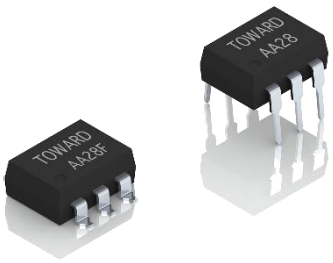


28 SERIES

HIGH CURRENT ▲ Si MOSFET RELAY

SILICON Si MOSFET RELAY ▲ DIP and SMD type
Switches AC or DC load
4500mA load current
Input TTL / CMOS compatible
Moisture Sensitivity Level ▲ MSL 3
UL 1577 approved ▲File no E344988

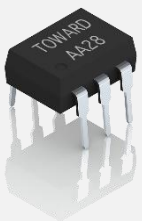
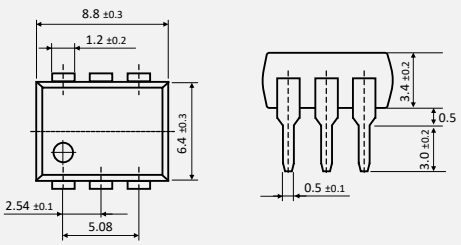
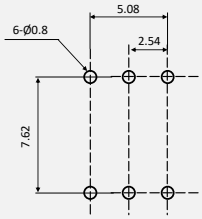
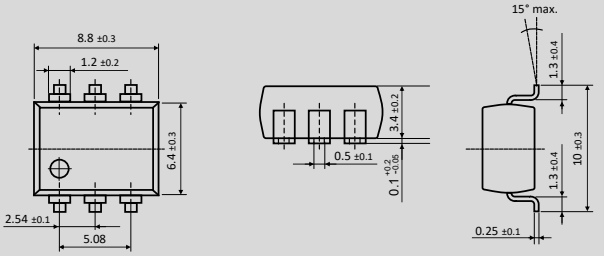
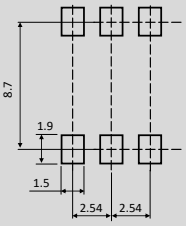
SPECIFICATION

Item		Characteristics
Contact Form		1 Form A ▲ Normally open switch
Load Voltage	V_L	40V
Operation LED Current	$I_{F\,ON}$	3mA
Load Current	I_L	4500mA
On-Resistance	R_{ON}	0.02Ω
Output Capacitance	C_{OUT}	690pF
Low Off-State Leakage Current	I_{LEAK}	1µA at $40V_{DC}$

APPLICATIONS

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

DIMENSIONS

Package	Illustration	Dimensions	PCB Board Pattern
DIP-6			 BOTTOM VIEW
SMD-6			 TOP VIEW

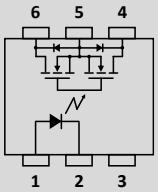
ABSOLUTE MAXIMUM RATINGS ▲ AMBIENT TEMPERATURE T_A = 25°C

Item		Condition	Symbol	Value		Unit
Type	Outline package			DIP-6	SMD-6	
	Part number			AA28	AA28F	
	Output channels			1	1	Channel
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		mV
Output	Load Voltage		V_L	40 (AC peak or DC)		V
	Load Current	Connecting A Connecting B Connecting C	I_L	4500 (AC or DC) 5000 (DC) 7000 (DC)		mA
	Peak Load Current	1 ms, 1 shot	I_{PEAK}	9500		mA
	Output Power Dissipation		P_{OUT}	500		mW
Relay	Total Power Dissipation		P_T	550		mW
	I/O Breakdown Voltage		$V_{I/O}$	3750		V_{RMS}
	I/O Breakdown Voltage (Suffix-H)		$V_{I/O}$	5000		V_{RMS}
	Operating Temperature Range		T_{OPR}	-40 to +85		°C
	Storage Temperature Range		T_{STG}	-40 to +100		°C

ELECTRICAL CHARACTERISTICS ▲ AMBIENT TEMPERATURE T_A = 25°C

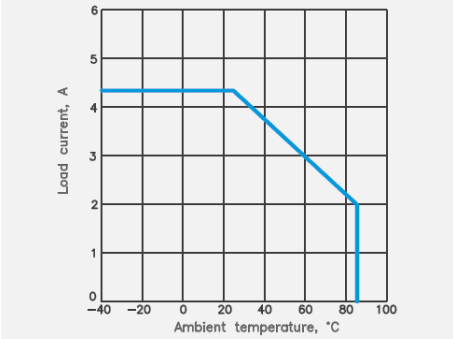
Item		Condition	Symbol	Min.	Typ.	Max.	Unit
Input	LED Forward Voltage	I_F = 10mA	V_F	1	1.37	1.5	V
	Operation LED Current		$I_{F\ ON}$		1.2	3	mA
	Recovery LED Voltage		$V_{F\ OFF}$	0.5	1.2		V
Output	On-Resistance Drain to Drain (tested within 1 sec.)	I_F=5mA, I_L=Rating	R_{ON}		0.02	0.03	Ω
	Off-State Leakage Current	V_L = 40V	I_{LEAK}			1	μA
	Output Capacitance	V_L=0V, f=1MHz	C_{OUT}		690		pF
Trans-mission	Turn-On Time	I_F=10mA, I_L=Rating	t_{ON}		1.2	4	ms
	Turn-Off Time	I_F=10mA, I_L=Rating	t_{OFF}		0.05	0.5	ms
Coupled	I/O Insulation Resistance		$R_{I/O}$	5 x 10^9			Ω
	I/O Capacitance	f=1MHz	$C_{I/O}$		1		pF

PIN DESCRIPTION AND PART NUMBER

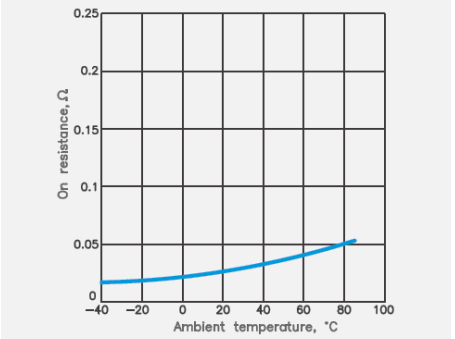
Circuit Diagram	Pin Description		Part No.	Package	Packing
	1 2 3 4,6 5	Anode (+) ▪ LED Cathode (-) ▪ LED NC Drain ▪ MOSFET Source ▪ MOSFET	AA28 AA28F AA28F-R1	DIP-6 SMD-6 SMD-6	Tube (50pcs) Tube (50pcs) Reel (1000pcs)

REFERENCE DATA

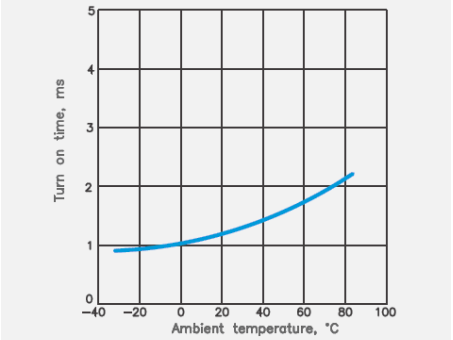
Load current vs. ambient temp.



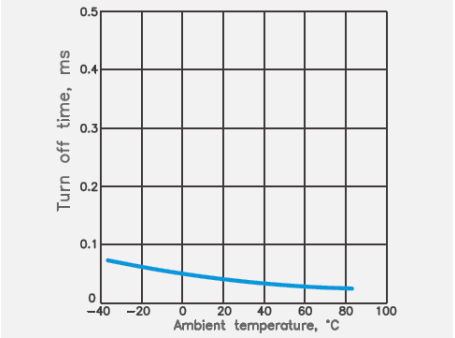
On resistance vs. ambient temp.



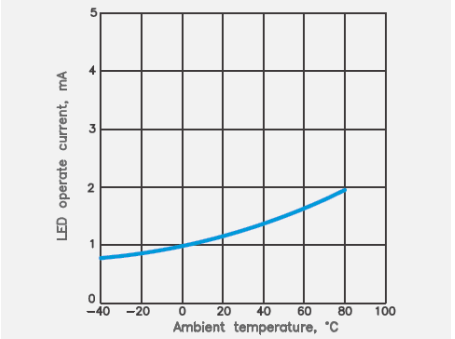
Turn on time vs. ambient temp.



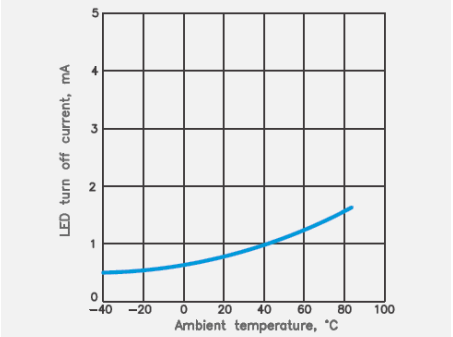
Turn off time vs. ambient temp.



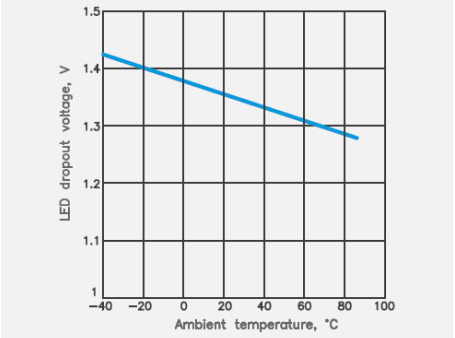
LED operate current vs. ambient temp



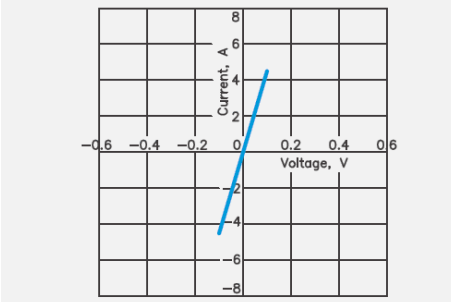
LED turn off current vs. ambient temp.



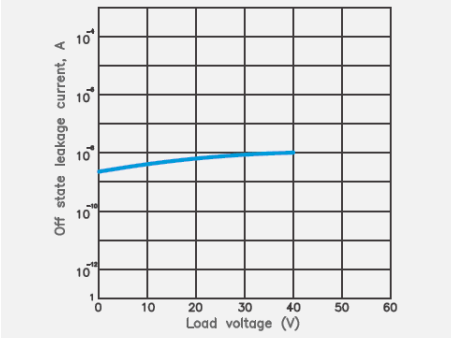
LED forward voltage vs. ambient temp.



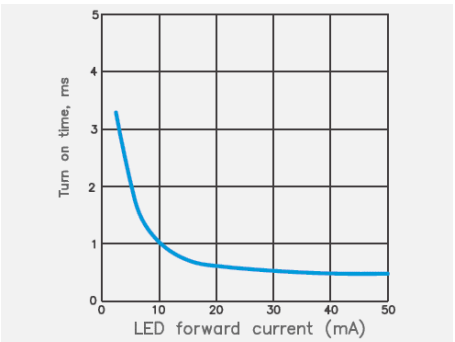
Current vs. voltage characteristics of output at MOS portion



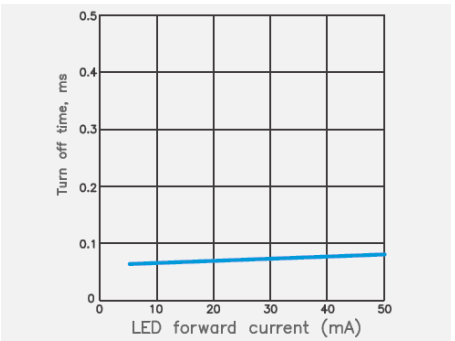
Off state leakage current vs. load voltage



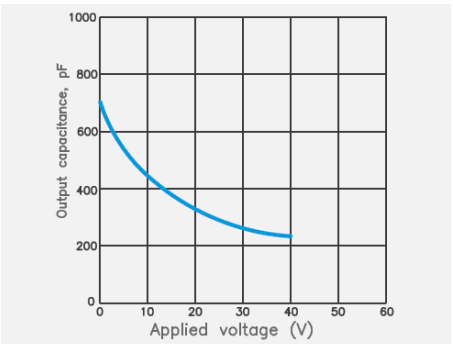
Turn on time vs. LED forward current



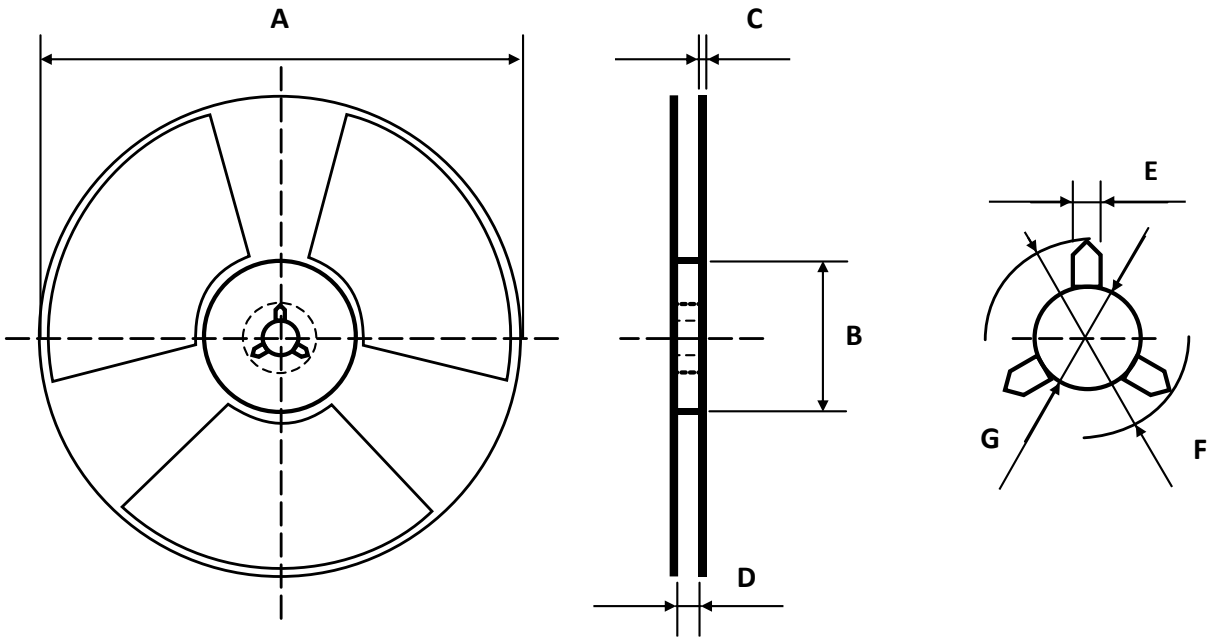
Turn off time vs. LED forward current



Output capacitance vs. applied voltage

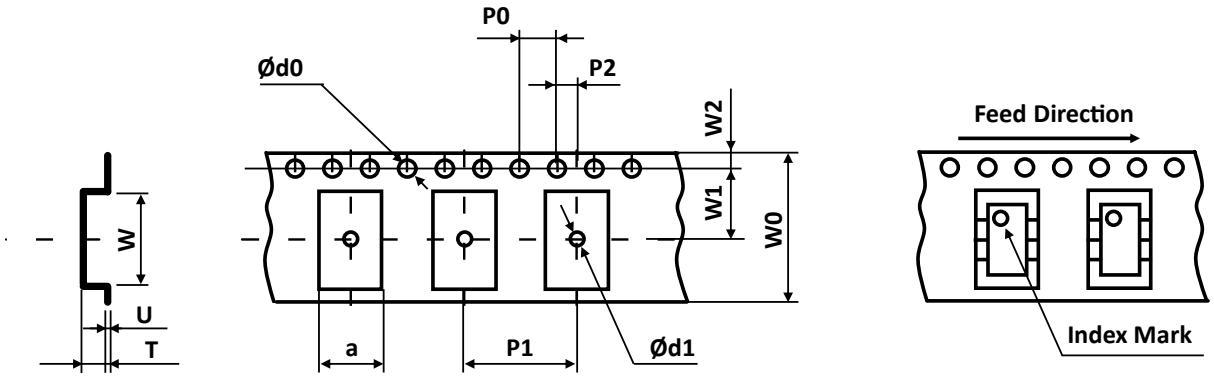


REEL DIMENSIONS ▲ All dimensions in mm



Size	A	B	C	D	E	F	G
SMD-6	380	80	2.2	17	2	13	21

TAPE DIMENSIONS ▲ All dimensions in mm



Size	W	U	T	a	Ød0	Ød1	P0	P1	P2	W0	W1	W2
SMD-6	9.15	0.3	4.45	10.4	1.5	1.5	4	16	2	16	11.5	1.75

PACKING QUANTITIES

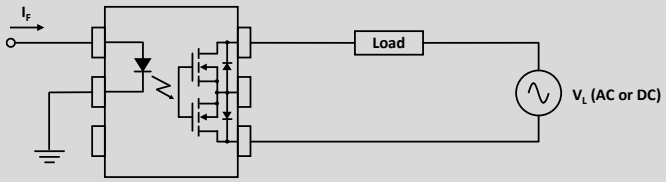
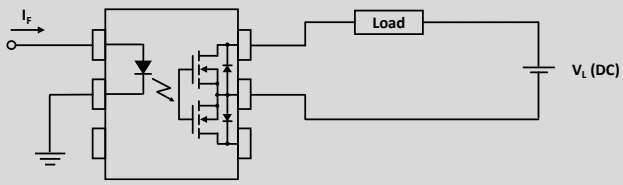
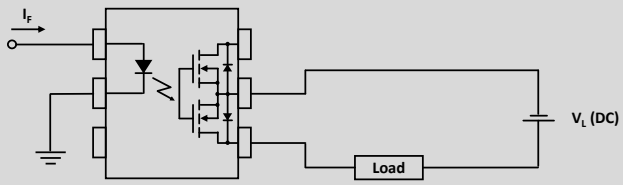
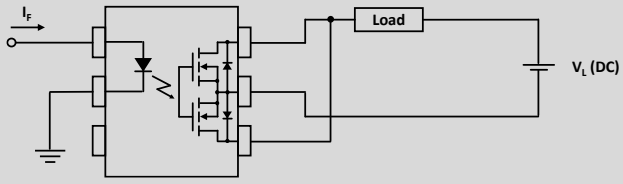
Tape and Reel Packing	PCS/Reel
SMD-6	1000

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

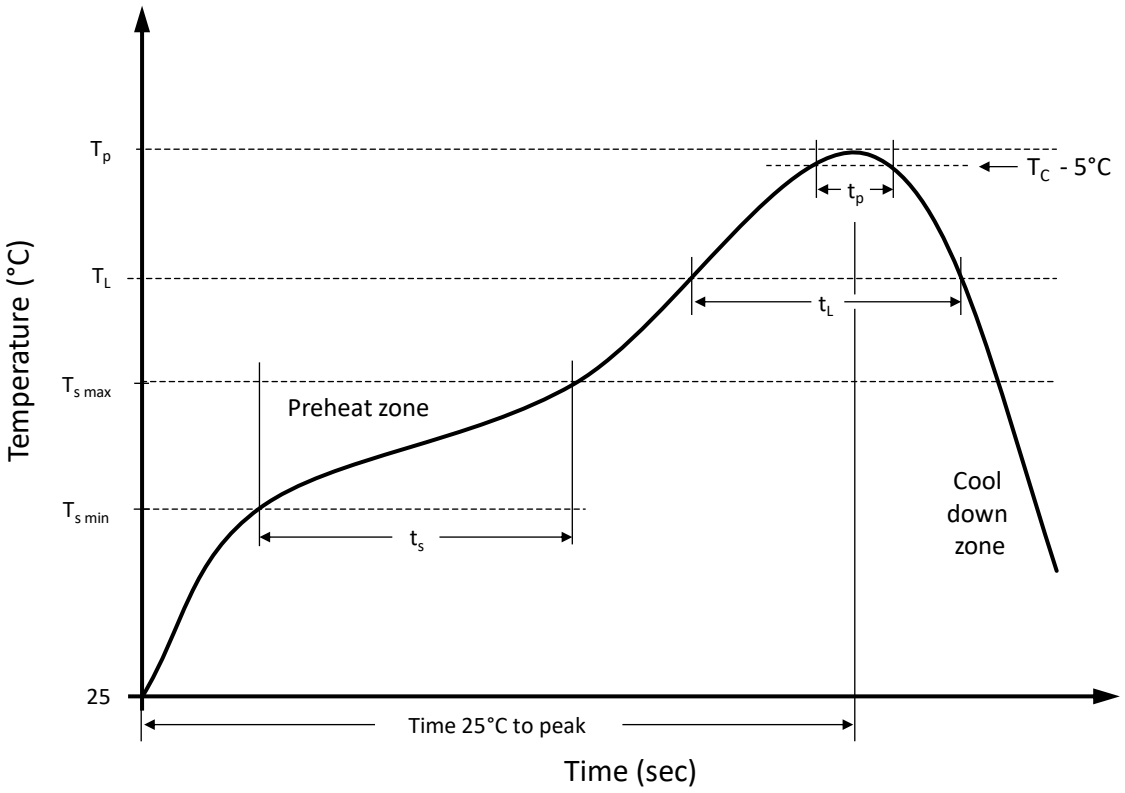
STORAGE AND HANDLING CONDITIONS

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

LOAD CONNECTING METHOD

Type	Load		Connection	Feature
6 pins	A	AC or DC		Control bi-directional signal
	B	DC		On-resistance is 1/2 of A-connection 2-Make-contacts (Source Common)
				
	C	DC		On-Resistance is 1/2 of B-connection

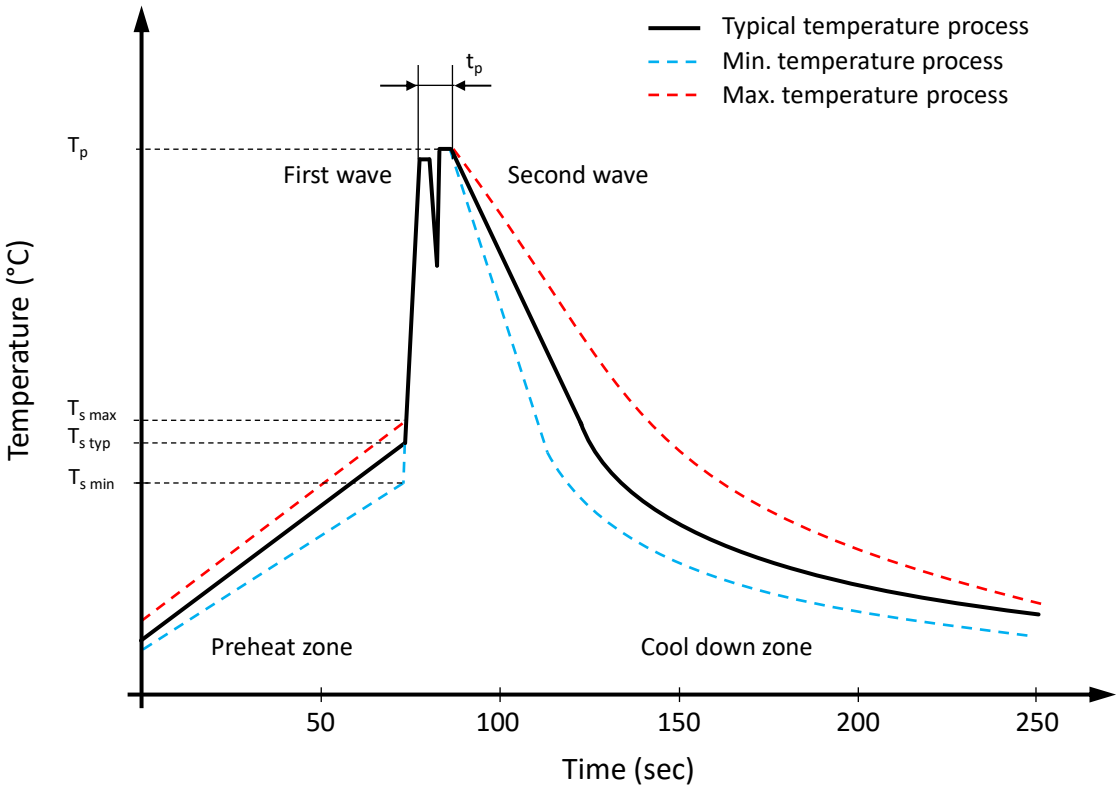
RECOMMENDED REFLOW SOLDERING PROFILE ▲ SMD PACKAGE



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

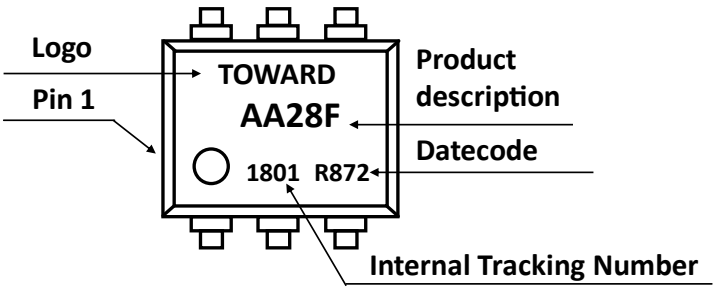
PRODUCT CODE

Example: AA28F series ▲ 1 Form A ▲ 40V ▲ SMD-6 ▲ Tape & Reel

AA		28		-		F		R1	
Package		Series		Special Suffix		Type		Packing	
AA	6 Pin ▲ 1 Form A	28	40V	Blank H	Standard High Insulation	Blank F	DIP SMD	Blank R1	Tube Reel

PRODUCT MARKING

Example: AA28F series ▲ 1 Form A ▲ 40V ▲ SMD-6 ▲ 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	1st
		9	2019	2	Feb	2	2nd
		A	2020	3	Mar	3	3rd
		B	2021	4	Apr	4	4th
H	Halogen free	C	2022	5	May		
		...	...	...	...		
		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-A-118B	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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