

AC45S-Q SERIES

AUTOMOTIVE ▲ Si MOSFET RELAY

SILICON Si MOSFET RELAY ▲ SMD type

Switches AC or DC load

AEC-Q101 qualified

Input TTL / CMOS compatible








Moisture Sensitivity Level ▲ MSL 1

 **UL 1577 approved ▲ File no E344988**

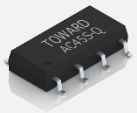
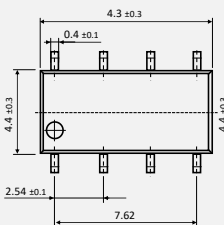
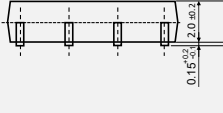
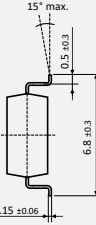
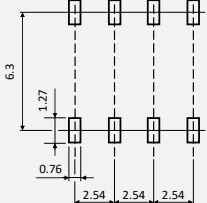
SPECIFICATION

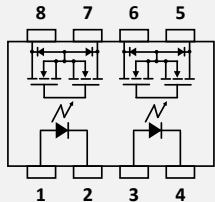
Item		Characteristics
Contact Form		2 Form A ▲ Normally open switch
Load Voltage	V_L	60V
Operation LED Current	I_{FON}	3mA
Load Current	I_L	200mA
On-Resistance	R_{ON}	2Ω
Output Capacitance	C_{OUT}	20pF
Low Off-State Leakage Current	I_{LEAK}	1μA at 60V _{DC}

APPLICATIONS

Automatic Test Equipment	Electric Mobility	I/O Modules	Industrial Automation	Measurement Equipment	Security Equipment	Sensing Equipment
						

DIMENSIONS, PIN DESCRIPTION AND PART NUMBER

Package	Illustration	Dimensions	PCB Board Pattern
SOP-8		  	 <p>TOP VIEW</p>

Circuit Diagram	Pin Description	Part No.	Package	Packing
	1,3 Anode (+) ■ LED 2,4 Cathode (-) ■ LED 5,6,7,8 Drain ■ MOSFET	AC45S-Q AC45S-Q-R1	SOP-8 SOP-8	Tube (50pcs) Reel (1000pcs)

ABSOLUTE MAXIMUM RATINGS ▲ AMBIENT TEMPERATURE $T_A = 25^\circ\text{C}$

Item	Condition	Symbol	Value	Unit
Type	Outline package		SOP-8	
	Part number		AC45S-Q	
	Output channels		2	Channel
Input	Continuous LED Current	I_F	50	mA
	Peak LED Current	I_{FP}	500	mA
	LED Reverse Voltage	V_R	5	V
	Input Power Dissipation	P_{IN}	75	mW
Output	Load Voltage	V_L	60 (AC peak or DC)	V
	Load Current	I_L	200 (1 channel) 160 (2 channel)	mA
	Peak Load Current	I_{PEAK}	600	mA
	Output Power Dissipation	P_{OUT}	300 (1 channel) 450 (2 channel)	mW
Relay	Total Power Dissipation	P_T	350 (1 channel) 500 (2 channel)	mW
	I/O Breakdown Voltage	$V_{I/O}$	1500	V_{RMS}
	Operating Temperature Range	T_{OPR}	-40 to +105	$^\circ\text{C}$
	Storage Temperature Range	T_{STG}	-40 to +125	$^\circ\text{C}$

ELECTRICAL CHARACTERISTICS ▲ AMBIENT TEMPERATURE $T_A = 25^\circ\text{C}$

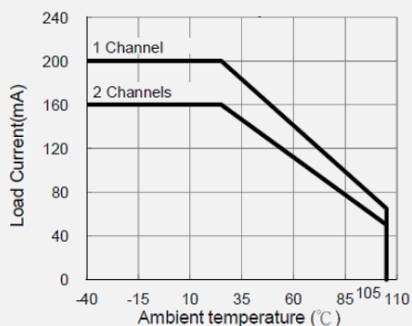
Item	Condition	Symbol	Min.	Typ.	Max.	Unit
Input	LED Forward Voltage	$I_F = 10\text{mA}$	V_F	0.9	1.17	1.3 V
	Operation LED Current		I_{FON}		0.5	3 mA
	Recovery LED Voltage		V_{FOFF}	0.5	1	V
Output	On-Resistance	$I_F=5\text{mA}, I_L=\text{Rating}$	R_{ON}		2	5 Ω
	Drain to Drain (tested within 1 sec.)					
	Off-State Leakage Current	$V_L = 60\text{V}$	I_{LEAK}			1 μA
Trans- mission	Output Capacitance	$V_L=0\text{V}, f=1\text{MHz}$	C_{OUT}		20	pF
	Turn-On Time	$I_F=5\text{mA}, I_L=\text{Rating}$	t_{ON}		0.05	0.5 ms
	Turn-Off Time	$I_F=5\text{mA}, I_L=\text{Rating}$	t_{OFF}		0.13	0.5 ms
Coupled	I/O Insulation Resistance		$R_{I/O}$	10^9		Ω
	I/O Capacitance	$f=1\text{MHz}$	$C_{I/O}$		1.3	pF

RECOMMENDED OPERATING CONDITION ▲ AMBIENT TEMPERATURE $T_A = 25^\circ\text{C}$

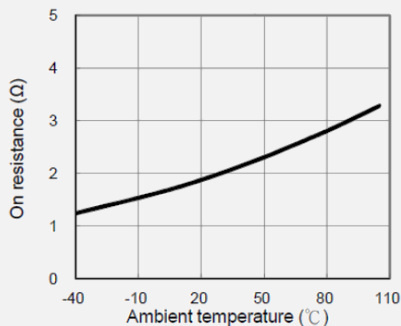
Item	Condition	Symbol	Min.	Typ.	Max.	Unit
Input	Continuous LED Current	I_F	5	10	15	mA
Output	Load Voltage	V_L			30	V
	Load Current	I_L	1 channel 2 channel		100 80	mA

REFERENCE DATA

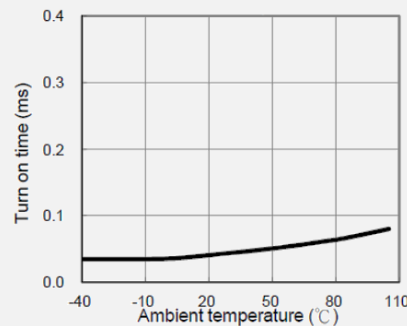
Load current vs. ambient temp.



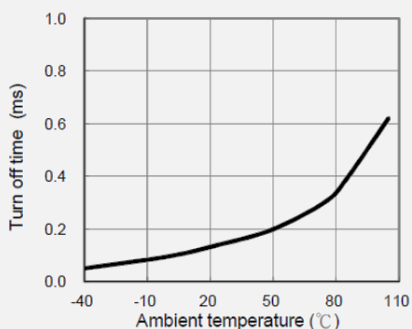
On resistance vs. ambient temp.



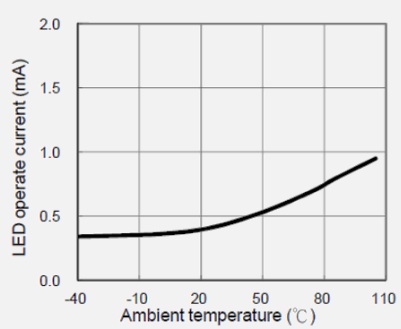
Turn on time vs. ambient temp.



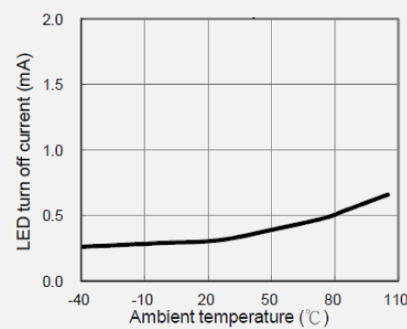
Turn off time vs. ambient temp.



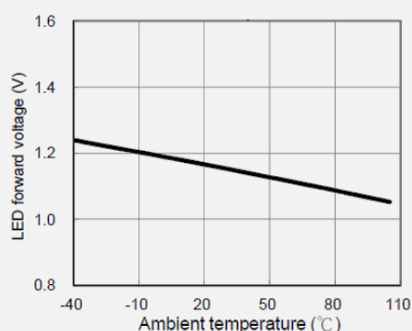
LED operate current vs. ambient temp



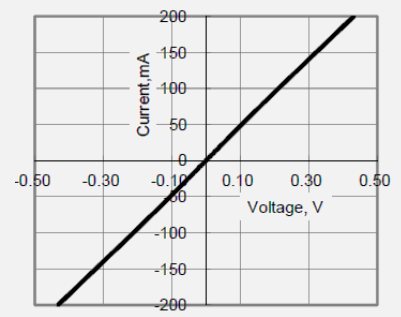
LED turn off current vs. ambient temp.



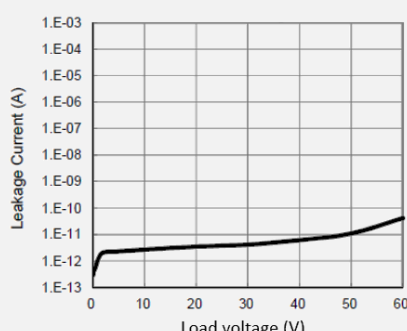
LED forward voltage vs. ambient temp.



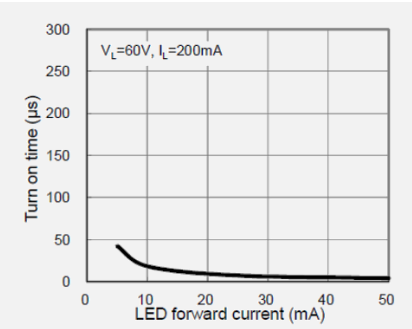
Current vs. voltage characteristics of output at MOS portion



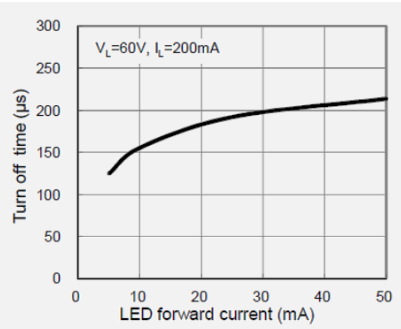
Off state leakage current vs. load voltage



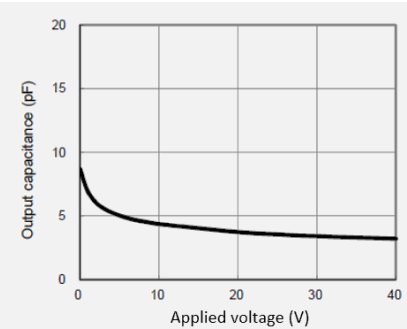
Turn on time vs. LED forward current



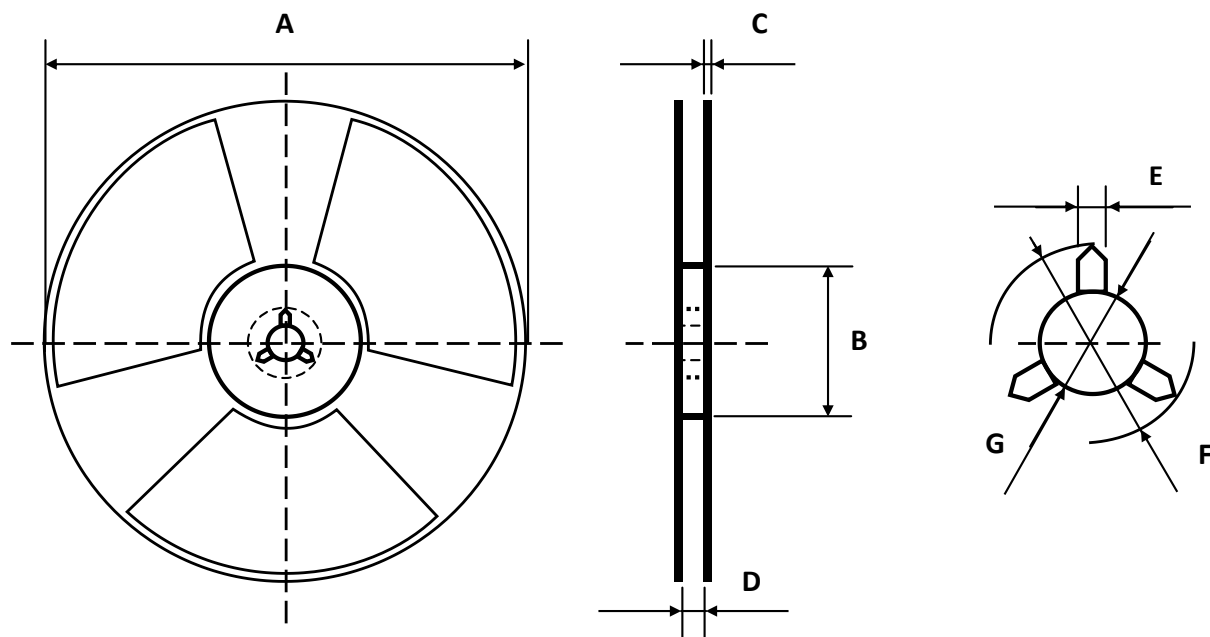
Turn off time vs. LED forward current



Output capacitance vs. applied voltage

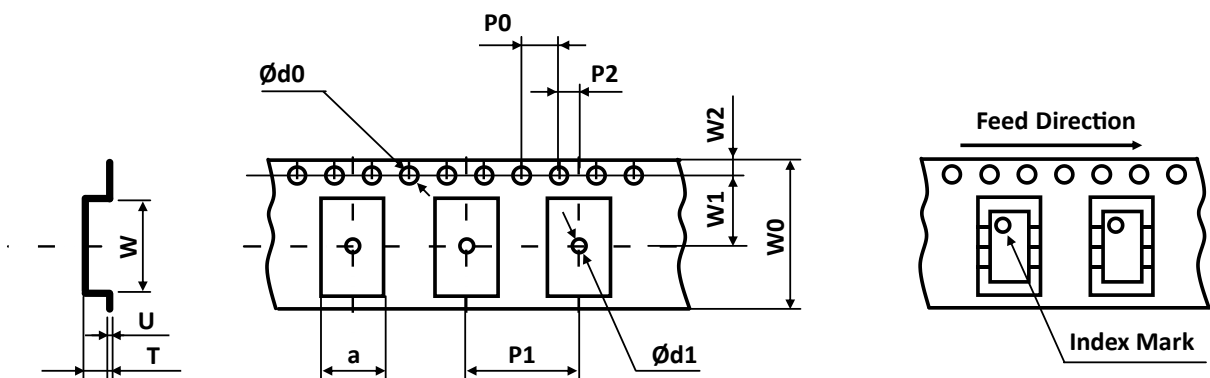


REEL DIMENSIONS ▲ All dimensions in mm



Size	A	B	C	D	E	F	G
SOP-8	330	100	2	17	2	13	21

TAPE DIMENSIONS ▲ All dimensions in mm



Size	W	U	T	a	Ød0	Ød1	P0	P1	P2	W0	W1	W2
SOP-8	10.4	0.3	2.3	7.5	1.5	1.5	4	12	2	16	7.5	1.75

PACKING QUANTITIES

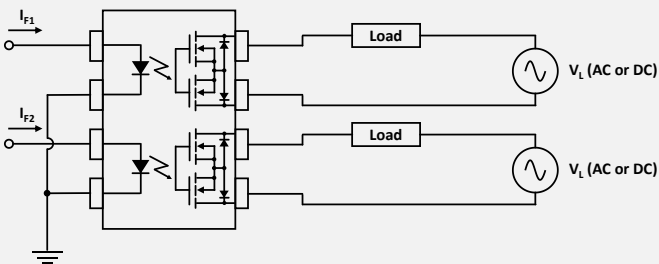
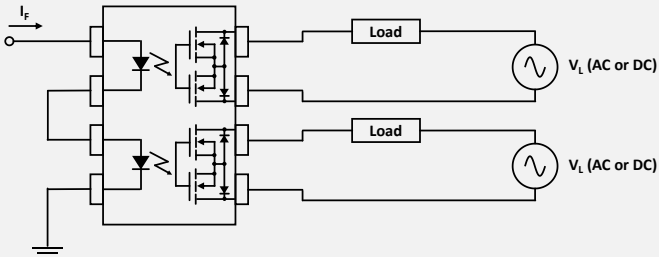
Tape and Reel Packing	PCS/Reel
SOP-8	1 000

Tube Packing	PCS/Tube	Tubes/Box	Units/Box
SOP-8	50	30	1 500

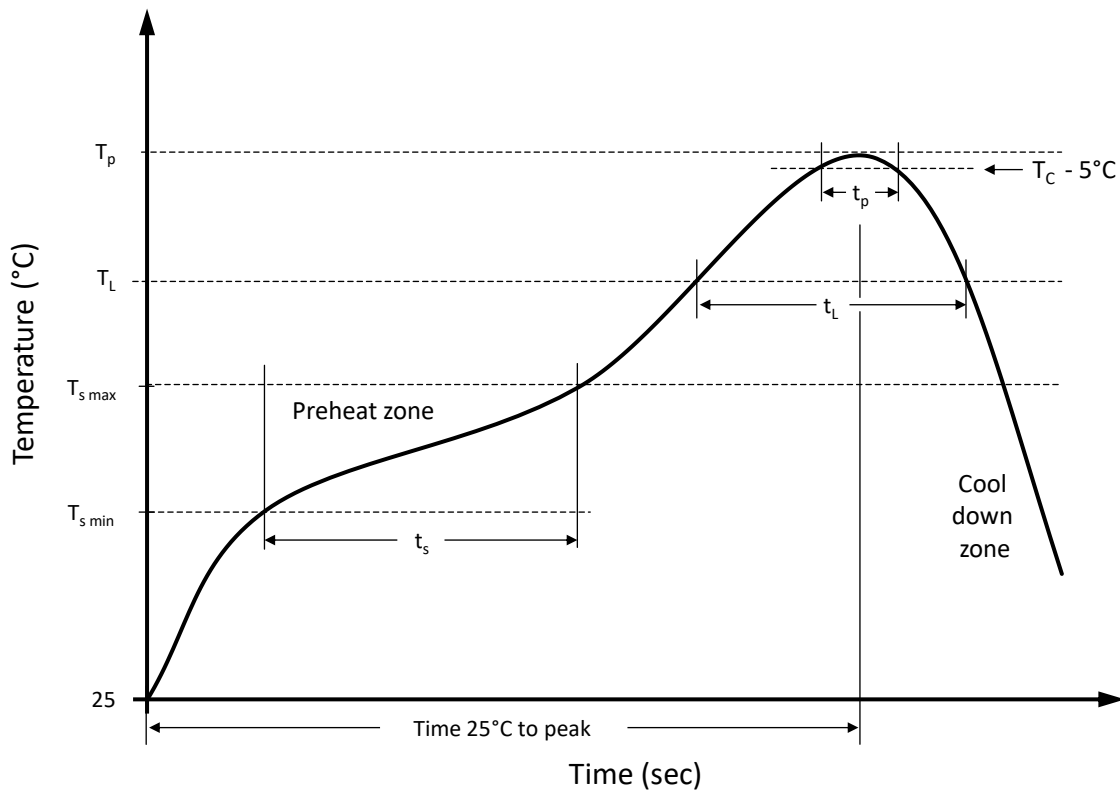
STORAGE AND HANDLING CONDITIONS

ESD level	Floor life	Conditions	MSL
HBM class 2	Unlimited	$T_A < 30^{\circ}\text{C}$, RH < 85%	1

LOAD CONNECTING METHOD

Type	Load	Connection	Feature
8 pins	AC or DC		2 input and 2 output
			1 input and 2 output

RECOMMENDED REFLOW SOLDERING PROFILE ▲ SMD PACKAGE



Recommended reflow soldering conditions ▲ Refer to JEDEC J-STD-020E

Profile Features		Sn-Pb Eutetic Assembly	Pb-Free Assembly
Preheat temperature min.	$T_{s \min}$	100 °C	150 °C
Preheat temperature max.	$T_{s \max}$	150 °C	200 °C
Preheat time t_s from $T_{s \min}$ to $T_{s \max}$	t_s	120 seconds	120 seconds
Ramp-up rate (T_L to T_p)		max. 3 °C/second	max. 3 °C/second
Liquidous temperature	T_L	183 °C	217 °C
Time t_L maintained above T_L	t_L	150 seconds max.	60 seconds max.
Peak package body temperature	T_p	235°C	260°C
Timeframe of within 5°C below and up to max actual peak body temperature	t_p	20 seconds max.	30 seconds max.
Ramp-down rate (T_L to T_p)		max. 6 °C/second	max. 6 °C/second
Time 25°C to peak temperature		max. 6 minutes	max. 8 minutes

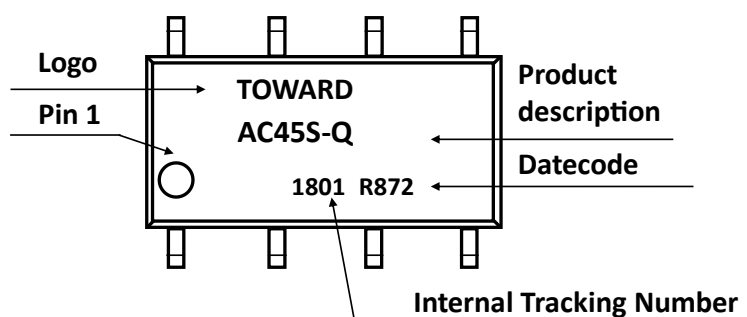
PRODUCT CODE

Example: AC45S-Q series ▲ 2 Form A ▲ AEC-Q101 ▲ 60V ▲ SOP-8 ▲ Tape & Reel

AC		45		S		Q		R1	
Package		Series		Type		Special Suffix		Packing	
AC	8 Pin ▲ 2 Form A	45	60V	S	SOP	Q	AEC-Q101	Blank R1	Tube Reel

PRODUCT MARKING

Example: AC45S-Q series ▲ 2 Form A ▲ AEC-Q101 ▲ 60V ▲ SOP-8 ▲ Tape & Reel



DATE CODE

Example: R872

R		8		7		2	
Material Characteristics		Year		Month		Week of the Month	
R	RoHS compliant	8	2018	1	Jan	1	1 st
		9	2019	2	Feb		2 nd
		A	2020	3	Mar		3 rd
		B	2021	4	Apr		4 th
H	Halogen free	C	2022	5	May	2	1 st
			2 nd
		G	2026	12	Dec		3 rd
							4 th

RELIABILITY TESTS ▲ STANDARD

Standard: AEC-Q101, JESD22-A, J-STD-002

No.	Test	Test Specification	Test Standard	Test Result
1	Precondition	Temperature: 25°C ± 5°C; Humidity: 55% RH ± 10% Bake condition: Temperature: 125°C; Duration 24 hours Soak condition: Temperature: 60°C; Humidity: 60% RH Duration 40 hours Reflow condition: Peak temperature: 250°C; time within 5°C of the peak temperature: at least 30 seconds Duration: 3 times	JESD22-A113	No abnormal phenomenon was found. Functional test passed.
2	Temperature Cycling Test	Temperature: 25°C ± 5°C; Humidity: 55% RH ± 15% Temperature range: -40°C ~ +125°C Dwell time: 10 minutes Transition time: 5 minutes Duration: 1000 cycles	JESD22-A104	No abnormal phenomenon was found. Functional test passed. No abnormal bond wire was found after DPA.
3	Unbiased Highly Accelerated Stress Test	Temperature: 25°C ± 5°C; Humidity: 55% RH ± 15% Temperature: 130°C Humidity: 85% RH Pressure: 33.3 psia Duration: 96 hours	JESD22-A118	No abnormal phenomenon was found. Functional test passed.
4	Resistance to Solder Heat Test	Temperature: 25°C ± 5°C; Humidity: 55% RH ± 10% Solder: SAC305 Flux: SM-25 (Flux #2) Temperature: 260°C Duration: 10 seconds	JESD22-A106	No abnormal phenomenon was found.
5	Solderability Test	Temperature: 25°C ± 5°C; Humidity: 55% RH ± 10% Solder: SAC305 Flux: SM-25 (Flux #2) Temperature: 245°C Duration: 5 seconds	J-STD-002D	All samples of solderability test passed the test.
6	Physical Dimensions Test	Temperature: 25°C ± 5°C; Humidity: 55% RH ± 10% Measurement: Width, depth, and height of device	JESD22-B100	All samples of physical dimension test in the criteria.
7	Power Temperature Cycling Test	Temperature: 25°C ± 5°C; Humidity: 55% RH ± 10% Temperature range: -40°C to +125°C Dwell time: 10 minutes Ramp time: 30 minutes Voltage: PS1: 5V, PS2: 1440V, On: 5 minutes, Off: 5 minutes	JESD22-A105	No abnormal phenomenon was found. Functional test passed.
8	Terminal Strength Test	Temperature: 25°C ± 5°C; Humidity: 55% RH ± 10% Test lead: Two leads on each device Loading force: 8 oz Bend angle: 90 arcs Bend cycle: Three cycles	JESD22-B105D	No broken lead of the device after three cycles of bending test.

RELIABILITY TESTS ▲ STANDARD

Standard: AEC-Q101, JESD22-A, J-STD-002

No.	Test	Test Specification	Test Standard	Test Limits
9	High Temperature Reverse Bias	Temperature: 25°C ± 5°C; Humidity: 55% RH ± 10% Temperature: 125°C Voltage: PS2: 1440V Duration: 1000 hours	MIL-STD-750 Method 1038	No abnormal phenomenon was found. Functional test passed.
10	High Humidity High Temperature Reverse Bias	Temperature: 25°C ± 5°C; Humidity: 55% RH ± 10% Temperature: 85°C; Humidity: 85% RH Voltage: PS2: 100V Duration: 1000 hours	JESD22-A101	No abnormal phenomenon was found. Functional test passed. No abnormal bond wire was found after DPA.
11	Human-Body Model Test	Temperature: 25°C ± 5°C; Humidity: 55% RH ± 10% Interval: > 1s; Zap 3 pulses Testing combinations: all to other pins	AEC-Q101-001 Rev.A	All samples of HBM test passed the test.
12	Charge Device Model Test	Temperature: 25°C ± 5°C; Humidity: 55% RH ± 15% Interval: > 1s; Zap 3 pulses; Test humidity: < 30% RH Test pin: All pins	AEC-Q101-005 Rev.A	All samples of CDM test passed the test.

REVISION TABLE

Revision	Date	Status	Notes
001	01/10/2021	Initial release	Initial publication

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