

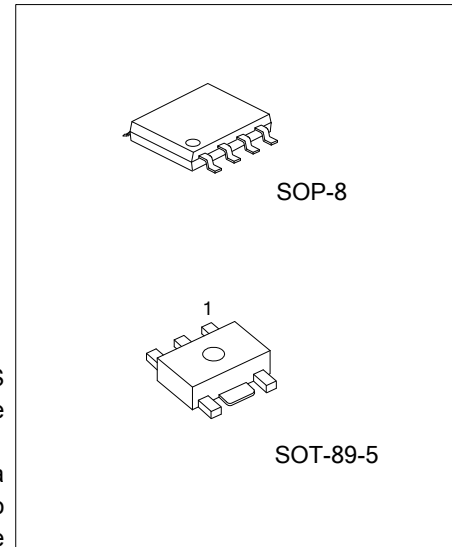


L1138

Preliminary

CMOS IC

HIGH OUTPUT CURRENT CMOS VOLTAGE REGULATOR WITH HIGH RIPPLE-REJECTION AND LOW DROPOUT



DESCRIPTION

The UTC L1138 is a positive LDO voltage regulator using CMOS technology. It is featured as: low dropout voltage, high output voltage accuracy, and low current consumption.

The internal circuits include a low on-resistance transistor to provide a low dropout voltage and large output current; an overcurrent protector to make sure the load current don't exceed the current capacitance of the output transistor, a thermal shutdown circuit to escape device damage from over-heat, and an ON/OFF circuit to keep the battery life longer.

In applications, the UTC L1138 can be used in power supply unit for DVD, CD-ROM drives, battery-powered devices, personal communication devices, and NBs.

FEATURES

- * Output voltage's high accuracy: $\pm 1.0\%$
- * Low dropout voltage: 120mV typ.
@3.0V output , $I_{OUT}=300mA$
- * Low current consumption: 80 μA (Typ.)160 μA max in operation
0.1 μA (Typ.)1.0 μA max in shutdown mode
- * High current capability: 800mA output
@ $V_{IN} \geq V_{OUT(S)} + 1.0V$
- * With ON/OFF circuit: Ensures long battery life.
- * Low ESR capacitor can be used: at least a 4.7 μF ceramic capacitor for the output capacitor.
- * High ripple rejection 70dB typ@1.0kHz
- * With over current protector
- * With thermal shutdown circuit

ORDERING INFORMATION

Ordering Number		Package	Packing
Lead Free	Halogen Free		
L1138L-xx-AB5-R	L1138G-xx-AB5-R	SOT-89-5	Tape Reel
L1138L-xx-S08-R	L1138G-xx-S08-R	SOP-8	Tape Reel

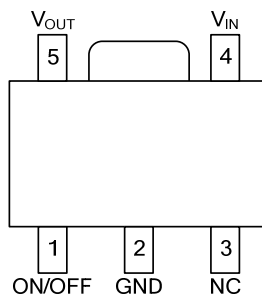
xx: Output Voltage, refer to Marking Information.

<p>L1138L-xx-AB5-R</p>	<p>(1) R: Tape Reel</p> <p>(2) AB5: SOT-89-5, S08: SOP-8</p> <p>(3) xx: Refer to Marking Information</p> <p>(4) G: Halogen Free, L: Lead Free</p>
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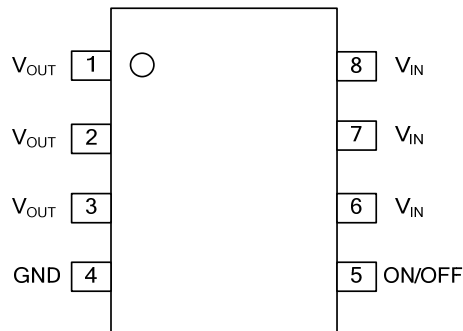
MARKING INFORMATION

PACKAGE	VOLTAGE CODE	MARKING
SOT-89-5	12 :1.2V 25 :2.5V	<p>Date Code ← Voltage Code G: Halogen Free L: Lead Free</p>
SOP-8	28 :2.8V 35 :3.5V	<p>Voltage Code ← Date Code G: Halogen Free L: Lead Free Lot Code</p>

PIN CONFIGURATION



SOT-89-5



SOP-8

PIN DESCRIPTION

FOR SOT-89-5 Package

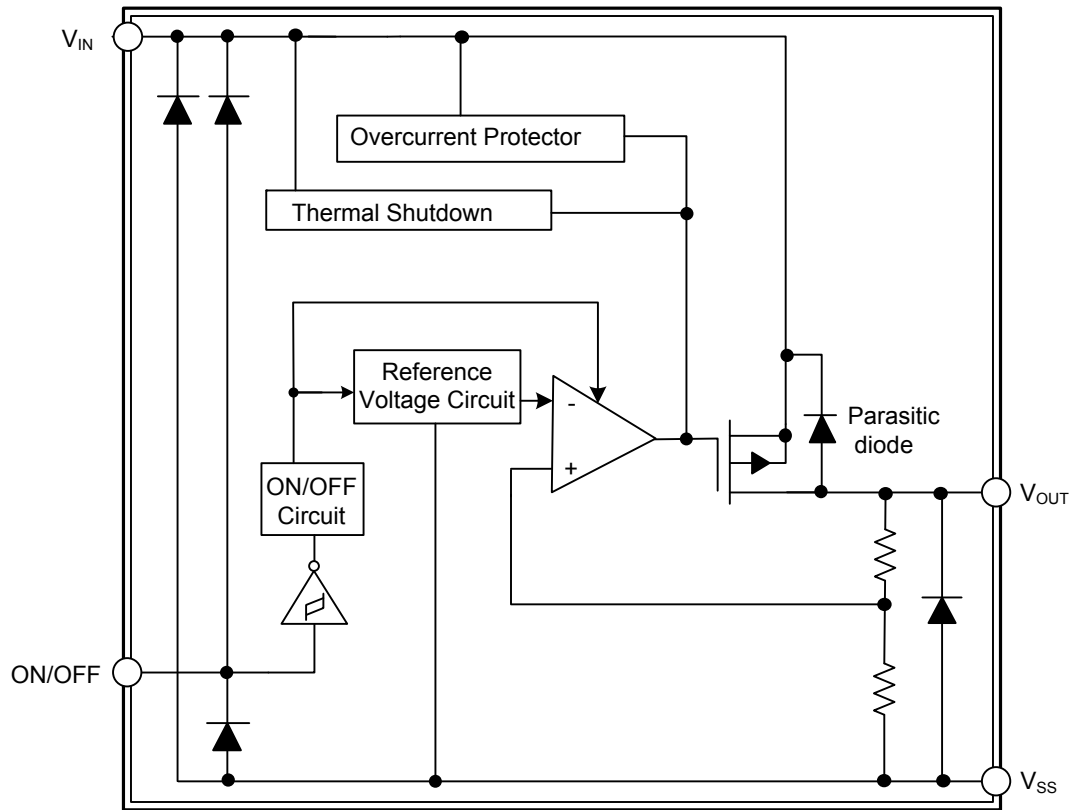
PIN NO.	PIN NAME	DESCRIPTION
1	ON/OFF	Shutdown Pin
2	GND	Ground Pin
3	NC	No Connection, NC pin is electrically open and can be connected V_{IN} and V_{SS}
4	V_{IN}	Input voltage Pin
5	V_{OUT}	Output voltage Pin

FOR SOP-8 Package

PIN NO.	PIN NAME	DESCRIPTION
1,2,3	V_{OUT}	Output voltage Pin (Note 1)
4	GND	Ground Pin
5	ON/OFF	Shutdown Pin
6,7,8	V_{IN}	Input voltage Pin (Note 2)

Note: 1.Short pins 1, 2 ,3
2.Short pins 6, 7, 8

■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATING($T_a = 25^\circ\text{C}$, unless otherwise specified)

PARAMETER	SYMBOL	RATINGS	UNIT
Input Voltage	V_{IN}	$V_{SS} - 0.3 \sim V_{SS} + 7$	V
	$V_{ON/OFF}$	$V_{SS} - 0.3 \sim V_{IN} + 0.3$	V
Output Voltage	V_{OUT}	$V_{SS} - 0.3 \sim V_{IN} + 0.3$	V
Power Dissipation	P_D	Internally limited	mW
Operating Temperature	T_{OPR}	$-40 \sim +85$	$^\circ\text{C}$
Storage Temperature	T_{STG}	$-40 \sim +125$	$^\circ\text{C}$

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.

■ ELECTRICAL CHARACTERISTICS ($T_a = 25^\circ\text{C}$, $V_{IN} = V_{OUT} + 1\text{V}$, unless otherwise specified)

Parameter	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT	
Input Voltage	V_{IN}				6.5	V	
Output Voltage (Note 1)	$V_{OUT(E)}$	$V_{IN} = V_{OUT(S)} + 1.0\text{V}$, $I_{OUT} = 100\text{mA}$	-1%		+1%	V	
Line Regulation	$\frac{\Delta V_{OUT1}}{\Delta V_{IN} \times V_{OUT}}$	$V_{OUT(S)} + 0.5\text{V} \leq V_{IN} \leq 6.5\text{V}$, $I_{OUT} = 100\text{mA}$		0.05	0.3	%/V	
Load Regulation	ΔV_{OUT2}	$V_{IN} = V_{OUT(S)} + 1.0\text{V}$, $1.0\text{mA} \leq I_{OUT} \leq 300\text{mA}$		30	100	mV	
Output Current (Note 2)	I_{OUT}	$V_{IN} \leq V_{OUT(S)} + 1.0\text{V}$	800			mA	
Current Consumption During	Operation	I_{SS1} $V_{IN} = V_{OUT(S)} + 1.0\text{V}$, ON/OFF pin = ON, no load		80	160	μA	
	Shutdown	I_{SS2} $V_{IN} = V_{OUT(S)} + 1.0\text{V}$, ON/OFF pin = OFF, no load		0.1	1.0	μA	
Short-Circuit Current	I_{SHORT}	$V_{IN} = V_{OUT(S)} + 1.0\text{V}$, ON/OFF pin = ON, $V_{OUT} = 0\text{V}$		350		mA	
Dropout Voltage (Note 3)	V_D	$I_{OUT} = 300\text{mA}$	$V_{OUT(S)} = 1.2\text{V}$		0.8	1.0	V
			$V_{OUT(S)} = 2.5\text{V}$		0.15	0.22	
			$V_{OUT(S)} = 2.8\text{V}$		0.15	0.22	
			$V_{OUT(S)} = 3.5\text{V}$		0.12	0.18	
Temperature Coefficient of Output Voltage	$T_C V_O$	$V_{IN} = V_{OUT(S)} + 1.0\text{V}$, $I_{OUT} = 10\text{mA}$, $-40^\circ\text{C} \leq T_a \leq 85^\circ\text{C}$		± 150		ppm/ $^\circ\text{C}$	
Power Supply Rejection	PSRR	$V_{IN} = V_{OUT(S)} + 1.0\text{V}$, $f = 1.0\text{kHz}$, $I_{OUT} = 100\text{mA}$, $\Delta V_{rip} = 0.5\text{V}_{rms}$	$1.2\text{V} \leq V_{OUT(S)} \leq 3.0\text{V}$		70	dB	
			$3.1\text{V} \leq V_{OUT(S)} \leq 5.5\text{V}$		65		
Shutdown Pin Input Voltage	High	V_{SH}	$V_{IN} = V_{OUT(S)} + 1.0\text{V}$	1.5		V	
	Low	V_{SL}	$V_{IN} = V_{OUT(S)} + 1.0\text{V}$		0.3	V	
Shutdown Pin Input Current	High	I_{SH}	$V_{IN} = 6.5\text{V}$, $V_{ON/OFF} = 6.5\text{V}$	-0.1	0.1	μA	
	Low	I_{SL}	$V_{IN} = 6.5\text{V}$, $V_{ON/OFF} = 0\text{V}$	-0.1	0.1	μA	
Thermal Shutdown Temperature	Detection	T_{SD}	Junction temperature		150	$^\circ\text{C}$	
	Release	T_{SR}	Junction temperature		120	$^\circ\text{C}$	

Notes: 1. $V_{OUT(S)}$: Specified output voltage.

$V_{OUT(E)}$: Actual output voltage at the fixed load

When fixing($I_{OUT} = 100\text{mA}$) and inputting $V_{OUT(S)} + 1.0\text{V}$

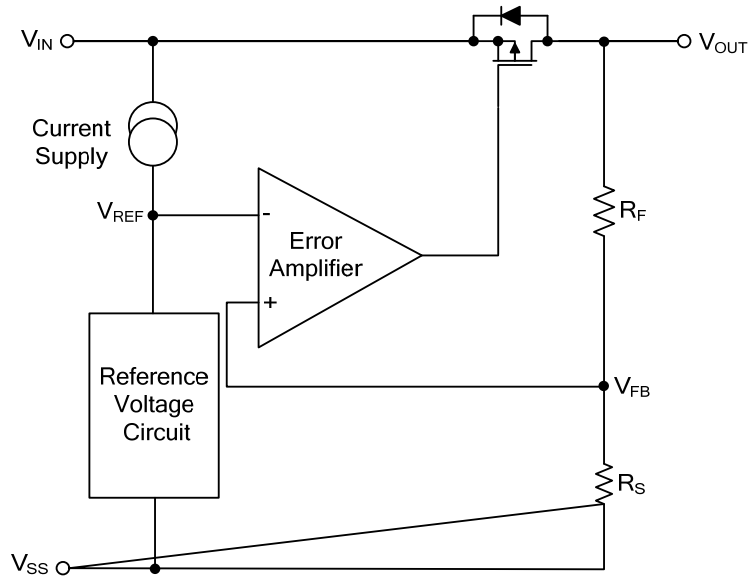
2. This output current means the one at which the output voltage becomes 98% of $V_{OUT(E)}$ after gradually increasing the output current.

3. The dropout voltage is detmed as $V_{IN} - V_{OUT}$, which is measured when V_{OUT} is $V_{OUT(normal)} \times 98\%$

■ OPERATION

1. Basic operation

The reference voltage (V_{REF}) and V_{FB} (the output voltage resistance-divided by feedback resistors R_S and R_F) are the input for the error amplifier.



2. Output transistor

A low on-resistance P-channel MOSFET is used as the output transistor. Inverse current flowing from V_{OUT} pin through a parasitic diode to V_{IN} pin can damage the regulator, so be sure that V_{OUT} does not exceed $V_{IN} + 0.3V$.

3. Shutdown pin (ON/OFF pin)

The shutdown pin can start and stop the regulator. The shutdown mode set by this pin can stop the operation of all internal circuits. The structure of the ON/OFF pin is shown in Fig. 1. When the ON/OFF pin is not used, connect it to the V_{SS} pin if the logic type is "A" and to the V_{IN} pin if it is "B".

Logic Type	ON/OFF Pin	Internal Circuits	V_{OUT} Pin Voltage	Current Consumption
A	"L": Power on	Operating	Set value	I_{SS1}
A	"H": Power off	Stopped	V_{SS} level	I_{SS2}
B	"L": Power off	Stopped	V_{SS} level	I_{SS2}
B	"H": Power on	Operating	Set value	I_{SS1}

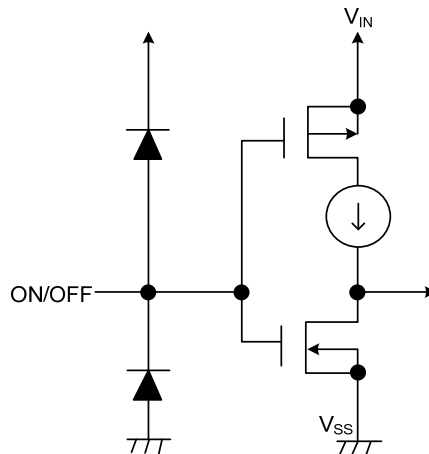
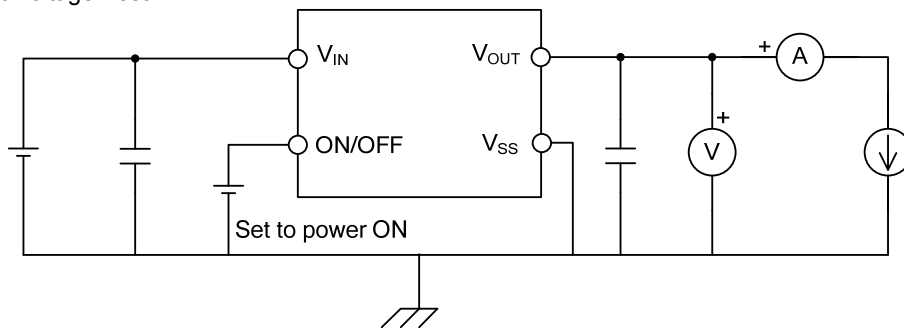


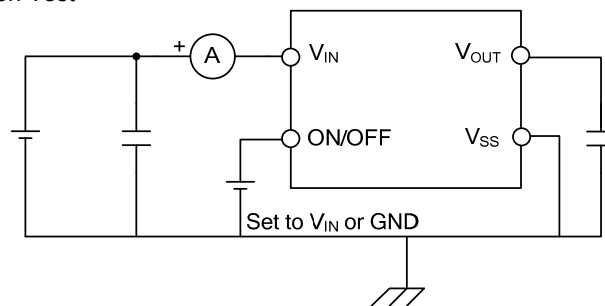
Fig. 1

■ TEST CIRCUITS

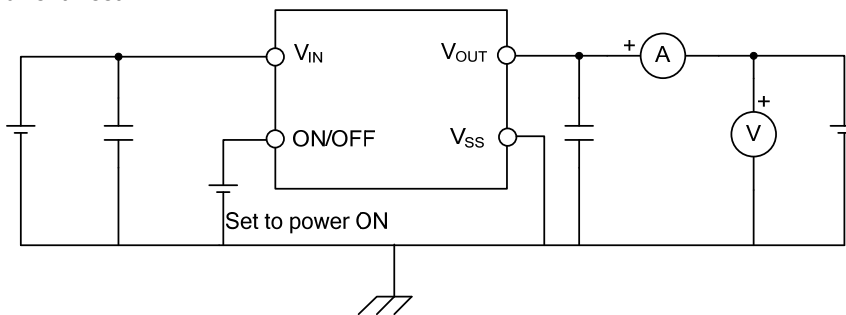
1. Output Voltage Test



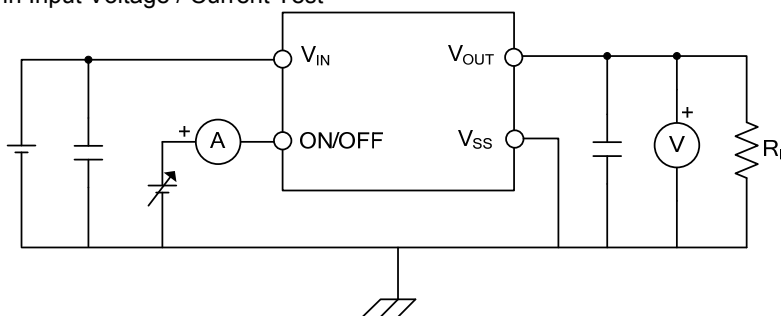
2. Current Consumption Test



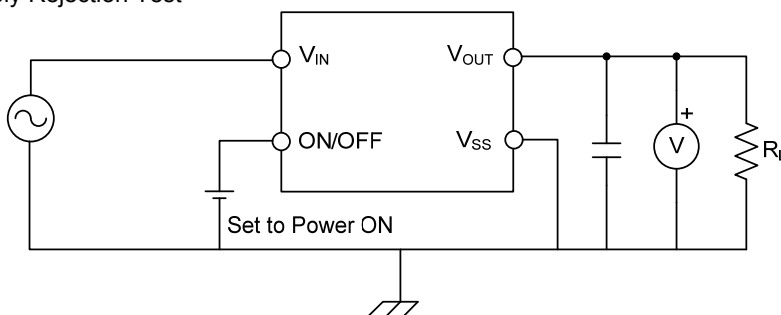
3. Output Current Test



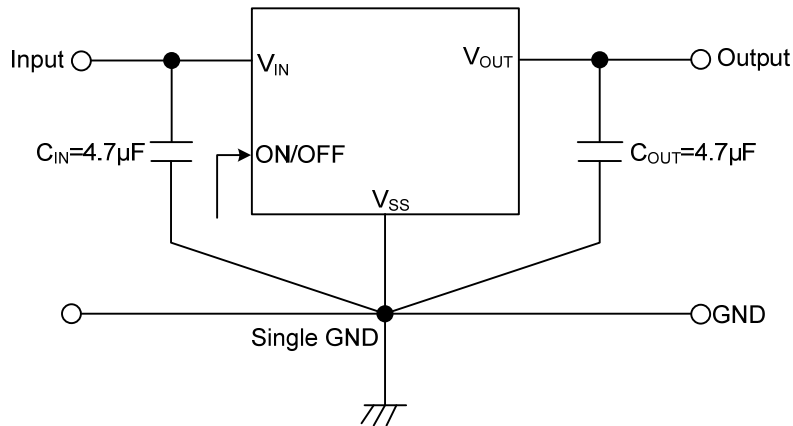
4. Shutdown Pin Input Voltage / Current Test



5. Power Supply Rejection Test



■ TYPICAL APPLICATION CIRCUIT



Notes: C_{IN} is a capacitor for stabilizing the input.
A ceramic capacitor of 4.7 μ F or more can be used for C_{OUT}

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