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 1.2V, 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℃ to +125℃.

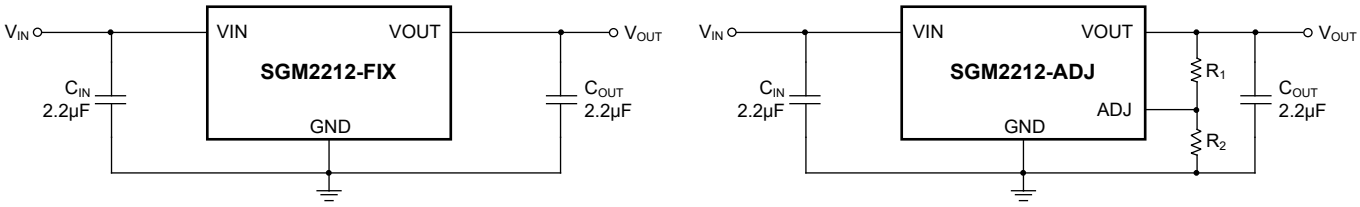
FEATURES

- **Input Voltage Range: 2.7V to 20V**
- **Output Current: 800mA**
- **Fixed Outputs of 1.2V, 1.8V, 2.5V, 2.8V, 3.3V, 5V**
- **Adjustable Output Voltage Range: 1.25V to 15V**
- **Output Voltage Accuracy: ±1% at +25℃**
- **Line Regulation: 0.012% (MAX)**
- **Load Regulation: 0.4% (MAX)**
- **Stable with Small Case Size Ceramic Capacitors**
- **Output Current Limit**
- **Thermal Shutdown Protection**
- **-40℃ to +125℃ 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

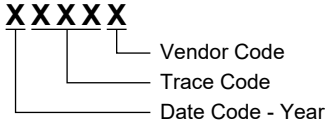
PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM2212-1.8	TO-252-2	-40℃ to +125℃	SGM2212-1.8XOB2G/TR	SGMCFB XOB2 XXXXX	Tape and Reel, 2500
SGM2212-2.5	TO-252-2	-40℃ to +125℃	SGM2212-2.5XOB2G/TR	SGMCFC XOB2 XXXXX	Tape and Reel, 2500
SGM2212-2.8	TO-252-2	-40℃ to +125℃	SGM2212-2.8XOB2G/TR	SGMCFD XOB2 XXXXX	Tape and Reel, 2500
SGM2212-3.3	TO-252-2	-40℃ to +125℃	SGM2212-3.3XOB2G/TR	SGMCFE XOB2 XXXXX	Tape and Reel, 2500
SGM2212-5.0	TO-252-2	-40℃ to +125℃	SGM2212-5.0XOB2G/TR	SGMCFF XOB2 XXXXX	Tape and Reel, 2500
SGM2212-1.8	TO-263-3	-40℃ to +125℃	SGM2212-1.8XOA3G/TR	SGMCF6 XOA3 XXXXX	Tape and Reel, 800
SGM2212-2.5	TO-263-3	-40℃ to +125℃	SGM2212-2.5XOA3G/TR	SGMCF7 XOA3 XXXXX	Tape and Reel, 800
SGM2212-2.8	TO-263-3	-40℃ to +125℃	SGM2212-2.8XOA3G/TR	SGMCF8 XOA3 XXXXX	Tape and Reel, 800
SGM2212-3.3	TO-263-3	-40℃ to +125℃	SGM2212-3.3XOA3G/TR	SGMCF9 XOA3 XXXXX	Tape and Reel, 800
SGM2212-5.0	TO-263-3	-40℃ to +125℃	SGM2212-5.0XOA3G/TR	SGMCFA XOA3 XXXXX	Tape and Reel, 800
SGM2212-1.2	SOT-223-3	-40℃ to +125℃	SGM2212-1.2XKC3G/TR	0CI XXXXX	Tape and Reel, 2500
SGM2212-1.8	SOT-223-3	-40℃ to +125℃	SGM2212-1.8XKC3G/TR	CAD XXXXX	Tape and Reel, 2500
SGM2212-2.5	SOT-223-3	-40℃ to +125℃	SGM2212-2.5XKC3G/TR	CAE XXXXX	Tape and Reel, 2500
SGM2212-2.8	SOT-223-3	-40℃ to +125℃	SGM2212-2.8XKC3G/TR	CAF XXXXX	Tape and Reel, 2500
SGM2212-3.3	SOT-223-3	-40℃ to +125℃	SGM2212-3.3XKC3G/TR	MN4 XXXXX	Tape and Reel, 2500
SGM2212-5.0	SOT-223-3	-40℃ to +125℃	SGM2212-5.0XKC3G/TR	MN5 XXXXX	Tape and Reel, 2500
SGM2212-ADJ	TDFN-3×3-8L	-40℃ to +125℃	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



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, θ_{JA} ..... 56℃/W
TO-252-2, θ_{JB} ..... 30℃/W
TO-252-2, θ_{JC} ..... 63℃/W
TO-263-3, θ_{JA} ..... 51℃/W
TO-263-3, θ_{JB} ..... 28℃/W
TO-263-3, θ_{JC} ..... 53℃/W
SOT-223-3, θ_{JA} ..... 117℃/W
SOT-223-3, θ_{JB} ..... 29℃/W
SOT-223-3, θ_{JC} ..... 62℃/W
TDFN-3×3-8L, θ_{JA} ..... 82℃/W
TDFN-3×3-8L, θ_{JB} ..... 42℃/W
TDFN-3×3-8L, θ_{JC} ..... 54℃/W
Junction Temperature ..... +150℃
Storage Temperature Range ..... -65℃ to +150℃
Lead Temperature (Soldering, 10s) ..... +260℃
ESD Susceptibility
HBM 7000V
CDM 1000V

RECOMMENDED OPERATING CONDITIONS

Input Voltage Range ..... 2.7V to 20V
Input Effective Capacitance, C_{IN} ..... 1μF (MIN)
Output Effective Capacitance, C_{OUT} ..... 1μF to 10μF
Operating Junction Temperature Range ..... -40℃ to +125℃

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

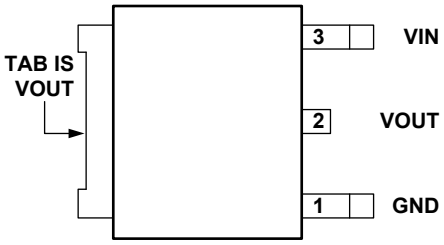
This integrated circuit can be damaged if ESD protections are not considered carefully. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance 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.

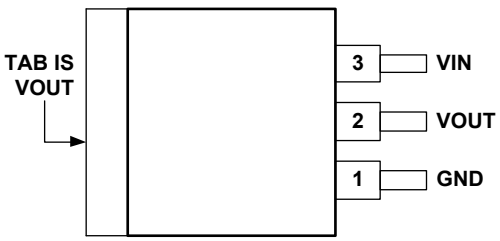
PIN CONFIGURATIONS

(TOP VIEW)



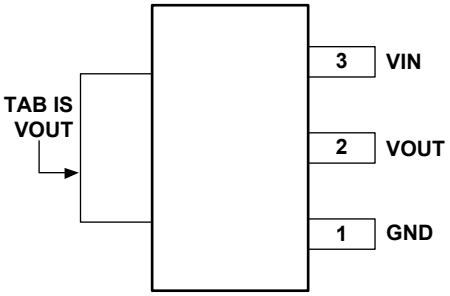
TO-252-2

(TOP VIEW)



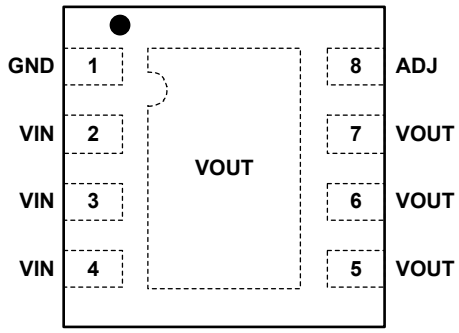
TO-263-3

(TOP VIEW)



SOT-223-3

(TOP VIEW)



TDFN-3×3-8L

PIN DESCRIPTION

PIN				NAME	FUNCTION
TO-252-2	TO-263-3	SOT-223-3	TDFN-3×3-8L		
1	1	1	1	GND	Ground.
2	2	2	5, 6, 7	VOUT	Regulator Output Pin. It is recommended to use a ceramic capacitor with effective capacitance in the range of 1μF to 10μF to ensure stability. Pins 5, 6 and 7 must be connected together for TDFN-3×3-8L package.
3	3	3	2, 3, 4	VIN	Input Voltage Supply Pin. Pins 2, 3 and 4 must be connected together for TDFN-3×3-8L package.
–	–	–	8	ADJ	Feedback Input Pin (adjustable voltage version only). Connect this pin to the midpoint of an 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_{IN} = $V_{OUT(NOM)}$ + 1V, C_{IN} = C_{OUT} = 2.2μF, T_J = -40℃ to +125℃, typical values are at T_J = +25℃, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNITS
Input Voltage	V_{IN}			2.7		20	V
Reference Voltage	V_{ADJ}	SGM2212-ADJ	I_{OUT} = 10mA, T_J = +25℃	1.238	1.25	1.262	V
			I_{OUT} = 0 to 800mA	1.232		1.268	
Output Voltage	V_{OUT}	SGM2212-1.2	I_{OUT} = 10mA, T_J = +25℃	1.188	1.2	1.212	V
			I_{OUT} = 0 to 800mA	1.182		1.218	
		SGM2212-1.8	I_{OUT} = 10mA, T_J = +25℃	1.782	1.8	1.818	
			I_{OUT} = 0 to 800mA	1.773		1.827	
		SGM2212-2.5	I_{OUT} = 10mA, T_J = +25℃	2.475	2.5	2.525	
			I_{OUT} = 0 to 800mA	2.463		2.537	
		SGM2212-2.8	I_{OUT} = 10mA, T_J = +25℃	2.772	2.8	2.828	
			I_{OUT} = 0 to 800mA	2.758		2.842	
		SGM2212-3.3	I_{OUT} = 10mA, T_J = +25℃	3.267	3.3	3.333	
			I_{OUT} = 0 to 800mA	3.251		3.349	
		SGM2212-5.0	I_{OUT} = 10mA, T_J = +25℃	4.950	5.0	5.050	
			I_{OUT} = 0 to 800mA	4.925		5.075	
Line Regulation	$\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$	I_{OUT} = 10mA	SGM2212-ADJ, T_J = +25℃		0.001	0.007	%/V
			SGM2212-ADJ			0.012	
	ΔV_{OUT}	I_{OUT} = 0mA	SGM2212-1.8, T_J = +25℃		0.2	1.5	mV
			SGM2212-1.8			2.5	
			SGM2212-2.5, T_J = +25℃		0.2	1.5	
			SGM2212-2.5			2.5	
			SGM2212-2.8, T_J = +25℃		0.2	1.5	
			SGM2212-2.8			2.5	
			SGM2212-3.3, T_J = +25℃		0.2	1.5	
			SGM2212-3.3			2.5	
			SGM2212-5.0, T_J = +25℃		0.2	1.5	
			SGM2212-5.0			2.5	
Load Regulation	$\frac{\Delta V_{OUT}}{V_{OUT}}$	I_{OUT} = 0mA to 800mA	SGM2212-ADJ, T_J = +25℃		0.08	0.32	%
			SGM2212-ADJ			0.4	
	ΔV_{OUT}	I_{OUT} = 0mA to 800mA	SGM2212-1.8, T_J = +25℃		1	4	mV
			SGM2212-1.8			5	
			SGM2212-2.5, T_J = +25℃		1.2	6	
			SGM2212-2.5			7	
			SGM2212-2.8, T_J = +25℃		1.5	6	
			SGM2212-2.8			8	
			SGM2212-3.3, T_J = +25℃		2	8	
			SGM2212-3.3			10	
			SGM2212-5.0, T_J = +25℃		2	8	
			SGM2212-5.0			10	

ELECTRICAL CHARACTERISTICS (continued)

(V_{IN} = $V_{OUT(NOM)}$ + 1V, C_{IN} = C_{OUT} = 2.2μF, T_J = -40℃ to +125℃, typical values are at T_J = +25℃, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Dropout Voltage (1) (ADJ, V_{OUT} = 3.3V)	V_{DROP}	I_{OUT} = 100mA, T_J = +25℃		35	45	mV
		I_{OUT} = 100mA			55	
		I_{OUT} = 500mA, T_J = +25℃		170	210	mV
		I_{OUT} = 500mA			275	
		I_{OUT} = 800mA, T_J = +25℃		280	350	mV
		I_{OUT} = 800mA			450	
Dropout Voltage (1) (V_{OUT} = 3.3V)	V_{DROP}	I_{OUT} = 100mA, T_J = +25℃		50	60	mV
		I_{OUT} = 100mA			80	
		I_{OUT} = 500mA, T_J = +25℃		240	280	mV
		I_{OUT} = 500mA			380	
		I_{OUT} = 800mA, T_J = +25℃		390	450	mV
		I_{OUT} = 800mA			610	
Output Current Limit	I_{LIMIT}	V_{OUT} = 80% × $V_{OUT(NOM)}$ (2)	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℃		80	110	μA
		I_{OUT} = 0mA			116	
		I_{OUT} = 100mA, T_J = +25℃		290	360	μA
		I_{OUT} = 100mA			370	
		I_{OUT} = 800mA, T_J = +25℃		1350	1560	μA
		I_{OUT} = 800mA			1610	
Power Supply Rejection Ratio	PSRR	f_{RIPPLE} = 120Hz, V_{RIPPLE} = Δ0.2V_{P-P}		80		dB
ADJ Pin Current	I_{ADJ}	T_J = +25℃		1	5	nA
					10	
Long Term Stability		1000Hrs, T_J = +125℃		0.1		%
RMS Output Noise		(% of V_{OUT}), f = 10Hz to 100kHz, I_{OUT} = 50mA		0.002		%
Thermal Shutdown Temperature	T_{SHDN}			165		℃
Thermal Shutdown Hysteresis	ΔT_{SHDN}			25		℃

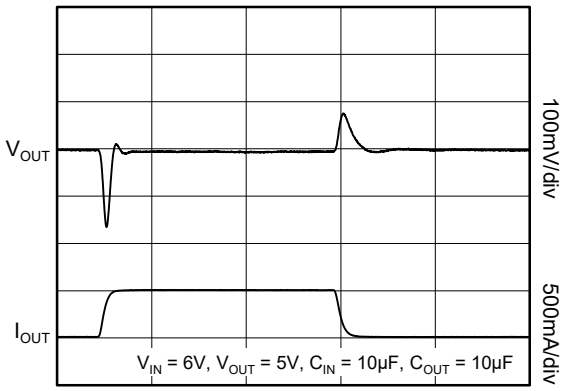
NOTES:

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

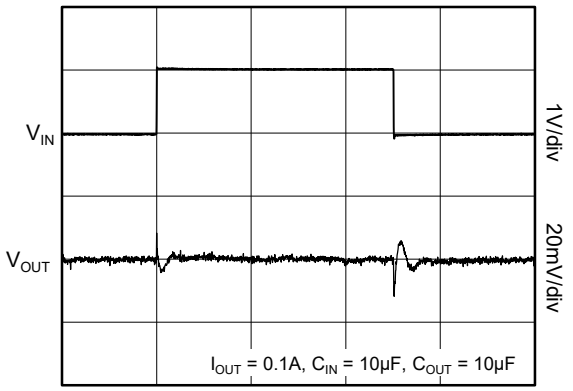
TYPICAL PERFORMANCE CHARACTERISTICS

T_J = +25℃, C_{IN} = C_{OUT} = 2.2μF, unless otherwise noted.

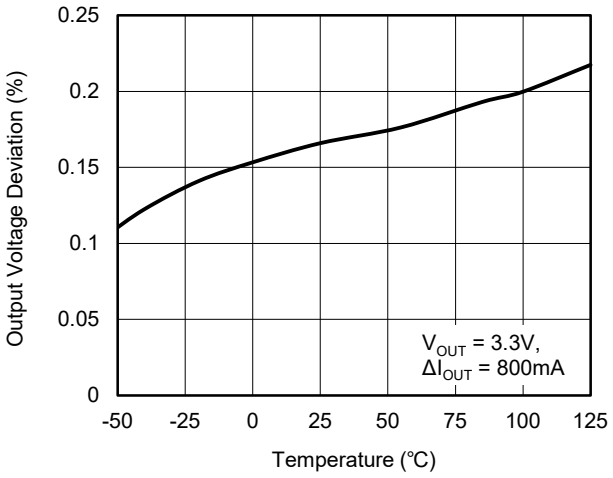
Load Transient Response



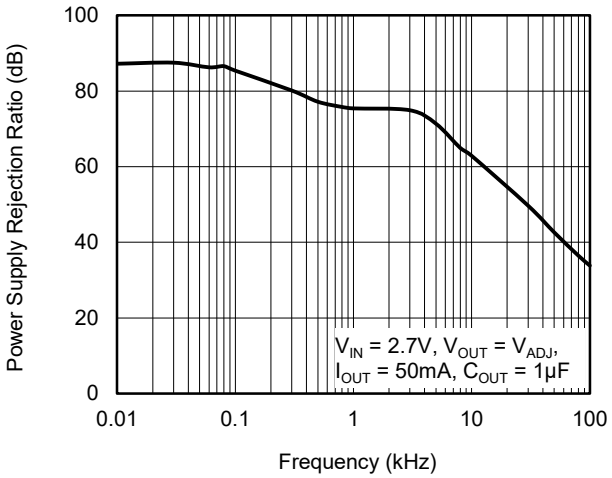
Line Transient Response



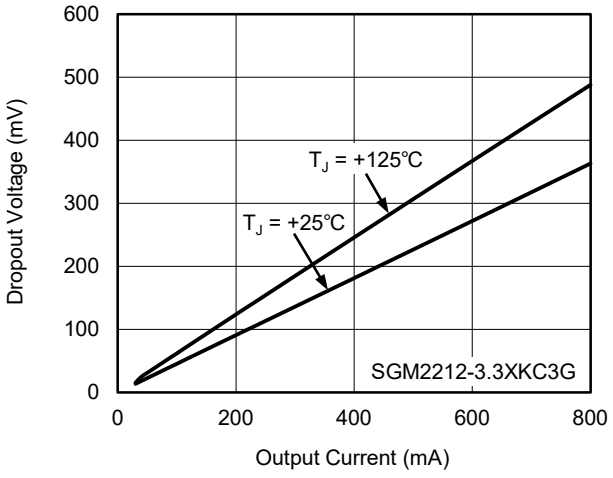
Load Regulation



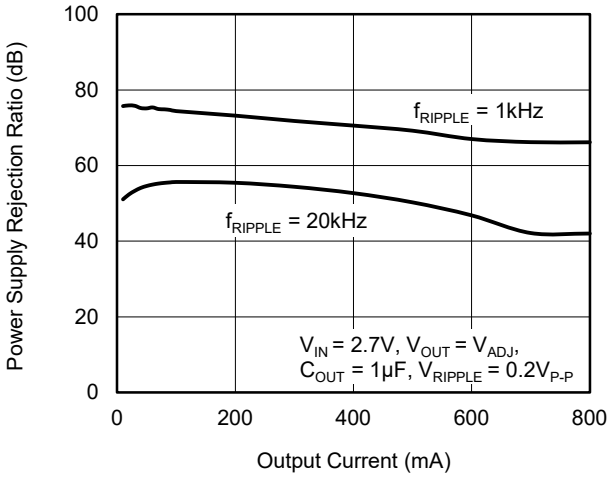
Power Supply Rejection Ratio vs. Frequency



Dropout Voltage vs. Output Current



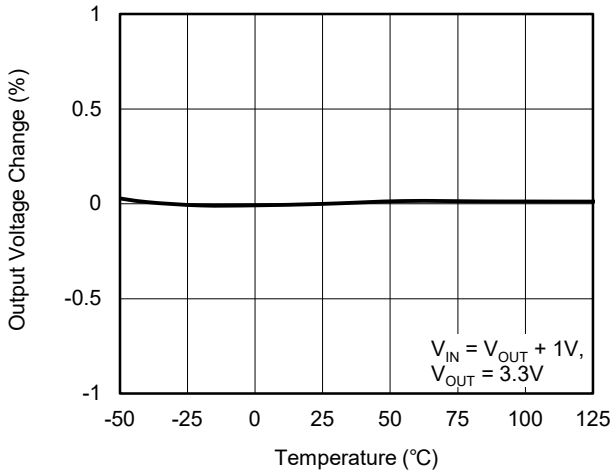
Power Supply Rejection Ratio vs. Output Current



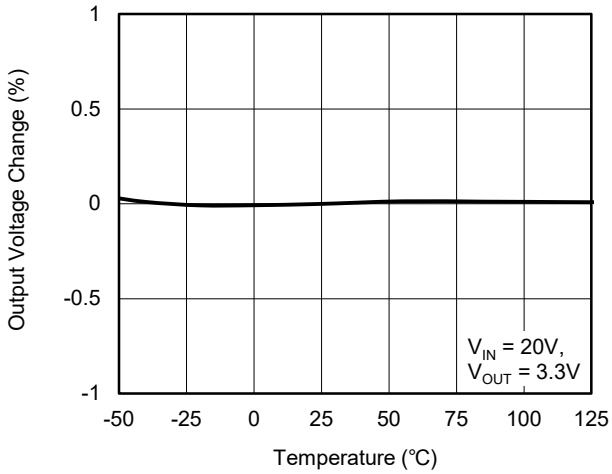
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

T_J = +25℃, C_{IN} = C_{OUT} = 2.2μF, unless otherwise noted.

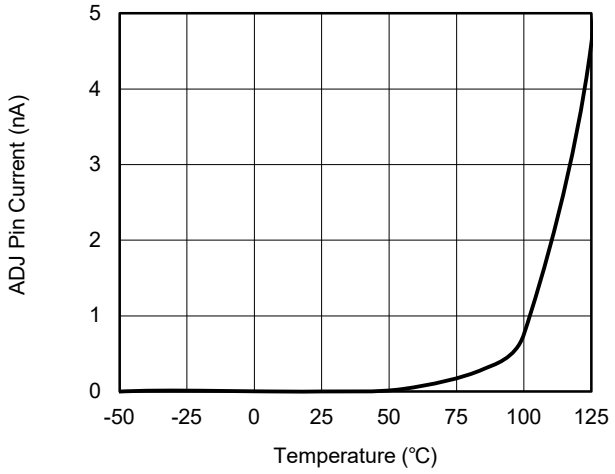
Temperature Stability



Temperature Stability



ADJ Pin Current vs. Temperature



FUNCTIONAL BLOCK DIAGRAMS

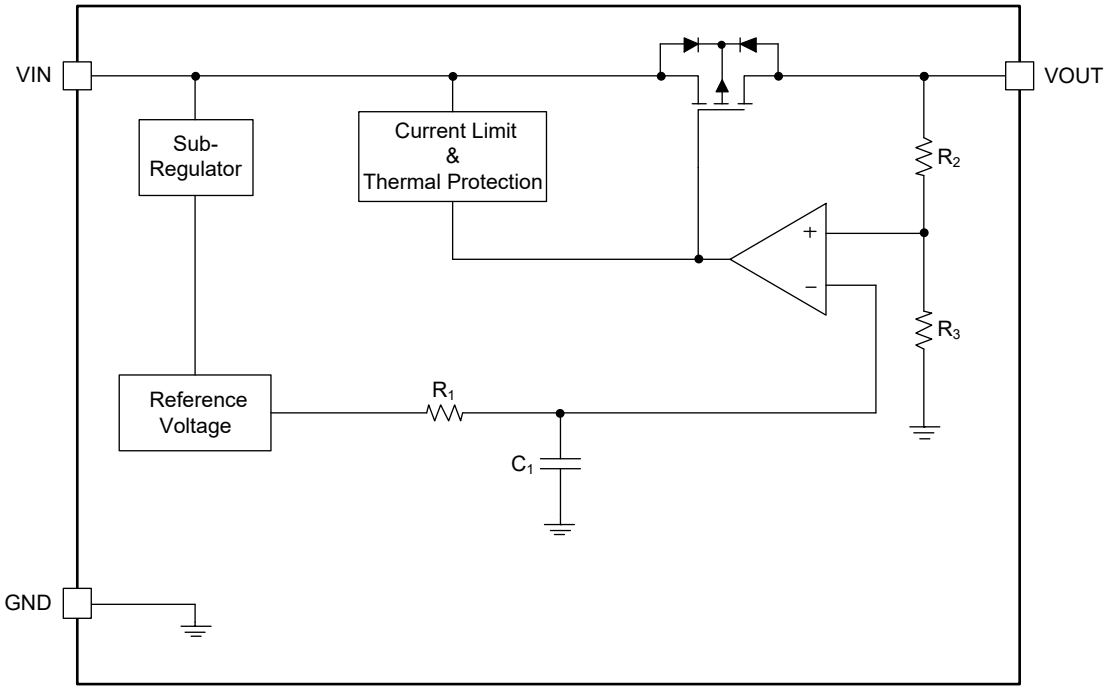


Figure 2. Fixed Output Regulator Block Diagram

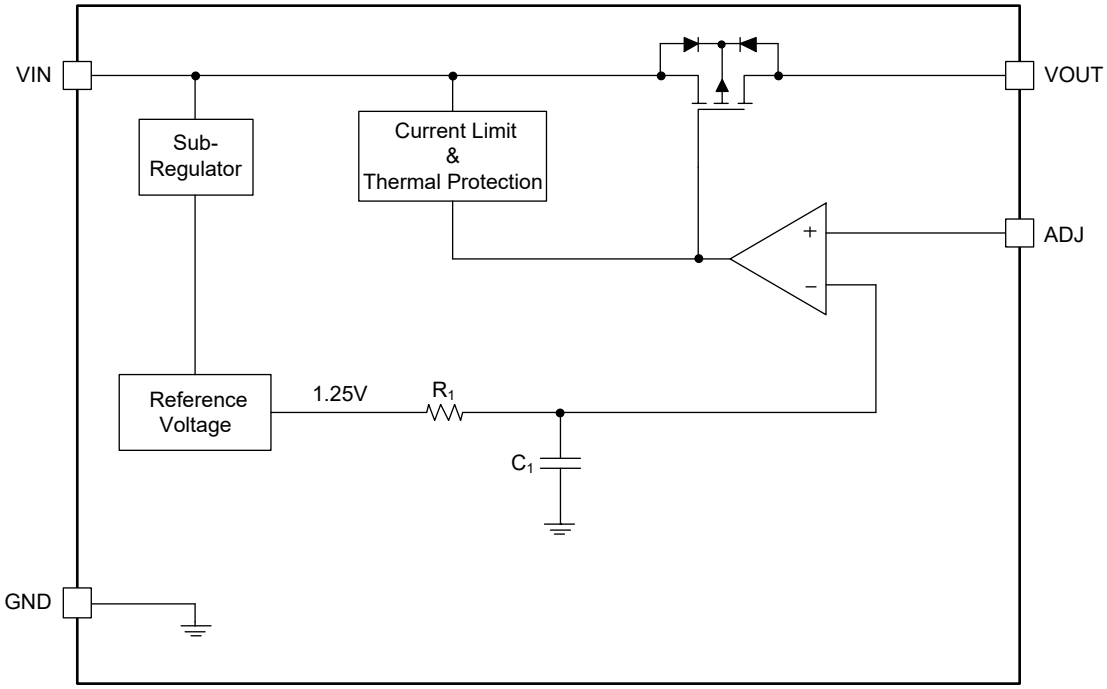


Figure 3. Adjustable Output Regulator Block Diagram

APPLICATION INFORMATION

The SGM2212 is a low noise, low quiescent current, high PSRR, fast transient response and low dropout voltage linear regulator. It consumes only 80μA (TYP) quiescent current and provides 800mA output current. The SGM2212 provides the protection functions for output overload, output short-circuit condition and overheating.

Input Capacitor Selection (C_{IN})

The input decoupling capacitor should be placed 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_{IN} 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_{OUT})

The output capacitor should be placed as close as possible to the VOUT pin. 2.2μF or larger X7R or X5R ceramic capacitor is selected to get good dynamic performance. The minimum effective capacitance of C_{OUT} 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_{OUT} must be considered in design. Additionally, C_{OUT} with larger capacitance and lower ESR will help increase the high frequency PSRR and improve the load transient response.

Adjustable Regulator

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

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

where:

V_{OUT} is output voltage and V_{ADJ} is the internal voltage reference, V_{ADJ} = 1.25V.

R_1 and R_2 can be calculated for any output voltage range using equation 1. Choose R_2 = 10kΩ to maintain a 125μA minimum load.

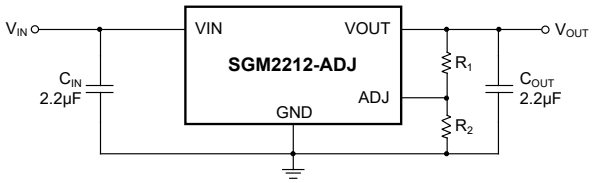


Figure 4. Adjustable Output Voltage Application

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.

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).

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℃.

Power Dissipation (P_D)

Power dissipation (P_D) of the SGM2212 can be calculated by the equation $P_D = (V_{IN} - V_{OUT}) \times I_{OUT}$. The maximum allowable power dissipation ($P_{D(MAX)}$) of the SGM2212 is affected by many factors, including the difference between junction temperature and ambient temperature ($T_{J(MAX)} - T_A$), package thermal resistance from the junction to the ambient environment (θ_{JA}), the rate of ambient airflow and PCB layout. $P_{D(MAX)}$ can be approximated by the following equation:

$$P_{D(MAX)} = (T_{J(MAX)} - T_A)/\theta_{JA} \quad (2)$$

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.

REVISION HISTORY

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

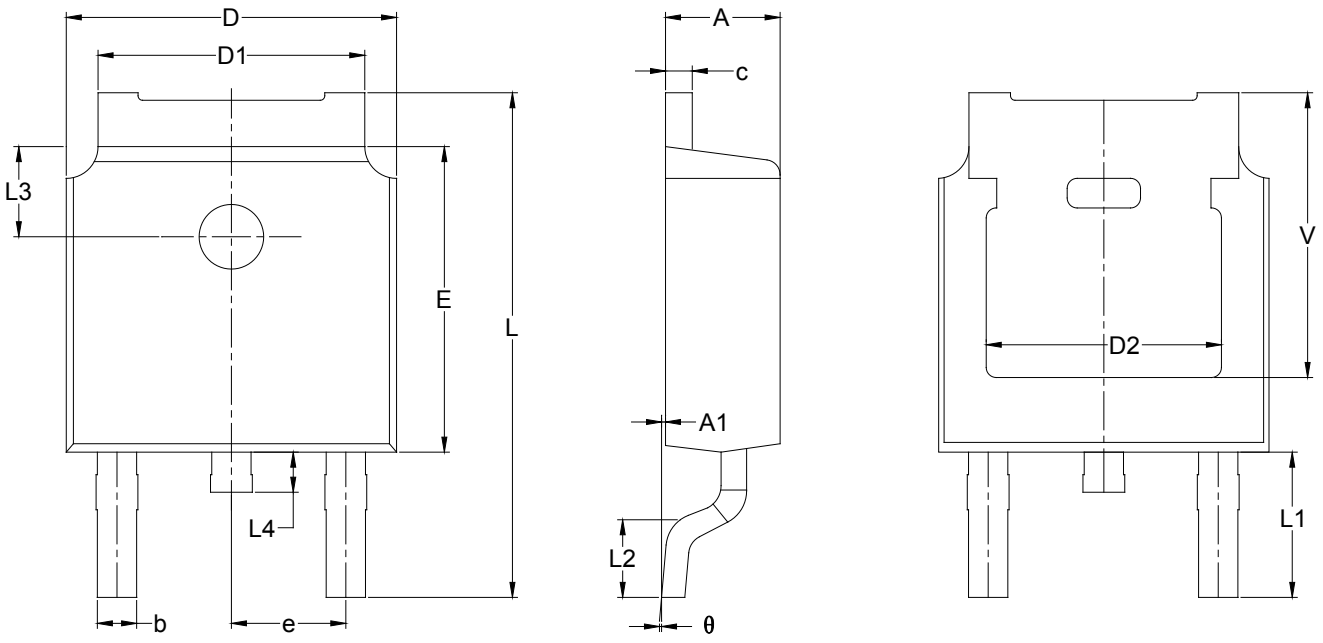
JULY 2023 – REV.A.1 to REV.A.2	Page
Added SGM2212-1.2XKC3G/TR to Package/Ordering Information section	2
Updated Electrical Characteristics section	5

FEBRUARY 2022 – REV.A to REV.A.1	Page
Updated Electrical Characteristics section	6

Changes from Original (DECEMBER 2019) to REV.A	Page
Changed from product preview to production data	All

PACKAGE OUTLINE DIMENSIONS

TO-252-2

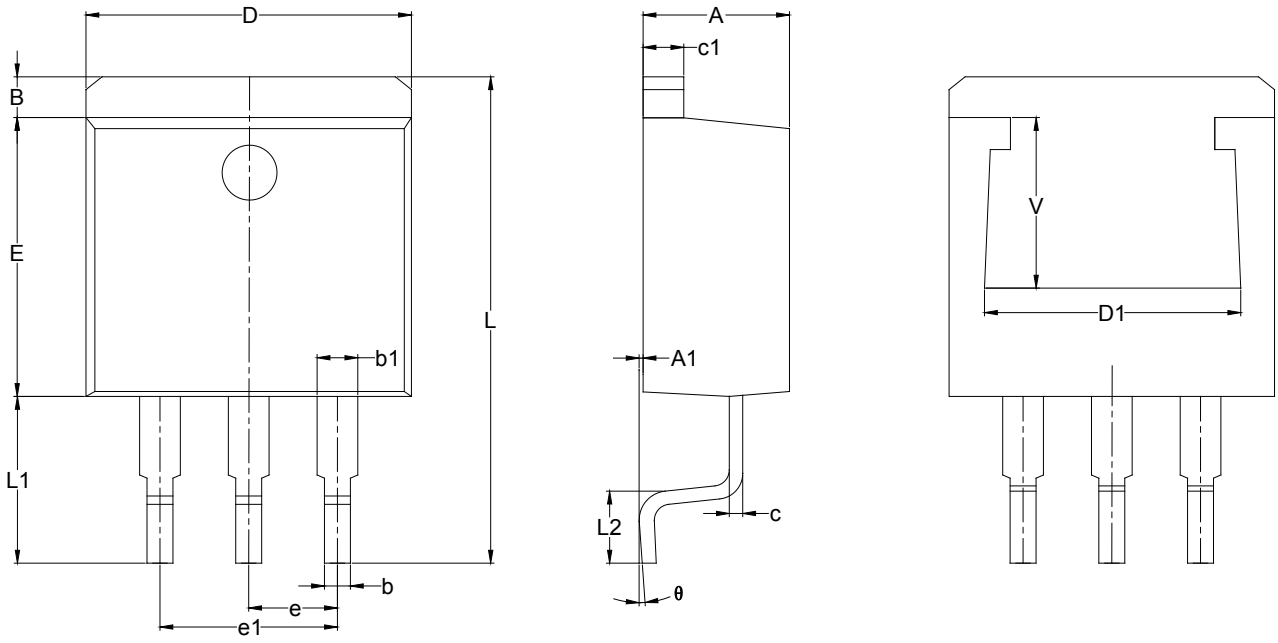


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	2.200	2.400	0.087	0.094
A1	0.000	0.127	0.000	0.005
b	0.660	0.860	0.026	0.034
c	0.460	0.580	0.018	0.023
D	6.500	6.700	0.256	0.264
D1	5.100	5.460	0.201	0.215
D2	4.830 REF		0.190 REF	
E	6.000	6.200	0.236	0.244
e	2.186	2.386	0.086	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

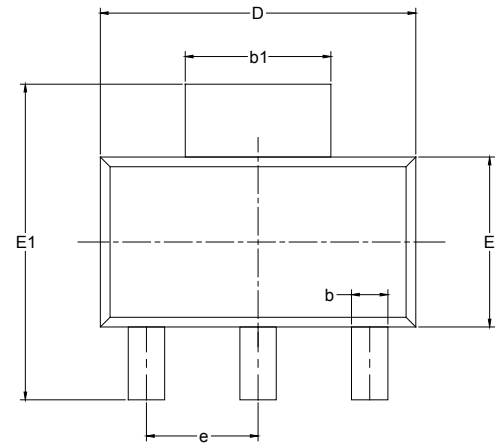


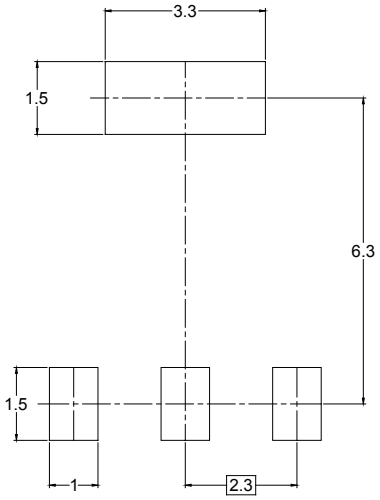
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	4.470	4.670	0.176	0.184
A1	0.000	0.150	0.000	0.006
B	1.120	1.420	0.044	0.056
b	0.710	0.910	0.028	0.036
b1	1.170	1.370	0.046	0.054
c	0.310	0.530	0.012	0.021
c1	1.170	1.370	0.046	0.054
D	10.010	10.310	0.394	0.406
E	8.500	8.900	0.335	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.

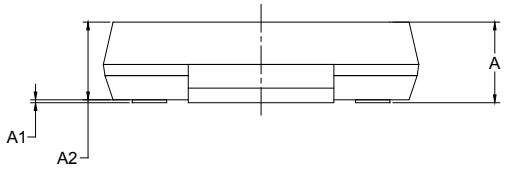
PACKAGE OUTLINE DIMENSIONS

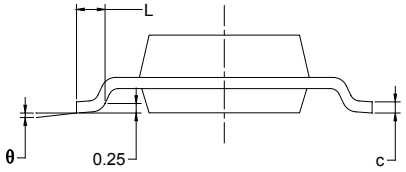
SOT-223-3





RECOMMENDED LAND PATTERN (Unit: mm)



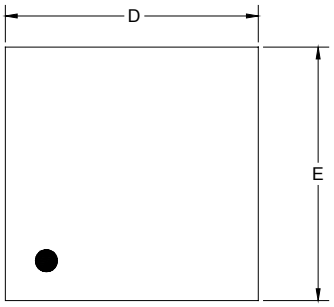


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A		1.800		0.071
A1	0.020	0.100	0.001	0.004
A2	1.500	1.700	0.059	0.067
b	0.660	0.840	0.026	0.033
b1	2.900	3.100	0.114	0.122
c	0.230	0.350	0.009	0.014
D	6.300	6.700	0.248	0.264
E	3.300	3.700	0.130	0.146
E1	6.700	7.300	0.264	0.287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

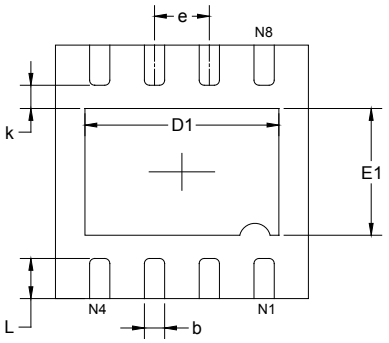
NOTES:
1. Body dimensions do not include mode flash or protrusion.
2. This drawing is subject to change without notice.

PACKAGE OUTLINE DIMENSIONS

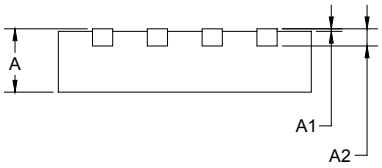
TDFN-3×3-8L



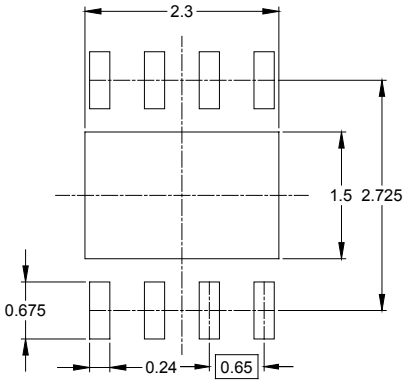
TOP VIEW



BOTTOM VIEW



SIDE VIEW



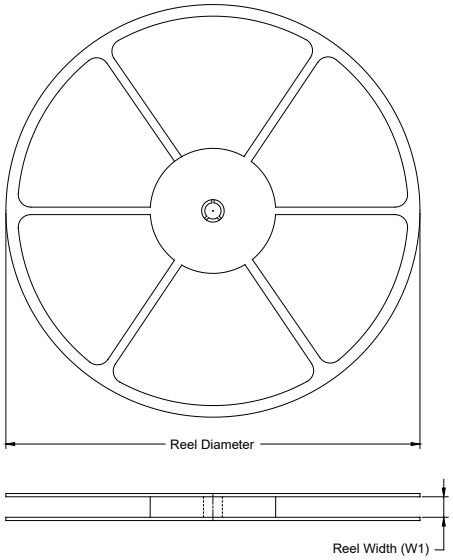
RECOMMENDED LAND PATTERN (Unit: mm)

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

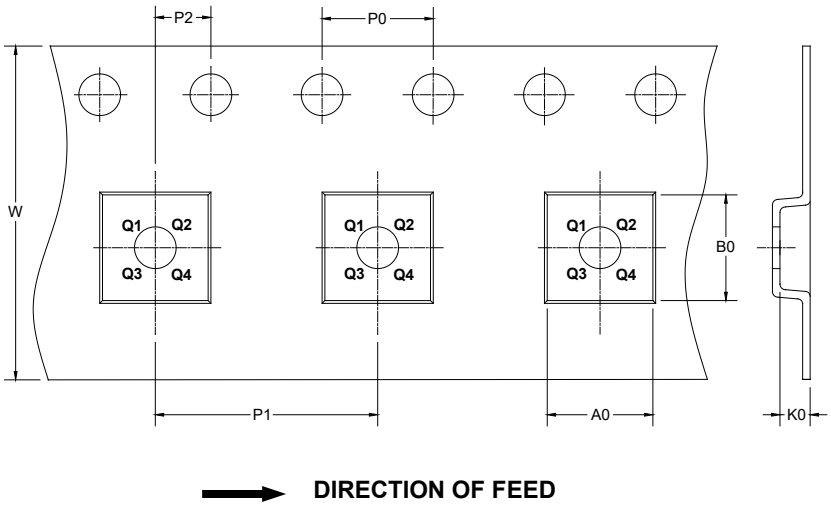
NOTE: This drawing is subject to change without notice.

TAPE AND REEL INFORMATION

REEL DIMENSIONS

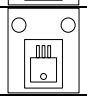


TAPE DIMENSIONS



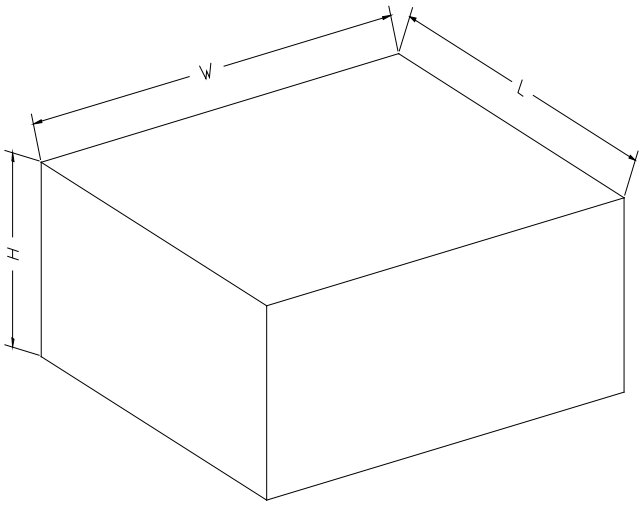
NOTE: The picture is only for reference. Please make the object as the standard.

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	5.21	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

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