

### General Description

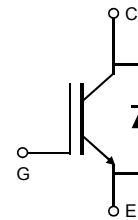
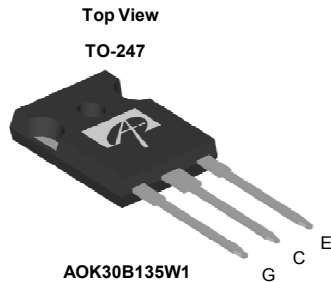
- Latest AlphaIGBT ( $\alpha$ IGBT) technology
- Best in Class  $V_{CE(SAT)}$  enables high efficiencies
- Low turn-off switching loss due to fast turn-off time
- Very smooth turn-off current waveforms reduce EMI
- Better thermal management
- High surge current capability
- Minimal gate spike due to high input capacitance

### Applications

- Induction Cooking
- Rice Cookers
- Microwave Ovens
- Other soft switching applications

### Product Summary

|  |       |
|--|-------|
| $V_{CE}$                                 | 1350V |
| $I_C$ ( $T_C=100^\circ\text{C}$ )        | 30A   |
| $V_{CE(sat)}$ ( $T_C=25^\circ\text{C}$ ) | 1.8V  |



| Orderable Part Number | Package Type | Form | Minimum Order Quantity |
|-----------------------|--------------|------|------------------------|
| AOK30B135W1           | TO247        | Tube | 240                    |

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

| Parameter  | Symbol         | AOK30B135W1             | Units            |
|--|----------------|-------------------------|------------------|
| Collector-Emitter Voltage  | $V_{CE}$       | 1350                    | 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 $T_{Jmax}$                              | $I_{Cpulse}$   | 120                     | A                |
| Non repetitive peak collector current <sup>A</sup>                           | $I_{CSM}$      | 200                     | A                |
| Turn off SOA, $V_{CE} \leq 600\text{V}$ , Limited by $T_{Jmax}$              | $I_{LM}$       | 120                     | A                |
| Continuous Diode Forward Current   | $I_F$          | $T_C=25^\circ\text{C}$  | 60               |
|  |                | $T_C=100^\circ\text{C}$ | 30               |
| Diode Pulsed Current, Limited by $T_{Jmax}$                                  | $I_{Fpulse}$   | 120                     | A                |
| Power Dissipation  | $P_D$          | $T_C=25^\circ\text{C}$  | 340              |
|  |                | $T_C=100^\circ\text{C}$ | 170              |
| 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                     | $^\circ\text{C}$ |

### Thermal Characteristics

| Parameter                      | Symbol          | AOK30B135W1 | Units              |
|--------------------------------|-----------------|-------------|--------------------|
| Maximum Junction-to-Ambient    | $R_{\theta JA}$ | 40          | $^\circ\text{C/W}$ |
| Maximum IGBT Junction-to-Case  | $R_{\theta JC}$ | 0.44        | $^\circ\text{C/W}$ |
| Maximum Diode Junction-to-Case | $R_{\theta JC}$ | 1.20        | $^\circ\text{C/W}$ |

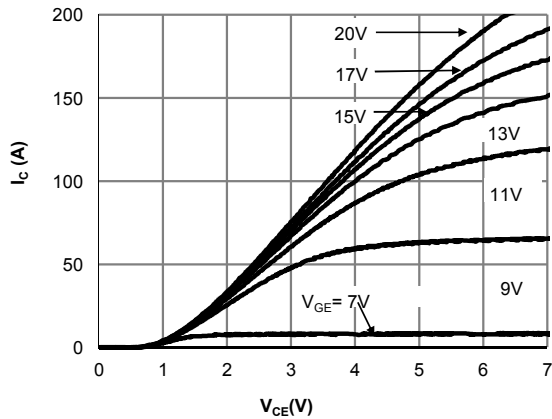
Note A: Capacitor charging saturation current limited by  $T_{Jmax} < 175^\circ\text{C}$  and  $t_p < 3\mu\text{s}$

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

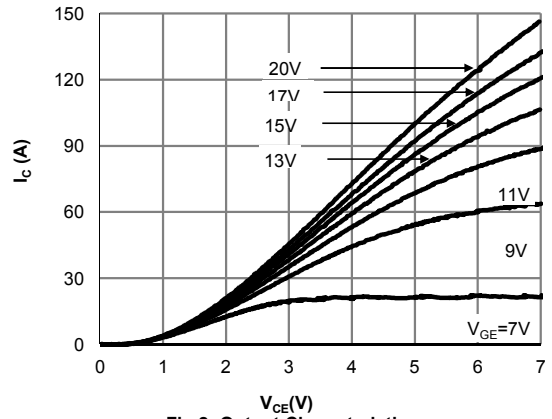
| Symbol   | Parameter                            | Conditions  | Min               | Typ  | Max       | Units    |         |
|--|--------------------------------------|---|-------------------|------|-----------|----------|---------|
| <b>STATIC PARAMETERS</b>   |                                      |   |                   |      |           |          |         |
| $BV_{CES}$   | Collector-Emitter Breakdown Voltage  | $I_C=1mA, V_{GE}=0V, T_J=25^\circ C$  | 1350              | -    | -         | V        |         |
| $V_{CE(sat)}$  | Collector-Emitter Saturation Voltage | $V_{GE}=15V, I_C=30A$   | $T_J=25^\circ C$  | -    | 1.8       | 2.2      | V       |
|  |                                      |   | $T_J=125^\circ C$ | -    | 2.3       | -        |         |
|  |                                      |   | $T_J=175^\circ C$ | -    | 2.5       | -        |         |
| $V_F$  | Diode Forward Voltage                | $V_{GE}=0V, I_C=30A$  | $T_J=25^\circ C$  | -    | 1.6       | 1.9      | V       |
|  |                                      |   | $T_J=125^\circ C$ | -    | 1.73      | -        |         |
|  |                                      |   | $T_J=175^\circ C$ | -    | 1.74      | -        |         |
| $V_{GE(th)}$   | Gate-Emitter Threshold Voltage       | $V_{CE}=5V, I_C=1mA$  | 4.7               | 5.15 | 5.9       | V        |         |
| $I_{CES}$  | Zero Gate Voltage Collector Current  | $V_{CE}=1350V, V_{GE}=0V$   | $T_J=25^\circ C$  | -    | -         | 10       | $\mu A$ |
|  |                                      |   | $T_J=125^\circ C$ | -    | -         | 800      |         |
|  |                                      |   | $T_J=175^\circ C$ | -    | -         | 8000     |         |
| $I_{GES}$  | Gate-Emitter leakage current         | $V_{CE}=0V, V_{GE}=\pm 30V$   | -                 | -    | $\pm 100$ | nA       |         |
| $g_{FS}$   | Forward Transconductance             | $V_{CE}=20V, I_C=30A$   | -                 | 31   | -         | S        |         |
| <b>DYNAMIC PARAMETERS</b>  |                                      |   |                   |      |           |          |         |
| $C_{ies}$  | Input Capacitance                    | $V_{GE}=0V, V_{CE}=25V, f=1MHz$   | -                 | 1932 | -         | pF       |         |
| $C_{oes}$  | Output Capacitance                   |   | -                 | 107  | -         | pF       |         |
| $C_{res}$  | Reverse Transfer Capacitance         |   | -                 | 32   | -         | pF       |         |
| $Q_g$  | Total Gate Charge                    | $V_{GE}=15V, V_{CE}=1080V, I_C=30A$   | -                 | 62   | -         | nC       |         |
| $Q_{ge}$   | Gate to Emitter Charge               |   | -                 | 13   | -         | nC       |         |
| $Q_{gc}$   | Gate to Collector Charge             |   | -                 | 29   | -         | nC       |         |
| $R_g$  | Gate resistance                      | $V_{GE}=0V, V_{CE}=0V, f=1MHz$  | -                 | 1.75 | -         | $\Omega$ |         |
| <b>SWITCHING PARAMETERS, (Load Inductive, T<sub>J</sub>=25°C)</b>  |                                      |   |                   |      |           |          |         |
| $t_{D(off)}$   | Turn-Off Delay Time                  | $T_J=25^\circ C$<br>$V_{GE}=15V, V_{CE}=600V, I_C=30A,$<br>$R_G=10\Omega,$<br>Parasitic Inductance=150nH  | -                 | 129  | -         | ns       |         |
| $t_f$  | Turn-Off Fall Time                   |   | -                 | 148  | -         | ns       |         |
| $E_{off}$  | Turn-Off Energy                      |   | -                 | 1.47 | -         | mJ       |         |
| <b>SWITCHING PARAMETERS, (Load Inductive, T<sub>J</sub>=175°C)</b> |                                      |   |                   |      |           |          |         |
| $t_{D(off)}$   | Turn-Off Delay Time                  | $T_J=175^\circ C$<br>$V_{GE}=15V, V_{CE}=600V, I_C=30A,$<br>$R_G=10\Omega,$<br>Parasitic Inductance=150nH | -                 | 154  | -         | ns       |         |
| $t_f$  | Turn-Off Fall Time                   |   | -                 | 208  | -         | ns       |         |
| $E_{off}$  | Turn-Off Energy                      |   | -                 | 1.63 | -         | mJ       |         |

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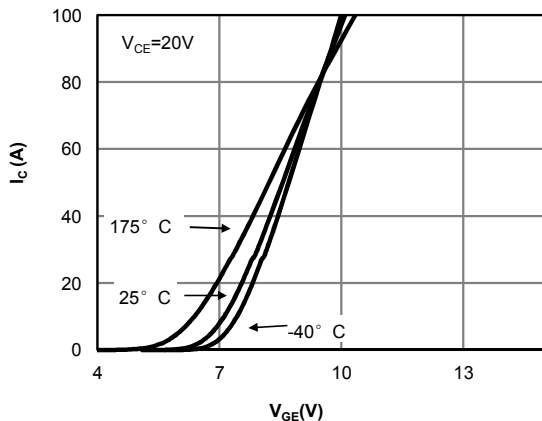
**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**



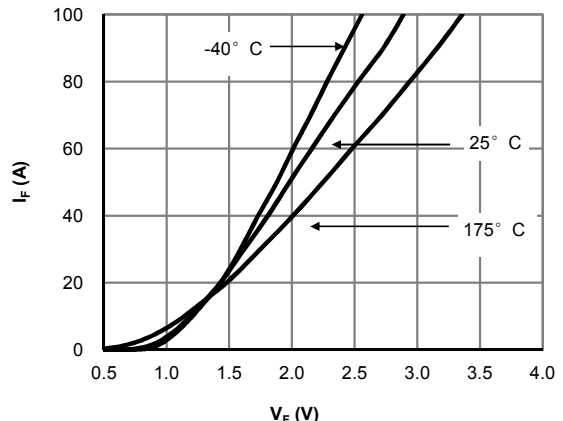
**Fig 1: Output Characteristic**  
( $T_j=25^\circ\text{C}$ )



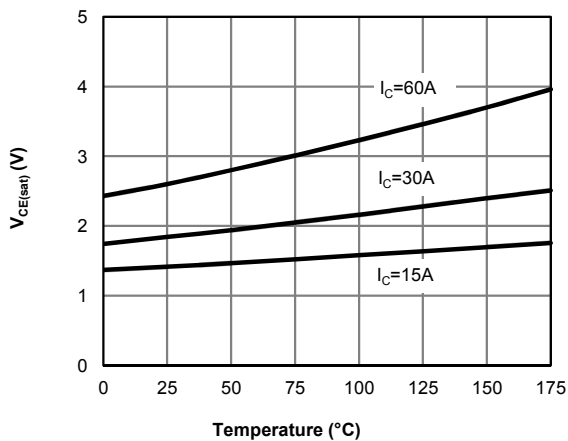
**Fig 2: Output Characteristic**  
( $T_j=175^\circ\text{C}$ )



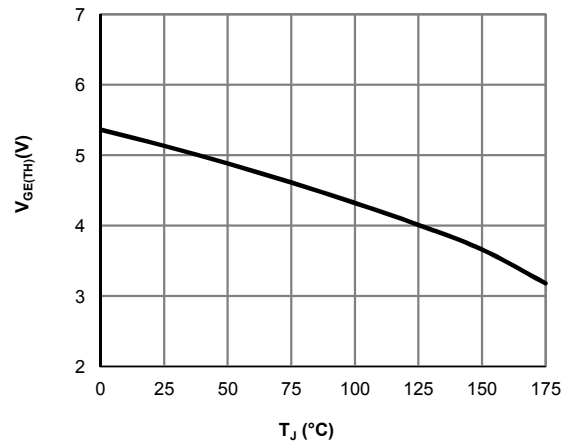
**Fig 3: Transfer Characteristic**



**Fig 4: Diode Characteristic**

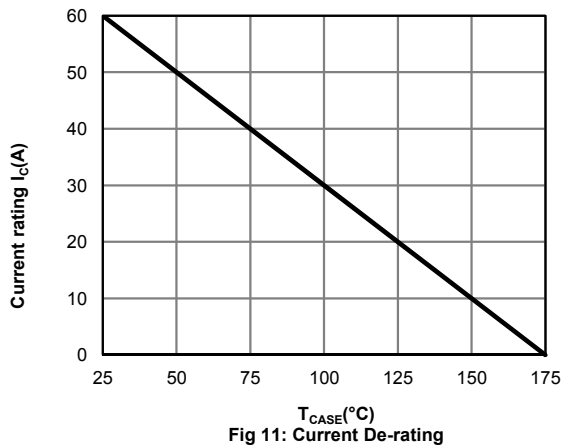
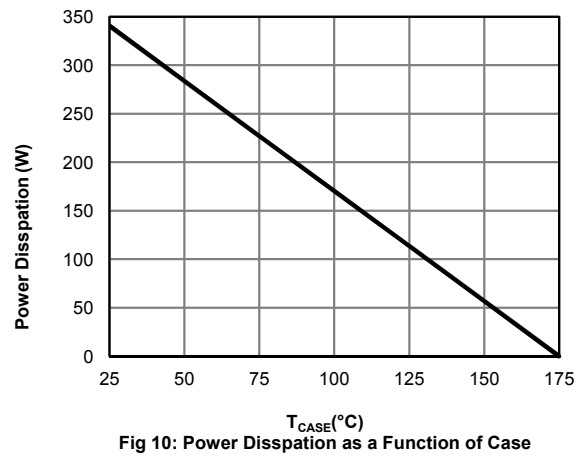
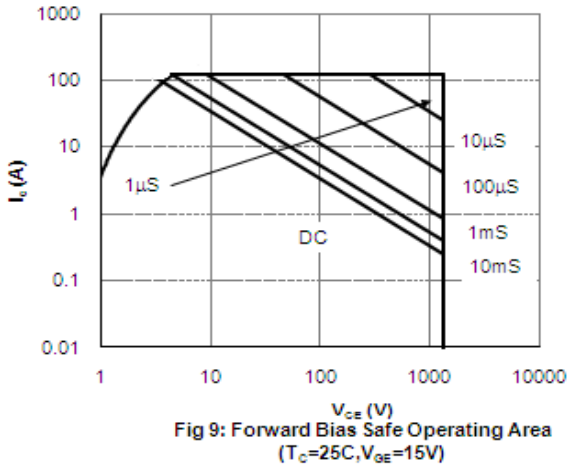
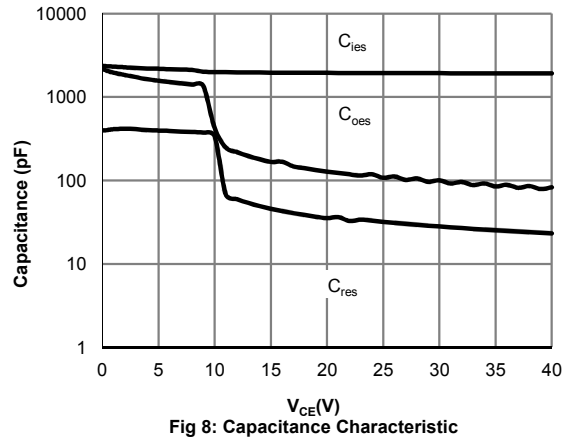
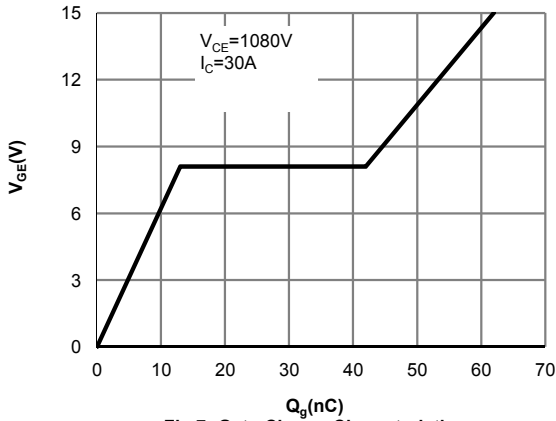


**Fig 5: Collector-Emitter Saturation Voltage vs. Junction Temperature**

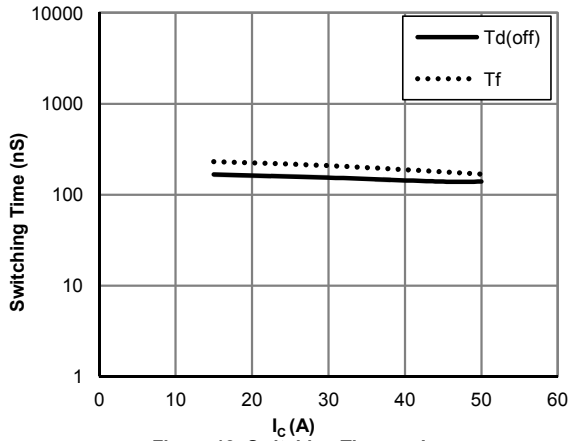


**Figure 6:  $V_{GE(TH)}$  vs.  $T_j$**

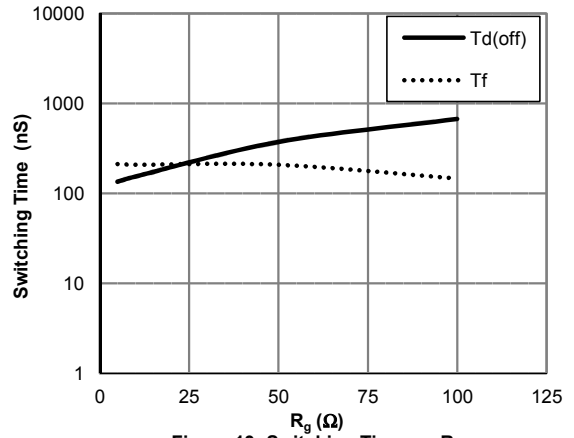
**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**



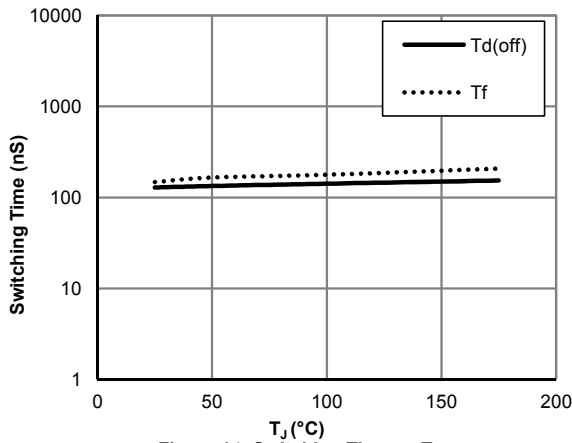
**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**



**Figure 12: Switching Time vs.  $I_C$**   
( $T_J=175^\circ\text{C}, V_{GE}=15\text{V}, V_{CE}=600\text{V}, R_g=10\Omega$ )

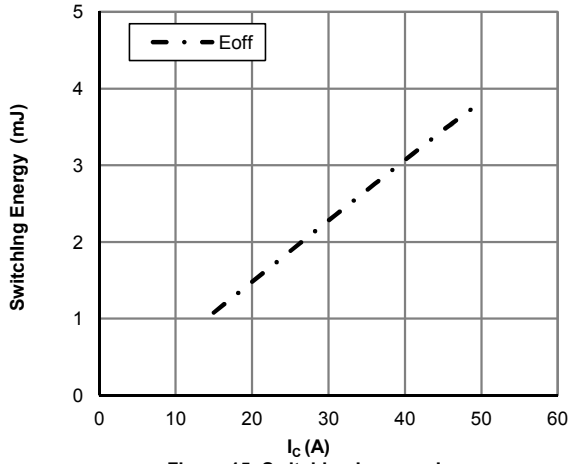


**Figure 13: Switching Time vs.  $R_g$**   
( $T_J=175^\circ\text{C}, V_{GE}=15\text{V}, V_{CE}=600\text{V}, I_C=30\text{A}$ )

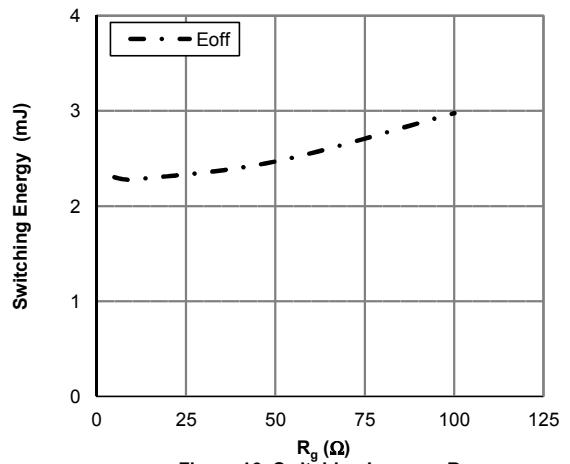


**Figure 14: Switching Time vs.  $T_J$**   
( $V_{GE}=15\text{V}, V_{CE}=600\text{V}, I_C=30\text{A}, R_g=10\Omega$ )

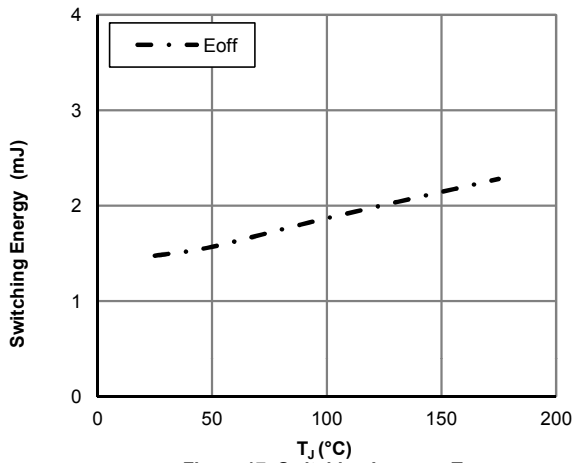
**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**



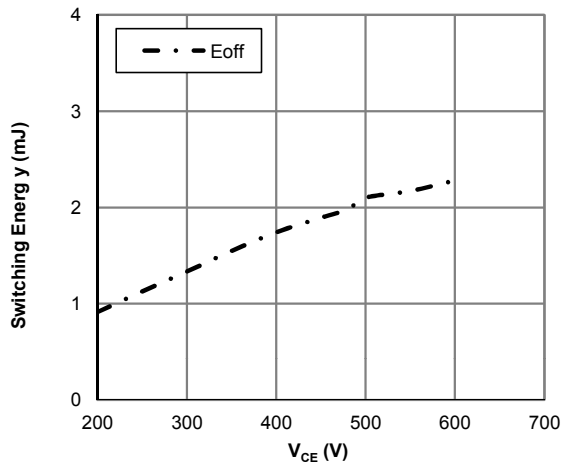
**Figure 15: Switching Loss vs.  $I_C$**   
( $T_J=175^\circ\text{C}, V_{GE}=15\text{V}, V_{CE}=600\text{V}, R_g=10\Omega$ )



**Figure 16: Switching Loss vs.  $R_g$**   
( $T_J=175^\circ\text{C}, V_{GE}=15\text{V}, V_{CE}=600\text{V}, I_C=30\text{A}$ )

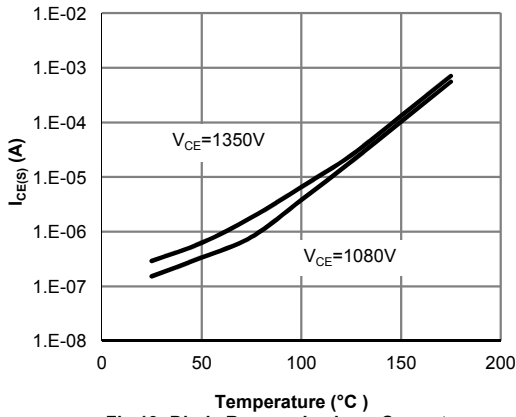


**Figure 17: Switching Loss vs.  $T_J$**   
( $V_{GE}=15\text{V}, V_{CE}=600\text{V}, I_C=30\text{A}, R_g=10\Omega$ )

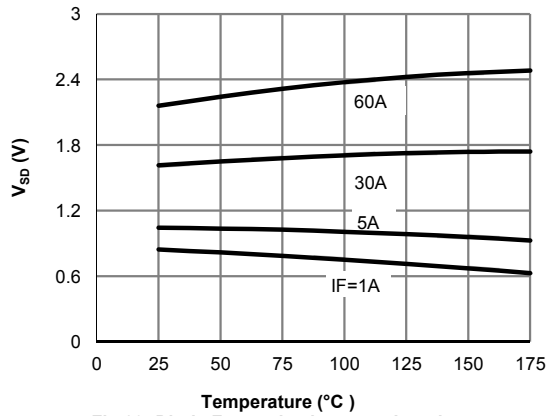


**Figure 18: Switching Loss vs.  $V_{CE}$**   
( $T_J=175^\circ\text{C}, V_{GE}=15\text{V}, I_C=30\text{A}, R_g=10\Omega$ )

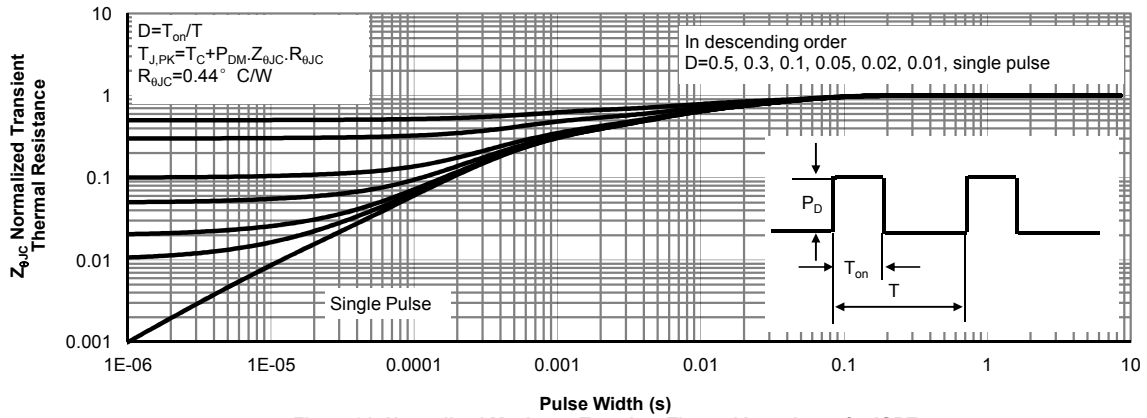
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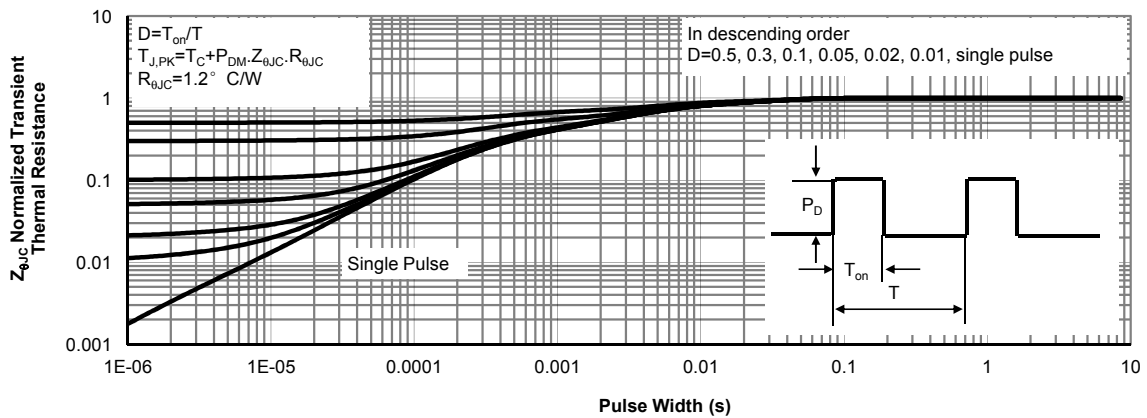
**Fig 19: Diode Reverse Leakage Current vs. Junction Temperature**



**Fig 20: Diode Forward Voltage vs. Junction Temperature**

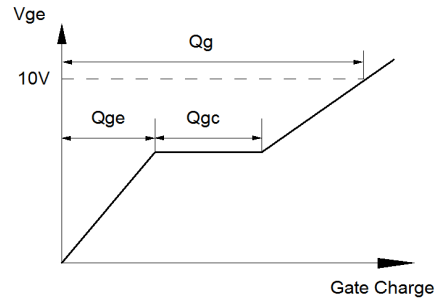
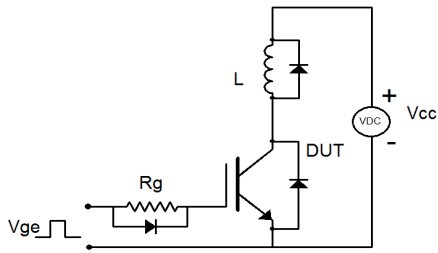


**Figure 21: Normalized Maximum Transient Thermal Impedance for IGBT**

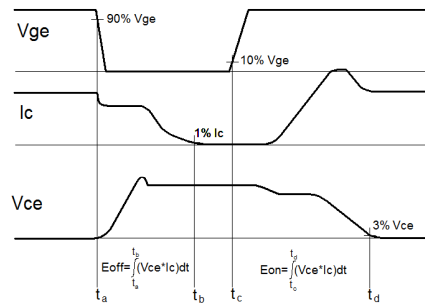
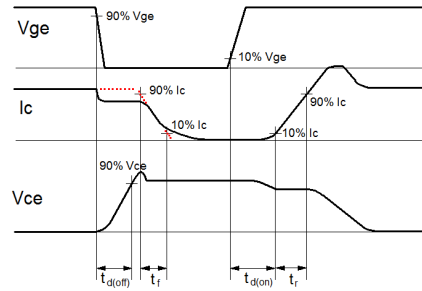
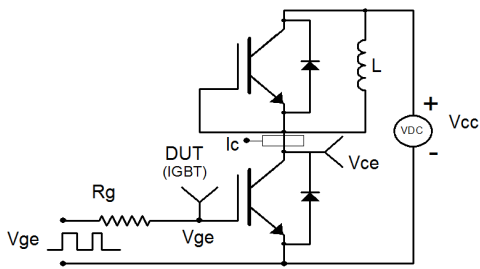


**Figure 22: Normalized Maximum Transient Thermal Impedance for Diode**

Gate Charge Test Circuit & Waveform



Inductive Switching Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

