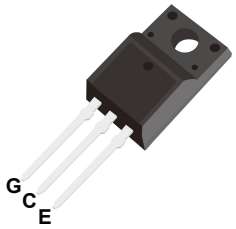
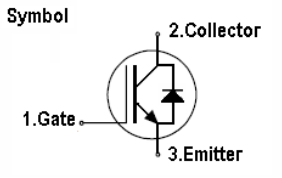
IGBT in TO-220F

Features

- 650V 20A,VCE(sat)(typ.) = 1.70 V@20A
- Field Stop IGBT Technology
- 10μs Short Circuit Capability
- Square RBSOA
- Positive VCE (on) Temperature Coefficient





Mechanical Data

- **Case:** TO-220F (plastic package).
  Lead free; RoHS compliant
- **Molding Compound Flammability Rating:**
  UL 94 V-0
- **Terminals:** High temperature soldering guaranteed:
  260 °C/10 sec. at terminals

Benefits

- High Efficiency for Motor Control
- Rugged Performance
- Excellent Current Sharing in Parallel Operation

Applications

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

Absolute Maximum 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 ℃)	40	A
	Continuous Collector Current (T_C=100℃)	20	A
I_{CM}	Pulsed Collector Current (Note 1)	80	A
I_F	Diode Continuous Forward Current (T_C=100 ℃)	20	A
I_{FM}	Diode Maximum Forward Current (Note 1)	80	A
t_{sc}	Short Circuit Withstand Time	10	us
Isc	Short Circuit Current	150	A
P_D	Maximum Power Dissipation (T_C=25 ℃)	37	W
P_D	Maximum Power Dissipation (T_C=100℃)	15	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	3.3	℃/ W
$R_{th\ j\text{-}c}$	Thermal Resistance, Junction to case for Diode	4.3	℃/W
$R_{th\ j\text{-}a}$	Thermal Resistance, Junction to Ambient	80	℃/W

Electrical Characteristics (TC=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= 20A	-	1.70		V
Q_g	Total Gate Charge	V_{CC}=480V V_{GE}=15V I_C=20A	-	79		nC
Q_{ge}	Gate-Emitter Charge		-	11		nC
Q_{gc}	Gate-Collector Charge		-	43		nC
$t_{d(on)}$	Turn-on Delay Time	V_{CC}=400V V_{GE}=15V I_C=20A R_G=10Ω Inductive Load T_C=25℃	-	16	-	ns
t_r	Turn-on Rise Time		-	27	-	ns
$t_{d(off)}$	Turn-off Delay Time		-	113	-	ns
t_f	Turn-off Fall Time		-	26	-	ns
Eon	Turn-on Switching Loss		-	0.49	-	mJ
Eoff	Turn-off Switching Loss		-	0.31	-	mJ
C_{ies}	Input Capacitance	V_{CE}=25V V_{GE}=0V f = 1MHz	-	980	-	pF
C_{oes}	Output Capacitance		-	130	-	pF
C_{res}	Reverse Transfer Capacitance		-	60	-	pF
R_{Gint}	Integrated gate resistor	f=1MHz;Vpp=1V		2.30		Ω

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
V_F	Diode Forward Voltage	I_F=20A	-	2.3		V
t_{rr}	Diode Reverse Recovery Time	V_{CE} = 400V I_F= 20A dIF/dt = 500A/us	-	42		ns
I_{rrm}	Diode peak Reverse Recovery Current		-	7.6		A
Q_{rr}	Diode Reverse Recovery Charge		-	186		nC

Notes:

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

Typical Characteristics

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

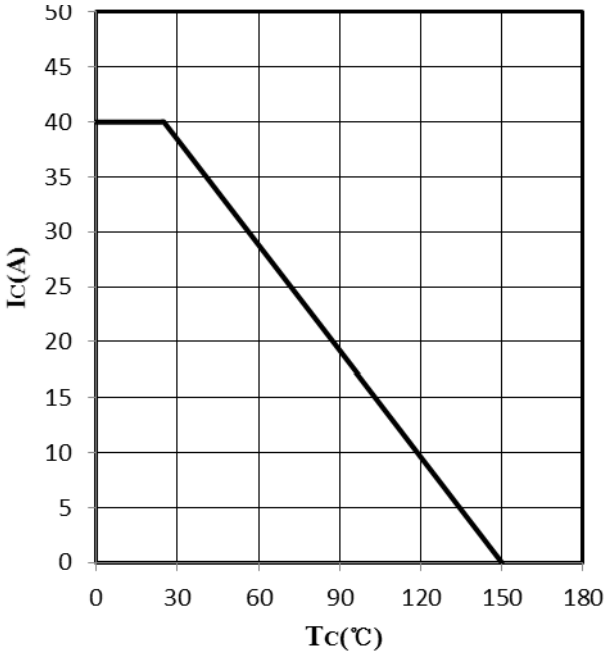


Fig 2. Power dissipation as a function of case temperature (Tj≤150℃)

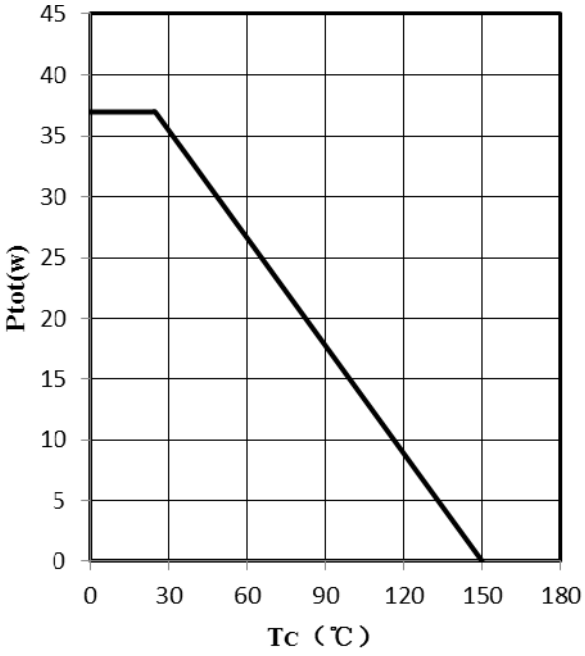


Fig 3. IGBT Forward safe operation area

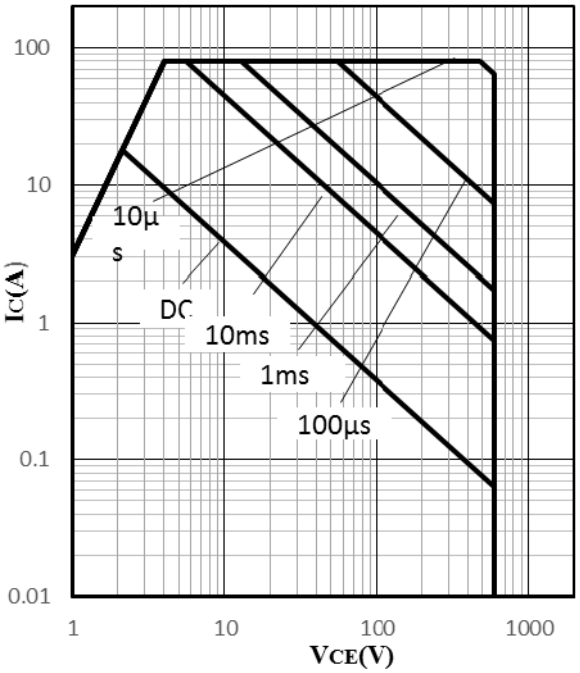
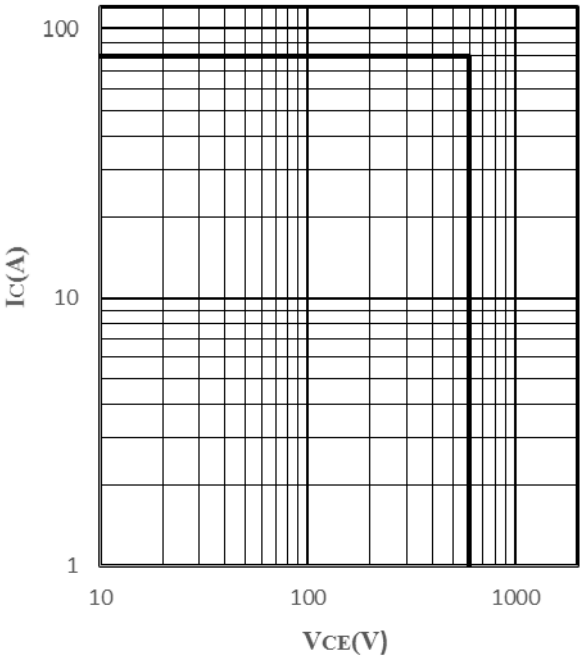


Fig 4. IGBT Reverse safe operation area



Typical Characteristics

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

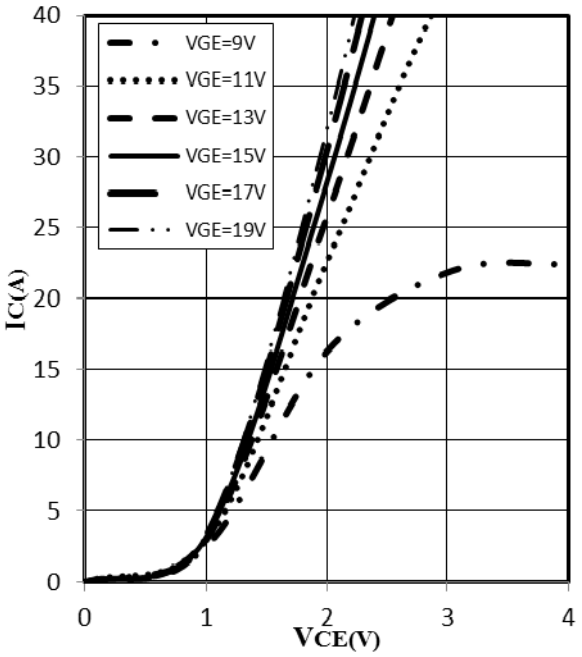


Fig 6. Typical output characteristic （Tj=125℃）

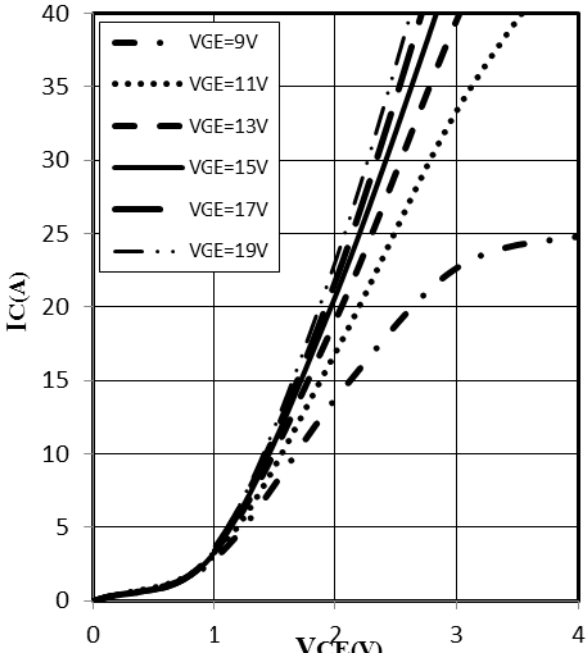


Fig 7. Typical transfer characteristic （V_{CE}=20V）

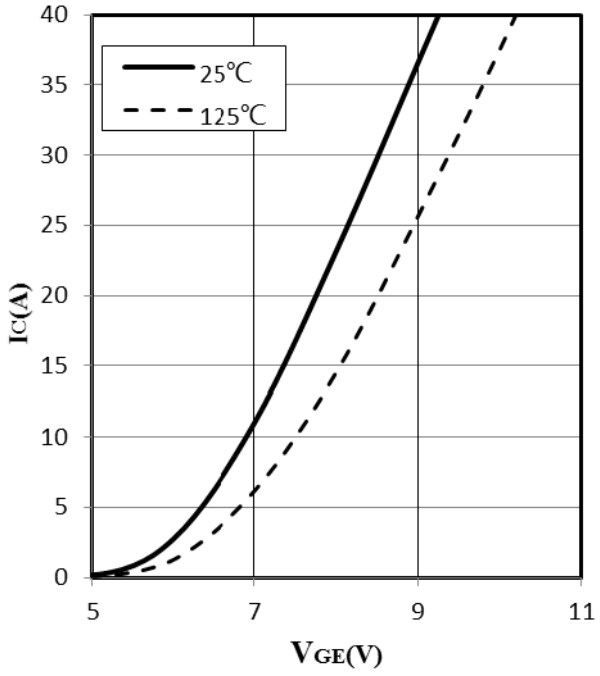
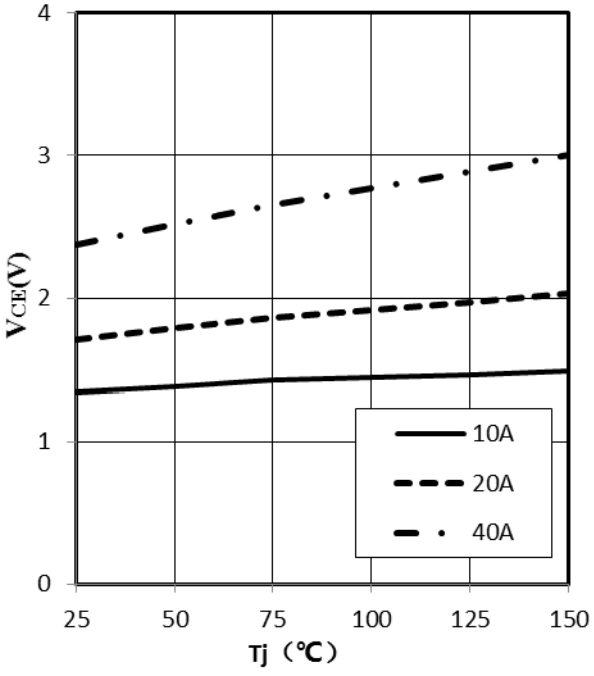


Fig 8. Typical collector-emitter saturation voltage as a function of junction temperature (VGE=15V)



Typical Characteristics

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

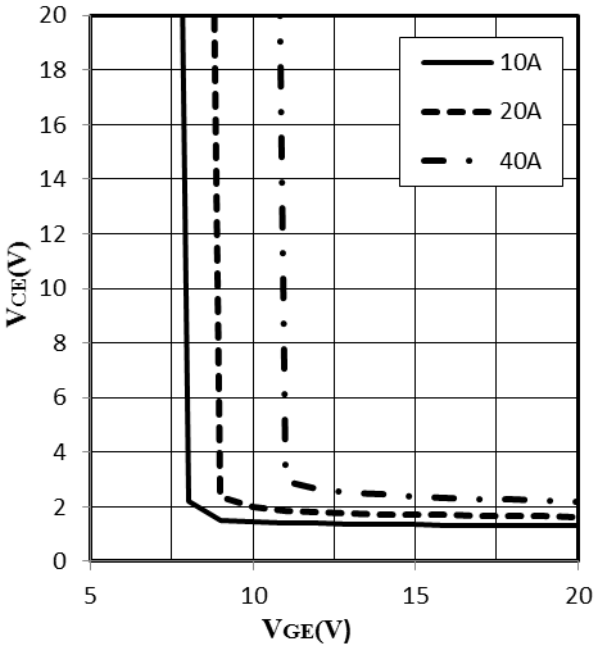


Fig 10. Typical collector-emitter saturation voltage as a function of V_{GE} (Tj=125℃)

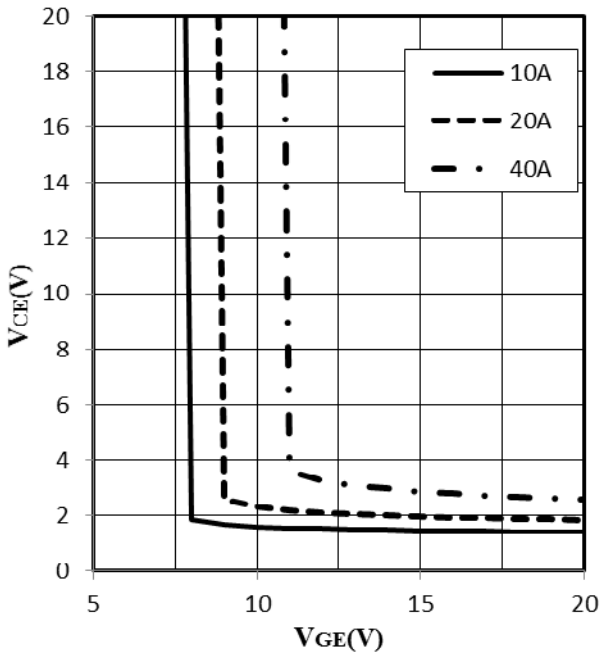


Fig 11. Typical switch energy as a function of Ic (inductive load，T_j=25℃，V_{CE}=400V,V_{GE}=15V,R_G=10Ω)

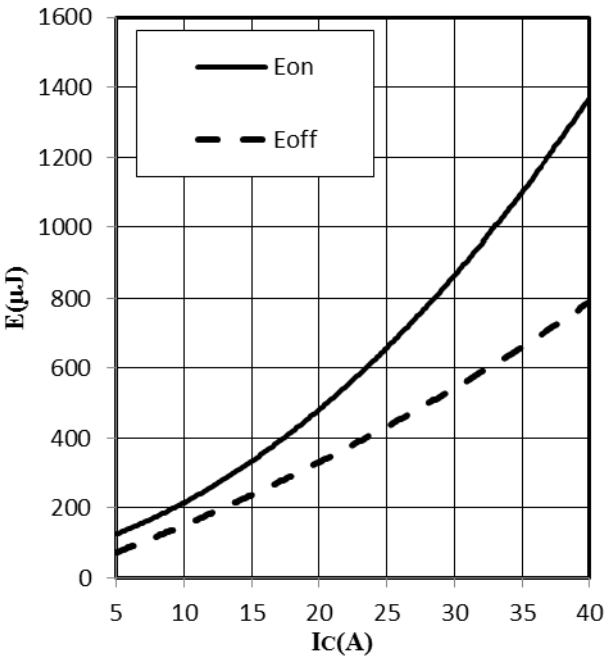
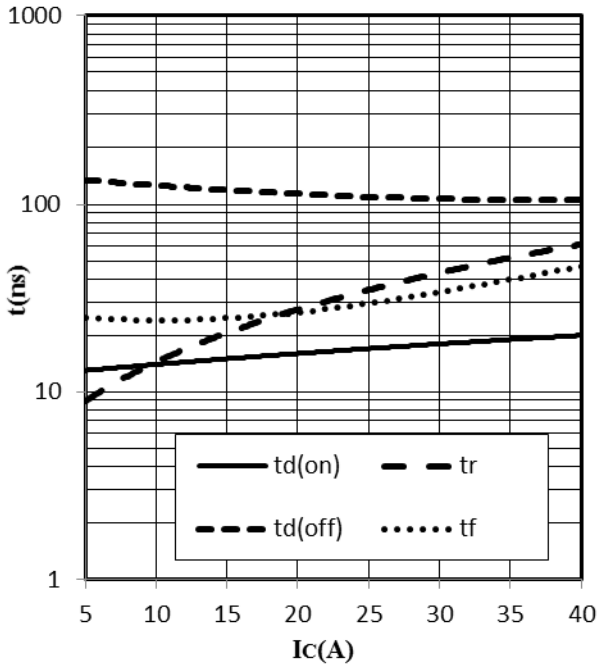


Fig 12. Typical switch time as a function of Ic (inductive load，T_j=25℃，V_{CE}=400V,V_{GE}=15V,R_G=10Ω)



Typical Characteristics

Fig 13. Typical switch energy as a function of R_G
(inductive load，T_j=25℃，V_{CE}=400V,V_{GE}=15V,Ic=20A)

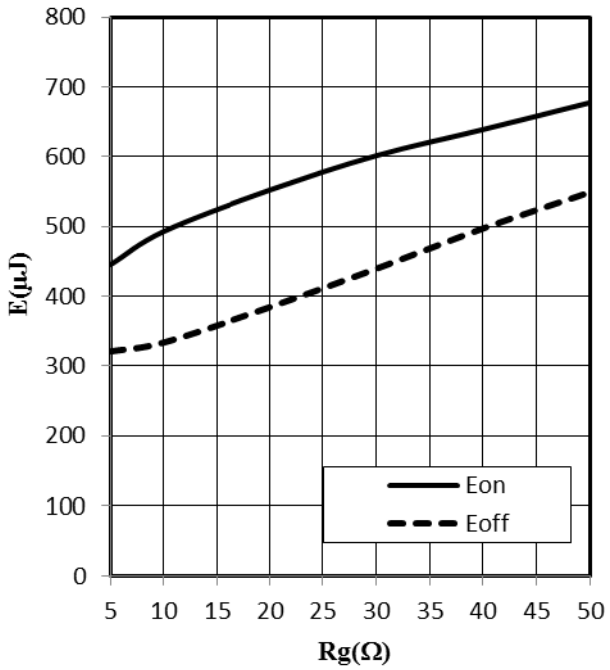


Fig 14. Typical switch time as a function of R_G
(inductive load，T_j=25℃，V_{CE}=400V,V_{GE}=15V,Ic=20A)

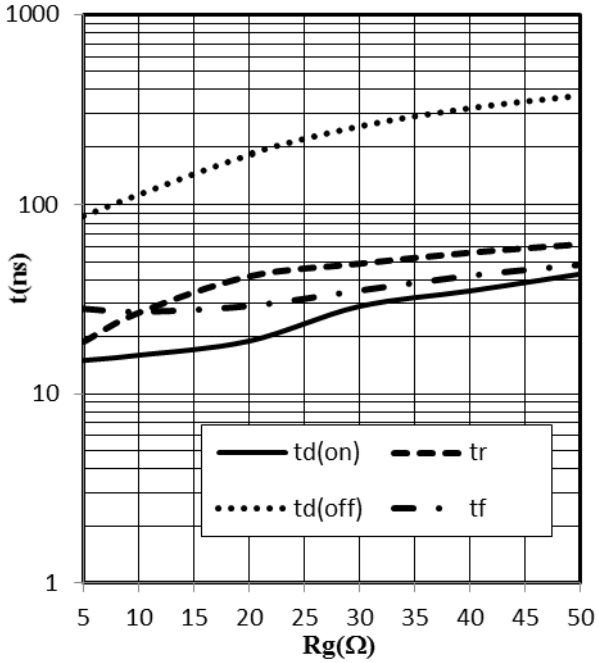


Fig 15. Typical capacitance as a function of collector-emitter voltage (V_{GE}=0V,f=1MHz)

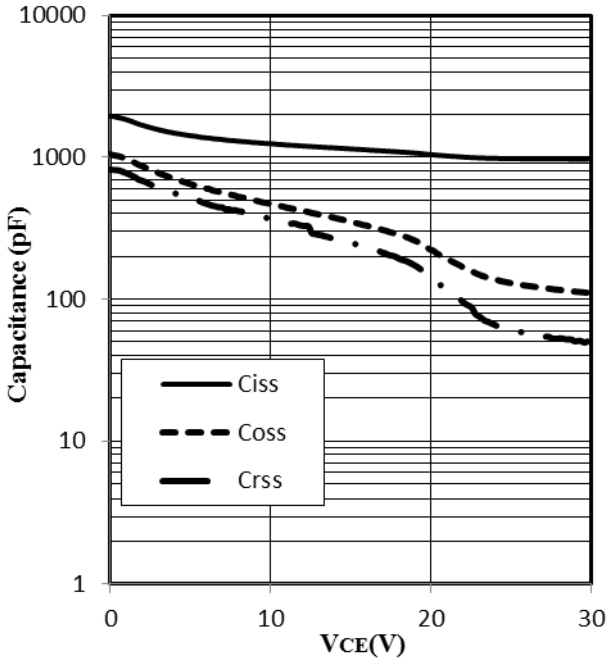
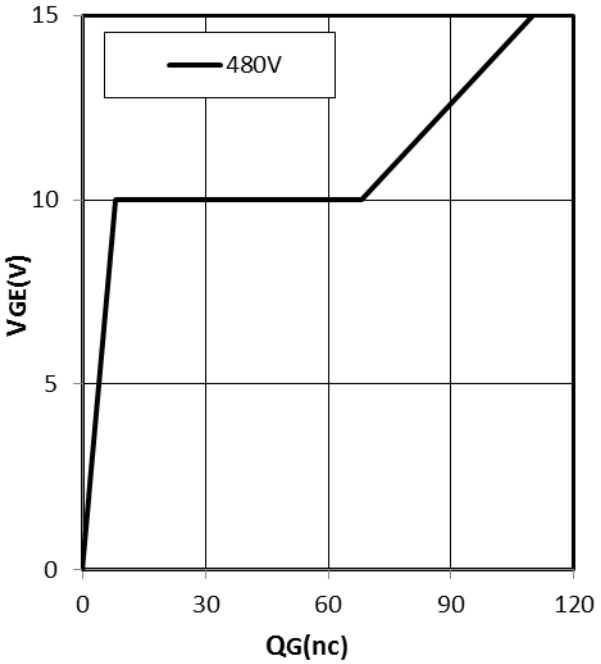


Fig 16. Typical gate charge (I_C=20A)



Typical Characteristics

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

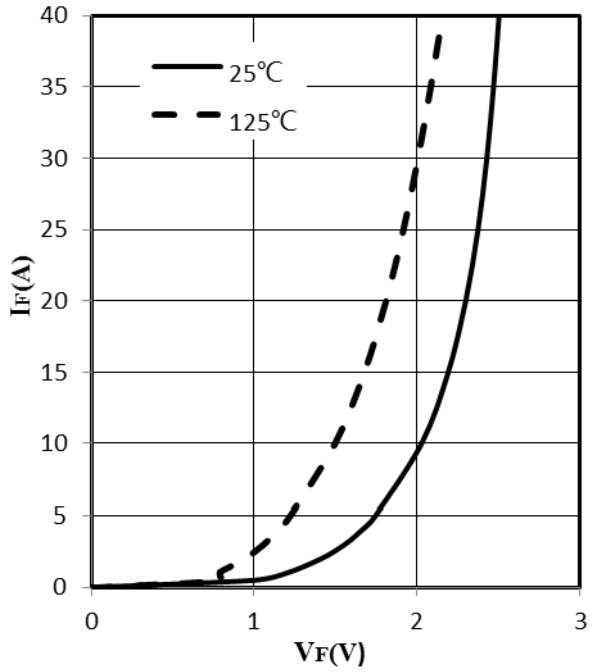


Fig 18. Typical trr as a function of dI_F/dt

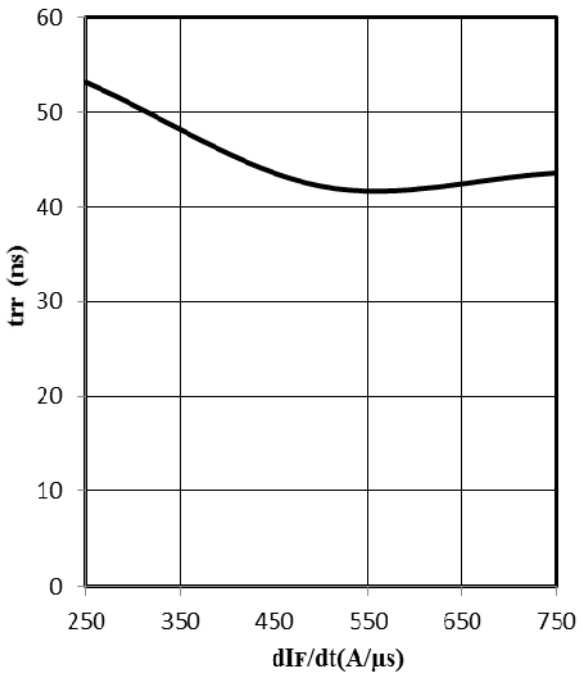


Fig 19. Typical I_{rrm} as a function of dI_F/dt

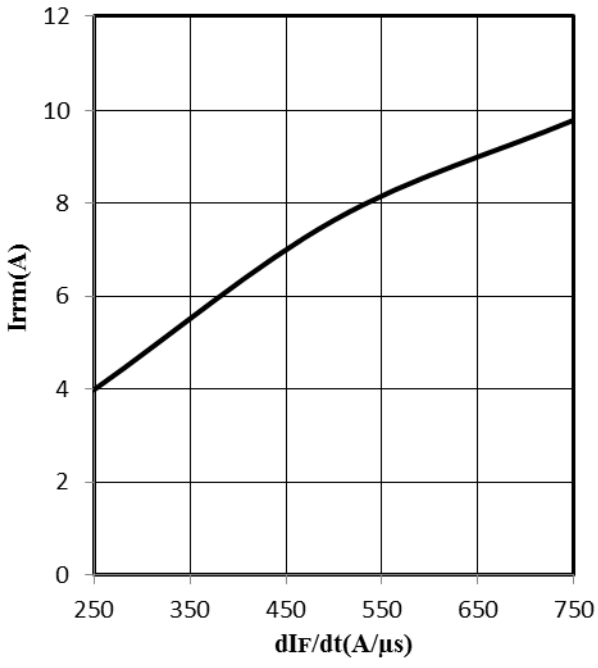
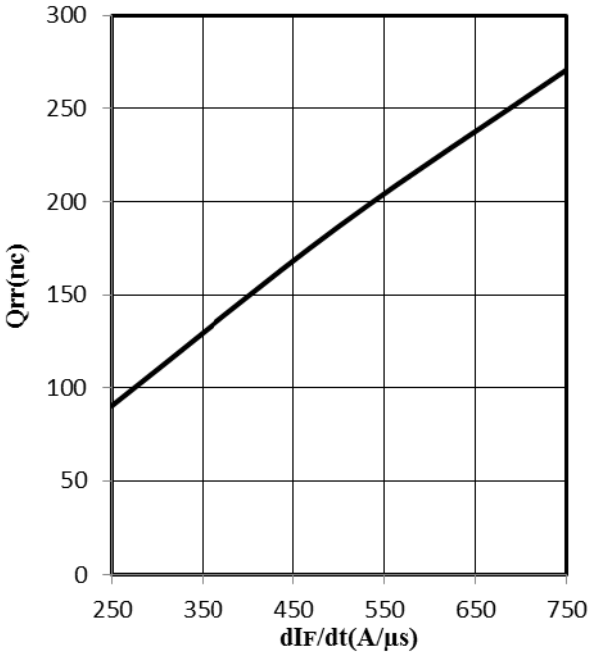
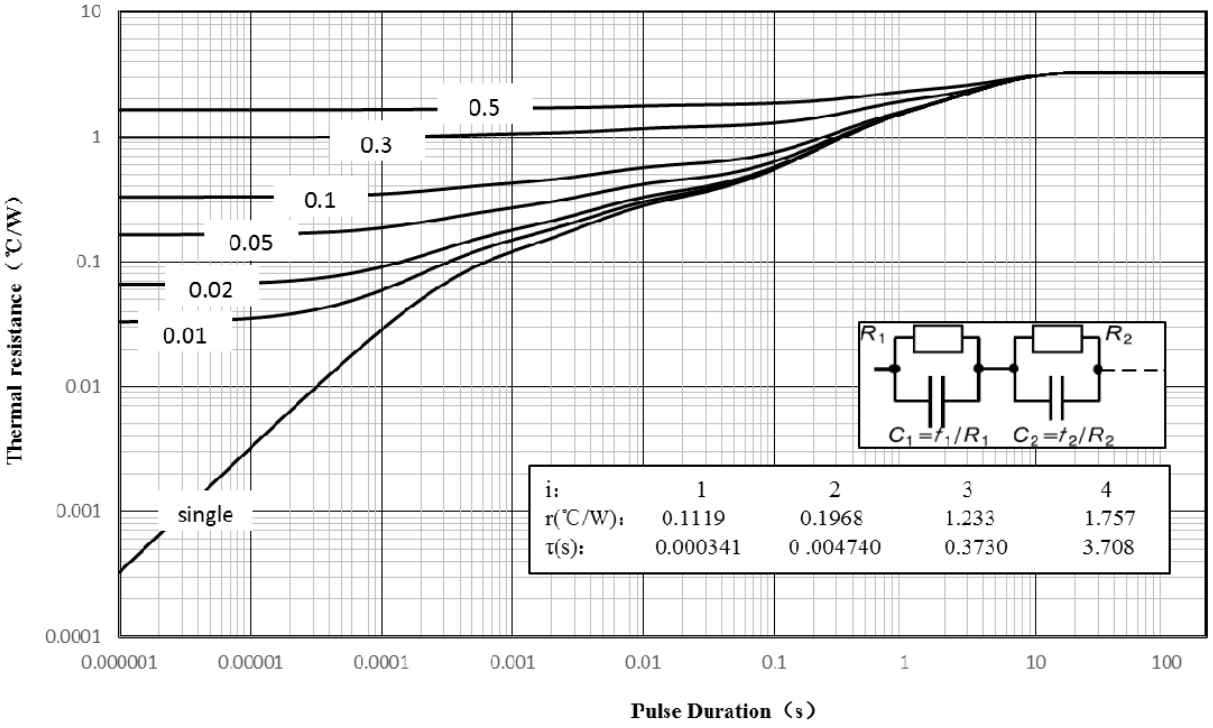


Fig 20. Typical Q_{rr} as a function of dI_F/dt

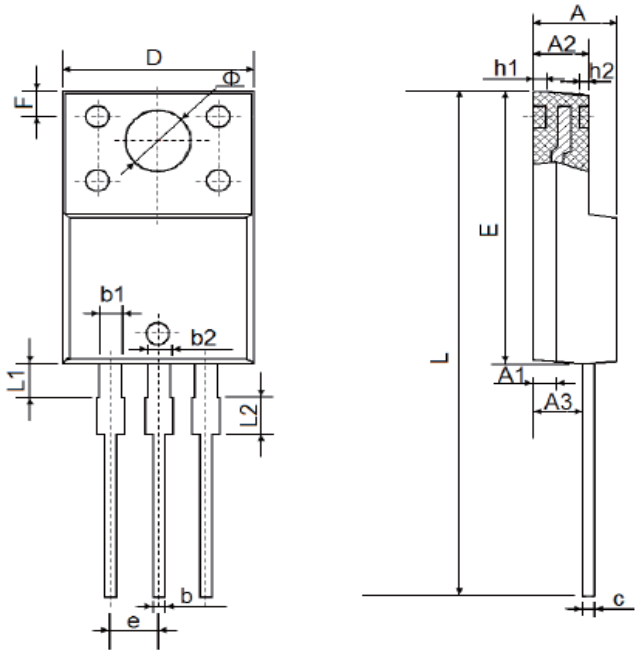


Typical Characteristics

Fig 21. IGBT transient thermal resistance(D=tp/T)



Package Dimensions



Symbol	Dimensions In Millimeters	
	Min.	Max.
A	4.300	4.700
A1	1.300 REF.	
A2	2.800	3.200
A3	2.500	2.900
b	0.500	0.750
b1	1.100	1.350
b2	1.500	1.750
c	0.500	0.750
D	9.960	10.360
E	14.800	15.200
e	2.540 TYP.	
F	2.700 REF.	
Φ	3.500 REF.	
h	0.000	0.300
h1	0.800 REF.	
h2	0.500 REF.	
L	28.000	28.400
L1	1.700	1.900
L2	0.900	1.100

Ordering information

Order code	Package	Packaging option	Base quantity	Packaging specification
CXG20N65FS	TO-220F	Tube/BOX	2000pcs / BOX	EIA STD RS-481

Revision history

Date	Revision	Changes
23-May-2012	1.0	Initial release

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