SGM37443
High Voltage LED Driver with 4-Channel 200mA Current Sinks

GENERAL DESCRIPTION

The SGM37443 is a 4-channel LED driver designed to supply up to 200mA per channel. It functions as a current-mode Boost converter with a switchable frequency adjustable via the FREQ pin, ranging from 210kHz (TYP) to 2.1MHz (TYP), and supports a wide input voltage range from 5.5V to 40V.

The output voltage control loop targets the LED string with the highest voltage, regulating its LED pin voltage to 0.6V typically. This approach accommodates voltage differences between LED strings. The SGM37443 also features automatic detection and disconnection of any open-circuit or faulty LED strings during operation from the voltage control loop, preventing the output voltage (V_{OUT}) from exceeding safe limits. LED currents across all four channels are closely matched within ±3% and can be easily set using a single resistor. By applying a PWM signal to the PWM/VDIM pin, precise digital PWM dimming with a very high contrast ratio is achievable. In addition, users can also achieve DC dimming or voltage dimming by configuring the mode selection pin. In PWM dimming mode, the voltage-holding method of the unique current sink, as well as adaptive operating time control of Boost converter, ensures excellent LED current accuracy and matching, even at extremely low duty cycles.

In the event of abnormal conditions such as over-voltage protection (OVP) or LED string short-circuit protection (LED SCP), the device will send a status signal to the system.

The SGM37443 is available in a Green TQFN-5×5-20L package.

FEATURES

- **5.5V to 40V Wide Input Supply Voltage Range**
- **210kHz (TYP) to 2.1MHz (TYP) Switching Frequency**
- **PWM, DC and Voltage Dimming Modes**
- **±3% Current Sink Accuracy**
- **±3% Matched Current Sink**
- **LED String Open Detection**
- **LED String Short Detection**
- **Adjustable LED String Over-Voltage Protection**
- **LED String Over-Current Protection**
- **Boost Current Limit**
- **VIN Under-Voltage Protection**
- **Thermal Shutdown Protection**
- **Available in a Green TQFN-5×5-20L Package**

APPLICATIONS

LED Driver Application
LCD TV and Monitor Display Backlight
General-Purpose Constant Current Source

SIMPLIFIED SCHEMATIC

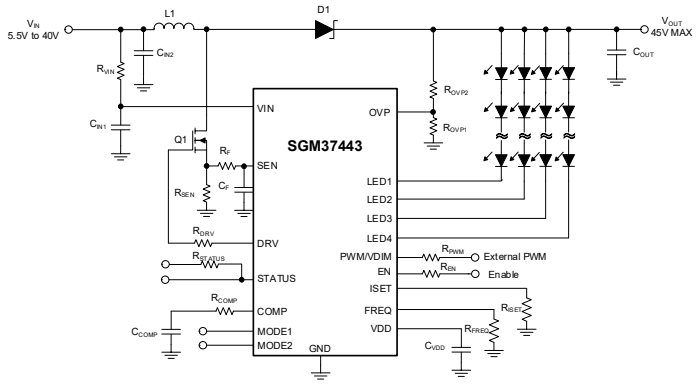


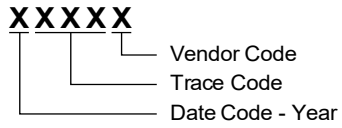
Figure 1. Simplified Schematic

PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM37443	TQFN-5×5-20L	-40℃ to +105℃	SGM37443GTRM20G/TR	SGM37443 GTRM20 XXXXX	Tape and Reel, 3000

MARKING INFORMATION

NOTE: XXXXX = Date Code, Trace Code and Vendor 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
VIN, STATUS ..... -0.3V to 45V
LED1 to LED4 ..... -0.3V to 46V
PWM/VDIM, EN, DRV, SEN, COMP, FREQ, VDD, OVP, ISET ..... -0.3V to 5.6V
Package Thermal Resistance
TQFN-5×5-20L, θ_{JA} ..... 31.5℃/W
TQFN-5×5-20L, θ_{JB} ..... 11.1℃/W
TQFN-5×5-20L, $\theta_{JC\ (TOP)}$ ..... 21.7℃/W
TQFN-5×5-20L, $\theta_{JC\ (BOT)}$ ..... 4.1℃/W
Junction Temperature ..... +155℃
Storage Temperature Range ..... -65℃ to +150℃
Lead Temperature (Soldering, 10s) ..... +260℃
ESD Susceptibility (1) (2)
HBM ..... ±4000V
CDM ..... ±1000V

NOTES:

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

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

RECOMMENDED OPERATING CONDITIONS

Supply Voltage, V_{IN} ..... 5.5V to 40V
LED1 to LED4 ..... 45V (MAX)
I_{LED1} to I_{LED4} ..... 200mA (MAX)
Operating Ambient Temperature Range ..... -40℃ to +105℃
Operating Junction Temperature Range ..... -40℃ to +125℃

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

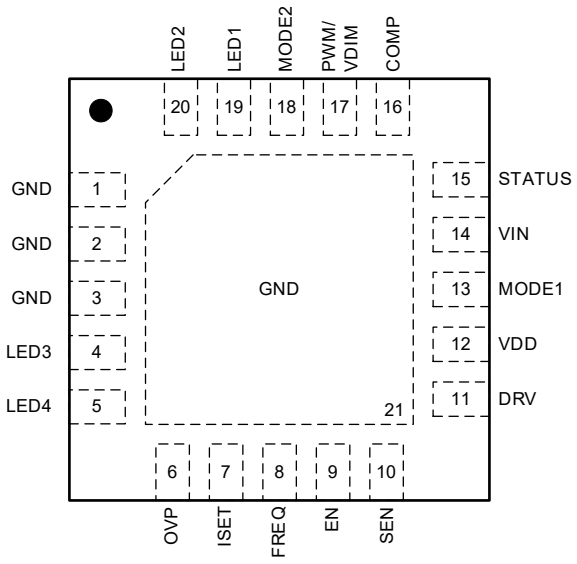
This integrated circuit can be damaged if ESD protections are not considered carefully. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance 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

(TOP VIEW)



TQFN-5×5-20L

PIN DESCRIPTION

PIN	NAME	TYPE	FUNCTION
1, 2, 3, 21 (Exposed Pad)	GND	G	Ground.
4, 5	LED3, LED4	I	Current Sink Regulation Input. Leave the pins floating if not used.
6	OVP	I	Over-Voltage Detection Pin. If the OVP pin voltage > 2V (TYP), the internal switching device will shut down and the STATUS pin will latch low to flag a fault condition.
7	ISET	I	Maximum LED Current Set Pin. The maximum LED current is configured by connecting a resistor to GND.
8	FREQ	I	Switching Frequency Setting Pin. Connect a resistor between the FREQ pin and ground to select the switching frequency of the Boost converter.
9	EN	I	Enable Control Input. Pulling this pin high will enable the device. The EN pin has a 200kΩ pull-down resistor inside.
10	SEN	I	Current Sense Pin. This pin monitors the voltage across the external current sense resistor during normal operation, enabling peak current mode control and limiting the inductor current every switching cycle.
11	DRV	O	Power Switch Gate Driver Pin. This pin outputs a voltage of 5V (TYP) to drive the gate of the external N-channel MOSFET power switch.
12	VDD	P	Internal Regulator Voltage. This pin provides a 5V voltage from the internal regulator and requires a capacitor of at least 1μF for stability.
13	MODE1	I	In PWM mode or voltage dimming mode, it can be left floating. In DC dimming mode, a capacitor of at least 100nF is required to be connected.
14	VIN	P	Input Supply Pin. Connect a bypass capacitor of at least 1μF from VIN to GND.
15	STATUS	O	Fault Status Indicator Output. This pin is pulled low to indicate a fault condition.
16	COMP	I	Loop Compensation Pin. Used for stabilizing the control loop of the Boost converter.
17	PWM/VDIM	I	Dimming Control Input pin. Brightness is controlled by applying a PWM signal to this pin in PWM dimming mode and DC dimming mode, or a DC voltage signal (VDIM) in voltage dimming mode.
18	MODE2	I	When MODE2 is floating, it operates in PWM mode. When MODE2 is connected to GND, it operates in DC mode. When MODE2 is connected to VDD, it operates in voltage mode.
19, 20	LED1, LED2	I	Current Sink Regulation Input. Leave the pins floating if not used.

NOTE: I = input, O = output, P = power, G = ground.

ELECTRICAL CHARACTERISTICS

(V_{IN} = 12V, T_J = -40℃ to +105℃, typical values are measured at T_J = +25℃, unless otherwise noted.)

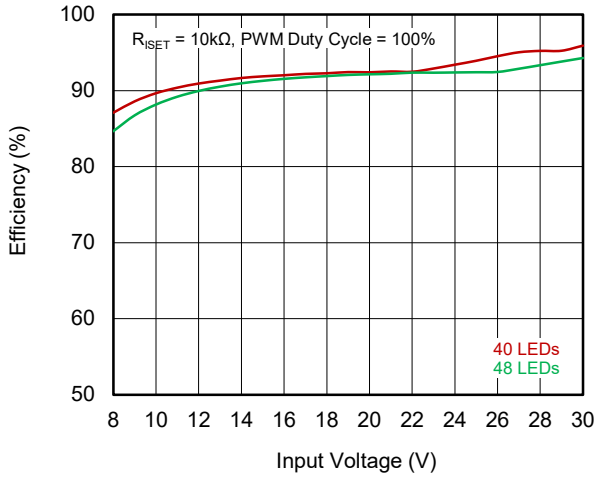
PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Supply Voltage						
Supply Current	I_{VIN}	EN = high, DRV switching off	1	2	3	mA
Shutdown Current	I_{SD}	EN = low		1	3	μA
VDD LDO Output	V_{DD}	I_{DD} = 10mA	4.5	4.9	5.4	V
VDD LDO Capability	I_{DD}	V_{DD} drop = 1V	40	70	100	mA
VIN UVLO Threshold	V_{UVLO}	V_{IN} rising	4	4.5	4.9	V
		V_{IN} falling	3.7	4.1	4.6	
VIN UVLO Threshold Hysteresis	V_{UVLO_HYS}			0.4		V
Logic High EN Threshold Voltage	V_{ENH}		1.2			V
Logic Low EN Threshold Voltage	V_{ENL}				0.5	
LED Current Programming						
LED Current Accuracy	I_{LED}	R_{ISET} = 15kΩ, V_{PWM} > 1.2V	78	80	82	mA
LED Current Matching	I_{LED_MATCH}	R_{ISET} = 15kΩ, $\frac{I_{LEDx} - I_{LED_AVE}}{I_{LED_AVE}} \times 100\%$	-3		3	%
LEDx Regulation Voltage	V_{LED_HD}	R_{ISET} = 15kΩ	0.4	0.6	0.8	V
VLED Open Threshold	V_{LED_OPEN}	LEDx falling	0.04	0.1	0.14	V
ISET Pin Voltage	V_{ISET}	Reference voltage for maximum LED current setting in PWM and DC dimming modes	1.1	1.2	1.3	V
Logical Input						
Logic High PWM Threshold Voltage	V_{PWMH}		1.2			V
Logic Low PWM Threshold Voltage	V_{PWML}				0.5	
PWM Boost Controller						
DRV Switching Frequency	f_{SW}	R_{FREQ} = 20kΩ	1.7	2.1	2.5	MHz
		R_{FREQ} = open	150	210	280	kHz
DRV Minimum On-Time	t_{ON}	Minimum on-time of DRV		60		ns
DRV Maximum Duty Cycle	D_{MAX}	f_{SW} = 1MHz		94		%
SEN Current Sense Limit (1)	V_{SEN}	Threshold voltage for external N-channel MOSFET current limit	0.3	0.5	0.62	V
Gate Driver Pull-up Impedance	R_{PULL_UP}		0.5	1	1.5	Ω
Gate Driver Pull-down Impedance	R_{PULL_DOWN}		0.2	0.6	1	Ω
OVP, LED SCP and OTP						
OVP Threshold	V_{OVP}	OVP pin rising	1.9	2	2.1	V
LED SCP Threshold	V_{SCP}	LEDx pin rising	5.5	6.7	8	V
STATUS Low Voltage	V_{STATUS}	Pull-up current of 10mA while STATUS = low	0.1	0.3	0.5	V
Thermal Shutdown	T_{SD}			155		℃
Thermal Shutdown Hysteresis	T_{SD_HYS}			30		℃

NOTE: 1. Refer to Current Limit (A) = 0.5V/R_{SEN}. If R_{SEN} = 0.1Ω, the current limit is 5A.

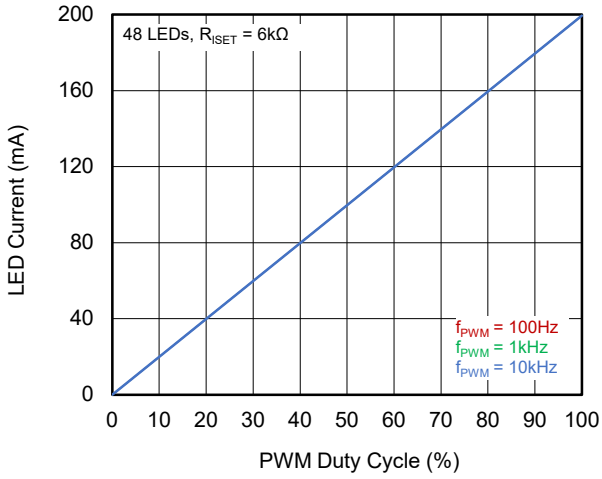
TYPICAL PERFORMANCE CHARACTERISTICS

T_A = +25℃, V_{IN} = 12V, f_{SW} = 1.2MHz, unless otherwise noted.

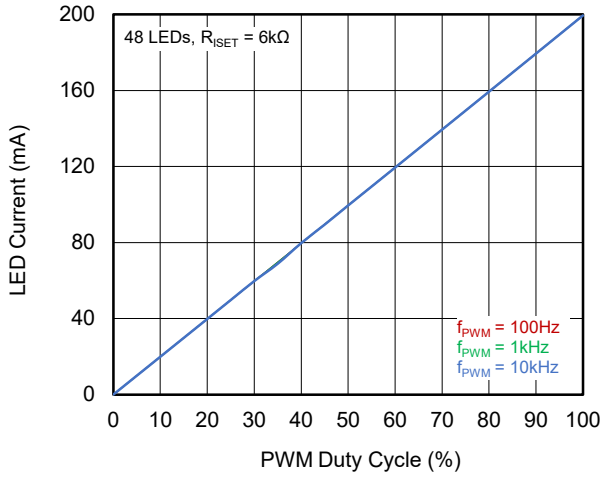
Boost Efficiency vs. Input Voltage (PWM Dimming Mode)



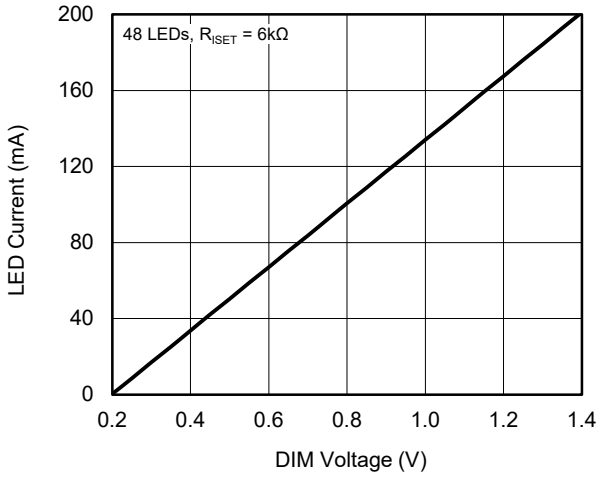
LED Current vs. PWM Duty Cycle (PWM Dimming Mode)



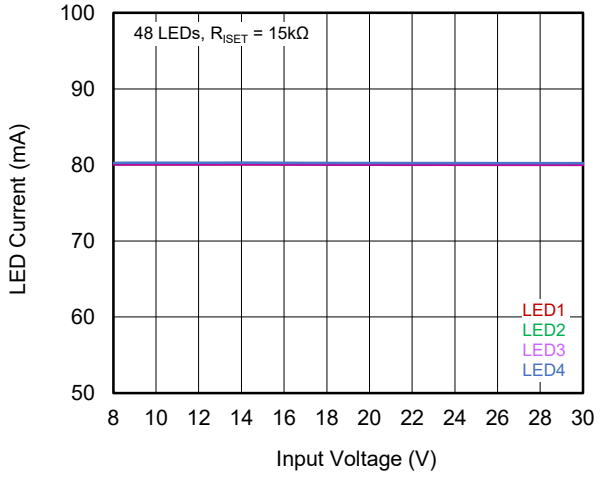
LED Current vs. PWM Duty Cycle (DC Dimming Mode)



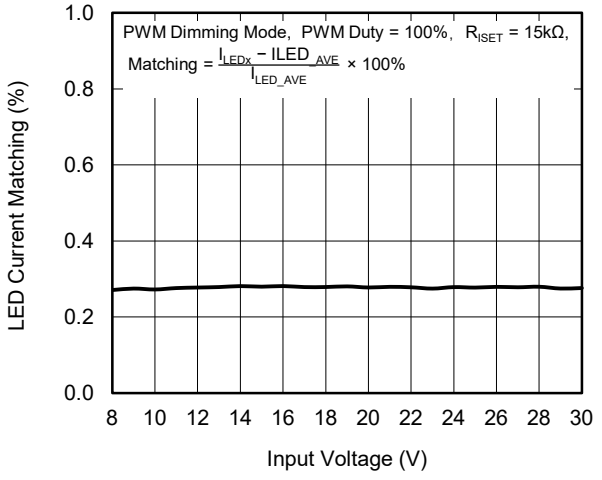
LED Current vs. DIM Voltage (Voltage Dimming Mode)



LED Current vs. Input Voltage



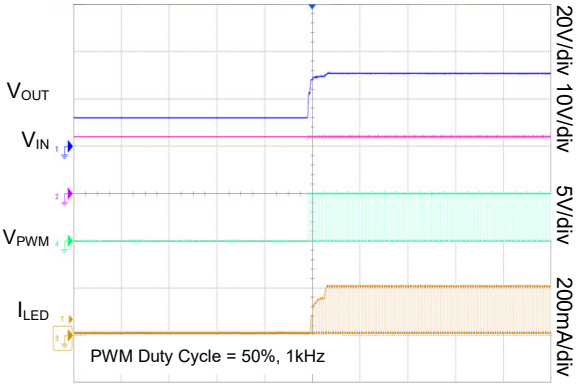
LED Current Matching vs. Input Voltage



TYPICAL PERFORMANCE CHARACTERISTICS (continued)

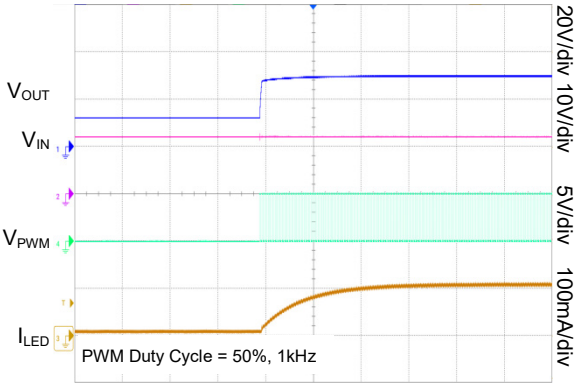
T_A = +25℃, V_{IN} = 12V, f_{SW} = 1.2MHz, unless otherwise noted.

PWM Mode Start-up with Fixed PWM Duty



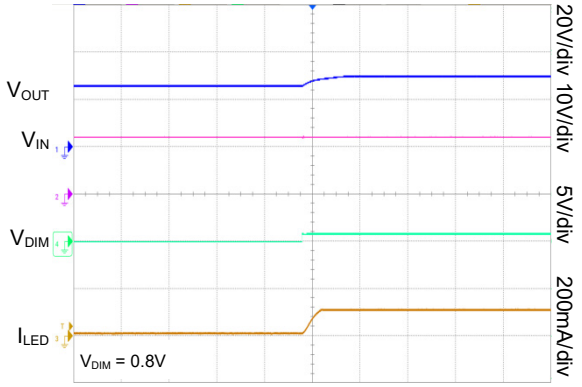
Time (20ms/div)

DC Mode Start-up with Fixed PWM Duty



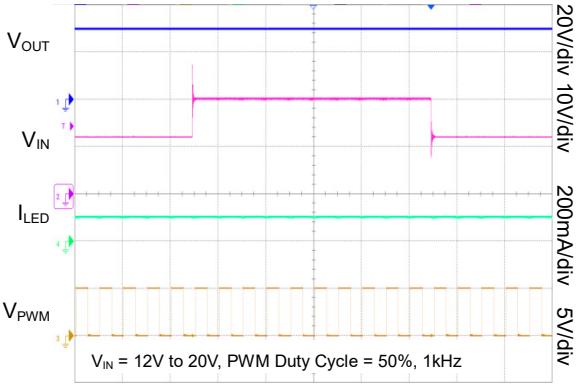
Time (20ms/div)

Voltage Mode Start-up with Fixed VDIM Input



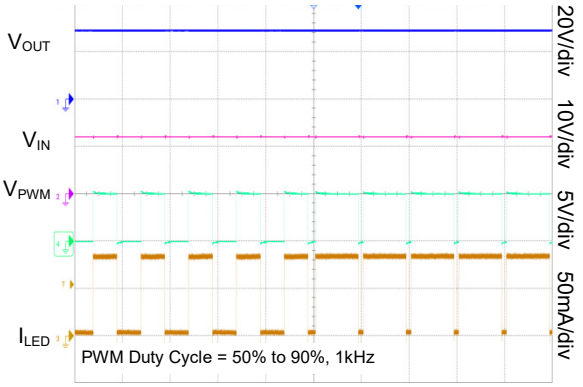
Time (1ms/div)

Line Transient (DC Dimming Mode)



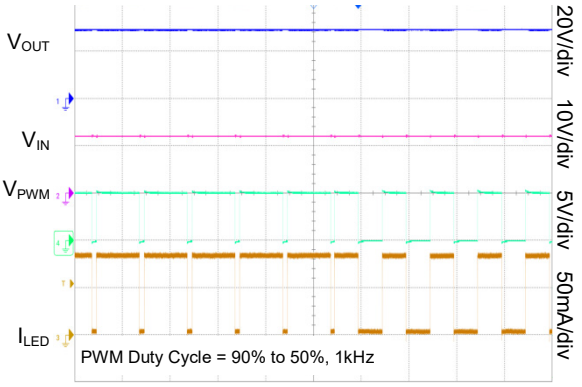
Time (2ms/div)

PWM Mode Brightness Transition-up



Time (1ms/div)

PWM Mode Brightness Transition-down

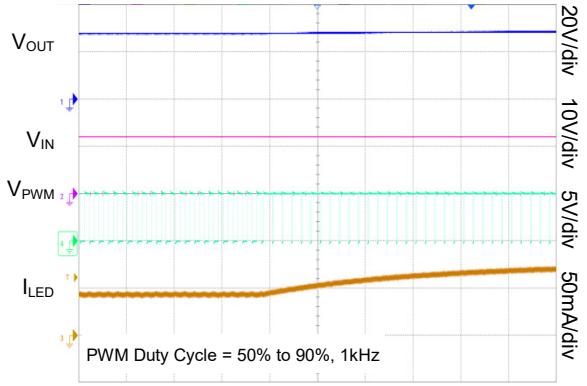


Time (1ms/div)

TYPICAL PERFORMANCE CHARACTERISTICS (continued)

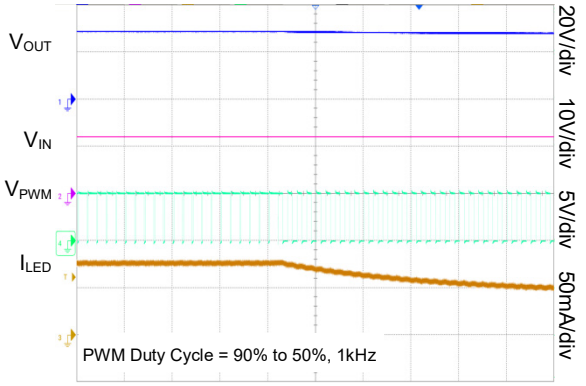
T_A = +25℃, V_{IN} = 12V, f_{SW} = 1.2MHz, unless otherwise noted.

DC Mode Brightness Transition-up



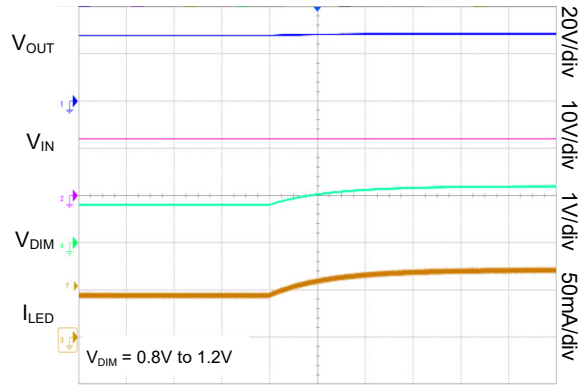
Time (5ms/div)

DC Mode Brightness Transition-down



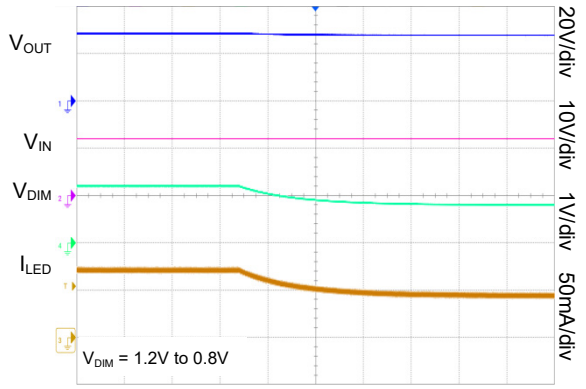
Time (5ms/div)

Voltage Mode Brightness Transition-up



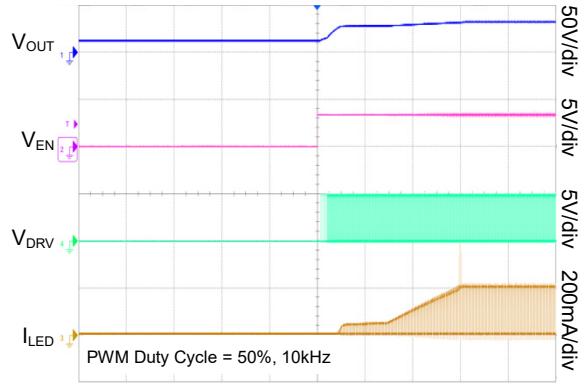
Time (10ms/div)

Voltage Mode Brightness Transition-down



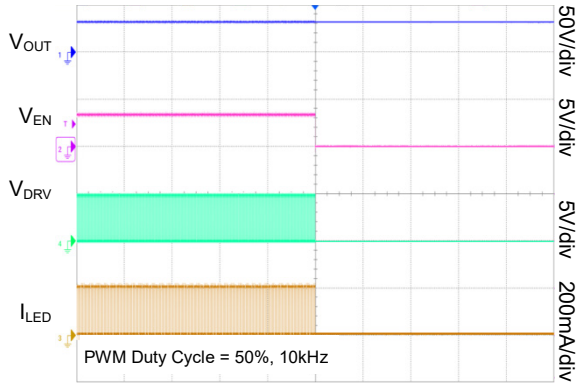
Time (10ms/div)

Power-on from EN



Time (5ms/div)

Power-off from EN

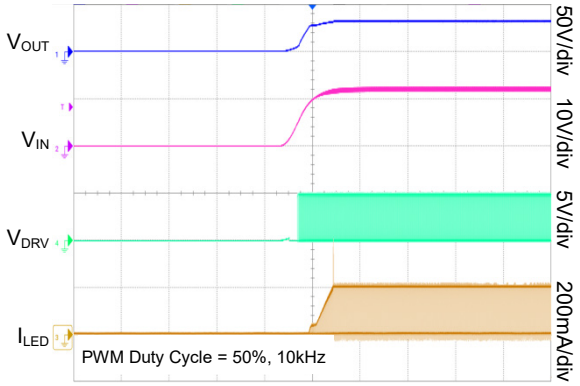


Time (5ms/div)

TYPICAL PERFORMANCE CHARACTERISTICS (continued)

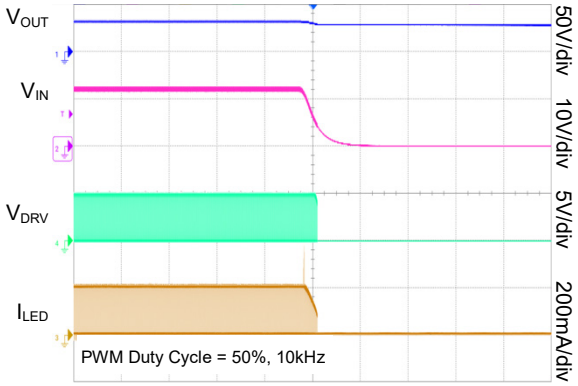
T_A = +25℃, V_{IN} = 12V, f_{SW} = 1.2MHz, unless otherwise noted.

Power-on from VIN



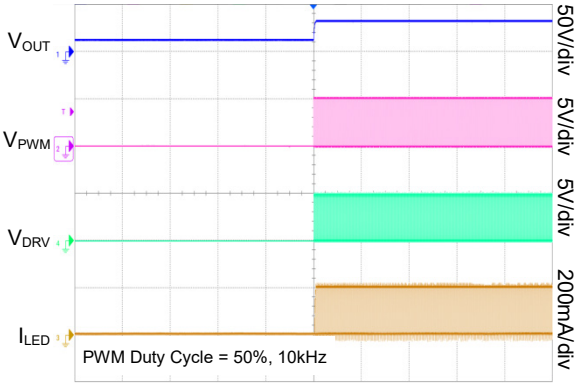
Time (20ms/div)

Power-off from VIN



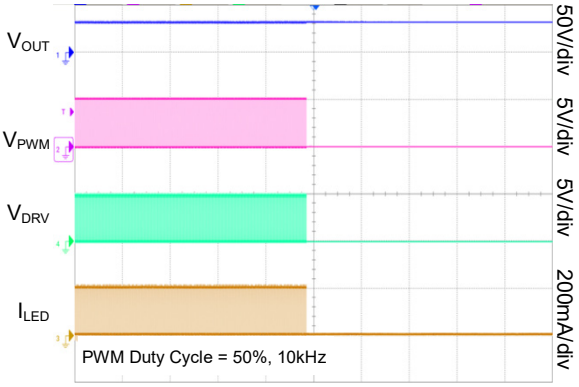
Time (20ms/div)

Power-on from PWM



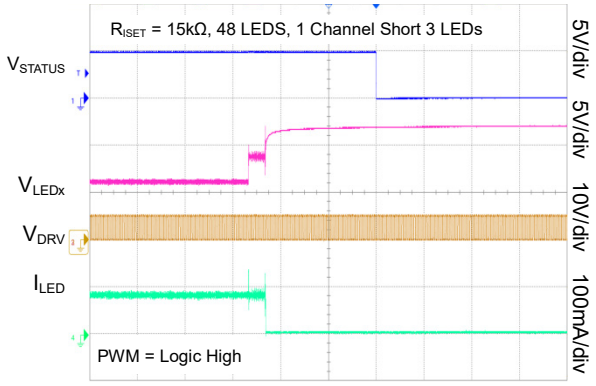
Time (10ms/div)

Power-off from PWM



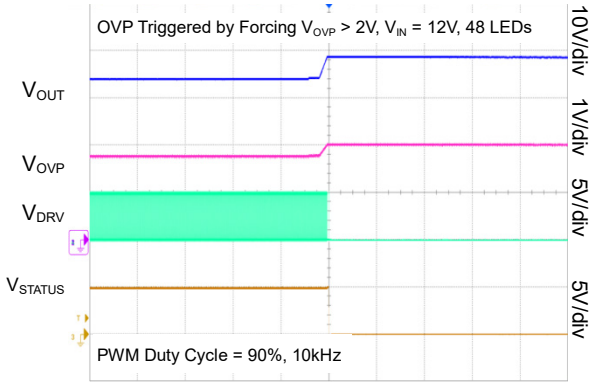
Time (10ms/div)

LED Short Protection Delay Time



Time (25μs/div)

OVP Protection



Time (2ms/div)

FUNCTIONAL BLOCK DIAGRAM

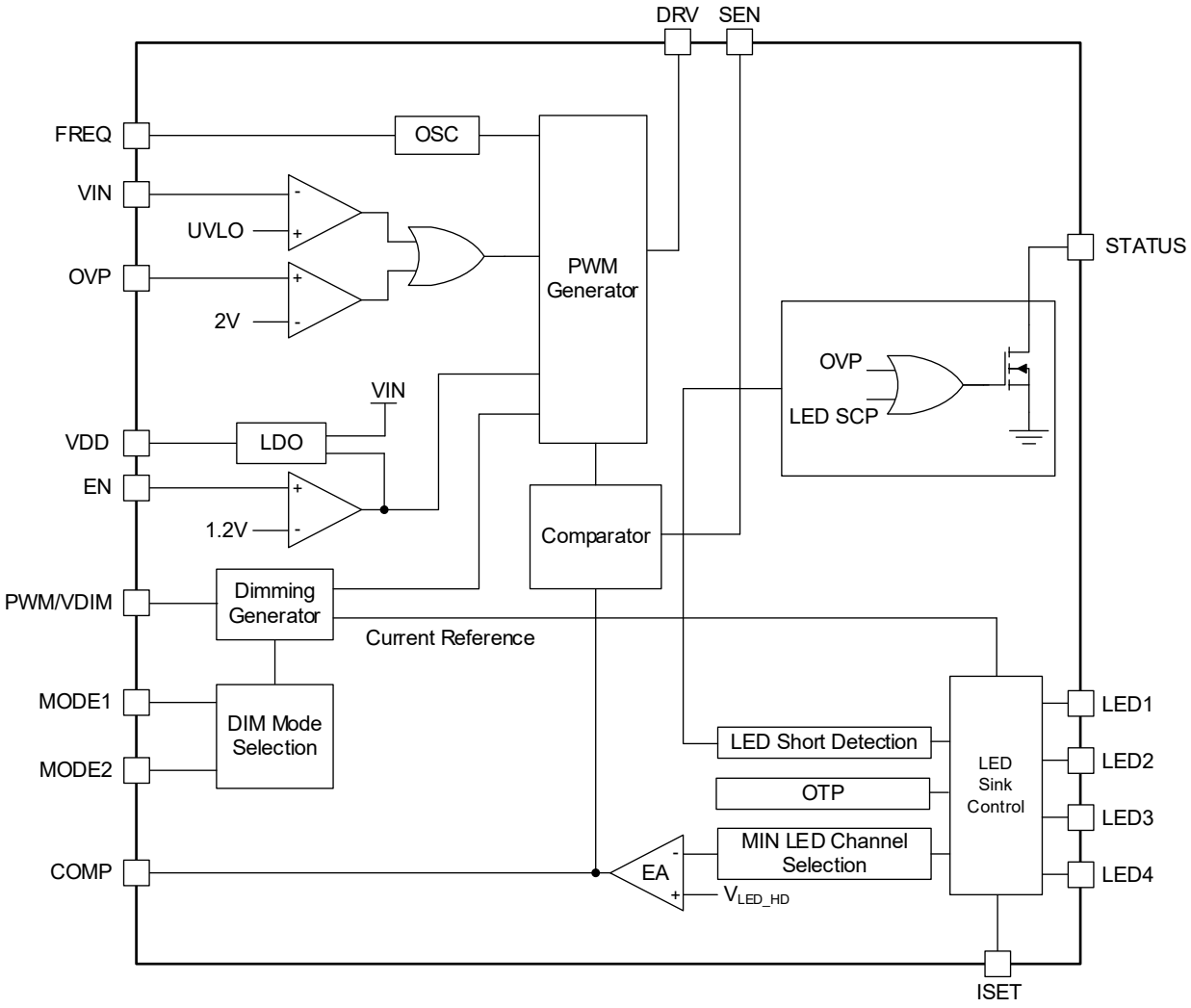


Figure 2. Block Diagram

TIMING DIAGRAM

Power-up/-down Sequences

The LED drivers require no specific power-up/down sequences, and Sequence 1, Sequence 2 and Sequence 3 correspond to distinct power sequence configurations, all of which operate stably without potential risks.

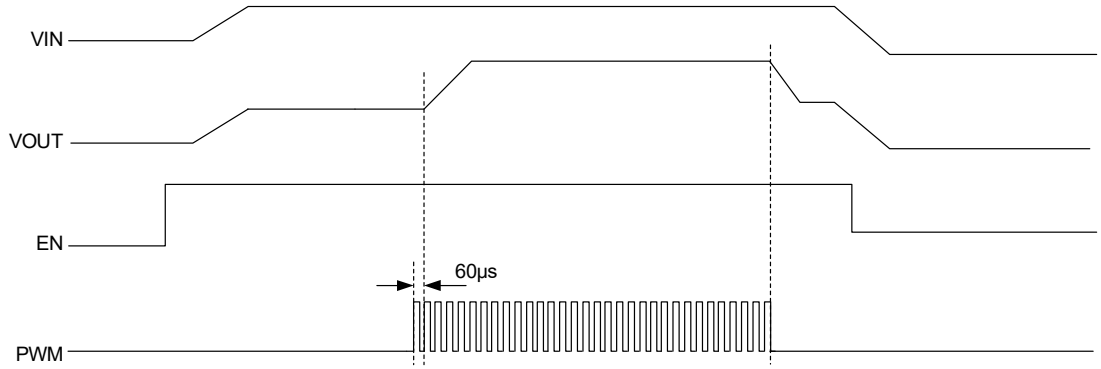


Figure 3. Delay Time of PWM vs. V_{OUT} of Sequence 1

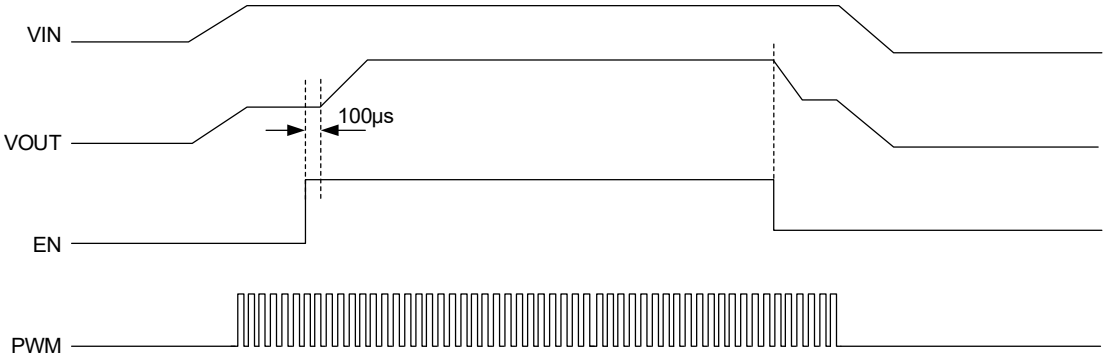


Figure 4. Delay Time of EN vs. V_{OUT} of Sequence 2

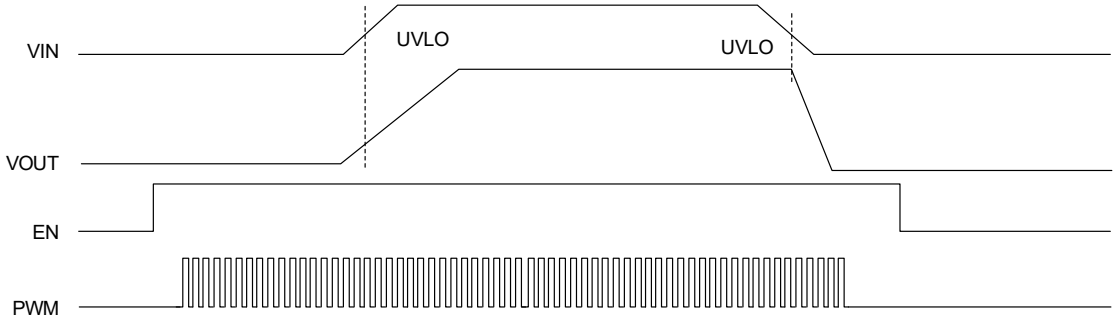


Figure 5. Delay Time of V_{IN} vs. V_{OUT} of Sequence 3

DETAILED DESCRIPTION

Overview

The SGM37443 integrates a current-mode Boost PWM controller with four built-in LED drivers. The controller initiates normal operation when the EN and PWM/VDIM pins are at high logic level and the input voltage (V_{IN}) exceeds the UVLO threshold.

During regular operation, the chip controls the external MOSFET to achieve Boost voltage conversion by outputting voltage through the DRV pin. When the DRV pin goes high, the inductor current rises gradually. As the voltage at the SEN pin matches the voltage level of the COMP pin, the current comparator is triggered, forcing the DRV output low to turn off the external MOSFET. The switching frequency of the oscillator can be configured via an external resistor connected to the FREQ pin.

The Boost converter's output voltage enables current and voltage regulation for the LEDx pins. The LED operating current is determined by an external resistor mounted on the ISET pin.

Brightness Control

The SGM37443 supports three dimming modes: PWM dimming, DC dimming, and voltage dimming. Their pin configurations are shown in Table 1.

Table 1. Dimming Modes Setting

Dimming Mode	MODE1 Pin Set	MODE2 Pin Set	PWM/VDIM Pin Set
PWM Dimming	Floating	Floating	PWM Signal
DC Dimming	100nF (MIN) Capacitor	GND	PWM Signal
Voltage Dimming	Floating	VDD	DC Voltage

When both MODE1 and MODE2 pins are left floating, the chip operates in PWM dimming mode, where the LED brightness is controlled by applying a PWM signal to the PWM/VDIM pin. When the input PWM signal is high, the LED channel turns on, and the LED current reaches its maximum value determined by the RISET resistor; when the PWM signal is low, the LED channel turns off and the LED current drops to zero. Thus, the chip can adjust the average current of the LED channel based on the duty cycle of the input PWM signal, achieving dimming effect. Nevertheless, inherent physical constraints associated with inductor current rise time prevent the LED current from maintaining ideal linearity with the PWM duty cycle. This deviation is particularly pronounced at high switching frequencies and low duty cycles. Relevant specifications are detailed in Table 2 for reference.

Table 2. Brightness Control Relevant Specifications

Dimming Frequency (Hz)	Duty (MIN)	Duty (MAX)
$100 < f_{PWM} \leq 500$	0.2%	100%
$500 < f_{PWM} \leq 1k$	0.4%	100%
$1k < f_{PWM} \leq 2k$	0.8%	100%
$2k < f_{PWM} \leq 5k$	1.5%	100%
$5k < f_{PWM} \leq 10k$	3%	100%

When the MODE1 pin is grounded through a capacitor with a capacitance of at least 100nF and the MODE2 pin is connected to GND, the chip operates in the DC dimming mode. The external RC filter converts the PWM signal input from the PWM/VDIM pin into a DC signal, and the LED current is controlled by the voltage level of this signal.

The SGM37443 also has the capability of voltage dimming. When the MODE1 pin is left floating and the MODE2 pin is connected to VDD, the chip operates in the voltage dimming mode. The chip controls the current of the LED channel through the DC voltage input on the PWM/VDIM pins, achieving the dimming effect.

DETAILED DESCRIPTION (continued)

The function of configuring the dimming modes via MODE1 and MODE2 pins is illustrated in Figure 6:

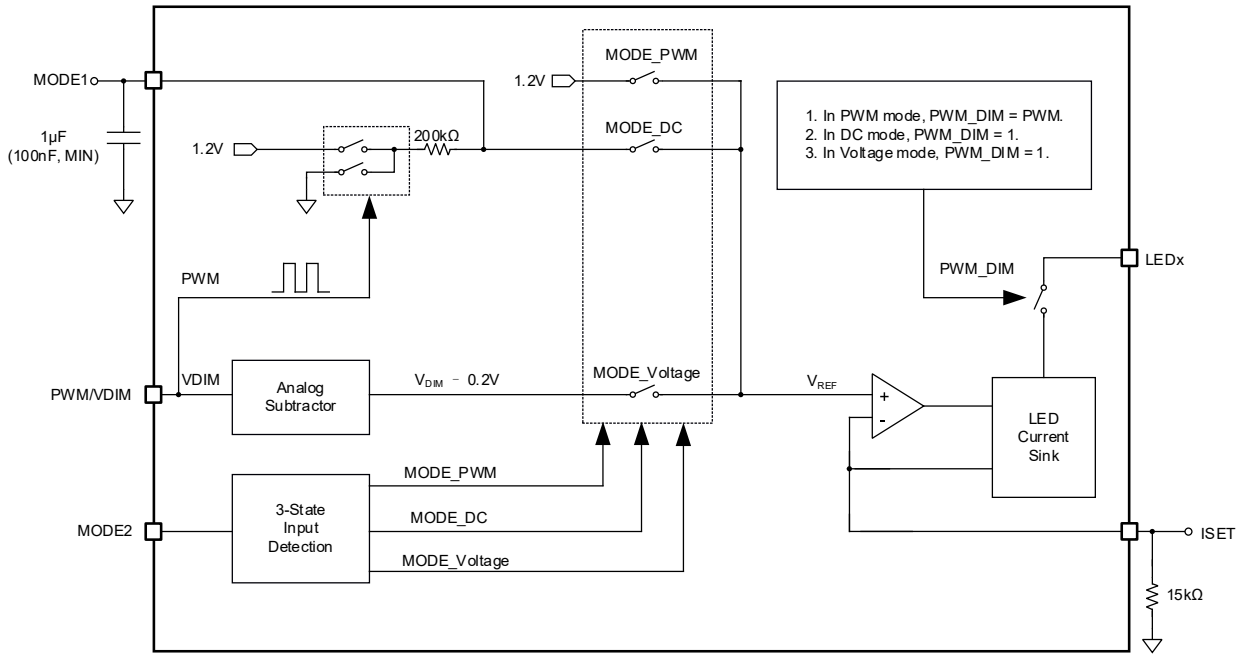


Figure 6. Dimming Modes Logic Diagram

LED Connection

The SGM37443 integrates four LED driver channels, with each channel capable of driving a maximum of 15 LEDs. Each LED string is wired between the Boost converter output and the corresponding LEDx pin (x = 1 to 4). Any unused LED channel pins should be left floating directly.

LED Current Setting and Regulation

The SGM37443 connects the ISET pin terminal to GND through the RISET resistor, establishing reference current for each LEDx pin. The integrated current sink governs LED current following this preset parameter.

In PWM dimming mode, the LED channel is disabled when the input PWM signal is at a low logic level, and enabled when the signal is at a high logic level. During the enabled state, the LED current equals the precision reference current, which is set by the RISET resistor. The LED current can be calculated by the following equation:

$$I_{LED}=\frac{1200}{R_{ISET}}(20mA \le I_{LED} \le 200mA) \quad (1)$$

where

I_{LED} = the maximum LED current in mA.

R_{ISET} = the LED current setting resistor in kΩ.

In DC dimming mode, the LED current is determined jointly by the RISET resistor and the duty cycle of PWM signal. The input PWM signal's duty information is filtered on the external capacitor connecting to the MODE1 pin. The resulting I_{LED} is calculated using the following expression:

$$I_{LED}=\frac{1200}{R_{ISET}}\times D_{PWM} \quad (2)$$

In voltage dimming mode, the LED current is determined jointly by the RISET resistor and a DC signal (VDIM). VDIM is applied directly to the dedicated PWM/VDIM pin. The resulting I_{LED} is calculated using the following expression:

$$I_{LED}=1000\times\frac{V_{PWM/VDIM}-0.2}{R_{ISET}} \quad (3)$$

Compensation

The COMP pin serves as the output terminal of the internal error amplifier, and peripheral components connected to this pin can optimize the regulator loop compensation. The compensation capacitor tunes the integrator bandwidth to guarantee system stability, while the compensation resistor modulates the integrator gain at specific frequencies to achieve fast transient response. Standard compensation component parameters are recommended as R_{COMP} = 560Ω and C_{COMP} = 0.22µF for typical applications.

DETAILED DESCRIPTION (continued)

Switching Frequency Setting

SGM37443's switching frequency ranges from 210kHz (TYP) to 2.1MHz (TYP) and is configurable via the oscillator resistor R_{FREQ}. Its value can be derived using the formula below.

$$f_{SW} = 210k + \frac{38 \times 10^9}{R_{FREQ}} \quad (4)$$

where R_{FREQ} = the frequency setting resistor in Ω.

Current Limit

The SGM37443 provides cycle-by-cycle over-current protection by detecting the voltage across the current-sensing resistor R_{SEN} between the SEN pin and ground. The Boost converter monitors inductor current throughout the switch-on phase, and the current limit threshold can be calculated by the formula below:

$$\text{Current Limit (A)} = \frac{0.5V}{R_{SEN}} \quad (5)$$

where R_{SEN} = the current-sensing resistor in Ω.

STATUS

SGM37443 features an open-drain STATUS pin dedicated to fault indication. Triggered by LED short or OVP faults, this fault flag clears upon reapplying VIN or EN supply.

LED Short-Circuit Protection (LED SCP)

Equipped with built-in LED short-circuit protection (LED SCP), SGM37443 pulls down the STATUS pin as a fault alert once any LED1 through LED4 terminal surpasses roughly 6.7V (TYP) in regular operation.

Over-Voltage Protection (OVP)

Built-in OVP circuitry is equipped in SGM37443. An over-voltage exceeding roughly 2V (TYP) at the OVP terminal cuts off the internal switch and pulls down STATUS pin; normal OVP input voltage restores switch operation. Output is voltage-clamped with magnitude obtainable from subsequent equations.

$$V_{OUT(OVP)} = V_{OVP} \times \left(1 + \frac{R_{OVP2}}{R_{OVP1}}\right) \quad (6)$$

The OVP pin connects to a resistive divider consisting of R_{OVP1} and R_{OVP2}. A maximum of 3.6MΩ is advised for R_{OVP2} to avoid loading impacts.

Over-Temperature Protection (OTP)

To protect against over-heating caused by excessive power consumption, the SGM37443 is embedded with thermal protection circuitry. Once the chip junction temperature rises above +155℃ (TYP), the chip will stop operating. The chip will resume normal operation only after the junction temperature drops by roughly 30℃ (TYP) for sufficient heat dissipation.

Table 3. Protection Functions

Type	Description	Behavior
LED SCP	Detect V_{LEDx} voltage. Triggered if V_{LEDx} > 6.7V (TYP).	During normal operation, if the voltage of any LED channel pin (LEDx) surpasses the approximate 6.7V (TYP) threshold, the STATUS pin will be pulled low to flag a fault condition.
OVP	Use OVP pin voltage for detection. Triggered if OVP pin voltage > 2V (TYP).	The internal switching device will shut down and trigger a low-level signal on the STATUS pin for fault indication. Normal switching operation will be automatically restored once the OVP pin voltage reverts to its rated operating range.
OTP	Triggered if T_J > 155℃ (TYP)	When the junction temperature exceeds 155℃ (TYP), the chip will shut down; when the temperature drops to 125℃ (TYP), the chip will resume normal operation.
Fault Indicator	STATUS pin is used as fault indicator. Fault and pull low.	The STATUS pin is asserted low to indicate faults such as LED short-circuits or over-voltage events. This fault latch can only be cleared by reapplying power to the VIN pin or retriggering the EN pin.

DETAILED DESCRIPTION (continued)

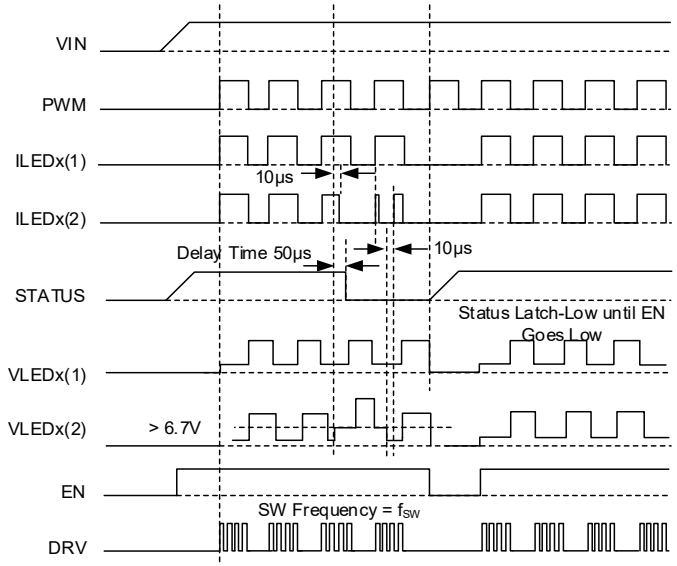


Figure 7. LED Short-Circuit Protection

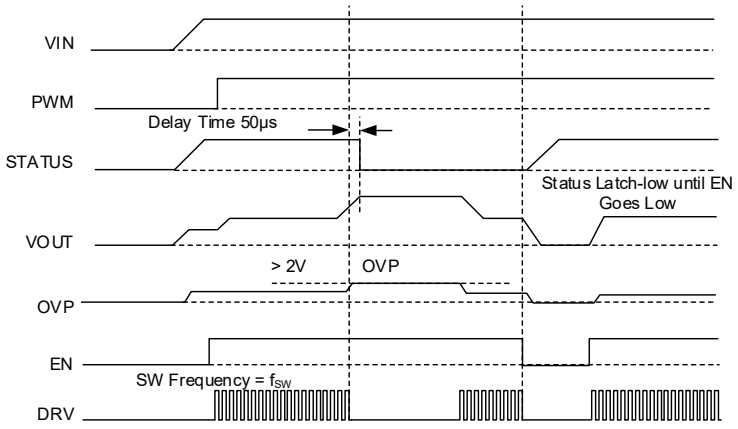


Figure 8. Over-Voltage Protection

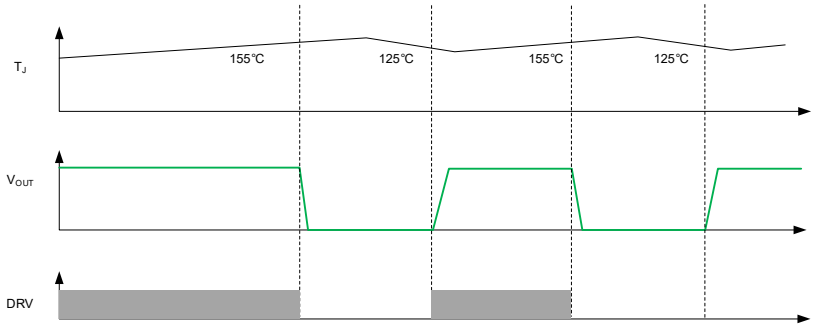
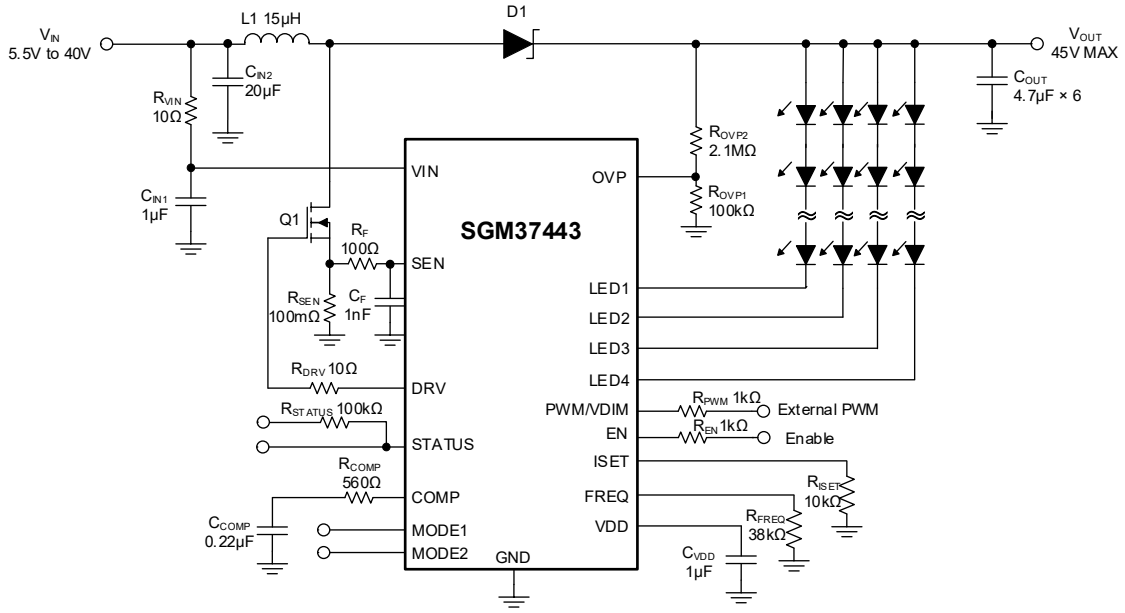


Figure 9. Over-Temperature Protection

APPLICATION INFORMATION

Typical Application

Figure 10 shows the typical application for SGM37443, which supports 4 LED strings, 120mA per string, with a Boost switching frequency of 1.2MHz.



I_{LED}	R_{ISET}
200mA	6kΩ
120mA	10kΩ
80mA	15kΩ
20mA	60kΩ

Figure 10. Typical Application Circuit

Inductor Selection

The inductance value (L) can be estimated via the formula below.

$$L = \frac{D \times (1-D)^2 \times V_{OUT} \times \eta}{0.4 \times f_{SW} \times I_{OUT}} \quad (7)$$

The duty cycle can be calculated by the following equation:

$$D = \frac{V_{OUT} - V_{IN}}{V_{OUT}} \quad (8)$$

In the corresponding formula, Η is the efficiency of the power converter, V_{OUT} denotes the maximum output voltage, V_{IN} represents the minimum input voltage, f_{SW} stands for the operating frequency, and I_{OUT} refers to the total current of all LED strings.

The inductor's saturated current rating must be higher than the peak current, which can be calculated from the formula below:

$$I_{PEAK} = \frac{V_{OUT} \times I_{OUT}}{\eta \times V_{IN}} + \frac{V_{IN} \times D \times T}{2 \times L} \quad (9)$$

where T is the switching period.

APPLICATION INFORMATION (continued)

Diode Selection

Schottky diodes are preferred for most application scenarios due to their fast reverse recovery speed and low forward voltage drop. Key parameters including power consumption, reverse voltage tolerance and peak pulse current should be fully considered during diode selection. It is essential to select a Schottky diode with a peak current rating higher than I_{PEAK} and a reverse voltage rating greater than the system's maximum output voltage.

Capacitor Selection

Input capacitors suppress input supply current surges and attenuate noise interference injected into the converter circuit. For conventional working conditions, four 4.7μF ceramic capacitors in parallel are adequate for normal operation. Designers can adopt larger or smaller capacitance values according to actual input noise intensity and converter input current demands.

Ceramic capacitors are prioritized for output side configuration to meet system output voltage ripple specifications. The minimum capacitance of the output capacitor C_{OUT} can be derived from the following formula:

$$C_{OUT} = \frac{I_{OUT} \times D}{\Delta V_{OUT} \times f_{SW}} \quad (10)$$

where ΔV_{OUT} is the peak-to-peak ripple voltage at the output.

Layout Considerations

Reasonable PCB layout design is critical for switching power converter circuits. Strict adherence to the following layout rules is required to ensure optimal operating performance of the SGM37443.

Refer to Figure 11 for the layout of the circuit configuration around the chip.

The compensation circuit needs to be isolated from power loops and shielded via ground traces to avoid noise coupling. The compensation components R_{COMP} and C_{COMP} should be placed right next to Pin 16.

In addition, the chip's exposed pad must be connected to the ground plane to facilitate heat dissipation and improve thermal performance. Power devices including Q1, D1 and C_{OUT} shall be arranged closely to the chip to shrink current loop areas, with short and wide copper traces adopted for all interconnecting power paths.

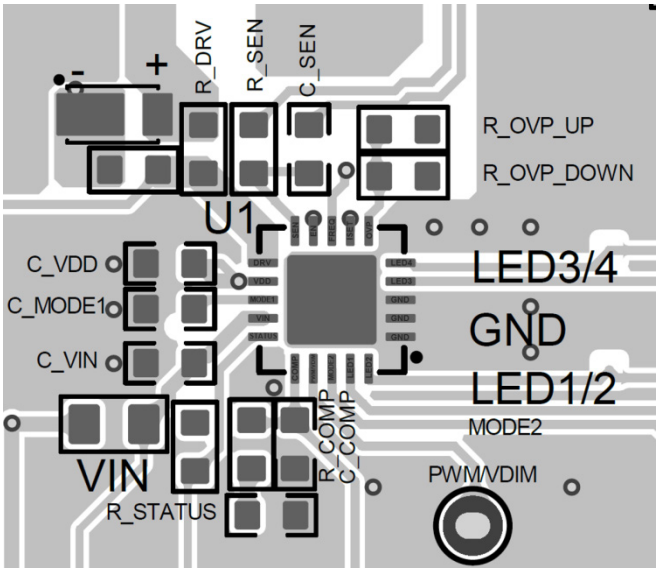


Figure 11. Layout Example

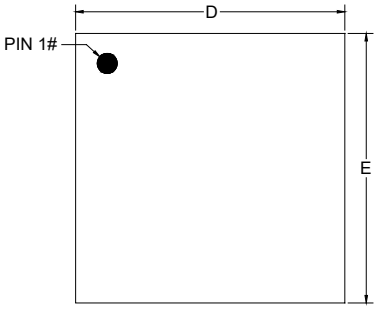
REVISION HISTORY

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

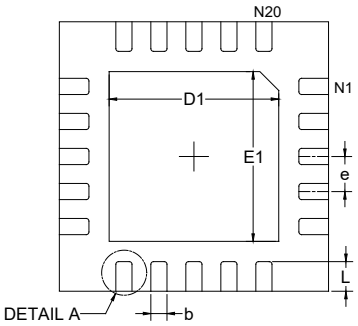
Changes from Original to REV.A (OCTOBER 2026)	Page
Changed from product preview to production data	All

PACKAGE OUTLINE DIMENSIONS

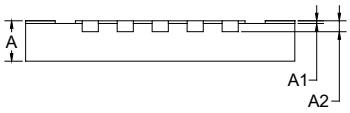
TQFN-5×5-20L



TOP VIEW



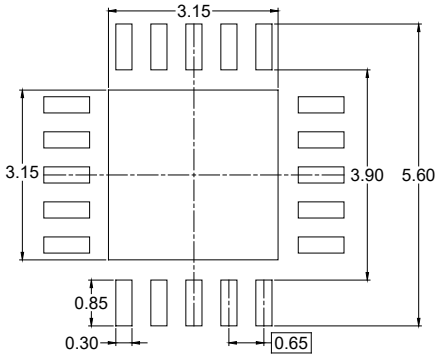
BOTTOM VIEW



SIDE VIEW



DETAIL A
ALTERNATE TERMINAL CONSTRUCTION



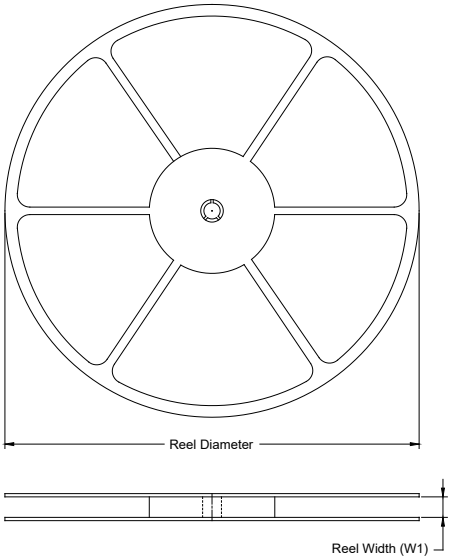
RECOMMENDED LAND PATTERN (Unit: mm)

Symbol	Dimensions In Millimeters		
	MIN	NOM	MAX
A	0.700	0.750	0.800
A1	0.000	-	0.050
A2	0.203 REF		
D	4.950	5.000	5.050
D1	3.100	3.150	3.200
E	4.950	5.000	5.050
E1	3.100	3.150	3.200
b	0.250	0.300	0.350
e	0.650 BSC		
L	0.500	0.550	0.600

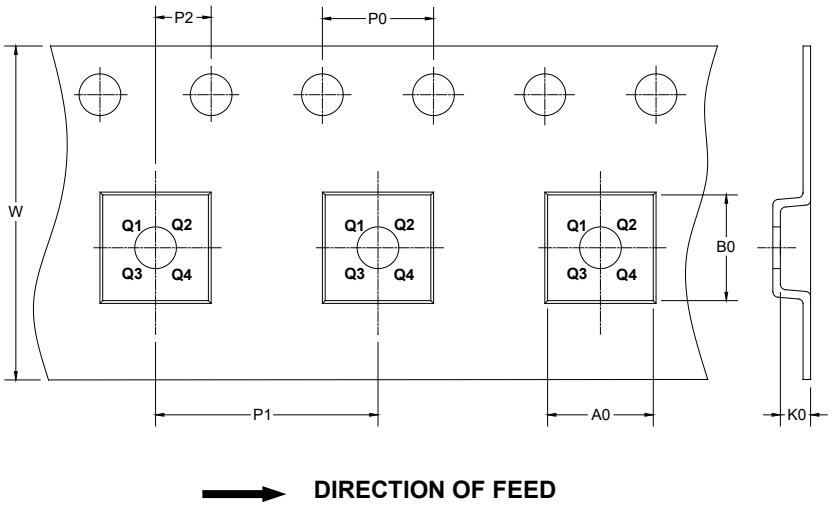
NOTE: This drawing is subject to change without notice.

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



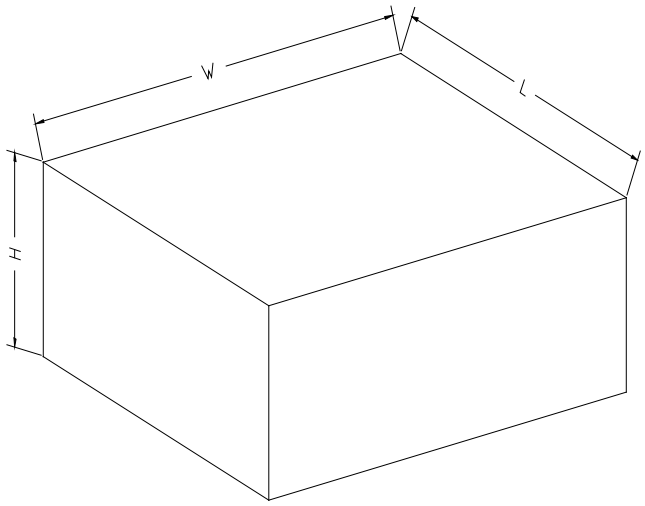
NOTE: The picture is only for reference. Please make the object as the standard.

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
TQFN-5×5-20L	13"	12.4	5.30	5.30	1.10	4.0	8.0	2.0	12.0	Q2

DD0001

CARTON BOX DIMENSIONS



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

KEY PARAMETER LIST OF CARTON BOX

Reel Type	Length (mm)	Width (mm)	Height (mm)	Pizza/Carton
13″	386	280	370	5

DD0002