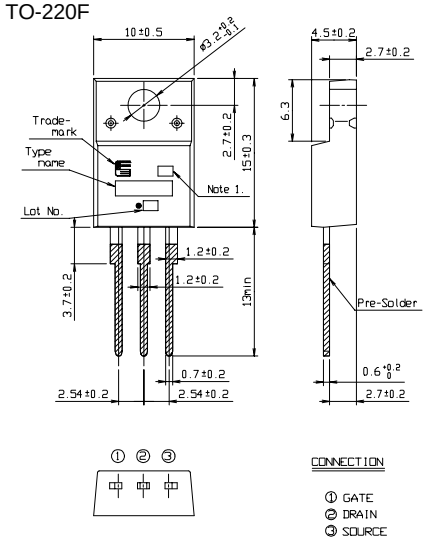
# 2SK3888-01MR

## N-CHANNEL SILICON POWER MOSFET

## ■ Outline Drawings (mm) 200406

TO-220F




## FUJI POWER MOSFET
## Super FAP-G Series

## ■ Features

**High speed switching** **Low on-resistance**
**No secondary breakdown** **Low driving power**
**Avalanche-proof**

## ■ Applications

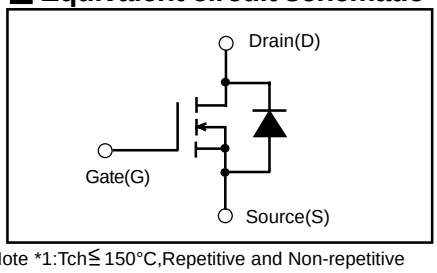
**Switching regulators** **DC-DC converters**
**UPS (Uninterruptible Power Supply)**

## ■ Maximum ratings and characteristic

● **Absolute maximum ratings**
**(Tc=25°C unless otherwise specified)**

| Item | Symbol | Ratings | Unit | Remarks |
|---|---|---|---|---|
| Drain-source voltage | $V_{DS}$ | 600 | V | |
| | $V_{DSX}$ | 600 | V | $V_{GS}$=-30V |
| Continuous Drain Current | $I_D$ | 9 | A | |
| Pulsed Drain Current | $I_{D(puls)}$ | ±36 | A | |
| Gate-Source Voltage | $V_{GS}$ | ±30 | V | |
| Maximum Avalanche current | $I_{AR}$ | 9 | A | Note *1 |
| Non-Repetitive Maximum Avalanche Energy | $E_{AS}$ | 462.3 | mJ | Note *2 |
| Repetitive Maximum Avalanche Energy | $E_{AR}$ | 6.0 | mJ | Note *3 |
| Maximum Drain-Source dV/dt | $dV_{DS}/dt$ | 20 | kV/µs | $V_{DS}$≦600V |
| Peak Diode Recovery dV/dt | dV/dt | 5 | kV/µs | Note *4 |
| Max. Power Dissipation | $P_D$ | 60 | W | Tc=25°C |
| | | 2.16 | | Ta=25°C |
| Operating and Storage Temperature range | $T_{ch}$ | +150 | ℃ | |
| | $T_{stg}$ | -55 to +150 | ℃ | |
| Isolation Voltage | $V_{ISO}$ | 2 | kVrms | t=60sec f=60Hz |

## ■ Equivalent circuit schematic




Note *1:Tch≦150°C,Repetitive and Non-repetitive
Note *2:StartingTch=25°C,$I_{AS}$=3.6A,L=65.4mH,
$V_{CC}$=60V,$R_G$=50Ω
$E_{AS}$ limited by maximum channel temperature and Avalanche current.
See to the 'Avalanche Energy' graph
Note *3:Repetitive rating:Pulse width limited by maximum channel temperature.
See to the 'Transient Thermal impedance' graph.
Note *4:$I_F$≦ -$I_D$, -di/dt=50A/µs,$V_{CC}$≦ $BV_{DSS}$,Tch≦150°C

● **Electrical characteristics ($T_C$ =25°C unless otherwise specified)**

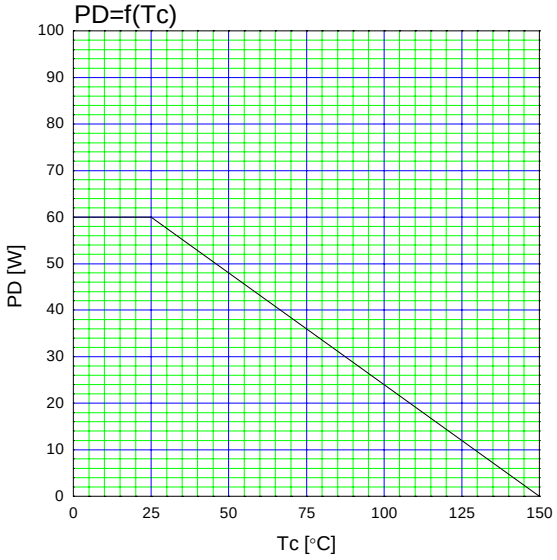
| Item | Symbol | Test Conditions | | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|---|
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | $I_D$= 250µA $V_{GS}$=0V | | 600 | | | V |
| Gate Threshold Voltage | $V_{GS(th)}$ | $I_D$= 250µA $V_{DS}$=$V_{GS}$ | | 3.0 | | 5.0 | V |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$=600V $V_{GS}$=0V | Tch=25°C | | | 25 | µA |
| | | $V_{DS}$=480V $V_{GS}$=0V | Tch=125°C | | | 250 | |
| Gate-Source Leakage Current | $I_{GSS}$ | $V_{GS}$=±30V $V_{DS}$=0V | | | | 100 | nA |
| Drain-Source On-State Resistance | $R_{DS(on)}$ | $I_D$=4.5A $V_{GS}$=10V | | | 0.82 | 1.00 | Ω |
| Forward Transconductance | $g_{fs}$ | $I_D$=4.5A $V_{DS}$=25V | | 4.5 | 9.0 | | S |
| Input Capacitance | $C_{iss}$ | $V_{DS}$=25V | | | 950 | 1425 | pF |
| Output Capacitance | $C_{oss}$ | $V_{GS}$=0V | | | 130 | 195 | |
| Reverse Transfer Capacitance | $C_{rss}$ | f=1MH | | | 6.0 | 9.0 | |
| Turn-On Time $t_{on}$ | $t_{d(on)}$ | $V_{CC}$=300V $I_D$=4.5A | | | 16 | 24 | ns |
| | $t_r$ | $V_{GS}$=10V | | | 6.0 | 9.0 | |
| Turn-Off Time $t_{off}$ | $t_{d(off)}$ | $R_{GS}$=10 Ω | | | 33 | 50 | |
| | $t_f$ | | | | 5.5 | 8.3 | |
| Total Gate Charge | $Q_G$ | $V_{CC}$=300V | | | 25 | 38 | nC |
| Gate-Source Charge | $Q_{GS}$ | $I_D$=9A | | | 10 | 15 | |
| Gate-Drain Charge | $Q_{GD}$ | $V_{GS}$=10V | | | 8.0 | 12.0 | |
| Diode forward on-voltage | $V_{SD}$ | $I_F$=9A $V_{GS}$=0V Tch=25°C | | | 1.10 | 1.50 | V |
| Reverse recovery time | $t_{rr}$ | $I_F$=9A $V_{GS}$=0V | | | 860 | | ns |
| Reverse recovery charge | $Q_{rr}$ | -di/dt=100A/µs Tch=25°C | | | 7.0 | | µC |

● **Thermal characteristics**

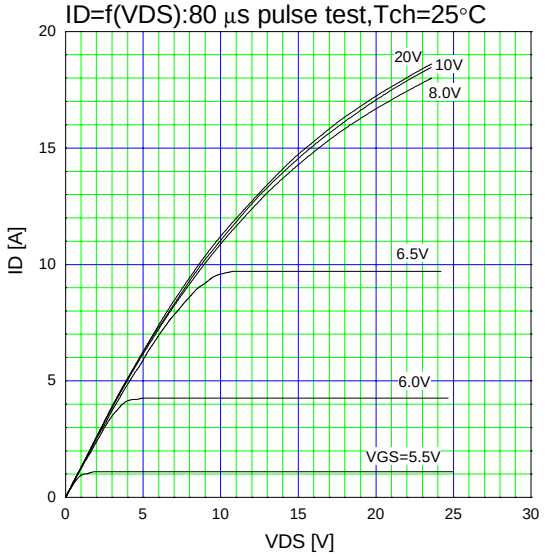
| Item | Symbol | Test Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| Thermal resistance | $R_{th(ch-c)}$ | channel to case | | | 2.083 | °C/W |
| | $R_{th(ch-a)}$ | channel to ambient | | | 58 | °C/W |

## Characteristics

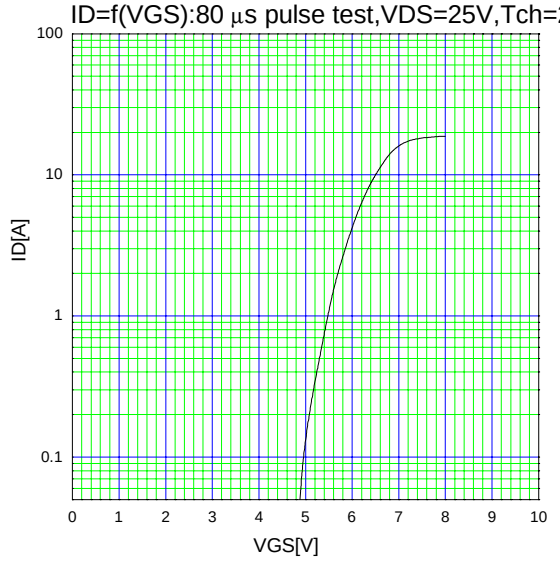
Allowable Power Dissipation
PD=f(Tc)



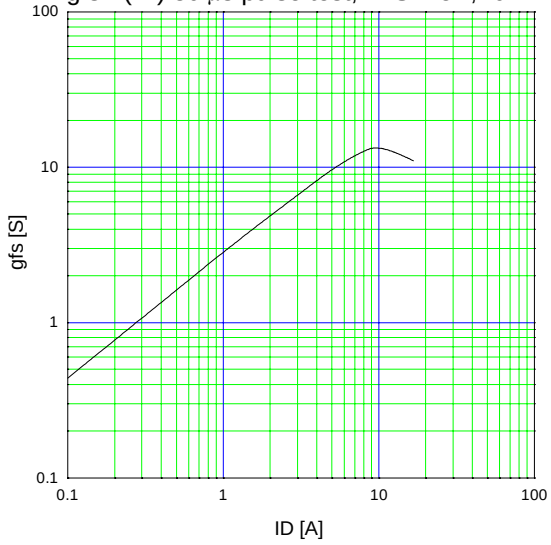

Typical Output Characteristics
ID=f(VDS):80 μs pulse test,Tch=25°C



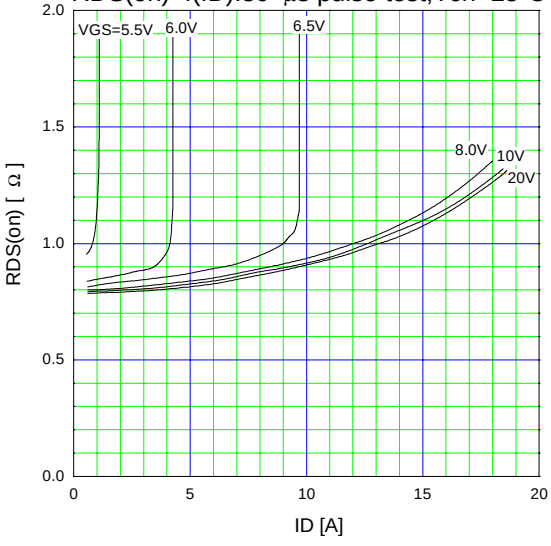

Typical Transfer Characteristic
ID=f(VGS):80 μs pulse test,VDS=25V,Tch=25°C



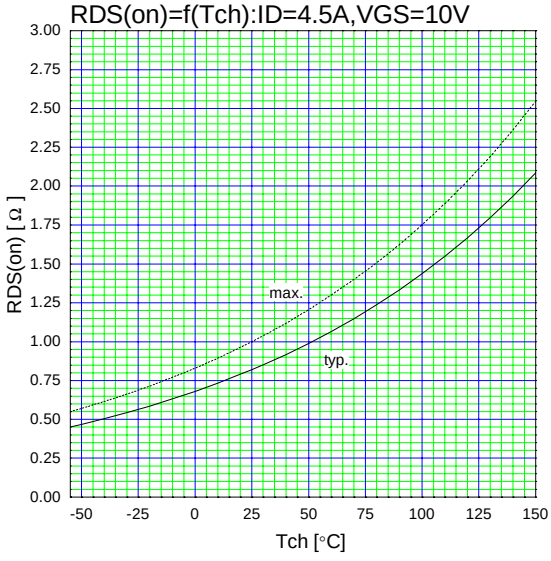

Typical Transconductance
gfs=f(ID):80 μs pulse test,VDS=25V,Tch=25°C



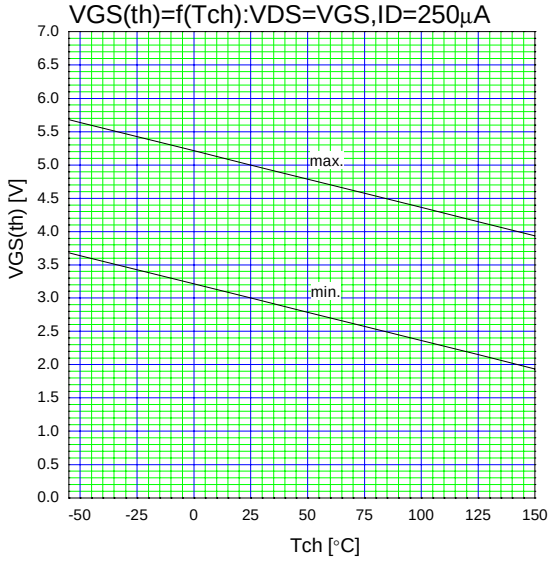

Typical Drain-Source on-state Resistance
RDS(on)=f(ID):80 μs pulse test,Tch=25°C



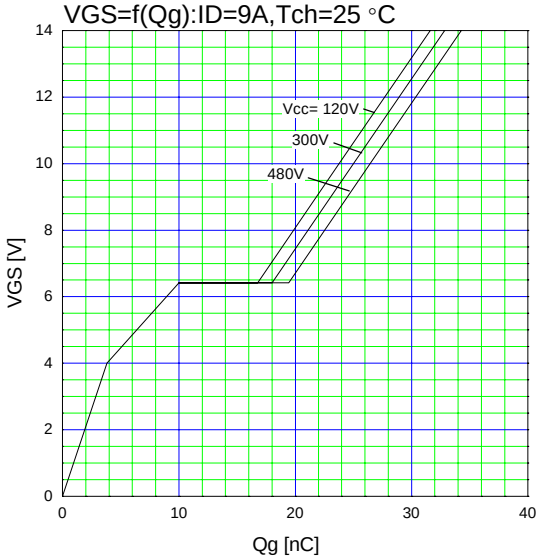

Drain-Source On-state Resistance
RDS(on)=f(Tch):ID=4.5A,VGS=10V



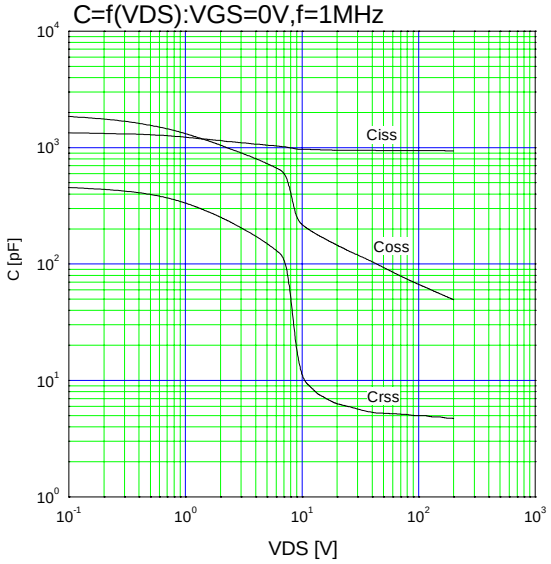
Gate Threshold Voltage vs. Tch
VGS(th)=f(Tch):VDS=VGS,ID=250μA



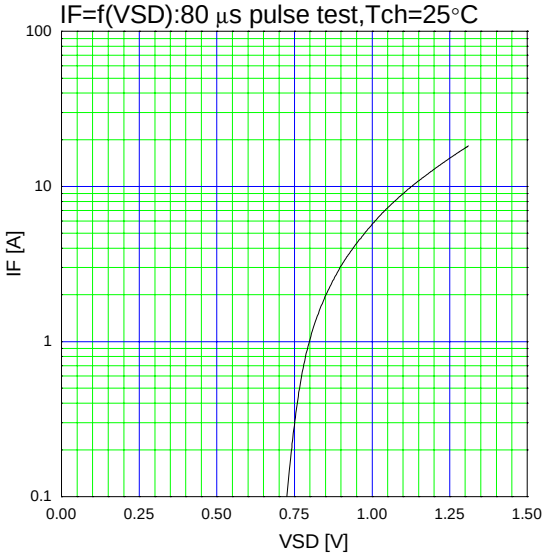

Typical Gate Charge Characteristics
VGS=f(Qg):ID=9A,Tch=25 °C



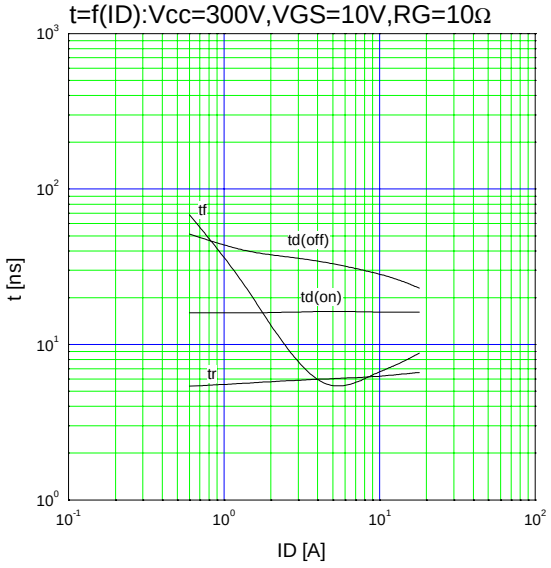

Typical Capacitance
C=f(VDS):VGS=0V,f=1MHz



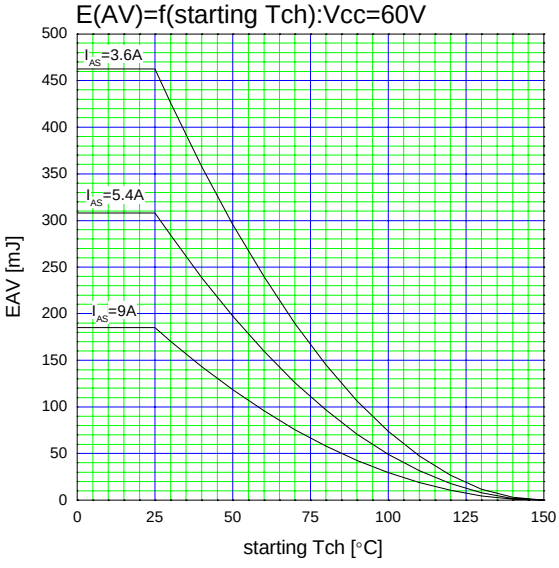

Typical Forward Characteristics of Reverse Diode
IF=f(VSD):80 μs pulse test,Tch=25°C



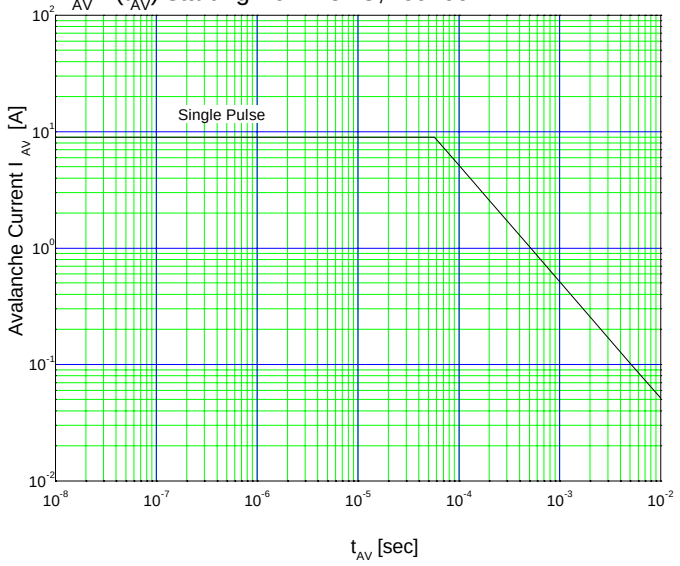

Typical Switching Characteristics vs. ID
t=f(ID):Vcc=300V,VGS=10V,RG=10Ω




Maximum Avalanche Energy vs. starting Tch
E(AV)=f(starting Tch):Vcc=60V



Maximum Avalanche Current Pulsewidth
$I_{AV}$=f($t_{AV}$):starting Tch=25 °C,Vcc=60V




Transient Thermal Impedance
Zth(ch-c)=f(t):D=0