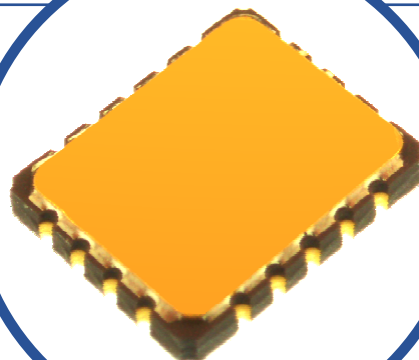


POSITIVE FIXED VOLTAGE REGULATOR

IP140ME SERIES IP140MAE SERIES IP78M00LCC4 SERIES IP78M00ALCC4 SERIES



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
- Start-up with negative voltage ($\pm$ supplies) on output.
- Hermetic Surface Mount Package
- Screening Options Available

DESCRIPTION

The IP140M/MA and IP78M00/A series of voltage regulators are fixed output voltage 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 protection.

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

V_{IN}	DC Input Voltage	35V
I_O	Output Current	Internally Limited
P_D	Power Dissipation	Internally Limited
T_J	Operating Junction Temperature Range	-55 to $+150^\circ\text{C}$
T_{stg}	Storage Temperature Range	-65 to $+150^\circ\text{C}$

THERMAL PROPERTIES

Symbols	Parameters	Max.	Units
$R_{\theta JA}$	Thermal Resistance, Junction To Ambient	120	$^\circ\text{C/W}$
$R_{\theta JC}$	Thermal Resistance, Junction To Case	20	$^\circ\text{C/W}$

Semelab Limited reserves the right to change test conditions, parameter limits and package dimensions without notice. Information furnished by Semelab is believed to be both accurate and reliable at the time of going to press. However Semelab assumes no responsibility for any errors or omissions discovered in its use. Semelab encourages customers to verify that datasheets are current before placing orders.

POSITIVE FIXED VOLTAGE REGULATOR IP140ME/MAE, IP78M00/ALCC4 SERIES

ELECTRICAL CHARACTERISTICS⁽¹⁾ ($T_C = 25^\circ\text{C}$ unless otherwise stated)

IP78M05LCC4, IP140ME-05						
Symbols	Parameters	Test Conditions	Min.	Typ	Max.	Units
V_O	Output Voltage	$I_{OUT} = 100\text{mA}$ $V_{IN} = 10\text{V}$	4.8	5	5.2	V
		$P \leq P_{MAX}$, $5\text{mA} \leq I_O \leq 350\text{mA}$, $V_{IN} = 7.5\text{V to } 20\text{V}$	• 4.75		5.25	
ΔV_O	Line Regulation ⁽²⁾	$I_O = 200\text{mA}$	$7\text{V} \leq V_{IN} \leq 25\text{V}$			50
			$8\text{V} \leq V_{IN} \leq 25\text{V}$	•		25
		$I_O = 500\text{mA}$	$8\text{V} \leq V_{IN} \leq 12\text{V}$			50
ΔV_O	Load Regulation ⁽²⁾	$V_{IN} = 10\text{V}$ $5\text{mA} \leq I_O \leq 500\text{mA}$	•		50	
I_Q	Quiescent Current	$V_{IN} = 10\text{V}$ $I_O = 350\text{mA}$	•	4	6	mA
ΔI_Q	Quiescent Current Change	$V_{IN} = 10\text{V}$ $5\text{mA} \leq I_O \leq 500\text{mA}$	•		0.5	
		$8\text{V} \leq V_{IN} \leq 25\text{V}$ $I_O = 200\text{mA}$	•		0.8	
V_N	Output Noise Voltage ⁽³⁾	$V_{IN} = 10\text{V}$ $10\text{Hz} \leq f \leq 100\text{KHz}$		40	200	μV
$\frac{\Delta V_{IN}}{\Delta V_O}$	Ripple Rejection	$f = 120\text{Hz}$ $I_O = 300\text{mA}$		62		dB
		$8\text{V} \leq V_{IN} \leq 18\text{V}$ $I_O = 100\text{mA}$	•	62		
V_D	Drop Out Voltage	$I_O = 350\text{mA}$			2.5	V
I_{SC}	Short-Circuit Current	$V_{IN} = 35\text{V}$		300	600	mA
I_{PK}	Short-Circuit Current	$V_{IN} = 10\text{V}$	0.7	1.0	1.6	A
	Average TC of V_O ⁽³⁾	$I_O = 5\text{mA}$		0.5		$\text{mV}/^\circ\text{C}$

Notes

The • denotes the specifications which apply over the full operating temperature range.

- (1) All characteristics are measured with a capacitor across the input of $0.22\mu\text{F}$ and a capacitor across the output of $0.1\mu\text{F}$. Although power dissipation is internally limited, these specifications are applicable to maximum power dissipation $P_{MAX} = 2\text{W}$, $I_{MAX} = 0.5\text{A}$, $T_J = 25^\circ\text{C}$
- (2) Regulation is measured at constant junction temperature, using pulse testing at a low duty cycle. Changes in output voltage due to heating effects must be taken into account separately.
- (3) By design, not a production test.

POSITIVE FIXED VOLTAGE REGULATOR IP140ME/MAE, IP78M00/ALCC4 SERIES

ELECTRICAL CHARACTERISTICS⁽¹⁾ ($T_C = 25^\circ\text{C}$ unless otherwise stated)

IP78M05ALCC4, IP140ME-05A						
Symbols	Parameters	Test Conditions	Min.	Typ	Max.	Units
V_O	Output Voltage	$I_{OUT} = 100\text{mA}$ $V_{IN} = 10\text{V}$	4.95	5	5.05	V
		$P \leq P_{MAX}$, $5\text{mA} \leq I_O \leq 350\text{mA}$, $V_{IN} = 7.5\text{V to } 20\text{V}$	● 4.85		5.15	
ΔV_O	Line Regulation ⁽²⁾	$I_O = 200\text{mA}$	$7\text{V} \leq V_{IN} \leq 25\text{V}$		3	mV
			$8\text{V} \leq V_{IN} \leq 25\text{V}$	●	3	
		$I_O = 500\text{mA}$	$8\text{V} \leq V_{IN} \leq 12\text{V}$		3	
ΔV_O	Load Regulation ⁽²⁾	$V_{IN} = 10\text{V}$ $5\text{mA} \leq I_O \leq 500\text{mA}$	●	5	50	
I_Q	Quiescent Current	$V_{IN} = 10\text{V}$ $I_O = 350\text{mA}$	●	4	6	mA
ΔI_Q	Quiescent Current Change	$V_{IN} = 10\text{V}$ $5\text{mA} \leq I_O \leq 500\text{mA}$	●	0.1	0.5	
		$8\text{V} \leq V_{IN} \leq 25\text{V}$ $I_O = 200\text{mA}$	●	0.2	0.8	
V_N	Output Noise Voltage ⁽³⁾	$V_{IN} = 10\text{V}$ $10\text{Hz} \leq f \leq 100\text{KHz}$		40	200	μV
$\frac{\Delta V_{IN}}{\Delta V_O}$	Ripple Rejection	$f = 120\text{Hz}$ $I_O = 300\text{mA}$		65	80	dB
		$8\text{V} \leq V_{IN} \leq 18\text{V}$ $I_O = 100\text{mA}$	●	65	80	
V_D	Drop Out Voltage	$I_O = 350\text{mA}$		2	2.5	V
I_{SC}	Short-Circuit Current	$V_{IN} = 35\text{V}$		300	600	mA
I_{PK}	Short-Circuit Current	$V_{IN} = 10\text{V}$	0.7	1.0	1.4	A
	Average TC of V_O ⁽³⁾	$I_O = 5\text{mA}$		0.5	2	$\text{mV}/^\circ\text{C}$

Notes

The ● denotes the specifications which apply over the full operating temperature range.

- (1) All characteristics are measured with a capacitor across the input of $0.22\mu\text{F}$ and a capacitor across the output of $0.1\mu\text{F}$. Although power dissipation is internally limited, these specifications are applicable to maximum power dissipation $P_{MAX} = 2\text{W}$, $I_{MAX} = 0.5\text{A}$, $T_J = 25^\circ\text{C}$
- (2) Regulation is measured at constant junction temperature, using pulse testing at a low duty cycle. Changes in output voltage due to heating effects must be taken into account separately.
- (3) By design, not a production test.

POSITIVE FIXED VOLTAGE REGULATOR IP140ME/MAE, IP78M00/ALCC4 SERIES

ELECTRICAL CHARACTERISTICS⁽¹⁾ ($T_C = 25^\circ\text{C}$ unless otherwise stated)

IP78M12LCC4, IP140ME-12						
Symbols	Parameters	Test Conditions	Min.	Typ	Max.	Units
V_O	Output Voltage	$I_{OUT} = 100\text{mA}$ $V_{IN} = 19\text{V}$	11.5	12	12.5	V
		$P \leq P_{MAX}$, $5\text{mA} \leq I_O \leq 350\text{mA}$, $V_{IN} = 14.8\text{V to } 27\text{V}$	● 11.4		12.6	
ΔV_O	Line Regulation ⁽²⁾	$I_O = 200\text{mA}$	$14.5\text{V} \leq V_{IN} \leq 30\text{V}$		60	mV
			$16\text{V} \leq V_{IN} \leq 30\text{V}$	●	30	
		$I_O = 500\text{mA}$	$16\text{V} \leq V_{IN} \leq 22\text{V}$		120	
ΔV_O	Load Regulation ⁽²⁾	$V_{IN} = 19\text{V}$ $5\text{mA} \leq I_O \leq 500\text{mA}$	●		120	
I_Q	Quiescent Current	$V_{IN} = 19\text{V}$ $I_O = 350\text{mA}$	●	4	6	mA
ΔI_Q	Quiescent Current Change	$V_{IN} = 19\text{V}$ $5\text{mA} \leq I_O \leq 500\text{mA}$	●		0.5	
		$14.8\text{V} \leq V_{IN} \leq 30\text{V}$ $I_O = 200\text{mA}$	●		0.8	
V_N	Output Noise Voltage ⁽³⁾	$V_{IN} = 19\text{V}$ $10\text{Hz} \leq f \leq 100\text{KHz}$		75	480	μV
$\frac{\Delta V_{IN}}{\Delta V_O}$	Ripple Rejection	$f = 120\text{Hz}$ $I_O = 300\text{mA}$	55			dB
		$15\text{V} \leq V_{IN} \leq 25\text{V}$ $I_O = 100\text{mA}$	● 55			
V_D	Drop Out Voltage	$I_O = 350\text{mA}$			2.5	V
I_{SC}	Short-Circuit Current	$V_{IN} = 35\text{V}$		300	600	mA
I_{PK}	Short-Circuit Current	$V_{IN} = 19\text{V}$	0.7	1.0	1.6	A
	Average TC of V_O ⁽³⁾	$I_O = 5\text{mA}$		1.2		$\text{mV}/^\circ\text{C}$

Notes

The ● denotes the specifications which apply over the full operating temperature range.

- (1) All characteristics are measured with a capacitor across the input of $0.22\mu\text{F}$ and a capacitor across the output of $0.1\mu\text{F}$. Although power dissipation is internally limited, these specifications are applicable to maximum power dissipation $P_{MAX} = 2\text{W}$, $I_{MAX} = 0.5\text{A}$, $T_J = 25^\circ\text{C}$
- (2) Regulation is measured at constant junction temperature, using pulse testing at a low duty cycle. Changes in output voltage due to heating effects must be taken into account separately.
- (3) By design, not a production test.

POSITIVE FIXED VOLTAGE REGULATOR IP140ME/MAE, IP78M00/ALCC4 SERIES

ELECTRICAL CHARACTERISTICS⁽¹⁾ ($T_C = 25^\circ\text{C}$ unless otherwise stated)

IP78M12ALCC4, IP140MAE-12								
Symbols	Parameters	Test Conditions		Min.	Typ	Max.	Units	
V _O	Output Voltage	I _{OUT} = 100mA V _{IN} = 19V			11.88	12	12.12	V
		P ≤ P _{MAX} , 5mA ≤ I _O ≤ 350mA, V _{IN} = 14.8V to 27V		●	11.64		12.36	
ΔV _O	Line Regulation (2)	I _O = 200mA	14.5V ≤ V _{IN} ≤ 30V			4	18	mV
			16V ≤ V _{IN} ≤ 30V	●		4	18	
		I _O = 500mA 16V ≤ V _{IN} ≤ 22V				4	18	
ΔV _O	Load Regulation (2)	V _{IN} = 19V 5mA ≤ I _O ≤ 500mA		●		10	60	
I _Q	Quiescent Current	V _{IN} = 19V I _O = 350mA		●		4	6	
ΔI _Q	Quiescent Current Change	V _{IN} = 19V 5mA ≤ I _O ≤ 500mA		●		0.1	0.5	mA
		14.8V ≤ V _{IN} ≤ 30V I _O = 200mA		●		0.2	0.8	
V _N	Output Noise Voltage (3)	V _{IN} = 19V 10Hz ≤ f ≤ 100KHz				75	480	μV
$\frac{\Delta V_{IN}}{\Delta V_O}$	Ripple Rejection	f = 120Hz	I _O = 300mA		58	72		dB
		15V ≤ V _{IN} ≤ 25V	I _O = 100mA	●	58	72		
V _D	Drop Out Voltage	I _O = 350mA				2	2.5	V
I _{SC}	Short-Circuit Current	V _{IN} = 35V				300	600	mA
I _{PK}	Short-Circuit Current	V _{IN} = 19V			0.7	1.0	1.4	A
	Average TC of V _O (3)	I _O = 5mA				1.2	4.8	mV/°C

Notes

The ● denotes the specifications which apply over the full operating temperature range.

- (1) All characteristics are measured with a capacitor across the input of $0.22\mu\text{F}$ and a capacitor across the output of $0.1\mu\text{F}$. Although power dissipation is internally limited, these specifications are applicable to maximum power dissipation $P_{MAX} = 2\text{W}$, $I_{MAX} = 0.5\text{A}$, $T_J = 25^\circ\text{C}$
- (2) Regulation is measured at constant junction temperature, using pulse testing at a low duty cycle. Changes in output voltage due to heating effects must be taken into account separately.
- (3) By design, not a production test.

POSITIVE FIXED VOLTAGE REGULATOR IP140ME/MAE, IP78M00/ALCC4 SERIES

ELECTRICAL CHARACTERISTICS⁽¹⁾ ($T_C = 25^\circ\text{C}$ unless otherwise stated)

IP78M15LCC4, IP140ME-15								
Symbols	Parameters	Test Conditions		Min.	Typ	Max.	Units	
V _O	Output Voltage	I _{OUT} = 100mA V _{IN} = 23V			14.4	15	15.6	V
		P ≤ P _{MAX} , 5mA ≤ I _O ≤ 350mA, V _{IN} = 18V to 30V		●	14.25		15.75	
ΔV _O	Line Regulation (2)	I _O = 200mA	17.5V ≤ V _{IN} ≤ 30V				60	mV
			20V ≤ V _{IN} ≤ 30V	●			30	
		I _O = 500mA 20V ≤ V _{IN} ≤ 26V					150	
ΔV _O	Load Regulation (2)	V _{IN} = 23V 5mA ≤ I _O ≤ 500mA		●			150	
I _Q	Quiescent Current	V _{IN} = 23V I _O = 350mA		●		4	6	mA
ΔI _Q	Quiescent Current Change	V _{IN} = 23V 5mA ≤ I _O ≤ 500mA		●			0.5	
		18V ≤ V _{IN} ≤ 30V I _O = 200mA		●			0.8	
V _N	Output Noise Voltage (3)	V _{IN} = 23V 10Hz ≤ f ≤ 100KHz				90	600	μV
$\frac{\Delta V_{IN}}{\Delta V_O}$	Ripple Rejection	f = 120Hz	I _O = 300mA		54			dB
		18.5V ≤ V _{IN} ≤ 28.5V	I _O = 100mA	●	54			
V _D	Drop Out Voltage	I _O = 350mA					2.5	V
I _{SC}	Short-Circuit Current	V _{IN} = 35V				300	600	mA
I _{PK}	Short-Circuit Current	V _{IN} = 23V			0.7	1.0	1.6	A
	Average TC of V _O (3)	I _O = 5mA				1.5		mV/°C

Notes

The ● denotes the specifications which apply over the full operating temperature range.

- All characteristics are measured with a capacitor across the input of $0.22\mu\text{F}$ and a capacitor across the output of $0.1\mu\text{F}$. Although power dissipation is internally limited, these specifications are applicable to maximum power dissipation $P_{MAX} = 2\text{W}$, $I_{MAX} = 0.5\text{A}$, $T_J = 25^\circ\text{C}$
- Regulation is measured at constant junction temperature, using pulse testing at a low duty cycle. Changes in output voltage due to heating effects must be taken into account separately.
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POSITIVE FIXED VOLTAGE REGULATOR IP140ME/MAE, IP78M00/ALCC4 SERIES

ELECTRICAL CHARACTERISTICS⁽¹⁾ ($T_C = 25^\circ\text{C}$ unless otherwise stated)

IP78M15ALCC4, IP140MAE-15								
Symbols	Parameters	Test Conditions		Min.	Typ	Max.	Units	
V _O	Output Voltage	I _{OUT} = 100mA V _{IN} = 23V			14.85	15	15.15	V
		P ≤ P _{MAX} , 5mA ≤ I _O ≤ 350mA, V _{IN} = 18V to 30V		●	14.55		15.45	
ΔV _O	Line Regulation (2)	I _O = 200mA	17.5V ≤ V _{IN} ≤ 30V			4	22	mV
			20V ≤ V _{IN} ≤ 30V	●		4	22	
		I _O = 500mA 20V ≤ V _{IN} ≤ 26V				4	22	
ΔV _O	Load Regulation (2)	V _{IN} = 23V 5mA ≤ I _O ≤ 500mA		●		12	75	
I _Q	Quiescent Current	V _{IN} = 23V I _O = 350mA		●		4	6	
ΔI _Q	Quiescent Current Change	V _{IN} = 23V 5mA ≤ I _O ≤ 500mA		●		0.1	0.5	mA
		18V ≤ V _{IN} ≤ 30V I _O = 200mA		●		0.2	0.8	
V _N	Output Noise Voltage (3)	V _{IN} = 23V 10Hz ≤ f ≤ 100KHz				90	600	μV
$\frac{\Delta V_{IN}}{\Delta V_O}$	Ripple Rejection	f = 120Hz	I _O = 300mA		57	70		dB
		18.5V ≤ V _{IN} ≤ 28.5V	I _O = 100mA	●	57	70		
V _D	Drop Out Voltage	I _O = 350mA				2	2.5	V
I _{SC}	Short-Circuit Current	V _{IN} = 35V				300	600	mA
I _{PK}	Short-Circuit Current	V _{IN} = 23V			0.7	1.0	1.4	A
	Average TC of V _O (3)	I _O = 5mA				1.5	6	mV/°C

Notes

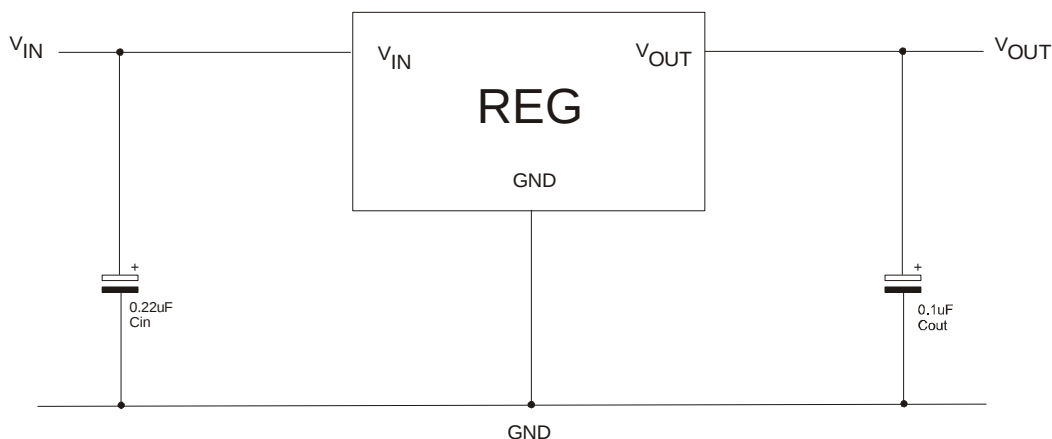
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- Regulation is measured at constant junction temperature, using pulse testing at a low duty cycle. Changes in output voltage due to heating effects must be taken into account separately.
- By design, not a production test.

POSITIVE FIXED VOLTAGE REGULATOR IP140ME/MAE, IP78M00/ALCC4 SERIES

APPLICATIONS INFORMATION

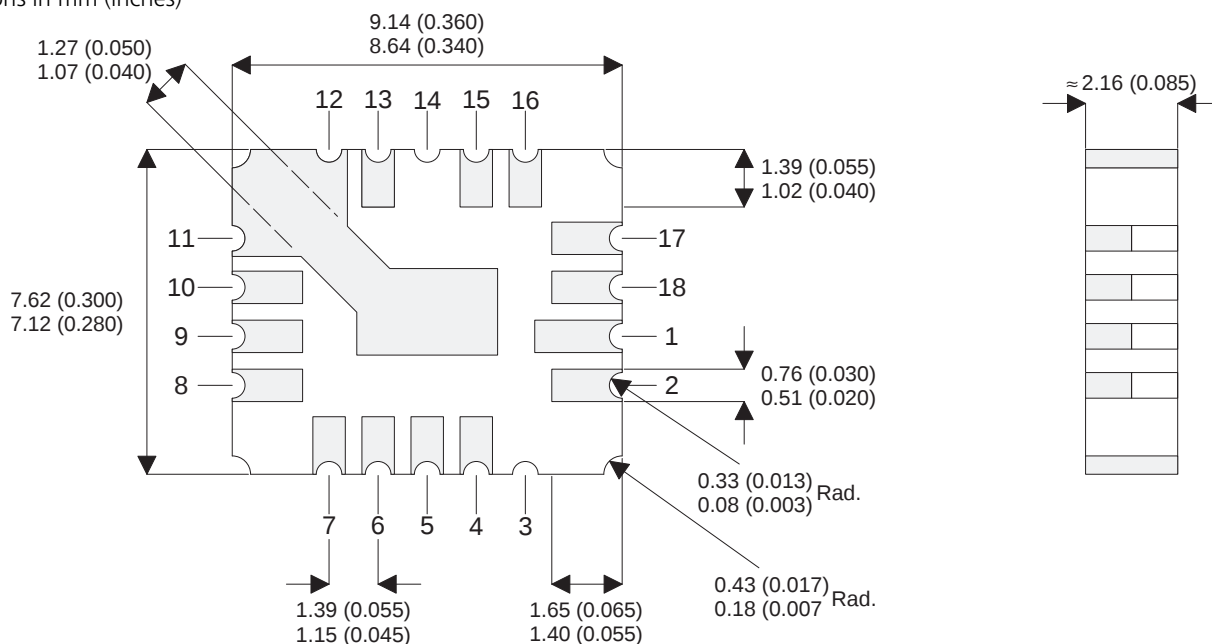
Fixed Output Regulator



- (a) Cin required if regulator is located an appropriate distance from power supply filter.
(b) Cout required for stability for given value.

MECHANICAL DATA

Dimensions in mm (inches)



LCC4 Underside View

Pads	Connection
Pads 4, 5	V_{IN}
Pads 6, 7, 8, 9, 10, 11, 12, 13	V_{OUT}
Pads 1, 2, 15, 16, 17, 18	GND
Pads 3, 14	No Connection