



**General Description**

- Proprietary  $\alpha$ MOS5™ technology
- Low  $R_{DS(ON)}$
- Optimized switching parameters for better EMI performance
- Enhanced body diode for robustness and fast reverse recovery

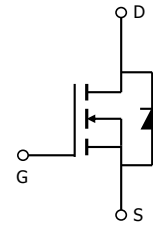
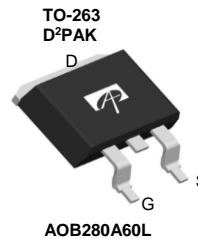
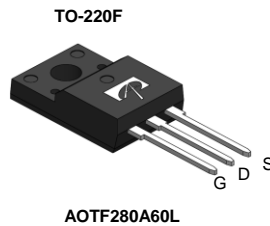
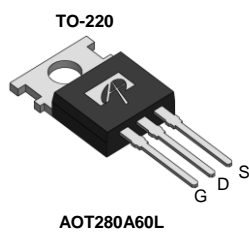
**Applications**

- SMPS with PFC, Flyback and LLC topologies
- Micro inverter with DC/AC inverter topology

**Product Summary**

|                      |                 |
|----------------------|-----------------|
| $V_{DS} @ T_{j,max}$ | 700V            |
| $I_{DM}$             | 56A             |
| $R_{DS(ON),max}$     | < 0.28 $\Omega$ |
| $Q_{g,typ}$          | 23.5nC          |
| $E_{oss} @ 400V$     | 3.1 $\mu$ J     |

100% UIS Tested  
100%  $R_g$  Tested



| Orderable Part Number | Package Type  | Form      | Minimum Order Quantity |
|-----------------------|---------------|-----------|------------------------|
| AOTF280A60L           | TO-220F Green | Tube      | 1000                   |
| AOT280A60L            | TO-220 Green  | Tube      | 1000                   |
| AOB280A60L            | TO-263 Green  | Tape&Reel | 800                    |

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

| Parameter  | Symbol         | AOT(B)280A60L                    | AOTF280A60L | Units            |
|--|----------------|----------------------------------|-------------|------------------|
| Drain-Source Voltage   | $V_{DS}$       | 600                              |             | V                |
| Gate-Source Voltage  | $V_{GS}$       | $\pm 20$                         |             | V                |
| Gate-Source Voltage (dynamic) AC( $f > 1\text{Hz}$ )                         | $V_{GS}$       | $\pm 30$                         |             | V                |
| Continuous Drain Current   | $I_D$          | $T_C=25^\circ\text{C}$           | 14          | 14*              |
|  |                | $T_C=100^\circ\text{C}$          | 9           | 9*               |
| Pulsed Drain Current <sup>C</sup>  | $I_{DM}$       | 56                               |             | A                |
| Avalanche Current <sup>C</sup>   | $I_{AR}$       | 3.6                              |             | A                |
| Repetitive avalanche energy <sup>C</sup>                                     | $E_{AR}$       | 6.5                              |             | mJ               |
| Single pulsed avalanche energy <sup>G</sup>                                  | $E_{AS}$       | 60                               |             | mJ               |
| MOSFET dv/dt ruggedness  | dv/dt          | 100                              |             | V/ns             |
| Peak diode recovery dv/dt  |                | 20                               |             |                  |
| Power Dissipation <sup>B</sup>   | $P_D$          | $T_C=25^\circ\text{C}$           | 156         | 30               |
|  |                | Derate above 25 $^\circ\text{C}$ | 1.3         | 0.2              |
| Junction and Storage Temperature Range                                       | $T_J, T_{STG}$ | -55 to 150                       |             | $^\circ\text{C}$ |
| Maximum lead temperature for soldering purpose, 1/8" from case for 5 seconds | $T_L$          | 300                              |             | $^\circ\text{C}$ |

**Thermal Characteristics**

| Parameter                                  | Symbol          | AOT(B)280A60L | AOTF280A60L | Units                     |
|--|-----------------|---------------|-------------|---------------------------|
| Maximum Junction-to-Ambient <sup>A,D</sup> | $R_{\theta JA}$ | 65            | 65          | $^\circ\text{C}/\text{W}$ |
| Maximum Case-to-sink <sup>A</sup>          | $R_{\theta CS}$ | 0.5           | --          | $^\circ\text{C}/\text{W}$ |
| Maximum Junction-to-Case                   | $R_{\theta JC}$ | 0.8           | 4.2         | $^\circ\text{C}/\text{W}$ |

\* Drain current limited by maximum junction temperature.

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

| Symbol                             | Parameter   | Conditions   | Min | Typ  | Max  | Units |
|------------------------------------|---|--|-----|------|------|-------|
| <b>STATIC PARAMETERS</b>           |   |  |     |      |      |       |
| BV <sub>DSS</sub>                  | Drain-Source Breakdown Voltage                            | I <sub>D</sub> =250μA, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C                       | 600 |      |      | V     |
|                                    |   | I <sub>D</sub> =250μA, V <sub>GS</sub> =0V, T <sub>J</sub> =150°C                      |     | 700  |      |       |
| BV <sub>DSS</sub> /ΔT <sub>J</sub> | Breakdown Voltage Temperature Coefficient                 | I <sub>D</sub> =250μA, V <sub>GS</sub> =0V   |     | 0.46 |      | V/°C  |
| I <sub>DSS</sub>                   | Zero Gate Voltage Drain Current                           | V <sub>DS</sub> =600V, V <sub>GS</sub> =0V   |     |      | 1    | μA    |
|                                    |   | V <sub>DS</sub> =480V, T <sub>J</sub> =125°C   |     |      | 10   |       |
| I <sub>GSS</sub>                   | Gate-Body leakage current                                 | V <sub>DS</sub> =0V, V <sub>GS</sub> =±20V   |     |      | ±100 | nA    |
| V <sub>GS(th)</sub>                | Gate Threshold Voltage                                    | V <sub>DS</sub> =5V, I <sub>D</sub> =250μA   | 2.4 | 3    | 3.6  | V     |
| R <sub>DS(ON)</sub>                | Static Drain-Source On-Resistance                         | V <sub>GS</sub> =10V, I <sub>D</sub> =7A   |     | 0.25 | 0.28 | Ω     |
| g <sub>FS</sub>                    | Forward Transconductance                                  | V <sub>DS</sub> =10V, I <sub>D</sub> =7A   |     | 11   |      | S     |
| V <sub>SD</sub>                    | Diode Forward Voltage                                     | I <sub>S</sub> =7A, V <sub>GS</sub> =0V  |     | 0.86 | 1.2  | V     |
| I <sub>S</sub>                     | Maximum Body-Diode Continuous Current                     |  |     |      | 14   | A     |
| I <sub>SM</sub>                    | Maximum Body-Diode Pulsed Current <sup>C</sup>            |  |     |      | 56   | A     |
| <b>DYNAMIC PARAMETERS</b>          |   |  |     |      |      |       |
| C <sub>iss</sub>                   | Input Capacitance   | V <sub>GS</sub> =0V, V <sub>DS</sub> =100V, f=1MHz                                     |     | 1350 |      | pF    |
| C <sub>oss</sub>                   | Output Capacitance  |  |     | 38   |      | pF    |
| C <sub>o(er)</sub>                 | Effective output capacitance, energy related <sup>H</sup> | V <sub>GS</sub> =0V, V <sub>DS</sub> =0 to 480V, f=1MHz                                |     | 35   |      | pF    |
| C <sub>o(tr)</sub>                 | Effective output capacitance, time related <sup>I</sup>   |  |     | 140  |      | pF    |
| C <sub>riss</sub>                  | Reverse Transfer Capacitance                              | V <sub>GS</sub> =0V, V <sub>DS</sub> =100V, f=1MHz                                     |     | 1    |      | pF    |
| R <sub>g</sub>                     | Gate resistance   | f=1MHz   |     | 5.3  |      | Ω     |
| <b>SWITCHING PARAMETERS</b>        |   |  |     |      |      |       |
| Q <sub>g</sub>                     | Total Gate Charge   | V <sub>GS</sub> =10V, V <sub>DS</sub> =480V, I <sub>D</sub> =7A                        |     | 23.5 |      | nC    |
| Q <sub>gs</sub>                    | Gate Source Charge  |  |     | 9    |      | nC    |
| Q <sub>gd</sub>                    | Gate Drain Charge   |  |     | 5.5  |      | nC    |
| t <sub>D(on)</sub>                 | Turn-On Delay Time  | V <sub>GS</sub> =10V, V <sub>DS</sub> =400V, I <sub>D</sub> =7A,<br>R <sub>G</sub> =5Ω |     | 25   |      | ns    |
| t <sub>r</sub>                     | Turn-On Rise Time   |  |     | 15   |      | ns    |
| t <sub>D(off)</sub>                | Turn-Off Delay Time                                       |  |     | 44   |      | ns    |
| t <sub>f</sub>                     | Turn-Off Fall Time  |  |     | 10   |      | ns    |
| t <sub>rr</sub>                    | Body Diode Reverse Recovery Time                          |  |     | 280  |      | ns    |
| I <sub>rm</sub>                    | Peak Reverse Recovery Current                             | I <sub>F</sub> =7A, di/dt=100A/μs, V <sub>DS</sub> =400V                               |     | 23   |      | A     |
| Q <sub>rr</sub>                    | Body Diode Reverse Recovery Charge                        |  |     | 3.8  |      | μC    |

A. The value of R<sub>θJA</sub> is measured with the device in a still air environment with T<sub>A</sub>=25° C.

B. The power dissipation P<sub>D</sub> is based on T<sub>J(MAX)</sub>=150° C, using junction-to-case thermal resistance, and is more useful in setting the upper dissipation limit for cases where additional heatsinking is used.

C. Repetitive rating, pulse width limited by junction temperature T<sub>J(MAX)</sub>=150° C. Ratings are based on low frequency and duty cycles to keep initial T<sub>J</sub>=25° C.

D. The R<sub>θJA</sub> is the sum of the thermal impedance from junction to case R<sub>θJC</sub> and case to ambient.

E. The static characteristics in Figures 1 to 6 are obtained using <300μs pulses, duty cycle 0.5% max.

F. These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of T<sub>J(MAX)</sub>=150° C. The SOA curve provides a single pulse rating.

G. L=60mH, I<sub>AS</sub>=1.4 A, R<sub>G</sub>=25Ω, Starting T<sub>J</sub>=25° C.

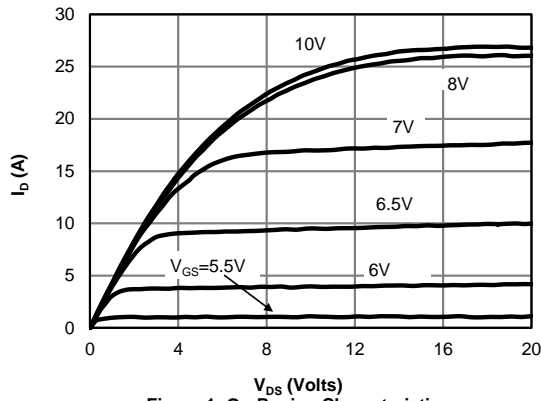
H. C<sub>o(er)</sub> is a fixed capacitance that gives the same stored energy as C<sub>oss</sub> while V<sub>DS</sub> is rising from 0 to 80% V<sub>(BR)DSS</sub>.

I. C<sub>o(tr)</sub> is a fixed capacitance that gives the same charging time as C<sub>oss</sub> while V<sub>DS</sub> is rising from 0 to 80% V<sub>(BR)DSS</sub>.

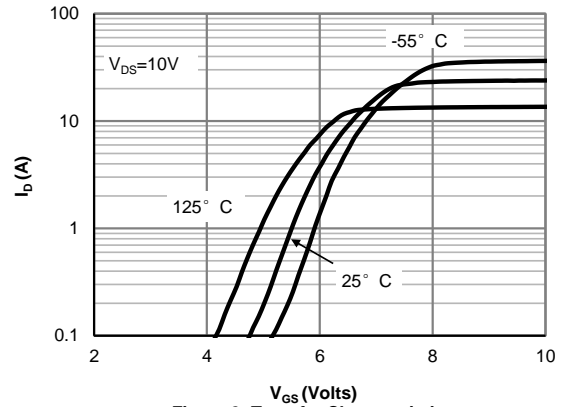
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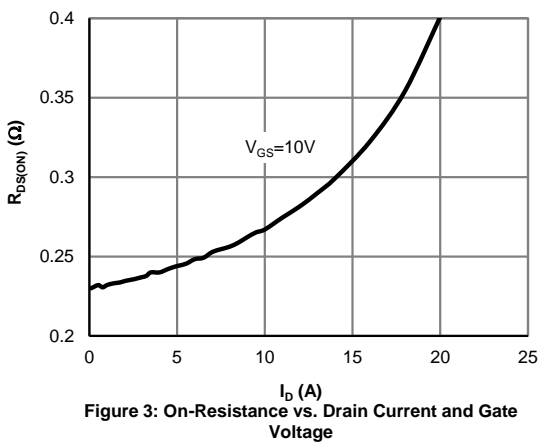
**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**



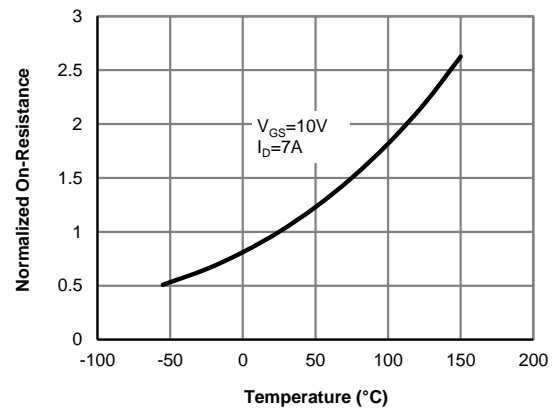
**Figure 1: On-Region Characteristics**



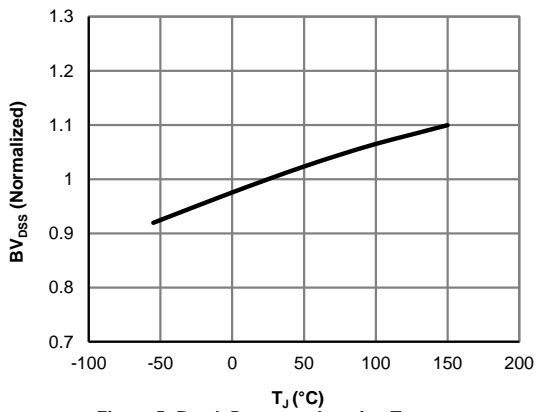
**Figure 2: Transfer Characteristics**



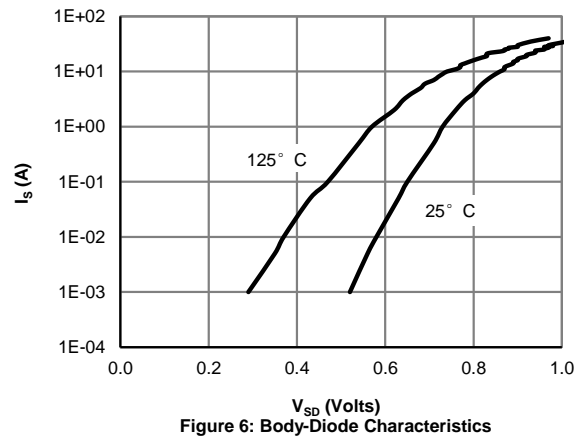
**Figure 3: On-Resistance vs. Drain Current and Gate Voltage**



**Figure 4: On-Resistance vs. Junction Temperature**

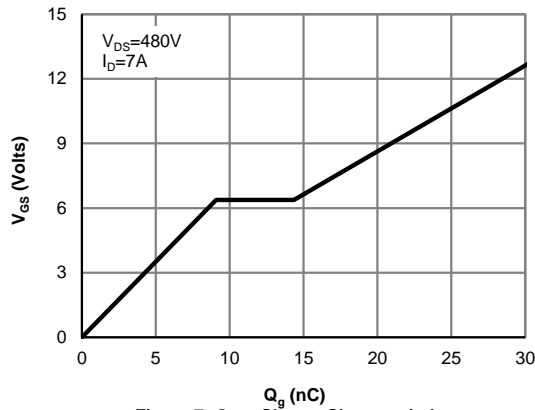


**Figure 5: Break Down vs. Junction Temperature**

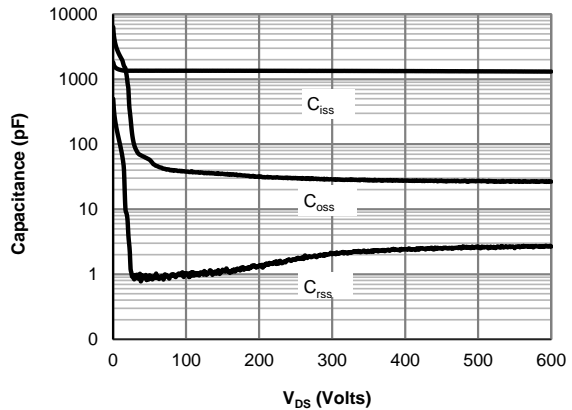


**Figure 6: Body-Diode Characteristics**

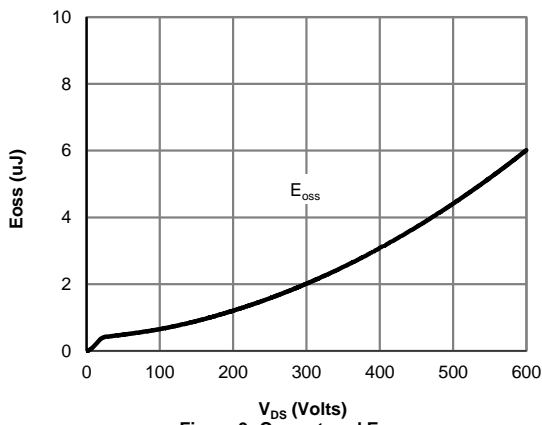
**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**



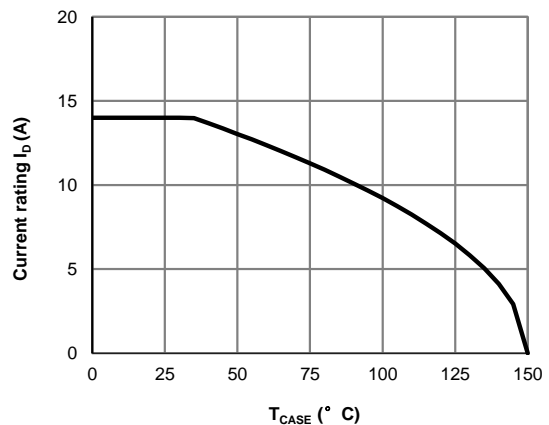
**Figure 7: Gate-Charge Characteristics**



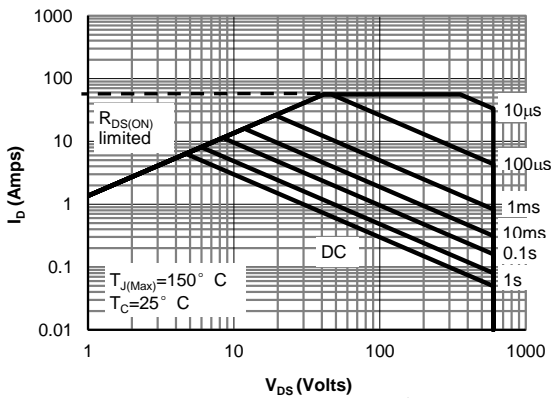
**Figure 8: Capacitance Characteristics**



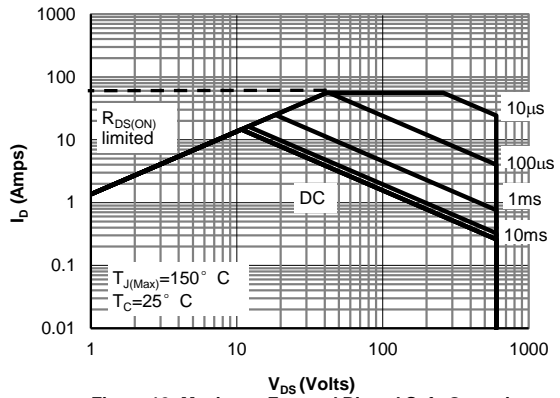
**Figure 9: Coss stored Energy**



**Figure 10: Current De-rating (Note F)**



**Figure 11: Maximum Forward Biased Safe Operating Area for AOTF280A60L (Note F)**



**Figure 12: Maximum Forward Biased Safe Operating Area for AOT(B)280A60L (Note F)**

**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**

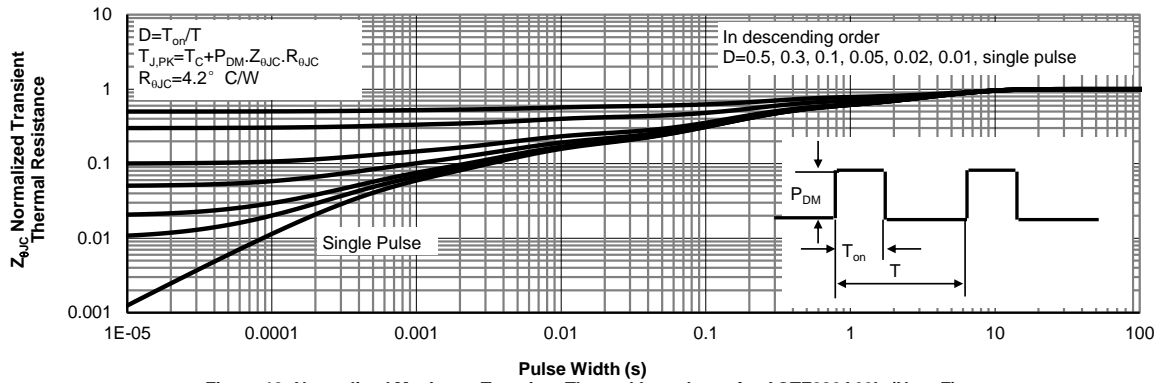


Figure 13: Normalized Maximum Transient Thermal Impedance for AOTF280A60L (Note F)

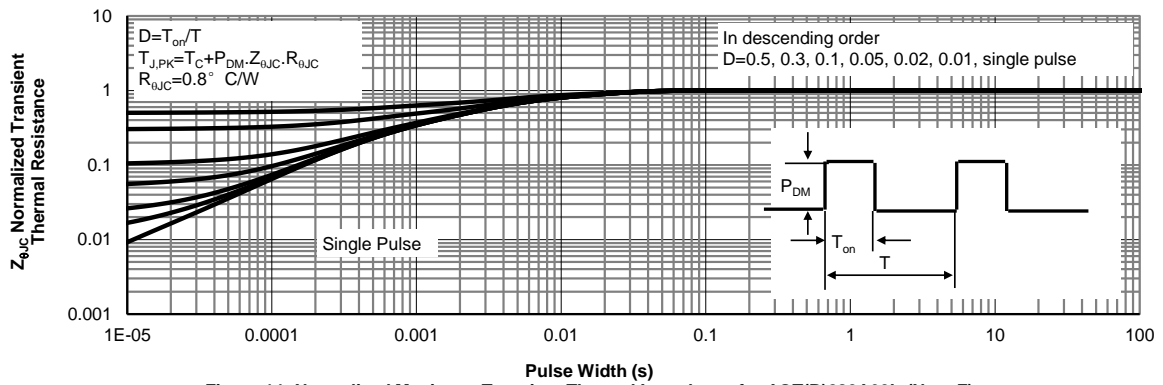
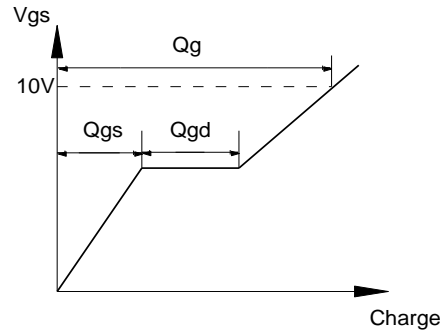
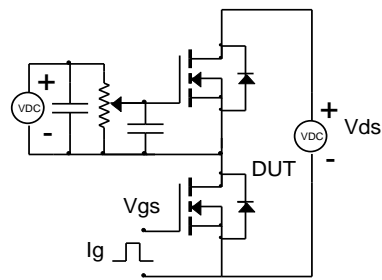
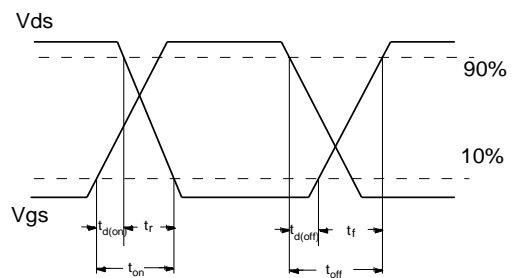
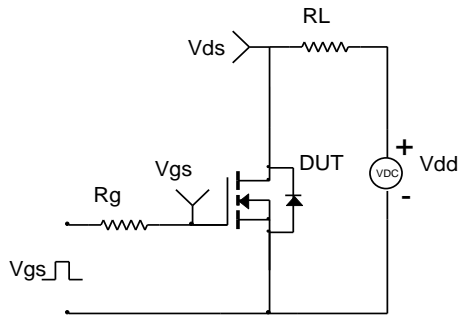


Figure 14: Normalized Maximum Transient Thermal Impedance for AOT(B)280A60L (Note F)

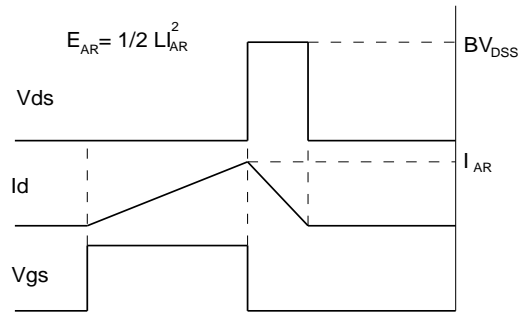
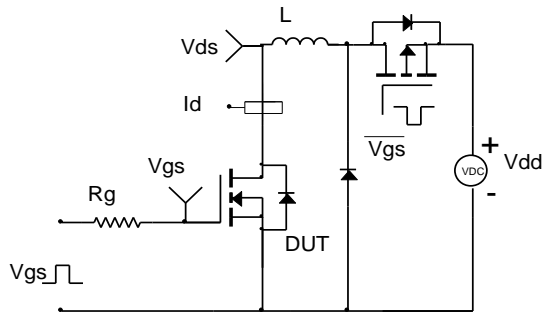
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

