Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

With the principle of “Quality Parts,Customers Priority,Honest Operation,and Considerate Service”,our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

We are looking forward to setting up business relationship with you and hope to provide you with the best service and solution. Let us make a better world for our industry!

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ALPHA & OMEGA SEMICONDUCTOR

AOK20B135E1

1350V, 20A Alpha IGBT™ with Diode

General Description

- Latest AlphaIGBT (α 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

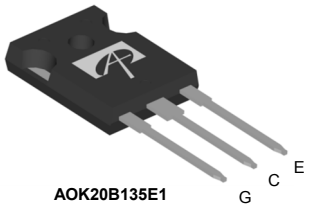
- Induction Cooking
- Rice Cookers
- Microwave Ovens
- Other soft switching applications

Product Summary

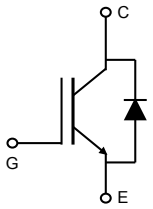
V_{CE}	1350V
I_C (T_C=100°C)	20A
$V_{CE(sat)}$ (T_C=25°C)	1.8V

RoHS Compliant

Top View
TO-247



AOK20B135E1



Orderable Part Number	Package Type	Form	Minimum Order Quantity
AOK20B135E1	TO247	Tube	240

Absolute Maximum Ratings T_A=25°C unless otherwise noted

Parameter		Symbol	AOK20B135E1	Units
Collector-Emitter Voltage		V_{CE}	1350	V
Gate-Emitter Voltage		V_{GE}	±30	V
Continuous Collector Current	T_C=25°C	I_C	40	A
	T_C=100°C		20	
Pulsed Collector Current, Limited by T_{Jmax}		I_{Cpulse}	80	A
Non repetitive peak collector current[A]		I_{CSM}	200	A
Turn off SOA, $V_{CE} \leqslant$ 600V, Limited by T_{Jmax}		I_{LM}	80	A
Continuous Diode Forward Current	T_C=25°C	I_F	40	A
	T_C=100°C		20	
Diode Pulsed Current, Limited by T_{Jmax}		I_{Fpulse}	80	A
Power Dissipation	T_C=25°C	P_D	250	W
	T_C=100°C		125	
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 175	°C
Maximum lead temperature for soldering purpose, 1/8" from case for 5 seconds		T_L	300	°C

Thermal Characteristics

Parameter	Symbol	AOK20B135E1	Units
Maximum Junction-to-Ambient	$R_{\theta JA}$	40	°C/W
Maximum IGBT Junction-to-Case	$R_{\theta JC}$	0.6	°C/W
Maximum Diode Junction-to-Case	$R_{\theta JC}$	1.6	°C/W

Note A: Capacitor charging saturation current limited by T_{jmax}<175°C and t_p<3µs

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=20A	T_J=25°C	-	1.8	2.3	V
			T_J=125°C	-	2.2	-	
			T_J=175°C	-	2.5	-	
V_F	Diode Forward Voltage	V_{GE}=0V, I_C=20A	T_J=25°C	-	1.6	2	V
			T_J=125°C	-	1.68		
			T_J=175°C	-	1.7	-	
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	V_{CE}=5V, I_C=1mA		4.5	5.15	5.8	V
I_{CES}	Zero Gate Voltage Collector Current	V_{CE}=1350V, V_{GE}=0V	T_J=25°C	-	-	10	µA
			T_J=125°C	-	-	500	
			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=20A		-	21	-	S
DYNAMIC PARAMETERS							
C_{ies}	Input Capacitance	V_{GE}=0V, V_{CE}=25V, f=1MHz		-	1455	-	pF
C_{oes}	Output Capacitance			-	86	-	pF
C_{res}	Reverse Transfer Capacitance			-	27	-	pF
Q_g	Total Gate Charge	V_{GE}=15V, V_{CE}=1080V, I_C=20A		-	58	-	nC
Q_{ge}	Gate to Emitter Charge			-	13	-	nC
Q_{gc}	Gate to Collector Charge			-	28	-	nC
R_g	Gate resistance	V_{GE}=0V, V_{CE}=0V, f=1MHz		-	2.1	-	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=20A, R_G=15Ω, Parasitic Inductance=150nH		-	134	-	ns
t_f	Turn-Off Fall Time			-	112	-	ns
E_{off}	Turn-Off Energy			-	0.8	-	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=20A, R_G=15Ω, Parasitic Inductance=150nH		-	157	-	ns
t_f	Turn-Off Fall Time			-	154	-	ns
E_{off}	Turn-Off Energy			-	1.26	-	mJ

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

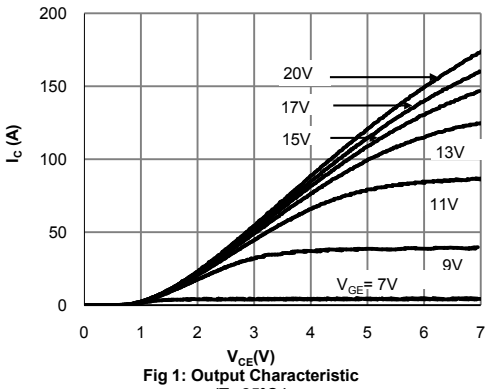


Fig 1: Output Characteristic (T_j=25°C)

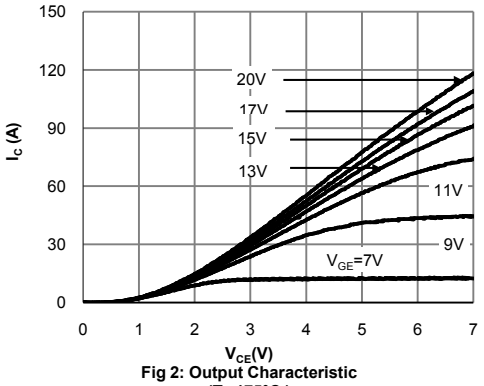


Fig 2: Output Characteristic (T_j=175°C)

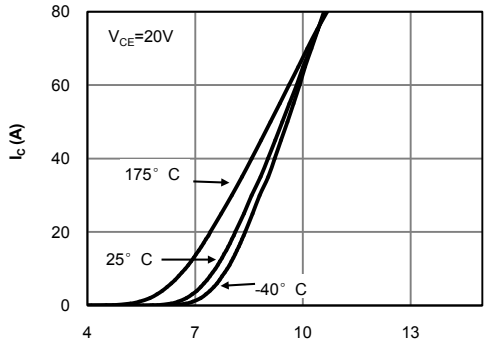


Fig 3: Transfer Characteristic

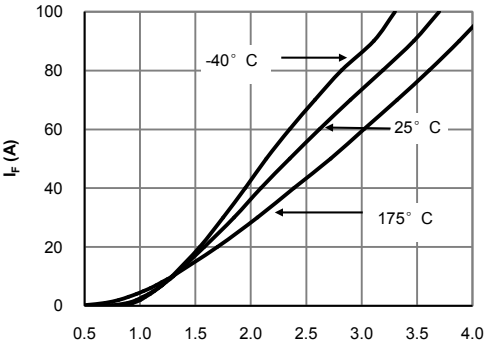


Fig 4: Diode Characteristic

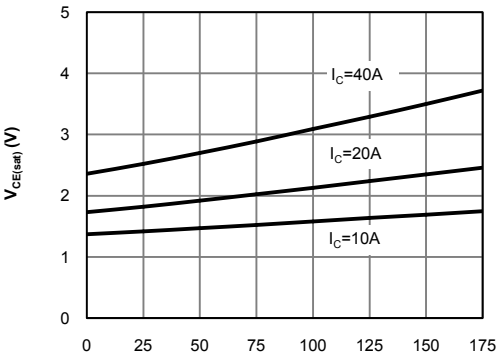


Fig 5: Collector-Emitter Saturation Voltage vs. Junction Temperature

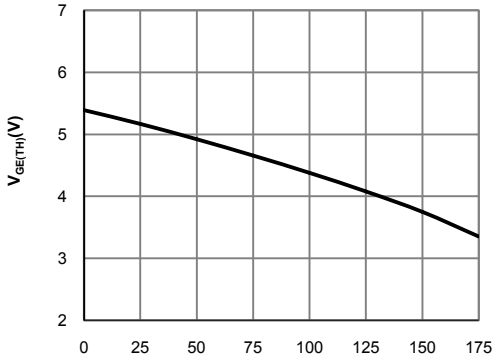


Figure 6: $V_{GE(TH)}$ vs. T_j

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

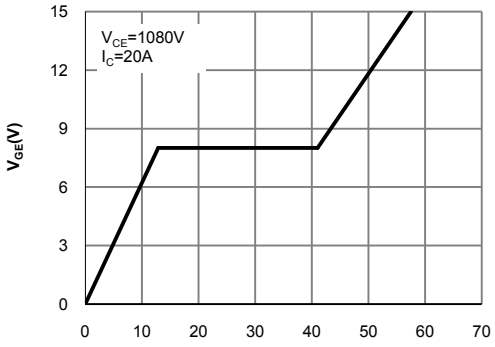


Fig 7: Gate-Charge Characteristics

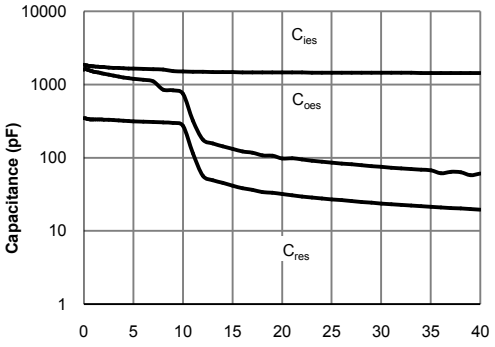


Fig 8: Capacitance Characteristic

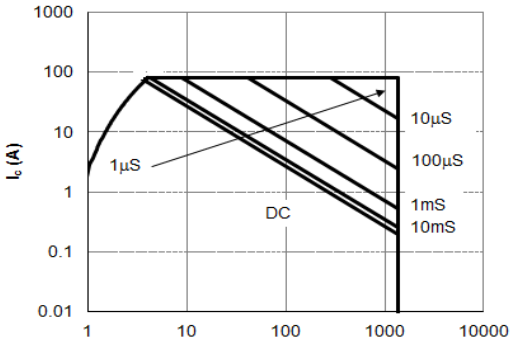


Fig 9: Forward Bias Safe Operating Area
(T_C=25C,V_{GE}=15V)

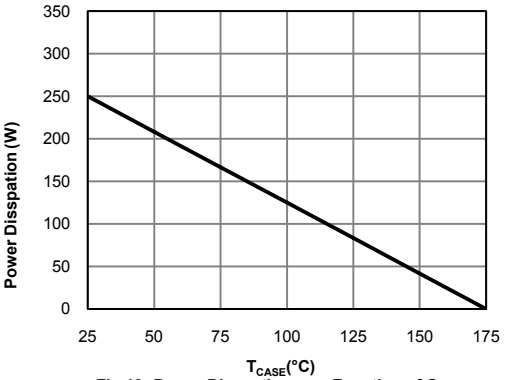


Fig 10: Power Disspation as a Function of Case

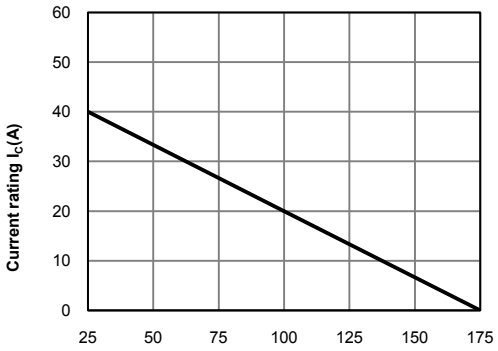


Fig 11: Current De-rating

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

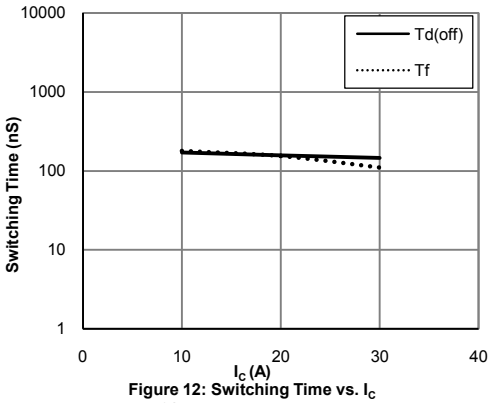


Figure 12: Switching Time vs. I_C
(T_j=175°C,V_{GE}=15V,V_{CE}=600V,R_g=15Ω)

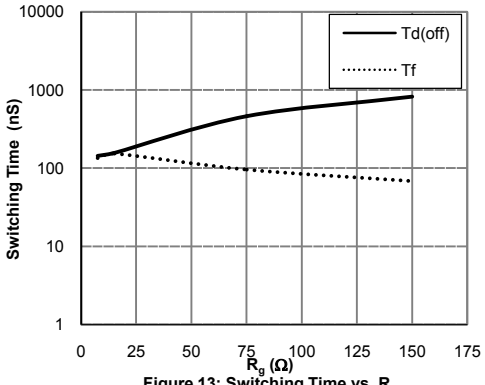


Figure 13: Switching Time vs. R_g
(T_j=175°C,V_{GE}=15V,V_{CE}=600V,I_C=20A)

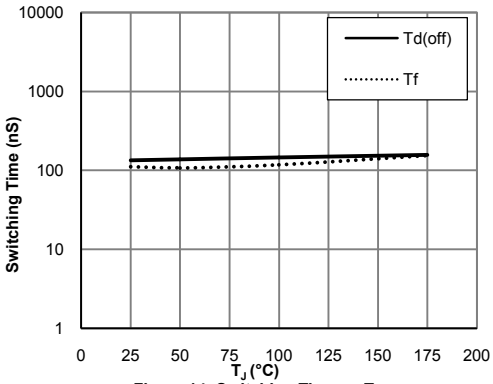


Figure 14: Switching Time vs.T_j
(V_{GE}=15V,V_{CE}=600V,I_C=20A,R_g=15Ω)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

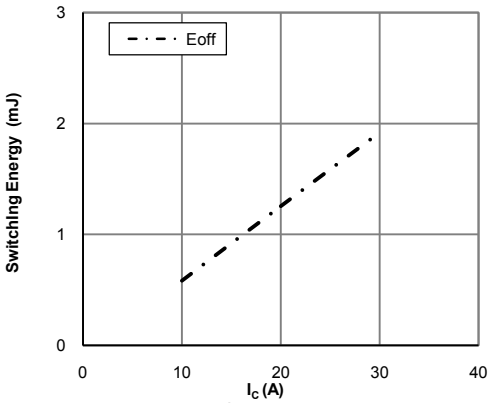


Figure 15: Switching Loss vs. I_C
(T_j=175°C,V_{GE}=15V,V_{CE}=600V,R_g=15Ω)

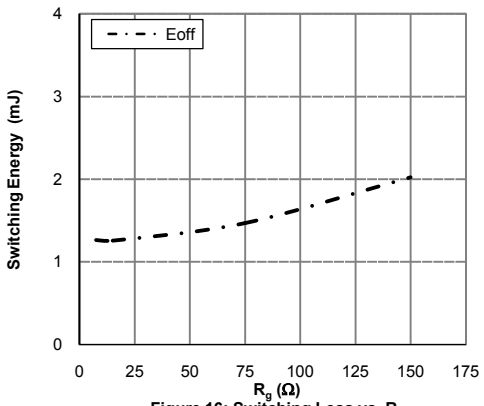


Figure 16: Switching Loss vs. R_g
(T_j=175°C,V_{GE}=15V,V_{CE}=600V,I_C=20A)

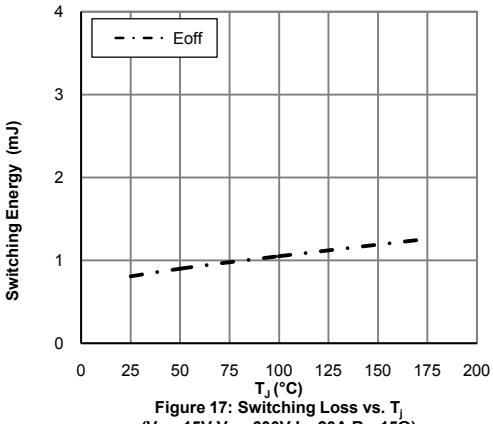


Figure 17: Switching Loss vs. T_j
(V_{GE}=15V,V_{CE}=600V,I_C=20A,R_g=15Ω)

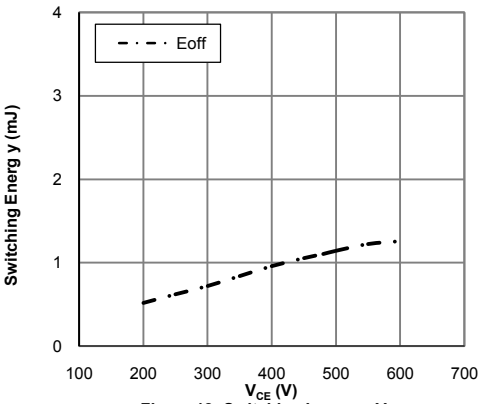


Figure 18: Switching Loss vs. V_{CE}
(T_j=175°C,V_{GE}=15V,I_C=20A,R_g=15Ω)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

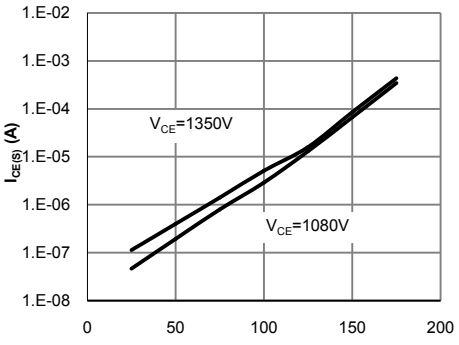


Fig 19: Diode Reverse Leakage Current vs. Junction Temperature

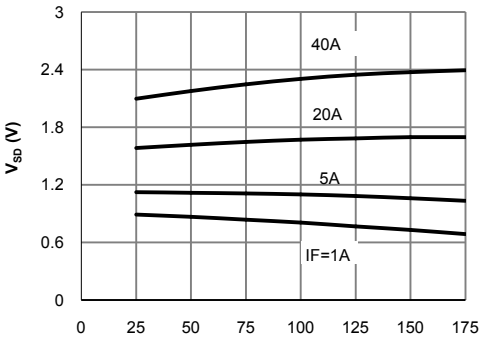


Fig 20: Diode Forward voltage vs. Junction Temperature

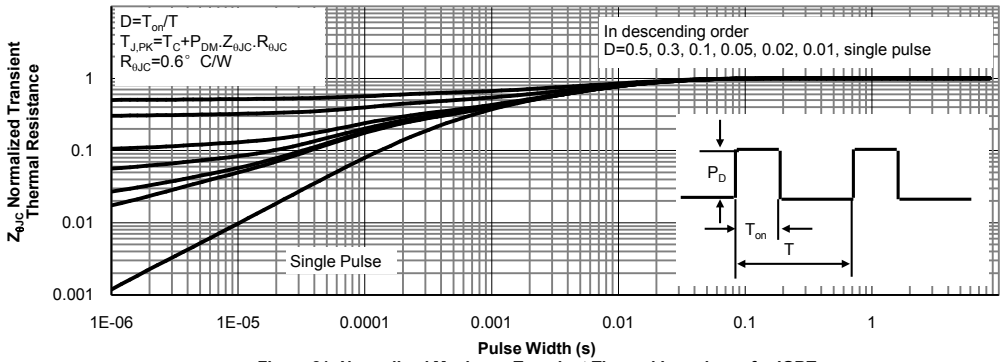


Figure 21: Normalized Maximum Transient Thermal Impedance for IGBT

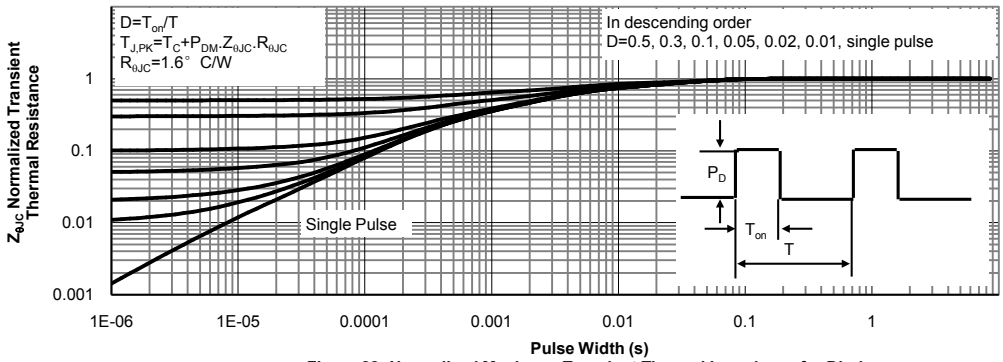
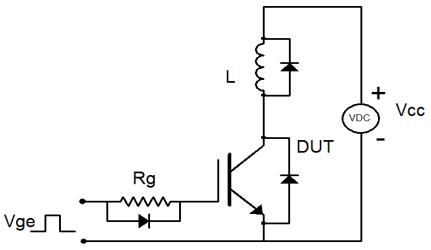
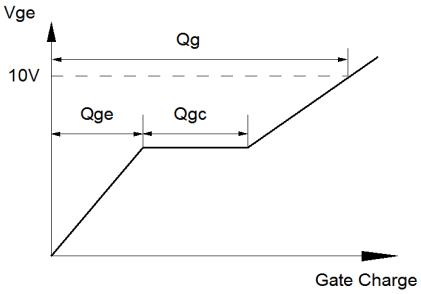


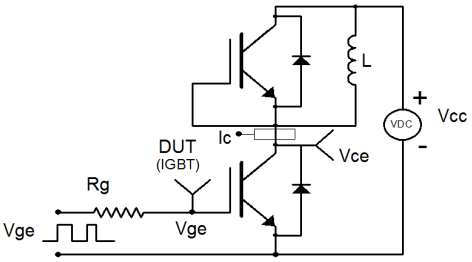
Figure 22: Normalized Maximum Transient Thermal Impedance for Diode

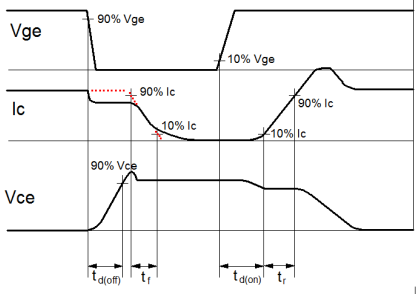
Gate Charge Test Circuit & Waveform

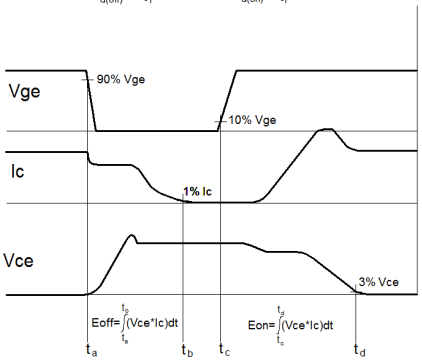




Inductive Switching Test Circuit & Waveforms







Diode Recovery Test Circuit & Waveforms