



# SGM2027 Dual, Low Dropout, 250mA LDO Regulator

## GENERAL DESCRIPTION

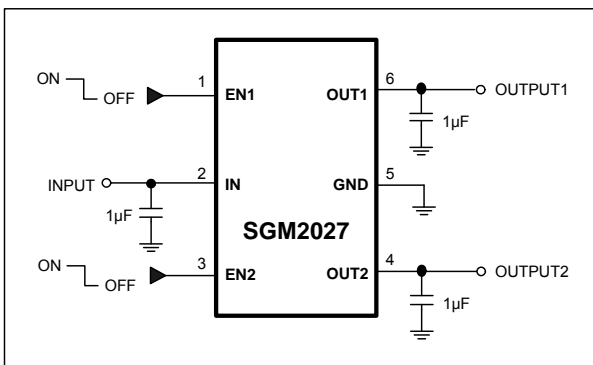
The SGM2027 is a dual, low-power, low-dropout, CMOS linear voltage regulator. It operates from a 2.5V to 5.5V input voltage and delivers up to 250mA at each channel.

The SGM2027 is the perfect choice for low voltage, low power. The ground current is 190µA (both LDO's enabled and active) that makes this part attractive for battery operated power systems. The SGM2027 also offers low dropout voltage (250mV at 250mA output) to prolong battery life in portable electronics.

Separate enable pins control each individual LDO output. The EN function allows the output of each regulator to be turned off independently, resulting in greatly reduced power consumption. Other features include a 10nA logic-controlled shutdown mode, current limit and thermal shutdown protection.

The SGM2027 is available in Green TSOT-23-6 package. It operates over an ambient temperature range of -40°C to +85°C.

## TYPICAL APPLICATION CIRCUIT



## FEATURES

- **Highly Accurate: ±2%**
- **Ultra-Low Dropout Voltage:  
250mV at 250mA Output**
- **190µA No-Load Supply Current**
- **Thermal-Overload Protection**
- **Output Current Limit**
- **10nA Logic-Controlled Shutdown**
- **Operating Temperature Range: -40°C to +85°C**
- **Available in Green TSOT-23-6 Package**

## APPLICATIONS

- Cellular Telephones
- Cordless Telephones
- PCMCIA Cards
- Modems
- MP3 Player
- Hand-Held Instruments
- Palmtop Computers
- Wireless LAN
- Portable/Battery-Powered Equipment

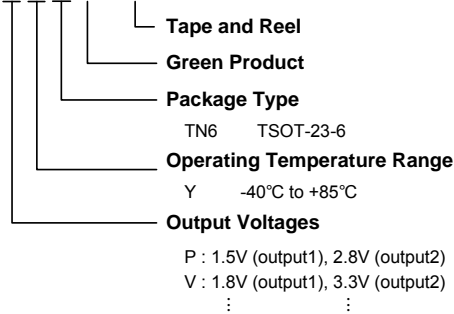
**PACKAGE/ORDERING INFORMATION**

ORDERING NUMBER	V <sub>OUT1</sub>	V <sub>OUT2</sub>	PIN-PACKAGE	SPECIFIED TEMPERATURE RANGE	PACKAGE MARKING	PACKAGE OPTION
SGM2027-BYTN6G/TR	3.0V	3.0V	TSOT-23-6	-40°C to +85°C	S67XX	Tape and Reel, 3000
SGM2027-PYTN6G/TR	1.5V	2.8V	TSOT-23-6	-40°C to +85°C	S35XX	Tape and Reel, 3000
SGM2027-VYTN6G/TR	1.8V	3.3V	TSOT-23-6	-40°C to +85°C	S3BXX	Tape and Reel, 3000
SGM2027-WYTN6G/TR	1.2V	2.8V	TSOT-23-6	-40°C to +85°C	S3CXX	Tape and Reel, 3000
SGM2027-YYTN6G/TR	1.8V	2.8V	TSOT-23-6	-40°C to +85°C	S3EXX	Tape and Reel, 3000
SGM2027-AAYTN6G/TR	1.2V	1.8V	TSOT-23-6	-40°C to +85°C	S65XX	Tape and Reel, 3000
SGM2027-ACYTN6G/TR	2.8V	3.3V	TSOT-23-6	-40°C to +85°C	S43XX	Tape and Reel, 3000
SGM2027-ADYTN6G/TR	1.8V	3.0V	TSOT-23-6	-40°C to +85°C	S66XX	Tape and Reel, 3000

NOTE: Order number and package marking are defined as the follow:

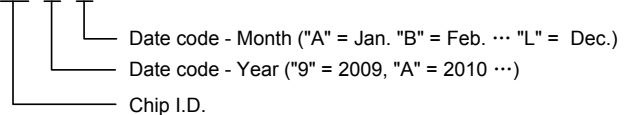
**ORDER NUMBER**

**SGM2027- X X X G / TR**



**MARKING INFORMATION**

**SYX X**



For example: S359A (2009, January)

**ABSOLUTE MAXIMUM RATINGS**

IN to GND.....	-0.3V to 6V
Output Short-Circuit Duration .....	Infinite
EN to GND.....	-0.3V to $V_{IN}$
OUT to GND.....	-0.3V to $(V_{IN} + 0.3V)$
Power Dissipation, $P_D$ @ $T_A = 25^\circ C$	
TSOT-23-6 .....	0.47W
Package Thermal Resistance	
TSOT-23-6, $\theta_{JA}$ .....	$265^\circ C/W$
Operating Temperature Range.....	$-40^\circ C$ to $+85^\circ C$
Junction Temperature.....	$150^\circ C$
Storage Temperature Range.....	$-65^\circ C$ to $+150^\circ C$
Lead Temperature (Soldering, 10s).....	$260^\circ C$
ESD Susceptibility	
HBM.....	4000V
MM.....	400V

**NOTE:**

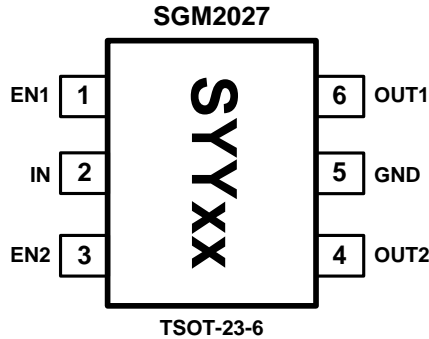
Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

**CAUTION**

This integrated circuit can be damaged by ESD if you don't pay attention to ESD protection. 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 very small parametric changes could cause the device not to meet its published specifications.

SGMICRO reserves the right to make any change in circuit design, specification or other related things if necessary without notice at any time. Please contact SGMICRO sales office to get the latest datasheet.

**PIN CONFIGURATION (TOP VIEW)**



NOTE: The location of pin 1 on the SGM2027 is determined by orienting the package marking as shown.

**PIN DESCRIPTION**

PIN	NAME	FUNCTION
1	EN1	On/Off Control 1. A logic low reduces the supply current to 10nA. If EN1 and EN2 are both low, both regulators and the reference turn off.
2	IN	Supply Input.
3	EN2	On/Off Control 2. A logic low reduces the supply current to 10nA. If EN1 and EN2 are both low, both regulators and the reference turn off.
4	OUT2	Channel 2 Output Voltage.
5	GND	Common Ground.
6	OUT1	Channel 1 Output Voltage.

**ELECTRICAL CHARACTERISTICS**

( $V_{IN} = V_{OUT(NOMINAL)} + 0.5V$  or  $2.5V$  (whichever is greater),  $T_A = -40^{\circ}C$  to  $+85^{\circ}C$ , typical values are at  $T_A = +25^{\circ}C$ , for each LDO unless otherwise specified.)

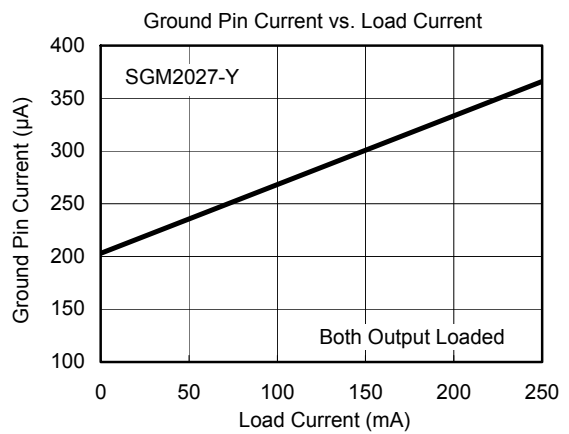
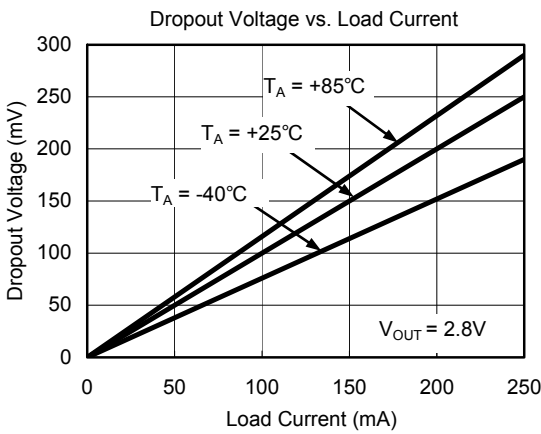
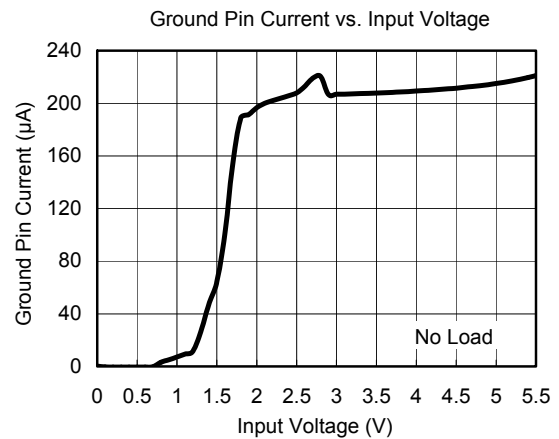
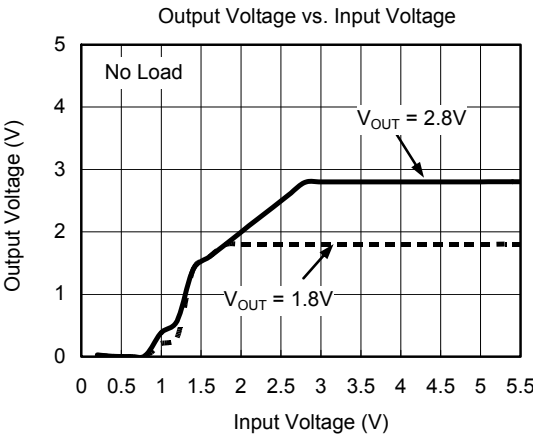
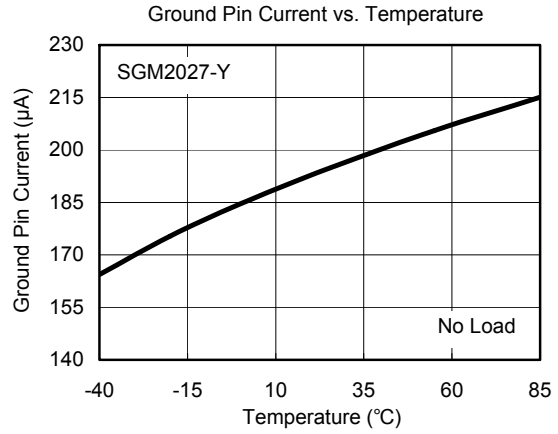
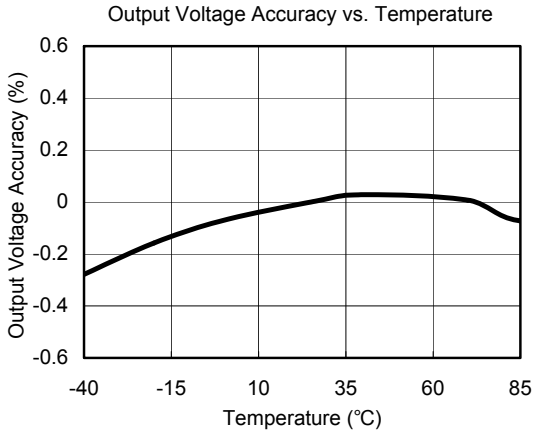
PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Input Voltage	$V_{IN}$		2.5		5.5	V
Output Voltage Accuracy		$I_{OUT} = 0.1mA$ , $T_A = +25^{\circ}C$	-2		+2	%
Maximum Output Current <sup>(3)</sup>			250			mA
Current Limit	$I_{LIM}$		310	500		mA
Ground Pin Current	$I_Q$	EN = 2V, both LDOs No Load		190	295	$\mu A$
Dropout Voltage <sup>(1)</sup>		$I_{OUT} = 1mA$		1		mV
		$I_{OUT} = 250mA$		250	350	
Line Regulation	$\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$	$V_{IN} = 2.5V$ or $(V_{OUT} + 0.5V)$ to $5.5V$ , $I_{OUT} = 1mA$		0.02	0.15	%/V
Load Regulation	$\frac{\Delta V_{OUT}}{\Delta I_{LOAD} \times V_{OUT}}$	$I_{OUT} = 0.1mA$ to $250mA$ , $C_{OUT} = 1\mu F$		0.00 4	0.01	%/mA
Power Supply Rejection Rate	PSRR	$I_{LOAD} = 50mA$ , $C_{OUT} = 1\mu F$ , $f = 100Hz$		71		dB
<b>SHUTDOWN</b>						
EN Input Threshold	$V_{IH}$	$V_{IN} = 2.5V$ to $5.5V$	1.5		0.4	V
	$V_{IL}$					
EN Input Bias Current	$I_{B(SHDN)}$	EN = 0V or EN = 5.5V	$T_A = +25^{\circ}C$	0.01	1	$\mu A$
			$T_A = +85^{\circ}C$	0.01		
Shutdown Supply Current	$I_{Q(SHDN)}$	EN1 = EN2 = 0.4V	$T_A = +25^{\circ}C$	0.01	1	$\mu A$
			$T_A = +85^{\circ}C$	0.01		
Shutdown Exit Delay <sup>(2)</sup>		$C_{OUT} = 1\mu F$ , No Load	$T_A = +25^{\circ}C$	20		$\mu s$
<b>THERMAL PROTECTION</b>						
Thermal Shutdown Temperature	$T_{SHDN}$			160		$^{\circ}C$
Thermal Shutdown Hysteresis	$\Delta T_{SHDN}$			15		$^{\circ}C$

## NOTES:

- The dropout voltage is defined as  $V_{IN} - V_{OUT}$ , when  $V_{OUT}$  is 100mV below the value of  $V_{OUT}$  for  $V_{IN} = V_{OUT} + 0.5V$ .  
(Only applicable for  $V_{OUT} = 2.5V$  to  $3.3V$ )
- Time needed for  $V_{OUT}$  to reach 95% of final value.
- Each channel provides 300mA of maximum output current when the condition of dissipating heat is good.

TYPICAL PERFORMANCE CHARACTERISTICS

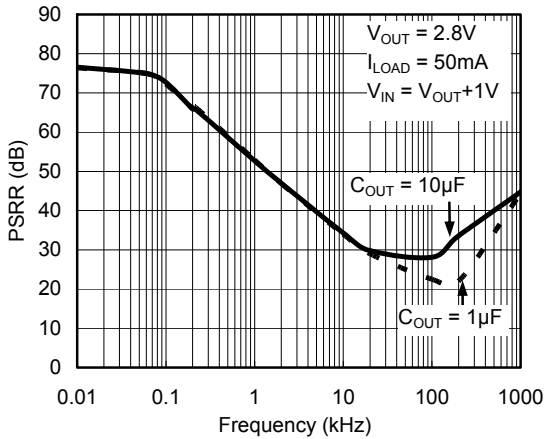
$V_{IN} = V_{OUT(NOMINAL)} + 0.5V$  or  $2.5V$  (whichever is greater),  $C_{IN} = 1\mu F$ ,  $C_{OUT} = 1\mu F$ ,  $T_A = +25^\circ C$ , unless otherwise noted.



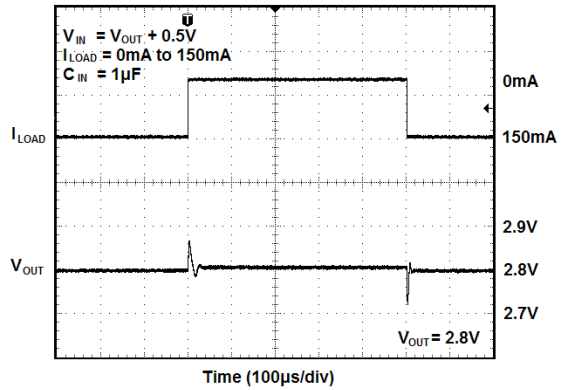
TYPICAL PERFORMANCE CHARACTERISTICS

$V_{IN} = V_{OUT(NOMINAL)} + 0.5V$  or  $2.5V$  (whichever is greater),  $C_{IN} = 1\mu F$ ,  $C_{OUT} = 1\mu F$ ,  $T_A = +25^\circ C$ , unless otherwise noted.

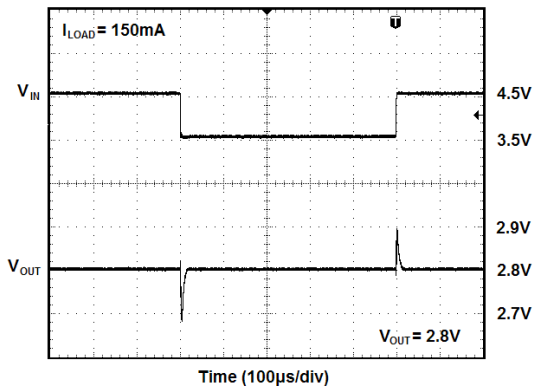
Power-Supply Rejection Ratio vs. Frequency



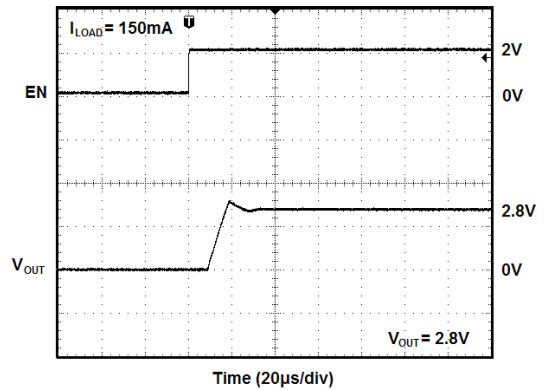
Load-Transient Response



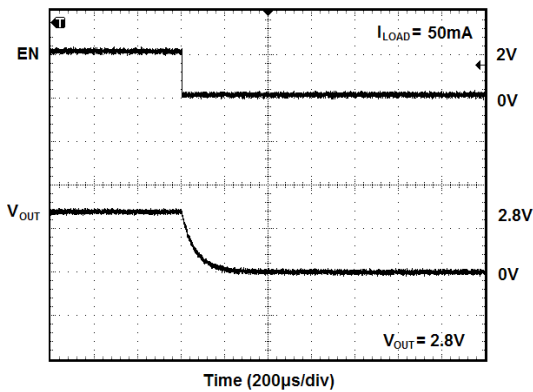
Line-Transient Response



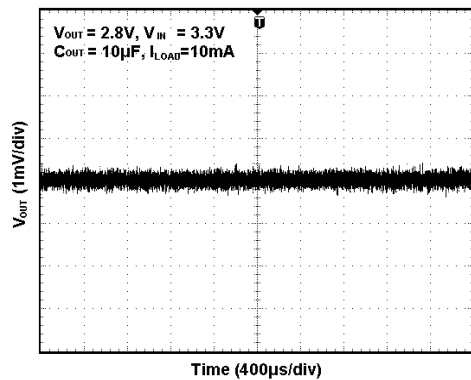
Shutdown Exit Delay



Entering Shutdown

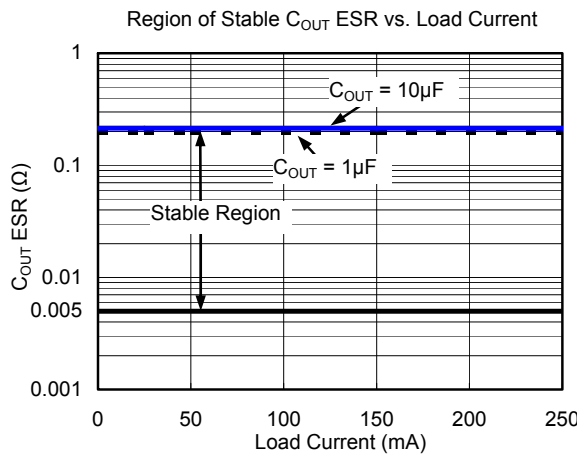


Output Noise 10Hz to 100kHz

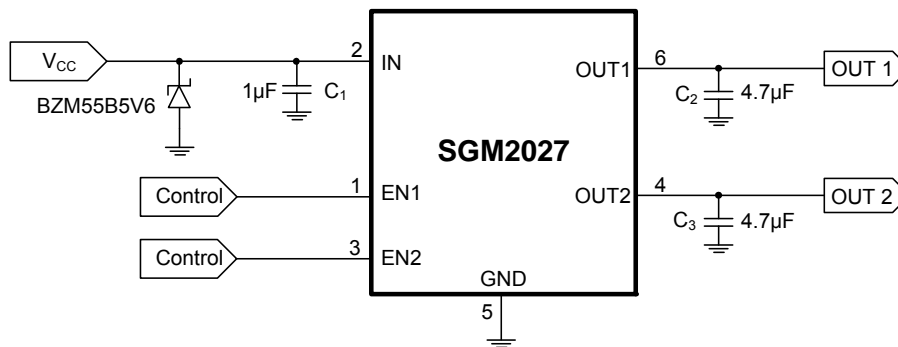


APPLICATION NOTE

The SGM2027 is designed specifically to work with low ESR ceramic output capacitor with space-saving and performance in consideration. Using a ceramic capacitor which is at least 1µF with ESR > 5mΩ on the SGM2027 output ensures stability. The SGM2027 still works well with output capacitor of other types due to the wide stable ESR range. The following figure shows the curves of allowable ESR range (5mΩ to 200mΩ) as a function of load current for various output capacitor values.



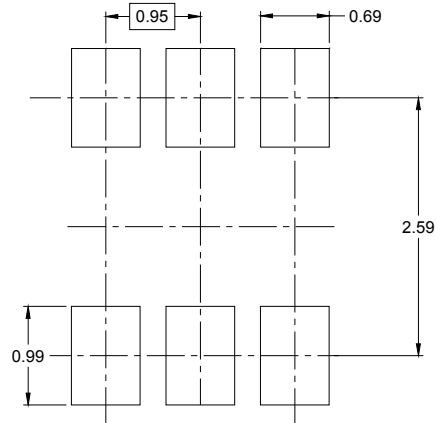
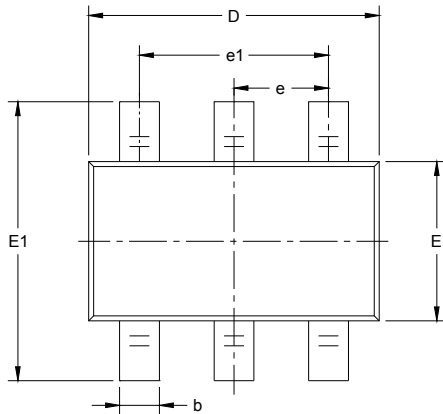
When LDO is used in handheld products, attention must be paid to voltage spikes which could damage SGM2027. In such applications, voltage spikes will be generated at charger interface and V<sub>BUS</sub> pin of USB interface when charger adapters and USB equipments are hot-plugged. Besides this, handheld products will be tested on the production line without battery. Test engineer will apply power from the connector pin which connects with positive pole of the battery. When external power supply is turned on suddenly, the voltage spikes will be generated at the battery connector. The voltage spikes will be very high, and it always exceeds the absolute maximum input voltage (6.0V) of LDO. In order to get robust design, design engineer needs to clear up this voltage spike. Zener diode is a cheap and effective solution to eliminate such voltage spike. For example, BZM55B5V6 is a 5.6V small package Zener diode which can be used to remove voltage spikes in cell phone designs. The schematic is shown below.



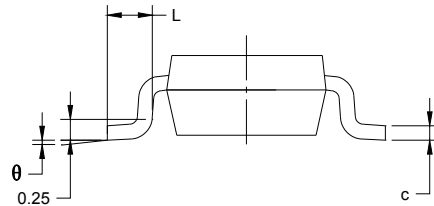
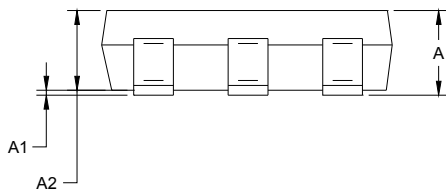


PACKAGE OUTLINE DIMENSIONS

TSOT-23-6



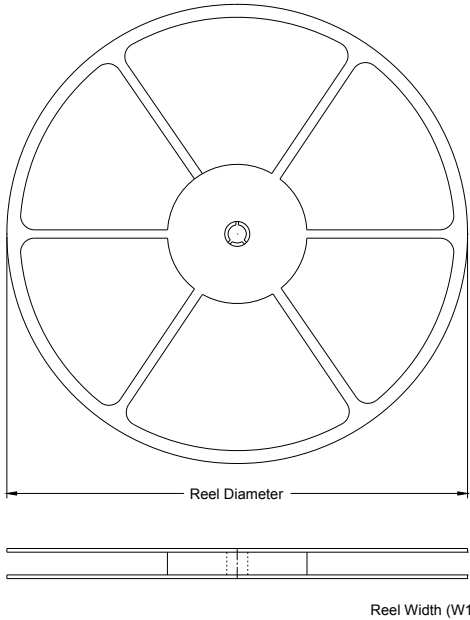
RECOMMENDED LAND PATTERN (Unit: mm)



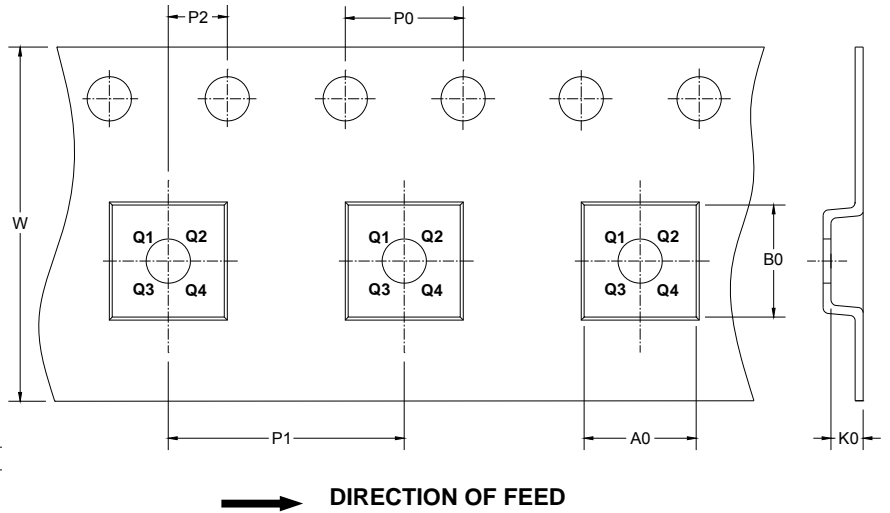
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.700	0.900	0.028	0.035
A1	0.000	0.100	0.000	0.004
A2	0.700	0.800	0.028	0.031
b	0.350	0.500	0.014	0.020
c	0.080	0.200	0.003	0.008
D	2.820	3.020	0.111	0.119
E	1.600	1.700	0.063	0.067
E1	2.650	2.950	0.104	0.116
e	0.950 BSC		0.037 BSC	
e1	1.900 BSC		0.075 BSC	
L	0.300	0.600	0.012	0.024
$\theta$	0°	8°	0°	8°

**TAPE AND REEL INFORMATION**

**REEL DIMENSIONS**



**TAPE DIMENSIONS**



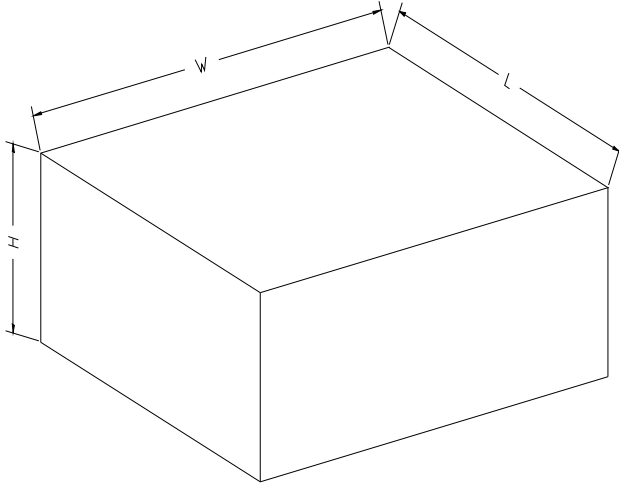
NOTE: The picture is only for reference. Please make the object as the standard.

**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
TSOT-23-6	7"	9.5	3.2	3.1	1.1	4.0	4.0	2.0	8.0	Q3

**SGM2027**

**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