



Quality, Reliability, and Process Flows

Corporate Views on Quality and Reliability

Cypress believes in product excellence. Excellence can only be defined by how the users perceive both our product quality and reliability. If you, the user, are not satisfied with every device that is shipped, then product excellence has not been achieved.

Product excellence does not occur by following the industry norms. It begins by being better than one's competitors, with better designs, processes, controls and materials. Therefore, product quality and reliability are built into every Cypress product from the beginning.

Some of the techniques used to insure product excellence are the following:

- Product Reliability is built into every product design, starting from the initial design conception.
- Product Quality is built into every step of the manufacturing process through stringent inspections of incoming materials and conformance checks after critical process steps.
- Stringent inspections and reliability conformance checks are done on finished product to insure the finished product quality requirements are met.
- Field data test results are encouraged and tracked so that accelerated testing can be correlated to actual use experiences.

Product Testing Categories

Three different testing categories are offered by Cypress:

1. Commercial operating range product: 0°C to +70°C.
2. Industrial operating range product: -40°C to +85°C.
3. Military SMD (Standard Military Drawing) product processed to QML Mil PRF 38535; Military operating range: -55°C to +125°C.

Military Product Assurance

Cypress under the QML program, uses MIL-STD-883 and MIL-PRF-38535 as baseline documents to determine our Test Methods, Procedures and General Specifications for Semiconductors.

Cypress's Military components and SMD products are processed per MIL-STD-883 using methods 5004 and 5005 to baseline our screening and quality conformance procedures. Refer to *Tables 3-7* for the baseline flows and requirements. The processing performed by Cypress results in a product that meets the class B screening requirements as specified by these methods. Every device shipped, as a minimum, meets these requirements.

Commercial Product Assurance

Cypress is an ISO9000 certified supplier. All commercial and industrial temperature range products are manufactured using the same controlled systems as our QML military product. *Tables 1* and *2* define the 100% screening and conformance inspection for commercial and industrial temp range product.

Table 1. Cypress Commercial and Industrial Product Screening Flows—Components

Screen	MIL-STD-883 Method	Product Temperature Ranges	
		Commercial 0°C to +70°C; Industrial –40°C to +85°C	
		Plastic	Hermetic
Visual/Mechanical <ul style="list-style-type: none"> Internal Visual Hermeticity <ul style="list-style-type: none"> —Fine Leak —Gross Leak 	2010 1014, Cond A or B (sample) 1014, Cond C	0.4% AQL Does Not Apply Does Not Apply	100% LTPD = 5 100%
Final Electrical <ul style="list-style-type: none"> Static (DC), Functional, and Switching (AC) Tests 	Per Device Specification 1. At Hot Temperature and Power Supply Extremes	100%	100%
Cypress Quality Lot Acceptance <ul style="list-style-type: none"> External Visual Final Electrical Conformance 	2009 Cypress Method 17-00064	461/0 461/0	461/0 461/0

Table 2. Cypress Commercial and Industrial Product Screening Flows—Modules

Screen	MIL-STD-883 Method	Product Temperature Ranges
		Commercial 0°C to +70°C; Industrial –40°C to +85°C
Final Electrical <ul style="list-style-type: none"> Static (DC), Functional, and Switching (AC) Tests 	Per Device Specification 1. At 25°C and Power Supply Extremes 2. At Hot Temperature and Power Supply Extremes	100% 100%
Cypress Quality Lot Acceptance <ul style="list-style-type: none"> External Visual Final Electrical Conformance 	2009 Cypress Method 17-00064	Per Cypress Module Specification Per Cypress Module Specification 1

Table 3. Cypress QML/JAN/SMD/Military Product Screening Flows for Class B

Screen	Screening Per Method 5004 of MIL-STD-883	Product Temperature Ranges –55°C to +125°C	
		QML/JAN/SMD/Military Components ^[1]	Military Modules
Visual/Mechanical <ul style="list-style-type: none"> Internal Visual Temperature Cycling Constant Acceleration Hermeticity: <ul style="list-style-type: none"> —Fine Leak —Gross Leak 	Method 2010, Cond B Method 1010, Cond C, (10 cycles) Method 2001, Cond E (Min.), Y1 Orientation Only Method 1014, Cond A or B Method 1014, Cond C	100% 100% 100% 100% 100%	N/A 100% N/A N/A 100%
Burn-in <ul style="list-style-type: none"> Pre-Burn-in Electrical Parameters Burn-in Test Post-Burn-in Electrical Parameters Percent Defective Allowable (PDA) 	Per Applicable Device Specification Method 1015, Cond D, 160 Hrs at 125°C Min. or 80 Hrs at 150°C Per Applicable Device Specification Maximum PDA, for All Lots	100% 100% 100% 5%	 100% 100% (48 Hours at 125°C) 100% 5%
Final Electrical Tests <ul style="list-style-type: none"> Static Tests Functional Tests Switching 	Method 5005 Subgroups 1, 2, and 3 Method 5005 Subgroups 7, 8A, and 8B Method 5005 Subgroups 9, 10, and 11	100% Test to Applicable Device Specification 100% Test to Applicable Device Specification 100% Test to Applicable Device Specification	100% Test to Applicable Device Specification 100% Test to Applicable Device Specification 100% Test to Applicable Device Specification
Quality Conformance Tests <ul style="list-style-type: none"> Group A Group B Group C^[2] Group D^[2] 	Method 5005, See <i>Table 4</i> Method 5005, See <i>Table 5</i> Method 5005, See <i>Table 6</i> Method 5005, See <i>Table</i>	Sample Sample Sample Sample	Sample Sample Sample Sample
External Visual	Method 2009	100%	100%

Notes:

1. QML product is allowed a reduction in screening requirements with DSCC approval per MIL-PRF-38535.
2. Group C and D end-point electrical tests for QML/SMD/Military Grade products are performed to Group A subgroups 1, 2, 3, 7, 8A, 8B, 9, 10, 11, or per JAN Slash Sheet.

Table 4. Group A Test Descriptions

Sub-group	Description	Sample Size/Accept No.	
		Components	Modules ^[3]
1	Static Tests at 25°C	116/0	116/0
2	Static Tests at Maximum Rated Operating Temperature	116/0	116/0
3	Static Tests at Minimum Rated Operating Temperature	116/0	116/0
4	Dynamic Tests at 25°C	116/0	116/0
5	Dynamic Tests at Maximum Rated Operating Temperature	116/0	116/0
6	Dynamic Tests at Minimum Rated Operating Temperature	116/0	116/0
7	Functional Tests at 25°C	116/0	116/0
8A	Functional Tests at Maximum Temperature	116/0	116/0
8B	Functional Tests at Minimum Temperature	116/0	116/0
9	Switching Tests at 25°C	116/0	116/0
10	Switching Tests at Maximum Temperature	116/0	116/0
11	Switching Tests at Minimum Temperature	116/0	116/0

Notes:

3. Military Grade Modules are processed to proposed JEDEC standard flows for MIL-STD-883 compliant modules. Alternate Group A method as detailed in JC-13-BP-123A.
4. Sample size is based upon leads taken from a minimum of 3 devices. In-line monitor performed.
5. Sample size is based upon leads taken from a minimum of 4 devices. In-line monitor performed.

Cypress uses an LTPD sampling plan that was developed by the Military to assure product quality. Testing is performed to the subgroups found to be appropriate for the particular device type. All Military products have a Group A sample test performed on each inspection lot per MIL-PRF-38535 or MIL-STD-883 and the applicable device specification.

Table 5. Group B Quality Tests

Sub-group	Description	Quantity/Accept # or LTPD	
		Components	Modules ^[3]
2	Resistance to Solvents, Method 2015	3/0	3/0
3	Solderability, Method 2003 ^[4]	22/0	3
5	Bond Strength, Method 2011 ^[5]	15/0	NA

Group B testing is performed for each inspection lot. An inspection lot is defined as a group of material of the same device type, package type and lead finish built within a six week seal period and submitted to Group B testing at the same time.

Table 6. Group C Quality Tests

Sub-group	Description	LTPD	
		Components	Modules ^[3]
1	Steady State Life Test, End-Point Electricals, Method 1005, Cond D	45/0	15/0

Group C tests for all Military Grade products are performed on one device type from one inspection lot representing each technology. Sample tests are performed per MIL-PRF-38535/MIL-STD-883 from each four calendar quarters production of devices, which is based upon the die fabrication date code.

End-point electrical tests and parameters are performed per the applicable device specification.

Table 7. Group D Quality Tests (Package Related)

Sub-group	Description	Quantity/Accept # or LTPD	
		Components	Modules ^[6]
1	Physical Dimensions, Method 2016	15/0	15/0
2	Lead Integrity, Seal: Fine and Gross Leak, Method 2004 and 1014	45/0 ^[4]	15/0 N/A for Seal
3	Thermal Shock, Temp-Cycling, Moisture Resistance, Seal: Fine and Gross Leak, Visual Examination, End-Point, Electricals, Methods 1011, 1010, 1004, and 1014	15/0	15/0 N/A for Moisture Resistance; N/A for Fine Leak
4	Mechanical Shock, Vibration - Variable Frequency, Constant Acceleration, Seal: Fine and Gross Leak, Visual Examination, End-Point Electricals, Methods 2002, 2007, 2001, and 1014	15/0	15/0 N/A for Constant Acceleration; N/A for Fine Leak
5	Salt Atmosphere, Seal: Fine & Gross Leak, Visual Examination, Methods 1009 & 1014	15/0	15/0 N/A for Fine Leak
6	Internal Water-Vapor Content; 5000 ppm maximum @ 100°C. Method 1018	3(0) or 5(1)	N/A
7	Adhesion of Lead Finish, ^[7] Method 2025	15/0	15/0
8	Lid Torque, Method 2024 ^[8]	5(0)	N/A

Group D tests for all Military Grade procedures are performed per MIL-PRF-38535/MIL-STD-883 on each package type from each six months of production, based on the identification (or date) codes.

End-point electrical tests and parameters are performed per the applicable device specification.

Military Modules

- Military Temperature Grade Modules are designated with an 'M' suffix only. These modules are screened to standard combined flows and tested at both military temperature extremes.
- MIL-STD-883 Equivalent Modules are processed to proposed JEDEC standard flows for MIL-STD-883 compliant

Notes:

- Does not apply to leadless chip carriers.
- Based on the number of leads.
- Applies only to packages with glass seals.

modules. All MIL-STD-883 equivalent modules are assembled with fully compliant MIL-STD-883 components.

Product Screening Summary Components

Commercial and Industrial Product

- Screened per *Table 1* product assurance flows
- Hermetic and molded packages available
- Incoming mechanical and electrical performance guaranteed:
 - 0.02% AQL Electrical Sample test performed on every lot prior to shipment
 - 0.01% AQL External Visual Sample inspection
- Electrically tested to Cypress data sheet

Ordering Information

- Order Standard Cypress part number
- Parts marked the same as ordered part number
Ex: CY7C122-15PC, PALC22V10-25PI

Military Product

- SMD and Military components are manufactured in compliance with paragraph 1.2.1 of MIL-STD-883. Compliant products are identified by an 'MB' suffix on the part number (CY7C122-25DMB) and the letter "C"
- QML devices are manufactured in accordance with MIL-PRF-38535. Compliant products are identified with the letter "Q."
- Military devices electrically tested to:
 - SMD devices are electrically tested to the applicable standard military drawing specifications
 - OR
 - Cypress data sheet specifications
- All devices supplied in hermetic packages
- Quality conformance inspection: Method 5005, Groups A, B, C, and D performed as part of the standard process flow
- Burn-in performed on all devices
 - Cypress detailed circuit specification for non-JAN devices
- Static functional and switching tests performed at 25°C as well as temperature and power supply extremes on 100% of the product in every lot

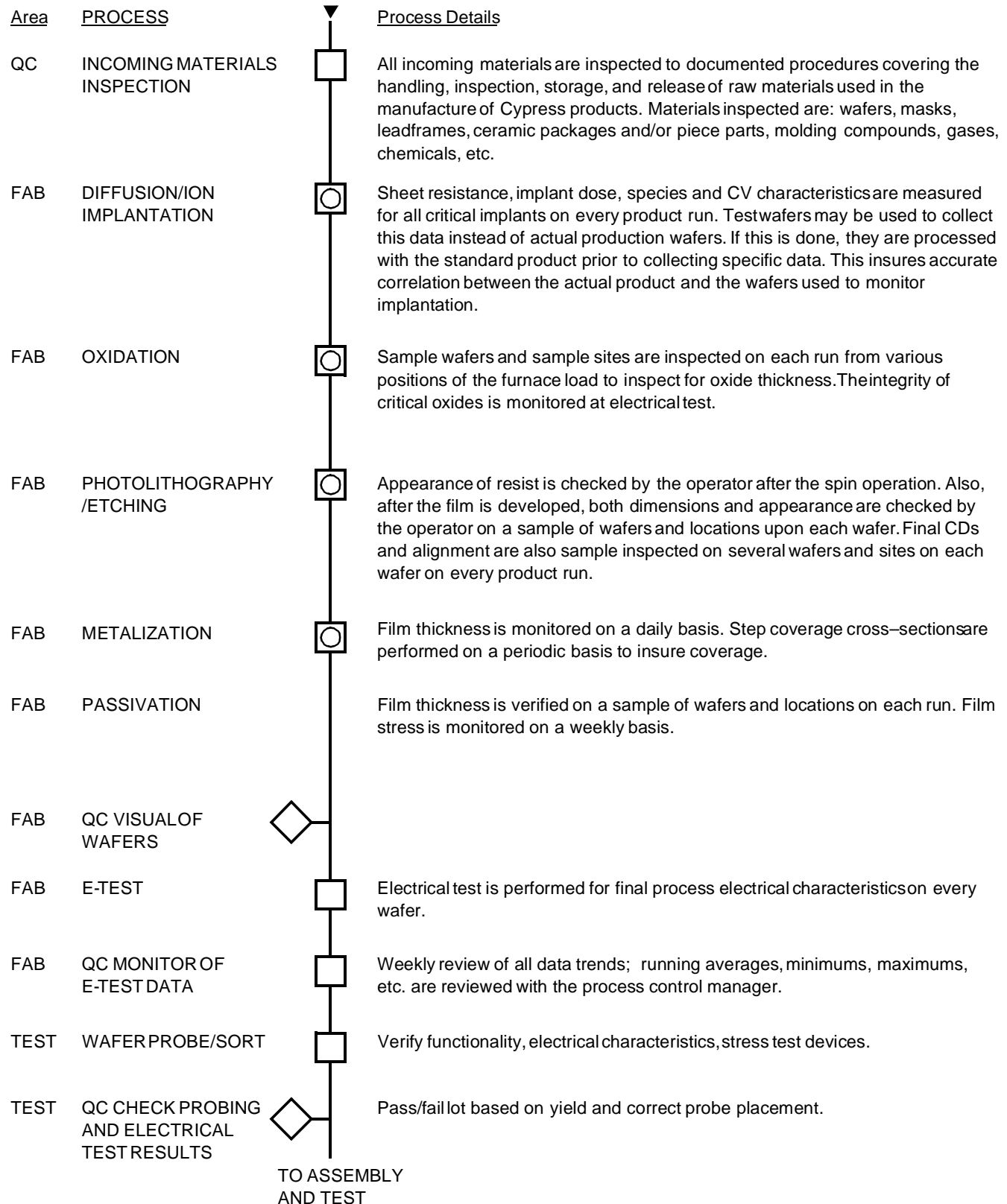
Ordering Information

SMD Product:

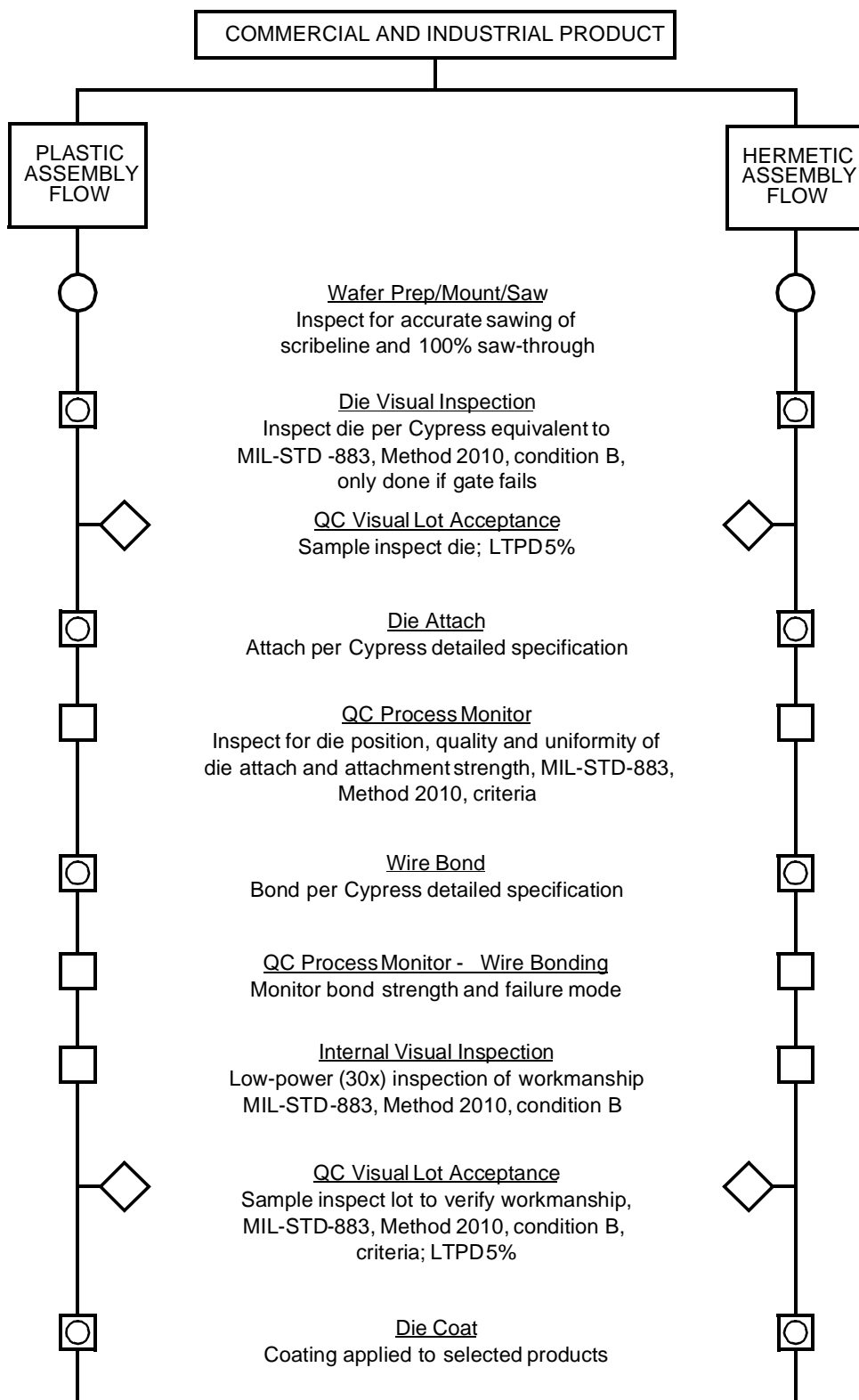
- Order per military document
- Marked per military document
Ex: 5962-8867001LA

Military Product:

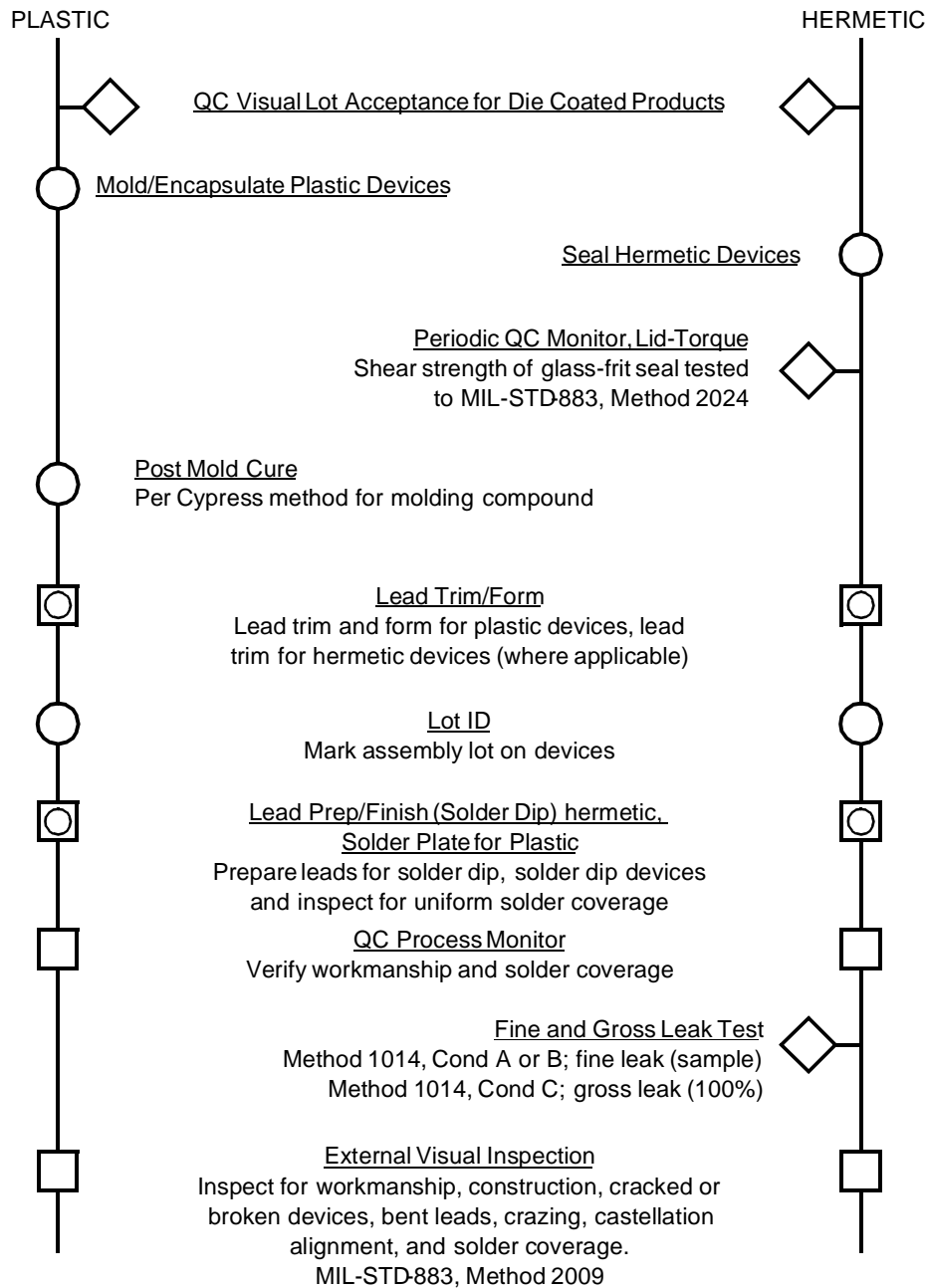
- Order per Cypress standard military part number
- Marked the same as ordered part number
Ex: CY7C122-25DMB

Product Quality Assurance Flow—Components


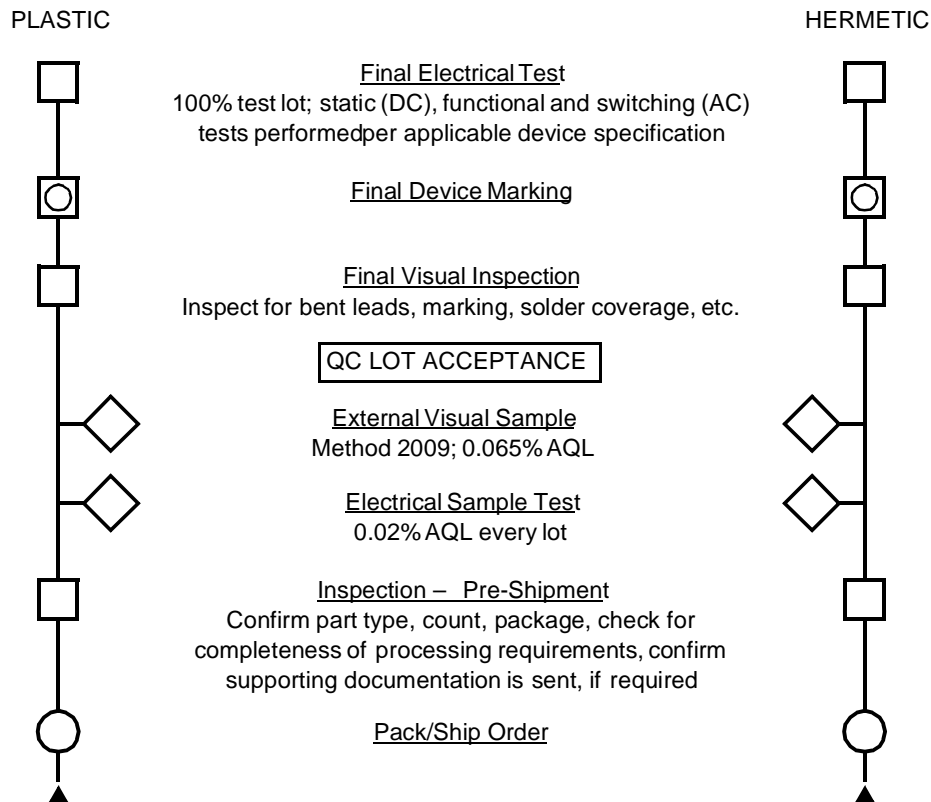
Product Quality Assurance Flow—Components (continued)
Commercial and Industrial Product







Product Quality Assurance Flow—Components (continued)
Commercial and Industrial Product



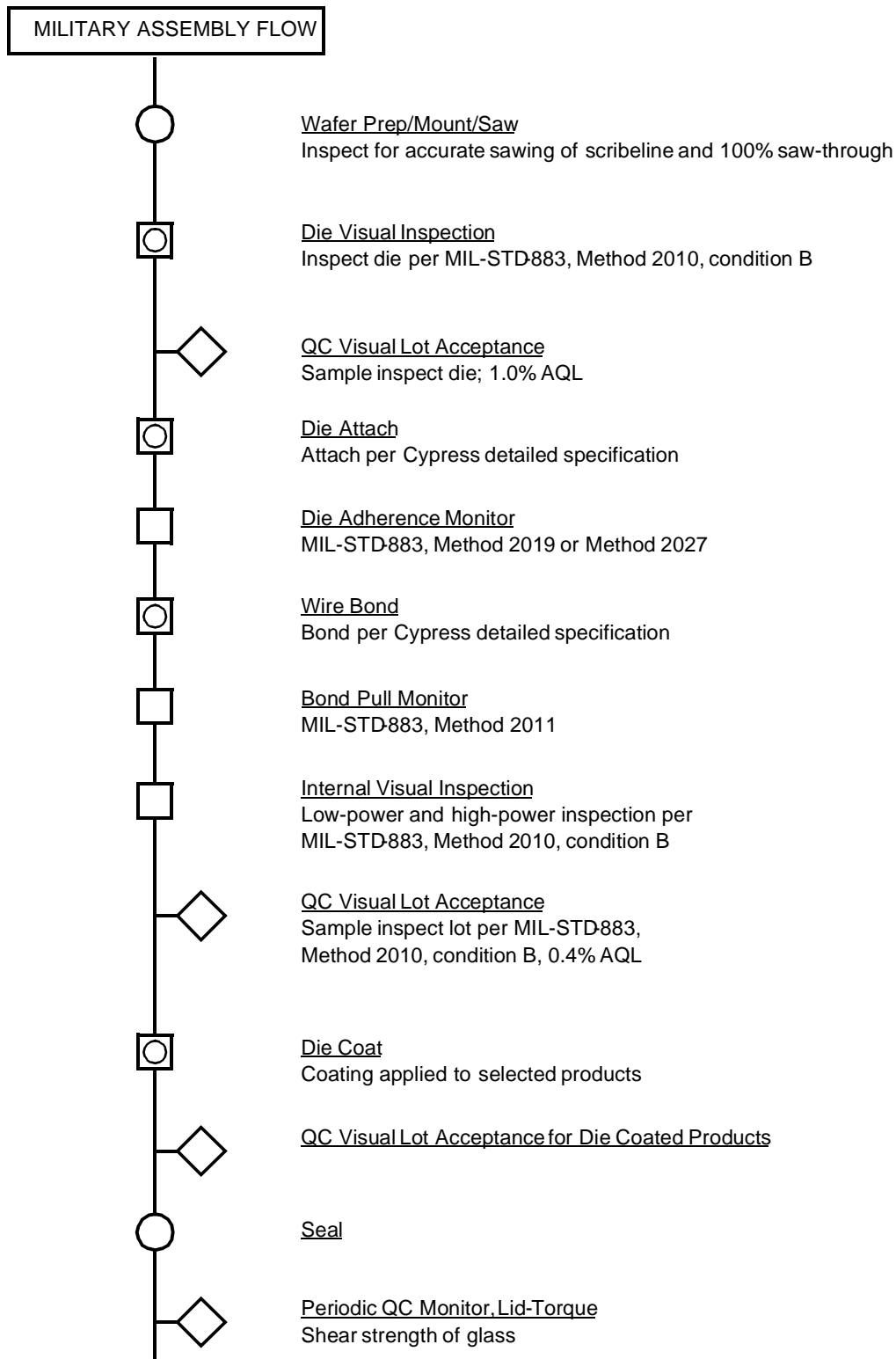
Product Quality Assurance Flow—Components (continued)
Commercial and Industrial Product



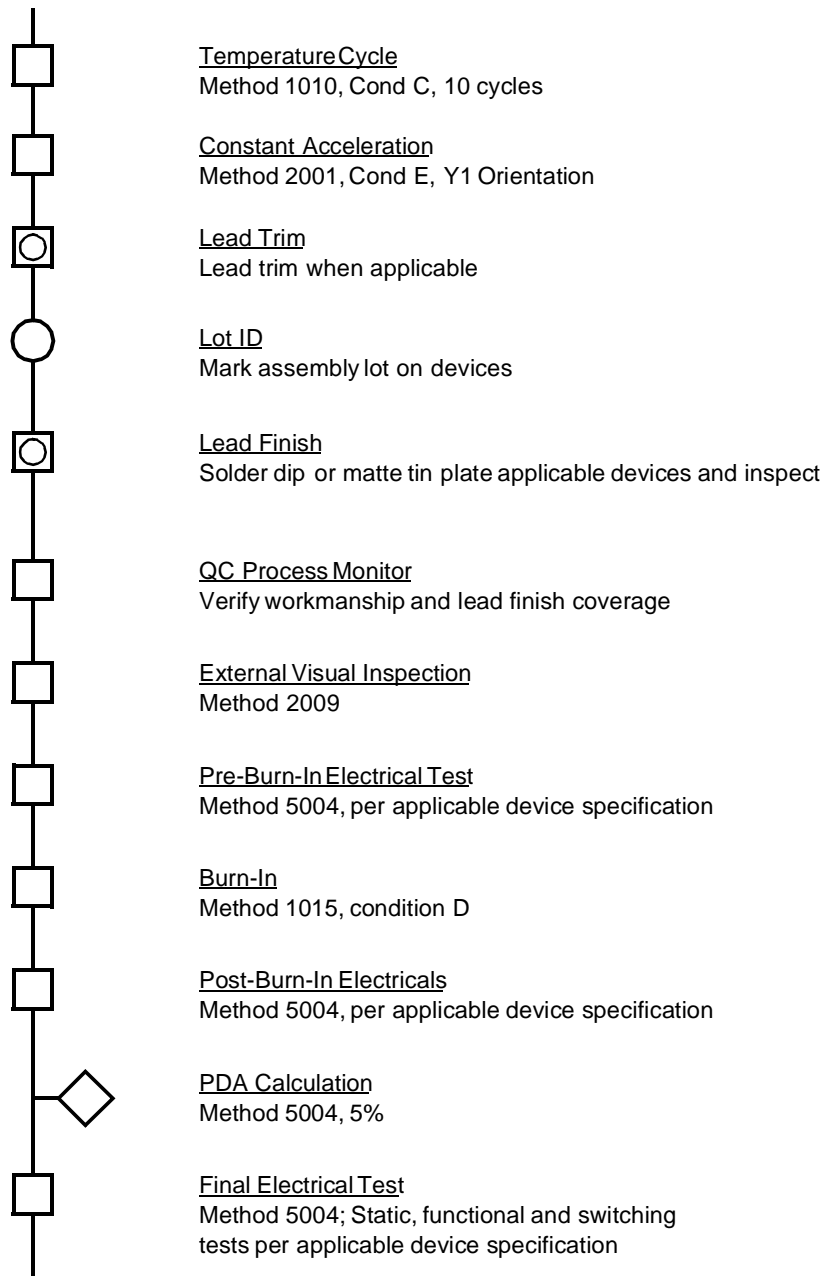
Key

-  Production Process
-  Test/Inspection
-  Production Process and Test Inspection
-  QC Sample Gate and Inspection

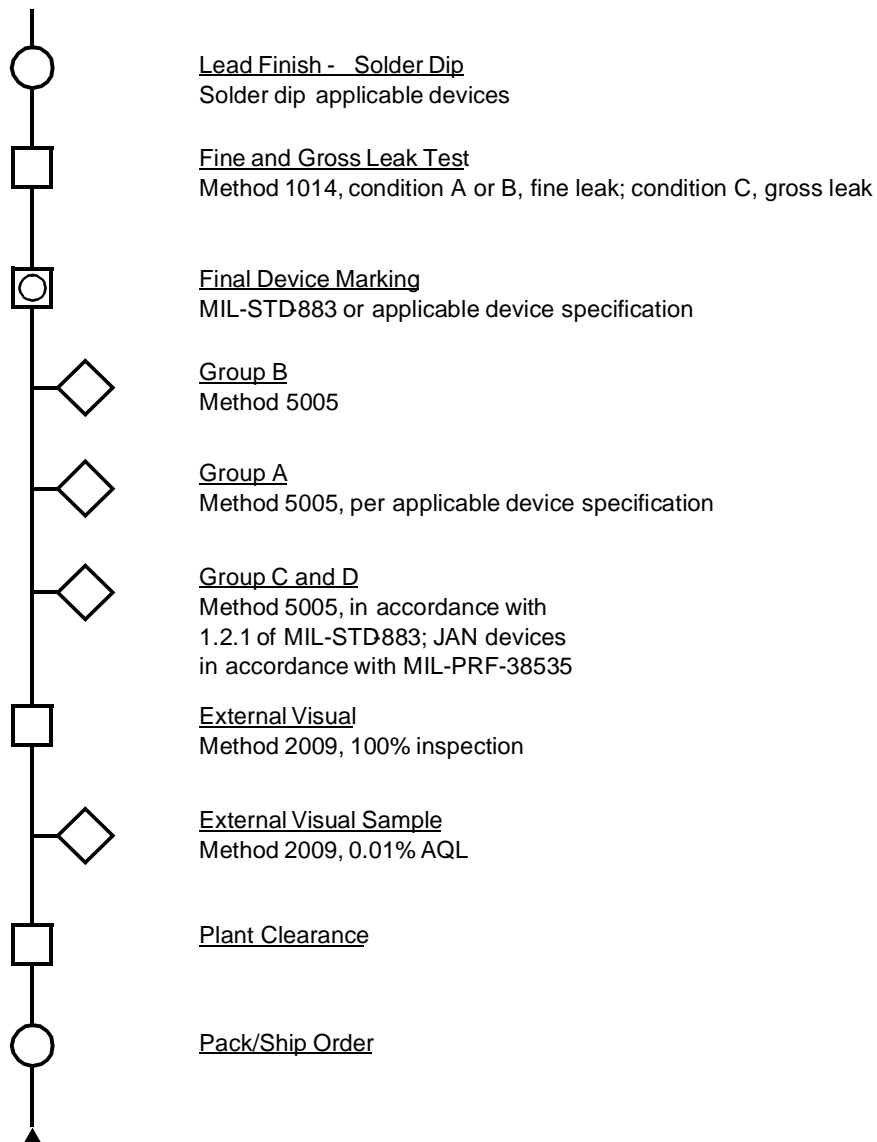
Product Quality Assurance Flow—Components (continued)
Military Components







Product Quality Assurance Flow—Components (continued)
Military Components

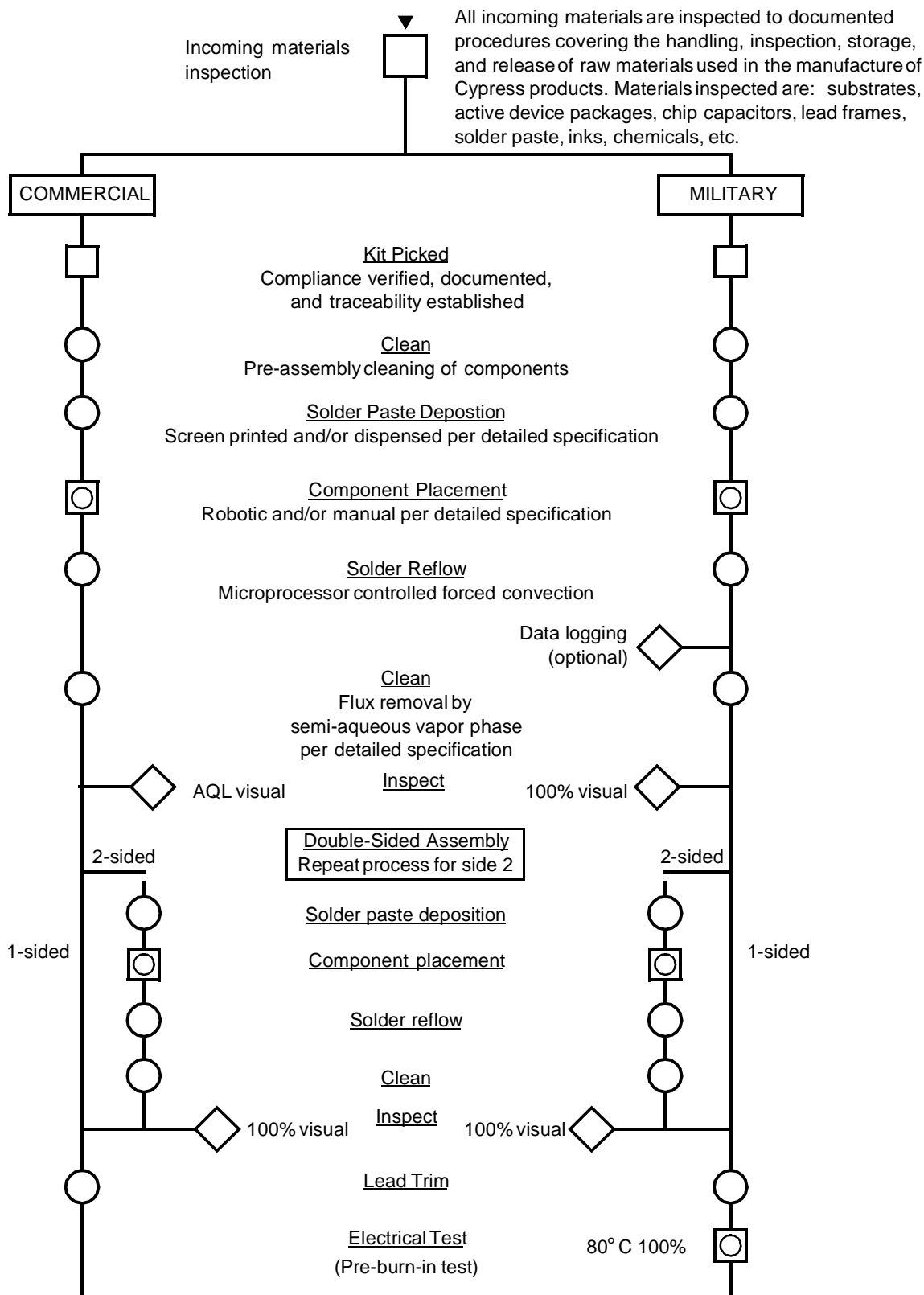


Product Quality Assurance Flow—Components (continued)
Military Components

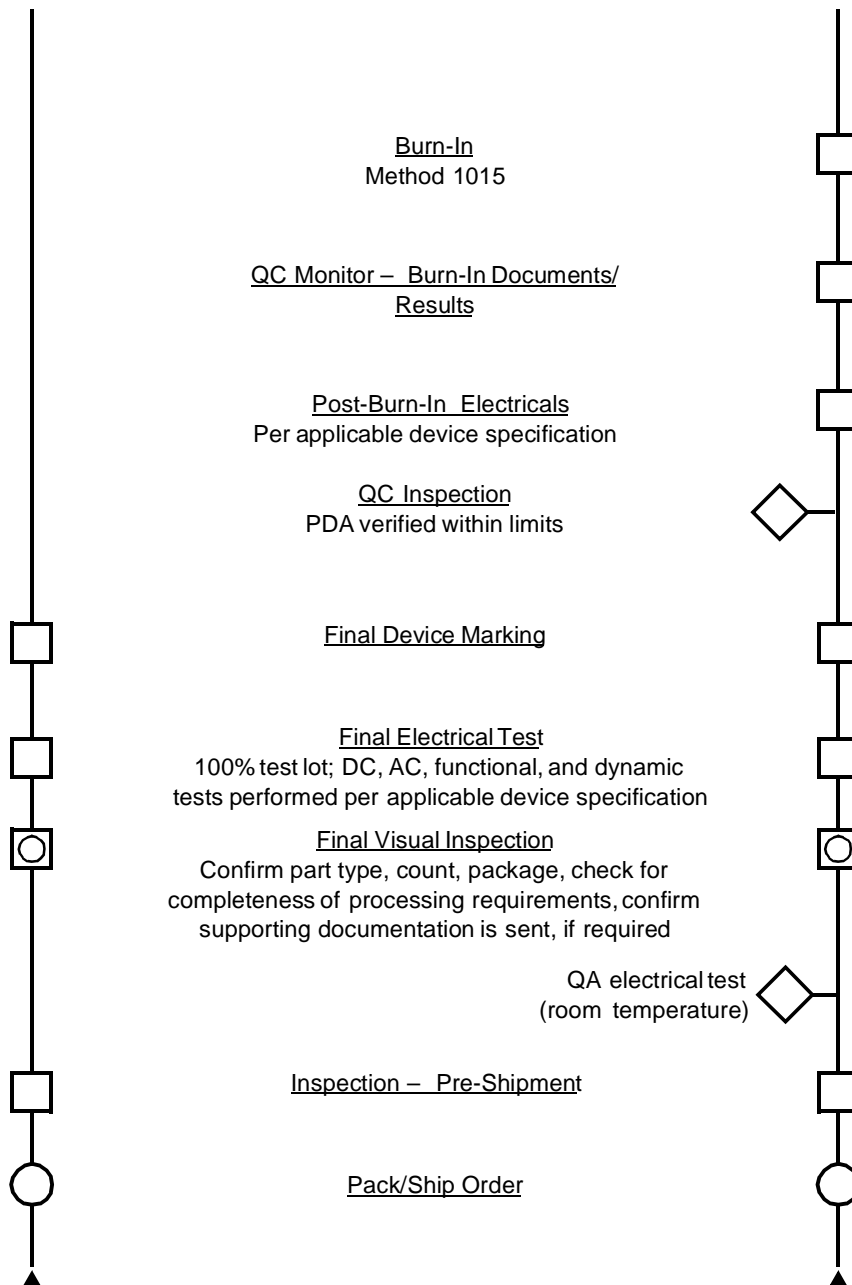


Key

-  Production Process
-  Test/Inspection
-  Production Process and Test Inspection
-  QC Sample Gate and Inspection

Product Quality Assurance Flow—Modules


Product Quality Assurance Flow—Modules (continued)



Key

- Production Process
- Test/Inspection
- ◻ Production Process and Test Inspection
- ◊ QC Sample gate and inspection

Reliability Monitor Program

The Reliability Monitor Program is a documented Cypress procedure that is described in Cypress specification #25-00008, which is available to Cypress customers upon request. This specification describes a procedure that provides for periodic reliability monitors to insure that all Cypress products comply with established goals for reliability improvement and to minimize reliability risks for Cypress customers.

The Reliability Monitor Program monitors our most Advanced technologies and packages. In addition, we also monitor all high-volume product, new qualified products, using worse-case technology and package combinations. Every technology produced at a given fabrication site (Tech. – Fab.) and all assembly houses are monitored at least quarterly. Detailed failure analyses are performed on all failures and corrective actions are implemented then appropriate. A summary of the Reliability Monitor Program is shown below.

Quarterly Reliability Monitor Test Matrix

Stress	Sampling Strategy	Lots Tested per Quarter
HTOL	Technology–Fab Location	>20
HTSSL	Technology–Fab Location	>20
TEV	Technology–Fab Location	>20
DRET	Technology–Fab Location	4
HAST	Technology–Fab Location	>10
	Package–Assembly Location	>15
TC	Technology–Fab Location	>10
	Package–Assembly Location	>15
PCT	Package–Assembly Location	>25

Reliability Monitor Test Conditions

Test	Abbrev.	Temp. (°C)	R.H. (%)	Bias	Sample Size	LTPD	Read Points (hrs.)
High-Temperature Operating Life	EFR	+125	N/A	5.75V Dynamic	500	0.5	96
High-Temperature Operating Life	HTOL	+125	N/A	5.75V Dynamic	116	2	96, 500, 1000, 2000
High-Temperature Steady-State Life	HTSSL	+125	N/A	5.75V Static	116	2	96, 500, 1000, 2000
Data Retention for Plastic Packages	DRET	+165	N/A	N/A	76	3	168, 1000
Data Retention for Ceramic Packages	DRET2	+250	N/A	N/A	76	3	168, 500
Pressure Cooker	PCT	+121	100	N/A	76	3	96, 168
Highly Accelerated Stress Test	HAST	+140/130	85	5.5V Static	76	3	128
Temperature Cycling	TC	–65 to +150°C	N/A	N/A	45	5	300, 1000 Cycles
Temperature Extreme Verification	TEV	Commercial Hot & Cold 0 to +70°C	N/A	N/A	116	2	N/A