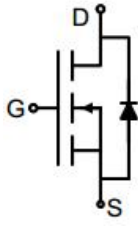



N-Channel Enhancement Mode Power MOSFET

| | |
|--|---|
| <p>Description</p> <p>The GC20N65F uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge. It can be used in a wide variety of applications.</p> <p>General Features</p> <ul style="list-style-type: none"> ● V_{DS} 650V ● I_D (at $V_{GS} = 10V$) 20A ● $R_{DS(ON)}$ (at $V_{GS} = 10V$) < 190mΩ ● 100% Avalanche Tested ● RoHS Compliant <p>Application</p> <ul style="list-style-type: none"> ● Power switch ● DC/DC converters |  <p>Schematic diagram</p>  <p>TO-220F</p> |
|--|---|

Ordering Information

| Device | Package | Marking | Packaging |
|----------|---------|---------|------------|
| GC20N65F | TO-220F | GC20N65 | 50psc/Tube |

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

| Parameter | Symbol | Value | Unit |
|--|----------------|------------|------|
| Drain-Source Voltage | V_{DS} | 650 | V |
| Continuous Drain Current | I_D | 20 | A |
| Pulsed Drain Current (note1) | I_{DM} | 80 | A |
| Gate-Source Voltage | V_{GS} | ±30 | V |
| Power Dissipation | P_D | 40 | W |
| Single pulse avalanche energy (note2) | E_{AS} | 484 | mJ |
| Operating Junction and Storage Temperature Range | T_J, T_{stg} | -55 To 150 | °C |

Thermal Resistance

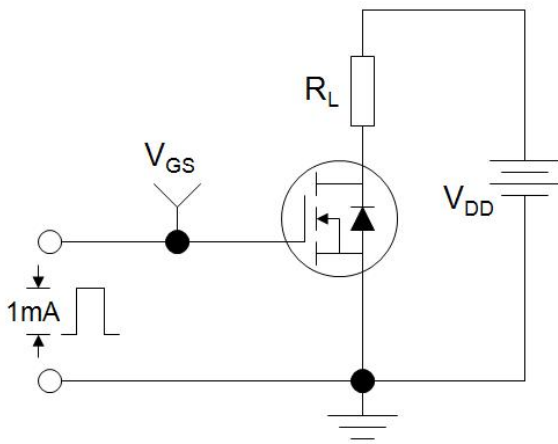
| Parameter | Symbol | Value | Unit |
|---|------------|-------|------|
| Thermal Resistance, Junction-to-Ambient | R_{thJA} | 65 | °C/W |
| Maximum Junction-to-Case | R_{thJC} | 3.1 | °C/W |

| Specifications $T_J = 25^\circ\text{C}$, unless otherwise noted | | | | | | |
|--|---------------|---|-------|------|-----------|------------|
| Parameter | Symbol | Test Conditions | Value | | | Unit |
| | | | Min. | Typ. | Max. | |
| Static Parameters | | | | | | |
| Drain-Source Breakdown Voltage | $V_{(BR)DSS}$ | $V_{GS} = 0V, I_D = 250\mu A$ | 650 | -- | -- | V |
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{DS} = 650V, V_{GS} = 0V$ | -- | -- | 1 | μA |
| Gate-Source Leakage | I_{GSS} | $V_{GS} = \pm 30V$ | -- | -- | ± 100 | nA |
| Gate-Source Threshold Voltage | $V_{GS(th)}$ | $V_{DS} = V_{GS}, I_D = 250\mu A$ | 2 | 3.5 | 4 | V |
| Drain-Source On-Resistance | $R_{DS(on)}$ | $V_{GS} = 10V, I_D = 10A$ | -- | 148 | 190 | m Ω |
| Forward Transconductance | g_{FS} | $V_{GS} = 5V, I_D = 10A$ | -- | 16 | -- | S |
| Dynamic Parameters | | | | | | |
| Input Capacitance | C_{iss} | $V_{GS} = 0V,$ $V_{DS} = 100V,$ $f = 1.0\text{MHz}$ | -- | 1603 | -- | pF |
| Output Capacitance | C_{oss} | | -- | 38 | -- | |
| Reverse Transfer Capacitance | C_{rss} | | -- | 3 | -- | |
| Total Gate Charge | Q_g | $V_{DD} = 480V,$ $I_D = 10A,$ $V_{GS} = 10V$ | -- | 39 | -- | nC |
| Gate-Source Charge | Q_{gs} | | -- | 9 | -- | |
| Gate-Drain Charge | Q_{gd} | | -- | 16 | -- | |
| Turn-on Delay Time | $t_{d(on)}$ | $V_{DD} = 400V,$ $I_D = 10A,$ $R_G = 25\Omega$ | -- | 77 | -- | ns |
| Turn-on Rise Time | t_r | | -- | 36 | -- | |
| Turn-off Delay Time | $t_{d(off)}$ | | -- | 120 | -- | |
| Turn-off Fall Time | t_f | | -- | 63 | -- | |
| Drain-Source Body Diode Characteristics | | | | | | |
| Continuous Body Diode Current | I_S | $T_C = 25^\circ\text{C}$ | -- | -- | 20 | A |
| Body Diode Voltage | V_{SD} | $T_J = 25^\circ\text{C}, I_{SD} = 10A, V_{GS} = 0V$ | -- | -- | 1.2 | V |
| Reverse Recovery Charge | Q_{rr} | $I_F = 10A, V_{GS} = 0V$ $di/dt = 100A/\mu s$ | -- | 7.5 | -- | nC |
| Reverse Recovery Time | T_{rr} | | -- | 375 | -- | ns |

Notes

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. EAS condition : $T_J = 25^\circ\text{C}, V_{DD} = 50V, V_{GS} = 10V, L = 0.5\text{mH}, R_G = 25\Omega$
3. Identical low side and high side switch with identical R_G

Gate Charge Test Circuit



Switch Time Test Circuit



EAS Test Circuit



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

Figure 1. Output Characteristics

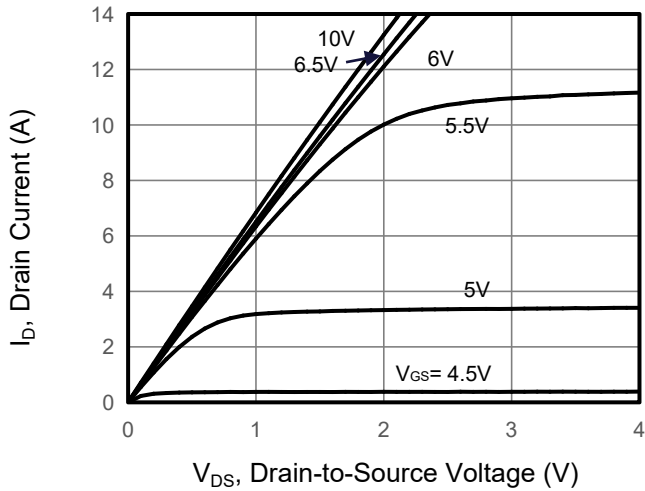


Figure 2. Transfer Characteristics

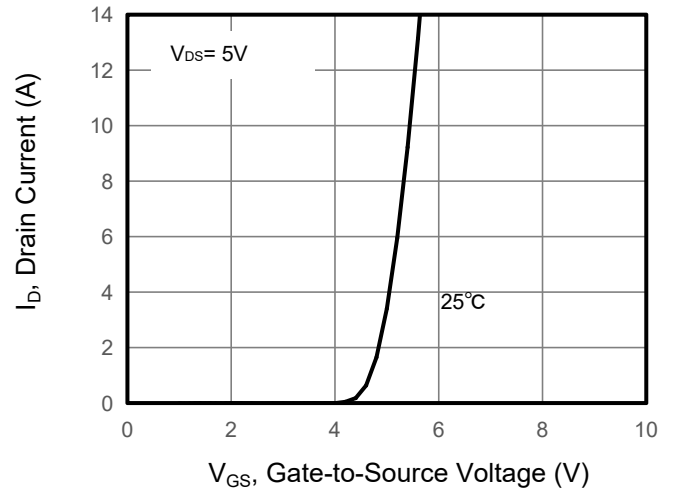


Figure 3. Drain Source On Resistance

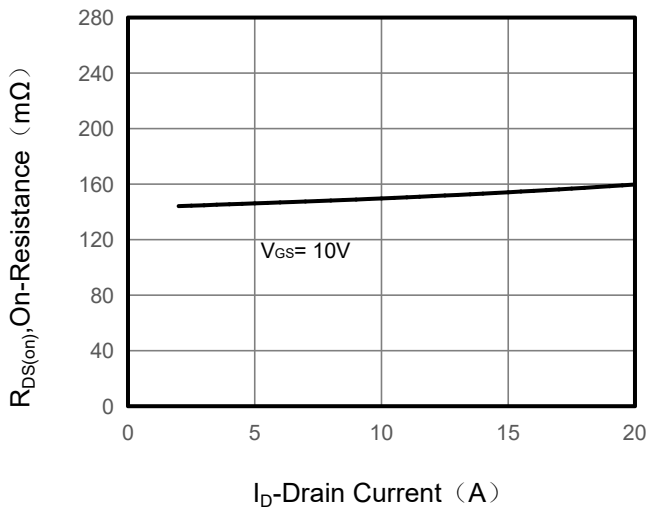


Figure 4. Gate Charge

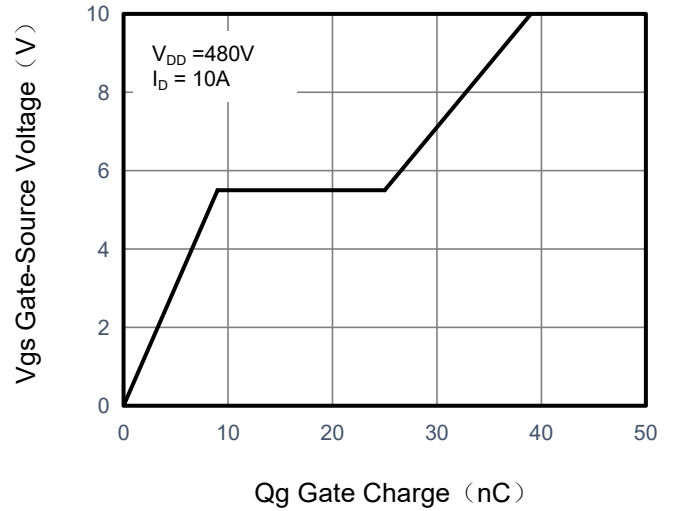


Figure 5. Capacitance

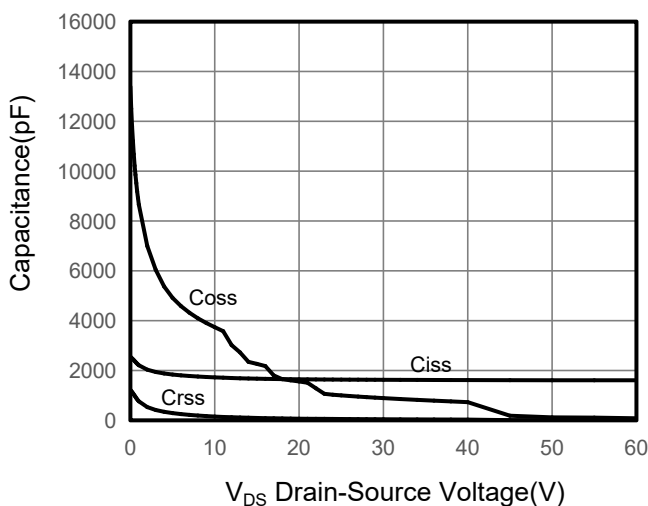
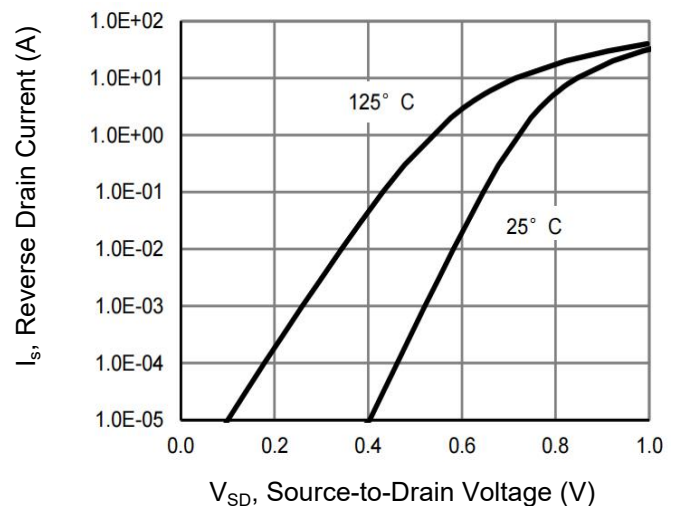


Figure 6. Source-Drain Diode Forward



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

Figure 7. Drain-Source On-Resistance

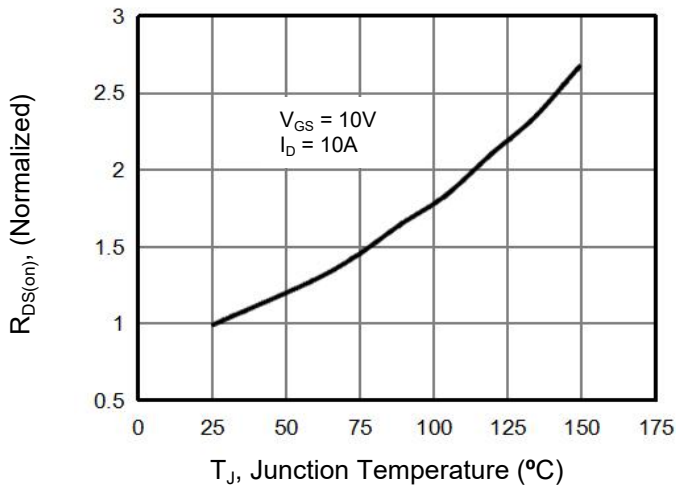


Figure 8. Safe Operation Area

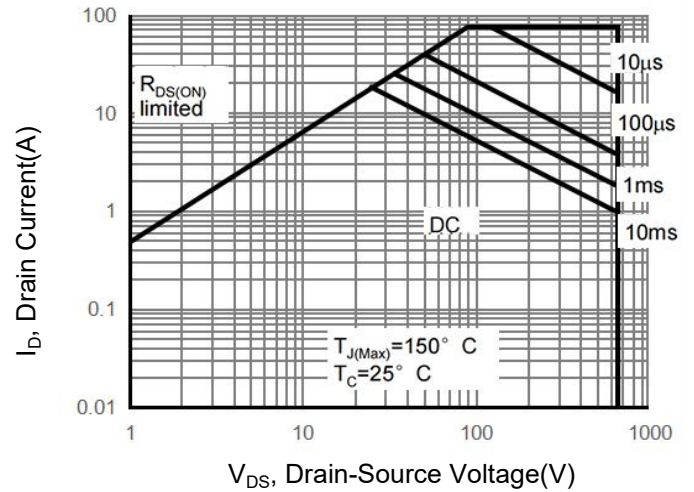
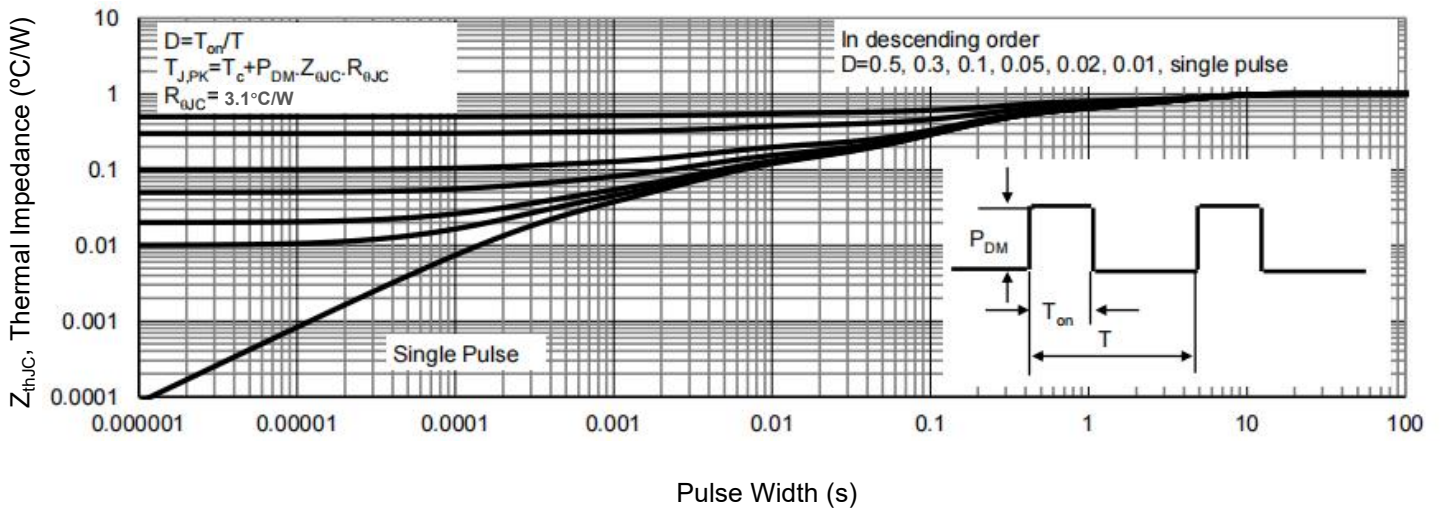
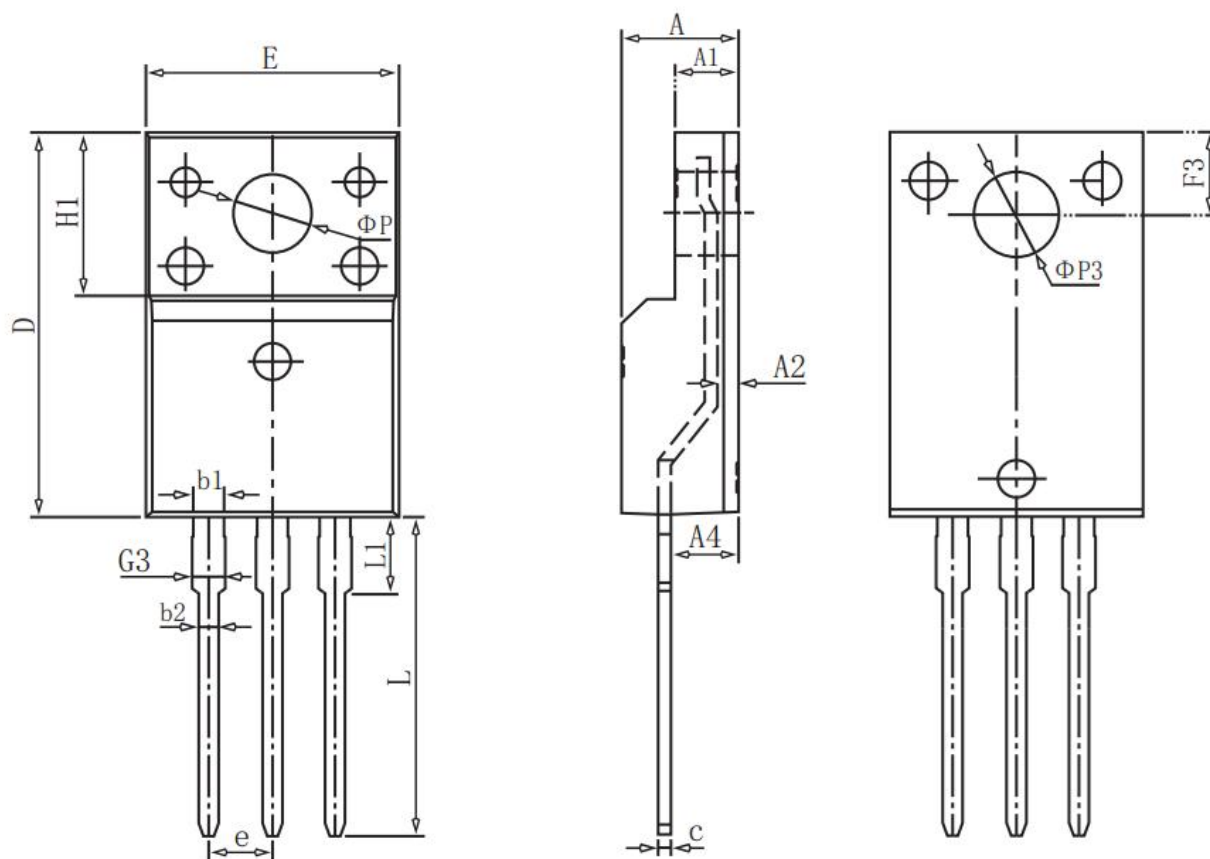


Figure 9. Normalized Maximum Transient Thermal Impedance



TO-220F Package Information



COMMON DIMENSIONS

| SYMBOL | mm | | |
|------------|----------|-------|-------|
| | MIN | NOM | MAX |
| E | 10.00 | 10.20 | 10.40 |
| A | 4.50 | 4.70 | 4.90 |
| A1 | 2.34 | 2.54 | 2.74 |
| A2 | 0.65 | 0.85 | 1.30 |
| A4 | 2.55 | 2.75 | 2.95 |
| c | 0.40 | 0.50 | 0.65 |
| D | 15.57 | 15.87 | 16.17 |
| H1 | 6.70REF | | |
| e | 2.54BSC | | |
| ΦP | 3.183REF | | |
| L | 12.68 | 12.98 | 13.28 |
| L_1 | 3.25 | 3.45 | 3.65 |
| ΦP_3 | 3.45REF | | |
| F3 | 3.10 | 3.30 | 3.50 |
| G3 | 1.10 | 1.30 | 1.50 |
| b_1 | 1.05 | 1.20 | 1.35 |
| b_2 | 0.70 | 0.80 | 0.92 |