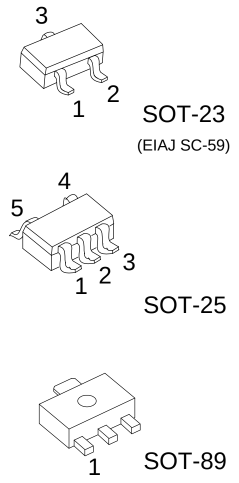
HIGH OPERATING VOLTAGE CMOS VOLTAGE REGULATOR



■ DESCRIPTION

The UTC **LR1012** series is high operating voltage regulator using UTC CMOS technology. The max operating voltage of UTC **LR1012L** is 12V so it works best in high-voltage applications. Moreover, it is also suitable in constructing low power portable devices including small current consumption, short-current protection.

■ FEATURES

* Operating current: Max. 1.2μA (3.0V)
* Output voltage: 1.8 ~ 6.0V, as 0.1V step
* ±2.0% output voltage accuracy
* Output current:
  50mA capable @ 3.0V output, V_{IN}=5.0V
  75mA capable @ 5.0V output, V_{IN}=7.0V
* Dropout voltage:120mV @V_{OUT} = 5.0V, I_{OUT}=10mA

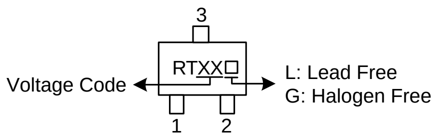
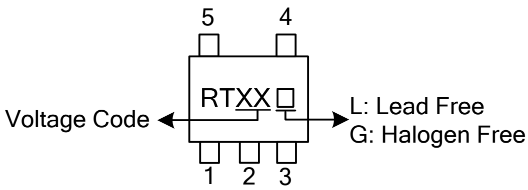
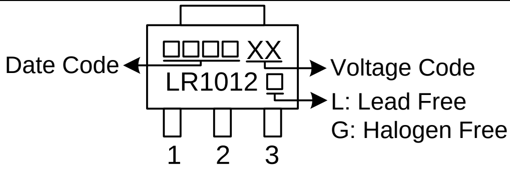
■ ORDERING INFORMATION

Ordering Number		Package	Packing
Lead Free	Halogen Free		
LR1012L-xx-AB3-R	LR1012G-xx-AB3-R	SOT-89	Tape Reel
LR1012L-xx-AE3-R	LR1012G-xx-AE3-R	SOT-23	Tape Reel
LR1012L-xx-AF5-R	LR1012G-xx-AF5-R	SOT-25	Tape Reel

Note: xx: Output Voltage, refer to Marking Information.

LR1012G-xx-AB3-R	
(1) Packing Type	(1) R: Tape Reel
(2) Package Type	(2) AB3: SOT-89, AE3: SOT-23, AF5: SOT-25
(3)Output Voltage Code	(3) xx: Refer to Marking Information
(4) Green Package	(4) G: Halogen Free and Lead Free, L: Lead Free

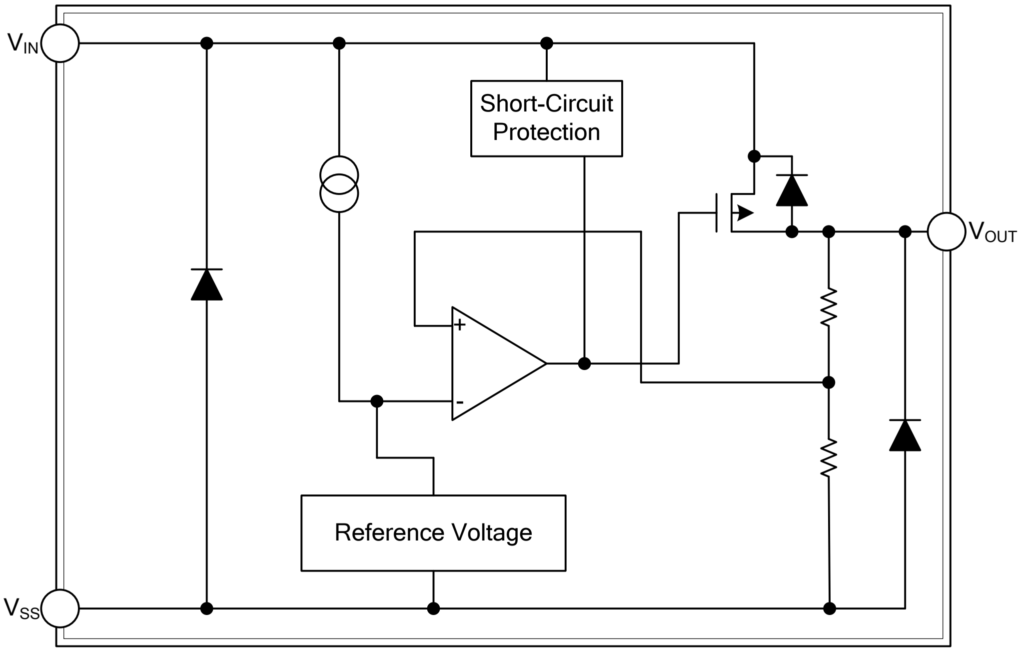
■ PIN CONFIGURATION

PACKAGE	VOLTAGE CODE	MARKING
SOT-23	18: 1.8V 33: 3.3V 40: 4.0V 50: 5.0V 52: 5.2V	
SOT-25		
SOT-89		

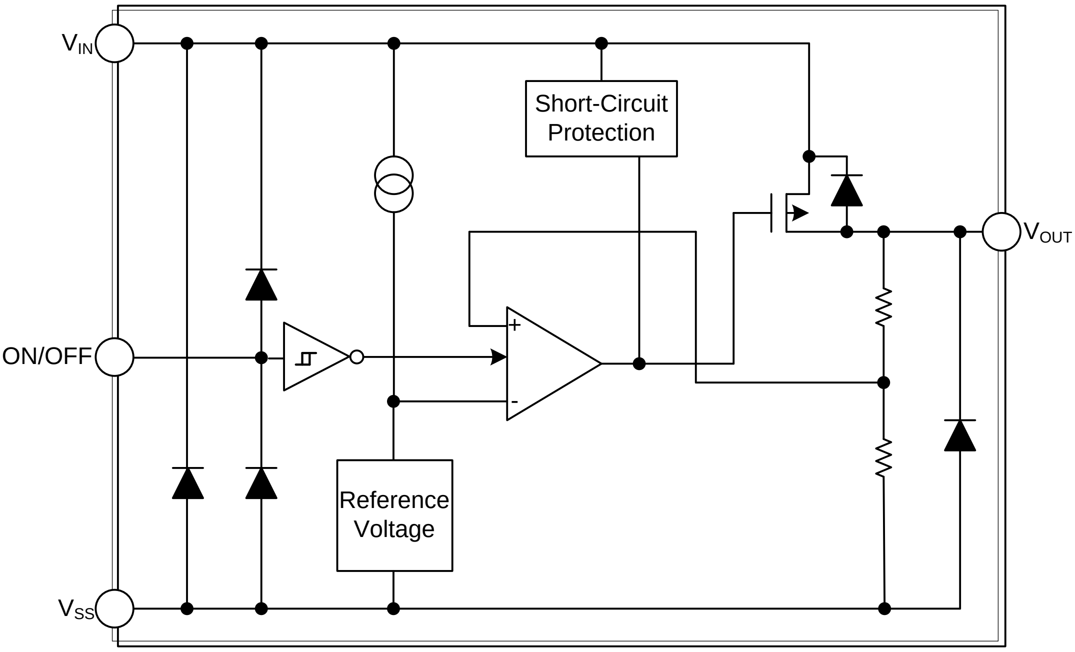
■ PIN DESCRIPTION

PIN NO.			PIN NAME	FUNCTION
SOT-23	SOT-25	SOT-89		
1	3	3	V_{OUT}	Output voltage
2	2	2	V_{IN}	Input voltage
3	1	1	V_{SS}	GND
-	4	-	N.C.	N.C. pin is electrically open. N.C. pin can be connected to V_{IN} or V_{SS}.
-	5	-	ON/OFF	ON/OFF Pin

BLOCK DIAGRAM



Without ON/OFF



With ON/OFF

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

PARAMETER		SYMBOL	RATINGS	UNIT
Input Voltage		V_{IN}	12	V
Output Voltage		V_{OUT}	V_{IN}+0.3	V
Power Dissipation	SOT-23/SOT-25	P_D	250	mW
	SOT-89		500	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, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS		MIN	TYP	MAX	UNIT
Output Voltage (Note 1)	$V_{OUT\ (E)}$	V_{IN}=V_{OUT}(S)+2V, I_{OUT}=10mA		V_{OUT}(S) × 0.98	V_{OUT}(S)	V_{OUT}(S) ×1.02	V
Output Current (Note 2)	I_{OUT}	V_{IN}=V_{OUT}(S)+2V	1.8V≤V_{OUT}(S)≤1.9V	30			mA
			2.0V≤V_{OUT}(S)≤2.9V	30			mA
			3.0V≤V_{OUT}(S)≤3.9V	50			mA
			4.0V≤V_{OUT}(S)≤4.9V	65			mA
			5.0V≤V_{OUT}(S)≤6.0V	75			mA
Dropout Voltage (Note 3)	Vdrop	I_{OUT} =10mA	1.8V≤V_{OUT}(S)≤1.9V		0.48	0.98	V
			2.0V≤V_{OUT}(S)≤2.4V		0.46	0.95	V
			2.5V≤V_{OUT}(S)≤2.9V		0.32	0.68	V
			3.0V≤V_{OUT}(S)≤3.4V		0.23	0.41	V
			3.5V≤V_{OUT}(S)≤3.9V		0.19	0.35	V
			4.0V≤V_{OUT}(S)≤4.4V		0.16	0.30	V
			4.5V≤V_{OUT}(S)≤4.9V		0.14	0.27	V
			5.0V≤V_{OUT}(S)≤5.4V		0.12	0.25	V
			5.5V≤V_{OUT}(S)≤6.0V		0.11	0.23	V
Line Regulation 1	$\Delta V_{OUT}1$	V_{OUT}(S)+1V≤V_{IN}≤12V, I_{OUT}=1mA			5	30	mV
Line Regulation 2	$\Delta V_{OUT}2$	V_{OUT}(S)+1V≤V_{IN}≤12V, I_{OUT}=1µA			5	40	mV
Load Regulation	$\Delta V_{OUT}3$	V_{IN}=V_{OUT}(S)+2V	1.8V≤V_{OUT}(S)≤1.9V, 1µA≤I_{OUT}≤20mA		5	25	mV
			2.0V≤V_{OUT}(S)≤2.9V, 1µA≤I_{OUT}≤20mA		6	30	mV
			3.0V≤V_{OUT}(S)≤3.9V, 1µA≤I_{OU}T≤30mA		10	45	mV
			4.0V≤V_{OUT}(S)≤4.9V, 1µA≤I_{OUT}≤40mA		13	65	mV
			5.0V≤V_{OUT}(S)≤6.0V, 1µA≤I_{OUT}≤50mA		17	80	mV
Output Voltage temperature coefficient (Note 4)	$\frac{\Delta V_{OUT}}{\Delta T_A \cdot V_{OUT}}$	V_{IN} = V_{OUT} (S) + 1 V, I_{OUT} = 10mA -40°C ≤ T_A ≤ 85°C			±100		ppm/°C
Current Consumption	I_{SS}	V_{IN}=V_{OUT}(S)+2V no load	1.8V≤V_{OUT}(S)≤1.9V		0.8	3.0	µA
			2.0V≤V_{OUT}(S)≤2.7V		0.9	3.0	µA
			2.8V≤V_{OUT}(S)≤3.7V		1.0	3.0	µA
			3.8V≤V_{OUT}(S)≤5.1V		1.2	3.0	µA
			5.2V≤V_{OUT}(S)≤6.0V		1.5	3.0	µA
Input Voltage	V_{IN}					12	V
Short-Circuit Current	I_{OS}	V_{IN}=V_{OUT}(S)+2V, V_{OUT} pin=0 V			40		mA

■ ELECTRICAL CHARACTERISTICS (Cont.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
APPLIED TO PRODUCTS WITH POWER-OFF FUNCTION						
Current consumption during power-off	I_{SS2}	$V_{IN} = V_{OUT(S)} + 2V$, $V_{ON/OFF} = 0V$, no load		0.1	0.5	μA
ON/OFF pin input voltage "H"	V_{SH}	$V_{IN} = V_{OUT(S)} + 2V$, $R_L = 1k\Omega$, determined by V_{OUT} output level	2			V
ON/OFF pin input voltage "L"	V_{SL}	$V_{IN} = V_{OUT(S)} + 2V$, $R_L = 1k\Omega$, determined by V_{OUT} output level			0.4	V
ON/OFF pin input current "H"	I_{SH}	$V_{ON/OFF} = V_{IN}$	-0.1		0.1	μA
ON/OFF pin input current "L"	I_{SH}	$V_{ON/OFF} = 0$	-0.1		0.1	μA

Notes: 1. $V_{OUT}(S)$=Specified output voltage
$V_{OUT}(E)$=Effective output voltage, i.e., the output voltage when fixing I_{OUT}(=10mA) and inputting $V_{OUT}(S)$+2.0V.
2. Output current at which output voltage becomes 95% of $V_{OUT}(E)$ after gradually increasing output current.
3. Vdrop=V_{IN1}-($V_{OUT}(E)\times0.98$), where V_{IN1} is the Input voltage at which output voltage becomes 98% of $V_{OUT}(E)$ after gradually decreasing input voltage.
4. Temperature change ratio for the output voltage [mV/°C] is calculated using the following equation.

$$\frac{\Delta V_{OUT}}{\Delta T_A}[mV/°C] = V_{OUT}(S)[V] \times \frac{\Delta V_{OUT}}{\Delta T_A \bullet V_{OUT}}[ppm/°C] \div 1000$$

■ APPLICATION CIRCUIT