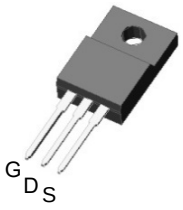
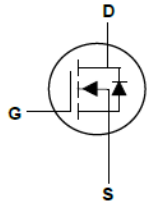
# N-Channel Enhancement Mode MOSFET

## Features

- Fast switching speed
- Reliable and Rugged
- ROHS Compliant
- 100% UIS and Rg Tested

## Pin Description

| TO-220F | Symbol |
|---|---|
|   |   |

## Applications

- Power Management in Desktop Computer
- DC/DC Converters

| | | |
|---|---|---|
| $V_{DSS}$ | 650 | V |
| $R_{DS(ON)-Typ}$ | 460 | mΩ |
| $I_D$ | 16 | A |

## Absolute Maximum Ratings($T_J$=25℃, Unless Otherwise Noted)

| Symbol | Parameter | | Rating | Unit |
|---|---|---|---|---|
| $V_{DSS}$ | Drain-Source Voltage | | 650 | V |
| $V_{GSS}$ | Gate-Source Voltage | | ±30 | V |
| $T_J$ | Maximum Junction Temperature | | -55 to 150 | ℃ |
| $T_{STG}$ | Storage Temperature Range | | -55 to 150 | ℃ |
| $E_{AS}$ | Single Pulse Avalanche Energy[3] | | 698 | mJ |
| $I_{DM}$ ① | Pulse Drain Current Tested | | 64 | A |
| $I_D$ | Continuous Drain Current | $T_C$=25°C | 16 | A |
| $P_D$ | Maximum Power Dissipation | $T_C$=25°C | 76 | W |

## Thermal Characteristics

| Symbol | Parameter | Rating | Unit |
|---|---|---|---|
| $R_{\theta JA}$ | Thermal Resistance Junction-Ambient[1] | 62.5 | ℃/W |
| $R_{\theta JC}$ | Thermal Resistance Junction-Case[1] | 1.64 | ℃/W |

Note ①: Max. current is limited by bonding wire.

Note ②: UIS tested and pulse width are limited by maximum junction temperature 150℃.

Note ③: Surface Mounted on 1in$^2$ FR-4 board with 1oz.

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## Electrical Characteristics ($T_J$=25℃, Unless Otherwise Noted)

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **Static Electrical Characteristics** | | | | | | |
| $BV_{DSS}$ | Drain-Source Breakdown Voltage | $V_{GS}$=0V, $I_D$=250uA | 650 | --- | --- | V |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$=650V, $V_{GS}$=0V | --- | --- | 1 | uA |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}$=$V_{GS}$ , $I_D$=250uA | 3 | --- | 5 | V |
| $I_{GSS}$ | Gate Leakage Current | $V_{GS}$=±30V, $V_{DS}$=0V | --- | --- | ±100 | nA |
| $R_{DS(ON)}$ | Drain-Source On-state Resistance | $V_{GS}$=10V , $I_D$=8A | --- | 460 | 520 | mΩ |
| **Dynamic Characteristics**⑤ | | | | | | |
| $C_{iss}$ | Input Capacitance | $V_{GS}$=0V, $V_{DS}$=25V, Freq.=1MHz | --- | 3325 | --- | pF |
| $C_{oss}$ | Output Capacitance | | --- | 225 | --- | |
| $C_{rss}$ | Reverse Transfer Capacitance | | --- | 22 | --- | |
| $T_{d(on)}$ | Turn-on Delay Time | $V_{DD}$=325V, $R_G$=25Ω, $I_D$=16A | --- | 175 | --- | nS |
| $T_r$ | Turn-on Rise Time | | --- | 121 | --- | |
| $T_{d(off)}$ | Turn-off Delay Time | | --- | 373 | --- | |
| $T_f$ | Turn-off Fall Time | | --- | 64 | --- | |
| $Q_g$ | Total Gate Charge | $V_{DS}$=520V , $V_{GS}$=10V , $I_D$=16A | --- | 50 | --- | nC |
| $Q_{gs}$ | Gate-Source Charge | | --- | 20 | --- | |
| $Q_{gd}$ | Gate-Drain Charge | | --- | 10 | --- | |
| **Source-Drain Characteristics** （$T_J$=25℃） | | | | | | |
| $V_{SD}$ | Diode Forward Voltage② | $V_{GS}$=0V , $I_S$=16A ,$T_J$=25℃ | --- | --- | 1.4 | V |
| $t_{rr}$ | Reverse Recovery Time | $V_{GS}$=0V, $I_S$=16A, di/dt=100A/μs，$T_J$=25℃ | --- | 484 | --- | nS |
| $Q_{rr}$ | Reverse Recovery Charge | | --- | 1.62 | --- | nC |

Note ④： Pulse test (pulse width≤300us, duty cycle≤2%).

Note ⑤：Guaranteed by design, not subject to production testing.

## Typical Characteristics

Fig. 1 Typical Output Characteristics

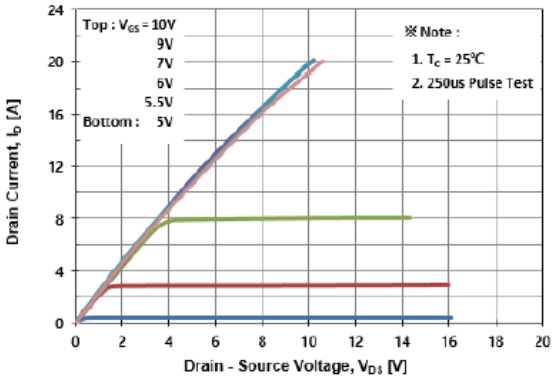



Fig. 2 Typical Output Characteristics

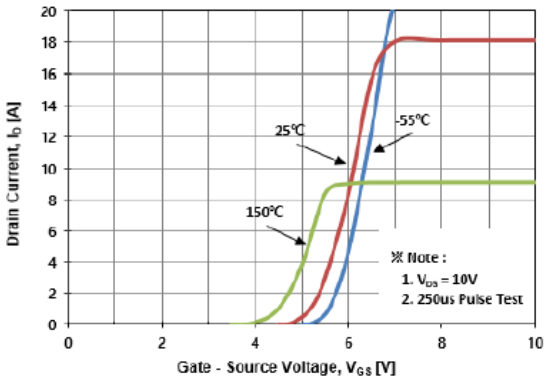



Fig.3 On-Resistance Variation with Drain Current and Gate Voltage

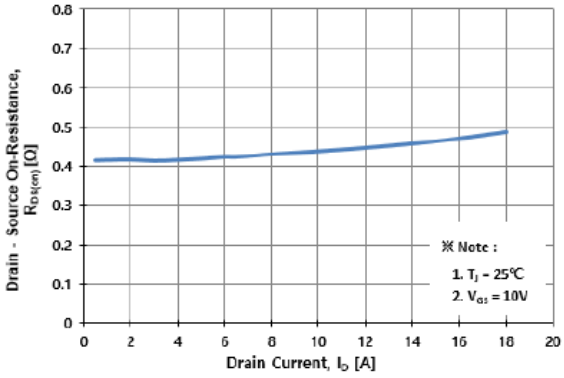



Fig. 4 Body Diode Forward Voltage Variation with Source Current

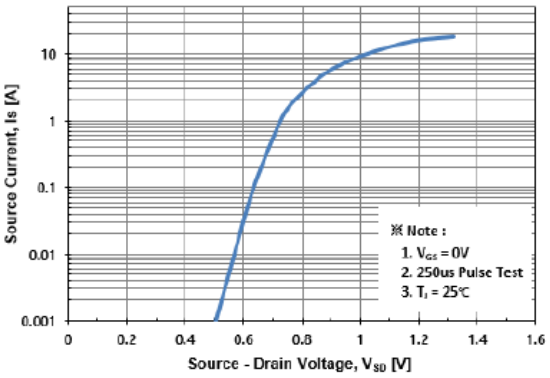



Fig. 5 Typical Capacitance Characteristics

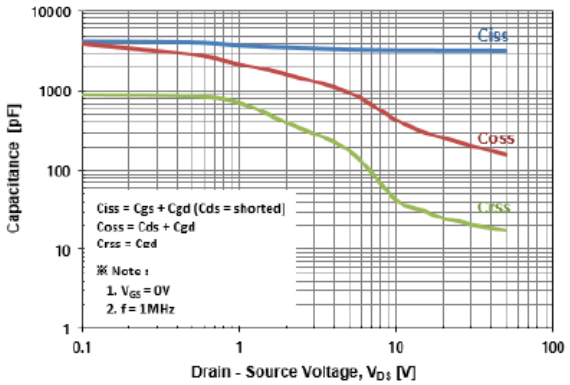



Fig. 6 Typical Total Gate Charge Characteristics

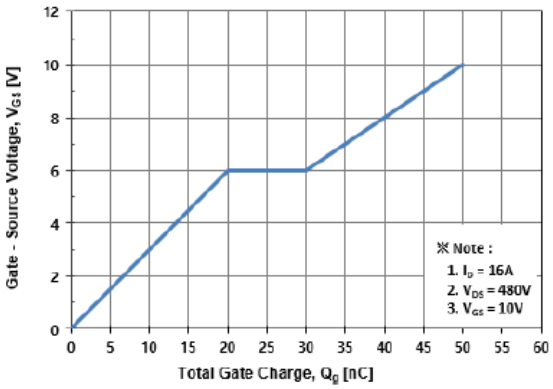


Fig. 7 Breakdown Voltage Variation vs. Temperature

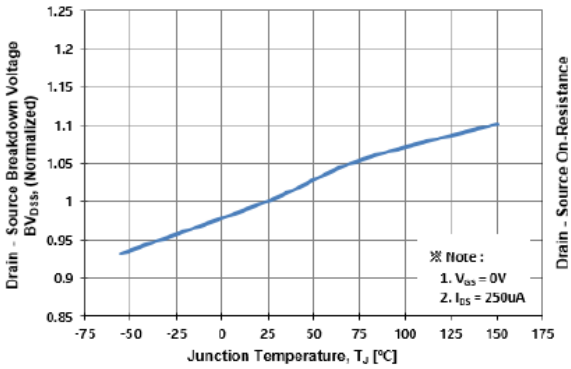



Fig. 8 On-Resistance Variation vs. Temperature

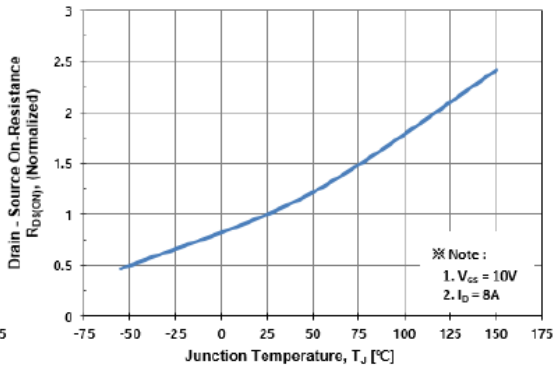



Fig. 9 Maximum Drain Current vs. Case Temperature

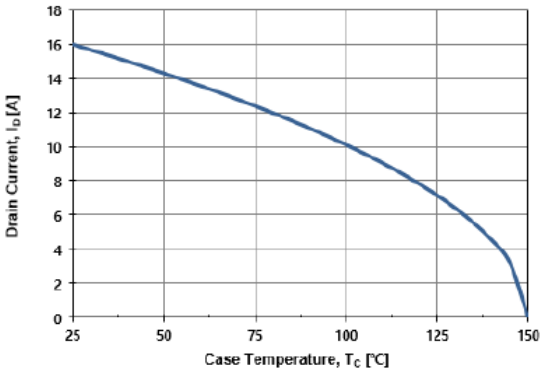



Fig. 10 Maximum Safe Operating Area

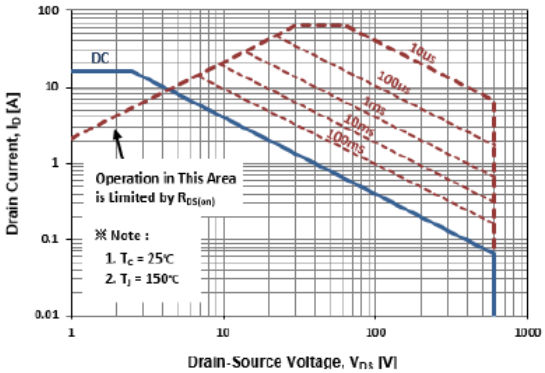
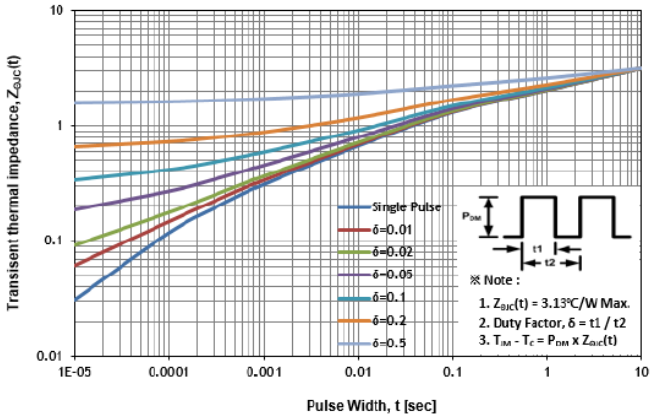



Fig. 11 Transient Thermal Impedance



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## TO-220F Package Outline Data