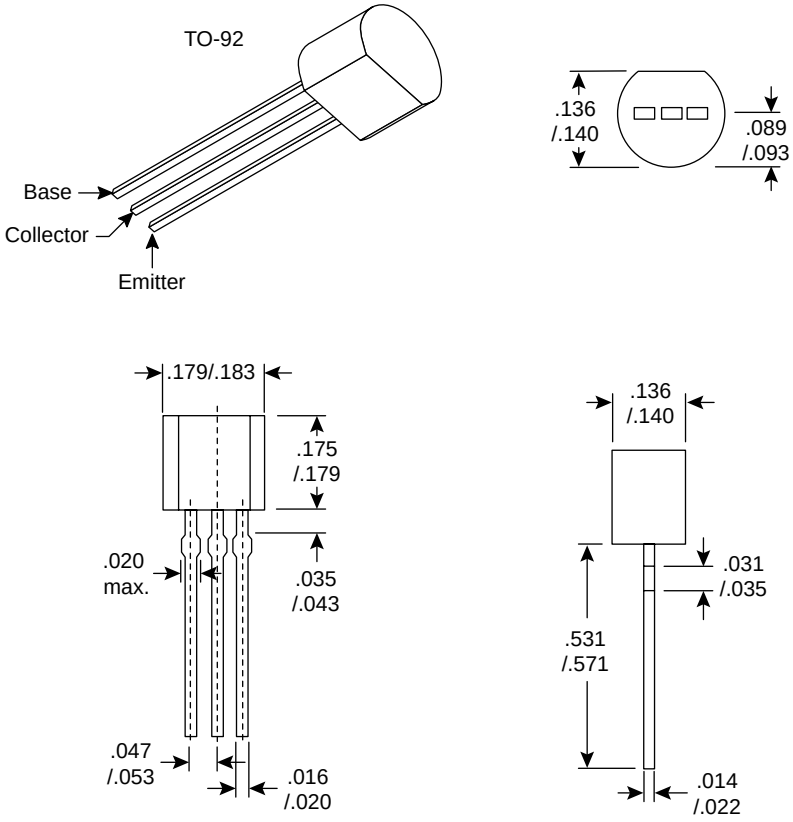
1. DC characteristics (V_{CC}=5V, Terminal voltage at no signal)

Pin No.	Item	Symbol	Typ.		Unit
			AM	FM	
1	(AM MIX IN)	V_1	1.5	0	V
2	(AM MIX BYPASS)	V_2	1.5	0	V
3	(AM OSC)	V_3	2.3	2.3	V
4	(REG)	V_4	2.3	2.3	V
5	(AM IF OUT)	V_5	1.0	0.9	V
6	(METER OU)	V_6	1.0	0.9	V
7	(LED)	V_7	-	-	V
8	(GND)	V_8	0	0	V
9	(DET OUT)	V_9	1.4	1.5	V
10	Vcc)	V_{10}	5.0	5.0	V
11	(FM DET)	V_{11}	5.0	5.0	V
12	AM IF BYPASS)	V_{12}	1.5	1.5	V
13	(AM IF IN)	V_{13}	1.5	1.5	V
14	(FM IF BYPASS)	V_{14}	1.5	1.5	V
15	(FM IF IN)	V_{15}	1.5	1.5	V
16	(AM MIX OUT)	V_{16}	5.0	5.0	V

Dimensions (In.)



Mouser Stock No.	V_{CEO}	I_C	Condition		h_{FE}		Condition		V_{CE}(sat)	V_{BE}(sat)	Condition		f_T
			V_{CE}	I_C	Min.	Max.	I_C	I_B	Max.	Max.	V_{CE}	I_C	Min.
	(V)	(A)	(V)	(mA)			(mA)	(mA)	(V)	(V)	(V)	(mA)	(MHz)
333-PN2222A	40	0.6	10	150	100	300	500	50	1.6	2.6	20	20	300
333-PN2222	30	0.6	10	150	100	300	500	50	1.6	2.6	20	20	250

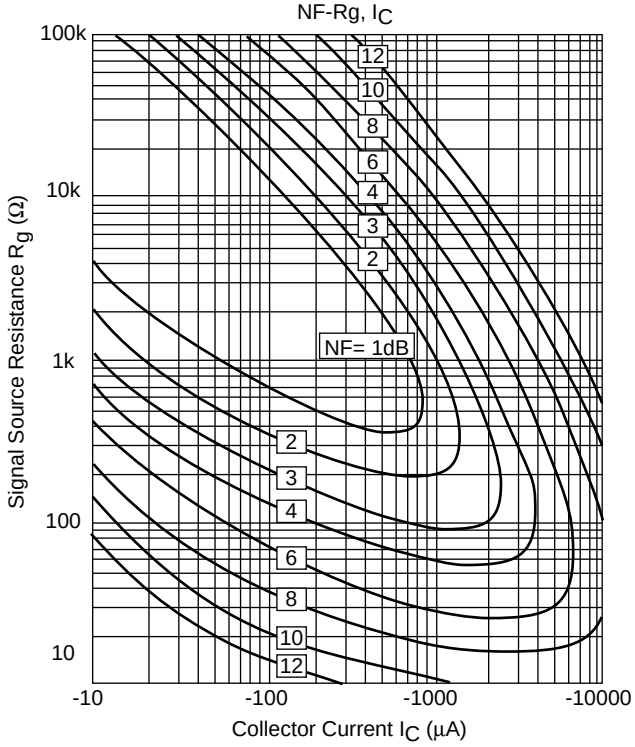


Dimensions (In.)
(min./max.)

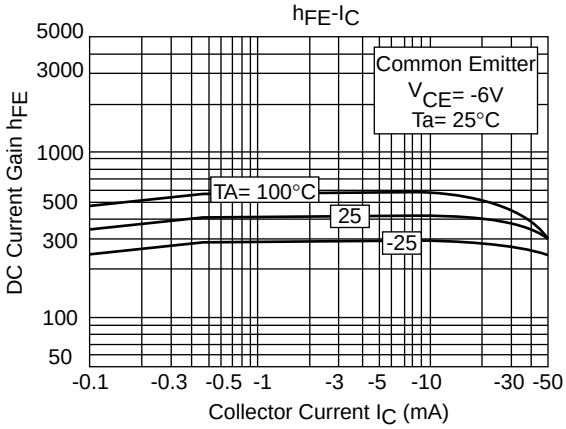
Specifications:

- Type: PNP audio amplifier
- Low noise (V_{CE} = -6V, I_C = 100µA):
  NF= 3dB typ. Rg= 100Ω, f= 1kHz
  NF= .5dB typ. Rg= 1KΩ, f=1kHz
  NF= 6dB max. Rg= 10KΩ, f=10Hz
  NF= 2dB max. Rg= 10KΩ, f=1kHz
- High DC current gain: h_{FE}= 200~700
- High voltage: V_{CEO}= -120V
- Low pulse noise: low 1/f noise
- V_{CBO}: -120V max.
- V_{CEO}: -120V max.
- V_{EBO}: -5V max.
- I_C: -100mA max.
- I_E: 100mA max.
- P_C: 300mW max.
- T_j: +125°C max.
- T_{stg}: -55~+125°C max.
- I_{CBO}: -100nA max. V_{CB}= -120, I_E= 0
- I_{EBO}: -100nA max. V_{EB}= -5V, I_C= 0
- h_{FE}: 200 min./700 max. V_{CE}= -6V, I_C= -2mA
- $V_{CE(sat)}$: -.3V max. I_C= -10mA, I_B= -1mA
- V_{BE}: -.65V typ. V_{CE}= -6V, I_C= -2mA
- f_T: 100MHz typ. V_{CE}= -6V, I_C= 1mA
- C_{OB}: 4pF typ. V_{CB}= -10V, I_E= 0, f= 1MHz

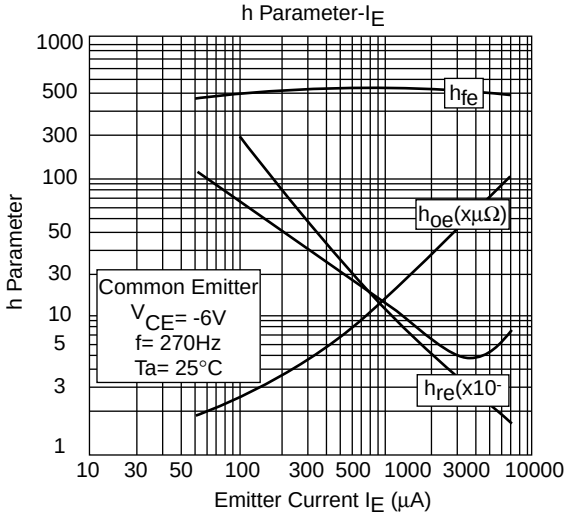
NF-Rg, I_C



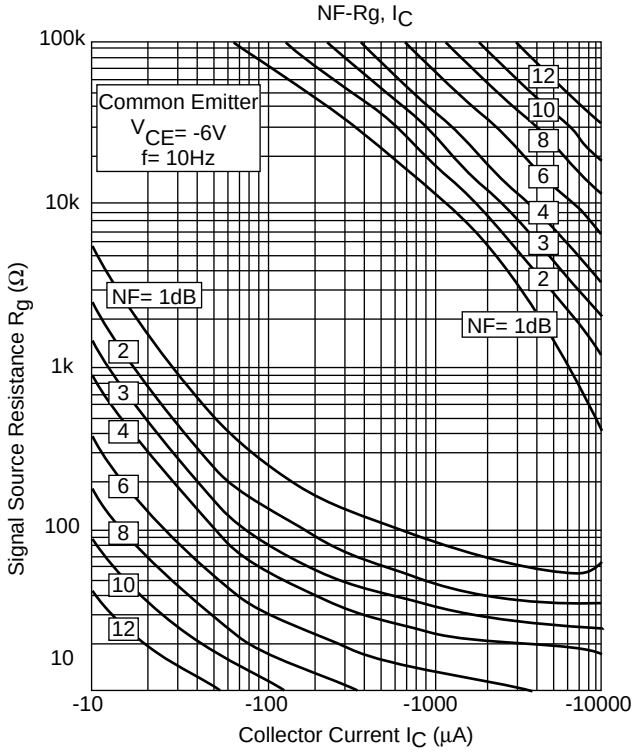
h_{FE}-I_C



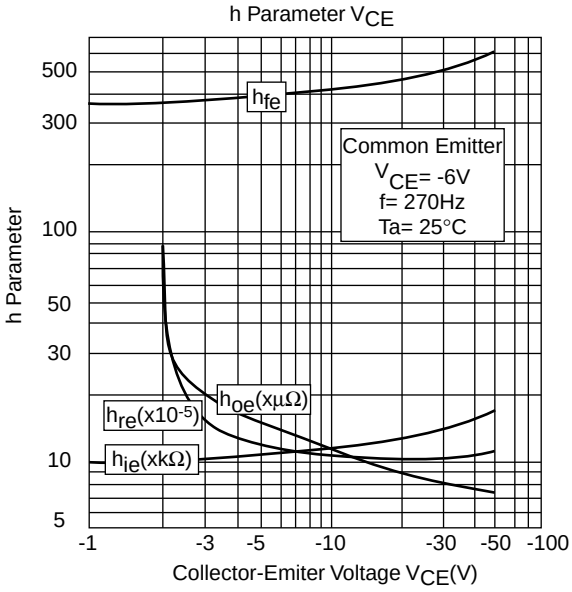
h Parameter-I_E

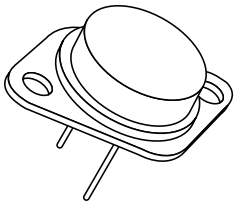


NF-Rg, I_C

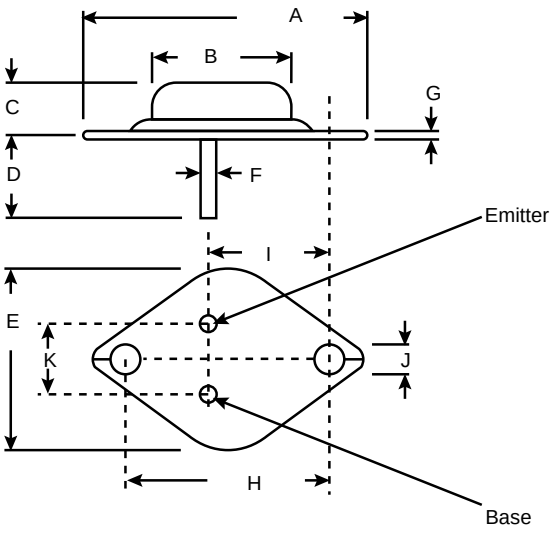


h Parameter V_{CE}

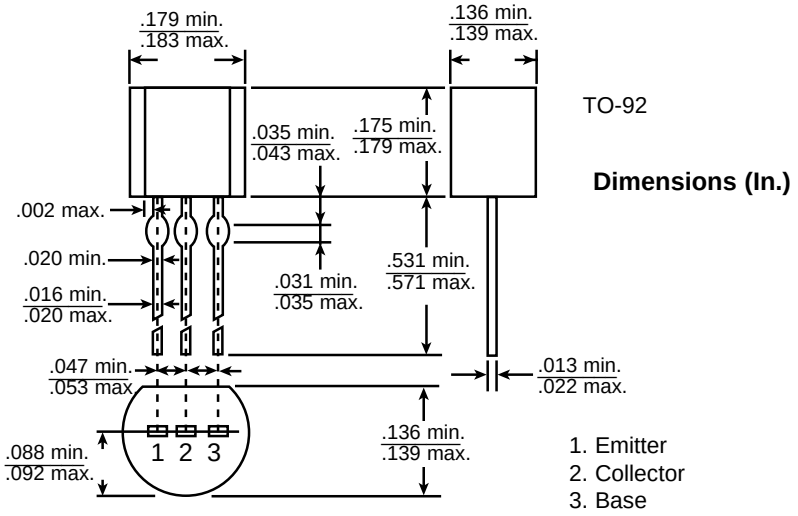




	Min.	Max.
A	-	1.57
B	.759	.875
C	.250	.450
D	.440	.479
E	.992	1.05
F	.038	.043
G	-	.135
H	1.177	1.197
I	.655	.681
J	.156	.158
K	.420	.440



Mouser Stock No.	I_C (A)	V_{CBO} (V)	V_{CEO} (V)	P_D (W)	H_{FE} (Min./Max.)	I_C/V_{CE} (A/V)	$V_{CE(SAT)}$ (V)	I_C/I_B (A/mA)
333-2N3055A	15	100	60	115	20/70	4.0/4	3.0	10.0/3300



Maximum Ratings (Ta=25°C)

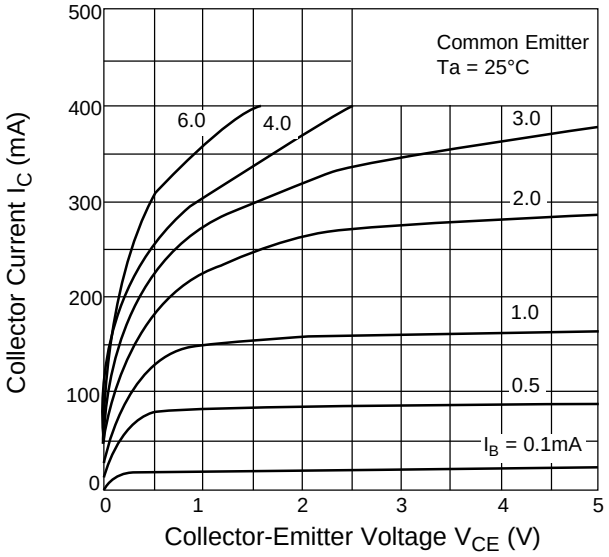
Characteristic	Symbol	Rating	Unit
Collector-base voltage	V_{CBO}	35	V
Collector-emitter voltage	V_{CEO}	30	V
Emitter-base voltage	V_{EBO}	5	V
Collector current	I_C	500	mA
Emitter current	I_E	-500	mA
Collector power dissipation	P_C	500	mW
Junction temperature	Tj	150	°C
Storage temperature range	Tstg	-55~150	°C

Electrical Characteristics (Ta=25°C)

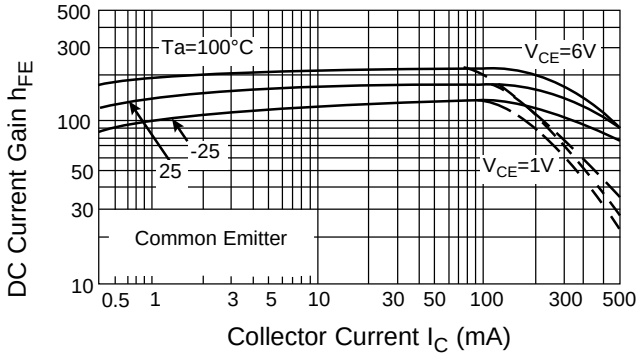
Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Collector cut-off current	I_{CBO}	V_{CB}=35V, I_E=0	-	-	0.1	µA
Emitter cut-off current	I_{CEO}	V_{EB}=5V, I_C=0	-	-	0.1	µA
DC current gain	$h_{FE}(1)$	V_{CE}=1V, I_C=100mA	70	-	240	
	$h_{FE}(2)$	V_{CE}=6, I_C=400mA	25	-	-	
Collector-emitter Saturation voltage	$V_{CE(SAT)}$	I_C=100mA, I_B=10mA	- -	0.1	0.25	V
Base-emitter voltage	V_{BE}	V_{CE}=1V, I_C=100mA	-	0.8	1.0	V
Transition frequency	f_T	V_{CE}=6V, I_C=20mA	-	300	-	MHz
Collector output capacitance	C_{OB}	V_{CB}=6V, I_E=0, f=1 MHz	-	7	-	pF

Note: $h_{FE}(1)$ classification 0: 70~140, Y: 120~240
$h_{FE}(2)$ classification 0: 25(min.), Y: 40(min.)

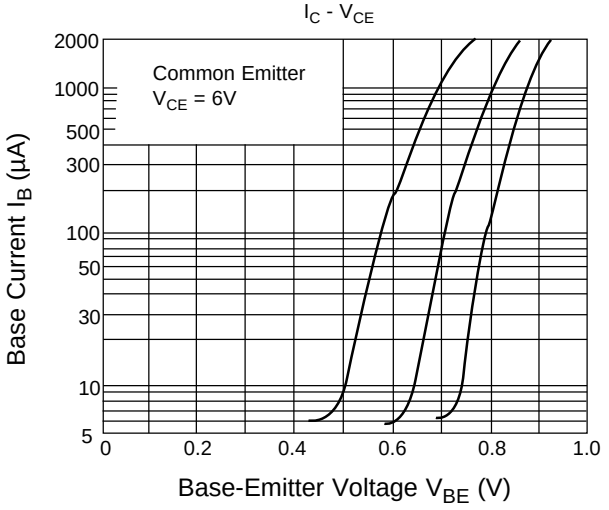
I_C - V_{CE}

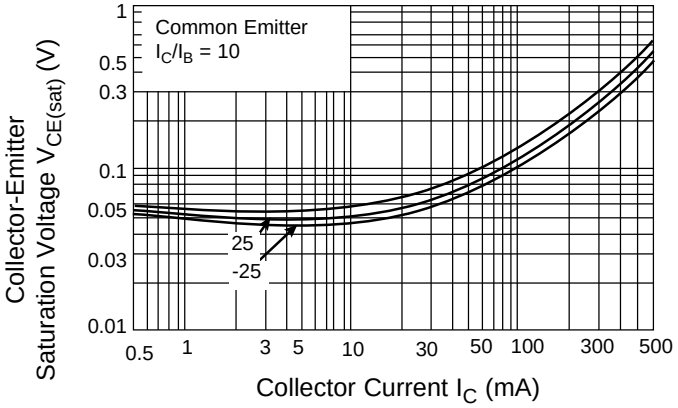


h_{FE} - I_C

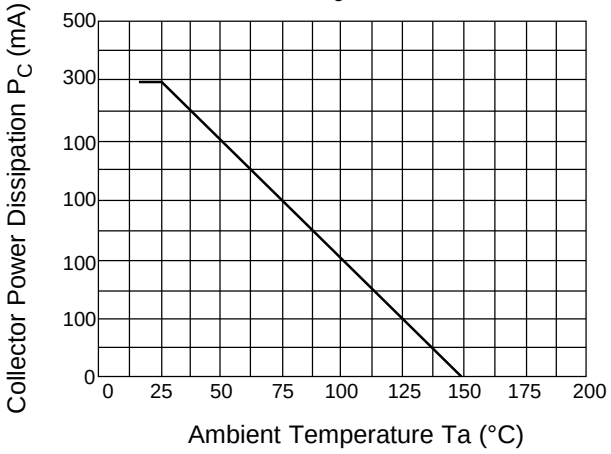


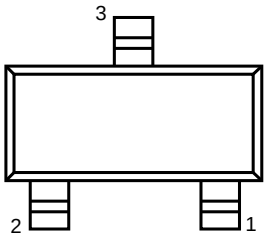
I_C - V_{CE}





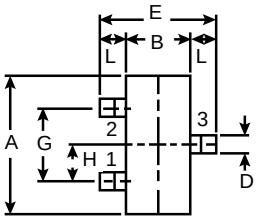
P_C - Ta

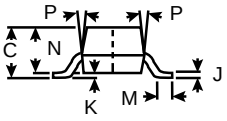




SOT-23

1. N.C. 2.Anode 3. Cathode





Dim.	Inches
A	.115 ± .007
B	.051 + .007 - .005
C	.051 max
D	.017 + .005 - .001
E	.094 + .011 - .007
G	.074
H	.037
J	.005 + .003 - .001
K	0 - .003
L	.021
M	.007 min
N	.039 + .007 - .003
P	.275

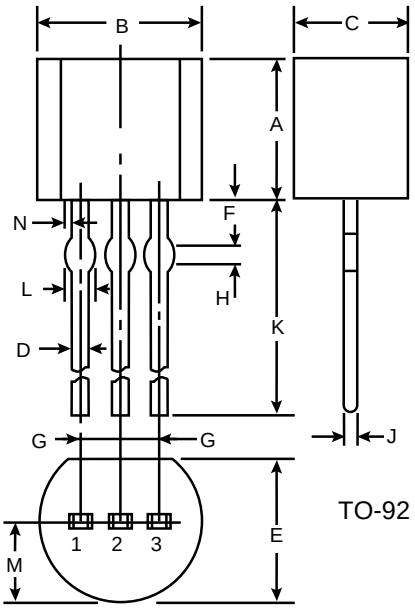
Specifications:

- Small package: SOT-23
- Nominal voltage tolerance about ±2.5%

Maximum Ratings (Ta=25°C)

Characteristic	Symbol	Rating	Unit
Power Dissipation	P_D	200	mW
Junction Temperature	T_j	150	°C
Storage Temperature Range	T_{stg}	-55 ~ 150	°C

Mouser Stock No.	Description	Zener Impedance (Max)Ω	Reverse Current (Max)μA	Reverse Voltage (V)		
					Min.	Max.
333-Z02W4.3V	200mW 4.3 volt	130	5.0	1.0	4.0	4.5
333-Z02W4.7V	200mW 4.7volt	120	5.0	1.0	4.4	4.9
333-Z02W5.1V	200mW 5.1volt	70	1.0	1.5	4.8	5.4
333-Z02W5.6V	200mW 5.6volt	40	1.0	2.5	5.3	6.0
333-Z02W6.2V	200mW 6.2volt	30	1.0	3.0	5.8	6.6
333-Z02W6.8V	200mW 6.8volt	25	0.5	5.0	6.4	7.2
333-Z02W7.5V	200mW 7.5volt	23	0.5	6.0	7.0	7.9
333-Z02W8.2V	200mW 8.2volt	20	0.5	6.5	7.7	8.7
333-Z02W9.3V	200mW 9.1volt	18	0.5	7.0	8.5	9.6
333-Z02W10V	200mW 10volt	15	0.5	8.0	9.4	10.6
333-Z02W11V	200mW 11volt	15	0.5	8.5	10.4	11.6
333-Z02W12V	200mW 12volt	15	0.5	9.0	11.4	12.6
333-Z02W13V	200mW 13volt	15	0.5	10.0	12.4	14.1
333-Z02W15V	200mW 15volt	15	0.5	11.0	13.8	15.6
333-Z02W16V	200mW 16volt	18	0.5	12.0	15.3	17.1
333-Z02W18V	200mW 18volt	20	0.5	14.0	16.8	19.1
333-Z02W20V	200mW 20volt	25	0.5	15.0	18.8	21.2
333-Z02W22V	200mW 22volt	30	0.5	17.0	20.8	23.3
333-Z02W24V	200mW 24volt	40	0.5	19.0	28.8	25.6



TO-92

1. Collector
2. Base
3. Emitter

Dim	Dimensions (In.) Min.	Max.
A	.175	.179
B	.179	.183
C	.136	.139
D	.016	.02
E	.136	.139
F	.035	.043
G	.047	.053
H	.031	.035
J	.013	.22
K	.531	.571
L	-	.02
M	.088	.092
N	-	.002

Maximum Ratings (Ta = 25°C)

Characteristic		Symbol	Rating	Unit
Collector-Base Voltage	333-BC549	V_{CBO}	45	V
	333-BC550		50	
Collector-Emitter Voltage	333-BC549	V_{CEO}	30	V
	333-BC550		45	
Emitter-Base Voltage		V_{EBO}	5	V
Collector Current		I_C	100	mA
Collector Power Dissipation		P_C	625	mW
Junction Temperature		T_j	150	°C
Storage Temperature Range		T_{stg}	-55~150	°C

Electrical Characteristics (Ta = 25°C)

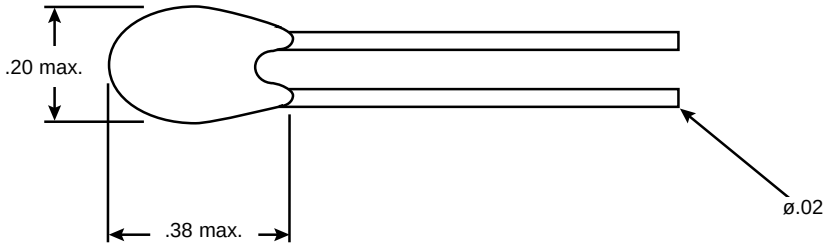
Characteristic		Symbol	Min.	Min.	Min.	Unit
Collector-Emitter Breakdown Voltage	333-BC549	$V_{(BR)\ CEO}$	30	30	30	V
	333-BC550		45	45	45	
Collector-Base Breakdown Voltage	333-BC549	$V_{(BR)\ CBO}$	45	45	45	V
	333-BC550		50	50	50	
Emitter-Base Breakdown Voltage		$V_{(BR)\ EBO}$	5	5	5	V
Collector Cut-off Current		I_{CBO}	-	-	-	mA
DC Current Gain		h_{FE}	110	110	110	mW
Base-Emitter Voltage		$V_{BE\ (ON)}$	0.55	0.55	0.55	°C
Collector-Emitter Saturation Voltage		$V_{CE\ (SAT)}$	-	-	-	°C
Base-Emitter Saturation Voltage		$V_{BE\ (SAT)}$	-	-	-	°C
Transistion Frequency		f_T	-	-	-	°C
Collector Output Capacitance		C_{ob}	-	-	-	°C
Noise Figure	333-BC549	NF	-	-	-	V
	333-BC550		-	-	-	

Note: h_{FE} Classification A: 110~220, B: 200~450, C: 420~800

MOUSER® ELECTRONICS

334-31101 334-38202 334-44503
334-31201 334-39302 334-45104
334-31301 334-39502 334-47204
334-31501 334-42103 334-47404
334-38102 334-42153 NTC Thermistors
334-38152 334-42203

Dimensions (In.)



Specifications:
- Small-size, light weight
- Heat resistance, and moisture proof.
- Superior manufacturing process produces large quantities of homogenious components.
- Almost indefinite life.

Application:
- Temperature compensation for transistor and various electronics circuits.
- Detection and control of temperature for air-conditioning equipment.
- Delay circuits, such as relays.

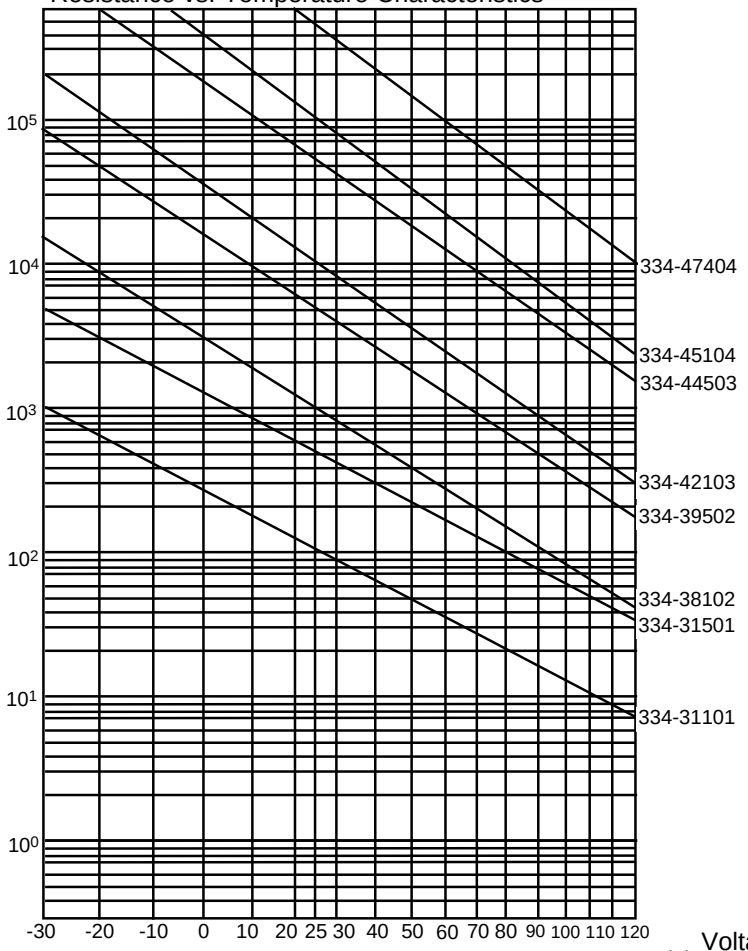
Rating:
- Temperature range: -40°C ~ +125°C
- Dissipation factor: 4.5mW/°C (@25°C)
- Maximum power rating: 450mW (@25°C)

Mouser Stock No.	Resistance @ 25°C (Ω)	Resistance @ 50°C (Ω)	B-Constant B25/50 (K)	Current (mA)		Coating Color
	Tolerance±15%		Tolerance±7%	Min.	Max.	
334-31101	100	44.7	3100	6.71	247.55	black
334-31201	200	89.5	3100	4.74	175.05	black
334-31301	300	134.2	3100	3.87	142.93	blue
334-31501	500	223.7	3100	3.00	110.71	black
334-38102	1K	373.1	3800	2.12	105.13	red
334-38152	1.5K	559.6	3800	1.73	85.84	green
334-38202	2K	746.1	3800	1.50	74.34	blue
334-39302	3K	1.09K	3900	1.22	63.31	blue
334-39502	5K	1.82K	3900	.95	49.04	green
334-42103	10K	3.36K	4200	.67	39.35	green
334-42153	15K	5.04K	4200	.55	32.13	black
334-42203	20K	6.73K	4200	.47	27.82	red
334-44503	50K	15.96K	4400	.30	19.14	black
334-45104	100K	31.11K	4500	.21	14.12	brown
334-47204	200K	59.07K	4700	.15	10.86	black
334-47404	400K	118.1K	4700	.11	7.68	blue

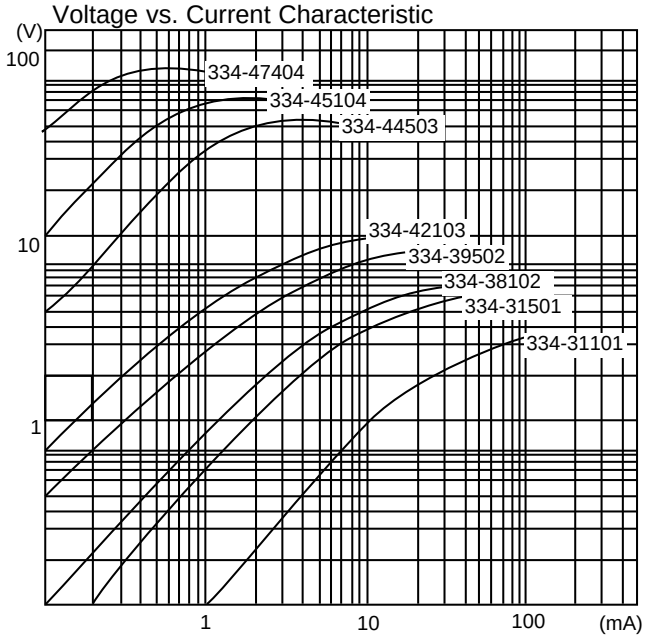
MOUSER® ELECTRONICS

334-31101	334-38202	334-44503
334-31201	334-39302	334-45104
334-31301	334-39502	334-47204
334-31501	334-42103	334-47404
334-38102	334-42153	NTC Thermistors
334-38152	334-42203	

Resistance vs. Temperature Characteristics



Voltage vs. Current Characteristic



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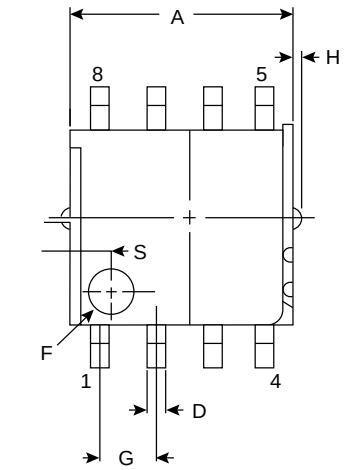
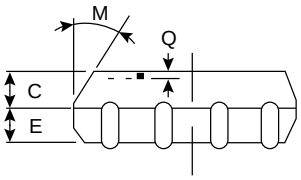
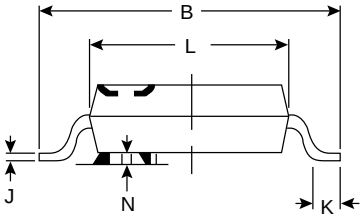
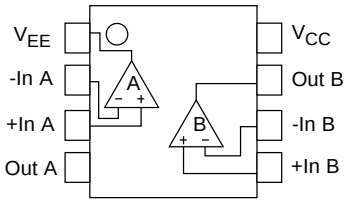
2-5-96

Dim.	Inches	
	Min.	Max.
A	.18	.20
B	.23	.26
C	.026	.033
D	.016	.017
E	.026	.033
F	.027	.035
G	.05	
H	-	.006
J	.004	.009
K	.018	.026
L	.16	.19
M	6°	
N	.004	
Q	-	.006
S	.039	









Operational Amplifier Features:

- In the linear mode the input common mode voltage range includes ground.
- Two internally compensated OP amps are in single package.
- Low power dissipation and power drain suitable for battery operation.
- Differential input voltage range equal to the power supply voltage.
- Wide power supply voltage range and signal power supply: single supply 3VDC to 36VDC
  dual supplies ±1.5VDC to ±18VDC
- Large output voltage swing: 0VDC to VCC-1.5VDC
- Low input biasing current: II=45nADC (typ.)

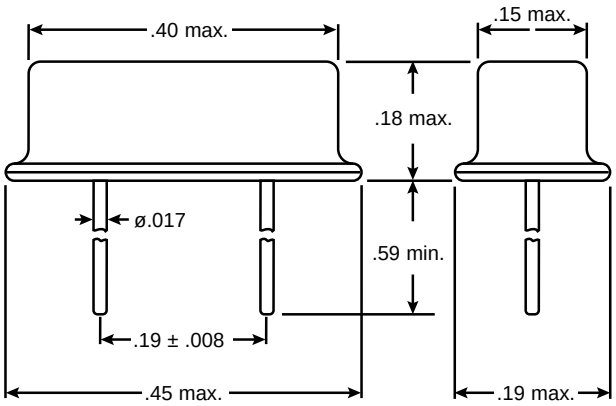
Maximum Ratings (Ta=25°C)

Characteristic	Symbol	Rating	Unit
Supply Voltage	V_{CC}	±18	V
	V_{EE}	36	
Differential Input Voltage	DV_{IN}	±36	V
Input Voltage	V_{IN}	-0.3~36	V
Power Dissipation	P_D	280	mW
Operating Temperature	T_{opr}	-40~85	°C
Storage Temperature	T_{stg}	-55~125	°C

Electrical Characteristics (V_{CC}=5V, V_{EE}=GND, Ta=25°C)

Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Input Offset Voltage	V_{IO}	Rg≤10kΩ	-	2	7	mV
Input Offset Current	I_{IO}	-	-	5	30	nA
Input Bias Current	I_I	-	-	45	150	nA
Common Mode Input Voltage	CMV_{IN}	V_{CC}=30V, V_{EE}=GND	0	-	V_{CC}-1.5	V
Supply Current	I_{CC}, I_{EE}	R_L=∞, All OP amps	-	0.7	1.2	mA
Voltage Gain	G_V	R_L≥2kΩ	86	100	-	dB
Maximum Output Voltage Swing	V_{OP-P}	R_L=2kΩ	0	-	V_{CC}-1.5	V
Common Mode Input Signal Rejection Ratio	CMRR	-	60	85	-	dB
Supply Voltage Rejection Ratio	SVRR	Rg=10kΩ	60	100	-	dB
Source Current	I_{source}	-IN=0V_{DC}, +IN=1V_{DC}	20	40	-	mA
Sink Current	I_{sink}	-IN=1V_{DC}, +IN=0V_{DC}	10	20	-	mA

Dimensions (In.)



Specifications:

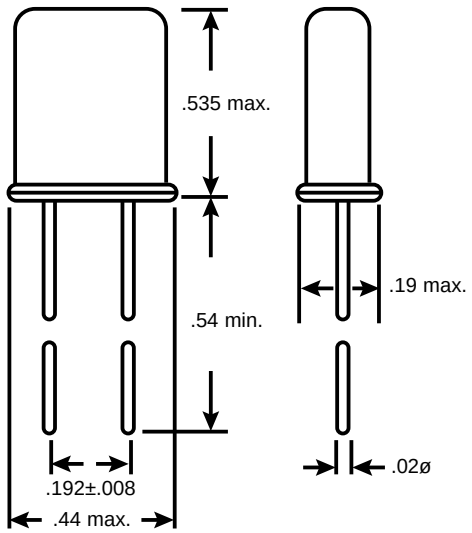
- Nominal frequency: 4.096 MHz
- Holder type: HC-49/S
- Mode of oscillation: fundamental
- Storage temperature range: -30°C ~ +80°C
- Frequency tolerance (@ 25°C ±2°C): ±50 PPM
- Frequency drift in operating temperature range: ±50 PPM (0°C ~ +70°C)
- Equivalent resistance (CI): 120Ω max (series)
- Load capacitance: 30 pF
- Drive level: 0.5mW
- Shunt capacitance: 7.0 pF max
- Insulation resistance: 500MΩ min. / 100VDC
- Test impedance meter: saunders / 150 D
- Aging (in a year): ±5 PPM

Specifications:

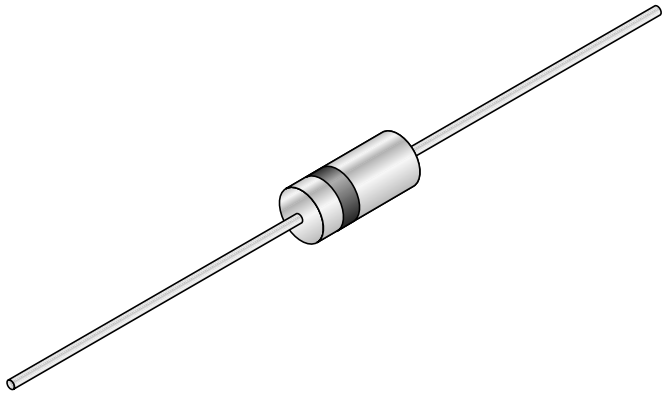
- Frequency range: 1.000000MHz to 96.000000MHz
- Calibration tolerance: ±50ppm (±0.005%) @ +25°C
- Temperature stability tolerance: ±100ppm (±0.01%) over -20°C to +70°C
- Shunt capacitance (CO): 7pF Max.
- Drive level (P): 2mW Max.

Mouser Stock No	Frequency MHZ	Calibrated @ Parallel or Series	Maximum Effective Series Resistance Ω
332-1010	1.000000	13pF	900
332-1018	1.843200	13pF	700
332-1020	2.000000	20pF	500
332-1024	2.457600	32pF	300
332-1030	3.000000	30pF	200
332-1033	3.276800	15pF	150
332-1035	3.579545	18pF	120
332-1036	3.686400	20pF	120
332-1040	4.000000	12pF	100
332-1042	4.194304	20pF	100
332-1044	4.433000	20pF	100
332-1045	4.433619	Series	100
332-1049	4.915200	20pF	70
332-1050	5.000000	Series	70
332-1051	5.068800	Series	70
332-1060	6.000000	30pF	50
332-1061	6.144000	Series	50
332-1066	6.553600	Series	50
332-1070	7.000000	20pF	50
332-1071	7.159090	Series	50
332-1073	7.372800	Series	50
332-1080	8.000000	Series	50
332-1098	9.830400	Series	30
332-1100	10.000000	32pF	30
332-1107	10.738635	Series	30
332-1110	11.000000	Series	30
332-1111	11.059200	Series	30
332-1120	12.000000	32pF	25
332-1143	14.318180	Series	25
332-1147	14.745600	Series	25
332-1150	15.000000	Series	25
332-1160	16.000000	Series	20
332-1180	18.432000	Series	20
332-1196	19.660800	Series	20
332-1200	20.000000	Series	20
332-1221	22.118400	Series	20
332-1240	24.000000	Series	20
332-1320	32.000000	Series	40
332-1480	48.000000	Series	40
332-1720	72.000000	Series	60
332-1960	96.000000	Series	60

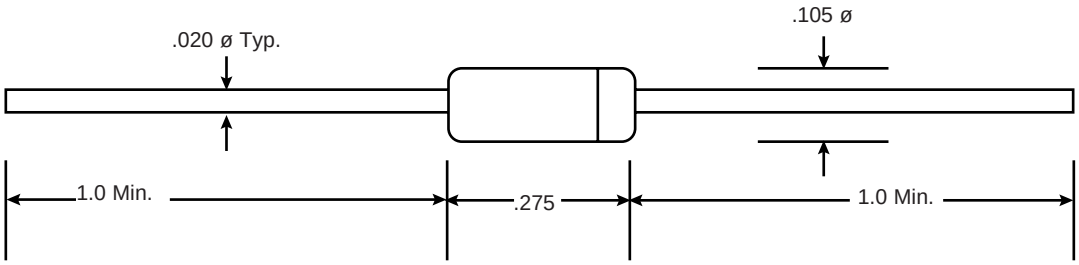
Dimensions (In.)



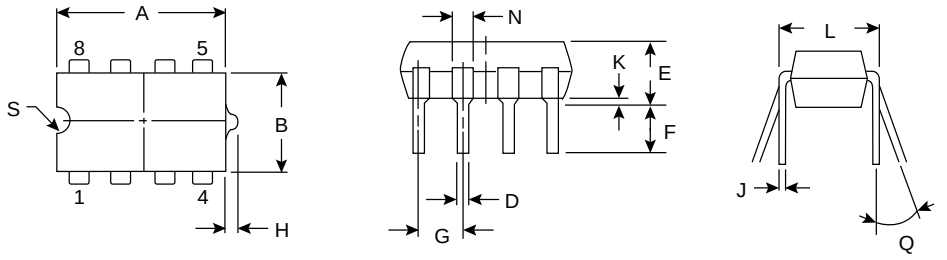
HC-49/U



Dimensions (In.)



Mouser Stock No	Peak Inverse Voltage	Max. Forward Voltage Drop @I_F	Forward Current	Max. Reverse Leakage Current @ V_R	Reverse Voltage
	PIV (V)	V_F (V)	I_F (mA)	I_R (uA)	V_R (V)
1N34A	60	1.0	5	30	30
1N60	50	1.0	5	40	20



Dim.	Inches	
	Min.	Max.
A	-	.378
B	-	.256
D	.014	.026
E	.20	5.00
F	.10	-
G	.10	
H	-	.008
J	.008	.014
K	.02	-
L	.280	.310
N	.041	.053
Q	7°	
S	R.039	

Dual Pre-Amplifier

- Dual pre amplifier for car or home stereo use.
- High voltage gain; G_{VO}=100dB (typ.) @ f=1kHz
- Excellent channel separation and high ripple rejection: CH_{sep}=65dB (typ.) (f=10KHz, Rg=2.2KΩ, V_{OUT}=0dBm): RR=50dB (typ.)
- Low noise: V_{NI}=1.0μV_{rms} (typ.) @ Rg=2.2kΩ, BW=20Hz~20kHz
- Wide operating supply voltage range: V_{CC}=6 ~ 16V (Ta=25°C)

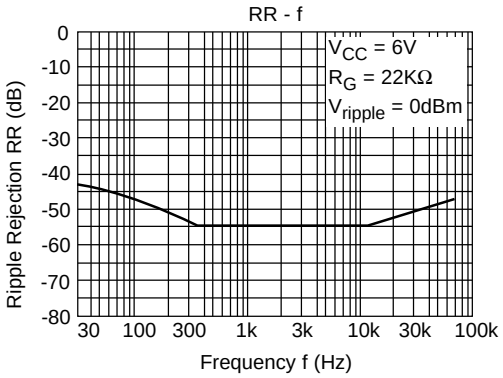
Maximum Ratings (Ta=25°C)

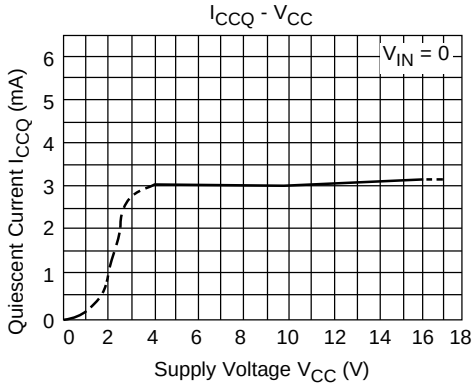
Characteristic	Symbol	Rating	Unit
Supply Voltage	V_{CC}	16	V
Power Dissipation	P_D	700	mW
		600	
Operating Temperature	T_{opr}	-30~85	°C
Storage Temperature	T_{stg}	-55~150	°C

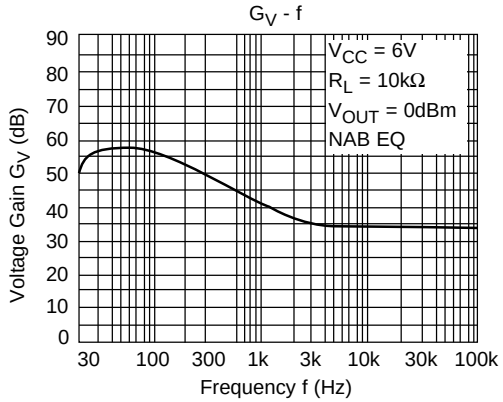
Electrical Characteristics

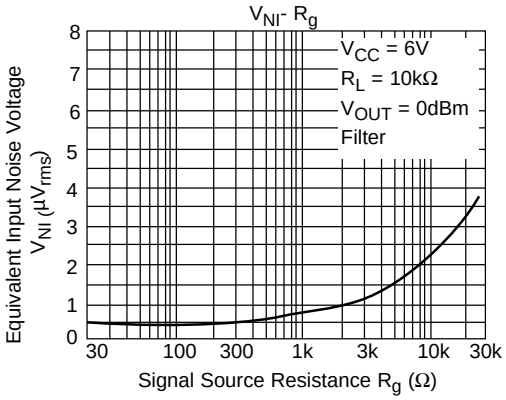
(Unless otherwise specified, V_{CC}=6V, f=1kHz, Rg=600Ω, R_L=20kΩ, Ta=25°C)

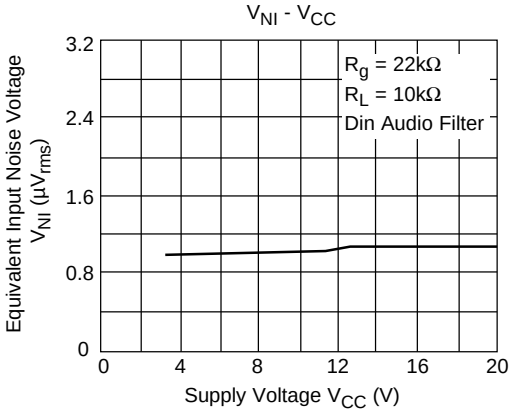
Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Supply Current	I_{CC}	V_{IN}=0	-	3	6	mA
Voltage Gain	G_{VO}	V_{OUT}=0dBm	75	100	-	dB
			38.5	41.5	44.5	
Maximum Output Voltage	G_V	V_{OUT}=0dBm	1.0	1.8	-	V_{rms}
Equivalent Input Noise Voltage	V_{NI}	THD=1%	-	1.0	1.7	μV_{rms}
Input Resistance	R_{IN}	Rg=2.2kΩ SPF=20hΩ ~ 20kHz	50	150	-	kΩ
Channel Separation	CH_{sep}	f=10kHz, V_{OUT}=0dBm	-	65	-	dB
Ripple Rejection	RR	f=100Hz, Rg=2.2kΩ	-	50	-	dB
Total Harmonic Distortion	THD	V_{OUT}=0dBm	-	0.04	0.25	%

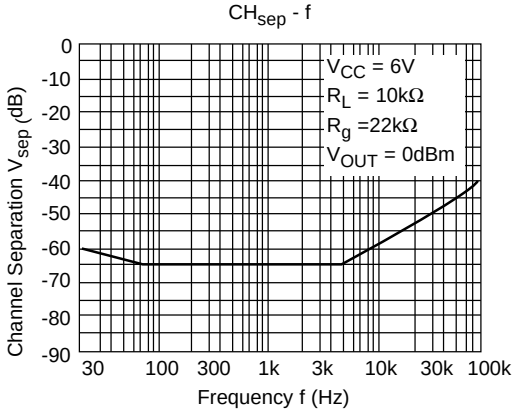

RR - f
Ripple Rejection RR (dB)
0
-10
-20
-30
-40
-50
-60
-70
-80
V_{CC} = 6V
R_G = 22KΩ
V_{ripple} = 0dBm
30 100 300 1k 3k 10k 30k 100k
Frequency f (Hz)

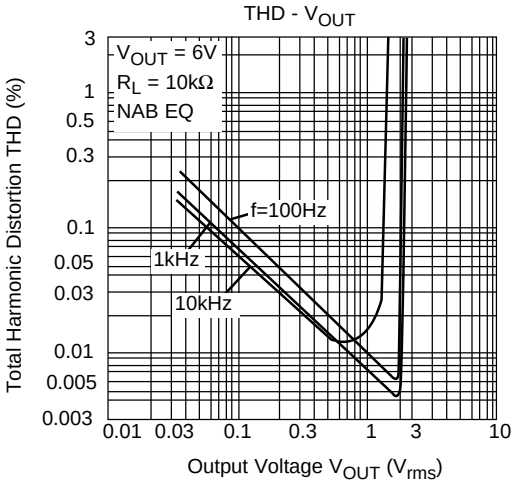

I_{CCQ} - V_{CC}
Quiescent Current I_{CCQ} (mA)
6
5
4
3
2
1
0
V_{IN} = 0
0 2 4 6 8 10 12 14 16 18
Supply Voltage V_{CC} (V)

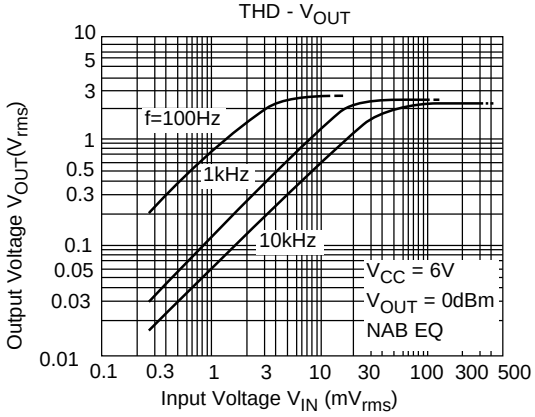

G_V - f
Voltage Gain G_V (dB)
90
80
70
60
50
40
30
20
10
0
V_{CC} = 6V
R_L = 10kΩ
V_{OUT} = 0dBm
NAB EQ
30 100 300 1k 3k 10k 30k 100k
Frequency f (Hz)

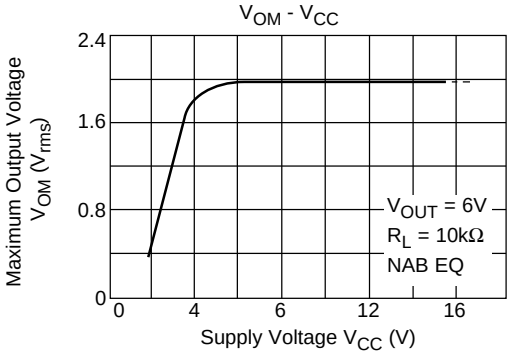

V_{NI}- R_g
Equivalent Input Noise Voltage V_{NI} (μV_{rms})
8
7
6
5
4
3
2
1
0
V_{CC} = 6V
R_L = 10kΩ
V_{OUT} = 0dBm
Filter
30 100 300 1k 3k 10k 30k
Signal Source Resistance R_g (Ω)

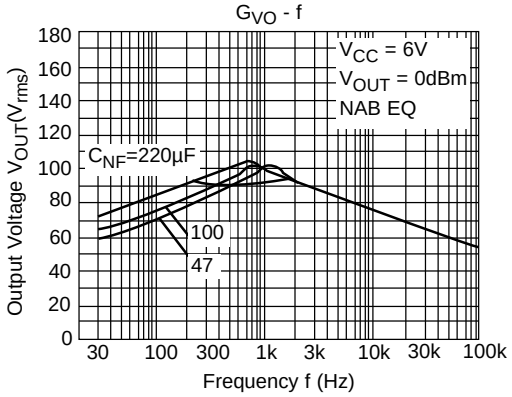

V_{NI} - V_{CC}
Equivalent Input Noise Voltage V_{NI} (μV_{rms})
3.2
2.4
1.6
0.8
0
R_g = 22kΩ
R_L = 10kΩ
Din Audio Filter
0 4 8 12 16 20
Supply Voltage V_{CC} (V)

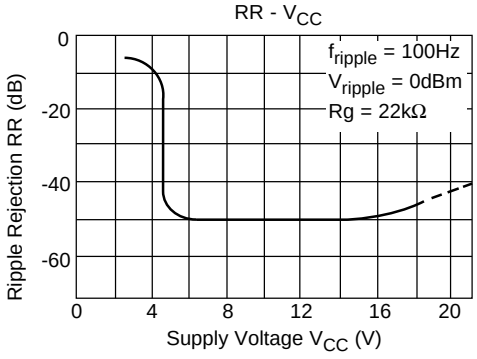

CH_{sep} - f
Channel Separation V_{sep} (dB)
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
V_{CC} = 6V
R_L = 10kΩ
R_g =22kΩ
V_{OUT} = 0dBm
30 100 300 1k 3k 10k 30k 100k
Frequency f (Hz)

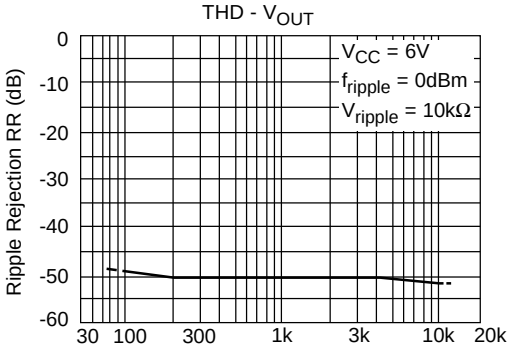

THD - V_{OUT}
V_{OUT} = 6V
R_L = 10kΩ
NAB EQ
f=100Hz
1kHz
10kHz
Total Harmonic Distortion THD (%)
Output Voltage V_{OUT} (V_{rms})

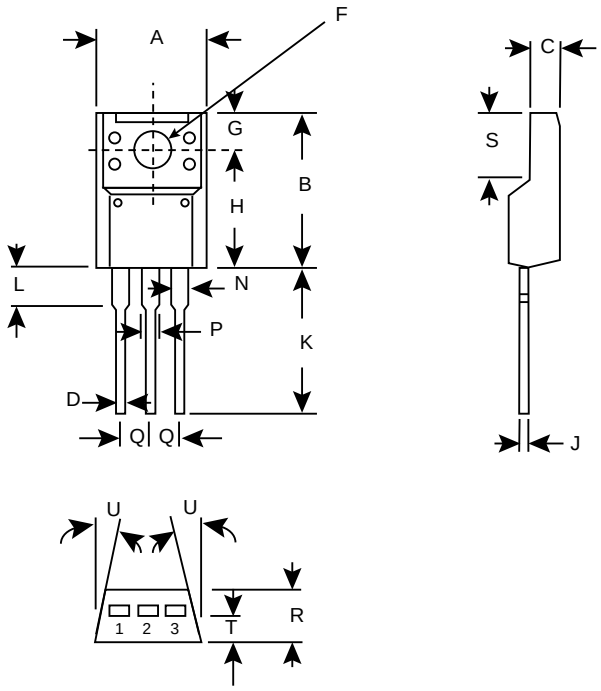

THD - V_{OUT}
f=100Hz
1kHz
10kHz
V_{CC} = 6V
V_{OUT} = 0dBm
NAB EQ
Output Voltage V_{OUT}(V_{rms})
Input Voltage V_{IN} (mV_{rms})


V_{OM} - V_{CC}
V_{OUT} = 6V
R_L = 10kΩ
NAB EQ
Maximum Output Voltage V_{OM} (V_{rms})
Supply Voltage V_{CC} (V)


G_{VO} - f
V_{CC} = 6V
V_{OUT} = 0dBm
NAB EQ
C_{NF}=220µF
100
47
Output Voltage V_{OUT}(V_{rms})
Frequency f (Hz)


RR - V_{CC}
f_{ripple} = 100Hz
V_{ripple} = 0dBm
Rg = 22kΩ
Ripple Rejection RR (dB)
Supply Voltage V_{CC} (V)


THD - V_{OUT}
V_{CC} = 6V
f_{ripple} = 0dBm
V_{ripple} = 10kΩ
Ripple Rejection RR (dB)



Dim.	Min.	Max.
A	- - -	.41
B	.58	.60
C	.10	.12
D	.01	.03
F	Ø.12	Ø.13
G	.12	.13
H	.46	.48
J	.03	.03
K	.51	.55
L	.14	.15
N	- - -	.10
P	- - -	.10
Q	.1	.1
R	.17	.19
S	.22	.25
T	.09	.11
U	5°	5°

1. Input
2. Common
3. Output

Maximum Ratings (Ta=25°C)

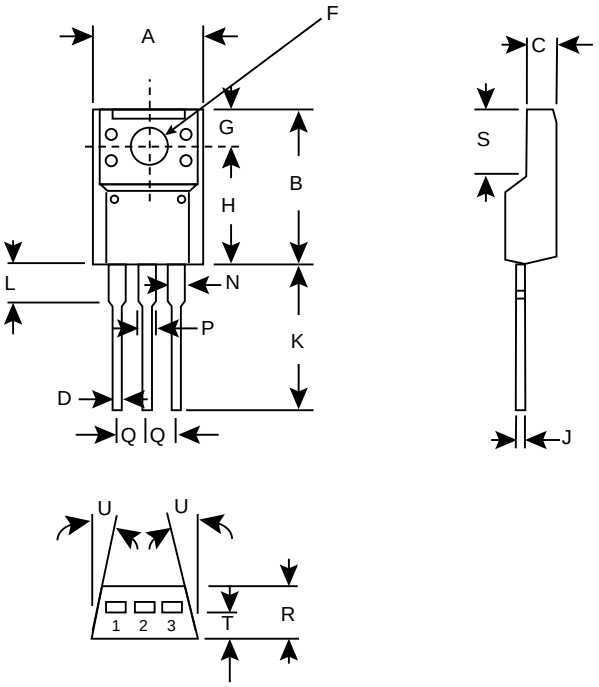
Characteristic	Symbol	Rating	Unit
Input Voltage	V_{IN}	35	V
Power Dissipation (note)	P_D	20.8	W
Operating Temperature	T_{opr}	-30~75	°C
Storage Temperature	T_{stg}	-55~150	°C

Note: T_C=25°C

333-7805PI

Electrical Characteristics (V_{IN}=10V, I_{OUT}=500mA, 0°C≤T_j≤125°C)

Characteristic	Symbol	Test Conditions		Min.	Typ.	Max.	Unit
Output Voltage	V_{OUT}	T_j=25°C, I_{OUT}=100mA		4.8	5.0	5.2	V
Input Regulation	Reg. line	T_j=25°C	7.0V≤V_{IN}≤2.5V	-	3	100	mV
			8.0V≤V_{IN}≤12V	-	1	50	
Load Regulation	Reg. load	T_j=25°C	5mA≤I_{OUT}≤1.4A	-	15	100	mV
			250mA≤I_{OUT}≤750mA	-	5	50	
Output Voltage	V_{OUT}	7.0V≤V_{IN}≤20V 5.0mA≤I_{OUT}≤1.0A, P_o<15W		4.75	-	5.25	V
Quiescent Current	I_B	T_j=25°C, I_{OUT}=5mA		-	4.2	8.0	mA
Quiescent Current Change	I_B	7.0V≤V_{IN}≤25V		-	-	1.3	mA
Output Noise Voltage	V_{NO}	Ta=25°C, 10Hz≤f≤100kHz I_{OUT}=50mA		-	50	-	µV
Ripple Rejection	RR	f=120Hz, 8.0V≤V_{IN}≤18V I_{OUT}=50mA, T_j=25°C		62	78	-	dB
Dropout Voltage	V_D	I_{OUT}=1.0A, T_j=25°C		-	2.0	-	V
Short Circuit Current Limit	I_{SC}	T_j=25°C		-	1.6	-	A
Average Temperature Coefficient of Output Voltage	T_{CVO}	I_{OUT}=5mA, 0°C≤T_j≤125°C		-	-0.6	-	mV/deg



Dim.	Min.	Max.
A	- - -	.41
B	.58	.60
C	.10	.12
D	.01	.03
F	Ø.12	Ø.13
G	.12	.13
H	.46	.48
J	.03	.03
K	.51	.55
L	.14	.15
N	- - -	.10
P	- - -	.10
Q	.1	.1
R	.17	.19
S	.22	.25
T	.09	.11
U	5°	5°

1. Input
2. Common
3. Output

Maximum Ratings (Ta=25°C)

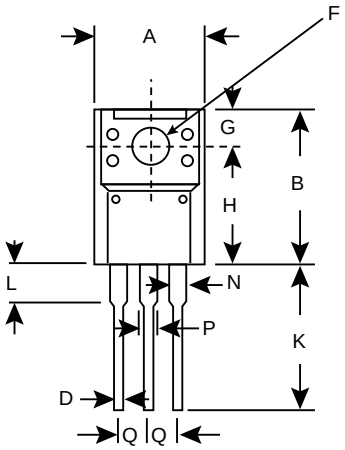
Characteristic	Symbol	Rating	Unit
Input Voltage	V_{IN}	35	V
Power Dissipation (note)	P_D	20.8	W
Operating Temperature	T_{opr}	-30~75	°C
Storage Temperature	T_{stg}	-55~150	°C

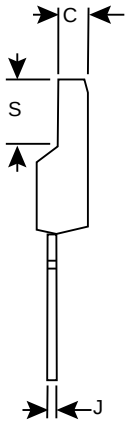
Note: T_C=25°C

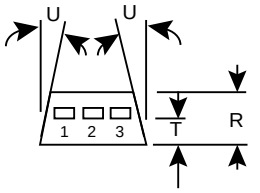
333-7806PI

Electrical Characteristics (V_{IN}=11V, I_{OUT}=500mA, 0°C≤T_j≤125°C)

Characteristic	Symbol	Test Conditions		Min.	Typ.	Max.	Unit
Output Voltage	V_{OUT}	T_j=25°C, I_{OUT}=100mA		5.75	6.0	6.26	V
Input Regulation	Reg. line	T_j=25°C	8.0V≤V_{IN}≤25V	-	4	120	mV
			9V≤V_{IN}≤13V	-	2	60	
Load Regulation	Reg. load	T_j=25°C	5mA≤I_{OUT}≤1.4A	-	15	120	mV
			250mA≤I_{OUT}≤750mA	-	5	60	
Output Voltage	V_{OUT}	8V≤V_{IN}≤21V 5.0mA≤I_{OUT}≤1.0A, P_o<15W		5.7	-	6.3	V
Quiescent Current	I_B	T_j=25°C, I_{OUT}=5mA		-	4.3	8.0	mA
Quiescent Current Change	I_B	8.0V≤V_{IN}≤25V		-	-	1.3	mA
Output Noise Voltage	V_{NO}	Ta=25°C, 10Hz≤f≤100kHz I_{OUT}=50mA		-	55	-	µV
Ripple Rejection	RR	f=120Hz, 9V≤V_{IN}≤19V I_{OUT}=50mA, T_j=25°C		61	77	-	dB
Dropout Voltage	V_D	I_{OUT}=1.0A, T_j=25°C		-	2.0	-	V
Short Circuit Current Limit	I_{SC}	T_j=25°C		-	1.5	-	A
Average Temperature Coefficient of Output Voltage	T_{CVO}	I_{OUT}=5mA, 0°C≤T_j≤125°C		-	-0.7	-	mV/deg







Dim.	Min.	Max.
A	- - -	.41
B	.58	.60
C	.10	.12
D	.01	.03
F	Ø.12	Ø.13
G	.12	.13
H	.46	.48
J	.03	.03
K	.51	.55
L	.14	.15
N	- - -	.10
P	- - -	.10
Q	.1	.1
R	.17	.19
S	.22	.25
T	.09	.11
U	5°	5°

1. Input
2. Common
3. Output

Maximum Ratings (Ta=25°C)

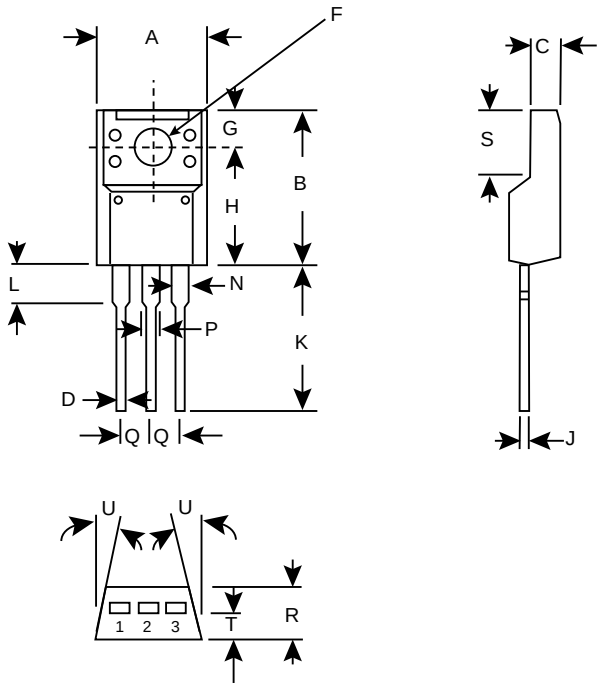
Characteristic	Symbol	Rating	Unit
Input Voltage	V_{IN}	35	V
Power Dissipation (note)	P_D	20.8	W
Operating Temperature	T_{opr}	-30~75	°C
Storage Temperature	T_{stg}	-55~150	°C

Note: T_C=25°C

333-7808PI

Electrical Characteristics (V_{IN}=14V, I_{OUT}=500mA, 0°C≤T_j≤125°C)

Characteristic	Symbol	Test Conditions		Min.	Typ.	Max.	Unit
Output Voltage	V_{OUT}	T_j=25°C, I_{OUT}=100mA		7.7	8.0	8.3	V
Input Regulation	Reg. line	T_j=25°C	10.5V≤V_{IN}≤25V	-	6	460	mV
			11V≤V_{IN}≤17V	-	2	80	
Load Regulation	Reg. load	T_j=25°C	5mA≤I_{OUT}≤1.4A	-	12	460	mV
			250mA≤I_{OUT}≤750mA	-	4	80	
Output Voltage	V_{OUT}	10.5V≤V_{IN}≤23V 5.0mA≤I_{OUT}≤1.0A, P_o<15W		7.6	-	8.4	V
Quiescent Current	I_B	T_j=25°C, I_{OUT}=5mA		-	4.3	8.0	mA
Quiescent Current Change	I_B	10.5V≤V_{IN}≤25V		-	-	1.0	mA
Output Noise Voltage	V_{NO}	Ta=25°C, 10Hz≤f≤100kHz I_{OUT}=50mA		-	70	-	µV
Ripple Rejection	RR	f=120Hz, 11.5V≤V_{IN}≤21.5V I_{OUT}=50mA, T_j=25°C		58	74	-	dB
Dropout Voltage	V_D	I_{OUT}=1.0A, T_j=25°C		-	2.0	-	V
Short Circuit Current Limit	I_{SC}	T_j=25°C		-	1.1	-	A
Average Temperature Coefficient of Output Voltage	T_{CVO}	I_{OUT}=5mA, 0°C≤T_j≤125°C		-	-1.0	-	mV/deg



Dim.	Min.	Max.
A	- - -	.41
B	.58	.60
C	.10	.12
D	.01	.03
F	Ø.12	Ø.13
G	.12	.13
H	.46	.48
J	.03	.03
K	.51	.55
L	.14	.15
N	- - -	.10
P	- - -	.10
Q	.1	.1
R	.17	.19
S	.22	.25
T	.09	.11
U	5°	5°

1. Input
2. Common
3. Output

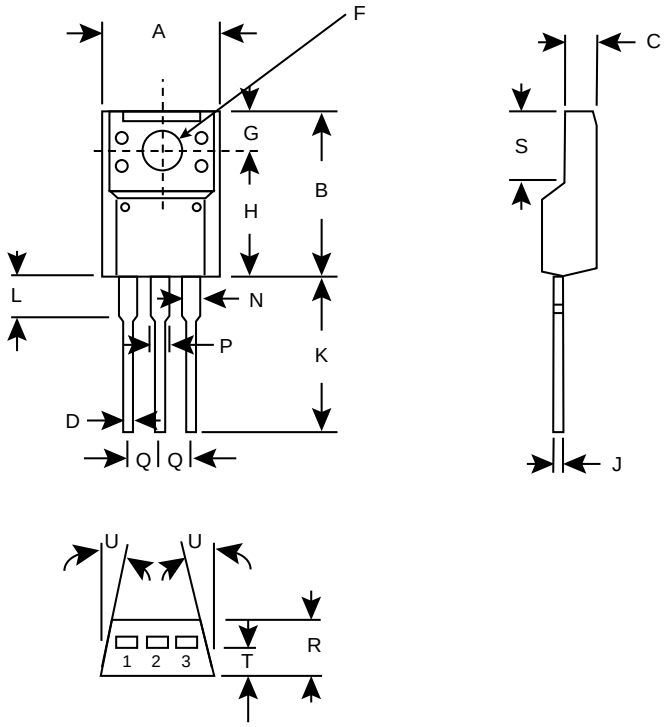
Maximum Ratings (Ta=25°C)

Characteristic	Symbol	Rating	Unit
Input Voltage	V_{IN}	35	V
Power Dissipation (note)	P_D	20.8	W
Operating Temperature	T_{opr}	-30~75	°C
Storage Temperature	T_{stg}	-55~150	°C

Note: T_C=25°C

333-7809PI
Electrical Characteristics (V_{IN}=15V, I_{OUT}=500mA, 0°C≤T_j≤125°C)

Characteristic	Symbol	Test Conditions		Min.	Typ.	Max.	Unit
Output Voltage	V_{OUT}	T_j=25°C, I_{OUT}=100mA		8.64	9.0	9.36	V
Input Regulation	Reg. line	T_j=25°C	11.5V≤V_{IN}≤26V	-	7.0	180	mV
			13V≤V_{IN}≤19V	-	2.5	90	
Load Regulation	Reg. load	T_j=25°C	5mA≤I_{OUT}≤1.4A	-	12	180	mV
			250mA≤I_{OUT}≤750mA	-	4.0	90	
Output Voltage	V_{OUT}	11.5V≤V_{IN}≤2.6V 5.0mA≤I_{OUT}≤1.0A, P_0<15W		8.55	-	9.45	V
Quiescent Current	I_B	T_j=25°C, I_{OUT}=5mA		-	4.3	8.0	mA
Quiescent Current Change	I_B	11.5V≤V_{IN}≤26V		-	-	1.0	mA
Output Noise Voltage	V_{NO}	Ta=25°C, 10Hz≤f≤100kHz I_{OUT}=50mA		-	75	-	µV
Ripple Rejection	RR	f=120Hz, 12.5V≤V_{IN}≤22.5V I_{OUT}=50mA, T_j=25°C		56	72	-	dB
Dropout Voltage	V_D	I_{OUT}=1.0A, T_j=25°C		-	2.0	-	V
Short Circuit Current Limit	I_{SC}	T_j=25°C		-	1.1	-	A
Average Temperature Coefficient of Output Voltage	T_{CVO}	I_{OUT}=5mA, 0°C≤T_j≤125°C		-	-1.1	-	mV/deg



Dim.	Min.	Max.
A	- - -	.41
B	.58	.60
C	.10	.12
D	.01	.03
F	Ø.12	Ø.13
G	.12	.13
H	.46	.48
J	.03	.03
K	.51	.55
L	.14	.15
N	- - -	.10
P	- - -	.10
Q	.10	.10
R	.17	.19
S	.22	.25
T	.09	.11
U	5°	5°

1. Input
2. Common
3. Output

Maximum Ratings (Ta=25°C)

Characteristic	Symbol	Rating	Unit
Input Voltage	V_{IN}	35	V
Power Dissipation (note)	P_D	20.8	W
Operating Temperature	T_{opr}	-30~75	°C
Storage Temperature	T_{stg}	-55~150	°C

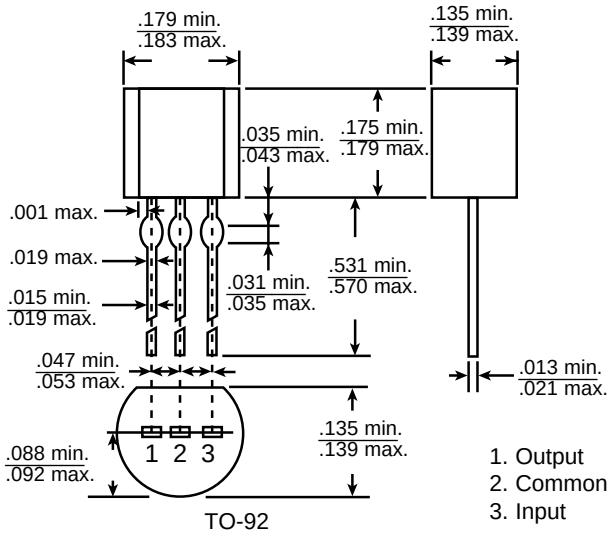
Note: T_C=25°C

333-7810PI

Electrical Characteristics (V_{IN}=16V, I_{OUT}=500mA, 0°C≤T_j≤125°C)

Characteristic	Symbol	Test Conditions		Min.	Typ.	Max.	Unit
Output Voltage	V_{OUT}	T_j=25°C, I_{OUT}=100mA		9.6	10.0	10.4	V
Input Regulation	Reg. line	T_j=25°C	12.5V≤V_{IN}≤27V	-	8	200	mV
			14V≤V_{IN}≤20V	-	2.5	100	
Load Regulation	Reg. load	T_j=25°C	5mA≤I_{OUT}≤1.4A	-	12	200	mV
			250mA≤I_{OUT}≤750mA	-	4.0	100	
Output Voltage	V_{OUT}	12.5V≤V_{IN}≤25V 5.0mA≤I_{OUT}≤1.0A, P_0<15W		9.5	-	10.5	V
Quiescent Current	I_B	T_j=25°C, I_{OUT}=5mA		-	4.3	8.0	mA
Quiescent Current Change	I_B	12.5V≤V_{IN}≤27V		-	-	1.0	mA
Output Noise Voltage	V_{NO}	Ta=25°C, 10Hz≤f≤100kHz I_{OUT}=50mA		-	8.0	-	µV
Ripple Rejection	RR	f=120Hz, 13.5V≤V_{IN}≤23.5V I_{OUT}=50mA, T_j=25°C		5.6	72	-	db
Dropout Voltage	V_D	I_{OUT}=1.0A, T_j=25°C		-	2.0	-	V
Short Circuit Current Limit	I_{SC}	T_j=25°C		-	0.9	-	A
Average Temperature Coefficient of Output Voltage	T_{CVO}	I_{OUT}=5mA, 0°C≤T_j≤125°C		-	-1.3	-	mV/deg

Dimensions (In.)



Specifications:

- Suitable for TTL, DTL, HTL, C-MOS power supply
- Internal short-circuit current limiting
- Internal thermal overload protection
- Maximum output current of 100mA (Tj=25°C)

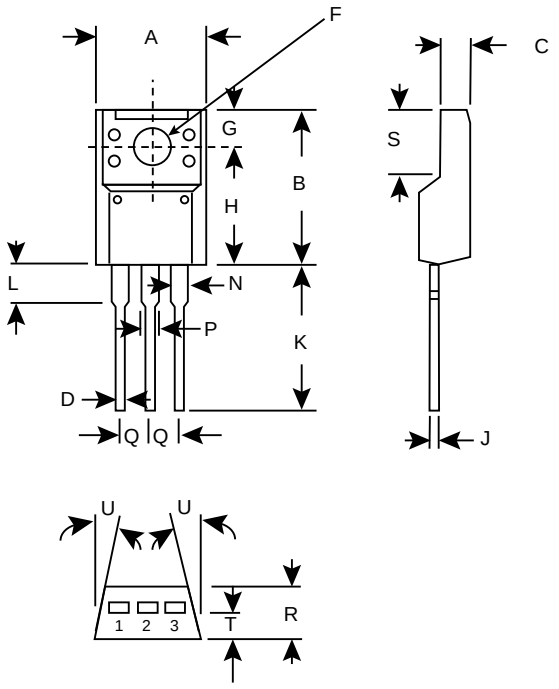
Maximum Ratings (Ta = 25°C)

Characteristic	Symbol	Rating	Unit
Input Voltage	V_{IN}	35	V
Power Dissipation	P_D	600	mW
Operating Temperature	T_{opr}	-40 ~ +85	°C
Storage Temperature	T_{stg}	-55 ~ +150	°C

333-78S05P Electrical Characteristics

(Unless otherwise specified, V_{IN}=10V, I_{OUT}=40mA, C_{IN}=0.33µF, C_{OUT}=0.1µF, 0°C≤T_j≤125°C

Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Output Voltage	V_{OUT}	Tj=25°C	4.8	5.0	5.2	V
Input Regulation	Reg. Line	Tj=25°C, 7.0V ≤ V_{IN} ≤ 20V	-	55	150	mV
		Tj=25°C, 8.0V ≤ V_{IN} ≤ 20V	-	45	100	
Load Regulation	Reg. Load	Tj=25°C, 1.0mA ≤ I_{OUT} ≤ 100mA	-	11	60	mV
		Tj=25°C, 1.0mA ≤ I_{OUT} ≤ 40mA	-	5.0	30	
Output Voltage	V_{OUT}	7.0V ≤ V_{IN} ≤ 20V, 1.0mA ≤ I_{OUT} ≤ 40mA	4.75	-	5.25	V
		V_{IN} ≤ 10V, 1.0mA ≤ I_{OUT} ≤ 70mA	4.75	-	5.25	
Quiescent Current	I_B	Tj=25°C	-	3.1	6.0	mA
		Tj=125°C	-	-	5.5	
Quiescent Current Change	ΔI_B	8.0V ≤ V_{IN} ≤ 20V	-	-	1.5	mA
		1.0mA ≤ I_{OUT} ≤ 40mA	-	-	0.1	
Output Noise Voltage	V_{NO}	Ta=25°C, 10Hz ≤ f ≤ 100kHz	-	40	-	µV
Long Term Stability	$\Delta V_{OUT}/\Delta t$		-	12	-	mV/1.0 KHrs
Ripple Rejection	RR	f=120Hz, 8.0V ≤ V_{IN} ≤ 18V, Tj=25°C	41	49	-	dB
Dropout Voltage	V_{IN} V_{OUT}	Tj=25°C	-	1.7	-	V
Average Temperature Coefficient of Output Voltage	TC_{VO}	I_{OUT}=5mA	-	-0.6	-	mV/°C



Dim.	Min.	Max.
A	- - -	.41
B	.58	.60
C	.10	.12
D	.01	.03
F	Ø.12	Ø.13
G	.12	.13
H	.46	.48
J	.03	.03
K	.51	.55
L	.14	.15
N	- - -	.10
P	- - -	.10
Q	.1	.1
R	.17	.19
S	.22	.25
T	.09	.11
U	5°	5°

1. Input
2. Common
3. Output

Maximum Ratings (Ta=25°C)

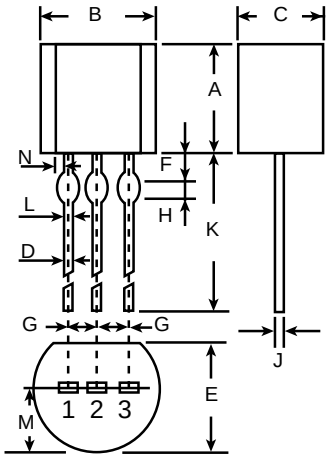
Characteristic	Symbol	Rating	Unit
Input Voltage	V_{IN}	40	V
Power Dissipation (note)	P_D	20.8	W
Operating Temperature	T_{opr}	-30~75	°C
Storage Temperature	T_{stg}	-55~150	°C

Note: T_C=25°C

333-7824PI

Electrical Characteristics (V_{IN}=33V, I_{OUT}=500mA, 0°C≤T_j≤125°C)

Characteristic	Symbol	Test Conditions		Min.	Typ.	Max.	Unit
Output Voltage	V_{OUT}	T_j=25°C, I_{OUT}=100mA		23.0	24.0	25.0	V
Input Regulation	Reg. line	T_j=25°C	27V≤V_{IN}≤38V	-	18	480	mV
			30V≤V_{IN}≤36V	-	36	240	
Load Regulation	Reg. load	T_j=25°C	5mA≤I_{OUT}≤1.4A	-	12	480	mV
			250mA≤I_{OUT}≤750mA	-	4	240	
Output Voltage	V_{OUT}	27V≤V_{IN}≤38V 5.0mA≤I_{OUT}≤1.0A, P_o<15W		22.8	-	25.2	V
Quiescent Current	I_B	T_j=25°C, I_{OUT}=5mA		-	4.6	8.0	mA
Quiescent Current Change	I_B	27V≤V_{IN}≤38V		-	-	1.0	mA
Output Noise Voltage	V_{NO}	Ta=25°C, 10Hz≤f≤100kHz I_{OUT}=50mA		-	150	-	µV
Ripple Rejection	RR	f=120Hz, 28V≤V_{IN}≤38V I_{OUT}=50mA, T_j=25°C		50	66	-	dB
Dropout Voltage	V_D	I_{OUT}=1.0A, T_j=25°C		-	2.0	-	V
Short Circuit Current Limit	I_{SC}	T_j=25°C		-	0.3	-	A
Average Temperature Coefficient of Output Voltage	T_{CVO}	I_{OUT}=5mA, 0°C≤T_j≤125°C		-	-3.5	-	mV/deg



1. Output
2. Common
3. Input

TO-92

Dim.	Inches	
	Min	Max
A	.175	.179
B	.179	.183
C	.135	.139
D	.015	.019
E	.135	.139
F	.035	.043
G	.047	.053
H	.031	.035
J	.013	.021
K	.531	.570
L	-	.019
M	.088	.092
N	-	.001

Specifications:

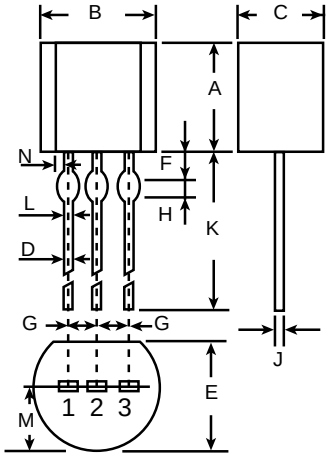
- Suitable for TTL, DTL, HTL, C-MOS power supply
- Internal short-circuit current limiting
- Internal thermal overload protection
- Maximum output current of 100mA (Tj=25°C)

Maximum Ratings (Ta = 25°C)

Characteristic	Symbol	Rating	Unit
Input Voltage	V_{IN}	35	V
Power Dissipation	P_D	600	mW
Operating Temperature	T_{opr}	-40 ~ 85	°C
Storage Temperature	Tstg	-55 ~150	°C

333-78S06P Electrical Characteristics
(Unless otherwise specified, V_{IN}=11V, I_{OUT}=40mA, C_{IN}=0.33µF, C_{OUT}=0.1µF, 0°C≤T_j≤125°C

Characteristic	Symbol	Test Condition		Min.	Typ.	Max.	Unit
Output Voltage	V_{OUT}	Tj=25°C		5.76	6.0	6.24	V
Input Regulation	Reg. Line	Tj=25°C	8.1V ≤ V_{IN} ≤ 21V	-	50	150	mV
			9.0V ≤ V_{IN} ≤ 21V	-	45	110	
Load Regulation	Reg. Load	Tj=25°C	1.0mA ≤ I_{OUT} ≤ 100mA	-	12	70	mV
			1.0mA ≤ I_{OUT} ≤ 40mA	-	5.5	35	
Output Voltage	V_{OUT}	8.1V ≤ V_{IN} ≤ 21V 1.0mA ≤ I_{OUT} ≤ 40mA		5.7	-	6.3	V
		V_{IN} ≤ 11V, 1.0mA ≤ I_{OUT} ≤ 70mA		5.7	-	6.3	
Quiescent Current	I_B	Tj=25°C		-	3.1	6.0	mA
		Tj=125°C		-	-	5.5	
Quiescent Current Change	ΔI_B	9.0V ≤ V_{IN} ≤ 20V		-	-	1.5	mA
		1.0mA ≤ I_{OUT} ≤ 40mA		-	-	0.1	
Output Noise Voltage	V_{NO}	Ta=25°C, 10Hz ≤ f ≤ 100kHz		-	40	-	µV
Long Term Stability	$\Delta V_{OUT}/\Delta t$			-	14	-	mV/ 1.0 KHrs
Ripple Rejection	RR	f=120Hz 9.0V ≤ V_{IN} ≤ 19V, Tj=25°C		39	47	-	dB
Dropout Voltage	V_{IN} V_{OUT}	Tj=25°C		-	1.7	-	V
Average Temperature Coefficient of Output Voltage	TC_{VO}	I_{OUT}=5mA		-	-0.7	-	mV/°C



1. Output
2. Common
3. Input

TO-92

Dim.	Inches	
	Min	Max
A	.175	.179
B	.179	.183
C	.135	.139
D	.015	.019
E	.135	.139
F	.035	.043
G	.047	.053
H	.031	.035
J	.013	.021
K	.531	.570
L	-	.019
M	.088	.092
N	-	.001

Specifcations:

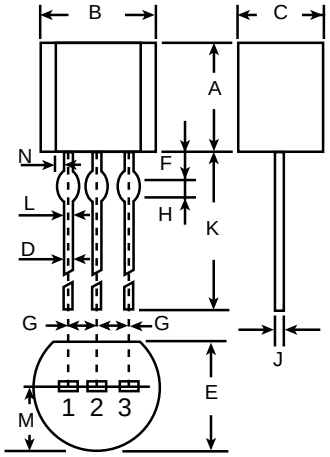
- Suitable for TTL, DTL, HTL, C-MOS power supply
- Internal short-circuit current limiting
- Internal thermal overload protection
- Maximum output current of 100mA (Tj=25°C)

Maximum Ratings (Ta = 25°C)

Characteristic	Symbol	Rating	Unit
Input Voltage	V_{IN}	35	V
Power Dissipation	P_D	600	mW
Operating Temperature	T_{opr}	-40 ~ 85	°C
Storage Temperature	Tstg	-55 ~150	°C

333-78S08P Electrical Characteristics
(Unless otherwise specified, V_{IN}=11V, I_{OUT}=40mA, C_{IN}=0.33µF, C_{OUT}=0.1µF, 0°C≤T_j≤125°C

Characteristic	Symbol	Test Condition		Min.	Typ.	Max.	Unit
Output Voltage	V_{OUT}	Tj=25°C		7.7	8.0	8.3	V
Input Regulation	Reg. Line	Tj=25°C	10.5V ≤ V_{IN} ≤ 23V	-	20	175	mV
			11V ≤ V_{IN} ≤ 23V	-	12	125	
Load Regulation	Reg. Load	Tj=25°C	1.0mA ≤ I_{OUT} ≤ 100mA	-	15	80	mV
			1.0mA ≤ I_{OUT} ≤ 40mA	-	7.0	40	
Output Voltage	V_{OUT}	10.5V ≤ V_{IN} ≤ 23V 1.0mA ≤ I_{OUT} ≤ 40mA		7.6	-	8.4	V
		V_{IN} ≤ 14V, 1.0mA ≤ I_{OUT} ≤ 70mA		7.6	-	8.4	
Quiescent Current	I_B	Tj=25°C		-	3.1	6.5	mA
		Tj=125°C		-	-	6.0	
Quiescent Current Change	ΔI_B	11V ≤ V_{IN} ≤ 23V		-	-	1.5	mA
		1.0mA ≤ I_{OUT} ≤ 40mA		-	-	0.1	
Output Noise Voltage	V_{NO}	Ta=25°C, 10Hz ≤ f ≤ 100kHz		-	60	-	µV
Long Term Stability	$\Delta V_{OUT}/\Delta t$			-	20	-	mV/1.0 KHrs
Ripple Rejection	RR	f=120Hz 12V ≤ V_{IN} ≤ 23V, Tj=25°C		37	45	-	dB
Dropout Voltage	V_{IN} V_{OUT}	Tj=25°C		-	1.7	-	V
Average Temperature Coefficient of Output Voltage	TC_{VO}	I_{OUT}=5mA		-	-0.8	-	mV/°C



1. Output
2. Common
3. Input

TO-92

Dim.	Inches	
	Min	Max
A	.175	.179
B	.179	.183
C	.135	.139
D	.015	.019
E	.135	.139
F	.035	.043
G	.047	.053
H	.031	.035
J	.013	.021
K	.531	.570
L	-	.019
M	.088	.092
N	-	.001

Specifications:

- Suitable for TTL, DTL, HTL, C-MOS power supply
- Internal short-circuit current limiting
- Internal thermal overload protection
- Maximum output current of 100mA (Tj=25°C)

Maximum Ratings (Ta = 25°C)

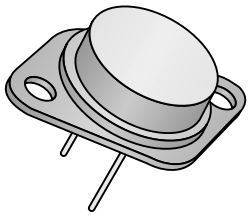
Characteristic	Symbol	Rating	Unit
Input Voltage	V_{IN}	35	V
Power Dissipation	P_D	600	mW
Operating Temperature	T_{opr}	-40 ~ 85	°C
Storage Temperature	Tstg	-55 ~150	°C

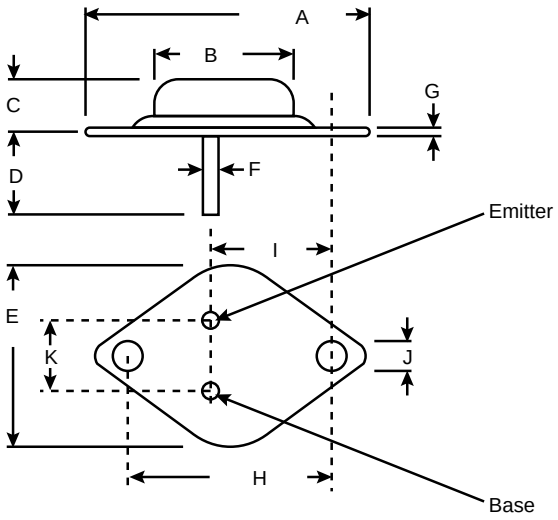
333-78S09P Electrical Characteristics
(Unless otherwise specified, V_{IN}=15V, I_{OUT}=40mA, C_{IN}=0.33µF, C_{OUT}=0.1µF, 0°C≤T_j≤125°C

Characteristic	Symbol	Test Condition		Min.	Typ.	Max.	Unit
Output Voltage	V_{OUT}	Tj=25°C		8.64	9.0	9.36	V
Input Regulation	Reg. Line	Tj=25°C	11.4V ≤ V_{IN} ≤ 24V	-	80	200	mV
			12V ≤ V_{IN} ≤ 24V	-	20	160	
Load Regulation	Reg. Load	Tj=25°C	1.0mA ≤ I_{OUT} ≤ 100mA	-	17	90	mV
			1.0mA ≤ I_{OUT} ≤ 40mA	-	8.0	45	
Output Voltage	V_{OUT}	11.4V ≤ V_{IN} ≤ 24V 1.0mA ≤ I_{OUT} ≤ 40mA		8.55	-	9.45	V
		V_{IN} ≤ 15V, 1.0mA ≤ I_{OUT} ≤ 70mA		8.55	-	9.45	
Quiescent Current	I_B	Tj=25°C		-	3.2	6.5	mA
		Tj=125°C		-	-	6.0	
Quiescent Current Change	ΔI_B	11.5V ≤ V_{IN} ≤ 26V		-	-	1.5	mA
		1.0mA ≤ I_{OUT} ≤ 40mA		-	-	0.1	
Output Noise Voltage	V_{NO}	Ta=25°C, 10Hz ≤ f ≤ 100kHz		-	65	-	µV
Long Term Stability	$\Delta V_{OUT}/\Delta t$			-	21	-	mV/1.0 KHrs
Ripple Rejection	RR	f=120Hz 12V ≤ V_{IN} ≤ 24V, Tj=25°C		36	44	-	dB
Dropout Voltage	V_{IN} V_{OUT}	Tj=25°C		-	1.7	-	V
Average Temperature Coefficient of Output Voltage	TC_{VO}	I_{OUT}=5mA		-	-0.85	-	mV/°C

MOUSER® ELECTRONICS

333-MJ4502 PNP General Purposes Power Transistor

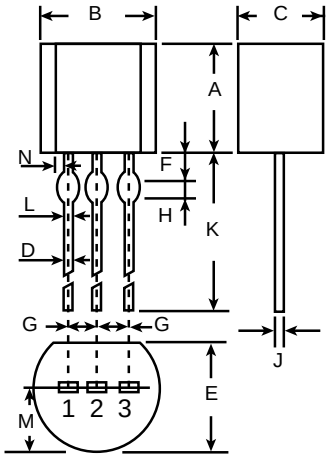




TO-3

	Inches	
	Min.	Max.
A	-	1.57
B	.759	.875
C	.250	.450
D	.440	.480
E	.992	1.05
F	.038	.043
G	-	.135
H	1.177	1.197
I	.655	.681
J	.156	.158
K	.420	.440

PNP	I_C (A)	V_{CBO} (V)	V_{CEO} (V)	P_D (W)	H_{FE} (Min/Max)	I_C/V_{CE} (A/V)	$V_{CE(SAT)}$ (V)	I_C/I_B (A/mA)
MJ4502	30	100	90	200	25/100	7.5/2	0.8	7.5/750



1. Output
2. Common
3. Input

TO-92

Dim.	Inches	
	Min	Max
A	.175	.179
B	.179	.183
C	.135	.139
D	.015	.019
E	.135	.139
F	.035	.043
G	.047	.053
H	.031	.035
J	.013	.021
K	.531	.570
L	-	.019
M	.088	.092
N	-	.001

Specifications:

- Suitable for TTL, DTL, HTL, C-MOS power supply
- Internal short-circuit current limiting
- Internal thermal overload protection
- Maximum output current of 100mA (Tj=25°C)

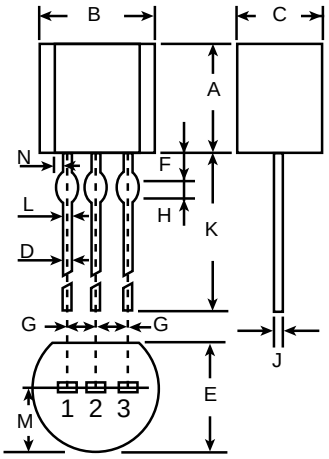
Maximum Ratings (Ta = 25°C)

Characteristic	Symbol	Rating	Unit
Input Voltage	V_{IN}	35	V
Power Dissipation	P_D	600	mW
Operating Temperature	T_{opr}	-40 ~ 85	°C
Storage Temperature	Tstg	-55 ~150	°C

333-78S12P Electrical Characteristics

(Unless otherwise specified, V_{IN}=19V, I_{OUT}=40mA, C_{IN}=0.33µF, C_{OUT}=0.1µF, 0°C≤T_j≤125°C

Characteristic	Symbol	Test Condition		Min.	Typ.	Max.	Unit
Output Voltage	V_{OUT}	Tj=25°C		11.5	12	12.5	V
Input Regulation	Reg. Line	Tj=25°C	14.5V ≤ V_{IN} ≤ 27V	-	120	250	mV
			16V ≤ V_{IN} ≤ 27V	-	100	200	
Load Regulation	Reg. Load	Tj=25°C	1.0mA ≤ I_{OUT} ≤ 100mA	-	20	100	mV
			1.0mA ≤ I_{OUT} ≤ 40mA	-	10	50	
Output Voltage	V_{OUT}	14.5V ≤ V_{IN} ≤ 27V 1.0mA ≤ I_{OUT} ≤ 40mA		11.4	-	12.6	V
		V_{IN} ≤ 19V, 1.0mA ≤ I_{OUT} ≤ 70mA		11.4	-	12.6	
Quiescent Current	I_B	Tj=25°C		-	3.2	6.5	mA
		Tj=125°C		-	-	6.0	
Quiescent Current Change	ΔI_B	16V ≤ V_{IN} ≤ 27V		-	-	1.5	mA
		1.0mA ≤ I_{OUT} ≤ 40mA		-	-	0.1	
Output Noise Voltage	V_{NO}	Ta=25°C, 10Hz ≤ f ≤ 100kHz		-	80	-	µV
Long Term Stability	$\Delta V_{OUT}/\Delta t$			-	24	-	mV/ 1.0 KHrs
Ripple Rejection	RR	f=120Hz 15V ≤ V_{IN} ≤ 25V, Tj=25°C		36	41	-	dB
Dropout Voltage	V_{IN} V_{OUT}	Tj=25°C		-	1.7	-	V
Average Temperature Coefficient of Output Voltage	TC_{VO}	I_{OUT}=5mA		-	-1.0	-	mV/°C



1. Output
2. Common
3. Input

TO-92

Dim.	Inches	
	Min	Max
A	.175	.179
B	.179	.183
C	.135	.139
D	.015	.019
E	.135	.139
F	.035	.043
G	.047	.053
H	.031	.035
J	.013	.021
K	.531	.570
L	-	.019
M	.088	.092
N	-	.001

Specifications:

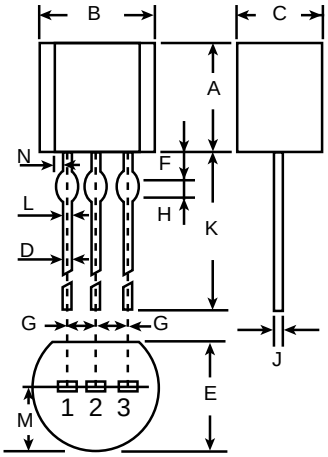
- Suitable for TTL, DTL, HTL, C-MOS power supply
- Internal short-circuit current limiting
- Internal thermal overload protection
- Maximum output current of 100mA (Tj=25°C)

Maximum Ratings (Ta = 25°C)

Characteristic	Symbol	Rating	Unit
Input Voltage	V_{IN}	35	V
Power Dissipation	P_D	600	mW
Operating Temperature	T_{opr}	-40 ~ 85	°C
Storage Temperature	Tstg	-55 ~150	°C

333-78S15P Electrical Characteristics
(Unless otherwise specified, V_{IN}=23V, I_{OUT}=40mA, C_{IN}=0.33µF, C_{OUT}=0.1µF, 0°C≤T_j≤125°C

Characteristic	Symbol	Test Condition		Min.	Typ.	Max.	Unit
Output Voltage	V_{OUT}	Tj=25°C		14.4	15	15.6	V
Input Regulation	Reg. Line	Tj=25°C	17.5V ≤ V_{IN} ≤ 30V	-	130	300	mV
			20V ≤ V_{IN} ≤ 30V	-	110	250	
Load Regulation	Reg. Load	Tj=25°C	1.0mA ≤ I_{OUT} ≤ 100mA	-	25	150	mV
			1.0mA ≤ I_{OUT} ≤ 40mA	-	12	75	
Output Voltage	V_{OUT}	17.5V ≤ V_{IN} ≤ 30V 1.0mA ≤ I_{OUT} ≤ 40mA		14.25	-	15.75	V
		V_{IN} ≤ 23V, 1.0mA ≤ I_{OUT} ≤ 70mA		14.25	-	15.75	
Quiescent Current	I_B	Tj=25°C		-	3.3	6.5	mA
		Tj=125°C		-	-	6.0	
Quiescent Current Change	ΔI_B	20V ≤ V_{IN} ≤ 30V		-	-	1.5	mA
		1.0mA ≤ I_{OUT} ≤ 40mA		-	-	0.1	
Output Noise Voltage	V_{NO}	Ta=25°C, 10Hz ≤ f ≤ 100kHz		-	90	-	µV
Long Term Stability	$\Delta V_{OUT}/\Delta t$			-	30	-	mV/ 1.0 KHrs
Ripple Rejection	RR	f=120Hz 18.5V ≤ V_{IN} ≤ 28.5V, Tj=25°C		34	40	-	dB
Dropout Voltage	V_{IN} V_{OUT}	Tj=25°C		-	1.7	-	V
Average Temperature Coefficient of Output Voltage	TC_{VO}	I_{OUT}=5mA		-	-1.3	-	mV/°C



1. Output
2. Common
3. Input

TO-92

Dim.	Inches	
	Min	Max
A	.175	.179
B	.179	.183
C	.135	.139
D	.015	.019
E	.135	.139
F	.035	.043
G	.047	.053
H	.031	.035
J	.013	.021
K	.531	.570
L	-	.019
M	.088	.092
N	-	.001

Specifications:

- Suitable for TTL, DTL, HTL, C-MOS power supply
- Internal short-circuit current limiting
- Internal thermal overload protection
- Maximum output current of 100mA (Tj=25°C)

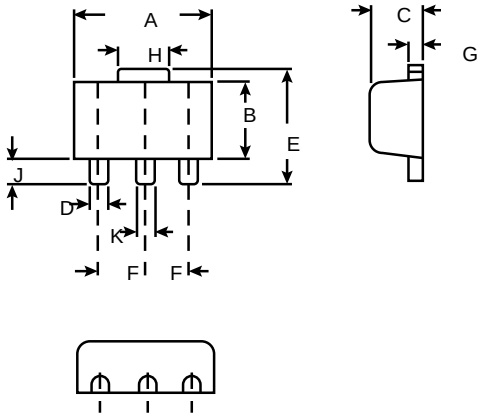
Maximum Ratings (Ta = 25°C)

Characteristic	Symbol	Rating	Unit
Input Voltage	V_{IN}	40	V
Power Dissipation	P_D	600	mW
Operating Temperature	T_{opr}	-40 ~ 85	°C
Storage Temperature	Tstg	-55 ~150	°C

333-78S18P Electrical Characteristics

(Unless otherwise specified, V_{IN}=27V, I_{OUT}=40mA, C_{IN}=0.33µF, C_{OUT}=0.1µF, 0°C≤T_j≤125°C

Characteristic	Symbol	Test Condition		Min.	Typ.	Max.	Unit
Output Voltage	V_{OUT}	Tj=25°C		17.3	18	18.7	V
Input Regulation	Reg. Line	Tj=25°C	21.4V ≤ V_{IN} ≤ 33V	-	32	325	mV
			22V ≤ V_{IN} ≤ 33V	-	27	275	
Load Regulation	Reg. Load	Tj=25°C	1.0mA ≤ I_{OUT} ≤ 100mA	-	30	170	mV
			1.0mA ≤ I_{OUT} ≤ 40mA	-	15	75	
Output Voltage	V_{OUT}	21.4V ≤ V_{IN} ≤ 33V 1.0mA ≤ I_{OUT} ≤ 40mA		17.1	-	18.9	V
		V_{IN} ≤ 27V, 1.0mA ≤ I_{OUT} ≤ 70mA		17.1	-	18.9	
Quiescent Current	I_B	Tj=25°C		-	3.3	6.5	mA
		Tj=125°C		-	-	6.0	
Quiescent Current Change	ΔI_B	22V ≤ V_{IN} ≤ 33V		-	-	1.5	mA
		1.0mA ≤ I_{OUT} ≤ 40mA		-	-	0.1	
Output Noise Voltage	V_{NO}	Ta=25°C, 10Hz ≤ f ≤ 100kHz		-	150	-	µV
Long Term Stability	$\Delta V_{OUT}/\Delta t$			-	45	-	mV/ 1.0 KHrs
Ripple Rejection	RR	f=120Hz 23V ≤ V_{IN} ≤ 33V, Tj=25°C		32	38	-	dB
Dropout Voltage	V_{IN} V_{OUT}	Tj=25°C		-	1.7	-	V
Average Temperature Coefficient of Output Voltage	TC_{VO}	I_{OUT}=5mA		-	-1.5	-	mV/°C



Dim.	Inches
A	.181 max.
B	.098±.004
C	.063 max.
D	$.017^{+.003}_{-.002}$
E	.165 max.
F	.059±.004
G	.016±.002
H	.070 max.
J	.031 min.
K	$.018^{+.003}_{-.002}$

1. Output
2. Common
3. Input

Specifications:

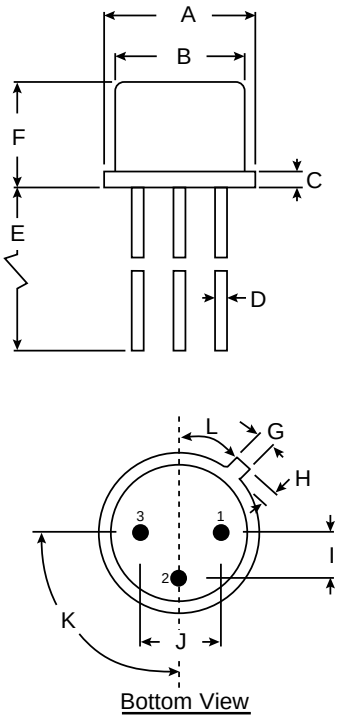
- Best suited to power supply for TTL/C^2 MOS
- No external part needed
- Built-in thermal protective circuit
- Max. output current 150mA. (Tj=25°C)

Maximum Ratings (Ta = 25°C)

Characteristic	Symbol	Rating	Unit
Input Voltage	V_{IN}	35	V
Power Dissipation	P_D	500	mW
Operating Temperature	T_{opr}	-30 ~ 75	°C
Storage Temperature	Tstg	-55 ~150	°C

333-78L06F
(Unless otherwise specified, V_{IN}=11V, I_{OUT}=40mA, C_{IN}=0.33µF, C_{OUT}=0.1µF, 0°C≤T_j≤125°C

Characteristic	Symbol	Test Condition		Min.	Typ.	Max.	Unit
Output Voltage	V_{OUT}	Tj=25°C		5.7	6.0	6.3	V
Input Regulation	Reg. Line	Tj=25°C	8.1V ≤ V_{IN} ≤ 21V	-	50	150	mV
			9.0V ≤ V_{IN} ≤ 21V	-	45	110	
Load Regulation	Reg. Load	Tj=25°C	1.0mA ≤ I_{OUT} ≤ 100mA	-	12	70	mV
			1.0mA ≤ I_{OUT} ≤ 40mA	-	5.5	35	
Output Voltage	V_{OUT}	8.1V ≤ V_{IN} ≤ 21V 1.0mA ≤ I_{OUT} ≤ 40mA		5.58	-	6.42	V
		V_{IN} ≤ 11V, 1.0mA ≤ I_{OUT} ≤ 70mA		5.58	-	6.42	
Quiescent Current	I_B	Tj=25°C		-	3.1	6.0	mA
		Tj=125°C		-	-	5.5	
Quiescent Current Change	ΔI_B	9.0V ≤ V_{IN} ≤ 20V		-	-	1.5	mA
		1.0mA ≤ I_{OUT} ≤ 40mA		-	-	0.1	
Output Noise Voltage	V_{NO}	Ta=25°C, 10Hz ≤ f ≤ 100kHz		-	40	-	µV
Long Term Stability	$\Delta V_{OUT}/\Delta t$			-	14	-	mV/1.0 KHrs
Ripple Rejection	RR	f=120Hz 9.0V ≤ V_{IN} ≤ 19V, Tj=25°C		39	47	-	dB
Dropout Voltage	V_{IN} V_{OUT}	Tj=25°C		-	1.7	-	V
Average Temperature Coefficient of Output Voltage	TC_{VO}	I_{OUT}=5mA		-	-0.7	-	mV/°C



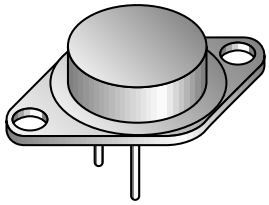
Bottom View

Dim.	Inches	
	Min.	Max.
A	.335	.370
B	.305	.335
C	- - -	.035
D	.016	.019
E	.500	- - -
F	.240	.260
G	.028	.034
H	.029	.035
I	.095	.105
J	.190	.210
K	90°	90°
L	42°	48°

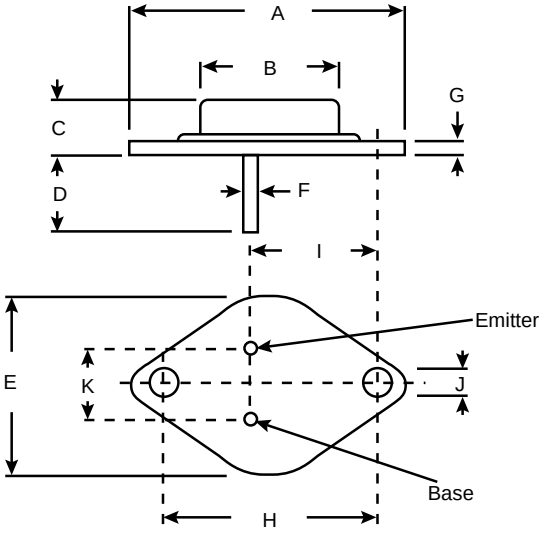
1. Emitter
2. Base
3. Collector

Specifications:

- VCEO: 80V/min.
- VCBO: 120V/min.
- VEBO: 5V/min.
- hFE at bias: 40 min./120 max.
- IC: 150mA
- VCE: 10V
- PTA: 600mW/max.
- VCE: 2,000V/typ.
- Ft: 5.0 mHz/typ.
- Cob: 50pf/typ.
- Ts: 20n sec./typ.



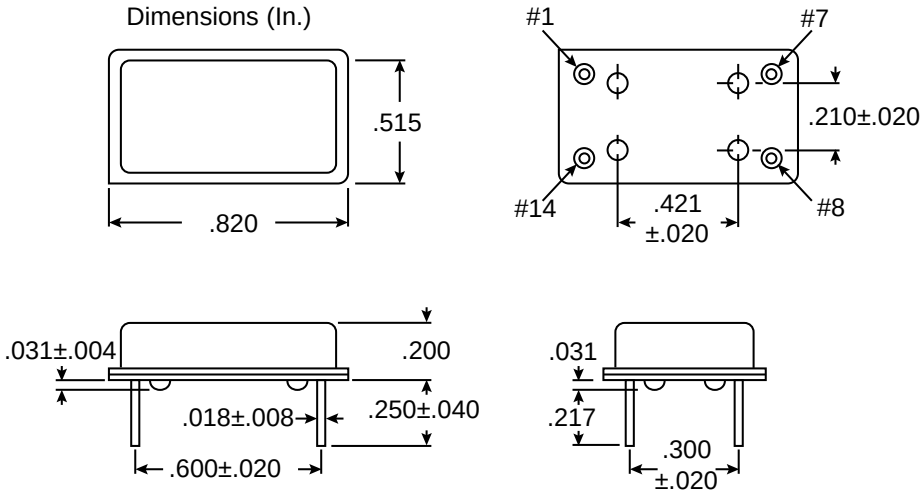
Dimensions (In.)



	Dimensions (In.)	
	Min.	Max.
A	- - -	1.573
B	.760	.075
C	.250	.450
D	.441	.480
E	.992	1.050
F	.038	.043
G	- - -	.135
H	1.177	1.197
I	.655	.681
J	.156	.158
K	.420	.440

Case: Collector

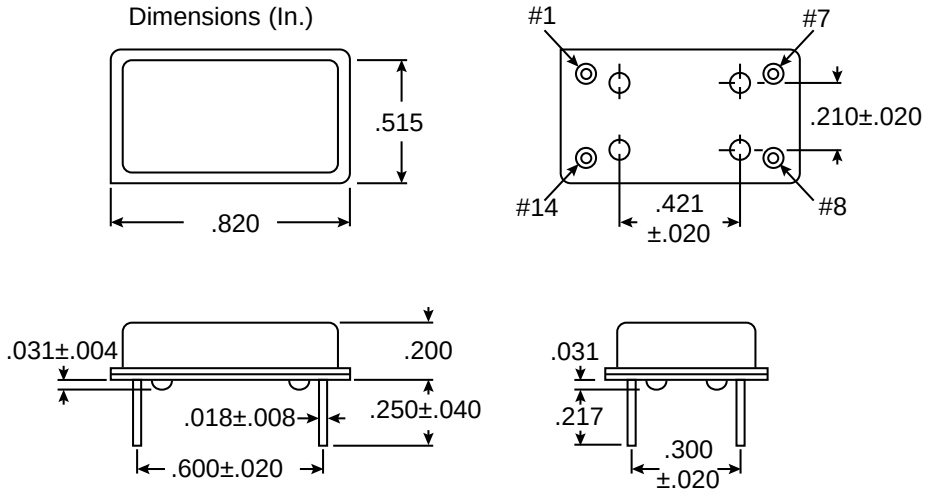
Mouser Stock No.	Package	I_C (A)	V_{CBO} (V)	V_{CEO} (V)	P_D (W)	H_{FE} (Min./Max.)	I_C/V_{CE} (A/V)	$V_{CE(SAT)}$ (V)	I_C/I_B (A/mA)
333-2N5882	TO-3	15	80	80	160	20/100	6.0/4	1.0	7.0/700



Pin	Connection
1	N.C.
7	GND
8	Output
14	+ VDC

Specifications:

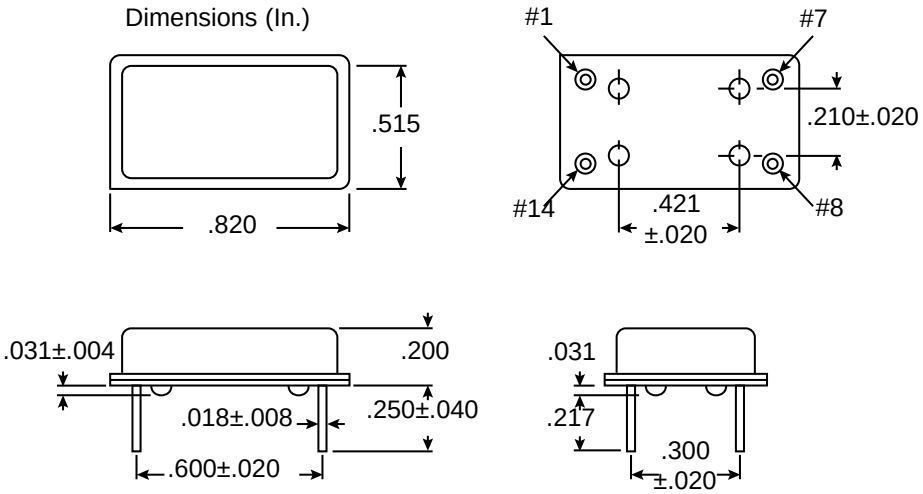
- Frequency: 9.216 MHz
- Frequency stability: 50 PPM (at 25°C)
- Operating temperature: 0°C to 70°C
- Input voltage: +5VDC ± 0.5V
- Input current: 20mA
- Rise and fall time: 10ns. max.
- "0" level: +0.4V max.
- "1" level: +2.4V min.
- "0" level: 16 mA min. (1.6 mA/gate)
- "1" source current: 400 uA min.
- Output load: 10 TTL gates max.



Pin	Connection
1	N.C.
7	GND
8	Output
14	+ VDC

Specifications:

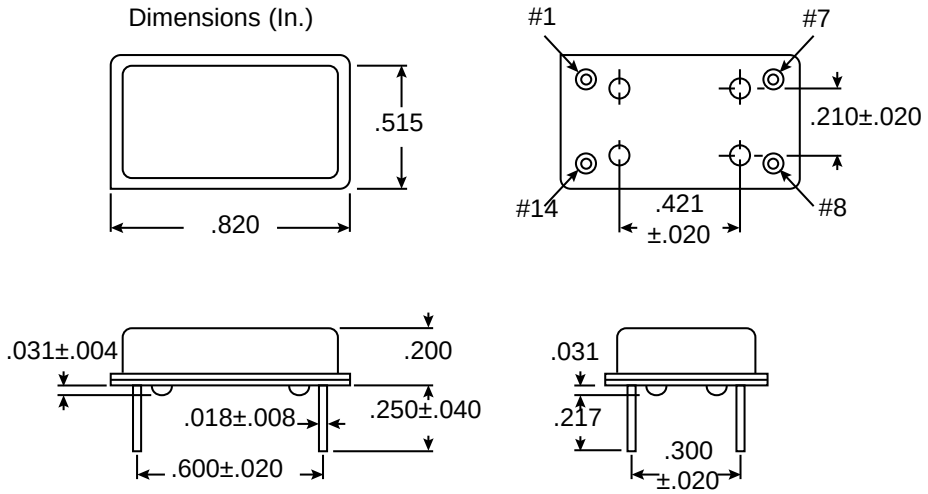
- Frequency: 10.0 MHz
- Frequency stability: 50 PPM (at 25°C)
- Operating temperature: 0°C to 70°C
- Input voltage: +5VDC ± 0.5V
- Input current: 20mA
- Rise and fall time: 10ns. max.
- "0" level: +0.4V max.
- "1" level: +2.4V min.
- "0" level: 16 mA min. (1.6 mA/gate)
- "1" source current: 400 uA min.
- Output load: 10 TTL gates max.



Pin	Connection
1	N.C.
7	GND
8	Output
14	+ VDC

Specifications:

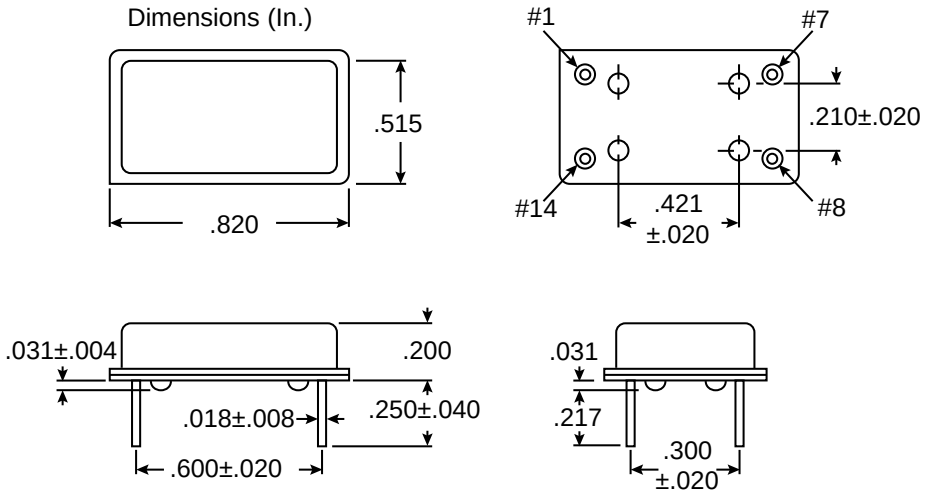
- Frequency: 11.0592 MHz
- Frequency stability: 50 PPM (at 25°C)
- Operating temperature: 0°C to 70°C
- Input voltage: +5VDC ± 0.5V
- Input current: 20mA
- Rise and fall time: 10ns. max.
- "0" level: +0.4V max.
- "1" level: +2.4V min.
- "0" level: 16 mA min. (1.6 mA/gate)
- "1" source current: 400 uA min.
- Output load: 10 TTL gates max.



Pin	Connection
1	N.C.
7	GND
8	Output
14	+ VDC

Specifications:

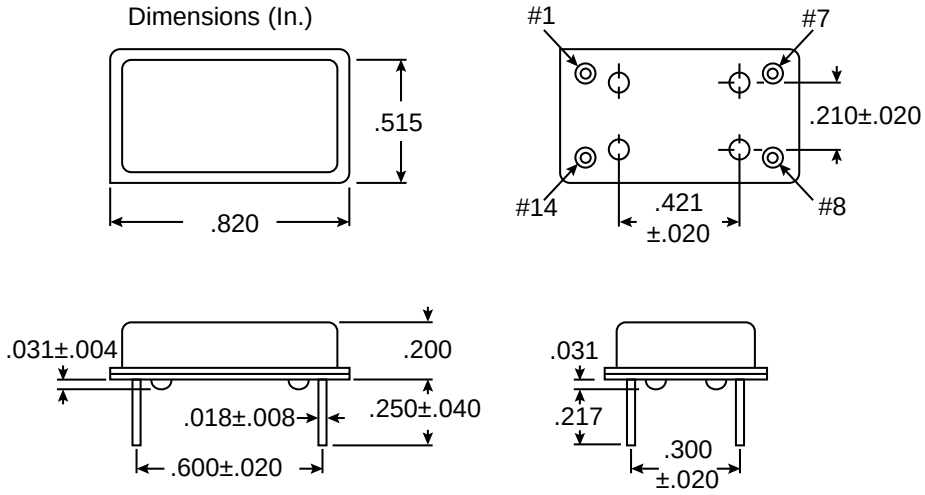
- Frequency: 16.257 MHz
- Frequency stability: 50 PPM (at 25°C)
- Operating temperature: 0°C to 70°C
- Input voltage: +5VDC ± 0.5V
- Input current: 20mA
- Rise and fall time: 10ns. max.
- "0" level: +0.4V max.
- "1" level: +2.4V min.
- "0" level: 16 mA min. (1.6 mA/gate)
- "1" source current: 400 uA min.
- Output load: 10 TTL gates max.



Pin	Connection
1	N.C.
7	GND
8	Output
14	+ VDC

Specifications:

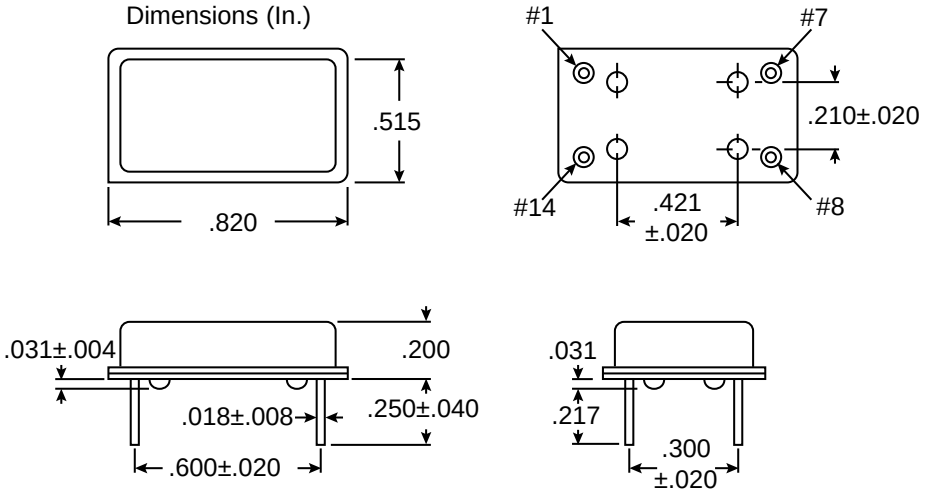
- Frequency: 18.0 MHz
- Frequency stability: 50 PPM (at 25°C)
- Operating temperature: 0°C to 70°C
- Input voltage: +5VDC ± 0.5V
- Input current: 20mA
- Rise and fall time: 10ns. max.
- "0" level: +0.4V max.
- "1" level: +2.4V min.
- "0" level: 16 mA min. (1.6 mA/gate)
- "1" source current: 400 uA min.
- Output load: 10 TTL gates max.



Pin	Connection
1	N.C.
7	GND
8	Output
14	+ VDC

Specifications:

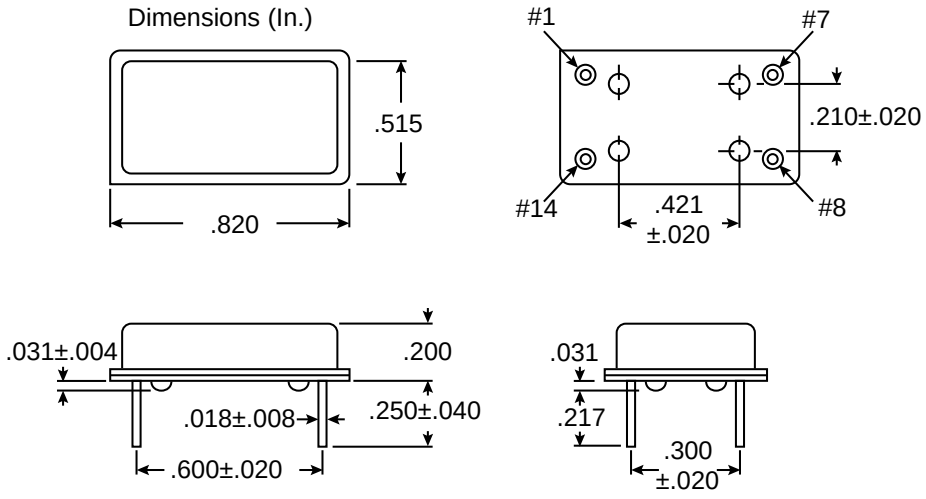
- Frequency: 18.432 MHz
- Frequency stability: 50 PPM (at 25°C)
- Operating temperature: 0°C to 70°C
- Input voltage: +5VDC ± 0.5V
- Input current: 20mA
- Rise and fall time: 10ns. max.
- "0" level: +0.4V max.
- "1" level: +2.4V min.
- "0" level: 16 mA min. (1.6 mA/gate)
- "1" source current: 400 uA min.
- Output load: 10 TTL gates max.



Pin	Connection
1	N.C.
7	GND
8	Output
14	+ VDC

Specifications:

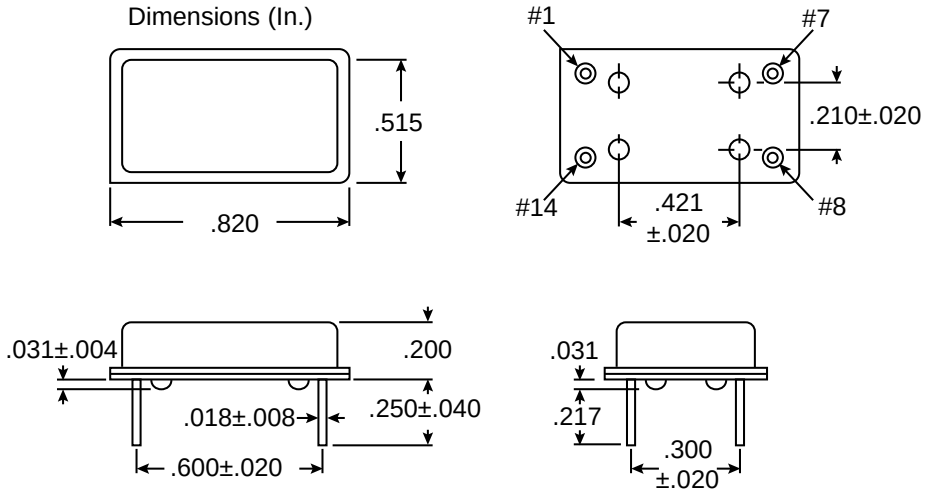
- Frequency: 19.6608 MHz
- Frequency stability: 50 PPM (at 25°C)
- Operating temperature: 0°C to 70°C
- Input voltage: +5VDC ± 0.5V
- Input current: 20mA
- Rise and fall time: 10ns. max.
- "0" level: +0.4V max.
- "1" level: +2.4V min.
- "0" level: 16 mA min. (1.6 mA/gate)
- "1" source current: 400 uA min.
- Output load: 10 TTL gates max.



Pin	Connection
1	N.C.
7	GND
8	Output
14	+ VDC

Specifications:

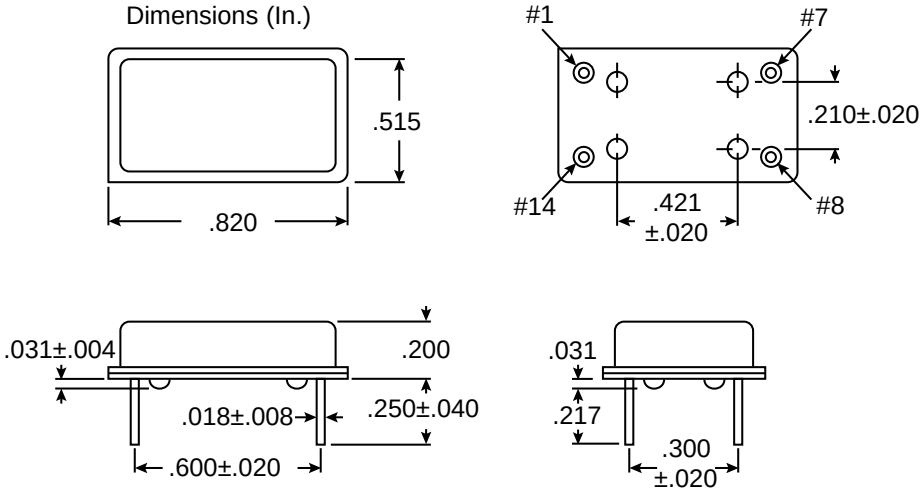
- Frequency: 20 MHz
- Frequency stability: 50 PPM (at 25°C)
- Operating temperature: 0°C to 70°C
- Input voltage: +5VDC ± 0.5V
- Input current: 20mA
- Rise and fall time: 10ns. max.
- "0" level: +0.4V max.
- "1" level: +2.4V min.
- "0" level: 16 mA min. (1.6 mA/gate)
- "1" source current: 400 uA min.
- Output load: 10 TTL gates max.



Pin	Connection
1	N.C.
7	GND
8	Output
14	+ VDC

Specifications:

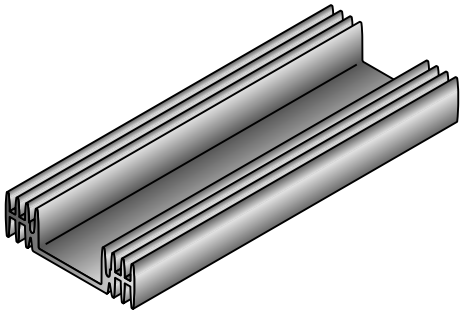
- Frequency: 24.0 MHz
- Frequency stability: 50 PPM (at 25°C)
- Operating temperature: 0°C to 70°C
- Input voltage: +5VDC ± 0.5V
- Input current: 20mA
- Rise and fall time: 10ns. max.
- "0" level: +0.4V max.
- "1" level: +2.4V min.
- "0" level: 16 mA min. (1.6 mA/gate)
- "1" source current: 400 uA min.
- Output load: 10 TTL gates max.



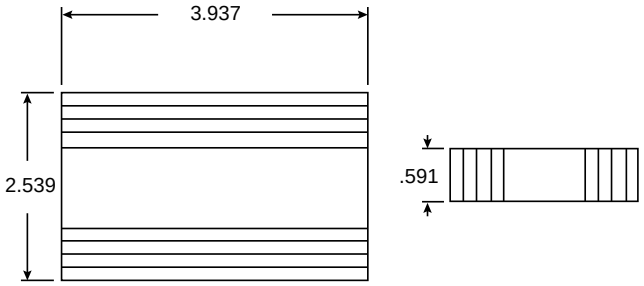
Pin	Connection
1	N.C.
7	GND
8	Output
14	+ VDC

Specifications:

- Frequency: 9.8304 MHz
- Frequency stability: 50 PPM (at 25°C)
- Operating temperature: 0°C to 70°C
- Input voltage: +5VDC ± 0.5V
- Input current: 20mA
- Rise and fall time: 10ns. max.
- "0" level: +0.4V max.
- "1" level: +2.4V min.
- "0" level: 16 mA min. (1.6 mA/gate)
- "1" source current: 400 uA min.
- Output load: 10 TTL gates max.



Dimensions (In.)

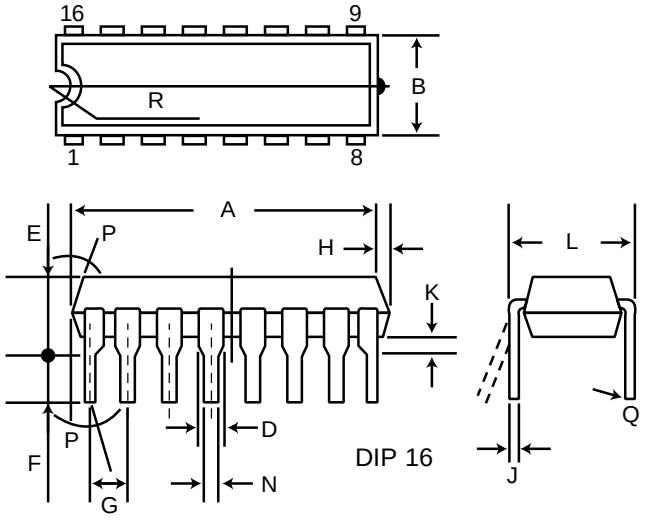


Material Specifications:

- Body: Aluminium
- Finish: Matte black

Electrical Specifications:

- Thermal resistance: 4.2°C per watt



Dimension	Inches	
	Min.	Max.
A	-	.783
B	-	.256
D	.014	.026
E	-	.197
F	.098	-
G	.100	.100
H	-	.008
J	.008	.014
K	.020	-
L	.290	.310
N	.049	.061
P	8°	8°
Q	7°	7°
R	R.039	R.039

Features:

- Wide same phase range of the error amplifier
- Built-in 250mA/100mA output buffer
- Dead time is adjustable
- Built-in low supply voltage protective circuit

Maximum Ratings (Ta=25°C)

Item	Symbol	Rating	Unit
Supply voltage	V_{CC}	41	V
Error amplifier input voltage	V_{ICM}	V_{CC}+0.3	V
Output voltage	V_{CER}	41	V
Output current	I_C	250	mA
Power consumption	P_D	750	mW
Operating temperature	Topr	-30~75	°C
Storage temperature	Tstg	-55~150	°C

Recommended Operating Conditions

Item	Symbol	MIN.	MAX.	UNIT
Supply voltage	V_{CC}	7	40	V
Output voltage	V_{CER}	-0.3	40	V
Output current (per one stage of output unit) (KIA494P)	I_C	-	200	mA
Error amplifier sink current	I_{OAMP}	-	-0.3	mA
Timing capacitor	C_T	.047	10000	nF
Timing resister	R_T	1.8	500	kΩ
Oscillation frequency	f_{OSC}	1	300	KHz
Operating temperature	Topr	-20	70	°C

Electrical Characteristics
Reference Voltage Unit

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Output voltage	Vref	Iref=1mA, Ta=25°C	4.75	5.00	5.25	V
Input stability	Reg IN	7V≤Vcc≤25V, Iref=1mA, Ta=25°C	-	8	.25	mV
Load stability	Reg L	1mA≤Iref≤10mA, Ta=25°C	-	1	.15	mV
Output voltage temp. change	Tc Vref	-20°C≤Ta≤75°C, Iref=1mA	-	0.01	0.03	%/°C
Output short-circuit current	I_S	Vref=0	-	50	-	mA

Oscillation Unit

CHARACTERISTIC	SYMBOL	TEST CONDITION	TYP.	MAX.	UNIT
Oscillation frequency set Value	f_{CSC}	C_T=0.001µF, R_T=30kΩ	40	-	kHz
Oscillation frequency setting Accuracy	f_{DIV}	C_T=0.001µF, R_T=30kΩ	3.0	-	%
Frequency input stability	f_{VIN}	7V≤Vcc≤25V, Ta=25°C	0.1	-	
Frequency temp. change	f_{TA}	0°C≤Ta≤70°C	1	2	

Pause Period Adjusting Unit

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Input bias current	I_{IND}	0≤V_{IN}≤5.25V Pin 4	-	-2	-10	A
Max. Duty (each output stage)	Dy Max.	V_{IN}=0, CT=0.1µF, R_T=12kΩ	45	48	-	%
Input threshold voltage 1	V_{TH}-1	Output pulse 0% duty	-	2.8	3.3	V
Input threshold voltage 2	V_{TH}-2	Output pulse max. duty	0	-	-	V

Output Unit

CHARACTERISTIC	SYMBOL	TEST CONDITION	TYP.	MAX.	UNIT
Collector cut-off current	I_{CER}	V_{CE}=25V, V_{CC}=25V Emitter grounded	-	100	µA
Emitter cut-off current	$I_{E(OFF)}$	V_{CC}=V_C=25V, V_E=OV Emitter follower	-	-100	µA
Emitter saturation voltage (Emitter grounded)	$V_{SAT(C)}$	I_C=50mA, Ve=OV	0.95	1.3	V
Collector saturation voltage (Emitter follower)	$V_{SAT(E)}$	I_E=-50mA, V_C=15V	1.6	2.5	V
Output voltage rise time (Emitter grounded)	trl		100	200	ns
Output voltage fall time (Emitter follower)	tfl		25	100	ns
Output voltage rise time (Emitter follower)	tf2		100	200	ns
Output voltage fall time (Emitter grounded)	tf2		40	100	ns
Output control input "L" state	I_{OCL}	V_{OC}≤0.4V	10	-	µA
Operating current "H" state	I_{OCH}	V_{OC}=Vref	0.2	3.5	mA

Current Consumption (Total)

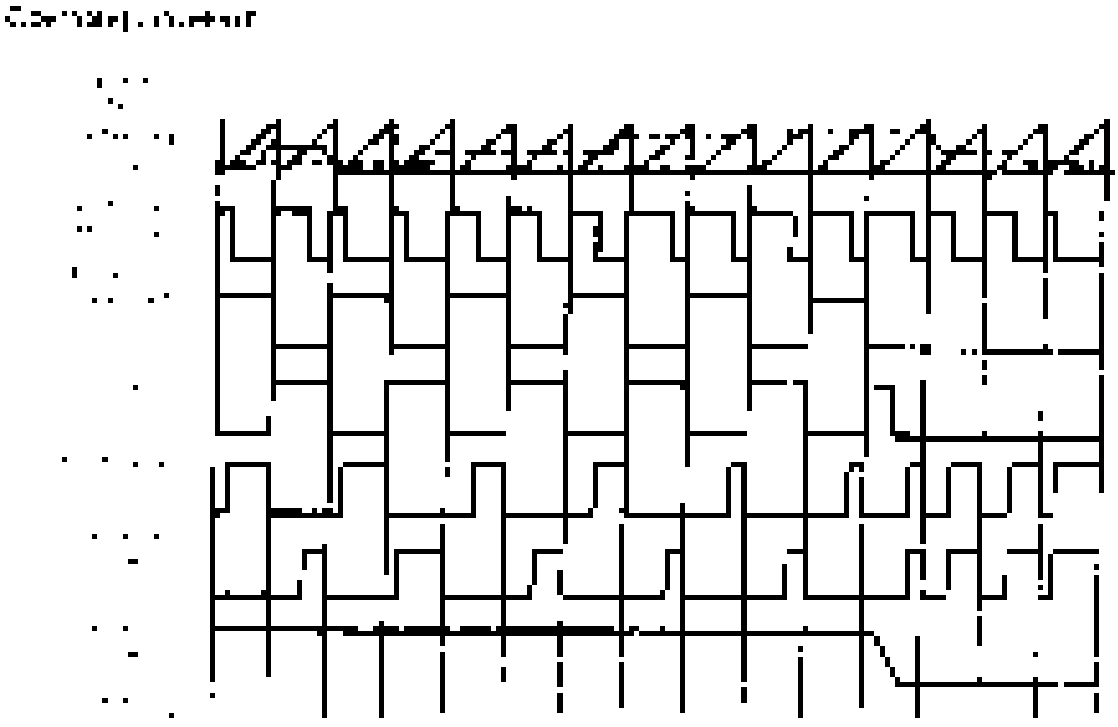
CHARACTERISTIC	SYMBOL	TEST CONDITION	TYP.	MAX.	UNIT
Standby current	$I_{CC(S\cdot B)}$	V_{CC}=15V, other terminal opened	8	12.5	mA
Bias current	I_{CC} total	V_{PN} 4=2V, C_T=0.01µF R_T=12kΩ, V_{CC}=15V	10	- -	mA

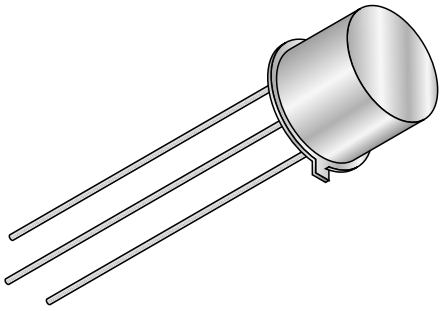
Error Amplifier I, II

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Input offset voltage	V_{IO}	V0 Pin 3=2.5V	-	2	10	mW
Input offset current	I_{IO}	V0 Pin 3=2.5V	-	5.0	250	nA
Input bias current	I_{IB}	V0 Pin 3=2.5V	-	0.1	1	A
I-phase input voltage range	CMR_{IN}	7V≤ V_{CC}≤ 25V	0.3	-	Vcc-2	V
Open load gain	G_V	V0 Pin 3=0.5~3.5V, R_L=2KΩ	70	95	-	dB
Unity gain frequency	f_O	V0 Pin 3=0.5~3.5V, R_L=2kΩ	-	350	-	kHz
In-phase signal removing ratio	CMR_R	V_{CC}=25V	65	90	-	dB
Output sink current	I0+	V0 Pin 3=0.7V	0.3	0.7	-	dB
Output source current	I0+	V0 Pin 3=3.5V	-2	-10	-	mA

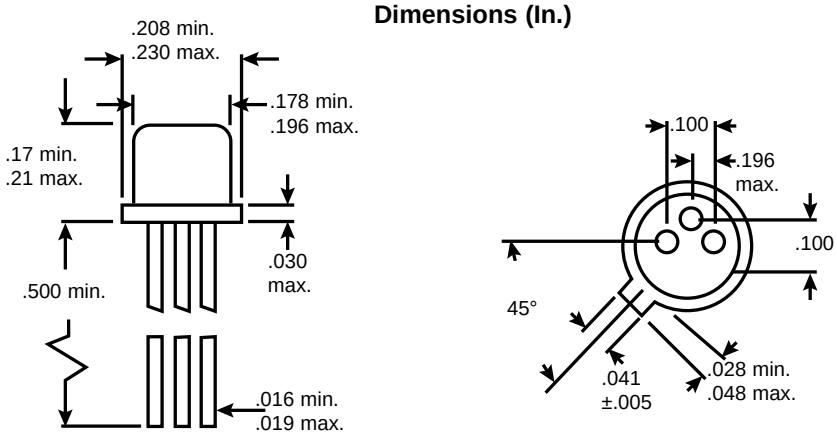
PWM Comparator

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Input threshold voltage	V_{TH}	Zero duty cycle	-	4	4.5	V
Input sink current	I_I	V0 Pin 3=0.7V	0.3	0.7	-	mA



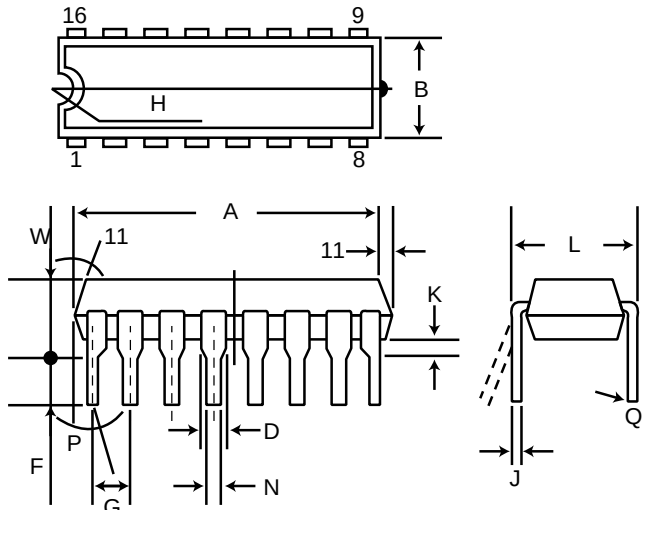


Dimensions (In.)



Bottom View

VCEO Volts (min.)	VCBO Volts (min.)	VEBO Volts (min.)	hFE at bias min./max.	IC mA	VCE Volts	ICM mA max.	PTA mW max.	PTC W max.	ICBO µA max.	VCE (sat) Volts max.	ICM mA max.	ICM mA max.	ICM mA max.
60	60	5	100/300	10	1	200	360	1.2	0.05	0.4	150	8	300



Dimension	Inches	
	Min.	Max.
A	-	.783
B	-	.256
D	.014	.026
E	-	.197
F	.098	-
G	.100	.100
H	-	.008
J	.008	.014
K	.020	-
L	.290	.310
N	.049	.061
P	8°	8°
Q	7°	7°
R	R.039	R.039

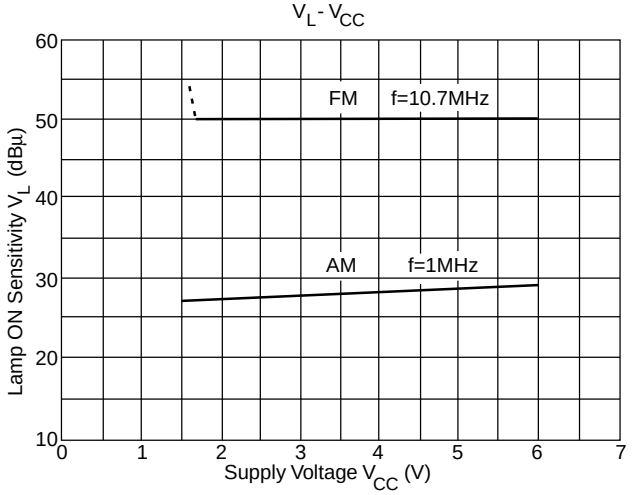
DIP 16

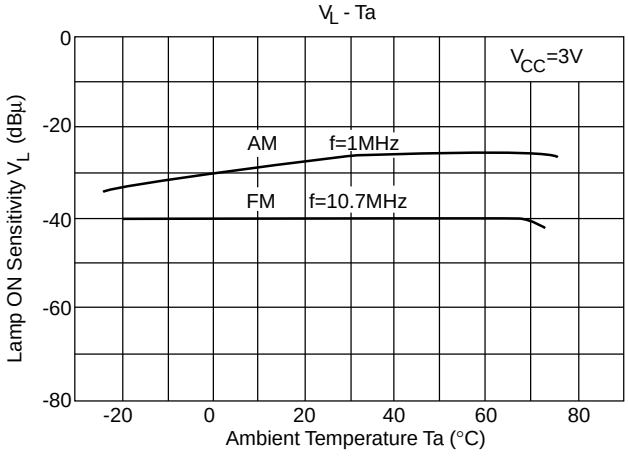
Features:

- Small installed area and few external parts
- Excellent tweet
- Low overload distortion
- Low supply current AM: Icc=4.5mA (typ.)
  FM: Icc=8mA (typ.)
- Tuning indicator LED driving capability, I_{LAMP}=10mA (max.)
- FM/AM mode switch built-in
- Common output for AM/FM
- Operating supply voltage range: Vcc(opr)=1.7~6V
- Recommended supply voltage: Vcc=3V

Maximum Ratings (Ta=25°C)

Characteristics	Symbol	Rating	Unit
Supply voltage	V_{CC}	6	V
Lamp current	V_{LAMP}	10	mA
Power dissipation	P_D	750	mW
Operating temperature	Topr	-25~75	°C
Storage temperature	Tstg	-55~150	°C
Lamp voltage	V_{LAMP}	8	V





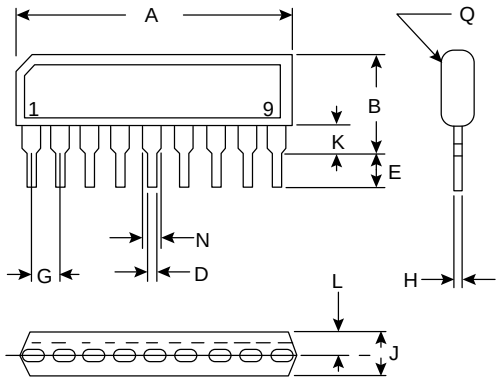
Electrical Characteristics

1. DC Characteristics (V_{CC}=3V, Ta=25°C, terminal voltage at no signal)

Pin No.	Item	Symbol	Typical Value		Unit
			AM	FM	
1	AM RF Bypass	V_1	0.96	0	V
2	AM RF Input	V_2	0.96	0	V
3	FM / AM Switch	V_3	0	3.0	V
4	AM OSC	V_4	1.4	1.4	V
5	Regulator	V_5	1.4	1.4	V
6	ACC	V_6	0.4	0.4	V
7	LED	V_7	-	-	V
8	GND	V_8	0	0	V
9	Det. Output	V_9	1.3	0.9	V
10	V_{CC}	V_{10}	3.0	3.0	V
11	AM IF Output	V_{11}	3.0	3.0	V
12	FM Det. Coil	V_{12}	3.0	3.0	V
13	AM IF Input	V_{13}	1.3	1.3	V
14	FM IF Bypass	V_{14}	1.3	1.3	V
15	FM IF Input	V_{15}	1.5	1.3	V
16	AM Mix Output	V_{16}	3.0	3.0	V

2. AC Characteristics (Ta=25°C, V_{CC}=3V, FM: f=10.7MHz, Δf=±22.5kHz, f_m=1kHz
AM: f=1MHz, Mod=30%, f_m=1kHz

Characteristic		Symbol	Test Condition	Min.	Typ.	Max.	Unit
Supply Current		$1_{CC(1)}$	FM V_{IN}=0	-	8	11	mA
		$1_{CC(2)}$	AM V_{IN}=0	-	4.5	7	
FM	Input Limiting Voltage	$V_{IN(lim)}$	-3dB Limiting	-	49	54	dBμ
	Recovered Output Voltage	V_{OD}	V_{IN}=86dBμ	45	65	90	mV_{rms}
	Signal to Noise Ratio	S/N	V_{IN}=86dBμ	-	65	-	dB
	Total Harmonic Distortion	THD	V_{IN}=86dBμ	-	0.1	-	%
	AM Rejection Ratio	AMR	V_{IN}=86dBμ	-	40	-	dB
	Lamp ON Sensitivity	V_L	I_L=1mA	-	49	54	dBμ
AM	Gain	G_V	V_{IN}=86dBμ	20	48	80	mV_{rms}
	Recovered Output Voltage	V_{OD}	V_{IN}=86dBμ	50	71	110	mV_{rms}
	Signal to Noise Ratio	S/N	V_{IN}=86dBμ	-	42	-	dB
	Total Harmonic Distortion	THD	V_{IN}=86dBμ	-	1.0	-	%
	Lamp ON Sensitivity	V_L	I_L=1mA	-	27	-	dBμ
	Local OSC Stop Voltage	V_{stop}	-	-	1.2	-	V
Output Resistance		$R_{09(FM)}$	f=1kHz	-	0.7	-	kΩ
		$R_{09(AM)}$		-	4.4	-	



	Inches	
	Min.	Max.
A	-	.906
B	-	.032
D	.014	.026
E	.098	-
G	.100	.100
H	.004	.016
J	.114	.138
K	.059	-
L	.071	.071
N	.037	.057
O	R.039	R.039

Maximum Ratings (Ta=25°C)

Characteristics	Symbol	Rating	Unit
Supply voltage	V_{CC}	15	V
Input voltage	V_{IN}	0.7	V
Power consumption	P_D	750	mW
Operating temperature	Topr	-25~75	°C
Storage temperature	Tstg	-55~150	°C

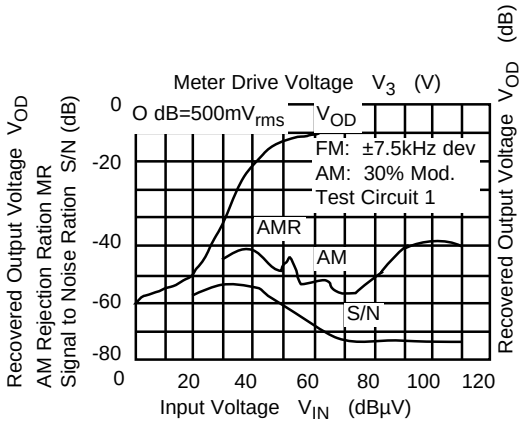
Features:

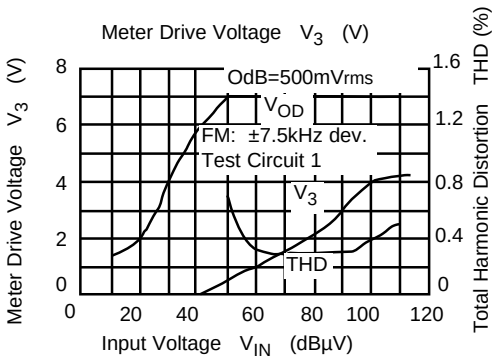
- FM IF system for car audio
- 3 stage differential IF amplifier
- Differential peak detector
- Muting circuit
- Signal meter drive circuit
- Variable-muting point
- Muting off @ open terminal
- Simplified single coil tuning

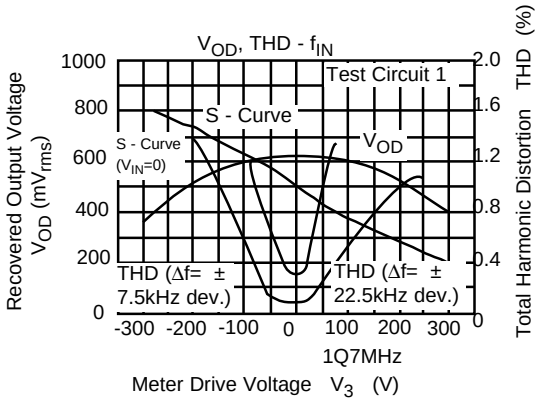
Electrical Characteristics (V_{CC}=12V, f=10.7MHz, f_m=400Hz, Ta=25°C)

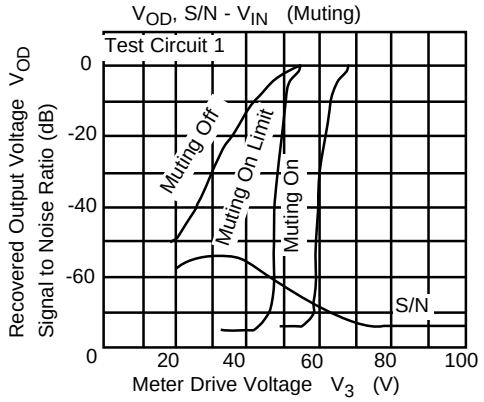
Characteristic		Symbol	Test Condition	Min.	Typ.	Max.	Unit
Supply Current		I_{CC}	V_{IN}=0	10	14	18	mA
Input Limiting Voltage		$V_{IN(lim)}$	Δf=±75kHz dev. -3dB LIMITING	-	50	55	dBμV
AM Rejection Ratio		AMR	FM: Δf=±75kHz dev. V_{IN}=80dBμV	-	50	-	dB
Recovered Output Voltage		V_{OD}	Δf=±75kHz dev. V_{IN}=80dBμV	300	500	700	mV_{rms}
Total Harmonic Distortion		THD	Δf=±22.5kHz dev. V_{IN}=80dBμV	-	0.1	-	%
Signal to Noise Ratio		S/N	Δf=±75kHz dev. V_{IN}=80dBμV	-	75	-	dB
Muting Attenuation		MA	Δf=±75kHz dev. V_{IN}=80dBμV, V_4=0	-	70	-	dB
Meter Drive Voltage		$V_{3(Max.)}$	V_{IN}=110dBμV	-	4	-	V
Input Impedance	Parallel Input Resistance	r_{ip}	f=10.7MHz, 1 pin-GND	-	5	-	kΩ
	Parallel Input Capacitance	c_{ip}		-	4.5	-	pF
Output Impedance	Parallel Output Resistance	r_{op}	f=10.7MHz, 6 pin-GND	-	1.3	-	kΩ
	Parallel Output Capacitance	c_{op}		-	4	-	pF
Output Resistance		R_O	f=400Hz, 8 pin-GND	-	7.7	-	kΩ

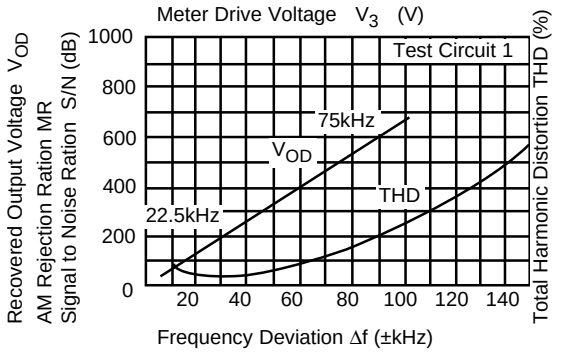
Note: V_{OD} Rank (at Δf=±22.5kHz)

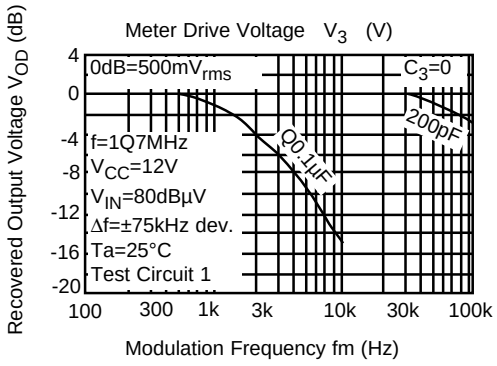


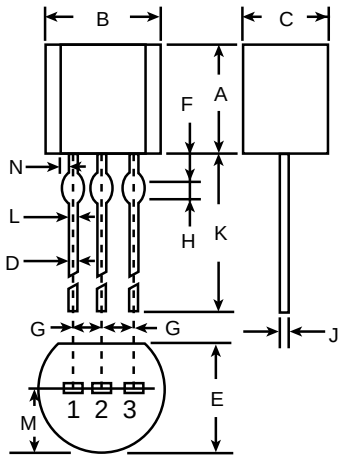












TO-92

1. Emitter
2. Base
3. Collector

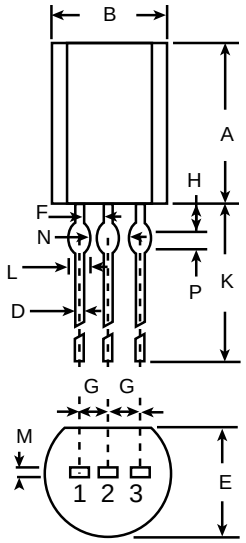
Dimension	Inches	
	Min.	Max.
A	.175	.179
B	.179	.183
C	.136	.140
D	.016	.020
E	.136	.140
F	.035	.043
G	.047	.053
H	.031	.035
J	.014	.022
K	.531	.571
L	-	.020
M	.089	.091
N	-	.002

Specifications:

- Low leakage current: I_{CEX}=-50nA (max.), I_{BL}=50nA (max.) @ V_{CE}=-30V, V_{BE}=3V
- Excellent DC current gain linearity
- Low saturation voltage: $V_{CE(SAT)}$=-0.4V (max.) @ I_C=-50nA, I_B-5mA
- Low collector output capacitance: Cob=4.5pF (max.) @ V_{CB}=-5V

Maximum Ratings (Ta=25°C)

Characteristics	Symbol	Rating	Unit
Collector-base voltage	V_{CBO}	-40	V
Collector-emitter voltage	V_{CEO}	-40	V
Emitter-base voltage	V_{EBO}	-5	V
Collector current	Ic	-200	mA
Base current	I_B	-50	mA
Collector power dissipation (Ta=25°C)	P_C	625	mW
Collector power dissipation (Tc=25°C)	P_C	1.5	W
Junction temperature	Tj	150	°C
Storage temperature range	Tstg	-55~150	°C



TO-92L

1. Common
2. Input
3. Output

Dimension	Inches	
	Min.	Max.
A	-	.323
B	-	.201
D	.016	.024
E	-	.161
F	.024	.024
G	.050	.050
H	-	.087
K	.413	-
L	-	.031
M	.016	.024
N	-	.039
P	.039	.039

Specifications:

- Best suited to a power supply for TTL and CMOS
- Built-in overcurrent protective circuit
- Built-in thermal protective circuit
- Max. output current 150mA (Tj=25°C)

Maximum Ratings (Ta=25°C)

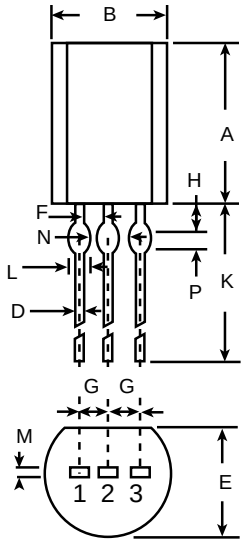
Characteristics	Symbol	Rating	Unit
Input Voltage	V_{IN}	-35	V
Power dissipation (Ta=25°C)	P_D	800	mW
Operating temperature	Topr	-30~75	°C
Storage temperature	Tstg	-55~150	°C

333-79L05BP

Electrical Characteristics

(V_{IN} =-10V, I_{OUT} = 40mA, CIN = 0.33µF, COUT = 0.1µF, 0°C ≥ T_j ≥ 125°C)

Characteristic	Symbol	Test Condition		Min.	Typ.	Max.	Unit
Output Voltage	V_{OUT}	T_j=25°C		-5.2	-5.0	-4.8	V
Input Regulation	Reg Line	T_j=25°C	-7.0V ≥ V_{IN} ≥ -20V	-	55	150	mV
			-8.0V ≥ V_{IN} ≥ -20V	-	45	100	
Load Regulation	Reg Load	T_j=25°C	-7.0V ≥ V_{IN} ≥ -20V	-	11	60	mV
			-8.0V ≥ V_{IN} ≥ -20V	-	5.0	30	
Output Voltage	V_{OUT}	-7.0V ≥ V_{IN} ≥ -20V 1.0mA ≥ I_{OUT} ≥ 40mA		-5.25	-	-4.75	V
		V_{IN} =-10V 1.0mA ≥ I_{OUT} ≥ 70mA		-5.25	-	-4.75	
Quiescent Current	I_B	T_j = 25°C		-	3.1	6.0	mA
		T_j = 125°C		-	-	5.5	
Quiescent Current Change	ΔI_{BO}	-8.0V ≥ V_{IN} ≥ -20V		-	-	1.5	mA
	ΔI_{BO}	1.0mA ≥ I_{OUT} ≥ 40mA		-	-	0.1	
Output Noise Voltage	V_{NO}	Ta = 25°C 10Hz ≤ f ≤ 100kHz		-	40	-	µV
Long Term Stability	ΔV_{OUT} /Δt			-	12	-	mV/ 1.0kHrs
Ripple Rejection Ratio	RR	-8.0V ≥ V_{IN} ≥ -18V Tj = 25°C, I_{OUT} = 40mA		41	49	-	dB
Dropout Voltage	$\|V_{IN}$- $V_{OUT}\|$	Tj = 25°C, I_{OUT} = 40mA		-	1.7	-	V
Average Temperature Coefficient Of Output Voltage	T_{CVO}	I_{OUT} = 5mA		-	0.6	-	mV/°C



TO-92L

1. Common
2. Input
3. Output

Dimension	Inches	
	Min.	Max.
A	-	.323
B	-	.201
D	.016	.024
E	-	.161
F	.024	.024
G	.050	.050
H	-	.087
K	.413	-
L	-	.031
M	.016	.024
N	-	.039
P	.039	.039

Specifications:

- Best suited to a power supply for TTL and CMOS
- Built-in overcurrent protective circuit
- Built-in thermal protective circuit
- Max. output current 150mA (Tj=25°C)

Maximum Ratings (Ta=25°C)

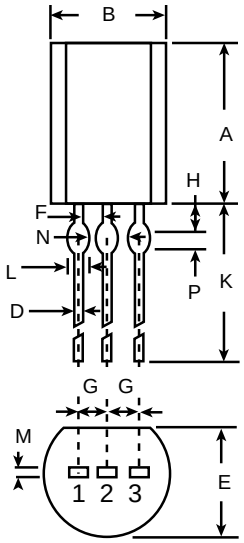
Characteristics	Symbol	Rating	Unit
Input Voltage	V_{IN}	-35	V
Power dissipation (Ta=25°C)	P_D	800	mW
Operating temperature	Topr	-30~75	°C
Storage temperature	Tstg	-55~150	°C

333-79L05BP

Electrical Characteristics

(V_{IN} =-10V, I_{OUT} = 40mA, CIN = 0.33µF, COUT = 0.1µF, 0°C ≥ T_j ≥ 125°C)

Characteristic	Symbol	Test Condition		Min.	Typ.	Max.	Unit
Output Voltage	V_{OUT}	T_j=25°C		-5.2	-5.0	-4.8	V
Input Regulation	Reg Line	T_j=25°C	-7.0V ≥ V_{IN} ≥ -20V	-	55	150	mV
			-8.0V ≥ V_{IN} ≥ -20V	-	45	100	
Load Regulation	Reg Load	T_j=25°C	-7.0V ≥ V_{IN} ≥ -20V	-	11	60	mV
			-8.0V ≥ V_{IN} ≥ -20V	-	5.0	30	
Output Voltage	V_{OUT}	-7.0V ≥ V_{IN} ≥ -20V 1.0mA ≥ I_{OUT} ≥ 40mA		-5.25	-	-4.75	V
		V_{IN} =-10V 1.0mA ≥ I_{OUT} ≥ 70mA		-5.25	-	-4.75	
Quiescent Current	I_B	T_j = 25°C		-	3.1	6.0	mA
		T_j = 125°C		-	-	5.5	
Quiescent Current Change	ΔI_{BO}	-8.0V ≥ V_{IN} ≥ -20V		-	-	1.5	mA
	ΔI_{BO}	1.0mA ≥ I_{OUT} ≥ 40mA		-	-	0.1	
Output Noise Voltage	V_{NO}	Ta = 25°C 10Hz ≤ f ≤ 100kHz		-	40	-	µV
Long Term Stability	ΔV_{OUT} /Δt			-	12	-	mV/ 1.0kHrs
Ripple Rejection Ratio	RR	-8.0V ≥ V_{IN} ≥ -18V Tj = 25°C, I_{OUT} = 40mA		41	49	-	dB
Dropout Voltage	$\|V_{IN}$- $V_{OUT}\|$	Tj = 25°C, I_{OUT} = 40mA		-	1.7	-	V
Average Temperature Coefficient Of Output Voltage	T_{CVO}	I_{OUT} = 5mA		-	0.6	-	mV/°C



TO-92L

1. Common
2. Input
3. Output

Dimension	Inches	
	Min.	Max.
A	-	.323
B	-	.201
D	.016	.024
E	-	.161
F	.024	.024
G	.050	.050
H	-	.087
K	.413	-
L	-	.031
M	.016	.024
N	-	.039
P	.039	.039

Features:

- Best suited to a power supply for TTL and CMOS
- Built-in overcurrent protective circuit
- Built-in thermal protective circuit
- Max. output current 150mA (Tj=25°C)

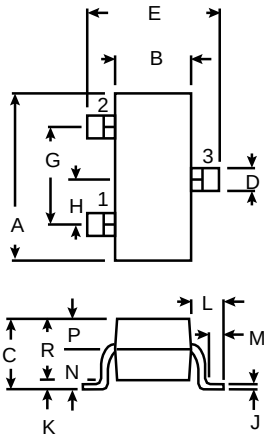
Maximum Ratings (Ta=25°C)

Characteristics	Symbol	Rating	Unit
Input Voltage	V_{IN}	-35	V
Power dissipation (Ta=25°C)	P_D	800	mW
Operating temperature	Topr	-30~75	°C
Storage temperature	Tstg	-55~150	°C

333-79L06BP

Electrical Characteristics
(V_{IN} =-11V, I_{OUT} = 40mA, C_{IN} = 0.33µF, C_{OUT} = 0.1µF, 0°C ≥ T_j ≥ 125°C)

Characteristic	Symbol	Test Condition		Min.	Typ.	Max.	Unit
Output Voltage	V_{OUT}	T_j=25°C		-6.24	-6.0	-5.76	V
Input Regulation	Reg Line	T_j=25°C	-8.1V ≥ V_{IN} ≥ -21V	-	50	150	mV
			-9.0V ≥ V_{IN} ≥ -21V	-	45	110	
Load Regulation	Reg Load	T_j=25°C	1.0mA ≥ I_{OUT} ≥ 100mA	-	12	70	mV
			1.0mA ≥ I_{OUT} ≥ 40mA	-	5.5	35	
Output Voltage	V_{OUT}	-8.1V ≥ V_{IN} ≥ -21V 1.0mA ≥ I_{OUT} ≥ 40mA		-6.3	-	-5.7	V
		V_{IN} =-11V 1.0mA ≥ I_{OUT} ≥ 70mA		-6.3	-	-5.7	
Quiescent Current	I_B	T_j = 25°C		-	3.1	6.0	mA
		T_j = 125°C		-	-	5.5	
Quiescent Current Change	ΔI_{BO}	-9.0V ≥ V_{IN} ≥ -20V		-	-	1.5	mA
	ΔI_{BO}	1.0mA ≥ I_{OUT} ≥ 40mA		-	-	0.1	
Output Noise Voltage	V_{NO}	Ta = 25°C 10Hz ≤ f ≤ 100kHz		-	40	-	µV
Long Term Stability	ΔV_{OUT} /Δt			-	14	-	mV/ 1.0kHrs
Ripple Rejection Ratio	RR	-9.0V ≥ V_{IN} ≥ -19V Tj = 25°C, f = 120mA		39	47	-	dB
Dropout Voltage	$\|V_{IN}$- $V_{OUT}\|$	Tj = 25°C, I_{OUT} = 40mA		-	1.7	-	V
Average Temperature Coefficient Of Output Voltage	T_{CVO}	I_{OUT} = 5mA		-	-0.7	-	mV/°C



SOT-23

1. Emitter
2. Base
3. Collector

Dimension	Inches	
	Min.	Max.
A	.110	.120
B	.049	.053
C	.038	.044
D	.015	.021
E	.091	.098
G	.075	.075
H	.036	.039
J	.004	.006
K	.0003	.004
L	.018	.024
M	.008	-
N	.010	.011
P	.026	.028
R	.037	.039

Maximum Ratings (Ta=25°C)

Characteristics	Symbol	Rating	Unit
Collector-emitter voltage	V_{CEO}	-300	V
Collector-base voltage	V_{CBO}	-300	V
Emitter-base voltage	V_{EBO}	-5.0	V
Collector current	Ic	-500	mA
Collector power dissipation (Ta=25°C)	Pc	350	mW
Storage Temperature range	Tstg	-55~150	°C

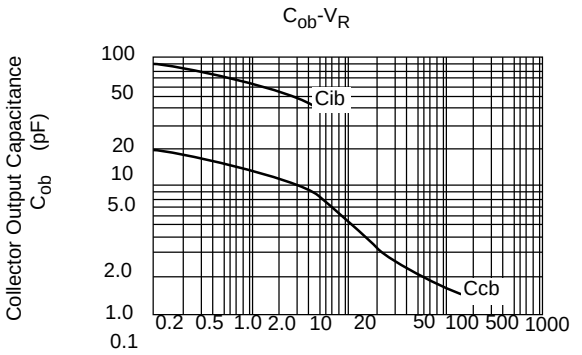
Electrical Characteristics (Ta=25°C)

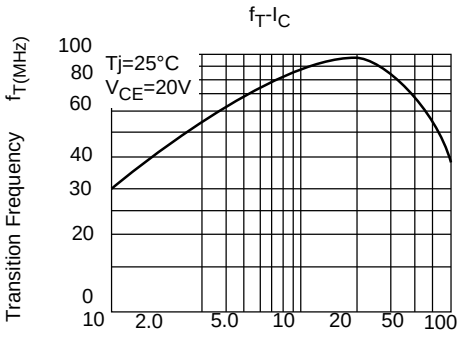
Characteristics	Symbol	Test Conditions	Min.	Max.	Unit
Collector-emitter breakdown voltage	$V_{(BR)CEO}$	I_C=1.0mA, I_B=0	-300	-	V
Collector-base breakdown voltage	$V_{(BR)CEO}$	I_C=100μA, I_E=0	-300	-	V
Emitter-base breakdown voltage	$V_{(BR)EBO}$	I_E=100μA, I_C=0	-5.0	-	V
Collector-cut off current	I_{CBO}	(V_{CB}=200V, I_E=0)	-	-0.25	μA
Emitter-cut off current voltage	I_{EBO}	V_{BE}=3.0V, I_C=0	-	-0.1	μA
Dc current gain	h_{FR} V_{CE}(sat) V_{BE}(sat)	Ic=0.1mA, V_{CE}=10V Ic=10mA, V_{CE}=10V Ic=30mA, V_{CE}=10V	25 40 25	- - -	-
Collector-emitter saturation voltage		Ic=20mA, I_B=2.0mA	-	-0.5	V
Base-emitter saturation voltage		Ic=20mA, I_B=2.0V	-	-0.9	V

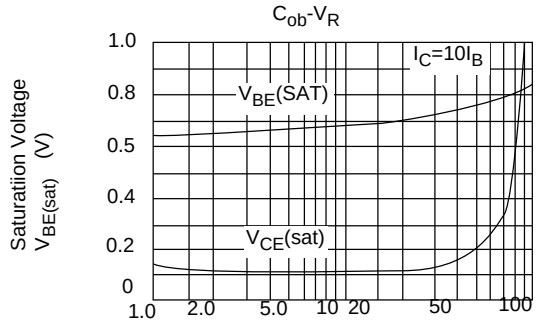
Electrical Characteristics (Ta=25°C unless otherwise noted)

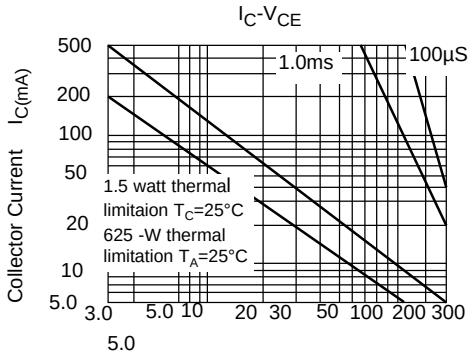
Characteristics	Symbol	Test Conditions	Min.	Max.	Unit
Current-gain bandwidth product	f_T	Ic=10mA, V_{CE}=20V f=100MHz	50	-	MHz
Collector-base capacitance	C_{OB}	V_{CB}=20V, I_E=0 f=1.0MHz	-	6.0	pF

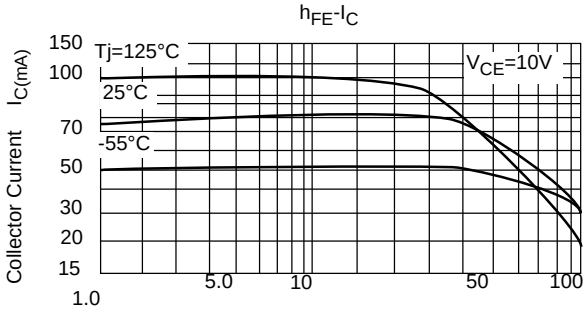
* Pulse Test: Pulse width ≤300μS, duty cycle ≤2.0%



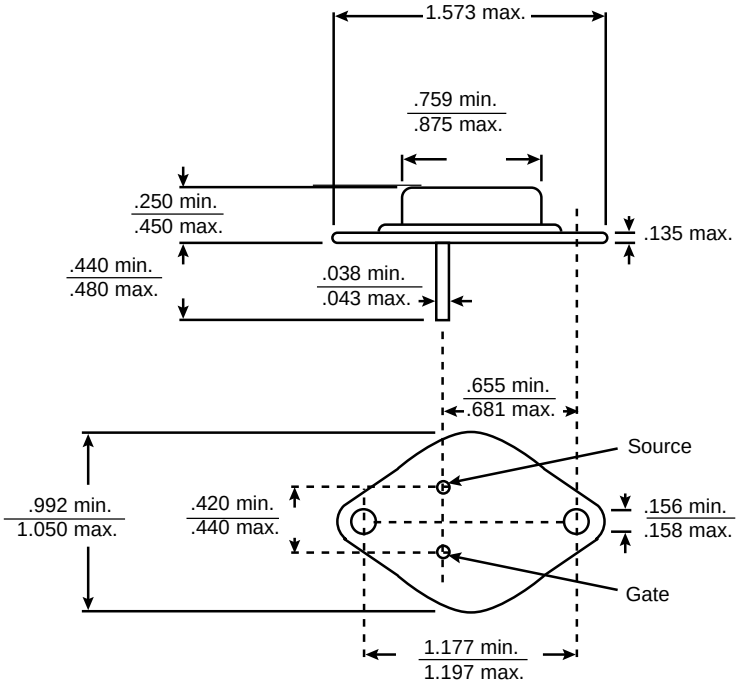








Dimensions (In.)

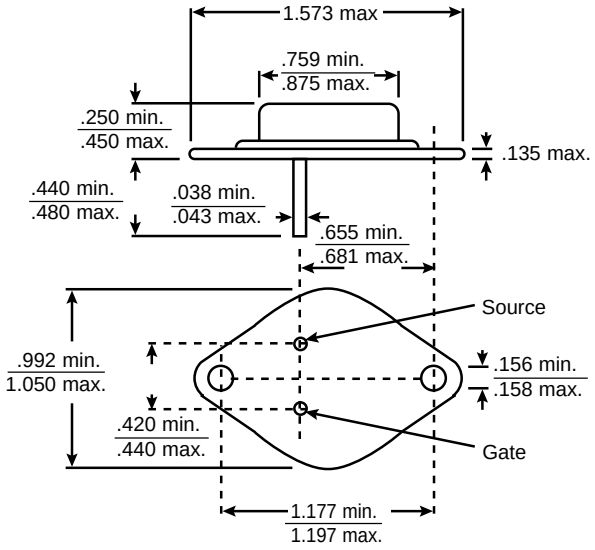


Case: Drain

TO-3

Mouser Stock No.	V_{DS} (V)	I_D 25°C (A)	100°C	R_{DS} (on) (Ω)	C_{ISS} (PF)	I_{DM} (A)	PD (W)
333-IRF320	400	3	2	1.8	600	12	40
333-IRF322	400	2.5	1.5	2.5	600	10	40
333-IRF330	400	5.5	3.5	1.0	900	22	75
333-IRF332	400	4.5	3	1.5	900	18	75
333-IRF340	400	10	6	0.55	1600	40	125

Dimensions (In.)



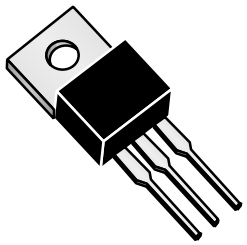
Case: Drain

TO-3

Mouser Stock No.	V_{DS} (V)	I_D 25°C (A)	100°C	R_{DS} (on) (Ω)	C_{ISS} (PF)	I_{DM} (A)	PD (W)
333-IRF420	500	2.5	1.5	3	400	10	40
333-IRF421	450	2.5	1.5	3	400	10	40
333-IRF422	500	2	1	4	400	8	40
333-IRF423	450	2	1	4	400	8	40
333-IRF430	500	4.5	3	1.5	800	18	75
333-IRF432	500	4	2.5	2	800	16	75
333-IRF440	500	8	5	0.85	1600	32	125
333-IRF441	450	8	5	0.85	1600	32	125
333-IRF442	500	7	4	1.1	1600	28	125
333-IRF443	450	7	4	1.1	1600	28	125

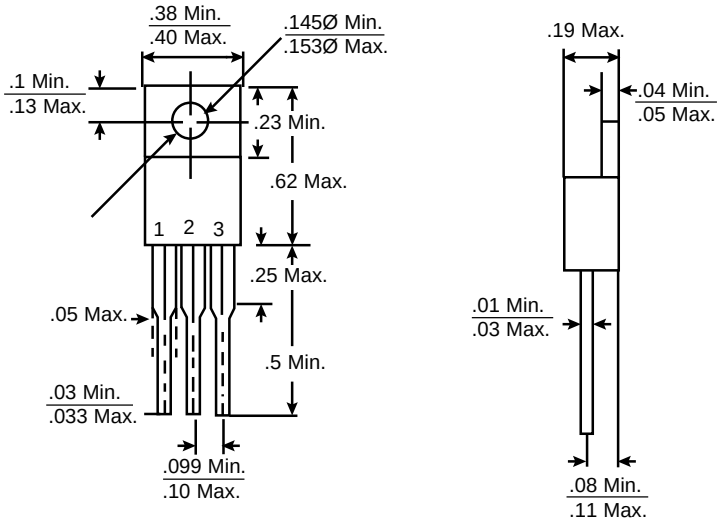
333-IRF540
333-IRF541
333-IRF542
333-IRF543

N-Channel
Power Mosfet



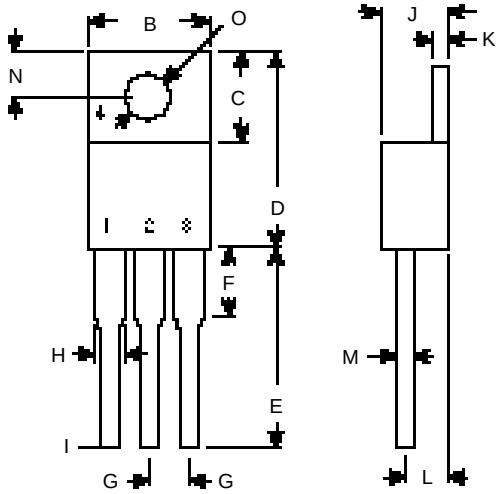
TO-220

Dimensions (In.)



1. Gate 2. Drain 3. Source

Mouser Stock No.	Drain Source Voltage (V)	On-state Resistance (Ω)	Continuous Drain Current (A)	Max Power Dissipation (watts)
333-IRF540	100	.085	27.0	125
333-IRF541	60	.085	27.0	125
333-IRF542	100	.11	24.0	125
333-IRF543	60	.11	24.0	125

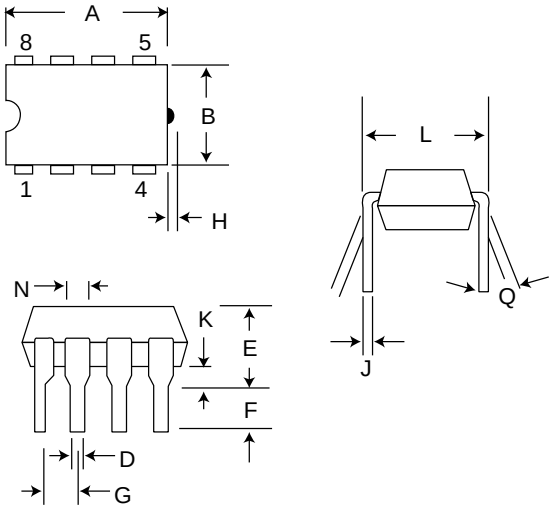


TO-220

1. Base
2. Collector
3. Emitter

	Dimensions (In.)	
	Min.	Max.
B	.386	.402
C	.217	- - -
D	- - -	.625
E	.500	- - -
F	- - -	.025
G	.099	.100
H	- - -	.051
I	.030	.033
J	- - -	.190
K	.043	.055
L	.081	.115
M	.015	.027
N	.100	.130
O	Ø.146	Ø.154

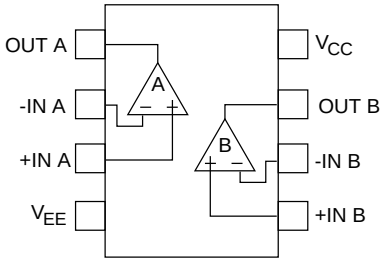
I_C (A)	V_{CBO} (V)	V_{CEO} (V)	P_D (W)	H_{FE} (Min./Max.)	I_C/V_{CE} (A/V)	$V_{CE(SAT)}$ (V)	I_C/I_B (A/mA)
8	60	60	75	1K/20K	4.0/4	2.0	4.0/16



Dimension	Inches	
	Min.	Max.
A	-	.378
B	-	.256
D	.014	.026
E	-	.197
F	.098	-
G	.100	.100
H	-	.008
J	.008	.014
K	.020	-
L	.290	.310
N	.041	.053
Q	7°	7°

Maximum Ratings (Ta=25°C)

Characteristics	Symbol	Rating	Unit
Supply voltage	V_{CC} V_{EE}	36+18 or 0-18	V
Diffential voltage	DV_{IN}	±30	V
Input voltage	V_{IN}	V_{CC}~V_{EE}	V
Power dissipation	P_D	500	mW
Operating temperature	Topr	-40~85	°C
Storage temperature	Tstg	-55~125	°C



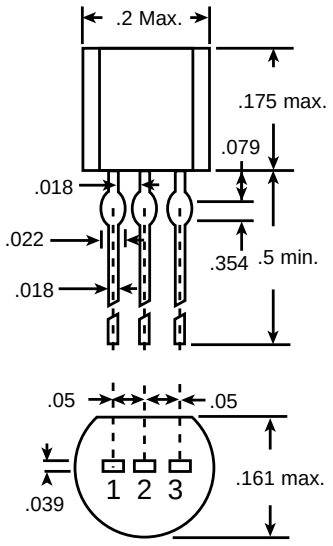
Electrical Characteristics (V_{CC}=15V, V_{EE}+-15V, Ta=25°C

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Input offset voltage	V_{IO}	Rg≤10kΩ	-	0.5	6	mV
Input offset current	I_{IO}	-	-	5	200	nA
Input bias current	I_I	-	-	60	500	nA
Common mode input voltage	CMV_{IN}	-	±12	±14	-	V
Maximum output voltage	V_{OM} V_{OMR}	R_L=10kΩ R_L=2kΩ	±12 ±10	±14 ±13	- -	V V
Source current	I_{SOURCE}	-	27	-	-	mA
Sink current	I_{SINK}	-	27	-	-	mA
Voltage gain (open loop)	G_V	Vout=±10V, R_L=2kΩ	86	100	-	dB
Common mode imput signal rejection ratio	CMRR	Rg≤10kΩ	70	90	-	dB
Supply voltage rejection ratio	SVRR	Rg≤10kΩ	-	30	150	µV/V
Slew rate	SR	Gv-1, R_L=kΩ	-	1.0	-	V/µs
Unity gain cross frequency	f_T	Open loop	-	3.0	-	MHz
Supply current	I_{CC}, I_{EE}	-	-	4.0	6.0	mA
Equivalent input noise voltage	V_{NI}	Rs=1kΩ, f=30Hz~30kHz	-	2.5	-	µVrms

MOUSER® ELECTRONICS

333-KN4400
NPN Gen. Pur. SW Transistor

DIMENSIONS (IN.)

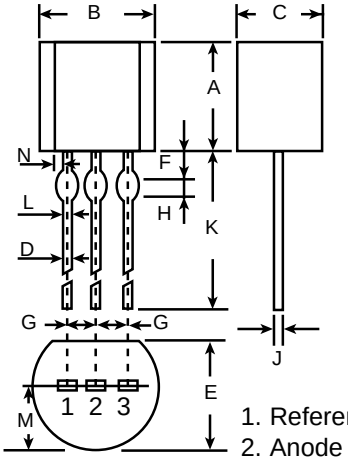


TO-92

1. = Emitter
2. = Base
3. = Collector

Maximum ratings			Electrical Characteristics (Ta=25°C)											
V_{CEO}	I_C	P_C	h_{FE}			V_{CE} (Sat) Max.			f_T Typ. min.			cob. *Cre		
				V_{CE}	I_C		I_C	I_B		V_{CE}	I_C	Typ. Max.	V_{CB}	f
(V)	(mA)	(mW)		(V)	(mA)	(V)	(mA)	(mA)	(MHz)	(V)	(pF)	(pF)	(V)	(MHz)
40	600	310	50~150	1/2	150	0.75	500	50	200	10	20	7	10	1

333-KIA431 Programmable
333-KIA431F Precision Reference

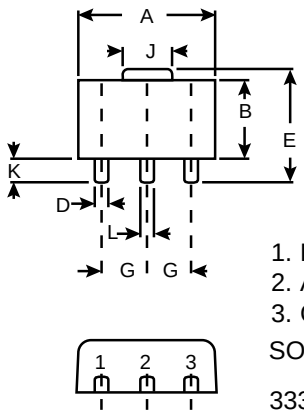


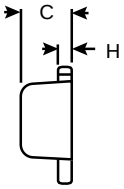
Dim.	Max
A	.179
B	.183
C	.140
D	.020
E	.140
F	.043
G	.053
H	.035
J	.022
K	.571
L	.020
M	.093
N	.002

1. Reference
2. Anode
3. Cathode

TO-92

333-KIA431





Dim.	Max
A	.181
B	.102
C	.063
D	.019
E	.165
G	.059
H	.018
J	.067
K	---
L	.021

1. Reference
2. Anode
3. Cathode

SOT-89

333-KIA431F

Features:

- Programmable output voltage to 36 volts
- Voltage reference tolerance: ±1.0%
- Low dynamic output impedance: 0.22Ω (typ.)
- Sink current capability of 1.0 to 100mA
- Equivalent full-range temperature coefficient of 50ppm/C° (typ.)
- Temperature compensated for operation over full rated operating temperature range
- Low output noise voltage

Maximum Ratings (full operating ambient temperature range applies unless otherwise noted.)

Characteristic		Symbol	Rating	Unit
Cathode to anode voltage		V_{KA}	37	V
Cathode current range, continuous		I_K	-100~150	mA
Reference input current range, continuous		I_{REF}	-0.05~10	mA
Operating junction temperature		T_J	150	°C
Operating temperature		T_{OPR}	-40~85	°C
Storage temperature		T_{STG}	-65~150	°C
Total power dissipation	KIA431	P_D	700	mW
	KIA431F		800	

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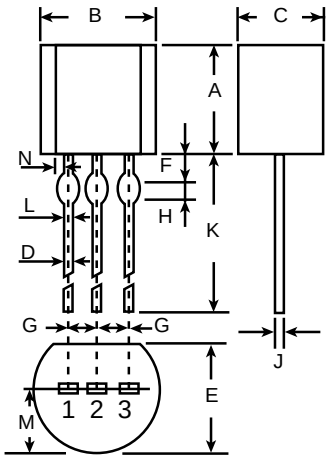
5-29-96

Electrical Characteristics (Ta=25°C)

Characteristics		Symbol	Test Condition		Min.	Typ.	Max.	Unit
Reference Input Voltage	Ta=25°C	Vref	V_{KA}=Vref, I_K=10mA		2.440	2.495	2.550	V
	Ta=Topr				2.410	—	2.580	
Reference input voltage deviation over temperature range		ΔVref	V_{KA}=Vref, I_K=10mA		—	7.0	30	mV
Ratio of change in reference input voltage to change in cathode to anode voltage		ΔVref	I_K=10mA	ΔV_{KA} =10~Vref	—	-1.0	-2.0	mV/V
		ΔV_{KA}		ΔV_{KA} =36V~10V	—	-1.4	-2.7	mV/V
Reference Input Current	Ta=25°C	Iref	I_K=10mA, R1=10KΩ, R2=∞		—	1.8	4.0	μA
	Ta=Topr				—	—	6.5	
Reference input current deviation over temperature range		ΔIref	I_K=10mA, R1=10KΩ, R2=∞		—	0.8	2.5	μA
Minimum cathode current for regualtion		Imin	V_{KA}=Vref		—	0.5	1.0	mA
Off-state cathode current		Ioff	V_{KA}=36V, Vref=0V		—	2.6	1000	nA
Dynamic impedance		Zka	V_{KA}=Vref, I_K=1.0~100mA, f≤1.0KHz		—	0.22	—	Ω

333-KTN2907 PNP General Purpose
333-KTN2907A Small Signal Transistor



1. Emitter
2. Base
3. Collector

TO-92

Dim.	Max
A	.179
B	.183
C	.140
D	.020
E	.140
F	.043
G	.053
H	.035
J	.022
K	.571
L	.020
M	.093
N	.002

Features:

- Low leakage current: I_{CEX}=-50nA (max.); V_{CS}=-30V, V_{BE}=0.5V
- Low saturation voltage: V_{CE} (sat)= -0V (max.); Ic=-150, I_B=-15mA
- Complementary to the KTN2222/2222A.
- KTN2907/2907A Electrically similar to 2N2907/2907A

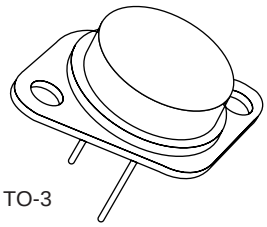
Maximum Ratings (Ta=25°C)

Characteristic	Symbol	Rating		Unit
		KTN2907	KTN2907A	
Collector-base voltage	V_{CBO}	-60		V
Collector-emitter voltage	V_{CEO}	-40	-60	V
Emitter-base voltage	V_{EBO}	-5		V
Collector current	I_C	-600		mA
Collector power dissipation (Ta=25°C)	P_C	625		mW
Junction temperature	T_J	150		°C
Storage temperature range	Tstg	-55~150		°C

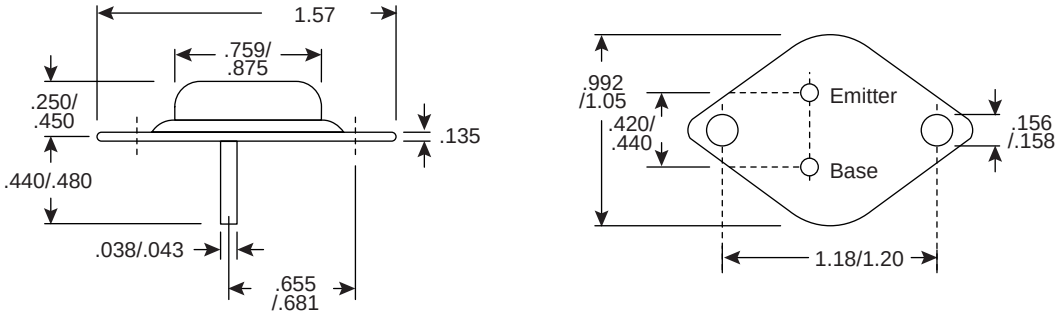
Electrical Characteristics

	Characteristic		Symbol	Test Condition	Min.	Typ.	Max.	Unit
	Collector cut-off current		I_{CEX}	V_{CE}=-30V, V_{BE}=0.5V	–	–	-50	nA
	Collector cut-off current	KTN2907	I_{CBO}	V_{CB}=-50V, I_E=0	–	–	-20	nA
		KTN2907A			–	–	-10	nA
*	Collector-base breakdown voltage		$V_{(BR)CBO}$	I_C=-10μA, I_E=0	-60	–	–	V
	Collector-emitter Breakdown voltage	KTN2907	$V_{(BR)CEO}$	I_C=-10mA, I_B=0	-40	–	–	V
		KTN2907A			-60	–	–	V
	Emitter-base breakdown voltage		$V_{(BR)EBO}$	I_E=-10μA, I_C=0	-5	–	–	V
*	DC Current Gain	KTN2907	h_{FE}(1)	I_C=-0.1mA, V_{CE}=-10V	35	–	–	
		KTN2907A			75	–	–	
		KTN2907	h_{FE}(2)	I_C=-1.0mA, V_{CE}=-10V	50	–	–	
		KTN2907A			100	–	–	
		KTN2907	h_{FE}(3)	I_C=-10mA, V_{CE}=-10V	75	–	–	
		KTN2907A			100	–	–	
		KTN2907	h_{FE}(4) *	I_C=-150mA, V_{CE}=-10V	100	–	300	
		KTN2907A						
		KTN2907	h_{FE}(5) *	I_C=-500mA, V_{CE}=-10V	30	–	–	
		KTN2907A			50	–	–	
*	Collector-emitter saturation voltage		V_{CE}(sat) 1	I_C=-150mA, I_B=-15mA	–	–	-0.4	V
			V_{CE}(sat) 2	I_C=-500mA, I_B=-50mA	–	–	-1.6	V
*	Base-emitter saturation voltage		V_{BE}(sat) 1	I_C=-150mA, I_B=-15mA	–	–	-1.3	V
			V_{BE}(sat) 2	I_C=-500mA, I_B=-50mA	–	–	-2.6	V
	Transition frequency		f_T	V_{CE}=-20V, I_C=-50mA, f=100MHz	200	–	–	MHz
	Collector output capacitance		C_{OB}	V_{CB}=-10V, I_E=0, f=1MHz	–	–	8	pF
	Input capacitance		Cib	V_{BE}=-2V, I_C=0, f=1MHz	–	–	30	pF
	Switching Time	Turn-on time	ton	V_{CC}=-30V, I_C=-150mA, I_{B1}=-15mA	–	26	45	
		Delay time	td		–	6.0	10	
		Rise time	tr		–	20	40	
		Turn-off time	toff	V_{CC}=-6V, I_C=-150mA, I_{B1}=I_{B2}-15mA	–	70	100	
		Storage time	tstg		–	50	80	
		Fall Time	tf		–	20	30	

* Pulse test: Pulse width ≤300 μs, duty cycle ≤2.0%



TO-3



Dimensions (In.)
(Minimum/Maximum)

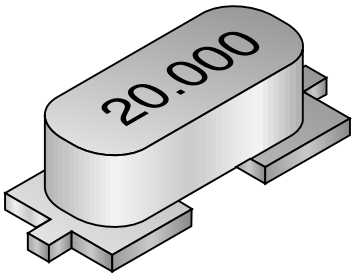
Specifications:

- Type: NPN power switching
- Collector: case
- V_{CBO}: 160V
- V_{CEO}: 140V

Mouser Stock No.	I_C	P_D	H_{FE} min./max.	I_C	V_{CE}	$V_{CE\ (SAT)}$ Volts	I_C	I_B
333-2N3773	16A	150W	15/60	8.0A	4V	4.0	16.0A	3200mA
333-2N3442	10A	117W	20/70	3.0A	4V	5.0	10.0A	2000mA

MOUSER® ELECTRONICS

332-SML1600 Surface Mount
Microprocessor Crystal



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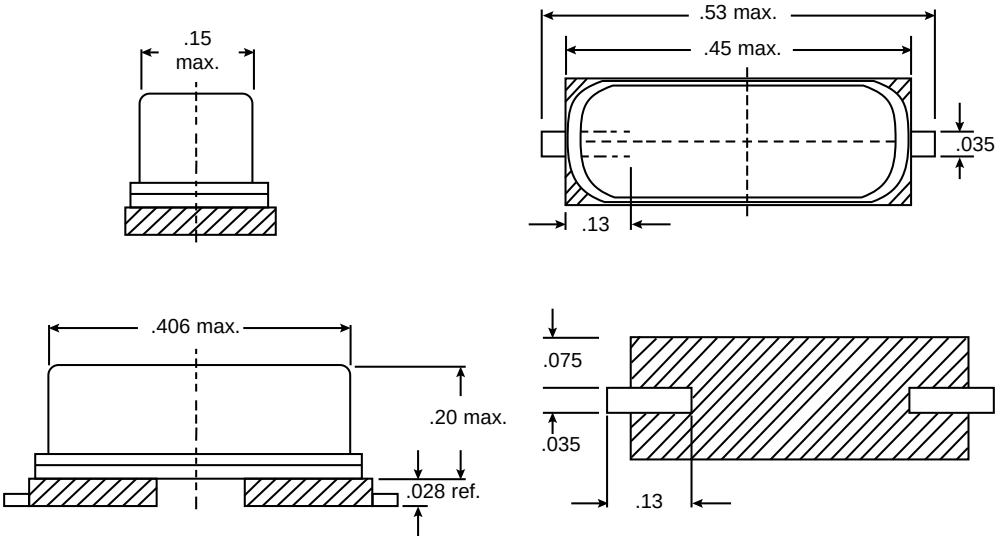
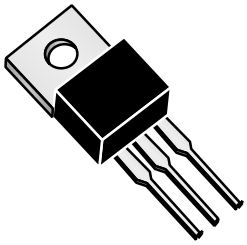


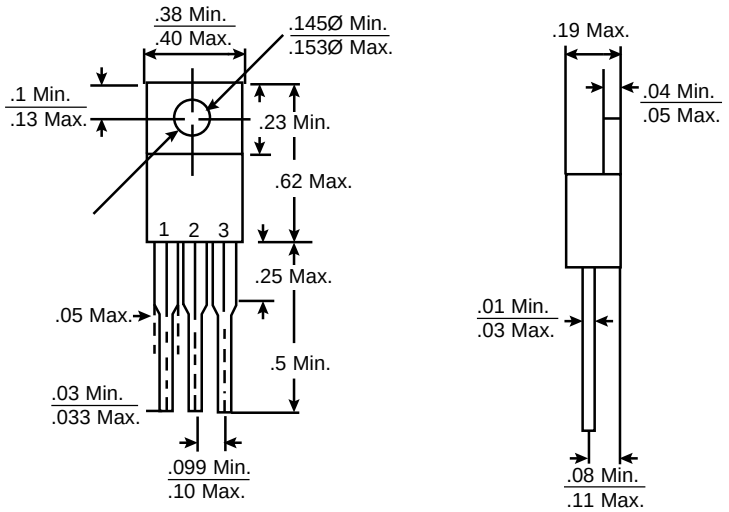
Specifications:

- Frequency: 16.000MHz
- Oscillation mode: Fundamental
- Frequency tolerance (@ 25°C ± 2°C): ±30ppm
- Storage temperature range: -30°C to 80°C
- Load capacitance: Series
- Drive level: 0.5mW
- Shunt capacitance: 7.0pF max.
- Insulation resistance: 500MΩ @ 100VDC
- Aging / Shock: ±5ppm per year



TO-220

Dimensions (In.)

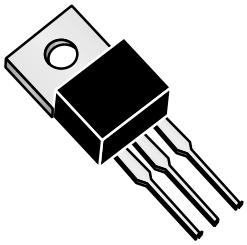


1. Gate 2. Drain 3. Source

Mouser Stock No.	Drain Source Voltage (V)	On-state Resistance (Ω)	Continuous Drain Current (A)	Max Power Dissipation (watts)
333-IRF740	400	.55	10.0	125

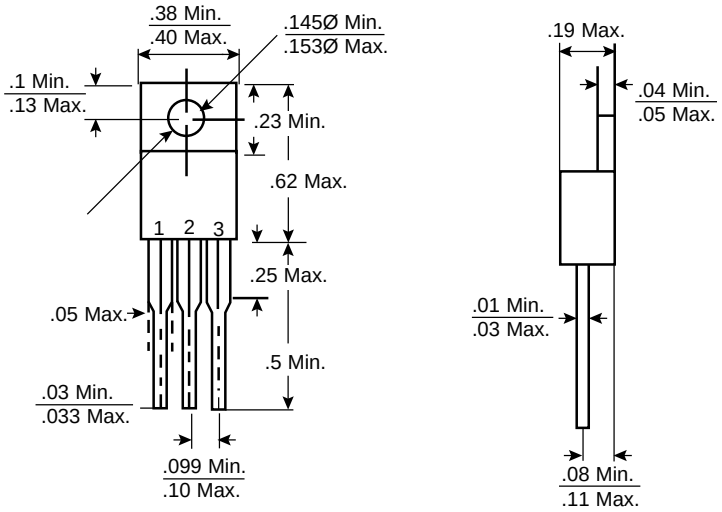
MOUSER® ELECTRONICS

333-IRF530
333-IRF531 N-Channel
333-IRF532 Power Mosfet
333-IRF533



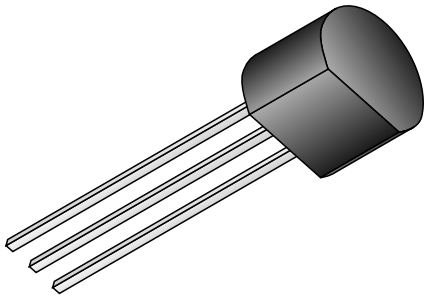
TO-220

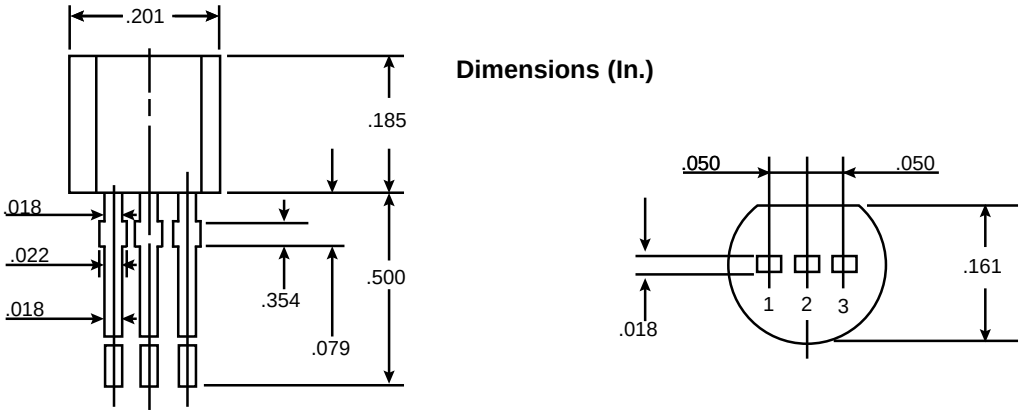
Dimensions (In.)



1. Gate 2. Drain 3. Source

Mouser Stock No.	Drain Source Voltage (V)	On-state Resistance (Ω)	Continuous Drain Current (A)	Max Power Dissipation (watts)
333-IRF530	100	.18	14.0	75
333-IRF531	60	.18	14.0	75
333-IRF532	100	.25	12.0	75
333-IRF533	60	.25	12.0	75





Dimensions (In.)

Pin	1	2	3
TO-92	E	B	C

E: Emitter
B: Base
C: Collector

General Purpose		Maximum Rating		
NPN	PNP	V_{CEO} (V)	I_C (mA)	P_C (mW)
KN3904	KN3906	40	200	310

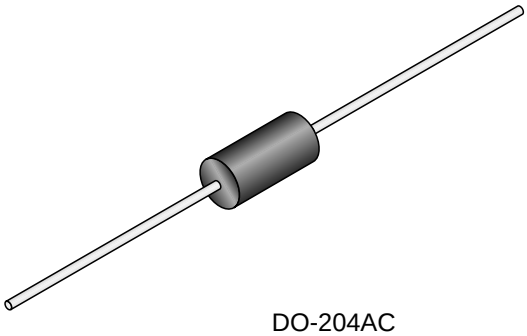
Electrical Characteristics (Ta=25°C)

h_{FE}			V_{CE} (Sat) Max			f_T Typ (min)			Cob. *Cre Typ			NF Typ (Max)				
	V_{CE} (V)	I_C (mA)	(V)	I_C (mA)	I_B (mA)	(MHz)	V_{CE} (V)	I_C (mA)	(Max) (p_F)	V_{CB} (V)	f (MHz)	(dB)	V_{CE} (V)	I_C (mA)	f (KHz)	Rg (KΩ)
100~300	1	10	0.3/ 0.4	50	5	(150)	20	10	(3) / (7)	10	1	1 (10)	6	0.1	10	1

MOUSER® ELECTRONICS

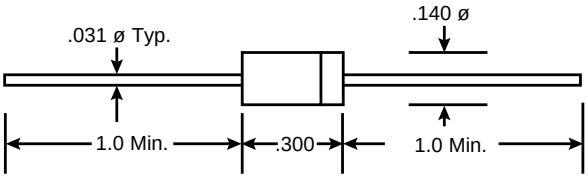
333-P6KE6.8A	333-P6KE15A	
333-P6KE7.5A	333-P6KE20A	333-P6KE33A
333-P6KE8.2A	333-P6KE24A	333-P6KE51A
333-P6KE10A	333-P6KE27A	333-P6KE68A
333-P6KE12A	333-P6KE30A	

EXL Transient Voltage Suppressors



DO-204AC

Dimensions (In.)



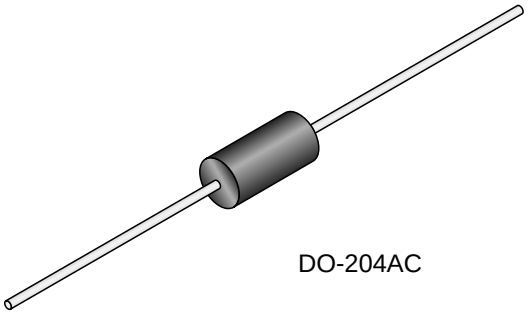
600 WATT, UNIDIRECTIONAL

Mouser Stock No.	Breakdown Voltage V (BR)@ IR			Reverse Current (IR) (mADC)	Reverse DC Leakage Curr. (µA)	Rated Standoff Volt. (V)
	Min.	Nom.	Max.			
333-P6KE6.8A	6.45	6.8	7.14	10	1000	5.8
333-P6KE7.5A	7.13	7.5	7.88	10	500	6.4
333-P6KE8.2A	7.79	8.2	8.61	10	200	7.02
333-P6KE10A	9.5	10.0	10.5	1	10	8.55
333-P6KE12A	11.4	12.0	12.6	1	5	10.2
333-P6KE15A	14.3	15.0	15.8	1	5	12.8
333-P6KE20A	19.0	20.0	21.0	1	5	17.1
333-P6KE24A	22.8	24.0	25.2	1	5	20.5
333-P6KE27A	25.7	27.0	28.4	1	5	23.1
333-P6KE30A	28.5	30.0	31.5	1	5	25.5
333-P6KE33A	31.4	33.0	34.7	1	5	28.2
333-P6KE51A	48.5	51.0	53.6	1	5	43.6
333-P6KE68A	64.6	68.0	71.4	1	5	58.1

MOUSER® ELECTRONICS

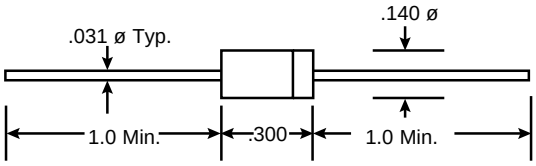
333-P6KE6.8CA	333-P6KE7.5CA	333-P6KE8.2CA
333-P6KE10CA	333-P6KE12CA	333-P6KE15CA
333-P6KE20CA	333-P6KE24CA	333-P6KE27CA
333-P6KE30CA	333-P6KE33CA	333-P6KE51CA
333-P6KE68CA	333-P6KE100CA	333-P6KE150CA

EXL Transient Voltage Suppressors



DO-204AC

Dimensions (In.)



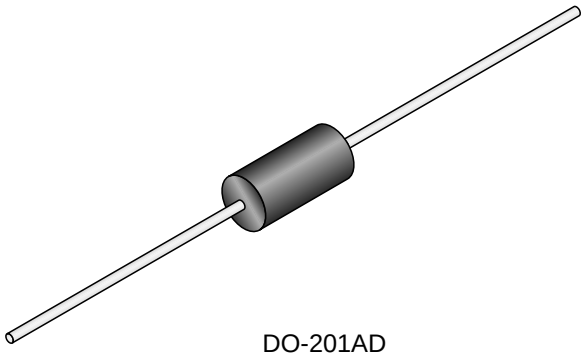
600 WATTS, BIDIRECTIONAL

Mouser Stock No.	Breakdown Voltage V (BR)@ IR			Reverse Current (IR) (mADC)	Reverse DC Leakage Curr. (µA)	Rated Standoff Volt. (V)
	Min.	Nom.	Max.			
333-P6KE6.8CA	6.45	6.8	7.14	10	1000	5.8
333-P6KE7.5CA	7.13	7.5	7.88	10	500	6.4
333-P6KE8.2CA	7.79	8.2	8.61	10	200	7.02
333-P6KE10CA	9.5	10.0	10.5	1	10	8.55
333-P6KE12CA	11.4	12.0	12.6	1	5	10.2
333-P6KE15CA	14.3	15.0	15.8	1	5	12.8
333-P6KE20CA	19.0	20.0	21.0	1	5	17.1
333-P6KE24CA	22.8	24.0	25.2	1	5	20.5
333-P6KE27CA	25.7	27.0	28.4	1	5	23.1
333-P6KE30CA	28.5	30.0	31.5	1	5	25.5
333-P6KE33CA	31.4	33.0	34.7	1	5	28.2
333-P6KE51CA	48.5	51.0	53.6	1	5	43.6
333-P6KE68CA	61.2	68.0	74.8	1	5	55.1
333-P6KE100CA	90.0	100.0	110.0	1	5	81.0
333-P6KE150CA	143.0	150.0	158.0	1	5	128.0

MOUSER® ELECTRONICS

333-1.5KE6.8A	333-1.5KE15A	
333-1.5KE7.5A	333-1.5KE20A	333-1.5KE33A
333-1.5KE8.2A	333-1.5KE24A	333-1.5KE51A
333-1.5KE10A	333-1.5KE27A	333-1.5KE68A
333-1.5KE12A	333-1.5KE30A	

EXL Transient Voltage Suppressors



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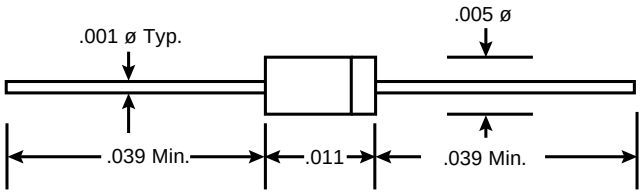


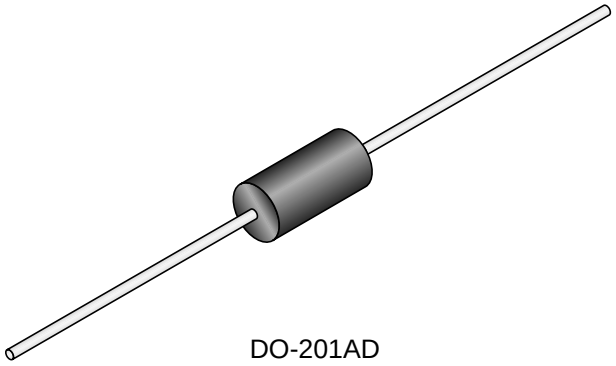
1500 WATT, UNIDIRECTIONAL

Mouser Stock No.	Breakdown Voltage V (BR)@ IR			Reverse Current (IR) (mADC)	Reverse DC Leakage Curr. (µA)	Rated Standoff Volt. (V)
	Min.	Nom.	Max.			
333-1.5KE6.8A	6.45	6.8	7.14	10	1000	5.8
333-1.5KE7.5A	7.13	7.5	7.88	10	500	6.4
333-1.5KE8.2A	7.79	8.2	8.61	10	200	7.02
333-1.5KE10A	9.5	10.0	10.5	1	10	8.55
333-1.5KE12A	11.4	12.0	12.6	1	5	10.2
333-1.5KE15A	14.3	15.0	15.8	1	5	12.8
333-1.5KE20A	19.0	20.0	21.0	1	5	17.1
333-1.5KE24A	22.8	24.0	25.2	1	5	20.5
333-1.5KE27A	25.7	27.0	28.4	1	5	23.1
333-1.5KE30A	28.5	30.0	31.5	1	5	25.5
333-1.5KE33A	31.4	33.0	34.7	1	5	28.2
333-1.5KE51A	48.5	51.0	53.6	1	5	43.6
333-1.5KE68A	64.6	68.0	71.4	1	5	58.1

MOUSER® ELECTRONICS

333-1.5KE6.8CA 333-1.5KE15CA 333-1.5KE33CA
333-1.5KE7.5CA 333-1.5KE20CA 333-1.5KE51CA
333-1.5KE8.2CA 333-1.5KE24CA 333-1.5KE68CA
333-1.5KE10CA 333-1.5KE27CA 333-1.5KE100CA
333-1.5KE12CA 333-1.5KE30CA 333-1.5KE150CA

EXL Transient Voltage Suppressors



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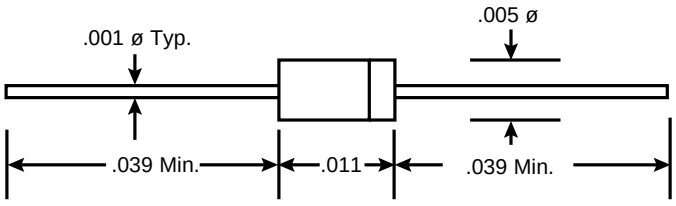
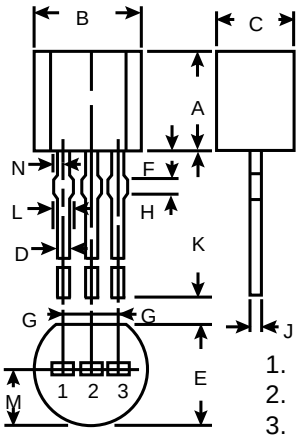
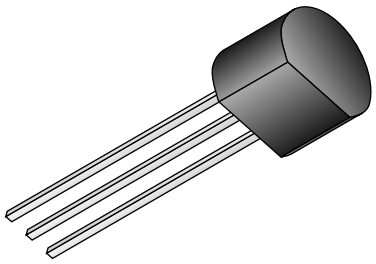


1500 WATTS, BIDIRECTIONAL

Mouser Stock No.	Breakdown Voltage V (BR)@ IR			Reverse Current (IR) (mADC)	Reverse DC Leakage Curr. (µA)	Rated Standoff Volt. (V)
	Min.	Nom.	Max.			
333-1.5KE6.8CA	6.12	6.8	7.48	10	1000	5.5
333-1.5KE7.5CA	7.13	7.5	7.88	10	500	6.4
333-1.5KE8.2CA	7.79	8.2	8.61	10	200	7.02
333-1.5KE10CA	9.5	10.0	10.5	1	10	8.55
333-1.5KE12CA	11.4	12.0	12.6	1	5	10.2
333-1.5KE15CA	14.3	15.0	15.8	1	5	12.8
333-1.5KE20CA	19.0	20.0	21.0	1	5	17.1
333-1.5KE24CA	22.8	24.0	25.2	1	5	20.5
333-1.5KE27CA	25.7	27.0	28.4	1	5	23.1
333-1.5KE30CA	28.5	30.0	31.5	1	5	25.5
333-1.5KE33CA	31.4	33.0	34.7	1	5	28.2
333-1.5KE51CA	48.5	51.0	53.6	1	5	43.6
333-1.5KE68CA	61.2	68.0	74.8	1	5	55.1
333-1.5KE100CA	95.0	100.0	105.0	1	5	85.5
333-1.5KE150CA	143.0	150.0	158.0	1	5	128.0



1. Collector
2. Base
3. Emitter

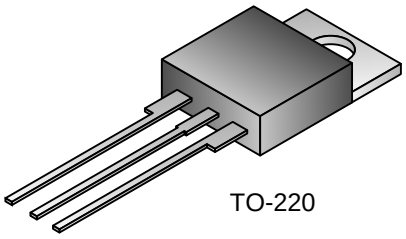


TO-92

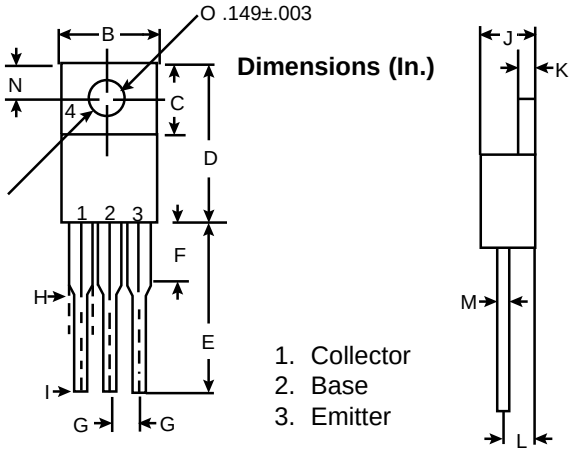
Characteristic		Symbol	Rating	Unit
Collector-Base Voltage	333-BC559	V_{CBO}	-30	V
	333-BC560		-50	
Collector -Emitter Voltage	333-BC559	V_{CEO}	-30	V
	333-BC560		-45	
Emitter-Base Voltage		V_{EBO}	-5	V
Collector Current		I_C	-100	mA
Collector Power Dissipation	333-BC559	P_C	500	mW
	333-BC560		625	
Junction Temperature		Tj	150	°C
Storage Temperature Range		Tstg	-55~150	°C

	Dimensions (In.)	
	Min.	Max.
A	.175	.179
B	.179	.183
C	.135	.139
D	.015	.020
E	.135	.139
F	.035	.043
G	.047	.053
H	.031	.035
I	.013	.021
K	.531	.570
L	-	.019
M	.088	.092
N	-	.001

Characteristic		Symbol	Test Condition	Unit	Unit	Unit	Unit
Collector-Emitter Breakdown Voltage	333-BC559	$V_{(BR)CEO}$	I_C=-10mA, I_B=0	-35	-	-	V
	333-BC560			-45	-	-	
Collector - Base Breakdown Voltage	333-BC559	$V_{(BR)CBO}$	I_C=-10μA, I_E=0	-45	-	-	V
	333-BC560			-50	-	-	
Emitter-Base Breakdown Voltage		$V_{(BR)EBO}$	I_E=-10μA, I_C=0	-5	-	-	V
Collector Cut-off Current		I_{CBO}	V_{CB}=-30V, I_E=0	-	-	-15	nA
DC Current Gain		h_{FE}	I_C=-2mA, V_{CE}=-5V	110	-	450	-
Base-Emitter Voltage		V_{BE}(on)	I_C=-2mA, V_{CE}=-5V	-0.55	-	-0.7	V
Collector-Emitter Saturation Voltage		V_{CE} (sat)	I_C=-100mA, I_B=-5mA	-	-	-0.6	V
Base-Emitter Saturation Voltage		V_{BE} (sat)	I_C=-100mA, I_B=-5mA	-	-0.9	-	V
Transition Frequency		f_T	I_C=-10mA, V_{CE}=-5V f=100MHz	-	300	-	MHz
Collector Output Capacitance		C_{ob}	V_{CE}=-10V, I_E=0, f=1MHz	-	-	7	pF
Noise Figure		NF	I_C=-200μA, V_{CE}=-5V Rg=10KΩ, f=1KHz	-	-	4	dB



TO-220

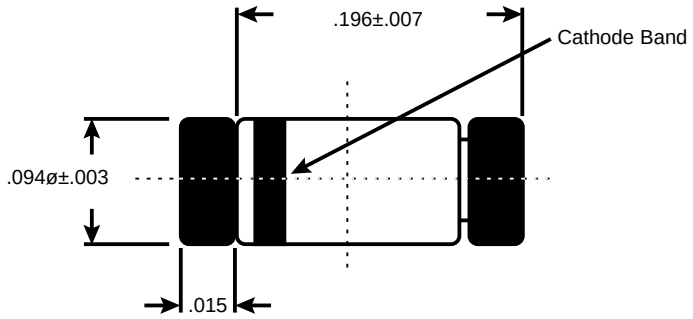


Dimensions (In.)

1. Collector
2. Base
3. Emitter

I_C (A)	8
V_{CBO} (V)	80
V_{CEO} (V)	80
P_D (W)	70
H_{FE} (Min/Max)	1K/15K
I_C/V_{CE} (A/V)	4.0/4
$V_{CE(SAT)}$ (V)	2.0
I_C/I_B (A/mA)	4.0/16

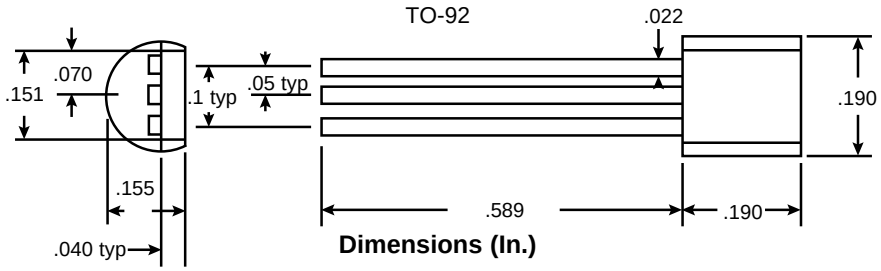
	Dimensions (In.)	
	Min.	Max.
B	.385	.401
C	.230	-
D	-	.624
E	0.5	-
F	-	.25
G	.099	.100
H	-	.051
I	.029	.033
J	-	.189
K	.043	.055
L	.080	.114
M	.014	.026
N	0.1	.129
O	.145ø	.153ø



Mouser Part No.	Nominal ZN.Vltg. @ I_{ZT} V_Z (V)	Test Current I_{ZT} (mA)	Max. Zener Impedance @ I_{ZT} Z_{ZT} (Ω)	Max. Zener Impedance @ I_{ZK} Z_{ZK} (Ω)	Test Current I_{ZK} (uA)	Max. Reverse Lkg. Current @V_R I_R (uA)	Test Voltage V_R (V)	Max. Surge Current I_S (mA)	Max. Fwd. Voltage @ 50°C I_{ZM} (mA)
333-ZM4730A	3.9	64	9	400	1.0	50	1.0	1170	234
333-ZM4731A	4.3	58	9	400	1.0	10	1.0	1085	217
333-ZM4732A	4.7	53	8	500	1.0	10	1.0	965	193
333-ZM4733A	5.1	49	7	550	1.0	10	1.0	890	178
333-ZM4734A	5.6	45	5	600	1.0	10	2.0	810	162
333-ZM4735A	6.2	41	2	700	1.0	10	3.0	730	146
333-ZM4736A	6.8	37	3.5	700	1.0	10	4.0	660	133
333-ZM4737A	7.5	34	4	700	0.5	10	5.0	605	121
333-ZM4738A	8.2	31	4.5	700	0.5	10	6.0	550	110
333-ZM4739A	9.1	28	5	700	0.5	10	7.0	500	100
333-ZM4740A	10	25	7	700	0.25	10	7.6	454	91
333-ZM4741A	11	23	8	700	0.25	5.0	8.4	414	83
333-ZM4742A	12	21	9	700	0.25	5.0	9.1	380	76
333-ZM4743A	13	19	10	700	0.25	5.0	9.9	344	69
333-ZM4744A	15	17	14	700	0.25	5.0	11.4	304	61
333-ZM4745A	16	15.5	16	700	0.25	5.0	12.2	285	57
333-ZM4746A	18	14	20	700	0.25	5.0	13.7	250	50
333-ZM4747A	20	12.5	22	750	0.25	5.0	15.2	225	45
333-ZM4748A	22	11.5	23	750	0.25	5.0	16.7	205	41
333-ZM4749A	24	10.5	25	750	0.25	5.0	18.2	190	38
333-ZM4750A	27	9.5	35	750	0.25	5.0	20.6	170	34
333-ZM4751A	30	8.5	40	1000	0.25	5.0	22.8	150	30
333-ZM4752A	33	7.5	45	1000	0.25	5.0	25.1	135	27

MOUSER ELECTRONICS ®

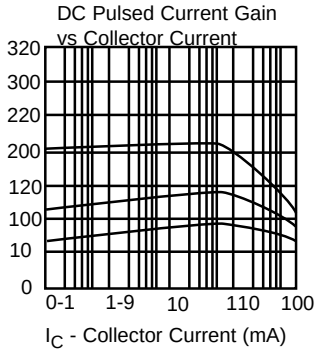
333-PN4355 PNP General Purpose Switching Transistor

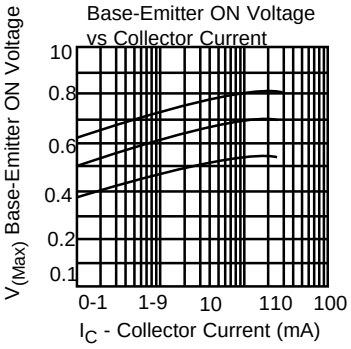


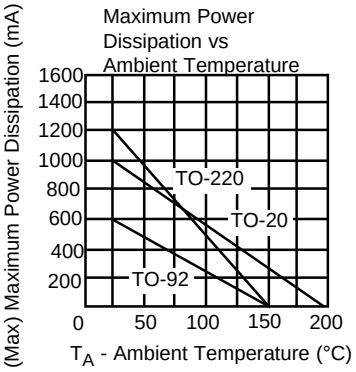
Dimensions (In.)

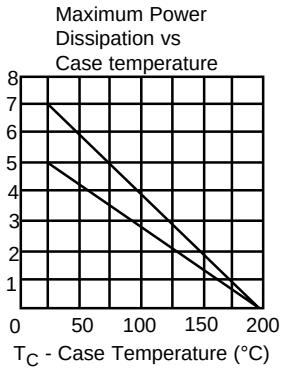
(Ta = 25°C)

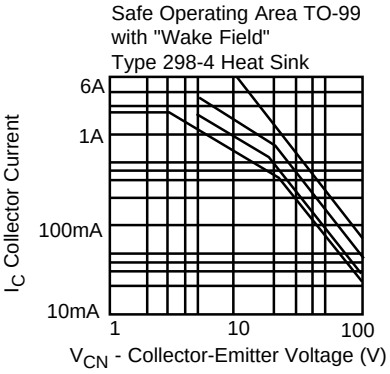
V_{CBO} (V) Min	V_{CEO} (V) Min	V_{EBO} (V) Min	I_{CES} I_{CBO} (mA) Max	V_{CB} (V)	h_{FE} Min	I_C (mA)	V_{CE} (V)	$V_{CE(SAT)}$ (V) Min	$V_{BE(SAT)}$ (V) Max	I_C (mA)	C_{OB} (pF) Max	f_T (MHz) Min	f_T (MHz) Max	I_C (mA)	T_{OFF} (na) Max	NF (dB) Max	P_D (dB) Max
60	60	5	50	50	75	500	10	.15	.9	150	30	100	500	50	400	3	800

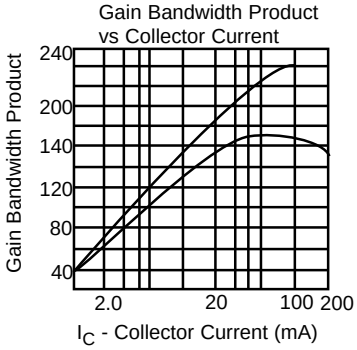












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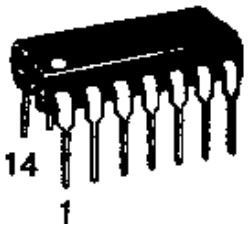
333-MPQ2222 NPN General Purpose SS Transistor



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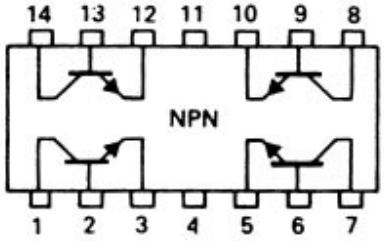

V_{CBO} (V) Min	V_{CEO} (V) Min	V_{EBO} (V) Min	I_{CBO} @ V_{CB} (mA) (V) Min		h_{FE} @ I_C & V_{CE} Min	Max	(mA)	(V)	$V_{CE(SAT)}$ & $V_{BE(SAT)}$ (V) Max	(V) Min	Max	@ I_C (mA)	C_{OB} (pF) Max	f_T (MHz) @ I_C Min	(mA)
60	40	5	50	50	75		10	10	0.4		1.3	150	8	200	20

3-27-95

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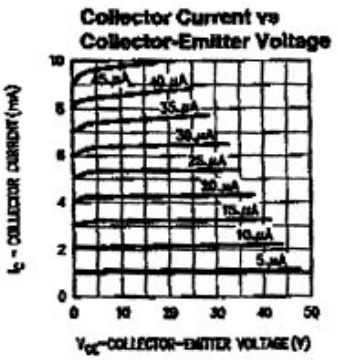
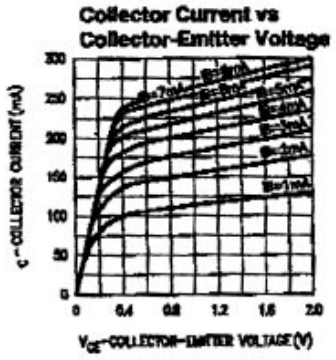
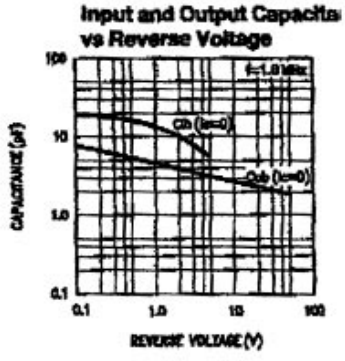
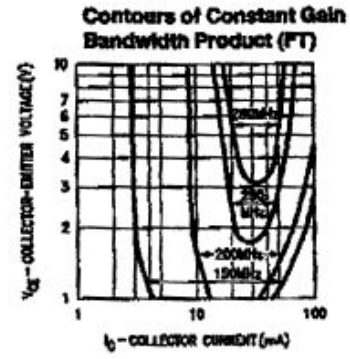
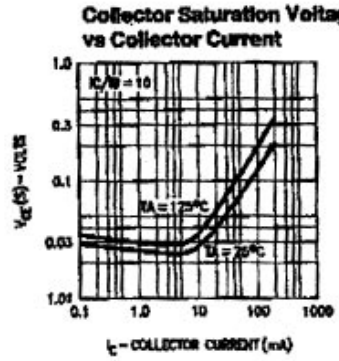
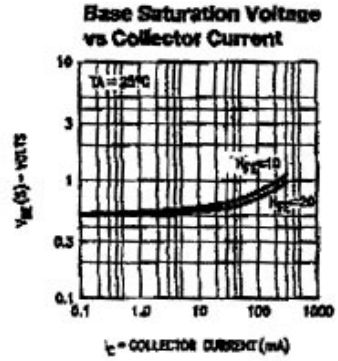


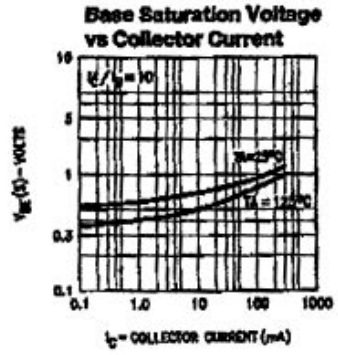


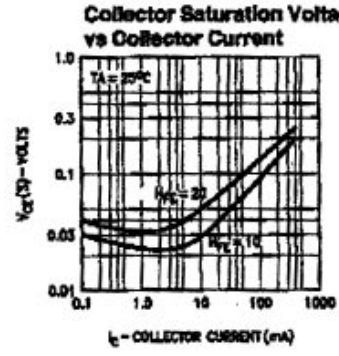


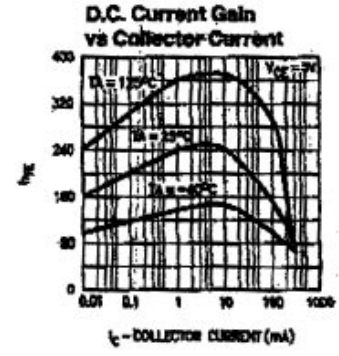


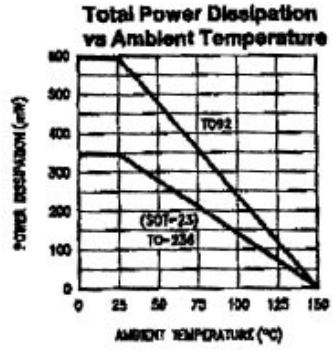


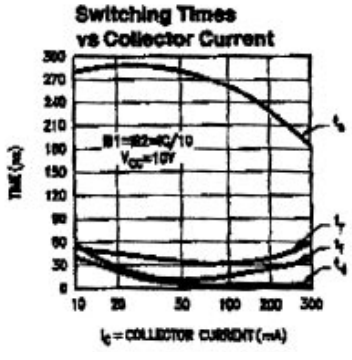






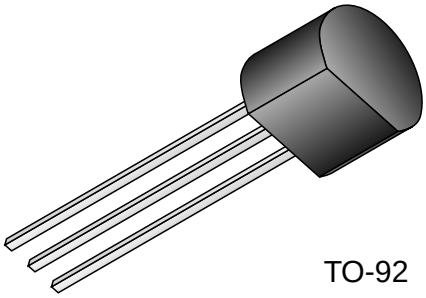




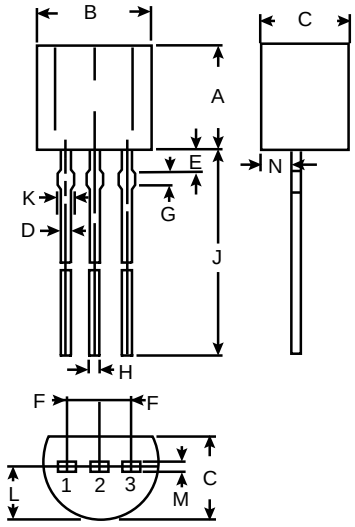


MOUSER ELECTRONICS ®

333-KTC3203 NPN Hi-Current SS Transistor



TO-92



Dim	Inches
A	.185 Max
B	.188 Max
C	.145 Max
D	.017
E	.039
F	.05
G	.033
H	.017
J	.551±.019
K	.021 Max
L	.090
M	.017 Max
N	.039

1. Emitter
2. Collector
3. Base

Maximum Ratings (Ta=25°C)

Characteristics	Symbol	Rating	Unit
Collector-Base Voltage	V_{CBO}	35	V
Collector-Emitter Voltage	V_{CEO}	30	V
Emitter-Base Voltage	V_{EBO}	5	V
Collector Current	I_C	800	mA
Emitter Current	I_E	-800	mA
Collector Power Dissipation	P_C	625	mW
Junction Temperature	T_j	150	°C
Storage Temperature Range	T_{stg}	-55~150	°C

Electrical Characteristics (Ta=25°C)

Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Typ.
Collector Cut-off Current	I_{CBO}	V_{CB}=35V, I_E=0	-	-	100	nA
Emitter Cut-off Current	I_{EBO}	V_{EB}=5V, I_C=0	-	-	100	nA
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	I_C=10mA	30	-	-	V
DC Current Gain	$h_{FE}(1)$ (Note)	V_{CE}=1V, I_C=100mA	100	-	320	
	$h_{FE}(2)$ (Note)	V_{CE}=1V, I_C=700mA	35	-	-	
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	I_C=500mA, I_B=20mA	-	-	0.5	V
Base-Emitter Voltage	V_{BE}	V_{CE}=1V, I_C=10mA	0.5	-	0.8	V
Transition Frequency	f_T	V_{CE}=5V, I_C=10mA	-	120	-	MHz
Collector Output Capacitance	C_{ob}	V_{CB}=10V, f=1MHz, I_E=0	-	13	-	pF

Note: $h_{FE}(1)$ Classification 0: 100~200, Y: 160~320

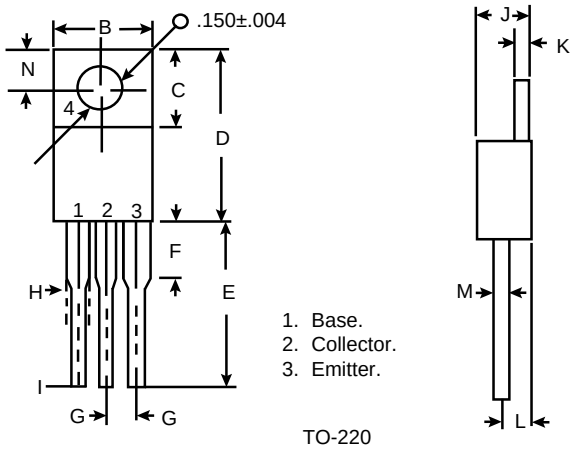
4-11-95

MOUSER® ELECTRONICS

333-TIP41
333-TIP41A
333-TIP41B
333-TIP41C

NPN General Purpose Power Transistor

Dimensions (In.)

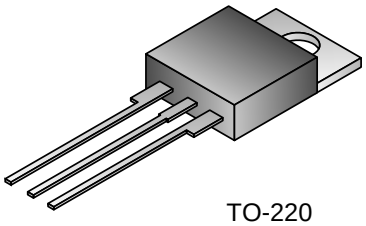


1. Base.
2. Collector.
3. Emitter.

TO-220

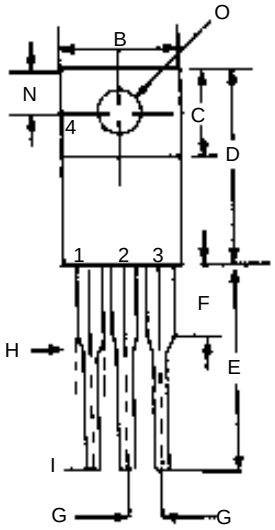
	Inches	
	Min.	**Max.**
B	-.386	.402
C	.230	-
D	-	.625
E	.500	-
F	-	.250
G	.100	.100
H	-	.051
I	.029	.033
J	-	.190
K	.043	.055
L	.081	.115
M	.015	.027
N	.100	.130
O	.146	.154

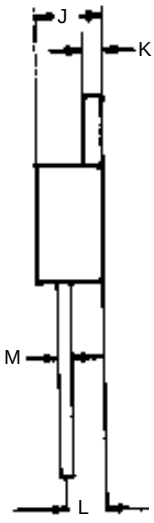
NPN	I_C (A)	V_{CBO} (V)	V_{CEO} (V)	P_D (W)	H_{FE} (Min./Max.)	I_C/V_{CE} (A/V)	$V_{CE(SAT)}$ (V)	I_C/I_B (A/mA)
TIP41	6	40	40	65	15/75	3.0 /4	1.5	6.0 /600
TIP41A	6	60	60	65	15/75	3.0 /4	1.5	6.0 /600
TIP41B	6	80	80	65	15/75	3.0 /4	1.5	6.0 /600
TIP41C	6	100	100	65	15/75	3.0 /4	1.5	6.0 /600



TO-220

Dimensions (In.)

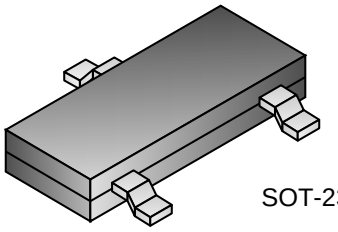




	Min.	Max.
B	.385	.401
C	.230	-
D	-	.624
E	.5	-
F	-	.25
G	.099	.100
H	-	.051
I	.029	.033
J	-	.189
K	.043	.055
L	.080	.114
M	.014	.026
N	.1	.129
O	.145ø	.153ø

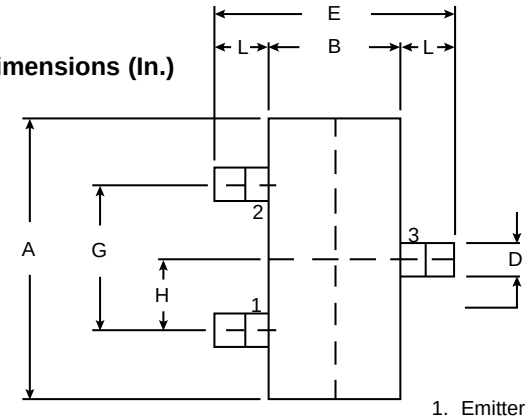
1. Base.
2. Collector.
3. Emitter.

I_C (A)	V_{CBO} (V)	V_{CEO} (V)	P_D (W)	Package	NPN	H_{FE} (Min./Max.)	I_C/V_{CE} (A/V)	$V_{CE(SAT)}$ (V)	I_C/I_B (A/mA)
10	60	60	65	TO-220	2N6387	1K/20K	5.0/3	2.0	5.0/10



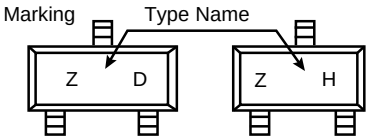
SOT-23

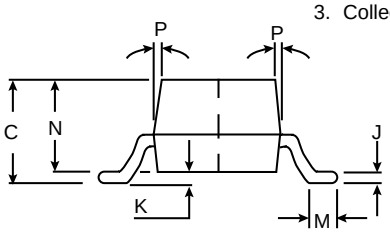
Dimensions (In.)



1. Emitter
2. Base
3. Collector

Dim	Inches
A	.115±.007
B	.051+.007 -.005
C	.051 Max.
D	.017+.005 -.001
E	.094+.011 -.007
G	.074
H	.037
J	.005+.003 -.001
K	0.00-.003
L	.021
M	.007 Min.
N	.039+.007 -.003
P	7





Maximum Rating (Ta=25°C)

Characteristic	Symbol	Rating KTN2907AS	Unit
Collector-Base Voltage	V_{CBO}	-60	V
Collector-Emitter Voltage	V_{CEO}	-60	V
Emitter-Base Voltage	V_{EBO}	-5	V
Collector Current	I_C	-600	mA
Collector Power Dissipation (Ta=25°C)	P_{C*}	350	mW
Junction Temperature	T_j	150	°C
Storage Temperature Range	T_{stg}	-55 ~ 150	°C

P_{C*}: package Mounted On 99.5% Alumina 10x8x0.6mm

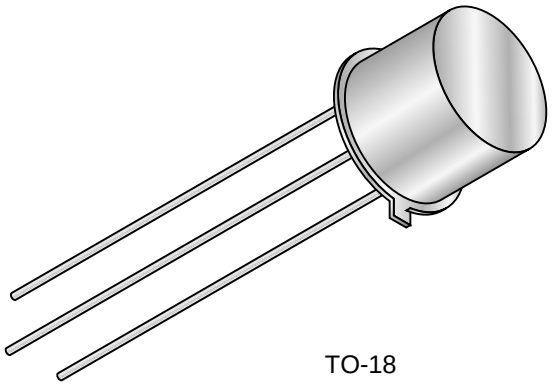
Specifications:

- Low leakage current: I_{CEX}=-50nA (Max.); V_{CE}=-30V, V_{BE}=0.5V
- Low saturation voltage: $V_{CE(sat)}$=-0.4V (Max.); I_C=-150mA, I_B=-15mA
- Complementary to: 333-KTN2222AS

Electrical Characteristics (Ta=25°C)

Characteristic		Symbol	Rating KTN2907AS	Min.	Max.	Unit
Collector Cut-off Current		I_{CEX}	V_{CE}=-30V, V_{BE}=0.5V	-	-50	nA
Collector Cut-off Current	KTN2907AS	I_{CBO}	V_{CB}=-50V, I_E=0	-	-10	nA
Collector-Base Breakdown Voltage		$V_{(BR)CBO}$	I_C=-10μA, I_E=0	-60	-	V
Collector-Emitter * Breakdown Voltage		$V_{(BR)CEO}$	I_C=-10mA, I_B=0	-60	-	V
Emitter-Base Breakdown Voltage		$V_{(BR)EBO}$	I_E=-10μA, I_C=0	-5.0	-	V
DC Current Gain	KTN2907AS	$h_{FE}(1)$	I_C=-0.1mA, V_{CE}=-10V	75	-	
		$h_{FE}(2)$	I_C=-1.0mA, V_{CE}=-10V	100	-	
		$h_{FE}(3)$	I_C=-10mA, V_{CE}=-10V	100	-	
		$h_{FE}(4)$*	I_C=-150mA, V_{CE}=-10V	100	300	
		$h_{FE}(5)$*	I_C=-500mA, V_{CE}=-10V	50	-	
Collector-Emitter Saturation Voltage *		$V_{CE(sat)}1$	I_C=-150mA, I_B=-15mA	-	-0.4	V
		$V_{CE(sat)}2$	I_C=-500mA, I_B=-15mA	-	-1.6	
Base-Emitter Saturation Voltage *		$V_{CE(sat)}1$	I_C=-150mA, I_B=-15mA	-	-1.3	V
		$V_{CE(sat)}2$	I_C=-500mA, I_B=-50mA	-	-2.6	
Transition Frequency		f_T	V_{CE}=-20V, I_C=50mA, f=100MHz	200	-	MHz
Collector Output Capacitance		C_{ob}	V_{CB}=-10V, I_E=0, f=1MHz	-	8.0	pF
Input Capacitance		C_{ib}	V_{BE}=-2V, I_C=0, f=1.0MHz	-	30	pF
Switching Time	Turn-On Time	t_{on}	V_{CC}=-30V, I_C=-150mA I_{B1}=-15mA	-	45	nS
	Delay Time	t_d		-	10	
	Rise Time	t_r		-	40	
	Turn-Off Time	t_{off}	V_{CC}=-6V, I_C=-150mA I_{B1}=I_{B2}=-15mA	-	100	
	Storage Time	t_{stg}		-	80	
	Fall Time	t_r		-	30	

Note: *Pulse Test: Pulse Width ≤300μS, Duty Cycle ≤2.0%



TO-18

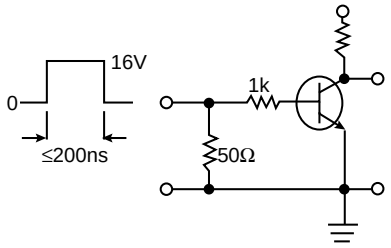


Figure 1. Saturated Turn On Switching Time Test Circuit

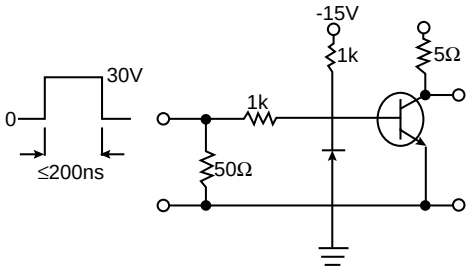


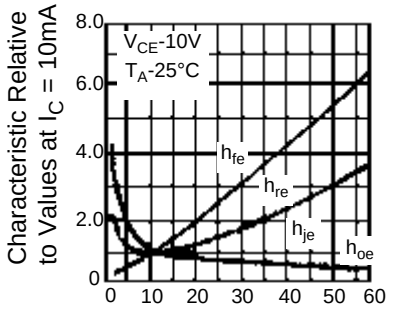
Figure 2. Saturated Turn Off Switching Time Test Circuit

Small Signal Characteristics (f = 1.0kHz)

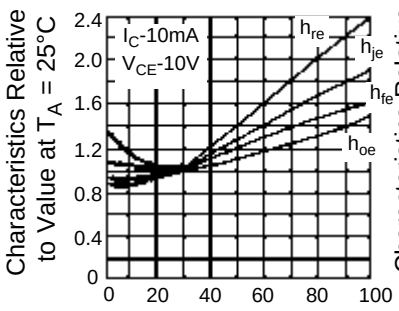
Symbol	Parameter	Conditions	Typ	Units
h_{je}	Input Resistance	I_C = 10mA, V_{CE} = 10V	700	Ω
h_{oe}	Output Conductance	I_C = 10mA, V_{CE} = 10V	120	µmbos
h_{fe}	Small Signal Current Gain	I_C = 10mA, V_{CE} = 10V	240	
h_{ne}	Voltage Feedback Ratio	I_C = 10mA, V_{CE} = 10V	460	x 10^{-6}

V_{CBO} (V) Min	V_{CEO} (V) Min	V_{EBO} (V) Min	V_{EBO} (V) @ I_C (V) Min	h_{FE} @ I_C & V_{CE} Min	Max	(mA)	(V)	$V_{CE(SAT)}$ (V) Max	$V_{BE(SAT)}$ & (V) @ Min	Max	I_C (mA)	C_{ob} (pF) Max	f_T @ I_C (MHz) (V) Min	Max	t_{off} (ns) Max	NF (dB) Max
75	40	6	10 80	40		500	10	0.3	0.8	1.2	150	8	250	20	285	4
				50		150	1									
				100	300	150	10	1		2	500					
				75		10	10									
				50		1	10									
				35		100µA	10									

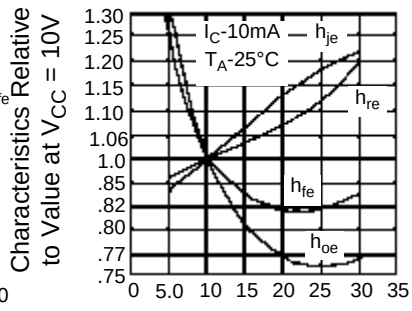
Typical Common Emitter Characteristics (f=1.0kHz)



I_C = Collector Current (mA)

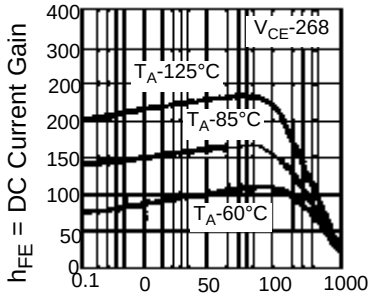


T_A = Ambient Temperature (°C)



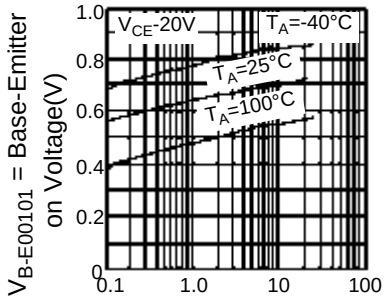
V_{CE} = Collector Voltage (V)

DC Current Gain vs Collector Current



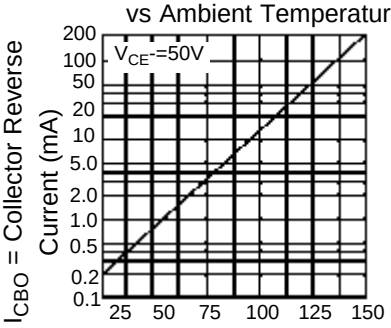
I_C = Collector Current (mA)

Base-Emitter ON Voltage vs Collector Current



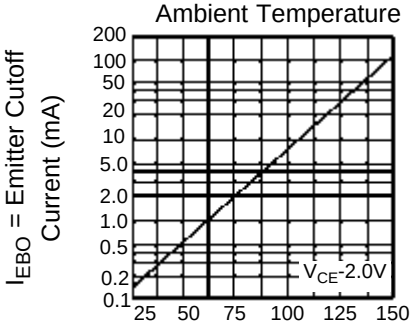
I_C = Collector Current (mA)

Collector Reverse Current vs Ambient Temperature



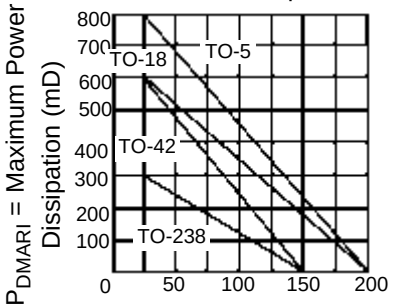
T_A = Ambient Temperature (°C)

Emitter Cutoff Current vs Ambient Temperature



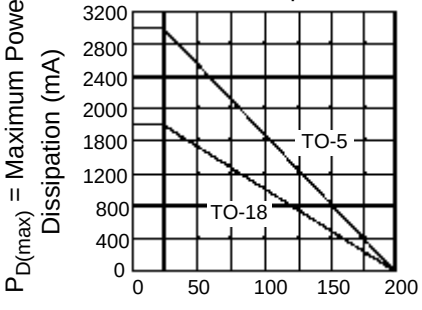
T_A - Ambient Temperature (°C)

Maximum Power Dissipation vs Ambient Temperature



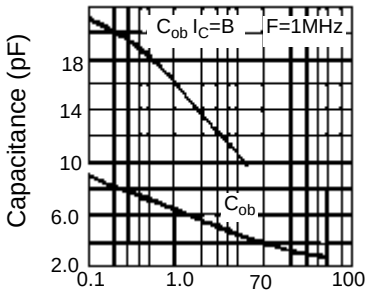
T_A - Ambient Temperature (°C)

Maximum Power Dissipation vs Case Temperature

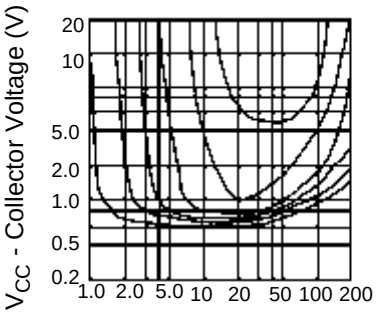


T_C - Case Temperature (°C)

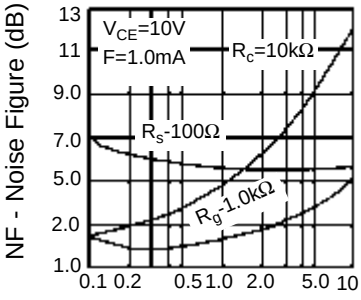
Emitter Transition and Output Capacitance vs Reverse Bias Voltage



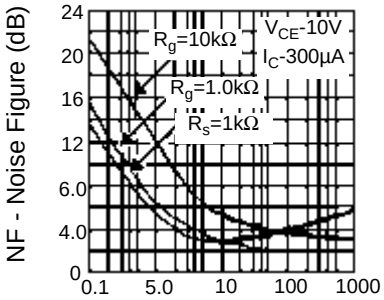
Contours of Constant Gain Bandwidth Product (f_T)



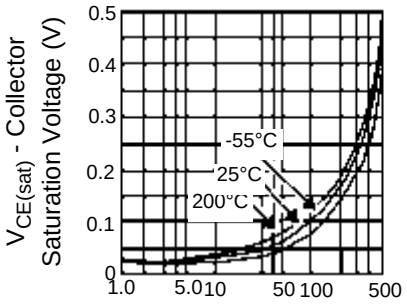
Noise Figure vs Collector Current



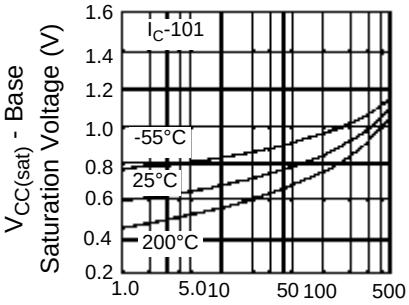
Noise Figure vs Frequency



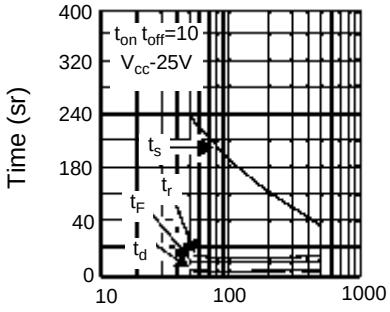
Collector Saturation Voltage vs Collector Current



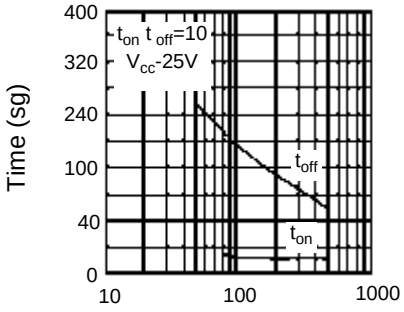
Base Saturation Voltage vs Collector Current



Switching Time vs Collector Current

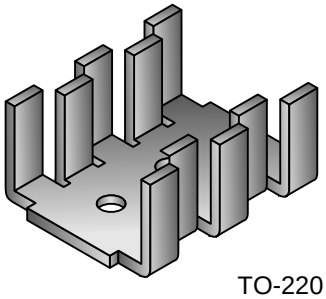


Turn On and Turn Off Times vs Collector Current



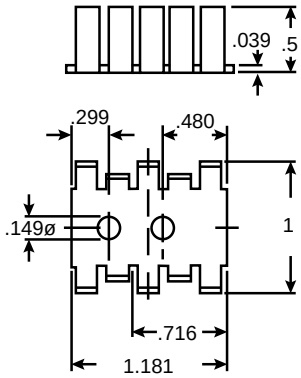
MOUSER® ELECTRONICS

33HS222 Heatsink For TO-220 Case Type



TO-220

Dimensions (In.)

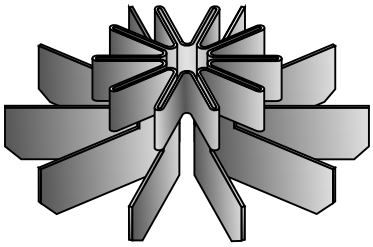


Mouser Stock No.	Description	Ther Res (°C/W)	Finish
33HS222	Horizontal mounting staggered fins	15	Black anodized

5-16-95

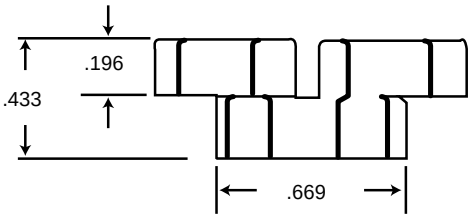
MOUSER® ELECTRONICS

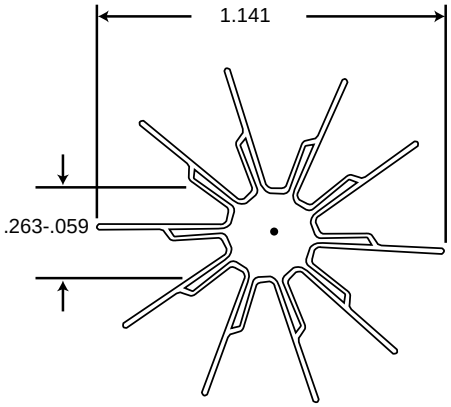
33HS504 Heatsink For TO-5 Case Type



TO-5

Dimensions (In.)



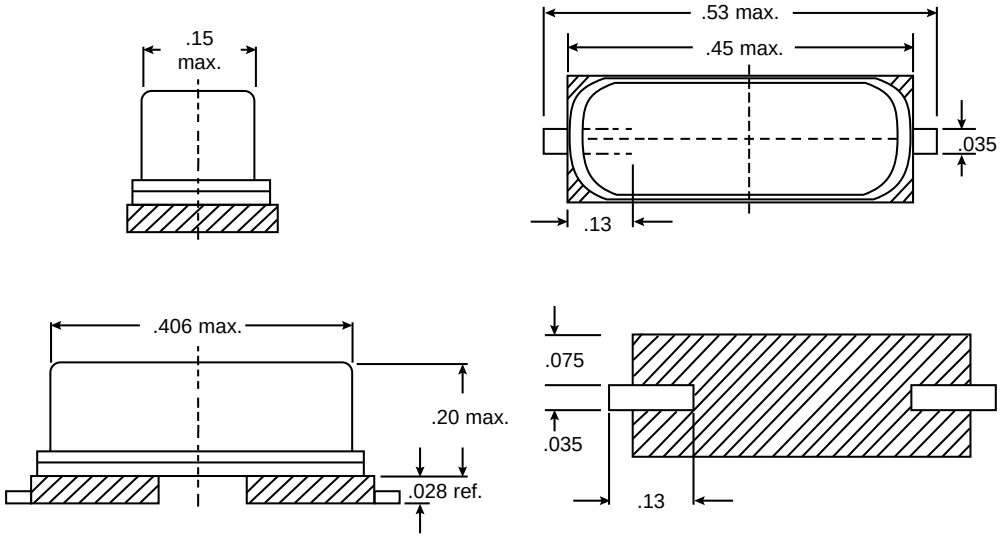


Mouser Stock No.	Description	Ther Res (°C/W)	Finish
33HS504	Maximum cooling push-on	33	Chemically blackened

MOUSER® ELECTRONICS

332-SML1000 Surface Mount
Microprocessor Crystal

Dimensions (In.)



Specifications:

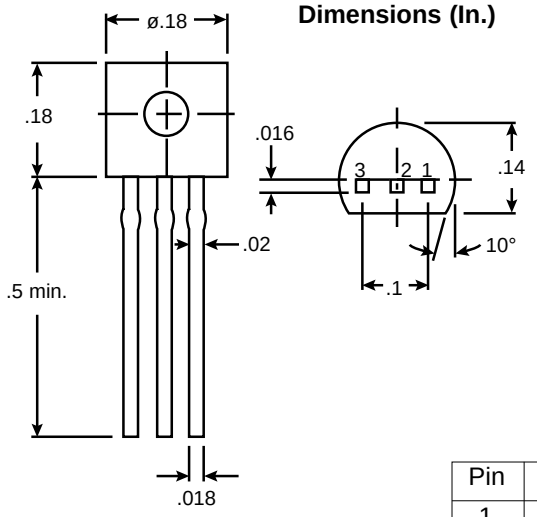
- Frequency: 10.000MHz
- Oscillation mode: fundamental
- Frequency tolerance (@ 25°C ± 2°C): ±30ppm
- Storage temperature range: -30°C to 80°C
- Load capacitance: Series
- Drive level: 0.5mW
- Shunt capacitance: 7.0pF max.
- Insulation resistance: 500MΩ @ 100VDC
- Aging / Shock: ±5ppm per year

MOUSER® ELECTRONICS

333-BC308
333-BC309

PNP Small Signal
Audio Amp Transistor

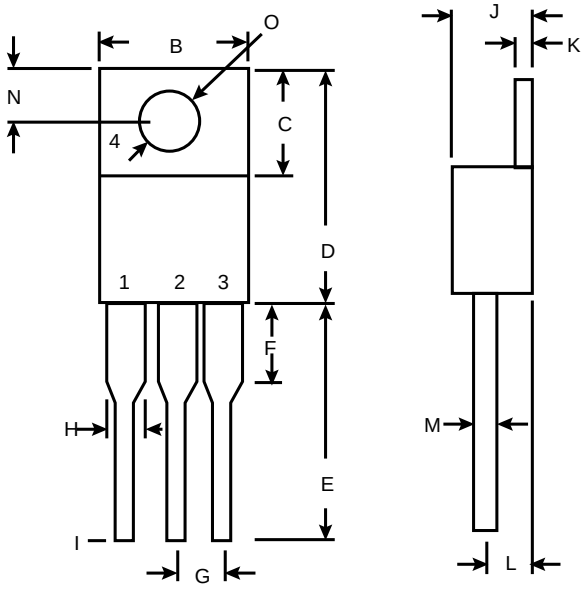
Dimensions (In.)



Pin	
1	Collector
2	Base
3	Emitter

Mouser Stock No.	Maximum Ratings			HFE				VCE (sat)		fT	Cob	N.F.
	Pd (mW)	IC (mA)	VCEO (V)	Min	Max	IC (mA)	VCE (V)	Max (V)	IC (mA)	Min (MHz)	Max (MHz)	Max (dB)
333-BC308	300	100	25	70	800	2	5	0.3	10	100	6	10
333-BC309	300	100	20	200	800	2	5	0.3	10	100	6	4

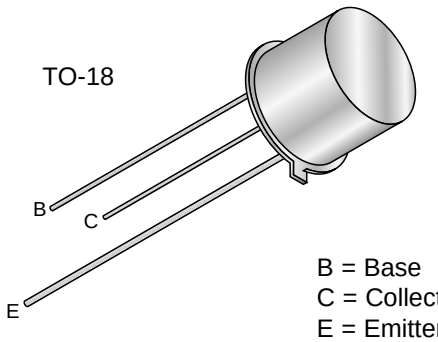
Dimensions (In.)



1. Base
2. Collector
3. Emitter
4.

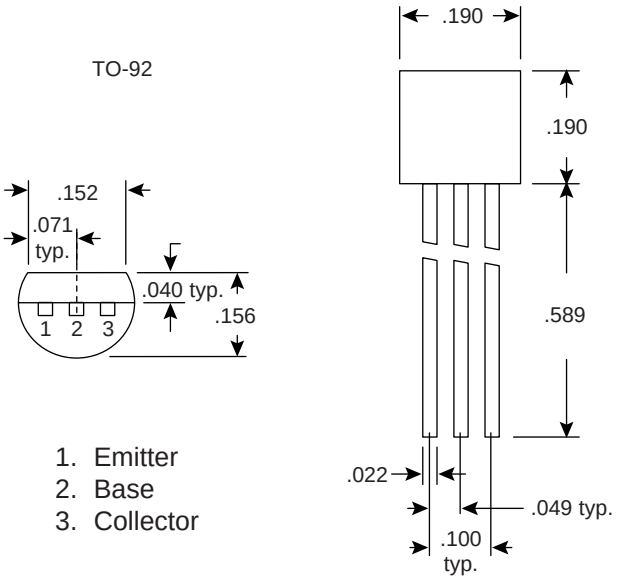
	Dimensions (In.)	
	Min.	Max.
B	.386	.402
C	.217	---
D	---	.625
E	.500	---
F	---	.025
G	.099	.100
H	---	.051
I	.030	.033
J	---	.190
K	.043	.055
L	.081	.115
M	.015	.027
N	.100	.130
O	Ø.146	Ø.154

I_C (A)	V_{CBO} (V)	V_{CEO} (V)	P_D (W)	H_{FE} (Min./Max.)	I_C/V_{CE} (A/V)	$V_{CE(SAT)}$ (V)	I_C/I_B (A/mA)
8	100	100	75	1K/20K	3.0/4	2.0	3.0/12



B = Base
C = Collector
E = Emitter

Mouser Stock No.	V_{ceo}(V) Min	V_{cbo}(V) Min	H_{fe} Min	H_{fe} Max	I_C/V_{CE} (mA/V)	f_T (MHz) Min
333-2N2221A	40	75	40	120	150/10	250



Dimensions (In.)

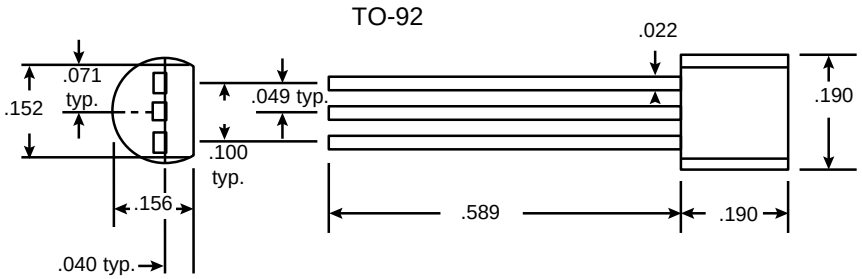
Specifications:

- Type: NPN general purpose small signal
- Junction temperature (TJ): 150°C
- Storage temperature (TSTG): -50 ~ 150°C

Maximum Ratings				Electrical Characteristics (T_A=25°C)								
BV_{CBO} BV_{CES}	BV_{CEO} BV_{CES}	I_C	P_D	I_{CBO} I_{CES} $+I_{CEX}$	Max. V_{CB} V_{CE} $+V_{CE}$	h_{FE} Typ. min./ max.	I_C	V_{CE}	V_{CESAT}	Max. I_C	Max. I_B	f_T min. Typical
60V	40V	600mA	625mW	100nA	35V	100/300	150mA	1V	0.4V	150mA	15mA	250MHz

Dimensions (In.)

TO-92



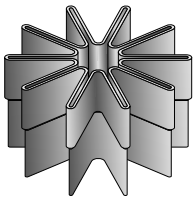
Operating Temperature: -55°C to +150°C

Mouser Stock No.	V_{CEO}	I_C	Condition		h_{FE}	Condition		V_{CE}(sat)	V_{BE}(sat)	Condition		f_T
			V_{CE}	I_C	Min.	I_C	I_B	Max.	Max.	V_{CE}	I_C	Min.
	(V)	(A)	(V)	(mA)		(mA)	(mA)	(V)	(V)	(V)	(mA)	(MHz)
333-MPSA93	200	0.5	10	30	40	20	2	0.5	0.9	20	10	50

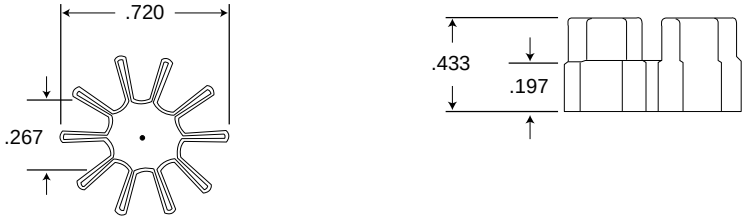
MOUSER® ELECTRONICS

33HS503 Heat Sink

Heat Sink for TO-5 or similar



Dimensions (In.)



Material Specifications:

• Finish: Chemical blackened, bronze

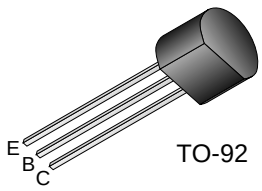
Mouser Stock No.	Description	Ther Res (°C/W)	Dimensions (In.)	
			H	W
33HS503	Medium cooling push-on for TO-5 case type	46	.433	.720

7-18-95

MOUSER® ELECTRONICS

333-PN5138

PNP General Purpose Switching Transistor



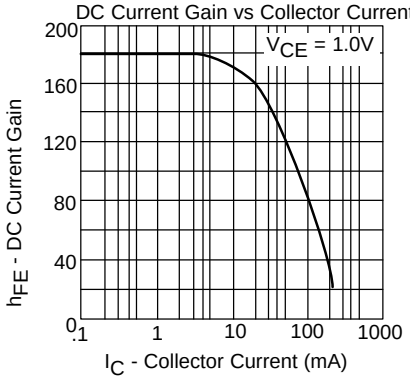
TO-92

V_{CBO} (V) Min	V_{CEO} (V) Min	V_{EBO} (V) Min	I_{CES} I_{CBO} (nA) Max	@ V_{CB} (V)	h_{FE} Min	Max	@ I_C (mA)	& V_{CE} (V)	$V_{CE(SAT)}$ (V) Max	& $V_{BE(SAT)}$ (V) Min	Max	@ I_C (mA)	C_{ob} (pF) Max	f_T (MHz) Min	Max	@ I_C (mA)
30	30	5	50	20	50		10	10	.3	-	1.0	10	7	30	-	.5
					50		1	10								
					50	800	.1	10								

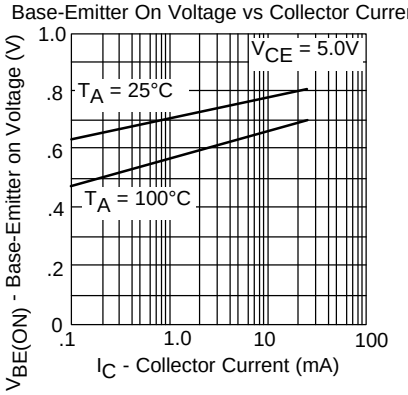
Electrical Characteristics (T_A = 25°C)

Symbol	Conditions	Min	Typ	Max	Units
t_{OFF}	I_C = 10mA, I_{B2} = 1mA		150	300	ns
t_{ON}	I_C = 10mA, I_{B1} = 1mA		30	70	ns
C_{ob}	V_{CB} = 5V		3.0	4.5	pF
C_{ib}	V_{EB} = 0.5V			15	pF
h_{FE}	f = 100MHz, V_{CE} = 20V, I_C = 10mA	2.5	4.5		
NF (wideband)	I_C = 100µA, V_{CE} = 5V, R_S = 1kΩ		2.0		dB
h_{FE}	I_C = .1mA, V_{CE} = 1V	40			
	I_C = 1mA, V_{CE} = 1V	50			
	I_C = 10mA, V_{CE} = 1V	50	150	350	
	I_C = 50mA, V_{CE} = 1V	40			
	I_C = 100mA, V_{CE} = 1V	20			
$V_{CE(SAT)}$	I_C = 10mA, I_B = 1mA			.25	V
	I_C = 50mA, I_B = 5mA			.40	V
$V_{BE(SAT)}$	I_C = 10mA, I_B = 1mA			.85	V
	I_C = 50mA, I_B = 5mA			.95	V
BV_{CEO}	I_C = 1mA	35			V
BV_{CBO}	I_C = 10µA	45			V
BV_{EBO}	I_E = 10µA	5.0			V
I_{CBO}	V_{CB} = 25V			100	nA
I_{EBO}	V_{EB} = 4V			100	nA

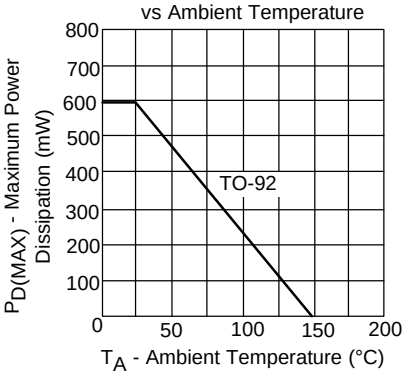
DC Current Gain vs Collector Current



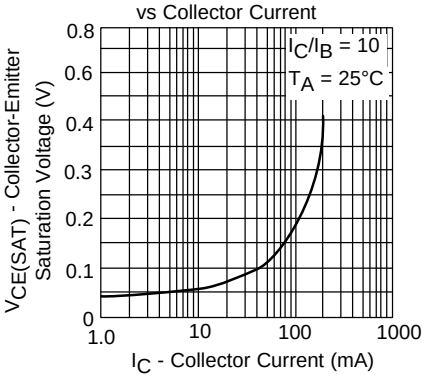
Base-Emitter On Voltage vs Collector Current



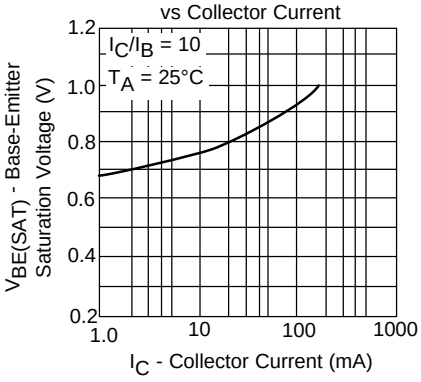
Maximum Power Dissipation vs Ambient Temperature



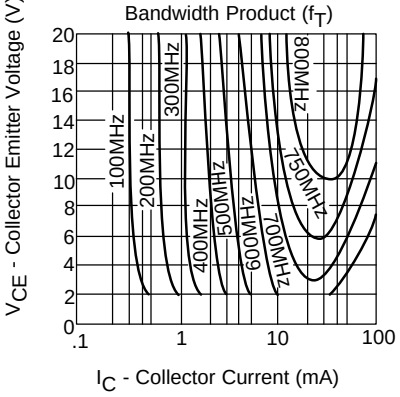
Collector-Emitter Saturation Voltage vs Collector Current



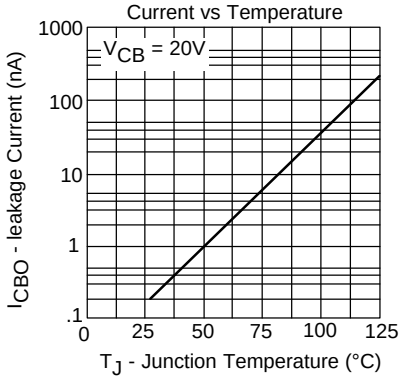
Base-Emitter Saturation Voltage vs Collector Current



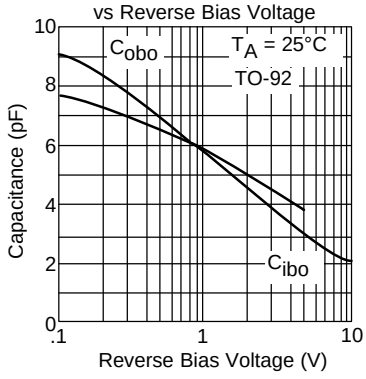
Contours of Constant Gain Bandwidth Product (f_T)



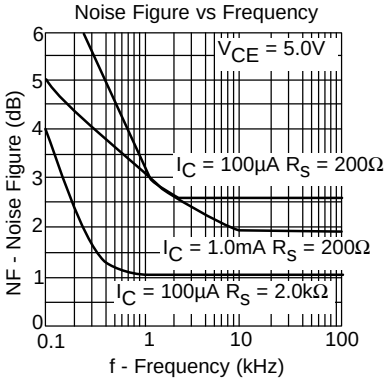
Collector-Base Diode Reverse Current vs Temperature



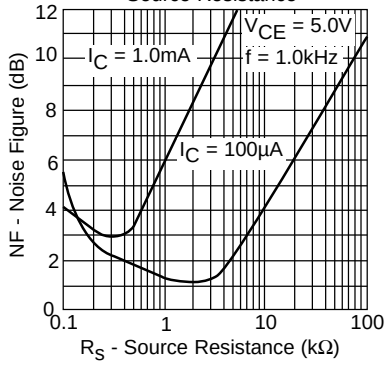
Common Base Open Circuit Input and Output Capacitance vs Reverse Bias Voltage



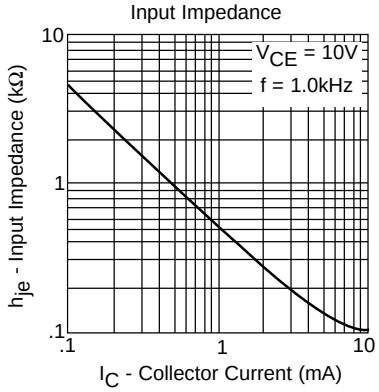
Noise Figure vs Frequency



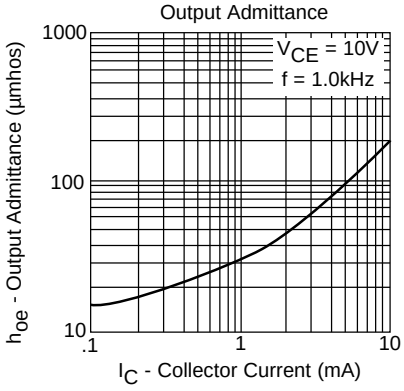
Noise Figure vs Source Resistance



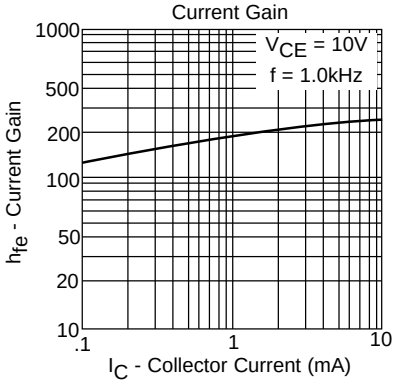
Input Impedance



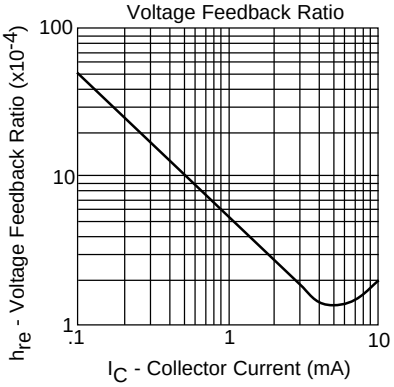
Output Admittance



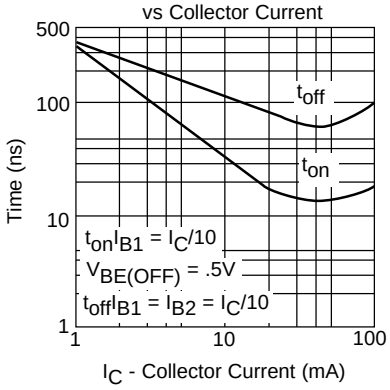
Current Gain



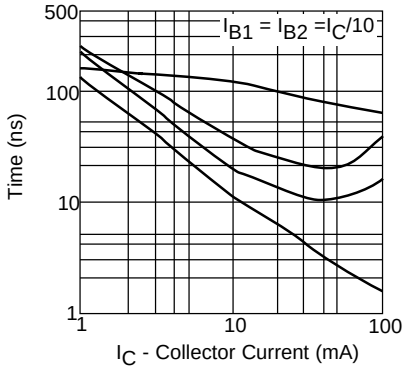
Voltage Feedback Ratio



Turn On and Turn Off Times vs Collector Current

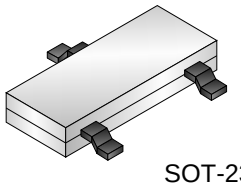


Switching Times vs Collector Current

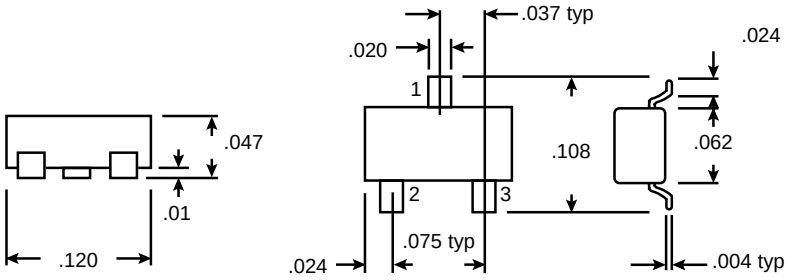


MOUSER® ELECTRONICS

333-MMBT2907A PNP General Purpose Transistor

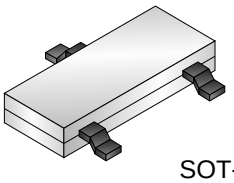


SOT-23



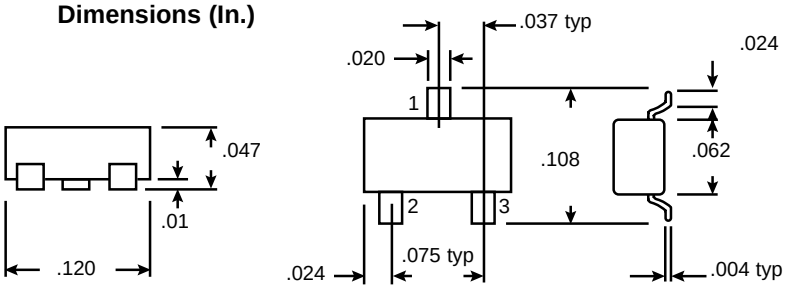
Pin	
1	Collector
2	Base
3	Emitter

		Condition		h_{FE}		Condition		V_{CE}(sat)	V_{BE}(sat)	Condition		f_T
V_{CEO}	I_C	V_{CE}	I_C	min	max	I_C	I_B	max	max	V_{CE}	I_C	min
(V)	(A)	(V)	(mA)			(mA)	(mA)	(V)	(V)	(V)	(mA)	(MHz)
60	.6	10	150	100	300	500	50	1.6	2.6	20	50	200



SOT-23

Dimensions (In.)

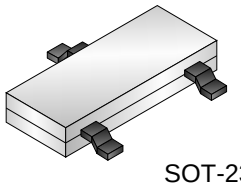


Pin	
1	Collector
2	Base
3	Emitter

		Condition		h_{FE}		Condition		V_{CE}(sat)	V_{BE}(sat)	Condition		f_T
V_{CEO}	I_C	V_{CE}	I_C	min	max	I_C	I_B	max	max	V_{CE}	I_C	min
(V)	(A)	(V)	(mA)			(mA)	(mA)	(V)	(V)	(V)	(mA)	(MHz)
40	.6	10	150	100	300	500	50	1.6	2.6	20	20	300

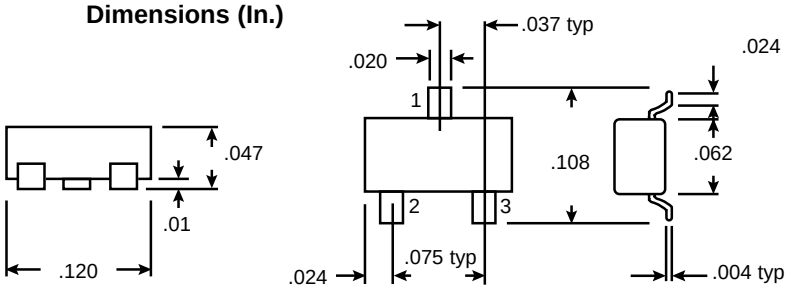
MOUSER® ELECTRONICS

333-MMBT3904 NPN General Small Signal Transistor



SOT-23

Dimensions (In.)

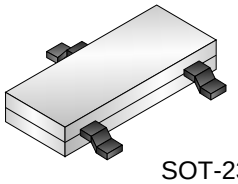


Pin	
1	Collector
2	Base
3	Emitter

V_{CEO}	I_C	Condition V_{CE}	Condition I_C	h_{FE} min	h_{FE} max	Condition I_C	Condition I_B	V_{CE}(sat) max	V_{BE}(sat) max	Condition V_{CE}	Condition I_C	f_T min
(V)	(A)	(V)	(mA)			(mA)	(mA)	(V)	(V)	(V)	(mA)	(MHz)
40	.2	1	10	100	300	50	5	.3	.95	20	10	300

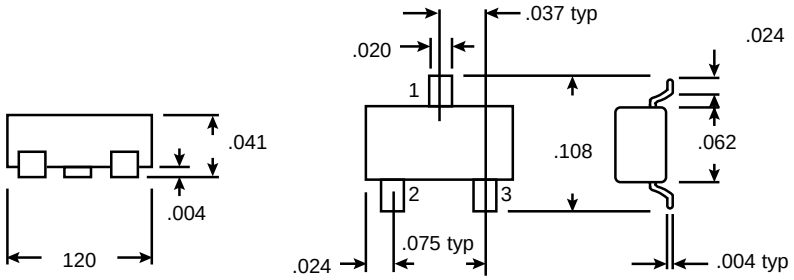
MOUSER® ELECTRONICS

333-MMBT5401 PNP General Purpose Amplifier Transistor



SOT-23

Dimensions (In.)



Specifications:

• Operating temperature: -55°C to 150°C

Pin	
1	Collector
2	Base
3	Emitter

		Condition		h_{FE}		Condition		V_{CE}(sat)	V_{BE}(sat)	Condition		f_T
V_{CEO}	I_C	V_{CE}	I_C	min	max	I_C	I_B	max	max	V_{CE}	I_C	min
(V)	(A)	(V)	(mA)			(mA)	(mA)	(V)	(V)	(V)	(mA)	(MHz)
150	.5	5	10	60	240	50	5	.5	1	10	10	100

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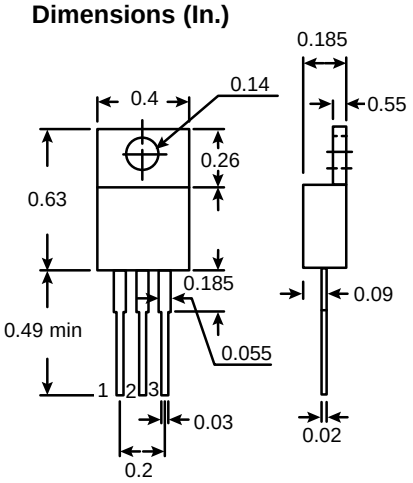
Dimensions (In.)



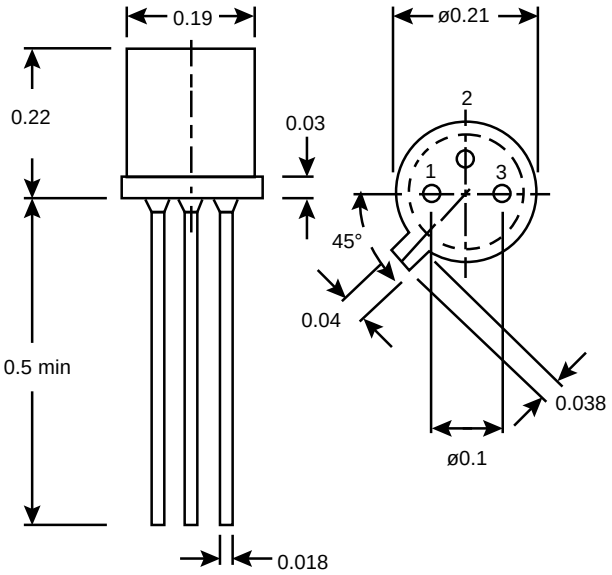
TO-220

Pin	
1	Ground
2	Input
3	Output

Mouser Stock No.	Maximum Ratings			Output Voltage				Line Regulation		Load Regulation		Ripple Rejection
	Pd (W)	IO (A)	VI (V)	(V) min	(V) typ	(V) max	(V) typ	(mA) max	Δ VI (V)	(mA) max	Δ IO (mA)	(dB) min
333-ML7905A	16☐	1	-35	-4.8	-5	-5.2	-10	50	-7~-25	80	5-1500	54
333-ML7906A	16☐	1	-35	-5.75	-6	-6.25	-11	60	-8~-25	90	5-1500	54
333-ML7908A	16☐	1	-35	-7.7	-8	-8.3	-14	80	-10.5~-25	110	5-1500	54
333-ML7909A	16☐	1	-35	-8.65	-9	-9.35	-15	90	-11.5~-25	120	5-1500	54
333-ML7912A	16☐	1	-35	-11.5	-12	-12.5	-19	120	-14.5~-30	150	5-1500	54
333-ML7915A	16☐	1	-35	-14.4	-15	-15.6	-23	150	-17.5~-30	180	5-1500	54
333-ML7918A	16☐	1	-40	-17.3	-18	-18.7	-27	180	-21~-33	210	5-1500	54
333-ML7924A	16☐	1	-40	-23	-24	-25	-33	240	-27~-38	270	5-1500	54

☐ Tc<45°C

Dimensions (In.)

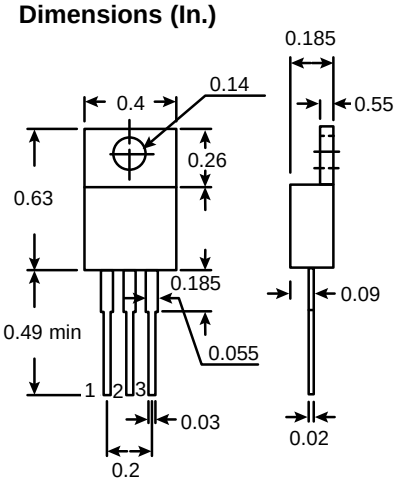


TO-18

Pin	
1	E
2	B
3	C

Mouser Stock No.	Maximum Ratings			HFE				VCE(sat)		fT	Cob
	Pd (mW)	IC (A)	VCEO (V)	min	max	IC (mA)	VCE (V)	max	(A)	min (MHz)	max (pF)
333-2N2222	500	0.8	30	100	300	150	10	0.4	0.15	250	8

Dimensions (In.)



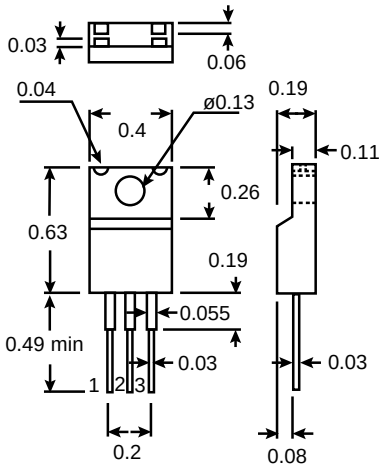
TO-220

Pin	
1	Input
2	Ground
3	Output

Mouser Stock No.	Maximum Ratings			Output Voltage				Line Regulation		Load Regulation		Ripple Rejection
	Pd (W)	IO (A)	VI (V)	(V) min	(V) typ	(V) max	(V) typ	(mA) max	Δ VI (V)	(mA) max	Δ IO (mA)	(dB) min
333-ML7805A	16☐	1	35	4.8	5	5.2	10	50	7~25	50	5-1500	68
333-ML7806A	16☐	1	35	5.75	6	6.25	11	60	8~25	60	5-1500	65
333-ML7808A	16☐	1	35	7.7	8	8.3	14	80	10.5~25	80	5-1500	62
333-ML7809A	16☐	1	35	8.65	9	9.35	15	90	12~25	90	5-1500	62
333-ML7812A	16☐	1	35	11.5	12	12.5	19	120	14.5~30	120	5-1500	61
333-ML7815A	16☐	1	35	14.4	15	15.6	23	150	17.5~30	150	5-1500	60
333-ML7818A	16☐	1	40	17.3	18	18.7	27	180	21~33	180	5-1500	59
333-ML7820A	16☐	1	40	19.2	20	20.8	29	200	23~35	200	5-1500	58
333-ML7824A	16☐	1	40	23	24	25	33	240	27~38	240	5-1500	56

☐ Tc<45°C

Dimensions (In.)

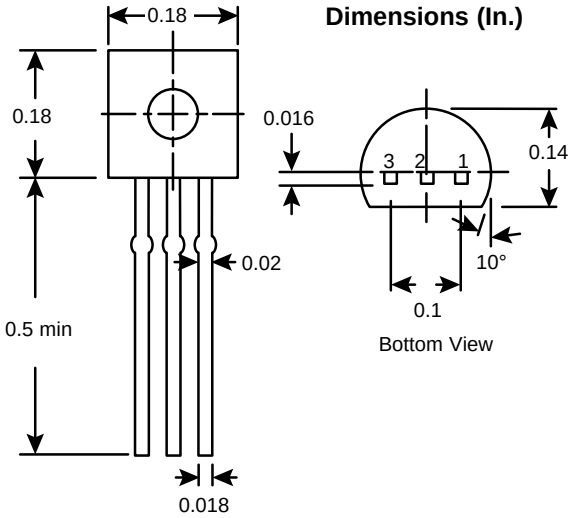


TO-220F

Pin	
1	Input
2	Ground
3	Output

Mouser Stock No.	Maximum Ratings			Output Voltage				Line Regulation		Load Regulation		Ripple Rejection
	Pd (W)	IO (A)	VI (V)	(V) min	(V) typ	(V) max	(V) typ	(mA) max	Δ VI (V)	(mA) max	Δ IO (mA)	(dB) min
333-ML7805FA	16☐	1	35	4.8	5	5.2	10	50	7~25	50	5-1500	68
333-ML7806FA	16☐	1	35	5.75	6	6.25	11	60	8~25	60	5-1500	65
333-ML7808FA	16☐	1	35	7.7	8	8.3	14	80	10.5~25	80	5-1500	62
333-ML7809FA	16☐	1	35	8.65	9	9.35	15	90	12~25	90	5-1500	62
333-ML7812FA	16☐	1	35	11.5	12	12.5	19	120	14.5~30	120	5-1500	61
333-ML7815FA	16☐	1	35	14.4	15	15.6	23	150	17.5~30	150	5-1500	60
333-ML7818FA	16☐	1	40	17.3	18	18.7	27	180	21~33	180	5-1500	59
333-ML7820FA	16☐	1	40	19.2	20	20.8	29	200	23~35	200	5-1500	58
333-ML7824FA	16☐	1	40	23	24	25	33	240	27~38	240	5-1500	56

☐ Tc<45°C

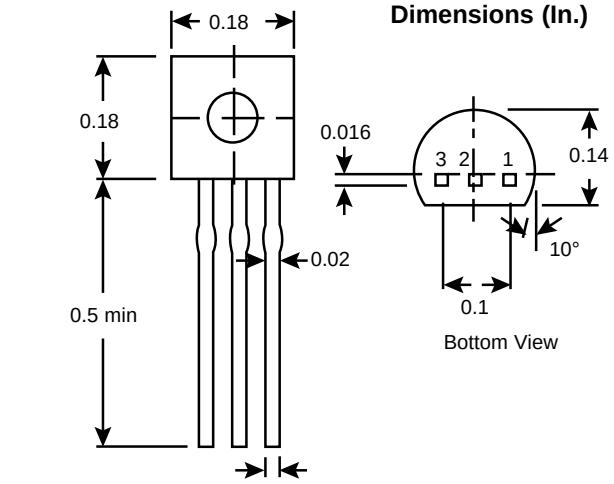


TO-92

Pin	
1	Output
2	Ground
3	Input

Mouser Stock No.	Maximum Ratings			Output Voltage				Line Regulation		Load Regulation		Ripple Rejection
	Pd (W)	IO (A)	VI (V)	(V) min	(V) typ	(V) max	VI (V)	(mA) max	Δ VI (V)	(mA) max	Δ Io (V)	(dB) min
333-ML78L05A	.5	.1	30	4.75	5	5.25	10	200	7 ~ 20	60	1-100	40
333-ML78L06A	.5	.1	30	5.7	6	6.3	12	200	8.5 ~ 20	80	1-100	40
333-ML78L08A	.5	.1	30	7.6	8	8.4	14	225	10.5 ~ 23	100	1-100	39
333-ML78L09A	.5	.1	30	8.55	9	9.45	15	250	11.5 ~ 23	100	1-100	38
333-ML78L12A	.5	.1	35	11.4	12	12.6	19	250	14.5 ~ 27	100	1-100	37
333-ML78L15A	.5	.1	35	14.3	15	15.7	23	300	17.5 ~ 30	150	1-100	34
333-ML78L18A	.5	.1	40	17.1	18	18.9	27	320	22 ~ 33	160	1-100	33
333-ML78L20A	.5	.1	40	19.0	20	21.0	29	330	23 ~ 34	180	1-100	32
333-ML78L24A	.5	.1	40	22.8	24	25.2	33	350	27 ~ 38	200	1-100	32

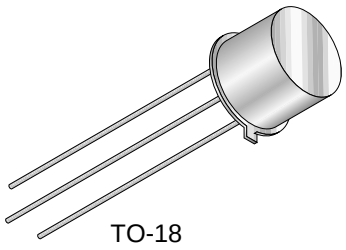
Dimensions (In.)



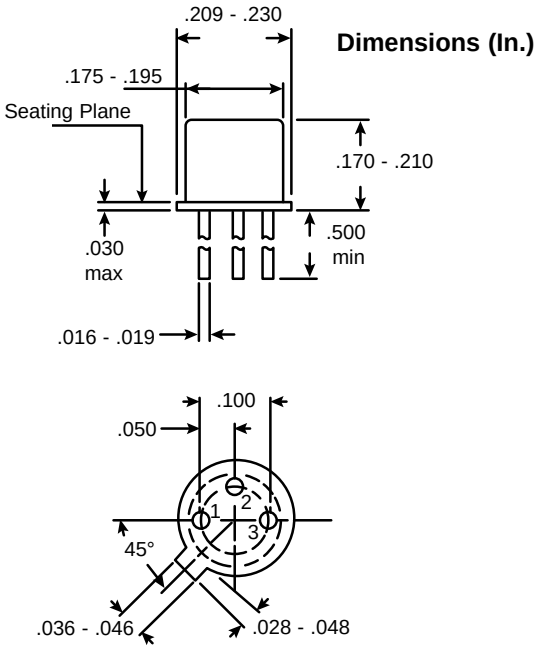
TO-92

Pin	
1	Ground
2	Input
3	Output

Mouser Stock No.	Maximum Ratings			Output Voltage (V)				Line Regulation		Load Regulation		Ripple Rejection
	Pd (W)	IO (A)	VI (V)	min	typ	max	VI (V)	(mA) max	Δ VI (V)	(mA) max	Δ Io (V)	(dB) min
333-ML79L05A	.5	.1	-30	-4.8	-5	-5.2	-10	150	-7 ~ -20	60	1-100	41
333-ML79L09A	.5	.1	-30	-8.64	-9	-9.36	-15	200	-11.5 ~ -23	90	1-100	38
333-ML79L12A	.5	.1	-30	-11.5	-12	-12.5	-19	250	-14.5 ~ -27	100	1-100	37
333-ML79L15A	.5	.1	-30	-14.4	-15	-15.6	-23	300	-17.5 ~ -30	150	1-100	34
333-ML79L18A	.5	.1	-30	-17.3	-18	-18.7	-27	325	-20.7 ~ -33	170	1-100	33
333-ML79L24A	.5	.1	-40	-23	-24	-25	-33	350	-27 ~ -38	200	1-100	31



TO-18



Pin	
1	E
2	B
3	C

Test Conditions:

• V_{CC} = 3V, I_C = 10mA, $I_B{}^1$ = 3mA, $I_B{}^2$ = 1.5mA

V_{CES} V_{CBO} (V) Min	V_{CEO} (V) Min	V_{EBO} (V) Min	I_{CES} I_{CBO} (nA) Max	@ V_{CB} (V)	h_{FE} Min	Max	@ I_C (mA)	& V_{CE} (V)	$V_{CE(SAT)}$ (V) Max	& $V_{BE(SAT)}$ (V) Min	Max	@ I_C (mA) (I_B=IC/10)	C_{ob} (pF) Max	f_T (MHz) Min	Max	@ I_C (mA)	$t_{(off)}$ (ns) Max
40	15	4.5	400	20	20	120	100	1	.2	.7	.85	10	4	500		10	18
					30	120	30	.4	.25		1.5	30					
					40	120	10	1	-		-	-					
					40	120	10	.35	.6		1.6	100					

Electrical Characteristics (T_A = 25°C)

Symbol	Conditions	Min	Typ	Max	Units
t_s	$I_{B1} = I_{B2} = I_C$ = 10mA (Figure 1)		7	13	ns
t_{ON}	I_C = 10mA, I_{B1} = 10mA (Figure 2)		9	12	ns
t_{OFF}	I_C = 10mA, I_{B2} = 1.50mA (Figure 2)		12	20	ns
h_{fe}	I_C = 10mA, V_{CE} = 10V, f = 100MHz	4.5	6.5		
C_{ob}	V_{CB} = 5V, f = 1MHz		2.0	4.0	pF
C_{ib}	V_{EB} = 0.5V, f = 1MHz			5.0	pF
h_{FE}	I_C = 1mA, V_{CE} = 1V	30			
	I_C = 10mA, V_{CE} = 1V	35	70	150	
	I_C = 50mA, V_{CE} = 1V	30	55	150	
	I_C = 100mA, V_{CE} = 1V	20			
	I_C = 10mA, V_{CE} = 0.35V	30			
	I_C = 30mA, V_{CE} = 0.4V	30			
$V_{CE(SAT)}$	I_C = 10mA, I_B = 1mA			.2	V
	I_C = 100mA, I_B = 10mA			.5	V
$V_{BE(SAT)}$	I_C = 10mA, I_B = 1mA			.85	V
	I_C = 100mA, I_B = 10mA			1.5	V
BV_{CEO}	I_C = 10mA	12			V
BV_{CBO}	I_C = 10µA	30			V
BV_{EBO}	I_E = 10µA	4.5			V
I_{CBO}	V_{CB} = 20V			100	nA
I_{EBO}	V_{EB} = 3V			100	nA
$P_{D(max)}$					
TO-18	T_A = 25°C	600			mW

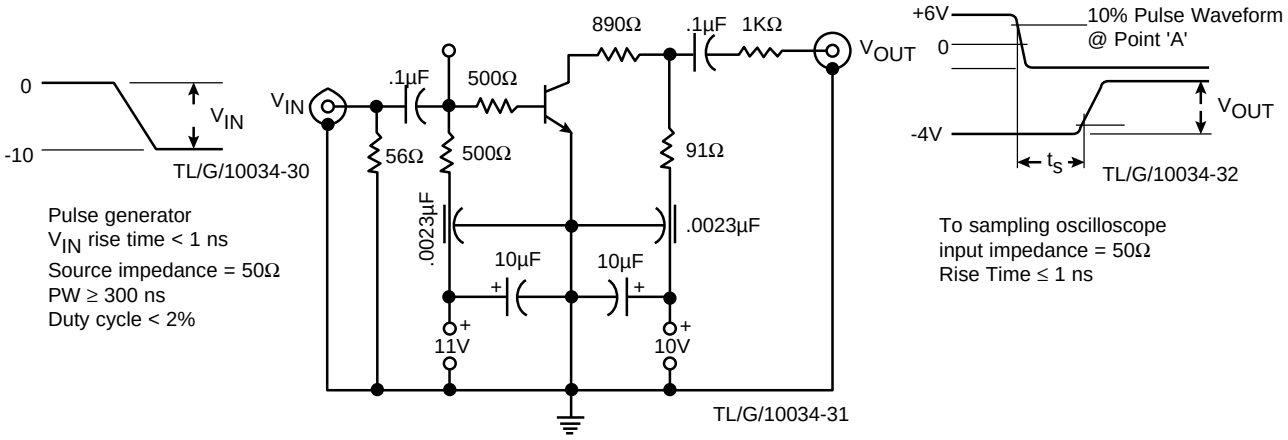


Figure 1. Charge Storage Time Measurement Circuit

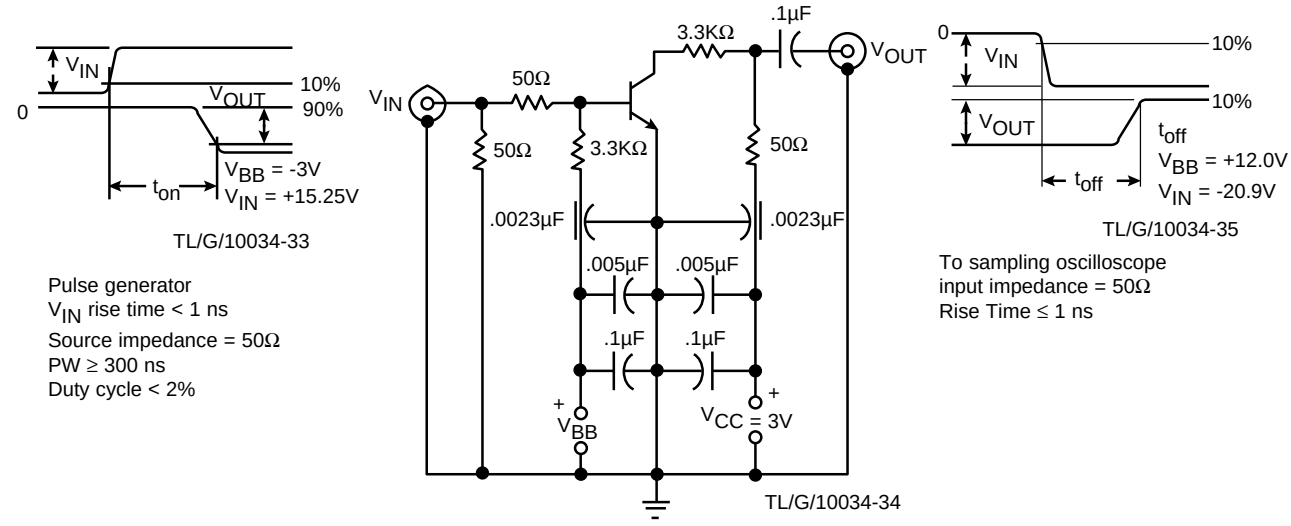
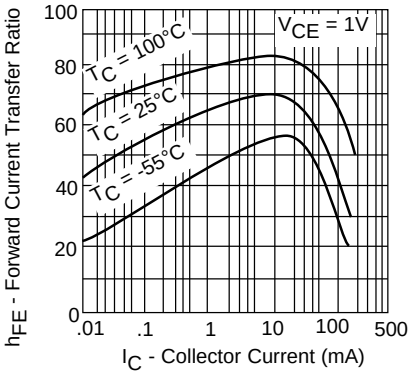
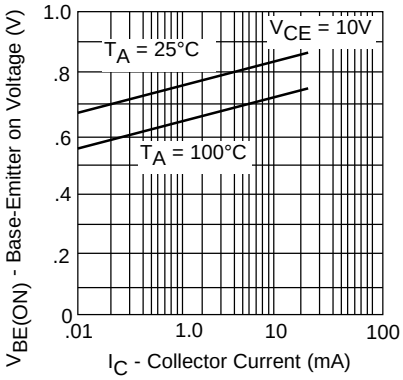


Figure 2. t_{ON}, t_{OFF} Measurement Circuit

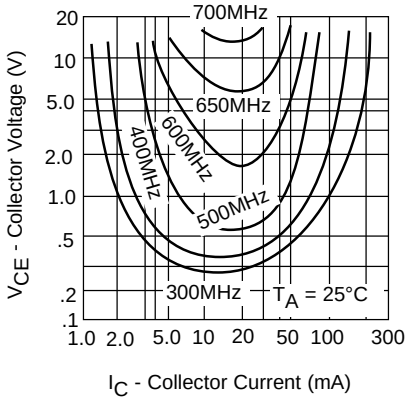
DC Current Gain vs Collector



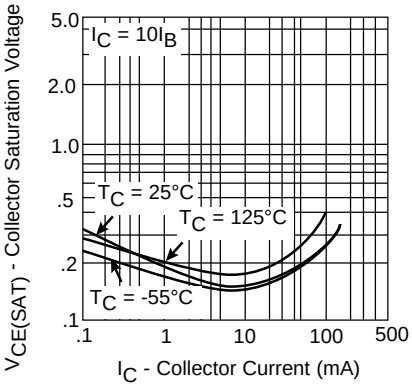
Base-Emitter On Voltage vs Collector Current



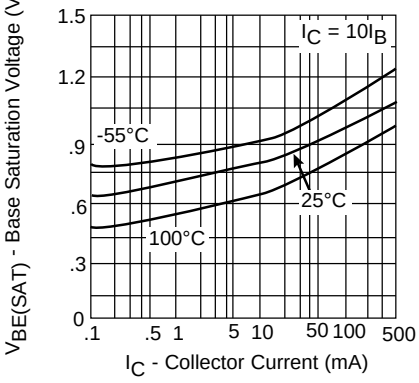
Contours of Constant Gain Bandwidth Product (f_T)



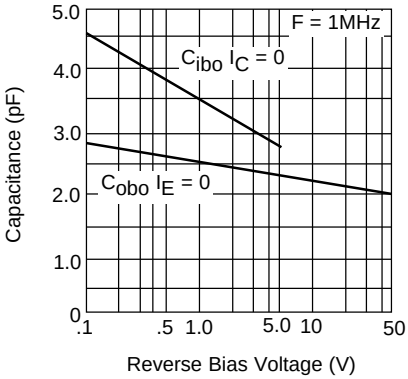
Collector Saturation Voltage vs Collector Current



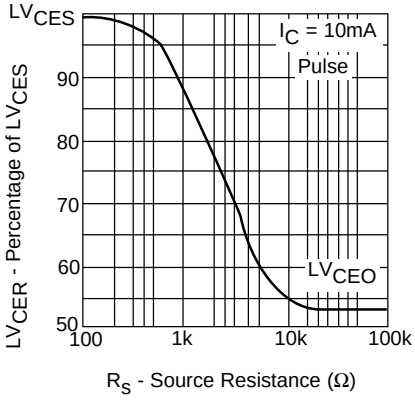
Base Saturation Voltage vs Collector Current



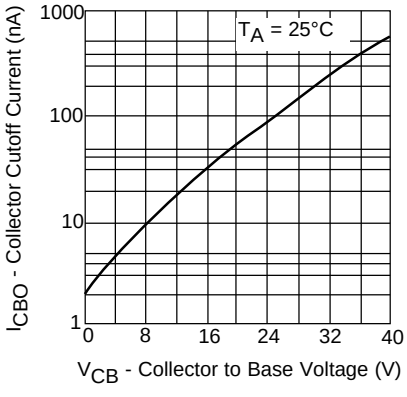
Emitter and Output Capacitances vs Reverse Bias Voltage



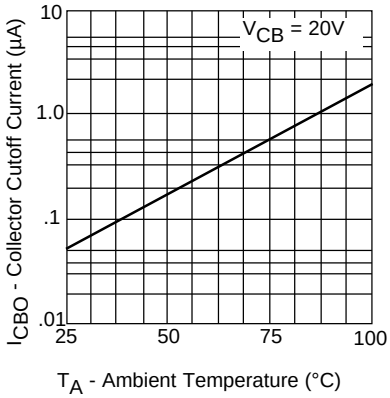
Lower Limiting Voltage vs Source Resistance

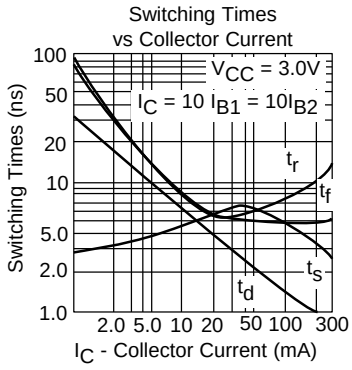


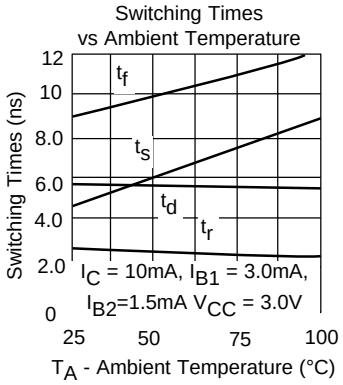
Collector Cutoff Current vs Reverse Bias Resistance

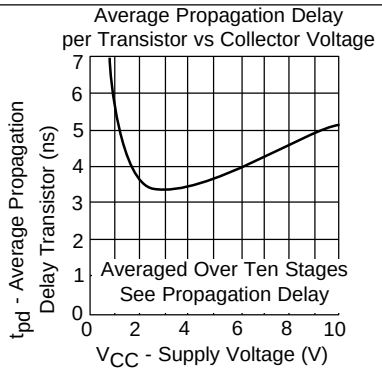


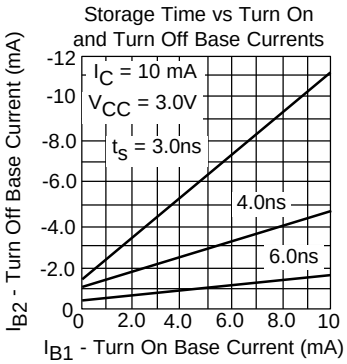
Collector Cutoff Current vs Ambient Temperature

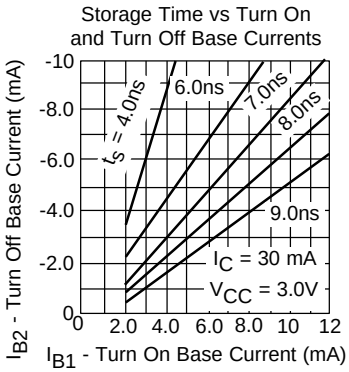


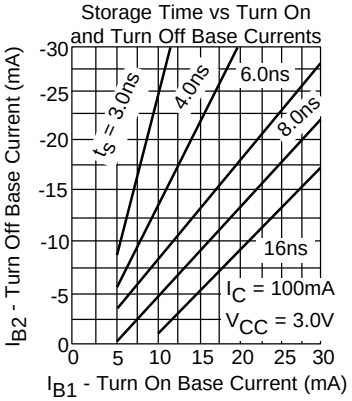


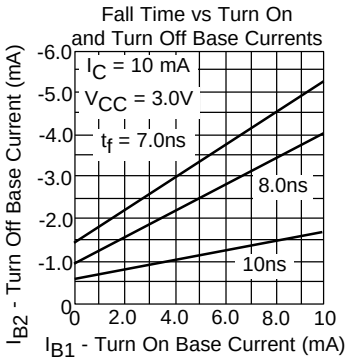


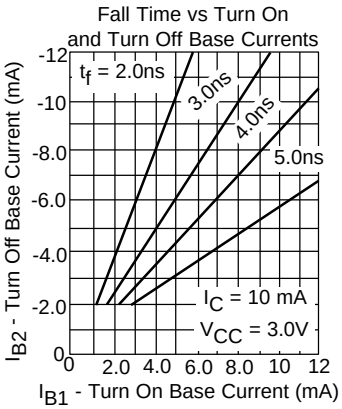


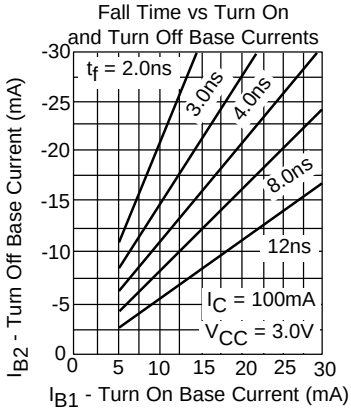


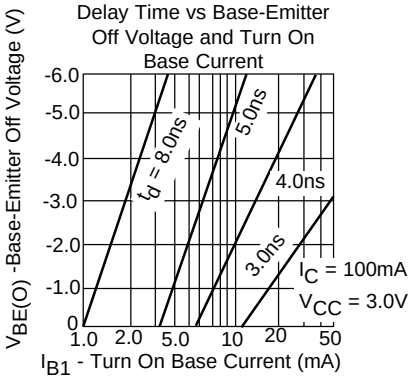


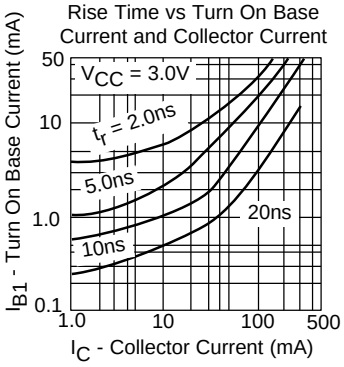


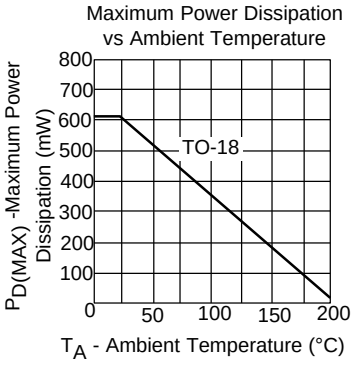




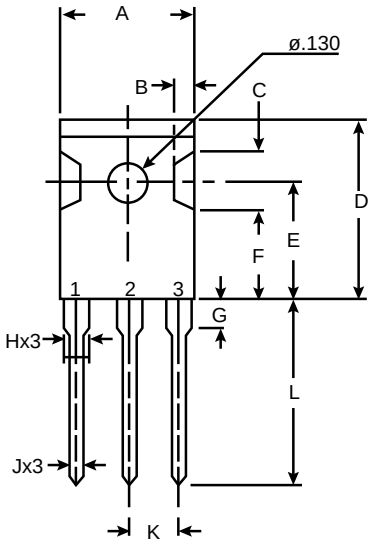




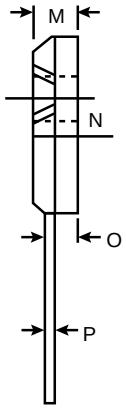




TO-3P



Dimensions (In.)



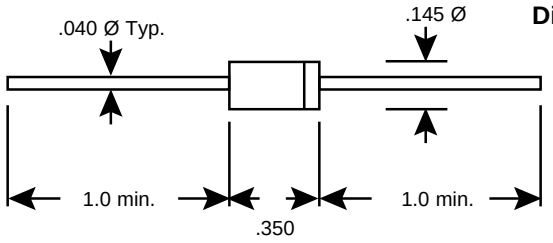
	Min.	Max.
A	-	.638
B	.067	.106
C	.197	.236
D	-	.866
E	.583	.598
F	.461	.5
G	-	.177
H	-	.098
I	-	.138
J	.043	.055
K	.207	.222
L	.748	-
M	.185	.209
N	.110	.126
O	.094	.110
P	.018	.033

1. Base
2. Collector
3. Emitter

Specifications:

- 333-TIP142: NPN
- 333-TIP147: PNP

I_C (A)	V_{CBO} (V)	V_{CEO} (V)	P_D (W)	h_{FE} (Min/Max)	I_C/V_{CE} (A/V)	$V_{CE(SAT)}$ (V)	I_C/I_B (A/mA)
10	100	100	100	60	5.0/4	2.0	5.0/10

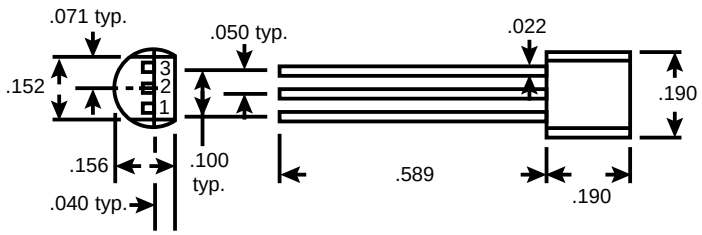


Dimensions (In.)

DO-201AE

Mouser Stock No.	Regular Voltage	Test Current	Maximum Zener Impedance	Maximum Reverse Current	I_R Test Voltage (-, A)	I_R Test Voltage (-B, C, D)	Max. Reg. Current	Maximum Dyn. Knee Imp. @ 1.0mA	Max. Surge Current	Max. Voltage Regltn.
	V_Z(V)	I_{ZT}(mAdc)	Z_Z(Ω)	I_R(µA)	V_R(V)	V_R(V)	I_{ZM}(mA)	Z_{ZK}(Ω)	I_{ZSM}(A)	ΔV_Z(V)
333-1N5334B	3.6	350.0	2.5	150.0	1.0	1.0	1320.0	500	18.7	.80
333-1N5335B	3.9	320.0	2.0	50.0	1.0	1.0	1220.0	500	17.6	.54
333-1N5336B	4.3	290.0	2.0	10.0	1.0	1.0	1100.0	500	16.4	.49
333-1N5337B	4.7	260.0	2.0	5.0	1.0	1.0	1010.0	450	15.3	.44
333-1N5338B	5.1	240.0	1.5	1.0	1.0	1.0	930.0	400	14.4	.39
333-1N5339B	5.6	220.0	1.0	1.0	2.0	2.0	865.0	400	13.4	.25
333-1N5340B	6.0	200.0	1.0	1.0	3.0	3.0	790.0	300	12.7	.19
333-1N5341B	6.2	200.0	1.0	1.0	3.0	3.0	765.0	200	12.4	.10
333-1N5342B	6.8	175.0	1.0	10.0	4.9	5.2	700.0	200	11.5	.15
333-1N5343B	7.5	175.0	1.5	10.0	5.4	5.7	630.0	200	10.7	.15
333-1N5344B	8.2	150.0	1.5	10.0	5.9	6.2	580.0	200	10.0	.20
333-1N5345B	8.7	150.0	2.0	10.0	6.25	6.6	545.0	200	9.5	.20
333-1N5346B	9.1	150.0	2.0	7.5	6.6	6.9	520.0	150	9.2	.22
333-1N5347B	10.0	125.0	2.0	5.0	7.2	7.6	475.0	125	8.6	.22
333-1N5348B	11.0	125.0	2.5	5.0	8.0	8.4	430.0	125	8.0	.25
333-1N5349B	12.0	100.0	2.5	2.0	8.6	9.1	395.0	125	7.5	.25
333-1N5350B	13.0	100.0	2.5	1.0	9.4	9.9	365.0	100	7.0	.25
333-1N5351B	14.0	100.0	2.5	1.0	10.1	10.6	340.0	75	6.7	.25
333-1N5352B	15.0	75.0	2.5	1.0	10.8	11.5	315.0	75	6.3	.25
333-1N5353B	16.0	75.0	2.5	1.0	11.5	12.2	295.0	75	6.0	.30
333-1N5354B	17.0	70.0	2.5	0.5	12.2	12.9	280.0	75	5.8	.35
333-1N5355B	18.0	65.0	2.5	0.5	13.0	13.7	264.0	75	5.5	.40
333-1N5356B	19.0	65.0	3.0	0.5	13.7	14.4	250.0	75	5.3	.40
333-1N5357B	20.0	65.0	3.0	0.5	14.4	15.2	237.0	75	5.1	.40
333-1N5358B	22.0	50.0	3.5	0.5	15.8	16.7	216.0	75	4.7	.45
333-1N5359B	24.0	50.0	3.5	0.5	17.3	18.2	198.0	100	4.4	.55
333-1N5360B	25.0	50.0	4.0	0.5	18.0	19.0	190.0	110	4.3	.55
333-1N5361B	27.0	50.0	5.0	0.5	19.4	20.6	176.0	120	4.1	.60

Dimensions (In.)



TO-92

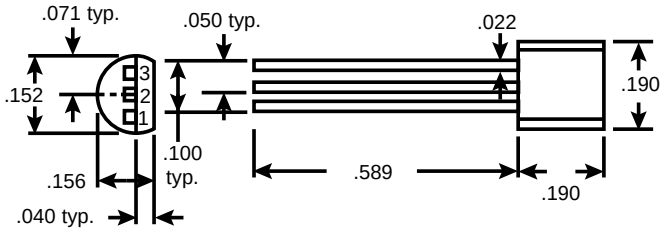
Pin	
1	Emitter
2	Base
3	Collector

Specifications:

• Operating temperature: -55°C to +150°C

Mouser Stock No.	Condition Frequency	V_{CEO}	I_C	Condition		h_{FE}		Condition		$V_{CE(sat)}$ Max.
				V_{CE}	I_C	Min.	Max.	I_C	I_B	
		(V)	(A)	(V)	(mA)			(mA)	(mA)	(V)
333-2N5088	10Hz to 15.7KHz	30	0.05	5	0.1	300	900	10	1.0	0.50
333-2N5089	10Hz to 15.7KHz	25	0.05	5	0.1	400	1200	10	1.0	0.50

Dimensions (In.)

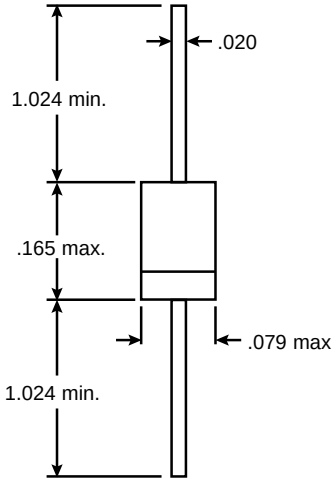


TO-92

Pin	
1	Emitter
2	Base
3	Collector

V_{CEO}	I_C	Condition		hFE		Condition		$V_{CE(sat)}$	$V_{BE(sat)}$	Condition		fT
		V_{CE}	I_C	Min.	Max.	I_C	I_B	Max.	Max.	V_{CE}	I_C	Min.
(V)	(A)	(V)	(mA)			(mA)	(mA)	(V)	(V)	(V)	(mA)	(MHz)
40	0.20	1	10	50	150	50	5.0	0.30	0.95	20	10	250

Dimensions (In.)

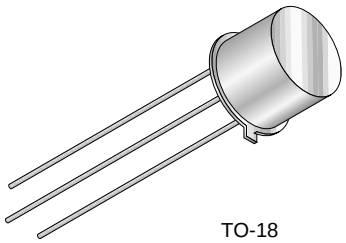


DO-35

Specifications:
- High source impedance
- Tolerance: ±10%
- Constant current over wide voltage range

Mouser Stock No.	Ip mA Nom.	VK V Max.	Zt Min. MΩ	Zk Min. MΩ
333-1N5283	.22	1.00	25.0	2.750
333-1N5284	.24	1.00	19.0	2.350
333-1N5285	.27	1.00	14.0	1.950
333-1N5286	.30	1.00	9.0	1.600
333-1N5287	.33	1.00	6.6	1.350
333-1N5288	.39	1.05	4.10	1.000
333-1N5289	.43	1.05	3.30	.870
333-1N5290	.47	1.05	2.70	.750
333-1N5291	.56	1.10	1.90	.560
333-1N5292	.62	1.13	1.55	.470
333-1N5293	.68	1.15	1.35	.400
333-1N5294	.75	1.20	1.15	.335
333-1N5295	.82	1.25	1.00	.290
333-1N5296	.91	1.29	.880	.240
333-1N5297	1.00	1.35	.800	.205
333-1N5298	1.10	1.40	.700	.180
333-1N5299	1.20	1.45	.640	.155
333-1N5300	1.30	1.50	.580	.135
333-1N5301	1.40	1.55	.540	.115
333-1N5302	1.50	1.60	.510	.105
333-1N5303	1.60	1.65	.475	.092
333-1N5304	1.80	1.75	.420	.074
333-1N5305	2.00	1.85	.395	.061
333-1N5306	2.20	1.95	.370	.052
333-1N5307	2.40	2.00	.345	.044
333-1N5308	2.70	2.15	.320	.035
333-1N5309	3.00	2.25	.300	.029
333-1N5310	3.30	2.35	.280	.024
333-1N5311	3.60	2.50	.265	.020
333-1N5312	3.90	2.60	.255	.017
333-1N5313	4.30	2.75	.245	.014
333-1N5314	4.70	2.90	.235	.012

Ip = Pinch-off current: measured by pulse @ 25°C
Vk = Voltage which produces 0.81 Ip or greater current
Zt = Minimum AC impedance when small AC signal voltage of 10KHz is added to 25VDC bias
Zk = Minimum knee impedance when the small AC signal voltage is added to Vk



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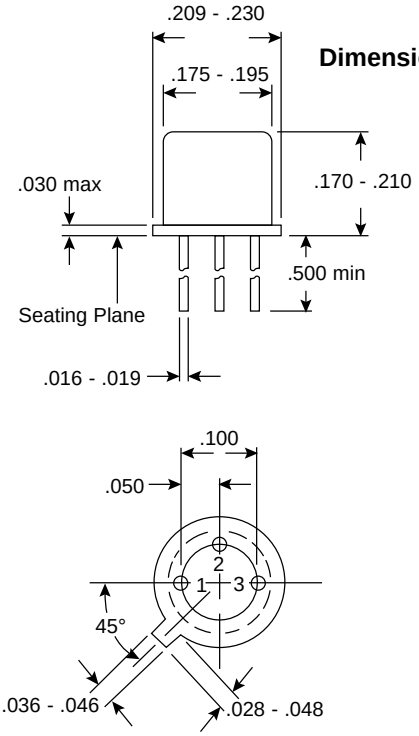
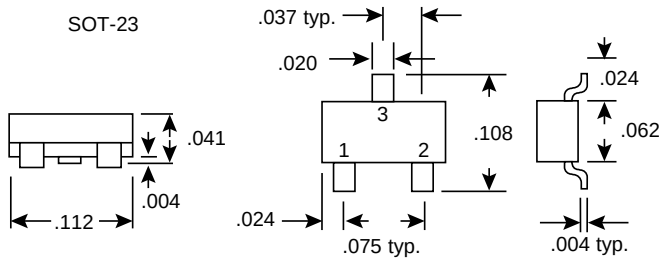


Dimensions (In.)

Pin	
1	Source
2	Drain
3	Gate

Mouser Stock No.	BV_{GSS} (V) min	V_P @ V_{DS} I_D				$R_{DS(on)}$ (Ω) @ I_D		Ciss (pF) max	Crss (pF) max	ton (ns) max	toff (ns) max
		(V)		(V)	(nA)						
		min	max			min	(mA)				
333-2N4391	40	4	10	20	1	30	1	14	3.5	15	20
333-2N4392	40	2	5	20	1	60	1	14	3.5	15	35

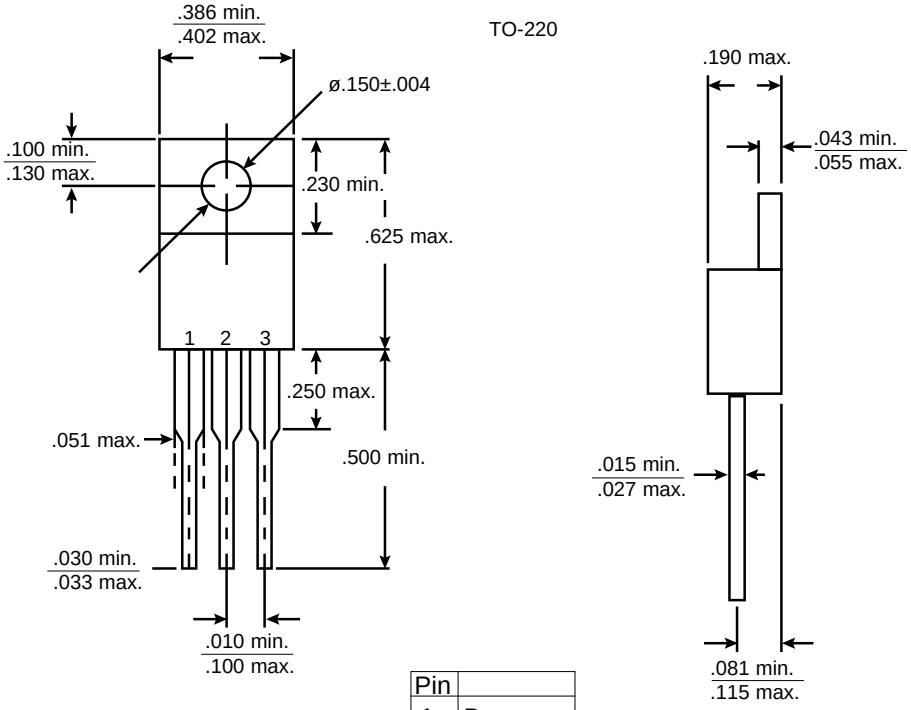
Dimensions (In.)



Pin	
1	Base
2	Emitter
3	Collector

Mouser Stock No.	V_{CEO}	I_C	Condition		hFE	Condition		$V_{CE(sat)}$	$V_{BE(sat)}$	Condition		f_T
			V_{CE}	I_C	Min	I_C	I_B	Max.	Min.	V_{CE}	I_C	Min
	(V)	(A)	(V)	(A)		(mA)	(mA)	(V)	(V)	(V)	(mA)	(MHz)
333-MMBTA42	300	0.5	10	30	40	20	2	0.50	0.9	20	10	50

Dimensions (In.)



Pin	
1	Base
2	Collector
3	Emitter

I_C (A)	V_{CBO} (V)	V_{CEO} (V)	P_D (W)	H_{FE} (Min/Max)	I_C/V_{CE} (A/V)	$V_{CE(SAT)}$ (V)	I_C/I_B (A/mA)
8	80	80	75	1K/20K	4.0/4	2.0	4.0/16

MOUSER® ELECTRONICS

333-PN4249 PNP Low Level Switching Transistor

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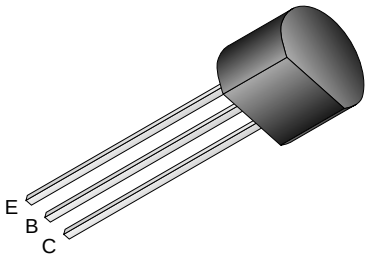
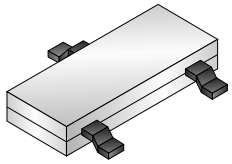
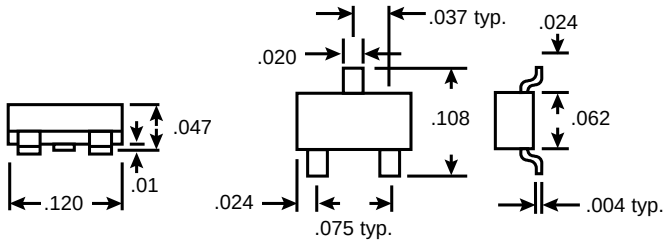


Mouser Stock No.	$V_{CEO\ (sust)}$ (Volts) min.	I_C (mA) max.	h_{FE} @ I_C			f_T @ I_C		NF (dB) max.	P_D (Amb) (mW) @ 25°C
			min.	max.	mA	(MHz) min.	mA		
333-PN4249	60	100	100	300	0.1	40	0.5	3.0	625

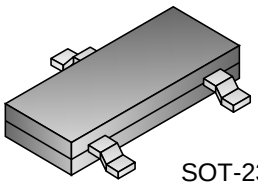


SOT-23

Dimensions (In.)

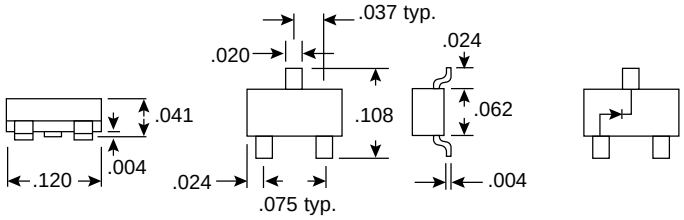


Mouser Stock No.	Polarity	V_{CEO} (V)	I_C (A)	Condition V_{CE} (V)	Condition I_C (mA)	H_{FE} Min.	H_{FE} Max.	Condition I_C (mA)	Condition I_B (mA)	V_{CE}(sat) Max. (V)	V_{BE}(sat) Max. (V)	Condition V_{CE} (V)	Condition I_C (mA)	f_T Min. (MHz)
333-MMBT4401	NPN	40	0.60	1	150.0	100	300	500	50	0.75	1.20	10	20	250
333-MMBT4403	PNP	40	0.60	1	150.0	100	300	500	50	0.75	1.30	10	20	250

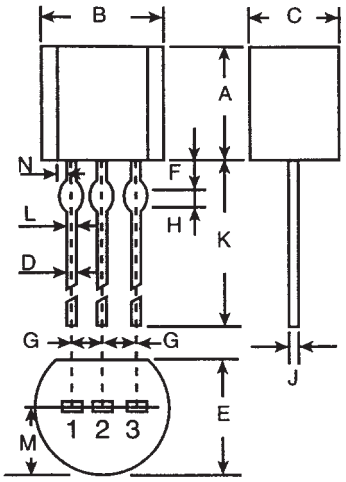


SOT-23

Dimensions (In.)



Min. Repetitive Rev. Voltage V_{RRM} (V)	Max. Cont. Reverse Current I_R(nA) @ V_R (V)	Max. Forward Voltage V_F(V) @ I_F (mA)	Maximum Capacitance C(pF)	Reverse Recovery Time T_{RR}(ns)	Operating Temperature
100	5000 @ 75	1.00 @ 10	4.0	4.00	-65°C to +150°C



1. Output
2. Common
3. Input

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Dim.	Inches	
	Min	Max
A	.175	.179
B	.179	.183
C	.135	.139
D	.015	.019
E	.135	.139
F	.035	.043
G	.047	.053
H	.031	.035
J	.013	.021
K	.531	.570
L	-	.019
M	.088	.092
N	-	.001

Specifications:

- Suitable for TTL, DTL, HTL, C-MOS power supply
- Internal short-circuit current limiting
- Internal thermal overload protection
- Maximum output current of 100mA (Tj=25°C)

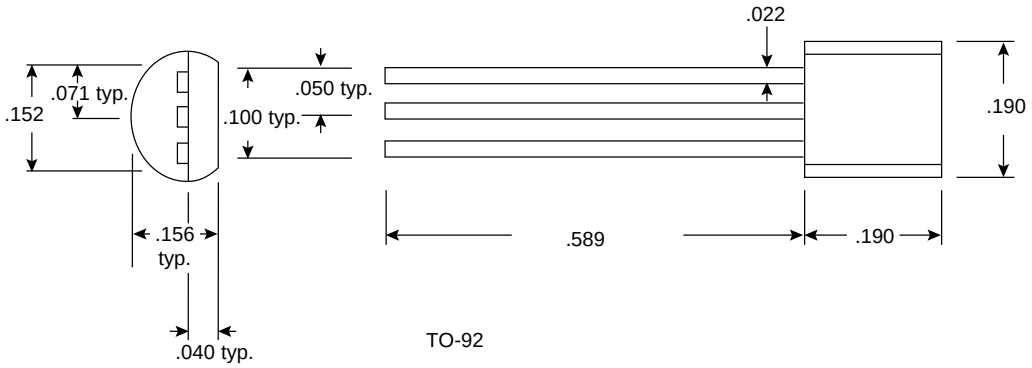
Maximum Ratings (Ta=25°C)

Characteristic	Symbol	Rating	Unit
Input Voltage	V_{IN}	35	V
Power Dissipation	P_D	600	mW
Operating Temperature	T_{opr}	-40 ~ 85	°C
Storage Temperature	T_{stg}	-55 ~ 150	°C

Electrical Characteristics
(Unless otherwise specified, V_{IN}=16V, I_{OUT}=40mA, C_{IN}=0.33µF, C_{OUT}=0.1µF, 0°C,T_j≤125°C)

Characteristic	Symbol	Test Condition		Min.	Typ.	Max.	Unit
Output Voltage	V_{OUT}	Tj=25°C		9.6	10	10.4	V
Input Regulation	Reg. Line	Tj=25°C	12.5V≤V_{IN}≤25V	-	80	230	mV
			13V≤V_{IN}≤25V	-	30	170	
Load Regulation	Reg. Load	Tj=25°C	1.0mA≤I_{OUT}≤100mA	-	18	90	mV
			1.0mA≤I_{OUT}≤40mA	-	8.5	45	
Output Voltage	V_{OUT}	12.5V≤V_{OUT}≤25V 1.0mA≤I_{OUT}≤40mA		9.5	-	10.5	V
		V_{IN}≤16V,1.0mA≤I_{OUT}≤70mA		9.5	-	10.5	
Quiescent Current	I_B	Tj=25°C		-	3.2	6.5	mA
		Tj=125°C		-	-	6.0	
Quiescent Current Change	ΔI_B	13V≤V_{IN}≤25V		-	-	1.5	mA
		1.0mA≤I_{OUT}≤40mA		-	-	0.1	
Output Noise Voltage	V_{NO}	Ta=25°C, 10Hz≤f≤100kHz		-	70	-	µV
Long Term Stability	$\Delta V_{OUT}/\Delta t$			-	22	-	mV/ 1.0 KHrs
Ripple Rejection	RR	f=120Hz 13V≤V_{IN}≤24V, Tj=25°C		36	43	-	dB
Dropout Voltage	V_{IN} V_{OUT}	Tj=25°C		-	1.7	-	V
Verage Temperature Coefficient of Output Voltage	TC_{VO}	I_{OUT}=5mA		-	-0.9	-	mV/°C

Dimensions (In.)



V_{CEO}	I_C	h_{FE} @				$V_{CE(sat)}$@			F_T @			
		Min.	Max.	V_{CE}	I_C	Max.	I_C	I_B	Min.	Max.	V_{CE}	I_C
(V)	(A)			(V)	(mA)	(V)	(mA)	(mA)	(MHz)	(MHz)	(V)	(mA)
30	.60	100	300	2	50	.60	100	5	100	-	2	50

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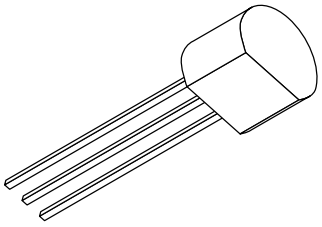
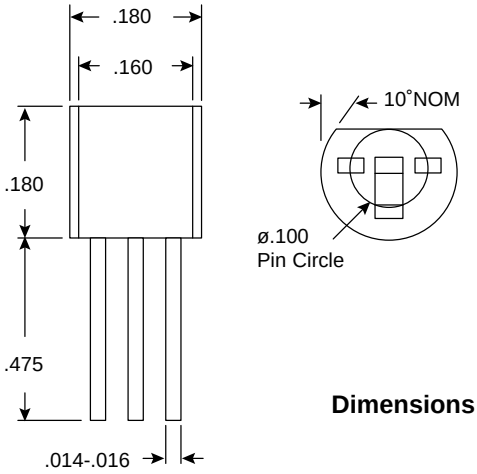




Dimensions (In.)

Specifications:

- Drain-source voltage (V_{DSS}): 60V
- Drain-gate voltage (V_{DGR}): 60V ($R_{GS} \leq 1M\Omega$)
- Gate- source voltage (V_{GSS}): ±20V
- Drain current-continuous (I_D): 500mA
- Total power dissipation (P_D): 830mW
- Derate above 25˚C (P_D): 6.6mW/˚C
- Operating & storage temperature (T_J, T_{STG}): -55 to 150˚C
- Lead temperature for soldering purposes (T_L): maximum 300˚C 1/16" from case for 10 seconds

Symbol	Parameter	Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{DSS}	Drain-source breakdown voltage	V_{GS} = 0V, I_D = 100µA	60			V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 25V, V_{GS} = 0V			0.5	µA
I_{GSSF}	Gate-body leakage, forward	V_{GS} = 15V, V_{DS} = 0V			10	nA
On Characteristics (Note 1)						
$V_{GS(th)}$	Gate threshold voltage	V_{DS} = V_{GS}, I_D = 1mA	0.8	2.1	3	v
$R_{DS(on)}$	Static drain-source on-resistance	V_{GS} = 10V, I_D = 200mA		1.2	5	Ω
g_{FS}	Forward transconductance	V_{DS} = 10V, I_D = 200mA		320		mS
Dynamic Characteristics						
C_{iss}	Input capacitance	V_{DS} = 10V, V_{GS} = OV, f = 1.0MHz		24	40	pF
C_{oss}	Output capacitance			17	30	pF
C_{rss}	Reverse transfer capacitance			7	10	pF
Switching Characteristics						
t_{on}	Turn-on time	V_{DD} = 25V, I_D = 200mA			10	nS
t_{off}	Turn-off time	V_{GS} = 10V, R_G = 25Ω			10	nS
Thermal Characteristics						
$R_{\theta JA}$	Thermal resistance, junction to ambient				150	˚C/W

Typical Electrical Characteristics

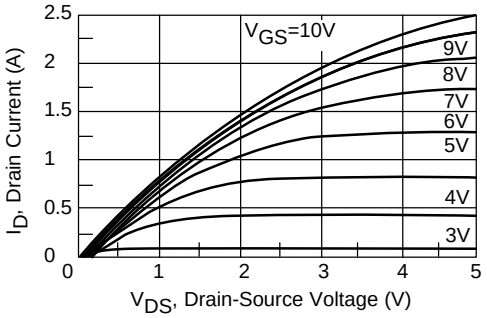


Figure 1. On-Region Characteristics

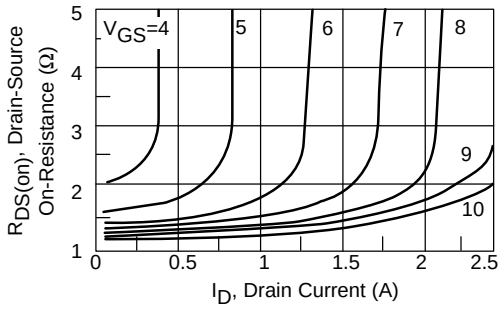


Figure 2. $R_{DS(on)}$ Variation w/Drain Current & Gate Voltage

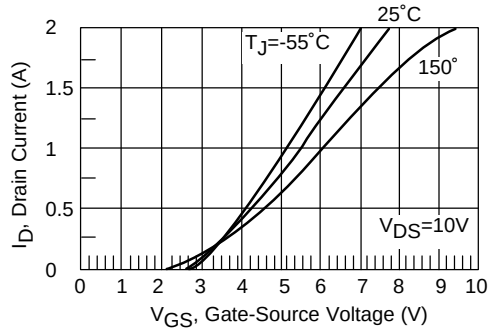


Figure 3. Transfer Characteristics

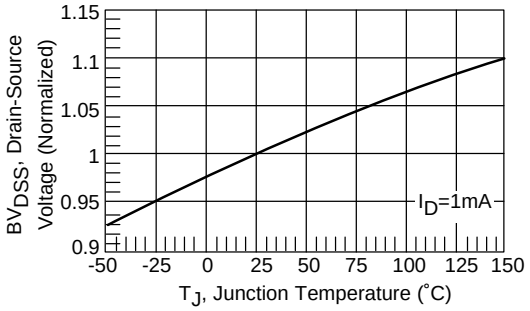


Figure 4. Breakdown Voltage Variation w/Temperature

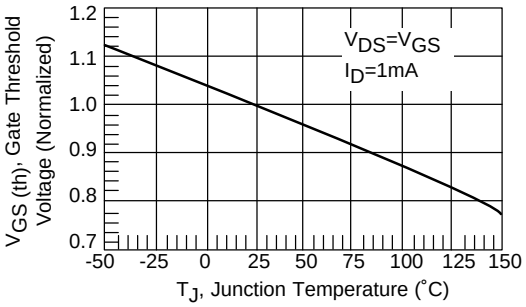


Figure 5. Gate Threshold Variation w/Temperature

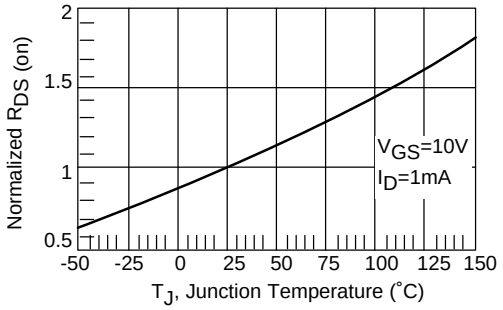


Figure 6. On-Resistance Variation w/Temperature

Typical Electrical Characteristics

Figure 7. On-Resistance vs Drain Current

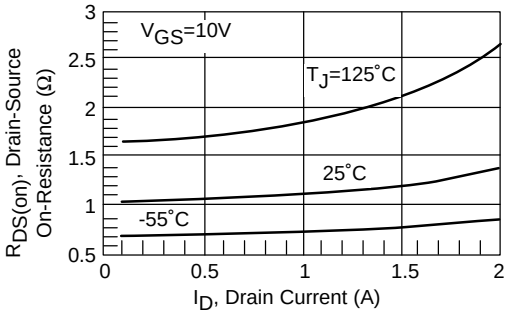
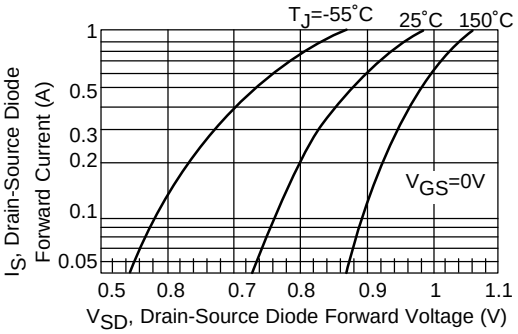


Figure 8. Body Diode Forward Voltage Variation w/Current & Temperature



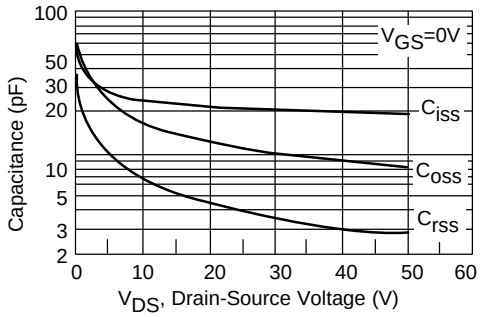


Figure 9. Capacitance vs Drain-Source Voltage

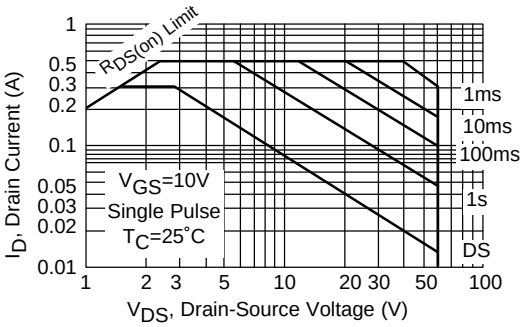
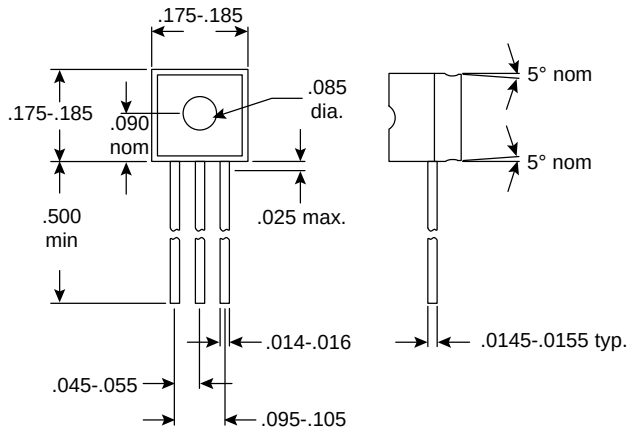
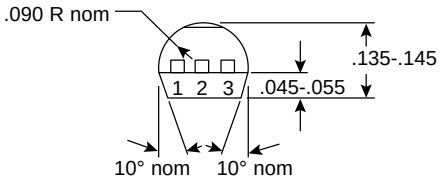


Figure 9. Safe Operating Area

Dimensions (In.)





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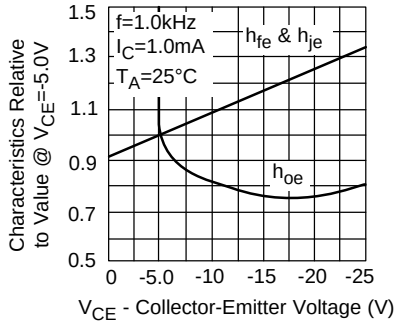
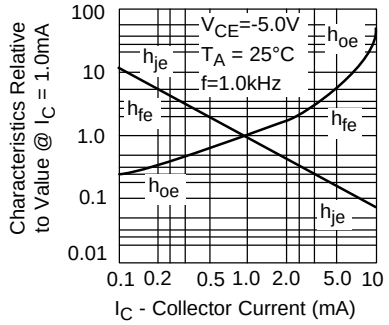
Pin	
1	C
2	B
3	E

Typical Common Emitter Characteristics (f=1.0kHz)

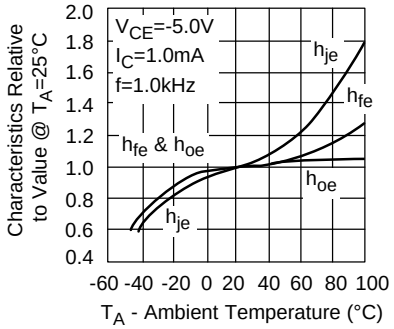
Common Emitter Characteristics vs Collector-Emitter Voltage



Common Emitter Characteristics vs Collector Current



Common Emitter Characteristics



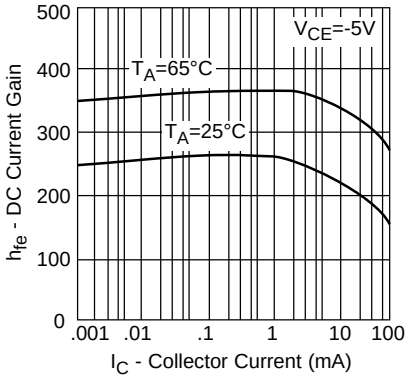
Small Signal Characteristics (f=1.0kHz)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Max.
h_{je}	Input Resistance	I_C=1.0mA, V_{CE}=-5.0V	2.5	8.0	20	20
h_{oe}	Output Conductance	I_C=1.0mA, V_{CE}=-5.0V	5.0	19	50	50
h_{re}	Voltage Feedback Ratio	I_C=1.0mA, V_{CE}=-5.0V			10	10
h_{fe}	Small Signal Current Gain	I_C=1.0mA, V_{CE}=-5.0V	100	250	800	800

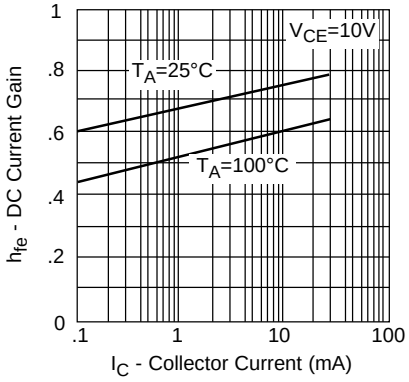
Electrical Characteristics (Ta = 25°C)

Symbol	Conditions	Min.	Typ.	Max.	Units
NF	V_{CE}=5V, I_C=10µA, R_S=10kΩ PBW=15.70kHz		1	3	dB
h_{fe}	V_{CE}=5V, I_C=500µA, f=20MHz	3	6		
C_{ib}	V_{EB}=0.5V			8	pF
C_{ob}	V_{CB}=5V		3.5	5	pF
h_{FE}	I_C=1µA, V_{CE}=5V	45			
	I_C=10µA, V_{CE}=5V	60			
	I_C=100µA, V_{CE}=5V	75			
	I_C=500µA, V_{CE}=5V	90			
	I_C=1mA, V_{CE}=5V	90	270	630	
	I_C=10mA, V_{CE}=5V	75			
$V_{CE(SAT)}$	I_C=1mA, I_B=0.1mA			0.10	V
	I_C=10mA, I_B=1mA			0.15	V
$V_{BE(SAT)}$	I_C=1mA, I_B=0.1mA			0.75	V
	I_C=10mA, I_B=1mA			0.90	V
BV_{CEO}	I_C=1mA	50			V
BV_{CBO}	I_C=10µA	60			V
BV_{EBO}	I_E=10µA	8			V
I_{CBO}	V_{CB}=40V			100	nA
I_{EBO}	V_{EB}=6V			100	nA
$P_{D(max)}$	Ta=25°C	600			mW
$T_{J(max.)}$		150			°C

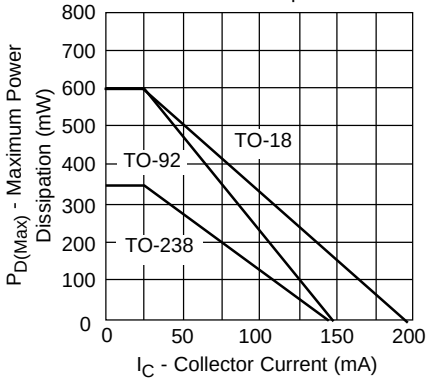
DC Current Gain vs Collector Gain



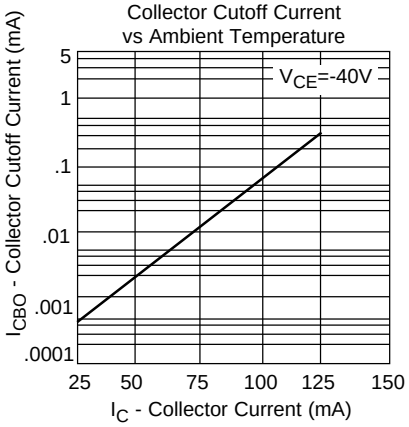
Base-Emitter On Voltage vs Collector Current



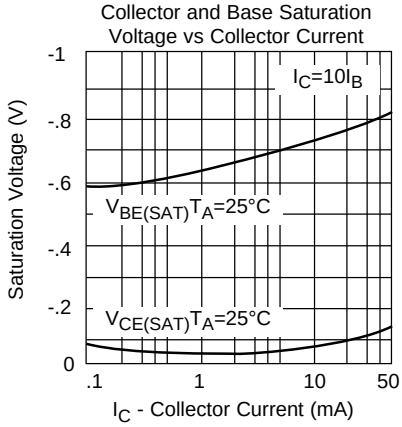
Maximum Power Dissipation vs Ambient Temperature



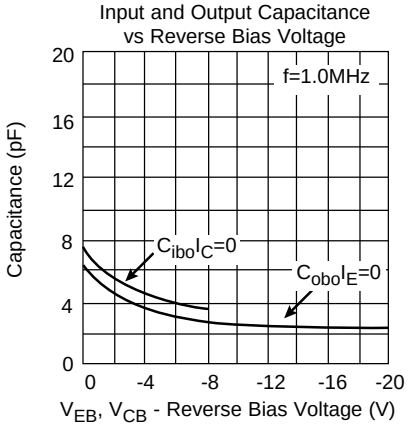
Collector Cutoff Current vs Ambient Temperature



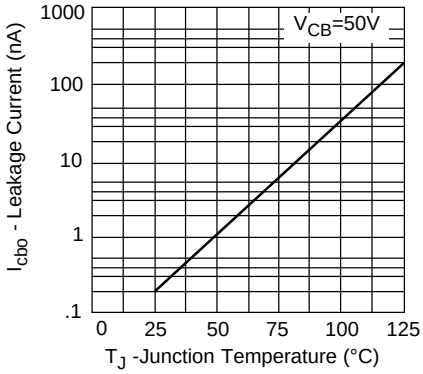
Collector and Base Saturation Voltage vs Collector Current

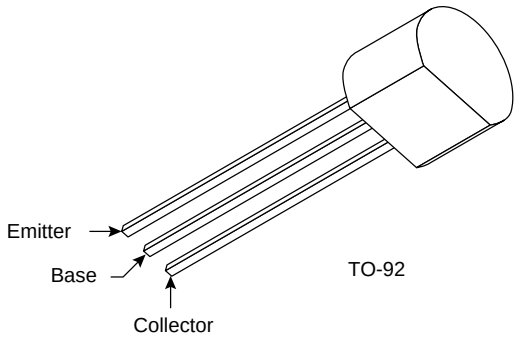


Input and Output Capacitance vs Reverse Bias Voltage



Collector-Base Diode Current vs Temperature





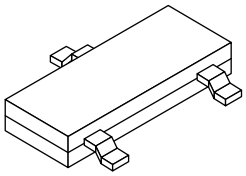
Absolute Maximum Ratings:

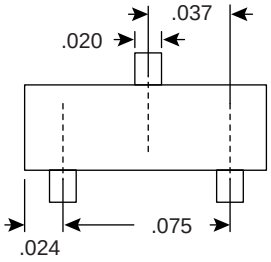
- Collector-base voltage: V_{CBO} = 75V
- Collector-emitter voltage: V_{CEO} = 40V
- Emitter-base voltage: V_{EBO} = 6V
- Collector current: I_C = 600mA
- Collector dissipation: P_C = 625mW
- Junction temperature: T_J = 150°C
- Storage temperature: Tstg = -55~150°C

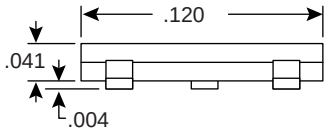
Electrical Characteristics (T_A=25°C)

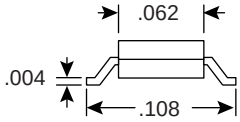
* Pulse Test: pulse width = 300µs, duty cycle = 2%

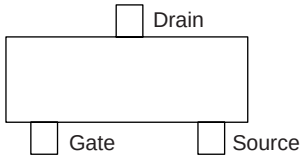
Characteristics	Ratings	Test Conditions
Collector-base breakdown voltage	BV_{CBO} = 75V min.	I_C = 10µA, I_E = 0
Collector-emitter breakdown voltage	BV_{CEO} = 40V min.	I_C = 10mA, I_B = 0
Emitter-base breakdown voltage	BV_{EBO} = 6V min.	I_E = 10µA, I_C = 0
Collector cut-off current	I_{CEO} = 0.01µA max.	V_{CB} = 60V, I_E = 0
Emitter cut-off current	I_{EBO} = 10nA max.	V_{EB} = 3V, I_C = 0
DC current gain	h_{FE} = 35 min. 50 min. 75 min. 100 min./300 max. 40 min.	I_C = 0.1mA, V_{CE} = 10V I_C = 1mA, V_{CE} = 10V I_C = 10mA, V_{CE} = 10V * I_C = 150mA, V_{CE} = 10V * I_C = 500mA, V_{CE} = 10V
* Collector-emitter saturation voltage	V_{CE} (sat) = 0.3V max. 1V max.	I_C = 150mA, I_B = 15mA I_C = 500mA, I_B = 50mA
* Base-emitter saturation voltage	V_{BE} (sat) = 0.6 typ. 1.2V max. 2V max.	I_C = 150mA, I_B = 15mA I_C = 500mA, I_B = 50mA
Current gain bandwidth product	f_T = 300MHz min.	I_C = 20mA, V_{CE} = 20V f = 100MHz
Output capacitance	Cob = 8pF max.	V_{CB} = 10V, I_E = 0, f = 1MHz
Turn on time	ton = 35ns max.	V_{CC} = 30V, I_C = 150mA I_{B1} = 15mA, V_{BE} (off) = 0.5V
Turn off time	toff = 285ns max.	V_{CC} = 30V, I_C = 150mA I_{B1} = I_{B2} = 15mA
Noise figure	NF = 4dB max.	I_C = 100µA, V_{CE} = 10V R_S = 1KΩ, f = 1KHz







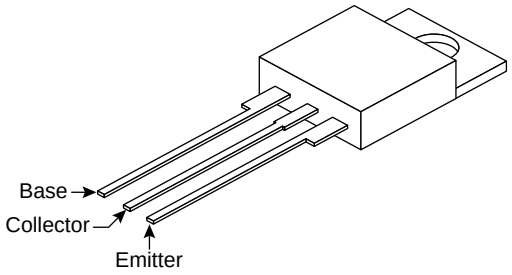


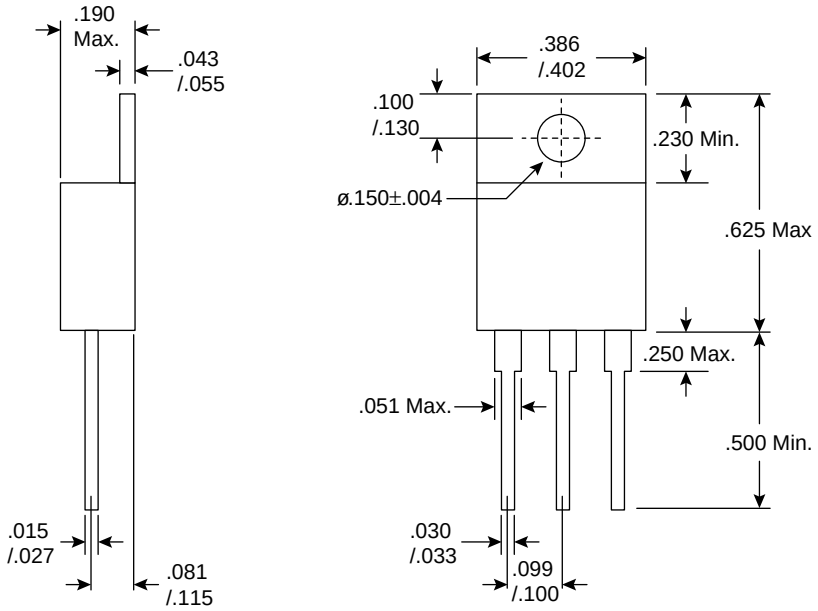


Dimensions (In.)

Specifications:

- Type: flat surface mount signal N-Chan Mosfet
- Case: SOT-23
- Min. drain-source breakdown voltage: 60V
- Max. static DS resistance: 7.5Ω @ 10V & 5V
- I_D: 0.115A max.
- $V_{GS(TH)}$: 1-2.5V
- P_D: 200mW max.

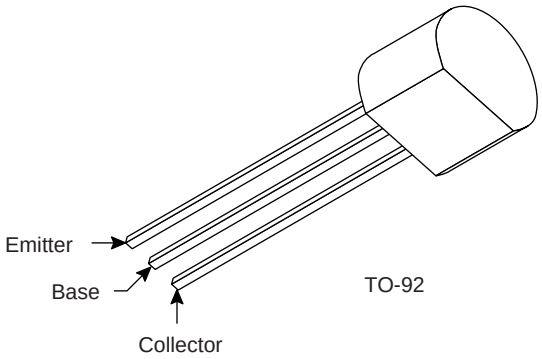




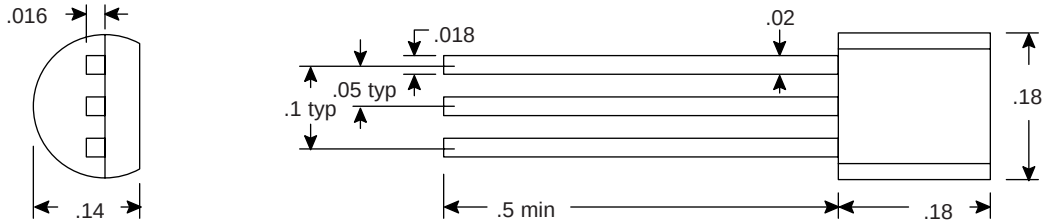
Dimensions (In.)
(Min. / Max.)

Specifications:

- Type: TO-220 NPN general purpose power
- I_C: 1A
- V_{CBO}: 500V
- V_{CEO}: 400V
- P_D: 40W
- H_{FE}: 30 min., 150 max.
- I_C/V_{CE}: .3A/10V
- V_{CE} (sat): 1V
- I_C/I_B: 1A/200mA



Dimensions (In.)



Specifications:

- Type: NPN medium power
- V_{CEO}: 40V (I_C = 1A)
- V_{CE}: 1V (I_C = 150mA)
- H_{FE}: 100 min., 300 max.
- V_{CE}(sat): 0.25V max. @ 0.15A
- f_T: 60MHz min.
- P_D: 625mW
- C_{OB}: 20pF max.

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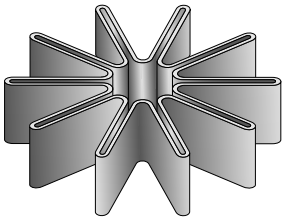
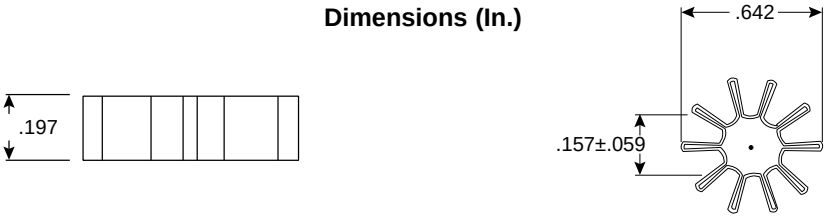
33HS182 TO-18 Standard Cooling Push-On Heatsink



Dimensions (In.)



Material Specifications:

- Chemical blackened

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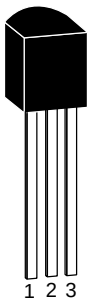
MOUSER® ELECTRONICS

333-2N3705

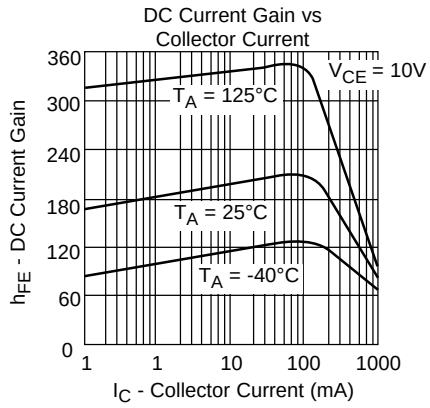
TO-92 NPN General Purpose Switch

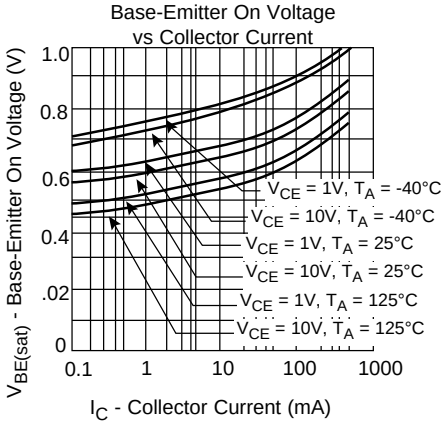
TO-92

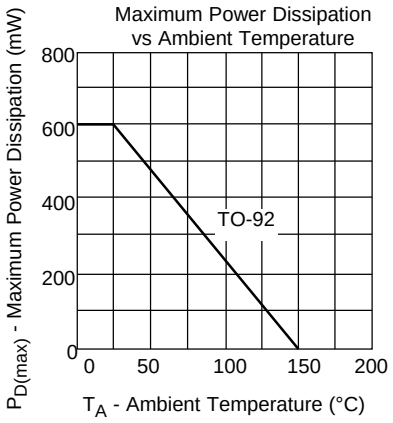


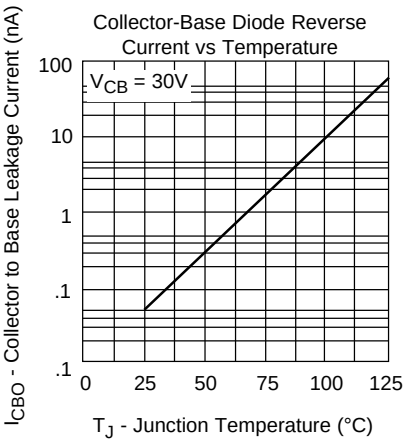
Pin	
1	Emitter
2	Base
3	Collector

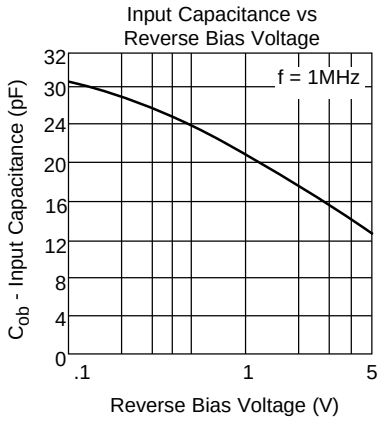
V_{CBO} (V) min	V_{CEO} (V) min	V_{EBO} (V) min	I_{CBO} (nA) @ V_{CB} (V) min		h_{FE} @ I_C (mA) & V_{CE} (V) min	max			$V_{CE(sat)}$ (V) @ I_C (mA) max		C_{ob} (pF) max	f_T (MHz) @ I_C (mA) min	max	
50	30	5	100	20	50	150	50	2	.8	100	12	100		50

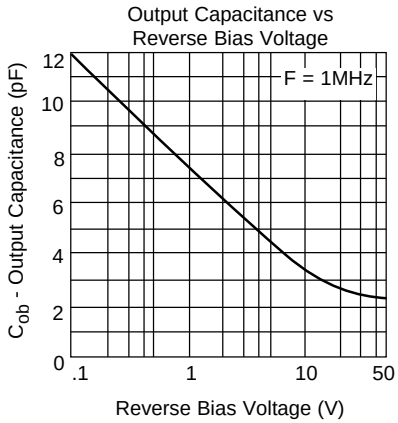


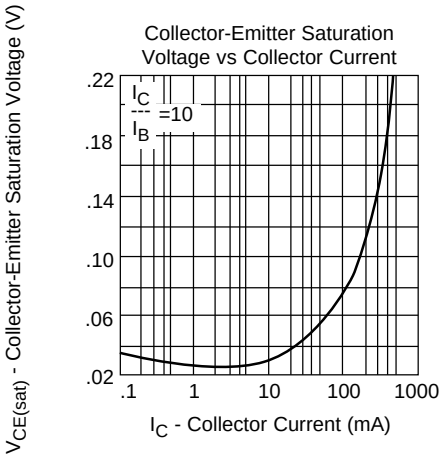


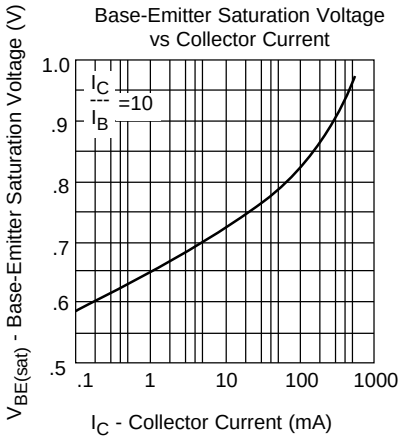




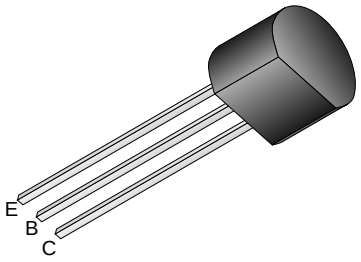




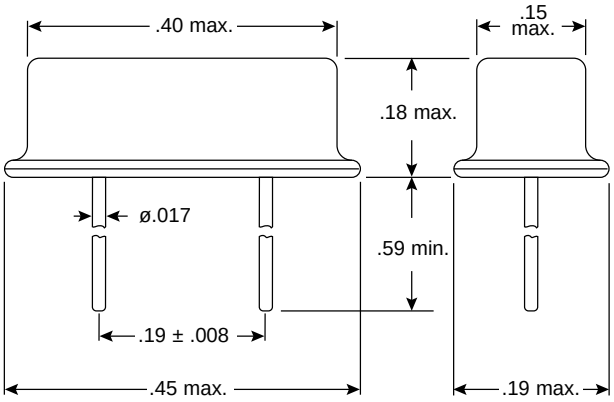




TO-92



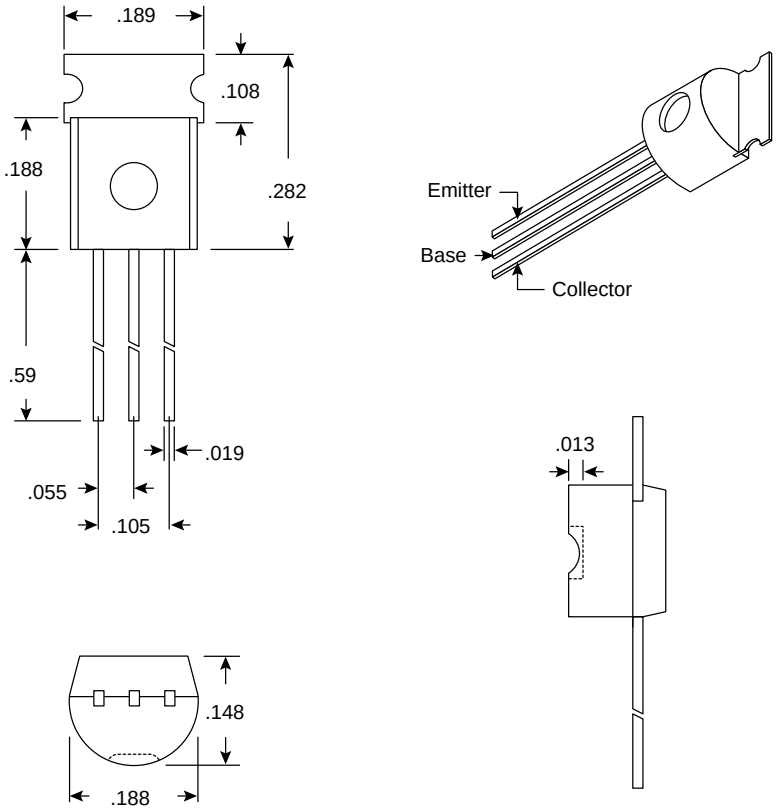
Mouser Stock No.	$V_{CEO\ (sust)}$ (Volts) min.	I_C (mA) max.	h_{FE} @ I_C V_{CE}			f_T (MHz) min.	C_{ob} pF max.	NF (dB) @ f	
			min.	mA	V			max.	MHz
333-2N5770	15	50	20	3.0	1.0	900	1.1	6.0	60



Dimensions (In.)

Specifications:

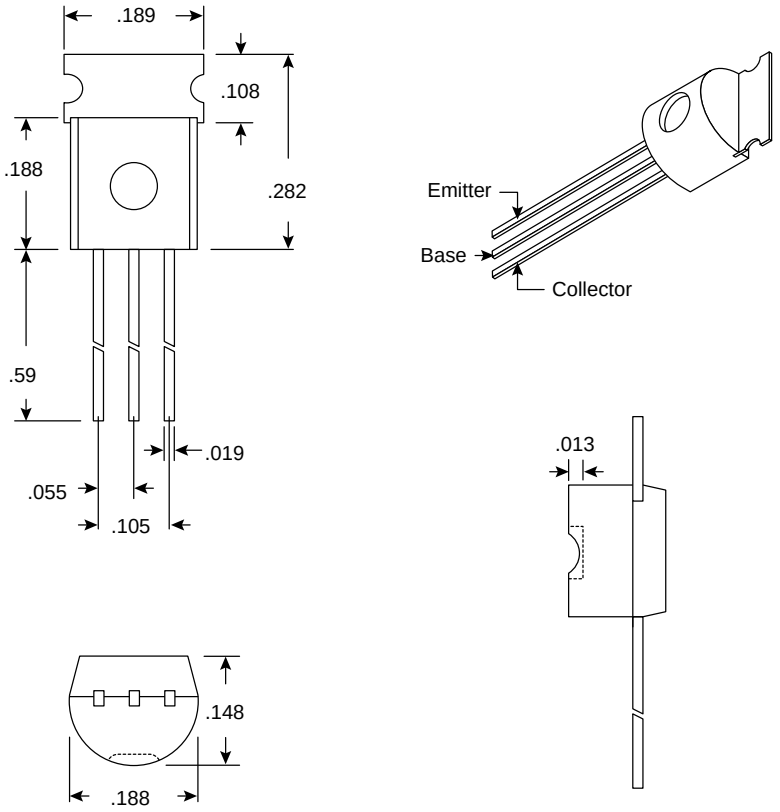
- Nominal frequency: 14.31818 MHz
- Holder type: HC-49/S
- Mode of oscillation: fundamental
- Storage temperature range: -30°C ~ +80°C
- Frequency tolerance (@ 25°C ±2°C): ±50 PPM
- Frequency drift in operating temperature range: ±50 PPM (0°C ~ +70°C)
- Equivalent resistance (CI): 50Ω max (series)
- Load capacitance: series
- Drive level: 0.5mW
- Shunt capacitance: 7.0 pF max
- Insulation resistance: 500MΩ min. / 100VDC
- Test impedance meter: saunders / 150 D
- Aging (in a year): ±5 PPM



Dimensions (In.)

Specifications:

- Type: TO-237
- Device type: 333-2N6715 = NPN
  333-2N6727 = PNP
- V_{CEO} (sust): 40V (min.)
- Collector current: 1,000mA (max.)
- h_{FE}: 50 (min.)/250 (max.) @1,000mA
- f_T: 50MHz @ 50mA
- P_D (Amb): 850mW @ 25°C



Dimensions (In.)

Specifications:

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  333-2N6727 = PNP
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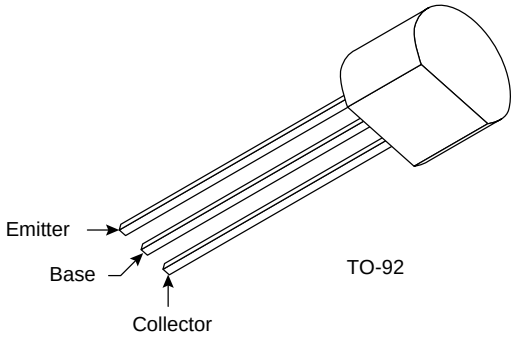
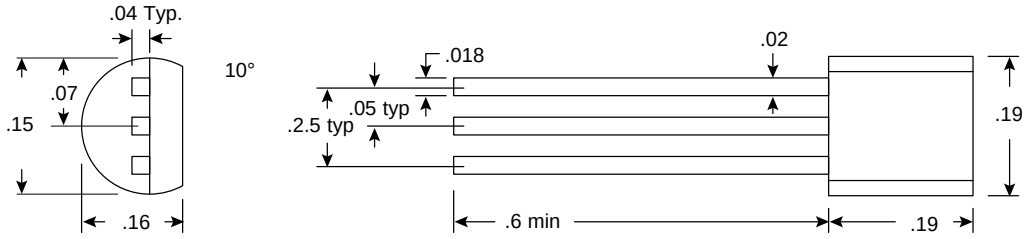
- P_D (Amb): 850mW @ 25°C

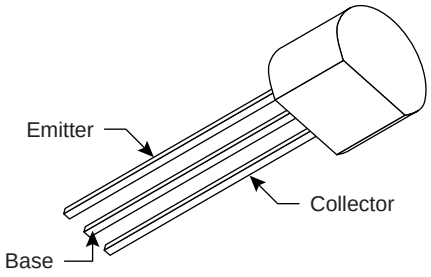




Dimensions (In.)

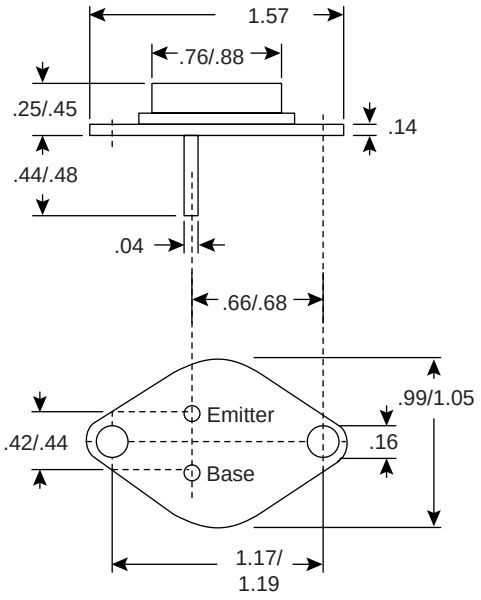
Specifications:

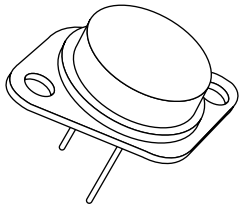
- Type: NPN general purpose SS
- V_{CEO}: 25V (I_C = .20A)
- H_{FE}: 120 min., 360 max. with V_{CE} @ 1V & I_C @ 2.0mA
- V_{CE}(sat): 0.30V max. with I_C @ 50mA & I_B = 5.0mA
- N_F: 5.0dB
- Condition frequency: audio



Specifications:

- Type: PNP general purpose switch
- t_{on}: 40ns max. (I_C = 300mA)
- t_{off}: 100ns max. (I_C = 300mA)
- V_{CE} (sat): .25V max. (I_C = 50mA, I_B = 2.5mA)
- I_C: 500mA max.
- h_{FE}: 100 max., 300 min. (I_C = 150mA)
- f_T: 200MHz min. (I_C = 20mA)
- P_D (Amb): 625mW @ 25°C



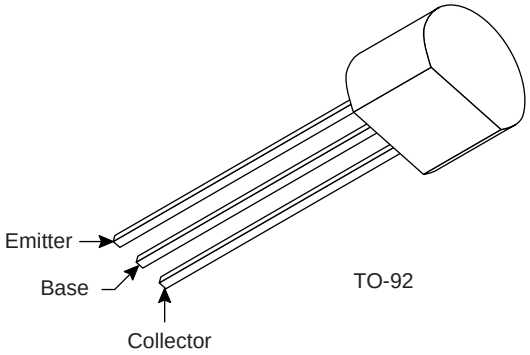


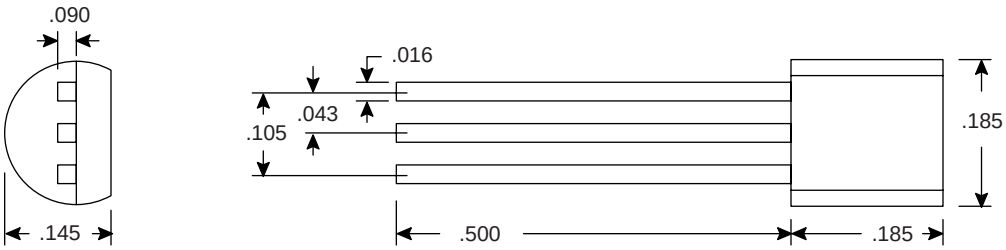
TO-3

Dimensions (In.)
(min./max.)

Specifications:

- Type: NPN general purpose power
- V_{CBO}: 60V (I_C = 16A)
- V_{CEO}: 60V (I_C = 16A)
- P_D: 150W
- H_{FE}: 1K (I_C = 10.0A, V_{CE} = 3V)
- V_{CE} (sat): 2.5V (I_C = 10.0A, I_B = 40mA)

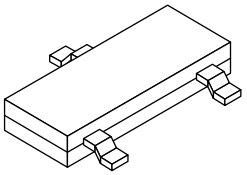


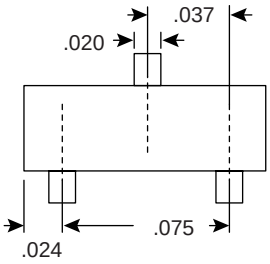


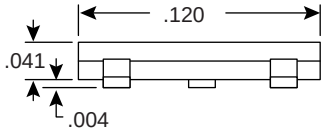
Dimensions (In.)

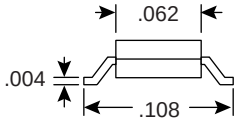
Specifications:

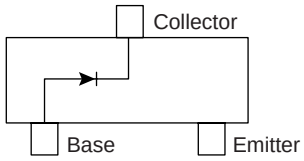
- I_T(RMS): 0.8A
- I_R: 10µA
- V_{RRM}/V_{DRM}: 200V (333-PCR100-4)
  400V (333-PCR100-6)
- I_{GT}: 0.2mA
- V_{GT}: 0.8V
- I_H: 5.0mA
- V_{TM}: 1.7V







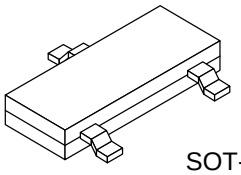




Dimensions (In.)

Specifications:

- Type: silicon signal diode
- Case: SOT-23
- Minimum repetitive reverse voltage: 100V
- Reverse recovery time: 4.0ns
- Maximum cont. reverse current: 5000nA @ 75V
- Maximum forward voltage: 1.00V @ 100mA (333-MMBD4448)
  1.00V @ 10mA (333-MMBD4148)
- Maximum capacitance: 4.0pF



SOT-23

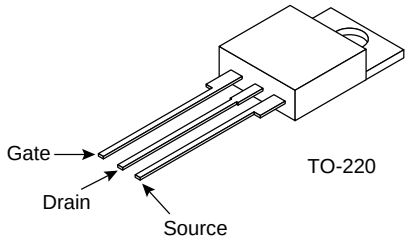
Maximum Ratings	
BV_{CBO}	40V
BV_{CEO}	15V
I_C	500mA
P_o	225mW

Electrical Characteristics (T_A=25°C)	
I_{CB0}	400nA
Maximum V_{CE}	20V
h_{FE} (min./max.)	40/120
I_C	10mA
V_{CE}	1V
V_{CE} (sat)	0.25V
Maximum I_C	10mA
Maximum I_R	1mA
C_{OB} Maximum	4pF

MOUSER® ELECTRONICS

333-IRFZ40
333-IRFZ44

N-Channel Mosfet Transistor



Features:
- Lower $R_{DS(ON)}$
- Improved inductive ruggedness
- Fast switching times
- Rugged polysilicon gate cell structure
- Lower input capacitance
- Extended safe operating area
- Improved high temperature reliability

Electrical Characteristics (T_C=25°C unless otherwise specified)

Symbol	Characteristic	Min.	Typ.	Max.	Unit	Test Conditions
BV_{DSS}	Drain-Source Breakdown Voltage IRFZ44 IRFZ40	 60 50	 - -	 - -	 V V	V_{GS}=0V, I_D=250µA
$V_{GS(th)}$	Gate Threshold Voltage	2.0	-	4.0	V	V_{DS}=V_{GS},I_D=250µA
I_{GSS}	Gate-Source Leakage Forward	-	-	100	nA	V_{GS}=20V
I_{GSS}	Gate-Source Leakage Reverse	-	-	-100	nA	V_{GS}=-20V
I_{DSS}	Zero Gate Voltage Drain Current	-	-	250	µA	V_{DS}= Max. rating, V_{GS}=0V
		-	-	1000	µA	V_{DS}= 0.8 Max. rating, V_{GS}=0V, T_C=150°C
$R_{DS(on)}$	Static Drain-Source On Resistance (2)	-	-	.028	Ω	V_{GS}=10V, I_D=25A
g_{fs}	Forward Transconductance (2)	15	-	-	Ω	V_{DS}≥50V, I_D=25A
C_{iss}	Input Capacitance	-	2450	-	pF	V_{GS}=0V, V_{DS}=25V, f=1.0MHz
C_{oss}	Output Capacitance	-	740	-	pF	
C_{rss}	Reverse Transfer Capacitance	-	360	-	pF	
$t_{d(on)}$	Turn-On Delay Time	-	-	32	ns	V_{DD}=0.5 BV_{DSS}, I_D=50A, Z_o=9.1Ω (MOSFET switching times are essentially independent of operating temperature)
t_r	Rise Time	-	-	210	ns	
$t_{d(off)}$	Turn-Off Delay Time	-	-	75	ns	
t_f	Fall Time	-	-	130	ns	
Q_g	Total Gate Charge (Gate-Source Plus Gate-Drain)	-	-	87	nC	V_{GS}=10V, I_D=50A, V_{DS}=0.8 Max. Rating (Gate charge is essentially independent of operating temperature)
Q_{gs}	Gate-Source Charge	-	26.6	-	nC	
Q_{gd}	Gate-Drain ("Miller") Charge	-	30.6	-	nC	

Absolute Maximum Ratings

Characteristic	Symbol	IRFZ44	IRFZ40	Unit
Drain-Source Voltage (1)	V_{DSS}	60	50	V
Drain-Gate Voltage (R_{GS}=1.0MΩ) (1)	V_{DGR}	60	50	V
Gate-Source Voltage	V_{GS}	±20		V
Continuous Drain Current T_C=25°C	I_D	50		A
Continuous Drain Current T_C=100°C	I_D	35		A
Drain Current - Pulsed (3)	I_{DM}	200		A
Gate Current - Pulsed	I_{GM}	±1.5		A
Single Pulsed Avalanche Energy (4)	E_{AS}	100		mJ
Avalanche Current	I_{AS}	50		A
Total Power Dissipation @ T_C=25°C Derate above 25°C	P_D	150 1.0		Watts W/°C
Operating and Storage Junction Temperature Range	T_J, T_{STG}	-55 to +175		°C
Maximum Lead Temp. for Soldering Purposes, 1/8" from case for 5 seconds	T_L	300		°C

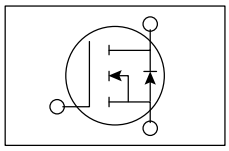
Notes: (1) T_J=25°C to 175°C; (2) Pulse test: pulse width ≤300µs, duty cycle ≤2%; (3) Repetitive rating: pulse width limited by max. junction temperature; (4) L=50µH, V_{dd}=25V, R_G=25Ω, starting T_J=25°C

Thermal Resistance

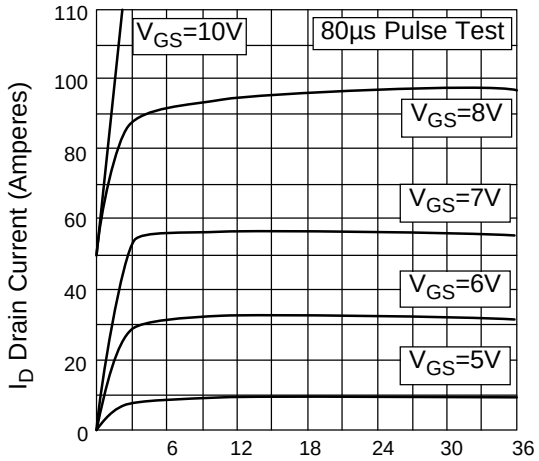
Symbol	Characteristics		All	Units	Remarks
R_{thJC}	Junction-to-Case	Max.	1.0	K/W	
R_{thCS}	Case-to-Sink	Typ.	0.5	K/W	Mounting surface flat smooth, and greased
R_{thJA}	Junction-to-Ambient	Max.	62.5	K/W	Free Air Operation

Notes: (1) T_J=25°C to 175°C; (2) Pulse test: pulse width ≤300µs, duty cycle ≤2%; (3) Repetitive rating: pulse width limited by max. junction temperature

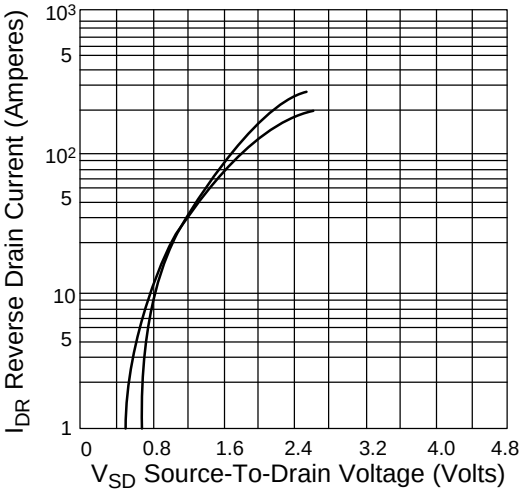
Source-Drain Diode Ratings and Characteristics

Symbol	Characteristic	Min.	Typ.	Max.	Units	Test Conditions
I_S	Continuous Source Current (Body Diode)	-	-	50	A	Modified MOSFET symbol showing the integral reverse P-N junction rectifier 
I_{SM}	Pulse Source Current (Body Diode) (3)	-	-	200	A	
V_{SD}	Diode Forward Voltage (2)	-	-	2.5	V	T_J=25°C, I_S=50A, V_{GS}=0V
t_{rr}	Reverse Recovery Time	-	-	250	ns	T_J=25°C, I_F=50A, $dI_{f/dt}$=100A/µS

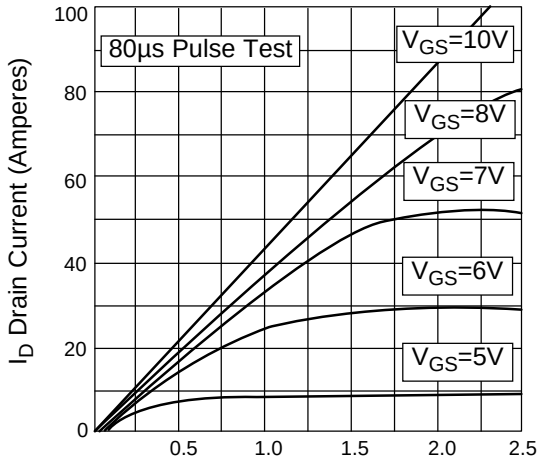
Notes: (1) T_J=25°C to 175°C; (2) Pulse test: pulse width ≤300µs, duty cycle ≤2%; (3) Repetitive rating: pulse width limited by max. junction temperature



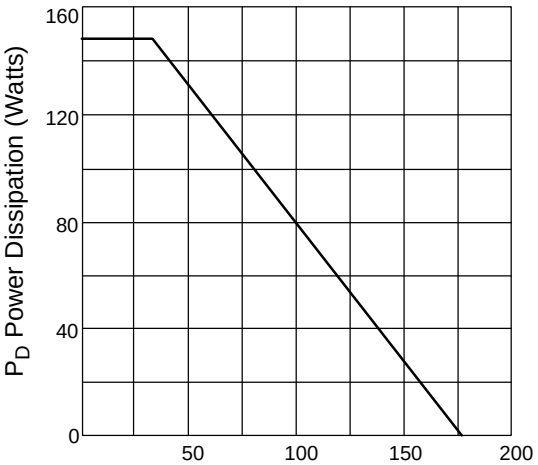
Typical Output Characteristics



Typical Source-Drain Diode Forward Voltage



Typical Saturation Characteristics



Power vs. Temperature Derating Curve

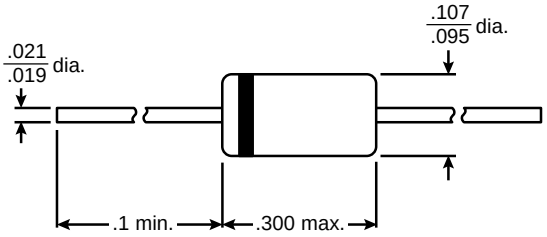
Absolute Maximum Ratings (@ 25°C unless otherwise specified)

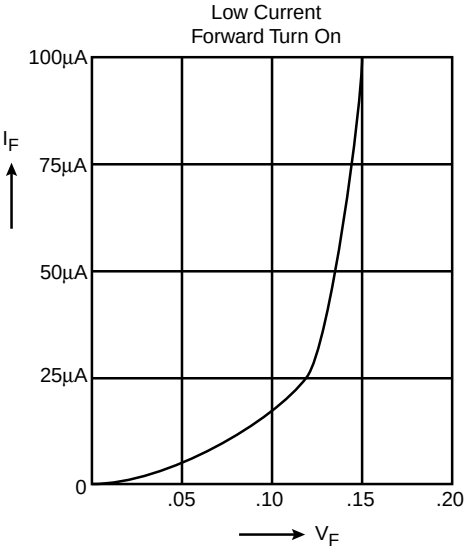
- Peak inverse voltage: 100V
- Peak forward current: 500mA
- Operating temperature range: -65°C to 85°C
- Average power dissipation: 80mW

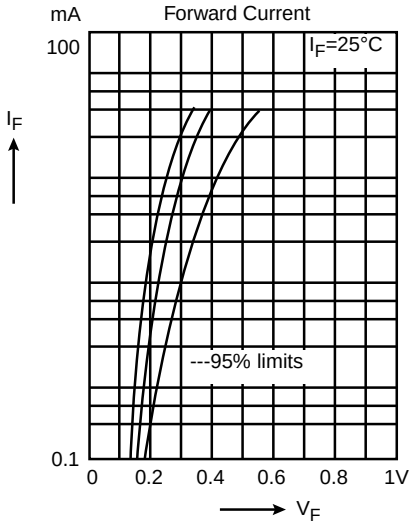
Electrical Caracteristics:

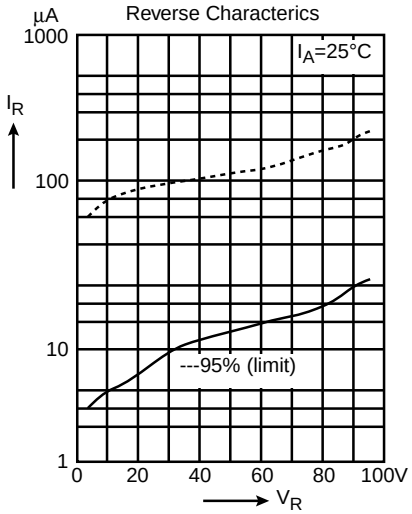
- Peak inverse voltage @ 1mA: 100V
- Reverse current @ 50V: 100µA
- Forward voltage @ 200mA: 1.0V

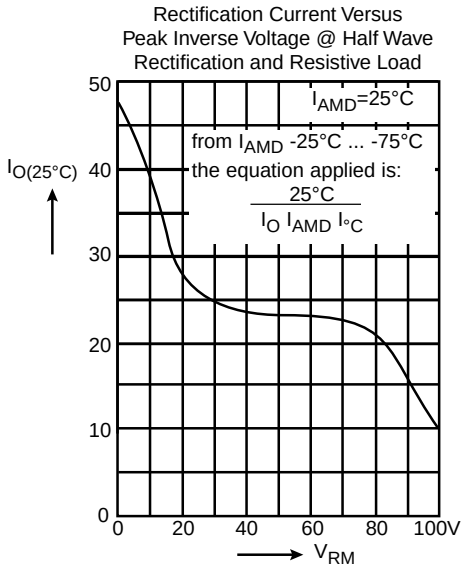
Dimensions (In.)

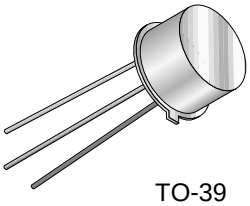












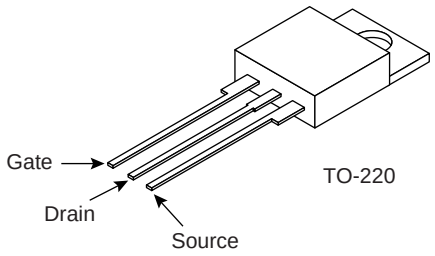
TO-39

Absolute Maximum Ratings

Symbol	Description	Value	Units
V_{CEO}	Collector-Emitter Voltage	150	Volts
V_{CBO}	Collector-Base Voltage	150	Volts
V_{EBO}	Emitter-Base Voltage	6	Volts
I_{CM}	Collector Current	300	mA
P_D	Power Dissipation @ T_A=25°C	1	W
	T_C=25°C	5	W
T_{stg}	Storage Temperature	-65 to +200	°C
T_J	Junction Temperature	+200	°C

Electrical Characteristics @ T_A=25°C (unless otherwise specified)

Symbol	Description	Test Condition	Value		Units
			Min.	Max.	
BV_{CEO}*	Collector Emitter Breakdown Voltage	I_C=10mA I_B=0	150		Volts
BV_{CBO}	Collector Base Breakdown Voltage	I_C=10µA I_E=0	150		Volts
BV_{EBO}	Emitter Base Breakdown Voltage	I_E=10µA I_C=0	6		Volts
I_{CBO}	Collector Leakage Current	V_{CB}=75V I_E=0		50	µA
		V_{CB}=75V T_A=150°C		50	µA
I_{EBO}	Emitter Leakage Current	V_{EB}=75V I_C=0		25	nA
$V_{CE(sat)}$*	Collector Emitter Saturation Voltage	I_C=10mA I_B=1mA		0.2	Volts
		I_C=50mA I_B=5mA		0.25	Volts
$V_{BE(sat)}$*	Base Emitter Saturation Voltage	I_C=10mA I_B=1mA		0.8	Volts
		I_C=50mA I_B=5mA		0.9	Volts
$V_{CE(sat)}$*	Collector Emitter Saturation Voltage	I_C=150mA I_B=15mA		0.4	Volts
$V_{BE(sat)}$*	Base Emitter Saturation Voltage	I_C=150mA I_B=15mA		1.2	Volts
h_{FE}	DC Current Gain	I_C=0.1mA V_{CE}=10V	35		
		* I_C=1mA V_{CE}=10V	50		
		* I_C=10mA V_{CE}=10V	75		
		* I_C=150mA V_{CE}=10V	100	300	
		* I_C=300mA V_{CE}=10V	20		



Features:

- Lower $R_{DS(ON)}$
- Excellent voltage stability
- Fast switching times
- Rugged polysilicon gate cell structure
- Lower input capacitance
- Extended safe operating area
- Improved high temperature reliability

Electrical Characteristics (T_C=25°C unless otherwise specified)

Symbol	Characteristic	Min.	Typ.	Max.	Unit	Test Conditions
BV_{DSS}	Drain-Source Breakdown Voltage	60	-	-	V	V_{GS}=0V, I_D=250µA
$V_{GS(th)}$	Gate Threshold Voltage	1.0	-	2.0	V	V_{DS}=V_{GS},I_D=1mA
I_{GSS}	Gate-Source Leakage Forward	-	-	100	nA	V_{GS}=15V
I_{GSS}	Gate-Source Leakage Reverse	-	-	-100	nA	V_{GS}=-15V
I_{DSS}	Zero Gate Voltage Drain Current	-	-	250	µA	V_{DS}= Max. rating, V_{GS}=0V
		-	-	1000	µA	V_{DS}= 0.8 Max. rating, V_{GS}=0V, T_C=125°C
$R_{DS(on)}$	Static Drain-Source On Resistance (2)	-	-	.04	Ω	V_{GS}=5V, I_D=18A
g_{fs}	Forward Transconductance (2)	15	-	-	℧	V_{DS}≥15V, I_D=18A
C_{iss}	Input Capacitance	-	2400	-	pF	V_{GS}=0V, V_{DS}=25V, f=1.0MHz
C_{oss}	Output Capacitance	-	795	-	pF	
C_{rss}	Reverse Transfer Capacitance	-	390	-	pF	
$t_{d(on)}$	Turn-On Delay Time	-	25	40	ns	V_{DD}=0.5 BV_{DSS}, I_D=3.5A, Z_o=9.1Ω (MOSFET switching times are essentially independent of operating temperature)
t_r	Rise Time	-	65	85	ns	
$t_{d(off)}$	Turn-Off Delay Time	-	350	400	ns	
t_f	Fall Time	-	180	200	ns	
Q_g	Total Gate Charge (Gate-Source Plus Gate-Drain)	-	-	80	nC	V_{GS}=5V, I_D=35A, V_{DS}=0.8 Max. Rating (Gate charge is essentially independent of operating temperature)
Q_{gs}	Gate-Source Charge	-	20	-	nC	
Q_{gd}	Gate-Drain ("Miller") Charge	-	30	-	nC	

Absolute Maximum Ratings

Characteristic	Symbol	IRLZ44	Unit
Drain-Source Voltage (1)	V_{DSS}	60	Vdc
Drain-Gate Voltage (R_{GS}=1.0MΩ) (1)	V_{DGR}	60	Vdc
Gate-Source Voltage	V_{GS}	±15	Adc
Continuous Drain Current T_C=25°C	I_D	35	Adc
Continuous Drain Current T_C=100°C	I_D	27	Adc
Drain Current - Pulsed (3)	I_{DM}	140	Adc
Total Power Dissipation @ T_C=25°C Derate above 25°C	P_D	150 1.0	Watts W/°C
Operating and Storage Junction Temperature Range	T_J, T_{STG}	-55 to +175	°C
Maximum Lead Temp. for Soldering Purposes, 1/8" from case for 5 seconds	T_L	300	°C

Notes: (1) T_J=25°C to 175°C; (2) Pulse test: pulse width ≤300µs, duty cycle ≤2%; (3) Repetitive rating: pulse width limited by max. junction temperature

Thermal Resistance

Symbol	Characteristics		All	Units	Remarks
R_{thJC}	Junction-to-Case	Max.	1.0	K/W	
R_{thCS}	Case-to-Sink	Typ.	0.5	K/W	Mounting surface flat smooth, and greased
R_{thJA}	Junction-to-Ambient	Max.	62.5	K/W	Free Air Operation

Notes: (1) T_J=25°C to 175°C; (2) Pulse test: pulse width ≤300µs, duty cycle ≤2%; (3) Repetitive rating: pulse width limited by max. junction temperature