

Low-Voltage, High-Efficiency, Step-up DC-DC Converter

Features

- 1.2V Low Start-up Input Voltage
- Deliver 3.3V 100mA from 2 Alkaline Battery Cell
- 90% Efficiency
- Adjustable Output from 2.5V to 5.5V
- 1.5A, 0.3Ω, 7V Power MOSFET
- 1.2V to 5.5V Input Range
- Fast 1MHz Switching Frequency
- SOT-23-6 & TSOT-23-6 Package

Applications

- MP3 Players
- PDAs
- Digital Still Cameras
- Portable Applications
- Hand-Held Devices

General Description

The G5107 boost converter in corporate high-performance, voltage-mode, fixed-frequency (at 1MHz), pulse width modulation (PWM) circuitry with a built-in 0.3Ω n-channel MOSFET to provide a highly efficient regulator. The low start-up input voltage 1.2V makes G5107 suitable for 2~4 cells alkaline battery applications.

High switching frequency allows easy filtering and faster loop performance. An external compensation pin provides the user flexibility in determining loop dynamics, allowing the use of various types of output capacitors. The device can produce an output voltage from 2.5V to 5.5V.

The G5107 is available in a space-saving SOT-23-6 & TSOT-23-6 package.

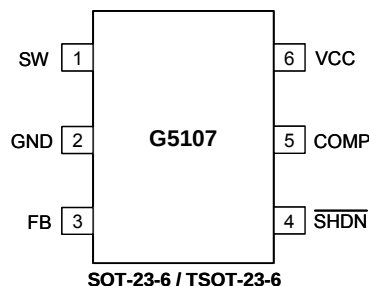
Ordering Information

ORDER NUMBER	MARKING	TEMP. RANGE	PACKAGE (Pb free)
G5107TBU	5107xx	-40°C ~ +85°C	SOT-23-6
G5107TPU	5107xx	-40°C ~ +85°C	TSOT-23-6

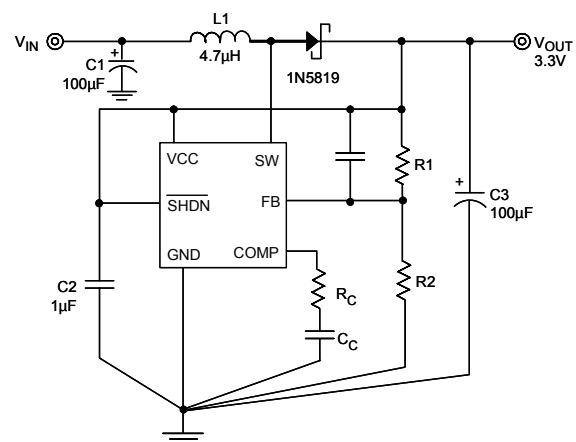
Note: TB : SOT23-6 TP: TSOT-23-6

U: Tape & Reel

Pin Configuration



Typical Application Circuit



**Absolute Maximum Ratings**

VCC, $\overline{\text{SHDN}}$, SW to GND. -0.3V to +7V
 FB, COMP to GND. -0.3V to VCC
 Operating Temperature. -40°C to 85°C

Junction Temperature 125°C
 Storage Temperature. -65°C to 150°C
 Reflow Temperature (soldering, 10sec) 260°C

Stress beyond those listed under "Absolute Maximum Rating" may cause permanent damage to the device.

Electrical Characteristics

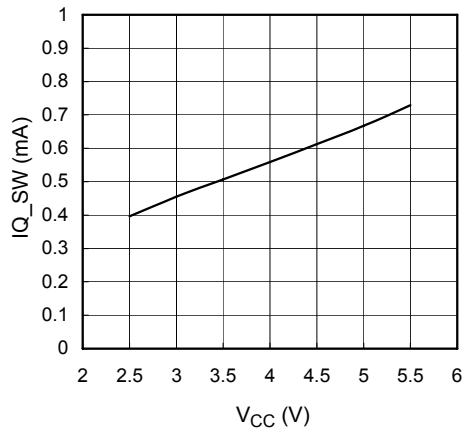
($V_{\text{IN}} = 1.5\text{V}$, $V_{\text{CC}} = V_{\overline{\text{SHDN}}} = 3\text{V}$, $T_{\text{A}} = 25^{\circ}\text{C}$)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Start-Up Voltage Range	$I_{\text{OUT}} = 1\text{mA}$	---	1.2	---	V
Operating Voltage Range		2.5	---	5.5	V
Quiescent Current	$V_{\text{FB}} = 1.5\text{V}$ (no switching)	---	100	200	μA
	$V_{\text{FB}} = 0\text{V}$ (switching)	---	---	2	mA
	$V_{\overline{\text{SHDN}}} = 0\text{V}$	---	0.1	1	μA
FB Comparator Trip Point	Initial Accuracy	1.26	1.28	1.3	V
	Temperature Coefficient	---	100	---	ppm/ $^{\circ}\text{C}$
Error Amp Transconductance		---	0.76	---	mmho
Error Amp Voltage Gain		---	100	---	V/V
Output Over Voltage Protection		---	5	10	%
Switching Frequency	$V_{\text{FB}} = 0\text{V}$	0.7	1	1.3	MHz
Maximum Duty		85	---	---	%
Switch $R_{\text{DS(ON)}}$	$I_{\text{SW}} = 150\text{mA}$	---	0.3	0.5	Ω
Switch Leakage Current	$V_{\text{SW}} = 7\text{V}$	---	0.1	10	μA
Switch Current Limit		1.2	1.5	1.8	A
Switch Current Limit (startup)		---	0.6	---	A
$\overline{\text{SHDN}}$ Pin Voltage High		$0.9 \times V_{\text{CC}}$	---	---	V
$\overline{\text{SHDN}}$ Pin Voltage Low		---	---	$0.1 \times V_{\text{CC}}$	V

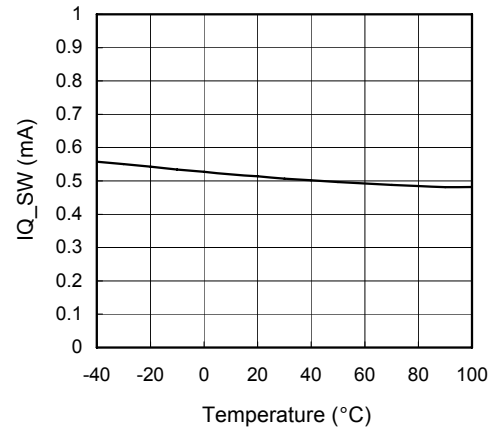
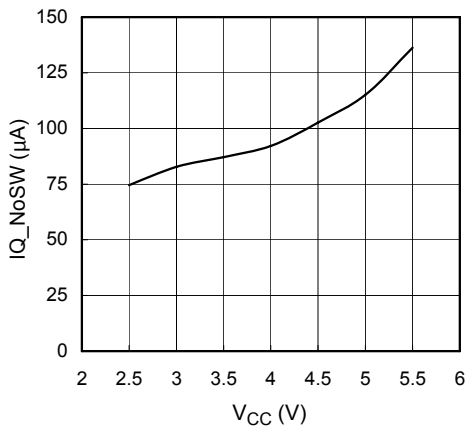


Typical Performance Characteristics

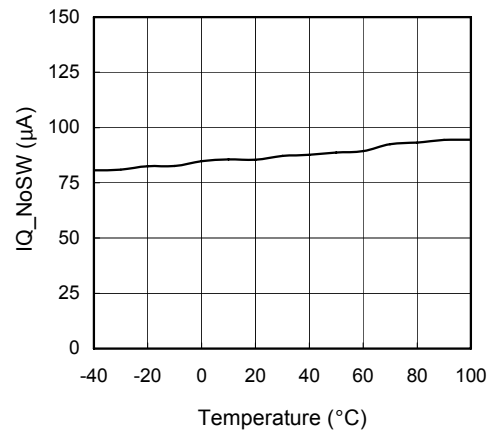
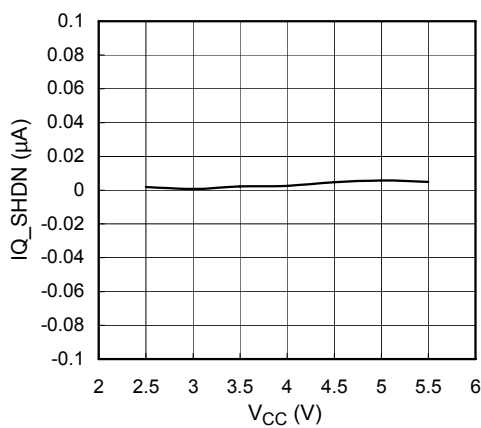
($V_{CC} = +3.6V$, $V_{SHDN} = +3.6V$, $L = 4.7\mu H$, $T_A = 25^\circ C$, unless otherwise noted.)

IQ_SW vs. V_{CC} 

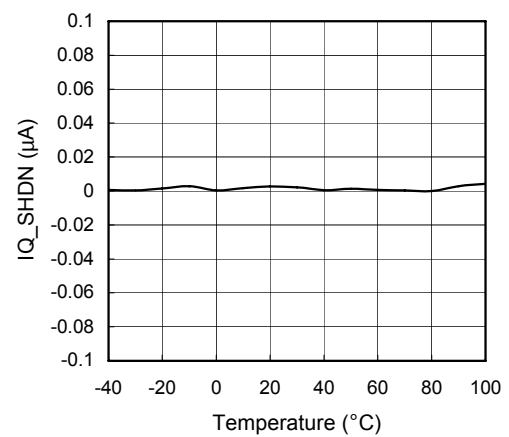
IQ_SW vs. Temperature

IQ_NoSW vs. V_{CC} 

IQ_NoSW vs. Temperature

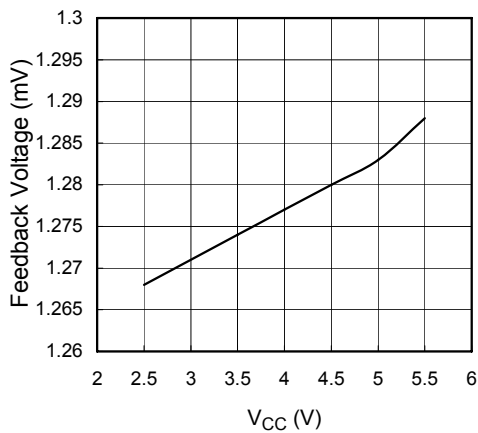
IQ_SHDN vs. V_{CC} 

IQ_SHDN vs. Temperature

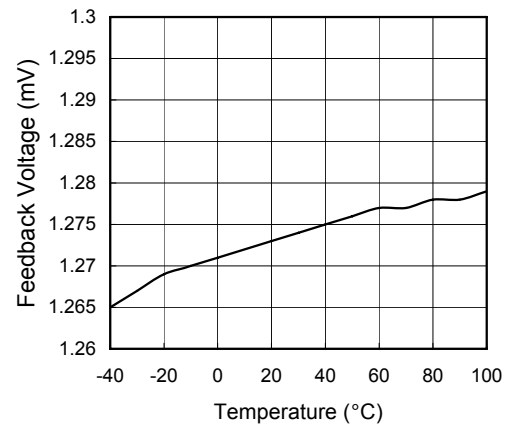
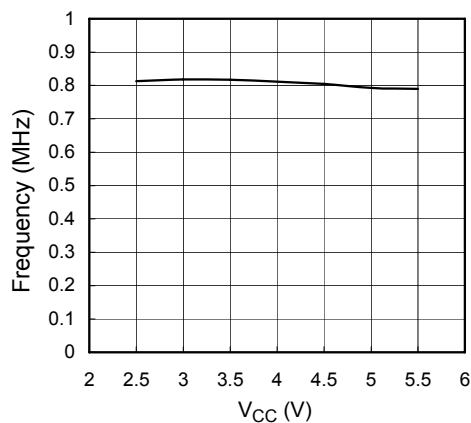




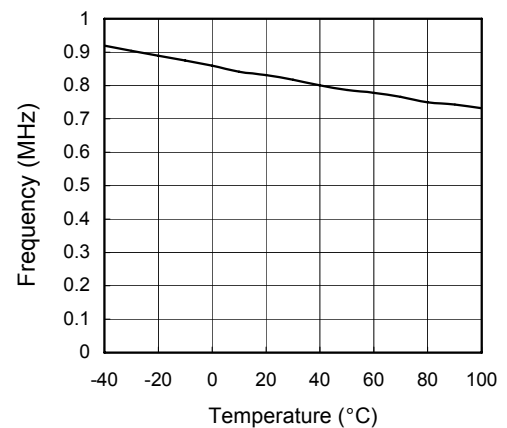
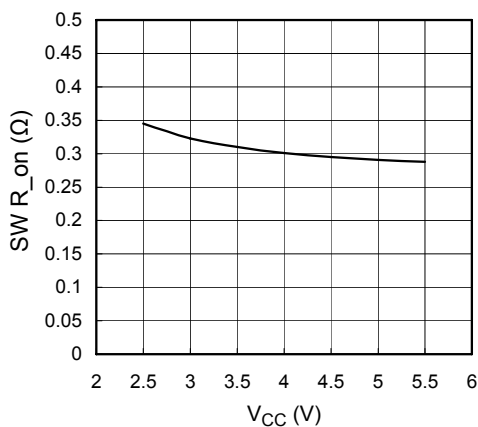
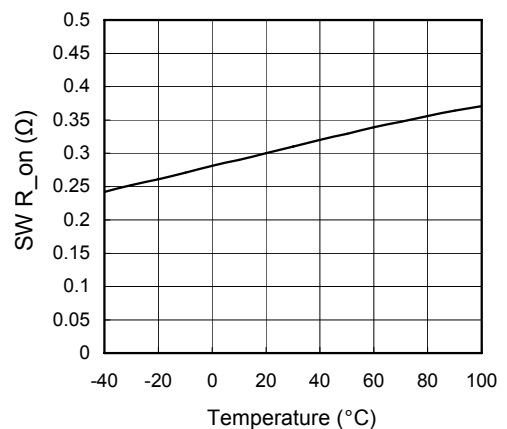
Typical Performance Characteristics (continued)

Feedback Voltage vs. V_{CC} 

Feedback Voltage vs. Temperature

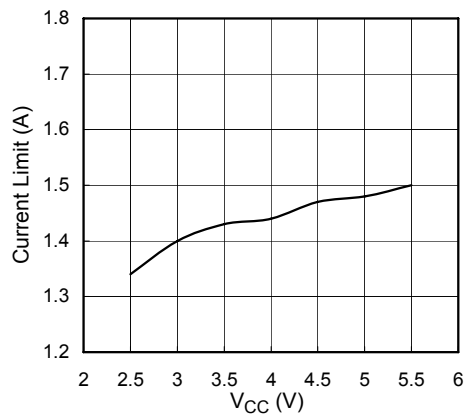
Frequency vs. V_{CC} 

Frequency vs. Temperature

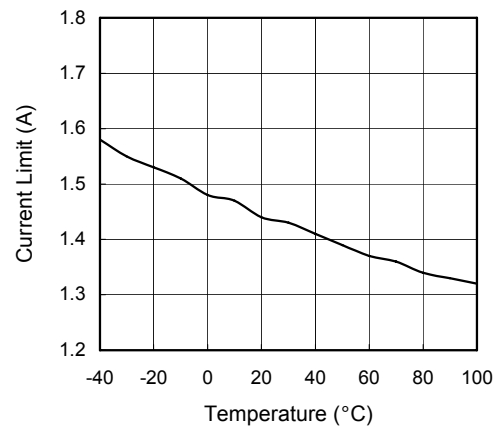
SW R_{on} vs. V_{CC} SW R_{on} vs. Temperature



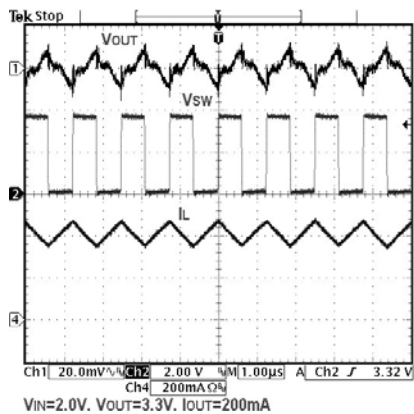
Typical Performance Characteristics (continued)

Current Limit vs. V_{CC} 

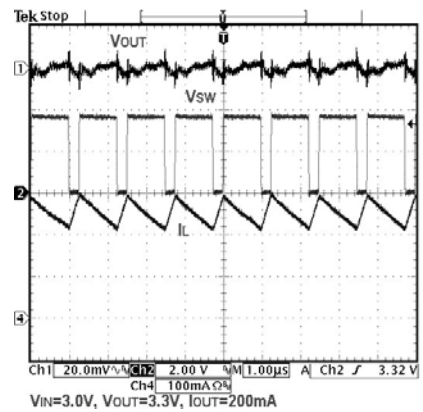
Current Limit vs. Temperature



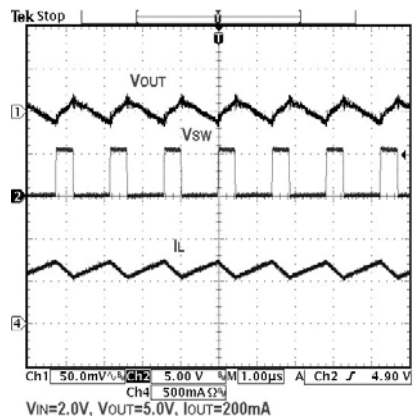
Stability Waveform



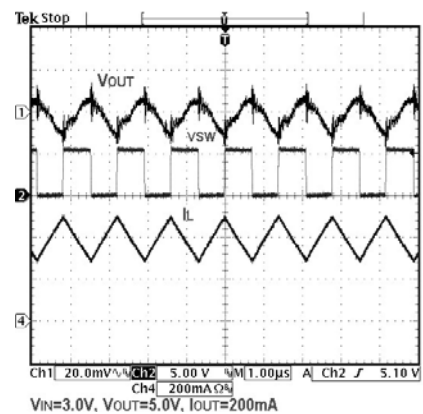
Stability Waveform



Stability Waveform

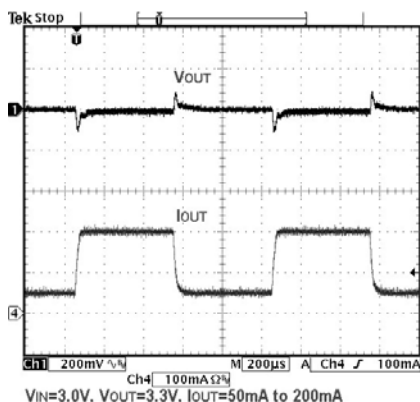


Stability Waveform

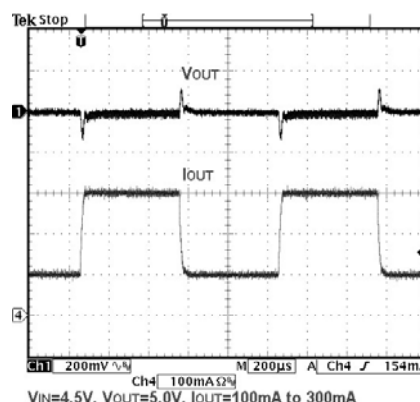


Typical Performance Characteristics (continued)

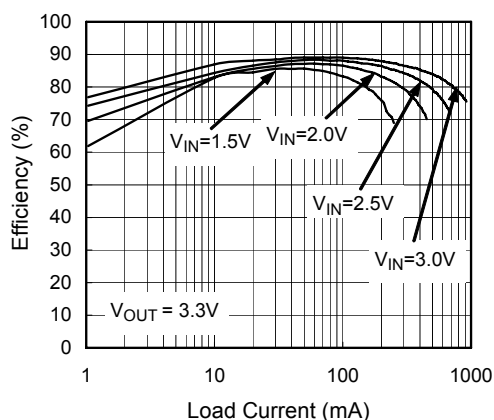
Load Transient



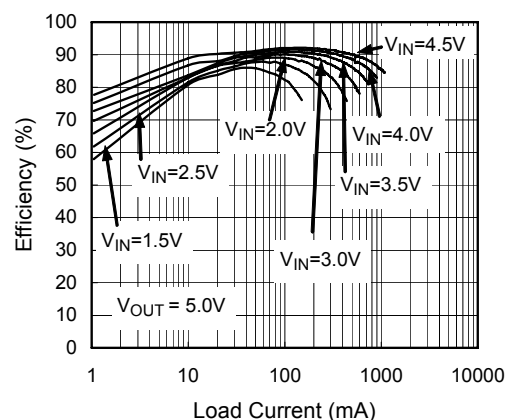
Load Transient



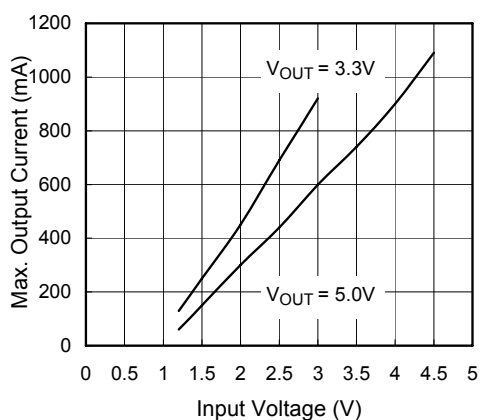
Efficiency vs. Load Current



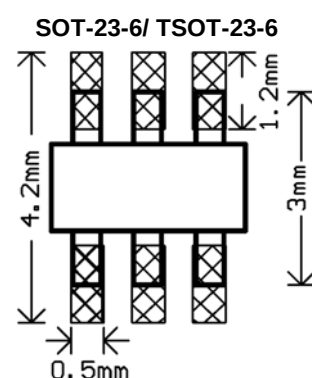
Efficiency vs. Load Current



Max. Output Current vs. Input Voltage



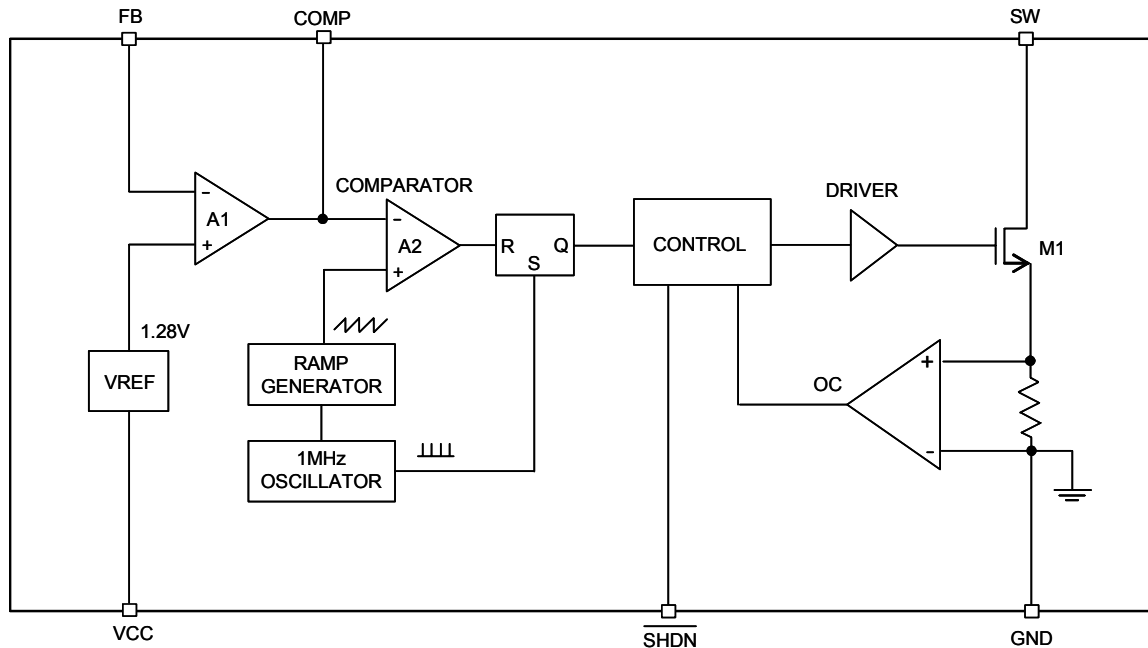
Recommended Minimum Footprint



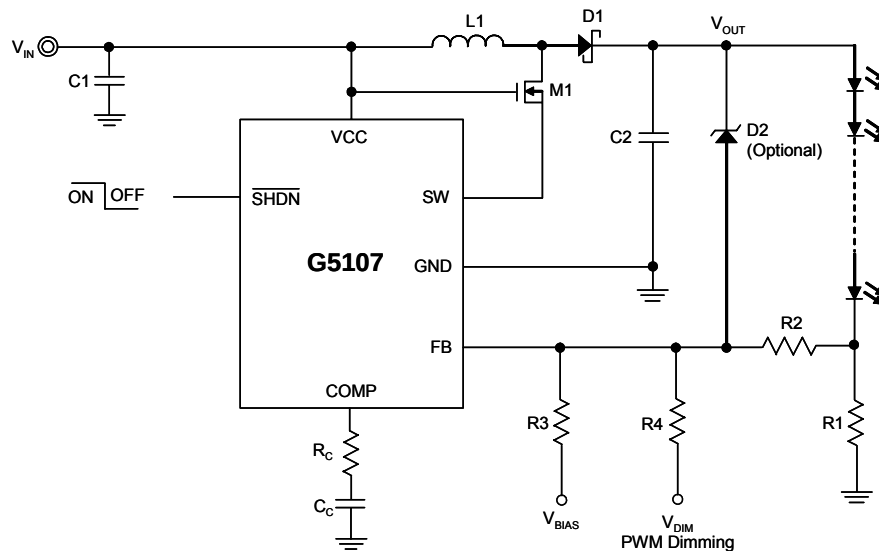
Pin Description

PIN	NAME	FUNCTION
1	SW	Switch Pin. The drain of the internal NMOS power switch. Connect this pin to inductor.
2	GND	Ground Pin.
3	FB	Feedback Pin.
4	$\overline{\text{SHDN}}$	Active Low Shutdown Pin.
5	COMP	Compensation Pin.
6	VCC	Input Supply Pin. Bypass this pin with a capacitor as close to the device as possible.

Block Diagram



White LED Driver





Function Description

Normal Operation

The G5107 uses a constant frequency control scheme to provide excellent line and load regulation. Operation can be best understood by referring to the block diagram. At the start of each oscillator cycle, the SR latch is set, which turns on the power switch M1. An artificial ramp is generated to the positive terminal of the PWM comparator A2. When this voltage exceeds the level at the negative input of A2, the SR latch is reset turning off the power switch. The level at the negative input of A2 is set by the error amplifier A1, and is simply an amplified version of the difference between the feedback voltage and the reference voltage of 1.28V. In this manner, the error amplifier sets the correct peak current level (DCM) or duty (CCM) to keep the output in regulation.

Over Voltage Protection

Over voltage protect function is designed to prevent the output accidentally damage the load. Once the device detects over voltage (nominal $\times$ 1.05) at the output, the internal NMOS switch turned off to stop power input.

Application Information

Inductor Selection

A 2.2 μ H~10 μ H inductor is recommended for small ripple applications. Small form factor and high efficiency are the major concerns for most G5107 applications. Inductor with low core losses and small DCR (copper wire resistance) at 1MHz are good choice for G5107 applications.

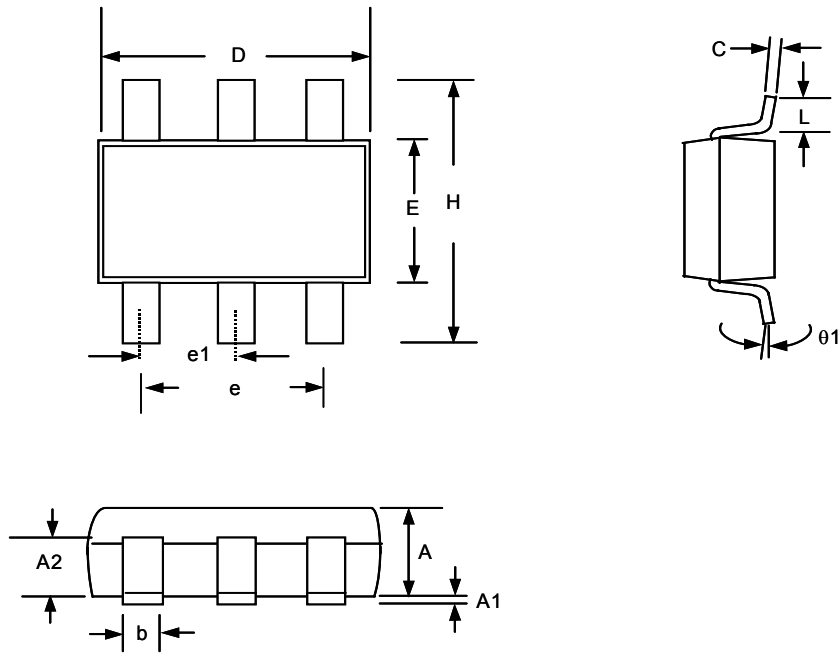
Capacitor Selection

Various types of output capacitor are suitable for G5107. To obtain small output ripple, the small size of ceramic capacitors are suitable for G5107 applications. X5R and X7R types are recommended because they retain their capacitance over wider voltage and temperature ranges than other types such as Y5V or Z5U. A 4.7 μ F~22 μ F output capacitor is enough for most applications.

To using a low cost Tantalum/Electrolytic type capacitors, a 47 μ F~100 μ F output capacitor is enough. Another small 1 μ F ceramic is recommended to place near G5107 V_{CC} pin to bypass high frequency noise generated from the higher ESR output capacitor.

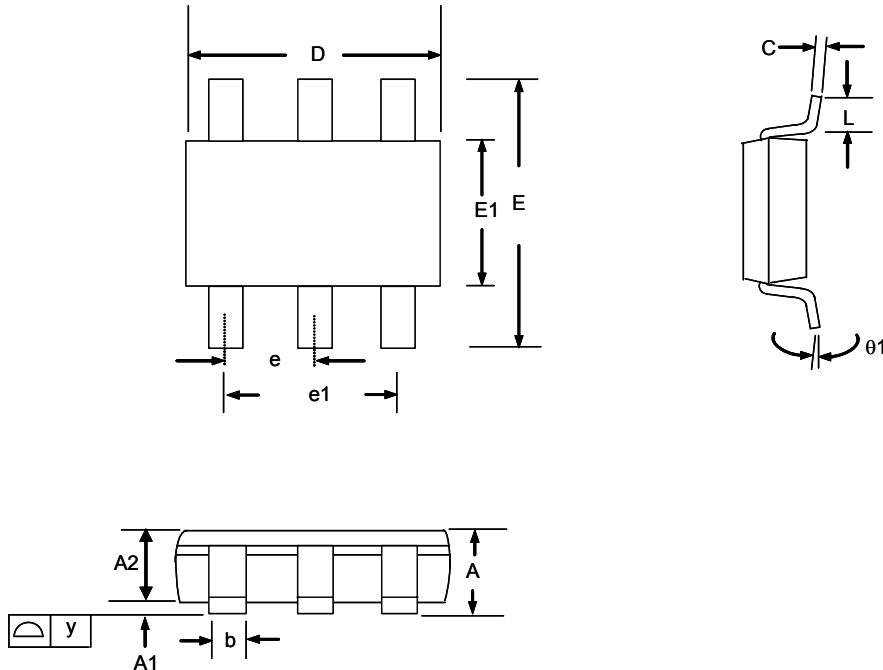
Diode Selection

Schottky diodes, with their low forward voltage drop and fast reverse recovery, are the ideal choices for G5107 applications. The forward voltage drop of a Schottky diode represents the conduction losses in the diode, while the diode capacitance (C_T or C_D) represents the switching losses. For diode selection, both forward voltage drop and diode capacitance need to be considered. Schottky diodes with higher current ratings usually have lower forward voltage drop and larger diode capacitance, which can cause significant switching losses at the 1MHz switching frequency of the G5107. A Schottky diode rated at 2A is sufficient for most G5107 applications.

**Package Information****SOT-23-6 (TB) Package****Note:**

1. Package body sizes exclude mold flash protrusions or gate burrs
- 2.
3. Tolerance ± 0.1000 mm (4mil) unless otherwise specified
4. Coplanarity: 0.1000mm
5. Dimension L is measured in gage plane

SYMBOL	DIMENSION IN MM			DIMENSION IN INCH		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	1.00	1.10	1.30	0.039	0.043	0.051
A1	0.00	----	0.10	0.000	----	0.004
A2	0.70	0.80	0.90	0.028	0.031	0.035
b	0.35	0.40	0.50	0.014	0.016	0.020
C	0.10	0.15	0.25	0.004	0.006	0.010
D	2.70	2.90	3.10	0.106	0.114	0.122
E	1.40	1.60	1.80	0.055	0.063	0.071
e	----	1.90(TYP)	----	----	0.075(TYP)	----
e1	----	0.95	----	----	0.037	----
H	2.60	2.80	3.00	0.102	0.110	0.118
L	0.37	----	----	0.015	----	----
$\theta 1$	1°	5°	9°	1°	5°	9°



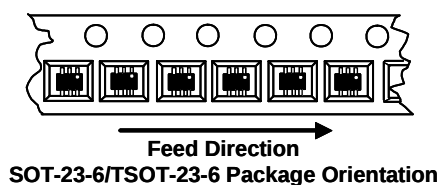
TSOT-23-6 (TP) Package

Note:

1. Dimension D does not include mold flash, protrusions or gate burrs. Mold flash, protrusions or gate burrs shall not exceed 0.1mm PER end. Dimension E1 does not include interlead flash or protrusion. Interlead flash or protrusion shall not exceed 0.15mm PER side.
2. The package top may be smaller than the package bottom. Dimensions D and E1 are determined at the outermost extremes of the plastic body exclusive of mold flash, tie bar burrs, gate burrs and interlead flash, but including any mismatch between the top and bottom of the plastic body.

SYMBOL	DIMENSION IN MM			DIMENSION IN INCH		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.75	-----	0.90	0.030	-----	0.035
A1	0.00	-----	0.10	0.000	-----	0.004
A2	0.70	0.75	0.80	0.028	0.030	0.031
b	0.35	-----	0.51	0.014	-----	0.020
C	0.10	-----	0.25	0.004	-----	0.010
D	2.80	2.90	3.00	0.110	0.114	0.118
E	2.60	2.80	3.00	0.102	0.110	0.118
E1	1.50	1.60	1.70	0.059	0.063	0.067
e	0.95 BSC			0.0374 BSC		
e1	1.90 BSC			0.0748 BSC		
L	0.37	-----	-----	0.015	-----	-----
y	-----	-----	0.10	-----	-----	0.004
θ 1	0°	-----	8°	0°	-----	8°

Taping Specification



PACKAGE	Q'TY/REEL
SOT-23-6	3,000 ea
TSOT-23-6	3,000 ea

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