



## LR9102/A

CMOS IC

### LOW NOISE 300mA LDO REGULATOR

#### DESCRIPTION

The UTC **LR9102/A** is a typical LDO (linear regulator) with the features of high output voltage accuracy, low supply current, low ON-resistance, and high ripple rejection.

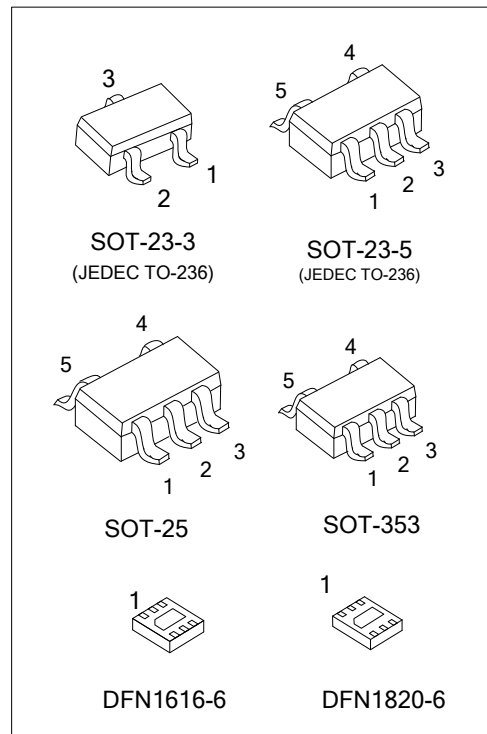
During operation of the UTC **LR9102/A**, the dropout voltage is very low and the response of line transient and load transient are very well.

Internally, there're many functions of UTC **LR9102/A** which can be seen in the block figure. There are a voltage reference unit, an error amplifier, resistor-net for voltage setting, a current limit circuit, and a chip enable circuit in each UTC **LR9102/A**, with auto discharge function at off state.

The UTC **LR9102/A** can be used as an ideal of the power supply for hand-held communication equipment, such as: power source for portable communication equipment, power source for electrical appliances, for example, cameras, VCRs and camcorders and power source for battery-powered equipment.

#### FEATURES

- \* Ultra Supply Current: LR9102: 50 $\mu$ A (Typ.)  
LR9102A: 90 $\mu$ A (Typ.)
- \* Standby Mode: 0.1 $\mu$ A (Typ.)
- \* Very Low Dropout Voltage: 0.12V (Typ.)  
@ I<sub>OUT</sub>=300mA, V<sub>OUT</sub>=2.85V
- \* Ripple Rejection: 75dB (Typ.)  
@ f=1kHz, V<sub>OUT</sub>=2.85V
- \* Temperature-Drift Coefficient of Output Voltage:  $\pm$ 50ppm/ $^{\circ}$ C (Typ.)
- \* Well Line Regulation: 0.02%/ V (Typ.)
- \* Output Voltage Accuracy:  $\pm$ 1.0%
- \* Internal Fold Back Protection Circuit: 50mA (Typ.) @ short mode
- \* C<sub>IN</sub>=C<sub>OUT</sub>=1 $\mu$ F or more (Ceramic capacitors) are recommended to be used with this IC



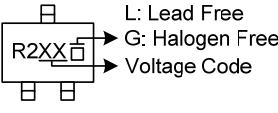
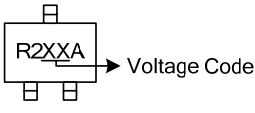
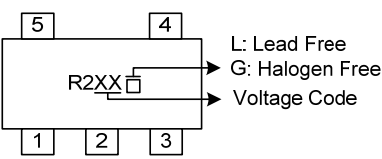
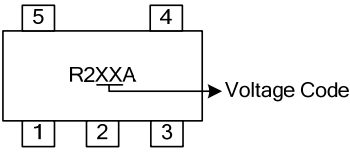
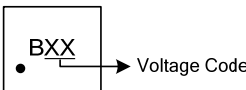
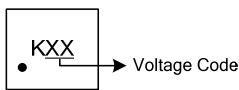
■ ORDERING INFORMATION

Ordering Number		Package	Packing
Lead Free	Halogen Free		
LR9102L-xx-AE2-R	LR9102G-xx-AE2-R	SOT-23-3	Tape Reel
LR9102L-xx-AE5-R	LR9102G-xx-AE5-R	SOT-23-5	Tape Reel
LR9102L-xx-AF5-R	LR9102G-xx-AF5-R	SOT-25	Tape Reel
LR9102L-xx-AL5-R	LR9102G-xx-AL5-R	SOT-353	Tape Reel
LR9102L-xx-K06-1616-R	LR9102G-xx-K06-1616-R	DFN1616-6	Tape Reel
LR9102L-xx-K06-1820-R	LR9102G-xx-K06-1820-R	DFN1820-6	Tape Reel
LR9102AL-xx-AE2-R	LR9102AG-xx-AE2-R	SOT-23-3	Tape Reel
LR9102AL-xx-AE5-R	LR9102AG-xx-AE5-R	SOT-23-5	Tape Reel
LR9102AL-xx-AF5-R	LR9102AG-xx-AF5-R	SOT-25	Tape Reel
LR9102AL-xx-AL5-R	LR9102AG-xx-AL5-R	SOT-353	Tape Reel
LR9102AL-xx-K06-1616-R	LR9102AG-xx-K06-1616-R	DFN1616-6	Tape Reel
LR9102AL-xx-K06-1820-R	LR9102AG-xx-K06-1820-R	DFN1820-6	Tape Reel

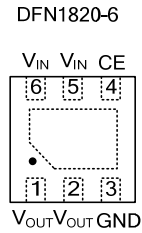
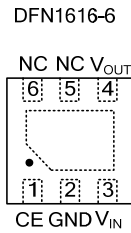
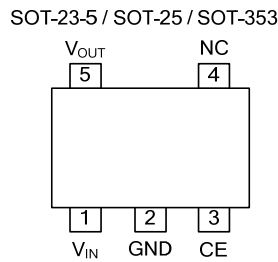
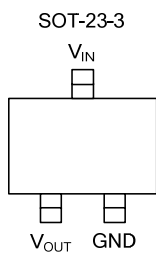
Note: xx: Output Voltage, refer to Marking Information.

<p>LR9102AG-xx-AE2-R</p> <p>(1) Packing Type  (2) Package Type  (3) Output Voltage Code  (4) Green Package  (5) Supply Current</p>	<p>(1) R: Tape Reel  (2) AE2: SOT-23-3, AE5: SOT-23-5, AF5: SOT-25, AL5: SOT-353, K06-1616: DFN1616-6, K06-1820: DFN1820-6  (3) xx: refer to Marking Information  (4) G: Halogen Free and Lead Free, L: Lead Free  (5) refer to ELECTRICAL CHARACTERISTICS</p>
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## MARKING INFORMATION

PACKAGE	VOLTAGE CODE	MARKING	
		LR9102	LR9102A
SOT-23-3	10: 1.0V 11: 1.1V 12: 1.2V 13: 1.3V 15: 1.5V		
SOT-23-5 SOT-25 SOT-353	18: 1.8V 25: 2.5V 27: 2.7V 28 :2.8V 2J: 2.85V 29: 2.9V		
DFN1616-6 DFN1820-6	30: 3.0V 33: 3.3V 36: 3.6V		

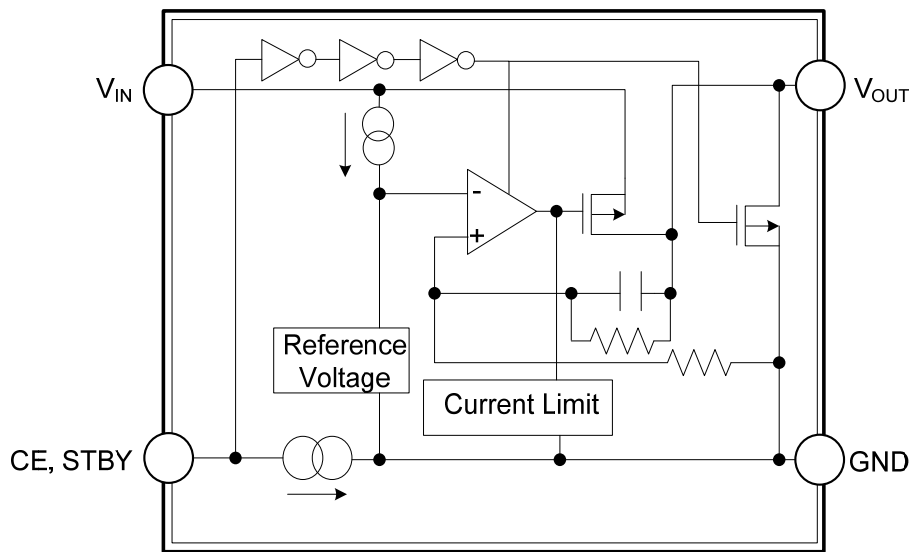
## PIN CONFIGURATION



## PIN DESCRIPTION

PIN NO.				PIN NAME	DESCRIPTION
SOT-23-3	SOT-23-5 SOT-25 SOT-353	DFN1616-6	DFN1820-6		
3	1	3	5, 6	$V_{IN}$	Input Pin
1	2	2	3	GND	Ground Pin
-	3	1	4	CE	Chip Enable Pin. Active when this Pin is high.
-	4	5, 6	-	NC	No Connection
2	5	4	1, 2	$V_{OUT}$	Output Pin

■ BLOCK DIAGRAM



### ■ ABSOLUTE MAXIMUM RATING

PARAMETER		SYMBOL	RATINGS	UNIT
Input Voltage		$V_{IN}$	6	V
Input Voltage (CE Pin)		$V_{CE}$	6	V
Output Voltage		$V_{OUT}$	-0.3 ~ $V_{IN}+0.3$	V
Output Current		$I_{OUT}$	400	mA
Power Dissipation	SOT-23-3	$P_D$	280	mW
	SOT-23-5/SOT-25		300	mW
	SOT-353			
	DFN1616-6			
	DFN1820-6			
Junction Temperature		$T_J$	+125	°C
Operating Temperature		$T_{OPR}$	-40 ~ +85	°C
Storage Temperature		$T_{STG}$	-55 ~ +125	°C

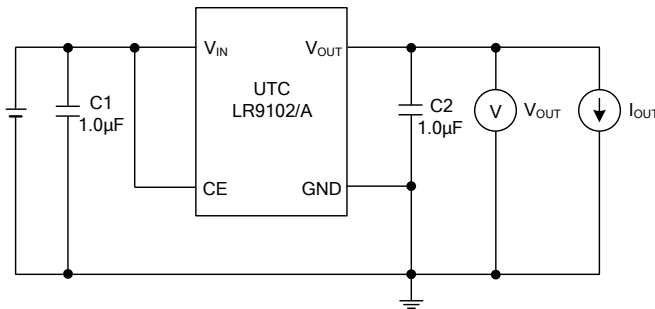
Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.

### ■ ELECTRICAL CHARACTERISTICS

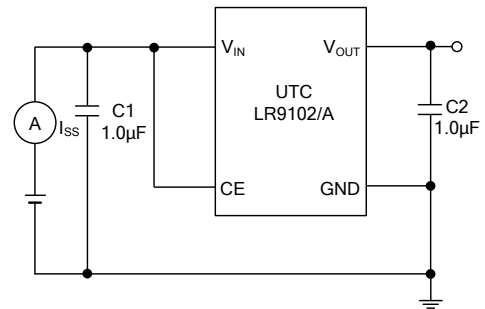
( $T_A=25^\circ\text{C}$ ,  $V_{IN}=\text{Set } V_{OUT}+1\text{V}$ ,  $I_{OUT}=1\text{mA}$ ,  $C_I=C_O=1\mu\text{F}$ , unless otherwise specified)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage		$V_{OUT}$	$V_{IN} = \text{Set } V_{OUT}+1\text{V}$ , $V_{OUT} > 2.0\text{V}$	×0.99		×1.01	V
			$V_{OUT} \leq 2.0\text{V}$	-20		+20	mV
Input Voltage		$V_{IN}$				6	V
Load Regulation		$\Delta V_{OUT}$	$1\text{mA} \leq I_{OUT} \leq 150\text{mA}$		20	40	mV
Output Current		$I_{OUT}$		300			mA
Supply Current		$I_{SS}$	$I_{OUT}=0\text{A}$	LR9102	50	90	$\mu\text{A}$
				LR9102A	90	130	$\mu\text{A}$
Supply Current (Standby)		$I_{ST-BY}$	$V_{CE}=0\text{V}$		0.1	2	$\mu\text{A}$
Short Current Limit		$I_{LIMIT}$	$V_{OUT}=0\text{V}$		50		mA
CE Pull-down Current		$I_{PD}$			0.3		$\mu\text{A}$
CE Input Voltage	High	$V_{CEH}$		1.2			V
	Low	$V_{CEL}$				0.3	V
Output Noise		eN	$B_W=10\text{Hz to } 100\text{kHz}$ , $I_{OUT}=30\text{mA}$		30		$\mu\text{Vrms}$
Ripple Rejection		RR	$f=1\text{kHz}$ , Ripple $0.2\text{V}_{P-P}$ $V_{IN}=\text{Set } V_{OUT}+1\text{V}$ , $I_{OUT}=30\text{mA}$ (In case that $V_{OUT}=2.0\text{V}$ , $V_{IN}=3\text{V}$ )		75		dB
Dropout Voltage		$V_D$	$I_{OUT}=300\text{mA}$	$1.0\text{V} \leq V_{OUT} < 1.2\text{V}$	0.60	1.00	V
				$1.2\text{V} \leq V_{OUT} < 1.5\text{V}$	0.38	0.70	
				$1.5\text{V} \leq V_{OUT} < 1.7\text{V}$	0.30	0.40	
				$1.7\text{V} \leq V_{OUT} < 2.0\text{V}$	0.20	0.28	
				$2.0\text{V} \leq V_{OUT} < 2.5\text{V}$	0.17	0.24	
				$2.5\text{V} \leq V_{OUT} < 2.8\text{V}$	0.14	0.20	
Line Regulation		$\frac{\Delta V_{OUT}}{\Delta V_{IN}}$	$1.0\text{V} \leq V_{OUT} \leq 4.0\text{V}$ , $V_{SET}+0.5\text{V} \leq V_{IN} \leq 5\text{V}$	0.02	0.10	%V	
			$4.0\text{V} < V_{OUT} \leq 5.0\text{V}$ , $V_{SET}+0.5\text{V} \leq V_{IN} \leq 6.5\text{V}$				
Output Voltage Temperature Coefficient		$\frac{\Delta V_{OUT}}{\Delta T}$	$-40^\circ\text{C} \leq T_{OPR} \leq 85^\circ\text{C}$		±50		ppm/°C
Low Output Nch Tr. ON Resistance		$R_{LOW}$	$V_{IN}=4.0\text{V}$ , $V_{CE}=0\text{V}$		70		$\Omega$

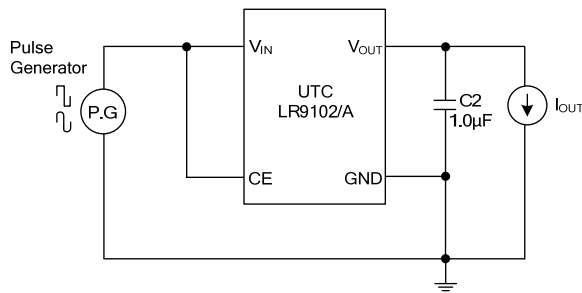
## ■ TEST CIRCUIT



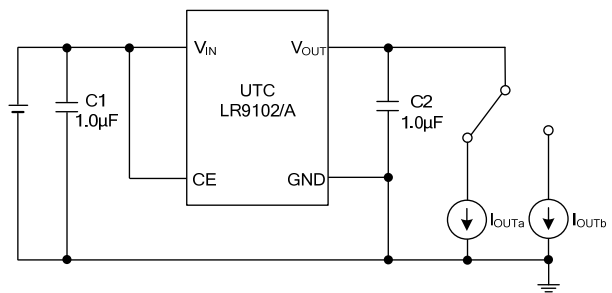
Basic Test Circuit



Test Circuit for Supply Current

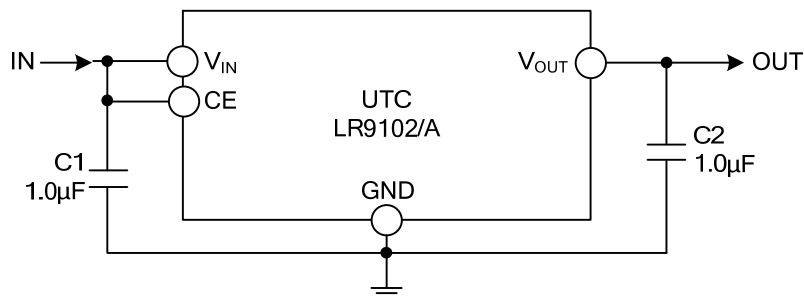


Test Circuit for Ripple Rejection



Test Circuit for Load Transient Response

## ■ TYPICAL APPLICATION CIRCUIT



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