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 0.01μA in shutdown mode and has fast turn-on time less than 50μs. 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 50μs)**
- **< 0.01μA 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 1μF Output Capacitor Required for Stability**
- **High Power Supply Rejection Ratio**
- **Custom Voltage Available**
- **RoHS Compliant and 100% Lead (Pb)-Free**

Applications

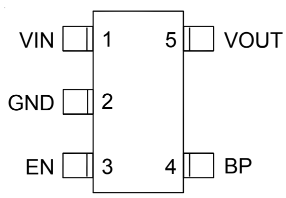
- CDMA/GSM Cellular Handsets
- Battery-Powered Equipment
- Laptop, Palmtops, Notebook Computers
- Hand-Held Instruments
- PCMCIA Cards
- Portable Information Appliances

Marking Information

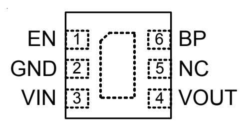
For marking information, contact our sales representative directly or through a RichTek distributor located in your area, otherwise visit our website for detail.

Pin Configurations

(TOP VIEW)

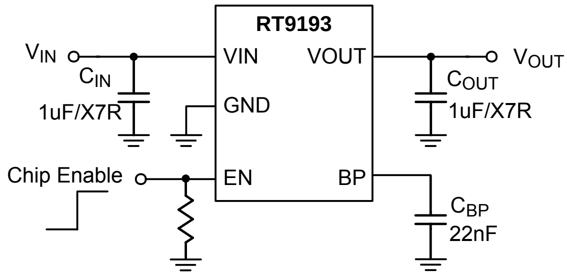


SC-70-5/SOT-23-5



WDFN-6L 2x2

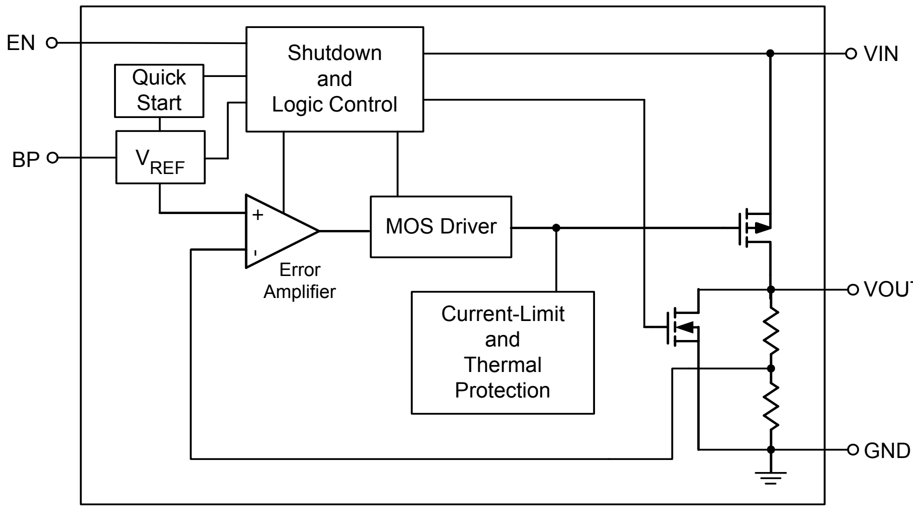
Typical Application Circuit



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



Absolute Maximum Ratings (Note 1)

- Supply Input Voltage ---------- 6V
- Power Dissipation, P_D @ T_A = 25°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} = 1µF, C_{BP} = 22nF, T_A = 25°C, unless otherwise specified)

Parameter		Symbol	Test Conditions	Min	Typ	Max	Units
Output Voltage Accuracy		ΔV_{OUT}	I_{OUT} = 1mA	–2	--	+2	%
Current Limit		I_{LIM}	R_{LOAD} = 1Ω	360	400	--	mA
Quiescent Current		I_Q	$V_{EN} \geq$ 1.2V, I_{OUT} = 0mA	--	90	130	µA
Dropout Voltage (Note 5)		V_{DROP}	I_{OUT} = 200mA, V_{OUT} > 2.8V		170	200	mV
			I_{OUT} = 300mA, V_{OUT} > 2.8V	--	220	300	
Line Regulation		ΔV_{LINE}	V_{IN} = (V_{OUT} + 1V) to 5.5V, I_{OUT} = 1mA	--	--	0.3	%
Load Regulation		ΔV_{LOAD}	1mA < I_{OUT} < 300mA	--	--	0.6	%
Standby Current		I_{STBY}	V_{EN} = GND, Shutdown	--	0.01	1	µA
EN Input Bias Current		I_{IBSD}	V_{EN} = GND or VIN	--	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} = 200mA C_{OUT} = 1µF	--	100	--	μV_{RMS}
Power Supply Rejection Rate	f = 100Hz	PSRR	C_{OUT} = 1µF, I_{OUT} = 10mA	--	–70	--	dB
	f = 10kHz			--	–50	--	
Thermal Shutdown Temperature		T_{SD}		--	165	--	°C

To be continued

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°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 $V_{OUT(NORMAL)}$ – 100mV.