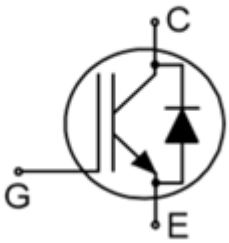
Trench Field-Stop Technology IGBT



Features

- 1200V, 15A
- $V_{CE(sat)(typ.)}$ =1.8V@V_{GE}=15V, I_C=15A
- 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
XD015H120BM1S3	1200V	15A	1.8V	175℃	D15H120BM1	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℃)	30	A
	Continuous Collector Current (T_C=100℃)	15	A
I_{CM}	Pulsed Collector Current (Note 1)	45	A
I_F	Diode Continuous Forward Current (T_C=100℃)	15	A
I_{FM}	Diode Maximum Forward Current (Note 1)	45	A
t_{sc}	Short Circuit Withstand Time	10	us
P_D	Maximum Power Dissipation (T_C=25℃)	245	W
	Maximum Power Dissipation (T_C=100℃)	122	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	0.61	℃/W
$R_{\theta JC}$	Thermal Resistance, Junction to Case for Diode	0.77	℃/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	40	℃/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	5.1	---	6.7	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	V_{GE}=15V, I_C=15A	---	1.8	2.1	V
Q_G	Total Gate Charge	V_{CC}=960V	---	72	---	nC
Q_{GE}	Gate-Emitter Charge	V_{GE}=15V	---	16	---	nC
Q_{GC}	Gate-Collector Charge	I_C=15A	---	37	---	nC
$t_{d(on)}$	Turn-on Delay Time	V_{CC}=600V V_{GE}=±15V I_C=15A R_G=39Ω Inductive Load T_C=25℃	---	42	---	ns
t_r	Turn-on Rise Time		---	47	---	ns
$t_{d(off)}$	Turn-off Delay Time		---	242	---	ns
t_f	Turn-off Fall Time		---	189	---	ns
E_{on}	Turn-on Switching Loss		---	0.62	---	mJ
E_{off}	Turn-off Switching Loss		---	0.81	---	mJ
E_{ts}	Total Switching Loss		---	1.43	---	mJ
C_{ies}	Input Capacitance	V_{CE}=25V V_{GE}=0V f =1MHz	---	1429	---	pF
C_{oes}	Output Capacitance		---	90	---	pF
C_{res}	Reverse Transfer Capacitance		---	25	---	pF

Diode Characteristics (T_C=25℃ unless otherwise noted)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_F	Diode Forward Voltage	I_F=15A	---	2.6	3.2	V
t_{rr}	Diode Reverse Recovery Time	V_{CE}=600V I_F=15A dI_F/dt=450A/us	---	131.5	---	ns
I_{rr}	Diode Peak Reverse Recovery Current		---	7.2	---	A
Q_{rr}	Diode Reverse Recovery Charge		---	466	---	nC

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

Typical Characteristics

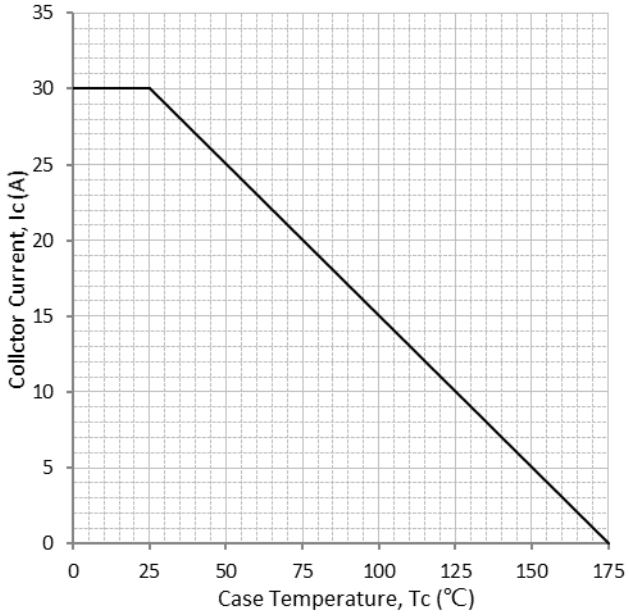


Fig. 1 Maximum DC Collector Current vs. Case Temperature

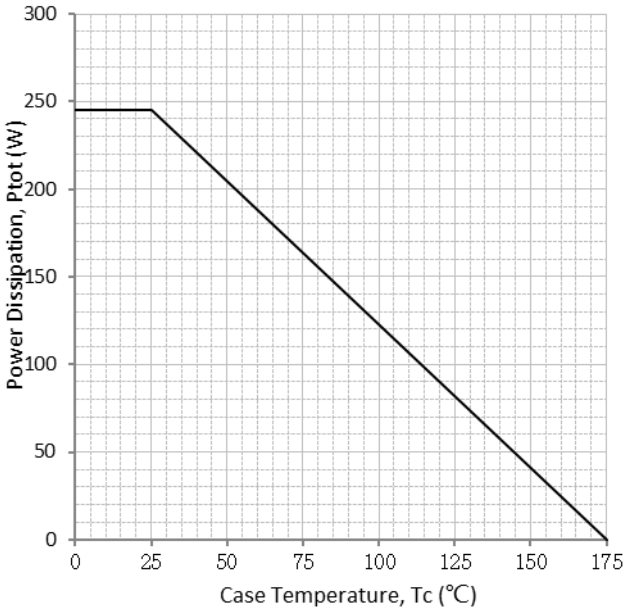


Fig. 2 Power Dissipation vs. Case Temperature

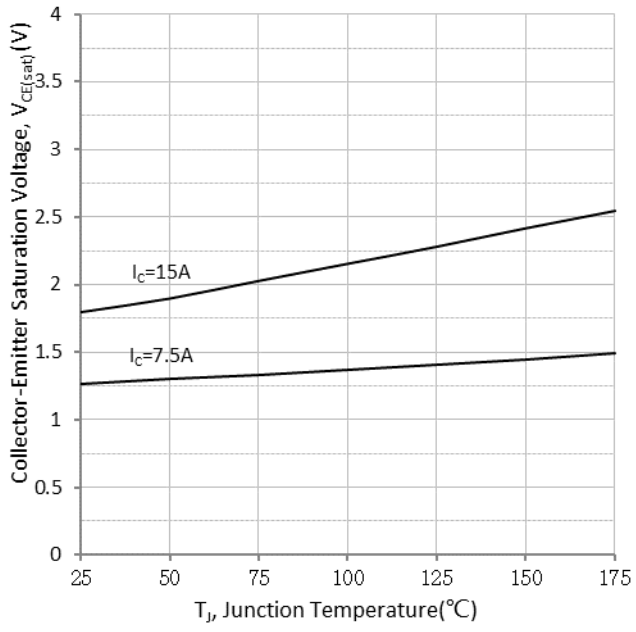


Fig. 3 Typical Collector-Emitter Saturation Voltage vs. Junction Temperature (V_{GE}=15V)

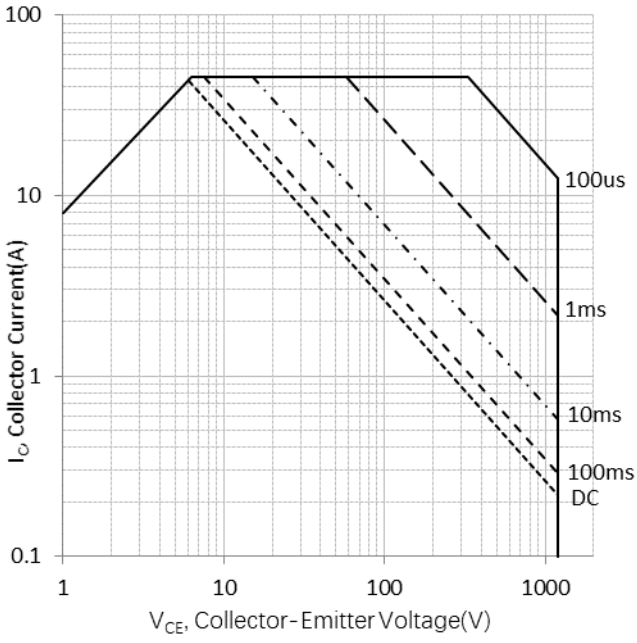


Fig. 4 Safe Operating Area at T_C=25℃ and T_J≤ 175℃

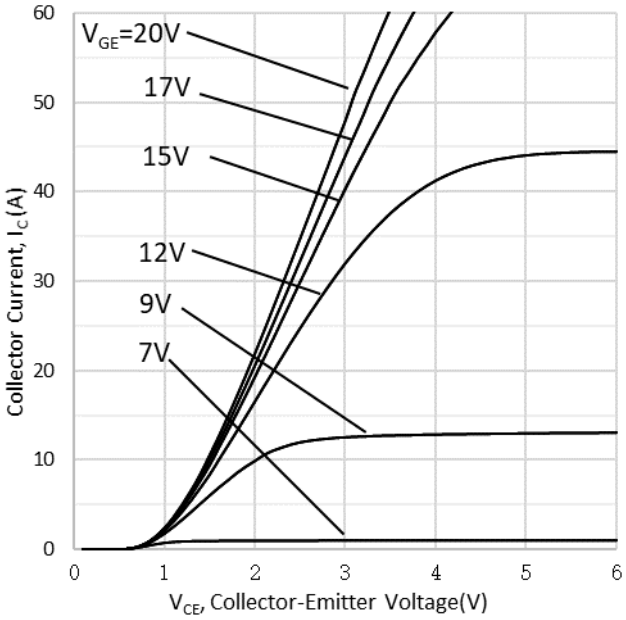


Fig. 5 Typical IGBT Output Characteristics at T_J=25℃

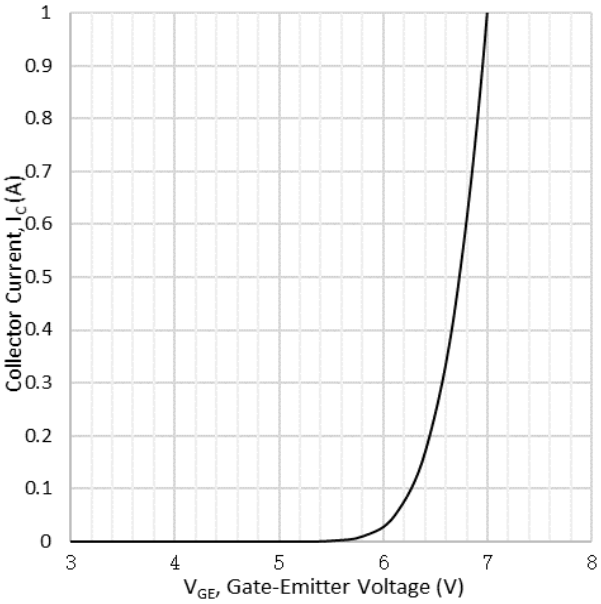


Fig. 6 Typical Transfer Characteristics at V_{CE}=20V

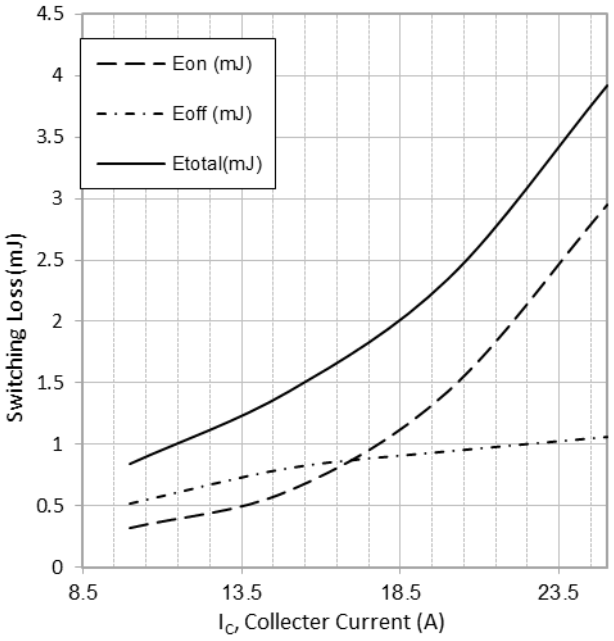


Fig. 7 Typical Energy Loss vs. I_C at T_C=25℃, V_{CE}=600V, V_{GE}=±15V and Rg=39Ω

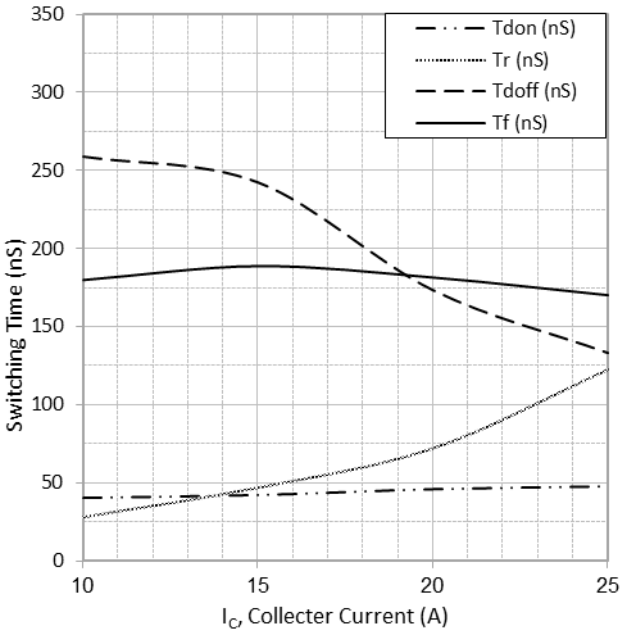


Fig. 8 Typical Switching Time vs. I_C at T_C=25℃, V_{CE}=600V, V_{GE}=±15V and Rg=39Ω

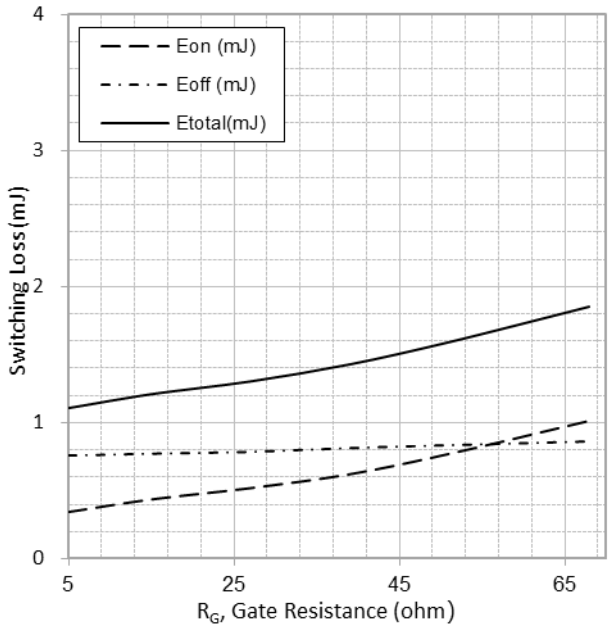


Fig. 9 Typical Energy Loss vs. Rg at T_C=25℃, V_{CE}=600V, V_{GE}=15V, I_C=15A and Rg=39Ω

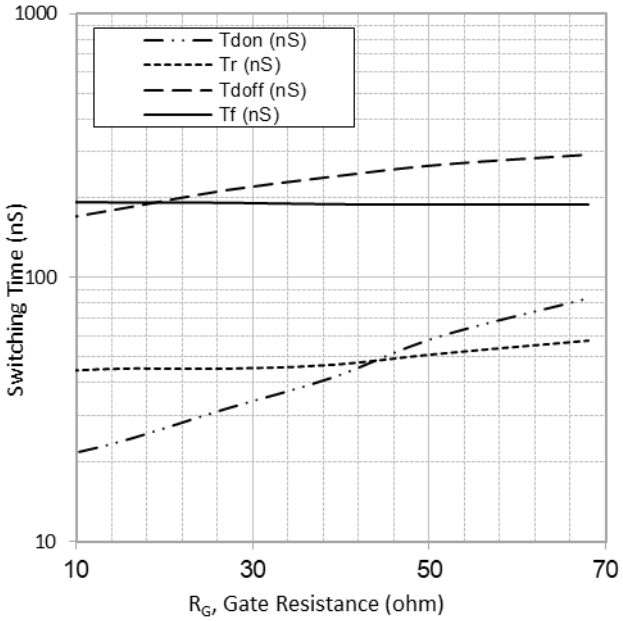


Fig. 10 Typical Switching Time vs. Rg at T_C=25℃, V_{CE}=600V, V_{GE}=15V, I_C=15A and Rg=39Ω

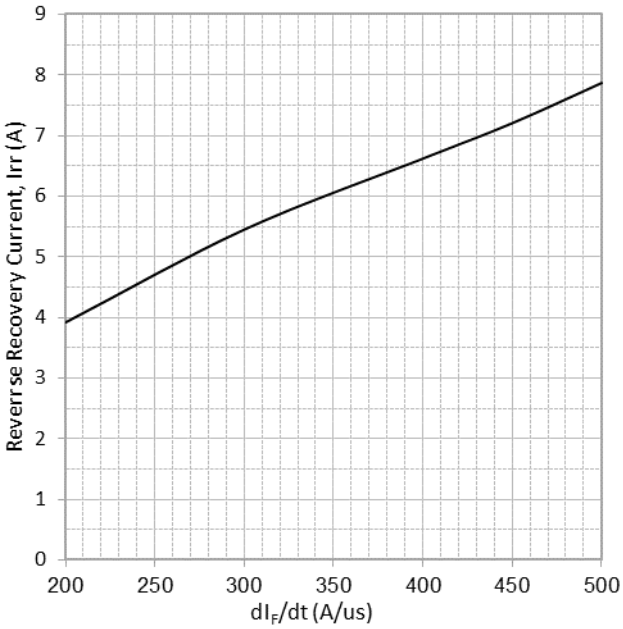


Fig. 11 Typical Diode Irr vs. dI_F/dt at V_{CC}=600V and V_F=15A

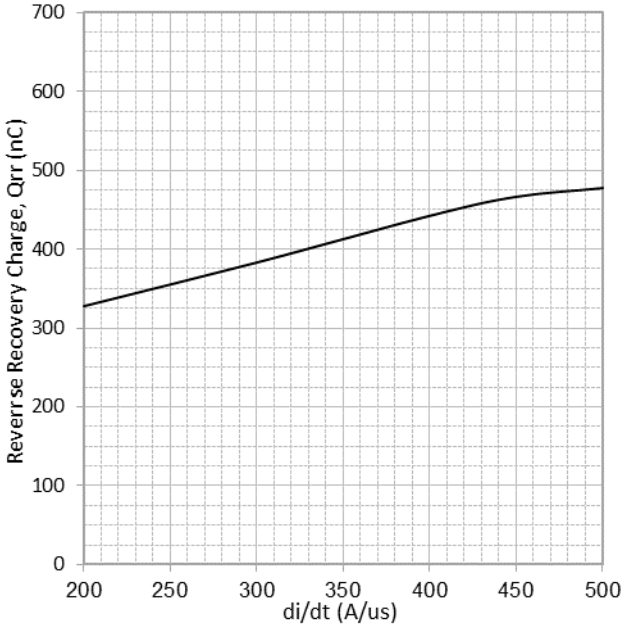


Fig. 12 Typical Diode Qrr vs. dI_F/dt at V_{CC}=600V and V_F=15A

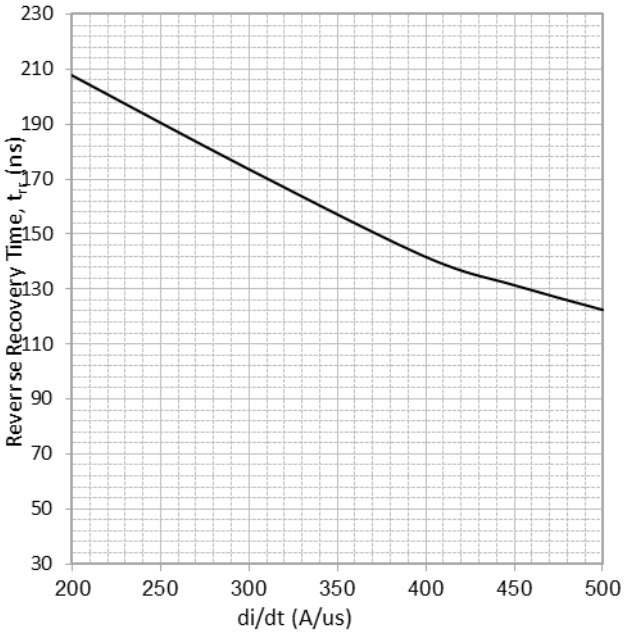


Fig. 13 Typical Diode t_{rr} vs. dI_F/dt at V_{CC}=600V and V_F=15A

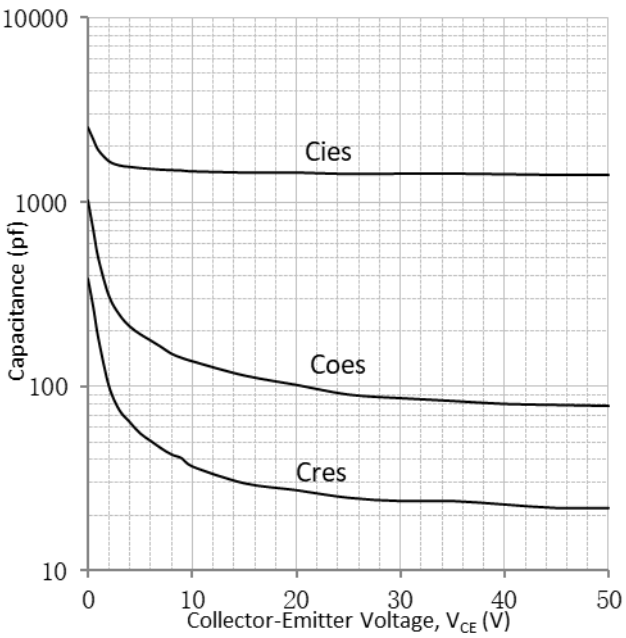


Fig. 14 Typical Capacitance vs. V_{CE} at V_{GE}=0V and f=1MHz

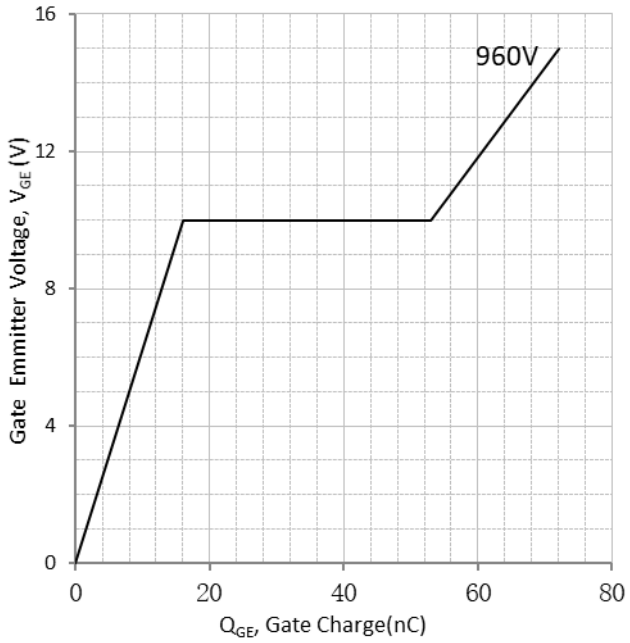


Fig. 15 Typical Gate Charge vs. V_{GE} at I_C=15A

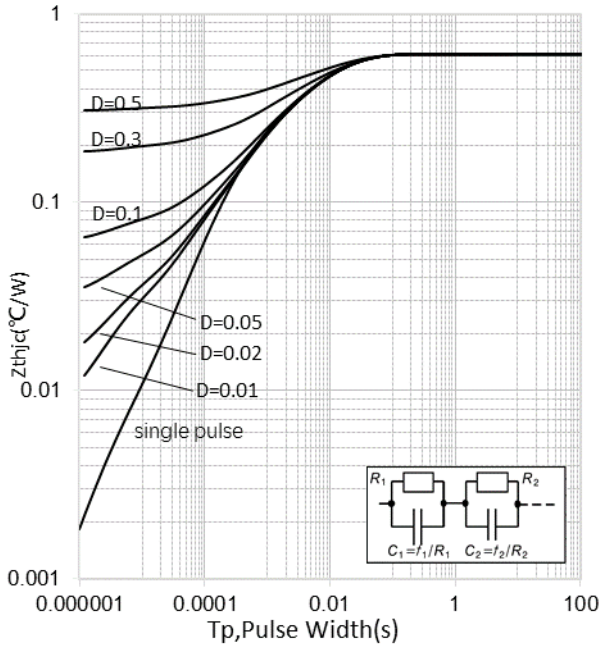
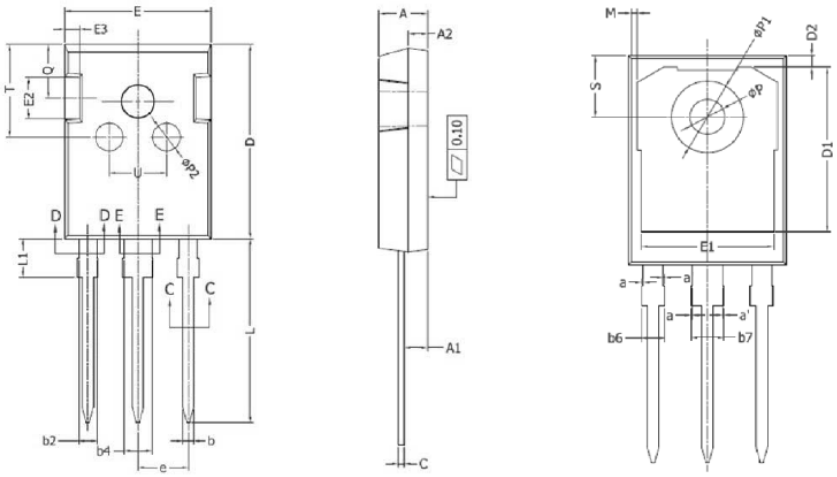


Fig. 16 IGBT Transient Thermal Resistance (D=t_p / T)

Package Information

TO-247



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

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	0.58	0.60	0.62
D	20.90	21.00	21.10
D1	16.25	16.55	16.85
D2	1.05	1.17	1.35
E	15.70	15.80	15.90
E1	13.10	13.30	13.50
E2	4.40	4.50	4.60
E3	1.50	1.60	1.70
e	5.436 BSC		
L	19.80	19.92	20.10
L1	---	---	4.30
M	0.35	---	0.95
P	3.40	3.50	3.60
P1	7.00	---	7.40
P2	2.40	2.50	2.60
Q	5.60	---	6.00
S	6.05	6.15	6.25
T	9.80	---	10.20
U	6.00	---	6.40

NOTES:
ALL DIMENSIONS REFER TO JEDEC STANDARD TO-247 AND DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS.
EJECTION MARK DEPTH $0.10^{+0.15}_{-0.10}$