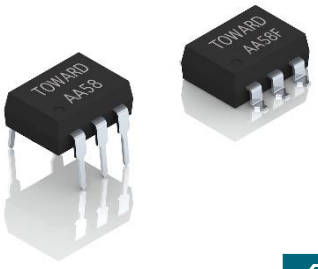


AA58 SERIES

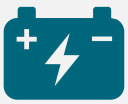
AEC-Q101 ▲ 1800V ▲ SiC MOSFET RELAY

SILICON CARBIDE SiC MOSFET RELAY ▲ DIP and SMD type
High voltage with low on-resistance
Fast reverse recovery time
AEC-Q101 qualified
Moisture Sensitivity Level ▲ MSL 1
UL 1577 approved ▲File no E344988

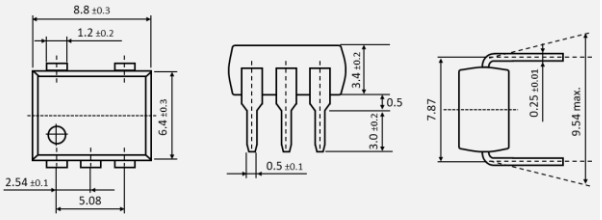
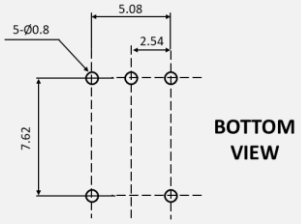
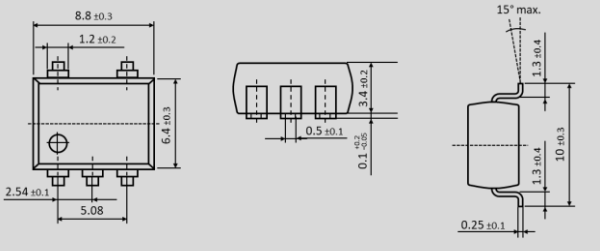
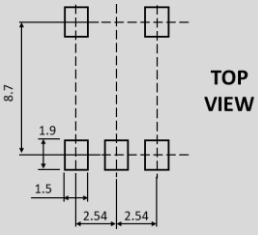
SPECIFICATION

Item		Characteristics
Contact Form		1 Form A ▲ Normally open switch
Load Voltage	V_L	1800V
Operation LED Current	$I_{F\ ON}$	5.0mA
Load Current	I_L	30mA
On-Resistance	R_{ON}	100Ω
Output Capacitance	C_{OUT}	10pF
Low Off-State Leakage Current	I_{LEAK}	1μA at $1500V_{DC}$ / 10μA at $1800V_{DC}$

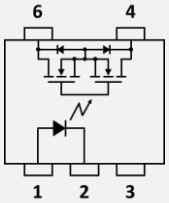
APPLICATIONS

Battery Management	Building Automation	Electric Mobility	Energy Management	EV Charging	Industrial Automation	Measurement Equipment
						

DIMENSIONS

Package	Dimensions	PCB Board Pattern
DIP6-5 		
SMD6-5 		

PIN DESCRIPTION AND PART NUMBER

Circuit Diagram	Pin Description	Part No.	Package	Packing
	1: Anode (+) ▪ LED 2: Cathode (-) ▪ LED 3: NC 4: Drain ▪ MOSFET 1 6: Drain ▪ MOSFET 2	AA58 AA58F AA58F-R1	DIP6-5 SMD6-5 SMD6-5	Tube (50pcs) Tube (50pcs) Reel (1000pcs)

ABSOLUTE MAXIMUM RATINGS ▲ AMBIENT TEMPERATURE T_A = 25°C

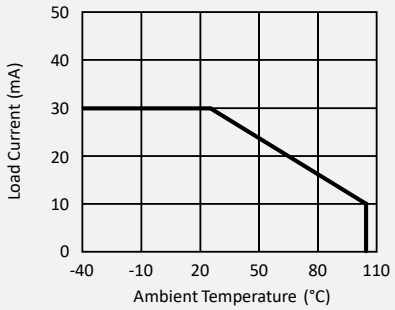
Item		Condition	Symbol	Value	Unit
Input	Continuous LED Current		I_F	50	mA
	Peak LED Current	100 Hz, Duty 1%	I_{FP}	500	mA
	LED Reverse Voltage		V_R	5	V
	Input Power Dissipation		P_{IN}	75	mW
Output	Load Voltage		V_L	1800	V (AC peak or DC)
	Load Current		I_L	30	mA
	Peak Load Current	10 ms, 1 shot	I_{PEAK}	80	mA
	Output Power Dissipation		P_{OUT}	450	mW
Relay	Total Power Dissipation		P_T	500	mW
	I/O Breakdown Voltage		$V_{I/O}$	3750	Vrms
	I/O Breakdown Voltage (Suffix-H)		$V_{I/O}$	5000	Vrms
	Operating Temperature Range		T_{OPR}	-40 to +105	°C
	Storage Temperature Range		T_{STG}	-40 to +125	°C

ELECTRICAL CHARACTERISTICS ▲ AMBIENT TEMPERATURE T_A = 25°C

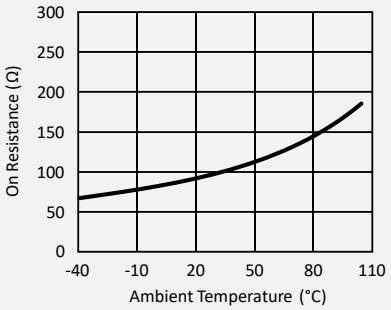
Item		Condition	Symbol	Min.	Typ.	Max.	Unit
Input	LED Forward Voltage	I_F = 10mA	V_F	1	1.33	1.5	V
	Operation LED Current		$I_{F\ ON}$		2	5	mA
	Recovery LED Voltage		$V_{F\ OFF}$	0.5	1.2		V
Output	On-Resistance	I_F=10mA, I_L=Rating	R_{ON}		120	200	Ω
	Drain to Drain (tested within 1 sec.)	I_F=10mA, I_L=5mA			100	180	
	Off-State Leakage Current	V_L =1800V	I_{LEAK}			10	μA
		V_L =1500V				1	
	Output Capacitance	V_L=0V, f=1 MHz	C_{OUT}		10		pF
Trans-mission	Turn-On Time	I_F=10mA, I_L=Rating	T_{ON}		0.2	3	ms
	Turn-Off Time	I_F=10mA, I_L=Rating	T_{OFF}		0.06	1	ms
Coupled	I/O Insulation Resistance		$R_{I/O}$	10^{10}			Ω
	I/O Capacitance	f=1MHz	$C_{I/O}$		1.3		pF

REFERENCE DATA

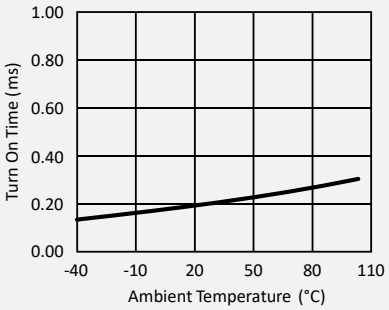
Load current vs. ambient temp.



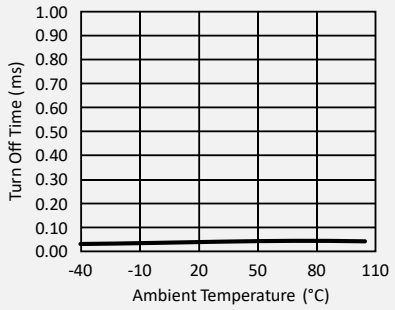
On resistance vs. ambient temp.



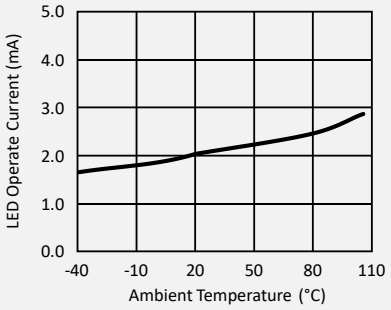
Turn on time vs. ambient temp.



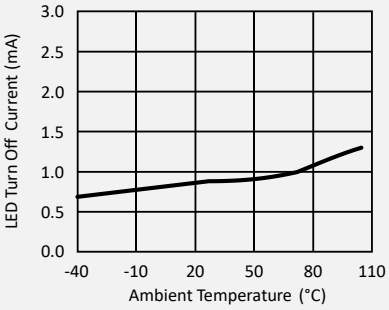
Turn off time vs. ambient temp.



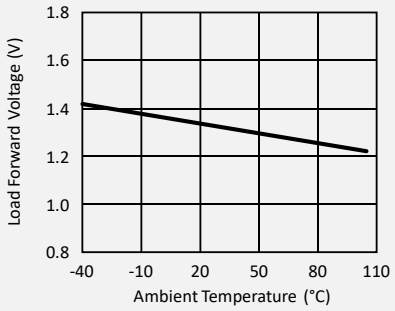
LED operate current vs. ambient temp



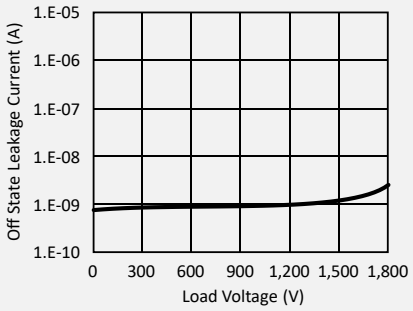
LED turn off current vs. ambient temp.



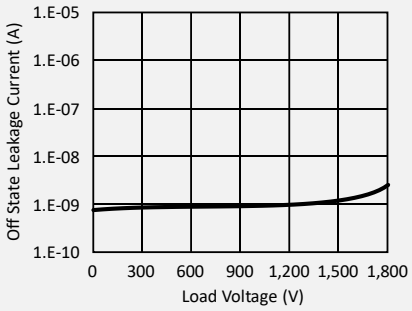
Load forward voltage vs. ambient temp.



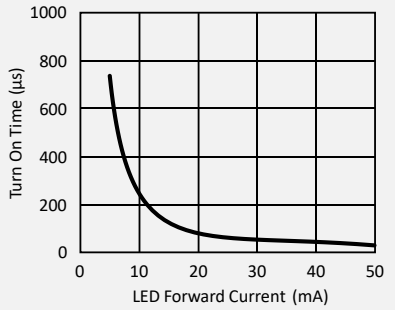
Current vs. voltage characteristics of output at MOS portion



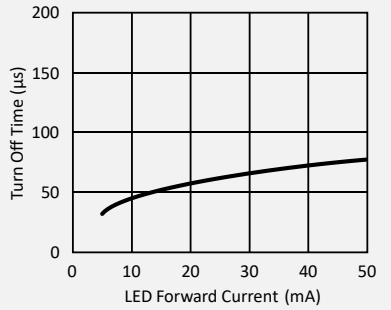
Off state leakage current vs. load voltage



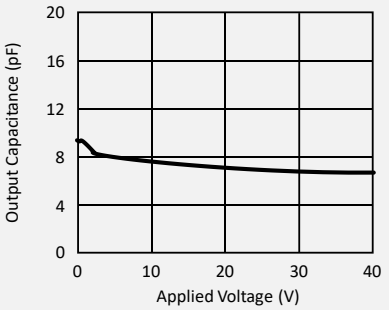
Turn on time vs. LED forward current



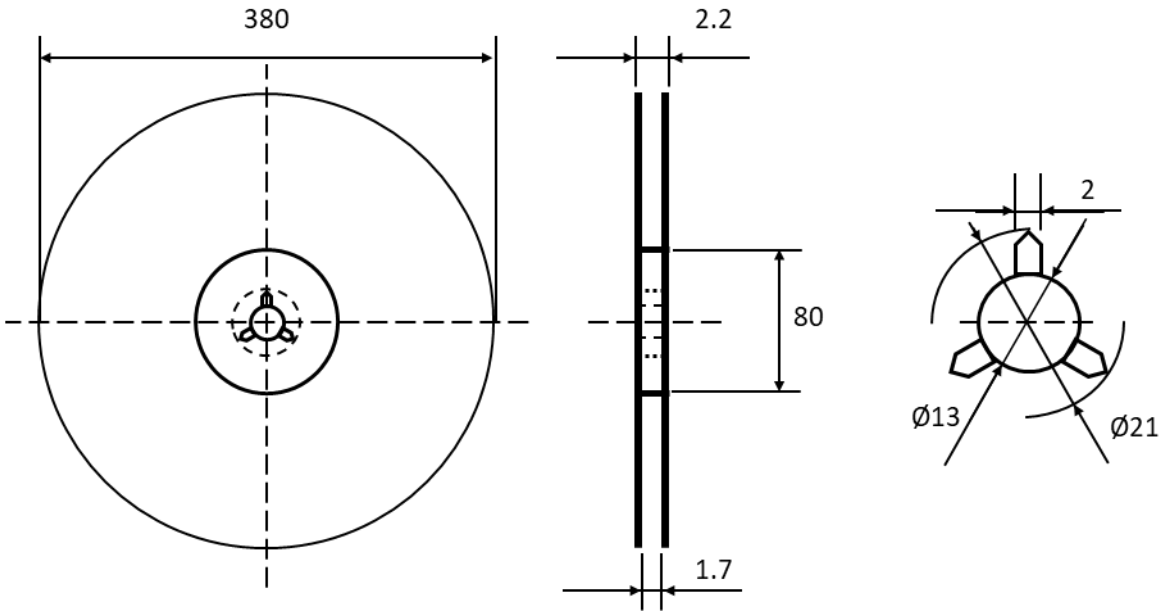
Turn off time vs. LED forward current



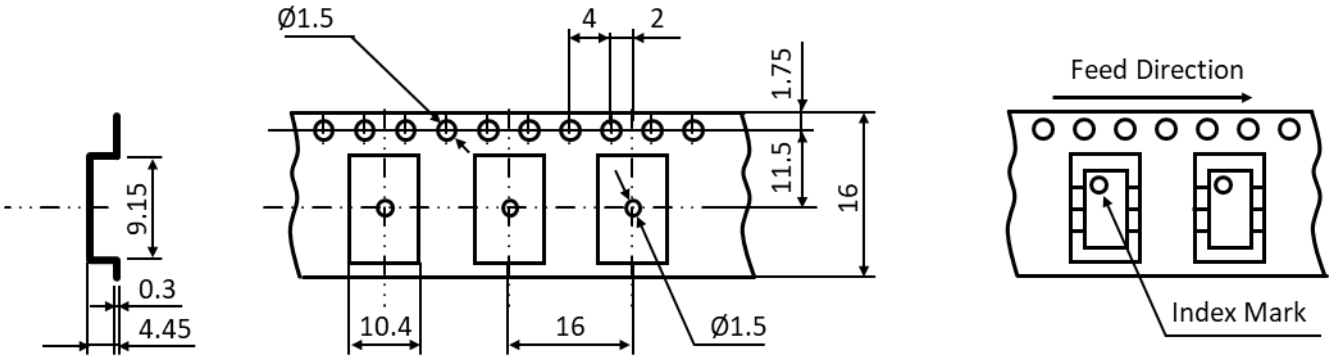
Output capacitance vs. applied voltage



REEL DIMENSIONS ▲ All dimensions in mm



TAPE DIMENSIONS ▲ All dimensions in mm



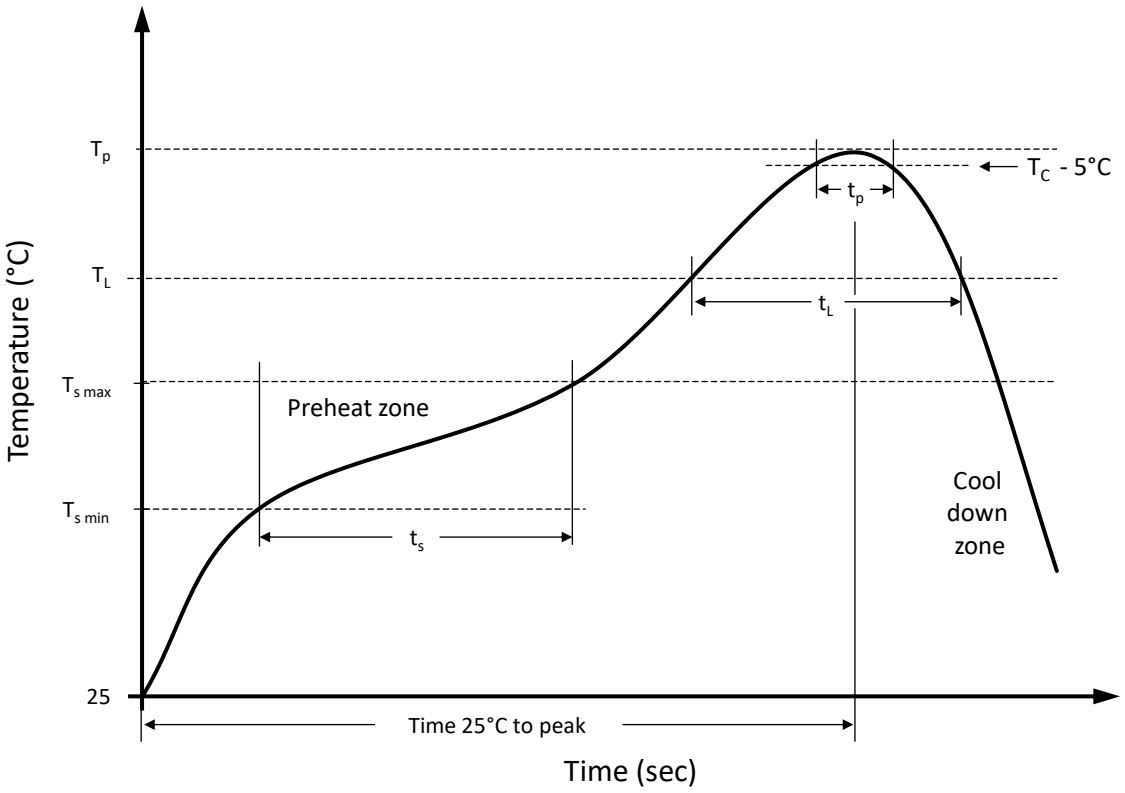
Tape and Reel Packing	PCS/Reel
SMD 6-5	1000

Tube Packing	PCS/Tube	Tubes/Box	Units/Box
SMD 6-5	50	30	1500
DIP 6-5	50	30	1500

STORAGE AND HANDLING CONDITIONS

ESD level	Floor life	Conditions	MSL
HBM class 2	Unlimited	T_A < 30°C, RH < 85%	1

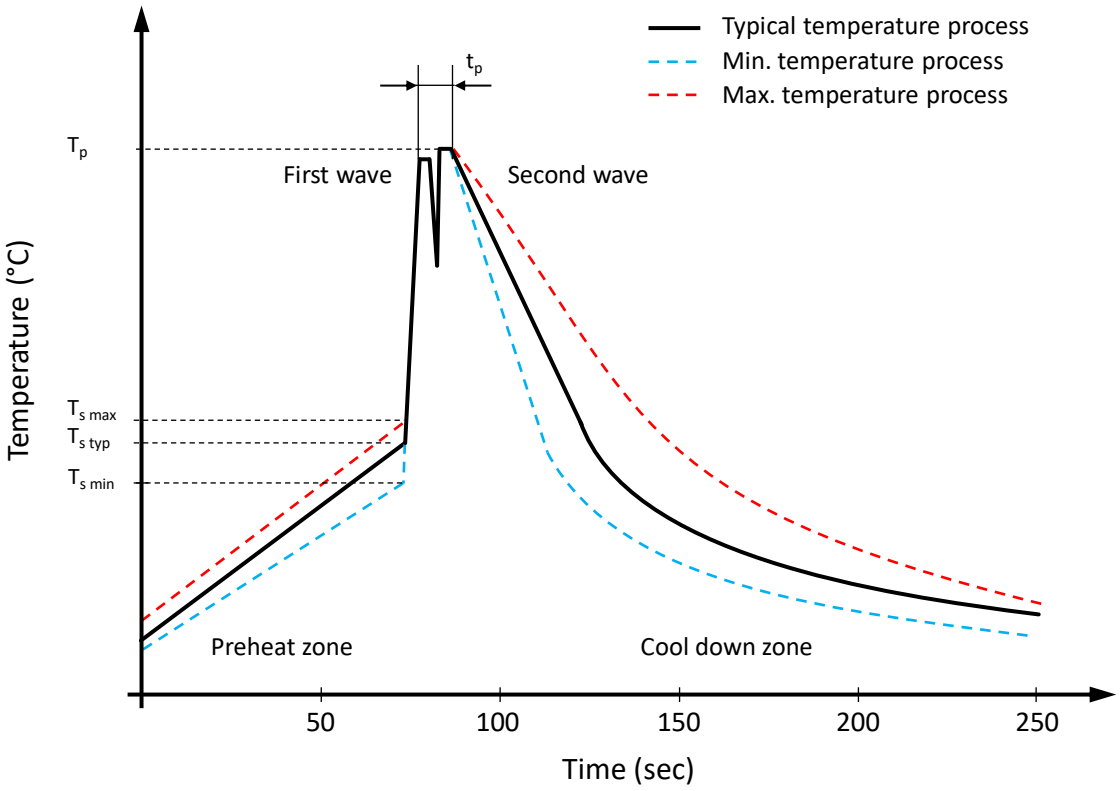
RECOMMENDED REFLOW SOLDERING PROFILE ▲ SMD PACKAGE



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

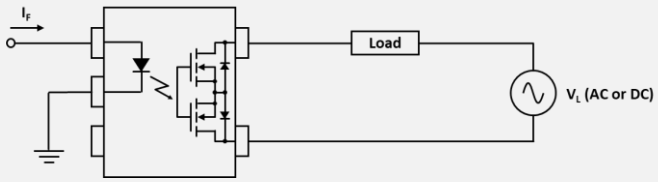
RECOMMENDED WAVE SOLDERING PROFILE ▲ THT PACKAGE



Classification wave soldering profile ▲ Refer to EN 61760-1: 2006

Profile Features		Value ▲ Sn-Pb Assembly	Value ▲ Pb-free Assembly
Preheat temperature min.	$T_{s\ min}$	100 °C	100 °C
Preheat temperature typical	$T_{s\ typ}$	120 °C	120 °C
Preheat temperature max.	$T_{s\ max}$	130 °C	130 °C
Preheat time t_s from $T_{s\ min}$ to $T_{s\ max}$	t_s	70 seconds	70 seconds
Peak temperature	T_p	235 °C to 260 °C	245 °C to 260 °C
Time of actual peak temperature	t_p	Max. 10 seconds Max. 5 second each wave	Max. 10 seconds Max. 5 second each wave
Ramp-down date min.		~ 2 °C/second	~ 2 °C/second
Ramp-down rate typical		~ 3.5 °C/second	~ 3.5 °C/second
Ramp-down rate max.		~ 5 °C/second	~ 5 °C/second
Time 25°C to 25°C		4 minutes	4 minutes

LOAD CONNECTING METHOD

Type	Load		Connection	Feature
5 pin	A	AC or DC		Control bi-directional signal

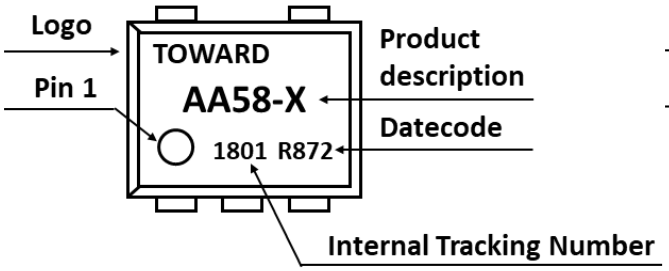
PRODUCT CODE

Example: AA58 series ▲ AEC-Q101 ▲ 1800V ▲ SMD6-5 ▲ Tape & Reel

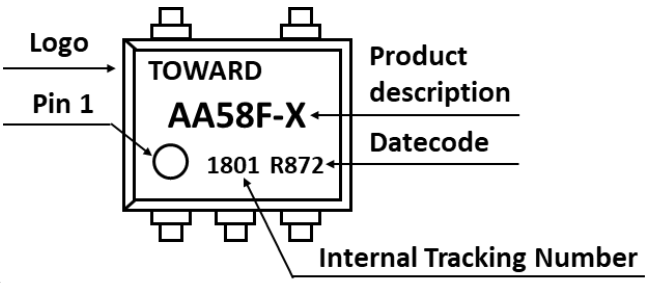
AA		58		-		F		R1	
Package		Series		Special Suffix		Type		Packing	
AA AM	6-5 8-6	50 51 52 53 54 58	650V 1200V 1700V 3300V 6600V 1800V	Blank A H	Standard Low Leakage Current High Insulation	Blank F S	DIP SMD SOP	Blank R1	Tube Reel

PRODUCT MARKING

Package DIP 6-5



Package SMD 6-5



DATE CODE

Example: R872

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

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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