



## 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.

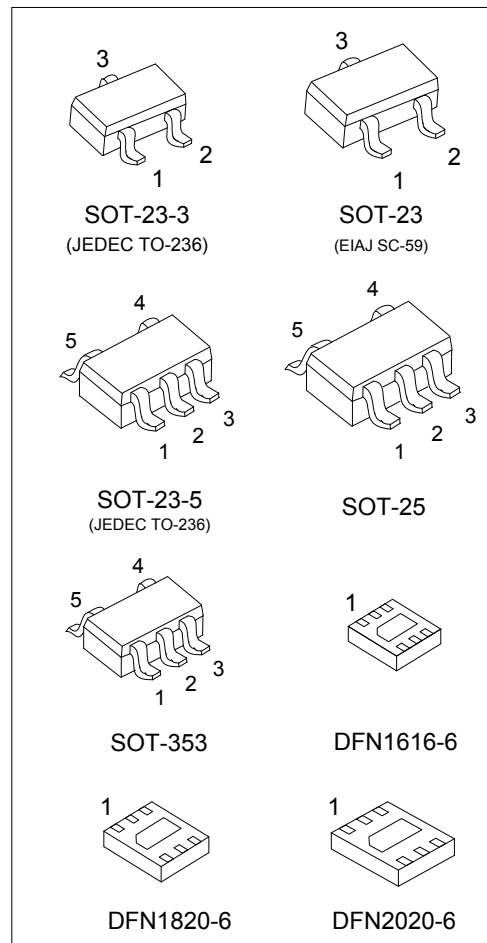
During operation of the UTC **LR9102/A**, the dropout voltage is very low and the response of line transient and load transient are very well.

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: 50mA (Typ.) @ short mode  
Circuit:
- \* 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
LR9102L-xx-AE3-R	LR9102G-xx-AE3-R	SOT-23	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
LR9102AL-xx-K06-2020-R	LR9102AG-xx-K06-2020-R	DFN2020-6	Tape Reel

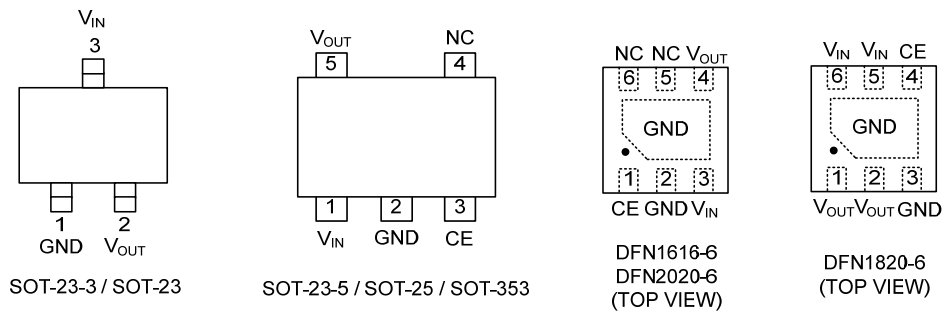
Note: xx: Output Voltage, refer to Marking Information.

<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, AE3: SOT-23, AE5: SOT-23-5, AF5: SOT-25, AL5: SOT-353, K06-1616: DFN1616-6, K06-1820: DFN1820-6, K06-2020: DFN2020-6 (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 SOT-23	10: 1.0V 11: 1.1V 12: 1.2V 13: 1.3V		
SOT-23-5 SOT-25 SOT-353	15: 1.5V 18: 1.8V 25: 2.5V 27: 2.7V 28: 2.8V 2J: 2.85V		
DFN1616-6 DFN1820-6 DFN2020-6	29: 2.9V 30: 3.0V 33: 3.3V 36: 3.6V		

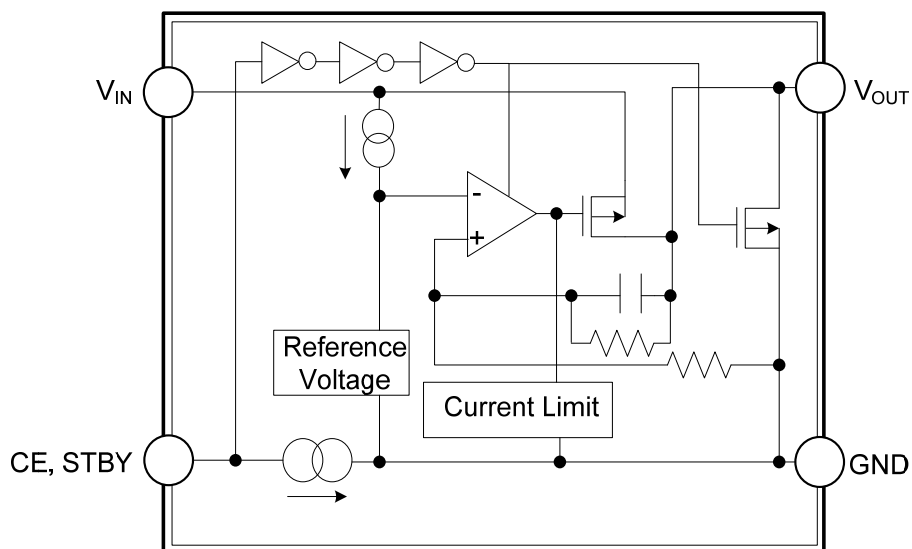
## PIN CONFIGURATION



## PIN DESCRIPTION

PIN NO.				PIN NAME	DESCRIPTION
SOT-23-3 SOT-23	SOT-23-5 SOT-25 SOT-353	DFN1616-6 DFN2020-6	DFN1820-6		
3	1	3	5, 6	V <sub>IN</sub>	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 <sub>OUT</sub>	Output Pin
-	-	Exposed Pad	Exposed Pad	GND	Connect exposed pad to GND.

## 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		$V_{OUT}$	$V_{IN}+0.3$	V
Output Current		$I_{OUT}$	400	mA
Power Dissipation	SOT-23-3/SOT-23	$P_D$	280	mW
	SOT-23-5/SOT-25		300	mW
	SOT-353		250	mW
	DFN1616-6		850 (Note 2)	mW
	DFN1820-6		1000 (Note 2)	mW
	DFN2020-6		1100 (Note 2)	mW
Junction Temperature		$T_J$	+125	°C
Operating Temperature		$T_{OPR}$	-40 ~ +125	°C
Storage Temperature		$T_{STG}$	-55 ~ +125	°C

Notes: 1. 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.

2. The data tested by surface mounted on a 2 inch<sup>2</sup> FR-4 board with 2OZ copper.

### ■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	SOT-23-3/SOT-23	$\theta_{JA}$	360	°C/W
	SOT-23-5/SOT-25		333	°C/W
	SOT-353		400	°C/W
	DFN1616-6		118 (Note)	°C/W
	DFN1820-6		100 (Note)	°C/W
	DFN2020-6		91 (Note)	°C/W
Junction to Case	SOT-23-3/SOT-23	$\theta_{JC}$	120	°C/W
	SOT-23-5/SOT-25		90	°C/W
	SOT-353		130	°C/W
	DFN1616-6		32	°C/W
	DFN1820-6		30	°C/W
	DFN2020-6		28	°C/W

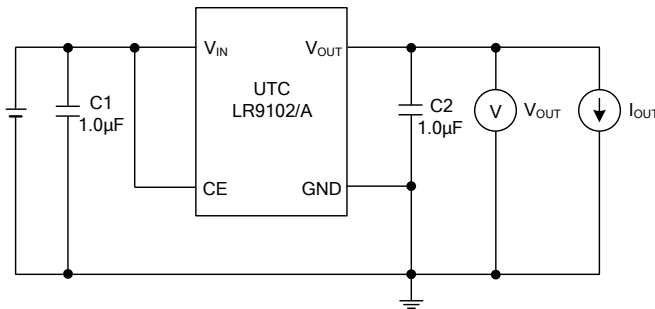
Note: The data tested by surface mounted on a 2 inch<sup>2</sup> FR-4 board with 2OZ copper.

### ■ ELECTRICAL CHARACTERISTICS

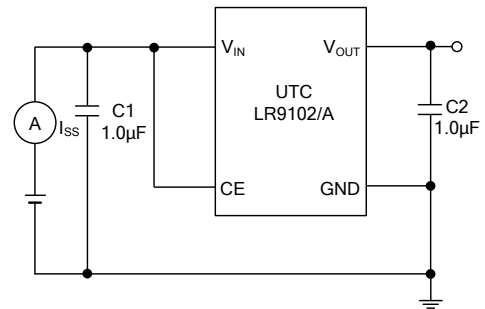
( $T_A=25^\circ\text{C}$ ,  $V_{IN}=\text{Set } V_{OUT}+1\text{V}$ ,  $I_{OUT}=1\text{mA}$ ,  $C_I=C_O=1\mu\text{F}$ , unless otherwise specified)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage		$V_{OUT}$	$V_{IN} = \text{Set } V_{OUT}+1\text{V}$	$V_{OUT} > 2.0\text{V}$	$\times 0.99$	$\times 1.01$	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	
				$2.8\text{V} \leq V_{OUT} \leq 5.0\text{V}$	0.12	0.19	
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		$\frac{\Delta V_{OUT}}{\Delta T}$	$-40^\circ\text{C} \leq T_{OPR} \leq 85^\circ\text{C}$		$\pm 50$		ppm/ $^\circ\text{C}$
Low Output Nch Tr. ON Resistance		$R_{LOW}$	$V_{IN}=4.0\text{V}$ , $V_{CE}=0\text{V}$		70		$\Omega$

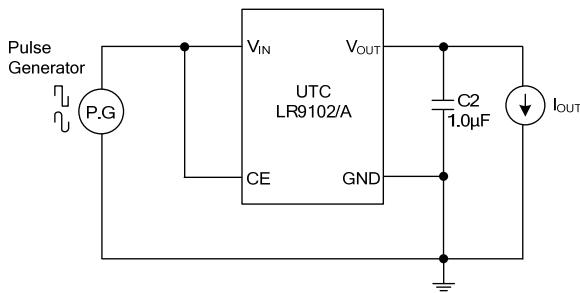
## ■ TEST CIRCUIT



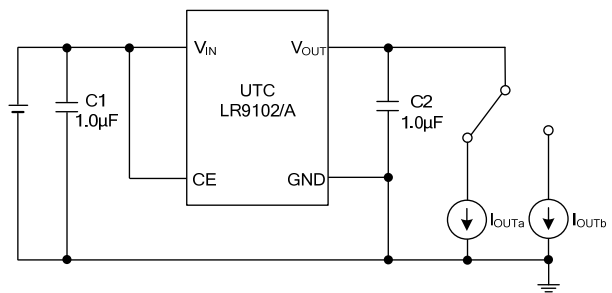
Basic Test Circuit



Test Circuit for Supply Current

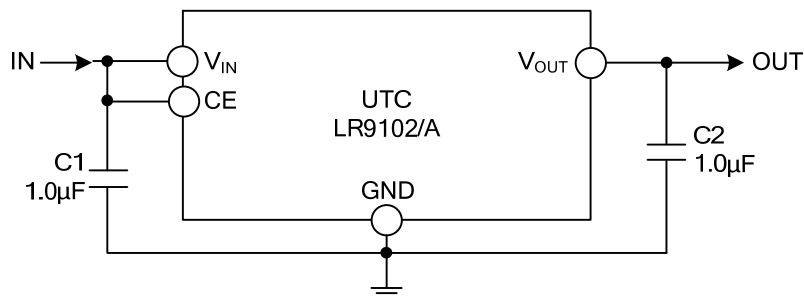


Test Circuit for Ripple Rejection



Test Circuit for Load Transient Response

## ■ TYPICAL APPLICATION CIRCUIT



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