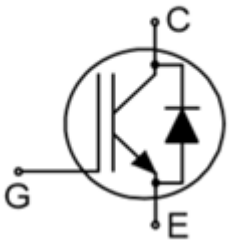
Trench Field-Stop Technology IGBT



Features

- 1200V, 50A
- $V_{CE(sat)(typ.)}$ =2.0V@V_{GE}=15V, I_C=50A
- Low Switching Losses
- $V_{CE(sat)}$ with Positive Temperature Coefficient
- Pb-free Lead Plating; RoHS Compliant

Applications

- Frequency Converters
- Uninterrupted Power Supply
- Air Conditioning
- Motor Drives

Order codes	V_{CE}	I_C	V_{CEsat}, T_{vj}=25℃	T_{vjmax}	Marking	Package
XD050H120BM1S3	1200V	50A	2.0V	175℃	D50H120BM1	TO247

Absolute Maximum Ratings

Symbol	Parameter	Value	Unit
V_{CES}	Collector-Emitter Voltage	1200	V
V_{GES}	Gate-Emitter Voltage	±20	V
I_C	Continuous Collector Current (T_C=25℃)	100	A
	Continuous Collector Current (T_C=100℃)	50	A
I_{CM}	Pulsed Collector Current (Note 1)	150	A
I_F	Diode Continuous Forward Current (T_C=100℃)	50	A
I_{FM}	Diode Maximum Forward Current (Note 1)	150	A
t_{sc}	Short Circuit Withstand Time	10	us
P_D	Maximum Power Dissipation (T_C=25℃)	333	W
	Maximum Power Dissipation (T_C=100℃)	166	W
T_J	Operating Junction Temperature Range	-40 to 175	℃
T_{STG}	Storage Temperature Range	-55 to 150	℃

Thermal Data

Symbol	Parameter	Max.	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case for IGBT	0.45	℃/W
$R_{\theta JCD}$	Thermal Resistance, Junction to Case for Diode	0.56	℃/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	32	℃/W

Electrical Characteristics (T_C=25℃ unless otherwise noted)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV_{CES}	Collector-Emitter Breakdown Voltage	V_{GE}=0V, I_C=1mA	1200	---	---	V
I_{CES}	Collector-Emitter Leakage Current	V_{CE}=1200V, V_{GE}=0V	---	---	1	mA
I_{GES}	Gate Leakage Current, Forward	V_{GE}=20V, V_{CE}=0V	---	---	400	nA
	Gate Leakage Current, Reverse	V_{GE}=-20V, V_{CE}=0V	---	---	-400	nA
$V_{GE(th)}$	Gate Threshold Voltage	V_{GE}=V_{CE}, I_C=1mA	5.2	---	6.8	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	V_{GE}=15V, I_C=50A	---	2.0	2.3	V
Q_G	Total Gate Charge	V_{CC}=960V V_{GE}=15V I_C=50A	---	196	---	nC
Q_{GE}	Gate-Emitter Charge		---	63	---	nC
Q_{GC}	Gate-Collector Charge		---	78	---	nC
$t_{d(on)}$	Turn-on Delay Time	V_{CC}=600V V_{GE}=±15V I_C=50A R_G=10Ω Inductive Load T_C=25℃	---	51	---	ns
t_r	Turn-on Rise Time		---	89	---	ns
$t_{d(off)}$	Turn-off Delay Time		---	181	---	ns
t_f	Turn-off Fall Time		---	140	---	ns
E_{on}	Turn-on Switching Loss		---	2.29	---	mJ
E_{off}	Turn-off Switching Loss		---	2.28	---	mJ
E_{ts}	Total Switching Loss		---	4.57	---	mJ
C_{ies}	Input Capacitance	V_{CE}=1000V V_{GE}=0V f =1MHz	---	5496	---	pF
C_{oes}	Output Capacitance		---	230	---	pF
C_{res}	Reverse Transfer Capacitance		---	52	---	pF

Diode Characteristics (T_C=25℃ unless otherwise noted)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_F	Diode Forward Voltage	I_F=50A	---	2.0	2.6	V
t_{rr}	Diode Reverse Recovery Time	V_{CE}=600V I_F=50A dI_F/dt=450A/us	---	308.7	---	ns
I_{rr}	Diode Peak Reverse Recovery Current		---	15.2	---	A
Q_{rr}	Diode Reverse Recovery Charge		---	2770	---	nC

Note 1：Repetitive Rating, Pulse width limited by maximum junction temperature

Typical Characteristics

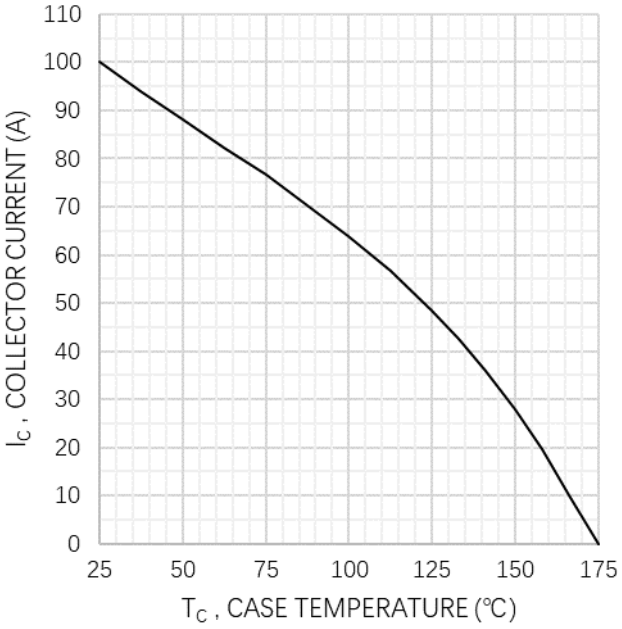


Fig. 1 Maximum DC Collector Current vs. Case Temperature

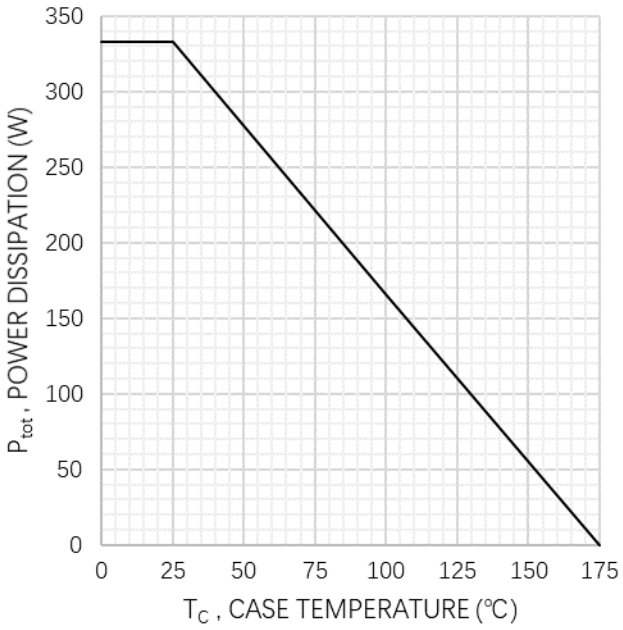


Fig. 2 Power Dissipation vs. Case Temperature

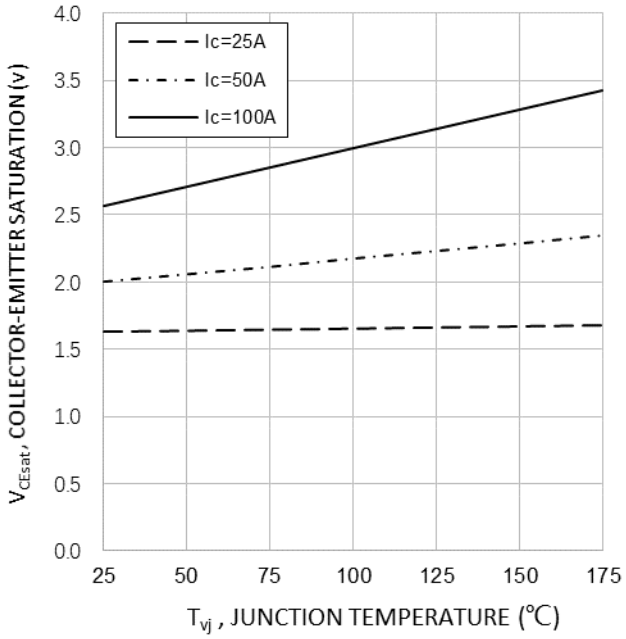


Fig. 3 Typical Collector-Emitter Saturation Voltage vs. Junction Temperature (V_{GE}=15V)

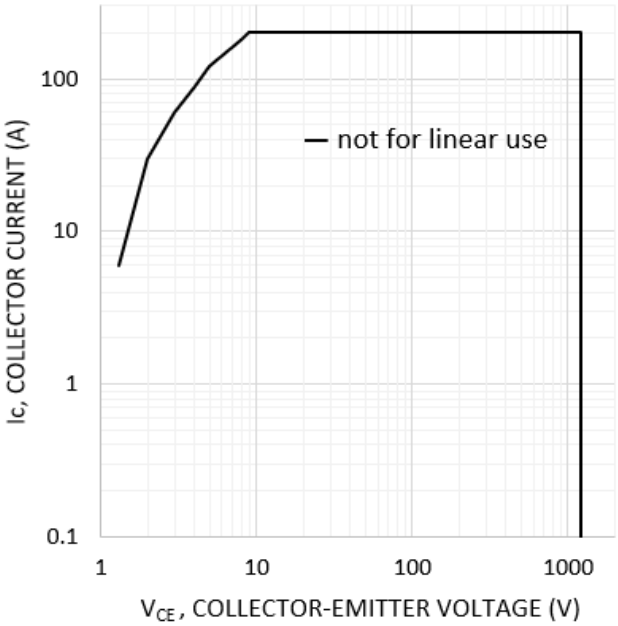


Fig. 4 Safe Operating Area at T_C=25℃ and T_J≤ 175℃

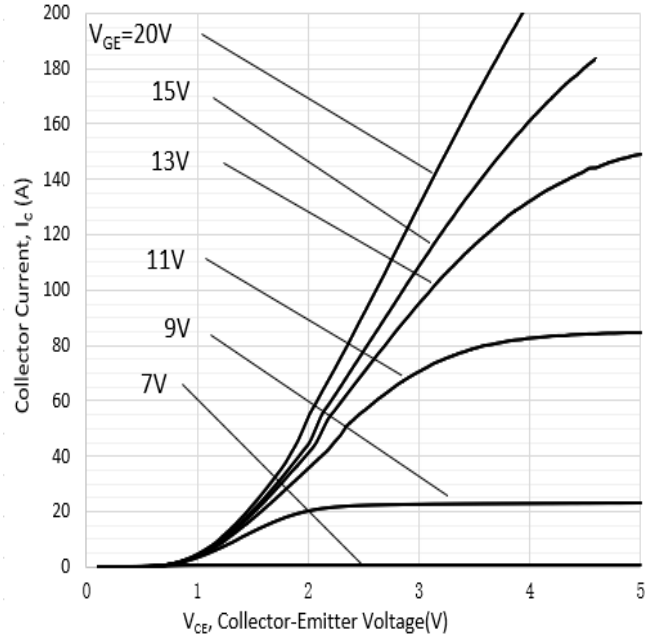


Fig. 5 Typical IGBT Output Characteristics at T_J=25℃

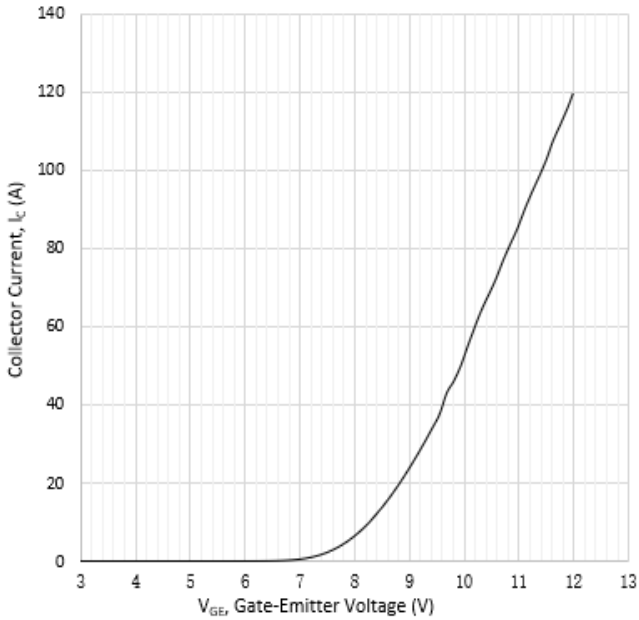


Fig. 6 Typical Transfer Characteristics at V_{CE}=20V

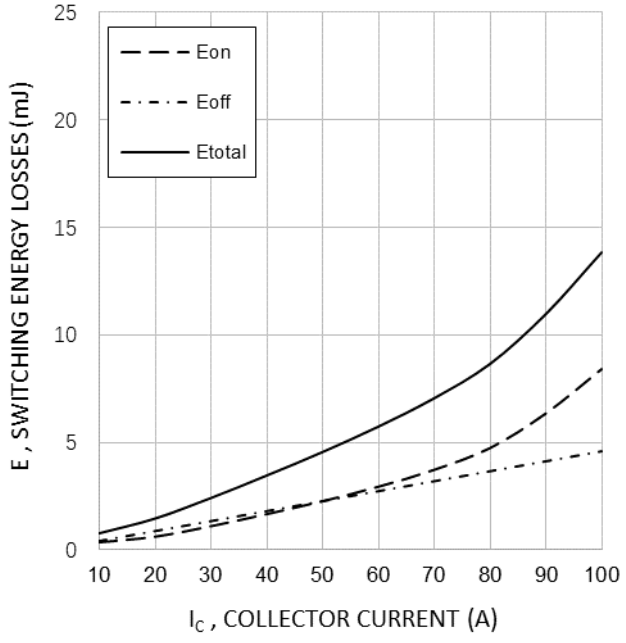


Fig. 7 Typical Energy Loss vs. I_C at T_C=25℃, V_{CE}=600V, V_{GE}=±15V and Rg=10Ω

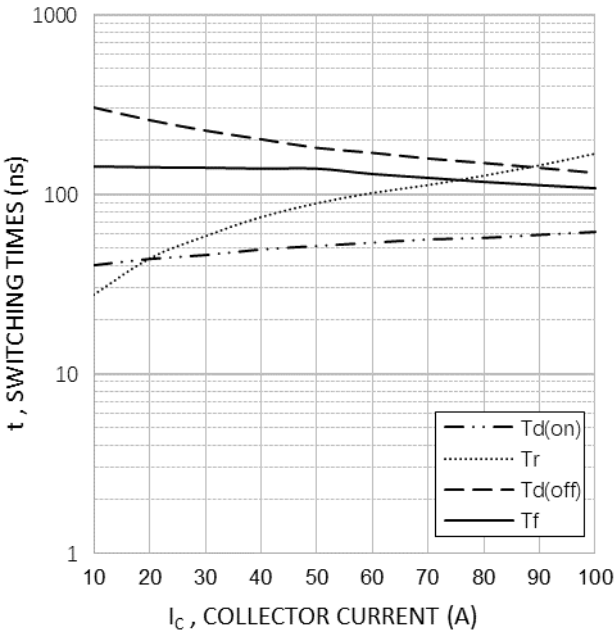


Fig. 8 Typical Switching Time vs. I_C at T_C=25℃, V_{CE}=600V, V_{GE}=±15V and Rg=10Ω

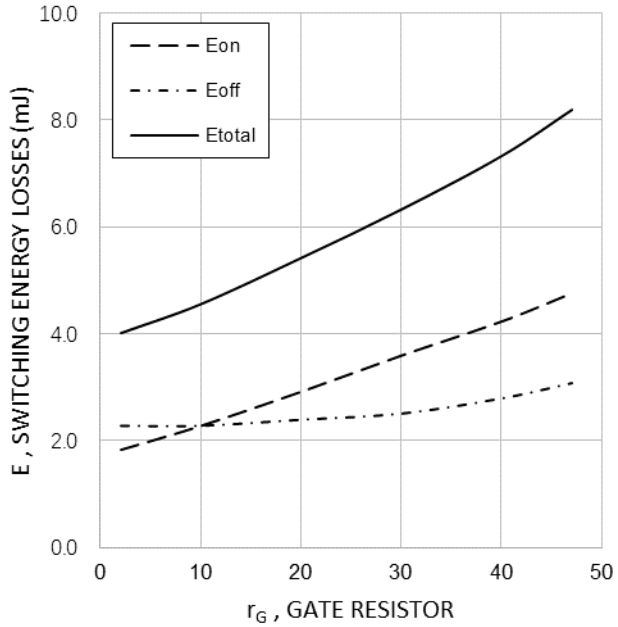


Fig. 9 Typical Energy Loss vs. Rg at T_C=25℃, V_{CE}=600V, V_{GE}=15V, I_C=50A

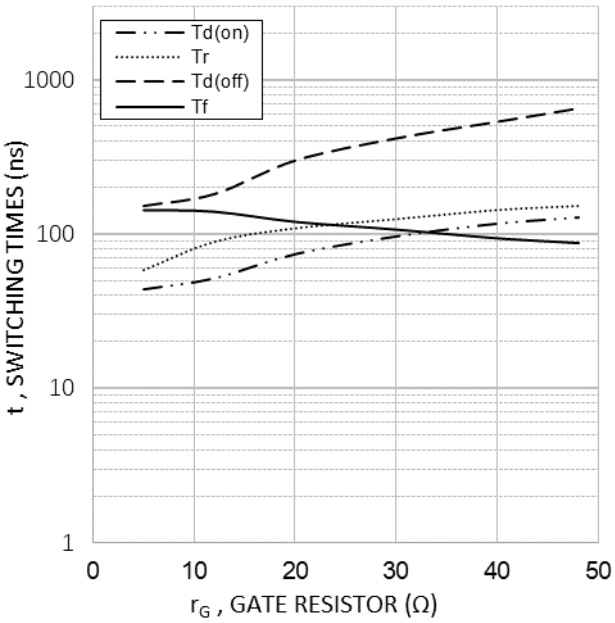


Fig. 10 Typical Switching Time vs. Rg at T_C=25℃, V_{CE}=600V, V_{GE}=15V, I_C=50A

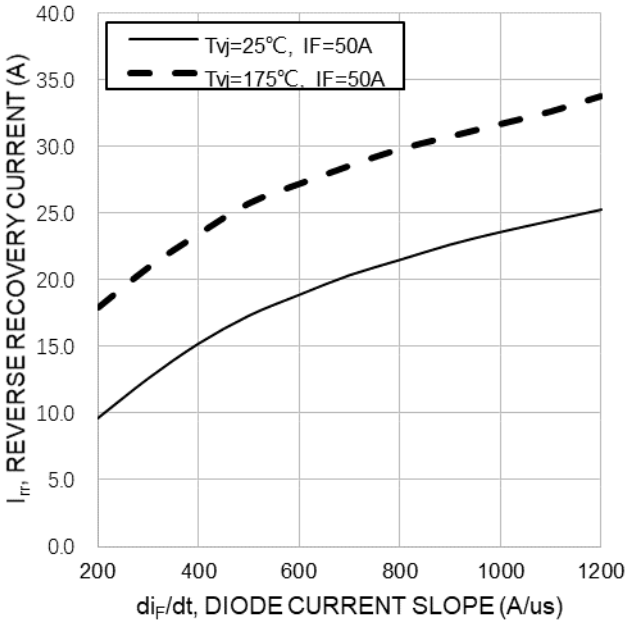


Fig. 11 Typical Diode Irr vs. dI_F/dt at V_{CC}=600V and V_F=50A

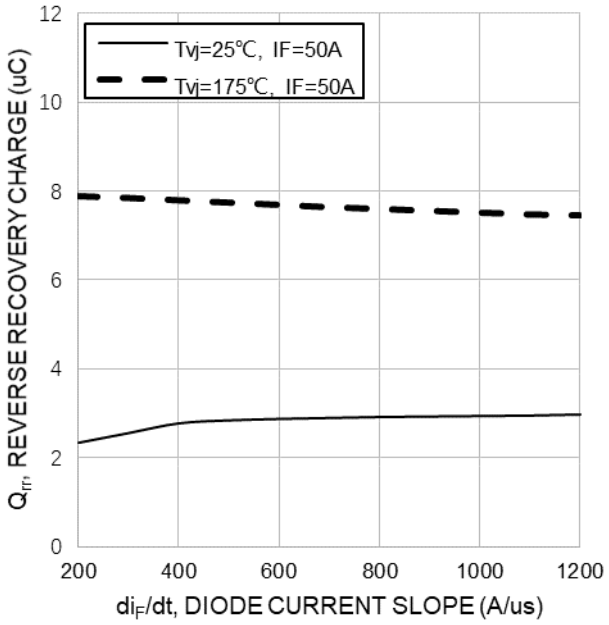


Fig. 12 Typical Diode Qrr vs. dI_F/dt at V_{CC}=600V and V_F=50A

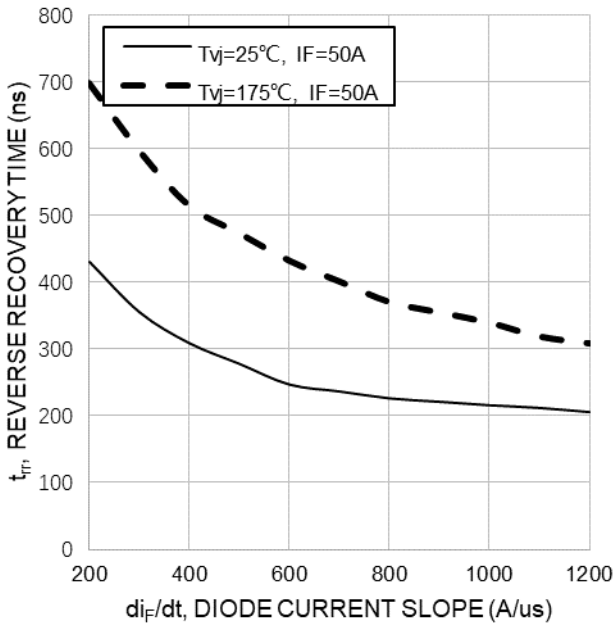


Fig. 13 Typical Diode t_{rr} vs. dI_F/dt at V_{CC}=600V and V_F=50A

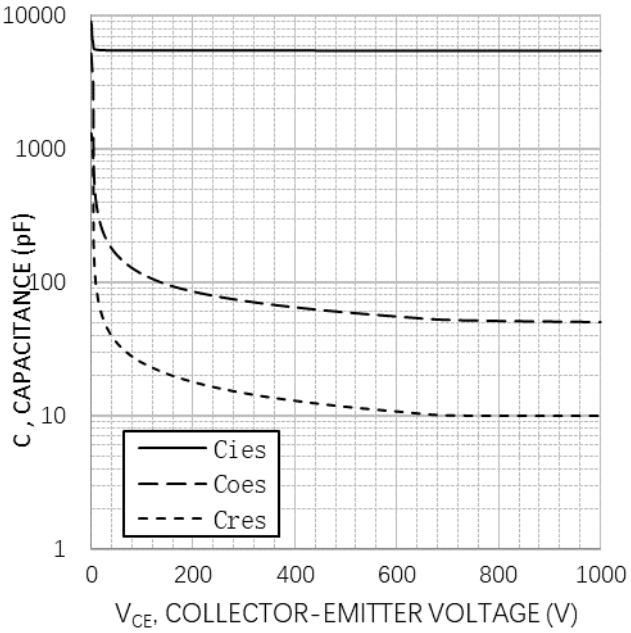


Fig. 14 Typical Capacitance vs. V_{CE} at V_{GE}=0V and f=1MHz

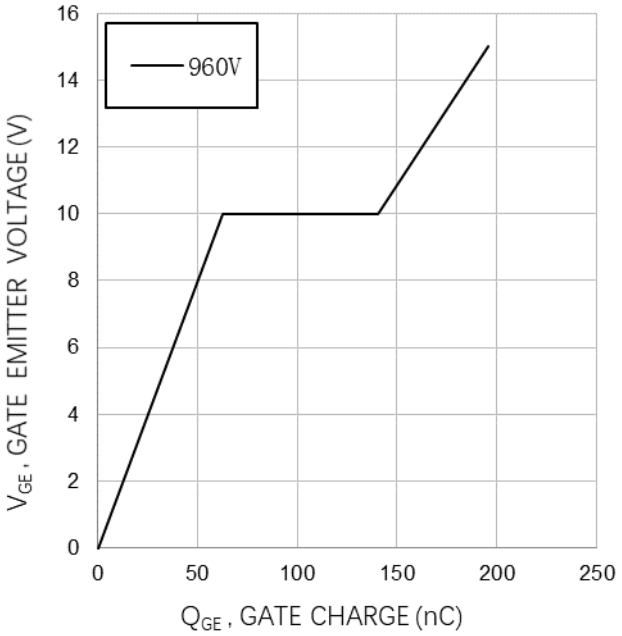


Fig. 15 Typical Gate Charge vs. V_{GE} at I_C=50A

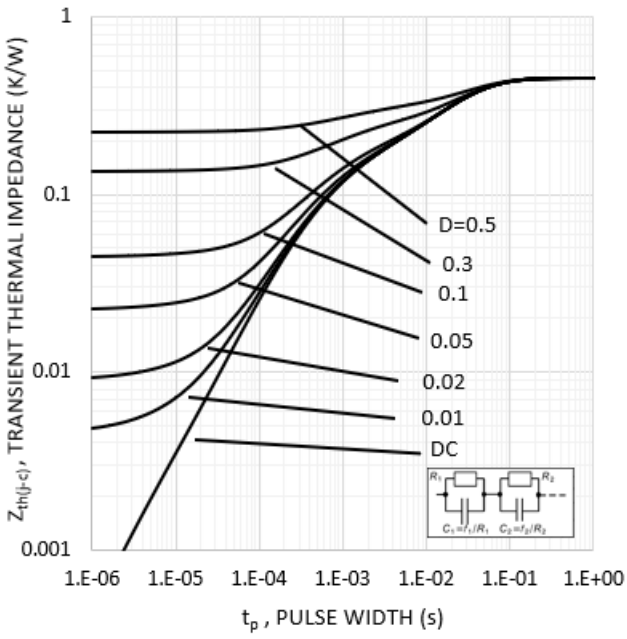
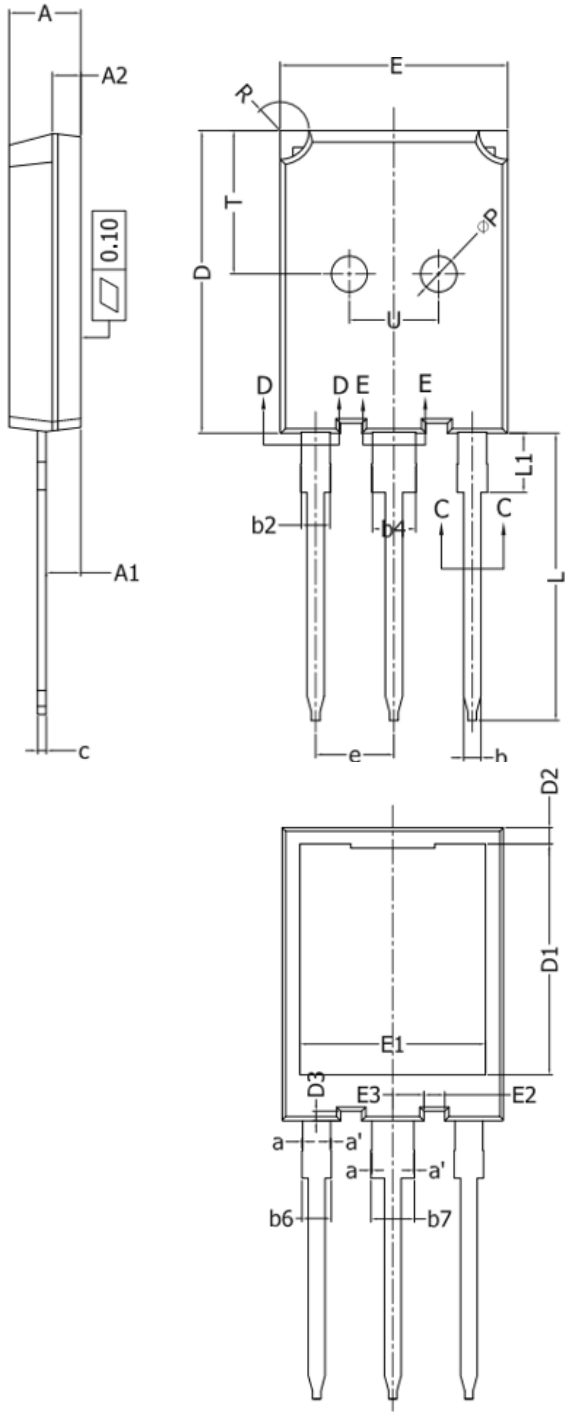


Fig. 16 IGBT Transient Thermal Resistance ($D=t_p / T$)

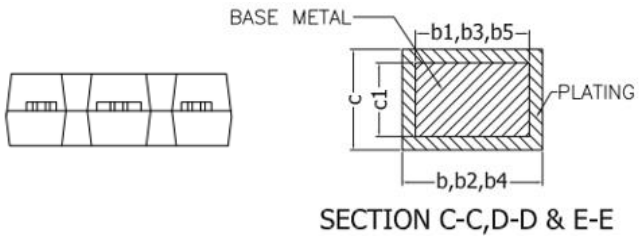
Package Information

TO-247-PLUS



COMMON DIMENSIONS
(UNITS OF MEASURE =MILLIMETER)

SYMBOL	MIN	NOM	MAX
A	4.90	5.00	5.10
A1	2.31	2.41	2.51
A2	1.90	2.00	2.10
a	0	---	0.15
a'	0	---	0.15
b	1.16	---	1.26
b1	1.15	1.2	1.22
b2	1.96	---	2.06
b3	1.95	2.00	2.02
b4	2.96	---	3.06
b5	2.96	3.00	3.02
b6	---	---	2.25
b7	---	---	3.25
c	0.59	---	0.66
c1	0.59	0.60	0.66
D	20.90	21.00	21.10
D1	16.25	16.55	16.85
D2	1.05	1.17	1.35
D3	0.58	---	0.78
E	15.70	15.80	15.90
E1	13.10	13.30	13.50
E2	1.40	1.50	1.60
E3	2.12	2.22	2.32
e	5.436 BSC		
L	19.80	19.95	20.10
L1	---	---	4.30
P	2.40	2.50	2.60
R	1.90	---	2.10
T	9.80	---	10.20
U	6.00	---	6.40



SECTION C-C,D-D & E-E