

# 150mA, Low Power Consumption, High Voltage CMOS LDO Regulator

## FEATURES

- **Low Power Consumption**
- **150mA Nominal Output Current**
- **Low Dropout Voltage**
- **Low Temperature Coefficient**
- **High Input Voltage (up to 36V)**
- **Output Voltage Accuracy:  $\pm 2.5\%$**
- **Operating Temperature Range:  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$**
- **Micro SIZE PACKAGES: SOT23-3, SOT89-3L and SOT89-3L(L-Type)**

## APPLICATIONS

- **Audio/Video Equipment**
- **Communication Equipment**
- **Battery-Powered Equipment**
- **Laptop, Palmtops, Notebook Computers**

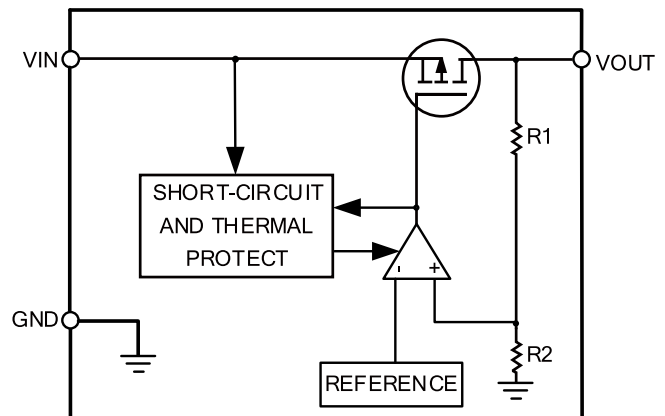
## DESCRIPTION

The RS3005 series is a set of low power high voltage regulators implemented in CMOS technology. It can operate from 2.5V to 36V, which can provide 150mA output current. The device allows input voltage as high as 36V.

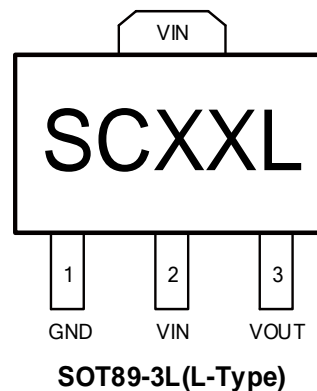
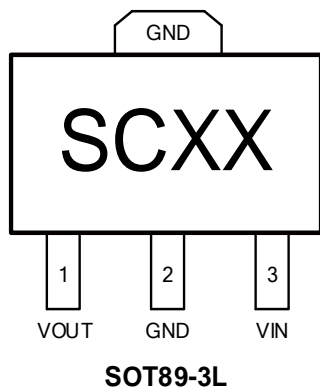
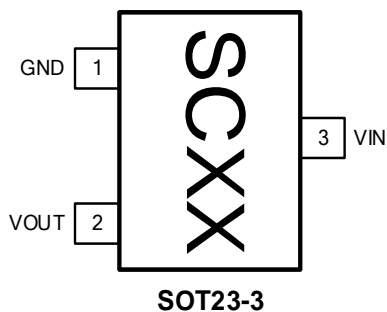
The RS3005 series is available in several fixed output voltages. CMOS technology ensures low dropout voltage and low quiescent current.

The RS3005 is available in Green SOT23-3 and SOT89-3L packages. It operates over an ambient temperature range of  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ .

## Function Block Diagram



## PIN CONFIGURATIONS



NOTE: XX indicate Output Voltage  
For example: SC33 ( $V_{OUT}=3.3V$ )

## PIN DESCRIPTION

NAME	PIN			FUNCTION
	SOT23-3	SOT89-3L	SOT89-3L (L-Type)	
GND	1	2	1	Ground.
VIN	3	3	2	Regulator Input. Up to 36V input voltage. At least 1 $\mu$ F supply bypass capacitor is recommended.
VOUT	2	1	3	Regulator Output. Recommended output capacitor range: 1 $\mu$ F to 10 $\mu$ F.

**ABSOLUTE MAXIMUM RATINGS <sup>(1)</sup>**

V <sub>IN</sub> to GND.....	-0.3 to 40V
V <sub>OUT</sub> to GND.....	-0.3V to Min (V <sub>IN</sub> + 0.3V, 7V)
Power Dissipation, P <sub>D</sub> @ T <sub>A</sub> = 25°C	
SOT23-3 .....	0.31W
SOT89-3L .....	1.3W
SOT89-3L(L-Type) .....	0.6W
Junction Temperature.....	+150°C
Operating Temperature Range .....	-40°C to +85°C
Package Thermal Resistance @ T <sub>A</sub> = 25°C	
SOT23-3.....	320°C/W
SOT89-3L.....	75°C/W
SOT89-3L(L-Type) .....	165°C/W
Storage Temperature Range.....	-65°C to +150°C
Lead Temperature (Soldering, 10s) .....	260°C
ESD Susceptibility	
HBM .....	1000V
MM .....	100V


**ESD SENSITIVITY CAUTION**

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

(1) Stresses above these ratings may cause permanent damage. Exposure to absolute maximum conditions for extended periods may degrade device reliability. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those specified is not implied.

**PACKAGE/ORDERING INFORMATION**

PRODUCT	ORDERING NUMBER	V <sub>OUT</sub> (V)	PACKAGE LEAD	PACKAGE MARKING	PACKAGE OPTION
RS3005-3.3	RS3005-3.3YF3	3.3	SOT23-3	SC33 XXXX	Tape and Reel,3000
	RS3005-3.3YE3	3.3	SOT89-3L	SC33 XXXX	Tape and Reel,1000
	RS3005-3.3YE3L	3.3	SOT89-3L (L-Type)	SC33L XXXX	Tape and Reel,1000
RS3005-5.0	RS3005-5.0YF3	5.0	SOT23-3	SC50 XXXX	Tape and Reel,3000
	RS3005-5.0YE3	5.0	SOT89-3L	SC50 XXXX	Tape and Reel,1000
	RS3005-5.0YE3L	5.0	SOT89-3L (L-Type)	SC50L XXXX	Tape and Reel,1000

NOTE: XXXX = Date Code and Vendor Code.

**ELECTRICAL CHARACTERISTICS**

 (V<sub>IN</sub> = V<sub>OUT</sub> + 2V, C<sub>IN</sub> = C<sub>OUT</sub> = 1μF, Full = -40°C to +85°C, typical values are at T<sub>A</sub> = +25°C, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS	
Input Voltage	V <sub>IN</sub>	V <sub>OUT</sub> = 3.3V	+25°C	2.5 <sup>(1)</sup>		36	V	
Output Voltage Accuracy		I <sub>OUT</sub> = 1mA	+25°C	-2.5	0	2.5	%	
Ground Pin Current		No load	+25°C	V <sub>IN</sub> = V <sub>OUT</sub> + 2V		11	18	μ A
				V <sub>IN</sub> = 36V		16	25	
		I <sub>OUT</sub> = 50mA			11			
Maximum Output Current <sup>(2)</sup>			+25°C	150			mA	
Dropout Voltage <sup>(3)</sup>	V <sub>DROP</sub>	I <sub>OUT</sub> = 150mA	+25°C		1300	1800	mV	
Line Regulation	$\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$	V <sub>IN</sub> = V <sub>OUT</sub> + 2V to 36V, I <sub>OUT</sub> = 1mA	+25°C		0.005	0.012	%/V	
Load Regulation	ΔV <sub>OUT</sub>	V <sub>IN</sub> = V <sub>OUT</sub> + 2V, I <sub>OUT</sub> = 1mA to 150mA	+25°C		10	25	mV	
Power Supply Rejection Ratio	PSRR	V <sub>OUT</sub> = 3.3V, I <sub>OUT</sub> = 10mA	+25°C	f = 217Hz		65	dB	
				f = 1KHz		63		
Output Voltage Temperature Coefficient <sup>(4)</sup>	$\frac{\Delta V_{OUT}}{\Delta T_A \times V_{OUT}}$	I <sub>OUT</sub> = 1mA	FULL		70		ppm/°C	
<b>THERMAL PROTECTION</b>								
Thermal Shutdown Temperature	T <sub>SHDN</sub>				120		°C	

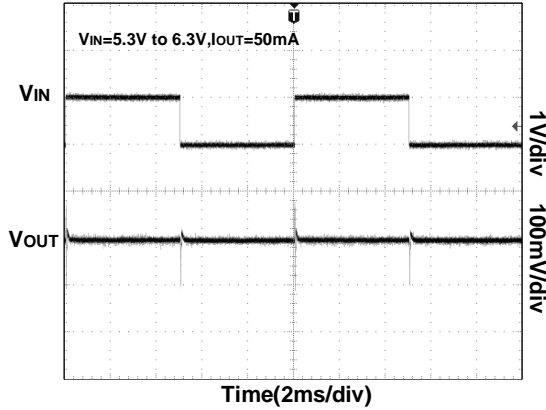
**NOTES:**

- V<sub>IN</sub> = V<sub>OUT</sub> (NOMINAL) or 2.5V, whichever is greater.
- Maximum output current is affected by the PCB layout, size of metal trace, the thermal conduction path between metal layers, ambient temperature and the other environment factors of system. Attention should be paid to the dropout voltage when V<sub>IN</sub> < V<sub>OUT</sub> + V<sub>DROP</sub>.
- The dropout voltage is defined as V<sub>IN</sub> - V<sub>OUT</sub>, when V<sub>OUT</sub> is 100mV below the value of V<sub>OUT</sub> for V<sub>IN</sub> = V<sub>OUT</sub> (NOMINAL) + 2V.
- Output voltage temperature coefficient is defined as the worst-case voltage change divided by the total temperature range.

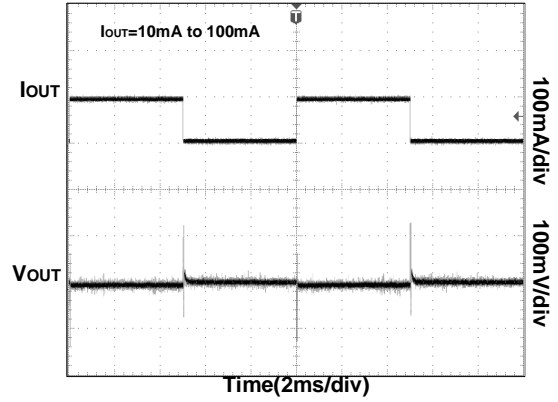
### TYPICAL CHARACTERISTICS

$V_{IN} = 5.3V$ ,  $V_{OUT} = 3.3V$ ,  $C_{IN} = C_{OUT} = 1\mu F$ ,  $T_A = 25^\circ C$  unless otherwise noted.

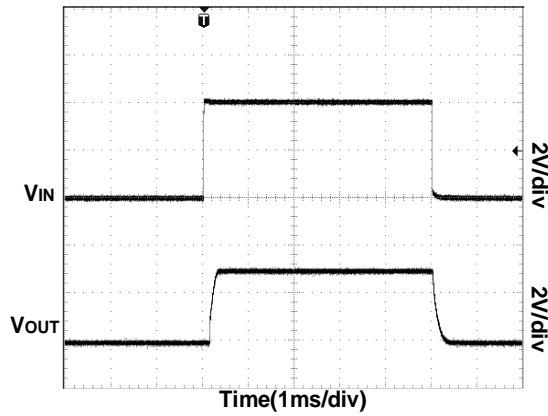
Line-Transient Response



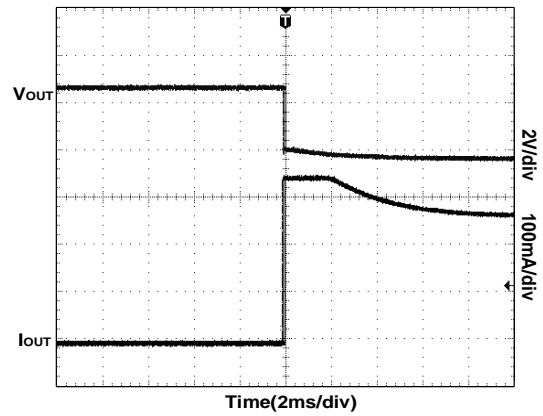
Load-Transient Response



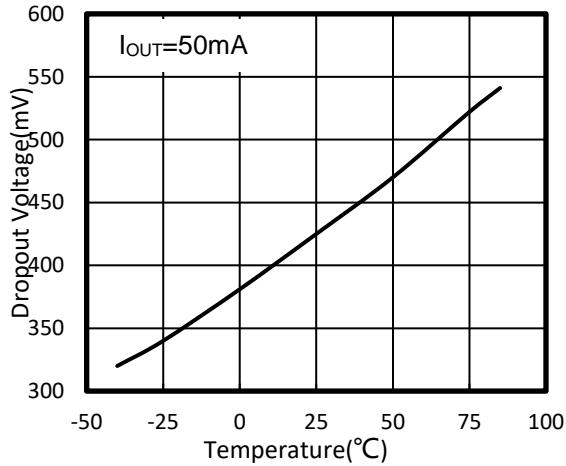
Power-Up/Power-Down Output Waveform



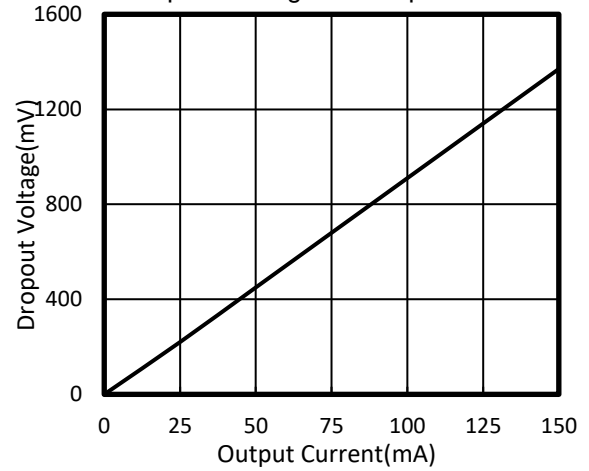
Output Short Waveform



Dropout Voltage vs. Temperature



Dropout Voltage vs. Output Current



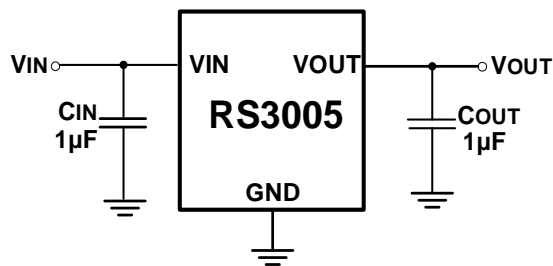
## APPLICATION NOTES

### Input Capacitor and Output Capacitor

For proper operation, using a ceramic capacitor ( $C_{IN}$ ) between  $1\mu\text{F}$  and  $10\mu\text{F}$  between the input pin and ground. The input capacitor must be located a distance of not more than 0.5 inch from the input pin of the IC and returned to a clean analog ground. The capacitor with larger value and lower ESR (equivalent series resistance) provides better PSRR and line-transient response. The output capacitor must meet both requirements for minimum amount of capacitance and ESR in all LDOs application for stable operation, use a ceramic capacitor ( $C_{OUT}$ ) between  $1\mu\text{F}$  and  $10\mu\text{F}$ . Larger values in this range will help improve load transient response and reduce noise. Output capacitors of other dielectric types may be used, but are not recommended as their capacitance can deviate greatly from their rated value over temperature.

### Thermal Considerations

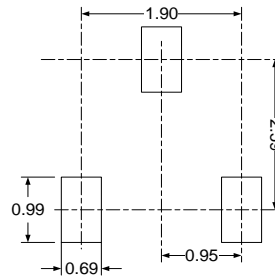
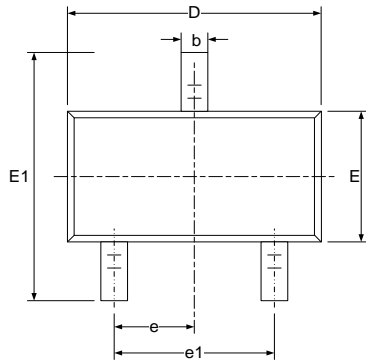
When the junction temperature is too high, the thermal protection circuitry sends a signal to the control logic that will shut down the IC. The IC will restart when the temperature has sufficiently cooled down. The maximum power dissipation is dependent on the thermal resistance of the case and the circuit board, the temperature difference between the die junction and the ambient air, and the rate of air flow. The GND pin must be connected to the ground plane for proper dissipation.



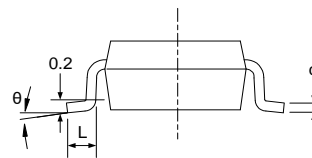
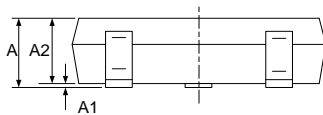
Typical Application Circuit

# PACKAGE OUTLINE DIMENSIONS

## SOT23-3

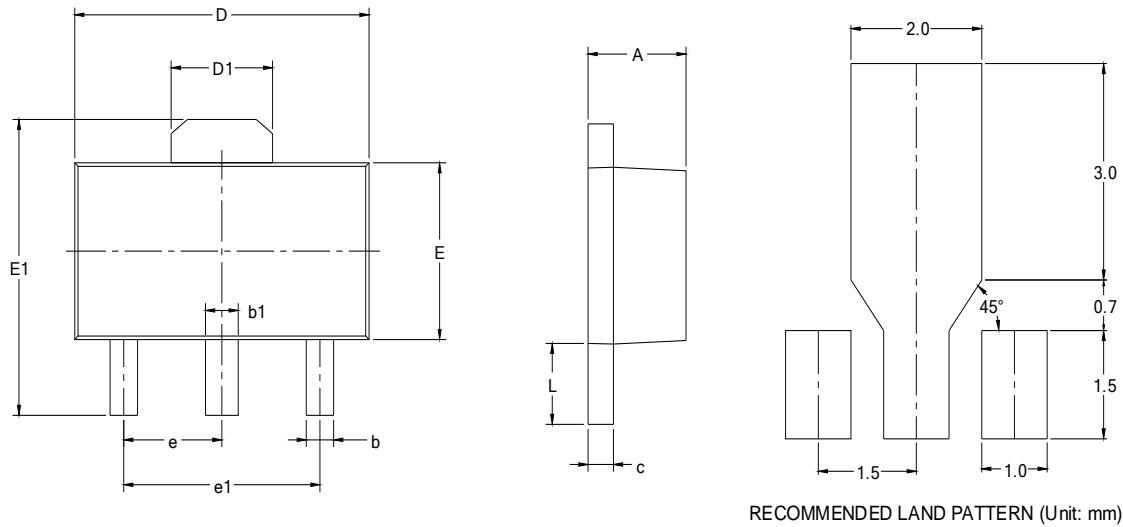


RECOMMENDED LAND PATTERN (Unit: mm)



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
$\theta$	0°	8°	0°	8°

# SOT89-3L



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.400	1.600	0.055	0.063
b	0.320	0.520	0.013	0.020
b1	0.400	0.580	0.016	0.023
c	0.350	0.440	0.014	0.017
D	4.400	4.600	0.173	0.181
D1	1.550 REF		0.061 REF	
E	2.300	2.600	0.091	0.102
E1	3.940	4.250	0.155	0.167
e	1.500 BSC		0.060 BSC	
e1	3.000 BSC		0.118 BSC	
L	0.900	1.200	0.035	0.047