GS5582

1.5MHz, 2A Synchronous Step-Down Converter

Product Description

The GS5582 is a high-efficiency, DC-to-DC step-down switching regulators, capable of delivering up to 2A of output current. The GS5582 operates from an input voltage range of 2.5V to 5.5V and provides an output voltage from 0.6V to VIN-0.3V, making the device GS5582 ideal for low voltage power conversions. Running at a fixed frequency of 1.5MHz allows the use of small external components, such as ceramic input and output caps, as well as small inductors, while still providing low output ripples.

This low noise output along with its excellent efficiency achieved by the internal synchronous rectifier, making GS5582 an ideal green replacement for large power consuming linear regulators.

Internal soft-start control circuitry reduces inrush current. Short-circuit and thermal-overload protection improves design reliability.

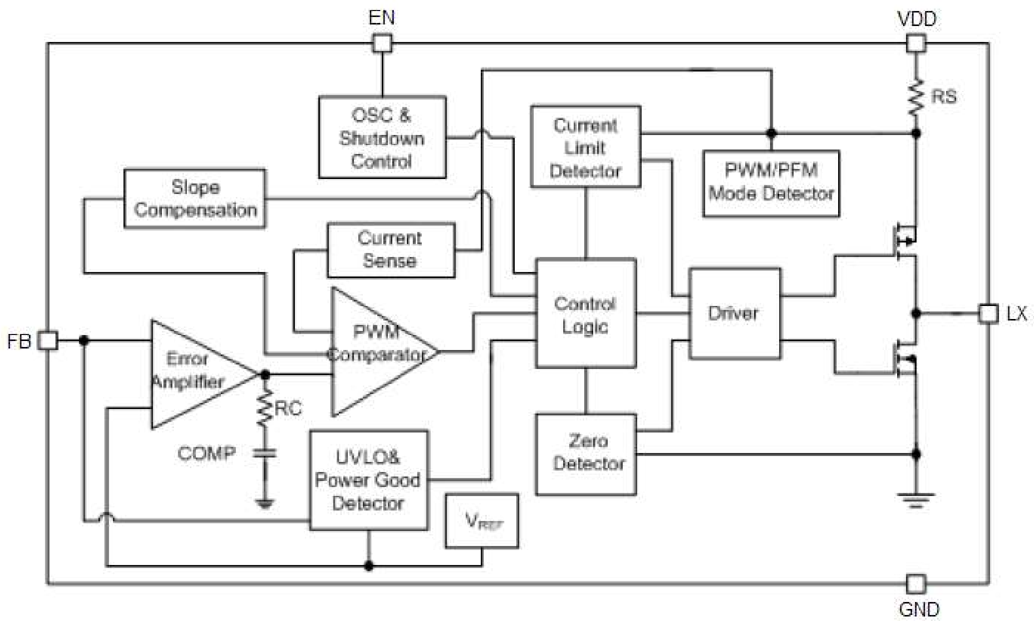
Features

- High Efficiency: Up to 95%
- 1.5MHz Constant Frequency Operation
- 2A Output Current
- No Schottky Diode Required
- Output Voltage as Low as 0.6V
- 100% Duty Cycle in Dropout Operation
- Short Circuit Protection
- Thermal Fault Protection
- Over Voltage Protection and UVLO
- Internal Compensation and Soft Start
- <1μA Shutdown Current
- SOT-23-5L and SOT-23-6L Packages
- RoHS Compliant, 100%Pb & Halogen Free

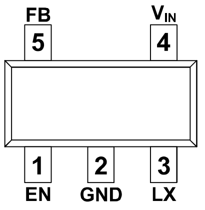
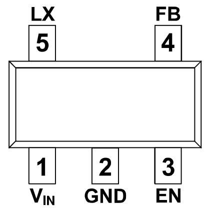
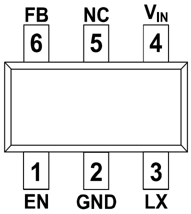
Applications

- Cellular and Smart Phones
- Wireless and DSL Modems
- PDAs
- Portable Instruments
- Digital Still and Video Cameras
- PC Cards

Block Diagram



Packages & Pin Assignments

GS5582LAF(SOT-23-5L)	GS5582LBF(SOT-23-5L)
 (Top View)	 (Top View)
GS5582RF(SOT-23-6L)	
 (Top View)	

Pin Name	Description
EN	Chip Enable Pin. Drive the pin to high to enable the Part. Do not leave EN floating.
GND	Analog ground pin.
LX	Power Switch Output. It is the switch node connection to Inductor. This pin connects to the drains of the internal P-ch and N-ch MOSFET switches.
V_{IN}	Analog supply input pin.
NC	No connected.
FB	Output Voltage Feedback Pin. An internal resistive divider divides the output voltage down for comparison to the internal reference voltage.

Typical Application Circuit

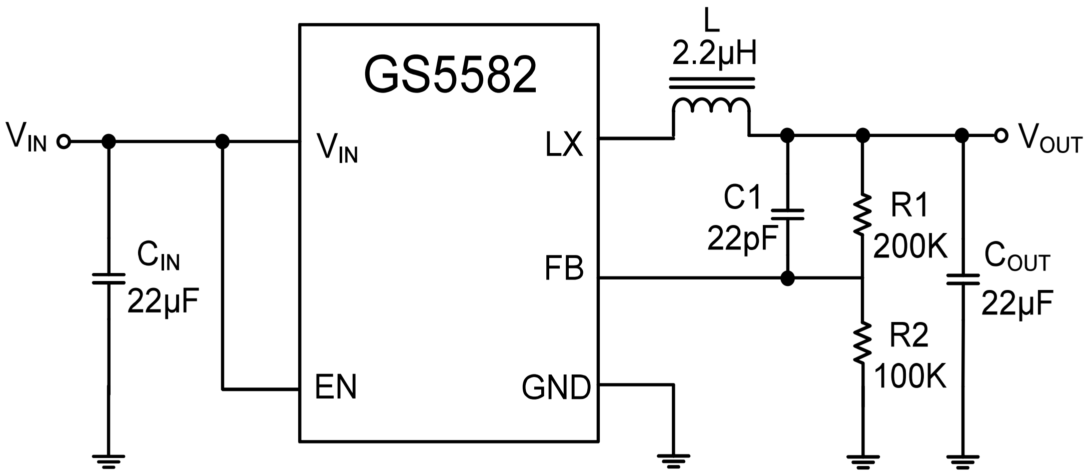
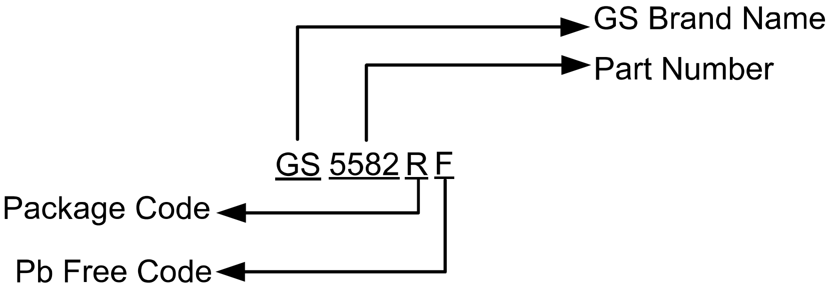


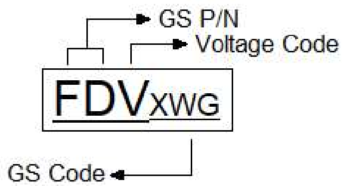
Figure1. GS5582 Adjustable Output Voltage Regulator

Ordering Information



Part Number	Temperature Range	Output Voltage	Package
GS5582LAF	-40ºC to 85ºC	ADJ	SOT-23-5L
GS5582LBF	-40ºC to 85ºC	ADJ	SOT-23-5L
GS5582RF	-40ºC to 85ºC	ADJ	SOT-23-6L

Marking Information



Part Number	Package	GS P/N	Voltage Code	GS Code
GS5582LAF	SOT-23-5L	FD	A	XWG
GS5582LBF	SOT-23-5L	FD	B	XWG
GS5582RF	SOT-23-6L	FD	A	XWG

Absolute Maximum Ratings (Note 1)

Symbol	Description	Value	Units
V_{IN}	Input Supply Voltage	-0.3 to 6.0	V
	EN,FB Voltages	-0.3 to (V_{IN}+0.3)	V
V_{LX}	LX Voltage	-0.3 to (V_{IN}+0.3)	V
T_A	Operating Temperature Range	-40 to +85	°C
T_{STG}	Storage Temperature Range	-40 to +150	°C
T_{LEAD}	Lead Temperature(Soldering,10s)	+260	°C
Tj	Junction Temperature (Note 2)	125	°C
PD	Power Dissipation	0.4	W

Electrical Characteristics (Note 3)

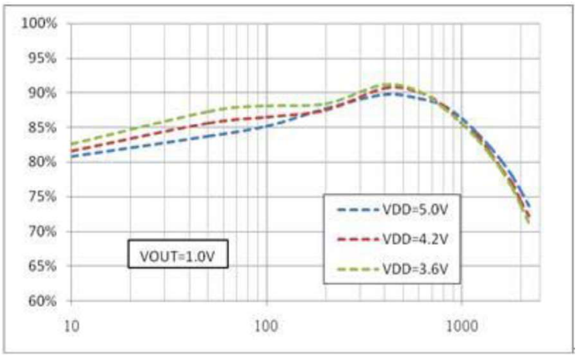
V_{IN}=V_{EN}=5V, L = 2.2uH, T_A = 25°C, unless otherwise noted.

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
V_{IN}	Input Voltage	-	2.5	-	5.5	V
V_{UVLO}	UVLO Threshold	V_{IN} Rising	-	-	2.1	V
I_Q	Input DC Supply Current	Active, VFB=0.65V I_{LOAD}=0mA (Note 4)	-	50	-	μA
I_{SHDN}	Input DC Supply Current (Shutdown Mode)	V_{EN}=0V, V_{IN}=4.2V (Note 4)	-	-	1.0	μA
V_{FB}	Regulated Feedback Voltage	T_A = 25°C	0.588	0.600	0.612	V
I_{FB}	Feedback Leakage Current		-	0.1	0.4	uA
V_{ENH}	EN Input High Voltage	-	1.5	-	-	V
V_{ENL}	EN Input Low Voltage	-	-	-	0.4	V
I_{EN}	EN Leakage Current	-	-	-	1.0	μA
I_{LX}	LX Leakage Current	V_{EN}=0V,V_{IN}=V_{LX}=5V	-	-	1.0	μA
$R_{DS(ON)H}$	On Resistance of PMOS	I_{LX}=100mA	-	120		mΩ
$R_{DS(ON)L}$	ON Resistance of NMOS	I_{LX}=100mA	-	100		mΩ
I_{PK}	Peak Current Limit	-	3	-	-	A
T_{SS}	Soft-Start Time	-	--	350	--	us
REG_{LOAD}	Output Voltage Load Regulation	I_{OUT}=10mA to 2000mA	-	0.2	-	%/A
F_{OSC}	Oscillation Frequency	-	-	1.5	-	MHz

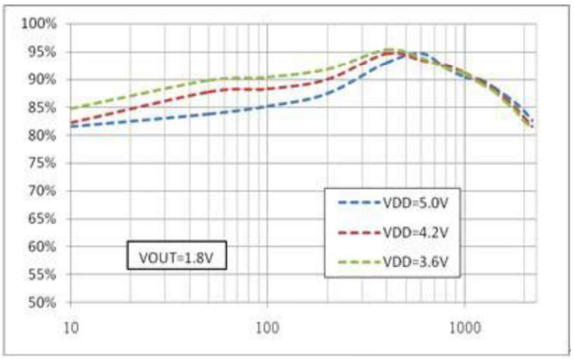
Note 1: Absolute Maximum Ratings are those values beyond which the life of a device may be impaired.
Note 2: T_J is calculated from the ambient temperature T_A and power dissipation P_D according to the following formula: $T_J = T_A + (P_D) \times (\theta_{JA})$.
Note 3: 100% production test at +25°C. Specifications over the temperature range are guaranteed by design and characterization.
Note 4: Dynamic supply current is higher due to the gate charge being delivered at the switching frequency.

Typical Performance Characteristics

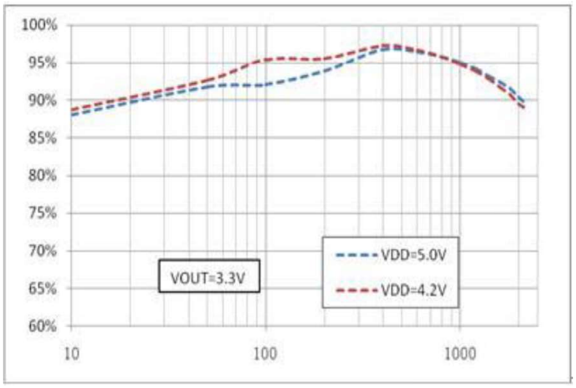
Tested under TA=25°C, unless otherwise specified



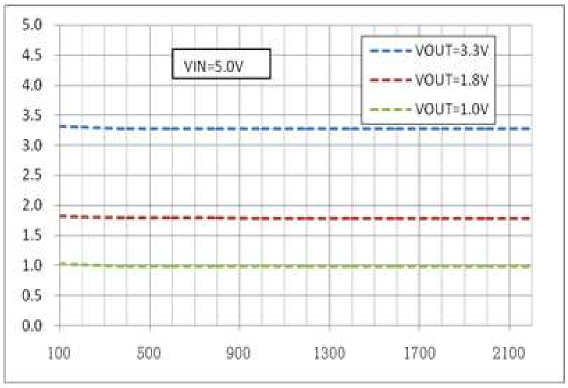
Efficiency vs. Load Current



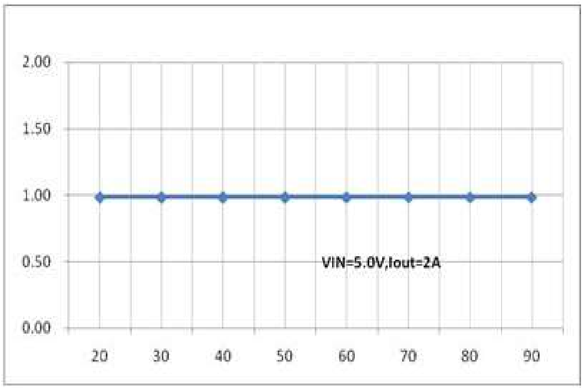
Efficiency vs. Load Current



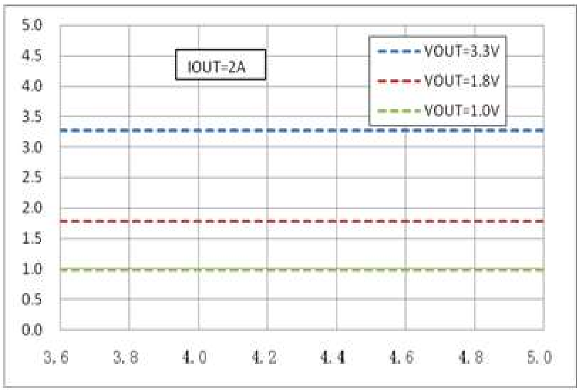
Efficiency vs. Load Current



Output Voltage vs. Output Current



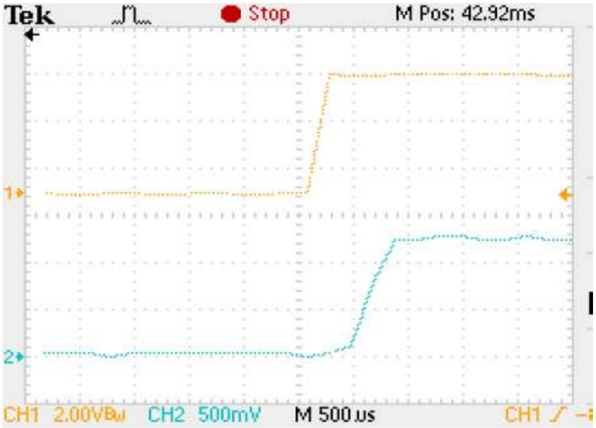
Operation Temperature vs. Output Voltage



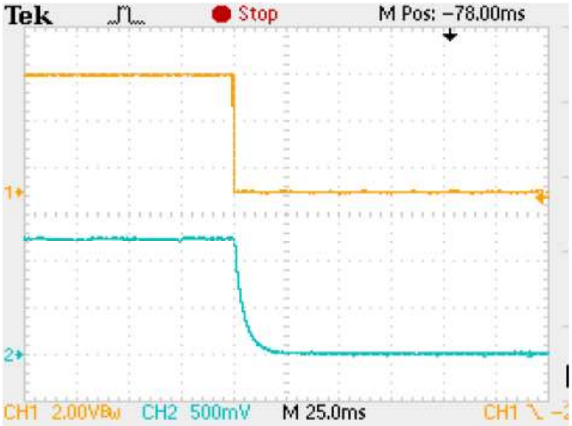
Input Voltage vs. Output Voltage

Typical Performance Characteristics (continue)

Tested under TA=25°C, unless otherwise specified

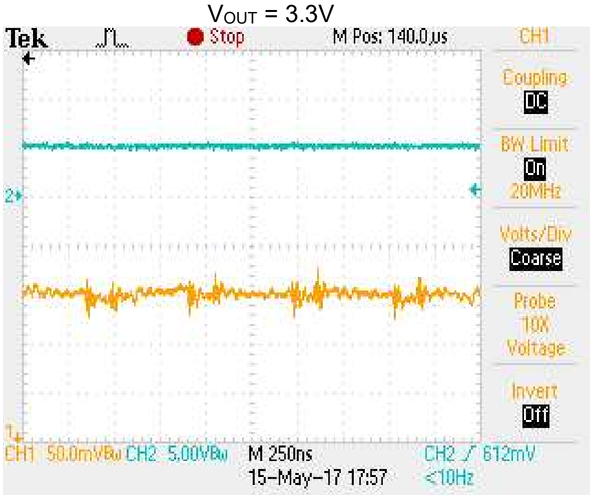


Start Up Waveform

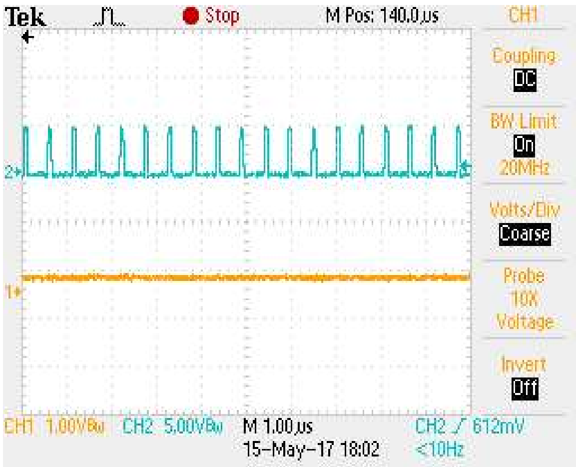


Shutdown Waveform

V_{OUT} = 3.3V



Output Ripple



Short Circuit Protection Waveform

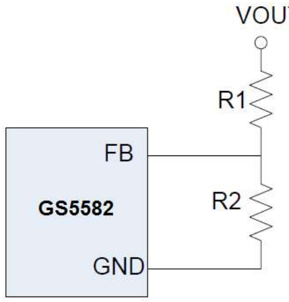
Applications Information

Setting the Output Voltage

Output voltages are set by external resistors. The FB threshold voltage (VFB) is 0.6V.

$$V_{OUT}=0.6V\times\left(1+\frac{R1}{R2}\right)$$

Set R2 to 100K, then R1 can be easily derived from the above equation



Output Capacitor Selection

The output capacitor is selected to handle the output ripple noise requirements, both steady state ripple and transient requirements must be taken into consideration when selecting this capacitor. For the best performance, it is recommended to use X5R or better grade ceramic capacitor with 6.3V rating and greater than 10uF Capacitance.

Input Capacitor Selection

This ripple current through input capacitor is calculated as:

$$I_{CIN\_RMS}=I_{OUT}\times\sqrt{D(1-D)}$$

This formula has a maximum at VIN=2V_{OUT} condition, where ICIN_RMS=I_{OUT}/2. This simple worst-case condition is commonly used for the DC-DC design.

With the maximum load current at 3.0A, A typical X5R or better grade ceramic capacitor with 6.3V rating and more than 1pcs 10uF capacitor can handle this ripple current well. To minimize the potential noise problem, ceramics ceramic capacitor should really be placed close to IN and GND pins. Care should be taken to minimize the loop area formed by CIN and IN/GND pins.

Output Capacitor Selection

There are several considerations in choosing this induction.

1) Choose the inductance to provide the desired ripple current. It is suggested to choose the ripple to be about 40% of maximum output current. The inductance is calculated as:

$$L=\frac{V_{OUT}(1-V_{OUT}/V_{IN,MAX})}{F_{SW}\times I_{OUT,MAX}\times 40\%}$$

Where FSW is the switching frequency and IOUT.MAX is the maximum load current.

The GS5582 regulator IC is quite tolerant of different ripple current amplitude. Consequently, the final choice of inductance can be slightly off the calculation value without significantly impacting the performance.

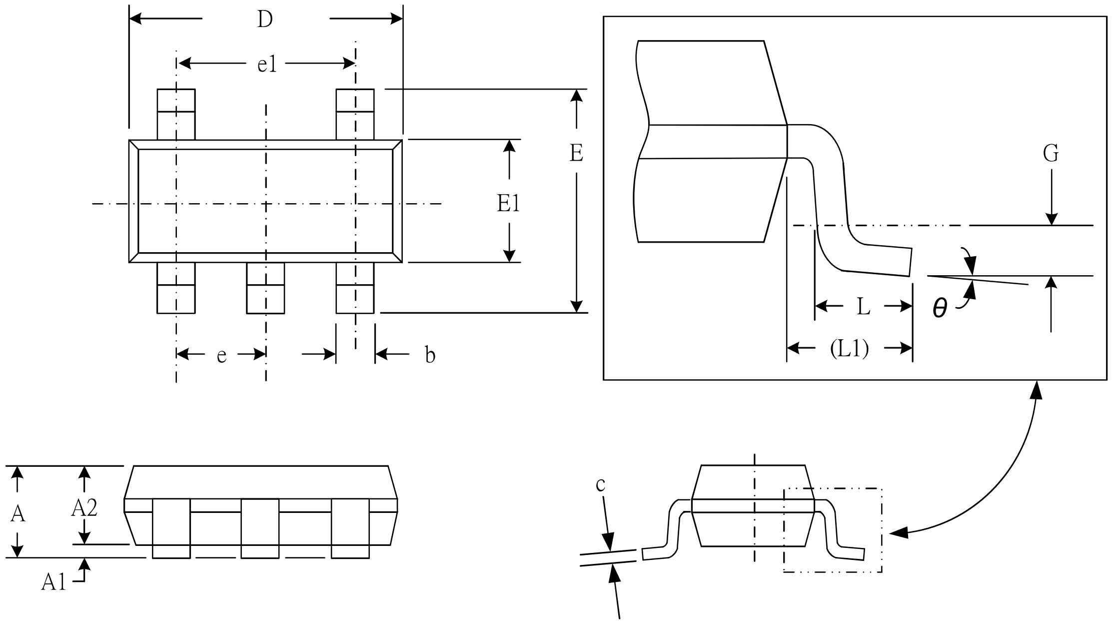
2) The saturation current rating of the inductor must be selected to be greater than the peak inductor current under full load conditions.

$$I_{SAT,MIN}>I_{OUT,MAX}+\frac{V_{OUT}(1-V_{OUT}/V_{IN,MAX})}{2\cdot F_{SW}\cdot L}$$

3) The DCR of inductor and the ore loss at the switching frequency must be low enough to achieve the desired efficiency requirement. It is desirable to choose an inductor with DCR<50mΩ to achieve a good overall efficiency.

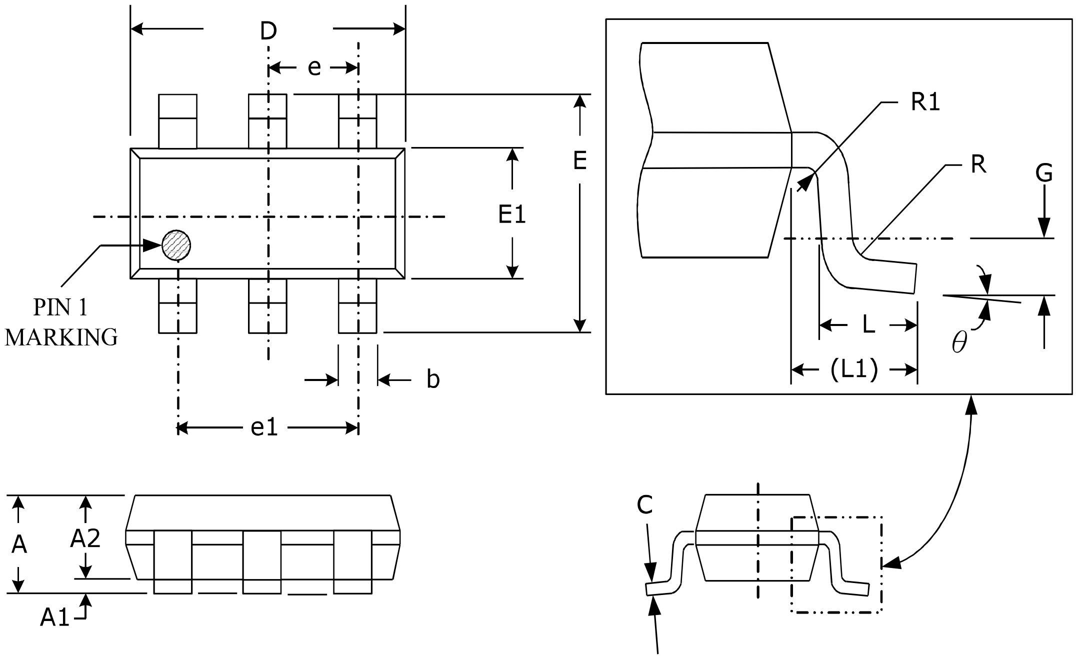
Package Dimension

SOT-23-5L



SYMBOL	Millimeters MIN	Millimeters MAX	Inches MIN	Inches MAX
A	0.95	1.45	.037	.057
A1	0.05	0.15	.002	.006
A2	0.90	1.30	.035	.051
b	0.30	0.50	.012	.020
c	0.08	0.20	.003	.008
D	2.80	3.00	.110	.118
E	2.60	3.00	.102	.118
E1	1.50	1.70	.059	.067
e	0.95 (TYP)		.037 (TYP)	
e1	1.90 (TYP)		.075 (TYP)	
L	0.35	0.55	.014	.022
L1	0.60 (TYP)		.024 (TYP)	
G	0.25 (TYP)		.010 (TYP)	
θ	0°	8°	0°	8°

SOT-23-6L



Dimensions				
SYMBOL	**Millimeters**		**Inches**	
	MIN	**MAX**	**MIN**	**MAX**
A	-	1.10	-	.043
A1	0.00	0.10	0	.004
A2	0.70	1.00	.028	.039
b	0.30	0.50	.012	.020
c	0.08	0.20	.003	.008
D	2.90 (TYP)		.114 (TYP)	
E	2.80 (TYP)		.110 (TYP)	
E1	1.60 (TYP)		.063 (TYP)	
e	0.95 (TYP)		.037 (TYP)	
e1	1.90 (TYP)		.075 (TYP)	
L	0.30	0.60	.014	.022
L1	0.60 (TYP)		.024 (TYP)	
R	0.10	-	.004	-
R1	0.10	0.25	.004	.010
G	0.25 (TYP)		.010 (TYP)	
θ	0°	8°	0°	8°

NOTICE

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