

# DSC120N120W

Silicon Carbide MOSFET 1200V, 120mΩ, 14A



重庆平伟半导体股份有限公司

## Features

- Uses PingWei advanced PerfectMOS technology
- Extremely low on-resistance  $R_{DS(on)}$
- Excellent  $Q_g \times R_{DS(on)}$  product(FOM)
- Excellent Low Ciss
- Qualified according to JEDEC criteria



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

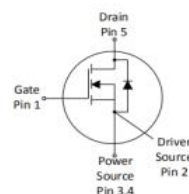
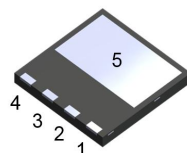
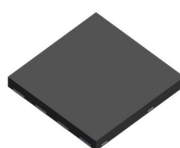
## Applications

- PFC stages, hard switching PWM stages and resonant switching
- PWM stages for e.g. PC Silverbox, Adapter, LCD & PDP TV,
- Lighting, Server, Telecom and UPS

## Product Summary

|                      |       |
|----------------------|-------|
| $V_{DS}$             | 1200V |
| $R_{DS(on)}@18V$ typ | 120mΩ |
| $I_D$                | 14A   |

DFN8\*8



## Package Marking and Ordering Information

| Part #      | Marking     | Package | Packing   | Reel Size | Tape Width | Qty     |
|-------------|-------------|---------|-----------|-----------|------------|---------|
| DSC120N120W | DSC120N120W | DFN8*8  | Tape&Reel | 13 inches | 16mm       | 4000pcs |

## Absolute Maximum Ratings

| Parameter                                                                                | Symbol                | Value      | Unit       |
|------------------------------------------------------------------------------------------|-----------------------|------------|------------|
| Drain-source voltage                                                                     | $V_{DS}$              | 1200       | V          |
| Continuous drain current<br>$T_C = 25^\circ C$<br>$T_C = 100^\circ C$                    | $I_D$                 | 14<br>10   | A          |
| Pulsed drain current ( $T_C = 25^\circ C$ )                                              | $I_{D \text{ pulse}}$ | 56         | A          |
| Avalanche energy, single pulse ( $L=5mH$ )                                               | $E_{AS}$              | 63         | mJ         |
| Gate-Source voltage,max.transient voltage                                                | $V_{GSmax}$           | -8/+22     | V          |
| Recommended operating values                                                             | $V_{GSsop}$           | -5/+18     | V          |
| Power dissipation<br>$T_C = 25^\circ C$                                                  | $P_{tot}$             | 50         | W          |
| Operating junction and storage temperature                                               | $T_j, T_{stg}$        | -55...+175 | $^\circ C$ |
| Soldering temperature, wave soldering only allowed at leads<br>(1.6mm from case for 10s) | $T_{sold}$            | 260        | $^\circ C$ |

**Thermal Resistance**

| Parameter                                              | Symbol | Value |      |      | Unit | Test Condition                                    |
|--------------------------------------------------------|--------|-------|------|------|------|---------------------------------------------------|
|                                                        |        | min.  | typ. | max. |      |                                                   |
| Thermal resistance, junction – case.                   | RthJC  | -     | -    | 3.0  | °C/W | -                                                 |
| Thermal resistance, junction - ambient(min. footprint) | RthJA  | -     | -    | 45.0 | °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 <sub>DSS</sub>   | 1200 | -   | -    | V  | V <sub>GS</sub> =0V, I <sub>D</sub> =250uA               |
| Gate threshold voltage           | V <sub>GS(th)</sub> | 2.2  | 3.6 | 4.2  | V  | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =2.5mA |
| Zero gate voltage drain current  | I <sub>DSS</sub>    | -    | -   | 1    | μA | V <sub>DS</sub> =1200V, V <sub>GS</sub> =0V              |
|                                  |                     | -    | -   | 100  | μA | T <sub>j</sub> =25°C<br>T <sub>j</sub> =175°C            |
| Gate-source leakage current      | I <sub>GSS</sub>    | -    | -   | 200  | nA | V <sub>GS</sub> =18V, V <sub>DS</sub> =0V                |
|                                  |                     | -    | -   | -100 | nA | V <sub>GS</sub> =-5V, V <sub>DS</sub> =0V                |
| Drain-source on-state resistance | R <sub>DS(on)</sub> | -    | 120 | 160  | mΩ | V <sub>GS</sub> =18V, I <sub>D</sub> =10A                |
|                                  |                     | -    | 160 | 192  | mΩ | V <sub>GS</sub> =15V, I <sub>D</sub> =10A                |
| Transconductance                 | g <sub>fs</sub>     | -    | 9   | -    | S  | V <sub>DS</sub> =20V, I <sub>D</sub> =13A                |

**Dynamic Characteristic**

|                              |                     |   |     |   |    |                                                                                                                                         |
|------------------------------|---------------------|---|-----|---|----|-----------------------------------------------------------------------------------------------------------------------------------------|
| Input Capacitance            | C <sub>iss</sub>    | - | 973 | - | pF | V <sub>GS</sub> =0V, V <sub>DS</sub> =800V,<br>f=1MHz                                                                                   |
| Output Capacitance           | C <sub>oss</sub>    | - | 40  | - |    |                                                                                                                                         |
| Reverse Transfer Capacitance | C <sub>rss</sub>    | - | 5.1 | - |    |                                                                                                                                         |
| Gate Total Charge            | Q <sub>G</sub>      | - | 45  | - | nC | V <sub>DS</sub> =800V, I <sub>D</sub> =10A<br>V <sub>GS</sub> =-5/18V                                                                   |
| Gate-Source charge           | Q <sub>GS</sub>     | - | 20  | - |    |                                                                                                                                         |
| Gate-Drain charge            | Q <sub>GD</sub>     | - | 12  | - |    |                                                                                                                                         |
| Turn-on delay time           | t <sub>d(on)</sub>  | - | 20  | - | ns | V <sub>GS</sub> =-5/18V,<br>V <sub>DD</sub> =800V,<br>R <sub>G_ext</sub> =0Ω, I <sub>D</sub> =10A<br>Timing relative to V <sub>DS</sub> |
| Rise time                    | t <sub>r</sub>      | - | 45  | - |    |                                                                                                                                         |
| Turn-off delay time          | t <sub>d(off)</sub> | - | 20  | - |    |                                                                                                                                         |
| Fall time                    | t <sub>f</sub>      | - | 15  | - |    |                                                                                                                                         |

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|                 |       |   |     |   |          |                                     |
|-----------------|-------|---|-----|---|----------|-------------------------------------|
| Gate resistance | $R_G$ | - | 6.5 | - | $\Omega$ | $V_{GS}=0V, V_{DS}=0V,$<br>$f=1MHz$ |
|-----------------|-------|---|-----|---|----------|-------------------------------------|

## Body Diode Characteristic

| Parameter                             | Symbol      | Value |      |      | Unit | Test Condition                                                     |
|---------------------------------------|-------------|-------|------|------|------|--------------------------------------------------------------------|
|                                       |             | min.  | typ. | max. |      |                                                                    |
| Body Diode Forward Voltage            | $V_{SD}$    | -     | 4.0  | -    | V    | $V_{GS}=0V, I_{SD}=10A$<br>$T_j=25^{\circ}C$<br>$T_j=175^{\circ}C$ |
| Body Diode Continuous Forward Current | $I_S$       | -     | -    | 14   | A    | $TC = 25^{\circ}C$                                                 |
| Body Diode Pulsed Current             | $I_S$ pulse | -     | -    | 56   | A    | $TC = 25^{\circ}C$                                                 |
| Body Diode Reverse Recovery Time      | $t_{rr}$    | -     | 10   | -    | ns   | $V_{GS}=-5V, I_{SD}=10A,$<br>$V_R=800V$                            |
| Body Diode Reverse Recovery Charge    | $Q_{rr}$    | -     | 40   | -    | nC   | $dI/dt=1200A/\mu s$                                                |

## Typical Performance Characteristics

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

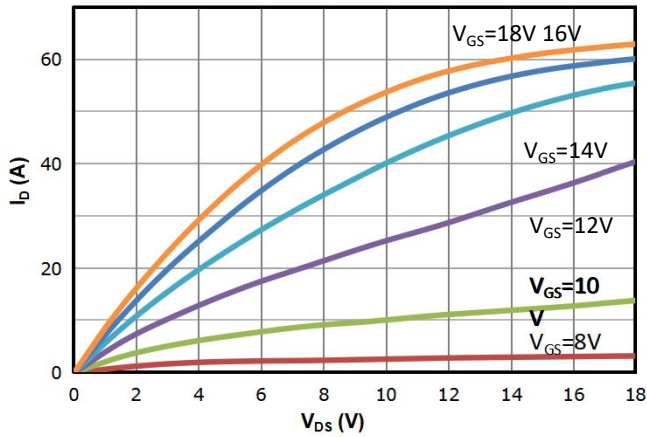


Fig 2: Output Characteristics  $T_j=175^{\circ}\text{C}$

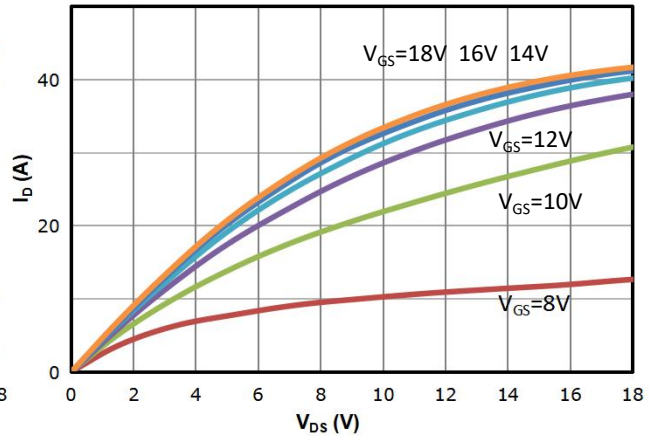


Fig 3: Transfer Characteristics

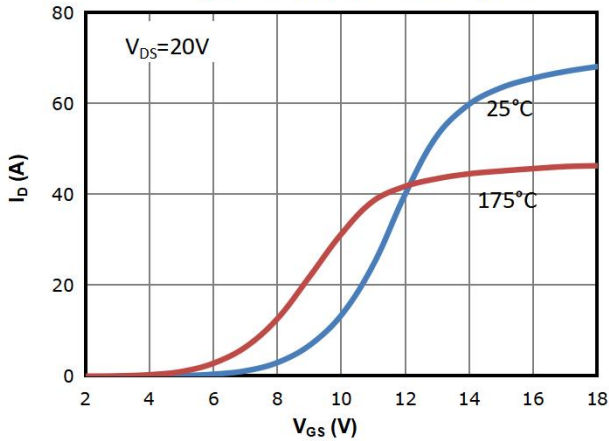


Fig 4:  $R_{DS(on)}$  vs Drain Current and Gate Voltage

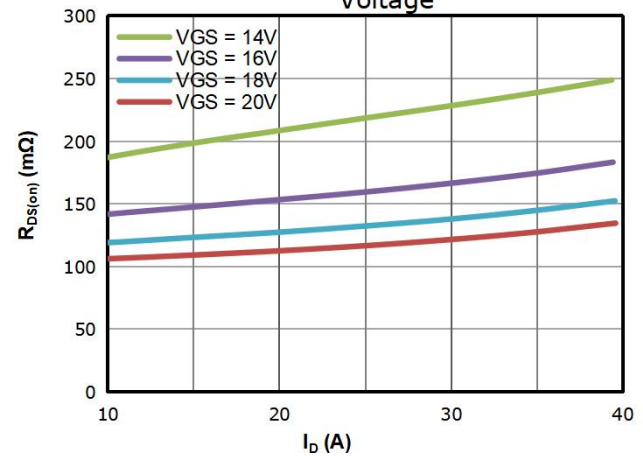


Fig 5:  $R_{DS(on)}$  vs. Temperature

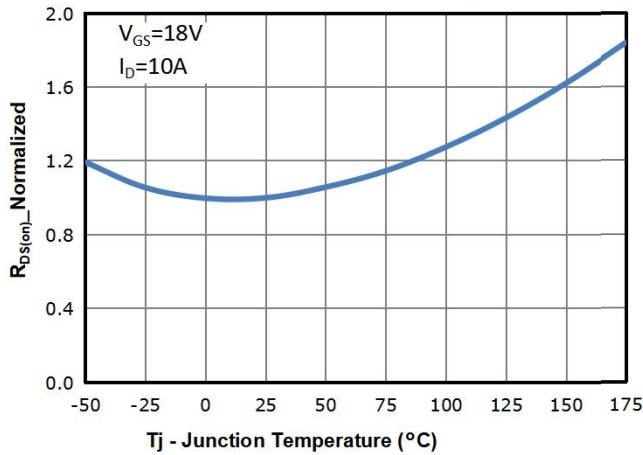


Fig 6:  $V_{GS(th)}$  vs. Temperature

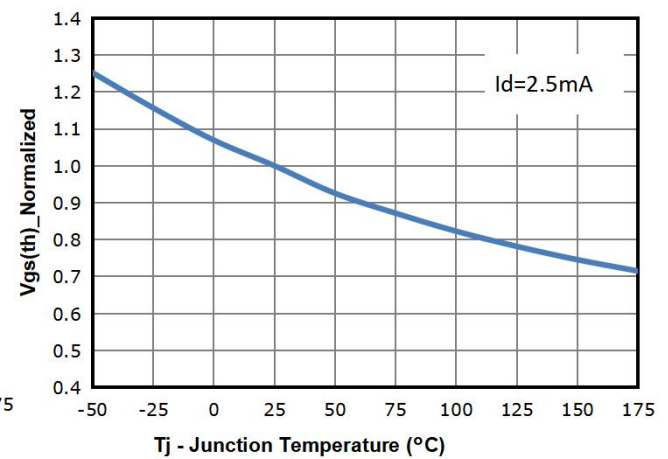


Fig 7: BVdss vs. Temperature

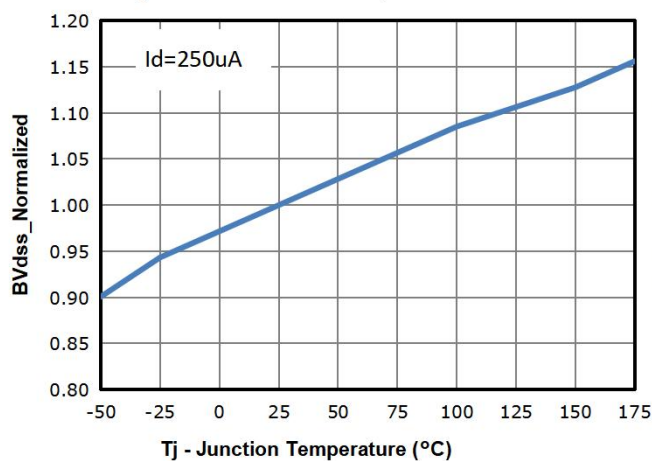


Fig 8: Capacitance Characteristics

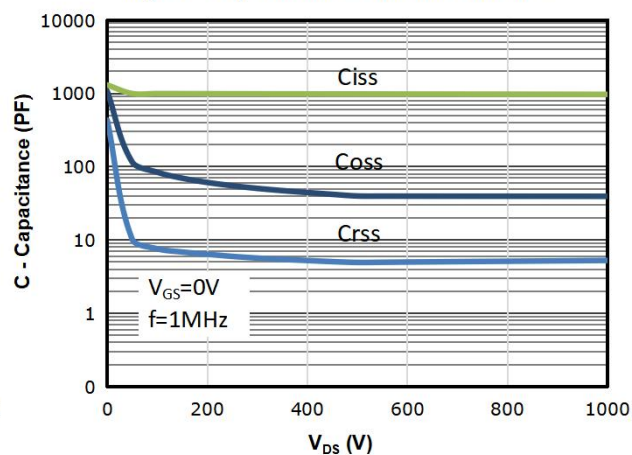


Fig 9: Gate Charge Characteristics

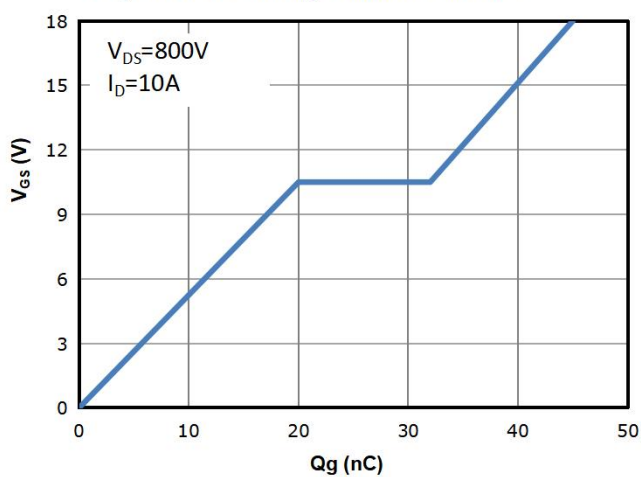


Fig 10: Body-diode Forward Characteristics

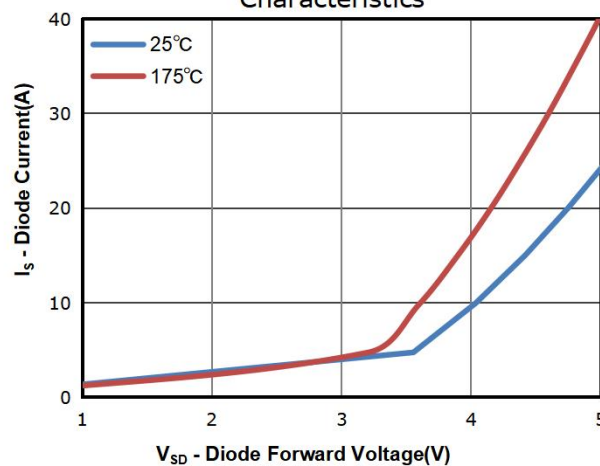


Fig 11: Power Dissipation

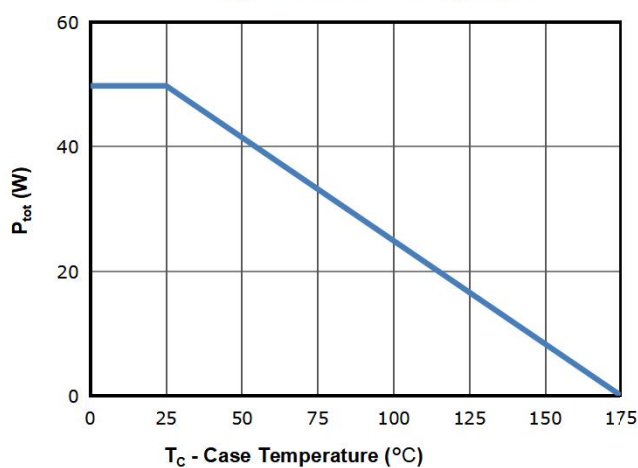


Fig 12: Drain Current Derating

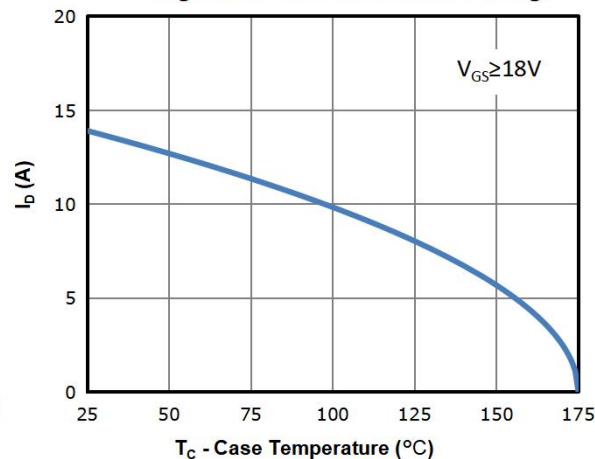


Fig 13: Safe Operating Area

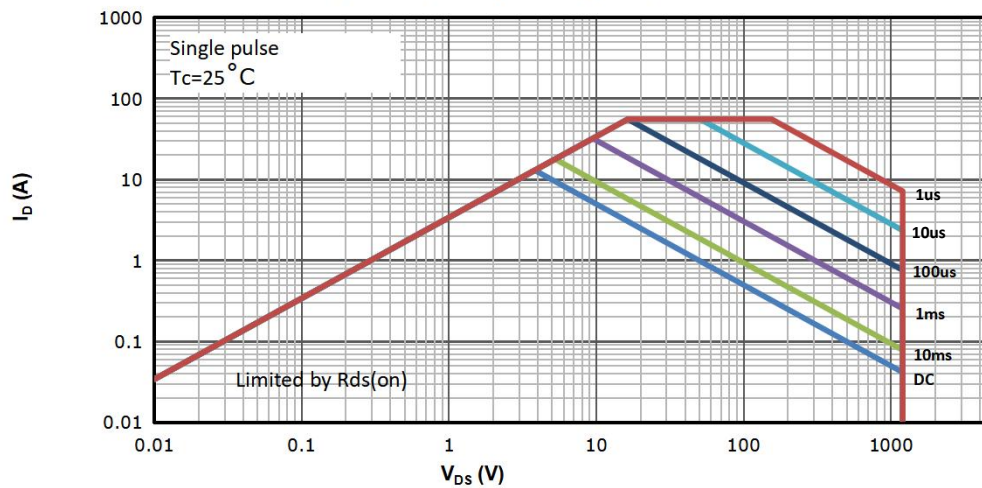
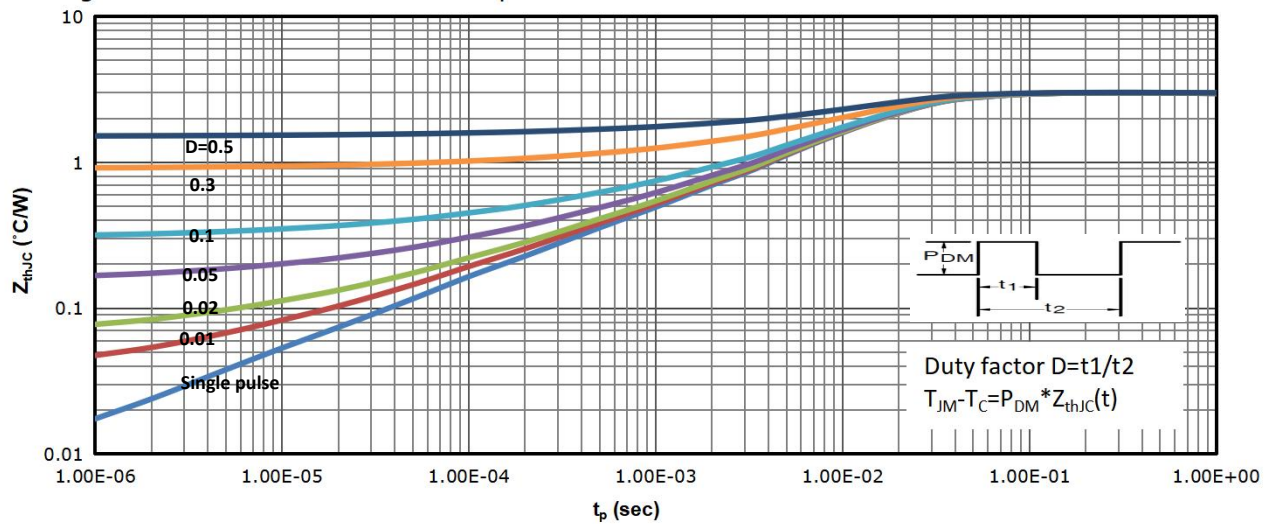
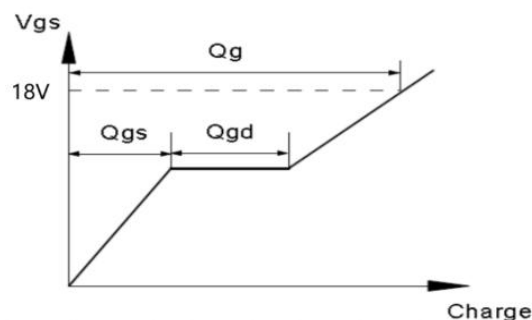
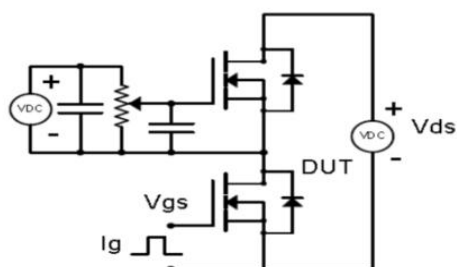


Fig 14: Max. Transient Thermal Impedance

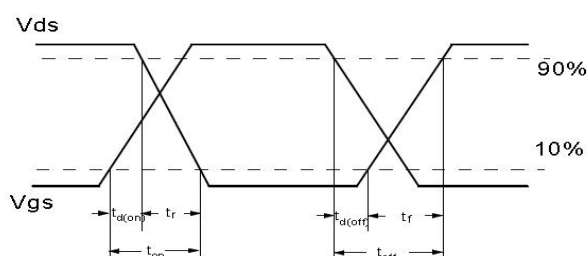
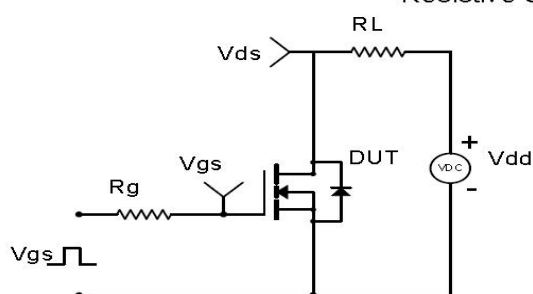


### Test Circuit & Waveform

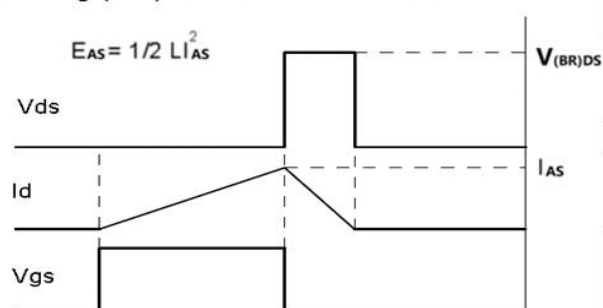
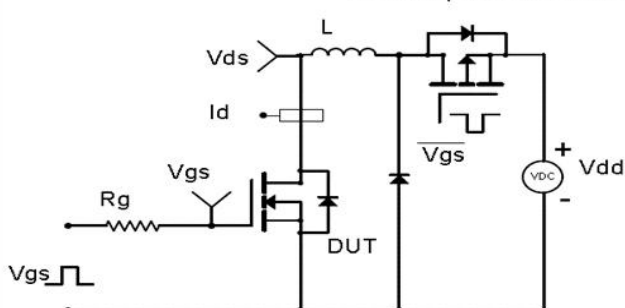
Gate Charge Test Circuit & Waveform



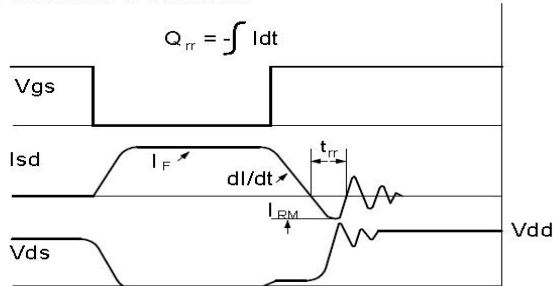
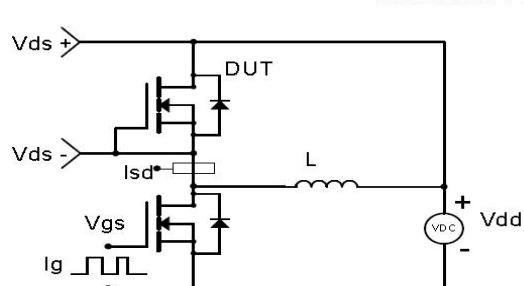
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

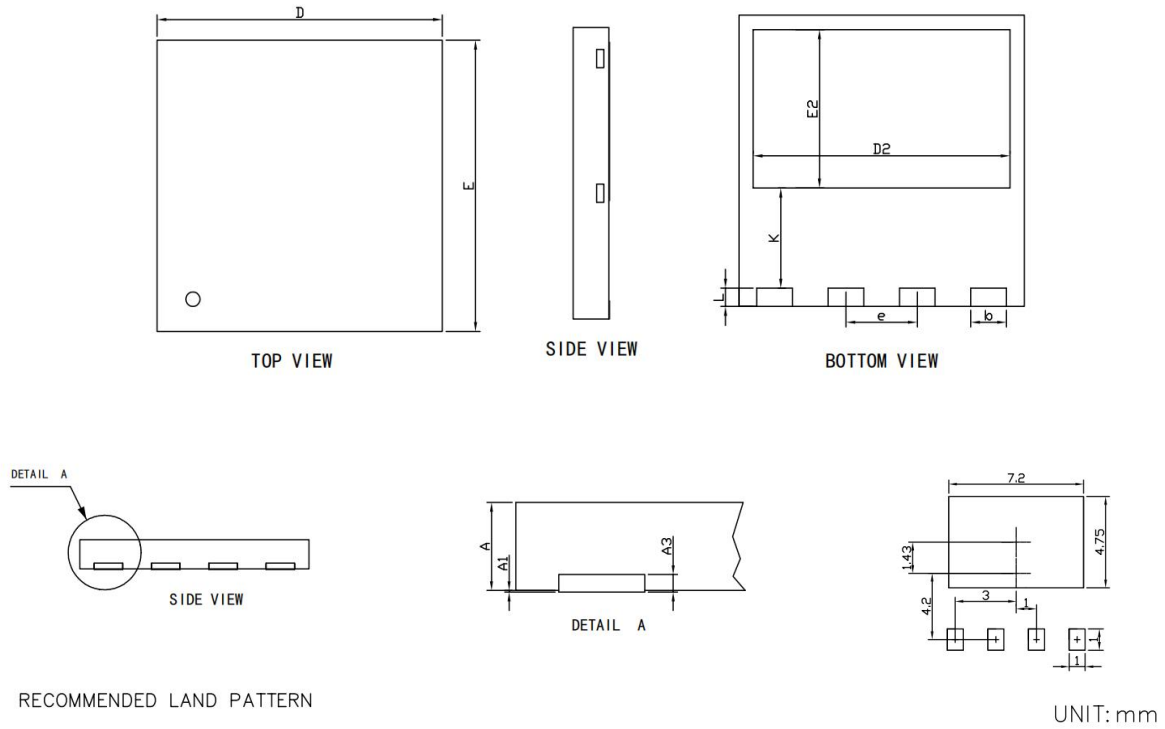


Diode Recovery Test Circuit & Waveforms





## Package Outline: DFN8\*8



| SYMBOL | MILLIMETERS |      | INCHES |       |
|--------|-------------|------|--------|-------|
|        | MIN         | MAX  | MIN    | MAX   |
| A      | 0.90        | 1.10 | 0.035  | 0.043 |
| A1     | 0.00        | 0.05 | 0.000  | 0.002 |
| A3     | 0.20        |      | 0.008  |       |
| b      | 0.90        | 1.10 | 0.035  | 0.043 |
| D      | 7.90        | 8.10 | 0.311  | 0.319 |
| E      | 7.90        | 8.10 | 0.311  | 0.319 |
| D2     | 7.10        | 7.30 | 0.280  | 0.287 |
| E2     | 4.25        | 4.45 | 0.167  | 0.175 |
| e      | 1.90        | 2.10 | 0.075  | 0.083 |
| K      | 2.65        | 2.85 | 0.104  | 0.112 |
| L      | 0.40        | 0.60 | 0.016  | 0.024 |



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### Disclaimer

Any and all semiconductor products have certain probability to fail or malfunction, which may result in personal injury, death or property damage. Customer are solely responsible for providing adequate safe measures when design their systems.

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