

### Description

The JSM7409B uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as 4.5V.

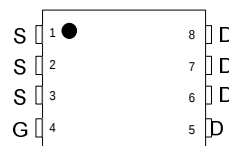
### General Features

- $V_{DS} = -30V, I_D = -25A$   
 $R_{DS(ON)} < 30m\Omega @ V_{GS} = -4.5V$   
 $R_{DS(ON)} < 17m\Omega @ V_{GS} = -10V$
- High power and current handing capability
- Lead free product is acquired
- Surface mount package

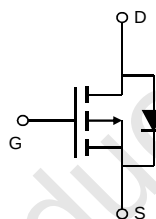
### Application

- Battery Switch
- Load switch
- Power management

### PDFN3X3-8L



### Equivalent Circuit



### MARKING



Y :year code W :week code

### Absolute Maximum Ratings ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

| Parameter                                              |                          | Symbol         | Limit      | Unit             |
|--------------------------------------------------------|--------------------------|----------------|------------|------------------|
| Drain-Source Voltage                                   |                          | $V_{DS}$       | -30        | V                |
| Gate-Source Voltage                                    |                          | $V_{GS}$       | $\pm 20$   | V                |
| Continuous Drain Current ( $T_J = 150^\circ\text{C}$ ) | $T_A = 25^\circ\text{C}$ | $I_D$          | -10        | A                |
|                                                        | $T_A = 70^\circ\text{C}$ |                | -8.0       |                  |
| Drain Current-Pulsed (Note 1)                          |                          | $I_{DM}$       | -45        | A                |
| Maximum Power Dissipation                              |                          | $P_D$          | 3.1        | W                |
| Operating Junction and Storage Temperature Range       |                          | $T_J, T_{STG}$ | -55 To 150 | $^\circ\text{C}$ |

### Thermal Characteristic

|                                                  |                 |    |                    |
|--------------------------------------------------|-----------------|----|--------------------|
| Thermal Resistance, Junction-to-Ambient (Note 2) | $R_{\theta JA}$ | 40 | $^\circ\text{C/W}$ |
|--------------------------------------------------|-----------------|----|--------------------|

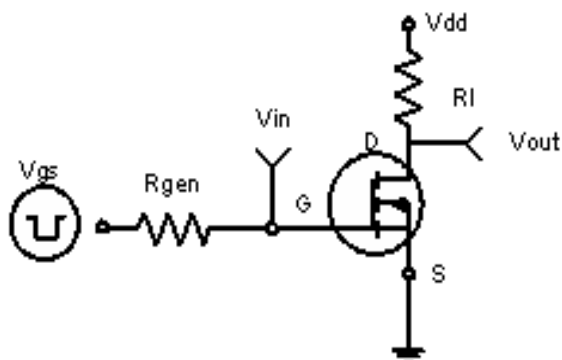
**Electrical Characteristics ( $T_A=25^{\circ}\text{C}$  unless otherwise noted)**

| Parameter                          | Symbol       | Condition                                                 | Min | Typ  | Max       | Unit       |
|------------------------------------|--------------|-----------------------------------------------------------|-----|------|-----------|------------|
| Off Characteristics                |              |                                                           |     |      |           |            |
| Drain-Source Breakdown Voltage     | $BV_{DSS}$   | $V_{GS}=0V, I_D=-250\mu A$                                | -30 | -33  | -         | V          |
| Zero Gate Voltage Drain Current    | $I_{DSS}$    | $V_{DS}=-30V, V_{GS}=0V$                                  | -   | -    | -1        | $\mu A$    |
| Gate-Body Leakage Current          | $I_{GSS}$    | $V_{GS}=\pm 20V, V_{DS}=0V$                               | -   | -    | $\pm 100$ | nA         |
| On Characteristics (Note 3)        |              |                                                           |     |      |           |            |
| Gate Threshold Voltage             | $V_{GS(th)}$ | $V_{DS}=V_{GS}, I_D=-250\mu A$                            | 1.0 | 1.7  | 3.0       | V          |
| Drain-Source On-State Resistance   | $R_{DS(ON)}$ | $V_{GS}=-10V, I_D=-10A$                                   | -   | 14   | 17        | m $\Omega$ |
|                                    |              | $V_{GS}=-4.5V, I_D=-10A$                                  | -   | 25   | 30        | m $\Omega$ |
| Forward Transconductance           | $g_{FS}$     | $V_{DS}=-15V, I_D=-10A$                                   | 10  | -    | -         | S          |
| Dynamic Characteristics (Note4)    |              |                                                           |     |      |           |            |
| Input Capacitance                  | $C_{ISS}$    | $V_{DS}=-15V, V_{GS}=0V,$<br>$F=1.0MHz$                   | -   | 1600 | -         | PF         |
| Output Capacitance                 | $C_{OSS}$    |                                                           | -   | 350  | -         | PF         |
| Reverse Transfer Capacitance       | $C_{RSS}$    |                                                           | -   | 300  | -         | PF         |
| Switching Characteristics (Note 4) |              |                                                           |     |      |           |            |
| Turn-on Delay Time                 | $t_{d(on)}$  | $V_{DD}=-15V, I_D=-1A,$<br>$V_{GS}=-10V, R_{GEN}=6\Omega$ | -   | 10   | -         | nS         |
| Turn-on Rise Time                  | $t_r$        |                                                           | -   | 15   | -         | nS         |
| Turn-Off Delay Time                | $t_{d(off)}$ |                                                           | -   | 110  | -         | nS         |
| Turn-Off Fall Time                 | $t_f$        |                                                           |     | 70   | -         | nS         |
| Total Gate Charge                  | $Q_g$        | $V_{DS}=-15V, I_D=-10A$<br>$V_{GS}=-10V$                  | -   | 30   | -         | nC         |
| Gate-Source Charge                 | $Q_{gs}$     |                                                           | -   | 5.5  | -         | nC         |
| Gate-Drain Charge                  | $Q_{gd}$     |                                                           | -   | 8    | -         | nC         |
| Drain-Source Diode Characteristics |              |                                                           |     |      |           |            |
| Diode Forward Voltage (Note 3)     | $V_{SD}$     | $V_{GS}=0V, I_S=-10A$                                     | -   | -    | 1.2       | V          |

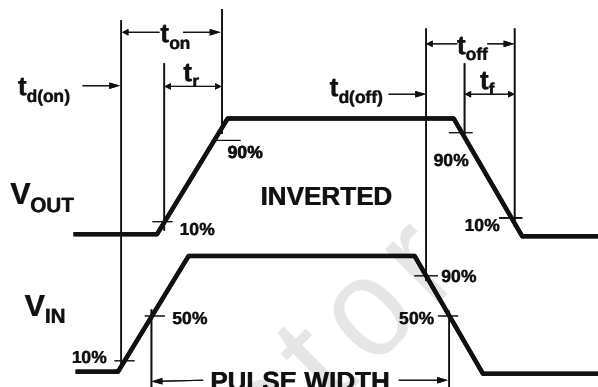
**Notes:**

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board,  $t \leq 10$  sec.
3. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$ .
4. Guaranteed by design, not subject to production

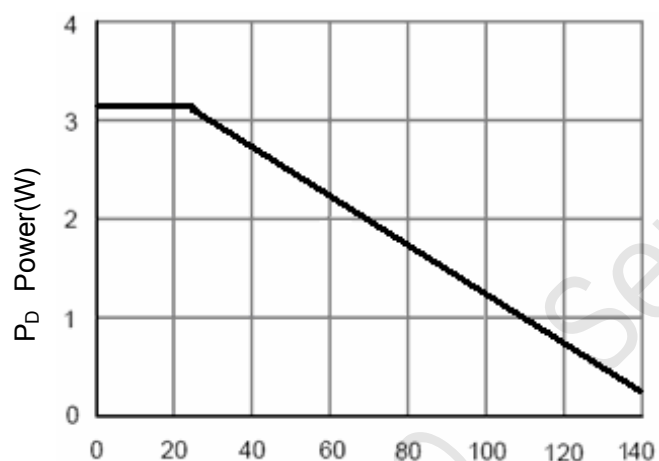
### Typical Electrical and Thermal Characteristics



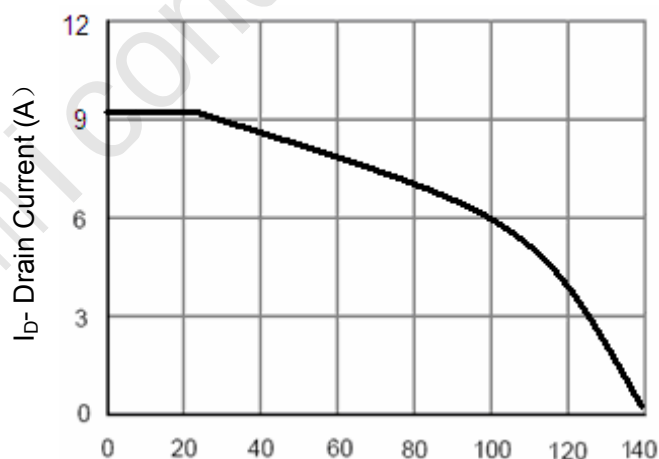
**Figure 1: Switching Test Circuit**



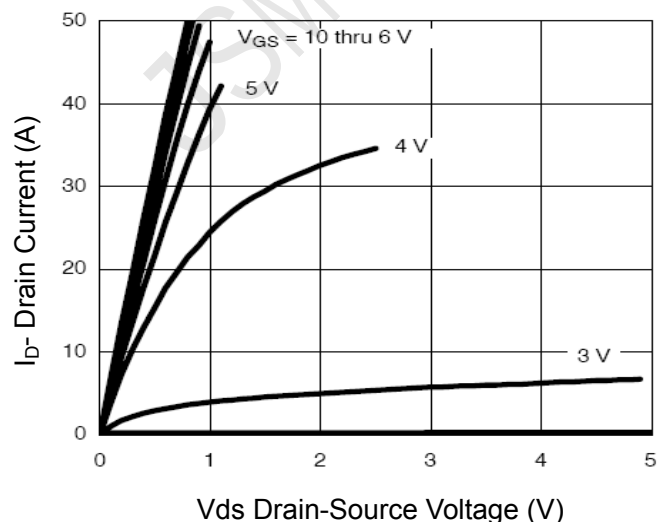
**Figure 2: Switching Waveforms**



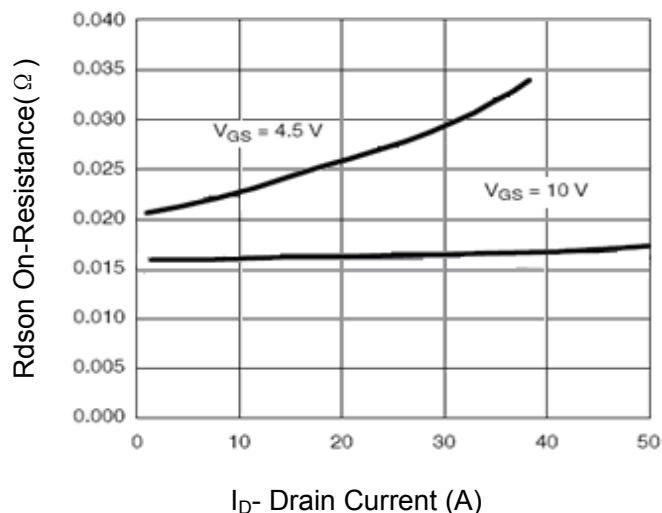
T<sub>J</sub>-Junction Temperature(°C)  
**Figure 3 Power Dissipation**



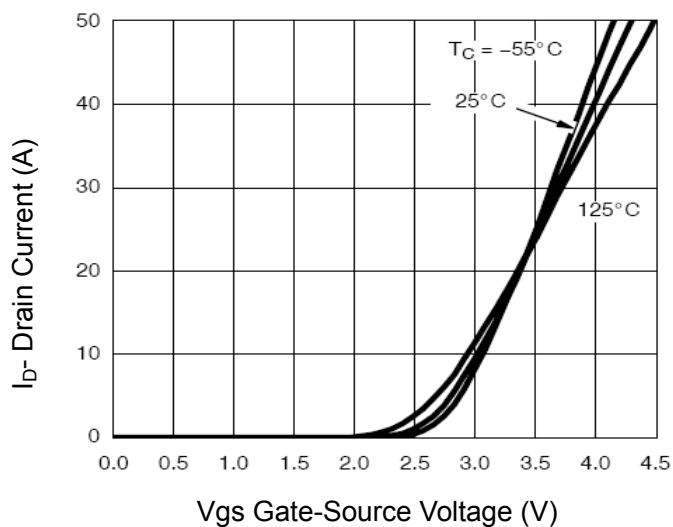
T<sub>J</sub>-Junction Temperature(°C)  
**Figure 4 Drain Current**



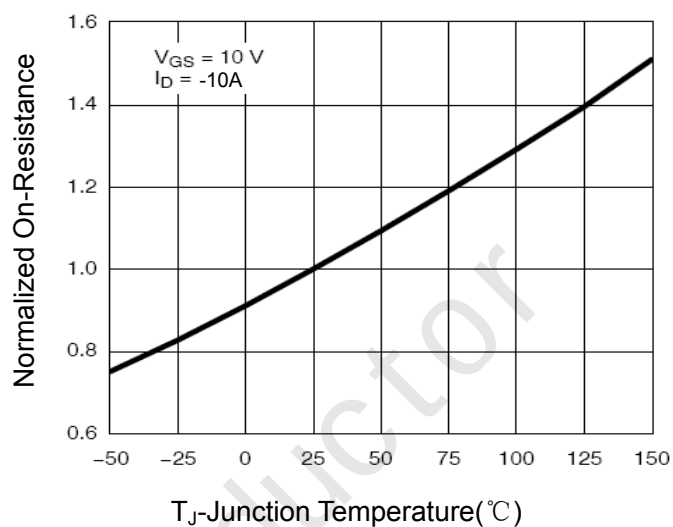
**Figure 5 Output Characteristics**



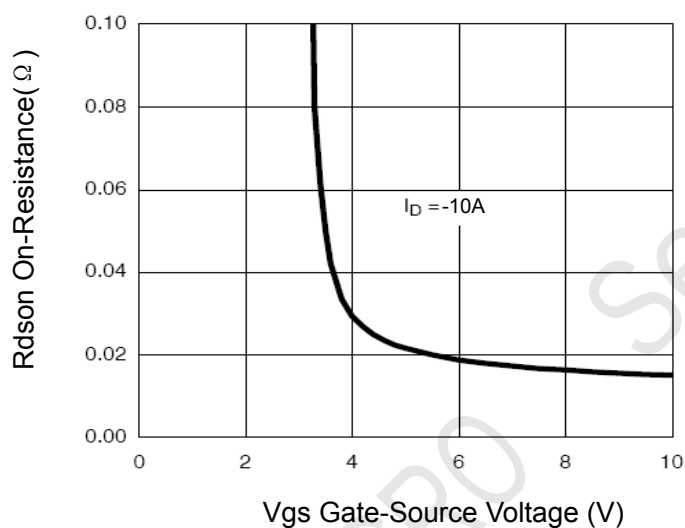
**Figure 6 Drain-Source On-Resistance**



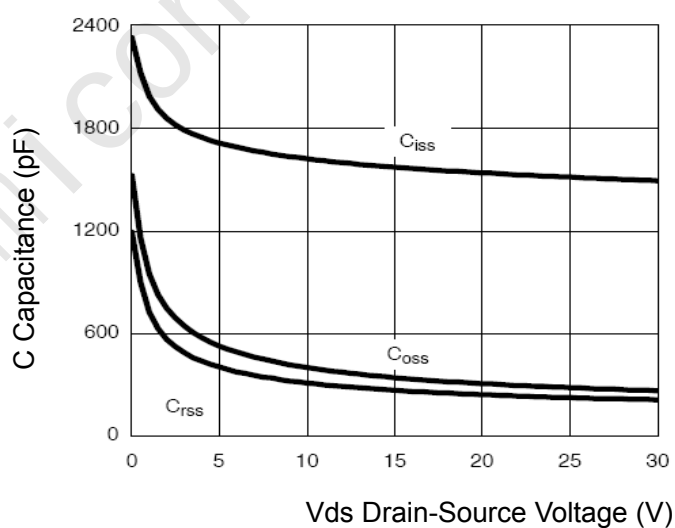
**Figure 7 Transfer Characteristics**



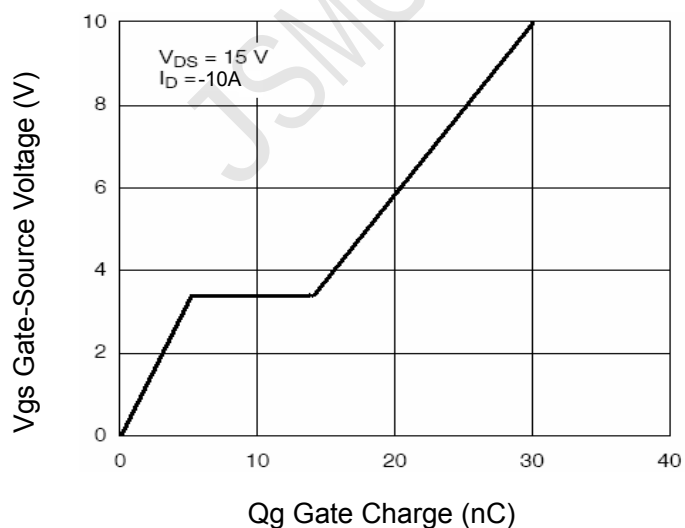
**Figure 8 Drain-Source On-Resistance**



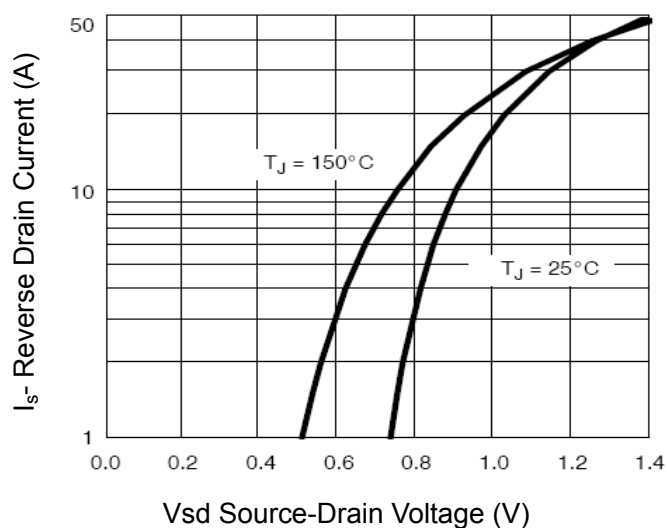
**Figure 9 Rdson vs VGS**



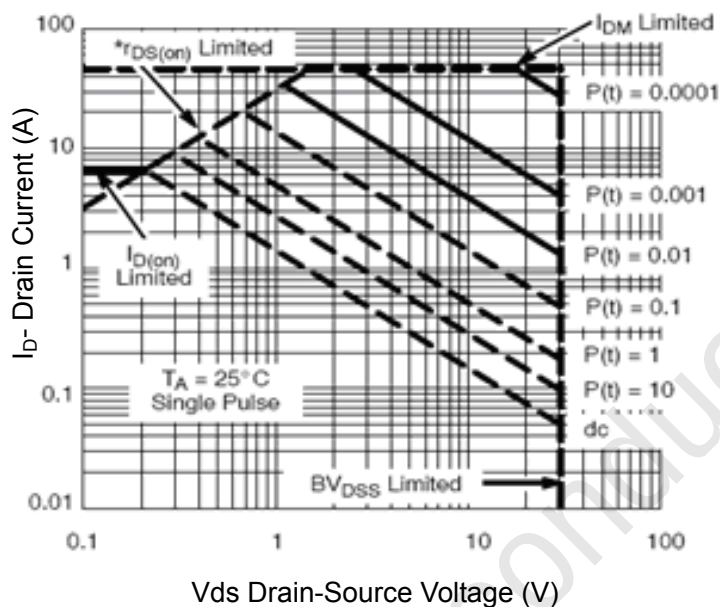
**Figure 10 Capacitance vs Vds**



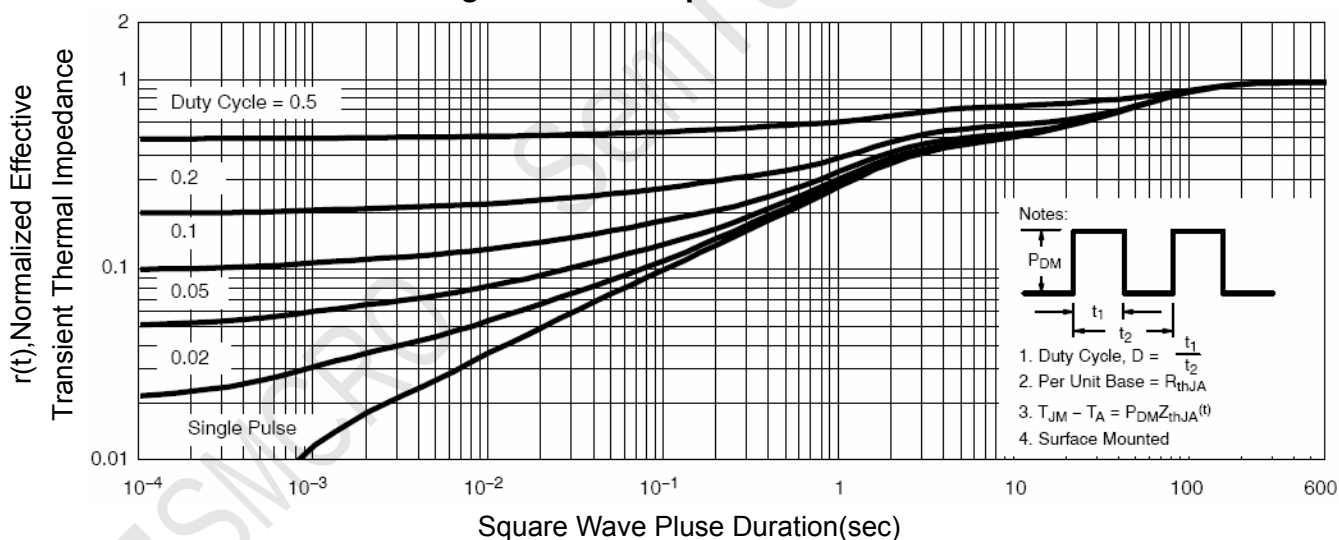
**Figure 11 Gate Charge**



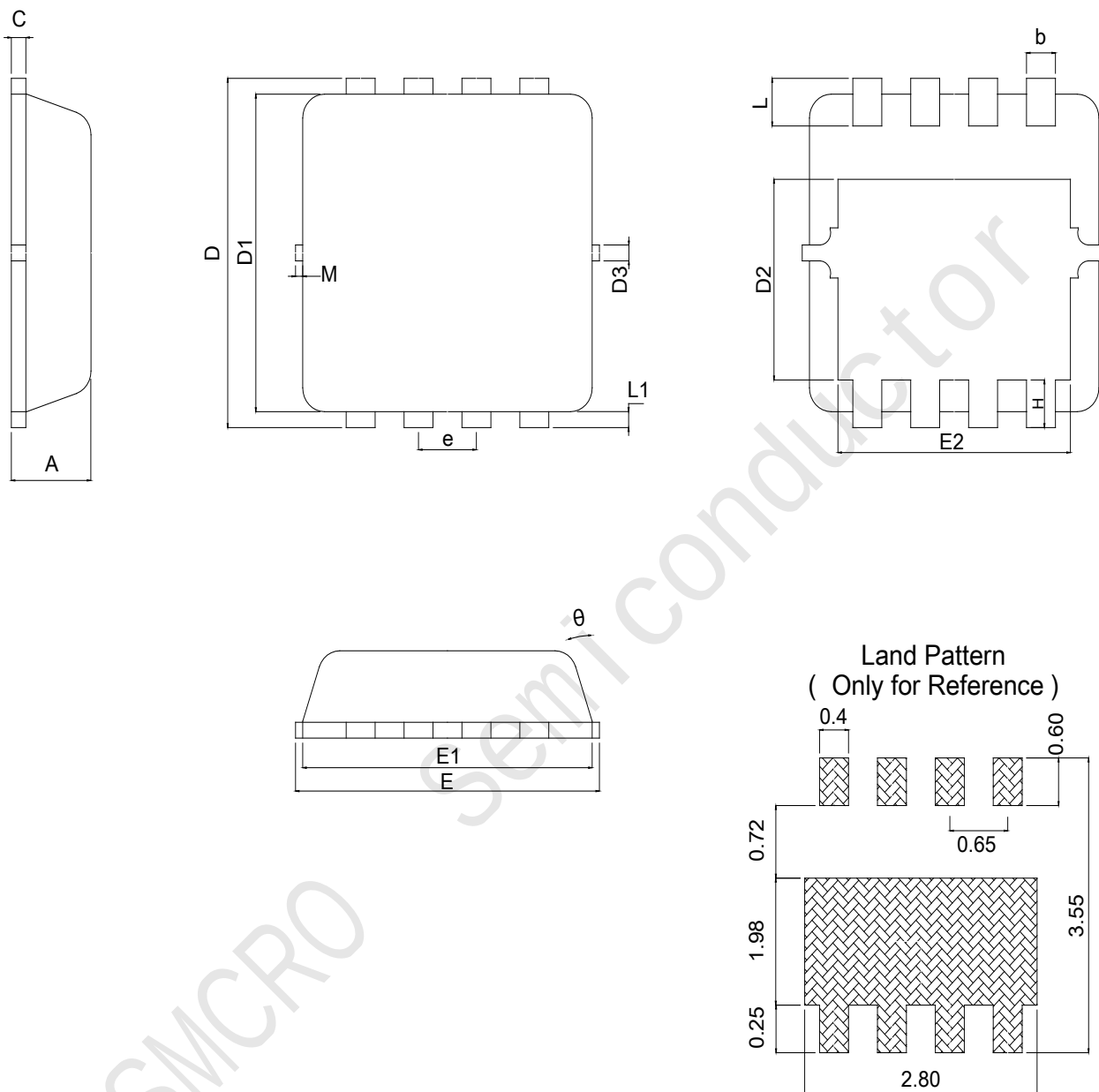
**Figure 12 Source- Drain Diode Forward**



**Figure 13 Safe Operation Area**



**Figure 14 Normalized Maximum Transient Thermal Impedance**

**Package Information**
**PDFN3333**


| SYMBOL | MM   |      |      | INCH  |       |       | SYMBOL | MM      |      |      | INCH     |       |       |
|--------|------|------|------|-------|-------|-------|--------|---------|------|------|----------|-------|-------|
|        | MIN  | NOM  | MAX  | MIN   | NOM   | MAX   |        | MIN     | NOM  | MAX  | MIN      | NOM   | MAX   |
| A      | 0.70 | 0.75 | 0.80 | 0.028 | 0.030 | 0.031 | E1     | 3.00    | 3.15 | 3.20 | 0.118    | 0.122 | 0.126 |
| b      | 0.25 | 0.30 | 0.35 | 0.010 | 0.012 | 0.014 | E2     | 2.39    | 2.49 | 2.59 | 0.094    | 0.098 | 0.102 |
| c      | 0.10 | 0.15 | 0.25 | 0.004 | 0.007 | 0.010 | e      | 0.65BSC |      |      | 0.026BSC |       |       |
| D      | 3.25 | 3.35 | 3.45 | 0.128 | 0.132 | 0.136 | H      | 0.30    | 0.40 | 0.50 | 0.012    | 0.016 | 0.020 |
| D1     | 3.00 | 3.10 | 3.20 | 0.118 | 0.122 | 0.126 | L      | 0.30    | 0.40 | 0.50 | 0.012    | 0.016 | 0.020 |
| D2     | 1.78 | 1.88 | 1.98 | 0.070 | 0.074 | 0.078 | L1     | *       | 0.13 | *    | *        | 0.005 | *     |
| D3     | *    | 0.13 | *    | *     | 0.005 | *     | θ      | *       | 10°  | 12°  | *        | 10°   | 12°   |
| E      | 3.20 | 3.30 | 3.40 | 0.126 | 0.130 | 0.134 | M      | *       | *    | 0.15 | *        | *     | 0.006 |