

General Description

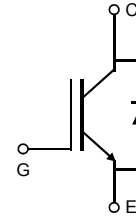
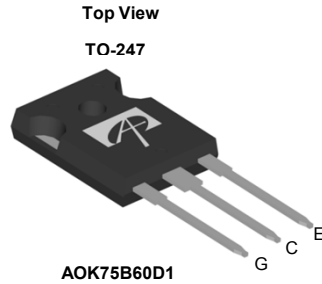
- AlphaIGBT (α IGBT) technology
- Low $V_{CE(SAT)}$ enables high efficiencies
- Smooth Switching waveforms reduce EMI
- Better thermal management
- Minimal gate spike under high dv/dt

Applications

- Welding Machines
- Solar Inverters
- Uninterruptible Power Supplies

Product Summary

V_{CE}	600V
I_C ($T_C=100^\circ\text{C}$)	75A
$V_{CE(sat)}$ ($T_J=25^\circ\text{C}$)	1.72V



Orderable Part Number	Package Type	Form	Minimum Order Quantity
AOK75B60D1	TO247	Tube	240

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

Parameter	Symbol	AOK75B60D1	Units
Collector-Emitter Voltage	V_{CE}	600	V
Gate-Emitter Voltage	V_{GE}	± 20	V
Continuous Collector Current	I_C	$T_C=25^\circ\text{C}$	150
		$T_C=100^\circ\text{C}$	75
Pulsed Collector Current, Limited by T_{Jmax}	I_{CM}	290	A
Turn off SOA, $V_{CE} \leq 600\text{V}$, Limited by T_{Jmax}	I_{LM}	290	A
Continuous Diode Forward Current	I_F	$T_C=25^\circ\text{C}$	75
		$T_C=100^\circ\text{C}$	37.5
Diode Pulsed Current, Limited by T_{Jmax}	I_{FM}	290	A
Short circuit withstanding time ¹⁾ $V_{GE}=15\text{V}$, $V_{CE} \leq 400\text{V}$, $T_J \leq 175^\circ\text{C}$	t_{SC}	10	μs
Power Dissipation	P_D	$T_C=25^\circ\text{C}$	600
		$T_C=100^\circ\text{C}$	300
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	AOK75B60D1	Units
Maximum Junction-to-Ambient	$R_{\theta JA}$	40	$^\circ\text{C/W}$
Maximum IGBT Junction-to-Case	$R_{\theta JC}$	0.25	$^\circ\text{C/W}$
Maximum Diode Junction-to-Case	$R_{\theta JC}$	0.95	$^\circ\text{C/W}$

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

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	600	-	-	V	
V _{CE(sat)}	Collector-Emitter Saturation Voltage	V _{GE} =15V, I _C =75A	T _J =25°C	-	1.72	2.1	V
			T _J =125°C	-	2	-	
			T _J =175°C	-	2.3	-	
V _F	Diode Forward Voltage	V _{GE} =0V, I _F =37.5A	T _J =25°C	-	1.44	2	V
			T _J =125°C	-	1.43	-	
			T _J =175°C	-	1.37	-	
V _{GE(th)}	Gate-Emitter Threshold Voltage	V _{CE} =5V, I _C =1mA	-	5.35	-	V	
I _{CES}	Zero Gate Voltage Collector Current	V _{CE} =600V, V _{GE} =0V	T _J =25°C	-	-	10	μA
			T _J =125°C	-	-	1250	
			T _J =175°C	-	-	15000	
I _{GES}	Gate-Emitter leakage current	V _{CE} =0V, V _{GE} =±20V	-	-	±100	nA	
g _{FS}	Forward Transconductance	V _{CE} =20V, I _C =75A	-	36	-	S	
DYNAMIC PARAMETERS							
C _{iss}	Input Capacitance	V _{GE} =0V, V _{CE} =25V, f=1MHz	-	4750	-	pF	
C _{oes}	Output Capacitance		-	470	-	pF	
C _{res}	Reverse Transfer Capacitance		-	16	-	pF	
Q _g	Total Gate Charge	V _{GE} =15V, V _{CE} =480V, I _C =75A	-	118	-	nC	
Q _{ge}	Gate to Emitter Charge		-	48	-	nC	
Q _{gc}	Gate to Collector Charge		-	36	-	nC	
I _{C(SC)}	Short circuit collector current, Max. 1000 short circuits, Delay between short circuits ≥ 1.0s	V _{GE} =15V, V _{CE} =400V, R _G =25Ω	-	290	-	A	
R _g	Gate resistance	V _{GE} =0V, V _{CE} =0V, f=1MHz	-	1.5	-	Ω	
SWITCHING PARAMETERS, (Load Inductive, T_J=25°C)							
t _{D(on)}	Turn-On DelayTime	T _J =25°C V _{GE} =15V, V _{CE} =400V, I _C =75A, R _G =4Ω, Parasitic Inductance=150nH	-	33	-	ns	
t _r	Turn-On Rise Time		-	69	-	ns	
t _{D(off)}	Turn-Off Delay Time		-	84	-	ns	
t _f	Turn-Off Fall Time		-	18.4	-	ns	
E _{on}	Turn-On Energy		-	3.7	-	mJ	
E _{off}	Turn-Off Energy		-	1.3	-	mJ	
E _{total}	Total Switching Energy		-	5	-	mJ	
t _{rr}	Diode Reverse Recovery Time	T _J =25°C I _F =37.5A, di/dt=200A/μs, V _{CE} =400V	-	147	-	ns	
Q _{rr}	Diode Reverse Recovery Charge		-	0.9	-	μC	
I _{rm}	Diode Peak Reverse Recovery Current		-	10	-	A	
SWITCHING PARAMETERS, (Load Inductive, T_J=175°C)							
t _{D(on)}	Turn-On DelayTime	T _J =175°C V _{GE} =15V, V _{CE} =400V, I _C =75A, R _G =4Ω, Parasitic Inductance=150nH	-	37	-	ns	
t _r	Turn-On Rise Time		-	67	-	ns	
t _{D(off)}	Turn-Off Delay Time		-	135	-	ns	
t _f	Turn-Off Fall Time		-	20	-	ns	
E _{on}	Turn-On Energy		-	3.8	-	mJ	
E _{off}	Turn-Off Energy		-	2	-	mJ	
E _{total}	Total Switching Energy		-	5.8	-	mJ	
t _{rr}	Diode Reverse Recovery Time	T _J =175°C I _F =37.5A, di/dt=200A/μs, V _{CE} =400V	-	220	-	ns	
Q _{rr}	Diode Reverse Recovery Charge		-	1.7	-	μC	
I _{rm}	Diode Peak Reverse Recovery Current		-	13	-	A	

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

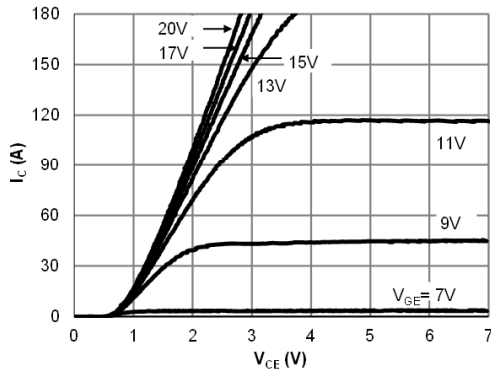


Fig 1: Output Characteristic
($T_j=25^\circ\text{C}$)

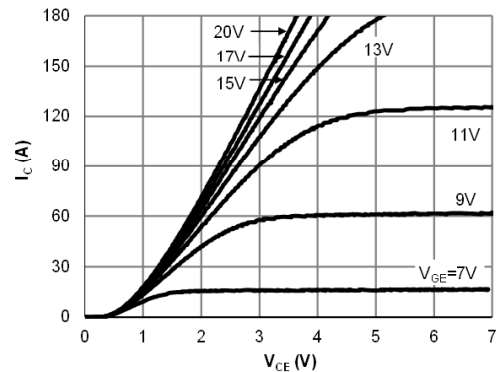


Fig 2: Output Characteristic
($T_j=175^\circ\text{C}$)

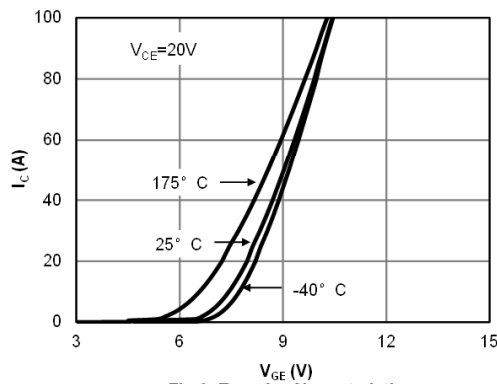


Fig 3: Transfer Characteristic

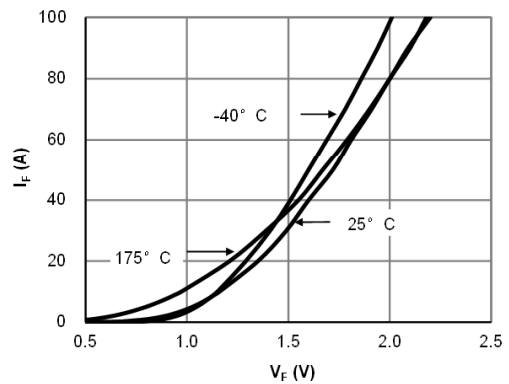


Fig 4: Diode Characteristic

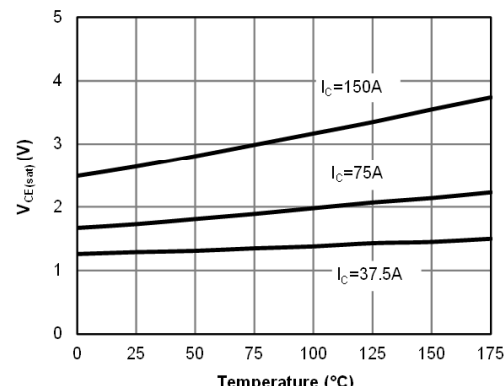


Fig 5: Collector-Emitter Saturation Voltage vs. Junction Temperature

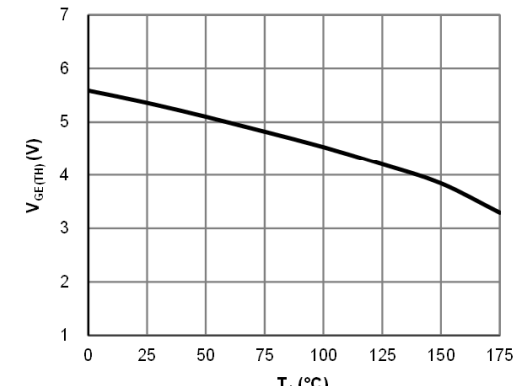


Figure 6: $V_{GE(TH)}$ vs. T_j

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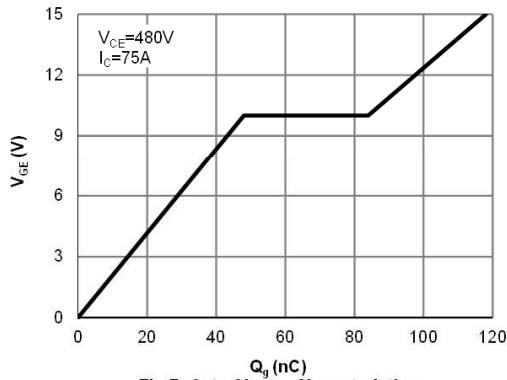


Fig 7: Gate-Charge Characteristics

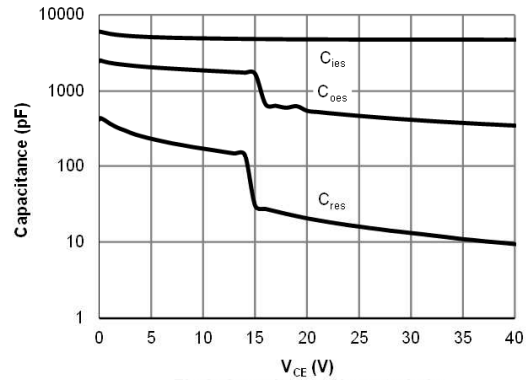


Fig 8: Capacitance Characteristic

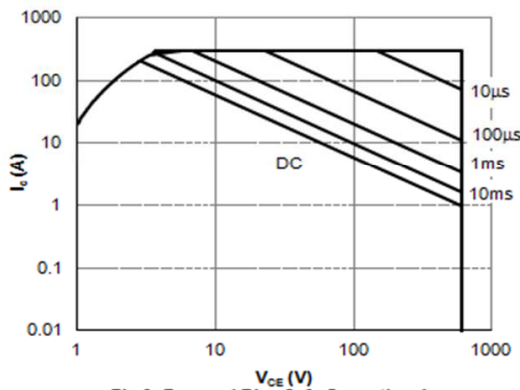


Fig 9: Forward Bias Safe Operating Area
($T_C=25^\circ\text{C}, V_{GE}=15\text{V}$)

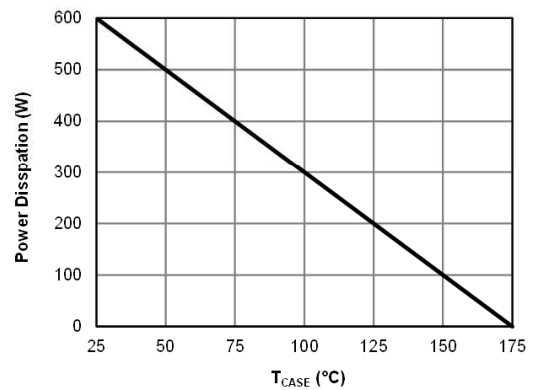


Fig 10: Power Dissipation as a Function of Case

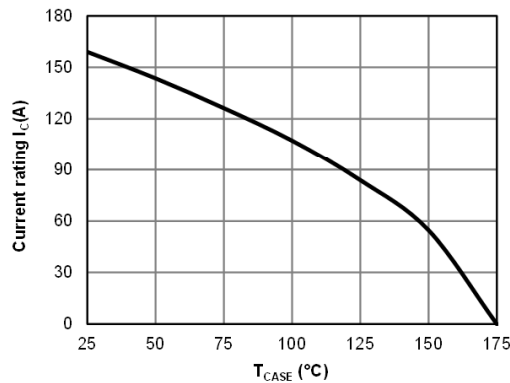


Fig 11: Current De-rating

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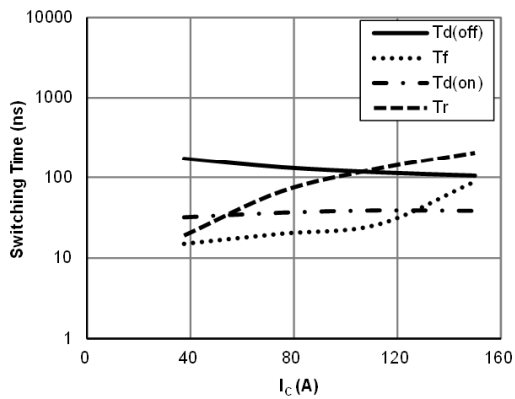


Figure 12: Switching Time vs. I_C
($T_J=175^\circ\text{C}$, $V_{GE}=15\text{V}$, $V_{CE}=400\text{V}$, $R_g=4\Omega$)

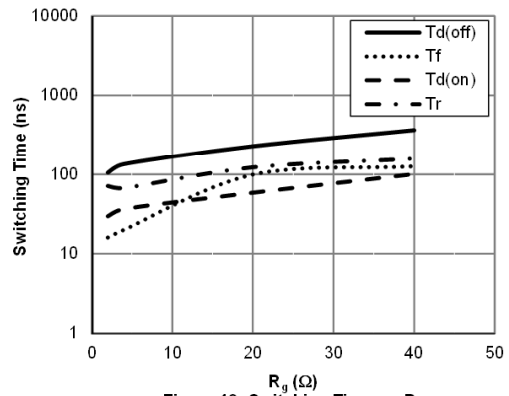


Figure 13: Switching Time vs. R_g
($T_J=175^\circ\text{C}$, $V_{GE}=15\text{V}$, $V_{CE}=400\text{V}$, $I_C=75\text{A}$)

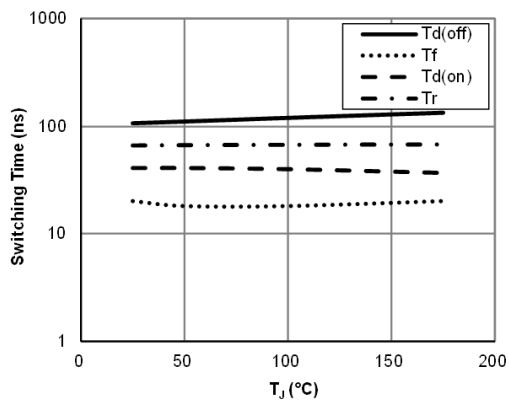


Figure 14: Switching Time vs. T_J
($V_{GE}=15\text{V}$, $V_{CE}=400\text{V}$, $I_C=75\text{A}$, $R_g=4\Omega$)

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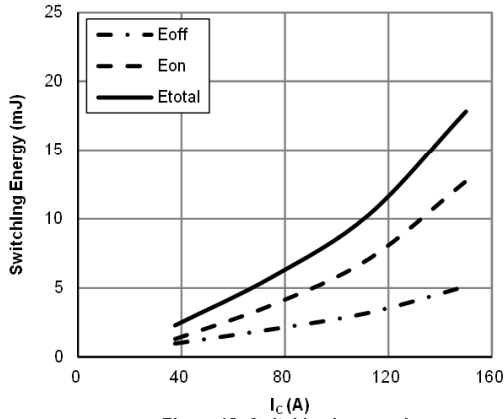


Figure 15: Switching Loss vs. I_C
($T_j=175^\circ\text{C}, V_{GE}=15\text{V}, V_{CE}=400\text{V}, R_g=4\Omega$)

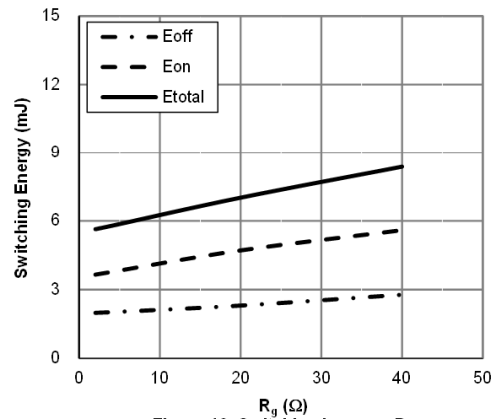


Figure 16: Switching Loss vs. R_g
($T_j=175^\circ\text{C}, V_{GE}=15\text{V}, V_{CE}=400\text{V}, I_C=75\text{A}$)

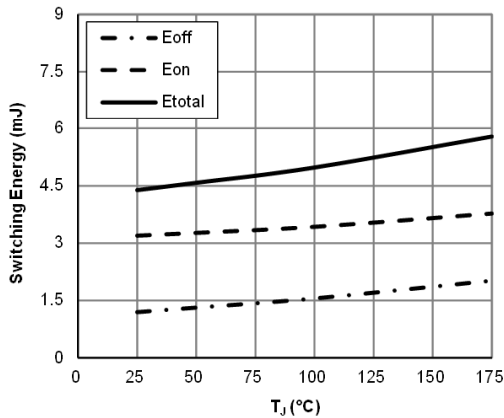


Figure 17: Switching Loss vs. T_j
($V_{GE}=15\text{V}, V_{CE}=400\text{V}, I_C=75\text{A}, R_g=4\Omega$)

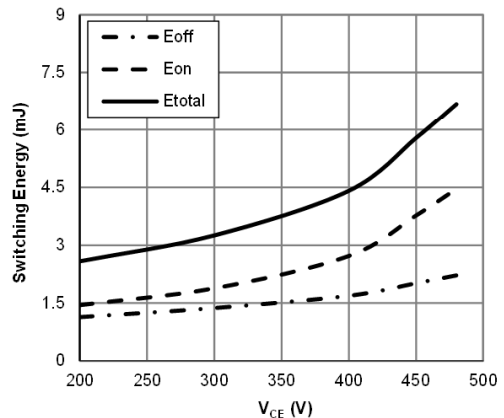


Figure 18: Switching Loss vs. V_{CE}
($T_j=175^\circ\text{C}, V_{GE}=15\text{V}, I_C=75\text{A}, R_g=4\Omega$)

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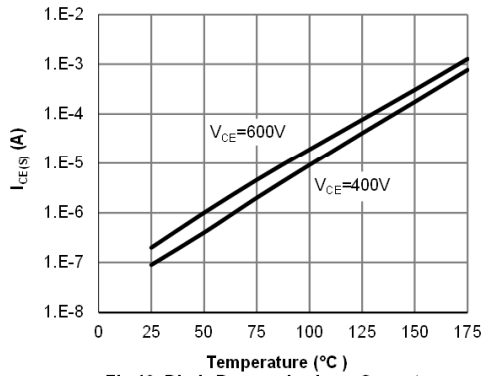


Fig 19: Diode Reverse Leakage Current vs. Junction Temperature

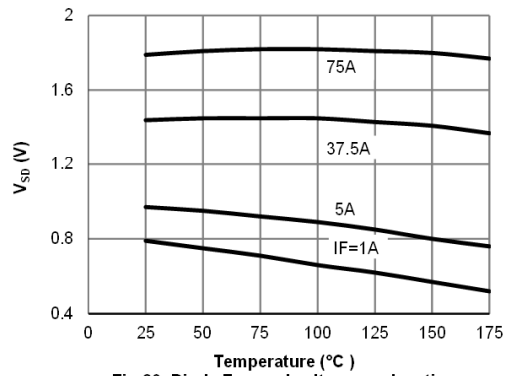


Fig 20: Diode Forward Voltage vs. Junction Temperature

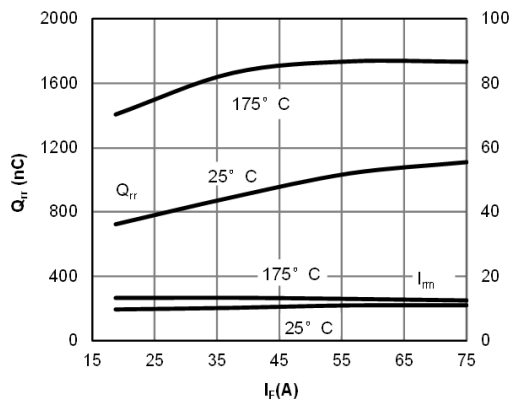


Fig 21: Diode Reverse Recovery Charge and Peak Current vs. Conduction Current
($V_{GE}=15V, V_{CE}=400V, di/dt=200A/\mu s$)

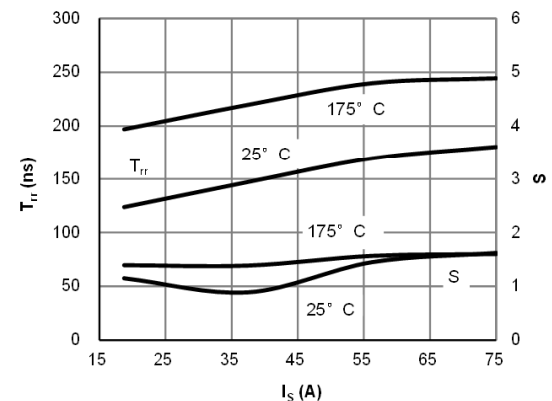


Fig 22: Diode Reverse Recovery Time and Softness Factor vs. Conduction Current
($V_{GE}=15V, V_{CE}=400V, di/dt=200A/\mu s$)

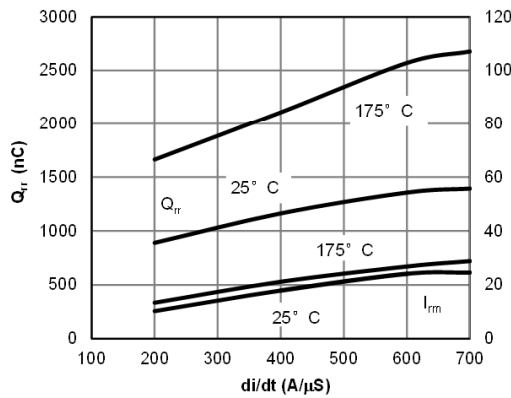


Fig 23: Diode Reverse Recovery Charge and Peak Current vs. di/dt
($V_{GE}=15V, V_{CE}=400V, I_F=37.5A$)

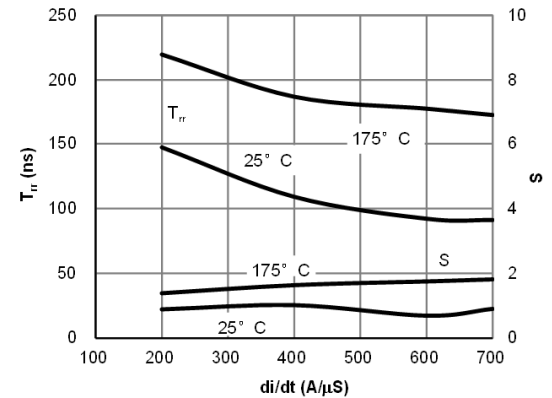


Fig 24: Diode Reverse Recovery Time and Softness Factor vs. di/dt
($V_{GE}=15V, V_{CE}=400V, I_F=37.5A$)

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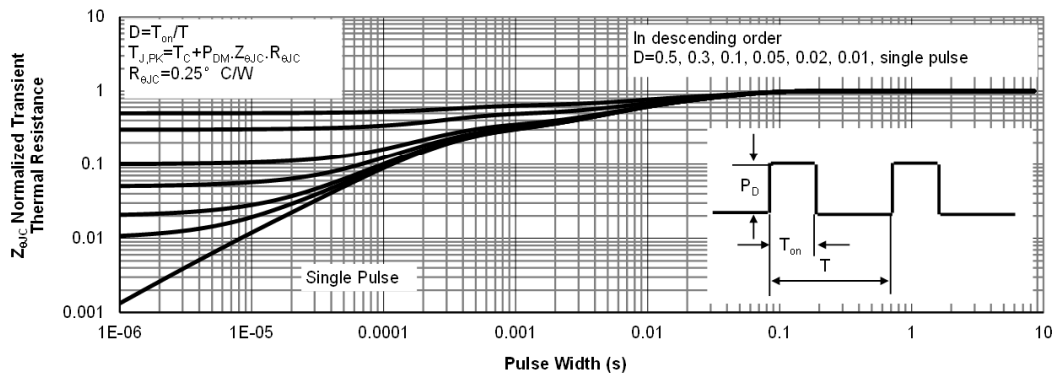


Figure 25: Normalized Maximum Transient Thermal Impedance for IGBT

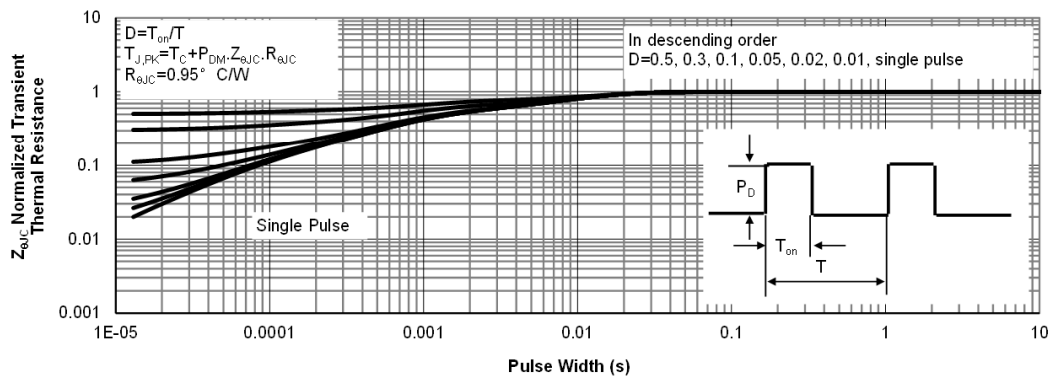


Figure 26: Normalized Maximum Transient Thermal Impedance for Diode

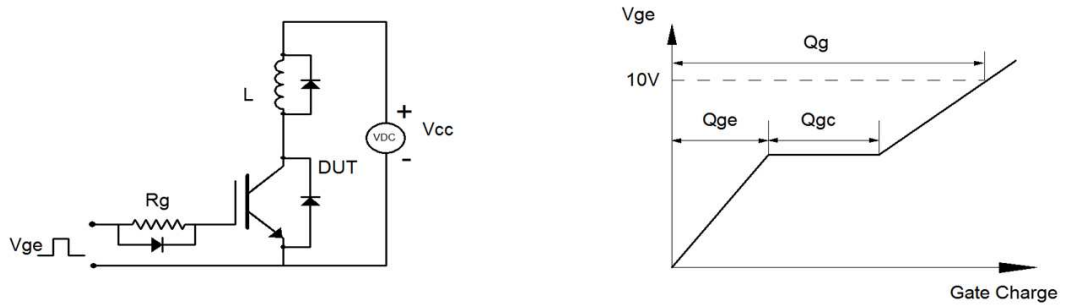


Figure A: Gate Charge Test Circuit & Waveforms

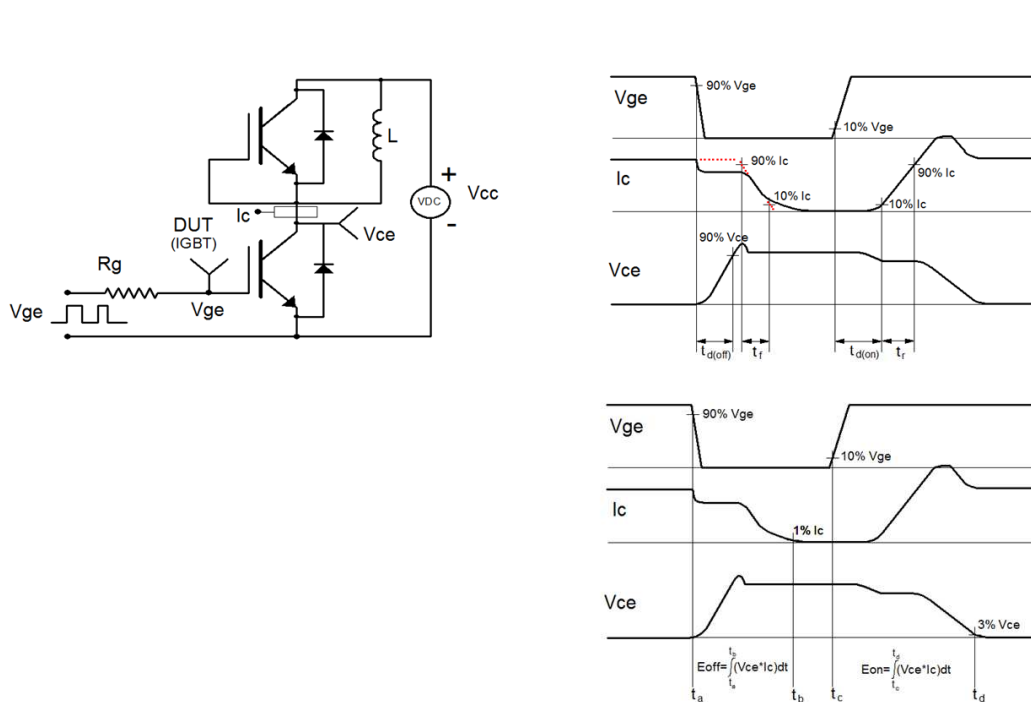


Figure B: Inductive Switching Test Circuit & Waveforms

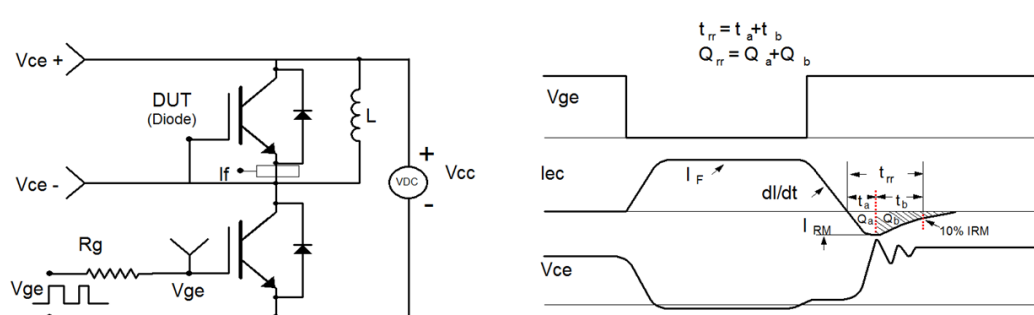


Figure C: Diode Recovery Test Circuit & Waveforms