



## LR9153

CMOS IC

### LOW NOISE 500mA LDO REGULATOR

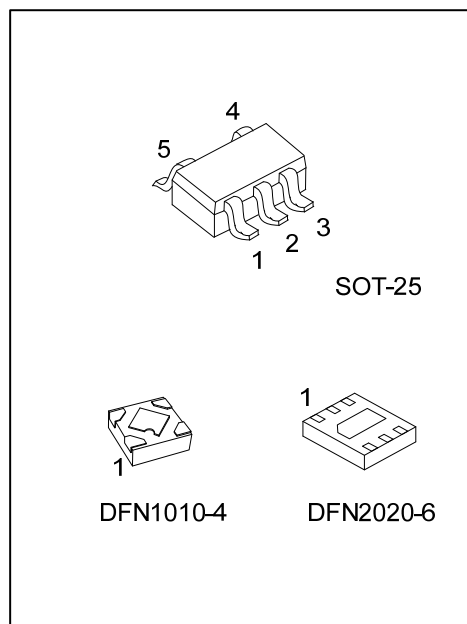
#### DESCRIPTION

The UTC **LR9153** 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 **LR9153**, 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 **LR9153** 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 **LR9153**.

The UTC **LR9153** 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: 50 $\mu$ A (Typ.)
- \* Standby Mode: 0.1 $\mu$ A (Typ.)
- \* Very Low Dropout Voltage: 0.30V (Typ.) @  $I_{OUT}=300mA$ ,  $V_{OUT}=2.85V$
- \* Well Line Regulation: 0.02%/ V (Typ.)
- \* Output Voltage Accuracy:  $\pm 2.0\%$
- \* Internal Fold Back Protection Circuit: 80mA (Typ.) (Current at short mode)
- \*  $C_{IN}=C_{OUT}=1.0\mu F$  or more (Ceramic capacitors) are recommended to be used with this IC

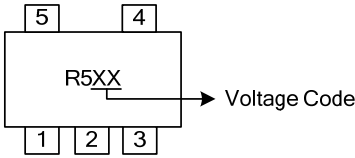
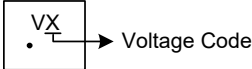
#### ORDERING INFORMATION

Ordering Number		Package	Packing
Lead Free	Halogen Free		
LR9153L-xx-AF5-R	LR9153G-xx-AF5-R	SOT-25	Tape Reel
LR9153L-xx-K04-1010-R	LR9153G-xx-K04-1010-R	DFN1010-4	Tape Reel
LR9153L-xx-K06-2020-R	LR9153G-xx-K06-2020-R	DFN2020-6	Tape Reel

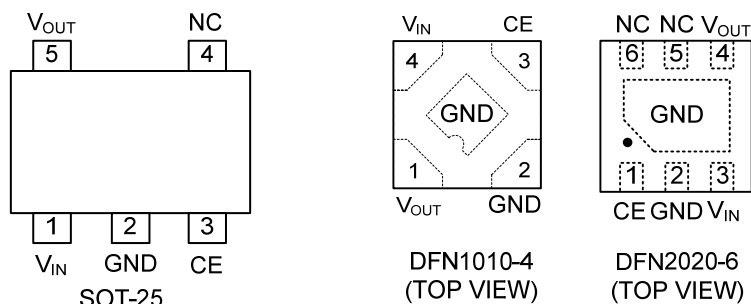
Note: xx: Output Voltage.

LR9153G-xx-AF5-R	(1) Packing Type	(1) R: Tape Reel
	(2) Package Type	(2) AF5: SOT-25, K04-1010: DFN1010-4 K06-2020: DFN2020-6
	(3) Output Voltage Code	(3) xx: 11: 1.1V, 12: 1.2V... 50: 5.0V
	(4) Green Package	(4) G: Halogen Free and Lead Free, L: Lead Free

## MARKING INFORMATION

PACKAGE	VOLTAGE CODE	MARKING
SOT-25	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 36: 3.6V 50: 5.0V	
DFN1010-4 DFN2020-6	A: 1.1V B: 1.2V C: 1.5V D: 1.8V E: 2.5V G: 2.8V J: 3.0V K: 3.3V F: 3.6V M: 5.0V	

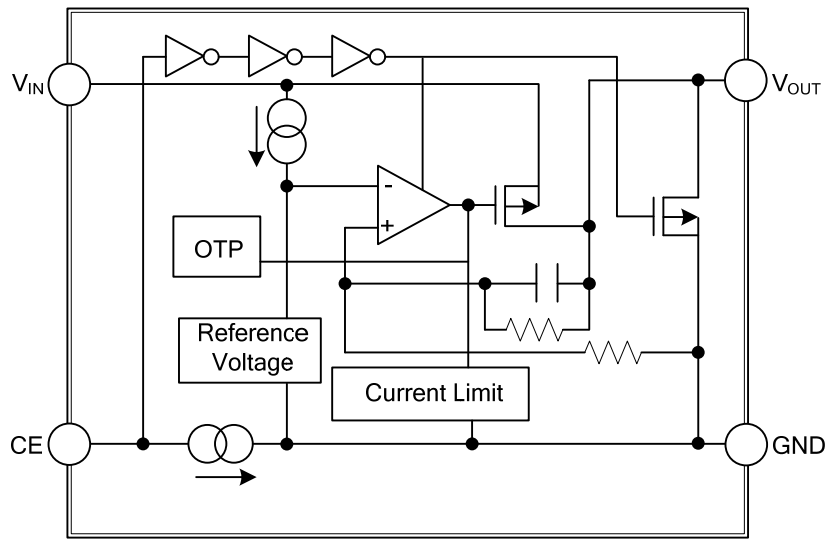
## PIN CONFIGURATION



## PIN DESCRIPTION

PIN NO.			PIN NAME	DESCRIPTION
SOT-25	DFN1010-4	DFN2020-6		
1	4	3	$V_{IN}$	Input Pin
2	2	2	GND	Ground Pin
3	3	1	CE	Chip Enable Pin. Active when this Pin is high.
4	-	5, 6	NC	No Connection
5	1	4	$V_{OUT}$	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		$V_{OUT}$	$-0.3 \sim V_{IN}+0.3$	V
Output Current		$I_{OUT}$	500	mA
Power Dissipation	SOT-25	$P_D$	360	mW
	DFN1010-4		550 (Note 2)	mW
	DFN2020-6		1000 (Note 2)	mW
Junction Temperature		$T_J$	+125	°C
Operating Temperature		$T_{OPR}$	-40 ~ +85	°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.

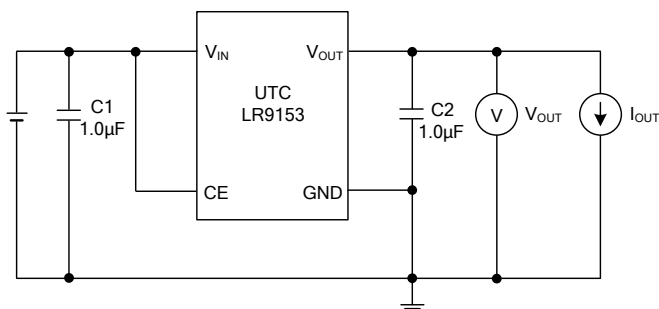
2. Heat Sink Area of PCB for DFN1010-4 and DFN2020-6, is recommended at least 10 mm x 10 mm.

## ■ ELECTRICAL CHARACTERISTICS

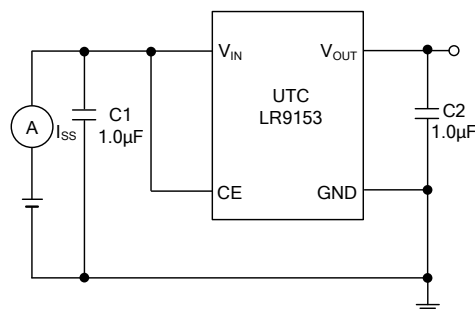
( $T_A=25^\circ\text{C}$ ,  $V_{IN}=\text{Set } V_{OUT}+1\text{V}$ ,  $I_{OUT}=1\text{mA}$ ,  $C_I=C_O=1.0\mu\text{F}$ , unless otherwise specified)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Voltage		V <sub>OUT</sub>	V <sub>IN</sub> =Set V <sub>OUT</sub> +1V	×0.98		×1.02	V
Input Voltage		V <sub>IN</sub>				6	V
Load Regulation		ΔV <sub>OUT</sub>	1mA≤I <sub>OUT</sub> ≤500mA		30	60	mV
Output Current		I <sub>OUT</sub>		500			mA
Supply Current		I <sub>SS</sub>	I <sub>OUT</sub> =0A		50	80	μA
Supply Current (Standby)		I <sub>ST-BY</sub>	V <sub>CE</sub> =0V		0.1	2	μA
Short Current Limit		I <sub>LIMIT</sub>	V <sub>OUT</sub> =0V		80		mA
CE Pull-down Current		I <sub>PD</sub>			0.3		μA
CE Input Voltage	High	V <sub>CEH</sub>		1.2			V
	Low	V <sub>CEL</sub>				0.3	V
Output Noise		eN	B <sub>W</sub> =10Hz~100kHz, I <sub>OUT</sub> =30mA		50		μVrms
Ripple Rejection		RR	f=1kHz, Ripple 0.2V <sub>P-P</sub> V <sub>IN</sub> =Set V <sub>OUT</sub> +1V, I <sub>OUT</sub> =30mA (In case that V <sub>OUT</sub> =2.0V, V <sub>IN</sub> =3V)		65		dB
Dropout Voltage	V <sub>D</sub>	I <sub>OUT</sub> =300mA	1.1V≤V <sub>OUT</sub> < 1.2V		0.87		V
			1.2V≤V <sub>OUT</sub> < 1.5V		0.79		
			1.5V≤V <sub>OUT</sub> < 1.7V		0.5		
			1.7V≤V <sub>OUT</sub> < 2.0V		0.44		
			2.0V≤V <sub>OUT</sub> < 2.5V		0.37		
			2.5V≤V <sub>OUT</sub> <2.8V		0.32		
			2.8V≤V <sub>OUT</sub> ≤5.0V		0.30		
Line Regulation	$\frac{\Delta V_{OUT}}{\Delta V_{IN}}$	1.2V≤V <sub>OUT</sub> ≤4.0V, V <sub>SET</sub> +0.5V≤V <sub>IN</sub> ≤5V			0.02	0.10	%V
		4.0V<V <sub>OUT</sub> ≤5.0V, V <sub>SET</sub> +0.5V≤V <sub>IN</sub> ≤6V					
Low Output Nch Tr. ON Resistance		R <sub>LOW</sub>	V <sub>IN</sub> =4.0, V <sub>CE</sub> =0V		60		Ω

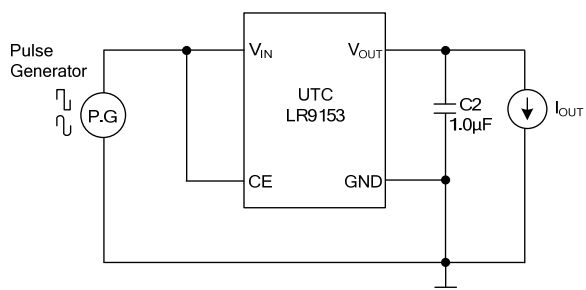
## ■ TEST CIRCUIT



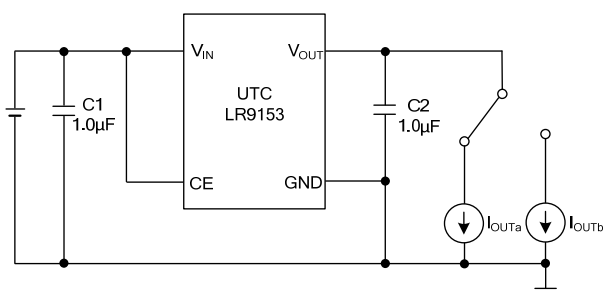
Basic Test Circuit



Test Circuit for Supply Current

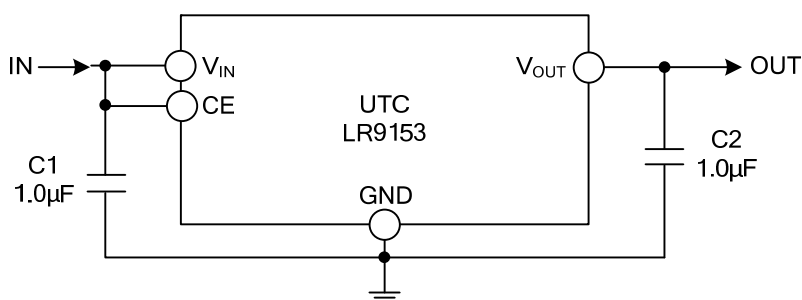


Test Circuit for Ripple Rejection



Test Circuit for Load Transient Response

## ■ TYPICAL APPLICATION CIRCUIT



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