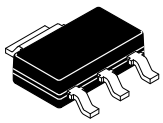
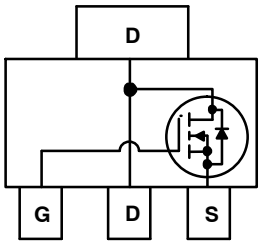
MOSFET – N-Channel Shielded Gate POWERTRENCH®

150 V, 2.8 A, 128 mΩ

FDT86244



SOT−223
CASE 318H



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.

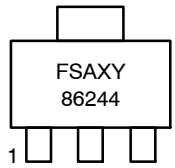
Features

- 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

MARKING DIAGRAM



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

MOSFET Maximum Ratings T_A = 25°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°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°C (Note 1a)	2.2	W
	Power Dissipation T_A = 25°C (Note 1b)	1.0	
T_J, T_{STG}	Operating and Storage Junction Temperature Range	−55 to +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.

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°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
Off Characteristics						
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 250 μA, V_{GS} = 0 V	150	–	–	V
$\frac{\Delta BV_{DSS(th)}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, referenced to 25°C	–	104	–	mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 120 V, V_{GS} = 0 V	–	–	1	μA
I_{GSS}	Gate to Source Leakage Current	V_{GS} = ±20 V, V_{DS} = 0 V	–	–	±100	nA
On Characteristics						
$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{GS} = V_{DS}, I_D = 250 μA	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 μA, referenced to 25°C	–	−10	–	mV/°C
$R_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10 V, I_D = 2.8 A	–	106	128	mΩ
		V_{GS} = 6 V, I_D = 2.4 A	–	127	178	
		V_{GS} = 10 V, I_D = 2.8 A, T_J = 125°C	–	196	237	
g_{FS}	Forward Transconductance	V_{DS} = 10 V, I_D = 2.8 A	–	12	–	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 75 V, V_{GS} = 0 V, f =1 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 V, I_D = 2.8 A, V_{GS} = 10 V, R_{GEN} = 6 Ω	–	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 V to 10 V, V_{GS} = 0 V to 5 V	–	4.9	7	nC
$Q_{g(TOT)}$	Total Gate Charge		–	2.8	4	nC
Q_{gs}	Total Gate Charge	V_{DD} = 75 V, I_D = 2.8 A	–	1.4	–	nC
Q_{gd}	Gate to Drain “Miller” Charge		–	1.3	–	nC

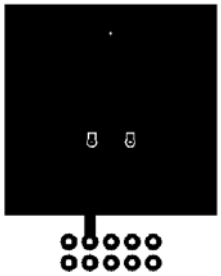
ELECTRICAL CHARACTERISTICS (continued) T_A = 25°C unless otherwise noted

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

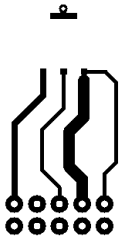
Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

NOTES:

1. $R_{\theta JA}$ is determined with the device mounted on a 1 in^2 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 in^2 pad of 2 oz copper



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

2. Pulse Test : Pulse Width < 300 μs, Duty Cycle < 2.0%
3. Starting T_J = 25 °C; N−ch: L = 1 mH, I_{AS} = 5 A, V_{DD} = 135 V, V_{GS} = 10 V.

TYPICAL CHARACTERISTICS T_J = 25°C UNLESS OTHERWISE NOTED

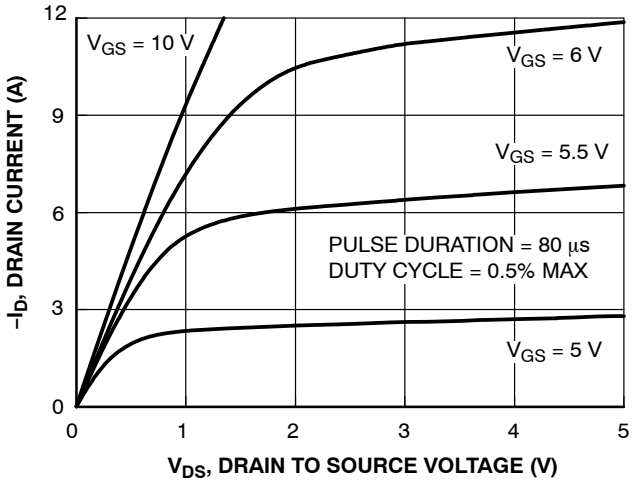


Figure 1. On−Region Characteristics

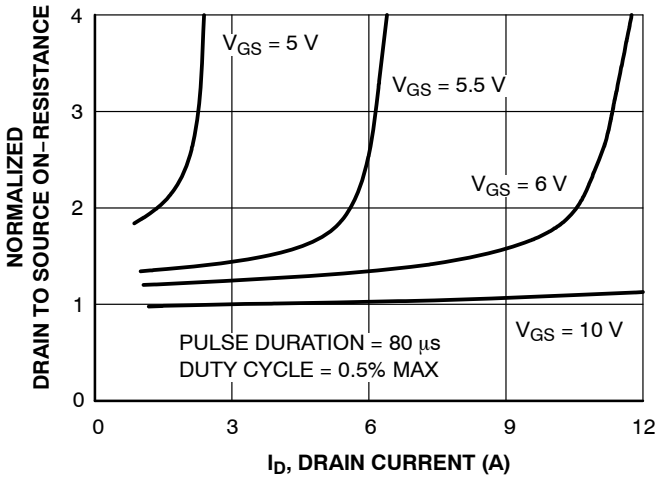


Figure 2. Normalized On−Resistance vs Drain Current and Gate Voltage

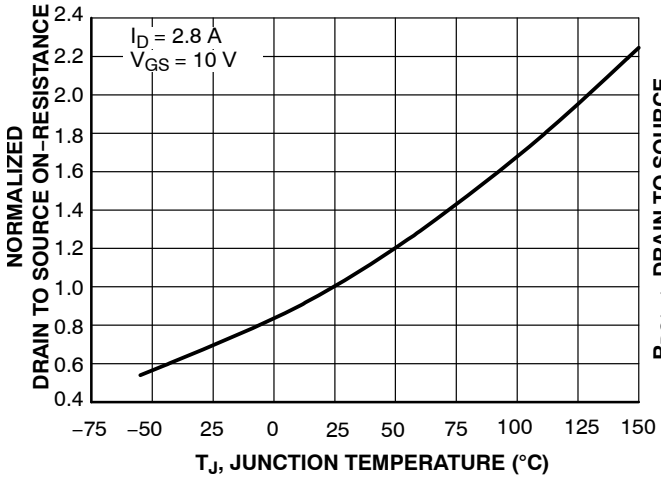


Figure 3. Normalized On Resistance vs Junction Temperature

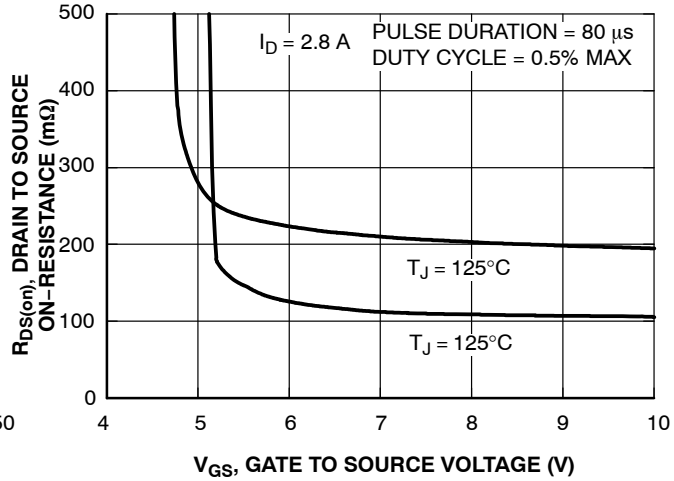


Figure 4. On−Resistance vs Gate to Source Voltage

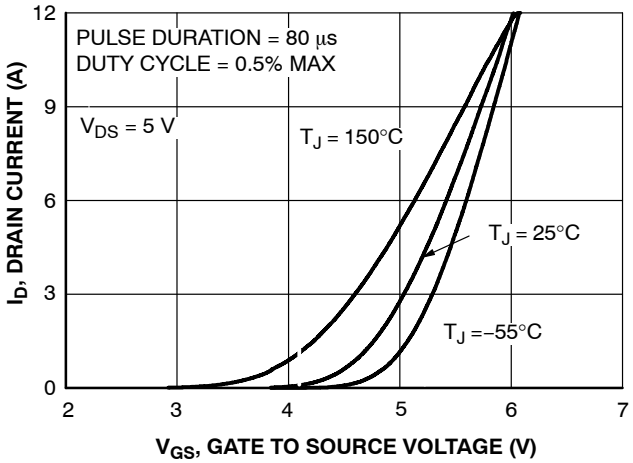


Figure 5. Transfer Characteristics

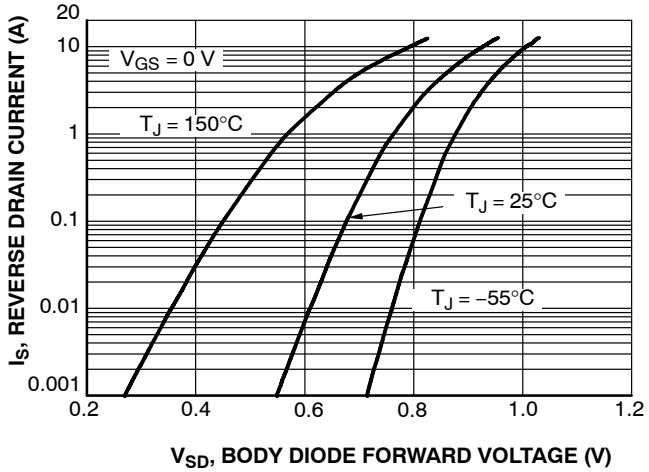


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

TYPICAL CHARACTERISTICS (CONTINUED) T_J = 25°C UNLESS OTHERWISE NOTED

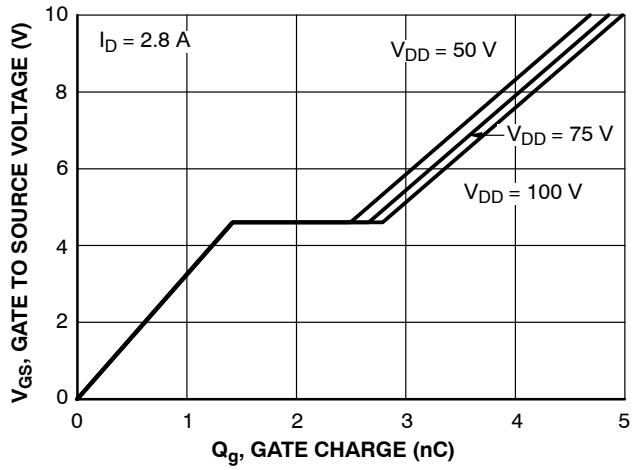


Figure 7. Gate Charge Characteristics

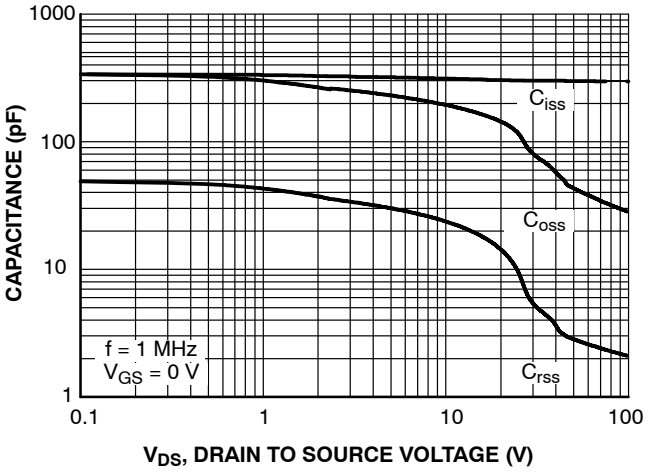


Figure 8. Capacitance vs Drain to Source Voltage

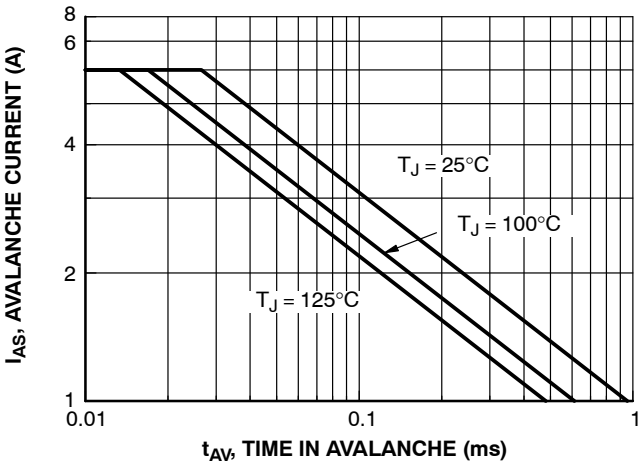


Figure 9. Unclamped Inductive Switching Capability

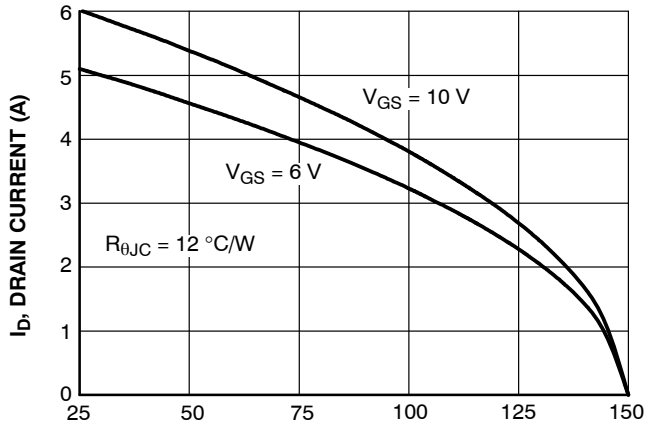


Figure 10. Maximum Continuous Drain Current vs Case Temperature

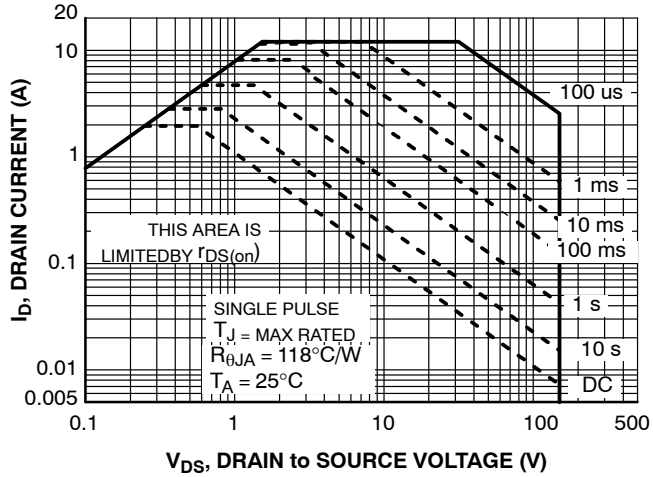


Figure 11. Forward Bias Safe Operating Area

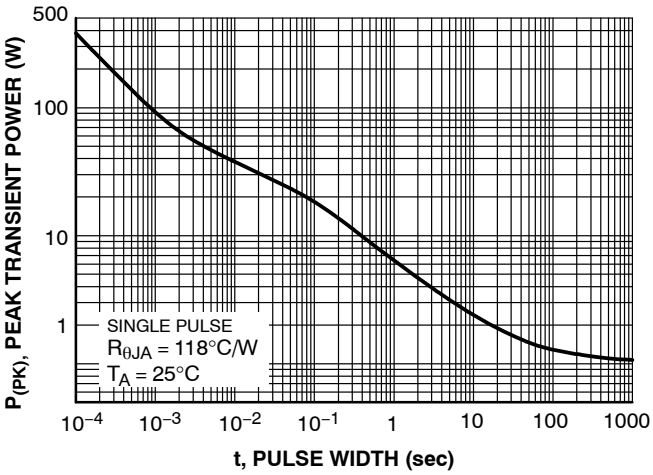


Figure 12. Single Pulse Maximum Power Dissipation

TYPICAL CHARACTERISTICS (CONTINUED) T_J = 25°C UNLESS OTHERWISE NOTED

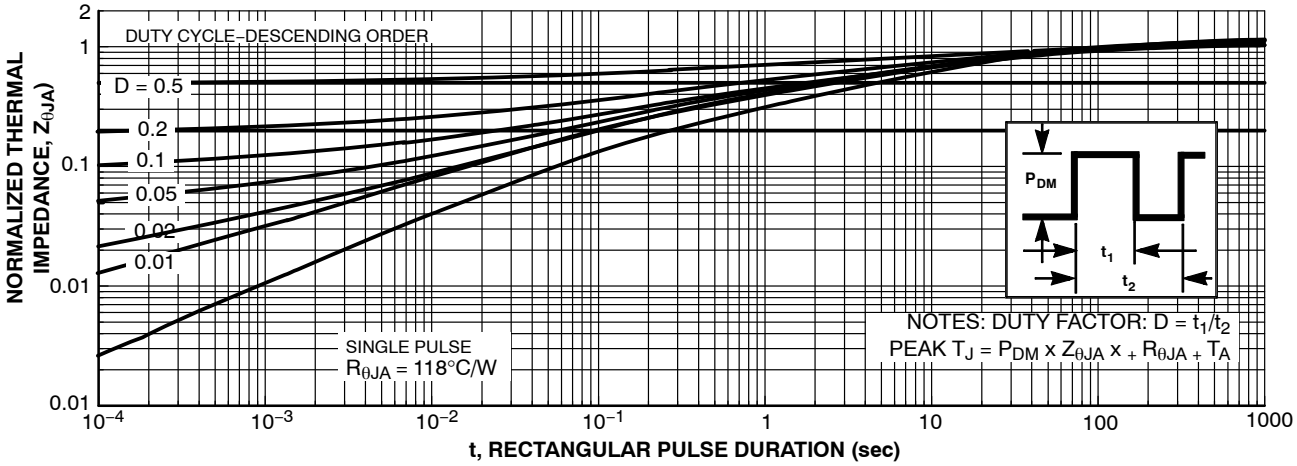
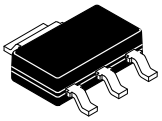


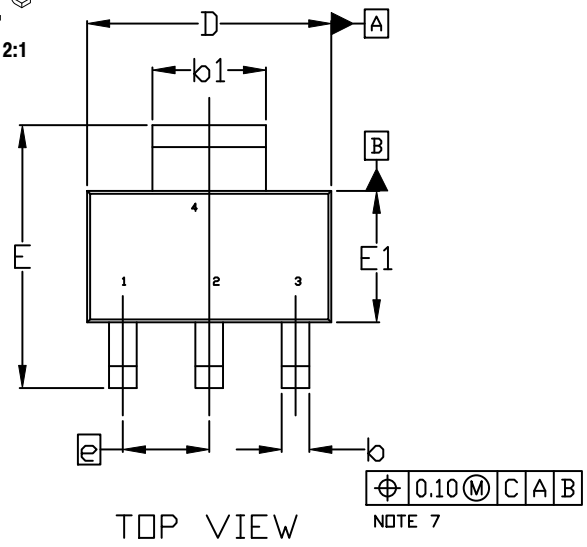
Figure 13. Junction−to−Ambient Transient Thermal Response Curve

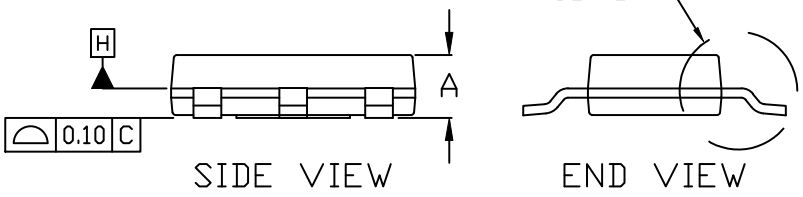


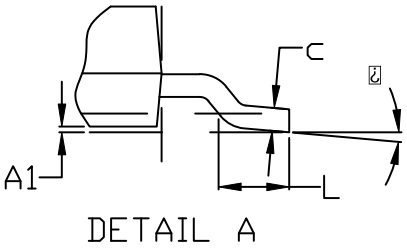
SCALE 2:1

SOT−223
CASE 318H
ISSUE B

DATE 13 MAY 2020

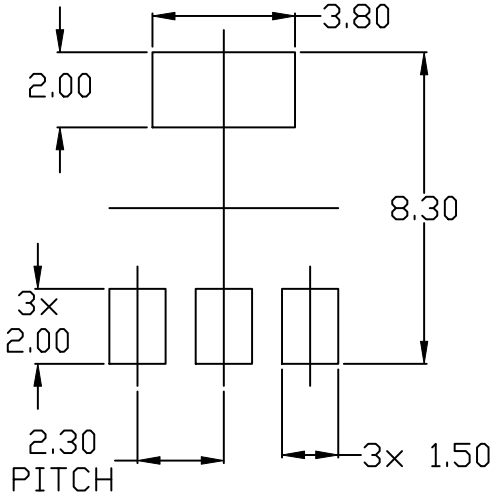






NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
2. CONTROLLING DIMENSION: MILLIMETERS
3. DIMENSIONS D & E1 ARE DETERMINED AT DATUM H. DIMENSIONS DO NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. SHALL NOT EXCEED 0.23mm PER SIDE.
4. LEAD DIMENSIONS b AND b1 DO NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBBAR 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.

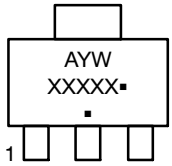
DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	---	---	1.80
A1	0.02	0.06	0.11
b	0.60	0.74	0.88
b1	2.90	3.00	3.10
c	0.24	---	0.35
D	6.30	6.50	6.70
E	6.70	7.00	7.30
E1	3.30	3.50	3.70
e	2.30 BSC		
L	0.25	---	---
θ	0°	---	10°



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, SOLDERRM/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.

DOCUMENT NUMBER:	**98ASH70634A**	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
DESCRIPTION:	**SOT−223**	**PAGE 1 OF 1**

ADDITIONAL INFORMATION

TECHNICAL PUBLICATIONS:
Technical Library: www.onsemi.com/design/resources/technical−documentation
onsemi Website: www.onsemi.com

ONLINE SUPPORT: www.onsemi.com/support
For additional information, please contact your local Sales Representative at www.onsemi.com/support/sales