

## P-Channel 20V (D-S) MOSFET with Schottky Diode

| $V_{(BR)DSS}/V_R$ | $R_{DS(on)}\text{MAX}$ | $I_D/I_F$ |
|-------------------|------------------------|-----------|
| -20V              | 110mΩ@-4.5V            | -2.9A     |
|                   | 150mΩ@-2.5V            |           |
|                   | 230mΩ@-1.8V            |           |
| 20V               | /                      | 1A        |

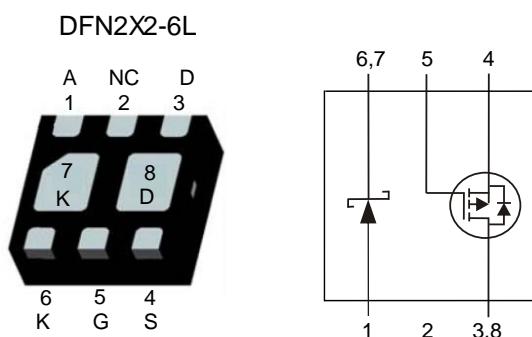
### Features

- Small package DFN2x2-6L
- High DC current gain
- RoHS and Halogen-Free Compliant

### Applications

- Charging Switch for Portable Devices
- Power management

### Pin Configuration



### Packing Information

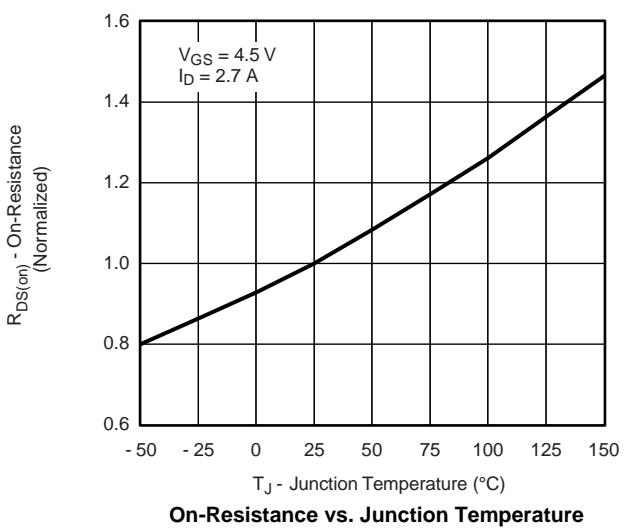
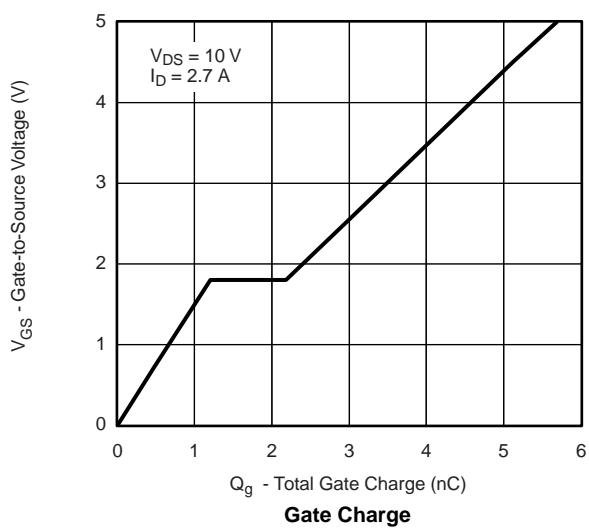
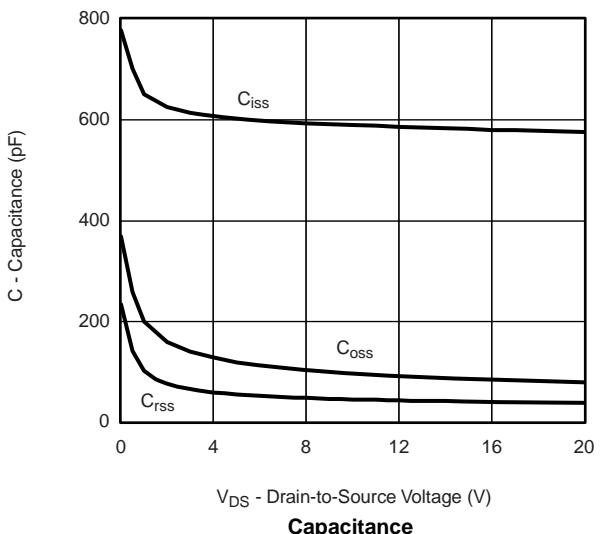
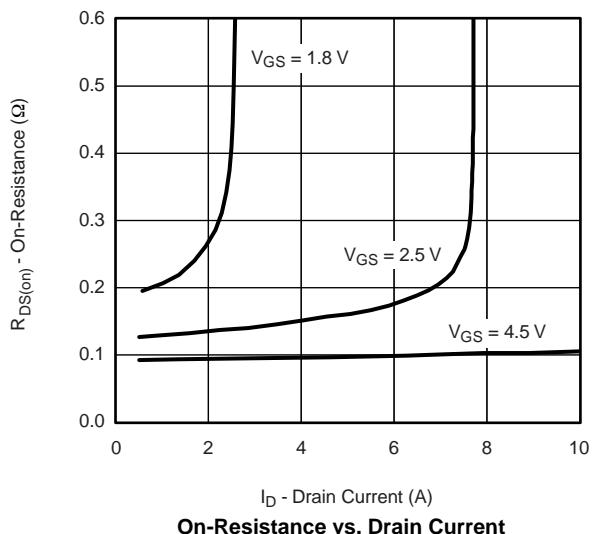
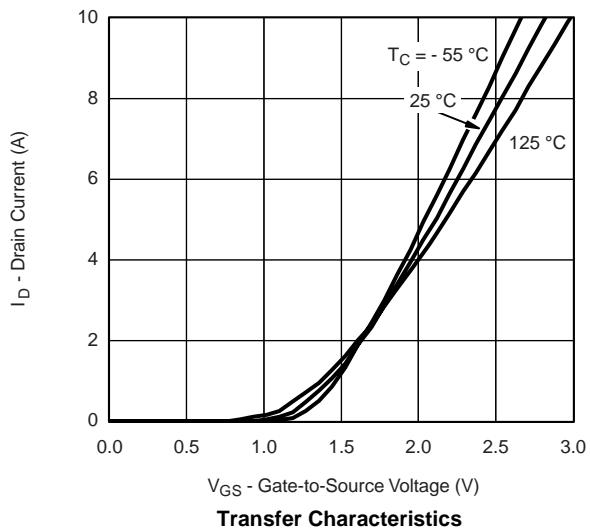
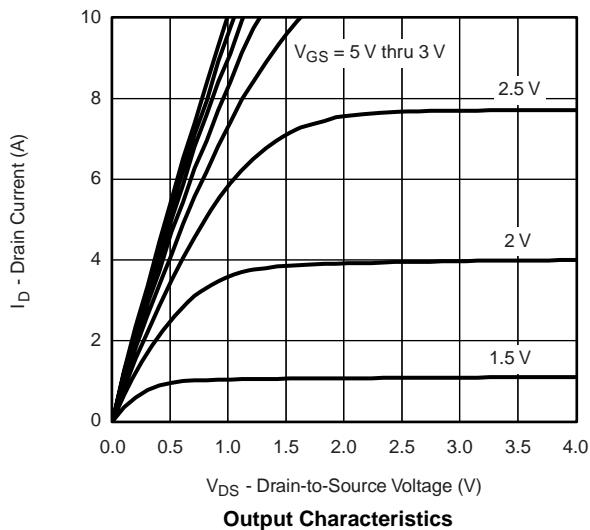
| Device | Marking  | Reel Size | Tape Width | Quantity |
|--------|----------|-----------|------------|----------|
| EC4511 | 13D .XXX | 7"        | 8mm        | 3000pcs  |

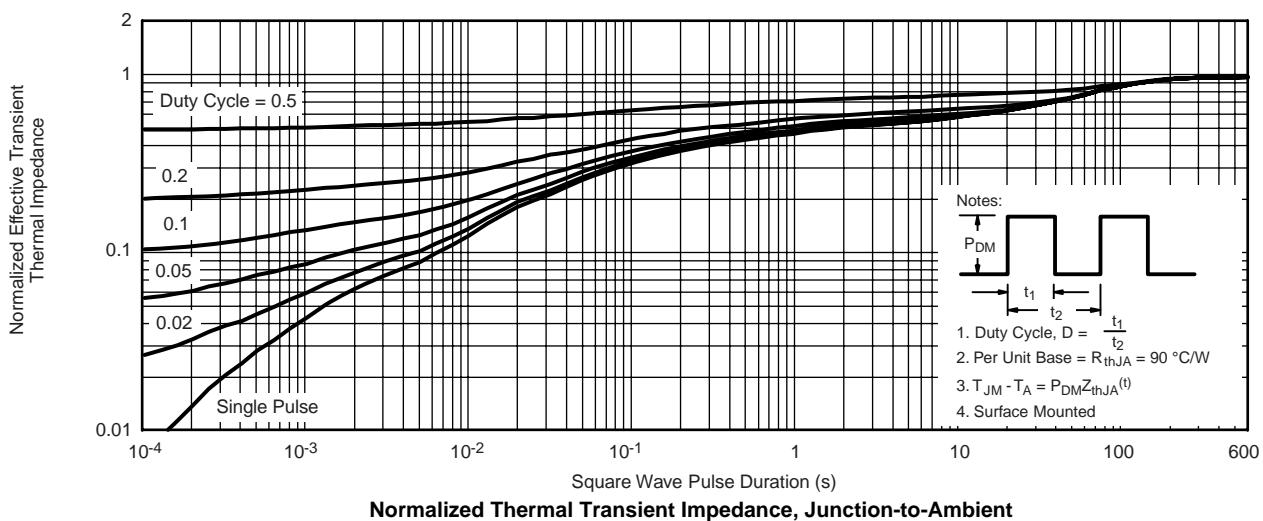
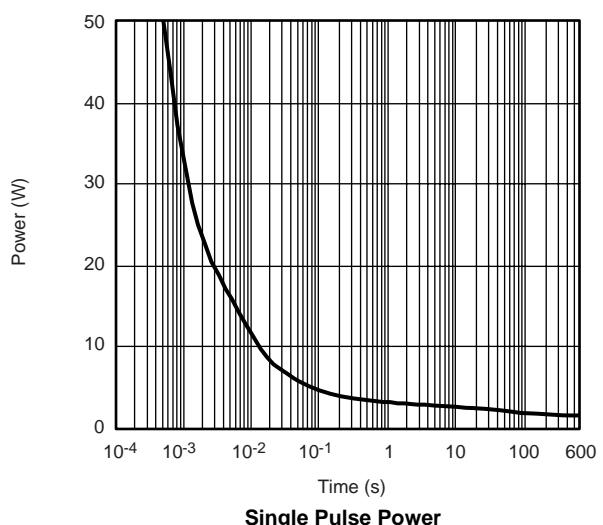
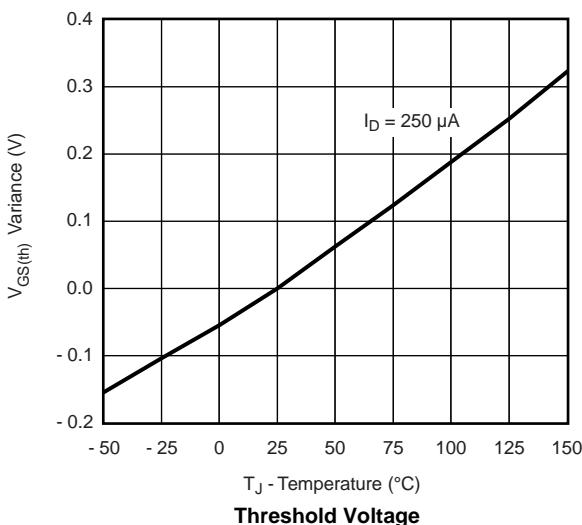
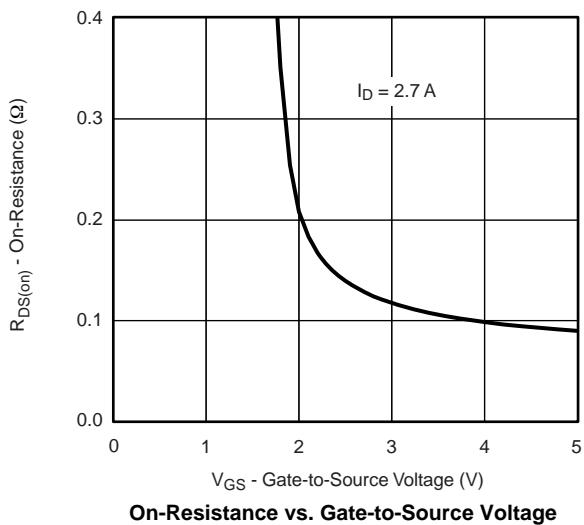
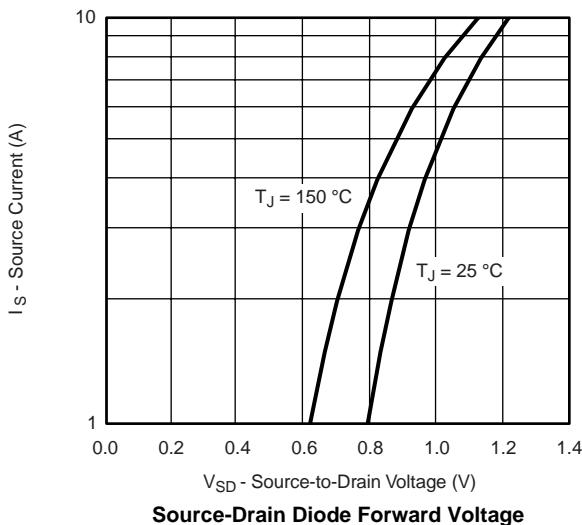
### Absolute Maximum Ratings ( $T_J=25^\circ\text{C}$ Unless Otherwise Noted)

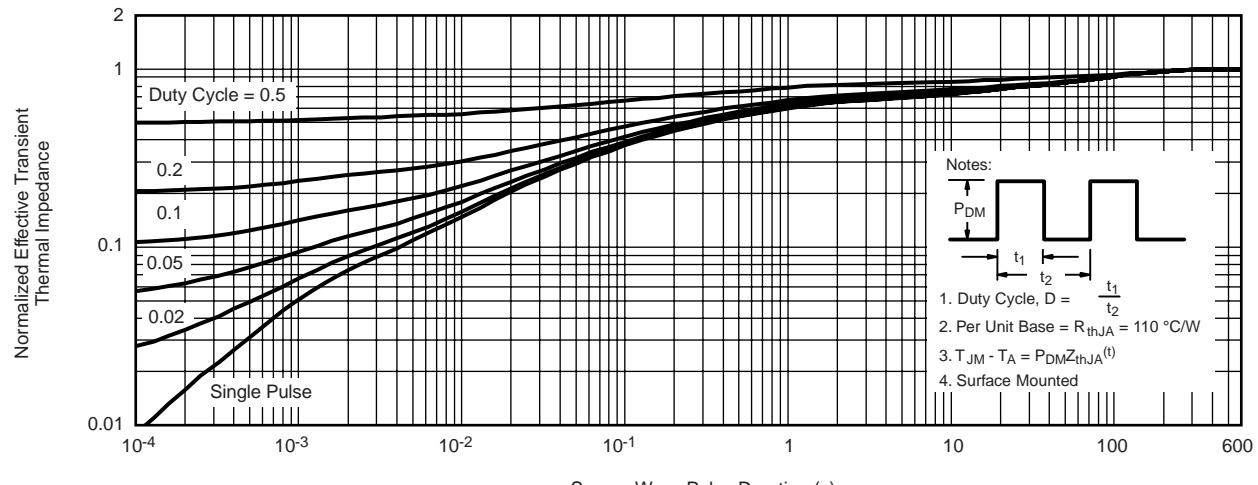
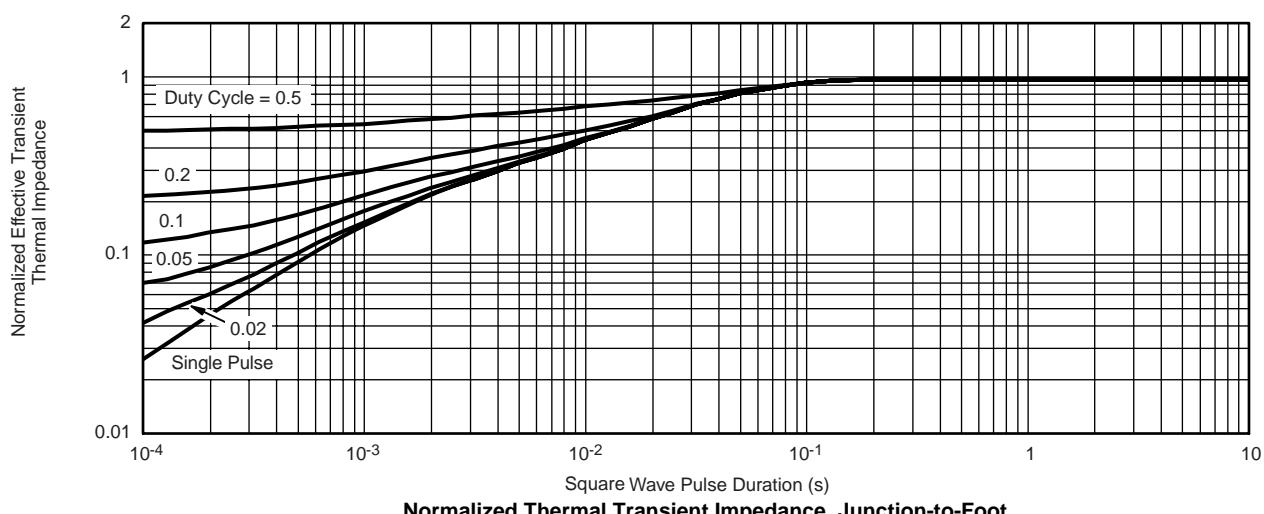
| Symbol   | Parameter  | Value    | Unit |
|--|--|----------|------|
| <b>P-MOSFET</b>  |  |          |      |
| $V_{DS}$   | Drain-Source Voltage   | -20      | V    |
| $V_{GS}$   | Gate-Source Voltage  | $\pm 8$  | V    |
| $I_D$  | Continuous Drain Current   | -2.9     | A    |
| $I_{DM}$   | Pulse Drain Current  | -9       | A    |
| <b>Schottky Barrier Diode</b>                                |  |          |      |
| $V_B$  | Peak Repetitive Reverse Voltage                                  | 20       | V    |
| $I_F$  | Average Rectified Forward Current                                | 1.0      | A    |
| $I_{FM}$   | Pulsed Forward Current   | 6        | A    |
| <b>Power Dissipation, Temperature and Thermal Resistance</b> |  |          |      |
| $P_D$  | Maximum Power Dissipation  | 1.1      | W    |
| $R_{\theta JA}$  | Thermal Resistance from Junction to Ambient                      | 114      | °C/W |
| $T_j$  | Junction Temperature   | 150      | °C   |
| $T_{stg}$  | Storage Temperature  | -55~+150 | °C   |
| $T_L$  | Lead Temperature for Soldering Purposes(1/8" from case for 10 s) | 260      | °C   |

**Electrical Characteristics (T<sub>J</sub>=25°C Unless Otherwise Specified)**

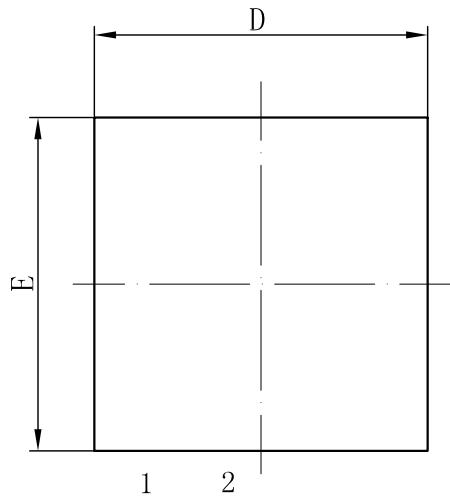
| Parameter                            | Symbol               | Test conditions  | Min   | Typ   | Max  | Unit |
|--------------------------------------|----------------------|--|-------|-------|------|------|
| <b>P-MOSFET</b>                      |                      |  |       |       |      |      |
| <b>STATIC PARAMETERS</b>             |                      |  |       |       |      |      |
| Drain-source breakdown voltage       | V <sub>(BR)DSS</sub> | V <sub>GS</sub> =0V, I <sub>D</sub> =-250μA  | -20   | -25   |      | V    |
| Zero gate voltage drain current      | I <sub>DSS</sub>     | V <sub>DS</sub> =-16V, V <sub>GS</sub> = 0V  |       |       | -1   | μA   |
| Gate-body leakage current            | I <sub>GSS</sub>     | V <sub>GS</sub> =±8V, V <sub>DS</sub> = 0V   |       |       | ±100 | nA   |
| Gate threshold voltage               | V <sub>GS(th)</sub>  | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250μA  | -0.45 | -0.65 | -0.9 | V    |
| Drain-source on-resistance(note1)    | R <sub>DS(on)</sub>  | V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-2.7A  |       |       | 110  | mΩ   |
|                                      |                      | V <sub>GS</sub> =-2.5V, I <sub>D</sub> =-2.2A  |       |       | 150  | mΩ   |
|                                      |                      | V <sub>GS</sub> =-1.8V, I <sub>D</sub> =-1A  |       |       | 230  | mΩ   |
| Forward transconductance(note1)      | g <sub>FS</sub>      | V <sub>DS</sub> =-10V, I <sub>D</sub> =-2.7A   |       | 7     |      | S    |
| Diode forward voltage(note1)         | V <sub>SD</sub>      | I <sub>S</sub> =-0.9A, V <sub>GS</sub> = 0V  |       | -0.8  | -1.2 | V    |
| <b>DYNAMIC PARAMETERS (note 2)</b>   |                      |  |       |       |      |      |
| Input capacitance                    | C <sub>iss</sub>     | V <sub>DS</sub> =-10V, V <sub>GS</sub> =0V, f =1MHz  |       |       | 300  | pF   |
| Output capacitance                   | C <sub>oss</sub>     |  |       |       | 150  | pF   |
| Reverse transfer capacitance         | C <sub>rss</sub>     |  |       |       | 50   | pF   |
| <b>SWITCHING PARAMETERS (note 2)</b> |                      |  |       |       |      |      |
| Turn-on delay time                   | t <sub>d(on)</sub>   | V <sub>GS</sub> =-4.5V, V <sub>DD</sub> =-10V,<br>R <sub>L</sub> =10Ω, R <sub>G</sub> =6Ω, I <sub>D</sub> =-1A |       |       | 25   | ns   |
| Turn-on rise time                    | t <sub>r</sub>       |  |       |       | 45   | ns   |
| Turn-off delay time                  | t <sub>d(off)</sub>  |  |       |       | 45   | ns   |
| Turn-off fall time                   | t <sub>f</sub>       |  |       |       | 40   | ns   |
| Total Gate Charge                    | Q <sub>g</sub>       | V <sub>DS</sub> =-10V, V <sub>GS</sub> =-4.5V,<br>I <sub>D</sub> =-2.7A  |       |       | 7.7  | nC   |
| Gate-Source Charge                   | Q <sub>gs</sub>      |  |       |       | 1.3  | nC   |
| Gate-Drain Charge                    | Q <sub>gd</sub>      |  |       |       | 0.9  | nC   |
| <b>SCHOTTKY BARRIER DIODE</b>        |                      |  |       |       |      |      |
| Forward voltage                      | V <sub>F</sub>       | I <sub>F</sub> =0.5A   |       | 0.42  | 0.47 | V    |
| Reverse current                      | I <sub>R</sub>       | V <sub>R</sub> =20V  |       |       | 100  | μA   |
| Junction capacitance                 | C <sub>j</sub>       | V <sub>R</sub> =10V, f=1MHz  |       | 36    |      | pF   |

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


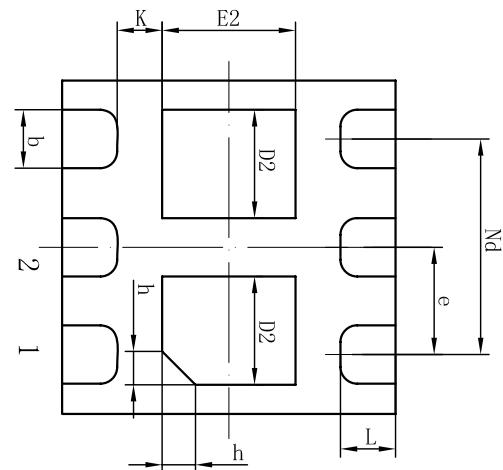
**MOSFET TYPICAL CHARACTERISTICS (25°C, unless otherwise noted)**


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

**Normalized Thermal Transient Impedance, Junction-to-Ambient**

**Normalized Thermal Transient Impedance, Junction-to-Foot**

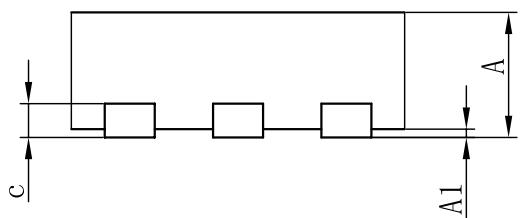
## DFN2X2-6L Package Information



Top View



Bottom View



Side View

| SYMBOL | MILLIMETER |      |      |
|--------|------------|------|------|
|        | MIN        | NOM  | MAX  |
| A      | 0.70       | 0.75 | 0.80 |
| A1     | 0          | 0.02 | 0.05 |
| b      | 0.30       | 0.35 | 0.40 |
| c      | 0.18       | 0.20 | 0.25 |
| D      | 1.95       | 2.00 | 2.05 |
| D2     | 0.60       | 0.65 | 0.70 |
| e      | 0.65BSC    |      |      |
| Nd     | 1.30BSC    |      |      |
| E      | 1.95       | 2.00 | 2.05 |
| E2     | 0.75       | 0.80 | 0.85 |
| K      | 0.20       | -    | -    |
| L      | 0.28       | 0.33 | 0.38 |
| h      | 0.15       | 0.20 | 0.25 |