

Positive Voltage Regulators 100 mA

MC78L00A Series, NCV78L00A

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)
- NCV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable
- These are Pb-Free Devices

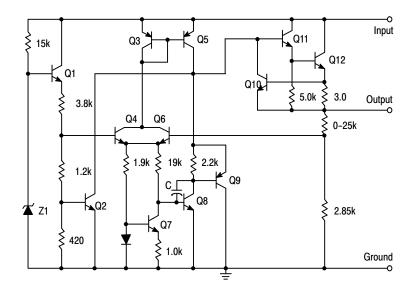
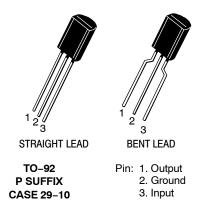


Figure 1. Representative Schematic Diagram





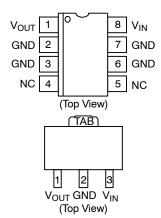
SOIC-8* D SUFFIX CASE 751



SOT-89 CASE 528AG

*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



ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 9 of this data sheet.

DEVICE MARKING INFORMATION

See general marking information in the device marking section on page 12 of this data sheet.

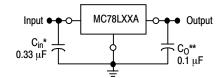


Figure 2. Standard Application

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.

ABSOLUTE MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Input Voltage (5.0 V-9.0 V) (12 V-18 V) (24 V)	Vı	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 those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

- 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	$R_{ heta JA}$	200	°C/W
Thermal Characteristics, SOIC8 Thermal Resistance, Junction-to-Ambient	$R_{ heta JA}$	Refer to Figure 8	°C/W
Thermal Characteristics, SOT-89 Thermal Resistance, Junction-to-Ambient	$R_{ heta JA}$	55	°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 μ F, C_O = 0.1 μ F, -40° C < T_J < +125 $^{\circ}$ C (for MC78LXXAB, NCV78L05A), 0° C < T_J < +125 $^{\circ}$ C (for MC78LXXAC), unless otherwise noted.)

		MC78L0			
Characteristics	Symbol	Min	Тур	Max	Unit
Output Voltage (T _J = +25°C)	Vo	4.8	5.0	5.2	Vdc
Line Regulation $(T_J = +25^{\circ}C, I_O = 40 \text{ mA})$ $7.0 \text{ Vdc} \le V_I \le 20 \text{ Vdc}$ $8.0 \text{ Vdc} \le V_I \le 20 \text{ Vdc}$	Reg _{line}	- -	55 45	150 100	mV
Load Regulation $ (T_J = +25^{\circ}C, \ 1.0 \ \text{mA} \le I_O \le 100 \ \text{mA}) \\ (T_J = +25^{\circ}C, \ 1.0 \ \text{mA} \le I_O \le 40 \ \text{mA}) $	Reg _{load}		11 5.0	60 30	mV
Output Voltage $ (7.0 \text{ Vdc} \leq \text{V}_{\text{I}} \leq 20 \text{ Vdc}, \ 1.0 \text{ mA} \leq \text{I}_{\text{O}} \leq 40 \text{ mA}) \\ (\text{V}_{\text{I}} = 10 \text{ V}, \ 1.0 \text{ mA} \leq \text{I}_{\text{O}} \leq 70 \text{ mA}) $	Vo	4.75 4.75	- -	5.25 5.25	Vdc
Input Bias Current $(T_J = +25^{\circ}C)$ $(T_J = +125^{\circ}C)$	I _{IB}	- -	3.8	6.0 5.5	mA
Input Bias Current Change (8.0 Vdc \leq V _I \leq 20 Vdc) (1.0 mA \leq I _O \leq 40 mA)	Δl _{IB}	- -	- -	1.5 0.1	mA
Output Noise Voltage $(T_A = +25^{\circ}C, 10 \text{ Hz} \le f \le 100 \text{ kHz})$	V _n	-	40	-	μV
Ripple Rejection ($I_O = 40 \text{ mA}$, f = 120 Hz, 8.0 Vdc \leq V _I \leq 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: $T_{low} = -40^{\circ}C$, $T_{high} = +125^{\circ}C$. 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 μ F, C_O = 0.1 μ F, -40° C < T_J < +125 $^{\circ}$ C (for MC78LXXAB), 0 $^{\circ}$ C < T_J < +125 $^{\circ}$ C (for MC78LXXAC), unless otherwise noted.)

		MC78L08AC, AB			
Characteristics	Symbol	Min	Тур	Max	Unit
Output Voltage (T _J = +25°C)	Vo	7.7	8.0	8.3	Vdc
Line Regulation $(T_J = +25^{\circ}C, I_O = 40 \text{ mA})$ $10.5 \text{ Vdc} \le V_I \le 23 \text{ Vdc}$	Reg _{line}	_	20	175	mV
11 $Vdc \le V_1 \le 23 Vdc$		_	12	125	
Load Regulation $(T_J = +25^{\circ}C, 1.0 \text{ mA} \le I_O \le 100 \text{ mA})$ $(T_J = +25^{\circ}C, 1.0 \text{ mA} \le I_O \le 40 \text{ mA})$	Reg _{load}	-	15 8.0	80 40	mV
Output Voltage $ (10.5 \text{ Vdc} \leq \text{V}_{\text{I}} \leq 23 \text{ Vdc}, \ 1.0 \text{ mA} \leq \text{I}_{\text{O}} \leq 40 \text{ mA}) \\ (\text{V}_{\text{I}} = 14 \text{ V}, \ 1.0 \text{ mA} \leq \text{I}_{\text{O}} \leq 70 \text{ mA}) $	Vo	7.6 7.6	- -	8.4 8.4	Vdc
Input Bias Current $(T_J = +25^{\circ}C)$ $(T_J = +125^{\circ}C)$	I _{IB}	- -	3.0	6.0 5.5	mA
Input Bias Current Change (11 $Vdc \le V_1 \le 23 Vdc$) (1.0 $mA \le I_0 \le 40 mA$)	$\Delta I_{ m IB}$	- -	- -	1.5 0.1	mA
Output Noise Voltage ($T_A = +25^{\circ}C$, 10 Hz $\leq f \leq$ 100 kHz)	V _n	-	60	-	μV
Ripple Rejection (I _O = 40 mA, f = 120 Hz, 12 V \leq V _I \leq 23 V, T _J = +25°C)	RR	37	57	-	dB
Dropout Voltage ($T_J = +25^{\circ}C$)	$V_I - V_O$	-	1.7	-	Vdc

ELECTRICAL CHARACTERISTICS (V_I = 15 V, I_O = 40 mA, C_I = 0.33 μ F, C_O = 0.1 μ F, -40° C < T_J < +125 $^{\circ}$ C (for MC78LXXAB), 0 $^{\circ}$ C < T_J < +125 $^{\circ}$ C (for MC78LXXAC), unless otherwise noted.)

		М	C78L09AC,	AB	
Characteristics	Symbol	Min	Тур	Max	Unit
Output Voltage (T _J = +25°C)	Vo	8.6	9.0	9.4	Vdc
Line Regulation $ \begin{array}{l} \text{(T}_J = +25^\circ\text{C, I}_O = 40 \text{ mA)} \\ 11.5 \text{ Vdc} \leq V_I \leq 24 \text{ Vdc} \\ 12 \text{ Vdc} \leq V_I \leq 24 \text{ Vdc} \end{array} $	Reg _{line}	_ _	20 12	175 125	mV
Load Regulation $ (T_J = +25^{\circ}C, 1.0 \text{ mA} \leq I_O \leq 100 \text{ mA}) \\ (T_J = +25^{\circ}C, 1.0 \text{ mA} \leq I_O \leq 40 \text{ mA}) $	Reg _{load}	- -	15 8.0	90 40	mV
Output Voltage (11.5 Vdc \leq V _I \leq 24 Vdc, 1.0 mA \leq I _O \leq 40 mA) (V _I = 15 V, 1.0 mA \leq I _O \leq 70 mA)	Vo	8.5 8.5	- -	9.5 9.5	Vdc
Input Bias Current $(T_J = +25^{\circ}C)$ $(T_J = +125^{\circ}C)$	I _{IB}	- -	3.0	6.0 5.5	mA
Input Bias Current Change (11 Vdc \leq V _I \leq 23 Vdc) (1.0 mA \leq I _O \leq 40 mA)	$\Delta l_{ m lB}$	- -		1.5 0.1	mA
Output Noise Voltage $(T_A = +25^{\circ}C, 10 \text{ Hz} \le f \le 100 \text{ kHz})$	V _n	-	60	-	μV
Ripple Rejection (I_O = 40 mA, f = 120 Hz, 13 V \leq V _I \leq 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 μ F, C_O = 0.1 μ F, -40° C < T_J < +125 $^{\circ}$ C (for MC78LXXAB), 0 $^{\circ}$ C < T_J < +125 $^{\circ}$ C (for MC78LXXAC), unless otherwise noted.)

		MC78L12AC, AB			
Characteristics	Symbol	Min	Тур	Max	Unit
Output Voltage (T _J = +25°C)	Vo	11.5	12	12.5	Vdc
Line Regulation $ (T_J = +25^\circ C, \ I_O = 40 \ Ma) \\ 14.5 \ Vdc \le V_I \le 27 \ Vdc \\ 16 \ Vdc \le V_I \le 27 \ Vdc $	Reg _{line}	_ _	120 100	250 200	mV
Load Regulation $ (T_J = +25^{\circ}C, \ 1.0 \ \text{mA} \le I_O \le 100 \ \text{mA}) \\ (T_J = +25^{\circ}C, \ 1.0 \ \text{mA} \le I_O \le 40 \ \text{mA}) $	Reg _{load}	- -	20 10	100 50	mV
Output Voltage $(14.5 \text{ Vdc} \le \text{V}_{\text{I}} \le 27 \text{ Vdc}, 1.0 \text{ mA} \le \text{I}_{\text{O}} \le 40 \text{ mA})$ $(\text{V}_{\text{I}} = 19 \text{ V}, 1.0 \text{ mA} \le \text{I}_{\text{O}} \le 70 \text{ mA})$	Vo	11.4 11.4	- -	12.6 12.6	Vdc
Input Bias Current $(T_J = +25^{\circ}C)$ $(T_J = +125^{\circ}C)$	I _{IB}	_ _	4.2 -	6.5 6.0	mA
Input Bias Current Change (16 Vdc \leq V $_{I}$ \leq 27 Vdc) (1.0 mA \leq I $_{O}$ \leq 40 mA)	$\Delta l_{ m IB}$	_ _	_ _	1.5 0.1	mA
Output Noise Voltage $(T_A = +25^{\circ}C, 10 \text{ Hz} \le f \le 100 \text{ kHz})$	V _n	_	80	-	μV
Ripple Rejection (I _O = 40 mA, f = 120 Hz, 15 V \leq V _I \leq 25 V, T _J = +25°C)	RR	37	42	-	dB
Dropout Voltage $(T_J = +25^{\circ}C)$	V _I – V _O	-	1.7	-	Vdc

ELECTRICAL CHARACTERISTICS (V_I = 23 V, I_O = 40 mA, C_I = 0.33 μ F, C_O = 0.1 μ F, -40° C < T_J < +125 $^{\circ}$ C (for MC78LXXAB), 0 $^{\circ}$ C < T_J < +125 $^{\circ}$ C (for MC78LXXAC), unless otherwise noted.)

		MC78L15			
Characteristics	Symbol	Min	Тур	Max	Unit
Output Voltage (T _J = +25°C)	Vo	14.4	15	15.6	Vdc
Line Regulation $ (T_J = +25^\circ C, \ I_O = 40 \ mA) \\ 17.5 \ Vdc \le V_I \le 30 \ Vdc \\ 20 \ Vdc \le V_I \le 30 \ Vdc $	Reg _{line}	_ _	130 110	300 250	mV
Load Regulation $ (T_J = +25^{\circ}C, 1.0 \text{ mA} \le I_O \le 100 \text{ mA}) \\ (T_J = +25^{\circ}C, 1.0 \text{ mA} \le I_O \le 40 \text{ mA}) $	Reg _{load}	_ _	25 12	150 75	mV
Output Voltage $(17.5 \text{ Vdc} \le \text{V}_{\text{I}} \le 30 \text{ Vdc}, 1.0 \text{ mA} \le \text{I}_{\text{O}} \le 40 \text{ mA})$ $(\text{V}_{\text{I}} = 23 \text{ V}, 1.0 \text{ mA} \le \text{I}_{\text{O}} \le 70 \text{ mA})$	Vo	14.25 14.25	- -	15.75 15.75	Vdc
Input Bias Current $(T_J = +25^{\circ}C)$ $(T_J = +125^{\circ}C)$	I _{IB}	_ _	4.4 -	6.5 6.0	mA
Input Bias Current Change (20 Vdc \leq V $_{I}$ \leq 30 Vdc) (1.0 mA \leq I $_{O}$ \leq 40 mA)	$\Delta I_{ m IB}$	_ _	- -	1.5 0.1	mA
Output Noise Voltage $(T_A = +25^{\circ}C, 10 \text{ Hz} \le f \le 100 \text{ kHz})$	Vn	-	90	-	μV
Ripple Rejection (I _O = 40 mA, f = 120 Hz, 18.5 V \leq V _I \leq 28.5 V, T _J = +25°C)	RR	34	39	-	dB
Dropout Voltage $(T_J = +25^{\circ}C)$	V _I – V _O	-	1.7	-	Vdc

$\textbf{ELECTRICAL CHARACTERISTICS} \ (V_{I} = 27 \ V, \ I_{O} = 40 \ \text{mA}, \ C_{I} = 0.33 \ \mu\text{F}, \ C_{O} = 0.1 \ \mu\text{F}, \ 0^{\circ}\text{C} < T_{J} < +125^{\circ}\text{C}, \ unless \ otherwise \ noted.)$

			MC78L18A)	
Characteristics	Symbol	Min	Тур	Max	Unit
Output Voltage (T _J = +25°C)	Vo	17.3	18	18.7	Vdc
Line Regulation $(T_J = +25^{\circ}C, I_O = 40 \text{ mA})$ $21.4 \text{ Vdc} \le V_I \le 33 \text{ Vdc}$ $20.7 \text{ Vdc} \le V_I \le 33 \text{ Vdc}$ $22 \text{ Vdc} \le V_I \le 33 \text{ Vdc}$	Reg _{line}	-	45	325	mV
21 Vdc \leq V _I \leq 33 Vdc		_	35	275	
Load Regulation $ (T_J = +25^{\circ}C, \ 1.0 \ \text{mA} \le I_O \le 100 \ \text{mA}) \\ (T_J = +25^{\circ}C, \ 1.0 \ \text{mA} \le I_O \le 40 \ \text{mA}) $	Reg _{load}	- -	30 15	170 85	mV
Output Voltage (21.4 Vdc \leq V _I \leq 33 Vdc, 1.0 mA \leq I _O \leq 40 mA) (20.7 Vdc \leq V _I \leq 33 Vdc, 1.0 mA \leq I _O \leq 40 mA) (V _I = 27 V, 1.0 mA \leq I _O \leq 70 mA) (V _I = 27 V, 1.0 mA \leq I _O \leq 70 mA)	Vo	17.1 17.1	-	18.9 18.9	Vdc
Input Bias Current $(T_J = +25^{\circ}C)$ $(T_J = +125^{\circ}C)$	I _{IB}	- -	3.1 -	6.5 6.0	mA
Input Bias Current Change (22 Vdc \leq V $_{I}$ \leq 33 Vdc) (21 Vdc \leq V $_{I}$ \leq 33 Vdc) (1.0 mA \leq I $_{O}$ \leq 40 mA)	Δl _{IB}	- -	_ _	1.5 0.1	mA
Output Noise Voltage $(T_A = +25^{\circ}C, 10 \text{ Hz} \le f \le 100 \text{ kHz})$	V _n	-	150	-	μV
Ripple Rejection (I _O = 40 mA, f = 120 Hz, 23 V \leq V _I \leq 33 V, T _J = +25°C)	RR	33	48	-	dB
Dropout Voltage $(T_J = +25^{\circ}C)$	V _I – V _O	-	1.7	-	Vdc

 $\textbf{ELECTRICAL CHARACTERISTICS} \ (V_I = 33 \ V, \ I_O = 40 \ \text{mA}, \ C_I = 0.33 \ \mu\text{F}, \ C_O = 0.1 \ \mu\text{F}, \ 0^{\circ}\text{C} < T_J < +125^{\circ}\text{C}, \ unless \ otherwise \ noted.)$

		MC78L24AC			
Characteristics	Symbol	Min	Тур	Max	Unit
Output Voltage (T _J = +25°C)	Vo	23	24	25	Vdc
	Reg _{line}	- - -	- 50 60	- 300 350	mV
Load Regulation $ \begin{aligned} &(T_J = +25^{\circ}C, \ 1.0 \ mA \leq I_O \leq 100 \ mA) \\ &(T_J = +25^{\circ}C, \ 1.0 \ mA \leq I_O \leq 40 \ mA) \end{aligned} $	Reg _{load}		40 20	200 100	mV
Output Voltage $ (28 \ Vdc \le V_I \le 38 \ Vdc, \ 1.0 \ mA \le I_O \le 40 \ mA) \\ (27 \ Vdc \le V_I \le 38 \ Vdc, \ 1.0 \ mA \le I_O \le 40 \ mA) \\ (28 \ Vdc \le V_I = 33 \ Vdc, \ 1.0 \ mA \le I_O \le 70 \ mA) \\ (27 \ Vdc \le V_I \le 33 \ Vdc, \ 1.0 \ mA \le I_O \le 70 \ mA) $	Vo	22.8 22.8	-	25.2 25.2	Vdc
Input Bias Current $(T_J = +25^{\circ}C)$ $(T_J = +125^{\circ}C)$	I _{IB}	_ _	3.1	6.5 6.0	mA
Input Bias Current Change (28 Vdc \leq V _I \leq 38 Vdc) (1.0 mA \leq I _O \leq 40 mA)	$\Delta I_{ m IB}$	- -		1.5 0.1	mA
Output Noise Voltage ($T_A = +25^{\circ}C$, 10 Hz \leq f \leq 100 kHz)	V _n	-	200	-	μV
Ripple Rejection (I _O = 40 mA, f = 120 Hz, 29 V \leq V _I \leq 35 V, T _J = +25°C)	RR	31	45	-	dB
Dropout Voltage $(T_J = +25^{\circ}C)$	V _I – V _O	-	1.7	-	Vdc

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

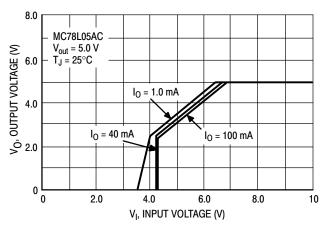


Figure 3. Dropout Characteristics

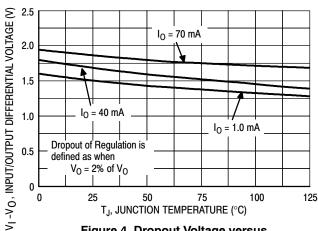


Figure 4. Dropout Voltage versus Junction Temperature

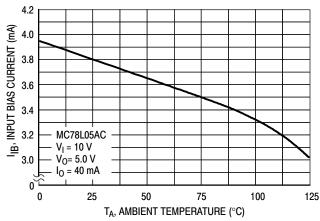


Figure 5. Input Bias Current versus Ambient Temperature

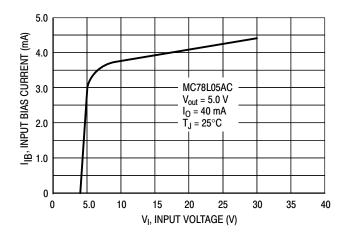


Figure 6. Input Bias Current versus Input Voltage

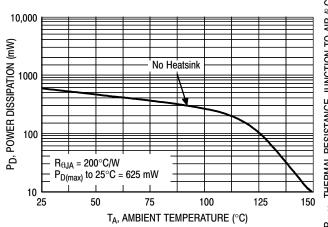


Figure 7. Maximum Average Power Dissipation versus Ambient Temperature – TO-92 Type Package

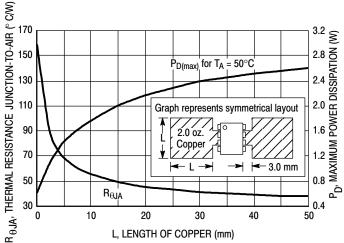


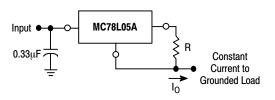
Figure 8. SOIC-8 Thermal Resistance and Maximum Power Dissipation versus P.C.B. Copper Length

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



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:

$$I_0 = \frac{5.0 \text{ V}}{\text{B}} + I_{\text{B}}$$

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

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.

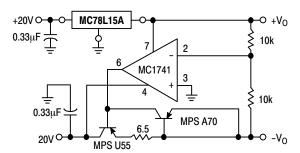


Figure 10. ±15 V Tracking Voltage Regulator

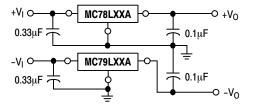


Figure 11. Positive and Negative Regulator

ORDERING INFORMATION

Device	Output Voltage	Operating Temperature Range	Package	Shipping [†]
MC78L05ABDG	5.0 V	$T_{J} = -40^{\circ} \text{ to } +125^{\circ}\text{C}$	SOIC-8 (Pb-Free)	98 Units / Rail
NCV78L05ABDG*	5.0 V	$T_{J} = -40^{\circ} \text{ to } +125^{\circ}\text{C}$	SOIC-8 (Pb-Free)	98 Units / Rail
MC78L05ABDR2G	5.0 V	$T_{J} = -40^{\circ} \text{ to } +125^{\circ}\text{C}$	SOIC-8 (Pb-Free)	2500 / Tape & Reel
NCV78L05ABDR2G*	5.0 V	$T_J = -40^{\circ} \text{ to } +125^{\circ}\text{C}$	SOIC-8 (Pb-Free)	2500 / Tape & Reel
MC78L05ABPG	5.0 V	$T_J = -40^{\circ} \text{ to } +125^{\circ}\text{C}$	TO-92 (Pb-Free)	2000 Units / Bag
NCV78L05ABPG*	5.0 V	$T_J = -40^{\circ} \text{ to } +125^{\circ}\text{C}$	TO-92 (Pb-Free)	2000 Units / Bag
MC78L05ABPRAG	5.0 V	$T_J = -40^{\circ} \text{ to } +125^{\circ}\text{C}$	TO-92 (Pb-Free)	2000 / Tape & Reel
NCV78L05ABPRAG*	5.0 V	$T_{J} = -40^{\circ} \text{ to } +125^{\circ}\text{C}$	TO-92 (Pb-Free)	2000 / Tape & Reel
MC78L05ABPREG	5.0 V	$T_{J} = -40^{\circ} \text{ to } +125^{\circ}\text{C}$	TO-92 (Pb-Free)	2000 / Tape & Reel
NCV78L05ABPREG*	5.0 V	$T_{J} = -40^{\circ} \text{ to } +125^{\circ}\text{C}$	TO-92 (Pb-Free)	2000 / Tape & Reel
MC78L05ABPRMG	5.0 V	$T_J = -40^{\circ} \text{ to } +125^{\circ}\text{C}$	TO-92 (Pb-Free)	2000 / Ammo Pack
NCV78L05ABPRMG*	5.0 V	$T_J = -40^{\circ} \text{ to } +125^{\circ}\text{C}$	TO-92 (Pb-Free)	2000 / Ammo Pack
NCV78L05ABPRPG*	5.0 V	$T_{J} = -40^{\circ} \text{ to } +125^{\circ}\text{C}$	TO-92 (Pb-Free)	2000 / Ammo Pack
MC78L05ACDG	5.0 V	$T_J = 0^\circ \text{ to } +125^\circ \text{C}$	SOIC-8 (Pb-Free)	98 Units / Rail
MC78L05ACDR2G	5.0 V	$T_J = 0^\circ \text{ to } +125^\circ \text{C}$	SOIC-8 (Pb-Free)	2500 / Tape & Reel
MC78L05ACPG	5.0 V	$T_J = 0^{\circ} \text{ to } +125^{\circ}\text{C}$	TO-92 (Pb-Free)	2000 Units / Bag
MC78L05ACPRAG	5.0 V	$T_J = 0^\circ \text{ to } +125^\circ \text{C}$	TO-92 (Pb-Free)	2000 / Tape & Reel
MC78L05ACPREG	5.0 V	$T_{J} = 0^{\circ} \text{ to } +125^{\circ}\text{C}$	TO-92 (Pb-Free)	2000 / Tape & Reel
MC78L05ACPRMG	5.0 V	$T_{J} = 0^{\circ} \text{ to } +125^{\circ}\text{C}$	TO-92 (Pb-Free)	2000 / Ammo Pack
MC78L05ACPRPG	5.0 V	T _J = 0° to +125°C	TO-92 (Pb-Free)	2000 / Ammo Pack
MC78L05ACHT1G	5.0 V	T _J = 0° to +125°C	SOT-89 (Pb-Free)	2500 / Tape & Reel
MC78L08ABDG	8.0 V	$T_J = -40^{\circ} \text{ to } +125^{\circ}\text{C}$	SOIC-8 (Pb-Free)	98 Units / Rail

^{*}NCV78L05A, NCV78L12A, NCV78L15A: T_{low} = -40°C, T_{high} = +125°C. Guaranteed by design. NCV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable. †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 [†]
MC78L08ABDR2G	8.0 V	$T_{J} = -40^{\circ} \text{ to } +125^{\circ}\text{C}$	SOIC-8 (Pb-Free)	2500 / Tape & Reel
NCV78L08ABDR2G*	8.0 V	$T_{J} = -40^{\circ} \text{ to } +125^{\circ}\text{C}$	SOIC-8 (Pb-Free)	2500 / Tape & Reel
MC78L08ABPG	8.0 V	$T_{J} = -40^{\circ} \text{ to } +125^{\circ}\text{C}$	TO-92 (Pb-Free)	2000 Units / Bag
MC78L08ABPRAG	8.0 V	$T_{J} = -40^{\circ} \text{ to } +125^{\circ}\text{C}$	TO-92 (Pb-Free)	2000 / Tape & Reel
MC78L08ABPRPG	8.0 V	$T_{J} = -40^{\circ} \text{ to } +125^{\circ}\text{C}$	TO-92 (Pb-Free)	2000 / Ammo Pack
MC78L08ACDG	8.0 V	$T_{J} = 0^{\circ} \text{ to } +125^{\circ}\text{C}$	SOIC-8 (Pb-Free)	98 Units / Rail
MC78L08ACDR2G	8.0 V	$T_J = 0^\circ$ to +125°C	SOIC-8 (Pb-Free)	2500 / Tape & Reel
MC78L08ACPG	8.0 V	$T_J = 0^\circ$ to $+125^\circ$ C	TO-92 (Pb-Free)	2000 Units / Bag
MC78L08ACPRAG	8.0 V	$T_J = 0^\circ$ to $+125^\circ C$	TO-92 (Pb-Free)	2000 / Tape & Reel
MC78L08ACPREG	8.0 V	$T_J = 0^\circ$ to $+125^\circ C$	TO-92 (Pb-Free)	2000 / Tape & Reel
MC78L08ACPRPG	8.0 V	$T_J = 0^\circ$ to $+125^\circ C$	TO-92 (Pb-Free)	2000 / Ammo Pack
MC78L09ABDG	9.0 V	$T_{J} = -40^{\circ} \text{ to } +125^{\circ}\text{C}$	SOIC-8 (Pb-Free)	98 Units / Rail
MC78L09ABDR2G	9.0 V	$T_{J} = -40^{\circ} \text{ to } +125^{\circ}\text{C}$	SOIC-8 (Pb-Free)	2500 / Tape & Reel
MC78L09ABPRAG	9.0 V	$T_{J} = -40^{\circ} \text{ to } +125^{\circ}\text{C}$	TO-92 (Pb-Free)	2000 / Tape & Reel
MC78L09ABPRPG	9.0 V	$T_J = -40^{\circ} \text{ to } +125^{\circ}\text{C}$	TO-92 (Pb-Free)	2000 / Ammo Pack
MC78L09ACDG	9.0 V	$T_J = 0^\circ$ to $+125^\circ$ C	SOIC-8 (Pb-Free)	98 Units / Rail
MC78L09ACDR2G	9.0 V	$T_J = 0^\circ$ to $+125^\circ$ C	SOIC-8 (Pb-Free)	2500 / Tape & Reel
MC78L09ACPG	9.0 V	$T_J = 0^\circ$ to $+125^\circ C$	TO-92 (Pb-Free)	2000 Units / Bag
MC78L12ABDG	12 V	$T_J = -40^{\circ} \text{ to } +125^{\circ}\text{C}$	SOIC-8 (Pb-Free)	98 Units / Rail
MC78L12ABDR2G	12 V	$T_{J} = -40^{\circ} \text{ to } +125^{\circ}\text{C}$	SOIC-8 (Pb-Free)	2500 / Tape & Reel
NCV78L12ABDG*	12 V	$T_{J} = -40^{\circ} \text{ to } +125^{\circ}\text{C}$	SOIC-8 (Pb-Free)	98 Units / Rail
NCV78L12ABDR2G*	12 V	$T_{J} = -40^{\circ} \text{ to } +125^{\circ}\text{C}$	SOIC-8 (Pb-Free)	2500 / Tape & Reel
MC78L12ABPG	12 V	$T_{J} = -40^{\circ} \text{ to } +125^{\circ}\text{C}$	TO-92 (Pb-Free)	2000 Units / Bag

^{*}NCV78L05A, NCV78L12A, NCV78L15A: T_{low} = -40°C, T_{high} = +125°C. Guaranteed by design. NCV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable.
†For information on tage reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications.

tions Brochure, BRD8011/D.

ORDERING INFORMATION (continued)

Device	Output Voltage	Operating Temperature Range	Package	Shipping [†]
MC78L12ABPRPG	12 V	$T_{J} = -40^{\circ} \text{ to } +125^{\circ}\text{C}$	TO-92 (Pb-Free)	2000 / Ammo Pack
NCV78L12ABPG*	12 V	$T_{J} = -40^{\circ} \text{ to } +125^{\circ}\text{C}$	TO-92 (Pb-Free)	2000 Units / Bag
MC78L12ACDG	12 V	$T_J = 0^\circ$ to $+125^\circ$ C	SOIC-8 (Pb-Free)	98 Units / Rail
MC78L12ACDR2G	12 V	$T_J = 0^\circ$ to $+125^\circ$ C	SOIC-8 (Pb-Free)	2500 / Tape & Reel
MC78L12ACPG	12 V	$T_J = 0^\circ$ to $+125^\circ$ C	TO-92 (Pb-Free)	2000 Units / Bag
MC78L12ACPRAG	12 V	$T_J = 0^\circ$ to $+125^\circ$ C	TO-92 (Pb-Free)	2000 / Tape & Reel
MC78L12ACPREG	12 V	$T_J = 0^\circ$ to $+125^\circ$ C	TO-92 (Pb-Free)	2000 / Tape & Reel
MC78L12ACPRMG	12 V	$T_J = 0^\circ$ to $+125^\circ$ C	TO-92 (Pb-Free)	2000 / Ammo Pack
MC78L12ACPRPG	12 V	$T_J = 0^\circ$ to $+125^\circ C$	TO-92 (Pb-Free)	2000 / Ammo Pack
MC78L15ABDG	15 V	$T_{J} = -40^{\circ} \text{ to } +125^{\circ}\text{C}$	SOIC-8 (Pb-Free)	98 Units / Rail
MC78L15ABDR2G	15 V	$T_{J} = -40^{\circ} \text{ to } +125^{\circ}\text{C}$	SOIC-8 (Pb-Free)	2500 / Tape & Reel
NCV78L15ABDR2G*	15 V	$T_{J} = -40^{\circ} \text{ to } +125^{\circ}\text{C}$	SOIC-8 (Pb-Free)	2500 / Tape & Reel
MC78L15ABPG	15 V	$T_{J} = -40^{\circ} \text{ to } +125^{\circ}\text{C}$	TO-92 (Pb-Free)	2000 Units / Bag
MC78L15ABPRAG	15 V	$T_{J} = -40^{\circ} \text{ to } +125^{\circ}\text{C}$	TO-92 (Pb-Free)	2000 / Tape & Reel
MC78L15ABPRPG	15 V	$T_{J} = -40^{\circ} \text{ to } +125^{\circ}\text{C}$	TO-92 (Pb-Free)	2000 / Ammo Pack
MC78L15ACDG	15 V	$T_{J} = 0^{\circ} \text{ to } +125^{\circ}\text{C}$	SOIC-8 (Pb-Free)	98 Units / Rail
MC78L15ACDR2G	15 V	$T_J = 0^\circ$ to $+125^\circ$ C	SOIC-8 (Pb-Free)	2500 / Tape & Reel
MC78L15ACPG	15 V	T _J = 0° to +125°C	TO-92 (Pb-Free)	2000 Units / Bag
MC78L15ACPRAG	15 V	T _J = 0° to +125°C	TO-92 (Pb-Free)	2000 / Tape & Reel
MC78L15ACPRPG	15 V	T _J = 0° to +125°C	TO-92 (Pb-Free)	2000 / Ammo Pack
MC78L18ABPG	18 V	$T_{J} = -40^{\circ} \text{ to } +125^{\circ}\text{C}$	TO-92 (Pb-Free)	2000 Units / Bag
MC78L18ACPG	18 V	T _J = 0° to +125°C	TO-92 (Pb-Free)	2000 Units / Bag
MC78L18ACPRAG	18 V	T _J = 0° to +125°C	TO-92 (Pb-Free)	2000 / Tape & Reel

^{*}NCV78L05A, NCV78L12A, NCV78L15A: $T_{low} = -40^{\circ}C$, $T_{high} = +125^{\circ}C$. Guaranteed by design. NCV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable.

[†]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.

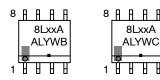
ORDERING INFORMATION (continued)

Device	Output Voltage	Operating Temperature Range	Package	Shipping [†]
MC78L18ACPRMG	18 V	$T_{J} = 0^{\circ} \text{ to } +125^{\circ}\text{C}$	TO-92 (Pb-Free)	2000 / Ammo Pack
MC78L18ACPRPG	18 V	$T_{J} = 0^{\circ} \text{ to } +125^{\circ}\text{C}$	TO-92 (Pb-Free)	2000 / Ammo Pack
MC78L24ABPG	24 V	$T_{J} = -40^{\circ} \text{ to } +125^{\circ}\text{C}$	TO-92 (Pb-Free)	2000 Units / Bag
NCV78L24ABPRPG*	24 V	$T_{J} = -40^{\circ} \text{ to } +125^{\circ}\text{C}$	TO-92 (Pb-Free)	2000 Units / Bag
MC78L24ACPG	24 V	$T_{J} = 0^{\circ} \text{ to } +125^{\circ}\text{C}$	TO-92 (Pb-Free)	2000 Units / Bag
MC78L24ACPRAG	24 V	$T_{J} = 0^{\circ} \text{ to } +125^{\circ}\text{C}$	TO-92 (Pb-Free)	2000 / Tape & Reel
MC78L24ACPRPG	24 V	$T_{J} = 0^{\circ} \text{ to } +125^{\circ}\text{C}$	TO-92 (Pb-Free)	2000 / Ammo Pack

^{*}NCV78L05A, NCV78L12A, NCV78L15A: T_{low} = -40°C, T_{high} = +125°C. Guaranteed by design. NCV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable. †For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications.

MARKING DIAGRAMS





= 05, 08, 09, 12, or 15 XX

Α = Assembly Location L = Wafer Lot

Υ = Year W = Work Week

B, C = Temperature Range

= Pb-Free Package

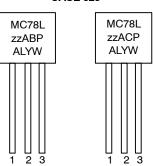
SOT-89 CASE 528AG



= Year = Work Week

XX = Specific Device Code

TO-92 **P SUFFIX CASE 029**



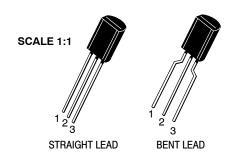
= 05, 08, 09, 12, 15, 18 or 24 ΖZ

Α = Assembly Location

= Wafer Lot = Year

= Work Week

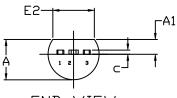
tions Brochure, BRD8011/D.



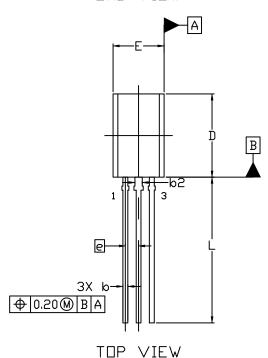
TO-92 (TO-226) 1 WATT CASE 29-10 ISSUE D

DATE 05 MAR 2021

STRAIGHT LEAD







NOTES:

- DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
- 2. CONTROLLING DIMENSION: MILLIMETERS
- 3. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH OR GATE PROTRUSIONS.
- 4. DIMENSION 6 AND 62 DOES NOT INCLUDE DAMBAR PROTRUSION. LEAD WIDTH INCLUDING PROTRUSION SHALL NOT EXCEED 0.20. DIMENSION 62 LOCATED ABOVE THE DAMBAR PORTION OF MIDDLE LEAD.

	MILLIMETERS			
DIM	MIN.	N□M.	MAX.	
Α	3.75	3.90	4.05	
A1	1.28	1.43	1.58	
b	0.38	0.465	0.55	
b2	0.62	0.70	0.78	
c	0.35	0.40	0.45	
D	7.85	8.00	8.15	
E	4.75	4.90	5.05	
E2	3.90			
е	1.27 BSC			
L	13.80	14.00	14.20	

STYLES AND MARKING ON PAGE 3

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DESCRIPTION:	TO-92 (TO-226) 1 WATT		PAGE 1 OF 3

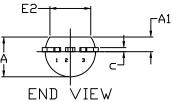
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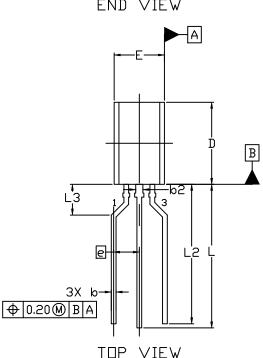


TO-92 (TO-226) 1 WATT CASE 29-10 ISSUE D

DATE 05 MAR 2021

FORMED LEAD





NOTES:

- DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
- 2. CONTROLLING DIMENSION: MILLIMETERS
- 3. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH OR GATE PROTRUSIONS.
- 4. DIMENSION 6 AND 62 DOES NOT INCLUDE DAMBAR PROTRUSION. LEAD WIDTH INCLUDING PROTRUSION SHALL NOT EXCEED 0.20. DIMENSION 62 LOCATED ABOVE THE DAMBAR PORTION OF MIDDLE LEAD.

	MILLIMETERS				
DIM	MIN.	N□M.	MAX.		
Α	3.75	3.90	4.05		
A1	1.28	1.43	1.58		
b	0.38	0.465	0.55		
b2	0.62	0.70	0.78		
c	0.35	0.40	0.45		
D	7.85	8.00	8.15		
E	4.75	4.90	5.05		
E2	3.90				
е	2.50 BSC				
L	13.80	14.00	14.20		
L2	13.20	13.60	14.00		
L3	3.00 REF				

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TO-92 (TO-226) 1 WATT

CASE 29-10 ISSUE D

DATE 05 MAR 2021

STYLE 1: PIN 1. 2. 3.	EMITTER BASE COLLECTOR	STYLE 2: PIN 1. 2. 3.	BASE EMITTER COLLECTOR	STYLE 3: PIN 1. 2. 3.	ANODE ANODE CATHODE	PIN 1.	CATHODE CATHODE ANODE		DRAIN SOURCE GATE
	GATE	PIN 1.	SOURCE DRAIN	PIN 1. 2.	DRAIN GATE	PIN 1.	BASE 1 EMITTER		
2.	CATHODE & ANODE	2.	MAIN TERMINAL 1 GATE MAIN TERMINAL 2	2.	ANODE 1 GATE CATHODE 2	2.	EMITTER		
2.	ANODE	PINI 1	COLLECTOR BASE EMITTER	PIN 1	ANODE	DINI 1	GATE ANODE CATHODE	2.	NOT CONNECTED CATHODE ANODE
2.			GATE	PIN 1. 2.	GATE SOURCE DRAIN	PIN 1. 2.	EMITTER COLLECTOR/ANODE CATHODE	PIN 1. 2.	
	V _{CC}		MT SUBSTRATE	PIN 1. 2.	CATHODE	PIN 1. 2.	NOT CONNECTED ANODE CATHODE	PIN 1. 2.	
		STYLE 32: PIN 1. 2. 3.	BASE COLLECTOR EMITTER	STYLE 33: PIN 1. 2. 3.	RETURN	PIN 1. 2.	INPUT GROUND LOGIC		

GENERIC MARKING DIAGRAM*



XXXX = Specific Device Code

A = Assembly Location

L = Wafer Lot Y = Year

W = Work Week

= Pb-Free Package

(Note: Microdot may be in either location)

*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "•", may or may not be present. Some products may not follow the Generic Marking.

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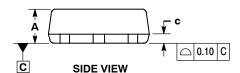


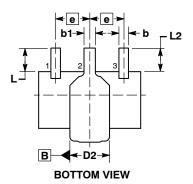


SOT-89, 3 LEAD CASE 528AG **ISSUE O**

DATE 04 MAR 2014

Ε **TOP VIEW**





NOTES:

- NOTES:

 1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.

 2. CONTROLLING DIMENSION: MILLIMETERS.

 3. LEAD THICKNESS INCLUDES LEAD FINISH.

 4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

 5. DIMENSIONS L, L2, D2, AND H ARE MEASURED AT DATUM PLANE C.

 6. CENTER LEAD CONTOUR MAY VARY WITHIN THE REGION DEFINED BY DIMENSION E.

 7. DIMENSION D2 IS DEFINED AT ITS WIDEST POINT.

	MILLIMETERS				
DIM	MIN	MAX			
Α	1.40	1.60			
b	0.38	0.47			
b1	0.46	0.55			
С	0.40	0.44			
D	4.40	4.60			
D2	1.60	1.90			
E	2.40	2.60			
е	1.50 BSC				
Н	4.05	4.25			
L	0.89	1.20			

GENERIC MARKING DIAGRAM*



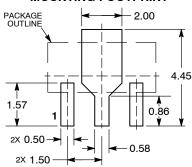
= Year

W = Work Week

= Specific Device Code

*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "•", may or may not be present. Some products may not follow the Generic Marking.

RECOMMENDED MOUNTING FOOTPRINT*



DIMENSIONS: MILLIMETERS

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

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DESCRIPTION:	SOT-89, 3 LEAD		PAGE 1 OF 1

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SOIC-8 NB CASE 751-07 **ISSUE AK**

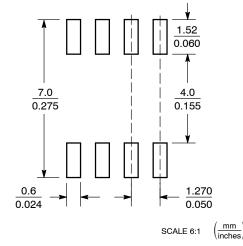
DATE 16 FEB 2011



- NOTES:
 1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 CONTROLLING DIMENSION: MILLIMETER.
- DIMENSION A AND B DO NOT INCLUDE MOLD PROTRUSION.
- MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE
- 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.
- 751-01 THRU 751-06 ARE OBSOLETE. NEW STANDARD IS 751-07.

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
Α	4.80	5.00	0.189	0.197
В	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	7 BSC	0.050 BSC	
Н	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*



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

GENERIC MARKING DIAGRAM*



XXXXX = Specific Device Code = Assembly Location = Wafer Lot

= Year = Work Week W = Pb-Free Package

XXXXXX AYWW AYWW H \mathbb{H} Discrete **Discrete** (Pb-Free) XXXXXX = Specific Device Code

= Assembly Location Α = Year ww = Work Week = Pb-Free Package

*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "•", may or may not be present. Some products may not follow the Generic Marking.

STYLES ON PAGE 2

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DATE 16 FEB 2011

			D, 112 101 2D 2
STYLE 1: PIN 1. EMITTER 2. COLLECTOR 3. COLLECTOR 4. EMITTER 5. EMITTER 6. BASE 7. BASE 8. EMITTER	STYLE 2: PIN 1. COLLECTOR, DIE, #1 2. COLLECTOR, #1 3. COLLECTOR, #2 4. COLLECTOR, #2 5. BASE, #2 6. EMITTER, #2 7. BASE, #1 8. EMITTER, #1 STYLE 6:	STYLE 3: PIN 1. DRAIN, DIE #1 2. DRAIN, #1 3. DRAIN, #2 4. DRAIN, #2 5. GATE, #2 6. SOURCE, #2 7. GATE, #1 8. SOURCE, #1 STYLE 7:	STYLE 4: PIN 1. ANODE 2. ANODE 3. ANODE 4. ANODE 5. ANODE 6. ANODE 7. ANODE 8. COMMON CATHODE STYLE 8:
PIN 1. DRAIN 2. DRAIN 3. DRAIN 4. DRAIN 5. GATE 6. GATE 7. SOURCE 8. SOURCE	PIN 1. SOURCE 2. DRAIN 3. DRAIN 4. SOURCE 5. SOURCE 6. GATE 7. GATE 8. SOURCE	STYLE 7: PIN 1. INPUT 2. EXTERNAL BYPASS 3. THIRD STAGE SOURCE 4. GROUND 5. DRAIN 6. GATE 3 7. SECOND STAGE Vd 8. FIRST STAGE Vd	3. BASE, #2 4. COLLECTOR, #2 5. COLLECTOR, #2 6. EMITTER #2
STYLE 9: PIN 1. EMITTER, COMMON 2. COLLECTOR, DIE #1 3. COLLECTOR, DIE #2 4. EMITTER, COMMON 5. EMITTER, COMMON 6. BASE, DIE #2 7. BASE, DIE #1 8. EMITTER, COMMON	STYLE 10: PIN 1. GROUND 2. BIAS 1 3. OUTPUT 4. GROUND 5. GROUND 6. BIAS 2 7. INPUT 8. GROUND	STYLE 11: PIN 1. SOURCE 1 2. GATE 1 3. SOURCE 2 4. GATE 2 5. DRAIN 2 6. DRAIN 2 7. DRAIN 1 8. DRAIN 1	STYLE 12: PIN 1. SOURCE 2. SOURCE 3. SOURCE 4. GATE 5. DRAIN 6. DRAIN 7. DRAIN 8. DRAIN
STYLE 13: PIN 1. N.C. 2. SOURCE 3. SOURCE 4. GATE 5. DRAIN 6. DRAIN 7. DRAIN 8. DRAIN	STYLE 14: PIN 1. N-SOURCE 2. N-GATE 3. P-SOURCE 4. P-GATE 5. P-DRAIN 6. P-DRAIN 7. N-DRAIN 8. N-DRAIN	8. DRAIN 1 STYLE 15: PIN 1. ANODE 1 2. ANODE 1 3. ANODE 1 4. ANODE 1 5. CATHODE, COMMON 6. CATHODE, COMMON 7. CATHODE, COMMON 8. CATHODE, COMMON	STYLE 16: PIN 1. EMITTER, DIE #1 2. BASE, DIE #1 3. EMITTER, DIE #2 4. BASE, DIE #2 5. COLLECTOR, DIE #2 6. COLLECTOR, DIE #2 7. COLLECTOR, DIE #1 8. COLLECTOR, DIE #1
STYLE 17: PIN 1. VCC 2. V2OUT 3. V1OUT 4. TXE 5. RXE 6. VEE 7. GND 8. ACC	STYLE 18: PIN 1. ANODE 2. ANODE 3. SOURCE 4. GATE 5. DRAIN 6. DRAIN 7. CATHODE 8. CATHODE	STYLE 19: PIN 1. SOURCE 1 2. GATE 1 3. SOURCE 2 4. GATE 2 5. DRAIN 2 6. MIRROR 2 7. DRAIN 1 8. MIRROR 1	STYLE 20: PIN 1. SOURCE (N) 2. GATE (N) 3. SOURCE (P) 4. GATE (P) 5. DRAIN 6. DRAIN 7. DRAIN 8. DRAIN
STYLE 21: PIN 1. CATHODE 1 2. CATHODE 2 3. CATHODE 3 4. CATHODE 4 5. CATHODE 5 6. COMMON ANODE 7. COMMON ANODE 8. CATHODE 6	STYLE 22: PIN 1. I/O LINE 1 2. COMMON CATHODE/VCC 3. COMMON CATHODE/VCC 4. I/O LINE 3 5. COMMON ANODE/GND 6. I/O LINE 4 7. I/O LINE 5 8. COMMON ANODE/GND	STYLE 23: PIN 1. LINE 1 IN 2. COMMON ANODE/GND 3. COMMON ANODE/GND 4. LINE 2 IN 5. LINE 2 OUT 6. COMMON ANODE/GND 7. COMMON ANODE/GND 8. LINE 1 OUT	STYLE 24: PIN 1. BASE 2. EMITTER 3. COLLECTOR/ANODE 4. COLLECTOR/ANODE 5. CATHODE 6. CATHODE 7. COLLECTOR/ANODE 8. COLLECTOR/ANODE
STYLE 25: PIN 1. VIN 2. N/C 3. REXT 4. GND 5. IOUT 6. IOUT 7. IOUT 8. IOUT	STYLE 26: PIN 1. GND 2. dv/dt 3. ENABLE 4. ILIMIT 5. SOURCE 6. SOURCE 7. SOURCE 8. VCC	STYLE 27: PIN 1. ILIMIT 2. OVLO 3. UVLO 4. INPUT+ 5. SOURCE 6. SOURCE 7. SOURCE 8. DRAIN	STYLE 28: PIN 1. SW_TO_GND 2. DASIC_OFF 3. DASIC_SW_DET 4. GND 5. V_MON 6. VBULK 7. VBULK 8. VIN
STYLE 29: PIN 1. BASE, DIE #1 2. EMITTER, #1 3. BASE, #2 4. EMITTER, #2 5. COLLECTOR, #2 6. COLLECTOR, #2 7. COLLECTOR, #1 8. COLLECTOR, #1	STYLE 30: PIN 1. DRAIN 1 2. DRAIN 1 3. GATE 2 4. SOURCE 2 5. SOURCE 1/DRAIN 2 6. SOURCE 1/DRAIN 2 7. SOURCE 1/DRAIN 2 8. GATE 1		

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