

## 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>         | 450                  | V     |
| Continuous drain current                | I <sub>D</sub>          | ±10                  | A     |
| Pulsed drain current                    | I <sub>D(puls)</sub>    | ±40                  | A     |
| Gate-source voltage                     | V <sub>GS</sub>         | ±30                  | V     |
| Repetitive or non-repetitive            | I <sub>AR</sub> *2      | 10                   | A     |
| Maximum Avalanche Energy                | E <sub>AS</sub> *1      | 155.3                | 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>a</sub> =25°C | 2.02  |
|                                         |                         | T <sub>c</sub> =25°C | 135   |
| Operating and storage temperature range | T <sub>ch</sub>         | +150                 | °C    |
|                                         | T <sub>stg</sub>        | -55 to +150          | °C    |

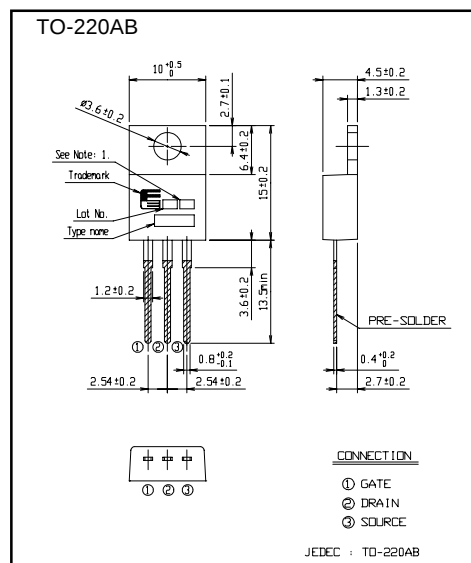
\*1 L=2.85mH, V<sub>CC</sub>=45V, See to Avalanche Energy Graph \*2 T<sub>ch</sub>≤150°C\*3 I<sub>F</sub>≤-I<sub>D</sub>, -di/dt=50A/μs, V<sub>CC</sub>≤BV<sub>DSS</sub>, T<sub>ch</sub>≤150°C \*4 V<sub>DS</sub>≤450V● Electrical characteristics (T<sub>c</sub>=25°C unless otherwise specified)

| 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                        | 450  |      |      | 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> =450V V <sub>GS</sub> =0V T <sub>ch</sub> =25°C  |      |      | 25   | μA    |
|                                  |                      | V <sub>DS</sub> =360V 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> =4A V <sub>GS</sub> =10V                          |      | 0.50 | 0.65 | Ω     |
| Forward transconductance         | g <sub>fs</sub>      | I <sub>D</sub> =4A V <sub>DS</sub> =25V                          | 4    | 8    |      | S     |
| Input capacitance                | C <sub>iss</sub>     | V <sub>DS</sub> =25V                                             |      | 800  | 1200 | pF    |
| Output capacitance               | C <sub>oss</sub>     | V <sub>GS</sub> =0V                                              |      | 120  | 150  |       |
| Reverse transfer capacitance     | C <sub>rss</sub>     | f=1MHz                                                           |      | 4.5  | 7    |       |
| Turn-on time t <sub>on</sub>     | td(on)               | V <sub>CC</sub> =300V I <sub>D</sub> =4A                         |      | 15   | 23   | ns    |
|                                  | tr                   | V <sub>GS</sub> =10V                                             |      | 12   | 18   |       |
| Turn-off time t <sub>off</sub>   | td(off)              | R <sub>GS</sub> =10Ω                                             |      | 25   | 38   |       |
|                                  | tr                   |                                                                  |      | 7    | 11   |       |
| Total Gate Charge                | Q <sub>G</sub>       | V <sub>CC</sub> =225V                                            |      | 22   | 33   | nC    |
| Gate-Source Charge               | Q <sub>GS</sub>      | I <sub>D</sub> =8A                                               |      | 9.5  | 14.5 |       |
| Gate-Drain Charge                | Q <sub>GD</sub>      | V <sub>GS</sub> =10V                                             |      | 6.5  | 10   |       |
| Avalanche capability             | I <sub>AV</sub>      | L=2.85mH T <sub>ch</sub> =25°C                                   | 10   |      |      | A     |
| Diode forward on-voltage         | V <sub>SD</sub>      | I <sub>F</sub> =8A 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> =8A V <sub>GS</sub> =0V                           |      | 0.7  |      | μs    |
| Reverse recovery charge          | Q <sub>rr</sub>      | -di/dt=100A/μs T <sub>ch</sub> =25°C                             |      | 3.5  |      | μC    |

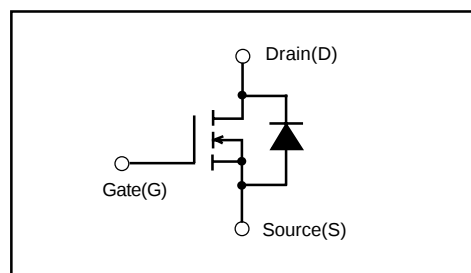
## ● Thermal characteristics

| Item               | Symbol                | Test Conditions    | Min. | Typ. | Max.  | Units |
|--------------------|-----------------------|--------------------|------|------|-------|-------|
| Thermal resistance | R <sub>th(ch-c)</sub> | channel to case    |      |      | 0.926 | °C/W  |
|                    | R <sub>th(ch-a)</sub> | channel to ambient |      |      | 62.0  | °C/W  |

## ■ Outline Drawings [mm]

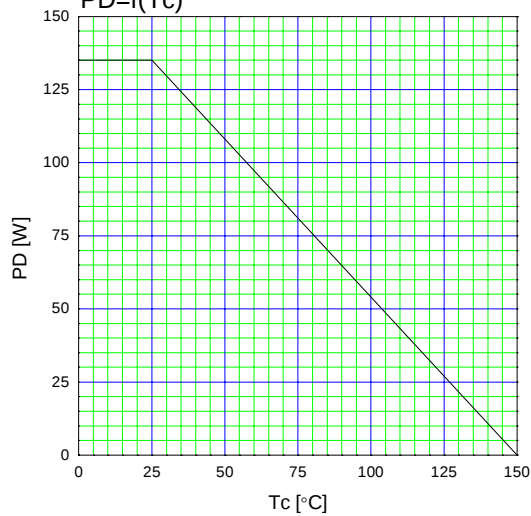


## ■ Equivalent circuit schematic

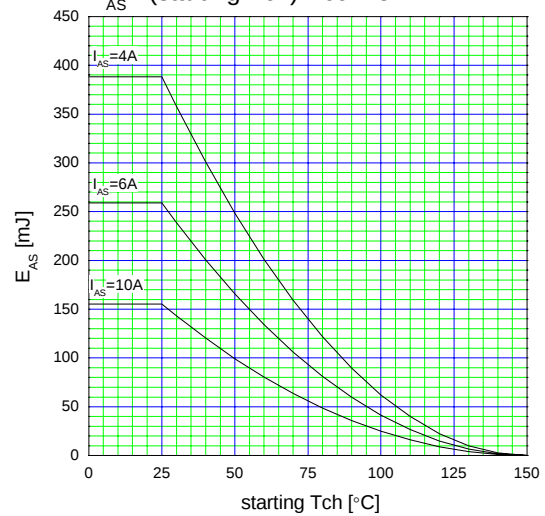


## Characteristics

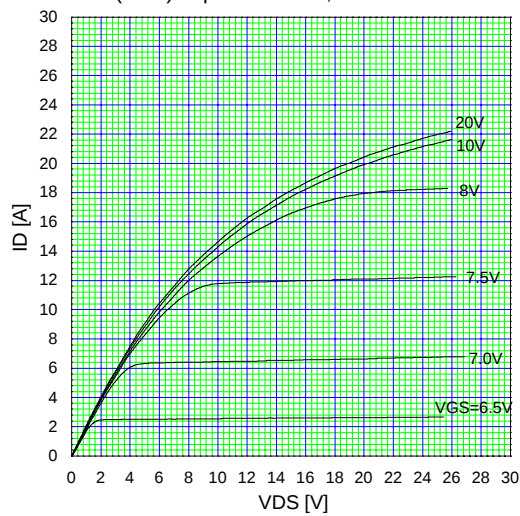
Allowable Power Dissipation  
 $PD=f(T_c)$



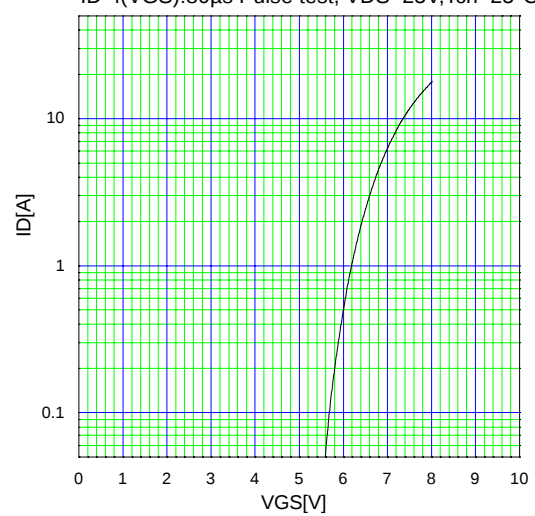
Maximum Avalanche Energy vs. starting  $T_{ch}$   
 $E_{AS}=f(\text{starting } T_{ch}): V_{cc}=45V$



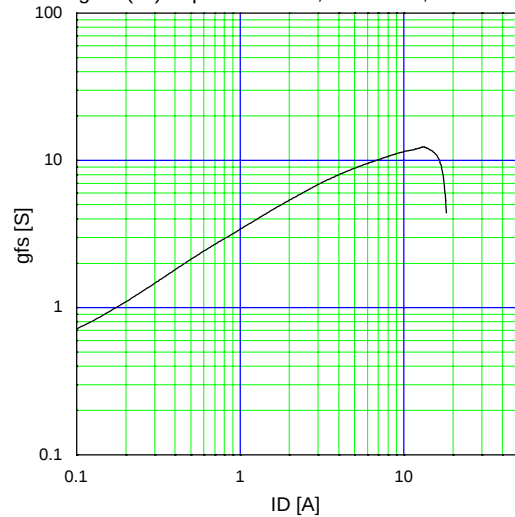
Typical Output Characteristics  
 $ID=f(V_{DS}): 80\mu s$  Pulse test,  $T_{ch}=25^\circ C$



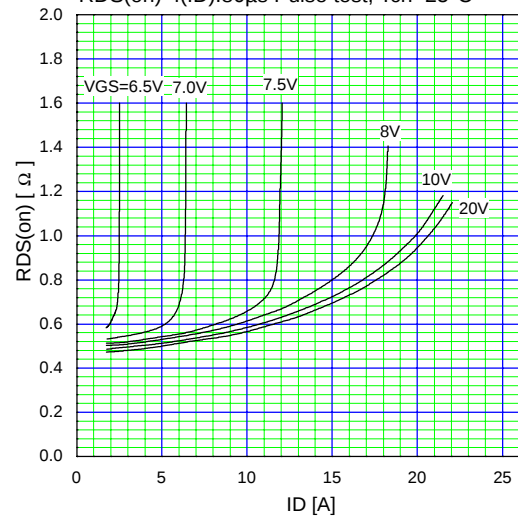
Typical Transfer Characteristic  
 $ID=f(V_{GS}): 80\mu s$  Pulse test,  $V_{DS}=25V, T_{ch}=25^\circ C$



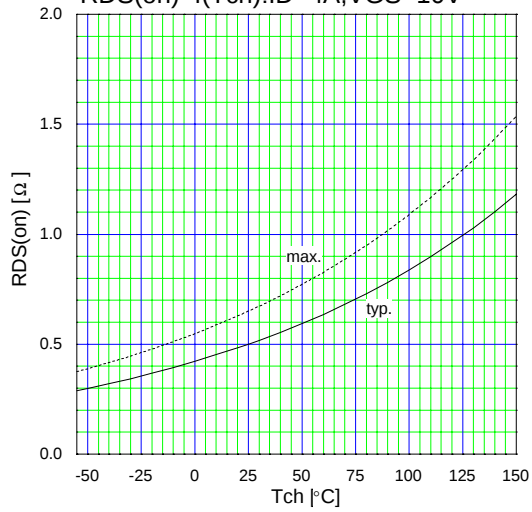
Typical Transconductance  
 $g_{fs}=f(ID): 80\mu s$  Pulse test,  $V_{DS}=25V, T_{ch}=25^\circ C$



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

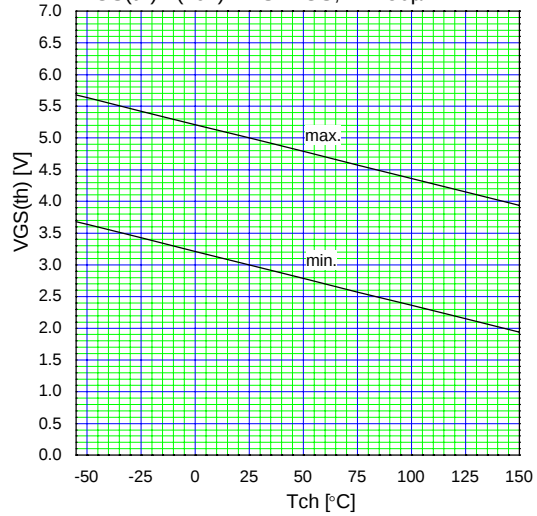


Drain-Source On-state Resistance  
 $R_{DS(on)} = f(T_{ch}): I_D = 4A, V_{GS} = 10V$

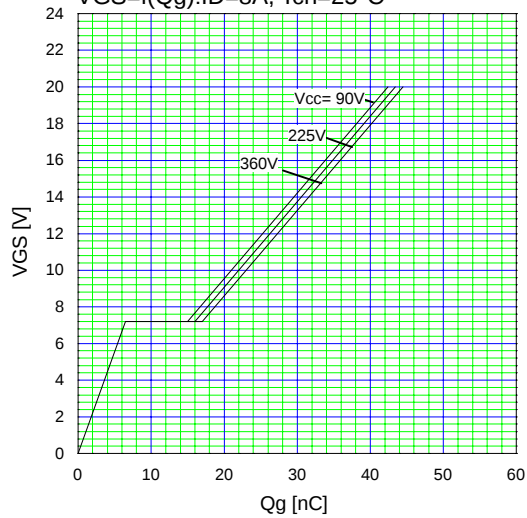


Gate Threshold Voltage vs.  $T_{ch}$

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

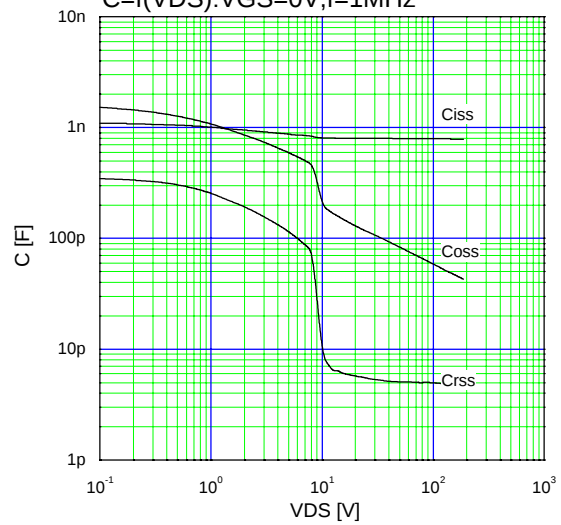


Typical Gate Charge Characteristics  
 $V_{GS} = f(Q_g): I_D = 8A, T_{ch} = 25^{\circ}C$

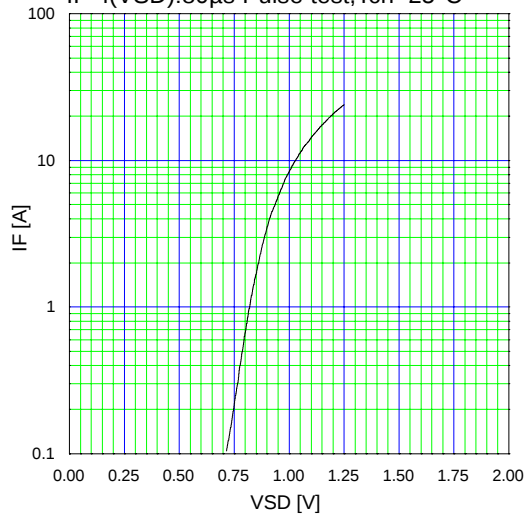


Typical Capacitance

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



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



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

