

## N-CHANNEL SILICON POWER MOSFET

## FAP-IIIB SERIES

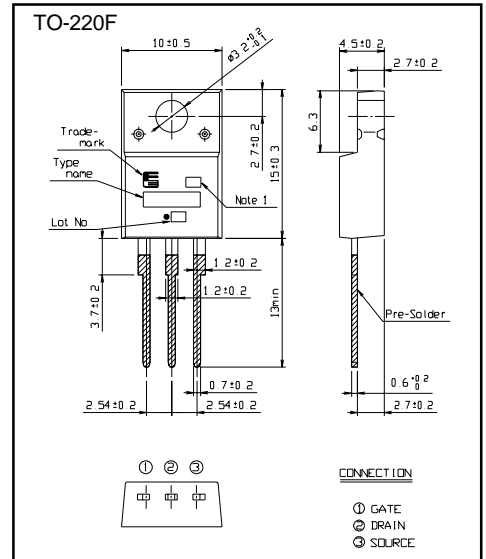
### Features

- 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

### Outline Drawings



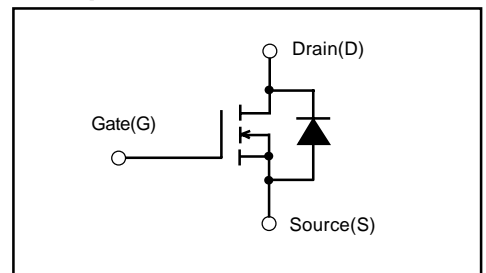
### Maximum ratings and characteristics

#### Absolute maximum ratings (T<sub>c</sub>=25°C unless otherwise specified)

| Item                                    | Symbol                | Rating      | Unit | Remarks |
|---|-----------------------|-------------|------|---------|
| Drain-source voltage                    | V <sub>DS</sub>       | 30          | V    |         |
| Continuous drain current                | I <sub>D</sub>        | ±35         | A    |         |
| Pulsed drain current                    | I <sub>D</sub> [puls] | ±140        | A    |         |
| Gate-source peak voltage                | V <sub>GS</sub>       | ±16         | V    |         |
| Maximum avalanche energy                | E <sub>AV</sub>       | 129.3       | mJ   | *1      |
| Maximum power dissipation               | P <sub>D</sub>        | 20          | W    |         |
| Operating and storage temperature range | T <sub>ch</sub>       | +150        | °C   |         |
|   | T <sub>stg</sub>      | -55 to +150 | °C   |         |

\*1 L=0.70mH, V<sub>CC</sub>=12V

### Equivalent circuit schematic



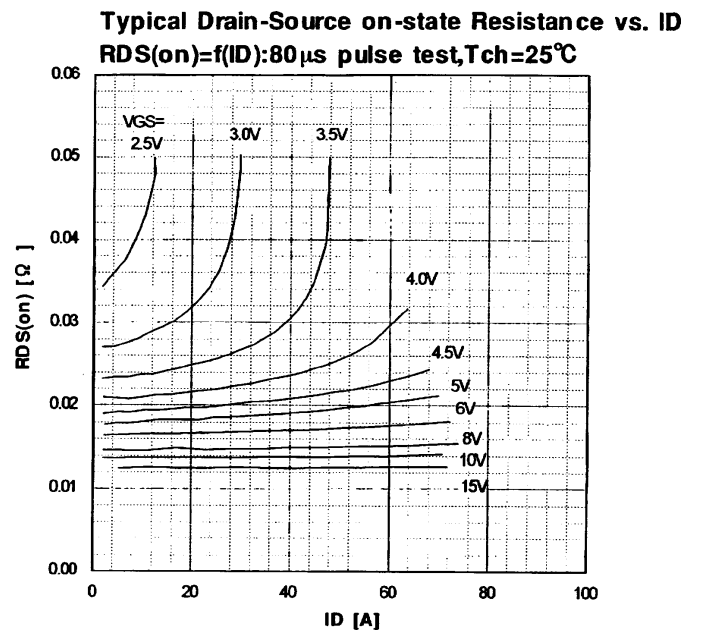
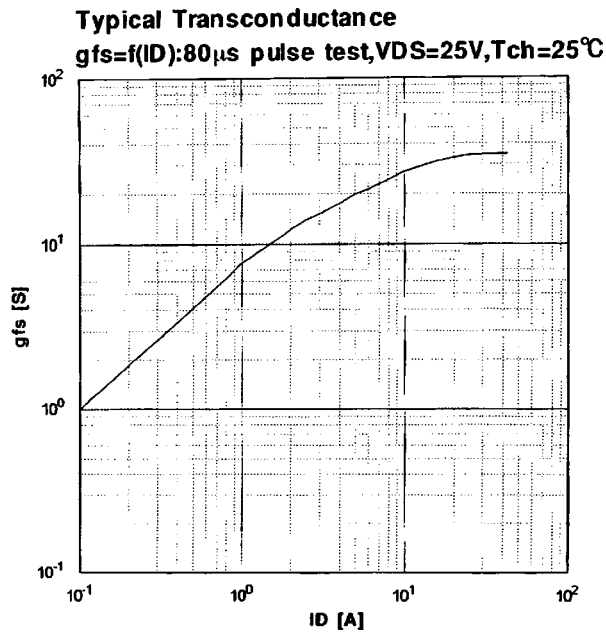
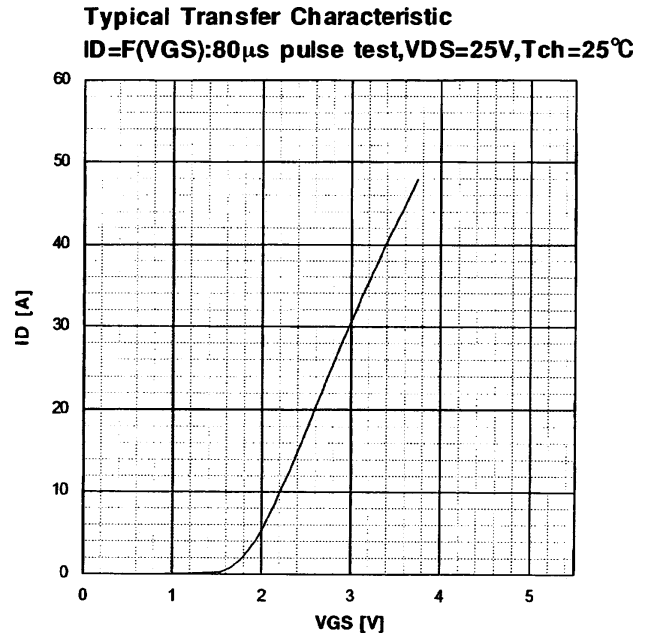
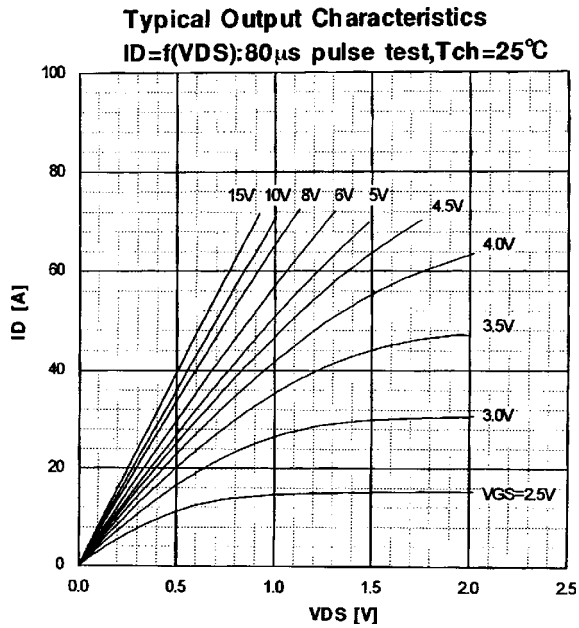
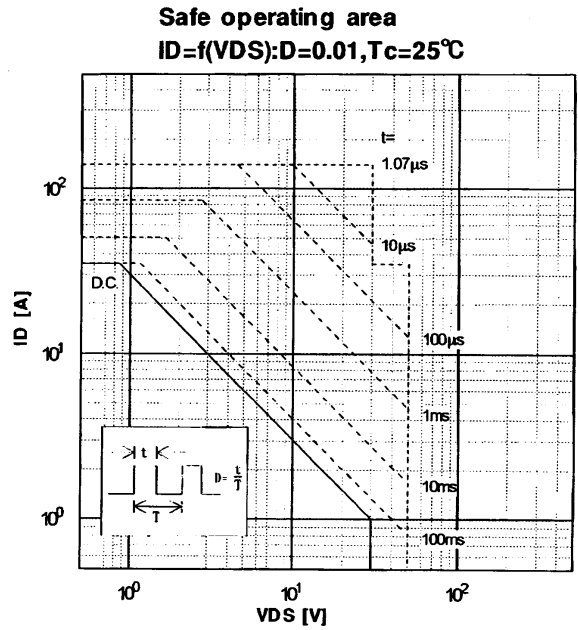
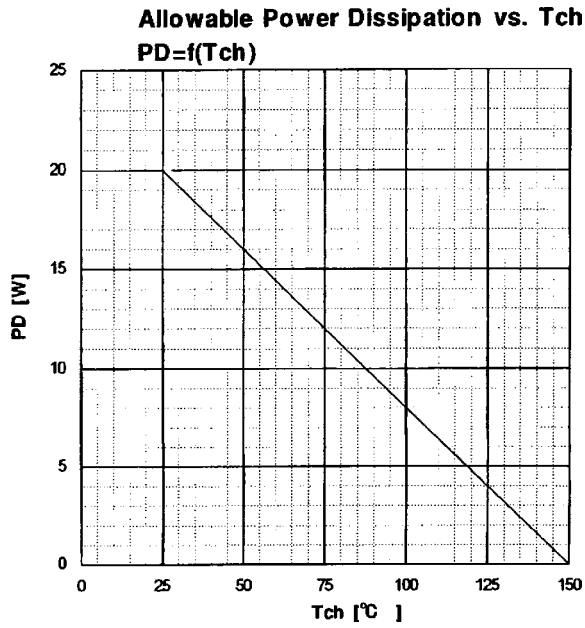
#### Electrical characteristics (T<sub>c</sub> =25°C unless otherwise specified)

| Item                             | Symbol               | Test Conditions  | Min.                   | Typ. | Max. | Units |
|----------------------------------|----------------------|--|------------------------|------|------|-------|
| Drain-source breakdown voltage   | V <sub>(BR)DSS</sub> | I <sub>D</sub> =1mA V <sub>GS</sub> =0V  | 30                     |      |      | 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> =30V 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> =±16V V <sub>DS</sub> =0V  |                        | 10   | 100  | nA    |
| Drain-source on-state resistance | R <sub>DS(on)</sub>  | I <sub>D</sub> =17.5A V <sub>GS</sub> =10V   | V <sub>GS</sub> =4V    | 22   | 30   | mΩ    |
|                                  |                      |  | V <sub>GS</sub> =10V   | 14   | 20   | mΩ    |
| Forward transconductance         | g <sub>fs</sub>      | I <sub>D</sub> =17.5A V <sub>DS</sub> =25V   | 16                     | 33   |      | S     |
| Input capacitance                | C <sub>iss</sub>     | V <sub>DS</sub> =25V V <sub>GS</sub> =0V f=1MHz                                    |                        | 1100 | 1650 | pF    |
| Output capacitance               | C <sub>oss</sub>     |  |                        | 550  | 830  |       |
| Reverse transfer capacitance     | C <sub>rss</sub>     |  |                        | 240  | 360  |       |
| Turn-on time                     | t <sub>d(on)</sub>   | V <sub>CC</sub> =15V R <sub>G</sub> =10 Ω I <sub>D</sub> =35A V <sub>GS</sub> =10V |                        | 9    | 15   | ns    |
|                                  | t <sub>r</sub>       |  |                        | 15   | 23   |       |
| Turn-off time                    | t <sub>d(off)</sub>  |  |                        | 75   | 115  |       |
|                                  | t <sub>f</sub>       |  |                        | 50   | 75   |       |
| Avalanche capability             | I <sub>AV</sub>      | L=100μH T <sub>ch</sub> =25°C  | 35                     |      |      | A     |
| Diode forward on-voltage         | V <sub>SD</sub>      | I <sub>F</sub> =2xI <sub>DR</sub> V <sub>GS</sub> =0V T <sub>ch</sub> =25°C        |                        | 0.98 | 1.71 | V     |
| Reverse recovery time            | t <sub>rr</sub>      | I <sub>F</sub> =2xI <sub>DR</sub> V <sub>GS</sub> =0V                              |                        | 50   |      | ns    |
| Reverse recovery charge          | Q <sub>rr</sub>      | -di/dt=100A/μs T <sub>ch</sub> =25°C   |                        | 0.08 |      | μC    |

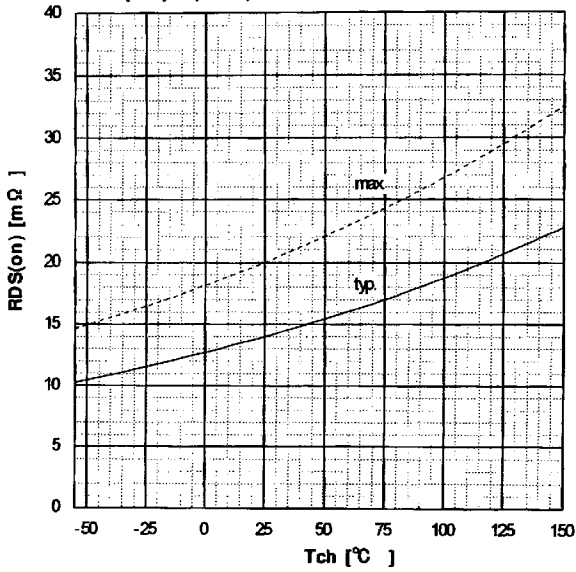
### Thermal characteristics

| Item               | Symbol                | Min. | Typ. | Max. | Units |
|--------------------|-----------------------|------|------|------|-------|
| Thermal resistance | R <sub>th(ch-c)</sub> |      |      | 6.25 | °C/W  |
|                    | R <sub>th(ch-a)</sub> |      |      | 62.5 | °C/W  |

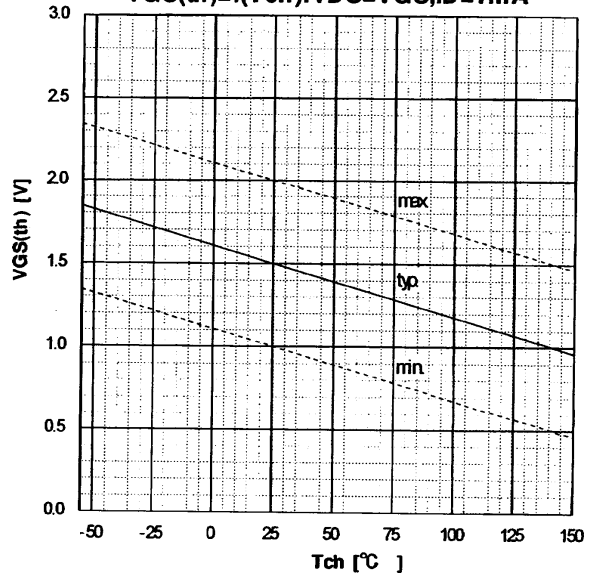
Characteristics



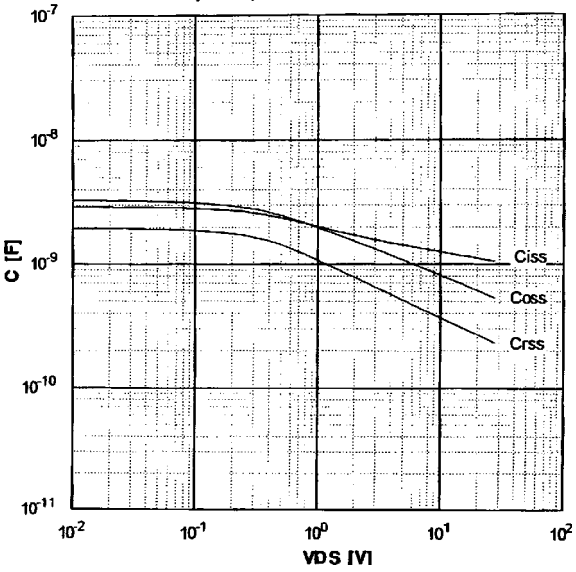
**Drain-Source On-state Resistance vs. T<sub>ch</sub>**  
 $R_{DS(on)} = f(T_{ch}): I_D = 17.5A, V_{GS} = 10V$



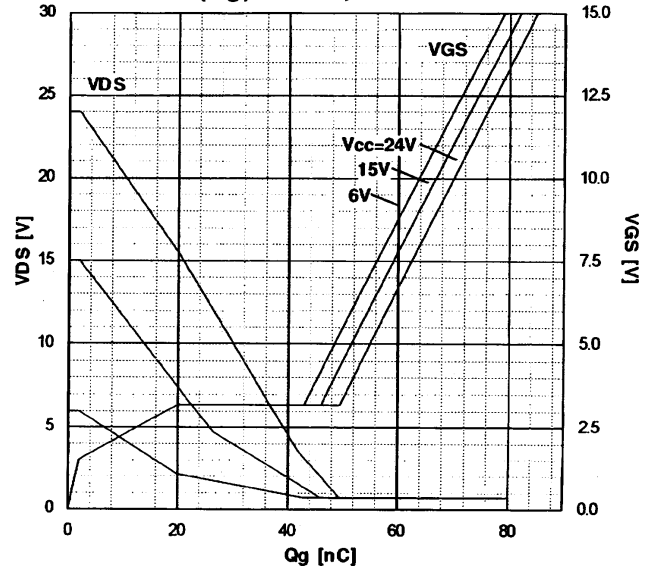
**Gate Threshold Voltage vs. T<sub>ch</sub>**  
 $V_{GS(th)} = f(T_{ch}): V_{DS} = V_{GS}, I_D = 1mA$



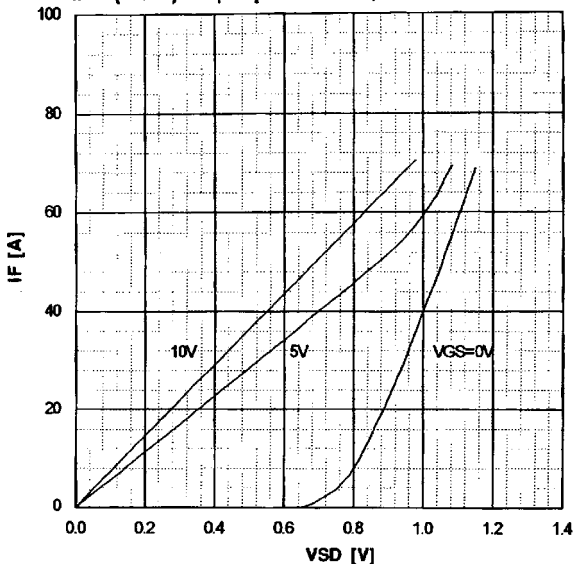
**Typical Capacitances vs. V<sub>DS</sub>**  
 $C = f(V_{DS}): V_{GS} = 0V, f = 1MHz$



**Typical Gate Charge Characteristics**  
 $V_{GS} = f(Q_g): I_D = 35A, T_{ch} = 25°C$



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



**Typical Switching Characteristics vs. I<sub>D</sub>**  
 $t = f(I_D): V_{CC} = 15V, V_{GS} = 10V, R_G = 10\Omega$

