

- ★ 100% EAS Guaranteed
- ★ Green Device Available
- ★ Super Low Gate Charge
- ★ Excellent  $CdV/dt$  effect decline
- ★ Advanced high cell density Trench technology

**Product Summary**

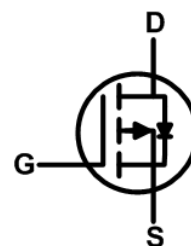
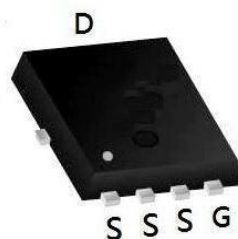

| BVDSS | RDSON | ID   |
|-------|-------|------|
| -100V | 31mΩ  | -40A |

**Description**

The XR40P10F is the high cell density trenched P-ch MOSFETs, which provides excellent RDSON and gate charge for most of the synchronous buck converter applications.

The XR40P10F meets the RoHS and Green

Product requirements 100% EAS guaranteed with full function reliability approved.

**PDFN5060-8L Pin Configuration**

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

| Symbol                      | Parameter                                                                             | Rating     | Units              |
|-----------------------------|---------------------------------------------------------------------------------------|------------|--------------------|
| $V_{DS}$                    | Drain-Source Voltage                                                                  | -100       | V                  |
| $V_{GS}$                    | Gate-Source Voltage                                                                   | $\pm 20$   | V                  |
| $I_D@T_C=25^\circ\text{C}$  | Continuous Drain Current, $V_{GS} @ 10V^{1,6}$                                        | -40        | A                  |
| $I_D@T_C=100^\circ\text{C}$ | Continuous Drain Current, $V_{GS} @ 10V^{1,6}$                                        | -21        | A                  |
| $I_{DM}$                    | Pulsed Drain Current <sup>2</sup>                                                     | -135       | A                  |
| EAS                         | Single Pulse Avalanche Energy <sup>3</sup>                                            | 95         | mJ                 |
| $I_{AS}$                    | Avalanche Current                                                                     | ---        | A                  |
| $P_D@T_C=25^\circ\text{C}$  | Total Power Dissipation <sup>4</sup>                                                  | 94         | W                  |
| $T_{STG}$                   | Storage Temperature Range                                                             | -55 to 150 | $^\circ\text{C}$   |
| $T_J$                       | Operating Junction Temperature Range                                                  | -55 to 150 | $^\circ\text{C}$   |
| $T_{sold}$                  | Soldering temperature ,wave soldering only allowed at leads (1.6mm from case for 10s) | 260        | $^\circ\text{C}$   |
| $R_{thJC}$                  | Thermal resistance, junction-case                                                     | ---        | $^\circ\text{C/W}$ |
| $R_{thJA}$                  | Thermal resistance ,junction-ambient(min,footprint)                                   | ---        |                    |

**Electrical Characteristics (T<sub>J</sub>=25 °C, unless otherwise noted)**

| Symbol                              | Parameter                                      | Conditions                                                                                   | Min. | Typ. | Max.  | Unit  |
|-------------------------------------|------------------------------------------------|----------------------------------------------------------------------------------------------|------|------|-------|-------|
| BV <sub>DSS</sub>                   | Drain-Source Breakdown Voltage                 | V <sub>GS</sub> =0V, I <sub>D</sub> =-250uA                                                  | -100 | ---  | ---   | V     |
| ΔBV <sub>DSS</sub> /ΔT <sub>J</sub> | BV <sub>DSS</sub> Temperature Coefficient      | Reference to 25 °C, I <sub>D</sub> =-1mA                                                     | ---  | ---  | ---   | V/°C  |
| R <sub>DS(ON)</sub>                 | Static Drain-Source On-Resistance <sup>2</sup> | V <sub>GS</sub> =-10V, I <sub>D</sub> =-22A, T <sub>J</sub> =25°C                            | ---  | 31   | 37    | mΩ    |
|                                     |                                                | V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-10A, T <sub>J</sub> =150°C                          | ---  | 37   | 48    |       |
| V <sub>GS(th)</sub>                 | Gate Threshold Voltage                         | V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =-250uA                                    | -1.5 | -2.0 | -2.5  | V     |
| ΔV <sub>GS(th)</sub>                | V <sub>GS(th)</sub> Temperature Coefficient    |                                                                                              | ---  | ---  | ---   | mV/°C |
| I <sub>DSS</sub>                    | Drain-Source Leakage Current                   | V <sub>DS</sub> =-20V, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C                             | ---  | ---  | -1    | uA    |
|                                     |                                                | V <sub>DS</sub> =-20V, V <sub>GS</sub> =0V, T <sub>J</sub> =150°C                            | ---  | ---  | -50   |       |
| I <sub>GSS</sub>                    | Gate-Source Leakage Current                    | V <sub>GS</sub> = ± 20V, V <sub>DS</sub> =0V                                                 | ---  | ---  | ± 100 | nA    |
| g <sub>fs</sub>                     | Forward Transconductance                       | V <sub>DS</sub> =-5V, I <sub>D</sub> =-22A                                                   | ---  | 58   | ---   | S     |
| R <sub>g</sub>                      | Gate Resistance                                | V <sub>DS</sub> =0V, V <sub>GS</sub> =0V, f=1MHz                                             | ---  | 3.8  | ---   | Ω     |
| Q <sub>g</sub>                      | Total Gate Charge                              | V <sub>GS</sub> =-10V, V <sub>DS</sub> =-50V, I <sub>D</sub> =-22A, f=1MHz                   | ---  | 100  | ---   | nC    |
| Q <sub>gs</sub>                     | Gate-Source Charge                             |                                                                                              | ---  | 25   | ---   |       |
| Q <sub>gd</sub>                     | Gate-Drain Charge                              |                                                                                              | ---  | 16   | ---   |       |
| T <sub>d(on)</sub>                  | Turn-On Delay Time                             | V <sub>GS</sub> =-10V, V <sub>DD</sub> =-50V, I <sub>D</sub> =-22A, R <sub>G_ext</sub> =2.7Ω | ---  | 15   | ---   | ns    |
| T <sub>r</sub>                      | Rise Time                                      |                                                                                              | ---  | 44   | ---   |       |
| T <sub>d(off)</sub>                 | Turn-Off Delay Time                            |                                                                                              | ---  | 90   | ---   |       |
| T <sub>f</sub>                      | Fall Time                                      |                                                                                              | ---  | 76   | ---   |       |
| C <sub>iss</sub>                    | Input Capacitance                              | V <sub>GS</sub> =-10V, V <sub>DD</sub> =-50V, f=1MHz                                         | ---  | 5805 | ---   | pF    |
| C <sub>oss</sub>                    | Output Capacitance                             |                                                                                              | ---  | 178  | ---   |       |
| C <sub>rss</sub>                    | Reverse Transfer Capacitance                   |                                                                                              | ---  | 86   | ---   |       |

**Diode Characteristics**

| Symbol          | Parameter                          | Conditions                                                       | Min. | Typ.  | Max. | Unit |
|-----------------|------------------------------------|------------------------------------------------------------------|------|-------|------|------|
| I <sub>S</sub>  | Body Diode Current <sup>1,4</sup>  | T <sub>C</sub> =25°C                                             | ---  | ---   | -40  | A    |
| V <sub>SD</sub> | Diode Forward Voltage <sup>2</sup> | V <sub>GS</sub> =0V, I <sub>SD</sub> =-22A, T <sub>J</sub> =25°C | ---  | -0.87 | -1.3 | V    |
| t <sub>rr</sub> | Reverse Recovery Time              | I <sub>SD</sub> =-22A, di/dt=100A/μs, T <sub>J</sub> = 25 °C     | ---  | 33    | ---  | nS   |
| Q <sub>rr</sub> | Reverse Recovery Charge            |                                                                  | ---  | 54    | ---  | nC   |

\*The value of R<sub>thJA</sub> is measured by placing the device in a still air box which is one cubic foot.

## Typical Performance Characteristics

Fig 1: Output Characteristics

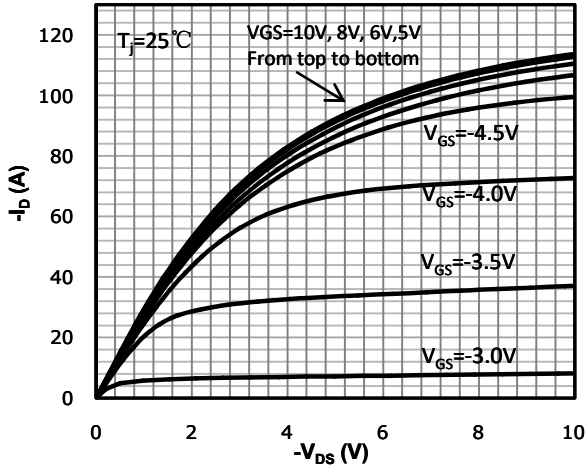


Fig 2: Transfer Characteristics

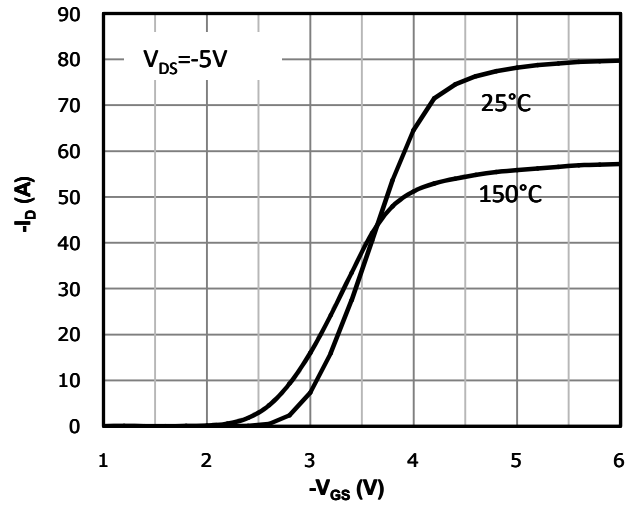


Fig 3:  $R_{DS(on)}$  vs Drain Current and Gate Voltage

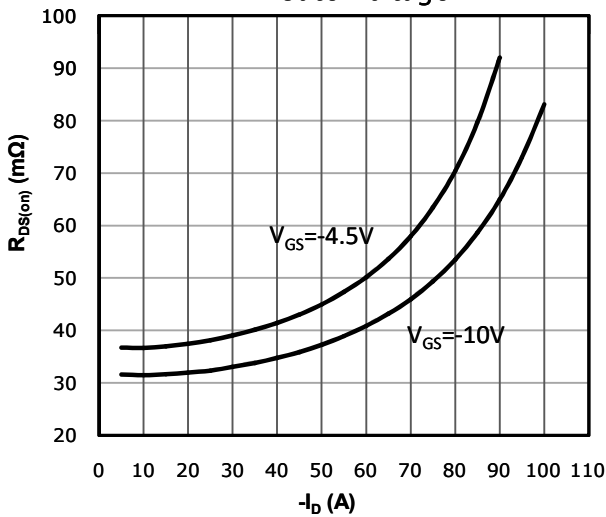


Fig 4:  $R_{DS(on)}$  vs Gate Voltage

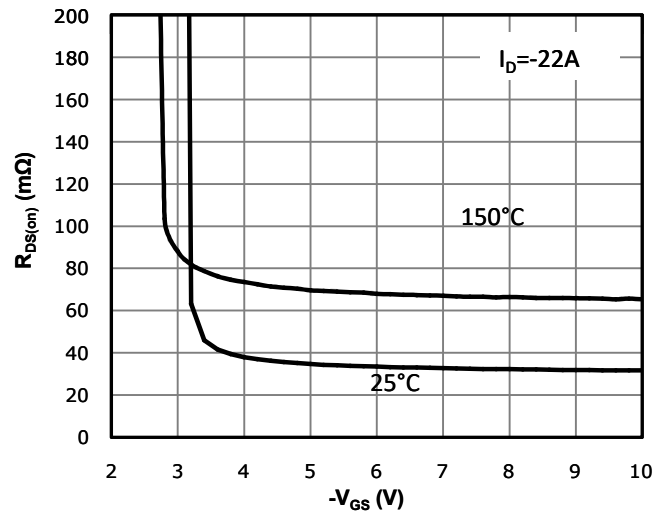


Fig 5:  $R_{DS(on)}$  vs. Temperature

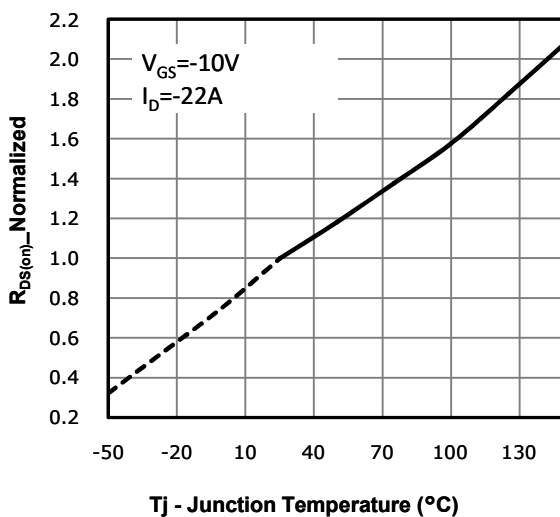


Fig 6: Capacitance Characteristics

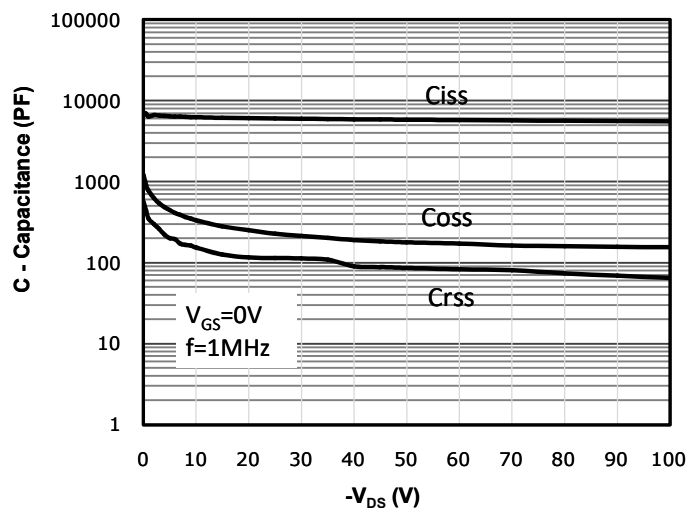


Fig 7: BVDS vs. Temperature

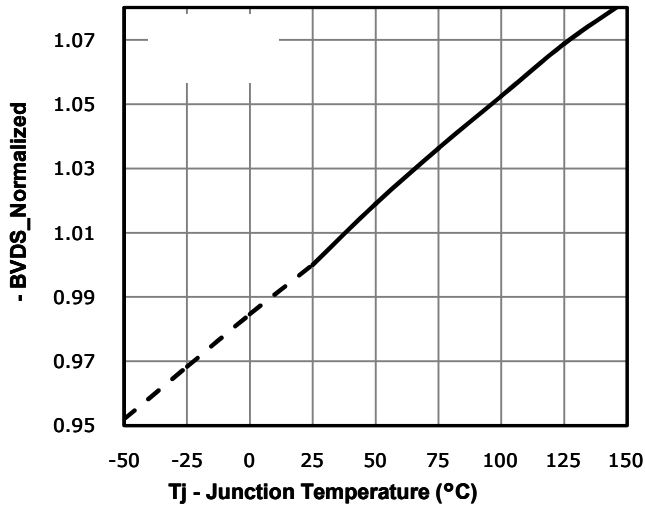


Fig 8:  $V_{GS(th)}$  vs. Temperature

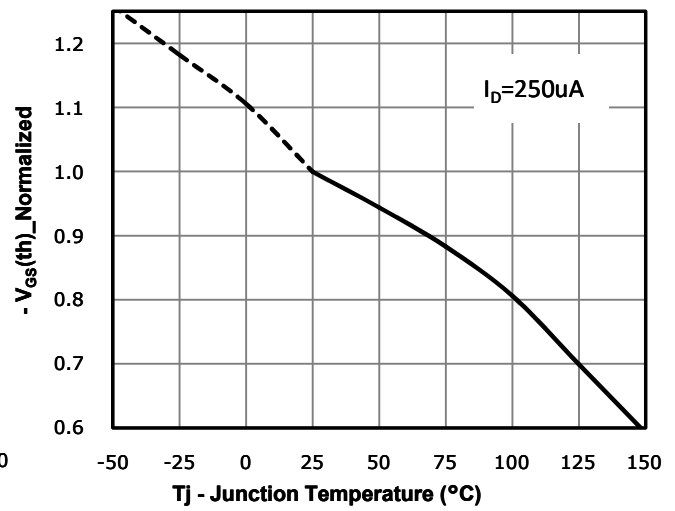


Fig 9: Gate Charge Characteristics

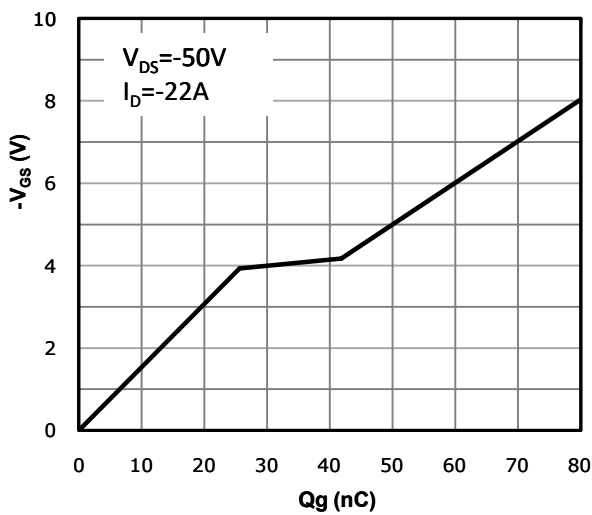


Fig 10: Body-diode Forward Characteristics

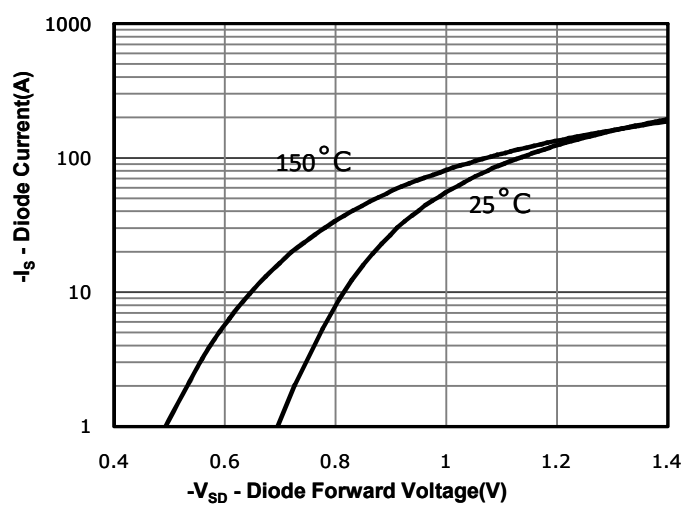


Fig 11: Power Dissipation

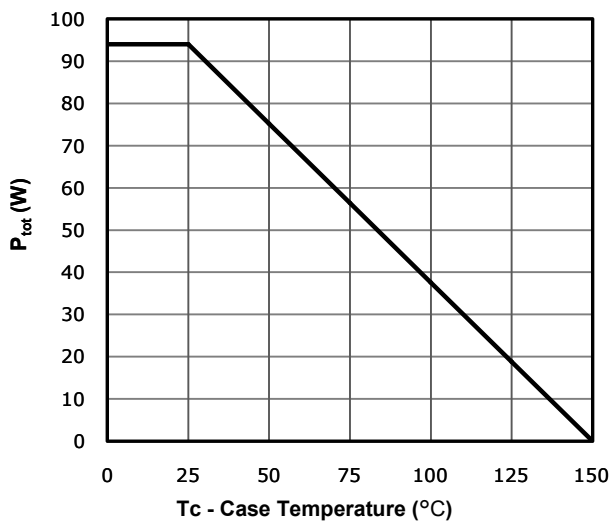
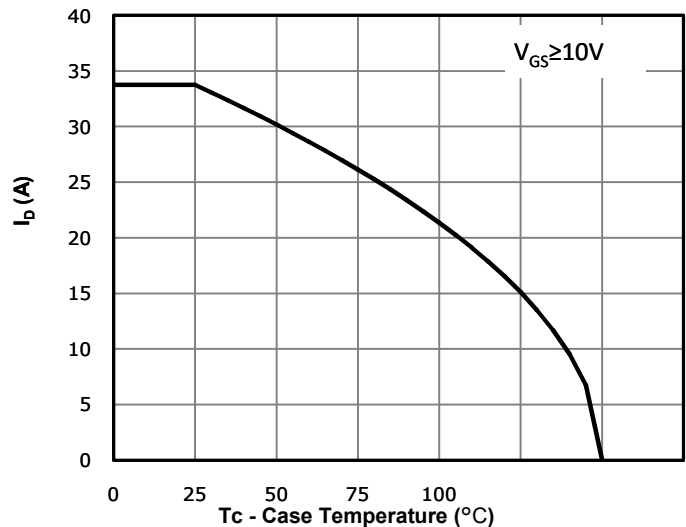
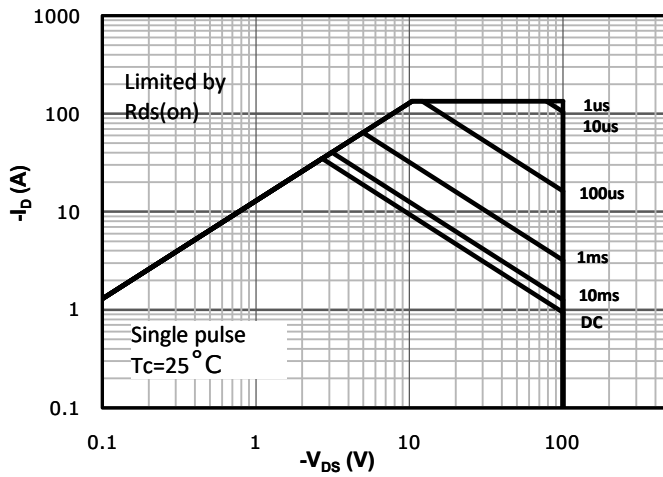


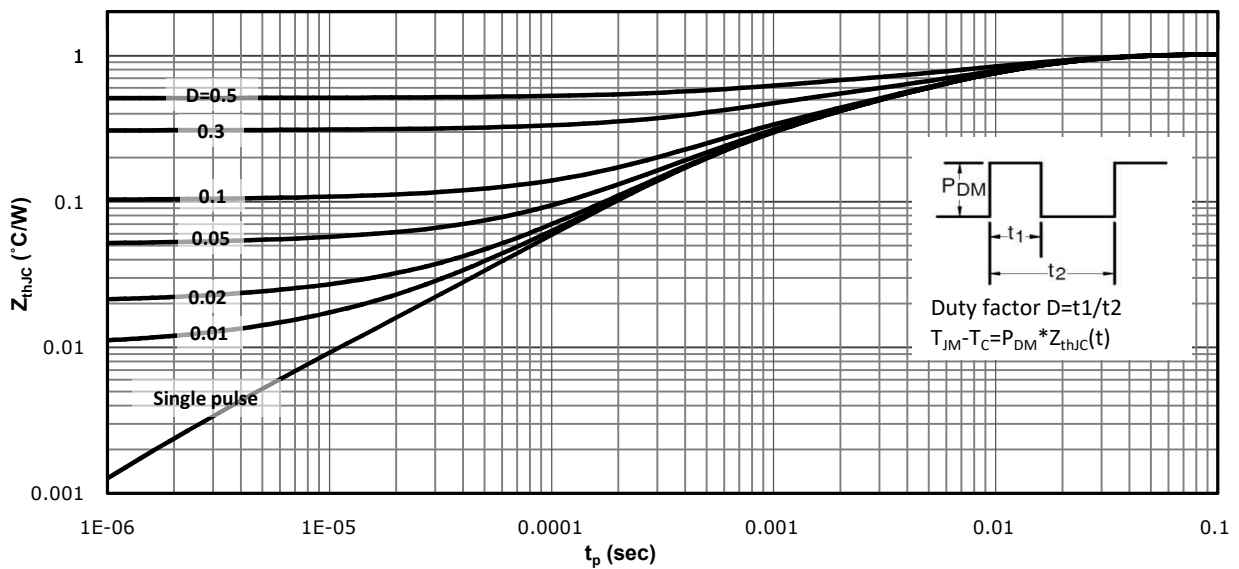
Fig 12: Drain Current Derating



**Fig 13: Safe Operating Area**

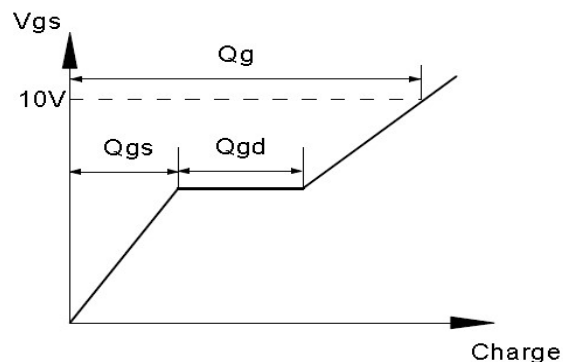
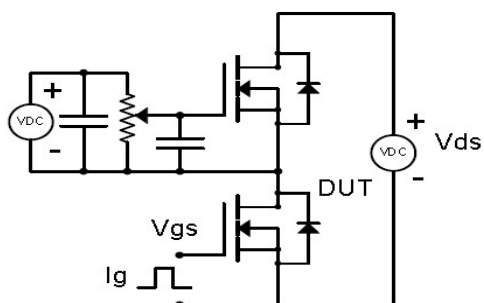


**Fig 14: Max. Transient Thermal Impedance**

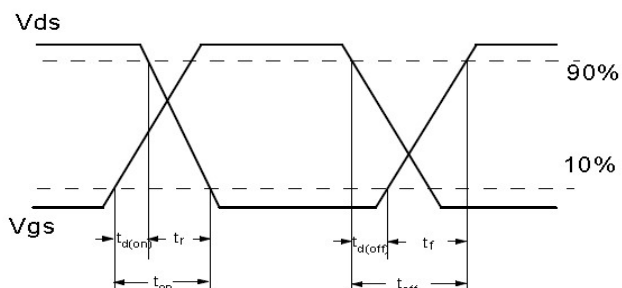
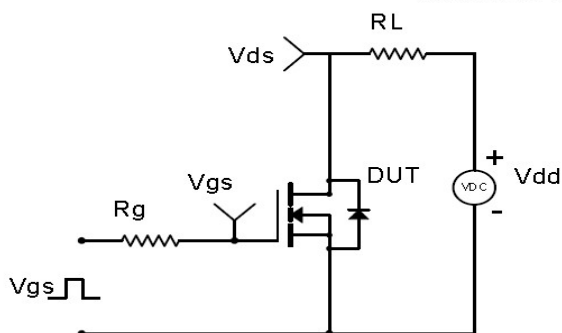


## Test Circuit & Waveform

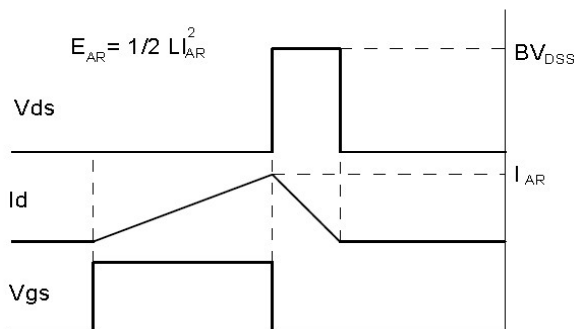
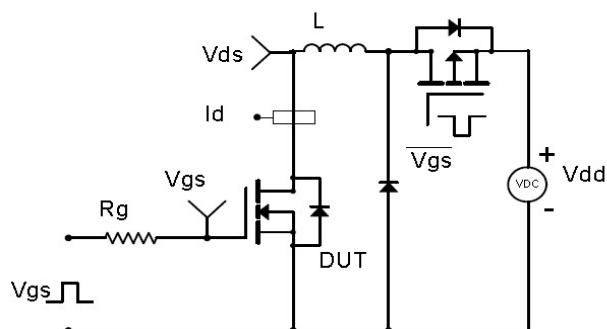
Gate Charge Test Circuit & Waveform



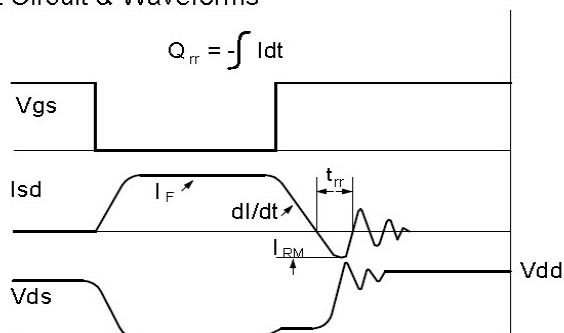
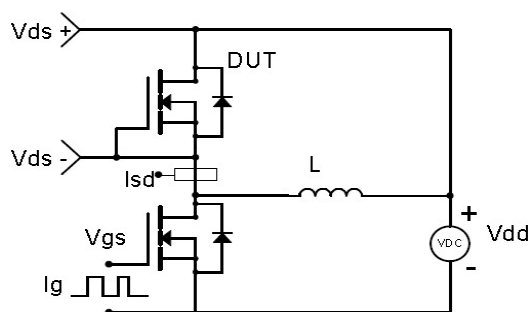
Resistive Switching Test Circuit & Waveforms



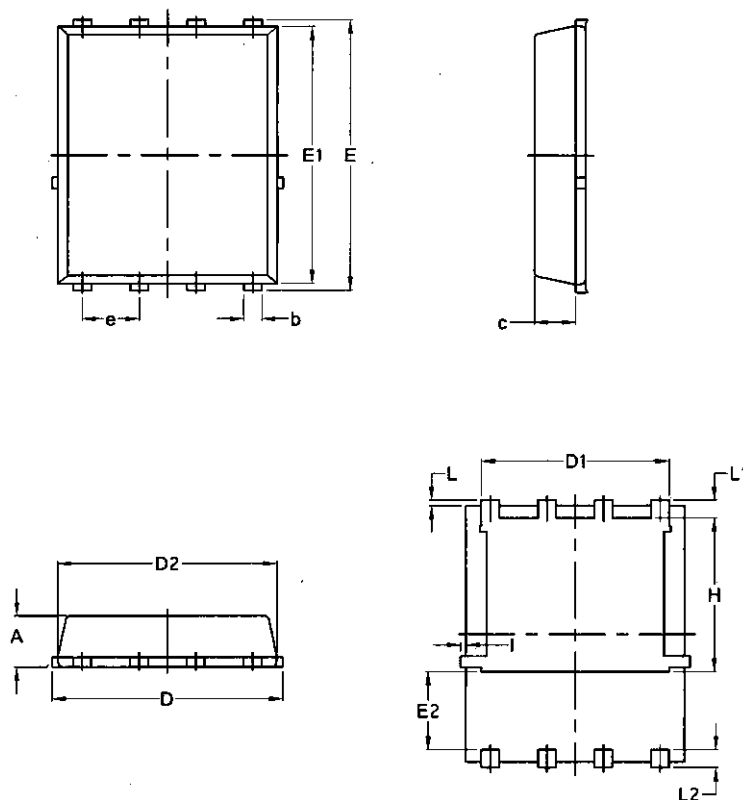
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



## Package Mechanical Data-PDFN5060-8L-Single



| Symbol | Common   |        |          |        |
|--------|----------|--------|----------|--------|
|        | mm       |        | Inch     |        |
|        | Min      | Max    | Min      | Max    |
| A      | 1.03     | 1.17   | 0.0406   | 0.0461 |
| b      | 0.34     | 0.48   | 0.0134   | 0.0189 |
| c      | 0.824    | 0.0970 | 0.0324   | 0.082  |
| D      | 4.80     | 5.40   | 0.1890   | 0.2126 |
| D1     | 4.11     | 4.31   | 0.1618   | 0.1697 |
| D2     | 4.80     | 5.00   | 0.1890   | 0.1969 |
| E      | 5.95     | 6.15   | 0.2343   | 0.2421 |
| E1     | 5.65     | 5.85   | 0.2224   | 0.2303 |
| E2     | 1.60     | /      | 0.0630   | /      |
| e      | 1.27 BSC |        | 0.05 BSC |        |
| L      | 0.05     | 0.25   | 0.0020   | 0.0098 |
| L1     | 0.38     | 0.50   | 0.0150   | 0.0197 |
| L2     | 0.38     | 0.50   | 0.0150   | 0.0197 |
| H      | 3.30     | 3.50   | 0.1299   | 0.1378 |
| I      | /        | 0.18   | /        | 0.0070 |