

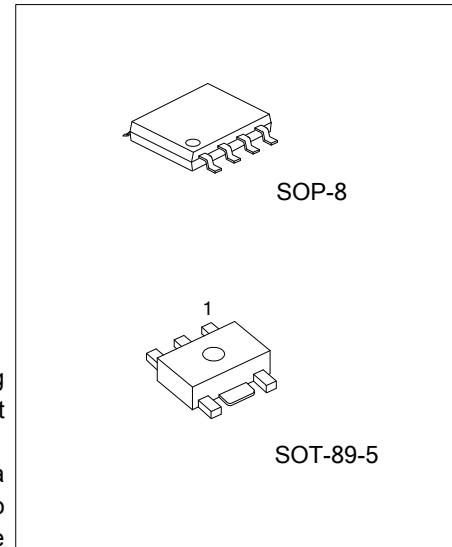


L1138

Preliminary

CMOS IC

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



DESCRIPTION

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

The internal circuits include low on-resistance transistor featured as a low dropout voltage and large output current, overcurrent protector to make sure the load current don't exceed the current capacitance of the output transistor, thermal shutdown circuit to make sure the heat won't damage the chip and ON/OFF circuit to keep the battery life longer.

In applications, the UTC **L1138** can be used equipment, such as power supplies for DVD, CD-ROM drives, battery-powered devices, personal communication devices, and personal communication devices.

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
- * Halogen Free

ORDERING INFORMATION

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

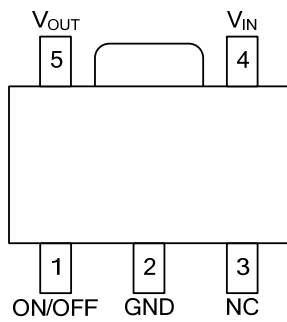
xx: Output Voltage, refer to Marking Information.

<p>L1138G-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</p>
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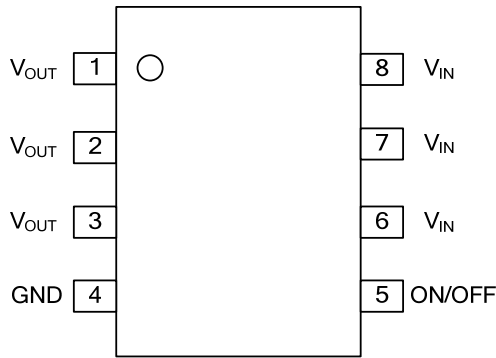
MARKING INFORMATION

PACKAGE	VOLTAGE CODE	MARKING
SOT-89-5	28 :2.8V 35 :3.5V	
SOP-8		

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(Note)	NC	No Connection
4	V _{IN}	Input voltage Pin
5	V _{OUT}	Output voltage Pin

Note: The NC pin is electrically open; it's can be connected V_{IN} and V_{SS}

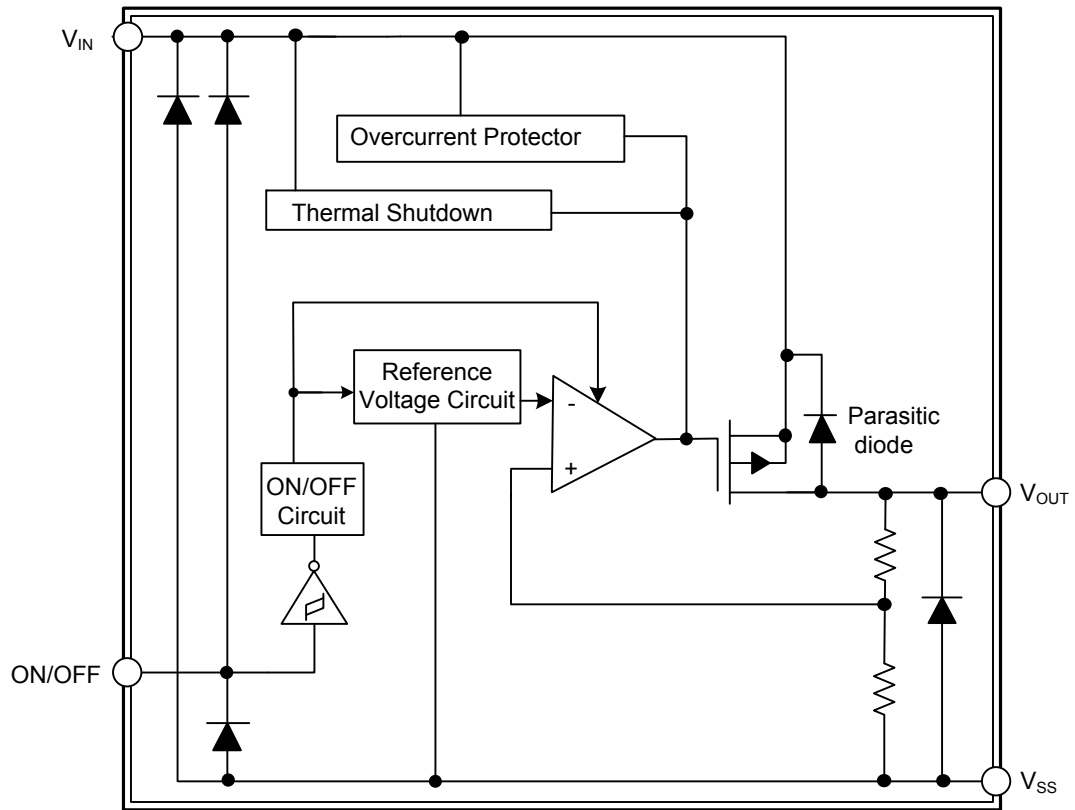
FOR SOP-8 Package

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

Notes: 1.Short pin 1, 2 ,3

2.Short pin 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~+85	$^\circ\text{C}$
Storage Temperature	T_{STG}	-40~+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 ($V_{IN} = V_{OUT} + 1\text{V}$, $T_a = 25^\circ\text{C}$, unless otherwise specified)

L1138-2.8V

Parameter		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Input Voltage		V_{IN}				6.5	V
Output Voltage (Note 1)		$V_{OUT(E)}$	$V_{IN} = V_{OUT(S)} + 1.0\text{V}$, $I_{OUT} = 100\text{mA}$	2.772	2.8	2.828	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		V_D	$V_{OUT(S)} = 2.8\text{V}$, $I_{OUT} = 300\text{mA}$		0.15	0.22	V
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	$V_{OUT(S)} = 2.8\text{V}$, $V_{IN} = V_{OUT(S)} + 1.0\text{V}$ $f = 1.0\text{kHz}$, $I_{OUT} = 100\text{mA}$ $\Delta V_{rip} = 0.5V_{rms}$		70		dB
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		$^\circ\text{C}$

■ ELECTRICAL CHARACTERISTICS(Cont.)

L1138-3.5V

Parameter	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Input Voltage	V_{IN}				6.5	V
Output Voltage (Note 1)	$V_{OUT(E)}$	$V_{IN} = V_{OUT(S)} + 1.0V, I_{OUT} = 100mA$	3.465	3.5	3.535	V
Line Regulation	$\frac{\Delta V_{OUT1}}{\Delta V_{IN} \times V_{OUT}}$	$V_{OUT(S)} + 0.5V \leq V_{IN} \leq 6.5V,$ $I_{OUT} = 100mA$		0.05	0.3	%/V
Load Regulation	ΔV_{OUT2}	$V_{IN} = V_{OUT(S)} + 1.0 V$ $1.0mA \leq I_{OUT} \leq 300mA$		30	100	mV
Output Current (Note 2)	I_{OUT}	$V_{IN} \leq V_{OUT(S)} + 1.0 V$	800			mA
Current Consumption During	Operation	I_{SS1} $V_{IN} = V_{OUT(S)} + 1.0 V$ ON/OFF pin = ON, no load		80	160	μA
	Shutdown	I_{SS2} $V_{IN} = V_{OUT(S)} + 1.0 V$ ON/OFF pin = OFF, no load		0.1	1.0	μA
Short-Circuit Current	I_{SHORT}	$V_{IN} = V_{OUT(S)} + 1.0 V$ ON/OFF pin = ON, $V_{OUT} = 0 V$		350		mA
Dropout Voltage	V_D	$V_{OUT(S)} = 3.5V, I_{OUT} = 300mA$		0.12	0.18	V
Temperature Coefficient of Output Voltage	$T_C V_O$	$V_{IN} = V_{OUT(S)} + 1.0V$ $I_{OUT} = 10mA, -40^\circ C \leq T_a \leq 85^\circ C$		± 150		ppm/ $^\circ C$
Power Supply Rejection	PSRR	$V_{OUT(S)} = 3.5V, V_{IN} = V_{OUT(S)} + 1.0 V$ $f = 1.0kHz, I_{OUT} = 100mA$ $\Delta V_{rip} = 0.5V_{rms}$		65		dB
Shutdown Pin Input Voltage	High	V_{SH} $V_{IN} = V_{OUT(S)} + 1.0V$	1.5			V
	Low	V_{SL} $V_{IN} = V_{OUT(S)} + 1.0V$			0.3	V
Shutdown Pin Input Current	High	I_{SH} $V_{IN} = 6.5V, V_{ON/OFF} = 6.5V$	-0.1		0.1	μA
	Low	I_{SL} $V_{IN} = 6.5V, V_{ON/OFF} = 0V$	-0.1		0.1	μA
Thermal Shutdown Temperature	Detection	T_{SD} Junction temperature		150		$^\circ C$
	Release	T_{SR} Junction temperature		120		$^\circ C$

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

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

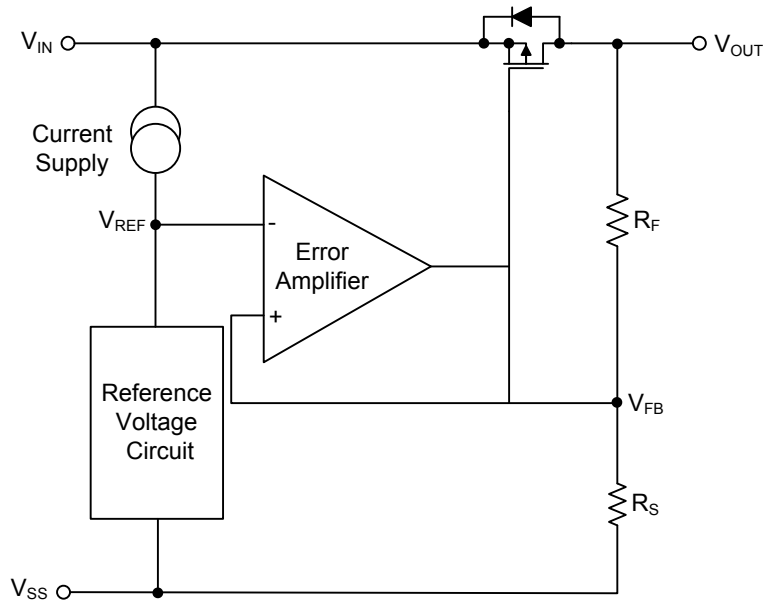
When fixing $I_{OUT}(= 100mA)$ and inputting $V_{OUT(S)} + 1.0 V$

2. This output current means the one at which the output voltage becomes 95% of $V_{OUT(E)}$ after gradually increasing the output current.

■ 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 MOS FET 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 $V_{IN} + 0.3$ V.

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}

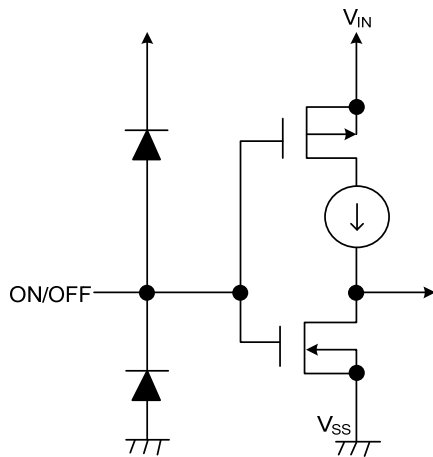
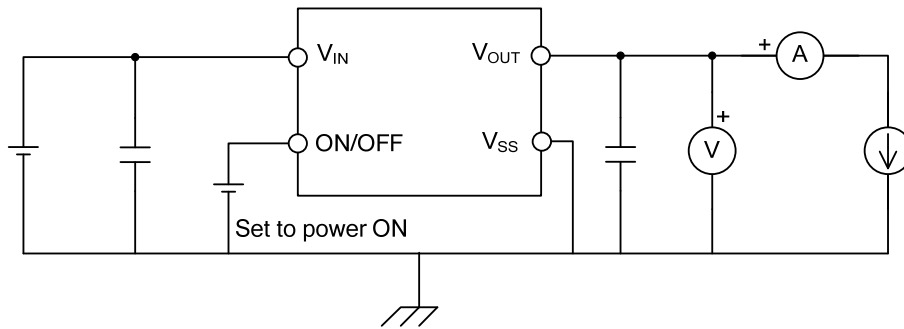


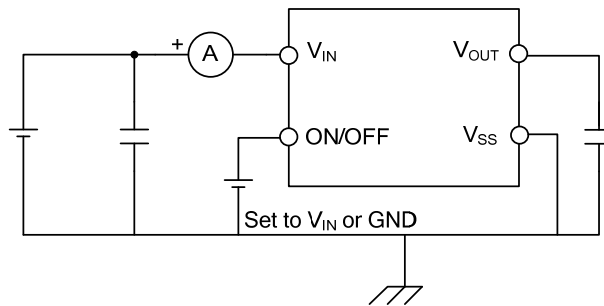
Fig. 1

■ TEST CIRCUITS

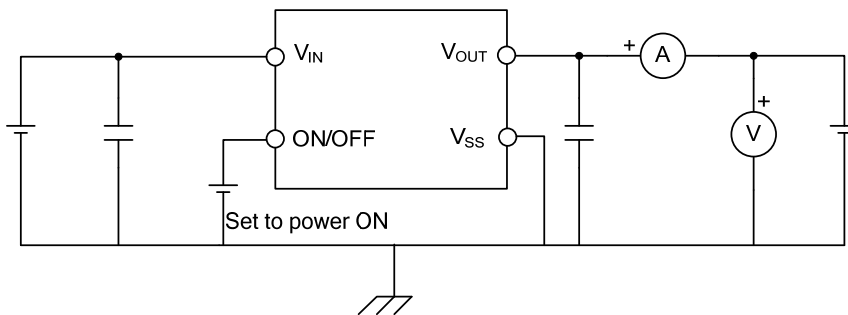
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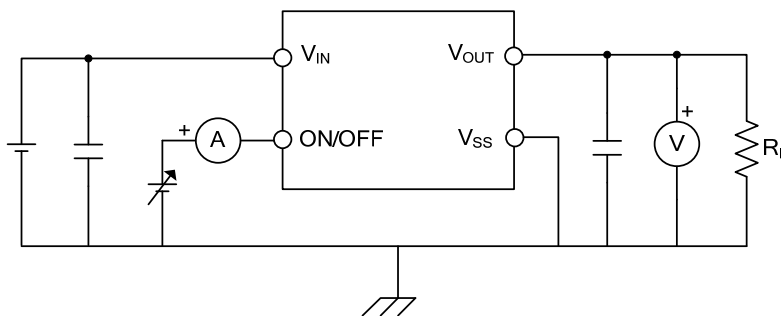
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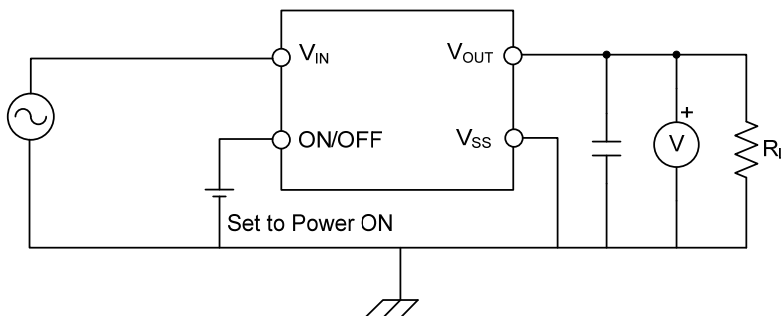
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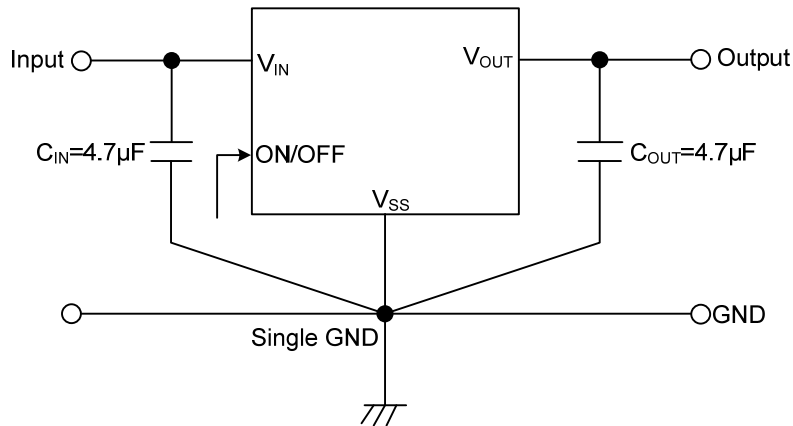
4.



5.



■ TYPICAL APPLICATION CIRCUIT



Notes: C_{IN} is a capacitor for stabilizing the input.

A ceramic capacitor of $4.7\mu\text{F}$ or more can be used for C_{OUT}

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