# 80N40DG-VB TO262 Datasheet

## N-Channel 40-V (D-S) 175 °C MOSFET

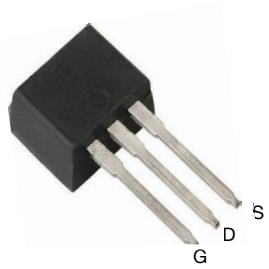
| PRODUCT SUMMARY | | | |
|---|---|---|---|
| $V_{(BR)DSS}$ (V) | $r_{DS(on)}$ (Ω) | $I_D$ (A) | $Q_g$ (Typ.) |
| 40 | 0.005 at $V_{GS}$ = 10 V | 100 | 95 |

### FEATURES

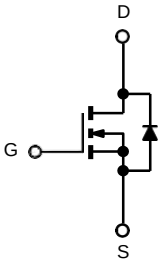
- TrenchFET® Power MOSFET
- 175 °C Junction Temperature
- High Threshold Voltage at High Temperature

RoHS COMPLIANT

**TO-262**




Top View




N-Channel MOSFET

| ABSOLUTE MAXIMUM RATINGS $T_C$ = 25 °C, unless otherwise noted | | | | |
|---|---|---|---|---|
| **Parameter** | | **Symbol** | **Limit** | **Unit** |
| Drain-Source Voltage | | $V_{DS}$ | 40 | V |
| Gate-Source Voltage | | $V_{GS}$ | 20 | |
| Continuous Drain Current ($T_J$ = 175 °C) | $T_C$ = 25 °C | $I_D$ | 110 | A |
| | $T_C$ = 125 °C | | 70 | |
| Pulsed Drain Current | | $I_{DM}$ | 300 | |
| Avalanche Current | | $I_{AR}$ | 50 | |
| Repetitive Avalanche Energy[a] | L = 0.1 mH | $E_{AR}$ | 125 | mJ |
| Maximum Power Dissipation[a] | $T_C$ = 25 °C | $P_D$ | 150[b] | W |
| | $T_A$ = 25 °C[c] | | 3.75 | |
| Operating Junction and Storage Temperature Range | | $T_J$, $T_{stg}$ | - 55 to 175 | °C |

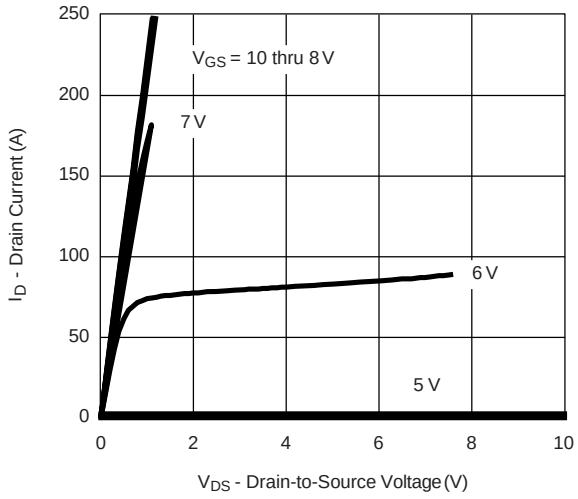
| THERMAL RESISTANCE RATINGS | | | | |
|---|---|---|---|---|
| **Parameter** | | **Symbol** | **Limit** | **Unit** |
| Junction-to-Ambient | PCB Mount[c] | $R_{thJA}$ | 40 | °C/W |
| Junction-to-Case | | $R_{thJC}$ | 1 | |

Notes:
a. Duty cycle ≤ 1 %.
b. See SOA curve for voltage derating.
c. When Mounted on 1" square PCB (FR-4 material).

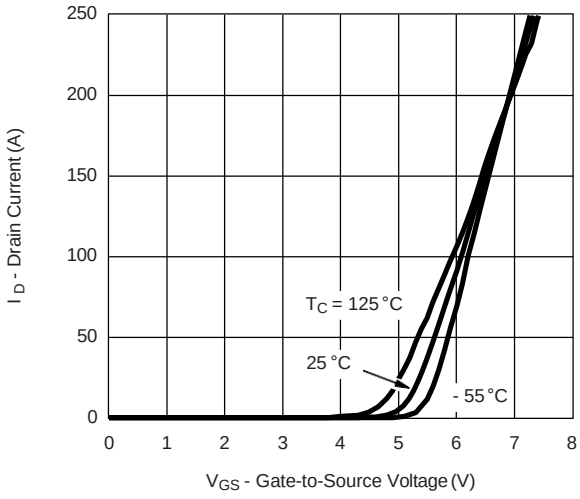
| **SPECIFICATIONS** $T_J$ = 25 °C, unless otherwise noted | | | | | | |
|---|---|---|---|---|---|---|
| **Parameter** | **Symbol** | **Test Conditions** | **Min.** | **Typ.** | **Max.** | **Unit** |
| **Static** | | | | | | |
| Drain-Source Breakdown Voltage | $V_{(BR)DSS}$ | $V_{DS}$ = 0 V, $I_D$ = 250 µA | 40 | | | V |
| Gate-Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$ = $V_{GS}$, $I_D$ = 250 µA | 1.0 | 2.0 | 4.0 | |
| Gate-Body Leakage | $I_{GSS}$ | $V_{DS}$ = 0 V, $V_{GS}$ = ± 20 V | | | ± 100 | nA |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$ = 40 V, $V_{GS}$ = 0 V | | | 1 | µA |
| | | $V_{DS}$ = 40 V, $V_{GS}$ = 0 V, $T_J$ = 125 °C | | | 50 | |
| | | $V_{DS}$ = 40 V, $V_{GS}$ = 0 V, $T_J$ = 175 °C | | | 250 | |
| On-State Drain Current[a] | $I_{D(on)}$ | $V_{DS}$ = 5 V, $V_{GS}$ = 10 V | 120 | | | A |
| Drain-Source On-State Resistance[a] | $r_{DS(on)}$ | $V_{GS}$ = 10 V, $I_D$ = 20 A | | 0.005 | | Ω |
| | | $V_{GS}$ = 10 V, $I_D$ = 15 A, $T_J$ = 125 °C | | 0.008 | | |
| | | $V_{GS}$ = 10 V, $I_D$ = 15 A, $T_J$ = 175 °C | | 0.0106 | | |
| Forward Transconductance[a] | $g_{fs}$ | $V_{DS}$ = 15 V, $I_D$ = 15 A | 20 | 50 | | S |
| **Dynamic[b]** | | | | | | |
| Input Capacitance | $C_{iss}$ | $V_{GS}$ = 0 V, $V_{DS}$ = 25 V, f = 1 MHz | | 3200 | | pF |
| Output Capacitance | $C_{oss}$ | | | 600 | | |
| Reverse Transfer Capacitance | $C_{rss}$ | | | 320 | | |
| Total Gate Charge[c] | $Q_g$ | $V_{DS}$ = 20 V, $V_{GS}$ = 10 V, $I_D$ = 50 A | | 95 | | nC |
| Gate-Source Charge[c] | $Q_{gs}$ | | | 37 | | |
| Gate-Drain Charge[c] | $Q_{gd}$ | | | 21 | | |
| Gate Resistance | $R_g$ | f = 1.0 MHz | | 1.7 | | Ω |
| Turn-On Delay Time[c] | $t_{d(on)}$ | $V_{DD}$ = 20 V, $R_L$ = 0.4 Ω, $I_D$ ≅ 50 A, $V_{GEN}$ = 10 V, $R_g$ = 2.5 Ω | | 20 | 30 | ns |
| Rise Time[c] | $t_r$ | | | 95 | 145 | |
| Turn-Off Delay Time[c] | $t_{d(off)}$ | | | 50 | 75 | |
| Fall Time[c] | $t_f$ | | | 12 | 20 | |
| **Source-Drain Diode Ratings and Characteristics** $T_C$ = 25 °C[b] | | | | | | |
| Continuous Current | $I_S$ | | | | 100 | A |
| Pulsed Current | $I_{SM}$ | | | | 300 | |
| Forward Voltage[a] | $V_{SD}$ | $I_F$ = 30 A, $V_{GS}$ = 0 V | | 0.90 | 1.50 | V |
| Reverse Recovery Time | $t_{rr}$ | $I_F$ = 30 A, di/dt = 100 A/µs | | 40 | 60 | ns |

Notes:
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.
b. Guaranteed by design, not subject to production testing.
c. Independent of operating temperature.

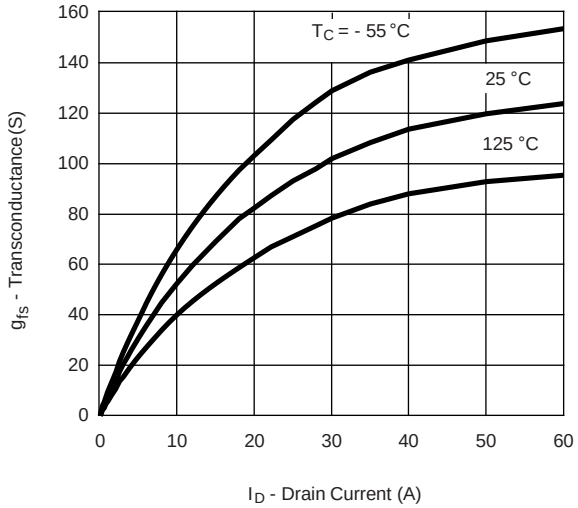
## TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



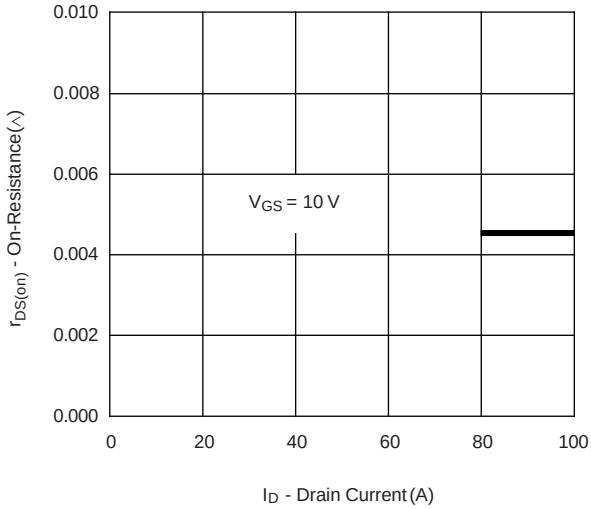

**Output Characteristics**



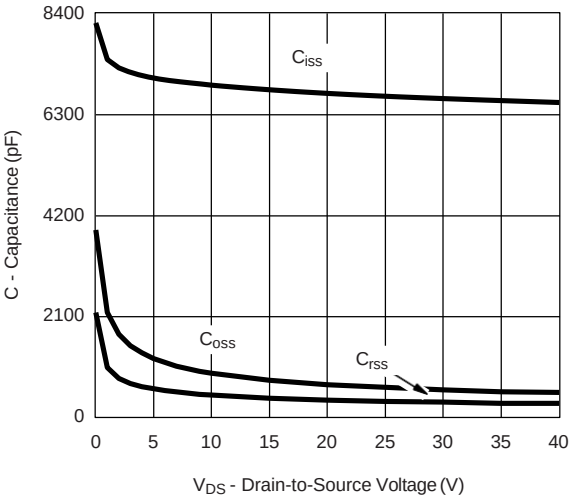

**Transfer Characteristics**



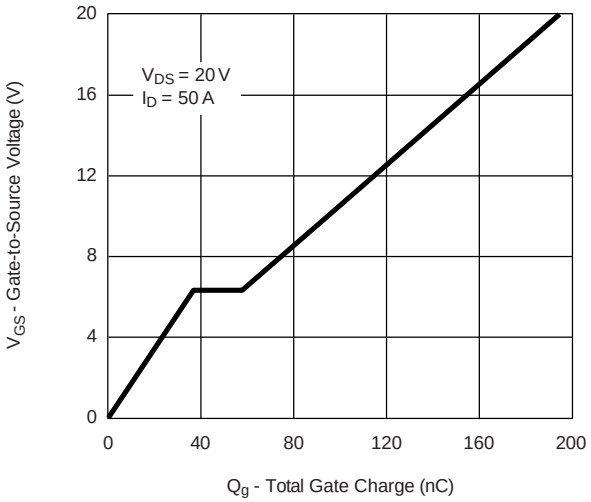

**Transconductance**




**On-Resistance vs. Drain Current**

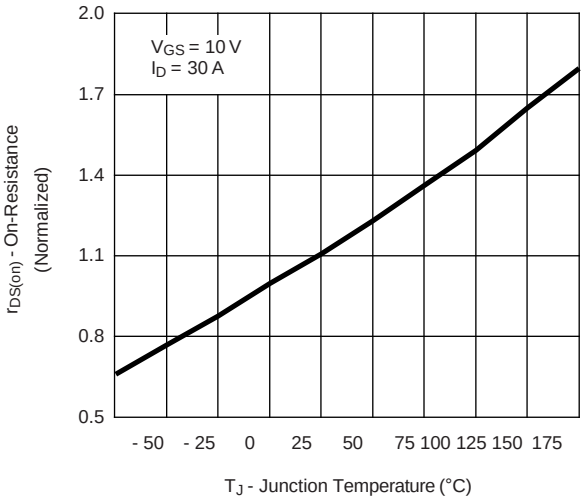



**Capacitance**

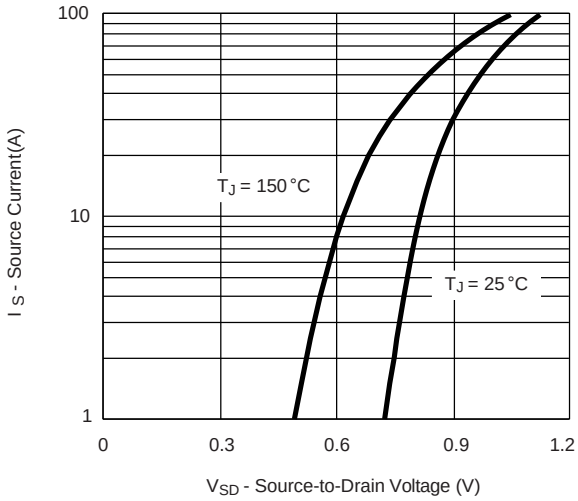



**Gate Charge**

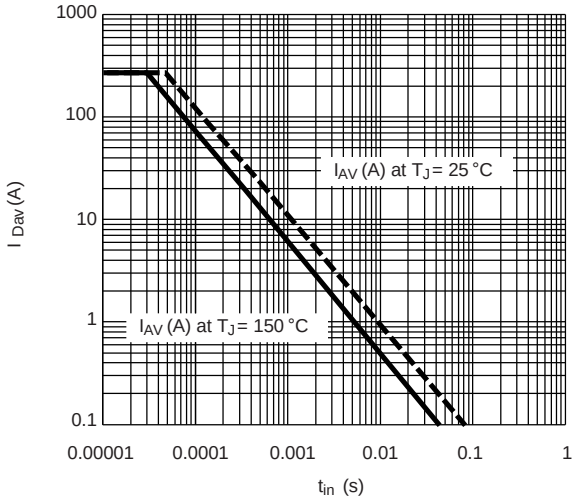
## TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



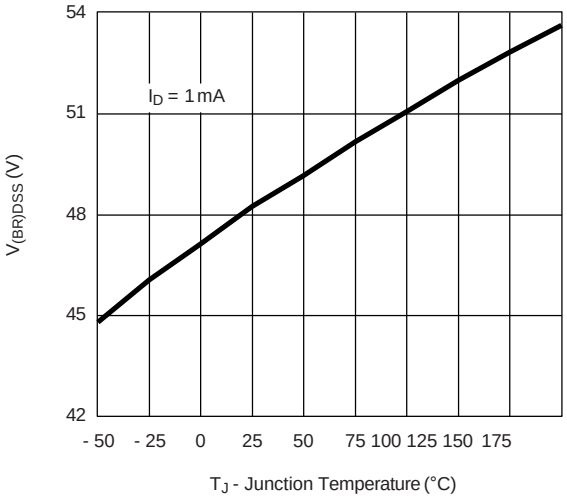

**On-Resistance vs. Junction Temperature**




**Source-Drain Diode Forward Voltage**

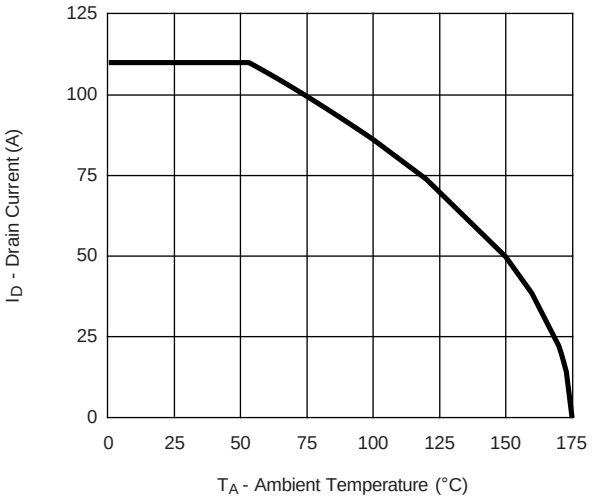



**Avalanche Current vs. Time**

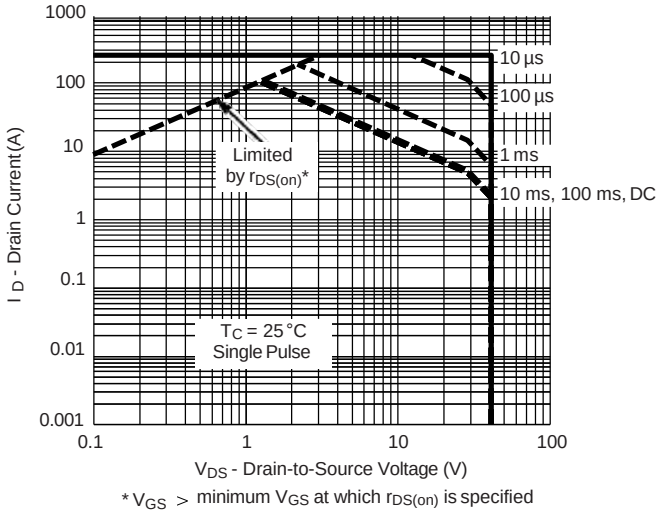



**Drain Source Breakdown vs. Junction Temperature**

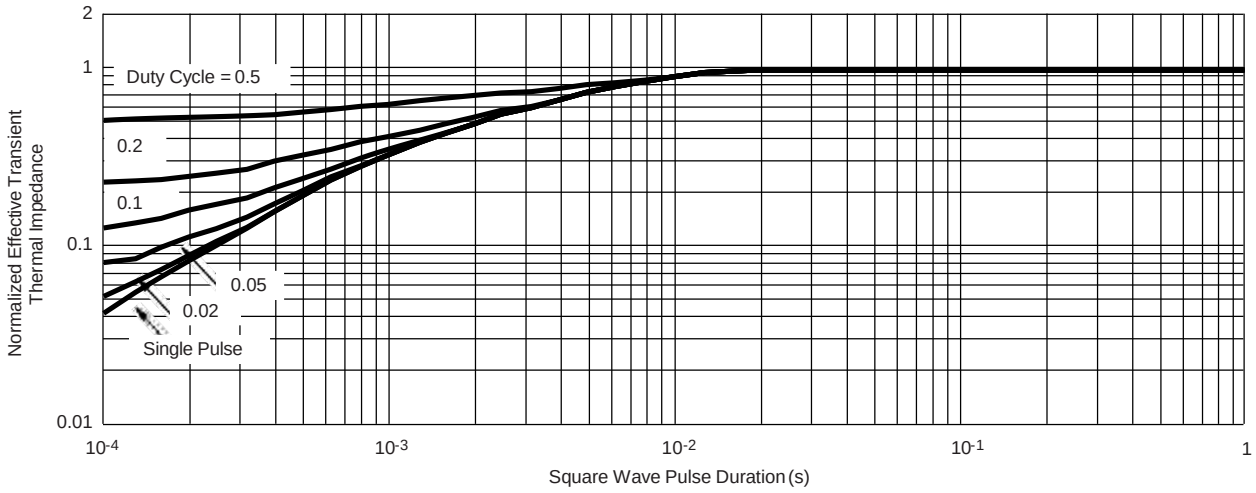
## THERMAL RATINGS




**Maximum Avalanche and Drain Current vs. Case Temperature**




**Safe Operating Area**




**Normalized Thermal Transient Impedance, Junction-to-Case**

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