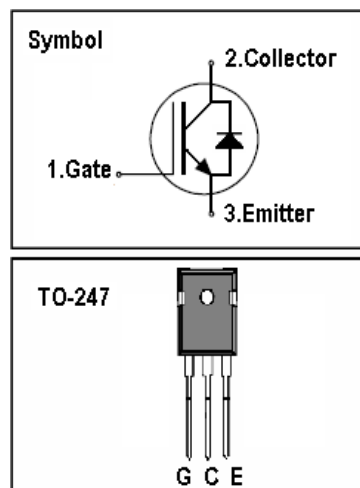


Features

- 650V 20A, $V_{CE(sat)(typ.)} = 1.8V$
- Field Stop IGBT Technology
- 10 μ s Short Circuit Capability
- Square RBSOA
- Positive VCE (on) Temperature Coefficient.

General Description

LGE's IGBTs offer lower losses and higher energy for application such as motor drive ,UPS, inverter and other soft switching applications.



Absolute Maxinmun Ratings

Symbol	Parameter	Value	Units
V_{CES}	Collector-Emitter Voltage	650	V
V_{GES}	Gate-Emitter Voltage	30	V
I_C	Continuous Collector Current ($T_C=25^{\circ}C$)	40	A
	Continuous Collector Current ($T_C=100^{\circ}C$)	20	A
I_{CM}	Pulsed Collector Current (Note 1)	80	A
I_F	Diode Continuous Forward Current ($T_C=100^{\circ}C$)	20	A
I_{FM}	Diode Maximum Forward Current (Note 1)	80	A
t_{sc}	Short Circuit Withstand Time	10	us
I_{sc}	Short Circuit Current	140	A
P_D	Maximum Power Dissipation ($T_C=25^{\circ}C$)	205	W
P_D	Maximum Power Dissipation ($T_C=100^{\circ}C$)	82	W
T_J	Operating Junction Temperature Range	-55 to +150	$^{\circ}C$
T_{STG}	Storage Temperature Range	-55 to +150	$^{\circ}C$

Thermal Characteristics

Symbol	Parameter	Max.	Units
$R_{th j-c}$	Thermal Resistance, Junction to case for IGBT	0.61	$^{\circ}C / W$
$R_{th j-c}$	Thermal Resistance, Junction to case for Diode	1.2	$^{\circ}C / W$
$R_{th j-a}$	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	$V_{GE}=0V, I_C=250\mu A$	650	-	-	V
I_{CES}	Collector-Emitter Leakage Current	$V_{CE}=600V, V_{GE}=0V$	-	-	40	μA
I_{GES}	Gate Leakage Current, Forward	$V_{GE}=30V, V_{CE}=0V$	-	-	100	nA
	Gate Leakage Current, Reverse	$V_{GE}=-30V, V_{CE}=0V$	-	-	-100	nA
$V_{GE(th)}$	Gate Threshold Voltage	$V_{GE}=V_{CE}, I_C=0.2mA$	4.0	-	6	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$V_{GE}=15V, I_C=20A$	-	1.8	2.0	V
Q_g	Total Gate Charge	$V_{CC}=400V$ $V_{GE}=15V$ $I_C=20A$	-	82	-	nC
Q_{ge}	Gate-Emitter Charge		-	11	-	nC
Q_{gc}	Gate-Collector Charge		-	41	-	nC
$t_{d(on)}$	Turn-on Delay Time	$V_{CC}=400V$ $V_{GE}=15V$ $I_C=20A$ $R_G=30\Omega$ Inductive Load $T_C=25^\circ\text{C}$	-	25	-	ns
t_r	Turn-on Rise Time		-	49	-	ns
$t_{d(off)}$	Turn-off Delay Time		-	168	-	ns
t_f	Turn-off Fall Time		-	64	-	ns
E_{on}	Turn-on Switching Loss		-	0.57	-	mJ
E_{off}	Turn-off Switching Loss		-	0.46	-	mJ
C_{ies}	Input Capacitance	$V_{CE}=25V$ $V_{GE}=0V$ $f=1MHz$	-	0.82	-	pF
C_{oes}	Output Capacitance		-	91	-	pF
C_{res}	Reverse Transfer Capacitance		-	25	-	pF
R_{Gint}	Integrated gate resistor	$f=1M; V_{pp}=1V$		2.25	-	Ω

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	$I_F=20A$	-	1.6	-	V
t_{rr}	Diode Reverse Recovery Time	$V_{CE}=400V$ $I_F=20A$ $dI_F/dt=500A/\mu s$	-	68	-	ns
I_{rrm}	Diode peak Reverse Recovery Current		-	12.5	-	A
Q_{rr}	Diode Reverse Recovery Charge		-	0.47	-	μC

Notes:

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

Typical Performance Characteristics

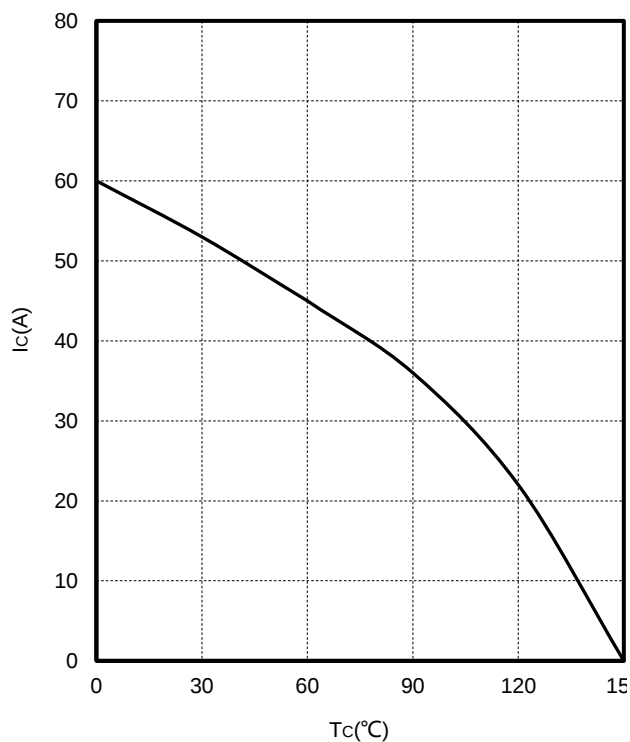


Fig 1. DC Collector current as a function of case temperature ($V_{GE} \geq 15V$, $T_j \leq 150^\circ C$)

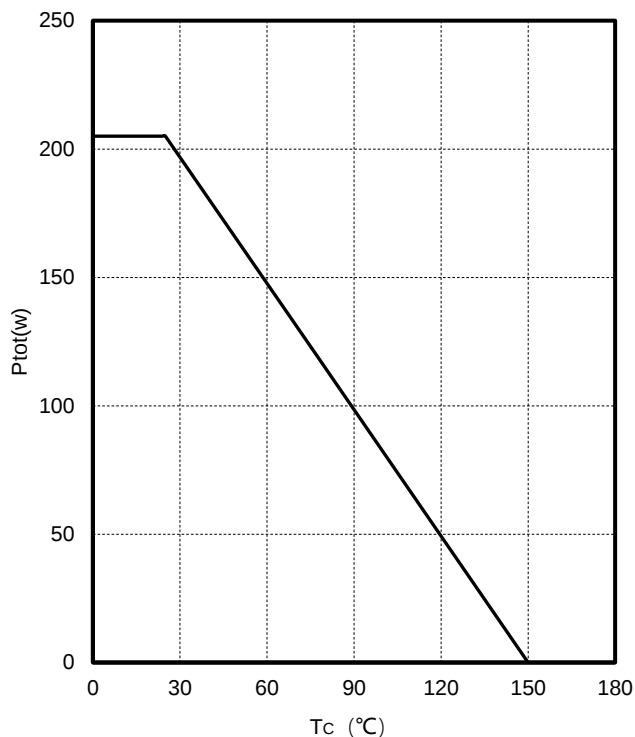


Fig 2. Power dissipation as a function of case temperature ($T_j \leq 150^\circ C$)

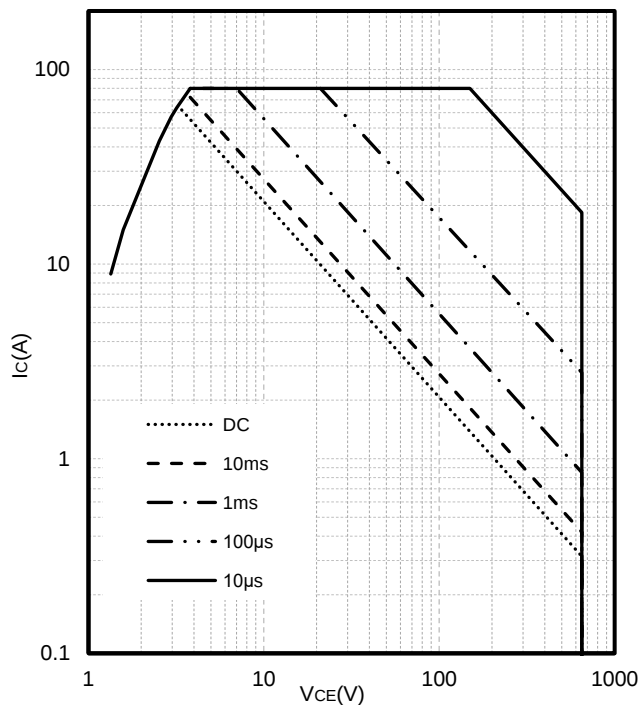


Fig 3. IGBT Forward safe operation area

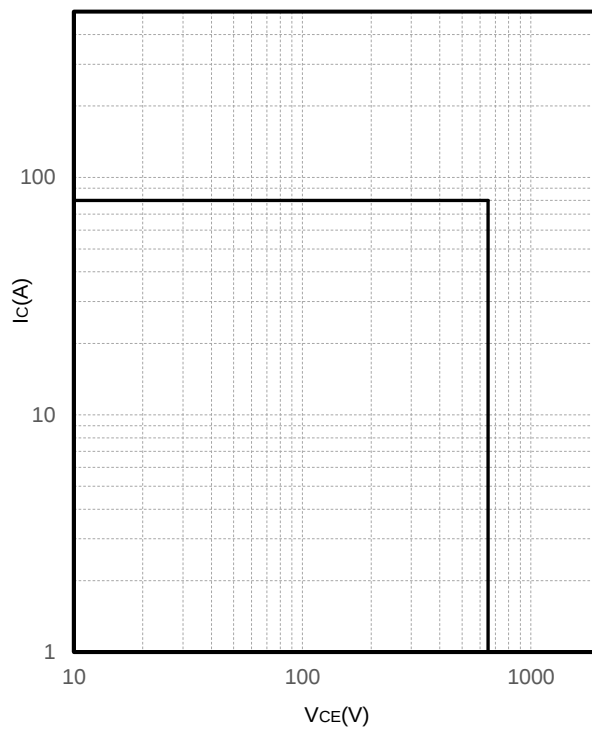


Fig 4. IGBT Reverse safe operation area

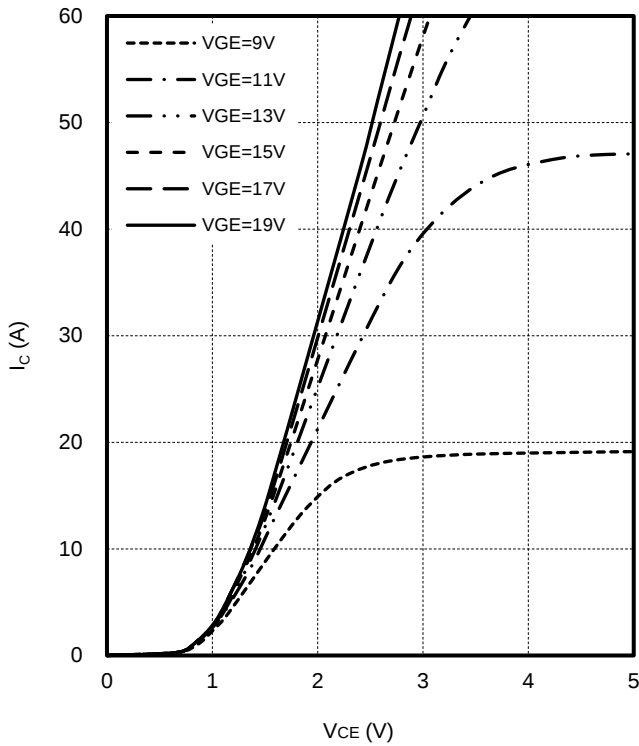


Fig 5. Typical output characteristic ($T_j=25^{\circ}\text{C}$)

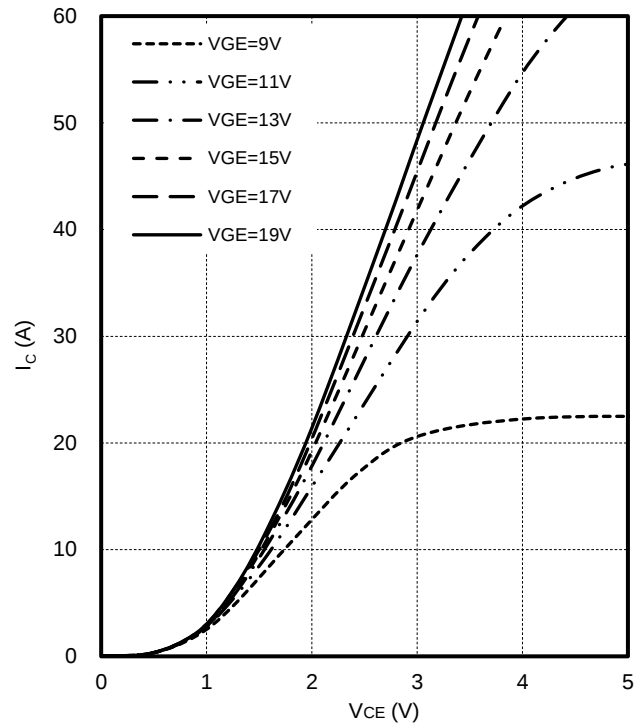


Fig 6. Typical output characteristic ($T_j=125^{\circ}\text{C}$)

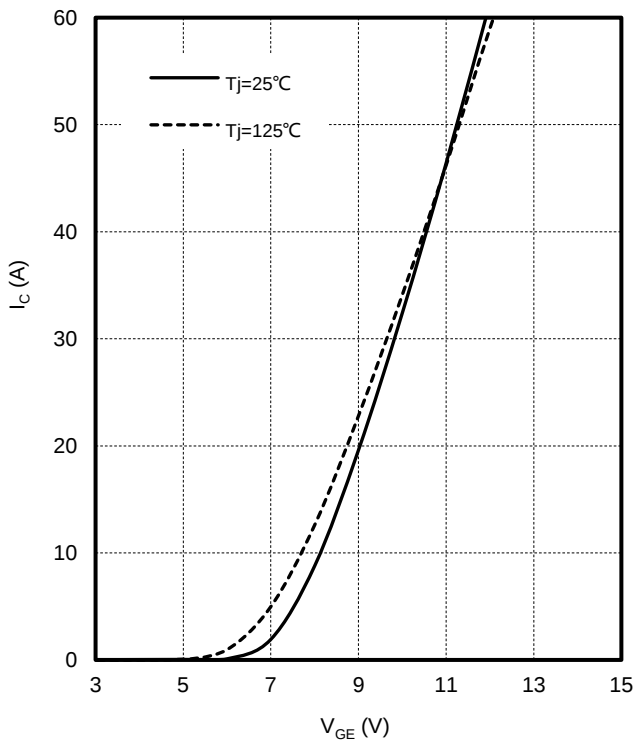


Fig 7. Transfer characteristic IGBT,
 $I_C=f(V_{GE}), V_{CE}=20\text{V}$

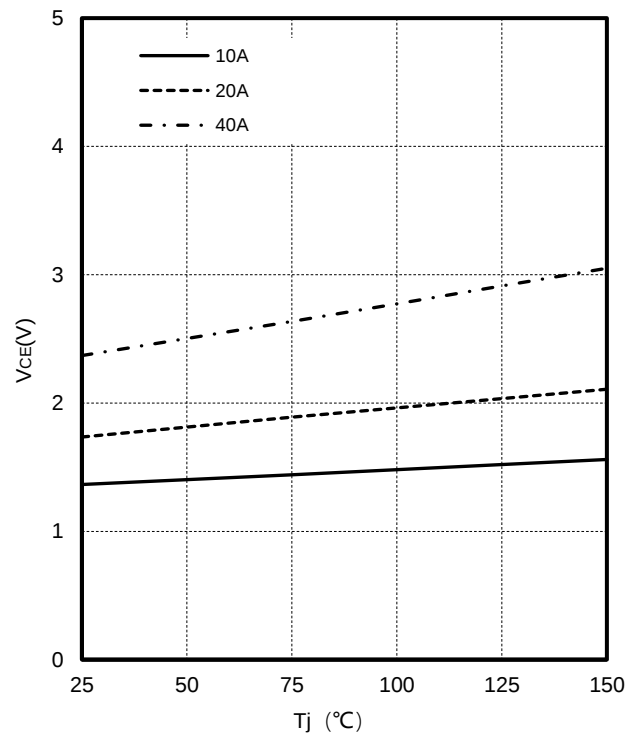


Fig 8. Typical collector-emitter saturation voltage
as a function of junction temperature,
 $I_{GBT} V_{CEsat} = f(T_{vj}), V_{GE} = 15\text{V}$

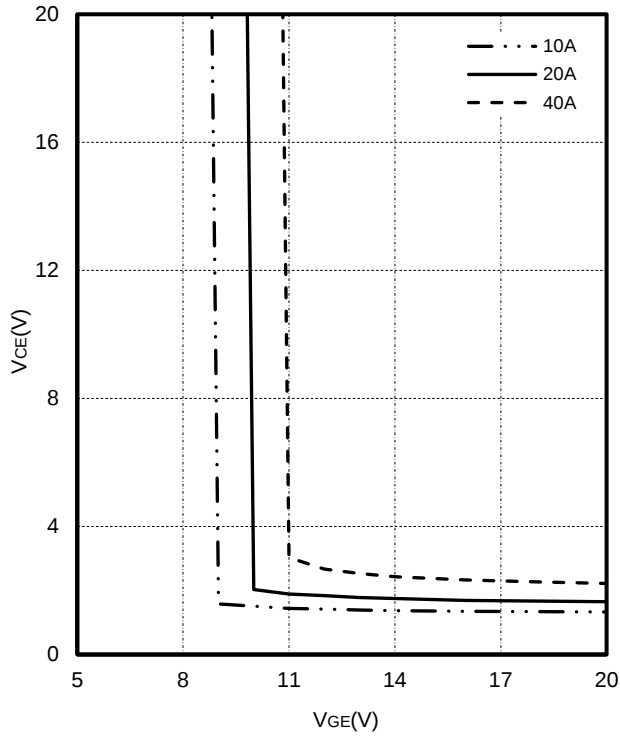


Fig 9. Typical collector-emitter saturation voltage as a function of V_{GE} ($T_j=25^\circ\text{C}$)

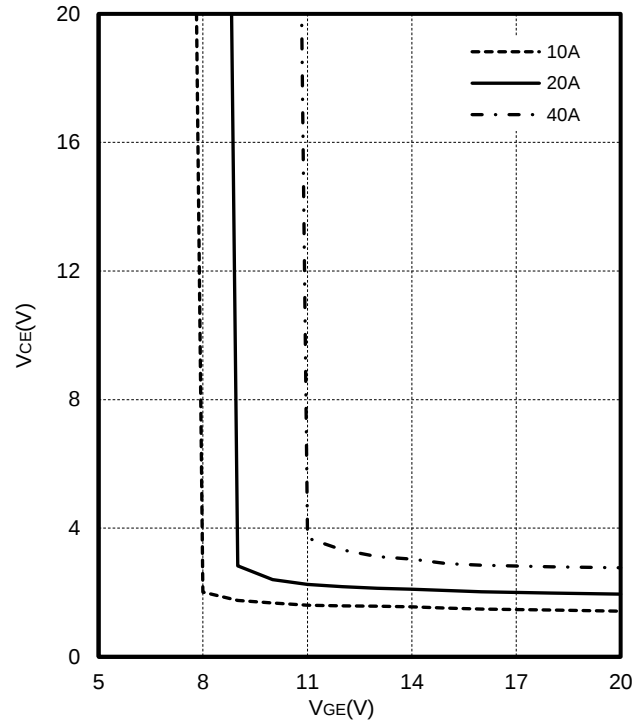


Fig 10. Typical collector-emitter saturation voltage as a function of V_{GE} ($T_j=125^\circ\text{C}$)

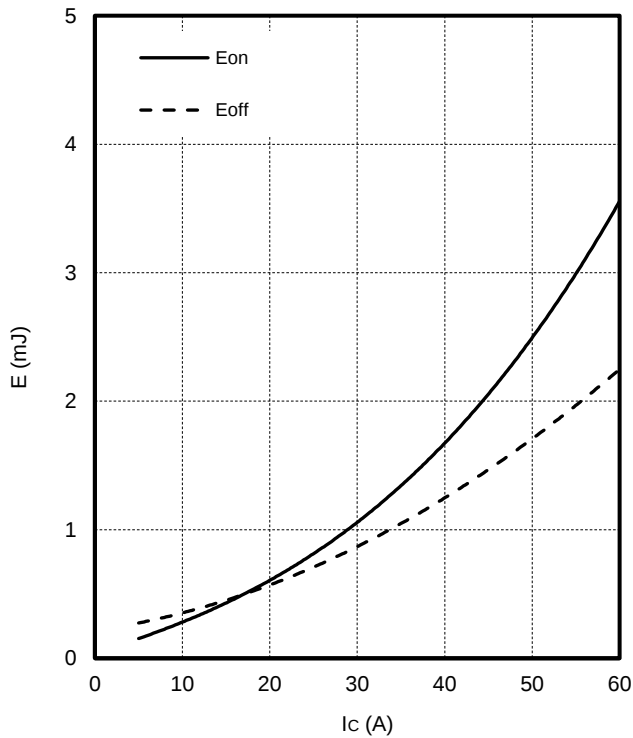


Fig 11. Typical switch energy as a function of I_C (Inductive load, $T_j=25^\circ\text{C}$, $V_{ce}=400\text{V}$, $V_{ge}=15\text{V}$, $R_g=30\Omega$)

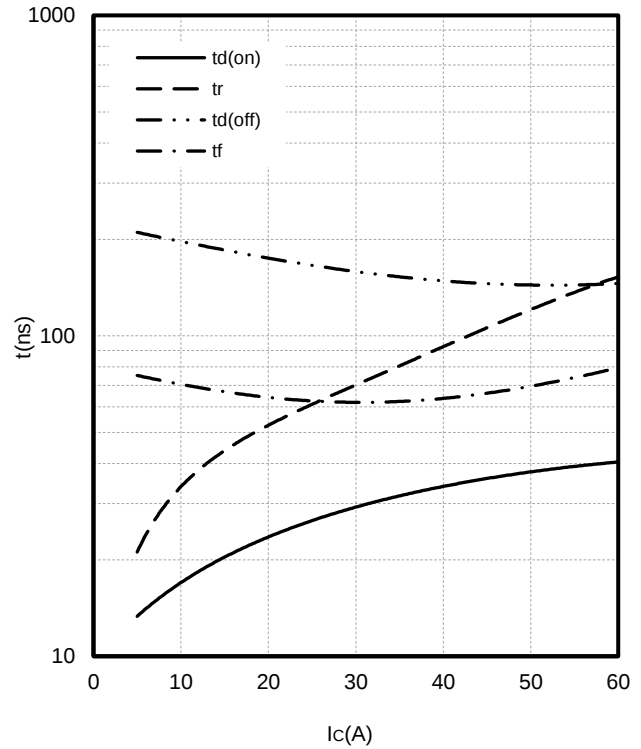


Fig 12. Typical switch time as a function of I_C (Inductive load, $T_j=25^\circ\text{C}$, $V_{ce}=400\text{V}$, $V_{ge}=15\text{V}$, $R_g=30\Omega$)

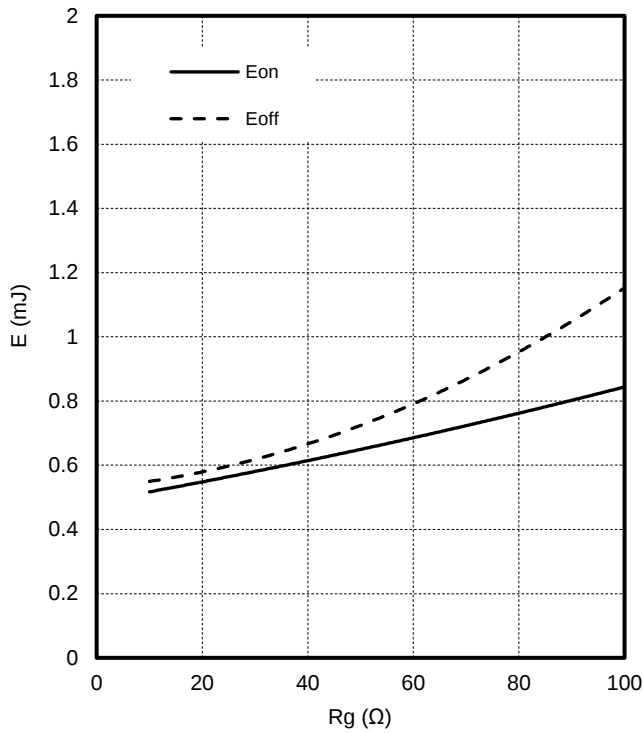


Fig 13. Typical switch energy as a function of R_g (inductive load, $T_j=25^\circ\text{C}$, $V_{ce}=400\text{V}$, $V_{ge}=15\text{V}$, $I_c=20\text{A}$)

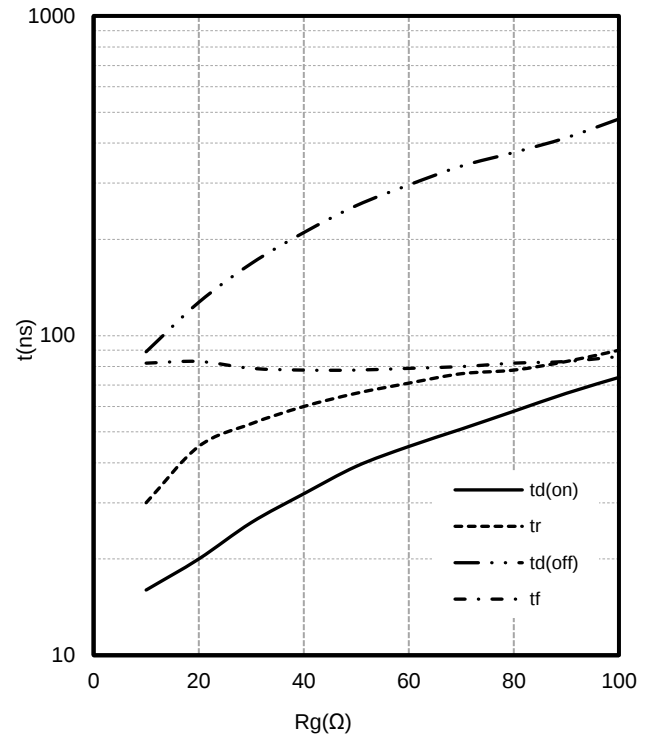


Fig 14. Typical switch time as a function of R_g (inductive load, $T_j=25^\circ\text{C}$, $V_{ce}=400\text{V}$, $V_{ge}=15\text{V}$, $I_c=20\text{A}$)

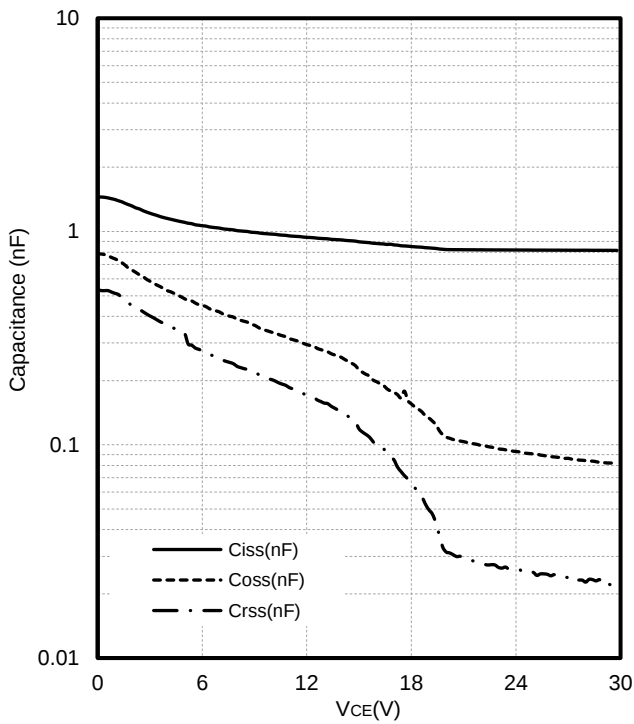


Fig 15. Typical capacitance as a function of collector-emitter voltage ($V_{ge}=0\text{V}$, $f=1\text{MHz}$)

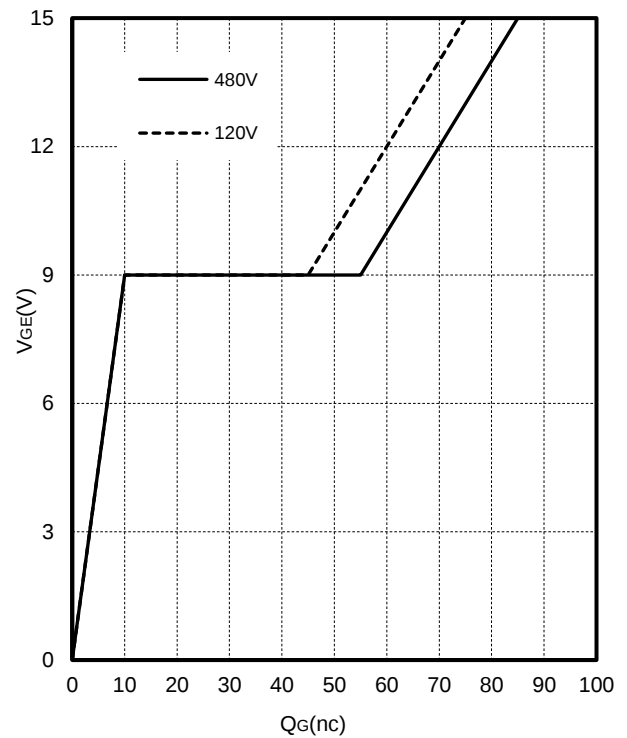


Fig 16. Typical gate charge ($I_c=20\text{A}$)

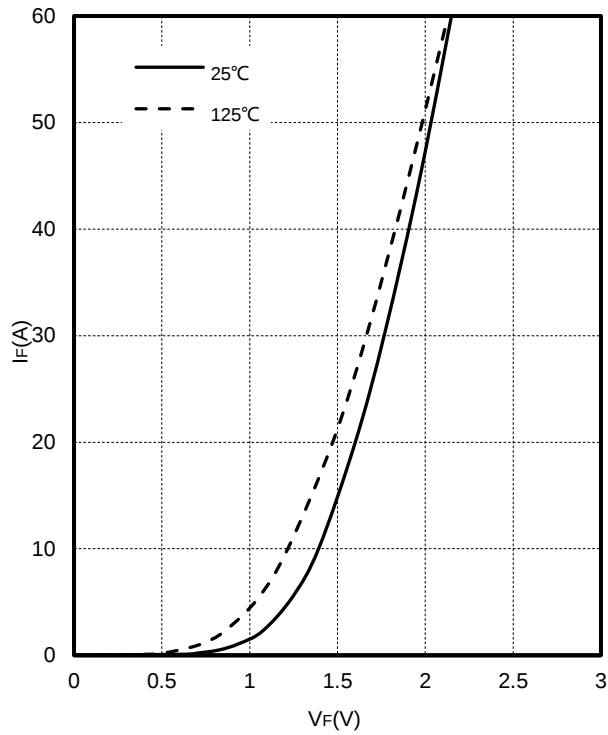


Fig 17. Typical diode forward current as a function of forward voltage

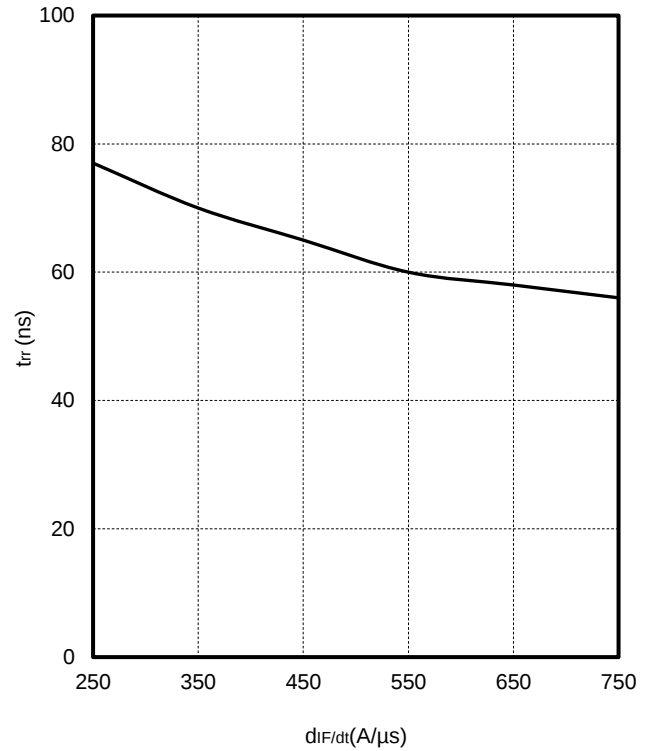


Fig 18. Typical t_{rr} as a function of diF/dt , $V_r=400V$, $I_f=20A$, $T_j=25^\circ C$

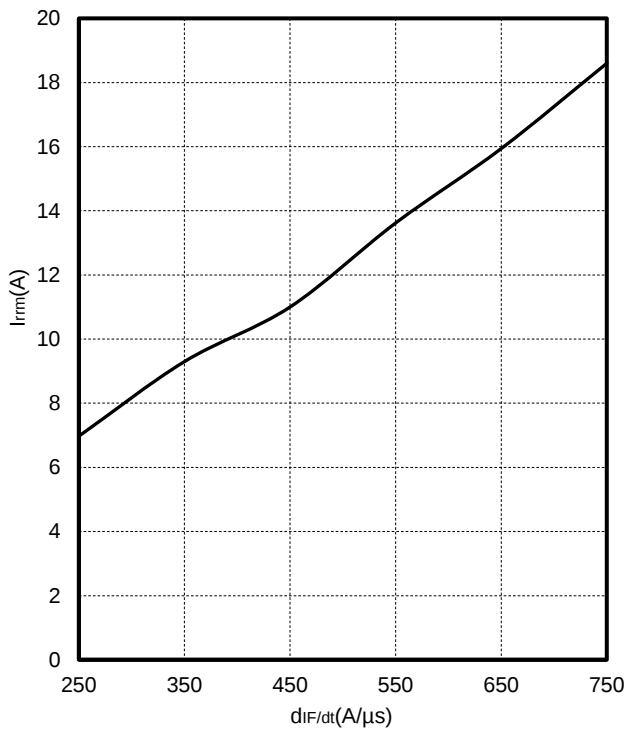


Fig 19. Typical I_{rrm} as a function of diF/dt , $V_r=400V$, $I_f=20A$, $T_j=25^\circ C$

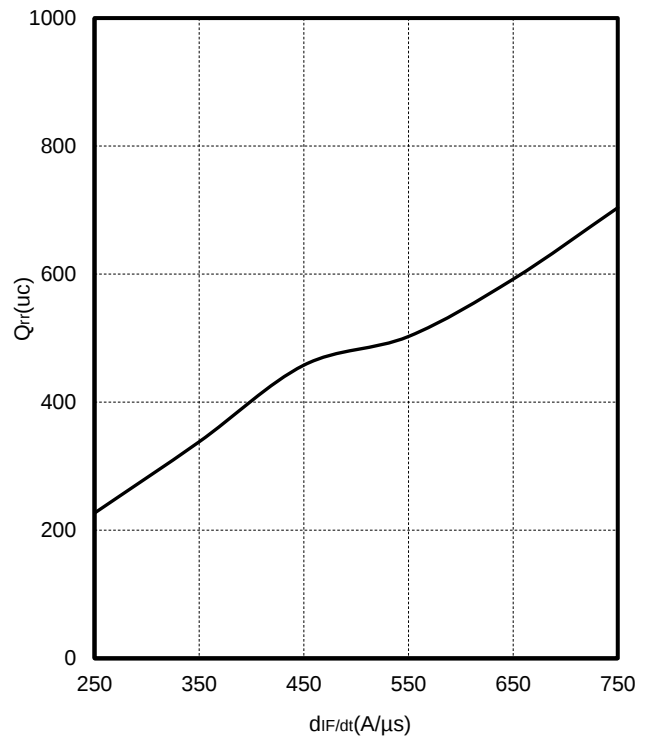


Fig 20. Typical Q_{rr} as a function of diF/dt , $V_r=400V$, $I_f=20A$, $T_j=25^\circ C$

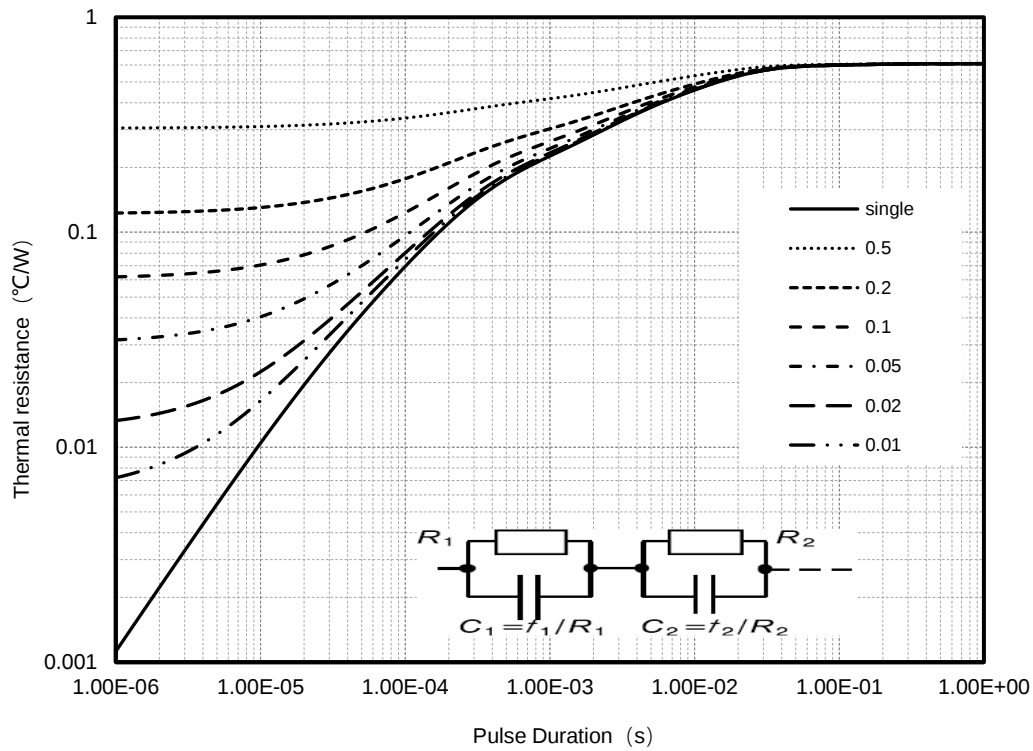
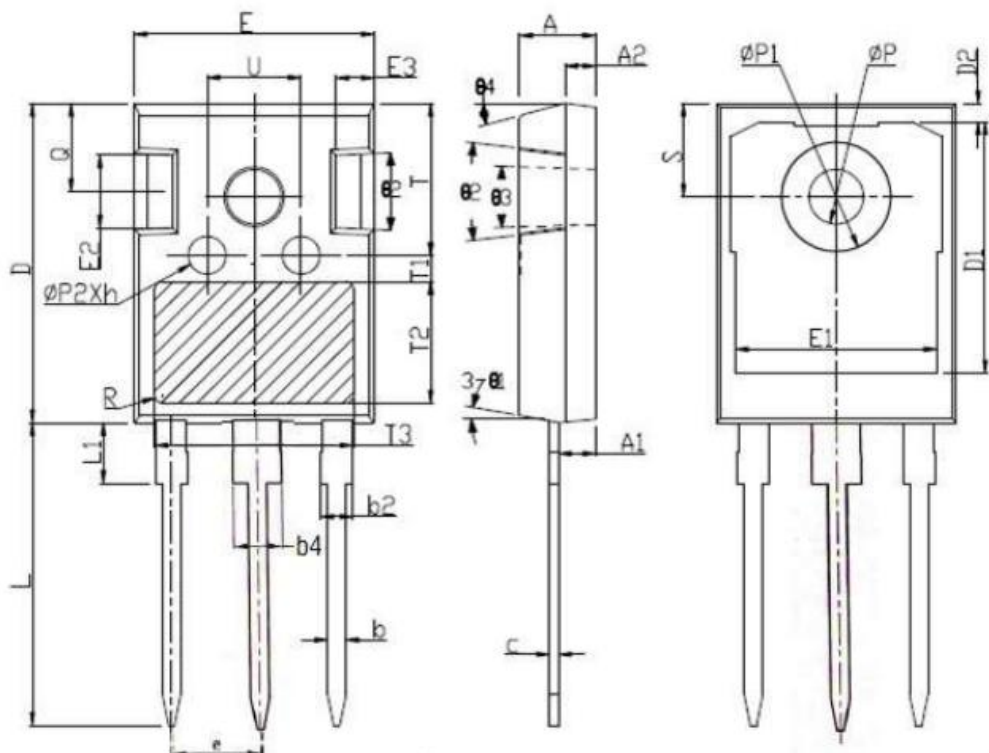


Fig 21. IGBT transient thermal impedance, $Z_{th}=f(t_p)$, $D=t_p/T$

Package Drawing



Symbol	Min	Nom	Max	Symbol	Min	Nom	Max
A	4.9	5.0	5.1	e	5.44BSC		
A1	2.3	2.4	2.5	h	0.05	0.10	0.15
A2	1.9	2.0	2.1	L	19.6	19.9	20.2
b	1.10	1.20	1.25	L1			4.3
b2	1.90	2.00	2.25	Φp	3.5	3.6	3.75
b4	2.90	3.00	3.25	Φp1			7.3
c	0.50	0.60	0.70	Φp2	2.4	2.5	2.6
D	20.8	21.0	21.2	Q	5.3		5.9
D1	16.25	16.55	16.85	S	6.15BSC		
D2	1.05	1.20	1.35	T	9.8		10.2
E	15.6	15.8	16.0	T1	1.65REF		
E1	13.1	13.3	13.5	T2	8.0REF		
E2	4.9	5.0	5.1	T3	12.8REF		
E3	2.4	2.5	2.6	U	6.0		6.4
Unit		mm		type		T0-247G	