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ICL7135	VOL 2	LP311	VOL 1	RC4558	VOL 1
LF198	VOL 1	LP339	VOL 1	RC4559	VOL 1
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TLC3704M	VOL 1	uA78L15AC	2-229		
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TLC4066	VOL 2	uA78M06	2-237		
TLC5502	VOL 2	uA78M08	2-237		
TLC5602	VOL 2	uA78M09	2-237		
TLC7135	VOL 2	uA78M10	2-237		
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TLE2021	VOL 1	uA7924	2-247		
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TLE2024	VOL 1	uA79M05M	2-253		
uA709M	VOL 1	uA79M05C	2-253		
uA709C	VOL 1	uA79M06M	2-253		
<b>uA723M</b>	<b>2-211</b>	uA79M06C	2-253		
<b>uA723C</b>	<b>2-211</b>	uA79M08M	2-253		
uA733M	VOL 1	uA79M08C	2-253		
uA733C	VOL 1	uA79M012M	2-253		
uA741M	VOL 1	uA79M012C	2-253		
uA741C	VOL 1	uA79M015M	2-253		
uA747M	VOL 1	uA79M015C	2-253		
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# VOLTAGE REGULATORS AND SUPERVISORS SELECTION GUIDE

## power supply supervisors

(Values specified for  $T_A = 25^\circ\text{C}$ )

FUNCTION	SENSE INPUT SUPPLY		SENSE INPUT THRESHOLD (V TYP)	THRESHOLD TOLERANCE (%)	OUTPUT	TYPE	PACKAGE	PAGE NO.
	1 VSU	2 VSU						
Oversvoltage Monitor	*	—	2.6	5	Open-Emitter	MC3423	D, JG, P	2-75
Undervoltage Monitor	*	—	2.53	1	Open-Collector	TL7702A	D, P	2-191
	5 V	—	4.55			TL7705A		
	9 V	—	7.6			TL7709A		
	12 V	—	10.8			TL7712A		
CMOS Undervoltage Monitor	*	—	1.2	1	Open-Drain	TLC7701	D, JG, P	3-15
	5 V	—	4.55		Push-Pull	TLC7721		
				Open-Drain	TLC7705			
	Push-Pull	TLC7725						
CMOS Undervoltage Monitor	5 V	*	4.55	1	Open-Collector	TL7780-5	D, N	2-205
	12 V	*	10.9			TL7780-12		
	15 V	*	13.64			TL7780-15		
Dual Undervoltage /Oversvoltage*	5 V	*	4.55	1	Open-Collector	TL7770-5	DW, N	2-199
	12 V	*	10.9			TL7770-12		
	15 V	*	13.64			TL7770-15		

\*Programmable

## switched-capacitor voltage converters

(Values specified for  $T_A = 25^\circ\text{C}$ )

CONTROL TOPOLOGY	OUTPUT SWITCH	SUPPLY VOLTAGE RANGE (V)	QUIESCENT CURRENT (NO LOAD)	MAXIMUM CONTINUOUS I OUT	MAXIMUM FREQUENCY (kHz)	TYPICAL CONVERSION EFFICIENCY (%)	TYPE	PACKAGE	PAGE NO.
Voltage Mode	Single	1.5–9	200 $\mu\text{A}$	50 mA	10	95	LTC1044	JG, L, P	2-59
		3.5–15	150 $\mu\text{A}$	300 mA	35	90	LT1044		3-5

## shunt voltage regulators/references

(Values specified for  $T_A = 25^\circ\text{C}$ )

REGULATOR VOLTAGE RANGE (V)	MINIMUM SHUNT CURRENT TO MAINTAIN REG	MAXIMUM SHUNT CURRENT	TOLERANCE (%)	TEMPERATURE COEFFICIENT (TYP)	DEVICE	PACKAGE	PAGE NO.
2.5 (Typ)	10 $\mu\text{A}$	20 mA	1	20 PPM/ $^\circ\text{C}$	LT1004	D, LD, LP	2-39
	20 $\mu\text{A}$		2		LM185-2.5	L	2-3
	100 $\mu\text{A}$		0.2	15 PPM/ $^\circ\text{C}$	TL201-2.5	D, LD, LP	2-51
2.5 to 30	10 $\mu\text{A}$ (Typ)	150 mA	4	30 PPM/ $^\circ\text{C}$	TL430	LP	2-107
2.5 to 36	270 $\mu\text{A}$ (Typ)		2		TL431	D, JG, LD, LP, P	2-111
			1		TL431A	D, LP, P	

# VOLTAGE REGULATORS AND SUPERVISORS SELECTION GUIDE

adjustable series-pass voltage regulators (Values specified over operating temperature range)

OUTPUT VOLTAGE	OUTPUT CURRENT	OUTPUT VOLTAGE RANGE (V)	TOLERANCE (%)	MAXIMUM (V <sub>I</sub> - V <sub>O</sub> ) DIFFERENCE	DEVICE	PACKAGE	PAGE NO.
Positive Output	100 mA	1.2 to 32	5	35 V	TL317	D, JG, LP	2-11
	100 mA	1.25 to 125	5	125 V	TL783	KC	2-11
	1.5 A	1.2 to 37	5	40 V	LM217 LM317		2-9
Negative Output	1.5 A	-1.2 to -37	4	-40 V	LM237 LM337		2-17
Positive or Negative Output	150 mA	2 to 37	5	38 V	uA723	D, J, N, U	2-211
Positive Output	5 A	3 to 28	2	30 V	LT1084	KA, KK	3-11

General Information



# VOLTAGE REGULATORS AND SUPERVISORS SELECTION GUIDE

switching power supply controllers and regulators

(Values specified for  $T_A = 25^\circ C$ )

CONTROL TOPOLOGY	SINGLE ENDED	FIXED PUSH-PULL	SINGLE SWITCH OUTPUTS	TOTEM-POLE OUTPUTS	OUTPUT CURRENT PER SWITCH (mA)	MAXIMUM FREQUENCY (kHz)	VOLTAGE REFERENCE TOLERANCE (%)	PULSE-BY-PULSE CURRENT LIMITING	OUTPUT START RING CONTROL	PROGRAMMABLE OUTPUTS	DEAD-TIME CONTROL	UNDERVOLTAGE LOCKOUT	SOFT START	ON-BOARD AMPLIFIERS	CURRENT-SENSE AMPLIFIERS	50% MAXIMUM DUTY CYCLE	TYPE	PKG	PAGE NO.		
Voltage-Mode Pulse-Width Modulated Controllers	X				200												MC34060	D, N	2-81		
		X			250	5											TL493	D, J, N	2-123		
			X																		TL494
						300	1											TL495	N	2-89	
		X																	SG2524		J, N
				X														SG3524	D, N	2-143	
																		TL594			D, J, N
																		TL595	D, N		
	X		X														TL598	D, J, N			
	X		Dual														TL1451A	D, N	2-185		
Current Mode Pulse-Width Modulated Controllers					500	1												UC2842	D, P	2-21	
	X			X			$\pm 1000$	X													UC2843
						500	1											UC3842	J	2-21	
						500	1												UC2844	FN, N	2-263
		X		X	$\pm 1000$			X													
						500	1												UC3844	J	2-263
					5000	40												UC1847	FN, N	2-263	
																					UC2846
	X		X															UC2847	KJ, KV	3-9	
																		UC3847			
Fixed On-Time Voltage Mode					1200	40												TL496	D, P	2-131	
	X		X			5												TL499A	P	3-13	
					700	50	5											TL497A	D, J, N	2-135	

X Applicable data  
- Non-applicable data

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General Information

# VOLTAGE REGULATORS AND SUPERVISORS SELECTION GUIDE

## positive fixed output series-pass voltage regulators

(Values specified over operating temperature range)

OUTPUT VOLTAGE (V)	OUTPUT CURRENT RATING	OUTPUT VOLTAGE TOLERANCE ( $\pm\%$ )	MINIMUM DIFFERENTIAL VOLTAGE (V)	TYPE	PACKAGE	PAGE NO.
2.6	100 mA	5	2	uA78L02A	D, JG, LP	2-229
		10		uA78L02		
5	100 mA	5	0.6	LM7805	D, KC, LP	2-37
		10		LM7805	D, JG, LP	2-229
		5	0.6	LM7805	KC	2-21
		10		LM7805	KC, LP	2-29
	150 mA	5	0.6	LM7805	D, KC, LP, P	2-159
		10		TL751L05	D, P	
	500 mA	5	2	uA7805	JG, KC	2-237
	750 mA	1	0.6	TL751M05	KC	2-163
				TL780-05		2-169
				uA7805		2-247
1.5 A	2	2	uA7805	KC	2-237	
5	uA7805A					
6	500 mA	5	2	uA7805A	D, JG, LP	2-229
		10		uA7805		
6.2	100 mA	5	2	uA7805A	KC	2-247
	1.5 A	10		uA7805		
8	100 mA	5	2	uA78L08A	D, JG, LP	2-229
		10		uA7808		
	150 mA	5	0.6	LM7808	KC, LP	2-29
				LM7808	D, KC, LP, P	2-159
				TL750L08	D, P	2-159
	750 mA	1	0.6	TL750M08	KC	2-163
				TL751M08		2-221
1.5 A	5	2	uA7808	KC	2-221	
5	uA7885					
8.5	500 mA	5	2	uA7808	D, JG, LP	2-229
9	100 mA	5	2	uA7808	KC	2-229
	500 mA	10		uA7808		
10	100 mA	5	2	uA7810A	D, JG, LP	2-229
		10		uA7810		
	150 mA	5	0.6	TL751L10	D, KC, LP, P	2-159
				TL751L10	D, P	2-159
3 A	1	2	uA78M10	KC	2-229	
Dual	5	4	2.2	LT1036	KJ, KV	3-3
	12		3			

# VOLTAGE REGULATORS AND SUPERVISORS SELECTION GUIDE

positive fixed output series-pass voltage regulators (continued)

(Values specified over operating temperature range)

OUTPUT VOLTAGE (V)	OUTPUT CURRENT RATING	OUTPUT VOLTAGE TOLERANCE ( $\pm$ %)	MINIMUM DIFFERENTIAL VOLTAGE (V)	TYPE	PACKAGE	PAGE NO.
10	750 mA	1	0.6	TL750M10	KC	2-163
	1.5 A	5		TL751M10		2-221
12	100 mA		5	2	uA78L12A	D, JG, LP
		10	uA78L12			
	150 mA	5	0.6	TL750L12	D, KC, LP, D	2-159
				TL751L12	D, P	2-159
	500 mA	1	2	uA7812	JG, KC	2-237
	750 mA			TL751M12	KC	2-163
1.5 A	2	5	TL780-12	KC		2-169
			uA7812		2-221	
			uA78L15A		D, JG, LP	2-229
100 mA	10	2	uA7815	JG, KC		
			500 mA		5	TL780-15
1.5 A	2	5	2	uA7815	KC	2-221
				uA7818		2-247
18	500 mA	5	2	uA78M20	KC	2-237
20				uA7820		
24				1.5 A		

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General Information

# VOLTAGE REGULATORS AND SUPERVISORS SELECTION GUIDE

## negative fixed output series-pass voltage regulators

(Values specified over operating temperature range)

OUTPUT VOLTAGE (V)	OUTPUT CURRENT RATING	OUTPUT VOLTAGE TOLERANCE ( $\pm$ %)	MINIMUM DIFFERENTIAL VOLTAGE (V)	TYPE	PACKAGE	PAGE NO.
5	100 mA	5	1.7	uA7905A	D, LP	2-77
		10				
5.2	1.5 A	5	2	uA79M06	JG, KC	2-253
				uA7905	KC	2-247
6	500 mA	5	2	uA7952		KC
				uA79M06	JG, KC	
8	500 mA	5	2	uA7906	KC	2-247
				uA79M06		
12	100 mA	10	1.7	MC79L12A	D, LP	2-77
		5	2	MC79L12	JG, KC	2-247
15	100 mA	5	2	uA7912	KC	2-247
				10		
18	500 mA	5	2	MC79L15	JG, KC	2-253
				10		
20	1.5 A	5	2	uA79M15	JG, KC	2-253
				10		
24	500 mA	5	2	uA7915	KC	2-247
				10		
24	1.5 A	5	2	uA7918	KC	2-247
				10		
24	500 mA	5	2	uA79M20	JG, KC	2-253
				10		
24	1.5 A	5	2	uA7924	KC	2-247
				10		

# VOLTAGE REGULATORS CROSS-REFERENCE GUIDE

Replacements are based on similarity of electrical and mechanical characteristics as shown in currently published data. Interchangeability in particular applications is not guaranteed. Before using a device as a substitute, the user should compare the specifications of the substitute device with the specifications of the original.

Texas Instruments makes no warranty as to the information furnished and buyer assumes all risk in the use thereof. No liability is assumed for damages resulting from the use of the information contained herein.

Manufacturers are arranged in alphabetical order.

LINEAR TECHNOLOGY	DIRECT TI REPLACEMENT	PAGE NO.
LM317	LM317	2-9
LM337	LM337	2-17
LM385-2.5	LM385-2.5	2-3
LT1004-2.5	LT1004-2.5	2-39
LT1009	LT1009	2-51
LT1036	LT1036	3-3
LT1070	LT1070	3-9
SG3524	SG3524	2-89
UC3846	UC3846	2-263
UC3847	UC3847	2-263

MOTOROLA	DIRECT TI REPLACEMENT	PAGE NO.
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LM237, LM337	LM237, LM337	2-17
MC1723	UA723	2-211
MC3423	MC3423	2-75
MC34060	MC34060	2-81
MC78L00 Series	uA78L00 Series	2-229
MC78M00 Series	uA78M00 Series	2-237
MC79L00 Series	MC79L00 Series	2-77
TL431	TL431	2-111
TL431A	TL431A	2-111
TL494	TL494	2-123
TL495	TL495	2-123
TL780-5	TL780-5	2-169
TL780-12	TL780-12	2-169
TL780-15	TL780-15	2-169

# VOLTAGE REGULATORS CROSS-REFERENCE GUIDE

NATIONAL	DIRECT TI REPLACEMENT	SUGGESTED TI REPLACEMENT	PAGE NO.
LM217, LM317	LM217, LM317		2-9
LM237, LM337	LM237, LM337		2-17
LM317L	TL317		2-101
LM330	LM330		2-21
LM336-2.5		LT1009	2-51
LM385-2.5	LM385-2.5	LT1004-2.5	2-39
LM723	uA723		2-211
LM2930-5	LM2930-5		2-29
LM2930-8	LM2930-8		2-29
LM2931-5	LM2931-5A		2-37
LM3524	SG3524		2-89
LM7800 Series	uA7800 Series		2-221
LM78L00 Series	uA78L00 Series		2-229
LM78M00 Series	uA78M00 Series		2-237
LM7900 Series	uA7900 Series		2-247
LM79L00 Series	MC79L00 Series		2-77
LM79M00 Series	uA79M00 Series		2-253
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SG3842/3/4/5	UC3842/3/4/5		3-21
SPRAGUE	DIRECT TI REPLACEMENT		PAGE NO.
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ULN8195	TL595		2-143
UNITRODE	DIRECT TI REPLACEMENT	SUGGESTED TI REPLACEMENT	PAGE NO.
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UC317	LM317		2-9
UC337	LM337		2-17
UC494	TL494		2-123
UC494A	TL594		2-143
UC495	TL495		2-123
UC495A	TL595		3-143
UC2842/3/4/5	UC2842/3/4/5		3-21
UC3842/3/4/5	UC3842/3/4/5		3-21
UC3846/UC2846	UC3846/UC2846		2-263
UC3847/UC2847	UC3847/UC2847		2-263
UC7800 Series	uA7800 Series		2-221
UC7800A Series		TL780-00 Series	2-169
UC7900 Series	uA7900 Series		2-247

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**SERIES REGULATORS**

**Bias Current**

The difference between input and output currents.

NOTE: This is sometimes referred to as quiescent current.

**Current-Limit Sense-Voltage**

The voltage that is a function of the load current and is normally used for control of the current-limiting circuitry. This is the current-sense voltage at which current limiting occurs.

**Dropout Voltage**

The low input-to-output differential voltage at which the circuit ceases to regulate against further reductions in input voltage.

**Feedback Sense Voltage**

The voltage that is a function of the output voltage and is used for feedback control of the regulator.

**Input Regulation**

The change in output voltage, often expressed as a percentage of output voltage, for a change in input voltage from one level to another level.

NOTE: Sometimes this characteristic is normalized with respect to the input voltage change.

**Output Noise Voltage**

The rms output noise voltage, sometimes expressed as a percentage of the dc output voltage, with constant load and no input ripple.

**Output Regulation**

The change in output voltage, often expressed as a percentage of output voltage, for a change in load current from one level to another level.

**Output Voltage Change with Temperature**

The percentage change in the output voltage for a change in temperature. This is the net change over the total temperature range.

**Output Voltage Long-Term Drift**

The change in output voltage over a long period of time.

**Peak Output Current**

The maximum output current that can be obtained from the regulator due to limiting circuitry within the regulator.

**Reference Voltage**

The voltage that is compared with the feedback sense voltage to control the regulator.

**Ripple Rejection**

The ratio of the peak-to-peak input ripple voltage to the peak-to-peak output ripple voltage.

NOTE: This is the reciprocal of ripple sensitivity.



# GLOSSARY

## VOLTAGE-REGULATOR TERMS AND DEFINITIONS

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### Ripple Sensitivity

The ratio of the peak-to-peak output ripple voltage, sometimes expressed as a percentage of output voltage, to the peak-to-peak input ripple voltage.

NOTE: This is the reciprocal of ripple rejection.

### Short-Circuit Output Current

The output current of the regulator with the output shorted to ground.

### Standby Current

The input current drawn by the regulator with no output load and no reference voltage load.

### Temperature Coefficient of Output Voltage ( $\alpha_{VO}$ )

The ratio of the change in output voltage, usually expressed as a percentage of output voltage, to the change in temperature. This is the average value for the total temperature change.

$$\alpha_{VO} = \pm \left[ \frac{V_O \text{ at } T_2 - V_O \text{ at } T_1}{V_O \text{ at } 25^\circ\text{C}} \right] \left[ \frac{100\%}{T_2 - T_1} \right]$$





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**SHUNT REGULATORS**

NOTE: These terms and symbols are based on JEDEC and IEC standards for voltage regulator diodes.

**Anode**

The electrode to which the regulator current flows within the regulator when it is biased for regulation.

**Cathode**

The electrode from which the regulator current flows within the regulator when it is biased for regulation.

**Dynamic Impedance  $|z_{KA}|$**

The quotient of a change in voltage across the regulator and the corresponding change in current through the regulator when it is biased for regulation.

**Noise Voltage ( $V_{nz}$ )**

The rms noise voltage with the regulator biased for regulation and with no input ripple.

**Reference Input Voltage ( $V_{ref}$ ) (of an adjustable shunt regulator)**

The voltage at the reference input terminal with respect to the anode terminal.

**Regulator Current ( $I_z$ )**

The dc current through the regulator when it is biased for regulation.

**Regulator Current near Lower Knee of Regulation Range ( $I_{zK}$ )**

The regulator current near the lower limit of the region within which regulation occurs; this corresponds to the breakdown knee of a regulator diode.

**Regulator Current at Maximum Limit of Regulation Range ( $I_{zM}$ )**

The regulator current above which the differential resistance of the regulator significantly increases.

**Regulator Voltage ( $V_z$ )**

The dc voltage across the regulator.

**Shunt Regulator**

A device having a voltage-current characteristic similar to that of a voltage-regulator diode. It is normally biased to operate in a region of low differential resistance (corresponding to the breakdown region of a regulator diode) and develops across its terminals an essentially constant voltage throughout a specified current range.

**Temperature Coefficient of Reference Voltage ( $\alpha V_{ref}$ )**

The ratio of the change in reference voltage to the change in temperature. This is the average value for the total temperature change.

To obtain a value in ppm/°C:

$$\alpha V_{ref} = \left[ \frac{V_{ref} \text{ at } T_2 - V_{ref} \text{ at } T_1}{V_{ref} \text{ at } 25^\circ\text{C}} \right] \left[ \frac{10^6}{T_2 - T_1} \right]$$