

# MOSFET – N-Channel, POWERTRENCH®

150 V, 2 A, 228 mΩ

## FDT86246L

### General Description

This N-Channel MOSFET is produced using onsemi's advanced POWERTRENCH process that has been optimized for  $r_{DS(on)}$ , switching performance and ruggedness.

### Features

- Max  $r_{DS(on)}$  = 228 mΩ at  $V_{GS} = 10\text{ V}$ ,  $I_D = 2\text{ A}$
- Max  $r_{DS(on)}$  = 280 mΩ at  $V_{GS} = 4.5\text{ V}$ ,  $I_D = 1.8\text{ A}$
- High Performance Trench Technology for Extremely Low  $r_{DS(on)}$
- High Power and Current Handling Capability in a widely used Surface Mount Package
- Fast Switching Speed
- 100% UIL Tested
- These Devices are Pb-Free and are RoHS Compliant

### Applications

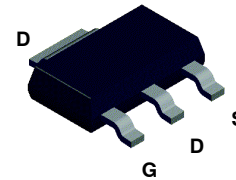
- Load Switch
- Primary Switch
- Buck/Boost Switch

### Specifications

#### MOSFET MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

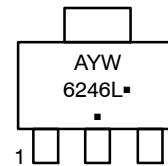
Symbol	Parameter	Ratings	Unit	
$V_{DS}$	Drain to Source Voltage	150	V	
$V_{GS}$	Gate to Source Voltage	$\pm 20$	V	
$I_D$	Drain Current	Continuous $T_A = 25^\circ\text{C}$ (Note 1a)	2	A
		Pulsed (Note 4)	20	
$E_{AS}$	Single Pulse Avalanche Energy (Note 3)	6	mJ	
$P_D$	Power Dissipation	$T_A = 25^\circ\text{C}$ (Note 1a)	2.2	W
		$T_A = 25^\circ\text{C}$ (Note 1b)	1.0	
$T_J, T_{STG}$	Operating and Storage Junction Temperature Range	-55 to +150	$^\circ\text{C}$	

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.



SOT-223  
CASE 318H

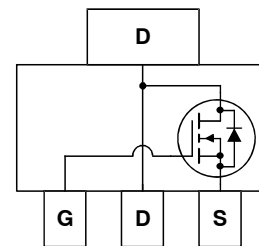
### MARKING DIAGRAM



- A = Assembly Location
- Y = Year
- W = Work Week
- 6246L = Specific Device Code
- = Pb-Free Package

(Note: Microdot availability will depend per Assembly site processed. Device is already Pb-free)

### PIN ASSIGNMENT



### ORDERING INFORMATION

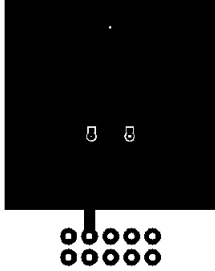
See detailed ordering and shipping information on page 2 of this data sheet.

# FDT86246L

## THERMAL CHARACTERISTICS

Symbol	Parameter	Ratings	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case (Note 1)	12	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	55	

1.  $R_{\theta JA}$  is determined with the device mounted on a 1 in<sup>2</sup> pad 2 oz copper pad on a 1.5 x 1.5 in. board of FR-4 material.  $R_{\theta JC}$  is guaranteed by design while  $R_{\theta JA}$  is determined by the user's board design.



a. 55°C/W when mounted on a 1 in<sup>2</sup> pad of 2 oz copper



b. 118°C/W when mounted on a minimum pad

## ORDERING INFORMATION

Device	Device Marking	Package Type	Shipping <sup>†</sup>
FDT86246L	86246L	SOT-223 (Pb-Free)	4000 units / Tape & Reel

<sup>†</sup>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.

# FDT86246L

## ELECTRICAL CHARACTERISTICS (T<sub>J</sub> = 25°C unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS

BV <sub>DSS</sub>	Drain to Source Breakdown Voltage	I <sub>D</sub> = 250 μA, V <sub>GS</sub> = 0 V	150			V
ΔBV <sub>DSS</sub> / ΔT <sub>J</sub>	Breakdown Voltage Temperature Coefficient	I <sub>D</sub> = 250 μA, referenced to 25°C		110		mV/°C
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> = 120 V, V <sub>GS</sub> = 0 V			1	μA
I <sub>GSS</sub>	Gate to Source Leakage Current	V <sub>GS</sub> = ±20 V, V <sub>DS</sub> = 0 V			±100	nA

### ON CHARACTERISTICS

V <sub>GS(th)</sub>	Gate to Source Threshold Voltage	V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = 250 μA	0.8	1.6	2.5	V
ΔV <sub>GS(th)</sub> / ΔT <sub>J</sub>	Gate to Source Threshold Voltage Temperature Coefficient	I <sub>D</sub> = 250 μA, referenced to 25°C		-5		mV/°C
r <sub>DS(on)</sub>	Static Drain to Source On Resistance	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 2 A		189	228	mΩ
		V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 1.8 A		208	280	
		V <sub>GS</sub> = 10 V, I <sub>D</sub> = 2 A, T <sub>J</sub> = 125°C		375	452	
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 2 A		7.3		S

### DYNAMIC CHARACTERISTICS

C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = 75 V, V <sub>GS</sub> = 0 V, f = 1 MHz		238	335	pF
C <sub>oss</sub>	Output Capacitance			20	30	pF
C <sub>rss</sub>	Reverse Transfer Capacitance			2	5	pF
R <sub>g</sub>	Gate Resistance		0.1	0.9	2.7	Ω

### SWITCHING CHARACTERISTICS

t <sub>d(on)</sub>	Turn-On Delay Time	V <sub>DD</sub> = 75 V, I <sub>D</sub> = 2 A, V <sub>GS</sub> = 10 V, R <sub>GEN</sub> = 6 Ω		4.5	10	ns
t <sub>r</sub>	Rise Time			1.3	10	ns
t <sub>d(off)</sub>	Turn-Off Delay Time			11	20	ns
t <sub>f</sub>	Fall Time			2	10	ns
Q <sub>g(TOT)</sub>	Total Gate Charge	V <sub>GS</sub> = 0 V to 10 V, V <sub>DD</sub> = 75 V, I <sub>D</sub> = 2 A		4.5	6.3	nC
		V <sub>GS</sub> = 0 V to 4.5 V, V <sub>DD</sub> = 75 V, I <sub>D</sub> = 2 A		2.3	3.3	nC
Q <sub>gs</sub>	Gate to Source Charge	V <sub>DD</sub> = 75 V, I <sub>D</sub> = 2 A		0.7		nC
Q <sub>gd</sub>	Gate to Drain "Miller" Charge			1.0		nC

### DRAIN-SOURCE DIODE CHARACTERISTICS

V <sub>SD</sub>	Source to Drain Diode Forward Voltage	V <sub>GS</sub> = 0 V, I <sub>S</sub> = 2 A (Note 2)		0.8	1.3	V
t <sub>rr</sub>	Reverse Recovery Time	I <sub>F</sub> = 2 A, di/dt = 100 A/μs		44	71	ns
Q <sub>rr</sub>	Reverse Recovery Charge			31	50	nC

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.

2. Pulse Test: Pulse Width < 300 μs, Duty cycle < 2.0%.

3. E<sub>AS</sub> of 6 mJ is based on starting T<sub>J</sub> = 25°C; N-ch: L = 3 mH, I<sub>AS</sub> = 2 A, V<sub>DD</sub> = 150 V, V<sub>GS</sub> = 10 V. 100% test at L = 0.1 mH, I<sub>AS</sub> = 7 A.

4. Pulsed I<sub>d</sub> please refer to Figure 11 SOA graph for more details.

5. Computed continuous current limited to Max Junction Temperature only, actual continuous current will be limited by thermal & electro-mechanical application board design.

TYPICAL CHARACTERISTICS ( $T_J = 25^\circ\text{C}$  unless otherwise noted)

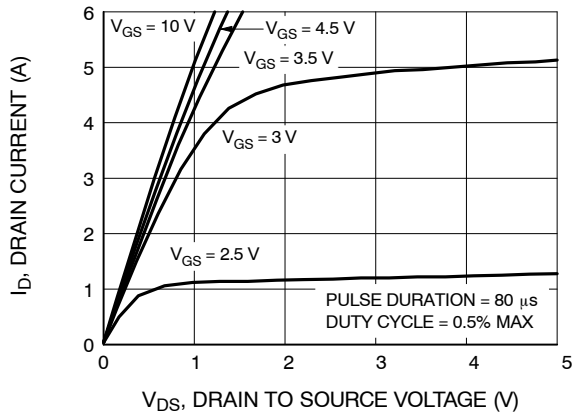


Figure 1. On Region Characteristics

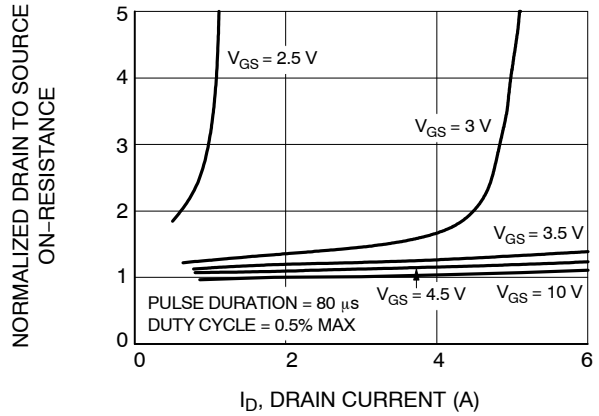


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

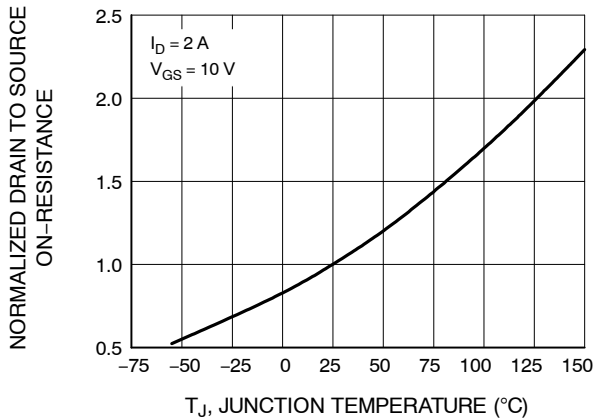


Figure 3. Normalized On Resistance vs. Junction Temperature

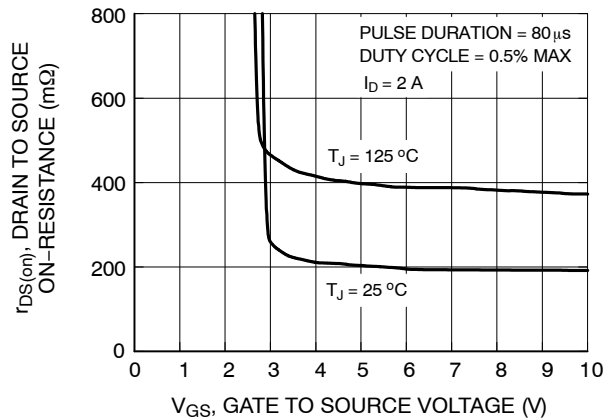


Figure 4. On-Resistance vs. Gate to Source Voltage

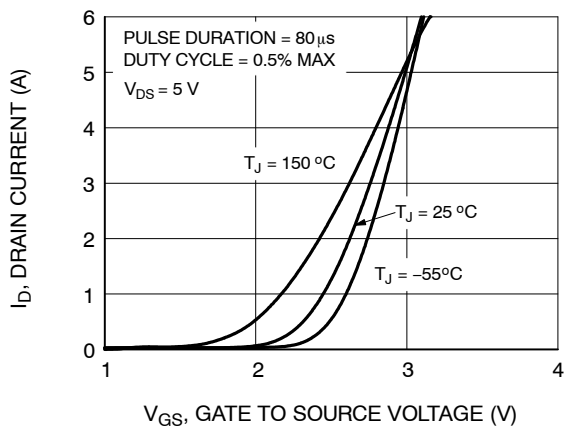


Figure 5. Transfer Characteristics

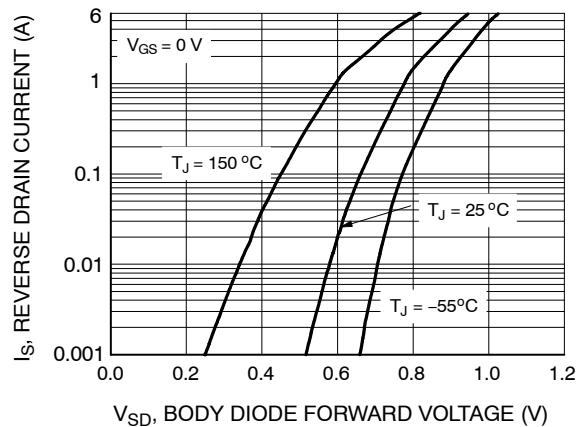


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

TYPICAL CHARACTERISTICS ( $T_J = 25^\circ\text{C}$  unless otherwise noted) (continued)

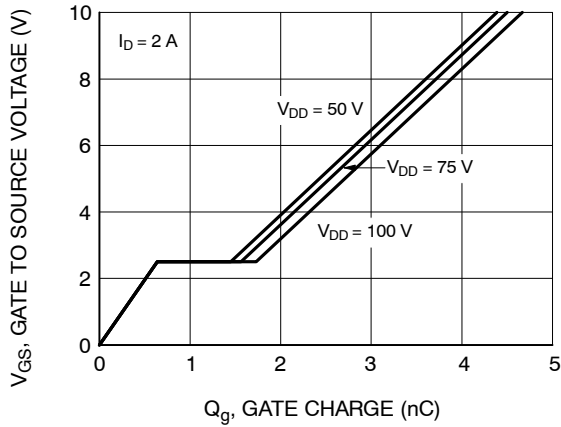


Figure 7. Gate Charge Characteristics

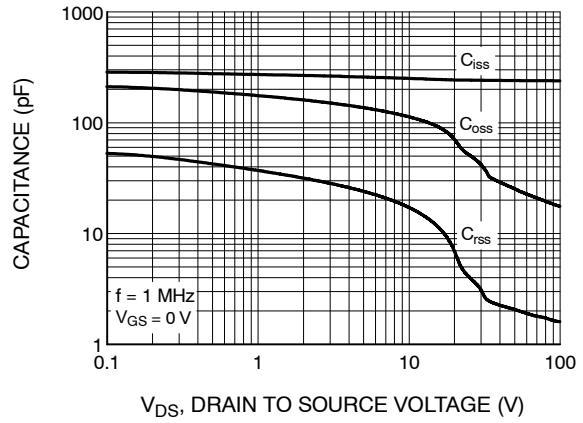


Figure 8. Capacitance vs. Drain to Source Voltage

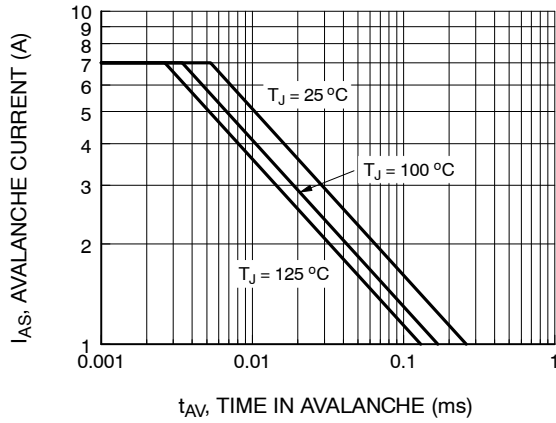


Figure 9. Unclamped Inductive Switching Capability

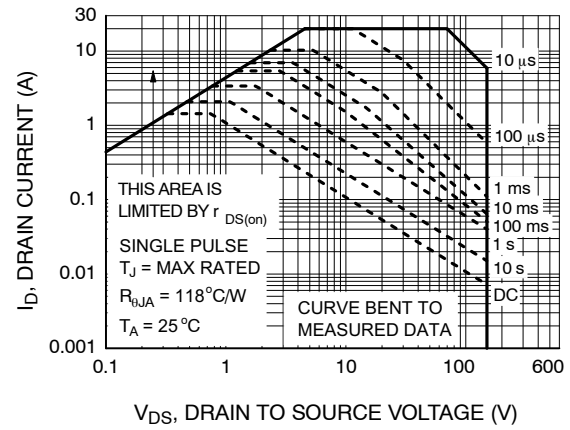


Figure 10. Forward Bias Safe Operating Area

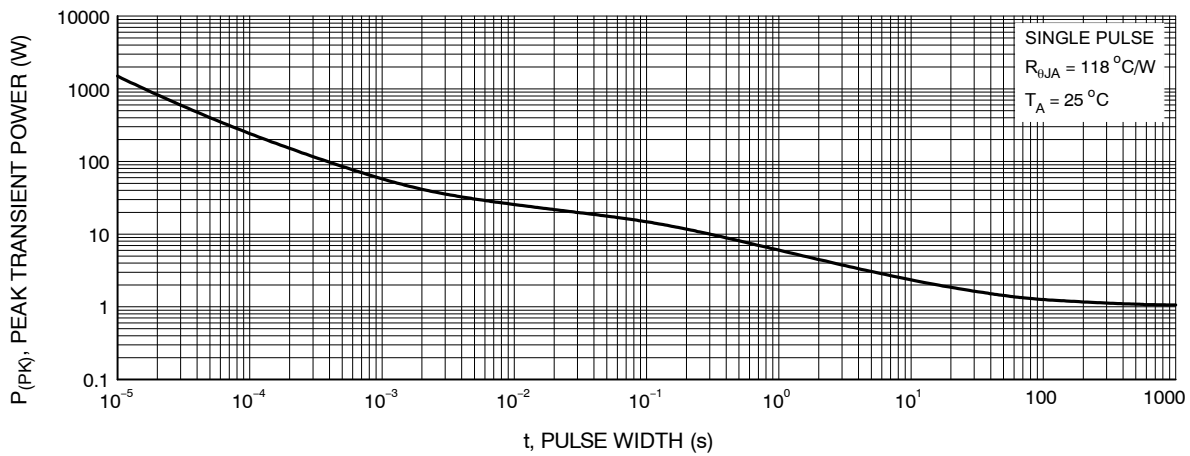


Figure 11. Single Pulse Maximum Power Dissipation

TYPICAL CHARACTERISTICS ( $T_J = 25^\circ\text{C}$  unless otherwise noted) (continued)

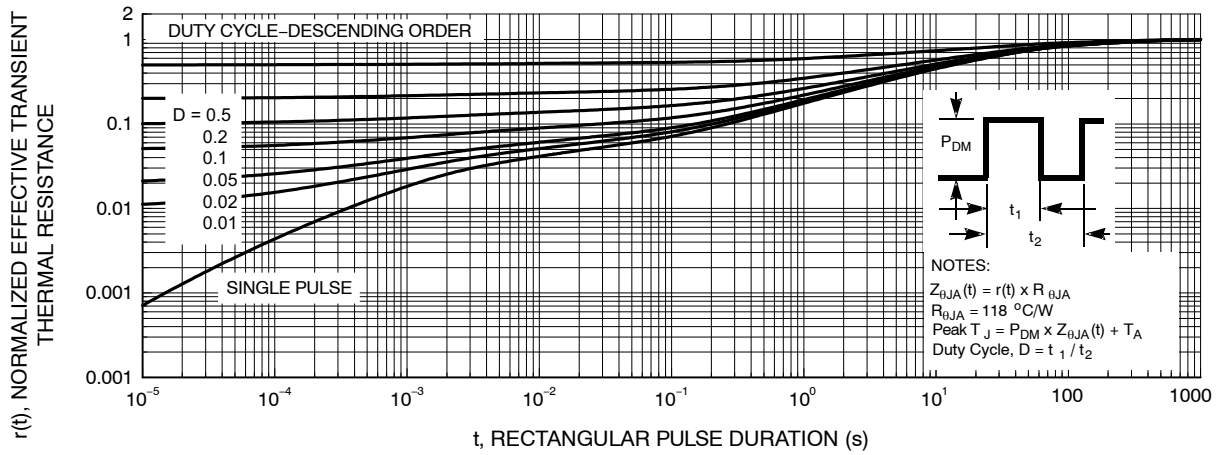
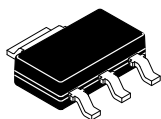


Figure 12. Junction-to-Ambient Transient Thermal Response Curve

# MECHANICAL CASE OUTLINE

## PACKAGE DIMENSIONS

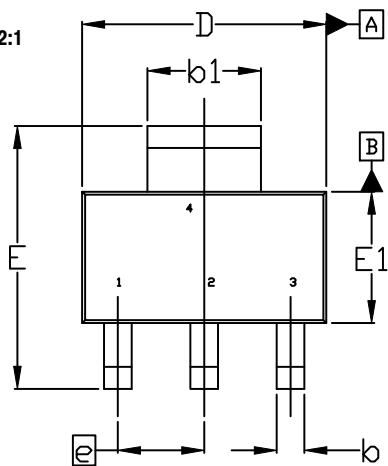
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**SOT-223**  
CASE 318H  
ISSUE B

DATE 13 MAY 2020

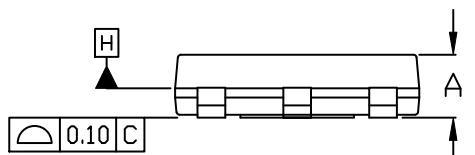
SCALE 2:1



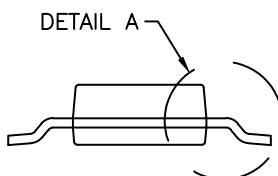
TOP VIEW

$\Phi 0.10 \text{ (M)}$  C A B

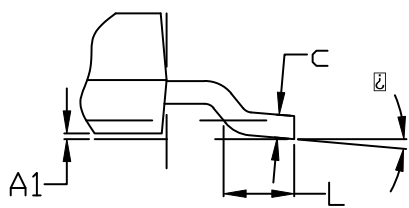
NOTE 7



SIDE VIEW



END VIEW

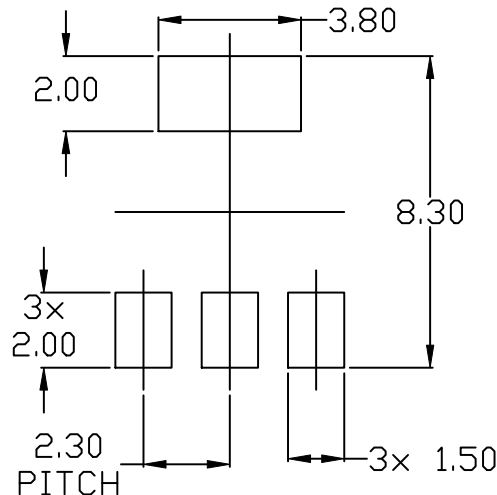


DETAIL A

**NOTES:**

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
2. CONTROLLING DIMENSION: MILLIMETERS
3. DIMENSIONS D & E1 ARE DETERMINED AT DATUM H. DIMENSIONS DO NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. SHALL NOT EXCEED 0.23mm PER SIDE.
4. LEAD DIMENSIONS b AND b1 DO NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION IS 0.08mm PER SIDE.
5. DATUMS A AND B ARE DETERMINED AT DATUM H.
6. A1 IS DEFINED AS THE VERTICAL DISTANCE FROM THE SEATING PLANE TO THE LOWEST POINT OF THE PACKAGE BODY.
7. POSITIONAL TOLERANCE APPLIES TO DIMENSIONS b AND b1.

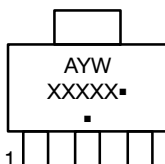
DIM	MILLIMETERS		
	MIN.	NDM.	MAX.
A	---	---	1.80
A1	0.02	0.06	0.11
b	0.60	0.74	0.88
b1	2.90	3.00	3.10
c	0.24	---	0.35
D	6.30	6.50	6.70
E	6.70	7.00	7.30
E1	3.30	3.50	3.70
e	2.30 BSC		
L	0.25	---	---
$\square$	0°	---	10°



RECOMMENDED MOUNTING FOOTPRINT

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

**GENERIC MARKING DIAGRAM\***



- A = Assembly Location
- Y = Year
- W = Work Week
- XXXXX = Specific Device Code
- = 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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