

## N-Channel 50 V (D-S) MOSFET

### PRODUCT SUMMARY

| $V_{DS}$ (V) | $R_{DS(on)}$ ( $\Omega$ )(Typ.) | $I_D$ (A) <sup>a</sup> | $Q_g$ (Typ.) |
|--------------|---------------------------------|------------------------|--------------|
| 50           | 1.2 at $V_{GS} = 10$ V          | 0.31                   | 1.7 nC       |
|              | 1.4 at $V_{GS} = 4.5$ V         |                        |              |

### FEATURES

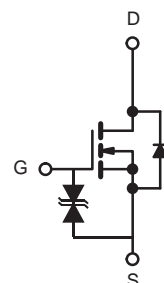
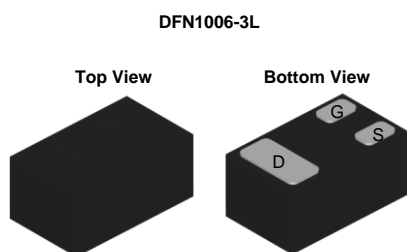
- DT-Trench Power MOSFET
- Surface Mount Package
- ESD Protection

### APPLICATIONS

- Battery operated systems
- Direct logic-level interface: TTL/CMOS



**RoHS**  
COMPLIANT



N-Channel MOSFET

### ABSOLUTE MAXIMUM RATINGS ( $T_J = 25$ °C, unless otherwise noted)

| PARAMETER  | SYMBOL         | LIMIT       | UNIT |
|--|----------------|-------------|------|
| Drain-Source Voltage                             | $V_{DS}$       | 50          | V    |
| Gate-Source Voltage                              | $V_{GS}$       | $\pm 20$    |      |
| Continuous Drain Current ( $T_J = 150$ °C)       | $I_D$          | 0.31        | A    |
|  |                | 0.22        |      |
| Pulsed Drain Current                             | $I_{DM}$       | 1.55        |      |
| Maximum Power Dissipation <sup>a</sup>           | $P_D$          | 0.36        | W    |
|  |                | 0.22        |      |
| Operating Junction and Storage Temperature Range | $T_J, T_{stg}$ | -55 to +150 | °C   |

### THERMAL RESISTANCE RATINGS

| PARAMETER                                    | SYMBOL     | LIMIT | UNIT |
|--|------------|-------|------|
| Junction-to-Ambient (PCB Mount) <sup>b</sup> | $R_{thJA}$ | 355   | °C/W |

Notes:

a.  $T_C = 25$  °C.

b. Surface mounted on 1" x 1" FR4 board.

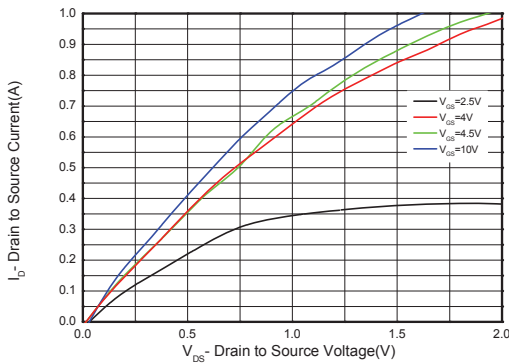
| SPECIFICATIONS (T <sub>J</sub> = 25 °C, unless otherwise noted)                           |                     |   |      |      |      |      |
|---|---------------------|---|------|------|------|------|
| PARAMETER   | SYMBOL              | TEST CONDITIONS   | MIN. | TYP. | MAX. | UNIT |
| Static  |                     |   |      |      |      |      |
| Drain-Source Breakdown Voltage  | V <sub>DS</sub>     | V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA  | 50   | -    | -    | V    |
| Gate Threshold Voltage  | V <sub>GS(th)</sub> | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA                                       | 0.8  | -    | 2    |      |
| Gate-Body Leakage   | I <sub>GSS</sub>    | V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ± 20 V   | -    | -    | ± 10 | μA   |
| Zero Gate Voltage Drain Current   | I <sub>DSS</sub>    | V <sub>DS</sub> = 240 V, V <sub>GS</sub> = 0 V  | -    | -    | 1    | μA   |
| On-State Drain Current <sup>a</sup>   | I <sub>D(on)</sub>  | V <sub>DS</sub> ≥ 5 V, V <sub>GS</sub> = 10 V   | 0.31 | -    | -    | A    |
| Drain-Source On-State Resistance <sup>a</sup>   | R <sub>DS(on)</sub> | V <sub>GS</sub> = 10 V, I <sub>D</sub> = 0.45 A   | -    | 1.2  | 1.8  | Ω    |
|   |                     | V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 0.25 A  | -    | 1.4  | 2    |      |
| Forward Transconductance <sup>a</sup>   | g <sub>fs</sub>     | V <sub>DS</sub> = 15 V, I <sub>D</sub> = 0.1 A  | -    | 0.5  | -    | S    |
| Dynamic <sup>b</sup>  |                     |   |      |      |      |      |
| Input Capacitance   | C <sub>iss</sub>    | V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 15 V, f = 1MHz   | -    | 23   | 40   | pF   |
| Output Capacitance  | C <sub>oss</sub>    |   | -    | 12   | 19   |      |
| Reverse Transfer Capacitance  | C <sub>rss</sub>    |   | -    | 5    | 10   |      |
| Total Gate Charge <sup>c</sup>  | Q <sub>g</sub>      | V <sub>DS</sub> = 30 V, V <sub>GS</sub> = 10 V, I <sub>D</sub> = 0.1 A                            | -    | 1.7  | 2.5  | nC   |
| Gate-Source Charge <sup>c</sup>   | Q <sub>gs</sub>     |   | -    | 0.4  | 0.6  |      |
| Gate-Drain Charge <sup>c</sup>  | Q <sub>gd</sub>     |   | -    | 0.45 | 0.8  |      |
| Switching Parameters  |                     |   |      |      |      |      |
| Turn-On Delay Time  | t <sub>d(on)</sub>  | V <sub>DS</sub> = 30 V, I <sub>D</sub> = 0.2 A,<br>V <sub>GS</sub> = 10 V, R <sub>g</sub> = 3.5 Ω | -    | 8.6  | -    | ns   |
| Rise Time   | t <sub>r</sub>      |   | -    | 4    | -    |      |
| Turn-Off DelayTime  | t <sub>d(off)</sub> |   | -    | 23   | -    |      |
| Fall Time   | t <sub>f</sub>      |   | -    | 14   | -    |      |
| Drain-Source Body Diode Ratings and Characteristics <sup>b</sup> (T <sub>C</sub> = 25 °C) |                     |   |      |      |      |      |
| Continuous Source Current   | I <sub>S</sub>      | T <sub>C</sub> = 25 °C  | -    | -    | 0.31 | A    |
| Pulsed Source Current   | I <sub>SM</sub>     |   | -    | -    | 1.55 | A    |
| Forward Voltage <sup>a</sup>  | V <sub>SD</sub>     | I <sub>S</sub> = 0.2 A, V <sub>GS</sub> = 0 V   | -    | -    | 1.2  | V    |

**Notes**

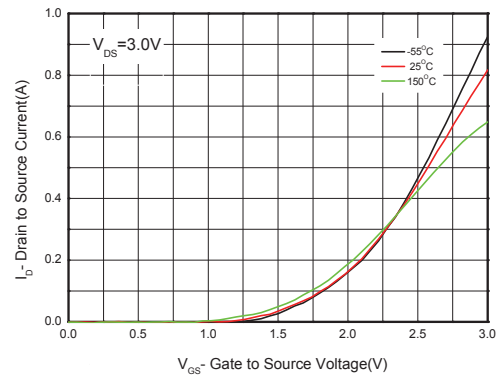
- a. Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .  
 b. Guaranteed by design, not subject to production testing.  
 c. Independent of operating temperature.

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

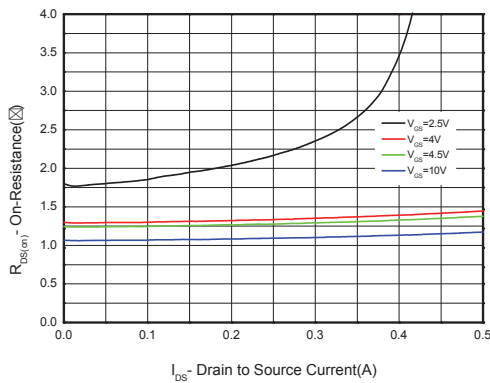
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



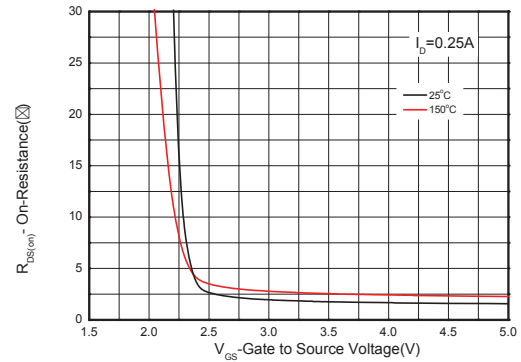
**Output characteristics**



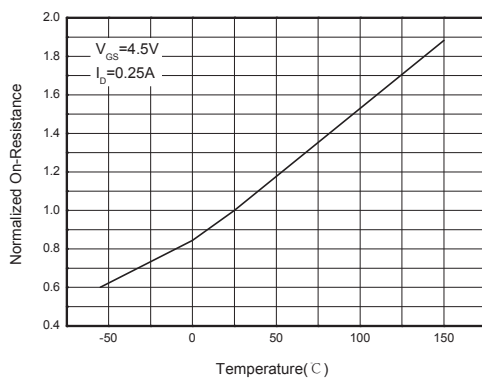
**Transfer characteristics**



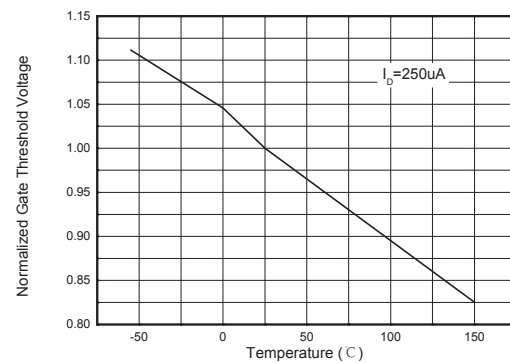
**On-Resistance vs. Drain current**



**On-Resistance vs. Gate-to-Source voltage**

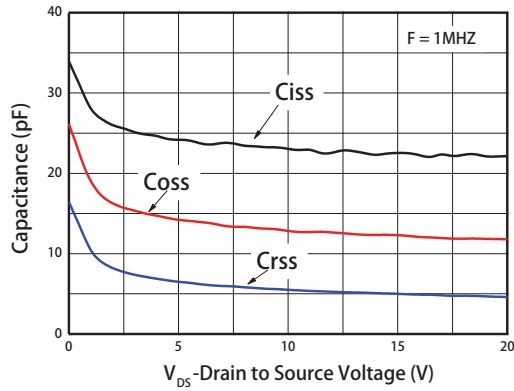


**On-Resistance vs. Junction temperature**

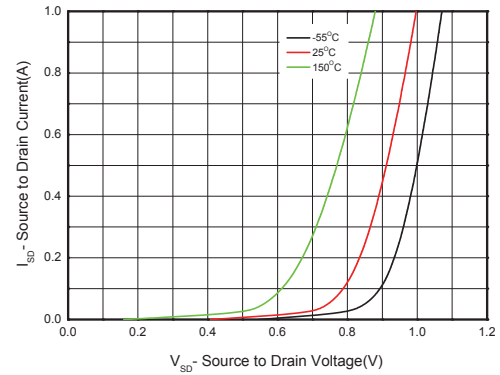


**Threshold voltage vs. Temperature**

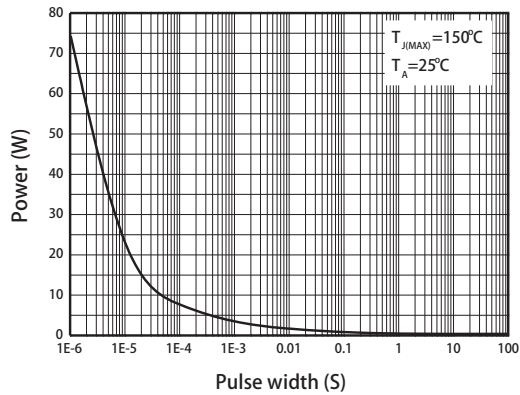
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



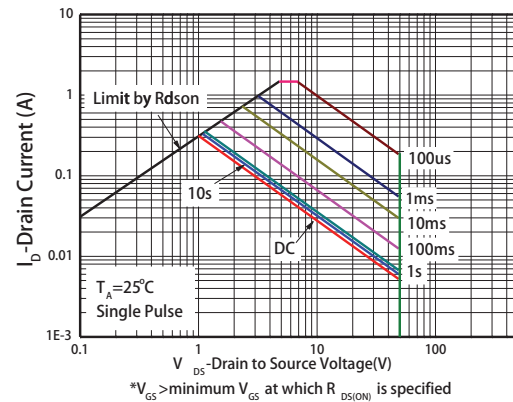
**Capacitance**



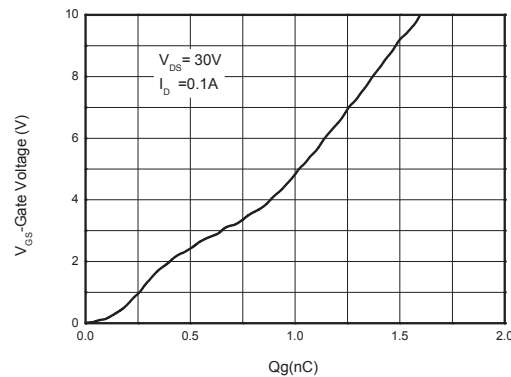
**Body diode forward voltage**



**Single pulse power**

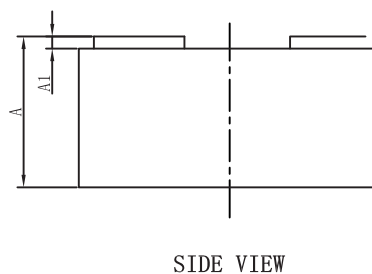
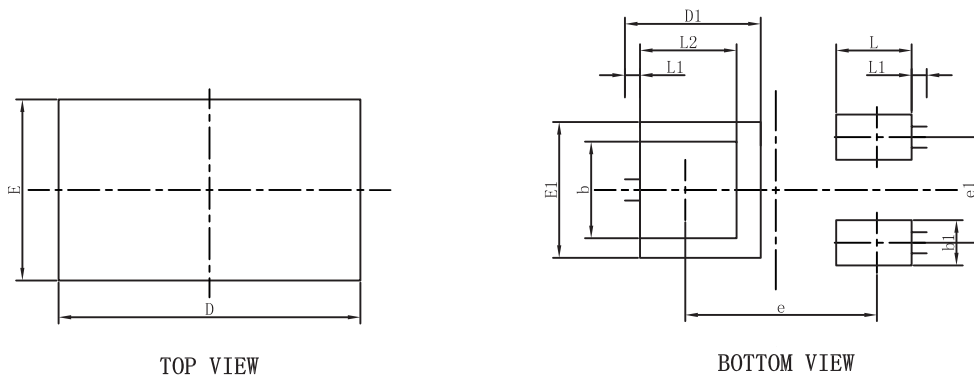


**Safe operating power**



**Gate charge Characteristics**

# DFN1006-3L PACKAGE OUTLINE



COMMON DIMENSIONS  
(UNITS OF MEASURE=MILLIMETER)

| SYMBOL | MIN      | TYP   | MAX   |
|--------|----------|-------|-------|
| A      | 0.400    | 0.500 | 0.600 |
| A1     | 0.000    | 0.050 | 0.150 |
| D      | 0.850    | 1.000 | 1.150 |
| E      | 0.450    | 0.600 | 0.750 |
| D1     | 0.450REF |       |       |
| E1     | 0.450REF |       |       |
| b      | 0.200    | 0.350 | 0.600 |
| b1     | 0.050    | 0.150 | 0.250 |
| e      | 0.635REF |       |       |
| e1     | 0.200    | 0.300 | 0.500 |
| L      | 0.150    | 0.250 | 0.350 |
| L1     | 0.050REF |       |       |
| L2     | 0.150    | 0.300 | 0.400 |

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