

# 1A Fixed and Adjustable Low Dropout Positive Voltage Regulators

## General Description

The RT9164A series of high performance positive voltage regulators is designed for applications requiring low dropout performance at fully rated current. Additionally, the RT9164A series provides excellent regulation over variations in line and load. Outstanding features include low dropout performance at rated current, fast transient response, internal current-limiting, and thermal-shutdown protection of the output device. The RT9164A series of three terminal regulators offers fixed and adjustable voltage options available in space-saving SOT-223, TO-252, and TO-263 packages.

## Ordering Information

RT9164A-□□□□	
Package Type	
G : SOT-223	
L: TO-252	
LR : TO-252 (R-Type)	
M : TO-263	
Lead Plating System	
P : Pb Free	
G : Green (Halogen Free and Pb Free)	
Output Voltage	
Default : Adjustable	
15 : 1.5V	
18 : 1.8V	
25 : 2.5V	
28 : 2.85V	
30 : 3.0V	
33 : 3.3V	
35 : 3.5V	

Note :

Richtek products are :

- ▶ RoHS compliant and compatible with the current requirements of IPC/JEDEC J-STD-020.
- ▶ Suitable for use in SnPb or Pb-free soldering processes.

## Marking Information

For marking information, contact our sales representative directly or through a Richtek distributor located in your area.

## Features

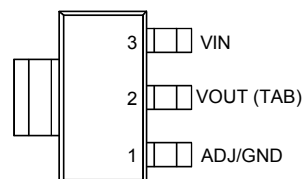
- Low Dropout Performance, 1.4V Max
- Full Current Rating Over Line and Temperature
- Fast Transient Response
- $\pm 2\%$  Output Voltage Accuracy
- 1.5V, 1.8V, 2.5V, 2.85V, 3.0V, 3.3V, and 3.5V Fixed Adjustable Output Voltage
- SOT-223, TO-252, and TO-263 Packages
- RoHS Compliant and 100% Lead (Pb)-Free

## Applications

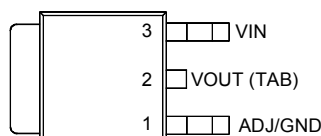
- Active SCSI Termination
- Low Voltage Microcontrollers
- Switching Power Supply Post-Regulator

## Pin ConFigurations

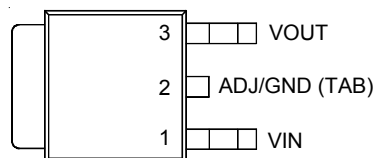
(TOP VIEW)



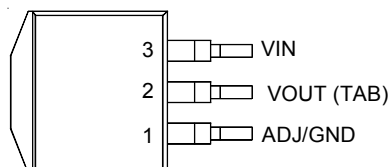
SOT-223



TO-252

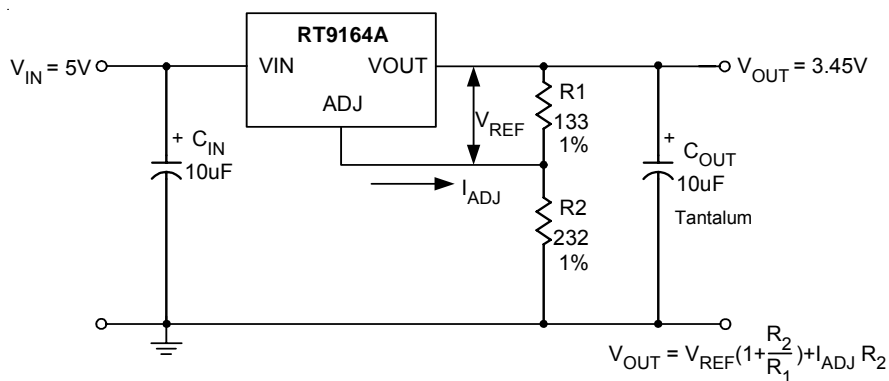


TO-252 (R-Type)



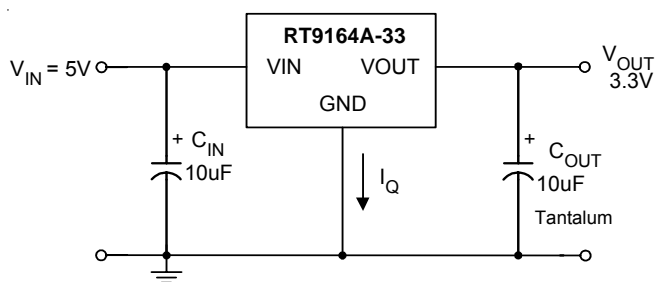
TO-263

## Typical Application Circuit



- (1)  $C_{IN}$  needed if device is far from filter capacitors.
- (2)  $C_{OUT}$  required for stability.

Figure 1. Adjustable Voltage Regulator



- (1)  $C_{IN}$  needed if device is far from filter capacitors.
- (2)  $C_{OUT}$  required for stability.

Figure 2. Fixed Voltage Regulator

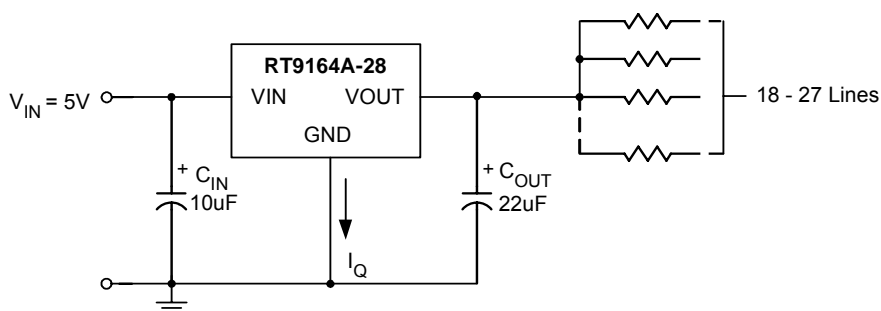
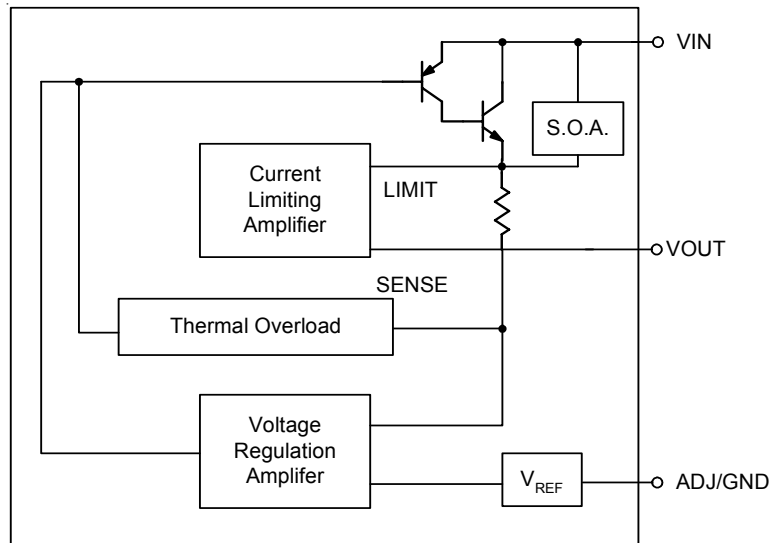


Figure 3. Active SCSI Bus Terminator

## Function Block Diagram



## Functional Pin Description

Pin Name	Pin Function
ADJ/GND	Adjust Output or Ground.
VOUT	Output Voltage.
VIN	Power Input.

## Absolute Maximum Ratings (Note 1)

• Supply Input Voltage	15V
• Power Dissipation, $P_D$ @ $T_A = 25^\circ\text{C}$	
SOT-223	0.740W
TO-252	1.471W
TO-263	2.222W
• Package Thermal Resistance (Note 2)	
SOT-223, $\theta_{JA}$	135°C/W
SOT-223, $\theta_{JC}$	19°C/W
TO-252, $\theta_{JA}$	68°C/W
TO-252, $\theta_{JC}$	7.5°C/W
TO-263, $\theta_{JA}$	45°C/W
TO-263, $\theta_{JC}$	7.8°C/W
• Lead Temperature (Soldering, 10 sec.)	260°C
• Junction Temperature	150°C
• Storage Temperature Range	-65°C to 150°C
• ESD Susceptibility (Note 3)	
HBM (Human Body Mode)	8 kV
MM (Machine Mode)	750V

## Recommended Operating Conditions (Note 4)

• Supply Input Voltage	3V to 14V
• Junction Temperature Range	-40°C to 125°C

## Electrical Characteristics

( $T_A = 25^\circ\text{C}$ , unless otherwise specified)

Parameter		Symbol	Test Conditions	Min	Typ	Max	Unit
Reference Voltage (Note 5)	RT9164A	V <sub>REF</sub>	I <sub>OUT</sub> = 10mA, (V <sub>IN</sub> – V <sub>OUT</sub> ) = 2V, T <sub>A</sub> = 25°C	1.243	1.256	1.281	V
			10mA < I <sub>OUT</sub> < 1.0A, 1.5V < V <sub>IN</sub> – V <sub>OUT</sub> < 10V	1.231	1.256	1.294	V
Output Voltage (Note 5)	RT9164A -15	V <sub>OUT</sub>	I <sub>OUT</sub> = 10mA, V <sub>IN</sub> = 3.3V, T <sub>J</sub> = 25°C	1.485	1.5	1.53	V
			10mA < I <sub>OUT</sub> < 1.0A, 3.3V < V <sub>IN</sub> < 10V	1.470	1.5	1.55	
	RT9164A -18		I <sub>OUT</sub> = 10mA, V <sub>IN</sub> = 3.3V, T <sub>J</sub> = 25°C	1.797	1.815	1.85	
			10mA < I <sub>OUT</sub> < 1.0A, 3.3V < V <sub>IN</sub> < 10V	1.779	1.815	1.87	
	RT9164A -25		I <sub>OUT</sub> = 10mA, V <sub>IN</sub> = 4.0V, T <sub>J</sub> = 25°C	2.475	2.500	2.550	
			10mA < I <sub>OUT</sub> < 1.0A, 4.0V < V <sub>IN</sub> < 10V	2.450	2.500	2.575	
	RT9164A -28		I <sub>OUT</sub> = 10mA, V <sub>IN</sub> = 4.25V, T <sub>J</sub> = 25°C	2.822	2.850	2.910	
			10mA < I <sub>OUT</sub> < 1.0A, 4.25V < V <sub>IN</sub> < 10V	2.793	2.850	2.936	
	RT9164A -30		I <sub>OUT</sub> = 10mA, V <sub>IN</sub> = 4.5V, T <sub>J</sub> = 25°C	2.970	3.000	3.060	
			10mA < I <sub>OUT</sub> < 1.0A, 4.5V < V <sub>IN</sub> < 10V	2.940	3.000	3.090	

To be continued

Parameter		Symbol	Test Conditions	Min	Typ	Max	Unit
Output Voltage (Note 5)	RT9164A -33	V <sub>OUT</sub>	I <sub>OUT</sub> = 10mA, V <sub>IN</sub> = 4.75V, T <sub>J</sub> = 25°C	3.267	3.300	3.365	V
			10mA < I <sub>OUT</sub> < 1.0A, 4.75V < V <sub>IN</sub> < 10V	3.234	3.300	3.400	
	RT9164A -35		I <sub>OUT</sub> = 10mA, V <sub>IN</sub> = 5V, T <sub>J</sub> = 25°C	3.465	3.500	3.570	
			10mA < I <sub>OUT</sub> < 1.0A, 5.0V < V <sub>IN</sub> < 10V	3.430	3.500	3.605	
Line Regulation (Note 5)	RT9164A	ΔV <sub>LINE</sub>	I <sub>OUT</sub> = 10mA, 1.5V ≤ V <sub>IN</sub> – V <sub>OUT</sub> ≤ 10V	--	0.1	0.3	%
	RT9164A -15		I <sub>OUT</sub> = 10mA, 3.3V ≤ V <sub>IN</sub> ≤ 15V	--	1	6	mV
	RT9164A -18		I <sub>OUT</sub> = 10mA, 3.3V ≤ V <sub>IN</sub> ≤ 15V	--	1	6	
	RT9164A -25		I <sub>OUT</sub> = 10mA, 4.0V ≤ V <sub>IN</sub> ≤ 15V	--	1	6	
	RT9164A -28		I <sub>OUT</sub> = 10mA, 4.25V ≤ V <sub>IN</sub> ≤ 15V	--	1	6	
	RT9164A -30		I <sub>OUT</sub> = 10mA, 4.5V ≤ V <sub>IN</sub> ≤ 15V	--	1	6	
	RT9164A -33		I <sub>OUT</sub> = 10mA, 4.75V ≤ V <sub>IN</sub> ≤ 15V	--	1	6	
	RT9164A -35		I <sub>OUT</sub> = 10mA, 5.0V ≤ V <sub>IN</sub> ≤ 15V	--	1	6	
Load Regulation (Note 5)	RT9164A	ΔV <sub>LOAD</sub>	(V <sub>IN</sub> – V <sub>OUT</sub> ) = 3V, 10mA ≤ I <sub>OUT</sub> ≤ 1.0A	--	0.2	0.4	%
	RT9164A -15		V <sub>IN</sub> = 3.3V, 10mA ≤ I <sub>OUT</sub> ≤ 1.0A	--	1	10	mV
	RT9164A -18		V <sub>IN</sub> = 3.3V, 10mA ≤ I <sub>OUT</sub> ≤ 1.0A	--	1	10	
	RT9164A -25		V <sub>IN</sub> = 4.0V, 10mA ≤ I <sub>OUT</sub> ≤ 1.0A	--	1	10	
	RT9164A -28		V <sub>IN</sub> = 4.25V, 10mA ≤ I <sub>OUT</sub> ≤ 1.0A	--	1	10	
	RT9164A -30		V <sub>IN</sub> = 4.5V, 10mA ≤ I <sub>OUT</sub> ≤ 1.0A	--	1	12	
	RT9164A -33		V <sub>IN</sub> = 4.75V, 10mA ≤ I <sub>OUT</sub> ≤ 1.0A	--	1	12	
	RT9164A -35		V <sub>IN</sub> = 5.0V, 10mA ≤ I <sub>OUT</sub> ≤ 1.0A	--	1	15	
Dropout Voltage (Note 6)		V <sub>DROP</sub>	I <sub>OUT</sub> = 500mA	--	1.15	1.25	V
			I <sub>OUT</sub> = 1.0A	--	1.3	1.4	
Current Limit		I <sub>LIM</sub>	V <sub>IN</sub> = 5V	1.0	1.8	–	A
Minimum Load Current	RT9164A		(V <sub>IN</sub> – V <sub>OUT</sub> ) = 2V	--	5	10	mA
Quiescent Current	RT9164A -XX	I <sub>Q</sub>	V <sub>IN</sub> = 5V	--	5	10	
Ripple Rejection		PSRR	f <sub>RIPPLE</sub> = 120Hz, (V <sub>IN</sub> – V <sub>OUT</sub> ) = 2V, V <sub>RIPPLE</sub> = 1V <sub>P-P</sub>	--	72	–	dB
Adjust Pin Current		I <sub>ADJ</sub>		--	65	120	μA
Adjust Pin Current Change		ΔI <sub>ADJ</sub>	10mA ≤ I <sub>OUT</sub> ≤ 1.0A, V <sub>IN</sub> = 5V	--	0.2	5	μA