

GENERAL DESCRIPTION

The SGM2588 is a single channel power distribution switch. The switch operates from a wide range of 2.5V to 5.5V supply voltage, and is controlled by the EN pin. It can be used in USB power distribution applications.

A 100mΩ low R_{ON} N-MOSFET is integrated. The small size and quiescent current make the device very suitable for space limited, battery-powered applications.

A number of protection features are provided in the device including soft-start, current limit and thermal shutdown. Thermal shutdown shuts off the output MOSFET and asserts the nFAULT output if the die temperature exceeds +150°C, and the output MOSFET remains off until the die temperature drops to +130°C. The nFAULT pin asserts low during fault conditions after a 13ms blanking time to prevent false reporting.

SGM2588 is available in a Green SOT-23-5 package. It is rated over the -40°C to +85°C temperature range.

APPLICATIONS

Digital TV

Set-Top Box

Motherboard USB Power Switch

USB Device Power Switch

FEATURES

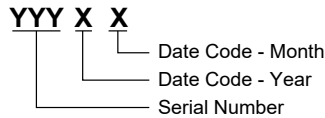
- **Input Voltage Range: 2.5V to 5.5V**
- **On-Resistance: 100mΩ (TYP)**
- **Three Current Limit Levels**
 - SGM2588A/B/G: 1100 ± 110mA**
 - SGM2588C/D/I: 2100 ± 220mA**
 - SGM2588E/F/K: 2600 ± 310mA**
- **Quiescent Current: 23μA (TYP)**
- **Shutdown Current: 0.1μA (TYP)**
- **Full Set of Protections**
 - ◆ **Soft-Start**
 - ◆ **Under-Voltage Lockout for VIN**
 - ◆ **No Reversed Leakage Current**
 - ◆ **Thermal Shutdown**
- **Quick Output Discharge: SGM2588A/B/C/D/E/F**
- **EN Pin Pull-Down Resistor: 500kΩ (SGM2588G/I/K)**
- **Evaluated to IEC 60950-1, Ed 2, Am1, Annex CC, Test Program 1 with CB Report (SGM2588A/C/E)**
- **Available in a Green SOT-23-5 Package**

PACKAGE/ORDERING INFORMATION

| MODEL | PACKAGE DESCRIPTION | SPECIFIED TEMPERATURE RANGE | ORDERING NUMBER | PACKAGE MARKING | PACKING OPTION |
|---------------------------|---------------------|-----------------------------|-----------------|-----------------|---------------------|
| SGM2588A (Active High) | SOT-23-5 | -40°C to +85°C | SGM2588AYN5G/TR | SSCXX | Tape and Reel, 3000 |
| SGM2588B (Active Low) | SOT-23-5 | -40°C to +85°C | SGM2588BYN5G/TR | SSDXX | Tape and Reel, 3000 |
| SGM2588C (Active High) | SOT-23-5 | -40°C to +85°C | SGM2588CYN5G/TR | SSEX | Tape and Reel, 3000 |
| SGM2588D (Active Low) | SOT-23-5 | -40°C to +85°C | SGM2588DYN5G/TR | ST0XX | Tape and Reel, 3000 |
| SGM2588E (Active High) | SOT-23-5 | -40°C to +85°C | SGM2588EYN5G/TR | ST1XX | Tape and Reel, 3000 |
| SGM2588F (Active Low) | SOT-23-5 | -40°C to +85°C | SGM2588FYN5G/TR | ST2XX | Tape and Reel, 3000 |
| SGM2588G (Active High) | SOT-23-5 | -40°C to +85°C | SGM2588GYN5G/TR | G51XX | Tape and Reel, 3000 |
| SGM2588I (Active High) | SOT-23-5 | -40°C to +85°C | SGM2588IYN5G/TR | G52XX | Tape and Reel, 3000 |
| SGM2588K (Active High) | SOT-23-5 | -40°C to +85°C | SGM2588KYN5G/TR | G53XX | Tape and Reel, 3000 |

MARKING INFORMATION

NOTE: XX = Date Code.



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

| | |
|--|-----------------|
| All Pins..... | 6V |
| nFAULT Current | 25mA |
| Power Dissipation, P _D @ T _A = +25°C | |
| SOT-23-5 | 0.3W |
| Package Thermal Resistance | |
| SOT-23-5, θ _{JA} | 220°C/W |
| SOT-23-5, θ _{JC} | 93°C/W |
| Junction Temperature..... | +150°C |
| Storage Temperature Range | -65°C to +150°C |
| Lead Temperature (Soldering, 10s)..... | +260°C |
| ESD Susceptibility | |
| HBM..... | 2000V |
| MM..... | 400V |
| CDM | 1000V |

RECOMMENDED OPERATING CONDITIONS

| | |
|---|-----------------|
| Input Voltage Range | 2.5V to 5.5V |
| EN Voltage Range | -0.3V to 5.5V |
| All Other Pins..... | 0V to 5.5V |
| Operating Junction Temperature Range..... | -40°C to +125°C |
| Operating Ambient Temperature Range | -40°C to +85°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.

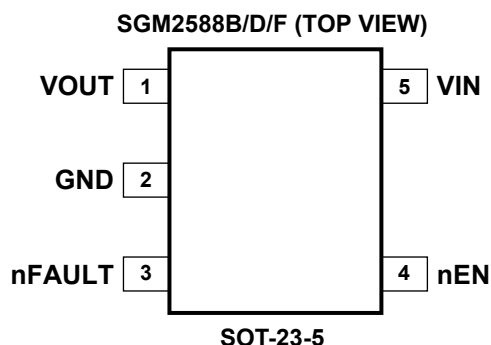
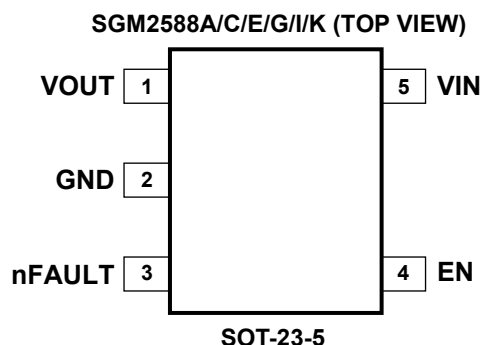
ESD SENSITIVITY CAUTION

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 |
|-----|--------|--|
| 1 | VOUT | Switch Input Pin. |
| 2 | GND | Ground. |
| 3 | nFAULT | Fault Flag Pin. Active low, open-drain output. Indicates over-current or thermal shutdown conditions. Over-current condition must last longer than t_D in order to assert nFAULT. |
| 4 | EN/nEN | Chip Enable Pin. Do not floating for SGM2588A/B/C/D/E/F. Active high for SGM2588A/C/E/G/I/K (EN) and active low for SGM2588B/D/F (nEN). SGM2588G/I/K have integrated a 500k Ω pull-down resistor at EN pin. |
| 5 | VIN | Switch Output Pin. |

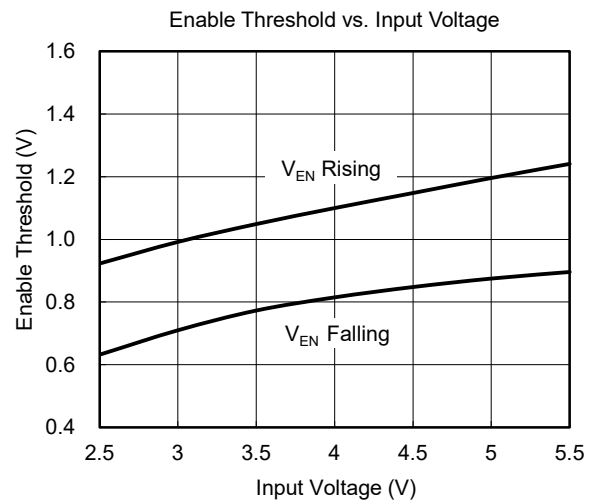
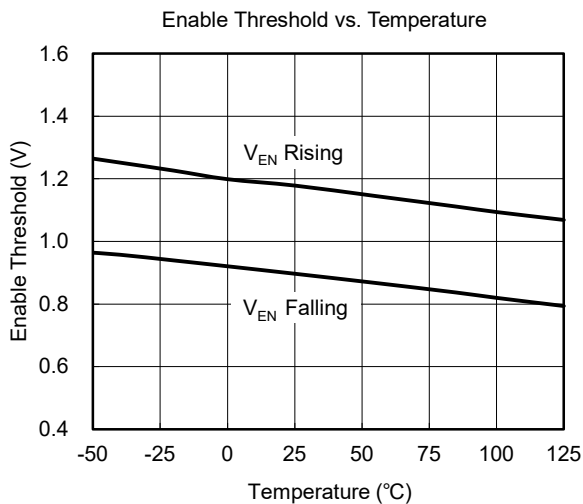
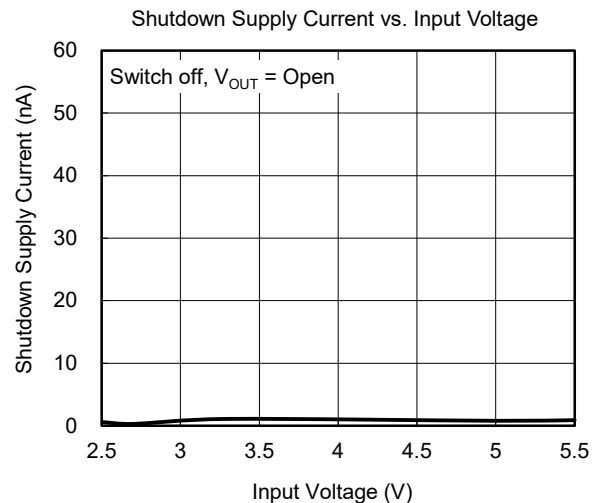
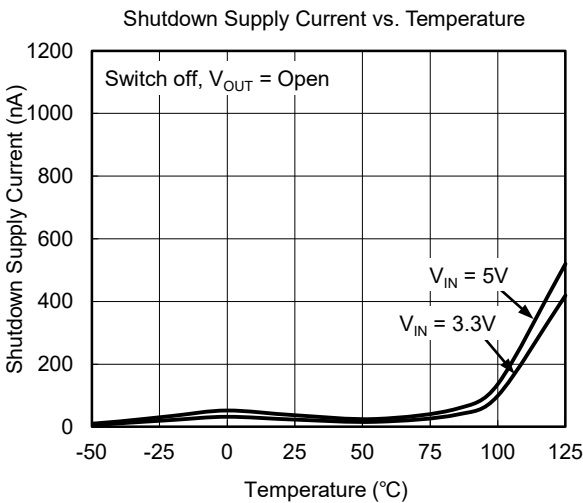
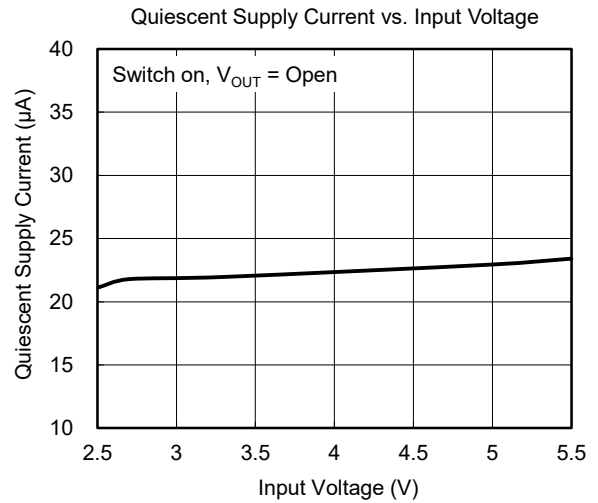
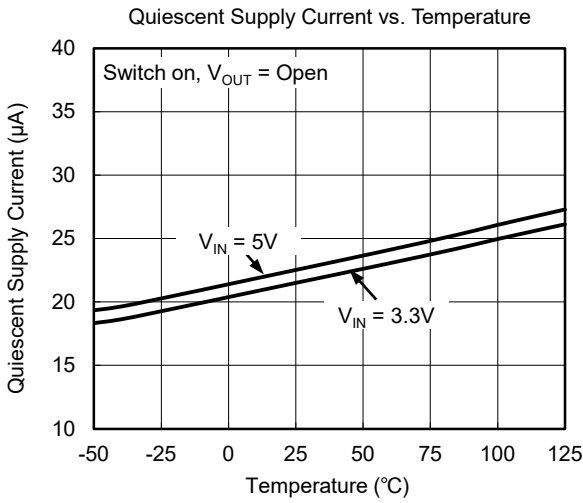
ELECTRICAL CHARACTERISTICS

(T_A = +25°C, V_{IN} = 5V, unless otherwise noted.)

| PARAMETER | | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNITS |
|---|--------------|------------------------|--|------|------|------|-------|
| Input Voltage Range | | V _{IN} | | 2.5 | | 5.5 | V |
| Quiescent Supply Current | | I _Q | Switch on, V _{OUT} = Open | | 23 | 35 | μA |
| Shutdown Supply Current | | I _{SD} | Switch off, V _{OUT} = Open | | 0.1 | | μA |
| Supply Leakage Current (SGM2588A/B/C/D/E/F) | | I _{LEAKAGE} | Switch off, V _{OUT} = 0V | | 0.1 | | μA |
| Output Leakage Current (SGM2588G/I/K) | | | Switch off, V _{OUT} = 5V | | 0.1 | | μA |
| Enable Input Threshold | | V _{IH} | V _{IN} = 2.5V to 5.5V | 1.6 | | | V |
| | | V _{IL} | V _{IN} = 2.5V to 5.5V | | | 0.4 | |
| Enable Input Current (SGM2588A/B/C/D/E/F) | | I _{EN} | V _{EN} = 0V to 5V | | 0.1 | | μA |
| EN Pin Pull-Down Resistor (SGM2588G/I/K) | | R _{PULL_DOWN} | | | 500 | | kΩ |
| Switch Resistance | | R _{DS(ON)} | I _{OUT} = 500mA | | 100 | | mΩ |
| Output Turn-On Delay Time | | t _{ON} | R _L = 10Ω, C _L = 1μF, Figure 3 | | 2.3 | | ms |
| Output Turn-Off Delay Time | | t _{OFF} | R _L = 10Ω, C _L = 1μF, Figure 3 | | 25 | | μs |
| Current Limit Threshold | SGM2588A/B/G | I _{LIM} | Ramped load | 1000 | 1100 | 1200 | mA |
| | SGM2588C/D/I | | Ramped load | 1890 | 2100 | 2310 | |
| | SGM2588E/F/K | | Ramped load | 2300 | 2600 | 2900 | |
| Over-Current nFAULT Response Delay Time | | t _D | Apply V _{OUT} = 0 until nFAULT is low | | 13 | | ms |
| Under-Voltage Lockout Threshold | | V _{UVLO} | V _{IN} rising | | 2.15 | 2.3 | V |
| Under-Voltage Lockout Threshold Hysteresis | | | | | 0.1 | | V |
| nFAULT Output Resistance | | R _{nFAULT} | nFAULT is low and I _{SINK} = 10mA | | 20 | | Ω |
| nFAULT Leakage Current | | I _{nFAULT} | nFAULT is high | | 0.1 | | μA |
| VO _{UT} Shutdown Discharge Resistance (SGM2588A/B/C/D/E/F) | | R _{DIS} | Switch off | | 50 | | Ω |
| Thermal Shutdown Temperature | | | T _J increasing | | 150 | | °C |
| Thermal Shutdown Hysteresis | | | | | 20 | | °C |

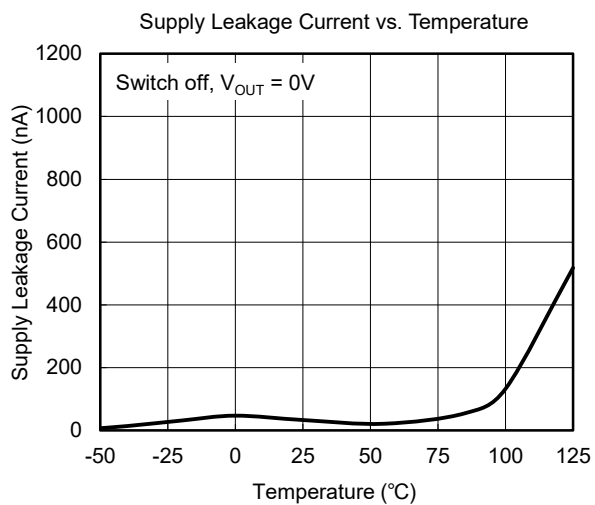
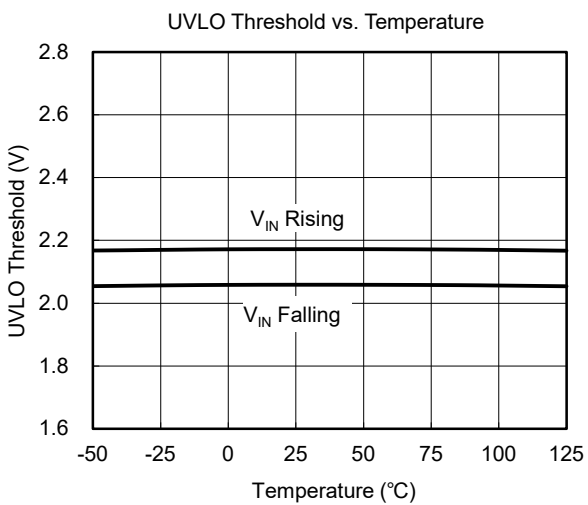
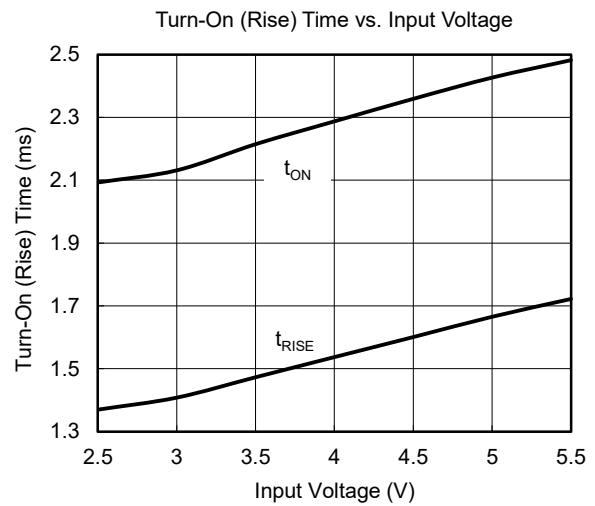
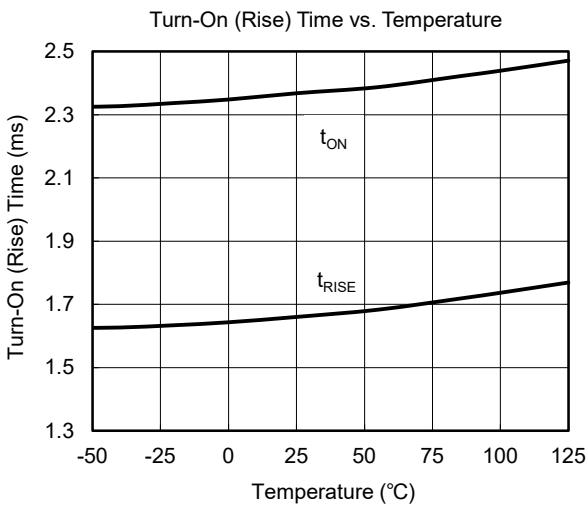
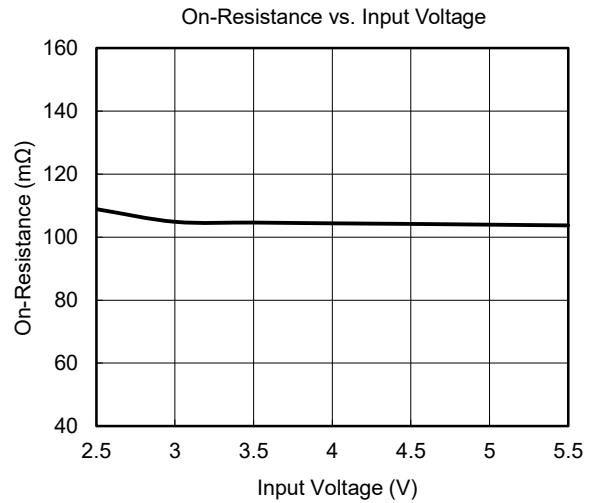
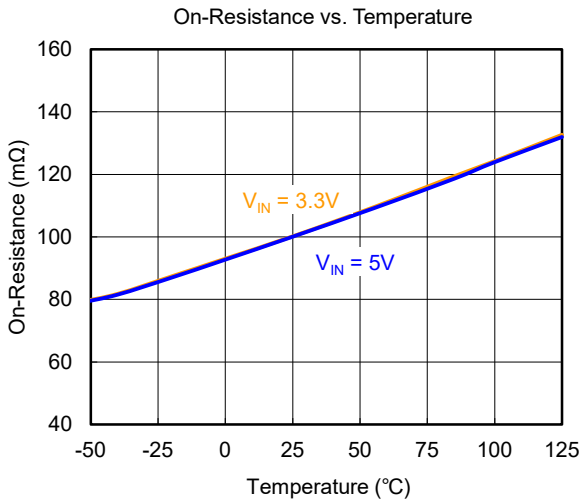
TYPICAL PERFORMANCE CHARACTERISTICS

T_A = +25°C, V_{IN} = 5V, unless otherwise noted.



TYPICAL PERFORMANCE CHARACTERISTICS (continued)

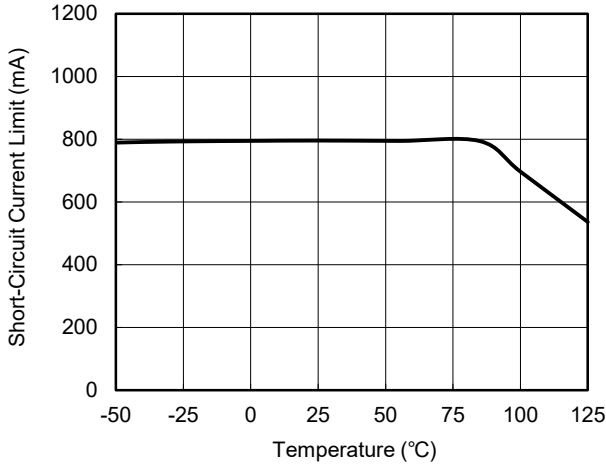
T_A = +25°C, V_{IN} = 5V, unless otherwise noted.



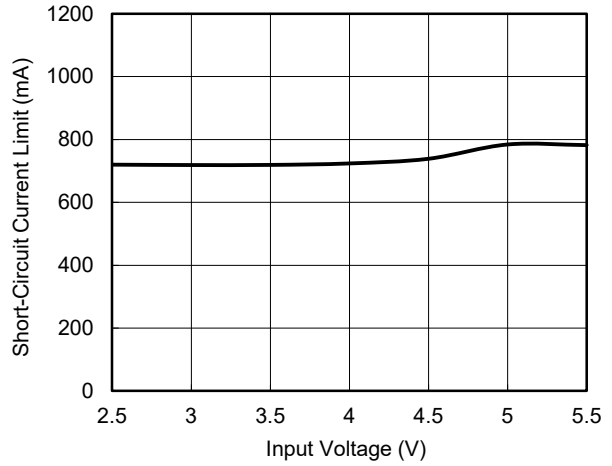
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

T_A = +25°C, V_{IN} = 5V, unless otherwise noted.

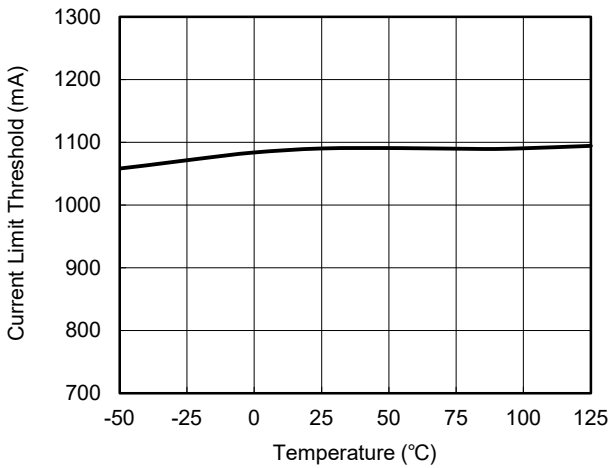
Short-Circuit Current Limit vs. Temperature
(SGM2588A/B/G)



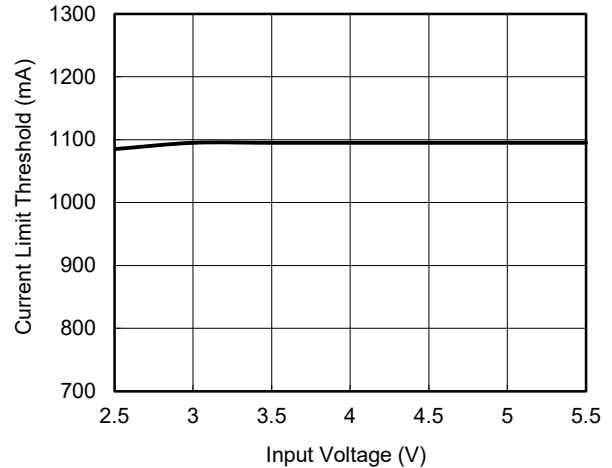
Short-Circuit Current Limit vs. Input Voltage
(SGM2588A/B/G)



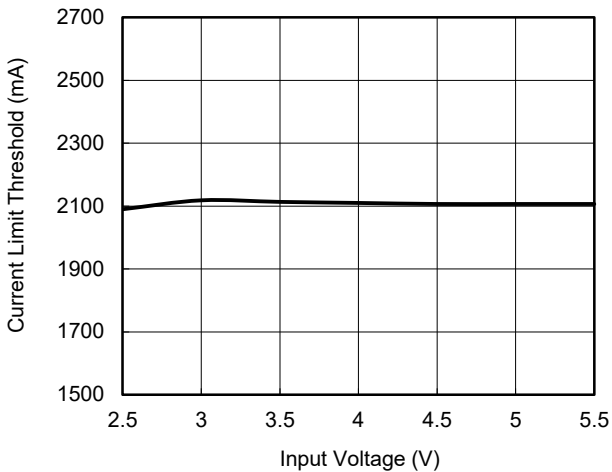
Current Limit Threshold vs. Temperature
(SGM2588A/B/G)



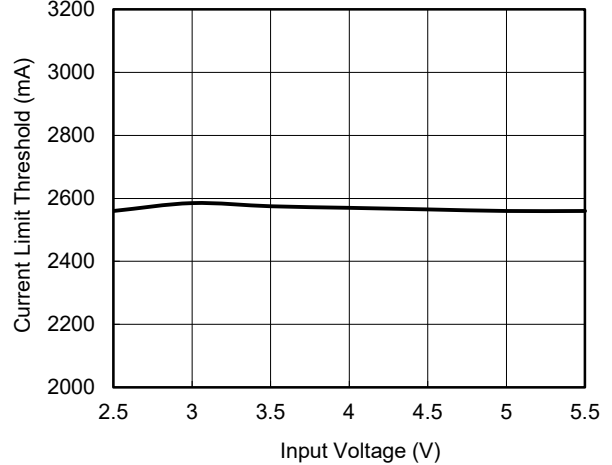
Current Limit Threshold vs. Input Voltage
(SGM2588A/B/G)



Current Limit Threshold vs. Input Voltage
(SGM2588C/D/I)



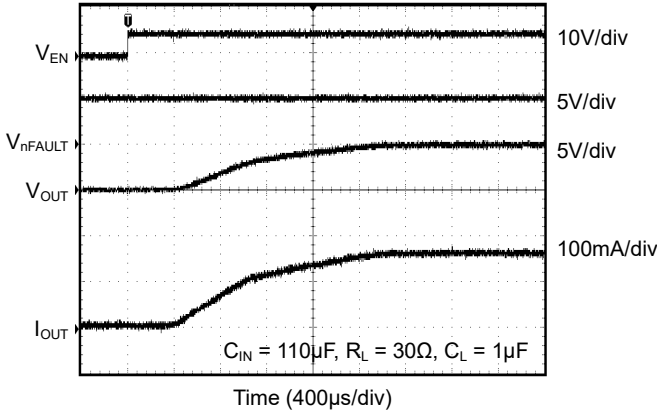
Current Limit Threshold vs. Input Voltage
(SGM2588E/F/K)



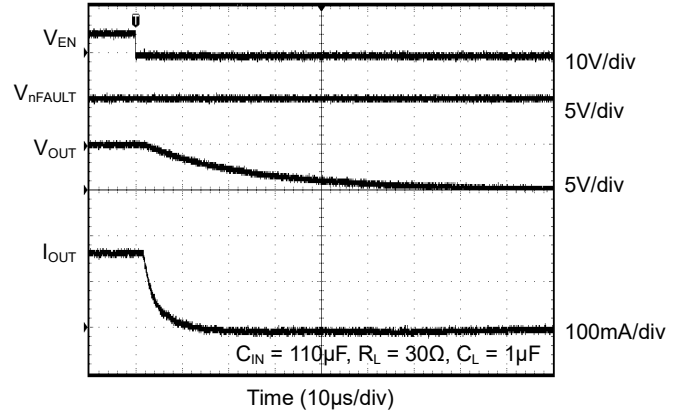
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

T_A = +25°C, V_{IN} = 5V, unless otherwise noted.

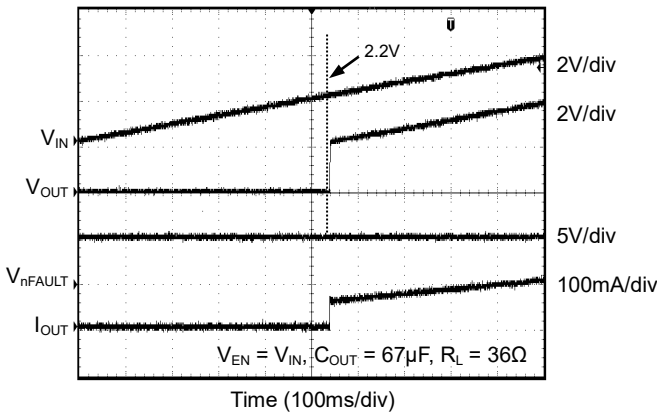
Turn-On Response (SGM2588A/C/E/G/I/K)



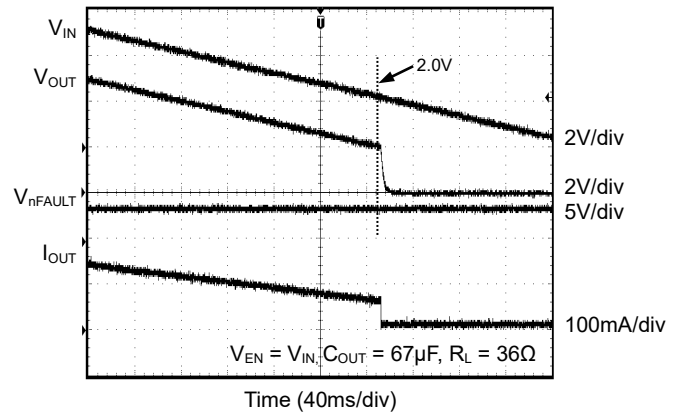
Turn-Off Response (SGM2588A/C/E/G/I/K)



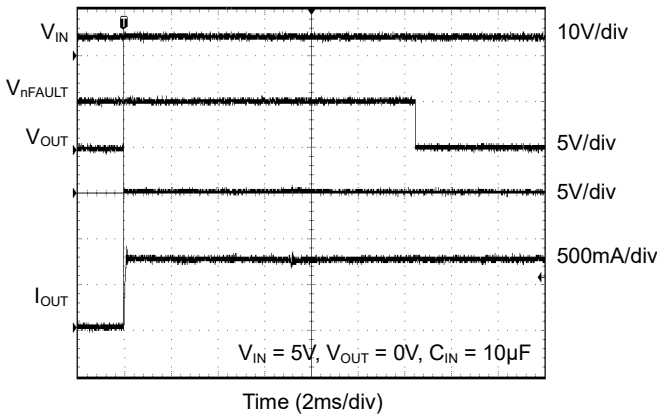
UVLO at V_{IN} Rising



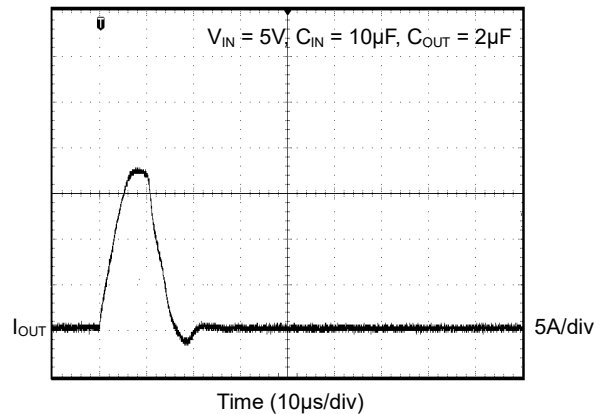
UVLO at V_{IN} Falling



Short-Circuit Response (SGM2588A/B/G)



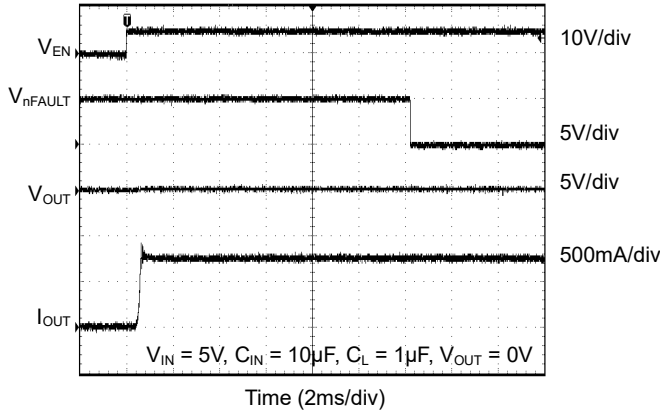
Short-Circuit Response (SGM2588A/B/G)



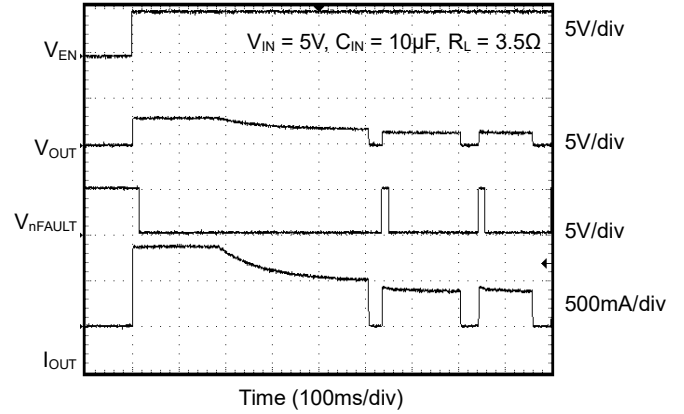
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

T_A = +25°C, V_{IN} = 5V, unless otherwise noted.

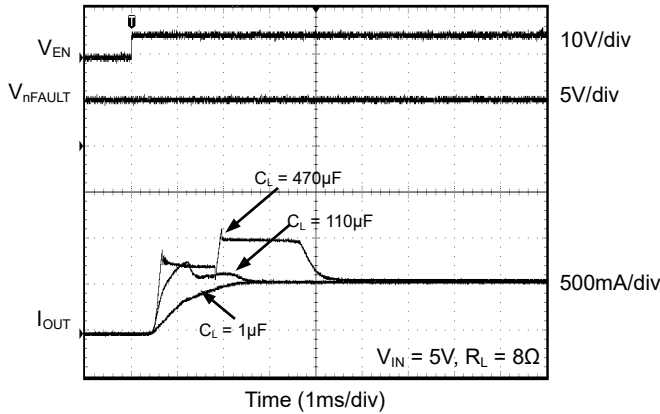
Enabled Into Short-Circuit (SGM2588A/G)



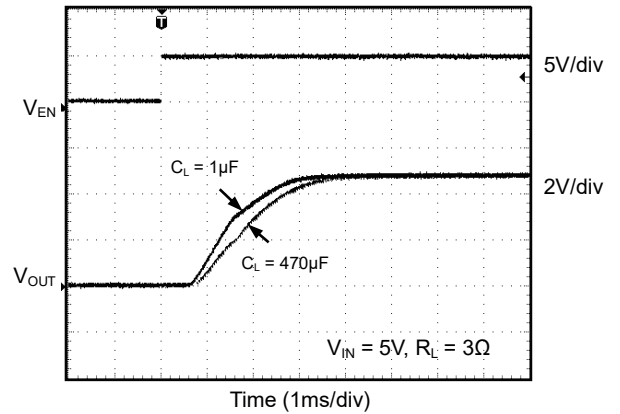
Thermal Shutdown Response (SGM2588A/G)



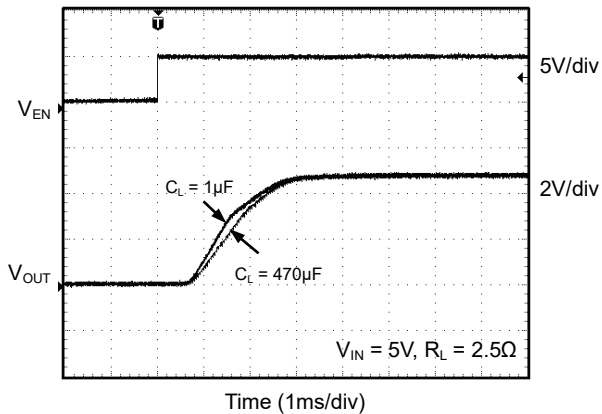
Inrush Current Response (SGM2588A/G)



Inrush Current Response (SGM2588C/I)



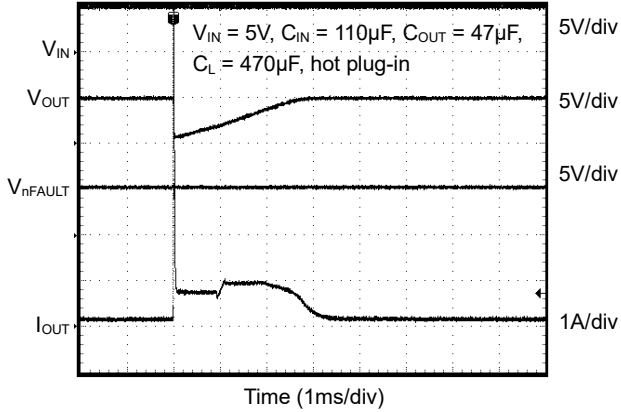
Inrush Current Response (SGM2588E/K)



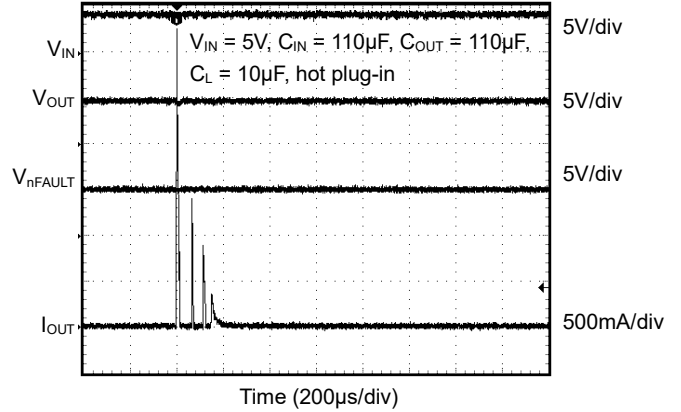
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

T_A = +25°C, V_{IN} = 5V, unless otherwise noted.

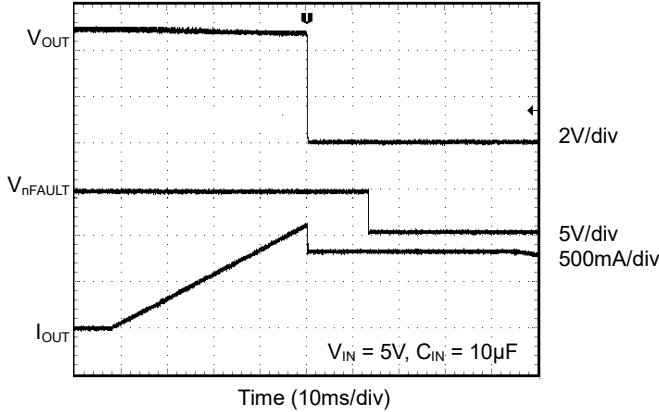
Capacitance Load Inrush Response (SGM2588A/B/G)



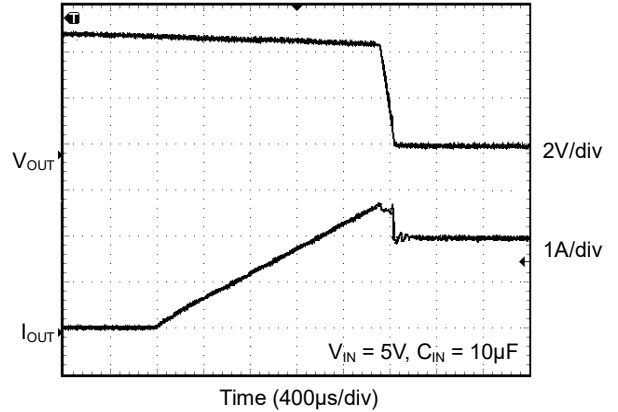
Capacitance Load Inrush Response (SGM2588A/B/G)



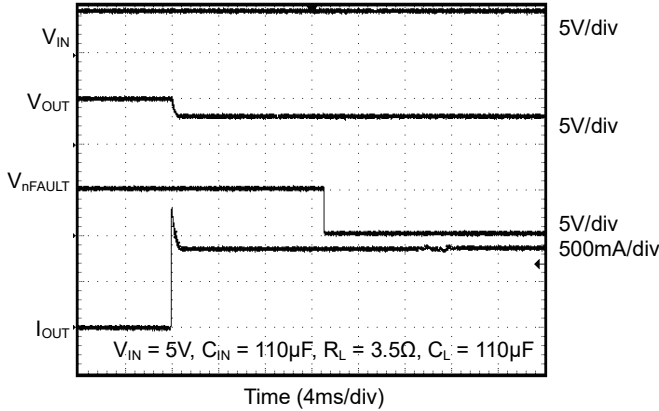
Ramped Load Response (SGM2588A/B/G)



Ramped Load Response (SGM2588E/F/K)



Resistance Load Inrush Response (SGM2588A/B/G)



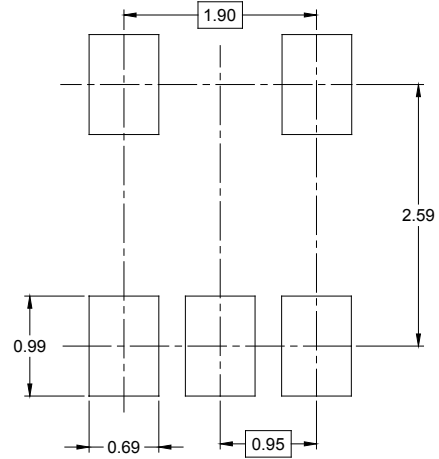
REVISION HISTORY

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

| FEBRUARY 2019 – REV.A.2 to REV.A.3 | Page |
|--|-------------|
| Updated Absolute Maximum Ratings section..... | 2 |
| DECEMBER 2017 – REV.A.1 to REV.A.2 | Page |
| Update Feature section | 1 |
| APRIL 2016 – REV.A to REV.A.1 | Page |
| Changed Reverse-Voltage Protection section..... | 10 |
| Changes from Original (OCTOBER 2015) to REV.A | Page |
| Changed from product preview to production data..... | All |

PACKAGE OUTLINE DIMENSIONS

SOT-23-5



RECOMMENDED LAND PATTERN (Unit: mm)



| Symbol | Dimensions In Millimeters | | Dimensions 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 |
| θ | 0° | 8° | 0° | 8° |

PACKAGE INFORMATION

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



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

KEY PARAMETER LIST OF TAPE AND REEL

| Package Type | Reel Diameter | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P0 (mm) | P1 (mm) | P2 (mm) | W (mm) | Pin1 Quadrant |
|--------------|---------------|--------------------|---------|---------|---------|---------|---------|---------|--------|---------------|
| SOT-23-5 | 7" | 9.5 | 3.20 | 3.20 | 1.40 | 4.0 | 4.0 | 2.0 | 8.0 | Q3 |

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PACKAGE INFORMATION

CARTON BOX DIMENSIONS



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

KEY PARAMETER LIST OF CARTON BOX

| Reel Type | Length (mm) | Width (mm) | Height (mm) | Pizza/Carton |
|-------------|-------------|------------|-------------|--------------|
| 7" (Option) | 368 | 227 | 224 | 8 |
| 7" | 442 | 410 | 224 | 18 |

DD0002

单击下面可查看定价，库存，交付和生命周期等信息

[>>SGMICRO\(圣邦微电子\)](#)