

1. Description

BLG15T65FUA 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 high switching frequency applications.

KEY CHARACTERISTICS

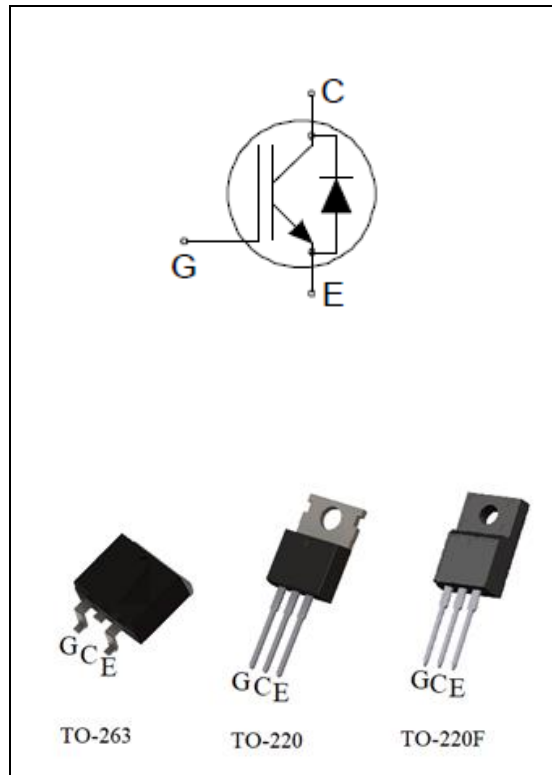
Parameter	Value	Unit
V_{CES}	650	V
I_C	15	A
$V_{CE(sat).typ}$	1.55	V

FEATURES

- Fast Switching
- LOW $V_{CE(sat)}$
- Positive temperature coefficient
- Fast recovery anti-parallel diode
- RoHS product

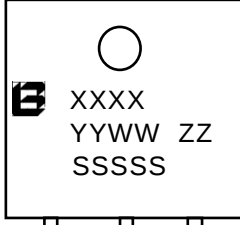
APPLICATIONS

- BLDC
- UPS
- Motor drives
- Portable power



ORDERING INFORMATION

Device Marking	Ordering Codes	Package	Product Code	Packing
15T65FUA	BLG15T65FUA-A	TO-220F	G15T65FUA	Tube
	BLG15T65FUA-B	TO-263	G15T65FUA	Reel
	BLG15T65FUA-P	TO-220	G15T65FUA	Tube

BLG15T65FUA-A/B/P (2) Package type (1) Chip name (1) BLG15T65FUA: 650V 15A (2) A:TO-220F B:TO-263 P:TO-220	 XXXX: Product Code YYWW: Year & Week ZZ: Assembly Code SSSSS: Lot Code
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2. ABSOLUTE RATINGS

Symbol	Parameter	TO-220/ TO-263	TO-220F	Units
V_{CES}	Collector-Emitter Voltage	650	650	V
I_C	Collector Current @ $T_C=25^{\circ}\text{C}$	30	30	A
	Collector Current @ $T_C=100^{\circ}\text{C}$	15	15	A
I_{CM}	Pulsed Collector Current, tp limited by T_{Jmax}	60	60	A
I_F	Diode Continuous Forward Current @ $T_C=25^{\circ}\text{C}$	15	15	A
	Diode Continuous Forward Current @ $T_C=100^{\circ}\text{C}$	7.5	7.5	A
I_{FM}	Diode Maximum Forward Current, limited by T_{Jmax}	30	30	A
V_{GES}	Gate-Emitter Voltage	± 30	± 30	V
t_{SC}	Short circuit withstand time $V_{GE}=15\text{V}$, $V_{CC}\leq 400\text{V}$, Allowed number of short circuits<1000, Times between short circuits: $\geq 1.0\text{s}$, $T_J \leq 150^{\circ}\text{C}$	5.0		μs
P_D	Power Dissipation @ $T_C=25^{\circ}\text{C}$	78	28	W
T_{Jmax}, T_{stg}	Operating Junction and Storage Temperature Range	150, -55 to 150		$^{\circ}\text{C}$
T_L	Maximum Temperature for Soldering	260		$^{\circ}\text{C}$

3. Thermal characteristics

Symbol	Parameter	TO-220/TO-263	TO-220F	Units
$R_{\theta JC}$	Junction-to-Case (IGBT)	1.6	4.4	$^{\circ}\text{C/W}$
$R_{\theta JC}$	Junction-to-Case (Diode)	2.1	3.9	$^{\circ}\text{C/W}$
$R_{\theta JA}$	Junction-to-Ambient	62.5	78	$^{\circ}\text{C/W}$

4. Electrical Characteristics

at $T_C = 25^{\circ}\text{C}$, unless otherwise specified

Static Characteristics

Symbol	Parameter	Test Conditions	Values			Units
			Min.	Typ.	Max.	
V_{CES}	Collector-Emitter Breakdown Voltage	$V_{GE} = 0\text{V}$, $I_C = 250\mu\text{A}$	650	--	--	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$V_{GE} = 15\text{V}$, $I_C = 15\text{A}$ $T_J=25^{\circ}\text{C}$	--	1.55	1.95	V
		$T_J=100^{\circ}\text{C}$	--	1.75	--	
		$T_J=150^{\circ}\text{C}$	--	1.95	--	

$V_{GE(TH)}$	Gate Threshold Voltage	$V_{CE} = V_{GE}, I_C = 1mA$	4.4	5.2	5.9	V
V_F	Diode Forward Voltage	$I_F = 8A$ $T_J = 25^\circ C$ $T_J = 100^\circ C$ $T_J = 150^\circ C$	-- -- --	2.00 1.70 1.60	2.60 -- --	V
I_{CES}	Collector-Emitter Leakage Current	$V_{CE} = 650V$, $V_{GE} = 0V$	--	--	15	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 $t_p \leq 300\mu s$, $\delta \leq 2\%$						

Dynamic Characteristics

Symbol	Parameter	Test Conditions	Values			Units
			Min.	Typ.	Max.	
C_{iss}	Input Capacitance	$V_{GE} = 0V$ $V_{CE} = 25V$ $f = 1.0MHz$	--	905	--	pF
C_{oss}	Output Capacitance		--	41	--	
C_{rss}	Reverse Transfer Capacitance		--	9	--	
Q_G	Gate charge	$V_{CC} = 520V$ $I_{CE} = 15A$ $V_{GE} = 15V$	--	38	--	nC
Q_{GE}	Gate-emitter charge		--	12	--	
Q_{GC}	Gate-collector charge		--	12	--	
$I_{C(SC)}$	Short circuit collector current Max.1000 short circuits, Times between short circuits: $\geq 1.0s$	$V_{GE} = 15.0V$, $V_{CC} \leq 400V$, $t_{sc} \leq 3\mu s$, $T_J \leq 150^\circ C$		90		A

IGBT Switching Characteristics, at $T_J = 25^\circ C$

Symbol	Parameter	Test Conditions	Values			Units
			Min.	Typ.	Max.	
$t_{d(on)}$	Turn-on Delay Time	$I_C = 15A$ $V_{CE} = 400V$ $V_{GE} = 15V$ $R_G = 5\Omega$ $T_J = 25^\circ C$ Inductive Load	--	10	--	ns
t_r	Rise Time		--	15	--	
$t_{d(off)}$	Turn-Off Delay Time		--	234	--	
t_f	Fall Time		--	17	--	
E_{on}	Turn-On Switching Loss		--	0.25	--	mJ
E_{off}	Turn-Off Switching Loss		--	0.20	--	
E_{ts}	Total Switching Loss		--	0.45	--	

IGBT Switching Characteristics, at $T_J=150^{\circ}\text{C}$

Symbol	Parameter	Test Conditions	Values			Units
			Min.	Typ.	Max.	
$t_{d(on)}$	Turn-on Delay Time	$I_C = 15\text{A}$ $V_{CE} = 400\text{V}$ $V_{GE} = 15\text{V}$ $R_G = 5\Omega$ $T_J = 150^{\circ}\text{C}$ Inductive Load	--	11	--	ns
t_r	Rise Time		--	13	--	
$t_{d(off)}$	Turn-Off Delay Time		--	259	--	
t_f	Fall Time		--	66	--	
E_{on}	Turn-On Switching Loss		--	0.39	--	mJ
E_{off}	Turn-Off Switching Loss		--	0.27	--	
E_{ts}	Total Switching Loss		--	0.66	--	

Diode Characteristics, at $T_J=25^{\circ}\text{C}$

Symbol	Parameter	Test Conditions	Values			Units
			Min.	Typ.	Max.	
T_{rr}	Reverse Recovery Time	$I_F = 8\text{A}$, $di/dt = 200\text{A}/\mu\text{s}$, $T_J = 25^{\circ}\text{C}$	--	68	--	ns
Q_{rr}	Reverse Recovery Charge		--	198	--	nC
I_{rrm}	Reverse Recovery Current		--	5.0	--	A
T_{rr}	Reverse Recovery Time	$I_F = 15\text{A}$, $di/dt = 200\text{A}/\mu\text{s}$, $T_J = 25^{\circ}\text{C}$	--	72	--	ns
Q_{rr}	Reverse Recovery Charge		--	214	--	nC
I_{rrm}	Reverse Recovery Current		--	5.2	--	A

Diode Characteristics, at $T_J=150^{\circ}\text{C}$

Symbol	Parameter	Test Conditions	Values			Units
			Min.	Typ.	Max.	
T_{rr}	Reverse Recovery Time	$I_F = 8\text{A}$, $di/dt = 200\text{A}/\mu\text{s}$, $T_J = 150^{\circ}\text{C}$	--	161	--	ns
Q_{rr}	Reverse Recovery Charge		--	609	--	nC
I_{rrm}	Reverse Recovery Current		--	7.0	--	A
T_{rr}	Reverse Recovery Time	$I_F = 15\text{A}$, $di/dt = 200\text{A}/\mu\text{s}$, $T_J = 150^{\circ}\text{C}$	--	221	--	ns
Q_{rr}	Reverse Recovery Charge		--	866	--	nC
I_{rrm}	Reverse Recovery Current		--	7.8	--	A

5. Characteristics Curves

Figure 1. Forward Bias Safe Operating Area for TO263/TO220

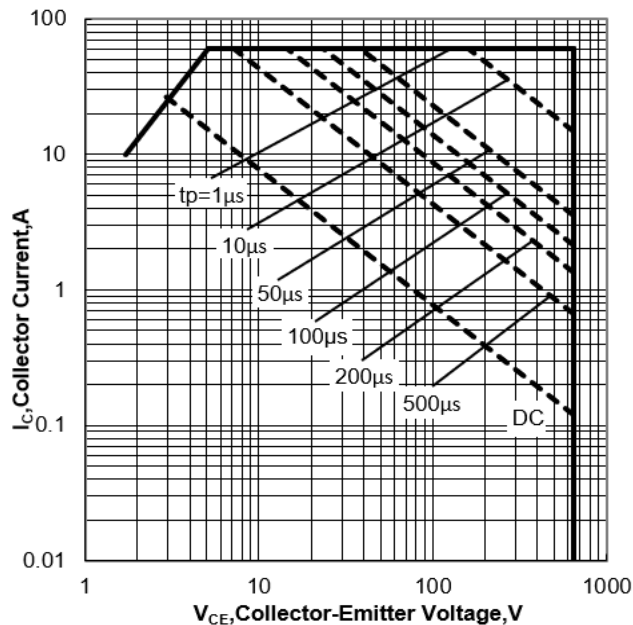


Figure 2. Forward Bias Safe Operating Area for TO220F

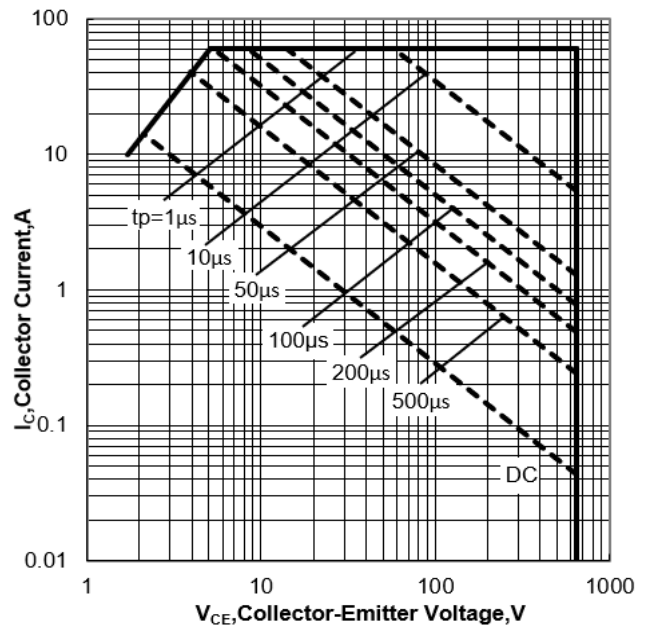


Figure 3. Power Dissipation vs Case Temperature for TO263/TO220

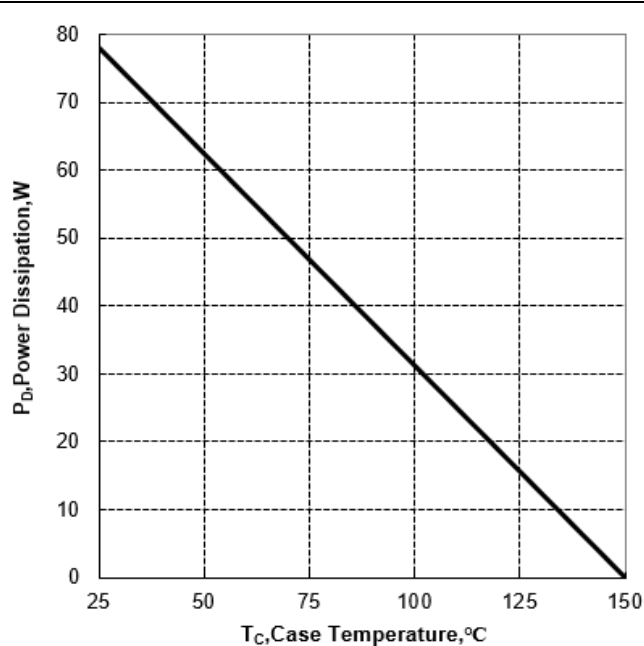


Figure 4. Power Dissipation vs Case Temperature for TO220F

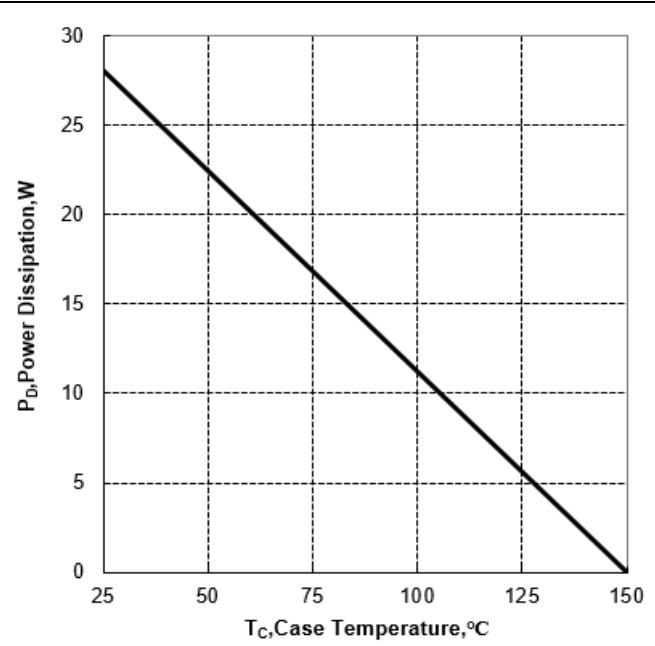


Figure 5. Collector Current vs Case Temperature

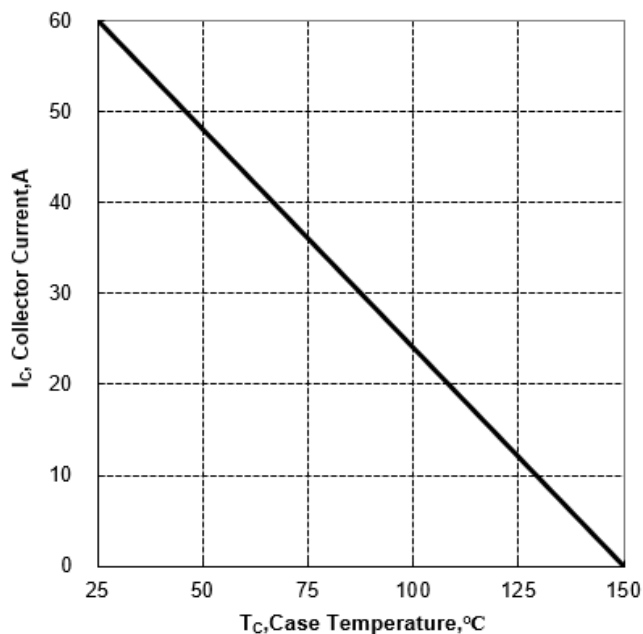


Figure 6. Typical Transfer Characteristics

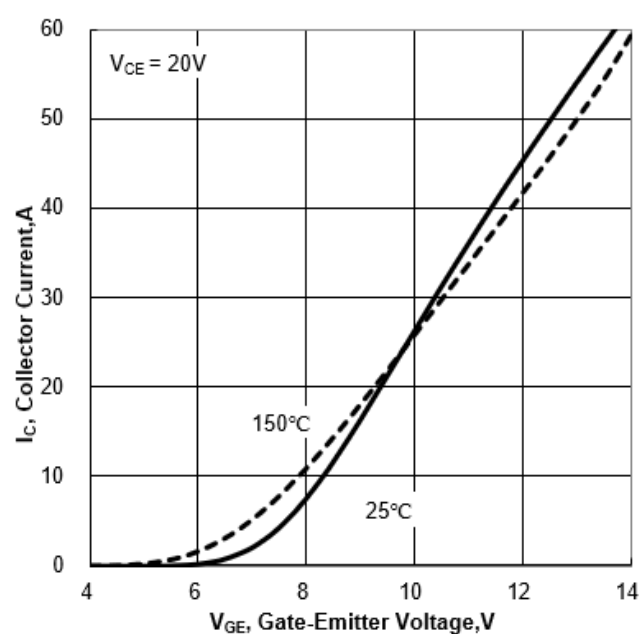


Figure 7. Output Characteristics ($T_J = 25^\circ\text{C}$)

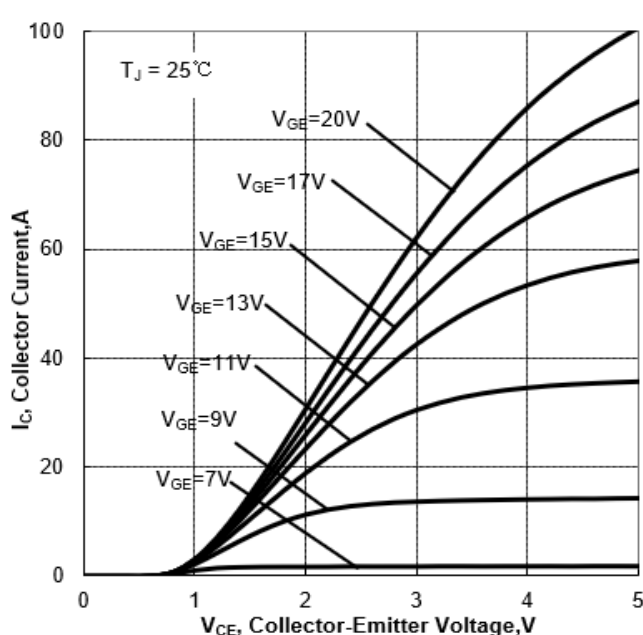


Figure 8. Output Characteristics ($T_J = 150^\circ\text{C}$)

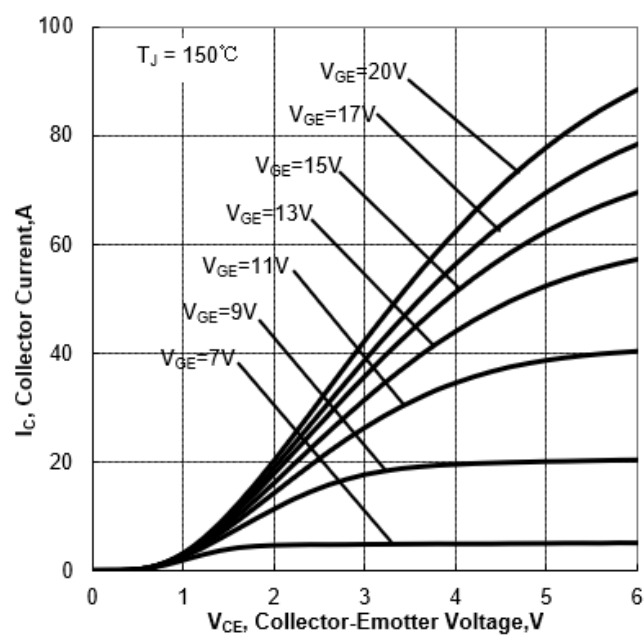


Figure 9. Collector-Emitter Saturation Voltage vs Junction Temperature($V_{GE}=15V$)

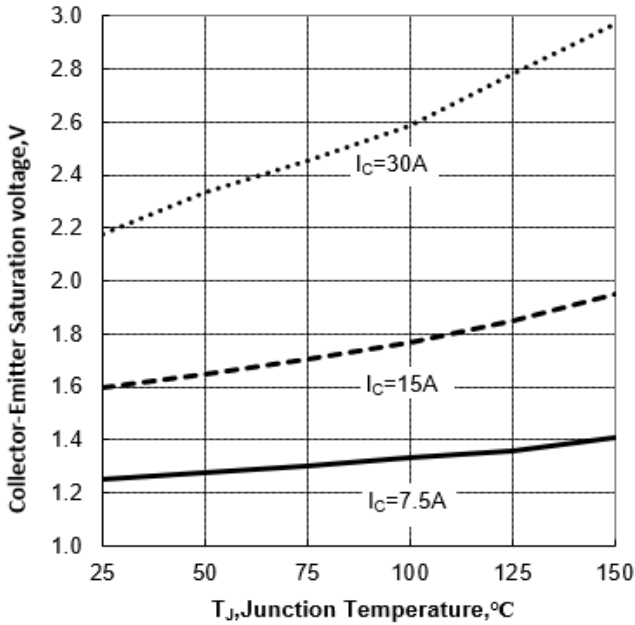


Figure 10. Threshold Voltage vs Junction Temperature($I_C=1mA$)

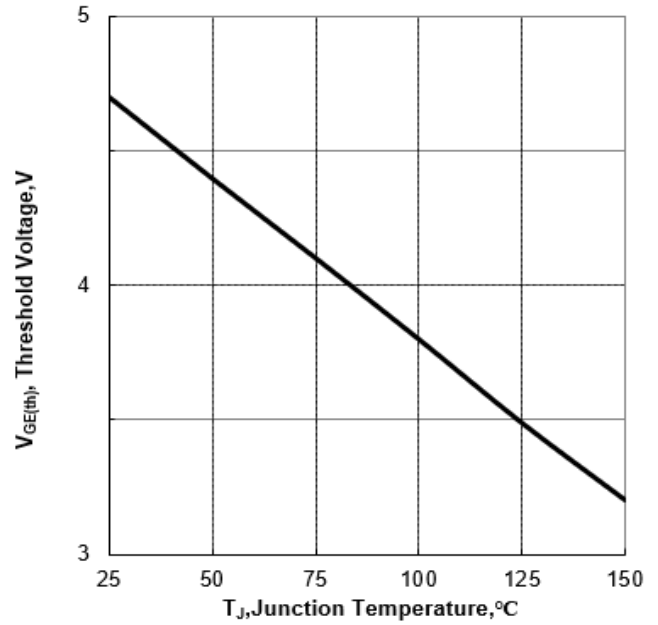


Figure 11. Typical Switching Times vs Gate Resistor($T_J=25^\circ C$, $V_{CE}=400V$, $V_{GE}=15/0V$, $I_C=15A$)

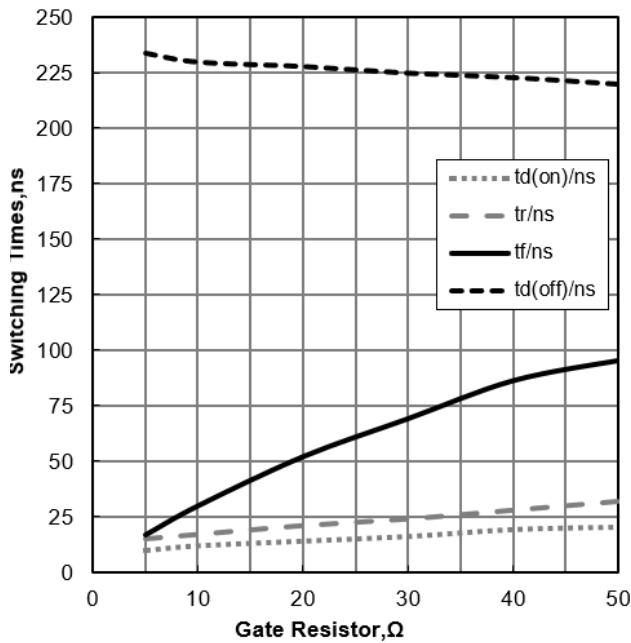


Figure 12. Typical Switching Energy vs Gate Resistor ($T_J=25^\circ C$, $V_{CE}=400V$, $V_{GE}=15/0V$)

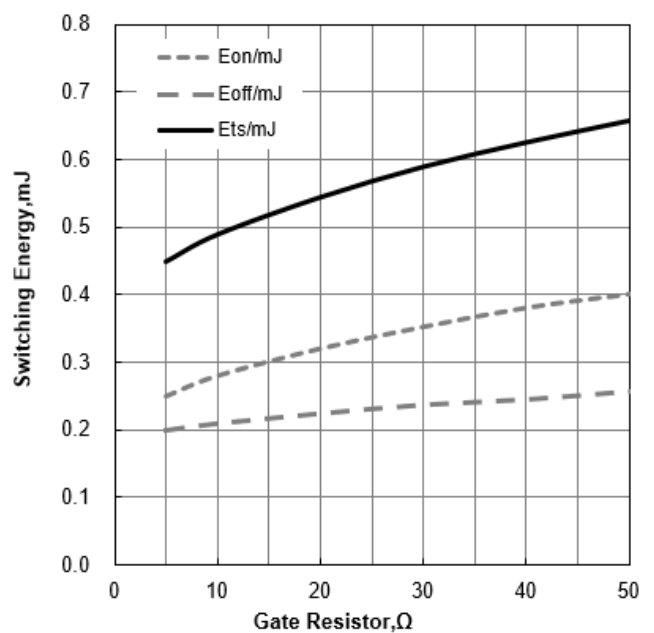


Figure 13. Typical Switching Times vs Junction Temperature ($V_{CE}=400V, V_{GE}=15/0V, I_C=15A$)

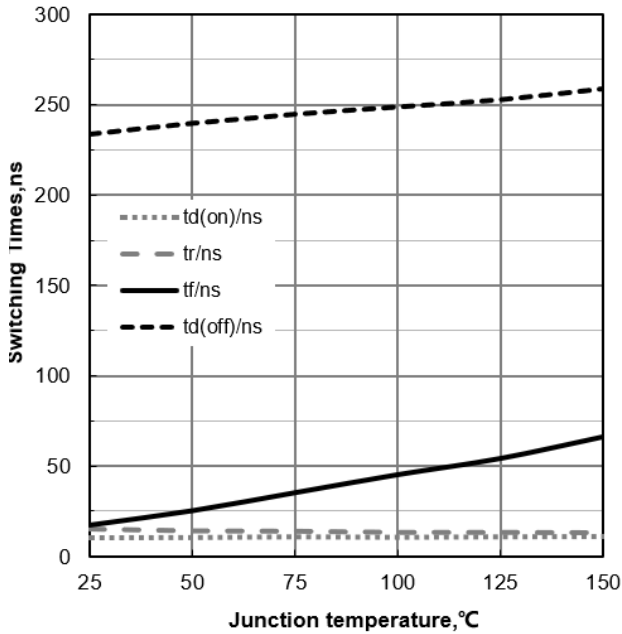


Figure 14. Typical Switching Energy vs Junction Temperature ($V_{CE}=400V, V_{GE}=15/0V, I_C=15A$)

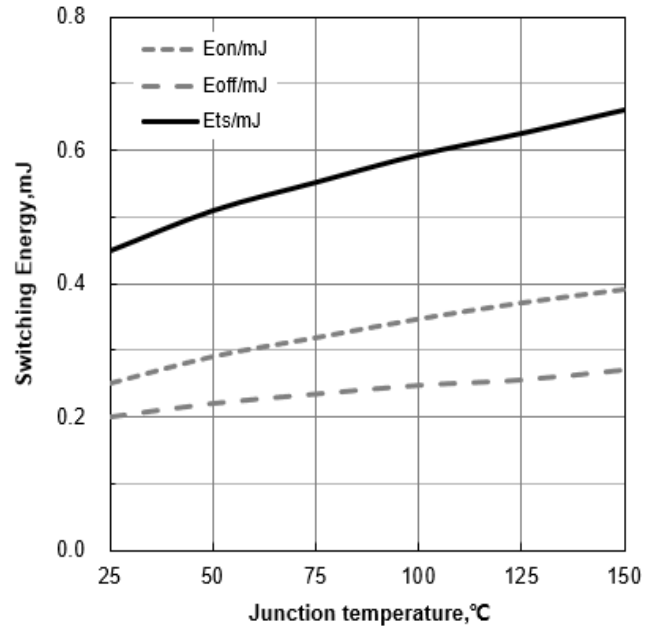


Figure 15. Typical Switching Times vs Collector Current ($T_J=25^\circ C, V_{CE}=400V, V_{GE}=15/0V$)

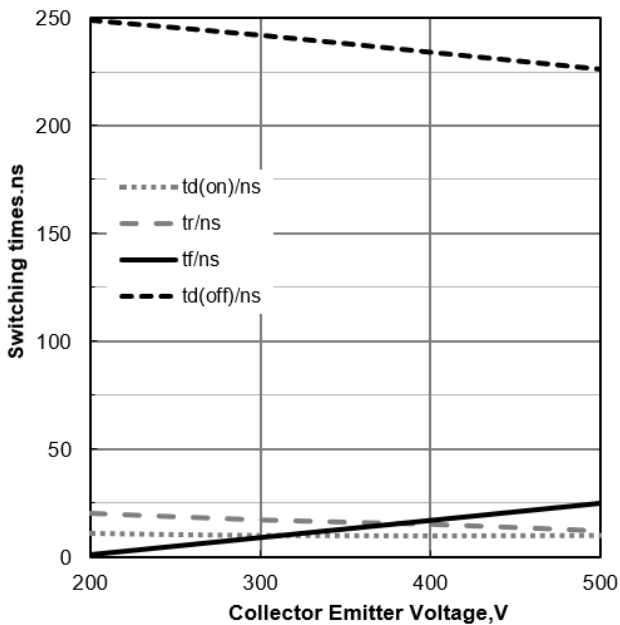


Figure 16. Typical Switching Energy vs Collector Current ($T_J=25^\circ C, V_{CE}=400V, V_{GE}=15/0V$)

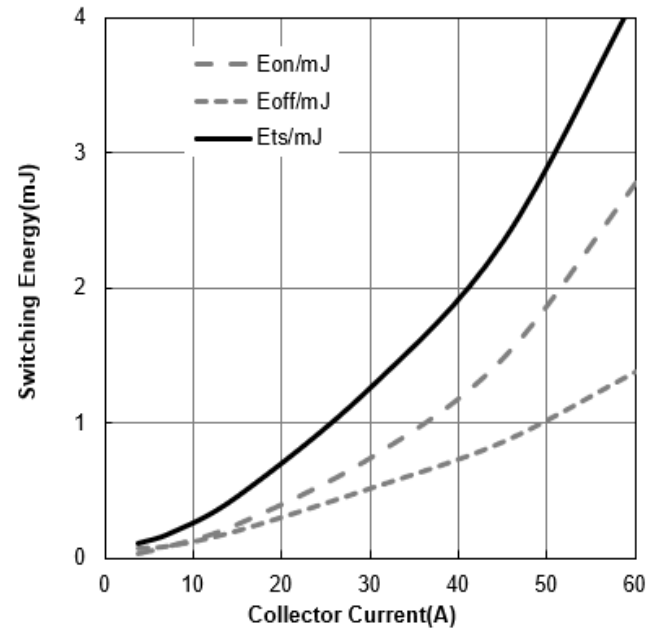


Figure 17. Typical Switching Times vs Collector Emitter Voltage ($T_J=25^{\circ}\text{C}$, $V_{GE}=15/0\text{V}$, $I_C=15\text{A}$)

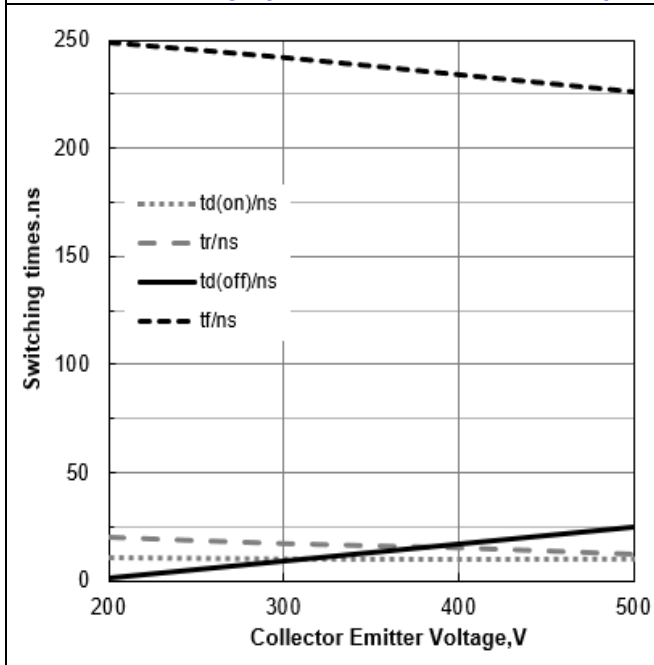


Figure 18. Typical Switching Energy vs Collector Emitter Voltage ($T_J=25^{\circ}\text{C}$, $V_{GE}=15/0\text{V}$, $I_C=15\text{A}$)

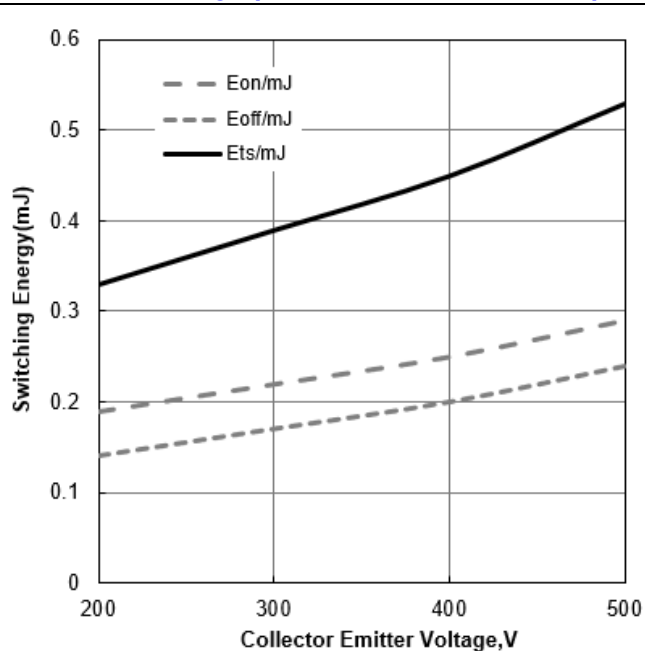


Figure 19. Gate Charge Characteristics

Figure 20. Typical Capacitance vs Collector-Emitter Voltage

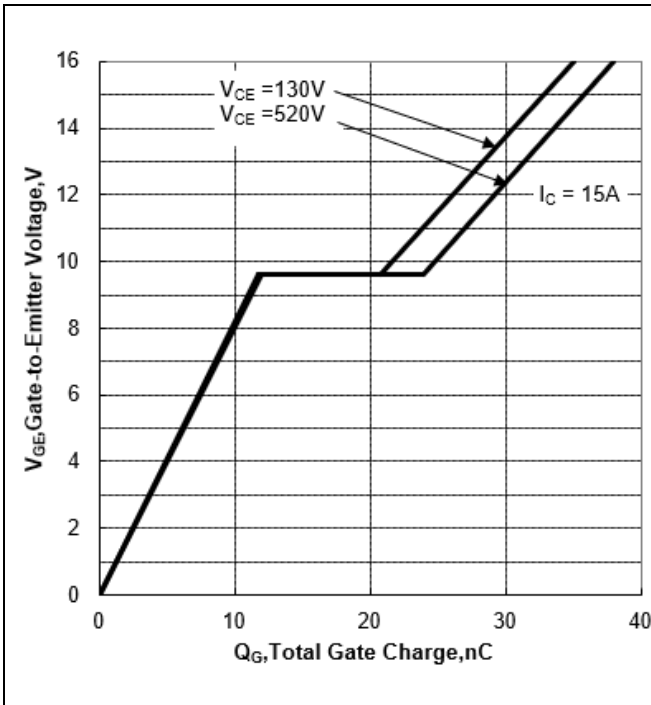


Figure 21. IGBT Transient Thermal Impedance vs Pulse Width for TO263/TO220

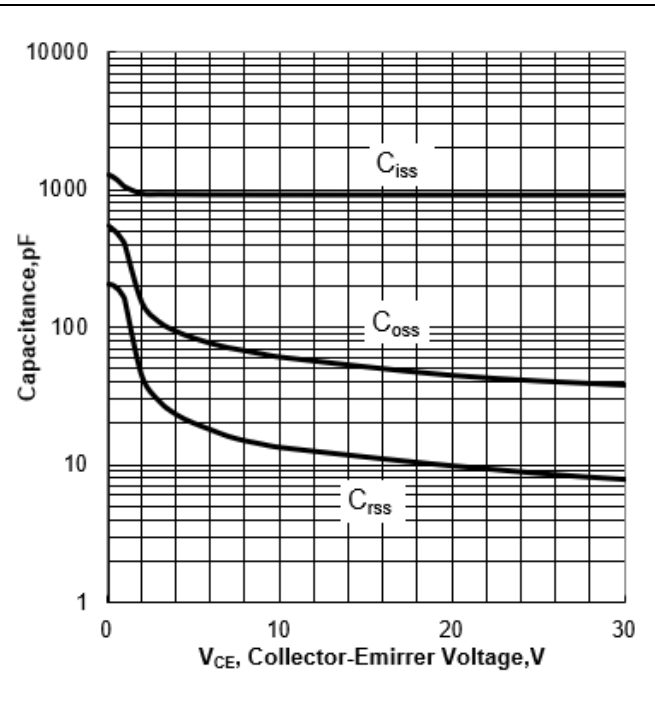


Figure 22. IGBT Transient Thermal Impedance vs Pulse Width for TO220F

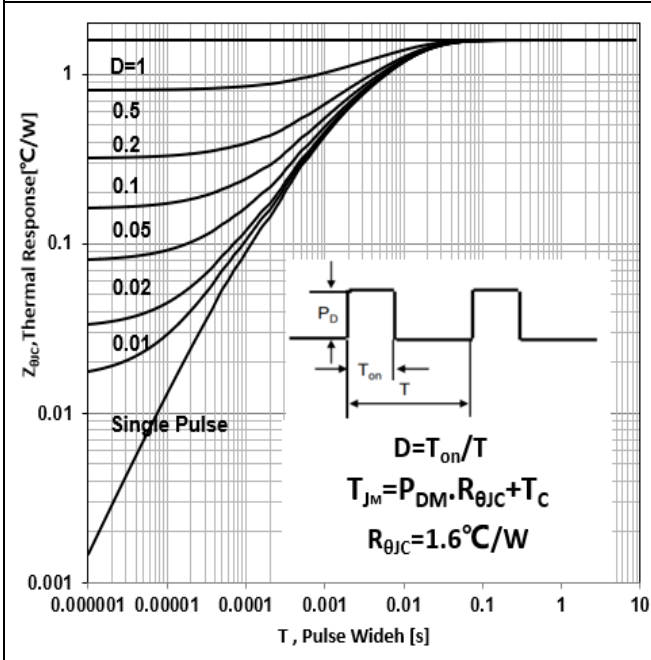


Figure 23. Diode Transient Thermal Impedance vs Pulse Width for TO263/TO220

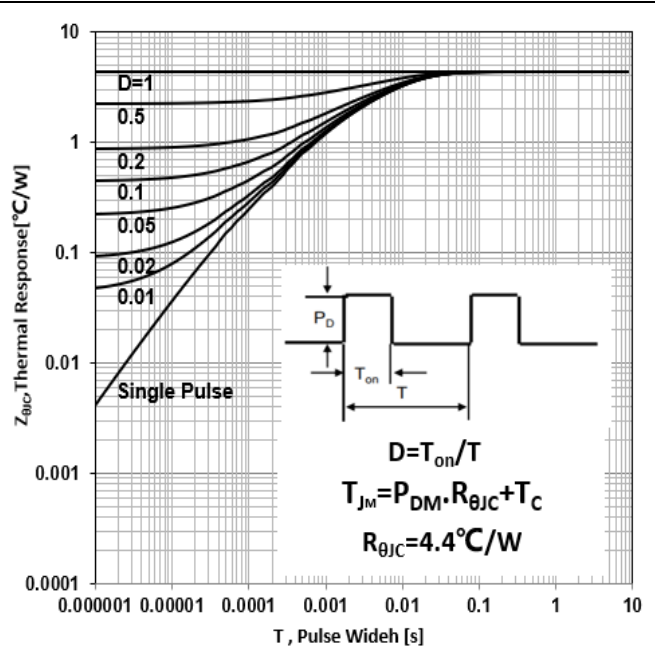


Figure 24. Diode Transient Thermal Impedance vs Pulse Width for TO220F

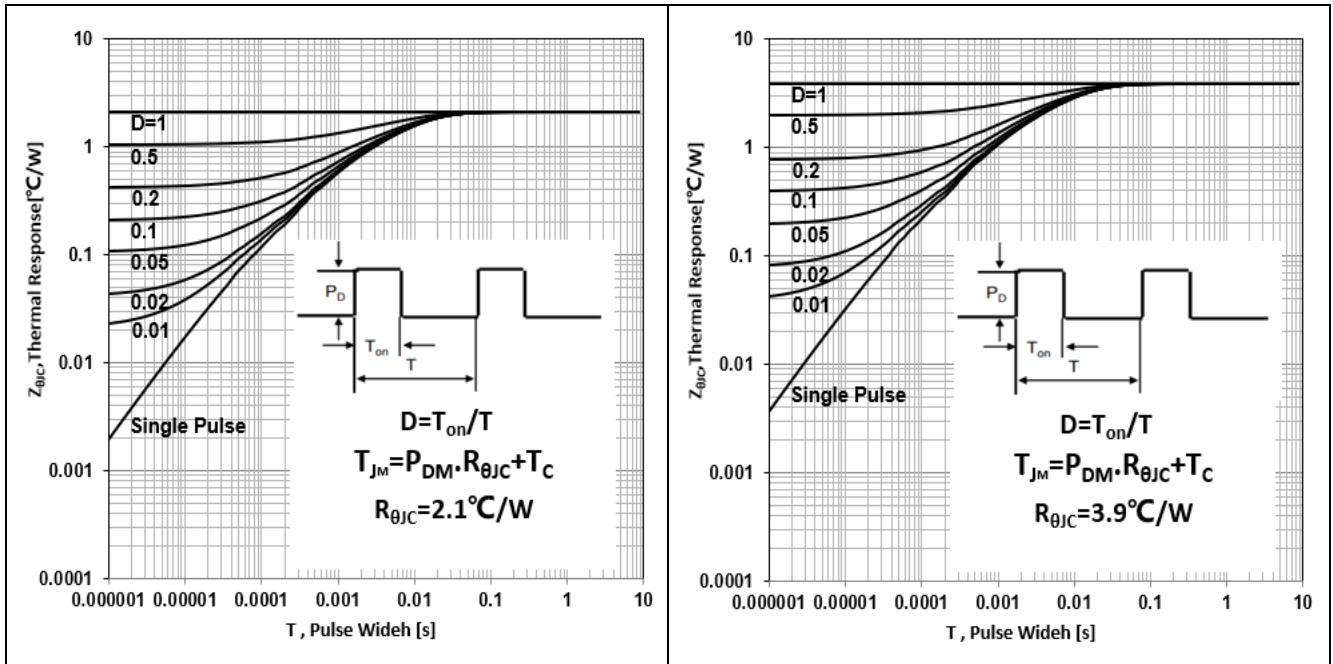
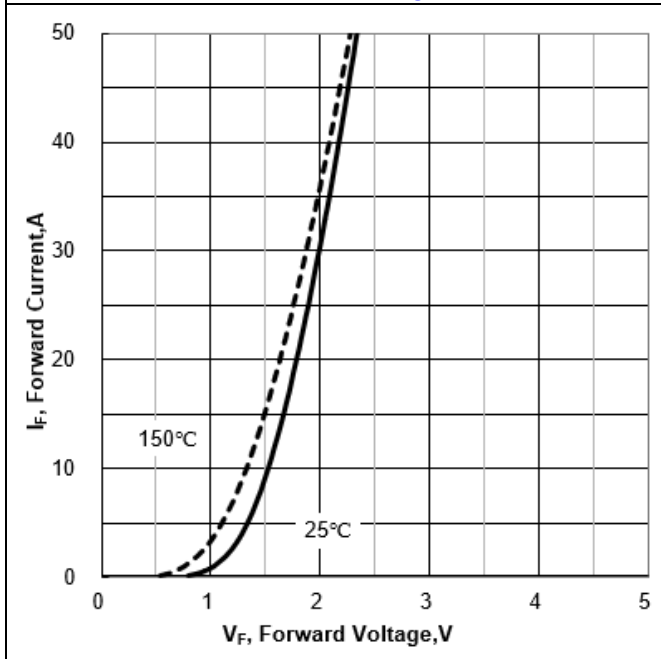


Figure 25. Typical Diode Forward Current vs Forward Voltage



6. Test Circuit and Waveform

Figure 26. Inductive Switching Test Circuit

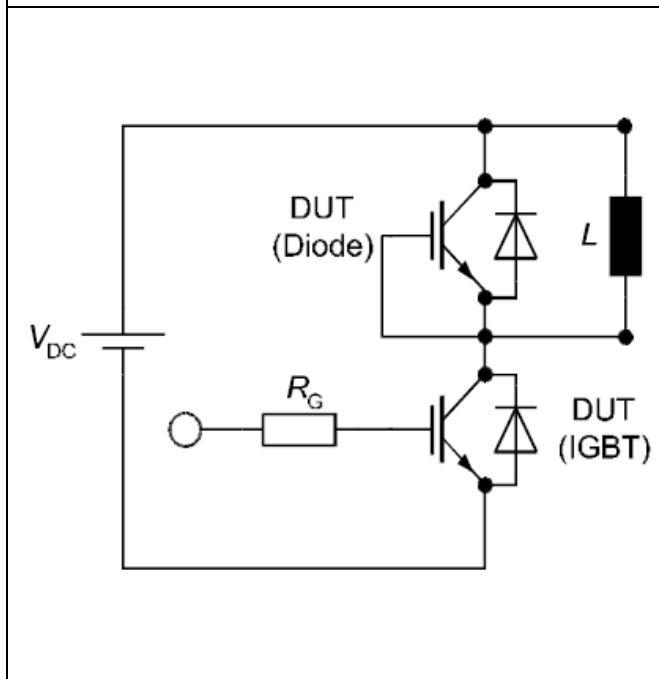


Figure 27. Definition of switching times

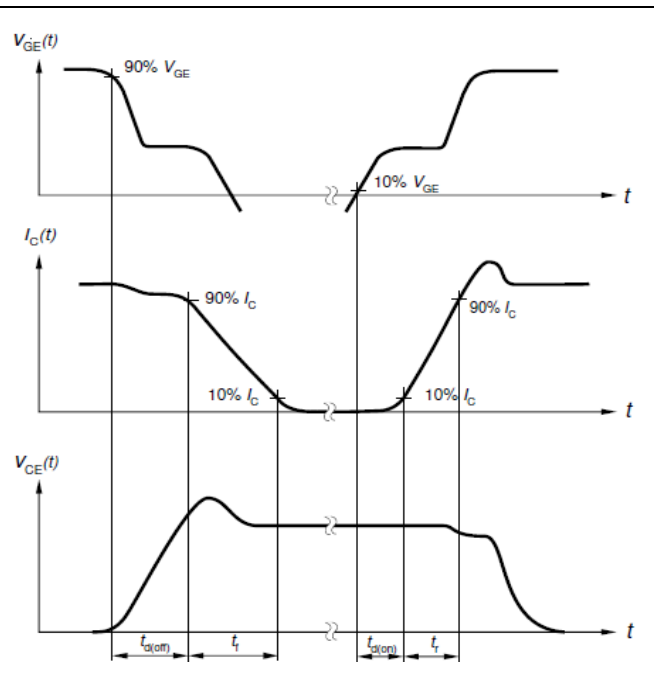


Figure 28. Definition of switching losses

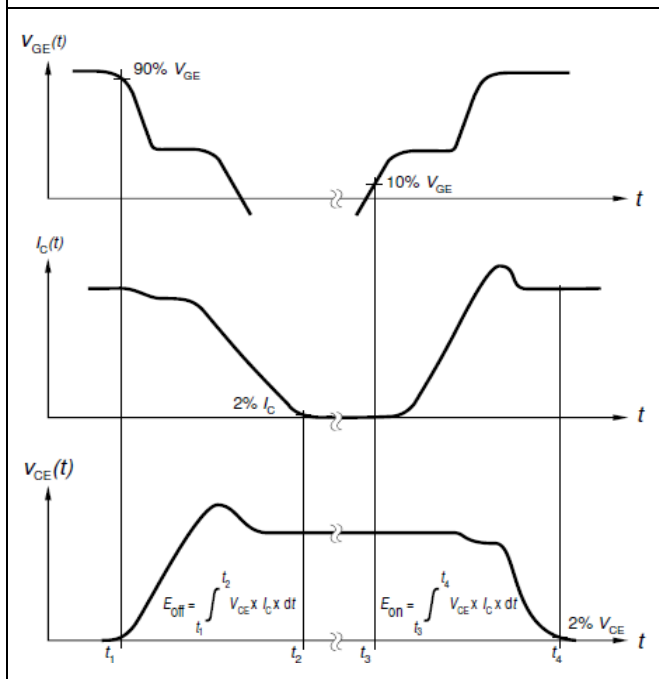
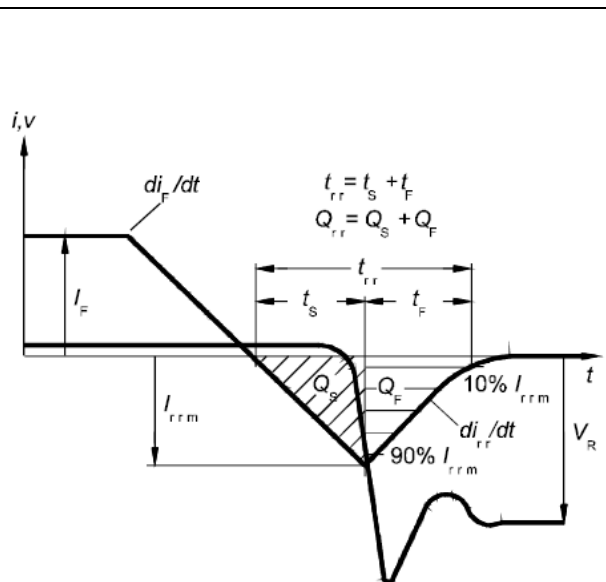
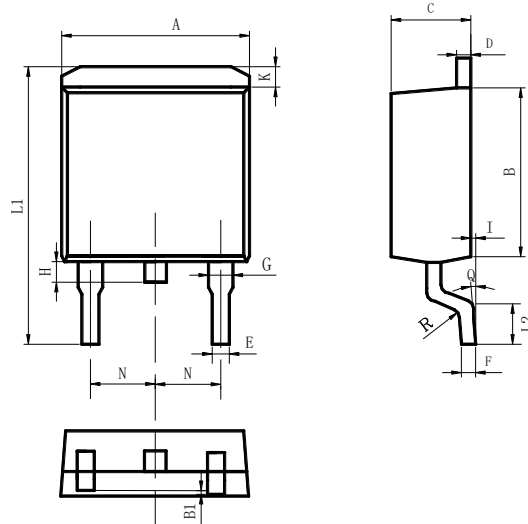


Figure 29. Definition of diode switching characteristics

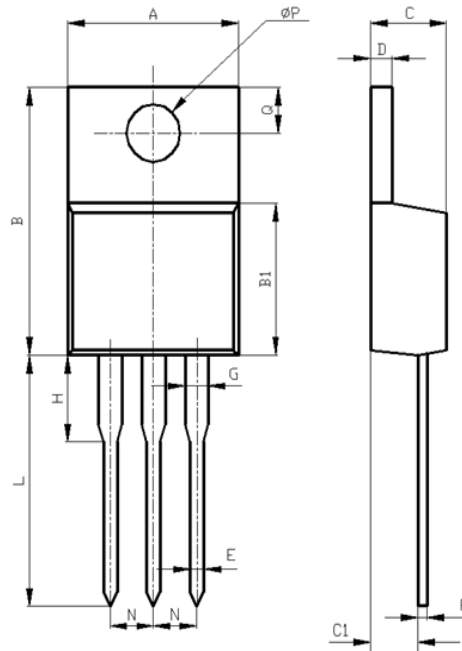


7. Package Description



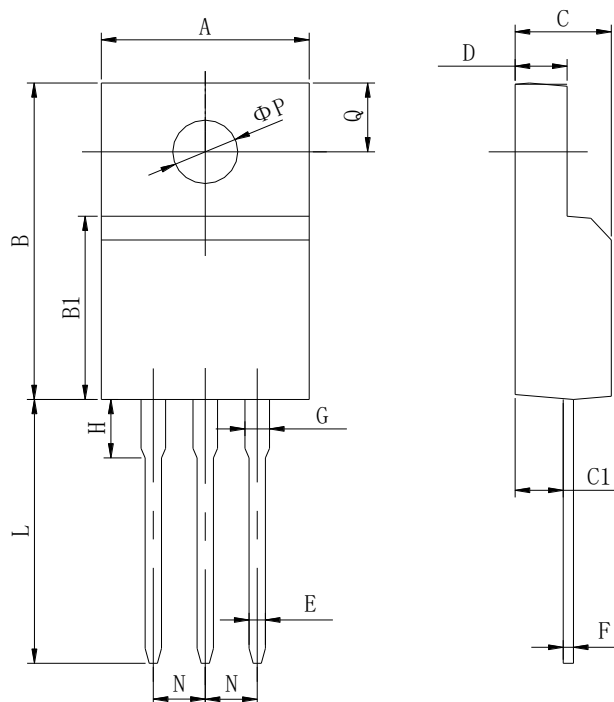
TO-263 Package

Items	Values(mm)	
	MIN	MAX
A	9.80	10.40
B	8.90	9.50
B1	0	0.10
C	4.40	4.80
D	1.16	1.37
E	0.70	0.95
F	0.30	0.60
G	1.07	1.47
H	1.30	1.80
K	0.95	1.37
L1	14.50	16.50
L2	1.60	2.30
I	0	0.2
Q	0°	8°
R	0.4	
N	2.39	2.69



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
Φ P	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
Φ P	2.90	3.30

NOTE:

1. Exceeding the maximum ratings of the device in performance may cause damage to the device, even the permanent failure, which may affect the dependability of the machine. Please do not exceed the absolute maximum ratings of the device when circuit designing.
2. When installing the heat sink, please pay attention to the torsional moment and the smoothness of the heat sink.
3. IGBTs is the device which is sensitive to the static electricity, it is necessary to protect the device from being damaged by the static electricity when using it.
4. Shanghai Belling reserves the right to make changes in this specification sheet and is subject to change without prior notice.

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