MC79L00A Series

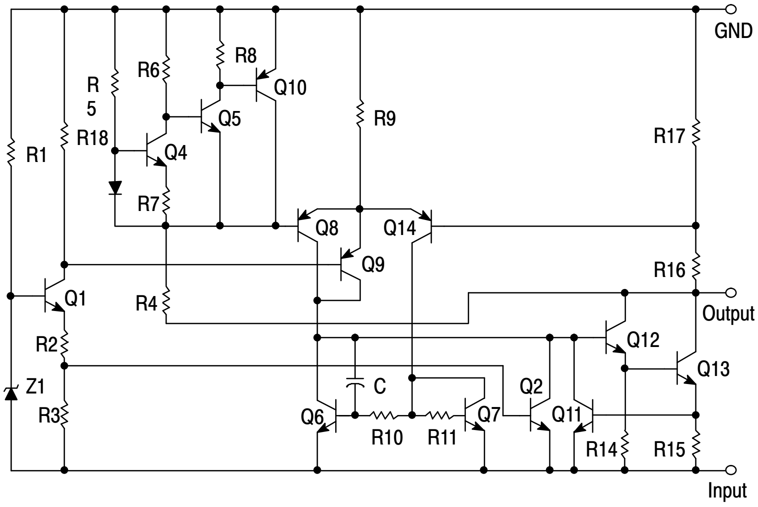
100 mA Negative Voltage Regulators

The MC79L00A Series negative voltage regulators are inexpensive, easy−to−use devices suitable for numerous applications requiring up to 100 mA. Like the higher powered MC7900 Series negative regulators, this series features thermal shutdown and current limiting, making them remarkably rugged. In most applications, no external components are required for operation.

The MC79L00A devices are useful for on−card regulation or any other application where a regulated negative voltage at a modest current level is needed. These regulators offer substantial advantage over the common resistor/Zener diode approach.

Features

- No External Components Required
- Internal Short Circuit Current Limiting
- Internal Thermal Overload Protection
- Low Cost
- Complementary Positive Regulators Offered (MC78L00 Series)
- Pb−Free Packages are Available



* Automotive temperature range selections are available with special test conditions and additional tests in 5, 12 and 15 V devices. Contact your local ON Semiconductor sales office for information.

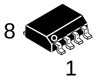
Figure 1. Representative Schematic Diagram

ON Semiconductor®

www.onsemi.com

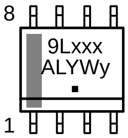
THREE−TERMINAL LOW CURRENT NEGATIVE FIXED VOLTAGE REGULATORS

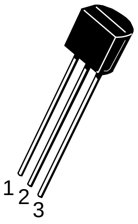
MARKING DIAGRAMS



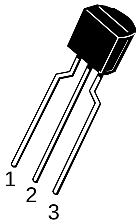
SOIC−8
D SUFFIX
CASE 751

Pin 1. V_{out}
2. V_{in}
3. V_{in}
4. NC
5. GND
6. V_{in}
7. V_{in}
8. NC





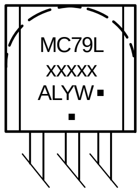
STRAIGHT LEAD
BULK PACK



BENT LEAD
TAPE & REEL
AMMO PACK

TO−92
P SUFFIX
CASE 29

Pin 1. Ground
2. Input
3. Output



xxx = Specific Device Code
A = Assembly Location
L = Wafer Lot
Y = Year
W = Work Week
y = B or C
▪ = Pb−Free Package
(Note: Microdot may be in either location)

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 7 of this data sheet.

MAXIMUM RATINGS (T_A = +25°C, unless otherwise noted.)

Rating	Symbol	Value	Unit
Input Voltage (−5 V)	V_I	−30	Vdc
(−12, −15, −18 V)		−35	
(−24 V)		−40	
Power Dissipation			
Case 29 (TO−92 Type)			
T_A = 25°C	PD	Internally Limited	W
Thermal Resistance, Junction−to−Ambient	$R_{\theta JA}$	160	°C/W
Thermal Resistance, Junction−to−Case	$R_{\theta JC}$	83	°C/W
Case 751 (SOIC−8 Type) (Note 1)			
T_A = 25°C	PD	Internally Limited	W
Thermal Resistance, Junction−to−Ambient	$R_{\theta JA}$	180	°C/W
Thermal Resistance, Junction−to−Case	$R_{\theta JC}$	45	°C/W
Storage Temperature Range	T_{stg}	−65 to +150	°C
Junction Temperature	T_J	+150	°C

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. SOIC−8 Junction−to−Ambient Thermal Resistance is for minimum recommended pad size. Refer to Figure 9 for Thermal Resistance variation versus pad size.

*This device series contains ESD protection and exceeds the following tests:
Human Body Model 2000 V per MIL_STD_883, Method 3015
Machine Model Method 200 V.

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 MC79LXXAB), 0°C < T_J < +125°C (for MC79LXXAC)).

Characteristics	Symbol	MC79L05AC, AB			Unit
		Min	Typ	Max	
Output Voltage (T_J = +25°C)	V_O	−4.8	−5.0	−5.2	Vdc
Input Regulation (T_J = +25°C)	Reg_{line}				mV
−7.0 Vdc ≥ V_I ≥ −20 Vdc		–	–	150	
−8.0 Vdc ≥ V_I ≥ −20 Vdc		–	–	100	
Load Regulation	Reg_{load}				mV
T_J = +25°C, 1.0 mA ≤ I_O ≤ 100 mA		–	–	60	
1.0 mA ≤ I_O ≤ 40 mA		–	–	30	
Output Voltage	V_O				Vdc
−7.0 Vdc ≥ V_I ≥ −20 Vdc, 1.0 mA ≤ I_O ≤ 40 mA		−4.75	–	−5.25	
V_I = −10 Vdc, 1.0 mA ≤ I_O ≤ 70 mA		−4.75	–	−5.25	
Input Bias Current	I_{IB}				mA
(T_J = +25°C)		–	–	6.0	
(T_J = +125°C)		–	–	5.5	
Input Bias Current Change	I_{IB}				mA
−8.0 Vdc ≥ V_I ≥ −20 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	–	40	–	μV
Ripple Rejection (−8.0 ≥ V_I ≥ −18 Vdc, f = 120 Hz, T_J = +25°C)	RR	41	49	–	dB
Dropout Voltage (I_O = 40 mA, T_J = +25°C)	$\lvert V_I - V_O \rvert$	–	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.

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 MC79LXXAB), 0°C < T_J < +125°C (for MC79LXXAC)).

Characteristics	Symbol	MC79L12AC, AB			Unit
		Min	Typ	Max	
Output Voltage (T_J = +25°C)	V_O	−11.5	−12	−12.5	Vdc
Input Regulation (T_J = +25°C) −14.5 Vdc ≥ V_I ≥ −27 Vdc −16 Vdc ≥ V_I ≥ −27 Vdc	Reg_{line}	– –	– –	250 200	mV
Load Regulation T_J = +25°C, 1.0 mA ≤ I_O ≤ 100 mA 1.0 mA ≤ I_O ≤ 40 mA	Reg_{load}	– –	– –	100 50	mV
Output Voltage −14.5 Vdc ≥ V_I ≥ −27 Vdc, 1.0 mA ≤ I_O ≤ 40 mA V_I = −19 Vdc, 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}	– –	– –	6.5 6.0	mA
Input Bias Current Change −16 Vdc ≥ V_I ≥ −27 Vdc 1.0 mA ≤ I_O ≤ 40 mA	I_{IB}	– –	– –	1.5 0.2	mA
Output Noise Voltage (T_A = +25°C, 10 Hz ≤ f ≤ 100 kHz)	V_n	–	80	–	μV
Ripple Rejection (−15 ≤ V_I ≤ −25 Vdc, f = 120 Hz, T_J = +25°C)	RR	37	42	–	dB
Dropout Voltage (I_O = 40 mA, T_J = +25°C)	$\lvert V_I – V_O \rvert$	–	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.

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 MC79LXXAB), 0°C < T_J < +125°C (for MC79LXXAC)).

Characteristics	Symbol	MC79L15AC, AB			Unit
		Min	Typ	Max	
Output Voltage (T_J = +25°C)	V_O	−14.4	−15	−15.6	Vdc
Input Regulation (T_J = +25°C) −17.5 Vdc ≥ V_I ≥ −30 Vdc −20 Vdc ≥ V_I ≥ −30 Vdc	Reg_{line}	– –	– –	300 250	mV
Load Regulation T_J = +25°C, 1.0 mA ≤ I_O ≤ 100 mA 1.0 mA ≤ I_O ≤ 40 mA	Reg_{load}	– –	– –	150 75	mV
Output Voltage −17.5 Vdc ≥ V_I ≥ −Vdc, 1.0 mA ≤ I_O ≤ 40 mA V_I = −23 Vdc, 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}	– –	– –	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 (−18.5 ≤ V_I ≤ −28.5 Vdc, f = 120 Hz)	RR	34	39	–	dB
Dropout Voltage I_O = 40 mA, T_J = +25°C	$\lvert V_I – V_O \rvert$	–	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.

ELECTRICAL CHARACTERISTICS (V_I = −27 V, I_O = 40 mA, C_I = 0.33 μF, C_O = 0.1 μF, −40°C < T_J +125°C (for MC79LXXAB), 0°C < T_J < +125°C (for MC79LXXAC), unless otherwise noted).

Characteristics	Symbol	MC79L18AC			Unit
		Min	Typ	Max	
Output Voltage (T_J = +25°C)	V_O	−17.3	−18	−18.7	Vdc
Input Regulation (T_J = +25°C)	Reg_{line}				mV
−20.7 Vdc ≥ V_I ≥ −33 Vdc		–	–	325	
−21.4 Vdc ≥ V_I ≥ −33 Vdc		–	–	–	
−22 Vdc ≥ V_I ≥ −33 Vdc		–	–	–	
−21 Vdc ≥ V_I ≥ −33 Vdc		–	–	275	
Load Regulation	Reg_{load}				mV
T_J = +25°C, 1.0 mA ≤ I_O ≤ 100 mA		–	–	170	
1.0 mA ≤ I_O ≤ 40 mA		–	–	85	
Output Voltage	V_O				Vdc
−20.7 Vdc ≥ V_I ≥ −33 Vdc, 1.0 mA ≤ I_O ≤ 40 mA		−17.1	–	−18.9	
−21.4 Vdc ≥ V_I ≥ −33 Vdc, 1.0 mA ≤ I_O ≤ 40 mA		–	–	–	
V_I = −27 Vdc, 1.0 mA ≤ I_O ≤ 70 mA		−17.1	–	−18.9	
Input Bias Current	I_{IB}				mA
(T_J = +25°C)		–	–	6.5	
(T_J = +125°C)		–	–	6.0	
Input Bias Current Change	I_{IB}				mA
−21 Vdc ≥ V_I ≥ −33 Vdc		–	–	1.5	
−27 Vdc ≥ V_I ≥ −33 Vdc		–	–	–	
1.0 mA ≤ I_O ≤ 40 mA		–	–	0.1	
Output Noise Voltage (T_A = +25°C, 10 Hz ≤ f ≤ 100 kHz)	V_n	–	150	–	μV
Ripple Rejection (−23 ≤ V_I ≤ −33 Vdc, f = 120 Hz, T_J = +25°C)	RR	33	48	–	dB
Dropout Voltage I_O = 40 mA, T_J = +25°C	$\lvert V_I - V_O \rvert$	–	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.

ELECTRICAL CHARACTERISTICS (V_I = −33 V, I_O = 40 mA, C_I = 0.33 μF, C_O = 0.1 μF, −40°C < T_J +125°C (for MC79LXXAB), 0°C < T_J < +125°C (for MC79LXXAC), unless otherwise noted).

Characteristics	Symbol	MC79L24AC			Unit
		Min	Typ	Max	
Output Voltage (T_J = +25°C)	V_O	−23	−24	−25	Vdc
Input Regulation (T_J = +25°C)	Reg_{line}				mV
−27 Vdc ≥ V_I ≥ −38 Vdc		–	–	350	
−27.5 Vdc ≥ V_I ≥ −38 Vdc		–	–	–	
−28 Vdc ≥ V_I ≥ −38 Vdc		–	–	300	
Load Regulation	Reg_{load}				mV
T_J = +25°C, 1.0 mA ≤ I_O ≤ 100 mA		–	–	200	
1.0 mA ≤ I_O ≤ 40 mA		–	–	100	
Output Voltage	V_O				Vdc
−27 Vdc ≥ V_I ≥ −38 V, 1.0 mA ≤ I_O ≤ 40 mA		−22.8	–	−25.2	
−28 Vdc ≥ V_I ≥ −38 Vdc, 1.0 mA ≤ I_O ≤ 40 mA		–	–	–	
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)		–	–	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 (−29 ≤ V_I ≤ −35 Vdc, f = 120 Hz, T_J = +25°C)	RR	31	47	–	dB
Dropout Voltage I_O = 40 mA, T_J = +25°C	$\lvert V_I - V_O \rvert$	–	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.

APPLICATIONS INFORMATION

Design Considerations

The MC79L00A Series of fixed voltage regulators are designed with Thermal Overload Protections that shuts down the circuit when subjected to an excessive power overload condition, Internal Short Circuit Protection that 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 length, or if the output load capacitance is large. An 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 regulator's input terminals. Normally 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.

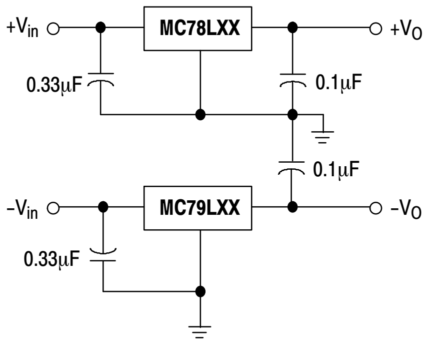
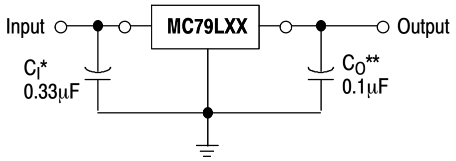


Figure 2. Positive and Negative Regulator



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 ripple voltage.

* C_I is required if regulator is located an appreciable distance from the power supply filter

** C_O improves stability and transient response.

Figure 3. Standard Application

TYPICAL CHARACTERISTICS

(T_A = +25°C, unless otherwise noted.)

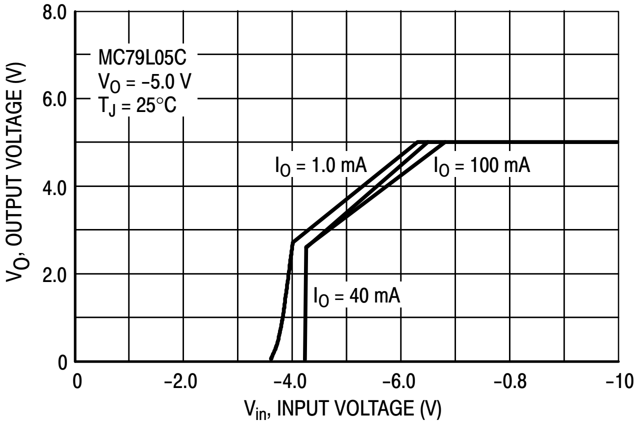


Figure 4. Dropout Characteristics

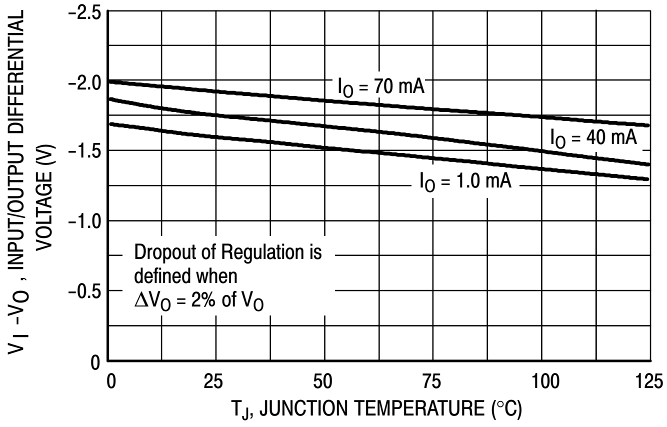


Figure 5. Dropout Voltage versus Junction Temperature

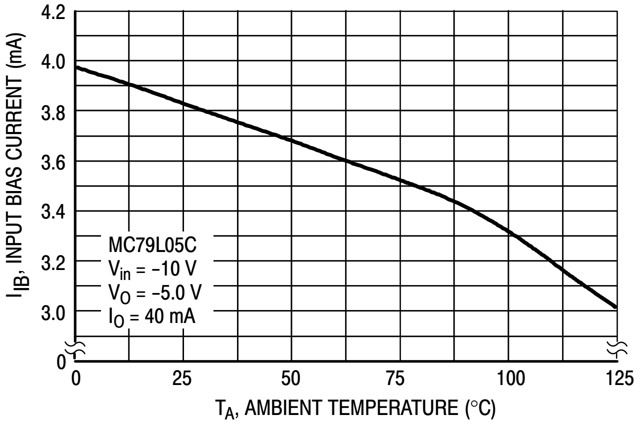


Figure 6. Input Bias Current versus Ambient Temperature

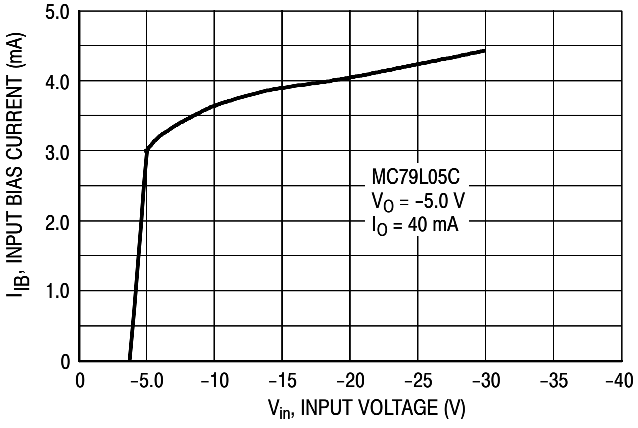


Figure 7. Input Bias Current versus Input Voltage

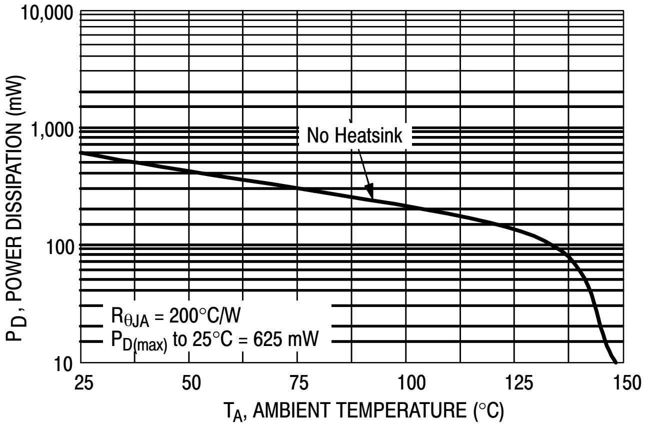


Figure 8. Maximum Average Power Dissipation versus Ambient Temperature (TO−92)

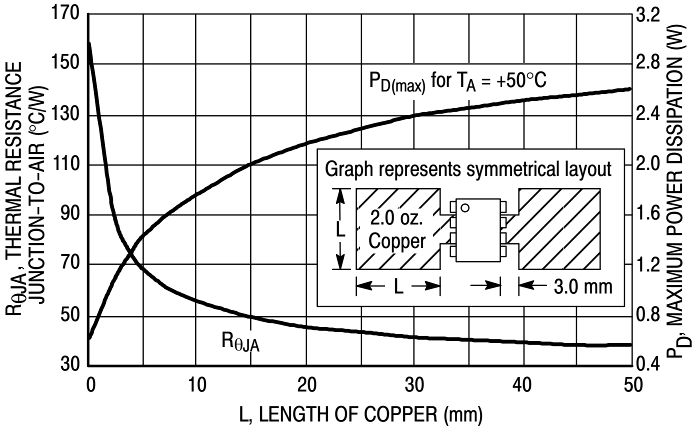


Figure 9. SOP−8 Thermal Resistance and Maximum Power Dissipation versus P.C.B. Copper Length

ORDERING INFORMATION

Device	Nominal Voltage	Operating Temperature Range	Package	Shipping[†]
MC79L05ABDG	−5.0 V	TJ = −40° to +125°C	SOIC−8 (Pb−Free)	98 Units / Rail
MC79L05ABDR2G			SOIC−8 (Pb−Free)	2500 / Tape & Reel
MC79L05ABPG			TO−92 (Pb−Free)	2000 Units / Bag
MC79L05ABPRAG			TO−92 (Pb−Free)	2000 / Tape & Reel
MC79L05ACDG		TJ = 0° to +125°C	SOIC−8 (Pb−Free)	98 Units / Rail
MC79L05ACDR2G			SOIC−8 (Pb−Free)	2500 / Tape & Reel
MC79L05ACPG			TO−92 (Pb−Free)	2000 Units / Bag
MC79L05ACPRAG			TO−92 (Pb−Free)	2000 / Tape & Reel
MC79L05ACPRMG			TO−92 (Pb−Free)	2000 / Tape & Ammo Box
MC79L05ACPRPG			TO−92 (Pb−Free)	2000 / Tape & Ammo Box
MC79L12ABDG	−12 V	TJ = −40° to +125°C	SOIC−8 (Pb−Free)	98 Units / Rail
MC79L12ABDR2G			SOIC−8 (Pb−Free)	2500 / Tape & Reel
MC79L12ABPG			TO−92 (Pb−Free)	2000 Units / Bag
MC79L12ABPRAG			TO−92 (Pb−Free)	2000 / Tape & Reel
MC79L12ACDG	−12 V	TJ = 0° to +125°C	SOIC−8 (Pb−Free)	98 Units / Rail
MC79L12ACDR2G			SOIC−8 (Pb−Free)	2500 / Tape & Reel
MC79L12ACPG			TO−92 (Pb−Free)	2000 Units / Bag
MC79L12ACPRAG			TO−92 (Pb−Free)	2000 / Tape & Reel
MC79L12ACPRPG			TO−92 (Pb−Free)	2000 / Tape & Ammo Box

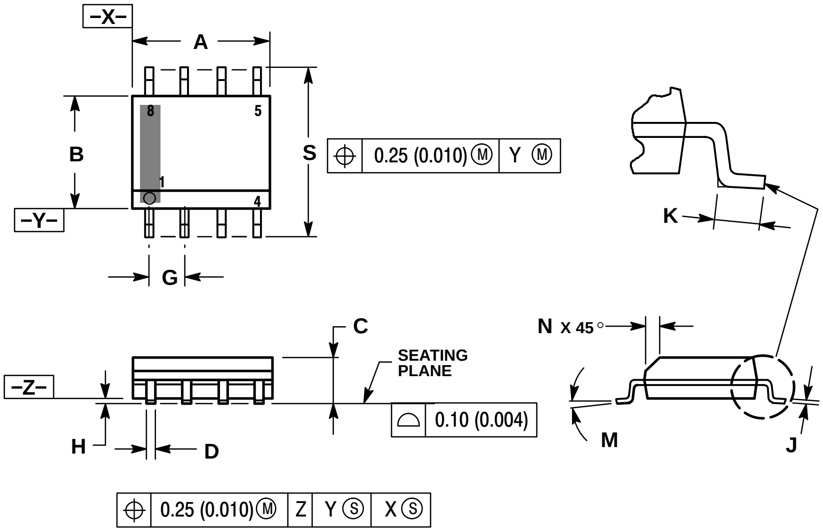
ORDERING INFORMATION (continued)

Device	Nominal Voltage	Operating Temperature Range	Package	Shipping†
MC79L15ABDG	−15 V	TJ = −40° to +125°C	SOIC−8 (Pb−Free)	98 Units / Rail
MC79L15ABDR2G			SOIC−8 (Pb−Free)	2500 / Tape & Reel
MC79L15ABPG			TO−92 (Pb−Free)	2000 Units / Bag
MC79L15ABPRPG			TO−92 (Pb−Free)	2000 / Tape & Ammo Box
MC79L15ACDG		TJ = 0° to +125°C	SOIC−8 (Pb−Free)	98 Units / Rail
MC79L15ACDR2G			SOIC−8 (Pb−Free)	2500 / Tape & Reel
MC79L15ACPG			TO−92 (Pb−Free)	2000 Units / Bag
MC79L15ACPRAG			TO−92 (Pb−Free)	2000 / Tape & Reel
MC79L15ACPREG			TO−92 (Pb−Free)	2000 / Tape & Reel
MC79L15ACPRPG			TO−92 (Pb−Free)	2000 / Tape & Ammo Box
MC79L18ABPRPG	−18 V	TJ = −40° to +125°C	TO−92 (Pb−Free)	2000 / Tape & Ammo Box
MC79L18ACPG		TJ = 0° to +125°C	TO−92 (Pb−Free)	2000 Units / Bag
MC79L24ABPG	−24 V	TJ = −40° to +125°C	TO−92 (Pb−Free)	2000 Units / Bag
MC79L24ACPG		TJ = 0° to +125°C	TO−92 (Pb−Free)	2000 Units / Bag
MC79L24ACPRMG			TO−92 (Pb−Free)	2000 / Tape & Ammo Box
MC79L24ACPRPG			TO−92 (Pb−Free)	2000 / Tape & Ammo Box

†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.

PACKAGE DIMENSIONS

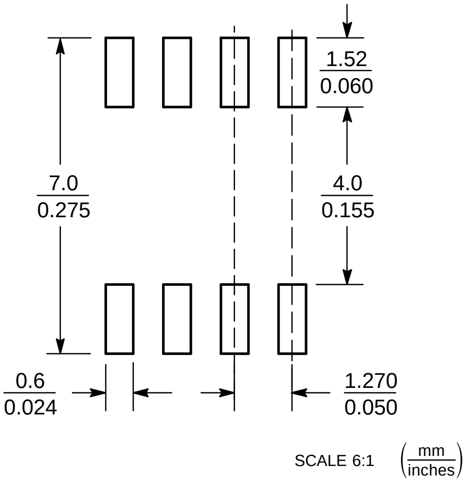
SOIC−8 NB
CASE 751−07
ISSUE AK



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

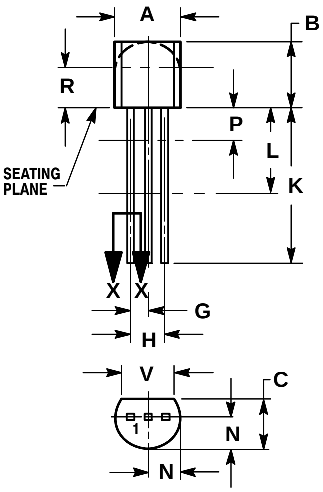
SOLDERING FOOTPRINT*



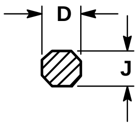
*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

PACKAGE DIMENSIONS

TO−92 (TO−226)
CASE 29−11
ISSUE AM



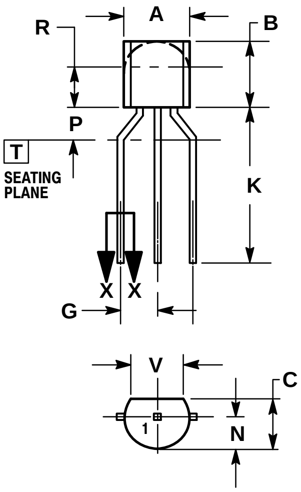
STRAIGHT LEAD
BULK PACK



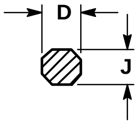
SECTION X−X

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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