

# DSC380N75ZE

Silicon Carbide MOSFET 750V, 380mΩ, 10A



重庆平伟半导体股份有限公司

## Features

- 0 V turn-off gate voltage can be applied
- High Blocking Voltage with Low RDS(on)
- High Speed Switching with Low Capacitances
- Easy to Parallel and Simple to Drive
- Qualified according to JEDEC criteria



## Applications

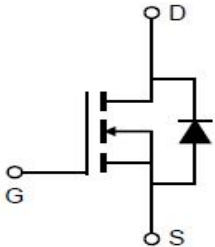
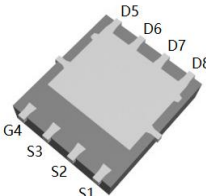
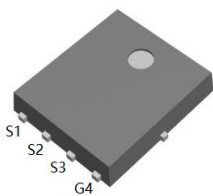
- Lighting
- Telecom and UPS
- PWM stages for e.g. PC Silverbox, Adapter, LCD & PDP TV

**100% DVDS Tested**  
**100% Avalanche Tested**

## Product Summary

|                          |       |
|--------------------------|-------|
| V <sub>DS</sub>          | 750V  |
| R <sub>DS(on)</sub> typ. | 380mΩ |
| I <sub>D</sub>           | 10A   |

PDFN5\*6



## Package Marking and Ordering Information

| Part #      | Marking     | Package | Packing   | Reel Size | Tape Width | Qty     |
|-------------|-------------|---------|-----------|-----------|------------|---------|
| DSC380N75ZE | DSC380N75ZE | PDFN5*6 | Tape&Reel | 13 inches | 12mm       | 5000pcs |

## Absolute Maximum Ratings

| Parameter                                         | Symbol                            | Value      | Unit |
|---------------------------------------------------|-----------------------------------|------------|------|
| Drain-source voltage                              | V <sub>DS</sub>                   | 750        | V    |
| Continuous drain current<br>T <sub>C</sub> = 25°C | I <sub>D</sub>                    | 10         | A    |
| T <sub>C</sub> = 100°C (Silicon limit)            |                                   | 7          |      |
| Pulsed drain current (T <sub>C</sub> = 25°C)      | I <sub>D pulse</sub>              | 31         | A    |
| Avalanche energy, single pulse (L=5mH)            | E <sub>AS</sub>                   | 16         | mJ   |
| Gate-Source voltage,max.transient voltage         | V <sub>GSmax</sub>                | -8/+22     | V    |
| Recommended operating values                      | V <sub>GSsop</sub>                | 0/+18      | V    |
| Power dissipation<br>T <sub>C</sub> = 25°C        | P <sub>tot</sub>                  | 65         | W    |
| Operating junction and storage temperature        | T <sub>j</sub> , T <sub>stg</sub> | -55...+175 | °C   |

**Thermal Resistance**

| Parameter                                              | Symbol     | Value |      |      | Unit | Test Condition                                    |
|--------------------------------------------------------|------------|-------|------|------|------|---------------------------------------------------|
|                                                        |            | min.  | typ. | max. |      |                                                   |
| Thermal resistance, junction – case.                   | $R_{thJC}$ | -     | 1.5  | 2.3  | °C/W | -                                                 |
| Thermal resistance, junction - ambient(min. footprint) | $R_{thJA}$ | -     | -    | 50   | °C/W | 1 inch <sup>2</sup> , 2oz single copper FR-4 PCB. |

**Electrical Characteristic (at T<sub>j</sub> = 25 °C, unless otherwise specified)**

| Parameter | Symbol | Value |      |      | Unit | Test Condition |
|-----------|--------|-------|------|------|------|----------------|
|           |        | min.  | typ. | max. |      |                |

**Static Characteristic**

|                                  |              |     |     |      |    |                                                                   |
|----------------------------------|--------------|-----|-----|------|----|-------------------------------------------------------------------|
| Drain-source breakdown voltage   | $BV_{DSS}$   | 750 | -   | -    | V  | $V_{GS}=0V, I_D=100\mu A$                                         |
| Gate threshold voltage           | $V_{GS(th)}$ | 2.5 | 3.5 | 4.5  | V  | $V_{DS}=V_{GS}, I_D=6mA$                                          |
| Zero gate voltage drain current  | $I_{DSS}$    | -   | 1   | 10   | μA | $V_{DS}=750V, V_{GS}=0V$<br>$T_j=25^\circ C$<br>$T_j=175^\circ C$ |
| Gate-source leakage current      | $I_{GSS}$    | -   | -   | 100  | nA | $V_{GS}=22V, V_{DS}=0V$                                           |
|                                  |              | -   | -   | -100 | nA | $V_{GS}=-8V, V_{DS}=0V$                                           |
| Drain-source on-state resistance | $R_{DS(on)}$ | -   | 380 | 500  | mΩ | $V_{GS}=15V, I_D=6A$                                              |
| Drain-source on-state resistance | $R_{DS(on)}$ | -   | 260 | 380  | mΩ | $V_{GS}=18V, I_D=6A$                                              |
| Transconductance                 | $g_{fs}$     | -   | 3.3 | -    | S  | $V_{DS}=20V, I_D=5A$                                              |

**Dynamic Characteristic**

|                              |              |   |     |   |    |                                                       |
|------------------------------|--------------|---|-----|---|----|-------------------------------------------------------|
| Input Capacitance            | $C_{iss}$    | - | 257 | - | pF | $V_{GS}=0V, V_{DS}=400V,$<br>$f=1MHz$                 |
| Output Capacitance           | $C_{oss}$    | - | 22  | - |    |                                                       |
| Reverse Transfer Capacitance | $C_{rss}$    | - | 2   | - |    |                                                       |
| Gate Total Charge            | $Q_G$        | - | 10  | - | nC | $V_{DS}=400V, I_D=6A$<br>$, V_{GS}=0V/15V$            |
| Gate-Source charge           | $Q_{gs}$     | - | 3   | - |    |                                                       |
| Gate-Drain charge            | $Q_{gd}$     | - | 6   | - |    |                                                       |
| Turn-on delay time           | $t_{d(on)}$  | - | 9   | - | ns | $V_{GS}=0/18V, V_{DD}=400V,$<br>$R_G=5\Omega, I_D=6A$ |
| Rise time                    | $t_r$        | - | 10  | - |    |                                                       |
| Turn-off delay time          | $t_{d(off)}$ | - | 15  | - |    |                                                       |
| Fall time                    | $t_f$        | - | 5   | - |    |                                                       |
| Gate resistance              | $R_G$        | - | 4.0 | - | Ω  | $V_{GS}=0V, f=1MHz$                                   |

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## Body Diode Characteristic

| Parameter                             | Symbol    | Value |      |      | Unit | Test Condition                                             |
|---------------------------------------|-----------|-------|------|------|------|------------------------------------------------------------|
|                                       |           | min.  | typ. | max. |      |                                                            |
| Body Diode Forward Voltage            | $V_{SD}$  | -     | 3.5  | -    | V    | $V_{GS}=0V, I_{SD}=3A$<br>$T_j=25^{\circ}C$                |
|                                       |           | -     | 3.3  | -    |      | $T_j=175^{\circ}C$                                         |
| Body Diode Continuous Forward Current | $I_S$     | -     | -    | 10   | A    | $T_C = 25^{\circ}C$                                        |
|                                       |           | -     | -    | 7    | A    | $T_C = 100^{\circ}C$                                       |
| Body Diode Reverse Recovery Time      | $t_{rr}$  | -     | 22   | -    | ns   | $V_{GS}=-5V, I_{SD}=3A,$<br>$V_R=400V$<br>$di/dt=1000A/us$ |
| Body Diode Reverse Recovery Charge    | $Q_{rr}$  | -     | 73   | -    | nC   |                                                            |
| Peak Reverse Recovery Current         | $I_{RRM}$ | -     | 3    | -    | A    |                                                            |

## Typical Performance Characteristics

Fig 1: Output Characteristics  $T_j=25^{\circ}\text{C}$

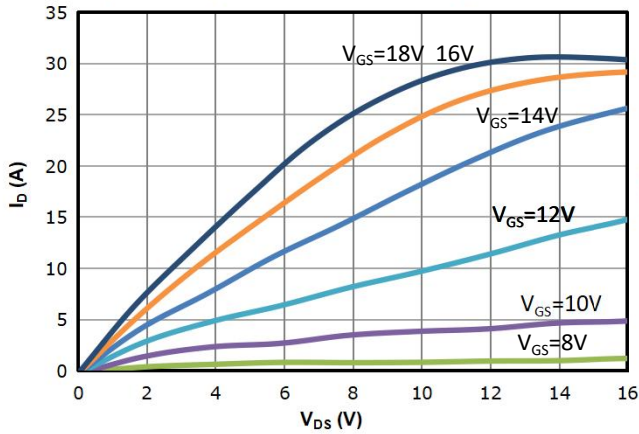


Fig 2: Output Characteristics  $T_j=175^{\circ}\text{C}$

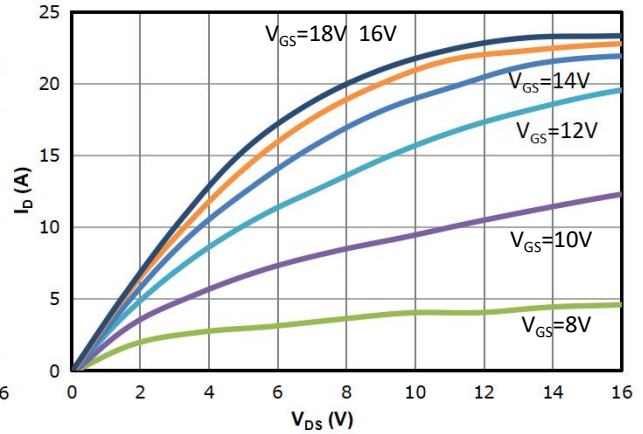


Fig 3: Transfer Characteristics

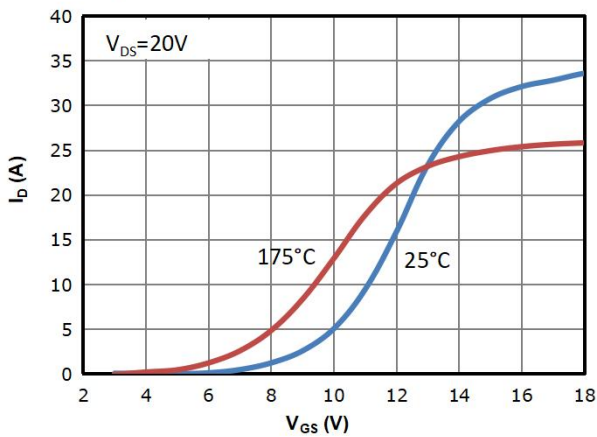


Fig 4:  $R_{ds(on)}$  vs Drain Current and Gate Voltage

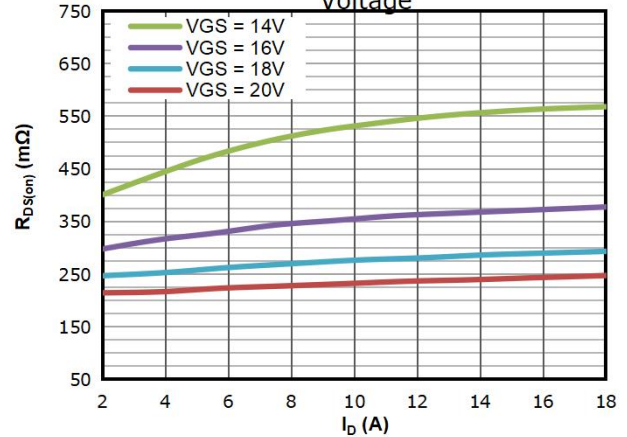


Fig 5:  $R_{ds(on)}$  vs. Temperature

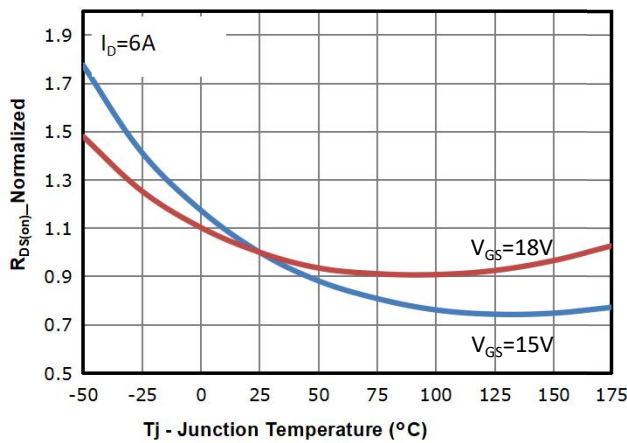


Fig 6:  $V_{gs(th)}$  vs. Temperature

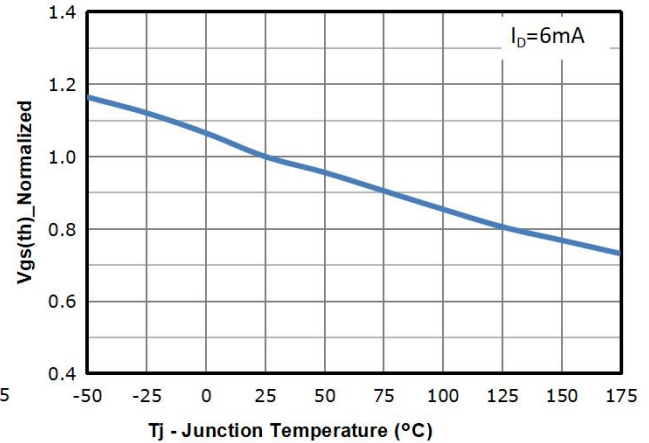


Fig 7: BVdss vs. Temperature

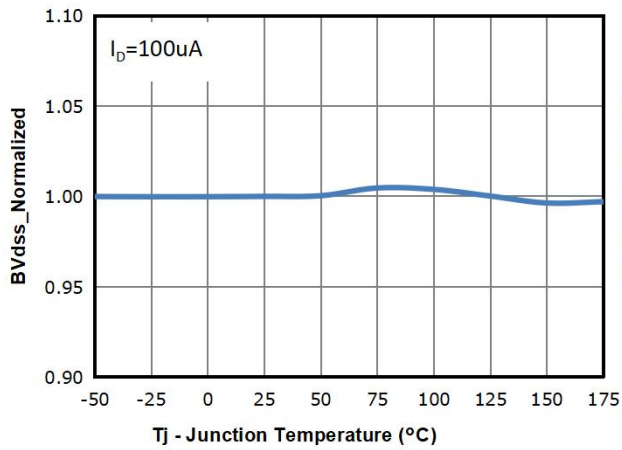


Fig 8: Capacitance Characteristics

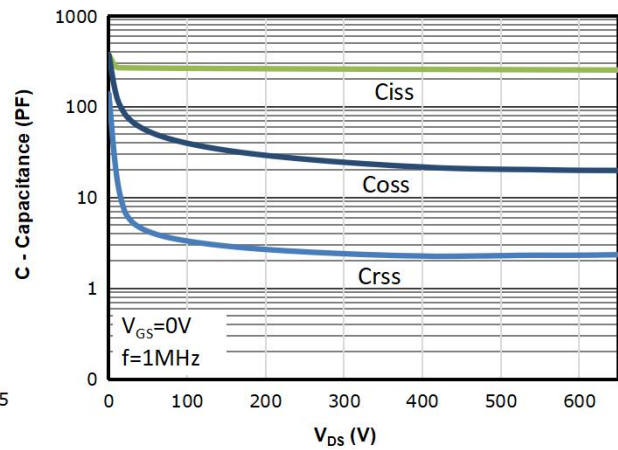


Fig 9: Gate Charge Characteristics

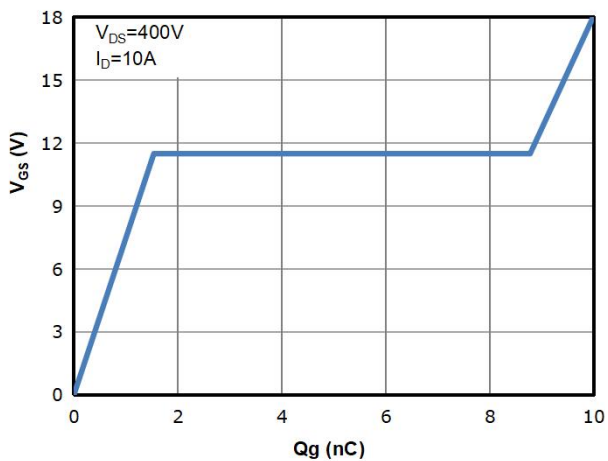


Fig 10: Body-diode Forward Characteristics

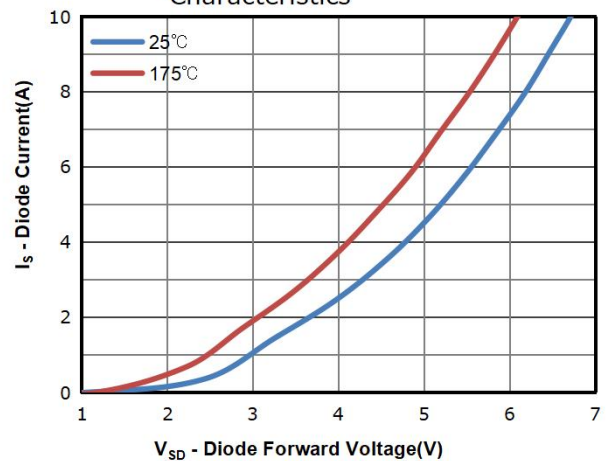


Fig 11: Power Dissipation

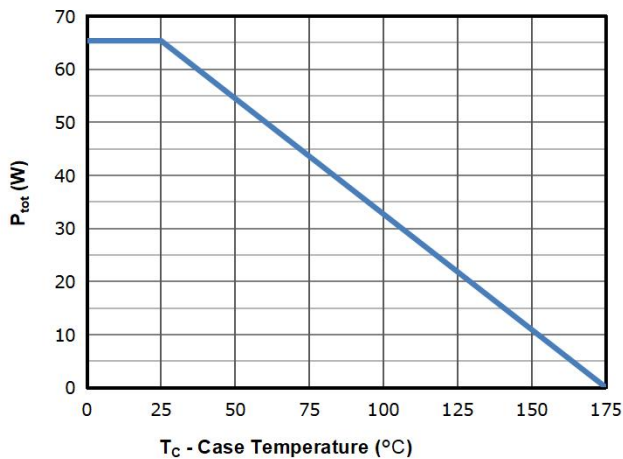


Fig 12: Drain Current Derating

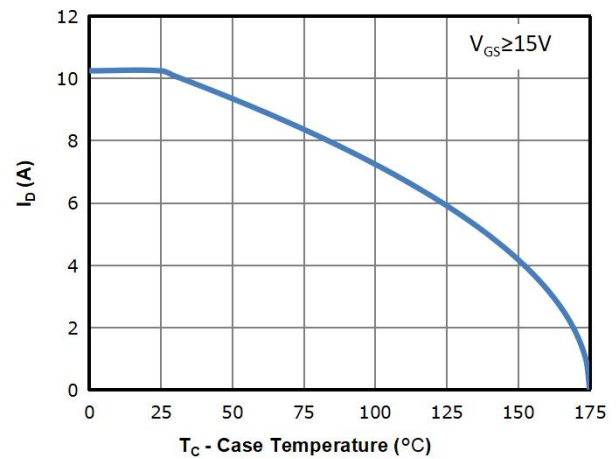




Fig 13: Safe Operating Area

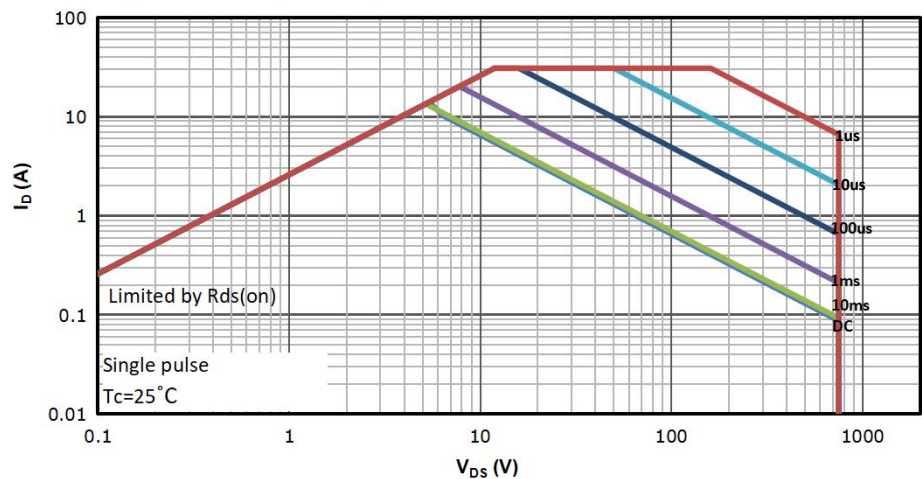
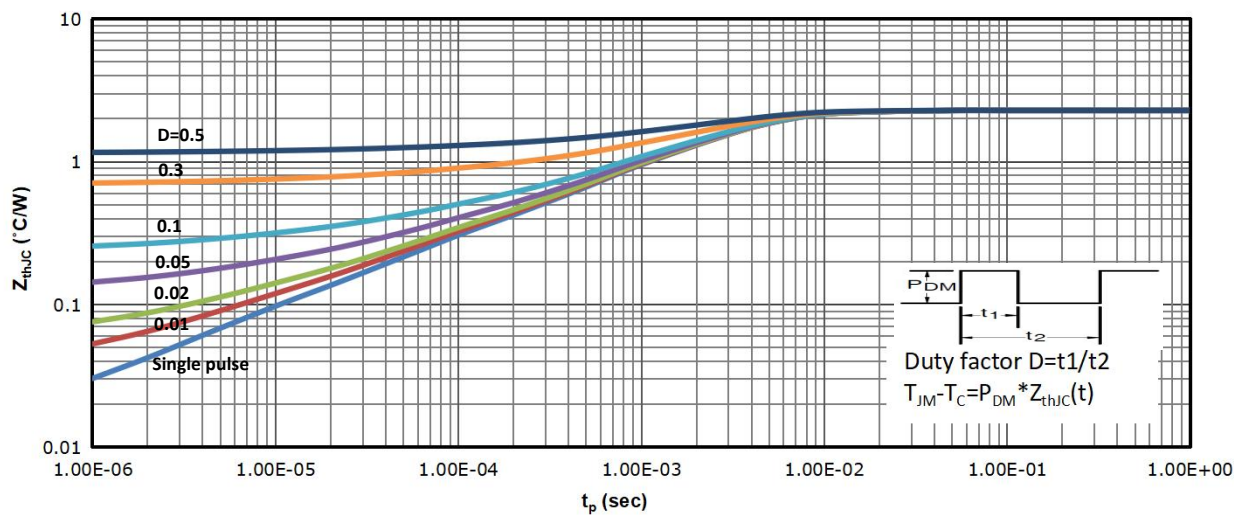
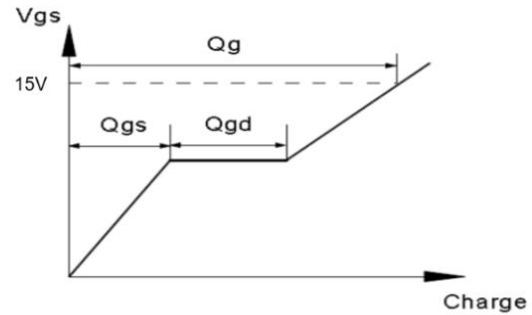
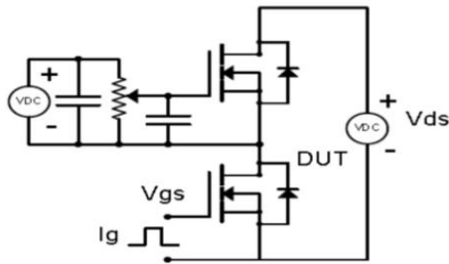


Fig 14: Max. Transient Thermal Impedance

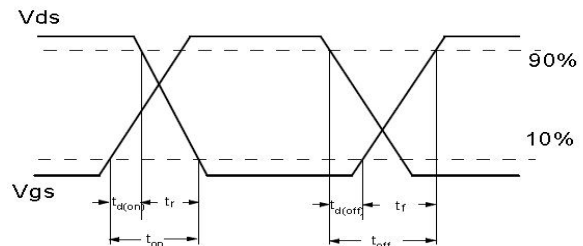
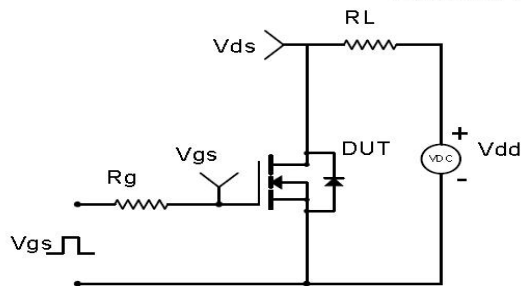


## Test Circuit & Waveform

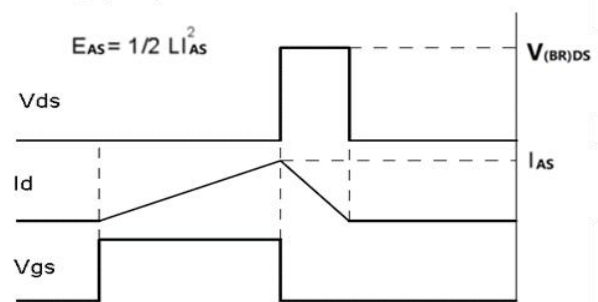
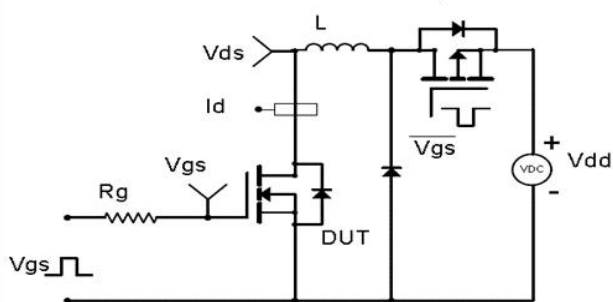
Gate Charge Test Circuit & Waveform



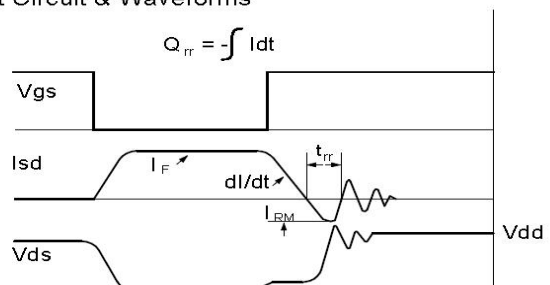
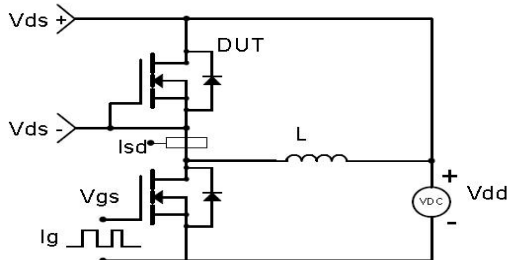
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



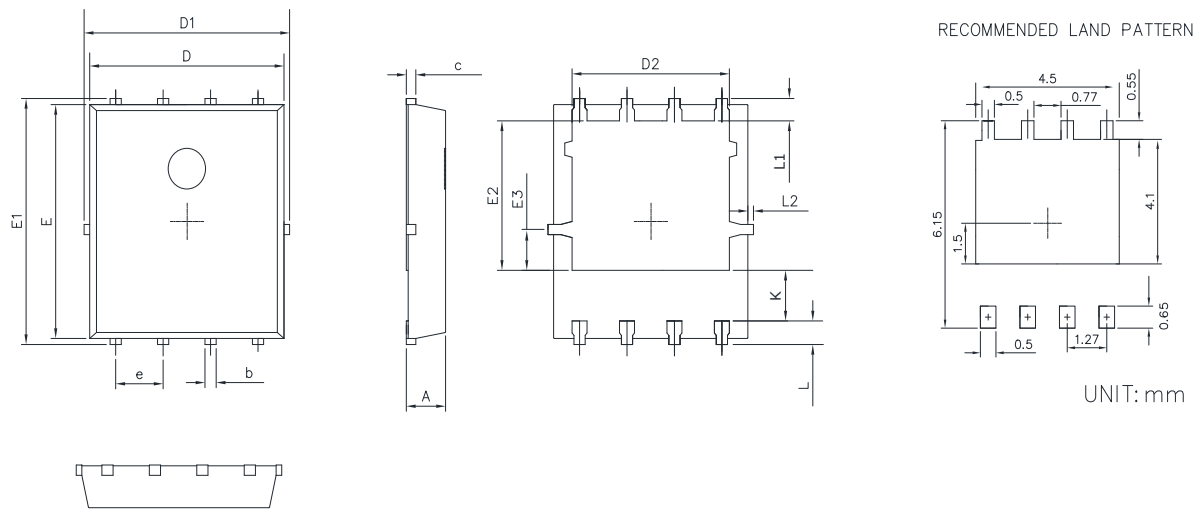
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## Package Outline: PDFN5\*6



| SYMBOL | MILLIMETERS |      | INCHES |       |
|--------|-------------|------|--------|-------|
|        | MIN         | MAX  | MIN    | MAX   |
| A      | 0.90        | 1.10 | 0.035  | 0.043 |
| b      | 0.25        | 0.50 | 0.010  | 0.020 |
| c      | 0.10        | 0.30 | 0.004  | 0.012 |
| D      | 4.80        | 5.30 | 0.189  | 0.209 |
| D1     | 4.90        | 5.50 | 0.193  | 0.217 |
| D2     | 3.92        | 4.20 | 0.154  | 0.165 |
| E      | 5.65        | 5.85 | 0.222  | 0.230 |
| E1     | 5.90        | 6.20 | 0.232  | 0.244 |
| E2     | 3.33        | 3.78 | 0.131  | 0.149 |
| E3     | 0.80        | 1.00 | 0.031  | 0.039 |
| e      | 1.27        |      | 0.050  |       |
| L      | 0.40        | 0.70 | 0.016  | 0.028 |
| L1     | 0.65        |      | 0.026  |       |
| L2     | 0.00        | 0.15 | 0.000  | 0.006 |
| K      | 1.00        | 1.50 | 0.039  | 0.059 |

## Disclaimer

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