



AOK30B135C1

1350V, 30A Alpha RC-IGBT™
with Monolithic Body Diode

General Description

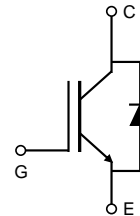
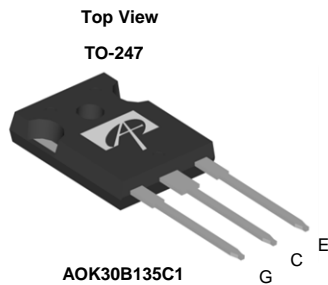
- Latest AlphaRC-IGBT (α RC-IGBT) technology
- Best in Class $V_{CE(SAT)}$ enables high efficiencies
- Low turn-off switching loss due to fast turn-off time
- Very smooth turn-off current waveforms reduce EMI
- Better thermal management
- High surge current capability
- Minimal gate spike due to high 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
$V_{CE(sat)}$ ($T_C=25^\circ\text{C}$)	1.92V



Orderable Part Number	Package Type	Form	Minimum Order Quantity
AOK30B135C1	TO247	Tube	240

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

Parameter	Symbol	AOK30B135C1	Units
Collector-Emitter Voltage	V_{CE}	1350	V
Gate-Emitter Voltage	V_{GE}	± 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 ^A	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	$T_C=25^\circ\text{C}$	288
		$T_C=100^\circ\text{C}$	144
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	AOK30B135C1	Units
Maximum Junction-to-Ambient	$R_{\theta JA}$	40	$^\circ\text{C/W}$
Maximum IGBT Junction-to-Case	$R_{\theta JC}$	0.52	$^\circ\text{C/W}$

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

Electrical Characteristics (T_J=25°C unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units	
STATIC PARAMETERS							
BV _{CES}	Collector-Emitter Breakdown Voltage	I _C =1mA, V _{GE} =0V, T _J =25°C	1350	-	-	V	
V _{CE(sat)}	Collector-Emitter Saturation Voltage	V _{GE} =15V, I _C =30A	T _J =25°C	-	1.92	2.4	V
			T _J =125°C	-	2.4	-	
			T _J =175°C	-	2.71	-	
V _F	Diode Forward Voltage	V _{GE} =0V, I _F =30A	T _J =25°C	-	2.2	2.8	V
			T _J =125°C	-	2.6	-	
			T _J =175°C	-	2.75	-	
V _{GE(th)}	Gate-Emitter Threshold Voltage	V _{CE} =5V, I _C =1mA		5.2		V	
I _{CES}	Zero Gate Voltage Collector Current	V _{CE} =1350V, V _{GE} =0V	T _J =25°C	-	-	10	μA
			T _J =125°C	-	-	100	
			T _J =175°C	-	-	5000	
I _{GES}	Gate-Emitter Leakage Current	V _{CE} =0V, V _{GE} =±30V	-	-	±100	nA	
g _{FS}	Forward Transconductance	V _{CE} =20V, I _C =30A	-	30	-	S	
DYNAMIC PARAMETERS							
C _{ies}	Input Capacitance	V _{GE} =0V, V _{CE} =25V, f=1MHz	-	2020	-	pF	
C _{oes}	Output Capacitance		-	75	-	pF	
C _{res}	Reverse Transfer Capacitance		-	30	-	pF	
Q _g	Total Gate Charge	V _{GE} =15V, V _{CE} =1080V, I _C =30A	-	65	-	nC	
Q _{ge}	Gate to Emitter Charge		-	16.5	-	nC	
Q _{gc}	Gate to Collector Charge		-	26	-	nC	
R _g	Gate resistance	V _{GE} =0V, V _{CE} =0V, f=1MHz	-	3.2	-	Ω	
SWITCHING PARAMETERS, (Load Inductive, T_J=25°C)							
t _{D(off)}	Turn-Off Delay Time	T _J =25°C V _{GE} =15V, V _{CE} =600V, I _C =30A, R _G =10Ω, Include diode (AOK30B135W1) reverse recovery	-	110	-	ns	
t _f	Turn-Off Fall Time		-	128	-	ns	
E _{off}	Turn-Off Energy		-	1.45	-	mJ	
SWITCHING PARAMETERS, (Load Inductive, T_J=175°C)							
t _{D(off)}	Turn-Off Delay Time	T _J =175°C V _{GE} =15V, V _{CE} =600V, I _C =30A, R _G =10Ω, Include diode (AOK30B135W1) reverse recovery	-	129	-	ns	
t _f	Turn-Off Fall Time		-	150	-	ns	
E _{off}	Turn-Off Energy		-	2.07	-	mJ	

APPLICATIONS OR USES AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS ARE NOT AUTHORIZED. AOS DOES NOT ASSUME ANY LIABILITY ARISING OUT OF SUCH APPLICATIONS OR USES OF ITS PRODUCTS. AOS RESERVES THE RIGHT TO MAKE CHANGES TO PRODUCT SPECIFICATIONS WITHOUT NOTICE. IT IS THE RESPONSIBILITY OF THE CUSTOMER TO EVALUATE SUITABILITY OF THE PRODUCT FOR THEIR INTENDED APPLICATION. CUSTOMER SHALL COMPLY WITH APPLICABLE LEGAL REQUIREMENTS, INCLUDING ALL APPLICABLE EXPORT CONTROL RULES, REGULATIONS AND LIMITATIONS.

AOS' products are provided subject to AOS' terms and conditions of sale which are set forth at:
http://www.aosmd.com/terms_and_conditions_of_sale

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

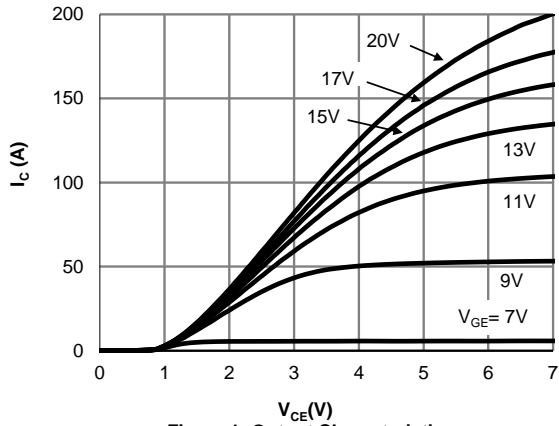


Figure 1: Output Characteristic
($T_j=25^\circ\text{C}$)

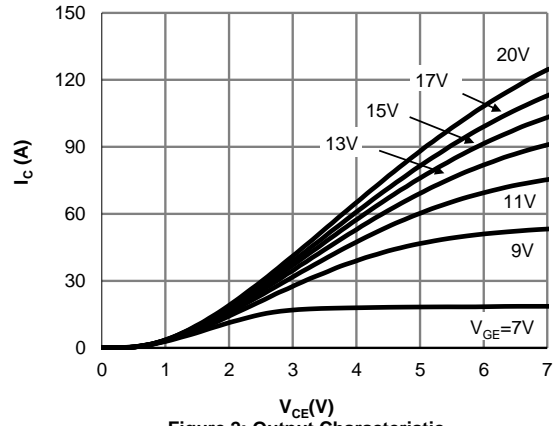


Figure 2: Output Characteristic
($T_j=175^\circ\text{C}$)

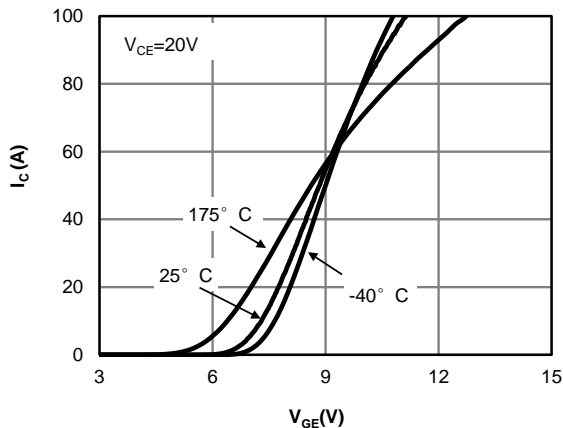


Figure 3: Transfer Characteristic

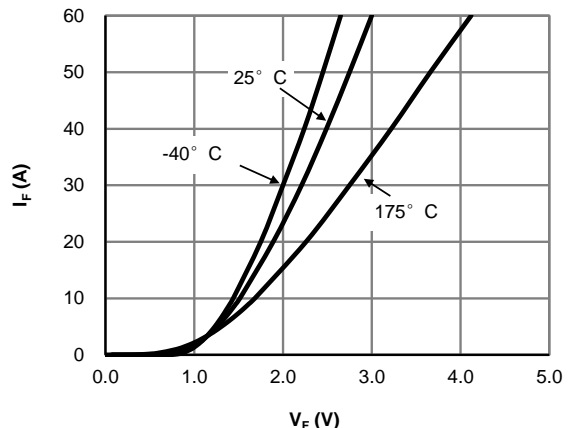


Figure 4: Diode Characteristic

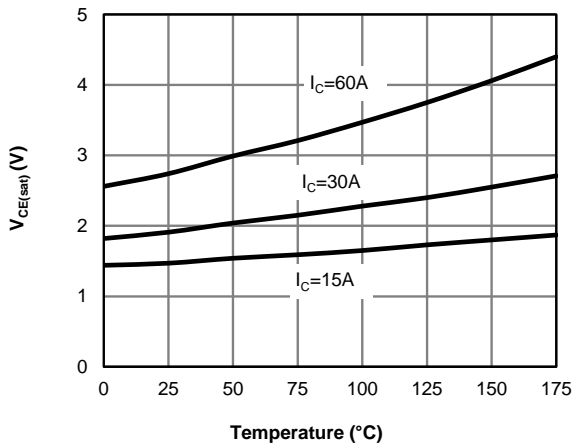


Figure 5: Collector-Emitter Saturation Voltage vs. Junction Temperature

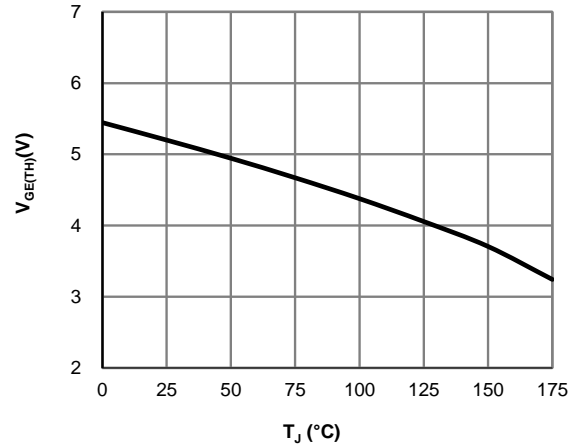


Figure 6: $V_{GE(TH)}$ vs. T_j

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

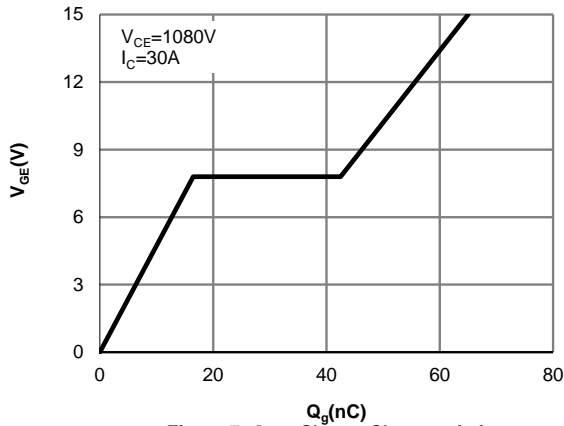


Figure 7: Gate-Charge Characteristics

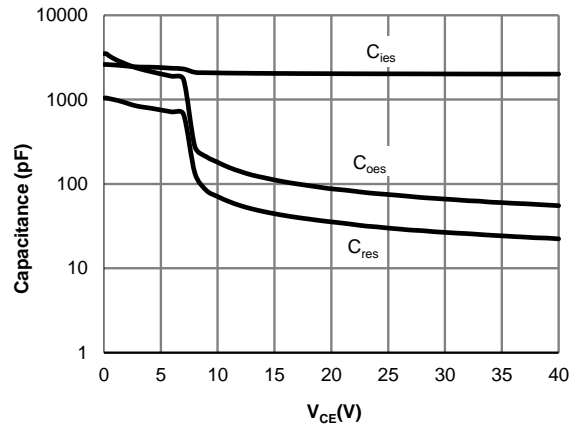


Figure 8: Capacitance Characteristic

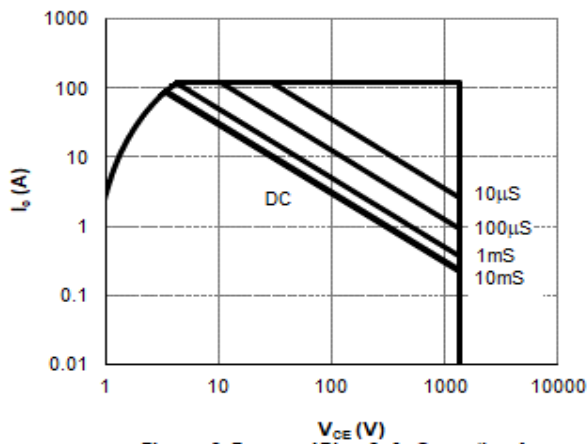


Figure 9: Forward Bias Safe Operating Area
($T_C=25^\circ\text{C}, V_{GE}=15\text{V}$)

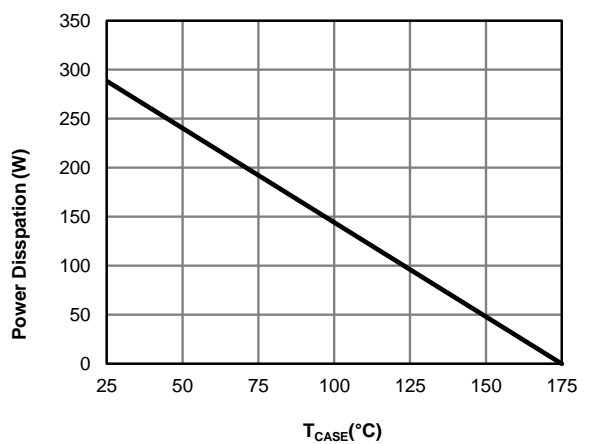


Figure 10: Power Dissipation as a Function of Case

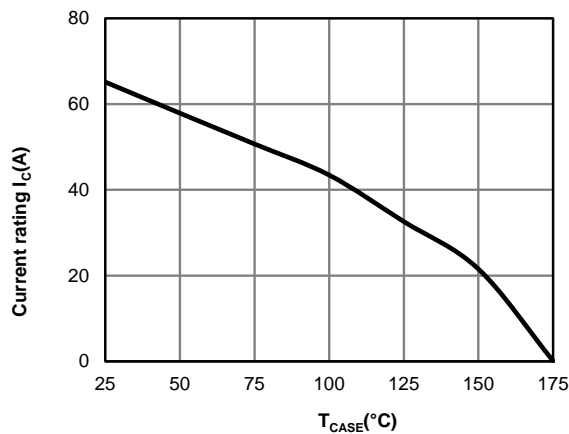


Figure 11: Current De-rating

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

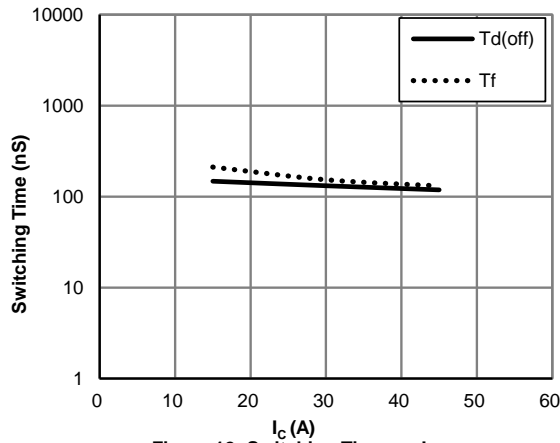


Figure 12: Switching Time vs. I_C
($T_J=175^\circ\text{C}, V_{GE}=15\text{V}, V_{CE}=600\text{V}, R_g=10\Omega$)

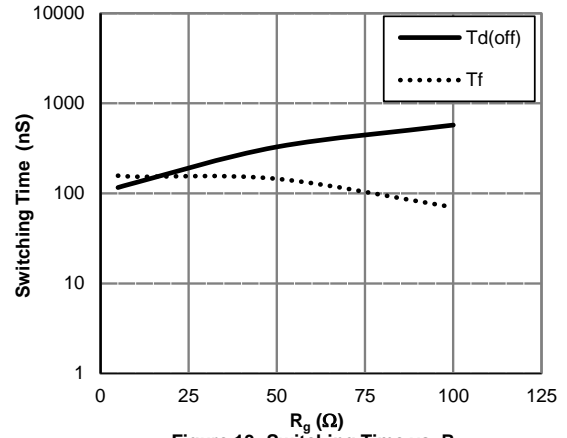


Figure 13: Switching Time vs. R_g
($T_J=175^\circ\text{C}, V_{GE}=15\text{V}, V_{CE}=600\text{V}, I_C=30\text{A}$)

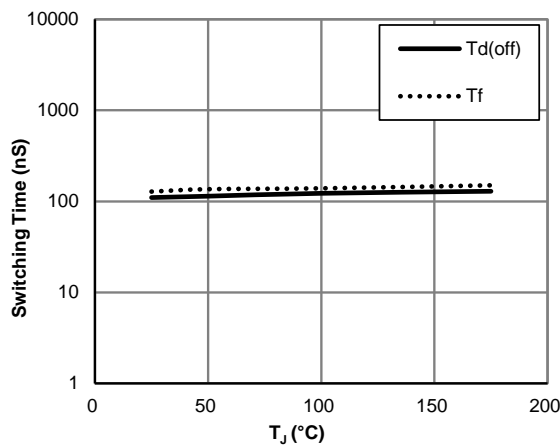


Figure 14: Switching Time vs. T_J
($V_{GE}=15\text{V}, V_{CE}=600\text{V}, I_C=30\text{A}, R_g=10\Omega$)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

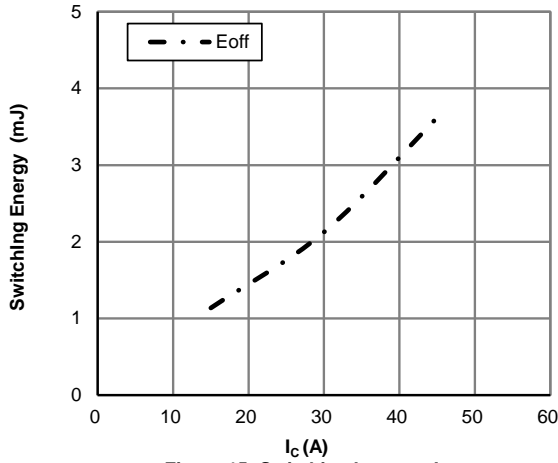


Figure 15: Switching Loss vs. I_C
($T_J=175^\circ\text{C}, V_{GE}=15\text{V}, V_{CE}=600\text{V}, R_g=10\Omega$)

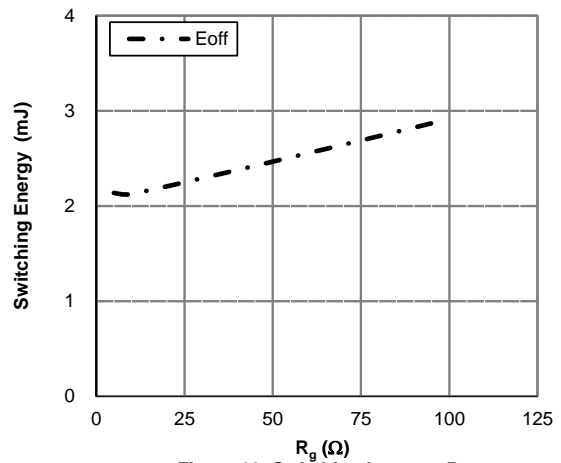


Figure 16: Switching Loss vs. R_g
($T_J=175^\circ\text{C}, V_{GE}=15\text{V}, V_{CE}=600\text{V}, I_C=30\text{A}$)

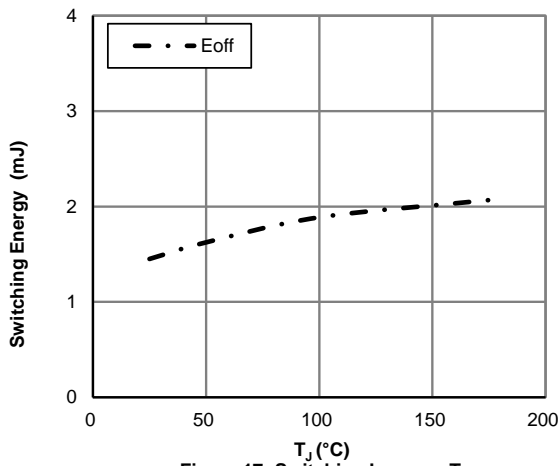


Figure 17: Switching Loss vs. T_J
($V_{GE}=15\text{V}, V_{CE}=600\text{V}, I_C=30\text{A}, R_g=10\Omega$)

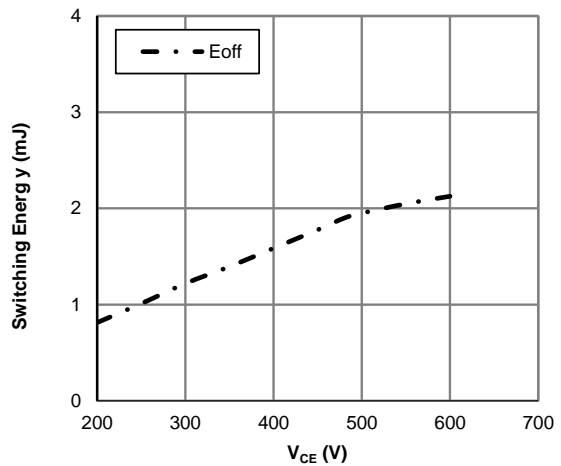


Figure 18: Switching Loss vs. V_{CE}
($T_J=175^\circ\text{C}, V_{GE}=15\text{V}, I_C=30\text{A}, R_g=10\Omega$)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

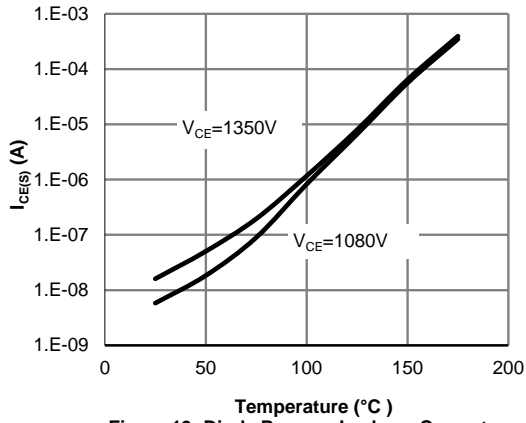


Figure 19: Diode Reverse Leakage Current vs. Junction Temperature

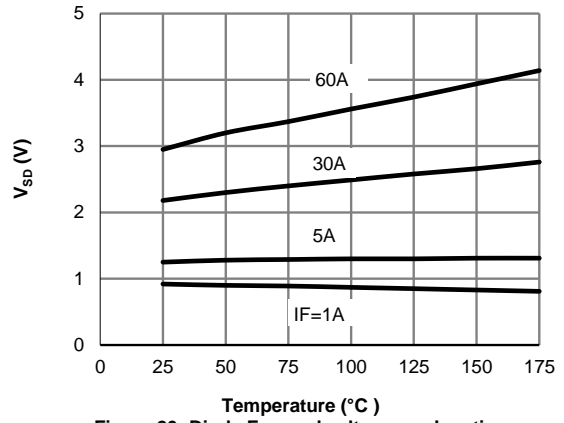


Figure 20: Diode Forward voltage vs. Junction Temperature

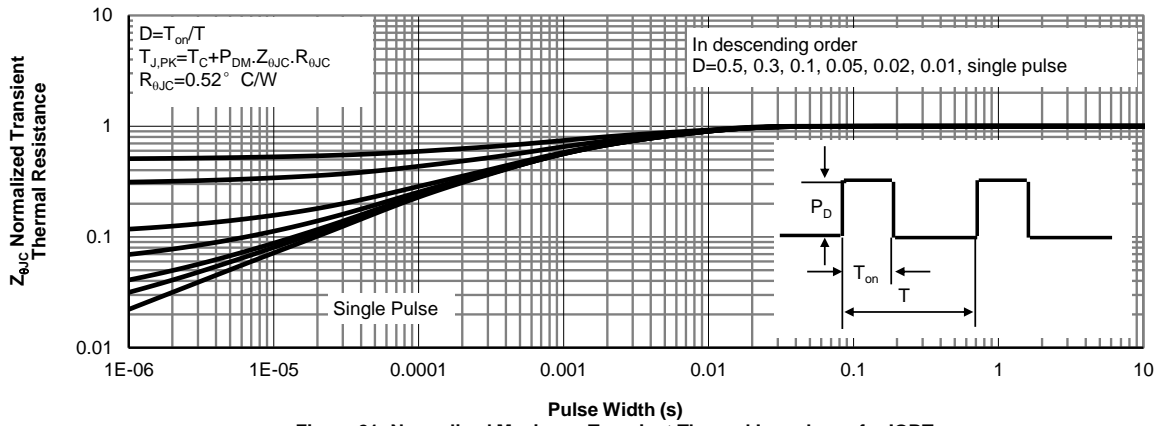
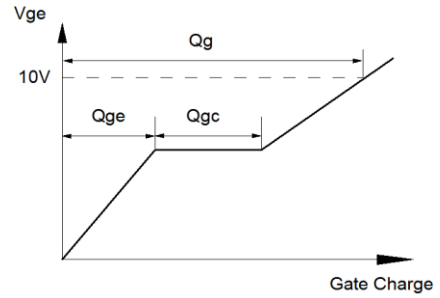
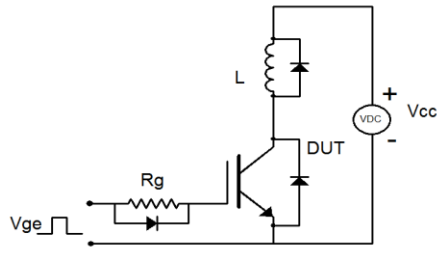
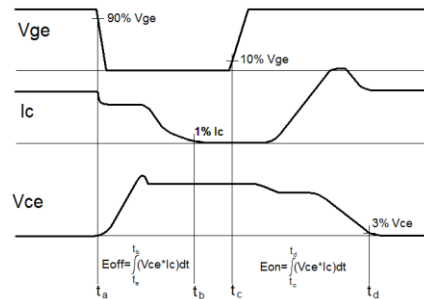
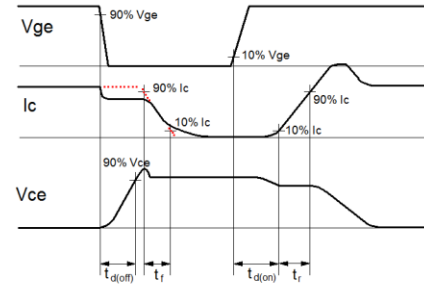
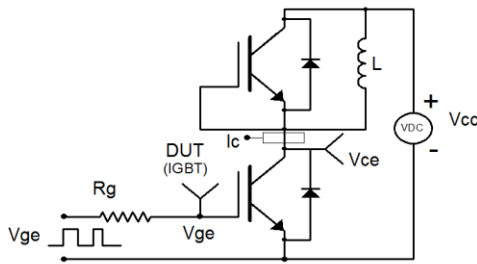


Figure 21: Normalized Maximum Transient Thermal Impedance for IGBT

Gate Charge Test Circuit & Waveform



Inductive Switching Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

