

# SGM2225

## 800mA, High Voltage, Low Noise and Low Dropout Voltage Regulator

### GENERAL DESCRIPTION

The SGM2225 is a high voltage linear voltage regulator with very low dropout voltage, typically 450mV at full load.

Designed especially for hand-held, battery-powered devices, the SGM2225 features low ground current to help prolong battery life. An enable pin on SOIC-8, TDFN-3×3-8L and TO-263-5B versions can further improve battery life with near-zero shutdown current.

Key features include high PSRR, low ground current, fast load transient, output short-circuit protection, current limiting, reversed-battery protection and over-temperature shutdown. The SGM2225 is available in adjustable or fixed output voltage versions.

The SGM2225 is available in Green SOT-223-3, SOT-89-3, SOIC-8, TDFN-3×3-8L and TO-263-5B packages. It operates over an operating temperature range of -40°C to +125°C.

### FEATURES

- **Wide Input Voltage Range: 3.6V to 36V**
- **Adjustable Output Voltage Range: 1.8V to 15V**
- **Output Voltage Accuracy:  $\pm 1.5\%$  at +25°C**
- **Low Dropout Voltage: 450mV (TYP) at Full Load**
- **Extremely Tight Load and Line Regulations**
- **Fast Load Transient**
- **Low Output Voltage Temperature Coefficient**
- **Output Short-Circuit to GND Protection**
- **Current and Thermal Limiting**
- **No-Load Stability**
- **-40°C to +125°C Operating Temperature Range**
- **Thermally-Efficient Surface-Mount Package**
- **Available in Green SOT-223-3, SOT-89-3, SOIC-8, TDFN-3×3-8L and TO-263-5B Packages**

### APPLICATIONS

Laptop, Notebook and Palmtop Computers  
Cellular Telephones  
Consumer and Personal Electronics  
SMPS Post-Regulator/DC-to-DC Modules  
High-Efficiency Linear Power Supplies

### TYPICAL APPLICATIONS

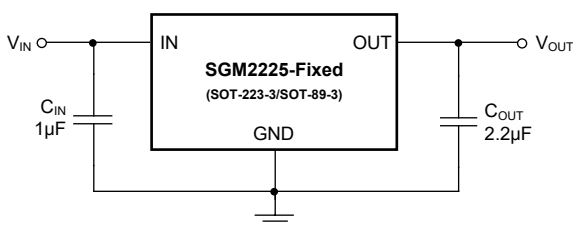


Figure 1. Fixed Voltage Typical Application Circuit

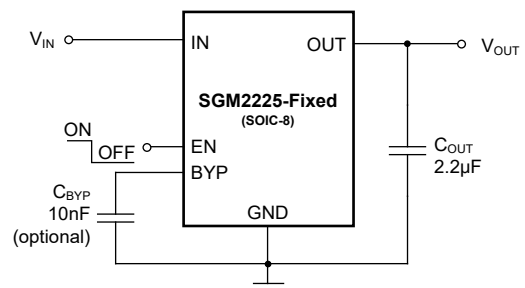


Figure 2. Low Noise Regulator

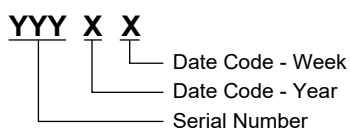
**PACKAGE/ORDERING INFORMATION**

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM2225-1.8	SOT-89-3	-40°C to +125°C	SGM2225-1.8XK3G/TR	RB8XX	Tape and Reel, 1000
SGM2225-3.3	SOT-89-3	-40°C to +125°C	SGM2225-3.3XK3G/TR	R8CXX	Tape and Reel, 1000
SGM2225-5.0	SOT-89-3	-40°C to +125°C	SGM2225-5.0XK3G/TR	R8DXX	Tape and Reel, 1000
SGM2225-1.8	SOT-223-3	-40°C to +125°C	SGM2225-1.8XKC3G/TR	RB9 XXXXX	Tape and Reel, 2500
SGM2225-2.5	SOT-223-3	-40°C to +125°C	SGM2225-2.5XKC3G/TR	SWG XXXXX	Tape and Reel, 2500
SGM2225-3.3	SOT-223-3	-40°C to +125°C	SGM2225-3.3XKC3G/TR	R8E XXXXX	Tape and Reel, 2500
SGM2225-5.0	SOT-223-3	-40°C to +125°C	SGM2225-5.0XKC3G/TR	R8F XXXXX	Tape and Reel, 2500
SGM2225-12	SOT-223-3	-40°C to +125°C	SGM2225-12XKC3G/TR	R16 XXXXX	Tape and Reel, 2500
SGM2225-3.3	SOIC-8	-40°C to +125°C	SGM2225-3.3XS8G/TR	SGM R90XS8 XXXXX	Tape and Reel, 4000
SGM2225-5.0	SOIC-8	-40°C to +125°C	SGM2225-5.0XS8G/TR	SGM R91XS8 XXXXX	Tape and Reel, 4000
SGM2225-ADJ	SOIC-8	-40°C to +125°C	SGM2225-ADJXS8G/TR	SGM 2225ADJXS8 XXXXX	Tape and Reel, 4000
SGM2225-1.8	TDFN-3×3-8L	-40°C to +125°C	SGM2225-1.8XTDB8G/TR	SGM SVPDB XXXXX	Tape and Reel, 4000
SGM2225-3.3	TDFN-3×3-8L	-40°C to +125°C	SGM2225-3.3XTDB8G/TR	SGM R92DB XXXXX	Tape and Reel, 4000
SGM2225-5.0	TDFN-3×3-8L	-40°C to +125°C	SGM2225-5.0XTDB8G/TR	SGM R93DB XXXXX	Tape and Reel, 4000
SGM2225-ADJ	TDFN-3×3-8L	-40°C to +125°C	SGM2225-ADJXTDB8G/TR	SGM R15DB XXXXX	Tape and Reel, 4000
SGM2225-ADJ	TO-263-5B	-40°C to +125°C	SGM2225-ADJXO5G/TR	SGMR94 XO5 XXXXX	Tape and Reel, 800

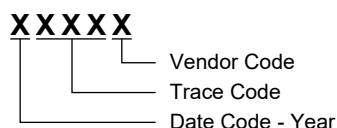
**MARKING INFORMATION**

NOTE: XX = Date Code. XXXXX = Date Code, Trace Code and Vendor Code.

**SOT-89-3**



**SOT-223-3/SOIC-8/TDFN-3×3-8L/TO-263-5B**



Green (RoHS & HSF): SG Micro Corp defines "Green" to mean Pb-Free (RoHS compatible) and free of halogen substances. If you have additional comments or questions, please contact your SGMICRO representative directly.

**ABSOLUTE MAXIMUM RATINGS**

Supply Voltage Range, $V_{IN}$ .....	-40V to +40V
EN to GND.....	-0.3V to $ V_{IN}  + 0.3V$
Package Thermal Resistance	
SOT-89-3, $\theta_{JA}$ .....	75°C/W
SOT-89-3, $\theta_{JC}$ .....	84°C/W
SOT-223-3, $\theta_{JA}$ .....	95°C/W
SOT-223-3, $\theta_{JC}$ .....	50°C/W
SOIC-8, $\theta_{JA}$ .....	95°C/W
SOIC-8, $\theta_{JC}$ .....	41°C/W
TDFN-3×3-8L, $\theta_{JA}$ .....	92°C/W
TDFN-3×3-8L, $\theta_{JC}$ .....	46°C/W
TO-263-5B, $\theta_{JA}$ .....	45°C/W
TO-263-5B, $\theta_{JC}$ .....	42°C/W
Junction Temperature .....	+150°C
Storage Temperature Range.....	-65°C to +150°C
Lead Temperature (Soldering, 10s) .....	+260°C
ESD Susceptibility	
HBM.....	6000V
CDM .....	1000V

**RECOMMENDED OPERATING CONDITIONS**

Supply Voltage Range, $V_{IN}$ .....	3.6V to 36V
Adjustable Output Voltage Range.....	1.8V to 15V
Input Capacitance, $C_{IN}$ .....	0.5 $\mu$ F (MIN)
Output Capacitance, $C_{OUT}$ .....	1 $\mu$ F to 10 $\mu$ F
Operating Junction Temperature Range .....	-40°C to +125°C

**OVERSTRESS CAUTION**

Stresses beyond those listed in Absolute Maximum Ratings may cause permanent damage to the device. Exposure to absolute maximum rating conditions for extended periods may affect reliability. Functional operation of the device at any conditions beyond those indicated in the Recommended Operating Conditions section is not implied.

**ESD SENSITIVITY CAUTION**

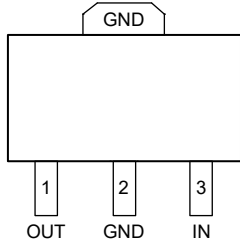
This integrated circuit can be damaged if ESD protections are not considered carefully. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because even small parametric changes could cause the device not to meet the published specifications.

**DISCLAIMER**

SG Micro Corp reserves the right to make any change in circuit design, or specifications without prior notice.

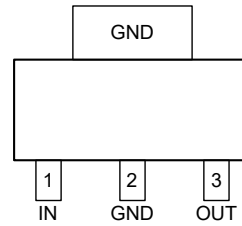
PIN CONFIGURATIONS

SGM2225-Fixed Output



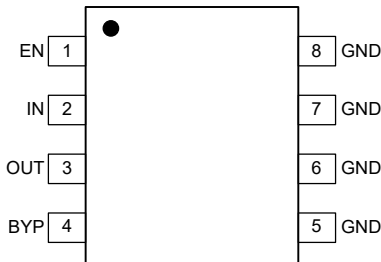
SOT-89-3

SGM2225-Fixed Output



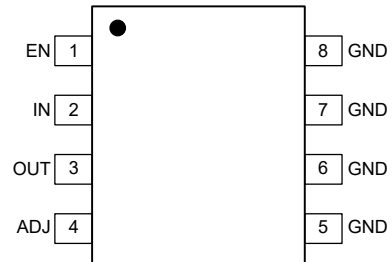
SOT-223-3

SGM2225-Fixed Output



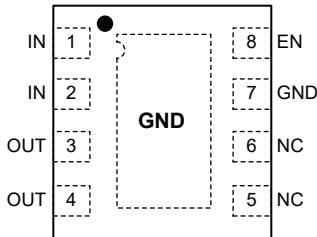
SOIC-8

SGM2225-ADJ



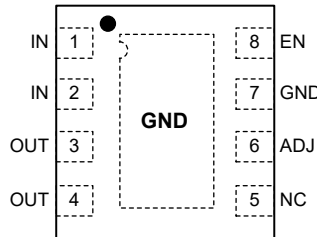
SOIC-8

SGM2225-Fixed Output



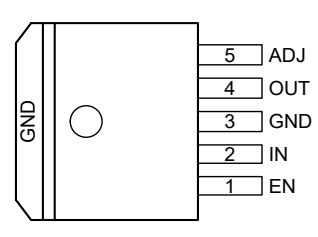
TDFN-3x3-8L

SGM2225-ADJ



TDFN-3x3-8L

SGM2225-ADJ



TO-263-5B

PIN DESCRIPTION

PIN					NAME	FUNCTION
SOT-89-3	SOT-223-3	SOIC-8	TDFN-3x3-8L	TO-263-5B		
1	3	3	3, 4	4	OUT	Regulator Output Pin. It is recommended to use an output capacitor with effective capacitance in the range of 1µF to 10µF. TDFN-3x3-8L pins 3 and 4 must be tied together.
2	2	5-8	7	3	GND	Ground Pin. SOIC-8 pins 5 through 8 are internally connected.
3	1	2	1, 2	2	IN	Supply Input Pin.
-	-	1	8	1	EN	Enable Pin. CMOS-logic compatible control input. Driving this pin to logic high enables the device; driving this pin to logic low disables the device.
-	-	4	-	-	BYP	Reference Bypass Pin (fixed voltage version only). Connect an external 10nF capacitor to GND to reduce output noise.
-	-	4	6	5	ADJ	Adjustable Pin. Feedback input (adjustable voltage version only). Connect to resistive voltage-divider network.
-	-	-	5	-	NC	Not Connected.
-	-	-	6	-	NC	Not Connected (fixed voltage version only).
-	-	-	Exposed Pad	-	GND	Exposed Thermal Pad. Connect to GND for best thermal performance.

## ELECTRICAL CHARACTERISTICS

( $V_{IN} = V_{OUT(NOM)} + 1V$ ,  $I_{OUT} = 100\mu A$  and  $C_{OUT} = 2.2\mu F$ ,  $T_J = -40^\circ C$  to  $+125^\circ C$ , typical values are at  $T_J = +25^\circ C$ , unless otherwise noted.)

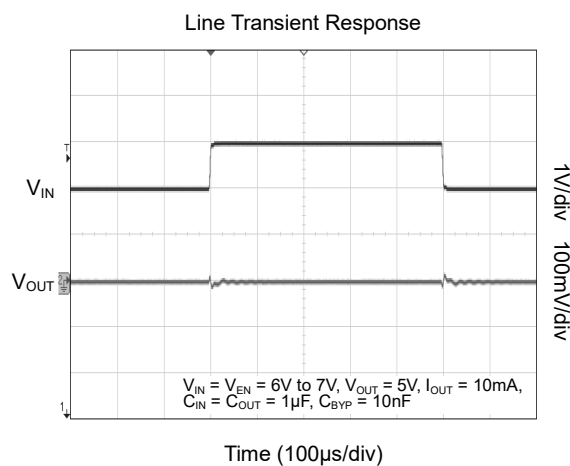
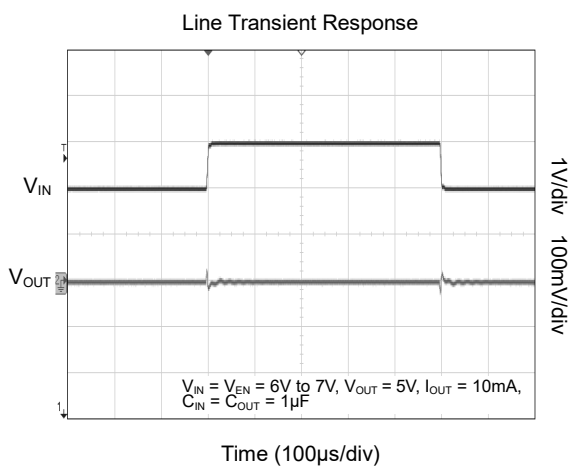
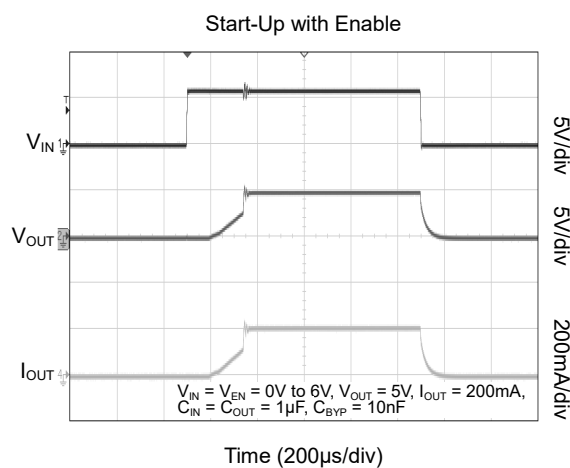
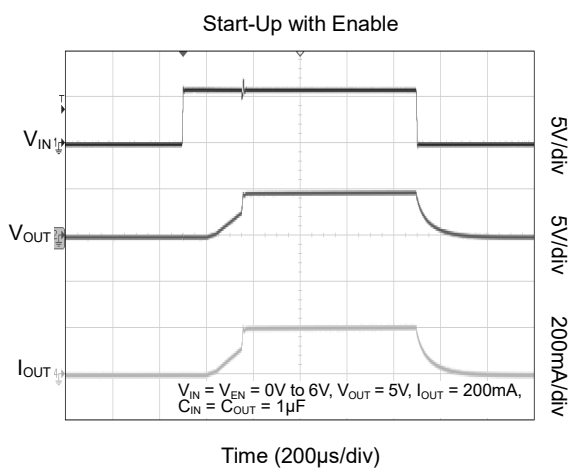
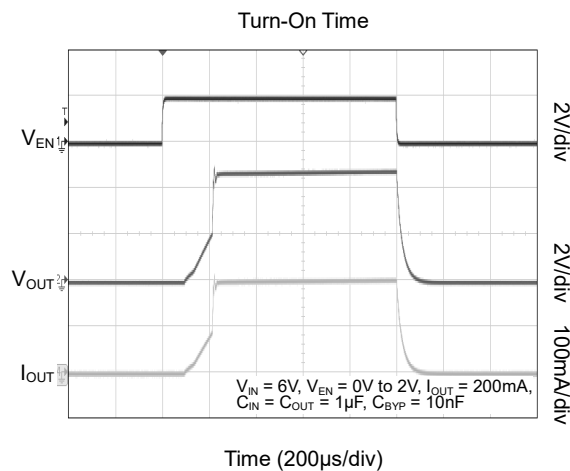
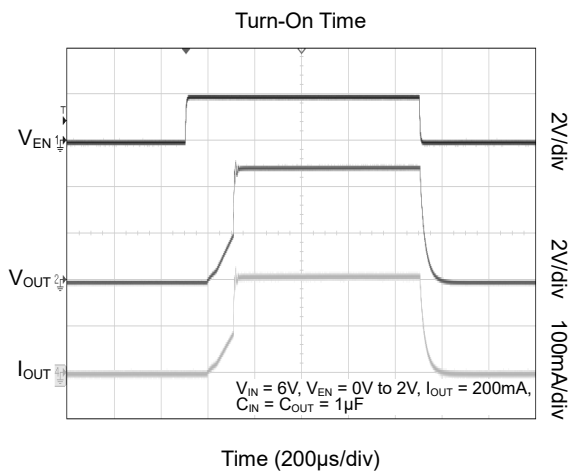
PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Input Voltage Range	$V_{IN}$	$T_J = +25^\circ C$	3.6		36	V
Output Voltage Accuracy	$V_{OUT}$	Variation from nominal $V_{OUT}$ , $T_J = +25^\circ C$	-1.5		1.5	%
		Variation from nominal $V_{OUT}$	-2		2	
Ground Pin Current <sup>(1)(2)</sup>	$I_Q$	$V_{EN} \geq 1.6V$ , no load, $T_J = +25^\circ C$		80	104	$\mu A$
		$V_{EN} \geq 1.6V$ , no load			112	
		$V_{EN} \geq 1.6V$ , $I_{OUT} = 100\mu A$ , $T_J = +25^\circ C$		80	104	
		$V_{EN} \geq 1.6V$ , $I_{OUT} = 100\mu A$			112	
		$V_{EN} \geq 1.6V$ , $I_{OUT} = 50mA$ , $T_J = +25^\circ C$		220	280	
		$V_{EN} \geq 1.6V$ , $I_{OUT} = 50mA$			290	
		$V_{EN} \geq 1.6V$ , $I_{OUT} = 800mA$ , $T_J = +25^\circ C$		1950	2250	
		$V_{EN} \geq 1.6V$ , $I_{OUT} = 800mA$			2350	
Ground Pin Quiescent Current <sup>(2)</sup>	$I_{Q(GND)}$	$V_{EN} \leq 0.4V$ (shutdown), $T_J = +25^\circ C$		6.5	8	$\mu A$
		$V_{EN} \leq 0.4V$ (shutdown)			12	
Current Limit	$I_{LIM}$	$V_{OUT} = 90\% \times V_{OUT(NOM)}$ , $T_J = +25^\circ C$	820	1100		mA
Short-Circuit Current	$I_{SHORT}$	$V_{IN} = V_{EN} = 3V$ , $V_{OUT} = 0V$		230		mA
Dropout Voltage <sup>(3)</sup>	$V_{DROP}$	$I_{OUT} = 50mA$ , $T_J = +25^\circ C$		30	38	mV
		$I_{OUT} = 50mA$			55	
		$I_{OUT} = 200mA$ , $T_J = +25^\circ C$		115	150	
		$I_{OUT} = 200mA$			210	
		$I_{OUT} = 800mA$ , $T_J = +25^\circ C$		450	610	
		$I_{OUT} = 800mA$			850	
Line Regulation	$\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$	$V_{IN} = V_{OUT(NOM)} + 1V$ to 36V, $T_J = +25^\circ C$		0.0003	0.003	%V
		$V_{IN} = V_{OUT(NOM)} + 1V$ to 36V			0.005	
Load Regulation	$\frac{\Delta V_{OUT}}{V_{OUT}}$	$I_{OUT} = 100\mu A$ to 800mA, $T_J = +25^\circ C$		0.1	0.3	%
		$I_{OUT} = 100\mu A$ to 800mA			0.4	
Power Supply Rejection Ratio	PSRR	$f = 1kHz$ , $V_{OUT} = 2.5V$ , $I_{OUT} = 50mA$		75		dB
Output Voltage Noise <sup>(4)</sup>	$e_n$	$V_{OUT} = 2.5V$ , $I_{OUT} = 50mA$ , $C_{BYP} = 0\mu F$		500		nV/ $\sqrt{Hz}$
Output Voltage Temperature Coefficient <sup>(5)</sup>	$\frac{\Delta V_{OUT}}{\Delta T_J \times V_{OUT}}$			40		ppm/ $^\circ C$
Enable Input Logic-Low Voltage	$V_{ENL}$	$V_{EN} = \text{logic low}$ (regulator shutdown)			0.4	V
		$V_{EN} = \text{logic high}$ (regulator enabled)	1.6			
Enable Input Current	$I_{ENL}$	$V_{ENL} \leq 0.4V$			1	$\mu A$
	$I_{ENH}$	$V_{ENH} \geq 1.6V$			1	
Voltage Reference	$V_{REF}$	$T_J = +25^\circ C$	1.182	1.2	1.218	V
			1.176		1.224	

## NOTES:

- Ground pin current is the regulator quiescent current plus pass transistor base current. The total current drawn from the supply is the sum of the load current plus the ground pin current.
- $V_{EN}$  is the voltage externally applied to devices with the EN (enable) input pin (SOIC-8, TDFN-3x3-8L and TO-263-5B packages only).
- Dropout voltage is characterized when  $V_{OUT}$  falls 5% below  $V_{OUT(NOM)}$ .
- $C_{BYP}$  is an optional, external bypass capacitor connected to devices with a BYP (bypass) pin (SOIC-8 package only).
- Output voltage temperature coefficient is defined as the worst-case voltage change divided by the total temperature range.

TYPICAL PERFORMANCE CHARACTERISTICS

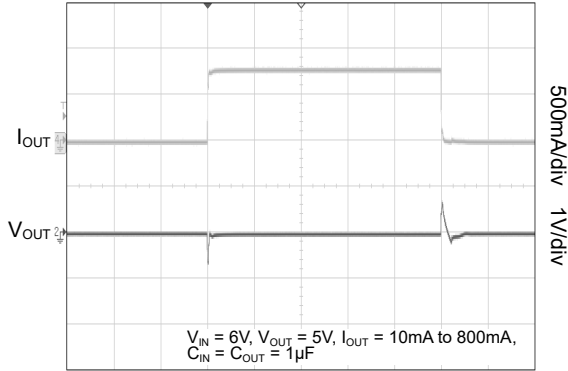
$T_J = +25^\circ\text{C}$ ,  $C_{OUT} = 2.2\mu\text{F}$  and  $I_{OUT} = 100\mu\text{A}$ , unless otherwise noted.



TYPICAL PERFORMANCE CHARACTERISTICS (continued)

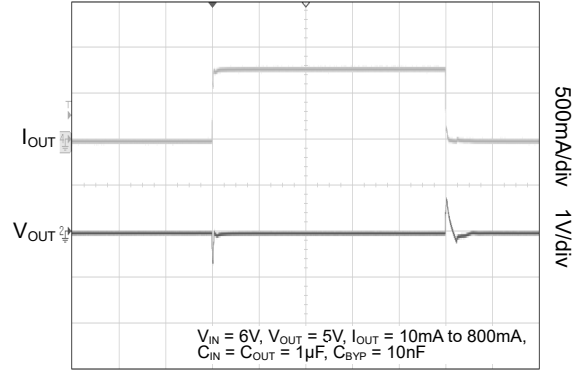
T<sub>J</sub> = +25°C, C<sub>OUT</sub> = 2.2µF and I<sub>OUT</sub> = 100µA, unless otherwise noted.

Load Transient Response



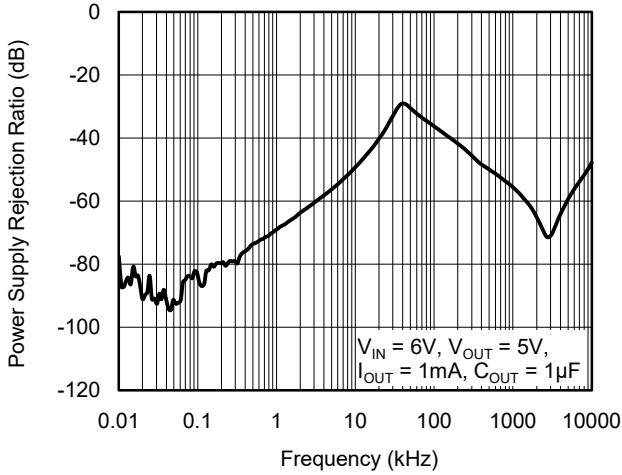
Time (100µs/div)

Load Transient Response



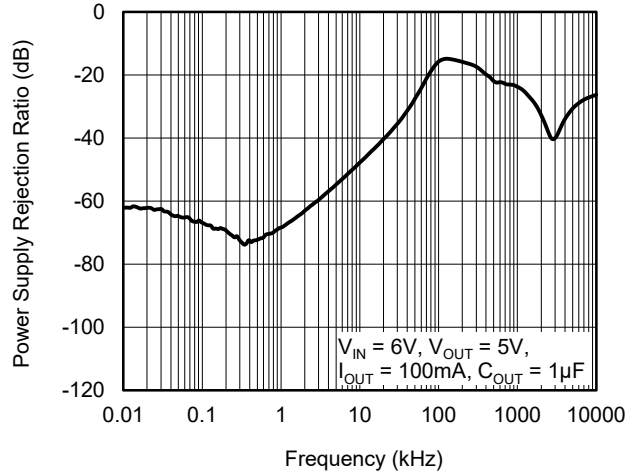
Time (100µs/div)

Power Supply Rejection Ratio vs. Frequency



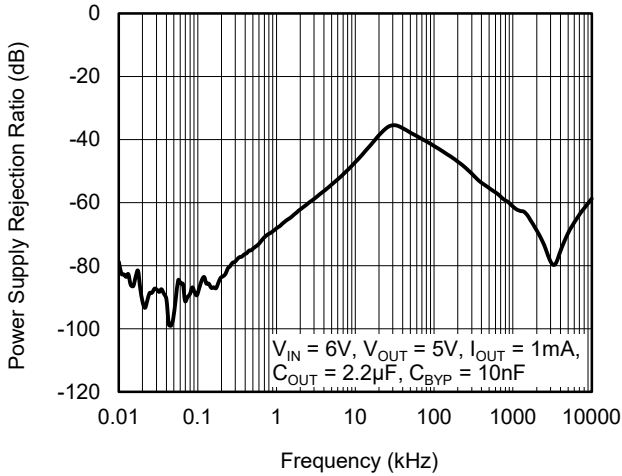
Frequency (kHz)

Power Supply Rejection Ratio vs. Frequency



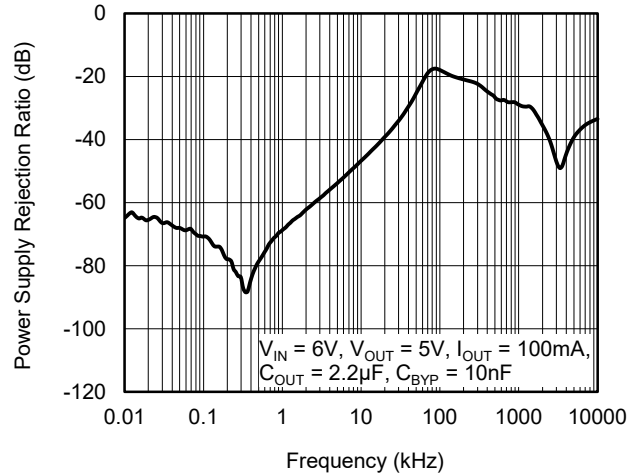
Frequency (kHz)

Power Supply Rejection Ratio vs. Frequency



Frequency (kHz)

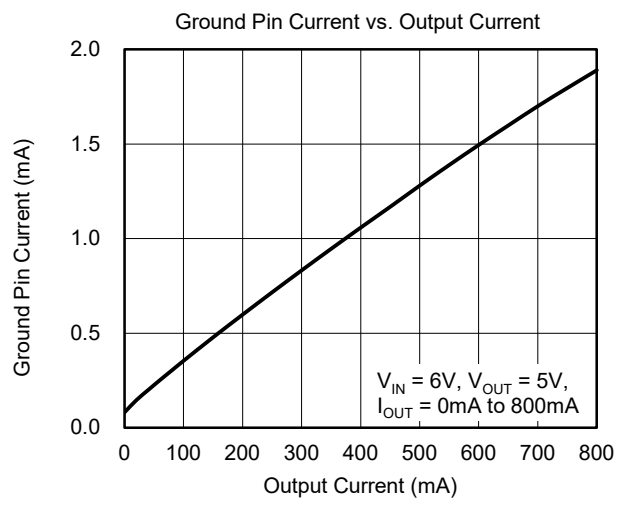
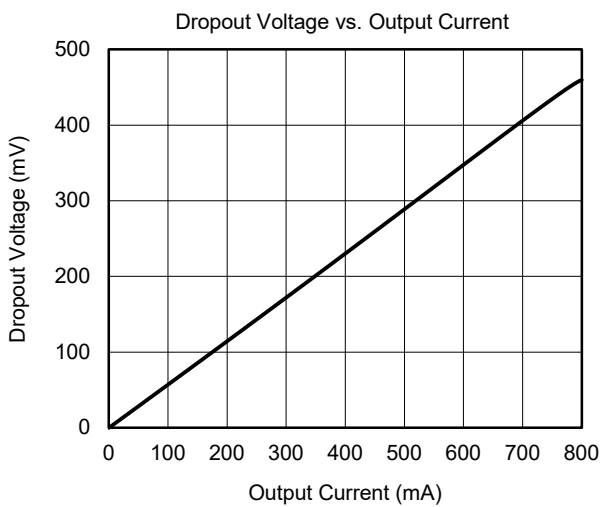
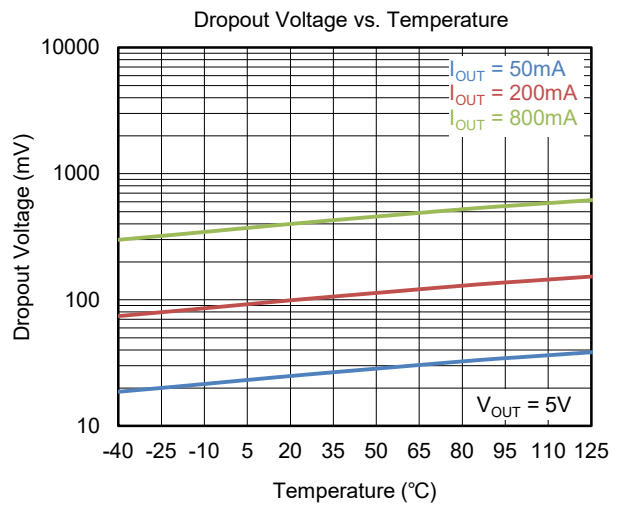
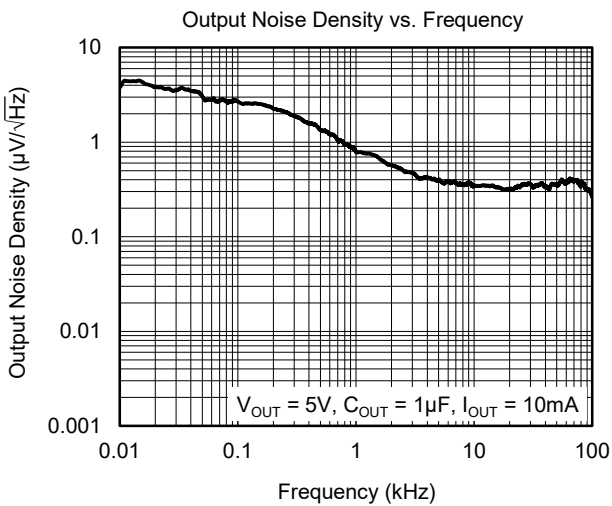
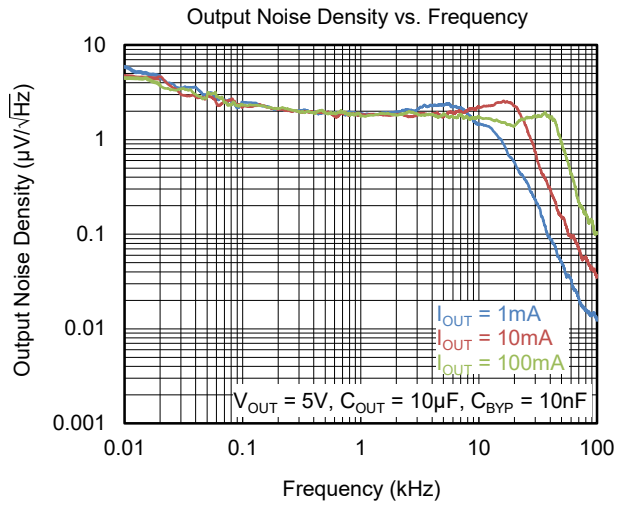
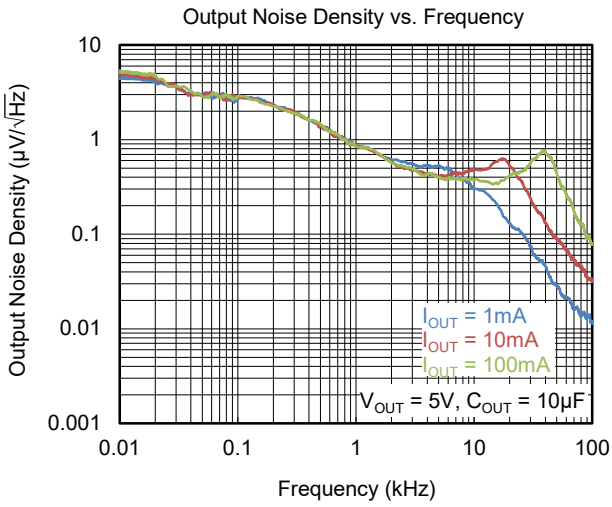
Power Supply Rejection Ratio vs. Frequency



Frequency (kHz)

TYPICAL PERFORMANCE CHARACTERISTICS (continued)

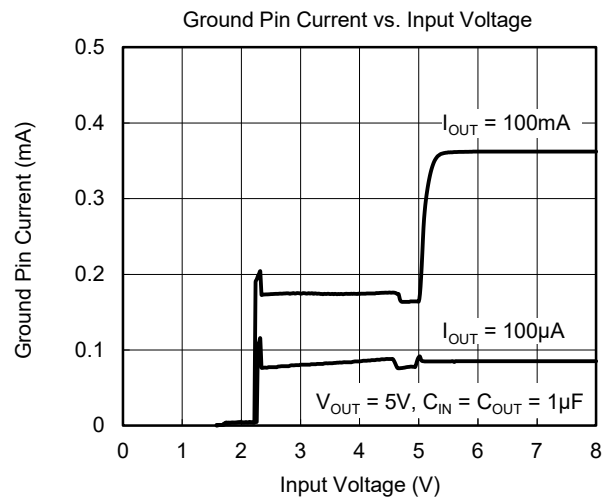
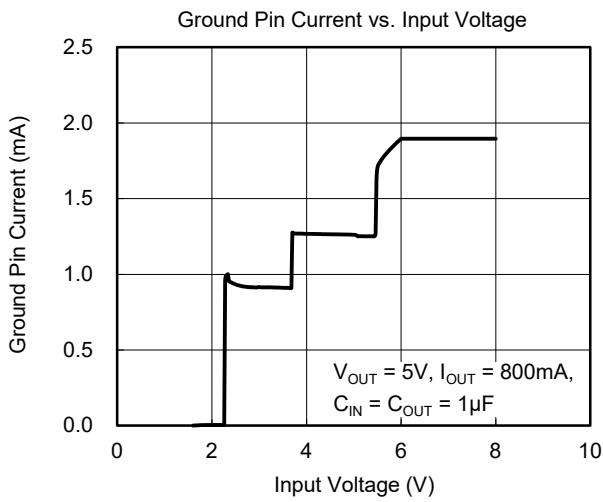
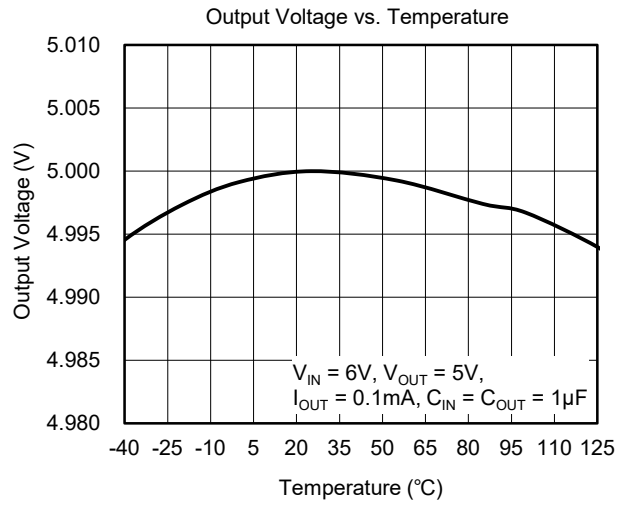
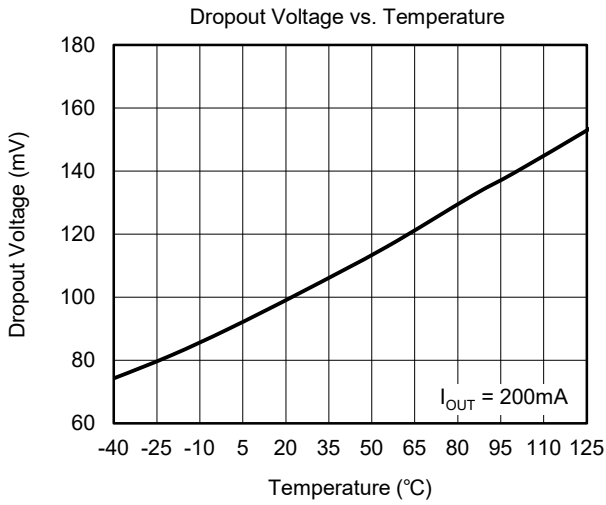
T<sub>J</sub> = +25°C, C<sub>OUT</sub> = 2.2μF and I<sub>OUT</sub> = 100μA, unless otherwise noted.





TYPICAL PERFORMANCE CHARACTERISTICS (continued)

$T_J = +25^\circ\text{C}$ ,  $C_{OUT} = 2.2\mu\text{F}$  and  $I_{OUT} = 100\mu\text{A}$ , unless otherwise noted.



FUNCTIONAL BLOCK DIAGRAMS

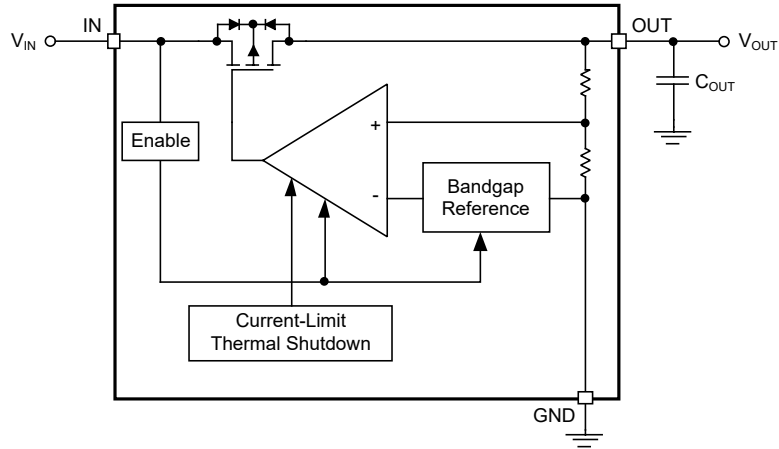


Figure 3. Low Noise Fixed Regulator (SOT-89-3 and SOT-223-3 Versions)

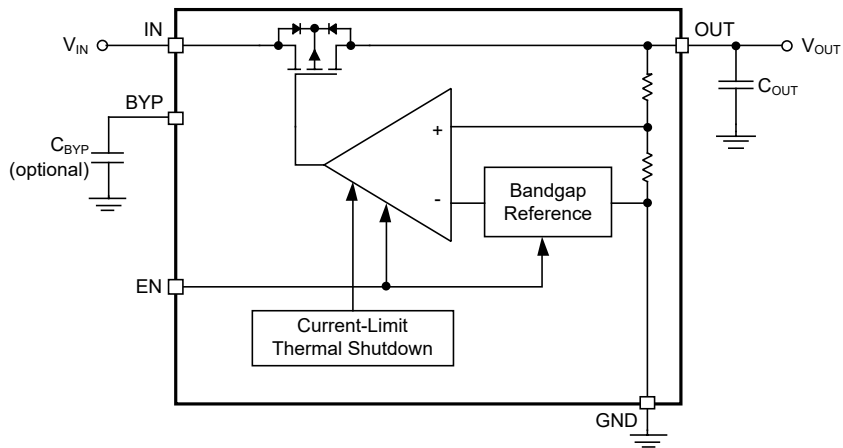


Figure 4. Low Noise Fixed Regulator (SOIC-8 Version)

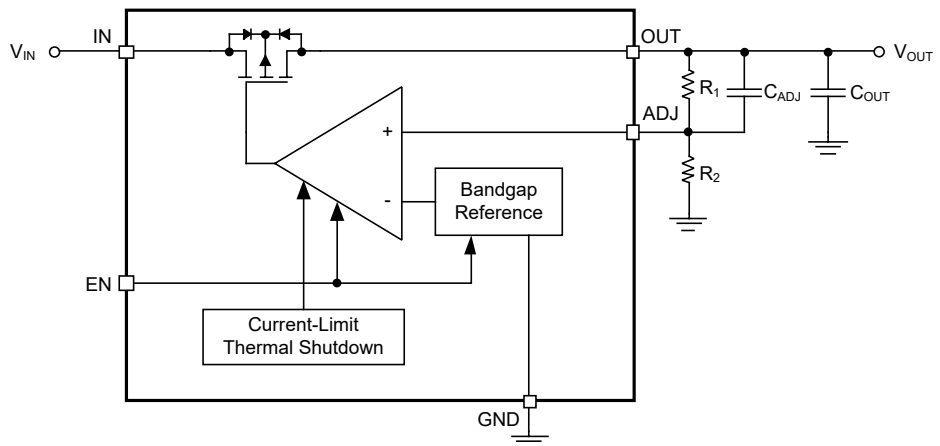


Figure 5. Low Noise Adjustable Regulator (SOIC-8, TDFN-3x3-8L and TO-263-5B Versions)

## APPLICATION INFORMATION

### Enable Shutdown

Enable is not available on devices in the SOT-89-3 and SOT-223-3 packages.

Forcing  $V_{EN}$  high ( $> 1.6V$ ) enables the regulator. The EN pin is CMOS-logic compatible. If the enable feature is not required, connect the EN pin to the IN pin (supply input) immediately.

### Input Capacitor ( $C_{IN}$ )

A  $1\mu F$  capacitor should be placed from the IN pin to GND if there is more than 10 inches of wire between the input and the AC filter capacitor or if a battery is used as the input.

### Output Capacitor ( $C_{OUT}$ )

An output capacitor is required between the OUT pin and GND to prevent oscillation. The minimum effective capacitance of the output capacitor is  $1\mu F$ . Larger values improve the regulator's transient response.

Most tantalum or aluminum electrolytic capacitors are adequate; film types will work, but are more expensive. Since many aluminum electrolytes have electrolytes that freeze at about  $-30^{\circ}C$ , solid tantalums are recommended for operation below  $-25^{\circ}C$ .

### No-Load Stability

The SGM2225 remains stable and in regulation with no load (other than the internal voltage divider) unlike many other voltage regulators. This is especially important in CMOS RAM keep-alive applications.

### Reference Bypass Capacitor ( $C_{BYP}$ )

Reference bypass is available only on device in SOIC-8 package.

BYP is connected to the internal voltage reference. A  $10nF$  capacitor connected from the BYP pin to GND

quiets this reference, providing a significant reduction in output noise (low noise performance).

The start-up speed of the SGM2225 is inversely proportional to the size of the reference bypass capacitor.

Applications requiring a slow ramp-up of output voltage should consider larger values of  $C_{BYP}$ . Likewise, if rapid turn-on is necessary, consider omitting  $C_{BYP}$ .

If output noise is not critical, omit  $C_{BYP}$  and leave the BYP pin open.

### Low Voltage Operation

During regulator power-up, the pass transistor is fully saturated for a short time, while the error amplifier and voltage reference are being powered up more slowly from the output (see Functional Block Diagrams).

Selecting larger output and bypass capacitors allows additional time for the error amplifier and reference to turn on and prevents overshoot.

To ensure that no overshoot is present when starting up with a light load ( $100\mu A$ ), use a  $4.7\mu F$  output capacitor and a  $10nF$  bypass capacitor. This slows the turn-on enough to allow the regulator to react and keep the output voltage from exceeding its nominal value. At heavier loads, use a  $10\mu F$  output capacitor and a  $10nF$  bypass capacitor. Lower values of output and bypass capacitance can be used, depending on the sensitivity of the system.

Applications that can withstand some overshoot on the output of the regulator can reduce the output capacitor and/or reduce or eliminate the bypass capacitor. Applications that are not sensitive to overshoot due to power-on reset delays can use normal output and bypass capacitor configurations.

APPLICATION INFORMATION (continued)

Fixed Regulator Circuits

Figure 6 (a) shows a basic SOIC-8 fixed output voltage regulator circuit. A 1µF minimum output capacitor is required for basic fixed output voltage applications.

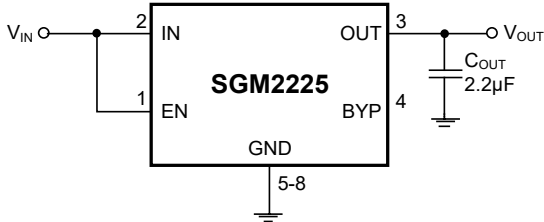


Figure 6 (a). Low Noise Fixed Output Voltage Application

Figure 6 (b) includes an optional 10nF noise bypass capacitor between the BYP pin and GND to reduce output noise.

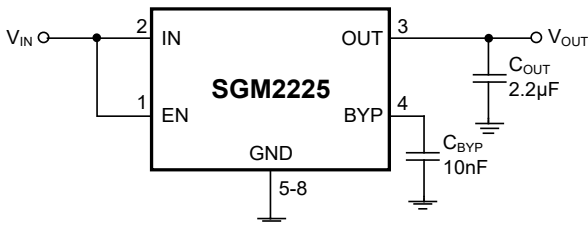


Figure 6 (b). Low Noise Fixed Output Voltage Application

Adjustable Regulator Circuit

The output voltage of the SGM2225-ADJ can be adjusted to a specific output voltage by using an external resistor divider as shown in Figure 7.

The resistors set the output voltage based on the equation:

$$V_{OUT} = 1.2V \times \left( 1 + \frac{R_1}{R_2} \right) \tag{1}$$

Although the ADJ pin is a high-impedance input, for best performance, R<sub>1</sub> should not exceed 470kΩ. The capacitor C<sub>ADJ</sub> = 4.7pF improves the stability.

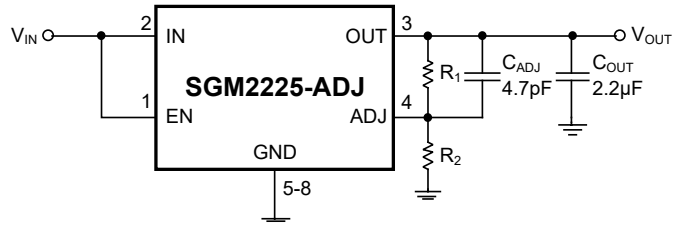
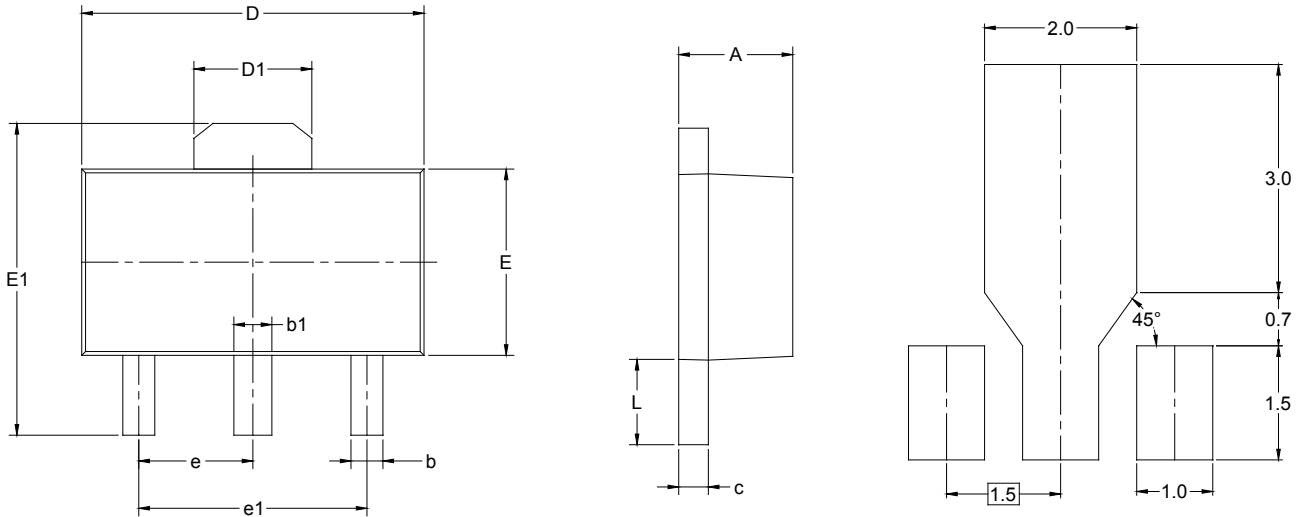


Figure 7. Low Noise Adjustable Output Voltage Application

# PACKAGE INFORMATION

## PACKAGE OUTLINE DIMENSIONS

### SOT-89-3



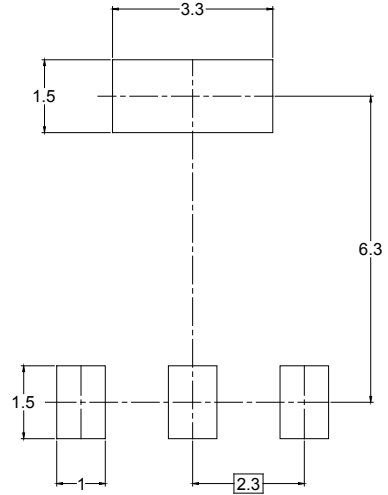
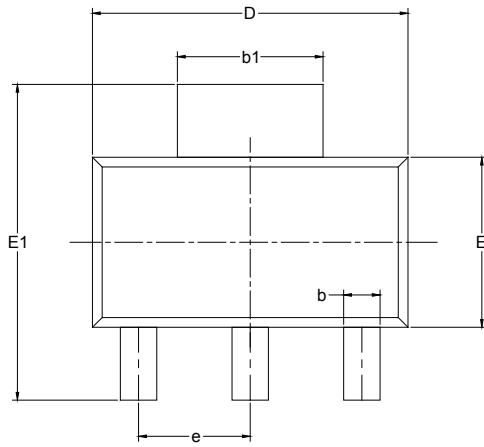
RECOMMENDED LAND PATTERN (Unit: mm)

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

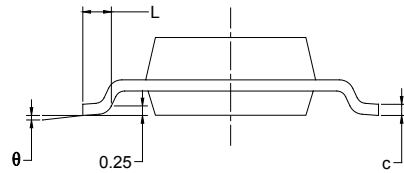
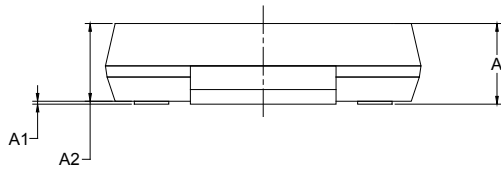
# PACKAGE INFORMATION

## PACKAGE OUTLINE DIMENSIONS

### SOT-223-3



RECOMMENDED LAND PATTERN (Unit: mm)

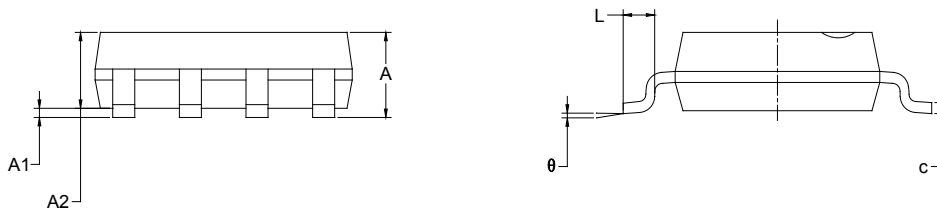
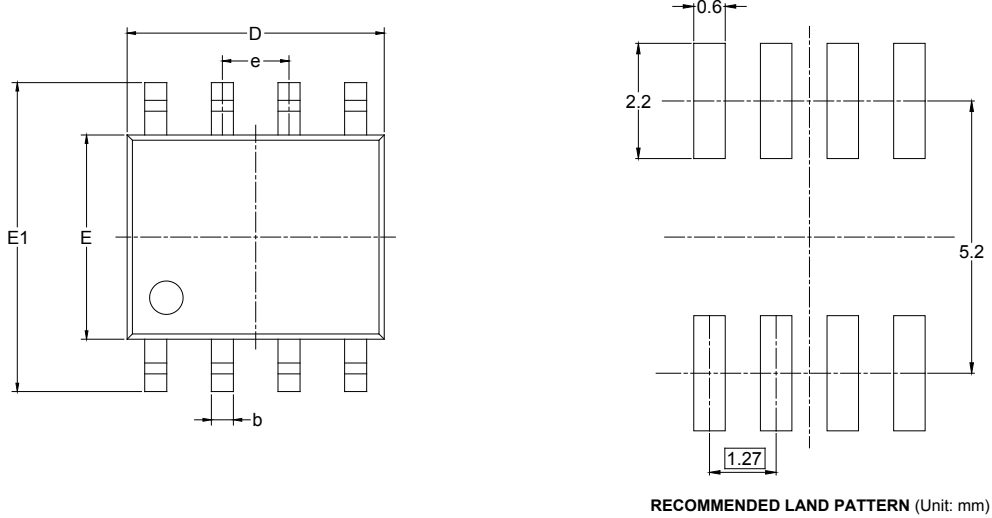


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A		1.800		0.071
A1	0.020	0.100	0.001	0.004
A2	1.500	1.700	0.059	0.067
b	0.660	0.840	0.026	0.033
b1	2.900	3.100	0.114	0.122
c	0.230	0.350	0.009	0.014
D	6.300	6.700	0.248	0.264
E	3.300	3.700	0.130	0.146
E1	6.700	7.300	0.264	0.287
e	2.300 BSC		0.091 BSC	
L	0.750		0.030	
$\theta$	0°	10°	0°	10°

# PACKAGE INFORMATION

## PACKAGE OUTLINE DIMENSIONS

### SOIC-8

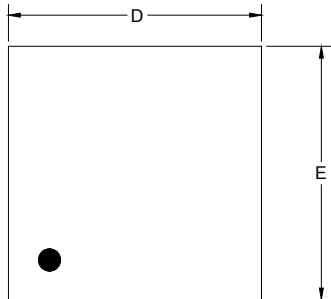


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.27 BSC		0.050 BSC	
L	0.400	1.270	0.016	0.050
$\theta$	0°	8°	0°	8°

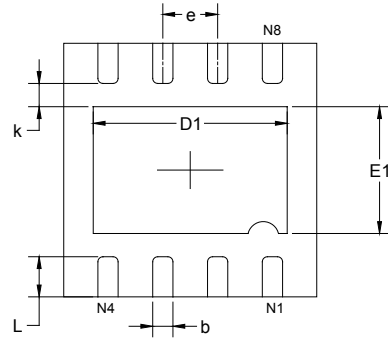
# PACKAGE INFORMATION

## PACKAGE OUTLINE DIMENSIONS

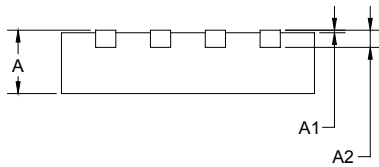
### TDFN-3×3-8L



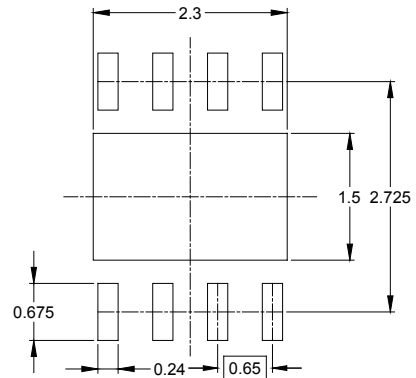
TOP VIEW



BOTTOM VIEW



SIDE VIEW



RECOMMENDED LAND PATTERN (Unit: mm)

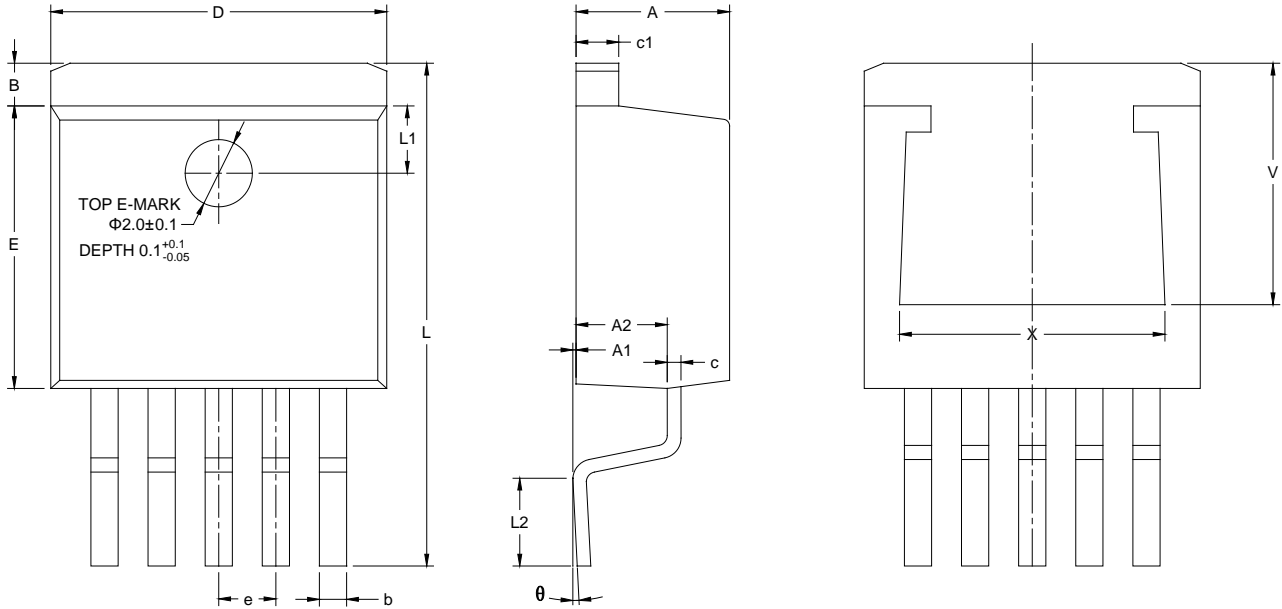
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.700	0.800	0.028	0.031
A1	0.000	0.050	0.000	0.002
A2	0.203 REF		0.008 REF	
D	2.900	3.100	0.114	0.122
D1	2.200	2.400	0.087	0.094
E	2.900	3.100	0.114	0.122
E1	1.400	1.600	0.055	0.063
k	0.200 MIN		0.008 MIN	
b	0.180	0.300	0.007	0.012
e	0.650 TYP		0.026 TYP	
L	0.375	0.575	0.015	0.023



# PACKAGE INFORMATION

## PACKAGE OUTLINE DIMENSIONS

### TO-263-5B



Symbol	Dimensions In Millimeters		
	MIN	MOD	MAX
A	4.40	4.57	4.70
A1	0	0.10	0.25
A2	2.59	2.69	2.79
b	0.77	-	0.90
c	0.34	-	0.47
c1	1.22	-	1.32
e	1.70 BSC		
D	10.06	10.16	10.26
E	9.05	9.15	9.25
B	1.17	1.27	1.40
V	6.86	-	7.50
X	7.50	-	8.30
L	14.70	15.10	15.50
L1	2.00 REF		
L2	2.00	2.30	2.60
$\theta$	0°	-	8°

# PACKAGE INFORMATION

## TAPE AND REEL INFORMATION

### REEL DIMENSIONS

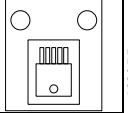


### TAPE DIMENSIONS



NOTE: The picture is only for reference. Please make the object as the standard.

### KEY PARAMETER LIST OF TAPE AND REEL

Package Type	Reel Diameter	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	P1 (mm)	P2 (mm)	W (mm)	Pin1 Quadrant
SOT-89-3	7"	13.2	4.85	4.45	1.85	4.0	8.0	2.0	12.0	Q3
SOT-223-3	13"	12.4	6.55	7.25	1.90	4.0	8.0	2.0	12.0	Q3
SOIC-8	13"	12.4	6.40	5.40	2.10	4.0	8.0	2.0	12.0	Q1
TDFN-3×3-8L	13"	12.4	3.35	3.35	1.13	4.0	8.0	2.0	12.0	Q1
TO-263-5B	13"	24.4	10.80	16.30	5.11	4.0	16.0	2.0	24.0	

DD0001

# PACKAGE INFORMATION

## CARTON BOX DIMENSIONS



NOTE: The picture is only for reference. Please make the object as the standard.

## KEY PARAMETER LIST OF CARTON BOX

Reel Type	Length (mm)	Width (mm)	Height (mm)	Pizza/Carton
7" (Option)	368	227	224	8
7"	442	410	224	18
13"	386	280	370	5

DD0002