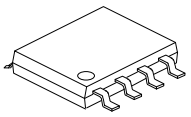
1.5A CMOS LDO



SOP-8

■ DESCRIPTION

The UTC **L11815B** is a positive, linear regulator. One of its features is the very low quiescent current typically as low as 45μA and the dropout voltage is extremely low.

The internal circuit includes thermal shutdown and current fold-back mechanism to prevent device failure when the circuit is operated in the bad conditions.

In application, the UTC **L11815B** needs a low noise and regulated supply. For stability, the output capacitance value should be 4.7μF or more.

The UTC **L11815B** is an ideal for battery applications, such as instrumentations, portable electronics, wireless devices, cordless phones, PC peripherals, and battery powered widgets. The output voltage values are set during manufacturing and their accuracy is trimmed to within 1.5%.

■ FEATURES

* Quiescent Current (45μA typ.)
* Accurate : ± 1.5%
* Very Low Dropout Voltage
* Guaranteed 1.5A Output
* Over-Temperature Shutdown
* With Current Limiting
* Short Circuit Current Fold-Back
* Power-Saving Shutdown Mode
* Low Temperature Coefficient

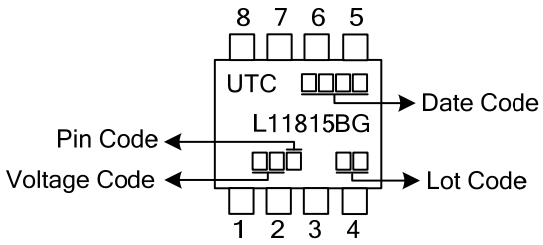
■ ORDERING INFORMATION

Ordering Number	Package	Packing
L11815BG-xx-x-S08-R	SOP-8	Tape Reel

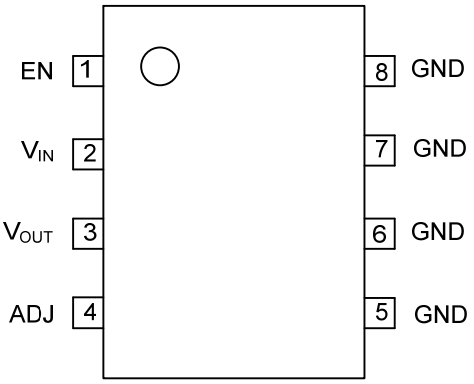
L11815BG-xx-x-S08-R

(1) Packing Type	(1) R: Tape Reel
(2) Package Type	(2) S08: SOP-8
(3) Pin Code	(3) x: refer to Pin Description
(4) Output Voltage Code	(4) xx: Refer to Marking Information
(5) Green Package	(5) G: Halogen Free and Lead Free

■ MARKING INFORMATION

PACKAGE	VOLTAGE CODE	MARKING
SOP-8	AD: ADJ	

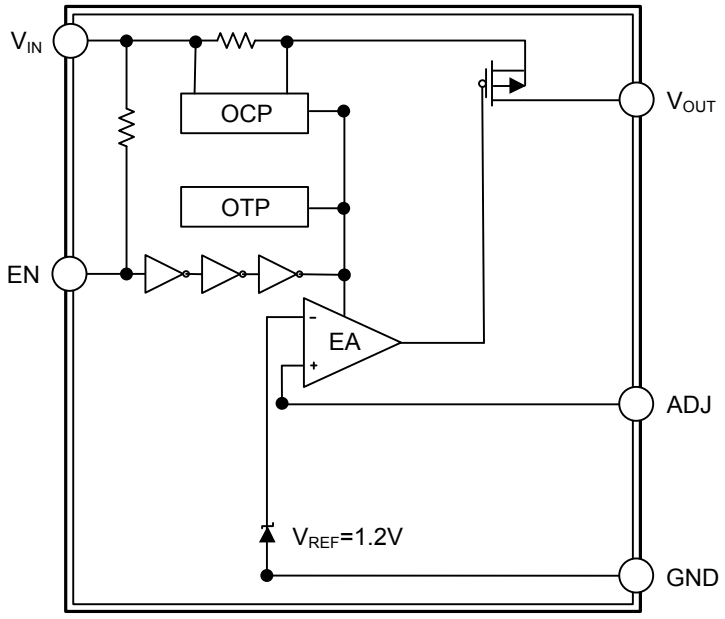
■ PIN CONFIGURATION



■ PIN DESCRIPTION

PIN NO	PIN NAME	Pin Code	DESCRIPTION
1	EN	C	Enable pin. When pulled low, the PMOS pass transistor turns off, current consuming less than 1μA.
2	V_{IN}		Input voltage pin. It should be decoupled with 1μF or greater capacitor.
3	V_{OUT}		LDO voltage regulator output pin. It should be decoupled with a 4.7μF or greater value low ESR ceramic capacitor.
4	ADJ		Feedback output voltage for adjustable device.
5~8	GND		Ground connection pin.

■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATING

PARAMETER	SYMBOL	RATINGS	UNIT
Input Voltage	V_{IN}	-0.3 ~ +8	V
Input Voltage (EN)	V_{EN}	-0.3 ~ +8	V
Output Voltage	V_{OUT}	-0.3 ~ V_{IN} + 0.3	V
Output Current	I_{OUT}	$\frac{P_D}{V_{IN}-V_{OUT}}$	mA
Power Dissipation	P_D	810	mW
Junction Temperature	T_J	150	°C
Operating Temperature	T_{OPR}	-40~+85	°C
Storage Temperature	T_{STG}	-65~+150	°C

Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.

■ THERMAL DATA

PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient	θ_{JA}	150	°C/W
Junction to Case (Note)	θ_{JC}	60	°C/W

Note: θ_{JC} on center of molding compound if IC has on tab.

■ ELECTRICAL CHARACTERISTICS (V_{IN} =V_{OUT}+2V, V_{EN} =V_{IN} , Ta =25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS		MIN	TYP	MAX	UNIT
Input Voltage	V_{IN}			Note1		7	V
Output Voltage Accuracy	V_{OUT}	V_{EN} = $V_{EH(MIN)}$, I_{OUT}=1mA		-1.5		1.5	%
ADJ Reference Voltage	V_{REF}			1.176	1.2	1.224	V
Line Regulation	$\frac{\Delta V_{OUT}}{V_{OUT}}$	I_{OUT}=1mA, V_{IN}=V_{OUT}+1~V_{OUT}+2	V_{OUT}<2.0V	-0.15		0.15	%
			4.0 >V_{OUT}≥2.0V	-0.1	0.02	0.1	%
			4.0V≤V_{OUT}	-0.4		0.4	%
Load Regulation	$\frac{\Delta V_{OUT}}{V_{OUT}}$	I_{OUT}=1mA ~ 1.5A		-1	0.2	1	%
Output Current	I_{OUT}	V_{OUT}>1.2V		1500			mA
Current Limit	I_{LIM}	V_{OUT}>1.2V		1500	2000		mA
Short Circuit Current	I_{SC}	V_{OUT}<0.4V			750		mA
Minimum Load Current	I_{MIN}			1			mA
Ground Pin Current	I_{GND}	I_{OUT}=1mA ~ 1.5A			45		μA
ADJ Input Bias Current	I_{ADJ}	V_{IN} = 5V , V_{ADJ} = 1.242V			1		μA
Dropout Voltage	V_D	I_{OUT}=1.5A, V_{OUT}=V_{OUT} -2.0%	1.5V<V_{OUT}≤2.0V			1300	mV
			2.0V<V_{OUT} ≤2.8V			800	mV
			2.8V<V_{OUT}			600	mV
Over Temperature Shutdown	OTS				150		°C
Over Temperature Hysteresis	OTH				30		°C
Temperature Coefficient of Output Voltage	T_CV_O				30		ppm/°C
Power Supply Rejection	PSRR	I_O=100mA, C_O=4.7μF ceramic	f=1kHz		50		dB
			f=10kHz		20		dB
Output Voltage Noise	eN	f=10Hz~100kHz, I_{OUT}=10mA, C_O=4.7μF			30		μVrms
EN Input Threshold	V_{EH}			2.0		V_{IN}	V
	V_{EL}			0		0.4	V
EN Input Bias Current	I_{EH}	V_{IN}= 7V				0.1	μA
	I_{EL}	V_{EN}=0V, V_{IN}= 7V				0.5	μA
Shutdown Supply Current	I_{SD}	V_{IN} = 5V , V_O=0V, V_{EN}=0V			0.5	2	μA

Note: $V_{IN(MIN)}$=V_{OUT}+$V_{DROPOUT}$

■ DETAILED DESCRIPTION

The UTC **L11815B** of CMOS regulators insist of a PMOS pass transistor, voltage reference, error amplifier, over-current protection, and thermal shutdown.

The error amplifier, over-current shutdown, and thermal protection circuits provides data for P-channel pass transistor. The error amplifier takes output voltage for a precision reference in the normal operation and the normal operation is restored when the junction temperature drops below 120°C. Over-current and Thermal shutdown circuits start to work when the junction temperature is higher than 140°C, or the current is higher than 2.2A. The output voltage stays low when the thermal shutdown is in active.

The UTC **L11815B** behaves like a current source when the load reaches 2.2A. But the current would fall back to 600mA to prevent excessive power loss when the load impedance value is below 0.3Ω.Normal operation is restored when the load resistance value is higher than 0.75Ω.

■ EXTERNAL CAPACITORS

The UTC **L11815B** has an output capacitor to ground of 4.7μF or more in the stable operation. Ceramic capacitors can provide the lowest ESR with the best AC performance. Aluminum Electrolytic capacitors, in contrast, have the highest ESR with poorest AC response. Unfortunately, large value ceramic capacitors are comparatively expensive. So we can parallel a 0.1μF ceramic capacitor with a 10μF Aluminum Electrolytic. The result is low ESR, high capacitance, and low overall cost.

A second capacitor is recommended between the input and ground to stabilize input voltage. To get an ideal effect the value of the input capacitor should be at least 0.1μF.

A third capacitor can be connected between the bypass pin and ground. This capacitor can be a low cost Polyester Film varies in the range of 0.001 ~ 0.01μF. A larger capacitor improves the AC ripple rejection, but also makes the output come up slowly. This "Soft" turn-on is desirable in some applications to limit turn-on surges.

At last, all the capacitors should keep a close proximity to the pins; you can achieve this with a star connection.

■ ENABLE

When pulled low, the PMOS pass transistor shuts off, and all internal circuits are powered down. In this state, the quiescent current is less than 1μA. This pin behaves much like an electronic switch.

100kΩ resistor is necessary between V_{EN} source and EN pin when V_{EN} is higher than V_{IN}.

(Note: There is no internal pull-up for EN PIN.)

■ ADJUSTABLE VERSION

The adjustable version uses external feedback resistors to generate an output voltage anywhere from 1.5V to 5.0V. V_{ADJ} is trimmed to 1.2V and V_{OUT} is given by the equation:

$V_{OUT} = V_{ADJ} (1 + R1 / R2)$

Feedback resistors R1 and R2 should be high enough to keep quiescent current low, but increasing R1 + R2 will reduce stability. In general, R1 and R2 in the 10's of kΩ will produce adequate stability, given reasonable layout precautions. To improve stability characteristics, keep parasitics on the ADJ pin to a minimum, and lower R1 and R2 values.

■ TYPICAL APPLICATION CIRCUIT