

Technical Data  
Data Sheet N1582, Rev. -

**150mA, Low Noise, Low Dropout Linear Regulator**

**Description:**

The SULR1730 is a low noise, low dropout linear regulator, and is housed in a small SOT-23-5 package. The device is in the “ON” state when the SHDN pin is set to logic high level. A low dropout voltage of 90mV at 50mA load current is performed. It offers high precision output voltage of  $\pm 2\%$ . The quality of low quiescent current and low dropout voltage makes this device ideal for battery power applications. The internal reverse bias protection eliminates the requirement for a reverse voltage protection diode. The high ripple rejection and low noise provide enhanced performance for critical applications. The noise bypass pin can be connected an external capacitor to reduce the output noise level.

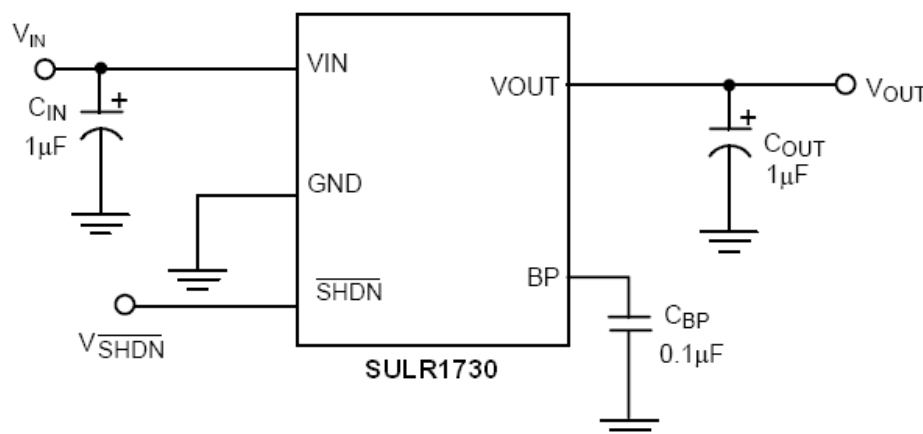
**Features:**

- Very Low Quiescent Current, 55 $\mu$ A
- Very Low Dropout Voltage, 90mV @ 50mA.
- Short Circuit and Thermal Protection.
- Available in  $\pm 2\%$  Output Tolerance.
- 1.8V to 3.3V Output Voltage with 0.1V Increment.
- Active Low Shutdown Control.
- Low Noise.
- Low Profile Package: SOT-23-5

**Applications:**

- Cellular Telephones.
- Pagers.
- Personal Communication Equipment.
- Cordless Telephones.
- Portable Instrumentation.
- Portable Consumer Equipment.
- Radio Control Systems.
- Low Voltage Systems.
- Battery Powered Systems.

**Typical application circuit:**



**Low Noise Low Dropout Linear Regulator**



## SULR1730

Technical Data  
Data Sheet N1582, Rev. -

### 150mA, Low Noise, Low Dropout Linear Regulator

#### Ordering Information:

SULR1730-XXXXX

PACKING TYPE  
TB: TUBE  
TR: TAPING & REEL

PACKAGING TYPE  
D: SOT-23-5

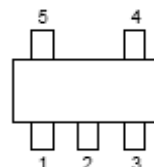
OUTPUT VOLTAGE  
18: 1.8V

.  
285: 2.85V

.  
33: 3.3V  
The output voltage is available by  
0.1V per step.

#### PIN CONFIGURATION

SOT-23-5  
TOP VIEW  
1: VIN  
2: GND  
3: SHDN  
4: BP  
5: VOUT



#### Marking Diagram:

Part No.	Marking
SULR1730-18DTR	EC18G
SULR1730-33DTR	EC33G
SULR1730-285DTR	EC2JG



**Absolute Maximum Ratings:**

Supply Voltage .....	12V
Shutdown Terminal Voltage.....	12V
Noise Bypass Terminal Voltage .....	5V
Operating Temperature Range .....	-40°C to 85°C
Maximum Junction Temperature .....	125°C
Storage Temperature Range .....	-65°C ~ 150°C
Lead Temperature (Soldering) 10 sec. ....	260°C
Thermal Resistance Junction to Case SOT-23-5 .....	130°C/W
Thermal Resistance Junction to Ambient SOT-23-5.....	220°C/W

(Assume no ambient airflow, no heatsink)

Absolute Maximum Ratings are those values beyond which the life of a device may be impaired.

**Test Circuit**

Refer to TYPICAL APPLICATION CIRCUIT

**Electrical Characteristics( $C_{IN} = 1\mu F$ ,  $C_{OUT} = 10\mu F$ ,  $T_J=25^\circ C$ , unless otherwise specified)(Note 1)**

PARAMETER	TEST CONDITIONS	SYMBOL	MIN.	TYP.	MAX.	UNIT	
Quiescent Current	$I_{OUT} = 0mA$ , $V_{IN} = 3.6\sim 12V$	$I_Q$		55	80	$\mu A$	
Standby Current	$V_{IN} = 3.6\sim 8V$ , output OFF	$I_{STBY}$			0.1	$\mu A$	
GND Pin Current	$I_{OUT} = 0.1\sim 150mA$	$I_{GND}$		55	80	$\mu A$	
Continuous Output Current	$V_{IN} = V_{OUT} + 1V$	$I_{OUT}$			150	mA	
Output Current Limit	$V_{IN} = V_{OUT} + 1V$ , $V_{OUT} = 0V$	$I_{IL}$	150	220		mA	
Output Voltage Tolerance	$V_{IN} = V_{OUT} + 1V$ , no load	$V_{OUT}$	-2		2	%	
Temperature Coefficient		TC		50	150	ppm/ $^\circ C$	
Line Regulation	$V_{IN} = V_{OUT(TYP)} + 1V$ to $V_{OUT(TYP)} + 6V$	$\Delta V_{LIR}$		2	7	mV	
Load Regulation	$V_{IN} = 5V$ , $I_{OUT} = 0.1\sim 150mA$	$\Delta V_{LOR}$		7	25	mV	
Dropout Voltage (1)	$I_{OUT} = 50 mA$	$V_{OUT} \geq 2.5V$	$V_{DROP1}$		90	160	mV
	$I_{OUT} = 100 mA$				140	230	mV
	$I_{OUT} = 150 mA$				200	350	mV
Dropout Voltage (2)	$I_{OUT} = 150 mA$	$V_{OUT} < 2.5V$	$V_{DROP2}$		700	mV	
Noise Bypass Terminal Voltage		$V_{REF}$		1.23		V	
Output Noise	$C_{BP} = 0.1\mu F$ , $f = 1KHz$ $V_{IN} = 5V$	$\Delta n$		0.46		$\frac{\mu V}{\sqrt{Hz}}$	
<b>SHUTDOWN TERMINAL SPECIFICATIONS</b>							
Shutdown Pin Current		$I_{SHDN}$			0.1	$\mu A$	
Shutdown Pin Voltage (ON)	Output ON	$V_{SHDN(ON)}$	1.6			V	
Shutdown Pin Voltage (OFF)	Output OFF	$V_{SHDN(OFF)}$			0.6	V	
Shutdown Exit Delay Time	$C_{BP} = 0.1\mu F$ , $C_{OUT} = 1\mu F$ , $I_{OUT} = 30mA$	$\Delta t$		300		$\mu S$	
<b>THERMAL PROTECTION</b>							
Thermal Shutdown Temperature		$T_{SD}$		155		$^\circ C$	
Thermal Shutdown Hysteresis	Guaranteed by design	$T_{HYST}$		20		$^\circ C$	

**Note 1:** Specifications are production tested at  $T_A=25^\circ C$ . Specifications over the  $-40^\circ C$  to  $85^\circ C$  operating temperature range are assured by design, characterization and correlation with Statistical Quality Controls (SQC).

- China - Germany - Korea - Singapore - United States •
- <http://www.smc-diodes.com> - [sales@smc-diodes.com](mailto:sales@smc-diodes.com) •

Typical Performance Characteristics

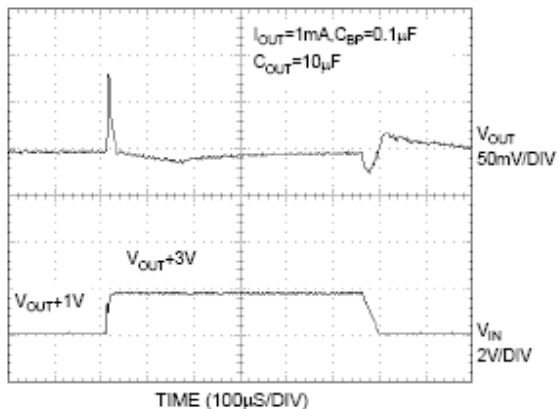


Fig. 1 Line Transient Response

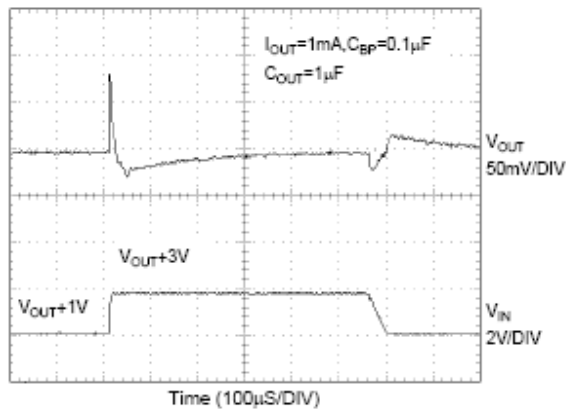


Fig. 2 Line Transient Response

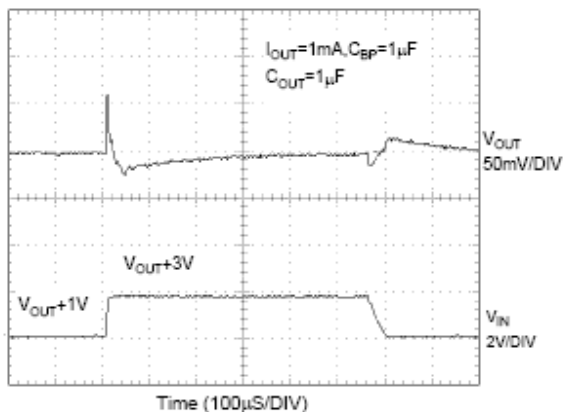


Fig. 3 Line Transient Response

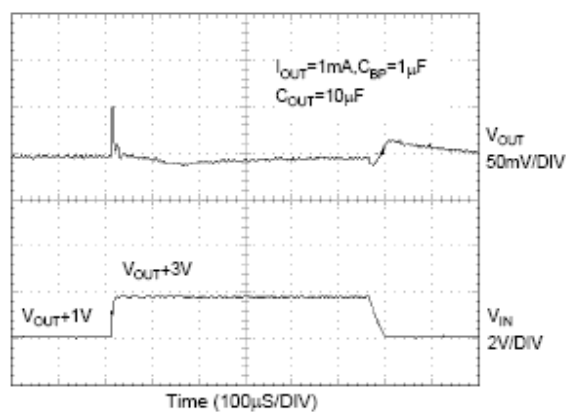


Fig. 4 Line Transient Response

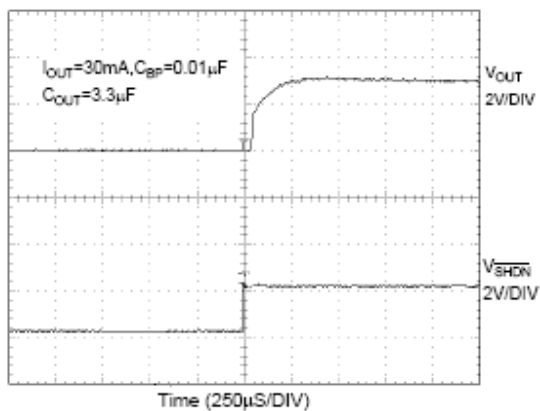


Fig. 5 Shutdown Exit Delay

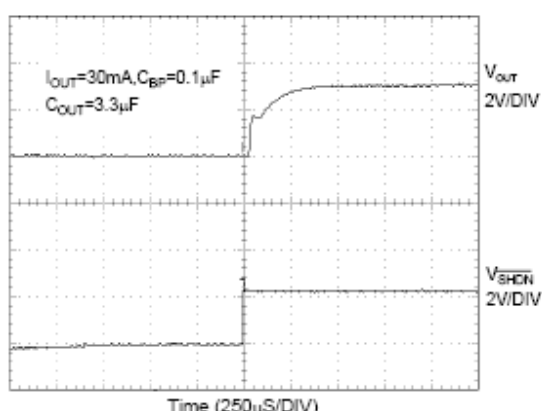


Fig. 6 Shutdown Exit Delay

Technical Data  
 Data Sheet N1582, Rev. -  
 Typical Performance Characteristics (Continued)

150mA, Low Noise, Low Dropout Linear Regulator

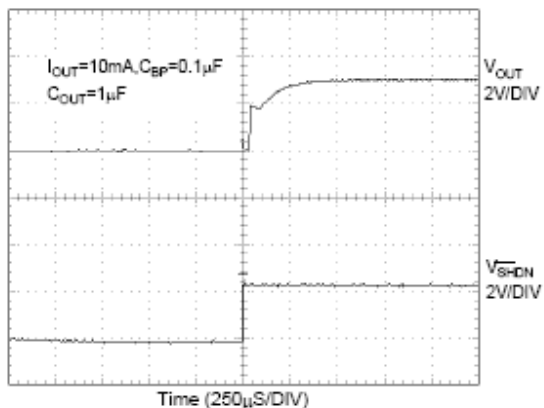


Fig. 7 Shutdown Exit Delay

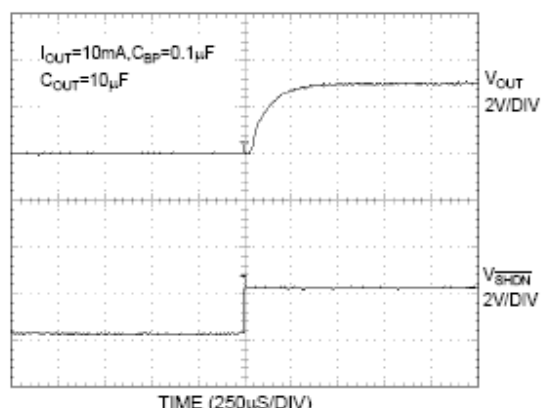


Fig. 8 Shutdown Exit Delay

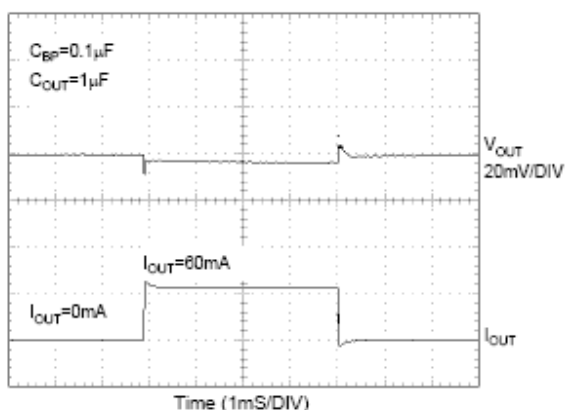


Fig. 9 Load Transient Response

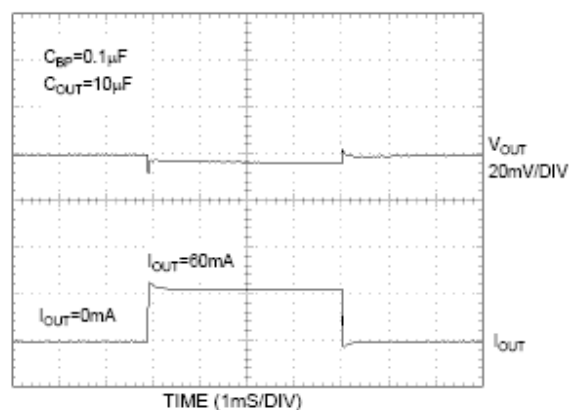


Fig. 10 Load Transient Response

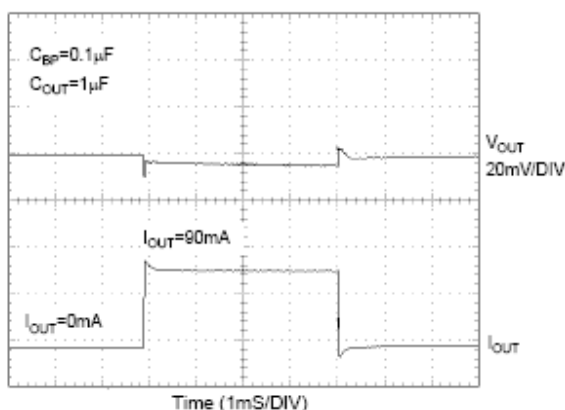


Fig. 11 Load Transient Response

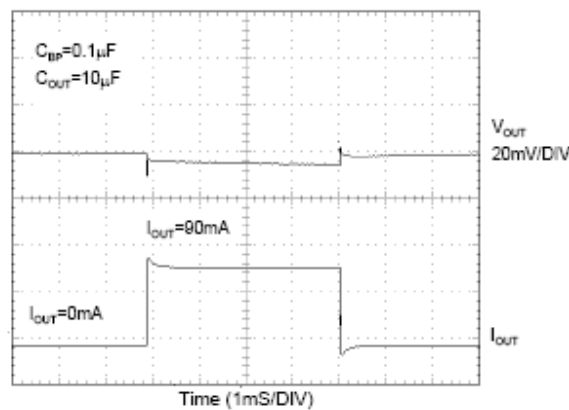


Fig. 12 Load Transient Response

Technical Data  
 Data Sheet N1582, Rev. -  
 Typical Performance Characteristics (Continued)

150mA, Low Noise, Low Dropout Linear Regulator

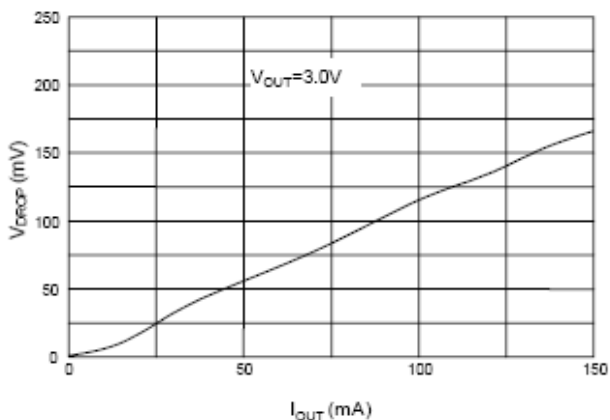


Fig. 13 Dropout Voltage vs. Output Current

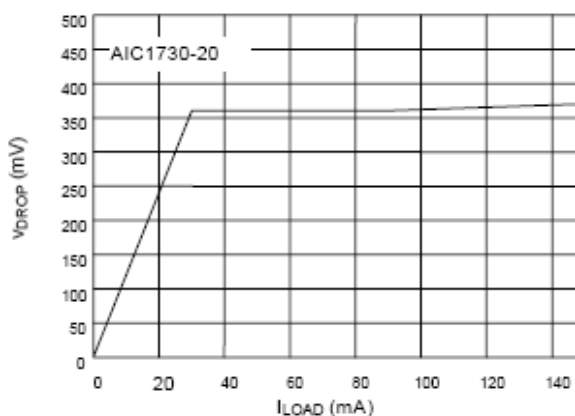


Fig. 14 Dropout Voltage vs. Output Current

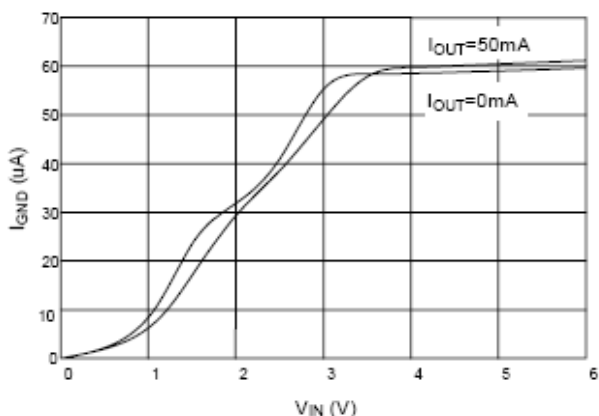


Fig. 15 Ground Current vs. Input Voltage (Vout=3.0V)

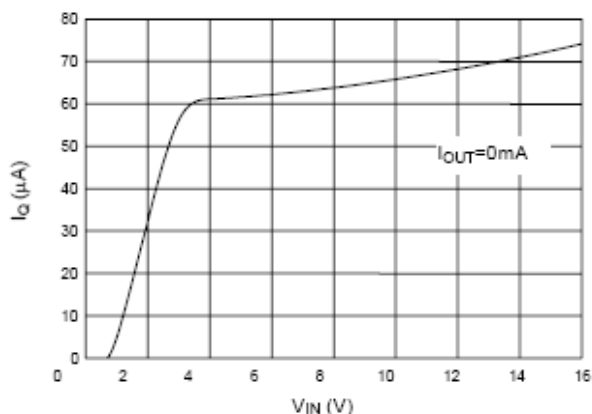


Fig. 16 Quiescent Current (ON Mode) vs. Input Voltage

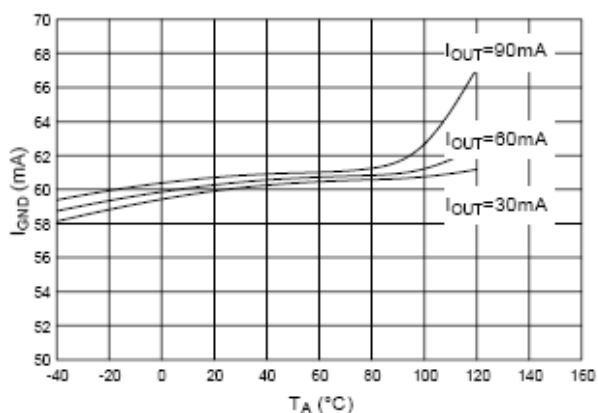


Fig. 17 Ground Current vs. Temperature

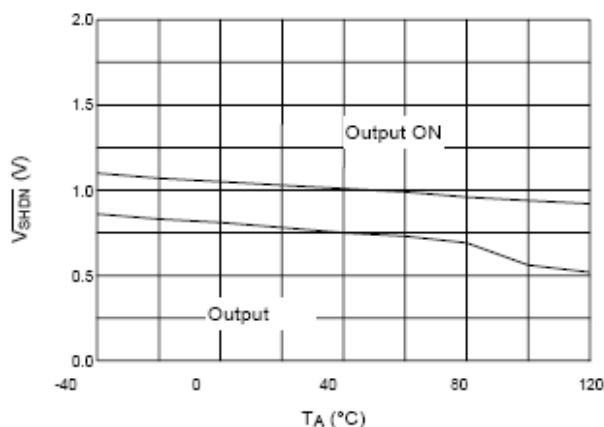


Fig. 18 Shutdown Voltage vs. Temperature

Typical Performance Characteristics (Continued)

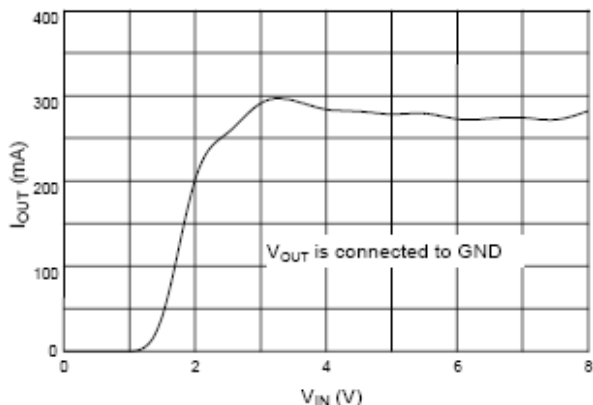


Fig. 19 Short Circuit Current vs. Input Voltage

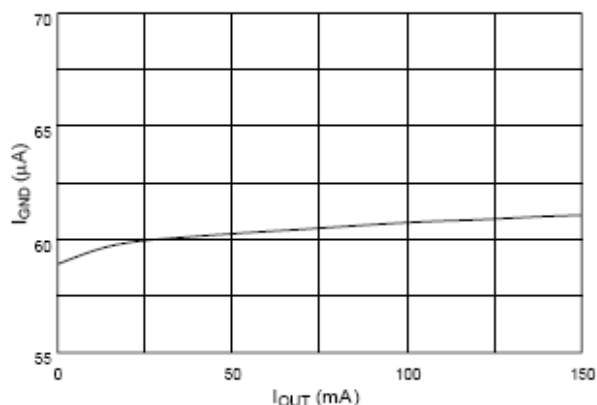


Fig. 20 Ground Current vs. Output Current

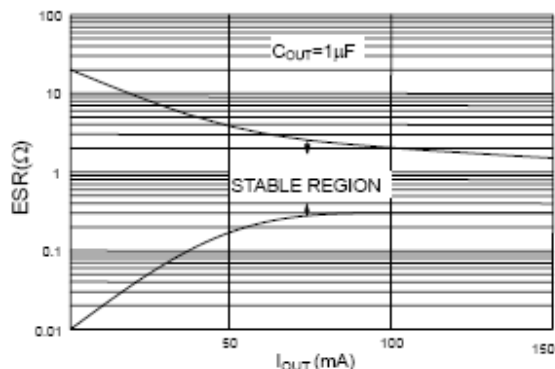


Fig. 21 Max Power Dissipation,  $C_{OUT}=1\mu F$

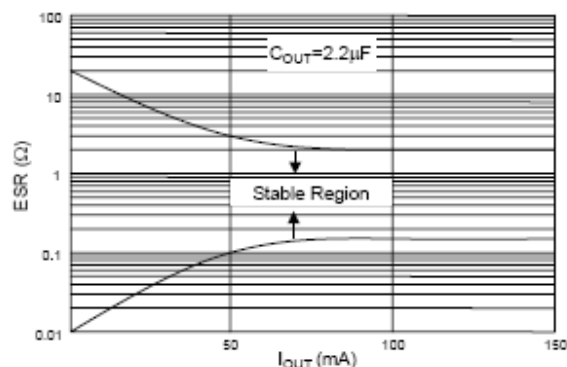


Fig. 22 Max Power Dissipation,  $C_{OUT}=2.2\mu F$

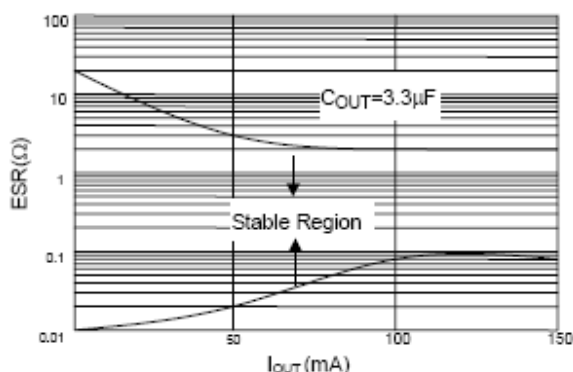


Fig. 23 Max Power Dissipation,  $C_{OUT}=3.3\mu F$

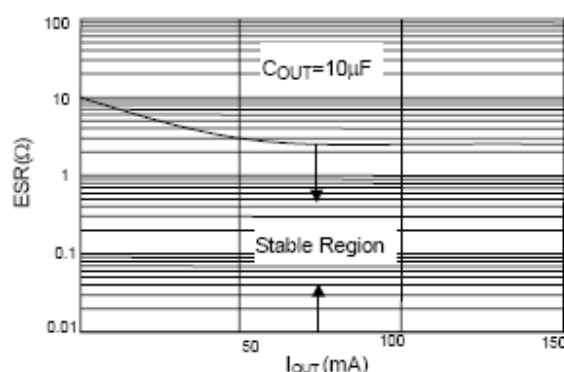
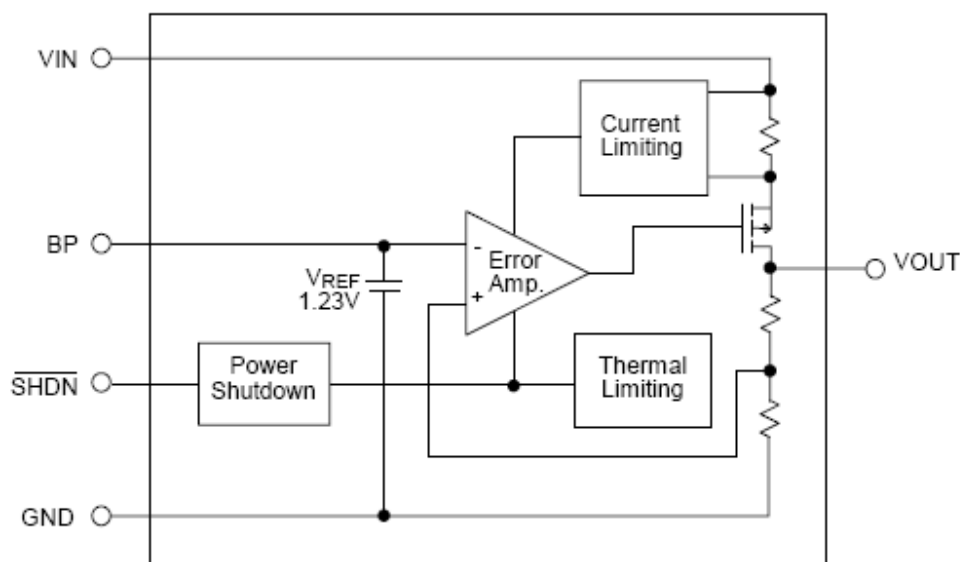


Fig. 24 Max Power Dissipation,  $C_{OUT}=10\mu F$



### Block Diagram



### Pin Descriptions

- PIN 1 : VIN - Power supply input pin. Bypass with a 1 $\mu$ F capacitor to GND
- PIN 2 : GND - Ground pin.
- PIN 3 : SHDN - Active-Low shutdown input pin.
- PIN 4 : BP - Noise bypass pin. An external bypass capacitor connecting to BP pin to reduce noises at the output.
- PIN 5 : VOUT - Output pin. Sources up to 150mA.



## Application Information

### INPUT-OUTPUT CAPACITORS

Linear regulators require input and output capacitors to maintain stability. Input capacitor at 1 $\mu$ F with 1 $\mu$ F aluminum electrolytic output capacitor is recommended. And it should be selected within the Equivalent Series Resistance (ESR) range as shown in the figure 21, 22, 23, and 24. ESR of ceramic capacitor is lower and its electrical characteristics (capacitance and ESR) vary widely over temperature. In general, tantalum or electric output capacitor is suggested for heavy load.

Normally, the output capacitor should be 1 $\mu$ F (aluminum electrolytic) at least and rates for operating temperature range. Note that it's important to check selected manufactures electrical characteristics (capacitance and ESR) over temperature.

### NOISE BYPASS CAPACITOR

0.1 $\mu$ F bypass capacitor at BP pin reduces output voltage noise. And the BP pin has to connect a capacitor to GND.

### POWER DISSIPATION

The maximum power dissipation of SULR1730 depends on the thermal resistance of its case and circuit board, the temperature difference between the die junction and ambient air, and the rate of airflow. The rate of temperature rise is greatly affected by the mounting pad configuration on the PCB, the board material, and the ambient temperature. When the IC mounting with good thermal conductivity is used, the junction temperature will be low even when large power dissipation applies.

The power dissipation across the device is  $P = I_{OUT} (V_{IN} - V_{OUT})$ .

The maximum power dissipation is:

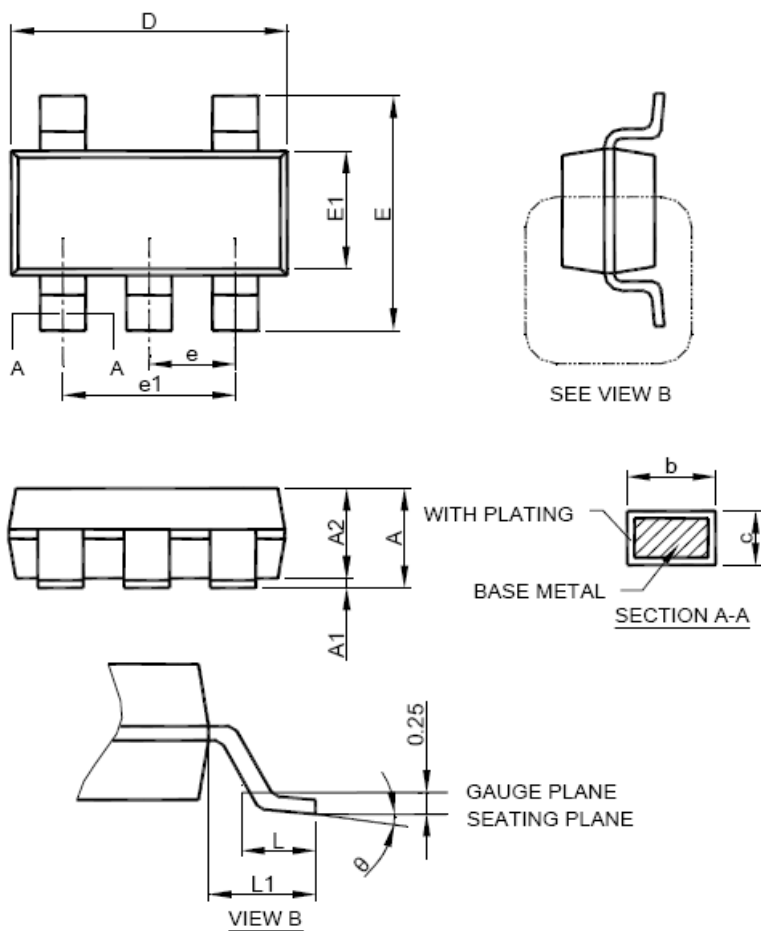
$$P_{MAX} = \frac{(T_J - T_A)}{(R_{\theta JB} + R_{\theta BA})}$$

Where  $T_J - T_A$  is the temperature difference between the die junction and the surrounding air,  $R_{\theta JB}$  is the thermal resistance of the package, and  $R_{\theta BA}$  is the thermal resistance through the PCB, copper traces, and other materials to the surrounding air.

As a general rule, the lower temperature is, the better reliability of the device is. So the PCB mounting pad should provide maximum thermal conductivity to maintain low device temperature. GND pin performs a dual function of providing an electrical connection to ground and channeling heat away. Therefore, connecting the GND pin to ground with a large pad or ground plane would increase the power dissipation and reduce the device temperature.

Physical Dimensions

SOT-23-5 (unit: mm)



SYMBOL	SOT-23-5	
	MILLIMETERS	
	MIN.	MAX.
A	0.95	1.45
A1	0.05	0.15
A2	0.90	1.30
b	0.30	0.50
c	0.08	0.22
D	2.80	3.00
E	2.60	3.00
E1	1.50	1.70
e	0.95 BSC	
e1	1.90 BSC	
L	0.30	0.60
L1	0.60 REF	
q	0°	8°

Note: 1. Refer to JEDEC MO-178AA.

2. Dimension "D" does not include mold flash, protrusions or gate burrs. Mold flash, protrusion or gate burrs shall not exceed 10 mil per side.

3. Dimension "E1" does not include inter-lead flash or protrusions.

4. Controlling dimension is millimeter, converted inch dimensions are not necessarily exact.



SULR1730

Technical Data  
Data Sheet N1582, Rev. -

150mA, Low Noise, Low Dropout Linear Regulator

**DISCLAIMER:**

- 1- The information given herein, including the specifications and dimensions, is subject to change without prior notice to improve product characteristics. Before ordering, purchasers are advised to contact the SMC - Sangdest Microelectronics (Nanjing) Co., Ltd sales department for the latest version of the datasheet(s).
- 2- In cases where extremely high reliability is required (such as use in nuclear power control, aerospace and aviation, traffic equipment, medical equipment, and safety equipment), safety should be ensured by using semiconductor devices that feature assured safety or by means of users' fail-safe precautions or other arrangement.
- 3- In no event shall SMC - Sangdest Microelectronics (Nanjing) Co., Ltd be liable for any damages that may result from an accident or any other cause during operation of the user's units according to the datasheet(s). SMC - Sangdest Microelectronics (Nanjing) Co., Ltd assumes no responsibility for any intellectual property claims or any other problems that may result from applications of information, products or circuits described in the datasheets.
- 4- In no event shall SMC - Sangdest Microelectronics (Nanjing) Co., Ltd be liable for any failure in a semiconductor device or any secondary damage resulting from use at a value exceeding the absolute maximum rating.
- 5- No license is granted by the datasheet(s) under any patents or other rights of any third party or SMC - Sangdest Microelectronics (Nanjing) Co., Ltd.
- 6- The datasheet(s) may not be reproduced or duplicated, in any form, in whole or part, without the expressed written permission of SMC - Sangdest Microelectronics (Nanjing) Co., Ltd.
- 7- The products (technologies) described in the datasheet(s) are not to be provided to any party whose purpose in their application will hinder maintenance of international peace and safety nor are they to be applied to that purpose by their direct purchasers or any third party. When exporting these products (technologies), the necessary procedures are to be taken in accordance with related laws and regulations..