



- ★ Green Device Available
- ★ Super Low Gate Charge
- ★ Excellent CdV/dt effect decline
- ★ Advanced high cell density Trench technology

## Product Summary



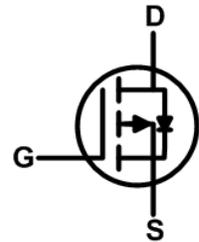
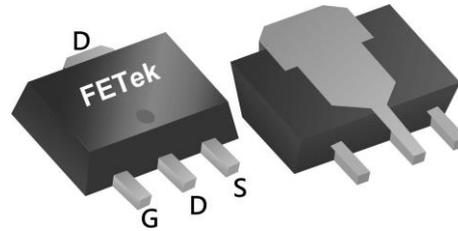
| BVDSS | RDSON | ID  |
|-------|-------|-----|
| -30V  | 52mΩ  | -4A |

## Description

The FKK3101 is the high cell density trenched P-ch MOSFETs, which provide excellent RDSON and gate charge for most of the synchronous buck converter applications.

The FKK3101 meet the RoHS and Green Product requirement, with full function reliability approved.

## SOT89 Pin Configuration



## Absolute Maximum Ratings

| Symbol                               | Parameter                            | Rating            | Units |
|--------------------------------------|--------------------------------------|-------------------|-------|
|                                      |                                      | Steady State      |       |
| V <sub>DS</sub>                      | Drain-Source Voltage                 | -30               | V     |
| V <sub>GS</sub>                      | Gate-Source Voltage                  | ±20               | V     |
| I <sub>D</sub> @T <sub>A</sub> =25°C | Continuous Drain Current             | -4                | A     |
| I <sub>D</sub> @T <sub>A</sub> =70°C | Continuous Drain Current             | -3                | A     |
| I <sub>DM</sub>                      | Pulsed Drain Current                 | -20 <sup>2</sup>  | A     |
| P <sub>D</sub> @T <sub>A</sub> =25°C | Total Power Dissipation              | 1.32 <sup>3</sup> | W     |
| P <sub>D</sub> @T <sub>A</sub> =70°C | Total Power Dissipation              | 0.84 <sup>3</sup> | W     |
| T <sub>STG</sub>                     | Storage Temperature Range            | -55 to 150        | °C    |
| T <sub>J</sub>                       | Operating Junction Temperature Range | -55 to 150        | °C    |

## Thermal Data

| Symbol           | Parameter   | Typ. | Max. | Unit |
|------------------|---|------|------|------|
| R <sub>θJA</sub> | Thermal Resistance Junction-Ambient (Steady State) <sup>1</sup> | ---  | 95   | °C/W |
| R <sub>θJC</sub> | Thermal Resistance Junction-Case <sup>1</sup>                   | ---  | 30   | °C/W |



**Electrical Characteristics (T<sub>J</sub>=25 °C, unless otherwise noted)**

| Symbol                              | Parameter                                      | Conditions   | Min. | Typ.   | Max. | Unit  |
|-------------------------------------|--|--|------|--------|------|-------|
| BV <sub>DSS</sub>                   | Drain-Source Breakdown Voltage                 | V <sub>GS</sub> =0V, I <sub>D</sub> =-250uA  | -30  | ---    | ---  | V     |
| ΔBV <sub>DSS</sub> /ΔT <sub>J</sub> | BV <sub>DSS</sub> Temperature Coefficient      | Reference to 25°C, I <sub>D</sub> =-1mA  | ---  | -0.023 | ---  | V/°C  |
| R <sub>DS(ON)</sub>                 | Static Drain-Source On-Resistance <sup>2</sup> | V <sub>GS</sub> =-10V, I <sub>D</sub> =-4A   | ---  | ---    | 52   | mΩ    |
|                                     |  | V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-2A  | ---  | ---    | 90   |       |
| V <sub>GS(th)</sub>                 | Gate Threshold Voltage                         | V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =-250uA                                  | -1.2 | ---    | -2.5 | V     |
| ΔV <sub>GS(th)</sub>                | V <sub>GS(th)</sub> Temperature Coefficient    |  | ---  | 4      | ---  | mV/°C |
| I <sub>DSS</sub>                    | Drain-Source Leakage Current                   | V <sub>DS</sub> =-24V, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C                           | ---  | ---    | -1   | uA    |
|                                     |  | V <sub>DS</sub> =-24V, V <sub>GS</sub> =0V, T <sub>J</sub> =55°C                           | ---  | ---    | -5   |       |
| I <sub>GSS</sub>                    | Gate-Source Leakage Current                    | V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V   | ---  | ---    | ±100 | nA    |
| g <sub>fs</sub>                     | Forward Transconductance                       | V <sub>DS</sub> =-5V, I <sub>D</sub> =-4A  | ---  | 11     | ---  | S     |
| Q <sub>g</sub>                      | Total Gate Charge (-4.5V)                      | V <sub>DS</sub> =-15V, V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-4A                         | ---  | 6.4    | ---  | nC    |
| Q <sub>gs</sub>                     | Gate-Source Charge                             |  | ---  | 2.3    | ---  |       |
| Q <sub>gd</sub>                     | Gate-Drain Charge                              |  | ---  | 1.9    | ---  |       |
| T <sub>d(on)</sub>                  | Turn-On Delay Time                             | V <sub>DD</sub> =-15V, V <sub>GS</sub> =-10V, R <sub>G</sub> =3.3Ω,<br>I <sub>D</sub> =-4A | ---  | 2.8    | ---  | ns    |
| T <sub>r</sub>                      | Rise Time                                      |  | ---  | 8.4    | ---  |       |
| T <sub>d(off)</sub>                 | Turn-Off Delay Time                            |  | ---  | 39     | ---  |       |
| T <sub>f</sub>                      | Fall Time                                      |  | ---  | 6      | ---  |       |
| C <sub>iss</sub>                    | Input Capacitance                              | V <sub>DS</sub> =-15V, V <sub>GS</sub> =0V, f=1MHz   | ---  | 583    | ---  | pF    |
| C <sub>oss</sub>                    | Output Capacitance                             |  | ---  | 100    | ---  |       |
| C <sub>riss</sub>                   | Reverse Transfer Capacitance                   |  | ---  | 80     | ---  |       |

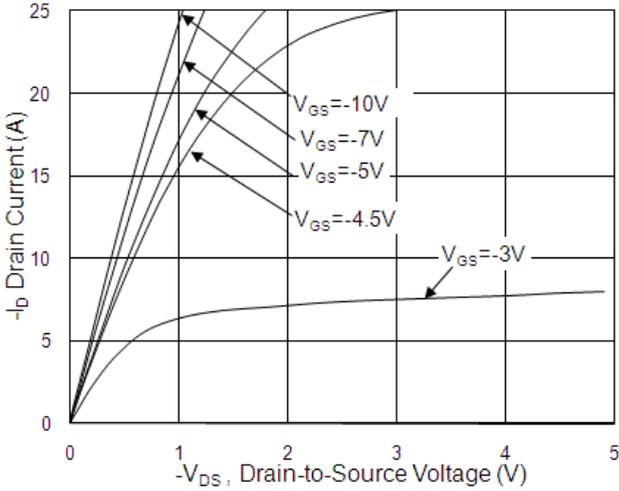
**Diode Characteristics**

| Symbol          | Parameter                                | Conditions   | Min. | Typ. | Max. | Unit |
|-----------------|--|--|------|------|------|------|
| I <sub>S</sub>  | Continuous Source Current <sup>1,4</sup> | V <sub>G</sub> =V <sub>D</sub> =0V, Force Current              | ---  | ---  | -4.5 | A    |
| I <sub>SM</sub> | Pulsed Source Current <sup>2,4</sup>     |  | ---  | ---  | -23  | A    |
| V <sub>SD</sub> | Diode Forward Voltage <sup>2</sup>       | V <sub>GS</sub> =0V, I <sub>S</sub> =-1A, T <sub>J</sub> =25°C | ---  | ---  | -1.2 | V    |
| t <sub>rr</sub> | Reverse Recovery Time                    | I <sub>F</sub> =-4A, dI/dt=100A/μs, T <sub>J</sub> =25°C       | ---  | 7.8  | ---  | nS   |
| Q <sub>rr</sub> | Reverse Recovery Charge                  |  | ---  | 2.5  | ---  | nC   |

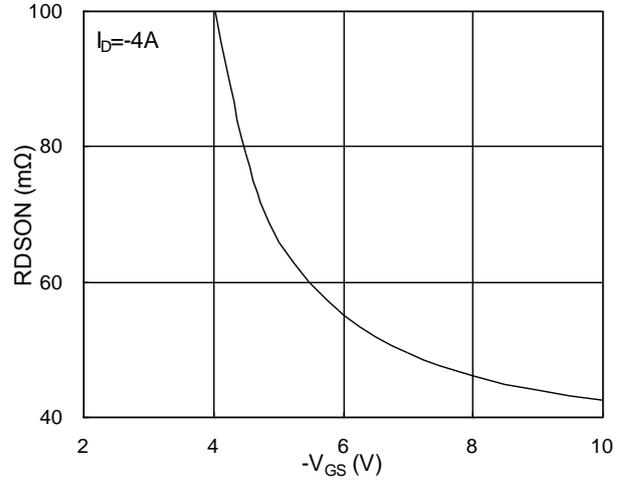
Note :

- 1.The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 1OZ copper.
- 2.The data tested by pulsed, pulse width ≤ 300us, duty cycle ≤ 2%
- 3.The power dissipation is limited by 150°C junction temperature
- 4.The data is theoretically the same as I<sub>D</sub> and I<sub>DM</sub>, in real applications, should be limited by total power dissipation.

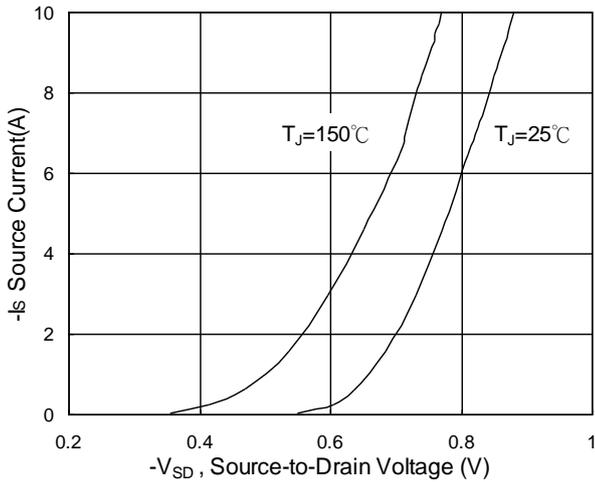
**Typical Characteristics**



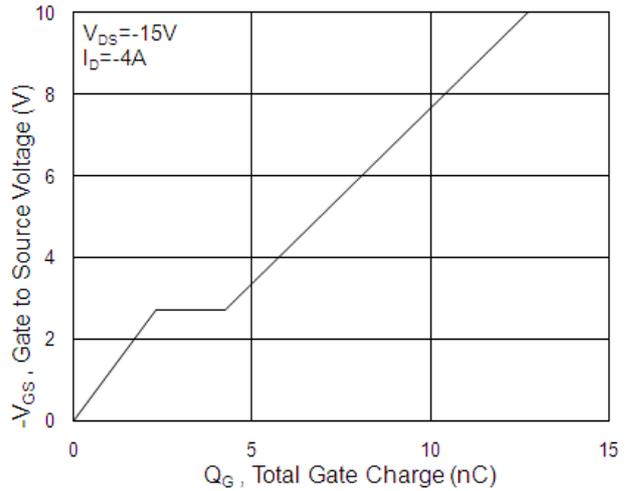
**Fig.1 Typical Output Characteristics**



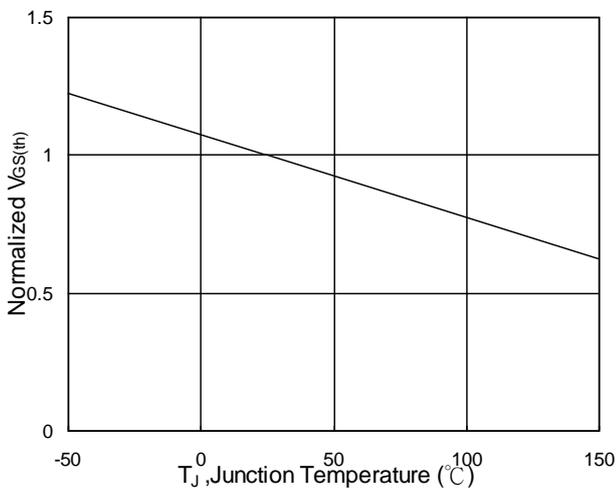
**Fig.2 On-Resistance vs. Gate-Source**



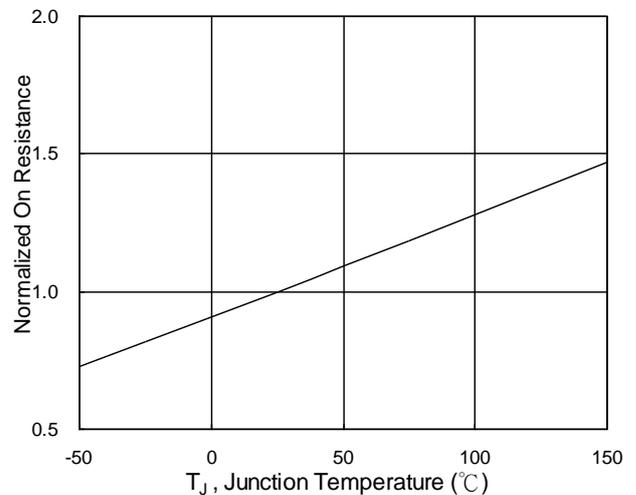
**Fig.3 Forward Characteristics of Reverse**



**Fig.4 Gate-Charge Characteristics**



**Fig.5 Normalized  $V_{GS(th)}$  vs.  $T_J$**



**Fig.6 Normalized  $R_{DS(on)}$  vs.  $T_J$**

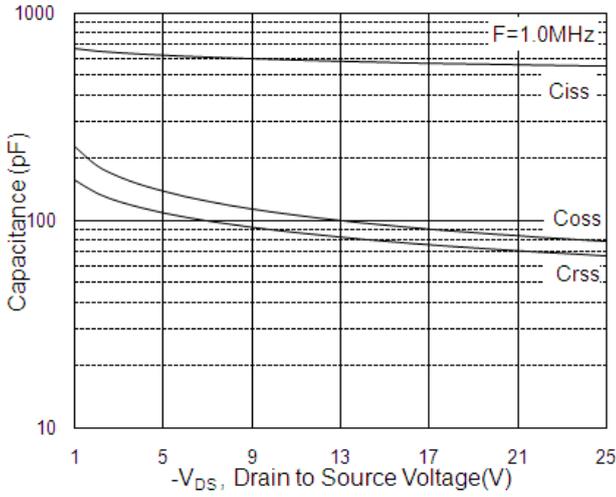


Fig.7 Capacitance

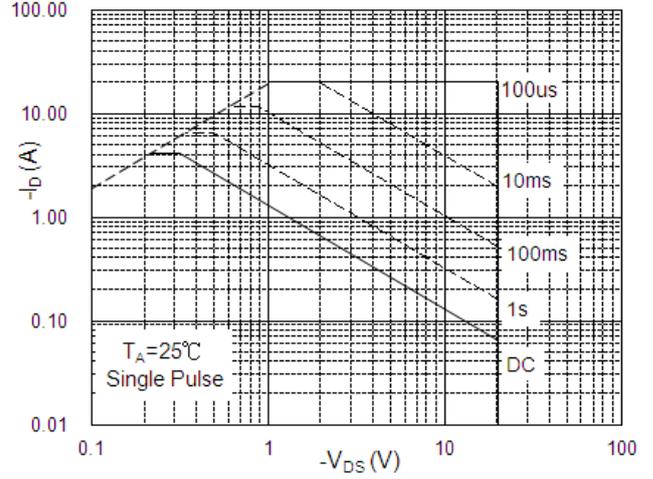


Fig.8 Safe Operating Area

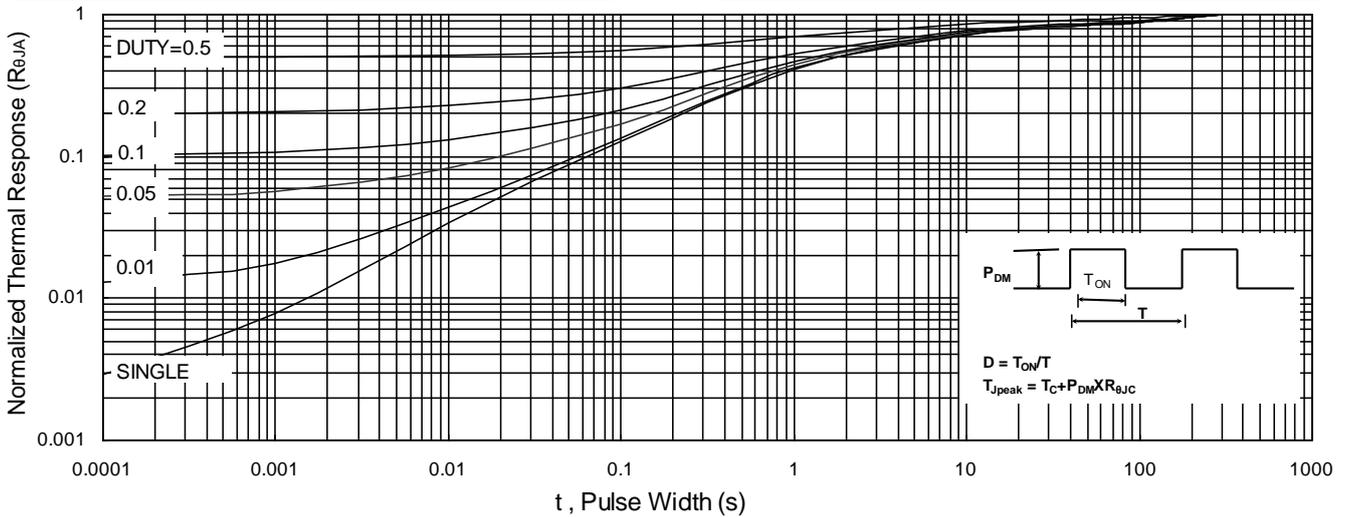


Fig.9 Normalized Maximum Transient Thermal Impedance

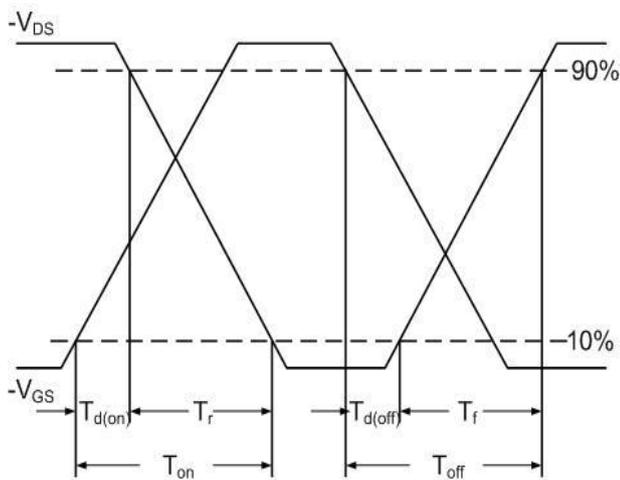


Fig.10 Switching Time Waveform

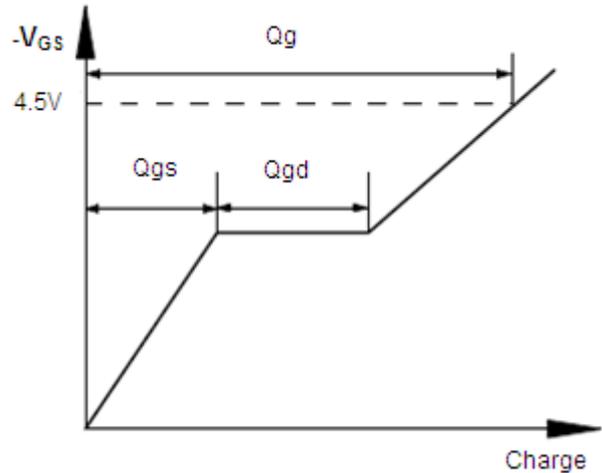


Fig.11 Gate Charge Waveform