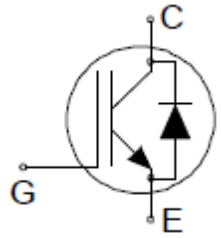
上海贝岭 SHANGHAI BELLING

BLG20T65FULA

IGBT

1. Description

BLG20T65FULA is obtained by advanced Trench Field Stop (T-FS) technology which is characteristic with low $V_{CE(sat)}$, optimized switching performance and low gate charge Q_g. The IGBT is suitable device for BLDC, UPS, and low $V_{CE(sat)}$ applications.



TO-220 TO-220F TO-247

KEY CHARACTERISTICS

Parameter	Value	Unit
V_{CES}	650	V
I_C	20	A
$V_{CE(sat).typ}$	1.55	V

FEATURES

- Fast Switching
- Low $V_{CE(sat)}$
- Positive temperature coefficient
- Very soft, fast recovery anti-parallel diode
- RoHS product

APPLICATIONS

- UPS
- Motor drives
- PFC
- Portable power station

ORDERING INFORMATION

Device Marking	Ordering Codes	Package	Product Code	Packing
20T65FULA	BLG20T65FULA-A	TO-220F	G20T65FULA	Tube
	BLG20T65FULA-P	TO-220		Tube
	BLG20T65FULA-F	TO-247		Tube

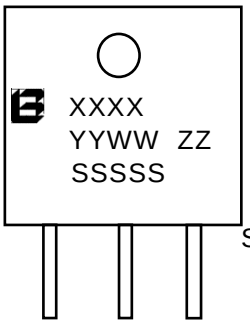
BLG20T65FULA-A/P

(2) Package type

(1) Chip name

(1) BLG20T65FUL: 650V 20A

(2) P:TO-220
A:TO-220F
F:TO-247



XXXX：Product Code

YYWW：Year & Week

ZZ：Assembly Code

SSSSS：Lot Code

2. ABSOLUTE RATINGS

Symbol	Parameter	TO-220	TO-220F	TO-247	Units
V_{CES}	Collector-Emitter Voltage	650	650	650	V
I_C	Collector Current @T_C=25°C	40	40	40	A
	Collector Current @T_C=100°C	20	20	20	A
I_{CM}	Pulsed Collector Current, tp limited by T_{Jmax}	80	80	80	A
I_F	Diode Continuous Forward Current @T_C=25°C	20	20	20	A
	Diode Continuous Forward Current @T_C=100°C	10	10	10	A
I_{FM}	Diode Maximum Forward Current, limited by T_{Jmax}	40	40	40	A
V_{GES}	Gate-Emitter Voltage	±30	±30	±30	V
t_{SC}	Short circuit withstand time V_{GE}=15V, V_{CC}≤400V, Allowed number of short circuits<1000,Times between short circuits: ≥ 1.0s,T_J ≤ 175°C	3.0			μs
P_D	Power Dissipation @T_C=25°C	136	39	300	W
T_{Jmax}, T_{stg}	Operating Junction and Storage Temperature Range	175, –55 to 175			℃
T_L	Maximum Temperature for Soldering	260			℃

3. Thermal characteristics

Symbol	Parameter	TO-220	TO-220F	TO-247	Units
$R_{\theta JC}$	Junction-to-Case (IGBT)	1.1	3.6	0.5	℃/W
$R_{\theta JC}$	Junction-to-Case (Diode)	1.8	3.6	0.65	℃/W
$R_{\theta JA}$	Junction-to-Ambient	62.5	78	40	℃/W

4. Electrical Characteristics

at T_C = 25°C, unless otherwise specified

Static Characteristics

Symbol	Parameter	Test Conditions	Values			Units
			Min.	Typ.	Max.	
V_{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 = 20A T_J=25℃ T_J=125℃ T_J=175℃	 -- -- --	 1.55 1.80 1.90	 1.95 -- --	V

$V_{GE(TH)}$	Gate Threshold Voltage	V_{CE} = V_{GE},I_C = 1mA	5.0	5.8	6.5	V
V_F	Diode Forward Voltage	I_F=10A T_J=25℃ T_J=125℃ T_J=175℃	-- -- --	2.15 1.95 1.85	2.70 -- --	V
I_{CES}	Collector-Emitter Leakage Current	V_{CE} = 650V, V_{GE} = 0V	--	--	25	μA
$I_{GES(F)}$	Gate-Emitter Forward Leakage Current	V_{GE} = +30V	--	--	200	nA
$I_{GES(R)}$	Gate-Emitter Reverse Leakage Current	V_{GE} = -30V	--	--	-200	nA
Pulse width tp≤300μs, δ≤2%						

Dynamic Characteristics

Symbol	Parameter	Test Conditions	Values			Units
			Min.	Typ.	Max.	
C_{iss}	Input Capacitance	V_{GE}=0V V_{CE}=25V f =1.0MHz	--	892	--	pF
C_{oss}	Output Capacitance		--	43	--	
C_{rss}	Reverse Transfer Capacitance		--	10	--	
Q_G	Gate charge	Vcc=520V I_{CE}=20A V_{GE}=15V	--	44	--	nC
Q_{GE}	Gate-emitter charge		--	13	--	
Q_{GC}	Gate-collector charge		--	18	--	
$I_{C(SC)}$	Short circuit collector current Max.1000 short circuits, Times between short circuits: ≥ 1.0s	V_{GE}=15.0V,V_{CC}≤400V， t_{SC}≤3us，T_J≤175℃		110		A

IGBT Switching Characteristics, at T_J=25℃

Symbol	Parameter	Test Conditions	Values			Units
			Min.	Typ.	Max.	
$t_{d(on)}$	Turn-on Delay Time	I_C =20A V_{CE} = 400V V_{GE} = 15V R_G =5Ω T_J=25°C Inductive Load	--	12	--	ns
tr	Rise Time		--	17	--	
$t_{d(off)}$	Turn-Off Delay Time		--	136	--	
t_f	Fall Time		--	36	--	
E_{on}	Turn-On Switching Loss		--	0.28	--	mJ
E_{off}	Turn-Off Switching Loss		--	0.28	--	
E_{ts}	Total Switching Loss		--	0.56	--	

IGBT Switching Characteristics, at T_J=175℃

Symbol	Parameter	Test Conditions	Values			Units
			Min.	Typ.	Max.	
$t_{d(on)}$	Turn-on Delay Time	I_C =20A V_{CE} = 400V V_{GE} = 15V R_G =5Ω T_J=175°C Inductive Load	--	12	--	ns
tr	Rise Time		--	17	--	
$t_{d(off)}$	Turn-Off Delay Time		--	158	--	
t_f	Fall Time		--	90	--	
E_{on}	Turn-On Switching Loss		--	0.44	--	mJ
E_{off}	Turn-Off Switching Loss		--	0.38	--	
E_{ts}	Total Switching Loss		--	0.82	--	

Diode Characteristics, at T_J=25℃

Symbol	Parameter	Test Conditions	Values			Units
			Min.	Typ.	Max.	
T_{rr}	Reverse Recovery Time	I_F=10A, di/dt=200A/μs, T_J=25°C	--	66	--	ns
Q_{rr}	Reverse Recovery Charge		--	182	--	nC
I_{rrm}	Reverse Recovery Current		--	4.5	--	A
T_{rr}	Reverse Recovery Time	I_F=20A, di/dt=200A/μs, T_J=25°C	--	75	--	ns
Q_{rr}	Reverse Recovery Charge		--	236	--	nC
I_{rrm}	Reverse Recovery Current		--	5.4	--	A

Diode Characteristics, at T_J=175℃

Symbol	Parameter	Test Conditions	Values			Units
			Min.	Typ.	Max.	
T_{rr}	Reverse Recovery Time	I_F=10A, di/dt=200A/μs, T_J=175°C	--	122	--	ns
Q_{rr}	Reverse Recovery Charge		--	690	--	nC
I_{rrm}	Reverse Recovery Current		--	10.0	--	A
T_{rr}	Reverse Recovery Time	I_F=20A, di/dt=200A/μs, T_J=175°C	--	150	--	ns
Q_{rr}	Reverse Recovery Charge		--	910	--	nC
I_{rrm}	Reverse Recovery Current		--	11.0	--	A

5. Characteristics Curves

Figure 1. Forward Bias Safe Operating Area for TO220

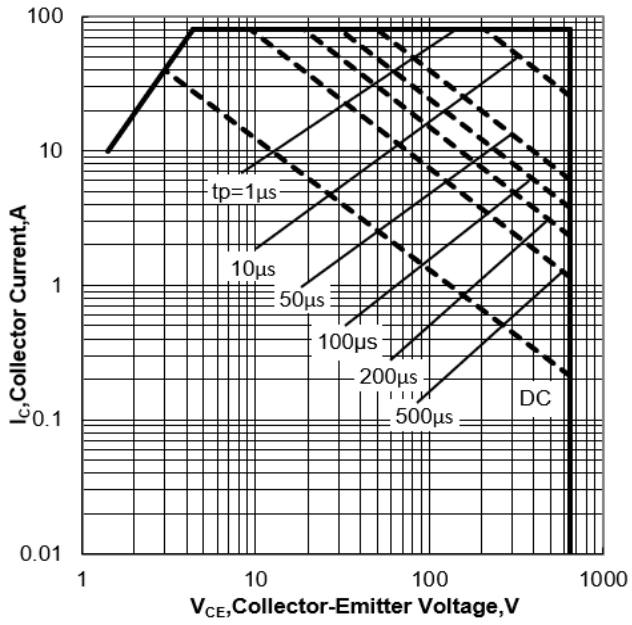


Figure 2. Forward Bias Safe Operating Area for TO220F

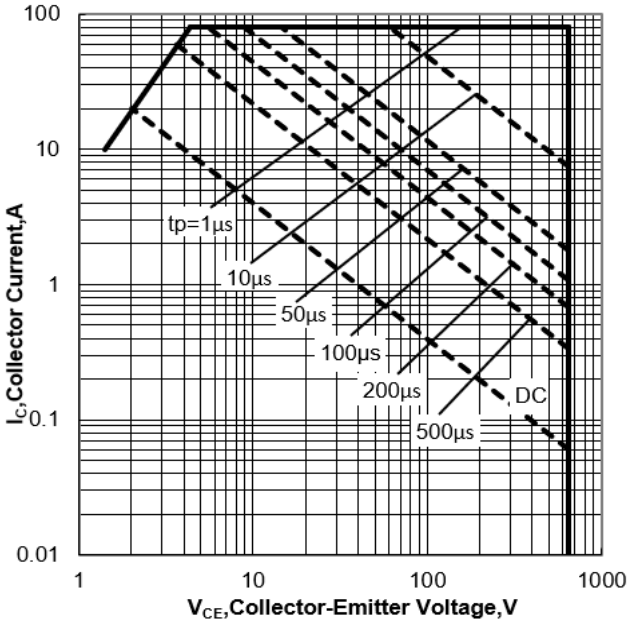


Figure 3. Forward Bias Safe Operating Area for TO247

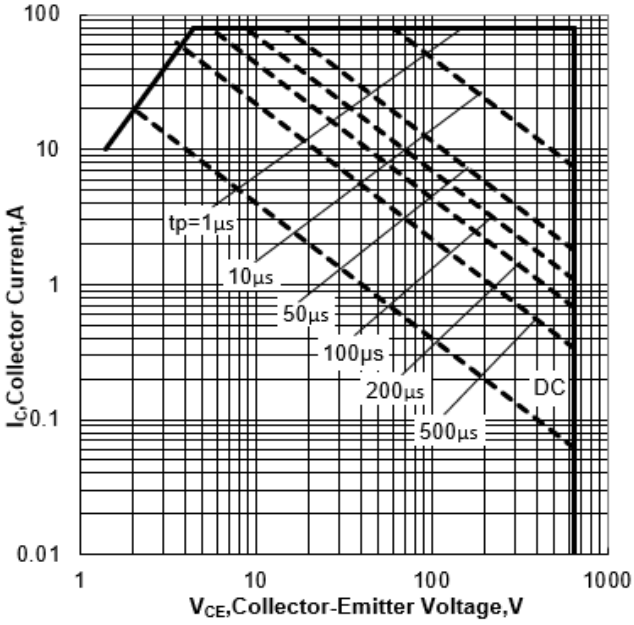


Figure 4. Power Dissipation vs Case Temperature for TO247

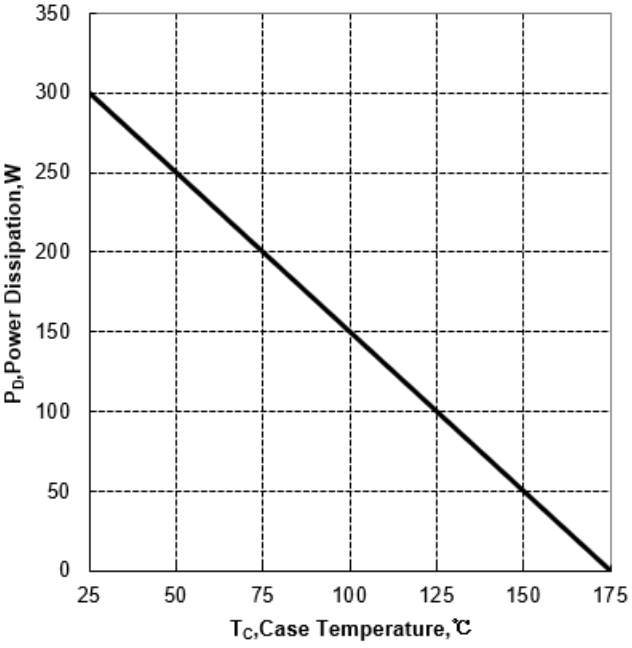


Figure 5. Power Dissipation vs Case Temperature for TO220

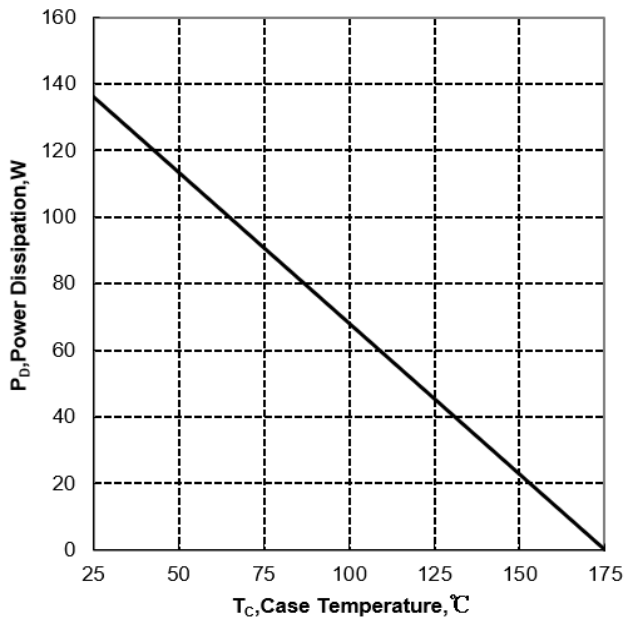


Figure 6. Power Dissipation vs Case Temperature for TO220F

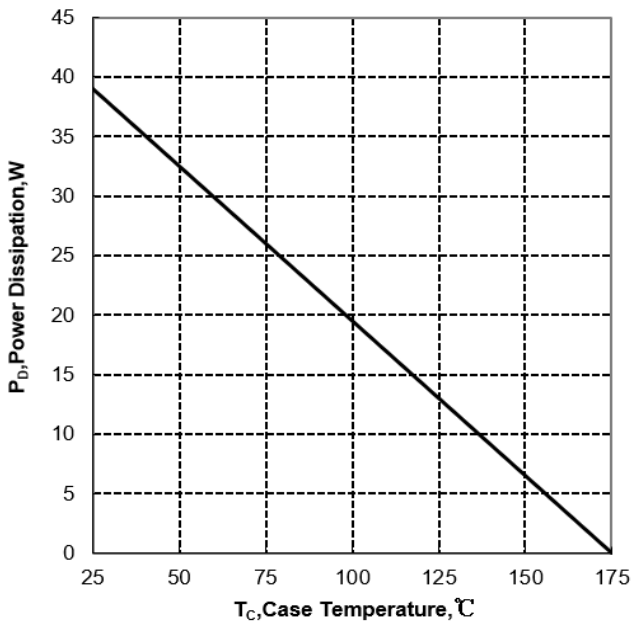


Figure 7. Collector Current vs Case Temperature

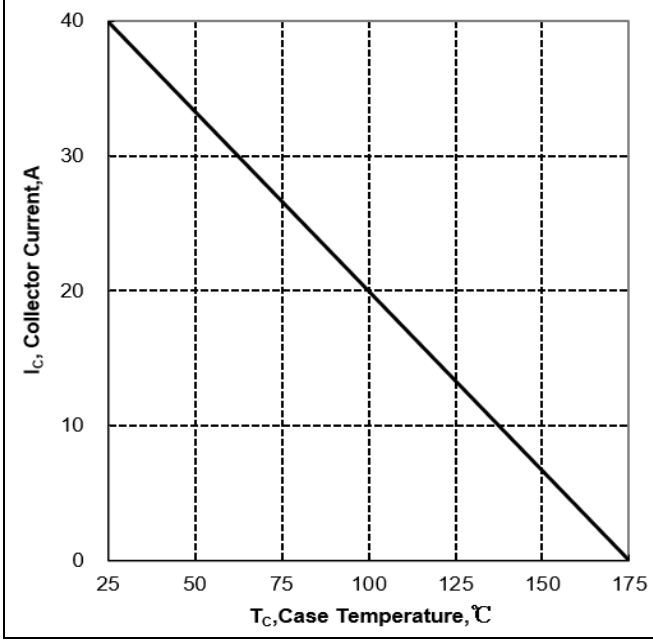


Figure 8. Typical Transfer Characteristics

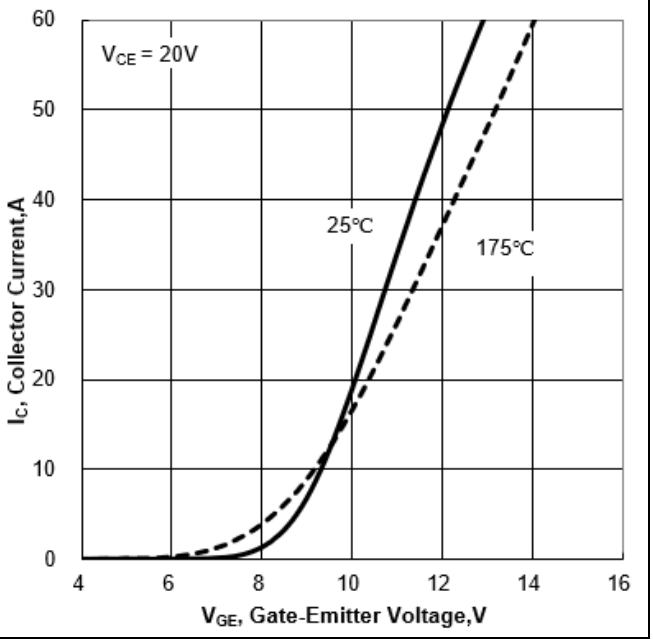


Figure 9. Typical Output Characteristics (T_J=25℃)

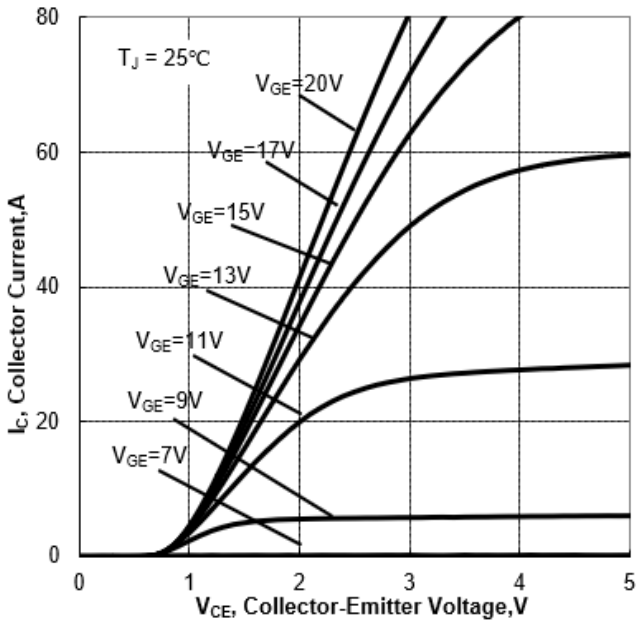


Figure 10. Typical Output Characteristics (T_J=175℃)

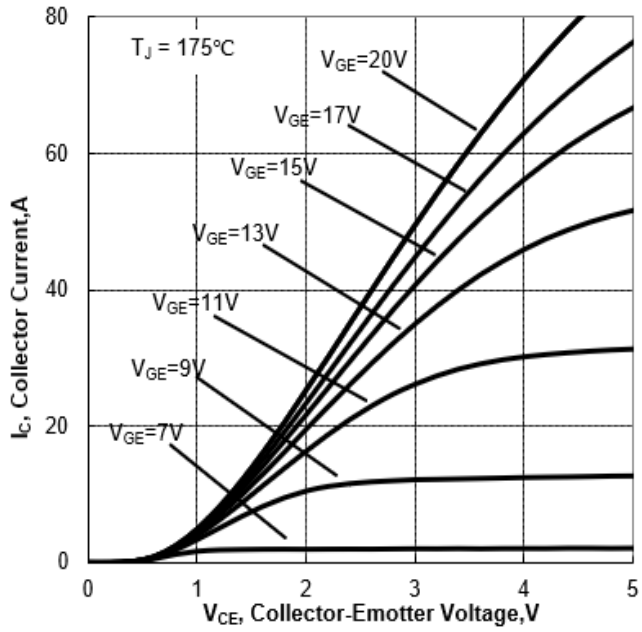


Figure 11. Typical Collector-Emitter Saturation Voltage vs Junction Temperature

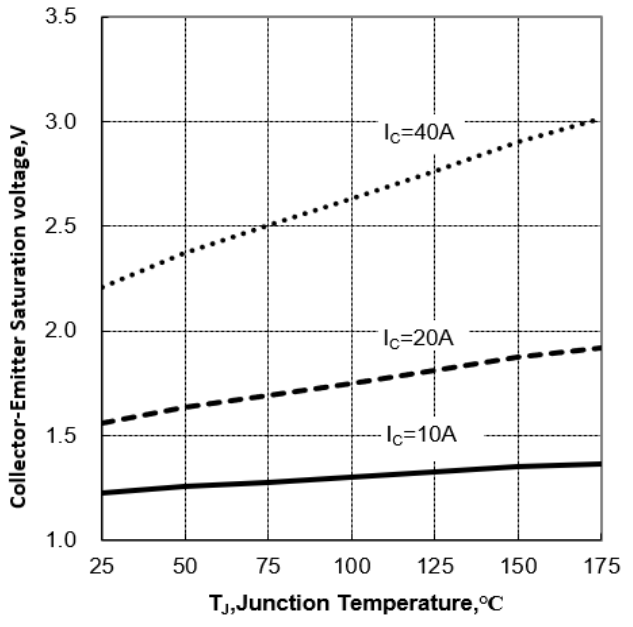


Figure 12. Typical Gate-Emitter Threshold Voltage vs Junction Temperature

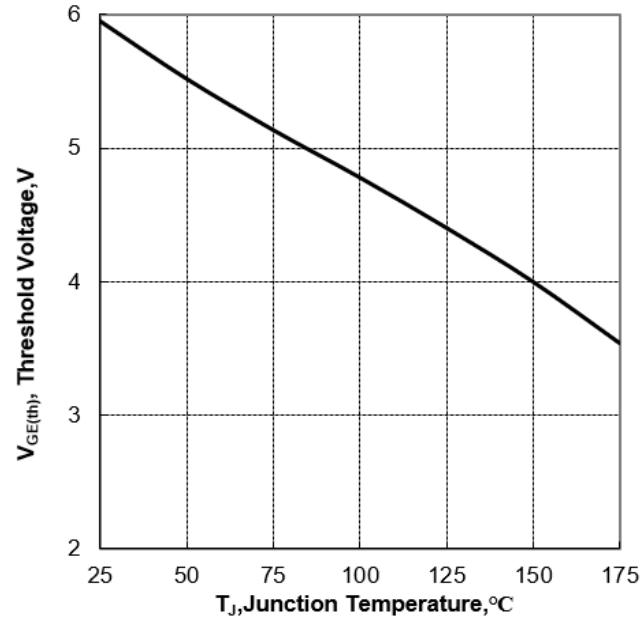


Figure 13. Typical Switching Times vs Gate Resistor (T_J=25℃, V_{CE}=400V, V_{GE}=15/0V, Ic=20A)

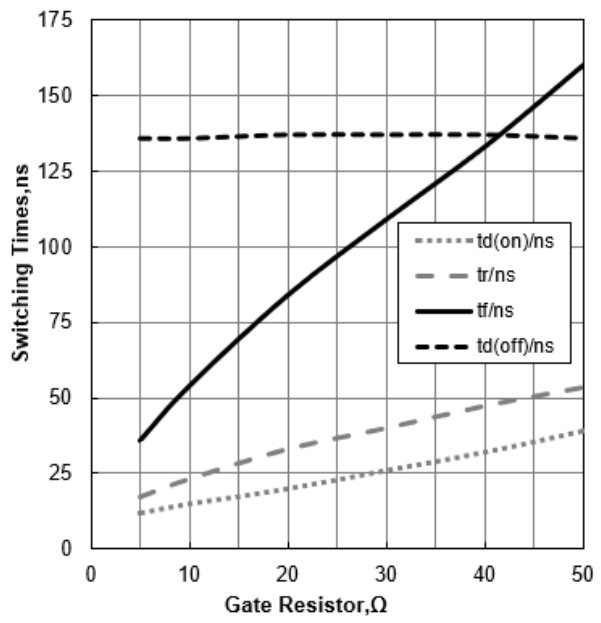


Figure 14. Typical Switching Energy vs Gate Resistor (T_J=25℃, V_{CE}=400V, V_{GE}=15/0V, Ic=20A)

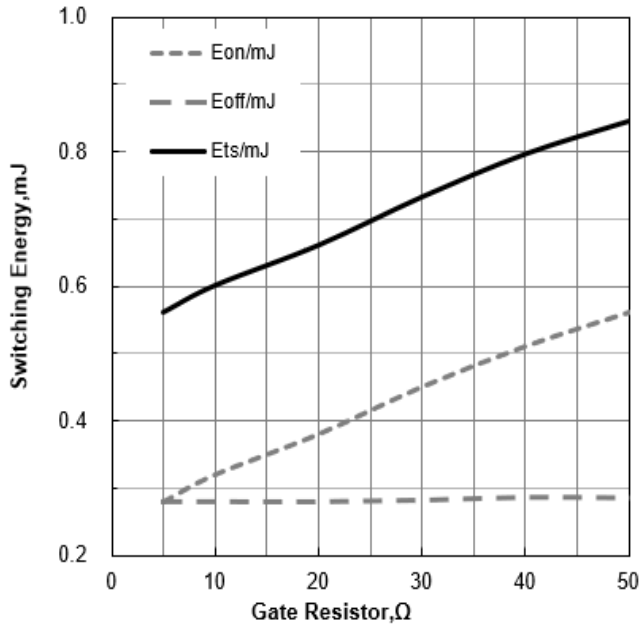


Figure 15. Typical Switching Times vs Junction Temperature (V_{CE}=400V, V_{GE}=15/0V, Ic=20A)

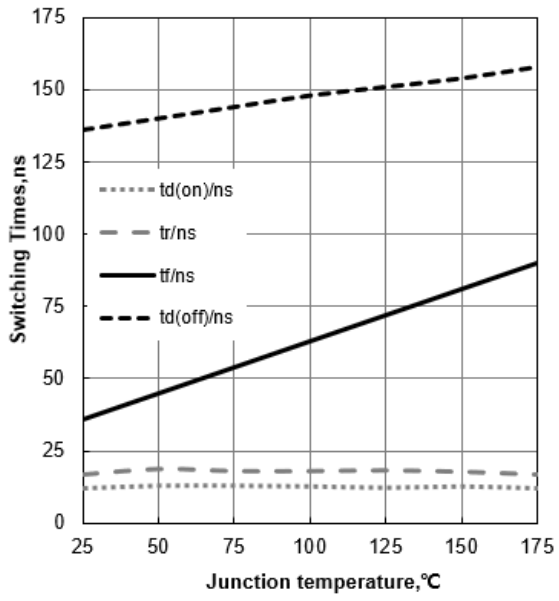


Figure 16. Typical Switching Energy vs Junction Temperature (V_{CE}=400V, V_{GE}=15/0V, Ic=20A)

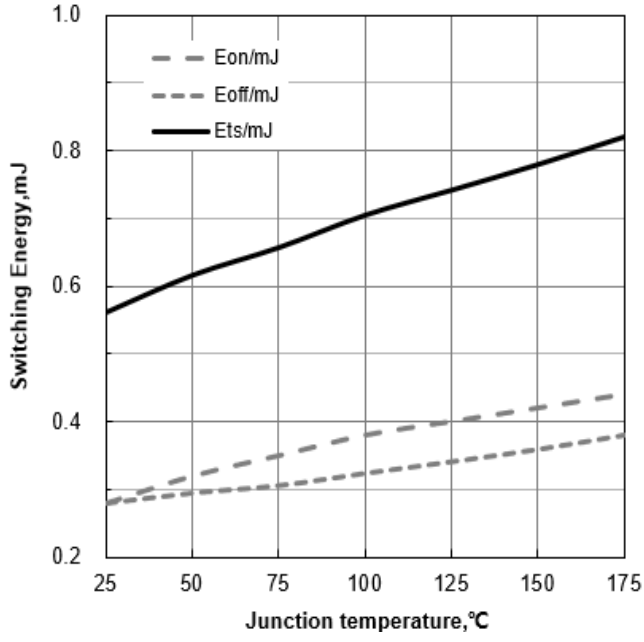


Figure 17. Typical Switching Times vs Collector Current (T_J=25℃, V_{CE}=400V, V_{GE}=15/0V)

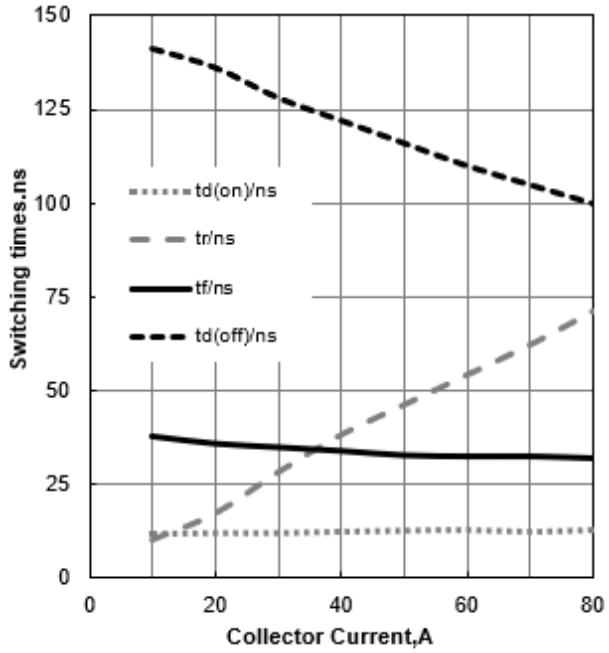


Figure 18. Typical Switching Energy vs Collector Current (T_J=25℃, V_{CE}=400V, V_{GE}=15/0V)

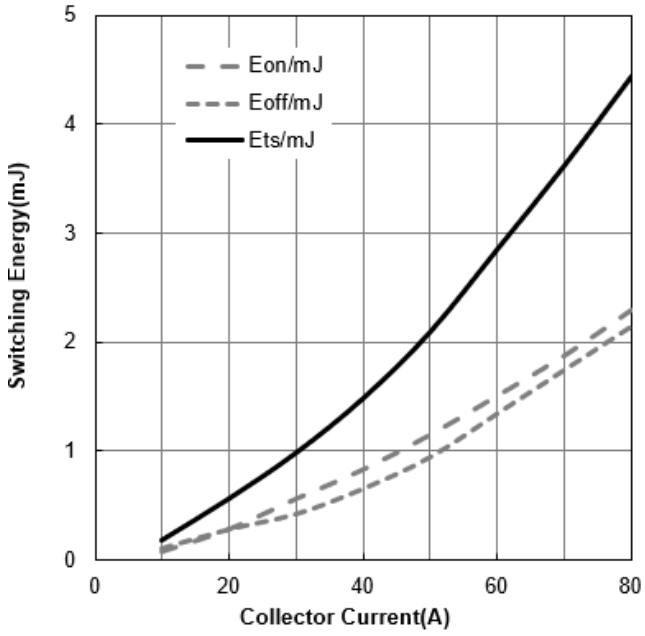


Figure 18. Typical Switching Times vs V_{CE} (T_J=25℃, V_{GE}=15/0V, Ic=20A)

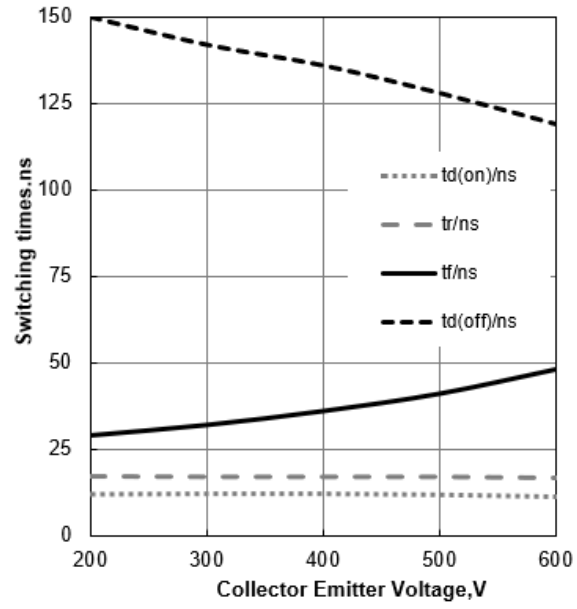


Figure 19. Typical Switching Energy vs vs V_{CE} (T_J=25℃, V_{GE}=15/0V, Ic=20A)

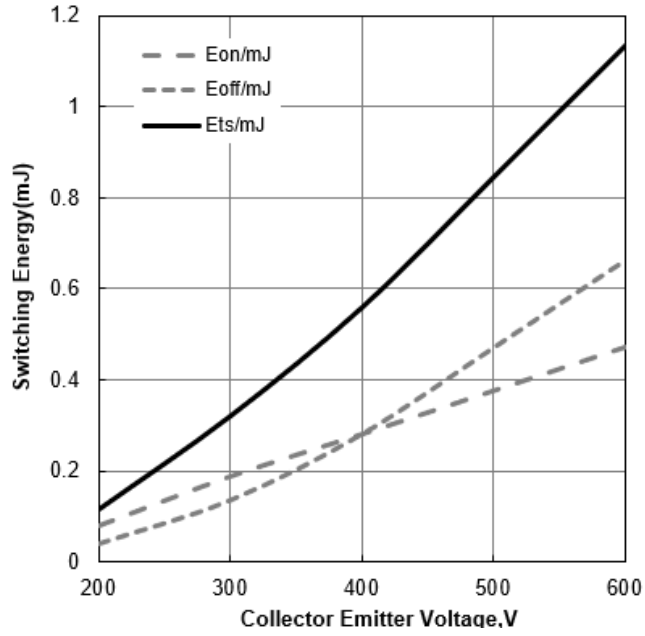


Figure 20. Typical Gate Charge

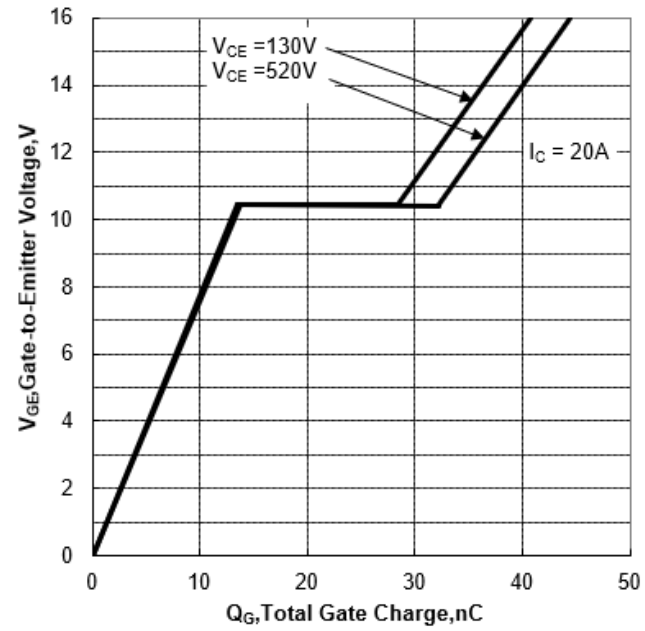


Figure 21. Typical Capacitance vs Collector-Emitter Voltage

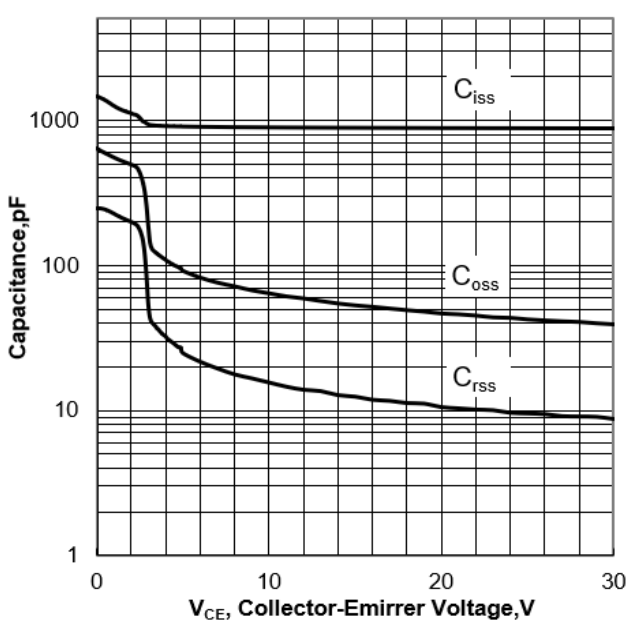


Figure 22. IGBT Transient Thermal Impedance vs Pulse Width(TO220)

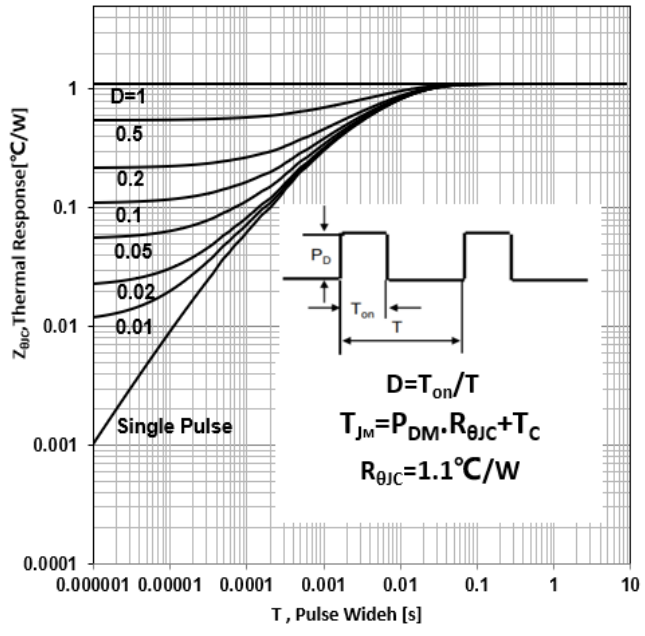


Figure 23. IGBT Transient Thermal Impedance vs Pulse Width(TO220F)

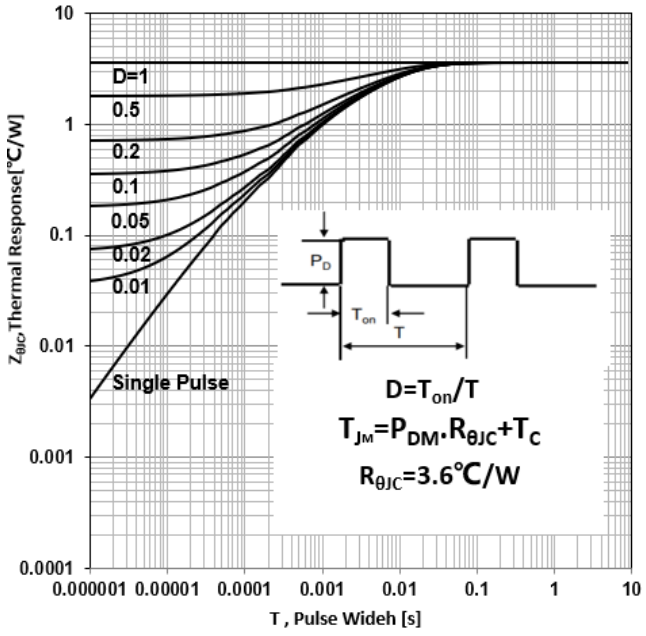


Figure 24. Diode Transient Thermal Impedance vs Pulse Width(TO220)

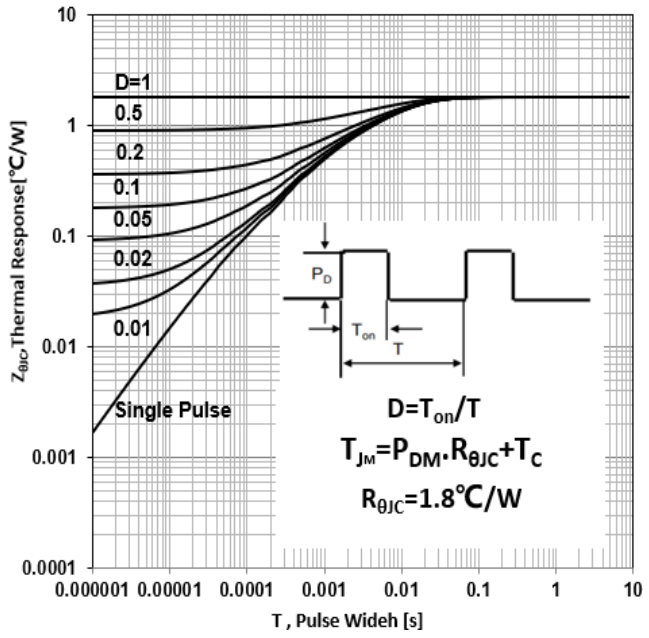


Figure 25. Diode Transient Thermal Impedance vs Pulse Width(TO220F)

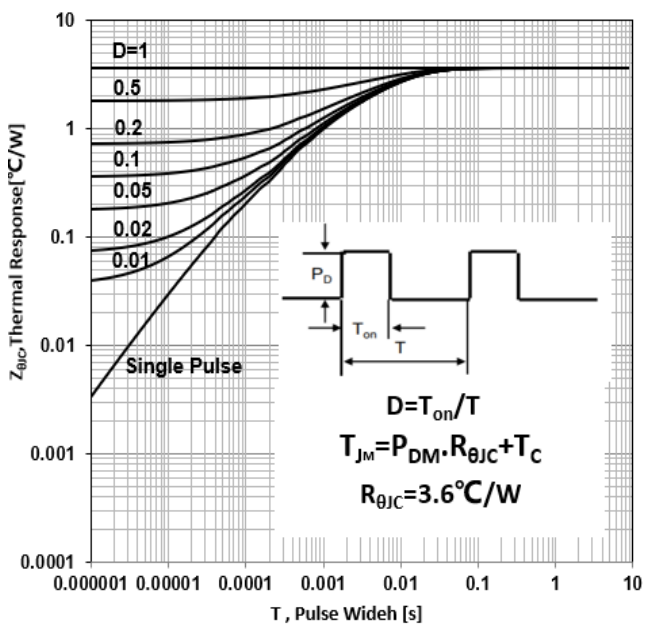


Figure 26. IGBT Transient Thermal Impedance vs Pulse Width(TO247)

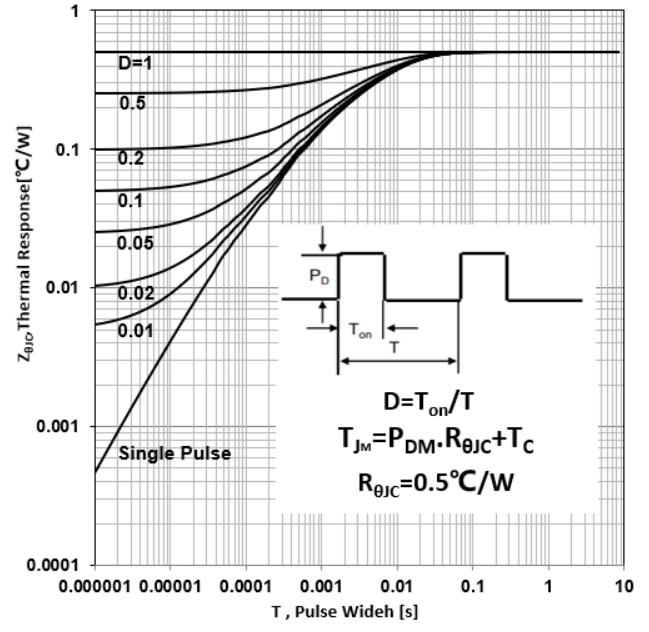


Figure 27. Diode Transient Thermal Impedance vs Pulse Width(TO247)

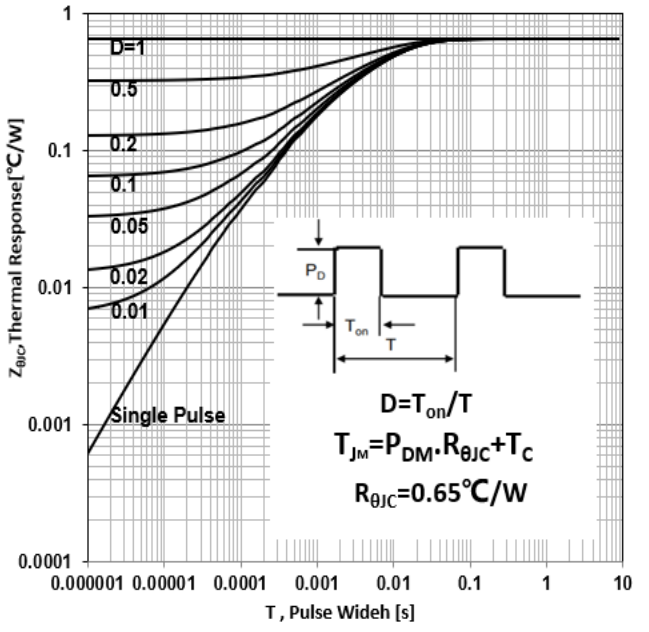
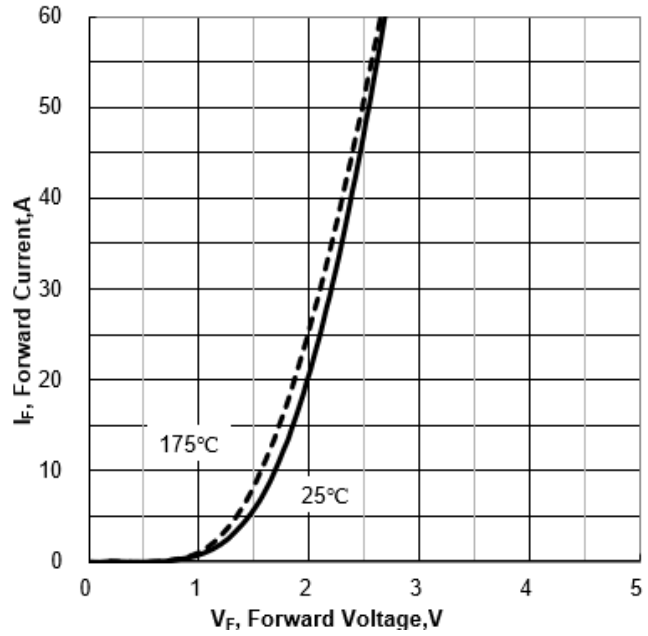


Figure 28. Typical Diode Forward Current vs Forward Voltage



6. Test Circuit and Waveform

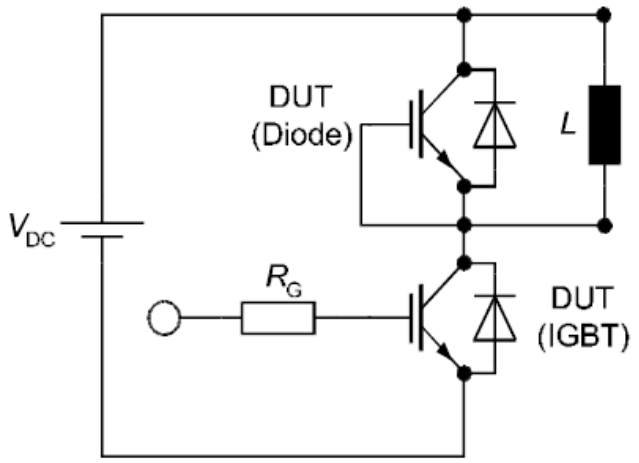
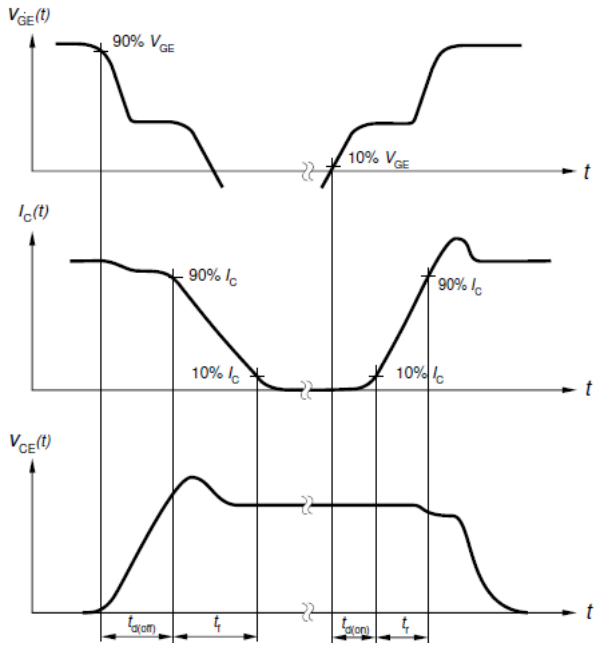
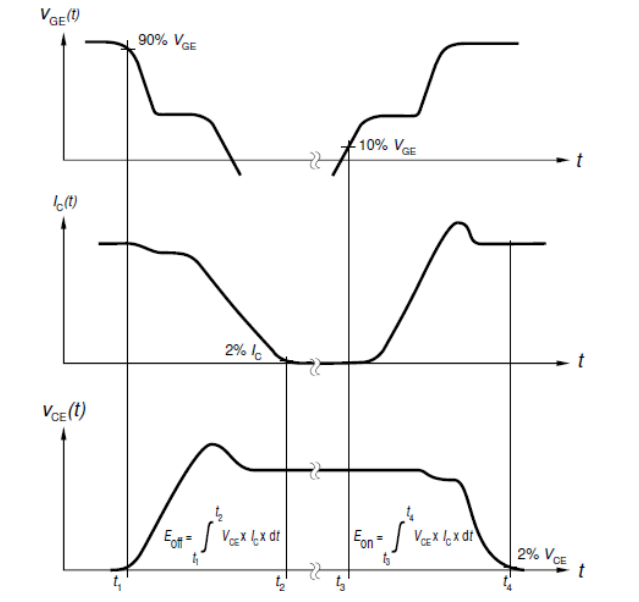
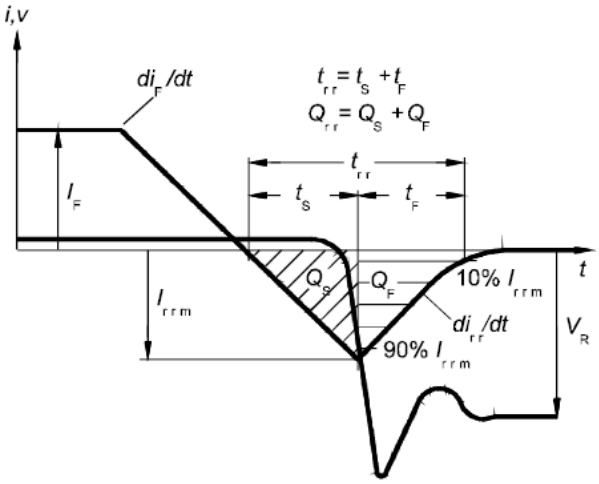
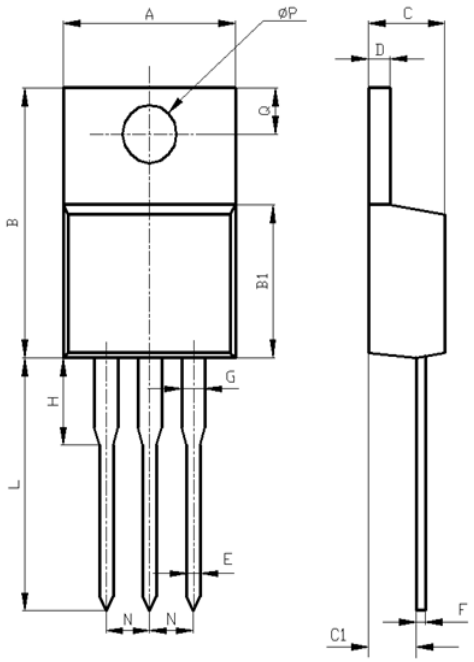
Figure 29. Inductive Switching Test Circuit	Figure 30. Definition of switching times
	

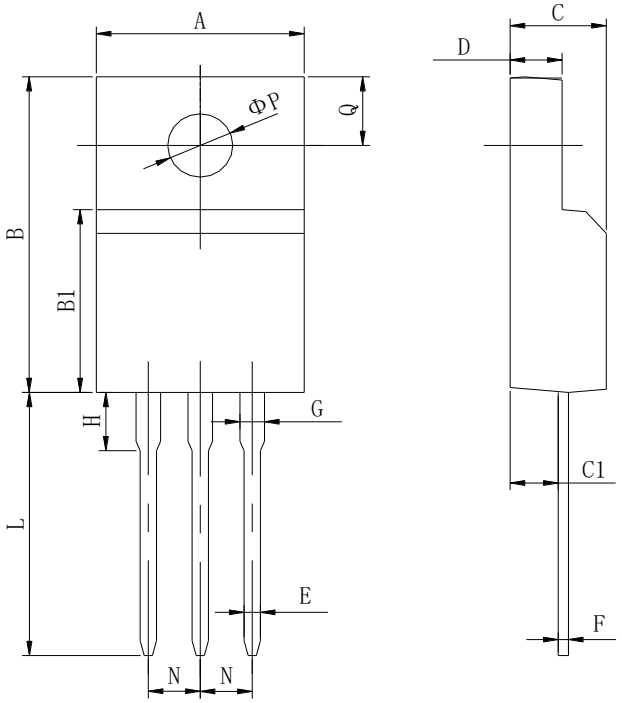
Figure 31. Definition of switching losses	Figure 32. Definition of diode switching characteristics
	

7. Package Description



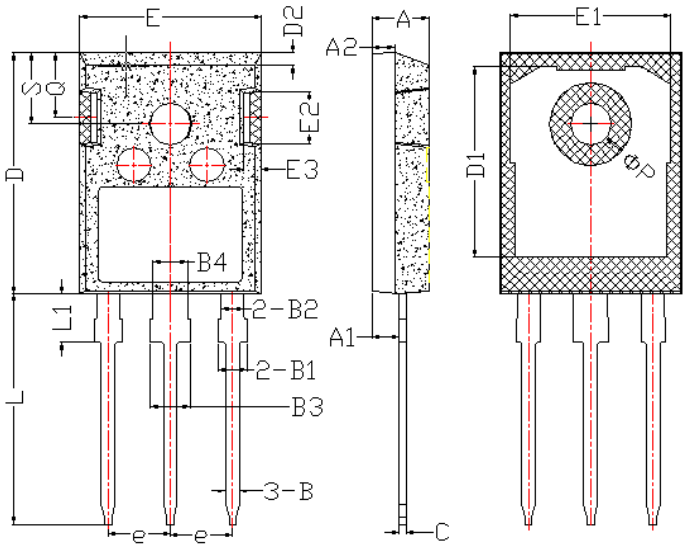
TO-220 Package

Items	Values(mm)	
	MIN	MAX
A	9.60	10.6
B	15.0	16.0
B1	8.90	9.50
C	4.30	4.80
C1	2.30	3.10
D	1.20	1.40
E	0.70	0.90
F	0.30	0.60
G	1.17	1.37
H	2.70	3.80
L	12.6	14.8
N	2.34	2.74
Q	2.40	3.00
ΦP	3.50	3.90



TO-220F Package

Items	Values(mm)	
	MIN	MAX
A	9.60	10.4
B	15.4	16.2
B1	8.90	9.50
C	4.30	4.90
C1	2.10	3.00
D	2.40	3.00
E	0.60	1.00
F	0.30	0.60
G	1.12	1.42
H	3.40	3.80
	1.60	2.90
L	12.0	14.0
N	2.34	2.74
Q	3.15	3.55
ΦP	2.90	3.30



TO-247 Package

Items	Values(mm)	
	MIN	MAX
A	4.90	5.16
A1	2,27	2.53
A2	1.85	2.11
B	1.07	1.33
B1	1.90	2.41
B2	1.75	2.15
B3	2.87	3.38
B4	2.87	3.13
C	0.55	0.68
D	20.82	21.10
D1	16.25	17.65
D2	1.05	1.35
E	15.70	16.03
E1	13.10	14.15
E2	3.68	5.10
E3	1.68	2.60
e	5.44	
L	19.80	20.31
L1	4.17	4.47
ΦP	3.50	3.70
Q	5.49	6.00
S	6.04	6.30