Features

- 8-channel Darlington Array
- 500-mA Rated Drain Current (Per Channel)
- Very Low Output Leakage < 10 nA Per Channel
- Power Efficient with Low R_{DS-on}
- Extended Temperature Range: T_A = –40°C to 125°C
- High-Voltage Outputs 50 V
- Compatible with 1.8-V to 5.0-V Logic Interface
- Integrated Free-wheeling Diodes for Inductive Load
- Improved Noise-immunity with Integrated RC Filter
- ESD Protection Exceeds JESD 22 to 2-kV HBM, 1.5-kV CDM
- Available in 18-pin SOP18 Package

Applications

- Inductive Loads
  - Relays
  - Unipolar Stepper & Brushed DC Motors
  - Solenoids & Valves
- LED Indicators
- Logic Level Shifting
- Gate & IGBT Drive

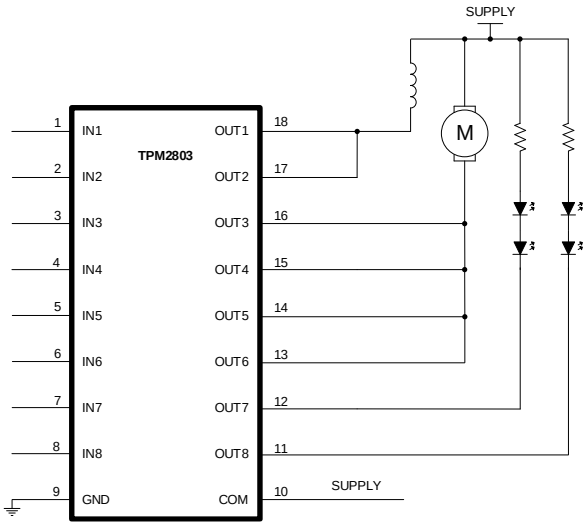
Description

The TPM2803 is a high-voltage, high-current NMOS transistor array. This device consists of eight channels of low-side NMOS transistors with high-voltage outputs and a free-wheeling diode for inductive loads.

The maximum drain-current rating of a single NMOS channel is 500 mA. The device supports a wide I/O voltage range from 1.8 V to 5 V. The transistors can be paralleled for higher current capability. Enhanced ESD performance enhances system-level reliability.

The TPM2803 can replace traditional bipolar Darlington arrays with better thermal efficiency and reliability.

Typical Application Circuit



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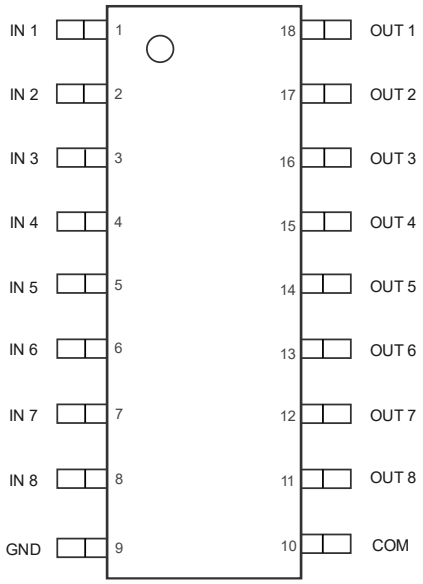
Revision History

Date	Revision	Notes
2022/5/11	Rev A.0	Release for production
2022/8/24	Rev A.1	Update datasheet format
2023/7/3	Rev A.2	Minor Correction

Pin Configuration and Functions

TPM2803
SOP18
Top View



Pin Functions

Pin		I/O	Description
No.	Name		
10	COM	Power	Device supply voltage, should be tied above 3.3 V.
9	GND	Ground	Device ground
1	IN1	Input	Logic Input. High-active to pull down OUT1
2	IN2	Input	Logic Input. High-active to pull down OUT2
3	IN3	Input	Logic Input. High-active to pull down OUT3
4	IN4	Input	Logic Input. High-active to pull down OUT4
5	IN5	Input	Logic Input. High-active to pull down OUT5
6	IN6	Input	Logic Input. High-active to pull down OUT6
7	IN7	Input	Logic Input. High-active to pull down OUT7
8	IN8	Input	Logic Input. High-active to pull down OUT8
18	OUT1	Output	Low-side driver output, IN1 high to pull down OUT1
17	OUT2	Output	Low-side driver output, IN2 high to pull down OUT2
16	OUT3	Output	Low-side driver output, IN3 high to pull down OUT3
15	OUT4	Output	Low-side driver output, IN4 high to pull down OUT4
14	OUT5	Output	Low-side driver output, IN5 high to pull down OUT5
13	OUT6	Output	Low-side driver output, IN6 high to pull down OUT6
12	OUT7	Output	Low-side driver output, IN7 high to pull down OUT7
11	OUT8	Output	Low-side driver output, IN8 high to pull down OUT8

Specifications

Absolute Maximum Ratings(1)

Parameter	Min	Max	Unit
Supply Voltage, VIN	–0.3	18	V
Switching Node Voltage, PH	–1	18	V
Switching Node Voltage, PH 5-ns Transient	–4	18	V
Switching Node Voltage, PH 10-ns Transient	–3	18	V
Bootstrap Voltage, BOOT – PH	–0.3	6.5	V
Feedback Voltage, VSENSE	–0.3	3	V
Compensation, COMP	–0.3	3	V
Enable Input, EN	–0.3	6	V
Power Good, PWRGD	–0.3	6	V
SS/TR	–0.3	3	V
RT/CLK	–0.3	6	V
Maximum Junction Temperature		150	°C
Operating Junction Temperature Range	–40	150	°C
Storage Temperature Range	–65	150	°C
Lead Temperature (Soldering, 10 sec)		260	°C

(1) Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. Exposure to any Absolute Maximum Rating condition for extended periods may affect device reliability and lifetime.
(2) The inputs are protected by ESD protection diodes to each power supply. If the input extends more than 300 mV beyond the power supply, the input current should be limited to less than 10 mA.
(3) Power dissipation and thermal limits must be observed.

ESD, Electrostatic Discharge Protection

Symbol	Parameter	Condition	Minimum Level	Unit
HBM	Human Body Model ESD	ANSI/ESDA/JEDEC JS-001(1)	±2	kV
CDM	Charged Device Model ESD	ANSI/ESDA/JEDEC JS-002(2)	±1.5	kV

(1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process.
(2) JEDEC document JEP157 states that 250-V CDM allows safe manufacturing with a standard ESD control process.

Recommended Operating Conditions

Parameter	Min	Max	Unit
Power Supply Voltage, COM	4.5	50	V
Output Voltage Range OUT1 – OUT8	0	50	V
IN logic low voltage		0.9	V
IN logic high voltage	1.5		V
Continuous output current OUT1-OUT8		500	mA
Operating Ambient Temperature Range	–40	125	°C

Thermal Information

Package Type	θ_{JA}	θ_{JC}	Unit
SOP18	98.0	50.5	°C/W

Electrical Characteristics

All test conditions: V_{COM} = 12 V, T_A = −40 °C to 125 °C, unless otherwise noted.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{UVLO}	COM Under-voltage Lock-Out Threshold	INx = 0 V;	2.1	3.5	4.3	V
V_{DS}	OUT1−OUT7 Low-Level Output Voltage	INx = 5 V; I_{OUTx} = 100 mA		200	320	mV
		INx = 5 V; I_{OUTx} = 200 mA		420	650	
		INx = 5 V; I_{OUTx} = 350 mA		800	1100	
I_{DS-OFF}	Off-State Output Leakage Current	INx = 0 V; V_{OUTx} = 12 V		10	500	nA
V_{FWD}	Clamp Forward Voltage	I_F = 350 mA		1.217		V
$I_{IN(ON)}$	IN1−IN7 Input On-State Current	INx = 1.5 V to 5 V			10	μA
$I_{IN(OFF)}$	IN1−IN7 Input Off-State Current	INx = 0 V			10	μA
I_{COM}	Quiescent Supply Current	INx = 0 V; V_{OUTx} = 12 V			500	μA
I_{COM}	Active Supply Current	INx = 5 V; V_{OUTx} = 0 V			500	μA
t_{pLH}	Propagation Delay Time, LOW to HIGH	VINx = 5 V; Vpull-up = 12 V; Rpull-up = 48Ω		350		ns
t_{pHL}	Propagation Delay Time, HIGH to LOW	VINx = 5 V; Vpull-up = 12 V; Rpull-up = 48 Ω		350		ns
T_{OTP}	Thermal Shutdown Threshold	INx = 0 V;		165		℃

Typical Performance Characteristics

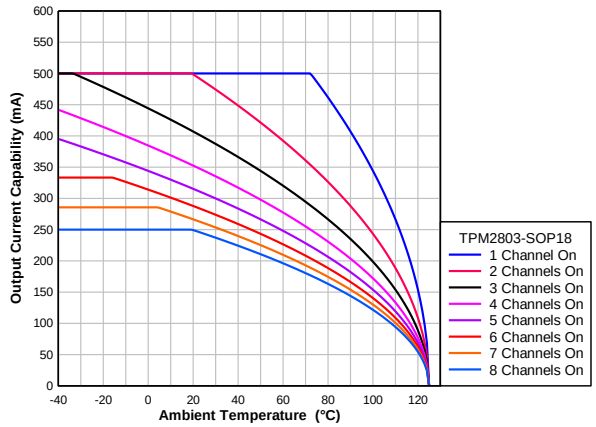


Figure 1. Output Current Capability vs. Ambient Temperature

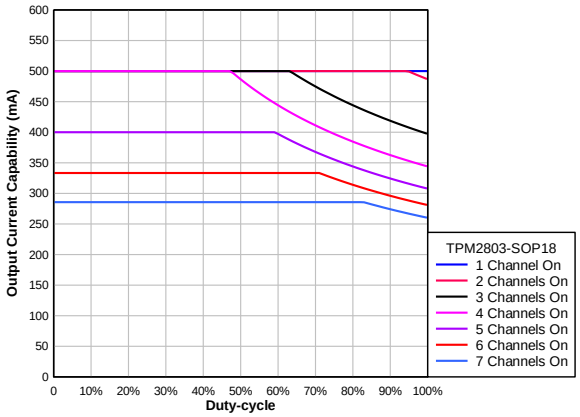


Figure 2. Output Current Capability vs. Dutycycle, TA = 25℃

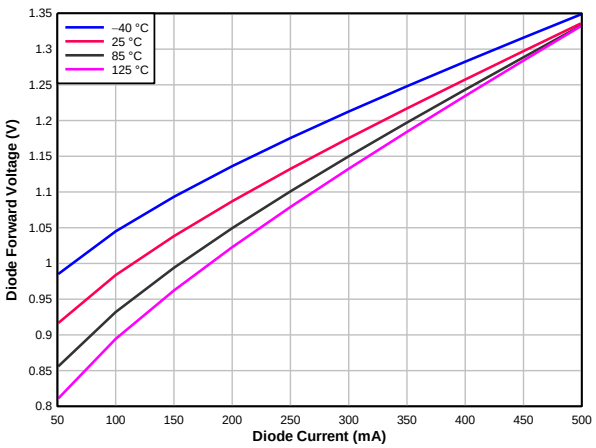


Figure 3. Diode Forward Voltage vs. Diode Current

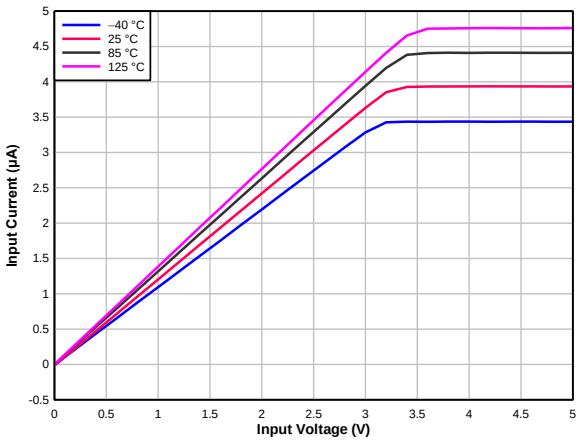


Figure 4. Input Current vs. Input Voltage

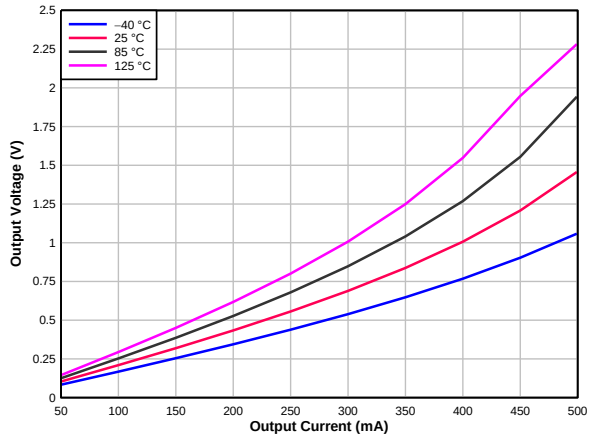


Figure 5. Output Voltage vs. Output Current

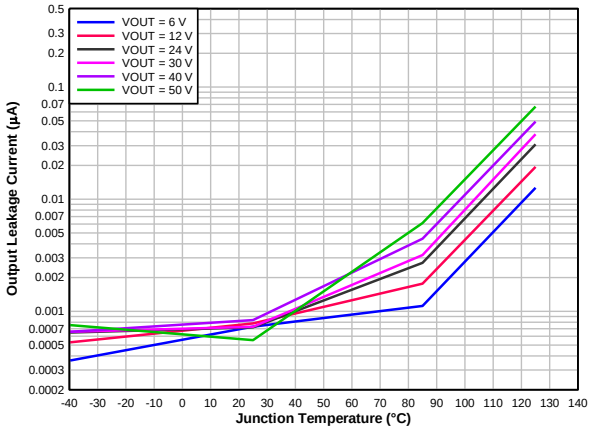


Figure 6. Output Leakage Current vs. Junction Temperature

Detailed Description

Overview

TPM2803 is an 8-ch low-side driver array. It consists of 8 channels of high-voltage low-side MOSFET. Its outputs can drive inductive loads up to 500 mA per channel with a wide temperature range. Its outputs can drive inductive loads, such as solenoids, relays, motors, and lamps up to 500 mA per channel with a wide temperature range. Multiple channels can be paralleled to increase driving capabilities or reduce thermal dissipation.

TPM2803 has various benefits to increase system robustness and ease of use. It can replace discrete bipolar components and various versions of bipolar-based Darlington arrays.

The input pins support a wide range of voltage ratings from 1.8 V logic, TTL logic up to 30 V voltage rail. With an integrated noise filter, the INx inputs improve system robustness in supporting robust industrial environment. The CMOS input gates can support modern microcontrollers without the need for current sourcing capabilities on microcontroller GPIOs.

Integrated over-temperature protection and under-voltage lock out protection provide advanced robustness to the system compared to the older generation of Darlington arrays. 3PEAK recommends connecting COM to a voltage supply instead of floating. The low on-resistance of output ensures lower power dissipated on the device. The low on-resistance increases driving efficiency and reduces device temperature, thus improving the system robustness.

The device also supports a wide ambient temperature range (−40°C to 125°C).

Functional Block Diagram

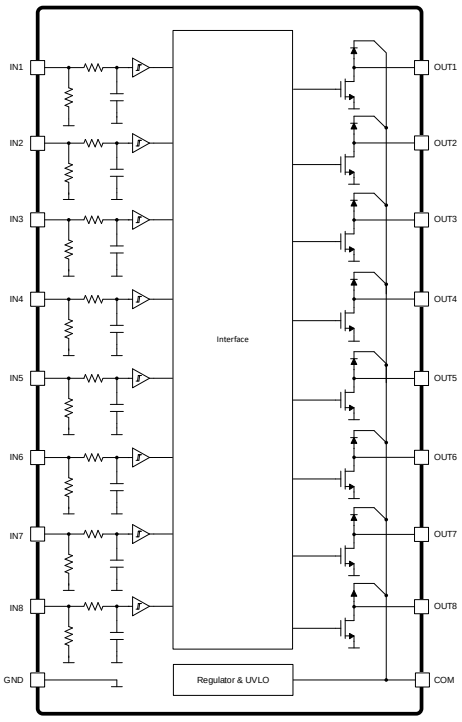


Figure 7. Functional Block Diagram

Feature Description

For each channel, the input pin INx controls the output. When INx is logic HIGH, the output transistor is ON. When INx is logic LOW, the output transistor is OFF. The devices use power from a COM pin to bias internal circuits with an internal low-dropout linear regulator. The power transistor delivers current with low $R_{DS(ON)}$ to improve system-level efficiency. To improve system-level reliability, TPM2803 has an integrated R-C filter.

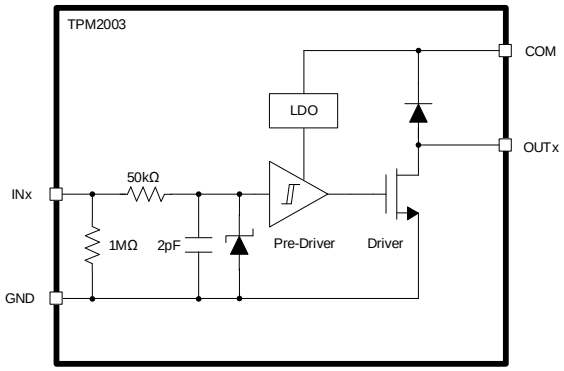
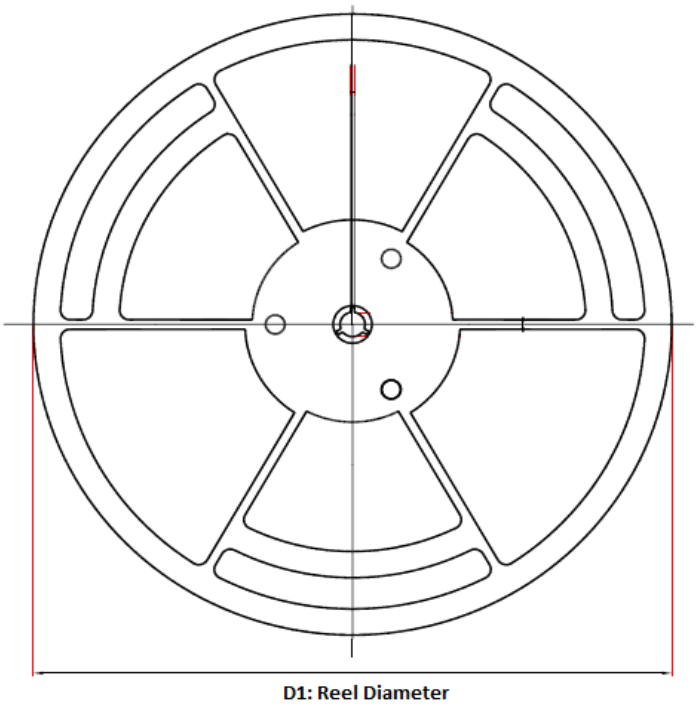
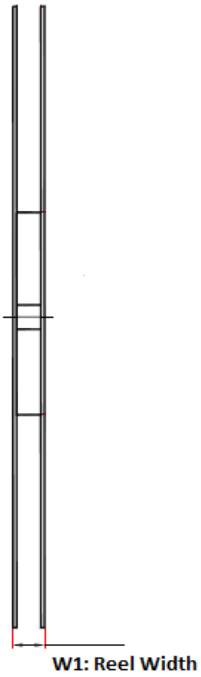
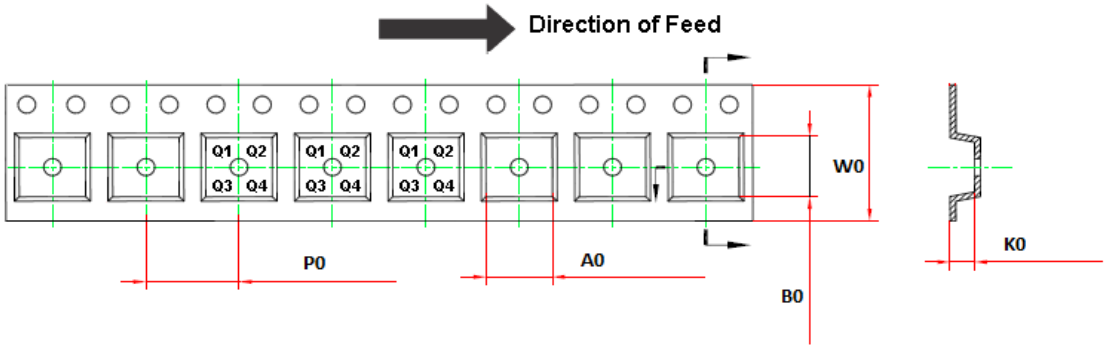


Figure 8. Single Channel Circuit

Tape and Reel Information





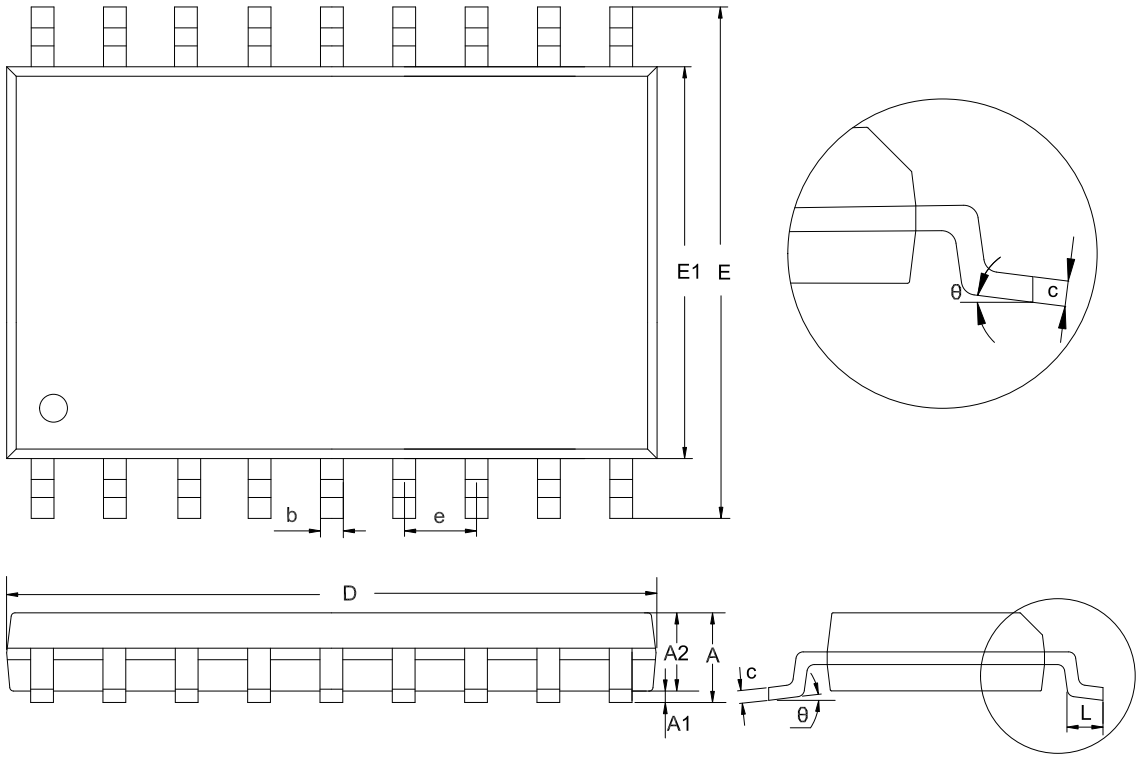


Order Number	Package	D1 (mm)	W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	W0 (mm)	Pin1 Quadrant
TPM2803-SO4R	SOP18	330.0	21.6	6.7	10.4	2.1	8.0	16.0	Q1

Package Outline Dimensions

SOP18

Package Outline Dimensions SO4(SOP-18-A)



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	2.300	2.650	0.091	0.104
A1	0.100	0.300	0.004	0.012
A2	2.200	2.400	0.087	0.094
b	0.350	0.430	0.014	0.017
c	0.250	0.290	0.010	0.011
D	11.350	11.550	0.447	0.455
E	10.100	10.500	0.398	0.413
E1	7.400	7.600	0.291	0.299
e	1.270 BSC		0.050 BSC	
L	0.700	1.000	0.028	0.039
θ	0	8°	0	8°

NOTES

1. Do not include mold flash or protrusion.
2. This drawing is subject to change without notice.

Order Information

Order Number	Operating Temperature Range	Package	Marking Information	MSL	Transport Media, Quantity	Eco Plan
TPM2803-SO4R	-40 to 125°C(1)	SOP18	M2803	3	1500	Green

(1) Ambient temperature indicates device operation condition range. Application thermal behavior needs to be taken care of when operating in high-temperature scenarios.

Green: 3PEAK defines "Green" to mean RoHS compatible and free of halogen substances.

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