



## SGM2032

### Low Power, Low Dropout, RF Linear Regulators

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#### GENERAL DESCRIPTION

The SGM2032 series low-power, low-noise, low-dropout, CMOS linear voltage regulators operate from a 2.5V to 5.5V input voltage. They are the perfect choice for low voltage, low power applications. A low ground current makes this part attractive for battery operated power systems. The SGM2032 series also offer low dropout voltage to prolong battery life in portable electronics. Systems requiring a quiet voltage source, such as RF applications, will benefit from the SGM2032 series' ultra low output noise and high PSRR. An external noise bypass capacitor connected to the device's BP pin can further reduce the noise level.

The output voltage is preset to voltages in the range of 0.9V to 5.0V. Other features include a 10nA logic-controlled shutdown mode, output current limit and thermal shutdown protection.

The SGM2032 is available in Green SOT-23-5 and SC70-5 packages. It operates over an ambient temperature range of -40°C to +85°C.

#### FEATURES

- **Low Output Noise**
- **Low Dropout Voltage**
- **Thermal-Overload Protection**
- **Output Current Limit**
- **High PSRR (75dB at 1kHz)**
- **10nA Logic-Controlled Shutdown**
- **Adjustable Output from 0.8V to 5.0V**
- **Available Fixed Output Voltages: 0.9V, 1.3V, 2.1V, 2.7V, 2.9V, 3.1V, 3.2V, 3.6V, 4.2V and 5.0V**
- **-40°C to +85°C Operating Temperature Range**
- **Available in Green SC70-5 and SOT-23-5 Packages**

#### APPLICATIONS

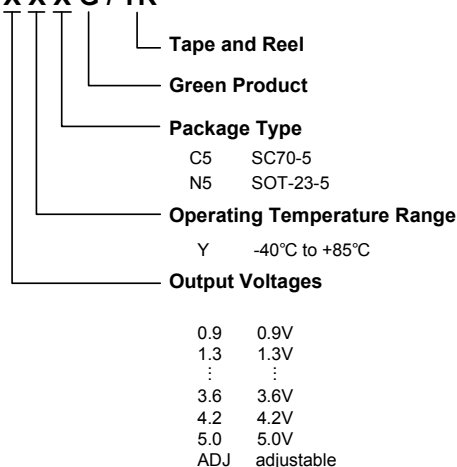
Cellular Telephones  
Cordless Telephones  
PCMCIA Cards  
Modems  
MP3 Player  
Hand-Held Instruments  
Palmtop Computers  
Electronic Planners  
Portable/Battery-Powered Equipment

**PACKAGE/ORDERING INFORMATION**

| MODEL       | V <sub>OUT</sub> (V) | PIN-PACKAGE | ORDERING NUMBER    | PACKAGE MARKING | PACKAGE OPTION      |
|-------------|----------------------|-------------|--------------------|-----------------|---------------------|
| SGM2032-0.9 | 0.9V                 | SOT-23-5    | SGM2032-0.9YN5G/TR | S60XX           | Tape and Reel, 3000 |
| SGM2032-0.9 | 0.9V                 | SC70-5      | SGM2032-0.9YC5G/TR | S61XX           | Tape and Reel, 3000 |
| SGM2032-1.3 | 1.3V                 | SC70-5      | SGM2032-1.3YC5G/TR | YJ13            | Tape and Reel, 3000 |
| SGM2032-1.3 | 1.3V                 | SOT-23-5    | SGM2032-1.3YN5G/TR | YJ13            | Tape and Reel, 3000 |
| SGM2032-2.1 | 2.1V                 | SC70-5      | SGM2032-2.1YC5G/TR | YJ21            | Tape and Reel, 3000 |
| SGM2032-2.1 | 2.1V                 | SOT-23-5    | SGM2032-2.1YN5G/TR | YJ21            | Tape and Reel, 3000 |
| SGM2032-2.7 | 2.7V                 | SC70-5      | SGM2032-2.7YC5G/TR | YJ27            | Tape and Reel, 3000 |
| SGM2032-2.7 | 2.7V                 | SOT-23-5    | SGM2032-2.7YN5G/TR | YJ27            | Tape and Reel, 3000 |
| SGM2032-2.9 | 2.9V                 | SC70-5      | SGM2032-2.9YC5G/TR | YJ29            | Tape and Reel, 3000 |
| SGM2032-2.9 | 2.9V                 | SOT-23-5    | SGM2032-2.9YN5G/TR | YJ29            | Tape and Reel, 3000 |
| SGM2032-3.1 | 3.1V                 | SC70-5      | SGM2032-3.1YC5G/TR | YJ31            | Tape and Reel, 3000 |
| SGM2032-3.1 | 3.1V                 | SOT-23-5    | SGM2032-3.1YN5G/TR | YJ31            | Tape and Reel, 3000 |
| SGM2032-3.2 | 3.2V                 | SC70-5      | SGM2032-3.2YC5G/TR | YJ32            | Tape and Reel, 3000 |
| SGM2032-3.2 | 3.2V                 | SOT-23-5    | SGM2032-3.2YN5G/TR | YJ32            | Tape and Reel, 3000 |
| SGM2032-3.6 | 3.6V                 | SC70-5      | SGM2032-3.6YC5G/TR | YJ36            | Tape and Reel, 3000 |
| SGM2032-3.6 | 3.6V                 | SOT-23-5    | SGM2032-3.6YN5G/TR | YJ36            | Tape and Reel, 3000 |
| SGM2032-4.2 | 4.2V                 | SC70-5      | SGM2032-4.2YC5G/TR | YJ42            | Tape and Reel, 3000 |
| SGM2032-4.2 | 4.2V                 | SOT-23-5    | SGM2032-4.2YN5G/TR | YJ42            | Tape and Reel, 3000 |
| SGM2032-5.0 | 5.0V                 | SC70-5      | SGM2032-5.0YC5G/TR | YJ50            | Tape and Reel, 3000 |
| SGM2032-5.0 | 5.0V                 | SOT-23-5    | SGM2032-5.0YN5G/TR | YJ50            | Tape and Reel, 3000 |
| SGM2032-ADJ | adjustable           | SOT-23-5    | SGM2032-ADJYN5G/TR | S5EXX           | Tape and Reel, 3000 |
| SGM2032-ADJ | adjustable           | SC70-5      | SGM2032-ADJYC5G/TR | S5FXX           | Tape and Reel, 3000 |

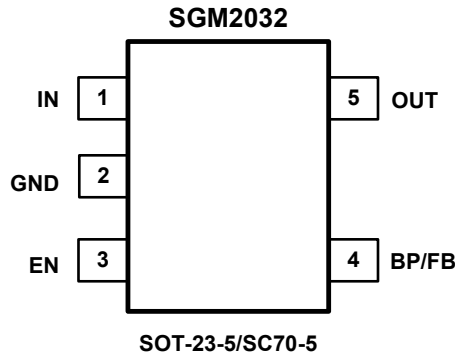
**ORDER NUMBER**

SGM2032 - X X X G / TR



SGM2032

PIN CONFIGURATIONS (TOP VIEW)



NOTE: Orientation of top mark determines pin1 location. Read the top product code mark left to right, pin1 is the lower left pin.

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 DESCRIPTION

| PIN | NAME | FUNCTION   |
|-----|------|--|
| 1   | IN   | Regulator Input. Supply voltage can range from 2.5V to 5.5V. Bypass with a 1µF capacitor to GND.   |
| 2   | GND  | Ground.  |
| 3   | EN   | Shutdown Input. A logic low reduces the supply current to 10nA. Connect to IN for normal operation.                                      |
| 4   | BP   | Reference-Noise Bypass (fixed voltage version only). Bypass with a low-leakage 0.01µF ceramic capacitor for reduced noise at the output. |
|     | FB   | Feedback Pin (adjustable voltage version only). This is used to set the output voltage of the device.                                    |
| 5   | OUT  | Regulator Output.  |

ABSOLUTE MAXIMUM RATINGS

|   |                                   |
|---|-----------------------------------|
| IN to GND.....  | -0.3V to 6V                       |
| Output Short-Circuit Duration .....                       | Infinite                          |
| EN to GND.....  | -0.3V to V <sub>IN</sub>          |
| OUT, BP/FB to GND.....                                    | -0.3V to (V <sub>IN</sub> + 0.3V) |
| Power Dissipation, P <sub>D</sub> @ T <sub>A</sub> = 25°C |                                   |
| SOT-23-5.....   | 0.4W                              |
| SC70-5 .....  | 0.3W                              |
| Package Thermal Resistance                                |                                   |
| SOT-23-5, θ <sub>JA</sub> .....                           | 260°C/W                           |
| SC70-5, θ <sub>JA</sub> .....                             | 330°C/W                           |
| Operating Temperature Range.....                          | -40°C to +85°C                    |
| Junction Temperature.....                                 | 150°C                             |
| Storage Temperature Range.....                            | -65°C to +150°C                   |
| Lead Temperature (Soldering, 10s).....                    | 260°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.

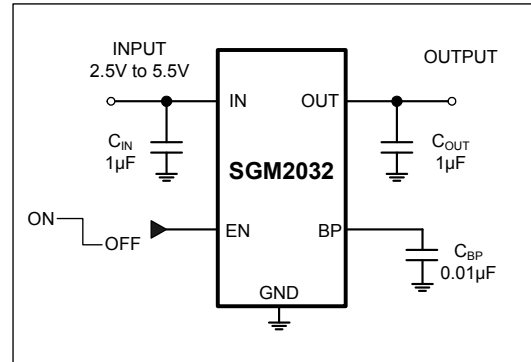
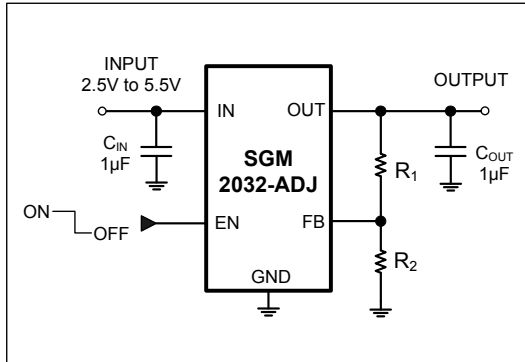
**ELECTRICAL CHARACTERISTICS**(V<sub>IN</sub> = V<sub>OUT (NOMINAL)</sub> + 0.5V or 2.5V, whichever is greater, Full = -40°C to +85°C, unless otherwise noted.)

| PARAMETER                          | SYMBOL               | CONDITIONS  | TEMP      | MIN   | TYP   | MAX   | UNITS             |    |
|------------------------------------|----------------------|---|-----------|-------|-------|-------|-------------------|----|
| Input Voltage                      | V <sub>IN</sub>      |   | +25°C     | 2.5   |       | 5.5   | V                 |    |
| Output Voltage Accuracy            |                      | I <sub>OUT</sub> = 0.1mA  | +25°C     | -2    |       | +2    | %                 |    |
| Maximum Output Current             |                      | SOT-23-5  | +25°C     | 300   |       |       | mA                |    |
|                                    |                      | V <sub>OUT</sub> < 1V, SC70-5   |           | 120   |       |       |                   |    |
|                                    |                      | 1V ≤ V <sub>OUT</sub> ≤ 2V, SC70-5  |           | 150   |       |       |                   |    |
|                                    |                      | V <sub>OUT</sub> > 2V, SC70-5   |           | 250   |       |       |                   |    |
| Current Limit                      | I <sub>LIM</sub>     |   | +25°C     | 310   | 500   |       | mA                |    |
| Ground Pin Current                 | I <sub>Q</sub>       | No load, EN = 2V  | +25°C     |       | 120   | 220   | μA                |    |
| Dropout Voltage <sup>(1)</sup>     |                      | I <sub>OUT</sub> = 1mA  | +25°C     |       | 0.9   |       | mV                |    |
|                                    |                      | I <sub>OUT</sub> = 300mA  |           |       | 270   | 400   |                   |    |
| Line Regulation                    | ΔV <sub>LNR</sub>    | V <sub>IN</sub> = 2.5V or (V <sub>OUT</sub> + 0.5V) to 5.5V,<br>I <sub>OUT</sub> = 1mA                | +25°C     |       | 0.02  | 0.05  | %/V               |    |
| Load Regulation                    | ΔV <sub>LDR</sub>    | I <sub>OUT</sub> = 0.1mA to 300mA, C <sub>OUT</sub> = 1μF,<br>V <sub>OUT</sub> > 2V                   | +25°C     |       | 0.002 | 0.005 | %/mA              |    |
|                                    |                      | I <sub>OUT</sub> = 0.1mA to 300mA, C <sub>OUT</sub> = 1μF,<br>V <sub>OUT</sub> ≤ 2V                   |           |       | 0.004 | 0.008 |                   |    |
| Output Voltage Noise               | e <sub>n</sub>       | f = 10Hz to 100kHz, C <sub>BP</sub> = 0.01μF,<br>C <sub>OUT</sub> = 10μF, Fixed Output of 0.9V        | +25°C     |       | 30    |       | μV <sub>RMS</sub> |    |
| Power Supply Rejection Ratio       | PSRR                 | C <sub>BP</sub> = 0.1μF, I <sub>LOAD</sub> = 50mA,<br>C <sub>OUT</sub> = 1μF, Fixed Output<br>of 0.9V | f = 217Hz | +25°C |       | 80    |                   | dB |
|                                    |                      |   | f = 1kHz  | +25°C |       | 75    |                   | dB |
| <b>SHUTDOWN <sup>(2)</sup></b>     |                      |   |           |       |       |       |                   |    |
| EN Input Threshold                 | V <sub>IH</sub>      | V <sub>IN</sub> = 2.5V to 5.5V, V <sub>EN</sub> = -0.3V to V <sub>IN</sub>                            | Full      | 1.5   |       |       | V                 |    |
|                                    | V <sub>IL</sub>      |   | Full      |       |       | 0.3   |                   |    |
| EN Input Bias Current              | I <sub>B(SHDN)</sub> | EN = 0V and EN = 5.5V   | +25°C     |       | 0.01  | 1     | μA                |    |
| Shutdown Supply Current            | I <sub>Q(SHDN)</sub> | EN = 0.3V   | +25°C     |       | 0.01  | 1     | μA                |    |
| Shutdown Exit Delay <sup>(3)</sup> |                      | C <sub>OUT</sub> = 1μF, No Load   | +25°C     |       | 30    |       | μs                |    |
| <b>THERMAL PROTECTION</b>          |                      |   |           |       |       |       |                   |    |
| Thermal Shutdown Temperature       | T <sub>SHDN</sub>    |   |           |       | 150   |       | °C                |    |
| Thermal Shutdown Hysteresis        | ΔT <sub>SHDN</sub>   |   |           |       | 15    |       | °C                |    |

## NOTES:

- The dropout voltage is defined as V<sub>IN</sub> - V<sub>OUT</sub>, when V<sub>OUT</sub> is 100mV below the value of V<sub>OUT</sub> for V<sub>IN</sub> = V<sub>OUT</sub> + 0.5V (only applicable for V<sub>OUT</sub> = +2.5V to +5.0V).
- V<sub>EN</sub> = -0.3V to V<sub>IN</sub>
- Time needed for V<sub>OUT</sub> to reach 90% of final value.

TYPICAL APPLICATION CIRCUITS



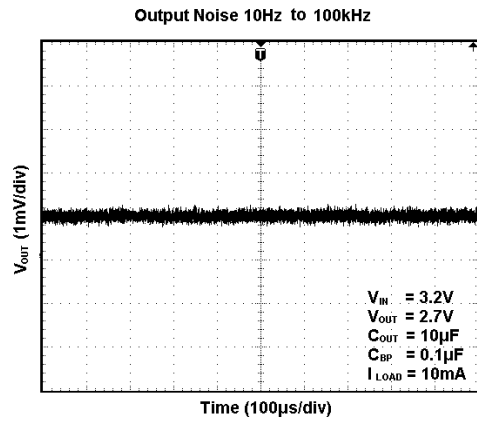
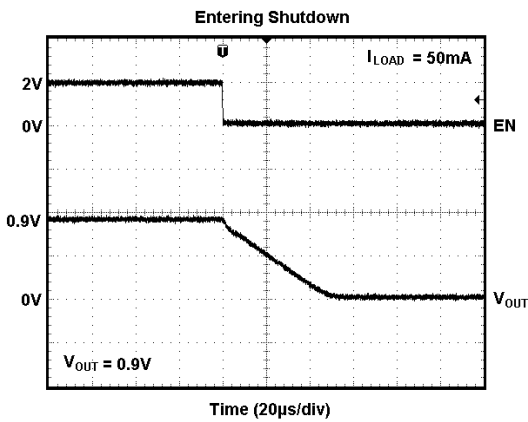
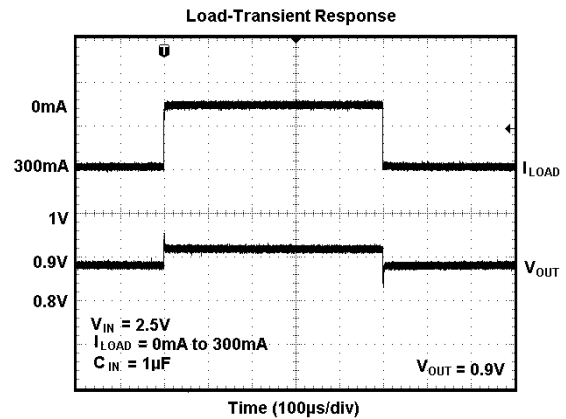
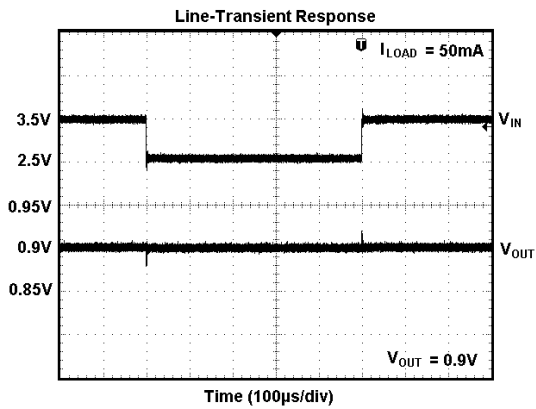
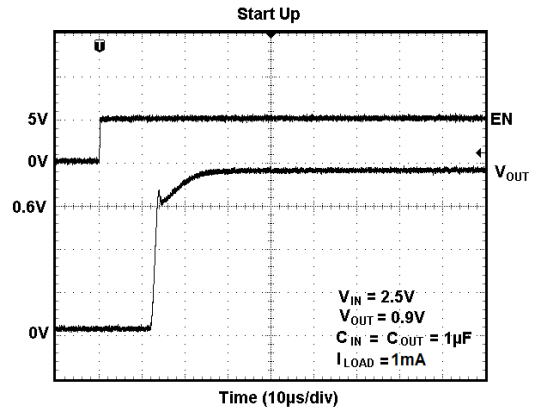
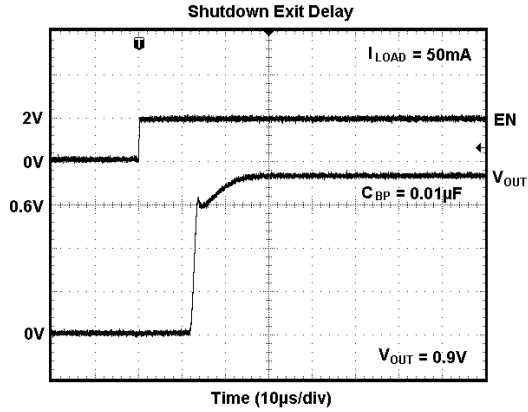
Standard 1% Resistor Values for Common Output Voltages of Adjustable Voltage Version

| V <sub>OUT</sub> (V) | R <sub>1</sub> (kΩ) | R <sub>2</sub> (kΩ) |
|----------------------|---------------------|---------------------|
| 0.8                  | No Need             | 40.2                |
| 1.0                  | 10.5                | 40.2                |
| 1.5                  | 35.7                | 40.2                |
| 1.8                  | 51.1                | 40.2                |
| 2.5                  | 86.6                | 40.2                |
| 2.7                  | 95.3                | 40.2                |
| 2.85                 | 97.6                | 37.4                |
| 2.9                  | 97.6                | 37.0                |
| 3.0                  | 97.6                | 35.7                |
| 3.6                  | 97.6                | 28.0                |

NOTE:  $V_{OUT} = (R_1 + R_2)/R_2 \times 0.8$

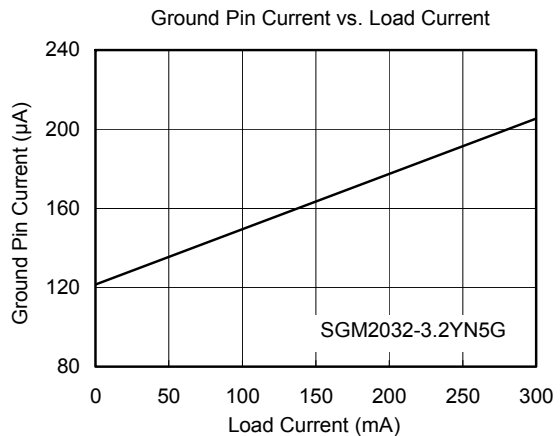
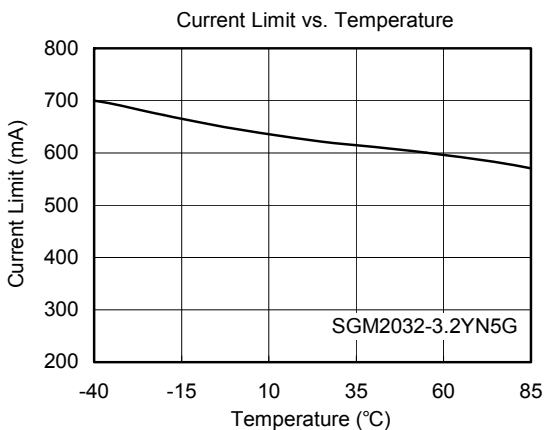
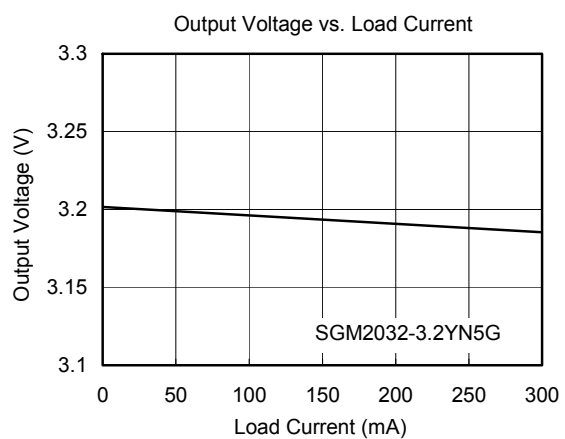
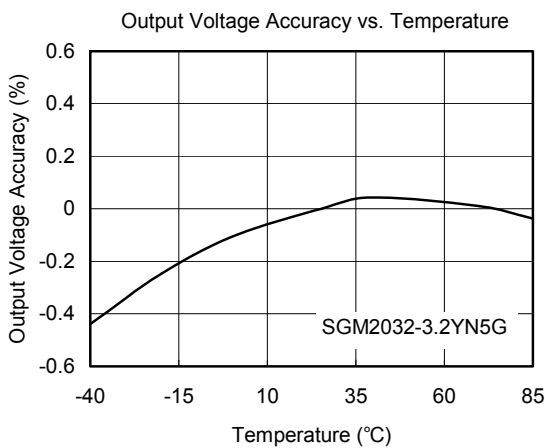
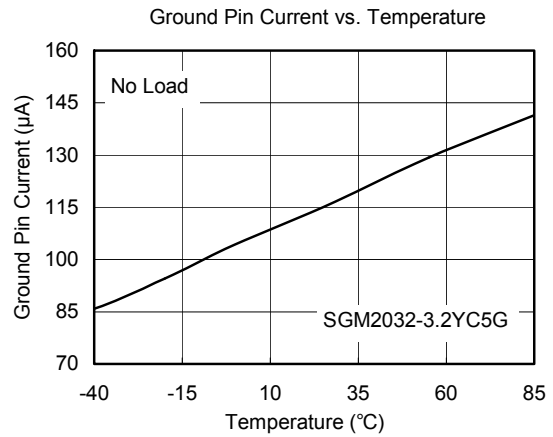
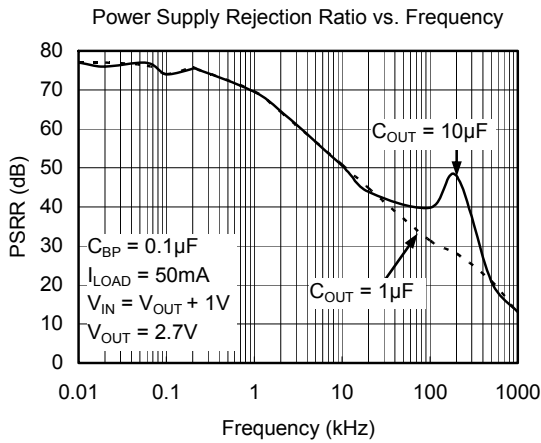
TYPICAL PERFORMANCE CHARACTERISTICS

$V_{IN} = V_{OUT(NOMINAL)} + 0.5V$  or  $2.5V$  (whichever is greater),  $C_{IN} = 1\mu F$ ,  $C_{OUT} = 1\mu F$ ,  $C_{BP} = 0.01\mu F$ ,  $T_A = +25^\circ C$ , unless otherwise noted.



**TYPICAL PERFORMANCE CHARACTERISTICS**

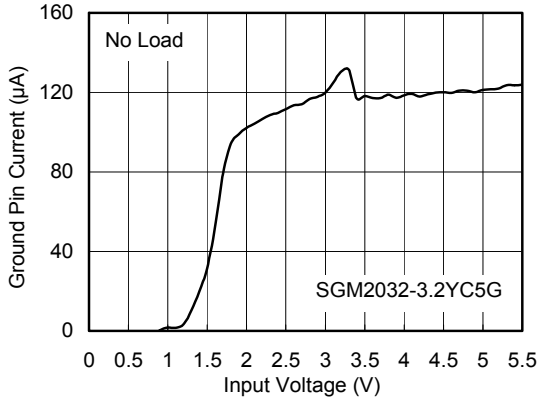
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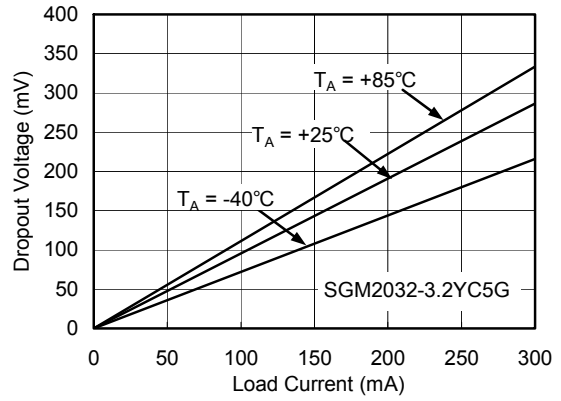
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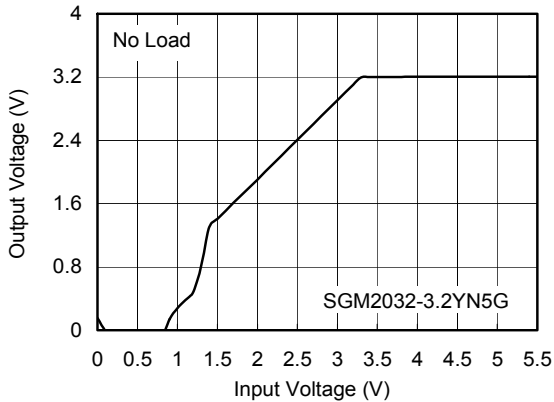
Ground Pin Current vs. Input Voltage



Dropout Voltage vs. Load Current



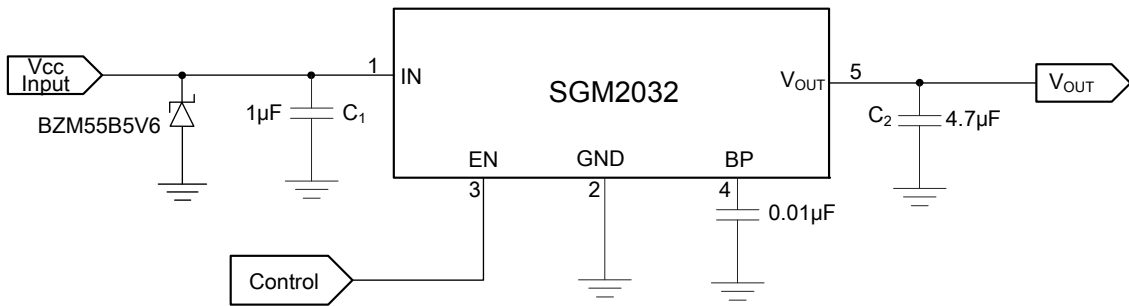
Output Voltage vs. Input Voltage





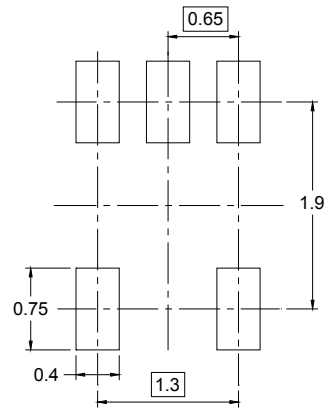
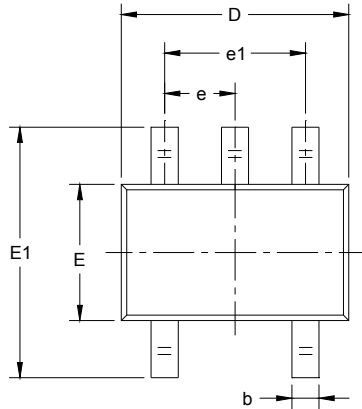
APPLICATION NOTE

When LDO is used in handheld products, attention must be paid to voltage spikes which could damage SGM2032. In such applications, voltage spikes will be generated at charger interface and  $V_{BUS}$  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.

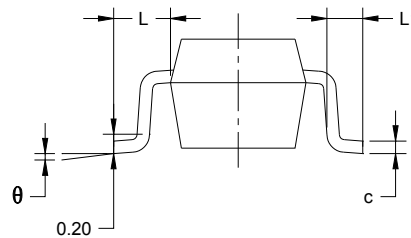
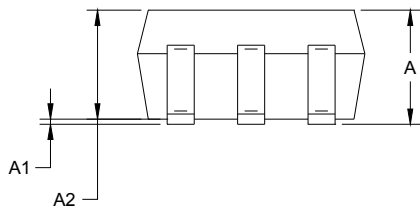


PACKAGE OUTLINE DIMENSIONS

SC70-5



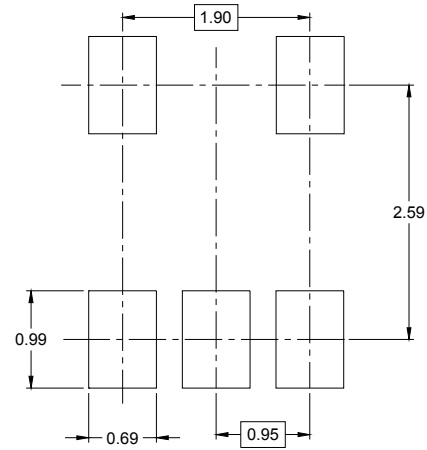
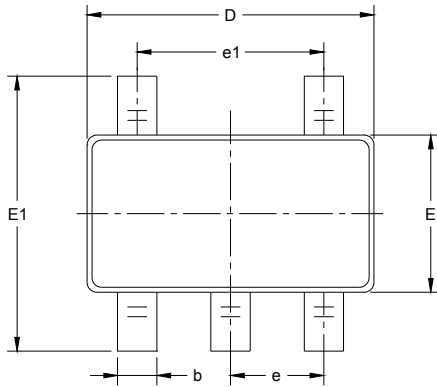
RECOMMENDED LAND PATTERN (Unit: mm)



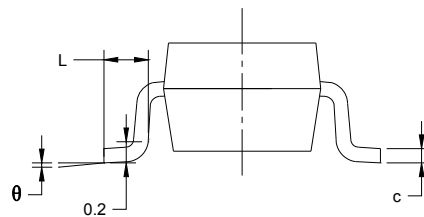
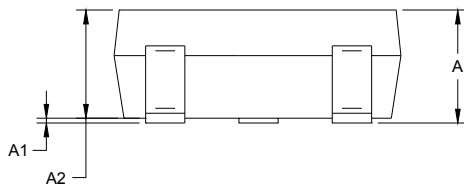
| Symbol | Dimensions<br>In Millimeters |       | Dimensions<br>In Inches |       |
|--------|------------------------------|-------|-------------------------|-------|
|        | MIN                          | MAX   | MIN                     | MAX   |
| A      | 0.900                        | 1.100 | 0.035                   | 0.043 |
| A1     | 0.000                        | 0.100 | 0.000                   | 0.004 |
| A2     | 0.900                        | 1.000 | 0.035                   | 0.039 |
| b      | 0.150                        | 0.350 | 0.006                   | 0.014 |
| c      | 0.080                        | 0.150 | 0.003                   | 0.006 |
| D      | 2.000                        | 2.200 | 0.079                   | 0.087 |
| E      | 1.150                        | 1.350 | 0.045                   | 0.053 |
| E1     | 2.150                        | 2.450 | 0.085                   | 0.096 |
| e      | 0.65 TYP                     |       | 0.026 TYP               |       |
| e1     | 1.300 BSC                    |       | 0.051 BSC               |       |
| L      | 0.525 REF                    |       | 0.021 REF               |       |
| L1     | 0.260                        | 0.460 | 0.010                   | 0.018 |
| θ      | 0°                           | 8°    | 0°                      | 8°    |

PACKAGE OUTLINE DIMENSIONS

SOT-23-5



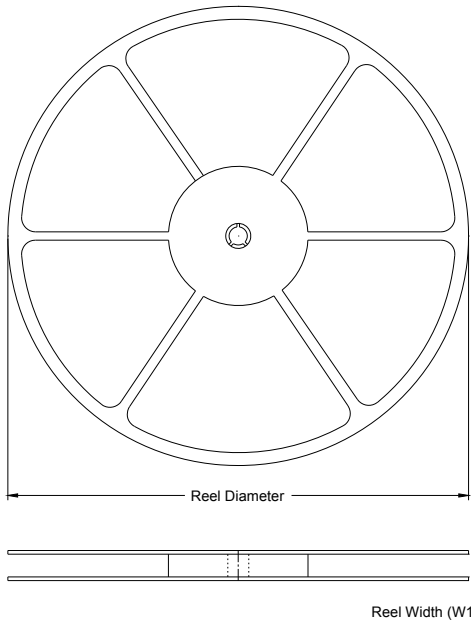
RECOMMENDED LAND PATTERN (Unit: mm)



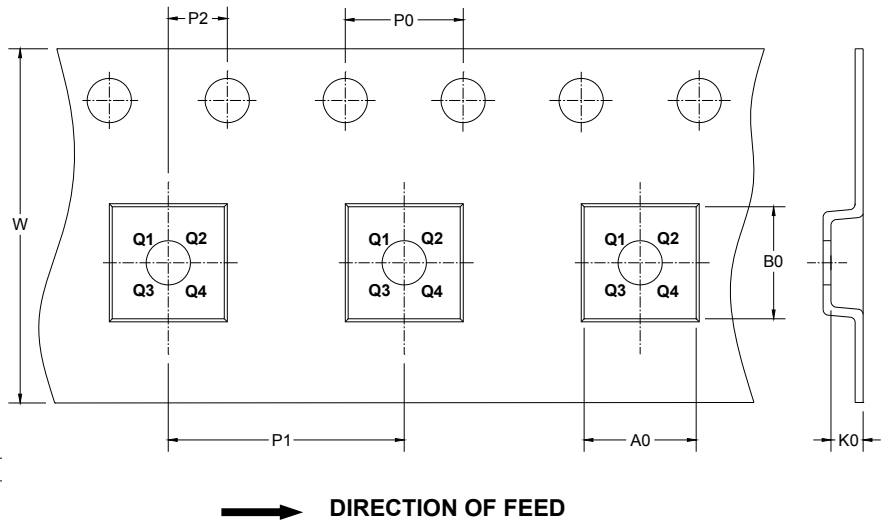
| Symbol   | Dimensions<br>In Millimeters |       | Dimensions<br>In Inches |       |
|----------|------------------------------|-------|-------------------------|-------|
|          | MIN                          | MAX   | MIN                     | MAX   |
| A        | 1.050                        |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

**TAPE AND REEL INFORMATION**

**REEL DIMENSIONS**



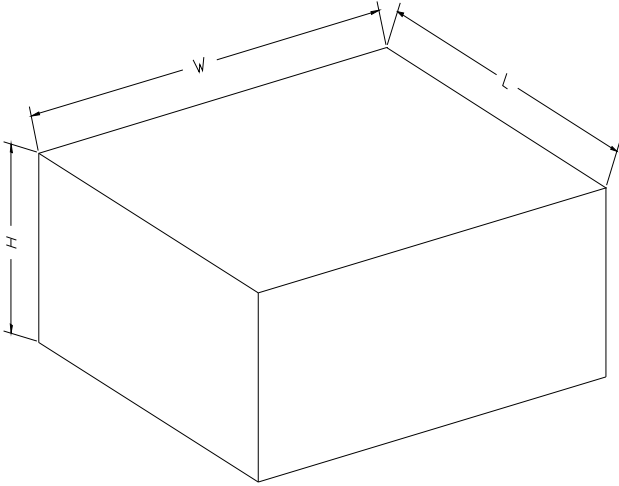
**TAPE DIMENSIONS**



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 |
|--------------|---------------|--------------------|---------|---------|---------|---------|---------|---------|--------|---------------|
| SC70-5       | 7"            | 9.5                | 2.25    | 2.55    | 1.20    | 4.0     | 4.0     | 2.0     | 8.0    | Q3            |
| SOT-23-5     | 7"            | 9.5                | 3.2     | 3.2     | 1.4     | 4.0     | 4.0     | 2.0     | 8.0    | Q3            |

**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           |