

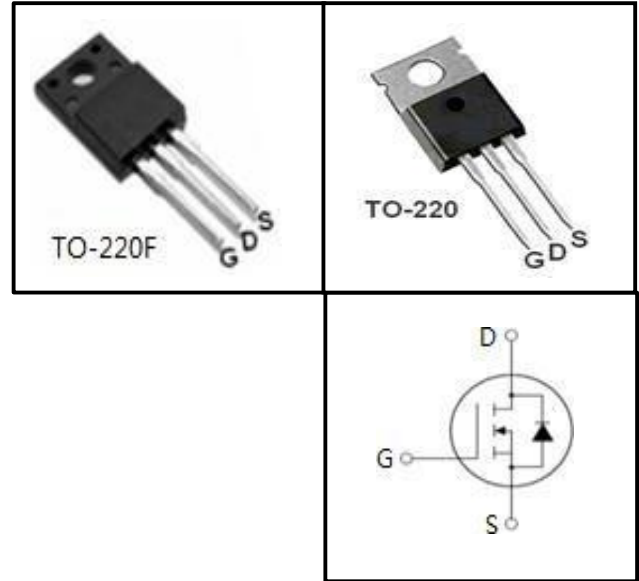
200V N-Channel MOSFET

FEATURES

- I Proprietary New Planar Technology
- I $R_{DS(ON),typ.}=50m\ \Omega@V_{GS}=10V$
- I Low Gate Charge Minimize Switching Loss
- I Fast Recovery Body Diode

APPLICATIONS

- I DC-DC Converters
- I DC-AC Inverters for UPS
- I SMPS and Motor controls



Device Marking and Package Information

| Device | Package | Marking |
|----------|---------|----------|
| MPF40N20 | TO-220F | MPF40N20 |
| MP40N20 | TO-220 | MP40N20 |

Absolute Maximum Ratings $T_C = 25^\circ\text{C}$, unless otherwise noted

| Parameter | Symbol | Value | | Unit |
|--|----------------|----------|--------|------------------|
| | | TO-220F | TO-220 | |
| Drain-Source Voltage | V_{DSS} | 200 | | V |
| Continuous Drain Current | I_D | 40 | | A |
| Pulsed Drain Current (note1) | I_{DM} | 160 | | A |
| Gate-Source Voltage | V_{GSS} | ± 20 | | V |
| Single Pulse Avalanche Energy (note1) | E_{AS} | 191 | | mJ |
| Avalanche Current (note1) | I_{AS} | 31 | | A |
| Repetitive Avalanche Energy (note1) | E_{AR} | 124 | | mJ |
| Power Dissipation ($T_C = 25^\circ\text{C}$) | P_D | 63.7 | 104 | W |
| Operating Junction and Storage Temperature Range | T_J, T_{stg} | -55~+150 | | $^\circ\text{C}$ |

Thermal Resistance

| Parameter | Symbol | Value | | Unit |
|---|------------|---------|--------|--------------------|
| | | TO-220F | TO-220 | |
| Thermal Resistance, Junction-to-Case | R_{thJC} | 1.96 | 1.2 | $^\circ\text{C/W}$ |
| Thermal Resistance, Junction-to-Ambient | R_{thJA} | 62.5 | 60 | |

| Specifications $T_J = 25^\circ\text{C}$, unless otherwise noted | | | | | | |
|--|---------------|---|-------|------|-----------|----------|
| Parameter | Symbol | Test Conditions | Value | | | Unit |
| | | | Min. | Typ. | Max. | |
| Static | | | | | | |
| Drain-Source Breakdown Voltage | $V_{(BR)DSS}$ | $V_{GS} = 0V, I_D = 250\mu A$ | 200 | -- | -- | V |
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{DS} = 200V, V_{GS} = 0V, T_J = 25^\circ\text{C}$ | -- | -- | 1 | μA |
| | | $V_{DS} = 200V, V_{GS} = 0V, T_J = 125^\circ\text{C}$ | -- | -- | 100 | |
| Gate-Source Leakage | I_{GSS} | $V_{GS} = \pm 20V, V_{DS} = 0V$ | -- | -- | ± 100 | nA |
| Gate-Source Threshold Voltage | $V_{GS(th)}$ | $V_{DS} = V_{GS}, I_D = 250\mu A$ | 2.0 | -- | 4.0 | V |
| Drain-Source On-Resistance (Note4) | $R_{DS(on)}$ | $V_{GS} = 10V, I_D = 20A$ | -- | 0.05 | 0.06 | Ω |
| Forward Transconductance (Note4) | gfs | $V_{DS} = 25V, I_D = 20A$ | -- | 16 | -- | S |
| Dynamic | | | | | | |
| Input Capacitance | C_{iss} | $V_{GS} = 0V,$ $V_{DS} = 25V,$ $f = 1.0\text{MHz}$ | -- | 2800 | -- | pF |
| Output Capacitance | C_{oss} | | -- | 355 | -- | |
| Reverse Transfer Capacitance | C_{rss} | | -- | 101 | -- | |
| Total Gate Charge | Q_g | $V_{DD} = 160V, I_D = 40A,$ | -- | 154 | -- | nC |
| Gate-Source Charge | Q_{gs} | | -- | 13 | -- | |
| Gate-Drain Charge | Q_{gd} | | -- | 58 | -- | |
| Turn-on Delay Time | $t_{d(on)}$ | $V_{DD} = 160V, I_D = 40A,$ $V_{GS} = 15V, R_G = 25\Omega$ | -- | 46 | -- | ns |
| Turn-on Rise Time | t_r | | -- | 54 | -- | |
| Turn-off Delay Time | $t_{d(off)}$ | | -- | 360 | -- | |
| Turn-off Fall Time | t_f | | -- | 96 | -- | |
| Drain-Source Body Diode Characteristics | | | | | | |
| Continuous Source Current | I_{SD} | Integral PN-diode in MOSFET | -- | -- | 40 | A |
| Pulsed Source Current | I_{SM} | | -- | -- | 160 | |
| Body Forward Voltage | V_{SD} | $I_S = 20A, V_{GS} = 0V$ | -- | -- | 1.4 | V |
| Reverse Recovery Time | t_{rr} | $V_{GS} = 0V, I_F = 10A,$ $di_F/dt = 100A/\mu s$ | -- | 152 | -- | ns |
| Reverse Recovery Charge | Q_{rr} | | -- | 1 | -- | μC |

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. $L = 1\text{mH}, V_{DD} = 30V, R_G = 25\Omega$, Starting $T_J = 25^\circ\text{C}$
3. Pulse Test: Pulse width $\leq 300\mu s$, Duty Cycle $\leq 1\%$

Typical Characteristics $T_J = 25^\circ\text{C}$, unless otherwise noted

Figure 1. Output Characteristics ($T_J = 25^\circ\text{C}$)

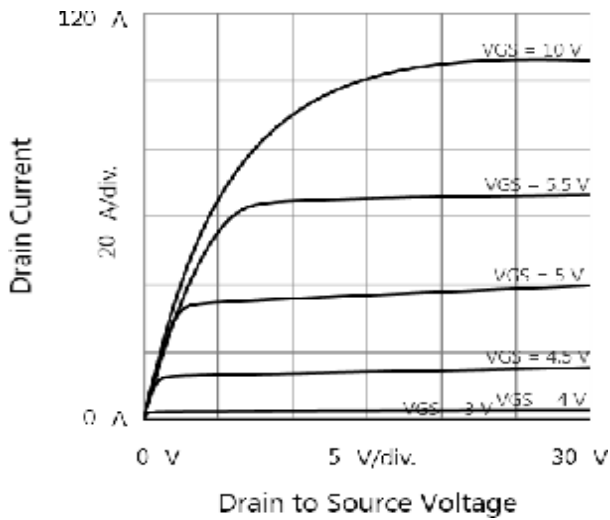


Figure 2. Transfer Characteristics

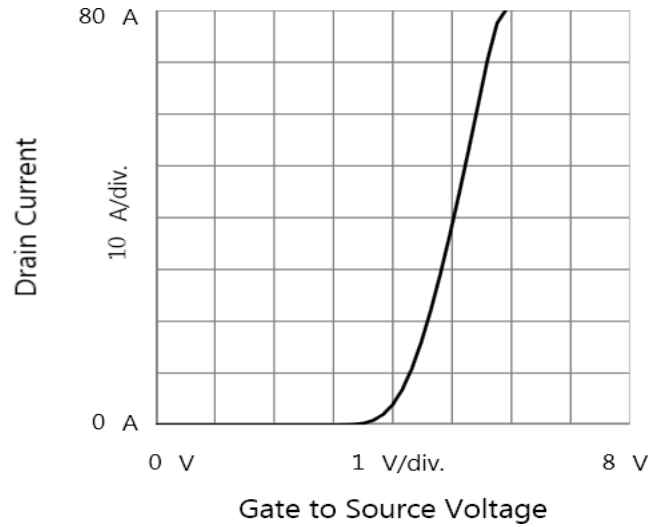


Figure 3. Drain to Source Resistance vs. Drain Current

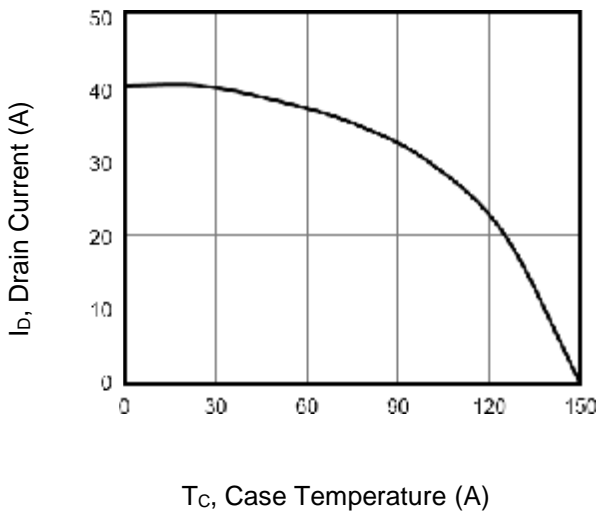


Figure 4. BV_{DSS} Variation vs. Temperature

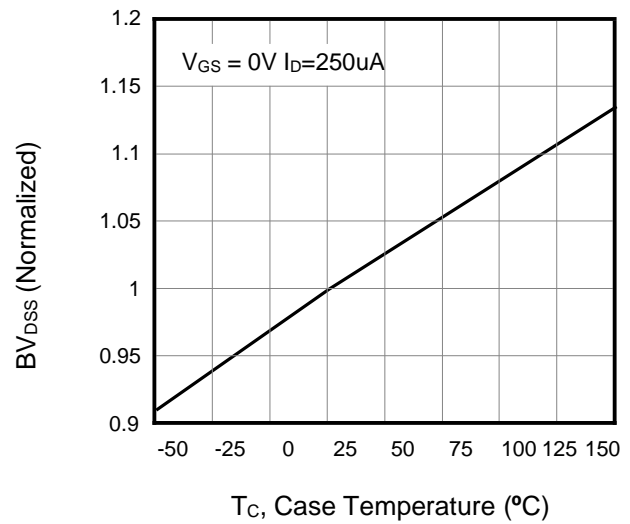


Figure 5. Drain to Source Voltage vs. Gate to Source Voltage

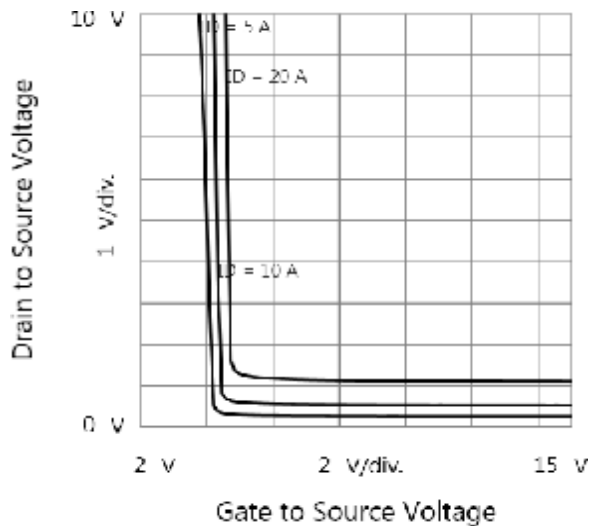
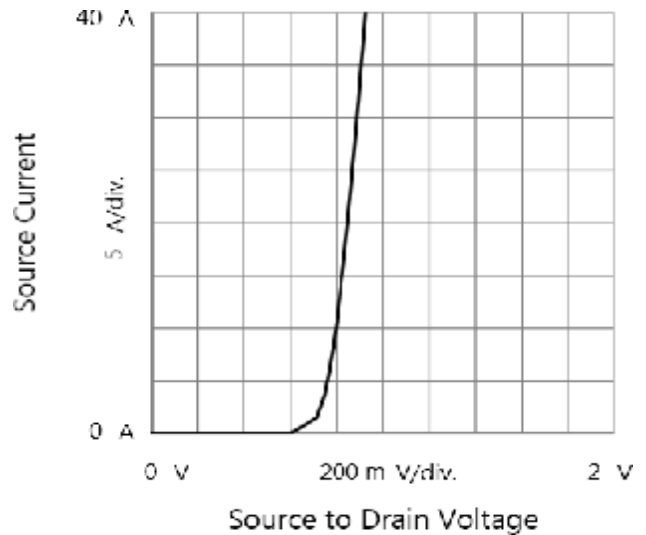


Figure 6. Body Diode Forward Characteristics



Typical Characteristics $T_J = 25^\circ\text{C}$, unless otherwise noted

Figure 7. Capacitance

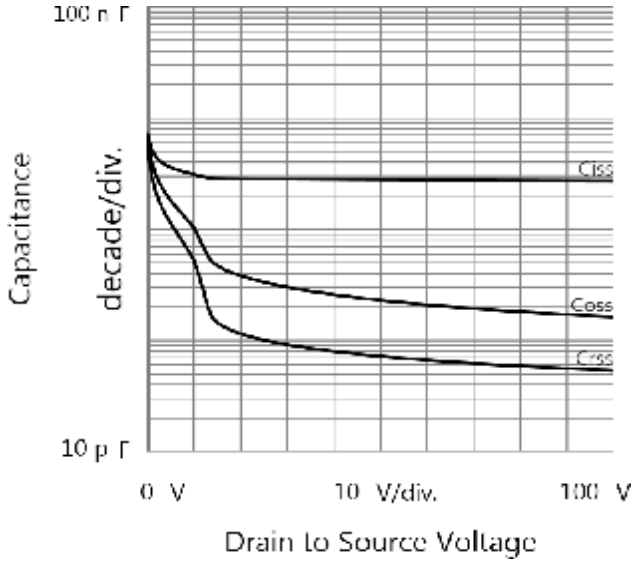


Figure 8. Gate Charge

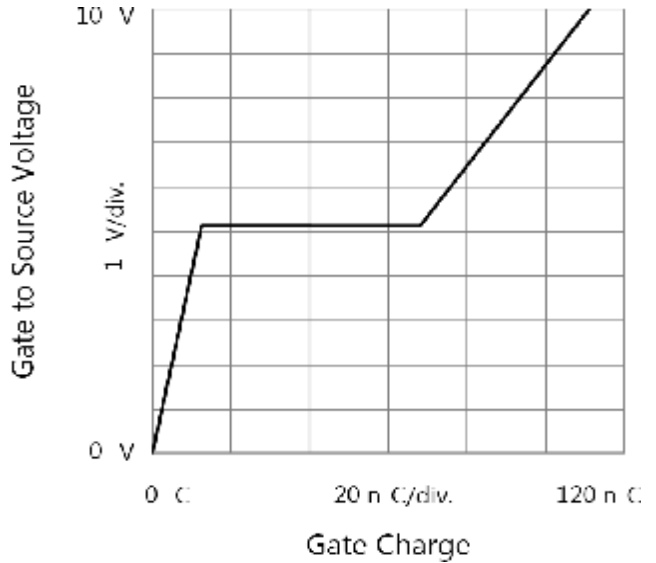


Figure 9. Transient Thermal Impedance TO-220F

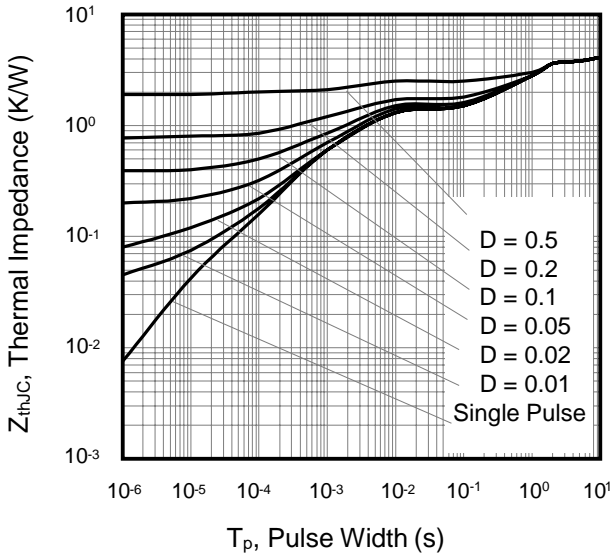


Figure 10. Transient Thermal Impedance TO-220

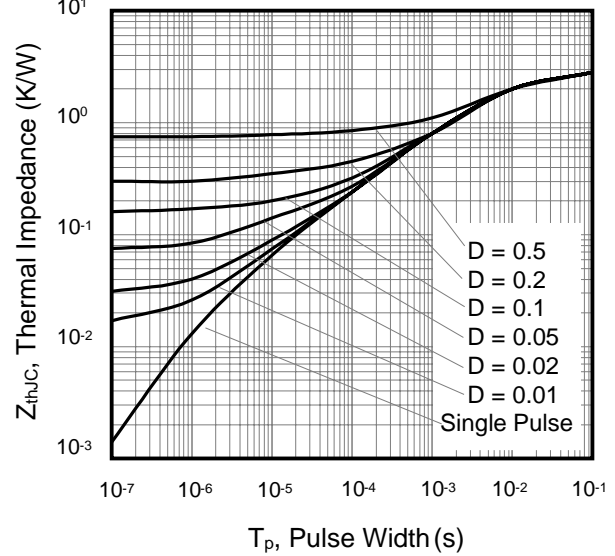


Figure A: Gate Charge Test Circuit and Waveform

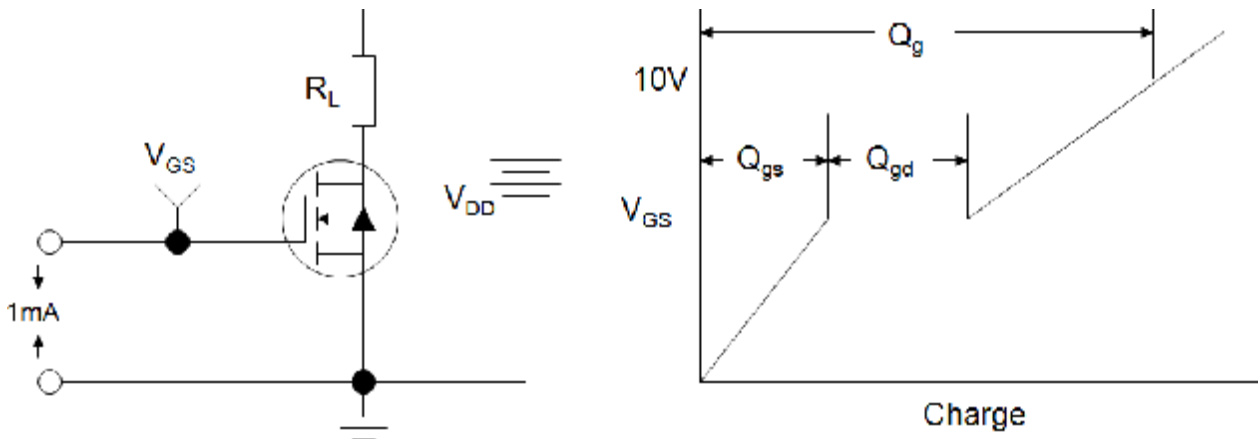


Figure B: Resistive Switching Test Circuit and Waveform

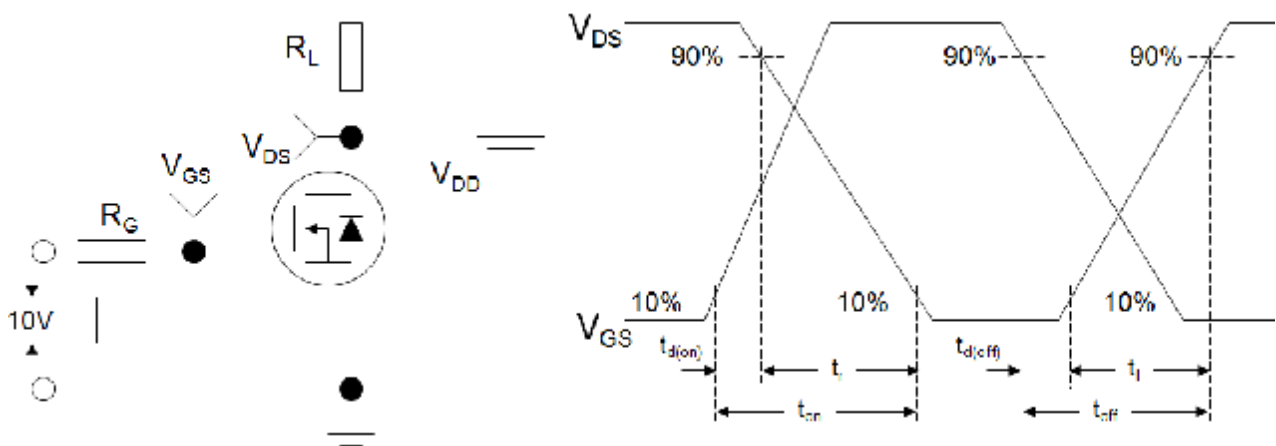


Figure C: Unclamped Inductive Switching Test Circuit and Waveform

