

## N-Channel 30 V (D-S) MOSFET

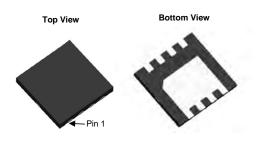
| PRODUCT SUMMARY     |                                     |                    |                       |  |  |  |
|---------------------|-------------------------------------|--------------------|-----------------------|--|--|--|
| V <sub>DS</sub> (V) | $R_{DS(on)}$ ( $\Omega$ ) Typ.      | I <sub>D</sub> (A) | Q <sub>g</sub> (Typ.) |  |  |  |
| 30                  | $0.004$ at $V_{GS} = 4.5 \text{ V}$ | 60                 | 33.5 nC               |  |  |  |
| 30                  | 0.005 at V <sub>GS</sub> = 2.5 V    | 50                 | 33.3 110              |  |  |  |

#### **FEATURES**

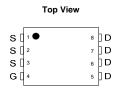
- Halogen-free According to IEC 61249-2-21 Definition
- TrenchFET® Power MOSFET
- 100 % R<sub>g</sub> and UIS Tested Compliant to RoHS Directive 2002/95/EC

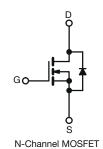
#### **APPLICATIONS**

- Motor Control
- Industrial
- Load Switch
- ORing



DFN 3x3 EP





| Parameter  | Symbol Limit  |                                   | Unit   |    |  |
|--|---|-----------------------------------|--|----|--|
| Drain-Source Voltage                               |   | V <sub>DS</sub>                   | 30   |    |  |
| Gate-Source Voltage                                |   | V <sub>GS</sub>                   | ± 20   | V  |  |
| Continuous Drain Current (T <sub>J</sub> = 150 °C) | $T_{C} = 25 ^{\circ}\text{C}$ $T_{C} = 70 ^{\circ}\text{C}$ $T_{A} = 25 ^{\circ}\text{C}$ $T_{A} = 70 ^{\circ}\text{C}$ | I <sub>D</sub>                    | 60 <sup>a, e</sup><br>40 <sup>a, e</sup><br>22 <sup>b, c</sup><br>15 <sup>b, c</sup> | A  |  |
| Pulsed Drain Current (t = 300 μs)                  |   | I <sub>DM</sub>                   | 150  | A  |  |
| Continuous Source-Drain Diode Current              | $T_C = 25 \degree C$<br>$T_A = 25 \degree C$  | I <sub>S</sub>                    | 35<br>3.3 <sup>b, c</sup>  |    |  |
| Single Pulse Avalanche Current L = 0.1 mH          |   | I <sub>AS</sub>                   | 20   |    |  |
| Single Pulse Avalanche Energy                      | L = 0.1 IIII  | E <sub>AS</sub>                   | 20   | mJ |  |
| Maximum Power Dissipation                          | $T_{C} = 25 ^{\circ}\text{C}$ $T_{C} = 70 ^{\circ}\text{C}$ $T_{A} = 25 ^{\circ}\text{C}$ $T_{A} = 70 ^{\circ}\text{C}$ | P <sub>D</sub>                    | 52<br>33<br>3.7 <sup>b, c</sup><br>2.4 <sup>b, c</sup>                               | w  |  |
| Operating Junction and Storage Temperature Range   |   | T <sub>J</sub> , T <sub>stg</sub> | - 55 to 150  | °C |  |
| Soldering Recommendations (Peak Tempera            |   | 260                               |  |    |  |

| THERMAL RESISTANCE RATINGS                  |              |            |         |         |      |  |
|---|--------------|------------|---------|---------|------|--|
| Parameter                                   |              | Symbol     | Typical | Maximum | Unit |  |
| Maximum Junction-to-Ambient <sup>b, d</sup> | t ≤ 10 s     | $R_{thJA}$ | 24      | 33      | °C/W |  |
| Maximum Junction-to-Case (Drain)            | Steady State | $R_{thJC}$ | 1.9     | 2.4     | 0/11 |  |

- a. Based on T<sub>C</sub> = 25 °C.
  b. Surface mounted on 1" x 1" FR4 board.
- c. t = 10 s.
- d. Maximum under steady state conditions is 90 °C/W.
- e. Calculated based on maximum junction temperature. Package limitation current is 80 A.



| Parameter                                     | Symbol                  | Test Conditions  | Min. | Тур.   | Max.  | Unit       |  |
|---|-------------------------|--|------|--------|-------|------------|--|
| Static  |                         |  |      |        |       |            |  |
| Drain-Source Breakdown Voltage                | V <sub>DS</sub>         | $V_{GS} = 0 \text{ V}, I_D = 250 \mu\text{A}$  | 30   |        |       | V          |  |
| V <sub>DS</sub> Temperature Coefficient       | $\Delta V_{DS}/T_{J}$   | ns/T <sub>1</sub>  |      | 30     |       | 1406       |  |
| V <sub>GS(th)</sub> Temperature Coefficient   | $\Delta V_{GS(th)}/T_J$ | $I_{D} = 250 \mu A$  |      | - 5.6  |       | mV/°C      |  |
| Gate-Source Threshold Voltage                 | V <sub>GS(th)</sub>     | $V_{DS} = V_{GS}$ , $I_D = 250 \mu A$  | 0.5  |        | 1.5   | V          |  |
| Gate-Source Leakage                           | I <sub>GSS</sub>        | $V_{DS} = 0 \text{ V}, V_{GS} = \pm 20 \text{ V}$  |      |        | ± 100 | nA         |  |
| Zana Oata Wallana Busin Ouwant                | ,                       | $V_{DS} = 30 \text{ V}, V_{GS} = 0 \text{ V}$  |      |        | 1     | 1<br>10 μΑ |  |
| Zero Gate Voltage Drain Current               | IDSS                    | $V_{DS} = 30 \text{ V}, V_{GS} = 0 \text{ V}, T_{J} = 55 \text{ °C}$                       |      |        | 10    |            |  |
| On-State Drain Current <sup>a</sup>           | I <sub>D(on)</sub>      | $V_{DS} \ge 5 \text{ V}, V_{GS} = 10 \text{ V}$  | 30   |        |       | Α          |  |
| D : 0   | Б                       | $V_{GS} = 4.5 \text{ V}, I_D = 10 \text{ A}$   |      | 0.0040 |       | Ω          |  |
| Drain-Source On-State Resistance <sup>a</sup> | R <sub>DS(on)</sub>     | $V_{GS} = 2.5 \text{ V}, I_D = 7 \text{ A}$  |      | 0.0050 |       |            |  |
| Forward Transconductance <sup>a</sup>         | 9 <sub>fs</sub>         | $V_{DS} = 15 \text{ V}, I_D = 10 \text{ A}$  |      | 65     |       | S          |  |
| Dynamic <sup>b</sup>                          | <u> </u>                |  |      |        |       |            |  |
| Input Capacitance                             | C <sub>iss</sub>        |  |      | 6000   |       | pF         |  |
| Output Capacitance                            | C <sub>oss</sub>        | $V_{DS} = 15 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$                           |      | 406    |       |            |  |
| Reverse Transfer Capacitance                  | C <sub>rss</sub>        |  |      | 360    |       |            |  |
| Total Oaks Observe                            | Q <sub>g</sub>          | $V_{DS} = 15 \text{ V}, V_{GS} = 10 \text{ V}, I_{D} = 10 \text{ A}$                       |      | 68     | 102   |            |  |
| Total Gate Charge                             |                         |  |      | 33.5   | 51    | nC         |  |
| Gate-Source Charge                            | Q <sub>gs</sub>         | $V_{DS} = 15 \text{ V}, V_{GS} = 4.5 \text{ V}, I_D = 10 \text{ A}$                        |      | 7.7    |       |            |  |
| Gate-Drain Charge                             | $Q_{gd}$                |  |      | 13.8   |       |            |  |
| Gate Resistance                               | $R_{g}$                 | f = 1 MHz  | 0.3  | 0.7    | 1.4   | Ω          |  |
| Turn-On Delay Time                            | t <sub>d(on)</sub>      |  |      | 24     | 45    |            |  |
| Rise Time                                     | t <sub>r</sub>          | $V_{DD}$ = 15 V, $R_L$ = 1.5 $\Omega$  |      | 24     | 45    |            |  |
| Turn-Off Delay Time                           | t <sub>d(off)</sub>     | $I_D\cong$ 10 A, $V_{GEN}$ = 4.5 V, $R_g$ = 1 $\Omega$                                     |      | 32     | 60    |            |  |
| Fall Time                                     | t <sub>f</sub>          |  |      | 12     | 24    |            |  |
| Turn-On Delay Time                            | t <sub>d(on)</sub>      |  |      | 14     | 28    | ns<br>-    |  |
| Rise Time                                     | t <sub>r</sub>          | $V_{DD}$ = 15 V, $R_L$ = 1.5 $\Omega$  |      | 13     | 26    |            |  |
| Turn-Off Delay Time                           | t <sub>d(off)</sub>     | $I_D\cong 10$ A, $V_{GEN}$ = 10 V, $R_g$ = 1 $\Omega$                                      |      | 33     | 60    |            |  |
| Fall Time                                     | t <sub>f</sub>          |  |      | 8      | 16    |            |  |
| <b>Drain-Source Body Diode Characteristi</b>  | cs                      |  |      |        |       |            |  |
| Continuous Source-Drain Diode Current         | I <sub>S</sub>          | T <sub>C</sub> = 25 °C   |      | 35     |       |            |  |
| Pulse Diode Forward Current                   | I <sub>SM</sub>         |  |      | 70     |       | A          |  |
| Body Diode Voltage                            | V <sub>SD</sub>         | I <sub>S</sub> = 3 A, V <sub>GS</sub> = 0 V  |      | 0.7    | 1.1   | ٧          |  |
| Body Diode Reverse Recovery Time              | t <sub>rr</sub>         |  |      | 21     | 40    | ns         |  |
| Body Diode Reverse Recovery Charge            | Q <sub>rr</sub>         | 1 10 A dl/dt 100 A/v- T 05 00  |      | 10     | 20    | nC         |  |
| Reverse Recovery Fall Time                    | ta                      | $I_F = 10 \text{ A}, \text{ dI/dt} = 100 \text{ A/}\mu\text{s}, T_J = 25 ^{\circ}\text{C}$ |      | 9      |       |            |  |
| Reverse Recovery Rise Time                    | t <sub>b</sub>          |  |      | 12     |       | ns         |  |

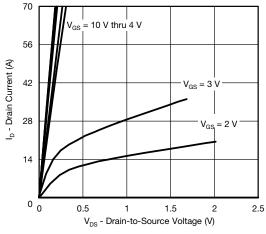
#### Notes:

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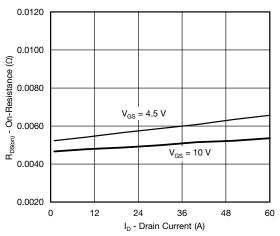
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

a. Pulse test; pulse width  $\leq$  300  $\mu s,$  duty cycle  $\leq$  2 % b. Guaranteed by design, not subject to production testing.

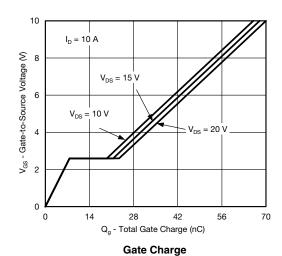


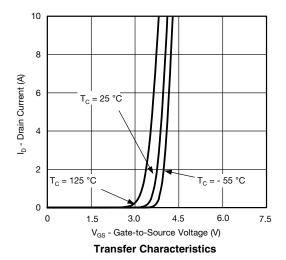


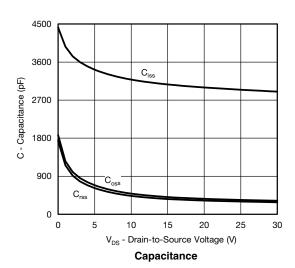


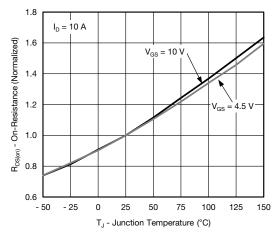


On-Resistance vs. Drain Current and Gate Voltage



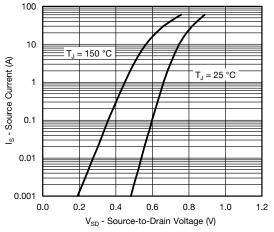




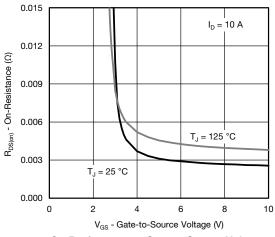


On-Resistance vs. Junction Temperature

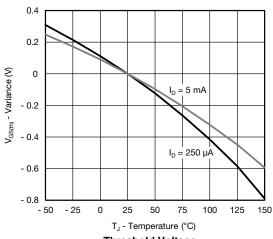




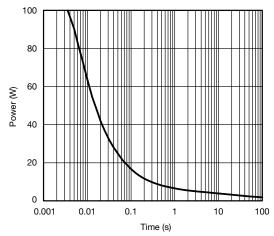
Source-Drain Diode Forward Voltage



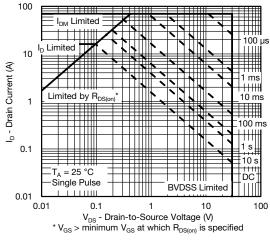
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage

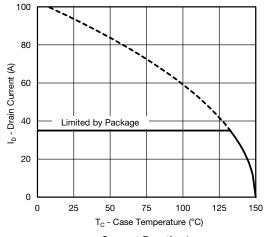


Single Pulse Power, Junction-to-Ambient

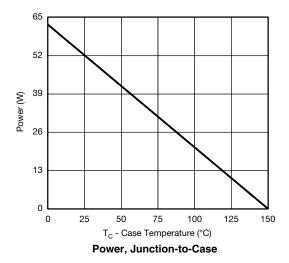


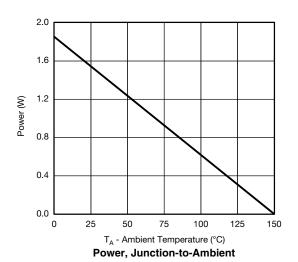
Safe Operating Area, Junction-to-Ambient





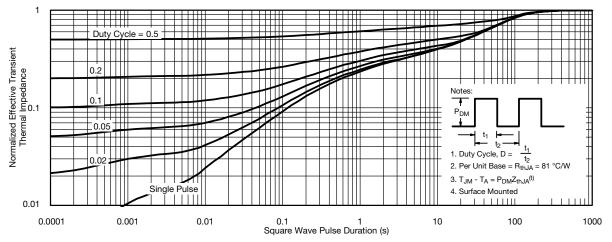
**Current Derating\*** 



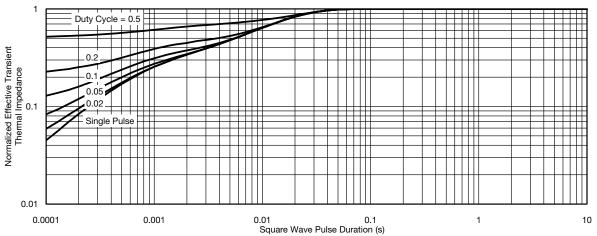


<sup>\*</sup> The power dissipation  $P_D$  is based on  $T_{J(max.)} = 150$  °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.



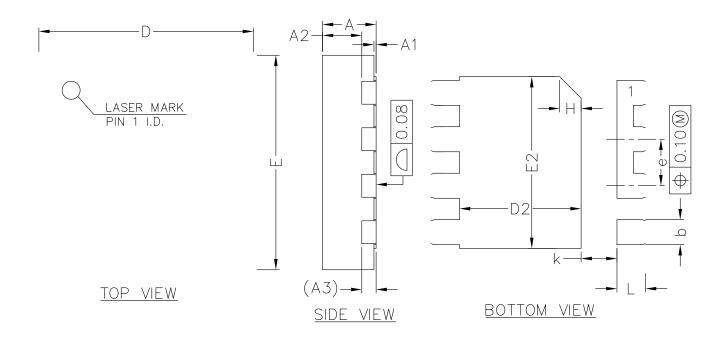


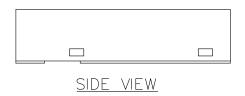
Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Case







COMMON DIMENSIONS (UNITS OF MEASURE=MILLIMETER)

| SYMBOL | MIN     | NOM  | MAX  |  |
|--------|---------|------|------|--|
| А      | 0.70    | 0.75 | 0.80 |  |
| A1     | 0.00    | 0.02 | 0.05 |  |
| A2     | 0.50    | 0.55 | 0.60 |  |
| А3     | 0.20REF |      |      |  |
| Ь      | 0.30    | 0.35 | 0.40 |  |
| D      | 2.90    | 3.00 | 3.10 |  |
| E      | 2.90    | 3.00 | 3.10 |  |
| D2     | 1.60    | 1.70 | 1.80 |  |
| E2     | 2.30    | 2.40 | 2.50 |  |
| е      | 0.55    | 0.65 | 0.75 |  |
| K      | 0.40    | 0.50 | 0.60 |  |
| L      | 0.35    | 0.40 | 0.45 |  |



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