SGM3129
White LED Driver with Low Dropout Current Source

GENERAL DESCRIPTION

The SGM3129 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 SGM3129 uses an internal resistor to set the bias current for four LEDs, which are matched to ±5%. The SGM3129'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 SGM3129 requires only a 40mV dropout voltage at a 20mA load on each output to match the LED brightness.

The SGM3129 is available in Green MSOP8 package. It operates over an ambient temperature range of -40℃ to +85℃.

FEATURES

- **Support up to 4 LEDs**
- **Low 40mV Dropout at 20mA**
- **Less than ±5% LED Current Matching**
- **Simple LED Brightness Control**
- **Low Shutdown Current**
- **2.5V to 5.5V Supply Voltage Range**
- **Thermal Shutdown Protection**
- **Operating Temperature Range: -40℃ to +85℃**
- **Available in Green MSOP8 Package**

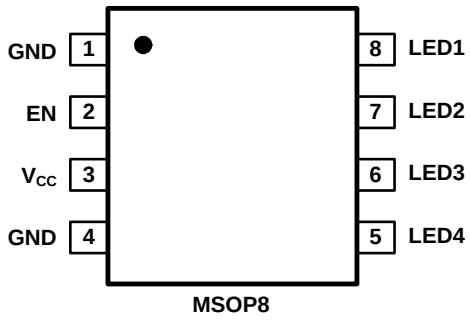
APPLICATIONS

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
SGM3129	SGM3129YMS8G/TR	MSOP8	-40°C to +85°C	Tape and Reel, 3000	SGM3129YMS8

PIN CONFIGURATION (TOP VIEW)



MSOP8

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.

ABSOLUTE MAXIMUM RATINGS

V_{CC} to GND..... -0.3V to 6V
The Other Pins to GND……..-0.3V to 6V
Storage Temperature Range.……...-65℃ to +150℃
Junction Temperature……...150℃
Operating Temperature Range…… -40℃ to +85℃
Power Dissipation, P_D @ T_A = 25℃
MSOP8…….. 0.58W
Package Thermal Resistance
MSOP8, θ_{JA} ……. 216℃/W
Lead Temperature Range (Soldering 10 sec)
…….. 260℃
ESD Susceptibility
HBM……4000V
MM……400V

NOTE:
Stresses above those listed under Absolute Maximum Ratings may cause permanent damage to the device. This is a stress rating only; functional operation of the device at these or any other conditions above those indicated in the operational section of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

PIN DESCRIPTION

PIN	NAME	FUNCTION
1, 4	GND	Ground.
2	EN	Enable Input (Active High). When disabled, LED1, LED2, LED3 and LED4 are high impedance.
3	V_{CC}	Power Supply.
5	LED4	LED4 Output Pin. Connect to LED4's Cathode. 20mA Constant Current Output. LED4 is High Impedance when EN is Low.
6	LED3	LED3 Output Pin. Connect to LED3's Cathode. 20mA Constant Current Output. LED3 is High Impedance when EN is Low.
7	LED2	LED2 Output Pin. Connect to LED2's Cathode. 20mA Constant Current Output. LED2 is High Impedance when EN is Low.
8	LED1	LED1 Output Pin. Connect to LED1's Cathode. 20mA Constant Current Output. LED1 is High Impedance when EN is Low.

ELECTRICAL CHARACTERISTICS

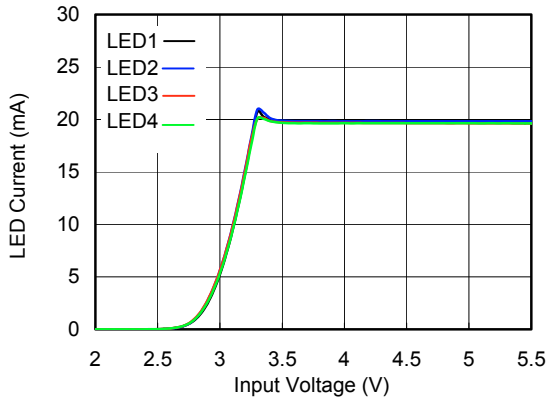
(V_{IN} = 3.7V, T_A = +25°C, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Operation Voltage Range	V_{EN}		2.5		5.5	V
LED Sink Current	I_{LED}		18	20	22	mA
Quiescent Power Supply Current	I_{EN}	I_{LED} = 0		190		μA
LED Dropout Voltage		I_{LED} = 20mA, V_{LED} @ I_{LEDn} = 90% × I_{LED}		40	90	mV
Shutdown Supply Current	I_{SHDN}	V_{EN} < 0.4V		1		μA
LED Current Deviation Matching	D_{LED}		-5		+5	%
OPT				145		°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

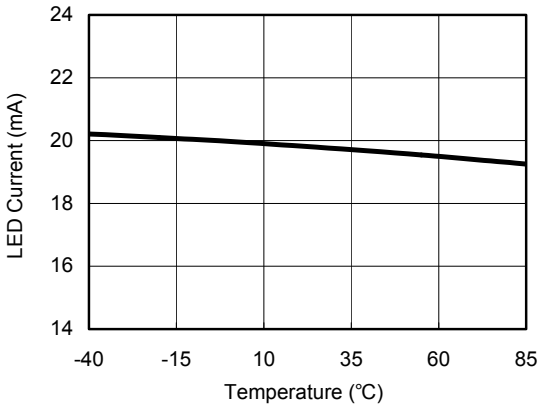
Specifications subject to changes without notice.

TYPICAL PERFORMANCE CHARACTERISTICS

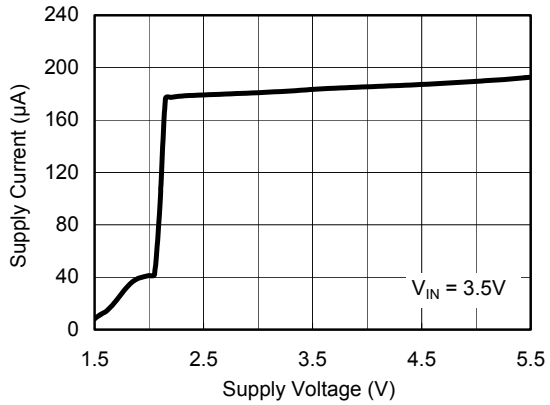
LED Current vs. Input Voltage



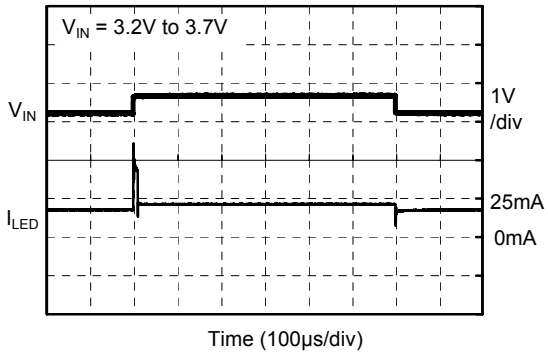
LED Current vs. Temperature



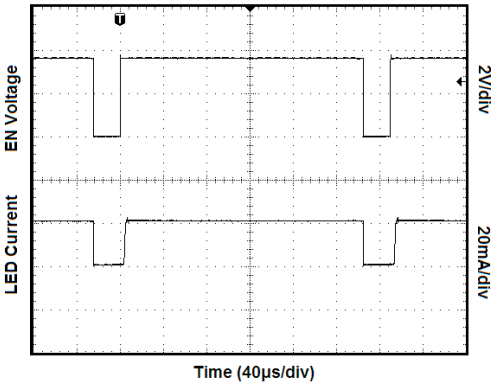
Supply Current vs. Supply Voltage



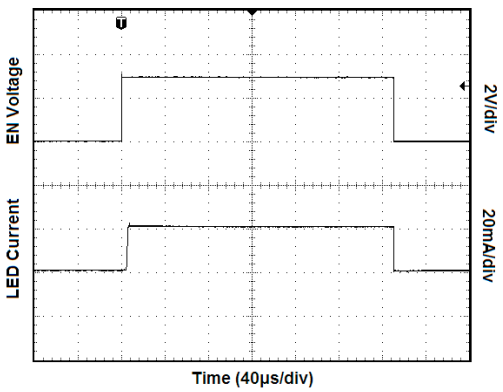
Line Transient Response



EN Pin Dimming Operation



EN Pin Shutdown Response



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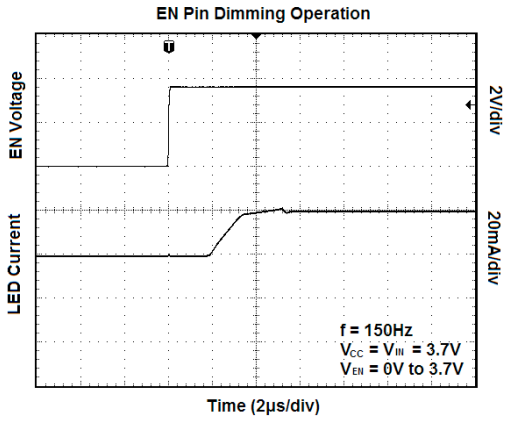
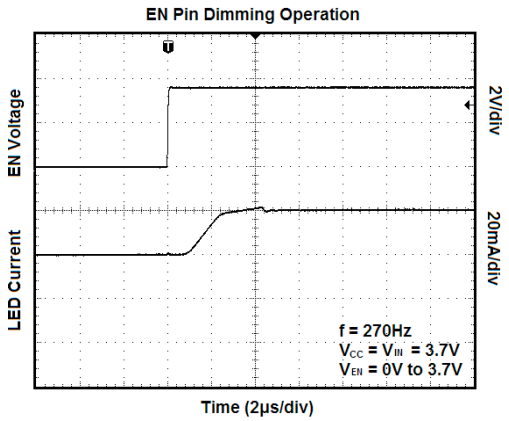




TYPICAL APPLICATION

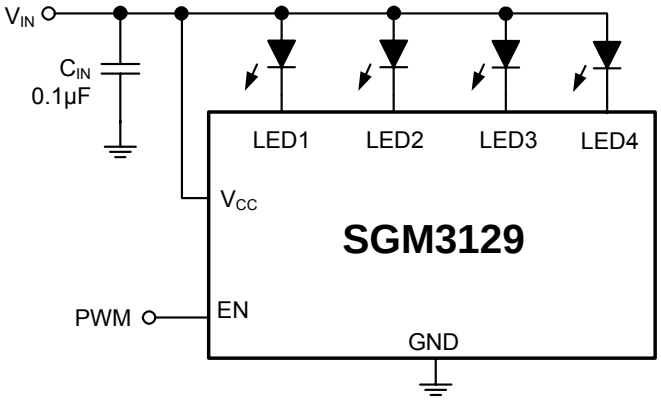


Figure 1. Application Circuit for Backlight

APPLICATIONS INFORMATION

The SGM3129 is a 4-Channel current source driver for white LEDs.

Enable Input

The EN pin enables and disables the Device. 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.

LED Current

SGM3129 provides a constant current to drive white LED. Figure 1 shows a typical application circuit to drive 4 white LEDs. Each channel supports up to 20mA current and regulates a constant current for uniform intensity. For keypad LED application, the all channels must be connected to LED as shown in Figure 2. In order to maintain LED constant current, the input voltage must provide the required LED forward voltage and current source dropout voltage. If the forward voltage of white LEDs is 3.3V, the input voltage should be higher than 3.4V to provide enough voltage headroom for maintaining constant brightness.

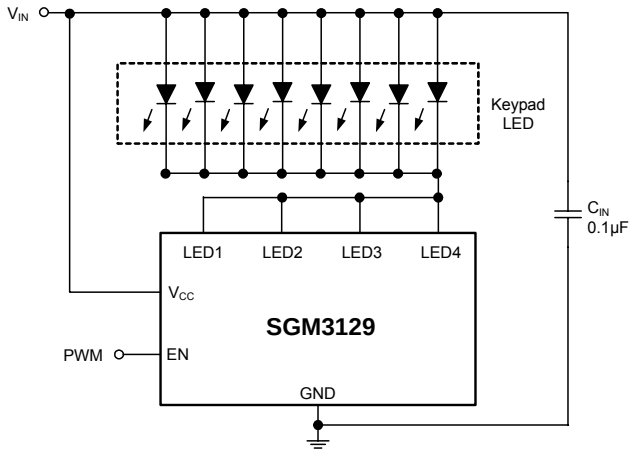


Figure 2. Application Circuit for Keypad

LED Brightness Dimming Control

For controlling the LED brightness, the SGM3129 can perform the dimming control by applying a PWM signal to EN pin. When an external PWM signal is connected 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 10kHz to 200Hz.

Thermal Considerations

For continuous operation, do not exceed absolute maximum operation junction temperature 150°C. The maximum power dissipation depends on the thermal resistance of IC package, PCB layout, the rate of surroundings airflow and temperature difference between junctions to ambient. The maximum power dissipation can be calculated by following formula:

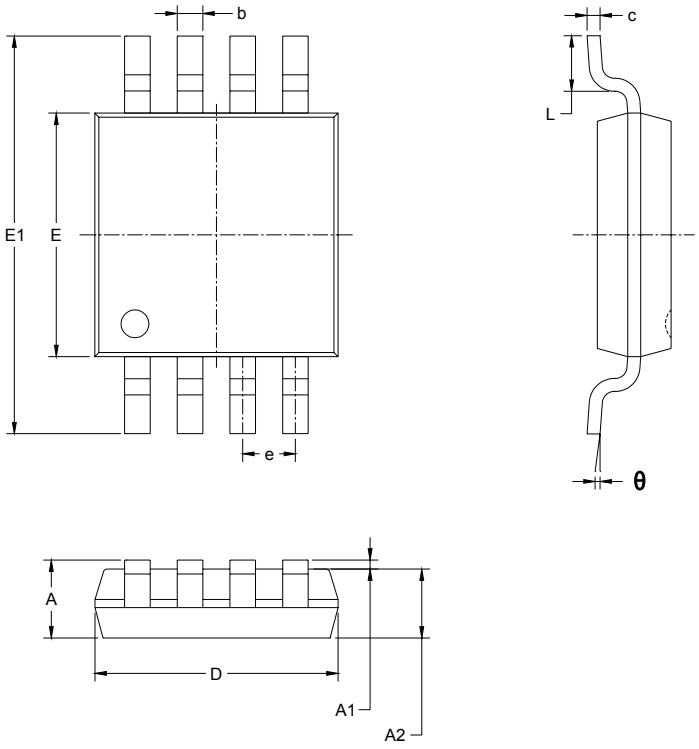
$$P_{D(MAX)} = (T_{J(MAX)} - T_A) / \theta_{JA}$$

Where $T_{J(MAX)}$ is the maximum operation junction temperature 150°C, T_A is the ambient temperature and the θ_{JA} is the junction to ambient thermal resistance.

For recommended operating conditions specification of SGM3129, where $T_{J(MAX)}$ is the maximum junction temperature of the die (150°C) and T_A is the maximum ambient temperature. The junction to ambient thermal resistance θ_{JA} is layout dependent.

PACKAGE OUTLINE DIMENSIONS

MSOP8



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.820	1.100	0.032	0.043
A1	0.020	0.150	0.001	0.006
A2	0.750	0.950	0.030	0.037
b	0.250	0.380	0.010	0.015
c	0.090	0.230	0.004	0.009
D	2.900	3.100	0.114	0.122
E	2.900	3.100	0.114	0.122
E1	4.750	5.050	0.187	0.199
e	0.650 BSC		0.026 BSC	
L	0.400	0.800	0.016	0.031
θ	0°	6°	0°	6°

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