

## AA53 SERIES

### 3300V ▲ SiC MOSFET RELAY

SILICON CARBIDE SiC MOSFET RELAY ▲ DIP and SMD type

High voltage with low on-resistance

Fast reverse recovery time

High avalanche ruggedness

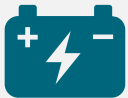






Moisture Sensitivity Level ▲ MSL 1

 UL 1577 approved ▲ File no E344988


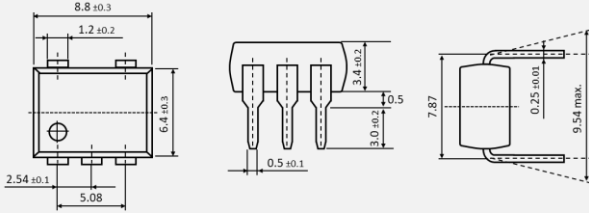
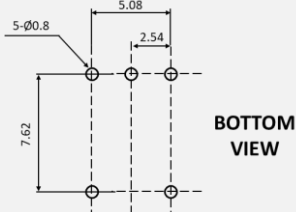

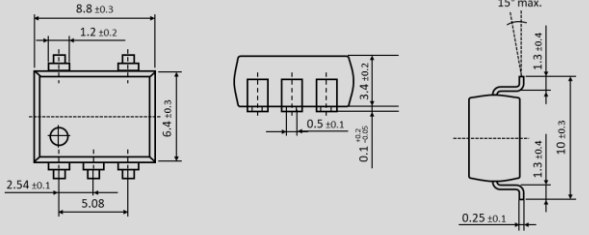
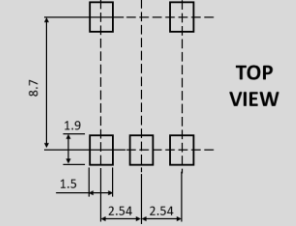
## SPECIFICATION

Item		Characteristics
Contact Form		1 Form A ▲ Normally open switch
Load Voltage	$V_L$	3300V
Operation LED Current	$I_{F\ ON}$	5.0mA
Load Current	$I_L$	350mA
On-Resistance	$R_{ON}$	3.2Ω
Output Capacitance	$C_{OUT}$	220pF
Low Off-State Leakage Current	$I_{LEAK}$	1μA at 3300V <sub>DC</sub>

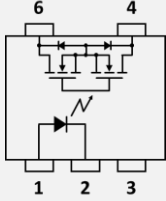
## APPLICATIONS

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

## DIMENSIONS

Package	Dimensions	PCB Board Pattern
<b>DIP6-5</b> 		
<b>SMD6-5</b> 		

## 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	AA53 AA53F AA53F-R1	DIP6-5 SMD6-5 SMD6-5	Tube (50pcs) Tube (50pcs) Reel (1 000pcs)

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

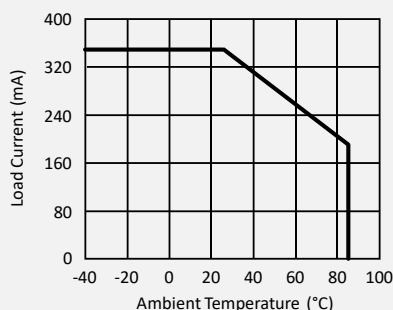
	Item	Condition	Symbol	Value	Unit
Input	Continuous LED Current		$I_F$	50	mA
	Peak LED Current	100 Hz, Duty 1%	$I_{FP}$	500	mA
	LED Reverse Voltage		$V_R$	5	V
	Input Power Dissipation		$P_{IN}$	75	mW
Output	Load Voltage		$V_L$	3300	V (AC peak or DC)
	Load Current		$I_L$	350	mA
	Peak Load Current	10 ms, 1 shot	$I_{PEAK}$	1050	mA
	Output Power Dissipation		$P_{OUT}$	550	mW
Relay	Total Power Dissipation		$P_T$	600	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 +85	$^{\circ}\text{C}$
	Storage Temperature Range		$T_{STG}$	-40 to +100	$^{\circ}\text{C}$

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

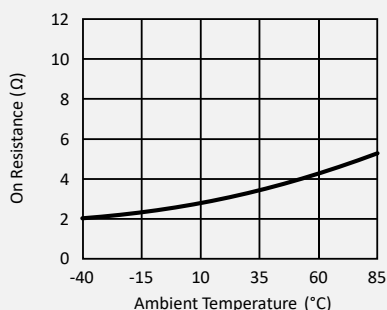
	Item	Condition	Symbol	Min.	Typ.	Max.	Unit
Input	LED Forward Voltage	$I_F = 10\text{mA}$	$V_F$	1	1.33	1.5	V
	Operation LED Current		$I_{F\text{ ON}}$		2.4	5	mA
	Recovery LED Voltage		$V_{F\text{ OFF}}$	0.5	1.2		V
Output	On-Resistance	$I_F=10\text{mA}, I_L=\text{Rating}$	$R_{ON}$		3.2	4	$\Omega$
	Drain to Drain (tested within 1 sec.)						
	Off-State Leakage Current	$V_L = 3300\text{V}$	$I_{LEAK}$			1	$\mu\text{A}$
	Output Capacitance	$V_L=0\text{V}, f=1\text{ MHz}$	$C_{OUT}$		220		pF
Trans- mission	Turn-On Time	$I_F=10\text{mA}, I_L=\text{Rating}$	$T_{ON}$		1	3	ms
	Turn-Off Time	$I_F=10\text{mA}, I_L=\text{Rating}$	$T_{OFF}$		0.05	1	ms
Coupled	I/O Insulation Resistance		$R_{I/O}$	$10^{10}$			$\Omega$
	I/O Capacitance	$f=1\text{MHz}$	$C_{I/O}$		1.3		pF

## REFERENCE DATA

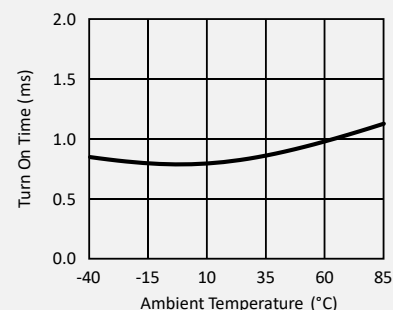
Load current vs. ambient temp.



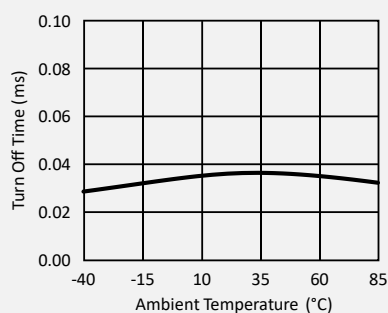
On resistance vs. ambient temp.



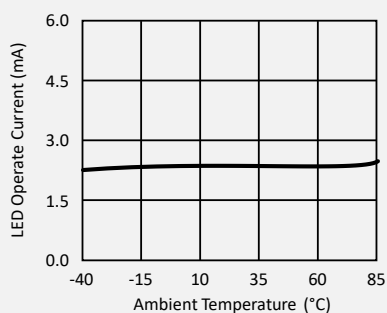
Turn on time vs. ambient temp.



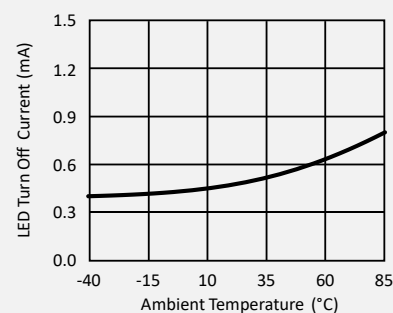
Turn off time vs. ambient temp.



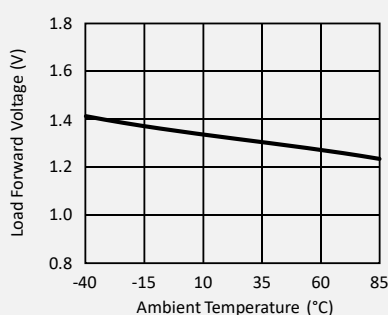
LED operate current vs. ambient temp



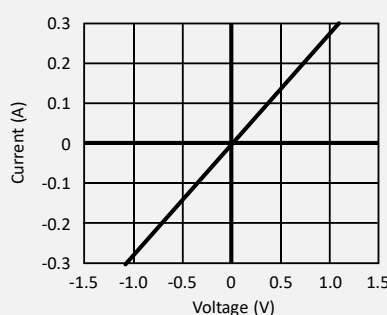
LED turn off current vs. ambient temp.



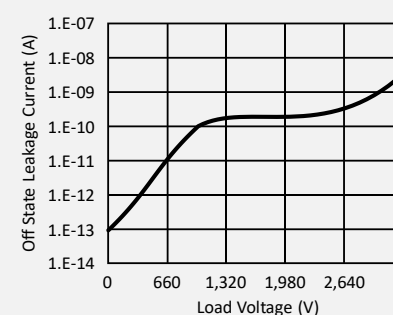
Load forward voltage vs. ambient temp.



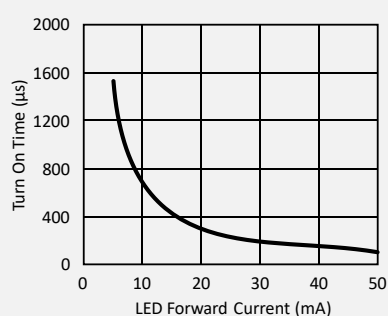
Current vs. voltage characteristics of output at MOS portion



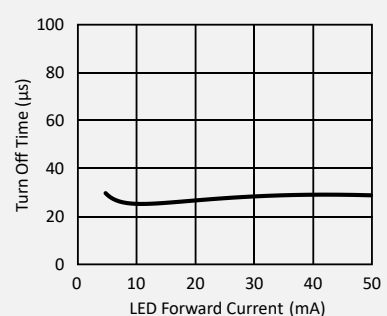
Off state leakage current vs. load voltage



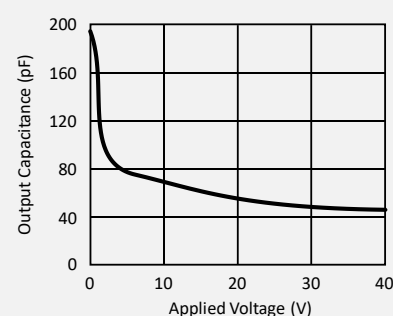
Turn on time vs. LED forward current



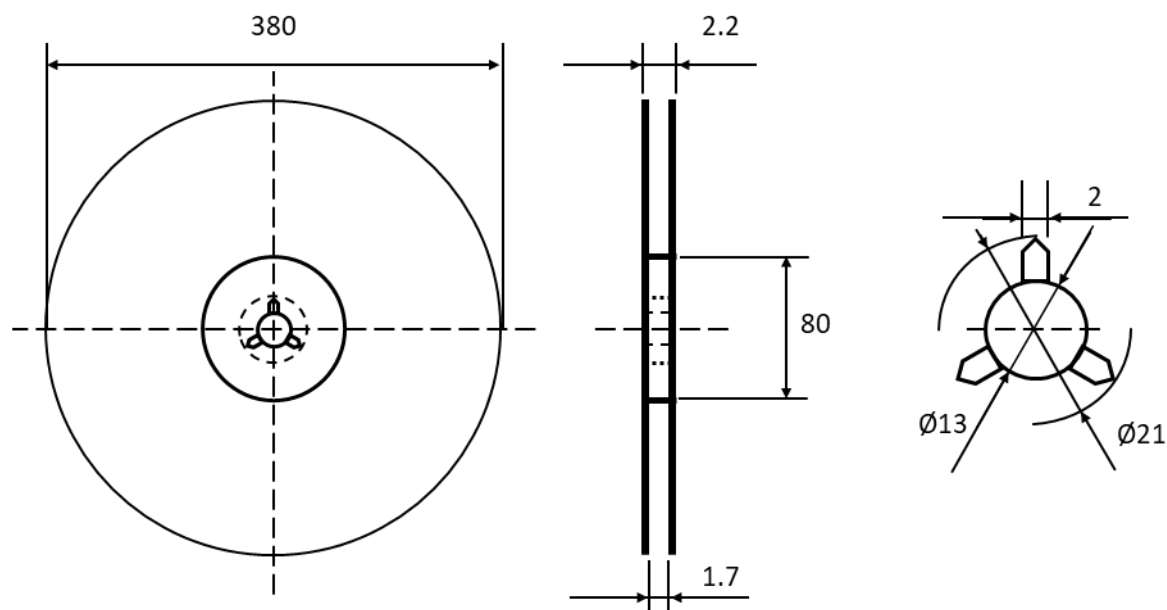
Turn off time vs. LED forward current



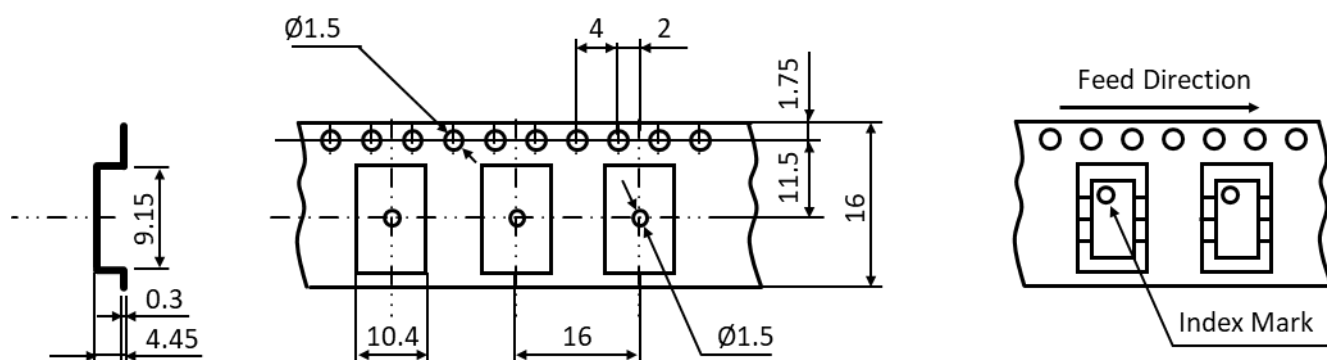
Output capacitance vs. applied voltage



## REEL DIMENSIONS ▲ All dimensions in mm



## TAPE DIMENSIONS ▲ All dimensions in mm



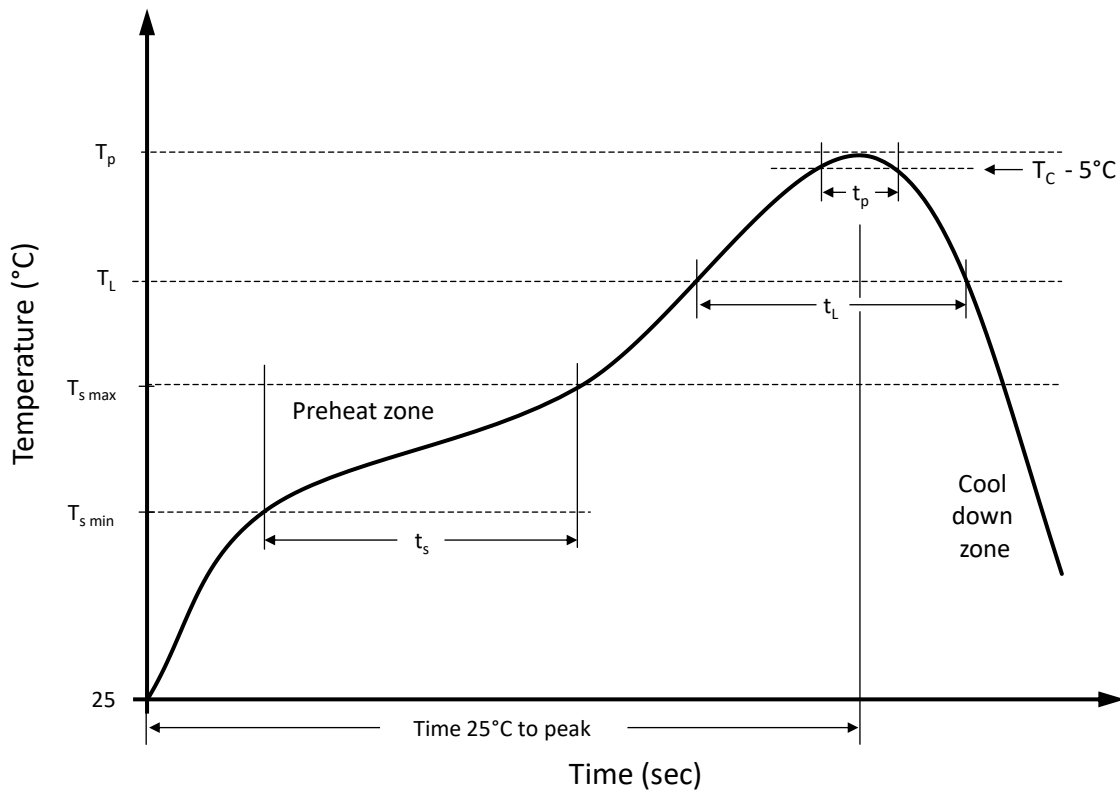
Tape and Reel Packing	PCS/Reel
SMD 6-5	1000

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 <sub>A</sub> < 30°C, RH < 85%	1

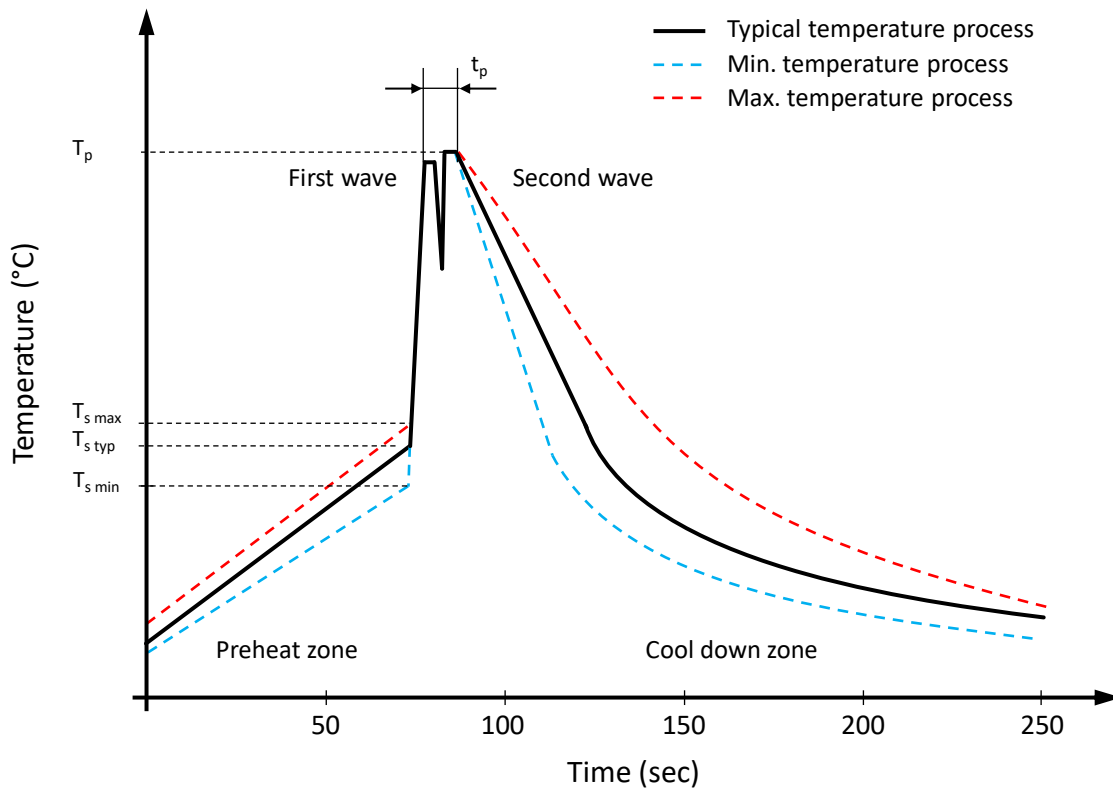
## RECOMMENDED REFLOW SOLDERING PROFILE ▲ SMD PACKAGE



### 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

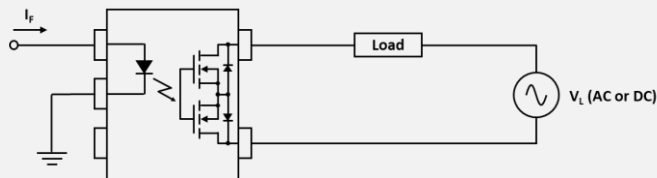


### Classification wave soldering profile ▲ Refer to EN 61760-1: 2006

Profile Features		Value - Sn-Pb Assembly	Value - Pb-free Assembly
Preheat temperature min.	$T_{s \text{ min}}$	100 °C	100 °C
Preheat temperature typical	$T_{s \text{ typ}}$	120 °C	120 °C
Preheat temperature max.	$T_{s \text{ max}}$	130 °C	130 °C
Preheat time $t_s$ from $T_{s \text{ min}}$ to $T_{s \text{ max}}$	$t_s$	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 rate 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



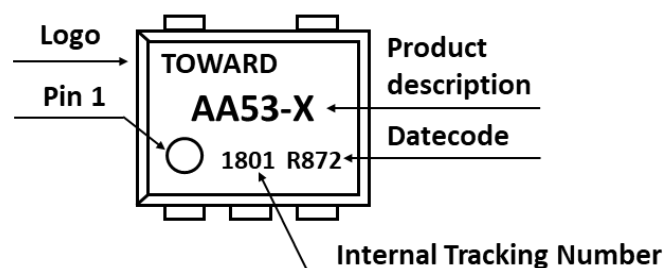
## PRODUCT CODE

Example: AA53 series ▲ 3300V ▲ SMD6-5 ▲ Tape & Reel

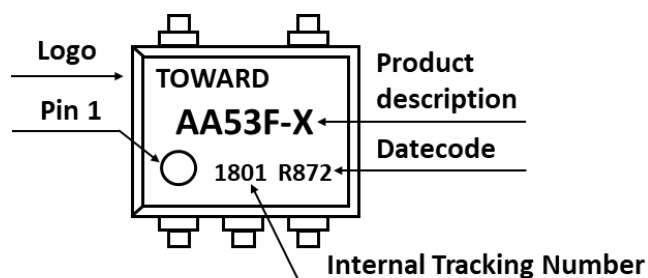
AA		53		-		F		R1	
Package		Series		Special Suffix		Type		Packing	
AA	6-5	50	650V	Blank	Standard	Blank	DIP	Blank	Tube
AM	8-6	51	1200V	A	Low Leakage Current	F	SMD	R1	Reel
		52	1700V	H	High Insulation	S	SOP		
		53	3300V						
		54	6600V						
		58	1800V						

## 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	2018	1	Jan	1	1 <sup>st</sup>
		9	2019	2	Feb	2	2 <sup>nd</sup>
		A	2020	3	Mar	3	3 <sup>rd</sup>
		B	2021	4	Apr	4	4 <sup>th</sup>
		C	2022	5	May		
H	Halogen free	...	...	...	...		
		G	2026	12	Dec		

## RELIABILITY TESTS ▲ STANDARD

Standard: JESD22-A

No.	Test	Test Specification	Test Standard	Test Limits
1	Moisture Sensitivity Level Test	Bake condition: Temperature: 125°C; Duration 24 hours Soak condition: Temperature: 30°C; Humidity: 60% RH Duration 192 hours Reflow condition: Peak temperature: 260°C Duration: 3 cycles	JESD22-A113H	No abnormal phenomenon was found. Functional test passed.
2	High Temperature Storage Test	Temperature: 150°C Duration: 500 hours	JESD22-A103E	No abnormal phenomenon was found. Functional test passed.
3	Temperature Cycling Test	Temperature range: -55°C to +125°C -55°C for 30 minutes +125°C for 30 minutes Duration: 100 cycles with 1 cycle = 70 minutes	JESD22-A104E	No abnormal phenomenon was found. Functional test passed.
4	Low Temperature Storage Test	Temperature: -40°C Duration: 500 hours	JESD22-A119E	No abnormal phenomenon was found. Functional test passed.
5	Temperature & Humidity Storage Test	Temperature: 85°C Humidity: 85% RH Duration: 500 hours	JESD22-A101D	No abnormal phenomenon was found. Functional test passed.
6	Highly Accelerated Temperature and Humidity Stress Test	Temperature: 130°C Humidity: 85% RH Duration: 96 hours	JESD22-A118B	No abnormal phenomenon was found. Functional test passed.



## REVISION TABLE

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

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