

RT9193

General Description

The RT9193 is designed for portable RF and wireless applications with demanding performance and space requirements. The RT9193 performance is optimized for battery-powered systems to deliver ultra low noise and low quiescent current. A noise bypass pin is available for further reduction of output noise. Regulator ground current increases only slightly in dropout, further prolonging the battery life. The RT9193 also works with low-ESR ceramic capacitors, reducing the amount of board space necessary for power applications, critical in hand-held wireless devices. The RT9193 consumes less than 0.01 μ A in shutdown mode and has fast turn-on time less than 50 μ s. The other features include ultra low dropout voltage, high output accuracy, current limiting protection, and high ripple rejection ratio. Available in the 5-lead of SC-70, SOT-23 and WDFN-6L 2x2 packages.

Ordering Information

RT9193-□□□□□	
□	Package Type U5 : SC-70-5 B : SOT-23-5 QW : WDFN-6L 2x2 (W-Type)
□	Operating Temperature Range P : Pb Free with Commercial Standard G : Green (Halogen Free with Commercial Standard)
□	Output Voltage 15 : 1.5V 16 : 1.6V : 49 : 4.9V 50 : 5.0V 1H : 1.85V 2H : 2.85V 4G : 4.75V

Features

- Ultra-Low-Noise for RF Application
- Ultra-Fast Response in Line/Load Transient
- Quick Start-Up (Typically 50 μ s)
- < 0.01 μ A Standby Current When Shutdown
- Low Dropout : 220mV @ 300mA
- Wide Operating Voltage Ranges : 2.5V to 5.5V
- TTL-Logic-Controlled Shutdown Input
- Low Temperature Coefficient
- Current Limiting Protection
- Thermal Shutdown Protection
- Only 1 μ F Output Capacitor Required for Stability
- High Power Supply Rejection Ratio
- Custom Voltage Available
- RoHS Compliant and 100% Lead (Pb)-Free

Applications

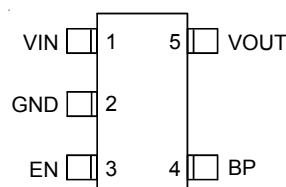
- CDMA/GSM Cellular Handsets
- Battery-Powered Equipment
- Laptop, Palmtops, Notebook Computers
- Hand-Held Instruments
- PCMCIA Cards
- Portable Information Appliances

Marking Information

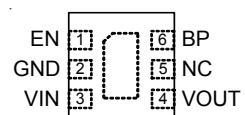
For marking information, contact our sales representative directly or through a RichTek distributor located in your area, otherwise visit our website for detail.

Pin Configurations

(TOP VIEW)



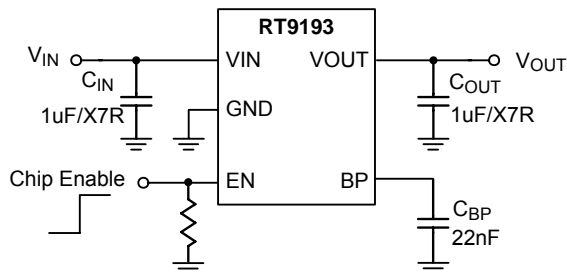
SC-70-5/SOT-23-5



WDFN-6L 2x2

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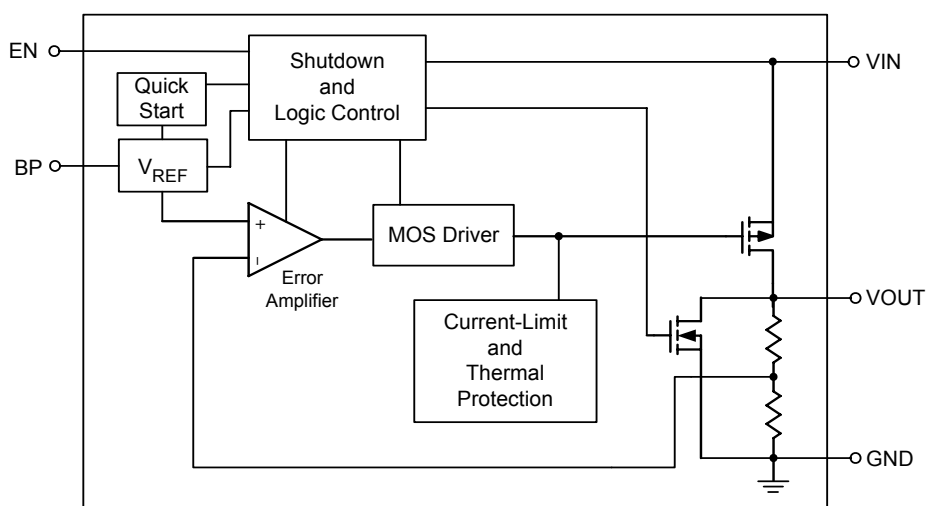
Typical Application Circuit



Functional Pin Description

Pin Name	Pin Function
EN	Chip Enable (Active High). Note that this pin is high impedance. There should be a pull low 100kΩ resistor connected to GND when the control signal is floating.
BP	Reference Noise Bypass
GND	Ground
VOUT	Output Voltage
VIN	Power Input Voltage

Function Block Diagram



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Absolute Maximum Ratings (Note 1)

• Supply Input Voltage	-----	6V
• Power Dissipation, $P_D @ T_A = 25^\circ\text{C}$		
SC-70-5	-----	300mW
SOT-23-5	-----	400mW
WDFN-6L 2x2	-----	606mW
• Package Thermal Resistance (Note 4)		
SOT-70-5, θ_{JA}	-----	333°C/W
SOT-23-5, θ_{JA}	-----	250°C/W
WDFN-6L 2x2, θ_{JA}	-----	165°C/W
• Junction Temperature	-----	150°C
• Lead Temperature (Soldering, 10 sec.)	-----	260°C
• Storage Temperature Range	-----	-65°C to 150°C
• ESD Susceptibility (Note 2)		
HBM (Human Body Mode)	-----	2kV
MM (Machine Mode)	-----	200V

Recommended Operating Conditions (Note 3)

• Supply Input Voltage	-----	2.5V to 5.5V
• EN Input Voltage	-----	0V to 5.5V
• Junction Temperature Range	-----	-40°C to 125°C
• Ambient Temperature Range	-----	-40°C to 85°C

Electrical Characteristics

($V_{IN} = V_{OUT} + 1V$, $C_{IN} = C_{OUT} = 1\mu\text{F}$, $C_{BP} = 22\text{nF}$, $T_A = 25^\circ\text{C}$, unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units	
Output Voltage Accuracy	ΔV_{OUT}	$I_{OUT} = 1\text{mA}$	-2	--	+2	%	
Current Limit	I_{LIM}	$R_{LOAD} = 1\Omega$	360	400	--	mA	
Quiescent Current	I_Q	$V_{EN} \geq 1.2V, I_{OUT} = 0\text{mA}$	--	90	130	μA	
Dropout Voltage (Note 5)	V_{DROP}	$I_{OUT} = 200\text{mA}, V_{OUT} > 2.8V$		170	200	mV	
		$I_{OUT} = 300\text{mA}, V_{OUT} > 2.8V$	--	220	300		
Line Regulation	ΔV_{LINE}	$V_{IN} = (V_{OUT} + 1V)$ to 5.5V, $I_{OUT} = 1\text{mA}$	--	--	0.3	%	
Load Regulation	ΔV_{LOAD}	$1\text{mA} < I_{OUT} < 300\text{mA}$	--	--	0.6	%	
Standby Current	I_{STBY}	$V_{EN} = \text{GND}$, Shutdown	--	0.01	1	μA	
EN Input Bias Current	I_{IBSD}	$V_{EN} = \text{GND}$ or V_{IN}	--	0	100	nA	
EN Threshold	Logic-Low Voltage	V_{IL}	$V_{IN} = 3V$ to 5.5V, Shutdown	--	--	0.4	V
	Logic-High Voltage	V_{IH}	$V_{IN} = 3V$ to 5.5V, Start-Up	1.2	--	--	
Output Noise Voltage	e_{NO}	10Hz to 100kHz, $I_{OUT} = 200\text{mA}$ $C_{OUT} = 1\mu\text{F}$	--	100	--	μV_{RMS}	
Power Supply Rejection Rate	f = 100Hz	PSRR	$C_{OUT} = 1\mu\text{F}, I_{OUT} = 10\text{mA}$	--	-70	--	dB
	f = 10kHz			--	-50	--	
Thermal Shutdown Temperature	T_{SD}		--	165	--	°C	

To be continued

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Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Thermal Shutdown Temperature Hysteresis	ΔT_{SD}		--	30	--	°C

Note 1. Stresses listed as the above "Absolute Maximum Ratings" may cause permanent damage to the device. These are for stress ratings. Functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may remain possibility to affect device reliability.

Note 2. Devices are ESD sensitive. Handling precaution recommended.

Note 3. The device is not guaranteed to function outside its operating conditions.

Note 4. θ_{JA} is measured in the natural convection at $T_A = 25^\circ\text{C}$ on a low effective thermal conductivity test board (Single Layer, 1S) of JEDEC 51-3 thermal measurement standard.

Note 5. The dropout voltage is defined as $V_{IN} - V_{OUT}$, which is measured when V_{OUT} is $V_{OUT(NORMAL)} - 100\text{mV}$.