Low Dropout Linear Regulator

Description

The SC21L03 is 300 mA low dropout linear regulator optimized to provide a high performance solution to low power system.

The device offers a new level of cost-effective performance in cellular phones, laptop and notebook computers, and other portable devices. Proprietary design techniques ensure highperformance.

The SC21L03 is designed to make use of low cost ceramic capacitors which ensure the stability of the output current, and enhance the efficiency in order to prolong the battery life of those portable devices.

The SC21L03 regulators are available in the industry standard SOT-23-5/SC70-5 power packages (or upon request).

Features

- Input Voltage：1.8V～5.5V
- Output Voltage：1.25V～5.0V
- Dropout Voltage：
  <350mV while output voltage≤1.8V;
  <200mV while output voltage≥2.8V
- 0.47μF～10μF Ceramic Capacitors Ensures the Stability
- Overload/over Temperature Protection
- Package: SOT-23-5/SC70-5 (lead-free packaging is now available)
- Specified from: - 40℃～+ 85℃
- High Ripple Rejection : 70dB @1kHz

Applications

- MP3/MP4 Players
- Cellular phones, radiophone, digital cameras,and portable electronics
- Laptop/notebook/palmtop computers
- Bluetooth and other radio products
- Battery chargers
- Disk driver
- Portable devices

Order Information

PART	VOUT(V)	MARK	PACKAGE
SC21L03-CES	1.8	4XK5	SOT-23-5
SC21L03-HES	2.5	4XY5	SOT-23-5
SC21L03-EES	2.8	4XX5	SOT-23-5
SC21L03-FES	3.0	4XZ5	SOT-23-5
SC21L03-GES	3.3	4B25	SOT-23-5
SC21L03-IES	1.3		SOT-23-5
SC21L03-KES	1.2		SOT-23-5
SC21L03-CBS	1.8	DG	SOT-353-5(SC70)
SC21L03-EBS	2.8	EG	SOT-353-5(SC70)
SC21L03-FBS	3.0	CG	SOT-353-5(SC70)
SC21L03-GBS	3.3	HG	SOT-353-5(SC70)

Typical Applications Circuit

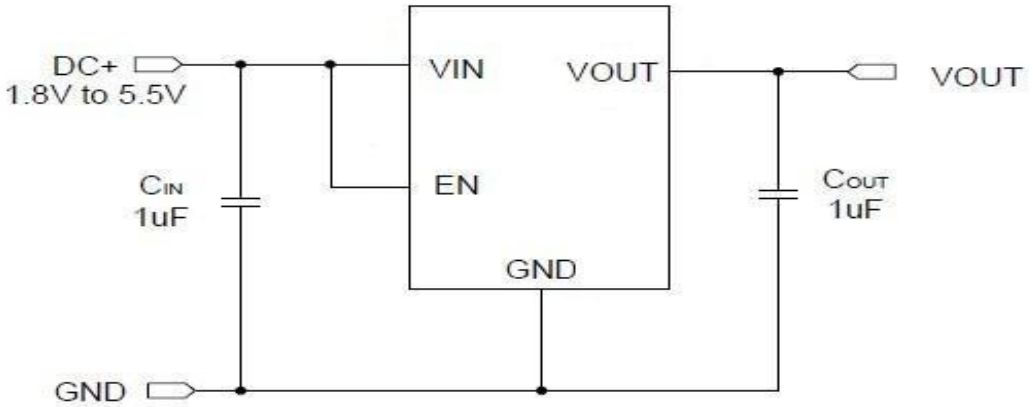
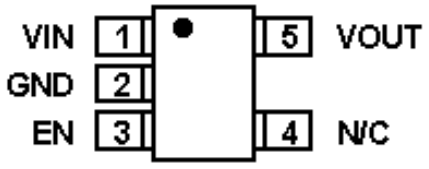


Figure 1: Typical Application Circuit

Pin Configurations

Package Type	Pin Configurations
SC21L03 SOT-23-5L	

Pin Description

PIN SOT-23-5L	NAME	DESCRIPTION
1	VIN	Supply voltage input.
2	GND	Ground.
3	EN	En Control Input (High Enable).
4	N/C	No used.
5	VOUT	Output Pin. In the nonadjustable version, the output voltage is fixed.

Absolute Maximum Ratings

- **Supply Input Voltage ---------- 6V**
- **Power Dissipation, PD @ TA = 25°C**
  SOT-23-5 ---------- 400mW
  SC-70-5 ----------300mW
- **Lead Temperature (Soldering, 10 sec.) ---------- +300°C**
- **Storage Temperature Range ---------- -65°C to +150°C**

Recommended Operating Conditions

- **Supply Input Voltage ---------- 1.8V to 5.5V**
- **EN Input Voltage ---------- 0V to 5.5V**
- **Junction Temperature Range---------- -40°C to + 125°C**
- **Ambient Temperature Range---------- -40°C to +85°C**

Electrical Characteristics

SC21l03-CES：Operating Conditions: T_A=25℃,V_{IN}=5V, C_{IN} = C_{OUT} =1uF, unless otherwise specified.

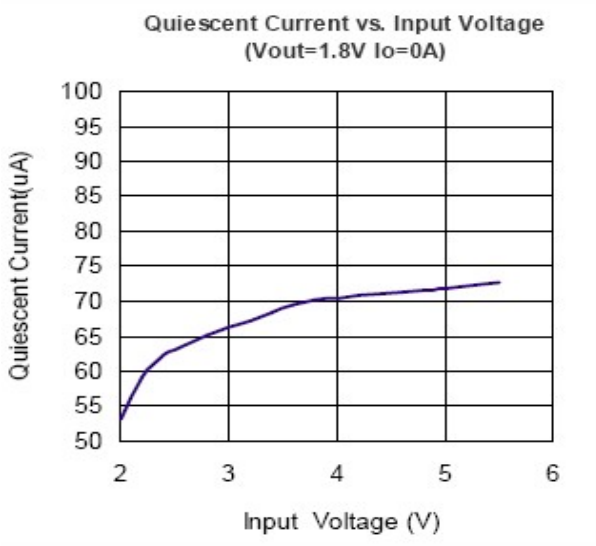
PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Output Voltage	I_{OUT} = 10mA		1.8		V
Output Voltage Accuracy		-2		2	%
Input Voltage Range		1.8		5.5	V
Quiescent Current	2.2V ≤ V_{IN} ≤ 5.5V		90		μA
Shutdown Current	V_{EN} = 0V, V_{IN} = 5V		0.02		μA
Drop Out Voltage V_{IN} - V_{OUT}	I_{OUT} =150mA, V_{OUT} ≤1.8V I_{OUT} =150mA, V_{OUT} ≥2.8V		150		mV
Overload Limited	V_{OUT} = 0V		300		mA
Line Regulation	3V ≤ V_{IN} ≤ 5V, I_{OUT} = 0mA		4		mV
Load Regulation	0mA ≤ I_{OUT} ≤ 100mA		30		mV
Ripple Rejection (Note 3)	I_{OUT} = 100 mA, f=1KHz		70		dB
V_{OUT} Temperature Coefficient	I_{OUT} = 1mA		100		ppm/℃
Thermal Shutdown Temperature			160		℃
EN ‘High’ Voltage	T_A=25℃	1.5		VIN	%
	- 40℃ ≤ T_A ≤ 80℃	1.7		VIN	
EN ‘Low’ Voltage	T_A=25℃			0.5	%
	- 40℃ ≤ T_A ≤ 80℃			0.2	

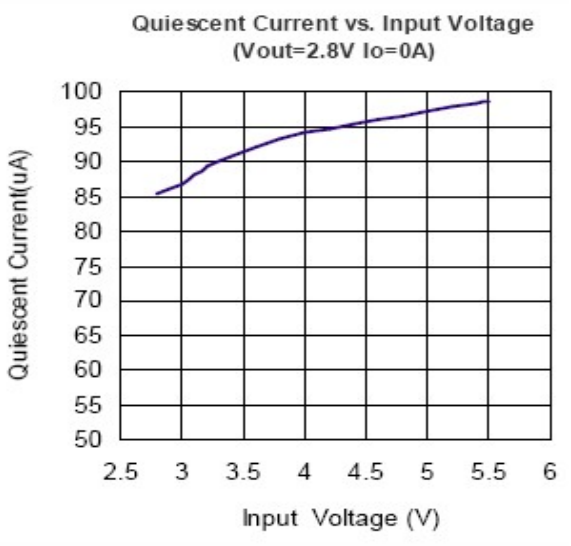
Note 1. Stresses listed as the above "Absolute Maximum Ratings" may cause permanent damage to the device. These are for stress ratings. Functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may remain possibility to affect device reliability.

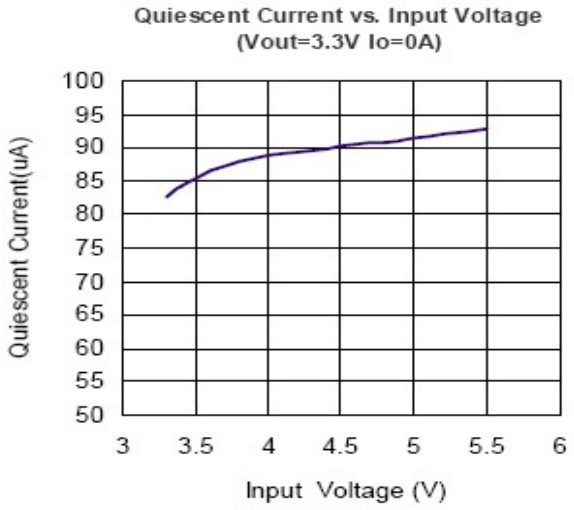
Note 2. The device is not guaranteed to function outside its operating conditions.

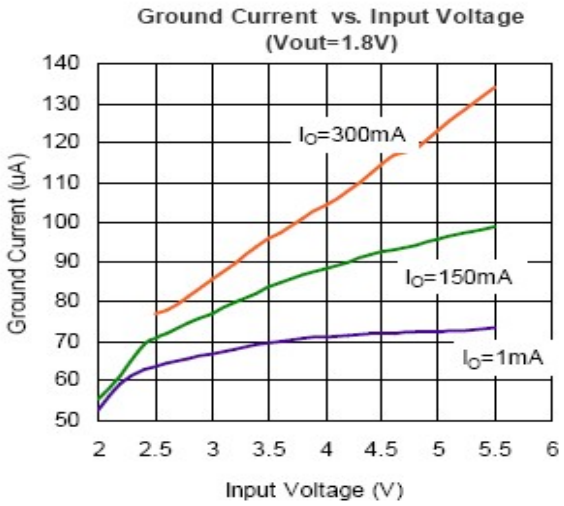
Note 3. The denotes is reliable by designed.

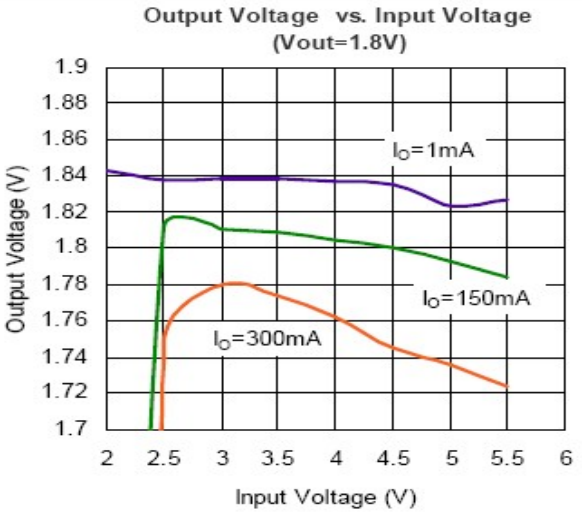
PTypical Performance Characteristics

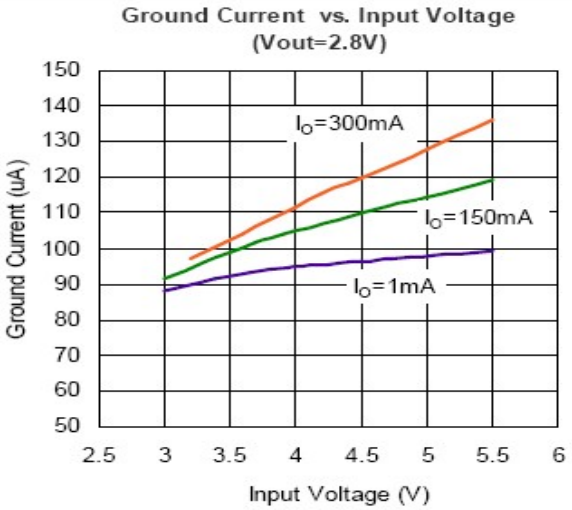


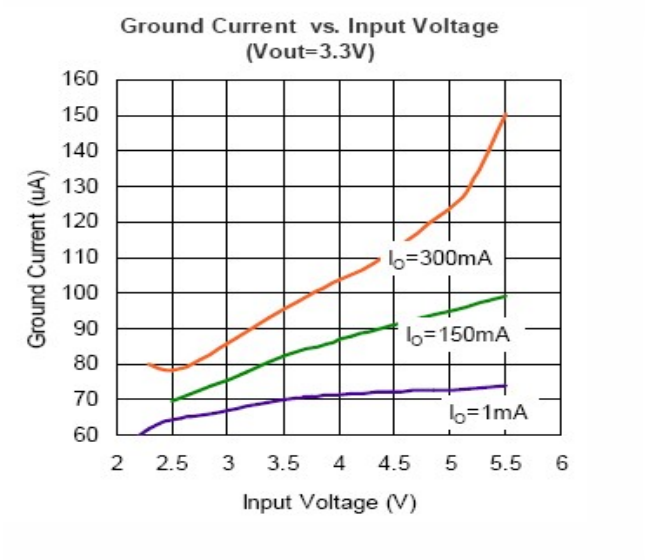


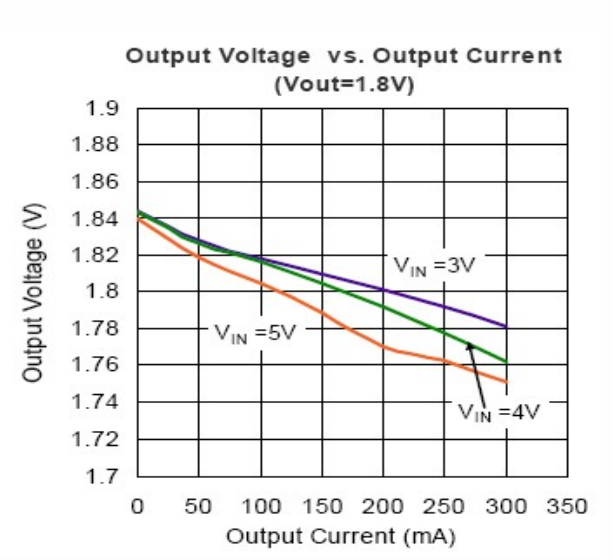


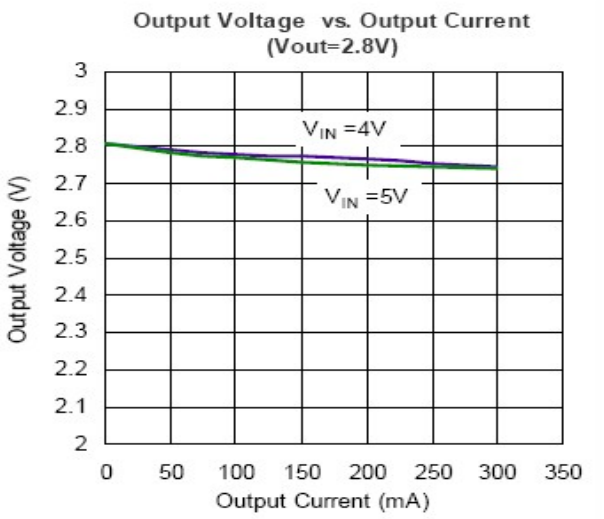


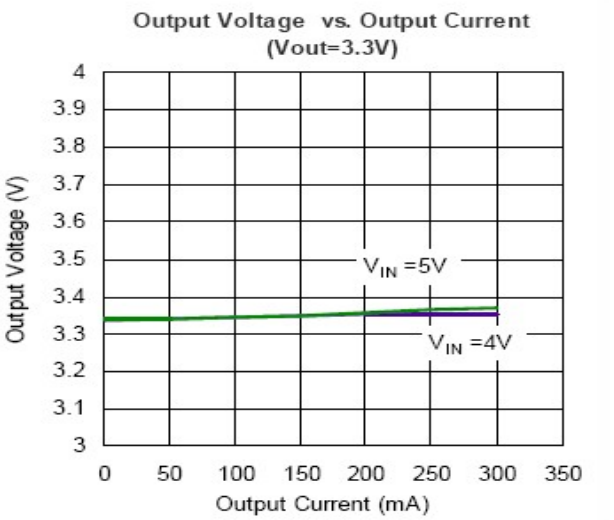


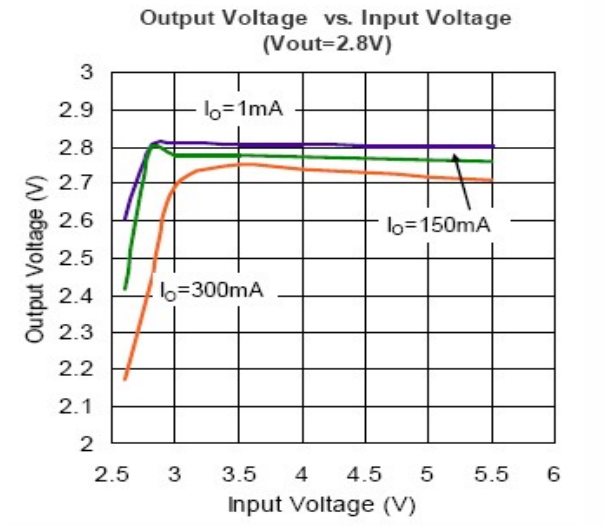


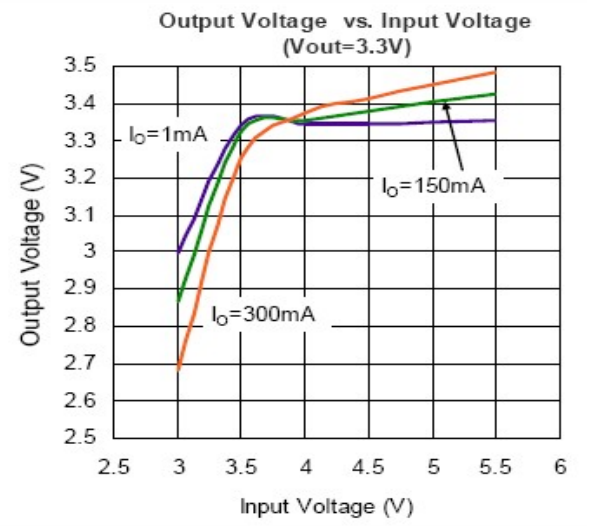

Ground Current vs. Input Voltage
(Vout=3.3V)
Ground Current (uA)
Input Voltage (V)
I_O=300mA
I_O=150mA
I_O=1mA


Output Voltage vs. Output Current
(Vout=1.8V)
Output Voltage (V)
Output Current (mA)
V_{IN} =3V
V_{IN} =5V
V_{IN} =4V

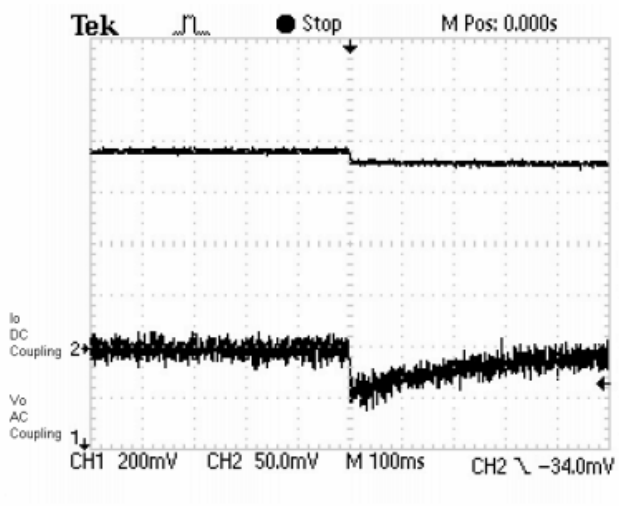

Output Voltage vs. Output Current
(Vout=2.8V)
Output Voltage (V)
Output Current (mA)
V_{IN} =4V
V_{IN} =5V


Output Voltage vs. Output Current
(Vout=3.3V)
Output Voltage (V)
Output Current (mA)
V_{IN} =5V
V_{IN} =4V

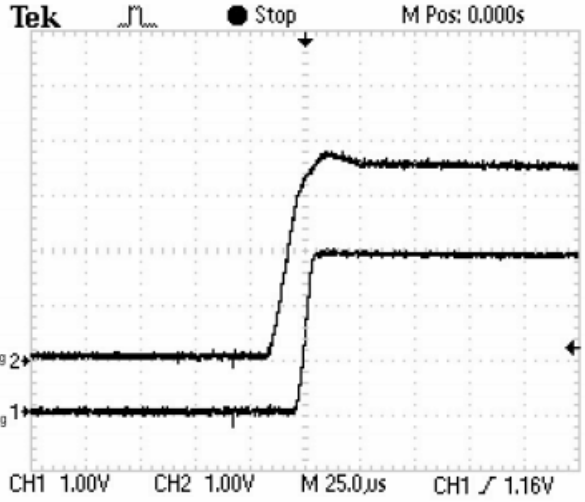

Output Voltage vs. Input Voltage
(Vout=2.8V)
Output Voltage (V)
Input Voltage (V)
I_O=1mA
I_O=150mA
I_O=300mA


Output Voltage vs. Input Voltage
(Vout=3.3V)
Output Voltage (V)
Input Voltage (V)
I_O=1mA
I_O=150mA
I_O=300mA

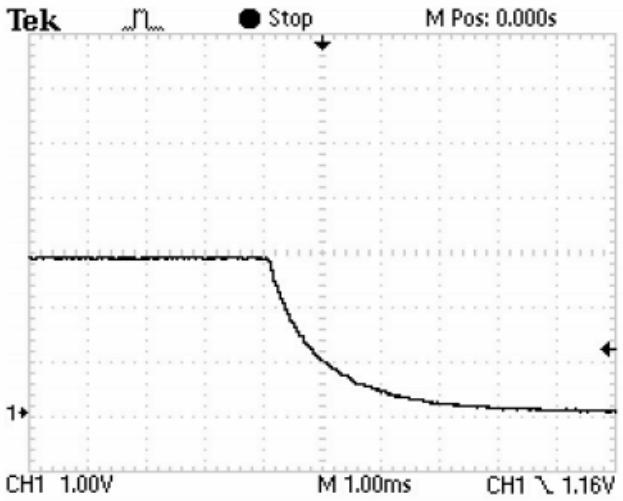
Load Transient Response



Turn-on Response



Turn-off Response



Application Information

The basic SC21L03 application circuit is shown in Typical Application Circuit. External component selection is determined by the maximum load

Output and Input Capacitor Selection

In continuous mode, the source current of the top MOSFET is a square wave of duty cycle VOUT/VIN.To prevent large voltage transients, a low ESR input capacitor sized for the maximum RMScurrent must be used. The maximum RMS capacitor current is given by:

$$C_{IN}\ \text{required}\ I_{RMS} \cong I_{OMAX}\frac{\left[V_{OUT}(V_{IN}-V_{OUT})\right]^{1/2}}{V_{IN}}$$

This formula has a maximum at VIN= 2VOUT, where IRMS=IOUT/2. This simple worst-case condition is commonly used for design because even significant deviations do not offer much relief. Note that the capacitor manufacturer'sripple current ratings are often based on 2000 hours of life. This makes it advisable to further derate the capacitor, or choose a capacitor rated at a higher temperature than required. Always consult the manufacturer if there is any question.

The selection of COUT is driven by the required effective series resistance (ESR).

Typically, once the ESR requirement for COUT has current and begins with the selection of the inductor value and operating frequency followed by CIN and COUT.

been met, the RMS current rating generally far exceeds the IRIPPLE(P-P) requirement. The output ripple△VOUT is determined by:

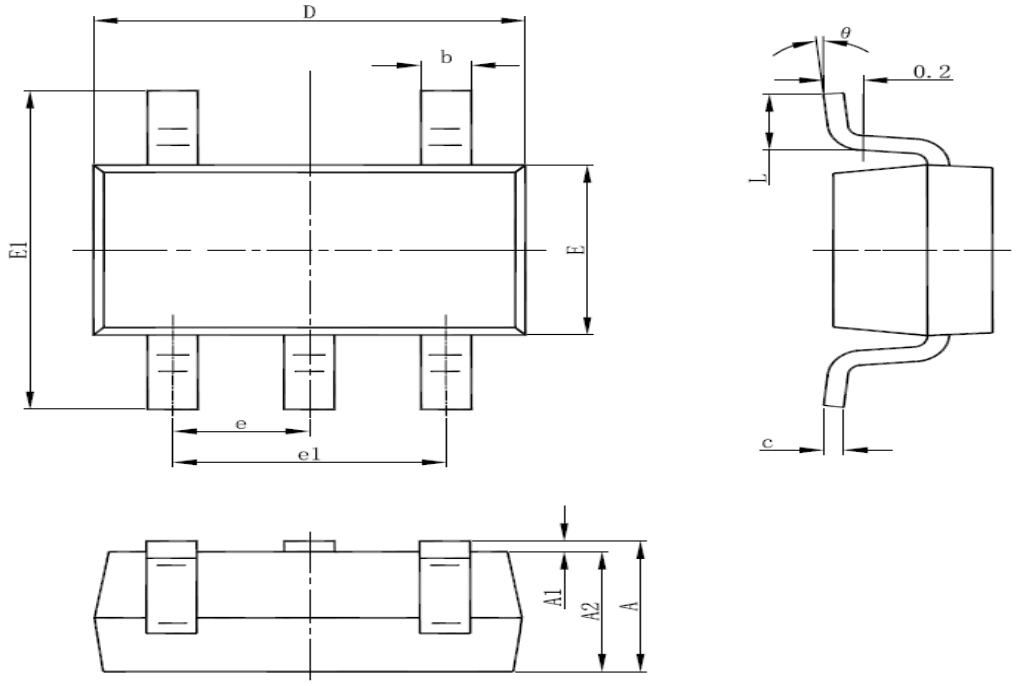
$$\Delta V_{OUT} \cong \Delta I_L\left(ESR+\frac{1}{8fC_{OUT}}\right)$$

Where f=operating frequency, COUT=output capacitance and △ IL=ripple current in the inductor. For a fixed output voltage, the output ripple is highest at maximum input voltage since △IL increases with input voltage.

Aluminum electrolytic and dry tantalum capacitors are both available in surface mount configurations. In the case of tantalum, it is critical that the capacitors are surge tested for use in switching power supplies. An excellent choice is the AVX TPS series of surface mount tantalum. These are specially constructed and tested for low ESR so they give the lowest ESR for a given volume. Other capacitor types include Sanyo POSCAP, Kemet T510 and T495 series, and Sprague 593D and 595D series. Consult the manufacturer for other specific recommendations.

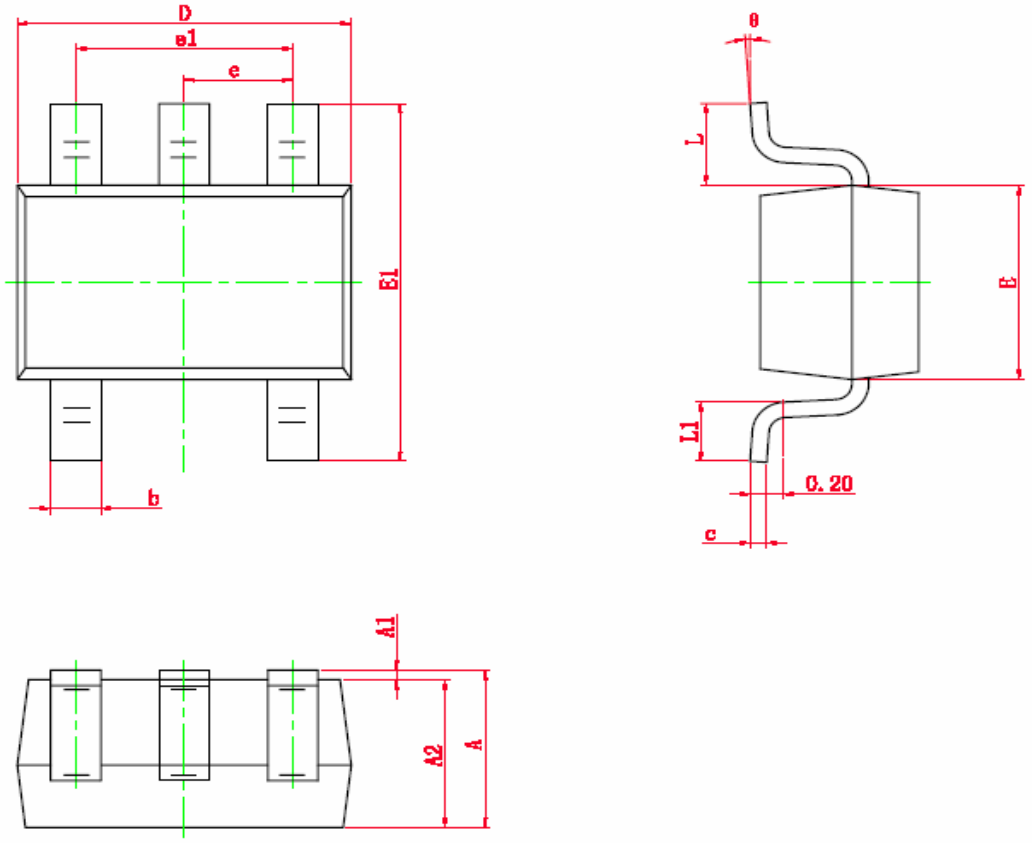
Packaging Information

SOT-23-5L Package Outline Dimension



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

SC70-5 Package Outline Dimension



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.900	1.100	0.035	0.043
A1	0.000	0.100	0.000	0.004
A2	0.900	1.000	0.035	0.039
b	0.150	0.350	0.006	0.014
c	0.080	0.150	0.003	0.006
D	2.000	2.200	0.079	0.087
E	1.150	1.350	0.045	0.053
E1	2.150	2.450	0.085	0.096
e	0.650 TYP		0.026 TYP	
e1	1.200	1.400	0.047	0.055
L	0.525 REF		0.021 REF	
L1	0.260	0.460	0.010	0.018
θ	0°	8°	0°	8°