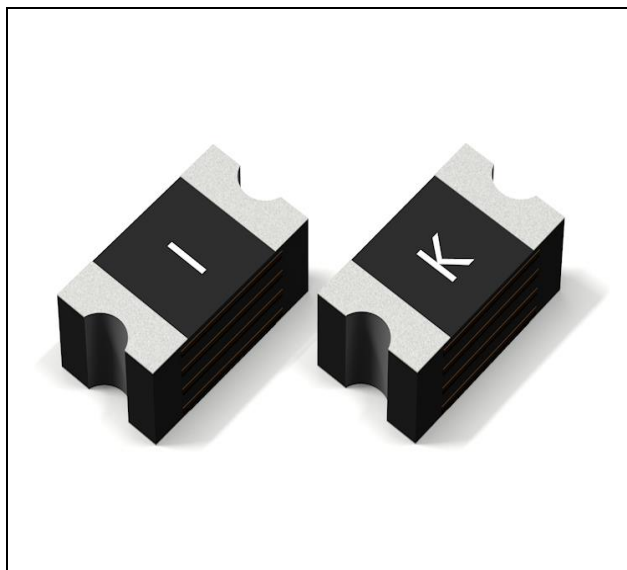




PPTC SMD Surface Mount 0603 Series

Revision: B



Applications

- Over current and over temperature protection of automotive electronics
- PC motherboards, Hard disk driver, and PC peripherals
- POS Equipment
- LCD / LED HDTV
- USB port protection
- HDMI source protection

Regulation/Standard



Features

- Surface Mount Devices
- Standard 0603mils footprint
- Surface Mount packaging for automated assembly
- Compatible with Pb and Pb-free solder reflow profiles

Agency Approvals

AGENCY	AGENCY FILE NUMBER
	E352136
	R 50505989

Electrical Characteristics

P/N	I_{hold} (A)	I_{trip} (A)	V_{max} (V)	I_{max} (A)	Time To Trip		Pd typ(W)	Resistance		Agency Approvals	
					Current (A)	Time (Sec.)		R_{min} (Ω)	$R1_{max}$ (Ω)	UL/CSA	TUV
TLC-FSMD001	0.01	0.03	60	40	0.20	1.00	0.50	15.0	120	×	√
TLC-FSMD002	0.02	0.06	60	40	0.20	1.00	0.50	12.0	70.0	×	√
TLC-FSMD003	0.03	0.09	30	40	0.20	1.00	0.50	6.00	50.0	×	√
TLC-FSMD004	0.04	0.12	24	20	0.20	1.00	0.50	3.5	40.0	×	√
TLC-FSMD005	0.05	0.15	15	40	0.50	0.10	0.50	3.5	35.0	×	√
TLC-FSMD008	0.08	0.24	15	40	0.50	0.10	0.50	3.5	40.0	×	√
TLC-FSMD010	0.10	0.30	15	40	0.50	1.00	0.50	0.90	6.00	√	√
TLC-FSMD020	0.20	0.50	9	40	1.00	0.60	0.50	0.55	3.50	√	√
TLC-FSMD035	0.35	0.75	6	40	8.00	0.10	0.50	0.20	1.40	√	√
TLC-FSMD035/9	0.35	0.75	9	40	8.00	0.10	0.50	0.20	1.40	×	√
TLC-FSMD050	0.50	1.00	6	40	8.00	0.10	0.50	0.10	0.80	√	√

I_{hold} : Holding Current: maximum current at which the device will not trip in 25°C still air.

I_{trip} : Tripping Current minimum current at which the device will trip in 25°C still air.

V_{max} : Maximum voltage device can withstand without damage at rated current.

I_{max} : Maximum fault current device can withstand without damage at rated voltage.

Time To Trip: Maximum time to trip(s) at assigned current.

Pd typ: Rated working power.

R_{min}: Minimum resistance of device prior to trip at 25°C.

R1_{max}: Maximum resistance of device is measured one hours post reflow at 25°C.

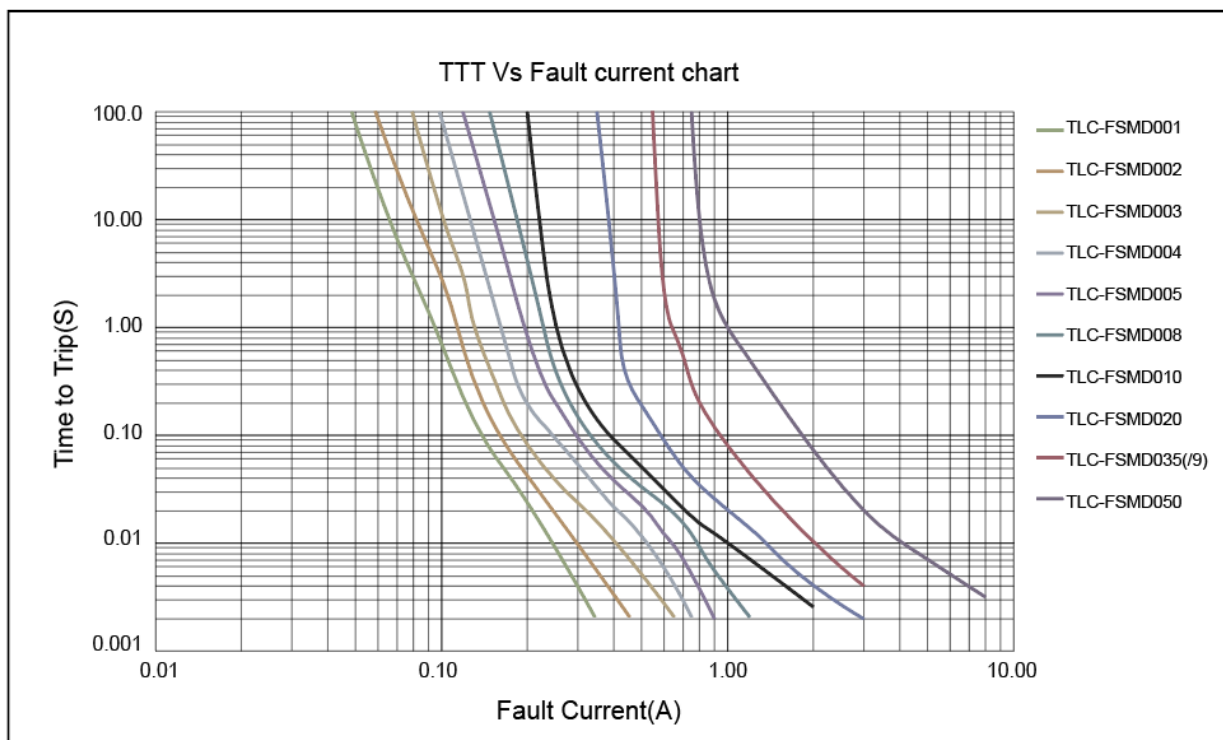
Noted: All electrical function test is conducted after PCB mounted.

Thermal Derating Chart – I hold/Itrip (Amps)

P/N	Test item	Ambient Operating Temperature								
		-40°C	-20°C	0°C	25°C	40°C	50°C	60°C	70°C	85°C
TLC-FSMD001	I-hold	0.013	0.012	0.011	0.010	0.009	0.008	0.007	0.006	0.005
	I-trip	0.039	0.036	0.033	0.030	0.027	0.024	0.021	0.018	0.015
TLC-FSMD002	I-hold	0.026	0.024	0.022	0.020	0.018	0.016	0.014	0.012	0.010
	I-trip	0.078	0.072	0.066	0.060	0.054	0.048	0.042	0.036	0.030
FLC-FSMD003	I-hold	0.039	0.036	0.033	0.030	0.027	0.024	0.020	0.017	0.014
	I-trip	0.108	0.102	0.096	0.090	0.084	0.078	0.070	0.064	0.058
TLC-FSMD004	I-hold	0.052	0.048	0.044	0.040	0.032	0.028	0.024	0.02	0.012
	I-trip	0.156	0.144	0.132	0.120	0.096	0.084	0.072	0.060	0.036
TLC-FSMD005	I-hold	0.065	0.060	0.055	0.050	0.045	0.040	0.035	0.030	0.025
	I-trip	0.195	0.180	0.165	0.150	0.135	0.120	0.105	0.090	0.075
TLC-FSMD008	I-hold	0.105	0.096	0.088	0.080	0.072	0.064	0.056	0.048	0.040
	I-trip	0.315	0.288	0.264	0.240	0.216	0.192	0.168	0.144	0.120
TLC-FSMD010	I-hold	0.13	0.12	0.11	0.10	0.08	0.07	0.06	0.05	0.03
	I-trip	0.39	0.36	0.33	0.30	0.24	0.21	0.18	0.15	0.09
TLC-FSMD020	I-hold	0.27	0.25	0.23	0.20	0.17	0.14	0.12	0.10	0.07
	I-trip	0.68	0.63	0.58	0.50	0.43	0.35	0.30	0.25	0.18
TLC-FSMD035	I-hold	0.47	0.41	0.38	0.35	0.29	0.26	0.24	0.20	0.14
	I-trip	1.01	0.88	0.81	0.75	0.62	0.56	0.51	0.43	0.30
TLC-FSMD035/9	I-hold	0.47	0.41	0.38	0.35	0.29	0.26	0.24	0.20	0.14
	I-trip	1.01	0.88	0.81	0.75	0.62	0.56	0.51	0.43	0.30
TLC-FSMD050	I-hold	0.67	0.59	0.54	0.50	0.41	0.37	0.34	0.29	0.20
	I-trip	1.34	1.18	1.08	1.00	0.82	0.74	0.68	0.58	0.40

Notes: The temperature derating data is for reference only. Please contact TLC technical support for detail temperature derating information.

Typical time to trip at 25°C



Note: TLC-FSMD035(/9) is represented for TLC-FSMD035 and TLC-FSMD035/9, and so on.

Product Dimensions & Marking (Unit: mm)

Top and Bottom View	Side View	Recommended Pad Layout(mm)	Part Identification

P/N	Marking	Device Dimension							Recommended Pad Layout(mm)		
		A		B		C		D	F	G	H
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Nor.	Nor.	Nor.
TLC-FSMD001	T	1.45	1.85	0.65	1.05	0.50	0.90	0.20	0.75	1.00	1.00
TLC-FSMD002	Y	1.45	1.85	0.65	1.05	0.35	0.85	0.20	0.75	1.00	1.00
TLC-FSMD003	E	1.45	1.85	0.65	1.05	0.35	0.85	0.20	0.75	1.00	1.00
TLC-FSMD004	K	1.45	1.85	0.65	1.05	0.35	0.85	0.20	0.75	1.00	1.00
TLC-FSMD005	K	1.45	1.85	0.65	1.05	0.35	0.85	0.20	0.75	1.00	1.00
TLC-FSMD008	N	1.45	1.85	0.65	1.05	0.35	0.85	0.20	0.75	1.00	1.00
TLC-FSMD010	I	1.45	1.85	0.65	1.05	0.35	0.85	0.20	0.75	1.00	1.00

TLC-FSMD020	—	1.45	1.85	0.65	1.05	0.30	0.75	0.20	0.75	1.00	1.00
TLC-FSMD035	II	1.45	1.85	0.65	1.05	0.30	0.75	0.20	0.75	1.00	1.00
TLC-FSMD035/9	II	1.45	1.85	0.65	1.05	0.30	0.75	0.20	0.75	1.00	1.00
TLC-FSMD050	●	1.45	1.85	0.65	1.05	0.60	1.00	0.20	0.75	1.00	1.00

Packaging

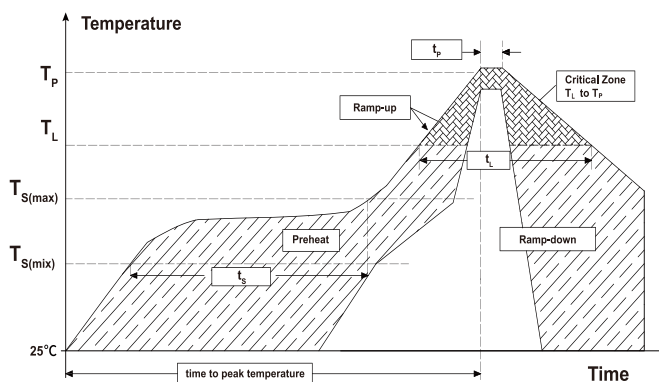
P/N	Product size	Packaging Option	Quantity
TLC-FSMD001	0603	Tape&Reel	4000
TLC-FSMD002	0603	Tape&Reel	5000
TLC-FSMD003	0603	Tape&Reel	5000
TLC-FSMD004	0603	Tape&Reel	5000
TLC-FSMD005	0603	Tape&Reel	5000
TLC-FSMD008	0603	Tape&Reel	5000
TLC-FSMD010	0603	Tape&Reel	5000
TLC-FSMD020	0603	Tape&Reel	5000
TLC-FSMD035	0603	Tape&Reel	5000
TLC-FSMD035/9	0603	Tape&Reel	5000
TLC-FSMD050	0603	Tape&Reel	4000

Reliability Requirement

Humidity Aging	+85°C, 85% R.H., 1000 hours ±5% Typical Resistance Change
Passive Aging	+85°C, 1000 hours ±5% Typical Resistance Change
Thermal Shock	30min@-40°C ~ 30min@85°C, 20cycles -33% Typical Resistance Change
Resistance to Solvents	MIL-STD-202, Method 215 Marking Still legible
Vibration	MIL-STD-883C, Method 2007.1, Condition A R min. < R i < R1 max
Solderability	245°C ±5°C, 5 Seconds >95% coverage

Solder Reflow Conditions

Reflow Profile	Lead free
Heating rate from T _{smax} to T _p	Max. 3°C/second
Pre-heat:	
T _{smin}	150°C
T _{smax}	200°C
T _{smin} to T _{smax}	60~180seconds
Soldering time:	>217°C
Temperature (T _L) Time (t _L)	60~150seconds
Peak temperature (T _p)	260°C
Time at Peak temperature ±5 (t _p)	20~40seconds
Cooling rate	Max. 6°C/second



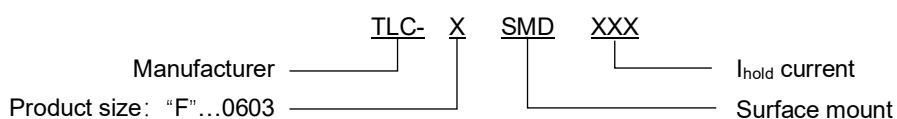
Time from 25°C to Peak Temperature	8 minutes max
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Warning for Reflow:

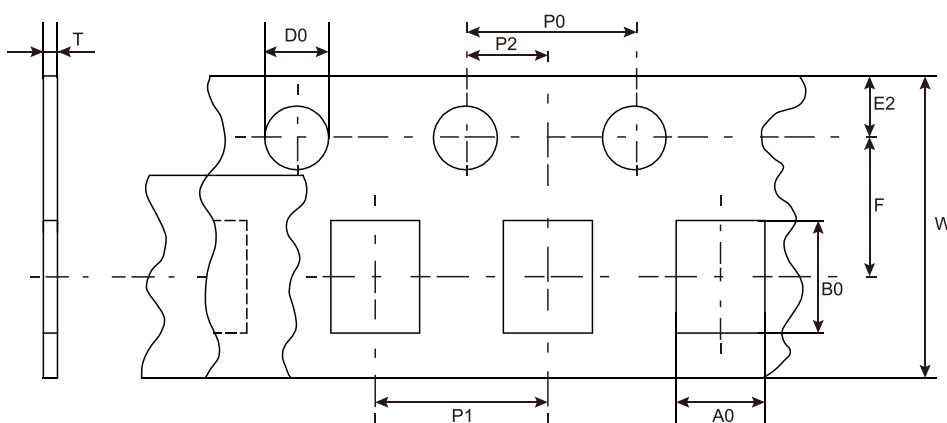
- 1.The printed solder thickness is not over 0.25mm, Excess solder may cause a short circuit, especially during hand soldering.
- 2.If reflow temperatures exceed the recommended profile, devices may not meet the performance requirements.
- 3.Device can not be wave soldered. Please contact TLC for hand soldering and dip soldering recommendations.
- 4.Device can't contact solvent.

Note: All temperature in top chart is measured on the surface of devices.

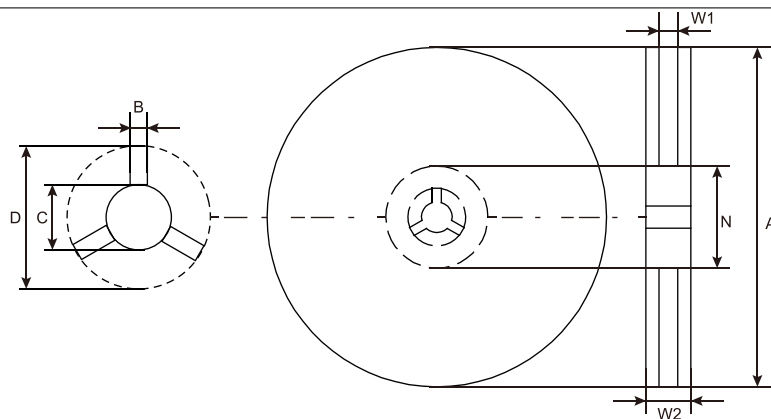
Product Ordering Number System



Tape and Reel Specification



Item	A0	B0	D0	E2	F
Spec.(mm)	1.25±0.05	2.05±0.05	1.55±0.05	1.75±0.10	3.50±0.05
Item	P0	P1	P2	T	W
Spec.(mm)	4.00±0.10	4.00±0.05	2.00±0.05	0.75/0.95 (±0.05)	8.00±0.10



Item	A	B	C	D	N	W1	W2
Spec.(mm)	179±1.0	1.5 min	13.2±1.5	20.2 min	50 min	9.5±1.5	12.1±1.5

Environmental Characteristics

Operating/Storage Temperature -40 °C to +85 °C

Maximum Device Surface Temperature in Tripped State 125 °C

Storage Conditions +40 °C Max. 70% RH Max. Packed in original packaging.

Cautions for SMD PPTC Use

1. Operation beyond the rated maximum voltage or current may result in device damage and possible electrical arcing or flame.
2. Hold current at all temperatures specified in the SPEC is the conventional performance of PTC obtained by one time reflow welding. PTC can hold 1 hour under current conditions at a given temperature. This current is not the condition of long-term charging or discharging current for this type of PTC.
3. The above parameters are concluded from one time of reflow soldering processing the PTC. If there is any further heat generated process like injection or dispensing at the customer's premise, the aforementioned parameters will decrease at certain degree. Therefore the verification test to be conducted is necessary.
4. The PTC is thermal sensitive device. It is recommended not to design any heat source devices around it to reduce the outside heat source impact.
5. SMD PTC is designed for SMT processing which applies reflow soldering. Please refer to the recommended solder reflow curve. If the reflow soldering temperature exceeds the recommended value, the PTC might be damaged. Hand welding PTC is prohibited. Heat gun is not allowed to use during the circuit board components or terminals rework .
6. Please do not smash, clamp, pull, dent or twist by tool during assembling process otherwise it might be a cause of the performance degradation.
7. PTC is resettable protection device which shall not be taken for use as switch. Multiple times tripping shall lower the PTC hold current.
8. In the process of PTC processing, if there is soldering iron welding process, it is suggested that the welding position should be more than 1.5mm away from PTC, the welding tool temperature should be lower than 350 °C, and the contact time between soldering iron and solder joint should not exceed 3sec.