



4N70F

4A N-Channel Power MOSFET

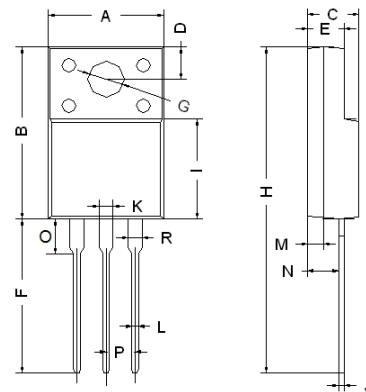
Features

- New technology for high voltage device
- Low on-resistance and low conduction losses
- Small package
- Ultra Low Gate Charge cause lower driving requirements
- 100% Avalanche Tested
- ROHS compliant

Mechanical Data

- Case :** TO-220F
- Terminals :** Solder plated, solderable per MIL-STD-750, Method 2026
- Polarity :** As marked
- Mounting Position :** Any

TO-220F

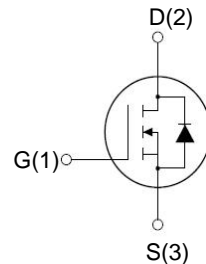
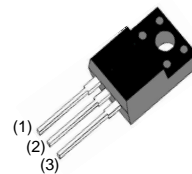


| TO-220F | | |
|---------|-------|-------|
| Dim | Min | Max |
| A | 9.80 | 10.30 |
| B | 15.20 | 15.80 |
| C | 4.37 | 4.77 |
| D | 2.90 | 3.30 |
| E | 2.50 | 2.90 |
| F | 12.90 | 13.50 |
| G | 3.10 | 3.30 |
| H | 28.40 | 29.16 |
| I | 8.40 | 9.10 |
| J | 0.35 | 0.58 |
| L | 0.68 | 0.94 |
| M | 1.30 | 1.50 |
| N | 2.40 | 2.60 |
| O | 2.60 | 3.10 |
| P | 2.40 | 2.60 |
| K/R | 1.10 | 1.32 |

All Dimensions in mm

Application

- Power factor correction (PFC)
- Switched mode power supplies(SMPS)
- Uninterruptible Power Supply (UPS)



Maximum Ratings And Electrical Characteristics

Ratings at 25°C ambient temperature unless otherwise specified. Single phase half-wave 60Hz, resistive or inductive load, for capacitive load current derate by 20%.

Table 1. Absolute Maximum Ratings (T_c=25°C)

| Parameter | Symbol | 4N70F | Unit |
|--|-------------------------|-------|------|
| Drain-Source Voltage (V _{GS} =0V) | V _{DS} | 700 | V |
| Gate-Source Voltage (V _{DS} =0V), AC (f>1 Hz) | V _{GS} | ±30 | V |
| Continuous Drain Current at T _c =25°C | I _{D (DC)} | 4* | A |
| Continuous Drain Current at T _c =100°C | I _{D (DC)} | 2.5* | A |
| Pulsed drain current (Note 1) | I _{DM (pluse)} | 16* | A |
| Maximum Power Dissipation(T _c =25°C) | P _D | 28.4 | W |
| Derate above 25°C | | 0.227 | W/°C |
| Single pulse avalanche energy (Note2) | E _{AS} | 27 | mJ |
| Avalanche current (Note 1) | I _{AR} | 0.7 | A |
| Repetitive Avalanche energy, t _{AR} limited by T _{jmax} (Note 1) | E _{AR} | 0.1 | mJ |



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| Parameter | Symbol | 4N70F | Unit |
|---|----------------|------------|------|
| Drain Source voltage slope, $V_{DS} \leq 480V$, | dv/dt | 50 | V/ns |
| Reverse diode dv/dt, $V_{DS} \leq 480V, I_{SD} < I_D$ | dv/dt | 15 | V/ns |
| Operating Junction and Storage Temperature Range | T_J, T_{STG} | -55...+150 | °C |

* limited by maximum junction temperature

Table 2. Thermal Characteristic

| Parameter SymbolUnit | Symbol | 4N70F | Unit |
|---|------------|-------|------|
| Thermal Resistance, Junction-to-Case (Maximum) | R_{thJC} | 4.4 | °C/W |
| Thermal Resistance, Junction-to-Ambient (Maximum) | R_{thJA} | 80 | °C/W |

Table 3. Electrical Characteristics (TA=25°C unless otherwise noted)

| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|--|--------------|---|-----|------|-----------|------------|
| On/off states | | | | | | |
| Drain-Source Breakdown Voltage | BV_{DSS} | $V_{GS}=0V, I_D=250\mu A$ | 700 | | | V |
| Zero Gate Voltage Drain Current($T_C=25^\circ C$) | I_{DSS} | $V_{DS}=650V, V_{GS}=0V$ | | | 1 | μA |
| Zero Gate Voltage Drain Current($T_C=125^\circ C$) | I_{DSS} | $V_{DS}=650V, V_{GS}=0V$ | | | 50 | μA |
| Gate-Body Leakage Current | I_{GSS} | $V_{GS}=\pm 20V, V_{DS}=0V$ | | | ± 100 | nA |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}=V_{GS}, I_D=250\mu A$ | 3 | | 4 | V |
| Drain-Source On-State Resistance | $R_{DS(on)}$ | $V_{GS}=10V, I_D=2A$ | | 1100 | 1300 | m Ω |
| Dynamic Characteristics | | | | | | |
| Input Capacitance | C_{iss} | $V_{DS}=50V, V_{GS}=0V,$ $F=1.0MHz$ | | 304 | | pF |
| Output Capacitance | C_{oss} | | | 17 | | pF |
| Reverse Transfer Capacitance | C_{riss} | | | 0.5 | | pF |
| Total Gate Charge | Q_g | $V_{DS}=480V, I_D=4A,$ $V_{GS}=10V$ | | 8.8 | 12 | nC |
| Gate-Source Charge | Q_{gs} | | | 2.3 | | nC |
| Gate-Drain Charge | Q_{gd} | | | 4 | | nC |
| Switching times | | | | | | |
| Turn-on Delay Time | $t_{d(on)}$ | $V_{DD}=380V, I_D=2.5A,$ $R_G=5\Omega, V_{GS}=10V$ | | 8 | | nS |
| Turn-on Rise Time | t_r | | | 4 | | nS |
| Turn-Off Delay Time | $t_{d(off)}$ | | | 52 | 70 | nS |
| Turn-Off Fall Time | t_f | | | 9 | 18 | nS |
| Source- Drain Diode Characteristics | | | | | | |
| Source-drain current(Body Diode) | I_{SD} | $T_C=25^\circ C$ | | | 4 | A |
| Pulsed Source-drain current(Body Diode) | I_{SDM} | | | | 16 | A |
| Forward On Voltage | V_{SD} | $T_J=25^\circ C, I_{SD}=4A, V_{GS}=0V$ | | 0.9 | 1.2 | V |
| Reverse Recovery Time | t_{rr} | $T_J=25^\circ C, I_F=2A, di/dt=100A/\mu s$ | | 200 | | nS |
| Reverse Recovery Charge | Q_{rr} | | | 0.6 | | μC |
| Peak reverse recovery current | I_{rrm} | | | 6 | | A |

Notes: 1.Repetitive Rating: Pulse width limited by maximum junction temperature

2. $T_J=25^\circ C, V_{DD}=50V, V_G=10V, R_G=25\Omega$



TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS (curves) 4N70F

Figure1. Safe operating area

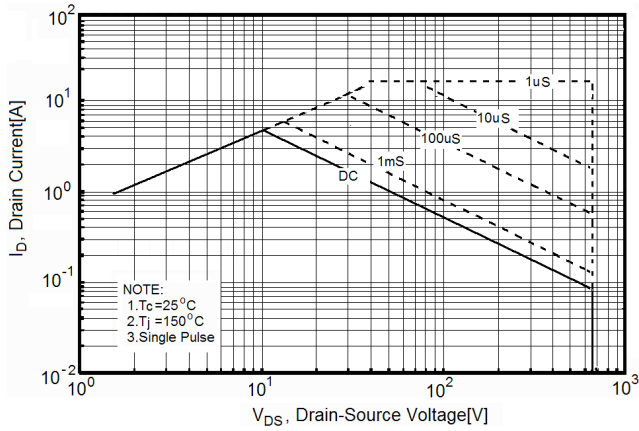


Figure2. Source-Drain Diode Forward Voltage

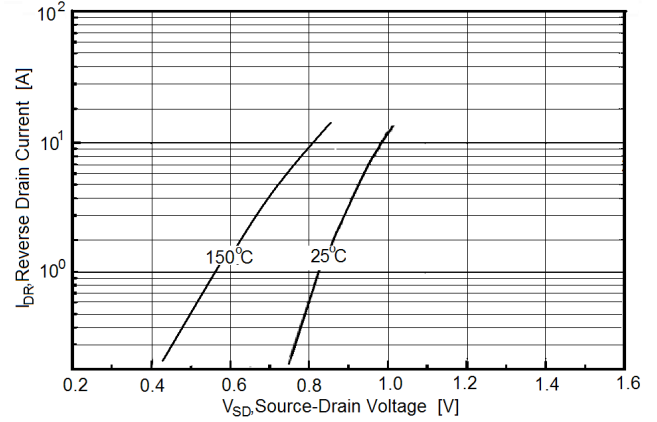


Figure3. Output characteristics

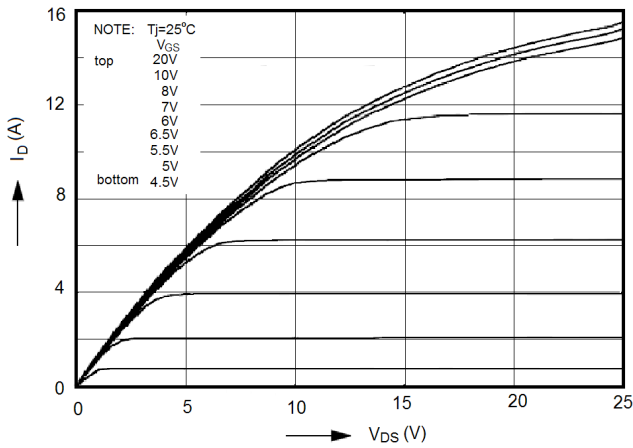


Figure4. Transfer characteristics

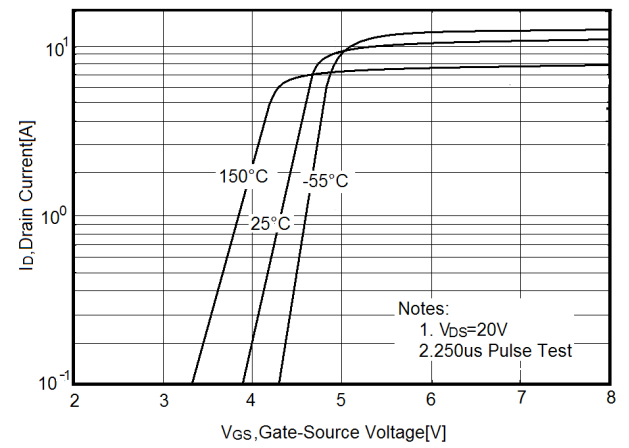


Figure5. Static drain-source on resistance

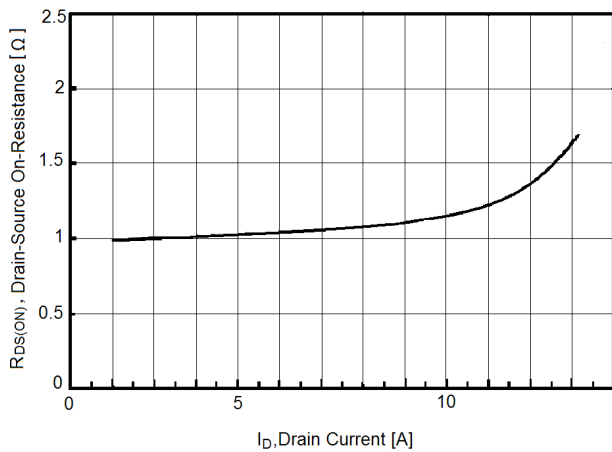
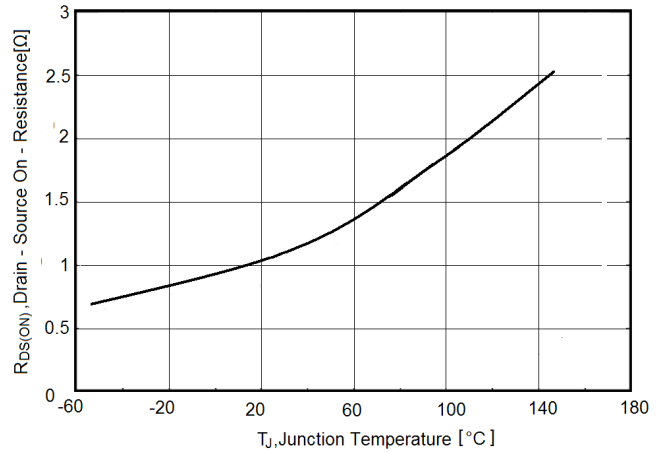


Figure6. $R_{DS(ON)}$ vs Junction Temperature





TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS (curves) 4N70F

Figure7. BV_{DSS} vs Junction Temperature

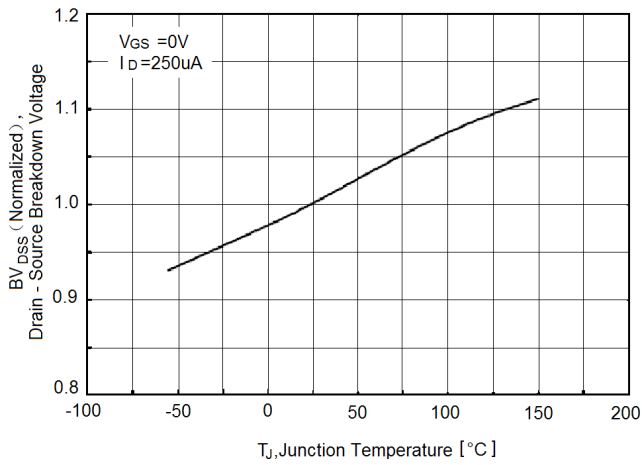


Figure8. Maximum I_D vs Junction Temperature

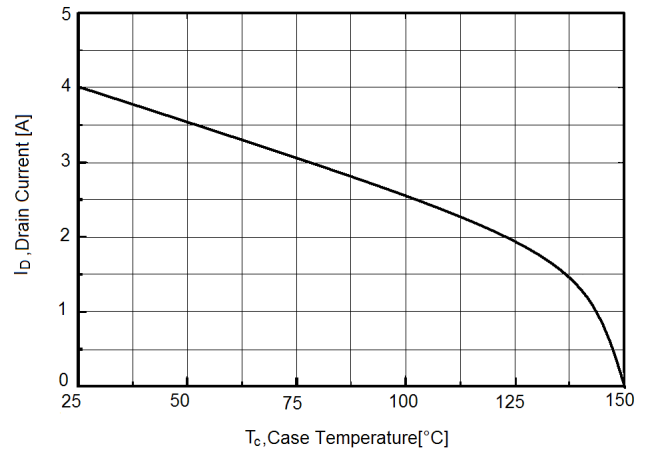


Figure9. Gate charge waveforms

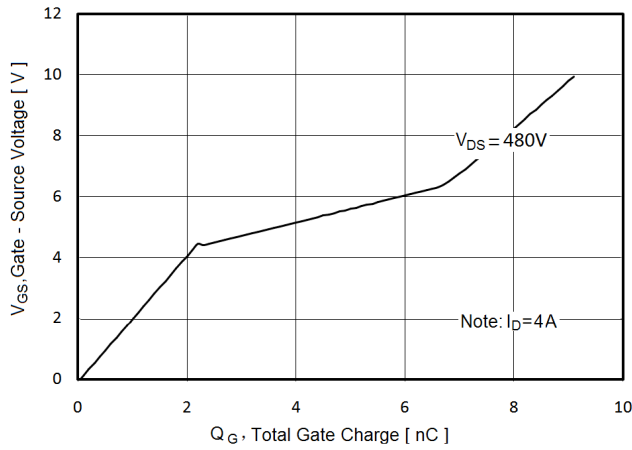


Figure10. Capacitance

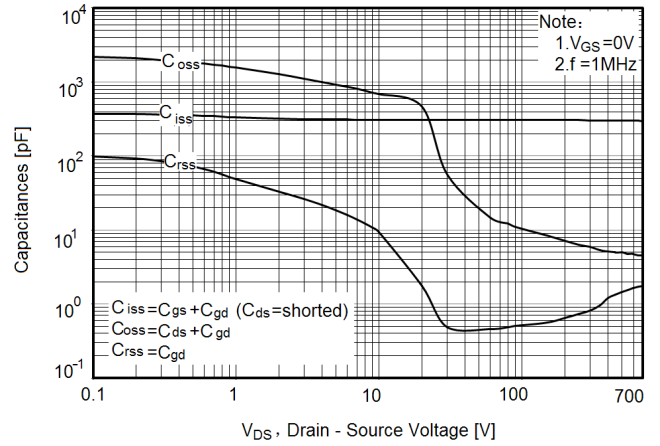


Figure11. Transient Thermal Impedance

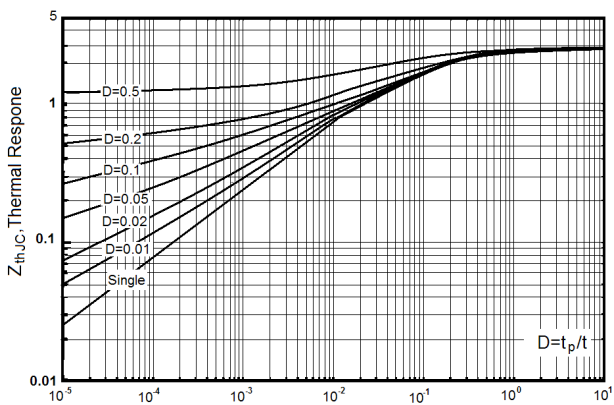


Figure12. Safe operating area

