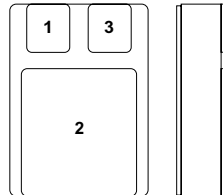


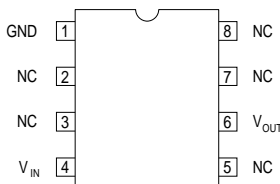
Pin 1 – V_{IN}
 Pin 2 – V_{OUT}
 Case – Ground

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

**0.5 AMP
 POSITIVE
 VOLTAGE REGULATOR**

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 ±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	$f = 120\text{Hz}$ $V_{IN} = 15\text{V to } 25\text{V}$	$I_O = 300\text{mA}$	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 = 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 V _{IN} = 20V to 30V T _J = -55 to 150°C	4		22			60	mV
		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 0.22μF and a capacitor across the output of 0.1μF.

All characteristics except noise voltage and ripple rejection ratio are measured using pulse techniques (t_p ≤ 10ms, δ ≤ 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°C

P_{MAX} = 2W for H Package (TO-39)

P_{MAX} = 1.05W for J Package (CERDIP)

P_{MAX} = 15W for SG Package (SMD1)