

## Super FAP-G Series

## N-CHANNEL SILICON POWER MOSFET

### 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

(Tc=25°C unless otherwise specified)

| Item                                    | Symbol                | Ratings     | Unit  |
|-----------------------------------------|-----------------------|-------------|-------|
| Drain-source voltage                    | V <sub>DS</sub>       | 600         | V     |
| Continuous drain current                | I <sub>D</sub>        | ±13         | A     |
| Pulsed drain current                    | I <sub>D</sub> (puls) | ±52         | A     |
| Gate-source voltage                     | V <sub>GS</sub>       | ±30         | V     |
| Repetitive or non-repetitive            | IAR*2                 | 13          | A     |
| Maximum Avalanche Energy                | EAS*1                 | 216.7       | mJ    |
| Maximum Drain-Source dV/dt              | dV <sub>DS</sub> /dt  | 20          | kV/μs |
| Peak Diode Recovery dV/dt               | dV/dt*3               | 5           | kV/μs |
| Max. power dissipation                  | P <sub>D</sub>        | Ta=25°C     | 2.16  |
|                                         |                       | Tc=25°C     | 80    |
| Operating and storage temperature range | T <sub>ch</sub>       | +150        | °C    |
|                                         | T <sub>stg</sub>      | -55 to +150 | °C    |
| Isolation Voltage                       | V <sub>ISO</sub> *4   | 2           | kVrms |

\*1 L=2.36mH, V<sub>CC</sub>=60V, 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>DS</sub>, T<sub>ch</sub>≤150°C \*4 t=60sec, f=60Hz

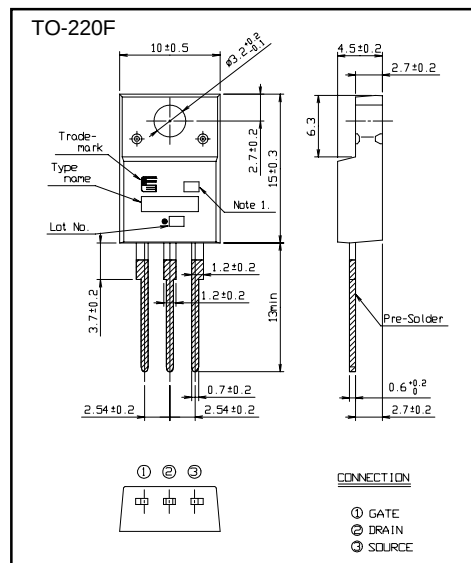
### Electrical characteristics (Tc =25°C unless otherwise specified)

| Item                             | Symbol              | Test Conditions                                                  | Min. | Typ. | Max. | Units |
|----------------------------------|---------------------|------------------------------------------------------------------|------|------|------|-------|
| Drain-source breakdown voltage   | V(BR)DSS            | I <sub>D</sub> =250μA V <sub>GS</sub> =0V                        | 600  |      |      | 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> =600V V <sub>GS</sub> =0V T <sub>ch</sub> =25°C  |      |      | 25   | μA    |
|                                  |                     | V <sub>DS</sub> =480V V <sub>GS</sub> =0V T <sub>ch</sub> =125°C |      |      | 250  |       |
| 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> =6A V <sub>GS</sub> =10V                          |      | 0.50 | 0.65 | Ω     |
| Forward transconductance         | g <sub>fs</sub>     | I <sub>D</sub> =6A V <sub>DS</sub> =25V                          | 5.5  | 11   |      | S     |
| Input capacitance                | C <sub>iss</sub>    | V <sub>DS</sub> =25V                                             |      | 1600 | 2400 | pF    |
| Output capacitance               | C <sub>oss</sub>    | V <sub>GS</sub> =0V                                              |      | 160  | 240  |       |
| Reverse transfer capacitance     | C <sub>rss</sub>    | f=1MHz                                                           |      | 7    | 10.5 |       |
| Turn-on time t <sub>on</sub>     | td(on)              | V <sub>CC</sub> =300V I <sub>D</sub> =6A                         |      | 18   | 27   | ns    |
|                                  | t <sub>r</sub>      | V <sub>GS</sub> =10V                                             |      | 16   | 24   |       |
|                                  | td(off)             | R <sub>GS</sub> =10 Ω                                            |      | 35   | 50   |       |
| Turn-off time t <sub>off</sub>   | t <sub>r</sub>      |                                                                  |      | 8    | 15   |       |
|                                  |                     |                                                                  |      | 34   | 51   |       |
|                                  |                     |                                                                  |      | 12.5 | 19   |       |
| Total Gate Charge                | Q <sub>G</sub>      | V <sub>CC</sub> =300V                                            |      |      |      | nC    |
| Gate-Source Charge               | Q <sub>GS</sub>     | I <sub>D</sub> =12A                                              |      |      |      |       |
| Gate-Drain Charge                | Q <sub>GD</sub>     | V <sub>GS</sub> =10V                                             |      |      |      |       |
| Avalanche capability             | I <sub>AV</sub>     | L=2.36mH T <sub>ch</sub> =25°C                                   | 13   |      |      | A     |
| Diode forward on-voltage         | V <sub>SD</sub>     | I <sub>F</sub> =12A V <sub>GS</sub> =0V T <sub>ch</sub> =25°C    |      | 1.00 | 1.50 | V     |
| Reverse recovery time            | t <sub>rr</sub>     | I <sub>F</sub> =12A V <sub>GS</sub> =0V                          |      | 0.75 |      | μs    |
| Reverse recovery charge          | Q <sub>rr</sub>     | -di/dt=100A/μs T <sub>ch</sub> =25°C                             |      | 6.5  |      | μC    |

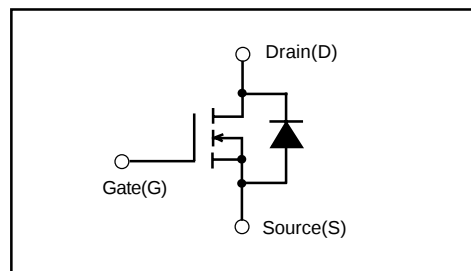
### Thermal characteristics

| Item               | Symbol                | Test Conditions    | Min. | Typ. | Max. | Units |
|--------------------|-----------------------|--------------------|------|------|------|-------|
| Thermal resistance | R <sub>th(ch-c)</sub> | channel to case    |      |      | 1.56 | °C/W  |
|                    | R <sub>th(ch-a)</sub> | channel to ambient |      |      | 50.0 | °C/W  |

### Outline Drawings [mm]

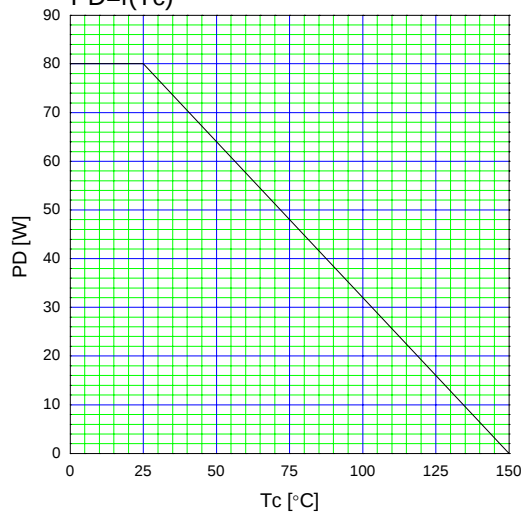


### Equivalent circuit schematic

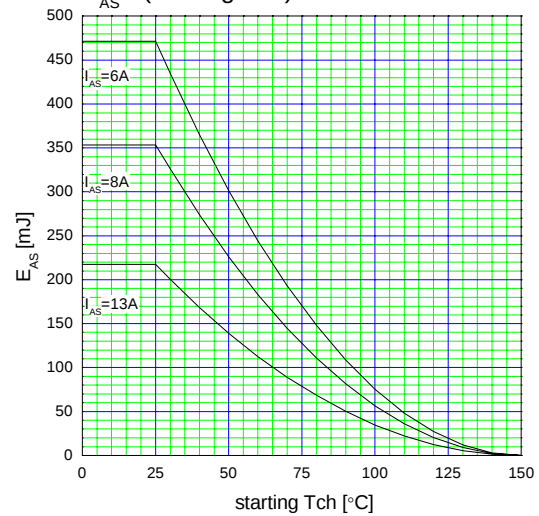


## Characteristics

Allowable Power Dissipation  
 $PD=f(T_c)$

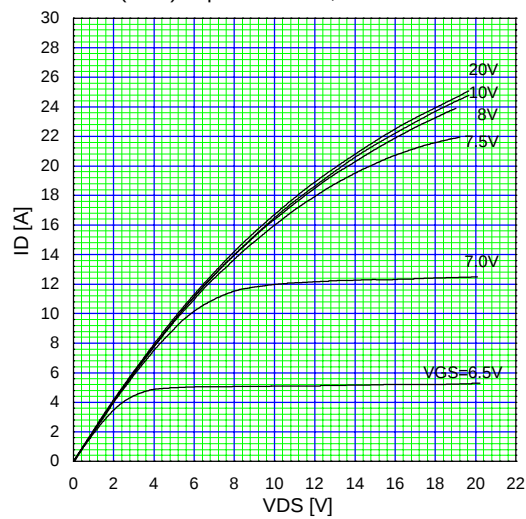


Maximum Avalanche Energy vs. starting  $T_{ch}$   
 $E_{AS}=f(\text{starting } T_{ch}): V_{cc}=60V$



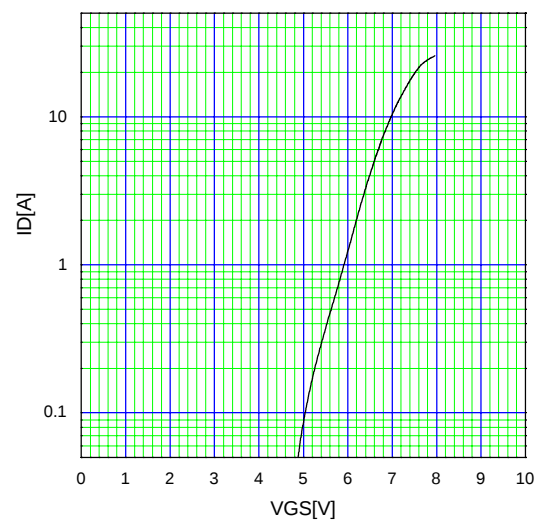
Typical Output Characteristics

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



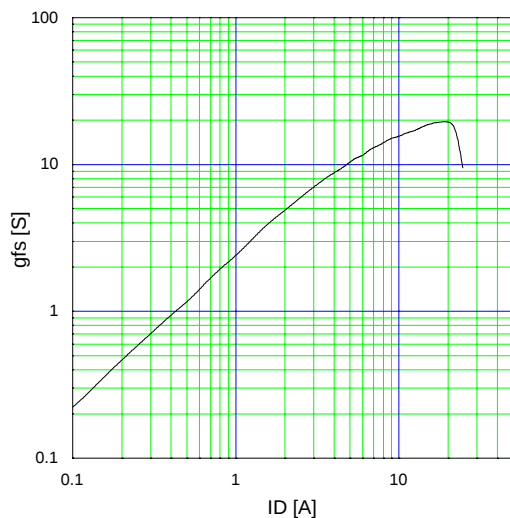
Typical Transfer Characteristic

$ID=f(V_{GS}): 80\mu s$  Pulse test,  $V_{DS}=25V$ ,  $T_{ch}=25^\circ C$



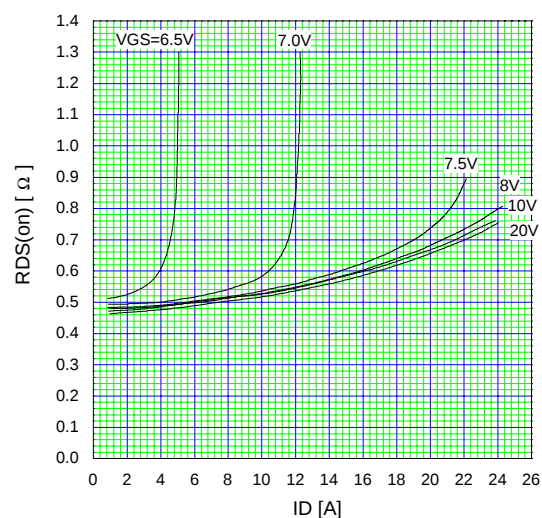
Typical Transconductance

$g_{fs}=f(ID): 80\mu s$  Pulse test,  $V_{DS}=25V$ ,  $T_{ch}=25^\circ C$

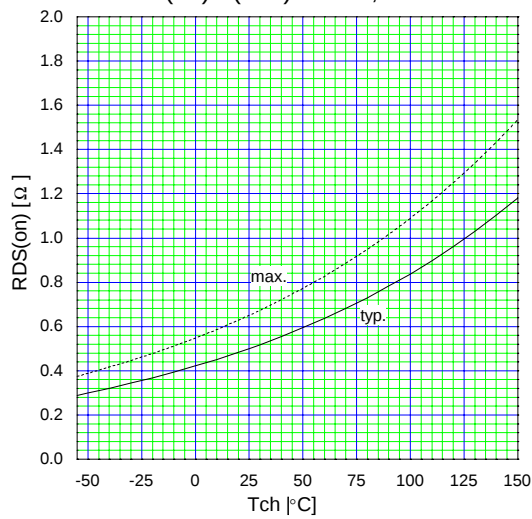


Typical Drain-Source on-state Resistance

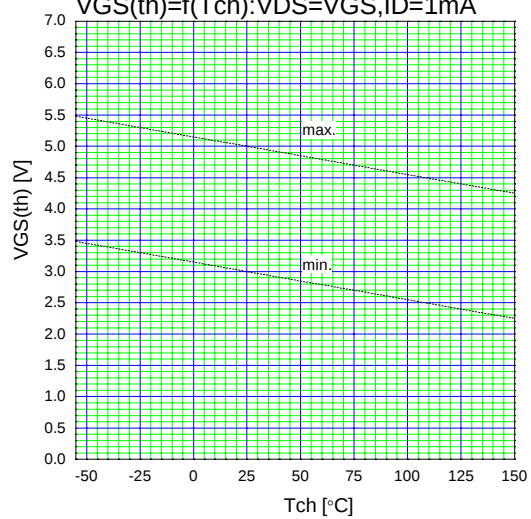
$R_{DS(on)}=f(ID): 80\mu s$  Pulse test,  $T_{ch}=25^\circ C$



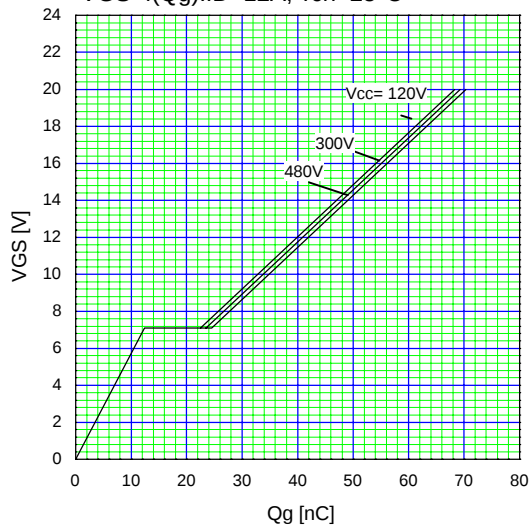
Drain-Source On-state Resistance  
 $R_{DS(on)} = f(T_{ch}): I_D = 6A, V_{GS} = 10V$



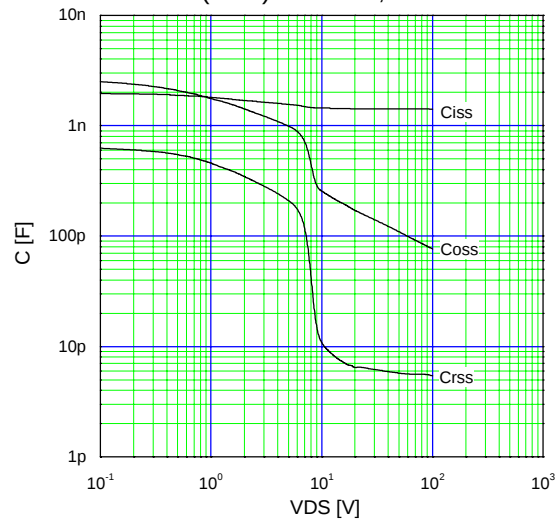
Gate Threshold Voltage vs.  $T_{ch}$   
 $V_{GS(th)} = f(T_{ch}): V_{DS} = V_{GS}, I_D = 1mA$



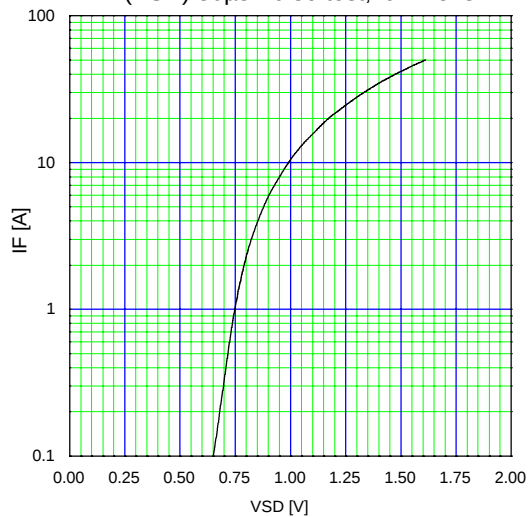
Typical Gate Charge Characteristics  
 $V_{GS} = f(Q_g): I_D = 12A, T_{ch} = 25^{\circ}C$



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



Typical Forward Characteristics of Reverse Diode  
 $I_F = f(V_{SD}): 80\mu s$  Pulse test,  $T_{ch} = 25^{\circ}C$



Typical Switching Characteristics vs.  $I_D$   
 $t = f(I_D): V_{CC} = 300V, V_{GS} = 10V, R_G = 10\Omega$

