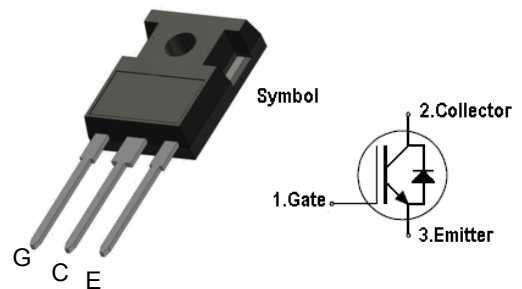


## IGBT in TO-247

### Features

- 650V 40A,  $V_{CE(sat)}(typ.) = 2.5V @ 40A$
- Field Stop IGBT Technology
- 10 $\mu$ s 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	$\pm 30$	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	us
$I_{SC}$	Short Circuit Current	220	A
$P_D$	Maximum Power Dissipation ( $T_C=25^\circ C$ )	312	W
$P_D$	Maximum Power Dissipation ( $T_C=100^\circ C$ )	125	W
$T_J$	Operating Junction Temperature Range	-55 to +150	
$T_{STG}$	Storage Temperature Range	-55 to +150	

### Thermal Characteristics

Symbol	Parameter	Max.	Units
$R_{th j-c}$	Thermal Resistance, Junction to case for IGBT	0.40	$^\circ C/W$
$R_{th j-c}$	Thermal Resistance, Junction to case for Diode	0.81	$^\circ C/W$
$R_{th j-a}$	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	$\mu A$
$I_{GES}$	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	$V_{GE} = 15V, I_C = 40A$	-	2.3		V
$Q_g$	Total Gate Charge	$V_{CC} = 480V$ $V_{GE} = 15V$ $I_C = 40A$	-	142		nC
$Q_{ge}$	Gate-Emitter Charge		-	19		nC
$Q_{gc}$	Gate-Collector Charge		-	75		nC
$t_{d(on)}$	Turn-on Delay Time	$V_{CC} = 400V$ $V_{GE} = 15V$ $I_C = 40A$ $R_G = 10\Omega$ Inductive Load $T_C = 25^\circ C$	-	23	-	ns
$t_r$	Turn-on Rise Time		-	52	-	ns
$t_{d(off)}$	Turn-off Delay Time		-	121	-	ns
$t_f$	Turn-off Fall Time		-	30	-	ns
$E_{on}$	Turn-on Switching Loss		-	1.05	-	mJ
$E_{off}$	Turn-off Switching Loss		-	0.60	-	mJ
$C_{ies}$	Input Capacitance		$V_{CE} = 25V$ $V_{GE} = 0V$ $f = 1MHz$	-	1550	-
$C_{oes}$	Output Capacitance	-		220	-	pF
$C_{res}$	Reverse Transfer Capacitance	-		105	-	pF
$R_{Gint}$	Integrated gate resistor	$f = 1M; V_{pp} = 1V$		1.50		$\Omega$

## 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 ( $V_{GE} \geq 15V$ ,  $T_j \leq 150^\circ C$ )

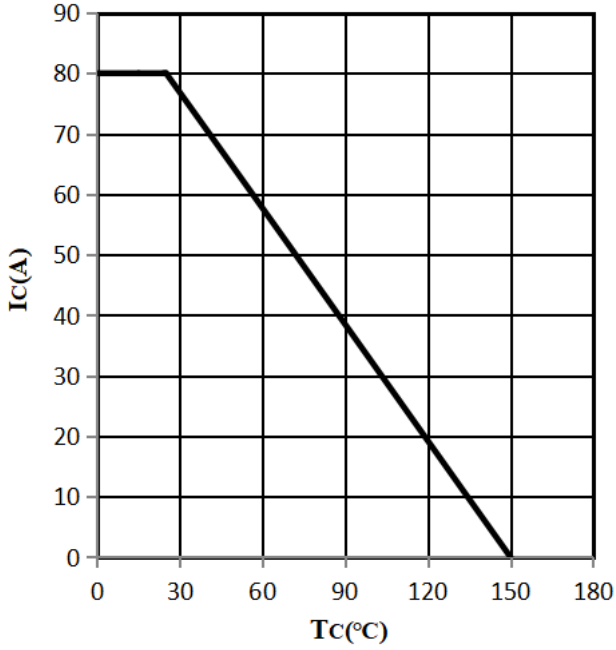


Fig 2. Power dissipation as a function of case temperature ( $T_j \leq 150^\circ C$ )

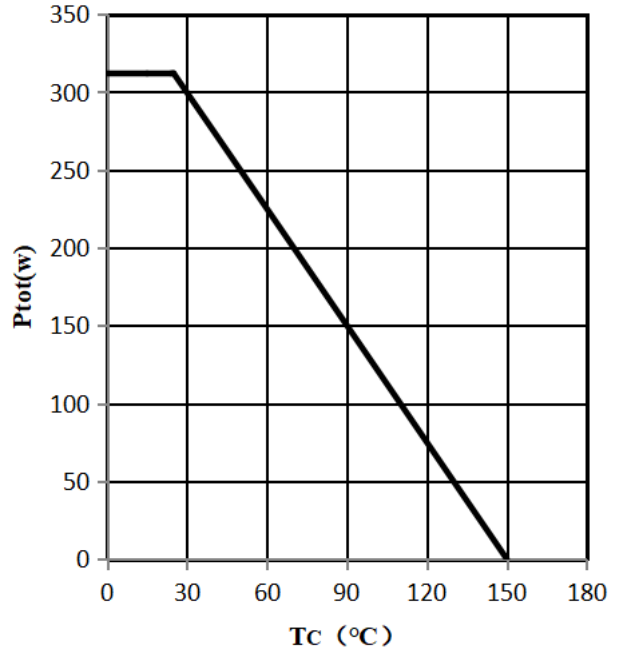


Fig 3. IGBT Forward safe operation area

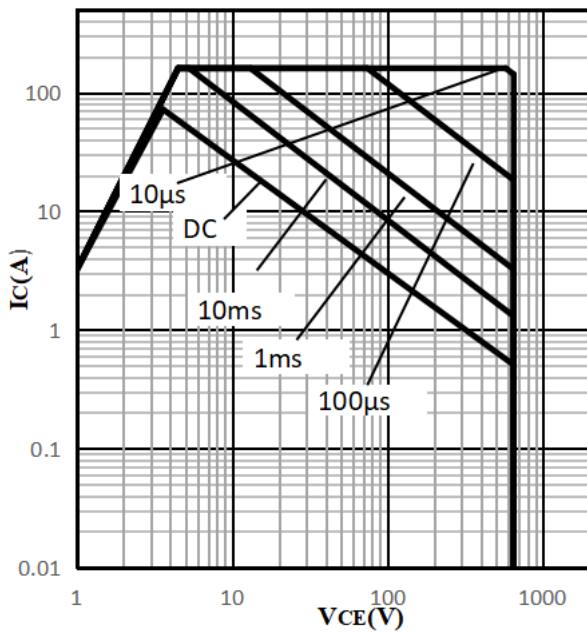
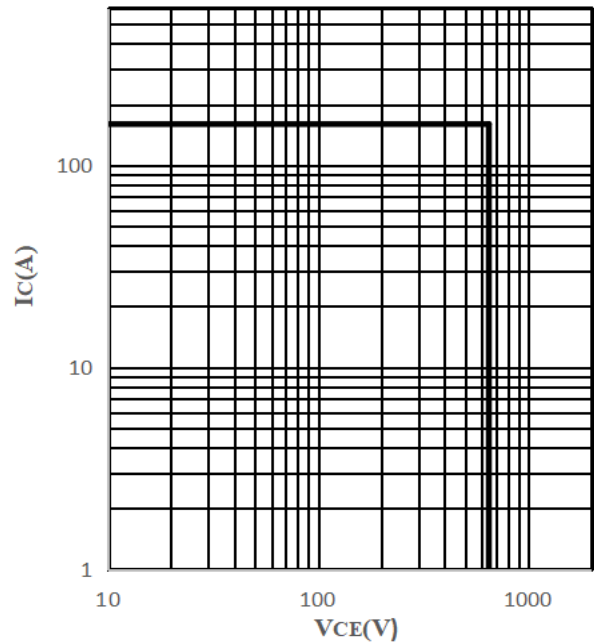


Fig 4. IGBT Reverse safe operation area



**Typical Characteristics**

Fig 5. Typical output characteristic (T<sub>j</sub>=25°C)

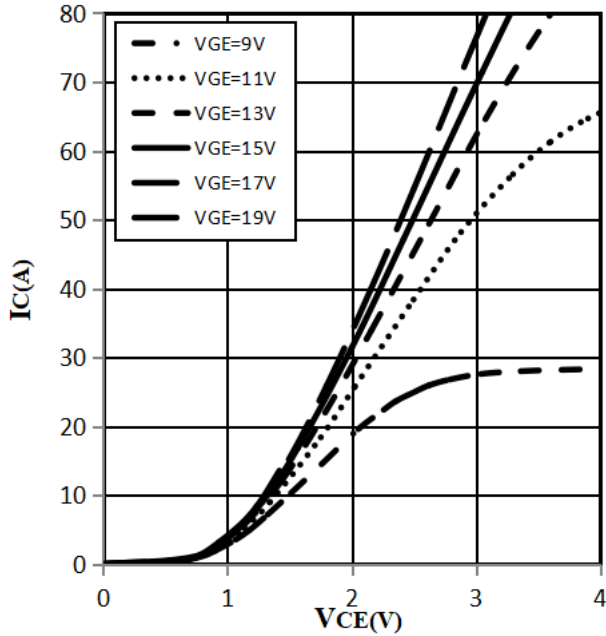


Fig 6. Typical output characteristic (T<sub>j</sub>=125°C)

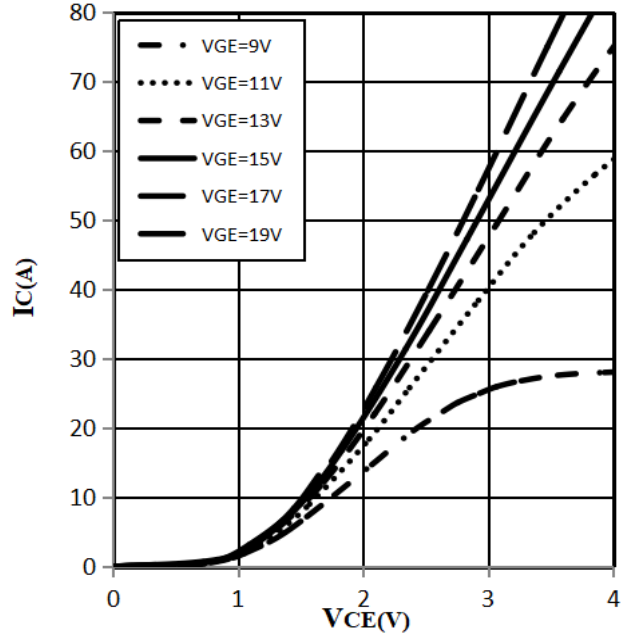


Fig 7. Typical transfer characteristic (V<sub>CE</sub>=20V)

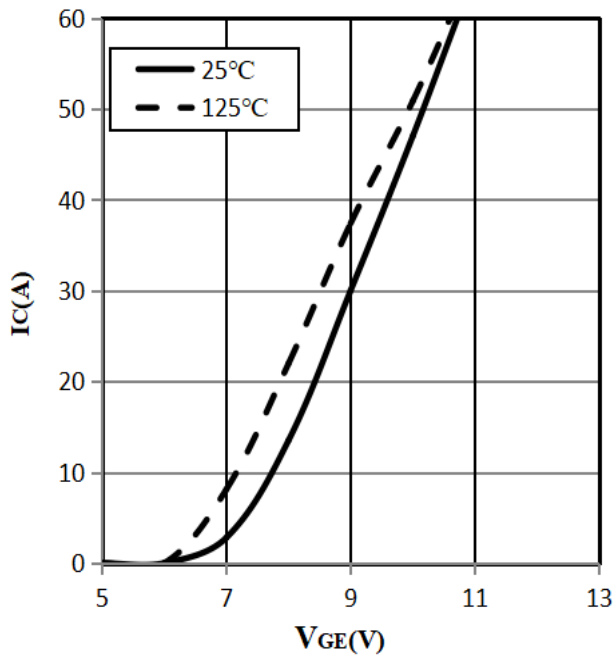
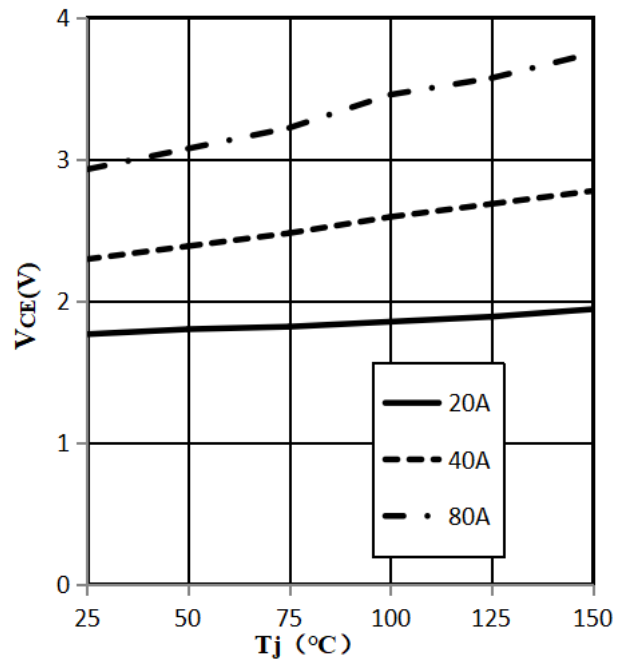


Fig 8. Typical collector-emitter saturation voltage as a function of junction temperature (V<sub>GE</sub>=15V)



**Typical Characteristics**

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

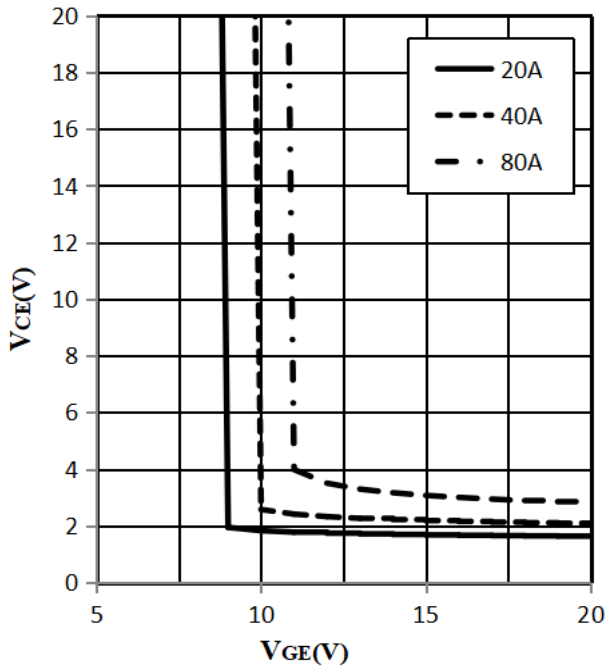


Fig 10. Typical collector-emitter saturation voltage as a function of  $V_{GE}$  ( $T_j=125^\circ\text{C}$ )

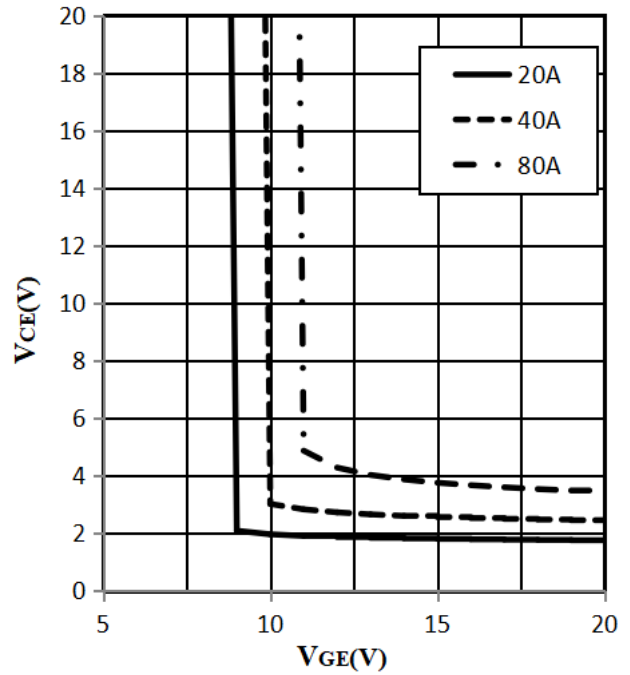


Fig 11. Typical switch energy as a function of  $I_C$  (inductive load,  $T_j=25^\circ\text{C}$ ,  $V_{CE}=400\text{V}$ ,  $V_{GE}=15\text{V}$ ,  $R_G=10\Omega$ )

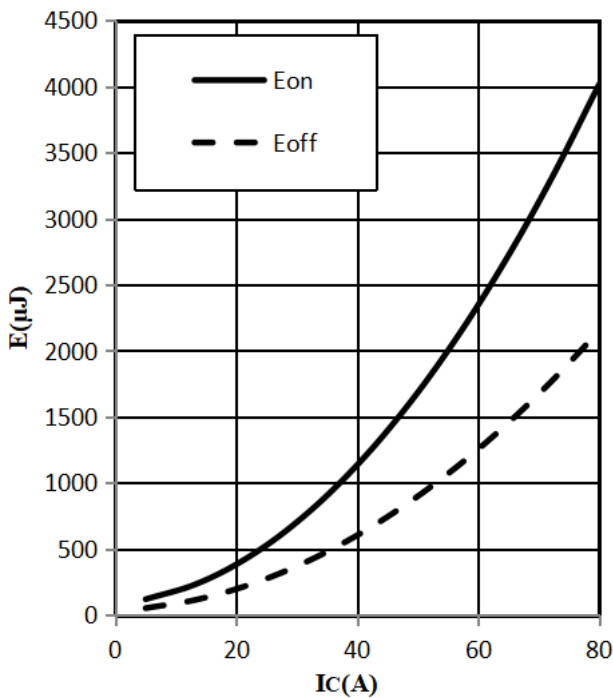
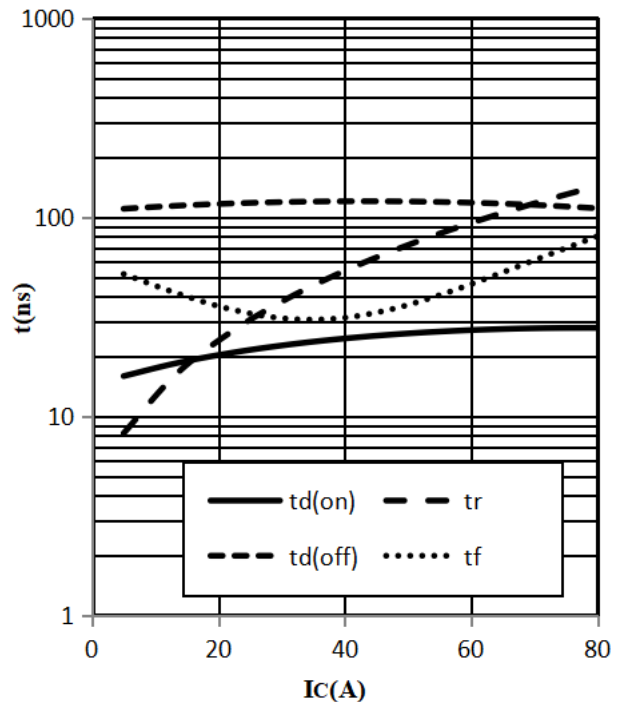


Fig 12. Typical switch time as a function of  $I_C$  (inductive load,  $T_j=25^\circ\text{C}$ ,  $V_{CE}=400\text{V}$ ,  $V_{GE}=15\text{V}$ ,  $R_G=10\Omega$ )



**Typical Characteristics**

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

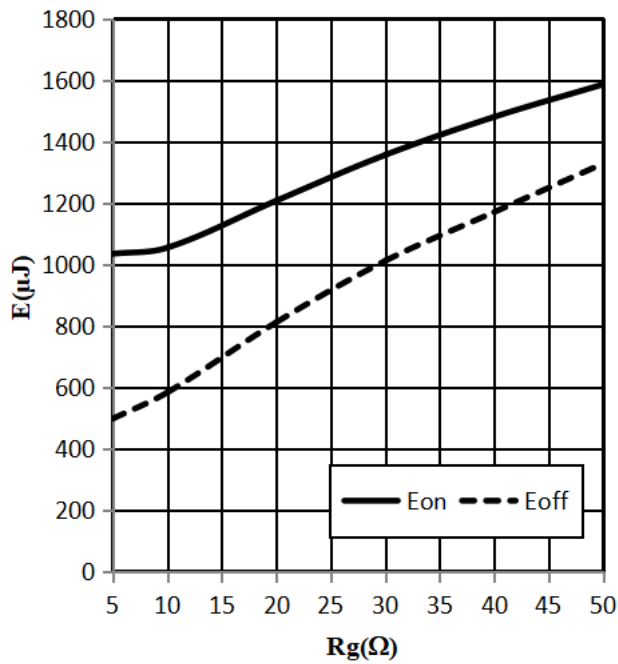


Fig 14. Typical switch time as a function of  $R_G$   
(inductive load,  $T_J=25^\circ\text{C}$ ,  $V_{CE}=400\text{V}$ ,  $V_{GE}=15\text{V}$ ,  $I_C=40\text{A}$ )

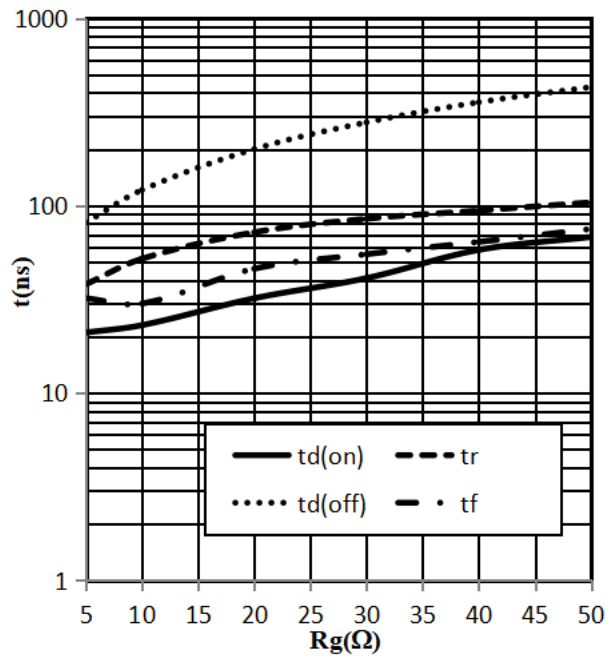


Fig 15. Typical capacitance as a function of collector-emitter voltage ( $V_{GE}=0\text{V}$ ,  $f=1\text{MHz}$ )

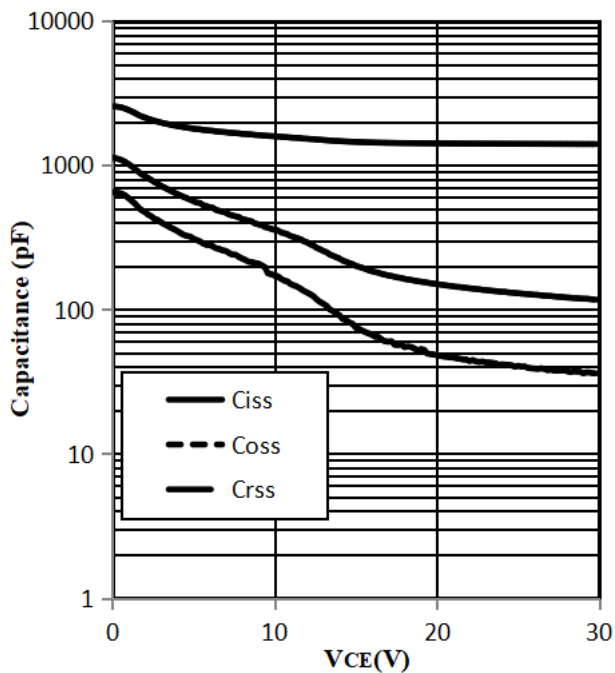
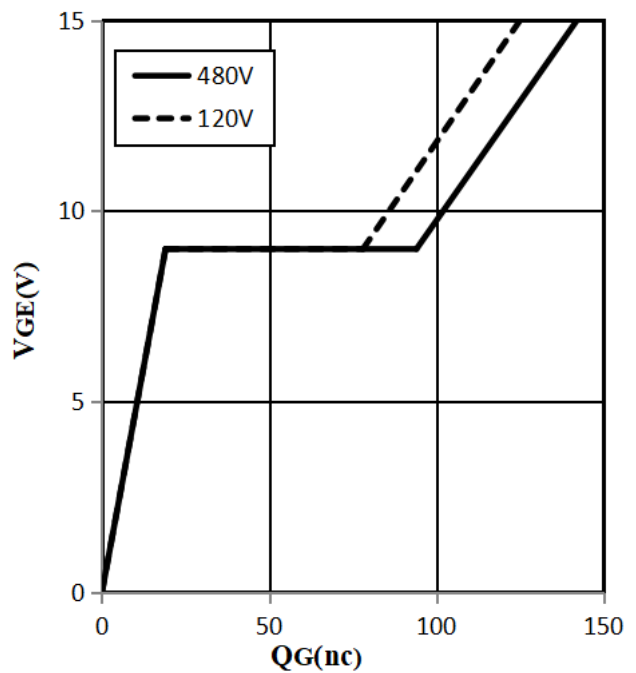


Fig 16. Typical gate charge ( $I_C=40\text{A}$ )



**Typical Characteristics**

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

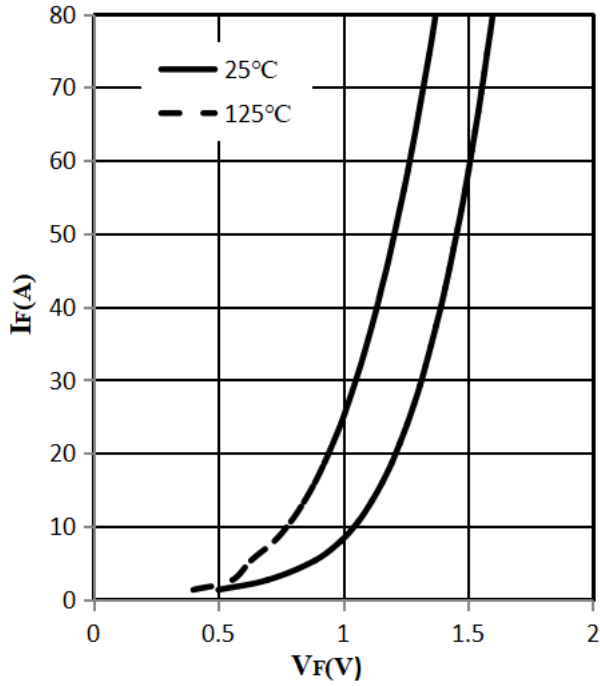


Fig 18. Typical trr as a function of dIF/dt (IF=40A)

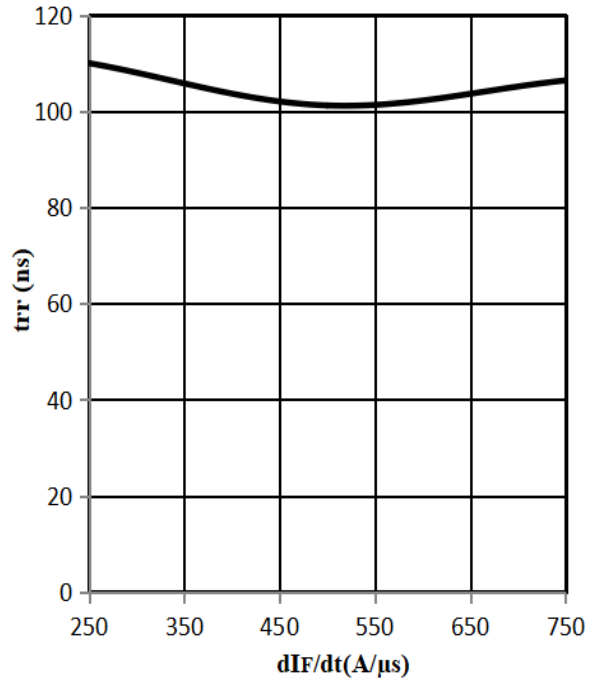


Fig 19. Typical Irrm as a function of dIF/dt (IF=40A)

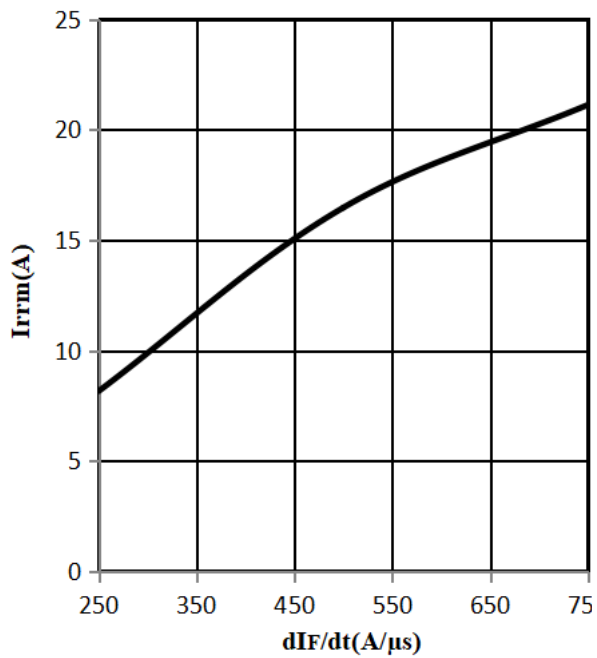
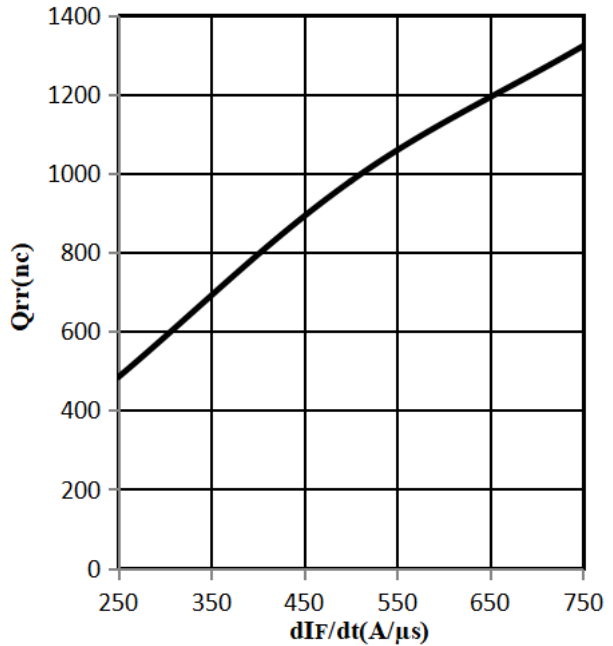
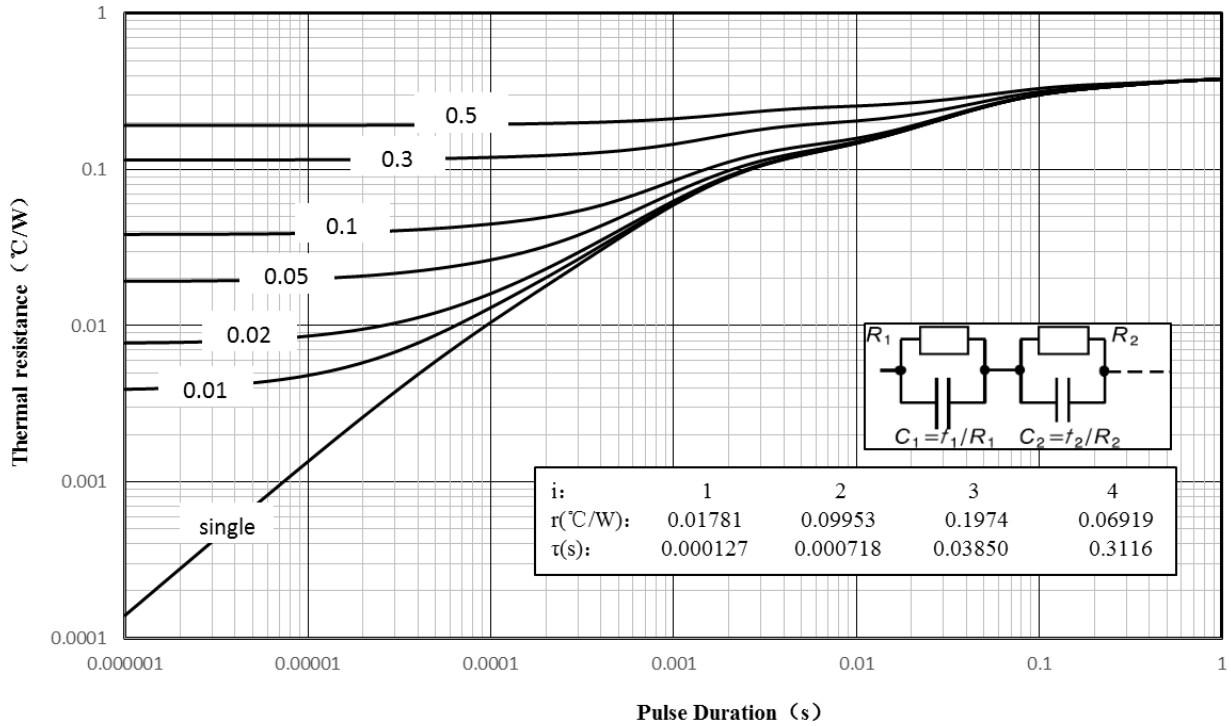


Fig 20. Typical Qrr as a function of dIF/dt (IF=40A)



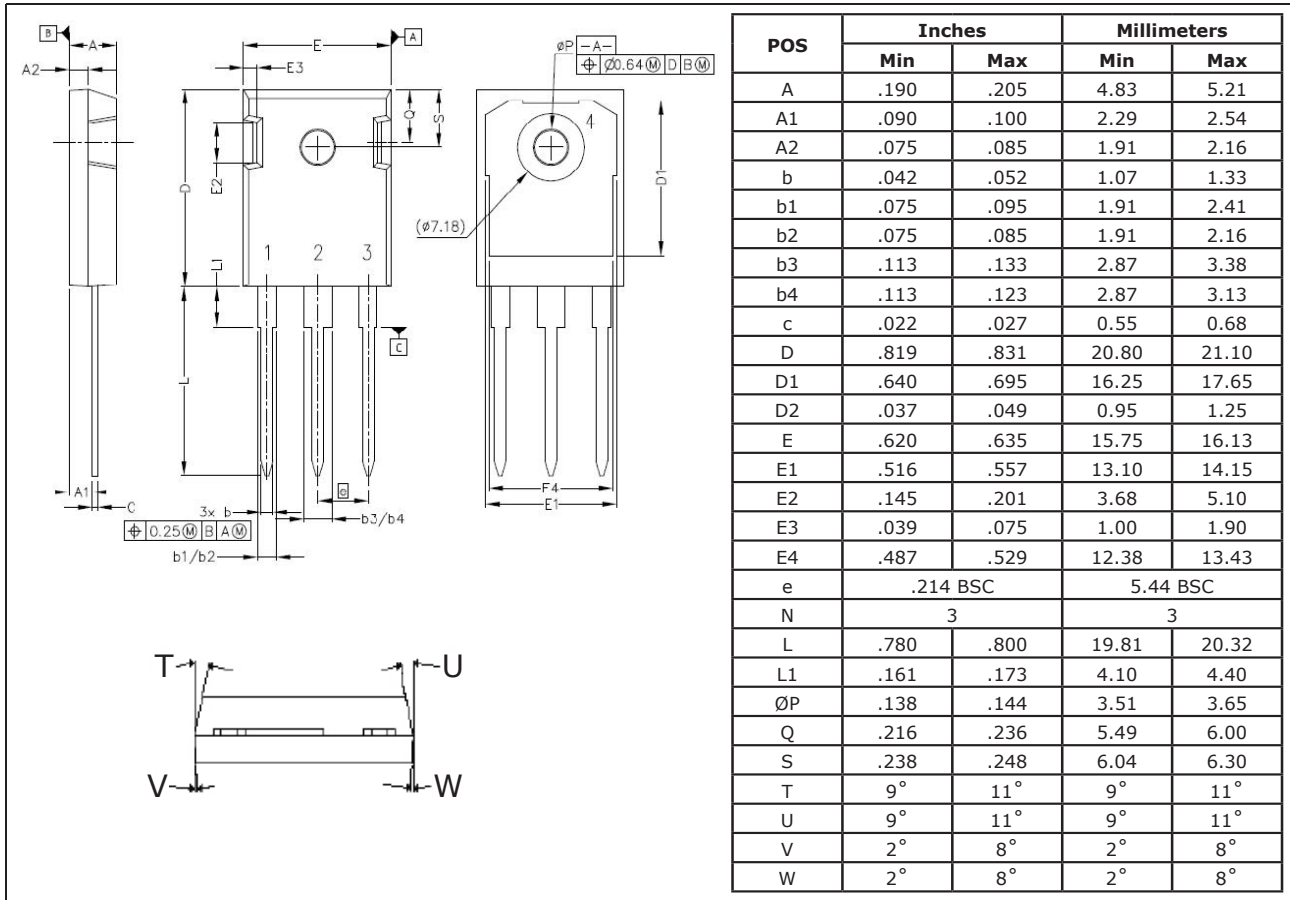
**Typical Characteristics**

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





## Package Dimensions



## Ordering information

Order code	Package	Packaging option	Base quantity	Packaging specification
CXG40N65HSEU	TO-247	Tube/BOX	2250pcs / BOX	

## Revision history

Date	Revision	Changes
23-May-2017	1.0	Initial release

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