

# MOSFET – N-Channel, POWERTRENC<sup>®</sup>

150 V, 2 A, 228 m $\Omega$

## FDT86246L

### General Description

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

### Features

- Max  $r_{DS(on)}$  = 228 m $\Omega$  at  $V_{GS}$  = 10 V,  $I_D$  = 2 A
- Max  $r_{DS(on)}$  = 280 m $\Omega$  at  $V_{GS}$  = 4.5 V,  $I_D$  = 1.8 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

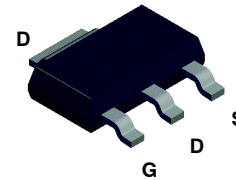
- Load Switch
- Primary Switch
- Buck/Boost Switch

### Specifications

#### MOSFET MAXIMUM RATINGS ( $T_A$ = 25°C unless otherwise noted)

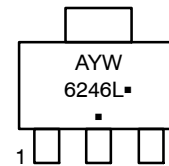
| Symbol         | Parameter                                        |                                   | Ratings     | Unit |
|----------------|--------------------------------------------------|-----------------------------------|-------------|------|
| $V_{DS}$       | Drain to Source Voltage                          |                                   | 150         | V    |
| $V_{GS}$       | Gate to Source Voltage                           |                                   | $\pm 20$    | V    |
| $I_D$          | Drain Current                                    | Continuous $T_A$ = 25°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°C (Note 1a)            | 2.2         | W    |
|                |                                                  | $T_A$ = 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.



SOT-223  
CASE 318H

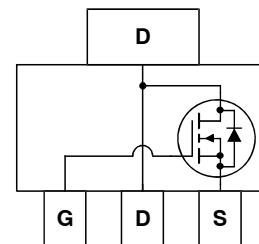
### MARKING DIAGRAM



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

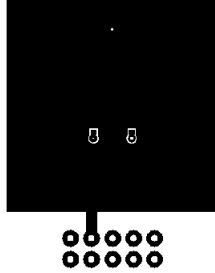
See detailed ordering and shipping information on page 2 of this data sheet.

# 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 |
|--------|-----------|-----------------|-----|-----|-----|------|
|--------|-----------|-----------------|-----|-----|-----|------|

### 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.

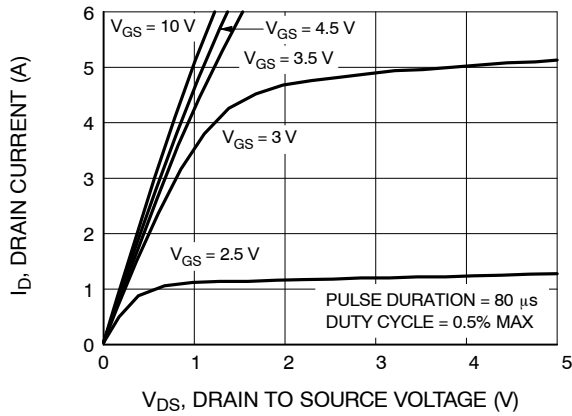
2. Pulse Test: Pulse Width < 300 μs, Duty cycle < 2.0%.

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.

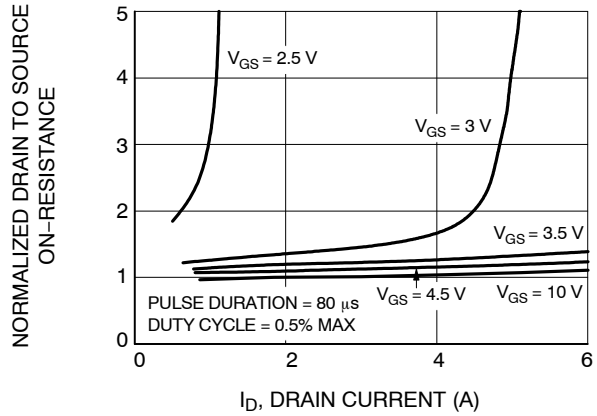
4. Pulsed I<sub>d</sub> please refer to Figure 11 SOA graph for more details.

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

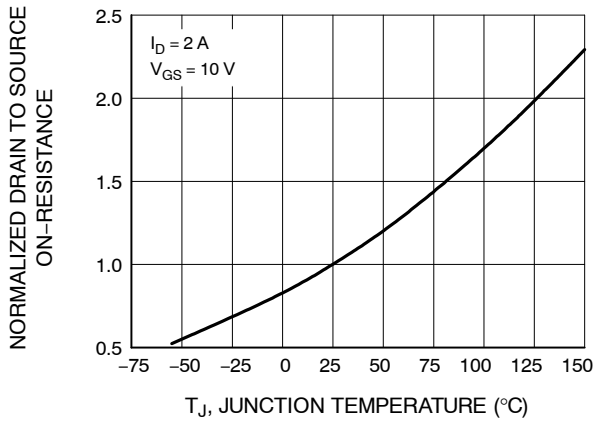
**TYPICAL CHARACTERISTICS** ( $T_J = 25^\circ\text{C}$  unless otherwise noted)



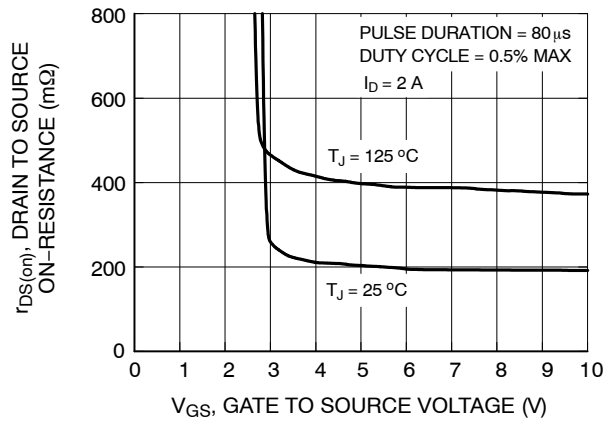
**Figure 1. On Region Characteristics**



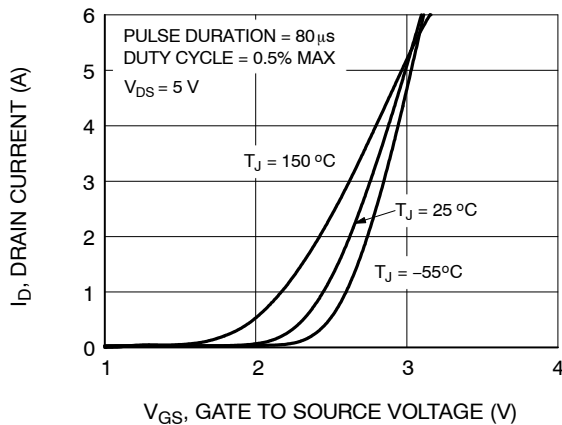
**Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage**



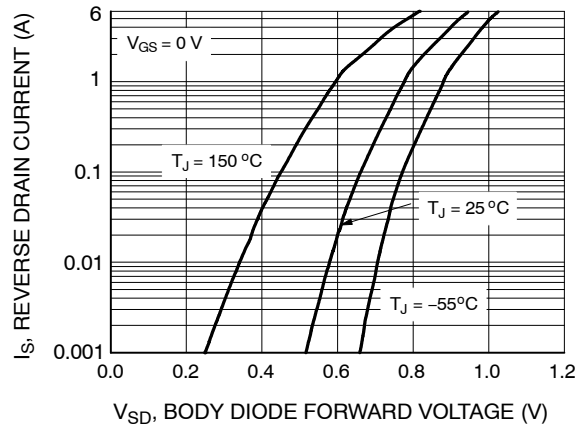
**Figure 3. Normalized On Resistance vs. Junction Temperature**



**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)

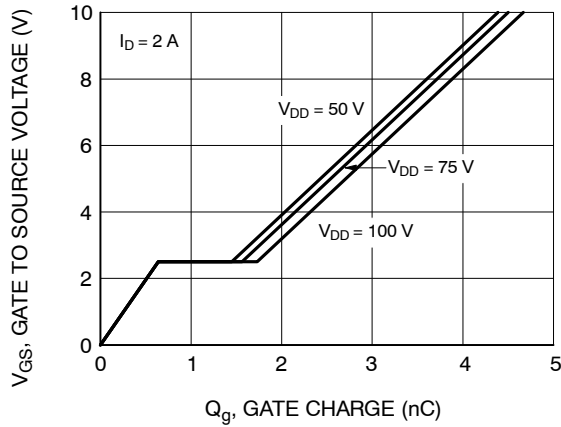


Figure 7. Gate Charge Characteristics

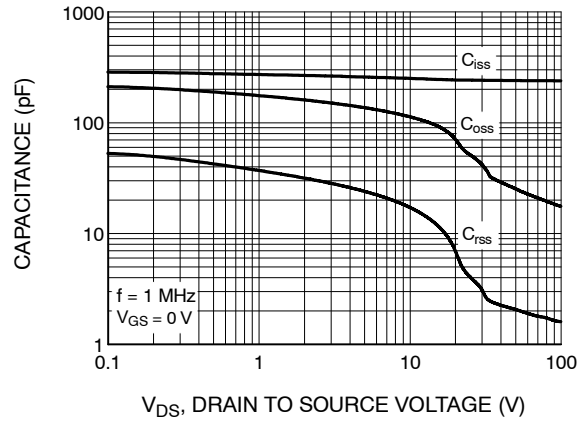


Figure 8. Capacitance vs. Drain to Source Voltage

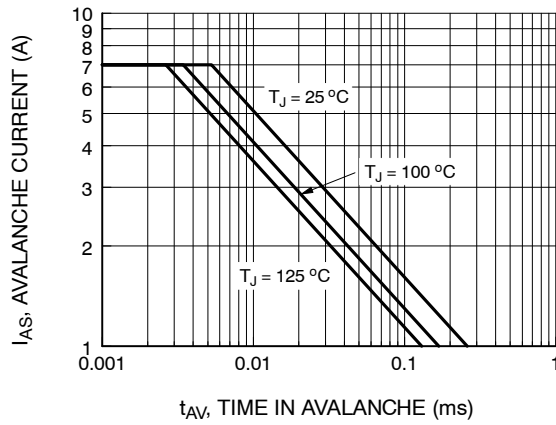


Figure 9. Unclamped Inductive Switching Capability

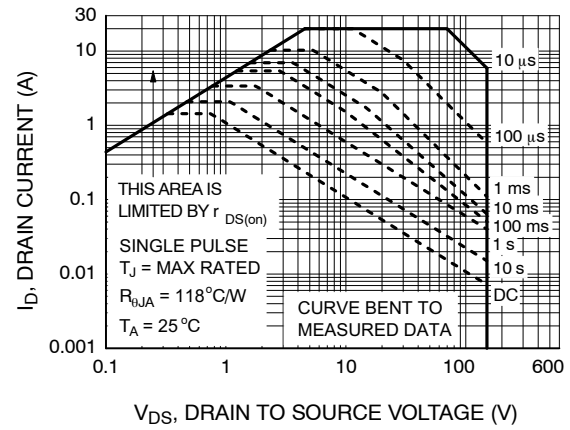


Figure 10. Forward Bias Safe Operating Area

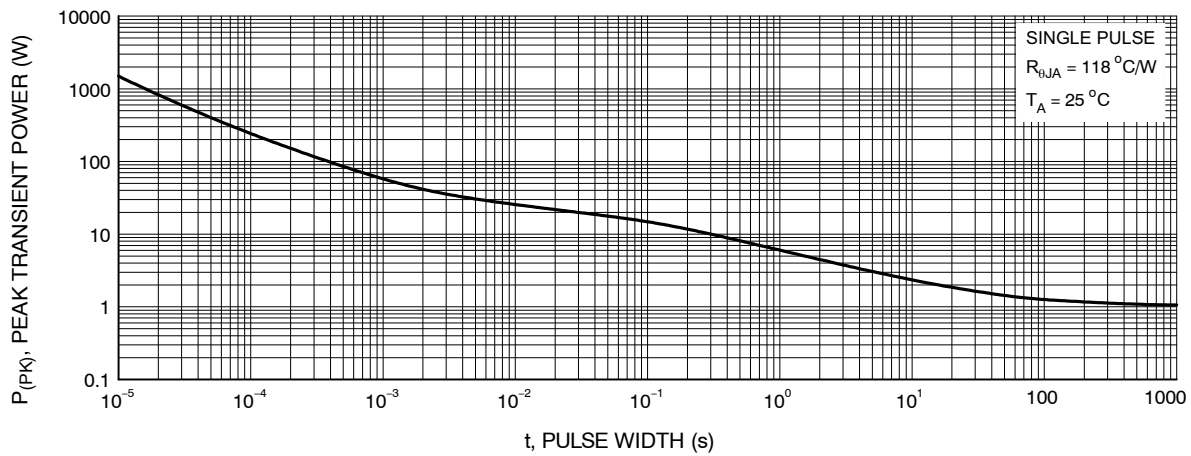


Figure 11. Single Pulse Maximum Power Dissipation

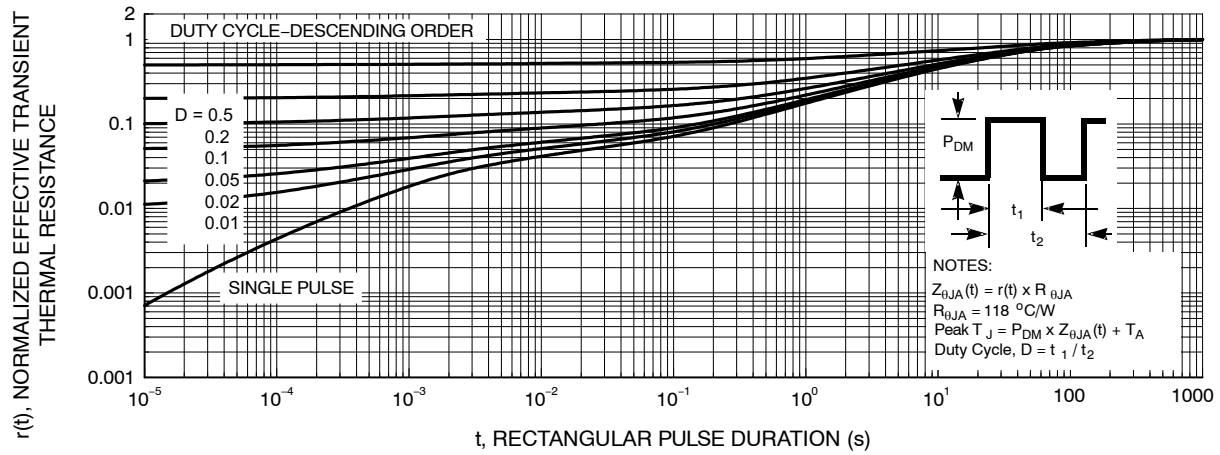
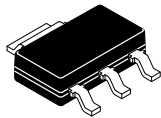
TYPICAL CHARACTERISTICS ( $T_J = 25^\circ\text{C}$  unless otherwise noted) (continued)

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



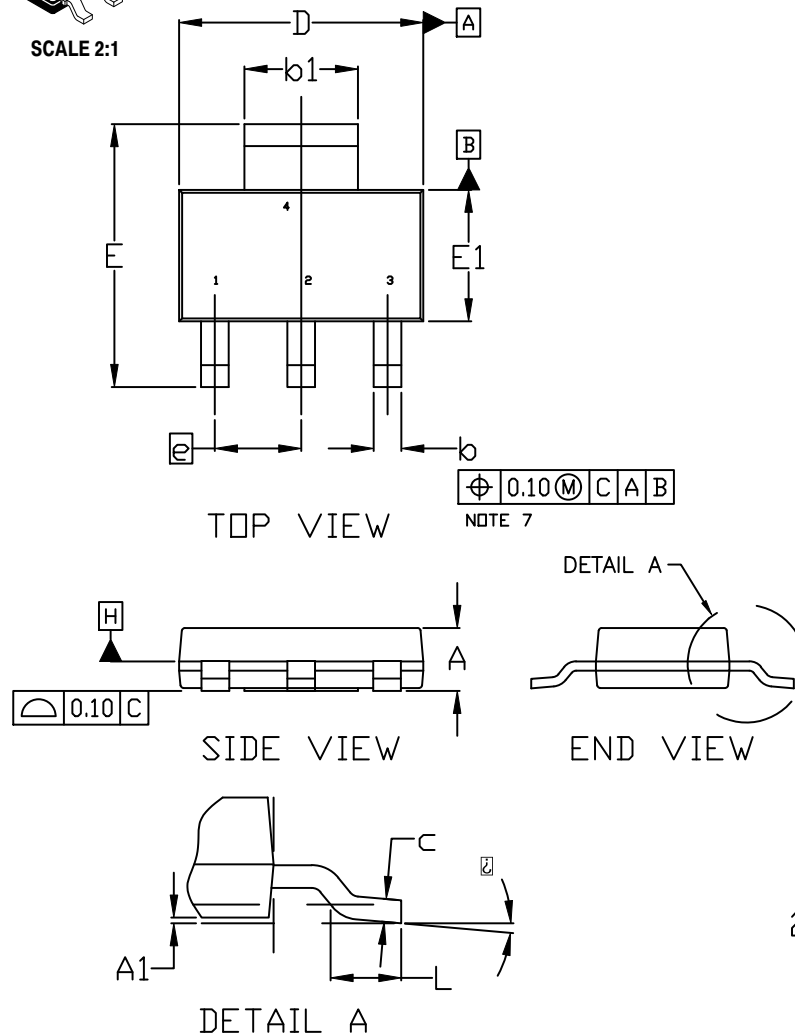
SCALE 2:1

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

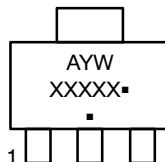
DATE 13 MAY 2020

## 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.



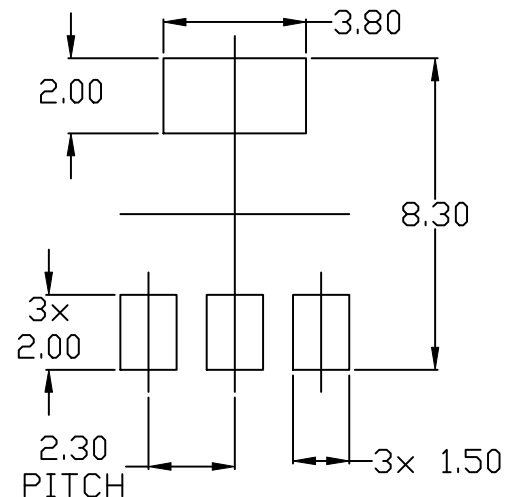
| DIM | MILLIMETERS |      |      |
|-----|-------------|------|------|
|     | MIN.        | NOM. | MAX. |
| A   | ---         | ---  | 1.80 |
| A1  | 0.02        | 0.06 | 0.11 |
| b   | 0.60        | 0.74 | 0.88 |
| b1  | 2.90        | 3.00 | 3.10 |
| c   | 0.24        | ---  | 0.35 |
| D   | 6.30        | 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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