

GENERAL DESCRIPTION

The SGM2238 is a high voltage, low quiescent current and low dropout voltage linear regulator. It is capable of supplying 300mA output current with typical dropout voltage of 450mV. The operating input voltage range is from 3V to 40V. The fixed output voltage range is from 1.8V to 12V and the adjustable output voltage range is from 1.25V to 24V.

Other features include logic-controlled shutdown mode and thermal shutdown protection. The SGM2238 has automatic discharge function to quickly discharge V_{OUT} in the disabled status.

The SGM2238 is available in a Green SOIC-8 (Exposed Pad) package. It operates over an operating temperature range of -40°C to $+125^{\circ}\text{C}$.

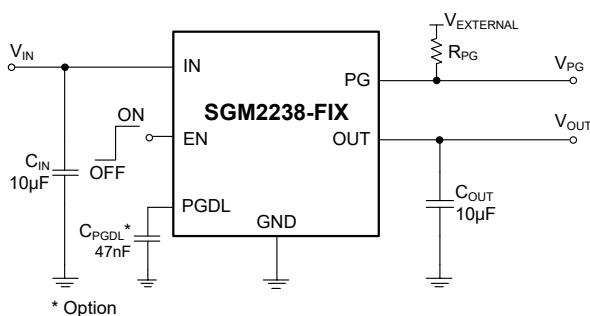
FEATURES

- Operating Input Voltage Range: 3V to 40V
- Enable Pin Accept Voltages Higher than the Supply Voltage and up to 40V
- Fixed Output from 1.8V to 12V
- Adjustable Output from 1.25V to 24V
- 300mA Output Current
- Output Voltage Accuracy: $\pm 1\%$ at $+25^{\circ}\text{C}$
- Low Quiescent Current: $3.8\mu\text{A}$ (TYP)
- Low Dropout Voltage: 450mV (TYP) at 300mA
- Current Limiting and Thermal Protection
- Support Power-Good Indicator Function
- With Output Automatic Discharge
- Stable with Small Case Size Ceramic Capacitors
- -40°C to $+125^{\circ}\text{C}$ Operating Temperature Range
- Available in a Green SOIC-8 (Exposed Pad) Package

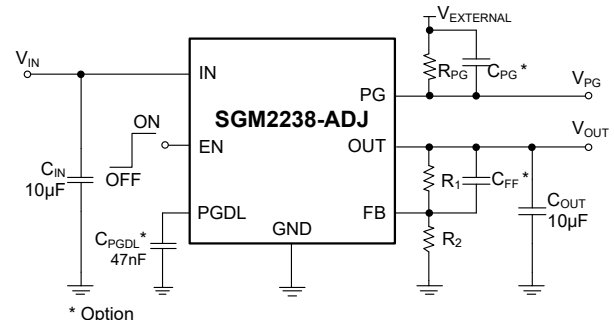
APPLICATIONS

Battery-Powered Equipment
Ultra-Low Power System
Medical Equipment
Industrial Equipment

TYPICAL APPLICATION



Fixed Output Voltage Version



Adjustable Output Voltage Version

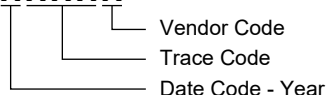
Figure 1. Typical Application Circuits

PACKAGE/ORDERING INFORMATION

| MODEL | PACKAGE DESCRIPTION | SPECIFIED TEMPERATURE RANGE | ORDERING NUMBER | PACKAGE MARKING | PACKING OPTION |
|-------------|-------------------------|-----------------------------|---------------------|-------------------------|---------------------|
| SGM2238-3.3 | SOIC-8 (Exposed Pad) | -40°C to +125°C | SGM2238-3.3XPS8G/TR | SGM 1MCXPS8 XXXXX | Tape and Reel, 4000 |
| SGM2238-3.6 | SOIC-8 (Exposed Pad) | -40°C to +125°C | SGM2238-3.6XPS8G/TR | SGM 1MDXPS8 XXXXX | Tape and Reel, 4000 |
| SGM2238-4.2 | SOIC-8 (Exposed Pad) | -40°C to +125°C | SGM2238-4.2XPS8G/TR | SGM 1MEXPS8 XXXXX | Tape and Reel, 4000 |
| SGM2238-5.0 | SOIC-8 (Exposed Pad) | -40°C to +125°C | SGM2238-5.0XPS8G/TR | SGM 1MFPS8 XXXXX | Tape and Reel, 4000 |
| SGM2238-8.0 | SOIC-8 (Exposed Pad) | -40°C to +125°C | SGM2238-8.0XPS8G/TR | SGM 1MGXPS8 XXXXX | Tape and Reel, 4000 |
| SGM2238-9.0 | SOIC-8 (Exposed Pad) | -40°C to +125°C | SGM2238-9.0XPS8G/TR | SGM 1MHXPS8 XXXXX | Tape and Reel, 4000 |
| SGM2238-12 | SOIC-8 (Exposed Pad) | -40°C to +125°C | SGM2238-12XPS8G/TR | SGM 1MIXPS8 XXXXX | Tape and Reel, 4000 |
| SGM2238-ADJ | SOIC-8 (Exposed Pad) | -40°C to +125°C | SGM2238-ADJXPS8G/TR | SGM 1MJXPS8 XXXXX | Tape and Reel, 4000 |

MARKING INFORMATION

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

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

| | |
|--|-----------------|
| IN, EN to GND | -0.3V to 45V |
| OUT, FB to GND..... | -0.3V to 45V |
| PG to GND..... | -0.3V to 45V |
| PGDL to GND | -0.3V to 6V |
| Package Thermal Resistance | |
| SOIC-8 (Exposed Pad), θ_{JA} | 36.2°C/W |
| SOIC-8 (Exposed Pad), θ_{JB} | 13.5°C/W |
| SOIC-8 (Exposed Pad), $\theta_{JC(TOP)}$ | 53.5°C/W |
| SOIC-8 (Exposed Pad), $\theta_{JC(BOT)}$ | 2.4°C/W |
| Junction Temperature..... | +150°C |
| Storage Temperature Range | -65°C to +150°C |
| Lead Temperature (Soldering, 10s)..... | +260°C |
| ESD Susceptibility ^{(1) (2)} | |
| HBM..... | ±2000V |
| CDM | ±1000V |

NOTES:

1. For human body model (HBM), all pins comply with ANSI/ESDA/JEDEC JS-001 specifications.
2. For charged device model (CDM), all pins comply with ANSI/ESDA/JEDEC JS-002 specifications.

RECOMMENDED OPERATING CONDITIONS

| | |
|---|--------------------------|
| Supply Voltage Range, V_{IN} | 3V to 40V |
| Enable Input Voltage Range, V_{EN} | 3V to 40V |
| Input Effective Capacitance, C_{IN} | 1 μ F (MIN) |
| Output Effective Capacitance, C_{OUT} | 1 μ F to 100 μ 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.

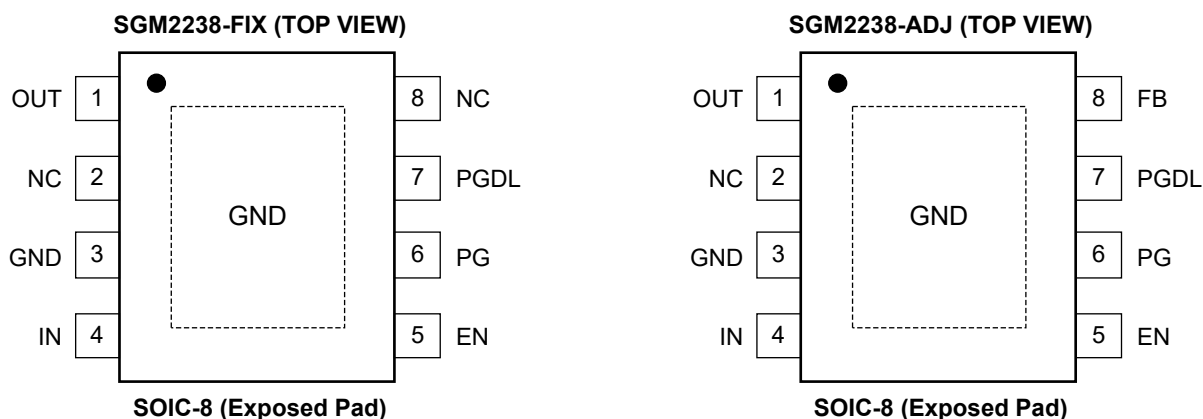
ESD SENSITIVITY CAUTION

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 |
|-------------|------|--|
| 1 | OUT | Regulator Output Pin. It is recommended to use a ceramic capacitor with effective capacitance in the range of 1 μ F to 100 μ F to ensure stability. This ceramic capacitor should be placed as close as possible to OUT pin. |
| 2 | NC | No Connection. |
| 3 | GND | Ground. |
| 4 | IN | Input Supply Voltage Pin. It is recommended to use a 2.2 μ F or larger ceramic capacitor from IN pin to ground to get good power supply decoupling. This ceramic capacitor should be placed as close as possible to IN pin. |
| 5 | EN | Enable Pin. Drive EN high to turn on the regulator. Drive EN low to turn off the regulator. |
| 6 | PG | Power-Good Indicator Output Pin. An open-drain, active-high output that indicates the status of V_{OUT} . When the output voltage reaches PG_{HTH} of the target, the PG pin goes into a high-impedance state. |
| 7 | PGDL | Power-Good Delay Pin. Keep this pin floating when it is not in use. |
| 8 | NC | No Connection (Fixed Version Only). |
| | FB | Feedback Voltage 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. |
| Exposed Pad | GND | Exposed Pad. Connect it to GND internally. Connect it to a large ground plane to maximize thermal performance. This pad is not an electrical connection point. |

40V, 300mA, Low Quiescent Current and Low Dropout Voltage Linear Regulator

The schematic diagram of the SGM2238-FIX voltage regulator shows the internal control logic and power stages. The input (IN) is connected to the power MOSFET gate. The output (OUT) is taken from the MOSFET drain. The ground (GND) is connected to the MOSFET source and the EN pin. The EN pin is connected to the EN input of the UVLO & Enable Logic block. The UVLO & Enable Logic block is connected to the gate of the MOSFET. The Current Limit & Thermal Protection block is connected to the drain of the MOSFET. The Reference Voltage block provides a reference voltage V_{REF} to the feedback network. The feedback network consists of resistors R_2 , R_3 , and R_{DIS} . The feedback voltage V_{FB} is the voltage across R_3 . The feedback op-amp compares V_{FB} with V_{REF} and drives the MOSFET gate. A delay block is connected to the output of the feedback op-amp and the PGDL pin. The delay block output is $0.94 \times V_{REF}$. The PGDL pin is connected to the output of the delay block. The PGDL pin is also connected to the output of the UVLO & Enable Logic block.

The schematic diagram illustrates the internal architecture of the SGM2238-ADJ voltage regulator. Key components and connections include:

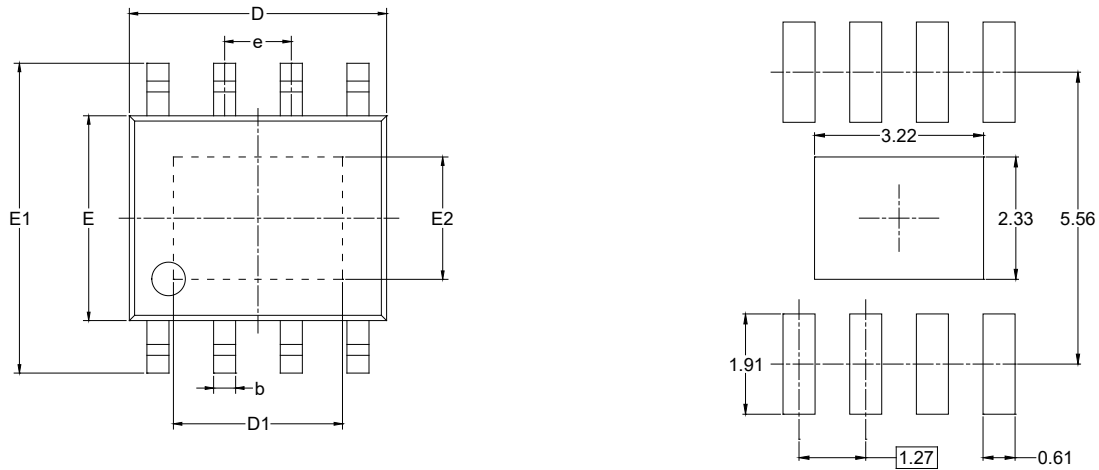
- Input (IN):** Connected to the main power input and the feedback network.
- Output (OUT):** The regulated output voltage.
- Feedback (FB):** Connected to the feedback network and the feedback amplifier.
- Power Good (PG):** Connected to the output and the enable (EN) pin.
- Reference Voltage:** Provides a stable reference voltage (V_{REF}) to the feedback network.
- Feedback Network:** Consists of a resistor divider (R_1 , R_2) and a capacitor (C_1) connected to the feedback pin.
- Feedback Amplifier:** Amplifies the error signal to regulate the output.
- Current Limit & Thermal Protection:** Protects the device from overcurrent and overheating.
- Delay Block:** Provides a delay for the power good (PG) signal.
- Enable (EN):** Controls the regulator's operation.



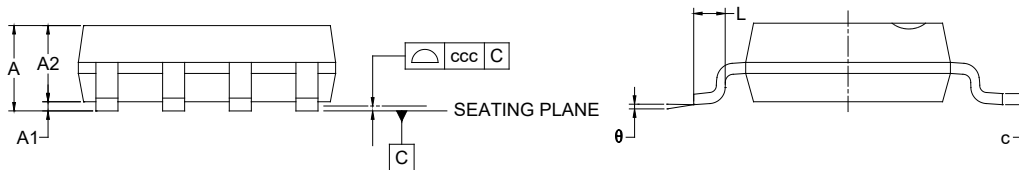
SG Micro Corp
www.sg-micro.com

PACKAGE OUTLINE DIMENSIONS

SOIC-8 (Exposed Pad)



RECOMMENDED LAND PATTERN (Unit: mm)



| Symbol | Dimensions In Millimeters | | |
|--------|------------------------------|-----|-------|
| | MIN | NOM | MAX |
| A | | | 1.700 |
| A1 | 0.000 | - | 0.150 |
| A2 | 1.250 | - | 1.650 |
| b | 0.330 | - | 0.510 |
| c | 0.170 | - | 0.250 |
| D | 4.700 | - | 5.100 |
| D1 | 3.020 | - | 3.420 |
| E | 3.800 | - | 4.000 |
| E1 | 5.800 | - | 6.200 |
| E2 | 2.130 | - | 2.530 |
| e | 1.27 BSC | | |
| L | 0.400 | - | 1.270 |
| θ | 0° | - | 8° |
| ccc | 0.100 | | |

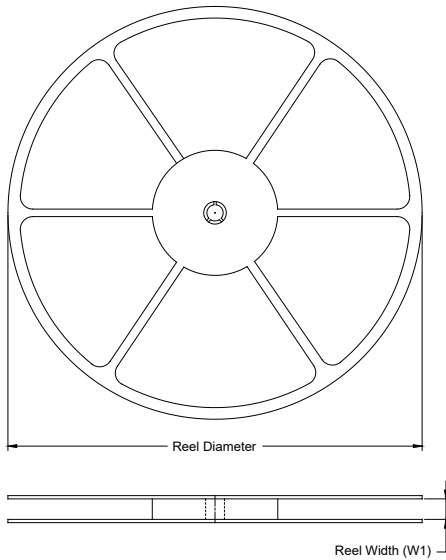
NOTES:

1. This drawing is subject to change without notice.
2. The dimensions do not include mold flashes, protrusions or gate burrs.
3. Reference JEDEC MS-012.

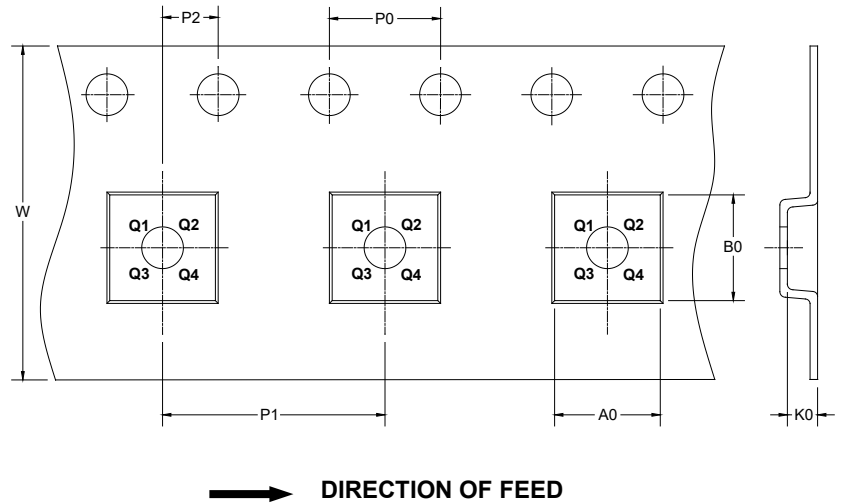
PACKAGE INFORMATION

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



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

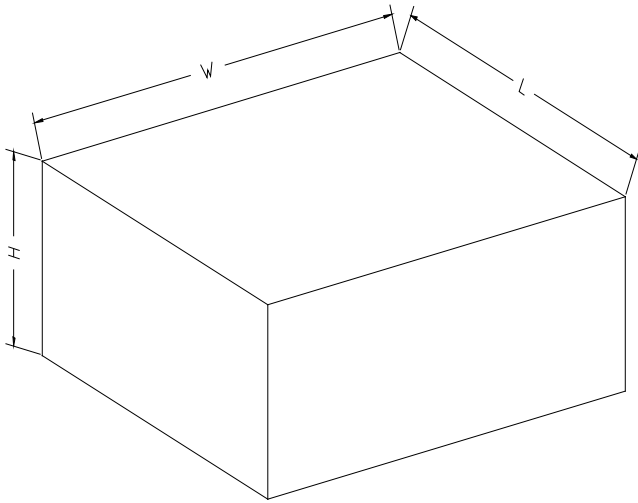
KEY PARAMETER LIST OF TAPE AND REEL

| Package Type | Reel Diameter | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P0 (mm) | P1 (mm) | P2 (mm) | W (mm) | Pin1 Quadrant |
|----------------------|---------------|--------------------|---------|---------|---------|---------|---------|---------|--------|---------------|
| SOIC-8 (Exposed Pad) | 13" | 12.4 | 6.40 | 5.40 | 2.10 | 4.0 | 8.0 | 2.0 | 12.0 | Q1 |

DD00001

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