

### GENERAL DESCRIPTION

With a 40V rated integrated switch FET, the SGM3749 is a boost converter that drives up to 10 LEDs in series. The boost converter runs at a 1.25MHz fixed switching frequency with 1.5A switch current limit, and allows for the use of a high brightness LED in general lighting.

The default white LED current is set with the external sensor resistor  $R_{SET}$ , and the feedback voltage is regulated to 200mV, as shown in the typical application. During the operation, the LED current can be controlled using PWM signal through the CTRL pin, the pulse width modulation (PWM) signal determines the feedback reference voltage. In PWM mode, the SGM3749 does not burst the LED current; therefore, it does not generate audible noises on the output capacitor. For maximum protection, the device features integrated open LED protection that disables the SGM3749 to prevent the output voltage from exceeding the IC's absolute maximum voltage ratings during open LED conditions.

The SGM3749 is available in Green TDFN-2x2-6L and TSOT-23-6 packages. It operates over an ambient temperature range of -40°C to +85°C.

### TYPICAL APPLICATION

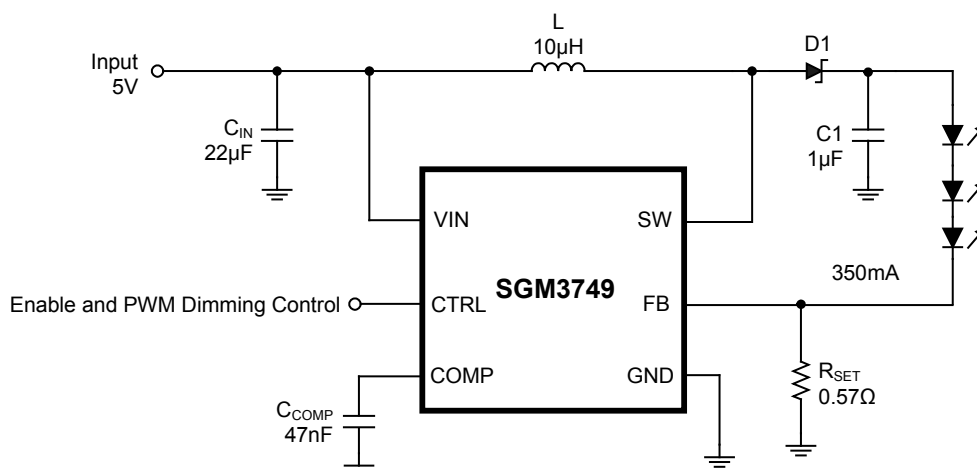


Figure 1. Typical Application Circuit

### FEATURES

- Input Voltage Range: 3V to 20V
- 38V Open LED Protection for 10 LEDs
- 200mV Reference Voltage
- 600kΩ Pull-Down Resistor on CTRL Pin
- 1.5A Switch FET with 1.25MHz Switching Frequency
- PWM Brightness Control
- 5kHz to 100kHz PWM Dimming Frequency Range
- Dimming Stable in More than 1:500 PWM Range
- Soft-Start Function
- Up to 90% Efficiency
- -40°C to +85°C Operating Temperature Range
- Available in Green TDFN-2x2-6L and TSOT-23-6 Packages

### APPLICATIONS

High Brightness LED Lighting

White LED Backlighting for Media Form Factor Display

**PACKAGE/ORDERING INFORMATION**

| MODEL   | PACKAGE DESCRIPTION | SPECIFIED TEMPERATURE RANGE | ORDERING NUMBER  | PACKAGE MARKING | PACKING OPTION      |
|---------|---------------------|-----------------------------|------------------|-----------------|---------------------|
| SGM3749 | TDFN-2×2-6L         | -40°C to +85°C              | SGM3749YTDI6G/TR | 3749<br>XXXX    | Tape and Reel, 3000 |
|         | TSOT-23-6           | -40°C to +85°C              | SGM3749YTN6G/TR  | SV7XX           | Tape and Reel, 3000 |

NOTE: XX = Date Code. XXXX = 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.

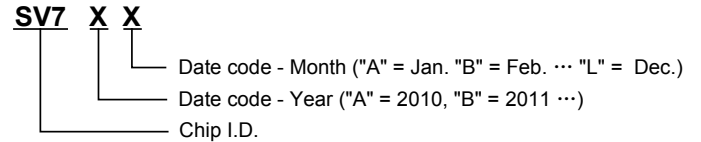
**ABSOLUTE MAXIMUM RATINGS**

|   |                 |
|---|-----------------|
| Supply Voltage on VIN.....                | -0.3V to 22V    |
| Voltage on CTRL .....                     | -0.3V to 6V     |
| Voltages on FB and COMP.....              | -0.3V to 3V     |
| Voltage on SW .....                       | -0.3V to 40V    |
| Package Thermal Resistance                |                 |
| TDFN-2×2-6L, $\theta_{JA}$ .....          | 120°C/W         |
| TSOT-23-6, $\theta_{JA}$ .....            | 190°C/W         |
| Junction Temperature.....                 | +150°C          |
| Storage Temperature Range .....           | -65°C to +150°C |
| Lead Temperature (Soldering, 10sec) ..... | +260°C          |
| ESD Susceptibility                        |                 |
| HBM.....                                  | 4000V           |
| MM.....                                   | 300V            |

**RECOMMENDED OPERATING CONDITIONS**

|                                   |                |
|-----------------------------------|----------------|
| Input Voltage Range .....         | 3V to 20V      |
| Operating Temperature Range ..... | -40°C to +85°C |

**MARKING INFORMATION**



For example: SV7FA (2015, January)

**OVERSTRESS CAUTION**

Stresses beyond those listed may cause permanent damage to the device. Functional operation of the device at these or any other conditions beyond those indicated in the operational section of the specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

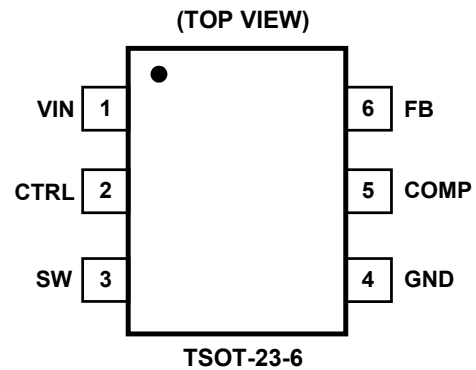
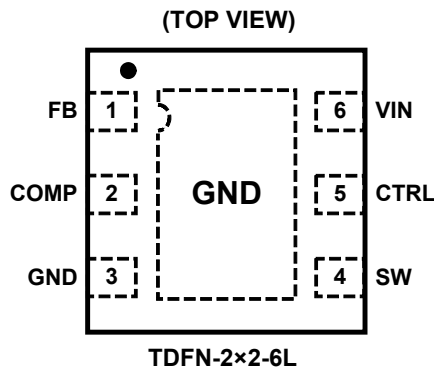
**ESD SENSITIVITY CAUTION**

This integrated circuit can be damaged by ESD if you don't pay attention to ESD protection. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

**DISCLAIMER**

SG Micro Corp reserves the right to make any change in circuit design, specification or other related things if necessary without notice at any time.

## PIN CONFIGURATIONS



## PIN DESCRIPTION

| PIN       |             | NAME | I/O | FUNCTION  |
|-----------|-------------|------|-----|---|
| TSOT-23-6 | TDFN-2x2-6L |      |     |   |
| 1         | 6           | VIN  | I   | Input Supply Pin. Connect VIN to a supply voltage between 3V and 20V.   |
| 2         | 5           | CTRL | I   | Control Pin of the Boost Regulator. It is a multi-functional pin which can be used for enable and PWM dimming control.                                |
| 3         | 4           | SW   | I   | Switching Node of the IC. Connect the inductor between the VIN and SW pin. This pin is also used to sense the output voltage for open LED protection. |
| 4         | 3           | GND  | O   | Ground.   |
| 5         | 2           | COMP | O   | Output of the Transconductance Error Amplifier. Connect an external capacitor to this pin to compensate the converter.                                |
| 6         | 1           | FB   | I   | Feedback Pin for Current. Connect the sense resistor from FB to GND.  |
| —         | Exposed Pad | GND  | —   | The exposed pad should be soldered to the analog ground plane. If possible, use thermal via to connect to ground plane for ideal power dissipation.   |

NOTE: I: input; O: output.

## ELECTRICAL CHARACTERISTICS

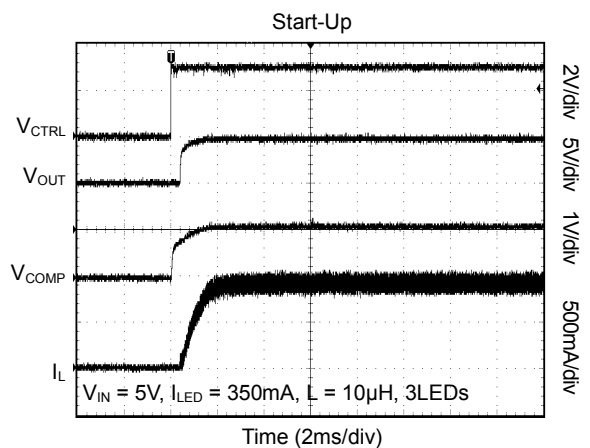
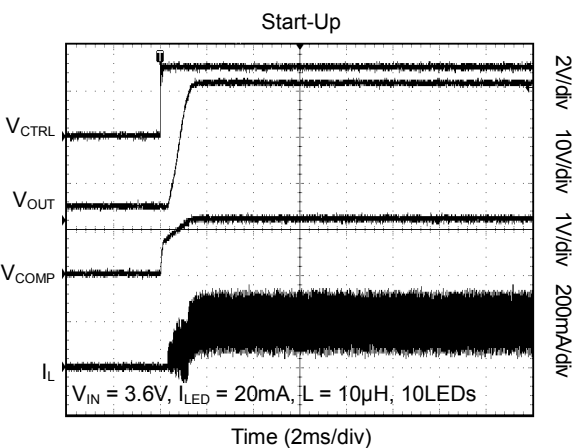
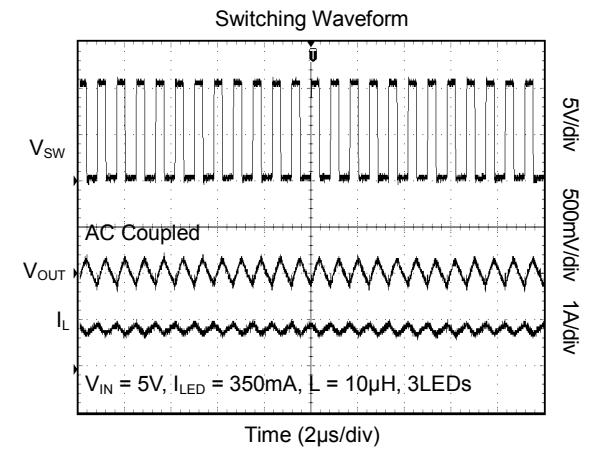
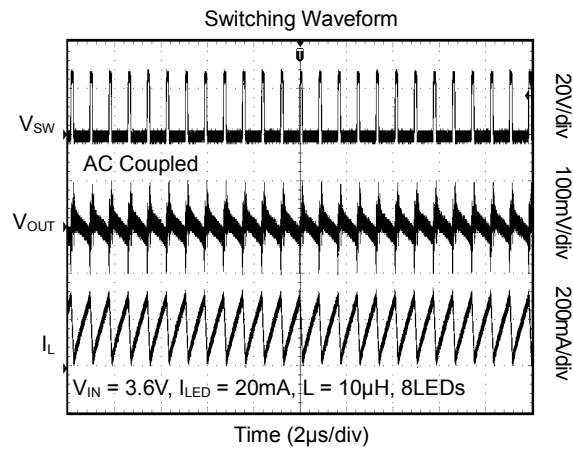
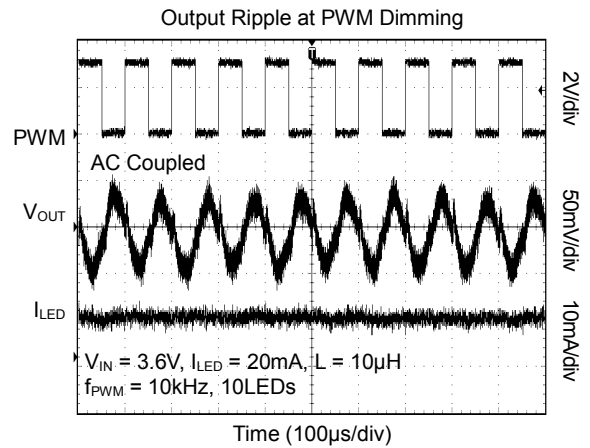
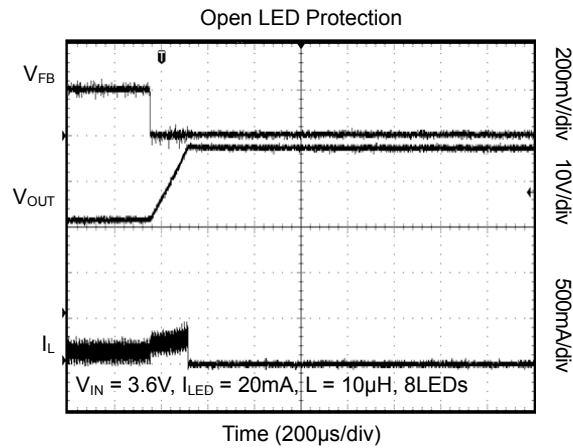
(V<sub>IN</sub> = 3.6V, V<sub>CTRL</sub> = V<sub>IN</sub>, C<sub>IN</sub> = 22μF, Full = -40°C to +85°C, typical values are at T<sub>A</sub> = +25°C, unless otherwise noted.)

| PARAMETER  | SYMBOL               | CONDITIONS  | TEMP  | MIN  | TYP   | MAX   | UNITS |
|--|----------------------|---|-------|------|-------|-------|-------|
| <b>SUPPLY CURRENT</b>  |                      |   |       |      |       |       |       |
| Input Voltage Range  | V <sub>IN</sub>      |   | +25°C | 3    |       | 20    | V     |
| Operating Quiescent Current into VIN                         | I <sub>Q</sub>       | V <sub>FB</sub> = 400mV   | +25°C |      | 0.4   | 0.6   | mA    |
| Shutdown Current   | I <sub>SD</sub>      | V <sub>CTRL</sub> = GND, V <sub>IN</sub> = 4.2V                     | +25°C |      |       | 1     | μA    |
| Under-Voltage Lockout Threshold                              | UVLO                 | V <sub>IN</sub> falling   | +25°C |      | 2.2   | 2.5   | V     |
| Under-Voltage Lockout Hysteresis                             | V <sub>HYS</sub>     |   | +25°C |      | 70    |       | mV    |
| <b>ENABLE AND REFERENCE CONTROL</b>                          |                      |   |       |      |       |       |       |
| CTRL Logic High Voltage                                      | V <sub>CTRLH</sub>   | V <sub>IN</sub> = 3V to 20V   | Full  | 1.5  |       |       | V     |
| CTRL Logic Low Voltage                                       | V <sub>CTRL</sub>    | V <sub>IN</sub> = 3V to 20V   | Full  |      |       | 0.35  | V     |
| CTRL Pull-Down Resistor                                      | R <sub>CTRL</sub>    |   | +25°C | 400  | 600   | 800   | kΩ    |
| CTRL Pulse Width to Shutdown                                 | t <sub>OFF</sub>     | CTRL high to low  | +25°C | 2.5  |       |       | ms    |
| <b>POWER SWITCH</b>  |                      |   |       |      |       |       |       |
| N-Channel MOSFET On-Resistance                               | R <sub>DS(ON)</sub>  | V <sub>IN</sub> = 3.6V  | +25°C |      | 0.3   | 0.55  | Ω     |
|  |                      | V <sub>IN</sub> = 3.0V  | +25°C |      |       | 0.6   |       |
| N-Channel Leakage Current                                    | I <sub>LN_NFET</sub> | V <sub>SW</sub> = 35V, T <sub>A</sub> = 25°C                        | +25°C |      |       | 1     | μA    |
| <b>VOLTAGE AND CURRENT CONTROL</b>                           |                      |   |       |      |       |       |       |
| Voltage Feedback Regulation Voltage                          | V <sub>REF</sub>     | V <sub>IN</sub> = 3.6V  | +25°C | 196  | 200   | 204.5 | mV    |
| Voltage Feedback Regulation Voltage Under Brightness Control | V <sub>REF_PWM</sub> | V <sub>IN</sub> = 3.6V, f <sub>PWM</sub> = 10kHz, duty cycle = 25%  | +25°C | 48   | 50.5  | 53.5  | mV    |
|  |                      | V <sub>IN</sub> = 3.6V, f <sub>PWM</sub> = 10kHz, duty cycle = 10%  | +25°C | 19   | 20.5  | 22.5  |       |
|  |                      | V <sub>IN</sub> = 3.6V, f <sub>PWM</sub> = 10kHz, duty cycle = 1%   | +25°C | 1.7  | 2.5   | 3.3   |       |
|  |                      | V <sub>IN</sub> = 3.6V, f <sub>PWM</sub> = 10kHz, duty cycle = 0.2% | +25°C |      | 1.25  |       |       |
| Voltage Feedback Input Bias Current                          | I <sub>FB</sub>      | V <sub>FB</sub> = 200mV   | Full  |      | 0.001 | 0.2   | μA    |
| Oscillator Frequency   | f <sub>S</sub>       |   | Full  | 0.95 | 1.25  | 1.6   | MHz   |
| Minimum ON Pulse Width                                       | t <sub>MIN_ON</sub>  |   | +25°C |      | 80    |       | ns    |
| COMP Pin Sink Current  | I <sub>SINK</sub>    |   | +25°C |      | 40    |       | μA    |
| COMP Pin Source Current                                      | I <sub>SOURCE</sub>  |   | +25°C |      | 20    |       | μA    |
| Error Amplifier Transconductance                             | G <sub>EA</sub>      |   | Full  | 160  | 280   | 400   | μmho  |
| <b>OVER-CURRENT AND OPEN LED PROTECTION</b>                  |                      |   |       |      |       |       |       |
| N-Channel MOSFET Current Limit                               | I <sub>LIM</sub>     |   | +25°C | 1.15 | 1.5   | 1.85  | A     |
| Open LED Protection Threshold                                | V <sub>OVP</sub>     | Measured on the SW pin  | Full  | 35.5 | 38    | 39.5  | V     |
| V <sub>REF</sub> Filter Time Constant                        | t <sub>REF</sub>     |   | +25°C |      | 130   |       | μs    |
| <b>PWM BRIGHTNESS CONTROL</b>                                |                      |   |       |      |       |       |       |
| PWM Dimming Frequency  | f <sub>PWM</sub>     |   | Full  | 5    |       | 100   | kHz   |
| Minimum PWM On-Time  |                      |   | +25°C | 30   |       |       | ns    |
| Minimum Stable Duty Cycle                                    | D <sub>MIN</sub>     |   | +25°C | 0.2  |       |       | %     |
| <b>THERMAL SHUTDOWN</b>                                      |                      |   |       |      |       |       |       |
| Thermal Shutdown Threshold                                   | T <sub>SHDN</sub>    |   |       |      | 150   |       | °C    |
| Thermal Shutdown Threshold Hysteresis                        | T <sub>HYS</sub>     |   |       |      | 15    |       | °C    |

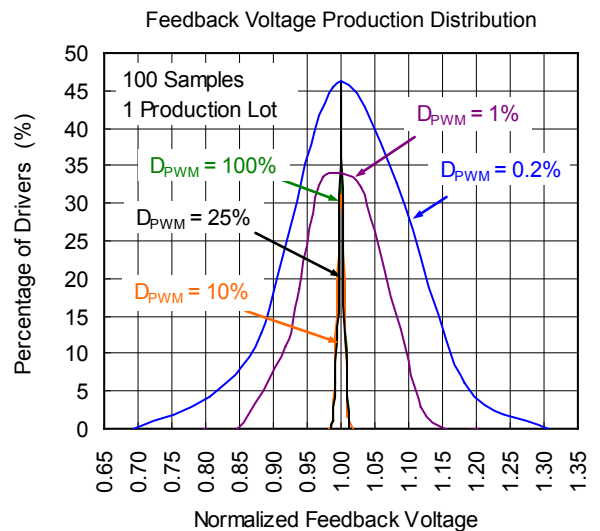
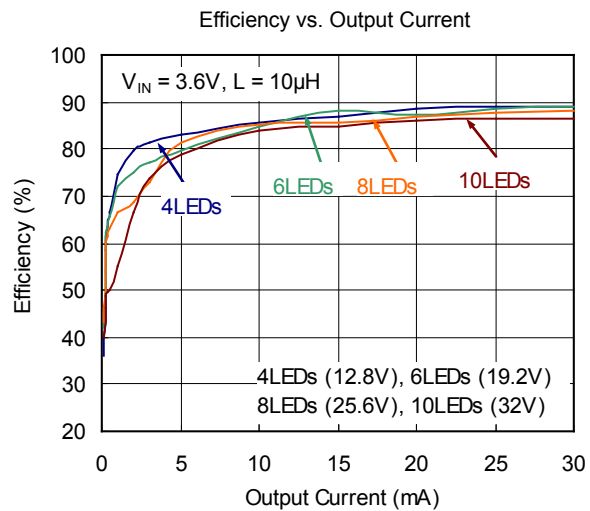
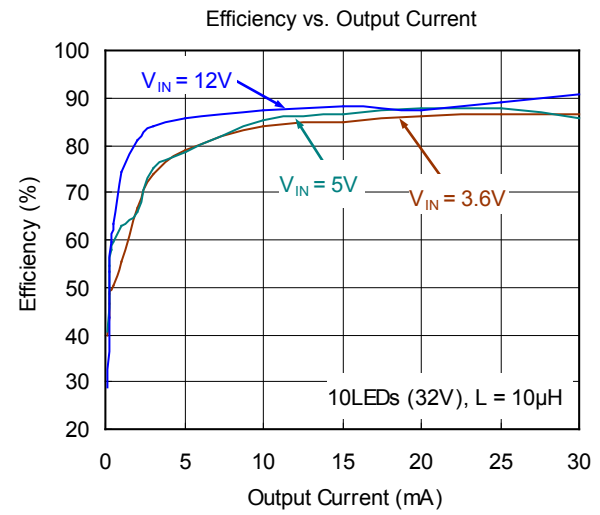
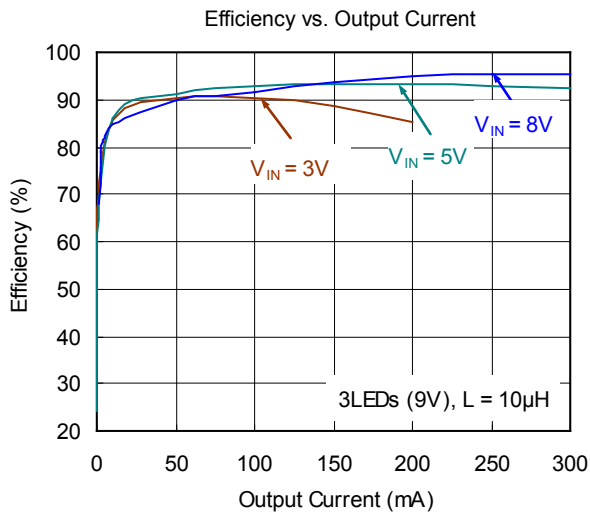
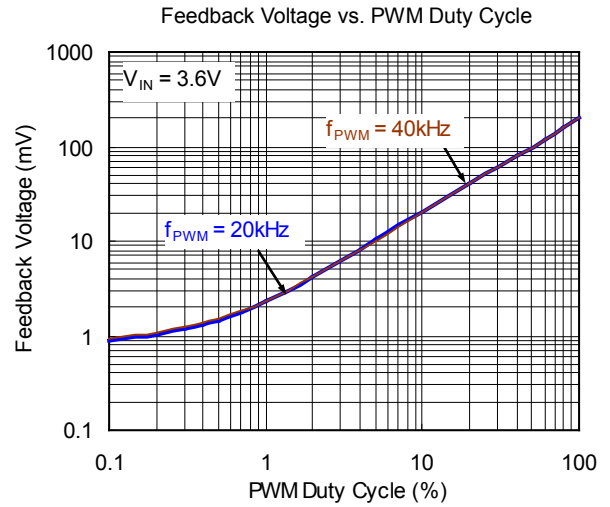
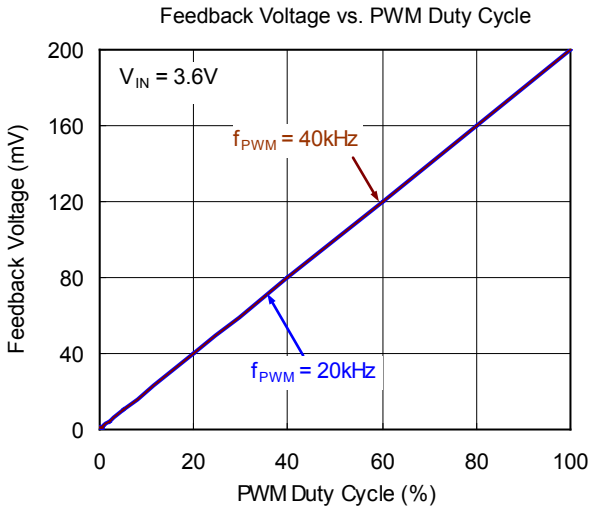
RECOMMENDED COMPONENTS OF TEST CIRCUITS

| COMPONENT |                   | COMPONENT |                          |
|-----------|-------------------|-----------|--------------------------|
| INDUCTOR  | 10μH/CD75NP-100KC | CAPACITOR | 22μF/C2012X7R1H226KT     |
|           |                   |           | 1μF/C2012X7R1H105KT      |
| DIODE     | MBR0540           |           | 47nF/C0603X7S0J473M030BB |

TYPICAL PERFORMANCE CHARACTERISTICS



TYPICAL PERFORMANCE CHARACTERISTICS (continued)



FUNCTIONAL BLOCK DIAGRAM

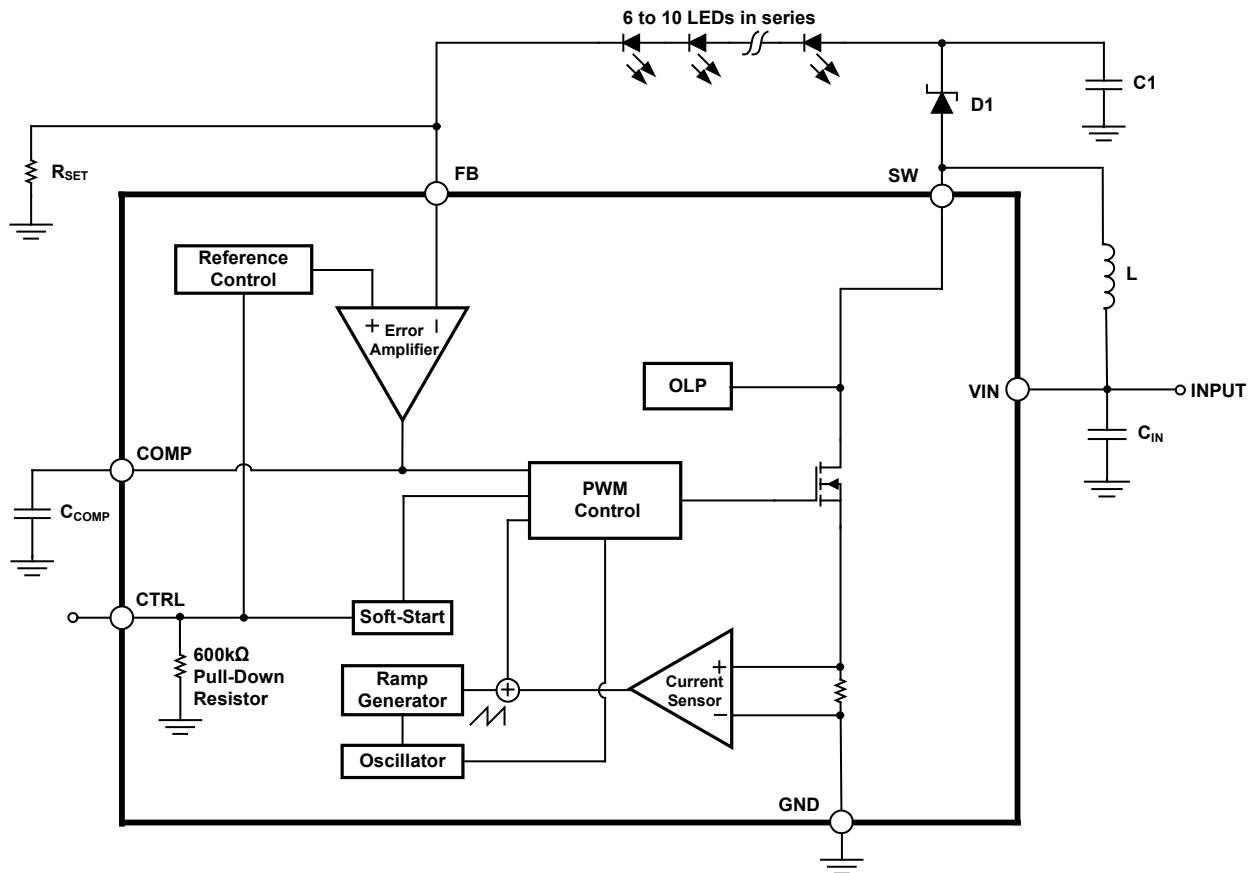


Figure 2. SGM3749 Block Diagram

## DETAILED DESCRIPTION

The SGM3749 is a high efficiency, high output voltage boost converter in small package size. The device is ideal for driving up to 10 white LEDs in series. The serial LED connection provides even illumination by sourcing the same output current through all LEDs, eliminating the need for expensive factory calibration. The device integrates 40V/1.5A switch FET and operates in pulse width modulation (PWM) with 1.25MHz fixed switching frequency. For operation see the FUNCTIONAL BLOCK DIAGRAM. The duty cycle of the converter is set by the error amplifier output and the current signal applied to the PWM control comparator. The control architecture is based on traditional current-mode control; therefore, a slope compensation is added to the current signal to allow stable operation for duty cycles larger than 40%. The feedback loop regulates the FB pin to a low reference voltage (200mV typical), reducing the power dissipation in the current sense resistor.

### Open LED Protection (OLP)

Open LED protection circuitry prevents IC damage as the result of white LED disconnection. The SGM3749 monitors the voltage at the SW pin during each switching cycle. The switch FET will be turned off, when the SW voltage exceeds the  $V_{OVP}$  threshold for 8 switching clock cycles. The switch FET will switch after about 12ms. When the above condition is met, the protection circuitry will work again.

### Current Program

The FB voltage is regulated by a low 200mV reference voltage. The LED current is programmed externally using a current sense resistor in series with the LED string. The value of the  $R_{SET}$  is calculated using Equation 1.

$$I_{LED} = \frac{V_{FB}}{R_{SET}} \quad (1)$$

Where:

$I_{LED}$  = output current of LEDs

$V_{FB}$  = regulated voltage of FB

$R_{SET}$  = current sense resistor

The output current tolerance depends on the FB accuracy and the current sensor resistor accuracy.

### Shutdown

The SGM3749 enters shutdown mode when the CTRL voltage is logic low for more than 2.5ms. During shutdown, the input supply current for the device is less than 1 $\mu$ A. Although the internal FET does not switch in shutdown, there is still a DC current path between the input and the LEDs through the inductor and Schottky diode. The minimum forward voltage of the LED array must exceed the maximum input voltage to ensure that the LEDs remain off in shutdown. However, in the typical application with two or more LEDs, the forward voltage is large enough to reverse bias the Schottky and keep leakage current low.



**DETAILED DESCRIPTION (continued)****LED Brightness Dimming Mode Selection**

The CTRL pin is used for the control input for enable and PWM dimming mode. The range of PWM dimming frequency is from 5kHz to 100kHz, and the recommended minimum PWM duty cycle is 0.1% for no blind dimming. When the CTRL pin is constantly high, the FB voltage is regulated to 200mV typically. However, the CTRL pin allows a PWM signal to reduce this regulation voltage; therefore, it achieves LED brightness dimming. The relationship between the duty cycle and FB voltage is given by Equation 2:

$$V_{FB} = \text{Duty} \times 200\text{mV} + 0.75\text{mV} \quad (2)$$

Where:

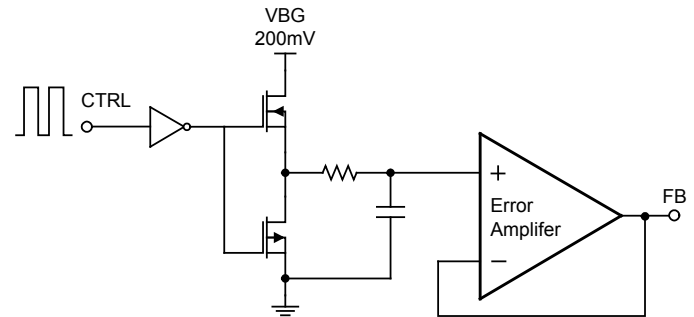
Duty = duty cycle of the PWM signal

200mV = internal reference voltage

0.75mV = most appreciate maximum from production statistics

As shown in Figure 3, the IC chops up the internal 200mV reference voltage at the duty cycle of the PWM signal. The pulse signal is then filtered by an internal low pass filter. The output of the filter is connected to the error amplifier as the reference voltage for the FB pin regulation. Therefore, although a PWM signal is used for brightness dimming, only the WLED DC current is modulated, which is often referred as analog dimming. This eliminates the audible noise which often occurs when the LED current is pulsed in replica of the frequency and duty cycle of PWM control. Unlike other scheme which filters the PWM signal for analog dimming, SGM3749 regulation voltage is independent

of the PWM logic voltage level which often has large variations.



**Figure 3. Block Diagram of Programmable FB Voltage Using PWM Signal**

**Under-Voltage Lockout**

An under-voltage lockout prevents operation of the device at input voltages below typical 2.2V. When the input voltage is below the under-voltage threshold, the device is shutdown and the internal switch FET is turned off. If the input voltage rises by under-voltage lockout hysteresis, the IC restarts.

**Thermal Shutdown**

An internal thermal shutdown turns off the device when the typical junction temperature of 150°C is exceeded. The device is released from shutdown automatically when the junction temperature decreases by 15°C.

## APPLICATION INFORMATION

### Maximum Output Current

The over-current limit in a boost converter limits the maximum input current and thus maximum input power for a given input voltage. Maximum output power is less than maximum input power due to power conversion losses. Therefore, the current limit setting, input voltage, output voltage and efficiency can all change maximum current output. The current limit clamps the peak inductor current; therefore, the ripple has to be subtracted to derive maximum DC current. The ripple current is a function of switching frequency, inductor value and duty cycle. The following equations take into account of all the above factors for maximum output current calculation.

$$I_P = \frac{1}{\left[ L \times f_s \times \left( \frac{1}{V_{OUT} + V_f - V_{IN}} + \frac{1}{V_{IN}} \right) \right]} \quad (3)$$

Where:

$I_P$  = inductor peak-to-peak ripple

$L$  = inductor value

$V_f$  = Schottky diode forward voltage

$f_s$  = switching frequency

$V_{OUT}$  = output voltage of the boost converter. It is equal to the sum of  $V_{FB}$  and the voltage drop across LEDs.

$$I_{OUT\_MAX} = \frac{V_{IN} \times (I_{LIM} - I_P / 2) \times \eta}{V_{OUT}} \quad (4)$$

Where:

$I_{OUT\_MAX}$  = maximum output current of the boost converter

$I_{LIM}$  = over-current limit

$\eta$  = efficiency

For instance, when  $V_{IN}$  is 3V, 8 LEDs output equivalent to  $V_{OUT}$  of 26V, the inductor is 22 $\mu$ H, the Schottky forward voltage is 0.2V; and then the maximum output current is 110mA in typical condition. When  $V_{IN}$  is 5V, 10 LEDs output equivalent to  $V_{OUT}$  of 32V, the inductor is 22 $\mu$ H, the Schottky forward voltage is 0.2V; and then the maximum output current is 150mA in typical condition.

### Inductor Selection

The selection of the inductor affects steady state operation as well as transient behavior and loop stability. These factors make it the most important component in power regulator design. There are three important inductor specifications, inductor value, DC resistance and saturation current. Considering inductor value alone is not enough.

The inductor value determines the inductor ripple current. Choose an inductor that can handle the necessary peak current without saturating, according to half of the peak-to-peak ripple current given by Equation 3, pause the inductor DC current given by:

$$I_{IN\_DC} = \frac{V_{OUT} \times I_{OUT}}{V_{IN} \times \eta} \quad (5)$$

Inductor values can have  $\pm 20\%$  tolerance with no current bias. When the inductor current approaches saturation level, its inductance can decrease 20% to 35% from the 0A value depending on how the inductor vendor defines saturation current. Using an inductor with a smaller inductance value forces discontinuous PWM when the inductor current ramps down to zero before the end of each switching cycle. This reduces the boost converter's maximum output current, causes large input voltage ripple and reduces efficiency. Large inductance value provides much more output current and higher conversion efficiency. For these reasons, a 6.8 $\mu$ H to 22 $\mu$ H inductor value range is recommended. A 22 $\mu$ H inductor optimized the efficiency for most application while maintaining low inductor peak-to-peak ripple.

SGM3749 has built-in slope compensation to avoid sub-harmonic oscillation associated with current mode control. If the inductor value is lower than 6.8 $\mu$ H, the slope compensation may not be adequate, and the loop can be unstable. Therefore, customers need to verify the inductor in their application if it is different from the recommended values.

## APPLICATION INFORMATION (continued)

### Schottky Diode Selection

The high switching frequency of the SGM3749 demands a high-speed rectification for optimum efficiency. Ensure that the diode's average and peak current rating exceeds the average output current and peak inductor current. In addition, the diode's reverse breakdown voltage must exceed the open LED protection voltage.

### Compensation Capacitor Selection

The compensation capacitor  $C_{COMP}$ , connected from COMP pin to GND, is used to stabilize the feedback loop of the SGM3749. A ceramic capacitor in the range of 22nF to 220nF for  $C_{COMP}$  is suitable for most applications.

### Input and Output Capacitor Selection

The output capacitor is mainly selected to meet the requirements for the output ripple and loop stability. This ripple voltage is related to the capacitor's capacitance and its equivalent series resistance (ESR). Assuming a capacitor with zero ESR, the minimum capacitance needed for a given ripple can be calculated by:

$$C_{OUT} = \frac{(V_{OUT} - V_{IN}) \times I_{OUT}}{V_{OUT} \times f_S \times V_{RIPPLE}} \quad (6)$$

Where,  $V_{RIPPLE}$  = peak-to-peak output ripple. The additional output ripple component caused by ESR is calculated using:

$$V_{RIPPLE\_ESR} = I_{OUT} \times R_{ESR} \quad (7)$$

Due to its low ESR,  $V_{RIPPLE\_ESR}$  can be neglected for ceramic capacitors, but must be considered if tantalum or electrolytic capacitors are used.

Care must be taken when evaluating a ceramic capacitors derating under DC bias, aging and AC signal. For example, larger form factor capacitors (in 1206 size) have a self resonant frequency in the range of the switching frequency. So the effective capacitance is

significantly lower. The DC bias can also significantly reduce capacitance. Ceramic capacitors can lose as much as 50% of its capacitance at its rated voltage. Therefore, leave the margin on the voltage rating to ensure adequate capacitance at the required output voltage.

The capacitor in the range of 1 $\mu$ F to 22 $\mu$ F is recommended for input side. The output requires a capacitor in the range of 1 $\mu$ F to 10 $\mu$ F. The output capacitor affects the loop stability of the boost regulator. If the output capacitor is below the range, the boost regulator can potentially become unstable. For example, if use the output capacitor of 0.1 $\mu$ F, a 470nF compensation capacitor has to be used for the loop stable.

### Thermal Considerations

The maximum IC junction temperature should be restricted to 150°C under normal operating conditions. This restriction limits the power dissipation of the SGM3749. Calculate the maximum allowable dissipation,  $P_{D(MAX)}$ , and keep the actual dissipation less than or equal to  $P_{D(MAX)}$ . The maximum-power-dissipation limit is determined using Equation 8:

$$P_{D(MAX)} = \frac{150^\circ\text{C} - T_A}{\theta_{JA}} \quad (8)$$

Where,  $T_A$  is the maximum ambient temperature for the application.  $\theta_{JA}$  is the thermal resistance junction-to-ambient given in Power Dissipation Table.

The SGM3749 comes in TDFN and TSOT packages. Compared with the TSOT package, the TDFN package has better heat dissipation. This package includes a thermal pad that improves the thermal capabilities of the package. The  $\theta_{JA}$  of the TDFN package greatly depends on the PCB layout and thermal pad connection. The thermal pad must be soldered to the analog ground on the PCB. Using thermal vias underneath the thermal pad as illustrated in the layout example.

## APPLICATION INFORMATION (continued)

## PCB Layout Considerations

As for all switching power supplies, especially those high frequency and high current ones, layout is an important design step. If layout is not carefully done, the regulator could suffer from instability as well as noise problems. To reduce switching losses, the SW pin rise and fall times are made as short as possible. To prevent radiation of high frequency resonance problems, proper layout of the high frequency switching path is essential. Minimize the length and area of all traces connected to the SW pin and always use a ground plane under the switching regulator to minimize inter-plane coupling. The loop including the PWM switch, Schottky diode, and output capacitor, contains high current rising and falling in nanosecond and should be kept as short as possible.

Connect the exposed paddle to the PCB ground plane using at least two vias. The input and the output bypass capacitors should be placed as close to the IC as possible. Minimize trace lengths between the IC and the inductor, the diode and the output capacitor; keep these traces short, direct, and wide.

A recommended PCB layout is shown in Figure 4. In order to dissipate the package heat, the package center pad (MC) must be connected to a large copper area on the ground plane underneath using multiple vias.

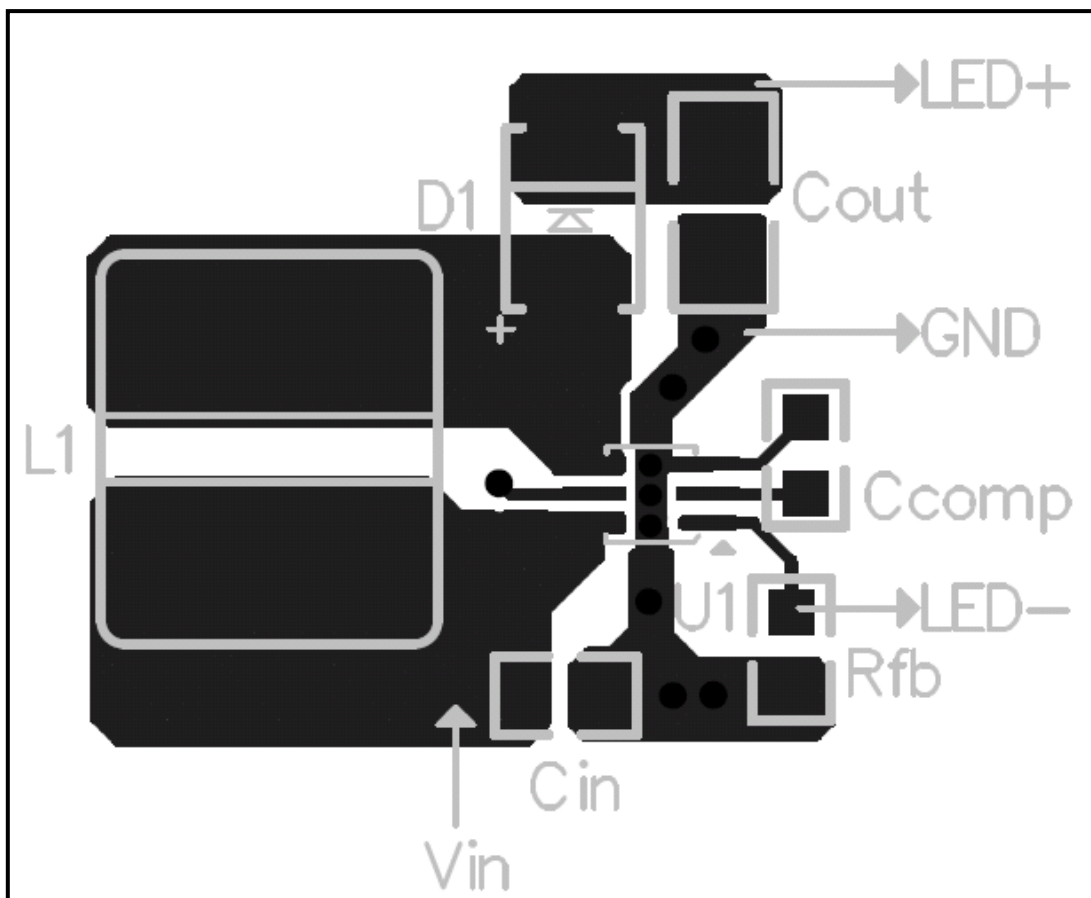


Figure 4. Recommended PCB Layout

ADDITIONAL TYPICAL APPLICATIONS

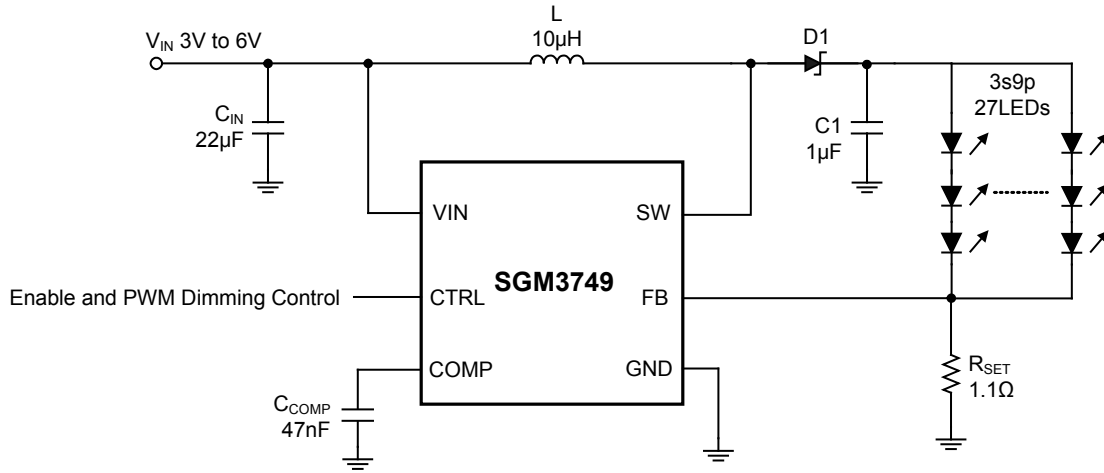


Figure 5. Drive 27 LEDs for Media Form Factor Display

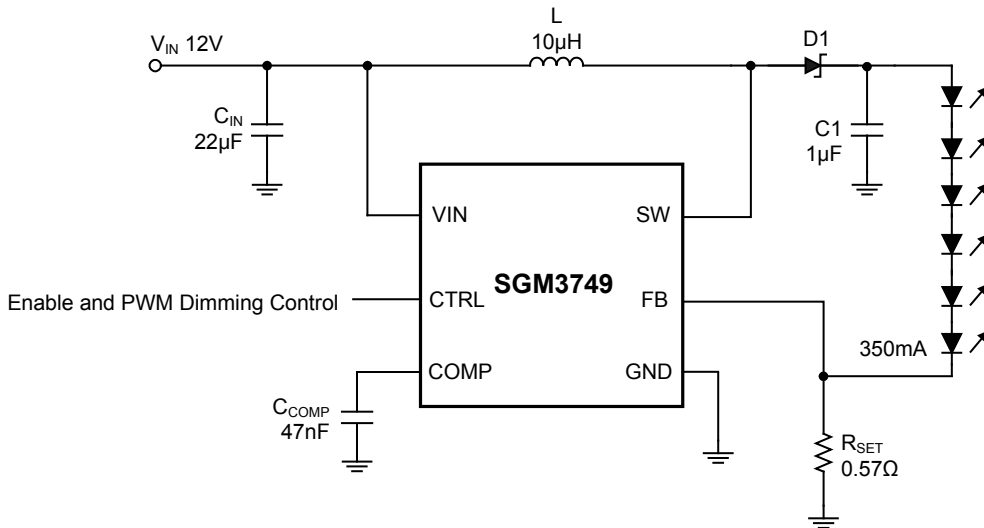


Figure 6. Drive 6 High Brightness LEDs

ADDITIONAL TYPICAL APPLICATIONS (continued)

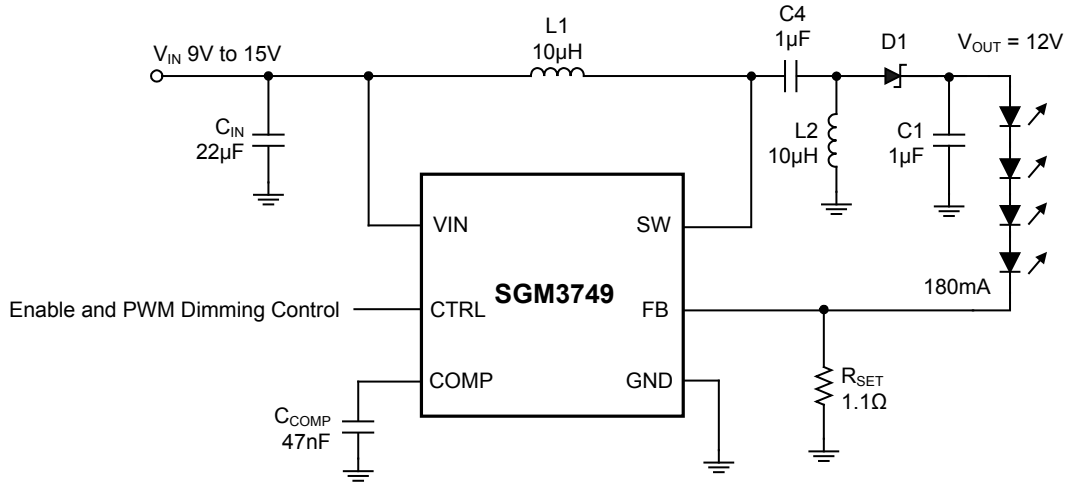


Figure 7. Drive 4 High Brightness LEDs with SEPIC Topology

REVISION HISTORY

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

JULY 2016 – REV.A.1 to REV.A.2

|   |        |
|---|--------|
| Changed Features item from: PWM Dimming Stable in 1:500 Range to: Dimming Stable in More than 1:500 PWM Range ..... | 1      |
| Changed Minimum PWM On-Time parameter .....   | 4      |
| Changed capacitor selection.....  | 5      |
| Changed Equation 2.....   | 9      |
| Changed Package Outline Dimensions section .....  | 15, 16 |

JUNE 2015 – REV.A to REV.A.1

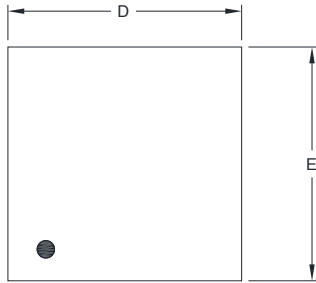
|   |   |
|---|---|
| Added the graph of Feedback Voltage Production Distribution ..... | 6 |
|---|---|

Changes from Original (APRIL 2015) to REV.A

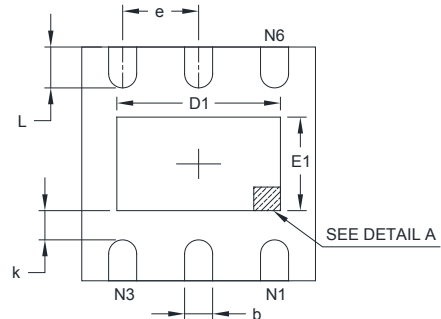
|  |     |
|--|-----|
| Changed from product preview to production data..... | All |
|--|-----|

PACKAGE OUTLINE DIMENSIONS

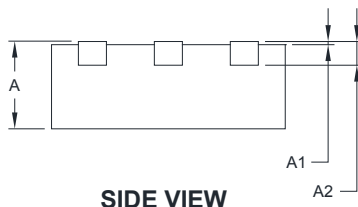
TDFN-2x2-6L



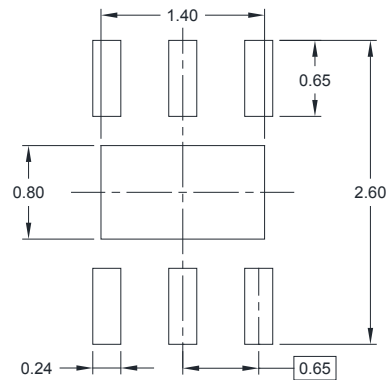
TOP VIEW



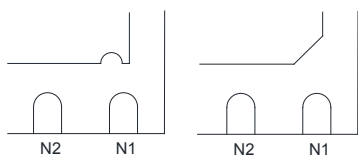
BOTTOM VIEW



SIDE VIEW



RECOMMENDED LAND PATTERN (Unit: mm)



DETAIL A

Pin #1 ID and Tie Bar Mark Options

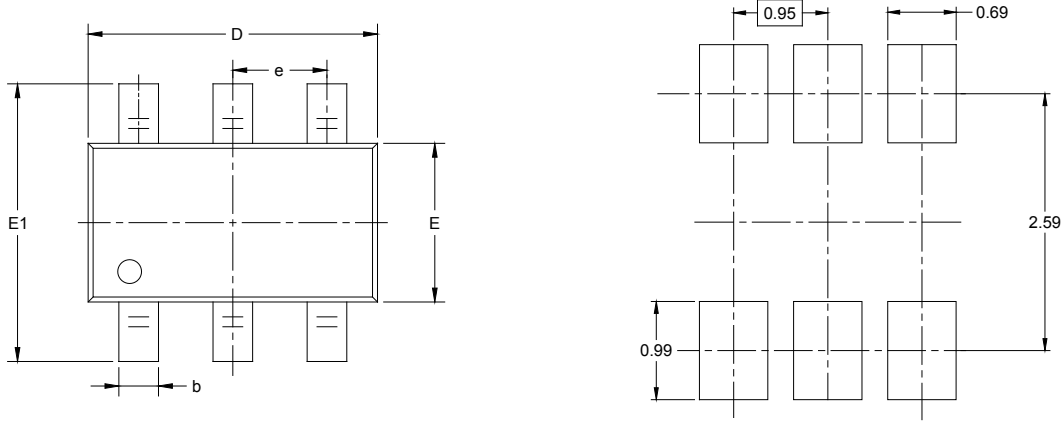
NOTE: The configuration of the Pin #1 identifier is optional, but must be located within the zone indicated.

| Symbol | Dimensions In Millimeters |       | Dimensions 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      | 1.900                     | 2.100 | 0.075                | 0.083 |
| D1     | 1.100                     | 1.450 | 0.043                | 0.057 |
| E      | 1.900                     | 2.100 | 0.075                | 0.083 |
| E1     | 0.600                     | 0.850 | 0.024                | 0.034 |
| k      | 0.200 MIN                 |       | 0.008 MIN            |       |
| b      | 0.180                     | 0.300 | 0.007                | 0.012 |
| e      | 0.650 TYP                 |       | 0.026 TYP            |       |
| L      | 0.250                     | 0.450 | 0.010                | 0.018 |

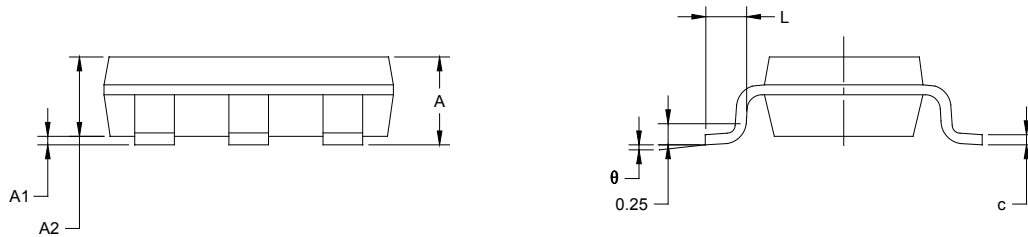
# PACKAGE INFORMATION

## PACKAGE OUTLINE DIMENSIONS

### TSOT-23-6



RECOMMENDED LAND PATTERN (Unit: mm)



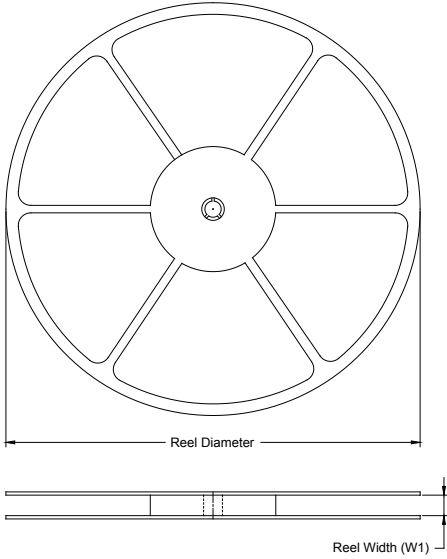
| Symbol   | Dimensions<br>In Millimeters |       | Dimensions<br>In Inches |       |
|----------|------------------------------|-------|-------------------------|-------|
|          | MIN                          | MAX   | MIN                     | MAX   |
| A        |                              | 1.000 |                         | 0.043 |
| A1       | 0.000                        | 0.100 | 0.000                   | 0.004 |
| A2       | 0.700                        | 0.900 | 0.028                   | 0.039 |
| b        | 0.300                        | 0.500 | 0.012                   | 0.020 |
| c        | 0.080                        | 0.200 | 0.003                   | 0.008 |
| D        | 2.850                        | 2.950 | 0.112                   | 0.116 |
| E        | 1.550                        | 1.650 | 0.061                   | 0.065 |
| E1       | 2.650                        | 2.950 | 0.104                   | 0.116 |
| e        | 0.950 BSC                    |       | 0.037 BSC               |       |
| L        | 0.300                        | 0.600 | 0.012                   | 0.024 |
| $\theta$ | 0°                           | 8°    | 0°                      | 8°    |



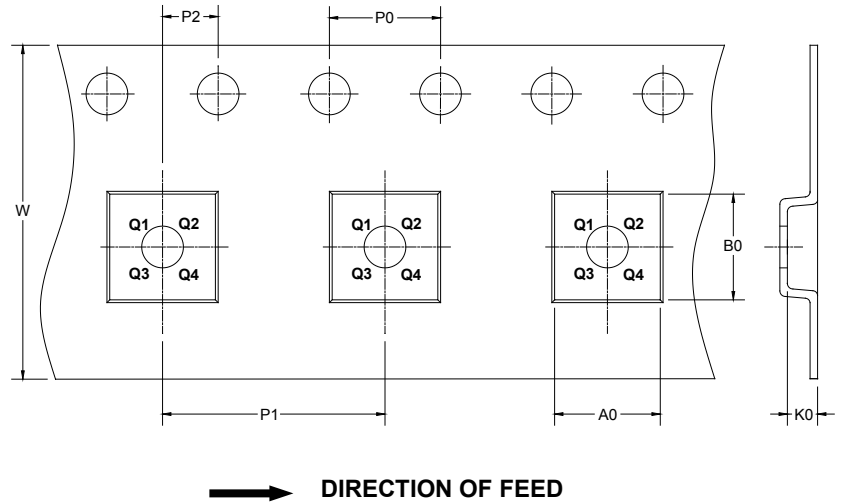
# PACKAGE INFORMATION

## 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 |
|--------------|---------------|--------------------|---------|---------|---------|---------|---------|---------|--------|---------------|
| TDFN-2x2-6L  | 7"            | 9.5                | 2.30    | 2.30    | 1.10    | 4.0     | 4.0     | 2.0     | 8.0    | Q1            |
| TSOT-23-6    | 7"            | 9.5                | 3.20    | 3.10    | 1.10    | 4.0     | 4.0     | 2.0     | 8.0    | Q3            |

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           |

DD0002

单击下面可查看定价，库存，交付和生命周期等信息

[>>SGMICRO\(圣邦微电子\)](#)