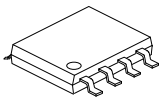
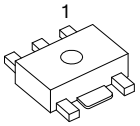
HIGH OUTPUT CURRENT CMOS VOLTAGE REGULATOR WITH HIGH RIPPLE-REJECTION AND LOW DROPOUT



SOP-8



SOT-89-5

■ 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: ±1.0%
* Low dropout voltage: 120mV typ.
  @3.3V output , I_{OUT}=300mA
* Low current consumption: 80μA(Typ.)160μA max in operation
  0.1μA(Typ.)1.0μA max in shutdown mode
* High current capability: 800mA output
  @V_{IN}≥$V_{OUT(S)}$+1.0V
* With ON/OFF circuit: Ensures long battery life.
* High ripple rejection 70dB typ@1.0kHz
* With over current protector
* With thermal shutdown circuit

■ ORDERING INFORMATION

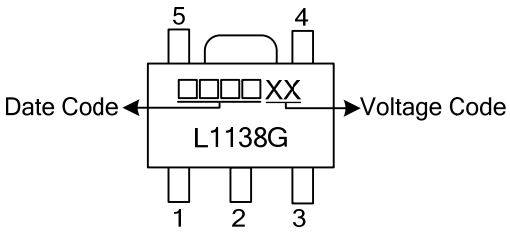
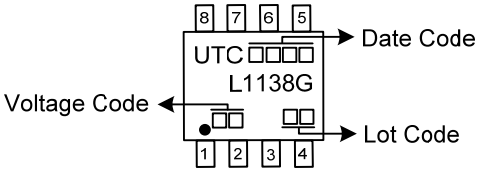
Ordering Number	Package	Packing
L1138G-xx-AB5-R	SOT-89-5	Tape Reel
L1138G-xx-S08-R	SOP-8	Tape Reel

xx: Output Voltage, refer to Marking Information.

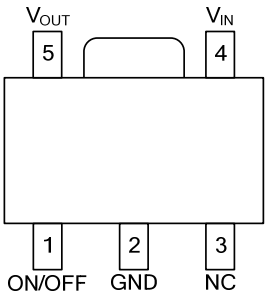
L1138G-xx-AB5-R

(1)Packing Type	(1) R: Tape Reel
(2)Package Type	(2) AB5: SOT-89-5, S08: SOP-8
(3)Output Voltage Code	(3) xx: Refer to Marking Information
(4)Green Package	(4) G: Halogen Free and Lead Free

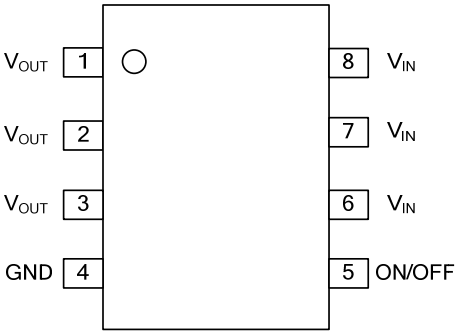
■ MARKING INFORMATION

PACKAGE	VOLTAGE CODE	MARKING
SOT-89-5	12: 1.2V 25: 2.5V 28: 2.8V 33: 3.3V 35: 3.5V 36: 3.6V 45: 4.5V 50: 5.0V	
SOP-8		

■ PIN CONFIGURATION



SOT-89-5



SOP-8

■ PIN DESCRIPTION

FOR SOT-89-5 Package

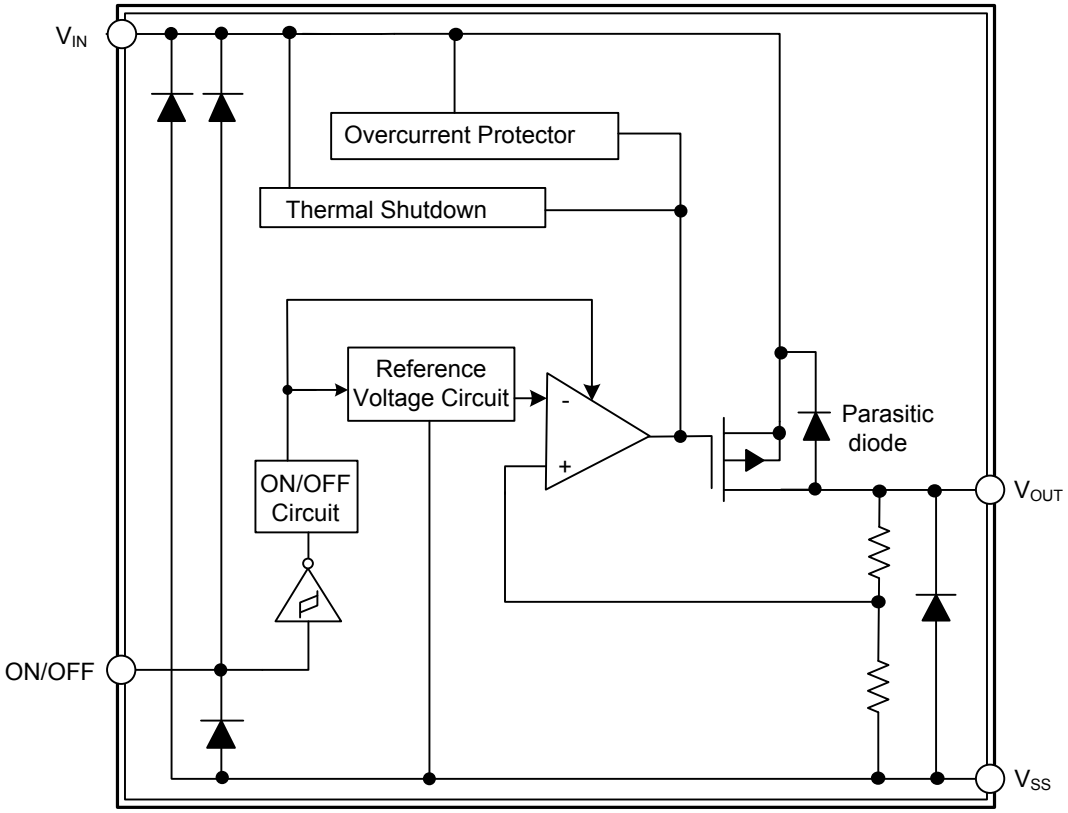
PIN NO.	PIN NAME	DESCRIPTION
1	ON/OFF	Shutdown Pin
2	GND	Ground Pin
3	NC	No Connection, NC pin is electrically open and can be connected V_{IN} and V_{SS}
4	V_{IN}	Input voltage Pin
5	V_{OUT}	Output voltage Pin

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)

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

■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATING(T_A = 25°C, unless otherwise specified)

PARAMETER	SYMBOL	RATINGS	UNIT
Input Voltage	V_{IN}	V_{SS} -0.3~V_{SS}+7	V
	$V_{ON/OFF}$	V_{SS} -0.3~V_{IN}+0.3	V
Output Voltage	V_{OUT}	V_{SS} -0.3~V_{IN}+0.3	V
Power Dissipation	P_D	Internally limited	mW
Operating Temperature	T_{OPR}	-40~+85	°C
Storage Temperature	T_{STG}	-40~+125	°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°C, V_{IN}=V_{OUT}+1V, unless otherwise specified)

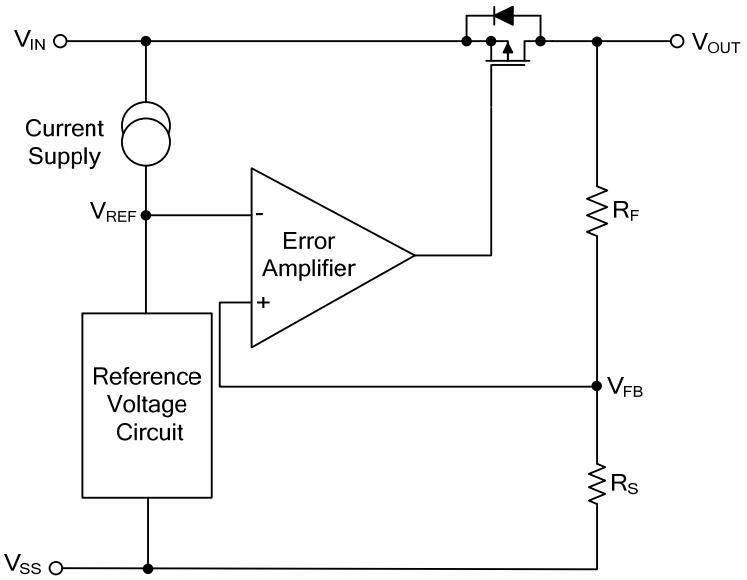
Parameter		SYMBOL	TEST CONDITIONS		MIN	TYP	MAX	UNIT
Input Voltage		V_{IN}					6.5	V
Output Voltage (Note 1)		$V_{OUT(E)}$	V_{IN} =$V_{OUT(S)}$+1.0V, I_{OUT} =100mA		-1%		+1%	V
Line Regulation		$\frac{\Delta V_{OUT1}}{\Delta V_{IN} \times V_{OUT}}$	$V_{OUT(S)}$ + 0.5V ≤V_{IN} ≤6.5V, I_{OUT} = 100mA			0.05	0.3	%/V
Load Regulation		ΔV_{OUT2}	V_{IN} = $V_{OUT(S)}$ + 1.0 V, 1.0mA ≤I_{OUT} ≤300mA			30	100	mV
Output Current (Note 2)		I_{OUT}	V_{IN} ≤$V_{OUT(S)}$+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 (Note 3)		V_D	I_{OUT} = 300mA	$V_{OUT(S)}$ =1.2V		0.8	1.0	V
				$V_{OUT(S)}$ =2.5V		0.15	0.22	
				$V_{OUT(S)}$ =2.8V		0.15	0.22	
				3.3V ≤ $V_{OUT(S)}$ ≤ 5.5V		0.12	0.18	
Temperature Coefficient of Output Voltage		T_CV_O	V_{IN} = $V_{OUT(S)}$ +1.0V, I_{OUT} = 10mA, -40°C≤ T_A ≤85°C			±150		ppm/°C
Power Supply Rejection		PSRR	V_{IN}= $V_{OUT(S)}$+1.0 V f = 1.0kHz, I_{OUT} = 100 mA ΔV_{rip} = 0.5V_{rms}	1.2V ≤$V_{OUT(S)}$≤ 3.0V		70		dB
				3.1V ≤$V_{OUT(S)}$≤ 5.5V		65		
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		°C
	Release	T_{SR}	Junction temperature			120		°C

Notes: 1. $V_{OUT(S)}$: Specified output voltage.
$V_{OUT(E)}$: Actual output voltage at the fixed load
2. When fixing(I_{OUT}= 100mA) and inputting $V_{OUT(S)}$ + 1.0 V
3. This output current means the one at which the output voltage becomes 98% of $V_{OUT(E)}$ after gradually increasing the output current.
4. The dropant voltage is detmed as V_{IN} - V_{OUT}, which is measured when V_{OUT} is $V_{OUT(normal)}$ × 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}

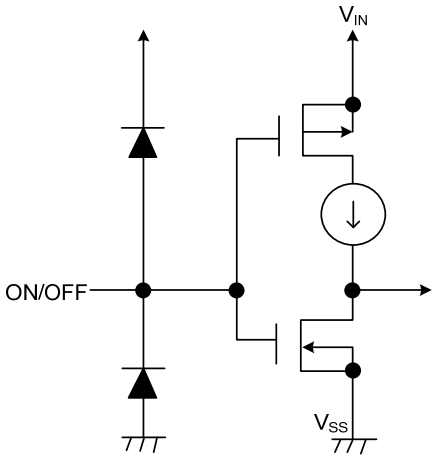
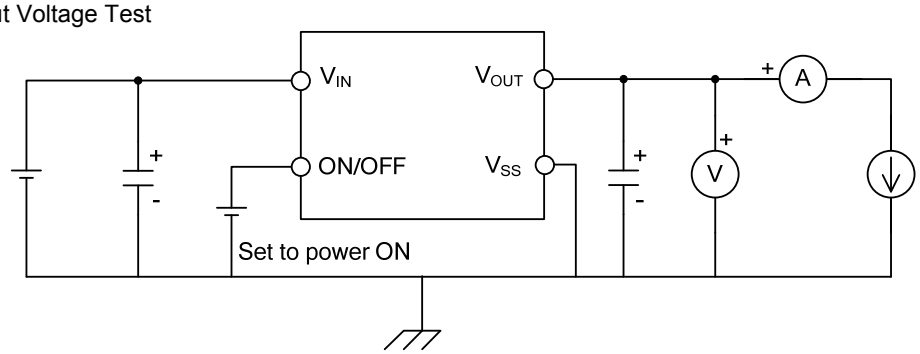


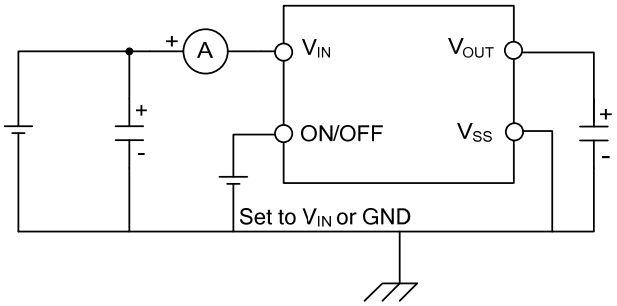
Fig. 1

■ TEST CIRCUITS

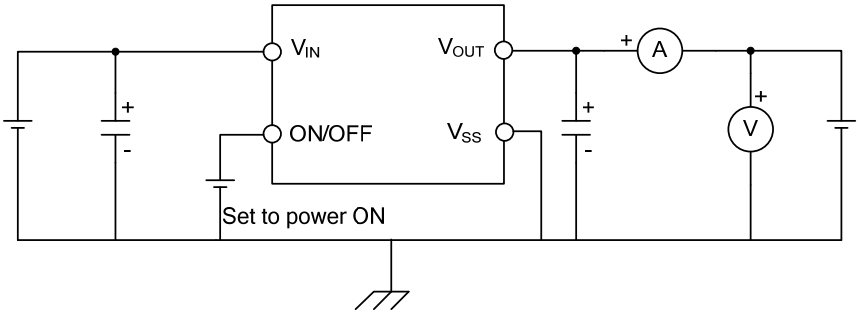
1. Output Voltage Test



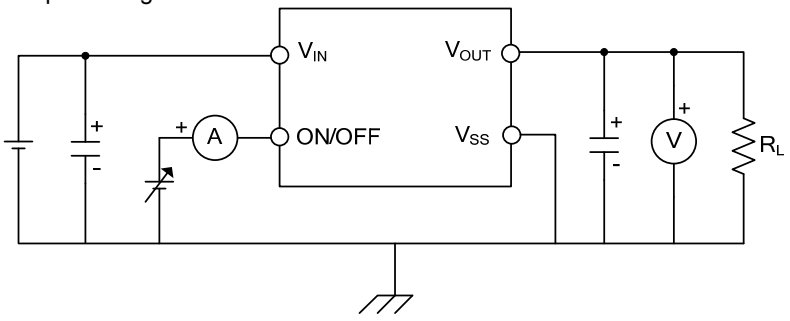
2. Current Consumption Test



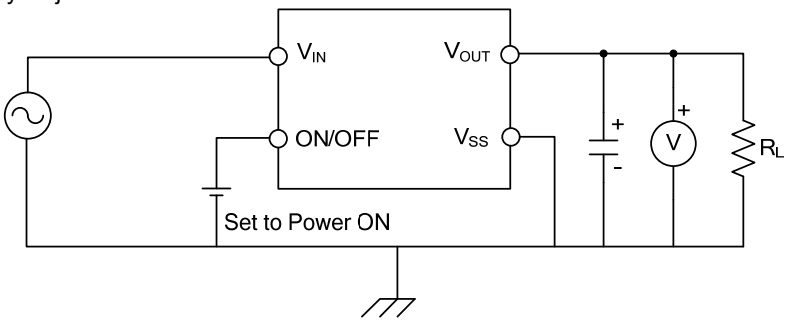
3. Output Current Test



4. Shutdown Pin Input Voltage / Current Test



5. Power Supply Rejection Test



■ TYPICAL APPLICATION CIRCUIT