

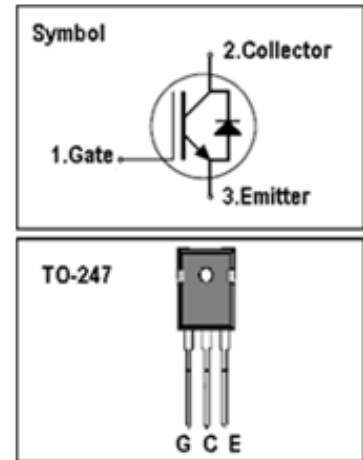
IGBT

Features

- 1200V,40A
- $V_{CE(sat)(typ.)}=1.6V@V_{GE}=15V,I_C=40A$
- High speed switching
- Higher system efficiency
- Soft current turn-off waveforms
- Square RBSOA

General Description

JIAEN Trench IGBTs offer lower losses and higher energy efficiency for application such as Motor control, general inverter and other soft switching applications.



Absolute Maximum Ratings

Symbol	Parameter	Value	Units
V_{CES}	Collector-Emitter Voltage	1200	V
V_{GES}	Gate-Emitter Voltage	± 30	V
I_C	Continuous Collector Current ($T_C=25^\circ C$)	80	A
	Continuous Collector Current ($T_C=100^\circ C$)	40	A
I_{CM}	Pulsed Collector Current (Note 1)	120	A
I_F	Diode Continuous Forward Current ($T_C=100^\circ C$)	40	A
I_{FM}	Diode Maximum Forward Current (Note 1)	120	A
t_{sc}	Short Circuit Withstand Time	10	us
P_D	Maximum Power Dissipation ($T_C=25^\circ C$)	395	W
	Maximum Power Dissipation ($T_C=100^\circ C$)	197	W
T_J	Operating Junction Temperature Range	-55 to +175	$^\circ C$
T_{STG}	Storage Temperature Range	-55 to +175	$^\circ C$

Thermal Characteristics

Symbol	Parameter	Max.	Units
$R_{th\ j-c}$	Thermal Resistance, Junction to case for IGBT	0.38	$^\circ C/W$
$R_{th\ j-c}$	Thermal Resistance, Junction to case for Diode	0.55	$^\circ C/W$
$R_{th\ j-a}$	Thermal Resistance, Junction to Ambient	40	$^\circ C/W$

Electrical Characteristics ($T_C=25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
BV_{CES}	Collector-Emitter Breakdown Voltage	$V_{GE}=0V, I_C=250\mu A$	1200	-	-	V
I_{CES}	Collector-Emitter Leakage Current	$V_{CE}=1200V, V_{GE}=0V$	-	-	100	μA
I_{GES}	Gate Leakage Current, Forward	$V_{GE}=\pm 30V, V_{CE}=0V$	-	-	± 200	nA
$V_{GE(th)}$	Gate Threshold Voltage	$V_{GE}=V_{CE}, I_C=1mA$	5.5	6.29	8.0	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$V_{GE}=15V, I_C=40A$	-	1.6	2.6	V
Q_g	Total Gate Charge	$V_{CC}=600V$ $V_{GE}=15V$ $I_C=40A$	-	164	-	nC
Q_{ge}	Gate-Emitter Charge		-	34.4	-	nC
Q_{gc}	Gate-Collector Charge		-	75	-	nC
$t_{d(on)}$	Turn-on Delay Time	$V_{CC}=600V$ $V_{GE}=15V$ $I_C=40A$ $R_G=4\Omega$ Inductive Load $T_C=25^\circ\text{C}$	-	30	-	ns
t_r	Turn-on Rise Time		-	20	-	ns
$t_{d(off)}$	Turn-off Delay Time		-	163	-	ns
t_f	Turn-off Fall Time		-	119	-	ns
E_{on}	Turn-on Switching Loss		-	2.3	-	mJ
E_{off}	Turn-off Switching Loss		-	2.1	-	mJ
E_{ts}	Total Switching Loss	-	4.4	-	mJ	
C_{ies}	Input Capacitance	$V_{CE}=25V$	-	3780	-	pF
C_{oes}	Output Capacitance	$V_{GE}=0V$	-	120	-	pF
C_{res}	Reverse Transfer Capacitance	$f=1MHz$	-	29	-	pF

Electrical Characteristics of Diode ($T_C=25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
V_F	Diode Forward Voltage	$I_F=40A$	-	1.9	3.2	V
t_{rr}	Diode Reverse Recovery Time	$V_{CE}=600V$	-	322		ns
I_{rr}	Diode peak Reverse Recovery Current	$I_F=40A$	-	6.9		A
Q_{rr}	Diode Reverse Recovery Charge	$dI_F/dt=200A/\mu s$	-	1300		nC

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature

Typical Performance Characteristics

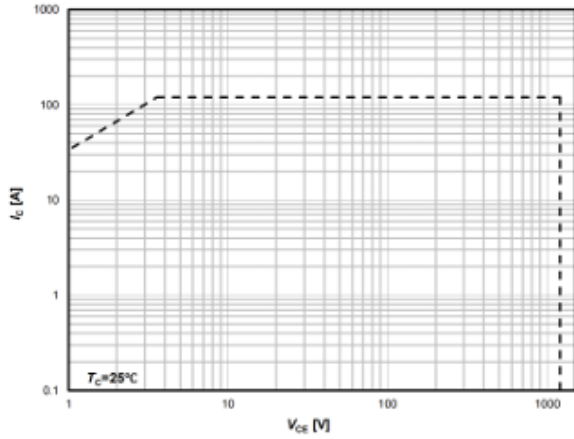


Figure 1. Forward bias safe operating area

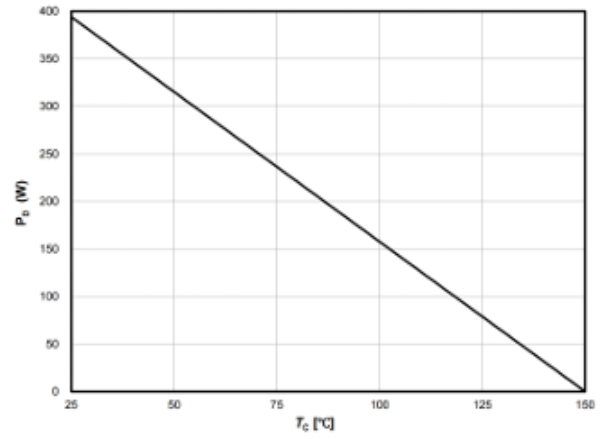


Figure 2. Power dissipation as a function of case temperature

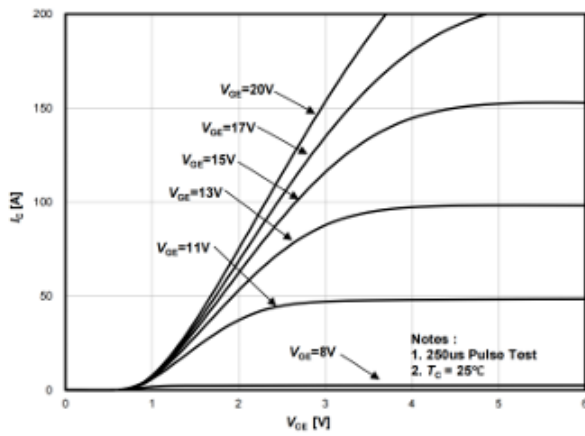


Figure 3. Typical output characteristic(25°C)

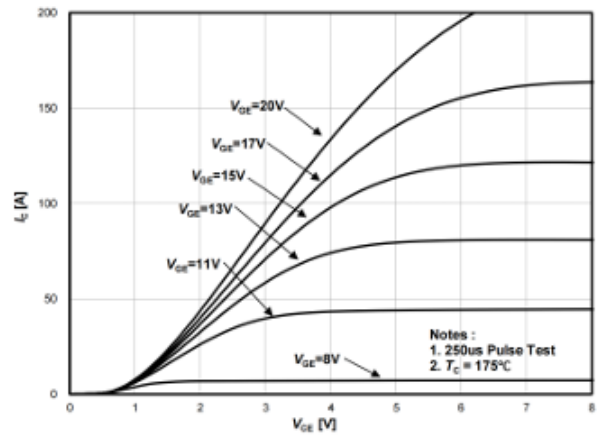
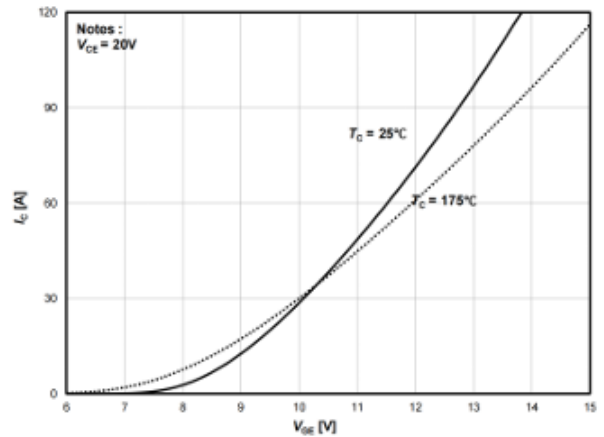
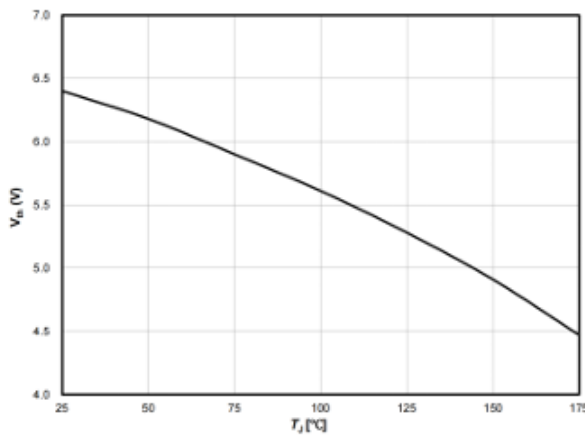


Figure 4. Typical output characteristic(175°C)



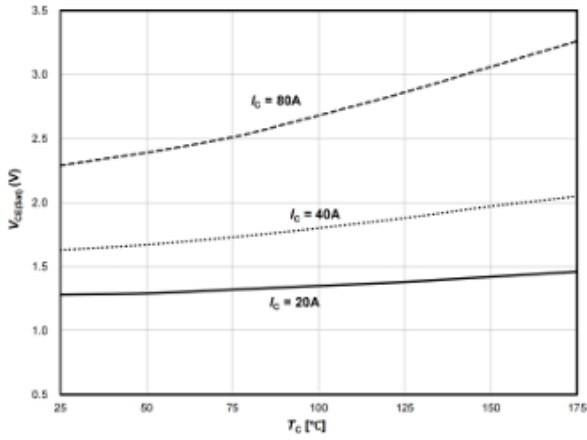


Figure 7. Typical collector-emitter saturation voltage as a function of junction temperature

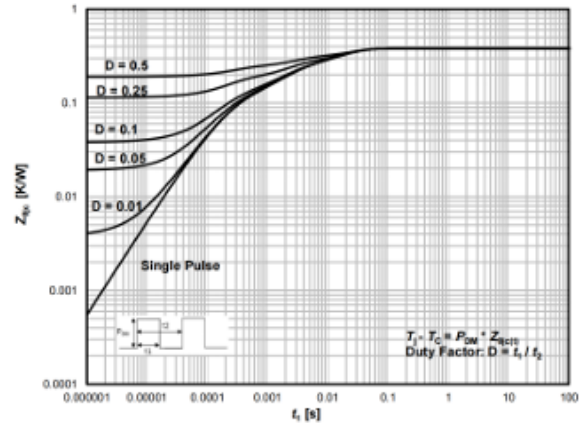


Figure 8. IGBT transient thermal impedance

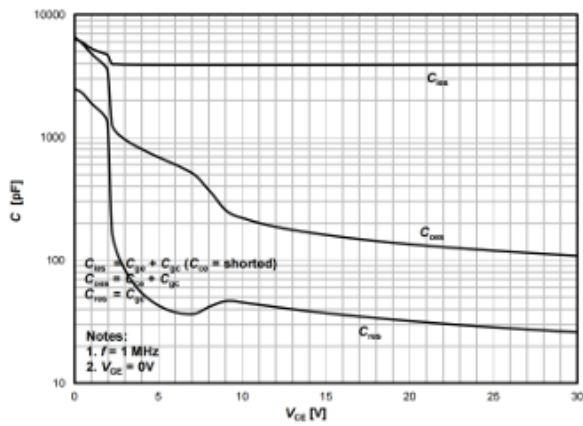


Figure 9. Typical capacitance as a function of collector-emitter voltage

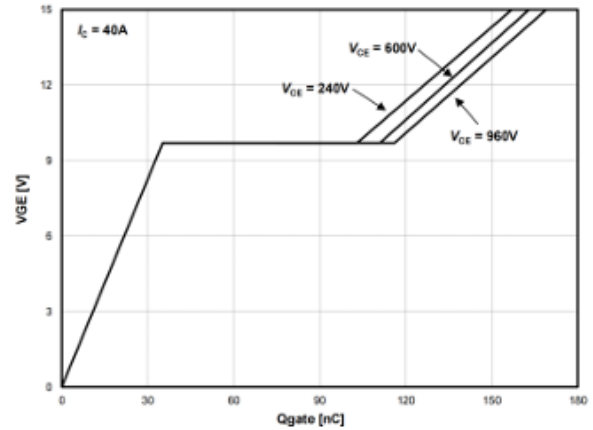


Figure 10. Typical gate charge

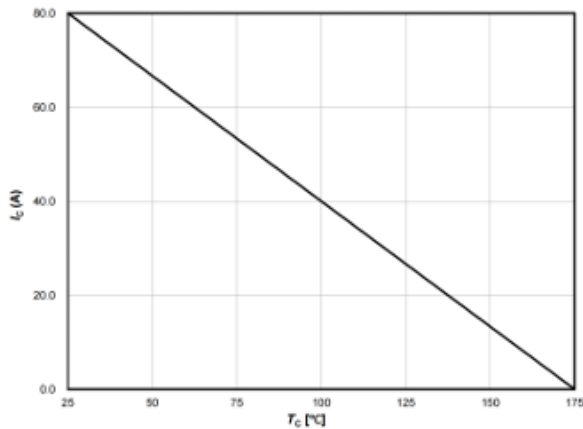


Figure 11. Collector current as a function of case temperature

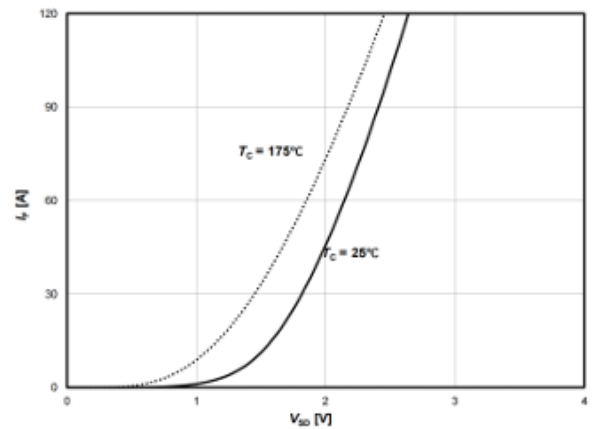


Figure 12. Typical diode forward current as a function of forward voltage

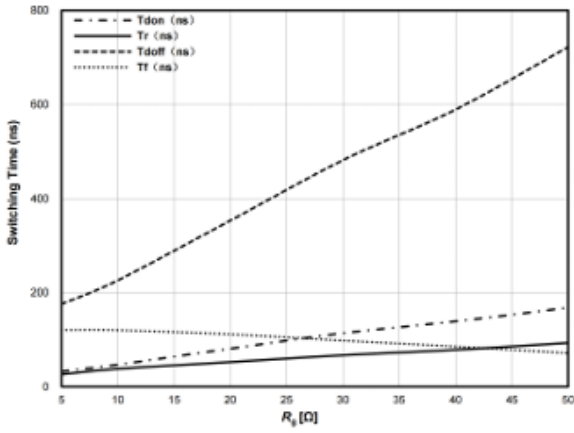


Figure 13. Typical switching times as a function of gate resistance

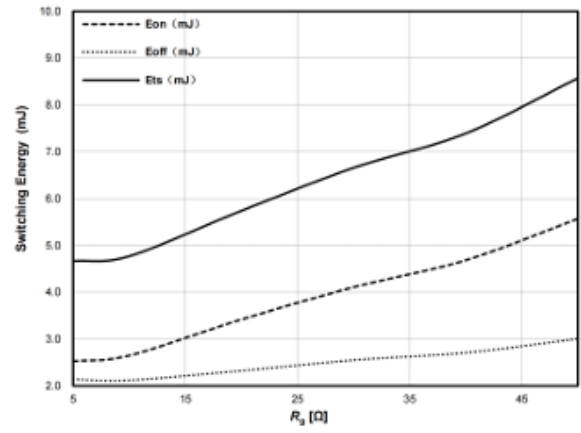


Figure 14. Typical switching energy losses as a function of gate resistance

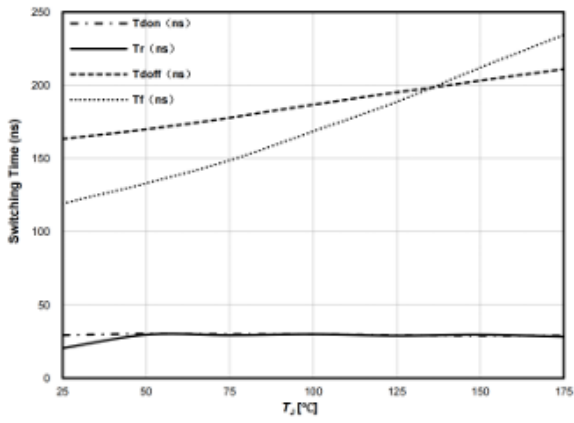


Figure 15. Typical switching times as a function of junction temperature

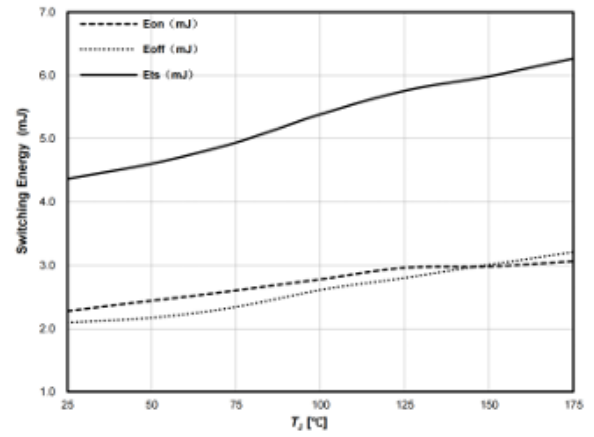


Figure 16. Typical switching energy losses as a function of junction temperature

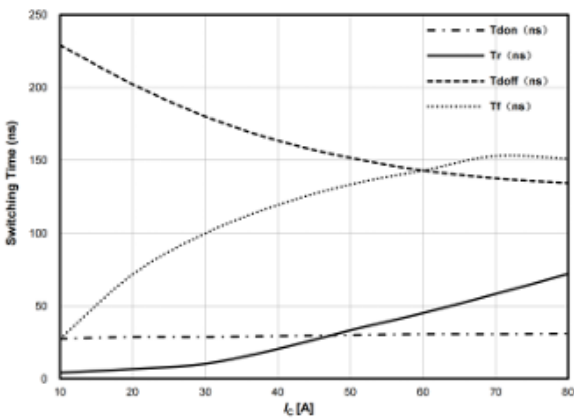


Figure 17. Typical switching times as a function of collector current

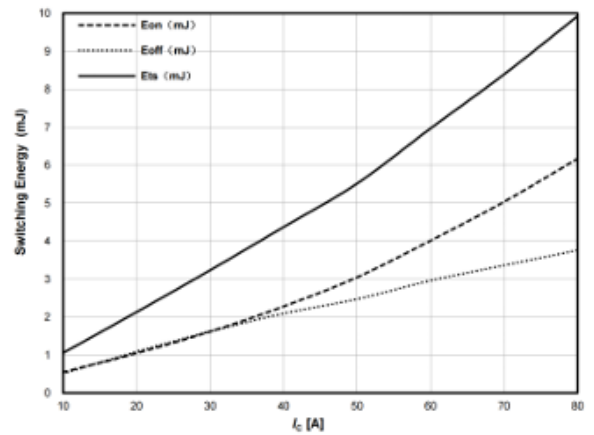


Figure 18. Typical switching energy losses as a function of collector current

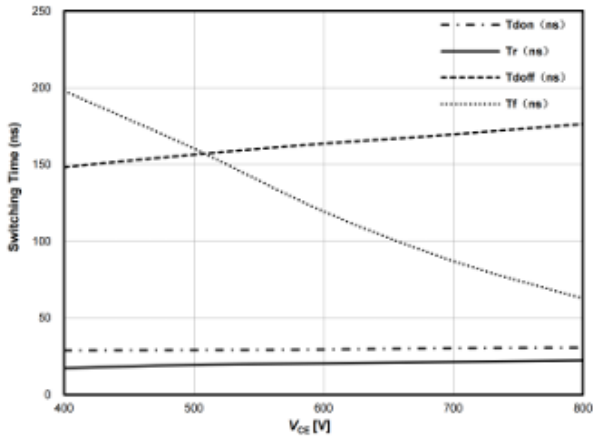


Figure 19. Typical switching times as a function of collector emitter voltage

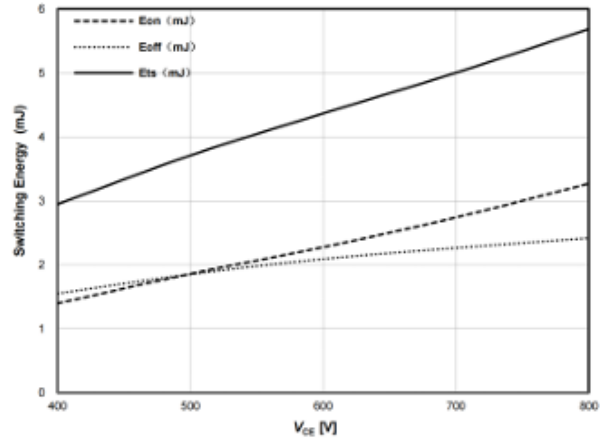
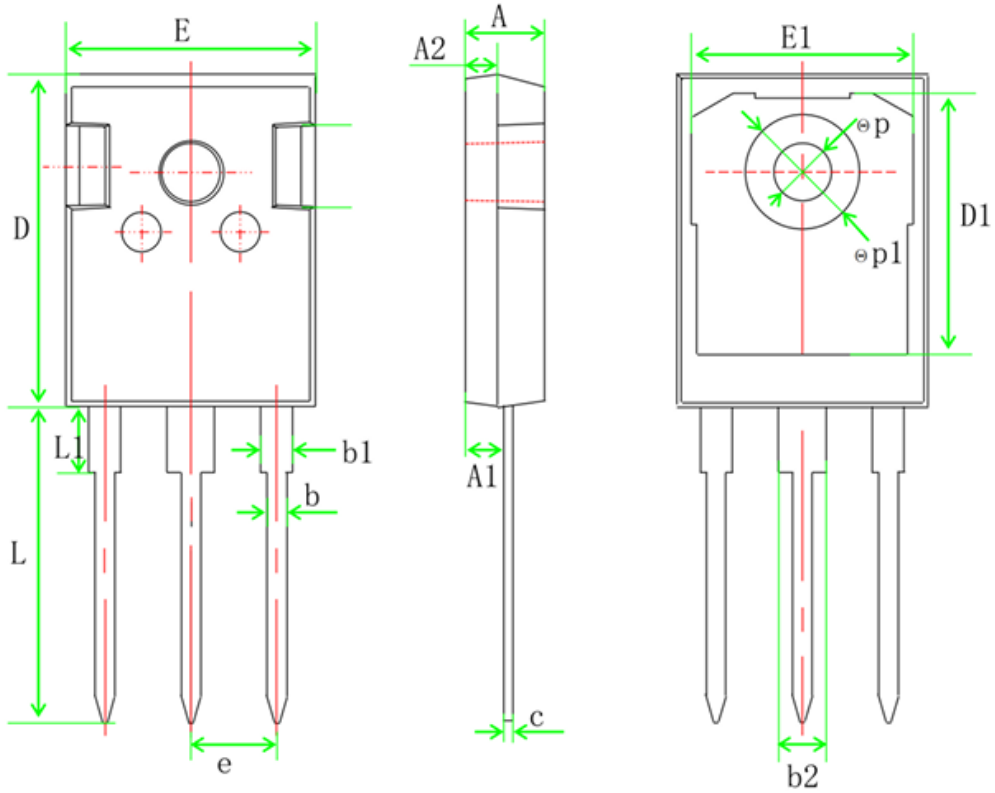


Figure 20. Typical switching energy losses as a function of collector emitter voltage

TO-247 PACKAGE OUTLINE



SYMBOL	Mechanical Dimensions/mm			SYMBOL	Mechanical Dimensions/mm		
	MIN	NOM	MAX		MIN	NOM	MAX
A	4.80	5.00	5.20	D	20.70	21.00	21.30
A1	2.21	2.41	2.61	D1	16.25	16.55	16.85
A2	1.85	2.00	2.15	E	15.50	15.80	16.10
b	1.10	1.20	1.36	E1	13.00	13.30	13.60
b1	1.90	2.00	2.21	L	19.42	19.92	20.42
b2	2.85	3.00	3.21	L1	4.03	4.13	4.43
c	0.45	0.60	0.75	$\varnothing p$	3.45	3.60	3.75
e	5.29	5.44	5.59	$\varnothing p1$			7.4

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