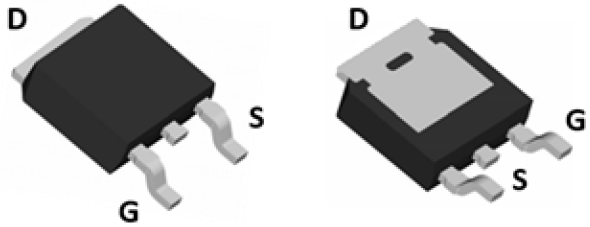
# N-Channel Enhancement Mode Field Effect Transistor

## Product Summary

- $V_{DS}$ 100V
- $I_D$ 50A
- $R_{DS(ON)}$( at $V_{GS}$=10V) ＜17 mohm
- $R_{DS(ON)}$( at $V_{GS}$=4.5V) ＜21.5 mohm
- 100% UIS Tested
- 100% ▽VDS Tested



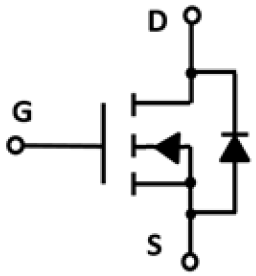

## General Description

- Low $R_{DS(on)}$ & FOM
- Extremely low switching loss
- Excellent stability and uniformity
- Fast switching and soft recovery

## Applications

- Power switching application
- Hard switched and high frequency circuits
- Uninterruptible power supply

TO-252




## ■ Absolute Maximum Ratings ($T_A$=25℃unless otherwise noted)

| Parameter | | Symbol | Limit | Unit |
|---|---|---|---|---|
| Drain-source Voltage | | $V_{DS}$ | 100 | V |
| Gate-source Voltage | | $V_{GS}$ | ±20 | V |
| Drain Current | $T_C$=25℃ | $I_D$ | 50 | A |
| | $T_C$=100℃ | | 28.5 | |
| Pulsed Drain Current [A] | | $I_{DM}$ | 180 | A |
| Avalanche energy [B] | | EAS | 81 | mJ |
| Total Power Dissipation [C] | Tc=25℃ | $P_D$ | 72 | W |
| | Tc=100℃ | | 28.8 | |
| Junction and Storage Temperature Range | | $T_J$ ,$T_{STG}$ | -55～+150 | ℃ |

## ■Thermal resistance

| Parameter | | Symbol | Typ | Max | Units |
|---|---|---|---|---|---|
| Thermal Resistance Junction-to-Ambient [D] | t≤10S | $R_{\theta JA}$ | 15 | 20 | ℃/W |
| Thermal Resistance Junction-to-Ambient [D] | Steady-State | | 40 | 50 | |
| Thermal Resistance Junction-to-Case | Steady-State | $R_{\theta JC}$ | 1.35 | 1.7 | |

## ■ Electrical Characteristics ($T_j$=25℃ unless otherwise noted)

| Parameter | Symbol | Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| **Static Parameter** | | | | | | |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | $V_{GS}$= 0V, $I_D$=250μA | 100 | | | V |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$=100,$V_{GS}$=0V | | | 1 | μA |
| Gate-Body Leakage Current | $I_{GSS}$ | $V_{GS}$= ±20V, $V_{DS}$=0V | | | ±100 | nA |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$= $V_{GS}$, $I_D$=250μA | 1 | 1.8 | 3 | V |
| Static Drain-Source On-Resistance | $R_{DS(ON)}$ | $V_{GS}$= 10V, $I_D$=20A | | 14 | 17 | mΩ |
| | | $V_{GS}$= 4.5V, $I_D$=20A | | 17 | 21.5 | mΩ |
| Diode Forward Voltage | $V_{SD}$ | $I_S$=20A,$V_{GS}$=0V | | | 1.3 | V |
| Maximum Body-Diode Continuous Current | $I_S$ | | | | 45 | A |
| Gate resistance | $R_G$ | f= 1 MHz, Open drain | | 1 | | Ω |
| **Dynamic Parameters** | | | | | | |
| Input Capacitance | $C_{iss}$ | $V_{DS}$=50V,$V_{GS}$=0V,f=1MHZ | | 1135 | | pF |
| Output Capacitance | $C_{oss}$ | | | 399 | | |
| Reverse Transfer Capacitance | $C_{rss}$ | | | 18 | | |
| **Switching Parameters** | | | | | | |
| Total Gate Charge | $Q_g$ | $V_{GS}$=10V,$V_{DS}$=50V,$I_D$=25A | | 16 | | nC |
| Gate-Source Charge | $Q_{gs}$ | | | 5.6 | | |
| Gate-Drain Charge | $Q_{gd}$ | | | 2.4 | | |
| Reverse Recovery Chrage | $Q_{rr}$ | $I_F$=20A, di/dt=100A/us | | 42 | | |
| Reverse Recovery Time | $t_{rr}$ | | | 39.8 | | ns |
| Turn-on Delay Time | $t_{D(on)}$ | $V_{GS}$=10V, $V_{DD}$=50V,$I_D$=25A $R_{GEN}$=2.2Ω | | 39.2 | | |
| Turn-on Rise Time | $t_r$ | | | 11 | | |
| Turn-off Delay Time | $t_{D(off)}$ | | | 53.2 | | |
| Turn-off fall Time | $t_f$ | | | 15.8 | | |

A. Repetitive rating; pulse width limited by max. junction temperature.
B. $V_{DD}$=50V, $V_{GS}$=10V, L=5mH, $I_{AS}$=5.7A.
C. Pd is based on max. junction temperature, using junction-case thermal resistance.
D. The value of RqJA is measured with the device mounted on 1in2 FR-4 board with 2oz. Copper, in a still air environment with TA =25°C. The Power dissipation PDSM is based on R qJA t≤ 10s and the maximum allowed junction temperature of 150°C. The value in any given application depends on the user's specific board design.

## ■ Typical Performance Characteristics

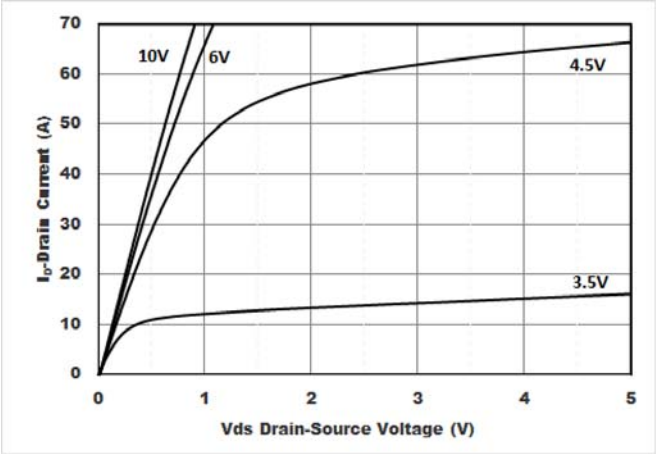



Figure1. Output Characteristics

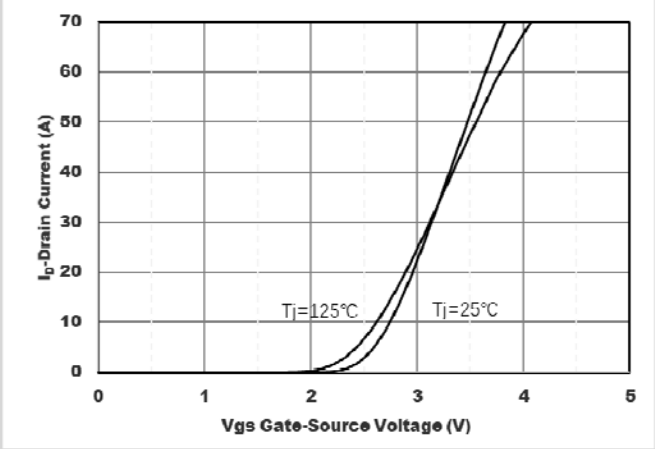



Figure2. Transfer Characteristics

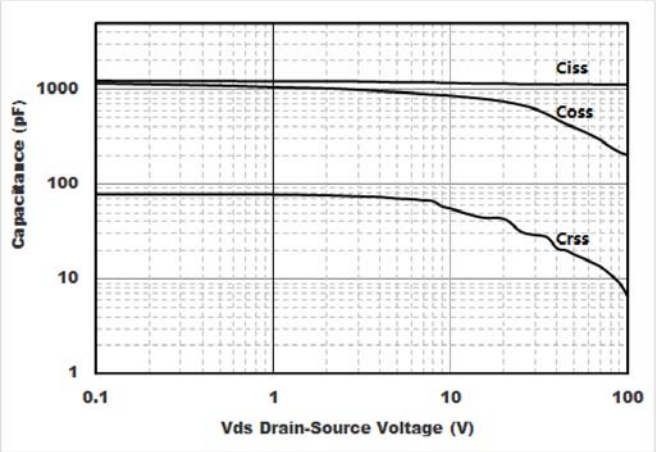



Figure3. Capacitance Characteristics

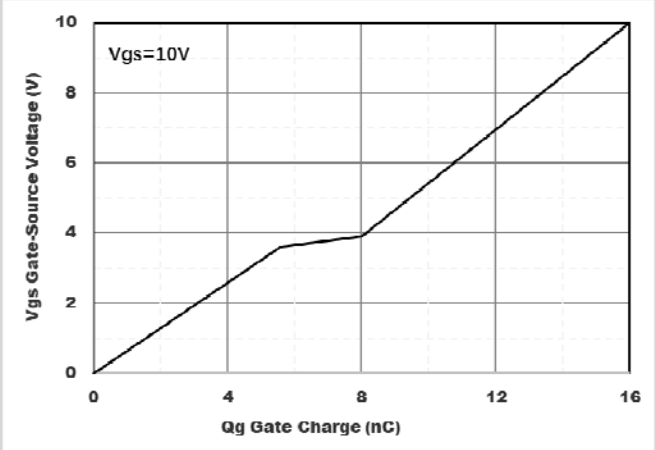



Figure4. Gate Charge

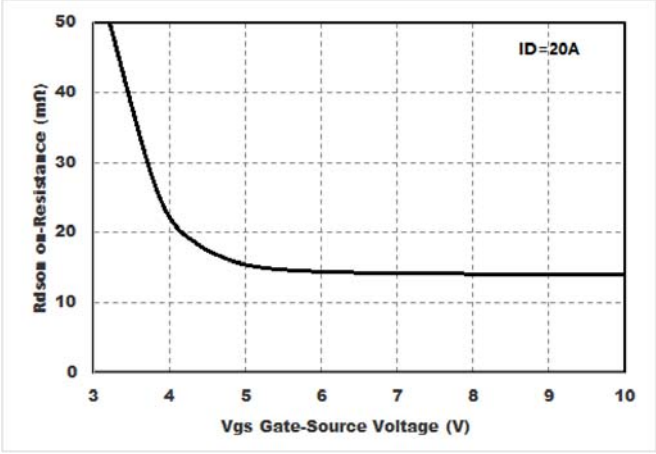



Figure5. : On-Resistance vs. Drain Current and Gate Voltage

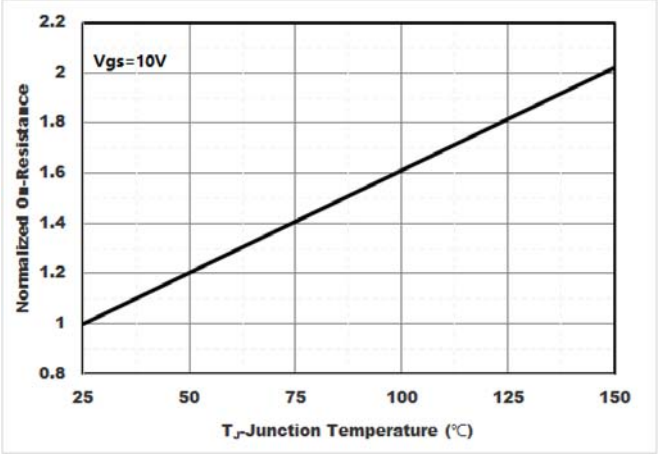



Figure6.Normalized On-Resistance

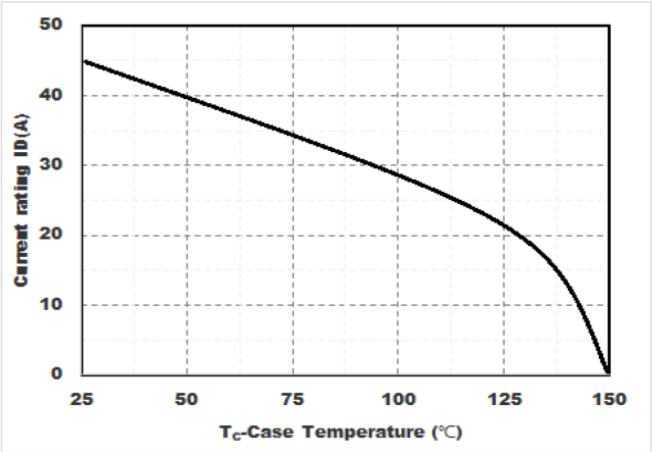



Figure7. Drain current

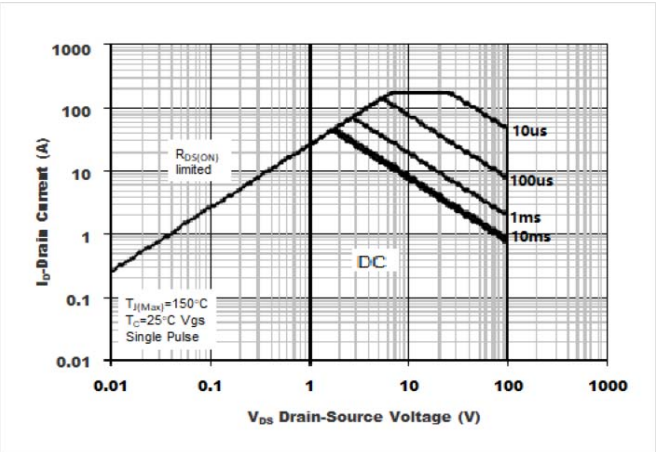



Figure8.Safe Operation Area

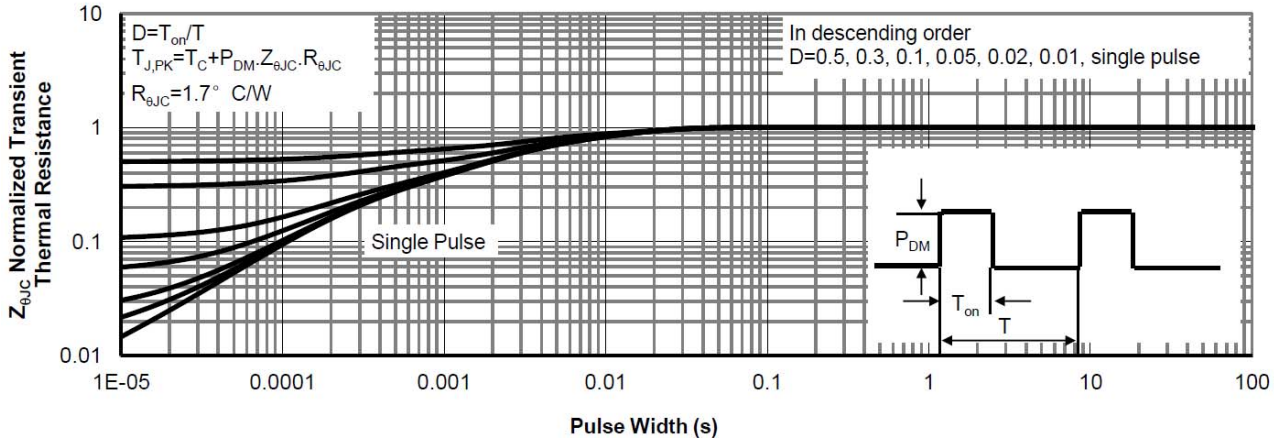
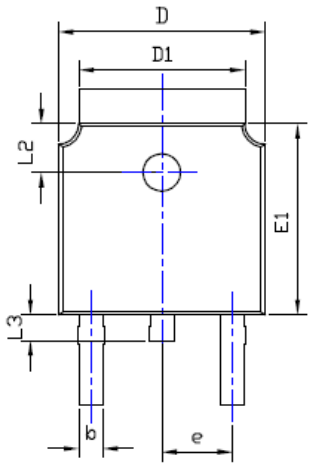
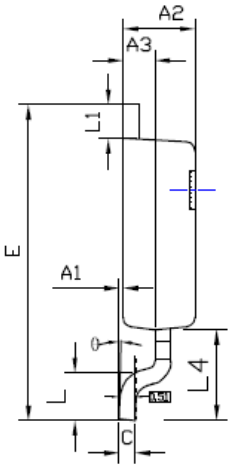



Figure9.Normalized Maximum Transient thermal impedance

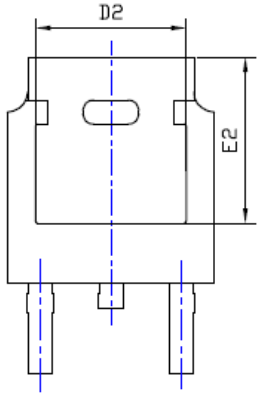
## ■ TO-252 Package information



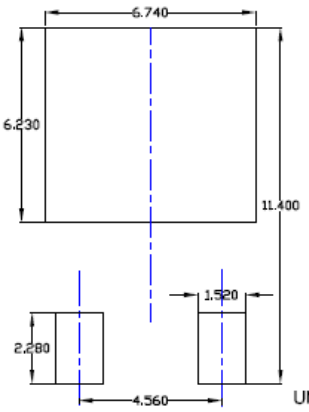

TOP VIEW




SIDE VIEW




BOTTOM VIEW




UNIT: mm

SUGGESTED SOLDER PAD LAYOUT

| DIMENSIONS | | | | | | |
|---|---|---|---|---|---|---|
| SYMBOL | INCHES | | | Millimeter | | |
| | MIN. | NOM. | MAX. | MIN. | NOM. | MAX. |
| A1 | 0.000 | --- | 0.008 | 0.000 | --- | 0.200 |
| A2 | 0.087 | 0.091 | 0.094 | 2.200 | 2.300 | 2.400 |
| A3 | 0.035 | 0.039 | 0.043 | 0.900 | 1.000 | 1.100 |
| b | 0.026 | 0.030 | 0.034 | 0.660 | 0.760 | 0.860 |
| c | 0.018 | 0.020 | 0.023 | 0.460 | 0.520 | 0.580 |
| D | 0.256 | 0.260 | 0.264 | 6.500 | 6.600 | 6.700 |
| D1 | 0.203 | 0.209 | 0.215 | 5.150 | 5.300 | 5.450 |
| D2 | 0.181 | 0.189 | 0.195 | 4.600 | 4.800 | 4.950 |
| E | 0.390 | 0.398 | 0.406 | 9.900 | 10.100 | 10.300 |
| E1 | 0.236 | 0.240 | 0.244 | 6.000 | 6.100 | 6.200 |
| E2 | 0.203 | 0.209 | 0.215 | 5.150 | 5.300 | 5.450 |
| e | 0.090BSC | | | 2.286BSC | | |
| L | 0.049 | 0.059 | 0.069 | 1.250 | 1.500 | 1.750 |
| L1 | 0.035 | --- | 0.050 | 0.900 | --- | 1.270 |
| L2 | 0.055 | --- | 0.075 | 1.400 | --- | 1.900 |
| L3 | 0.240 | 0.310 | 0.039 | 0.600 | 0.800 | 1.000 |
| L4 | 0.114REF | | | 2.900REF | | |
| θ | 0° | --- | 10° | 0° | --- | 10° |