

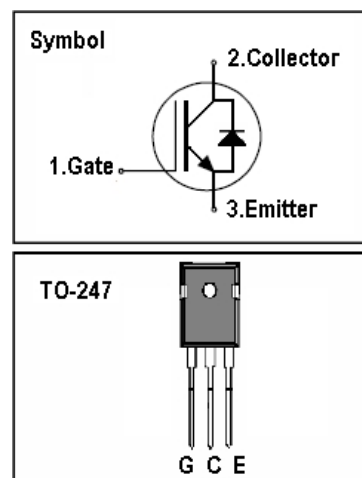
IGBT

Features

- 650V 60A, $V_{CE(sat)(typ.)} = 2.3 \text{ V}@60\text{A}$
- Field Stop IGBT Technology.
- 10 μs Short Circuit Capability.
- Square RBSOA.
- Positive V_{CE} (on) Temperature Coefficient.

Benefits

- High Efficiency for Welding, Inductive heating, UPS and other high frequency application
- Rugged Performance
- Excellent Current Sharing in Parallel Operation



Absolute Maximun Ratings

Symbol	Parameter	Value	Units
V_{CES}	Collector-Emitter Voltage	650	V
V_{GES}	Gate-Emitter Voltage	± 30	V
I_C	Continuous Collector Current ($T_C=25^\circ\text{C}$)	120	A
	Continuous Collector Current ($T_C=100^\circ\text{C}$)	60	A
I_{CM}	Pulsed Collector Current (Note 1)	240	A
I_F	Diode Continuous Forward Current ($T_C=100^\circ\text{C}$)	60	A
I_{FM}	Diode Maximum Forward Current (Note 1)	240	A
t_{sc}	Short Circuit Withstand Time	10	us
I_{sc}	Short Circuit Current	270	A
P_D	Maximum Power Dissipation ($T_C=25^\circ\text{C}$)	416	W
P_D	Maximum Power Dissipation ($T_C=100^\circ\text{C}$)	166	W
T_J	Operating Junction Temperature Range	-55 to +150	$^\circ\text{C}$
T_{STG}	Storage Temperature Range	-55 to +150	$^\circ\text{C}$

Thermal Characteristics

Symbol	Parameter	Max.	Units
$R_{th j-c}$	Thermal Resistance, Junction to case for IGBT	0.30	$^\circ\text{C}/\text{W}$
$R_{th j-c}$	Thermal Resistance, Junction to case for Diode	0.65	$^\circ\text{C}/\text{W}$
$R_{th j-a}$	Thermal Resistance, Junction to Ambient	80	$^\circ\text{C}/\text{W}$

Electrical Characteristics (T_C=25°C unless otherwise noted)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
BV _{CES}	Collector-Emitter Breakdown Voltage	V _{GE} = 0V, I _C = 250uA	650	-	-	V
I _{CES}	Collector-Emitter Leakage Current	V _{CE} = 650V, V _{GE} = 0V	-	-	250	uA
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 = 250uA	4.0	-	5.5	V
V _{CE(sat)}	Collector-Emitter Saturation Voltage	V _{GE} = 15V, I _C = 40A	-	2.3		V
Q _g	Total Gate Charge	V _{CC} = 480V V _{GE} = 15V I _C = 60A	-	210		nC
Q _{ge}	Gate-Emitter Charge		-	28		nC
Q _{gc}	Gate-Collector Charge		-	115		nC
t _{d(on)}	Turn-on Delay Time	V _{CC} = 400V V _{GE} = 15V I _C = 60A R _G = 10Ω Inductive Load T _C = 25°C	-	33	-	ns
t _r	Turn-on Rise Time		-	117	-	ns
t _{d(off)}	Turn-off Delay Time		-	189	-	ns
t _f	Turn-off Fall Time		-	75	-	ns
E _{on}	Turn-on Switching Loss		-	2.90	-	mJ
E _{off}	Turn-off Switching Loss		-	1.70	-	mJ
C _{ies}	Input Capacitance	V _{CE} = 25V	-	2020	-	pF
C _{oes}	Output Capacitance	V _{GE} = 0V	-	280	-	pF
C _{res}	Reverse Transfer Capacitance	f = 1MHz	-	130	-	pF
R _{Gint}	Integrated gate resistor	f = 1MHz; V _{pp} = 1V		1.55		Ω

Electrical Characteristics of Diode (T_C=25°C unless otherwise noted)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
V _F	Diode Forward Voltage	I _F = 60A	-	1.6		V
t _{rr}	Diode Reverse Recovery Time	V _{CE} = 400V	-	125		ns
I _{rrm}	Diode peak Reverse Recovery Current	I _F = 60A	-	16		A
Q _{rr}	Diode Reverse Recovery Charge	dI _F /dt = 500A/us	-	950		nC

Notes:

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

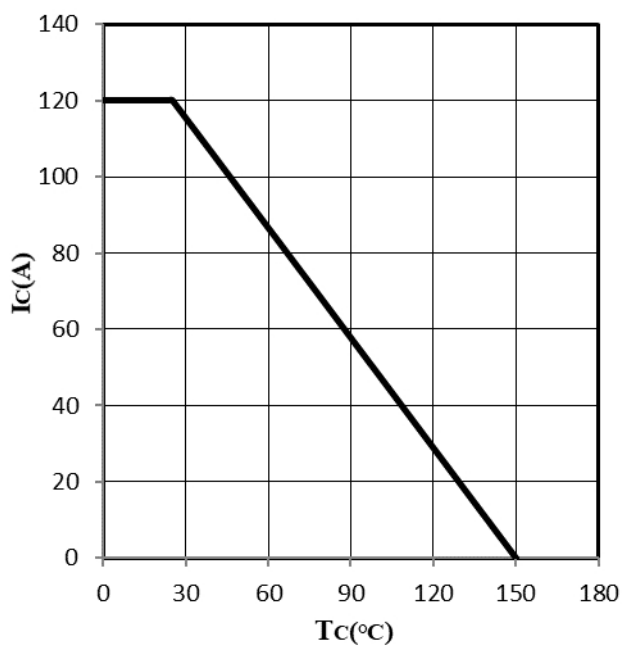


Fig 1. DC Collector current as a function of case temperature ($V_{GE} \geq 15V$, $T_j \leq 150^\circ C$)

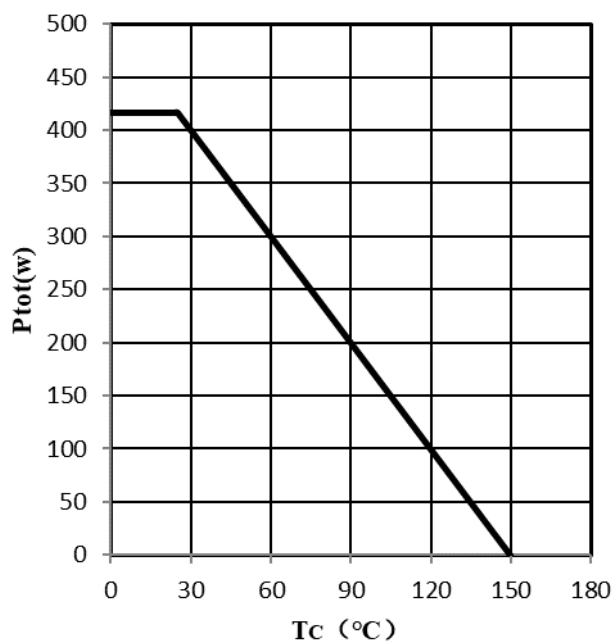


Fig 2. Power dissipation as a function of case temperature ($T_j \leq 150^\circ C$)

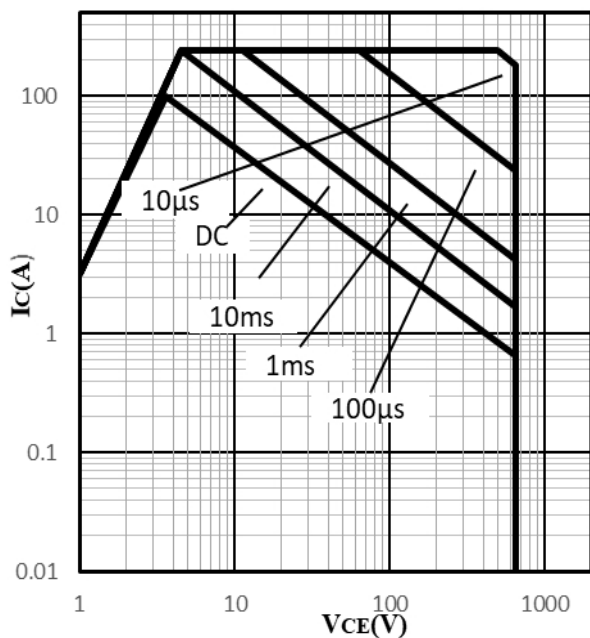


Fig 3. IGBT Forward safe operation area

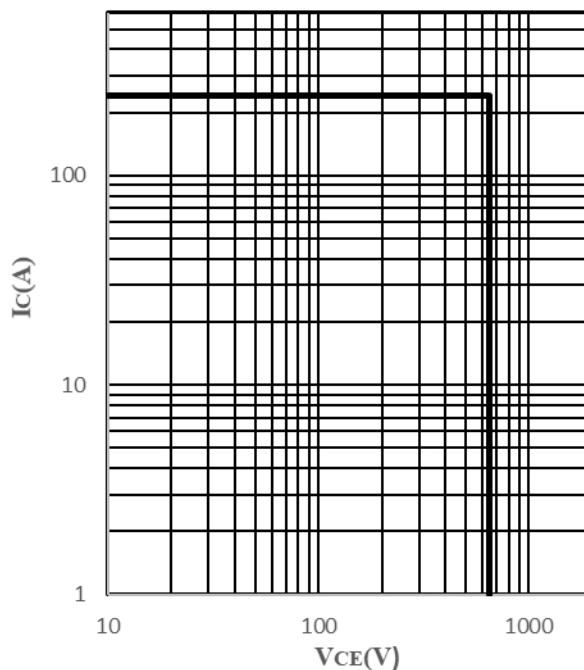


Fig 4. IGBT Reverse safe operation area

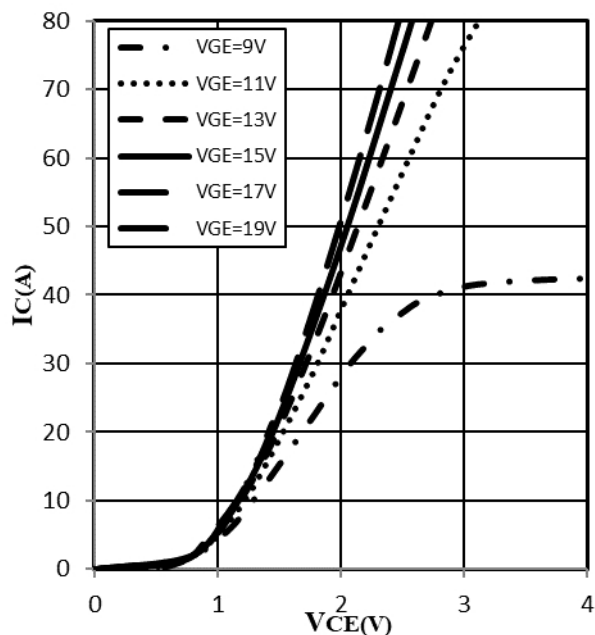


Fig 5. Typical output characteristic ($T_j=25^{\circ}\text{C}$)

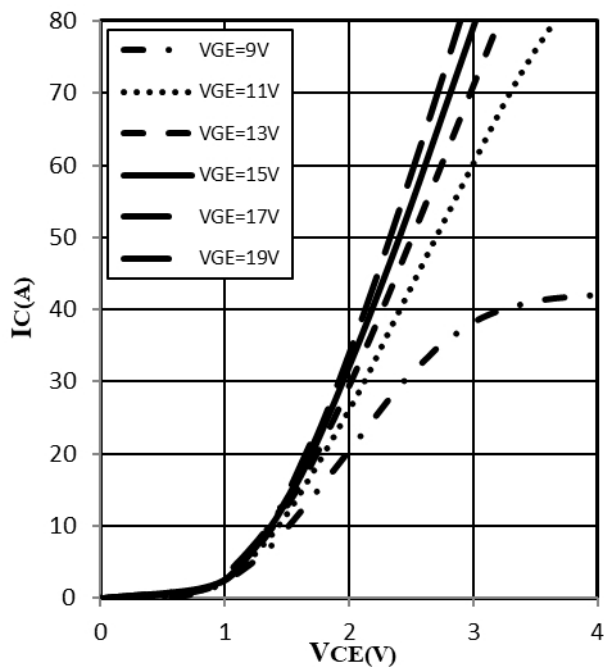


Fig 6. Typical output characteristic ($T_j=125^{\circ}\text{C}$)

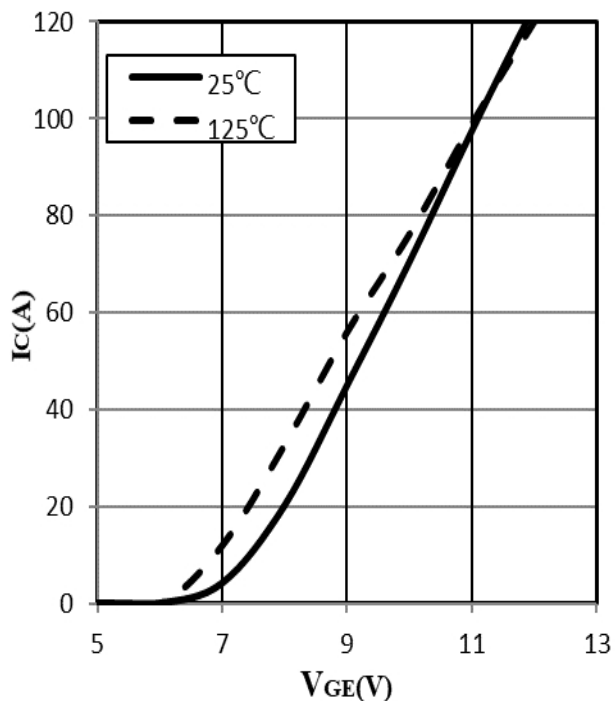


Fig 7. Typical transfer characteristic ($V_{CE}=20\text{V}$)

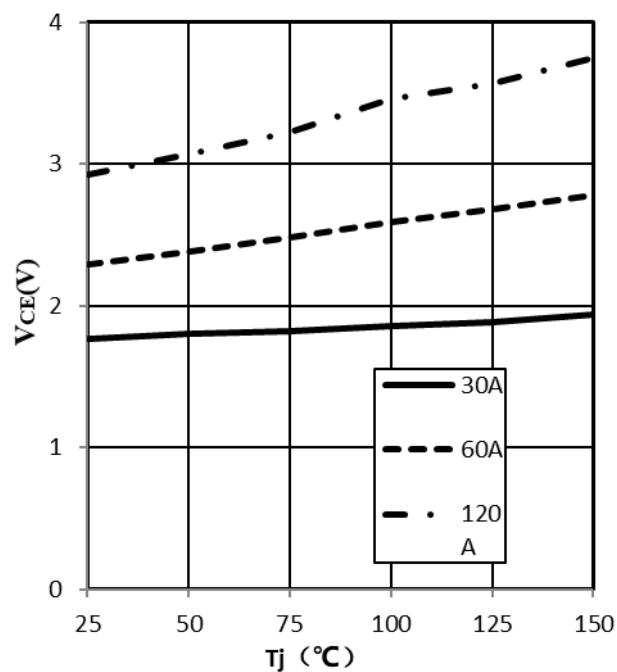


Fig 8. Typical collector-emitter saturation voltage as a function of junction temperature ($V_{GE}=15\text{V}$)

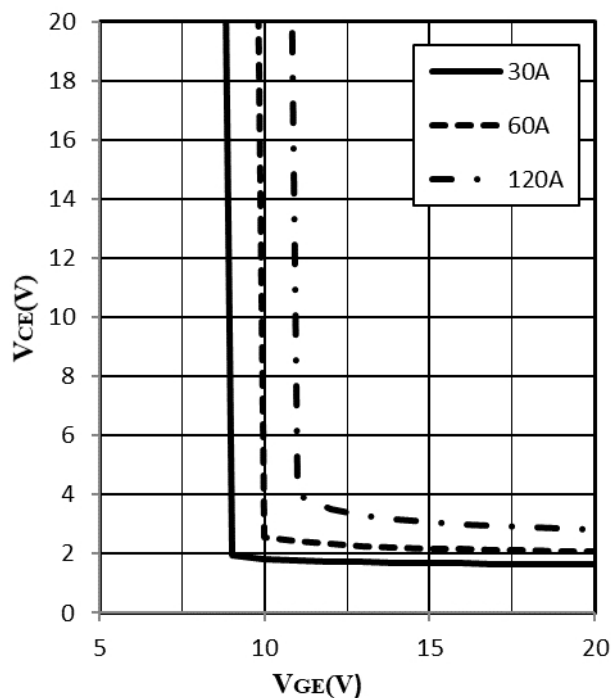


Fig 9. Typical collector-emitter saturation voltage as a function of V_{GE} ($T_j=25^\circ\text{C}$)

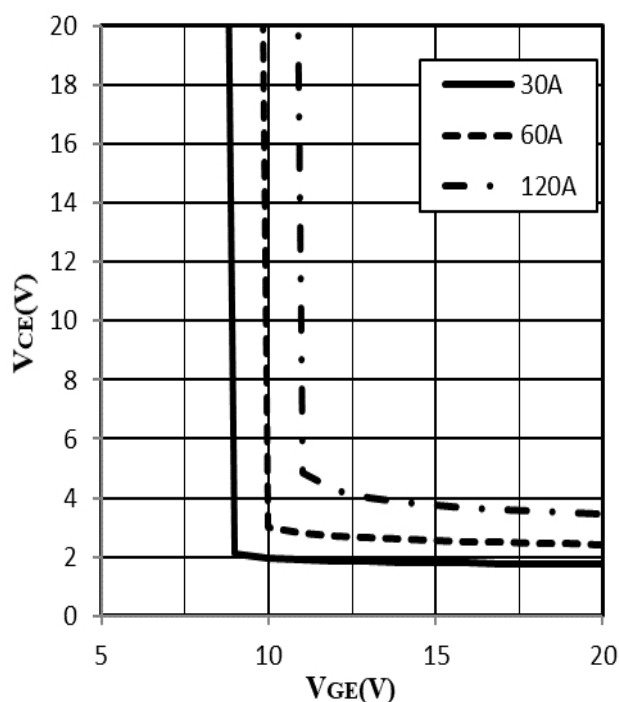


Fig 10. Typical collector-emitter saturation voltage as a function of V_{GE} ($T_j=125^\circ\text{C}$)

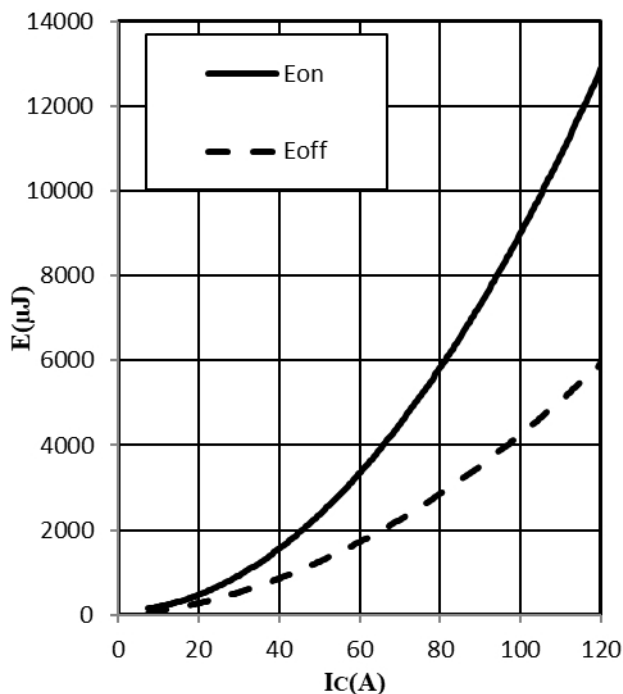


Fig 11. Typical switch energy as a function of I_C (inductive load, $T_j=25^\circ\text{C}$, $V_{CE}=400\text{V}$, $V_{GE}=15\text{V}$, $R_G=10\Omega$)

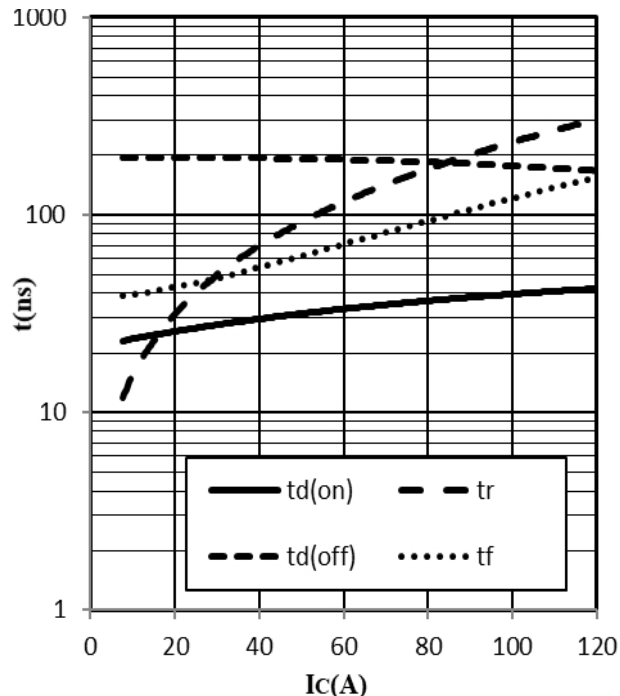


Fig 12. Typical switch time as a function of I_C (inductive load, $T_j=25^\circ\text{C}$, $V_{CE}=400\text{V}$, $V_{GE}=15\text{V}$, $R_G=10\Omega$)

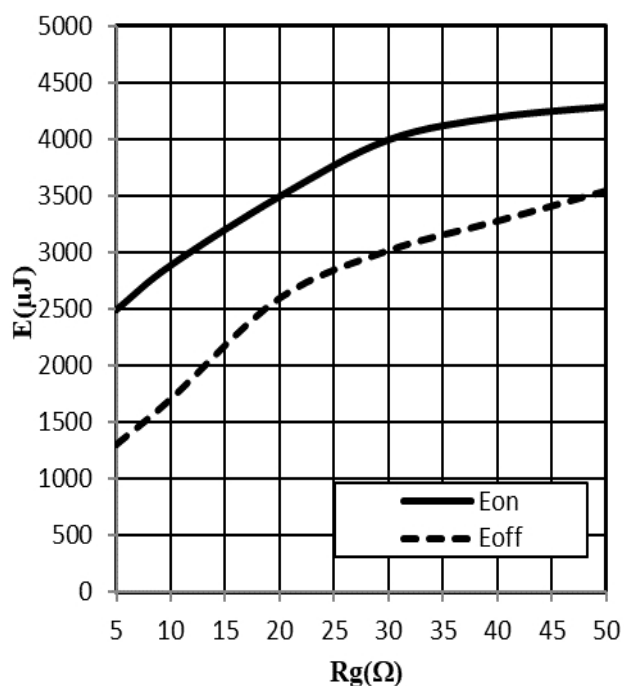


Fig 13. Typical switch energy as a function of R_G
(inductive load, $T_J=25^\circ\text{C}$, $V_{CE}=400\text{V}$, $V_{GE}=15\text{V}$, $I_C=60\text{A}$)

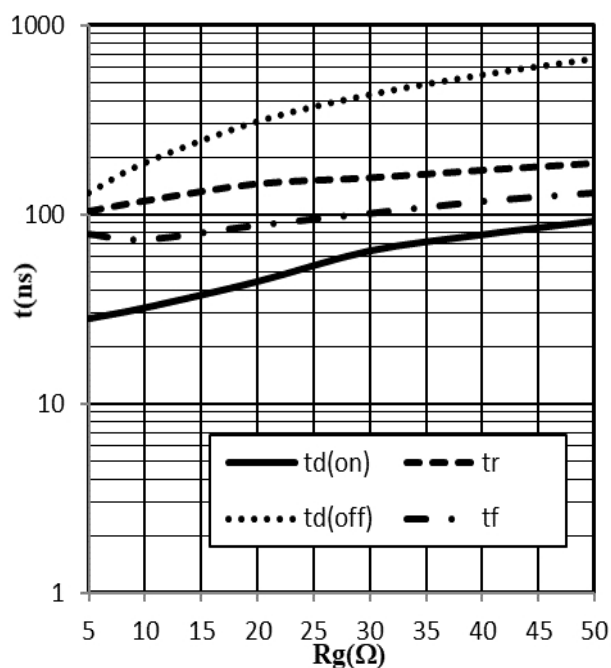


Fig 14. Typical switch time as a function of R_G
(inductive load, $T_J=25^\circ\text{C}$, $V_{CE}=400\text{V}$, $V_{GE}=15\text{V}$, $I_C=60\text{A}$)

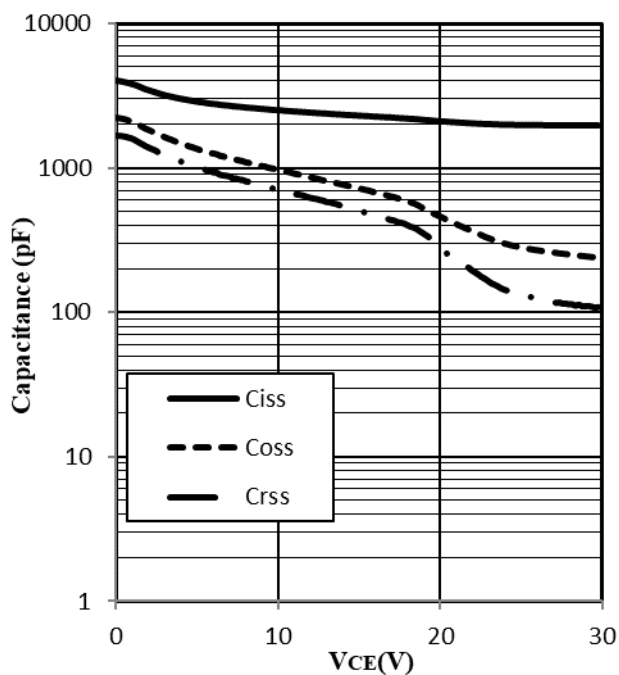


Fig 15. Typical capacitance as a function of collector-emitter voltage ($V_{GE}=0\text{V}$, $f=1\text{MHz}$)

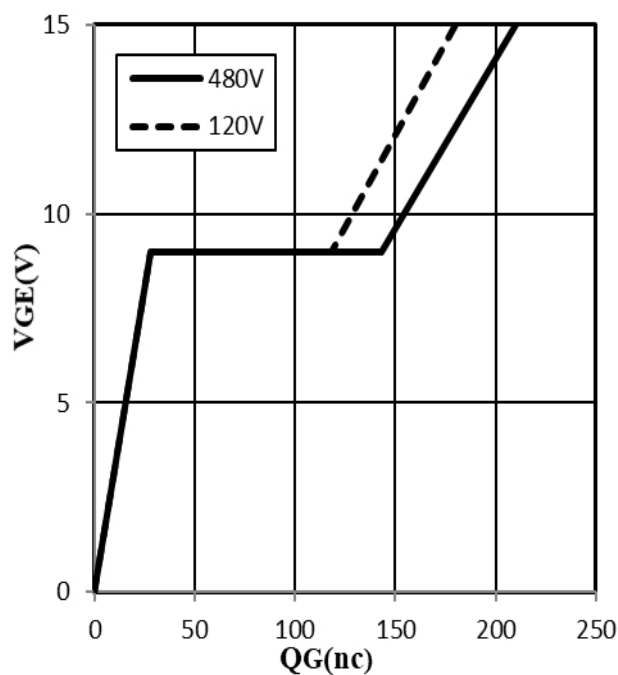


Fig 16. Typical gate charge ($I_C=60\text{A}$)

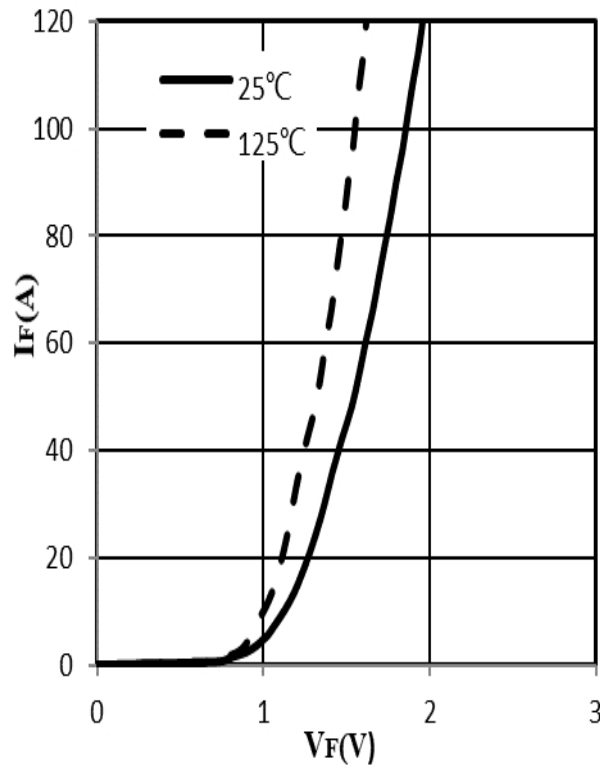


Fig 17. Typical diode forward current as a function of forward voltage

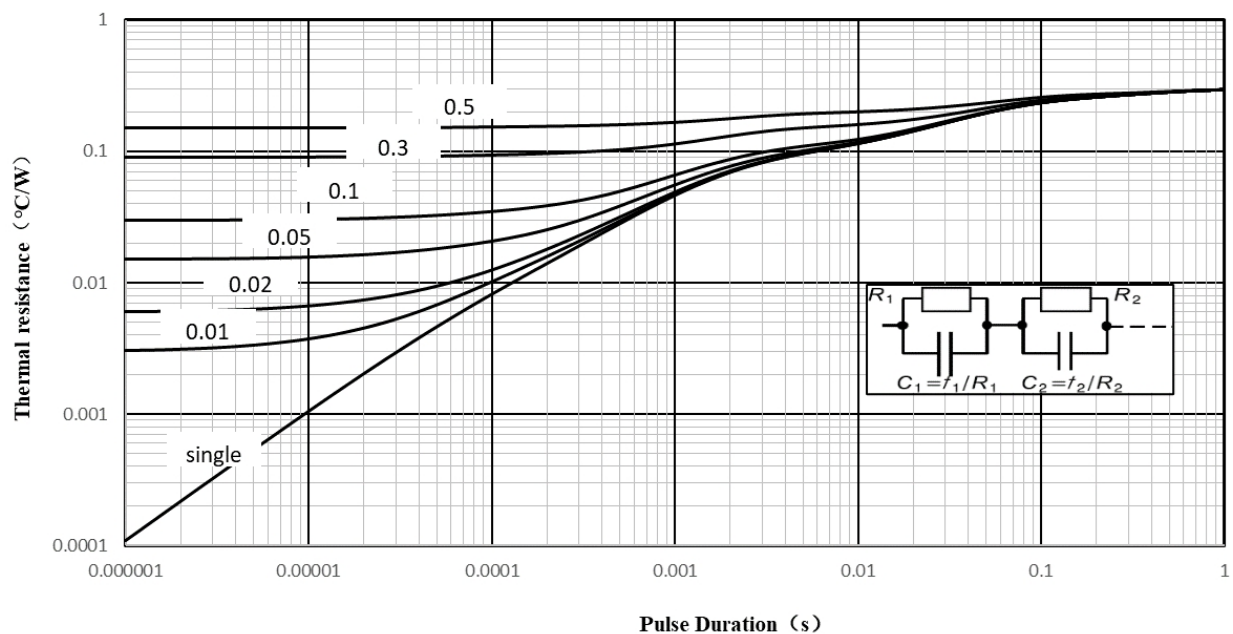
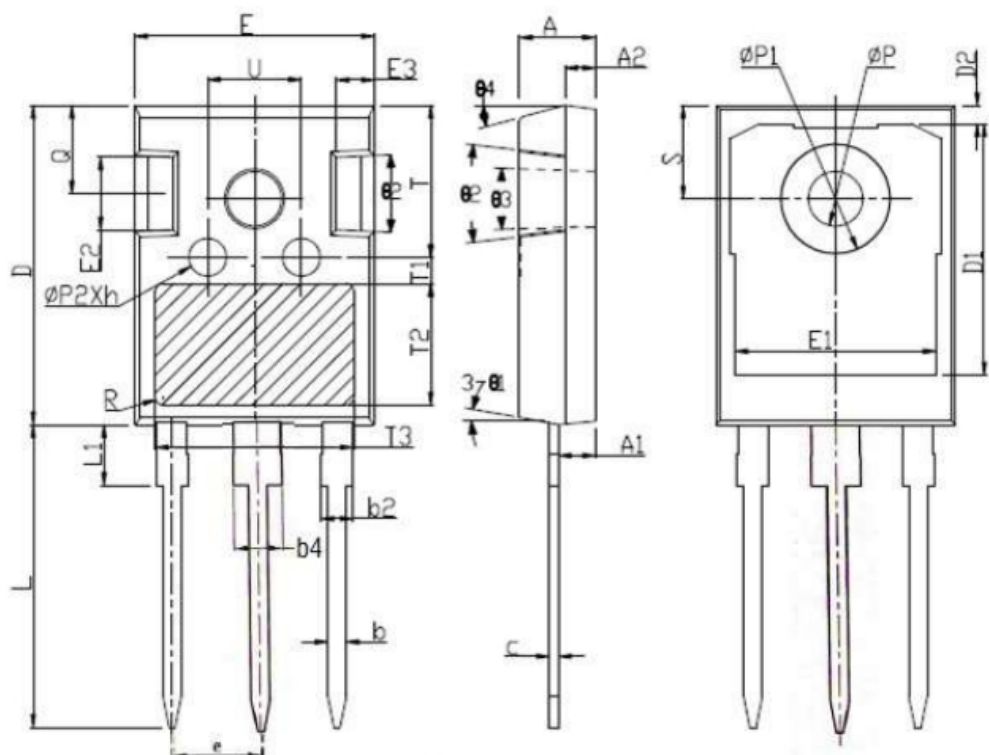


Fig 18. IGBT transient thermal resistance($D=t_p/T$)

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	