

# MSKSEMI

SEMICONDUCTOR



ESD



TVS



TSS



MOV



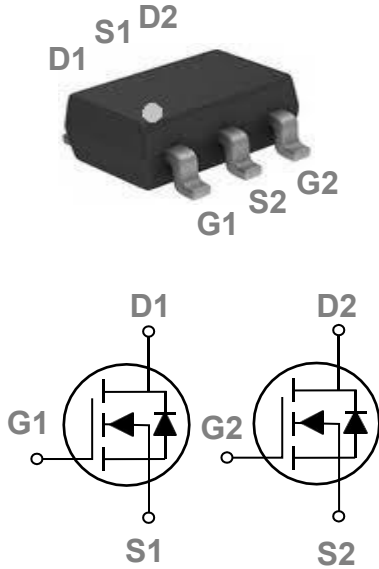
GDT



PLED

Product data sheet

**SOT23-6 Dual Pin Configuration**



**Features**

- 20V, 3.5A,  $R_{DS(ON)} = 50m\Omega @ V_{GS} = 4.5V$
- Improved  $dv/dt$  capability
- Fast switching
- Green Device Available

**Applications**

- Notebook
- Load Switch
- Hand-Held Instruments

|       |       |      |
|-------|-------|------|
| BVDSS | RDSON | ID   |
| 20V   | 50mΩ  | 3.5A |

**Absolute Maximum Ratings**  $T_c=25^\circ C$  unless otherwise noted

| Symbol    | Parameter                                       | Rating     | Units |
|-----------|---|------------|-------|
| $V_{DS}$  | Drain-Source Voltage                            | 20         | V     |
| $V_{GS}$  | Gate-Source Voltage                             | $\pm 12$   | V     |
| $I_D$     | Drain Current – Continuous ( $T_A=25^\circ C$ ) | 3.5        | A     |
|           | Drain Current – Continuous ( $T_A=70^\circ C$ ) | 2.9        | A     |
| $I_{DM}$  | Drain Current – Pulsed <sup>1</sup>             | 14.4       | A     |
| $P_D$     | Power Dissipation ( $T_A=25^\circ C$ )          | 1.25       | W     |
|           | Power Dissipation – Derate above 25°C           | 0.01       | W/°C  |
| $T_{STG}$ | Storage Temperature Range                       | -55 to 150 | °C    |
| $T_J$     | Operating Junction Temperature Range            | -55 to 150 | °C    |

**Thermal Characteristics**

| Symbol          | Parameter                              | Typ. | Max. | Unit |
|-----------------|--|------|------|------|
| $R_{\theta JA}$ | Thermal Resistance Junction to ambient | ---  | 100  | °C/W |

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

| 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                       | 20   | ---  | ---  | V    |
| ΔBV <sub>DSS</sub> /ΔT <sub>J</sub> | BV <sub>DSS</sub> Temperature Coefficient | Reference to 25°C, I <sub>D</sub> =1mA                           | ---  | 0.02 | ---  | V/°C |
| I <sub>DSS</sub>                    | Drain-Source Leakage Current              | V <sub>DS</sub> =20V, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C  | ---  | ---  | 1    | uA   |
|                                     |   | V <sub>DS</sub> =16V, V <sub>GS</sub> =0V, T <sub>J</sub> =125°C | ---  | ---  | 10   | uA   |
| I <sub>GSS</sub>                    | Gate-Source Leakage Current               | V <sub>GS</sub> =±12V, V <sub>DS</sub> =0V                       | ---  | ---  | ±100 | nA   |

**On Characteristics**

|                      |   |  |     |     |     |       |
|----------------------|---|--|-----|-----|-----|-------|
| R <sub>DS(on)</sub>  | Static Drain-Source On-Resistance           | V <sub>GS</sub> =4.5V, I <sub>D</sub> =3A                | --- | 50  | 60  | mΩ    |
|                      |   | V <sub>GS</sub> =2.5V, I <sub>D</sub> =2A                | --- | 60  | 80  |       |
| V <sub>GS(th)</sub>  | Gate Threshold Voltage                      | V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =250uA | 0.4 | 0.8 | 1.2 | V     |
| ΔV <sub>GS(th)</sub> | V <sub>GS(th)</sub> Temperature Coefficient |  | --- | 2   | --- | mV/°C |
| g <sub>fs</sub>      | Forward Transconductance                    | V <sub>DS</sub> =10V, I <sub>S</sub> =2A                 | --- | 4.4 | --- | S     |

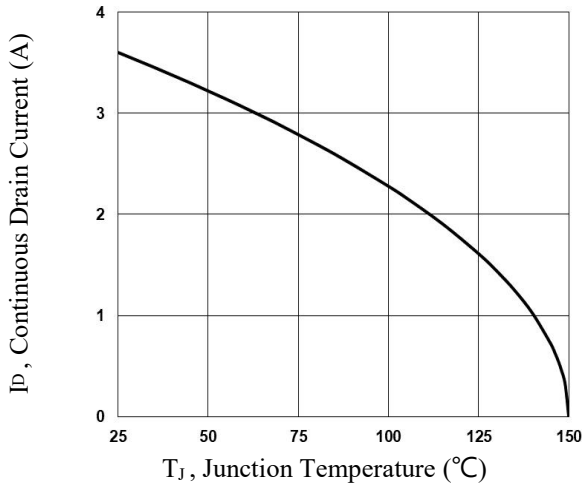
**Dynamic and switching Characteristics**

|                     |                                    |  |     |      |     |    |
|---------------------|------------------------------------|--|-----|------|-----|----|
| Q <sub>g</sub>      | Total Gate Charge <sup>2,3</sup>   | V <sub>DS</sub> =10V, V <sub>GS</sub> =4.5V, I <sub>D</sub> =1A                        | --- | 3.6  | --- | nC |
| Q <sub>gs</sub>     | Gate-Source Charge <sup>2,3</sup>  |  | --- | 0.38 | --- |    |
| Q <sub>gd</sub>     | Gate-Drain Charge <sup>2,3</sup>   |  | --- | 0.6  | --- |    |
| T <sub>d(on)</sub>  | Turn-On Delay Time <sup>2,3</sup>  | V <sub>DD</sub> =10V, V <sub>GS</sub> =4.5V, R <sub>G</sub> =25Ω<br>I <sub>D</sub> =1A | --- | 1.8  | --- | nS |
| T <sub>r</sub>      | Rise Time <sup>2,3</sup>           |  | --- | 5.6  | --- |    |
| T <sub>d(off)</sub> | Turn-Off Delay Time <sup>2,3</sup> |  | --- | 11.3 | --- |    |
| T <sub>f</sub>      | Fall Time <sup>2,3</sup>           |  | --- | 3.2  | --- |    |
| C <sub>iss</sub>    | Input Capacitance                  | V <sub>DS</sub> =15V, V <sub>GS</sub> =0V, F=1MHz                                      | --- | 180  | --- | pF |
| C <sub>oss</sub>    | Output Capacitance                 |  | --- | 32   | --- |    |
| C <sub>rss</sub>    | Reverse Transfer Capacitance       |  | --- | 26   | --- |    |

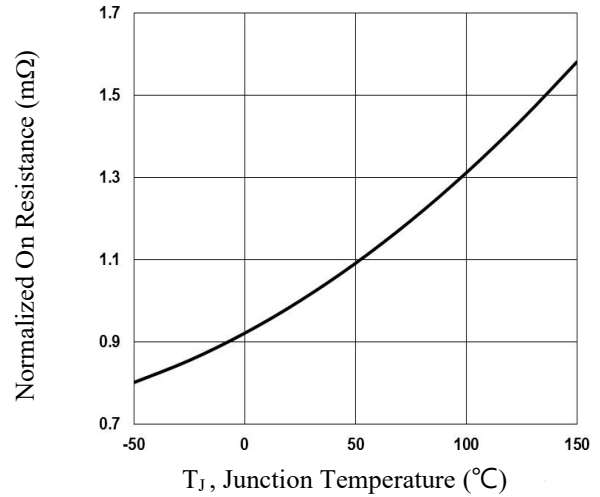
**Drain-Source Diode Characteristics and Maximum Ratings**

| Symbol          | Parameter                 | Conditions  | Min. | Typ. | Max. | Unit |
|-----------------|---------------------------|---|------|------|------|------|
| I <sub>S</sub>  | Continuous Source Current | V <sub>G</sub> =V <sub>D</sub> =0V, Force Current             | ---  | ---  | 3.5  | A    |
| I <sub>SM</sub> | Pulsed Source Current     |   | ---  | ---  | 7.0  | A    |
| V <sub>SD</sub> | Diode Forward Voltage     | V <sub>GS</sub> =0V, I <sub>S</sub> =1A, T <sub>J</sub> =25°C | ---  | ---  | 1.2  | V    |

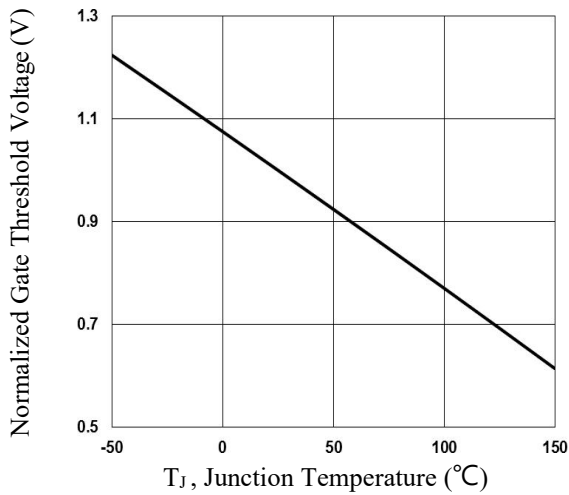
**PACKAGE MECHANICAL DATA**



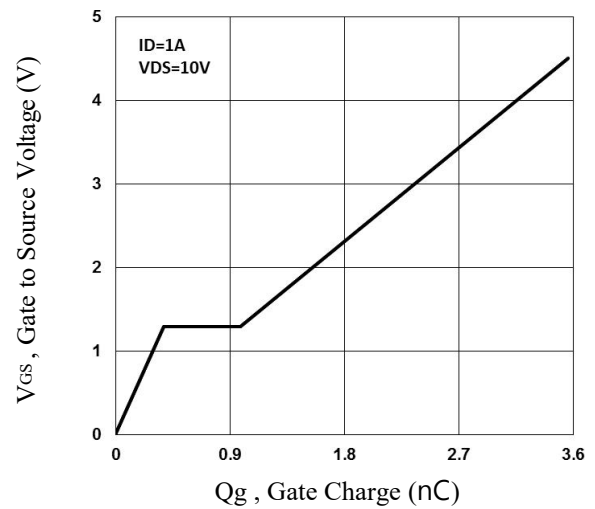
**Fig.1 Continuous Drain Current vs.  $T_J$**



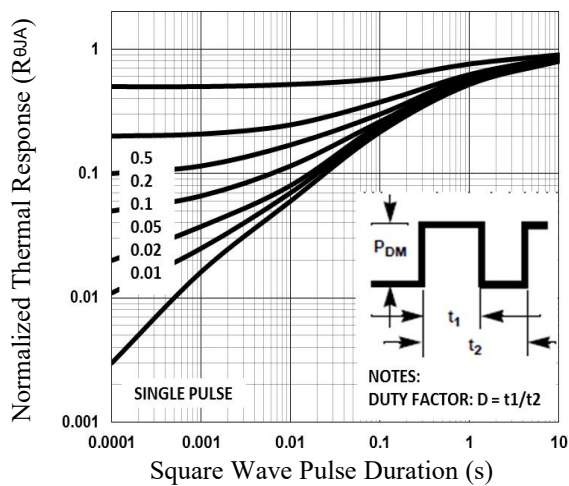
**Fig.2 Normalized  $R_{DS(on)}$  vs.  $T_J$**



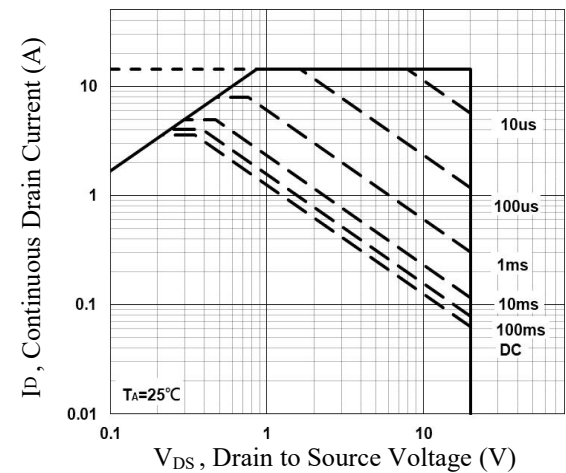
**Fig.3 Normalized  $V_{th}$  vs.  $T_J$**



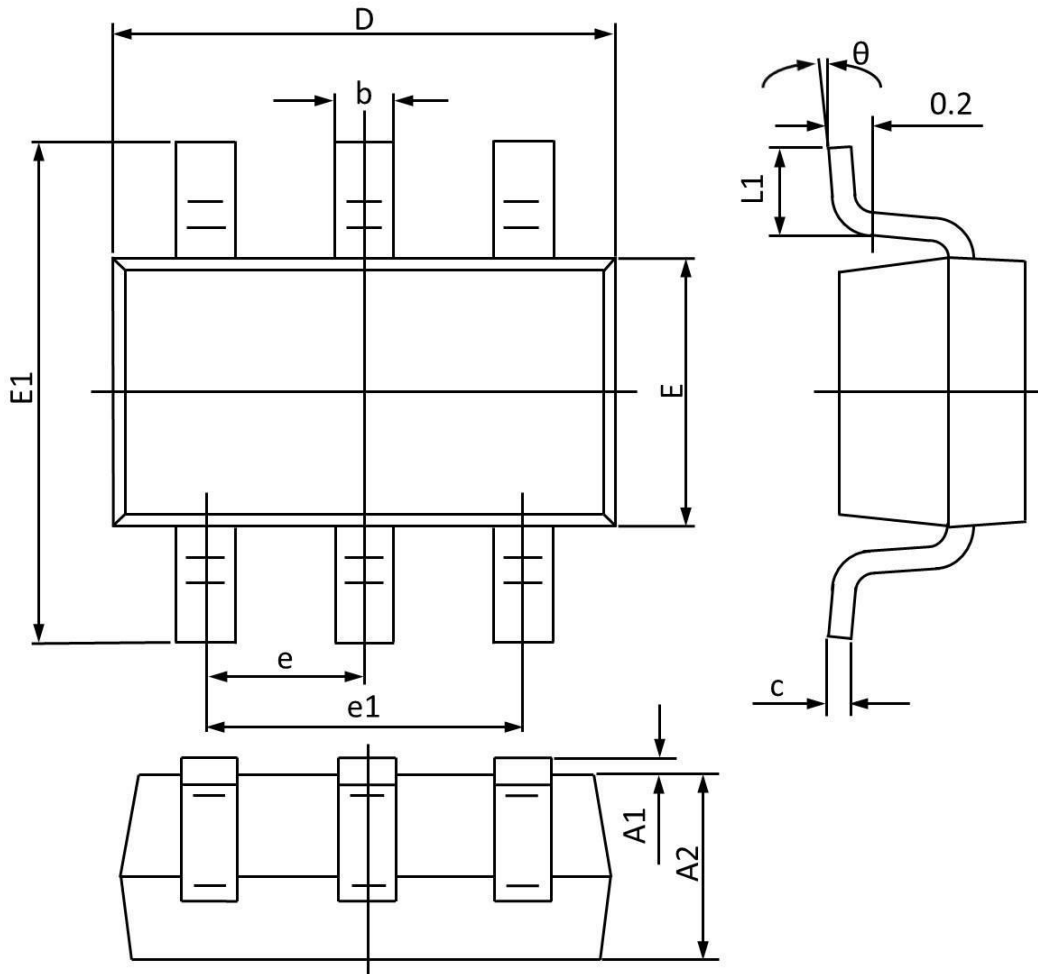
**Fig.4 Gate Charge Waveform**



**Fig.5 Normalized Transient Impedance**



**Fig.6 Maximum Safe Operation Area**



| Symbol | Dimensions In Millimeters |       | Dimensions In Inches |       |
|--------|---------------------------|-------|----------------------|-------|
|        | Min                       | Max   | Min                  | Max   |
| A1     | 0.000                     | 0.100 | 0.000                | 0.004 |
| A2     | 1.000                     | 1.200 | 0.040                | 0.047 |
| b      | 0.300                     | 0.500 | 0.012                | 0.019 |
| c      | 0.047                     | 0.207 | 0.002                | 0.008 |
| D      | 2.800                     | 3.000 | 0.110                | 0.118 |
| E      | 1.500                     | 1.800 | 0.059                | 0.070 |
| E1     | 2.600                     | 3.000 | 0.103                | 0.118 |
| e      | 0.950 TYP                 |       | 0.037 TYP            |       |
| e1     | 1.900 TYP                 |       | 0.075 TYP            |       |
| L1     | 0.250                     | 0.550 | 0.010                | 0.021 |
| θ      | 0°                        | 8°    | 0°                   | 8°    |

**REEL SPECIFICATION**

| P/N      | PKG      | QTY  |
|----------|----------|------|
| FDC6401N | SOT-23-6 | 3000 |

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