



QUALITY AND RELIABILITY TESTING STANDARDS

Quality and Reliability Test Data

Reliability Test

- ▼ In addition to the reliability assurance level check mentioned above, we also perform reliability tests to identify the design limit and destructive failure modes, and to predict the field reliability of products.
- ▼ Reliability tests are roughly classified into durability, thermal environment, and mechanical tests. The test methods used are specified in the Japan Industrial Standards (JIS), the Standards of the Electronic Industry Association of Japan (EIAJ), the U.S. MIL Standards (MIL), International Electro technical Commission (IEC), and some others. We use our own standardized test methods in accordance with these institutionalized standards.

Test	Test items	Test conditions	Purpose
Durability	Constant operation	$T_a = 25^{\circ}\text{C}, \pm 5^{\circ}\text{C}, I_F (\text{MAX.})$	Evaluates product durability against long-term electrical stresses.
	High temperature storage	$T_a = T_{eq} (\text{MIN.}), 1,000\text{hrs}$	Evaluates product durability after long-term storage at high temperature.
	Low temperature storage	$T_a = T_{eq} (\text{MIN.}), 1,000\text{hrs}$	Evaluates product durability following long-term storage in low temperature.
	High humidity storage	$T_a = 60^{\circ}\text{C}, \text{RH}=90\%, 1,000\text{hrs}$	Evaluates product durability in long-term storage in high humidity.
Thermal environment	Soldering heat resistance	$260^{\circ}\text{C}, 5\text{seconds}$	Evaluates resistance to thermal stress caused by soldering.
	Temperature cycle	$T_a = [T_{eq_MIN} \rightarrow T_{eq_MAX}] \times 30 \text{ cycles}$	Evaluates product durability against sudden temperature variations.
Mechanical environment	Solder ability	$230^{\circ}\text{C}, 5 \text{ seconds (with flux)}$	Evaluates the solder ability of terminals.
	Vibration	$[200\text{m/s}^2, 100 \text{ to } 2,000\text{Hz}, 4\text{min}] \times 4 \text{ cycles each ways in X, Y and Z directions.}$	Evaluates resistance to vibrations during transit or operation.
	Mechanical shock	$[15,000\text{m/s}^2, 0.5\text{msec}] \times 30 \text{ cycles each in X, Y and Z directions.}$	Evaluates structural and mechanical resistance to serve mechanical shock.
	Terminal strength	Tensile strength : constant load, 5 seconds. Bending strength : constant load, bent 90 degree in both directions once.	Evaluates product durability against mechanical stress applied to terminals.



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Outdoor Reliability

■ Test items and results

Test Item	Standard Test Method	Test Conditions	Note	Number of Damaged
Resistance to Soldering Heat	JIS C 7021 (1977) A-1	Tsol=260±5°C, 10seconds. (3mm from the base of the epoxy bulb)	1 time	0/100
Solder ability	JIS C 7021 (1977) A-2	Tsol=235±5°C, 5 seconds. (using flux)	1 time over 95%	0/100
Heat Shock	JIS C 7021 (1977) A-3	0°C~100°C 5 seconds. 15 seconds.	100 cycles	0/100
Temperature Cycle	JIS C 7021 (1977) A-4	-40°C~25°C~100°C ~25°C 30min. 5 min. 30min. 5min	100 cycles	0/100
High Humidity Heat Cycle	JIS C 7021 (1977) A-5	30°C~65°C~-10°C 90%RH 24hrs./1cycle	10 cycles	0/100
Mechanical Strength of Terminal (bend test)	JIS C 7021 (1977) A-11	Load 25N(0.25kgf) 0°C~90°C~0°C bend 3 times	No noticeable damage	0/100
Mechanical Strength of Terminal (pull test)	JIS C 7021 (1977) A-11	Load 10N(1kgf) 30±1sec.	No noticeable damage	0/100
High Temperature Storage	JIS C 7021 (1977) B-10	Ta=100°C	1000hrs.	0/100
Humidity Heat	JIS C 7021 (1977) B-11	Ta=60°C, RH=90%	1000hrs.	0/100
Low Temperature Storage	JIS C 7021 (1977) B-12	Ta=-40°C	1000hrs.	0/100
Life Test	JIS C 7035 (1985)	Ta=25°C, Ir=30mA	1000hrs.	0/100
High Humidity Heat Life Test		Ta=60°C, RH=90%, Ir=20mA	500hrs.	0/100
Low Temperature Life Test		Ta=-30°C, Ir=20mA	1000hrs.	0/100