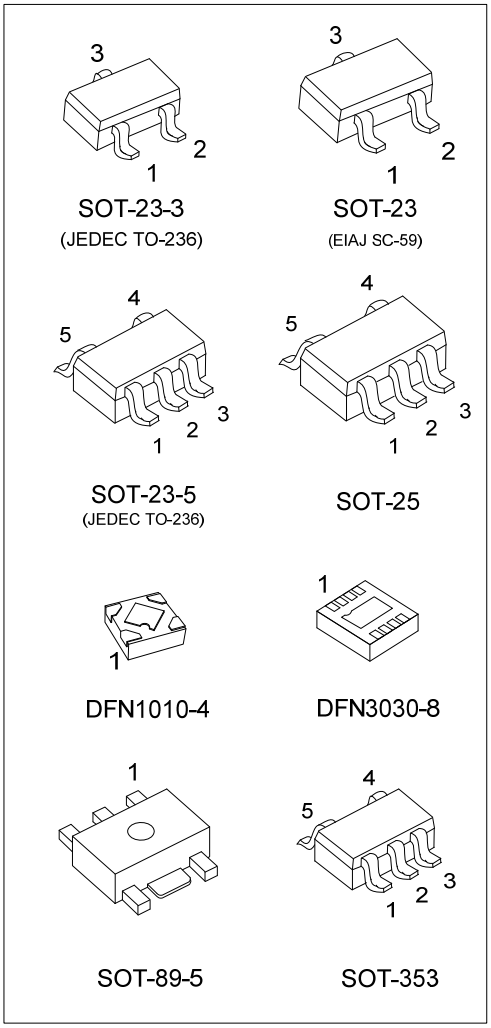
LR9133

CMOS IC

LOW NOISE 300mA LDO REGULATOR



■ DESCRIPTION

The UTC **LR9133** 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 **LR9133**, 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 **LR9133** 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 **LR9133**.

The UTC **LR9133** 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

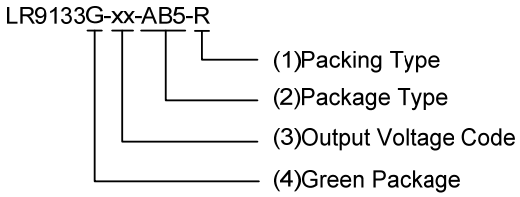
* Ultra Supply Current: 36μA (Typ.)
* Standby Mode: 0.1μA (Typ.)
* Very Low Dropout Voltage: 0.13V (Typ.) @ I_{OUT} =150mA, V_{OUT} =2.85V
* Ripple Rejection: 65dB (Typ.) @ f=1kHz,V_{OUT}=2.85V
* Temperature-Drift Coefficient of Output Voltage: ±100ppm/°C (Typ.)
* Well Line Regulation: 0.02%/ V (Typ.)
* *Output Voltage Accuracy: ±1.0%
* Internal Fold Back Protection Circuit: 80mA (Typ.) (Current at short mode)

*C_{IN}=C_{OUT}=1.0μF or more (Ceramic capacitors) are recommended to be used with this IC

■ ORDERING INFORMATION

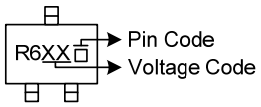
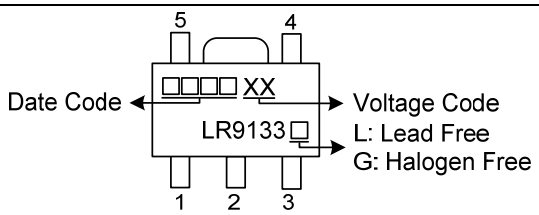
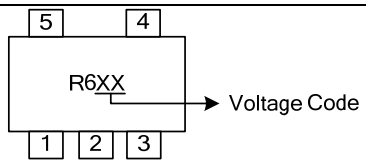
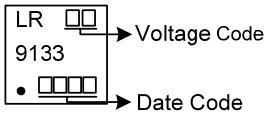
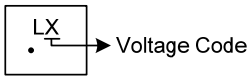
Ordering Number		Package	Packing
Lead Free	Halogen Free		
LR9133L-AB5-R	LR9133G-AB5-R	SOT-89-5	Tape Reel
LR9133L-xx-AE2-3-R	LR9133G-xx-AE2-3-R	SOT-23-3	Tape Reel
LR9133L-xx-AE3-3-R	LR9133G-xx-AE3-3-R	SOT-23	Tape Reel
LR9133L-xx-AE5-R	LR9133G-xx-AE5-R	SOT-23-5	Tape Reel
LR9133L-xx-AF5-R	LR9133G-xx-AF5-R	SOT-25	Tape Reel
LR9133L-xx-AL5-R	LR9133G-xx-AL5-R	SOT-353	Tape Reel
LR9133L-xx-K04-1010-R	LR9133G-xx-K04-1010-R	DFN1010-4	Tape Reel
LR9133L-xx-K08-3030-R	LR9133G-xx-K08-3030-R	DFN3030-8	Tape Reel

Note: xx: Output Voltage.

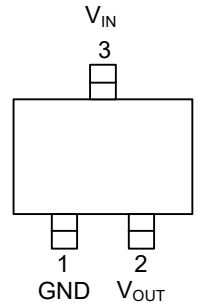


(1) R: Tape Reel
(2) AB5: SOT-89-5, AE2: SOT-23-3, AE3: SOT-23, AE5: SOT-23-5, AF5: SOT-25, AL5: SOT-353, K04-1010: DFN1010-4, K08-3030: DFN3030-8
(3) xx: refer to Marking Information
(4) G: Halogen Free and Lead Free, L: Lead Free

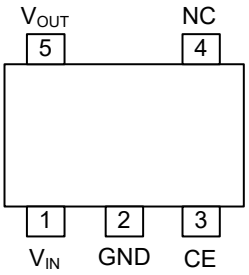
■ MARKING INFORMATION

PACKAGE	VOLTAGE CODE	MARKING
SOT-23-3 SOT-23	11: 1.1V 12: 1.2V 15: 1.5V 18: 1.8V 20: 2.0V 25: 2.5V 28: 2.8V 30: 3.0V 33: 3.3V 34: 3.4V 50: 5.0V	
SOT-89-5		
SOT-23-5 SOT-25 SOT-353		
DFN3030-8		
DFN1010-4	A: 1.1V B: 1.2V C: 1.5V D: 1.8V E: 2.5V S: 2.7V G: 2.8V R: 2.85V J: 3.0V K: 3.3V	

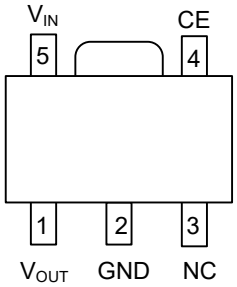
■ PIN CONFIGURATION



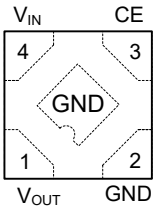
SOT-23-3 / SOT-23



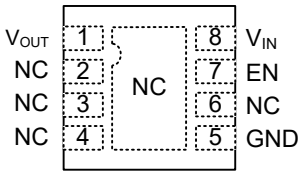
SOT-23-5



SOT-89-5



DFN1010-4
(TOP VIEW)

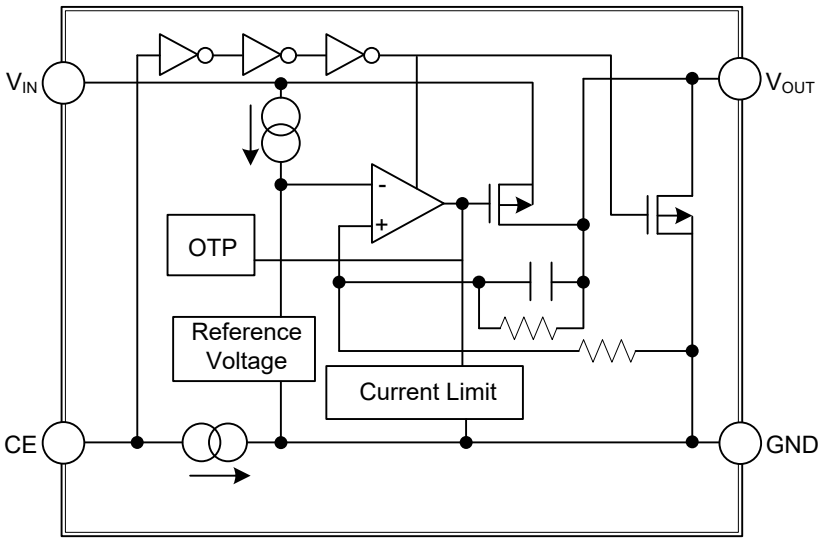


DFN3030-8
(TOP View)

■ PIN DESCRIPTION

PIN NO.					PIN NAME	DESCRIPTION
SOT-23-3 SOT-23	SOT-23-5 SOT-25 SOT-353	SOT-89-5	DFN1010-4	DFN3030-8		
3	1	5	4	8	V_{IN}	Input Pin
1	2	2	2	5	GND	Ground Pin
-	3	4	3	7	CE	Chip Enable Pin. Active when this Pin is high.
-	4	3	-	2, 3, 4, 6	NC	No Connection
2	5	1	1	1	V_{OUT}	Output Pin
-	-	-	Exposed Pad	-	GND	Connect exposed pad to GND.
-	-	-	-	Exposed Pad	NC	No Connection

■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATING

PARAMETER		SYMBOL	RATINGS	UNIT
Input Voltage		V_{IN}	6.5	V
Input Voltage (CE Pin)		V_{CE}	6	V
Output Voltage		V_{OUT}	-0.3 ~ V_{IN}+0.3	V
Output Current		I_{OUT}	350	mA
Power Dissipation	SOT-23-3 SOT-23	P_D	330	mW
	SOT-23-5 SOT-25		360	mW
	SOT-89-5		555	mW
	SOT-353		250	mW
	DFN1010-4		550 (Note 2)	mW
	DFN3030-8		1660 (Note 3)	mW
Junction Temperature		T_J	+125	°C
Operating Temperature		T_{OPR}	-40 ~ +125	°C
Storage Temperature		T_{STG}	-55 ~ +150	°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. Heat Sink Area of PCB for DFN1x1-4 is recommended at least 2.5mmx4mm.
3. The data tested by surface mounted on a 2 inch2 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-89-5		180	°C/W
	SOT-353		400	°C/W
	DFN1010-4		181	°C/W
	DFN3030-8		60 (Note)	°C/W
Junction to Case	SOT-23-3 SOT-23	θ_{JC}	90	°C/W
	SOT-23-5 SOT-25		90	°C/W
	SOT-89-5		50	°C/W
	SOT-353		130	°C/W
	DFN1010-4		38	°C/W
	DFN3030-8		12	°C/W

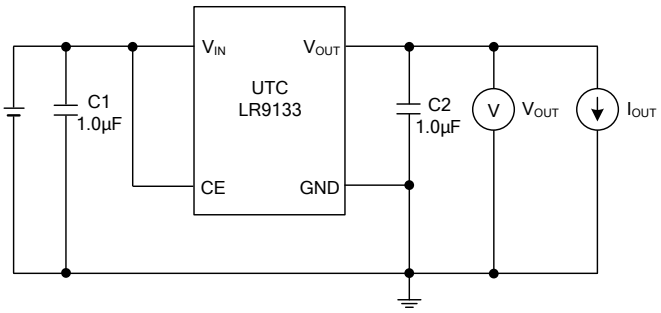
Note: The data tested by surface mounted on a 2 inch2 FR-4 board with 2OZ copper.

■ ELECTRICAL CHARACTERISTICS

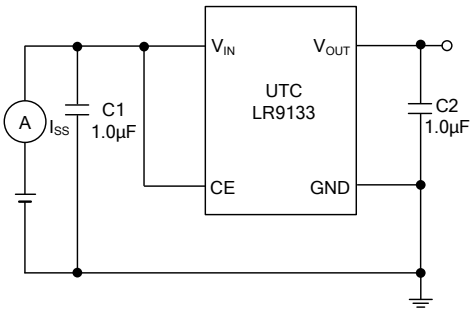
(T_A=25°C, V_{IN}=Set V_{OUT}+1V, I_{OUT}=1mA, C_I =C_O=1.0μF, unless otherwise specified)

PARAMETER		SYMBOL	TEST CONDITIONS		MIN	TYP	MAX	UNIT
Output Voltage		V_{OUT}	V_{IN}=Set V_{OUT}+1V		×0.99		×1.01	V
Input Voltage		V_{IN}					6.5	V
Load Regulation		ΔV_{OUT}	1mA≤I_{OUT}≤300mA			20	50	mV
Output Current		I_{OUT}			300			mA
Supply Current		I_{SS}	I_{OUT}=0A			36	60	μA
Supply Current (Standby)		I_{ST-BY}	V_{CE}=0V			0.1	2	μA
Short Current Limit		I_{LIMIT}	V_{OUT}=0V			80		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~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)			65		dB
Dropout Voltage		V_D	I_{OUT}=150mA	1.1V≤V_{OUT}＜1.5V		0.40		V
				1.5V≤V_{OUT}＜1.7V		0.24		
				1.7V≤V_{OUT}＜2.0V		0.21		
				2.0V≤V_{OUT}＜2.5V		0.17		
				2.5V≤V_{OUT}＜2.8V		0.14		
				2.8V≤V_{OUT}≤5.0V		0.13		
Line Regulation		$\frac{\Delta V_{OUT}}{\Delta V_{IN}}$	1.1V≤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			±100		ppm/°C
Thermal Shutdown Detector Threshold Temperature		TTSD	Junction Temperature			150		°C
Thermal Shutdown Released Temperature		TTSR	Junction Temperature			120		°C
Low Output Nch Tr. ON Resistance		R_{LOW}	V_{IN}=4.0, V_{CE}=0V			70		Ω

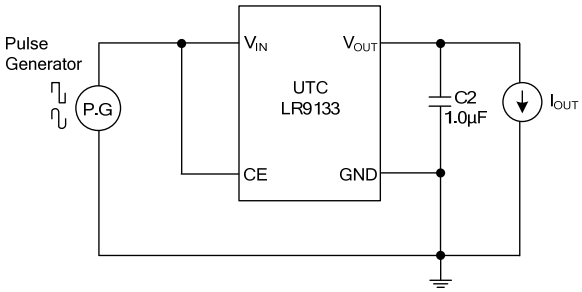
■ TEST CIRCUIT



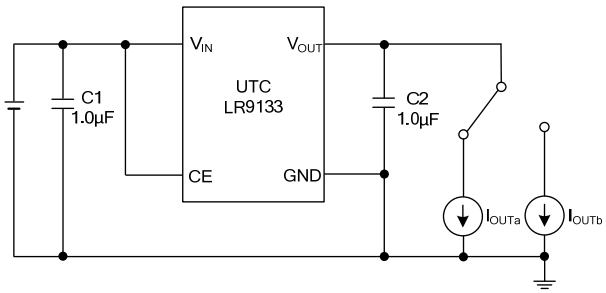
Basic Test Circuit



Test Circuit for Supply Current



Test Circuit for Ripple Rejection



Test Circuit for Load Transient Response

■ TYPICAL APPLICATION CIRCUIT