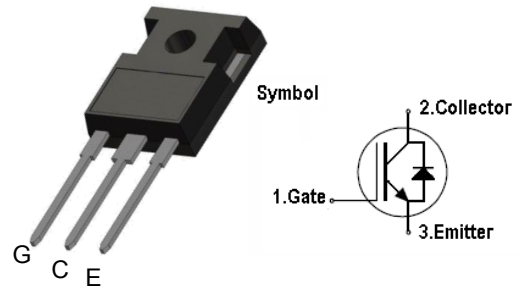


IGBT in TO-247

Features

- 650V 40A, $V_{CE(sat)}(typ.) = 1.7 V @ 40A$
- Field Stop IGBT Technology
- 10 μs Short Circuit Capability
- Square RBSOA
- Positive $V_{CE(on)}$ Temperature Coefficient



Mechanical Data

- **Case:** TO-247 (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 ($T_C=25^{\circ}C$)	80	A
	Continuous Collector Current ($T_C=100^{\circ}C$)	40	A
I_{CM}	Pulsed Collector Current (Note 1)	160	A
I_F	Diode Continuous Forward Current ($T_C=100^{\circ}C$)	40	A
I_{FM}	Diode Maximum Forward Current (Note 1)	160	A
t_{sc}	Short Circuit Withstand Time	10	μs
I_{SC}	Short Circuit Current	260	A
P_D	Maximum Power Dissipation ($T_C=25^{\circ}C$)	367	W
P_D	Maximum Power Dissipation ($T_C=100^{\circ}C$)	147	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	0.34	$^{\circ}C/W$
$R_{th j-c}$	Thermal Resistance, Junction to case for Diode	0.96	$^{\circ}C/W$
$R_{th j-a}$	Thermal Resistance, Junction to Ambient	80	$^{\circ}C/W$

Electrical Characteristics (TC=25°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	$V_{CE} = 650V, V_{GE} = 0V$	-	-	250	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	$V_{GE} = V_{CE}, I_C = 250\mu A$	4.0		5.5	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$V_{GE} = 15V, I_C = 40A$	-	1.7		V
Q_g	Total Gate Charge	$V_{CC} = 480V$ $V_{GE} = 15V$ $I_C = 40A$	-	165		nC
Q_{ge}	Gate-Emitter Charge		-	22		nC
Q_{gc}	Gate-Collector Charge		-	85		nC
$t_{d(on)}$	Turn-on Delay Time	$V_{CC} = 400V$ $V_{GE} = 15V$ $I_C = 40A$ $R_G = 10\Omega$ Inductive Load $T_C = 25^\circ C$	-	26	-	ns
t_r	Turn-on Rise Time		-	49	-	ns
$t_{d(off)}$	Turn-off Delay Time		-	167	-	ns
t_f	Turn-off Fall Time		-	37	-	ns
E_{on}	Turn-on Switching Loss		-	1.25	-	mJ
E_{off}	Turn-off Switching Loss		-	0.70	-	mJ
C_{ies}	Input Capacitance	$V_{CE} = 25V$ $V_{GE} = 0V$ $f = 1MHz$	-	1630	-	pF
C_{oes}	Output Capacitance		-	270	-	pF
C_{res}	Reverse Transfer Capacitance		-	144	-	pF
R_{Gint}	Integrated gate resistor	$f = 1M; V_{pp} = 1V$		1.35		Ω

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
V_F	Diode Forward Voltage	$I_F = 40A$	-	1.35		V
t_{rr}	Diode Reverse Recovery Time	$V_{CE} = 400V$ $I_F = 40A$ $dI_F/dt = 500A/\mu s$	-	100		ns
I_{rrm}	Diode peak Reverse Recovery Current		-	16.5		A
Q_{rr}	Diode Reverse Recovery Charge		-	980		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 ($V_{GE} \geq 15V$, $T_j \leq 150^\circ C$)

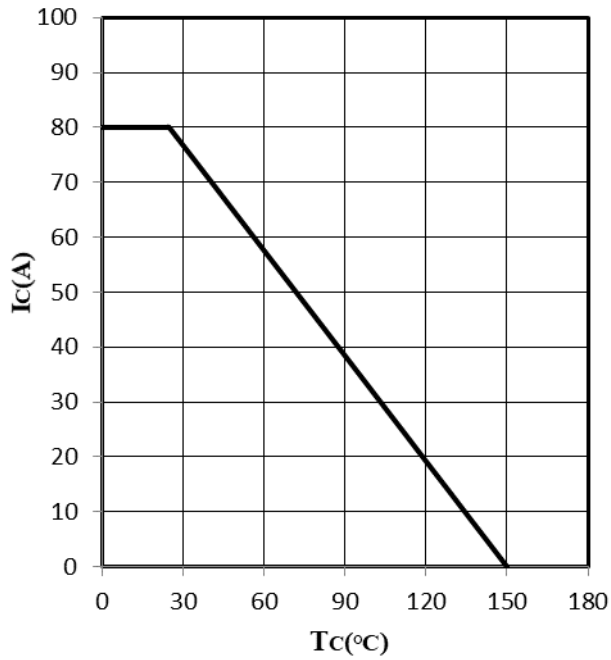


Fig 2. Power dissipation as a function of case temperature ($T_j \leq 150^\circ C$)

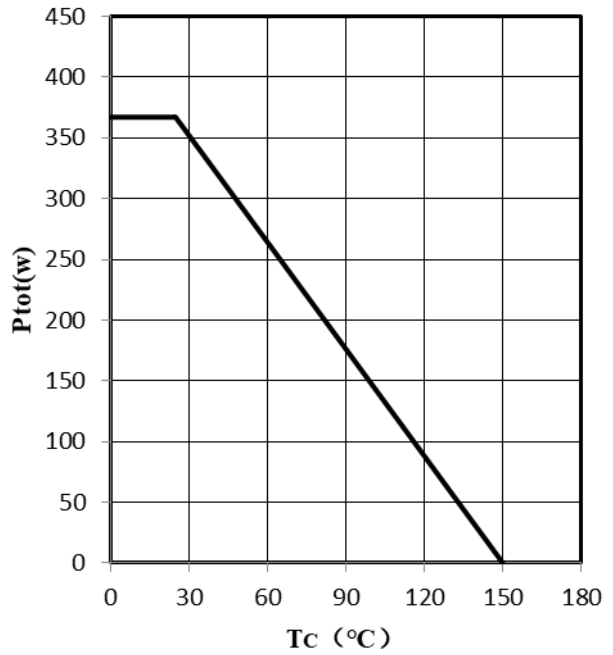


Fig 3. IGBT Forward safe operation area

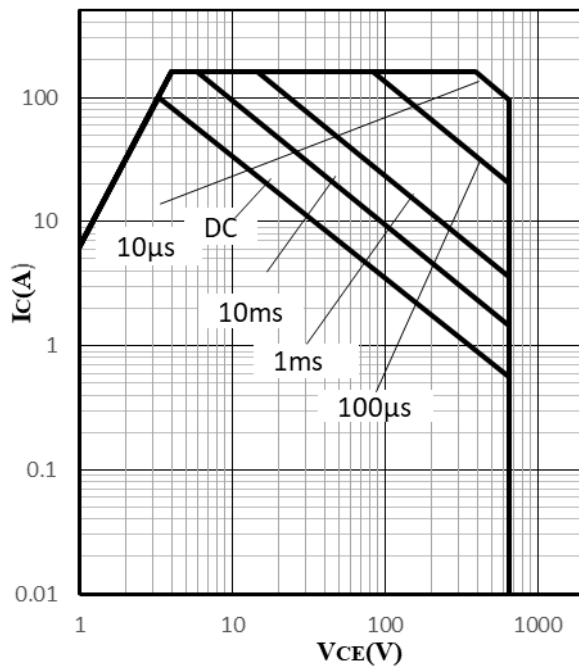
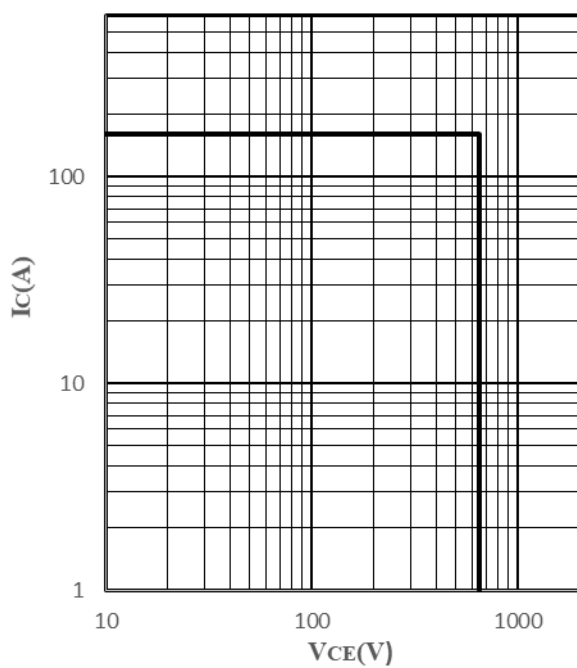


Fig 4. IGBT Reverse safe operation area



Typical Characteristics

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

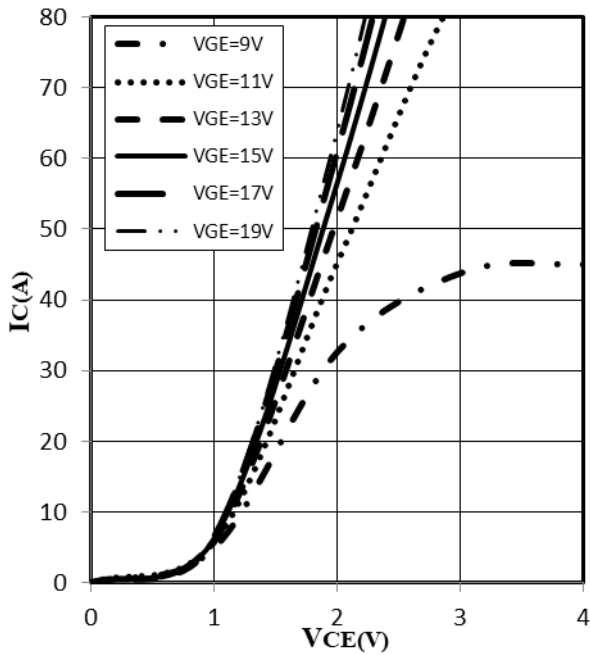


Fig 6. Typical output characteristic ($T_j=125^\circ\text{C}$)

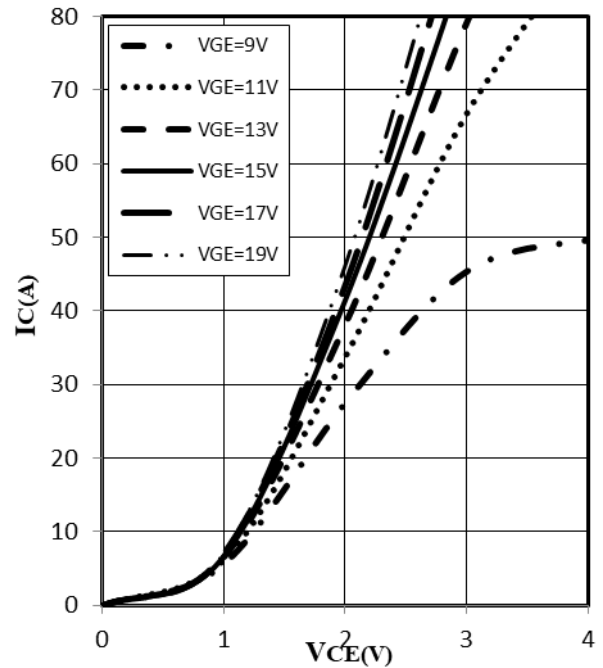


Fig 7. Typical transfer characteristic ($V_{ce}=20\text{V}$)

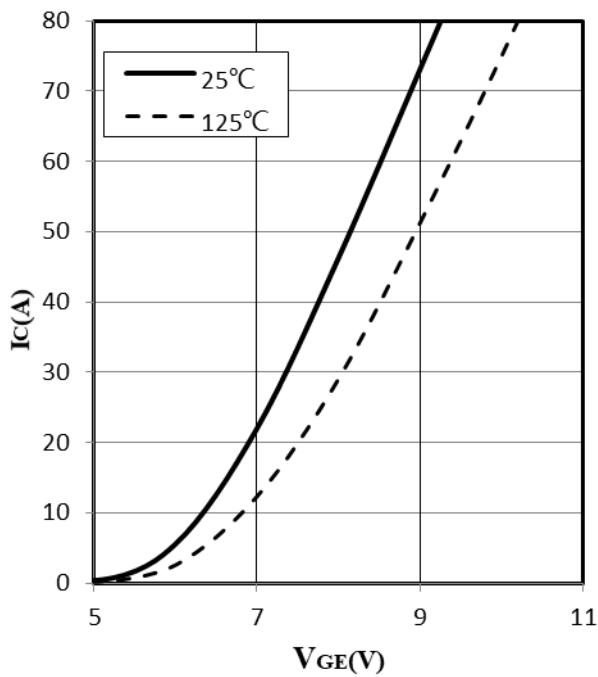
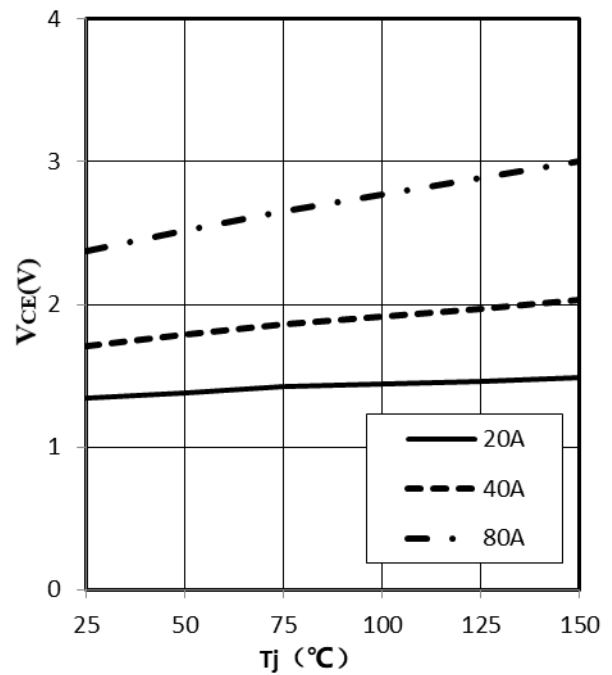


Fig 8. Typical collector-emitter saturation voltage as a function of junction temperature ($V_{ge}=15\text{V}$)



Typical Characteristics

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

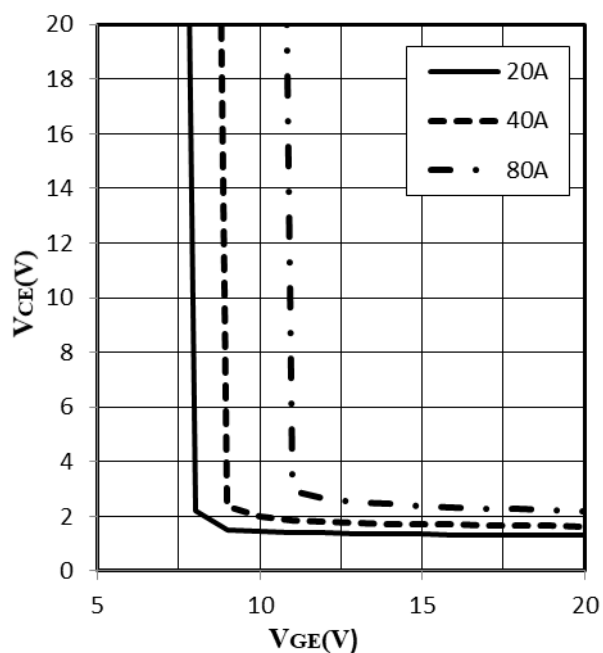


Fig 10. Typical collector-emitter saturation voltage as a function of V_{GE} ($T_J=125^\circ\text{C}$)

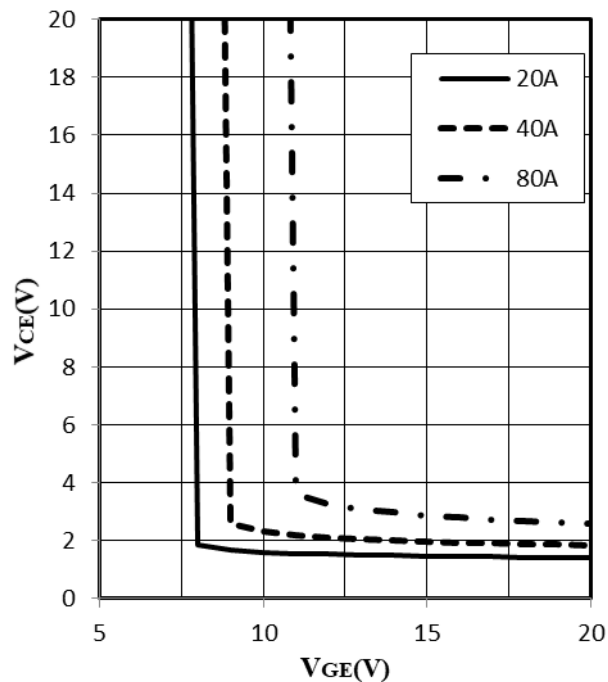


Fig 11. Typical switch energy as a function of I_C (inductive load, $T_J=25^\circ\text{C}$, $V_{CE}=400\text{V}$, $V_{GE}=15\text{V}$, $R_G=10\Omega$)

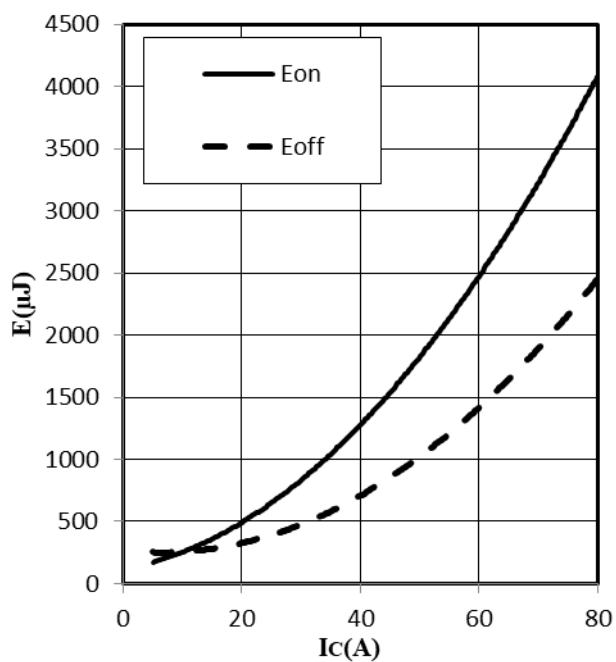
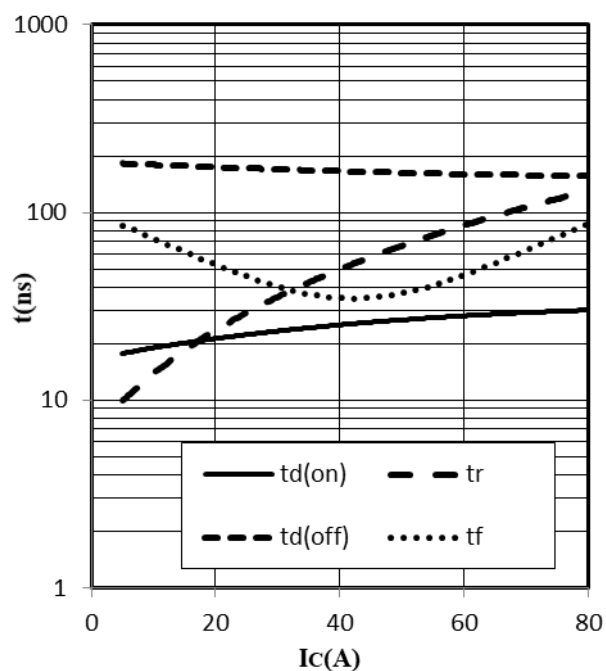


Fig 12. Typical switch time as a function of I_C (inductive load, $T_J=25^\circ\text{C}$, $V_{CE}=400\text{V}$, $V_{GE}=15\text{V}$, $R_G=10\Omega$)



Typical Characteristics

Fig 13. Typical switch energy as a function of R_G
(inductive load, $T_J=25^\circ\text{C}$, $V_{CE}=400\text{V}$, $V_{GE}=15\text{V}$, $I_C=40\text{A}$)

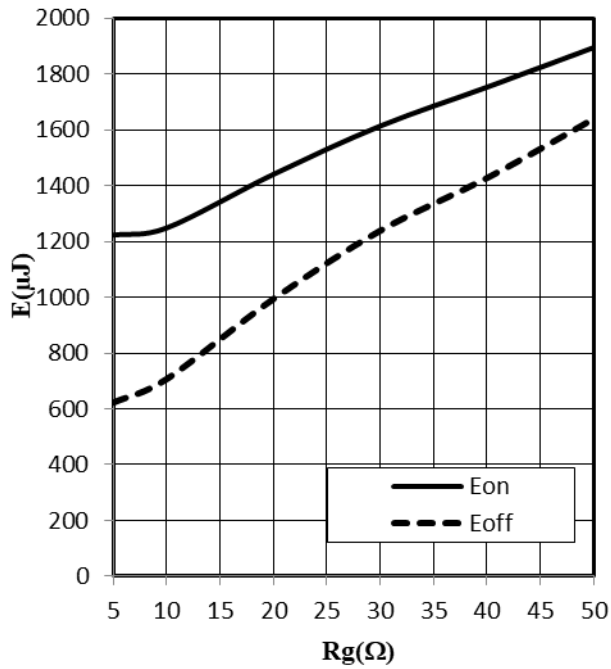


Fig 14. Typical switch time as a function of R_G
(inductive load, $T_J=25^\circ\text{C}$, $V_{CE}=400\text{V}$, $V_{GE}=15\text{V}$, $I_C=40\text{A}$)

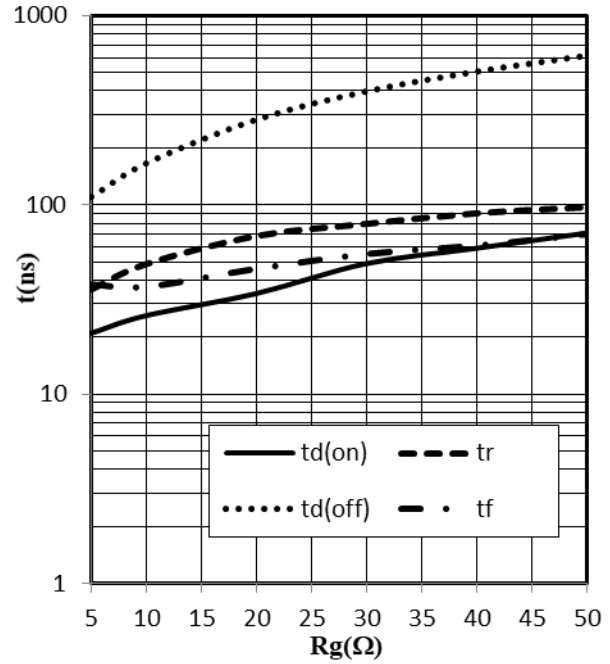


Fig 15. Typical capacitance as a function of collector-emitter voltage ($V_{GE}=0\text{V}$, $f=1\text{MHz}$)

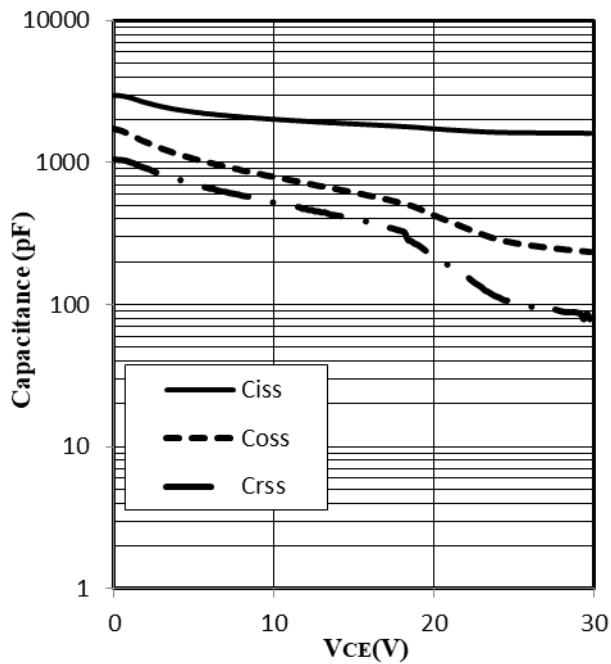
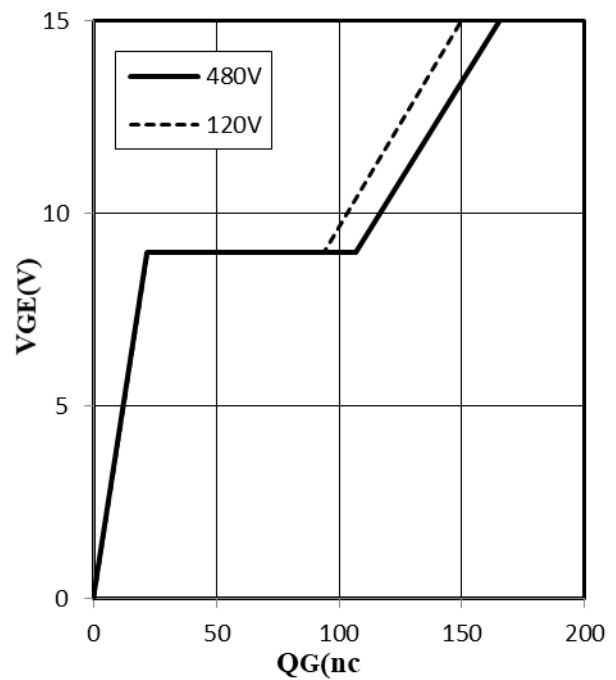


Fig 16. Typical gate charge ($I_C=40\text{A}$)



Typical Characteristics

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

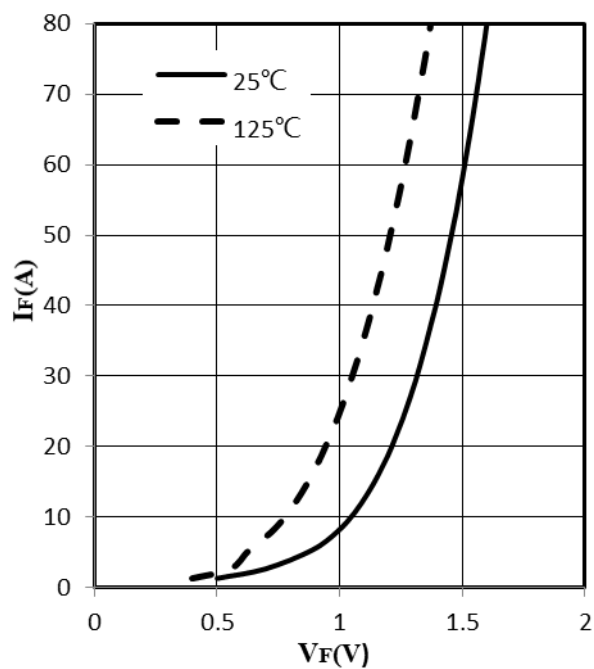


Fig 18. Typical trr as a function of dI_F/dt

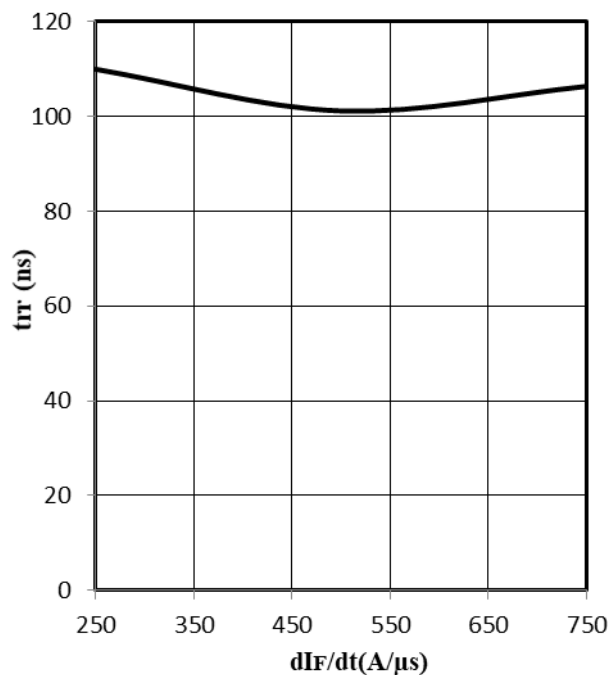


Fig 19. Typical I_{rrm} as a function of dI_F/dt

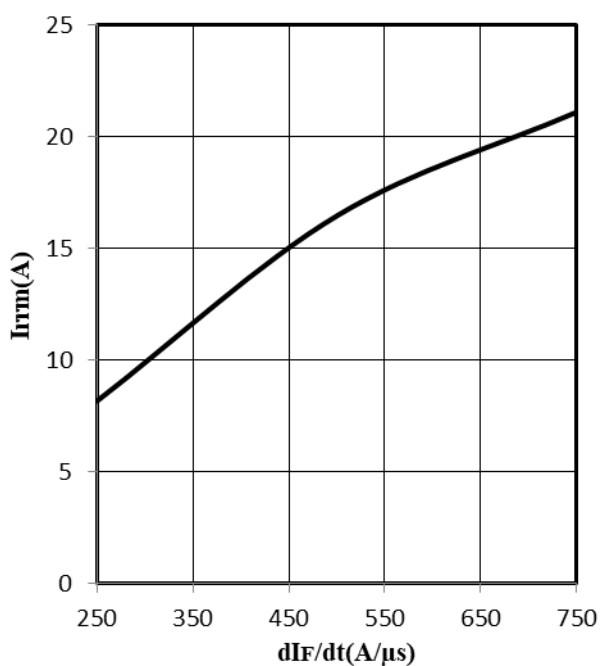
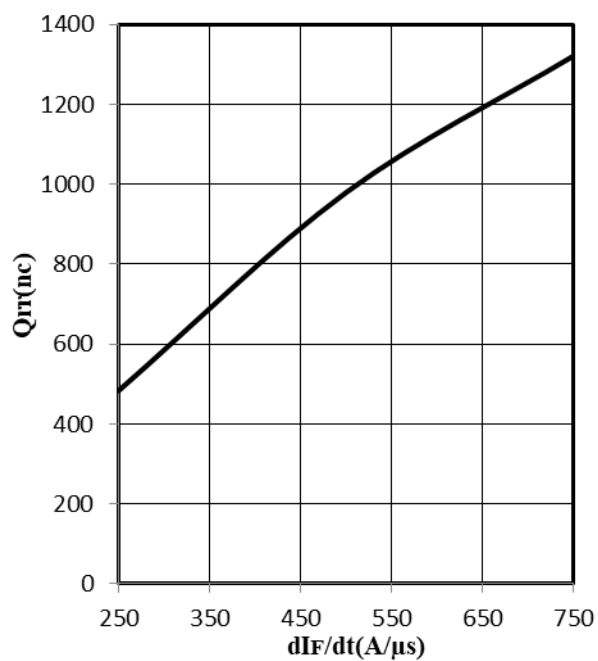
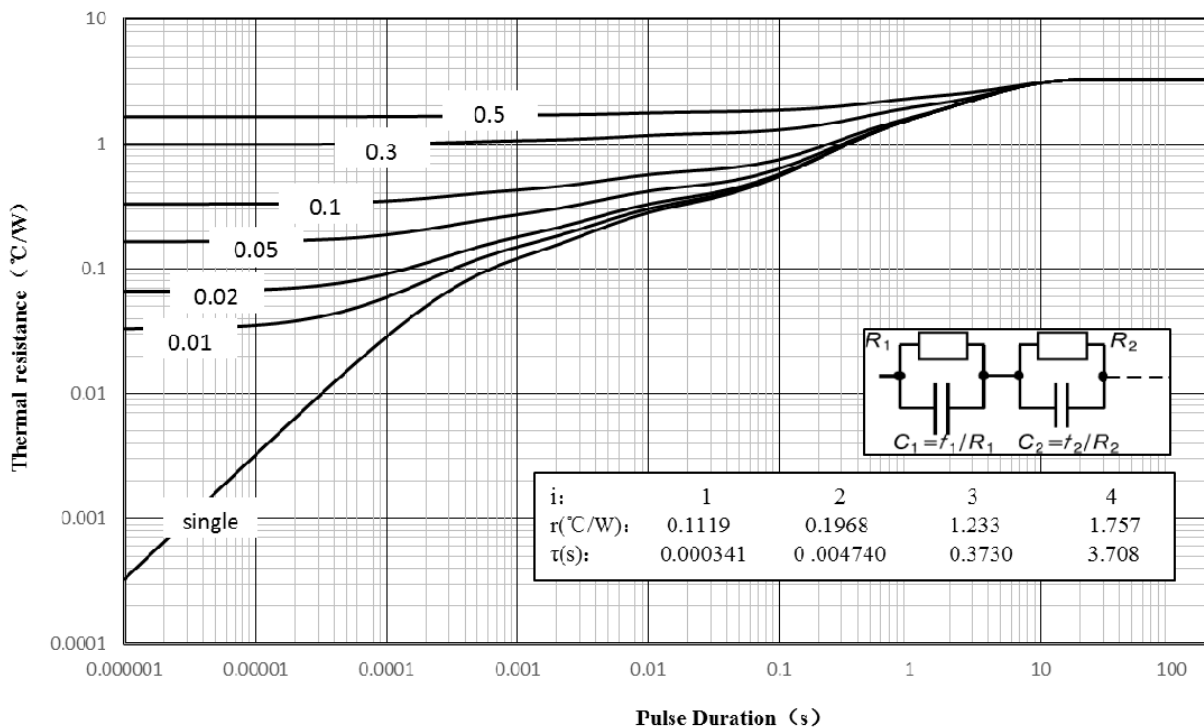


Fig 20. Typical Q_{rr} as a function of dI_F/dt

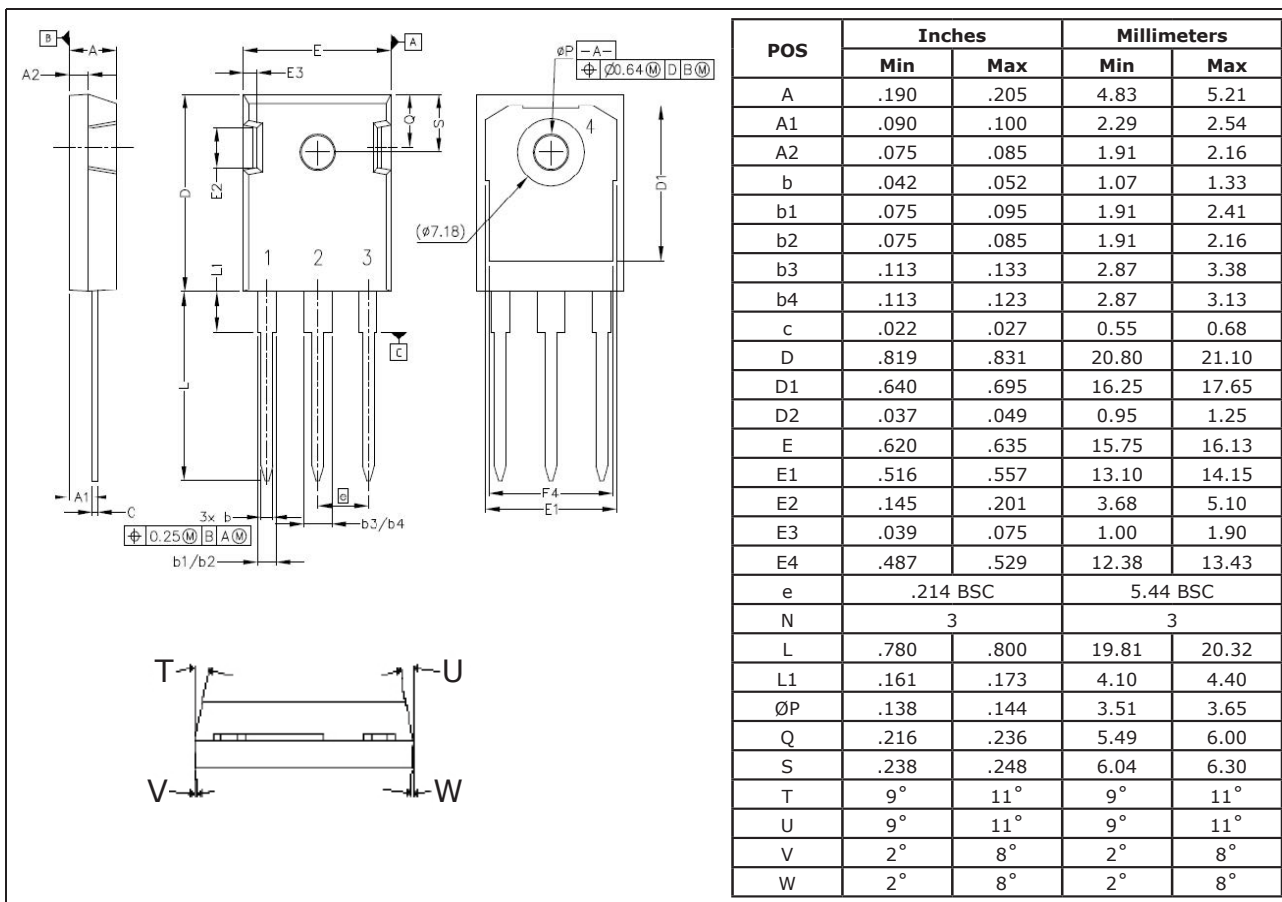


Typical Characteristics

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



Package Dimensions



Ordering information

Order code	Package	Packaging option	Base quantity	Packaging specification
CXG40N65HS	TO-247	Tube/BOX	2000pcs / BOX	

Revision history

Date	Revision	Changes
23-May-2017	1.0	Initial release

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