THE DATASHEET OF

MC79M12CTG

MC79M00 Series

500 mA Negative Voltage Regulators

The MC79M00 series of fixed output negative voltage regulators are intended as complements to the popular MC78M00 series devices.

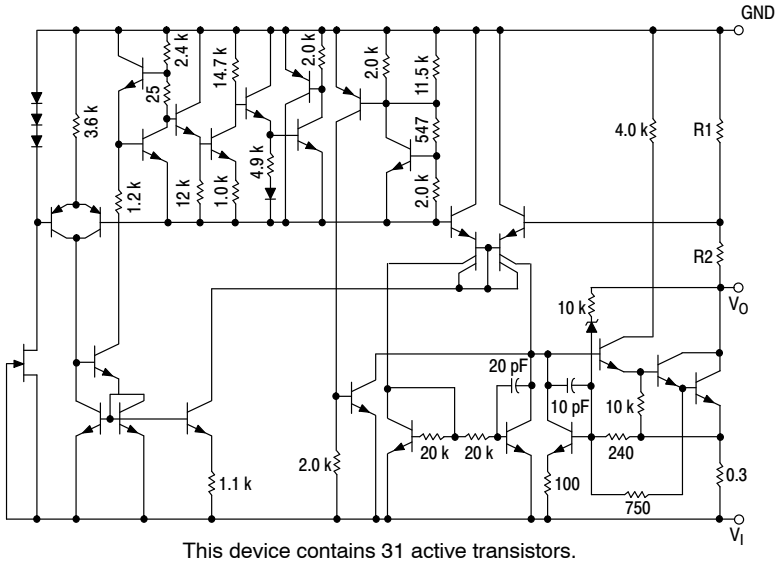
Available in fixed output voltage options of −5.0 V, −8.0 V, −12 V and −15 V, these regulators employ current limiting, thermal shutdown, and safe−area compensation, making them remarkably rugged under most operating conditions. With adequate heatsinking they can deliver output currents in excess of 0.5 A.

Features

- No External Components Required
- Internal Thermal Overload Protection
- Internal Short Circuit Current Limiting
- Output Transistor Safe−Area Compensation
- Also Available in Surface Mount DPAK (DT) Package
- Pb−Free Packages are Available

DEVICE TYPE/NOMINAL OUTPUT VOLTAGE

Device	Nominal Output Voltage
MC79M05	−5.0 V
MC79M08	−8.0 V
MC79M12	−12 V
MC79M15	−15 V



This device contains 31 active transistors.

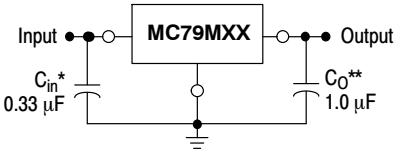
Figure 1. Representative Schematic Diagram

ON Semiconductor®

http://onsemi.com

THREE−TERMINAL NEGATIVE FIXED VOLTAGE REGULATORS

STANDARD APPLICATION

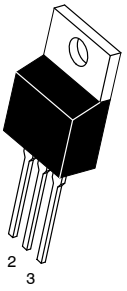


A common ground is required between the input and the output voltages. The input voltage must remain typically 1.1 V more negative even during the high point of the input ripple voltage.

XX These two digits of the type number indicate nominal voltage.

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

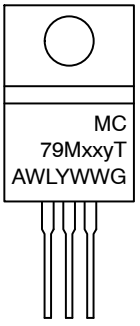
** C_O improve stability and transient response.

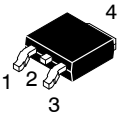


TO−220−3
T SUFFIX
CASE 221AB

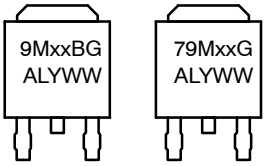
Pin 1. Ground
2. Input
3. Output

MARKING DIAGRAMS





DPAK−3
DT SUFFIX
CASE 369C



xx	= 05, 08, 12, or 15
y	= B or C
A	= Assembly Location
WL, L	= Wafer Lot
Y	= Year
WW	= Work Week
G	= Pb−Free Device

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 6 of this data sheet.

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

Rating	Symbol	Value	Unit
Input Voltage	V_I	−35	Vdc
Power Dissipation			
Case 221A (TO−220−3)			
T_A = 25°C	P_D	Internally Limited	W
Thermal Resistance, Junction−to−Ambient	θ_{JA}	65	°C/W
Thermal Resistance, Junction−to−Case	θ_{JC}	5.0	°C/W
Case 369C (DPAK−3)			
T_A = 25°C	P_D	Internally Limited	W
Thermal Resistance, Junction−to−Ambient	θ_{JA}	92	°C/W
Thermal Resistance, Junction−to−Case	θ_{JC}	6.0	°C/W
Storage Junction Temperature	T_{stg}	−65 to +150	°C
Operating Junction Temperature Range	T_J	−40 to +150	°C

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.

*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

MC79M05B, C

ELECTRICAL CHARACTERISTICS (V_I = −10 V, I_O = 350 mA, T_{low} to T_{high} (Note 2), unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
Output Voltage (T_J = 25°C)	V_O	−4.8	−5.0	−5.2	Vdc
Line Regulation, T_J = 25°C (Note 1) −7.0 Vdc ≥ V_I ≥ −25 Vdc −8.0 Vdc ≥ V_I ≥ −18 Vdc	Reg_{line}	 – –	 7.0 2.0	 50 30	mV
Load Regulation, T_J = 25°C (Note 1) 5.0 mA ≤ I_O ≤ 500 mA	Reg_{load}	–	30	100	mV
Output Voltage −7.0 Vdc ≥ V_I ≥ −25 Vdc, 5.0 mA ≤ I_O ≤ 350 mA	V_O	−4.75	–	−5.25	Vdc
Input Bias Current (T_J = 25°C)	I_{IB}	–	4.3	8.0	mA
Input Bias Current Change −8.0 Vdc ≥ V_I ≥ −25 Vdc, I_O = 350 mA 5.0 mA ≤ I_O ≤ 350 mA, V_I = −10 V	ΔI_{IB}	 – –	 – –	 0.4 0.4	mA
Output Noise Voltage, T_A = 25°C, 10 Hz ≤ f ≤ 100 kHz	V_n	–	40	–	μV
Ripple Rejection (f = 120 Hz)	RR	54	66	–	dB
Dropout Voltage I_O = 500 mA, T_J = 25°C	V_I−V_O	–	1.1	–	Vdc
Average Temperature Coefficient of Output Voltage I_O = 5.0 mA, 0°C ≤ T_J ≤ 125°C	$\Delta V_O/\Delta T$	–	0.2	–	mV/°C

1. Load and line regulation are specified at constant temperature. Change in V_O due to heating effects must be taken into account separately. Pulse testing with low duty cycle is used.
2. B = T_{low} to T_{high}, −40°C < T_J < 125°C C = T_{low} to T_{high}, 0°C < T_J < 125°C.

MC79M08B, C
ELECTRICAL CHARACTERISTICS (V_I = −10 V, I_O = 350 mA, T_{low} to T_{high} (Note 4), unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
Output Voltage (T_J = 25°C)	V_O	−7.7	−8.0	−8.3	Vdc
Line Regulation, T_J = 25°C (Note 3) −10.5 Vdc ≥ V_I ≥ −25 Vdc −11 Vdc ≥ V_I ≥ −21 Vdc	Reg_{line}	 – –	 5.0 3.0	 80 50	mV
Load Regulation, T_J = 25°C (Note 3) 5.0 mA ≤ I_O ≤ 500 mA	Reg_{load}	 –	 30	 100	mV
Output Voltage −10.5 Vdc ≥ V_I ≥ −25 Vdc, 5.0 mA ≤ I_O ≤ 350 mA	V_O	 −7.6	 −8.0	 −8.4	Vdc
Input Bias Current (T_J = 25°C)	I_{IB}	–	–	8.0	mA
Input Bias Current Change −10.5 Vdc ≥ V_I ≥ −25 Vdc, I_O = 350 mA 5.0 mA ≤ I_O ≤ 350 mA, V_I = −10 V	ΔI_{IB}	 – –	 – –	 0.4 0.4	mA
Output Noise Voltage, T_A = 25°C, 10 Hz ≤ f ≤ 100 kHz	V_n	–	60	–	μV
Ripple Rejection (f = 120 Hz)	RR	54	63	–	dB
Dropout Voltage I_O = 500 mA, T_J = 25°C	V_I–V_O	 –	 1.1	 –	Vdc
Average Temperature Coefficient of Output Voltage I_O = 5.0 mA, 0°C ≤ T_J ≤ 125°C	$\Delta V_O/\Delta T$	 –	 0.4	 –	mV/°C

3. Load and line regulation are specified at constant temperature. Change in V_O due to heating effects must be taken into account separately. Pulse testing with low duty cycle is used.
4. B = T_{low} to T_{high}, −40°C < T_J < 125°C
   C = T_{low} to T_{high}, 0°C < T_J < 125°C

MC79M12B, C
ELECTRICAL CHARACTERISTICS (V_I = −19 V, I_O = 350 mA, T_{low} to T_{high} (Note 6), unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
Output Voltage (T_J = 25°C)	V_O	−11.5	−12	−12.5	Vdc
Line Regulation, T_J = 25°C (Note 5) −14.5 Vdc ≥ V_I ≥ −30 Vdc −15 Vdc ≥ V_I ≥ −25 Vdc	Reg_{line}	 – –	 5.0 3.0	 80 50	mV
Load Regulation, T_J = 25°C (Note 5) 5.0 mA ≤ I_O ≤ 500 mA	Reg_{load}	 –	 30	 240	mV
Output Voltage −14.5 Vdc ≥ V_I ≥ −30 Vdc, 5.0 mA ≤ I_O ≤ 350 mA	V_O	 −11.4	 –	 −12.6	Vdc
Input Bias Current (T_J = 25°C)	I_{IB}	–	4.4	8.0	mA
Input Bias Current Change −14.5 Vdc ≥ V_I ≥ −30 Vdc, I_O = 350 mA 5.0 mA ≤ I_O ≤ 350 mA, V_I = −19 V	ΔI_{IB}	 – –	 – –	 0.4 0.4	mA
Output Noise Voltage, T_A = 25°C, 10 Hz ≤ f ≤ 100 kHz	V_n	–	75	–	μV
Ripple Rejection (f = 120 Hz)	RR	54	60	–	dB
Dropout Voltage I_O = 500 mA, T_J = 25°C	V_I–V_O	 –	 1.1	 –	Vdc
Average Temperature Coefficient of Output Voltage I_O = 5.0 mA, 0°C ≤ T_J ≤ 125°C	$\Delta V_O/\Delta T$	 –	 −0.8	 –	mV/°C

5. Load and line regulation are specified at constant temperature. Change in V_O due to heating effects must be taken into account separately. Pulse testing with low duty cycle is used.
6. B = T_{low} to T_{high}, −40°C < T_J < 125°C
   C = T_{low} to T_{high}, 0°C < T_J < 125°C

MC79M15B, C
ELECTRICAL CHARACTERISTICS (V_I = −23 V, I_O = 350 mA, T_{low} to T_{high} (Note 8), unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
Output Voltage (T_J = 25°C)	V_O	−14.4	−15	−15.6	Vdc
Line Regulation, T_J = 25°C (Note 7) −17.5 Vdc ≥ V_I ≥ −30 Vdc −18 Vdc ≥ V_I ≥ −28 Vdc	Reg_{line}	 – –	 5.0 3.0	 80 50	mV
Load Regulation, T_J = 25°C (Note 7) 5.0 mA ≤ I_O ≤ 500 mA	Reg_{load}	 –	 30	 240	mV
Output Voltage −17.5 Vdc ≥ V_I ≥ −30 Vdc, 5.0 mA ≤ I_O ≤ 350 mA	V_O	 −14.25	 –	 −15.75	Vdc
Input Bias Current (T_J = 25°C)	I_{IB}	–	4.4	8.0	mA
Input Bias Current Change −17.5 Vdc ≥ V_I ≥ −30 Vdc, I_O = 350 mA 5.0 mA ≤ I_O ≤ 350 mA, V_I = −23 V	ΔI_{IB}	 – –	 – –	 0.4 0.4	mA
Output Noise Voltage, T_A = 25°C, 10 Hz ≤ f ≤ 100 kHz	V_n	–	90	–	μV
Ripple Rejection (f = 120 Hz)	RR	54	60	–	dB
Dropout Voltage I_O = 500 mA, T_J = 25°C	V_I–V_O	 –	 1.1	 –	Vdc
Average Temperature Coefficient of Output Voltage I_O = 5.0 mA, 0°C ≤ T_J ≤ 125°C	$\Delta V_O/\Delta T$	 –	 −1.0	 –	mV/°C

7. Load and line regulation are specified at constant temperature. Change in V_O due to heating effects must be taken into account separately. Pulse testing with low duty cycle is used.
8. B = T_{low} to T_{high}, −40°C < T_J < 125°C
   C = T_{low} to T_{high}, 0°C < T_J < 125°C

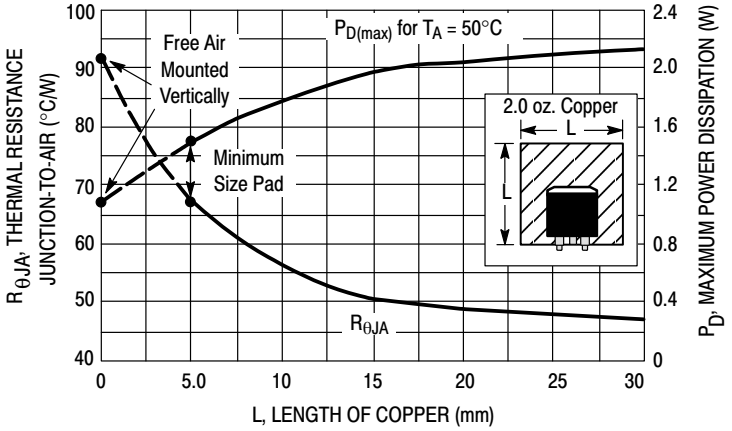


Figure 1. DPAK−3 Thermal Resistance and Maximum Power Dissipation versus P.C.B. Copper Length

Protection Diodes

When external capacitors are used with MC79M00 series regulator it is sometimes necessary to add protection diodes to prevent the capacitors from discharging through low current points into the regulator or from output polarity reversals. Generally, no protection diode is required for values of output capacitance less then 10μF. Figure 2 shows the MC79M15 with the recommended protection diodes.

- Opposite Polarity Protection

Diode D_1 protects the regulator from output polarity reversals during startup, power off and short-circuit operation.

- Reverse-bias Protection

Diode D_2 prevents output capacitor from discharging thru the MC79M15 during an input short circuit or fast switch off of power supply.

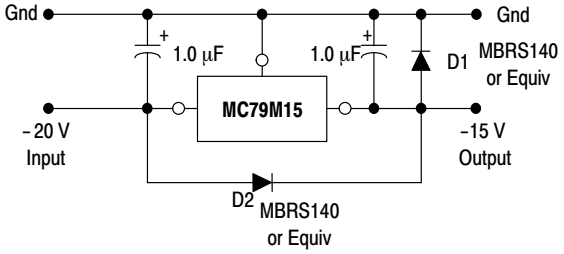


Figure 2. Protection Diodes

ORDERING INFORMATION

Device	Output Voltage Tolerance	Operating Temperature Range	Package	Shipping†
MC79M05BDT	4.0%	T_J = −40°C to +125°C	DPAK	75 Units / Rail
MC79M05BDTG			DPAK (Pb−Free)	75 Units / Rail
MC79M05BDTRK			DPAK	2500 Units / Reel
MC79M05BDTRKG			DPAK (Pb−Free)	2500 Units / Reel
MC79M05BT			TO−220	50 Units / Rail
MC79M05BTG			TO−220 (Pb−Free)	50 Units / Rail
MC79M05CDT		T_J = 0°C to +125°C	DPAK	75 Units / Rail
MC79M05CDTG			DPAK (Pb−Free)	75 Units / Rail
MC79M05CDTRK			DPAK	2500 Units / Reel
MC79M05CDTRKG			DPAK (Pb−Free)	2500 Units / Reel
MC79M05CT			TO−220	50 Units / Rail
MC79M05CTG			TO−220 (Pb−Free)	50 Units / Rail
MC79M08BDT		T_J = −40°C to +125°C	DPAK	75 Units / Rail
MC79M08BDTRK			DPAK	2500 Units / Reel
MC79M08BDTRKG			DPAK (Pb−Free)	2500 Units / Reel
MC79M08BT			TO−220	50 Units / Rail
MC79M08BTG			TO−220 (Pb−Free)	50 Units / Rail
MC79M08CDT		T_J = 0°C to +125°C	DPAK	75 Units / Rail
MC79M08CDTG			DPAK (Pb−Free)	75 Units / Rail
MC79M08CDTRK			DPAK	2500 Units / Reel
MC79M08CDTRKG			DPAK (Pb−Free)	2500 Units / Reel
MC79M08CT			TO−220	50 Units / Rail
MC79M08CTG			TO−220 (Pb−Free)	50 Units / Rail
MC79M12BDT		T_J = −40°C to +125°C	DPAK	75 Units / Rail
MC79M12BDTG			DPAK (Pb−Free)	75 Units / Rail
MC79M12BDTRK			DPAK	2500 Units / Reel
MC79M12BDTRKG			DPAK (Pb−Free)	2500 Units / Reel
MC79M12BT			TO−220	50 Units / Rail
MC79M12BTG			TO−220 (Pb−Free)	50 Units / Rail
MC79M12CDT		T_J = 0°C to +125°C	DPAK	75 Units / Rail
MC79M12CDTG			DPAK (Pb−Free)	75 Units / Rail
MC79M12CDTRK			DPAK	2500 Units / Reel
MC79M12CDTRKG			DPAK (Pb−Free)	2500 Units / Reel
MC79M12CT			TO−220	50 Units / Rail
MC79M12CTG			TO−220 (Pb−Free)	50 Units / Rail

†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.

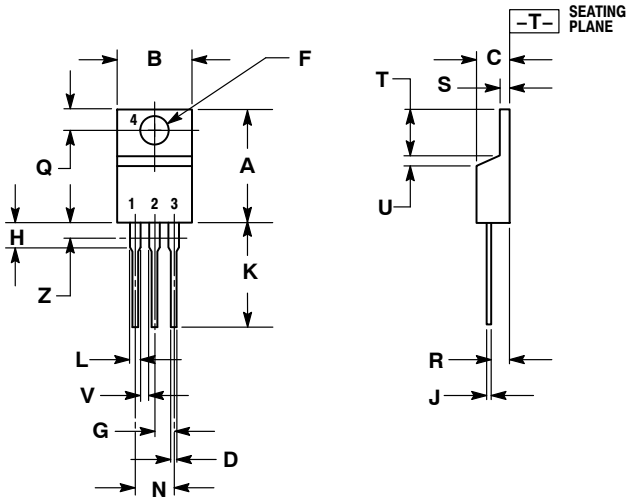
ORDERING INFORMATION

Device	Output Voltage Tolerance	Operating Temperature Range	Package	Shipping†
MC79M15BDT	4.0%	T_J = −40°C to +125°C	DPAK	75 Units / Rail
MC79M15BDTG			DPAK (Pb−Free)	75 Units / Rail
MC79M15BDTRK			DPAK	2500 Units / Reel
MC79M15BDTRKG			DPAK (Pb−Free)	2500 Units / Reel
MC79M15BT			TO−220	50 Units / Rail
MC79M15BTG			TO−220 (Pb−Free)	50 Units / Rail
MC79M15CDT		T_J = 0°C to +125°C	DPAK	75 Units / Rail
MC79M15CDTG			DPAK (Pb−Free)	75 Units / Rail
MC79M15CDTRK			DPAK	2500 Units / Reel
MC79M15CDTRKG			DPAK (Pb−Free)	2500 Units / Reel
MC79M15CT			TO−220	50 Units / Rail
MC79M15CTG			TO−220 (Pb−Free)	50 Units / Rail

†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

TO−220, SINGLE GAUGE
CASE 221AB
ISSUE A

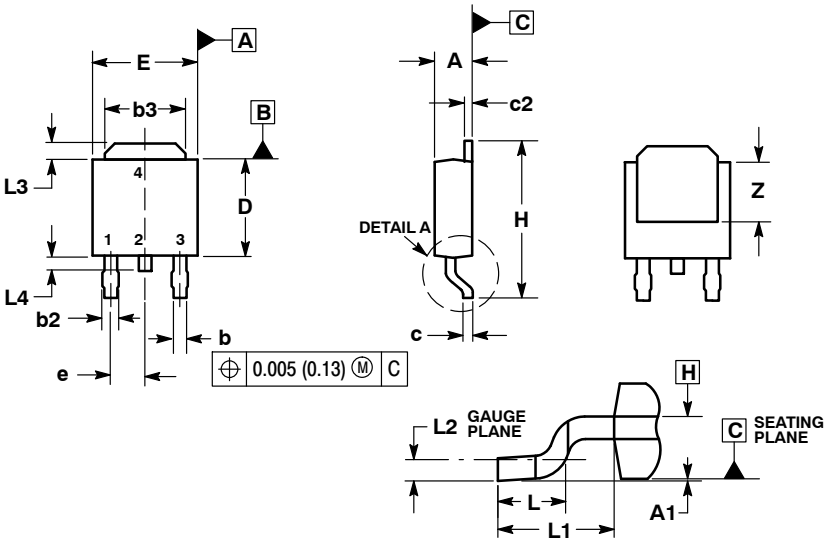


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCHES.
3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.
4. PRODUCT SHIPPED PRIOR TO 2008 HAD DIMENSIONS S = 0.045 − 0.055 INCHES (1.143 − 1.397 MM)

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.570	0.620	14.48	15.75
B	0.380	0.405	9.66	10.28
C	0.160	0.190	4.07	4.82
D	0.025	0.035	0.64	0.88
F	0.142	0.147	3.61	3.73
G	0.095	0.105	2.42	2.66
H	0.110	0.155	2.80	3.93
J	0.018	0.025	0.46	0.64
K	0.500	0.562	12.70	14.27
L	0.045	0.060	1.15	1.52
N	0.190	0.210	4.83	5.33
Q	0.100	0.120	2.54	3.04
R	0.080	0.110	2.04	2.79
S	0.020	0.024	0.508	0.61
T	0.235	0.255	5.97	6.47
U	0.000	0.050	0.00	1.27
V	0.045	---	1.15	---
Z	---	0.080	---	2.04

PACKAGE DIMENSIONS

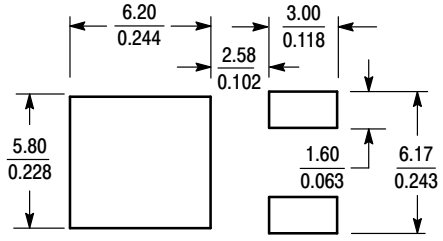
DPAK−3
DT SUFFIX
CASE 369C
ISSUE D



NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: INCHES.
3. THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSIONS b3, L3 and Z.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.006 INCHES PER SIDE.
5. DIMENSIONS D AND E ARE DETERMINED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY.
6. DATUMS A AND B ARE DETERMINED AT DATUM PLANE H.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.086	0.094	2.18	2.38
A1	0.000	0.005	0.00	0.13
b	0.025	0.035	0.63	0.89
b2	0.030	0.045	0.76	1.14
b3	0.180	0.215	4.57	5.46
c	0.018	0.024	0.46	0.61
c2	0.018	0.024	0.46	0.61
D	0.235	0.245	5.97	6.22
E	0.250	0.265	6.35	6.73
e	0.090 BSC		2.29 BSC	
H	0.370	0.410	9.40	10.41
L	0.055	0.070	1.40	1.78
L1	0.108 REF		2.74 REF	
L2	0.020 BSC		0.51 BSC	
L3	0.035	0.050	0.89	1.27
L4	−−−	0.040	−−−	1.01
Z	0.155	−−−	3.93	−−−

SOLDERING FOOTPRINT*



SCALE 3:1 $\left(\frac{\text{mm}}{\text{inches}}\right)$

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

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Literature Distribution Center for ON Semiconductor
P.O. Box 5163, Denver, Colorado 80217 USA
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Fax: 303−675−2176 or 800−344−3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

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Phone: 421 33 790 2910
Japan Customer Focus Center
Phone: 81−3−5817−1050

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