



150mA ULTRA LOW DROPOUT MICROPOWER LINEAR REGULATOR

SC112

PRELIMINARY - July 25, 2000

TEL:805-498-2111 FAX:805-498-3804 WEB:http://www.semtech.com

DESCRIPTION

The SC112 is a 150mA ultra low dropout linear regulator with a built in CMOS/TTL logic level enable, designed specifically for battery powered applications where low quiescent current and low dropout are critical for battery longevity.

The SC112 uses a Semtech proprietary internal PNP device for the pass element, providing a low dropout voltage of 130mV at a load of 60mA.

The output noise is reduced to 30μV (typical) by placing a very low leakage 10nF capacitor on pin 3 (noise bypass).

Each device contains a bandgap reference, error amplifier, PNP pass element, thermal and current limiting circuitry and resistor divider network for setting output voltage.

The SC112 is packaged in a six lead SOT-23 surface mount package for a very small footprint and it requires only a 1μF capacitor on the output and a 0.01μF on the bypass pin for a minimum number of external components.

FEATURES

- Low dropout voltage
- CMOS/TTL compatible control switch
- Very low quiescent current 60μA (ON, no load)
- Internal thermal shutdown
- Short circuit protection
- Very low standby current 0.1μA maximum (OFF)
- Low noise with external bypass capacitor
- Industrial temperature range

APPLICATIONS

- Battery powered systems
- Cellular telephones
- Cordless telephones
- Pagers, personal digital assistants
- Portable instrumentation
- Low voltage systems

ORDERING INFORMATION

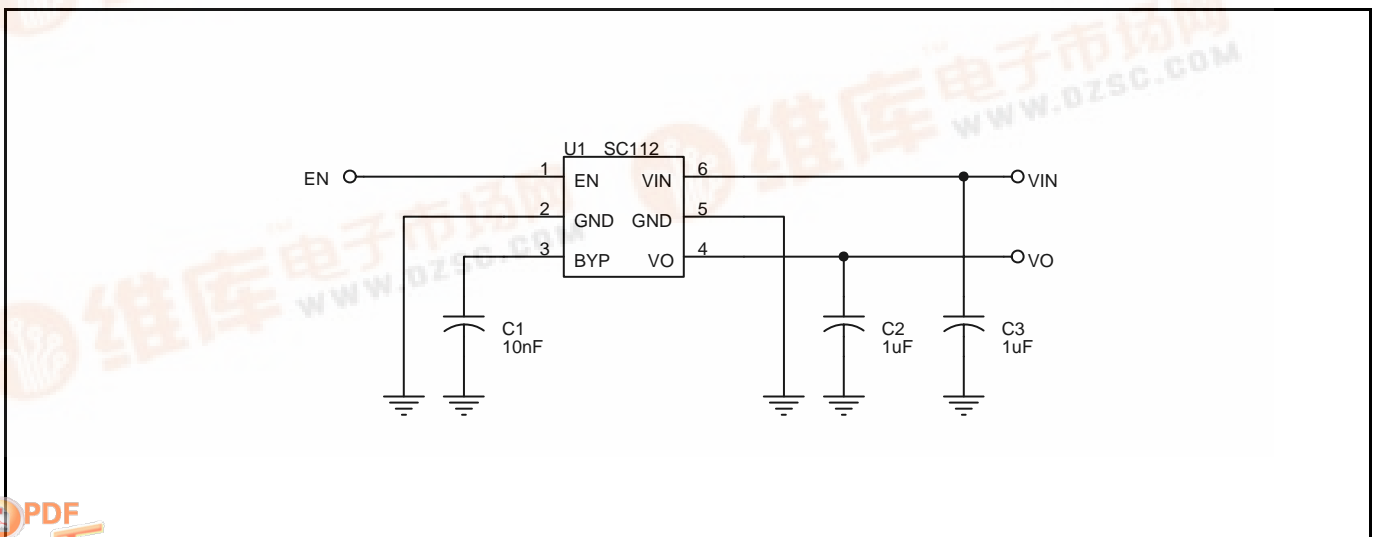
DEVICE ⁽¹⁾⁽²⁾	PACKAGE
SC112XXCSK.TR	6 pin SOT-23

Notes:

(1) Where XX denotes voltage options. Available voltages are: 2.2V, 2.5V, 2.8V, 3.0V, 3.3V, 3.6V, 3.8V, 4.0V and 5.0V. Contact factory for additional voltage options.

(2) Only available in tape and reel packaging. A reel contains 3000 devices

TYPICAL APPLICATION CIRCUIT



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ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Maximum	Units
Input Supply Voltage	V _{IN}	-0.3 to +16	V
Enable Input Voltage	V _{EN}	-0.3 to V _{IN}	V
Power Dissipation	P _D	Internally Limited	W
Thermal Resistance Junction to Ambient	θ _{JA}	230	°C/W
Operating Ambient Temperature Range	T _A	-40 to +85	°C
Operating Junction Temperature Range	T _A	-40 to +125	°C
Storage Temperature Range	T _{STG}	-55 to +150	°C
Lead Temperature (Soldering) 10 sec.	T _{LEAD}	300	°C
ESD Rating	ESD	2	kV

ELECTRICAL CHARACTERISTICS

 Unless specified, T_A = 25°C, V_{IN} = V_{O(NOM)} + 1V, C_{IN} = 1μF, C_{BYP} = 10nF, C_O = 1μF.
 Values in **bold** apply over full operating temperature range.

Parameter	Symbol	Test Conditions	MIN	TYP	MAX	Units	
VIN							
Supply Voltage Range	V _{IN}		2.5		14.5	V	
Ground Pin Current	I _{GND}	I _O = 0mA		60	75	μA	
					90		
		I _O = 60mA		1.0	1.25	mA	
					1.5		
				2.1	2.5		
		I _O = 100mA			3.0		
	4.2		4.75				
			5.25				
		V _{IN} = 8V, Output OFF			0.1	μA	
VO							
Output Voltage	V _O	I _O = 30 mA	-2.5	V _O	+2.5	%	
			-3.0		+3.0		
Line Regulation	REG _(LINE)	V _{IN} = (V _{O(NOM)} + 1V) to (V _{O(NOM)} + 6V), I _O = 1mA		5	10	mV	
					20		
Load Regulation	REG _(LOAD)	I _O = 1mA to 60mA		7.5	35	mV	
					20		65
					35		110
Temperature Coefficient	ΔV _O /ΔT	I _O = 10mA		40		ppm/°C	

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ELECTRICAL CHARACTERISTICS

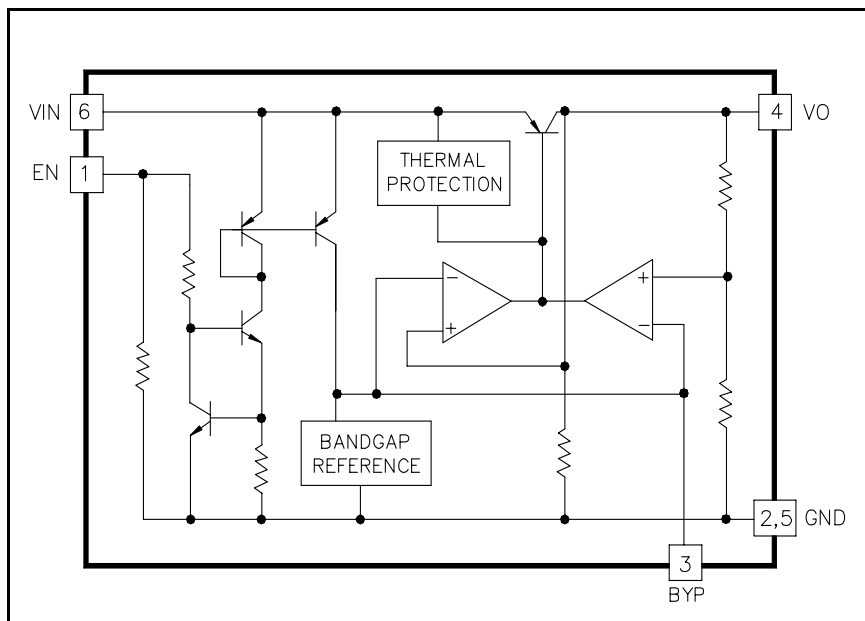
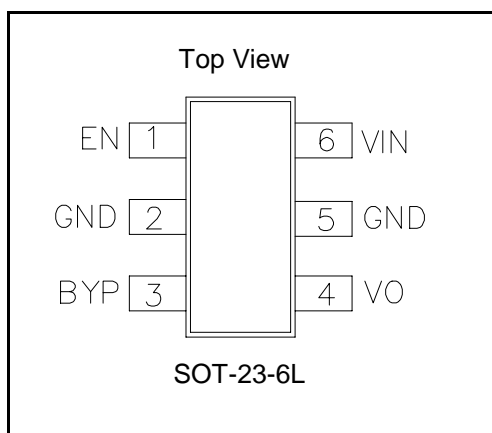
 Unless specified, $T_A = 25^\circ\text{C}$, $V_{IN} = V_{O(NOM)} + 1\text{V}$, $C_{IN} = 1\mu\text{F}$, $C_{BYP} = 10\text{nF}$, $C_O = 1\mu\text{F}$.
 Values in **bold** apply over full operating temperature range.

Parameter	Symbol	Test Conditions	MIN	TYP	MAX	Units
VO (Cont.)						
Current Limit ⁽¹⁾	I_{LIM}		180	200		mA
Dropout Voltage	V_D	$I_O = 60\text{mA}$		130	150	mV
					180	
		$I_O = 100\text{mA}$		165	195	
					225	
		$I_O = 150\text{mA}$		200	245	
					275	
Power Supply Rejection Ratio	RR	$V_{RIPPLE} = 100\text{mV(rms)}$, $f = 400\text{Hz}$, $I_O = 30\text{mA}$		60		dB
Output Noise Voltage	e_n	$10\text{ Hz} \leq f \leq 80\text{ kHz}$, $I_O = 60\text{mA}$		30		$\mu\text{V(rms)}$
BYP						
Noise Bypass Terminal Voltage	V_{BYP}			1.250		V
EN						
Enable Input Threshold Voltage	V_{IH}	Output ON	1.8			V
	V_{IL}	Output OFF			0.5	
Enable Input Bias Current	I_{EN}	$V_{EN} = 1.8\text{V}$, Output ON		6	10	μA

NOTE:

 (1) As the load resistance further decreases, the SC112 folds back the output current to approximately 100mA at $V_O = 0\text{V}$.

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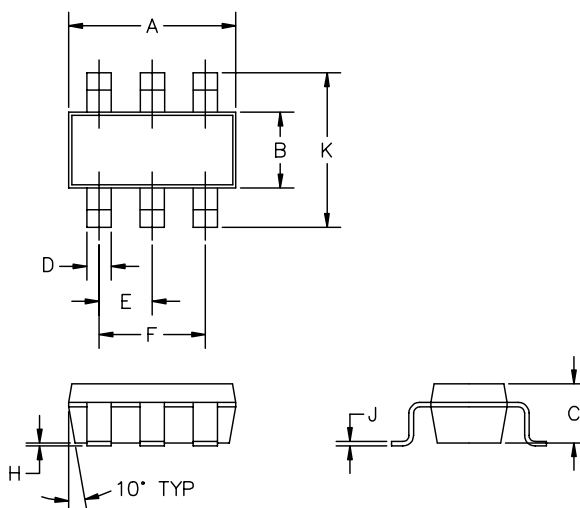
BLOCK DIAGRAM

PIN CONFIGURATION

APPLICATION HINTS (Refer to Sheet 1):

- (1) C_{IN} (C3) is needed if the device is far from the supply's filter capacitors, or for operation from a battery. A value of $1.0\mu\text{F}$ or greater should be used. C_{IN} may be tantalum or ceramic.
- (2) C_O (C2) should be a $1\mu\text{F}$ or greater tantalum or ceramic capacitor, with an Equivalent Series Resistance (ESR) between $10\text{m}\Omega$ and 1Ω over temperature. Larger value capacitors will improve the overall transient response.
- (3) C_{BYP} (C1 - required) should be placed as close as possible to pin 3 and ground. A 10nF ceramic capacitor is recommended.
- (4) EN may be tied to V_{IN} if the shutdown feature is not required. Maximum EN voltage = V_{IN} .
- (5) Connect both ground pins (2 and 5) to ground to maximize heat conduction.

PIN DESCRIPTION

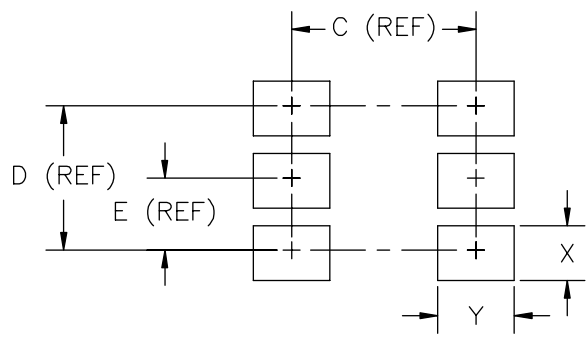
Pin #	Pin Name	Description
1	EN	Active high enable pin. Connect to V_{IN} if not being used.
2	GND	Ground pin. Use for heatsinking along with Pin #5.
3	BYP	Noise bypass pin. Connect a 10nF capacitor (required) between this pin and GND.
4	VO	Regulator output, supplying a guaranteed 150mA .
5	GND	Ground pin. Use for heatsinking along with Pin #2.
6	VIN	Power input pin.

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DEVICE OUTLINE - SOT23-6L


DIM ^N	DIMENSIONS ^①				NOTE
	INCHES		MM		
A	.110	.120	2.80	3.05	—
B	.059	.070	1.50	1.75	—
C	.036	.051	.90	1.30	—
D	.014	.020	.35	.50	—
E	.033	.040	.85	1.05	—
F	.067	.083	1.7	2.1	—
H	.0004	.006	.010	.150	—
J	.0035	.008	.090	.20	—
K	.102	.118	2.6	3.00	—

^② PACKAGE OUTLINE EXCLUSIVE OF MOLD FLASH AND METAL BURR.
^① CONTROLLING DIMENSIONS: MILLIMETERS.

MINIMUM LAND PATTERN - SOT23-6L


DIMENSIONS			
DIM ^N	INCHES	MM	NOTE
C	.094	2.4	—
D	.074	1.9	—
E	.037	.95	—
X	.028	.7	—
Y	.039	1.0	—