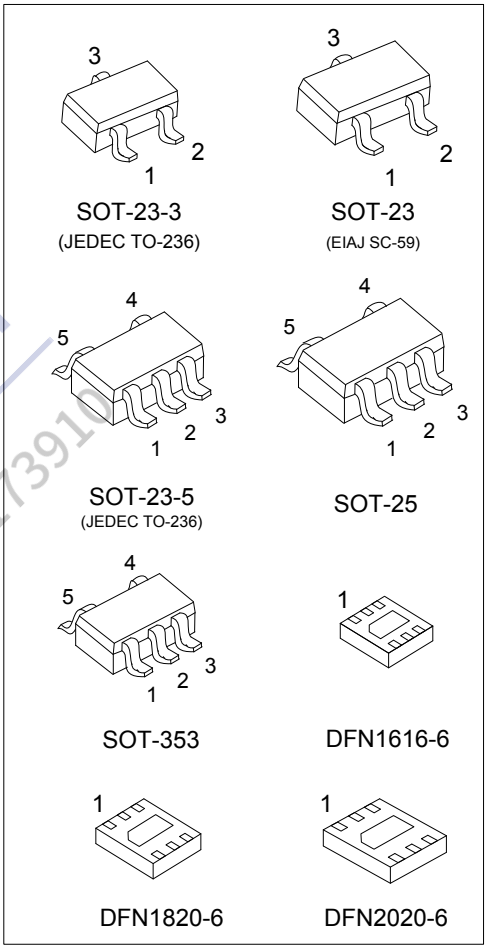
LR9102

CMOS IC

LOW NOISE 300mA LDO REGULATOR



■ DESCRIPTION

The UTC **LR9102** 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**, 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** 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**, with auto discharge function at off state.

The UTC **LR9102** 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.

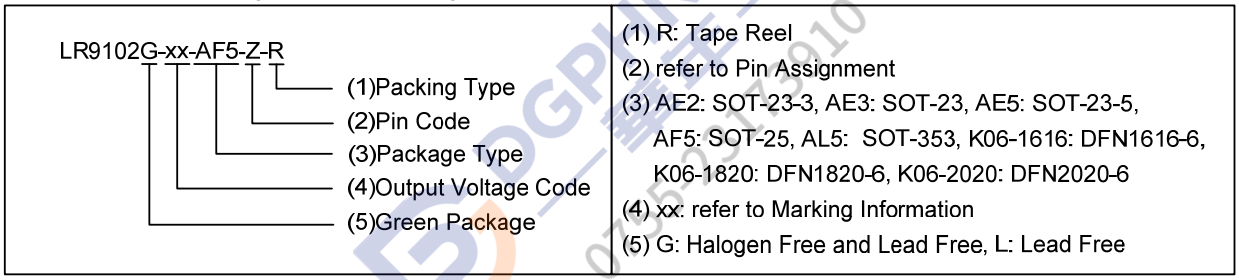
■ FEATURES

* Ultra Supply Current: LR9102: 50μA (Typ.)
* Standby Mode: 0.1μA (Typ.)
* Very Low Dropout Voltage: 0.12V (Typ.) @I_{OUT} =300mA, V_{OUT} =2.85V
* Ripple Rejection: 75dB (Typ.) @ f=1kHz,V_{OUT}=2.85V
* Temperature-Drift Coefficient of Output Voltage: ±50ppm/°C (Typ.)
* Well Line Regulation: 0.02%/ V (Typ.)
* Output Voltage Accuracy: ±1.0%
* Internal Fold Back Protection Circuit: 50mA (Typ.) @ short mode
* C_{IN}=C_{OUT}=1μF or more (Ceramic capacitors) are recommended to be used with this IC

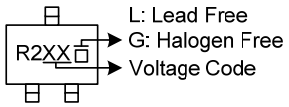
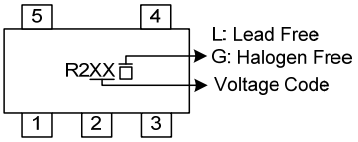
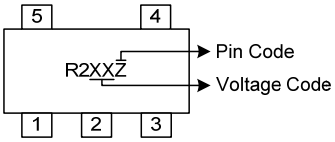
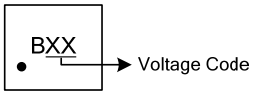
■ ORDERING INFORMATION

Ordering Number		Package	Packing
Lead Free	Halogen Free		
LR9102L-xx-AE2-R	LR9102G-xx-AE2-R	SOT-23-3	Tape Reel
LR9102L-xx-AE3-R	LR9102G-xx-AE3-R	SOT-23	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-AF5-Z-R	LR9102G-xx-AF5-Z-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
LR9102L-xx-K06-2020-R	LR9102G-xx-K06-2020-R	DFN2020-6	Tape Reel

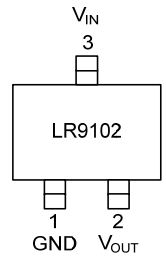
Note: xx: Output Voltage, refer to Marking Information.



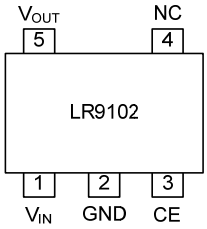
■ MARKING INFORMATION

PACKAGE	VOLTAGE CODE	MARKING
SOT-23-3 SOT-23	10: 1.0V 11: 1.1V 12: 1.2V 13: 1.3V 15: 1.5V 18: 1.8V 25: 2.5V 27: 2.7V 28 :2.8V 2J: 2.85V 29: 2.9V 30: 3.0V 33: 3.3V 36: 3.6V	
SOT-23-5 SOT-25 SOT-353		
SOT-25 (LR9102-Z)		
DFN1616-6 DFN1820-6 DFN2020-6		

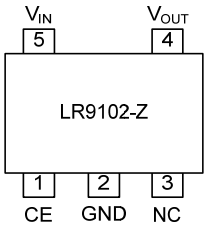
■ PIN CONFIGURATION



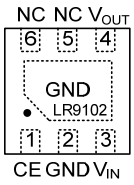
SOT-23-3 / SOT-23



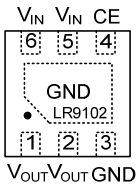
SOT-23-5 / SOT-25 / SOT-353



SOT-25



DFN1616-6
DFN2020-6
(TOP VIEW)



DFN1820-6
(TOP VIEW)

■ PIN DESCRIPTION

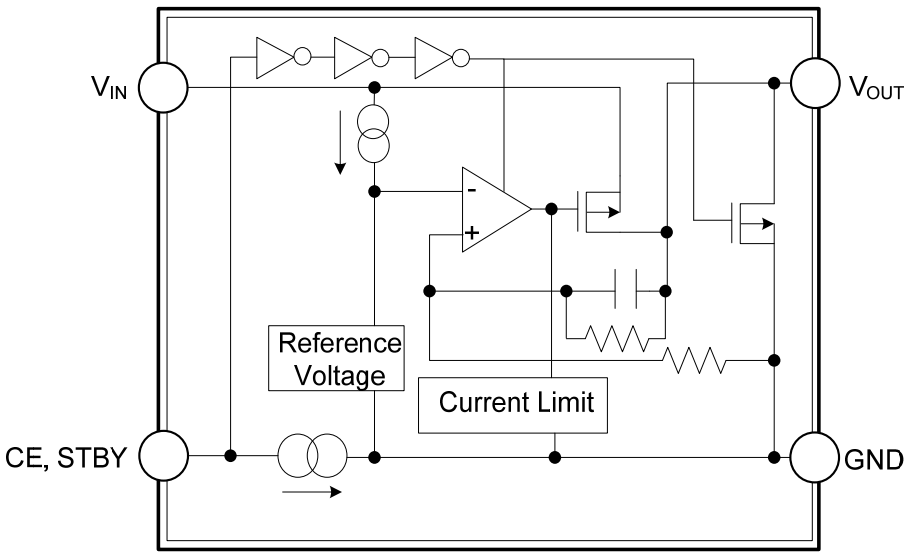
For LR9102

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_{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
-	-	Exposed Pad	Exposed Pad	GND	Connect exposed pad to GND.

For LR9102-Z

PIN NO.	PIN NAME	DESCRIPTION
1	CE	Chip Enable Pin. Active when this Pin is high.
2	GND	Ground Pin
3	NC	No Connection
4	V_{OUT}	Output Pin
5	V_{IN}	Input 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}	V_{IN}+0.3	V
Output Current		I_{OUT}	400	mA
Power Dissipation	SOT-23-3/SOT-23	P_D	330	mW
	SOT-23-5/SOT-25		355	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^2 FR-4 board with 2OZ copper.

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	SOT-23-3/SOT-23	θ_{JA}	300	°C/W
	SOT-23-5/SOT-25		280	°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	θ_{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

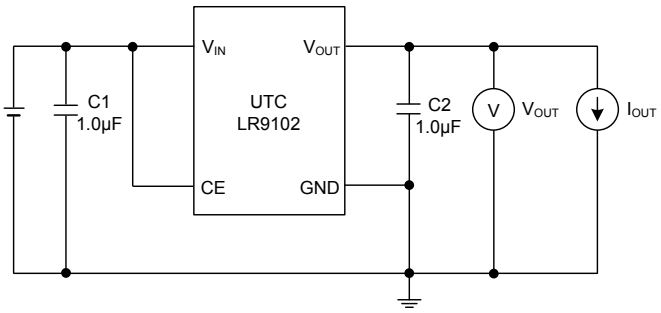
Note: The data tested by surface mounted on a 2 inch^2 FR-4 board with 2OZ copper.

■ ELECTRICAL CHARACTERISTICS

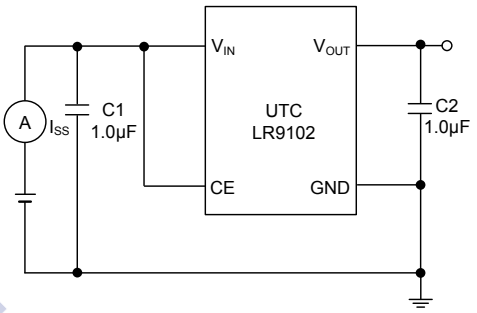
(T_A=25°C, V_{IN}=Set V_{OUT}+1V, I_{OUT}=1mA, C_I =C_O=1μF, unless otherwise specified)

PARAMETER		SYMBOL	TEST CONDITIONS		MIN	TYP	MAX	UNIT
Output Voltage		V_{OUT}	V_{IN} = Set V_{OUT}+1V	V_{OUT} > 2.0V	×0.99		×1.01	V
				V_{OUT} ≤ 2.0V	-20		+20	mV
Input Voltage		V_{IN}					6	V
Load Regulation		ΔV_{OUT}	1mA≤I_{OUT}≤150mA			20	40	mV
Output Current		I_{OUT}			300			mA
Supply Current		I_{SS}	I_{OUT}=0A			50	90	μA
Supply Current (Standby)		I_{ST-BY}	V_{CE}=0V			0.1	2	μA
Short Current Limit		I_{LIMIT}	V_{OUT}=0V			50		mA
CE Pull-down Current		I_{PD}				0.3		μA
CE Input Voltage	High	V_{CEH}			1.2			V
	Low	V_{CEL}					0.3	V
Output Noise		eN	B_W=10Hz to 100kHz, I_{OUT} =30mA			30		μVrms
Ripple Rejection		RR	f=1kHz, Ripple 0.2V_{P-P} V_{IN}=Set V_{OUT}+1V, I_{OUT}=30mA (In case that V_{OUT}=2.0V, V_{IN}=3V)			75		dB
Dropout Voltage		V_D	I_{OUT}=300mA	1.0V ≤V_{OUT} <1.2V		0.60	1.00	V
				1.2V ≤V_{OUT} <1.5V		0.38	0.70	
				1.5V ≤V_{OUT} <1.7V		0.30	0.40	
				1.7V ≤V_{OUT} <2.0V		0.20	0.28	
				2.0V ≤V_{OUT} <2.5V		0.17	0.24	
				2.5V ≤V_{OUT} <2.8V		0.14	0.20	
				2.8V ≤V_{OUT} ≤5.0V		0.12	0.19	
Line Regulation		$\frac{\Delta V_{OUT}}{\Delta V_{IN}}$	1.0V≤V_{OUT}≤4.0V, V_{SET}+0.5V≤V_{IN}≤5V			0.02	0.10	%/V
			4.0V<V_{OUT}≤5.0V, V_{SET}+0.5V≤V_{IN}≤6.5V					
Output Voltage Temperature Coefficient		$\frac{\Delta V_{OUT}}{\Delta T}$	-40°C ≤ T_{OPR} ≤ 85°C			±50		ppm/°C
Low Output Nch Tr. ON Resistance		R_{LOW}	V_{IN}=4.0,V_{CE}=0V			70		Ω

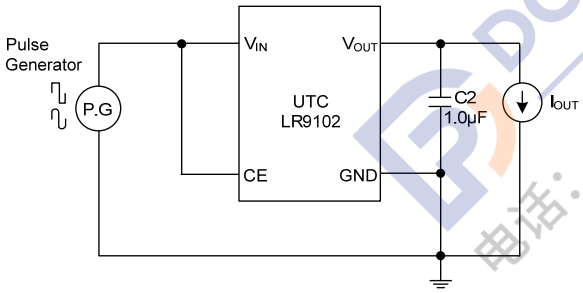
■ TEST CIRCUIT



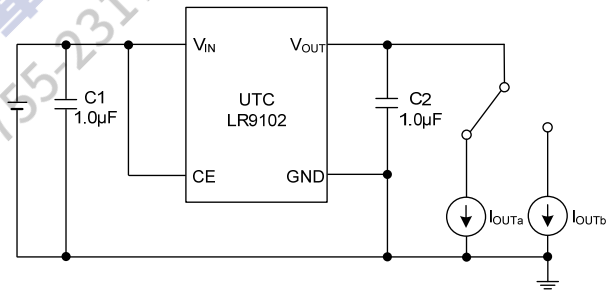
Basic Test Circuit



Test Circuit for Supply Current



Test Circuit for Ripple Rejection



Test Circuit for Load Transient Response

■ TYPICAL APPLICATION CIRCUIT