

Features

- Fixed Output Voltage: 1.25 V, 2.048 V, 2.5 V, 3 V, 3.3 V, 4.096 V
- High Initial Accuracy and Low Temperature Coefficient
 - Max 0.2%
 - 30 ppm/°C at -40°C to 85°C
 - 50 ppm/°C at -40°C to 125°C
- Operation From -40°C to 125°C
- Low Output Noise: 50 μ Vpp of TPR3525
- Quiescent current: 210 μ A
- Stable with 0.1 to 10 μ F Capacitive Loads

Description

The TPR35 is a voltage reference with guaranteed temperature stability over the entire operating temperature range. The temperature range is extended from -40°C to +125°C.

Applications

- Power
- Instrumentation
- Industry

Pin Configuration

TPR35
SOT23-G
Top View

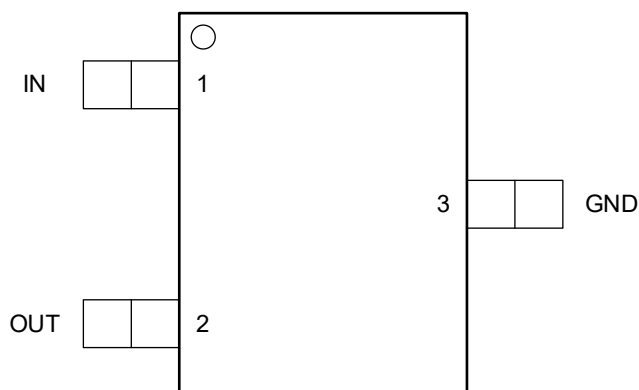


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Revision History

Date	Revision	Notes
2020-9-10	Rev.A.0	Initial Version.
2021-11-24	Rev.A.1	1. Updated ESD Rating 2. Added Tape and Reel Information

Specifications

Absolute Maximum Ratings⁽¹⁾

Parameters	Rating
Supply Voltage	6.9 V
Maximum Operating Junction Temperature	150°C
Operating Temperature Range	-40 to 125°C
Storage Temperature Range	-65 to 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.

ESD Rating

Symbol	Parameter	Condition	Minimum Level	Unit
HBM	Human Body Model ESD	ANSI/ESDA/JEDEC JS-001 ⁽¹⁾	±4	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.

Thermal Information

Package Type	θ_{JA}	θ_{JC}	Unit
SOT23-G	250	81	°C/W

Electrical Characteristics

All test conditions: $T_A = 25^{\circ}\text{C}$, unless otherwise noted.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
TPR3512						
V_{OUT}	Output voltage			1.25		V
	Initial accuracy		-0.2		0.2	%
	Output voltage noise	$f = 0.1 \text{ Hz to } 10 \text{ Hz}$		25		μVpp
TPR3520						
V_{OUT}	Output voltage			2.048		V
	Initial accuracy		-0.2		0.2	%
	Output voltage noise	$f = 0.1 \text{ Hz to } 10 \text{ Hz}$		40		μVpp
TPR3525						
V_{OUT}	Output voltage			2.5		V
	Initial accuracy		-0.2		0.2	%
	Output voltage noise	$f = 0.1 \text{ Hz to } 10 \text{ Hz}$		50		μVpp
TPR3530						
V_{OUT}	Output voltage			3.0		V
	Initial accuracy		-0.2		0.2	%
	Output voltage noise	$f = 0.1 \text{ Hz to } 10 \text{ Hz}$		60		μVpp
TPR3533						
V_{OUT}	Output voltage			3.3		V
	Initial accuracy		-0.2		0.2	%
	Output voltage noise	$f = 0.1 \text{ Hz to } 10 \text{ Hz}$		66		μVpp
TPR3540						
V_{OUT}	Output voltage			4.096		V
	Initial accuracy		-0.2		0.2	%
	Output voltage noise	$f = 0.1 \text{ Hz to } 10 \text{ Hz}$		80		μVpp

Electrical Characteristics (Continued)

All test conditions: $T_A = 25^\circ\text{C}$, unless otherwise noted.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
TPR3512,TPR3520, TPR3525, TPR3530, TPR3533, TPR3540, Power Supply							
V _S	Supply voltage	TPR3512		2.1		5.5	V
		All parts except TPR3512, I _{LOAD} = ±1 mA		V _{OUT} + 0.05		5.5	V
I _q	Quiescent current				150	210	μA
		T _A = −40 to 125°C				250	μA
	Minimum dropout voltage	I _{LOAD} = ±1 mA, all parts except TPR3512	T _A = 25°C		25	50	mV
			T _A = 0 to 70°C			50	mV
			T _A = −40 to 125°C			100	mV
		I _{LOAD} = ±5 mA, all parts except TPR3512	T _A = 25°C			200	mV
			T _A = −40 to 125°C			250	mV
TPR3512, TPR3520, TPR3525, TPR3530, TPR3533, TPR3540, Reference Output							
	Output voltage temperature drift	T _A = −40 to 85°C			10	30	ppm/°C
		T _A = −40 to 125°C			20	50	
	Line regulation, TPR3512	V _{IN} = 2.1 to 5.5 V ⁽¹⁾		−65		65	ppm/V
		V _{IN} = 2.1 to 5.5 V ⁽¹⁾ , T _A = −40 to 125°C		−85		85	ppm/V
	Line regulation, TPR35XX except TPR3512	V _{IN} = V _{OUT} + 300 mV to 5.5 V		−50		50	ppm/V
			T _A = −40 to 125°C	−70		70	ppm/V
	Load regulation	V _{IN} = V _{OUT} + 300 mV, I _{LOAD} = −5 to 5 mA ⁽¹⁾		−20		20	ppm/mA
			T _A = −40 to 125°C	−30		30	ppm/mA
	Thermal hysteresis				80		ppm
	Capacitive load			0.1		10	μF
	Turn-on settling time	To 0.1% with C _L = 1 μF			500		μs

(1) The minimum supply voltage for the TPR3512 is 2.1 V.

Typical Performance Characteristics – TPR3525

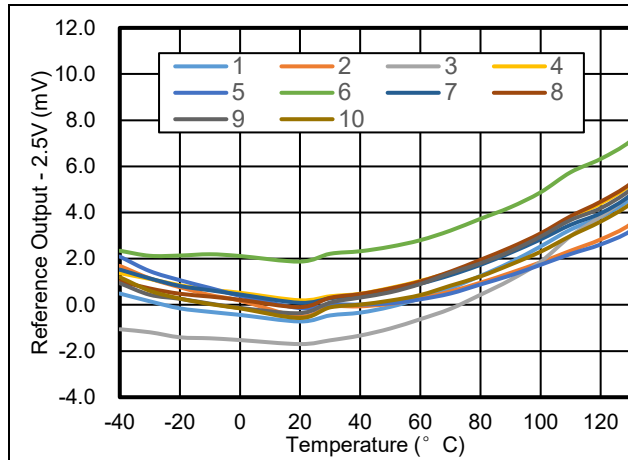


Figure 1. V_{OUT} vs. Temperature, 10pcs Samples, $V_{IN} = 5\text{ V}$, $C_{IN} = 1\text{ }\mu\text{F}$, $C_{OUT} = 1\text{ }\mu\text{F}$

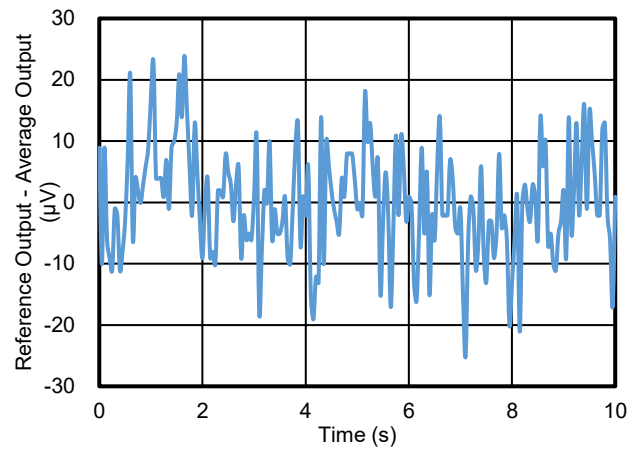


Figure 2. 0.1 to 10 Hz Voltage Noise, $V_{IN} = 5\text{ V}$, $C_{IN} = 1\text{ }\mu\text{F}$, $C_{OUT} = 1\text{ }\mu\text{F}$

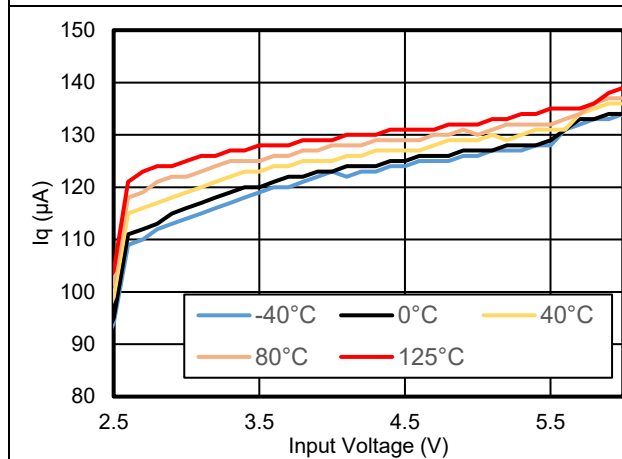


Figure 3. I_Q vs. Input Voltage

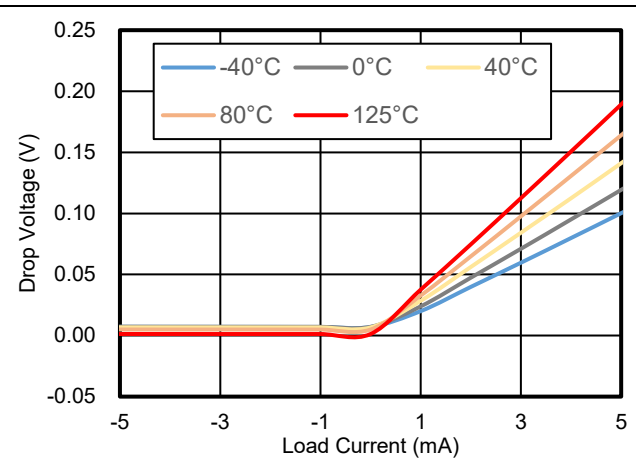


Figure 4. Drop Voltage vs. Load Current

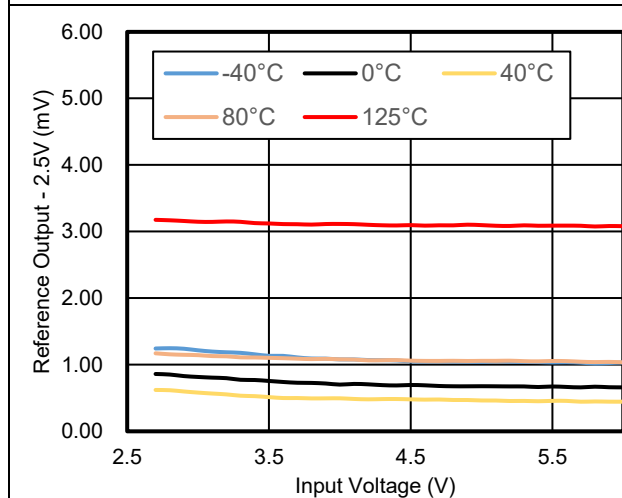


Figure 5. Output Voltage vs. Input Voltage

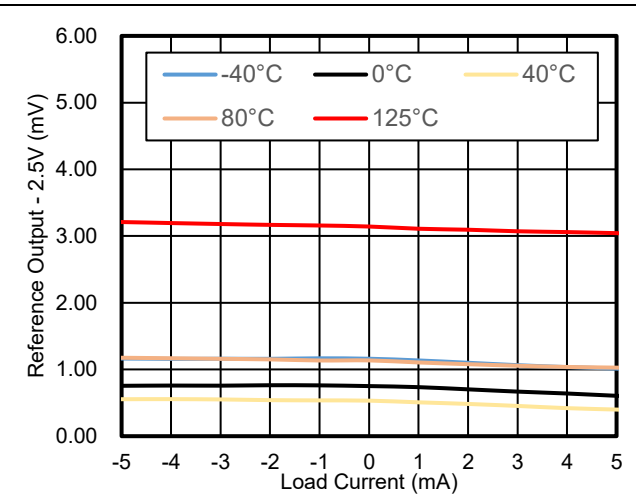


Figure 6. Output Voltage vs. Load Current

Typical Performance Characteristics – TPR3525 (Continued)

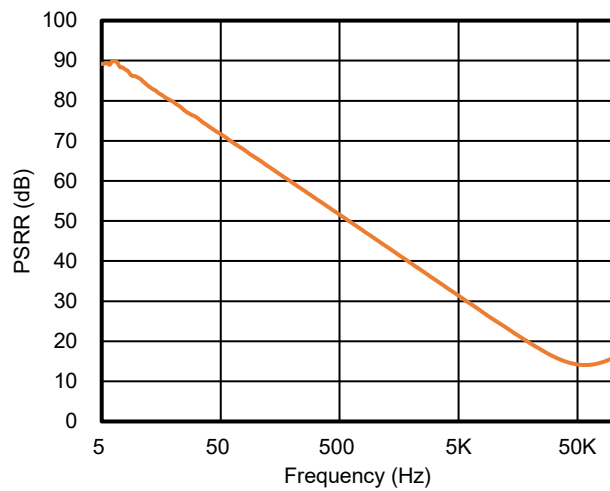


Figure 7. PSRR vs. Frequency

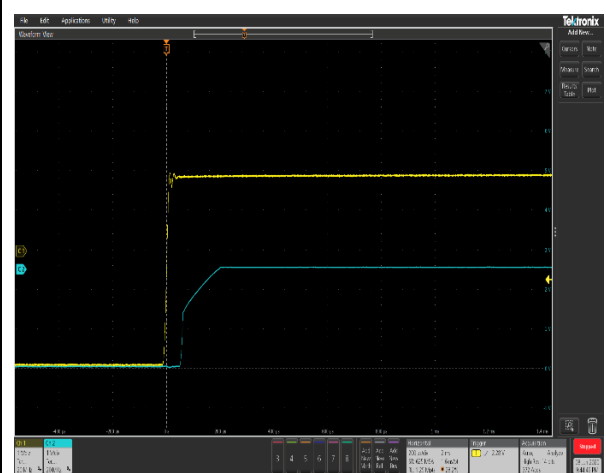


Figure 8. Step Response, $V_{IN} = 5\text{ V}$, $C_{IN} = 1\text{ }\mu\text{F}$, $C_{OUT} = 0.1\text{ }\mu\text{F}$, 200 us/div

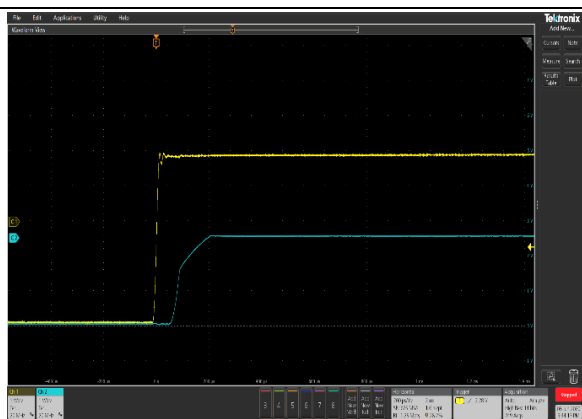


Figure 9. Step Response, $V_{IN} = 5\text{ V}$, $C_{IN} = 1\text{ }\mu\text{F}$, $C_{OUT} = 1\text{ }\mu\text{F}$, 200 μs /div

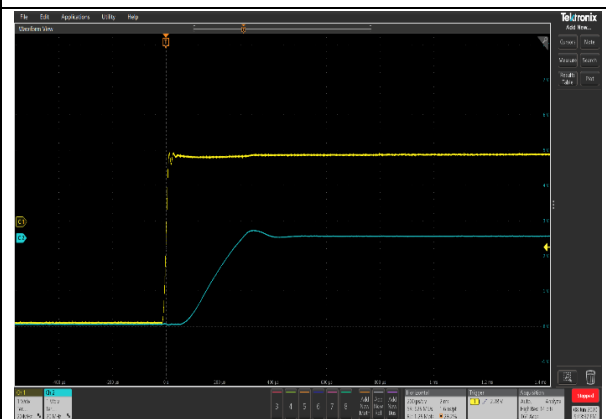


Figure 10. Step Response, $V_{IN} = 5\text{ V}$, $V_{IN} = 5\text{ V}$, $C_{IN} = 1\text{ }\mu\text{F}$, $C_{OUT} = 10\text{ }\mu\text{F}$, 200 μs /div



Figure 11. Load Transient, $\pm 5\text{ mA}$, $V_{IN} = 5\text{ V}$, $C_{IN} = 1\text{ }\mu\text{F}$, $C_{OUT} = 1\text{ }\mu\text{F}$, 50 mV/div



Figure 12. Load Transient, $\pm 5\text{ mA}$, $V_{IN} = 2.8\text{ V}$, $C_{IN} = 1\text{ }\mu\text{F}$, $C_{OUT} = 1\text{ }\mu\text{F}$, 50 mV/div

Typical Performance Characteristics – TPR3525 (Continued)



Figure 13. Load Transient, ± 2 mA, $V_{IN} = 5$ V,
 $C_{IN} = 1$ μ F, $C_{OUT} = 1$ μ F, 20 mV/div



Figure 14. Load Transient, ± 2 mA, $V_{IN} = 2.8$ V,
 $C_{IN} = 1$ μ F, $C_{OUT} = 1$ μ F, 20 mV/div

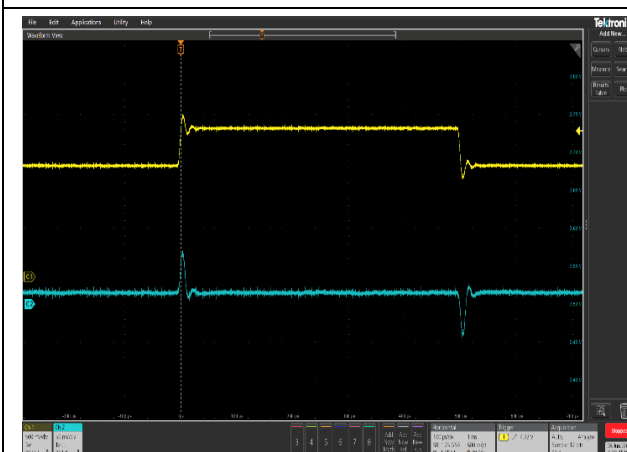
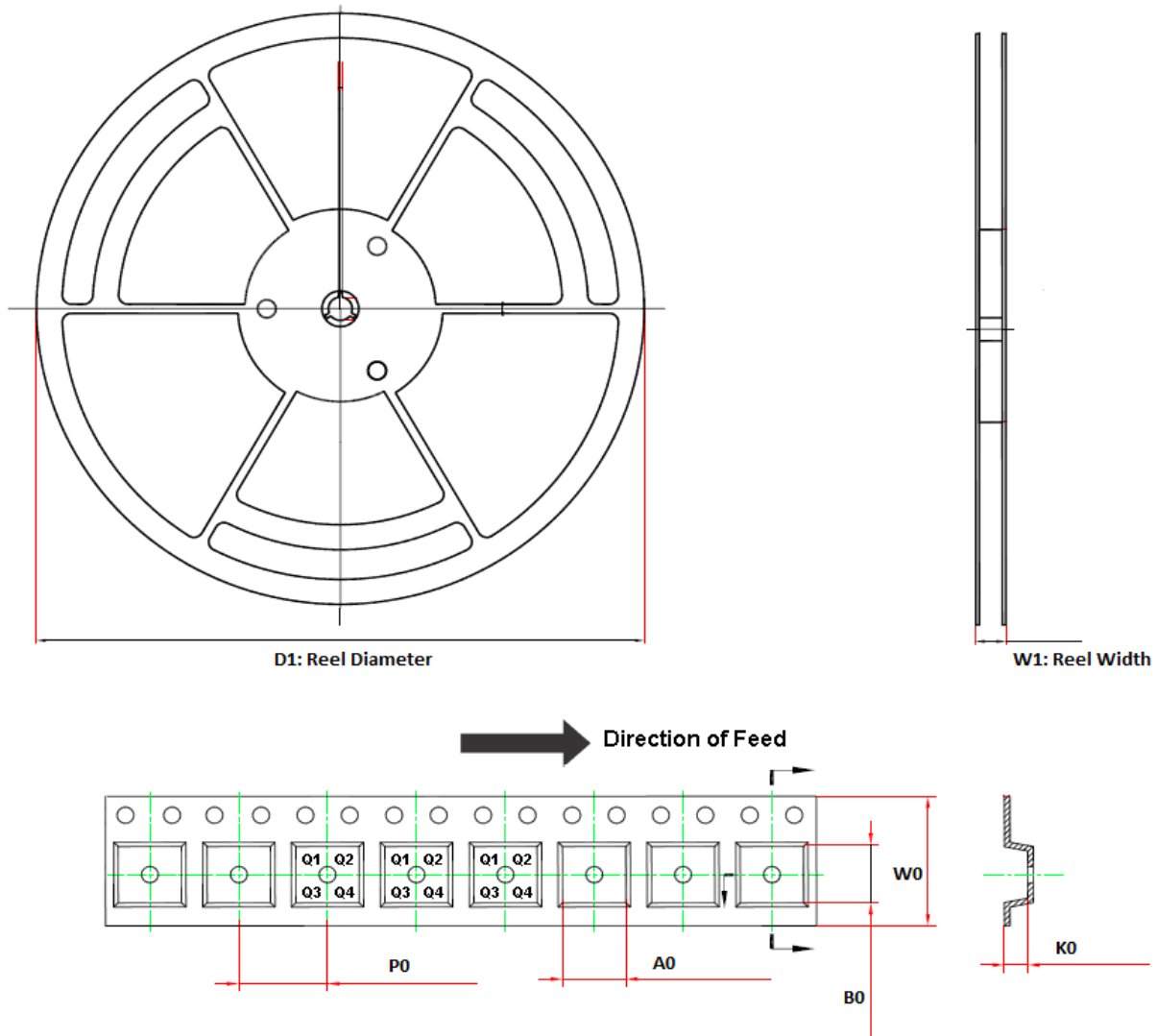


Figure 15. Line Transient, 500 mV Step,
 $C_{IN} = 1$ μ F, $C_{OUT} = 1$ μ F, 50 mV/div

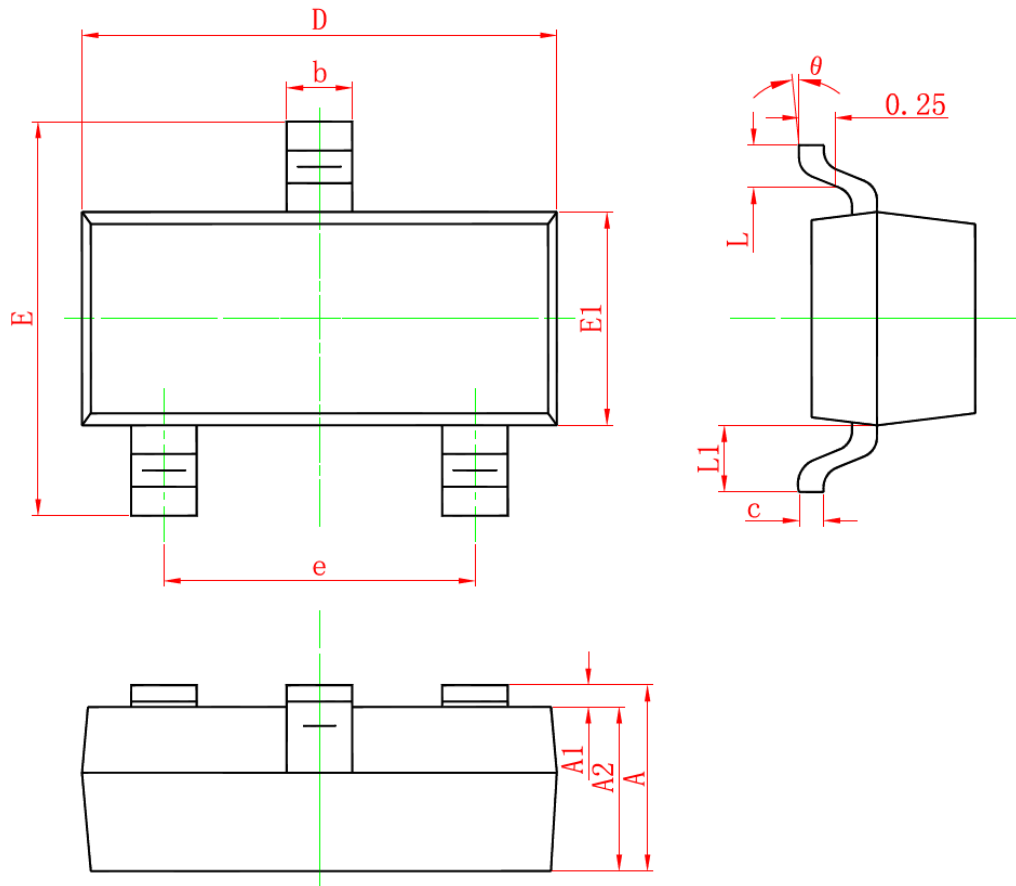
Tape and Reel Information



Order Number	Package	D1 (mm)	W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	W0 (mm)	Pin1 Quadrant
TPR35XX-S3TR	SOT23-G	178	12.1	3.15	2.77	1.22	4.0	8.0	Q3

Package Outline Dimensions

SOT23-G



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.15Max.		0.045Max.	
A1	0.000	0.100	0.000	0.004
A2	0.900	1.100	0.035	0.043
b	0.300	0.500	0.012	0.020
c	0.132	0.202	0.005	0.008
D	2.800	3.000	0.110	0.118
E	2.250	2.550	0.089	0.100
E1	1.200	1.400	0.047	0.055
e	1.800	2.000	0.071	0.079
L	0.300	0.500	0.012	0.020
L1	0.550 REF.		0.022 REF.	
θ	0°	8°	0°	8°

Order Information

Order Number	Output Voltage	Operating Temperature Range	Package	Marking Information	MSL	Transport Media, Quantity
TPR3512-S3TR	1.25 V	-40 to 125°C	SOT23-G	R3A	MSL 3	3000
TPR3520-S3TR	2.048 V	-40 to 125°C	SOT23-G	R3B	MSL 3	3000
TPR3525-S3TR	2.5 V	-40 to 125°C	SOT23-G	R3C	MSL 3	3000
TPR3530-S3TR	3 V	-40 to 125°C	SOT23-G	R3D	MSL 3	3000
TPR3533-S3TR	3.3 V	-40 to 125°C	SOT23-G	R3E	MSL 3	3000
TPR3540-S3TR	4.096 V	-40 to 125°C	SOT23-G	R3F	MSL 3	3000

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