CS3111

Revision History

Rev. No.	History	Issue Date
1.0	New issue	Sep. 10,2012
1.1	Add Current Limit=300mA(Min.) Delete TSOT-23-5 Package Add SOT-23-5 Package Modify Ordering information and Marking information Add Application Information	May. 06,2013
1.2	Add Output Type Code 4.0V	Jan, 14,2014

Rev. 1.2

CS3111

300mA High-PSRR Low Dropout Voltage Linear Regulators

👉 General Description

The CS3111 is a 300mA, low dropout and low noise linear regulator with high ripple rejection ratio and fast turn-on time. It has fixed output voltage ranging from 1.2V to 4.8V.

The CS3111 includes a voltage reference unit, an error amplifier, resistor net for voltage setting, a current limit circuit and a chip enable circuit. These ICs perform with low dropout voltage and a chip enable function (SOT-23-5L package only).

The CS3111 works well with low ESR ceramic capacitors, suitable for portable RF and wireless battery-powered applications with stringent space requirements and demanding performance. It also offers ultra low noise output and has low quiescent current.
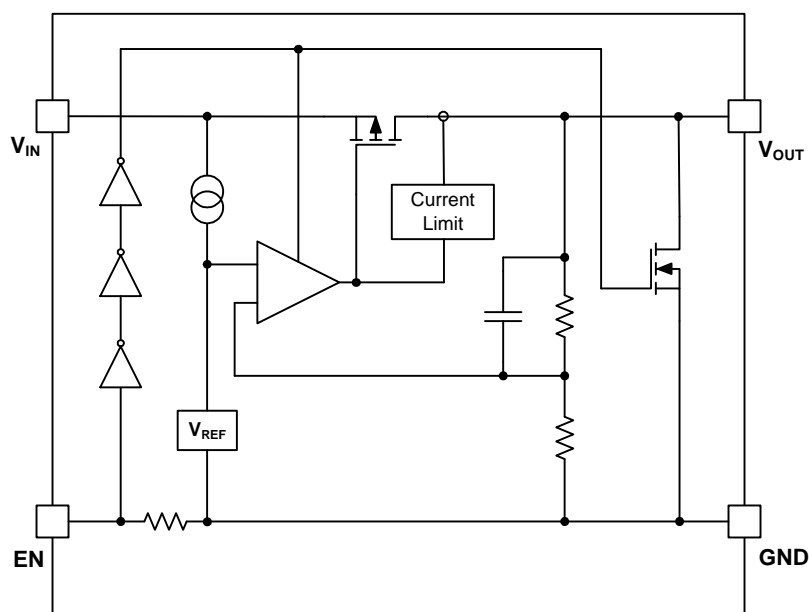
👉 Applications

◆ Portable Communication Equipment
◆ Battery-Powered Equipment

👉 Features

◆ V_{IN} Range: 2.0V to 6.0V
◆ Low Dropout Voltage: 0.22V (Typ)
  (V_{OUT}= 3.3V, I_{OUT}= 150mA)
◆ High Ripple Rejection: 65dB (Typ)(f=10KHz)
◆ Excellent Line Regulation: 0.01%/V(Typ)
◆ Output Voltage Accuracy: ±2.0%
◆ Low Supply Current: 25μA (Typ)
◆ Standby Current: 0.01μA (Typ)
◆ Over Current Protection
◆ Fixed Output Voltage: 1.2V ~ 4.8V
◆ Ultra Fast Transient Response

👉 Functional Block Diagram
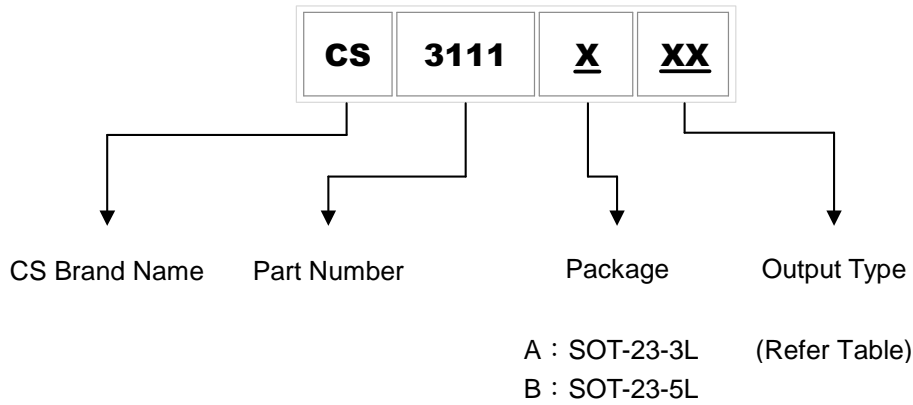
Ordering Information

CS	3111	X	XX

CS Brand Name   Part Number   Package   Output Type

A：SOT-23-3L   (Refer Table)
B：SOT-23-5L

Marking Information

CA	X	XX

CS P/N Code   Package   Output Type

A：SOT-23-3L   (Refer Table)
B：SOT-23-5L
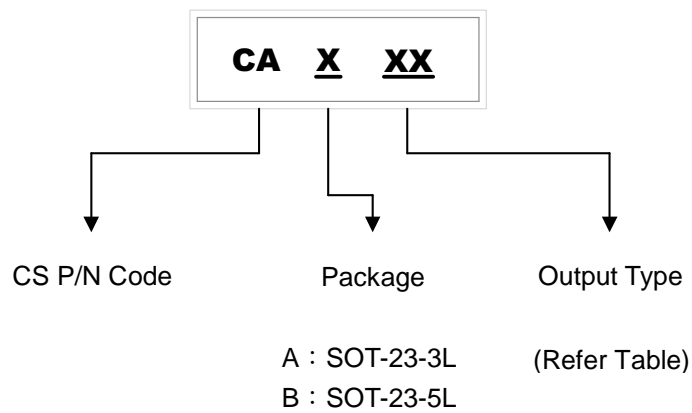
Output Type Code		
12: 1.2V	25: 2.5V	33: 3.3V
15: 1.5V	28: 2.8V	40: 4.0V
18: 1.8V	30: 3.0V	

Rev. 1.2

👉 Pin Configuration

SOT-23-3L	SOT-23-5L

SOT-23-3L:
- Pin 3: V_{IN}
- Pin 1: GND
- Pin 2: V_{OUT}

SOT-23-5L:
- Pin 5: V_{OUT}
- Pin 4: NC
- Pin 1: V_{IN}
- Pin 2: GND
- Pin 3: EN
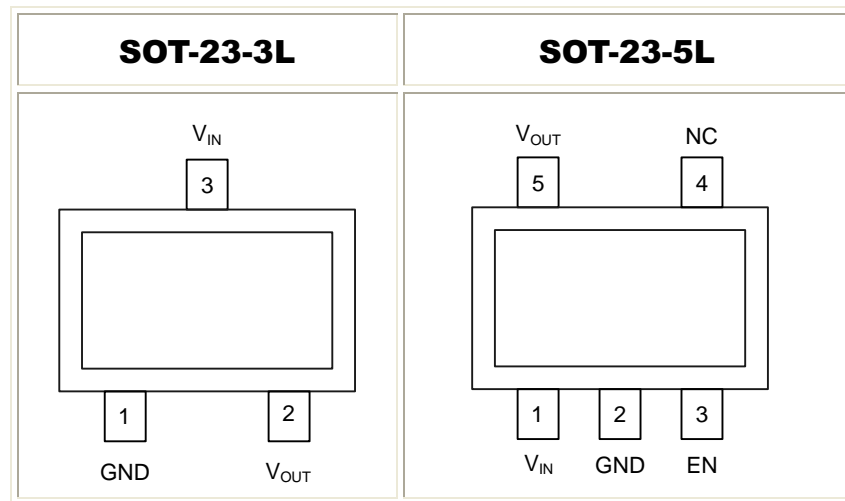
👉 Absolute Maximum Rating(Note 1)

➢ Enable Voltage (V_{EN}): 【6.5V】

➢ Power Input Voltage (V_{IN}): 【6.5V】

➢ Storage Temperature Range (T_{STG}): 【-65℃ to +150℃】

➢ Maximum Junction Temperature (T_J): 【125℃】

➢ ESD Rating:(Note 2)

   HBM (Human Body Mode) : 【2KV】

   MM (Machine Mode) : 【200V】

👉 Thermal Information

➢ Thermal Resistance: (Note 3)

   Junction to Ambient (θ_{JA}):

   SOT-23-3L: 【357℃/W】

   SOT-23-5L : 【330℃/W】

   Junction to Case (θ_{JC}):

   SOT-23-3L: 【100℃/W】

   SOT-23-5L : 【100℃/W】

➢ Power Dissipation, P_D @ $T_A = 25℃$ (Note 4)

   SOT-23-3L : 【280mW】

   SOT-23-5L : 【300mW】

Recommended Operation Conditions(Note 5)

➢ Operating Junction Temperature Range (T_J) : 【- 40℃ to +125℃ 】

➢ Operating Ambient Temperature Range (T_{OPA}): 【- 40℃ to +85℃ 】

➢ Enable Voltage (V_{EN}): 【-0.3V to V_{IN}】

➢ Power Input Voltage (V_{IN}): 【+6V】

Note 1:Stresses listed as the above "Absolute Maximum Ratings" may cause permanent damage to the device. These are for stress ratings. Functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may remain possibility to affect device reliability.
Note 2:Devices are ESD sensitive. Handling precaution recommended.
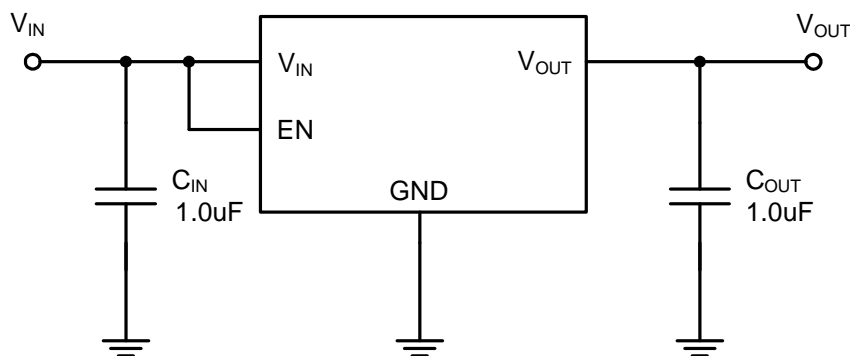Note 3:Thermal Resistance is specified with approximately 1 square of 1 oz copper.
Note 4:Thermal Resistance is specified with the component mounted on a low effective thermal conductivity test board in free air at T_A=25℃.
Note 5:The device is not guaranteed to function outside its operating conditions.

Typical Applications

SOT-23-3L

SOT-23-5L

Rev. 1.2
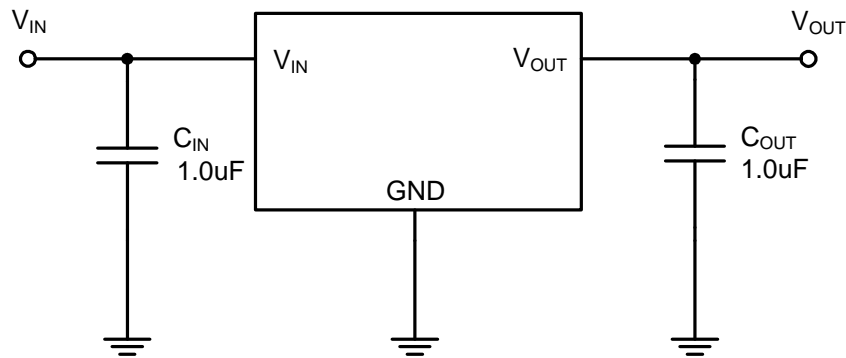
☞ Application Information

The CS3111 requires input and output decoupling capacitors. The device is specifically designed for portable applications requiring minimum board space and smallest components. These capacitors must be correctly selected for good performance. Please note that linear regulators with a low dropout voltage have high internal loop gains which require care in guarding against oscillation caused by insufficient decoupling capacitance.

Input Capacitor

An input capacitance of 1μF is required space between input pin and ground pin directly (the amount of the capacitance may be increased without limit). The input capacitor must be located less than 1cm from the device to assure input stability. A lower ESR capacitor allows the use of less capacitance, while higher ESR type (like aluminum electrolytic) requires more capacitance. Capacitor types (aluminum, ceramic and tantalum) can be mixed in parallel, but the total equivalent input capacitance ESR must be defined as above to stable operation. There are no requirements for the ESR on the input capacitor, but tolerance and temperature coefficient must be considered when selecting the capacitor to ensure the capacitance will be 1μF over the entire operating temperature range.

Output Capacitor

The CS3111 is designed specifically to work with very small ceramic output capacitors. A ceramic capacitor (temperature characteristics X7R, X5R) in 1μF is suitable for the CS3111 application. The recommended minimum capacitance for the device is 1μF(X5R or X7R dielectric ceramic), between V_{OUT} and GND for stability, but it may be increased without limit. Higher capacitance values help to improve transient. The output capacitor's ESR is critical because it forms a zero to provide phase lead which is required for loop stability.

Thermal Considerations

The CS3111 series can provide a current of up to 300mA over the full operating junction temperature range. However, the maximum output current must be debated at higher ambient temperature to ensure the junction temperature does not exceed 125℃. With all possible conditions, the junction temperature must be within the range specified under operating conditions. Power dissipation can be calculated based on the output current and the voltage drop across regulator.
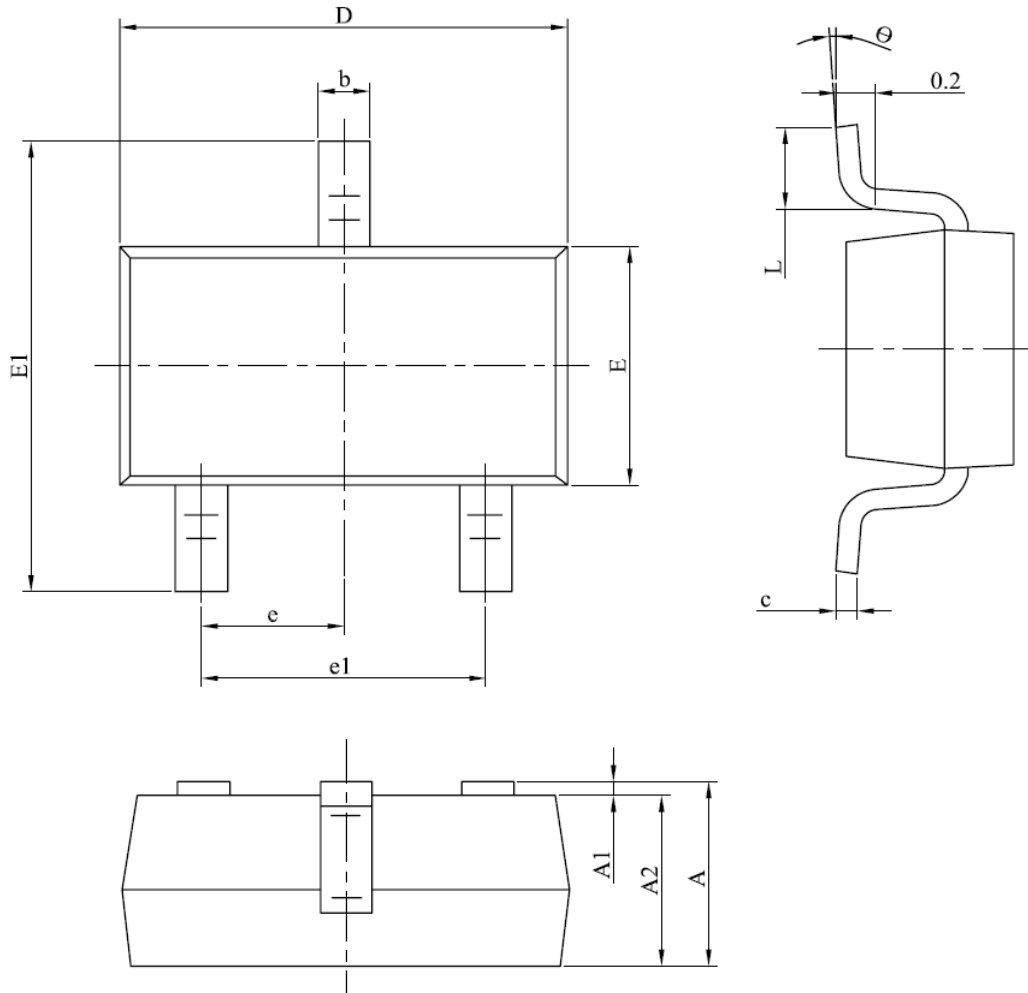
👉 **Electrical Characteristics** (Unless otherwise specified $V_{IN}=V_{OUT}+1V$, $T_A=25°C$)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{IN}	Input Voltage		2.0		6.0	V
V_{OUT}	Output Voltage	$I_{OUT}=1mA$	-2		2	%
Reg_line	Line Regulation	$V_{OUT} >1.7V$, $V_{IN}=(V_{OUT}+0.5V)$ to 6V $V_{OUT} ≤1.7V$, $V_{IN}=2.2V$ to 6V $I_{OUT}=1mA$		0.01	0.2	%/V
Reg_load	Load Regulation	$I_{OUT}=1mA$ to 150mA		0.005	0.015	%/mA
V_{DROP}	Dropout Voltage(Note 6)	$V_{OUT} <1.5V$, $I_{OUT}=150mA$			1.00	V
		$1.5V ≤V_{OUT} ≤ 2.0V$, $I_{OUT}=150mA$		0.45	0.7	
		$2.1V ≤V_{OUT}≤ 4.8V$, $I_{OUT}=150mA$		0.25	0.50	
PSRR	Ripple Rejection	f=10KHz Ripple=$0.3V_{P-P}$ $V_{OUT} >1.7V$, $V_{IN} -V_{OUT}=1.0V$ $V_{OUT} ≤1.7V$, $V_{IN} -V_{OUT}=1.2V$ $I_{OUT}=10mA$		65		dB
I_{SS}	Supply Current	$I_{OUT}=0mA$		25		µA
$I_{STANDBY}$	Standby Current	$V_{EN}=GND$		0.01	1	µA
$\triangle V_{OUT}/\triangle T$	Output Voltage Temperature Coefficient	$I_{OUT}=1mA$, $-40°C ≤ T_J ≤ 85°C$		±100		ppm/°C
I_{LIMIT}	Current Limit		300			mA
R_{PD}	EN Pull-Down Resistance		0.7	2.0	8.0	MΩ
$V_{EN(HI)}$	EN Input Voltage "H"		1.2		V_{IN}	V
$V_{EN(LO)}$	EN Input Voltage "L"				0.4	V
$I_{EN(HI)}$	EN Pin Current	$V_{EN}= V_{IN}$		0.01	1	µA
eN	Output Noise Voltage	BW=10Hz to 100KHz, $C_O=1µF$		100		µVrms
R_{LOW}	On Resistance for Auto Discharge	$V_{EN}=0V$		60		Ω

Note 6: Dropout voltage is tested by reducing input voltage until the output drops 2% below its nominal value.

Rev. 1.2

Package Dimension

SOT-23-3L

UNIT \ SYMBOL		A	A1	A2	b	c	D	E	E1	e	e1	L	θ
mm	Min.	1.050	0.000	1.050	0.300	0.100	2.820	1.500	2.650	0.950 (BSC)	1.800	0.300	0°
	Nom.	-	-	-	-	-	-	-	-		-	-	-
	Max.	1.250	0.100	1.150	0.500	0.200	3.020	1.700	2.950		2.000	0.600	8°
inch	Min.	0.041	0.000	0.041	0.012	0.004	0.111	0.059	0.104	0.037 (BSC)	0.071	0.012	0°
	Nom.	-	-	-	-	-	-	-	-		-	-	-
	Max.	0.049	0.004	0.045	0.020	0.008	0.119	0.067	0.116		0.079	0.024	8°

Rev. 1.2

SOT-23-5L

UNIT \ SYMBOL		A	A1	A2	b	c	D	E	E1	e	e1	L	θ
mm	Min.	1.050	0.000	1.050	0.300	0.100	2.820	1.500	2.650	0.950 (BSC)	1.800	0.300	0°
	Nom.	-	-	-	-	-	-	-	-		-	-	-
	Max.	1.250	0.100	1.150	0.500	0.200	3.020	1.700	2.950		2.000	0.600	8°
inch	Min.	0.041	0.000	0.041	0.012	0.004	0.111	0.059	0.104	0.037 (BSC)	0.071	0.012	0°
	Nom.	-	-	-	-	-	-	-	-		-	-	-
	Max.	0.049	0.004	0.045	0.020	0.008	0.119	0.067	0.116		0.079	0.024	8°

Rev. 1.2