



SGM3123

White LED Driver with Low Dropout Current Source

GENERAL DESCRIPTION

The SGM3123 low-dropout bias supply for white LEDs is a high-performance alternative to the simple ballast resistors used in conventional white LED designs. It is optimized for low power keypad and portable backlighting applications.

The SGM3123 uses an internal resistor to set the bias current for four LEDs, which are matched to $\pm 5\%$. The SGM3123's advantages over ballast resistors include much lower bias variation with supply voltage variation, significantly lower dropout voltage, and in some applications, significantly improved efficiency.

The SGM3123 requires only a 40mV dropout voltage at a 20mA load on each output to match the LED brightness.

The SGM3123 is available in Green TQFN-3x3-16L package. It operates over an ambient temperature range of -40°C to $+85^{\circ}\text{C}$.

FEATURES

- Support up to 4 LEDs
- Low 40mV Dropout at 20mA
- Less than $\pm 5\%$ LED Current Matching
- Simple LED Brightness Control
- Low Shutdown Current
- 2.5V to 5.0V Supply Voltage Range
- Thermal Shutdown Protection
- Operating Temperature Range: -40°C to $+85^{\circ}\text{C}$
- Available in Green TQFN-3x3-16L Package

APPLICATIONS

Wireless Handsets
MP3, MP4, and PMP
Cellular Phones
Portable Communication Devices
Digital Cameras, Camcorders
PDAs, Palmtops, and Handy Terminals
LED/Display Back Light Driver
LEDs for Camera Flash
Battery-Powered Equipment

PACKAGE/ORDERING INFORMATION

MODEL	ORDER NUMBER	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	PACKAGE OPTION	MARKING INFORMATION
SGM3123	SGM3123YTQ16G/TR	TQFN-3x3-16L	-40°C to +85°C	Tape and Reel, 3000	3123TQ

ABSOLUTE MAXIMUM RATINGS

V_{IN} to GND.....	-0.3V to 6V
The Other Pins to GND.....	-0.3V to 6V
Storage Temperature Range.....	-65°C to +150°C
Junction Temperature.....	150°C
Operating Temperature Range.....	-40°C to +85°C
Power Dissipation ⁽¹⁾ , P_D @ $T_A = 25^\circ\text{C}$	
TQFN-3x3-16L	1.47W
Package Thermal Resistance ⁽¹⁾	
TQFN-3x3-16L, θ_{JA}	68°C/W
Lead Temperature (Soldering 10 sec)	
.....	260°C
ESD Susceptibility	
HBM.....	4000V
MM.....	400V

NOTES:

1. The thermal resistance figures are for general reference only. Actual thermal characteristics may vary with the PCB layout, size of metal trace, the thermal conduction path between metal layers and the environment of the system.

2. Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

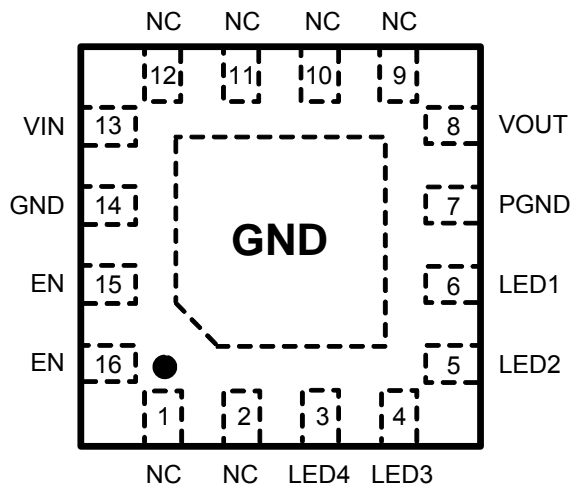
CAUTION

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.

SGMICRO reserves the right to make any change in circuit design, specification or other related things if necessary without notice at any time. Please contact SGMICRO sales office to get the latest datasheet.



PIN CONFIGURATION (TOP VIEW)



TQFN-3x3-16L

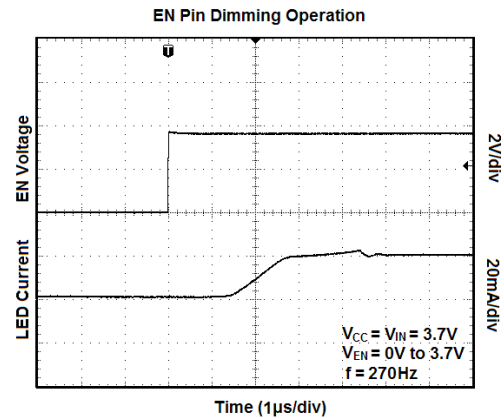
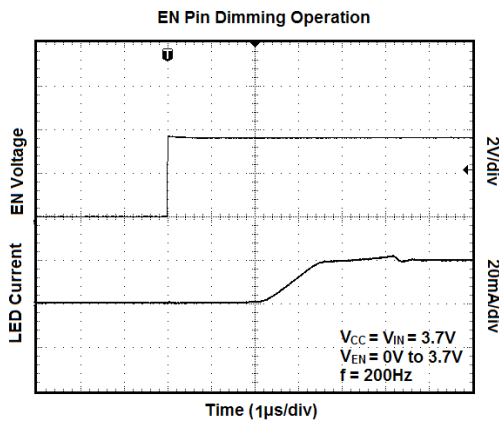
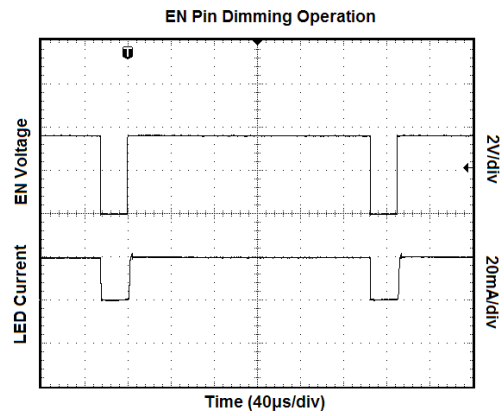
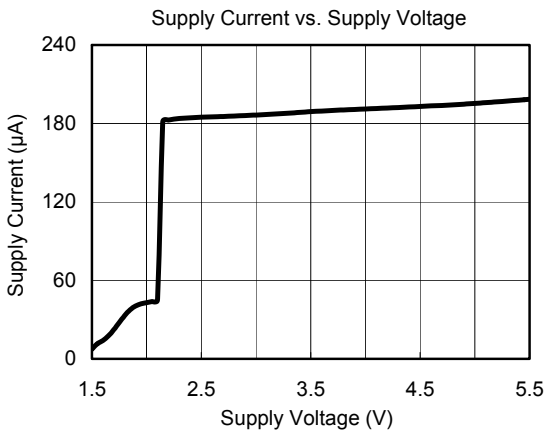
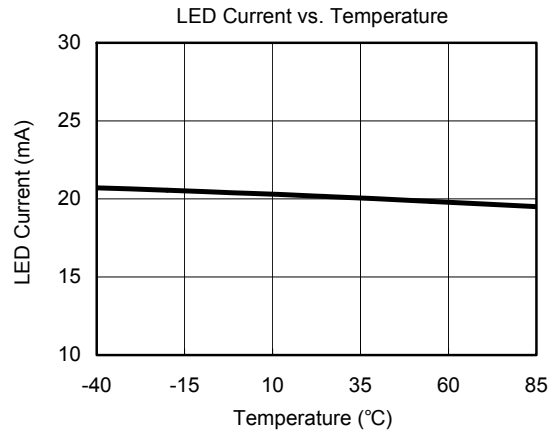
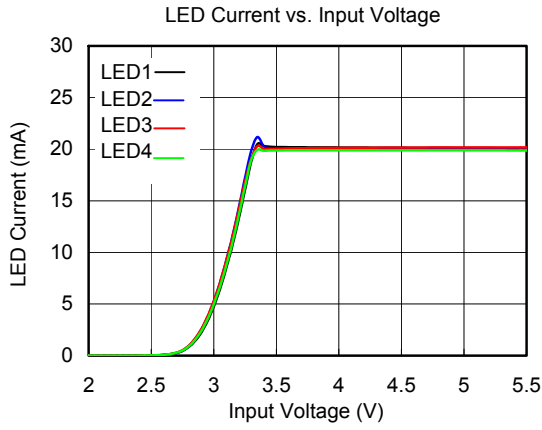
PIN DESCRIPTION

PIN	NAME	FUNCTION
1, 2, 9, 10, 11, 12	NC	No Internal Connection.
3, 4, 5, 6	LED1-LED4	LED1-LED4 Output Pin. Connect to LED1-LED4's cathode. 20mA constant current output. They are high impedance when EN is low.
7	PGND	Power Ground.
8	VOUT	Output Voltage Source for LED1 to LED4.
13	VIN	Supply Voltage Input.
14	GND	Analog Ground.
15, 16	EN	Enable Input (Active High).
Exposed Pad	GND	Exposed pad should be soldered to PCB board and connected to GND.

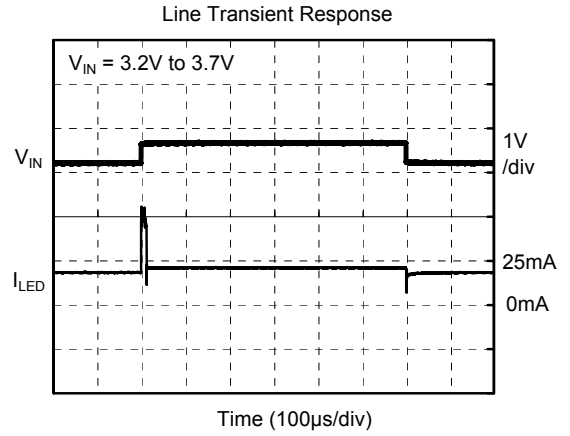
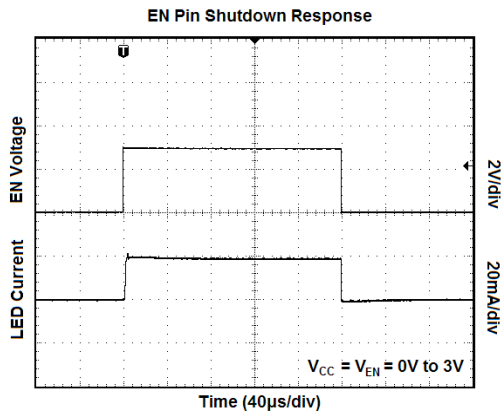
ELECTRICAL CHARACTERISTICS(V_{IN} = 3.7V, T_A = +25°C, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Operation Voltage Range	V _{IN}		2.5		5.0	V
Shutdown Supply Current	I _{SHDN}	V _{EN} < 0.4V		1		μA
LED Sink Current	I _{LED}		18	20	22	mA
Quiescent Power Supply Current	I _Q	I _{LED} = 0		190		μA
LED Dropout Voltage		I _{LED} = 20mA, V _{LED} @ I _{LEDn} = 90% × I _{LED}		40	90	mV
LED Current Deviation Matching	D _{LED}		-5		+5	%
OPT				150		°C
OPT Hysteresis				10		°C
Input High Voltage at EN	V _{IH}	V _{EN} > V _{IH} for enable IH	1.5			V
Input Low Voltage at EN	V _{IL}	V _{EN} < V _{IL} for disable IL			0.4	V

TYPICAL PERFORMANCE CHARACTERISTICS



TYPICAL PERFORMANCE CHARACTERISTICS



TYPICAL APPLICATION

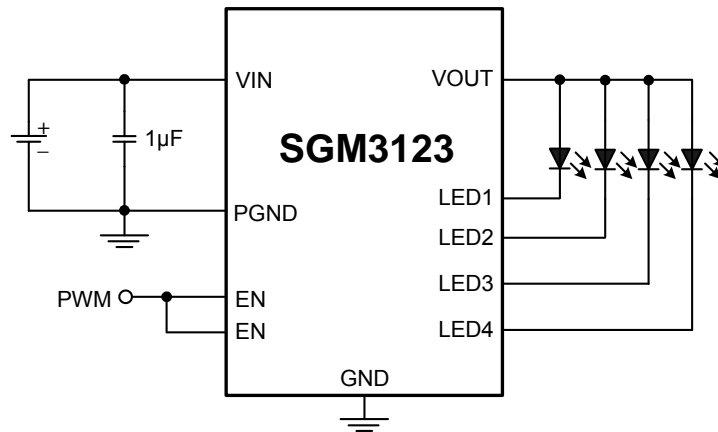


Figure 1. Application Circuit for Backlight

APPLICATION INFORMATION

Enable Input

Drive EN high to enable the device; drive EN low to force LED1, LED2, LED3 and LED4 into a high-impedance state. When driven high, EN draws 190µA to power the IC. Driving EN low longer than 3ms will disable the device and the typical supply current will be less than 1µA.

Input UVLO

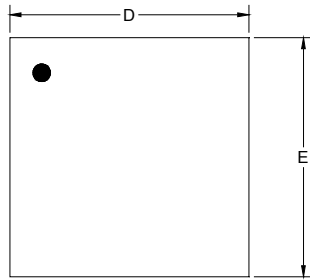
An input capacitor at the V_{CC} pin could reduce ripple voltage. It is recommended to use a ceramic 1µF or larger capacitance as the input capacitor. This IC provides an under voltage lockout (UVLO) function to prevent it from unstable issue when startup. The UVLO threshold of input rising voltage is set at 2.1V typically with a hysteresis 0.11V.

LED Brightness Dimming Control

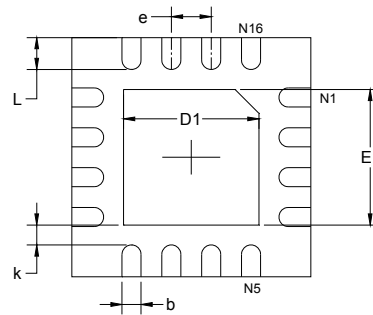
For controlling the LED brightness, the SGM3123 can perform the dimming control by applying a PWM signal to EN pin. When an external PWM signal is applied to the EN pin, brightness of white LED is adjusted by the duty cycle. The average LED current is proportional to the PWM signal duty cycle. The magnitude of the PWM signal must be higher than the minimum level of enable input high level, in order to let the dimming control perform correctly. The suggested PWM frequency range is 20kHz to 200Hz.

PACKAGE OUTLINE DIMENSIONS

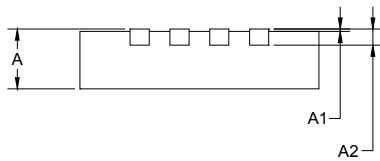
TQFN-3x3-16L



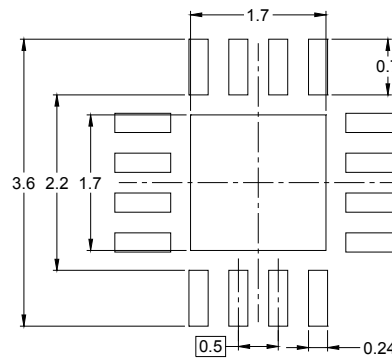
TOP VIEW



BOTTOM VIEW



SIDE VIEW

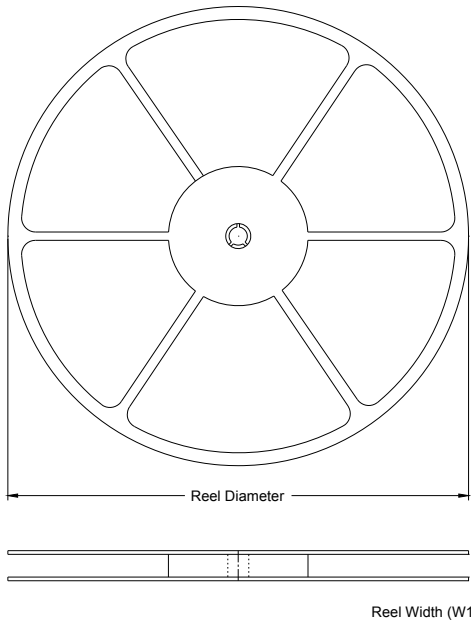


RECOMMENDED LAND PATTERN (Unit: mm)

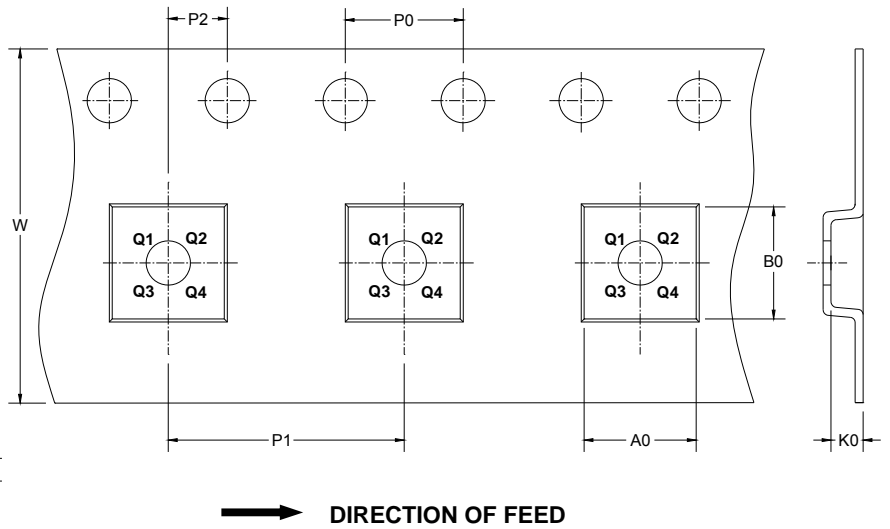
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.700	0.800	0.028	0.031
A1	0.000	0.050	0.000	0.002
A2	0.203 REF		0.008 REF	
D	2.900	3.100	0.114	0.122
D1	1.600	1.800	0.063	0.071
E	2.900	3.100	0.114	0.122
E1	1.600	1.800	0.063	0.071
k	0.200 MIN		0.008 MIN	
b	0.180	0.300	0.007	0.012
e	0.500 TYP		0.020 TYP	
L	0.300	0.500	0.012	0.020

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS

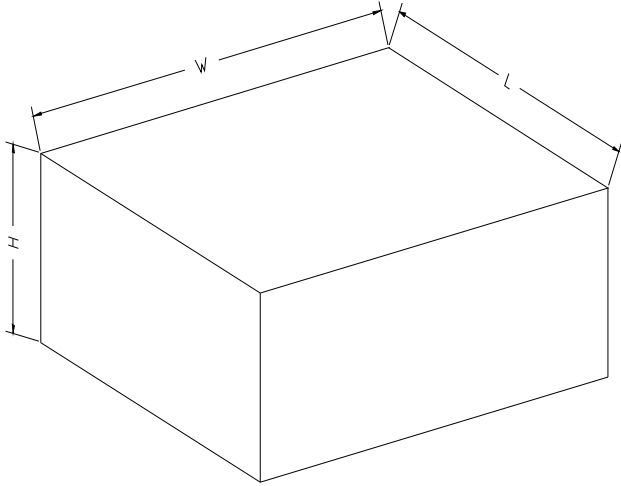


NOTE: The picture is only for reference. Please make the object as the standard.

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-3×3-16L	13"	12.40	3.35	3.35	1.13	4.00	4.00	2.00	12.00	Q1

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