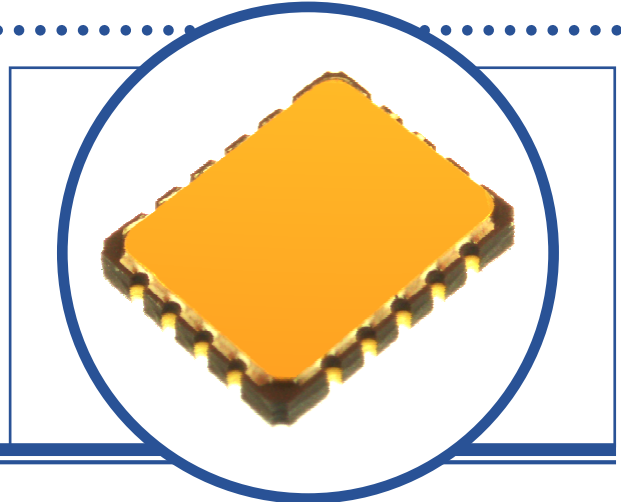


# POSITIVE FIXED VOLTAGE REGULATOR

## 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°C
$T_{stg}$	Storage Temperature Range	-65 to +150°C

### THERMAL PROPERTIES

Symbols	Parameters	Max.	Units
$R_{\theta JA}$	Thermal Resistance, Junction To Ambient	120	°C/W
$R_{\theta JC}$	Thermal Resistance, Junction To Case	20	°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		
$\Delta V_O$	Line Regulation (2)	$I_O = 200\text{mA}$	$7\text{V} \leq V_{IN} \leq 25\text{V}$			50	mV
			$8\text{V} \leq V_{IN} \leq 25\text{V}$	•		25	
		$I_O = 500\text{mA}$	$8\text{V} \leq V_{IN} \leq 12\text{V}$			50	
$\Delta V_O$	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	
$\Delta I_Q$	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	$\mu\text{V}$	
$\frac{\Delta V_{IN}}{\Delta V_O}$	Ripple Rejection	$f = 120\text{Hz}$		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.

- 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.
- 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	
$\Delta V_O$	Line Regulation (2)	$I_O = 200\text{mA}$	$7\text{V} \leq V_{IN} \leq 25\text{V}$			3	10	mV
			$8\text{V} \leq V_{IN} \leq 25\text{V}$	●		3	10	
		$I_O = 500\text{mA}$	$8\text{V} \leq V_{IN} \leq 12\text{V}$			3	10	
$\Delta V_O$	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
$\Delta I_Q$	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	$\mu\text{V}$
$\frac{\Delta V_{IN}}{\Delta V_O}$	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.

- 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.
- 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		
$\Delta V_O$	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	
$\Delta V_O$	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	
$\Delta I_Q$	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	$\mu\text{V}$	
$\frac{\Delta V_{IN}}{\Delta V_O}$	Ripple Rejection	$f = 120\text{Hz}$		55		dB	
		$15\text{V} \leq V_{IN} \leq 25\text{V}$	$I_O = 300\text{mA}$ $I_O = 100\text{mA}$	● 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.

- 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.
- 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	$I_{OUT} = 100\text{mA}$ $V_{IN} = 19\text{V}$	11.88	12	12.12	V	
		$P \leq P_{MAX}$ , $5\text{mA} \leq I_O \leq 350\text{mA}$ , $V_{IN} = 14.8\text{V to } 27\text{V}$	● 11.64		12.36		
$\Delta V_O$	Line Regulation (2)	$I_O = 200\text{mA}$	$14.5\text{V} \leq V_{IN} \leq 30\text{V}$		4	18	mV
			$16\text{V} \leq V_{IN} \leq 30\text{V}$	●	4	18	
		$I_O = 500\text{mA}$	$16\text{V} \leq V_{IN} \leq 22\text{V}$		4	18	
$\Delta V_O$	Load Regulation (2)	$V_{IN} = 19\text{V}$ $5\text{mA} \leq I_O \leq 500\text{mA}$	●	10	60		
$I_Q$	Quiescent Current	$V_{IN} = 19\text{V}$ $I_O = 350\text{mA}$	●	4	6	mA	
$\Delta I_Q$	Quiescent Current Change	$V_{IN} = 19\text{V}$ $5\text{mA} \leq I_O \leq 500\text{mA}$	●	0.1	0.5		
		$14.8\text{V} \leq V_{IN} \leq 30\text{V}$ $I_O = 200\text{mA}$	●	0.2	0.8		
$V_N$	Output Noise Voltage (3)	$V_{IN} = 19\text{V}$ $10\text{Hz} \leq f \leq 100\text{KHz}$		75	480	$\mu\text{V}$	
$\frac{\Delta V_{IN}}{\Delta V_O}$	Ripple Rejection	$f = 120\text{Hz}$		58	72	dB	
		$15\text{V} \leq V_{IN} \leq 25\text{V}$	$I_O = 300\text{mA}$ $I_O = 100\text{mA}$	● 58	72		
$V_D$	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	$V_{IN} = 19\text{V}$	0.7	1.0	1.4	A	
	Average TC of $V_O$ (3)	$I_O = 5\text{mA}$		1.2	4.8	$\text{mV}/^\circ\text{C}$	

### 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.
- 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	$I_{OUT} = 100\text{mA}$ $V_{IN} = 23\text{V}$	14.4	15	15.6	V	
		$P \leq P_{MAX}$ , $5\text{mA} \leq I_O \leq 350\text{mA}$ , $V_{IN} = 18\text{V to } 30\text{V}$	● 14.25		15.75		
$\Delta V_O$	Line Regulation (2)	$I_O = 200\text{mA}$	$17.5\text{V} \leq V_{IN} \leq 30\text{V}$			60	mV
			$20\text{V} \leq V_{IN} \leq 30\text{V}$	●		30	
		$I_O = 500\text{mA}$	$20\text{V} \leq V_{IN} \leq 26\text{V}$			150	
$\Delta V_O$	Load Regulation (2)	$V_{IN} = 23\text{V}$ $5\text{mA} \leq I_O \leq 500\text{mA}$	●		150		
$I_Q$	Quiescent Current	$V_{IN} = 23\text{V}$ $I_O = 350\text{mA}$	●	4	6	mA	
$\Delta I_Q$	Quiescent Current Change	$V_{IN} = 23\text{V}$ $5\text{mA} \leq I_O \leq 500\text{mA}$	●		0.5		
		$18\text{V} \leq V_{IN} \leq 30\text{V}$ $I_O = 200\text{mA}$	●		0.8		
$V_N$	Output Noise Voltage (3)	$V_{IN} = 23\text{V}$ $10\text{Hz} \leq f \leq 100\text{KHz}$		90	600	$\mu\text{V}$	
$\frac{\Delta V_{IN}}{\Delta V_O}$	Ripple Rejection	$f = 120\text{Hz}$		54		dB	
		$18.5\text{V} \leq V_{IN} \leq 28.5\text{V}$	$I_O = 300\text{mA}$ $I_O = 100\text{mA}$	● 54			
$V_D$	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	$V_{IN} = 23\text{V}$	0.7	1.0	1.6	A	
	Average TC of $V_O$ (3)	$I_O = 5\text{mA}$		1.5		$\text{mV}/^\circ\text{C}$	

### 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.
- 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)

IP78M15ALCC4, IP140MAE-15							
Symbols	Parameters	Test Conditions	Min.	Typ	Max.	Units	
$V_O$	Output Voltage	$I_{OUT} = 100\text{mA}$ $V_{IN} = 23\text{V}$	14.85	15	15.15	V	
		$P \leq P_{MAX}$ , $5\text{mA} \leq I_O \leq 350\text{mA}$ , $V_{IN} = 18\text{V to } 30\text{V}$	● 14.55		15.45		
$\Delta V_O$	Line Regulation (2)	$I_O = 200\text{mA}$	$17.5\text{V} \leq V_{IN} \leq 30\text{V}$		4	22	mV
			$20\text{V} \leq V_{IN} \leq 30\text{V}$	●	4	22	
		$I_O = 500\text{mA}$	$20\text{V} \leq V_{IN} \leq 26\text{V}$		4	22	
$\Delta V_O$	Load Regulation (2)	$V_{IN} = 23\text{V}$ $5\text{mA} \leq I_O \leq 500\text{mA}$	●	12	75		
$I_Q$	Quiescent Current	$V_{IN} = 23\text{V}$ $I_O = 350\text{mA}$	●	4	6	mA	
$\Delta I_Q$	Quiescent Current Change	$V_{IN} = 23\text{V}$ $5\text{mA} \leq I_O \leq 500\text{mA}$	●	0.1	0.5		
		$18\text{V} \leq V_{IN} \leq 30\text{V}$ $I_O = 200\text{mA}$	●	0.2	0.8		
$V_N$	Output Noise Voltage (3)	$V_{IN} = 23\text{V}$ $10\text{Hz} \leq f \leq 100\text{KHz}$		90	600	$\mu\text{V}$	
$\frac{\Delta V_{IN}}{\Delta V_O}$	Ripple Rejection	$f = 120\text{Hz}$		57	70	dB	
		$18.5\text{V} \leq V_{IN} \leq 28.5\text{V}$	$I_O = 300\text{mA}$	● 57	70		
$V_D$	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	$V_{IN} = 23\text{V}$	0.7	1.0	1.4	A	
	Average TC of $V_O$ (3)	$I_O = 5\text{mA}$		1.5	6	$\text{mV}/^\circ\text{C}$	

### Notes

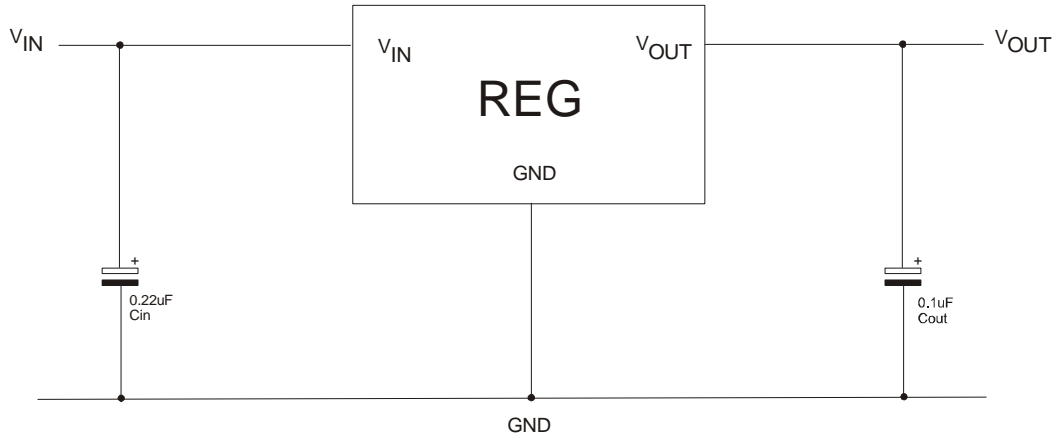
The ● denotes the specifications which apply over the full operating temperature range.

- 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.
- By design, not a production test.

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

## APPLICATIONS INFORMATION

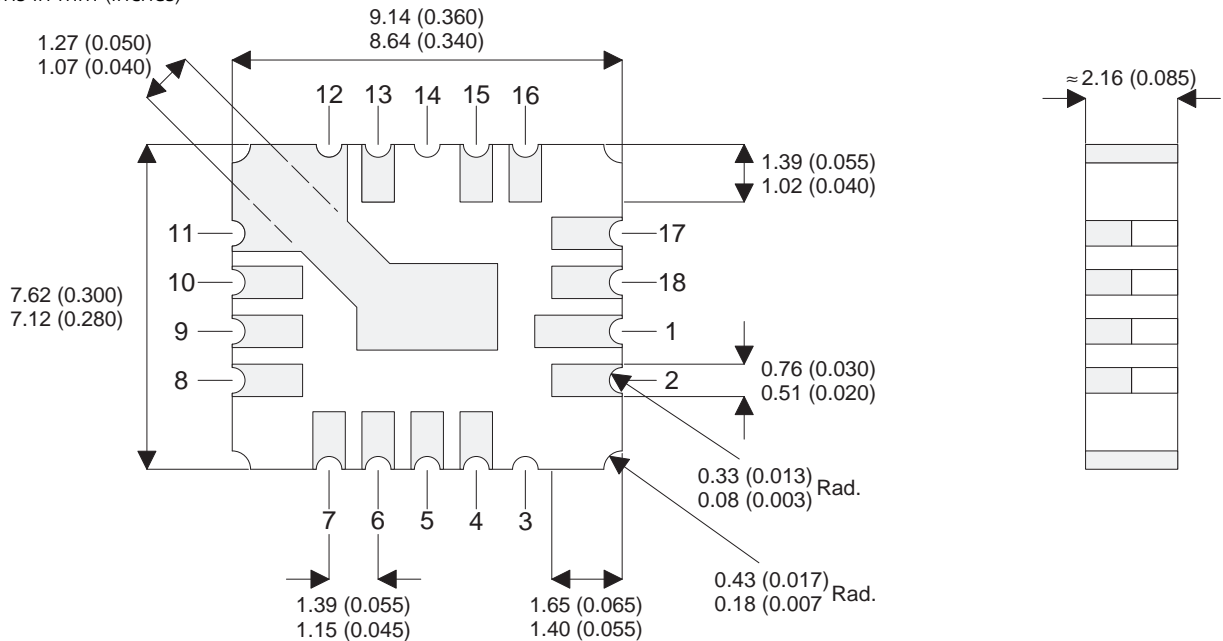
### Fixed Output Regulator



- (a)  $C_{in}$  required if regulator is located an appropriate distance from power supply filter.
- (b)  $C_{out}$  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