



CRG40T120CK3LDQ

General Description:

Using owner proprietary trench design and advanced Field Stop (FS) technology, offering superior conduction and switching performances. RoHS Compliant.

Features:

- Qualified to AEC-Q101
- Short Circuit Withstand Time 10μs
- FS Trench Technology, Positive temperature coefficient
- Low saturation voltage:

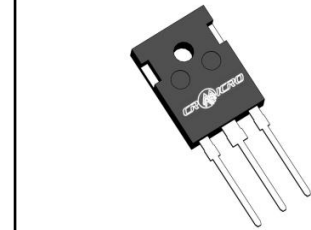
$$V_{CE(sat),TYP}=1.80V @ I_C=40A, V_{GE}=15V;$$

Applications

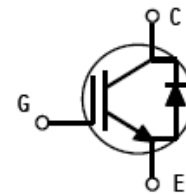
- Electric Automotive Air-Condition Compressor
- PTC heater
- General Inverter

V_{CES}	1200	V
I_C	40	A
$P_{tot} (T_C=25^{\circ}C)$	550	W
$V_{CE(sat)}$	1.80	V

Outline : TO-247



Inner Circuit:



Package Parameters

Type	Marking	Package	Packing
CRG40T120CK3LDQ	G40T120CK3LDQ	TO-247	Tube

Absolute Maximum Ratings ($T_C=25^{\circ}\text{C}$ unless otherwise specified):

Symbol	Parameter	Rating	Unit
V_{CES}	Collector-Emitter Voltage	1200	V
V_{GES}	Gate- Emitter Voltage	± 20	V
V_{GES}	Gate- Emitter Voltage ($t_p \leq 10\mu\text{s}, D < 0.01$)	± 30	V
I_C	Collector Current @ $T_C = 25^{\circ}\text{C}$	80	A
	Collector Current @ $T_C = 100^{\circ}\text{C}$	40	
I_{CM}^{a1}	Pulsed Collector Current	160	A
I_F	Diode Continuous Forward Current @ $T_C = 25^{\circ}\text{C}$	80	A
	Diode Continuous Forward Current @ $T_C = 100^{\circ}\text{C}$	40	
I_{FM}	Diode Maximum Forward Current	160	A
T_{sc}	Short Circuit Withstand Time @ $V_{GE}=15\text{V}, V_{CE}=600\text{V}$	10	μs
P_D	Power Dissipation @ $T_C = 25^{\circ}\text{C}$	550	W
	Power Dissipation @ $T_C = 100^{\circ}\text{C}$	275	
T_{vjop}^{a2}	Operating Junction temperature range	-40~175	$^{\circ}\text{C}$
T_{stg}	Storage Temperature Range	-55~150	$^{\circ}\text{C}$
T_L	Maximum Temperature for Soldering	270	$^{\circ}\text{C}$

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit
$R\theta_{JC}$	Thermal Resistance, Junction to case for IGBT	--	0.27	$^{\circ}\text{C}/\text{W}$
$R\theta_{JC}$	Thermal Resistance, Junction to case for Diode	--	1.0	$^{\circ}\text{C}/\text{W}$
$R\theta_{JA}$	Thermal Resistance, Junction to Ambient	--	40	$^{\circ}\text{C}/\text{W}$

Electrical Characteristics of the IGBT ($T_C=25^{\circ}\text{C}$ unless otherwise specified):

Symbol	Parameter	Conditions	Value			Unit
			Min.	Typ	Max.	
OFF Characteristics						
$V_{(BR)CES}$	Collector-Emitter Breakdown Voltage	$V_{GE}=0\text{V}, I_{CE}=250\mu\text{A}$	1200	--	--	V
I_{CES}	Collector Cut-off Current	$V_{GE}=0\text{V}, V_{CE}=1200\text{V}$	--	--	100	μA
$I_{GES(F)}$	Gate-Emitter Forward Leakage Current	$V_{GE}=+20\text{V}$	--	--	+250	nA
$I_{GES(R)}$	Gate-Emitter Reverse Leakage Current	$V_{GE}=-20\text{V}$	--	--	-250	nA
ON Characteristics						
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C=40\text{A}, V_{GE}=15\text{V}$ @ $T_C = 25^{\circ}\text{C}$	--	1.80	2.4	V
		$I_C=40\text{A}, V_{GE}=15\text{V}$ @ $T_C = 175^{\circ}\text{C}$	--	2.50	--	V

$V_{GE(th)}$	Gate - Emitter Threshold Voltage	$I_C=250\mu A, V_{CE}=V_{GE}$	4.5	5.8	7.0	V
Pulse width $t_p \leq 300\mu s, \delta \leq 2\%$						
Dynamic Characteristics						
C_{ies}	Input Capacitance	$V_{CE}=30V, V_{GE}=0V$ $f=1MHz$	--	4067	--	pF
C_{oes}	Output Capacitance		--	167	--	
C_{res}	Reverse Transfer Capacitance		--	90	--	
Switching Characteristics						
$t_{d(on)}$	Turn-on Delay Time	$V_{CE}=600V, I_C=40A,$ $R_g=10\Omega, V_{GE}=15V,$ Inductive Load, $T_J=25^\circ C,$	--	46.5	--	ns
t_r	Rise Time		--	40.4	--	
$t_{d(off)}$	Turn-Off Delay Time		--	273	--	
t_f	Fall Time		--	36.1	--	
E_{on}	Turn-On Switching Loss		--	4.2	--	mJ
E_{off}	Turn-Off Switching Loss		--	1.47	--	
E_{ts}	Total Switching Loss		--	5.67	--	
$t_{d(on)}$	Turn-on Delay Time	$V_{CE}=600V, I_C=40A,$ $R_g=10\Omega, V_{GE}=15V,$ Inductive Load, $T_J=175^\circ C$	--	41	--	ns
t_r	Rise Time		--	43	--	
$t_{d(off)}$	Turn-Off Delay Time		--	292	--	
t_f	Fall Time		--	92	--	
E_{on}	Turn-On Switching Loss		--	4.44	--	mJ
E_{off}	Turn-Off Switching Loss		--	1.83	--	
E_{ts}	Total Switching Loss		--	6.27	--	
Q_g	Total Gate Charge	$V_{CE}=600V, I_C=40A,$ $V_{GE}=15V,$	--	225	--	nC
Q_{ge}	Gate to Emitter Charge		--	23	--	
Q_{gc}	Gate to Collector Charge		--	130	--	
Electrical Characteristics of the DIODE						
V_F	Diode Forward Voltage	$I_F=40A \quad TC=25^\circ C$	--	2.4	3.2	V
		$I_F=40A \quad TC=175^\circ C$	--	1.85	--	V
t_{rr}	Reverse Recovery Time	$I_F=40A$ $di/dt=100A/\mu S$	--	123	--	ns
I_{rrm}	Reverse Recovery Current		--	3.6	--	A
Q_{rr}	Reverse Recovery Charge		--	223	--	nC

Notes:

a1: Repetitive rating; pulse width limited by maximum junction temperature

a2: Overload condition, it is allowed to operate under the maximum junction temperature $T_{vjop} = 175^\circ C$, the maximum duty cycle is less than 20% (lasting for 60s at most)

Typical Performance Characteristics

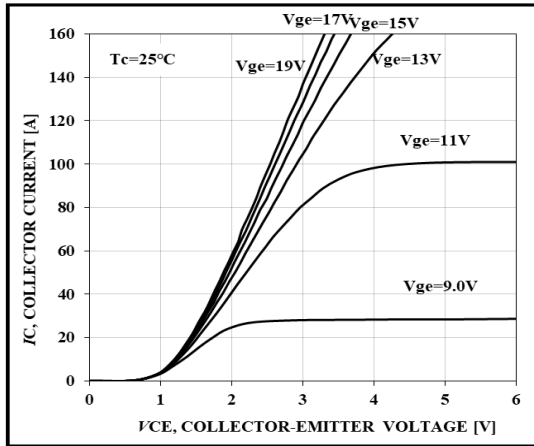


Figure 1. Output Characteristics

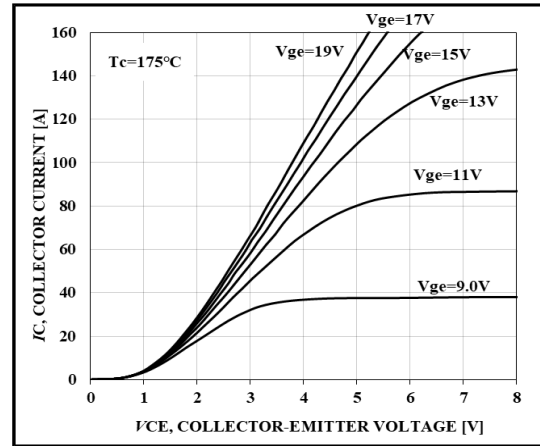


Figure 2. Output Characteristics

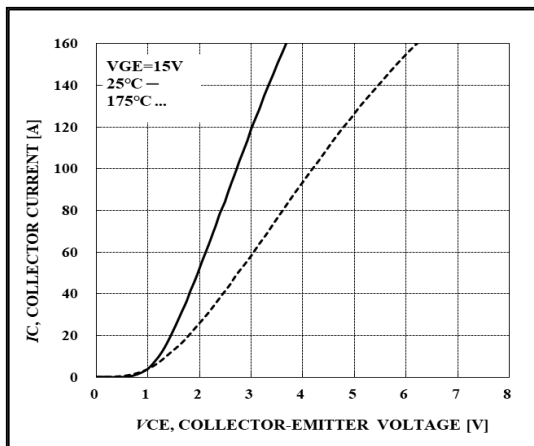


Figure 3. Saturation Voltage Characteristics

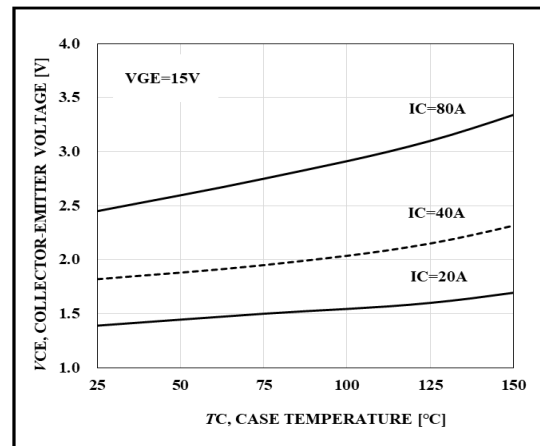


Figure 4. Saturation Voltage - T_c Characteristics

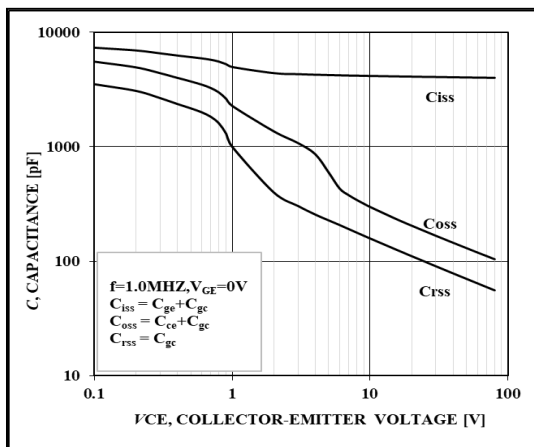


Figure 5. Capacitance Characteristics

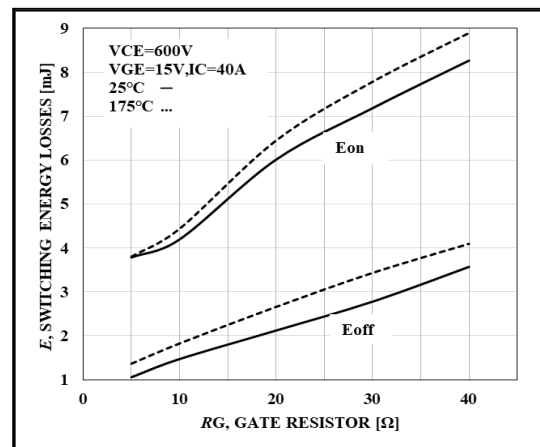


Figure 6. Switching Loss- R_g Characteristics

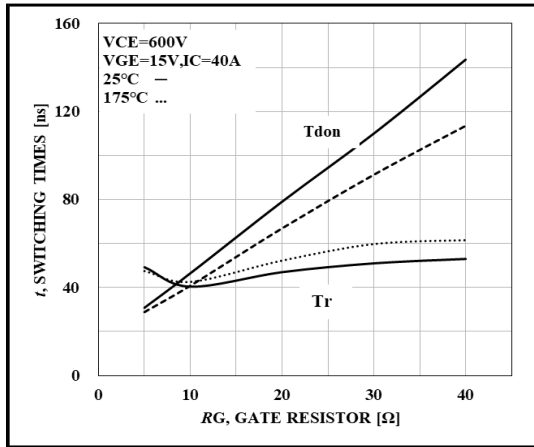


Figure 7. Switching Time- R_G Characteristics

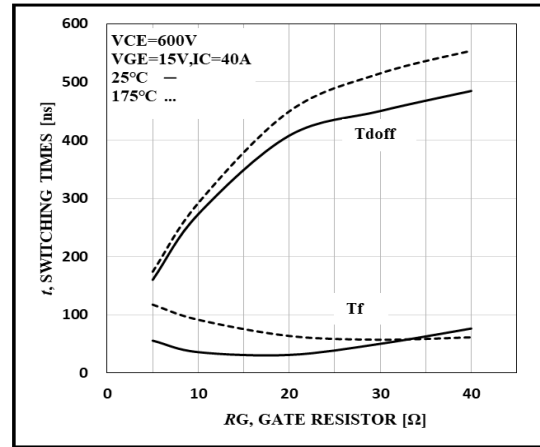


Figure 8. Switching Time- R_G Characteristics

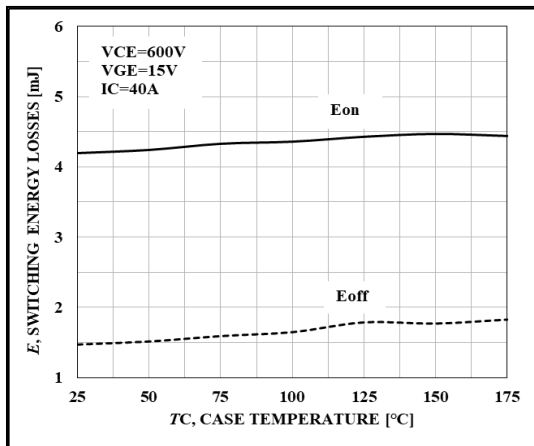


Figure 9. Switching Loss- T_C Characteristics

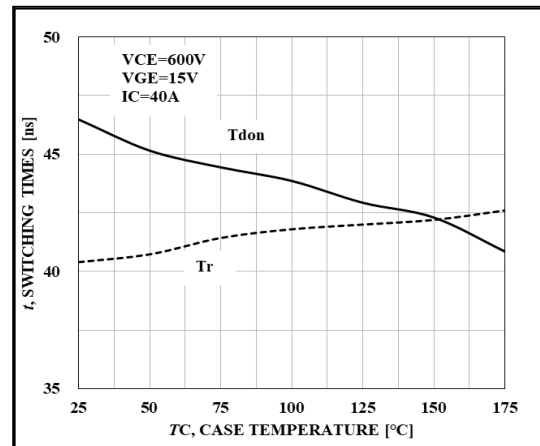


Figure 10. Switching Time- T_C Characteristics

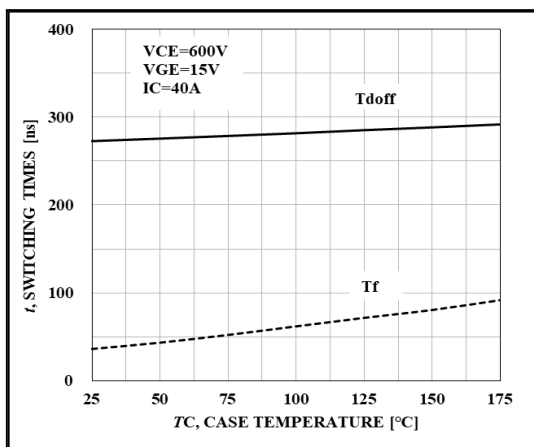


Figure 11. Switching Time- T_C Characteristics

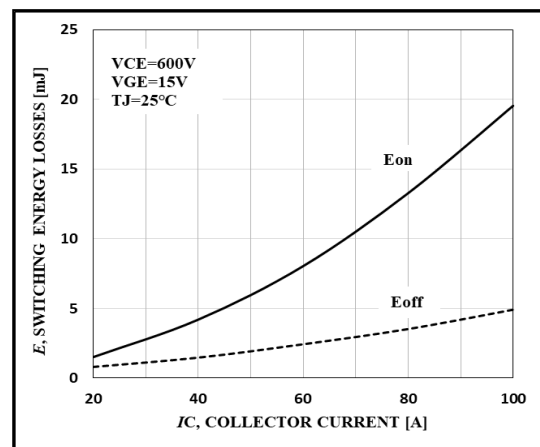


Figure 12. Switching Loss- I_C Characteristics

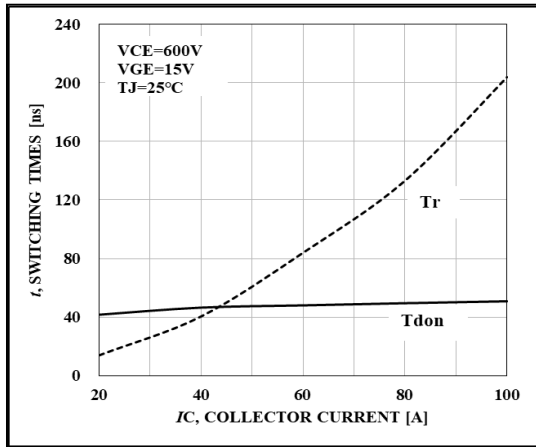


Figure 13. Switching Time-I_C Characteristics

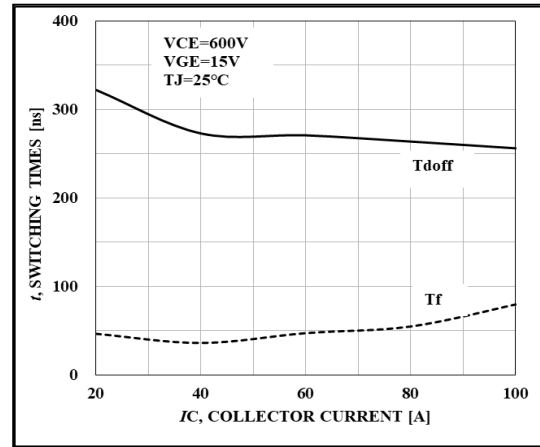


Figure 14. Switching Time-I_C Characteristics

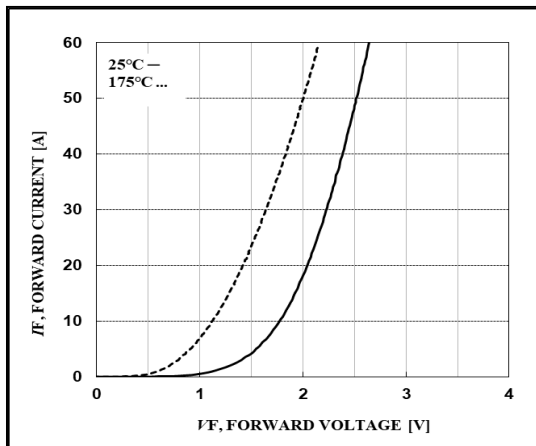


Figure 15. Diode Forward Characteristics

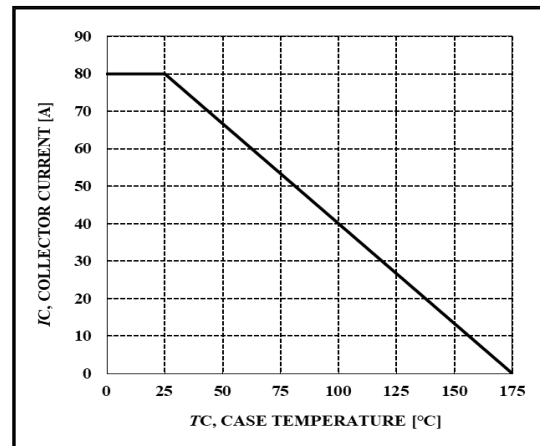


Figure 16. Collector Current-T_c Characteristics
(T_j ≤ 175°C)

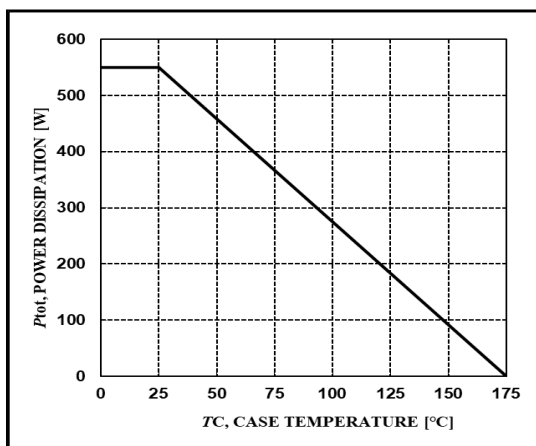


Figure 17. Power Dissipation-T_c Characteristics
(T_j ≤ 175°C)

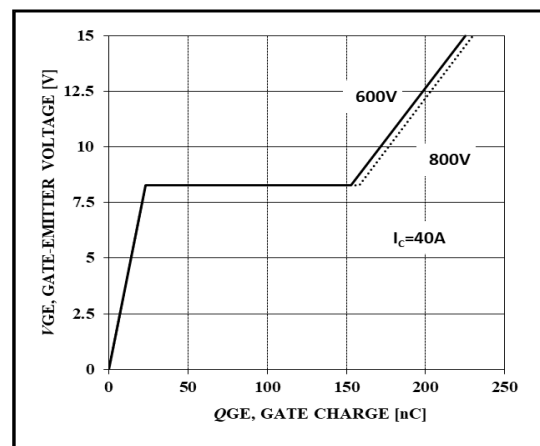


Figure 18. Gate Charge Characteristics

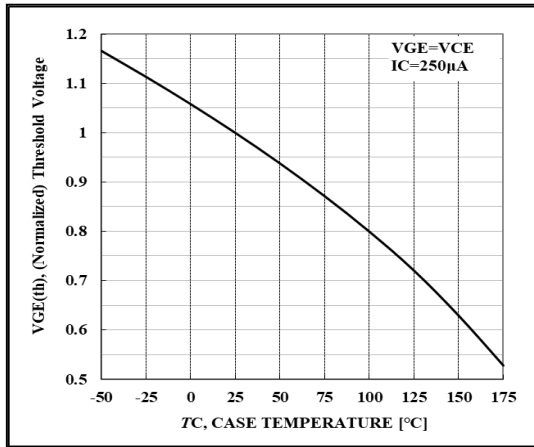


Figure 19. Threshold Voltage -Tc Characteristics

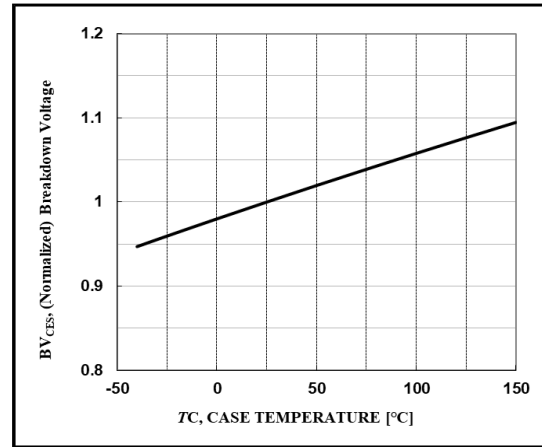


Figure 20. Breakdown Voltage-Tc Characteristics

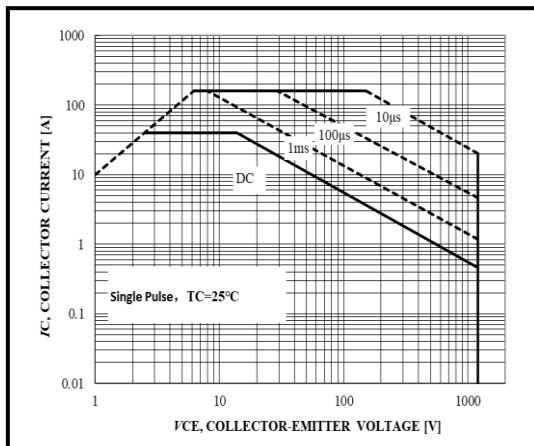


Figure 21. Forward Bias Safe Operating Area

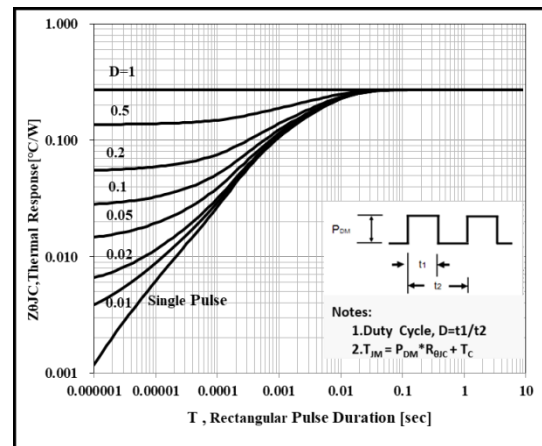
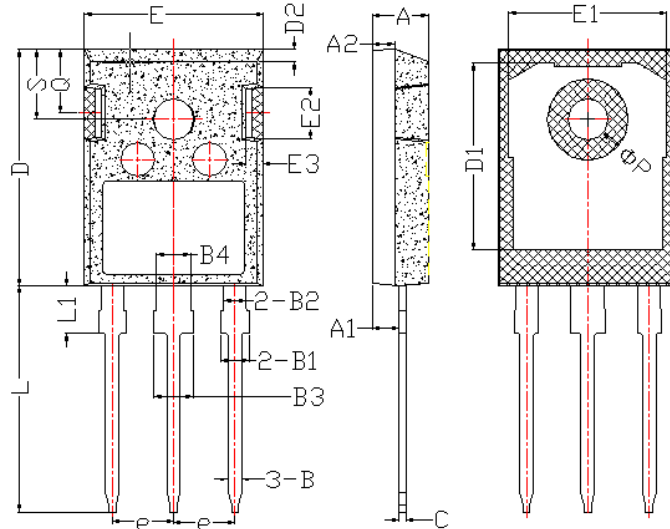


Figure 22. IGBT Transient Thermal Impedance

Package Information


Item	Value (mm)	
	MIN	MAX
A	4.6	5.2
A1	2.2	2.6
B	0.9	1.4
B1	1.75	2.35
B2	1.75	2.15
B3	2.8	3.35
B4	2.8	3.15
C	0.5	0.7
D	20.60	21.30
D1	16	18
E	15.5	16.10
E1	13	14.7
E2	3.80	5.3
E3	0.8	2.60
e	5.2	5.7
L	19	20.5
L1	3.9	4.6
ΦP	3.3	3.70
Q	5.2	6.00
S	5.8	6.6

TO-247 Package

The name and content of poisonous and harmful material in products

Part's Name Limit	Hazardous Substance									
	Pb	Hg	Cd	Cr(VI)	PBB	PBDE	DIBP	DEHP	DBP	BBP
	≤0.1%	≤0.1%	≤0.01%	≤0.1%	≤0.1%	≤0.1%	≤0.1%	≤0.1%	≤0.1%	≤0.1%
Lead Frame	○	○	○	○	○	○	○	○	○	○
Molding	○	○	○	○	○	○	○	○	○	○
Chip	○	○	○	○	○	○	○	○	○	○
Wire Bonding	○	○	○	○	○	○	○	○	○	○
Solder	×	○	○	○	○	○	○	○	○	○
Note	○: Means the hazardous material is under the criterion of 2011/65/EU. ×: Means the hazardous material exceeds the criterion of 2011/65/EU. The plumbum element of solder exist in products presently, but within the allowed range of Eurogroup's RoHS.									

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