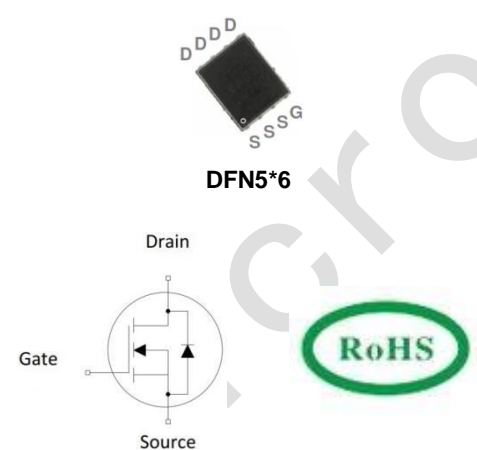


## N-channel 80V, 52A, 10mΩ Super-Junction Power MOSFET

|  |  |                             |     |                  |      |       |     |
|--|--|-----------------------------|-----|------------------|------|-------|-----|
| <p><b>Description</b></p> <p>This power MOSFET is designed with split gate trench technology. The resulting device has extremely low on resistance, making it especially suitable for applications which require superior power density and outstanding efficiency.</p> <p><b>Features</b></p> <ul style="list-style-type: none"> <li>◆ Very low FOM <math>R_{DS(on)} \times Q_g</math></li> <li>◆ 100% UIS tested</li> <li>◆ RoHS compliant</li> </ul> <p><b>Applications</b></p> <ul style="list-style-type: none"> <li>◆ Motor Drivers.</li> <li>◆ DC-DC Converter.</li> <li>◆ Uninterrupted power supply (UPS).</li> </ul> | <p><b>Product Summary</b></p> <table> <tr> <td><math>V_{DS} @ T_{j,25^\circ C}</math></td> <td>80V</td> </tr> <tr> <td><math>R_{DS(on),max}</math></td> <td>10mΩ</td> </tr> <tr> <td><math>I_D</math></td> <td>52A</td> </tr> </table> <div style="text-align: center;">  <p>DFN5*6</p> <p>RoHS</p> <p>N-Channel MOSFET</p> </div> | $V_{DS} @ T_{j,25^\circ C}$ | 80V | $R_{DS(on),max}$ | 10mΩ | $I_D$ | 52A |
| $V_{DS} @ T_{j,25^\circ C}$  | 80V  |                             |     |                  |      |       |     |
| $R_{DS(on),max}$   | 10mΩ   |                             |     |                  |      |       |     |
| $I_D$  | 52A  |                             |     |                  |      |       |     |

### Absolute Maximum Ratings

| Parameter                                       | Symbol         | Value       | Unit |
|---|----------------|-------------|------|
| Drain-Source Voltage                            | $V_{DSS}$      | 80          | V    |
| Continuous drain current ( $T_C = 25^\circ C$ ) | $I_D$          | 52          | A    |
| ( $T_C = 100^\circ C$ )                         |                | 35          | A    |
| Pulsed drain current <sup>1)</sup>              | $I_{DM}$       | 208         | A    |
| Gate-Source voltage                             | $V_{GSS}$      | $\pm 20$    | V    |
| Avalanche energy, single pulse <sup>2)</sup>    | $E_{AS}$       | 180         | mJ   |
| Power Dissipation DFN5*6 ( $T_C = 25^\circ C$ ) | $P_D$          | 56          | W    |
| - Derate above 25°C                             |                | 0.82        | W/°C |
| Operating and Storage Temperature Range         | $T_J, T_{STG}$ | -55 to +150 | °C   |
| Continuous diode forward current                | $I_S$          | 52          | A    |
| Diode pulse current                             | $I_{S,pulse}$  | 208         | A    |

**Thermal Characteristics DFN5\*6**

| Parameter  | Symbol          | Value | Unit          |
|--|-----------------|-------|---------------|
| Thermal Resistance, Junction-to-Case   | $R_{\theta JC}$ | 0.73  | $^{\circ}C/W$ |
| Thermal Resistance, Junction-to-Ambient  | $R_{\theta JA}$ | 49    | $^{\circ}C/W$ |
| Soldering temperature, wave soldering only allowed at leads. (1.6mm from case for 10s) | $T_{sold}$      | 260   | $^{\circ}C$   |

**Electrical Characteristics**  $T_c = 25^{\circ}C$  unless otherwise noted

| Parameter                            | Symbol        | Test Condition   | Min. | Typ. | Max. | Unit       |
|--------------------------------------|---------------|--|------|------|------|------------|
| <b>Static characteristics</b>        |               |  |      |      |      |            |
| Drain-source breakdown voltage       | $BV_{DSS}$    | $V_{GS}=0V, I_D=250\mu A$  | 80   | -    | -    | V          |
| Gate threshold voltage               | $V_{GS(th)}$  | $V_{DS}=V_{GS}, I_D=250\mu A$  | 1    | -    | 3    | V          |
| Drain cut-off current                | $I_{DSS}$     | $V_{DS}=100V, V_{GS}=0V,$<br>$T_j = 25^{\circ}C$<br>$T_j = 125^{\circ}C$ | -    | -    | 1    | $\mu A$    |
|                                      |               |  | -    | 10   | -    |            |
| Gate leakage current, Forward        | $I_{GSSF}$    | $V_{GS}=20V, V_{DS}=0V$  | -    | -    | 100  | nA         |
| Gate leakage current, Reverse        | $I_{GSSR}$    | $V_{GS}=-20V, V_{DS}=0V$   | -    | -    | -100 | nA         |
| Drain-source on-state resistance     | $R_{DS(on)}$  | $V_{GS}=10V, I_D=35A$<br>$T_j = 25^{\circ}C$                             | -    | 10.6 | 13.5 | m $\Omega$ |
|                                      |               |  | -    | -    | -    |            |
| <b>Dynamic characteristics</b>       |               |  |      |      |      |            |
| Input capacitance                    | $C_{iss}$     | $V_{DS} = 50V, V_{GS} = 0V,$<br>$f = 1MHz$                               | -    | 1590 | -    | pF         |
| Output capacitance                   | $C_{oss}$     |  | -    | 580  | -    |            |
| Reverse transfer capacitance         | $C_{rss}$     |  | -    | 5.5  | -    |            |
| Turn-on delay time                   | $t_{d(on)}$   | $V_{DD} = 50V, I_D = 35A$<br>$R_G = 25\Omega, V_{GS}=10V$                | -    | 15   | -    | ns         |
| Rise time                            | $t_r$         |  | -    | 40   | -    |            |
| Turn-off delay time                  | $t_{d(off)}$  |  | -    | 120  | -    |            |
| Fall time                            | $t_f$         |  | -    | 80   | -    |            |
| <b>Gate charge characteristics</b>   |               |  |      |      |      |            |
| Gate to source charge                | $Q_{gs}$      | $V_{DD}=80V, I_D=35A,$<br>$V_{GS}=0$ to 10 V                             | -    | 6.4  | -    | nC         |
| Gate to drain charge                 | $Q_{gd}$      |  | -    | 3.2  | -    |            |
| Gate charge total                    | $Q_g$         |  | -    | 26   | -    |            |
| Gate plateau voltage                 | $V_{plateau}$ |  | -    | 2.5  | -    | V          |
| <b>Reverse diode characteristics</b> |               |  |      |      |      |            |
| Diode forward voltage                | $V_{SD}$      | $V_{GS}=0V, I_F=35A$   | -    | 0.9  | -    | V          |
| Reverse recovery time                | $t_{rr}$      | $V_R=50V, I_F=35A,$<br>$dI_F/dt=100A/\mu s$                              | -    | 68   | -    | ns         |
| Reverse recovery charge              | $Q_{rr}$      |  | -    | 95   | -    | nC         |

**Notes:**

- Limited by maximum junction temperature, maximum duty cycle is 0.75.
- $I_{AS} = 20A, V_{DD} = 50V,$  Starting  $T_j = 25^{\circ}C$ .
- Repetitive Rating: Pulse width limited by maximum junction temperature.

**Electrical Characteristics Diagrams**

Figure 1. Output Characteristics

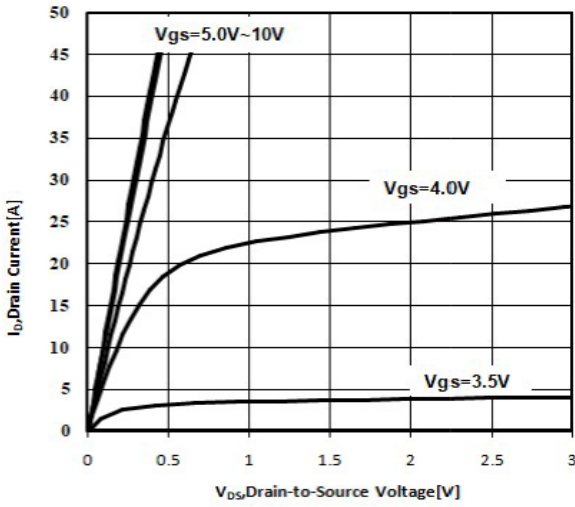


Figure 2. Transfer Characteristics

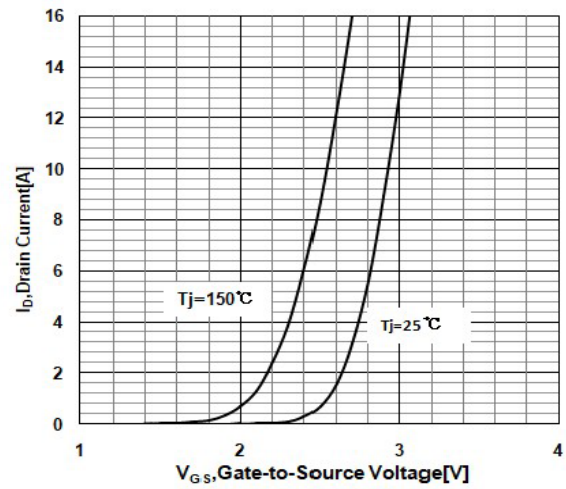


Figure 3. On-Resistance vs. Drain Current

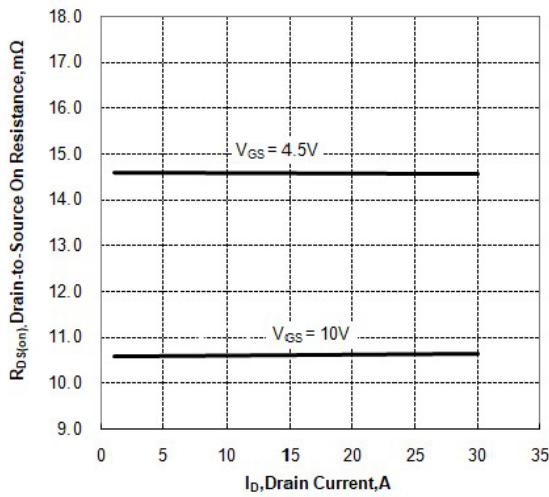


Figure 4. Capacitance Characteristics

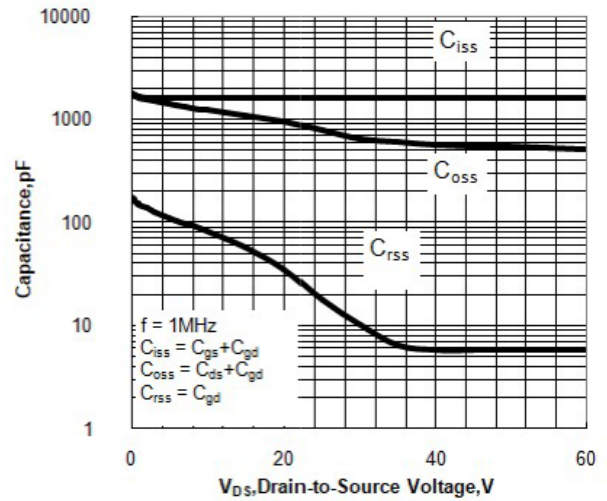


Figure 5. Gate Charge Characteristics

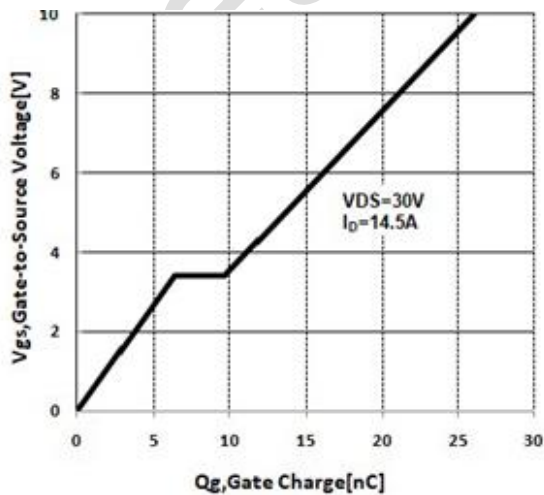


Figure 6. Body Diode Forward Voltage

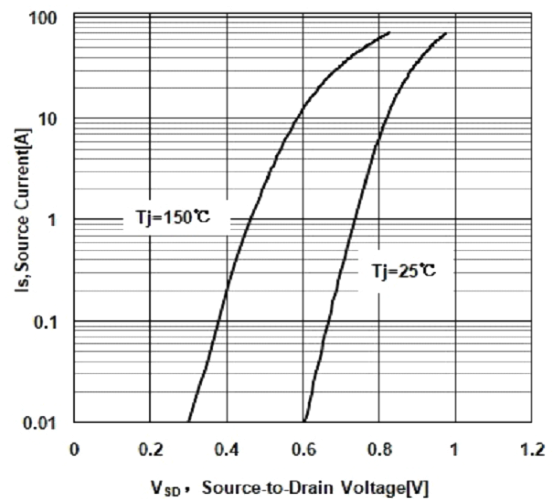


Figure 7. Breakdown Voltage vs. Temperature

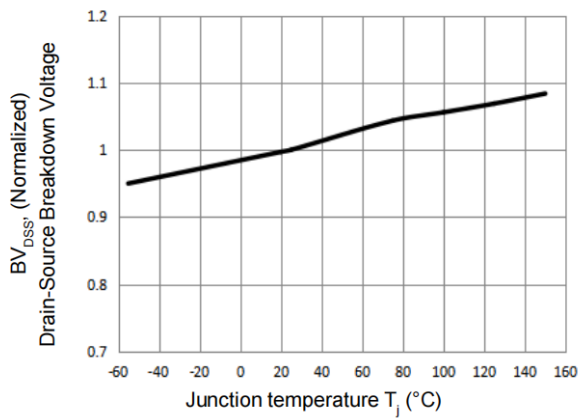


Figure 8. On-Resistance vs. Temperature

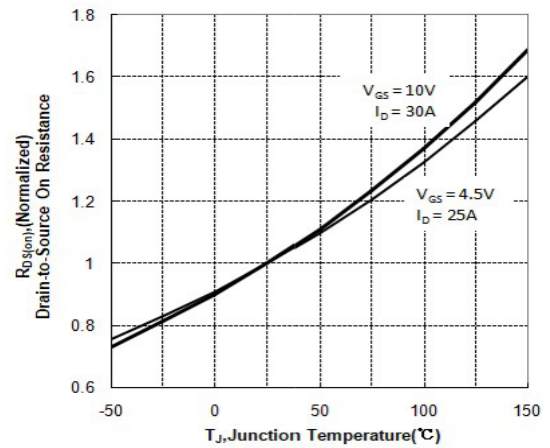


Figure 9. Transient Thermal Impedance

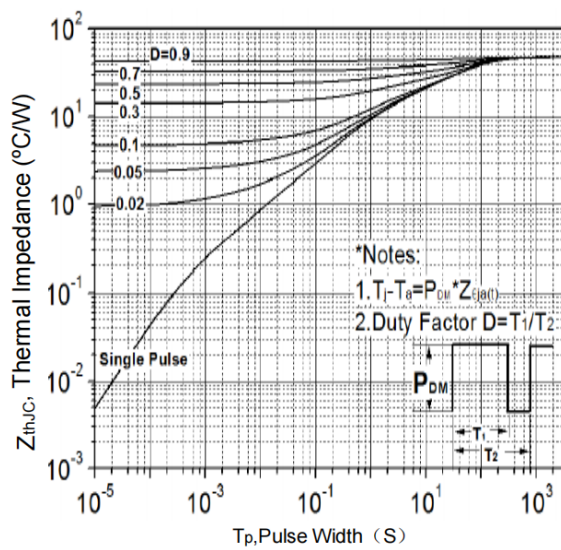
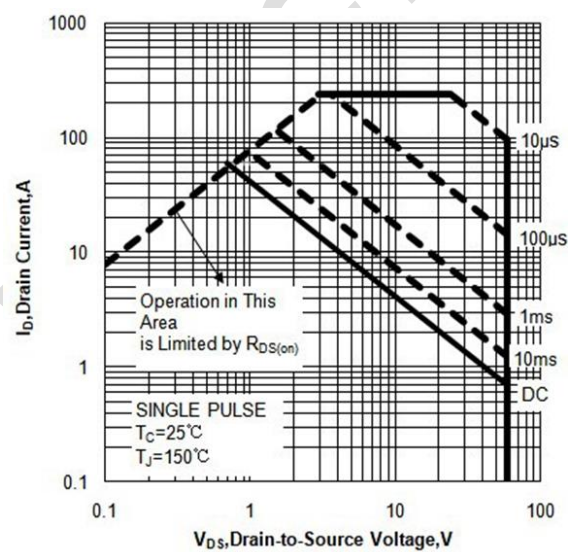
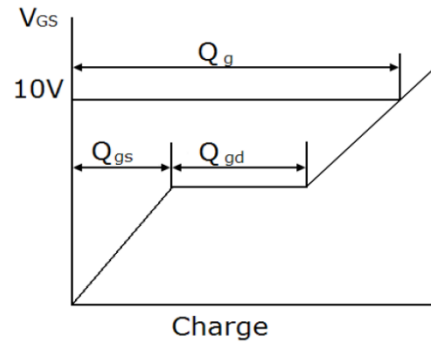
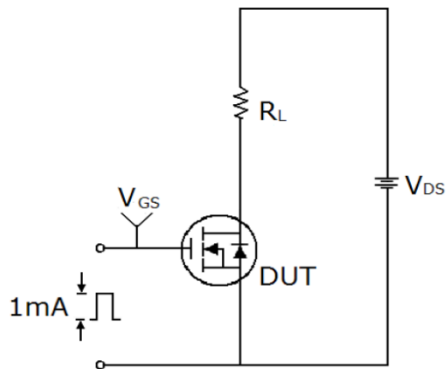


Figure 10. Maximum Safe Operating Area

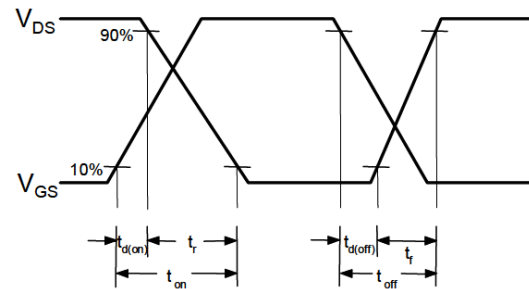
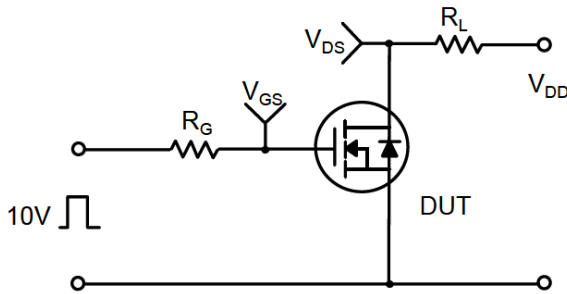


**Test Circuits**

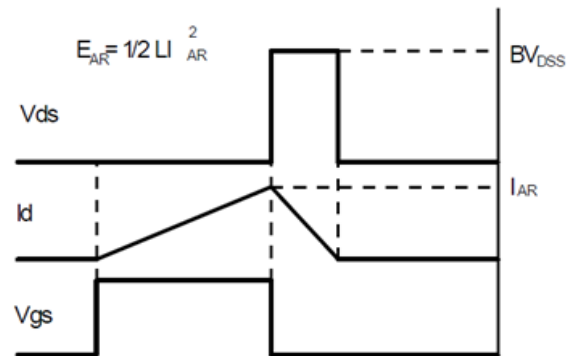
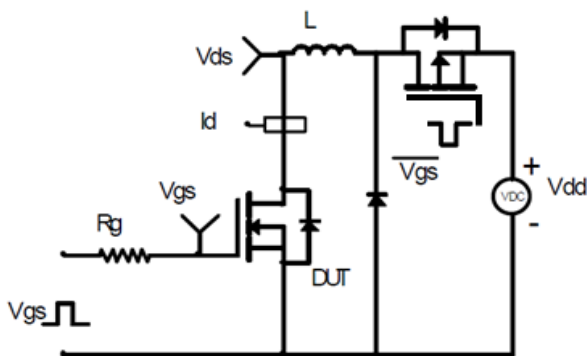
**Gate Charge Test Circuit & Waveform**



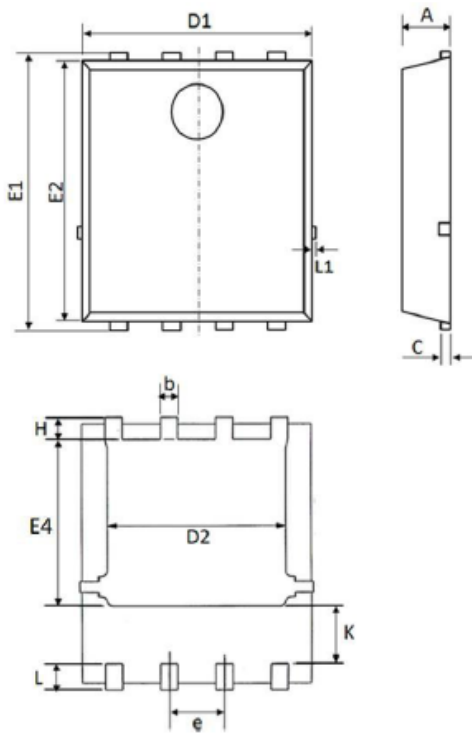
**Switching Test Circuit & Waveform**



**Unclamped Inductive Switching Test Circuit & Waveform**



**Mechanical Dimensions for DFN5\*6**



| COMMON DIMENSIONS |             |       |       |           |       |       |
|-------------------|-------------|-------|-------|-----------|-------|-------|
| SYMBOL            | MILLIMETERS |       |       | INCHS     |       |       |
|                   | MIN         | NOM   | MAX   | MIN       | NOM   | MAX   |
| A                 | 1           | 1.1   | 1.2   | 0.039     | 0.043 | 0.047 |
| b                 | 0.3         | 0.4   | 0.5   | 0.012     | 0.016 | 0.020 |
| C                 | 0.154       | 0.254 | 0.354 | 0.006     | 0.010 | 0.014 |
| D1                | 5           | 5.2   | 5.4   | 0.197     | 0.205 | 0.213 |
| D2                | 3.8         | 4.1   | 4.25  | 0.150     | 0.161 | 0.167 |
| E1                | 5.95        | 6.15  | 6.35  | 0.234     | 0.242 | 0.250 |
| E2                | 5.66        | 5.86  | 6.06  | 0.223     | 0.231 | 0.239 |
| E4                | 3.52        | 3.72  | 3.92  | 0.139     | 0.146 | 0.154 |
| e                 | 1.27 BSC    |       |       | 0.050 BSC |       |       |
| H                 | 0.4         | 0.5   | 0.6   | 0.016     | 0.020 | 0.024 |
| L                 | 0.5         | 0.6   | 0.7   | 0.020     | 0.024 | 0.028 |
| L1                | -           | -     | 0.12  | -         | -     | 0.005 |
| K                 | 1.14        | 1.29  | 1.44  | 0.045     | 0.051 | 0.057 |

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