

MOSFET – N-Channel Shielded Gate POWERTRENCH®

150 V, 2.8 A, 128 mΩ

FDT86244

Description

This N-Channel MOSFET is produced using Fairchild onsemi advanced PowerTrench® process that incorporates Shielded Gate technology. This process has been optimized for $R_{DS(on)}$, switching performance and ruggedness.

Features

- Shielded Gate MOSFET Technology
- Max $R_{DS(on)}$ = 128 mΩ at V_{GS} = 10 V, I_D = 2.8 A
- Max $R_{DS(on)}$ = 178 mΩ at V_{GS} = 6 V, I_D = 2.4 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

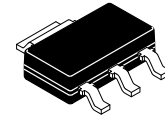
Typical Applications

- Load Switch
- Primary Switch

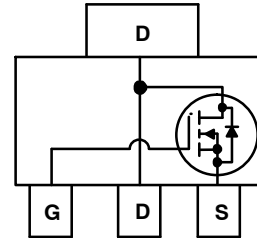
MOSFET Maximum Ratings $T_A = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Ratings	Unit
V_{DS}	Drain to Source Voltage	150	V
V_{GS}	Gate to Source Voltage	20	V
I_D	Drain Current –Continuous $T_A = 25^\circ\text{C}$ (Note 1a)	2.8	A
	–Pulsed	12	
E_{AS}	Single Pulse Avalanche Energy (Note 3)	12	mJ
P_D	Power Dissipation $T_A = 25^\circ\text{C}$ (Note 1a)	2.2	W
	Power Dissipation $T_A = 25^\circ\text{C}$ (Note 1b)	1.0	
T_J, T_{STG}	Operating and Storage Junction Temperature Range	–55 to +150	$^\circ\text{C}$

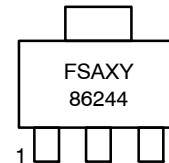
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.



SOT-223
CASE 318H



MARKING DIAGRAM



Z = Assembly Plan Code
 XY = Date Code (Year & week)
 86244 = Specific Device Code

ORDERING INFORMATION

Device	Package	Shipping†
FDT86244	SOT-223 (Pb-Free)	4000 / Tape & Reel

†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](#).

THERMAL CHARACTERISTICS

Symbol	Parameter	Value	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	

ELECTRICAL CHARACTERISTICS $T_A = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
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Off Characteristics

BV_{DSS}	Drain to Source Breakdown Voltage	$I_D = 250\ \mu\text{A}$, $V_{GS} = 0\ \text{V}$	150	–	–	V
$\frac{\Delta BV_{DSS(th)}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$, referenced to 25°C	–	104	–	mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 120\ \text{V}$, $V_{GS} = 0\ \text{V}$	–	–	1	μA
I_{GSS}	Gate to Source Leakage Current	$V_{GS} = \pm 20\ \text{V}$, $V_{DS} = 0\ \text{V}$	–	–	± 100	nA

On Characteristics

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}$, $I_D = 250\ \mu\text{A}$	2.0	3.1	4.0	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$, referenced to 25°C	–	–10	–	mV/°C
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\ \text{V}$, $I_D = 2.8\ \text{A}$	–	106	128	m Ω
		$V_{GS} = 6\ \text{V}$, $I_D = 2.4\ \text{A}$	–	127	178	
		$V_{GS} = 10\ \text{V}$, $I_D = 2.8\ \text{A}$, $T_J = 125^\circ\text{C}$	–	196	237	
g_{FS}	Forward Transconductance	$V_{DS} = 10\ \text{V}$, $I_D = 2.8\ \text{A}$	–	12	–	S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 75\ \text{V}$, $V_{GS} = 0\ \text{V}$, $f = 1\ \text{MHz}$	–	295	395	pF
C_{oss}	Output Capacitance		–	33	45	pF
C_{rss}	Reverse Transfer Capacitance		–	2.4	5	pF
R_g	Gate Resistance		–	1	–	Ω

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 75\ \text{V}$, $I_D = 2.8\ \text{A}$, $V_{GS} = 10\ \text{V}$, $R_{GEN} = 6\ \Omega$	–	5.3	11	ns
t_r	Rise Time		–	1.3	10	ns
$t_{d(off)}$	Turn-Off Delay Time		–	9.8	20	ns
t_f	Fall Time		–	2.4	10	ns
$Q_{g(TOT)}$	Total Gate Charge	$V_{GS} = 0\ \text{V}$ to $10\ \text{V}$, $V_{GS} = 0\ \text{V}$ to $5\ \text{V}$	–	4.9	7	nC
$Q_{g(TOT)}$	Total Gate Charge		–	2.8	4	nC
Q_{gs}	Total Gate Charge	$V_{DD} = 75\ \text{V}$, $I_D = 2.8\ \text{A}$	–	1.4	–	nC
Q_{gd}	Gate to Drain "Miller" Charge		–	1.3	–	nC

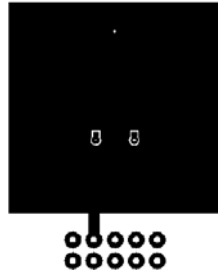
ELECTRICAL CHARACTERISTICS (continued) $T_A = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
Drain-Source Diode Characteristics						
V_{SD}	Source to Drain Diode Forward Voltage	$V_{GS} = 0\text{ V}$, $I_S = 2.8\text{ A}$ (Note 2)	–	0.82	1.3	V
t_{rr}	Reverse Recovery Time	$I_F = 2.8\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$	–	48	77	ns
Q_{rr}	Reverse Recovery Charge		–	44	70	nC

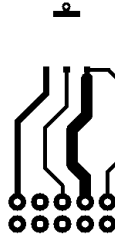
Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

NOTES:

- $R_{\theta JA}$ is determined with the device mounted on a 1 in² 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 $R_{\theta CA}$ is determined by the user's board design.



a) 55°C/W when mounted on a 1 in² pad of 2 oz copper



b) 118°C/W when mounted on a minimum pad of 2 oz copper

- Pulse Test : Pulse Width $< 300\text{ }\mu\text{s}$, Duty Cycle $< 2.0\%$
- Starting $T_J = 25^\circ\text{C}$; N-ch: $L = 1\text{ mH}$, $I_{AS} = 5\text{ A}$, $V_{DD} = 135\text{ V}$, $V_{GS} = 10\text{ V}$.

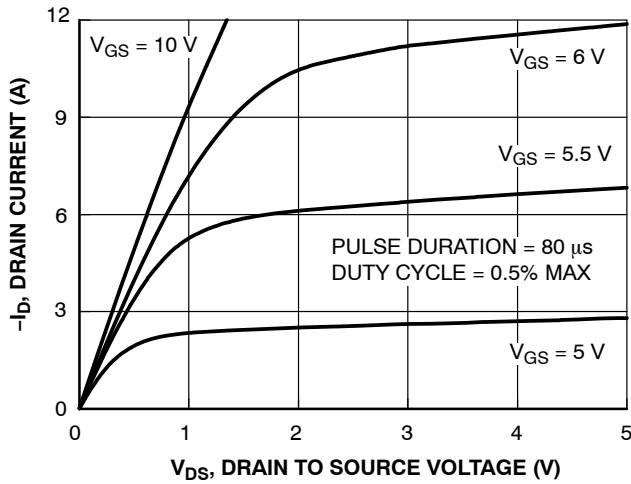
TYPICAL CHARACTERISTICS $T_J = 25^\circ\text{C}$ UNLESS OTHERWISE NOTED

Figure 1. On-Region Characteristics

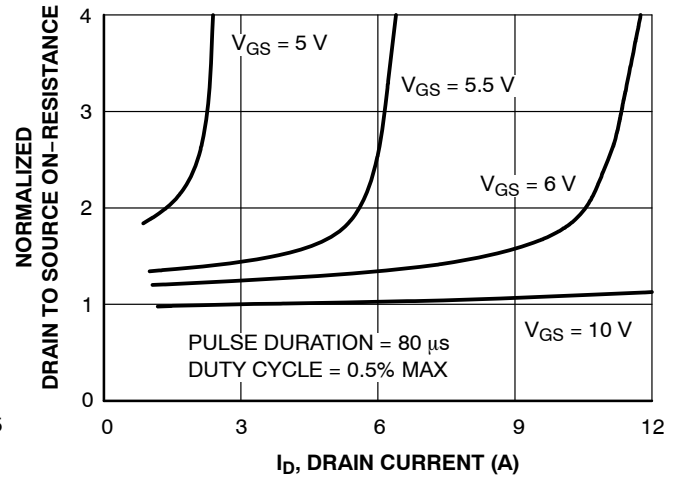


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

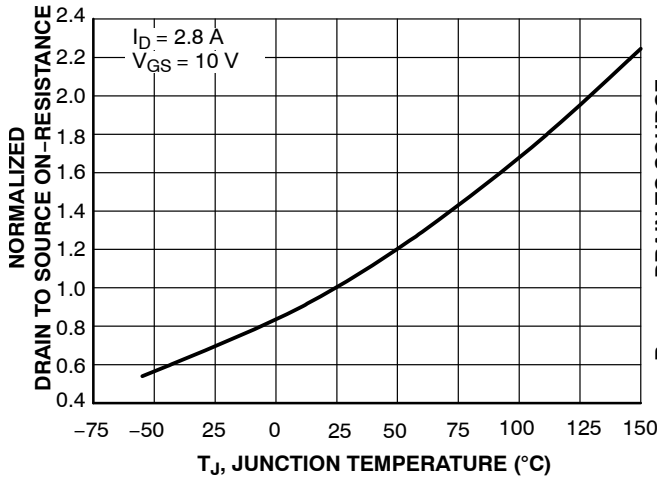


Figure 3. Normalized On Resistance vs Junction Temperature

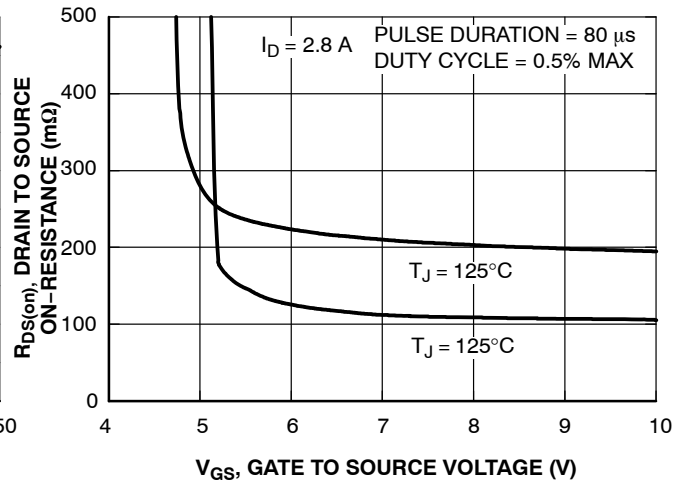


Figure 4. On-Resistance vs Gate to Source Voltage

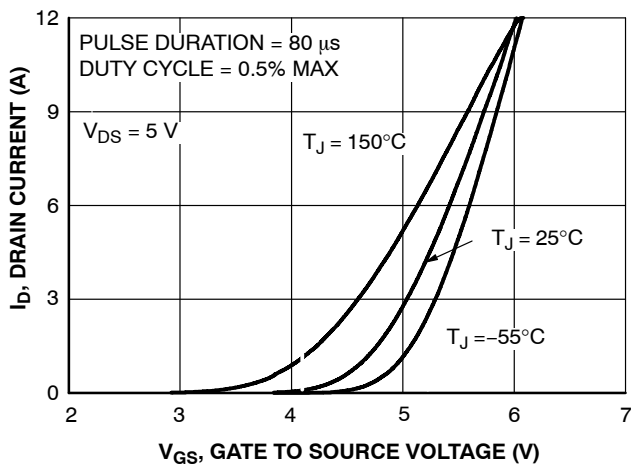


Figure 5. Transfer Characteristics

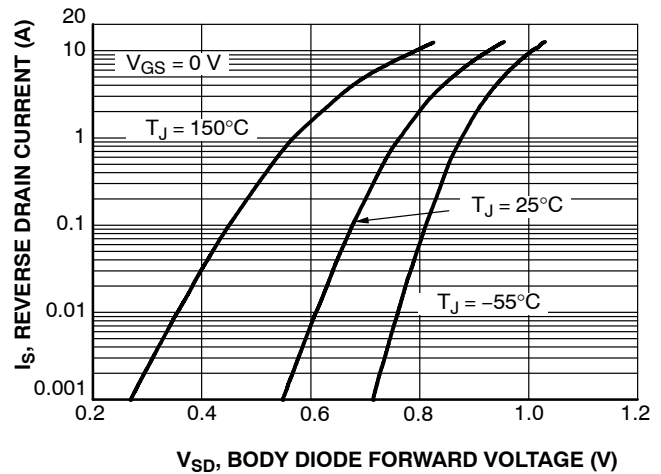


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

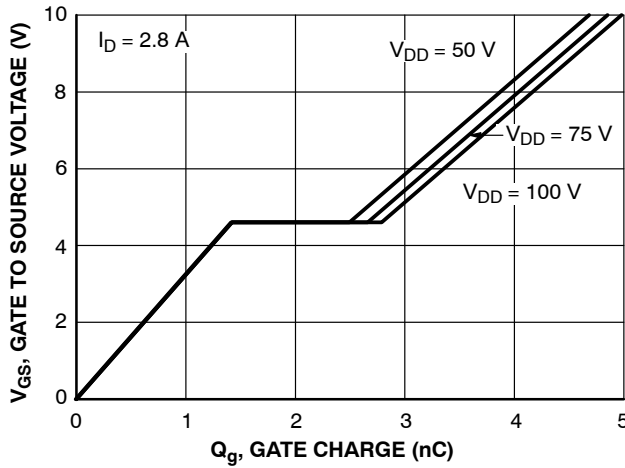
TYPICAL CHARACTERISTICS (CONTINUED) $T_J = 25^\circ\text{C}$ UNLESS OTHERWISE NOTED

Figure 7. Gate Charge Characteristics

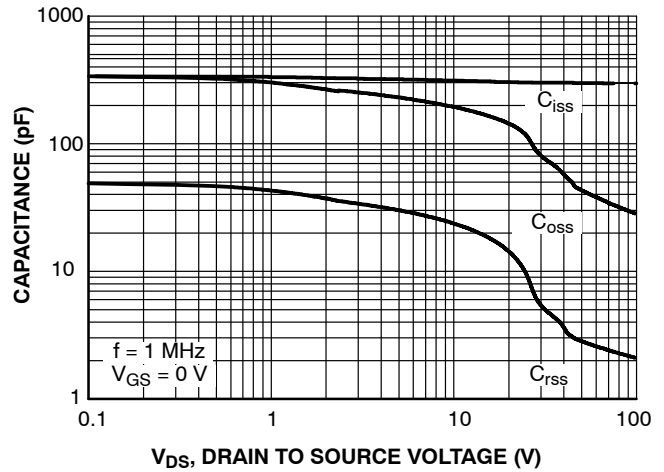


Figure 8. Capacitance vs Drain to Source Voltage

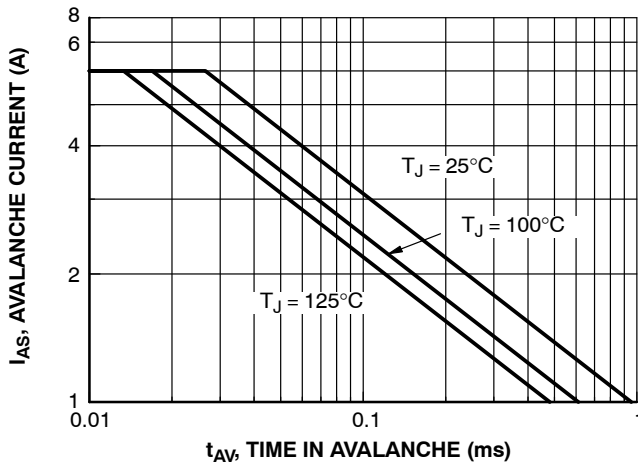


Figure 9. Unclamped Inductive Switching Capability

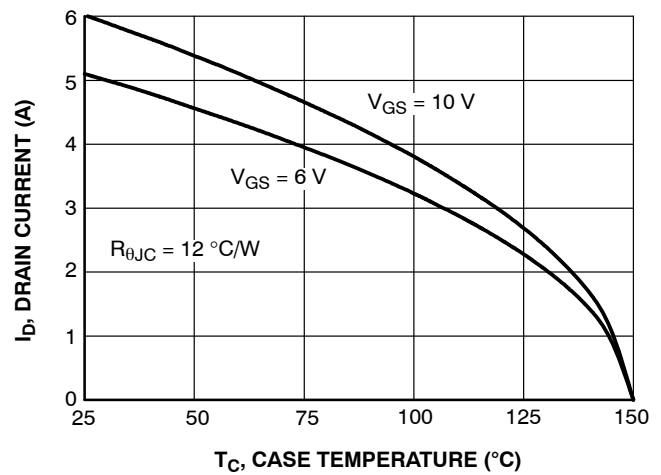


Figure 10. Maximum Continuous Drain Current vs Case Temperature

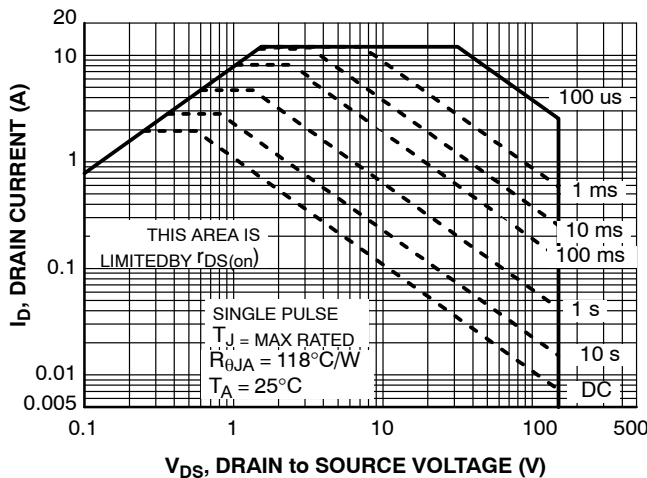


Figure 11. Forward Bias Safe Operating Area

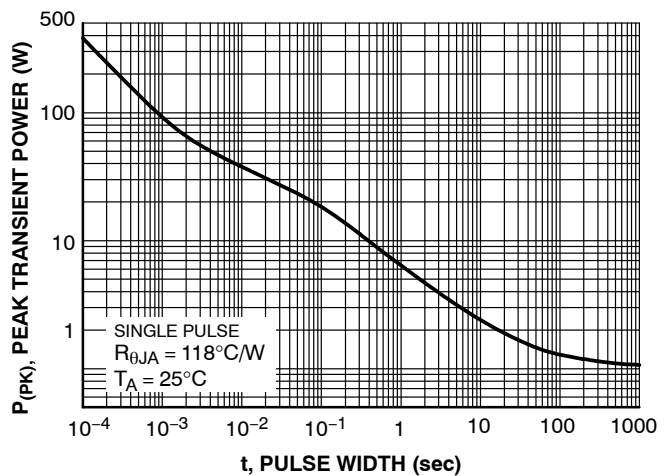


Figure 12. Single Pulse Maximum Power Dissipation

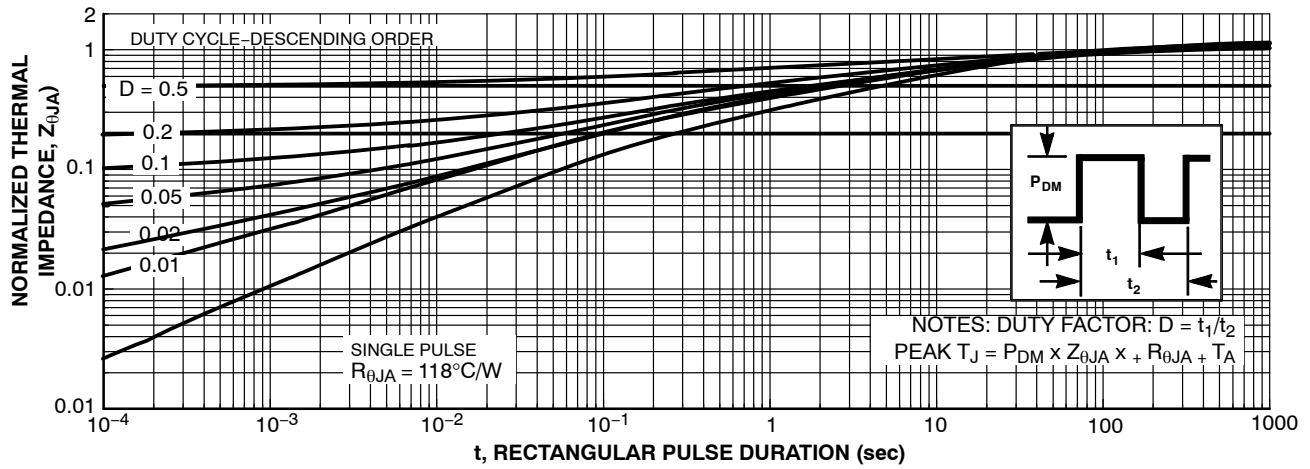
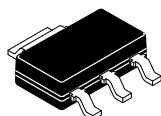
TYPICAL CHARACTERISTICS (CONTINUED) $T_J = 25^\circ\text{C}$ UNLESS OTHERWISE NOTED

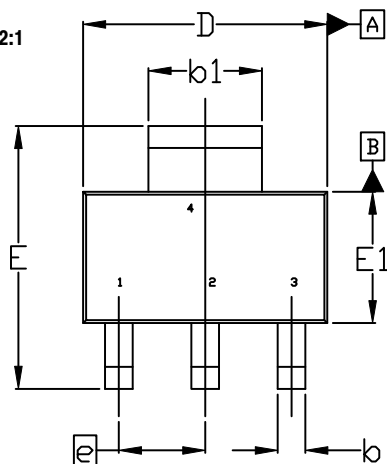
Figure 13. Junction-to-Ambient Transient Thermal Response Curve



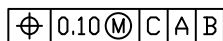
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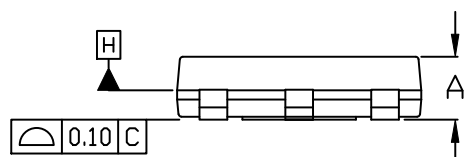
SCALE 2:1



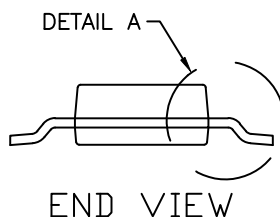
TOP VIEW



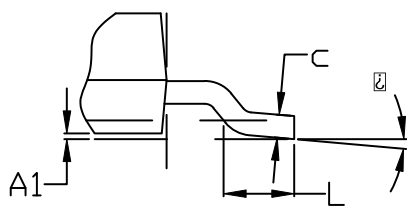
NOTE 7



SIDE VIEW

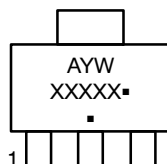


END VIEW



DETAIL A

GENERIC MARKING DIAGRAM*



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

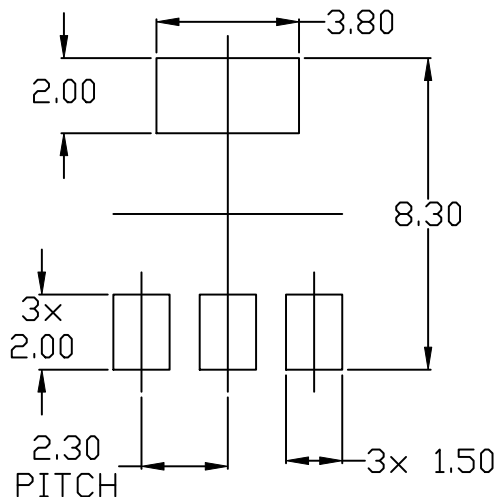
(Note: Microdot may be in either location)

*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.

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.	NOM.	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	---	---
⌀	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.

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