

# 2SK3870-01

## N-CHANNEL SILICON POWER MOSFET

■ Outline Drawings (mm) 200406

### FUJI POWER MOSFET Super FAP-G Series

#### ■ Features

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

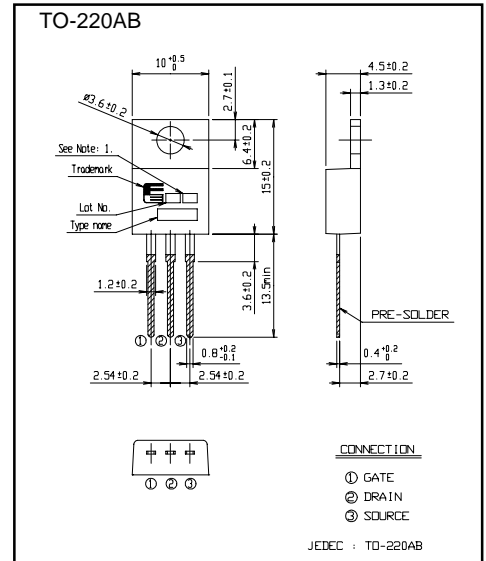
#### ■ Applications

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

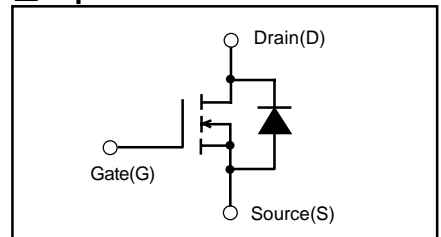
#### ■ Maximum ratings and characteristic

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

| Item                                    | Symbol               | Ratings     | Unit  | Remarks               |
|---|----------------------|-------------|-------|-----------------------|
| Drain-source voltage                    | V <sub>DS</sub>      | 230         | V     |                       |
|   | V <sub>DSX</sub>     | 230         | V     | V <sub>GS</sub> =-30V |
| Continuous Drain Current                | I <sub>D</sub>       | 40          | A     |                       |
| Pulsed Drain Current                    | I <sub>D(puls)</sub> | ±160        | A     |                       |
| Gate-Source Voltage                     | V <sub>GS</sub>      | ±30         | V     |                       |
| Maximum Avalanche current               | I <sub>AS</sub>      | 40          | A     | Note *1               |
| Non-Repetitive Maximum Avalanche Energy | E <sub>AS</sub>      | 633.1       | mJ    | Note *2               |
| Repetitive Maximum Avalanche Energy     | E <sub>AR</sub>      | 27          | mJ    | Note *3               |
| Maximum Drain-Source dV/dt              | dV <sub>DS</sub> /dt | 20          | kV/μs | V <sub>DS</sub> ≤230V |
| Peak Diode Recovery dV/dt               | dV/dt                | 5           | kV/μs | Note *4               |
| Max. Power Dissipation                  | P <sub>D</sub>       | 270         | W     | T <sub>c</sub> =25°C  |
|   |                      | 2.02        |       | T <sub>a</sub> =25°C  |
| Operating and Storage Temperature range | T <sub>ch</sub>      | +150        | °C    |                       |
|   | T <sub>stg</sub>     | -55 to +150 | °C    |                       |



#### ■ Equivalent circuit schematic



Note \*1: T<sub>ch</sub> ≤ 150°C, Repetitive and Non-repetitive

Note \*2: Starting T<sub>ch</sub>=25°C, I<sub>AS</sub>=16A, L=4.09mH,

V<sub>CC</sub>=48V, R<sub>G</sub>=50Ω

E<sub>AS</sub> limited by maximum channel temperature and Avalanche current.

See to the 'Avalanche Energy' graph

Note \*3: Repetitive rating: Pulse width limited by maximum channel temperature.

See to the 'Transient Thermal impedance' graph.

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

Note \*4: I<sub>r</sub> ≤ -I<sub>D</sub>, -di/dt=50A/μs, V<sub>CC</sub> ≤ BV<sub>DSS</sub>, T<sub>ch</sub> ≤ 150°C

| Item                             | Symbol              | Test Conditions   | Min. | Typ. | Max. | Units |
|----------------------------------|---------------------|---|------|------|------|-------|
| Drain-Source Breakdown Voltage   | BV <sub>DSS</sub>   | I <sub>D</sub> =250μA V <sub>GS</sub> =0V                     | 230  |      |      | 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> =230V V <sub>GS</sub> =0V                     |      |      | 25   | μA    |
|                                  |                     | V <sub>DS</sub> =184V V <sub>GS</sub> =0V                     |      |      | 250  |       |
| Gate-Source Leakage Current      | I <sub>GSS</sub>    | V <sub>GS</sub> =±30V V <sub>DS</sub> =0V                     |      |      | 100  | nA    |
| Drain-Source On-State Resistance | R <sub>DS(on)</sub> | I <sub>D</sub> =20A V <sub>GS</sub> =10V                      |      | 58   | 76   | mΩ    |
| Forward Transconductance         | g <sub>fs</sub>     | I <sub>D</sub> =20A V <sub>DS</sub> =25V                      | 12   | 24   |      | S     |
| Input Capacitance                | C <sub>iss</sub>    | V <sub>DS</sub> =75V  |      | 1880 | 2820 | pF    |
| Output Capacitance               | C <sub>oss</sub>    | V <sub>GS</sub> =0V   |      | 230  | 345  |       |
| Reverse Transfer Capacitance     | C <sub>rss</sub>    | f=1MH   |      | 12   | 18   |       |
| Turn-On Time t <sub>on</sub>     | td(on)              | V <sub>CC</sub> =180V I <sub>D</sub> =20A                     |      | 28   | 42   | ns    |
|                                  | t <sub>r</sub>      | V <sub>GS</sub> =10V  |      | 8.4  | 12.6 |       |
| Turn-Off Time t <sub>off</sub>   | td(off)             | R <sub>GS</sub> =10Ω  |      | 56   | 84   | ns    |
|                                  | t <sub>f</sub>      |   |      | 6    | 9    |       |
| Total Gate Charge                | Q <sub>G</sub>      | V <sub>CC</sub> =115V   |      | 42.0 | 63.0 | nC    |
| Gate-Source Charge               | Q <sub>GS</sub>     | I <sub>D</sub> =40A   |      | 18.0 | 27.0 |       |
| Gate-Drain Charge                | Q <sub>GD</sub>     | V <sub>GS</sub> =10V  |      | 12.0 | 18.0 |       |
| Diode forward on-voltage         | V <sub>SD</sub>     | I <sub>F</sub> =40A V <sub>GS</sub> =0V T <sub>ch</sub> =25°C |      | 1.10 | 1.50 | V     |
| Reverse recovery time            | t <sub>rr</sub>     | I <sub>F</sub> =40A V <sub>GS</sub> =0V                       |      | 230  |      | ns    |
| Reverse recovery charge          | Q <sub>rr</sub>     | -di/dt=100A/μs T <sub>ch</sub> =25°C                          |      | 2.5  |      | 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 |      |      | 62    | °C/W  |

## Characteristics

