

NP80N04NDG-S18-AY-VB Datasheet

N-Channel 40-V (D-S) 175 °C MOSFET

PRODUCT SUMMARY

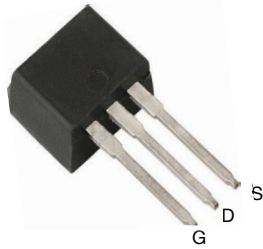
| $V_{(BR)DSS}$ (V) | $r_{DS(on)}$ (Ω) | I_D (A) | Q_g (Typ.) |
|-------------------|---------------------------|-----------|--------------|
| 40 | 0.005 at $V_{GS} = 10$ V | 100 | 95 |

FEATURES

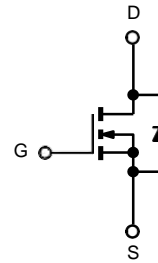
- Trench Power MOSFET
- 175 °C Junction Temperature
- High Threshold Voltage at High Temperature


RoHS
 COMPLIANT

TO-262



Top View



N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS $T_C = 25\text{ }^\circ\text{C}$, unless otherwise noted

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

THERMAL RESISTANCE RATINGS

| Parameter | | Symbol | Limit | Unit |
|---------------------|------------------------|------------|-------|--------------------|
| Junction-to-Ambient | PCB Mount ^c | R_{thJA} | 40 | $^\circ\text{C/W}$ |
| Junction-to-Case | | R_{thJC} | 1 | |

Notes:

a. Duty cycle $\leq 1\%$.

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 |

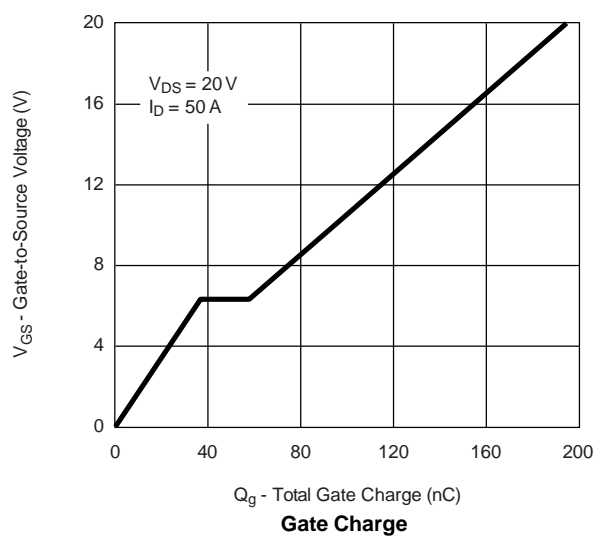
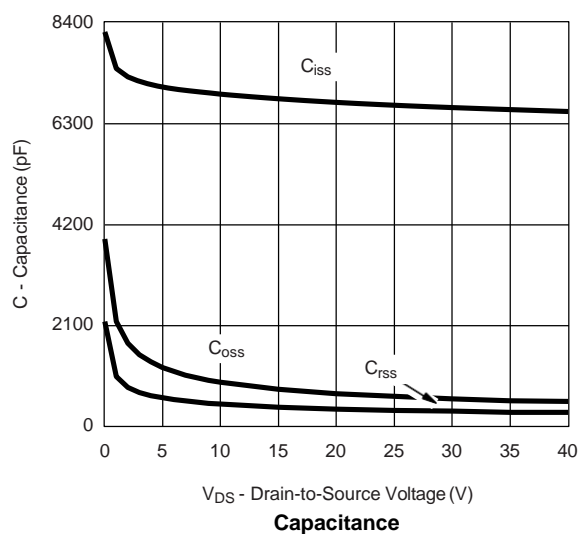
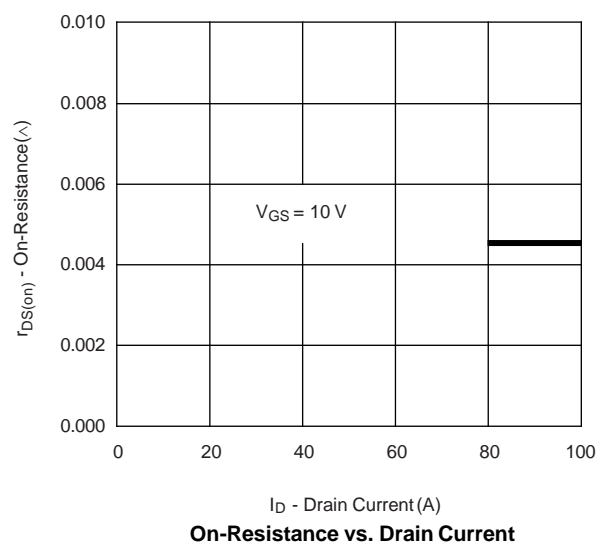
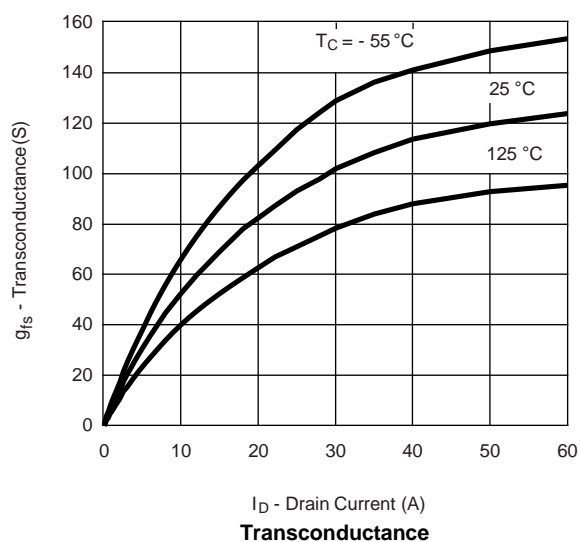
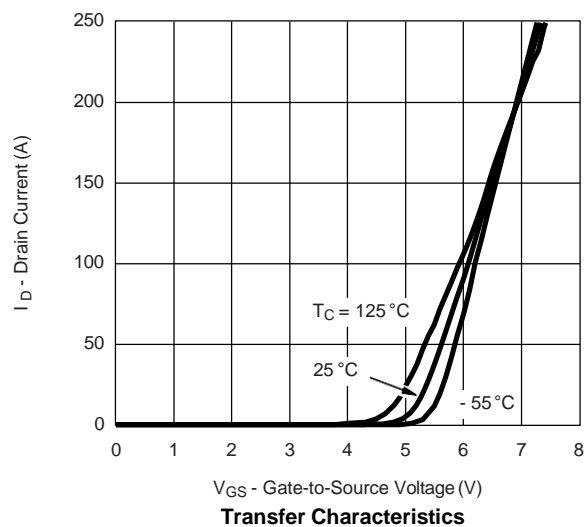
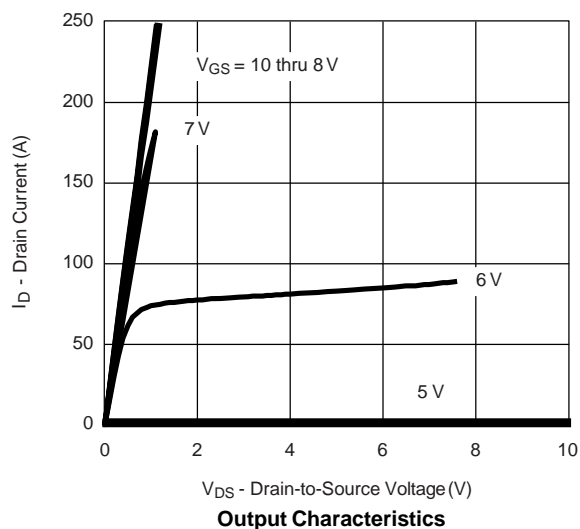
Notes:

a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.

b. Guaranteed by design, not subject to production testing.

c. Independent of operating temperature.

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



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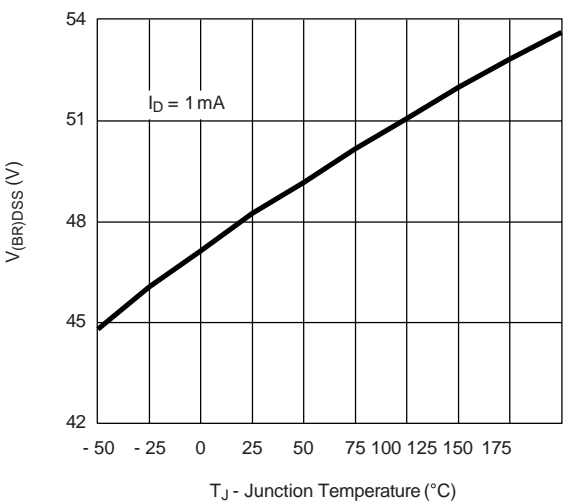
On-Resistance vs. Junction Temperature



Source-Drain Diode Forward Voltage



Avalanche Current vs. Time

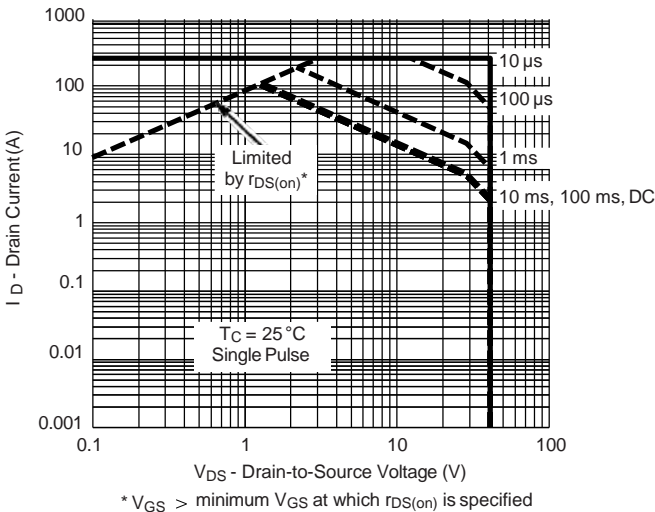


Drain Source Breakdown vs. Junction Temperature

THERMAL RATINGS



Maximum Avalanche and Drain Current
vs. Case Temperature



Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Case

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