Low Voltage Supervisory Circuit with Manual Reset

Features

- Precision low voltage monitoring
- 200 ms (typical) reset timeout
- Manual reset input
- Reset output stage
- Push-pull Active-low output (TPV811)
- Push-pull Active-high output (TPV812)
- Low power consumption: 2.2 μA
- Guaranteed reset output valid to V_{CC} = 1 V
- Power supply glitch immunity
- Specified from −40°C to +125°C
- 5-lead SOT-23-5 package and 4-lead SOT-143 package

Applications

- Microprocessor systems
- Computers
- Controllers
- Intelligent instruments
- Portable equipment

Description

The TPV811/812 is a supervisory circuit that monitors power supply voltage levels and provides a power-on reset signal.

A reset signal can also be asserted by an external manual reset input.

The reset periods are fixed at 200 ms (typical).

The TPV811/812 is available in a 5-lead SOT-23-5 package and 4-lead SOT-143 package. And typically consumes only 2.2 μA, suitable for use in low power, portable applications.

Typical Application Circuit

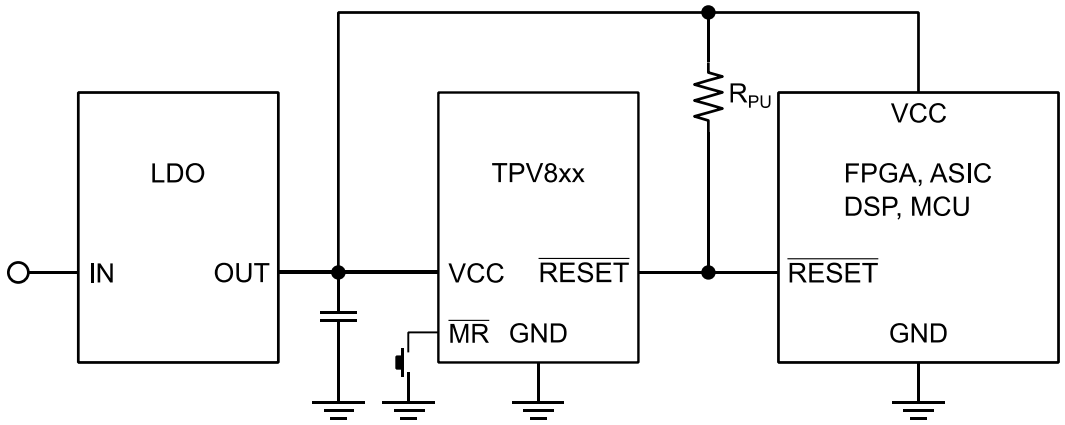


Table of Contents

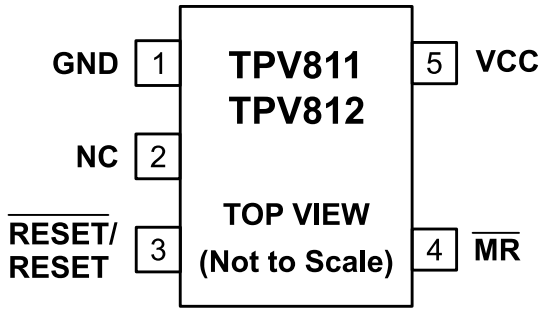
Features **1**
Applications **1**
Description **1**
Typical Application Circuit **1**
Revision History **3**
Pin Configuration and Functions **4**
Pin Functions 4
Specifications **5**
Absolute Maximum Ratings 5
ESD, Electrostatic Discharge Protection 5
Electrical Characteristics 6
Typical Performance Characteristics 7
Detailed Description **8**
Overview 8
Functional Block Diagram 8
Feature Description 8
Application and Implementation **10**
Power up/down Restriction 10
Tape and Reel Information **11**
Package Outline Dimensions **12**
SOT-23-5 12
SOT-143 13
Order Information – TPV811 ..... **14**
Order Information – TPV812 ..... **15**

Revision History

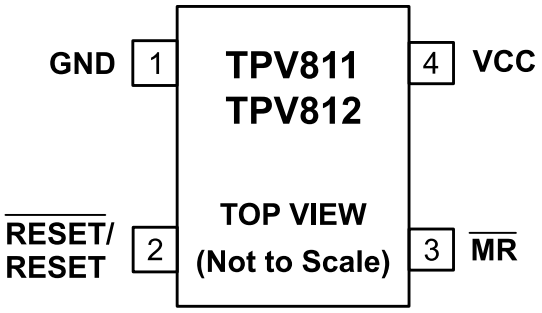
Date	Revision	Notes
2018/9/1	Rev.A.0	Version 1.0
2018/1/1	Rev.A.1	Update RESET VOH, VOL parameters.
2021/6/2	Rev.A.2	Update V_{CC} PIN NO of SOT-143, and pin 1 position of SOT-143 package.
2021/8/5	Rev.A.3	Add Application Note.

Pin Configuration and Functions

SOT-23-5
Top View



SOT-143
Top View



Pin Functions

Pin No.		Pin Name	Description
SOT-23-5	SOT-143		
1	1	GND	Ground.
2	-	NC	Not connected.
3	2	$\overline{\text{RESET}}$	TPV811: Active-Low Reset Push-Pull Output Stage. Asserted whenever V_{CC} is below the reset threshold, V_{TH}.
3	2	RESET	TPV812: Active-High Reset Push-Pull Output Stage. Asserted whenever V_{CC} is below the reset threshold, V_{TH}.
4	3	$\overline{\text{MR}}$	Manual Reset Input. This is an active-low input, which, when forced low for at least 1 μs, generates a reset. It features a 50 kΩ internal pull-up.
5	4	VCC	Power Supply Voltage Being Monitored.

Specifications

Absolute Maximum Ratings

Parameter	Rating
V_{CC}	−0.3 V to 6 V
Output Current	20 mA
Operating Temperature Range	−40°C to 125°C
Storage Temperature Range	−65°C to 150°C
Maximum Junction Temperature	150°C
Lead Temperature (Soldering, 10 sec)	260°C

Note: 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.

(1) This data was taken with the JEDEC low effective thermal conductivity test board.

(2) This data was taken with the JEDEC standard multilayer test boards.

ESD, Electrostatic Discharge Protection

Symbol	Parameter	Condition	Minimum Level	Unit
HBM	Human Body Model ESD	ANSI/ESDA/JEDEC JS-001(1)	4000	V
CDM	Charged Device Model ESD	ANSI/ESDA/JEDEC JS-002(2)	2000	V

(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.

Electrical Characteristics

V_{CC} = 1.53 V to 5.5 V; T_A = –40°C to +125°C, unless otherwise noted.

Parameter	Test conditions	Min	Typ	Max	Unit
V_{CC} Operating Voltage Range		1		5.5	V
Supply Current	V_{CC} = 1.8 V		2.2	10	μA
	V_{CC} = 5 V		6	15	μA
RESET THRESHOLD VOLTAGE					
TPV8xxV	V_{TH}	1.51	1.58	1.63	V
TPV8xxW	V_{TH}	1.62	1.67	1.71	V
TPV8xxY	V_{TH}	2.12	2.19	2.25	V
TPV8xxZ	V_{TH}	2.25	2.32	2.38	V
TPV8xxR	V_{TH}	2.55	2.63	2.70	V
TPV8xxS	V_{TH}	2.85	2.93	3.00	V
TPV8xxT	V_{TH}	3.00	3.08	3.15	V
TPV8xxM	V_{TH}	4.25	4.38	4.5	V
TPV8xxL	V_{TH}	4.5	4.63	4.75	V
RESET THRESHOLD TEMPERATURE COEFFICIENT			60		ppm/°C
RESET THRESHOLD HYSTERESIS			2 × V_{TH}/1000		mV
V_{CC} TO RESET DELAY	V_{TH} − V_{CC} = 100 mV		20		μs
RESET TIMEOUT PERIOD		140	200	280	ms
RESET OUTPUT VOLTAGE VOL (Push-Pull)	V_{CC} ≥ 1 V, I_{SINK} = 50 μA			0.3	V
RESET OUTPUT VOLTAGE VOL (Push-Pull)	Vcc = V_{TH}, I_{SINK} = 1.2 mA V_{TH} ≥ 2.63 V			0.3	V
RESET OUTPUT VOLTAGE VOL (Push-Pull)	Vcc = V_{TH}, I_{SINK} = 3.2 mA V_{TH} ≥ 4 V			0.4	V
RESET OUTPUT VOLTAGE VOH (Push-Pull)	V_{CC} ≥ 1.8 V, I_{SOURCE} = 200 μA	0.8 × V_{CC}			V
RESET OUTPUT VOLTAGE VOH (Push-Pull)	V_{CC} = V_{TH}, I_{SOURCE} = 500 μA V_{TH} ≥ 2.63 V	0.8 × V_{CC}			V
RESET OUTPUT VOLTAGE VOH (Push-Pull)	V_{CC} = V_{TH}, I_{SOURCE} = 800 μA V_{TH} ≥ 4 V	V_{CC}-1.5 V			V
$\overline{MR}$ Input Threshold VIL				0.3 × V_{CC}	V
$\overline{MR}$ Input Threshold VIH		0.7 × V_{CC}			V
$\overline{MR}$ Input Pulse Width		1			μS
$\overline{MR}$ Glitch Rejection			100		nS
$\overline{MR}$ to Reset Delay			200		nS
$\overline{MR}$ Pull-Up Resistance			50		kΩ

Typical Performance Characteristics

All test condition is V_{CC} = 3.3 V, T_A = +25°C, R_L = 150 Ω to GND, unless otherwise noted.

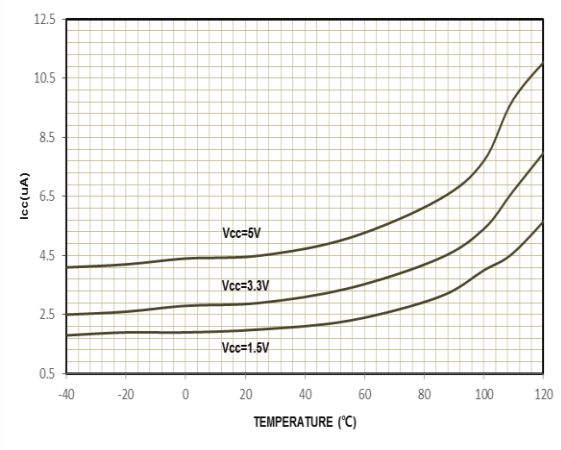


Figure 1 Supply Current vs. Temperature

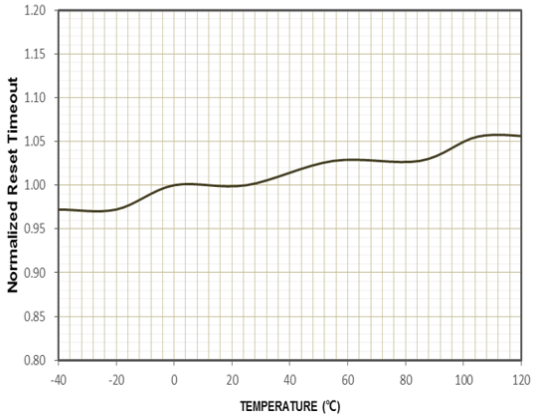


Figure 2 Normalized RESET Timeout Period vs. Temperature

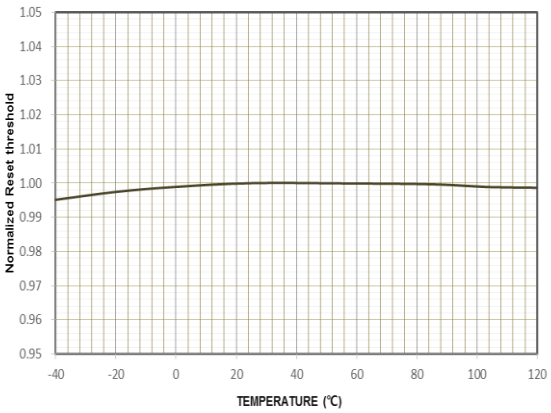


Figure 3 Normalized RESET Threshold vs. Temperature

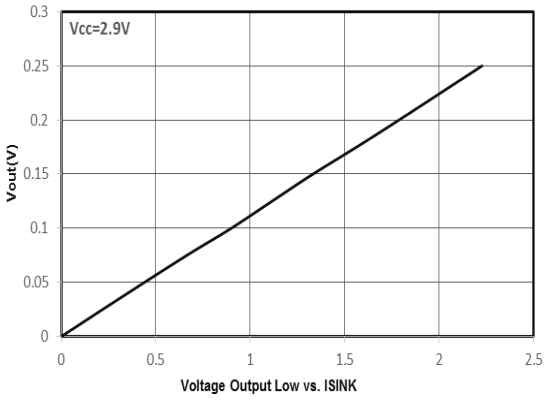


Figure 4 Voltage Output Low vs. ISINK

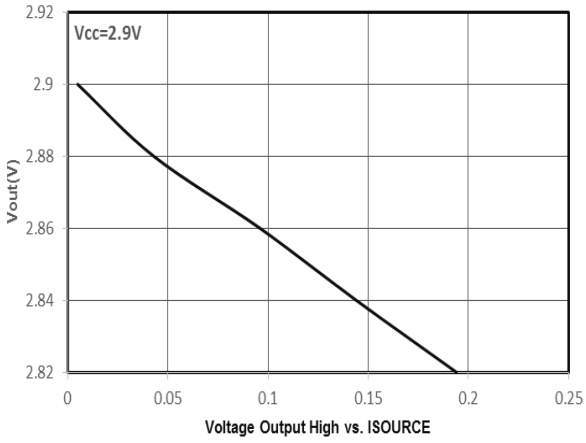


Figure 5 Voltage Output Low vs. I_{SOURCE}

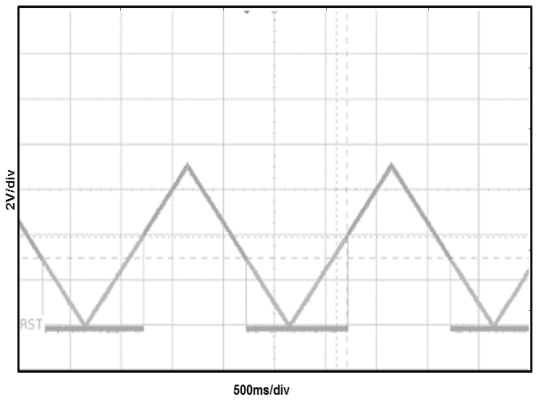


Figure 6 RESET Output Voltage vs. Supply Voltage

Detailed Description

Overview

The TPV811/812 provides supply voltage supervision as well as manual reset function.

A reset signal is asserted when the supply voltage is below a preset threshold. In addition, the TPV811/812 allows supply voltage stabilization with a fixed timeout before the reset de-asserts after the supply voltage rises above the threshold.

A manual reset input is available to reset the microprocessor, for example, by using an external push-button.

Functional Block Diagram

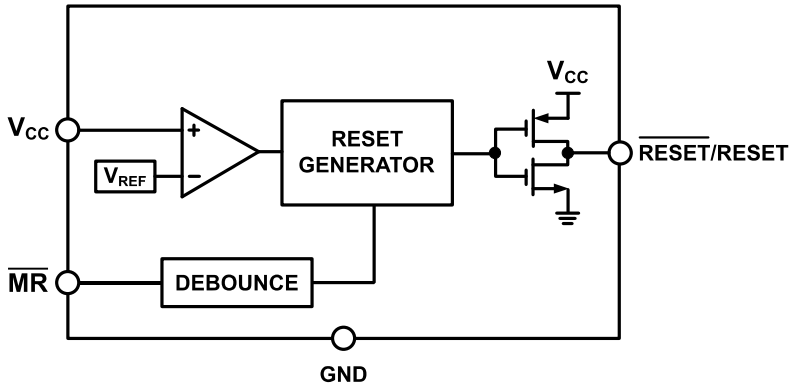


Figure 7 Functional Block Diagram

Feature Description

RESET Output

The TPV811/812 features an active-low or active-high push-pull output. For active-low output, the reset signal is guaranteed to be logic low for V_{CC} down to 1 V. The reset output is asserted when V_{CC} is below the reset threshold (V_{TH}), when $\overline{MR}$ is driven low. Reset remains asserted for the duration of the reset active timeout period (t_{RP}) after V_{CC} rises above the reset threshold, after $\overline{MR}$ transitions from low to high. Figure 8 shows the reset (active low) outputs.

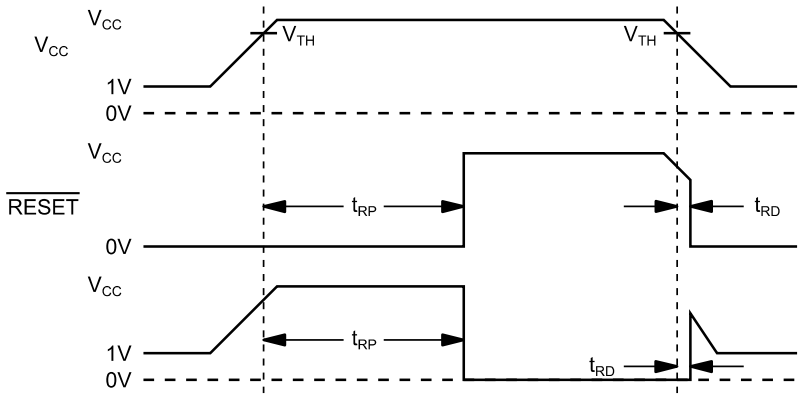


Figure 8 Reset Timing Diagram

Manual RESET Input

The TPV811/812 features a manual reset input ($\overline{MR}$), which, when driven low, asserts the reset output. When $\overline{MR}$ transitions from low to high, reset remains asserted for the duration of the reset active timeout period before de-asserting.

The $\overline{MR}$ input has an internal pull-up resistor so that the input is always high when unconnected. Noise immunity is provided on the $\overline{MR}$ input, and fast, negative-going transients are ignored. A 0.1 μF capacitor between $\overline{MR}$ and ground provides additional noise immunity.

Application and Implementation

NOTE

Information in the following applications sections is not part of the 3PEAK's component specification and 3PEAK does not warrant its accuracy or completeness. 3PEAK's customers are responsible for determining suitability of components for their purposes. Customers should validate and test their design implementation to confirm system functionality.

Power up/down Restriction

When power supply ramps up very slow at high temperature, there may be a certain percentage of the chips are probabilistic abnormal (With abnormal current appears around 0.6 V, internal LDO is pulled down, and then the RESET output is incorrect). Through simulation and experiment, certain requirements of power supply up and down should be followed to avoid this kind of issue.

The requirements are shown in Figure 9:

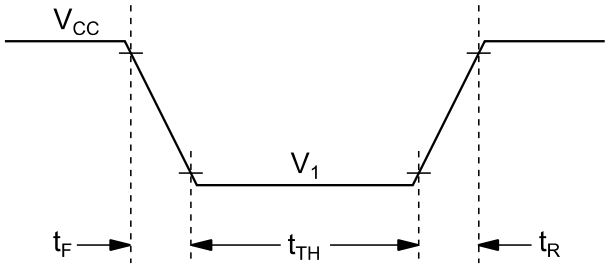
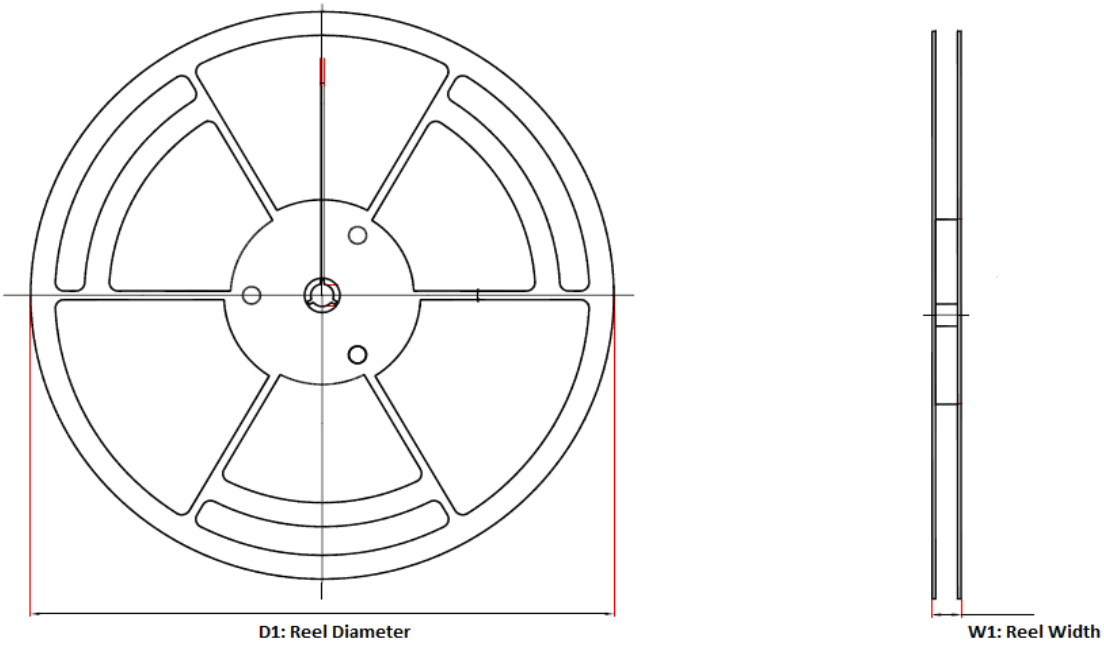


Figure 9 power supply requirements

- V_1 < 200 mV
- t_{TH} > 40 ms
- t_R > 0.2 V/ms
- In power up duration (t_R), Ripple or noise on V_{CC} should be < 100 mV

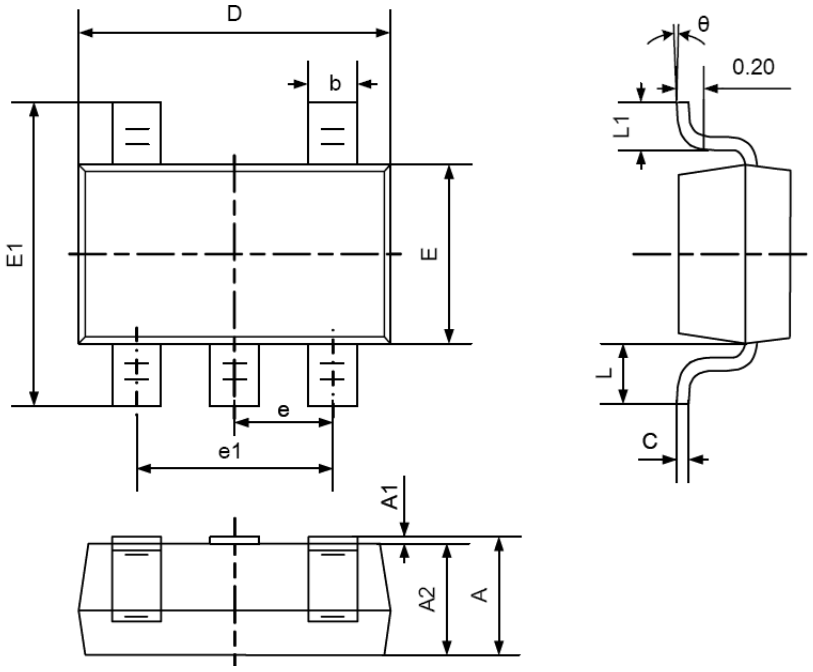
Tape and Reel Information



Order Number	Package	D1 (mm)	W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	W0 (mm)	Pin1 Quadrant
TPV81XX-5TR	SOT-23-5	180	13.1	3.2	3.2	1.4	4	8	Q3
TPV81XX-4LTR	SOT-143	178	12.1	3.19	2.8	1.31	4	8	Q3

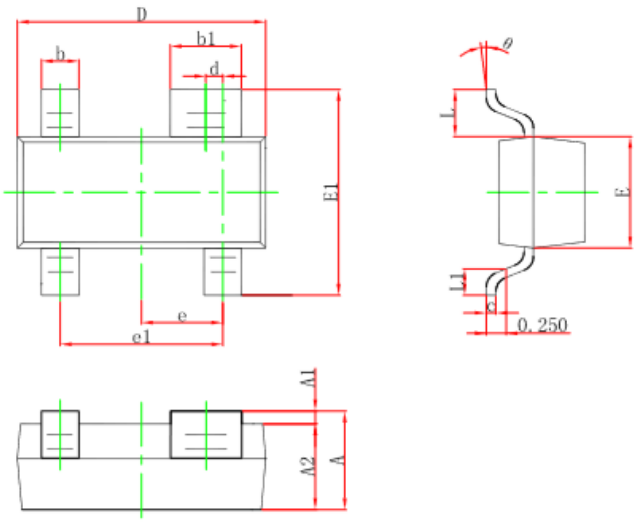
Package Outline Dimensions

SOT-23-5



Symbol	Dimensions In Millimeters	
	Min	Max
A	1.050	1.250
A1	0.000	0.100
A2	1.000	1.150
b	0.300	0.500
C	0.100	0.200
D	2.820	3.020
E	1.500	1.700
E1	2.600	3.000
e	0.950TYP	
e1	1.800	2.000
L	0.600REF	
L1	0.300	0.600
θ	0°	8°

SOT-143



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.900	1.150	0.035	0.045
A1	0.000	0.100	0.000	0.004
A2	0.900	1.050	0.035	0.041
b	0.300	0.500	0.012	0.020
b1	0.750	0.900	0.030	0.035
c	0.080	0.150	0.003	0.006
D	2.800	3.000	0.110	0.118
d	0.200 TYP.		0.008 TYP.	
E	1.200	1.400	0.047	0.055
E1	2.250	2.550	0.089	0.100
e	0.950 TYP.		0.037 TYP.	
e1	1.800	2.000	0.071	0.079
L	0.550 REF.		0.022 REF.	
L1	0.300	0.500	0.012	0.020
θ	0°	8°	0°	8°

Note: Pin1 is up-right pin (the wider one).

Order Information – TPV811

Order Number	Operating Temperature Range	Package	Marking Information	MSL	Transport Media, Quantity	Eco Plan
TPV811V-5TR	−40°C to 125°C	SOT-23-5	V4V	3	Tape and Reel, 3,000	Green
TPV811W-5TR	−40°C to 125°C	SOT-23-5	V4W	3	Tape and Reel, 3,000	Green
TPV811Y-5TR	−40°C to 125°C	SOT-23-5	V4Y	3	Tape and Reel, 3,000	Green
TPV811Z-5TR	−40°C to 125°C	SOT-23-5	V4Z	3	Tape and Reel, 3,000	Green
TPV811R-5TR	−40°C to 125°C	SOT-23-5	V4R	3	Tape and Reel, 3,000	Green
TPV811S-5TR	−40°C to 125°C	SOT-23-5	V4S	3	Tape and Reel, 3,000	Green
TPV811T-5TR	−40°C to 125°C	SOT-23-5	V4T	3	Tape and Reel, 3,000	Green
TPV811M-5TR	−40°C to 125°C	SOT-23-5	V4M	3	Tape and Reel, 3,000	Green
TPV811L-5TR	−40°C to 125°C	SOT-23-5	V4L	3	Tape and Reel, 3,000	Green
TPV811V-4LTR	−40°C to 125°C	SOT-143	V4V	3	Tape and Reel, 3,000	Green
TPV811W-4LTR	−40°C to 125°C	SOT-143	V4W	3	Tape and Reel, 3,000	Green
TPV811Y-4LTR	−40°C to 125°C	SOT-143	V4Y	3	Tape and Reel, 3,000	Green
TPV811Z-4LTR	−40°C to 125°C	SOT-143	V4Z	3	Tape and Reel, 3,000	Green
TPV811R-4LTR	−40°C to 125°C	SOT-143	V4R	3	Tape and Reel, 3,000	Green
TPV811S-4LTR	−40°C to 125°C	SOT-143	V4S	3	Tape and Reel, 3,000	Green
TPV811T-4LTR	−40°C to 125°C	SOT-143	V4T	3	Tape and Reel, 3,000	Green
TPV811M-4LTR	−40°C to 125°C	SOT-143	V4M	3	Tape and Reel, 3,000	Green
TPV811L-4LTR	−40°C to 125°C	SOT-143	V4L	3	Tape and Reel, 3,000	Green

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

Order Information – TPV812

Order Number	Operating Temperature Range	Package	Marking Information	MSL	Transport Media, Quantity	Eco Plan
TPV812V-5TR	−40°C to 125°C	SOT-23-5	V5V	3	Tape and Reel, 3,000	Green
TPV812W-5TR	−40°C to 125°C	SOT-23-5	V5W	3	Tape and Reel, 3,000	Green
TPV812Y-5TR	−40°C to 125°C	SOT-23-5	V5Y	3	Tape and Reel, 3,000	Green
TPV812Z-5TR	−40°C to 125°C	SOT-23-5	V5Z	3	Tape and Reel, 3,000	Green
TPV812R-5TR	−40°C to 125°C	SOT-23-5	V5R	3	Tape and Reel, 3,000	Green
TPV812S-5TR	−40°C to 125°C	SOT-23-5	V5S	3	Tape and Reel, 3,000	Green
TPV812T-5TR	−40°C to 125°C	SOT-23-5	V5T	3	Tape and Reel, 3,000	Green
TPV812M-5TR	−40°C to 125°C	SOT-23-5	V5M	3	Tape and Reel, 3,000	Green
TPV812L-5TR	−40°C to 125°C	SOT-23-5	V5L	3	Tape and Reel, 3,000	Green
TPV812V-4LTR	−40°C to 125°C	SOT-143	V5V	3	Tape and Reel, 3,000	Green
TPV812W-4LTR	−40°C to 125°C	SOT-143	V5W	3	Tape and Reel, 3,000	Green
TPV812Y-4LTR	−40°C to 125°C	SOT-143	V5Y	3	Tape and Reel, 3,000	Green
TPV812Z-4LTR	−40°C to 125°C	SOT-143	V5Z	3	Tape and Reel, 3,000	Green
TPV812R-4LTR	−40°C to 125°C	SOT-143	V5R	3	Tape and Reel, 3,000	Green
TPV812S-4LTR	−40°C to 125°C	SOT-143	V5S	3	Tape and Reel, 3,000	Green
TPV812T-4LTR	−40°C to 125°C	SOT-143	V5T	3	Tape and Reel, 3,000	Green
TPV812M-4LTR	−40°C to 125°C	SOT-143	V5M	3	Tape and Reel, 3,000	Green
TPV812L-4LTR	−40°C to 125°C	SOT-143	V5L	3	Tape and Reel, 3,000	Green

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