

# MOSFET – N-Channel, POWERTRENCH®

100 V, 6.6 A, 28 mΩ

**FDT86102LZ**

## General Description

This N-Channel MOSFET is produced using onsemi's advanced POWERTRENCH process that has been especially tailored to minimize the on-state resistance and switching loss. G-S zener has been added to enhance ESD voltage level.

## Features

- Max  $r_{DS(on)}$  = 28 mΩ at  $V_{GS} = 10$  V,  $I_D = 6.6$  A
- Max  $r_{DS(on)}$  = 38 mΩ at  $V_{GS} = 4.5$  V,  $I_D = 5.5$  A
- HBM ESD Protection Level > 6 kV Typical (Note 4)
- Very Low Qg and Qgd Compared to Competing Trench Technologies
- Fast Switching Speed
- 100% UIL Tested
- This Device is Pb-Free, Halide Free and RoHS Compliant

## Applications

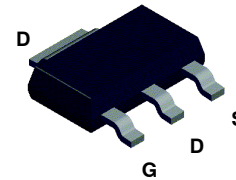
- DC – DC Conversion
- Inverter
- Synchronous Rectifier

## Specifications

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

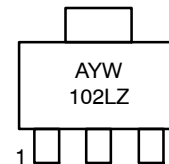
Symbol	Parameter	Ratings	Unit
$V_{DS}$	Drain to Source Voltage	100	V
$V_{GS}$	Gate to Source Voltage	$\pm 20$	V
$I_D$	Drain Current	–Continuous	A
		–Pulsed	
$E_{AS}$	Single Pulse Avalanche Energy (Note 3)	84	mJ
$P_D$	Power Dissipation	$T_A = 25^\circ\text{C}$ (Note 1a)	W
		$T_A = 25^\circ\text{C}$ (Note 1b)	
$T_J, T_{STG}$	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.



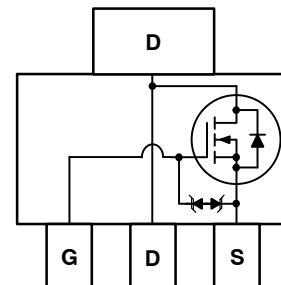
SOT-223  
CASE 318H

## MARKING DIAGRAM



A = Assembly Location  
Y = Year  
W = Work Week  
102LZ = Specific Device Code

## PIN ASSIGNMENT



## ORDERING INFORMATION

See detailed ordering and shipping information on page 6 of this data sheet.

# FDT86102LZ

## 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	

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

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

$BV_{DSS}$	Drain to Source Breakdown Voltage	$I_D = 250\ \mu\text{A}$ , $V_{GS} = 0\ \text{V}$	100			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$ , Referenced to $25^\circ\text{C}$		70		mV/°C
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 80\ \text{V}$ , $V_{GS} = 0\ \text{V}$			1	$\mu\text{A}$
$I_{GSS}$	Gate to Source Leakage Current	$V_{GS} = \pm 20\ \text{V}$ , $V_{DS} = 0\ \text{V}$			$\pm 10$	$\mu\text{A}$

### ON CHARACTERISTICS

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}$ , $I_D = 250\ \mu\text{A}$	1.0	1.4	3.0	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$ , Referenced to $25^\circ\text{C}$		-6		mV/°C
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\ \text{V}$ , $I_D = 6.6\ \text{A}$		22	28	m $\Omega$
		$V_{GS} = 4.5\ \text{V}$ , $I_D = 5.5\ \text{A}$		27	38	
		$V_{GS} = 10\ \text{V}$ , $I_D = 6.6\ \text{A}$ , $T_J = 125^\circ\text{C}$		36	46	
$g_{FS}$	Forward Transconductance	$V_{DS} = 5\ \text{V}$ , $I_D = 6.6\ \text{A}$		26		S

### DYNAMIC CHARACTERISTICS

$C_{iss}$	Input Capacitance	$V_{DS} = 50\ \text{V}$ , $V_{GS} = 0\ \text{V}$ , $f = 1\ \text{MHz}$		1118	1490	pF
$C_{oss}$	Output Capacitance			181	245	pF
$C_{rss}$	Reverse Transfer Capacitance			7.5	15	pF
$R_g$	Gate Resistance			0.5		$\Omega$

### SWITCHING CHARACTERISTICS

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 50\ \text{V}$ , $I_D = 6.6\ \text{A}$ , $V_{GS} = 10\ \text{V}$ , $R_{GEN} = 6\ \Omega$		6.6	14	ns
$t_r$	Rise Time			1.9	10	ns
$t_{d(off)}$	Turn-Off Delay Time			19	31	ns
$t_f$	Fall Time			2.2	10	ns
$Q_{g(TOT)}$	Total Gate Charge	$V_{GS} = 0\ \text{V}$ to $10\ \text{V}$ , $V_{DD} = 50\ \text{V}$ , $I_D = 6.6\ \text{A}$		17	25	nC
		$V_{GS} = 0\ \text{V}$ to $4.5\ \text{V}$ , $V_{DD} = 50\ \text{V}$ , $I_D = 6.6\ \text{A}$		8.3	12	
$Q_{gs}$	Gate to Source Charge	$V_{DD} = 50\ \text{V}$ , $I_D = 6.6\ \text{A}$		2.6		nC
$Q_{gd}$	Gate to Drain "Miller" Charge			2.2		nC

### DRAIN-SOURCE DIODE CHARACTERISTICS

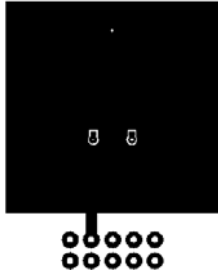
$V_{SD}$	Source to Drain Diode Forward Voltage	$V_{GS} = 0\ \text{V}$ , $I_S = 6.6\ \text{A}$ (Note 2)		0.82	1.3	V
		$V_{GS} = 0\ \text{V}$ , $I_S = 1.0\ \text{A}$ (Note 2)		0.68	1.2	
$t_{rr}$	Reverse Recovery Time	$I_F = 6.6\ \text{A}$ , $di/dt = 100\ \text{A}/\mu\text{s}$		40	64	ns
$Q_{rr}$	Reverse Recovery Charge			36	58	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.

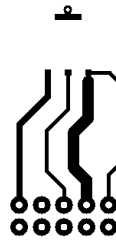
## FDT86102LZ

### NOTES:

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  $R_{\theta CA}$  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 of 2 oz copper

2. Pulse Test: Pulse Width < 300  $\mu$ s, Duty cycle < 2.0%.
3. Starting  $T_J = 25^\circ\text{C}$ ,  $L = 1$  mH,  $I_{AS} = 13$  A,  $V_{DD} = 90$  V,  $V_{GS} = 10$  V.
4. The diode connected between gate and source serves only as protection against ESD. No gate overvoltage rating is implied.

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

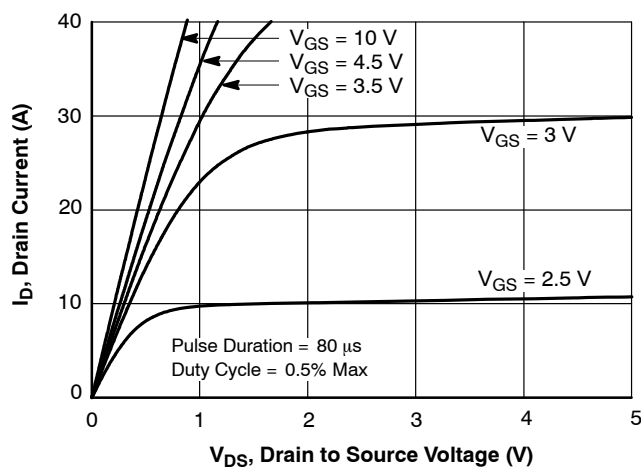


Figure 1. On Region Characteristics

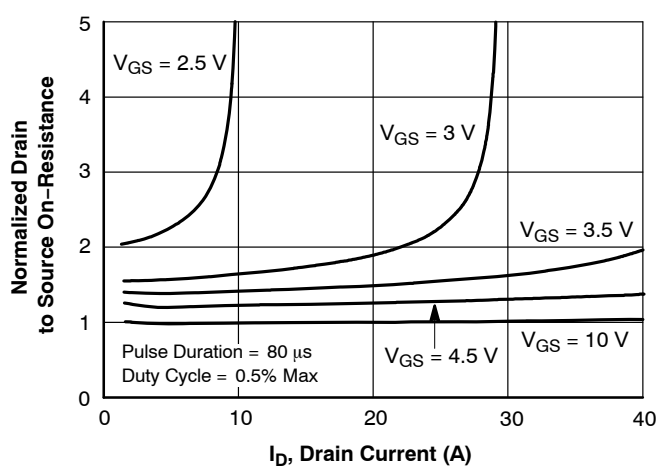


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

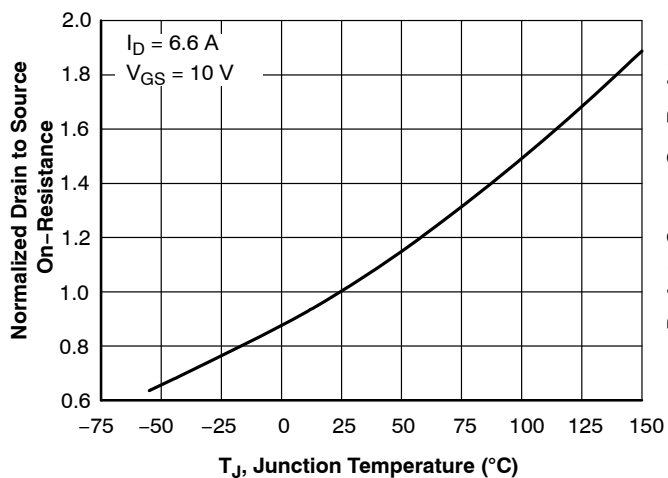


Figure 3. Normalized On Resistance vs. Junction Temperature

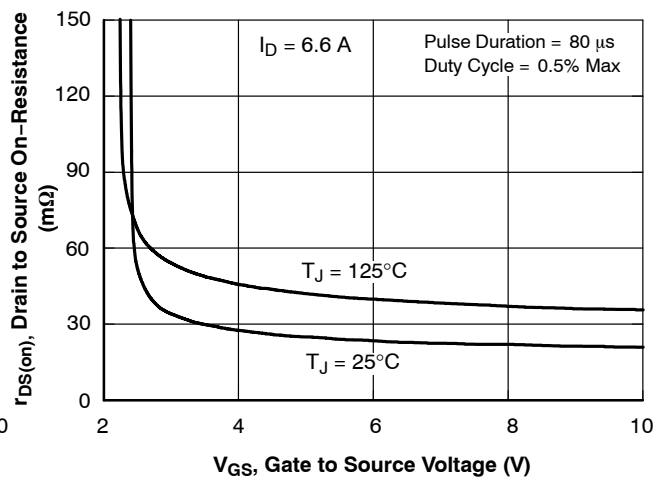


Figure 4. On-Resistance vs. Gate to Source Voltage

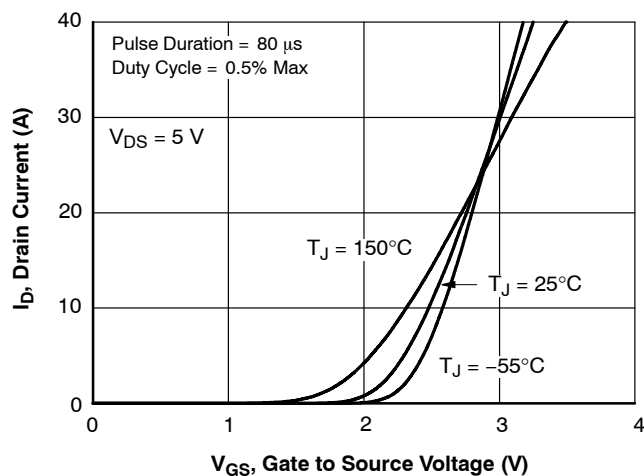


Figure 5. Transfer Characteristics

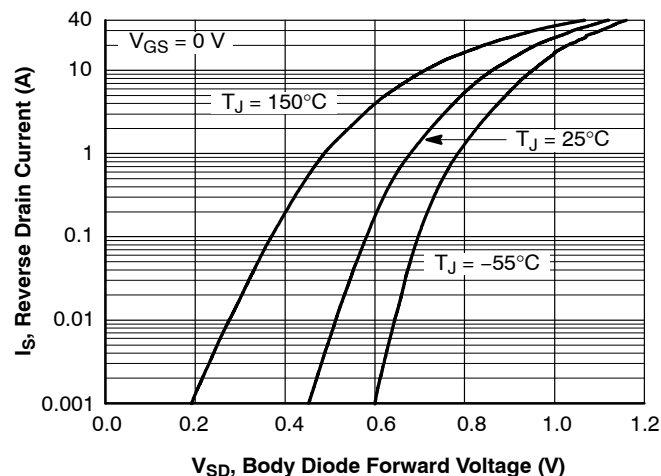


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

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

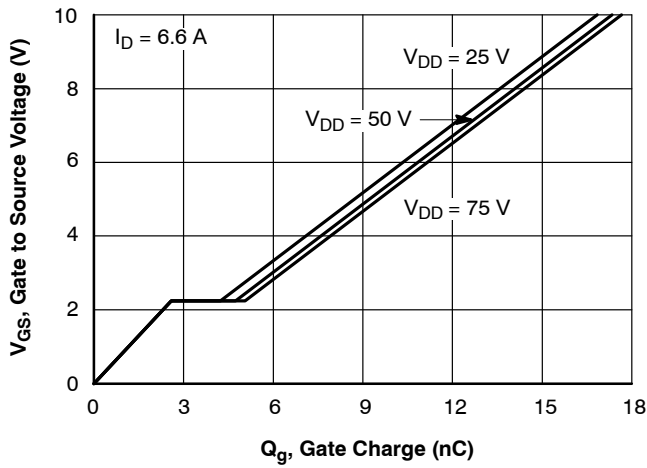


Figure 7. Gate Charge Characteristics

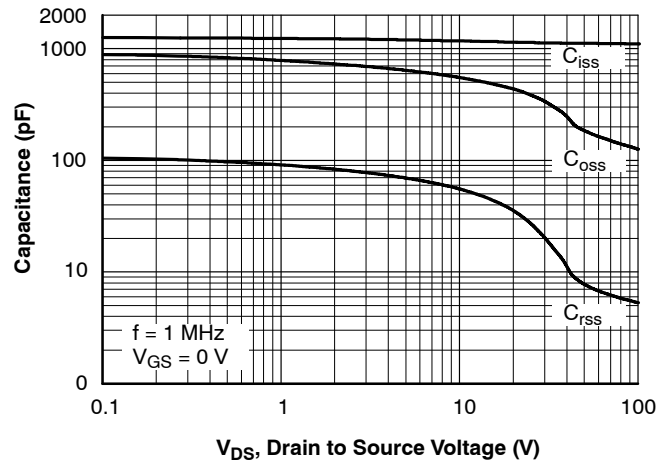


Figure 8. Capacitance vs. Drain to Source Voltage

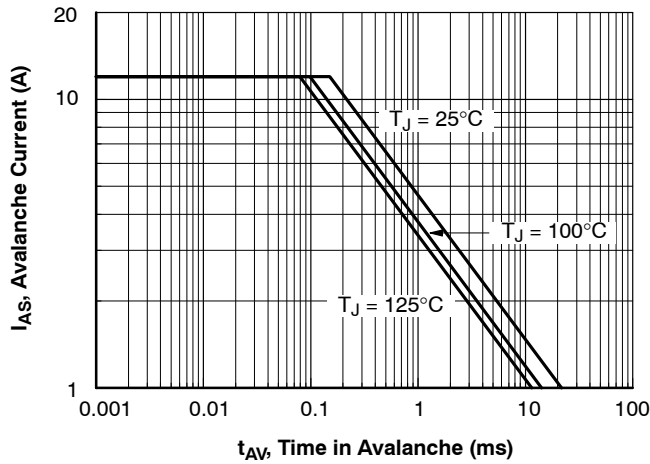


Figure 9. Unclamped Inductive Switching Capability

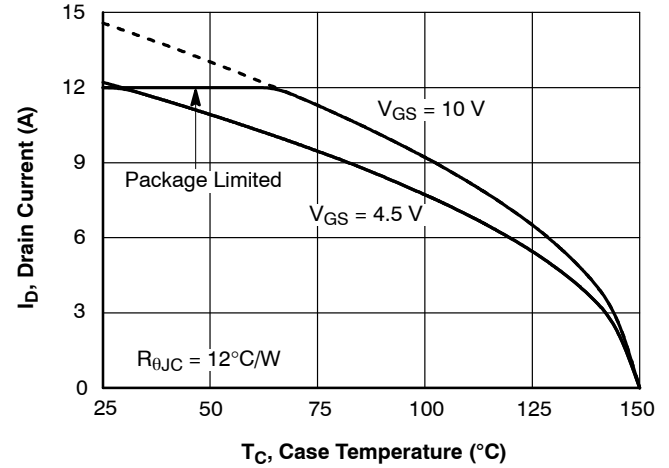


Figure 10. Maximum Continuous Drain Current vs Case Temperature

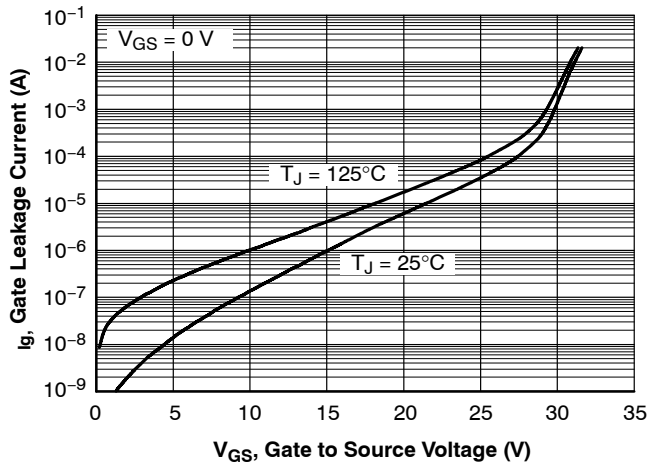


Figure 11. Gate Leakage Current vs Gate to Source Voltage

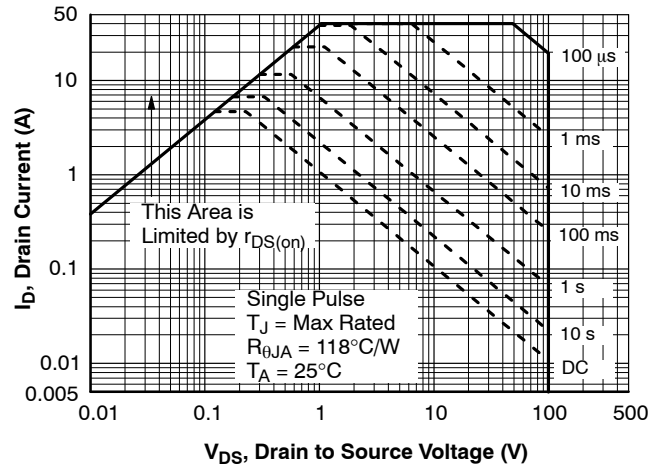


Figure 12. Forward Bias Safe Operating Area

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

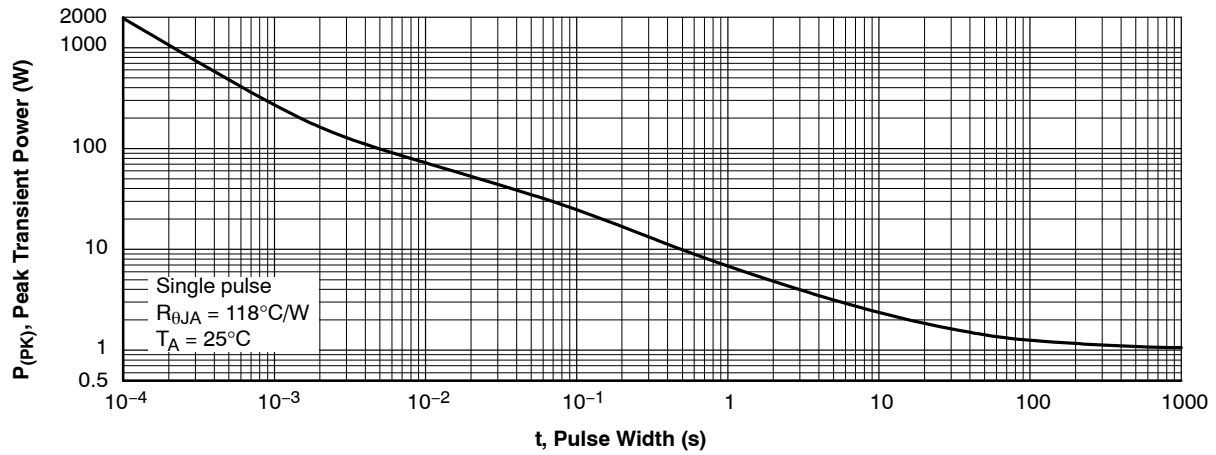


Figure 13. Single Pulse Maximum Power Dissipation

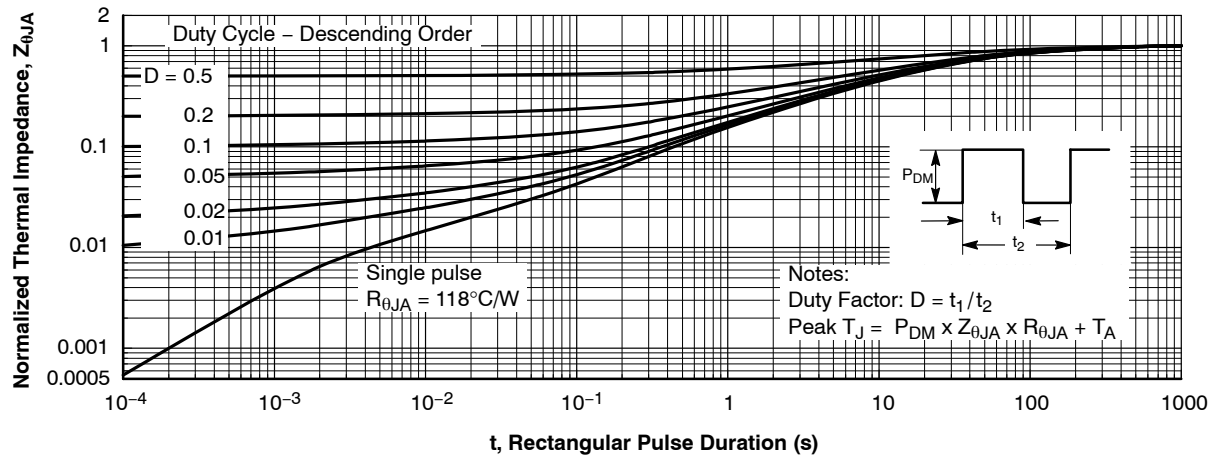
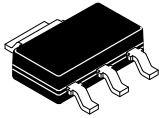


Figure 14. Junction-to-Ambient Transient Thermal Response Curve

### ORDERING INFORMATION

Device	Device Marking	Package Type	Shipping <sup>†</sup>
FDT86102LZ	102LZ	SOT-223 (Pb-Free)	4000 / 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.



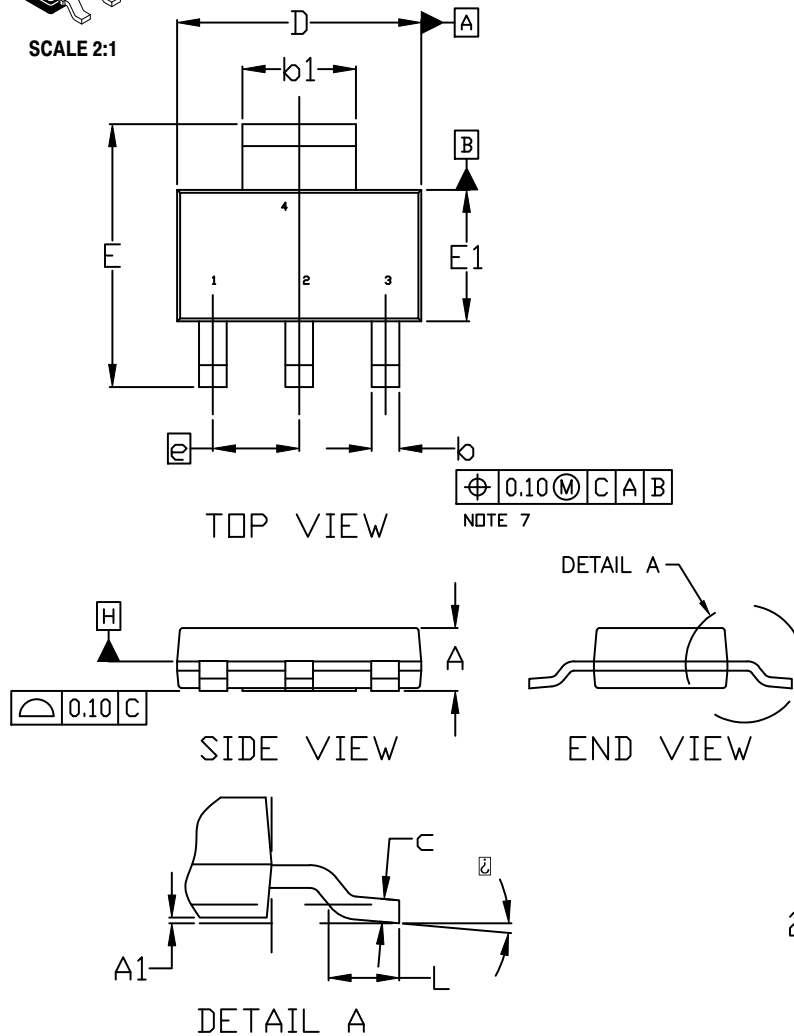
SCALE 2:1

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

DATE 13 MAY 2020

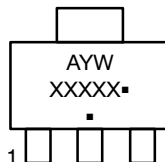
**NOTES:**

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 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°

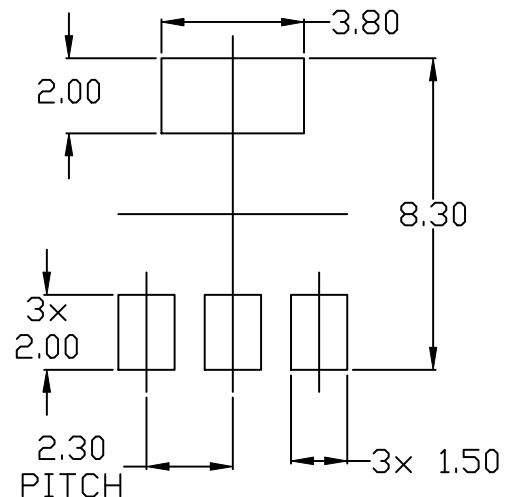
**GENERIC MARKING DIAGRAM\***



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.



**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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