

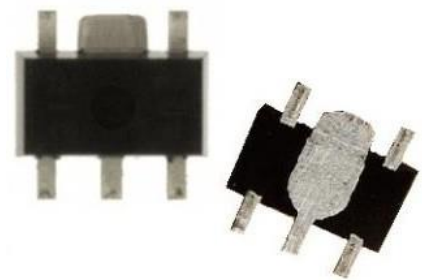
Low-dropout fixed voltage regulator

Description

- The SL2103 Series is a single-chip integrated low-dropout voltage regulator designed for applications requiring ultra-low quiescent current, with a typical load current of 70mA. This device comes in an SOT89-5L surface-mount package, suitable for supplying power to MCU systems in harsh automotive environments, featuring additional protections for overload, short circuit, and over temperature. Of course, the SL2103 can also be used in any other application requiring stable voltage regulation.
- Within the range of $5.0V < V_{SP} < 42V$, input voltage is regulated to an output voltage V_{out} with an accuracy of 1%. The SL2103-3.3 provides a 3.3V output, the SL2103-5.0 provides a 5V output, and the SL2103-ADJ offers an adjustable output voltage (refer to specific formula 5.1).

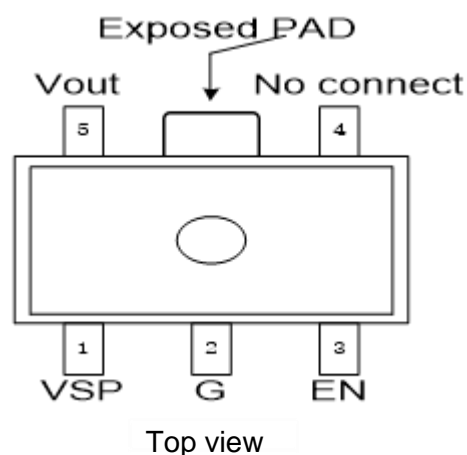
Features

- Output voltage accuracy $\leq \pm 1\%$
- Output 70mA typical operating current
- Low-dropout, ultra-low power dissipation: 80uA
- Over temperature and short-circuit protection
- Suitable for automotive electronics
- RoHS
- Industrial Grade ($-40^{\circ}C$ to $+85^{\circ}C$)



SOT89-5

Pin Description



3-1 SL2103-5.0/SL2103-3.3 Pin Configuration

Table 3.1 Pin definition and function

Pin	Symbol	Function
1	VSP	Power input terminal
2	G	Ground
3	EN	Enable pin
4	NC	Not connected
5	V _{out}	Output

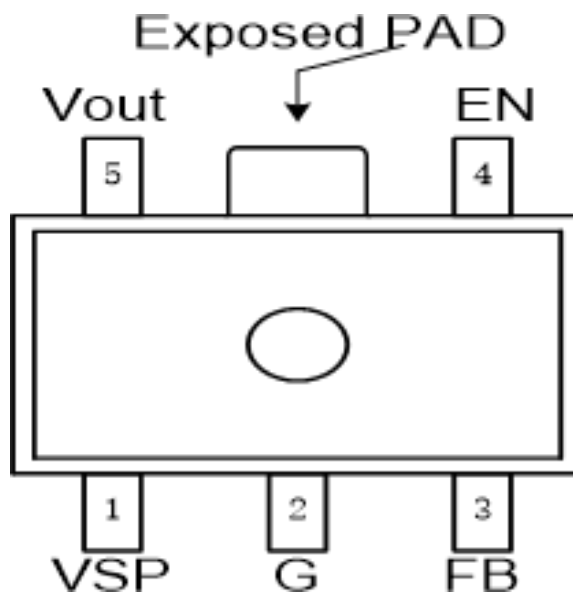


Fig.3-2 SL2013-ADJ Pin Configuration

Table 3.2 Pin definition and function

Pin	Symbol	Function
1	VSP	Power input terminal
2	G	Ground
3	FB	Feedback terminal
4	EN	Enable pin
5	V _{out}	Output

Circuit description

The internal operational amplifier of the chip compares a high-precision reference voltage adjusted by resistors with a voltage proportional to the output voltage. It drives the gate of a series MOSFET through a buffer.

A current limiting control unit for the load prevents power device saturation. The chip also features overload and over temperature protection.

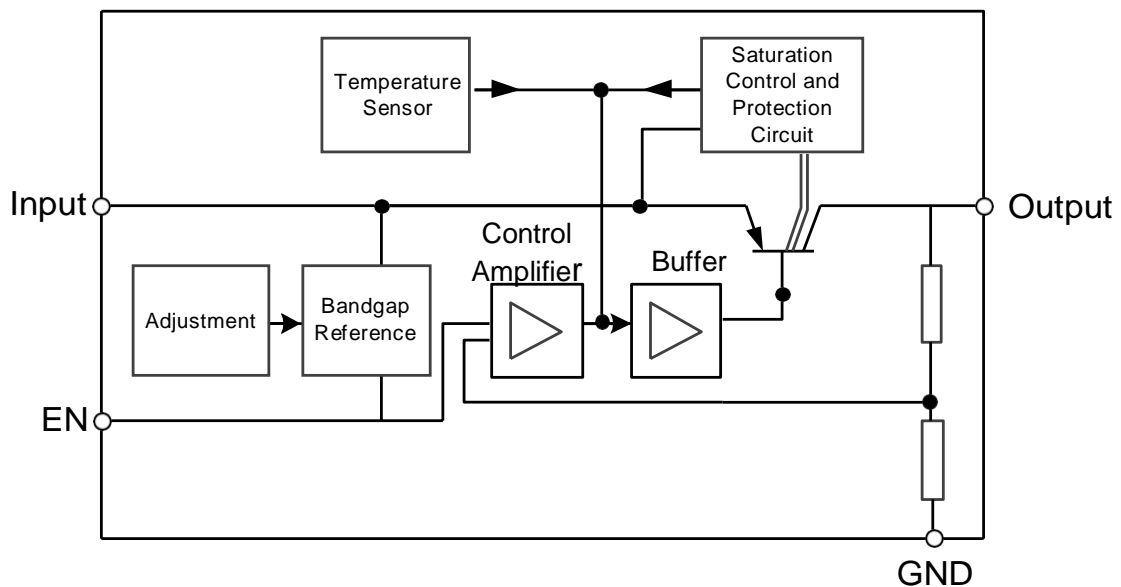


Fig.4-1 SL2013-5.0/SL2013-3.3 Block Diagram

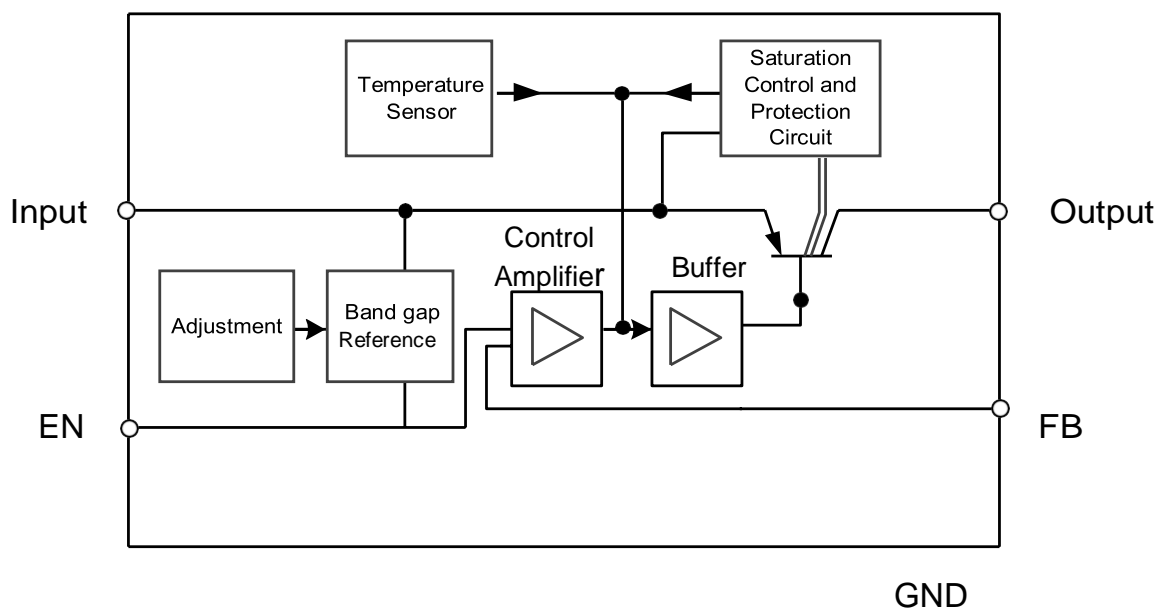


Fig.4-2 SL2013-ADJ Block Diagram

Table 4.1 Maximum Ratings

$T_j = -40^{\circ}\text{C}$ to 150°C . Unless otherwise specified, all voltages are referenced to ground.

Parameter	Symbol	Value		Unit	Description
		Min.	Max.		
Input voltage	V_{SP}	-0.3	42	V	
Enable voltage	V_{EN}	-0.3	42	V	
Output voltage	V_{out}	3.27	3.33	V	SL2013-3.3
		4.95	5.05	V	SL2013-5.0
		1.25	40V	V	SL2013-ADJ
Temperature	T_j	-40	150	$^{\circ}\text{C}$	Junction temperature
	T_{stg}	-40	150	$^{\circ}\text{C}$	Storage temperature
Thermal resistance	R_{thj-a}		100	K/W	SOT89-5L
ESD with stand voltage	$V_{ESD-HBM}$	-2000	2000	V	Human body discharge model
	$V_{ESD-CDM}$	-1000	1000	V	Component charging model

1. ESD withstands the Human Body Model according to JESD22-A114.
2. ESD withstand voltage per charged device model according to JESD22-C101E.

Table 4.2 Electrical characteristics

Unless otherwise specified, $V_{SP} = 13.5V$; $-40^{\circ}C \leq T_j \leq 150^{\circ}C$

Parameter	Symbol	Value			Unit	Remarks
		Min	Typ.	Max.		
Operating voltage	V_{SP}	5	13.5	42	V	SL2013-5.0
		4.5		42		SL2013-3.3/ADJ
Enable turn-on threshold	EN_ON		2.1	2.5	V	$1mA < I_{out} < 150mA$; $5V < V_{SP} < 40V$
Enable hysteresis voltage	EN_Hys		1.1	1.5	V	
Output voltage	V_{out}	3.2 7	3.3	3.33	V	$1mA < I_{out} < 150mA$; $5V < V_{SP} < 40V$
		4.9 5	5.0	5.05	V	
		FB=1.25 adjustable output			V	
Output current limit	I_{lim}		150	-	mA	
Quiescent current	I_{q1}		8	12	μA	EN=0
	I_{q2}		350	400	μA	EN=5V, $I_{out}=100mA$
	I_{q3}		80	100	μA	EN=5V, $I_{out}=0$
Voltage drop	V_{dr}		0.1	0.25	V	$I_{out}=10mA$
			0.2	0.40	V	$I_{out}=50mA$
			0.3	0.50	V	$I_{out}=100mA$
Input voltage regulation	Reg line		1.0	20	mV	$6.0V < V_{SP} < 42V$, $I_{out}=1.0mA$
Load regulation	Reg load		8.0	30	mV	$1.0mA < I_{out} < 100mA$
Power supply rejection ratio	P_{SRR}		70		dB	$F_r = 100HZ$; $V_r = 0.5V_{pp}$
Output capacitor	CQ	1			μF	$ESR \leq 4\Omega @ 10KHZ$

"Voltage drop" $V_{dr} = V_{SP} - V_{out}$ (The minimum required difference between the input voltage and the output voltage of a regulator, to maintain the output voltage within $\pm 100mV$ of its rated value)

Application information

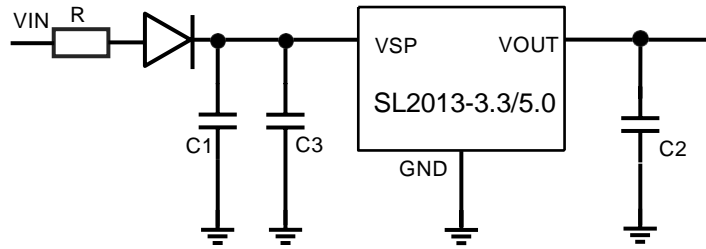


Fig.5-1 SL2103-3.3/5.0 Application Circuit

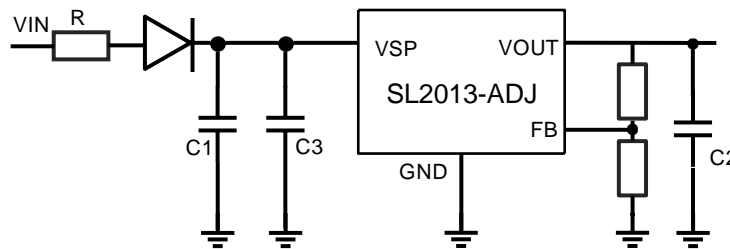


Fig.5-2 SL2103-ADJ Application Circuit

In SL2103, the output voltage is compared to a typical internal reference voltage of 1.25V after voltage division. Within an input voltage range of $5.0V < VSP < 42V$, SL2103-3.3/5.0 provides 3.3V or 5V output voltage with 1% accuracy. For SL2103-ADJ, the output voltage accuracy of 1% is described by Equation 5.1.

$$V_{out} = 1.25 \cdot (R1+R2) / R2 \dots\dots\dots 5.1$$

Figs.5-1 and 5-2 depict a typical application circuit. To ensure stable control loop operation, the SL2103 output requires an output capacitor with a minimum value of 1uF and a maximum equivalent series resistance (ESR) of 4 ohms. Both tantalum and multilayer ceramic capacitors are suitable for this purpose.

To compensate for wiring effects, a regulator's input requires an input capacitor (typically a 100nF ceramic capacitor is recommended). Serially connecting a resistor of approximately 1 ohm to input capacitor C1 can suppress any oscillations caused by input inductance and input capacitance.

To mitigate power line effects, a 470uF electrolytic capacitor C3 is added at the input terminal of the application circuit shown in Fig.5-1. This capacitor is especially recommended when the device is powered by supply lines several meters long.

Typical characteristic curves

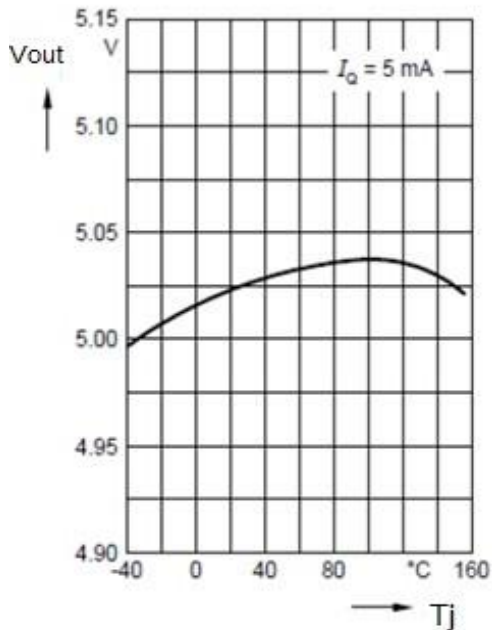


Fig.6-1 Output Voltage vs. Junction Temperature

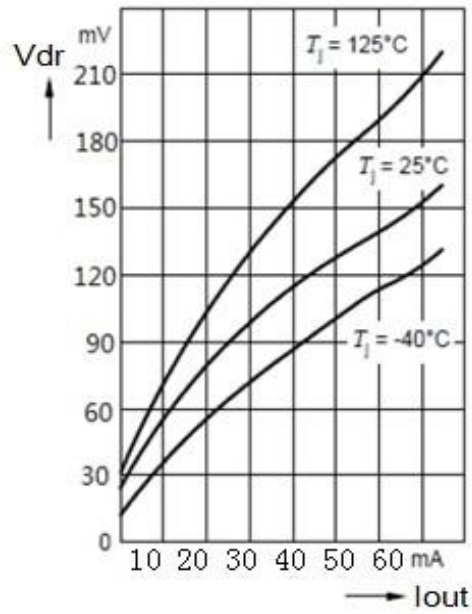


Fig.6-2 Pressure Difference vs. Output Current

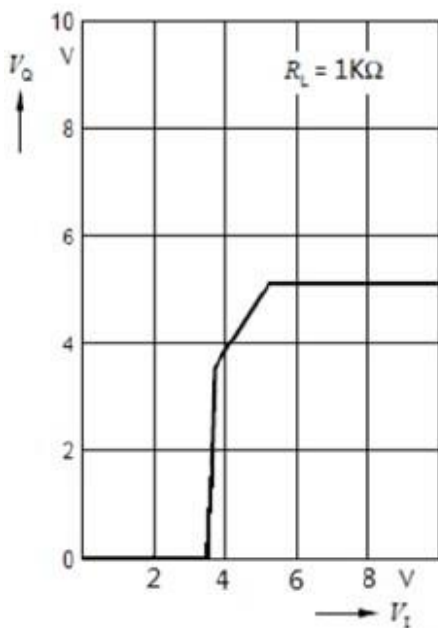


Fig.6-3 Output Voltage vs. Input Voltage.

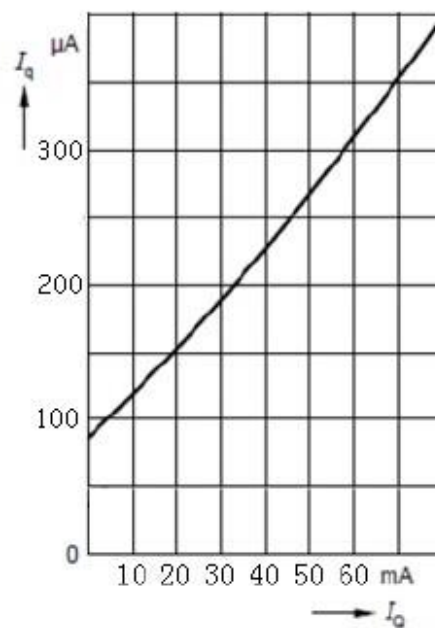
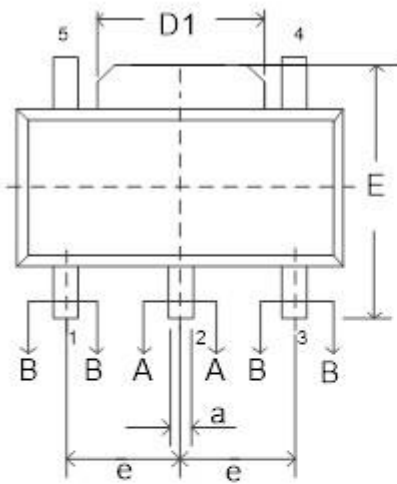


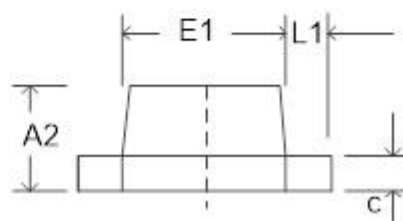
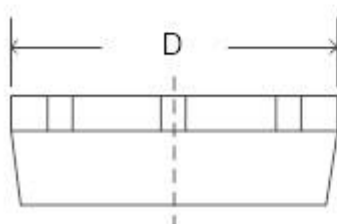
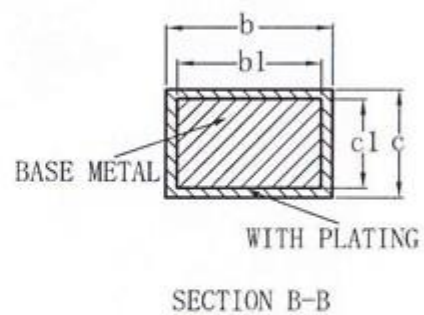
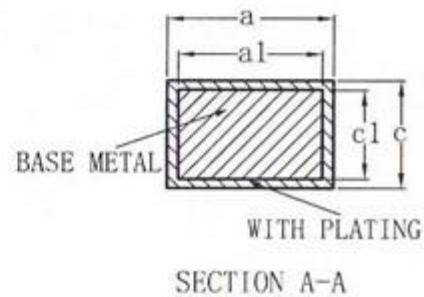
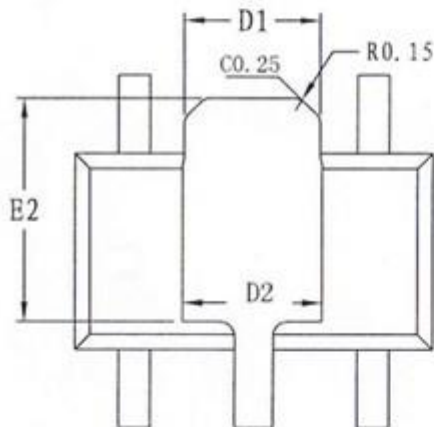
Fig.6-4 Static Current vs. Output Current

Package Description

SOT89-5L package dimensions



SYMBOL	MILLIMETER		
	MIN	NOR	MAX
A2	1.40	1.50	1.60
b	0.38	--	0.46
b1	0.37	0.40	0.43
c	0.38	--	0.42
c1	0.37	0.38	0.39
a	0.46	--	0.56
a1	0.45	0.48	0.51
D	4.40	4.50	4.60
D1	1.70REF		
D2	1.75REF		
E	4.00	4.20	4.40
E1	2.40	2.50	2.60
E2	2.84REF		
e	1.50BSC		
L1	0.80	1.00	1.20





SL2103 Series

Ordering Information

Part Number	Package	Output Voltage	Packaging Information
SL2013-3.3	SOT89-5L	3.3V	1000pcs/Tape&Reel
SL2013-5.0	SOT89-5L	5.0V	1000pcs/Tape&Reel
SL2013-ADJ	SOT89-5L	Adjustable	1000pcs/Tape&Reel