RT9178

General Description

The RT9178 is designed for portable RF and wireless applications with demanding performance and space requirements.

The RT9178' s performance is optimized for battery-powered systems to deliver ultra low noise and low quiescent current. A noise bypass pin is also available for further reduction of output noise. Regulator ground current increases only slightly in dropout, further prolonging the battery life. The RT9178 also works with low-ESR ceramic capacitors, reducing the amount of board space necessary for power applications, critical in hand-held wireless devices.

The RT9178 consumes less than 0.01μA in shutdown mode and has fast turn-on time less than 100μs. The other features include ultra low dropout voltage, high output accuracy, current limiting protection, and high ripple rejection ratio. Available in the SOT-23-5 package.

Ordering Information

RT9178-□□□□□

Package Type
B : SOT-23-5
BR : SOT-23-5 (R-Type)

Operating Temperature Range
P : Pb Free with Commercial Standard
G : Green (Halogen Free with Commercial Standard)

Output Voltage
24 : 2.4V
25 : 2.5V
:
31 : 3.1V
32 : 3.2V
2H : 2.85V

Features

- **Ultra-Low-Noise for RF Application**
- **Ultra-Fast Response in Line/Load Transient**
- **Quick Start-Up (Typically 100μs)**
- **< 0.01μA Quiescent Current When Shutdown**
- **Low Dropout : 200mV at 200mA**
- **Wide Operating Voltage Ranges : 2.5V to 6.0V**
- **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

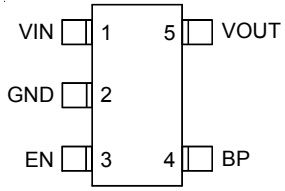
- CDMA/GSM Cellular Handsets
- Battery-Powered Equipment
- Laptop, Palmtops, Notebook Computers
- Hand-Held Instruments
- PCMCIA Cards
- Portable Information Appliances

Marking Information

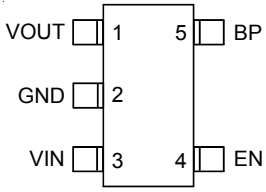
For marking information, contact our sales representative directly or through a RichTek distributor located in your area, otherwise visit our website for detail.

Pin Configurations

(TOP VIEW)



SOT-23-5

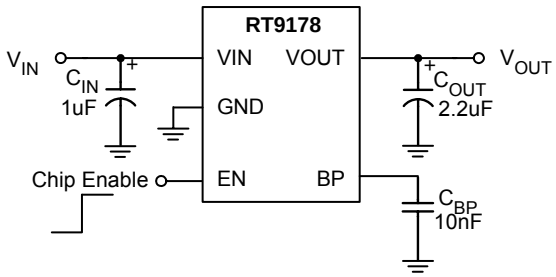


R-Type

SOT-23-5

RT9178

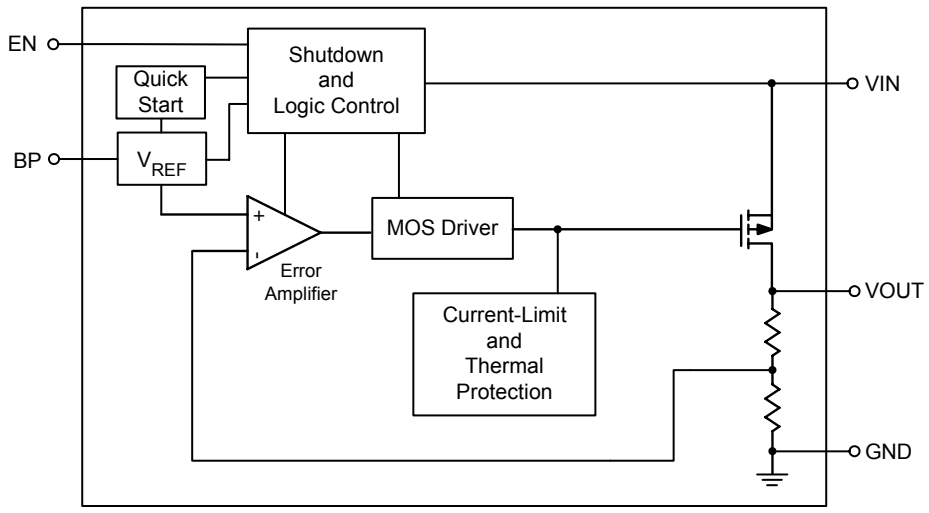
Typical Application Circuit



Functional Pin Description

Pin No.		Pin Name	Pin Function
RT9178-□□CB	RT9178-□□CBR		
1	3	VIN	Power Input Voltage
5	1	VOUT	Output Voltage
2	2	GND	Ground
3	4	EN	Enable Input Logic, Active Low. If the Shutdown Feature is not Required, Connect EN to VIN.
4	5	BP	Reference Noise Bypass

Function Block Diagram



Absolute Maximum Ratings (Note 1)

- Supply Input Voltage ---------- 7V
- Enable Input Voltage ---------- 7V
- Power Dissipation, P_D @ T_A = 25°C
  SOT-23-5 ---------- 0.4W
- Package Thermal Resistance (Note 8)
  SOT-23-5, θ_{JA} ---------- 250°C/W
- Lead Temperature (Soldering, 10 sec.) ---------- 260°C
- Junction Temperature ---------- 150°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 6V
- Enable Input Voltage ---------- 0V to 6V
- Junction Temperature Range ---------- –40°C to 125°C

Electrical Characteristics

(V_{IN} = V_{OUT} + 1V, C_{IN} =C_{OUT} = 1μF, C_{BP} = 1nF, 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	--	400	--	mA
Quiescent Current (Note 6)		I_Q	V_{EN} > 1.0V, I_{OUT} = 0mA	--	90	150	μA
Dropout Voltage (Note 4)		V_{DROP}	I_{OUT} = 200mA	--	200	300	mV
Line Regulation		ΔV_{LINE}	V_{IN} = (V_{OUT} + 0.3V) to 6.0V, I_{OUT} = 1mA	--	--	6	mV/V
Load Regulation (Note 5)		ΔV_{LOAD}	1mA < I_{OUT} < 200mA	--	7	20	mV
Standby Current (Note 7)		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	1.0	--	--	
Output Noise Voltage		e_{NO}	10Hz to 100kHz, I_{OUT} = 200mA C_{OUT} = 10μF	--	50	--	μV_{RMS}
Power Supply Rejection Rate	f = 100Hz	PSRR	C_{OUT} = 10μF, I_{OUT} = 200mA	--	–70	--	dB
	f = 10kHz			--	–40	--	
Thermal Shutdown Temperature		T_{SD}		--	150	--	°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. The dropout voltage is defined as V_{IN} -V_{OUT}, which is measured when V_{OUT} is $V_{OUT(NORMAL)}$ – 100mV.

Note 5. Regulation is measured at constant junction temperature by using a 20ms current pulse. Devices are tested for load regulation in the load range from 1mA to 200mA.

Note 6. Quiescent, or ground current, is the difference between input and output currents. It is defined by $I_Q = I_{IN} - I_{OUT}$ under no load condition (I_{OUT} = 0mA). The total current drawn from the supply is the sum of the load current plus the ground pin current.

Note 7. Standby current is the input current drawn by a regulator when the output voltage is disabled by a shutdown signal (V_{EN} = GND). It is measured with V_{IN} = 6V.

Note 8. θ_{JA} is measured in the natural convection at T_A = 25°C on a low effective thermal conductivity test board of JEDEC 51-3 thermal measurement standard.