

# SGM2212

## 800mA, Low Noise, Low Quiescent Current, High PSRR, Low Dropout Linear Regulator

### GENERAL DESCRIPTION

The SGM2212 is a low noise, low quiescent current, high PSRR, fast transient response and low dropout voltage linear regulator which is designed using CMOS technology. It provides 800mA output current capability. The operating input voltage range is from 2.7V to 20V. The fixed output voltages are 1.8V, 2.5V, 2.8V, 3.3V, 5V and adjustable output voltage range is from 1.25V to 15V.

Other features include short-circuit current limit and thermal shutdown protection.

The SGM2212 is available in Green TO-252-2, TO-263-3, SOT-223-3 and TDFN-3×3-8L packages. It operates over an operating temperature range of -40°C to +125°C.

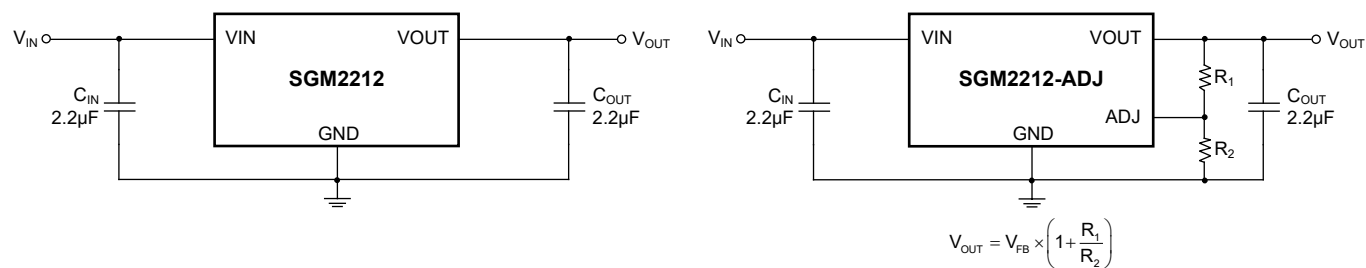
### FEATURES

- **Input Voltage Range: 2.7V to 20V**
- **Output Current: 800mA**
- **Fixed Output Voltages: 1.8V, 2.5V, 2.8V, 3.3V, 5V**
- **Adjustable Output Voltage Range: 1.25V to 15V**
- **Output Voltage Accuracy: ±1% at +25°C**
- **Line Regulation: 0.012% (MAX)**
- **Load Regulation: 0.4% (MAX)**
- **Stable with Small Case Size Ceramic Capacitors**
- **Output Current Limit**
- **Thermal Shutdown Protection**
- **-40°C to +125°C Operating Temperature Range**
- **Available in Green TO-252-2, TO-263-3, SOT-223-3 and TDFN-3×3-8L Packages**

### APPLICATIONS

- Portable Electronic Device
- Battery-Powered Equipment
- Industrial and medical Equipment
- Post Regulator for Switching DC/DC Converters

### TYPICAL APPLICATION



Fixed Voltage Typical Application Circuit

Adjustable Voltage Typical Application Circuit

Figure 1. Typical Application Circuits

# 800mA, Low Noise, Low Quiescent Current, SGM2212 High PSRR, Low Dropout Linear Regulator

## PACKAGE/ORDERING INFORMATION

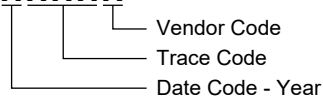
MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM2212-1.8	TO-252-2	-40°C to +125°C	SGM2212-1.8XOB2G/TR	SGMCFB XOB2 XXXXX	Tape and Reel, 2500
SGM2212-2.5	TO-252-2	-40°C to +125°C	SGM2212-2.5XOB2G/TR	SGMCFC XOB2 XXXXX	Tape and Reel, 2500
SGM2212-2.8	TO-252-2	-40°C to +125°C	SGM2212-2.8XOB2G/TR	SGMCFD XOB2 XXXXX	Tape and Reel, 2500
SGM2212-3.3	TO-252-2	-40°C to +125°C	SGM2212-3.3XOB2G/TR	SGMCFE XOB2 XXXXX	Tape and Reel, 2500
SGM2212-5.0	TO-252-2	-40°C to +125°C	SGM2212-5.0XOB2G/TR	SGMCFE XOB2 XXXXX	Tape and Reel, 2500
SGM2212-1.8	TO-263-3	-40°C to +125°C	SGM2212-1.8XOA3G/TR	SGMCF6 XOA3 XXXXX	Tape and Reel, 800
SGM2212-2.5	TO-263-3	-40°C to +125°C	SGM2212-2.5XOA3G/TR	SGMCF7 XOA3 XXXXX	Tape and Reel, 800
SGM2212-2.8	TO-263-3	-40°C to +125°C	SGM2212-2.8XOA3G/TR	SGMCF8 XOA3 XXXXX	Tape and Reel, 800
SGM2212-3.3	TO-263-3	-40°C to +125°C	SGM2212-3.3XOA3G/TR	SGMCF9 XOA3 XXXXX	Tape and Reel, 800
SGM2212-5.0	TO-263-3	-40°C to +125°C	SGM2212-5.0XOA3G/TR	SGMCF9 XOA3 XXXXX	Tape and Reel, 800
SGM2212-1.8	SOT-223-3	-40°C to +125°C	SGM2212-1.8XKC3G/TR	CAD XXXXX	Tape and Reel, 2500
SGM2212-2.5	SOT-223-3	-40°C to +125°C	SGM2212-2.5XKC3G/TR	CAE XXXXX	Tape and Reel, 2500
SGM2212-2.8	SOT-223-3	-40°C to +125°C	SGM2212-2.8XKC3G/TR	CAF XXXXX	Tape and Reel, 2500
SGM2212-3.3	SOT-223-3	-40°C to +125°C	SGM2212-3.3XKC3G/TR	MN4 XXXXX	Tape and Reel, 2500
SGM2212-5.0	SOT-223-3	-40°C to +125°C	SGM2212-5.0XKC3G/TR	MN5 XXXXX	Tape and Reel, 2500
SGM2212-ADJ	TDFN-3×3-8L	-40°C to +125°C	SGM2212-ADJXTDB8G/TR	SGM MN6DB XXXXX	Tape and Reel, 4000

## MARKING INFORMATION

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

**TO-252-2/TO-263-3/SOT-223-3/TDFN-3×3-8L**

**XXXXX**



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**

VIN to GND.....	22V
Package Thermal Resistance	
TO-252-2, $\theta_{JA}$ .....	56°C/W
TO-252-2, $\theta_{JB}$ .....	30°C/W
TO-252-2, $\theta_{JC}$ .....	63°C/W
TO-263-3, $\theta_{JA}$ .....	51°C/W
TO-263-3, $\theta_{JB}$ .....	28°C/W
TO-263-3, $\theta_{JC}$ .....	53°C/W
SOT-223-3, $\theta_{JA}$ .....	117°C/W
SOT-223-3, $\theta_{JB}$ .....	29°C/W
SOT-223-3, $\theta_{JC}$ .....	62°C/W
TDFN-3x3-8L, $\theta_{JA}$ .....	82°C/W
TDFN-3x3-8L, $\theta_{JB}$ .....	42°C/W
TDFN-3x3-8L, $\theta_{JC}$ .....	54°C/W
Junction Temperature.....	+150°C
Storage Temperature Range.....	-65°C to +150°C
Lead Temperature (Soldering, 10s).....	+260°C
ESD Susceptibility	
HBM.....	7000V
CDM.....	1000V

**RECOMMENDED OPERATING CONDITIONS**

Input Voltage Range.....	2.7V to 20V
Input Effective Capacitance, $C_{IN}$ .....	1 $\mu$ F (MIN)
Output Effective 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.

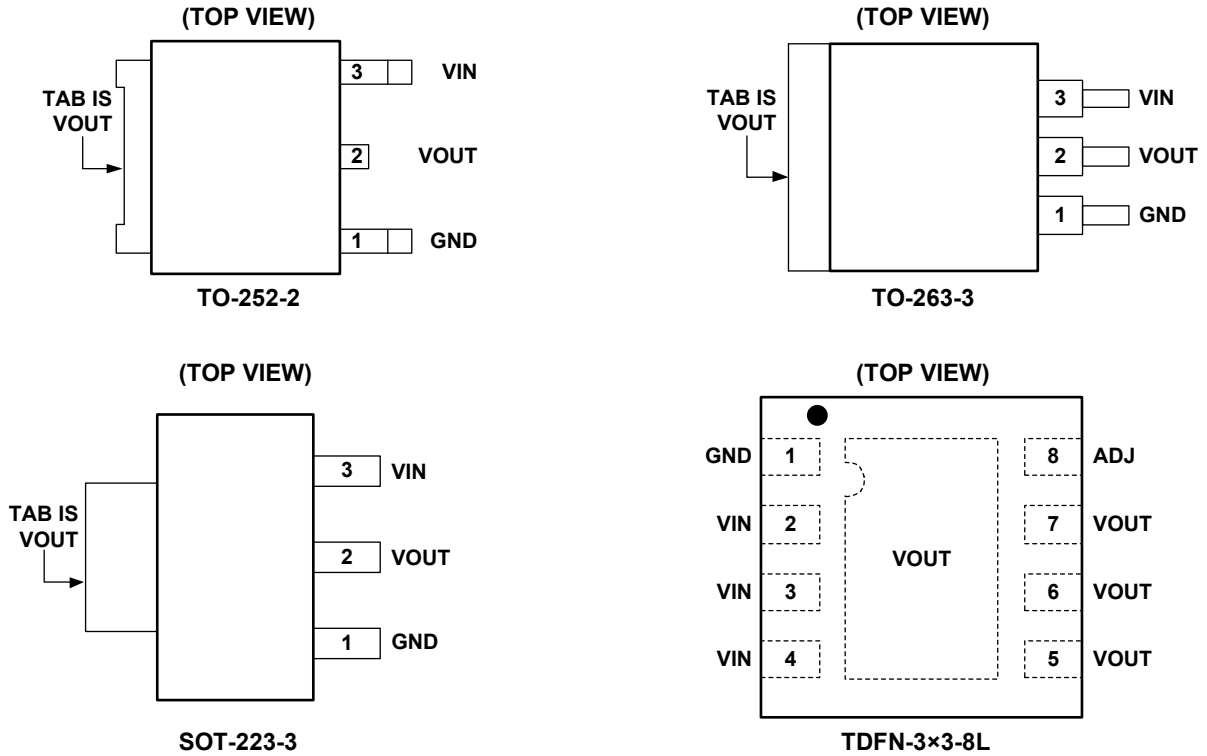
**ESD SENSITIVITY CAUTION**

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**



**PIN DESCRIPTION**

PIN				NAME	FUNCTION
TO-252-2	TO-263-3	SOT-223-3	TDFN-3x3-8L		
1	1	1	1	GND	Ground.
2	2	2	5, 6, 7	VOUT	Regulator Output Pin. It is recommended to use an output capacitor with effective capacitance in the range of 1μF to 10μF. Pins 5, 6 and 7 must be connected together for TDFN-3x3-8L package.
3	3	3	2, 3, 4	VIN	Input Voltage Supply Pin. Pins 2, 3 and 4 must be connected together for TDFN-3x3-8L package.
-	-	-	8	ADJ	Feedback Input Pin (adjustable voltage version only). Connect this pin to the external resistor divider to adjust the output voltage. Place the resistors as close as possible to this pin.
TAB	TAB	TAB	Exposed Pad	VOUT	Exposed Pad. Connected to VOUT pin.

**ELECTRICAL CHARACTERISTICS**

(V<sub>IN</sub> = V<sub>OUT(NOM)</sub> + 1V, C<sub>IN</sub> = C<sub>OUT</sub> = 2.2μF, T<sub>J</sub> = -40°C to +125°C, typical values are at T<sub>J</sub> = +25°C, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNITS				
Input Voltage	V <sub>IN</sub>			2.7		20	V				
Reference Voltage	V <sub>FB</sub>	SGM2212-ADJ	I <sub>OUT</sub> = 10mA, T <sub>J</sub> = +25°C	1.238	1.25	1.262	V				
			I <sub>OUT</sub> = 0 to 800mA	1.232		1.268					
Output Voltage	V <sub>OUT</sub>	SGM2212-1.8	I <sub>OUT</sub> = 10mA, T <sub>J</sub> = +25°C	1.782	1.8	1.818	V				
			I <sub>OUT</sub> = 0 to 800mA	1.773		1.827					
		SGM2212-2.5	I <sub>OUT</sub> = 10mA, T <sub>J</sub> = +25°C	2.475	2.5	2.525					
			I <sub>OUT</sub> = 0 to 800mA	2.463		2.537					
		SGM2212-2.8	I <sub>OUT</sub> = 10mA, T <sub>J</sub> = +25°C	2.772	2.8	2.828					
			I <sub>OUT</sub> = 0 to 800mA	2.758		2.842					
		SGM2212-3.3	I <sub>OUT</sub> = 10mA, T <sub>J</sub> = +25°C	3.267	3.3	3.333					
			I <sub>OUT</sub> = 0 to 800mA	3.251		3.349					
		SGM2212-5.0	I <sub>OUT</sub> = 10mA, T <sub>J</sub> = +25°C	4.950	5.0	5.050					
			I <sub>OUT</sub> = 0 to 800mA	4.925		5.075					
		Line Regulation	$\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$	I <sub>OUT</sub> = 10mA	SGM2212-ADJ, T <sub>J</sub> = +25°C			0.001	0.007	%V	
					SGM2212-ADJ				0.012		
$\Delta V_{OUT}$	I <sub>OUT</sub> = 0mA		SGM2212-1.8, T <sub>J</sub> = +25°C		0.2	1.5	mV				
			SGM2212-1.8			2.5					
			SGM2212-2.5, T <sub>J</sub> = +25°C		0.2	1.5					
			SGM2212-2.5			2.5					
			SGM2212-2.8, T <sub>J</sub> = +25°C		0.2	1.5					
			SGM2212-2.8			2.5					
			SGM2212-3.3, T <sub>J</sub> = +25°C		0.2	1.5					
			SGM2212-3.3			2.5					
			SGM2212-5.0, T <sub>J</sub> = +25°C		0.2	1.5					
			SGM2212-5.0			2.5					
			Load Regulation	$\frac{\Delta V_{OUT}}{V_{OUT}}$	I <sub>OUT</sub> = 0 to 800mA	SGM2212-ADJ, T <sub>J</sub> = +25°C			0.08	0.32	%
						SGM2212-ADJ				0.4	
$\Delta V_{OUT}$	I <sub>OUT</sub> = 0 to 800mA	SGM2212-1.8, T <sub>J</sub> = +25°C			1	4	mV				
		SGM2212-1.8				5					
		SGM2212-2.5, T <sub>J</sub> = +25°C			1.2	6					
		SGM2212-2.5				7					
		SGM2212-2.8, T <sub>J</sub> = +25°C			1.5	6					
		SGM2212-2.8				8					
		SGM2212-3.3, T <sub>J</sub> = +25°C			2	8					
		SGM2212-3.3				10					
SGM2212-5.0, T <sub>J</sub> = +25°C		2	8								
SGM2212-5.0			10								

# 800mA, Low Noise, Low Quiescent Current, High PSRR, Low Dropout Linear Regulator

**SGM2212**

## ELECTRICAL CHARACTERISTICS (continued)

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

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Dropout Voltage <sup>(1)</sup> (ADJ, $V_{OUT} = 3.3V$ )	$V_{DROP}$	$I_{OUT} = 100mA$ , $T_J = +25^\circ C$		35	45	mV
		$I_{OUT} = 100mA$			55	
		$I_{OUT} = 500mA$ , $T_J = +25^\circ C$		170	210	mV
		$I_{OUT} = 500mA$			275	
		$I_{OUT} = 800mA$ , $T_J = +25^\circ C$		280	350	mV
		$I_{OUT} = 800mA$			450	
Dropout Voltage <sup>(1)</sup> ( $V_{OUT} = 3.3V$ )	$V_{DROP}$	$I_{OUT} = 100mA$ , $T_J = +25^\circ C$		50	60	mV
		$I_{OUT} = 100mA$			80	
		$I_{OUT} = 500mA$ , $T_J = +25^\circ C$		240	280	mV
		$I_{OUT} = 500mA$			380	
		$I_{OUT} = 800mA$ , $T_J = +25^\circ C$		390	450	mV
		$I_{OUT} = 800mA$			610	
Output Current Limit	$I_{LIMIT}$	$V_{OUT} = 80\% \times V_{OUT(NOM)}$ <sup>(2)</sup>	810	1100		mA
Short Current Limit	$I_{SHORT}$	$V_{IN} = 3V$ , $V_{OUT} = 0V$		360		mA
Ground Pin Current	$I_{GND}$	$I_{OUT} = 0mA$ , $T_J = +25^\circ C$		80	110	$\mu A$
		$I_{OUT} = 0mA$			116	
		$I_{OUT} = 100mA$ , $T_J = +25^\circ C$		290	360	$\mu A$
		$I_{OUT} = 100mA$			370	
		$I_{OUT} = 800mA$ , $T_J = +25^\circ C$		1350	1560	$\mu A$
		$I_{OUT} = 800mA$			1610	
Power Supply Rejection Ratio	PSRR	$f_{RIPPLE} = 120Hz$ , $V_{RIPPLE} = \Delta 0.2V_{P-P}$		80		dB
ADJ Pin Current	$I_{ADJ}$	$T_J = +25^\circ C$		1	5	nA
					10	
Long Term Stability		1000Hrs, $T_J = +125^\circ C$		0.1		%
RMS Output Noise		(% of $V_{OUT}$ ), $f = 10Hz$ to $100kHz$ , $I_{OUT} = 50mA$		0.002		%
Thermal Shutdown Temperature	$T_{SHDN}$			165		$^\circ C$
Thermal Shutdown Hysteresis	$\Delta T_{SHDN}$			25		$^\circ C$

**NOTES:**

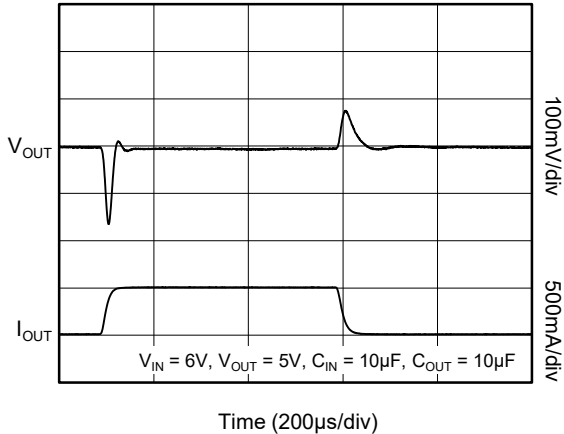
- The dropout voltage is defined as the difference between  $V_{IN}$  and  $V_{OUT}$  when  $V_{OUT}$  falls to  $95\% \times V_{OUT(NOM)}$ .
- $V_{OUT} = 80\% \times V_{OUT(NOM)}$  when  $V_{OUT} \leq 2.8V$ ,  $V_{IN} = V_{OUT} + 1.3V$ .

# SGM2212 800mA, Low Noise, Low Quiescent Current, High PSRR, Low Dropout Linear Regulator

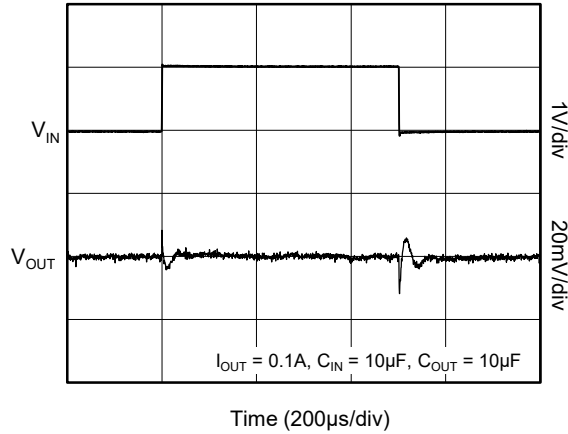
## TYPICAL PERFORMANCE CHARACTERISTICS

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

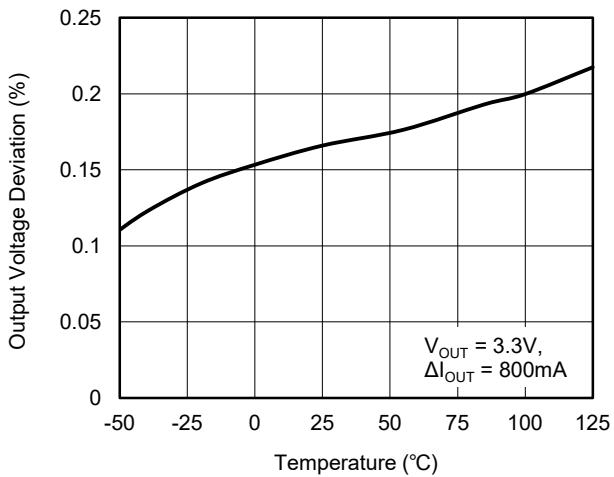
Load Transient Response



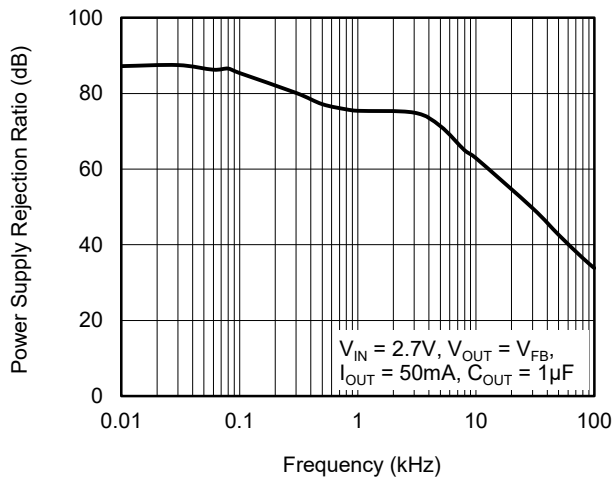
Line Transient Response



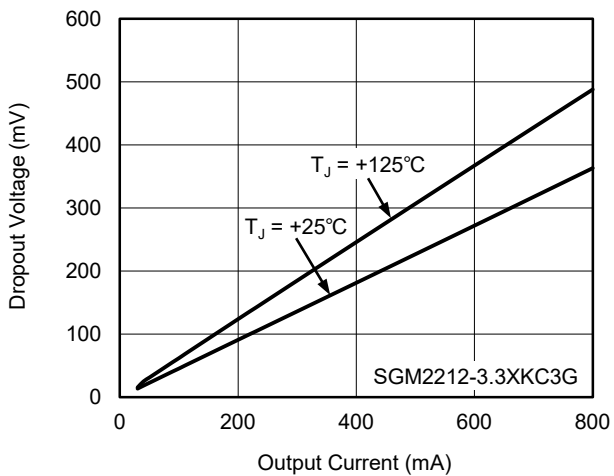
Load Regulation



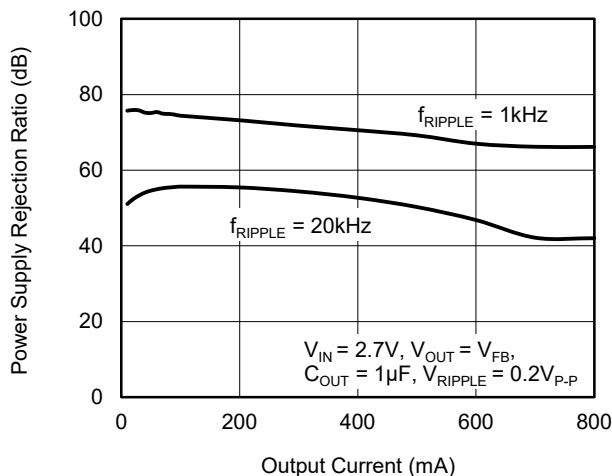
Power Supply Rejection Ratio vs. Frequency



Dropout Voltage vs. Output Current



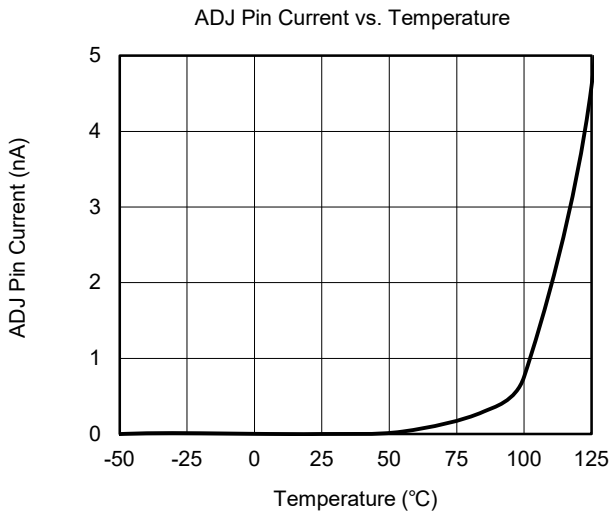
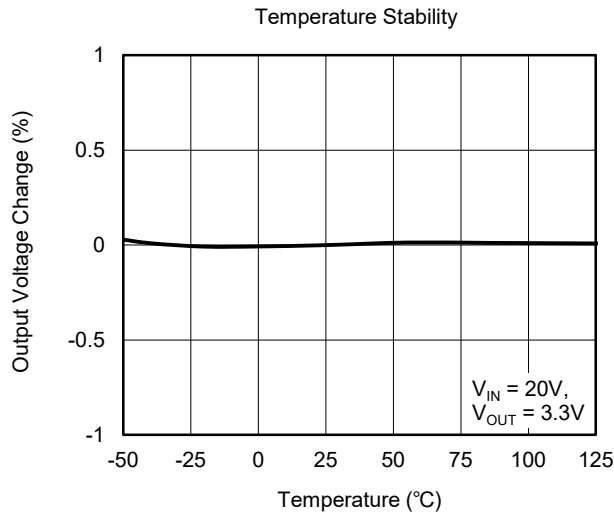
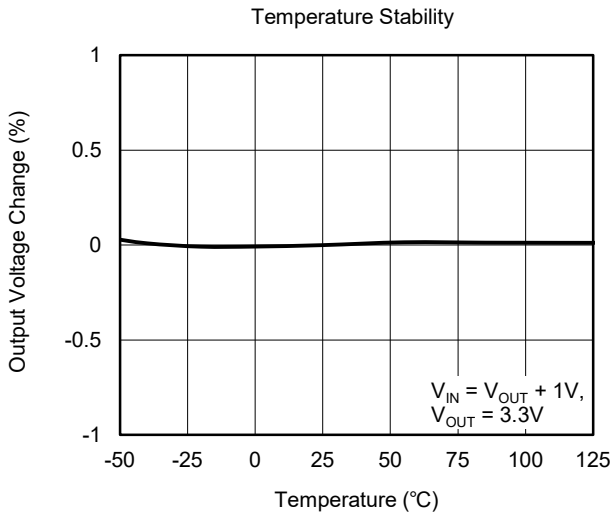
Power Supply Rejection Ratio vs. Output Current



# SGM2212 800mA, Low Noise, Low Quiescent Current, High PSRR, Low Dropout Linear Regulator

## TYPICAL PERFORMANCE CHARACTERISTICS (continued)

T<sub>J</sub> = +25°C, C<sub>IN</sub> = C<sub>OUT</sub> = 2.2µF, unless otherwise noted.





# SGM2212 800mA, Low Noise, Low Quiescent Current, High PSRR, Low Dropout Linear Regulator

## FUNCTIONAL BLOCK DIAGRAMS

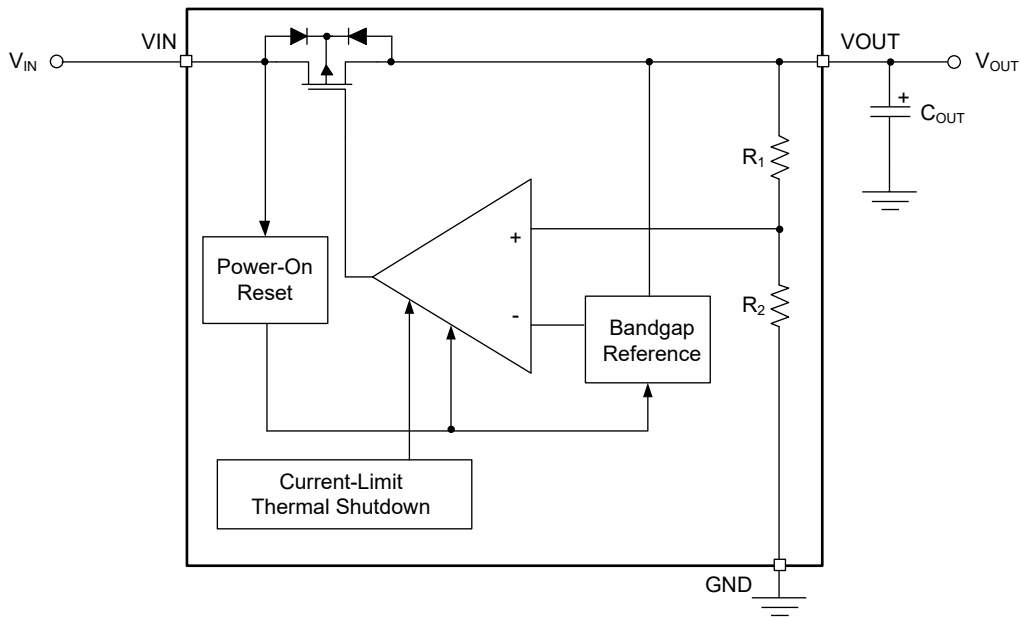


Figure 2. Fixed Output Regulator Block Diagram

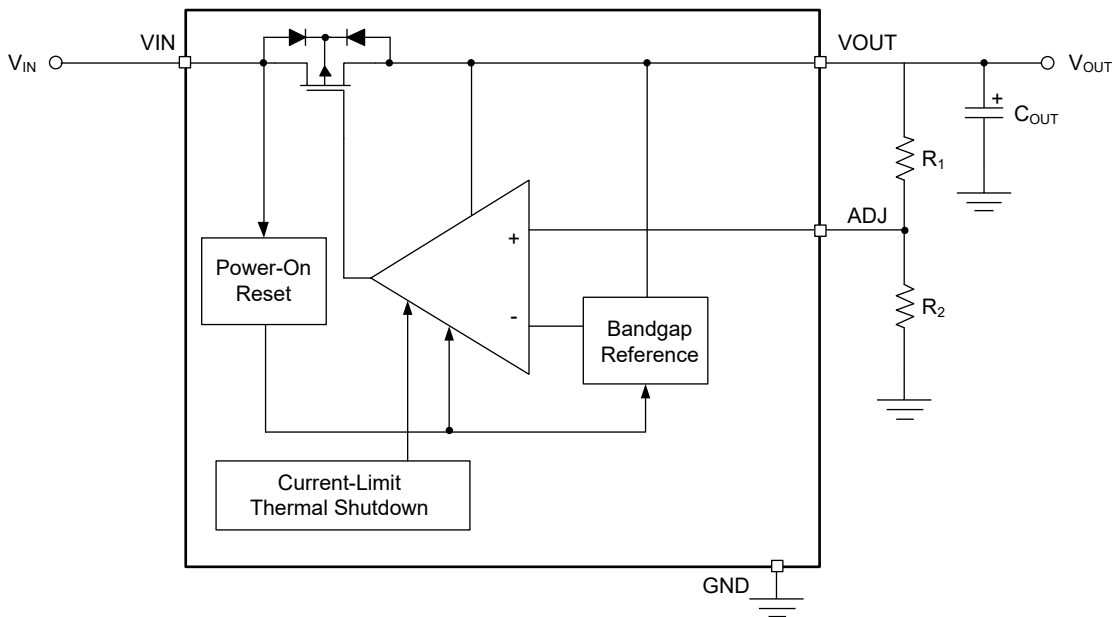


Figure 3. Adjustable Output Regulator Block Diagram

**APPLICATION INFORMATION**

The SGM2212 is a low noise, fast transient response high performance LDO, it consumes only 80µA (TYP) quiescent current and provides 800mA output current. The SGM2212 provides the protection function for output overload, output short-circuit condition and overheating.

The SGM2212 is suitable for application which has noise sensitive circuit such as battery-powered equipment and smartphones.

**Input Capacitor Selection (C<sub>IN</sub>)**

The input decoupling capacitor is necessary to be connected as close as possible to the VIN pin for ensuring the device stability. 2.2µF or greater X7R or X5R ceramic capacitor is selected to get good dynamic performance.

When V<sub>IN</sub> is required to provide large current instantaneously, a large effective input capacitor is required. Multiple input capacitors can limit the input tracking inductance. Adding more input capacitors is available to restrict the ringing and to keep it below the device absolute maximum ratings.

**Output Capacitor Selection (C<sub>OUT</sub>)**

The output decoupling capacitor should be located as close as possible to the VOUT pin. A 2.2µF or greater X7R or X5R ceramic capacitor is selected to get good dynamic performance. The minimum effective capacitance of C<sub>OUT</sub> that SGM2212 can remain stable is 1µF. For ceramic capacitor, temperature, DC bias and package size will change the effective capacitance, so enough margin of C<sub>OUT</sub> must be considered in design. Larger capacitance and lower ESR C<sub>OUT</sub> will help improve the load transient response and increase the high frequency PSRR.

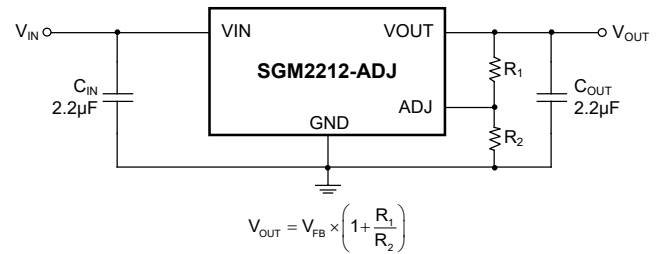
**Adjustable Regulator**

The output voltage of the SGM2212 can be adjusted from 1.25V to 15V. The ADJ pin will be connected with two external resistors as shown in Figure 4, the output voltage is determined by the following equation:

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

where:

V<sub>OUT</sub> is output voltage and V<sub>FB</sub> is the internal voltage reference, V<sub>FB</sub> = 1.25V.



**Figure 4. Adjustable Output Voltage Application**

R<sub>1</sub> and R<sub>2</sub> can be calculated for any output voltage range using Equation 1. Choose R<sub>2</sub> = 10kΩ to maintain an 125µA minimum load.

**Output Current Limit and Short-Circuit Protection**

When overload events happen, the output current is internally limited to 1100mA (TYP). When the OUT pin is shorted to ground, the short-circuit protection will limit the output current to 360mA (TYP).

**Power Dissipation (P<sub>D</sub>)**

Thermal protection limits power dissipation in the SGM2212. When power dissipation on pass element (P<sub>D</sub> = (V<sub>IN</sub> - V<sub>OUT</sub>) × I<sub>OUT</sub>) is too much that raise the operation junction temperature exceeds +165°C, the OTP circuit starts the thermal shutdown function and turns the pass element off.

Therefore, thermal analysis for the chosen application is important to guarantee reliable performance over all conditions. To guarantee reliable operation, the junction temperature of the SGM2212 must not exceed +125°C.

In order to calculate the maximum power that the device can dissipate, the following formula is used:

$$P_{D(MAX)} = (125^\circ\text{C} - T_A) / \theta_{JA} \tag{2}$$

where T<sub>A</sub> is the ambient temperature, and θ<sub>JA</sub> is the junction-to-ambient thermal resistance.

**APPLICATION INFORMATION (continued)**

**Thermal Shutdown**

The SGM2212 can detect the temperature of die. When the die temperature exceeds the threshold value of thermal shutdown, the SGM2212 will be in shutdown state and remain in this state until the die temperature decreases to +140°C.

**Input Power Supply**

The input power supply range is from 2.7V to 20V.  $V_{IN}$  must be larger than  $(V_{OUT} + V_{DROP})$  in application. The input ceramic capacitor must be placed as close as possible to the IN pin, this  $C_{IN}$  can help improve the output noise performance of LDO.

**Layout Guidelines**

To get good PSRR, low output noise and high transient response performance, the input and output bypass capacitors must be placed as close as possible to the VIN pin and VOUT pin separately.  $V_{IN}$  and  $V_{OUT}$  had better use separate ground planes and these ground planes are single point connected to the GND pin.

**REVISION HISTORY**

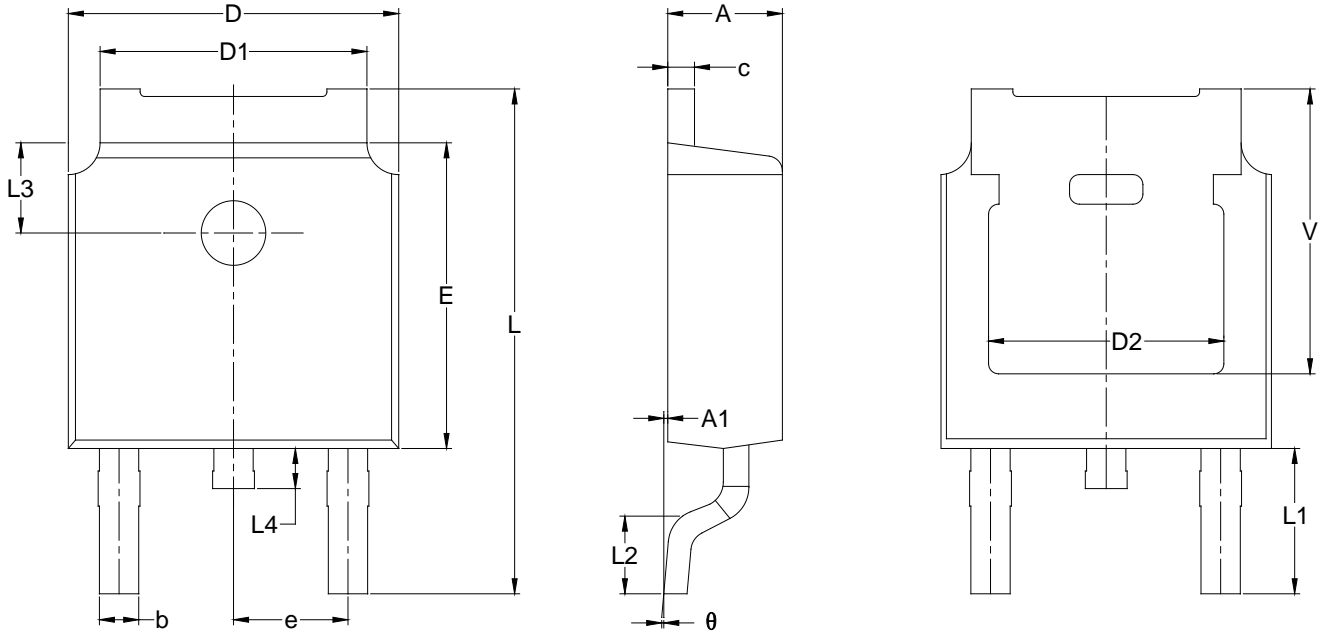
NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

<b>FEBRUARY 2022 – REV.A to REV.A.1</b>	<b>Page</b>
Updated Electrical Characteristics section .....	6
<b>Changes from Original (DECEMBER 2019) to REV.A</b> .....	<b>Page</b>
Changed from product preview to production data .....	All

# PACKAGE INFORMATION

## PACKAGE OUTLINE DIMENSIONS

### TO-252-2



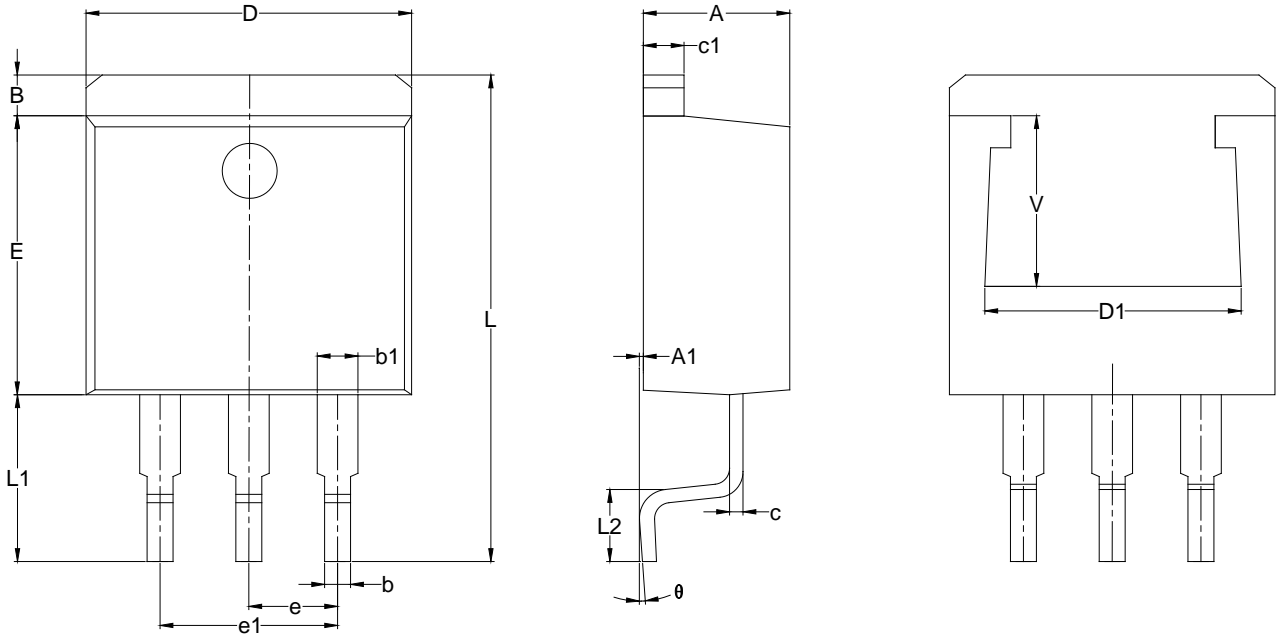
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	2.200	2.400	0.087	0.094
A1	0.000	0.127	0.000	0.005
b	0.660	0.860	0.026	0.034
c	0.460	0.580	0.018	0.023
D	6.500	6.700	0.256	0.264
D1	5.100	5.460	0.201	0.215
D2	4.830 REF		0.190 REF	
E	6.000	6.200	0.236	0.244
e	2.186	2.386	0.086	0.094
L	9.800	10.400	0.386	0.409
L1	2.900 REF		0.114 REF	
L2	1.400	1.700	0.055	0.067
L3	1.600 REF		0.063 REF	
L4	0.600	1.000	0.024	0.039
θ	0°	8°	0°	8°
V	5.350 REF		0.211 REF	

**NOTES:**

1. Body dimensions do not include mode flash or protrusion.
2. This drawing is subject to change without notice.

PACKAGE OUTLINE DIMENSIONS

TO-263-3



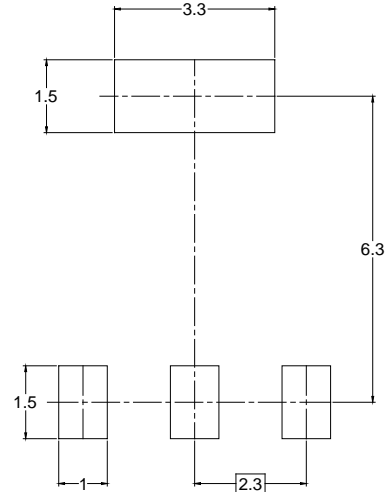
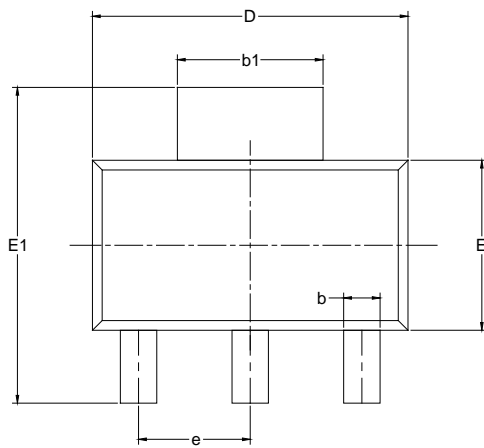
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	4.470	4.670	0.176	0.184
A1	0.000	0.150	0.000	0.006
B	1.120	1.420	0.044	0.056
b	0.710	0.910	0.028	0.036
b1	1.170	1.370	0.046	0.054
c	0.310	0.530	0.012	0.021
c1	1.170	1.370	0.046	0.054
D	10.010	10.310	0.394	0.406
E	8.500	8.900	0.335	0.350
e	2.540 TYP		0.100 TYP	
e1	4.980	5.180	0.196	0.204
L	14.940	15.500	0.588	0.610
L1	4.950	5.450	0.195	0.215
L2	2.340	2.740	0.092	0.108
θ	0°	8°	0°	8°
D1	7.510	8.510	0.296	0.335
V	4.800	5.800	0.189	0.228

- NOTES:  
 1. Body dimensions do not include mode flash or protrusion.  
 2. This drawing is subject to change without notice.

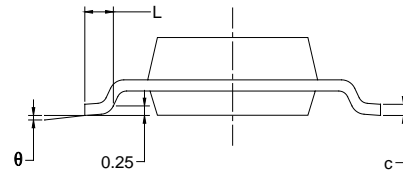
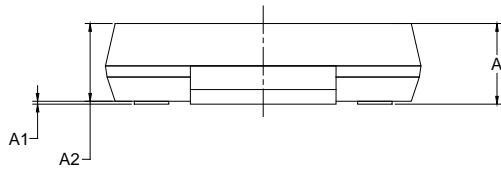
# PACKAGE INFORMATION

## 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°

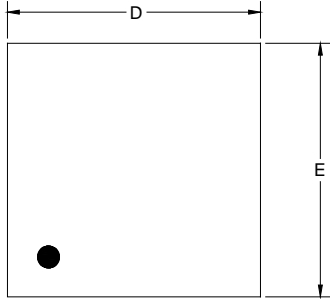
**NOTES:**

1. Body dimensions do not include mode flash or protrusion.
2. This drawing is subject to change without notice.

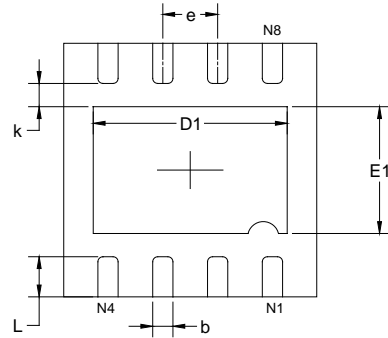
# PACKAGE INFORMATION

## PACKAGE OUTLINE DIMENSIONS

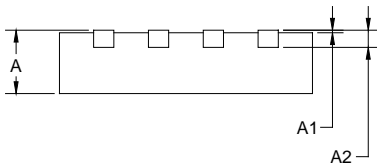
### TDFN-3x3-8L



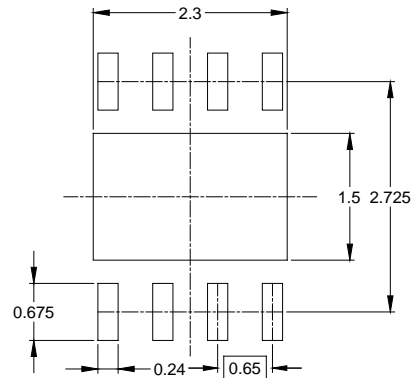
TOP VIEW



BOTTOM VIEW



SIDE VIEW



RECOMMENDED LAND PATTERN (Unit: mm)

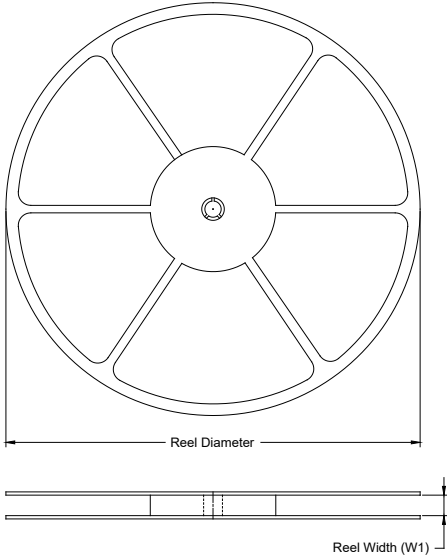
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.700	0.800	0.028	0.031
A1	0.000	0.050	0.000	0.002
A2	0.203 REF		0.008 REF	
D	2.900	3.100	0.114	0.122
D1	2.200	2.400	0.087	0.094
E	2.900	3.100	0.114	0.122
E1	1.400	1.600	0.055	0.063
k	0.200 MIN		0.008 MIN	
b	0.180	0.300	0.007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

NOTE: This drawing is subject to change without notice.

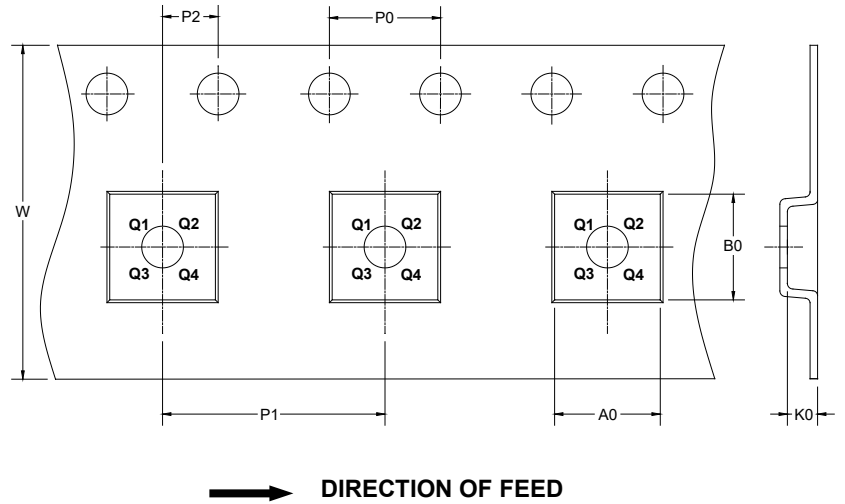
# PACKAGE INFORMATION

## 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
TO-252-2	13"	16.4	6.90	10.50	2.70	4.0	8.0	2.0	16.0	
TO-263-3	13"	24.4	10.80	16.13	4.70	4.0	16.0	2.0	24.0	
SOT-223-3	13"	12.4	6.55	7.25	1.90	4.0	8.0	2.0	12.0	Q3
TDFN-3×3-8L	13"	12.4	3.35	3.35	1.13	4.0	8.0	2.0	12.0	Q1

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
13"	386	280	370	5

DD0002