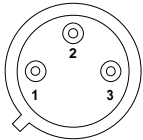
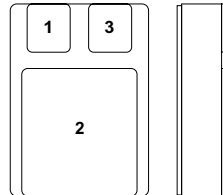


## 0.5 AMP POSITIVE VOLTAGE REGULATOR



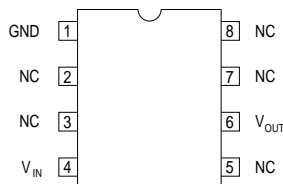
Pin 1 –  $V_{IN}$   
 Pin 2 –  $V_{OUT}$   
 Case – Ground

**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 <sup>1</sup>
$R_{\theta JC}$	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		
$\Delta V_O$ 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			
$\Delta V_O$ 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
$\Delta I_Q$ 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	$\mu\text{V}$
$\frac{\Delta V_{IN}}{\Delta V_O}$ 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	
$\Delta V_O$ 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	
$\Delta V_O$ 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
$\Delta I_Q$ 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	$\mu\text{V}$
$\frac{\Delta V_{IN}}{\Delta V_O}$ Ripple Rejection	$f = 120\text{Hz}$ $V_{IN} = 15\text{V to } 25\text{V}$	$I_O = 300\text{mA}$	58	72	55			dB
		$I_O = 100\text{mA}$ $T_J = -55 \text{ to } 150^\circ\text{C}$	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	$I_O = 100\text{mA}$ $V_{IN} = 23\text{V}$	14.85	15	15.15	14.40	15	15.60	V
	$I_O = 5\text{mA to } 350\text{mA}$ $P_D \leq P_{MAX}$ $V_{IN} = 18\text{V to } 30\text{V}$ $T_J = -55\text{ to } 150^\circ\text{C}$	14.55		15.45	14.25		15.75	
$\Delta V_O$ Line Regulation	$I_O = 200\text{mA}$ $V_{IN} = 17.5\text{V to } 30\text{V}$ $V_{IN} = 20\text{V to } 30\text{V}$ $T_J = -55\text{ to } 150^\circ\text{C}$	4		22			60	mV
		4		22			30	
	$I_O = 500\text{mA}$ $V_{IN} = 20\text{V to } 26\text{V}$	4		22			150	
$\Delta V_O$ Load Regulation	$I_O = 5\text{mA to } 500\text{mA}$ $V_{IN} = 23\text{V}$ $T_J = -55\text{ to } 150^\circ\text{C}$		12	75			150	mV
$I_Q$ Quiescent Current	$V_{IN} = 23\text{V}$ $I_O = 350\text{mA}$ $T_J = -55\text{ to } 150^\circ\text{C}$		4	6		4	6	mA
$\Delta I_Q$ Quiescent Current Change	$I_O = 5\text{mA to } 500\text{mA}$ $V_{IN} = 23\text{V}$ $T_J = -55\text{ to } 150^\circ\text{C}$		0.1	0.5			0.5	mA
	$I_O = 200\text{mA}$ $V_{IN} = 18\text{V to } 30\text{V}$ $T_J = -55\text{ to } 150^\circ\text{C}$		0.2	0.8			0.8	
$V_N$ Output Noise Voltage	$f = 10\text{Hz to } 100\text{kHz}$		90	600		90	600	$\mu\text{V}$
$\frac{\Delta V_{IN}}{\Delta V_O}$ Ripple Rejection	$f = 120\text{Hz}$ $V_{IN} = 18.5\text{V to } 28.5\text{V}$	$I_O = 300\text{mA}$	57	70	54			dB
		$I_O = 100\text{mA}$ $T_J = -55\text{ to } 150^\circ\text{C}$	57	70	54			
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	$V_{IN} = 23\text{V}$	0.7	1.0	1.4	0.7	1.0	1.6	A
Average Temperature Coefficient of $V_O$	$I_O = 5\text{mA}$		1.5	6.0		1.5		$\text{mV}/^\circ\text{C}$

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)