

300mA LOW POWER LDO

FEATURES

- **Low Quiescent Current I_{Q} : 3uA Typical at Light Loads**
- **300mA Output Current**
- **Low Dropout Voltage**
- **Low Temperature Coefficient**
- **High Input Voltage (up to 45V)**
- **Output Voltage Accuracy: $\pm 2\%$**
- **Fixed 1.8V、2.5V、3.0V、3.3V、3.6V and 5V Output Voltage**
- **Over temperature protection and over-current protection function**
- **Micro SIZE PACKAGES: SOT23-3、SOT89-3 (L-Type)**

APPLICATIONS

- **Smart Power Network Equipment**
- **Portable Power Tools**
- **BMS systems**
- **Motor control system/Industrial control system**
- **Power Meter/Instrument**
- **Vehicle-mounted system**
- **Firefighting / security equipment**
- **Consumer products**

DESCRIPTION

The RS73xx-1 series is a set of low dropout linear regulators implemented in CMOS technology. Which can provide 300mA output current. The device allows input voltage as high as 45V. It is very suitable for multicell battery systems, bus voltage power supply systems and other high DC voltage systems. Wide input voltage can make it well withstand the impact of surge voltage and ensure the stability of output voltage.

The RS73xx-1 series only 3uA (typical) current is consumed by itself, which is especially important in multi-battery power supply systems and can reduce the standby power consumption of the whole system.

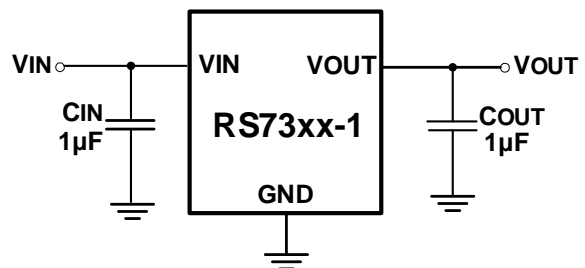
The RS73xx-1 is available in Green SOT23-3 and SOT89-3 (L-Type) packages. Meet the requirements of dissipative power for different applications.

Device Information (1)

PART NUMBER	PACKAGE	BODY SIZE(NOM)
RS73xx-1	SOT23-3	1.60mm×2.92mm
	SOT89-3	2.45mm×4.50mm

Note: XX represents output voltage

Typical Application Schematic

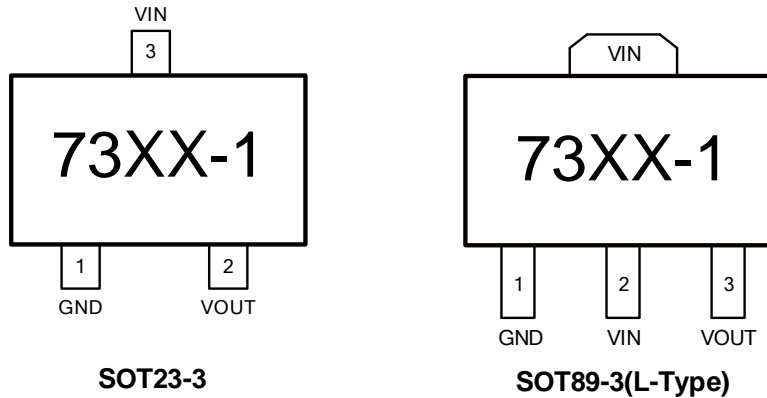


Revision History

Note: Page numbers for previous revisions may differ from page numbers in the current version.

Version	Change Date	Change Item
A.4	2024/03/07	(1) Change SOT23-3 and SOT89-3 (L-Type) Thermal Information on Page 4 @A.3 Version. (2) Add the TAPE AND REEL INFORMATION (3) Modify packaging naming

Pin Configuration and Functions (Top View)



**NOTE: XX indicate Output Voltage, xx indicate Date Code
For example: 7333-1($V_{OUT}=3.3V$)**

PIN DESCRIPTION

NAME	PIN		FUNCTION
	SOT23-3	SOT89-3(L-Type)	
GND	1	1	Ground.
VOUT	2	3	Output Pin. Recommended output capacitor range: $1\mu F$ to $10\mu F$.
VIN	3	2	Input Pin. At least $1\mu F$ supply bypass capacitor is recommended.
EN	/	/	Enable Pin. EN pin voltage is higher than $V_{EN(H)}$ enable output and lower than $V_{EN(L)}$ close output.
NC	/	/	No connection

PACKAGE/ORDERING INFORMATION

PRODUCT	ORDERING NUMBER	V _{OUT} (V)	PACKAGE LEAD	PACKAGE MARKING ⁽¹⁾	PACKAGE OPTION
RS7318-1	RS7318-1YF3	1.8	SOT23-3	7318	Tape and Reel,3000
	RS7318-1YE3L	1.8	SOT89-3(L-Type)	7318	Tape and Reel,1000
RS7325-1	RS7325-1YF3	2.5	SOT23-3	7325	Tape and Reel,3000
	RS7325-1YE3L	2.5	SOT89-3(L-Type)	7325	Tape and Reel,1000
RS7330-1	RS7330-1YF3	3.0	SOT23-3	7330	Tape and Reel,3000
	RS7330-1YE3L	3.0	SOT89-3(L-Type)	7330	Tape and Reel,1000
RS7333-1	RS7333-1YF3	3.3	SOT23-3	7333	Tape and Reel,3000
	RS7333-1YE3L	3.3	SOT89-3(L-Type)	7333	Tape and Reel,1000
RS7336-1	RS7336-1YF3	3.6	SOT23-3	7336	Tape and Reel,3000
	RS7336-1YE3L	3.6	SOT89-3(L-Type)	7336	Tape and Reel,1000
RS7350-1	RS7350-1YF3	5.0	SOT23-3	7350	Tape and Reel,3000
	RS7350-1YE3L	5.0	SOT89-3(L-Type)	7350	Tape and Reel,1000

NOTE:

(1) There may be additional marking, which relates to the lot trace code information (data code and vendor code), the logo or the environmental category on the device.

SPECIFICATIONS

Absolute Maximum Ratings

over operating free-air temperature range (unless otherwise noted) ⁽¹⁾ ⁽²⁾

		MIN	MAX	UNIT
V _{IN}	Input voltage	-0.3	48	V
V _{EN}	V _{EN} voltage range	-0.3	V _{IN}	V
T _J	PN Junction temperature	-40	175	°C
P _D	Continuous power dissipation ⁽³⁾	Internal thermal protection temperature limit		W
T _{stg}	Storage temperature range	-55	150	°C

(1) Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under Recommended Operating Conditions is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

(2) All voltages are with respect to the GND pin.

(3) Internal thermal shutdown circuitry protects the device from permanent damage. The actual chip output current is subject to the input-output voltage difference, ambient temperature and PCB heat dissipation design.

ESD Ratings

		VALUE	UNIT	
V _(ESD)	Electrostatic discharge	Human-body model (HBM)	±4000	V
		Charge device model (CDM)	±1500	V

Recommended Operating Conditions

over operating free-air temperature range (unless otherwise noted) ⁽¹⁾

		MIN	MAX	UNIT
V _{IN}	Input supply voltage	2.5	45	V
I _{OUT}	Output current	0	300	mA
C _{IN}	Input pin capacitance	1	10	uF
C _{OUT}	Output pin capacitance	1	10	uF
ESR	Capacitance equivalent resistance	5	100	mΩ
T _A	Operating temperature	-40	+85 ⁽²⁾	°C

(1) All voltage is with respect to the GND pin.

(2) The operating temperature of the actual chip depends on the PN junction temperature. Please refer to the detailed calculation method in the application precautions section.

Thermal Information

THERMAL METRIC		RS73xx-1		UNIT
		SOT23-3	SOT89-3(L-Type)	
		3 PINS	3 PINS	
R _{θJA}	Junction-to-ambient thermal resistance	312.5	208.3	°C/W
R _{θJC(top)}	Junction-to-case (top) thermal resistance	134.3	88.5	°C/W
R _{θJB}	Junction-to-board thermal resistance	84.5	39.6	°C/W
ψ _{JT}	Junction-to-top characterization parameter	4.8	26.5	°C/W
ψ _{JB}	Junction-to-board characterization parameter	81.5	49.7	°C/W
R _{θJC(bot)}	Junction-to-case (bottom) thermal resistance	N/A	77.7	°C/W
P _D	Power Dissipation	0.4	0.6	W

ELECTRICAL CHARACTERISTICS

($V_{IN} = V_{OUT} + 2V$, $C_{IN} = C_{OUT} = 1\mu F$, Full = $-40^{\circ}C$ to $+85^{\circ}C$, typical values are at $T_A = +25^{\circ}C$, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS	
Input Voltage ⁽¹⁾	V_{IN}		$+25^{\circ}C$	2.5 ⁽¹⁾		45	V	
Output Voltage Accuracy		$I_{OUT} = 10mA$	$+25^{\circ}C$	-2.0		2.0	%	
Static power consumption	I_Q	$I_{OUT} = 0mA$	$+25^{\circ}C$		3.0	4.0	μA	
Shutdown Current	I_{Q-OFF}	$V_{EN} = 0V$	$+25^{\circ}C$		0.1	1.0	μA	
Output current ⁽²⁾			$+25^{\circ}C$	300	350	-	mA	
Dropout Voltage ⁽³⁾	$V_{DROPOUT}$ $I_{OUT} = 100mA$	$V_{OUT} = 1.8V$	$+25^{\circ}C$	-	450	550	mV	
		$V_{OUT} = 2.5V$		-	385	485		
		$V_{OUT} = 3.0V$		-	350	450		
		$V_{OUT} = 3.3V$		-	335	435		
		$V_{OUT} = 5.0V$		-	300	400		
Line Regulation	$\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$	$V_{IN} = V_{OUT} + 2V$ to $36V$, $I_{OUT} = 1mA$	$+25^{\circ}C$	-	0.05	0.2	%/V	
Load Regulation	ΔV_{OUT}	$V_{IN} = V_{OUT} + 1V$, $I_{OUT} = 1mA$ to $50mA$	$+25^{\circ}C$	-	5	20	mV	
Output limiting current	I_{LMT}	$V_{IN} = V_{OUT} + 1V$	$+25^{\circ}C$	300	450	-	mA	
short-circuit current	I_{short}	$V_{OUT} = 0$	$+25^{\circ}C$	-	100	-	mA	
Power Supply Rejection Ratio	PSRR	$V_{OUT} = 3.3V$, $I_{OUT} = 10mA$	$+25^{\circ}C$	$f = 217Hz$	-	72	-	dB
				$f = 1KHz$	-	77	-	
				$f = 10KHz$	-	60	-	
Enable pin threshold	V_{ENH}		$+25^{\circ}C$	1.2	-	-	V	
	V_{ENL}			-	-	0.4	V	
Output Voltage Temperature Coefficient ⁽⁴⁾	$\frac{\Delta V_{OUT}}{\Delta T_A \times V_{OUT}}$	$I_{OUT} = 1mA$	FULL	-	100	-	ppm/ $^{\circ}C$	
Output noise voltage	e_n	$V_{IN} = V_{OUT} + 1V$, $I_{OUT} = 1mA$, $V_{OUT} = 3.0V$, $f = 10Hz$ to $100KHz$		-	100	-	μV_{rms}	
Thermal Shutdown Temperature	T_{SHDN}			-	170	-	$^{\circ}C$	
Thermal Shutdown Hysteresis Temperature	T_{SDH}			-	20	-	$^{\circ}C$	

NOTES:

(1). $V_{IN} = V_{OUT (NOMINAL)}$ or 2.5V, or higher voltage.

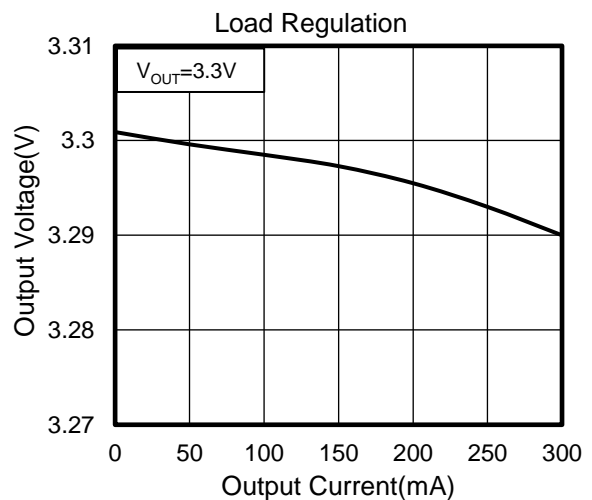
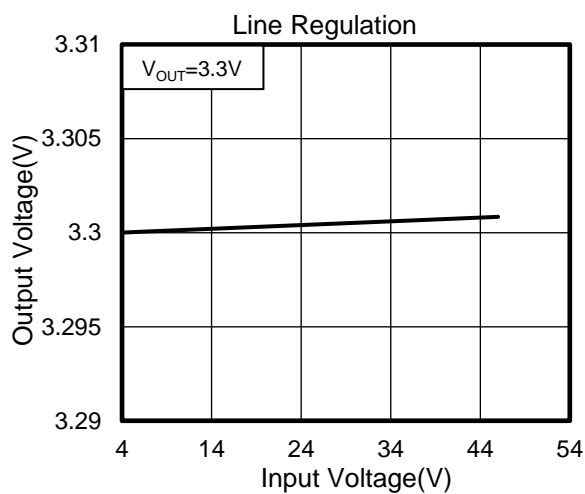
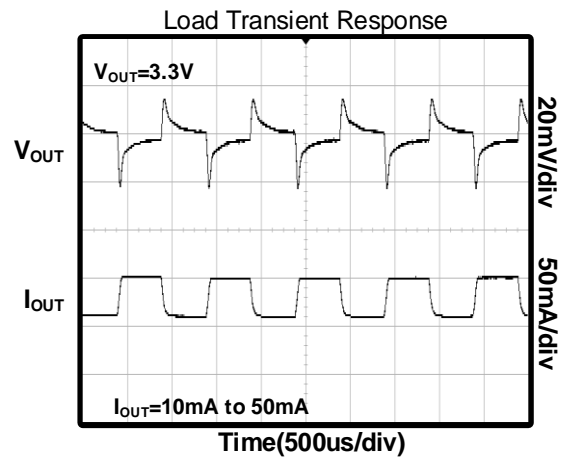
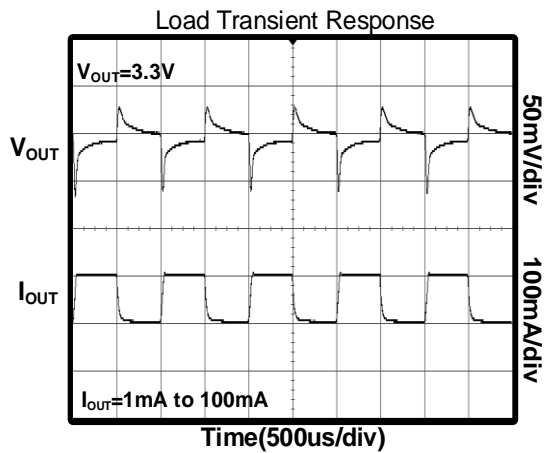
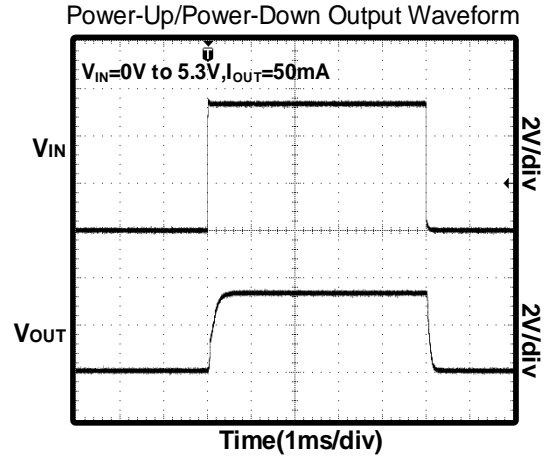
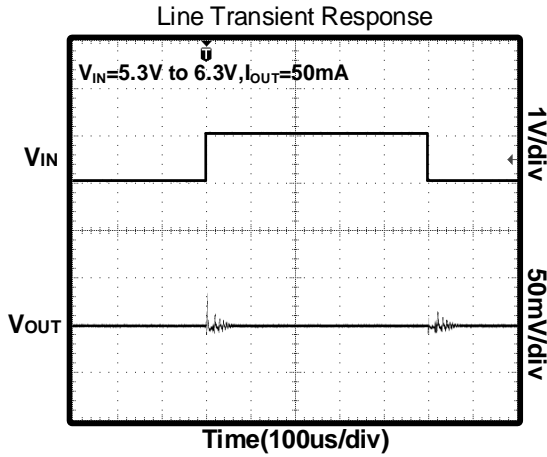
(2). The maximum output current of the actual chip is subject to PCB heat dissipation design, input voltage, output voltage difference and ambient temperature.

(3). Under the condition of $V_{IN} = V_{OUT} + 2V$ and a fixed load, the output voltage decreases by 2%. At this time, the input voltage minus the output voltage is the dropout voltage.

(4). Output voltage temperature coefficient is defined as the worst-case voltage change divided by the total temperature range.

TYPICAL CHARACTERISTICS

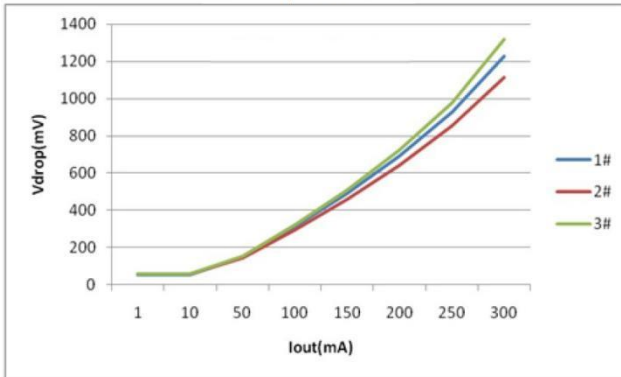
($V_{IN} = V_{OUT} + 2V$, $C_{IN} = C_{OUT} = 1\mu F$, $V_{OUT} = 3.3V$, typical values are at $T_A = +25^\circ C$, unless otherwise noted.)



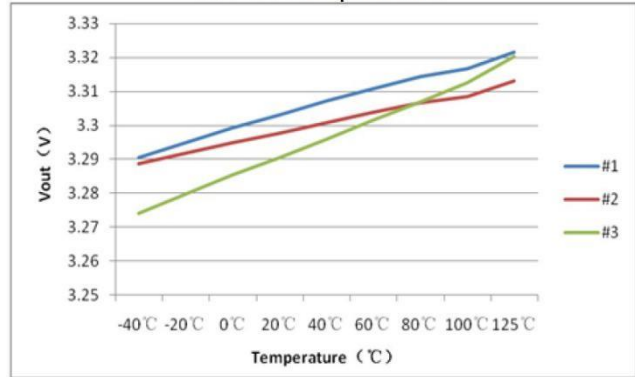
TYPICAL CHARACTERISTICS (Continued)

($V_{IN} = V_{OUT} + 2V$, $C_{IN} = C_{OUT} = 1\mu F$, $V_{OUT} = 3.3V$, typical values are at $T_A = +25^\circ C$, unless otherwise noted.)

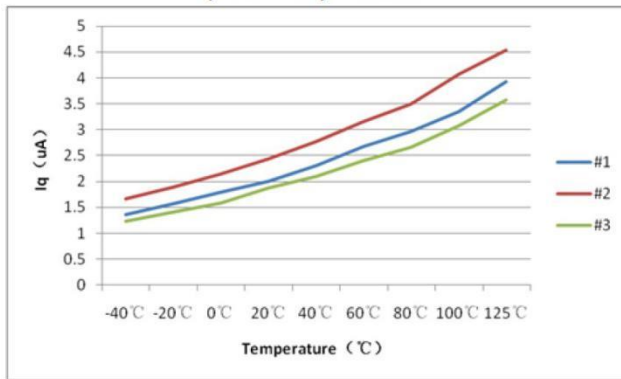
Vdrop vs. Iout



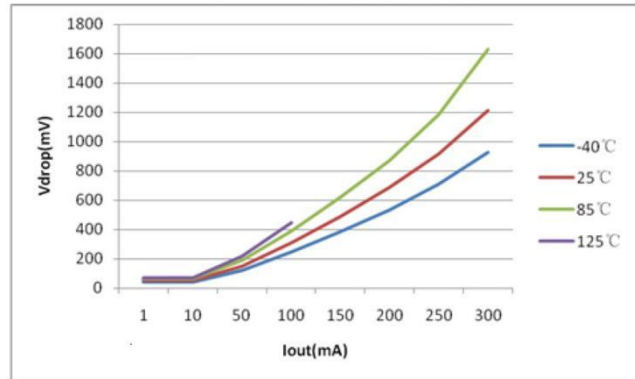
Vout vs. Temperature



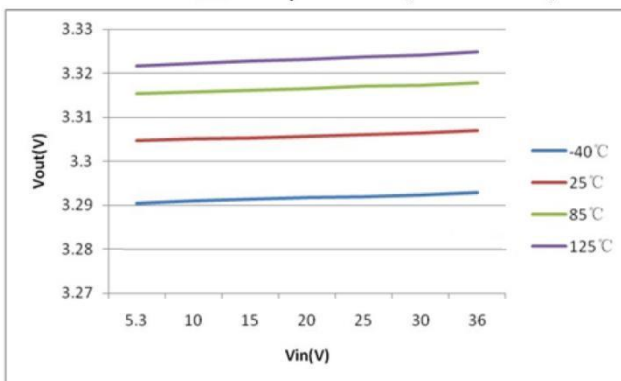
Iq vs. Temperature



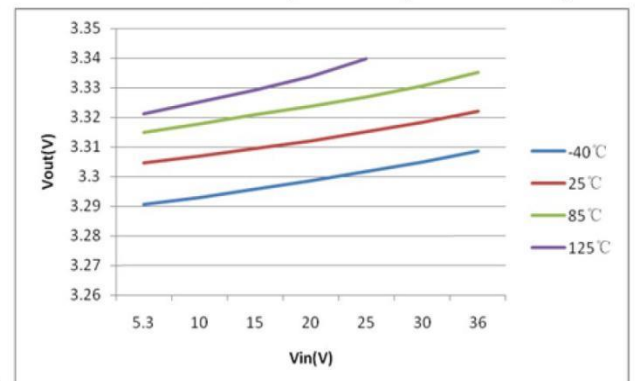
Vdrop - Iout vs. Temperature



Vout - Vin vs. Temperature (Iout = 1mA)

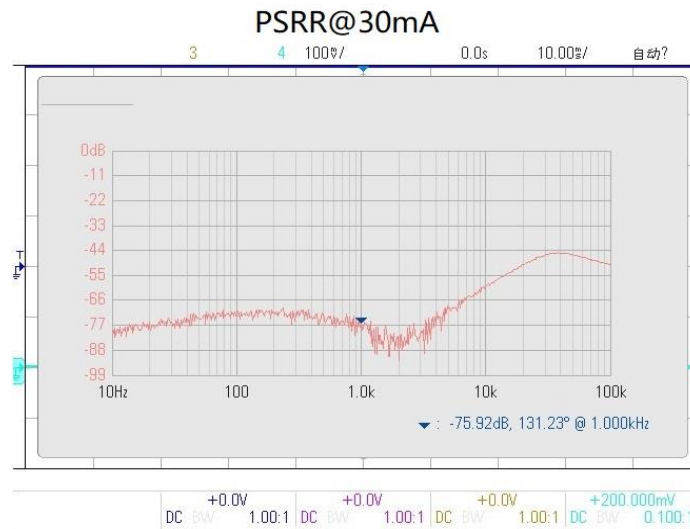


Vout - Vin vs. Temperature (Iout = 10mA)



TYPICAL CHARACTERISTICS (Continued)

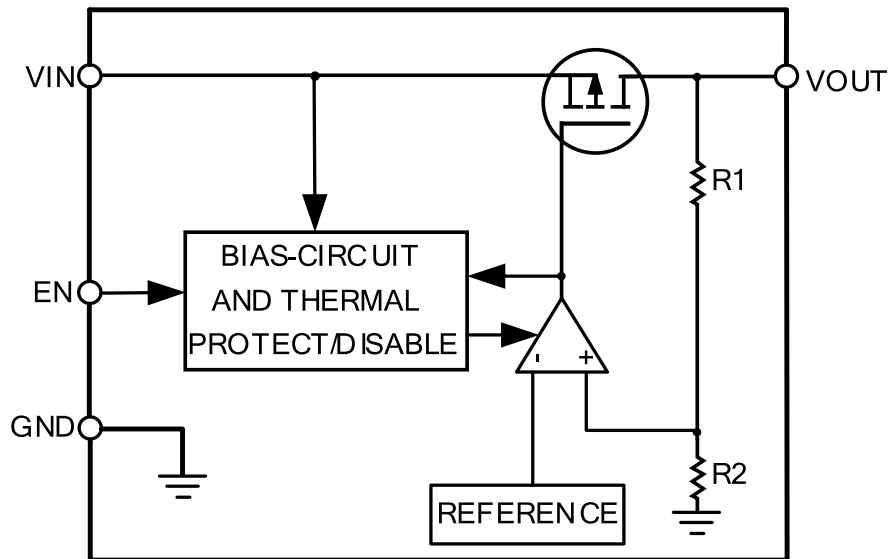
($V_{IN} = V_{OUT} + 2V$, $C_{IN} = C_{OUT} = 1\mu F$, $V_{OUT} = 3.3V$, typical values are at $T_A = +25^\circ C$, unless otherwise noted.)



Function introduction

RS73xx-1 series low dropout linear regulator (LDO) consumes only 3uA of current and has excellent linear adjustment and load characteristics to meet the requirements of lower output noise and higher PSRR, making it more suitable for applications requiring ultra-low standby power consumption of the whole machine.

Functional Block Diagram



Precautions for heat dissipation design

When the junction temperature of PN junction is too high and reaches the set temperature value, it will trigger the thermal protection circuit to send a signal to the control logic to turn off the chip output. When the PN junction temperature is lower than the set protection temperature, the chip will restart automatically. The maximum output power actually provided by the chip depends on the heat dissipation design of the system, including ambient temperature, wiring thickness and layout, and cooling design, such as adding heat sink and air cooling. Increasing the PCB area of GND pin can also obtain better heat dissipation performance.

Other application considerations

- (1) The phase compensation circuit and ESR of the output capacitor are used inside the circuit to compensate, so a capacitor larger than 1.0uF must be connected to the ground.
- (2) It is recommended to use 1uF polar capacitors for input and output, and to keep the capacitors as close to the V_{IN} and V_{OUT} pins of LDO as possible.
- (3) Pay attention to the service conditions of input and output voltage and load current to make the junction temperature of PN junction lower than the overheat protection temperature.

Approximate estimation method of PN junction temperature:

$$T_{PN} = (V_{IN} - V_{OUT}) \times I_{OUT} \times R_{\theta JA} + T$$

I_{OUT} is Load current;

T is ambient temperature.

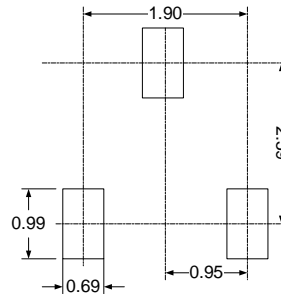
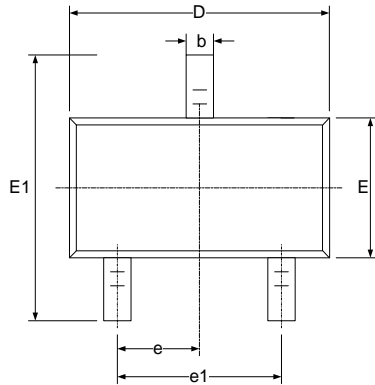
- (4) When the input voltage V_{IN} is greater than 2.5V, if V_{IN} is also higher than the output set value plus the device dropout voltage, V_{OUT} is equal to the set value. Otherwise, V_{OUT} is equal to V_{IN} minus the dropout voltage. If V_{IN} lower than 2.5V, the V_{OUT} is:

$$V_{OUT} = V_{IN} - V_{Dropout}$$

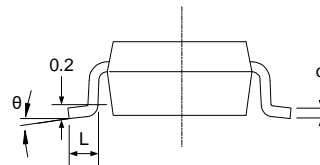
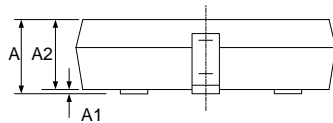
$V_{Dropout}$ is converted according to the actual load current and basically maintains a linear relationship.

PACKAGE OUTLINE DIMENSIONS

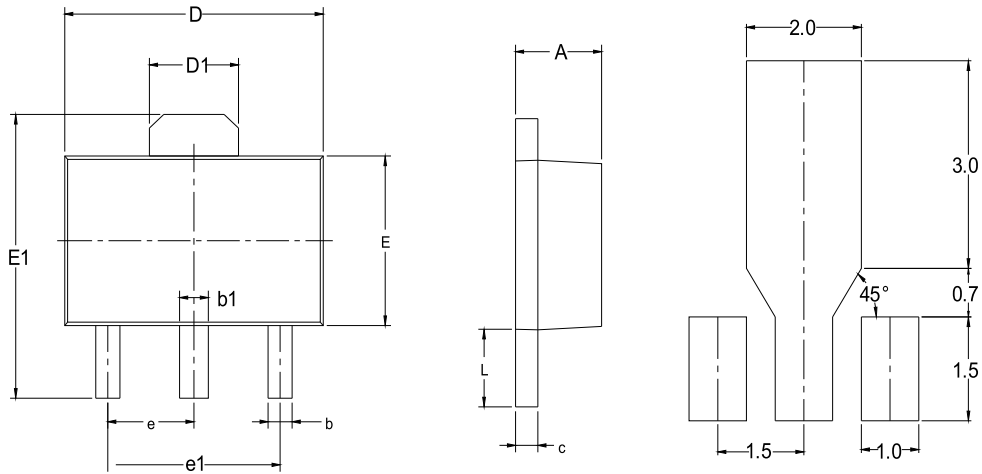
SOT23-3



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
θ	0°	8°	0°	8°

SOT89-3


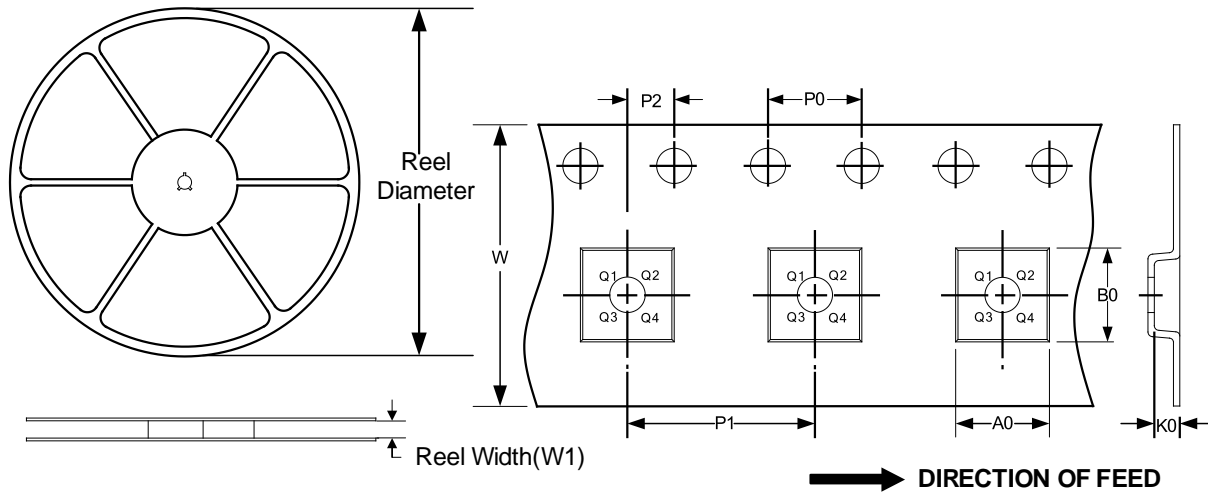
RECOMMENDED LAND PATTERN (Unit: mm)

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

TAPE AND REEL INFORMATION

REEL DIMENSIONS

TAPE DIMENSION



NOTE: The picture is only for reference. Please make the object as the standard.

KEY PARAMETER LIST OF TAPE AND REEL

Package Type	Reel Diameter	Reel Width(mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	P1 (mm)	P2 (mm)	W (mm)	Pin1 Quadrant
SOT23-3	7"	9.0	3.20	3.30	1.30	4.0	4.0	2.0	8.0	Q3
SOT89-3	7"	13.2	4.85	4.45	1.85	4.0	8.0	2.0	12.0	Q3