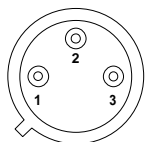
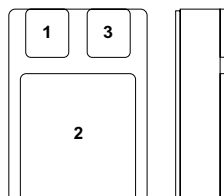


0.5 AMP POSITIVE VOLTAGE REGULATOR



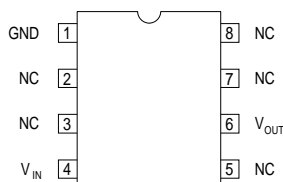
Pin 1 – V_{IN}
Pin 2 – V_{OUT}
Case – Ground

H Package – TO–39



Pin 1 – V_{IN}
Pin 2 – Ground
Pin 3 – V_{OUT}

**SMD 1
CERAMIC SURFACE MOUNT**



8 Pin J Package

Order Information

Part Number	H-Pack (TO–39)	J-Pack Cerdip	SG-Pack SMD	Temp. Range
IP78MxxAzz	✓	✓	✓	-55 to +150°C
IP78Mxxzz	✓	✓	✓	"
IP140MAzz–xx	✓		✓	"
IP140Mzz–xx	✓		✓	"

Note:

xx = Voltage Code (05, 12, 15)
zz = Package Code (H, J, SG)
eg. IP78M05J IP140MAH–12

FEATURES

- **OUTPUT CURRENT UP TO 0.5A**
- **OUTPUT VOLTAGES OF 5, 12, 15V**
- **0.01% / V LINE REGULATION**
- **0.3% / A LOAD REGULATION**
- **THERMAL OVERLOAD PROTECTION**
- **SHORT CIRCUIT PROTECTION**
- **OUTPUT TRANSISTOR SOA PROTECTION**
- **1% VOLTAGE TOLERANCE (–A VERSIONS)**

DESCRIPTION

The IP140MA and IP78M00A 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 500mA 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.

ABSOLUTE MAXIMUM RATINGS ($T_C = 25^\circ\text{C}$ unless otherwise stated)

V_I	DC Input Voltage (for $V_O = 5, 12, 15\text{V}$)	35V
P_D	Power Dissipation	Internally limited ¹
$R_{\theta JC}$	Thermal Resistance Junction to Case – H Package	20°C / W
$R_{\theta JC}$	Thermal Resistance Junction to Case – SG Package	TBA °C / W
$R_{\theta JA}$	Thermal Resistance Junction to Ambient – J Package	119°C / W
T_J	Operating Junction Temperature Range	–55 to 150°C
T_{stg}	Storage Temperature	–65 to 150°C

Note 1. Although power dissipation is internally limited, these specifications are applicable for maximum power dissipation P_{MAX} of 2W for the H–Package, 1.05W for the J–Package and 15W for the SG–Package.

ELECTRICAL CHARACTERISTICS

Parameter	Test Conditions		IP78M05A IP140MA-05			IP78M05 IP140M-05			Units
			Min.	Typ.	Max.	Min.	Typ.	Max.	
V_O Output Voltage	$I_O = 100\text{mA}$ $V_{IN} = 10\text{V}$		4.95	5	5.05	4.8	5	5.2	V
	$I_O = 5\text{mA to } 350\text{mA}$ $P_D \leq P_{MAX}$ $V_{IN} = 7.5\text{V to } 20\text{V}$ $T_J = -55 \text{ to } 150^\circ\text{C}$		4.85		5.15	4.75		5.25	
ΔV_O Line Regulation	$I_O = 200\text{mA}$	$V_{IN} = 7\text{V to } 25\text{V}$		3	10			50	mV
		$V_{IN} = 8\text{V to } 25\text{V}$ $T_J = -55 \text{ to } 150^\circ\text{C}$		3	10			25	
	$I_O = 500\text{mA}$ $V_{IN} = 8\text{V to } 12\text{V}$			3	10			50	
ΔV_O Load Regulation	$I_O = 5\text{mA to } 500\text{mA}$ $V_{IN} = 10\text{V}$ $T_J = -55 \text{ to } 150^\circ\text{C}$			5	50			50	mV
I_Q Quiescent Current	$V_{IN} = 10\text{V}$	$I_O = 350\text{mA}$ $T_J = -55 \text{ to } 150^\circ\text{C}$		4	6		4	6	mA
ΔI_Q Quiescent Current Change	$I_O = 5\text{mA to } 500\text{mA}$ $V_{IN} = 10\text{V}$ $T_J = -55 \text{ to } 150^\circ\text{C}$			0.1	0.5			0.5	mA
	$I_O = 200\text{mA}$ $V_{IN} = 8\text{V to } 25\text{V}$ $T_J = -55 \text{ to } 150^\circ\text{C}$			0.2	0.8			0.8	
V_N Output Noise Voltage	$f = 10\text{Hz to } 100\text{kHz}$			40	200		40	200	μV
$\frac{\Delta V_{IN}}{\Delta V_O}$ Ripple Rejection	$f = 120\text{Hz}$ $V_{IN} = 8\text{V to } 18\text{V}$	$I_O = 300\text{mA}$	65	80		62			dB
		$I_O = 100\text{mA}$ $T_J = -55 \text{ to } 150^\circ\text{C}$	65	80		62			
Dropout Voltage	$I_O = 350\text{mA}$			2	2.5			2.5	V
I_{SC} Short Circuit Current	$V_{IN} = 35\text{V}$			300	600		300	600	mA
I_{pk} Peak Output Current	$V_{IN} = 10\text{V}$		0.7	1.0	1.4	0.7	1.0	1.6	A
Average Temperature Coefficient of V_O	$I_O = 5\text{mA}$			0.5	2.0		0.5		$\text{mV}/^\circ\text{C}$

- 1) All characteristics are measured with a capacitor across the input of $0.22\mu\text{F}$ and a capacitor across the output of $0.1\mu\text{F}$.
 All characteristics except noise voltage and ripple rejection ratio are measured using pulse techniques ($t_p \leq 10\text{ms}$, $\delta \leq 5\%$). Output voltage changes due to changes in internal temperature must be taken into account separately.
- 2) Test Conditions unless otherwise stated: $T_J = 25^\circ\text{C}$
 $P_{MAX} = 2\text{W}$ for H Package (TO-39)
 $P_{MAX} = 1.05\text{W}$ for J Package (CERDIP)
 $P_{MAX} = 15\text{W}$ for SG Package (SMD1)

ELECTRICAL CHARACTERISTICS

Parameter	Test Conditions	IP78M12A IP140MA-12			IP78M12 IP140M-12			Units
		Min.	Typ.	Max.	Min.	Typ.	Max.	
V_O Output Voltage	$I_O = 100\text{mA}$ $V_{IN} = 19\text{V}$	11.88	12	12.12	11.50	12	12.50	V
	$I_O = 5\text{mA to } 350\text{mA}$							
	$P_D \leq P_{MAX}$ $V_{IN} = 14.8\text{V to } 27\text{V}$ $T_J = -55 \text{ to } 150^\circ\text{C}$	11.64		12.36	11.40		12.60	
ΔV_O Line Regulation	$I_O = 200\text{mA}$ $V_{IN} = 14.5\text{V to } 30\text{V}$		4	18			60	mV
	$V_{IN} = 16\text{V to } 30\text{V}$ $T_J = -55 \text{ to } 150^\circ\text{C}$		4	18			30	
	$I_O = 500\text{mA}$ $V_{IN} = 16\text{V to } 22\text{V}$		4	18			120	
ΔV_O Load Regulation	$I_O = 5\text{mA to } 500\text{mA}$ $V_{IN} = 19\text{V}$ $T_J = -55 \text{ to } 150^\circ\text{C}$		10	60			120	mV
I_Q Quiescent Current	$V_{IN} = 19\text{V}$ $I_O = 350\text{mA}$ $T_J = -55 \text{ to } 150^\circ\text{C}$		4	6		4	6	mA
ΔI_Q Quiescent Current Change	$I_O = 5\text{mA to } 500\text{mA}$ $V_{IN} = 19\text{V}$ $T_J = -55 \text{ to } 150^\circ\text{C}$		0.1	0.5			0.5	mA
	$I_O = 200\text{mA}$ $V_{IN} = 14.8\text{V to } 30\text{V}$ $T_J = -55 \text{ to } 150^\circ\text{C}$		0.2	0.8			0.8	
V_N Output Noise Voltage	$f = 10\text{Hz to } 100\text{kHz}$		75	480		75	480	μV
$\frac{\Delta V_{IN}}{\Delta V_O}$ Ripple Rejection	$f = 120\text{Hz}$ $I_O = 300\text{mA}$	58	72		55			dB
	$V_{IN} = 15\text{V to } 25\text{V}$ $I_O = 100\text{mA}$ $T_J = -55 \text{ to } 150^\circ\text{C}$	58	72		55			
Dropout Voltage	$I_O = 350\text{mA}$		2	2.5			2.5	V
I_{SC} Short Circuit Current	$V_{IN} = 35\text{V}$		300	600		300	600	mA
I_{pk} Peak Output Current	$V_{IN} = 19\text{V}$	0.7	1.0	1.4	0.7	1.0	1.6	A
Average Temperature Coefficient of V_O	$I_O = 5\text{mA}$		1.2	4.8		1.2		$\text{mV}/^\circ\text{C}$

1) All characteristics are measured with a capacitor across the input of $0.22\mu\text{F}$ and a capacitor across the output of $0.1\mu\text{F}$.
 All characteristics except noise voltage and ripple rejection ratio are measured using pulse techniques ($t_p \leq 10\text{ms}$, $\delta \leq 5\%$). Output voltage changes due to changes in internal temperature must be taken into account separately.

2) Test Conditions unless otherwise stated: $T_J = 25^\circ\text{C}$
 $P_{MAX} = 2\text{W}$ for H Package (TO-39)
 $P_{MAX} = 1.05\text{W}$ for J Package (CERDIP)
 $P_{MAX} = 15\text{W}$ for SG Package (SMD1)

ELECTRICAL CHARACTERISTICS

Parameter	Test Conditions		IP78M15A IP140MA-15			IP78M15 IP140M-15			Units
			Min.	Typ.	Max.	Min.	Typ.	Max.	
V _O Output Voltage	I _O = 100mA V _{IN} = 23V		14.85	15	15.15	14.40	15	15.60	V
	I _O = 5mA to 350mA P _D ≤ P _{MAX} V _{IN} = 18V to 30V T _J = -55 to 150°C		14.55 15.45			14.25 15.75			
ΔV _O Line Regulation	I _O = 200mA	V _{IN} = 17.5V to 30V	4 22			60			mV
		V _{IN} = 20V to 30V T _J = -55 to 150°C	4 22			30			
	I _O = 500mA V _{IN} = 20V to 26V		4 22			150			
ΔV _O Load Regulation	I _O = 5mA to 500mA V _{IN} = 23V T _J = -55 to 150°C		12 75			150			mV
I _Q Quiescent Current	V _{IN} = 23V I _O = 350mA T _J = -55 to 150°C		4 6			4 6			mA
ΔI _Q Quiescent Current Change	I _O = 5mA to 500mA V _{IN} = 23V T _J = -55 to 150°C		0.1 0.5			0.5			mA
	I _O = 200mA V _{IN} = 18V to 30V T _J = -55 to 150°C		0.2 0.8			0.8			
V _N Output Noise Voltage	f = 10Hz to 100kHz		90 600			90 600			μV
$\frac{\Delta V_{IN}}{\Delta V_O}$ Ripple Rejection	f = 120Hz	I _O = 300mA	57	70		54			dB
	V _{IN} = 18.5V to 28.5V	I _O = 100mA T _J = -55 to 150°C	57	70		54			
Dropout Voltage		I _O = 350mA	2 2.5			2.5			V
I _{sc} Short Circuit Current	V _{IN} = 35V		300 600			300 600			mA
I _{pk} Peak Output Current	V _{IN} = 23V		0.7	1.0	1.4	0.7	1.0	1.6	A
Average Temperature Coefficient of V _O		I _O = 5mA	1.5 6.0			1.5			mV/°C

- 1) All characteristics are measured with a capacitor across the input of $0.22\mu\text{F}$ and a capacitor across the output of $0.1\mu\text{F}$.
 All characteristics except noise voltage and ripple rejection ratio are measured using pulse techniques ($t_p \leq 10\text{ms}$, $\delta \leq 5\%$). Output voltage changes due to changes in internal temperature must be taken into account separately.
- 2) Test Conditions unless otherwise stated: $T_J = 25^\circ\text{C}$
 $P_{MAX} = 2\text{W}$ for H Package (TO-39)
 $P_{MAX} = 1.05\text{W}$ for J Package (CERDIP)
 $P_{MAX} = 15\text{W}$ for SG Package (SMD1)