



LR1012

CMOS IC

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 16V so it works best in high-voltage applications. Moreover, it is also suitable in constructing lowpower portable devices including small current consumption, short-current protection.

FEATURES

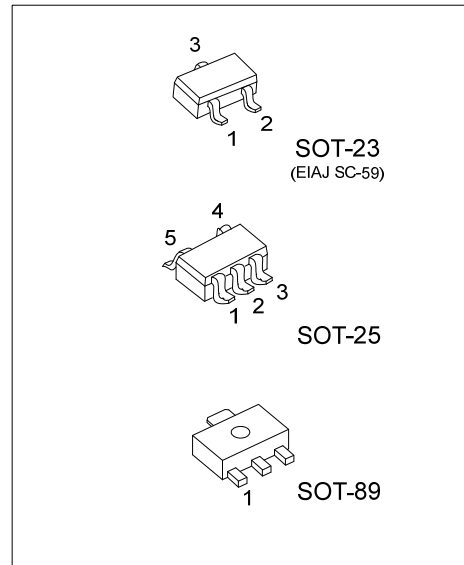
- * Operating current: Max. 1.2 μ A (3.0V)
- * Output voltage: 2.0 ~ 6.0V, as 0.1V step
- * $\pm 2.0\%$ output voltage accuracy
- * Output current:
 - 50mA capable @ 3.0V output, $V_{IN}=5.0V$
 - 75mA capable @ 5.0V output, $V_{IN}=7.0V$
- * Dropout voltage: 120mV @ $V_{OUT} = 5.0V$, $I_{OUT}=10mA$

ORDERING INFORMATION

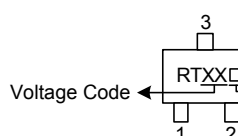
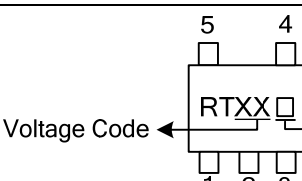
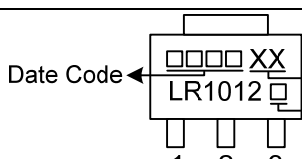
Ordering Number		Package	Packing
Lead Free	Halogen Free		
LR1012L-xx-AB3-R	LR1012G-xx-AB3-R	SOT-89	Tape Reel
LR1012L-xx-AE3-R	LR1012G-xx-AE3-R	SOT-23	Tape Reel
LR1012L-xx-AF5-R	LR1012G-xx-AF5-R	SOT-25	Tape Reel

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



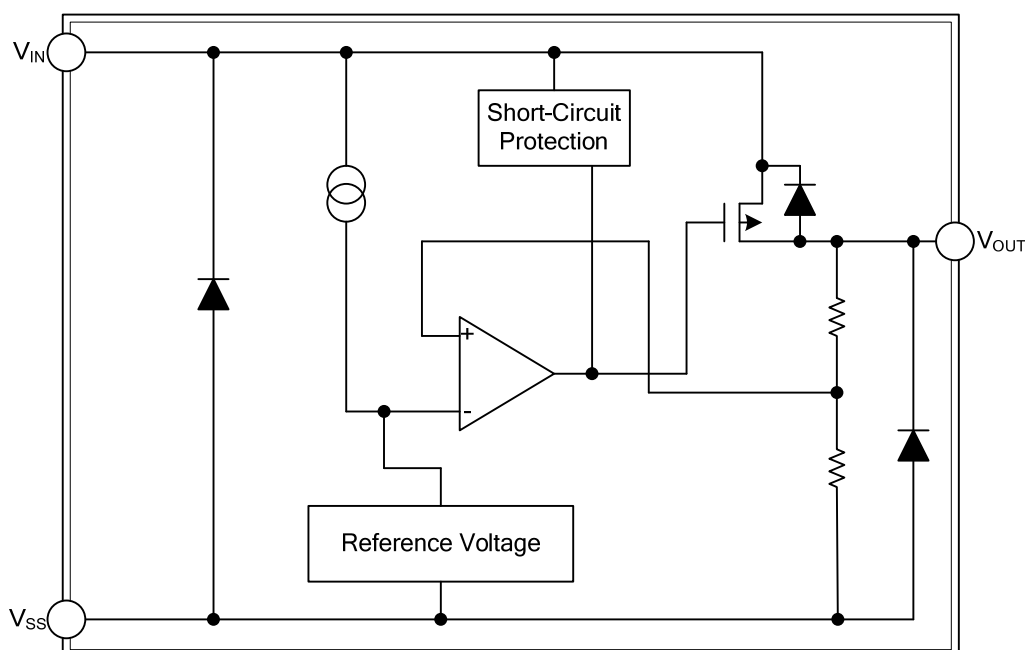
PIN CONFIGURATION

PACKAGE	VOLTAGE CODE	MARKING
SOT-23	18: 1.8V 33: 3.3V 40: 4.0V 50: 5.0V 52: 5.2V	 Voltage Code ← RTXX → L: Lead Free G: Halogen Free
SOT-25		 Voltage Code ← RTXX → L: Lead Free G: Halogen Free
SOT-89		 Date Code ← LR1012 → Voltage Code L: Lead Free G: Halogen Free

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, 5	-	N.C.	N.C. pin is electrically open. N.C. pin can be connected to V_{IN} or V_{SS} .

BLOCK DIAGRAM



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

PARAMETER		SYMBOL	RATINGS	UNIT
Input Voltage		V_{IN}	18	V
Output Voltage		V_{OUT}	$V_{SS}-0.3 \sim V_{IN}+0.3$	V
Power Dissipation	SOT-23/SOT-25	P_D	250	mW
	SOT-89		500	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 ($T_A=25^{\circ}\text{C}$, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage (Note 1)	$V_{OUT(E)}$	$V_{IN}=V_{OUT(S)}+2V$, $I_{OUT}=10\text{mA}$	$V_{OUT(S)} \times 0.98$	$V_{OUT(S)}$	$V_{OUT(S)} \times 1.02$	V
Output Current (Note 2)	I_{OUT}	$V_{OUT(S)}+2 \leq V_{IN} \leq 16V$	$2.0V \leq V_{OUT(S)} \leq 2.9V$	30		mA
			$3.0V \leq V_{OUT(S)} \leq 3.9V$	50		mA
			$4.0V \leq V_{OUT(S)} \leq 4.9V$	65		mA
			$5.0V \leq V_{OUT(S)} \leq 6.0V$	75		mA
Dropout Voltage (Note 3)	V_{drop}	$I_{OUT}=10\text{mA}$	$2.0V \leq V_{OUT(S)} \leq 2.4V$	0.46	0.95	V
			$2.5V \leq V_{OUT(S)} \leq 2.9V$	0.32	0.68	V
			$3.0V \leq V_{OUT(S)} \leq 3.4V$	0.23	0.41	V
			$3.5V \leq V_{OUT(S)} \leq 3.9V$	0.19	0.35	V
			$4.0V \leq V_{OUT(S)} \leq 4.4V$	0.16	0.30	V
			$4.5V \leq V_{OUT(S)} \leq 4.9V$	0.14	0.27	V
			$5.0V \leq V_{OUT(S)} \leq 5.4V$	0.12	0.25	V
			$5.5V \leq V_{OUT(S)} \leq 6.0V$	0.11	0.23	V
Line Regulation 1	ΔV_{OUT1}	$V_{OUT(S)}+1V \leq V_{IN} \leq 16V$, $I_{OUT}=1\text{mA}$		5	30	mV
Line Regulation 2	ΔV_{OUT2}	$V_{OUT(S)}+1V \leq V_{IN} \leq 16V$, $I_{OUT}=1\mu\text{A}$		5	40	mV
Load Regulation	ΔV_{OUT3}	$V_{IN}=V_{OUT(S)}+2V$	$2.0V \leq V_{OUT(S)} \leq 2.9V$, $1\mu\text{A} \leq I_{OUT} \leq 20\text{mA}$	6	30	mV
			$3.0V \leq V_{OUT(S)} \leq 3.9V$, $1\mu\text{A} \leq I_{OUT} \leq 30\text{mA}$	10	45	mV
			$4.0V \leq V_{OUT(S)} \leq 4.9V$, $1\mu\text{A} \leq I_{OUT} \leq 40\text{mA}$	13	65	mV
			$5.0V \leq V_{OUT(S)} \leq 6.0V$, $1\mu\text{A} \leq I_{OUT} \leq 50\text{mA}$	17	80	mV
Output Voltage temperature coefficient (Note 4)	$\frac{\Delta V_{OUT}}{\Delta T_A \cdot V_{OUT}}$	$V_{IN} = V_{OUT(S)} + 1V$, $I_{OUT} = 10\text{mA}$ $-40^{\circ}\text{C} \leq T_A \leq 85^{\circ}\text{C}$		± 100		ppm/ $^{\circ}\text{C}$
Current Consumption	I_{SS}	$V_{IN}=V_{OUT(S)}+2V$ no load	$2.0V \leq V_{OUT(S)} \leq 2.7V$	0.9	1.6	μA
			$2.8V \leq V_{OUT(S)} \leq 3.7V$	1.0	1.8	μA
			$3.8V \leq V_{OUT(S)} \leq 5.1V$	1.2	2.1	μA
			$5.2V \leq V_{OUT(S)} \leq 6.0V$	1.5	2.5	μA
Input Voltage	V_{IN}				16	V
Short-Circuit Current	I_{OS}	$V_{IN}=V_{OUT(S)}+2V$, V_{OUT} pin=0 V		40		mA

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

$V_{OUT(E)}$ =Effective output voltage, i.e., the output voltage when fixing $I_{OUT}(=10\text{mA})$ and inputting $V_{OUT(S)}+2.0V$.

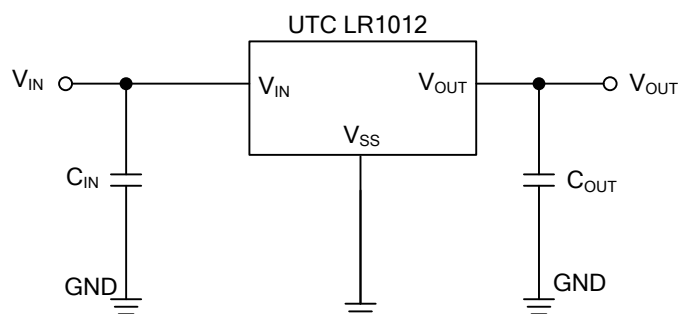
2. Output current at which output voltage becomes 95% of $V_{OUT(E)}$ after gradually increasing output current.

3. $V_{drop}=V_{IN1}-(V_{OUT(E)} \times 0.98)$, 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 [$\text{mV}/^{\circ}\text{C}$] is calculated using the following equation.

$$\frac{\Delta V_{OUT}}{\Delta T_A} [\text{mV}/^{\circ}\text{C}] = V_{OUT(S)} [\text{V}] \times \frac{\Delta V_{OUT}}{\Delta T_A \cdot V_{OUT}} [\text{ppm}/^{\circ}\text{C}] \div 1000$$

■ APPLICATION CIRCUIT



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