

1000mA Three Terminal Voltage Regulator

Features

- Quiescent Current: 2.3mA@10V(Typ.)
- Input Voltage: 7 to 40V, Limit Voltage: 50V
- Output Voltage: 5V, 9V, 12V, 15V
- Output Current: 1000mA
- Low Dropout Voltage: 2.1V(Typ.)@1000mA
- Output Voltage Tolerance: ±5%

Applications

- Appliances and White Goods
- TVs and Set-Top Boxes
- Electronic Point-of-Sale
- Motor Drives

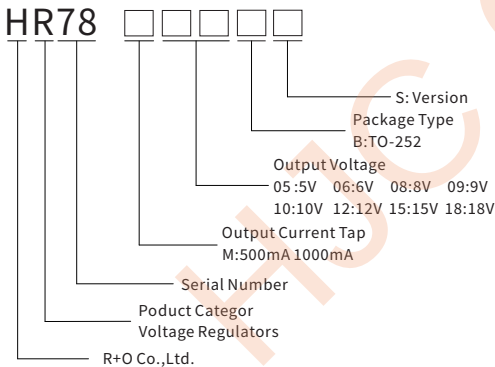
General Description

The HR78M Series is three-terminal positive regulators. These regulators can deliver up to 1000mA of output current. The internal limiting and thermal-shutdown features of the regulator make them essentially immune to overload. When used as are placement for a zener diode-resistor Combination, an effective improvement in output impedance can be obtained, together with lower quiescent current.

Reference News

TO-252 Marking:
HR78M05B: R+O+78M05+Date Code HR78M09B: R+O+78M09+Date Code
HR78M12B: R+O+78M12+Date Code HR78M15B: R+O+78M15+Date Code

Part Numbering

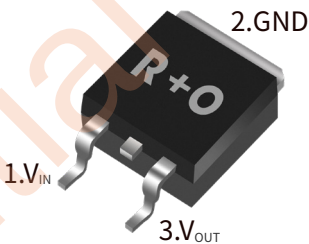


Ordering Information

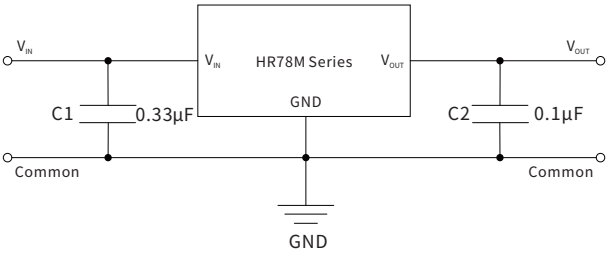
Package	Package Code	Unit Weight(g)	Reel(pcs)	Box(pcs)	Carton(pcs)	Delivery Mode	MSL
TO-252	R3	0.305	2500	2500	25000	13"	3

Output Current
1000mA
Input Voltage
40V

TO-252



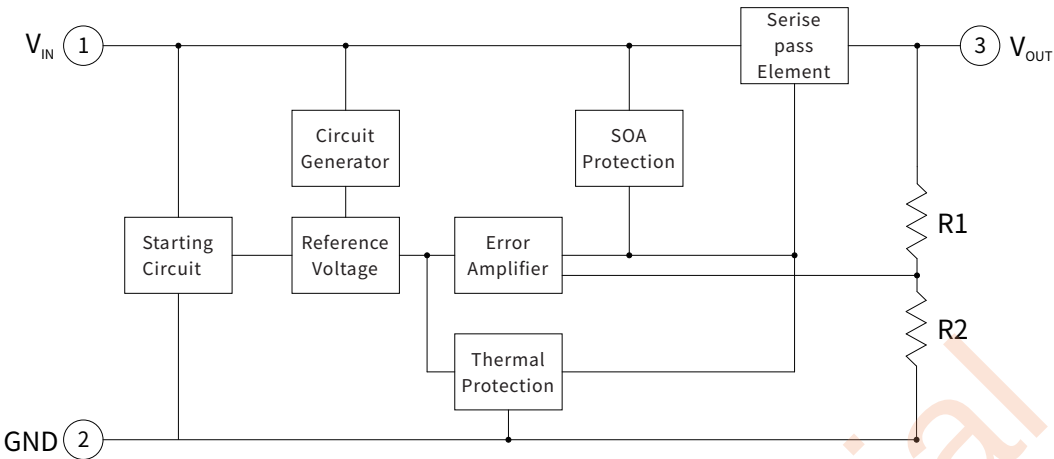
Typical Application Circuit



HR78M Series

Three-Terminal Positive Voltage Regulators

Block Diagram



Absolute Maximum Ratings (T_A = 25°C Unless otherwise specified)

PARAMETER	SYMBOL		Value	UNIT
Input Voltage Limit	V _{IN}		40	V
Operating Current	I _O		1000	mA
Power Dissipation	P _D	TO-252	1.25	mW
Thermal Resistance Junction-Ambient	R _{θJA}	TO-252	80	°C /W
Solder Temperature/Time	T _d		260/10	°C /S
Operating Ambient Temperature	T _A		-40 to +85	°C
Junction Temperature	T _J		-55 to +150	°C
Storage Temperature	T _{stg}		-55 to +150	°C

Note: Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device.

● **Electrical Characteristics**(HR78M05B, $T_A = 25^\circ\text{C}$ Unless otherwise specified)

PARAMETER	SYMBOL	Conditions	Min.	Typ.	Max.	UNIT
Output Voltage	V_{OUT}	$V_{IN} = 10\text{V}, I_O = 350\text{mA}$	4.85	5.0	5.15	V
		$7.5\text{V} < V_{IN} < 20\text{V}$ $5\text{mA} < I_O < 350\text{mA}$	4.75	5.0	5.25	
Line Regulation	$\Delta V_{OUT} / \Delta V_{IN} \cdot V_{OUT}$	$7\text{V} < V_{IN} < 25\text{V}, I_O = 200\text{mA}$	--	--	100	mV
		$8\text{V} < V_{IN} < 25\text{V}, I_O = 200\text{mA}$	--	--	50	
Load Regulation	ΔV_{OUT}	$5\text{mA} < I_O < 500\text{mA}$	--	--	100	mV
Quiescent Current	I_Q	$T_A = 25^\circ\text{C}$	--	2.3	5	mA
Quiescent Current Change	ΔI_Q	$8\text{V} < V_{IN} < 25\text{V}, I_O = 200\text{mA}$	--	--	0.8	mA
Quiescent Current Change	ΔI_Q	$5\text{mA} < I_O < 350\text{mA}$	--	--	0.5	mA
Output Noise Voltage	V_n	$f = 10\text{Hz to } 100\text{KHz}$	--	40	--	μV
Power-Supply Rejection Ratio	PSRR	$f = 100\text{Hz}, I_O = 300\text{mA}$	62	78	--	dB
Peak Output Current	I_{PK}	$T_A = 25^\circ\text{C}$	--	1.5	--	A
Output Voltage Temperature Coefficient	V_{TC}	$I_O = 10\text{mA}$	--	0.5	--	$\text{mV}/^\circ\text{C}$
Dropout Voltage	V_{Drop}	$I_O = 500\text{mA}$	--	1.75	2.0	V
		$I_O = 1\text{A}$	--	2.1	2.5	
Minimum Input Voltage	$V_{IN, MIN}$	$I_O = 500\text{mA}$	--	--	7.0	V
Maximum Input Voltage	$V_{IN, MAX}$	$I_O = 10\text{mA}$	--	35	--	V

● **Electrical Characteristics**(HR78M09B, $T_A = 25^\circ\text{C}$ Unless otherwise specified)

PARAMETER	SYMBOL	Conditions	Min.	Typ.	Max.	UNIT
Output Voltage	V_{OUT}	$V_{IN} = 14\text{V}, I_O = 350\text{mA}$	8.73	9.0	9.27	V
		$11.5\text{V} < V_{IN} < 25\text{V}$ $5\text{mA} < I_O < 350\text{mA}$	8.55	9.0	9.45	
Line Regulation	$\Delta V_{OUT} / \Delta V_{IN} \cdot V_{OUT}$	$11.5\text{V} < V_{IN} < 25\text{V}, I_O = 200\text{mA}$	--	--	100	mV
		$13\text{V} < V_{IN} < 25\text{V}, I_O = 200\text{mA}$	--	--	50	
Load Regulation	ΔV_{OUT}	$5\text{mA} < I_O < 500\text{mA}$	--	--	100	mV
Quiescent Current	I_Q	$T_A = 25^\circ\text{C}$	--	2.3	5	mA
Quiescent Current Change	ΔI_Q	$12\text{V} < V_{IN} < 25\text{V}, I_O = 200\text{mA}$	--	--	0.8	mA
Quiescent Current Change	ΔI_Q	$5\text{mA} < I_O < 350\text{mA}$	--	--	0.5	mA
Output Noise Voltage	V_n	$f = 10\text{Hz to } 100\text{KHz}$	--	40	--	μV
Power-Supply Rejection Ratio	PSRR	$f = 100\text{Hz}, I_O = 300\text{mA}$	62	78	--	dB
Peak Output Current	I_{PK}	$T_A = 25^\circ\text{C}$	--	1.5	--	A
Output Voltage Temperature Coefficient	V_{TC}	$I_O = 10\text{mA}$	--	0.5	--	$\text{mV}/^\circ\text{C}$
Dropout Voltage	V_{Drop}	$I_O = 500\text{mA}$	--	1.75	2.0	V
		$I_O = 1\text{A}$	--	2.1	2.5	
Minimum Input Voltage	$V_{IN, MIN}$	$I_O = 500\text{mA}$	--	--	11	V
Maximum Input Voltage	$V_{IN, MAX}$	$I_O = 10\text{mA}$	--	35	--	V

HR78M Series

Three-Terminal Positive Voltage Regulators

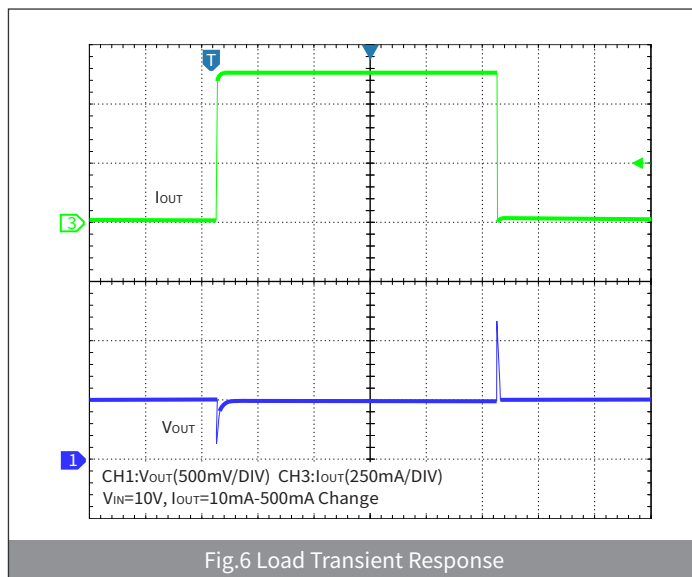
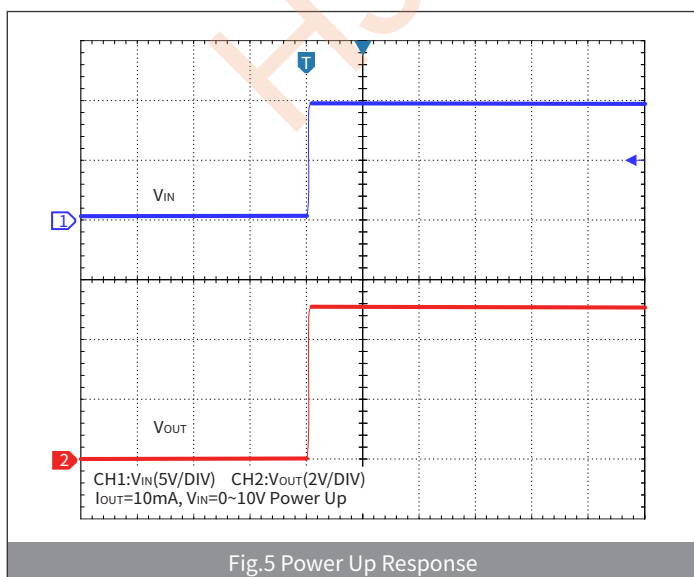
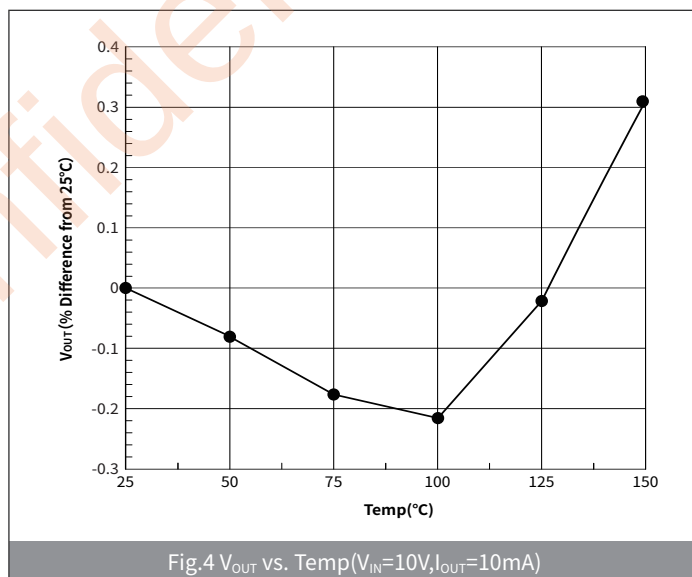
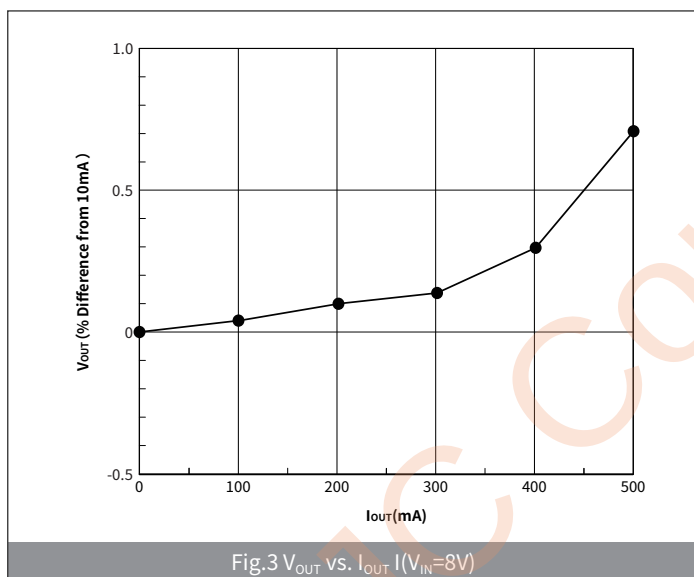
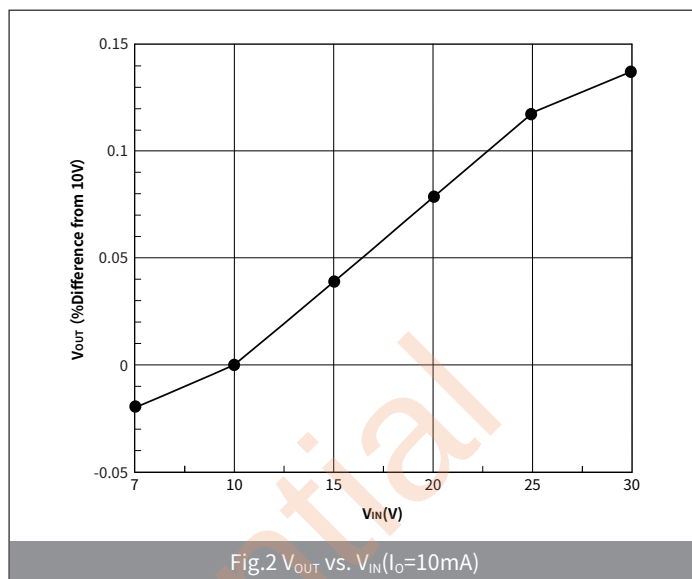
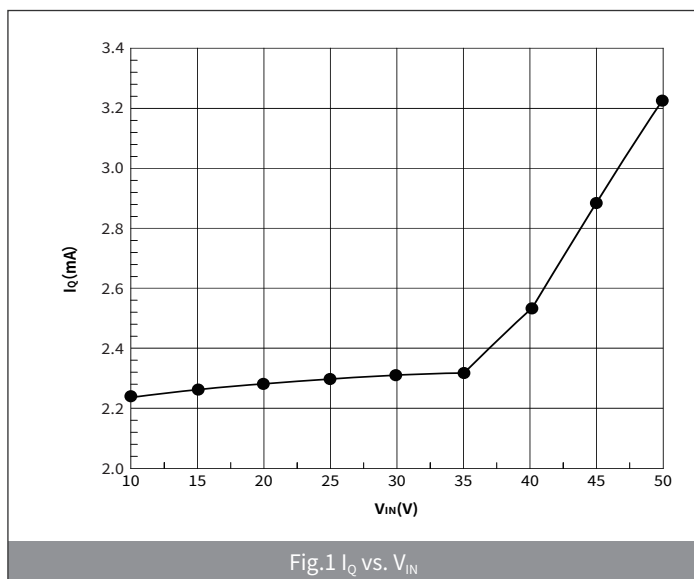
● Electrical Characteristics (HR78M12B, $T_A = 25^\circ\text{C}$ Unless otherwise specified)

PARAMETER	SYMBOL	Conditions	Min.	Typ.	Max.	UNIT
Output Voltage	V_{OUT}	$V_{IN} = 17\text{V}, I_O = 350\text{mA}$	11.64	12	12.36	V
		$14.5\text{V} < V_{IN} < 27\text{V}$ $5\text{mA} < I_O < 350\text{mA}$	11.4	12	12.6	
Line Regulation	$\Delta V_{OUT} / \Delta V_{IN} \cdot V_{OUT}$	$14.5\text{V} < V_{IN} < 32\text{V}, I_O = 200\text{mA}$	--	--	100	mV
		$16\text{V} < V_{IN} < 32\text{V}, I_O = 200\text{mA}$	--	--	50	
Load Regulation	ΔV_{OUT}	$5\text{mA} < I_O < 500\text{mA}$	--	--	240	mV
Quiescent Current	I_Q	$T_A = 25^\circ\text{C}$	--	2.3	5	mA
Quiescent Current Change	ΔI_Q	$14.5\text{V} < V_{IN} < 32\text{V}, I_O = 200\text{mA}$	--	--	0.8	mA
Quiescent Current Change	ΔI_Q	$5\text{mA} < I_O < 350\text{mA}$	--	--	0.5	mA
Output Noise Voltage	V_n	$f = 10\text{Hz to } 100\text{KHz}$	--	75	--	μV
Power-Supply Rejection Ratio	PSRR	$f = 100\text{Hz}, I_O = 300\text{mA}$	55	78	--	dB
Peak Output Current	I_{PK}	$T_A = 25^\circ\text{C}$	--	1.5	--	A
Output Voltage Temperature Coefficient	V_{TC}	$I_O = 10\text{mA}$	--	1.0	--	$\text{mV}/^\circ\text{C}$
Dropout Voltage	V_{Drop}	$I_O = 500\text{mA}$	--	1.75	2.0	V
		$I_O = 1\text{A}$	--	2.1	2.5	
Minimum Input Voltage	$V_{IN, MIN}$	$I_O = 500\text{mA}$	--	--	14.0	V
Maximum Input Voltage	$V_{IN, MAX}$	$I_O = 10\text{mA}$	--	41	--	V

● **Electrical Characteristics**(HR78M15B, $T_A = 25^\circ\text{C}$ Unless otherwise specified)

PARAMETER	SYMBOL	Conditions	Min.	Typ.	Max.	UNIT
Output Voltage	V_{OUT}	$V_{IN} = 20\text{V}, I_O = 350\text{mA}$	14.55	15	15.45	V
		$17.5\text{V} < V_{IN} < 32\text{V}$ $5\text{mA} < I_O < 350\text{mA}$	14.25	15	15.75	
Line Regulation	$\Delta V_{OUT} / \Delta V_{IN} \cdot V_{OUT}$	$17.5\text{V} < V_{IN} < 32\text{V}, I_O = 200\text{mA}$	--	--	100	mV
		$20\text{V} < V_{IN} < 32\text{V}, I_O = 200\text{mA}$	--	--	50	
Load Regulation	ΔV_{OUT}	$5\text{mA} < I_O < 500\text{mA}$	--	--	240	mV
Quiescent Current	I_Q	$T_A = 25^\circ\text{C}$	--	2.3	5	mA
Quiescent Current Change	ΔI_Q	$17.5\text{V} < V_{IN} < 32\text{V}, I_O = 200\text{mA}$	--	--	0.8	mA
Quiescent Current Change	ΔI_Q	$5\text{mA} < I_O < 350\text{mA}$	--	--	0.5	mA
Output Noise Voltage	V_n	$f = 10\text{Hz to } 100\text{KHz}$	--	75	--	μV
Power-Supply Rejection Ratio	PSRR	$f = 100\text{Hz}, I_O = 300\text{mA}$	55	78	--	dB
Peak Output Current	I_{PK}	$T_A = 25^\circ\text{C}$	--	1.5	--	A
Output Voltage Temperature Coefficient	V_{TC}	$I_O = 10\text{mA}$	--	1.0	--	$\text{mV}/^\circ\text{C}$
Dropout Voltage	V_{Drop}	$I_O = 500\text{mA}$	--	1.75	2.0	V
		$I_O = 1\text{A}$	--	2.1	2.5	
Minimum Input Voltage	$V_{IN, MIN}$	$I_O = 500\text{mA}$	--	--	17.0	V
Maximum Input Voltage	$V_{IN, MAX}$	$I_O = 10\text{mA}$	--	41	--	V

● **Ratings And Characteristics Curves** (HR78M05B, $C_{IN}=300nF$, $C_{OUT}=100nF$, $T_A = 25^{\circ}C$ Unless otherwise specified)



HR78M Series

Three-Terminal Positive Voltage Regulators

Package Outline Dimensions (TO-252)

Symbol	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	6.50	6.70	0.256	0.264
B	5.10	5.46	0.201	0.215
C	1.40	1.80	0.055	0.071
D	6.00	6.20	0.236	0.244
E	10.00	10.40	0.394	0.409
F	2.16	2.36	0.085	0.093
G	0.66	0.86	0.026	0.034
Φ	1.05	1.35	0.041	0.053
H	0.46	0.58	0.018	0.023
J	2.20	2.40	0.087	0.094
K	-	0.30	-	0.012
L	0.89	2.29	0.035	0.090
M	2.73	3.08	0.107	0.121
N	0.43	0.58	0.017	0.023

Suggested Pad Layout

Symbol	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
a	3.70	-	0.146	-
b	4.37	-	0.172	-
X	-	5.80	-	0.228
X1	-	1.20	-	0.047
Y	-	5.85	-	0.230
Y1	-	2.00	-	0.079