

Cree® LED Lamp Reliability Test Standard

Criteria for Performing LED Reliability Tests

This application note applies to the following high-brightness-LED products:

- Oval and round LEDs
- P4 LEDs
- Surface-mount PLCC LEDs

For XLamp LED reliability information, refer to the XLamp LED Reliability Application Note (CLD-AP06).

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1. P2 RGB LED Lamps

Tests and Results

Test	Applicable Standards	Test Condition	Note	Number of Damaged
Temperature Cycle	JEITA ED-4701 100 105	-40°C~25°C~100°C~25°C 30 mins, 5 mins, 30 mins, 5 mins	100 cycles	0/100
Thermal Shock*	MIL-STD-202G	-40°C~100°C 30 mins, 30 mins	100 cycles	0/100
Moisture-Resistance Cycle	JEITA ED-4701 200 203	25°C~65°C 90% RH 24 hrs/1cycle	10 cycles	0/100
High-Temperature Storage	JEITA ED-4701 200 201	T _A =100°C	1000 hrs	0/100
Humidity Heat Storage	JEITA ED-4701 100 103	T _A =60°C RH=90%	1000 hrs	0/100
Low-Temperature Storage	JEITA ED-4701 200 202	T _A =-40°C	1000 hrs	0/100
Life Test*	-	T _A =25°C Oval: I _F =35 mA (GB) I _F =50 mA (R) Round: I _F =30 mA (GB) I _F =50 mA (R)	1000 hrs	0/100
High Humidity Heat Life Test*	-	60°C RH=90% I _F =20 mA	500 hrs	0/100
Low Temperature Life Test	-	T _A =-30°C I _F =20 mA	1000 hrs	0/100
Resistance to Soldering Heat*	JEITA ED-4701 300 302	T _{SOL} =260(±5)°C, 10 sec (3 mm from the base of the epoxy bulb)	1 time	0/100
Solderability	JEITA ED-4701 300 303	T _{SOL} =235(±5)°C, 5 sec (using flux)	1 time (over 95%)	0/100
Lead Bend Test	JEITA ED-4701 400 401	Load 5N (0.5 kgf) 0°~90°~0° bend 2 times	No notice- able damage	0/100
Lead Pull Test	JEITA ED-4701 400 401	Load 10N (1 kgf) 10(±1) sec	No notice- able damage	0/100
Electrostatic Discharge Test	AEC (Q101-001)	Human body model 1000 V (forward and reverse current conduct electricity, each 1 time)		0/10

Failure Criteria

Item	Symbol	Test Condition	Criteria for Judgment	
			Min	Max
Forward Voltage	V _F	I _F = 20 mA	-	Initial Data x 1.1
Reverse Current	I _R	V _R = 5 V	-	100 μA
Luminous Flux/Intensity	I _V	I _F = 20 mA	Initial Data x 0.7 (Total degradation) Initial Data x 0.5 (Single lamp degradation)	



2. P2 White LED Lamps

Tests and Results

Test	Applicable Standards	Test Condition	Note	Number of Damaged
Temperature Cycle	JEITA ED-4701 100 105	-40°C~25°C~100°C~25°C 30 mins, 5 mins, 30 mins, 5 mins	100 cycles	0/100
Thermal Shock*	MIL-STD-202G	-40°C~100°C 30 mins, 30 mins	100 cycles	0/100
Moisture-Resistance Cycle	JEITA ED-4701 200 203	25°C~65°C 90% RH 24 hrs/1cycle	10 cycles	0/100
High-Temperature Storage	JEITA ED-4701 200 201	T _A =100°C	1000 hrs	0/100
Humidity Heat Storage	JEITA ED-4701 100 103	T _A =60°C RH=90%	1000 hrs	0/100
Low-Temperature Storage	JEITA ED-4701 200 202	T _A =-40°C	1000 hrs	0/100
Life Test*	-	T _A =25°C Oval: I _F =30 mA Round: I _F =30 mA	1000 hrs	0/100
High Humidity Heat Life Test*	-	60°C RH=90% I _F =20 mA	500 hrs	0/100
Low Temperature Life Test	-	T _A =-30°C I _F =20 mA	1000 hrs	0/100
Resistance to Soldering Heat*	JEITA ED-4701 300 302	T _{SOL} =260(±5)°C, 10 sec (3 mm from the base of the epoxy bulb)	1 time	0/100
Solderability	JEITA ED-4701 300 303	T _{SOL} =235(±5)°C, 5 sec (using flux)	1 time (over 95%)	0/100
Lead Bend Test	JEITA ED-4701 400 401	Load 5N (0.5 kgf) 0°~90°~0° bend 2 times	No notice- able damage	0/100
Lead Pull Test	JEITA ED-4701 400 401	Load 10N (1 kgf) 10(±1) sec	No notice- able damage	0/100
Electrostatic Discharge Test	AEC (Q101-001)	Human body model 1000 V (forward and reverse current conduct electricity, each 1 time)		0/10

Failure Criteria

Item	Symbol	Test Condition	Criteria for Judgment	
			Min	Max
Forward Voltage	V _F	I _F = 20 mA	-	Initial Data x 1.1
Reverse Current	I _R	V _R = 5 V	-	100 µA
Luminous Flux/Intensity	I _V	I _F = 20 mA	Initial Data x 0.7 (Total degradation) Initial Data x 0.5 (Single lamp degradation)	-



3. P4 RGB LED Lamps

Tests and Results

Test	Applicable Standard	Test Condition	Note	Number of Damaged
Temperature Cycle	JEITA ED-4701 100 105	-40°C~25°C~100°C~25°C 30 mins, 5 mins, 30 mins, 5 mins	100 cycles	0/100
Thermal Shock*	MIL-STD-202G	-40°C~100°C 30 mins, 30 mins	100 cycles	0/100
Moisture-Resistance Cycle	JEITA ED-4701 200 203	25°C~65°C 90% RH 24 hrs / 1 cycle	10 cycles	0/100
High-Temperature Storage	JEITA ED-4701 200 201	T _A =100°C	1000 hrs	0/100
Humidity Heat Storage	JEITA ED-4701 100 103	T _A =60°C RH=90%	1000 hrs	0/100
Low-Temperature Storage	JEITA ED-4701 200 202	T _A =-40°C	1000 hrs	0/100
Life Test*	-	T _A =25°C Green, Blue: I _F =30 mA Red, Amber: I _F =70 mA	1000 hrs	0/100
High-Humidity Heat Life Test*	-	60°C RH=90% I _F =20 mA	500 hrs	0/100
Low-Temperature Life Test	-	T _A =-30°C I _F =30 mA	1000 hrs	0/100
Resistance to Soldering Heat*	JEITA ED-4701 300 302	T _{SOL} =260(±5)°C, 10 sec (3 mm from the base of the epoxy bulb)	1 time	0/100
Solder ability	JEITA ED-4701 300 303	T _{SOL} =235(±5)°C, 5 sec (using flux)	1 time (over 95%)	0/100
Lead Bend Test	JEITA ED-4701 400 401	Load 5N (0.5 kgf) 0°~90°~0° bend 2 times	No notice- able damage	0/100
Lead Pull Test	JEITA ED-4701 400 401	Load 10N (1 kgf) 10(±1) sec.	No notice- able damage	0/100
Electrostatic Discharge Test	AEC (Q101-001)	Human body model 1000 V (forward and reverse current conduct electricity, each 1 time)		0/10

Failure Criteria

Item	Symbol	Test Condition	Criteria for Judgment	
			Min	Max
Forward Voltage	V _F	I _F = 30 mA	-	Initial Data x 1.2
Reverse Current	I _R	V _R = 5 V	-	100 μA
Luminous Flux/Intensity	I _V	I _F = 30 mA	Initial Data x 0.65 (Total degradation) Initial Data x 0.5 (Single lamp degradation)	



4. P4 White LED Lamps

Tests and Results

Test	Applicable Standard	Test Condition	Note	Number of Damaged
Temperature Cycle	JEITA ED-4701 100 105	-40°C~25°C~100°C~25°C 30 mins, 5 mins, 30 mins, 5 mins	100 cycles	0/100
Thermal Shock*	MIL-STD-202G	-40°C~100°C 30 mins, 30 mins	100 cycles	0/100
Moisture-Resistance Cycle	JEITA ED-4701 200 203	25°C~65°C 90% RH 24 hrs / 1 cycle	10 cycles	0/100
High-Temperature Storage	JEITA ED-4701 200 201	T _A =100°C	1000 hrs	0/100
Humidity Heat Storage	JEITA ED-4701 100 103	T _A =60°C RH=90%	1000 hrs	0/100
Low-Temperature Storage	JEITA ED-4701 200 202	T _A =-40°C	1000 hrs	0/100
Life Test*	-	T _A =25°C I _F =35 mA	1000 hrs	0/100
High-Humidity Heat Life Test*	-	60°C RH=90% I _F =20 mA	500 hrs	0/100
Low-Temperature Life Test	-	T _A =-30°C I _F =30 mA	1000 hrs	0/100
Resistance to Soldering Heat*	JEITA ED-4701 300 302	T _{SOL} =260(±5)°C, 10 sec (3 mm from the base of the epoxy bulb)	1 time	0/100
Solder ability	JEITA ED-4701 300 303	T _{SOL} =235(±5)°C, 5 sec (using flux)	1 time (over 95%)	0/100
Lead Bend Test	JEITA ED-4701 400 401	Load 5N (0.5 kgf) 0°~90°~0° bend 2 times	No notice- able damage	0/100
Lead Pull Test	JEITA ED-4701 400 401	Load 10N (1 kgf) 10(±1) sec.	No notice- able damage	0/100
Electrostatic Discharge Test	AEC (Q101-001)	Human body model 1000 V (forward and reverse current conduct electricity, each 1 time)		0/10

Failure Criteria

Item	Symbol	Test Condition	Criteria for Judgment	
			Min	Max
Forward Voltage	V _F	I _F = 30 mA	-	Initial Data x 1.2
Reverse Current	I _R	V _R = 5 V	-	100 μA
Luminous Intensity	I _V	I _F = 30 mA	Initial Data x 0.65 (Total degradation) Initial Data x 0.5 (Single lamp degradation)	-



5. TOP SMD LED Lamps

Tests and Results

Type	Test Item	Applicable Standard	Test Condition	Note	Number of Damaged
Environmental Sequence	Temperature Cycle*	JEITA ED-4701 100 105	-40°C~25°C~100°C~25°C 30 mins, 5 mins, 30 mins, 5 mins	100 cycles	0/50
	Thermal Shock*	MIL-STD-202G	-40°C~100°C 30 mins, 30 mins	100 cycles	0/50
	Moisture Resistance	JEITA ED-4701 200 203	25°C~65°C 90% RH 24 hrs / 1 cycle	10 cycles	0/50
	High-Temperature Storage	JEITA ED-4701 200 201	T _A =100°C	500 hrs	0/50
	Humidity Heat Storage	JEITA ED-4701 100 103	T _A =60°C RH=90%	500 hrs	0/50
	Low-Temperature Storage	JEITA ED-4701 200 202	T _A =-40°C	500 hrs	0/50
Operation Sequence	Life Test*	-	T _A =25°C I _F : R=50 mA, G=25 mA, B=25 mA	1000 hrs	0/50
	High-Temperature Life Test*	-	T _A =85°C I _F (single chip): R=30 mA, G=15 mA, B=15 mA I _F (RGB): R=15 mA, G=15 mA, B=15 mA	1000 hrs	0/50
	High-Temperature/High-Humidity Life Test*	-	T _A =60°C, 90%RH I _F (single chip): R=30 mA, G=15 mA, B=15 mA I _F (RGB): R=15 mA, G=15 mA, B=15 mA	500 hrs	0/50
	Low-Temperature Life Test	-	T _A =-40°C I _F : R=30 mA, G=15 mA, B=15 mA	500 hrs	0/50
Destructive Sequence	Resistance to Soldering Heat* (Reflow Soldering)	JEITA ED-4701 300 301	T _{sol} =260°C, 10 sec (Pre-treatment 30°C, 70%, 168 hrs)	2 times	0/50
ESD	Electrostatic Discharge Test	AEC (Q101-001)	Human body model 1000 V (forward and reverse current conduct electricity, each 1 time)		0/50
Physical Sequence	Vibration-Variable Frequency	MIL-STD-883 Method 2007	20G min, 20 to 2000 Hz, 4 cycle, 4 mins, each X ,Y, Z		0/50

Failure Criteria

Item	Symbol	Test Condition	Criteria for Judgment	
			Min	Max
Forward Voltage	V _F	I _F = 20 mA	-	Initial Data x 1.1
Reverse Current	I _R	V _R = 5 V	-	10 μA
Luminous Intensity	I _V	I _F = 20 mA	Initial Data x 0.7	-
Resistance to Soldering Heat		I _F = 20 mA	No dead lamps or visual damage	
Vibration-variable Frequency		I _F = 20 mA	No dead lamps or visual damage	



6. TOP White and Warm White SMD LED Lamps

Tests and Results

Type	Test Item	Applicable Standard	Test Condition	Note	Number of Damaged
Environmental Sequence	Temperature Cycle*	JEITA ED-4701 100 105	-40°C~25°C~100°C~25°C 30 mins, 5 mins, 30 mins, 5 mins	100 cycles	0/50
	Thermal Shock*	MIL-STD-202G	-40°C~100°C 30 mins, 30 mins	100 cycles	0/50
	Moisture Resistance	JEITA ED-4701 200 203	25°C~65°C 90% RH 24 hrs / 1 cycle	10 cycles	0/50
	High-Temperature Storage	JEITA ED-4701 200 201	T _A =100°C	500 hrs	0/50
	Humidity Heat Storage	JEITA ED-4701 100 103	T _A =60°C RH=90%	500 hrs	0/50
	Low-Temperature Storage	JEITA ED-4701 200 202	T _A =-40°C	500 hrs	0/50
Operation Sequence	Life Test* (1 die LV1)	-	T _A =25°C, I _F =35 mA	1000 hrs	0/50
	Life Test*	-	T _A =25°C, I _F =25 mA	1000 hrs	0/50
	High-Temperature Life Test*	-	T _A =85°C, I _F =15 mA	1000 hrs	0/50
	High-Temperature/High-Humidity Life Test*	-	T _A =60°C, 90%RH I _F =15 mA	500 hrs	0/50
	Low-Temperature Life Test	-	T _A =-40°C, I _F =15 mA	500 hrs	0/50
Destructive Sequence	Resistance to Soldering Heat* (Reflow Soldering)	JEITA ED-4701 300 301	T _{SOL} =260°C, 10 sec (Pre-treatment 30°C, 70%, 168 hrs)	2 times	0/50
ESD	Electrostatic Discharge Test	AEC (Q101-001)	Human body model 1000 V (forward and reverse current conduct electricity, each 1 time)		0/50
Physical Sequence	Vibration-Variable Frequency	MIL-STD-883 Method 2007	20G min, 20 to 2000 Hz, 4 cycle, 4 mins, each X ,Y, Z		0/50

Failure Criteria

Item	Symbol	Test Condition	Criteria for Judgment	
			Min	Max
Forward Voltage	V _F	I _F = 20 mA	-	Initial Data x 1.1
Reverse Current	I _R	V _R = 5 V	-	10 μA
Luminous Intensity	I _V	I _F = 20 mA	Initial Data x 0.7	-
Resistance to Soldering Heat		I _F = 20 mA	No dead lamps or visual damage	
Vibration-variable Frequency		I _F = 20 mA	No dead lamps or visual damage	



7. Power SMD and Power SMD with Lens LED Lamps

Tests and Results

Type	Test Item	Applicable Standard	Test Condition	Note	Number of Damaged
Environmental Sequence	Temperature Cycle*	JEITA ED-4701 100 105	-40°C~25°C~100°C~25°C 30 mins, 5 mins, 30 mins, 5 mins	100 cycles	0/50
	Thermal Shock*	MIL-STD-202G	-40°C~100°C 30 mins, 30 mins	100 cycles	0/50
	Moisture Resistance	JEITA ED-4701 200 203	25°C~65°C 90% RH 24 hrs / 1 cycle	10 cycles	0/50
	High-Temperature Storage	JEITA ED-4701 200 201	T _A =100°C	500 hrs	0/50
	Humidity Heat Storage	JEITA ED-4701 100 103	T _A =60°C RH=90%	500 hrs	0/50
	Low-Temperature Storage	JEITA ED-4701 200 202	T _A =-40°C	500 hrs	0/50
Operation Sequence	Life Test*	-	T _A =25°C I _F : R=70 mA, G=30 mA, B=30 mA	1000 hrs	0/50
	High-Temperature Life Test*	-	T _A =85°C I _F : R=50 mA, G=15 mA, B=15 mA	1000 hrs	0/50
	High-Temperature/High-Humidity Life Test*	-	T _A =60°C, 90%RH I _F : R=50 mA, G=15 mA, B=15 mA	500 hrs	0/50
	Low-Temperature Life Test	-	T _A =-40°C I _F : R=50 mA, G=15 mA, B=15 mA	500 hrs	0/50
Destructive Sequence	Resistance to Soldering Heat* (Reflow Soldering)	JEITA ED-4701 300 301	T _{SOL} =260°C, 10 sec (Pre-treatment 30°C, 70%, 168 hrs)	2 times	0/50
ESD	Electrostatic Discharge Test	AEC (Q101-001)	Human body model 1000 V (forward and reverse current conduct electricity, each 1 time)		0/50
Physical Sequence	Vibration-Variable Frequency	MIL-STD-883 Method 2007	20G min, 20 to 2000 Hz, 4 cycle, 4 mins, each X, Y, Z		0/50

Failure Criteria

Item	Symbol	Test Condition	Criteria for Judgment	
			Min	Max
Forward Voltage	V _F	I _F = 20 mA	-	Initial Data x 1.1
Reverse Current	I _R	V _R = 5 V	-	10 μA
Luminous Intensity	I _V	I _F = 20 mA	Initial Data x 0.7	-
Resistance to Soldering Heat		I _F = 20 mA	No dead lamps or visual damage	
Vibration-variable Frequency		I _F = 20 mA	No dead lamps or visual damage	



8. Power White SMD LED Lamps

Tests and Results

Type	Test Item	Applicable Standard	Test Condition	Note	Number of Damaged
Environmental Sequence	Temperature Cycle*	JEITA ED-4701 100 105	-40°C~25°C~100°C~25°C 30 mins, 5 mins, 30 mins, 5 mins	100 cycles	0/50
	Thermal Shock*	MIL-STD-202G	-40°C~100°C 30 mins, 30 mins	100 cycles	0/50
	Moisture Resistance	JEITA ED-4701 200 203	25°C~65°C 90% RH 24 hrs / 1 cycle	10 cycles	0/50
	High-Temperature Storage	JEITA ED-4701 200 201	T _A =100°C	500 hrs	0/50
	Humidity Heat Storage	JEITA ED-4701 100 103	T _A =60°C RH=90%	500 hrs	0/50
	Low-Temperature Storage	JEITA ED-4701 200 202	T _A =-40°C	500 hrs	0/50
Operation Sequence	Life Test*	-	T _A =25°C I _F =35 mA	1000 hrs	0/50
	High-Temperature Life Test*	-	T _A =85°C I _F =15 mA	1000 hrs	0/50
	High-Temperature/High-Humidity Life Test*	-	T _A =60°C, 90%RH I _F =15 mA	500 hrs	0/50
	Low-Temperature Life Test	-	T _A =-40°C I _F =15 mA	500 hrs	0/50
Destructive Sequence	Resistance to Soldering Heat* (Reflow Soldering)	JEITA ED-4701 300 301	T _{SOL} =260°C, 10 sec (Pre-treatment 30°C, 70%, 168 hrs)	2 times	0/50
ESD	Electrostatic Discharge Test	AEC (Q101-001)	Human body model 1000 V (forward and reverse current conduct electricity, each 1 time)		0/50
Physical Sequence	Vibration-Variable Frequency	MIL-STD-883 Method 2007	20G min, 20 to 2000 Hz, 4 cycle, 4 mins, each X, Y, Z		0/50

Failure Criteria

Item	Symbol	Test Condition	Criteria for Judgment	
			Min	Max
Forward Voltage	V _F	I _F = 20 mA	-	Initial Data x 1.1
Reverse Current	I _R	V _R = 5 V	-	10 μA
Luminous Intensity	I _V	I _F = 20 mA	Initial Data x 0.7	-
Resistance to Soldering Heat		I _F = 20 mA	No dead lamps or visual damage	
Vibration-variable Frequency		I _F = 20 mA	No dead lamps or visual damage	



9. Sideview SMD LED Lamps

Tests and Results

Type	Test Item	Applicable Standard	Test Condition	Note	Number of Damaged
Environmental Sequence	Temperature Cycle*	JEITA ED-4701 100 105	-40°C~25°C~100°C~25°C 30 mins, 5 mins, 30 mins, 5 mins	100 cycles	0/50
	Thermal Shock*	MIL-STD-202G	-40°C~100°C 30 mins, 30 mins	100 cycles	0/50
	Moisture Resistance	JEITA ED-4701 200 203	25°C~65°C 90% RH 24 hrs / 1 cycle	10 cycles	0/50
	High-Temperature Storage	JEITA ED-4701 200 201	T _A =100°C	500 hrs	0/50
	Humidity Heat Storage	JEITA ED-4701 100 103	T _A =60°C RH=90%	500 hrs	0/50
	Low-Temperature Storage	JEITA ED-4701 200 202	T _A =-40°C	500 hrs	0/50
Operation Sequence	Life Test*	-	T _A =25°C I _F : R=30 mA, G=20 mA, B=20 mA	1000 hrs	0/50
	High-Temperature Life Test*	-	T _A =85°C I _F : R=20 mA, G=15 mA, B=15 mA	1000 hrs	0/50
	High-Temperature/High-Humidity Life Test*	-	T _A =60°C, 90%RH I _F : R=20 mA, G=15 mA, B=15 mA	500 hrs	0/50
	Low-Temperature Life Test	-	T _A =-40°C I _F : R=20 mA, G=15 mA, B=15 mA	500 hrs	0/50
Destructive Sequence	Resistance to Soldering Heat* (Reflow Soldering)	JEITA ED-4701 300 301	T _{SOL} =260°C, 10 sec (Pre-treatment 30°C, 70%, 168 hrs)	2 times	0/50
ESD	Electrostatic Discharge Test	AEC (Q101-001)	Human body model 1000 V (forward and reverse current conduct electricity, each 1 time)		0/50
Physical Sequence	Vibration-Variable Frequency	MIL-STD-883 Method 2007	20G min, 20 to 2000 Hz, 4 cycle, 4 mins, each X, Y, Z		0/50

Failure Criteria

Item	Symbol	Test Condition	Criteria for Judgment	
			Min	Max
Forward Voltage	V _F	I _F = 20 mA	-	Initial Data x 1.1
Reverse Current	I _R	V _R = 5 V	-	10 μA
Luminous Intensity	I _V	I _F = 20 mA	Initial Data x 0.7	-
Resistance to Soldering Heat		I _F = 20 mA	No dead lamps or visual damage	
Vibration-variable Frequency		I _F = 20 mA	No dead lamps or visual damage	



10. Sideview White SMD LED Lamps

Tests and Results

Type	Test Item	Applicable Standard	Test Condition	Note	Number of Damaged
Environmental Sequence	Temperature Cycle*	JEITA ED-4701 100 105	-40°C~25°C~100°C~25°C 30 mins, 5 mins, 30 mins, 5 mins	100 cycles	0/50
	Thermal Shock*	MIL-STD-202G	-40°C~100°C 30 mins, 30 mins	100 cycles	0/50
	Moisture Resistance	JEITA ED-4701 200 203	25°C~65°C 90% RH 24 hrs / 1 cycle	10 cycles	0/50
	High-Temperature Storage	JEITA ED-4701 200 201	T _A =100°C	500 hrs	0/50
	Humidity Heat Storage	JEITA ED-4701 100 103	T _A =60°C RH=90%	500 hrs	0/50
	Low-Temperature Storage	JEITA ED-4701 200 202	T _A =-40°C	500 hrs	0/50
Operation Sequence	Life Test*	-	T _A =25°C I _F =20 mA	1000 hrs	0/50
	High-Temperature Life Test*	-	T _A =85°C I _F =15 mA	1000 hrs	0/50
	High-Temperature/High-Humidity Life Test*	-	T _A =60°C, 90%RH I _F =15 mA	500 hrs	0/50
	Low-Temperature Life Test	-	T _A =-40°C I _F =15 mA	500 hrs	0/50
Destructive Sequence	Resistance to Soldering Heat* (Reflow Soldering)	JEITA ED-4701 300 301	T _{SOL} =260°C, 10 sec (Pre-treatment 30°C, 70%, 168 hrs)	2 times	0/50
ESD	Electrostatic Discharge Test	AEC (Q101-001)	Human body model 1000 V (forward and reverse current conduct electricity, each 1 time)		0/50
Physical Sequence	Vibration-Variable Frequency	MIL-STD-883 Method 2007	20G min, 20 to 2000 Hz, 4 cycle, 4 mins, each X, Y, Z		0/50

Failure Criteria

Item	Symbol	Test Condition	Criteria for Judgment	
			Min	Max
Forward Voltage	V _F	I _F = 20 mA	-	Initial Data x 1.1
Reverse Current	I _R	V _R = 5 V	-	10 μA
Luminous Intensity	I _V	I _F = 20 mA	Initial Data x 0.7	-
Resistance to Soldering Heat		I _F = 20 mA	No dead lamps or visual damage	
Vibration-variable Frequency		I _F = 20 mA	No dead lamps or visual damage	



11. 6-Pin SMD LED Lamps

Tests and Results

Type	Test Item	Applicable Standard	Test Condition	Note	Number of Damaged
Environmental Sequence	Temperature Cycle*	JEITA ED-4701 100 105	-40°C~25°C~100°C~25°C 30 mins, 5 mins, 30 mins, 5 mins	100 cycles	0/50
	Thermal Shock*	MIL-STD-202G	-40°C~100°C 30 mins, 30 mins	100 cycles	0/50
	Moisture Resistance	JEITA ED-4701 200 203	25°C~65°C 90% RH 24 hrs / 1 cycle	10 cycles	0/50
	High-Temperature Storage	JEITA ED-4701 200 201	T _A =100°C	500 hrs	0/50
	Humidity Heat Storage	JEITA ED-4701 100 103	T _A =60°C RH=90%	500 hrs	0/50
	Low-Temperature Storage	JEITA ED-4701 200 202	T _A =-40°C	500 hrs	0/50
Operation Sequence	Life Test*	-	T _A =25°C I _F : R=50 mA, G=50 mA, B=50 mA	1000 hrs	0/50
	High-Temperature Life Test*	-	T _A =85°C I _F : R=15 mA, G=15 mA, B=15 mA	1000 hrs	0/50
	High-Temperature/High-Humidity Life Test*	-	T _A =60°C, 90%RH I _F : R=15 mA, G=15 mA, B=15 mA	500 hrs	0/50
	Low-Temperature Life Test	-	T _A =-40°C I _F : R=15 mA, G=15 mA, B=15 mA	500 hrs	0/50
Destructive Sequence	Resistance to Soldering Heat* (Reflow Soldering)	JEITA ED-4701 300 301	T _{SOL} =260°C, 10 sec (Pre-treatment 30°C, 70%, 168 hrs)	2 times	0/50
ESD	Electrostatic Discharge Test	AEC (Q101-001)	Human body model 1000 V (forward and reverse current conduct electricity, each 1 time)		0/50
Physical Sequence	Vibration-Variable Frequency	MIL-STD-883 Method 2007	20G min, 20 to 2000 Hz, 4 cycle, 4 mins, each X, Y, Z		0/50

Failure Criteria

Item	Symbol	Test Condition	Criteria for Judgment	
			Min	Max
Forward Voltage	V _F	I _F = 20 mA	-	Initial Data x 1.1
Reverse Current	I _R	V _R = 5 V	-	10 μA
Luminous Intensity	I _V	I _F = 20 mA	Initial Data x 0.7	-
Resistance to Soldering Heat		I _F = 20 mA	No dead lamps or visual damage	
Vibration-variable Frequency		I _F = 20 mA	No dead lamps or visual damage	



12. 6-Pin White SMD LED Lamps

Tests and Results

Type	Test Item	Applicable Standard	Test Condition	Note	Number of Damaged
Environmental Sequence	Temperature Cycle*	JEITA ED-4701 100 105	-40°C~25°C~100°C~25°C 30 mins, 5 mins, 30 mins, 5 mins	100 cycles	0/50
	Thermal Shock*	MIL-STD-202G	-40°C~100°C 30 mins, 30 mins	100 cycles	0/50
	Moisture Resistance	JEITA ED-4701 200 203	25°C~65°C 90% RH 24 hrs / 1 cycle	10 cycles	0/50
	High-Temperature Storage	JEITA ED-4701 200 201	T _A =100°C	500 hrs	0/50
	Humidity Heat Storage	JEITA ED-4701 100 103	T _A =60°C RH=90%	500 hrs	0/50
	Low-Temperature Storage	JEITA ED-4701 200 202	T _A =-40°C	500 hrs	0/50
Operation Sequence	Life Test*	-	T _A =25°C I _F =50 mA	1000 hrs	0/50
	High-Temperature Life Test*	-	T _A =85°C I _F =15 mA	1000 hrs	0/50
	High-Temperature/High-Humidity Life Test*	-	T _A =60°C, 90%RH I _F =15 mA	500 hrs	0/50
	Low-Temperature Life Test	-	T _A =-40°C I _F =15 mA	500 hrs	0/50
Destructive Sequence	Resistance to Soldering Heat* (Reflow Soldering)	JEITA ED-4701 300 301	T _{SOL} =260°C, 10 sec (Pre-treatment 30°C, 70%, 168 hrs)	2 times	0/50
ESD	Electrostatic Discharge Test	AEC (Q101-001)	Human body model 1000 V (forward and reverse current conduct electricity, each 1 time)		0/50
Physical Sequence	Vibration-Variable Frequency	MIL-STD-883 Method 2007	20G min, 20 to 2000 Hz, 4 cycle, 4 mins, each X, Y, Z		0/50

Failure Criteria

Item	Symbol	Test Condition	Criteria for Judgment	
			Min	Max
Forward Voltage	V _F	I _F = 20 mA	-	Initial Data x 1.1
Reverse Current	I _R	V _R = 5 V	-	100 μA
Luminous Intensity	I _V	I _F = 20 mA	Initial Data x 0.7	-
Resistance to Soldering Heat		I _F = 20 mA	No dead lamps or visual damage	
Vibration-variable Frequency		I _F = 20 mA	No dead lamps or visual damage	



13. Small 6-Pin SMD LED Lamps

Tests and Results

Type	Test Item	Applicable Standard	Test Condition	Note	Number of Damaged
Environmental Sequence	Temperature Cycle*	JEITA ED-4701 100 105	-40°C~25°C~100°C~25°C 30 mins, 5 mins, 30 mins, 5 mins	100 cycles	0/50
	Thermal Shock*	MIL-STD-202G	-40°C~100°C 30 mins, 30 mins	100 cycles	0/50
	Moisture Resistance	JEITA ED-4701 200 203	25°C~65°C 90% RH 24 hrs / 1 cycle	10 cycles	0/50
	High-Temperature Storage	JEITA ED-4701 200 201	T _A =100°C	500 hrs	0/50
	Humidity Heat Storage	JEITA ED-4701 100 103	T _A =60°C RH=90%	500 hrs	0/50
	Low-Temperature Storage	JEITA ED-4701 200 202	T _A =-40°C	500 hrs	0/50
Operation Sequence	Life Test*	-	T _A =25°C I _F : R=50 mA, G=40 mA, B=40 mA	1000 hrs	0/50
	High-Temperature Life Test*	-	T _A =85°C I _F : R=15 mA, G=15 mA, B=15 mA	1000 hrs	0/50
	High-Temperature/High-Humidity Life Test*	-	T _A =60°C, 90%RH I _F : R=15 mA, G=15 mA, B=15 mA	500 hrs	0/50
	Low-Temperature Life Test	-	T _A =-40°C I _F : R=15 mA, G=15 mA, B=15 mA	500 hrs	0/50
Destructive Sequence	Resistance to Soldering Heat* (Reflow Soldering)	JEITA ED-4701 300 301	T _{SOL} =260°C, 10 sec (Pre-treatment 30°C, 70%, 168 hrs)	2 times	0/50
ESD	Electrostatic Discharge Test	AEC (Q101-001)	Human body model 1000 V (forward and reverse current conduct electricity, each 1 time)		0/50
Physical Sequence	Vibration-Variable Frequency	MIL-STD-883 Method 2007	20G min, 20 to 2000 Hz, 4 cycle, 4 mins, each X, Y, Z		0/50

Failure Criteria

Item	Symbol	Test Condition	Criteria for Judgment	
			Min	Max
Forward Voltage	V _F	I _F = 20 mA	-	Initial Data x 1.1
Reverse Current	I _R	V _R = 5 V	-	10 μA
Luminous Intensity	I _V	I _F = 20 mA	Initial Data x 0.7	-
Resistance to Soldering Heat		I _F = 20 mA	No dead lamps or visual damage	
Vibration-variable Frequency		I _F = 20 mA	No dead lamps or visual damage	



14. Small 6-Pin White SMD LED Lamps

Tests and Results

Type	Test Item	Applicable Standard	Test Condition	Note	Number of Damaged
Environmental Sequence	Temperature Cycle*	JEITA ED-4701 100 105	-40°C~25°C~100°C~25°C 30 mins, 5 mins, 30 mins, 5 mins	100 cycles	0/50
	Thermal Shock*	MIL-STD-202G	-40°C~100°C 30 mins, 30 mins	100 cycles	0/50
	Moisture Resistance	JEITA ED-4701 200 203	25°C~65°C 90% RH 24 hrs / 1 cycle	10 cycles	0/50
	High-Temperature Storage	JEITA ED-4701 200 201	T _A =100°C	500 hrs	0/50
	Humidity Heat Storage	JEITA ED-4701 100 103	T _A =60°C RH=90%	500 hrs	0/50
	Low-Temperature Storage	JEITA ED-4701 200 202	T _A = -40°C I _F = 40 mA	500 hrs	0/50
Operation Sequence	Life Test*	-	T _A = 25°C I _F = 15 mA	1000 hrs	0/50
	High-Temperature Life Test*	-	T _A = 85°C I _F = 15 mA	1000 hrs	0/50
	High-Temperature/High-Humidity Life Test*	-	T _A = 60°C, 90%RH I _F = 15 mA	500 hrs	0/50
	Low-Temperature Life Test	-	T _A = -40°C I _F = 15 mA	500 hrs	0/50
Destructive Sequence	Resistance to Soldering Heat* (Reflow Soldering)	JEITA ED-4701 300 301	T _{SOL} = 260°C, 10 sec (Pre-treatment 30°C, 70%, 168 hrs)	2 times	0/50
ESD	Electrostatic Discharge Test	AEC (Q101-001)	Human body model 1000 V (forward and reverse current conduct electricity, each 1 time)		0/50
Physical Sequence	Vibration-Variable Frequency	MIL-STD-883 Method 2007	20G min, 20 to 2000 Hz, 4 cycle, 4 mins, each X, Y, Z		0/50

Failure Criteria

Item	Symbol	Test Condition	Criteria for Judgment	
			Min	Max
Forward Voltage	V _F	I _F = 20 mA	-	Initial Data x 1.1
Reverse Current	I _R	V _R = 5 V	-	10 μA
Luminous Intensity	I _V	I _F = 20 mA	Initial Data x 0.7 (Total degradation)	-
Resistance to Soldering Heat		I _F = 20 mA	No dead lamps or visual damage	
Vibration-variable Frequency		I _F = 20 mA	No dead lamps or visual damage	



15. Small TOP SMD LED Lamps

Tests and Results

Type	Test Item	Applicable Standard	Test Condition	Note	Number of Damaged
Environmental Sequence	Temperature Cycle*	JEITA ED-4701 100 105	-40°C~25°C~100°C~25°C 30 mins, 5 mins, 30 mins, 5 mins	100 cycles	0/50
	Thermal Shock*	MIL-STD-202G	-40°C~100°C 30 mins, 30 mins	100 cycles	0/50
	Moisture Resistance	JEITA ED-4701 200 203	25°C~65°C 90% RH 24 hrs / 1 cycle	10 cycles	0/50
	High-Temperature Storage	JEITA ED-4701 200 201	T _A =100°C	500 hrs	0/50
	Humidity Heat Storage	JEITA ED-4701 100 103	T _A =60°C RH=90%	500 hrs	0/50
	Low-Temperature Storage	JEITA ED-4701 200 202	T _A =-40°C	500 hrs	0/50
Operation Sequence	Life Test*	-	T _A =25°C I _F : R=50 mA, G=25 mA, B=25 mA	1000 hrs	0/50
	High-Temperature Life Test*	-	T _A =85°C I _F : R=30 mA, G=15 mA, B=15 mA	1000 hrs	0/50
	High-Temperature/High-Humidity Life Test*	-	T _A =60°C, 90%RH I _F : R=30 mA, G=15 mA, B=15 mA	500 hrs	0/50
	Low-Temperature Life Test	-	T _A =-40°C I _F : R=30 mA, G=15 mA, B=15 mA	500 hrs	0/50
Destructive Sequence	Resistance to Soldering Heat* (Reflow Soldering)	JEITA ED-4701 300 301	T _{SOL} =260°C, 10 sec (Pre-treatment 30°C, 70%, 168 hrs)	2 times	0/50
ESD	Electrostatic Discharge Test	AEC (Q101-001)	Human body model 1000 V (forward and reverse current conduct electricity, each 1 time)		0/50
Physical Sequence	Vibration-Variable Frequency	MIL-STD-883 Method 2007	20G min, 20 to 2000 Hz, 4 cycle, 4 mins, each X, Y, Z		0/50

Failure Criteria

Item	Symbol	Test Condition	Criteria for Judgment	
			Min	Max
Forward Voltage	V _F	I _F = 20 mA	-	Initial Data x 1.1
Reverse Current	I _R	V _R = 5 V	-	10 μA
Luminous Intensity	I _V	I _F = 20 mA	Initial Data x 0.7	-
Resistance to Soldering Heat		I _F = 20 mA	No dead lamps or visual damage	
Vibration-variable Frequency		I _F = 20 mA	No dead lamps or visual damage	



16. Small TOP White SMD LED Lamps

Tests and Results

Type	Test Item	Applicable Standard	Test Condition	Note	Number of Damaged
Environmental Sequence	Temperature Cycle*	JEITA ED-4701 100 105	-40°C~25°C~100°C~25°C 30 mins, 5 mins, 30 mins, 5 mins	100 cycles	0/50
	Thermal Shock*	MIL-STD-202G	-40°C~100°C 30 mins, 30 mins	100 cycles	0/50
	Moisture Resistance	JEITA ED-4701 200 203	25°C~65°C 90% RH 24 hrs / 1 cycle	10 cycles	0/50
	High-Temperature Storage	JEITA ED-4701 200 201	T _A =100°C	500 hrs	0/50
	Humidity Heat Storage	JEITA ED-4701 100 103	T _A =60°C RH=90%	500 hrs	0/50
	Low-Temperature Storage	JEITA ED-4701 200 202	T _A =-40°C	500 hrs	0/50
Operation Sequence	Life Test*	-	T _A =25°C I _F =25 mA	500 hrs	0/50
	High-Temperature Life Test*	-	T _A =85°C I _F =15 mA	1000 hrs	0/50
	High-Temperature/High-Humidity Life Test*	-	T _A =60°C, 90%RH I _F =15 mA	500 hrs	0/50
	Low-Temperature Life Test	-	T _A =-40°C I _F =15 mA	500 hrs	0/50
Destructive Sequence	Resistance to Soldering Heat* (Reflow Soldering)	JEITA ED-4701 300 301	T _{SOL} =260°C, 10 sec (Pre-treatment 30°C, 70%, 168 hrs)	2 times	0/50
ESD	Electrostatic Discharge Test	AEC (Q101-001)	Human body model 1000 V (forward and reverse current conduct electricity, each 1 time)		0/50
Physical Sequence	Vibration-Variable Frequency	MIL-STD-883 Method 2007	20G min, 20 to 2000 Hz, 4 cycle, 4 mins, each X, Y, Z		0/50

Failure Criteria

Item	Symbol	Test Condition	Criteria for Judgment	
			Min	Max
Forward Voltage	V _F	I _F = 20 mA	-	Initial Data x 1.1
Reverse Current	I _R	V _R = 5 V	-	10 μA
Luminous Intensity	I _V	I _F = 20 mA	Initial Data x 0.7 (Total degradation)	-
Resistance to Soldering Heat		I _F = 20 mA	No dead lamps or visual damage	
Vibration-variable Frequency		I _F = 20 mA	No dead lamps or visual damage	



17. Mini Sideview SMD LED Lamps

Tests and Results

Type	Test Item	Applicable Standard	Test Condition	Note	Number of Damaged
Environmental Sequence	Temperature Cycle*	JEITA ED-4701 100 105	-40°C~25°C~100°C~25°C 30 mins, 5 mins, 30 mins, 5 mins	100 cycles	0/50
	Thermal Shock*	MIL-STD-202G	-40°C~100°C 30 mins, 30 mins	100 cycles	0/50
	Moisture Resistance	JEITA ED-4701 200 203	25°C~65°C 90% RH 24 hrs / 1 cycle	10 cycles	0/50
	High-Temperature Storage	JEITA ED-4701 200 201	T _A =100°C	500 hrs	0/50
	Humidity Heat Storage	JEITA ED-4701 100 103	T _A =60°C RH=90%	500 hrs	0/50
	Low-Temperature Storage	JEITA ED-4701 200 202	T _A =-40°C	500 hrs	0/50
Operation Sequence	Life Test*	-	T _A =25°C I _F : R=20 mA, G=20 mA, B=20 mA	1000 hrs	0/50
	High-Temperature Life Test*	-	T _A =85°C I _F : R=20 mA, G=15 mA, B=15 mA	1000 hrs	0/50
	High-Temperature/High-Humidity Life Test*	-	T _A =60°C, 90%RH I _F : R=20 mA, G=15 mA, B=15 mA	500 hrs	0/50
	Low-Temperature Life Test	-	T _A =-40°C I _F : R=20 mA, G=20 mA, B=20 mA	500 hrs	0/50
Destructive Sequence	Resistance to Soldering Heat* (Reflow Soldering)	JEITA ED-4701 300 301	T _{SOL} =260°C, 10 sec (Pre-treatment 30°C, 70%, 168 hrs)	2 times	0/50
ESD	Electrostatic Discharge Test	AEC (Q101-001)	Human body model 1000 V (forward and reverse current conduct electricity, each 1 time)		0/50
Physical Sequence	Vibration-Variable Frequency	MIL-STD-883 Method 2007	20G min, 20 to 2000 Hz, 4 cycle, 4 mins, each X, Y, Z		0/50

Failure Criteria

Item	Symbol	Test Condition	Criteria for Judgment	
			Min	Max
Forward Voltage	V _F	I _F = 20 mA	-	Initial Data x 1.1
Reverse Current	I _R	V _R = 5 V	-	10 μA
Luminous Intensity	I _V	I _F = 20 mA	Initial Data x 0.7	-
Resistance to Soldering Heat		I _F = 20 mA	No dead lamps or visual damage	
Vibration-variable Frequency		I _F = 20 mA	No dead lamps or visual damage	



18. Mini Sideview White SMD LED Lamps

Tests and Results

Type	Test Item	Applicable Standard	Test Condition	Note	Number of Damaged
Environmental Sequence	Temperature Cycle*	JEITA ED-4701 100 105	-40°C~25°C~100°C~25°C 30 mins, 5 mins, 30 mins, 5 mins	100 cycles	0/50
	Thermal Shock*	MIL-STD-202G	-40°C~100°C 30 mins, 30 mins	100 cycles	0/50
	Moisture Resistance	JEITA ED-4701 200 203	25°C~65°C 90% RH 24 hrs / 1 cycle	10 cycles	0/50
	High-Temperature Storage	JEITA ED-4701 200 201	T _A =100°C	500 hrs	0/50
	Humidity Heat Storage	JEITA ED-4701 100 103	T _A =60°C RH=90%	500 hrs	0/50
	Low-Temperature Storage	JEITA ED-4701 200 202	T _A =-40°C	500 hrs	0/50
Operation Sequence	Life Test*	-	T _A =25°C LT1: I _F =20 mA, LT2: I _F =35 mA	1000 hrs	0/50
	High-Temperature Life Test*	-	T _A =85°C I _F =15 mA	1000 hrs	0/50
	High-Temperature/High-Humidity Life Test*	-	T _A =60°C, 90%RH I _F =15 mA	500 hrs	0/50
	Low-Temperature Life Test	-	T _A =-30°C I _F =20 mA	500 hrs	0/50
Destructive Sequence	Resistance to Soldering Heat* (Reflow Soldering)	JEITA ED-4701 300 301	T _{SOL} =260°C, 10 sec (Pre-treatment 30°C, 70%, 168 hrs)	2 times	0/50
ESD	Electrostatic Discharge Test	AEC (Q101-001)	Human body model 1000 V (forward and reverse current conduct electricity, each 1 time)		0/50
Physical Sequence	Vibration-Variable Frequency	MIL-STD-883 Method 2007	20G min, 20 to 2000 Hz, 4 cycle, 4 mins, each X, Y, Z		0/50

Failure Criteria

Item	Symbol	Test Condition	Criteria for Judgment	
			Min	Max
Forward Voltage	V _F	I _F = 20 mA	-	Initial Data x 1.1
Reverse Current	I _R	V _R = 5 V	-	10 μA
Luminous Intensity	I _V	I _F = 20 mA	Initial Data x 0.7	-
Resistance to Soldering Heat		I _F = 20 mA	No dead lamps or visual damage	
Vibration-variable Frequency		I _F = 20 mA	No dead lamps or visual damage	



19. LN6 White SMD LED Lamps

Tests and Results

Type	Test Item	Applicable Standard	Test Condition	Note	Number of Damaged
Environmental Sequence	Temperature Cycle*	JEITA ED-4701 100 105	-40°C~25°C~100°C~25°C 30 mins, 5 mins, 30 mins, 5 mins	100 cycles	0/50
	Thermal Shock*	MIL-STD-202G	-40°C~100°C 30 mins, 30 mins	100 cycles	0/50
	Moisture Resistance	JEITA ED-4701 200 203	25°C~65°C 90% RH 24 hrs / 1 cycle	10 cycles	0/25
	High-Temperature Storage	JEITA ED-4701 200 201	T _A =100°C	1000 hrs	0/25
	Humidity Heat Storage	JEITA ED-4701 100 103	T _A =60°C RH=90%	1000 hrs	0/25
	Low-Temperature Storage	JEITA ED-4701 200 202	T _A =-40°C	1000 hrs	0/25
Operation Sequence	Life Test*	-	T _A =25°C I _F =350 mA	1000 hrs	0/25
	High-Temperature Life Test*	-	T _A =85°C I _F =160 mA	1000 hrs	0/25
	High-Temperature/High-Humidity Life Test*	-	T _A =60°C, 90%RH I _F =250 mA	500 hrs	0/25
	Low-Temperature Life Test	-	T _A =-40°C I _F =300 mA	1000 hrs	0/25
Destructive Sequence	Resistance to Soldering Heat* (Reflow Soldering)	JEITA ED-4701 300 301	T _{SOL} =260°C, 10 sec (Pre-treatment 30°C, 70%, 168 hrs)	2 times	0/25
	Solderability (Reflow Soldering)	JEITA ED-4701 300 303	T _{SOL} =215±5°C, 3 sec. (lead solder)	1 time over 95%	0/25
	Substrate Bending	JEITA ED-4702	3 mm, 5±1 sec.	1 time	0/25
	Adhesion Strength	JEITA ED-4702	5N, 10±1 sec.	1 time	0/25
ESD	Electrostatic Discharge Test	JEITA ED-4701 300 304	Human body model 1000 V	±1 time	0/25
Physical Sequence	Vibration-Variable Frequency	MIL-STD-883 Method 2007	20G min, 20 to 2000 Hz, 4 cycle, 4 mins, each X ,Y, Z	16 mins.	0/25

Failure Criteria

Item	Symbol	Test Condition	Criteria for Judgment	
			Min	Max
Forward Voltage	V _F	I _F = 300 mA	-	Initial Data x 1.1
Reverse Current	I _R	V _R = 5 V	-	10 µA
Luminous Intensity	I _V	I _F = 20 mA	Initial Data x 0.7	-
Resistance to Soldering Heat		I _F = 20 mA	No dead lamps or visual damage	
Vibration-variable Frequency		I _F = 20 mA	No dead lamps or visual damage	



20. LV6 SMD LED Lamps

Tests and Results

Type	Test Item	Applicable Standard	Test Condition	Note	Number of Damaged
Environmental Sequence	Temperature Cycle*	JEITA ED-4701 100 105	-40°C~25°C~100°C~25°C 30 mins, 5 mins, 30 mins, 5 mins	100 cycles	0/50
	Thermal Shock*	MIL-STD-202G	-40°C~100°C 30 mins, 30 mins	100 cycles	0/50
	Moisture Resistance	JEITA ED-4701 200 203	25°C~65°C 90% RH 24 hrs / 1 cycle	10 cycles	0/50
	High-Temperature Storage	JEITA ED-4701 200 201	T _A =100°C	500 hrs	0/50
	Humidity Heat Storage	JEITA ED-4701 100 103	T _A =60°C RH=90%	500 hrs	0/50
	Low-Temperature Storage	JEITA ED-4701 200 202	T _A =-40°C	500 hrs	0/50
Operation Sequence	Life Test*	-	T _A =25°C I _F : R=30 mA, G=35 mA, B=20 mA	1000 hrs	0/50
	High-Temperature Life Test*	-	T _A =85°C I _F =30 mA	1000 hrs	0/50
	High-Temperature/High-Humidity Life Test*	-	T _A =60°C, 90%RH I _F =30 mA	500 hrs	0/50
	Low-Temperature Life Test	-	T _A =-40°C I _F : R=30 mA, G=35 mA, B=20 mA	500 hrs	0/50
Destructive Sequence	Resistance to Soldering Heat* (Reflow Soldering)	JEITA ED-4701 300 301	T _{SOL} =260°C, 10 sec (Pre-treatment 30°C, 70%, 168 hrs)	2 times	0/50
ESD	Electrostatic Discharge Test	AEC (Q101-001)	Human body model 1000 V (forward and reverse current conduct electricity, each 1 time)		0/50
Physical Sequence	Vibration-Variable Frequency	MIL-STD-883 Method 2007	20G min, 20 to 2000 Hz, 4 cycle, 4 mins, each X, Y, Z		0/50

Failure Criteria

Item	Symbol	Test Condition	Criteria for Judgment	
			Min	Max
Forward Voltage	V _F	I _F = 20 mA	-	Initial Data x 1.1
Reverse Current	I _R	V _R = 5 V	-	10 μA
Luminous Intensity	I _V	I _F = 20 mA	Initial Data x 0.7	-
Resistance to Soldering Heat		I _F = 20 mA	No dead lamps or visual damage	
Vibration-variable Frequency		I _F = 20 mA	No dead lamps or visual damage	