



# Low-Noise Step-up DC-DC Converter

## Features

- 90% Efficiency
- Adjustable Output from  $V_{IN}$  to 20V
- 0.8A, 0.6Ω, 24V Power MOSFET
- 2.5V to 5.5V Input Range
- Fast 1MHz Switching Frequency
- SOT-23-6 and TSOT-23-6 Package

## Applications

- Small/Medium Size LCD Displays
- Organic LED Bias
- Portable Applications
- Hand-Held Devices

## General Description

The G5105 boost converter incorporate high-performance, voltage-mode, fixed-frequency (at 1MHz), pulse width modulation (PWM) circuitry with a built-in 0.6Ω n-channel MOSFET to provide a highly efficient regulator.

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 small, low ESR ceramic output capacitors. The device can produce an output voltage as high as 20V.

The G5105 is available in a space-saving SOT-23-6 and TSOT-23-6 package.

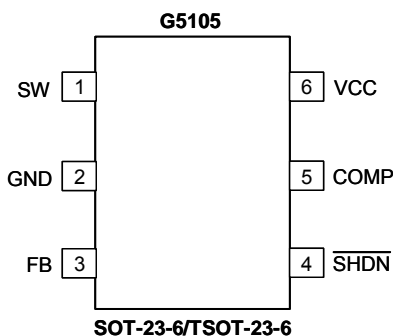
## Ordering Information

ORDER NUMBER	MARKING	TEMP. RANGE	PACKAGE (Pb free)
G5105TBU	5105xx	-40°C ~ +85°C	SOT-23-6
G5105TPU	5105x	-40°C ~ +85°C	TSOT-23-6

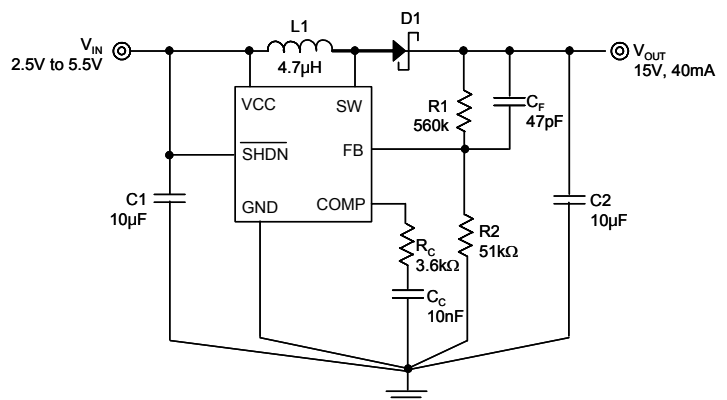
Note:TB : SOT-23-6 TP: TSOT-23-6

U: Tape & Reel

## Pin Configuration



## Typical Application Circuit



**Absolute Maximum Ratings**

VCC,  $\overline{\text{SHDN}}$  to GND. . . . . -0.3V to +7V  
 FB, COMP to GND . . . . . -0.3V to VCC  
 SW to GND . . . . . -0.3V to +24V  
 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.

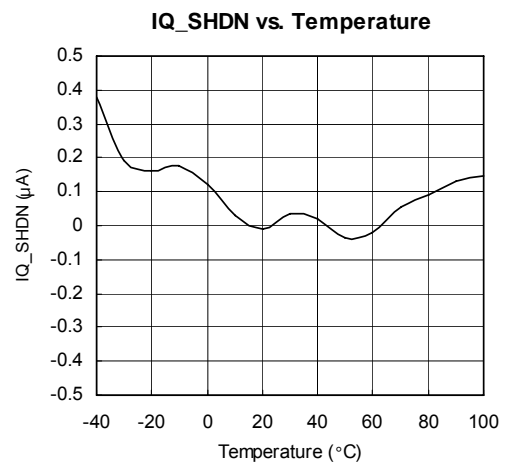
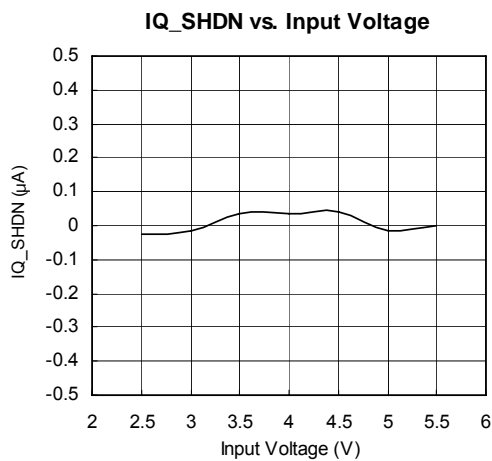
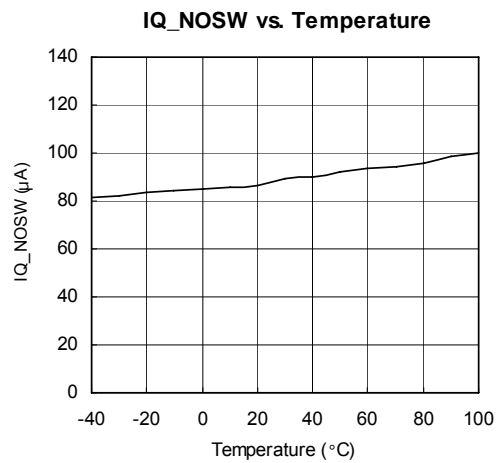
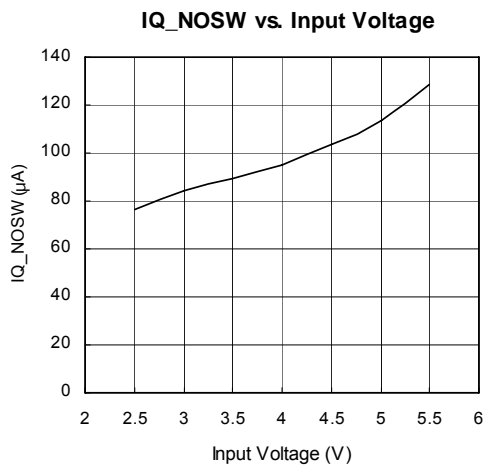
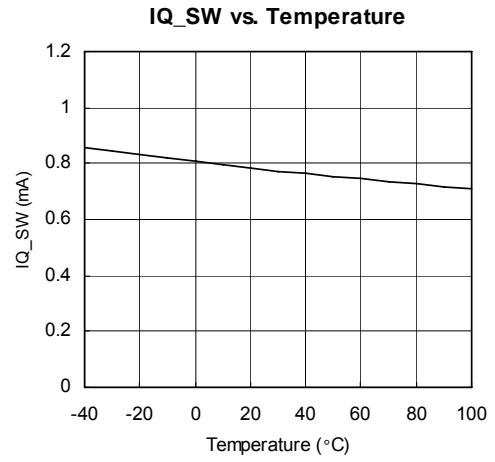
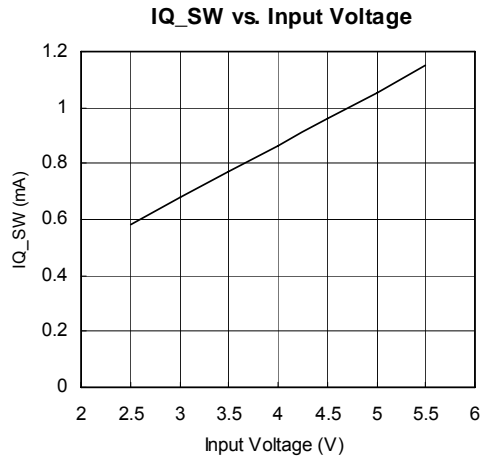
**Electrical Characteristics**

( $V_{CC} = V_{\overline{\text{SHDN}}} = 3.6\text{V}$ ,  $T_A = 25^\circ\text{C}$ )

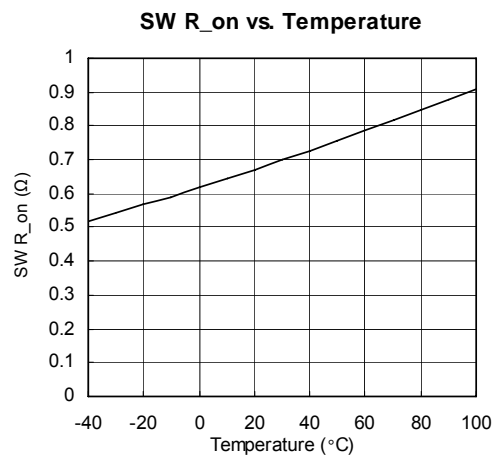
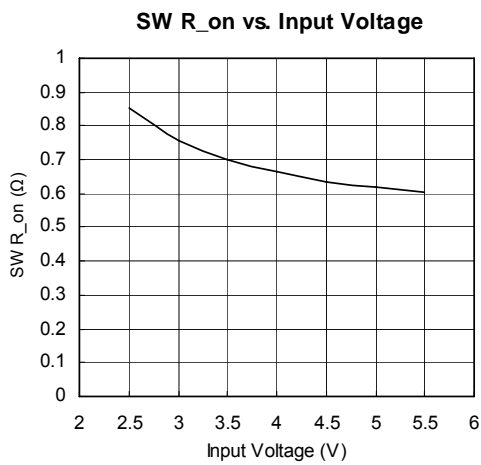
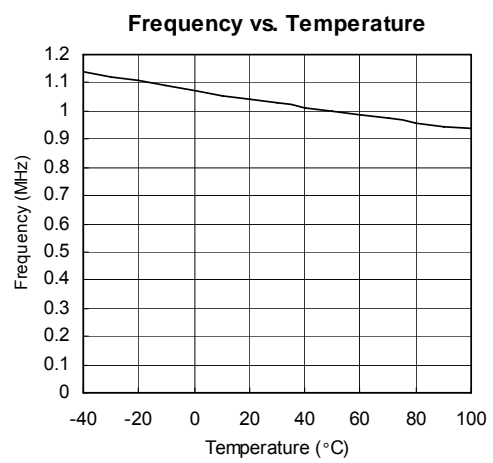
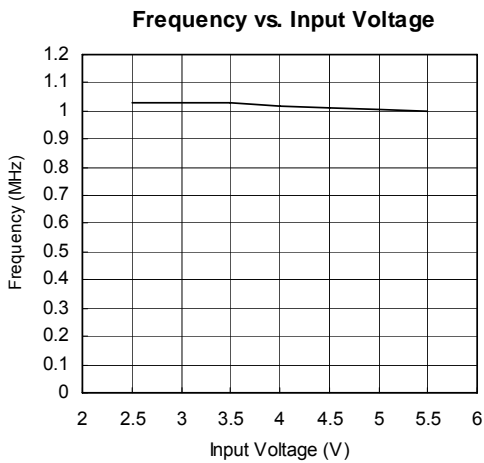
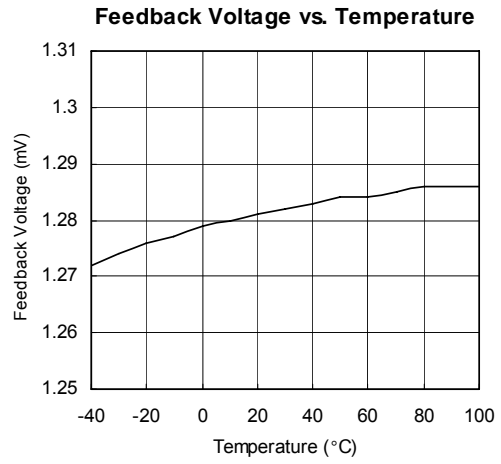
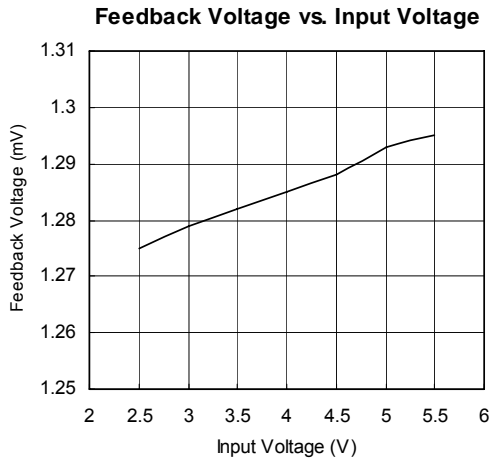
PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Input Voltage Range		2.5	---	5.5	V
Input Voltage UVLO		1.7	2.0	2.3	V
Quiescent Current	$V_{FB} = 1.5\text{V}$ (no switching)	---	100	200	$\mu\text{A}$
	$V_{FB} = 0\text{V}$ (switching)	---	---	2	mA
	$V_{\overline{\text{SHDN}}} = 0\text{V}$	---	0.1	1	$\mu\text{A}$
FB Comparator Trip Point	Initial Accuracy	1.25	1.28	1.31	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	$V_{FB} = 0.2\text{V}$	0.7	1	1.3	MHz
Maximum Duty		85	---	---	%
Switch $R_{DS(ON)}$	$I_{SW} = 150\text{mA}$	---	0.6	1	$\Omega$
Switch Leakage Current	$V_{SW} = 20\text{V}$	---	0.1	10	$\mu\text{A}$
Switch Current Limit		0.7	0.95	1.3	A
$\overline{\text{SHDN}}$ Pin Voltage High		2	---	---	V
$\overline{\text{SHDN}}$ Pin Voltage Low		---	---	0.8	V

**Typical Performance Characteristics**

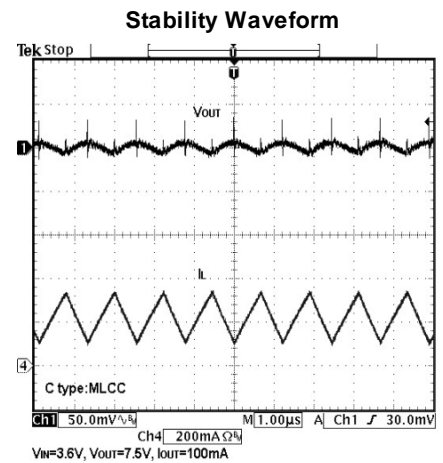
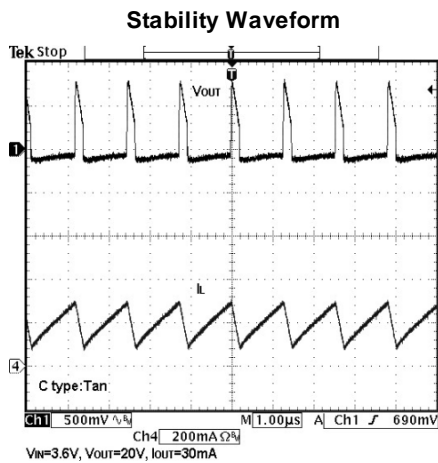
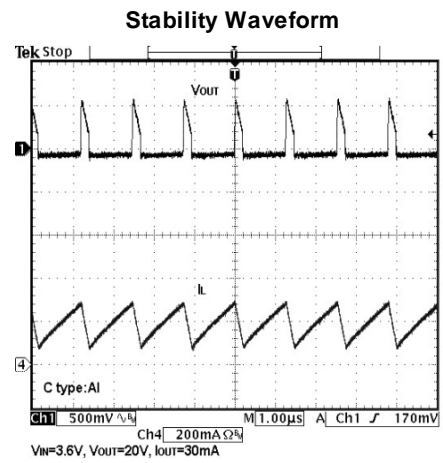
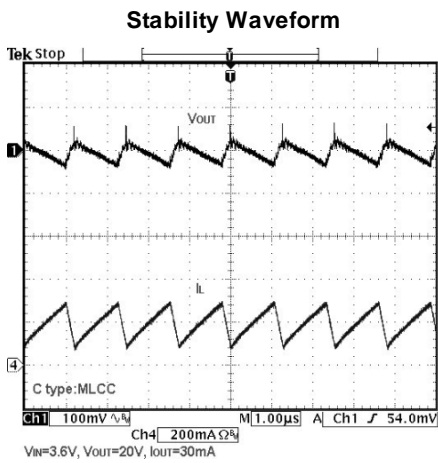
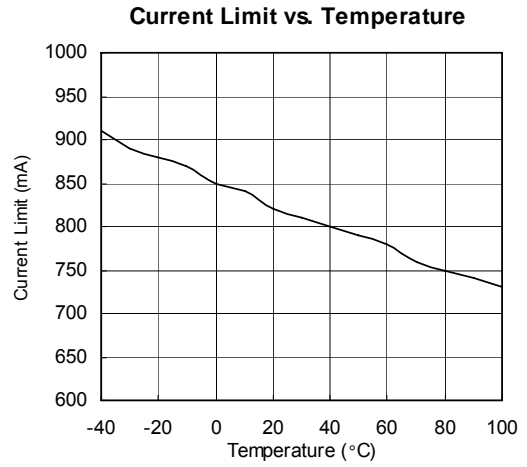
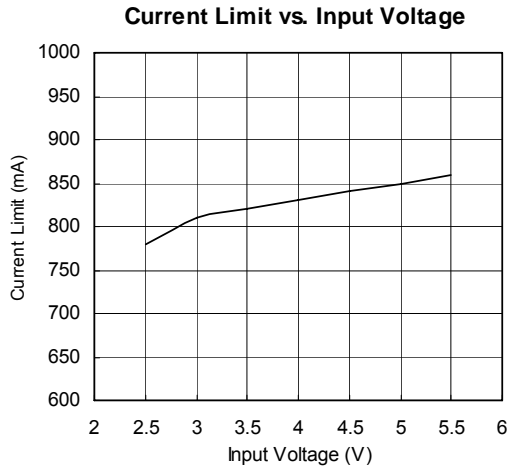
( $V_{CC} = +3.6V$ ,  $V_{SHDN} = +3.6V$ ,  $L = 10\mu H$ ,  $T_A = 25^\circ C$ , unless otherwise noted.)



Typical Performance Characteristics (continued)

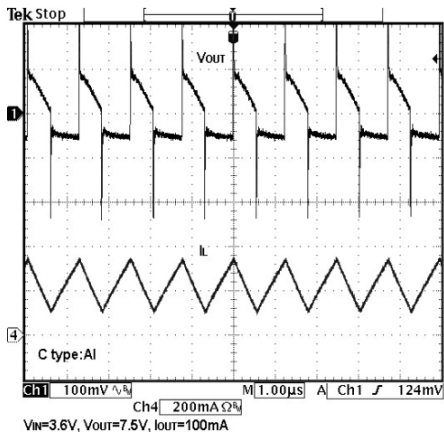


Typical Performance Characteristics (continued)

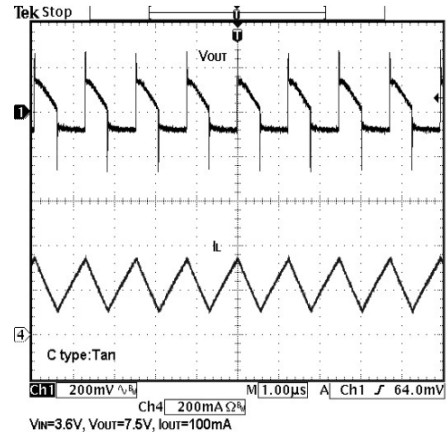


Typical Performance Characteristics (continued)

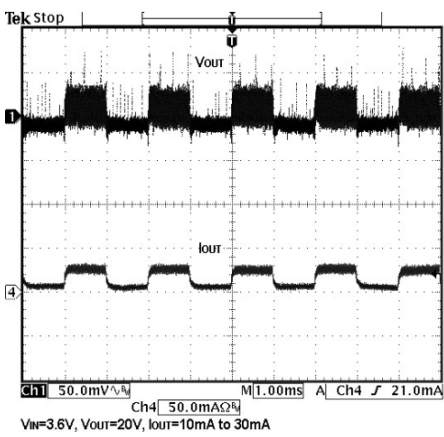
Stability Waveform



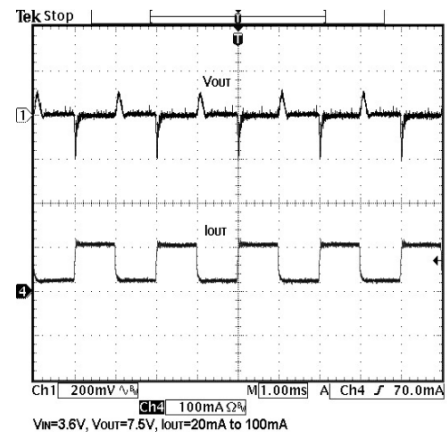
Stability Waveform



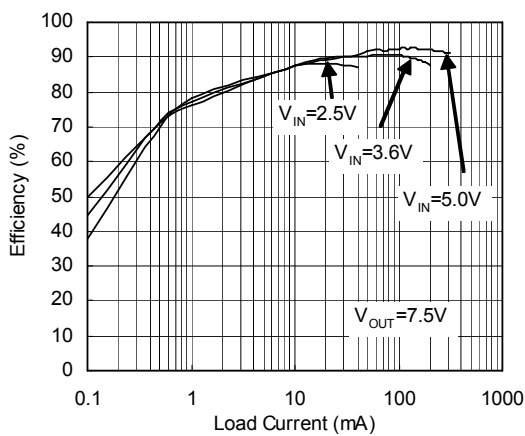
Load Transient



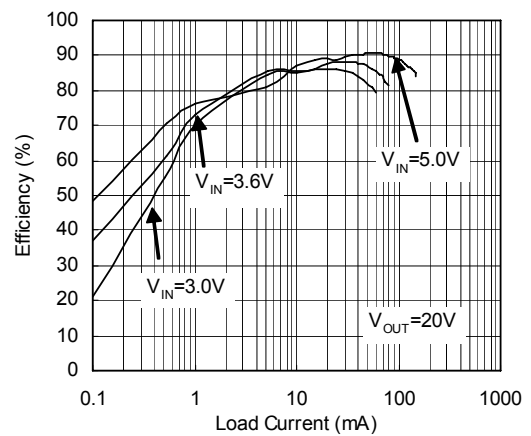
Load Transient



Efficiency vs. Load Current

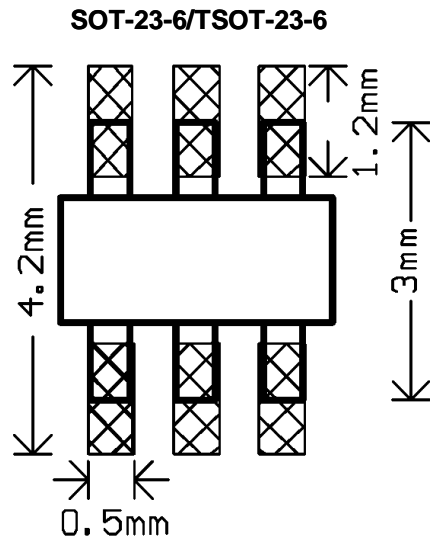


Efficiency vs. Load Current





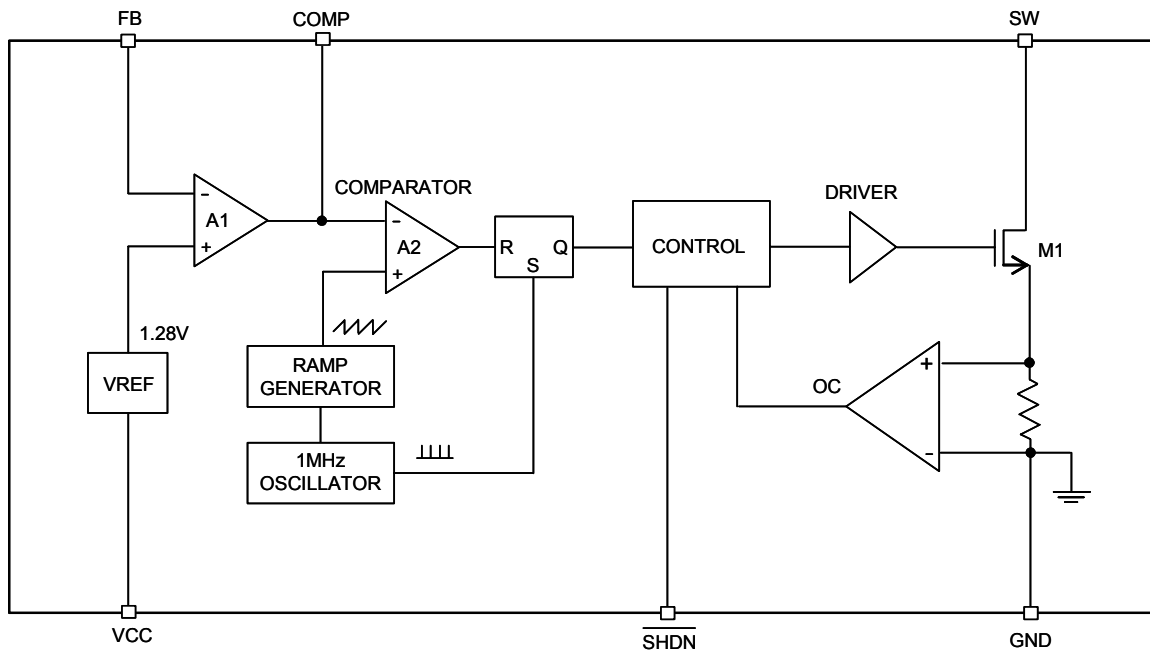
Recommended Minimum Footprint



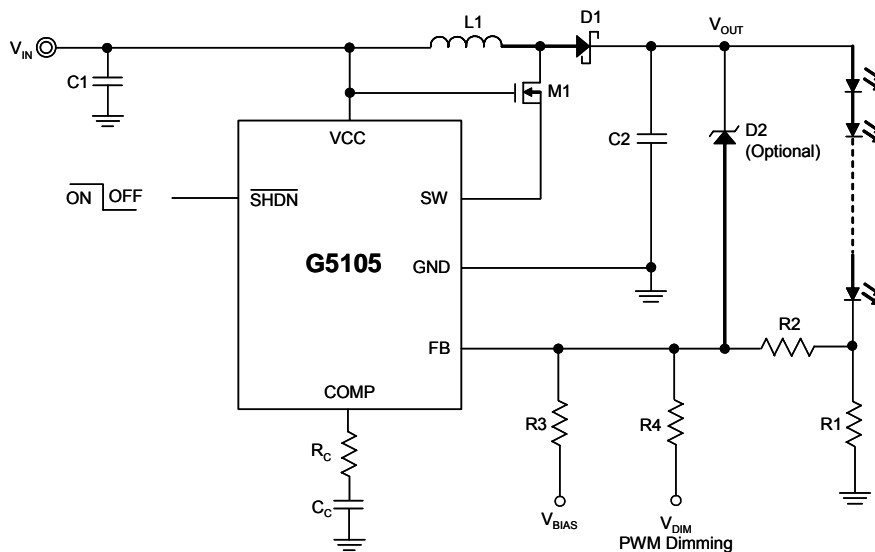
**Pin Description**

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

**Block Diagram**



**White LED Driver**







## Function Description

### Normal Operation

The G5105 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 turns off to stop power input

## Application Information

### Inductor Selection

A 4.7 $\mu$ H or 10 $\mu$ H inductor is recommended for small ripple applications. Small form factor and high effi-

ciency are the major concerns for most G5105 applications. Inductor with low core losses and small DCR (copper wire resistance) at 1MHz are good choice for G5105 applications.

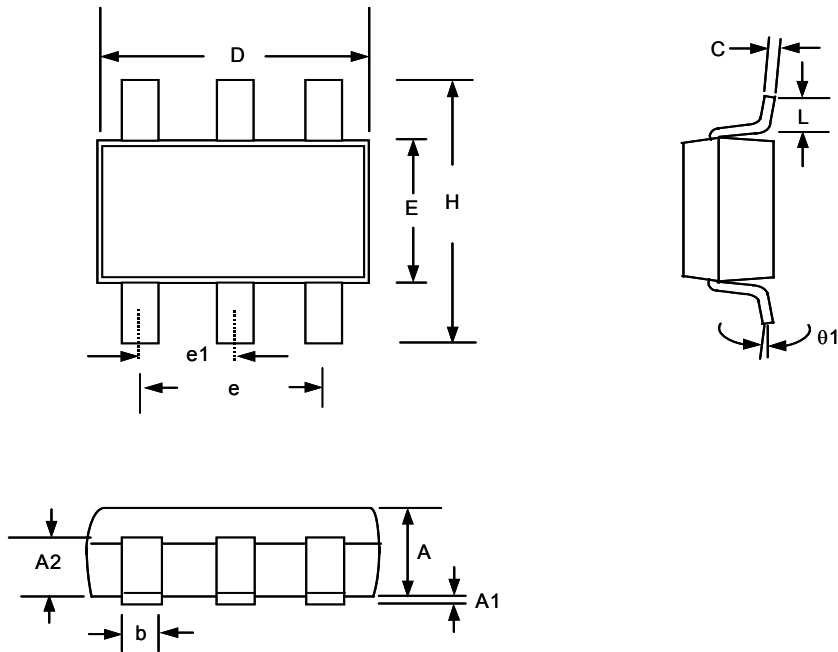
### Capacitor Selection

The small size of ceramic capacitors makes them suitable for G5105 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 10 $\mu$ F or 22 $\mu$ F capacitor for input and output are recommended for most applications. Smaller input/output capacitor enlarges the input/output ripple.

### Diode Selection

Schottky diodes, with their low forward voltage drop and fast reverse recovery, are the ideal choices for G5105 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 G5105. A Schottky diode rated at 1A is sufficient for most G5105 applications.

## Package Information

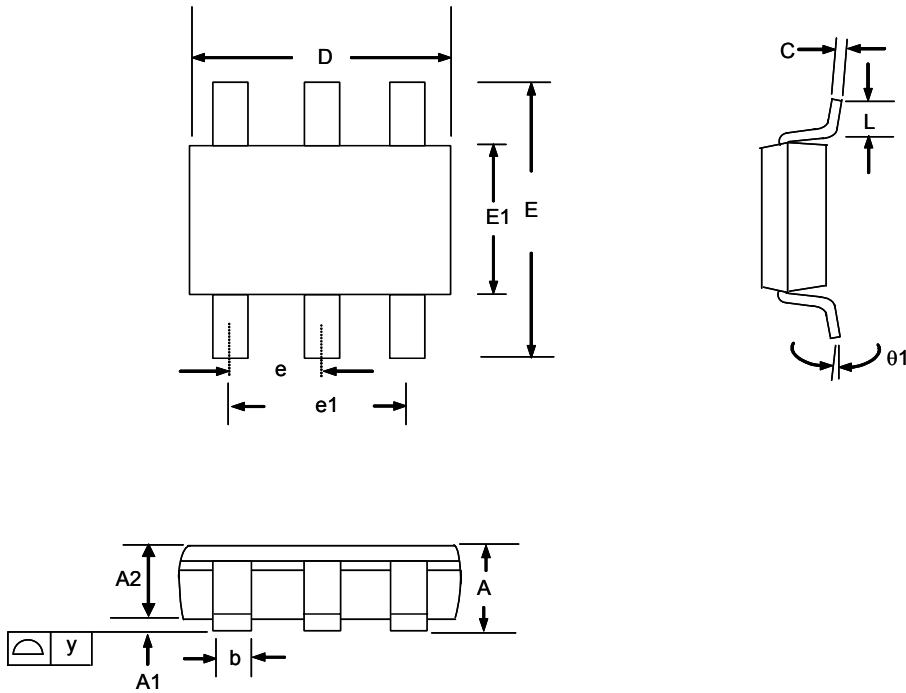


**SOT-23-6 (TB) Package**

**Note:**

1. Package body sizes exclude mold flash protrusions or gate burrs
2. Tolerance  $\pm 0.1000$  mm (4mil) unless otherwise specified
3. Coplanarity: 0.1000mm
4. 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)	----
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°



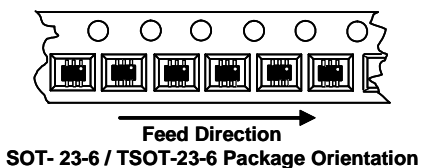
**TSOT-23-6 (TP) Package**

**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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