

## P-Channel 150-V (D-S) MOSFET

### PRODUCT SUMMARY

| $V_{DS}$ (V) | $R_{DS(on)}$ ( $\Omega$ ) | $I_D$ (A) |
|--------------|---------------------------|-----------|
| - 150        | 2.1 at $V_{GS} = - 10$ V  | - 1.7     |

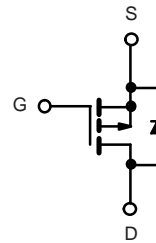
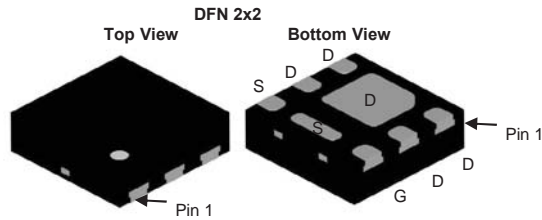
### FEATURES

- DT-Trench Power MOSFET
- Ultra Small DFN2X2 Chipscale Packaging Reduces Footprint Area



### APPLICATIONS

- Active Clamp Circuits in DC/DC Power Supplies
- Load switch



P-Channel MOSFET

### ABSOLUTE MAXIMUM RATINGS $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise noted

| Parameter  | Symbol         | LIMIT                            |                  |
|--|----------------|----------------------------------|------------------|
| Drain-Source Voltage   | $V_{DS}$       | - 150                            | V                |
| Gate-Source Voltage  | $V_{GS}$       | $\pm 20$                         |                  |
| Continuous Drain Current ( $T_J = 150\text{ }^\circ\text{C}$ ) <sup>a, b</sup> | $I_D$          | $T_A = 25\text{ }^\circ\text{C}$ | A                |
|  |                | $T_A = 70\text{ }^\circ\text{C}$ |                  |
| Pulsed Drain Current   | $I_{DM}$       | - 6.5                            |                  |
| Continuous Source Current (Diode Conduction) <sup>a, b</sup>                   | $I_S$          | - 1.7                            |                  |
| Single Pulse Avalanche Current   | $I_{AS}$       | -1.5                             |                  |
| Single Pulse Avalanche Energy  | $E_{AS}$       | 0.12                             | mJ               |
| Maximum Power Dissipation <sup>a, b</sup>                                      | $P_D$          | $T_C = 25\text{ }^\circ\text{C}$ | 16.2             |
|  |                | $T_C = 70\text{ }^\circ\text{C}$ | 10.8             |
| Operating Junction and Storage Temperature Range                               | $T_J, T_{stg}$ | - 55 to 150                      | $^\circ\text{C}$ |

### THERMAL RESISTANCE RATINGS

| Parameter                                | Symbol     | Typical      | Maximum | Unit               |
|--|------------|--------------|---------|--------------------|
| Maximum Junction-to-Ambient <sup>a</sup> | $R_{thJA}$ | $t \leq 5$ s | 30      | 50                 |
|  |            | Steady State | 60      | 96                 |
| Maximum Junction-to-Foot (Drain)         | $R_{thJF}$ | 8            | 12      | $^\circ\text{C/W}$ |

Notes:

a. Surface Mounted on 1" x 1" FR4 board.

b. Pulse width limited by maximum junction temperature.

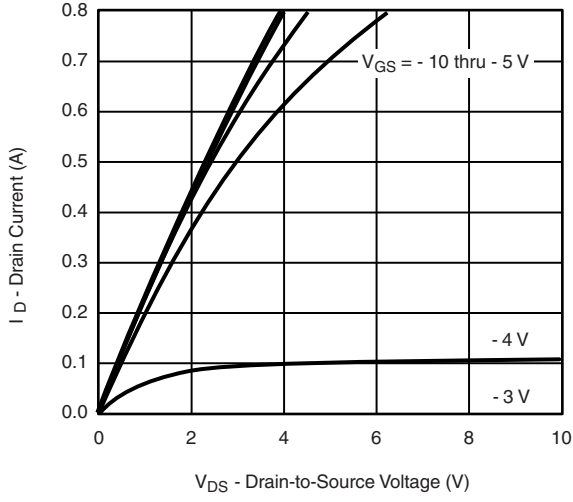
| <b>SPECIFICATIONS</b> $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted |               |   |        |       |           |               |
|---|---------------|---|--------|-------|-----------|---------------|
| Parameter   | Symbol        | Test Conditions   | Limits |       |           | Unit          |
|   |               |   | Min.   | Typ.  | Max.      |               |
| <b>Static</b>   |               |   |        |       |           |               |
| Drain-Source Breakdown Voltage  | $V_{(BR)DSS}$ | $V_{GS} = 0\text{ V}, I_D = -250\text{ }\mu\text{A}$  | - 150  |       |           | V             |
| Gate-Threshold Voltage  | $V_{GS(th)}$  | $V_{DS} = V_{GS}, I_D = -250\text{ }\mu\text{A}$  | - 2.0  |       | - 4.0     |               |
| Gate-Body Leakage   | $I_{GSS}$     | $V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$   |        |       | $\pm 100$ | nA            |
| Zero Gate Voltage Drain Current   | $I_{DSS}$     | $V_{DS} = -150\text{ V}, V_{GS} = 0\text{ V}$   |        |       | - 1       | $\mu\text{A}$ |
|   |               | $V_{DS} = -150\text{ V}, V_{GS} = 0\text{ V}, T_J = 55\text{ }^\circ\text{C}$   |        |       | - 10      |               |
| On-State Drain Current <sup>a</sup>   | $I_{D(on)}$   | $V_{DS} \leq -15\text{ V}, V_{GS} = 10\text{ V}$  | - 0.9  |       |           | A             |
| Drain-Source On-Resistance <sup>a</sup>   | $R_{DS(on)}$  | $V_{GS} = -10\text{ V}, I_D = -0.5\text{ A}$  |        | 2.1   | 2.7       | $\Omega$      |
|   |               | $V_{GS} = -6\text{ V}, I_D = -0.5\text{ A}$   |        | 2.2   | 3         |               |
| Forward Transconductance <sup>a</sup>   | $g_{fs}$      | $V_{DS} = -10\text{ V}, I_D = -0.5\text{ A}$  |        | 1.7   |           | S             |
| Diode Forward Voltage   | $V_{SD}$      | $I_S = -0.5\text{ A}, V_{GS} = 0\text{ V}$  |        | - 0.7 | - 1.2     | V             |
| <b>Dynamic<sup>b</sup></b>  |               |   |        |       |           |               |
| Total Gate Charge   | $Q_g$         | $V_{DS} = -75\text{ V}, V_{GS} = 10\text{ V},$<br>$I_D \cong -0.5\text{ A}$   |        | 4.7   | 10        | nC            |
| Gate-Source Charge  | $Q_{gs}$      |   |        | 1.0   |           |               |
| Gate-Drain Charge   | $Q_{gd}$      |   |        | 1.5   |           |               |
| Gate Resistance   | $R_g$         | $f = 1.0\text{ MHz}$  |        | 9     |           | $\Omega$      |
| Input Capacitance   | $C_{iss}$     | $V_{DS} = -75\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$  |        | 183   |           | pF            |
| Output Capacitance  | $C_{oss}$     |   |        | 10    |           |               |
| Reverse Transfer Capacitance  | $C_{rss}$     |   |        | 6     |           |               |
| <b>Switching<sup>c</sup></b>  |               |   |        |       |           |               |
| Turn-On Time  | $t_{d(on)}$   | $V_{DD} = -75\text{ V}, R_L = 75\text{ }\Omega$<br>$I_D \cong -1.0\text{ A}, V_{GEN} = -10\text{ V}$<br>$R_g = 6\text{ }\Omega$ |        | 7     | 13        | ns            |
|   | $t_r$         |   |        | 21    | 57        |               |
| Turn-Off Time   | $t_{d(off)}$  |   |        | 10    | 25        |               |
|   | $t_f$         |   |        | 31    | 47        |               |
| <b>Drain-Source Body Diode Characteristics</b>                                  |               |   |        |       |           |               |
| Continuous Source-Drain Diode Current   | $I_S$         | $T_C = 25\text{ }^\circ\text{C}$  |        |       | - 1.7     | A             |
| Pulse Diode Forward Current   | $I_{SM}$      |   |        |       | - 6.5     |               |
| Body Diode Voltage  | $V_{SD}$      | $I_S = -0.5\text{ A}, V_{GS} = 0\text{ V}$  |        | - 0.7 | - 1.2     | V             |
| Body Diode Reverse Recovery Time  | $t_{rr}$      | $I_F = -1\text{ A}, di/dt = 100\text{ A}/\mu\text{s}, T_J = 25\text{ }^\circ\text{C}$   |        | 49    |           | ns            |
| Body Diode Reverse Recovery Charge  | $Q_{rr}$      |   |        | 70    |           | nC            |
| Reverse Recovery Fall Time  | $t_a$         |   |        | 33    |           | ns            |
| Reverse Recovery Rise Time  | $t_b$         |   |        | 20    |           |               |

Notes:

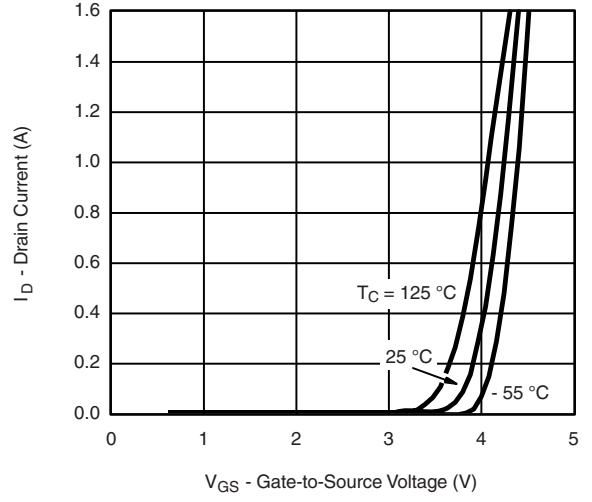
- a. Pulse test:  $PW \leq 300\text{ }\mu\text{s}$  duty cycle  $\leq 2\%$ .
- b. For DESIGN AID ONLY, not subject to production testing.
- c. Switching time is essentially independent of operating temperature.

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.

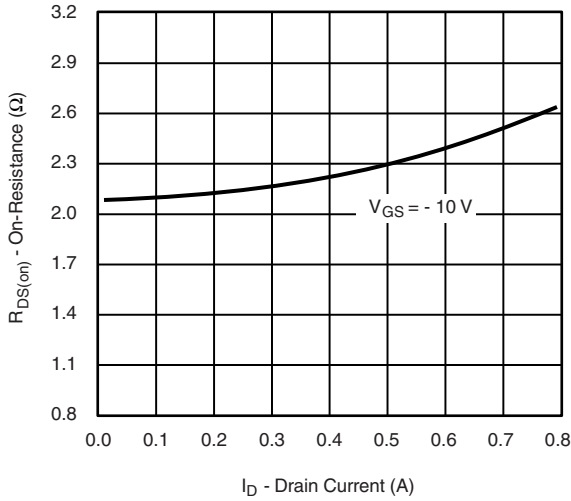
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



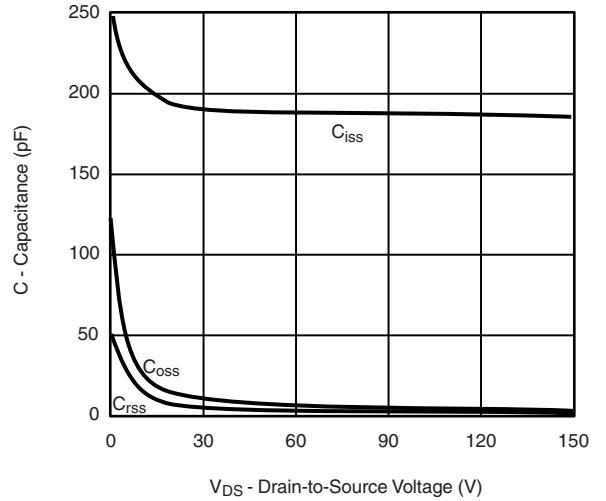
**Output Characteristics**



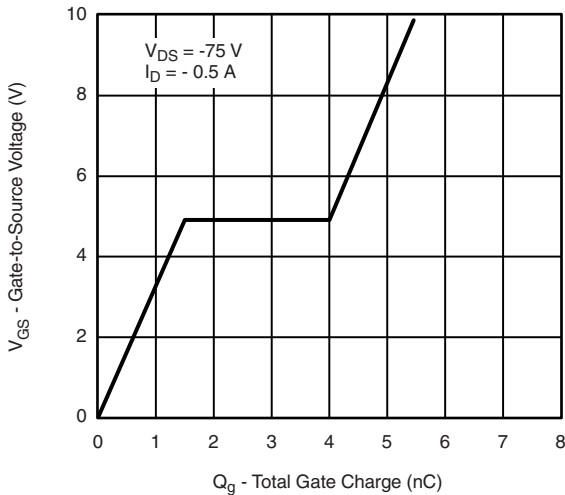
**Transfer Characteristics**



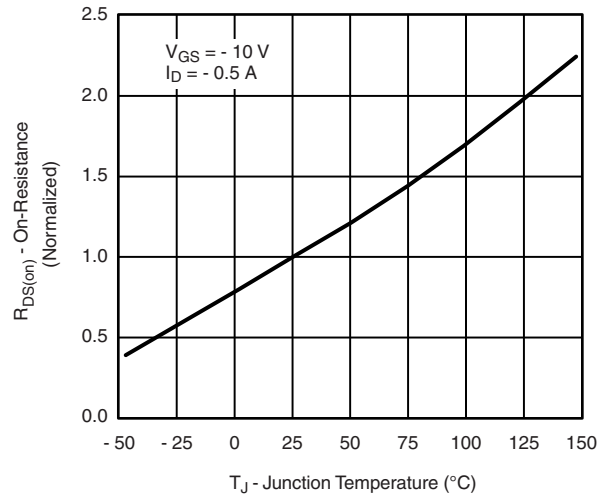
**On-Resistance vs. Drain Current**



**Capacitance**

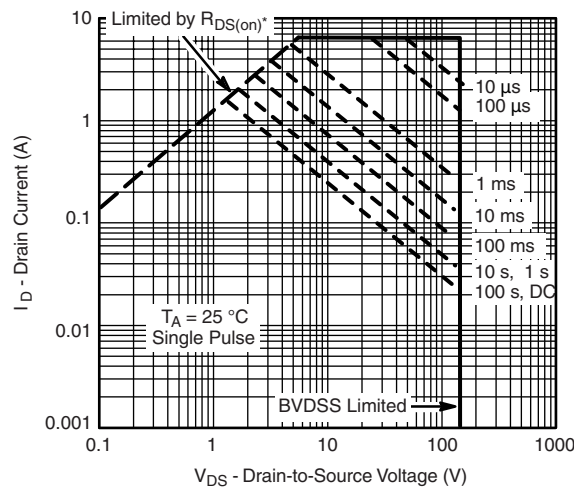
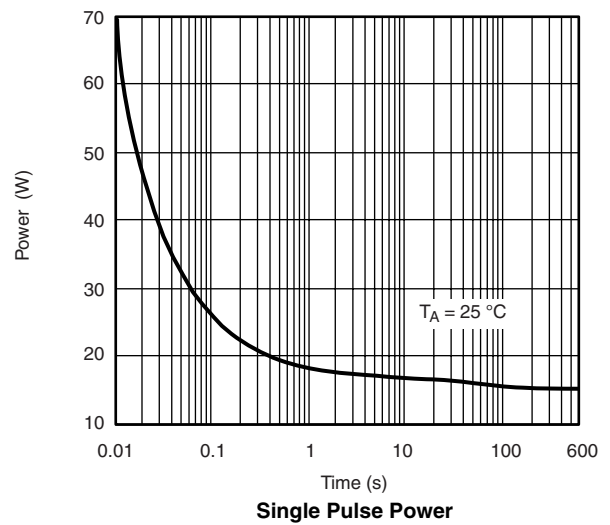
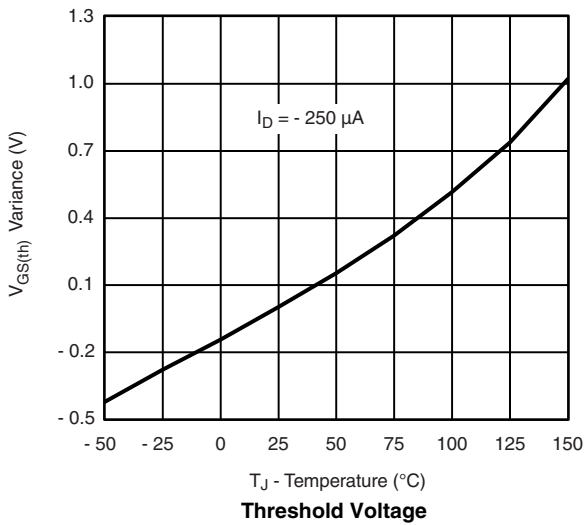
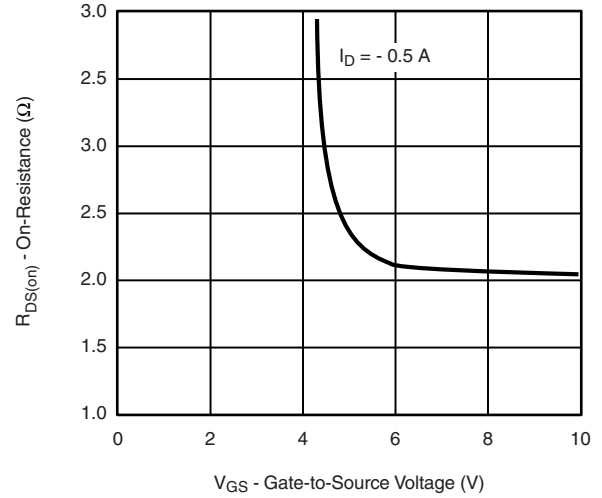
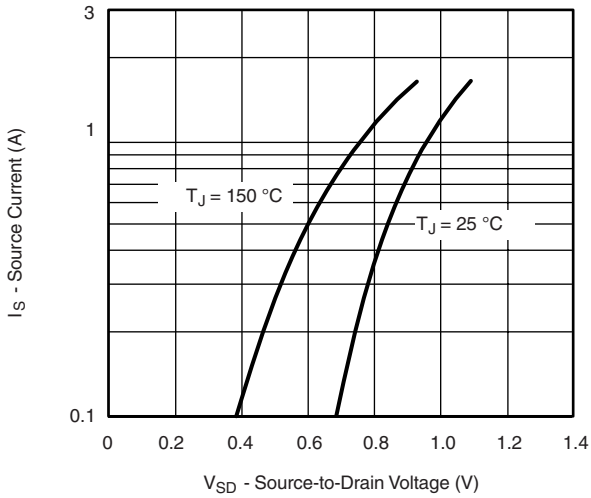


**Gate Charge**



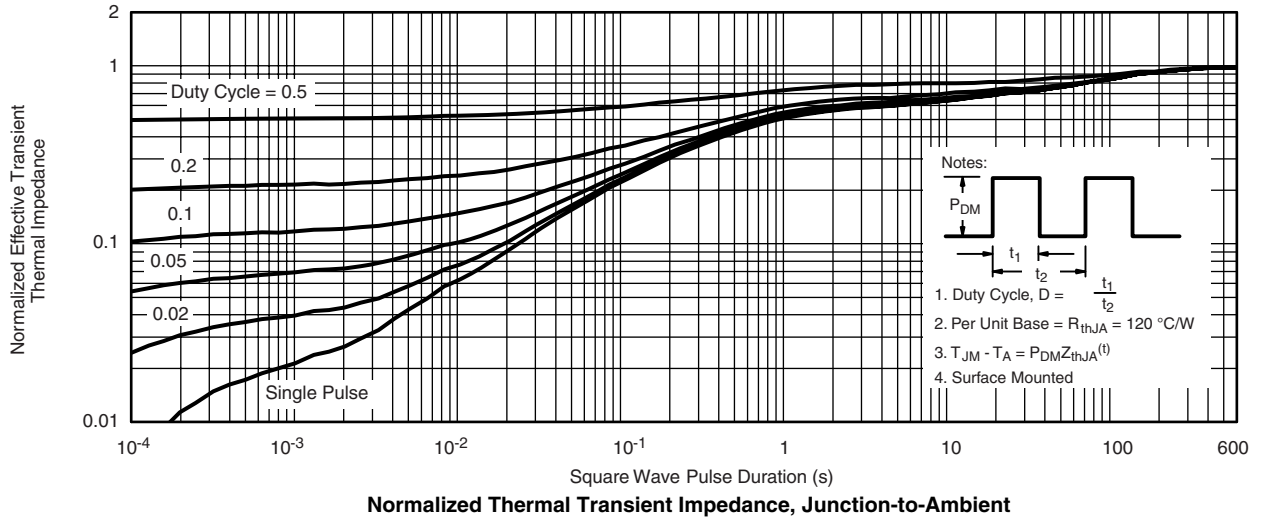
**On-Resistance vs. Junction Temperature**

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

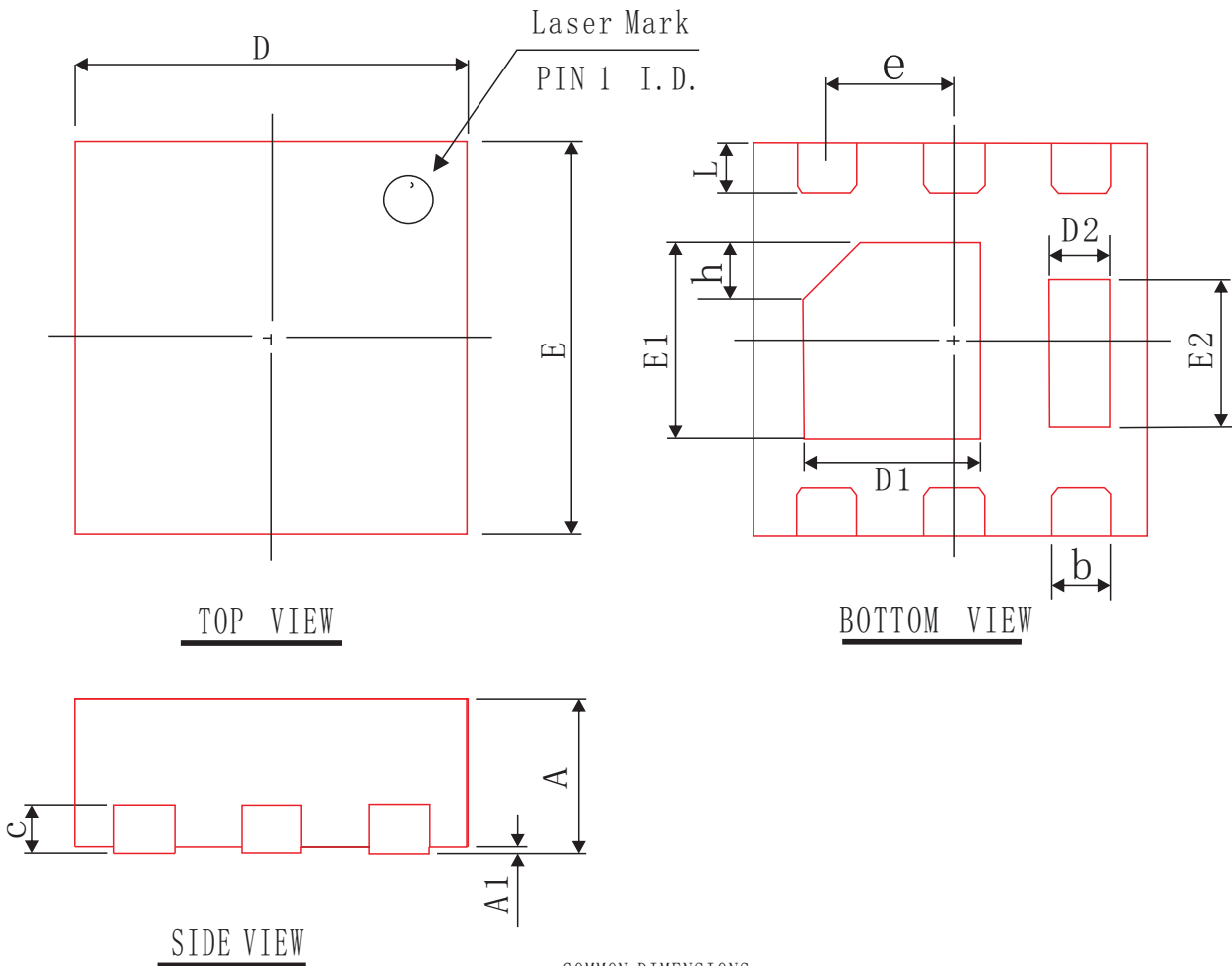


\*  $V_{GS} >$  minimum  $V_{GS}$  at which  $R_{DS(on)}$  is specified

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



**DFN2x2-6L PACKAGE OUTLINE**



COMMON DIMENSIONS  
(UNITS OF MEASURE=mm)

| SYMBOL | MIN       | NOM  | MAX  |
|--------|-----------|------|------|
| A      | 0.70      | 0.75 | 0.80 |
| A1     | 0.00      | 0.02 | 0.05 |
| b      | 0.20      | 0.25 | 0.30 |
| D      | 1.95      | 2.00 | 2.07 |
| E      | 1.95      | 2.00 | 2.07 |
| D1     | 0.80      | 0.90 | 1.00 |
| E1     | 0.90      | 1.00 | 1.10 |
| D2     | 0.20      | 0.30 | 0.40 |
| E2     | 0.65      | 0.75 | 0.85 |
| L      | 0.20      | 0.25 | 0.35 |
| h      | 0.20      | 0.25 | 0.30 |
| c      | 0.203 REF |      |      |
| e      | 0.65 BSC  |      |      |
| A*     | 0.55      | 0.60 | 0.65 |
| A*     | 0.50      | 0.55 | 0.60 |

A\*: Other thicknesses

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