

GENERAL DESCRIPTION

The SGM3766 is a high efficiency white LED driver with a 1.2MHz boost converter. With the fixed switching frequency and an internal 40V/2.75A switch FET, the SGM3766 is designed for powering single or parallel LED strings for various size panel backlighting.

The SGM3766 is capable of driving 10 white LEDs in series. The FB feedback voltage is regulated at 200mV typically. The default LED current is programmed by an external R_{SET} resistor. During the operation, the LED current can be controlled by applying a PWM signal to the CTRL pin. The feedback voltage depends on the PWM signal duty cycle. For PWM dimming control, there are no audible noises on the output capacitor.

The SGM3766 integrates LED open protection. It prevents the device from damaging due to the over-voltage during LED open conditions.

The SGM3766 is available in a Green TSOT-23-5 package. It operates over an ambient temperature range of -40°C to +85°C.

FEATURES

- **Input Voltage Range: 2.7V to 5.5V**
- **Integrated 40V/2.75A Switch**
- **Up to 90% Efficiency**
- **Switching Frequency: 1.2MHz**
- **Feedback Voltage: 200mV**
- **PWM Dimming Control**
- **38V LED Open Protection for 10 LEDs**
- **Automatic Soft-Start for Reducing Inrush Current**
- **1:500 Stable Luminance Dimming**
- **Low EMI by Conducting Ringing Cancelling**
- **Improved PSRR for Waveless Lighting**
- **Protection Features**
 - ♦ **Over-Voltage Protection**
 - ♦ **Under-Voltage Lockout Protection**
 - ♦ **Thermal Shutdown**
- **-40°C to +85°C Operating Temperature Range**
- **Available in a Green TSOT-23-5 Package**

APPLICATIONS

Smart Phone and Tablet Backlighting
 Handheld Computers, PDAs, GPS Receivers
 Backlight for Media Form Factor Displays

TYPICAL APPLICATION

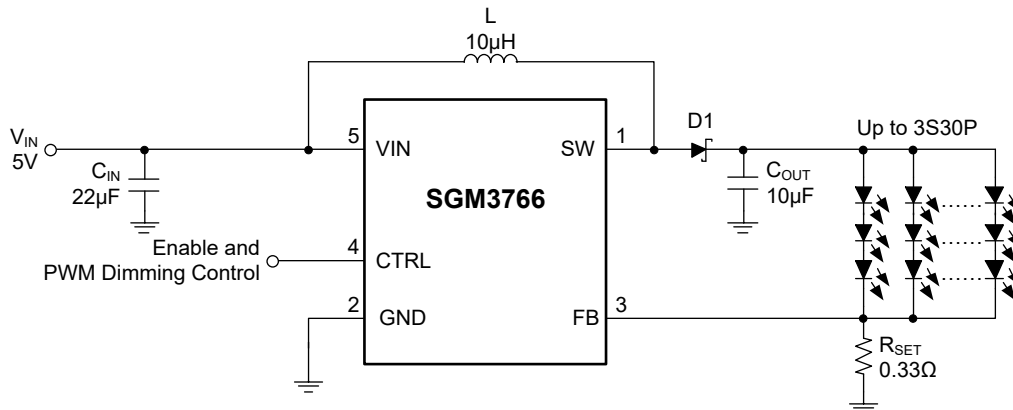


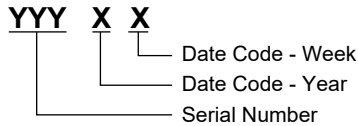
Figure 1. Typical Application

PACKAGE/ORDERING INFORMATION

| MODEL | PACKAGE DESCRIPTION | SPECIFIED TEMPERATURE RANGE | ORDERING NUMBER | PACKAGE MARKING | PACKING OPTION |
|---------|---------------------|-----------------------------|-----------------|-----------------|---------------------|
| SGM3766 | TSOT-23-5 | -40°C to +85°C | SGM3766YTN5G/TR | MD1XX | 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

- Voltage on VIN, CTRL, FB..... -0.3V to 6V
- Package Thermal Resistance
- TSOT-23-5, θ_{JA} 190°C/W
- Voltage on SW..... -0.3V to 40V
- Junction Temperature..... +150°C
- Storage Temperature Range..... -65°C to +150°C
- Lead Temperature (Soldering, 10s)..... +260°C
- ESD Susceptibility
- HBM..... 3000V
- MM..... 200V
- CDM..... 1000V

RECOMMENDED OPERATING CONDITIONS

- Input Voltage Range..... 2.7V to 5.5V
- Output Voltage Range..... V_{IN} to 38V
- Inductor..... 4.7 μ H to 10 μ H
- Input Capacitor..... 1 μ F (MIN)
- Output Capacitor..... 1 μ F to 10 μ F
- Operating 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.

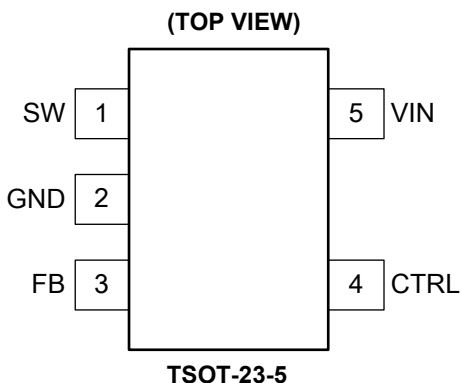
ESD SENSITIVITY CAUTION

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 CONFIGURATION



PIN DESCRIPTION

| PIN | NAME | I/O | FUNCTION |
|-----|------|-----|--|
| 1 | SW | I | Drain Connection for Internal N-Channel MOSFET. |
| 2 | GND | O | Ground Pin. |
| 3 | FB | I | Feedback Input for Current. Connect the sense resistor from FB to GND. |
| 4 | CTRL | I | PWM Dimming Input. |
| 5 | VIN | I | Input Supply Pin. |

NOTE: I: input, O: output.

ELECTRICAL CHARACTERISTICS(V_{IN} = 3.6V, CTRL = V_{IN}, C_{IN} = 22μF, Full = -40°C to +85°C, typical values are at T_A = +25°C, unless otherwise noted.)

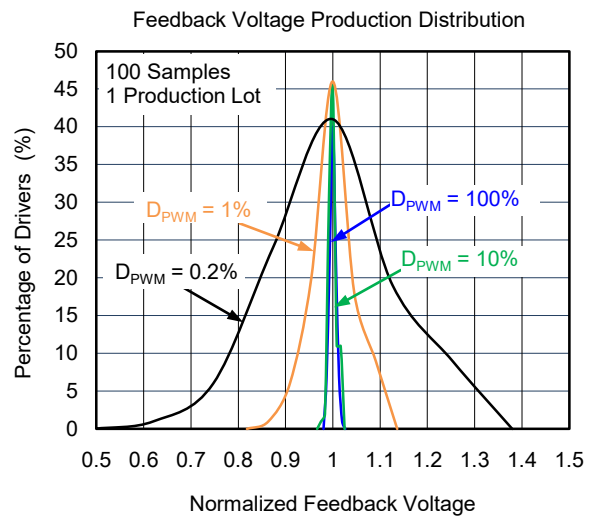
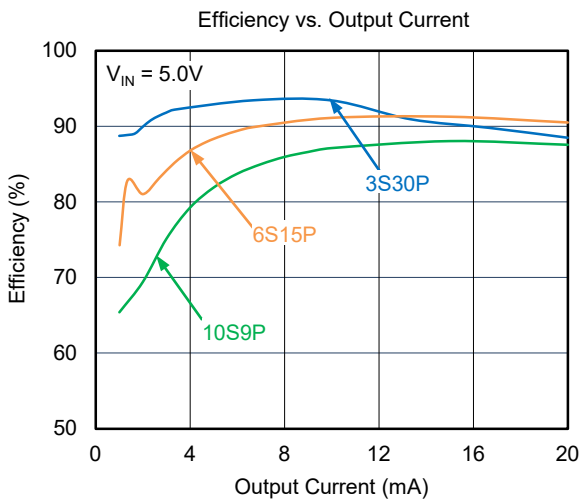
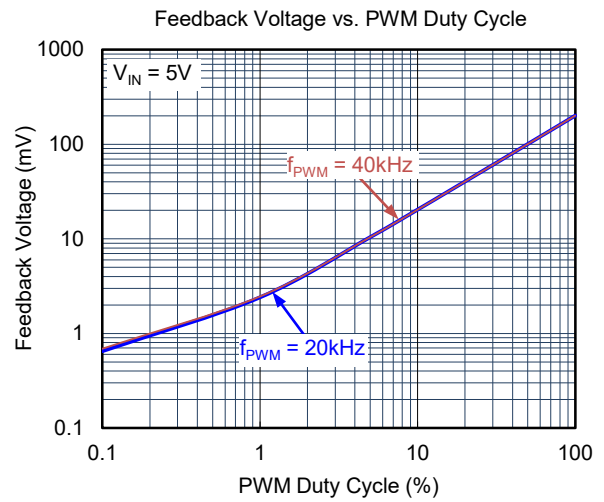
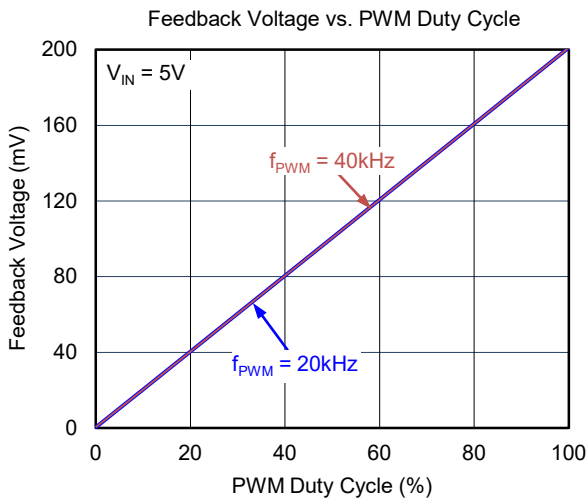
| PARAMETER | SYMBOL | CONDITIONS | TEMP | MIN | TYP | MAX | UNIT |
|--|-----------------------|---------------------------------------|-------|-------|------|------|------|
| Power Supply | | | | | | | |
| Input Voltage Range | V _{IN} | | Full | 2.7 | | 5.5 | V |
| Under-Voltage Lockout Threshold | UVLO | V _{IN} falling | +25°C | | 2.2 | | V |
| | | V _{IN} rising | +25°C | | 2.3 | 2.5 | |
| UVLO Hysteresis | V _{HYS} | | +25°C | | 100 | | mV |
| Operating Quiescent Current into V _{IN} | I _Q | V _{FB} = 300mV, no switching | +25°C | | 0.2 | 0.35 | mA |
| Shutdown Current | I _{SD} | CTRL = GND | +25°C | | | 1 | μA |
| Boost Converter | | | | | | | |
| Voltage Feedback Regulation Voltage | V _{REF} | PWM duty cycle 100% | +25°C | 194.5 | 200 | 207 | mV |
| | | PWM duty cycle 10% | +25°C | 18.5 | 20 | 21.5 | mV |
| | | PWM duty cycle 1% | +25°C | 1.4 | 2.2 | 3 | mV |
| | | PWM duty cycle 0.2% | +25°C | | 0.65 | | mV |
| FB Pin Bias Current | I _{FB} | V _{FB} = 100mV | +25°C | | 0.6 | 1 | μA |
| V _{REF} Filter Time Constant | t _{REF} | | +25°C | | 0.1 | | ms |
| N-Channel MOSFET On-Resistance | R _{DS(ON)} | | +25°C | | 0.2 | 0.3 | Ω |
| Switching Frequency | f _{SW} | | Full | 0.9 | 1.2 | 1.35 | MHz |
| Switching MOSFET Current Limit | I _{LIM} | | +25°C | 2.3 | 2.75 | 3.2 | A |
| Output Voltage Over-Voltage Threshold | V _{OVP_SW} | | Full | 36 | 38 | 39.5 | V |
| Control | | | | | | | |
| CTRL Logic High Voltage | V _H | | Full | 1.5 | | | V |
| CTRL Logic Low Voltage | V _L | | Full | | | 0.4 | V |
| CTRL Pin Internal Pull-Down Resistor | R _{PD} | | +25°C | | 600 | | kΩ |
| CTRL Logic Low Time to Shutdown | t _{SD} | CTRL high to low | +25°C | 2.5 | | | ms |
| PWM Dimming Frequency Range | DFR | | +25°C | 10 | | 100 | kHz |
| Minimum PWM On-Time | | | +25°C | 40 | | | ns |
| PWM Duty Cycle Changing Time to Output | DCCTO | Duty cycle from 100% to 50% | +25°C | | 2 | | ms |
| Stable Dimming Range | DR | | +25°C | 0.2 | | 100 | % |
| Thermal Shutdown | | | | | | | |
| Thermal Shutdown Threshold | T _{SHUTDOWN} | | | | 160 | | °C |
| Thermal Shutdown Hysteresis | T _{HYS} | | | | 20 | | °C |

RECOMMENDED COMPONENTS OF TEST CIRCUITS

| COMPONENT | | COMPONENT | |
|-----------|-------------------|-----------|----------------------|
| INDUCTOR | 10μH/ETQP3M100KVP | CAPACITOR | 10μF/C2012X7R1H106JT |
| DIODE | PMEG4030ER | | 22μF/C2012X7R1H226JT |

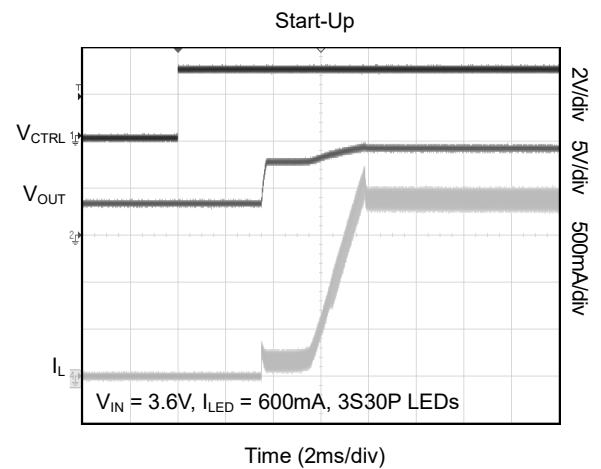
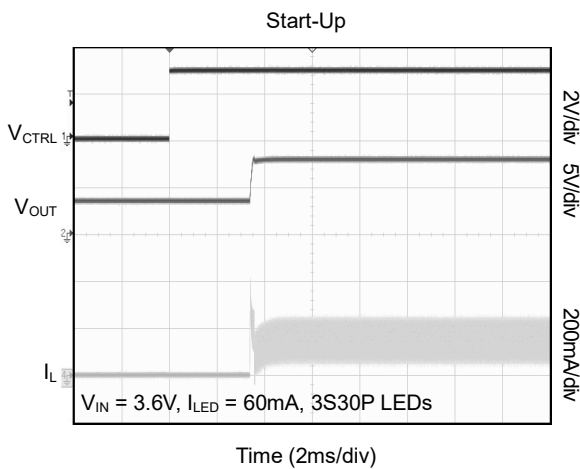
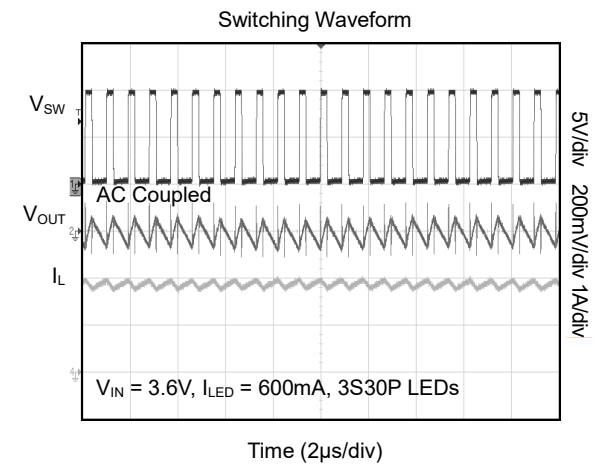
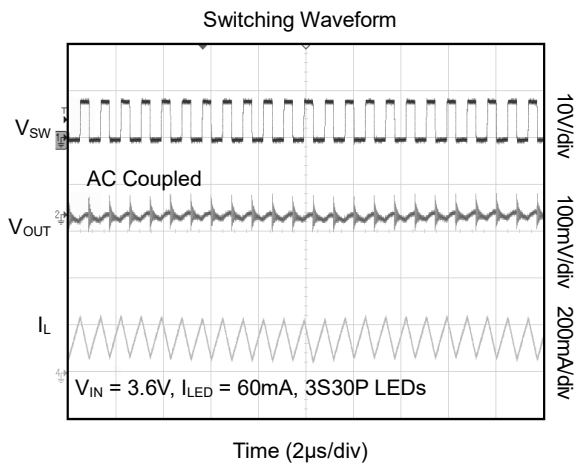
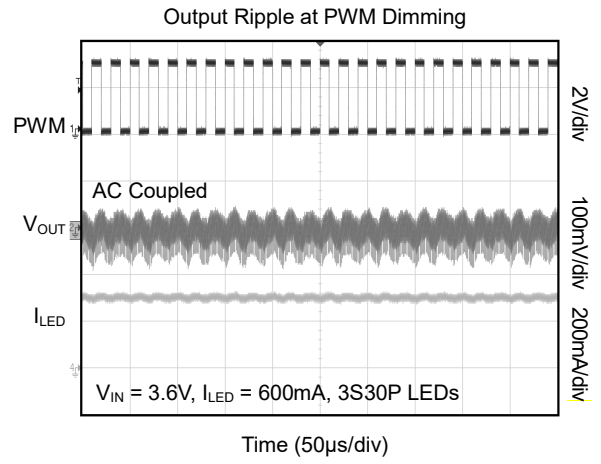
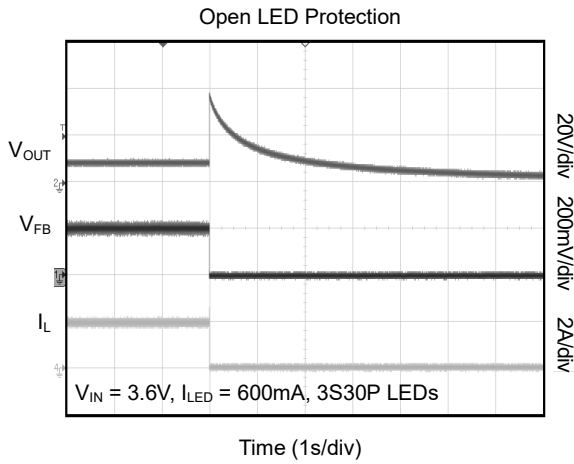
TYPICAL PERFORMANCE CHARACTERISTICS

T_A = +25°C, L = 10μH, C_{IN} = 22μF, C_{OUT} = 10μF, unless otherwise noted.



TYPICAL PERFORMANCE CHARACTERISTICS (continued)

T_A = +25°C, L = 10μH, C_{IN} = 22μF, C_{OUT} = 10μF, unless otherwise noted.



ADDITIONAL TYPICAL APPLICATIONS

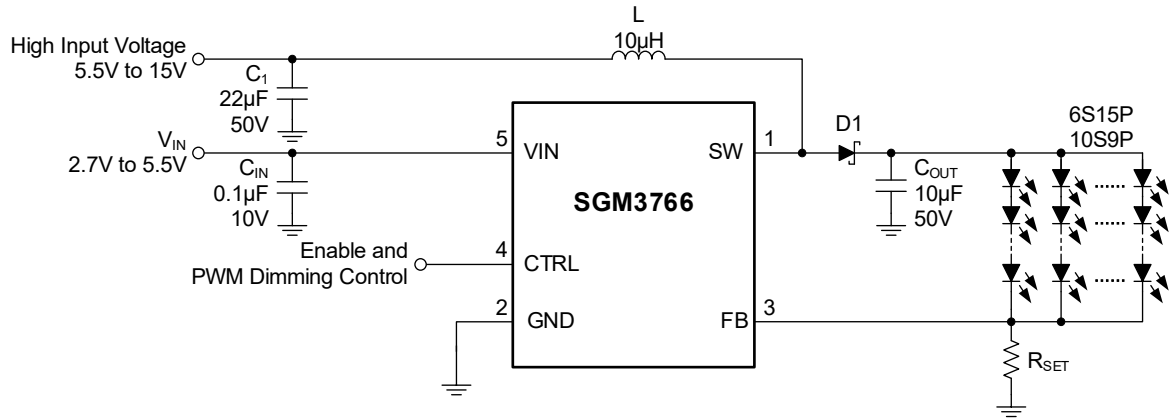


Figure 2. Driving Up to 90 LEDs (6S15P or 10S9P) with High and Low Voltage Power Supplies

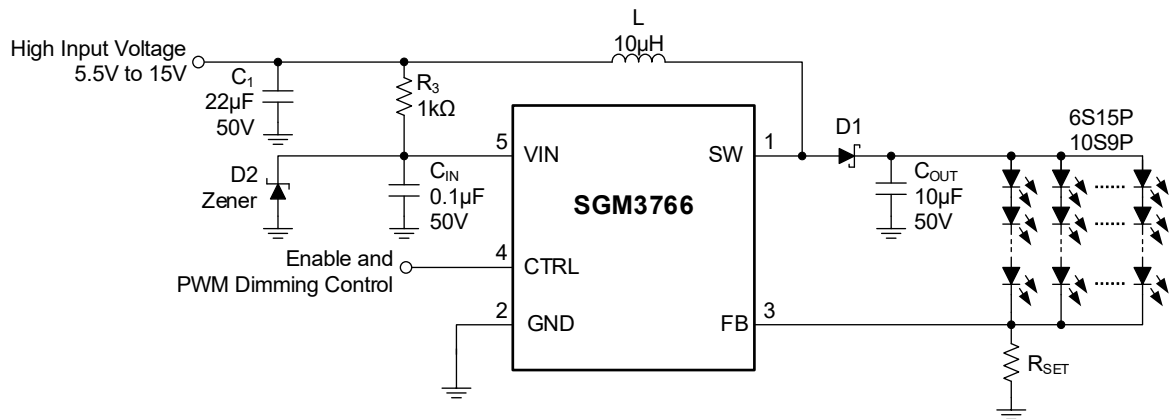


Figure 3. Driving Up to 90 LEDs (6S15P or 10S9P) with a High Voltage Power Supply

ADDITIONAL TYPICAL APPLICATIONS (continued)

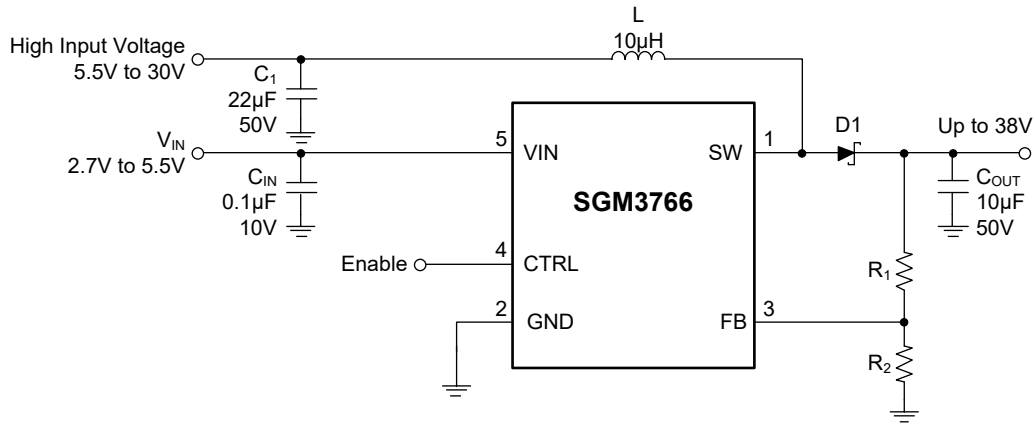


Figure 4. Used as a Constant Output Voltage Boost Converter with High and Low Voltage Power Supplies

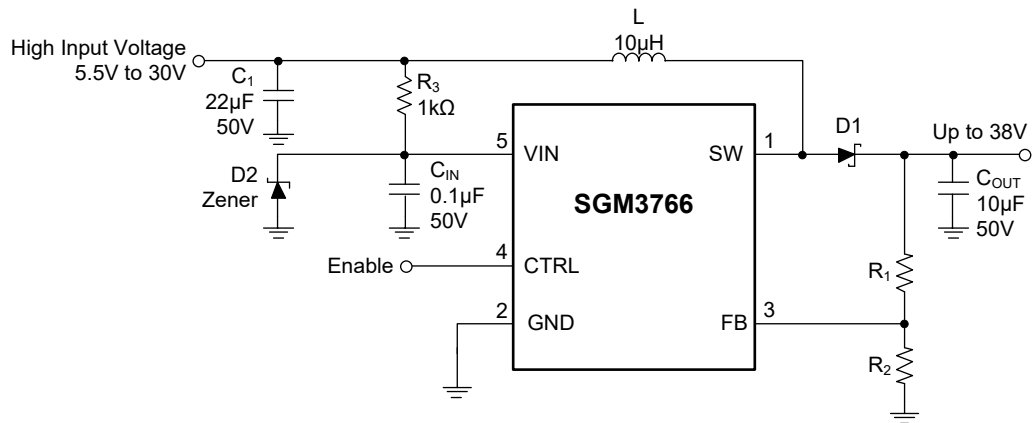


Figure 5. Used as a Constant Output Voltage Boost Converter with a High Voltage Power Supply

REVISION HISTORY

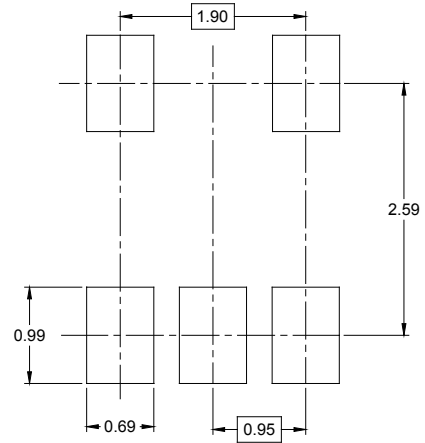
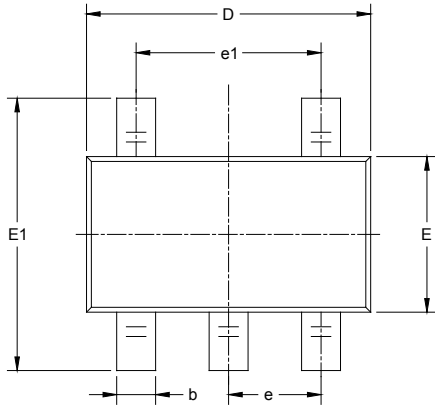
NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Changes from Original (AUGUST 2018) to REV.A

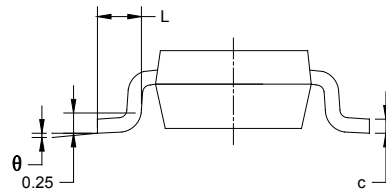
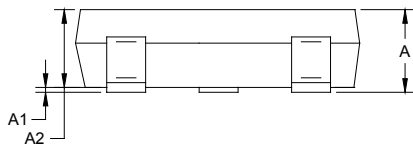
| | |
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| Changed from product preview to production data..... | All |
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PACKAGE OUTLINE DIMENSIONS

TSOT-23-5



RECOMMENDED LAND PATTERN (Unit: mm)



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

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



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

KEY PARAMETER LIST OF TAPE AND REEL

| Package Type | Reel Diameter | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P0 (mm) | P1 (mm) | P2 (mm) | W (mm) | Pin1 Quadrant |
|--------------|---------------|--------------------|---------|---------|---------|---------|---------|---------|--------|---------------|
| TSOT-23-5 | 7" | 9.5 | 3.17 | 3.10 | 1.10 | 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 |

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