500-mA High PSRR, Ultra-low Noise LDO

Features

- Input Voltage Range: 1.75 V to 5.5 V
- Output Voltage Range: 0.9 V to 5 V
- ±2.5% Output Accuracy Over Line, Load Regulation, and Operating Temperature Range
- 500-mA Maximum Output Current
- Low Dropout Voltage: 150 mV typical at 500 mA
- High PSRR:
  - 82 dB at 1 kHz
  - 88 dB at 10 kHz
  - 61 dB at 100 kHz
  - 45 dB at 1 MHz
- 8.6-μV_{RMS} Output Voltage Noise
- Excellent Transient Response
- Stable with a 1-µF or Greater Ceramic Output Capacitor
- Output Reverse Current Protection
- Output Shortage Protection
- Over-Temperature and Over-Current Protection
- Junction Temperature Range: −40°C to +125°C
- Package Options:
  - SOT23-5
  - DFN1X1-4

Applications

- Portable and Battery-Powered Equipment
- Mobile Phones and Tablets
- Digital Cameras and Audio Devices Power Supply
- Video Surveillance

Description

The TPL9052 is a series of 500-mA high-PSRR, ultra-low noise, and low-dropout linear regulators with high-output accuracy. The TPL9052 series supports both fixed output voltage ranging from 0.9 V to 5 V and is stable with 1-µF or larger ceramic output capacitors.

The TPL9052 series has high PSRR with 88 dB at 10 kHz and 8.6-μV_{RMS} ultra-low noise. These features make the TPL9052 series very suitable for noise-sensitive applications with high noise from the previous stage power supply, such as high-performance analog devices, or high-definition imaging equipment.

The TPL9052 series integrates protection features: output reverse current protection, output shortage protection, over-temperature protection, and overload protection. All these features significantly improve system reliability and simplify the circuitry design under different operating conditions.

The TPL9052 series provides SOT23-5 and DFN1X1-4 packages with guaranteed operating junction temperature (T_J) ranging from −40°C to +125°C.

Typical Application Circuit

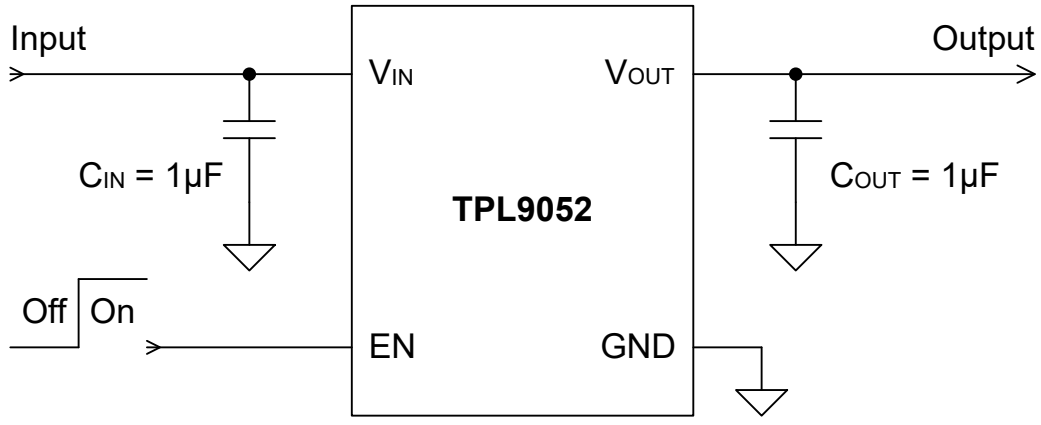


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Product Family Table

Order Number	Output Voltage (V)	Package
TPL905209-S5TR	0.9 V	SOT23-5
TPL905210-S5TR	1.0 V	SOT23-5
TPL905211-S5TR	1.1 V	SOT23-5
TPL905212-S5TR	1.2 V	SOT23-5
TPL905213-S5TR	1.3 V	SOT23-5
TPL905215-S5TR	1.5 V	SOT23-5
TPL905216-S5TR	1.6 V	SOT23-5
TPL905218-S5TR	1.8 V	SOT23-5
TPL905219-S5TR	1.9 V	SOT23-5
TPL905221-S5TR	2.1 V	SOT23-5
TPL905222-S5TR	2.2 V	SOT23-5
TPL905224-S5TR	2.4 V	SOT23-5
TPL905225-S5TR	2.5 V	SOT23-5
TPL905226-S5TR	2.6 V	SOT23-5
TPL905227-S5TR	2.7 V	SOT23-5
TPL905228-S5TR	2.8 V	SOT23-5
TPL905229-S5TR	2.9 V	SOT23-5
TPL905230-S5TR	3.0 V	SOT23-5
TPL905231-S5TR	3.1 V	SOT23-5
TPL905232-S5TR	3.2 V	SOT23-5
TPL905233-S5TR	3.3 V	SOT23-5
TPL905235-S5TR	3.5 V	SOT23-5
TPL905236-S5TR	3.6 V	SOT23-5
TPL905237-S5TR	3.7 V	SOT23-5
TPL905240-S5TR	4.0 V	SOT23-5
TPL905245-S5TR	4.5 V	SOT23-5
TPL905250-S5TR	5.0 V	SOT23-5
TPL905209-DF1R	0.9 V	DFN1X1-4
TPL905210-DF1R	1.0 V	DFN1X1-4
TPL905211-DF1R	1.1 V	DFN1X1-4
TPL905212-DF1R	1.2 V	DFN1X1-4
TPL905213-DF1R	1.3 V	DFN1X1-4
TPL905215-DF1R	1.5 V	DFN1X1-4
TPL905216-DF1R	1.6 V	DFN1X1-4
TPL905218-DF1R	1.8 V	DFN1X1-4
TPL905219-DF1R	1.9 V	DFN1X1-4

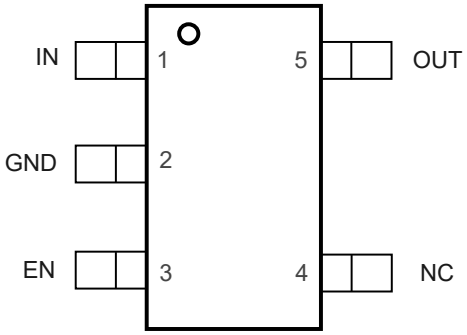
TPL905221-DF1R	2.1 V	DFN1X1-4
TPL905222-DF1R	2.2 V	DFN1X1-4
TPL905224-DF1R	2.4 V	DFN1X1-4
TPL905225-DF1R	2.5 V	DFN1X1-4
TPL905226-DF1R	2.6 V	DFN1X1-4
TPL905227-DF1R	2.7 V	DFN1X1-4
TPL905228-DF1R	2.8 V	DFN1X1-4
TPL905229-DF1R	2.9 V	DFN1X1-4
TPL905230-DF1R	3.0 V	DFN1X1-4
TPL905231-DF1R	3.1 V	DFN1X1-4
TPL905232-DF1R	3.2 V	DFN1X1-4
TPL905233-DF1R	3.3 V	DFN1X1-4
TPL905235-DF1R	3.5 V	DFN1X1-4
TPL905236-DF1R	3.6 V	DFN1X1-4
TPL905237-DF1R	3.7 V	DFN1X1-4
TPL905240-DF1R	4.0 V	DFN1X1-4
TPL905245-DF1R	4.5 V	DFN1X1-4
TPL905250-DF1R	5.0 V	DFN1X1-4

Revision History

Date	Revision	Notes
2020-07-31	Rev.Pre.0	Preliminary version
2021-11-15	Rev.A.0	Initial released
2022-05-31	Rev.A.1	Removed WLCSP package
2024-11-24	Rev.A.2	Updated to a new datasheet format

Pin Configuration and Functions

TPL9052
SOT23-5 Package
Top View



TPL9052
DFN1X1-4 Package
Top View

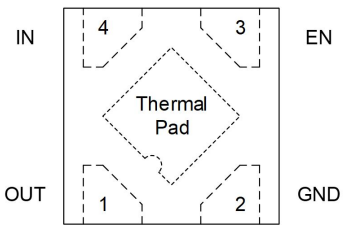


Table 1. Pin Functions: TPL9052

Pin No.		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-μF or greater capacitor.
4	–	NC	–	No connection.
5	1	OUT	O	Regulated output voltage pin. Bypass OUT to GND with a 1-μF or greater capacitor.

(1) Thermal Pad **MUST** be connected to PCB ground plane directly.

Specifications

Absolute Maximum Ratings

Parameter		Min	Max	Unit
IN, EN		−0.3	6	V
OUT		−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.
(2) All voltage values are with respect to GND.

ESD, Electrostatic Discharge Protection

Parameter		Condition	Minimum Level	Unit
HBM	Human Body Model ESD	ANSI/ESDA/JEDEC JS-001 (1)	±6000	V
CDM	Charged Device Model ESD	ANSI/ESDA/JEDEC JS-002 (2)	±1500	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.

Recommended Operating Conditions

Parameter		Min	Max	Unit
IN		1.75	5.5	V
EN		0	V_{IN}	V
OUT		0	5.5	V
C_{OUT}		1	10	μF
ESR of C_{OUT}		0.001	0.1	Ω
T_J	Junction Temperature Range	−40	125	°C
P_D	Power Dissipation	0	400	mW

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 V, I_{OUT} = 1 mA, C_{IN} = 1 µF, C_{OUT} = 1 µF, −40°C ≤ T_J ≤ +125°C, unless otherwise noted.

Parameter		Conditions	Min	Typ	Max	Unit
Supply Input Voltage and Current						
V_{IN}	Input Supply Voltage Range		1.75		5.5	V
I_{GND}	Ground Pin Current	I_{OUT} = 0 mA		120		µA
I_{SHDN}	Shutdown Current	EN = GND		0.02	2	µA
Enable Input Voltage and Current						
$V_{IH(EN)}$	EN Logic-input High Level (enable)		1.2		V_{IN}	V
$V_{IL(EN)}$	EN Logic-input Low Level (disable)		0		0.4	V
I_{EN}	EN Pin Leakage Current	V_{EN} = 5 V		1	2	µA
Regulated Output Voltage and Current						
V_{OUT}	Output Voltage Accuracy	−40°C ≤ T_J ≤ +125°C, 0 mA ≤ I_{OUT} ≤ 300 mA	−2%		2%	
		−40°C ≤ T_J ≤ +125°C, 0 mA ≤ I_{OUT} ≤ 500 mA	−2.5%		2.5%	
ΔV_{OUT}	Line Regulation	V_{IN} = $V_{OUT\ (NOM)}$ + 1 V to 5.5 V		1		mV
	Load Regulation	V_{IN} = $V_{OUT\ (NOM)}$ + 1 V, I_{OUT} = 1 mA to 500 mA		5		mV
V_{DO} (1)	Dropout Voltage	V_{OUT} = 3.3 V, I_{OUT} = 100 mA		30		mV
		V_{OUT} = 3.3 V, I_{OUT} = 300 mA		90	180	mV
		V_{OUT} = 3.3 V, I_{OUT} = 500 mA		150	300	mV
I_{OUT}	Output Current	V_{OUT} in regulation	0		500	mA
I_{CL}	Output Current Limit	V_{OUT} = 0.9 × $V_{OUT\ (NOM)}$	550	800		mA
I_{SC}	Short-circuit Current Limit	R_{LOAD} = 20 mΩ, T_A = 25°C		100		mA
R_{DIS}	Active Output Discharge Resistance	V_{EN} < $V_{IL(EN)}$		290		Ω
PSRR	Power Supply Rejection Ratio	I_{OUT} = 20 mA, f = 100 Hz		82		dB
		I_{OUT} = 20 mA, f = 1 kHz		82		dB
		I_{OUT} = 20 mA, f = 10 kHz		88		dB
		I_{OUT} = 20 mA, f = 100 kHz		61		dB
		I_{OUT} = 20 mA, f = 1 MHz		45		dB
V_N	Output Noise Voltage	I_{OUT} = 150 mA, BW = 10 Hz to 100 kHz		8.6		μV_{RMS}
t_{STR}	Start-up Time	VOUT reaches 95% of nominal output voltage after EN = high		750		µs
Temperature Range						

Parameter		Conditions	Min	Typ	Max	Unit
T_{SD}	Thermal Shutdown Temperature			165		ºC
	Thermal Shutdown Hysteresis			15		ºC

(1) Dropout voltage is the minimum input-to-output voltage differential needed to maintain regulation at a specified output current and measure for $V_{OUT\ (NOM)} \geq 1.8$ V. In the dropout mode, the output voltage will be equal to: $V_{IN} - V_{DROPOUT}$.

Typical Performance Characteristics

All test conditions: V_{IN} = $V_{OUT\ (NOM)}$ + 1 V, I_{OUT} = 1 mA, C_{IN} = 1 µF, C_{OUT} = 1 µF, −40°C ≤ T_J ≤ +125°C, unless otherwise noted.

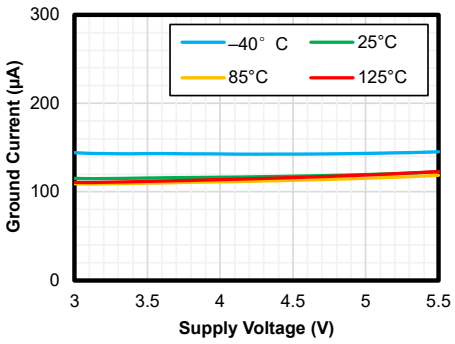


Figure 1. Quiescent Current vs Input Voltage

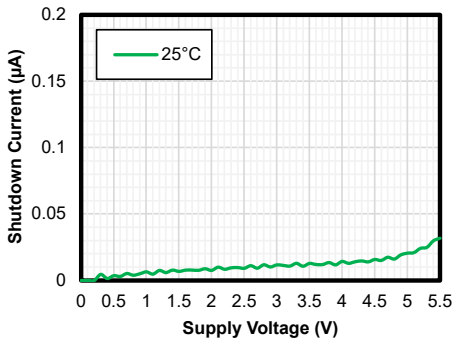


Figure 2. Shutdown Current vs Input Voltage

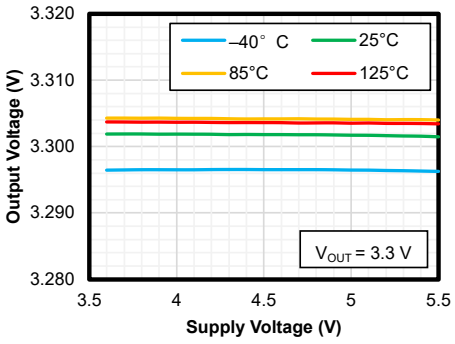


Figure 3. Line Regulation

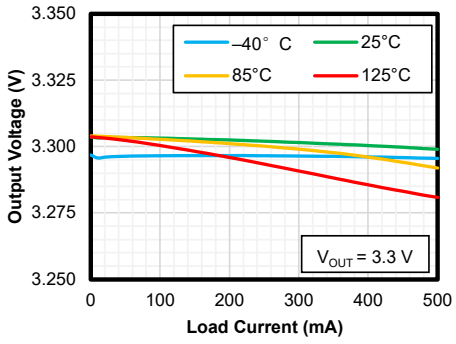


Figure 4. Load Regulation

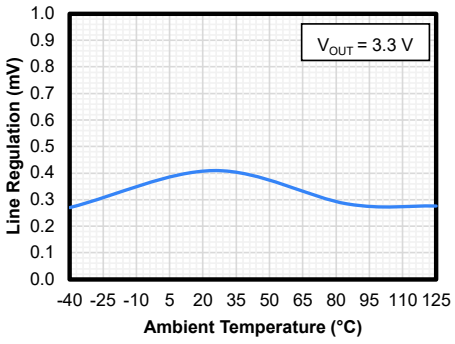


Figure 5. Line Regulation vs. Temperature

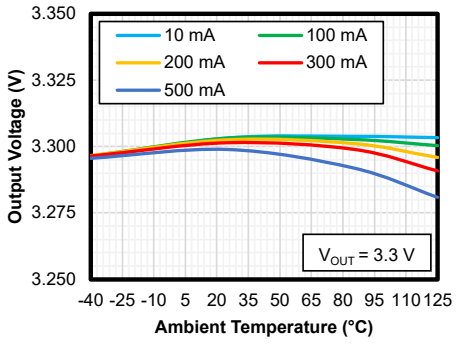


Figure 6. Output Voltage vs. Temperature

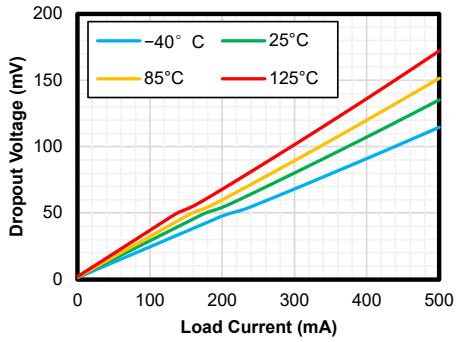


Figure 7. Dropout Voltage vs Output Current

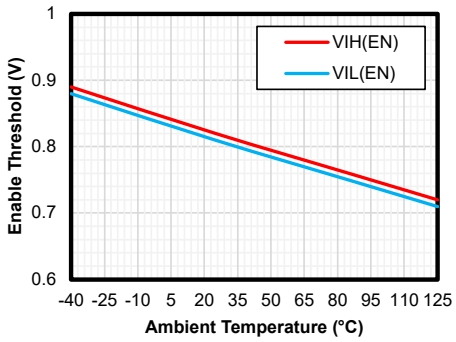


Figure 8. Enable Threshold vs. Temperature

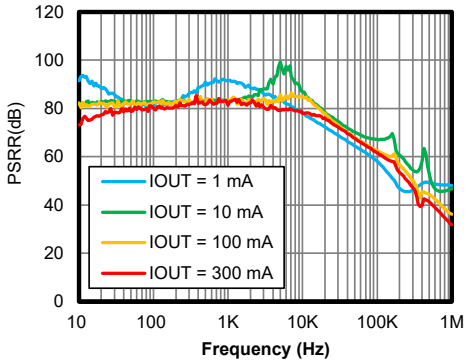


Figure 9. PSRR

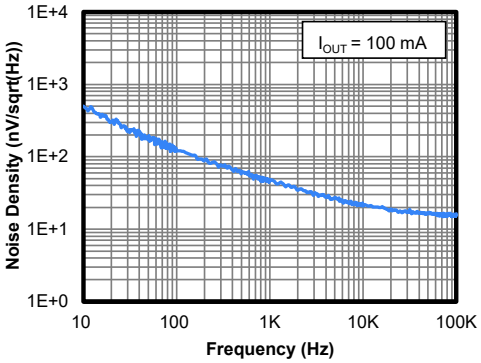


Figure 10. Noise

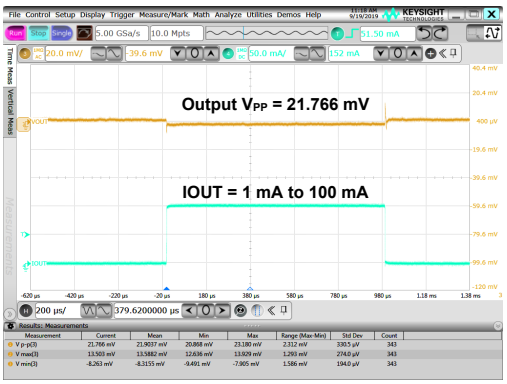


Figure 11. Load Transient

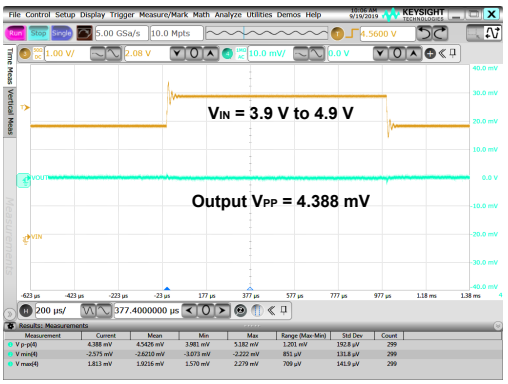


Figure 12. Line Transient

Detailed Description

Overview

The TPL9052 is a series of 500-mA high-PSRR, ultra-low noise, low-dropout linear regulators with high-output accuracy. The TPL9052 series supports both fixed output voltage ranging from 0.9 V to 5 V and is stable with 1-μF or larger ceramic output capacitors.

The TPL9052 series has high PSRR with 88 dB at 10 kHz and 8.6-μV_{RMS} ultra-low noise. These features make the TPL9052 series very suitable for noise-sensitive applications with high noise from the previous stage power supply, such as high-performance analog devices, or high-definition imaging equipment.

The TPL9052 series integrates protection features: output reverse current protection, output shortage protection, over-temperature protection, and overload protection. All these features significantly improve the system reliability and simplify circuitry design under different operating conditions.

Functional Block Diagram

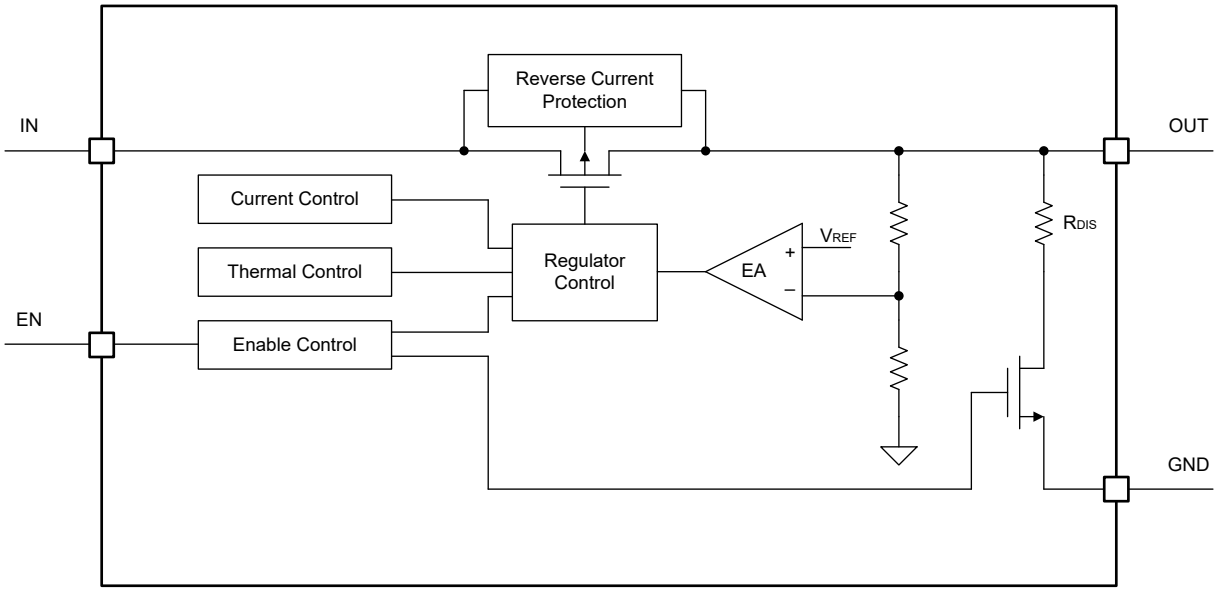


Figure 13. Functional Block Diagram

Feature Description

Enable (EN)

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.

Operating Voltage Range (V_{IN})

The TPL9052 series does not include any dedicated UVLO circuitry. The output voltage of the TPL9052 series is not well regulated until V_{IN} exceeds 1.75 V or (V_{OUT} + V_{DO}), whichever is greater.

Regulated Output Voltage (V_{OUT})

The TPL9052 series is available in fixed voltage versions of 0.9 V to 5 V. When the input voltage is higher than $V_{OUT\ (NOM)}$ + 1, the output pin is the regulated output based on the selected voltage version. When the input voltage falls below $V_{OUT\ (NOM)}$ + 1, the output pin tracks the input voltage minus the dropout voltage based on the load current.

Reverse-Current Protection (RCP)

The TPL9052 series provides reverse-current protection (RCP) to prevent the output reverse current. If large capacitors are used at the output, there would be a large reverse current when the input voltage is lower than the output voltage. The TPL9052 series can shut off the regulator and body diode path to prevent the device from being damaged due to reverse current faults.

Current Limit

The TPL9052 series integrates an internal current limit that helps to protect the regulator during fault conditions. When the output is shorted, the LDO supplies a typical current of 100 mA. The output voltage is not regulated when the device is in current limit, and $V_{OUT} = I_{CL} \times R_{LOAD}$.

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. When the junction temperature falls below a value, which equals to thermal-shutdown threshold minus thermal-shutdown hysteresis, the output turns on again.

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 TPL9052 is a series of 500-mA high-PSRR, ultra-low noise, low-dropout linear regulators. The following application schematic shows a typical usage of the TPL9052 series.

Typical Application

Figure 14 shows the typical application schematic of the TPL9052 series.

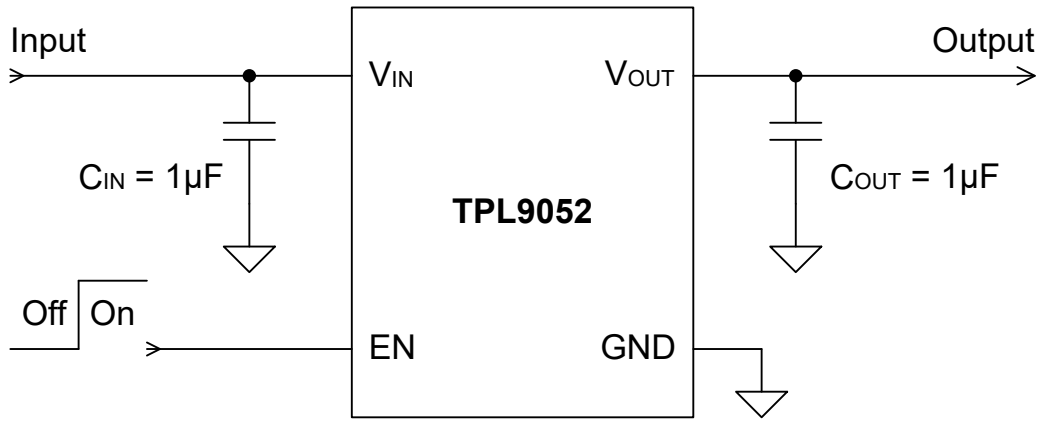


Figure 14. Typical Application Circuit

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 TPL9052 series requires an output capacitor of 1 μF or greater. 3PEAK recommends selecting an X5R- or X7R-type ceramic capacitor with low ESR over temperature.

Both input 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 below equations 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.

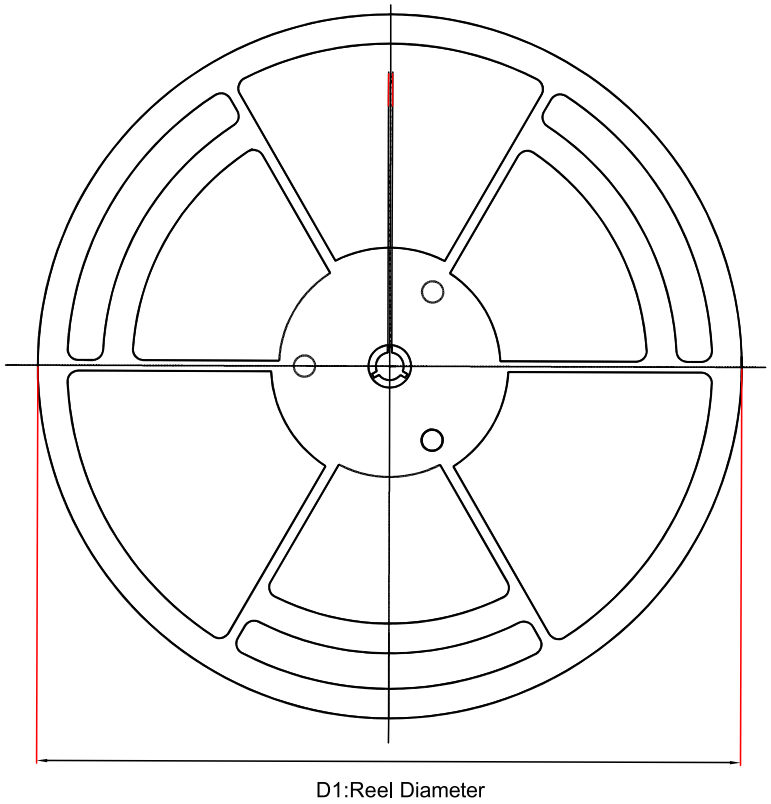
$$T_J = T_A + P_D \times \theta_{JA} \quad (2)$$

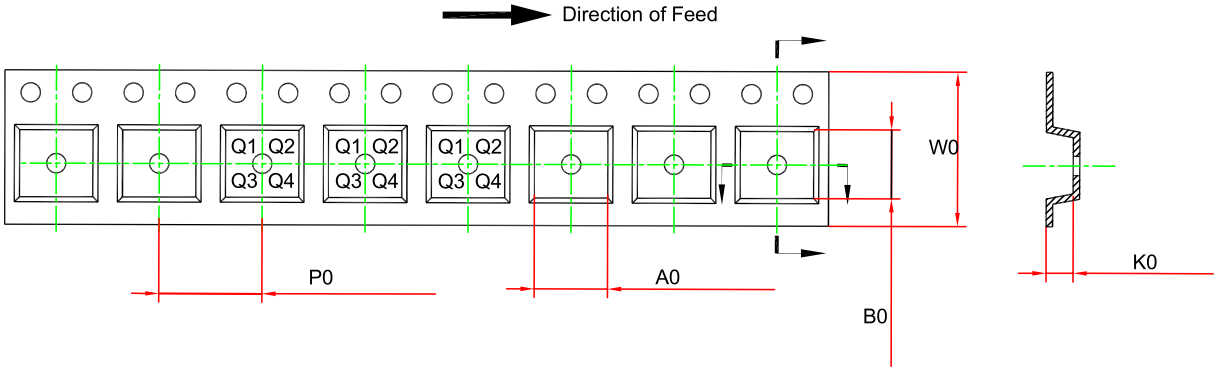
Layout

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 ground with a 0.1-μF 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×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
TPL9052xx-S5TR (1)	SOT23-5	180.0	13.1	3.2	3.2	1.4	4.0	8.0	Q3
TPL9052xx-DF1R (2)	DFN1X1-4	180.0	10.0	1.16	1.16	0.5	2.0	8.0	Q1
TPL905228-DF1R	DFN1X1-4	180.0	10.0	1.16	1.16	0.5	2.0	8.0	Q2

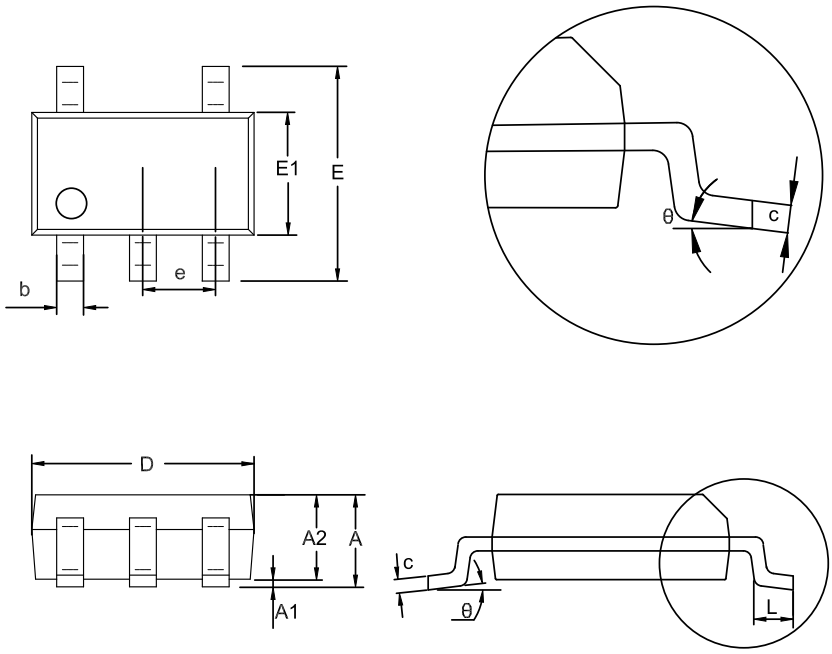
Order Number	Package	D1 (mm)	W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	W0 (mm)	Pin1 Quadrant
TPL905229-DF1R	DFN1X1-4	180.0	10.0	1.16	1.16	0.5	2.0	8.0	Q2

(1) Output voltage value, xx = 09 to 50. e.g., 33 means 3.3 V output voltage.
(2) Output voltage 2.8 V and 2.9 V are not included.

Package Outline Dimensions

SOT23-5

Package Outline Dimensions S5T(SOT23-5-A)



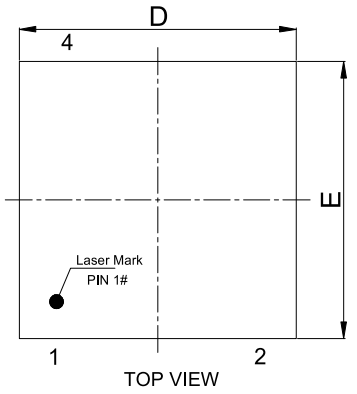
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.050	1.250	0.041	0.049
A1	0.000	0.150	0.000	0.006
A2	1.000	1.200	0.039	0.047
b	0.280	0.500	0.011	0.020
c	0.100	0.230	0.004	0.009
D	2.820	3.020	0.111	0.119
E	2.600	3.000	0.102	0.118
E1	1.500	1.720	0.059	0.068
e	0.950 BSC		0.037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

NOTES

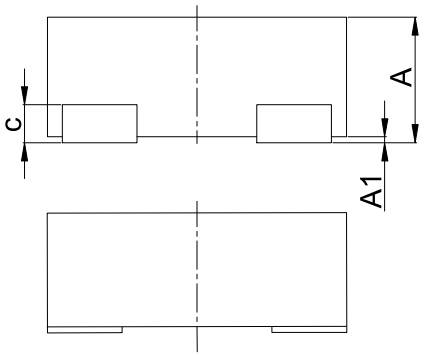
1. Do not include mold flash or protrusion.
2. This drawing is subject to change without notice.

DFN1X1-4

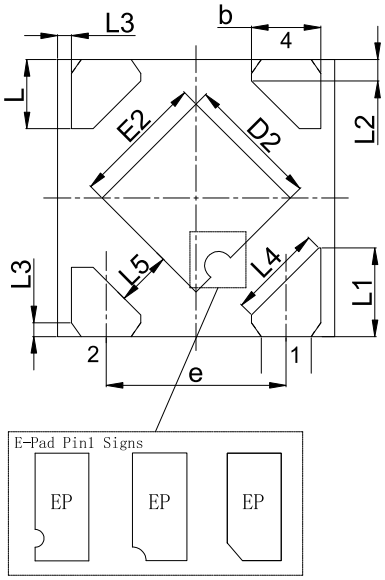
Package Outline Dimensions DF1(DFN1X1-4-A)



TOP VIEW



SIDE VIEW



BOTTOM VIEW

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	Operating Temperature Range	Package	Marking Information	MSL	Transport Media, Quantity	Eco Plan
TPL905209-S5TR(1)	−40°C to +125°C	SOT23-5	L8D	MSL3	Tape and Reel, 3,000	Green
TPL905210-S5TR(1)	−40°C to +125°C	SOT23-5	L8E	MSL3	Tape and Reel, 3,000	Green
TPL905211-S5TR(1)	−40°C to +125°C	SOT23-5	L8F	MSL3	Tape and Reel, 3,000	Green
TPL905212-S5TR	−40°C to +125°C	SOT23-5	L8G	MSL3	Tape and Reel, 3,000	Green
TPL905213-S5TR(1)	−40°C to +125°C	SOT23-5	L8H	MSL3	Tape and Reel, 3,000	Green
TPL905215-S5TR(1)	−40°C to +125°C	SOT23-5	L8I	MSL3	Tape and Reel, 3,000	Green
TPL905216-S5TR(1)	−40°C to +125°C	SOT23-5	L8J	MSL3	Tape and Reel, 3,000	Green
TPL905218-S5TR	−40°C to +125°C	SOT23-5	L8K	MSL3	Tape and Reel, 3,000	Green
TPL905219-S5TR(1)	−40°C to +125°C	SOT23-5	L8L	MSL3	Tape and Reel, 3,000	Green
TPL905221-S5TR(1)	−40°C to +125°C	SOT23-5	L8M	MSL3	Tape and Reel, 3,000	Green
TPL905222-S5TR(1)	−40°C to +125°C	SOT23-5	L8N	MSL3	Tape and Reel, 3,000	Green
TPL905224-S5TR(1)	−40°C to +125°C	SOT23-5	L8O	MSL3	Tape and Reel, 3,000	Green
TPL905225-S5TR(1)	−40°C to +125°C	SOT23-5	L8P	MSL3	Tape and Reel, 3,000	Green
TPL905226-S5TR(1)	−40°C to +125°C	SOT23-5	L8Q	MSL3	Tape and Reel, 3,000	Green
TPL905227-S5TR(1)	−40°C to +125°C	SOT23-5	L8R	MSL3	Tape and Reel, 3,000	Green
TPL905228-S5TR(1)	−40°C to +125°C	SOT23-5	L8T	MSL3	Tape and Reel, 3,000	Green
TPL905229-S5TR(1)	−40°C to +125°C	SOT23-5	L8V	MSL3	Tape and Reel, 3,000	Green
TPL905230-S5TR(1)	−40°C to +125°C	SOT23-5	L8W	MSL3	Tape and Reel, 3,000	Green
TPL905231-S5TR(1)	−40°C to +125°C	SOT23-5	L8X	MSL3	Tape and Reel, 3,000	Green
TPL905232-S5TR(1)	−40°C to +125°C	SOT23-5	L8Y	MSL3	Tape and Reel, 3,000	Green

TPL905233-S5TR	−40°C to +125°C	SOT23-5	L8Z	MSL3	Tape and Reel, 3,000	Green
TPL905235-S5TR(1)	−40°C to +125°C	SOT23-5	L81	MSL3	Tape and Reel, 3,000	Green
TPL905236-S5TR(1)	−40°C to +125°C	SOT23-5	L82	MSL3	Tape and Reel, 3,000	Green
TPL905237-S5TR(1)	−40°C to +125°C	SOT23-5	L83	MSL3	Tape and Reel, 3,000	Green
TPL905240-S5TR(1)	−40°C to +125°C	SOT23-5	L84	MSL3	Tape and Reel, 3,000	Green
TPL905245-S5TR(1)	−40°C to +125°C	SOT23-5	L85	MSL3	Tape and Reel, 3,000	Green
TPL905250-S5TR(1)	−40°C to +125°C	SOT23-5	L86	MSL3	Tape and Reel, 3,000	Green
TPL905209-DF1R(1)	−40°C to +125°C	DFN1X1-4	L8D	MSL3	Tape and Reel, 3,000	Green
TPL905210-DF1R(1)	−40°C to +125°C	DFN1X1-4	L8E	MSL3	Tape and Reel, 3,000	Green
TPL905211-DF1R(1)	−40°C to +125°C	DFN1X1-4	L8F	MSL3	Tape and Reel, 3,000	Green
TPL905212-DF1R(1)	−40°C to +125°C	DFN1X1-4	L8G	MSL3	Tape and Reel, 3,000	Green
TPL905213-DF1R(1)	−40°C to +125°C	DFN1X1-4	L8H	MSL3	Tape and Reel, 3,000	Green
TPL905215-DF1R(1)	−40°C to +125°C	DFN1X1-4	L8I	MSL3	Tape and Reel, 3,000	Green
TPL905216-DF1R(1)	−40°C to +125°C	DFN1X1-4	L8J	MSL3	Tape and Reel, 3,000	Green
TPL905218-DF1R	−40°C to +125°C	DFN1X1-4	L8K	MSL3	Tape and Reel, 3,000	Green
TPL905219-DF1R(1)	−40°C to +125°C	DFN1X1-4	L8L	MSL3	Tape and Reel, 3,000	Green
TPL905221-DF1R(1)	−40°C to +125°C	DFN1X1-4	L8M	MSL3	Tape and Reel, 3,000	Green
TPL905222-DF1R(1)	−40°C to +125°C	DFN1X1-4	L8N	MSL3	Tape and Reel, 3,000	Green
TPL905224-DF1R(1)	−40°C to +125°C	DFN1X1-4	L8O	MSL3	Tape and Reel, 3,000	Green
TPL905225-DF1R(1)	−40°C to +125°C	DFN1X1-4	L8P	MSL3	Tape and Reel, 3,000	Green
TPL905226-DF1R(1)	−40°C to +125°C	DFN1X1-4	L8Q	MSL3	Tape and Reel, 3,000	Green
TPL905227-DF1R(1)	−40°C to +125°C	DFN1X1-4	L8R	MSL3	Tape and Reel, 3,000	Green
TPL905228-DF1R(1)	−40°C to +125°C	DFN1X1-4	L8T	MSL3	Tape and Reel, 3,000	Green
TPL905229-DF1R(1)	−40°C to +125°C	DFN1X1-4	L8V	MSL3	Tape and Reel, 3,000	Green

TPL905230-DF1R(1)	−40°C to +125°C	DFN1X1-4	L8W	MSL3	Tape and Reel, 3,000	Green
TPL905231-DF1R(1)	−40°C to +125°C	DFN1X1-4	L8X	MSL3	Tape and Reel, 3,000	Green
TPL905232-DF1R(1)	−40°C to +125°C	DFN1X1-4	L8Y	MSL3	Tape and Reel, 3,000	Green
TPL905233-DF1R(1)	−40°C to +125°C	DFN1X1-4	L8Z	MSL3	Tape and Reel, 3,000	Green
TPL905235-DF1R(1)	−40°C to +125°C	DFN1X1-4	L81	MSL3	Tape and Reel, 3,000	Green
TPL905236-DF1R(1)	−40°C to +125°C	DFN1X1-4	L82	MSL3	Tape and Reel, 3,000	Green
TPL905237-DF1R(1)	−40°C to +125°C	DFN1X1-4	L83	MSL3	Tape and Reel, 3,000	Green
TPL905240-DF1R(1)	−40°C to +125°C	DFN1X1-4	L84	MSL3	Tape and Reel, 3,000	Green
TPL905245-DF1R(1)	−40°C to +125°C	DFN1X1-4	L85	MSL3	Tape and Reel, 3,000	Green
TPL905250-DF1R(1)	−40°C to +125°C	DFN1X1-4	L86	MSL3	Tape and Reel, 3,000	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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