

# MOSFET - Single N-Channel

## 150 V, 4.4 mΩ, 187 A

### NVBLS4D0N15MC

#### Features

- Low  $R_{DS(on)}$  to Minimize Conduction Losses
- Low  $Q_G$  and Capacitance to Minimize Driver Losses
- Lowers Switching Noise/EMI
- AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

#### Typical Applications

- Power Tools, Battery Operated Vacuums
- UAV/Drones, Material Handling
- BMS/Storage, Home Automation

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

| Symbol         | Parameter  |  | Value                     | Unit             |
|----------------|--|--|---------------------------|------------------|
| $V_{DSS}$      | Drain-to-Source Voltage  |  | 150                       | V                |
| $V_{GS}$       | Gate-to-Source Voltage   |  | $\pm 20$                  | V                |
| $I_D$          | Continuous Drain Current $R_{\theta JC}$ (Note 2)                                  | Steady State                                   | $T_C = 25^\circ\text{C}$  | 187              |
|                |  |  | $T_C = 100^\circ\text{C}$ | 132              |
| $P_D$          | Power Dissipation $R_{\theta JC}$ (Note 2)   | Steady State                                   | $T_C = 25^\circ\text{C}$  | 316              |
|                |  |  | $T_C = 100^\circ\text{C}$ | 158              |
| $I_D$          | Continuous Drain Current $R_{\theta JA}$ (Notes 1, 2)                              | Steady State                                   | $T_A = 25^\circ\text{C}$  | 22               |
|                |  |  | $T_A = 100^\circ\text{C}$ | 15               |
| $P_D$          | Power Dissipation $R_{\theta JA}$ (Notes 1, 2)                                     | Steady State                                   | $T_A = 25^\circ\text{C}$  | 4                |
|                |  |  | $T_A = 100^\circ\text{C}$ | 2                |
| $I_{DM}$       | Pulsed Drain Current   | $T_A = 25^\circ\text{C}, t_p = 10 \mu\text{s}$ | 900                       | A                |
| $T_J, T_{stg}$ | Operating Junction and Storage Temperature Range                                   |  | -55 to +175               | $^\circ\text{C}$ |
| $I_S$          | Source Current (Body Diode)  |  | 263                       | A                |
| $E_{AS}$       | Single Pulse Drain-to-Source Avalanche Energy ( $I_{LPEAK} = 15.9 \text{ A}$ )     |  | 2300                      | mJ               |
| $T_L$          | Lead Temperature Soldering Reflow for Soldering Purposes (1/8" from case for 10 s) |  | 260                       | $^\circ\text{C}$ |

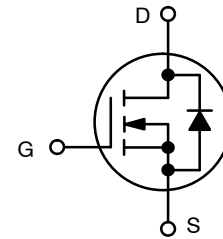
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Surface-mounted on FR4 board using 1 in<sup>2</sup> pad size, 2 oz Cu pad.
2. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.

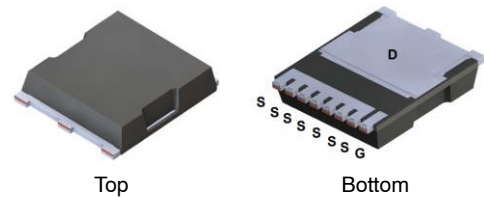
#### THERMAL RESISTANCE RATINGS

| Symbol          | Parameter                                   | Max  | Unit                      |
|-----------------|---|------|---------------------------|
| $R_{\theta JC}$ | Junction-to-Case – Steady State (Note 2)    | 0.5  | $^\circ\text{C}/\text{W}$ |
| $R_{\theta JA}$ | Junction-to-Ambient – Steady State (Note 2) | 35.8 |                           |

| $V_{(BR)DSS}$ | $R_{DS(ON) MAX}$ | $I_D MAX$ |
|---------------|------------------|-----------|
| 150 V         | 4.4 mΩ @ 10 V    | 187 A     |

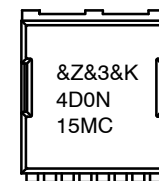


N-CHANNEL MOSFET



H-PSOF8L 11.68x9.80  
MO-299A  
CASE 100CU

#### MARKING DIAGRAM



- &Z = Assembly Plant Code
- &3 = Numeric Date Code
- &K = Lot Code
- 4D0N15MC = Specific Device Code

#### ORDERING INFORMATION

| Device        | Package           | Shipping†          |
|---------------|-------------------|--------------------|
| NVBLS4D0N15MC | MO-299A (Pb-Free) | 2000 / 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.

# NVBLS4D0N15MC

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

| Symbol | Parameter | Test Condition | Min | Typ | Max | Unit |
|--------|-----------|----------------|-----|-----|-----|------|
|--------|-----------|----------------|-----|-----|-----|------|

### OFF CHARACTERISTICS

|                     |   |  |                           |       |           |                            |               |
|---------------------|---|--|---------------------------|-------|-----------|----------------------------|---------------|
| $V_{(BR)DSS}$       | Drain-to-Source Breakdown Voltage                         | $V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$        | 150                       | -     | -         | V                          |               |
| $V_{(BR)DSS} / T_J$ | Drain-to-Source Breakdown Voltage Temperature Coefficient | $I_D = 250\ \mu\text{A}$ , ref to $25^\circ\text{C}$ | -                         | 30.23 | -         | $\text{mV}/^\circ\text{C}$ |               |
| $I_{DSS}$           | Zero Gate Voltage Drain Current                           | $V_{GS} = 0\text{ V}, V_{DS} = 120\text{ V}$         | $T_J = 25^\circ\text{C}$  | -     | -         | 1                          | $\mu\text{A}$ |
|                     |   |  | $T_J = 125^\circ\text{C}$ | -     | -         | 10                         | $\mu\text{A}$ |
| $I_{GSS}$           | Gate-to-Source Leakage Current                            | $V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$      | -                         | -     | $\pm 100$ | nA                         |               |

### ON CHARACTERISTICS

|                    |  |  |     |        |     |                            |
|--------------------|--|--|-----|--------|-----|----------------------------|
| $V_{GS(TH)}$       | Gate Threshold Voltage                     | $V_{GS} = V_{DS}, I_D = 584\ \mu\text{A}$            | 2.5 | 3.7    | 4.5 | V                          |
| $V_{GS(TH)} / T_J$ | Negative Threshold Temperature Coefficient | $I_D = 250\ \mu\text{A}$ , ref to $25^\circ\text{C}$ | -   | -10.12 | -   | $\text{mV}/^\circ\text{C}$ |
| $R_{DS(on)}$       | Drain-to-Source On Resistance              | $V_{GS} = 10\text{ V}, I_D = 80\text{ A}$            | -   | 3.1    | 4.4 | $\text{m}\Omega$           |
| $g_{FS}$           | Forward Transconductance                   | $V_{DS} = 5\text{ V}, I_D = 80\text{ A}$             | -   | 174    | -   | S                          |
| $R_G$              | Gate-Resistance                            | $T_A = 25^\circ\text{C}$                             | -   | 1.3    | -   | $\Omega$                   |

### CHARGES & CAPACITANCES

|              |                              |   |   |      |   |    |
|--------------|------------------------------|---|---|------|---|----|
| $C_{ISS}$    | Input Capacitance            | $V_{GS} = 0\text{ V}, f = 1\text{ MHz}, V_{DS} = 75\text{ V}$   | - | 7490 | - | pF |
| $C_{OSS}$    | Output Capacitance           |   | - | 2055 | - |    |
| $C_{RSS}$    | Reverse Transfer Capacitance |   | - | 27.2 | - |    |
| $Q_{G(TOT)}$ | Total Gate Charge            | $V_{GS} = 10\text{ V}, V_{DS} = 75\text{ V}, I_D = 80\text{ A}$ | - | 90.4 | - | nC |
| $Q_{G(TH)}$  | Threshold Gate Charge        |   | - | 24.7 | - |    |
| $Q_{GS}$     | Gate-to-Source Charge        |   | - | 40.2 | - |    |
| $Q_{GD}$     | Gate-to-Drain Charge         |   | - | 12.6 | - |    |
| $V_{GP}$     | Plateau Voltage              |   | - | 5.7  | - |    |

### SWITCHING CHARACTERISTICS, $V_{GS} = 10\text{ V}$ (Note 3)

|              |                     |  |   |     |   |    |
|--------------|---------------------|--|---|-----|---|----|
| $t_{d(ON)}$  | Turn-On Delay Time  | $V_{GS} = 10\text{ V}, V_{DS} = 75\text{ V}, I_D = 80\text{ A}, R_G = 6\ \Omega$ | - | 47  | - | ns |
| $t_r$        | Rise Time           |  | - | 115 | - |    |
| $t_{d(OFF)}$ | Turn-Off Delay Time |  | - | 58  | - |    |
| $t_f$        | Fall Time           |  | - | 11  | - |    |

### DRAIN-SOURCE DIODE CHARACTERISTICS

|          |                         |  |                           |     |      |     |    |
|----------|-------------------------|--|---------------------------|-----|------|-----|----|
| $V_{SD}$ | Forward Diode Voltage   | $V_{GS} = 0\text{ V}, I_S = 80\text{ A}$                                     | $T_J = 25^\circ\text{C}$  | -   | 0.86 | 1.2 | V  |
|          |                         |  | $T_J = 125^\circ\text{C}$ | -   | 0.75 | -   |    |
| $t_{RR}$ | Reverse Recovery Time   | $V_{GS} = 0\text{ V}, di_S/dt = 100\text{ A}/\mu\text{s}, I_S = 80\text{ A}$ | -                         | 84  | -    | ns  |    |
| $t_a$    | Charge Time             |  | -                         | 55  | -    |     |    |
| $t_b$    | Discharge Time          |  | -                         | 29  | -    |     |    |
| $Q_{RR}$ | Reverse Recovery Charge |  | -                         | 180 | -    |     | 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.

3. Switching characteristics are independent of operating junction temperatures

# NVBLS4D0N15MC

## TYPICAL CHARACTERISTICS

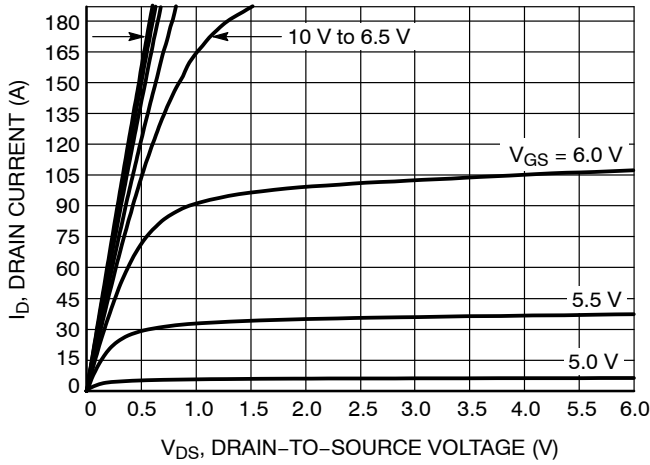


Figure 1. On-Region Characteristics

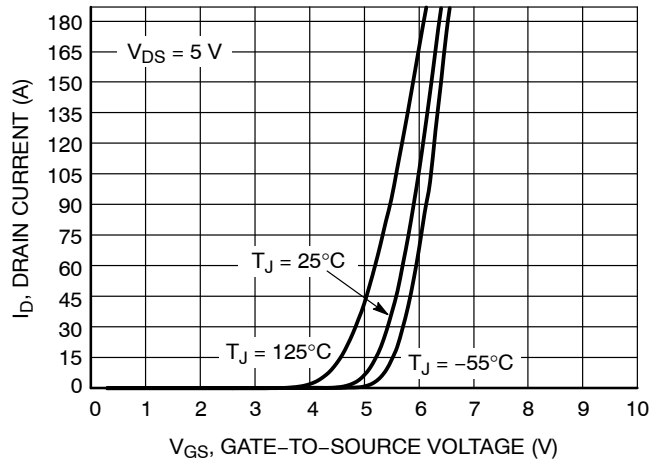


Figure 2. Transfer Characteristics

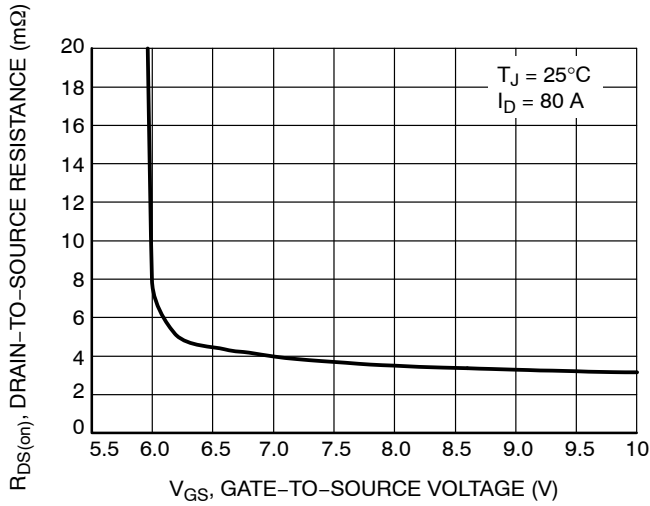


Figure 3. On-Resistance vs.  $V_{GS}$

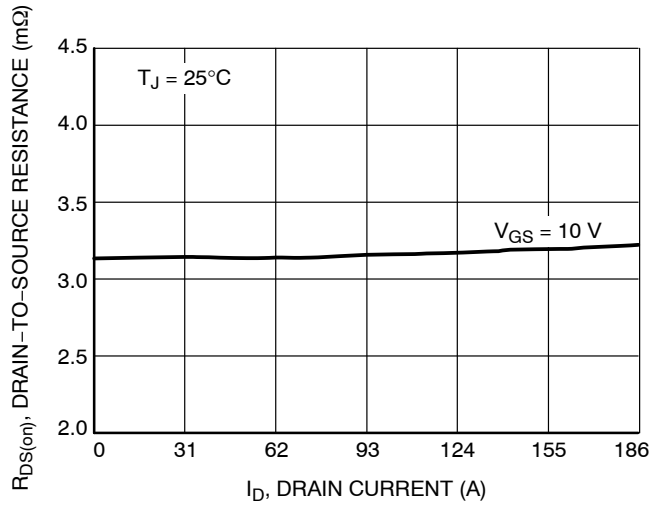


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

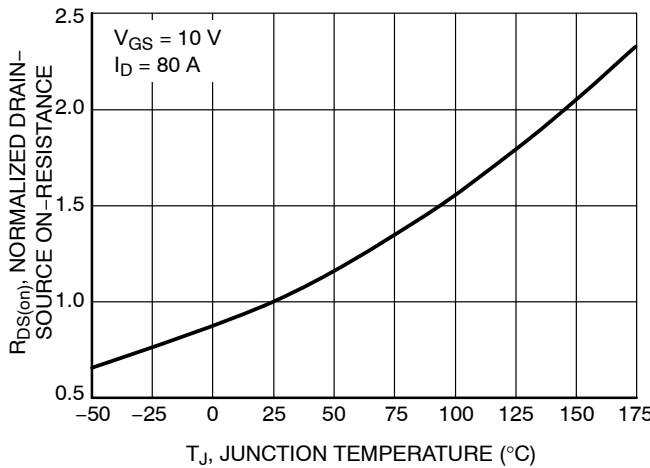


Figure 5. On-Resistance Variation with Temperature

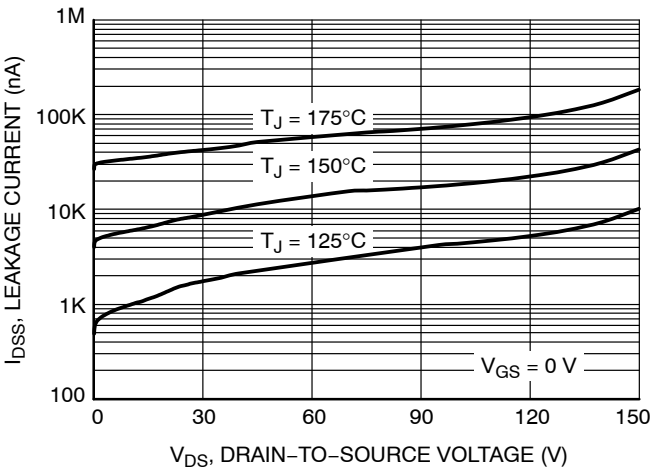


Figure 6. Drain-to-Source Leakage Current vs. Voltage

# NVBLS4D0N15MC

## TYPICAL CHARACTERISTICS

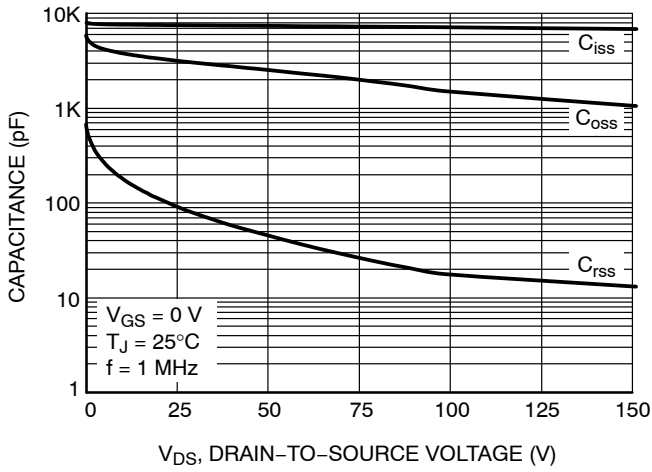


Figure 7. Capacitance Variation

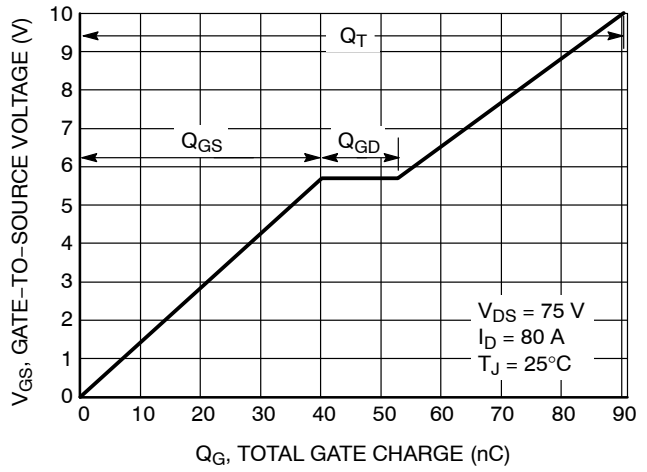


Figure 8. Gate-to-Source Voltage vs. Total Gate Charge

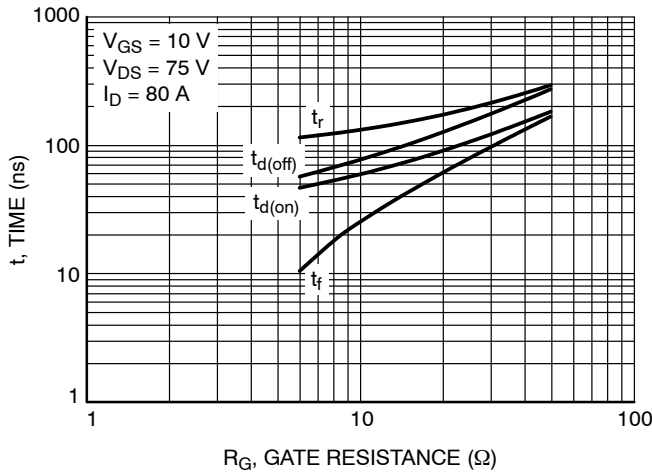


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

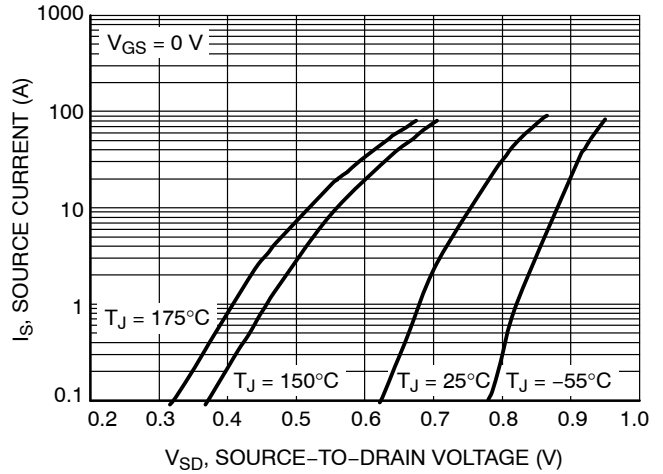


Figure 10. Diode Forward Voltage vs. Current

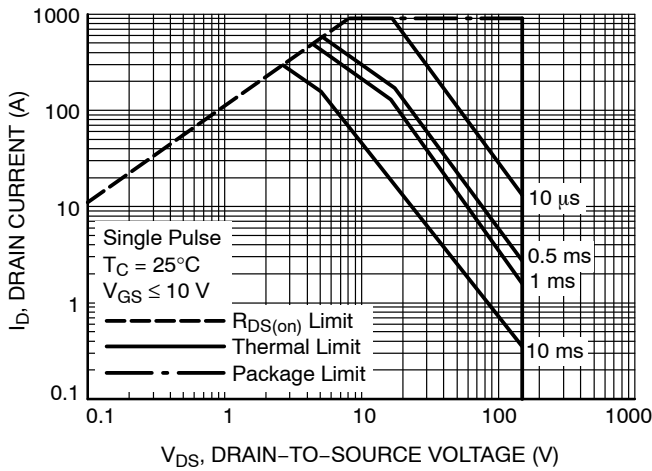


Figure 11. Maximum Rated Forward Biased Safe Operating Area

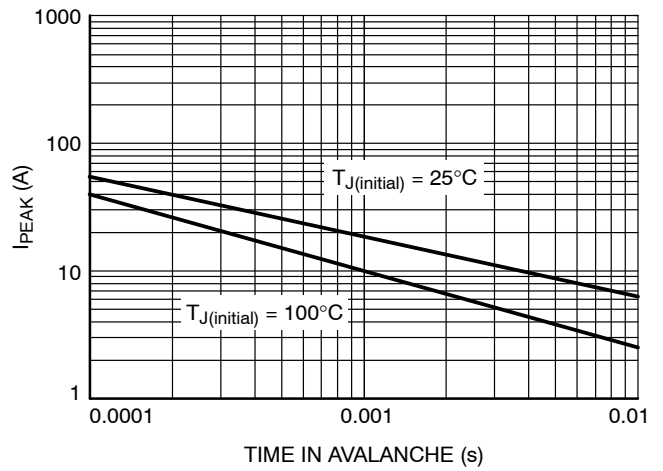


Figure 12.  $I_{PEAK}$  vs. Time in Avalanche

# NVBLS4D0N15MC

## TYPICAL CHARACTERISTICS

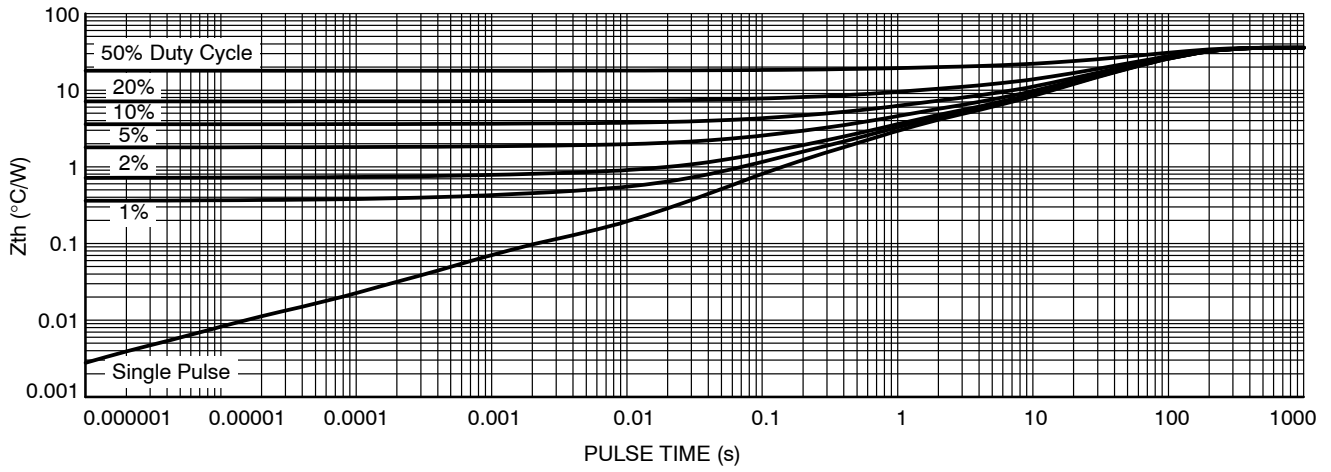


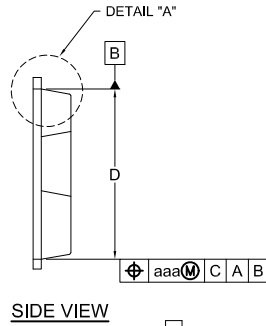
Figure 13. Thermal Characteristics (Junction-to-Ambient)

# MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



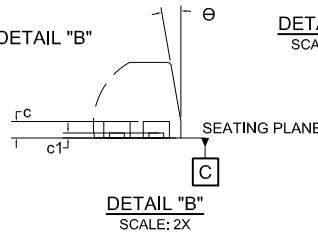
**H-PSOF8L 11.68x9.80**  
CASE 100CU  
ISSUE C

DATE 22 MAY 2023



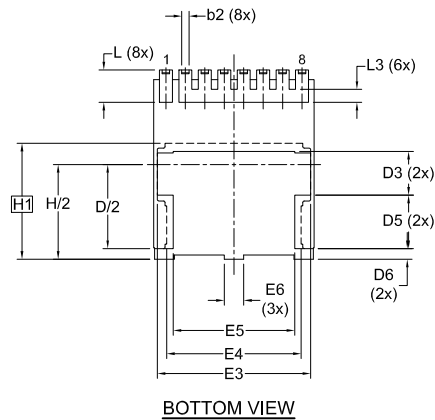
### LAND PATTERN RECOMMENDATION

\*FOR ADDITIONAL INFORMATION ON OUR PB-FREE STRATEGY AND SOLDERING DETAILS, PLEASE DOWNLOAD THE ON SEMICONDUCTOR SOLDERING AND MOUNTING TECHNIQUES REFERENCE MANUAL, SOLDERRM/D.

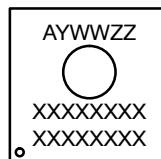


#### NOTES:

1. PACKAGE STANDARD REFERENCE: JEDEC MO-299, ISSUE A.
2. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
3. CONTROLLING DIMENSION: MILLIMETERS.
4. COPLANARITY APPLIES TO THE EXPOSED WELL AS THE TERMINALS.
5. DIMENSIONS D1 AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.
6. SEATING PLANE IS DEFINED BY THE TERMINALS. "A1" IS DEFINED AS THE DISTANCE FROM THE SEATING PLANE TO THE LOWEST POINT ON THE PACKAGE BODY.



### GENERIC MARKING DIAGRAM\*



A = Assembly Location  
Y = Year  
WW = Work Week  
ZZ = Assembly Lot Code  
XXXX = Specific Device Code

| DIM | MILLIMETERS |       |       |
|-----|-------------|-------|-------|
|     | MIN.        | NOM.  | MAX.  |
| A   | 2.20        | 2.30  | 2.40  |
| A1  | 1.70        | 1.80  | 1.90  |
| b   | 0.70        | 0.80  | 0.90  |
| b1  | 9.70        | 9.80  | 9.90  |
| b2  | 0.35        | 0.45  | 0.55  |
| c   | 0.40        | 0.50  | 0.60  |
| c1  | 0.10        | —     | —     |
| D   | 10.28       | 10.38 | 10.48 |
| D/2 | 5.09        | 5.19  | 5.29  |
| D1  | 10.98       | 11.08 | 11.18 |
| D2  | 3.20        | 3.30  | 3.40  |
| D3  | 2.60        | 2.70  | 2.80  |
| D4  | 4.45        | 4.55  | 4.65  |
| D5  | 3.20        | 3.30  | 3.40  |
| D6  | 0.55        | 0.65  | 0.75  |
| E   | 9.80        | 9.90  | 10.00 |
| E1  | 7.30        | 7.40  | 7.50  |
| E2  | 0.30        | 0.40  | 0.50  |
| E3  | 9.36        | 9.46  | 9.56  |

| DIM   | MILLIMETERS |       |       |
|-------|-------------|-------|-------|
|       | MIN.        | NOM.  | MAX.  |
| E4    | 8.20        | 8.30  | 8.40  |
| E5    | 7.40        | 7.50  | 7.60  |
| E6    | 1.10        | 1.20  | 1.30  |
| e     | 1.20 BSC    |       |       |
| e/2   | 0.60 BSC    |       |       |
| e1    | 8.40 BSC    |       |       |
| H     | 11.58       | 11.68 | 11.78 |
| H/2   | 5.74        | 5.84  | 5.94  |
| H1    | 7.15 BSC    |       |       |
| L     | 1.90        | 2.00  | 2.10  |
| L1    | 0.60        | 0.70  | 0.80  |
| L2    | 0.50        | 0.60  | 0.70  |
| L3    | 0.70        | 0.80  | 0.90  |
| theta | 0°          | —     | 12°   |
| aaa   | 0.20        |       |       |
| bbb   | 0.25        |       |       |
| ccc   | 0.20        |       |       |
| ddd   | 0.20        |       |       |
| eee   | 0.10        |       |       |

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "a", may or may not be present. Some products may not follow the Generic Marking.

|                         |                            |   |
|-------------------------|----------------------------|---|
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