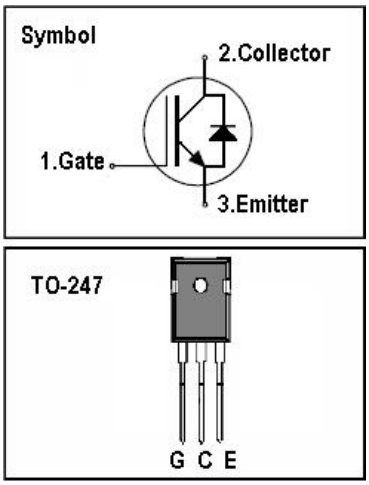


IGBT

Features

- 650V 60A,$V_{CE(sat)(typ.)}$ = 2.3 V@60A
- Field Stop IGBT Technology.
- 10μs Short Circuit Capability.
- Square RBSOA.
- Positive VCE (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 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 ℃)	120	A
	Continuous Collector Current (T_C=100℃)	60	A
I_{CM}	Pulsed Collector Current (Note 1)	240	A
I_F	Diode Continuous Forward Current (T_C=100 ℃)	60	A
I_{FM}	Diode Maximum Forward Current (Note 1)	240	A
t_{sc}	Short Circuit Withstand Time	10	us
Isc	Short Circuit Current	270	A
P_D	Maximum Power Dissipation (T_C=25 ℃)	416	W
P_D	Maximum Power Dissipation (T_C=100℃)	166	W
T_J	Operating Junction Temperature Range	-55 to +150	℃
T_{STG}	Storage Temperature Range	-55 to +150	℃

Thermal Characteristics

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

Electrical Characteristics (T_C=25℃ 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℃	-	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
Eon	Turn-on Switching Loss		-	2.90	-	mJ
Eoff	Turn-off Switching Loss		-	1.70	-	mJ
C_{ies}	Input Capacitance	V_{CE}=25V V_{GE}=0V f = 1MHz	-	2020	-	pF
C_{oes}	Output Capacitance		-	280	-	pF
C_{res}	Reverse Transfer Capacitance		-	130	-	pF
R_{Gint}	Integrated gate resistor	f=1MHz;Vpp=1V		1.55		Ω

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
V_F	Diode Forward Voltage	I_F=60A	-	1.35		V
t_{rr}	Diode Reverse Recovery Time	V_{CE} = 400V I_F= 60A dI_F/dt = 500A/us	-	100		ns
I_{rrm}	Diode peak Reverse Recovery Current		-	15		A
Q_{rr}	Diode Reverse Recovery Charge		-	630		nC

Notes:

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

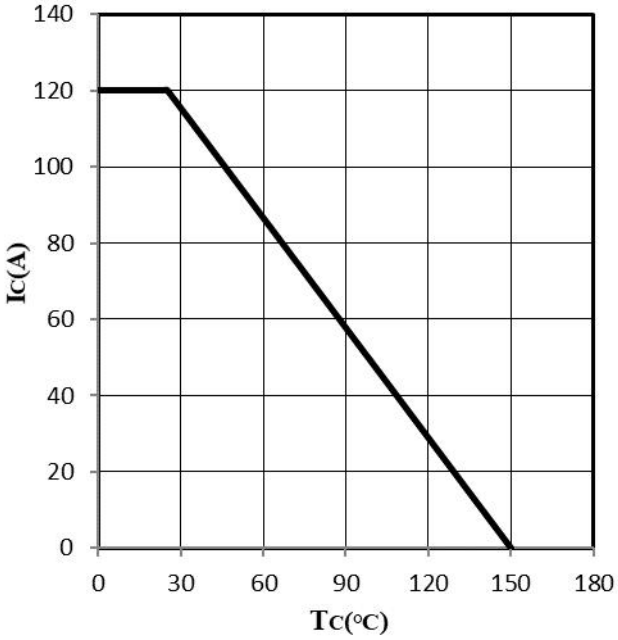


Fig 1. DC Collector current as a function of case temperature (VGE≥15V , Tj≤150℃)

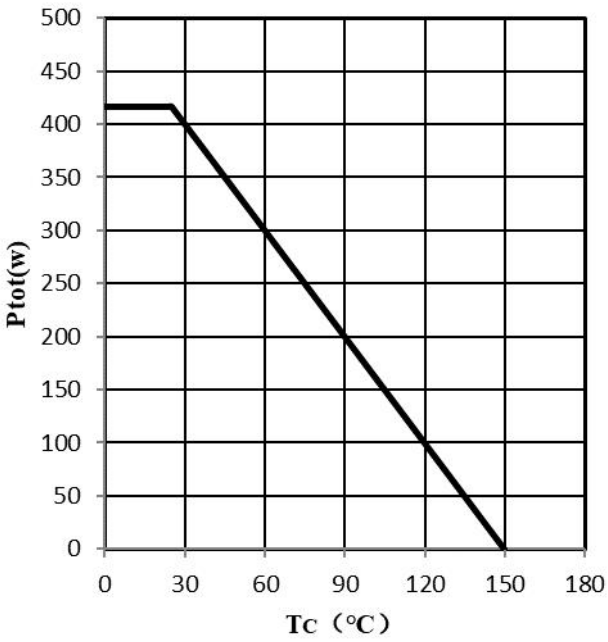


Fig 2. Power dissipation as a function of case temperature (Tj≤150℃)

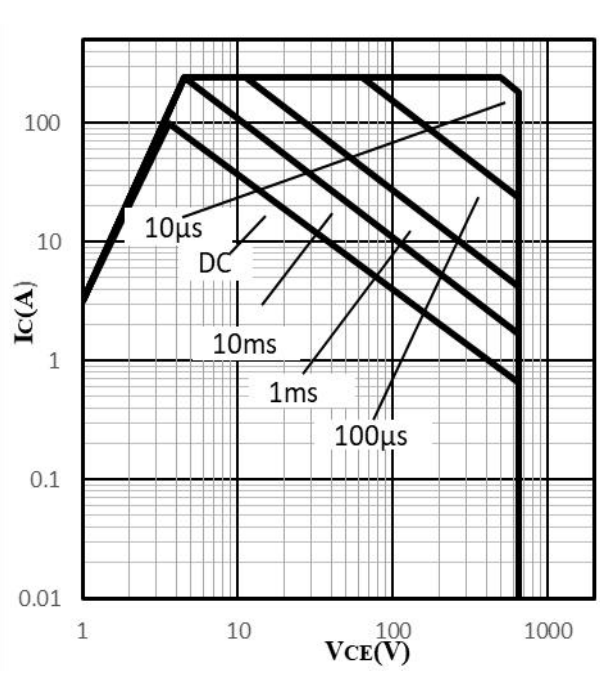


Fig 3. IGBT Forward safe operation area

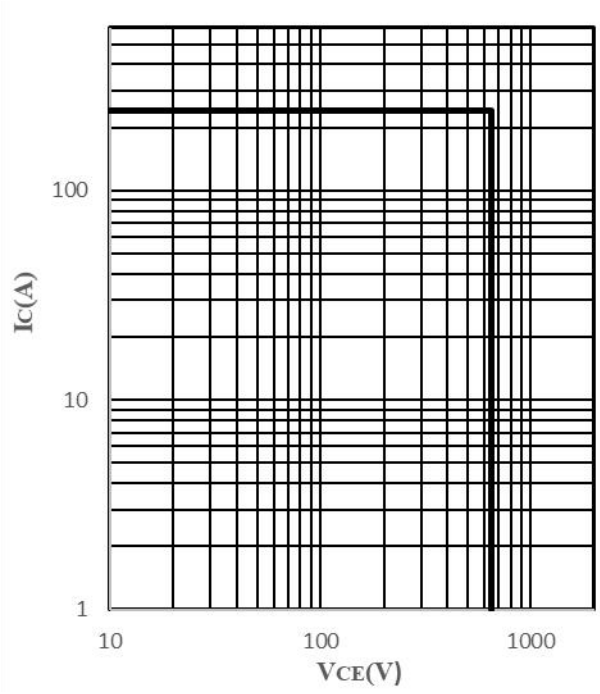


Fig 4. IGBT Reverse safe operation area

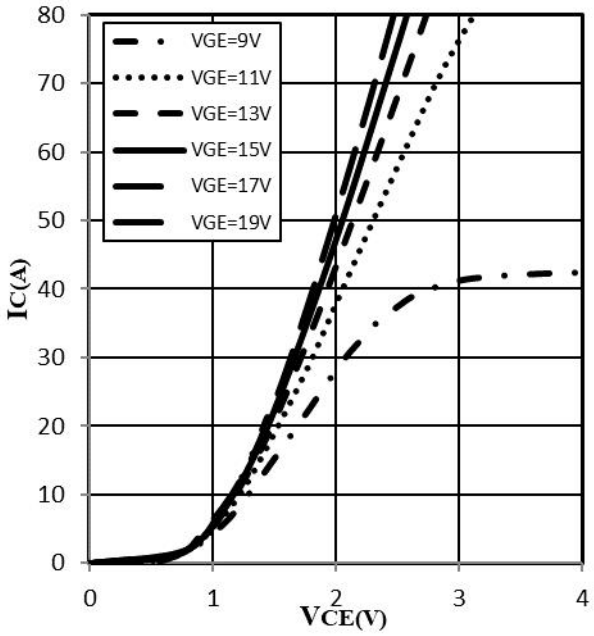


Fig 5. Typical output characteristic （Tj=25℃）

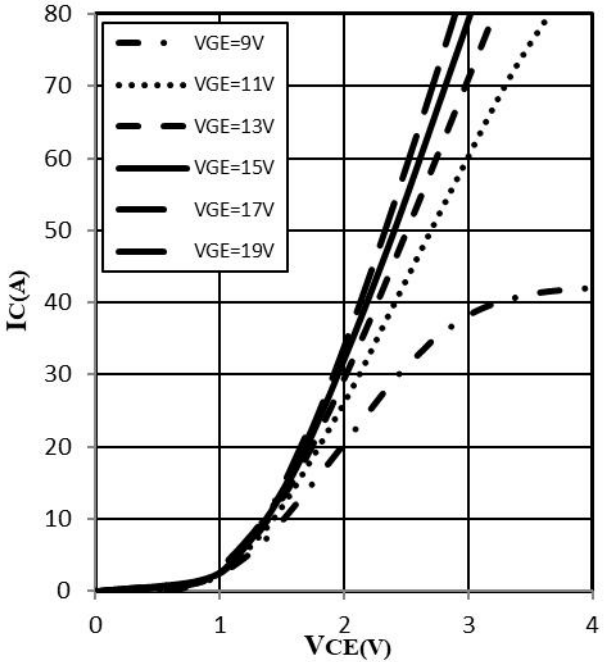


Fig 6. Typical output characteristic （Tj=125℃）

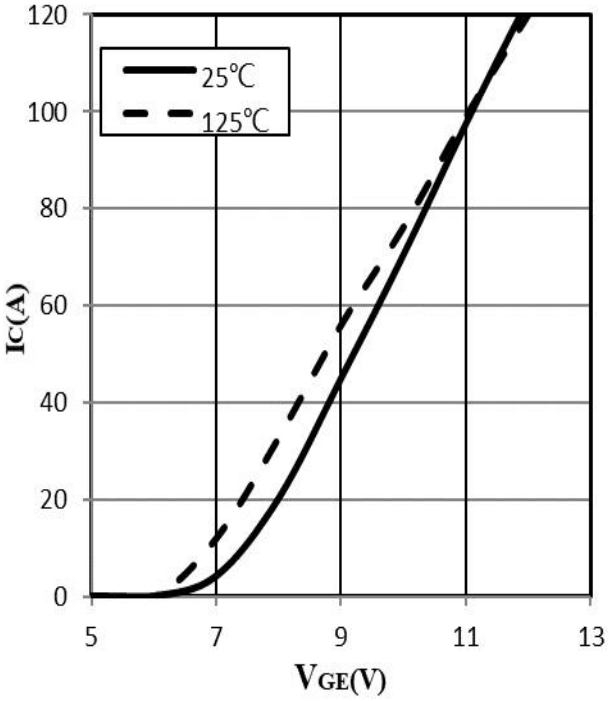


Fig 7. Typical transfer characteristic （V_{CE}=20V）

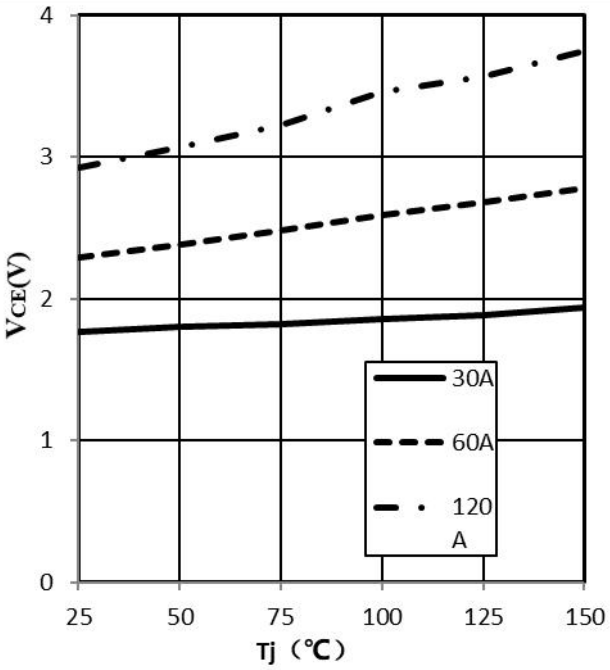


Fig 8. Typical collector-emitter saturation voltage as a function of junction temperature (VGE=15V)

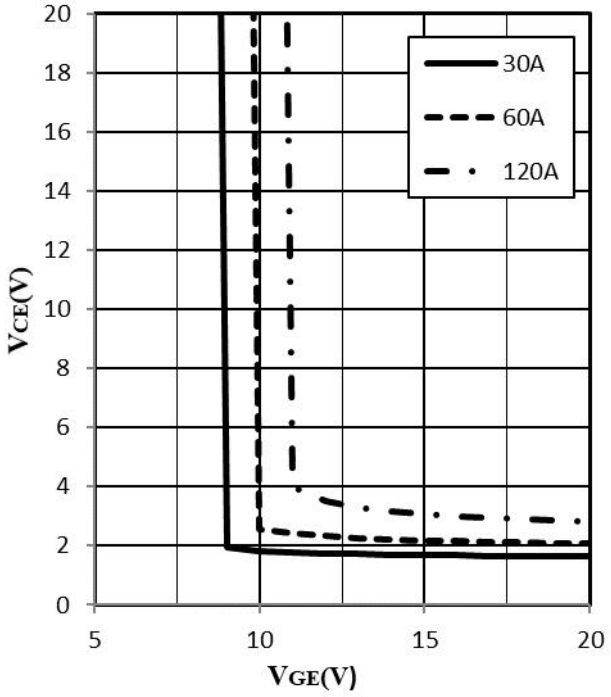


Fig 9. Typical collector-emitter saturation voltage as a function of V_{GE} (Tj=25℃)

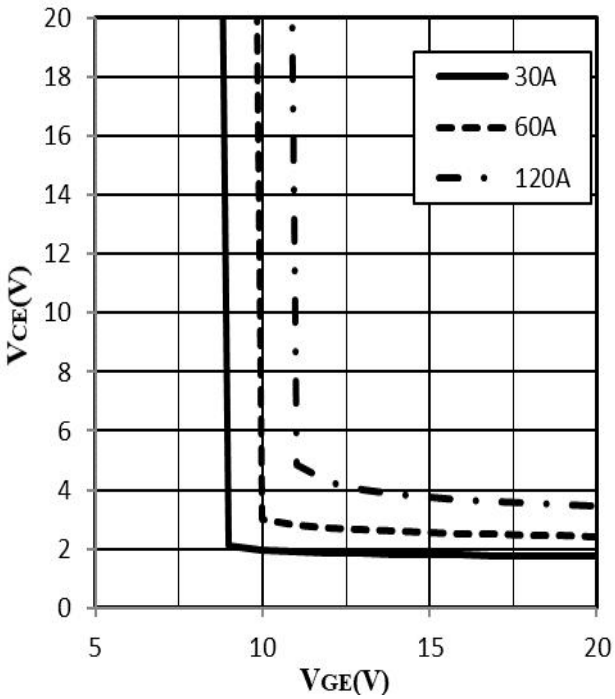


Fig 10. Typical collector-emitter saturation voltage as a function of V_{GE} (Tj=125℃)

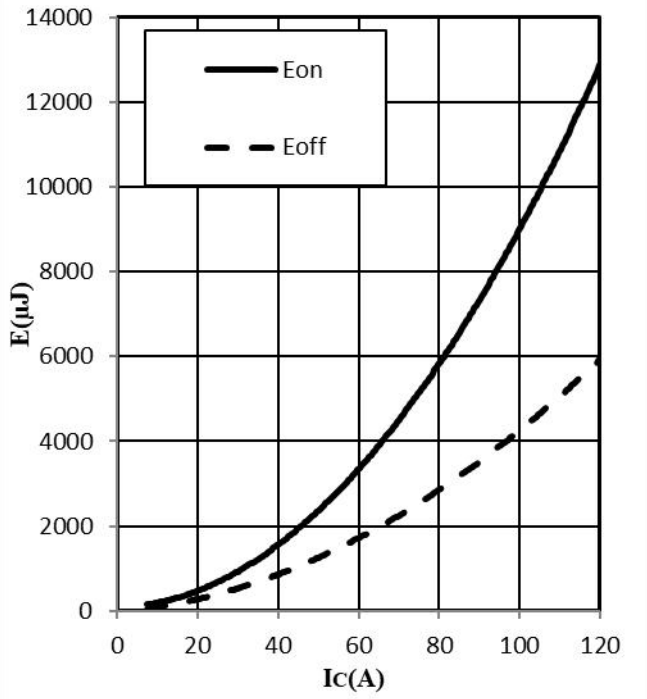


Fig 11. Typical switch energy as a function of Ic (inductive load，T_j=25℃，V_{CE}=400V,V_{GE}=15V,R_G=10Ω)

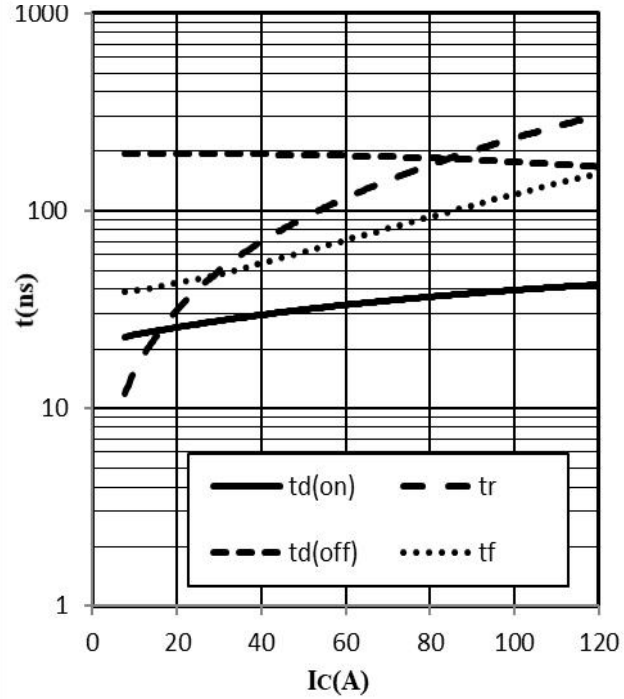


Fig 12. Typical switch time as a function of Ic (inductive load，T_j=25℃，V_{CE}=400V,V_{GE}=15V,R_G=10Ω)

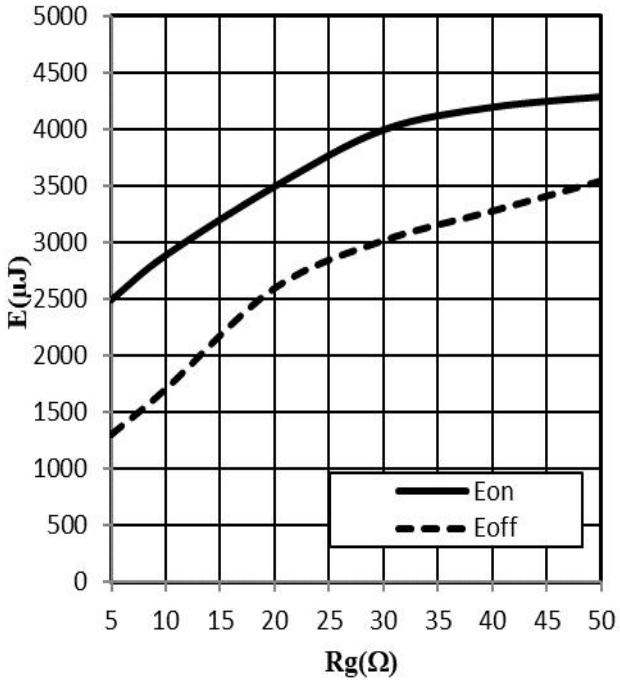


Fig 13. Typical switch energy as a function of R_G
(inductive load，T_j=25℃，V_{CE}=400V,V_{GE}=15V,Ic=60A)

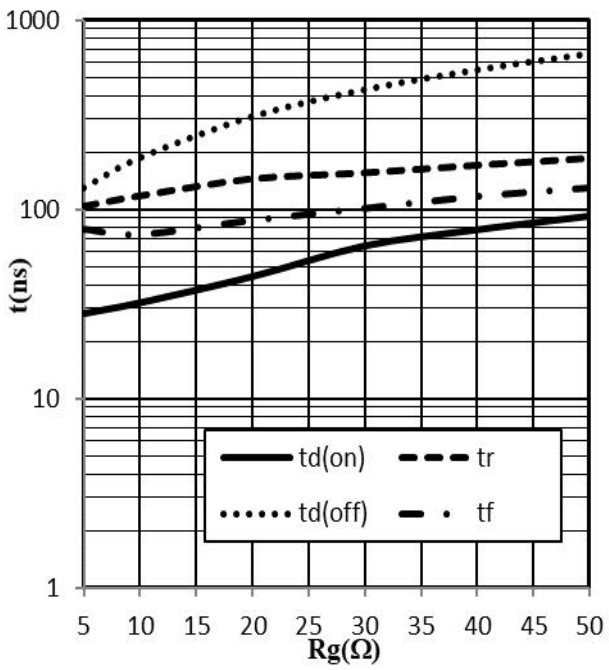


Fig 14. Typical switch time as a function of R_G
(inductive load，T_j=25℃，V_{CE}=400V,V_{GE}=15V,Ic=60A)

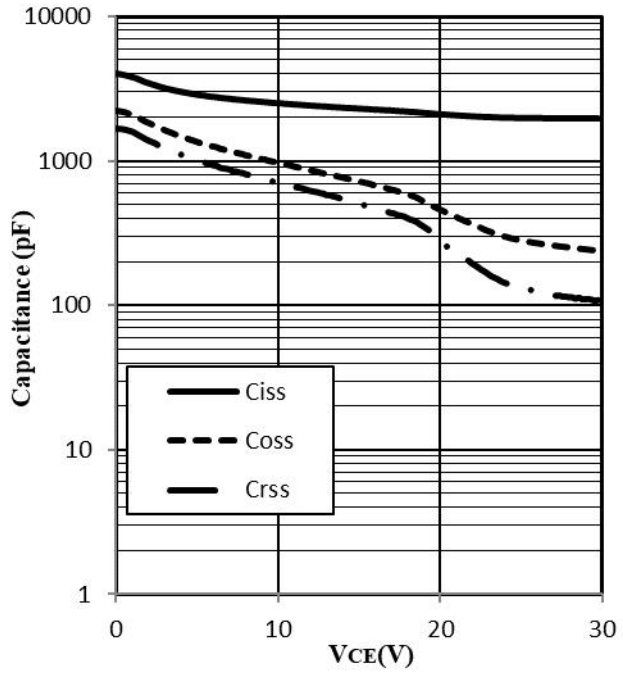


Fig 15. Typical capacitance as a function of collector-emitter voltage (V_{GE}=0V,f=1MHz)

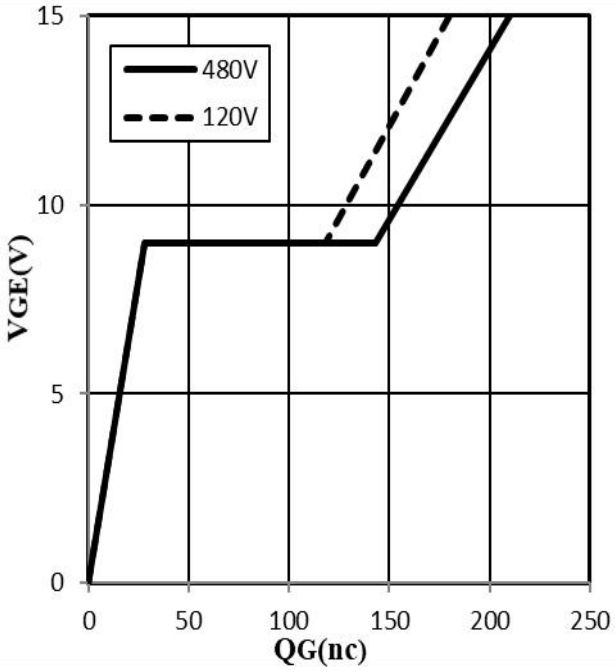


Fig 16. Typical gate charge (I_C=60A)

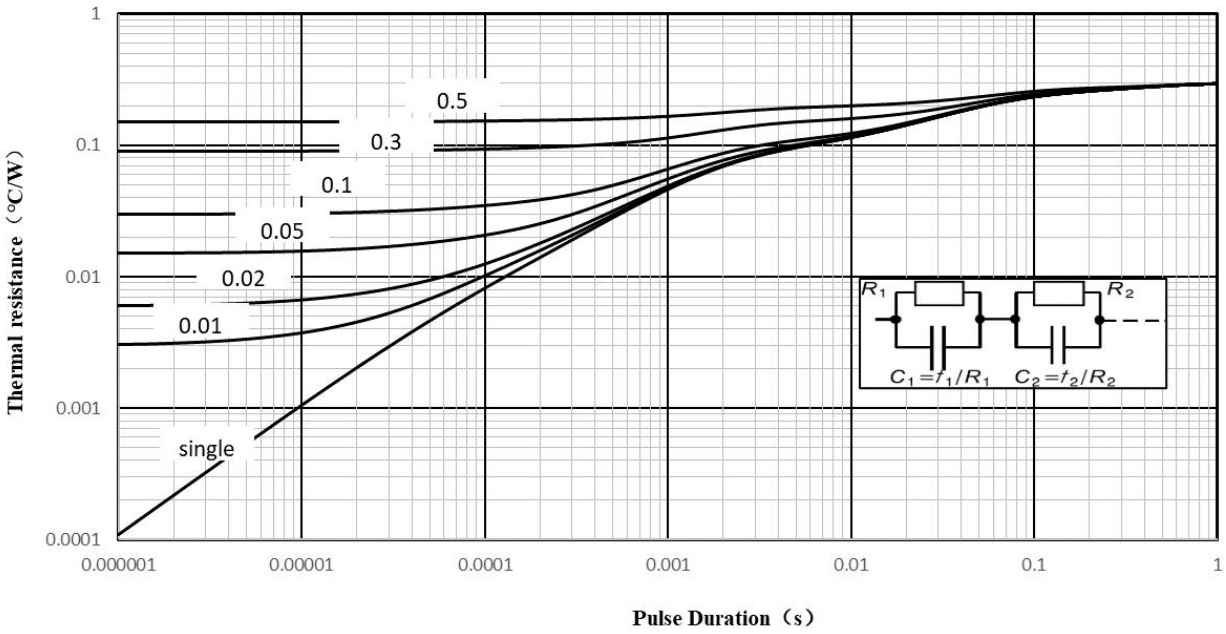
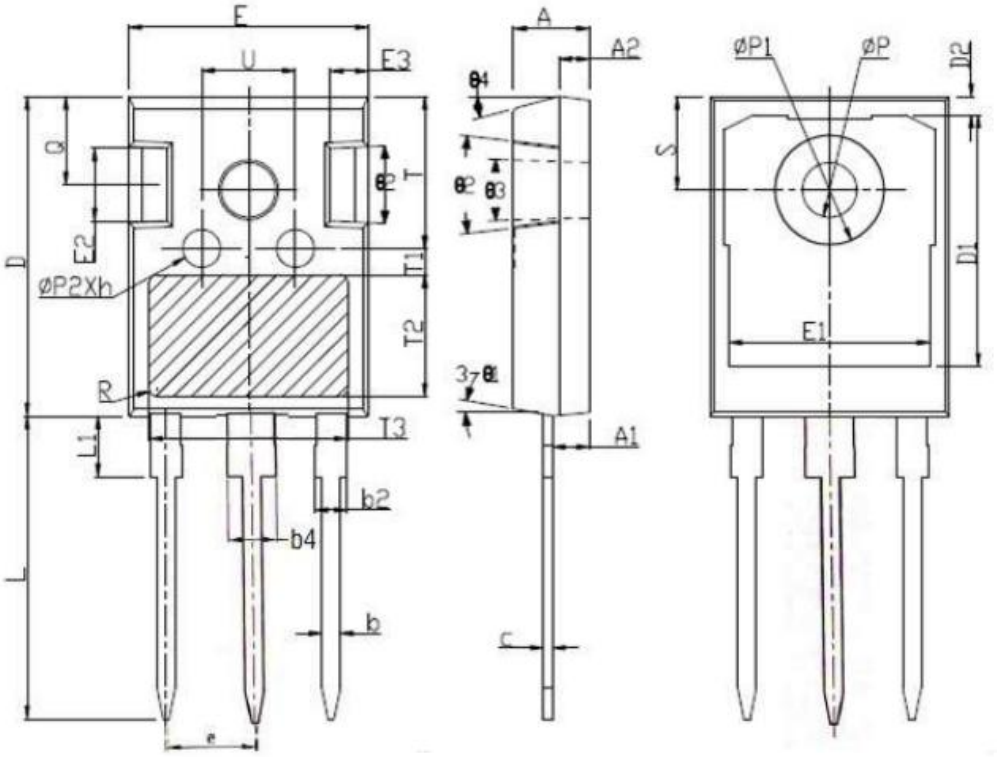


Fig 18. IGBT transient thermal resistance(D=tp/T)

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		TO-247G	