

Features

- Typical 350-nA Ultra-low Quiescent Current
- Input Voltage Range: 2 V to 5.5 V
- Output Voltage Options:
 - Fixed: 1.2 V, 1.5 V, 1.8 V
- $\pm 1.5\%$ Output Accuracy Through Operating Conditions
- Maximum Output Current: 300 mA
- Low Shutdown Current
- Low Dropout Voltage: 310 mV typ @ 200mA
- Current Limit and Thermal Protection
- Stable with 1 μ F to 22 μ F Ceramic Capacitor
- Active Output Discharge While Disable
- Soft-start Limits Input Current Surge During Enable
- Junction Temperature Range: -40°C to $+125^{\circ}\text{C}$
- Packages: SOT23-5 and DFN1x1-4

Applications

- Handheld Devices with Battery Power Supply
- Portable Devices with Battery Power Supply
- Wearable Applications, Bluetooth Headsets
- Wireless and IoT Modules
- Personal Electronics, Personal Healthcare

Description

The TPL7032 is an ultra-low quiescent current low-dropout linear regulator (LDO) that can source 300 mA with excellent transient performance.

The TPL7032, with an ultra-low typical I_Q of 350 nA, is designed specifically for applications where very-low quiescent current is a critical parameter. When in shutdown or disabled mode, the device consumes ultra-low current that helps increase the shelf life of the battery.

The TPL7032 has Current-limit and thermal overload protection which improves the reliability under heavy-load conditions. The TPL7032 series is fully specified for $T_J = -40^{\circ}\text{C}$ to $+125^{\circ}\text{C}$ operation.

Typical Application Schematic

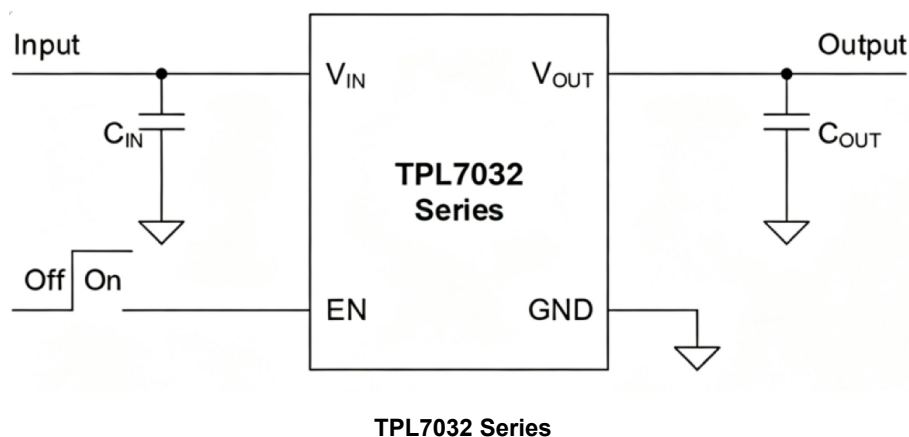


Table of Contents

Features	1
Applications	1
Description	1
Typical Application Schematic	1
Product Family Table	3
Revision History	3
Pin Configuration and Functions	4
Specifications	5
Absolute Maximum Ratings.....	5
ESD, Electrostatic Discharge Protection.....	5
Recommended Operating Conditions.....	5
Thermal Information.....	5
Electrical Characteristics.....	6
Typical Performance Characteristics.....	8
Detailed Description	9
Overview.....	9
Functional Block Diagram.....	9
Feature Description.....	9
Application and Implementation	11
Application Information	11
Typical Application.....	11
Layout	12
Layout Guideline.....	12
Tape and Reel Information	13
Package Outline Dimensions	14
SOT23-5.....	14
DFN1X1-4.....	15
Order Information	16
IMPORTANT NOTICE AND DISCLAIMER	17

Product Family Table

Order Number	Output Voltage (V)	Package
TPL703212-S5TR ⁽¹⁾	Fixed 1.2 V	SOT23-5
TPL703212-DF1R ⁽¹⁾	Fixed 1.2 V	DFN1x1-4
TPL703215-S5TR	Fixed 1.5 V	SOT23-5
TPL703215-DF1R ⁽¹⁾	Fixed 1.5 V	DFN1x1-4
TPL703218-S5TR ⁽¹⁾	Fixed 1.8 V	SOT23-5
TPL703218-DF1R ⁽¹⁾	Fixed 1.8 V	DFN1x1-4

(1) For future products, contact the 3PEAK factory for more information and samples.

Revision History

Date	Revision	Notes
2026-09-20	Rev.A.0	Released Version

Pin Configuration and Functions

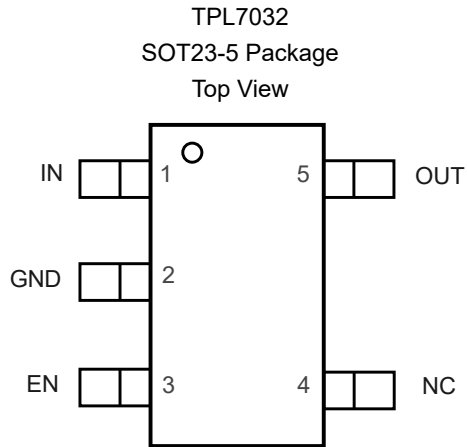
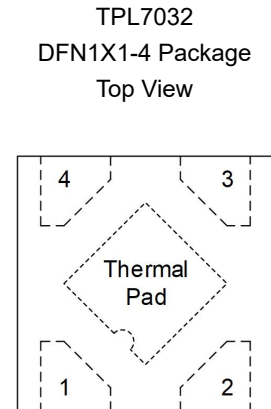


Table 1. Pin Functions: TPL7032

Pin Number		Name	I/O	Description
SOT23-5	DFN1X1-4			
3	3	EN	I	Regulator enable pin. Drive EN high to turn on the regulator; drive EN low to turn off the regulator. For automatic startup, connect EN to IN directly.
2	2	GND	–	Ground reference pin. Connect the GND pin to the PCB ground plane directly.
1	4	IN	I	Input voltage pin. Bypass IN to GND with a 1 μ F or greater capacitor.
4	–	NC	–	No connection.
5	1	OUT	O	Regulated output voltage pin. Bypass OUT to GND with a 1 μ F or greater capacitor.

(1) Thermal pad must be connected to the PCB ground plane to maximize the thermal performance.

Specifications

Absolute Maximum Ratings

Parameter		Min	Max	Unit
V _{IN} , V _{EN}	Input Voltage	-0.3	6	V
V _{OUT}	Output Voltage	-0.3	6	V
T _J	Junction Temperature Range	-40	150	°C
T _{STG}	Storage Temperature Range	-65	150	°C
T _L	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) All voltage values are with respect to GND.

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	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
V _{IN}	Input Voltage	2	5.5	V
V _{EN}	Enable Voltage	0	V _{IN}	V
V _{OUT}	Output Voltage	0	5	V
I _{OUT}	Output Current	0	300	mA
T _J	Operating Junction Temperature Range	-40	125	°C

Thermal Information

Package Type	θ _{JA}	θ _{JC}	Unit
SOT23-5	280	62	°C/W
DFN1x1-4	210	110	°C/W

Electrical Characteristics

All test conditions: $V_{IN} = V_{OUT(NOM)} + 1\text{ V}$, $C_{OUT} = 1\text{ }\mu\text{F}$, $T_J = -40^\circ\text{C}$ to 125°C , all typical values are at $T_J = 25^\circ\text{C}$, unless otherwise noted.

Parameter		Conditions	Min	Typ	Max	Unit
Supply Voltage and Current						
V_{IN}	Input Voltage Range		2		5.5	V
I_{GND}	Ground Pin Current	$I_{OUT} = 0\text{ mA}$, $-40^\circ\text{C} \leq T_J \leq +85^\circ\text{C}$		350	550	nA
		$I_{OUT} = 1\text{ mA}$, $-40^\circ\text{C} \leq T_J \leq +85^\circ\text{C}$		2.5		μA
		$I_{OUT} = 100\text{ mA}$, $-40^\circ\text{C} \leq T_J \leq +85^\circ\text{C}$		200		μA
I_{SHDN}	Shutdown Current	$EN = GND$, $T_A = +25^\circ\text{C}$		10		nA
Enable Input Voltage and Current						
$V_{IH(EN)}$	EN Logic-input High Level		1.1		V_{IN}	V
$V_{IL(EN)}$	EN Logic-input Low Level		0		0.3	V
I_{EN}	EN Pin Leakage Current	$EN = 5\text{ V}$		10		nA
Regulated Output Voltage and Current						
V_{OUT}	Output Voltage Accuracy	$I_{OUT} = 1\text{ mA}$, $T_J = 25^\circ\text{C}$	-0.8%		0.8%	
V_{OUT}	Output Voltage Accuracy	$I_{OUT} = 1\text{ mA}$, $T_J = -40^\circ\text{C}$ to $+125^\circ\text{C}$	-1.5%		1.5%	
ΔV_{OUT}	Line Regulation	$V_{IN} = V_{OUT(NOM)} + 0.5\text{ V}$ to 5.5 V , $I_{OUT} = 1\text{ mA}$			5	mV
	Load Regulation	$I_{OUT} = 1\text{ mA}$ to 300 mA		40	50	mV
$V_{DO}^{(1)}$	Dropout Voltage	$V_{IN} = 0.98 \times V_{OUT(NOM)}$, $I_{OUT} = 200\text{ mA}$			310	mV
I_{OUT}	Output Current	V_{OUT} in Regulation	0		300	mA
I_{CL}	Output Current limit	$V_{OUT} = 0.9 \times V_{OUT(NOM)}$	301		900	mA
R_{DIS}	Output Discharge Resistance	$V_{IN} = V_{OUT(NOM)} + 1\text{ V}$, $EN = GND$		500		Ω
PSRR	Power Supply Rejection Ratio	$I_{OUT} = 30\text{ mA}$, $f = 1\text{ kHz}$, $C_{OUT} = 1\text{ }\mu\text{F}$		55		dB
V_N	Output Noise Voltage	$I_{OUT} = 1\text{ mA}$, $V_{OUT} = 3.3\text{ V}$, $BW = 10\text{ Hz}$ to 100 kHz		150		μV_{RMS}

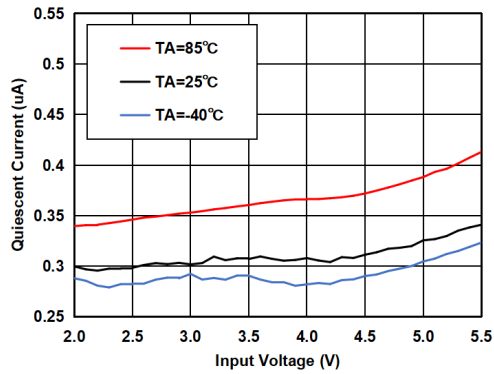
350-nA Ultra Low Quiescent Current, 300mA Linear Regulator

Parameter		Conditions	Min	Typ	Max	Unit
T_{STR}	Start-up Time from EN Assertion to $0.98 \times V_{OUT(NOM)}$	$I_{OUT} = 1\text{ mA}$, $C_{OUT} = 1\text{ }\mu\text{F}$		1		ms
Temperature Range						
T_{SD}	Thermal Shutdown Temperature			155		$^{\circ}\text{C}$
	Thermal Shutdown Hysteresis			15		$^{\circ}\text{C}$

(1) Dropout voltage is the minimum input-to-output voltage differential needed to maintain regulation at a specified output current. In dropout, the output voltage will be equal to $V_{IN} - V_{DROPOUT}$.

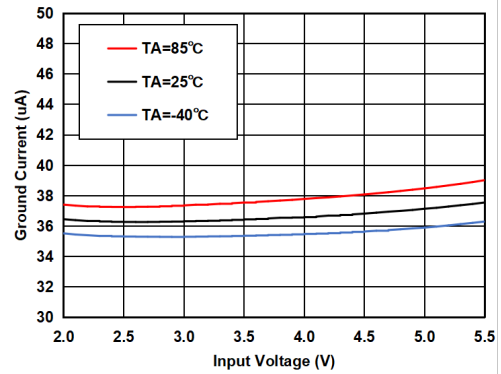
Typical Performance Characteristics

All test conditions: $V_{IN} = V_{OUT(NOM)} + 1\text{ V}$ or 2.4 V , whichever is greater; $C_{OUT} = 2.2\text{ }\mu\text{F}$, $T_A = +25^\circ\text{C}$, unless otherwise noted.



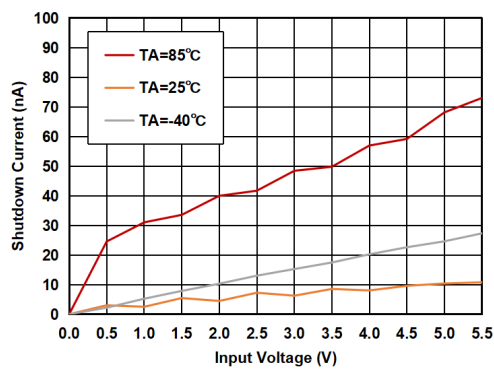
$V_{OUT} = 3.3\text{ V}$, $I_{OUT} = 0$

Figure 1. Ground Current vs. Input Voltage



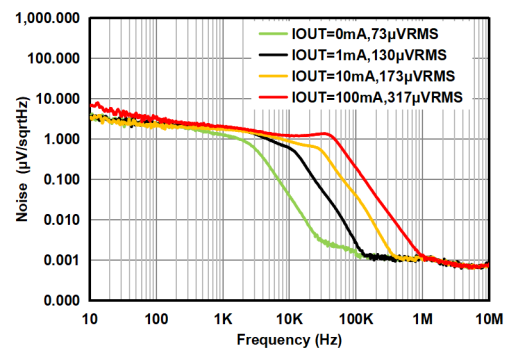
$V_{OUT} = 3.3\text{ V}$, $I_{OUT} = 100\text{ mA}$

Figure 2. Ground Current vs. Input Voltage



$V_{OUT} = 3.3\text{ V}$

Figure 3. Shutdown Current vs. Input Voltage



$V_{OUT} = 3.3\text{ V}$

Figure 4. Noise

Detailed Description

Overview

The TPL7032 is an ultra-low quiescent current low-dropout linear regulator (LDO) that can source 300 mA with excellent transient performance.

The TPL7032, with an ultra-low typical IQ of 350 nA, is designed specifically for applications where very-low quiescent current is a critical parameter. When in shutdown or disabled mode, the device consumes ultra-low Current that helps increase the shelf life of the battery.

The TPL7032 has Current-limit and thermal overload protection which improves the reliability under heavy-load conditions. The TPL7032 series is fully specified for $T_J = -40^{\circ}\text{C}$ to $+125^{\circ}\text{C}$ operation.

Functional Block Diagram

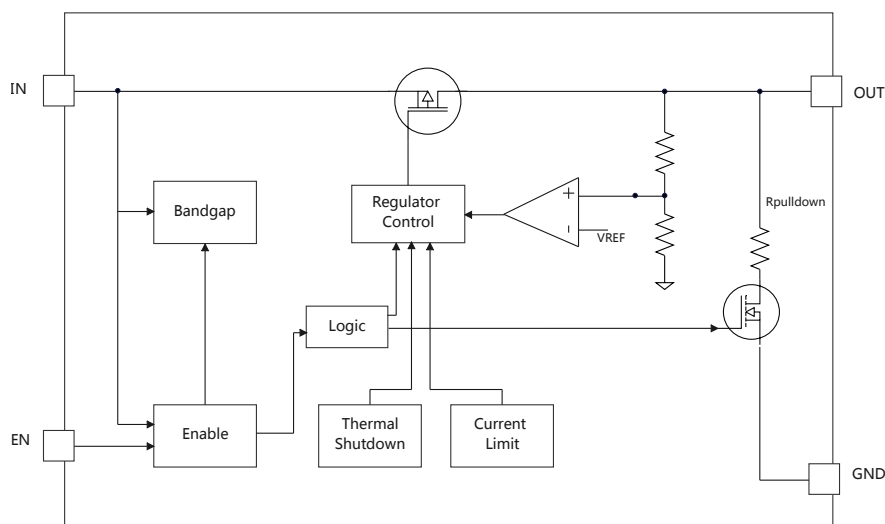


Figure 5. Functional Block Diagram

Feature Description

Enable

The enable pin (EN) is active high. Connect this pin to the GPIO of an external processor or digital logic control circuit to enable and disable the device, or connect this pin to the IN pin for self-bias applications.

Regulated Output Voltage

The TPL7032 series provides fixed output voltages of 1.2 V, 1.5 V, and 1.8 V.

Current Limit

The TPL7032 series integrates an internal current limit that helps to protect the regulator during fault conditions. Output voltage is not regulated when the device is in current limit mode, and V_{OUT} equals $I_{CL} \times R_{LOAD}$.

Short-Circuit Protection

The TPL7032 series integrates short-circuit protection. When OUT is shorted to GND or forced below 0.2 V, the TPL7032 series limits the output current to a typical 200 mA.

Thermal Shutdown

During normal operation, the LDO junction temperature should not exceed 125°C. When the junction temperature exceeds the thermal shutdown threshold, the LDO shuts down the output immediately. The output turns on again after the junction temperature falls below the thermal shutdown threshold minus the hysteresis.

Application and Implementation

Note

Information in the following application 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.

Application Information

The TPL7032 is a 300 mA low-dropout linear regulator with ultra-low quiescent current. The following application schematic shows a typical usage of the TPL7032 series.

Typical Application

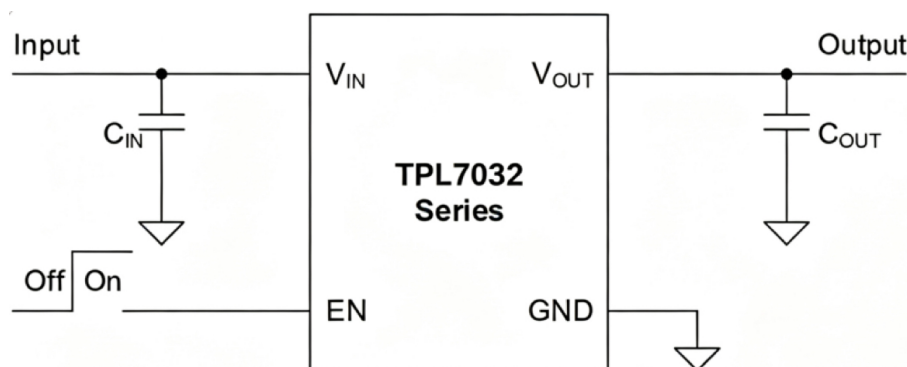


Figure 6. TPL7032 Series Application Schematic

Input Capacitor and Output Capacitor

3PEAK recommends adding a 1 μF or greater capacitor with a 0.1- μF bypass capacitor in parallel at the IN pin to keep the input voltage stable. The voltage rating of the capacitors must be greater than the maximum input voltage.

To ensure loop stability, the TPL7032 series requires an output capacitor with a capacitance value from 1 μF to 22 μF . 3PEAK recommends selecting an X5R- or X7R-type ceramic capacitor with low ESR over temperature. A larger output capacitor is recommended to get better transient response.

Both input capacitors and output capacitors must be placed as close to the device pins as possible.

Power Dissipation

During normal operation, the LDO junction temperature should not exceed 125°C. Use the equations below to calculate the power dissipation and estimate the junction temperature.

The power dissipation can be calculated using [Equation 1](#).

$$P_D = (V_{IN} - V_{OUT}) \times I_{OUT} + V_{IN} \times I_{GND} \quad (1)$$

The junction temperature can be estimated using [Equation 2](#). θ_{JA} is the junction-to-ambient thermal resistance (See Section [Thermal Information](#)).

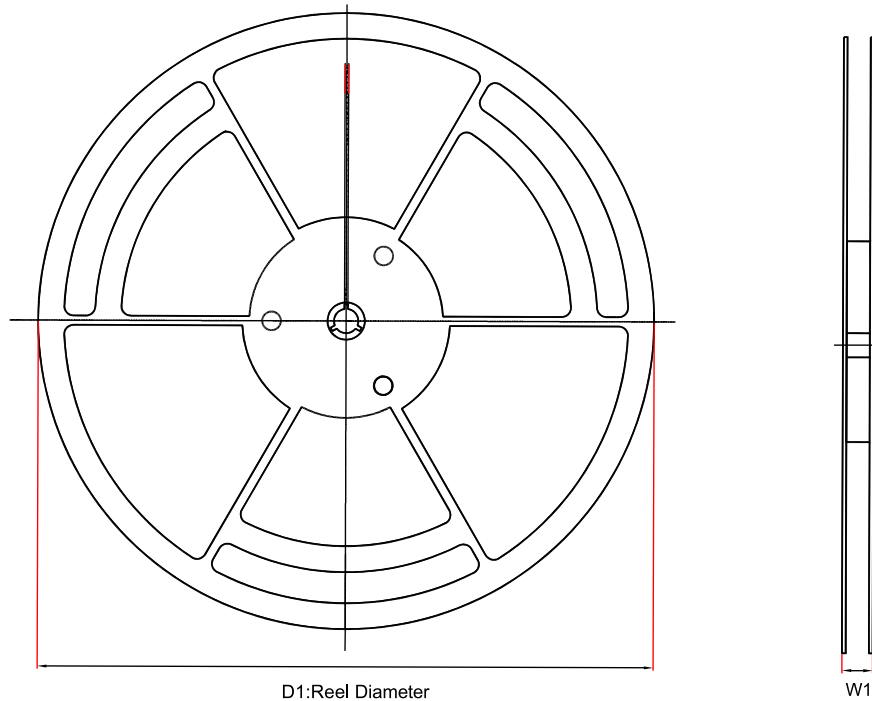
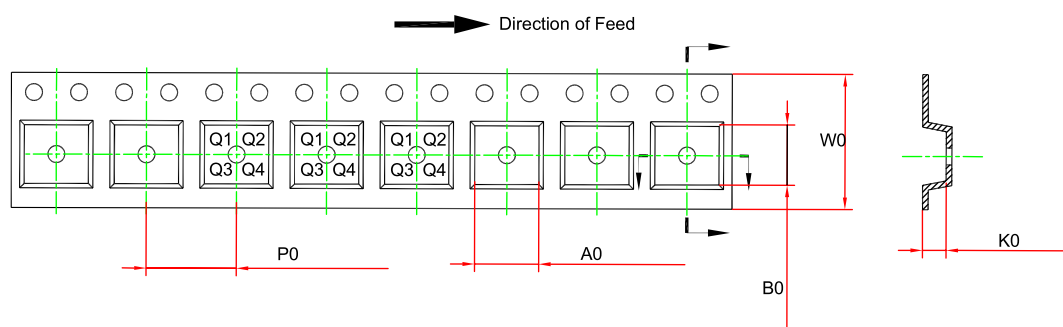
$$T_J = T_A + P_D \times \theta_{JA} \quad (2)$$

Layout

Layout Guideline

- Both input and output capacitors must be placed as close to the device pins as possible.
- It is recommended to bypass the input pin to the ground with a 0.1- μ F bypass capacitor. The loop area formed by the bypass capacitor connection, the IN pin, and the GND pin of the system must be as small as possible.
- It is recommended to use wide and thick copper to minimize $I \times R$ drop and heat dissipation.

Tape and Reel Information



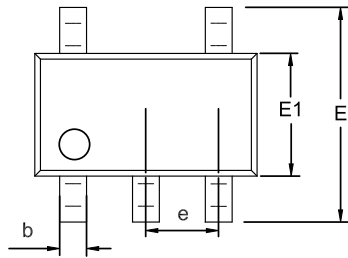
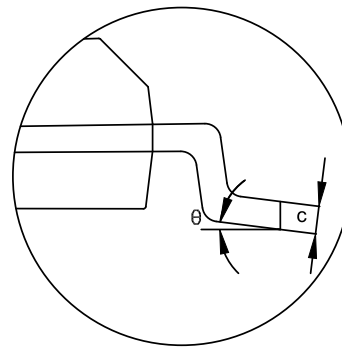
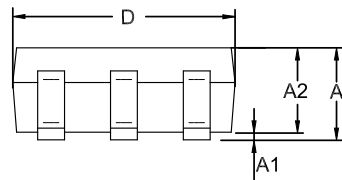
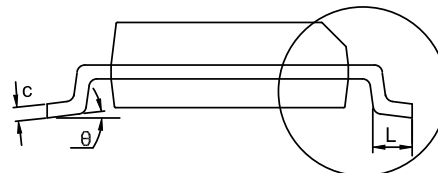
Order Number	Package	D1 (mm)	W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	W0 (mm)	Pin1 Quadrant
TPL703215-S5TR	SOT23-5	180	12	3.3	3.25	1.4	4	8	Q3
TPL703215-DF1R	DFN1x1-4	180	12.5	1.16	1.16	0.5	2	8	Q1

Package Outline Dimensions

SOT23-5

Package Outline Dimensions

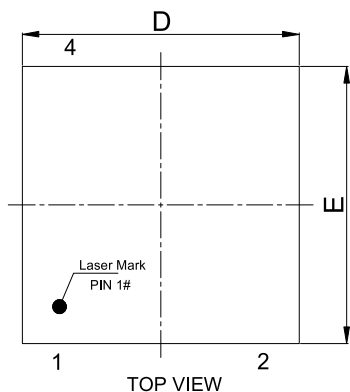
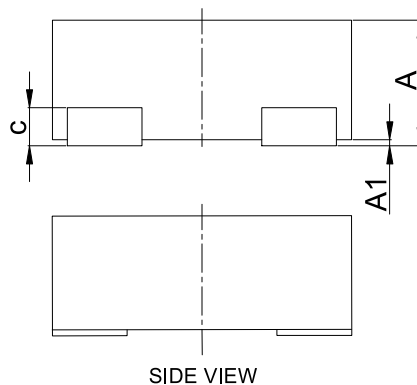
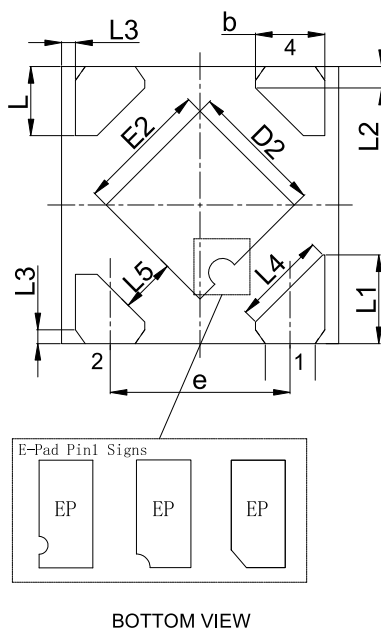
S5T(SOT23-5-A)



NOTES

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

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.050	1.250	0.041	0.049
A1	0.000	0.150	0.000	0.006
A2	1.000	1.200	0.039	0.047
b	0.280	0.500	0.011	0.020
c	0.100	0.230	0.004	0.009
D	2.820	3.020	0.111	0.119
E	2.600	3.000	0.102	0.118
E1	1.500	1.720	0.059	0.068
e	0.950 BSC		0.037 BSC	
L	0.300	0.600	0.012	0.024
θ	0	8°	0	8°

DFN1X1-4
Package Outline Dimensions
DF1(DFN1X1-4-A)


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.350	0.400	0.014	0.016
A1	0.000	0.050	0.000	0.002
b	0.200	0.300	0.008	0.012
c	0.070	0.170	0.003	0.007
D	0.950	1.050	0.037	0.041
D2	0.430	0.530	0.017	0.021
E	0.950	1.050	0.037	0.041
E2	0.430	0.530	0.017	0.021
e	0.650 BSC		0.026 BSC	
L	0.200	0.300	0.008	0.012
L1	0.270	0.370	0.011	0.015
L2	0.077 BSC		0.003 BSC	
L3	0.050 BSC		0.002 BSC	
L4	0.340 BSC		0.013 BSC	
L5	0.200 BSC		0.008 BSC	

NOTES

1. Do not include mold flash or protrusion.
2. This drawing is subject to change without notice.
3. The many types of E-pad Pin1 signs may appear in the product.

Order Information

Order Number	Junction Temperature Range	Package	Marking Information	MSL	Transport Media, Quantity	Eco Plan
TPL703212-S5TR ⁽¹⁾	-40 to 125°C	SOT23-5	LQR	MSL3	Tape and Reel, 3,000	Green
TPL703212-DF1R ⁽¹⁾	-40 to 125°C	DFN1x1-4	LQR	MSL3	Tape and Reel, 12,000	Green
TPL703215-S5TR	-40 to 125°C	SOT23-5	LQQ	MSL3	Tape and Reel, 3,000	Green
TPL703215-DF1R ⁽¹⁾	-40 to 125°C	DFN1x1-4	LQQ	MSL3	Tape and Reel, 12,000	Green
TPL703218-S5TR ⁽¹⁾	-40 to 125°C	SOT23-5	LQS	MSL3	Tape and Reel, 3,000	Green
TPL703218-DF1R ⁽¹⁾	-40 to 125°C	DFN1x1-4	LQS	MSL3	Tape and Reel, 12,000	Green

(1) For future products, contact the 3PEAK factory for more information and samples.

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

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