

4825898 INTEGRATED POWER

**INTEGRATED
POWER**
SEMICONDUCTORS, LTD.

82D 00330

0.5 Amp, 3-Terminal
Positive Regulators

1-58-1113

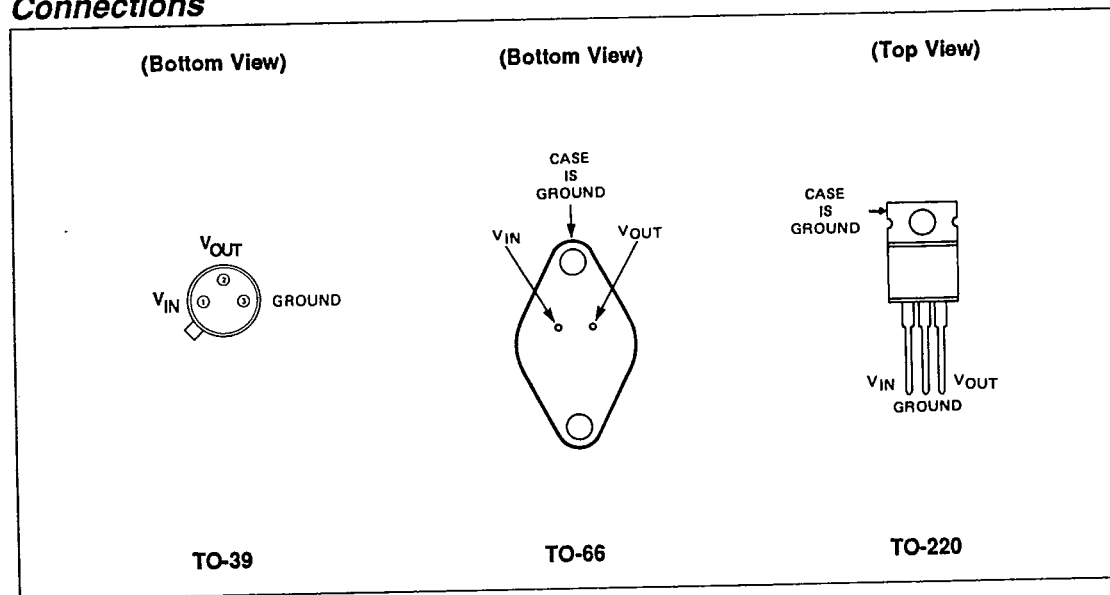
Description

The IP78M00/A/AC/C series of voltage regulators are fixed output regulators intended for local, on-card voltage regulation. These devices are available in 5, 12, and 15 volt options and are capable of delivering in excess of 500 mA over temperature. The A-suffix devices are fully specified at 0.5A, provide 0.01%/V line regulation, 0.3%/A load regulation, and $\pm 1\%$ output voltage tolerance at room temperature. Protection features include safe operating area, current limiting and thermal shutdown. The entire series of regulators is available in the TO-39 and TO-66 packages and the IP78M00AC/IP78M00C series is also available in the TO-220 plastic power package.

Features

- 1% output voltage tolerance
- 5, 12, and 15V fixed output voltages available
- 0.01%/V line regulation
- 0.3%/A load regulation
- Thermal overload protection
- Short-circuit current limit protection
- Safe operating area protection
- 100% thermal limit burn-in
- Start-up with negative voltage ($\pm$ supplies) on output

Connections


Section 5 - Voltage Regulators
IP78M00 Series, IP78M00A Series,
IP78M00C Series, IP78M00AC Series


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Absolute Maximum Ratings

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Input Voltage ($V_O = 5V, 12V, 15V$) 35V
 Internal Power Dissipation (Note 1) Internally Limited
 Operating Temperature Range (T_j)
 IP78M00A, IP78M00 -55°C to +150°C
 IP78M00AC, IP78M00C 0°C to +125°C

Maximum Junction Temperature
 TO-39 Package H 150°C
 TO-66 Package R 150°C
 TO-220 Package T 125°C
 Storage Temperature Range -65°C to +150°C
 Lead Temperature (Soldering, 10 sec.) 300°C

Absolute maximum ratings are those values beyond which the safety of the device cannot be guaranteed. They are not meant to imply that the device should be operated at these limits. The electrical characteristics provide conditions for actual device operation.

Electrical Characteristics (Note 2)

Parameter	Test Conditions	IP78M05A IP78M05AC			IP78M05 IP78M05C			Units
		Min	Typ	Max	Min	Typ	Max	
Output Voltage, V_O	$I_O = 100mA, V_{IN} = 10V$	4.95	5	5.05	4.80	5	5.20	V
	$P_D \leq P_{MAX}, 5mA \leq I_O \leq 350mA$	• 4.85		5.15	4.75		5.25	V
	$7.5V \leq V_{IN} \leq 20V$							
Line Regulation, ΔV_O	$I_O = 200mA$ $7V \leq V_{IN} \leq 25V$		3	10			50	mV
	$7.5V \leq V_{IN} \leq 20V$	•	3	10			25	mV
	$I_O = 500mA$ $8V \leq V_{IN} \leq 12V$		3	10			50	mV
	$5mA \leq I_O \leq 500mA, V_{IN} = 10V$	•	5	50			50	mV
Load Regulation, ΔV_O	$5mA \leq I_O \leq 500mA, V_{IN} = 10V$	•	5	50			50	mV
Quiescent Current, I_Q	$V_{IN} = 10V, I_O = 350mA$	•	4	6		4	6	mA
Quiescent Current Change, ΔI_Q	$5mA \leq I_O \leq 500mA, V_{IN} = 10V$	•	0.1	0.5			0.5	mA
	$8V \leq V_{IN} \leq 25V, I_O = 200mA$	•	0.2	0.8			0.8	mA
Output Noise Voltage, V_n	$10Hz \leq f \leq 100kHz$		40	200		40	200	μV
Ripple Rejection, $\Delta V_{IN}/\Delta V_{OUT}$	$f = 120Hz, I_O = 300mA$	65	80		62			dB
	$8V \leq V_{IN} \leq 18V, I_O = 100mA$	• 65	80		62			dB
Dropout Voltage	$I_O = 350mA$		2	2.5			2.5	V
Short Circuit Current, I_{SC}	$V_{IN} = 35V$		300	600		300	600	mA
Peak Output Current, I_{PK}	$V_{IN} = 10V$	0.7	1.0	1.4	0.7	1.0	1.6	A
Average Temperature Coefficient of Output Voltage	$I_O = 5mA$		0.5	2.0		0.5		mV/°C

The • denotes the specifications which apply over the full operating temperature range, all others apply at $T_j = 25^\circ C$ unless otherwise specified.

Note 1. Thermal resistance of the TO-39 package (H) is typically 20°C/W junction to case and 120°C/W case to ambient. Thermal resistance of the TO-66 package (R) is typically 4°C/W junction to case and 35°C/W case to ambient. Thermal resistance of the TO-220 package (T) is typically 4°C/W junction to case and 50°C/W case to ambient.

Note 2. All characteristics are measured with a capacitor across the input of 0.22 μF and a capacitor across the output of 0.1 μF . All characteristics except noise voltage and ripple rejection ratio are measured using pulse techniques ($t_{PW} \leq 10ms$, duty cycle $\leq 5\%$). Output voltage changes due to changes in internal temperature must be taken into account separately.

Section 5 - Voltage Regulators
 IP78M00 Series, IP78M00A Series,
 IP78M00C Series, IP78M00AC Series

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Electrical Characteristics (Cont.)

Parameter	Test Conditions	IP78M12A IP78M12AC			IP78M12 IP78M12C			Units
		Min	Typ	Max	Min	Typ	Max	
Output Voltage, V_O	$I_O = 100\text{mA}$, $V_{IN} = 19\text{V}$	11.88	12	12.12	11.50	12	12.50	V
	$P_D \leq P_{MAX}$, $5\text{mA} \leq I_O \leq 350\text{mA}$ $14.8\text{V} \leq V_{IN} \leq 27\text{V}$	11.64		12.36	11.40		12.60	V
Line Regulation, ΔV_O	$I_O = 200\text{mA}$, $14.5\text{V} \leq V_{IN} \leq 30\text{V}$		4	18			60	mV
	$14.8\text{V} \leq V_{IN} \leq 27\text{V}$		4	18			30	mV
	$I_O = 500\text{mA}$, $16\text{V} \leq V_{IN} \leq 22\text{V}$		4	18			120	mV
							120	mV
Load Regulation, ΔV_O	$5\text{mA} \leq I_O \leq 500\text{mA}$, $V_{IN} = 19\text{V}$		10	60				mV
Quiescent Current, I_Q	$V_{IN} = 19\text{V}$, $I_O = 350\text{mA}$		4	6		4	6	mA
Quiescent Current Change, ΔI_Q	$5\text{mA} \leq I_O \leq 500\text{mA}$, $V_{IN} = 19\text{V}$		0.1	0.5			0.5	mA
	$14.8\text{V} \leq V_{IN} \leq 30\text{V}$, $I_O = 200\text{mA}$		0.2	0.8			0.8	mA
Output Noise Voltage, V_n	$10\text{Hz} \leq f \leq 100\text{kHz}$		75	480		75	480	μV
Ripple Rejection, $\Delta V_{IN}/\Delta V_{OUT}$	$f = 120\text{Hz}$, $I_O = 300\text{mA}$	58	72		55			dB
	$15\text{V} \leq V_{IN} \leq 25\text{V}$, $I_O = 100\text{mA}$	58	72		55			dB
Dropout Voltage	$I_O = 350\text{mA}$		2	2.5			2.5	V
Short Circuit Current, I_{SC}	$V_{IN} = 35\text{V}$		300	600		300	600	mA
Peak Output Current, I_{PK}	$V_{IN} = 19\text{V}$	0.7	1.0	1.4	0.7	1.0	1.6	A
Average Temperature Coefficient of Output Voltage	$I_O = 5\text{mA}$		1.2	4.8		1.2		$\text{mV}/^\circ\text{C}$

Parameter	Test Conditions	IP78M15A IP78M15AC			IP78M15 IP78M15C			Units
		Min	Typ	Max	Min	Typ	Max	
Output Voltage, V_O	$I_O = 100\text{mA}$, $V_{IN} = 23\text{V}$	14.85	15	15.15	14.40	15	15.60	V
	$P_D \leq P_{MAX}$, $5\text{mA} \leq I_O \leq 350\text{mA}$ $18\text{V} \leq V_{IN} \leq 30\text{V}$	14.55		15.45	14.25		15.75	V
Line Regulation, ΔV_O	$I_O = 200\text{mA}$, $17.5\text{V} \leq V_{IN} \leq 30\text{V}$		4	22			60	mV
	$18\text{V} \leq V_{IN} \leq 30\text{V}$		4	22			30	mV
	$I_O = 500\text{mA}$, $20\text{V} \leq V_{IN} \leq 26\text{V}$		4	22			150	mV
							150	mV
Load Regulation, ΔV_O	$5\text{mA} \leq I_O \leq 500\text{mA}$, $V_{IN} = 23\text{V}$		12	75				mV
Quiescent Current, I_Q	$V_{IN} = 23\text{V}$, $I_O = 350\text{mA}$		4	6		4	6	mA
Quiescent Current Change, ΔI_Q	$5\text{mA} \leq I_O \leq 500\text{mA}$, $V_{IN} = 23\text{V}$		0.1	0.5			0.5	mA
	$18\text{V} \leq V_{IN} \leq 30\text{V}$, $I_O = 200\text{mA}$		0.2	0.8			0.8	mA
Output Noise Voltage, V_n	$10\text{Hz} \leq f \leq 100\text{kHz}$		90	600		90	600	μV
Ripple Rejection, $\Delta V_{IN}/\Delta V_{OUT}$	$f = 120\text{Hz}$, $I_O = 300\text{mA}$	57	70		54			dB
	$18.5\text{V} \leq V_{IN} \leq 28.5\text{V}$, $I_O = 100\text{mA}$	57	70		54			dB
Dropout Voltage	$I_O = 350\text{mA}$		2	2.5			2.5	V
Short Circuit Current, I_{SC}	$V_{IN} = 35\text{V}$		300	600		300	600	mA
Peak Output Current, I_{PK}	$V_{IN} = 23\text{V}$	0.7	1.0	1.4	0.7	1.0	1.6	A
Average Temperature Coefficient of Output Voltage	$I_O = 5\text{mA}$		1.5	6.0		1.5		$\text{mV}/^\circ\text{C}$

Section 5 - Voltage Regulators
 IP78M00 Series, IP78M00A Series,
 IP78M00C Series, IP78M00AC Series



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Order Information

Part Number	Temperature Range	Package
IP78M05AH	-55°C to +150°C	TO-39
IP78M05H	-55°C to +150°C	TO-39
IP78M05ACH	0°C to +125°C	TO-39
IP78M05CH	0°C to +125°C	TO-39
IP78M12AH	-55°C to +150°C	TO-39
IP78M12H	-55°C to +150°C	TO-39
IP78M12ACH	0°C to +125°C	TO-39
IP78M12CH	0°C to +125°C	TO-39
IP78M15AH	-55°C to +150°C	TO-39
P78M15H	-55°C to +150°C	TO-39
IP78M15ACH	0°C to +125°C	TO-39
IP78M15CH	0°C to +125°C	TO-39
IP78M05AR	-55°C to +150°C	TO-66
IP78M05R	-55°C to +150°C	TO-66
IP78M05ACR	0°C to +125°C	TO-66
IP78M05CR	0°C to +125°C	TO-66
IP78M12AR	-55°C to +150°C	TO-66
IP78M12R	-55°C to +150°C	TO-66
IP78M12ACR	0°C to +125°C	TO-66
IP78M12CR	0°C to +125°C	TO-66
IP78M15AR	-55°C to +150°C	TO-66
P78M15R	-55°C to +150°C	TO-66
IP78M15ACR	0°C to +125°C	TO-66
IP78M15CR	0°C to +125°C	TO-66
IP78M05ACT	0°C to +125°C	TO-220
IP78M05CT	0°C to +125°C	TO-220
IP78M12ACT	0°C to +125°C	TO-220
IP78M12CT	0°C to +125°C	TO-220
IP78M15ACT	0°C to +125°C	TO-220
IP78M15CT	0°C to +125°C	TO-220

Section 5 - Voltage Regulators
 IP78M00 Series, IP78M00A Series,
 IP78M00C Series, IP78M00AC Series

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Integrated Power Semiconductors, Ltd.

2727 Walsh Avenue, Suite 201, Santa Clara, CA 95051 • Telephone: 408-727-2772 • Telex: 350073 (IPS SNTA) • FAX: 408-988-6185
 8 Quaker Drive, West Warwick, RI 02893 • Telephone: 401-821-4260 • Telex: 332948 (IPS RI) • FAX: 401-823-7260
 2081 Business Center Drive, Suite 140, Irvine, CA 92715 • Telephone: 714-752-0188 • FAX: 714-752-5019
 789 Turnpike Street, North Andover, MA 01845 • Telephone: 617-683-9042 • FAX: 617-975-0193