

P40N20ZA-VB Datasheet

N-Channel 200-V (D-S) MOSFET

| PRODUCT SUMMARY | | | |
|-------------------|---------------------------|-----------|--------------|
| $V_{(BR)DSS}$ (V) | $R_{DS(on)}$ (Ω) | I_D (A) | Q_g (Typ.) |
| 200 | 0.046 at $V_{GS} = 15$ V | 50 | 57 |
| | 0.048 at $V_{GS} = 10$ V | 46 | |

FEATURES

- TrenchFET[®] Power MOSFETS
- 175 °C Junction Temperature
- 100 % R_g and UIS Tested



RoHS
COMPLIANT

APPLICATIONS

- Power Supply
- Lighting Systems

TO-220AB



Top View



N-Channel MOSFET

| ABSOLUTE MAXIMUM RATINGS $T_A = 25$ °C, unless otherwise noted | | | |
|--|----------------|----------------------------|------------------|
| Parameter | Symbol | Limit | Unit |
| Drain-Source Voltage | V_{DS} | 200 | V |
| Gate-Source Voltage | V_{GS} | ± 25 | |
| Continuous Drain Current ($T_J = 175$ °C) | I_D | $T_C = 25$ °C | 50 |
| | | $T_C = 100$ °C | 30 |
| Pulsed Drain Current | I_{DM} | 150 | A |
| Single Pulse Avalanche Current | I_{AS} | 20 | |
| Single Pulse Avalanche Energy ^a | E_{AS} | 20 | |
| Maximum Power Dissipation ^a | P_D | $T_C = 25$ °C | 166 ^b |
| | | $T_A = 25$ °C ^c | 3.12 |
| 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 (Drain) | R_{thJC} | 0.75 | |

Notes:

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

| SPECIFICATIONS ($T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted) | | | | | | |
|--|--------------|--|------|-------------------|-----------|---------------|
| Parameter | Symbol | Test Conditions | Min. | Typ. ^a | Max. | Unit |
| Static | | | | | | |
| Drain-Source Breakdown Voltage | V_{DS} | $V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$ | 200 | | | V |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$ | 2 | | 4 | |
| Gate-Body Leakage | I_{GSS} | $V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$ | | | ± 100 | nA |
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{DS} = 200\text{ V}, V_{GS} = 0\text{ V}$ | | | 1 | μA |
| | | $V_{DS} = 200\text{ V}, V_{GS} = 0\text{ V}, T_J = 125\text{ }^\circ\text{C}$ | | | 50 | |
| | | $V_{DS} = 200\text{ V}, V_{GS} = 0\text{ V}, T_J = 175\text{ }^\circ\text{C}$ | | | 250 | |
| On-State Drain Current ^b | $I_{D(on)}$ | $V_{DS} = 5\text{ V}, V_{GS} = 10\text{ V}$ | 40 | | | A |
| Drain-Source On-State Resistance ^b | $R_{DS(on)}$ | $V_{GS} = 10\text{ V}, I_D = 3\text{ A}$ | | 0.048 | | Ω |
| | | $V_{GS} = 10\text{ V}, I_D = 3\text{ A}, T_J = 125\text{ }^\circ\text{C}$ | | 0.050 | | |
| | | $V_{GS} = 10\text{ V}, I_D = 3\text{ A}, T_J = 175\text{ }^\circ\text{C}$ | | 0.070 | | |
| | | $V_{GS} = 6\text{ V}, I_D = 3\text{ A}$ | | 0.092 | | |
| Forward Transconductance ^b | g_{fs} | $V_{DS} = 15\text{ V}, I_D = 3\text{ A}$ | | 35 | | S |
| Dynamic^a | | | | | | |
| Input Capacitance | C_{iss} | $V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, F = 1\text{ MHz}$ | | 3000 | | μF |
| Output Capacitance | C_{oss} | | | 180 | | |
| Reverse Transfer Capacitance | C_{rss} | | | 80 | | |
| Total Gate Charge ^c | Q_g | $V_{DS} = 100\text{ V}, V_{GS} = 10\text{ V}, I_D = 3\text{ A}$ | | 34 | 51 | nC |
| Gate-Source Charge ^c | Q_{gs} | | | 8 | | |
| Gate-Drain Charge ^c | Q_{gd} | | | 12 | | |
| Gate Resistance | R_g | | 0.5 | | 2.9 | Ω |
| Turn-On Delay Time ^c | $t_{d(on)}$ | $V_{DD} = 100\text{ V}, R_L = 5.2\text{ }\Omega$ $I_D \cong 3\text{ A}, V_{GEN} = 10\text{ V}, R_g = 2.5\text{ }\Omega$ | | 15 | 25 | ns |
| Rise Time ^c | t_r | | | 50 | 75 | |
| Turn-Off Delay Time ^c | $t_{d(off)}$ | | | 30 | 45 | |
| Fall Time ^c | t_f | | | 60 | 90 | |
| Source-Drain Diode Ratings and Characteristics ($T_C = 25\text{ }^\circ\text{C}$) | | | | | | |
| Pulsed Current | I_{SM} | | | | 36 | A |
| Diode Forward Voltage ^b | V_{SD} | $I_F = 3\text{ A}, V_{GS} = 0\text{ V}$ | | 0.9 | 1.5 | V |
| Source-Drain Reverse Recovery Time | t_{rr} | $I_F = 3\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$ | | 180 | 250 | ns |

Notes:

- a. Guaranteed by design, not subject to production testing.
- b. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
- c. Independent of operating temperature.

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

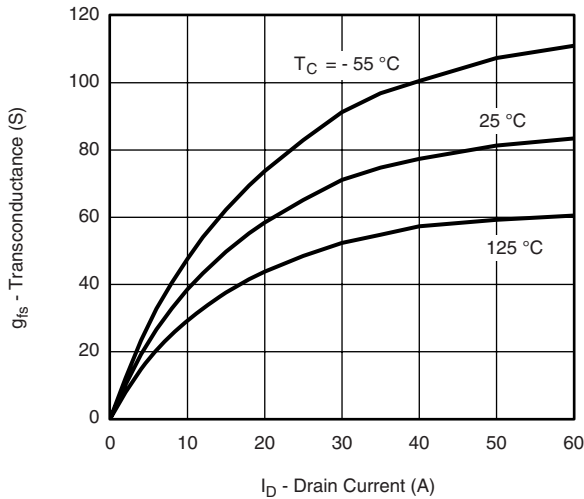
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



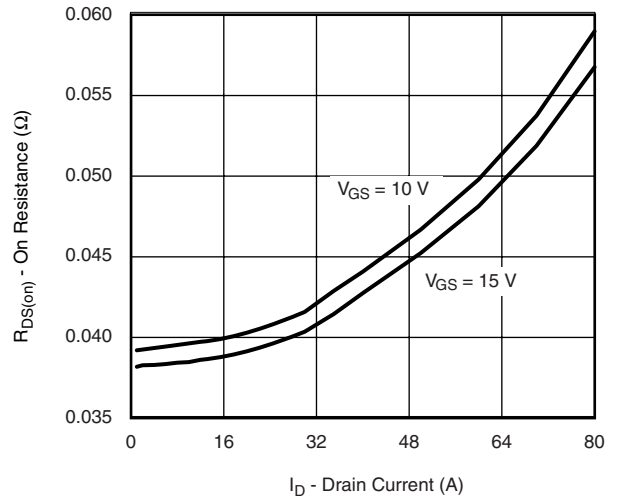
Output Characteristics



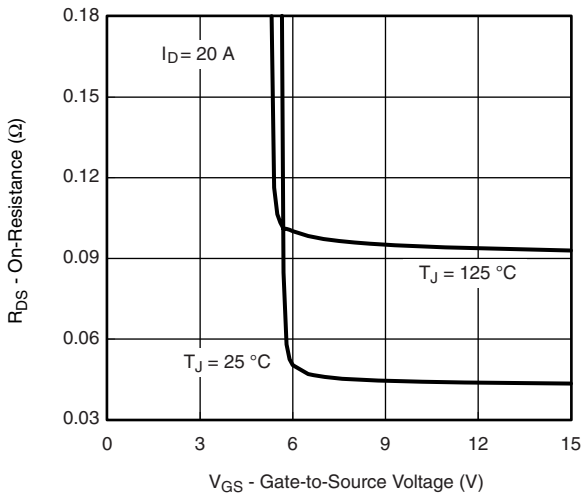
Transfer Characteristics



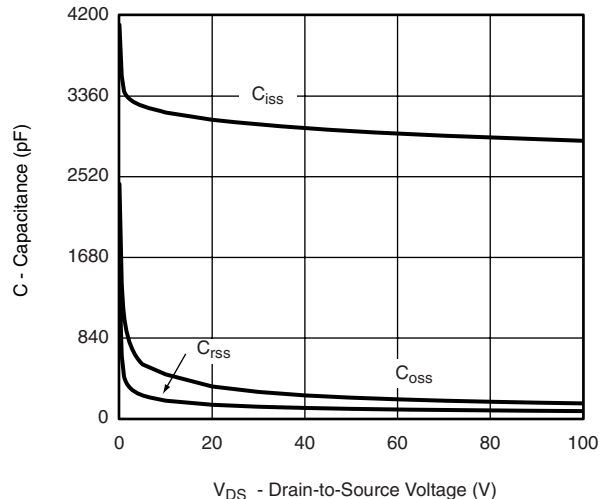
Transconductance



On-Resistance vs. Drain Current

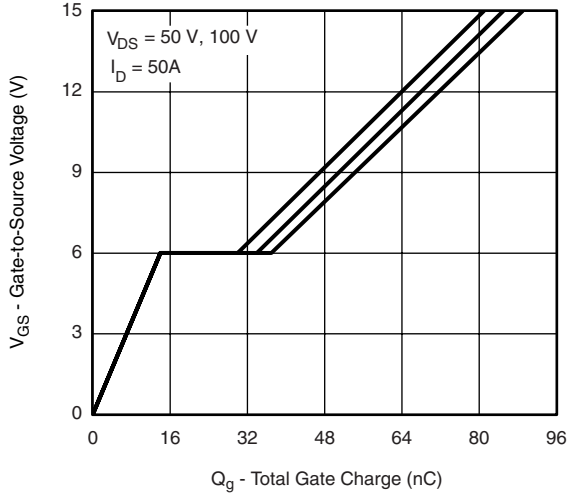


On-Resistance vs. Gate-to-Source Voltage

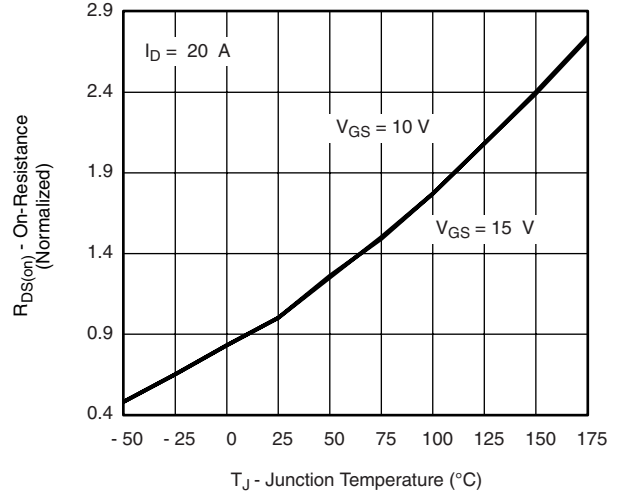


Capacitance

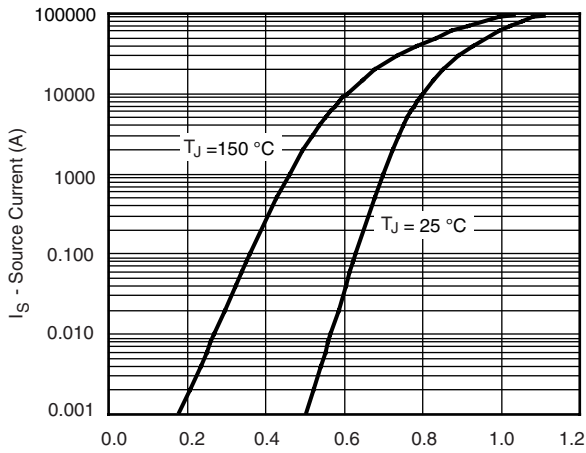
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



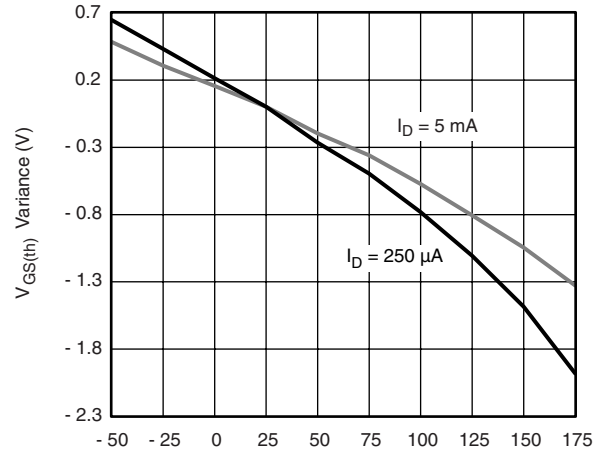
Gate Charge



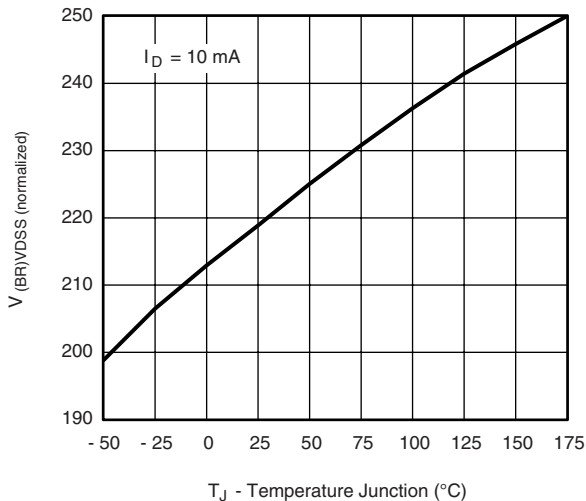
On-Resistance vs. Junction Temperature



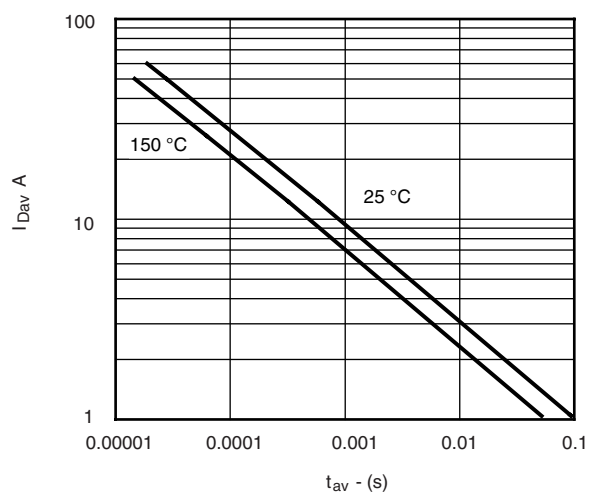
Source-Drain Diode Forward Voltage



Threshold Voltage



Drain Source Breakdown vs. Junction Temperature



Single Pulse Avalanche Current Capability vs. Time

THERMAL RATINGS

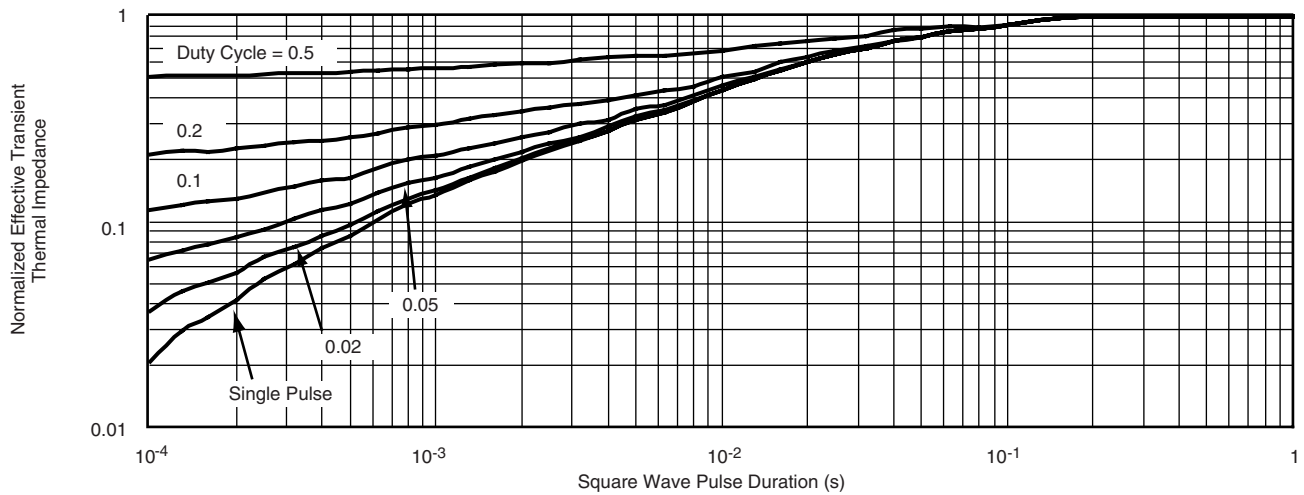


Maximum Drain Current vs. Case Temperature



* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Case

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