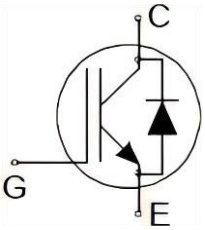
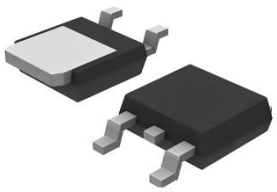
Trench Field-stop IGBT Discrete

Parameter	Value	Unit
V_{CE}	650	V
$I_{C@TC=100°C}$	6	A
$V_{CE(SAT)}$	1.63	V





FEATURES

- High efficiency for motor control
- Positive temperature coefficient
- Fast Switching
- Positive VCE(sat) temperature coefficient
- Reliable and Rugged

APPLICATIONS

- Static var generator
- Inverter for motor drive
- High Power Converters
- Home appliances
- Fan, Pumps, Vacuum cleaner

Absolute Maximum Ratings of IGBT

Symbol	Parameter	Values	Units
V_{CES}	Collector-Emitter Voltage	650	V
I_C	Collector Current @TC=25°C	12	A
	Collector Current @TC=100°C	6	A
I_{CM}	Pulsed Collector Current, tp limited by TJmax	18	A
I_F	Diode Continuous Forward Current @TC=25°C	12	A
	Diode Continuous Forward Current @TC=100°C	6	A
I_{FM}	Diode Maximum Forward Current, limited by TJmax	18	A
V_{GES}	Gate-Emitter Voltage	±30	V
t_{SC}	Short circuit withstand time VGE=15V, VCC≤400V, allowed number of short circuits<1000,times between short circuits≥1.0s,TJ≤175°C	15	μs
P_D	Power Dissipation @TC=25°C	83	W
T_{Jmax}, T_{stg}	Operating Junction and Storage Temperature Range	–55 to 175	℃
T_L	Maximum Temperature for Soldering	260	℃

Thermal Characteristics

Symbol	Parameter	Values	Units
$R_{\theta JC}$	Junction-to-Case (IGBT)	1.80	℃/W
$R_{\theta JC}$	Junction-to-Case (Diode)	2.20	℃/W
$R_{\theta JA}$	Junction-to-Ambient	70	℃/W

Electrical Characteristics of IGBT

Symbol	Parameter	Test Conditions	Values			Units
			Min.	Typ.	Max.	
BV_{CES}	Collector-Emitter Breakdown Voltage	V_{GE}=0V I_C=250μA	650	--	--	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	V_{GE}=15V, I_C=6A T_J=25℃ T_J=125℃ T_J=175℃	-- -- --	1.63 1.95 2.10	1.95	V
$V_{GE(TH)}$	Gate Threshold Voltage	V_{CE}=V_{GE},I_C=1mA	4.5	5.5	6.5	V
V_F	Diode Forward Voltage	I=6A T_J=25℃ T_J=125℃ T_J=175℃	-- -- --	1.90 1.63 1.43	2.25 -- --	V
I_{CES}	Collector-Emitter Leakage Current	V_{CE}=650V V_{GE}=0V	--	--	10	μA
$I_{GES(F)}$	Gate-Emitter Forward Leakage Current	V_{GE}=+20V	--	--	100	nA
$I_{GES(R)}$	Gate-Emitter Reverse Leakage Current	V_{GE}=-20V	--	--	-100	nA
Pulse width tp≤300μs, δ≤2%						

Dynamic Characteristics

Symbol	Parameter	Test Conditions	Values			Units
			Min.	Typ.	Max.	
C_{ies}	Input Capacitance	V_{GE}=0V V_{CE}=25V f=1.0MHz	--	246	--	pF
C_{oes}	Output Capacitance		--	33	--	
C_{res}	Reverse Transfer Capacitance		--	3.0	--	
Q_g	Gate charge	V_{cc}=520V I_{cc}=6A V_{GE}=15V	--	9.0	--	nC
Q_{ge}	Gate-emitter charge		--	3.0	--	
Q_{gc}	Gate-collector charge		--	3.2	--	
$I_{C(SC)}$	Short circuit collector current Max.1000 short circuits,times between short circuits≥1.0s	V_{GE}=15V,V_{CC}≤400V t_{sc}≤15μs,T_J≤175℃		32		A

IGBT Switching Characteristics

Symbol	Parameter	Test Conditions		Values			Units
				Min.	Typ.	Max.	
td(on)	Turn-on Delay Time	Ic=6A Vcc=400V Vge=15V Rg=5Ω Inductive Load	Tj= 25℃	--	9	--	ns
			Tj= 175℃		10		
tr	Rise Time		Tj= 25℃	--	12	--	
			Tj= 175℃		33		
td(off)	Turn-Off Delay Time		Tj= 25℃	--	39	--	
			Tj= 175℃		57		
tf	Fall Time		Tj= 25℃	--	135	--	
			Tj= 175℃		180		
Eon	Turn-On Switching Loss		Tj= 25℃	--	0.08	--	mJ
			Tj= 175℃		0.11		
Eoff	Turn-Off Switching Loss		Tj= 25℃	--	0.16	--	
			Tj= 175℃		0.23		
Ets	Total Switching Loss		Tj= 25℃	--	0.24	--	
			Tj= 175℃		0.34		

Diode Characteristics

Symbol	Parameter	Test Conditions		Values			Units
				Min.	Typ.	Max.	
Trr	Reverse Recovery Time	I=6A Vcc=400V di/dt=200A/μs	Tj= 25℃	--	91	--	ns
			Tj= 175℃		122		
Qrr	Reverse Recovery Charge		Tj= 25℃	--	0.25	--	μC
			Tj= 175℃		0.44		
Irm	Reverse Recovery Current		Tj= 25℃	--	4.9	--	A
			Tj= 175℃		6.5		

Characteristics diagrams

Figure 1: Power Dissipation

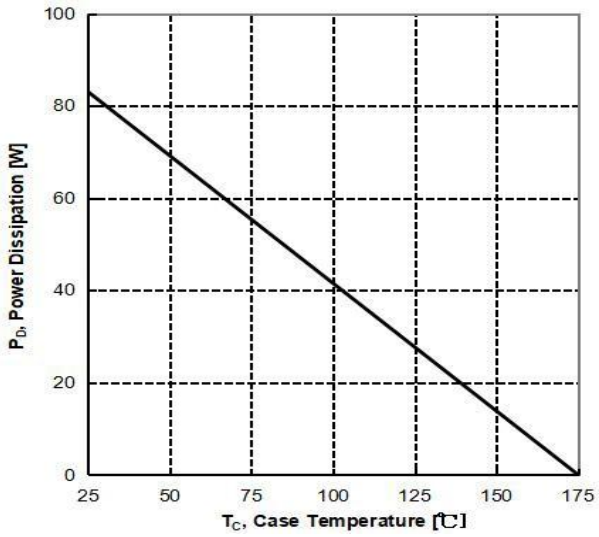


Figure 2: Collector Current vs. Case Temperature

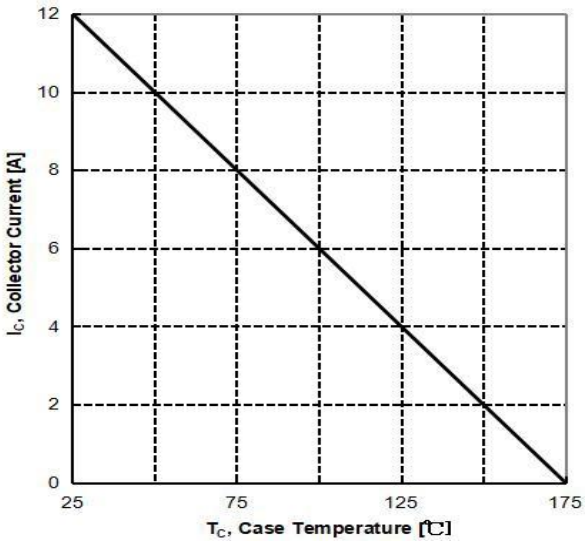


Figure 3: Safe Operation Area

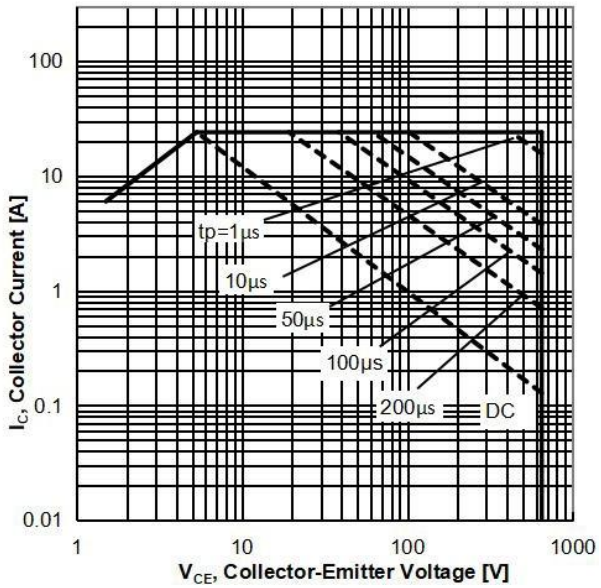


Figure 4: Typical Transfer Characteristics

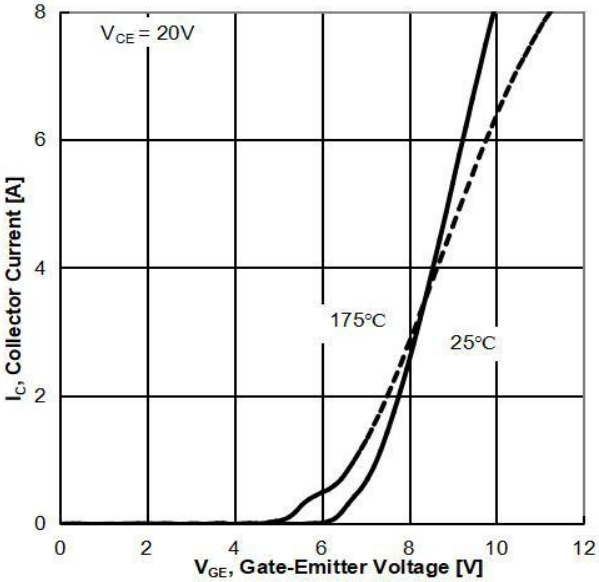


Figure 5: Typical Output Characteristics

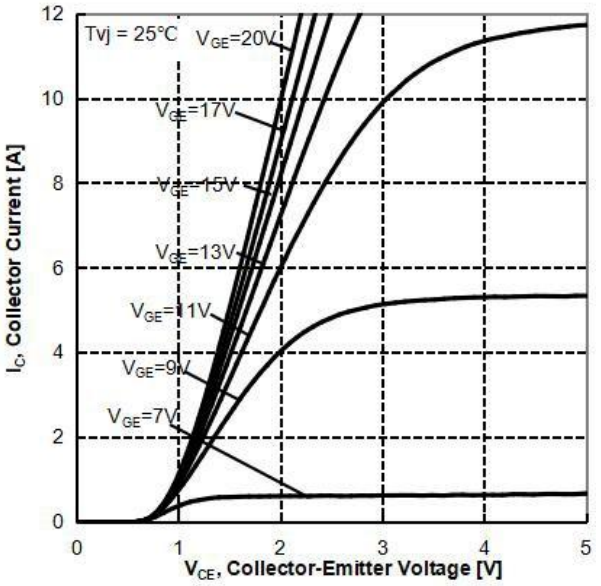


Figure 6: Typical Output Characteristics

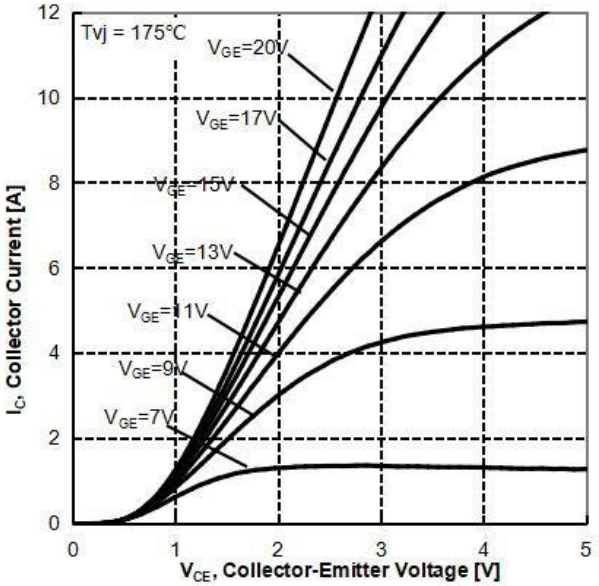


Figure 7: Typical Collector-Emitter Saturation Voltage vs. Junction Temperature

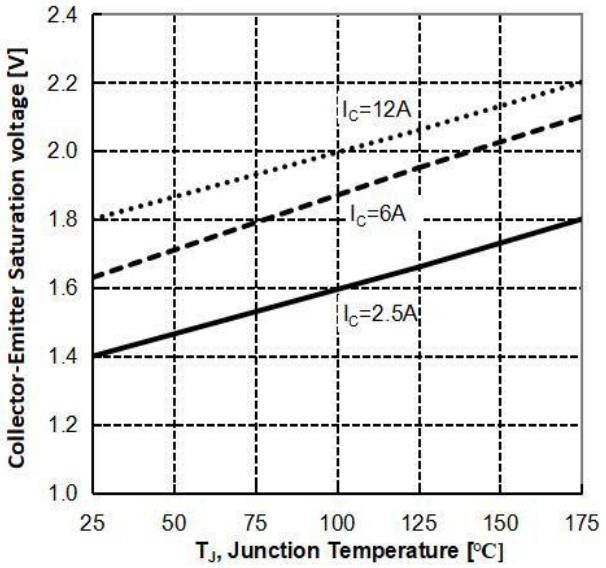


Figure 8: Typical Gate-Emitter Threshold Voltage vs. Junction Temperature

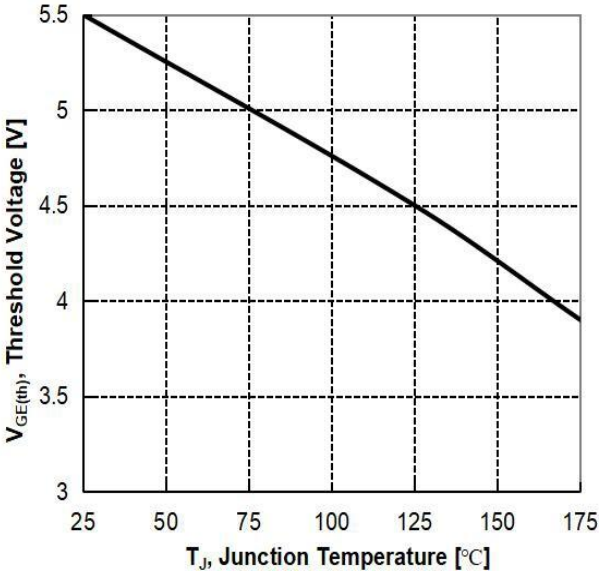


Figure 9: Typical Switching Times vs. Gate Resistor (TJ=25℃, VCE=400V, VGE=15V, IC=6A)

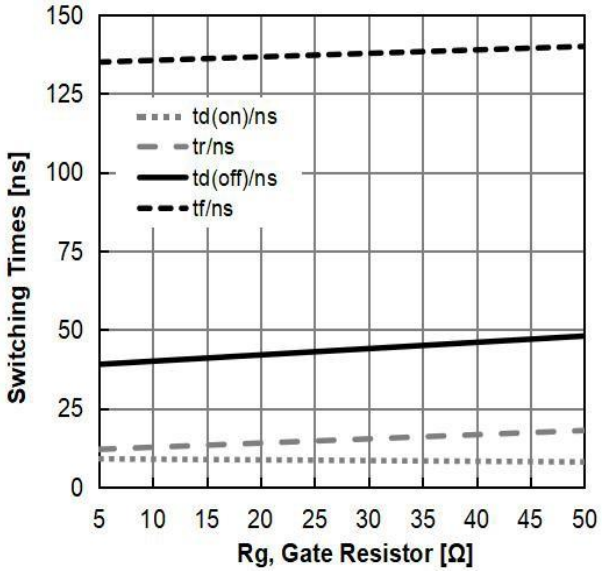


Figure 10: Typical Switching Energy vs. Gate Resistor (TJ=25℃, VCE=400V, VGE=15V, IC=6A)

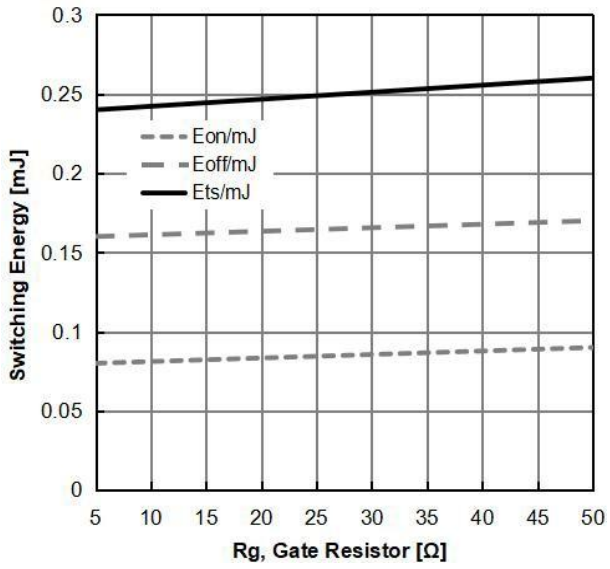


Figure 11: Typical Switching Times vs. Junction Temperature (VCE=400V, VGE=15V, C=6A,Rg=5Ω)

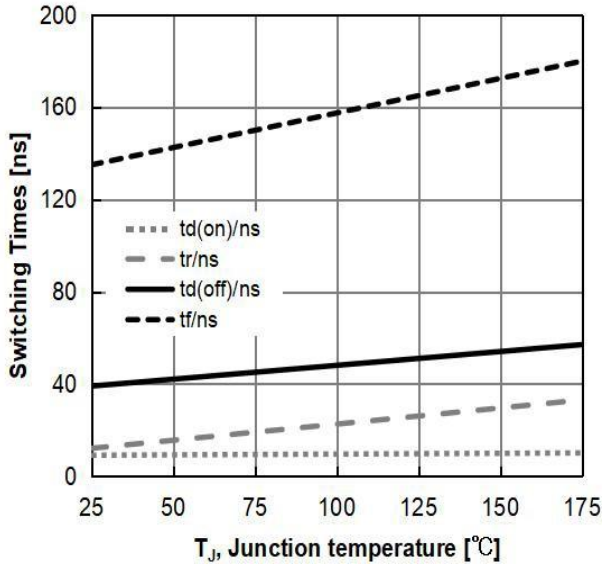


Figure 12: Typical Switching Energy vs. Junction Temperature (VCE=400V, VGE=15V, IC=6A,Rg=5Ω)

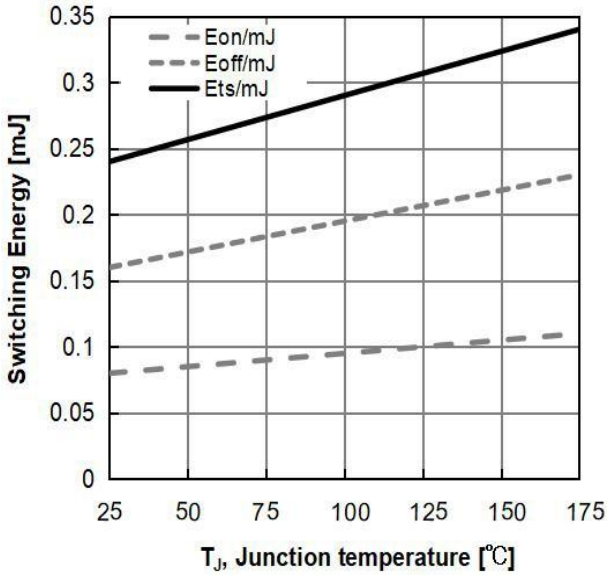


Figure 15: Typical Switching Times vs. VCE (TJ=25℃, VGE=15V, IC=6A,Rg=5Ω)

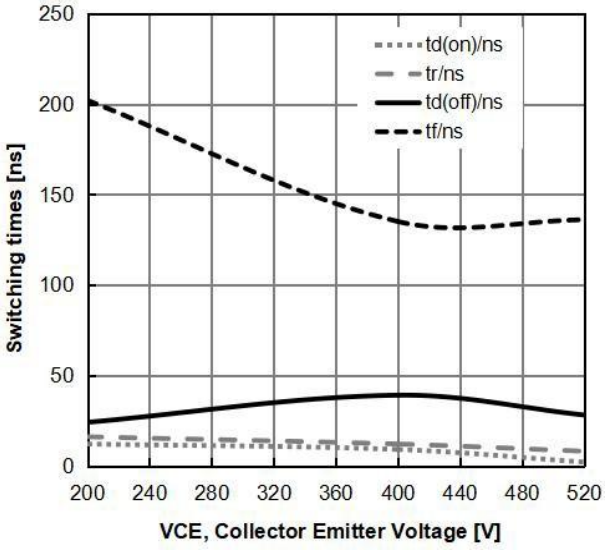


Figure 16: Typical Switching Energy vs. VCE (TJ=25℃, VGE=15V, IC=6A,,Rg=5Ω)

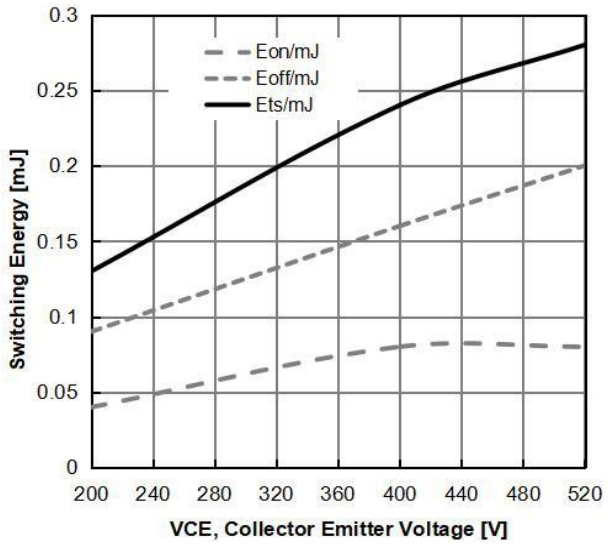


Figure 17: Typical Capacitance vs. Collector-Emitter Voltage

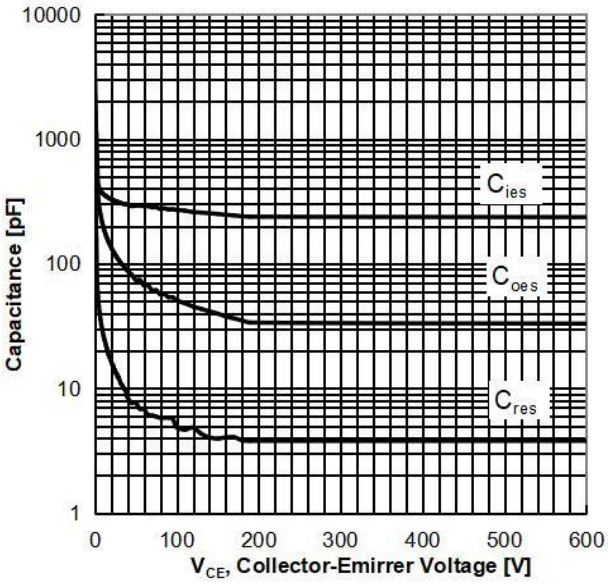


Figure 18: Typical Gate Charge

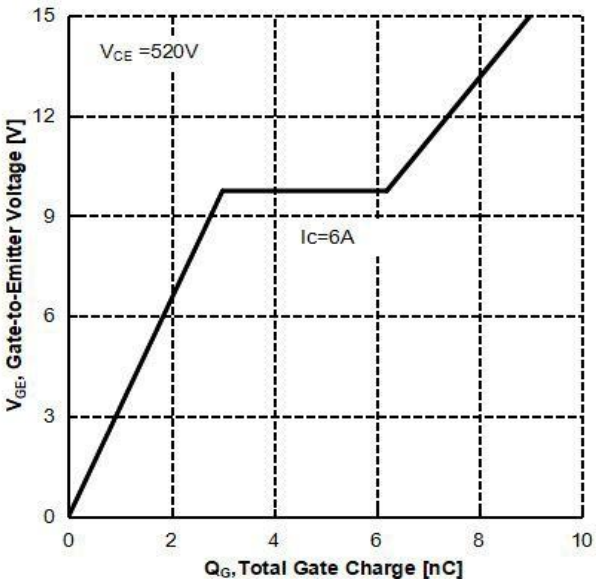


Figure 19: IGBT Transient Thermal Impedance vs. Pulse Width

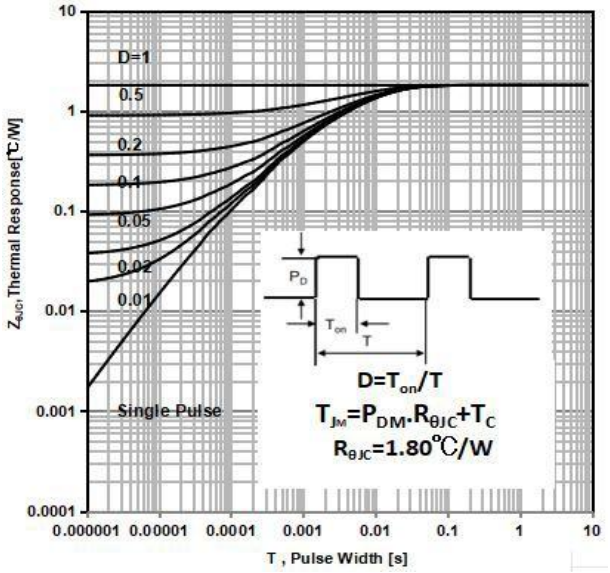


Figure 20: Diode Transient Thermal Impedance vs. Pulse Width

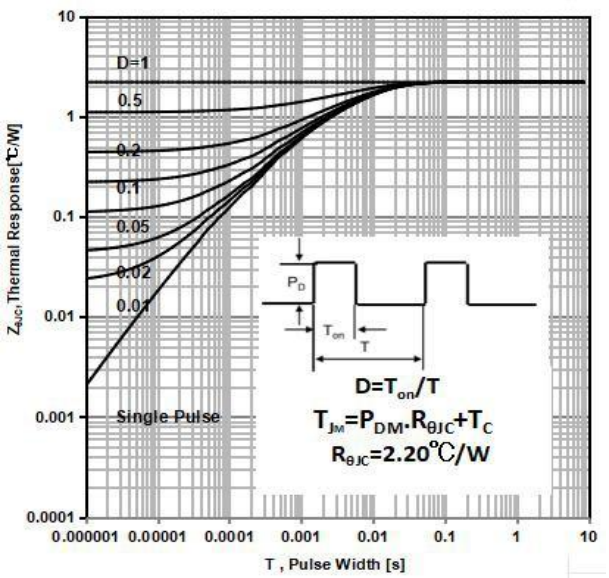
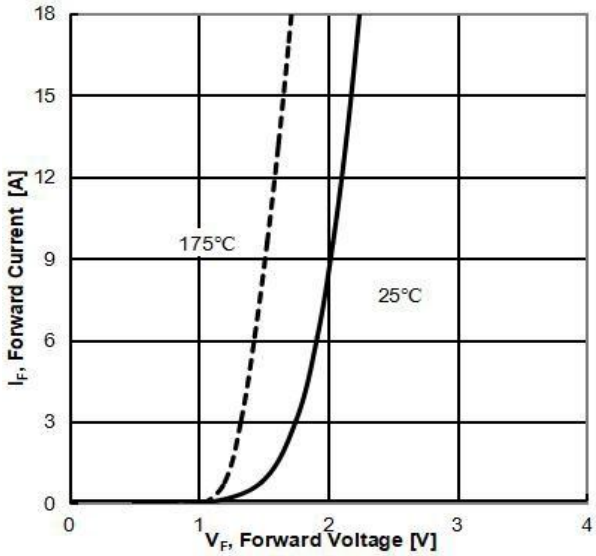
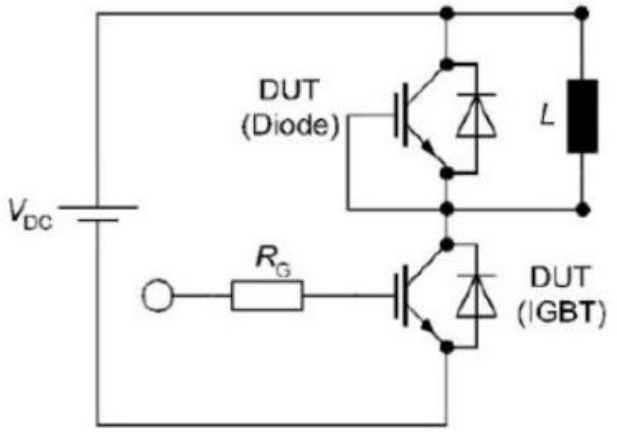


Figure 21: Typical Capacitance vs. Collector-Emitter Voltage

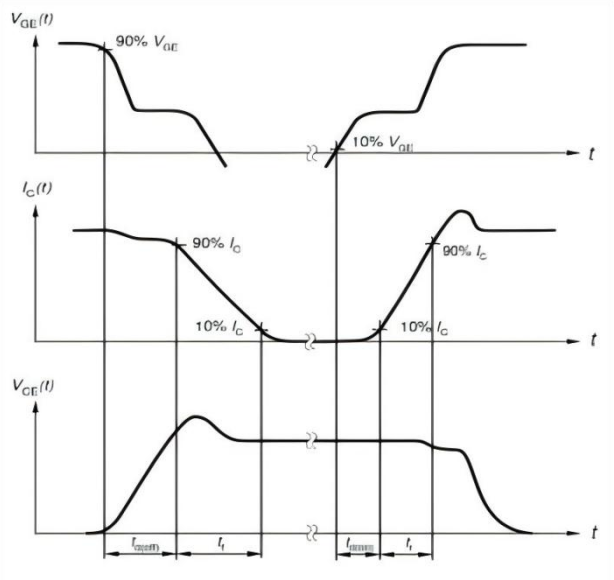


Test circuits and waveform:

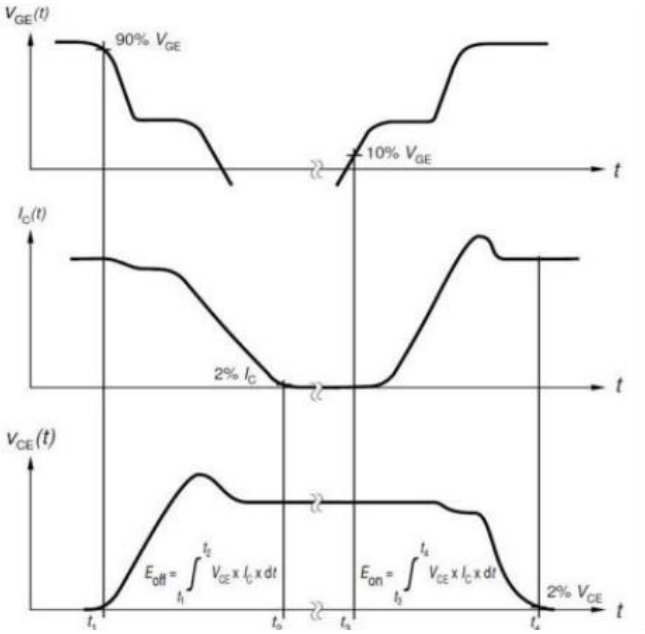
Inductive switching test circuit



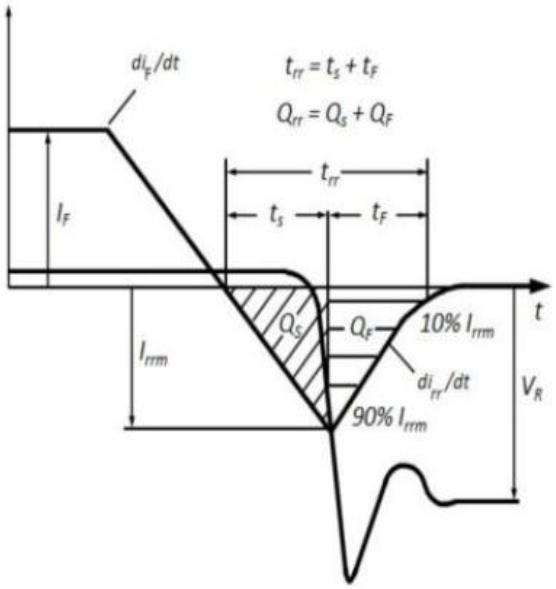
Definition of switching times



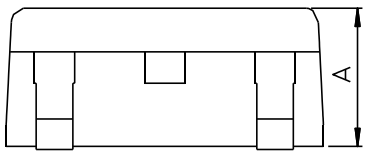
Definition of switching losses

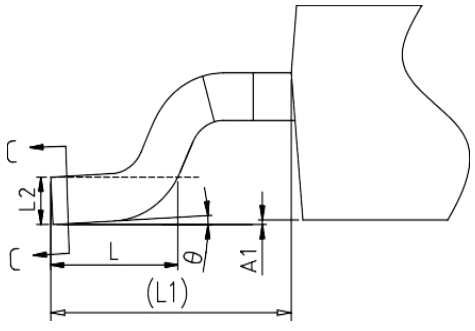


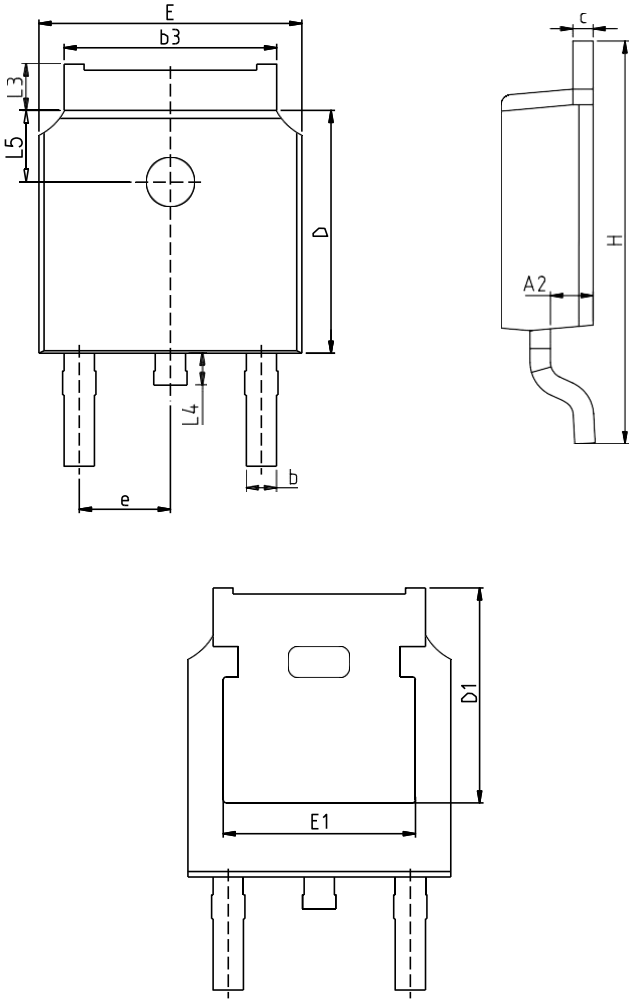
Definition of diodes witching characteristics



Package Outline (Unit：mm)







COMMON DIMENSIONS			
SYMBOL	mm		
	MIN	NOM	MAX
A	2.20	2.30	2.40
A1	0.00	-	0.12
A2	0.97	1.07	1.17
b	0.68	0.78	0.90
b3	5.20	5.33	5.46
c	0.43	0.53	0.61
D	5.98	6.10	6.22
D1	5.30REF		
E	6.40	6.60	6.73
E1	4.63	-	-
e	2.286BSC		
H	9.40	10.10	10.50
L	1.38	1.50	1.75
L1	2.90REF		
L2	0.51BSC		
L3	0.88	-	1.28
L4	0.50	-	1.00
L5	1.65	1.80	1.95
θ	0°	-	8°

***Important Usage Information and Disclaimer**

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