

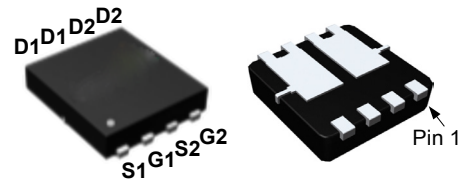
### Features

- 60V/40A
  - $R_{DS(ON)}=15m\Omega(\text{typ.})@V_{GS}=10V$
  - $R_{DS(ON)}=18m\Omega(\text{typ.})@V_{GS}=4.5V$
- 100% UIS +  $R_g$  Tested
- Reliable and Rugged
- Lead Free and Green Devices Available (RoHS Compliant)
- Moisture Sensitivity Level MSL1 (per JEDEC J-STD-020D)

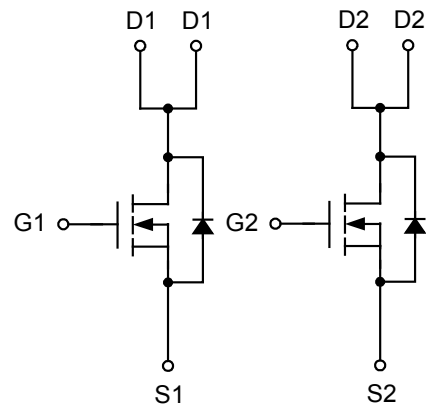
### Applications

- Switching applications.

### Pin Description



PDFN5\*6-8L



N-Channel MOSFET

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

| Symbol                        | Parameter                              |                       | Rating     | Unit |
|-------------------------------|----------------------------------------|-----------------------|------------|------|
| Common Ratings                |                                        |                       |            |      |
| V <sub>DSS</sub>              | Drain-Source Voltage                   |                       | 60         | V    |
| V <sub>GSS</sub>              | Gate-Source Voltage                    |                       | ±20        |      |
| T <sub>J</sub>                | Maximum Junction Temperature           |                       | 150        | °C   |
| T <sub>STG</sub>              | Storage Temperature Range              |                       | -55 to 150 |      |
| I <sub>S</sub>                | Diode Continuous Forward Current       | T <sub>C</sub> =25°C  | 12         | A    |
| I <sub>D</sub>                | Continuous Drain Current               | T <sub>C</sub> =25°C  | 40         | A    |
|                               |                                        | T <sub>C</sub> =100°C | 21         |      |
| I <sub>DM</sub> <sup>a</sup>  | Pulsed Drain Current                   | T <sub>C</sub> =25°C  | 96         |      |
| P <sub>D</sub>                | Maximum Power Dissipation              | T <sub>C</sub> =25°C  | 35.7       | W    |
|                               |                                        | T <sub>C</sub> =100°C | 14.3       |      |
| R <sub>θJC</sub>              | Thermal Resistance-Junction to Case    | Steady state          | 3.5        | °C/W |
| I <sub>D</sub>                | Continuous Drain Current               | T <sub>A</sub> =25°C  | 10         | A    |
|                               |                                        | T <sub>A</sub> =70°C  | 8          |      |
| P <sub>D</sub>                | Maximum Power Dissipation              | T <sub>A</sub> =25°C  | 1.39       | W    |
|                               |                                        | T <sub>A</sub> =70°C  | 0.89       |      |
| R <sub>θJA</sub> <sup>b</sup> | Thermal Resistance-Junction to Ambient | Steady state          | 90         | °C/W |
| I <sub>AS</sub> <sup>c</sup>  | Avalanche Current, Single pulse        | L=0.5mH               | 21         | A    |
| E <sub>AS</sub> <sup>c</sup>  | Avalanche Energy, Single pulse         | L=0.5mH               | 104        | mJ   |

Note \* : Current limited by bonding wire.

Note a : Pulse width limited by max. junction temperature.

Note b : Surface mounted on  $1\text{in}^2$  pad area.

Note c : UIS tested and pulse width limited by maximum junction temperature  $150^{\circ}\text{C}$  (initial temperature  $T_J=25^{\circ}\text{C}$ ).

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

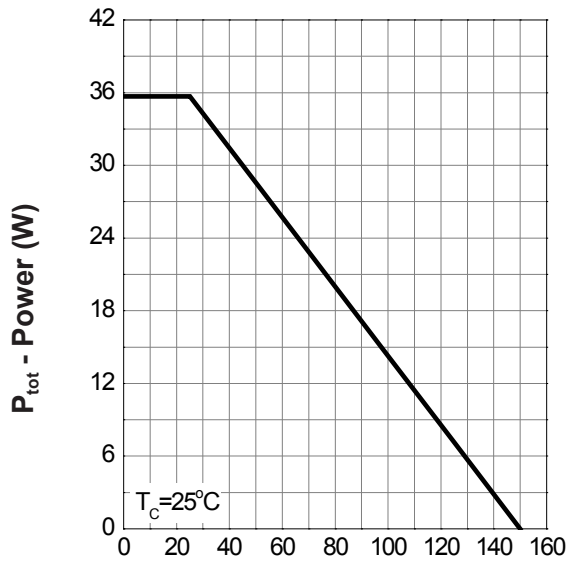
| Symbol                                   | Parameter                        | Test Conditions                                                                                                 | Min. | Typ. | Max. | Unit |
|------------------------------------------|----------------------------------|-----------------------------------------------------------------------------------------------------------------|------|------|------|------|
| Static Characteristics                   |                                  |                                                                                                                 |      |      |      |      |
| BV <sub>DSS</sub>                        | Drain-Source Breakdown Voltage   | V <sub>GS</sub> =0V, I <sub>DS</sub> =250μA                                                                     | 60   | -    | -    | V    |
| I <sub>DSS</sub>                         | Zero Gate Voltage Drain Current  | V <sub>DS</sub> =48V, V <sub>GS</sub> =0V                                                                       | -    | -    | 1    | μA   |
|                                          |                                  | T <sub>J</sub> =85°C                                                                                            | -    | -    | 30   |      |
| V <sub>GS(th)</sub>                      | Gate Threshold Voltage           | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>DS</sub> =250μA                                                       | 1    | 1.8  | 3    | V    |
| I <sub>GSS</sub>                         | Gate Leakage Current             | V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V                                                                      | -    | -    | ±100 | nA   |
| R <sub>DS(ON)</sub> <sup>d</sup>         | Drain-Source On-state Resistance | V <sub>GS</sub> =10V, I <sub>DS</sub> =10A                                                                      | -    | 15   | 19   | mΩ   |
|                                          |                                  | V <sub>GS</sub> =4.5V, I <sub>DS</sub> =8A                                                                      | -    | 18   | 22   |      |
| Diode Characteristics                    |                                  |                                                                                                                 |      |      |      |      |
| V <sub>SD</sub> <sup>d</sup>             | Diode Forward Voltage            | I <sub>SD</sub> =10A, V <sub>GS</sub> =0V                                                                       | -    | 0.8  | 1.3  | V    |
| t <sub>rr</sub>                          | Reverse Recovery Time            | I <sub>SD</sub> =10A, dI <sub>SD</sub> /dt=100A/μs                                                              | -    | 35   | -    | ns   |
| Q <sub>rr</sub>                          | Reverse Recovery Charge          |                                                                                                                 | -    | 37   | -    | nC   |
| Dynamic Characteristics <sup>e</sup>     |                                  |                                                                                                                 |      |      |      |      |
| R <sub>G</sub>                           | Gate Resistance                  | V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, F=1MHz                                                                | -    | 1.5  | -    | Ω    |
| C <sub>iss</sub>                         | Input Capacitance                | V <sub>GS</sub> =0V,<br>V <sub>DS</sub> =30V,<br>Frequency=1.0MHz                                               | -    | 2405 | 3125 | pF   |
| C <sub>oss</sub>                         | Output Capacitance               |                                                                                                                 | -    | 435  | -    |      |
| C <sub>rss</sub>                         | Reverse Transfer Capacitance     |                                                                                                                 | -    | 195  | -    |      |
| t <sub>d(ON)</sub>                       | Turn-on Delay Time               | V <sub>DD</sub> =30V, R <sub>L</sub> =30Ω,<br>I <sub>DS</sub> =1A, V <sub>GEN</sub> =10V,<br>R <sub>G</sub> =6Ω | -    | 17   | 31   | ns   |
| t <sub>r</sub>                           | Turn-on Rise Time                |                                                                                                                 | -    | 8    | 15   |      |
| t <sub>d(OFF)</sub>                      | Turn-off Delay Time              |                                                                                                                 | -    | 47   | 85   |      |
| t <sub>f</sub>                           | Turn-off Fall Time               |                                                                                                                 | -    | 50   | 90   |      |
| Gate Charge Characteristics <sup>e</sup> |                                  |                                                                                                                 |      |      |      |      |
| Q <sub>g</sub>                           | Total Gate Charge                | V <sub>DS</sub> =30V, V <sub>GS</sub> =4.5V,<br>I <sub>DS</sub> =10A                                            | -    | 17.7 | -    | nC   |
| Q <sub>g</sub>                           | Total Gate Charge                | V <sub>DS</sub> =30V, V <sub>GS</sub> =10V,<br>I <sub>DS</sub> =10A                                             | -    | 38   | 53   |      |
| Q <sub>gs</sub>                          | Gate-Source Charge               |                                                                                                                 | -    | 7.7  | -    |      |
| Q <sub>gd</sub>                          | Gate-Drain Charge                |                                                                                                                 | -    | 5    | -    |      |

Note d : Pulse test ; pulse width $\leq 300\mu s$ , duty cycle $\leq 2\%$ .

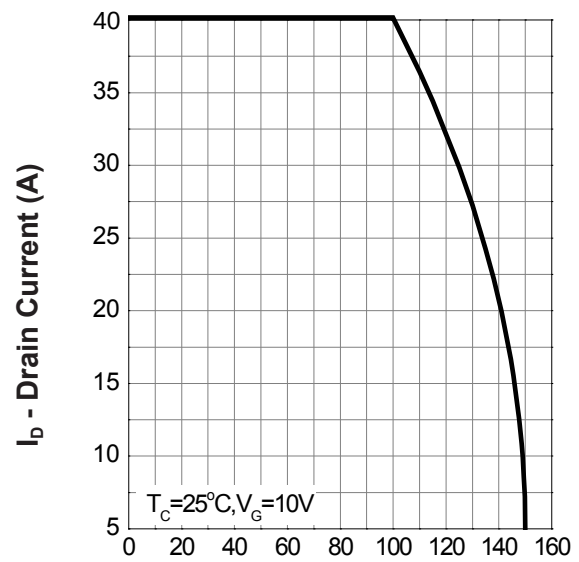
Note e : Guaranteed by design, not subject to production testing.

### Typical Operating Characteristics

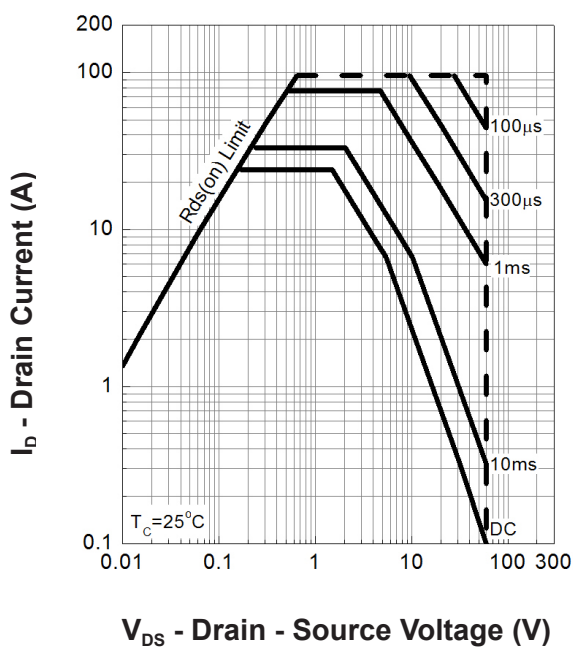
Power Dissipation



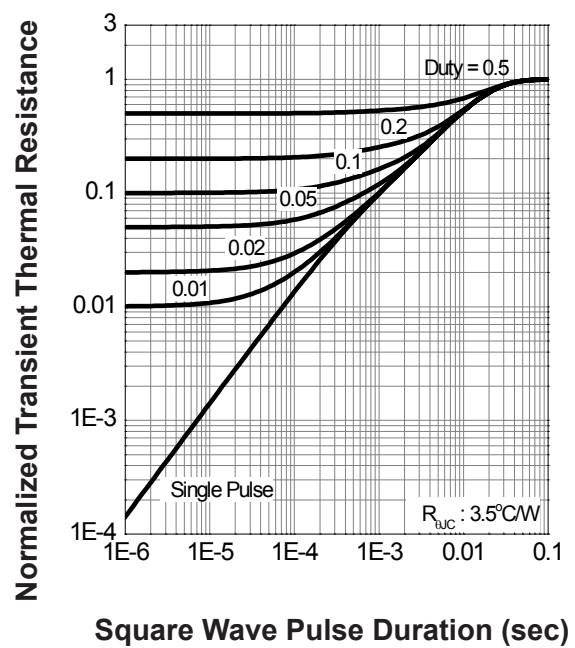
Drain Current



Safe Operation Area

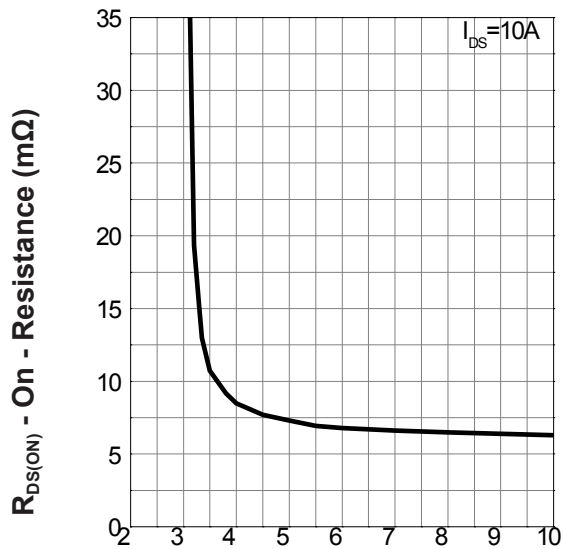


Thermal Transient Impedance



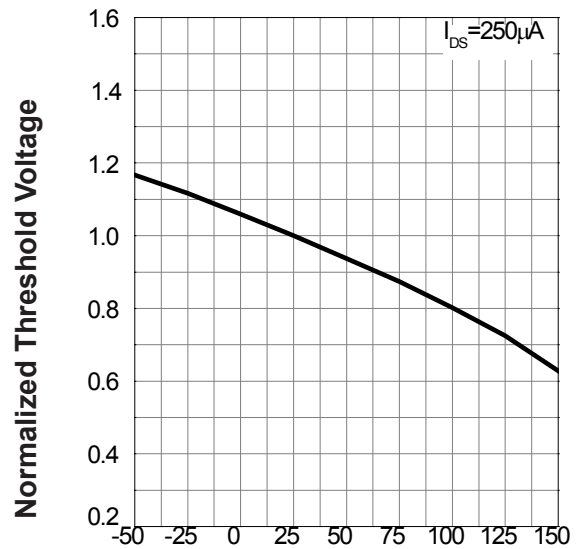
### Typical Operating Characteristics(Cont.)

Gate-Source On Resistance



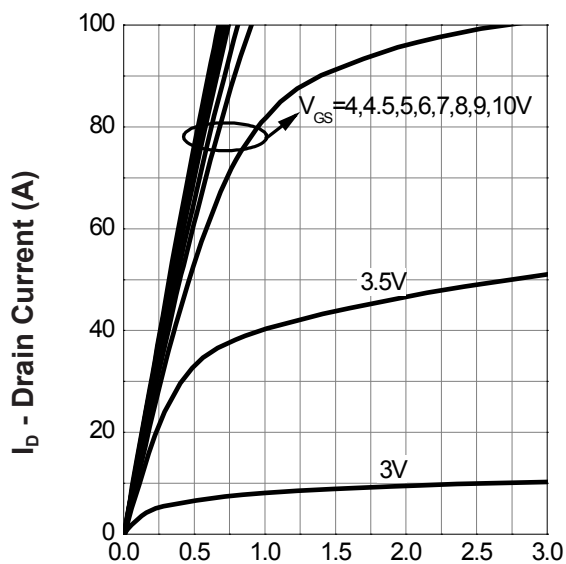
$V_{GS}$  - Gate - Source Voltage (V)

Gate Threshold Voltage



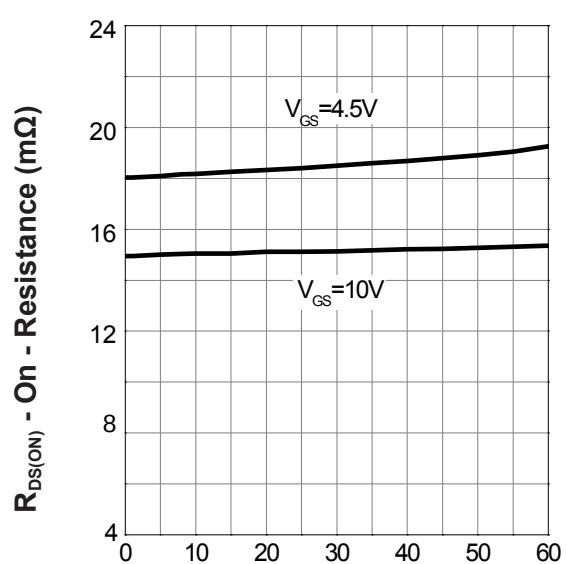
$T_j$  - Junction Temperature (°C)

Output Characteristics



$V_{DS}$  - Drain - Source Voltage (V)

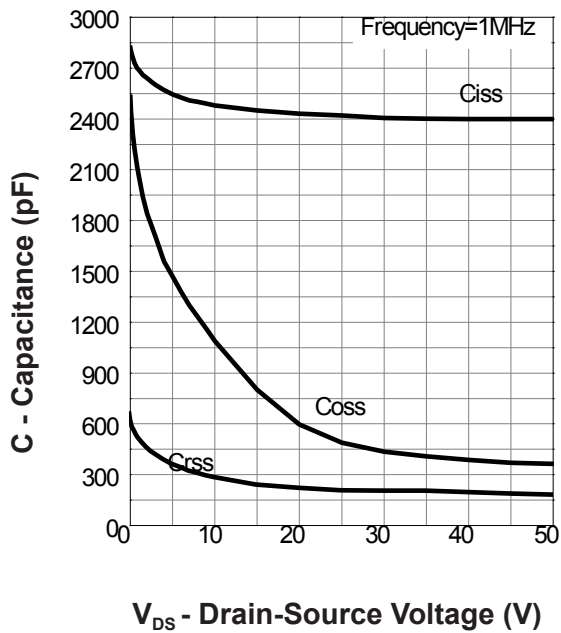
Drain-Source On Resistance



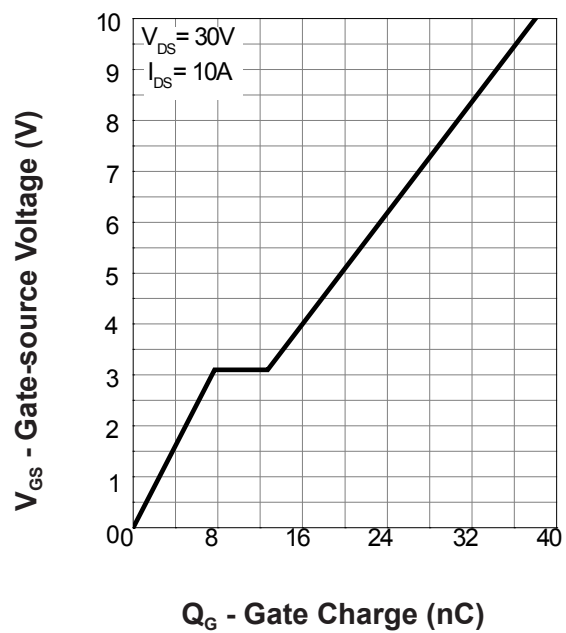
$I_D$  - Drain Current (A)

### Typical Operating Characteristics(Cont.)

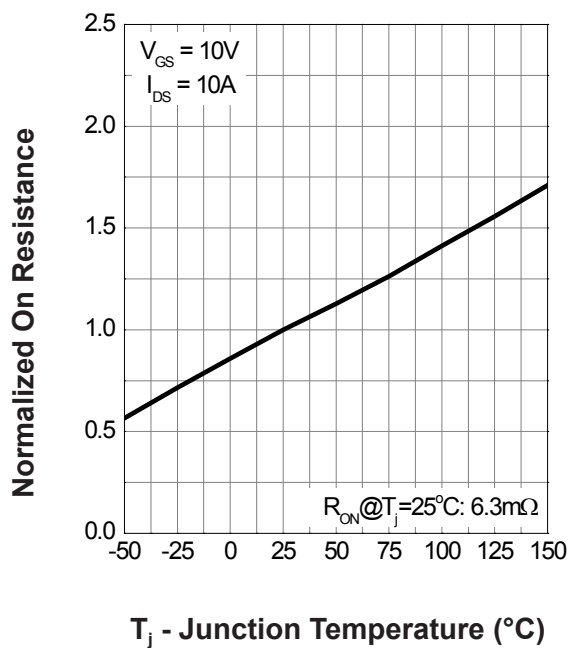
Capacitance



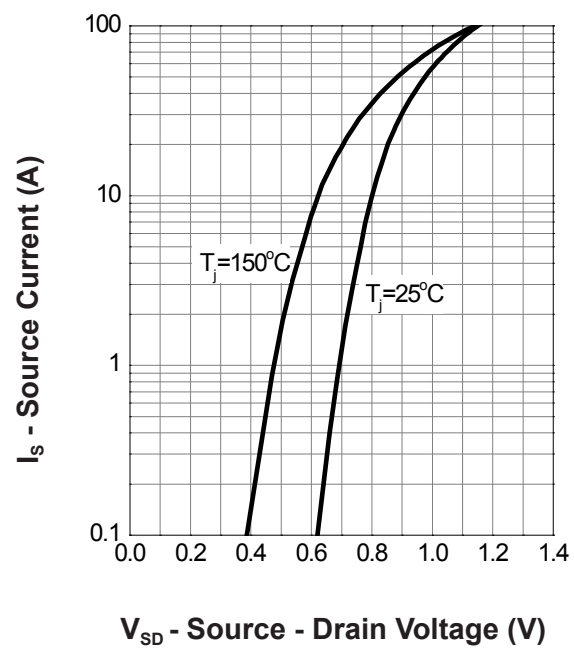
Gate Charge



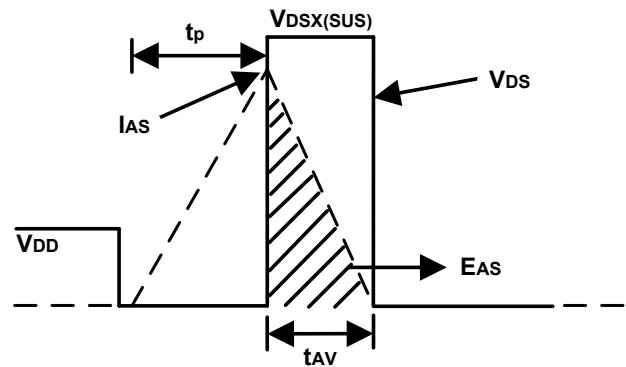
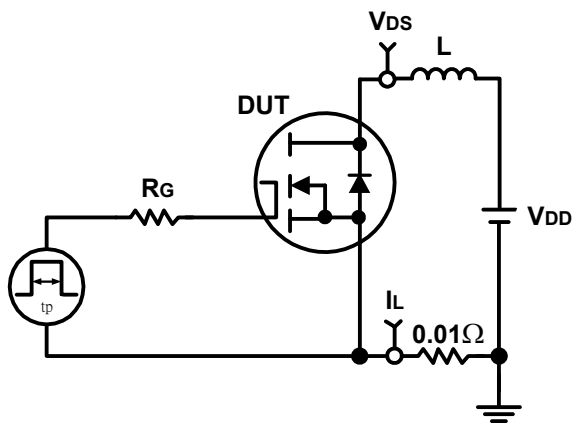
Drain-Source On Resistance



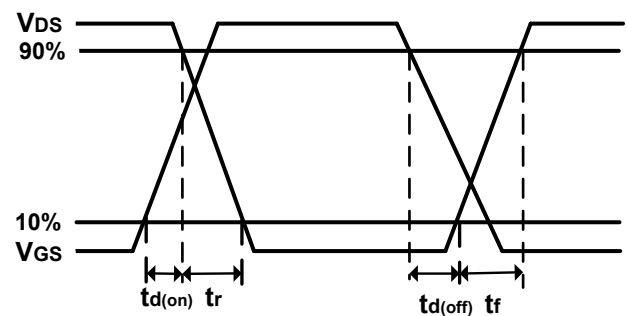
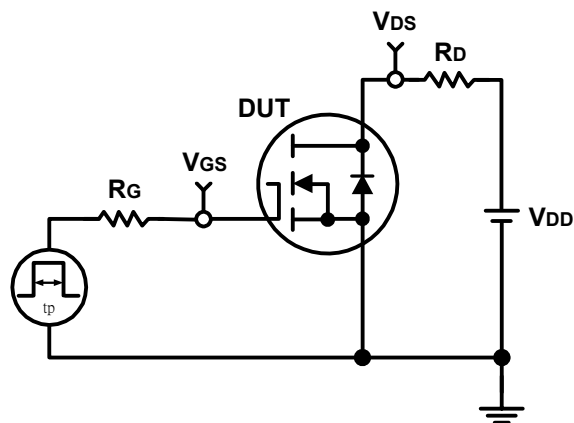
Source-Drain Diode Forward



## Avalanche Test Circuit and Waveforms

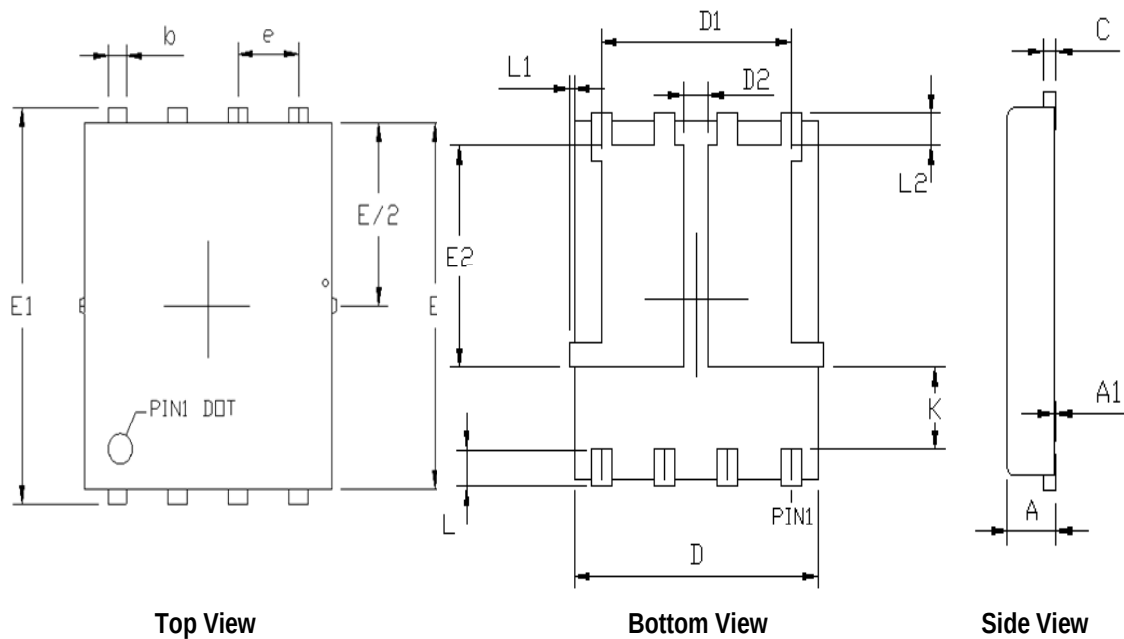


## Switching Time Test Circuit and Waveforms



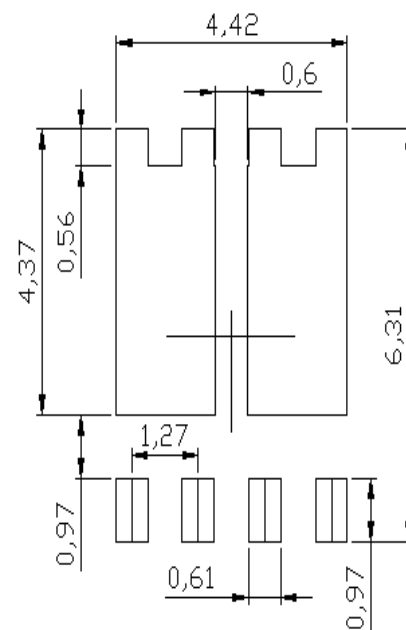
## Package Information

PDFN5\*6-8L



| SYMBOLS | MILLIMETERS |       | INCHES    |       |
|---------|-------------|-------|-----------|-------|
|         | MIN.        | MAX.  | MIN.      | MAX.  |
| A       | 0.900       | 1.200 | 0.035     | 0.047 |
| A1      | 0.000       | 0.050 | 0.000     | 0.002 |
| b       | 0.300       | 0.500 | 0.012     | 0.020 |
| c       | 0.150       | 0.300 | 0.006     | 0.012 |
| D       | 4.800       | 5.000 | 0.189     | 0.197 |
| D1      | 3.550       | 4.550 | 0.140     | 0.179 |
| D2      | 0.500       | 0.910 | 0.020     | 0.036 |
| E       | 5.650       | 5.850 | 0.222     | 0.230 |
| E1      | 5.900       | 6.200 | 0.232     | 0.244 |
| E2      | 3.200       | 3.780 | 0.126     | 0.149 |
| e       | 1.27 BSC    |       | 0.050 BSC |       |
| K       | 1.100       | -     | 0.043     | -     |
| L       | 0.500       | 0.800 | 0.020     | 0.031 |
| L1      | 0.000       | 0.150 | 0.000     | 0.006 |
| L2      | 0.325       | 0.610 | 0.013     | 0.024 |

## RECOMMENDED LAND PATTERN



UNIT: mm