MC78L00A Series, NCV78L00A

100 mA Positive Voltage Regulators

The MC78L00A Series of positive voltage regulators are inexpensive, easy−to−use devices suitable for a multitude of applications that require a regulated supply of up to 100 mA. Like their higher powered MC7800 and MC78M00 Series cousins, these regulators feature internal current limiting and thermal shutdown making them remarkably rugged. No external components are required with the MC78L00 devices in many applications.

These devices offer a substantial performance advantage over the traditional zener diode−resistor combination, as output impedance and quiescent current are substantially reduced.

Features

- Wide Range of Available, Fixed Output Voltages
- Low Cost
- Internal Short Circuit Current Limiting
- Internal Thermal Overload Protection
- No External Components Required
- Complementary Negative Regulators Offered (MC79L00A Series)
- Pb−Free Packages are Available
- NCV Prefix for Automotive and Other Applications Requiring Site and Control Changes

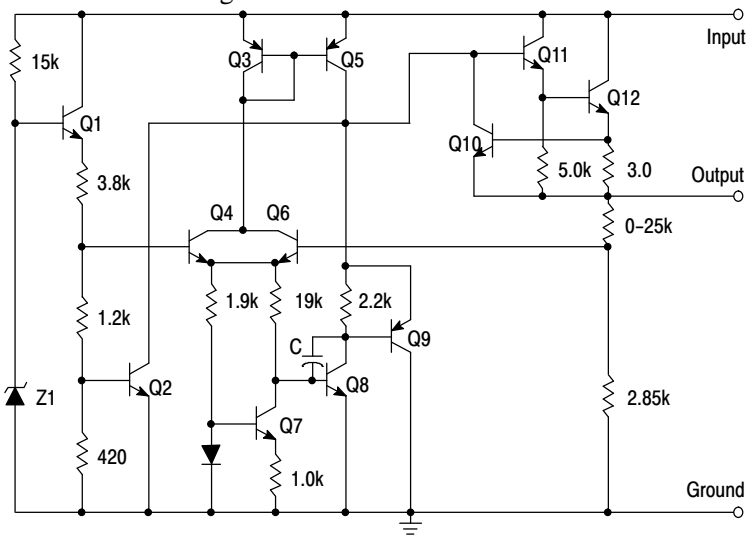

Figure 1. Representative Schematic Diagram

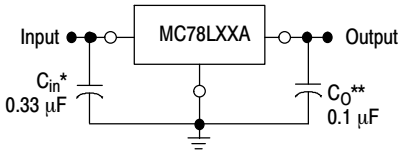

Figure 2. Standard Application

A common ground is required between the input and the output voltages. The input voltage must remain typically 2.0 V above the output voltage even during the low point on the input ripple voltage.

* C_{in} is required if regulator is located an appreciable distance from power supply filter.

** C_O is not needed for stability; however, it does improve transient response.

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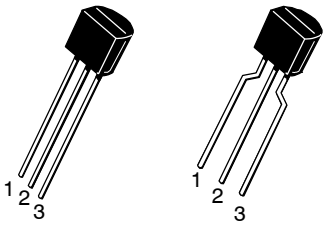


STRAIGHT LEAD BULK PACK

BENT LEAD TAPE & REEL AMMO PACK

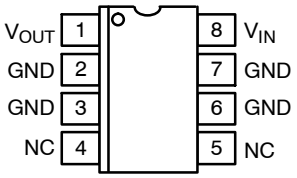
TO−92
P SUFFIX
CASE 029

Pin: 1. Output
2. Ground
3. Input

SOIC−8*
D SUFFIX
CASE 751

*SOIC−8 is an internally modified SO−8 package. Pins 2, 3, 6, and 7 are electrically common to the die attach flag. This internal lead frame modification decreases package thermal resistance and increases power dissipation capability when appropriately mounted on a printed circuit board. SOIC−8 conforms to all external dimensions of the standard SO−8 package.

PIN CONNECTIONS



(Top View)

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 10 of this data sheet.

DEVICE MARKING INFORMATION

See general marking information in the device marking section on page 16 of this data sheet.

ABSOLUTE MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Input Voltage (5.0 V−9.0 V) (12 V−18 V) (24 V)	V_I	30 35 40	Vdc
Storage Temperature Range	T_{stg}	−65 to +150	°C
Maximum Junction Temperature	T_J	150	°C
Moisture Sensitivity Level	MSL	1	–
ESD Capability, Human Body Model (Note 1)	ESD_{HBM}	2000	V
ESD Capability, Machine Model (Note 1)	ESD_{MM}	200	V
ESD Capability, Charged Device Model (Note 1)	ESD_{CDM}	2000	V

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. This device series incorporates ESD protection and is tested by the following methods:
   ESD Human Body Model tested per AEC−Q100−002 (EIA/JESD22−A114)
   ESD Machine Model tested per AEC−Q100−003 (EIA/JESD22−A115)
   ESD Charged Device Model tested per EIA/JES D22/C101, Field Induced Charge Model.

THERMAL CHARACTERISTICS

Rating	Symbol	Value	Unit
Package Dissipation	PD	Internally Limited	W
Thermal Characteristics, TO−92 Thermal Resistance, Junction−to−Ambient	$R_{\theta JA}$	200	°C/W
Thermal Characteristics, SOIC8 Thermal Resistance, Junction−to−Ambient	$R_{\theta JA}$	Refer to Figure 8	°C/W

2. Thermal Resistance, Junction−to−Ambient depends on P.C.B. Copper area. See details in Figure 8.

Thermal Resistance, Junction−to−Case is not defined. SOIC 8 lead and TO-92 packages that do not have a heat sink like other packages may have. This is the reason that a Theta JC is never specified. A little heat transfer will occur through the package but since it is plastic, it is minimal. The majority of the heat that is transferred is through the leads where they connect to the circuit board.

ELECTRICAL CHARACTERISTICS (V_I = 10 V, I_O = 40 mA, C_I = 0.33 μF, C_O = 0.1 μF, −40°C < T_J < +125°C (for MC78LXXAB, NCV78L05A), 0°C < T_J < +125°C (for MC78LXXAC), unless otherwise noted.)

Characteristics	Symbol	MC78L05AC, AB, NCV78L05A			Unit
		Min	Typ	Max	
Output Voltage (T_J = +25°C)	V_O	4.8	5.0	5.2	Vdc
Line Regulation (T_J = +25°C, I_O = 40 mA) 7.0 Vdc ≤ V_I ≤ 20 Vdc 8.0 Vdc ≤ V_I ≤ 20 Vdc	Reg_{line}	 – –	 55 45	 150 100	mV
Load Regulation (T_J = +25°C, 1.0 mA ≤ I_O ≤ 100 mA) (T_J = +25°C, 1.0 mA ≤ I_O ≤ 40 mA)	Reg_{load}	 – –	 11 5.0	 60 30	mV
Output Voltage (7.0 Vdc ≤ V_I ≤ 20 Vdc, 1.0 mA ≤ I_O ≤ 40 mA) (V_I = 10 V, 1.0 mA ≤ I_O ≤ 70 mA)	V_O	 4.75 4.75	 – –	 5.25 5.25	Vdc
Input Bias Current (T_J = +25°C) (T_J = +125°C)	I_{IB}	 – –	 3.8 –	 6.0 5.5	mA
Input Bias Current Change (8.0 Vdc ≤ V_I ≤ 20 Vdc) (1.0 mA ≤ I_O ≤ 40 mA)	ΔI_{IB}	 – –	 – –	 1.5 0.1	mA
Output Noise Voltage (T_A = +25°C, 10 Hz ≤ f ≤ 100 kHz)	V_n	–	40	–	μV
Ripple Rejection (I_O = 40 mA, f = 120 Hz, 8.0 Vdc ≤ V_I ≤ 18 V, T_J = +25°C)	RR	41	49	–	dB
Dropout Voltage (T_J = +25°C)	$V_I - V_O$	–	1.7	–	Vdc

NOTE: NCV78L05A: T_{low} = −40°C, T_{high} = +125°C. Guaranteed by design. NCV prefix is for automotive and other applications requiring site and change control.

ELECTRICAL CHARACTERISTICS (V_I = 14 V, I_O = 40 mA, C_I = 0.33 μF, C_O = 0.1 μF, −40°C < T_J < +125°C (for MC78LXXAB), 0°C < T_J < +125°C (for MC78LXXAC), unless otherwise noted.)

Characteristics	Symbol	MC78L08AC, AB			Unit
		Min	Typ	Max	
Output Voltage (T_J = +25°C)	V_O	7.7	8.0	8.3	Vdc
Line Regulation (T_J = +25°C, I_O = 40 mA) 10.5 Vdc ≤ V_I ≤ 23 Vdc 11 Vdc ≤ V_I ≤ 23 Vdc	Reg_{line}	 – –	 20 12	 175 125	mV
Load Regulation (T_J = +25°C, 1.0 mA ≤ I_O ≤ 100 mA) (T_J = +25°C, 1.0 mA ≤ I_O ≤ 40 mA)	Reg_{load}	 – –	 15 8.0	 80 40	mV
Output Voltage (10.5 Vdc ≤ V_I ≤ 23 Vdc, 1.0 mA ≤ I_O ≤ 40 mA) (V_I = 14 V, 1.0 mA ≤ I_O ≤ 70 mA)	V_O	 7.6 7.6	 – –	 8.4 8.4	Vdc
Input Bias Current (T_J = +25°C) (T_J = +125°C)	I_{IB}	 – –	 3.0 –	 6.0 5.5	mA
Input Bias Current Change (11 Vdc ≤ V_I ≤ 23 Vdc) (1.0 mA ≤ I_O ≤ 40 mA)	ΔI_{IB}	 – –	 – –	 1.5 0.1	mA
Output Noise Voltage (T_A = +25°C, 10 Hz ≤ f ≤ 100 kHz)	V_n	–	60	–	μV
Ripple Rejection (I_O = 40 mA, f = 120 Hz, 12 V ≤ V_I ≤ 23 V, T_J = +25°C)	RR	37	57	–	dB
Dropout Voltage (T_J = +25°C)	$V_I - V_O$	–	1.7	–	Vdc

ELECTRICAL CHARACTERISTICS (V_I = 15 V, I_O = 40 mA, C_I = 0.33 μF, C_O = 0.1 μF, −40°C < T_J < +125°C (for MC78LXXAB), 0°C < T_J < +125°C (for MC78LXXAC), unless otherwise noted.)

Characteristics	Symbol	MC78L09AC, AB			Unit
		Min	Typ	Max	
Output Voltage (T_J = +25°C)	V_O	8.6	9.0	9.4	Vdc
Line Regulation (T_J = +25°C, I_O = 40 mA) 11.5 Vdc ≤ V_I ≤ 24 Vdc 12 Vdc ≤ V_I ≤ 24 Vdc	Reg_{line}	 – –	 20 12	 175 125	mV
Load Regulation (T_J = +25°C, 1.0 mA ≤ I_O ≤ 100 mA) (T_J = +25°C, 1.0 mA ≤ I_O ≤ 40 mA)	Reg_{load}	 – –	 15 8.0	 90 40	mV
Output Voltage (11.5 Vdc ≤ V_I ≤ 24 Vdc, 1.0 mA ≤ I_O ≤ 40 mA) (V_I = 15 V, 1.0 mA ≤ I_O ≤ 70 mA)	V_O	 8.5 8.5	 – –	 9.5 9.5	Vdc
Input Bias Current (T_J = +25°C) (T_J = +125°C)	I_{IB}	 – –	 3.0 –	 6.0 5.5	mA
Input Bias Current Change (11 Vdc ≤ V_I ≤ 23 Vdc) (1.0 mA ≤ I_O ≤ 40 mA)	ΔI_{IB}	 – –	 – –	 1.5 0.1	mA
Output Noise Voltage (T_A = +25°C, 10 Hz ≤ f ≤ 100 kHz)	V_n	–	60	–	μV
Ripple Rejection (I_O = 40 mA, f = 120 Hz, 13 V ≤ V_I ≤ 24 V, T_J = +25°C)	RR	37	57	–	dB
Dropout Voltage (T_J = +25°C)	$V_I - V_O$	–	1.7	–	Vdc

ELECTRICAL CHARACTERISTICS (V_I = 19 V, I_O = 40 mA, C_I = 0.33 μF, C_O = 0.1 μF, −40°C < T_J < +125°C (for MC78LXXAB), 0°C < T_J < +125°C (for MC78LXXAC), unless otherwise noted.)

Characteristics	Symbol	MC78L12AC, AB			Unit
		Min	Typ	Max	
Output Voltage (T_J = +25°C)	V_O	11.5	12	12.5	Vdc
Line Regulation (T_J = +25°C, I_O = 40 mA) 14.5 Vdc ≤ V_I ≤ 27 Vdc 16 Vdc ≤ V_I ≤ 27 Vdc	Reg_{line}	 – –	 120 100	 250 200	mV
Load Regulation (T_J = +25°C, 1.0 mA ≤ I_O ≤ 100 mA) (T_J = +25°C, 1.0 mA ≤ I_O ≤ 40 mA)	Reg_{load}	 – –	 20 10	 100 50	mV
Output Voltage (14.5 Vdc ≤ V_I ≤ 27 Vdc, 1.0 mA ≤ I_O ≤ 40 mA) (V_I = 19 V, 1.0 mA ≤ I_O ≤ 70 mA)	V_O	 11.4 11.4	 – –	 12.6 12.6	Vdc
Input Bias Current (T_J = +25°C) (T_J = +125°C)	I_{IB}	 – –	 4.2 –	 6.5 6.0	mA
Input Bias Current Change (16 Vdc ≤ V_I ≤ 27 Vdc) (1.0 mA ≤ I_O ≤ 40 mA)	ΔI_{IB}	 – –	 – –	 1.5 0.1	mA
Output Noise Voltage (T_A = +25°C, 10 Hz ≤ f ≤ 100 kHz)	V_n	–	80	–	μV
Ripple Rejection (I_O = 40 mA, f = 120 Hz, 15 V ≤ V_I ≤ 25 V, T_J = +25°C)	RR	37	42	–	dB
Dropout Voltage (T_J = +25°C)	$V_I - V_O$	–	1.7	–	Vdc

ELECTRICAL CHARACTERISTICS (V_I = 23 V, I_O = 40 mA, C_I = 0.33 μF, C_O = 0.1 μF, −40°C < T_J < +125°C (for MC78LXXAB), 0°C < T_J < +125°C (for MC78LXXAC), unless otherwise noted.)

Characteristics	Symbol	MC78L15AC, AB / NCV78L15A			Unit
		Min	Typ	Max	
Output Voltage (T_J = +25°C)	V_O	14.4	15	15.6	Vdc
Line Regulation (T_J = +25°C, I_O = 40 mA) 17.5 Vdc ≤ V_I ≤ 30 Vdc 20 Vdc ≤ V_I ≤ 30 Vdc	Reg_{line}	 – –	 130 110	 300 250	mV
Load Regulation (T_J = +25°C, 1.0 mA ≤ I_O ≤ 100 mA) (T_J = +25°C, 1.0 mA ≤ I_O ≤ 40 mA)	Reg_{load}	 – –	 25 12	 150 75	mV
Output Voltage (17.5 Vdc ≤ V_I ≤ 30 Vdc, 1.0 mA ≤ I_O ≤ 40 mA) (V_I = 23 V, 1.0 mA ≤ I_O ≤ 70 mA)	V_O	 14.25 14.25	 – –	 15.75 15.75	Vdc
Input Bias Current (T_J = +25°C) (T_J = +125°C)	I_{IB}	 – –	 4.4 –	 6.5 6.0	mA
Input Bias Current Change (20 Vdc ≤ V_I ≤ 30 Vdc) (1.0 mA ≤ I_O ≤ 40 mA)	ΔI_{IB}	 – –	 – –	 1.5 0.1	mA
Output Noise Voltage (T_A = +25°C, 10 Hz ≤ f ≤ 100 kHz)	V_n	–	90	–	μV
Ripple Rejection (I_O = 40 mA, f = 120 Hz, 18.5 V ≤ V_I ≤ 28.5 V, T_J = +25°C)	RR	34	39	–	dB
Dropout Voltage (T_J = +25°C)	$V_I - V_O$	–	1.7	–	Vdc

ELECTRICAL CHARACTERISTICS (V_I = 27 V, I_O = 40 mA, C_I = 0.33 μF, C_O = 0.1 μF, 0°C < T_J < +125°C, unless otherwise noted.)

Characteristics	Symbol	MC78L18AC			Unit
		Min	Typ	Max	
Output Voltage (T_J = +25°C)	V_O	17.3	18	18.7	Vdc
Line Regulation (T_J = +25°C, I_O = 40 mA) 21.4 Vdc ≤ V_I ≤ 33 Vdc 20.7 Vdc ≤ V_I ≤ 33 Vdc 22 Vdc ≤ V_I ≤ 33 Vdc 21 Vdc ≤ V_I ≤ 33 Vdc	Reg_{line}	 – –	 45 35	 325 275	mV
Load Regulation (T_J = +25°C, 1.0 mA ≤ I_O ≤ 100 mA) (T_J = +25°C, 1.0 mA ≤ I_O ≤ 40 mA)	Reg_{load}	 – –	 30 15	 170 85	mV
Output Voltage (21.4 Vdc ≤ V_I ≤ 33 Vdc, 1.0 mA ≤ I_O ≤ 40 mA) (20.7 Vdc ≤ V_I ≤ 33 Vdc, 1.0 mA ≤ I_O ≤ 40 mA) (V_I = 27 V, 1.0 mA ≤ I_O ≤ 70 mA) (V_I = 27 V, 1.0 mA ≤ I_O ≤ 70 mA)	V_O	 17.1 17.1	 – –	 18.9 18.9	Vdc
Input Bias Current (T_J = +25°C) (T_J = +125°C)	I_{IB}	 – –	 3.1 –	 6.5 6.0	mA
Input Bias Current Change (22 Vdc ≤ V_I ≤ 33 Vdc) (21 Vdc ≤ V_I ≤ 33 Vdc) (1.0 mA ≤ I_O ≤ 40 mA)	ΔI_{IB}	 – –	 – –	 1.5 0.1	mA
Output Noise Voltage (T_A = +25°C, 10 Hz ≤ f ≤ 100 kHz)	V_n	–	150	–	μV
Ripple Rejection (I_O = 40 mA, f = 120 Hz, 23 V ≤ V_I ≤ 33 V, T_J = +25°C)	RR	33	48	–	dB
Dropout Voltage (T_J = +25°C)	$V_I - V_O$	–	1.7	–	Vdc

ELECTRICAL CHARACTERISTICS (V_I = 33 V, I_O = 40 mA, C_I = 0.33 μF, C_O = 0.1 μF, 0°C < T_J < +125°C, unless otherwise noted.)

Characteristics	Symbol	MC78L24AC			Unit
		Min	Typ	Max	
Output Voltage (T_J = +25°C)	V_O	23	24	25	Vdc
Line Regulation	Reg_{line}				mV
(T_J = +25°C, I_O = 40 mA)					
27.5 Vdc ≤ V_I ≤ 38 Vdc		–	–	–	
28 Vdc ≤ V_I ≤ 80 Vdc		–	50	300	
27 Vdc ≤ V_I ≤ 38 Vdc		–	60	350	
Load Regulation	Reg_{load}				mV
(T_J = +25°C, 1.0 mA ≤ I_O ≤ 100 mA)		–	40	200	
(T_J = +25°C, 1.0 mA ≤ I_O ≤ 40 mA)		–	20	100	
Output Voltage	V_O				Vdc
(28 Vdc ≤ V_I ≤ 38 Vdc, 1.0 mA ≤ I_O ≤ 40 mA)					
(27 Vdc ≤ V_I ≤ 38 Vdc, 1.0 mA ≤ I_O ≤ 40 mA)		22.8	–	25.2	
(28 Vdc ≤ V_I _ 33 Vdc, 1.0 mA ≤ I_O ≤ 70 mA)					
(27 Vdc ≤ V_I ≤ 33 Vdc, 1.0 mA ≤ I_O ≤ 70 mA)		22.8	–	25.2	
Input Bias Current	I_{IB}				mA
(T_J = +25°C)		–	3.1	6.5	
(T_J = +125°C)		–	–	6.0	
Input Bias Current Change	ΔI_{IB}				mA
(28 Vdc ≤ V_I ≤ 38 Vdc)		–	–	1.5	
(1.0 mA ≤ I_O ≤ 40 mA)		–	–	0.1	
Output Noise Voltage (T_A = +25°C, 10 Hz ≤ f ≤ 100 kHz)	V_n	–	200	–	μV
Ripple Rejection (I_O = 40 mA, f = 120 Hz, 29 V ≤ V_I ≤ 35 V, T_J = +25°C)	RR	31	45	–	dB
Dropout Voltage (T_J = +25°C)	$V_I - V_O$	–	1.7	–	Vdc

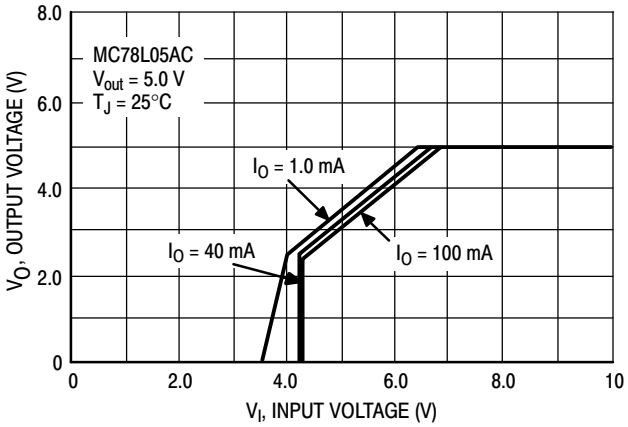


Figure 3. Dropout Characteristics

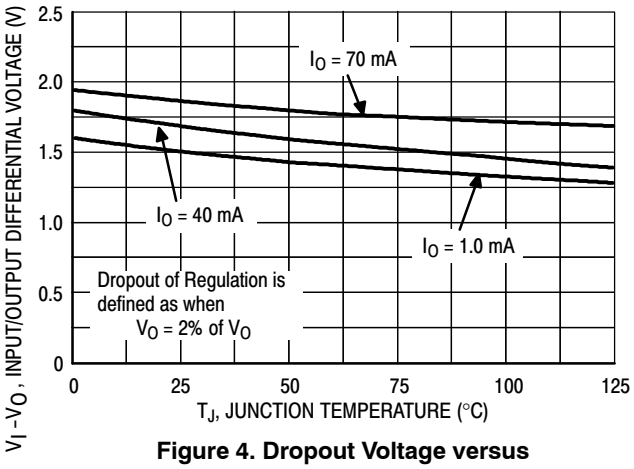


Figure 4. Dropout Voltage versus Junction Temperature

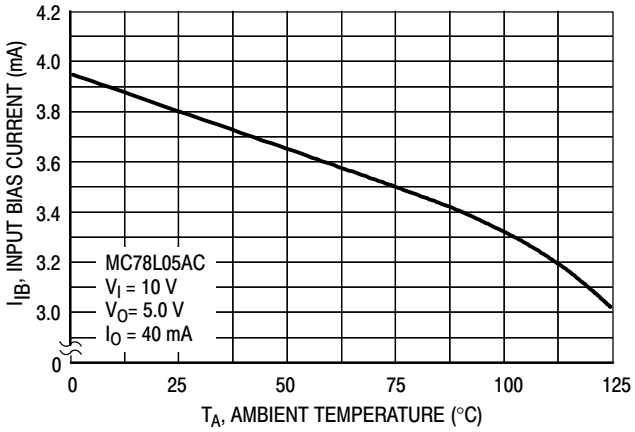


Figure 5. Input Bias Current versus Ambient Temperature

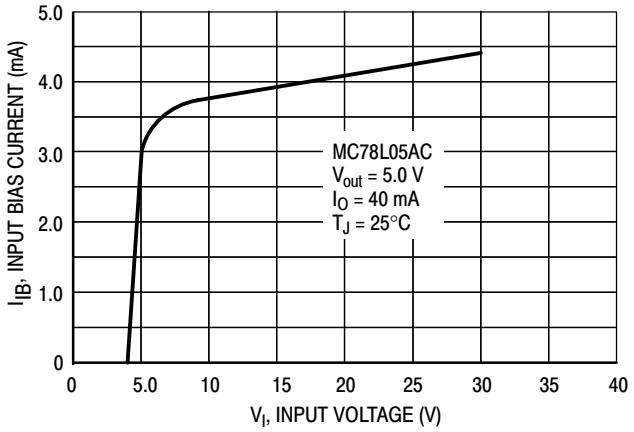


Figure 6. Input Bias Current versus Input Voltage

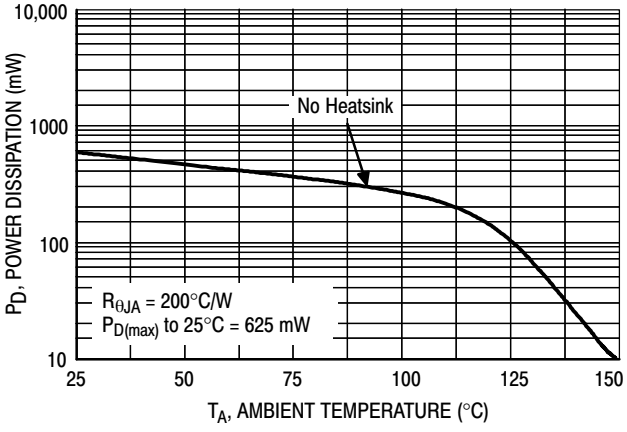


Figure 7. Maximum Average Power Dissipation versus Ambient Temperature – TO−92 Type Package

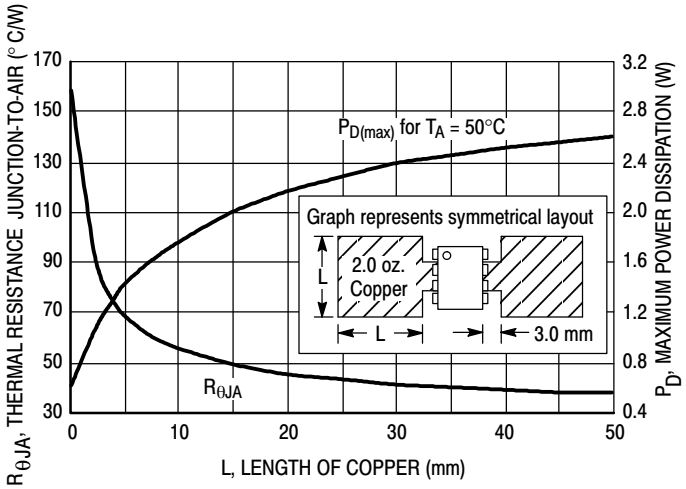


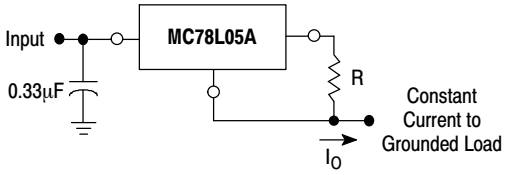
Figure 8. SOIC−8 Thermal Resistance and Maximum Power Dissipation versus P.C.B. Copper Length

APPLICATIONS INFORMATION

Design Considerations

The MC78L00A Series of fixed voltage regulators are designed with Thermal Overload Protection that shuts down the circuit when subjected to an excessive power overload condition. Internal Short Circuit Protection limits the maximum current the circuit will pass.

In many low current applications, compensation capacitors are not required. However, it is recommended that the regulator input be bypassed with a capacitor if the regulator is connected to the power supply filter with long wire lengths, or if the output load capacitance is large. The input bypass capacitor should be selected to provide good high−frequency characteristics to insure stable operation under all load conditions. A 0.33 μF or larger tantalum, mylar, or other capacitor having low internal impedance at high frequencies should be chosen. The bypass capacitor should be mounted with the shortest possible leads directly across the regulators input terminals. Good construction techniques should be used to minimize ground loops and lead resistance drops since the regulator has no external sense lead. Bypassing the output is also recommended.



The MC78L00 regulators can also be used as a current source when connected as above. In order to minimize dissipation the MC78L05C is chosen in this application. Resistor R determines the current as follows:

$$I_O = \frac{5.0\ V}{R} + I_B$$

I_{IB} = 3.8 mA over line and load changes

For example, a 100 mA current source would require R to be a 50 Ω, 1/2 W resistor and the output voltage compliance would be the input voltage less 7 V.

Figure 9. Current Regulator

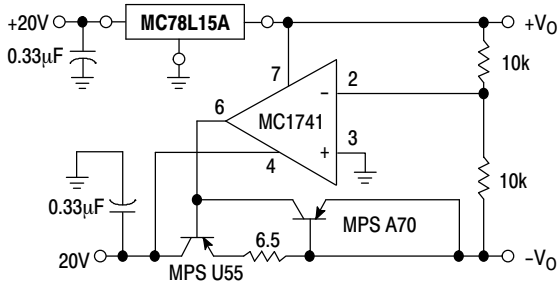


Figure 10. ± 15 V Tracking Voltage Regulator

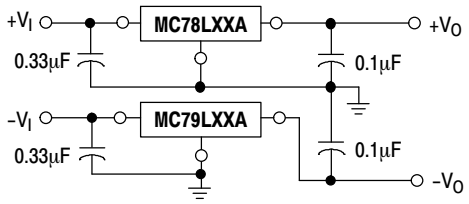


Figure 11. Positive and Negative Regulator

ORDERING INFORMATION

Device	Output Voltage	Operating Temperature Range	Package	Shipping†
MC78L05ABD	5.0 V	T_J = −40° to +125°C	SOIC−8	98 Units/Rail
MC78L05ABDG			SOIC−8 (Pb−Free)	98 Units/Rail
NCV78L05ABDG*			SOIC−8 (Pb−Free)	98 Units/Rail
MC78L05ABDR2			SOIC−8	2500 Tape & Reel
MC78L05ABDR2G			SOIC−8 (Pb−Free)	2500 Tape & Reel
NCV78L05ABDR2*			SOIC−8	2500 Tape & Reel
NCV78L05ABDR2G*			SOIC−8 (Pb−Free)	2500 Tape & Reel
MC78L05ABP			TO−92	2000 Units/Bag
MC78L05ABPG			TO−92 (Pb−Free)	2000 Units/Bag
NCV78L05ABPG*			TO−92 (Pb−Free)	2000 Units/Bag
MC78L05ABPRA			TO−92	2000 Tape & Reel
MC78L05ABPRAG			TO−92 (Pb−Free)	2000 Tape & Reel
NCV78L05ABPRAG*			TO−92 (Pb−Free)	2000 Tape & Reel
MC78L05ABPRE			TO−92	2000 Tape & Reel
MC78L05ABPREG			TO−92 (Pb−Free)	2000 Tape & Reel
NCV78L05ABPREG*			TO−92 (Pb−Free)	2000 Tape & Reel
MC78L05ABPRM			TO−92	2000 Ammo Pack
MC78L05ABPRMG			TO−92 (Pb−Free)	2000 Ammo Pack
NCV78L05ABPRMG*			TO−92 (Pb−Free)	2000 Ammo Pack
NCV78L05ABPRPG*			TO−92 (Pb−Free)	2000 Ammo Pack
MC78L05ACD	5.0 V	T_J = 0° to +125°C	SOIC−8	98 Units/Rail
MC78L05ACDG			SOIC−8 (Pb−Free)	98 Units/Rail
MC78L05ACDR2			SOIC−8	2500 Tape & Reel
MC78L05ACDR2G			SOIC−8 (Pb−Free)	2500 Tape & Reel
MC78L05ACP			TO−92	2000 Units/Bag
MC78L05ACPG			TO−92 (Pb−Free)	2000 Units/Bag
MC78L05ACPRA			TO−92	2000 Tape & Reel
MC78L05ACPRAG			TO−92 (Pb−Free)	2000 Tape & Reel
MC78L05ACPRE			TO−92	2000 Tape & Reel
MC78L05ACPREG			TO−92 (Pb−Free)	2000 Tape & Reel
MC78L05ACPRM			TO−92	2000 Ammo Pack
MC78L05ACPRMG			TO−92 (Pb−Free)	2000 Ammo Pack
MC78L05ACPRP			TO−92	2000 Ammo Pack
MC78L05ACPRPG			TO−92 (Pb−Free)	2000 Ammo Pack

*NCV78L05A: T_{low} = −40°C, T_{high} = +125°C. Guaranteed by design. NCV prefix is for automotive and other applications requiring site and change control.
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

ORDERING INFORMATION (continued)

Device	Output Voltage	Operating Temperature Range	Package	Shipping†
MC78L08ABD	8.0 V	T_J = −40° to +125°C	SOIC−8	98 Units/Rail
MC78L08ABDG			SOIC−8 (Pb−Free)	98 Units/Rail
MC78L08ABDR2			SOIC−8	2500 Tape & Reel
MC78L08ABDR2G			SOIC−8 (Pb−Free)	2500 Tape & Reel
NCV78L08ABDR2*			SOIC−8	2500 Tape & Reel
NCV78L08ABDR2G*			SOIC−8 (Pb−Free)	2500 Tape & Reel
MC78L08ABP			TO−92	2000 Units/Bag
MC78L08ABPG			TO−92 (Pb−Free)	2000 Units/Bag
MC78L08ABPRA			TO−92	2000 Tape & Reel
MC78L08ABPRAG			TO−92 (Pb−Free)	2000 Tape & Reel
MC78L08ABPRP			TO−92	2000 Ammo Pack
MC78L08ABPRPG			TO−92 (Pb−Free)	2000 Ammo Pack
MC78L08ACD		T_J = 0° to +125°C	SOIC−8	98 Units/Rail
MC78L08ACDG			SOIC−8 (Pb−Free)	98 Units/Rail
MC78L08ACDR2			SOIC−8	2500 Tape & Reel
MC78L08ACDR2G			SOIC−8 (Pb−Free)	2500 Tape & Reel
MC78L08ACP			TO−92	2000 Units/Bag
MC78L08ACPG			TO−92 (Pb−Free)	2000 Units/Bag
MC78L08ACPRA			TO−92	2000 Tape & Reel
MC78L08ACPRAG			TO−92 (Pb−Free)	2000 Tape & Reel
MC78L08ACPRE			TO−92	2000 Tape & Reel
MC78L08ACPREG			TO−92 (Pb−Free)	2000 Tape & Reel
MC78L08ACPRP			TO−92	2000 Ammo Pack
MC78L08ACPRPG			TO−92 (Pb−Free)	2000 Ammo Pack

ORDERING INFORMATION (continued)(continued)

Device	Output Voltage	Operating Temperature Range	Package	Shipping†
MC78L09ABD	9.0 V	T_J = −40° to +125°C	SOIC−8	98 Units/Rail
MC78L09ABDG			SOIC−8 (Pb−Free)	98 Units/Rail
MC78L09ABDR2			SOIC−8	2500 Tape & Reel
MC78L09ABDR2G			SOIC−8 (Pb−Free)	2500 Tape & Reel
MC78L09ABPRA			TO−92	2000 Tape & Reel
MC78L09ABPRAG			TO−92 (Pb−Free)	2000 Tape & Reel
MC78L09ABPRP			TO−92	2000 Ammo Pack
MC78L09ABPRPG			TO−92 (Pb−Free)	2000 Ammo Pack
MC78L09ACD	9.0 V	T_J = 0° to +125°C	SOIC−8	98 Units/Rail
MC78L09ACDG			SOIC−8 (Pb−Free)	98 Units/Rail
MC78L09ACDR2			SOIC−8	2500 Tape & Reel
MC78L09ACDR2G			SOIC−8 (Pb−Free)	2500 Tape & Reel
MC78L09ACP			TO−92	2000 Units/Bag
MC78L09ACPG			TO−92 (Pb−Free)	2000 Units/Bag

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

ORDERING INFORMATION (continued)

Device	Output Voltage	Operating Temperature Range	Package	Shipping†
MC78L12ABD	12 V	T_J = –40° to +125°C	SOIC–8	98 Units/Rail
MC78L12ABDG			SOIC–8 (Pb–Free)	98 Units/Rail
MC78L12ABDR2			SOIC–8	2500 Tape & Reel
MC78L12ABDR2G			SOIC–8 (Pb–Free)	2500 Tape & Reel
NCV78L12ABDG*			SOIC–8 (Pb–Free)	98 Units/Rail
NCV78L12ABDR2*			SOIC–8	2500 Tape & Reel
NCV78L12ABDR2G*			SOIC–8 (Pb–Free)	2500 Tape & Reel
MC78L12ABP			TO–92	2000 Units/Bag
MC78L12ABPG			TO–92 (Pb–Free)	2000 Units/Bag
MC78L12ABPRP			TO–92	2000 Ammo Pack
MC78L12ABPRPG			TO–92 (Pb–Free)	2000 Ammo Pack
NCV78L12ABPG*			TO–92 (Pb–Free)	2000 Units/Bag
MC78L12ACD		T_J = 0° to +125°C	SOIC–8	98 Units/Rail
MC78L12ACDG			SOIC–8 (Pb–Free)	98 Units/Rail
MC78L12ACDR2			SOIC–8	2500 Tape & Reel
MC78L12ACDR2G			SOIC–8 (Pb–Free)	2500 Tape & Reel
MC78L12ACP			TO–92	2000 Units/Bag
MC78L12ACPG			TO–92 (Pb–Free)	2000 Units/Bag
MC78L12ACPRA			TO–92	2000 Tape & Reel
MC78L12ACPRAG			TO–92 (Pb–Free)	2000 Tape & Reel
MC78L12ACPRE			TO–92	2000 Tape & Reel
MC78L12ACPREG			TO–92 (Pb–Free)	2000 Tape & Reel
MC78L12ACPRM			TO–92	2000 Ammo Pack
MC78L12ACPRMG			TO–92 (Pb–Free)	2000 Ammo Pack
MC78L12ACPRP			TO–92	2000 Ammo Pack
MC78L12ACPRPG			TO–92 (Pb–Free)	2000 Ammo Pack

*NCV78L12A: T_{low} = –40°C, T_{high} = +125°C. Guaranteed by design. NCV prefix is for automotive and other applications requiring site and change control.
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

ORDERING INFORMATION (continued)

Device	Output Voltage	Operating Temperature Range	Package	Shipping†
MC78L15ABD	15 V	T_J = −40° to +125°C	SOIC−8	98 Units/Rail
MC78L15ABDG			SOIC−8 (Pb−Free)	98 Units/Rail
MC78L15ABDR2			SOIC−8	2500 Tape & Reel
MC78L15ABDR2G			SOIC−8 (Pb−Free)	2500 Tape & Reel
NCV78L15ABDR2G*			SOIC−8 (Pb−Free)	2500 Tape & Reel
MC78L15ABP			TO−92	2000 Units/Bag
MC78L15ABPG			TO−92 (Pb−Free)	2000 Units/Bag
MC78L15ABPRA			TO−92	2000 Tape & Reel
MC78L15ABPRAG			TO−92 (Pb−Free)	2000 Tape & Reel
MC78L15ABPRP			TO−92	2000 Ammo Pack
MC78L15ABPRPG			TO−92 (Pb−Free)	2000 Ammo Pack
MC78L15ACD		T_J = 0° to +125°C	SOIC−8	98 Units/Rail
MC78L15ACDG			SOIC−8 (Pb−Free)	98 Units/Rail
MC78L15ACDR2			SOIC−8	2500 Tape & Reel
MC78L15ACDR2G			SOIC−8 (Pb−Free)	2500 Tape & Reel
MC78L15ACP			TO−92	2000 Units/Bag
MC78L15ACPG			TO−92 (Pb−Free)	2000 Units/Bag
MC78L15ACPRA			TO−92	2000 Tape & Reel
MC78L15ACPRAG			TO−92 (Pb−Free)	2000 Tape & Reel
MC78L15ACPRP			TO−92	2000 Ammo Pack
MC78L15ACPRPG			TO−92 (Pb−Free)	2000 Ammo Pack

*NCV78L15A: T_{low} = −40°C, T_{high} = +125°C. Guaranteed by design. NCV prefix is for automotive and other applications requiring site and change control.
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

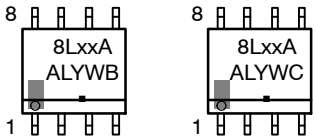
ORDERING INFORMATION (continued)

Device	Output Voltage	Operating Temperature Range	Package	Shipping†
MC78L18ABP	18 V	T_J = −40° to +125°C	TO−92	2000 Units/Bag
MC78L18ABPG			TO−92 (Pb−Free)	2000 Units/Bag
MC78L18ACP		T_J = 0° to +125°C	TO−92	2000 Units/Bag
MC78L18ACPG			TO−92 (Pb−Free)	2000 Units/Bag
MC78L18ACPRA			TO−92	2000 Tape & Reel
MC78L18ACPRAG			TO−92 (Pb−Free)	2000 Tape & Reel
MC78L18ACPRM			TO−92	2000 Ammo Pack
MC78L18ACPRMG			TO−92 (Pb−Free)	2000 Ammo Pack
MC78L18ACPRP			TO−92	2000 Ammo Pack
MC78L18ACPRPG			TO−92 (Pb−Free)	2000 Ammo Pack
MC78L24ABP	24 V	T_J = −40° to +125°C	TO−92	2000 Units/Bag
MC78L24ABPG			TO−92 (Pb−Free)	2000 Units/Bag
NCV78L24ABPRPG*			TO−92 (Pb−Free)	2000 Units/Bag
MC78L24ACP		T_J = 0° to +125°C	TO−92	2000 Units/Bag
MC78L24ACPG			TO−92 (Pb−Free)	2000 Units/Bag
MC78L24ACPRA			TO−92	2000 Tape & Reel
MC78L24ACPRAG			TO−92 (Pb−Free)	2000 Tape & Reel
MC78L24ACPRP			TO−92	2000 Ammo Pack
MC78L24ACPRPG			TO−92 (Pb−Free)	2000 Ammo Pack

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

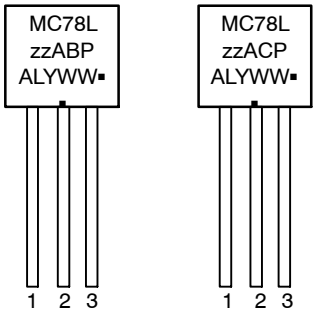
MARKING DIAGRAMS

SOIC−8
D SUFFIX
CASE 751



xx = 05, 08, 09, 12, or 15
A = Assembly Location
L = Wafer Lot
Y = Year
W = Work Week
B, C = Temperature Range
▪ = Pb−Free Package

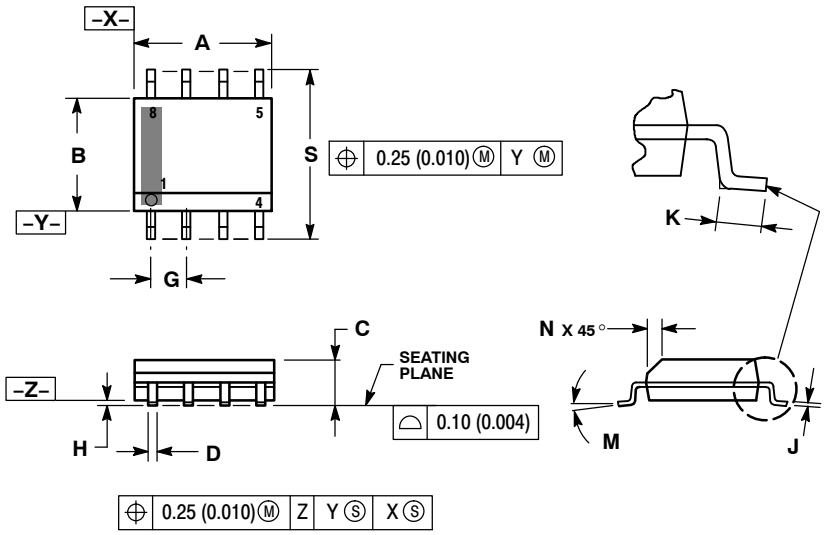
TO−92
P SUFFIX
CASE 029



zz = 05, 08, 09, 12, 15, 18 or 24
A = Assembly Location
L = Wafer Lot
Y = Year
WW = Work Week
▪ = Pb−Free Package
(Note: Microdot may be in either location)

PACKAGE DIMENSIONS

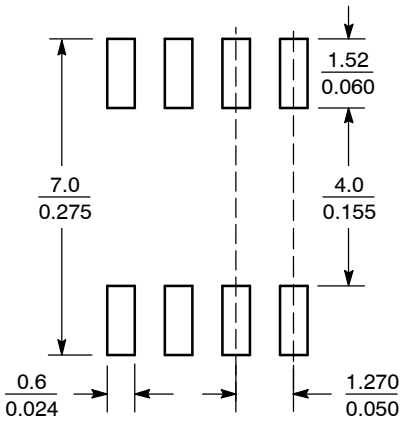
SOIC−8 NB
D SUFFIX
CASE 751−07
ISSUE AJ



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.
6. 751−01 THRU 751−06 ARE OBSOLETE. NEW STANDARD IS 751−07.

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	4.80	5.00	0.189	0.197
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.053	0.069
D	0.33	0.51	0.013	0.020
G	1.27 BSC		0.050 BSC	
H	0.10	0.25	0.004	0.010
J	0.19	0.25	0.007	0.010
K	0.40	1.27	0.016	0.050
M	0 °	8 °	0 °	8 °
N	0.25	0.50	0.010	0.020
S	5.80	6.20	0.228	0.244

SOLDERING FOOTPRINT*

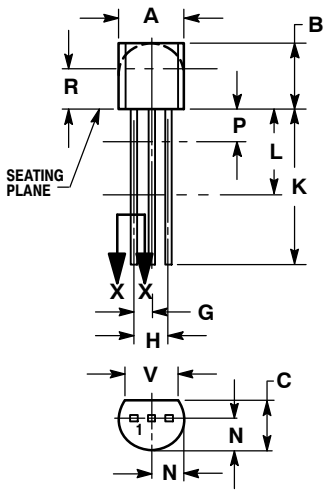


SCALE 6:1 (mm / inches)

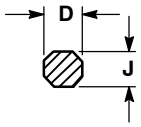
*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

PACKAGE DIMENSIONS

TO−92 (TO−226)
P SUFFIX
CASE 29−11
ISSUE AM



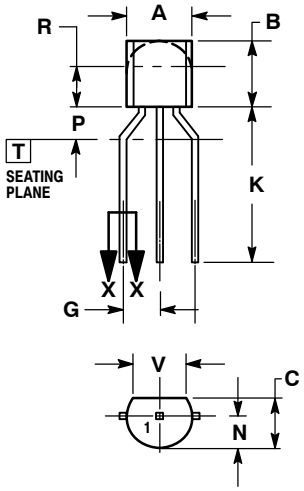
STRAIGHT LEAD
BULK PACK



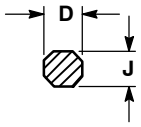
SECTION X−X

NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. CONTOUR OF PACKAGE BEYOND DIMENSION R IS UNCONTROLLED.
4. LEAD DIMENSION IS UNCONTROLLED IN P AND BEYOND DIMENSION K MINIMUM.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.175	0.205	4.45	5.20
B	0.170	0.210	4.32	5.33
C	0.125	0.165	3.18	4.19
D	0.016	0.021	0.407	0.533
G	0.045	0.055	1.15	1.39
H	0.095	0.105	2.42	2.66
J	0.015	0.020	0.39	0.50
K	0.500	---	12.70	---
L	0.250	---	6.35	---
N	0.080	0.105	2.04	2.66
P	---	0.100	---	2.54
R	0.115	---	2.93	---
V	0.135	---	3.43	---



BENT LEAD
TAPE & REEL
AMMO PACK



SECTION X−X

NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. CONTOUR OF PACKAGE BEYOND DIMENSION R IS UNCONTROLLED.
4. LEAD DIMENSION IS UNCONTROLLED IN P AND BEYOND DIMENSION K MINIMUM.

	MILLIMETERS	
DIM	MIN	MAX
A	4.45	5.20
B	4.32	5.33
C	3.18	4.19
D	0.40	0.54
G	2.40	2.80
J	0.39	0.50
K	12.70	---
N	2.04	2.66
P	1.50	4.00
R	2.93	---
V	3.43	---

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MC78L00A/D