

# MOSFET - Power, Single N-Channel, STD Gate, TCPAK57

80 V, 3.3 mohm, 137 A

NVMJST3D3N08X

## Features

- Low  $Q_{RR}$ , Soft Recovery Body Diode
- Low  $R_{DS(on)}$  to Minimize Conduction Losses
- Low  $Q_G$  and Capacitance to Minimize Driver Losses
- AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

## Applications

- Synchronous Rectification (SR) in DC-DC and AC-DC
- Primary Switch in Isolated DC-DC Converter
- Motor Drives
- Automotive 48 V System

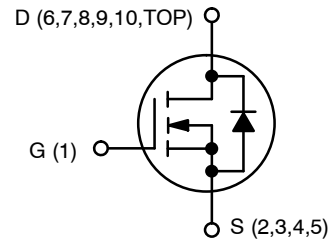
## MAXIMUM RATINGS ( $T_J = 25^\circ\text{C}$ unless otherwise noted)

| Parameter                                                         |                                                                        | Symbol         | Value       | Unit               |
|-------------------------------------------------------------------|------------------------------------------------------------------------|----------------|-------------|--------------------|
| Drain-to-Source Voltage                                           |                                                                        | $V_{DSS}$      | 80          | V                  |
| Gate-to-Source Voltage                                            |                                                                        | $V_{GS}$       | 20          | V                  |
| Continuous Drain Current                                          | $T_C = 25\text{ }^{\circ}\text{C}$                                     | $I_D$          | 137         | A                  |
|                                                                   | $T_C = 100\text{ }^{\circ}\text{C}$                                    |                | 97          |                    |
| Power Dissipation                                                 | $T_C = 25\text{ }^{\circ}\text{C}$                                     | $P_D$          | 122         | W                  |
| Pulsed Drain Current                                              | $T_C = 25\text{ }^{\circ}\text{C}$ ,<br>$t_p = 100\text{ }\mu\text{s}$ | $I_{DM}$       | 410         | A                  |
| Operating Junction and Storage Temperature Range                  |                                                                        | $T_J, T_{stg}$ | -55 to +175 | $^{\circ}\text{C}$ |
| Continuous Source-Drain Current (Body Diode)                      | $T_C = 25\text{ }^{\circ}\text{C}$ ,<br>$V_{GS} = 0\text{ V}$          | $I_S$          | 137         | A                  |
| Single Pulse Avalanche Energy ( $I_{PK} = 52\text{ A}$ )          |                                                                        | $E_{AS}$       | 135         | mJ                 |
| Lead Temperature for Soldering Purposes (1/8" from case for 10 s) |                                                                        | $T_L$          | 260         | $^{\circ}\text{C}$ |

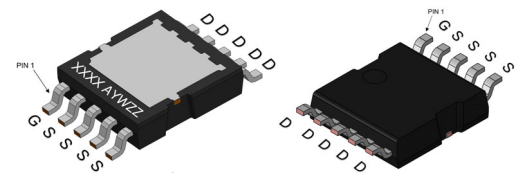
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

- Surface-mounted on FR4 board using a 1 in<sup>2</sup>, 1 oz. Cu pad
- The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.
- $E_{AS}$  is based on started  $T_J = 25^\circ\text{C}$ , rated  $I_{AS}$ ,  $V_{DD} = 64\text{ V}$ ,  $V_{GS} = 10\text{ V}$ , 100% avalanche tested.

| $V_{(BR)DSS}$ | $R_{DS(ON)} \text{ MAX}$                | $I_D \text{ MAX}$ |
|---------------|-----------------------------------------|-------------------|
| 80 V          | 3.3 m $\Omega$ @ $V_{GS} = 10\text{ V}$ | 137 A             |

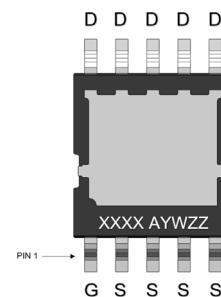


N-CHANNEL MOSFET



TCPAK57  
CASE 760AG

## MARKING DIAGRAM



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

## ORDERING INFORMATION

See detailed ordering, marking and shipping information on page 5 of this data sheet.

# NVMJST3D3N08X

## THERMAL CHARACTERISTICS

| Parameter                               | Symbol          | Typ | Max | Unit |
|-----------------------------------------|-----------------|-----|-----|------|
| Thermal Resistance, Junction-to-Case    | $R_{\theta JC}$ |     | 1.2 | °C/W |
| Thermal Resistance, Junction-to-Ambient | $R_{\theta JA}$ | 44  |     |      |

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

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

### OFF CHARACTERISTICS

|                                                           |                                   |                                                                            |    |    |     |               |
|-----------------------------------------------------------|-----------------------------------|----------------------------------------------------------------------------|----|----|-----|---------------|
| Drain-to-Source Breakdown Voltage                         | $V_{(BR)DSS}$                     | $V_{GS} = 0\text{ V}, I_D = 1\text{ mA}, T_J = 25\text{ }^{\circ}\text{C}$ | 80 |    |     | V             |
| Drain-to-Source Breakdown Voltage Temperature Coefficient | $\Delta V_{(BR)DSS} / \Delta T_J$ | $I_D = 1\text{ mA}$ , Referenced to $25\text{ }^{\circ}\text{C}$           |    | 41 |     | mV/°C         |
| Zero Gate Voltage Drain Current                           | $I_{DSS}$                         | $V_{DS} = 80\text{ V}, T_J = 25\text{ }^{\circ}\text{C}$                   |    |    | 1.0 | $\mu\text{A}$ |
|                                                           |                                   | $V_{DS} = 80\text{ V}, T_J = 125\text{ }^{\circ}\text{C}$ (Note 4)         |    |    | 250 |               |
| Gate-to-Source Leakage Current                            | $I_{GSS}$                         | $V_{GS} = 20\text{ V}, V_{DS} = 0\text{ V}$                                |    |    | 100 | nA            |

### ON CHARACTERISTICS

|                                                |                                  |                                                                                   |     |      |     |            |
|------------------------------------------------|----------------------------------|-----------------------------------------------------------------------------------|-----|------|-----|------------|
| Drain-to-Source On Resistance                  | $R_{DS(ON)}$                     | $V_{GS} = 10\text{ V}, I_D = 30\text{ A}, T_J = 25\text{ }^{\circ}\text{C}$       |     | 2.8  | 3.3 | m $\Omega$ |
| Gate Threshold Voltage                         | $V_{GS(TH)}$                     | $V_{GS} = V_{DS}, I_D = 153\text{ }\mu\text{A}, T_J = 25\text{ }^{\circ}\text{C}$ | 2.4 |      | 3.6 | V          |
| Gate Threshold Voltage Temperature Coefficient | $\Delta V_{GS(TH)} / \Delta T_J$ | $V_{GS} = V_{DS}, I_D = 153\text{ }\mu\text{A}$                                   |     | -8.4 |     | mV/°C      |
| Forward Transconductance                       | $g_{FS}$                         | $V_{DS} = 5\text{ V}, I_D = 30\text{ A}$                                          |     | 94   |     | S          |

### CHARGES, CAPACITANCES & GATE RESISTANCE

|                              |              |                                                                 |  |      |  |          |
|------------------------------|--------------|-----------------------------------------------------------------|--|------|--|----------|
| Input Capacitance            | $C_{ISS}$    | $V_{DS} = 40\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$   |  | 2677 |  | pF       |
| Output Capacitance           | $C_{OSS}$    |                                                                 |  | 779  |  |          |
| Reverse Transfer Capacitance | $C_{RSS}$    |                                                                 |  | 12   |  |          |
| Output Charge                | $Q_{OSS}$    |                                                                 |  | 56   |  |          |
| Total Gate Charge            | $Q_{G(TOT)}$ | $V_{DD} = 40\text{ V}, I_D = 30\text{ A}, V_{GS} = 10\text{ V}$ |  | 38   |  | nC       |
| Threshold Gate Charge        | $Q_{G(TH)}$  |                                                                 |  | 8.2  |  |          |
| Gate-to-Source Charge        | $Q_{GS}$     |                                                                 |  | 13   |  |          |
| Gate-to-Drain Charge         | $Q_{GD}$     |                                                                 |  | 5.9  |  |          |
| Gate Plateau Voltage         | $V_{GP}$     |                                                                 |  | 4.7  |  |          |
| Gate Resistance              | $R_G$        | $f = 1\text{ MHz}$                                              |  | 0.62 |  | $\Omega$ |

### SWITCHING CHARACTERISTICS

|                     |              |                                                                                                              |  |     |  |    |
|---------------------|--------------|--------------------------------------------------------------------------------------------------------------|--|-----|--|----|
| Turn-On Delay Time  | $t_{d(ON)}$  | Resistive Load<br>$V_{GS} = 0/10\text{ V}, V_{DD} = 64\text{ V}, I_D = 30\text{ A}, R_G = 2.5\text{ }\Omega$ |  | 22  |  | ns |
| Rise Time           | $t_r$        |                                                                                                              |  | 6.9 |  |    |
| Turn-Off Delay Time | $t_{d(OFF)}$ |                                                                                                              |  | 33  |  |    |
| Fall Time           | $t_f$        |                                                                                                              |  | 5.0 |  |    |

### SOURCE-TO-DRAIN DIODE CHARACTERISTICS

|                         |          |                                                                                                   |  |      |      |    |
|-------------------------|----------|---------------------------------------------------------------------------------------------------|--|------|------|----|
| Forward Diode Voltage   | $V_{SD}$ | $V_{GS} = 0\text{ V}, I_S = 30\text{ A}, T_J = 25\text{ }^{\circ}\text{C}$                        |  | 0.82 | 0.93 | V  |
|                         |          | $V_{GS} = 0\text{ V}, I_S = 30\text{ A}, T_J = 125\text{ }^{\circ}\text{C}$                       |  | 0.7  |      |    |
| Reverse Recovery Time   | $t_{RR}$ | $V_{GS} = 0\text{ V}, I_S = 30\text{ A}, dI/dt = 1000\text{ A}/\mu\text{s}, V_{DD} = 64\text{ V}$ |  | 23   |      | ns |
| Charge Time             | $t_a$    |                                                                                                   |  | 13   |      |    |
| Discharge Time          | $t_b$    |                                                                                                   |  | 9.9  |      |    |
| Reverse Recovery Charge | $Q_{RR}$ |                                                                                                   |  | 151  |      |    |

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.

4. Defined by design and is not production tested



TYPICAL CHARACTERISTICS

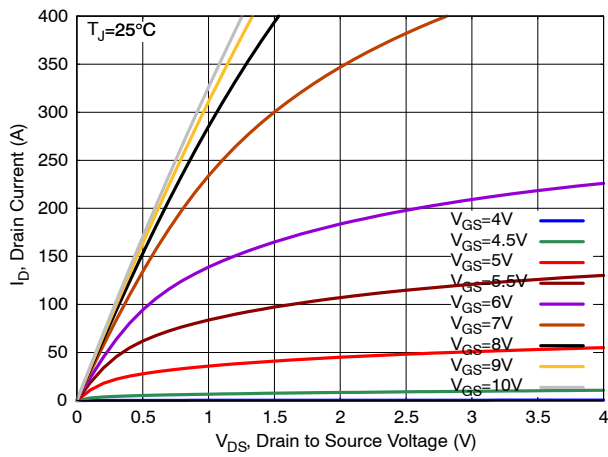


Figure 1. On-Region Characteristics

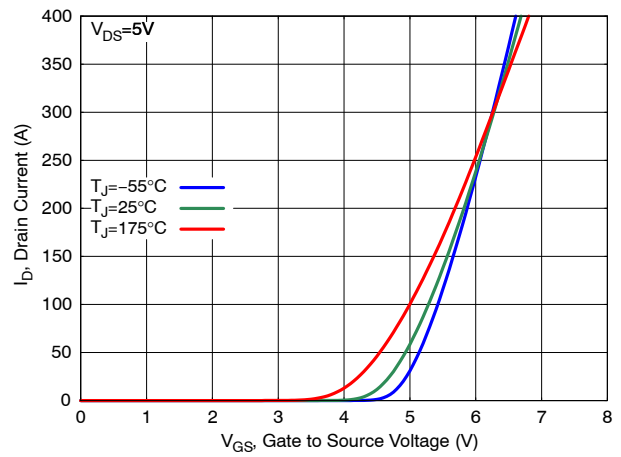


Figure 2. Transfer Characteristics

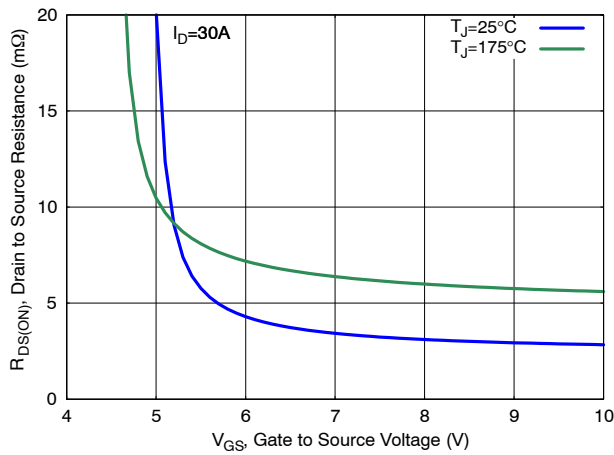


Figure 3. On-Resistance vs. Gate Voltage

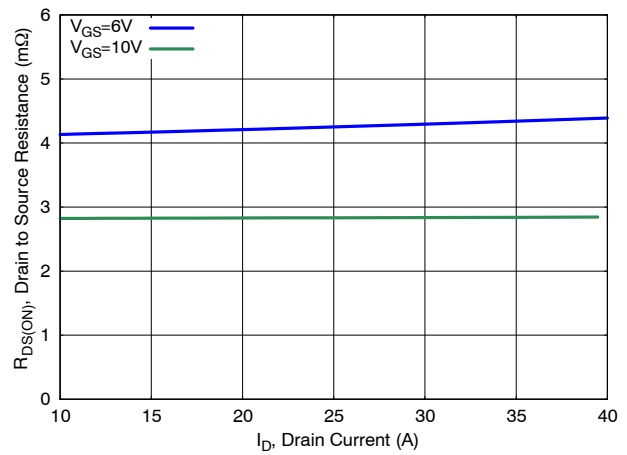


Figure 4. On-Resistance vs. Drain Current

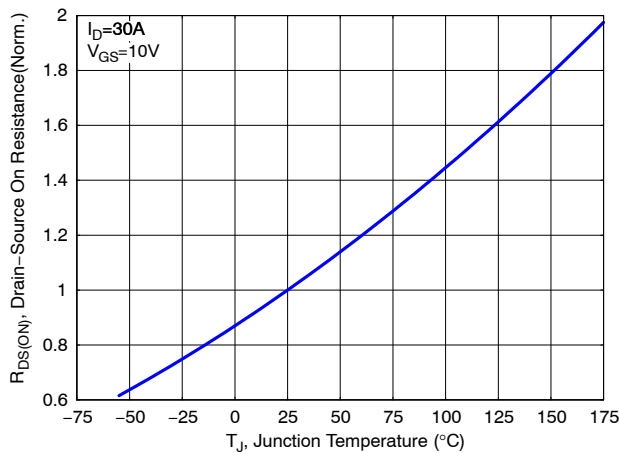


Figure 5. Normalized ON Resistance vs. Junction Temperature

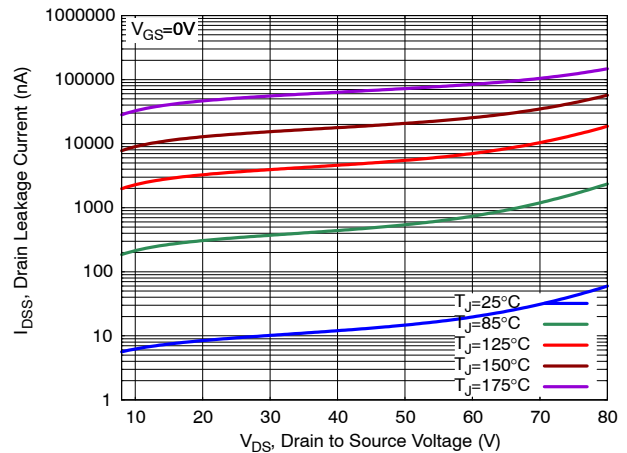


Figure 6. Drain Leakage Current vs. Drain Voltage

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## TYPICAL CHARACTERISTICS

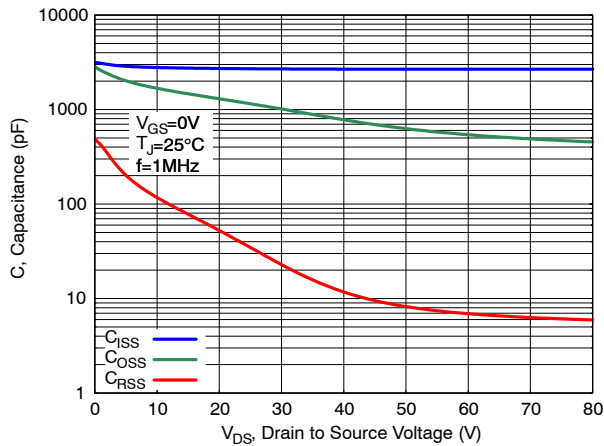


Figure 7. Capacitance Characteristics

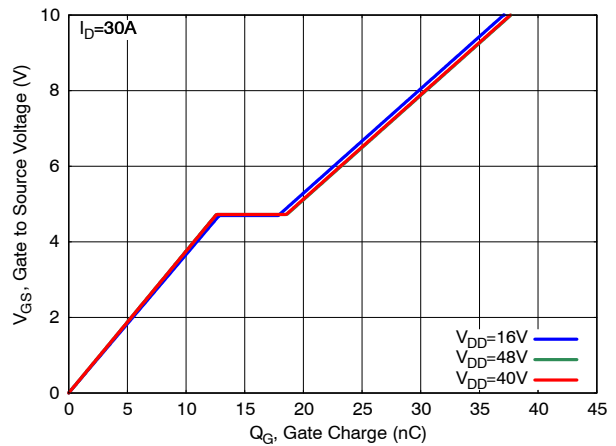


Figure 8. Gate Charge Characteristics

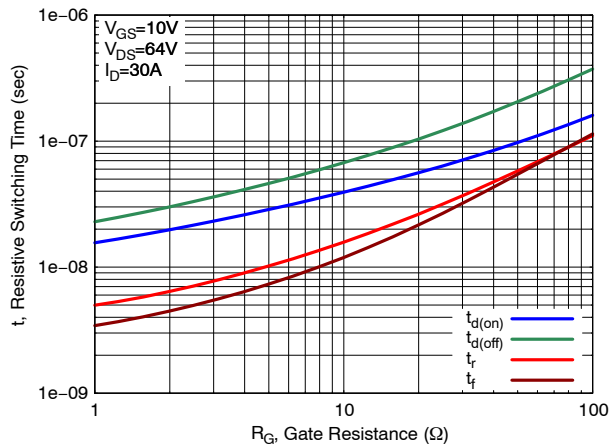


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

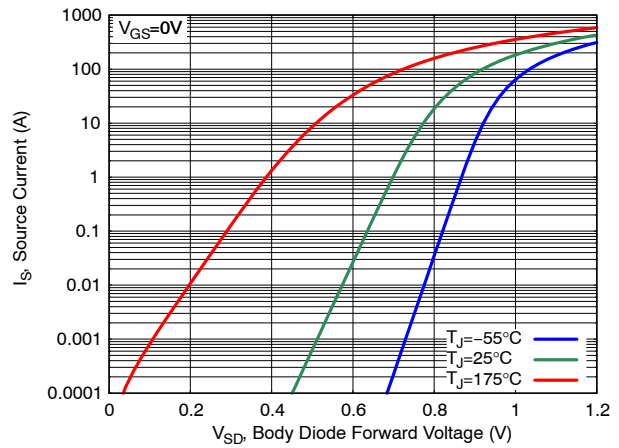


Figure 10. Diode Forward Characteristics

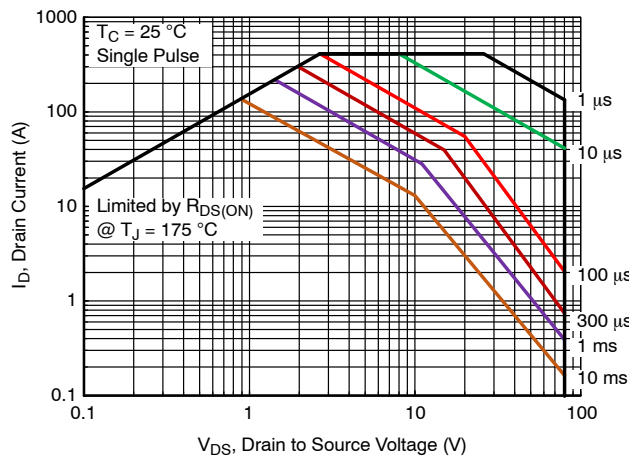


Figure 11. Safe Operating Area (SOA)

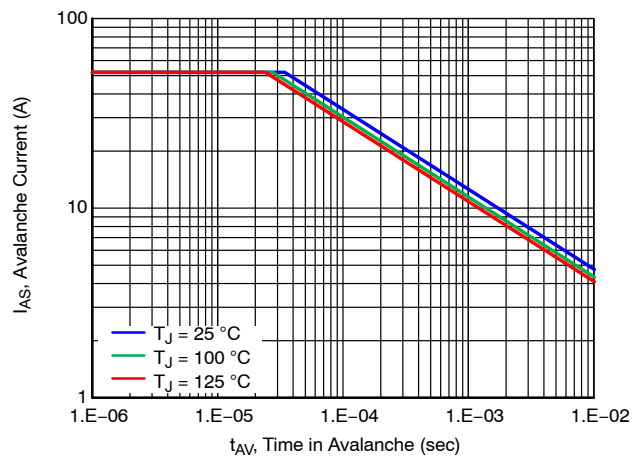


Figure 12. Avalanche Current vs. Pulse Time (UIS)

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## TYPICAL CHARACTERISTICS

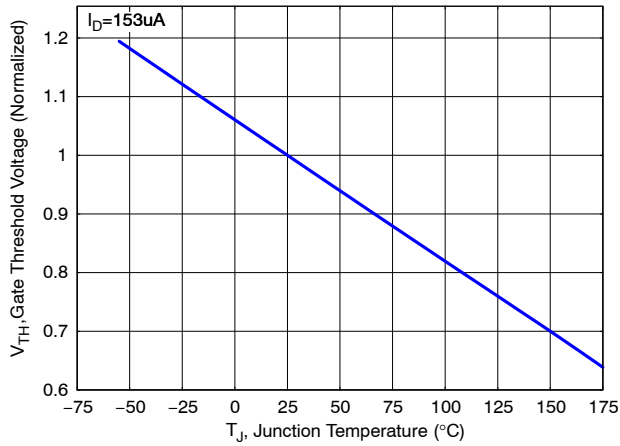


Figure 13. Gate Threshold Voltage vs. Junction Temperature

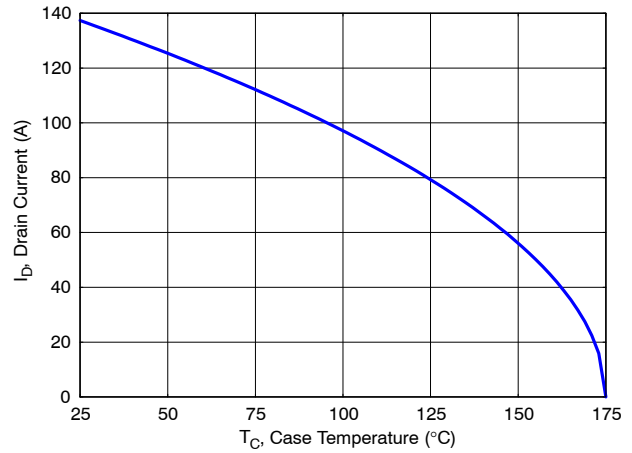


Figure 14. Maximum Current vs. Case Temperature

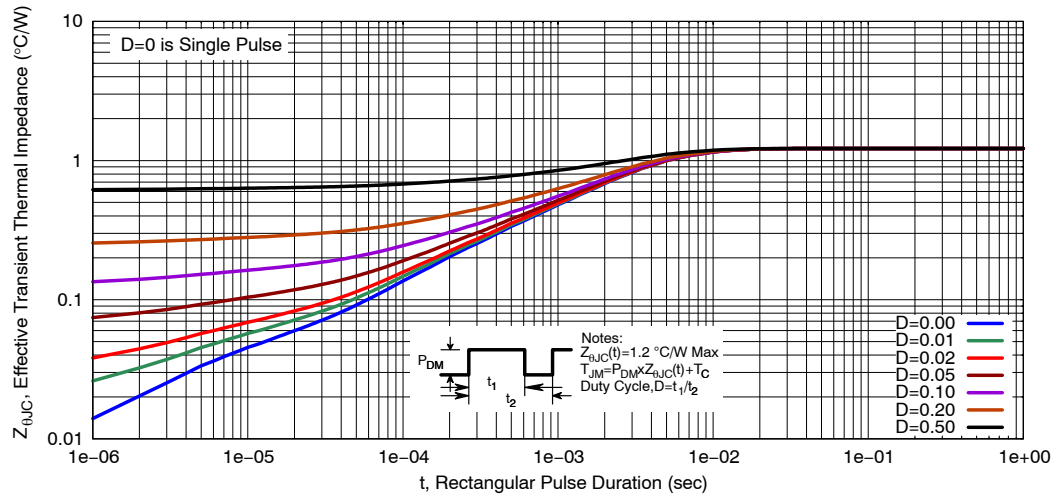


Figure 15. Transient Thermal Response

## DEVICE ORDERING INFORMATION

| Device           | Marking | Package                    | Shipping <sup>†</sup> |
|------------------|---------|----------------------------|-----------------------|
| NVMJST3D3N08XTXG | 3D38    | TCPAK57 Top Cool (Pb-Free) | 3000 / 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](#).

# NVMJST3D3N08X

## REVISION HISTORY

| Revision | Description of Changes    | Date      |
|----------|---------------------------|-----------|
| 0        | Initial document release. | 7/16/2026 |

This document has undergone updates prior to the inclusion of this revision history table. The changes tracked here only reflect updates made on the noted approval dates.





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