Features

- Maximum Operating Voltage: 40V
- Output Voltage: 1.5V~5.0V, step=100mV
- Output Accuracy: ±1.0%
- Low Power Consumption: 2.5μA
- <0.2μA Standby Current
- Current Limiting, Thermal Shutdown
- Available in SOT23-3L, SOT23-5L and SOT89-3 Packages

General Description

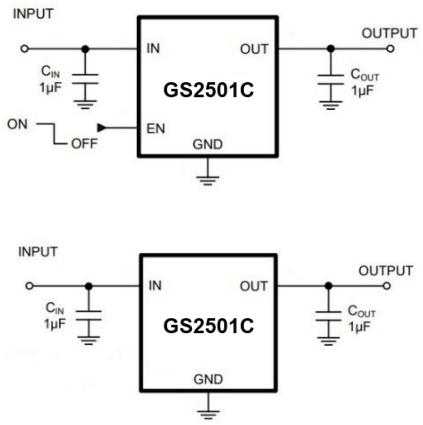
The GS2501C is a 40V low-power high accuracy LDO regulator. The 2.5μA power consumption makes it ideal for most HV power-saving systems. The maximum operating voltage can be as high as 40V. The output accuracy is as excellent as ±1.0%. The other features include low dropout voltage, current limiting protection and thermal shutdown protection. The GS2501C is available in SOT23-3L, SOT23-5L and SOT89-3 packages.

Applications

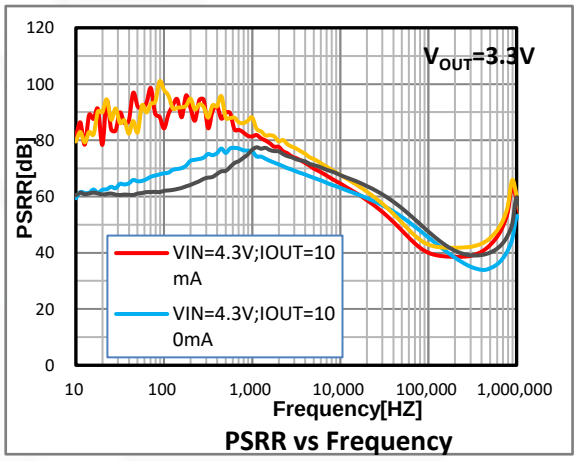
1

- M Battery Supplied Systems
- Telecom Systems
- Audio & Video Devices

Typical Application Circuit



Typical Performance Characteristcs



Pin Configuration

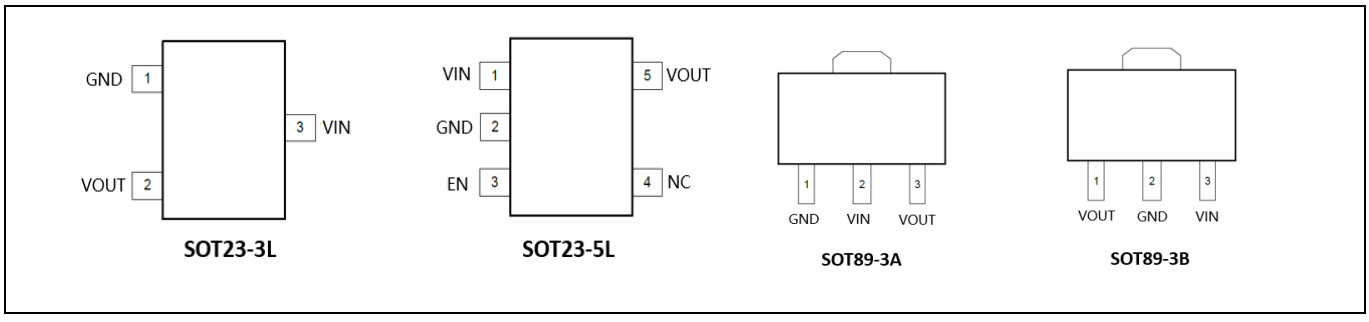


Figure 1. Pin Assignment Diagram

Pin Description

PIN No				SYMBOL	DESCRIPTTION
SOT23-3L	SOT23-5L	SOT89-3A	SOT89-3B		
1	2	1	2	GND	Ground
2	5	3	1	VOUT	Output
3	1	2	3	VIN	Power Supply Input
-	3	-	-	EN	Chip Enable
-	4	-	-	NC	Not Connected

Package/Ordering Information

MODEL	ORDER NUMBER	PACKAGE DESCRIPTION	PACKAGE OPTION
GS2501C	GS2501C-XXTR5	SOT23-5	Tape and Reel,3000
	GS2501C-XXTR3	SOT23-3	Tape and Reel,3000
	GS2501C-XXSTR3	SOT89-3A	Tape and Reel,3000
	GS2501CY-XXSTR3	SOT89-3B	Tape and Reel,3000

Note: "XX" represents the type of voltage value.

Absolute Maximum Ratings(1)

(T_A =25℃, unless otherwise specified.)

Symbol	Item		Rating	Unit
V_{IN}	Supply Voltage		-0.3~44	V
V_{EN}	EN pin to GND Voltage		-0.3~44	V
V_{OUT}	VOUT pin to GND Voltage		-0.3~6.0	V
$V_{(ESD)}$	ESD Susceptibility, HBM(2)		±2000	V
P_D	Maximum Power Dissipation(3)	SOT23-3/5L	0.5	W
		SOT89-3	1.0	W
$R_{\theta JA}$	Junction-to-ambient Thermal Resistance(3)	SOT23-3/5L	250	℃/W
		SOT89-3	125	℃/W
T_J	Junction Temperature Range		-40~150	℃
T_{STG}	Storage Temperature Range		-40~150	℃
T_{SOLDER}	Lead Temperature (Soldering)		260℃, 10s	

Note:

1. Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under Recommended Operating Conditions is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability 2. per ANSI/ESDA/JEDEC JS-0013. Device mounted on FR-4 PCB

Application schematic

SYMBOL	ITEM	VALUE	UNIT
V_{IN}	VIN Supply Voltage	2.5~40	V
V_{EN}	EN Pin Voltage	0~40	V
V_{OUT}	V_{OUT} Pin Voltage	1.5~5.0	V
I_{OUT}	Output Current	0~150	mA
T_J	Junction Temperature Range	-40~125	℃

Electrical Characteristics

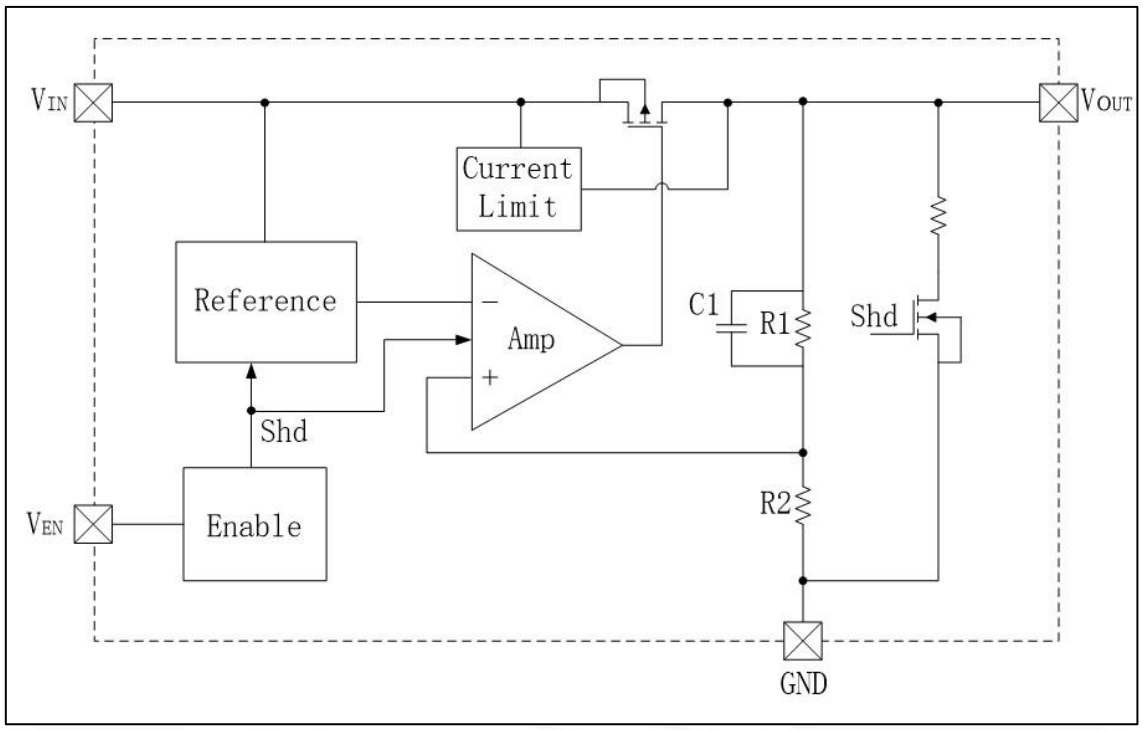
(V_{IN}=V_{OUT}+1V, V_{OUT} =3.3V, C_{IN}=C_{OUT}=1uF, T_A =25℃, unless otherwise specified.)

Symbol	Parameter	Test Conditions		MIN	TYP	MAX	Units
V_{IN}	Input Voltage			2.5		40	V
V_{OUT}	Output Accuracy	I_{OUT}= 1mA		-1.0		+1.0	%
I_{LIM}	Current Limit	V_{IN}=4.3V, V_{OUT} =3.3V		150	210		mA
I_Q	Quiescent Current	V_{IN}= V_{EN}=V_{OUT}+1V, No Load	V_{OUT}＜1.8V		3.0	4.0	μA
			V_{OUT}≥1.8V		2.5	3.5	
I_{SHD}	Shutdown Current	V_{IN}=12V, V_{EN}=0V			0.1	0.2	μA
V_{DROP}	Dropout Voltage(1)	I_{OUT}=100mA, V_{OUT}=1.8V			700		mV
		I_{OUT}=100mA, V_{OUT}=3.3V			450		
		I_{OUT}=100mA, V_{OUT}=5.0V			360		
S_{LINE}	Line Regulation	V_{IN}= V_{OUT} +1V to 40V, I_{OUT}=1mA			0.02	0.05	%/V
S_{LOAD}	Load Regulation	1mA≤I_{OUT}≤150mA			0.002	0.005	%/mA
I_{SHORT}	Short Current	V_{OUT}=0V			15		mA
V_{ENH}	EN High Voltage	V_{IN}=2.5V to 40V, I_{OUT}=1mA		1.5			V
V_{ENL}	EN Low Voltage					0.5	V
PSRR	Power Supply Rejection Ratio	V_{IN}=5.0V, C_{IN} =None, I_{OUT}=10mA	f=217Hz		86		dB
			f=1KHz		81		
			f=10KHz		64		
			f=100KHz		40		
T_{SD}	Overheat Protection	Temperature rising			165		℃
△T_{SD}	TSD Hysteresis	Temperature falling			15		℃
R_{DSCHG}	R_{ON} of V_{OUT} Discharge MOSFET	V_{IN}= 12V, V_{OUT}=5.0V, V_{EN}=0V			130		Ω

NOTES:

1. The dropout voltage is defined as V_{IN} - V_{OUT}, when V_{OUT} =95%*$V_{OUT(NOM)}$

Simplified Block Diagram



Detail Operation Description

The GS2501C is a low power consumption low drop-out voltage regulator. It consists of a current limiter circuit, a driver transistor, a precision reference voltage and an error correction circuit, and is compatible with low ESR ceramic capacitors. The current limiter's fold-back circuit operates as a short circuit protection as well as the output current limiter.

Current Limiting and Short-Circuit Protection

The current limit circuitry prevents damage to the MOSFET switch and the hub downstream port but can deliver load current up to the current limit threshold through the switch. When a heavy load or short circuit is applied to an enabled switch, a large transient current may flow until the current limit circuitry responds. Once this current limit threshold is exceeded the device enters constant current mode until the thermal shutdown occurs or the fault is removed.

Typical Performance characteristics

Tested under V_{IN}=V_{OUT}+1V, C_{IN}= C_{OUT}=1uF, T_A =25℃,(unless otherwise specified）

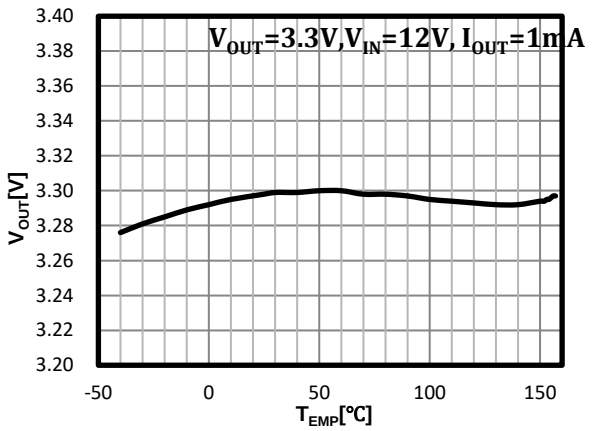


Figure 1. V_{OUT} vs Temperature

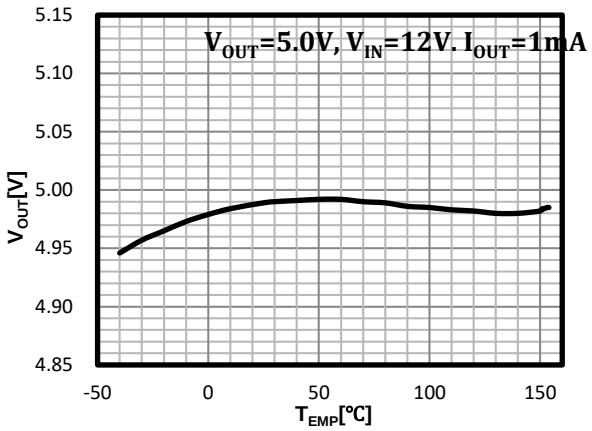


Figure 2. V_{OUT} vs Temperature

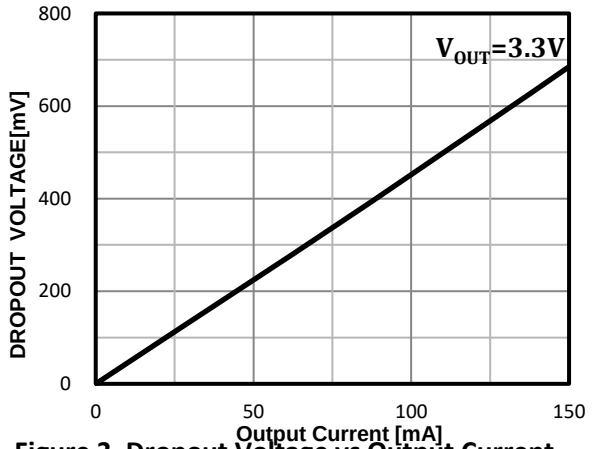


Figure 3. Dropout Voltage vs Output Current

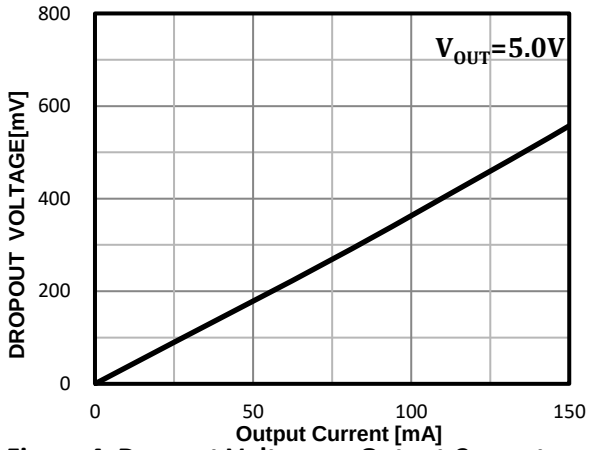


Figure 4. Dropout Voltage vs Output Current

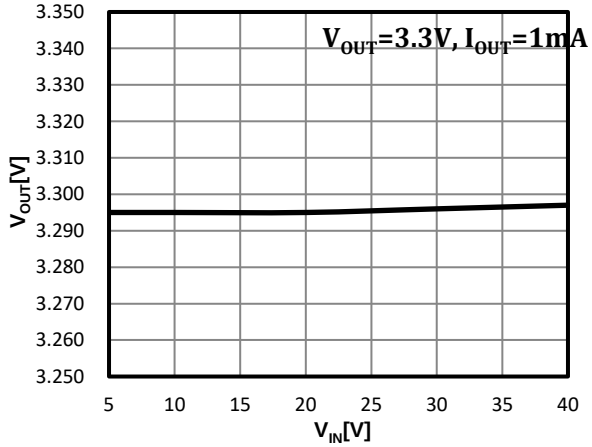


Figure 5. Line Regulation vs V_{IN}

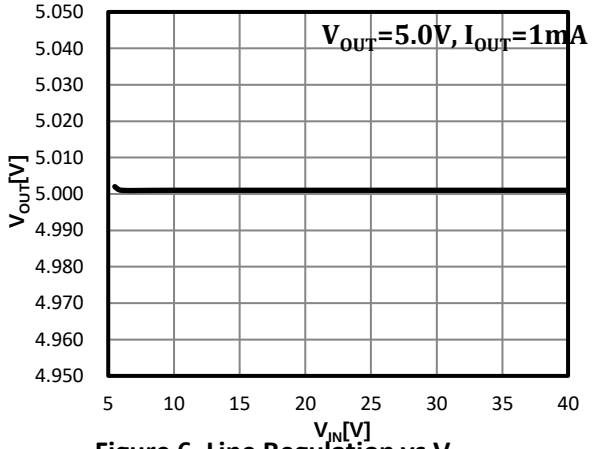


Figure 6. Line Regulation vs V_{IN}

Typical Performance characteristics

Tested under V_{IN}=V_{OUT}+1V, C_{IN}= C_{OUT}=1uF, T_A =25℃,(unless otherwise specified）

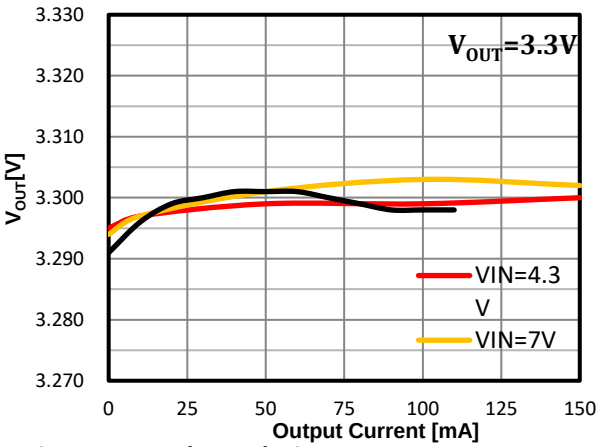


Figure 7. Load Regulation vs Output Current

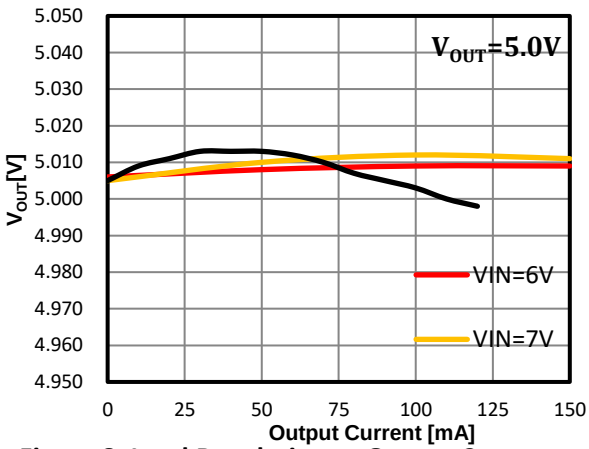
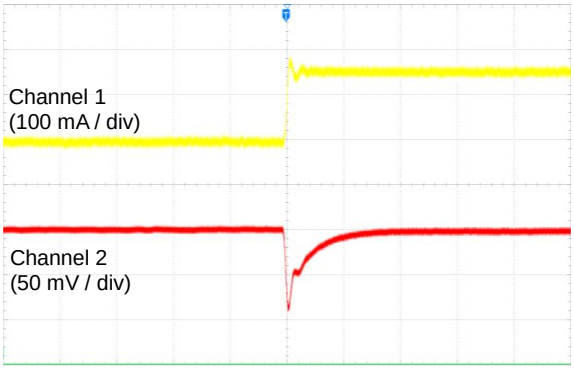


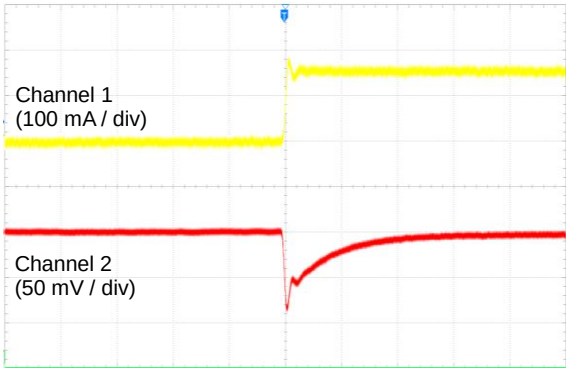
Figure 8. Load Regulation vs Output Current



Time (200 us / div)

Channel 1 = I_{OUT}, channel 2 =V_{OUT}, V_{IN}=4.3 V, V_{OUT}=3.3V

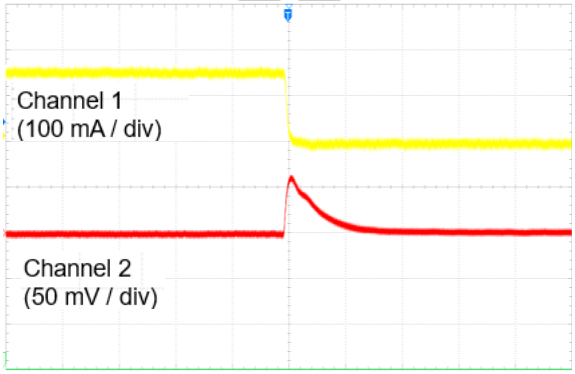
Figure 9. Load Transient (1 mA to 150 mA)



Time (200 us / div)

Channel 1 = I_{OUT}, channel 2 =V_{OUT}, V_{IN}=6.0V, V_{OUT}=5.0V

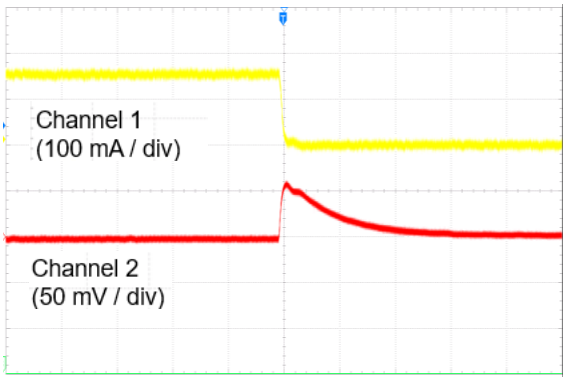
Figure 10. Load Transient (1 mA to 150 mA)



Time (200 us / div)

Channel 1 = En, channel 2 =V_{OUT}, V_{IN}=4.3, V_{OUT}=3.3V, I_{OUT}=10mA

Figure 11. Load Transient (150 mA to 1 mA)



Time (200 us / div)

Channel 1 = En, channel 2 =V_{OUT}, V_{IN}=6.0V, V_{OUT}=5.0V, I_{OUT}=10mA

Figure 12. Load Transient (150 mA to 1 mA)

Typical Performance characteristics

Tested under V_{IN}=V_{OUT}+1V, C_{IN}= C_{OUT}=1uF, T_A =25℃,(unless otherwise specified)

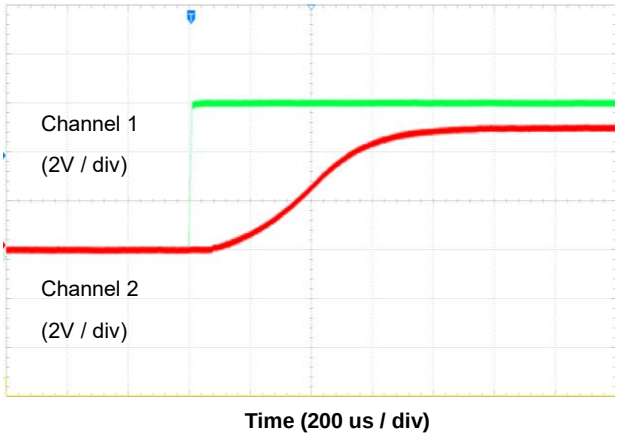


Figure 13. Power-Up with Enable

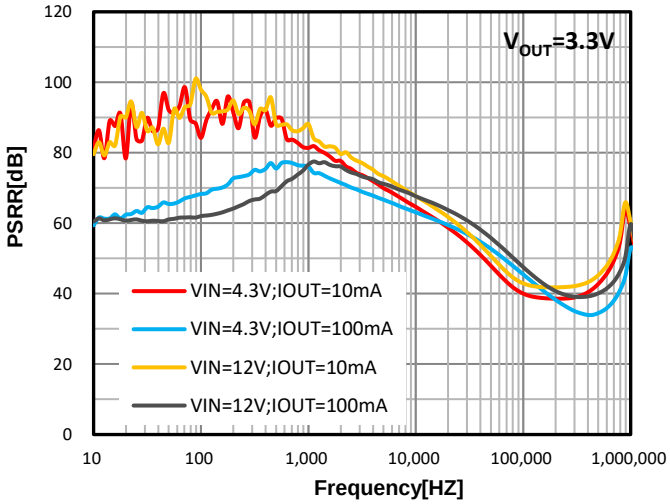
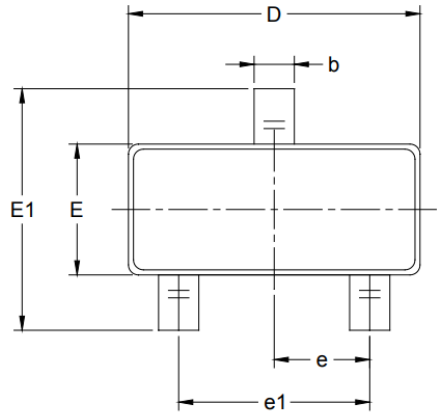
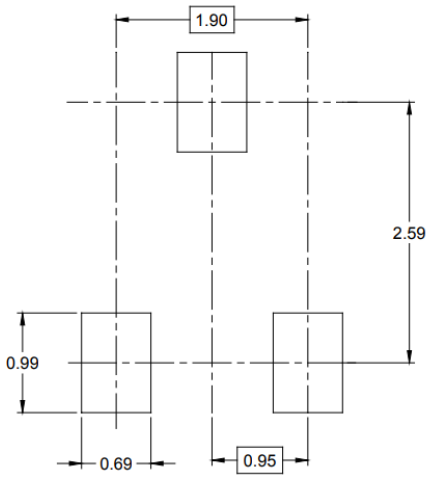


Figure 14. PSRR vs Frequency

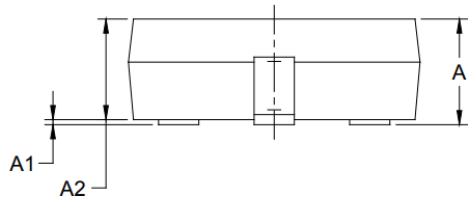
Package Information

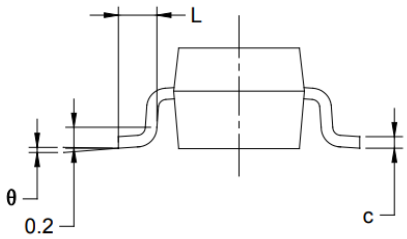
SOT23-3L Package





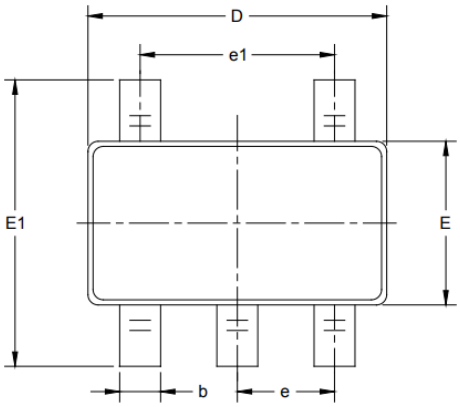
RECOMMENDED LAND PATTERN (Unit: mm)

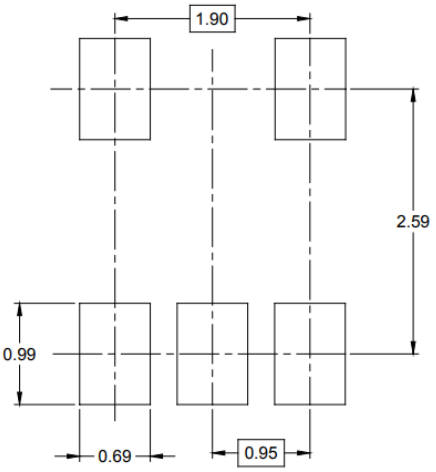




Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950 BSC		0.037 BSC	
e1	1.900 BSC		0.075 BSC	
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

SOT23-5L Package





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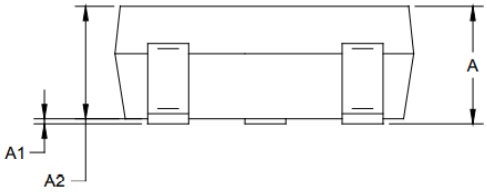
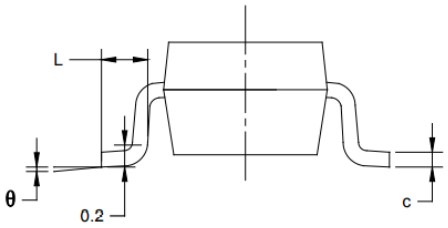
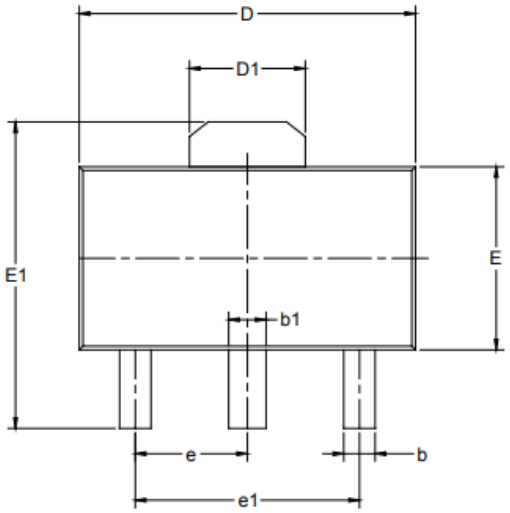
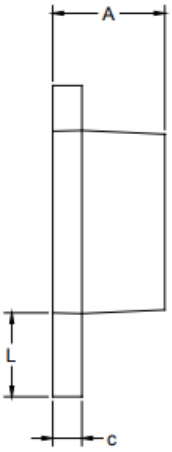


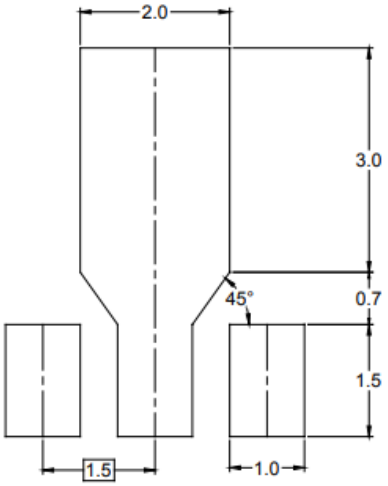


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950 BSC		0.037 BSC	
e1	1.900 BSC		0.075 BSC	
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

SOT89-3 Package







RECOMMENDED LAND PATTERN (Unit: mm)

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.400	1.600	0.055	0.063
b	0.320	0.520	0.013	0.020
b1	0.400	0.580	0.016	0.023
c	0.350	0.440	0.014	0.017
D	4.400	4.600	0.173	0.181
D1	1.550 REF		0.061 REF	
E	2.300	2.600	0.091	0.102
E1	3.940	4.250	0.155	0.167
e	1.500 TYP		0.060 TYP	
e1	3.000 TYP		0.118 TYP	
L	0.900	1.200	0.035	0.047