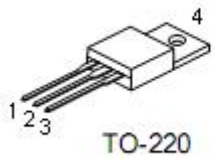
## 1. Features

- $R_{DS(ON)}$=0.08Ω @$V_{GS}$=10V
- RoHS compliant
- Low on resistance
- Low gate charge
- Fast switching

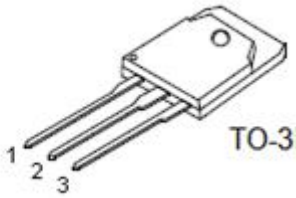
## 2. Applications

- DC-DC converters
- DC-AC converters for UPS
- SMPS and motor controls

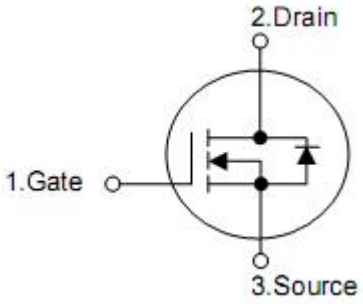
## 3.Symbol



TO-220



TO-3P




| Pin | Function |
|---|---|
| 1 | Gate |
| 2 | Drain |
| 3 | Source |
| 4 | Drain |

## 4. Absolute maximum ratings

($T_C$=25°C,unless otherwise specified)

| Parameter | Symbol | Rating | Units |
|---|---|---|---|
| Drain-source voltage | $V_{DSS}$ | 200 | V |
| Continuous drain current | $I_D$ | 40 | A |
| Continuous drain current $T_C$=100 ºC | | 19.2 | A |
| Pulsed drain current, $V_{GS}$@10V (note*1) | $I_{DM}$ | 120 | A |
| Power dissipation | $P_D$ | 175 | W |
| Derating factor above 25ºC | | 1.43 | W/ºC |
| Gate-source voltage | $V_{GS}$ | ±30 | V |
| Single pulse avalanche energy (note*2) | $E_{AS}$ | 800 | mJ |
| Avalanche current (note*1) | $I_{AR}$ | 32 | A |
| Repetitive avalanche energy (note*1) | $E_{AR}$ | 17.5 | mJ |
| Peak diode recovery dv/dt (note*3) | dv/dt | 4.5 | V/ns |
| Operating junction and storage temperature range | $T_J$ ,$T_{STG}$ | -55 to150 | ºC |
| Maximum temperature for soldering 1/8″ from case for 5 seconds | $T_L$ | 300 | ºC |

## 5. Thermal characteristics

| Parameter | Symbol | TO-220 | TO-3P | Unit |
|---|---|---|---|---|
| Junction-case | $R_{\theta JC}$ | 0.49 | 0.6 | ºC/W |
| Case-sink typ | $R_{\theta JS}$ | 0.5 | - | |
| Junction-ambient | $R_{\theta JA}$ | 62.5 | 60 | ºC/W |

## 6. Electrical characteristics

($T_J$=25°C,unless otherwise specified)

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| Drain-source breakdown voltage | $BV_{DSS}$ | $V_{GS}$=0V,$I_D$=250μA | 200 | - | - | V |
| Breakdown voltage temperature coefficient Figure 11 | $\triangle BV_{DSS}/\triangle T_J$ | Reference 25℃ $I_D$=250uA | - | 0.2 | - | V/ºC |
| Drain-source leakage current | $I_{DSS}$ | $V_{DS}$=200V, $V_{GS}$=0V | - | - | 1 | μA |
| | | $V_{DS}$=160V, $T_J$=125°C | - | - | 10 | |
| Gate-source forward leakage | $I_{GSS}$ | $V_{GS}$=30V | - | - | 100 | nA |
| Gate-source reverse leakage | | $V_{GS}$=-30V | - | - | -100 | |
| Drain-source on-resistance Figure 9 and 10 | $R_{DS(on)}$ | $V_{GS}$=10V,$I_D$=16A | - | 0.08 | 0.1 | Ω |
| Gate threshold voltage, Figure 12 | $V_{GS(TH)}$ | $V_{DS}$= $V_{GS}$, $I_D$=250uA | 2 | - | 4 | V |
| Forward transconductance | gfs | $V_{DS}$=40V, $I_D$=16A (note*4) | - | 22 | - | S |
| Input capacitance | $C_{iss}$ | $V_{DS}$=25V,$V_{GS}$=0V f=1MHz Figure 14 | - | 1560 | - | pF |
| Output capacitance | $C_{oss}$ | | - | 370 | - | |
| Reverse transfer capacitance | $C_{rss}$ | | - | 150 | - | |
| Turn-on delay time | $t_{d(on)}$ | $V_{DD}$=100V, $I_D$=32A, $R_G$=25Ω,$V_{GS}$=10V | - | 26 | - | ns |
| Rise time | $t_r$ | | - | 32 | - | |
| Turn-off delay time | $t_{d(off)}$ | | - | 141 | - | |
| Fall time | $t_f$ | | - | 83 | - | |
| Total gate charge | $Q_g$ | $V_{DS}$=160V, $I_D$=32A, $V_{GS}$=10V | - | 50 | - | nC |
| Gate-source charge | $Q_{gs}$ | | - | 12 | - | |
| Gate-drain (“Miller”)charge | $Q_{gd}$ | | - | 22 | - | |
| Continuous source current（body diode） | $I_S$ | Integral pn-diode in MOSFET | - | - | 40 | A |
| Maximum pulsed current（body diode） | $I_{SM}$ | | - | - | 128 | |
| Diode forward voltage | $V_{SD}$ | $I_S$=32A, $V_{GS}$=0V | - | - | 1.4 | V |
| Reverse recovery time | $t_{rr}$ | $I_S$=32A, $V_{GS}$=0V dI/dt=100A/μs | - | 215 | - | ns |
| Reverse recovery charge | $Q_{rr}$ | | - | 1.8 | - | uC |

Note:*1. $I_{AS}$=32A, $V_{DD}$=50V, $R_G$=25Ω, $T_J$=25°C

*2. Repetitive rating; pulse width limited by maximum junction temperature.

*3. $I_{SD}$≤ 40A di/dt ≤ 200A/μs, $V_{DD}$ ≤ $BV_{DSS}$, $T_J$=175°C.

*4. Pulse width ≤ 300μs, duty cycle ≤ 2%.

*5. Essentianlly independent of operating temperature.

## 7. Typical operating characteristics

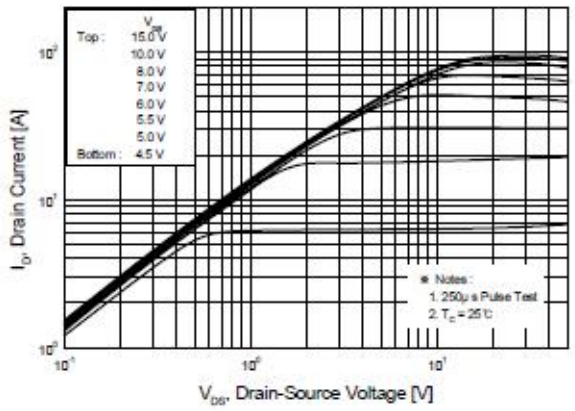



Figure 1. On-Region Characteristics

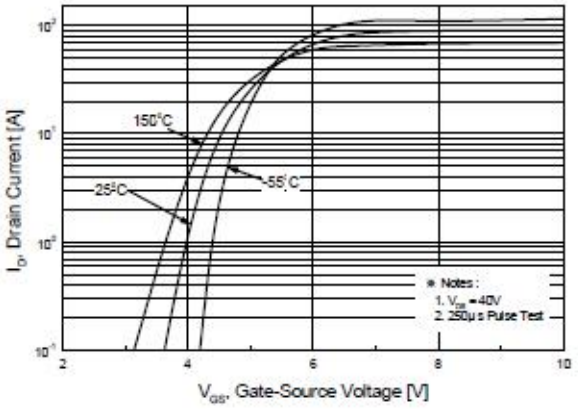



Figure 2. Transfer Characteristics

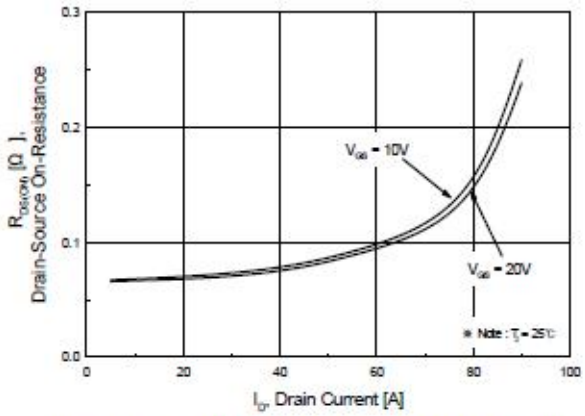



Figure 3. On-Resistance Variation vs Drain Current and Gate Voltage

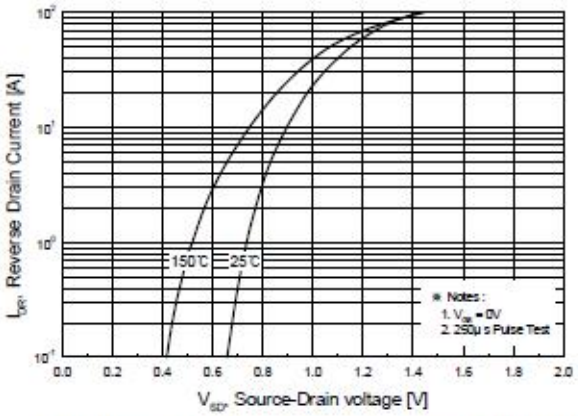



Figure 4. Body Diody Forward Voltage Variation with Source Current and Temperature

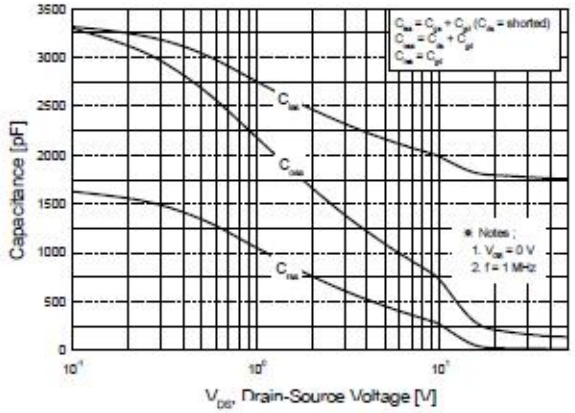



Figure 5. Capacitance Characteristics

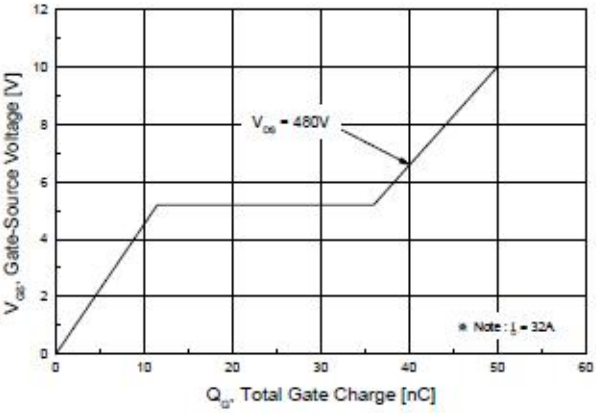



Figure 6. Gate Charge Characteristics

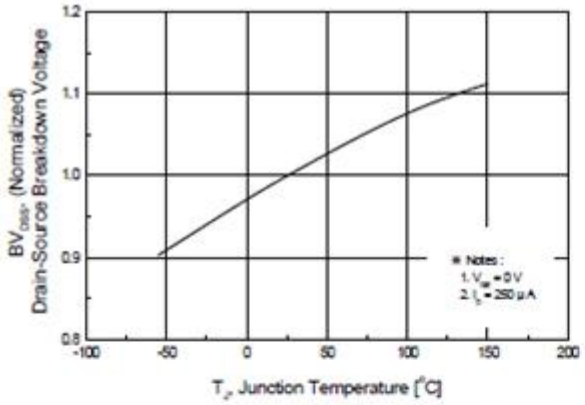



Figure 7. Breakdown Voltage Variation vs Temperature

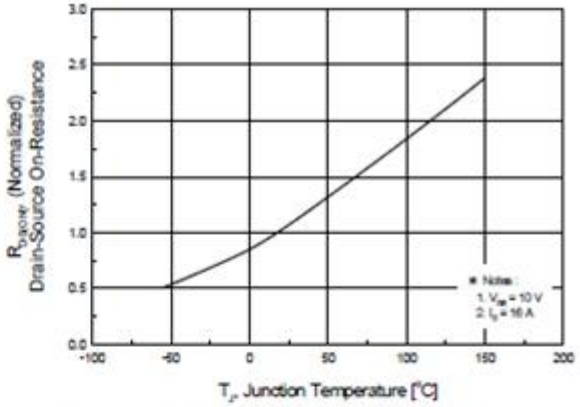



Figure 8. On-Resistance Variation vs Temperature

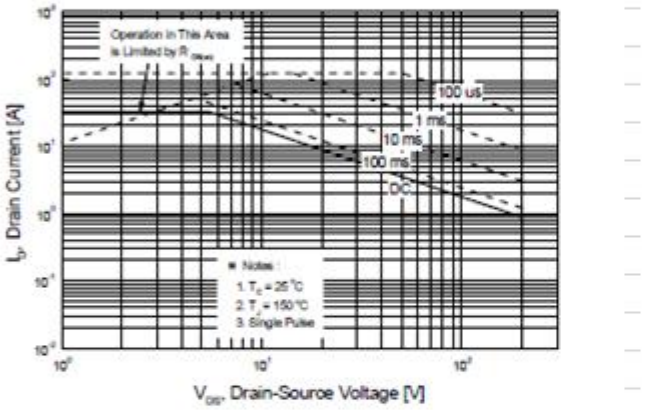



Figure 9. Maximum Safe Operating Area

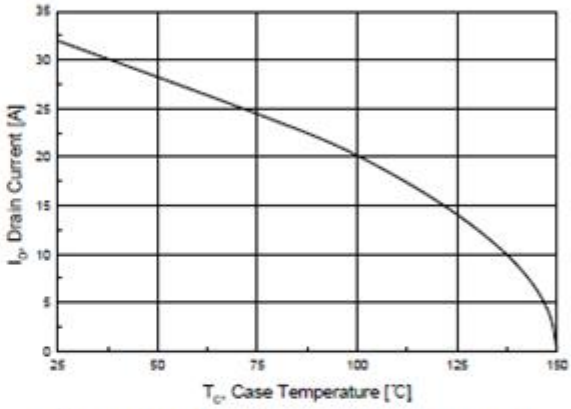



Figure 10. Maximum Drain Current vs Case Temperature

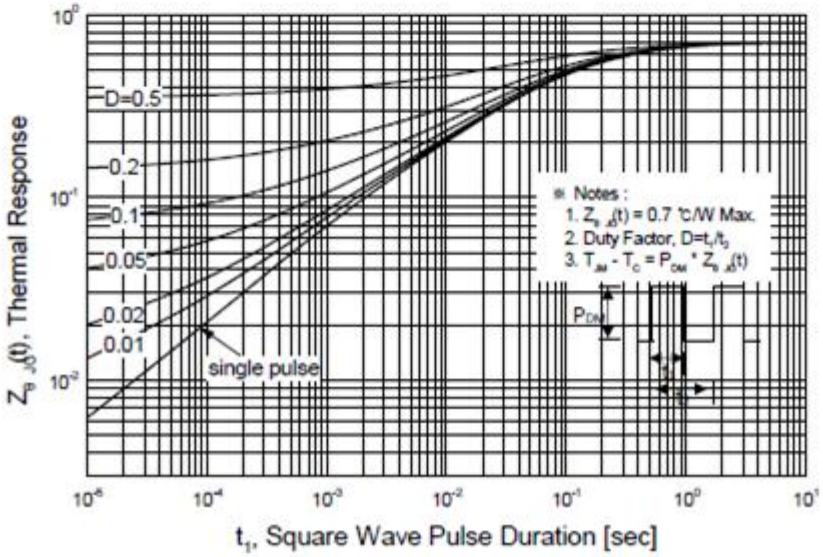



Figure 11. Transient Thermal Response Curve