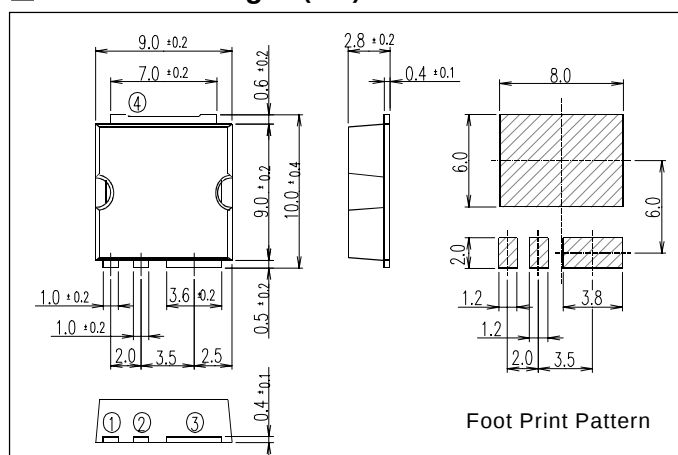


# FUJI POWER MOSFET

## Super FAP-G Series

### N-CHANNEL SILICON POWER MOSFET

#### ■ Outline Drawings (mm)



#### ■ Features

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

#### ■ Applications

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

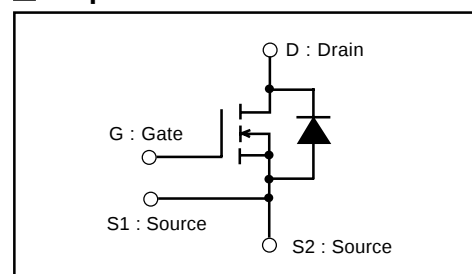
#### ■ Maximum ratings and characteristic

Absolute maximum ratings

● (T<sub>c</sub>=25°C unless otherwise specified)

| Item                                    | Symbol                  | Ratings              | Unit    |   |
|-----------------------------------------|-------------------------|----------------------|---------|---|
| Drain-source voltage                    | V <sub>DS</sub>         | 200                  | V       |   |
|                                         | V <sub>DSX</sub> *5     | 170                  | V       |   |
| Continuous drain current                | I <sub>D</sub>          | T <sub>c</sub> =25°C | ±45     | A |
|                                         |                         | T <sub>a</sub> =25°C | ±4.3 ** | A |
| Pulsed drain current                    | I <sub>D(puls)</sub>    | ±180                 | A       |   |
| Gate-source voltage                     | V <sub>GS</sub>         | ±30                  | V       |   |
| Non-repetitive Avalanche current        | I <sub>AS</sub> *2      | 45                   | A       |   |
| Maximum Avalanche Energy                | E <sub>AS</sub> *1      | 258.9                | mJ      |   |
| Maximum Drain-Source dV/dt              | dV <sub>DS</sub> /dt *4 | 20                   | kV/μs   |   |
| Peak Diode Recovery dV/dt               | dV/dt *3                | 5                    | kV/μs   |   |
| Max. power dissipation                  | P <sub>D</sub>          | T <sub>c</sub> =25°C | 270     | W |
|                                         |                         | T <sub>a</sub> =25°C | 2.4 **  |   |
| Operating and storage temperature range | T <sub>ch</sub>         | +150                 | °C      |   |
|                                         | T <sub>stg</sub>        | -55 to +150          | °C      |   |

#### ■ Equivalent circuit schematic



\*\* Surface mounted on 1000mm<sup>2</sup>, t=1.6mm FR-4 PCB(Drain pad area : 500mm<sup>2</sup>) T<sub>a</sub>=25°C

\*1 L=205μH, V<sub>CC</sub>=48V, T<sub>ch</sub>=25°C, See to Avalanche Energy Graph \*2 T<sub>ch</sub>≤150°C

\*3 I<sub>F</sub>≤-I<sub>D</sub>, -di/dt=50A/μs, V<sub>CC</sub>≤BV<sub>DSS</sub>, T<sub>ch</sub>≤150°C \*4 V<sub>DS</sub>≤200V \*5 V<sub>GS</sub>=-30V

#### ● Electrical characteristics (T<sub>c</sub>=25°C unless otherwise specified)

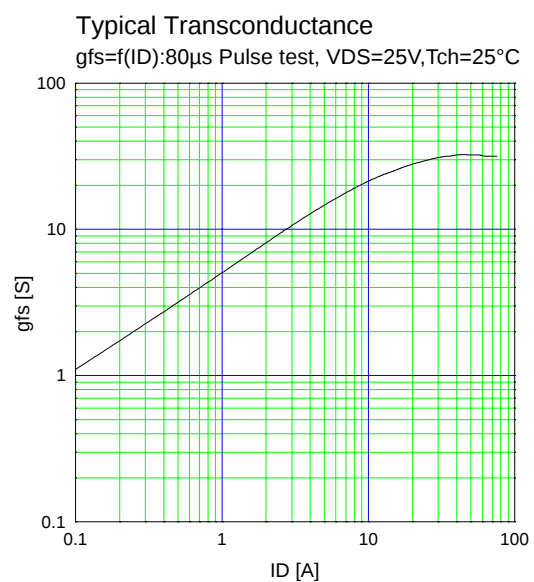
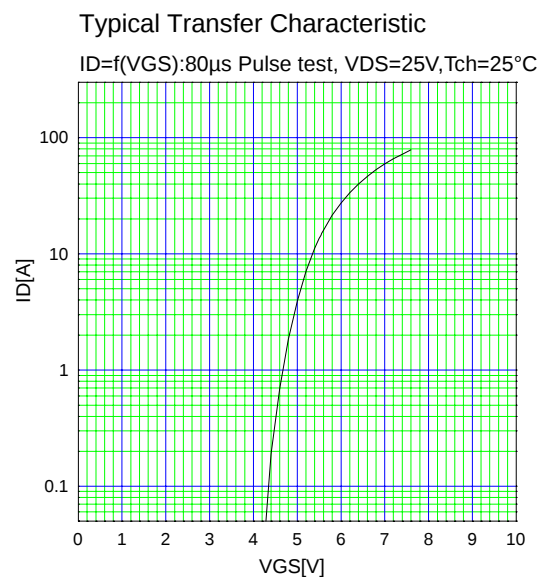
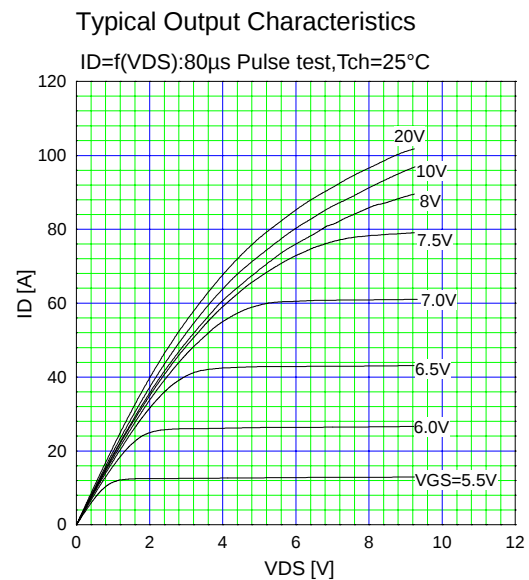
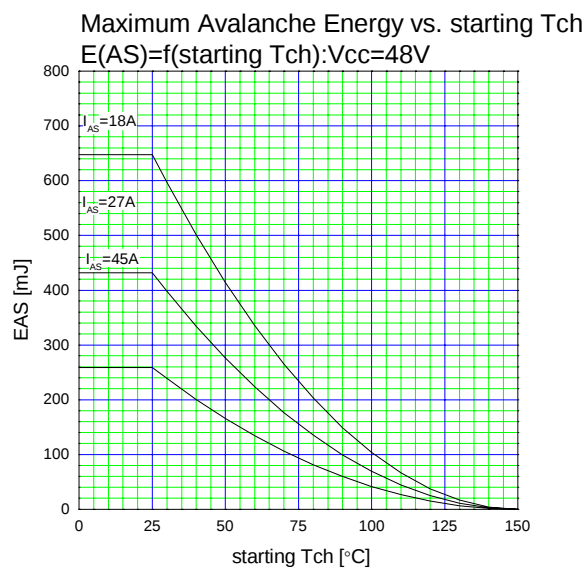
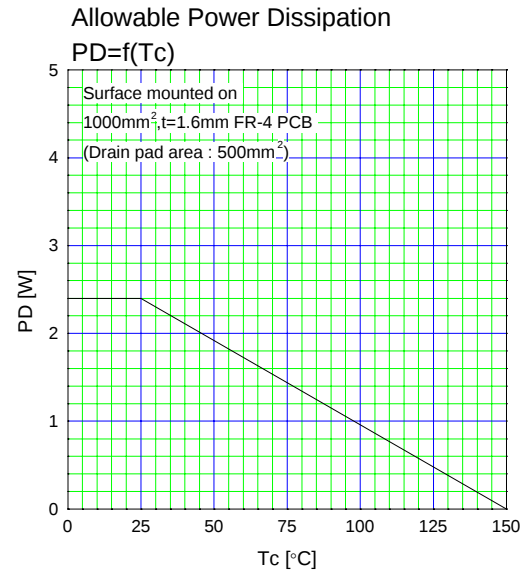
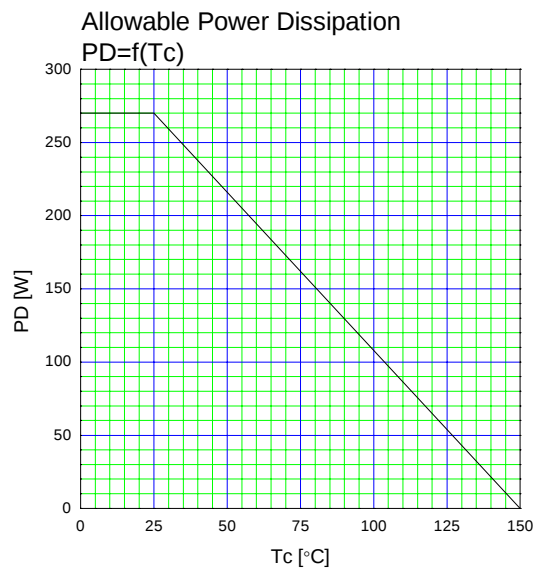
| Item                             | Symbol               | Test Conditions                                               | Min. | Typ. | Max. | Units |
|----------------------------------|----------------------|---------------------------------------------------------------|------|------|------|-------|
| Drain-source breakdown voltage   | V <sub>(BR)DSS</sub> | I <sub>D</sub> =250μA V <sub>GS</sub> =0V                     | 200  |      |      | V     |
| Gate threshold voltage           | V <sub>GS(th)</sub>  | I <sub>D</sub> =250μA V <sub>DS</sub> =V <sub>GS</sub>        | 3.0  |      | 5.0  | V     |
| Zero gate voltage drain current  | I <sub>DSS</sub>     | V <sub>DS</sub> =200V V <sub>GS</sub> =0V                     |      |      | 25   | μA    |
|                                  |                      | V <sub>DS</sub> =160V V <sub>GS</sub> =0V                     |      |      | 250  | μA    |
| Gate-source leakage current      | I <sub>GSS</sub>     | V <sub>GS</sub> =±30V V <sub>DS</sub> =0V                     |      | 10   | 100  | nA    |
| Drain-source on-state resistance | R <sub>DS(on)</sub>  | I <sub>D</sub> =15A V <sub>GS</sub> =10V                      |      | 50   | 66   | mΩ    |
| Forward transconductance         | g <sub>fs</sub>      | I <sub>D</sub> =15A V <sub>DS</sub> =25V                      | 12.5 | 25   |      | S     |
| Input capacitance                | C <sub>iss</sub>     | V <sub>DS</sub> =75V                                          |      | 1960 | 2940 | pF    |
| Output capacitance               | C <sub>oss</sub>     | V <sub>GS</sub> =0V                                           |      | 260  | 390  | pF    |
| Reverse transfer capacitance     | C <sub>rss</sub>     | f=1MHz                                                        |      | 18   | 27   | pF    |
| Turn-on time t <sub>on</sub>     | td(on)               | V <sub>CC</sub> =48V I <sub>D</sub> =15A                      |      | 20   | 30   | ns    |
|                                  | t <sub>r</sub>       | V <sub>GS</sub> =10V                                          |      | 17   | 26   | ns    |
| Turn-off time t <sub>off</sub>   | td(off)              | R <sub>GS</sub> =10 Ω                                         |      | 53   | 80   | ns    |
|                                  | t <sub>f</sub>       |                                                               |      | 19   | 29   | ns    |
| Total Gate Charge                | Q <sub>G</sub>       | V <sub>CC</sub> =100V                                         |      | 51   | 76.5 | nC    |
| Gate-Source Charge               | Q <sub>GS</sub>      | I <sub>D</sub> =30A                                           |      | 15   | 22.5 | nC    |
| Gate-Drain Charge                | Q <sub>GD</sub>      | V <sub>GS</sub> =10V                                          |      | 16   | 24   | nC    |
| Avalanche capability             | I <sub>AV</sub>      | L=205μH T <sub>ch</sub> =25°C                                 | 45   |      |      | A     |
| Diode forward on-voltage         | V <sub>SD</sub>      | I <sub>F</sub> =30A V <sub>GS</sub> =0V T <sub>ch</sub> =25°C |      | 1.10 | 1.65 | V     |
| Reverse recovery time            | t <sub>rr</sub>      | I <sub>F</sub> =30A V <sub>GS</sub> =0V                       |      | 0.19 |      | μs    |
| Reverse recovery charge          | Q <sub>rr</sub>      | -di/dt=100A/μs T <sub>ch</sub> =25°C                          |      | 1.4  |      | μC    |

#### ● Thermal characteristics

| Item               | Symbol                   | Test Conditions    | Min. | Typ. | Max.  | Units |
|--------------------|--------------------------|--------------------|------|------|-------|-------|
| Thermal resistance | R <sub>th(ch-c)</sub>    | channel to case    |      |      | 0.463 | °C/W  |
|                    | R <sub>th(ch-a)</sub>    | channel to ambient |      |      | 87.0  | °C/W  |
|                    | R <sub>th(ch-a)</sub> ** | channel to ambient |      |      | 52.0  | °C/W  |

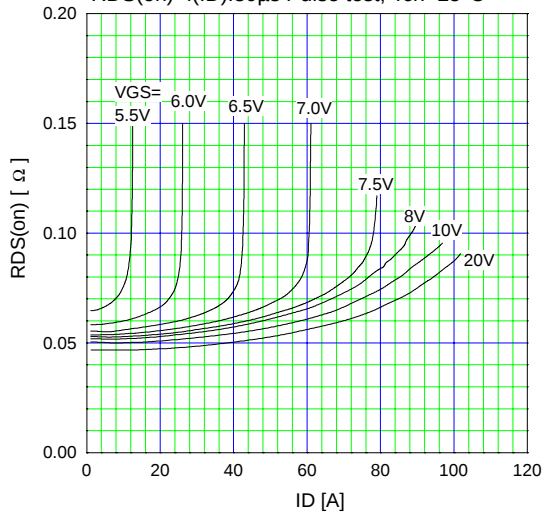
\*\* Surface mounted on 1000mm<sup>2</sup>, t=1.6mm FR-4 PCB(Drain pad area : 500mm<sup>2</sup>)

## Characteristics



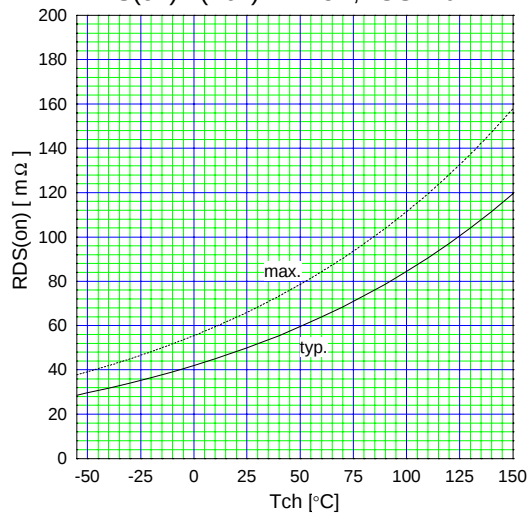
Typical Drain-Source on-state Resistance

$R_{DS(on)} = f(I_D)$ : 80 $\mu$ s Pulse test,  $T_{ch} = 25^\circ\text{C}$



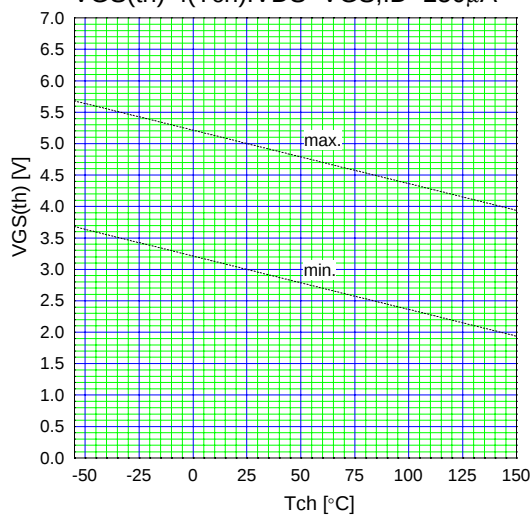
Drain-Source On-state Resistance

$R_{DS(on)} = f(T_{ch})$ :  $I_D = 15\text{A}$ ,  $V_{GS} = 10\text{V}$



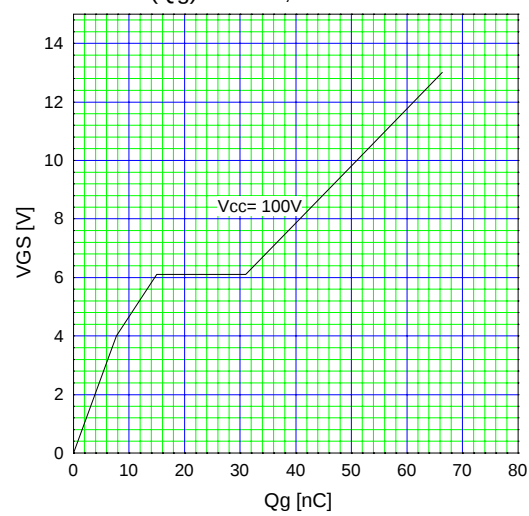
Gate Threshold Voltage vs.  $T_{ch}$

$V_{GS(th)} = f(T_{ch})$ :  $V_{DS} = V_{GS}$ ,  $I_D = 250\mu\text{A}$



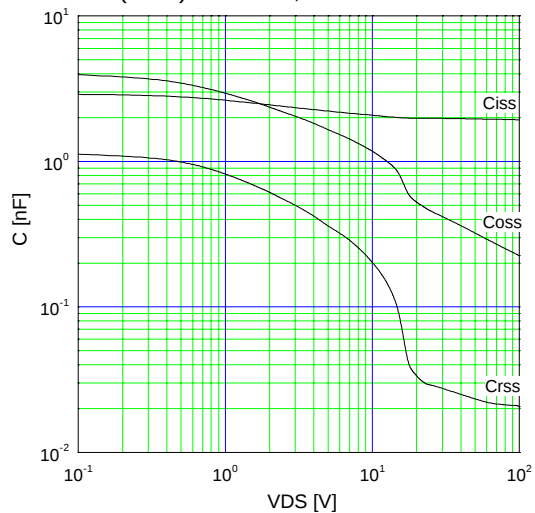
Typical Gate Charge Characteristics

$V_{GS} = f(Q_g)$ :  $I_D = 30\text{A}$ ,  $T_{ch} = 25^\circ\text{C}$



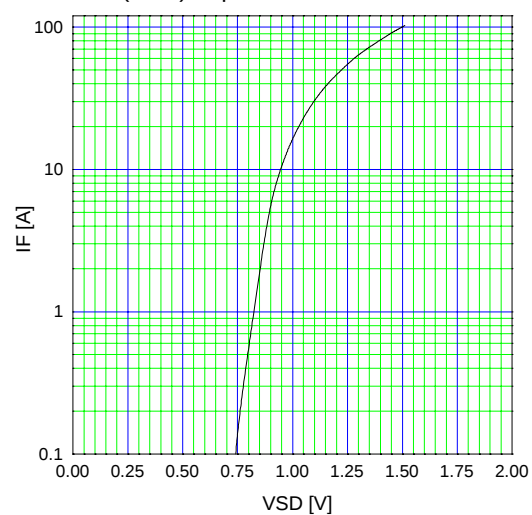
Typical Capacitance

$C = f(V_{DS})$ :  $V_{GS} = 0\text{V}$ ,  $f = 1\text{MHz}$

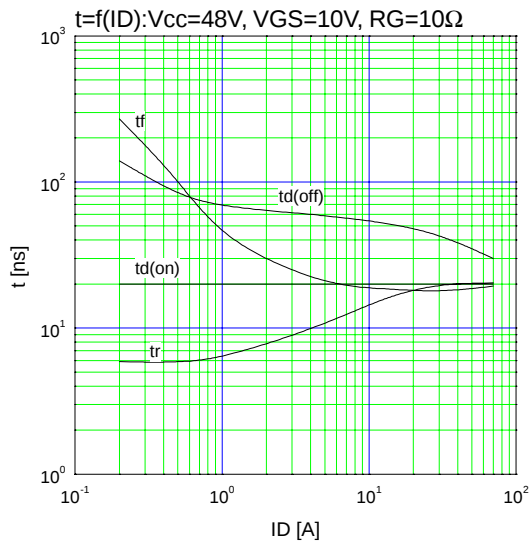


Typical Forward Characteristics of Reverse Diode

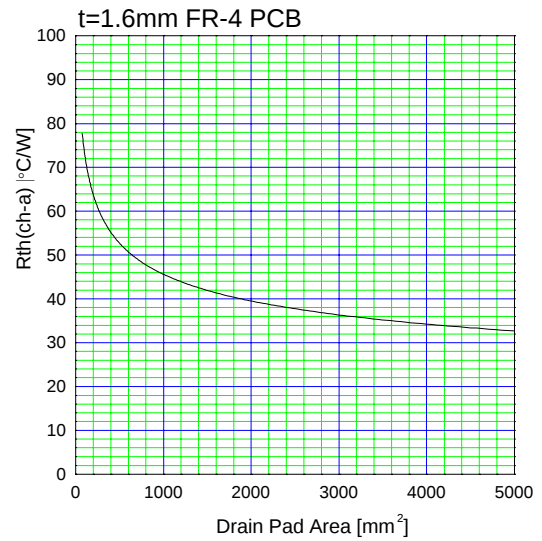
$I_F = f(V_{SD})$ : 80 $\mu$ s Pulse test,  $T_{ch} = 25^\circ\text{C}$



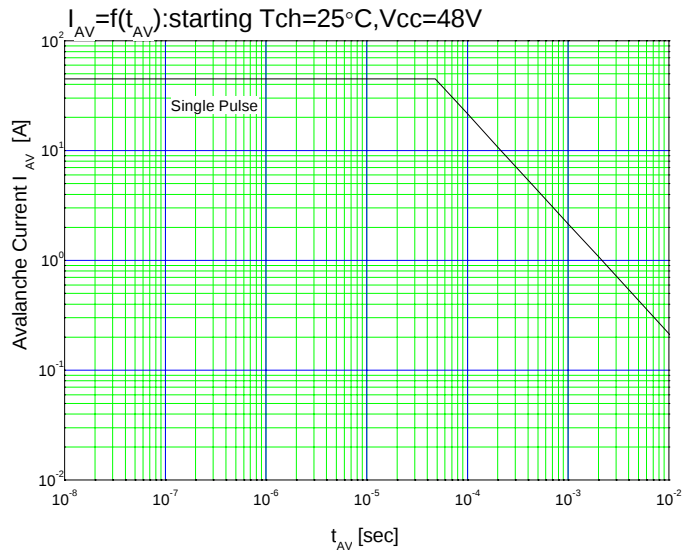
Typical Switching Characteristics vs.  $I_D$



Thermal Resistance vs. Drain Pad area



Maximum Avalanche Current Pulsewidth



Maximum Transient Thermal Impedance

