

General Description

The EM78L series in positive voltage regulators are cost effective devices to provide a simple solution for a wide variety of application, which requires a regulated supply of up to 100mA

These virtually indestructible positive voltage regulators are protected by thermal shut down and internal current limiting. Most applications require no external components.

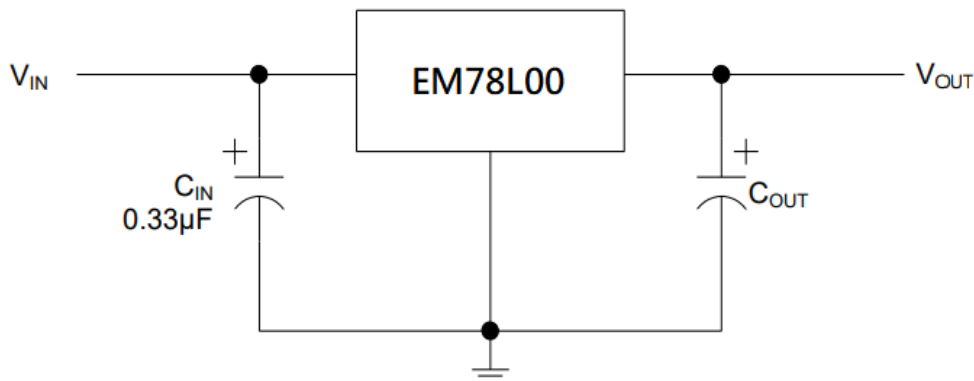
The EM78L is very versatile, which can be used as fixed voltage regulators in a wide range of application, including both local and on-card regulation for elimination of noise and distribution problems associated with single-point regulation. They can also be used with power pass elements to make high current voltage regulators.

The EM78L series offer impressive performance advantages over traditional zener diode and resistor combinations, provide lower output impedance and reduced quiescent current.

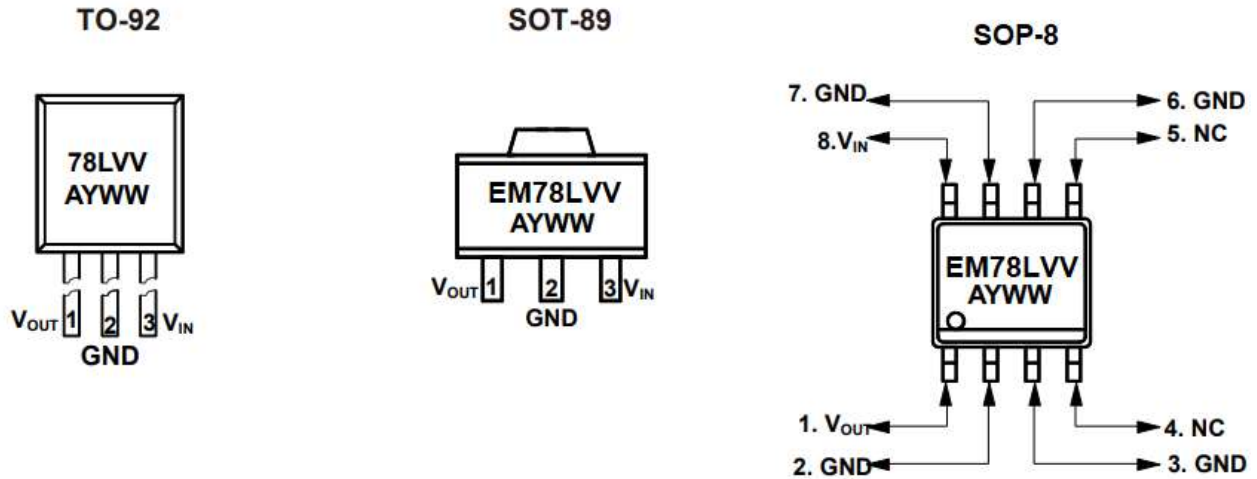
Features

- Maximum output current up 100mA
- Fixed output voltage options: 5V, 6V, 8V, 9V, 10V, 12V, 15V, 18V and 24V
- No external components required
- Internal thermal overload protection
- Internal short circuit current limiting
- Available in TO-92, SOT-89 and SOP-8 packages

Typical Application Circuit



Marking Information and Pin Configurations (Top View)



VV: Output Voltage Codes (05: 5.0V, ...12:12V)

A: Assembly/Test Site Code

Y: Year WW: Week

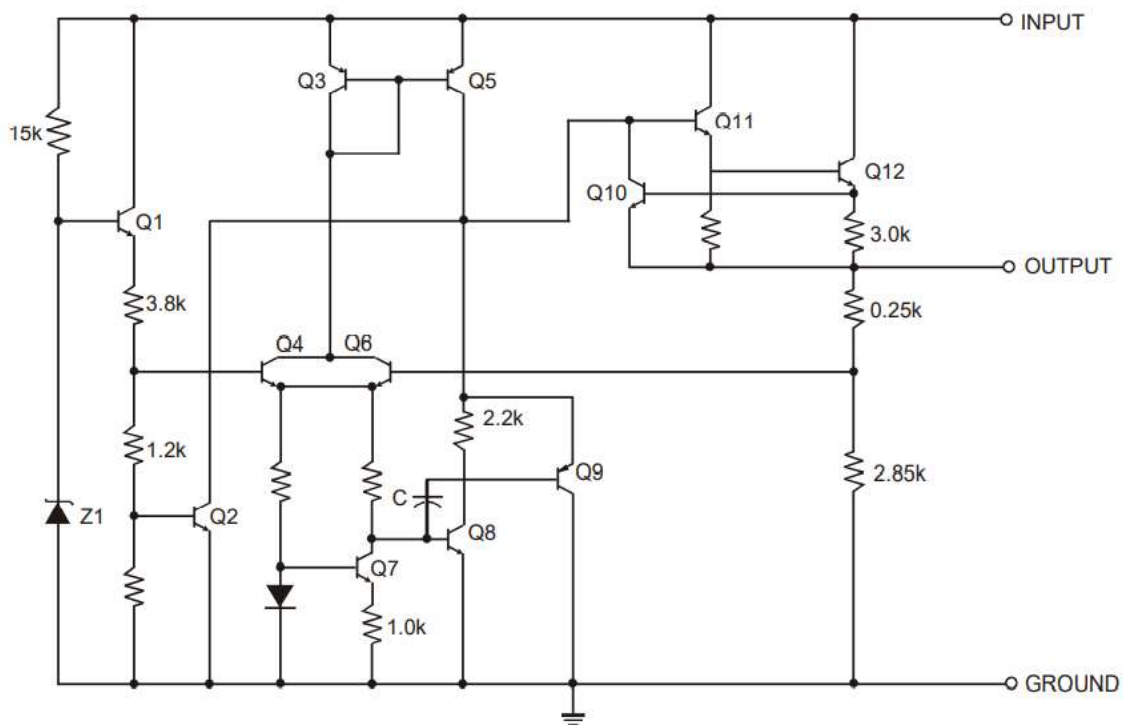
Ordering Information

Ordering Number	V _{OUT}	Package	Shipping
EM78L00A6GB	00 = 5.0V 6.0V 8.0V 9.0V 10.0V 12.0V 15.0V 18.0V 24.0V	TO-92	1,000 Units/ESD Bag
EM78L00A6GRL		TO-92	2,000 Units/Ammo Pack (Tape)
EM78L00B6GR		SOT-89	1,000 Units/Tape and Reel
EM78L00M1GT		SOP-8	100 Units/Tube
EM78L00M1GR		SOP-8	2,500 Units/Tape & Reel

Absolute Maximum Ratings

PARAMETER	SYMBOL	RATINGS	UNITS
Input Voltage	V_{IN}	EM78L05 to EM78L10	30
		EM78L12 to EM78L18	35
		EM78L24	40
Operating Ambient Temperature	T_A	- 40 to 125	°C
Storage Temperature	T_{stg}	- 60 to 150	°C

Block Diagram



EM78L05 Electrical Characteristics ($V_I = 10V$, $I_O = 40mA$ unless otherwise noted)

Parameter	Test Condition		Min	Typ	Max	Unit
Output Voltage		25°C	4.8	5.0	5.2	V
	$I_O = 1mA$ to 40mA $V_I = 7V$ to 20V	0°C to 125°C	4.75	5.0	5.25	
	$I_O = 1mA$ to 70mA		4.75	5.0	5.25	
Input Regulation	$V_I = 7V$ to 20V	25°C		32	150	mV
	$V_I = 8V$ to 20V			26	100	
Ripple Rejection	$V_I = 8V$ to 18V, $f = 120KHz$	25°C	41	49		dB
Output Regulation	$I_O = 1mA$ to 100mA	25°C		15	60	mV
	$I_O = 1mA$ to 40mA			8	30	
Output Noise Voltage	$F = 10Hz$ to 100KHz	25°C		42		µV
Bias Current		25°C		3.8	6	mA
		125°C			5.5	
Bias Current Change	$V_I = 8V$ to 20V	0°C to 125°C			1.5	mA
	$I_O = 1mA$ to 40mA				0.1	

EM78L06 Electrical Characteristics ($V_I = 11V$, $I_O = 40mA$ unless otherwise noted)

Parameter	Test Condition		Min	Typ	Max	Unit
Output Voltage		25°C	5.75	6.0	6.25	V
	$I_O = 1mA$ to 40mA $V_I = 8V$ to 20V	0°C to 125°C	5.70	6.0	6.30	
	$I_O = 1mA$ to 70mA		5.70	6.0	6.30	
Input Regulation	$V_I = 8V$ to 20V	25°C		35	175	mV
	$V_I = 9V$ to 20V			29	125	
Ripple Rejection	$V_I = 9V$ to 18V, $f = 120KHz$	25°C	10	18		dB
Output Regulation	$I_O = 1mA$ to 100mA	25°C		16	80	mV
	$I_O = 1mA$ to 40mA			9	40	
Output Noise Voltage	$F = 10Hz$ to 100KHz	25°C		46		µV
Bias Current		25°C		3.9	6	mA
		125°C			5.5	
Bias Current Change	$V_I = 9V$ to 20V	0°C to 125°C			1.5	mA
	$I_O = 1mA$ to 40mA				0.1	

EM78L08 Electrical Characteristics ($V_I = 14V$, $I_O = 40mA$ unless otherwise noted)

Parameter	Test Condition		Min	Typ	Max	Unit
Output Voltage		25°C	7.7	8.0	8.3	V
	$I_O = 1mA$ to 40mA $V_I = 10.5V$ to 23V	0°C to 125°C	7.6	8.0	8.4	
	$I_O = 1mA$ to 70mA		7.6	8.0	8.4	
Input Regulation	$V_I = 10.5V$ to 23V	25°C		42	175	mV
	$V_I = 11V$ to 23V			36	125	
Ripple Rejection	$V_I = 13V$ to 23V, $f = 120KHz$	25°C	37	46		dB
Output Regulation	$I_O = 1mA$ to 100mA	25°C		18	80	mV
	$I_O = 1mA$ to 40mA			10	40	
Output Noise Voltage	$F = 10Hz$ to 100KHz	25°C		54		µV
Dropout Voltage		25°C		1.7		V
Bias Current		25°C		4	6	mA
		125°C			5.5	
Bias Current Change	$V_I = 11V$ to 23V	0°C to 125°C			1.5	mA
	$I_O = 1mA$ to 40mA				0.1	

EM78L09 Electrical Characteristics ($V_I = 16V$, $I_O = 40mA$ unless otherwise noted)

Parameter	Test Condition		Min	Typ	Max	Unit
Output Voltage		25°C	8.6	9.0	9.4	V
	$I_O = 1mA$ to 40mA $V_I = 12V$ to 24V	0°C to 125°C	8.55	9.0	9.45	
	$I_O = 1mA$ to 70mA		8.55	9.0	9.45	
Input Regulation	$V_I = 12V$ to 24V	25°C		45	175	mV
	$V_I = 13V$ to 24V			40	125	
Ripple Rejection	$V_I = 15V$ to 25V, $f = 120KHz$	25°C	38	44		dB
Output Regulation	$I_O = 1mA$ to 100mA	25°C		19	90	mV
	$I_O = 1mA$ to 40mA			11	40	
Output Noise Voltage	$F = 10Hz$ to 100KHz	25°C		58		µV
Dropout Voltage		25°C		1.7		V
Bias Current		25°C		4.1	6	mA
		125°C			5.5	
Bias Current Change	$V_I = 13V$ to 24V	0°C to 125°C			1.5	mA
	$I_O = 1mA$ to 40mA				0.1	



EM78L10 Electrical Characteristics ($V_I = 17V$, $I_O = 40mA$ unless otherwise noted)

Parameter	Test Condition		Min	Typ	Max	Unit
Output Voltage		25°C	9.6	10	10.4	V
	$I_O = 1mA$ to 40mA $V_I = 13V$ to 25V	0°C to 125°C	9.5	10	10.5	
	$I_O = 1mA$ to 70mA		9.5	10	10.5	
Input Regulation	$V_I = 13V$ to 25V	25°C		51	175	mV
	$V_I = 14V$ to 24V			42	125	
Ripple Rejection	$V_I = 15V$ to 25V, $f = 120KHz$	25°C	38	44		dB
Output Regulation	$I_O = 1mA$ to 100mA	25°C		20	90	mV
	$I_O = 1mA$ to 40mA			11	40	
Output Noise Voltage	$F = 10Hz$ to 100KHz	25°C		62		µV
Dropout Voltage		25°C		1.7		V
Bias Current		25°C		4.2	6	mA
		125°C			5.5	
Bias Current Change	$V_I = 14V$ to 25V	0°C to 125°C			1.5	mA
	$I_O = 1mA$ to 40mA				0.1	

EM78L12 Electrical Characteristics ($V_I = 19V$, $I_O = 40mA$ unless otherwise noted)

Parameter	Test Condition		Min	Typ	Max	Unit
Output Voltage		25°C	11.5	12	12.5	V
	$I_O = 1mA$ to 40mA $V_I = 14V$ to 27V	0°C to 125°C	11.4	12	12.6	
	$I_O = 1mA$ to 70mA		11.4	12	12.6	
Input Regulation	$V_I = 14.5V$ to 27V	25°C		55	250	mV
	$V_I = 16V$ to 27V			49	200	
Ripple Rejection	$V_I = 16V$ to 27V, $f = 120KHz$	25°C	37	42		dB
Output Regulation	$I_O = 1mA$ to 100mA	25°C		22	100	mV
	$I_O = 1mA$ to 40mA			13	50	
Output Noise Voltage	$F = 10Hz$ to 100KHz	25°C		70		µV
Dropout Voltage		25°C		1.7		V
Bias Current		25°C		4.3	6.5	mA
		125°C			6	
Bias Current Change	$V_I = 16V$ to 27V	0°C to 125°C			1.5	mA
	$I_O = 1mA$ to 40mA				0.1	

EM78L15 Electrical Characteristics ($V_I = 23V$, $I_O = 40mA$ unless otherwise noted)

Parameter	Test Condition		Min	Typ	Max	Unit
Output Voltage		25°C	14.4	15	15.6	V
	$I_O = 1mA$ to 40mA $V_I = 17.5V$ to 30V	0°C to 125°C	14.25	15	15.75	
	$I_O = 1mA$ to 70mA		14.25	15	15.75	
Input Regulation	$V_I = 17.5V$ to 30V	25°C		65	300	mV
	$V_I = 19V$ to 30V			58	250	
Ripple Rejection	$V_I = 18.5V$ to 28.5V, $f = 120KHz$	25°C	34	39		dB
Output Regulation	$I_O = 1mA$ to 100mA	25°C		25	150	mV
	$I_O = 1mA$ to 40mA			15	75	
Output Noise Voltage	$F = 10Hz$ to 100KHz	25°C		82		µV
Dropout Voltage		25°C		1.7		V
Bias Current		25°C		4.6	6.5	mA
		125°C			6	
Bias Current Change	$V_I = 19V$ to 30V	0°C to 125°C			1.5	mA
	$I_O = 1mA$ to 40mA				0.1	

EM78L18 Electrical Characteristics ($V_I = 26V$, $I_O = 40mA$ unless otherwise noted)

Parameter	Test Condition		Min	Typ	Max	Unit
Output Voltage		25°C	17.3	18	18.7	V
	$I_O = 1mA$ to 40mA $V_I = 20.5V$ to 33V	0°C to 125°C	17.1	18	18.9	
	$I_O = 1mA$ to 70mA		17.1	18	18.9	
Input Regulation	$V_I = 20.5V$ to 33V	25°C		70	360	mV
	$V_I = 22V$ to 33V			64	300	
Ripple Rejection	$V_I = 21.5V$ to 31.5V, $f = 120KHz$	25°C	32	36		dB
Output Regulation	$I_O = 1mA$ to 100mA	25°C		27	180	mV
	$I_O = 1mA$ to 40mA			19	90	
Output Noise Voltage	$F = 10Hz$ to 100KHz	25°C		89		µV
Dropout Voltage		25°C		1.7		V
Bias Current		25°C		4.7	6.5	mA
		125°C			6	
Bias Current Change	$V_I = 22V$ to 33V	0°C to 125°C			1.5	mA
	$I_O = 1mA$ to 40mA				0.1	

EM78L24 Electrical Characteristics ($V_I = 32V$, $I_O = 40mA$ unless otherwise noted)

Parameter	Test Condition		Min	Typ	Max	Unit
Output Voltage		25°C	23	24	25	V
	$I_O = 1mA$ to 40mA $V_I = 26.5V$ to 39V	0°C to 125°C	22.8	24	25.2	
	$I_O = 1mA$ to 70mA		22.8	24	25.2	
Input Regulation	$V_I = 26.5V$ to 39V	25°C		95	480	mV
	$V_I = 29V$ to 39V			78	400	
Ripple Rejection	$V_I = 21.5V$ to 31.5V, $f = 120KHz$	25°C	32	36		dB
Output Regulation	$I_O = 1mA$ to 100mA	25°C		41	240	mV
	$I_O = 1mA$ to 40mA			28	120	
Output Noise Voltage	$F = 10Hz$ to 100KHz	25°C		97		μV
Dropout Voltage		25°C		1.7		V
Bias Current		25°C		4.8	6.5	mA
		125°C			6	
Bias Current Change	$V_I = 26V$ to 39V	0°C to 125°C			1.5	mA
	$I_O = 1mA$ to 40mA				0.1	

Typical Performance Characteristics

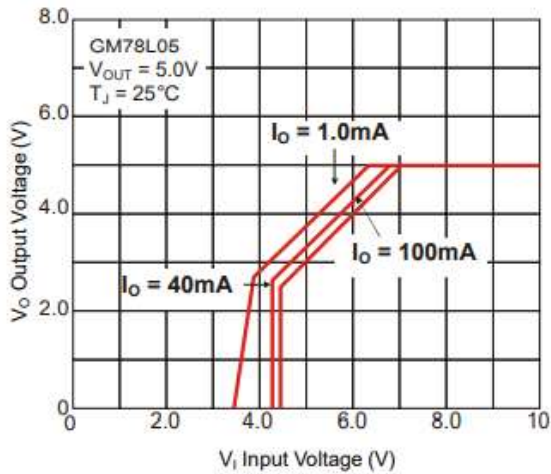


Figure 1. Dropout Characteristics

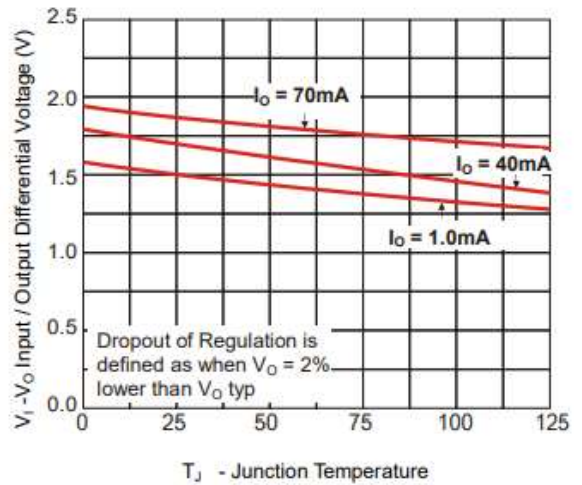


Figure 2. Dropout Voltage vs. Junction Temperature

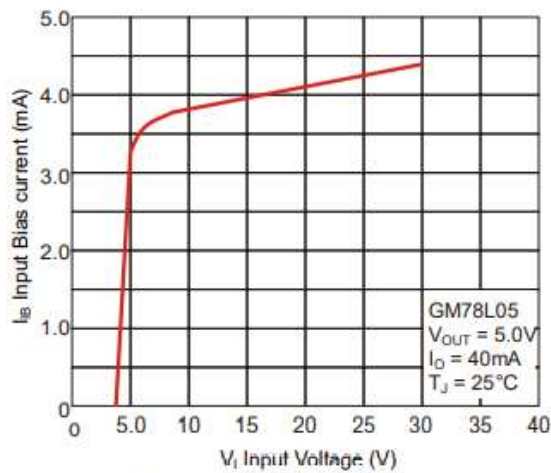


Figure 3. Input Bias Current vs. Input Voltage

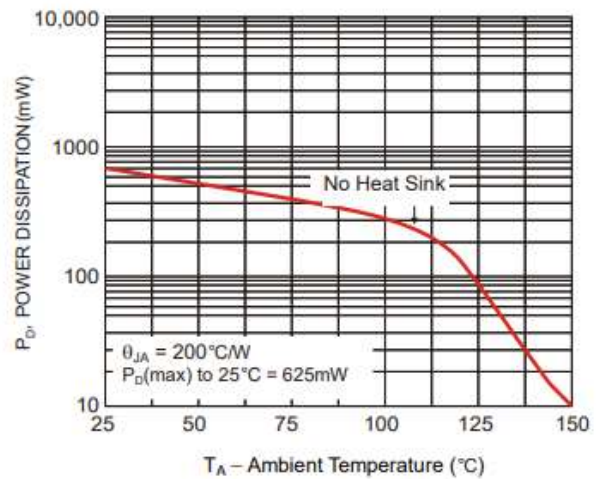
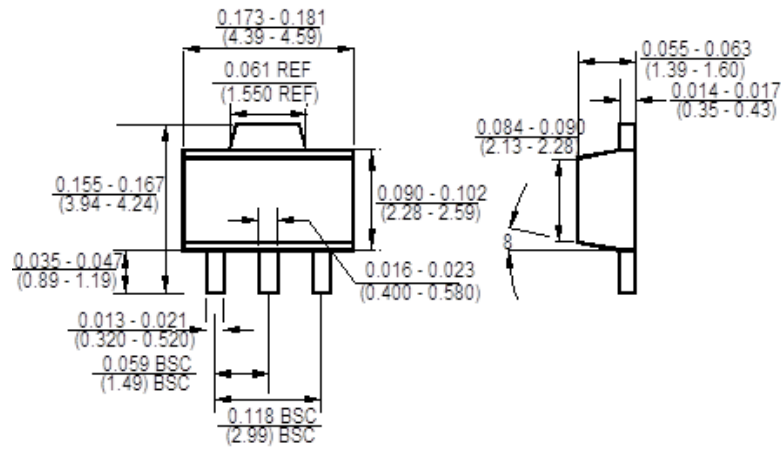
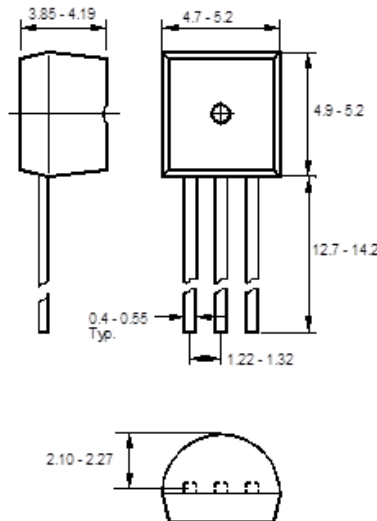


Figure 4. Maximum Average Power Dissipation vs. Ambient Temperature TO-92 Package

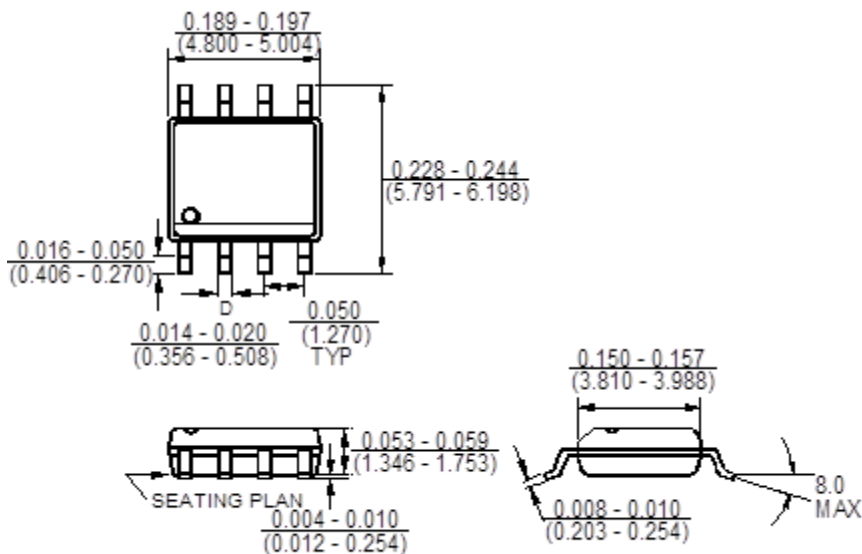
Package Outline Dimensions – SOT 89



Package Outline Dimensions – TO 92



Package Outline Dimensions – SOP-8





Ordering Number

E M 7 8 L 00 00 G 0

B = Bag
RL = Ammo Pack (Tape)
T = Tube
R = Tape & Reel

A6 = TO-92
B6 = SOT-89
M1 = SOP-8

Output Voltages

- 05= 5.0V
- 06= 6.0V
- 08= 8.0V
- 09= 9.0V
- 10= 10V
- 12= 12V
- 15= 15V
- 18= 18V
- 24= 24V