

### General Description

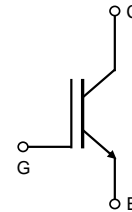
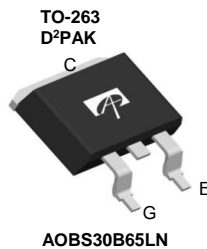
- 650V breakdown voltage
- Low Vce(sat) and fast turn-on speed
- High ruggedness and temperature stable behavior
- Automotive qualified

### Applications

- Discharge switch
- Relay replacement
- PTC heater

### Product Summary

|                                          |       |
|------------------------------------------|-------|
| $V_{CE}$                                 | 650V  |
| $I_C$ ( $T_C=100^\circ\text{C}$ )        | 30A   |
| $V_{CE(sat)}$ ( $T_J=25^\circ\text{C}$ ) | 1.86V |



| Orderable Part Number                                                                                                            | Package Type    | Form                    | Minimum Order Quantity |
|----------------------------------------------------------------------------------------------------------------------------------|-----------------|-------------------------|------------------------|
| AOBS30B65LN                                                                                                                      | TO263           | Tape & Reel             | 800                    |
| <b>Absolute Maximum Ratings <math>T_A=25^\circ\text{C}</math> unless otherwise noted</b>                                         |                 |                         |                        |
| Parameter                                                                                                                        | Symbol          | AOBS30B65LN             | Units                  |
| Collector-Emitter Voltage                                                                                                        | $V_{CE}$        | 650                     | V                      |
| Gate-Emitter Voltage                                                                                                             | $V_{GE}$        | $\pm 30$                | V                      |
| Continuous Collector Current                                                                                                     | $I_C$           | $T_C=25^\circ\text{C}$  | 60                     |
|                                                                                                                                  |                 | $T_C=100^\circ\text{C}$ | 30                     |
| Pulsed Collector Current, Limited by $T_{Jmax}$                                                                                  | $I_{CM}$        | 90                      | A                      |
| Turn-Off SOA, $V_{CE} \leq 650\text{V}$ , Limited by $T_{Jmax}$                                                                  | $I_{LM}$        | 90                      | A                      |
| Short Circuit Withstanding Time <sup>(1)</sup><br>$V_{GE}=15\text{V}$ , $V_{CC} \leq 400\text{V}$ , $T_J \leq 175^\circ\text{C}$ | $t_{SC}$        | 5                       | $\mu\text{s}$          |
| Power Dissipation                                                                                                                | $P_D$           | $T_C=25^\circ\text{C}$  | 227                    |
|                                                                                                                                  |                 | $T_C=100^\circ\text{C}$ | 114                    |
| Junction and Storage Temperature Range                                                                                           | $T_J, T_{STG}$  | -55 to 175              | $^\circ\text{C}$       |
| Maximum lead temperature for soldering purpose, 1/8" from case for 5 seconds                                                     | $T_L$           | 300                     | $^\circ\text{C}$       |
| <b>Thermal Characteristics</b>                                                                                                   |                 |                         |                        |
| Parameter                                                                                                                        | Symbol          | AOBS30B65LN             | Units                  |
| Maximum Junction-to-Ambient                                                                                                      | $R_{\theta JA}$ | 65                      | $^\circ\text{C/W}$     |
| Maximum IGBT Junction-to-Case                                                                                                    | $R_{\theta JC}$ | 0.66                    | $^\circ\text{C/W}$     |

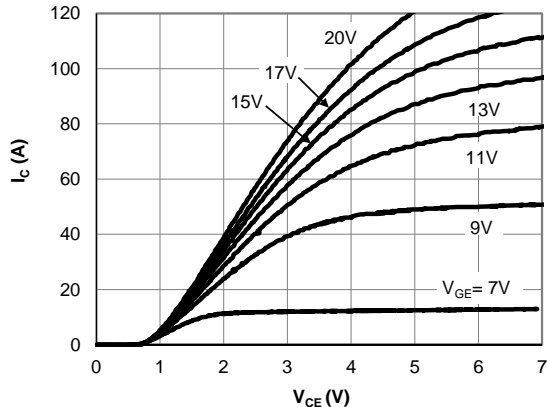
(1) Allowed number of short circuits: <1000; time between short circuits: >1s.

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

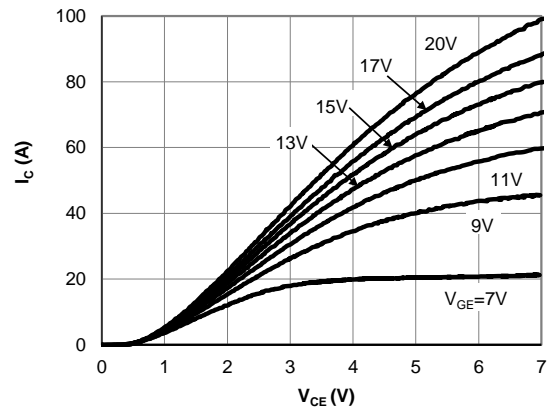
| Symbol                                                             | Parameter                            | Conditions                                                                                                                                                                                                      | Min                   | Typ  | Max  | Units |    |
|--------------------------------------------------------------------|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|------|------|-------|----|
| <b>STATIC PARAMETERS</b>                                           |                                      |                                                                                                                                                                                                                 |                       |      |      |       |    |
| BV <sub>CES</sub>                                                  | Collector-Emitter Breakdown Voltage  | I <sub>C</sub> =1mA, V <sub>GE</sub> =0V, T <sub>J</sub> =25°C                                                                                                                                                  | 650                   | -    | -    | V     |    |
| V <sub>CE(sat)</sub>                                               | Collector-Emitter Saturation Voltage | V <sub>GE</sub> =15V, I <sub>C</sub> =30A                                                                                                                                                                       | T <sub>J</sub> =25°C  | -    | 1.86 | 2.35  | V  |
|                                                                    |                                      |                                                                                                                                                                                                                 | T <sub>J</sub> =125°C | -    | 2.32 | -     |    |
|                                                                    |                                      |                                                                                                                                                                                                                 | T <sub>J</sub> =175°C | -    | 2.58 | -     |    |
| V <sub>GE(th)</sub>                                                | Gate-Emitter Threshold Voltage       | V <sub>CE</sub> =5V, I <sub>C</sub> =1mA                                                                                                                                                                        | 4                     | 4.7  | 5.4  | V     |    |
| I <sub>CES</sub>                                                   | Zero Gate Voltage Collector Current  | V <sub>CE</sub> =650V, V <sub>GE</sub> =0V                                                                                                                                                                      | T <sub>J</sub> =25°C  | -    | -    | 10    | μA |
|                                                                    |                                      |                                                                                                                                                                                                                 | T <sub>J</sub> =125°C | -    | -    | 500   |    |
|                                                                    |                                      |                                                                                                                                                                                                                 | T <sub>J</sub> =175°C | -    | -    | 10000 |    |
| I <sub>GES</sub>                                                   | Gate-Emitter Leakage Current         | V <sub>CE</sub> =0V, V <sub>GE</sub> =±30V                                                                                                                                                                      | -                     | -    | ±100 | nA    |    |
| g <sub>FS</sub>                                                    | Forward Transconductance             | V <sub>CE</sub> =20V, I <sub>C</sub> =30A                                                                                                                                                                       | -                     | 20   | -    | S     |    |
| <b>DYNAMIC PARAMETERS</b>                                          |                                      |                                                                                                                                                                                                                 |                       |      |      |       |    |
| C <sub>ies</sub>                                                   | Input Capacitance                    | V <sub>GE</sub> =0V, V <sub>CC</sub> =25V, f=1MHz                                                                                                                                                               | -                     | 1246 | -    | pF    |    |
| C <sub>oes</sub>                                                   | Output Capacitance                   |                                                                                                                                                                                                                 | -                     | 77   | -    | pF    |    |
| C <sub>res</sub>                                                   | Reverse Transfer Capacitance         |                                                                                                                                                                                                                 | -                     | 38   | -    | pF    |    |
| Q <sub>g</sub>                                                     | Total Gate Charge                    | V <sub>GE</sub> =15V, V <sub>CC</sub> =520V, I <sub>C</sub> =30A                                                                                                                                                | -                     | 52   | -    | nC    |    |
| Q <sub>ge</sub>                                                    | Gate to Emitter Charge               |                                                                                                                                                                                                                 | -                     | 14   | -    | nC    |    |
| Q <sub>gc</sub>                                                    | Gate to Collector Charge             |                                                                                                                                                                                                                 | -                     | 22   | -    | nC    |    |
| I <sub>C(SC)</sub>                                                 | Short Circuit Collector Current      | V <sub>GE</sub> =15V, V <sub>CC</sub> =400V,<br>t <sub>sc</sub> ≤5μs, T <sub>J</sub> ≤175°C                                                                                                                     | -                     | 150  | -    | A     |    |
| R <sub>g</sub>                                                     | Gate Resistance                      | V <sub>GE</sub> =0V, V <sub>CC</sub> =0V, f=1MHz                                                                                                                                                                | -                     | 11   | -    | Ω     |    |
| <b>SWITCHING PARAMETERS, (Load Inductive, T<sub>J</sub>=25°C)</b>  |                                      |                                                                                                                                                                                                                 |                       |      |      |       |    |
| T <sub>d(on)</sub>                                                 | Turn-On Delay Time                   | T <sub>J</sub> =25°C<br>V <sub>GE</sub> =15V, V <sub>CC</sub> =400V, I <sub>C</sub> =30A,<br>R <sub>G</sub> =10Ω<br>E <sub>on</sub> and E <sub>total</sub> include diode<br>(AOTF30B65LN2) reverse<br>recovery  | -                     | 24   | -    | ns    |    |
| T <sub>r</sub>                                                     | Turn-On Rise Time                    |                                                                                                                                                                                                                 | -                     | 28   | -    | ns    |    |
| T <sub>d(off)</sub>                                                | Turn-Off Delay Time                  |                                                                                                                                                                                                                 | -                     | 109  | -    | ns    |    |
| T <sub>f</sub>                                                     | Turn-Off Fall Time                   |                                                                                                                                                                                                                 | -                     | 13   | -    | ns    |    |
| E <sub>on</sub>                                                    | Turn-On Energy                       |                                                                                                                                                                                                                 | -                     | 0.74 | -    | mJ    |    |
| E <sub>off</sub>                                                   | Turn-Off Energy                      |                                                                                                                                                                                                                 | -                     | 0.33 | -    | mJ    |    |
| E <sub>total</sub>                                                 | Total Switching Energy               |                                                                                                                                                                                                                 | -                     | 1.07 | -    | mJ    |    |
| <b>SWITCHING PARAMETERS, (Load Inductive, T<sub>J</sub>=175°C)</b> |                                      |                                                                                                                                                                                                                 |                       |      |      |       |    |
| T <sub>d(on)</sub>                                                 | Turn-On Delay Time                   | T <sub>J</sub> =175°C<br>V <sub>GE</sub> =15V, V <sub>CC</sub> =400V, I <sub>C</sub> =30A,<br>R <sub>G</sub> =10Ω<br>E <sub>on</sub> and E <sub>total</sub> include diode<br>(AOTF30B65LN2) reverse<br>recovery | -                     | 22   | -    | ns    |    |
| T <sub>r</sub>                                                     | Turn-On Rise Time                    |                                                                                                                                                                                                                 | -                     | 31   | -    | ns    |    |
| T <sub>d(off)</sub>                                                | Turn-Off Delay Time                  |                                                                                                                                                                                                                 | -                     | 130  | -    | ns    |    |
| T <sub>f</sub>                                                     | Turn-Off Fall Time                   |                                                                                                                                                                                                                 | -                     | 28   | -    | ns    |    |
| E <sub>on</sub>                                                    | Turn-On Energy                       |                                                                                                                                                                                                                 | -                     | 0.82 | -    | mJ    |    |
| E <sub>off</sub>                                                   | Turn-Off Energy                      |                                                                                                                                                                                                                 | -                     | 0.62 | -    | mJ    |    |
| E <sub>total</sub>                                                 | Total Switching Energy               |                                                                                                                                                                                                                 | -                     | 1.44 | -    | mJ    |    |

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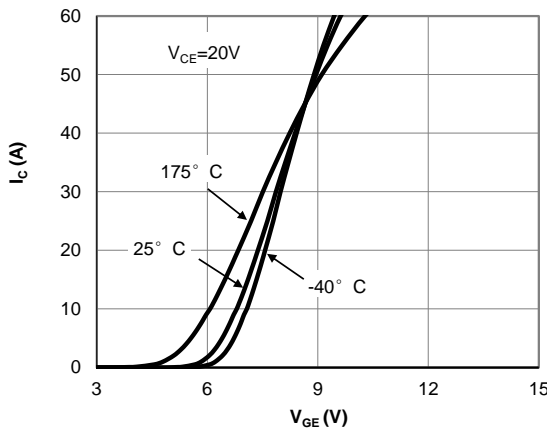
**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**



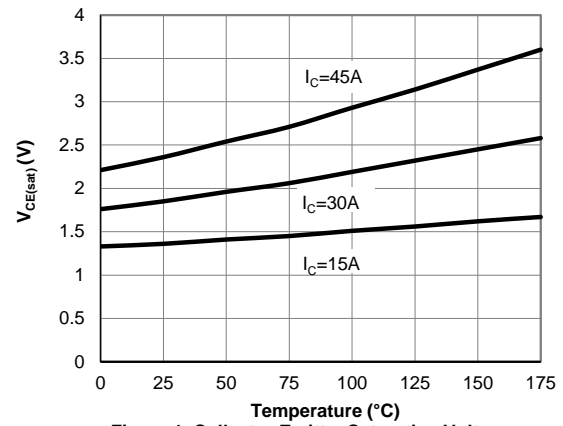
**Figure 1: Output Characteristic**  
( $T_j=25^\circ\text{C}$ )



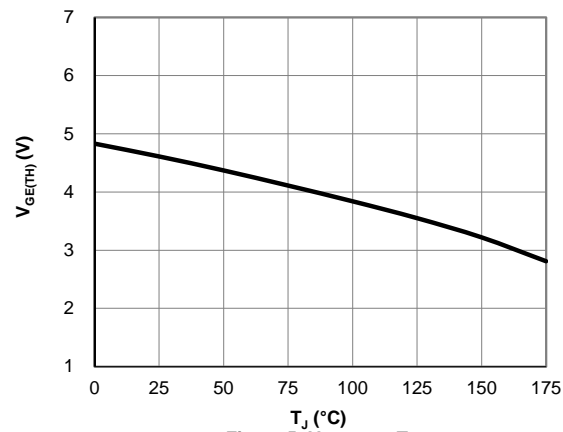
**Figure 2: Output Characteristic**  
( $T_j=175^\circ\text{C}$ )



**Figure 3: Transfer Characteristic**



**Figure 4: Collector-Emitter Saturation Voltage vs. Junction Temperature**



**Figure 5:  $V_{GE(TH)}$  vs.  $T_j$**

**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**

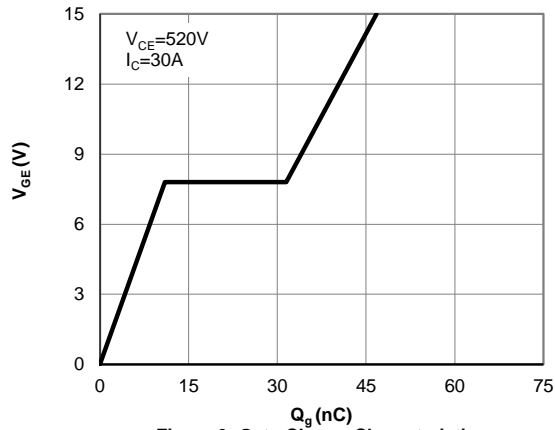


Figure 6: Gate-Charge Characteristics

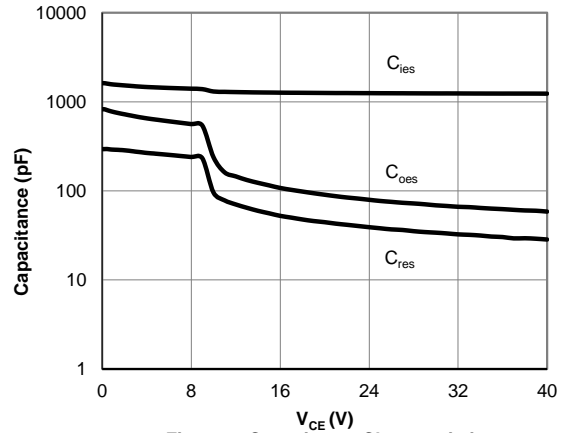


Figure 7: Capacitance Characteristic

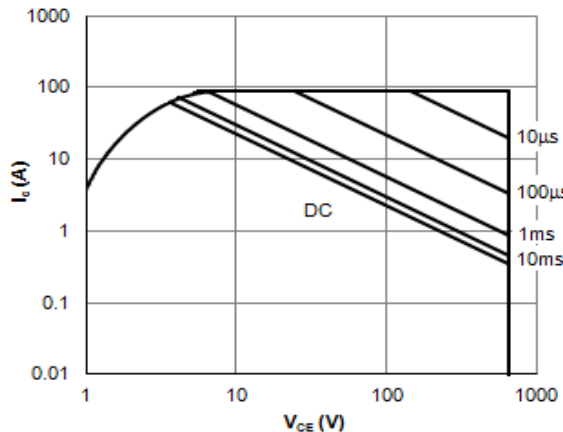


Figure 8: Forward Bias Safe Operating Area  
( $T_c=25^\circ\text{C}$ ,  $V_{GE}=15\text{V}$ )

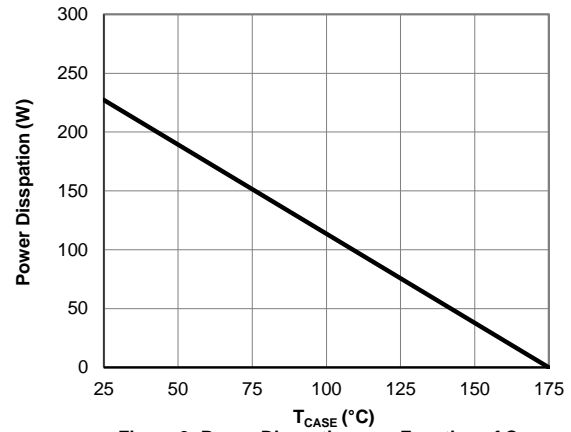


Figure 9: Power Dissipation as a Function of Case

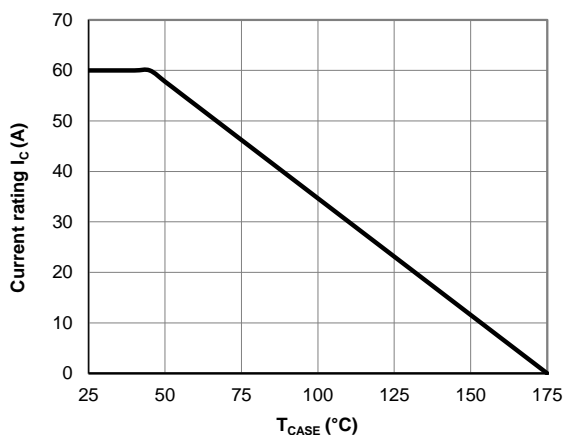


Figure 10: Current De-rating

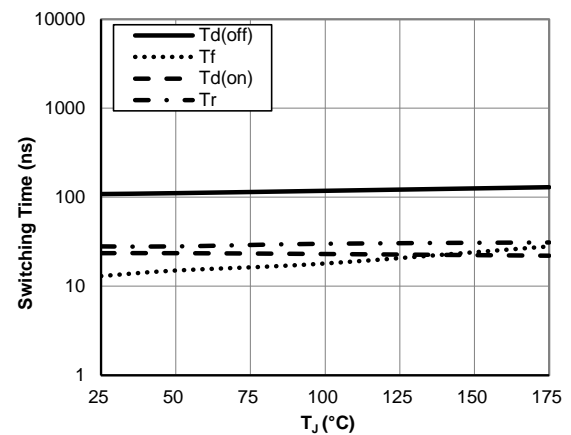
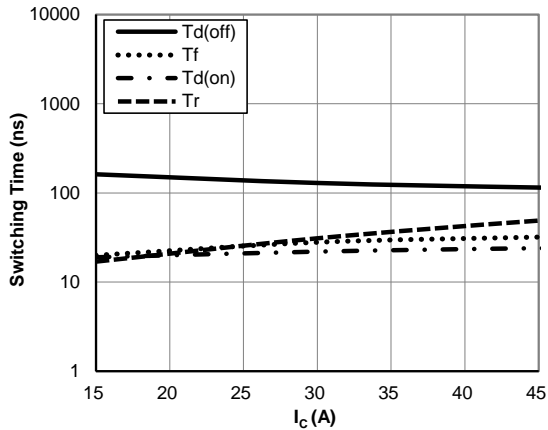
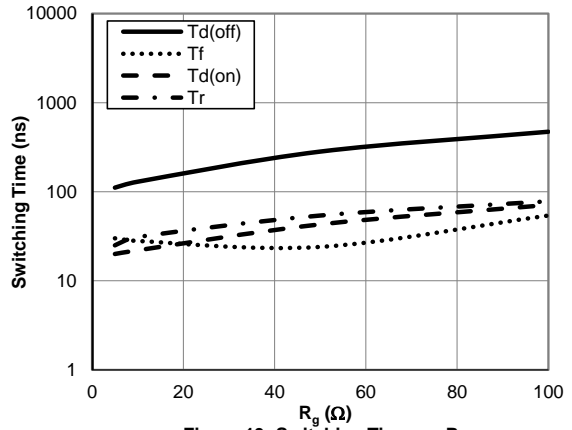


Figure 11: Switching Time vs.  $T_J$   
( $V_{GE}=15\text{V}$ ,  $V_{CE}=400\text{V}$ ,  $I_C=30\text{A}$ ,  $R_g=10\Omega$ )

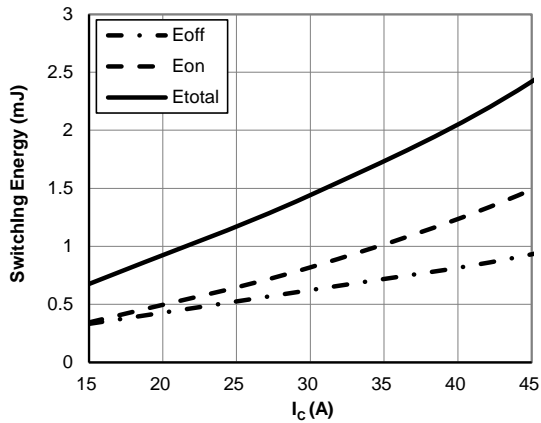
**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**



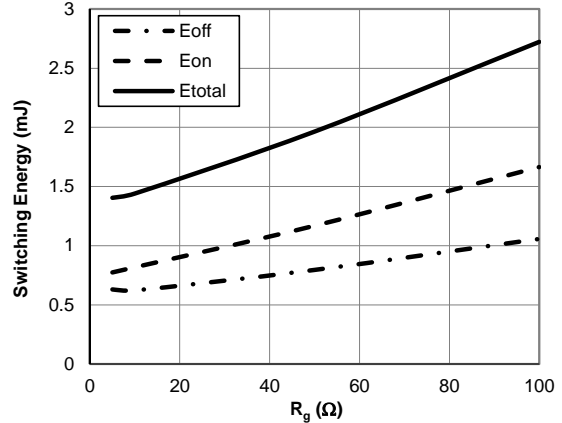
**Figure 12: Switching Time vs.  $I_C$**   
( $T_J=175^\circ\text{C}$ ,  $V_{GE}=15\text{V}$ ,  $V_{CE}=400\text{V}$ ,  $R_g=10\Omega$ )



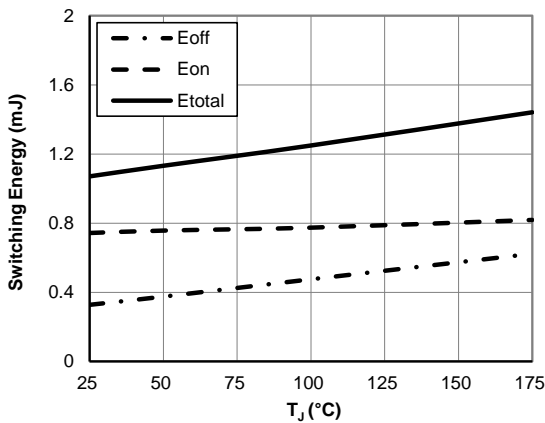
**Figure 13: Switching Time vs.  $R_g$**   
( $T_J=175^\circ\text{C}$ ,  $V_{GE}=15\text{V}$ ,  $V_{CE}=400\text{V}$ ,  $I_C=30\text{A}$ )



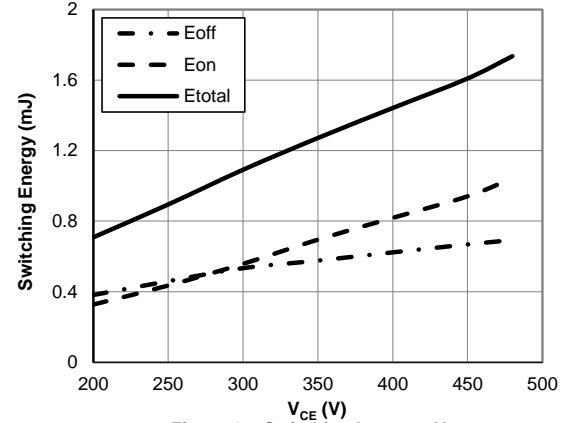
**Figure 14: Switching Loss vs.  $I_C$**   
( $T_J=175^\circ\text{C}$ ,  $V_{GE}=15\text{V}$ ,  $V_{CE}=400\text{V}$ ,  $R_g=10\Omega$ )



**Figure 15: Switching Loss vs.  $R_g$**   
( $T_J=175^\circ\text{C}$ ,  $V_{GE}=15\text{V}$ ,  $V_{CE}=400\text{V}$ ,  $I_C=30\text{A}$ )



**Figure 16: Switching Loss vs.  $T_J$**   
( $V_{GE}=15\text{V}$ ,  $V_{CE}=400\text{V}$ ,  $I_C=30\text{A}$ ,  $R_g=10\Omega$ )



**Figure 17: Switching Loss vs.  $V_{CE}$**   
( $T_J=175^\circ\text{C}$ ,  $V_{GE}=15\text{V}$ ,  $I_C=30\text{A}$ ,  $R_g=10\Omega$ )

**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**

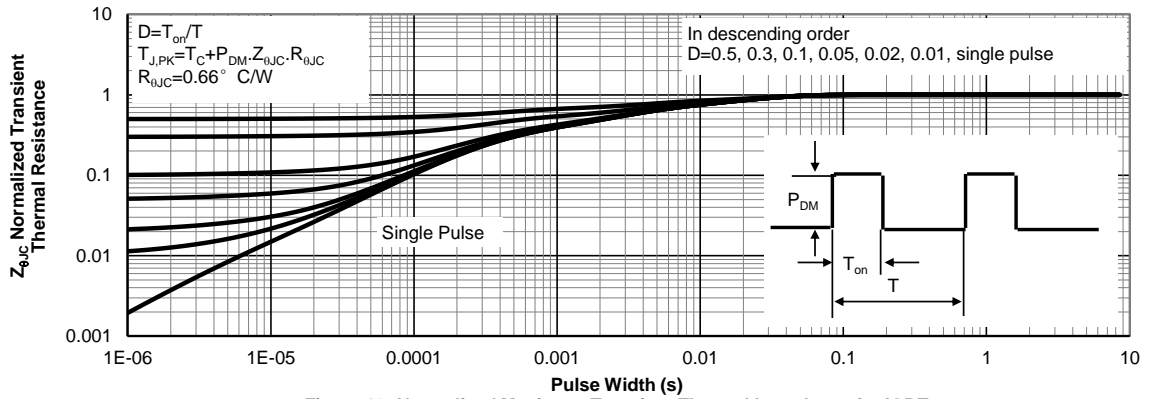


Figure 18: Normalized Maximum Transient Thermal Impedance for IGBT

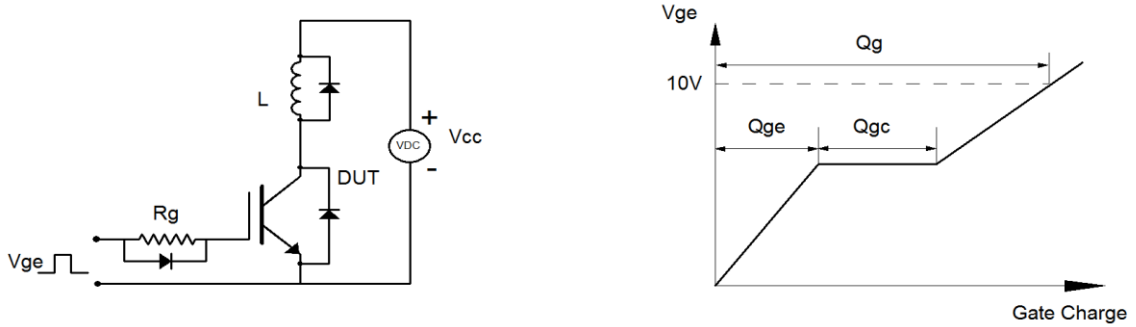


Figure A: Gate Charge Test Circuit & Waveforms

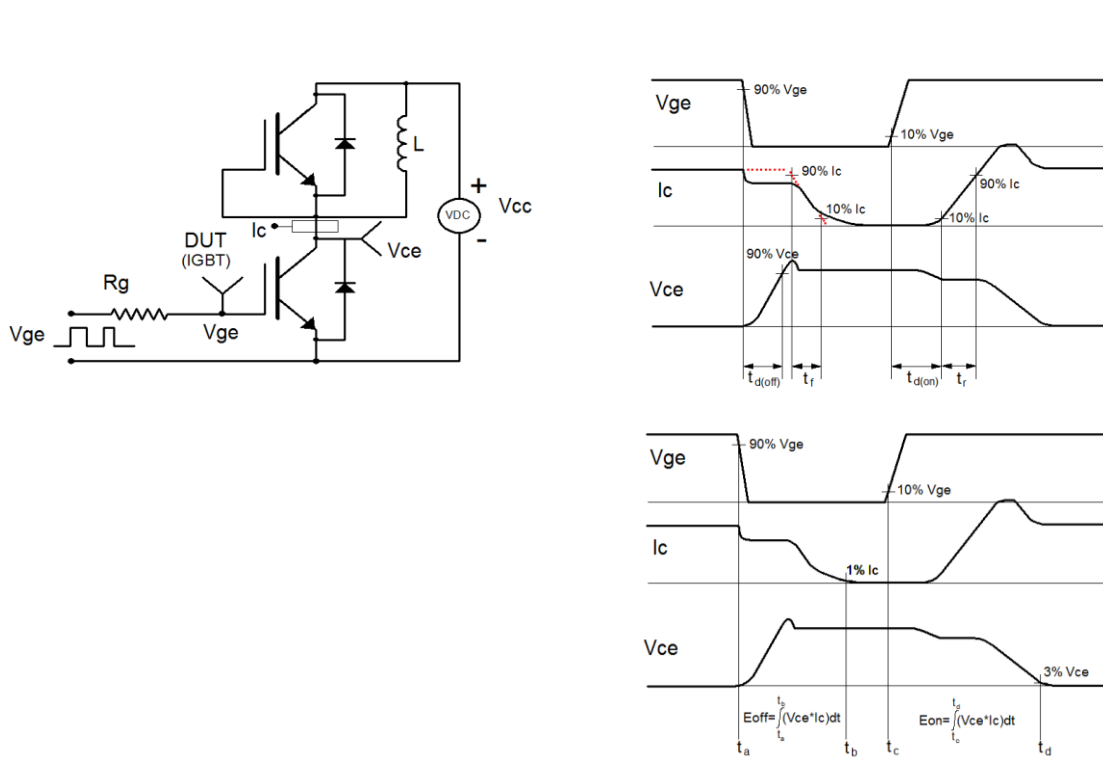


Figure B: Inductive Switching Test Circuit & Waveforms

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