

# Engineering Product Specifications

## (产品承认书)

**Customer Name (客户):** \_\_\_\_\_

**Customer NO. (客户料号):** \_\_\_\_\_

**Model No. (产品型号):** \_\_\_\_\_

**Product Description (品名):** **PPTC Fuse**

**Part NO. (产品编号):** **TLC-MSMD Series**

**Remark:** \_\_\_\_\_

Document Release		Date(日期)
Prepared by (制表)		
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Approved by (批准)		

Customer Approval		Date(日期)
Signed by (承认)		
Checked by (审核)		
Approved by (批准)		

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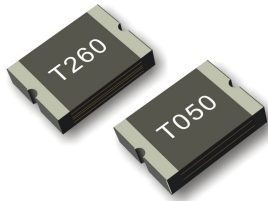
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## 1. SCOPE AND DESCRIPTION



Following electronic product specifications apply to fuses of the TLC-MSMD series. The TLC-MSMD series is a PPTC fuse for over-current protection.

Almost anywhere there is a low voltage power supply, up to DC60V and a load to be protected, including over-current and over-temperature protection of automotive electronics, PC motherboards, Hard disk driver, and PC peripherals, POS Equipment, USB port protection and HDMI source protection.

## 2. GENERAL INFORMATION


### General Description

The TLC-MSMD series PPTC provides surface mount over current protection for applications where space is at a premium and resettable protection is desired.

### Detailed Features

- Surface Mount Devices
- Standard 1812mils(4832mm) footprint
- Surface mount packaging for automated assembly
- Compatible with Pb and Pb-free solder reflow profiles.
- Operation Current: 0.10~3.0A
- Maximum Operation Voltage: 60V DC
- Maximum Fault current: 100A

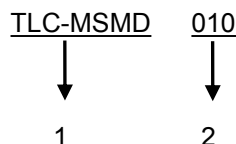
## 3. AGENCY APPROVALS

Agency	Agency File Number	Ampere/ Voltage Range
	E345393	0.1, 0.14, 0.2A/60V; 0.2, 0.3A/30V; 0.75A/33V; 0.75, 1.1, 1.5A/24V; 0.35, 0.5, 0.75, 1.1, 1.6, 2.5A/16V; 1.1, 1.25, 1.5, 2.6, 3.0A/6V; 1.5, 1.6A/12V; 1.6, 2.0A/8V;

## 4. PART NUMBERING SYSTEM

### 4.1 Part Number

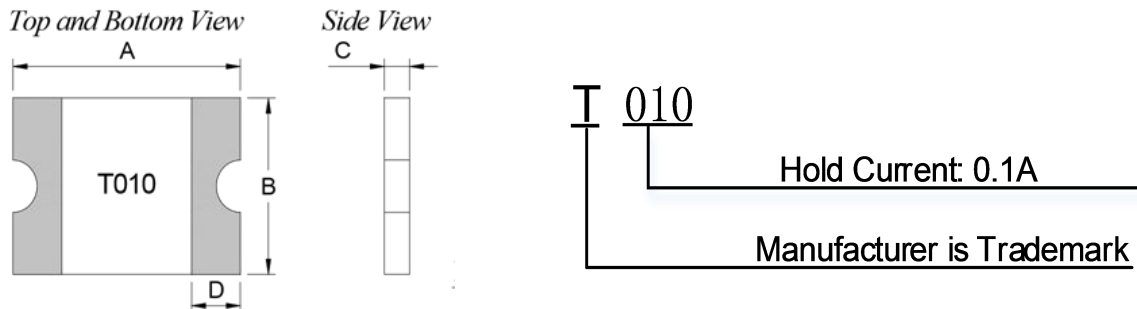
Example: TLC-MSMD010



1 .....	Product Size .....	1812 footprint
2 .....	Hold Current .....	0.1A

## 5. CONSTRUCTION AND MECHANICAL CHARACTERISTICS

### 5.1 Dimensions (units: mm)



P/N	Marking	A		B		C		D
		Min.	Max.	Min.	Max.	Min.	Max.	Min.
TLC-MSMD010	T010	4.37	4.73	3.07	3.4	0.80	1.2	0.30
TLC-MSMD014	T014	4.37	4.73	3.07	3.4	0.80	1.2	0.30
TLC-MSMD020	T020	4.37	4.73	3.07	3.4	0.80	1.2	0.30
TLC-MSMD020/60	T020	4.37	4.73	3.07	3.4	0.80	1.2	0.30
TLC-MSMD030	T030	4.37	4.73	3.07	3.4	0.80	1.2	0.30
TLC-MSMD035	T035	4.37	4.73	3.07	3.4	0.60	1.0	0.30
TLC-MSMD050	T050	4.37	4.73	3.07	3.4	0.60	1.0	0.30
TLC-MSMD050/30	T050	4.37	4.73	3.07	3.4	0.60	1.0	0.30
TLC-MSMD075	T075	4.37	4.73	3.07	3.4	0.60	1.0	0.30
TLC-MSMD075/24	T075	4.37	4.73	3.07	3.4	0.60	1.0	0.30
TLC-MSMD075/33	T075	4.37	4.73	3.07	3.4	0.60	1.0	0.30
TLC-MSMD110	T110	4.37	4.73	3.07	3.4	0.60	1.0	0.30
TLC-MSMD110/16	T110	4.37	4.73	3.07	3.4	0.60	1.0	0.30
TLC-MSMD110/24	T110	4.37	4.73	3.07	3.4	0.90	1.3	0.30
TLC-MSMD125	T125	4.37	4.73	3.07	3.4	0.60	1.0	0.30
TLC-MSMD125/16	T125	4.37	4.73	3.07	3.4	0.45	0.85	0.30
TLC-MSMD150	T150	4.37	4.73	3.07	3.4	0.45	0.9	0.30
TLC-MSMD150/12	T150	4.37	4.73	3.07	3.4	0.45	0.9	0.30
TLC-MSMD150/24	T150	4.37	4.73	3.07	3.4	0.90	1.3	0.30
TLC-MSMD160	T160	4.37	4.73	3.07	3.4	0.45	0.9	0.30
TLC-MSMD160/12	T160	4.37	4.73	3.07	3.4	0.45	0.9	0.30
TLC-MSMD160/16	T160	4.37	4.73	3.07	3.4	0.45	0.9	0.30
TLC-MSMD200	T200	4.37	4.73	3.07	3.4	0.70	1.1	0.30
TLC-MSMD250/16	T250	4.37	4.73	3.07	3.4	0.70	1.1	0.30
TLC-MSMD260	T260	4.37	4.73	3.07	3.4	0.70	1.1	0.30
TLC-MSMD300	T300	4.37	4.73	3.07	3.4	0.70	1.1	0.30

### 5.2 Environmental Characteristics

Item	Spec.
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.

## 5.3 Conformance Requirement

NO.	Item	Test Condition	Spec.	Unit
1	Rmin	Resistance measurement at 25°C	0.700	Ω
2	Post Trip R1max	Resistance measurement one hour after post trip	15.000	Ω
3	2X Rmin Tsw	2 times of minimum Resistance value of R/T testing	85 ± 15	°C
4	I-hold	Hold rated current 1800 second without trip, @ 60Vdc, 25°C	0.10	A
5	I-trip	Device must trip within 900 second under rated current, @ 60Vdc, 25°C	0.30	A
6	TTT	@60Vdc/0.50A,25°C	Max:1.50	Sec.
7	Cycle Life	60Vdc/ 10A,100cycles	No visible damage or burning	N/A
8	Trip Endurance	60Vdc/ 10A, hold under 24 hours	No visible damage or burning	N/A
9	Power dissipation	@ 60Vdc/0.50A,25°C	0.80 TYP	Watts

## 5.4 Reliability Requirement

NO.	Item	Test Condition	Spec.
1	Humidity Aging	85°C, 85% R.H., 1000 Hours	± 5% Typical Resistance Change
2	Passive Aging	85°C, 1000 Hours	± 5% Typical Resistance Change
3	Thermal Shock	-40°C ~ 85°C, 20 times	-33% Typical Resistance Change
4	Resistance to Solvents	MIL-STD-202, Method 215	Marking Still legible
5	Vibration	MIL-STD-833C, Method 2007.1, Condition A	Rmin. < R < R1max.
6	Solderability	245°C ± 5°C, 5 Seconds	>95% coverage

## 6. ELECTRICAL SPECIFICATIONS

### 6.1 Electrical Characteristics(25°C)

P/N	I <sub>H</sub> (A)	I <sub>T</sub> (A)	V <sub>max</sub> (V)	I <sub>max</sub> (A)	Maximum Time to trip		Pd <sub>type</sub> (w)	Resistance	
					(A)	(Sec.)		R <sub>min</sub>	R1 <sub>max</sub>
TLC-MSMD010	0.10	0.30	60	10	0.5	1.50	0.8	0.70	15.00
TLC-MSMD014	0.14	0.34	60	10	1.5	0.15	0.8	0.40	6.50
TLC-MSMD020	0.20	0.40	30	10	8.0	0.02	0.8	0.75	5.00
TLC-MSMD020/60	0.20	0.40	60	10	1.5	0.15	0.8	0.40	6.00
TLC-MSMD030	0.30	0.60	30	10	8.0	0.10	0.8	0.30	3.00
TLC-MSMD035	0.35	0.70	16	10	8.0	0.10	0.8	0.20	1.80
TLC-MSMD050	0.50	1.00	16	30	8.0	0.15	0.8	0.15	1.00
TLC-MSMD050/30	0.50	1.00	30	40	8.0	0.15	0.8	0.15	1.00
TLC-MSMD075	0.75	1.50	16	40	8.0	0.20	0.8	0.11	0.45
TLC-MSMD075/24	0.75	1.50	24	40	8.0	0.20	0.8	0.11	0.45
TLC-MSMD075/33	0.75	1.50	33	40	8.0	0.20	0.8	0.11	0.45

TLC-MSMD110	1.10	2.20	6	100	8.0	0.30	0.8	0.04	0.23
TLC-MSMD110/16	1.10	2.20	16	100	8.0	0.50	0.8	0.04	0.23
TLC-MSMD110/24	1.10	2.20	24	100	8.0	0.50	0.8	0.06	0.18
TLC-MSMD125	1.25	2.50	6	40	8.0	0.40	0.8	0.04	0.14
TLC-MSMD125/16	1.25	2.50	16	40	8.0	0.40	0.8	0.035	0.14
TLC-MSMD150	1.50	3.00	6	100	8.0	0.50	0.8	0.03	0.12
TLC-MSMD150/12	1.50	3.00	12	100	8.0	0.50	1.0	0.03	0.12
TLC-MSMD150/24	1.50	3.00	24	20	8.0	1.50	1.0	0.03	0.14
TLC-MSMD160	1.60	3.20	8	100	8.0	0.50	0.8	0.03	0.12
TLC-MSMD160/12	1.60	3.20	12	100	8.0	1.00	1.0	0.03	0.12
TLC-MSMD160/16	1.60	3.20	16	100	8.0	1.00	1.0	0.03	0.12
TLC-MSMD200	2.00	4.00	16	100	8.0	3.00	0.8	0.02	0.08
TLC-MSMD250/16	2.50	5.00	16	100	8.0	5.00	1.2	0.02	0.10
TLC-MSMD260	2.60	5.20	16	100	8.0	5.00	0.8	0.02	0.08
TLC-MSMD300	3.00	6.00	12	100	8.0	5.00	0.8	0.01	0.06

$I_H$ : Holding Current: maximum current at which the device will not trip in 25°C still air.

$I_T$ : 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.

$T_{trip}$ : Maximum time to trip(s) at assigned current.

$P_{d\ typ}$ : Rated working power.

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

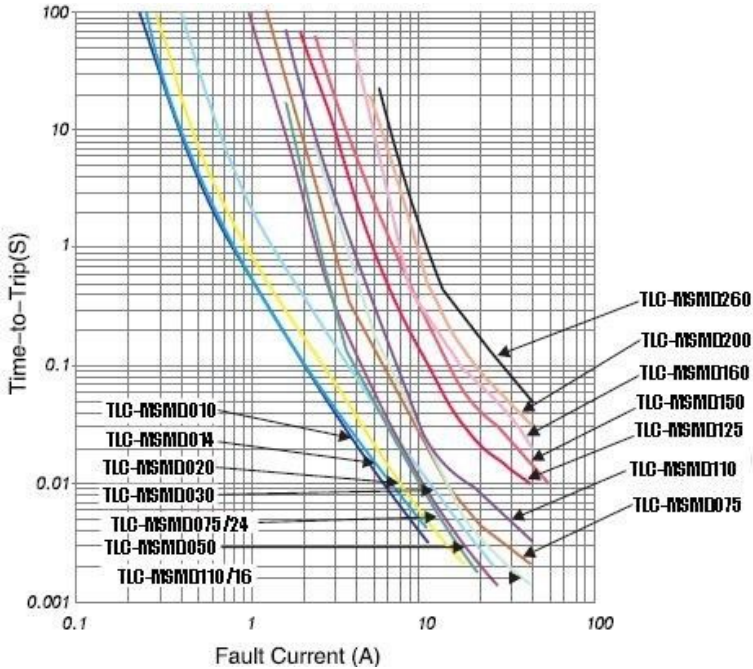
$R1_{max}$ : Maximum resistance of device measured one hour after tripping at 25°C.

## 6.2 Thermal Derating Chart - I hold (Amps)

P/N	Ambient Operating Temperature								
	-40°C	-20°C	0°C	25°C	40°C	50°C	60°C	70°C	85°C
TLC-MSMD010	0.16	0.14	0.12	0.1	0.1	0.07	0.1	0.05	0.03
TLC-MSMD014	0.23	0.19	0.17	0.14	0.1	0.10	0.1	0.08	0.06
TLC-MSMD020	0.29	0.26	0.23	0.2	0.2	0.15	0.1	0.12	0.10
TLC-MSMD020/60	0.29	0.26	0.23	0.2	0.2	0.15	0.1	0.12	0.10
TLC-MSMD030	0.44	0.39	0.35	0.3	0.3	0.23	0.2	0.18	0.15
TLC-MSMD035	0.51	0.46	0.41	0.35	0.3	0.27	0.3	0.21	0.18
TLC-MSMD050	0.77	0.68	0.59	0.5	0.4	0.40	0.4	0.33	0.29
TLC-MSMD050/30	0.77	0.68	0.59	0.5	0.44	0.40	0.37	0.33	0.29
TLC-MSMD075	1.15	1.01	0.88	0.75	0.7	0.60	0.6	0.49	0.43
TLC-MSMD075/24	1.15	1.01	0.88	0.75	0.7	0.60	0.6	0.49	0.43
TLC-MSMD075/33	1.15	1.01	0.88	0.75	0.7	0.60	0.6	0.49	0.43
TLC-MSMD110	1.59	1.43	1.26	1.1	1.0	0.87	0.8	0.71	0.60
TLC-MSMD110/16	1.59	1.43	1.26	1.1	1.0	0.87	0.8	0.71	0.60
TLC-MSMD110/24	2.00	1.70	1.4	1.1	1.0	0.88	0.8	0.73	0.61
TLC-MSMD125	1.80	1.63	1.43	1.25	1.1	0.99	0.9	0.81	0.68
TLC-MSMD125/16	1.80	1.63	1.43	1.25	1.08	0.99	0.9	0.81	0.68
TLC-MSMD150	2.17	1.95	1.72	1.5	1.3	1.18	1.1	0.97	0.82
TLC-MSMD150/12	2.17	1.95	1.72	1.5	1.3	1.18	1.1	0.97	0.82
TLC-MSMD150/24	2.17	1.95	1.72	1.5	1.3	1.18	1.1	0.97	0.82
TLC-MSMD160	2.30	2.20	1.9	1.6	1.5	1.30	1.2	1.03	0.91
TLC-MSMD160/12	2.30	2.20	1.9	1.6	1.5	1.30	1.2	1.03	0.91
TLC-MSMD160/16	2.30	2.20	1.9	1.6	1.5	1.30	1.2	1.03	0.91
TLC-MSMD200	3.08	2.71	2.35	2	1.8	1.60	1.5	1.40	1.25
TLC-MSMD250/16	3.85	3.45	3	2.5	2.1	1.85	1.8	1.30	1.10

TLC-MSMD260	4.00	3.52	3.06	2.6	2.3	2.08	2.0	1.39	1.04
TLC-MSMD300	4.40	3.90	3.5	3	2.6	2.30	2.1	1.80	1.50

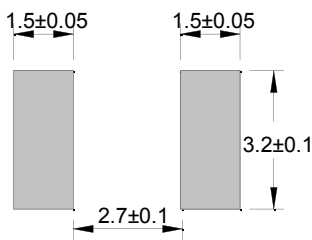
### Typical time to trip at 25°C



◆ The Time to Trip curves represent typical performance of a device in a simulated application environment. Actual performance in specific customer applications may differ from these values due to the influence of other variables.

## 7. SOLDERING PARAMETERS

### Recommended Pad Layout and Solder Reflow Conditions

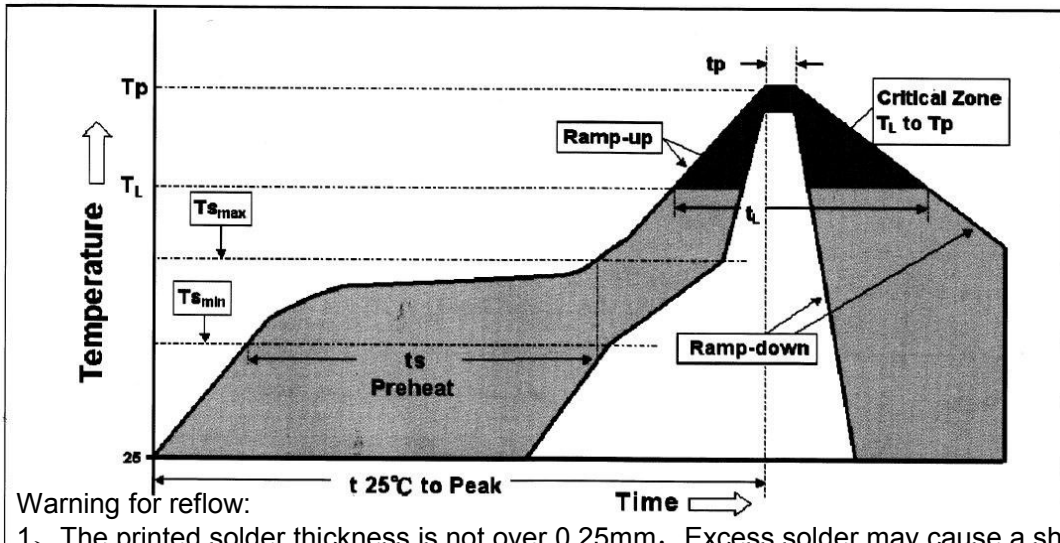


Termination pad characteristics

- Terminal pad material:  
Tin-Plated Nickel-Copper or Au-Plated Nickel-Copper
- Terminal pad solderability:  
Meets EIA specification RS186-9E and ANSI/J-STD -002 category 3.

Reflow Profile	Lead Free
Heating rate from T <sub>smax</sub> to T <sub>p</sub>	Max. 3°C/second
Pre-heat:	
T <sub>sm</sub>	150°C
T <sub>sm</sub>	200°C
T <sub>sm</sub> to T <sub>sm</sub>	60~180seconds
Soldering time:	
Temperature(T <sub>L</sub> )	>217°C
Time(t <sub>L</sub> )	60~180 seconds
Peak temperature(T <sub>p</sub> )	260°C
Time at peak temperature ±5°C(t <sub>p</sub> )	20~40 seconds

Cooling rate	Max.6°C/second
Time from 25 °C to Peak Temperature	8 minutes max



1. The printed solder thickness is not over 0.25mm, Excess solder may cause a short circuit, especially during hand solderin.
2. If reflow temperatures exceed the recommended profile, devices may not meet the performance requirements.
3. Device can not be wave soldered. Please contact Betterfuse 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

## 8. ORDERING INFORMATION

The following information are necessary in order to place your order with us correctly:

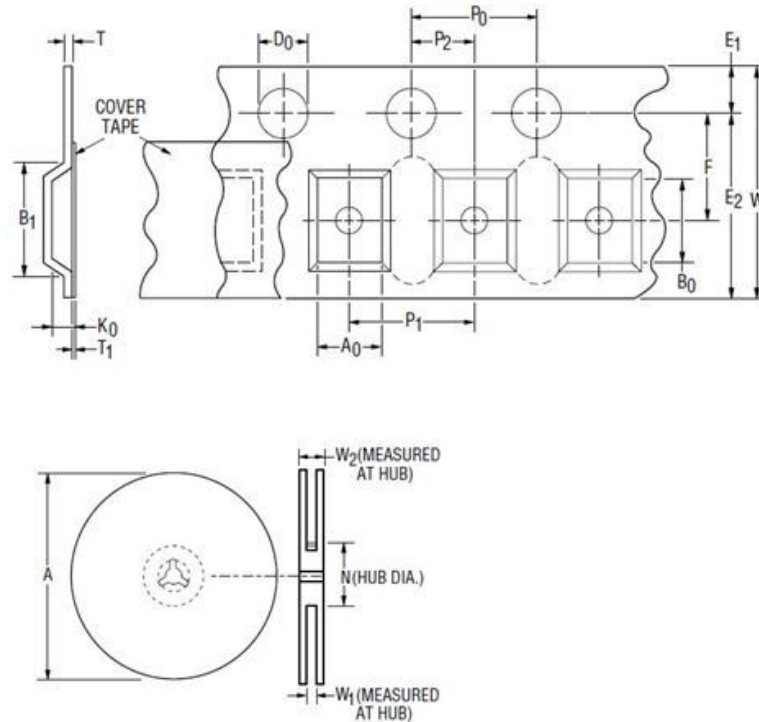
Series No.	Amp Code	Packaging Code	Quantity	Purchase Order No.
TLC-MSMD				



## 9. PACKING INFORMATION

### Tape and Reel Specification(mm)

Tape Dimensions	EIA 481-1
W	12±0.3
P0	4.0±0.10
P1	8.0±0.10
P2	2.0±0.05
A0	3.5±0.23
B0	5.1±0.15
B1max.	5.9
D0	1.5+0.1,-0
F	5.5±0.05
E1	1.75±0.10
E2min.	10.25
Tmax.	0.6
T1max.	0.1
K0	0.9±0.15
Leader min.	390
Trailer min.	160
Reel Dimensions	
Amax.	178
Nmin.	60
W1	12.4+2.0,-0.0
E2max.	18.4



### Package information

Model	Q'ty/Reel
TLC-MSMD010 ~ TLC-MSMD030, TLC-MSMD110/24, TLC-MSMD150/24, TLC-MSMD200~TLC-MSMD300	1500pcs
TLC-MSMD050 ~ TLC-MSMD160	2000pcs

**Note: Reel packaging per EIA-481-1 standard**

### Warning:

- 1、 Use PPTC beyond the maximum ratings or improper use may result in device damage and possible electrical arcing and flame.
- 2、 PPTC are intended for protection against occasional over current or over temperature fault conditions and should not be used when repeated fault conditions or prolonged trip events are anticipated.
- 3、 Device performance can be impacted negatively if devices are handled in a manner inconsistent with recommended electronic, thermal and mechanical procedures for electronic components.
- 4、 Use PPTC with a large inductance in circuit will generate a circuit voltage ( $L di/dt$ ) above the rated voltage of the PPTC.

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## 10. APPENDIX

### Appendix A: International Certifications



#### XGPU2.E345393 Thermistor-type Devices - Component

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#### Thermistor-type Devices - Component

See General Information for Thermistor-type Devices - Component

**DONGGUAN BETTER ELECTRONICS TECHNOLOGY CO LTD**  
 RM 601 OF 16 BLK  
 XINZHUYUAN NO 4 XINZHU RD  
 SONGSHANLAKE HIGHTECH INDUSTRIAL DEVELOPMENT ZONE  
 DONGGUAN, GUANGDONG 523808 CHINA

E345393

**PTC current limiter:**


Model No.	Voltage (V)		Current (A)				T <sub>moa</sub> (°C)	Class	CA
	V <sub>max</sub>	V <sub>r</sub>	I <sub>h</sub> (mA)	I <sub>t</sub> (mA)	I <sub>max</sub> (A)	I <sub>sc</sub> (A)			
TLC-NSMD005	30	30	50	150	10	10	85	C2	1(95), 2, 3, 4, #
TLC-NSMD010	30	30	100	200	10	10	85	C3	1(99.5), 2, 3, 4, #
TLC-NSMD012	30	30	120	290	10	10	85	C3	1(99.5), 2, 3, 4, #
TLC-NSMD020	24	24	200	460	10	10	85	C3	1(99.5), 2, 3, 4, #
TLC-NSMD025	16	16	250	550	10	10	85	C3	1(99.5), 2, 3, 4, #
TLC-NSMD035	6	6	350	750	40	40	85	C3	1(99.5), 2, 3, 4, #
TLC-NSMD040	6	6	400	800	40	40	85	C3	1(99.5), 2, 3, 4, #
TLC-MSMD010	60	60	100	300	10	10	85	C2	1(106.4), 2, 3, 4, #
TLC-MSMD014	60	60	140	340	10	10	85	C2	1(106.4), 2, 3, 4, #
TLC-MSMD020	30	30	200	400	10	10	85	C2	1(106.4), 2, 3, 4, #
TLC-MSMD020/60	60	60	200	400	10	10	85	C2	1(106.4), 2, 3, 4, #
TLC-MSMD025	30	30	250	500	10	10	85	C2	1(106.4), 2, 3, 4, #
TLC-MSMD030	30	30	300	600	10	10	85	C2	1(106.4), 2, 3, 4, #
TLC-MSMD035	16	16	350	700	40	40	85	C2	1(106.4), 2, 3, 4, #
TLC-MSMD040	16	16	400	800	10	10	85	C1	1(103.4), 2, 3, 4, #
TLC-MSMD050	15	15	500	1000	40	40	85	C1	1(103.4), 2, 3, 4, #
TLC-MSMD060	16	16	650	1300	40	40	85	C1	1(103.4), 2, 3, 4, #
TLC-MSMD075	16	16	750	1500	40	40	85	C1	1(103.4), 2, 3, 4, #
TLC-MSMD075/24	24	24	750	1500	40	40	85	C1	1(103.4), 2, 3, 4, #
TLC-MSMD075/33	33	33	750	1500	40	40	85	C1	1(103.4), 2, 3, 4, #
TLC-MSMD090	16	16	900	1800	40	40	85	C1	1(103.4), 2, 3, 4, #
TLC-MSMD110	6	6	1100	2200	100	100	85	C1	1(107.5), 2, 3, 4, #
TLC-MSMD110/16	16	16	1100	2200	100	100	85	C2	1(107.5), 2, 3, 4, #

TLC-MSMD110/24	24	24	1100	2200	100	100	85	C2	1(107.5), 2, 3, 4, #
TLC-MSMD125	6	6	1250	2500	40	40	85	C2	1(107.5), 2, 3, 4, #
TLC-MSMD150	6	6	1500	3000	100	100	85	C2	1(115.6), 2, 3, 4, #
TLC-MSMD150/12	12	12	1500	3000	100	100	85	C2	1(115.6), 2, 3, 4, #
TLC-MSMD150/24	24	24	1500	3000	100	100	85	C2	1(115.6), 2, 3, 4, #
TLC-MSMD160	8	8	1600	3200	100	100	85	C2	1(115.6), 2, 3, 4, #
TLC-MSMD160/12	12	12	1600	3200	100	100	85	C2	1(115.6), 2, 3, 4, #
TLC-MSMD160/16	16	16	1600	3200	100	100	85	C2	1(115.6), 2, 3, 4, #
TLC-MSMD200	8	8	2000	4000	40	40	85	C2	1(115.6), 2, 3, 4, #
TLC-MSMD250/16	16	16	2500	5000	100	100	85	C1	1(111.2), 2, 3, 4, #
TLC-MSMD260	6	6	2600	5200	100	100	85	C4	1(112.0), 2, 3, 4, #
TLC-MSMD300	6	6	3000	6000	100	100	85	C4	1(112.0), 2, 3, 4, #

Note "\$" - Denotes the I-hold and I-trip are upon ambient at 40 °C.

Note "#" - Denotes refer to Report for further conditions of acceptability.

# Indicates unique Condition of Acceptability

Marking: Company name or trademark, part designation and the Recognized Component Mark  permanently and legibly marked on individual parts or on the smallest shipping container.

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