

### GENERAL DESCRIPTION

The SGM2205 is a high voltage, low noise and low dropout voltage linear regulator. It is capable of supplying 800mA output current with typical dropout voltage of only 450mV. The operating input voltage range is from 2.5V to 20V.

Other features include logic-controlled shutdown mode, short-circuit current limit and thermal shutdown protection. The SGM2205 has automatic discharge function to quickly discharge  $V_{OUT}$  in the disabled status.

The SGM2205 is available in Green SOT-89-3, SOT-223-3, SOIC-8, TDFN-3×3-8L and TO-263-5B packages. It operates over an operating temperature range of -40°C to +125°C.

### FEATURES

- Wide Operating Input Voltage Range: 2.5V to 20V
- Fixed Outputs of 1.8V, 2.5V, 3.0V, 3.3V, 3.6V, 4.2V, 5.0V and 12V
- Adjustable Output from 1.8V to 15V
- Output Voltage Accuracy:  $\pm 1\%$  at +25°C
- Low Dropout Voltage: 450mV (TYP) at 800mA
- Current Limiting and Thermal Protection
- Excellent Load and Line Transient Responses
- With Output Automatic Discharge
- No-Load Stability
- -40°C to +125°C Operating Temperature Range
- Available in Green SOT-89-3, SOT-223-3, SOIC-8, TDFN-3×3-8L and TO-263-5B Packages

### APPLICATIONS

Cellular Telephones  
 Palmtop Computers  
 High-Efficiency Linear Power Supplies  
 Portable Equipment  
 Battery-Powered Systems

### TYPICAL APPLICATIONS

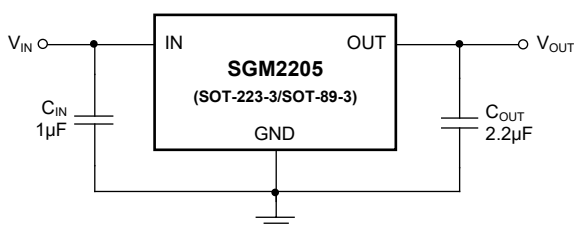


Figure 1. Fixed Voltage Typical Application Circuit

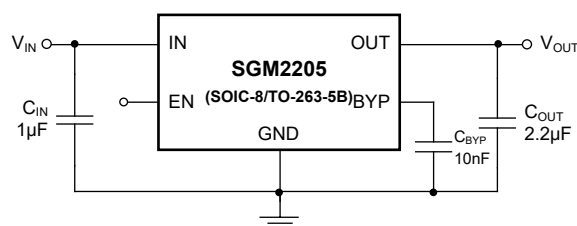


Figure 2. Low Noise Regulator (Fixed Voltage Version)

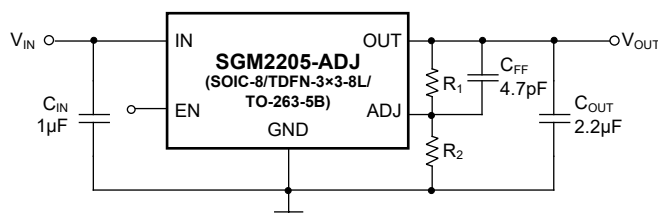


Figure 3. Low Noise Regulator (Adjustable Voltage Version)

## PACKAGE/ORDERING INFORMATION

| MODEL       | PACKAGE DESCRIPTION | SPECIFIED TEMPERATURE RANGE | ORDERING NUMBER     | PACKAGE MARKING            | PACKING OPTION      |
|-------------|---------------------|-----------------------------|---------------------|----------------------------|---------------------|
| SGM2205-1.8 | SOT-89-3            | -40°C to +125°C             | SGM2205-1.8XK3G/TR  | MJFX                       | Tape and Reel, 1000 |
| SGM2205-2.5 | SOT-89-3            | -40°C to +125°C             | SGM2205-2.5XK3G/TR  | RA4XX                      | Tape and Reel, 1000 |
| SGM2205-3.3 | SOT-89-3            | -40°C to +125°C             | SGM2205-3.3XK3G/TR  | RA5XX                      | Tape and Reel, 1000 |
| SGM2205-4.2 | SOT-89-3            | -40°C to +125°C             | SGM2205-4.2XK3G/TR  | M34XX                      | Tape and Reel, 1000 |
| SGM2205-5.0 | SOT-89-3            | -40°C to +125°C             | SGM2205-5.0XK3G/TR  | RA6XX                      | Tape and Reel, 1000 |
| SGM2205-1.8 | SOT-223-3           | -40°C to +125°C             | SGM2205-1.8XKC3G/TR | M86<br>XXXXX               | Tape and Reel, 2500 |
| SGM2205-2.5 | SOT-223-3           | -40°C to +125°C             | SGM2205-2.5XKC3G/TR | M87<br>XXXXX               | Tape and Reel, 2500 |
| SGM2205-3.0 | SOT-223-3           | -40°C to +125°C             | SGM2205-3.0XKC3G/TR | M89<br>XXXXX               | Tape and Reel, 2500 |
| SGM2205-3.3 | SOT-223-3           | -40°C to +125°C             | SGM2205-3.3XKC3G/TR | M8A<br>XXXXX               | Tape and Reel, 2500 |
| SGM2205-3.6 | SOT-223-3           | -40°C to +125°C             | SGM2205-3.6XKC3G/TR | M8B<br>XXXXX               | Tape and Reel, 2500 |
| SGM2205-4.2 | SOT-223-3           | -40°C to +125°C             | SGM2205-4.2XKC3G/TR | GP4<br>XXXXX               | Tape and Reel, 2500 |
| SGM2205-5.0 | SOT-223-3           | -40°C to +125°C             | SGM2205-5.0XKC3G/TR | M8C<br>XXXXX               | Tape and Reel, 2500 |
| SGM2205-12  | SOT-223-3           | -40°C to +125°C             | SGM2205-12XKC3G/TR  | M8D<br>XXXXX               | Tape and Reel, 2500 |
| SGM2205-1.8 | SOIC-8              | -40°C to +125°C             | SGM2205-1.8XS8G/TR  | SGM<br>MM2XS8<br>XXXXX     | Tape and Reel, 4000 |
| SGM2205-2.5 | SOIC-8              | -40°C to +125°C             | SGM2205-2.5XS8G/TR  | SGM<br>MM3XS8<br>XXXXX     | Tape and Reel, 4000 |
| SGM2205-3.0 | SOIC-8              | -40°C to +125°C             | SGM2205-3.0XS8G/TR  | SGM<br>MM4XS8<br>XXXXX     | Tape and Reel, 4000 |
| SGM2205-3.3 | SOIC-8              | -40°C to +125°C             | SGM2205-3.3XS8G/TR  | SGM<br>MM5XS8<br>XXXXX     | Tape and Reel, 4000 |
| SGM2205-3.6 | SOIC-8              | -40°C to +125°C             | SGM2205-3.6XS8G/TR  | SGM<br>MM6XS8<br>XXXXX     | Tape and Reel, 4000 |
| SGM2205-4.2 | SOIC-8              | -40°C to +125°C             | SGM2205-4.2XS8G/TR  | SGM<br>M33XS8<br>XXXXX     | Tape and Reel, 4000 |
| SGM2205-5.0 | SOIC-8              | -40°C to +125°C             | SGM2205-5.0XS8G/TR  | SGM<br>MM7XS8<br>XXXXX     | Tape and Reel, 4000 |
| SGM2205-12  | SOIC-8              | -40°C to +125°C             | SGM2205-12XS8G/TR   | SGM<br>MM8XS8<br>XXXXX     | Tape and Reel, 4000 |
| SGM2205-ADJ | SOIC-8              | -40°C to +125°C             | SGM2205-ADJXS8G/TR  | SGM<br>2205ADJXS8<br>XXXXX | Tape and Reel, 4000 |

## PACKAGE/ORDERING INFORMATION (continued)

| MODEL       | PACKAGE DESCRIPTION | SPECIFIED TEMPERATURE RANGE | ORDERING NUMBER      | PACKAGE MARKING            | PACKING OPTION      |
|-------------|---------------------|-----------------------------|----------------------|----------------------------|---------------------|
| SGM2205-1.8 | TDFN-3×3-8L         | -40°C to +125°C             | SGM2205-1.8XTDB8G/TR | SGM<br>MP6DB<br>XXXXX      | Tape and Reel, 4000 |
| SGM2205-3.3 | TDFN-3×3-8L         | -40°C to +125°C             | SGM2205-3.3XTDB8G/TR | SGM<br>CABDB<br>XXXXX      | Tape and Reel, 4000 |
| SGM2205-5.0 | TDFN-3×3-8L         | -40°C to +125°C             | SGM2205-5.0XTDB8G/TR | SGM<br>CACDB<br>XXXXX      | Tape and Reel, 4000 |
| SGM2205-ADJ | TDFN-3×3-8L         | -40°C to +125°C             | SGM2205-ADJXTDB8G/TR | SGM<br>R1DB<br>XXXXX       | Tape and Reel, 4000 |
| SGM2205-1.8 | TO-263-5B           | -40°C to +125°C             | SGM2205-1.8XO5G/TR   | SGMMA<br>XO5<br>XXXXX      | Tape and Reel, 800  |
| SGM2205-2.5 | TO-263-5B           | -40°C to +125°C             | SGM2205-2.5XO5G/TR   | SGMMB<br>XO5<br>XXXXX      | Tape and Reel, 800  |
| SGM2205-3.0 | TO-263-5B           | -40°C to +125°C             | SGM2205-3.0XO5G/TR   | SGMMC<br>XO5<br>XXXXX      | Tape and Reel, 800  |
| SGM2205-3.3 | TO-263-5B           | -40°C to +125°C             | SGM2205-3.3XO5G/TR   | SGMMD<br>XO5<br>XXXXX      | Tape and Reel, 800  |
| SGM2205-3.6 | TO-263-5B           | -40°C to +125°C             | SGM2205-3.6XO5G/TR   | SGMME<br>XO5<br>XXXXX      | Tape and Reel, 800  |
| SGM2205-4.2 | TO-263-5B           | -40°C to +125°C             | SGM2205-4.2XO5G/TR   | SGMN2<br>XO5<br>XXXXX      | Tape and Reel, 800  |
| SGM2205-5.0 | TO-263-5B           | -40°C to +125°C             | SGM2205-5.0XO5G/TR   | SGMMF<br>XO5<br>XXXXX      | Tape and Reel, 800  |
| SGM2205-12  | TO-263-5B           | -40°C to +125°C             | SGM2205-12XO5G/TR    | SGMN0<br>XO5<br>XXXXX      | Tape and Reel, 800  |
| SGM2205-ADJ | TO-263-5B           | -40°C to +125°C             | SGM2205-ADJXO5G/TR   | SGM2205ADJ<br>XO5<br>XXXXX | Tape and Reel, 800  |

## MARKING INFORMATION

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

## SOT-89-3

YYY X X  
 └───┬───┬───  
 Date Code - Week  
 Date Code - Year  
 Serial Number

## SOT-223-3/SOIC-8/TDFN-3×3-8L/TO-263-5B

XXXXX  
 └───┬───┬───  
 Vendor Code  
 Trace Code  
 Date Code - Year

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**

|                                                |                                       |
|------------------------------------------------|---------------------------------------|
| Supply Voltage Range, $V_{IN}$ .....           | -24V to +24V                          |
| OUT to GND ( $V_{IN} \geq 0V$ ).....           | -0.3V to Min( $V_{IN} + 5.5V$ , +24V) |
| EN to GND ( $V_{IN} \geq 0V$ ).....            | -0.3V to +24V                         |
| ADJ, BYP to GND ( $V_{IN} \geq 0V$ ).....      | -0.3V to +6V                          |
| Power Dissipation, $P_D$ @ $T_J = +25^\circ C$ |                                       |
| SOT-89-3.....                                  | 1.66W                                 |
| SOT-223-3.....                                 | 1.32W                                 |
| SOIC-8.....                                    | 1.32W                                 |
| TDFN-3×3-8L.....                               | 1.36W                                 |
| TO-263-5B.....                                 | 2.78W                                 |
| Package Thermal Resistance                     |                                       |
| SOT-89-3, $\theta_{JA}$ .....                  | 75°C/W                                |
| SOT-89-3, $\theta_{JC}$ .....                  | 84°C/W                                |
| SOT-223-3, $\theta_{JA}$ .....                 | 95°C/W                                |
| SOT-223-3, $\theta_{JC}$ .....                 | 50°C/W                                |
| SOIC-8, $\theta_{JA}$ .....                    | 95°C/W                                |
| SOIC-8, $\theta_{JC}$ .....                    | 41°C/W                                |
| TDFN-3×3-8L, $\theta_{JA}$ .....               | 92°C/W                                |
| TDFN-3×3-8L, $\theta_{JC}$ .....               | 46°C/W                                |
| TO-263-5B, $\theta_{JA}$ .....                 | 45°C/W                                |
| TO-263-5B, $\theta_{JC}$ .....                 | 42°C/W                                |
| Junction Temperature.....                      | +150°C                                |
| Storage Temperature Range.....                 | -65°C to +150°C                       |
| Lead Temperature (Soldering, 10s).....         | +260°C                                |
| ESD Susceptibility                             |                                       |
| HBM.....                                       | 6000V                                 |
| CDM.....                                       | 1000V                                 |

**RECOMMENDED OPERATING CONDITIONS**

|                                               |                 |
|-----------------------------------------------|-----------------|
| Input Voltage Range, $V_{IN}$ .....           | 2.5V to 20V     |
| Adjustable Output Voltage Range.....          | 1.8V to 15V     |
| Input Effective Capacitance, $C_{IN}$ .....   | 0.5μF (MIN)     |
| Output Effective Capacitance, $C_{OUT}$ ..... | 1μF to 10μF     |
| $C_{BYP}$ Effective Capacitance.....          | 10nF            |
| $C_{FF}$ Effective Capacitance.....           | 4.7pF           |
| 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.

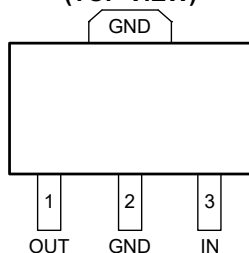
**ESD SENSITIVITY CAUTION**

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.

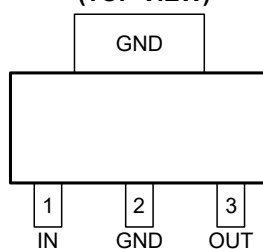
**DISCLAIMER**

SG Micro Corp reserves the right to make any change in circuit design, or specifications without prior notice.

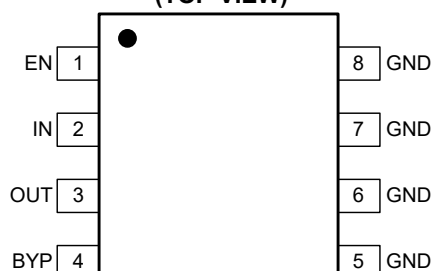
## PIN CONFIGURATIONS

SGM2205-Fixed Output  
(TOP VIEW)

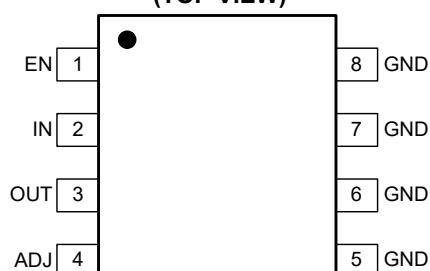
SOT-89-3

SGM2205-Fixed Output  
(TOP VIEW)

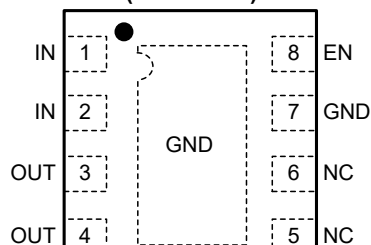
SOT-223-3

SGM2205-Fixed Output  
(TOP VIEW)

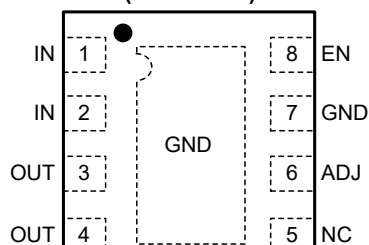
SOIC-8

SGM2205-ADJ  
(TOP VIEW)

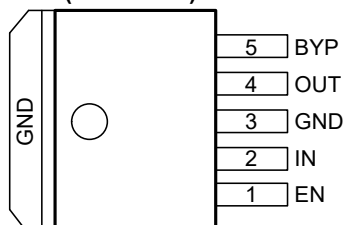
SOIC-8

SGM2205-Fixed Output  
(TOP VIEW)

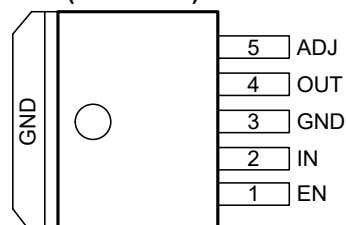
TDFN-3x3-8L

SGM2205-ADJ  
(TOP VIEW)

TDFN-3x3-8L

SGM2205-Fixed Output  
(TOP VIEW)

TO-263-5B

SGM2205-ADJ  
(TOP VIEW)

TO-263-5B

## PIN DESCRIPTION

| PIN      |           |        |             |           | NAME | FUNCTION                                                                                                                                                                                                           |
|----------|-----------|--------|-------------|-----------|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SOT-89-3 | SOT-223-3 | SOIC-8 | TDFN-3×3-8L | TO-263-5B |      |                                                                                                                                                                                                                    |
| 1        | 3         | 3      | 3, 4        | 4         | OUT  | Regulator Output Pin. It is recommended to use an output capacitor with effective capacitance in the range of 1μF to 10μF to ensure stability. Pins 3 and 4 must be tied together for TDFN-3×3-8L package.         |
| 2        | 2         | 5-8    | 7           | 3         | GND  | Ground. Pins 5 to 8 are internally connected for SOIC-8 package.                                                                                                                                                   |
| 3        | 1         | 2      | 1, 2        | 2         | IN   | Input Supply Voltage Pin. It is recommended to use a 1μF or larger ceramic capacitor from IN pin to ground to get good power supply decoupling.                                                                    |
| –        | –         | 1      | 8           | 1         | EN   | Enable Pin. Drive EN high to turn on the regulator. Drive EN low to turn off the regulator.                                                                                                                        |
| –        | –         | 4      | –           | 5         | BYP  | Reference Bypass Pin (fixed voltage version only). Bypass with an external capacitor C <sub>BYP</sub> can reduce output noise to very low level.                                                                   |
|          |           |        | 6           |           | ADJ  | 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. |
| –        | –         | –      | 5           | –         | NC   | No Connection.                                                                                                                                                                                                     |
| –        | –         | –      | 6           | –         | NC   | No Connection (fixed voltage version only).                                                                                                                                                                        |
| –        | –         | –      | Exposed Pad | –         | –    | 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.                                                     |

## ELECTRICAL CHARACTERISTICS

(V<sub>IN</sub> = V<sub>OUT(NOM)</sub> + 1V, I<sub>OUT</sub> = 0.1mA, C<sub>OUT</sub> = 2.2μF, T<sub>J</sub> = -40°C to +125°C, typical values are at T<sub>J</sub> = +25°C, unless otherwise noted.)

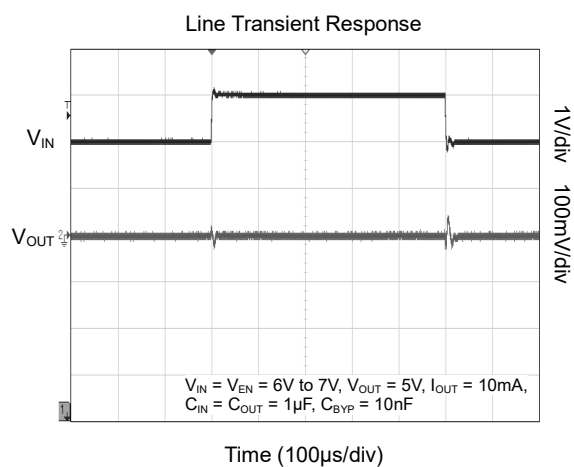
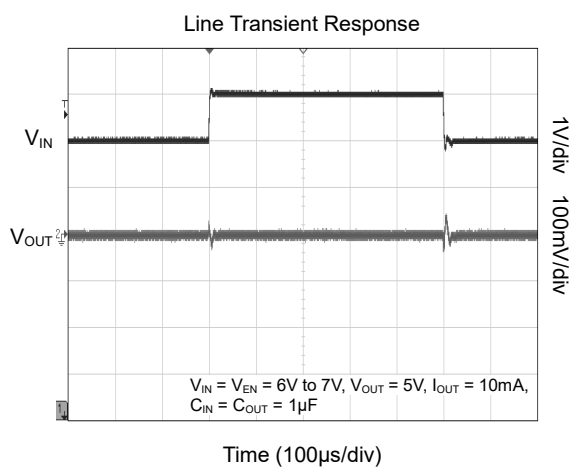
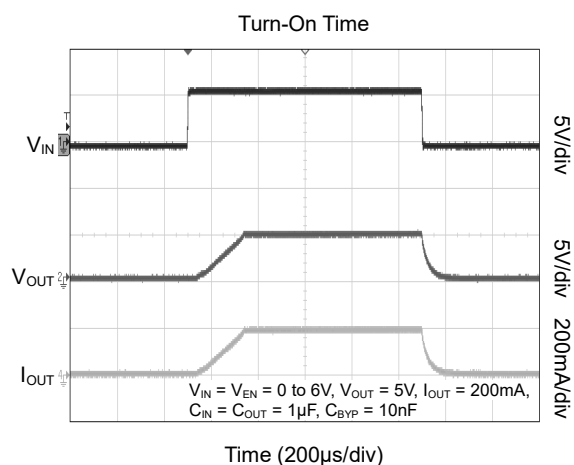
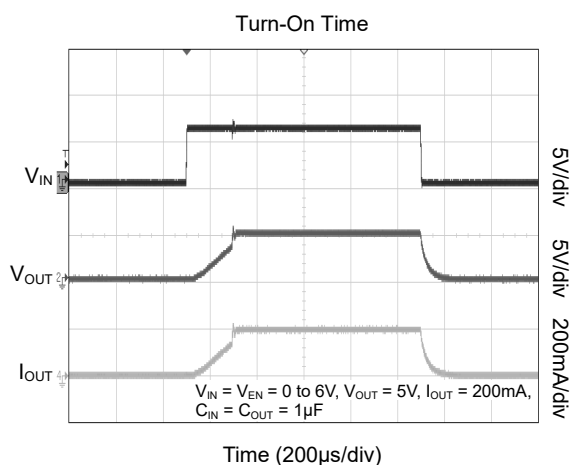
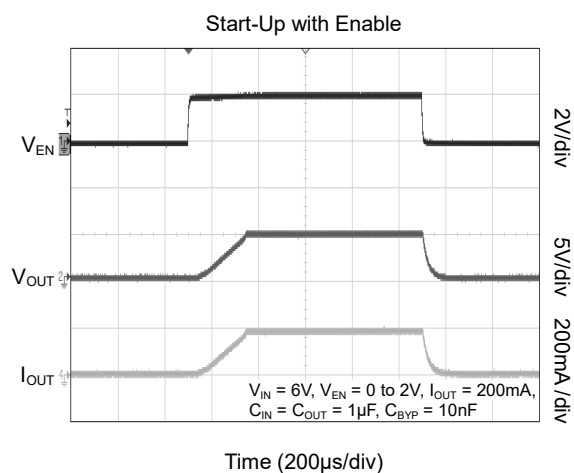
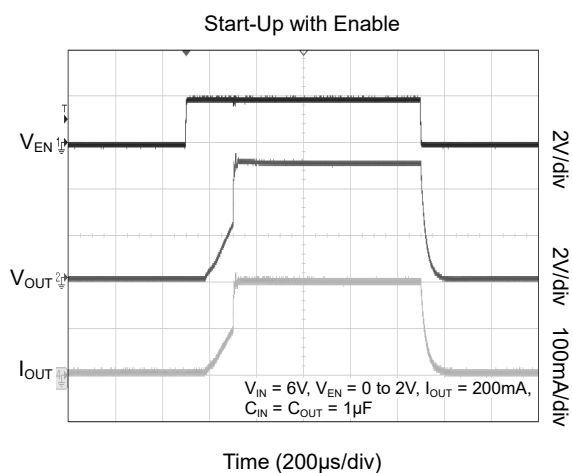
| PARAMETER                              | SYMBOL                                                | CONDITIONS                                                                                                    | MIN   | TYP    | MAX   | UNITS  |
|----------------------------------------|-------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|-------|--------|-------|--------|
| Input Voltage Range                    | V <sub>IN</sub>                                       | T <sub>J</sub> = +25°C                                                                                        | 2.5   |        | 20    | V      |
| Output Voltage Accuracy                | V <sub>OUT</sub>                                      | I <sub>OUT</sub> = 0.1mA, T <sub>J</sub> = +25°C                                                              | -1    |        | 1     | %      |
|                                        |                                                       | I <sub>OUT</sub> = 0.1mA to 800mA                                                                             | -2    |        | 2     |        |
| Reference Voltage                      | V <sub>REF</sub>                                      | T <sub>J</sub> = +25°C                                                                                        | 1.188 | 1.2    | 1.212 | V      |
|                                        |                                                       |                                                                                                               | 1.176 |        | 1.224 |        |
| Line Regulation                        | $\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$ | V <sub>IN</sub> = (V <sub>OUT(NOM)</sub> + 1V) to 20V, T <sub>J</sub> = +25°C                                 |       | 0.0003 | 0.003 | %V     |
|                                        |                                                       | V <sub>IN</sub> = (V <sub>OUT(NOM)</sub> + 1V) to 20V                                                         |       |        | 0.005 |        |
| Load Regulation                        | $\frac{\Delta V_{OUT}}{V_{OUT}}$                      | I <sub>OUT</sub> = 0.1mA to 800mA, T <sub>J</sub> = +25°C                                                     |       | 0.1    | 0.3   | %      |
|                                        |                                                       | I <sub>OUT</sub> = 0.1mA to 800mA                                                                             |       |        | 0.4   |        |
| Dropout Voltage <sup>(1)</sup>         | V <sub>DROP</sub>                                     | V <sub>OUT</sub> = 3.3V, I <sub>OUT</sub> = 50mA, T <sub>J</sub> = +25°C                                      |       | 30     | 38    | mV     |
|                                        |                                                       | V <sub>OUT</sub> = 3.3V, I <sub>OUT</sub> = 50mA                                                              |       |        | 55    |        |
|                                        |                                                       | V <sub>OUT</sub> = 3.3V, I <sub>OUT</sub> = 200mA, T <sub>J</sub> = +25°C                                     |       | 115    | 150   |        |
|                                        |                                                       | V <sub>OUT</sub> = 3.3V, I <sub>OUT</sub> = 200mA                                                             |       |        | 210   |        |
|                                        |                                                       | V <sub>OUT</sub> = 3.3V, I <sub>OUT</sub> = 800mA, T <sub>J</sub> = +25°C                                     |       | 450    | 610   |        |
|                                        |                                                       | V <sub>OUT</sub> = 3.3V, I <sub>OUT</sub> = 800mA                                                             |       |        | 850   |        |
| Output Current Limit                   | I <sub>LIMIT</sub>                                    | V <sub>OUT</sub> = 93% × V <sub>OUT(NOM)</sub> , T <sub>J</sub> = +25°C                                       | 820   | 1100   |       | mA     |
| Short-Circuit Current                  | I <sub>SHORT</sub>                                    | V <sub>IN</sub> = V <sub>EN</sub> = 3V, V <sub>OUT</sub> = 0V                                                 |       | 230    |       | mA     |
| Ground Pin Current                     | I <sub>Q</sub>                                        | V <sub>EN</sub> ≥ 1.2V, no load, T <sub>J</sub> = +25°C                                                       |       | 80     | 104   | μA     |
|                                        |                                                       | V <sub>EN</sub> ≥ 1.2V, no load                                                                               |       |        | 112   |        |
|                                        |                                                       | V <sub>EN</sub> ≥ 1.2V, I <sub>OUT</sub> = 0.1mA, T <sub>J</sub> = +25°C                                      |       | 80     | 104   |        |
|                                        |                                                       | V <sub>EN</sub> ≥ 1.2V, I <sub>OUT</sub> = 0.1mA                                                              |       |        | 112   |        |
|                                        |                                                       | V <sub>EN</sub> ≥ 1.2V, I <sub>OUT</sub> = 50mA, T <sub>J</sub> = +25°C                                       |       | 220    | 280   |        |
|                                        |                                                       | V <sub>EN</sub> ≥ 1.2V, I <sub>OUT</sub> = 50mA                                                               |       |        | 290   |        |
|                                        |                                                       | V <sub>EN</sub> ≥ 1.2V, I <sub>OUT</sub> = 800mA, T <sub>J</sub> = +25°C                                      |       | 1950   | 2250  |        |
|                                        |                                                       | V <sub>EN</sub> ≥ 1.2V, I <sub>OUT</sub> = 800mA                                                              |       |        | 2350  |        |
| Ground Pin Quiescent Current           | I <sub>Q(GND)</sub>                                   | V <sub>EN</sub> ≤ 0.4V (shutdown), T <sub>J</sub> = +25°C                                                     |       | 2.7    | 3.5   | μA     |
|                                        |                                                       | V <sub>EN</sub> ≤ 0.4V (shutdown)                                                                             |       |        | 6.8   |        |
| Enable Input Logic Voltage             | V <sub>EN</sub>                                       | V <sub>EN</sub> = Logic low (regulator shutdown)                                                              |       |        | 0.4   | V      |
|                                        |                                                       | V <sub>EN</sub> = Logic high (regulator enabled)                                                              | 1.2   |        |       |        |
| Enable Input Current                   | I <sub>ENL</sub>                                      | V <sub>EN</sub> ≤ 0.4V                                                                                        |       |        | 1     | μA     |
|                                        | I <sub>ENH</sub>                                      | V <sub>EN</sub> = V <sub>IN</sub>                                                                             |       |        | 1     |        |
| Power Supply Rejection Ratio           | PSRR                                                  | f = 1kHz, V <sub>OUT</sub> = 2.5V, I <sub>OUT</sub> = 50mA                                                    |       | 75     |       | dB     |
| Output Voltage Noise                   | e <sub>n</sub>                                        | f = 1kHz, V <sub>OUT</sub> = 2.5V, I <sub>OUT</sub> = 50mA, C <sub>OUT</sub> = 2.2μF                          |       | 400    |       | nV/√Hz |
|                                        |                                                       | f = 1kHz, V <sub>OUT</sub> = 2.5V, I <sub>OUT</sub> = 50mA, C <sub>OUT</sub> = 2.2μF, C <sub>BYP</sub> = 10nF |       | 240    |       |        |
| Output Voltage Temperature Coefficient | $\frac{\Delta V_{OUT}}{\Delta T_J \times V_{OUT}}$    |                                                                                                               |       | 40     |       | ppm/°C |
| Thermal Shutdown Temperature           | T <sub>SHDN</sub>                                     |                                                                                                               |       | 155    |       | °C     |
| Thermal Shutdown Hysteresis            | ΔT <sub>SHDN</sub>                                    |                                                                                                               |       | 25     |       | °C     |

## NOTE:

1. The dropout voltage is defined as the difference between V<sub>IN</sub> and V<sub>OUT</sub> when V<sub>OUT</sub> falls to 95% × V<sub>OUT(NOM)</sub>.

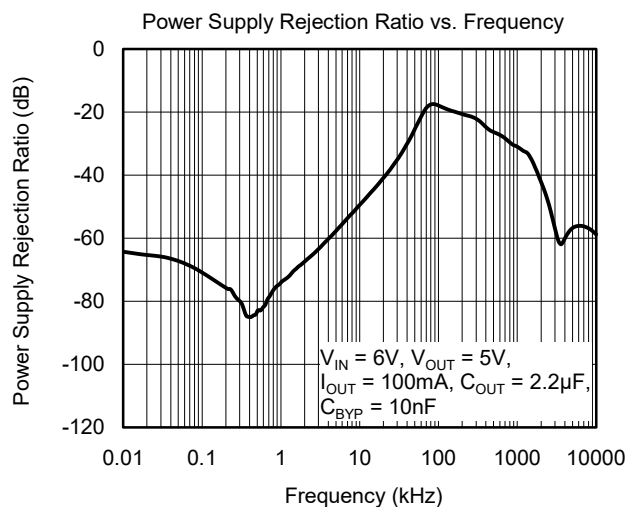
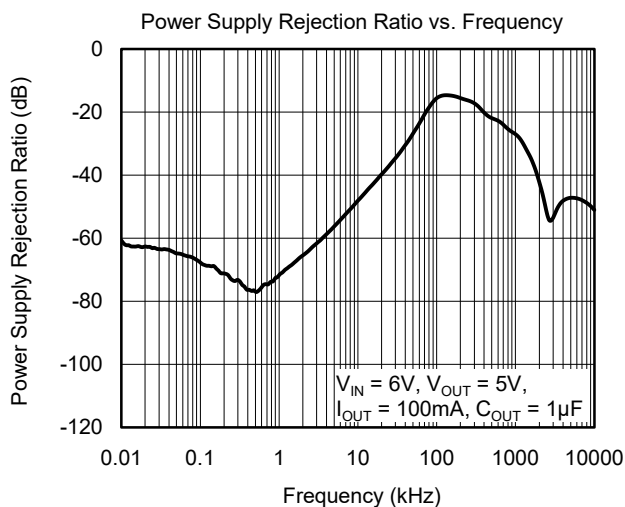
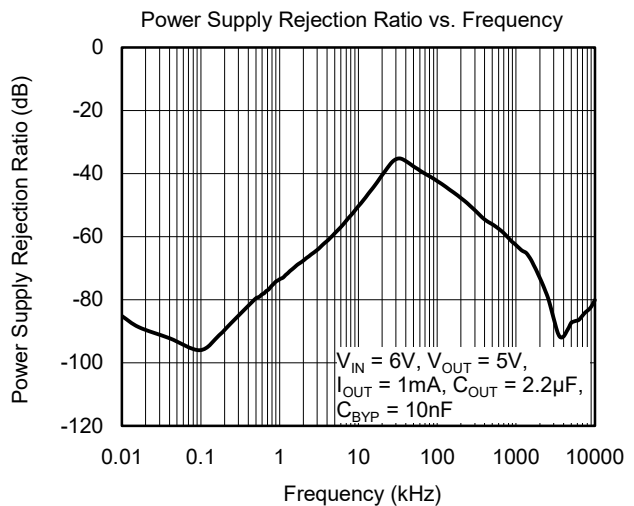
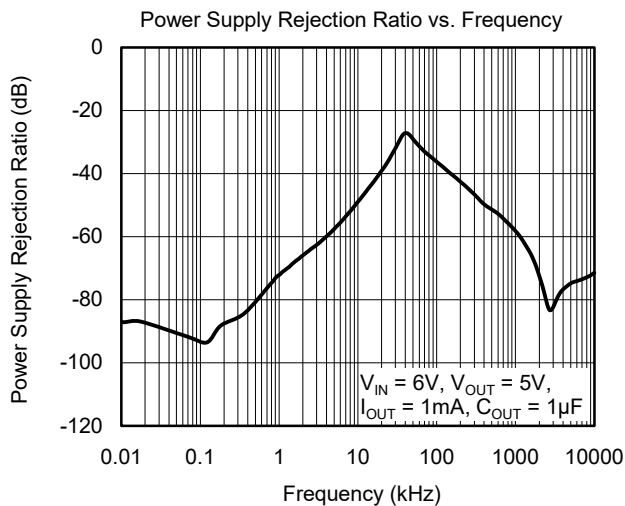
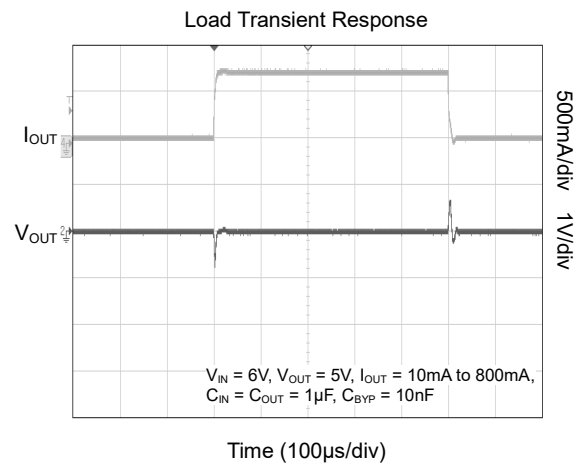
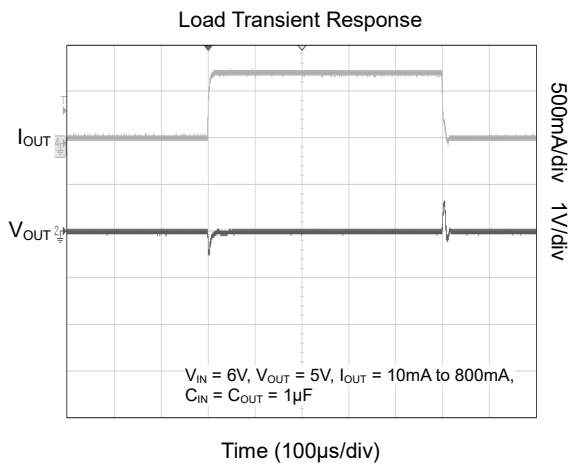
## TYPICAL PERFORMANCE CHARACTERISTICS

$T_J = +25^\circ\text{C}$ ,  $C_{OUT} = 2.2\mu\text{F}$  and  $I_{OUT} = 0.1\text{mA}$ , unless otherwise noted.



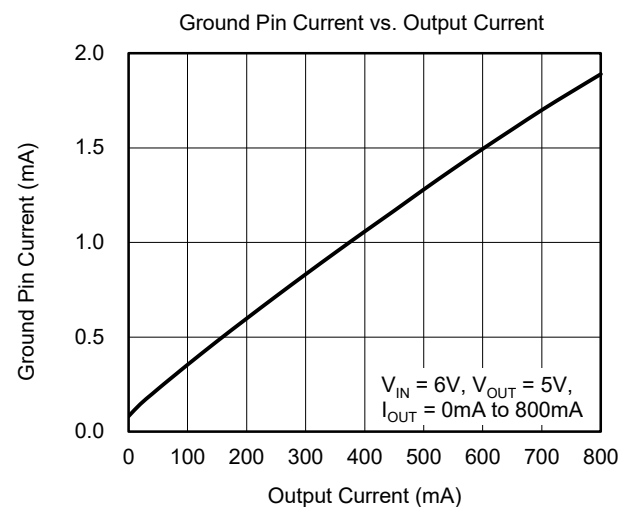
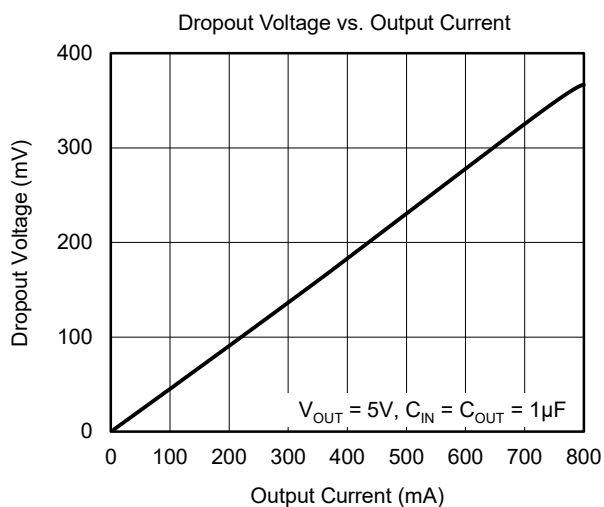
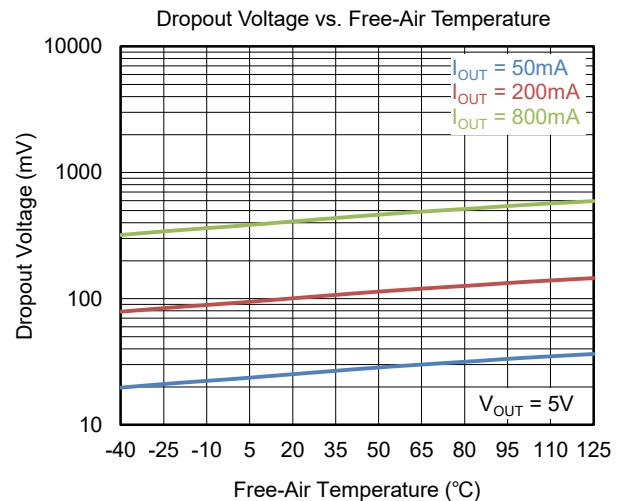
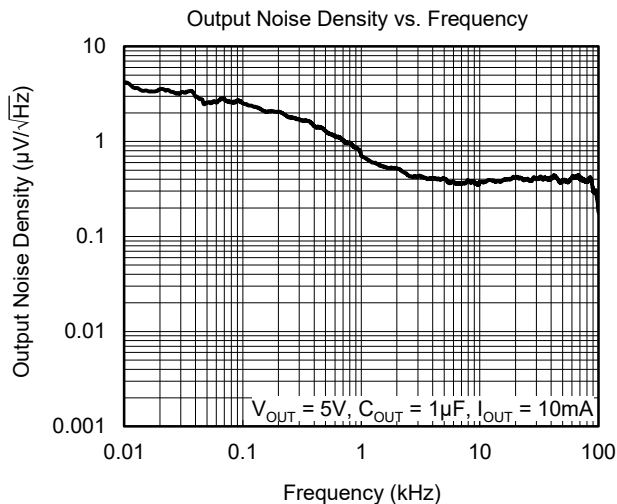
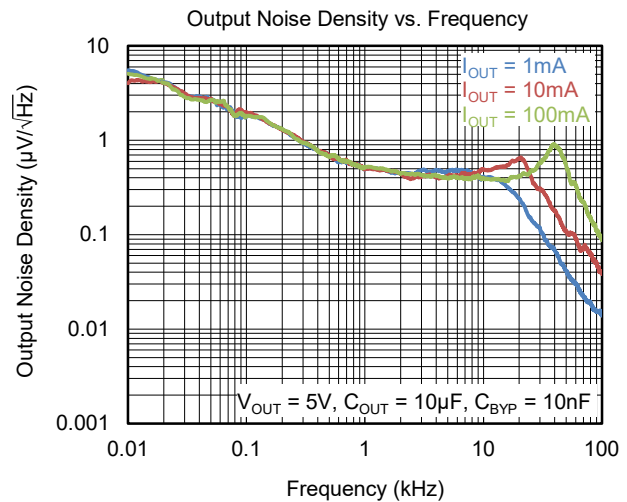
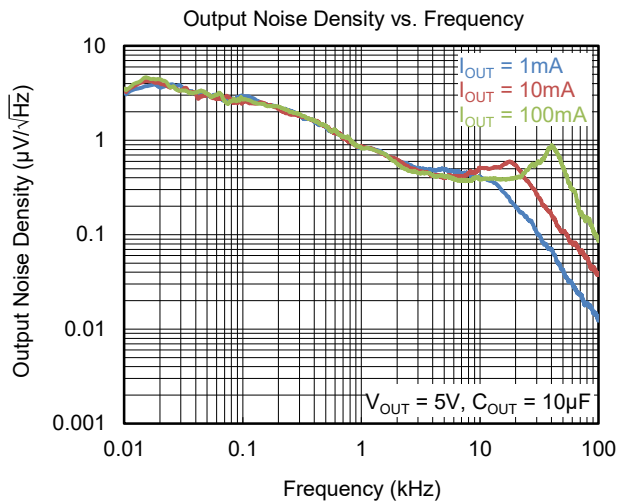
## TYPICAL PERFORMANCE CHARACTERISTICS (continued)

$T_J = +25^\circ\text{C}$ ,  $C_{OUT} = 2.2\mu\text{F}$  and  $I_{OUT} = 0.1\text{mA}$ , unless otherwise noted.



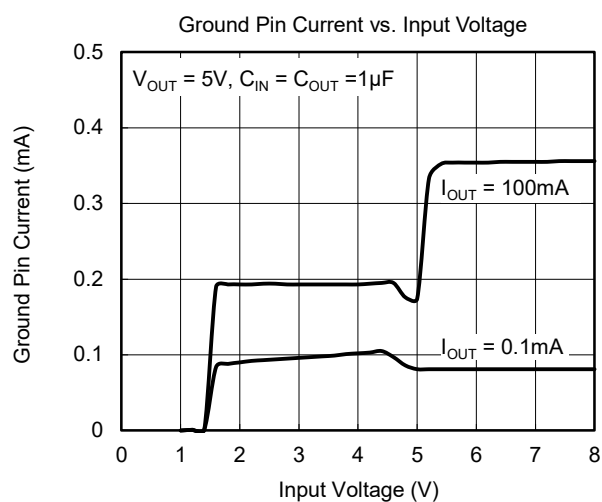
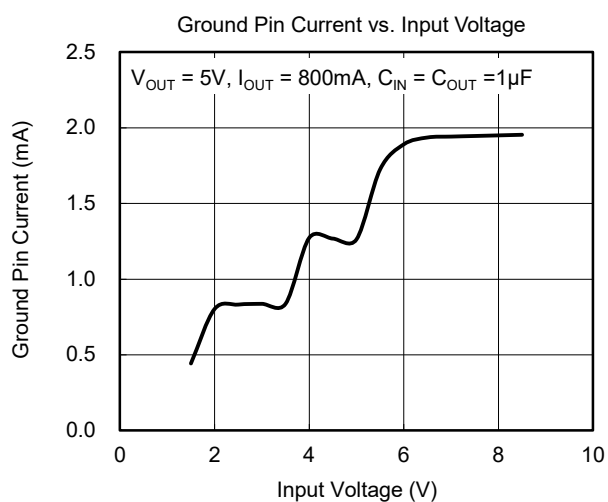
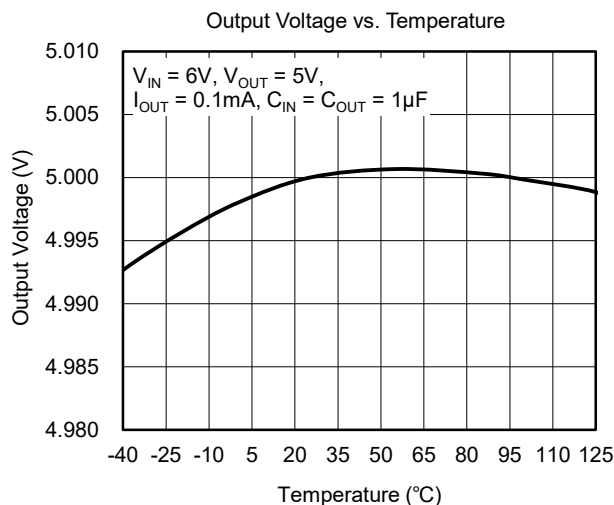
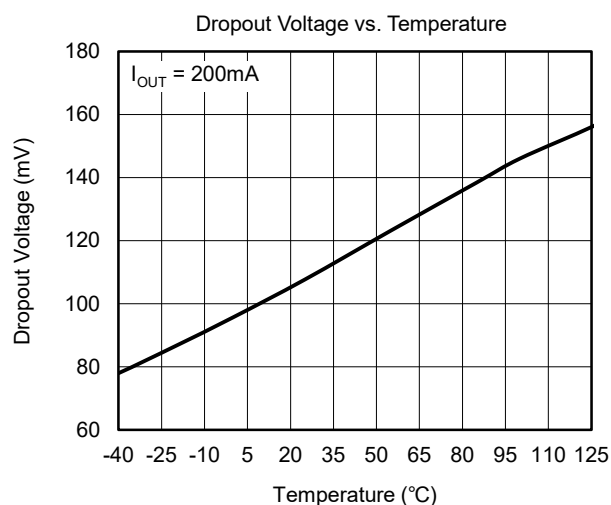
## TYPICAL PERFORMANCE CHARACTERISTICS (continued)

$T_J = +25^\circ\text{C}$ ,  $C_{OUT} = 2.2\mu\text{F}$  and  $I_{OUT} = 0.1\text{mA}$ , unless otherwise noted.



## TYPICAL PERFORMANCE CHARACTERISTICS (continued)

$T_J = +25^\circ\text{C}$ ,  $C_{OUT} = 2.2\mu\text{F}$  and  $I_{OUT} = 0.1\text{mA}$ , unless otherwise noted.



## FUNCTIONAL BLOCK DIAGRAMS

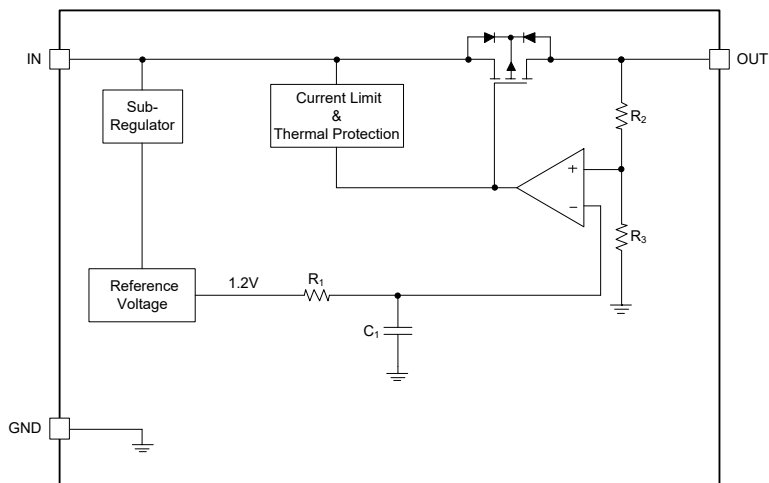


Figure 4. Internal Block Diagram of Fixed Output Voltage (SOT-89-3 and SOT-223-3 Versions)

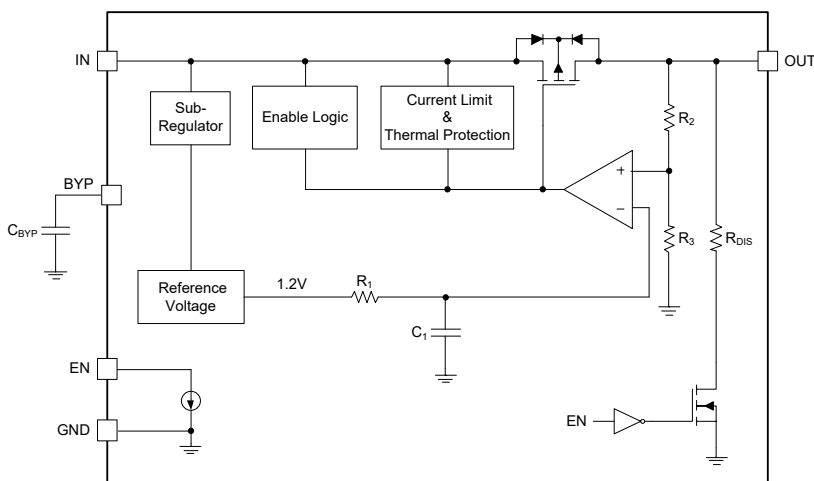


Figure 5. Internal Block Diagram of Low Noise Fixed Regulator (SOIC-8 and TO-263-5B Versions)

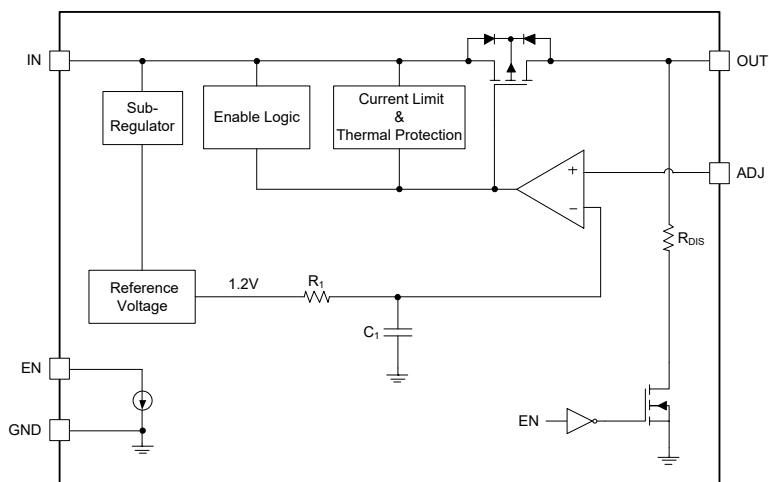


Figure 6. Internal Block Diagram of Adjustable Output Voltage (SOIC-8, TDFN-3x3-8L and TO-263-5B Versions)

## APPLICATION INFORMATION

The SGM2205 is a high voltage, low noise and low dropout LDO and provides 800mA output current. These features make the device a reliable solution to solve many challenging problems in the generation of clean and accurate power supply. The high performance also makes the SGM2205 useful in a variety of applications. The SGM2205 provides protection functions for output overload, output short-circuit condition and overheating.

The SGM2205 provides an EN pin as an external chip enable control to enable/disable the device.

### Input Capacitor Selection ( $C_{IN}$ )

The input decoupling capacitor should be placed as close as possible to the IN pin to ensure the device stability. 1 $\mu$ F or larger 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 OUT pin. 2.2 $\mu$ F or larger X7R or X5R ceramic capacitor is selected to get good dynamic performance. The minimum effective capacitance of  $C_{OUT}$  that SGM2205 can remain stable is 1 $\mu$ F. 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.

### Noise Bypass Capacitor ( $C_{BYP}$ )

In noise sensitive applications, a bypass capacitor can be connected to the BYP pin (SOIC-8 and TO-263-5B packages only) to reduce the noise of output voltage. A 10nF ceramic capacitor is recommended in application.

### Adjustable Regulator

The output voltage of the SGM2205-ADJ can be adjusted from 1.8V to 15V. The ADJ pin will be connected to two external resistors as shown in Figure 7, the output voltage is determined by the following equation:

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

where:

$V_{OUT}$  is output voltage and  $V_{FB}$  is the internal voltage reference,  $V_{REF} = 1.2V$ .

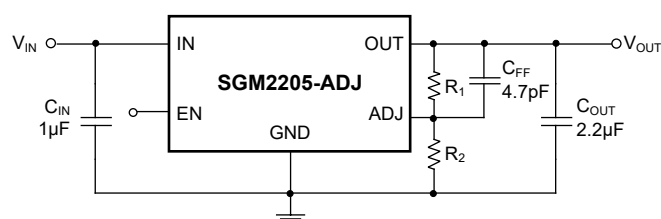


Figure 7. Adjustable Output Voltage Application

$R_1$  and  $R_2$  can be calculated for any output voltage range using equation 1 and  $R_1$  is recommended to be less than 470k $\Omega$ .

### Enable Operation

The EN pin of the SGM2205 is used to enable/disable the device and to deactivate/activate the output automatic discharge function.

When the EN pin voltage is lower than 0.4V, the device is in shutdown state. There is no current flowing from IN to OUT pins. In this state, the automatic discharge transistor is active to discharge the output voltage through a resistor.

When the EN pin voltage is higher than 1.2V, the device is in active state. The output voltage is regulated to expected value and the automatic discharge transistor is turned off.

### No-Load Stability

The SGM2205 can maintain stability without output load (except internal voltage divider).

**APPLICATION INFORMATION (continued)****Input Power Supply**

The input power supply range is from 2.5V 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 230mA (TYP).

**Thermal Shutdown**

The SGM2205 can detect the temperature of die. When the die temperature exceeds the threshold value of thermal shutdown, the SGM2205 will be in shutdown state and remain in this state until the die temperature decreases to +130°C.

**Power Dissipation ( $P_D$ )**

Thermal protection limits power dissipation in the SGM2205. When power dissipation on pass element ( $P_D = (V_{IN} - V_{OUT}) \times I_{OUT}$ ) is too much and the operating junction temperature exceeds +155°C, the OTP circuit

starts the thermal shutdown function and turns the pass element off.

Therefore, thermal analysis for the chosen application is important to guarantee reliable performance over all conditions. To guarantee reliable operation, the junction temperature of the SGM2205 must not exceed +125°C.

The maximum allowable power dissipation depends on the thermal resistance of the IC package, the PCB layout, the rate of surrounding airflow, and the difference between the junction temperature and ambient temperature. The maximum power dissipation can be approximated using the following equation:

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

where  $T_{J(MAX)}$  is the maximum junction temperature,  $T_A$  is the ambient temperature, and  $\theta_{JA}$  is the junction-to-ambient thermal resistance.

**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 IN pin and OUT pin separately.  $V_{IN}$  and  $V_{OUT}$  had better use separate ground planes and these ground planes are single point connected to the GND pin.

**REVISION HISTORY**

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

**AUGUST 2022 – REV.A.1 to REV.A.2****Page**

Updated Electrical Characteristics section ..... 7

**NOVEMBER 2020 – REV.A to REV.A.1****Page**

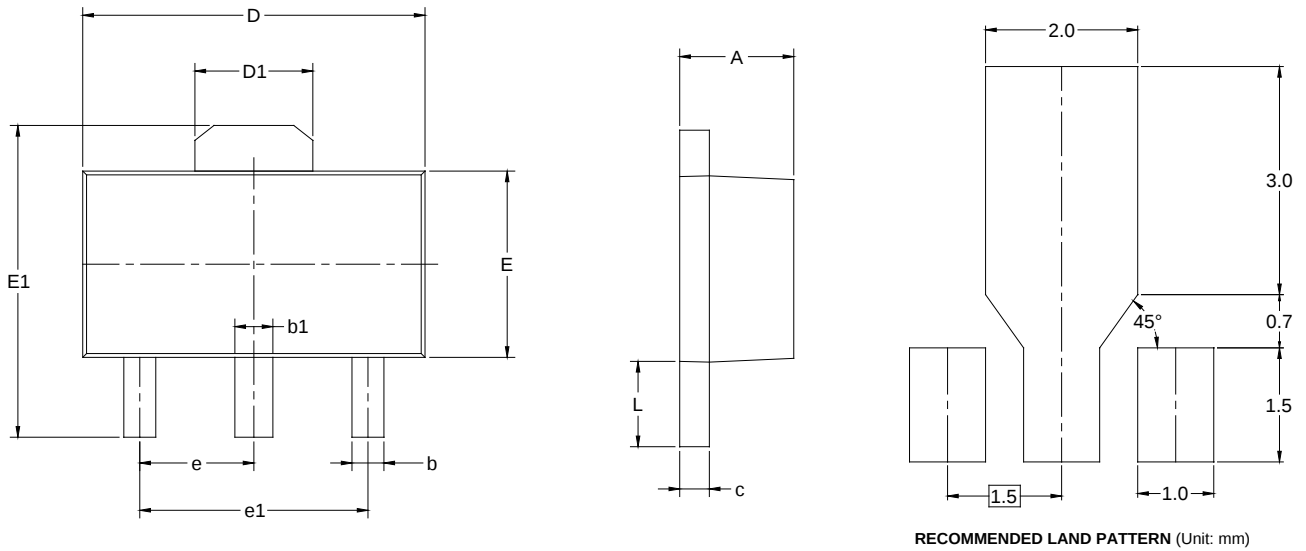
Added SGM2205-2.5XK3G/TR, SGM2205-3.3XK3G/TR, SGM2205-4.2XK3G/TR and SGM2205-5.0XK3G/TR versions..... All

**Changes from Original (DECEMBER 2019) to REV.A****Page**

Changed from product preview to production data..... All

## PACKAGE OUTLINE DIMENSIONS

### SOT-89-3



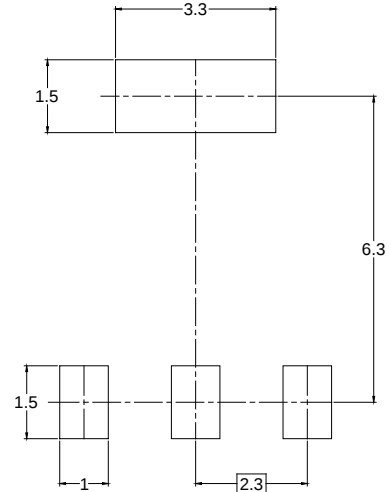
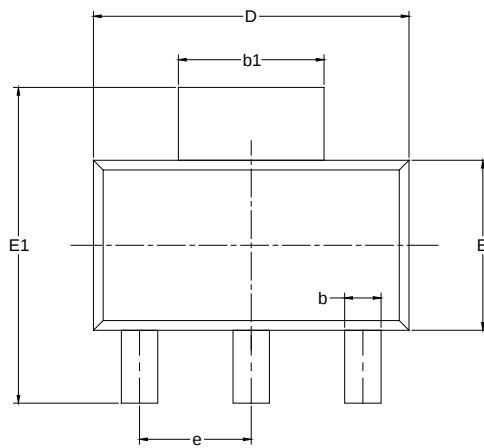
| Symbol | Dimensions<br>In Millimeters |       | Dimensions<br>In Inches |       |
|--------|------------------------------|-------|-------------------------|-------|
|        | MIN                          | MAX   | MIN                     | MAX   |
| A      | 1.400                        | 1.600 | 0.055                   | 0.063 |
| b      | 0.320                        | 0.520 | 0.013                   | 0.020 |
| b1     | 0.400                        | 0.580 | 0.016                   | 0.023 |
| c      | 0.350                        | 0.440 | 0.014                   | 0.017 |
| D      | 4.400                        | 4.600 | 0.173                   | 0.181 |
| D1     | 1.550 REF                    |       | 0.061 REF               |       |
| E      | 2.300                        | 2.600 | 0.091                   | 0.102 |
| E1     | 3.940                        | 4.250 | 0.155                   | 0.167 |
| e      | 1.500 TYP                    |       | 0.060 TYP               |       |
| e1     | 3.000 TYP                    |       | 0.118 TYP               |       |
| L      | 0.900                        | 1.200 | 0.035                   | 0.047 |

#### NOTES:

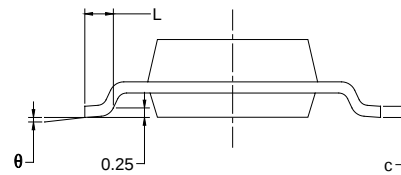
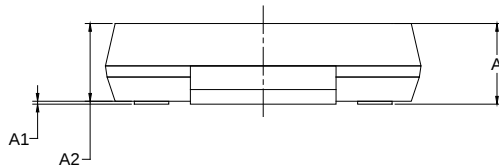
1. Body dimensions do not include mode flash or protrusion.
2. This drawing is subject to change without notice.

## PACKAGE OUTLINE DIMENSIONS

### SOT-223-3



RECOMMENDED LAND PATTERN (Unit: mm)



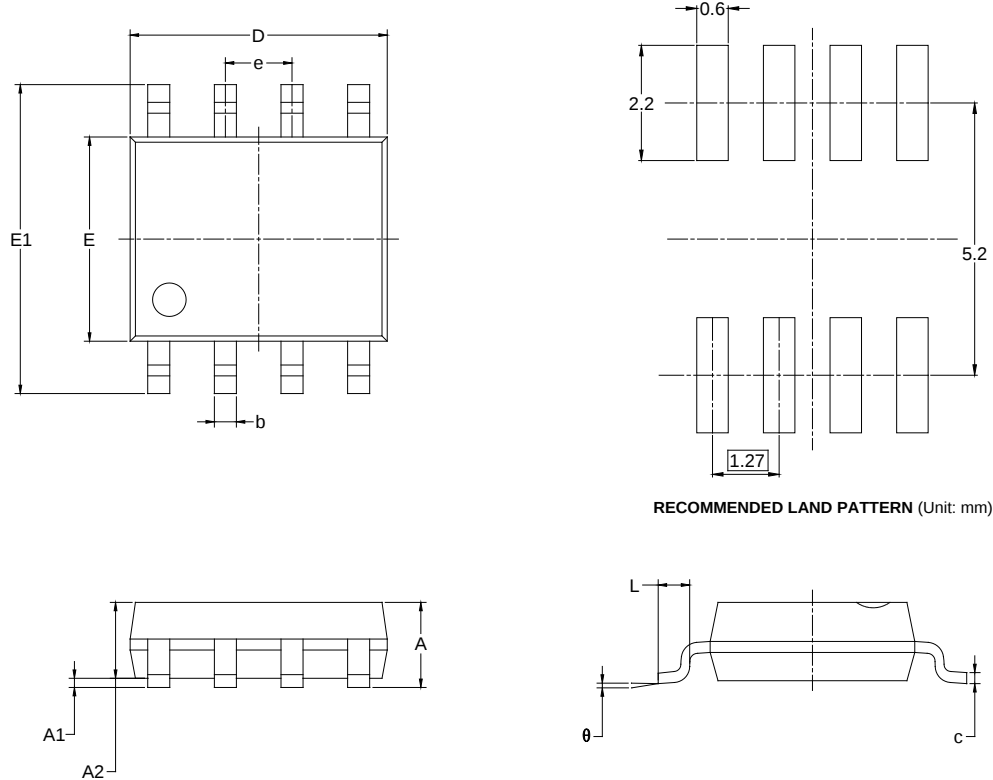
| Symbol | Dimensions<br>In Millimeters |       | Dimensions<br>In Inches |       |
|--------|------------------------------|-------|-------------------------|-------|
|        | MIN                          | MAX   | MIN                     | MAX   |
| A      |                              | 1.800 |                         | 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 mold flash or protrusion.
2. This drawing is subject to change without notice.

## PACKAGE OUTLINE DIMENSIONS

### SOIC-8



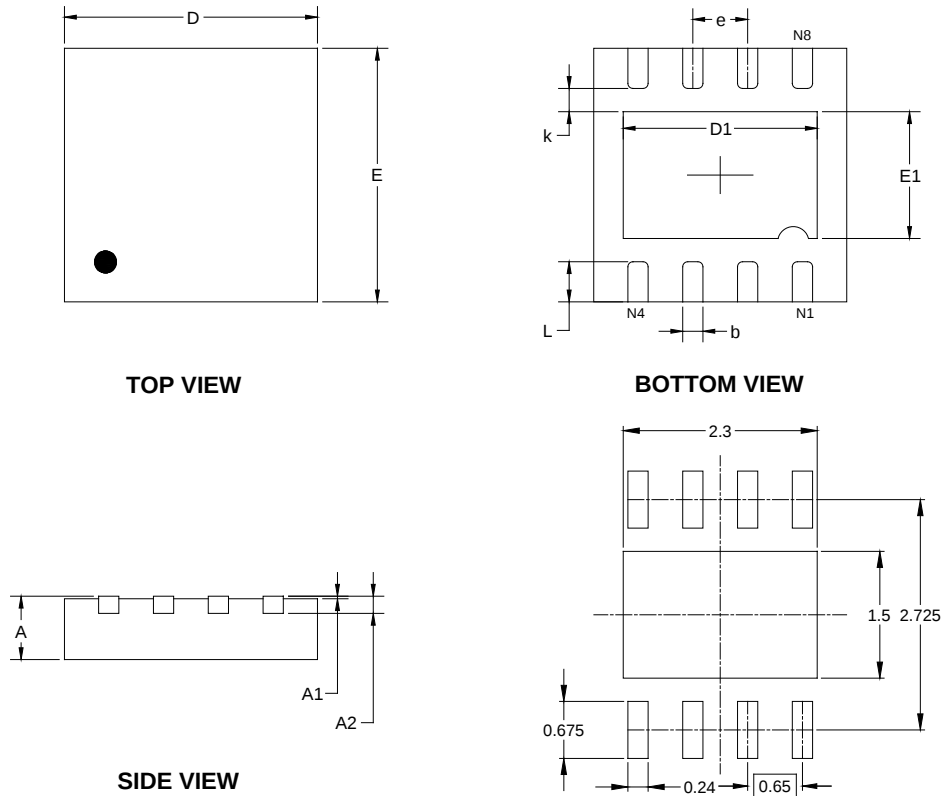
| Symbol | Dimensions<br>In Millimeters |       | Dimensions<br>In Inches |       |
|--------|------------------------------|-------|-------------------------|-------|
|        | MIN                          | MAX   | MIN                     | MAX   |
| A      | 1.350                        | 1.750 | 0.053                   | 0.069 |
| A1     | 0.100                        | 0.250 | 0.004                   | 0.010 |
| A2     | 1.350                        | 1.550 | 0.053                   | 0.061 |
| b      | 0.330                        | 0.510 | 0.013                   | 0.020 |
| c      | 0.170                        | 0.250 | 0.006                   | 0.010 |
| D      | 4.700                        | 5.100 | 0.185                   | 0.200 |
| E      | 3.800                        | 4.000 | 0.150                   | 0.157 |
| E1     | 5.800                        | 6.200 | 0.228                   | 0.244 |
| e      | 1.27 BSC                     |       | 0.050 BSC               |       |
| L      | 0.400                        | 1.270 | 0.016                   | 0.050 |
| θ      | 0°                           | 8°    | 0°                      | 8°    |

#### NOTES:

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

## PACKAGE OUTLINE DIMENSIONS

### TDFN-3×3-8L



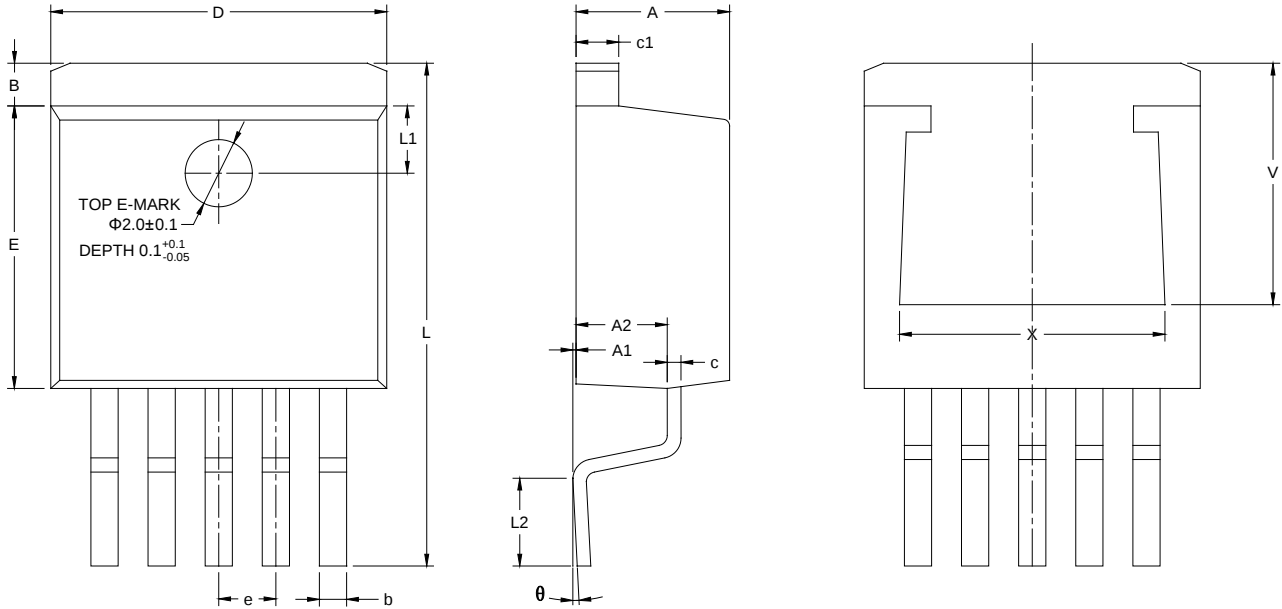
RECOMMENDED LAND PATTERN (Unit: mm)

| Symbol | Dimensions<br>In Millimeters |       | Dimensions<br>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.

## PACKAGE OUTLINE DIMENSIONS

### TO-263-5B



| Symbol   | Dimensions In Millimeters |       |       |
|----------|---------------------------|-------|-------|
|          | MIN                       | MOD   | MAX   |
| A        | 4.40                      | 4.57  | 4.70  |
| A1       | 0                         | 0.10  | 0.25  |
| A2       | 2.59                      | 2.69  | 2.79  |
| b        | 0.77                      | -     | 0.90  |
| c        | 0.34                      | -     | 0.47  |
| c1       | 1.22                      | -     | 1.32  |
| e        | 1.70 BSC                  |       |       |
| D        | 10.06                     | 10.16 | 10.26 |
| E        | 9.05                      | 9.15  | 9.25  |
| B        | 1.17                      | 1.27  | 1.40  |
| V        | 6.86                      | -     | 7.50  |
| X        | 7.50                      | -     | 8.30  |
| L        | 14.70                     | 15.10 | 15.50 |
| L1       | 2.00 REF                  |       |       |
| L2       | 2.00                      | 2.30  | 2.60  |
| $\theta$ | 0°                        | -     | 8°    |

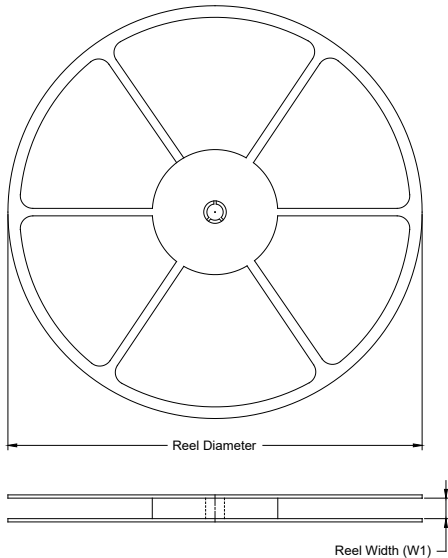
#### NOTES:

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

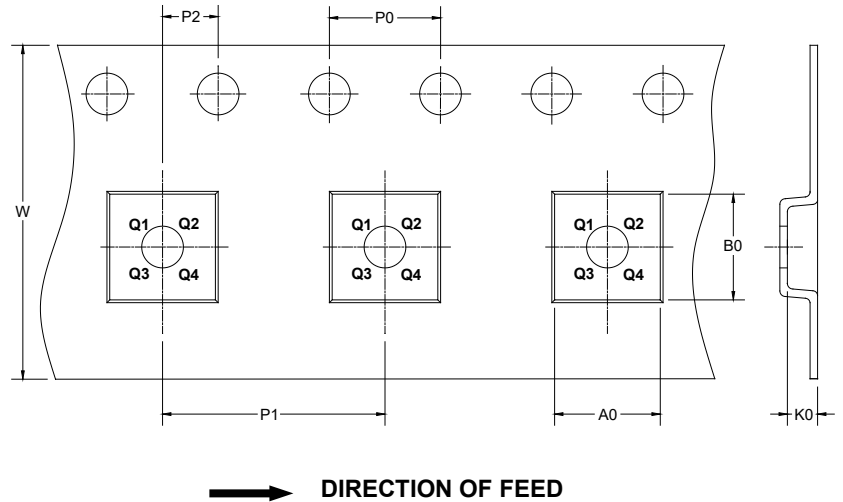
# PACKAGE INFORMATION

## TAPE AND REEL INFORMATION

### REEL DIMENSIONS

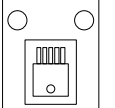


### TAPE DIMENSIONS



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

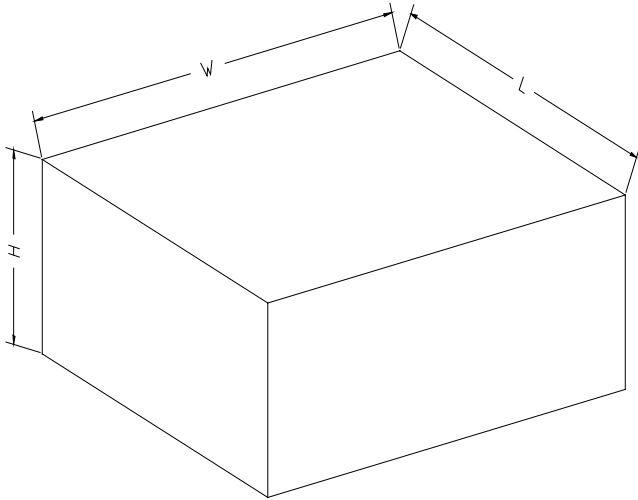
### KEY PARAMETER LIST OF TAPE AND REEL

| 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-89-3     | 7"            | 13.2               | 4.85    | 4.45    | 1.85    | 4.0     | 8.0     | 2.0     | 12.0   | Q3                                                                                    |
| SOT-223-3    | 13"           | 12.4               | 6.55    | 7.25    | 1.90    | 4.0     | 8.0     | 2.0     | 12.0   | Q3                                                                                    |
| SOIC-8       | 13"           | 12.4               | 6.40    | 5.40    | 2.10    | 4.0     | 8.0     | 2.0     | 12.0   | Q1                                                                                    |
| TDFN-3×3-8L  | 13"           | 12.4               | 3.35    | 3.35    | 1.13    | 4.0     | 8.0     | 2.0     | 12.0   | Q1                                                                                    |
| TO-263-5B    | 13"           | 24.4               | 10.80   | 16.30   | 5.11    | 4.0     | 16.0    | 2.0     | 24.0   |  |

DD0001

## 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           |
| 13"         | 386         | 280        | 370         | 5            |

DD0002