

### N-CHANNEL SILICON POWER MOSFET

### FAP-IIB SERIES

#### Features

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

#### Applications

- Switching regulators
- DC-DC converters
- General purpose power amplifier

#### Maximum ratings and characteristics

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

| Item                                    | Symbol                | Rating      | Unit | Remarks |
|---|-----------------------|-------------|------|---------|
| Drain-source voltage                    | V <sub>DS</sub>       | 60          | V    |         |
| Continuous drain current                | I <sub>D</sub>        | ±70         | A    |         |
| Pulsed drain current                    | I <sub>D</sub> [puls] | ±280        | A    |         |
| Gate-source peak voltage                | V <sub>GS</sub>       | ±20         | V    |         |
| Maximum avalanche energy                | E <sub>AV</sub>       | 685         | mJ   | *1      |
| Maximum power dissipation               | P <sub>D</sub>        | 100         | W    |         |
| Operating and storage temperature range | T <sub>ch</sub>       | +150        | °C   |         |
|   | T <sub>stg</sub>      | -55 to +150 | °C   |         |

\*1 L=0.186mH, V<sub>CC</sub>=24V

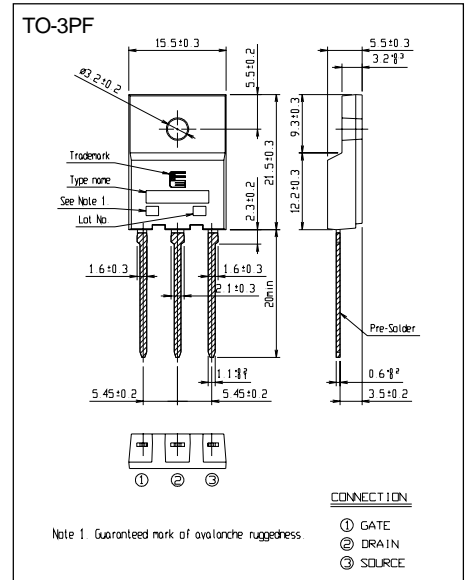
##### Electrical characteristics (Tc =25°C unless otherwise specified)

| Item                             | Symbol               | Test Conditions  | Min.                   | Typ. | Max. | Units |
|----------------------------------|----------------------|--|------------------------|------|------|-------|
| Drain-source breakdown voltage   | V <sub>(BR)DSS</sub> | I <sub>D</sub> =1mA V <sub>GS</sub> =0V  | 60                     |      |      | V     |
| Gate threshold voltage           | V <sub>GS(th)</sub>  | I <sub>D</sub> =1mA V <sub>DS</sub> =V <sub>GS</sub>                               | 1.0                    | 1.5  | 2.0  | V     |
| Zero gate voltage drain current  | I <sub>DSS</sub>     | V <sub>DS</sub> =60V V <sub>GS</sub> =0V   | T <sub>ch</sub> =25°C  | 10   | 500  | μA    |
|                                  |                      |  | T <sub>ch</sub> =125°C | 0.2  | 1.0  | mA    |
| Gate-source leakage current      | I <sub>GSS</sub>     | V <sub>GS</sub> =20V V <sub>DS</sub> =0V   |                        | 10   | 100  | nA    |
| Drain-source on-state resistance | R <sub>DS(on)</sub>  | I <sub>D</sub> =40A V <sub>GS</sub> =10V   | V <sub>GS</sub> =4V    | 12   | 17   | mΩ    |
|                                  |                      |  | V <sub>GS</sub> =10V   | 7.5  | 10   | mΩ    |
| Forward transconductance         | g <sub>fs</sub>      | I <sub>D</sub> =40A V <sub>DS</sub> =25V   | 25                     | 55   |      | S     |
| Input capacitance                | C <sub>iss</sub>     | V <sub>DS</sub> =25V V <sub>GS</sub> =0V f=1MHz                                    |                        | 3500 | 5250 | pF    |
| Output capacitance               | C <sub>oss</sub>     |  |                        | 1250 | 1870 |       |
| Reverse transfer capacitance     | C <sub>rss</sub>     |  |                        | 360  | 540  |       |
| Turn-on time                     | t <sub>d(on)</sub>   | V <sub>CC</sub> =30V R <sub>G</sub> =10 Ω I <sub>D</sub> =75A V <sub>GS</sub> =10V |                        | 15   | 23   | ns    |
|                                  | t <sub>r</sub>       |  |                        | 75   | 120  |       |
| Turn-off time                    | t <sub>d(off)</sub>  |  |                        | 190  | 285  |       |
|                                  | t <sub>f</sub>       |  |                        | 110  | 165  |       |
| Avalanche capability             | I <sub>AV</sub>      | L=100μH T <sub>ch</sub> =25°C  | 70                     |      |      | A     |
| Diode forward on-voltage         | V <sub>SD</sub>      | I <sub>F</sub> =160A V <sub>GS</sub> =0V T <sub>ch</sub> =25°C                     |                        | 1.15 | 1.65 | V     |
| Reverse recovery time            | t <sub>rr</sub>      | I <sub>F</sub> =80A  |                        | 75   | 120  | ns    |
| Reverse recovery charge          | Q <sub>rr</sub>      | -di/dt=100A/μs T <sub>ch</sub> =25°C   |                        | 0.17 |      | μC    |

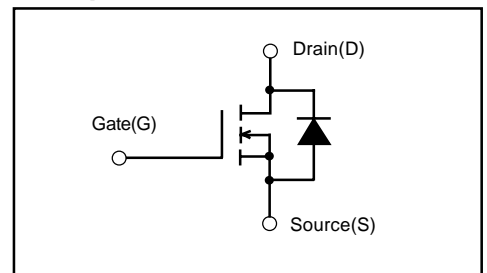
#### Thermal characteristics

| Item               | Symbol                | Min. | Typ. | Max. | Units |
|--------------------|-----------------------|------|------|------|-------|
| Thermal resistance | R <sub>th(ch-c)</sub> |      |      | 1.25 | °C/W  |
|                    | R <sub>th(ch-a)</sub> |      |      | 30.0 | °C/W  |

#### Outline Drawings

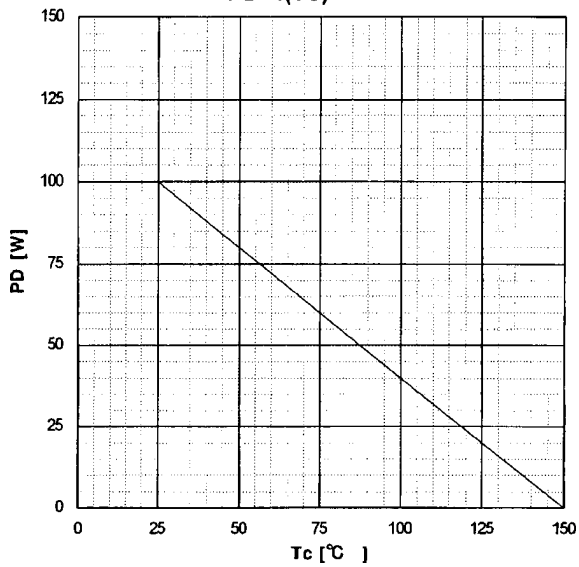


#### Equivalent circuit schematic

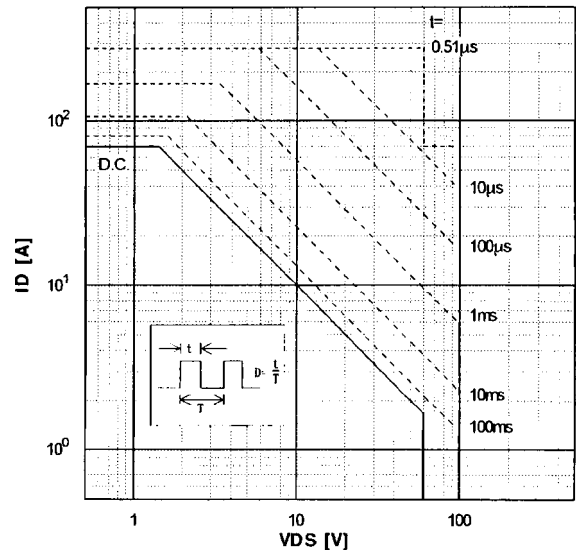


Characteristics

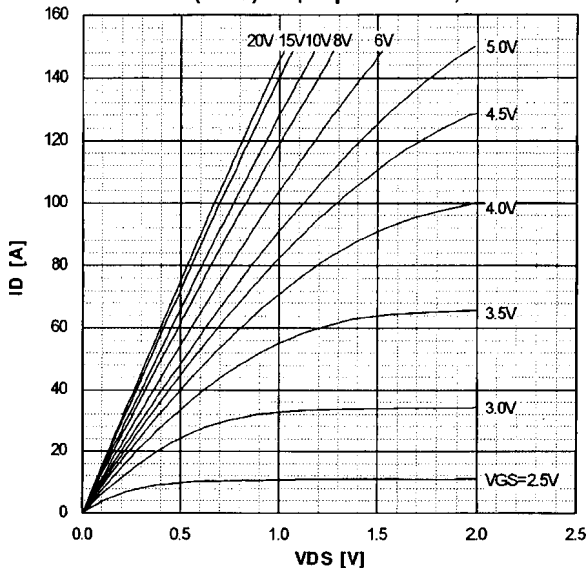
**Power Dissipation**  
 $PD=f(T_c)$



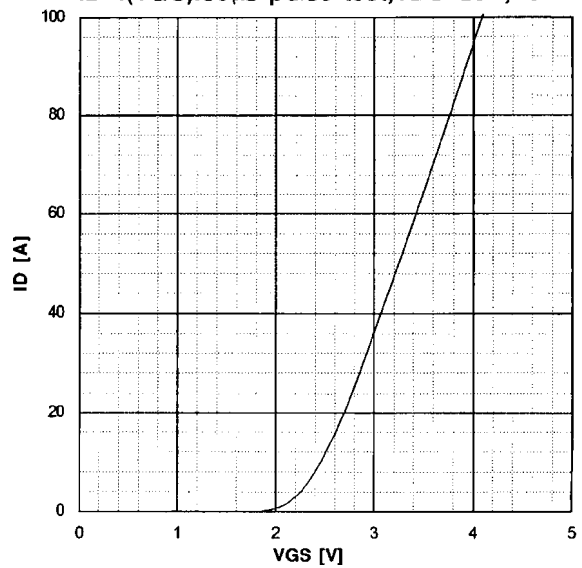
**Safe operating area**  
 $ID=f(V_{DS}):D=0.01, T_c=25^\circ C$



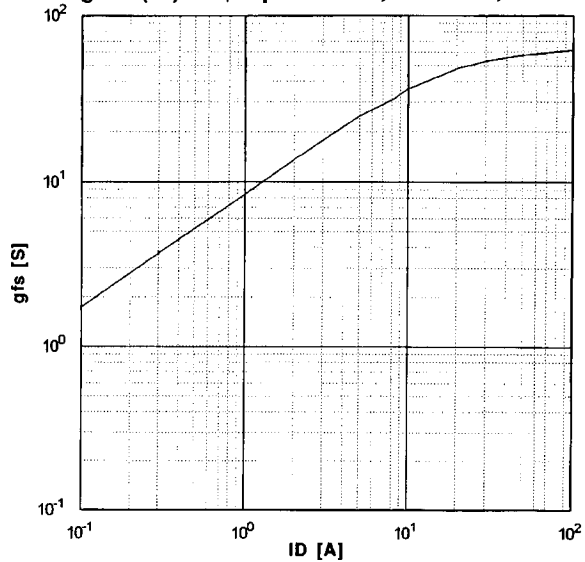
**Typical Output Characteristics**  
 $ID=f(V_{DS}):80\mu s \text{ pulse test}, T_{ch}=25^\circ C$



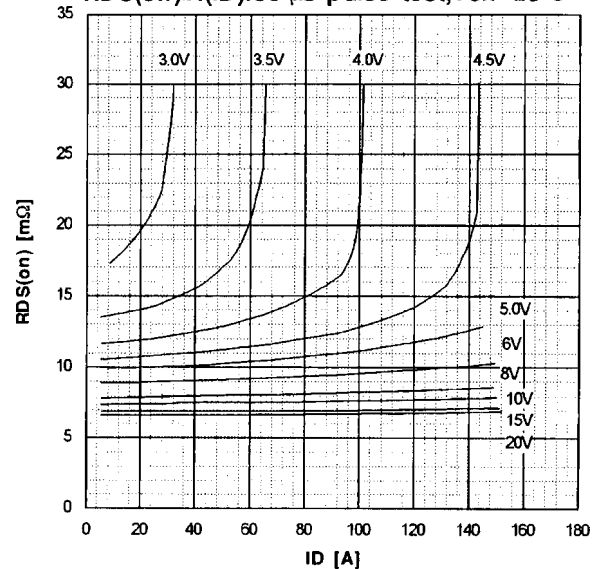
**Typical Transfer Characteristic**  
 $ID=f(V_{GS}):80\mu s \text{ pulse test}, V_{DS}=25V, T_{ch}=25^\circ C$

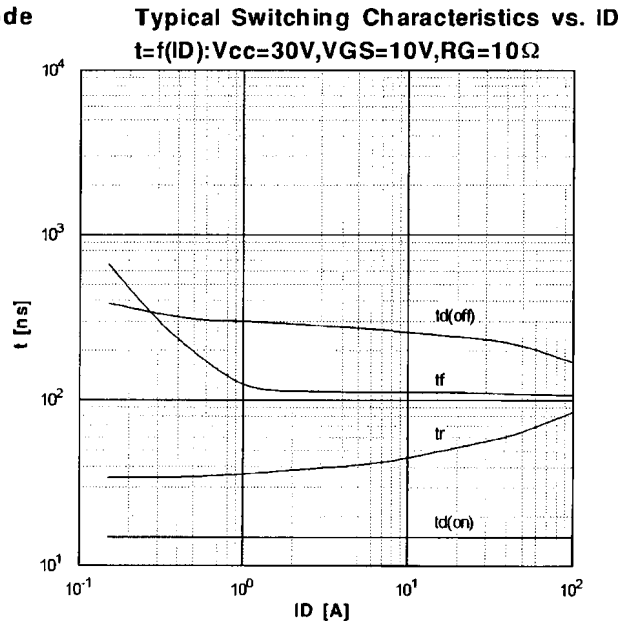
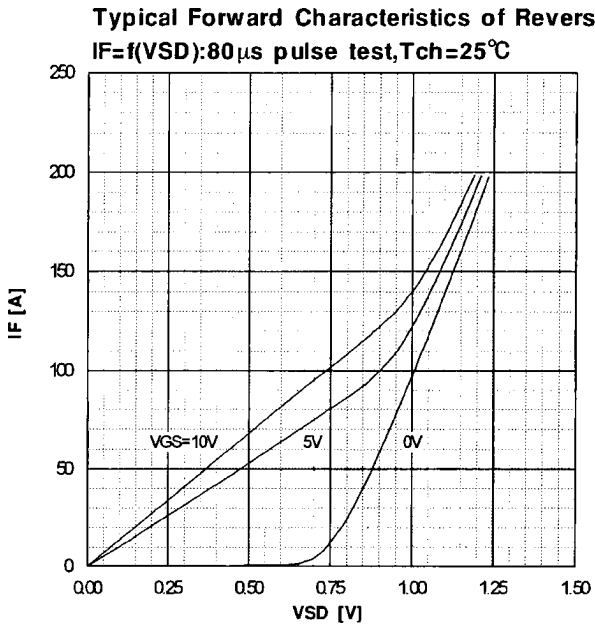
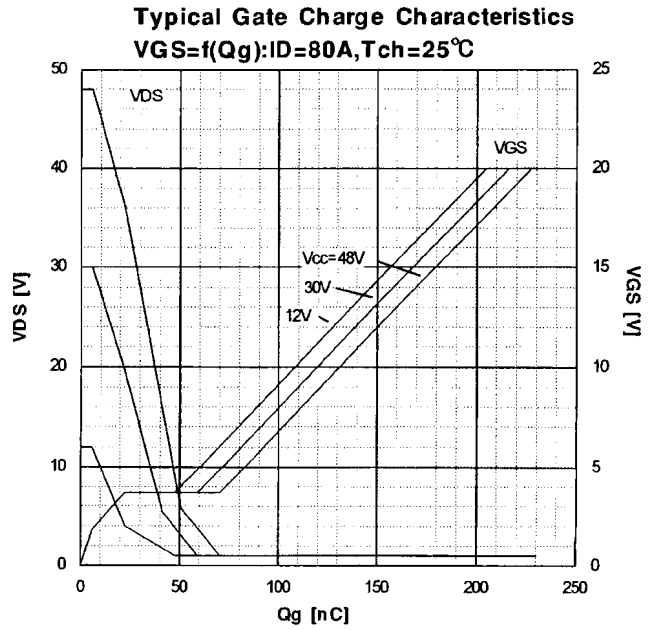
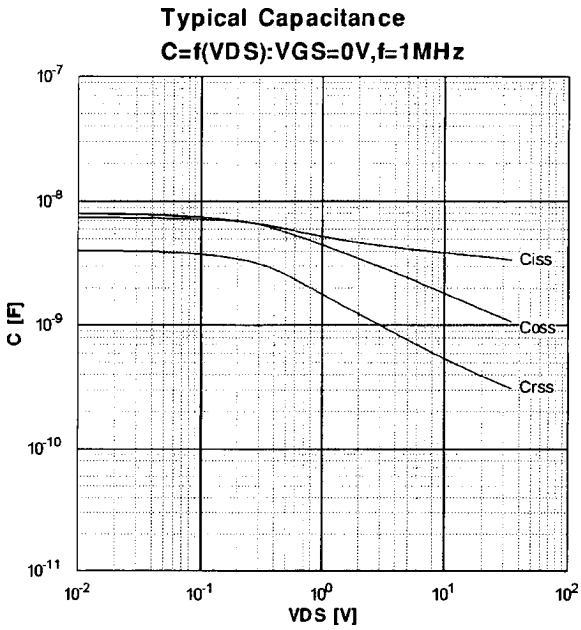
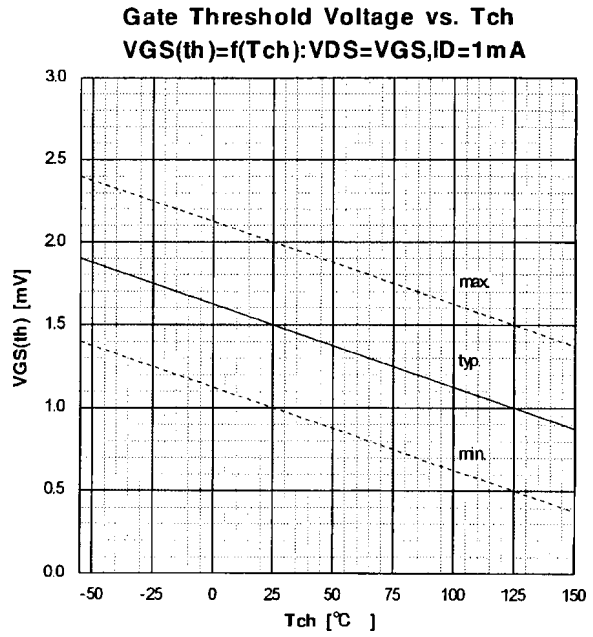
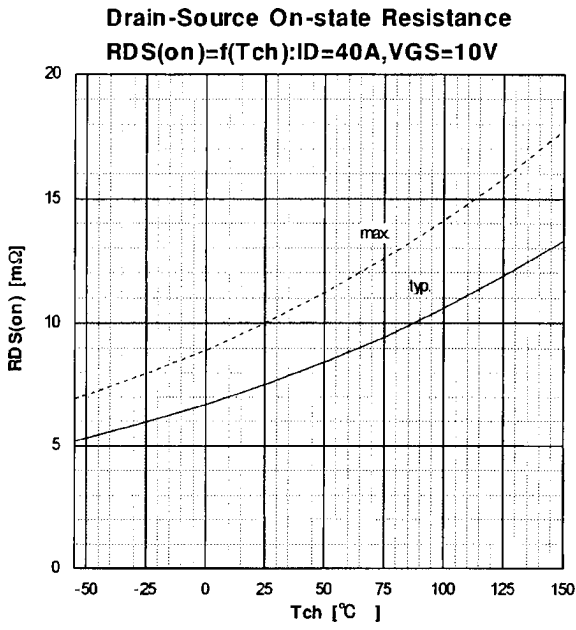


**Typical Transconductance**  
 $g_{fs}=f(ID):80\mu s \text{ pulse test}, V_{DS}=25V, T_{ch}=25^\circ C$

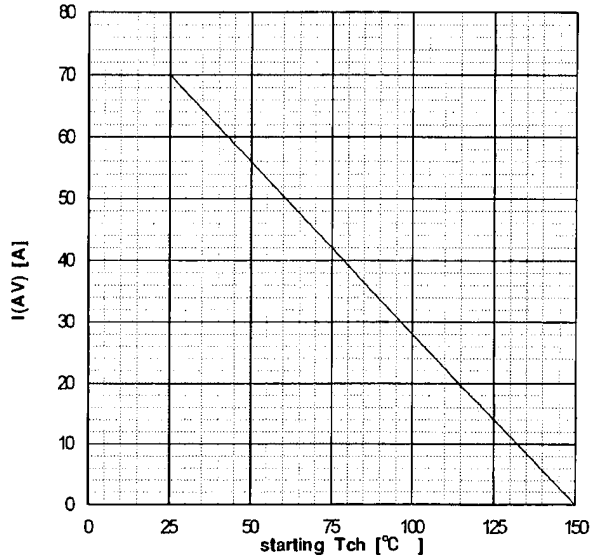


**Typical Drain-Source on-State Resistance**  
 $R_{DS(on)}=f(ID):80\mu s \text{ pulse test}, T_{ch}=25^\circ C$

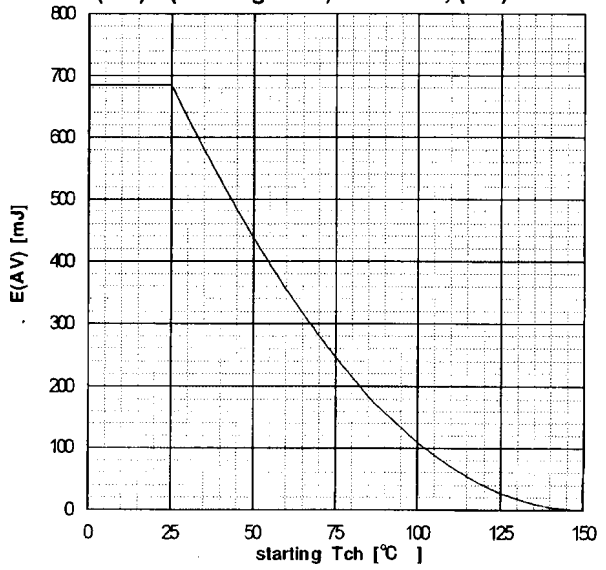




Maximum Avalanche Current vs. starting Tch  
 $I(AV)=f(\text{starting Tch})$



Maximum Avalanche Energy vs. starting Tch  
 $E(AV)=f(\text{starting Tch}): V_{CC}=24V, I(AV) \leq 70A$



Transient Thermal Impedance  
 $Z_{th}(ch-c)=f(t)$  parameter:  $D=t/T$

