

IRFB38N20DPBF-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

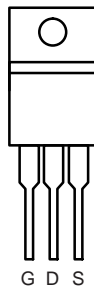
- Trench Power MOSFETS
- 175 °C Junction Temperature
- 100 % R_g and UIS Tested


RoHS
 COMPLIANT

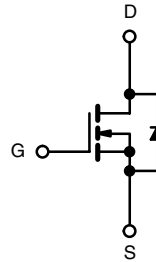
APPLICATIONS

- 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 | 50 | A |
| | | 30 | |
| Pulsed Drain Current | I_{DM} | 150 | |
| Single Pulse Avalanche Current | I_{AS} | 20 | |
| Single Pulse Avalanche Energy ^a | E_{AS} | 20 | mJ |
| Maximum Power Dissipation ^a | P_D | 166 ^b | W |
| | | 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:

a. Duty cycle ≤ 1 %.

b. See SOA curve for voltage derating.

c. When Mounted on 1" square PCB (FR-4 material).

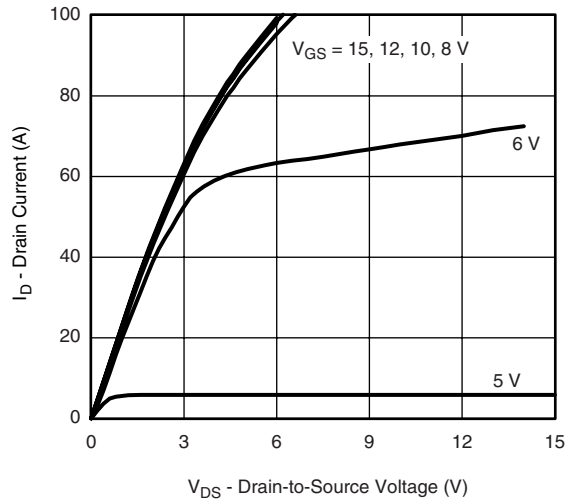
| SPECIFICATIONS (T _J = 25 °C, unless otherwise noted) | | | | | | |
|---|---------------------|--|------|-------------------|-------|------|
| Parameter | Symbol | Test Conditions | Min. | Typ. ^a | Max. | Unit |
| Static | | | | | | |
| Drain-Source Breakdown Voltage | V _{DS} | V _{GS} = 0 V, I _D = 250 μA | 200 | | | V |
| Gate Threshold Voltage | V _{GS(th)} | V _{DS} = V _{GS} , I _D = 250 μA | 2 | | 4 | |
| Gate-Body Leakage | I _{GSS} | V _{DS} = 0 V, V _{GS} = ± 20 V | | | ± 100 | nA |
| Zero Gate Voltage Drain Current | I _{DSS} | V _{DS} = 200 V, V _{GS} = 0 V | | | 1 | μA |
| | | V _{DS} = 200 V, V _{GS} = 0 V, T _J = 125 °C | | | 50 | |
| | | V _{DS} = 200 V, V _{GS} = 0 V, T _J = 175 °C | | | 250 | |
| On-State Drain Current ^b | I _{D(on)} | V _{DS} = 5 V, V _{GS} = 10 V | 40 | | | A |
| Drain-Source On-State Resistance ^b | R _{DS(on)} | V _{GS} = 10 V, I _D = 3 A | | 0.048 | | Ω |
| | | V _{GS} = 10 V, I _D = 3 A, T _J = 125 °C | | 0.050 | | |
| | | V _{GS} = 10 V, I _D = 3 A, T _J = 175 °C | | 0.070 | | |
| | | V _{GS} = 6 V, I _D = 3 A | | 0.092 | | |
| Forward Transconductance ^b | g _{fs} | V _{DS} = 15 V, I _D = 3 A | | 35 | | S |
| Dynamic ^a | | | | | | |
| Input Capacitance | C _{iss} | V _{GS} = 0 V, V _{DS} = 25 V, F = 1 MHz | | 3000 | | pF |
| Output Capacitance | C _{oss} | | | 180 | | |
| Reverse Transfer Capacitance | C _{rss} | | | 80 | | |
| Total Gate Charge ^c | Q _g | V _{DS} = 100 V, V _{GS} = 10 V, I _D = 3 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 V, R _L = 5.2 Ω I _D ≅ 3 A, V _{GEN} = 10 V, R _g = 2.5 Ω | | 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 °C) | | | | | | |
| Pulsed Current | I _{SM} | | | | 36 | A |
| Diode Forward Voltage ^b | V _{SD} | I _F = 3 A, V _{GS} = 0 V | | 0.9 | 1.5 | V |
| Source-Drain Reverse Recovery Time | t _{rr} | I _F = 3 A, dI/dt = 100 A/μs | | 180 | 250 | ns |

Notes:

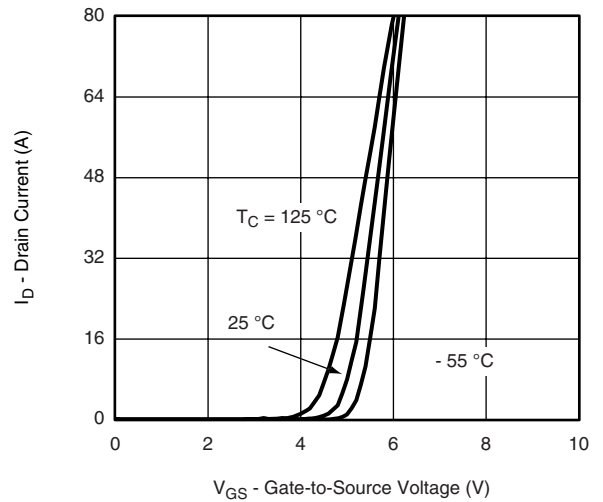
- a. Guaranteed by design, not subject to production testing.
- b. Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2 %.
- c. Independent of operating temperature.

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.

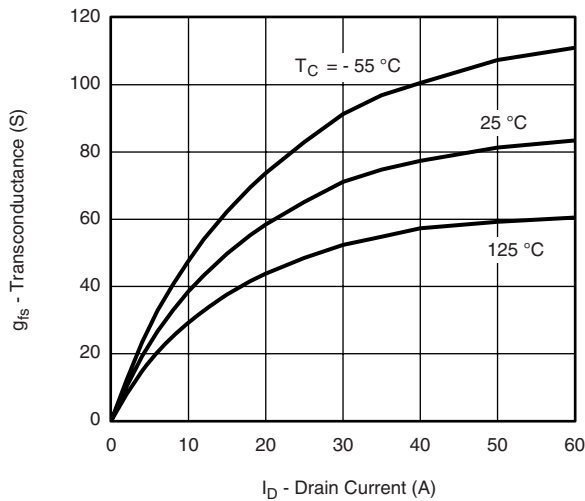
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



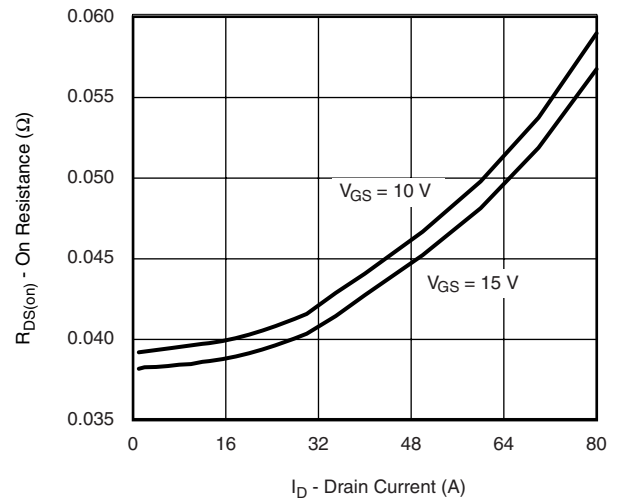
Output Characteristics



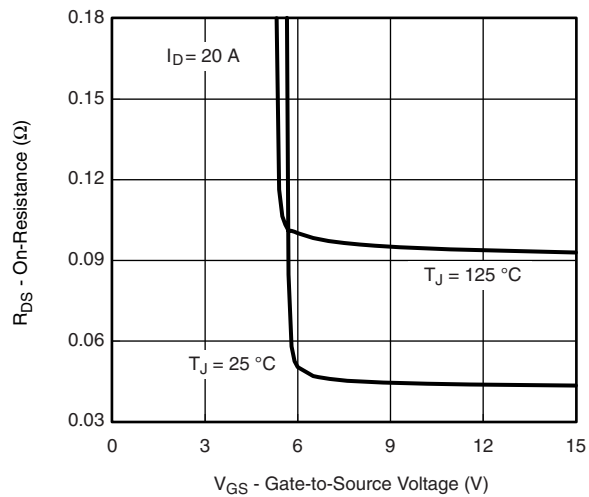
Transfer Characteristics



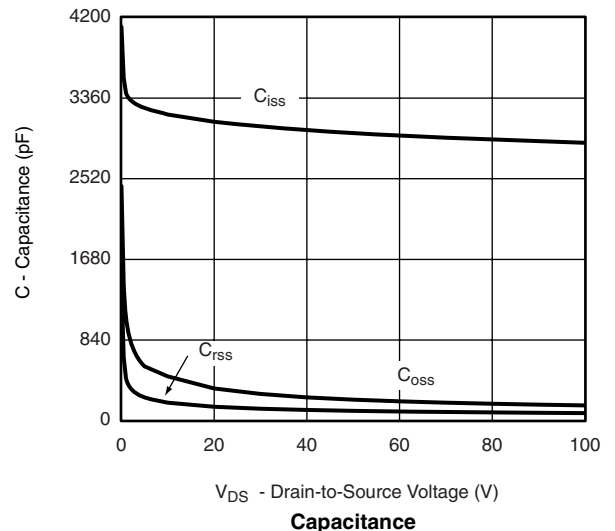
Transconductance



On-Resistance vs. Drain Current

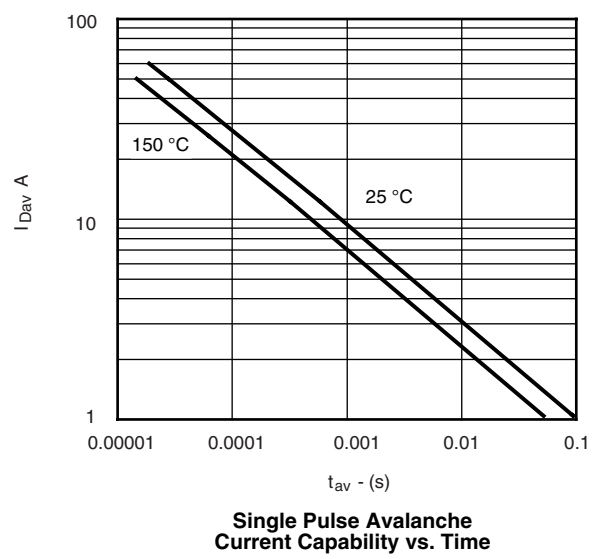
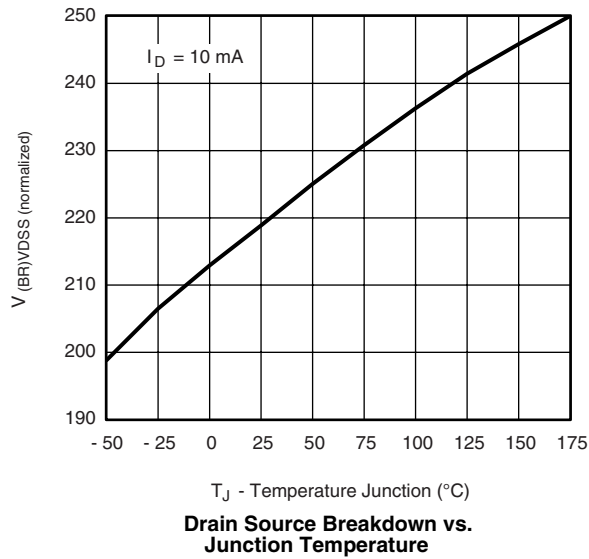
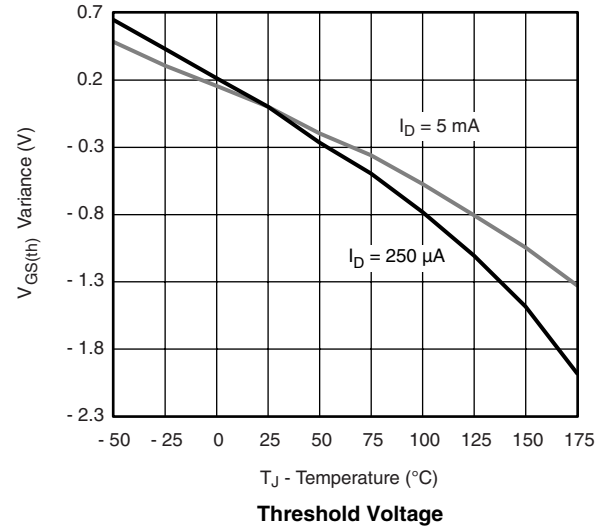
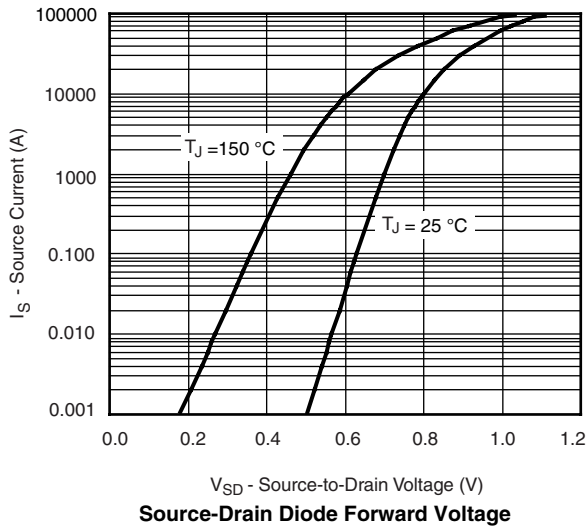
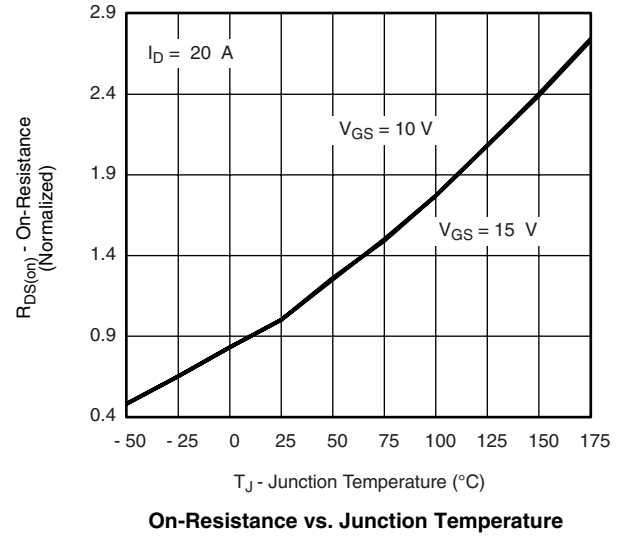
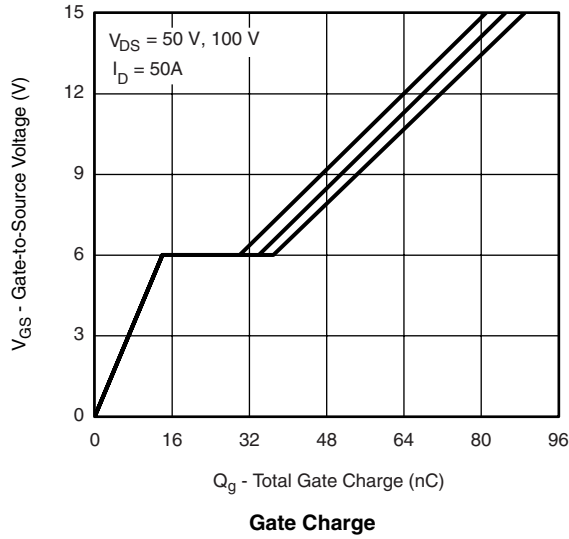


On-Resistance vs. Gate-to-Source Voltage

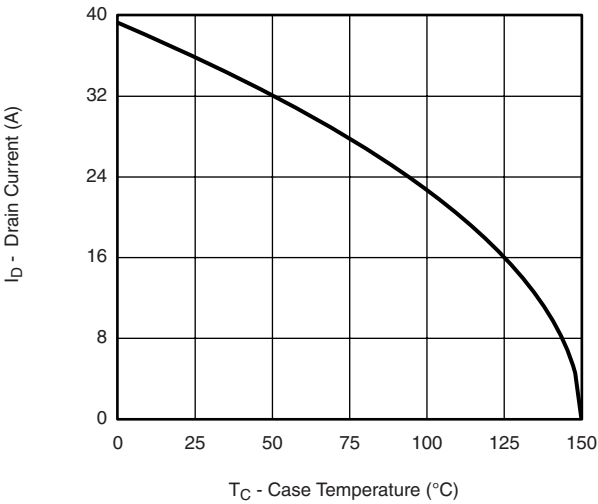


Capacitance

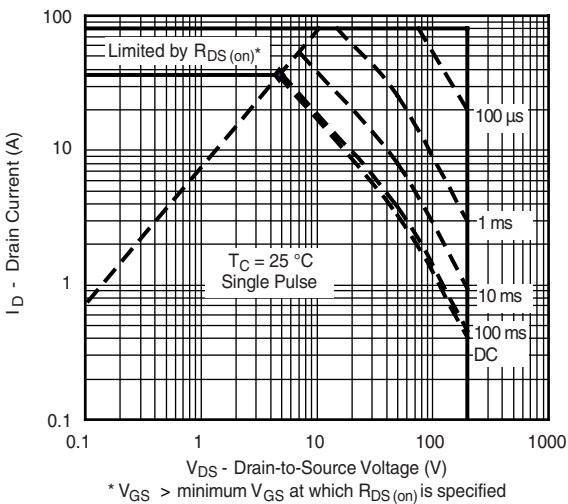
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



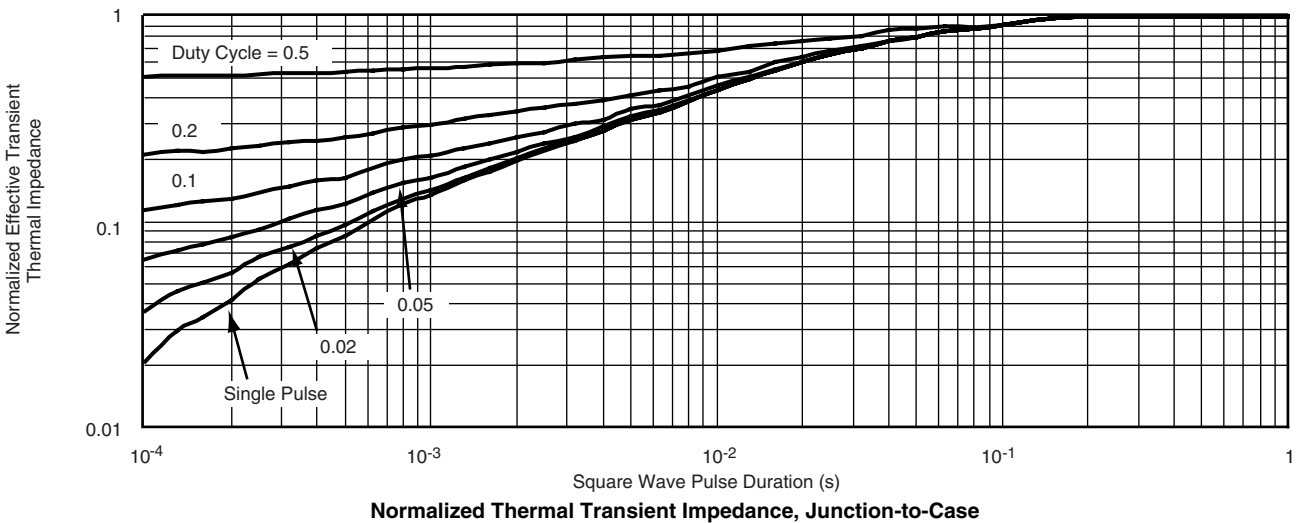
THERMAL RATINGS



Maximum Drain Current vs. Case Temperature



Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Case

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