Silicon FS Trench IGBT

CRG40T65RK5SDQ

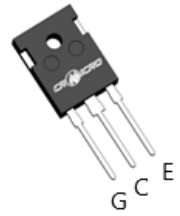
General Description：

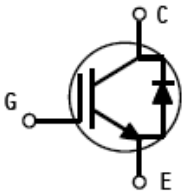
Using micro trench design and advanced Field Stop (FS) technology, offering superior conduction and switching performances.

RoHS Compliant.

V_{CES}	650	V
I_C	40	A
P_{tot} （T_C=25℃）	250	W
$V_{CE(sat)}$	1.5	V

TO-247





Features：

- ●Qualified to AEC-Q101
- ●FS Trench Technology, Positive temperature coefficient
- ●Low saturation voltage：

  $V_{CE(sat)}$,TYP=1.5V @I_C=40A,V_{GE}=15V；
- ● Low switching loss：

Applications

- ● OBC
- ●Electric Automotive Air-Condition Compressor

Package Parameters

Type	Package	Marking	Packing
CRG40T65RK5SDQ	TO-247	G40T65RK5SDQ	Tube

Absolute Maximum Ratings（T_C= 25℃ unless otherwise specified）:

Symbol	Parameter	Rating	Units
V_{CES}	Collector-Emitter Voltage	650	V
V_{GES}	Gate- Emitter Voltage	±20	V
	Gate- Emitter Voltage（tp≤10us,D<0.01）	±30	
I_C [a1]	Collector Current @T_C = 25 ℃	80	A
	Collector Current @T_C = 100 ℃	40	
I_{CM}	Pulsed Collector Current @T_C=25℃	160	A
I_F [a2]	Diode Continuous Forward Current @T_C = 25 ℃	80	A
	Diode Continuous Forward Current @T_C = 100 ℃	40	
I_{FM}	Diode Maximum Forward Current	160	A
T_{SC}	Short Circuit Withstand Time @V_{GE}=15V,V_{CE}=400V	6	μs
P_D	Power Dissipation @ T_C = 25 ℃	250	W
	Power Dissipation @T_C = 100 ℃	125	
T_j [a3]	Operating Junction temperature range	-40～175	℃
T_{stg}	Storage Temperature Range	−55～150	℃
T_L	Maximum Temperature for Soldering	270	℃

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Thermal Resistance, Junction to case for IGBT	--	0.60	℃/W
$R_{\theta JC}$	Thermal Resistance, Junction to case for Diode	--	0.72	℃/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	--	40	℃/W

Electrical Characteristics of the IGBT（T_C= 25℃ unless otherwise specified）:

Symbol	Parameter	Test Conditions	SPEC			Units
			Min.	Typ.	Max.	
OFF Characteristics						
$V_{(BR)CES}$	Collector-Emitter Breakdown Voltage	V_{GE}=0V,I_{CE}=250uA	650	--	--	V
I_{CES}	Collector-Emitter Leakage Current	V_{GE}=0V,V_{CE}=650V	--	--	10	uA
$I_{GES(F)}$	Gate to Emitter Forward Leakage	V_{GE}=+20V	--	--	+250	nA
$I_{GES(R)}$	Gate to Source Reverse Leakage	V_{GE} =-20V	--	--	-250	nA
ON Characteristics						
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C=40A ,V_{GE}=15V，Tc=25℃	--	1.5	1.9	V
		I_C=40A ,V_{GE}=15V，Tc=175℃	--	1.95	--	V
$V_{GE(th)}$	Gate Threshold Voltage	I_C=250uA ,V_{CE}=V_{GE}	4		7	V
Pulse width tp≤300μs,δ≤2%						

Dynamic Characteristics						
C_{ies}	Input Capacitance	V_{CE}=30V,V_{GE}=0V f=1MHz	--	3010	--	pF
C_{oes}	Output Capacitance		--	132	--	
C_{res}	Reverse Transfer Capacitance		--	16	--	
Switching Characteristics						
$t_{d(on)}$	Turn-on Delay Time	V_{CE}=400V,I_C=40A, R_g=10Ω,V_{GE}=15V, Inductive Load, T_J=25°C	--	42	--	ns
t_r	Rise Time		--	52	--	
$t_{d(off)}$	Turn-Off Delay Time		--	89	--	
t_f	Fall Time		--	74	--	
E_{on}[a4]	Turn-On Switching Loss		--	1.47	--	mJ
E_{off}	Turn-Off Switching Loss		--	0.59	--	
E_{ts}	Total Switching Loss		--	2.06	--	
$t_{d(on)}$	Turn-on Delay Time	V_{CE}=400V,I_C=40A, R_g=10Ω,V_{GE}=15V, Inductive Load, T_J=175°C	--	40	--	ns
t_r	Rise Time		--	53	--	
$t_{d(off)}$	Turn-Off Delay Time		--	108	--	
t_f	Fall Time		--	91	--	
E_{on}[a4]	Turn-On Switching Loss		--	1.61	--	mJ
E_{off}	Turn-Off Switching Loss		--	0.80	--	
E_{ts}	Total Switching Loss		--	2.41	--	
Qg	Total Gate Charge	V_{CE}=520V,I_C=40A, V_{GE}=15V	--	100	--	nC
Qge	Gate to Emitter Charge		--	26	--	
Qgc	Gate to Collector Charge		--	52	--	
Electrical Characteristics of the DIODE（T_C= 25°C unless otherwise specified）:						
V_F	Diode Forward Voltage	I_F=40A,T_C=25°C	--	1.5	2.0	V
		I_F=40A,T_C=175°C		1.25	--	
T_{rr}	Reverse Recovery Time	I_F=40A di/dt=200A/μS	--	301.9	--	ns
I_{rrm}	Reverse Recovery Current		--	2.74	--	A
Q_{rr}	Reverse Recovery Charge		--	414.2	--	nC

Notes：

a1：The collector DC current is limited by the maximum junction temperature, limited by the bond wire current capacity at 25 ℃

a2：FRD DC forward current is limited by the maximum junction temperature, limited by the bond wire current capacity at 25 ℃

a3：Repetitive rating; pulse width limited by maximum junction temperature Tvjop = 175℃, the maximum duty cycle is less than 20% (lasting for 60s at most)

a4：Turn-on losses include diode losses

Typical Performance Characteristics:

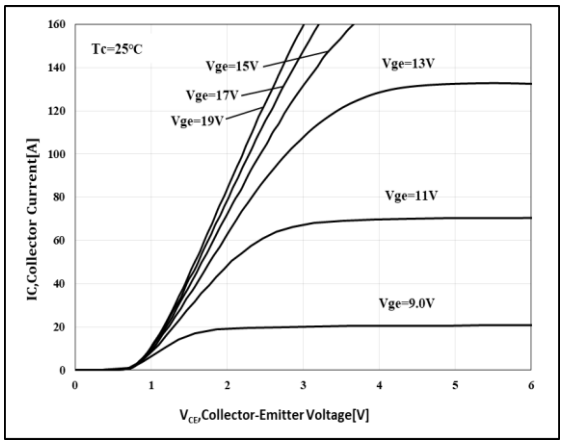


Figure 1.Output Characteristics

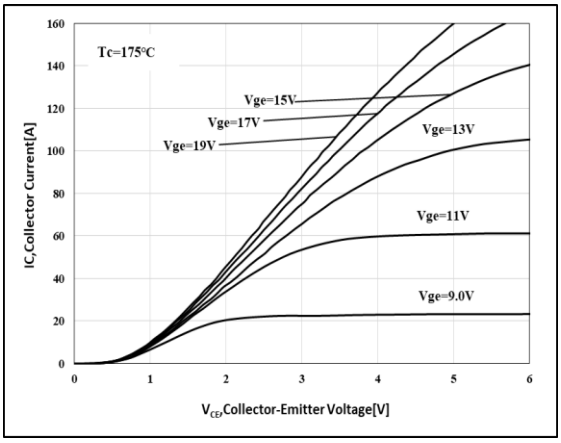


Figure 2.Output Characteristics

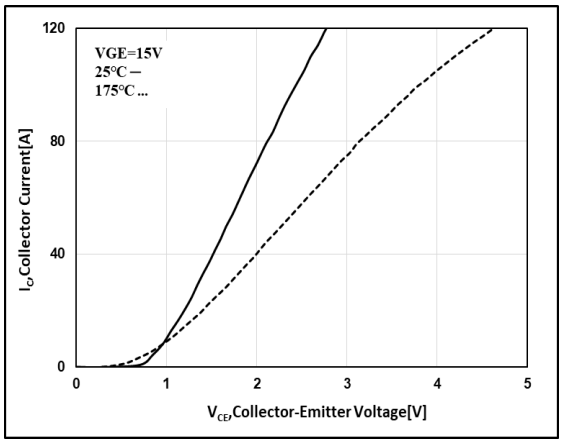


Figure 3.Saturation Voltage Characteristics

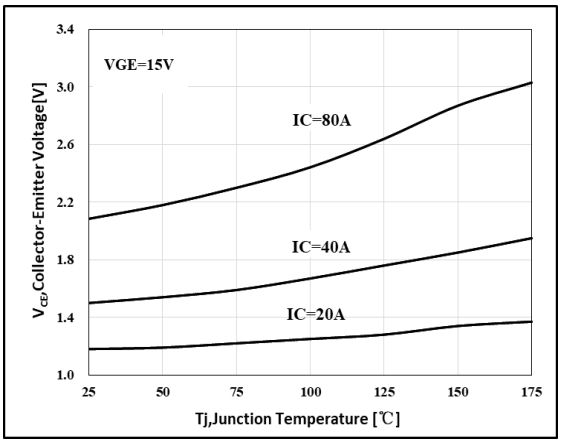


Figure 4.Saturation Voltage –T_J Characteristics

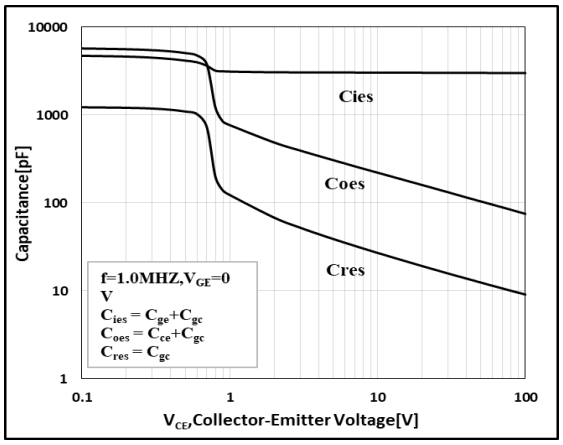


Figure 5.Capacitance Characteristics

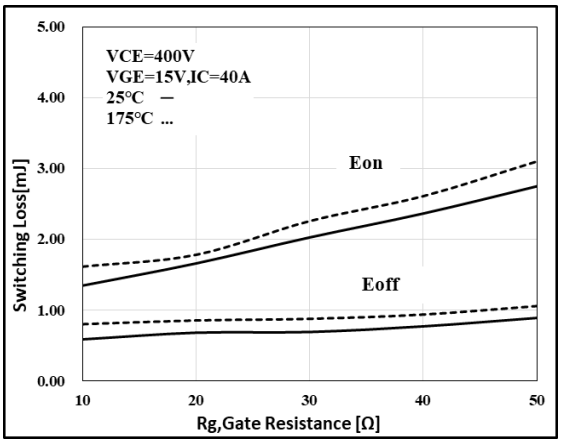


Figure 6.Switching Loss-R_G Characteristics

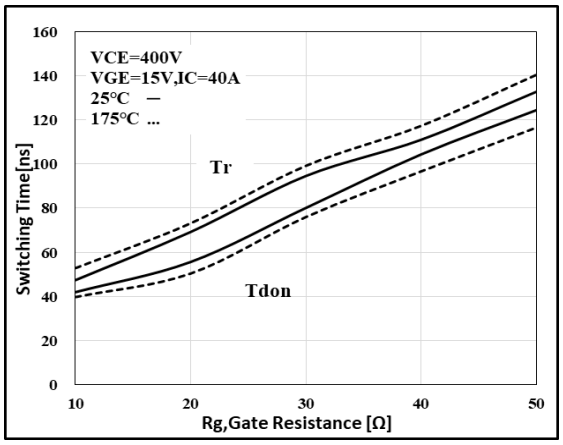


Figure 7.Switching Time-R_G Characteristics

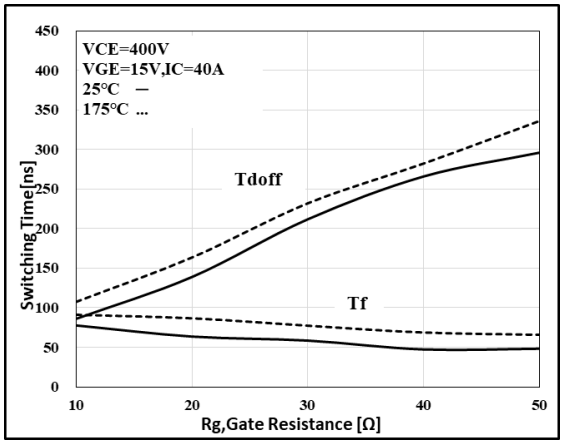


Figure 8.Switching Time-R_G Characteristics

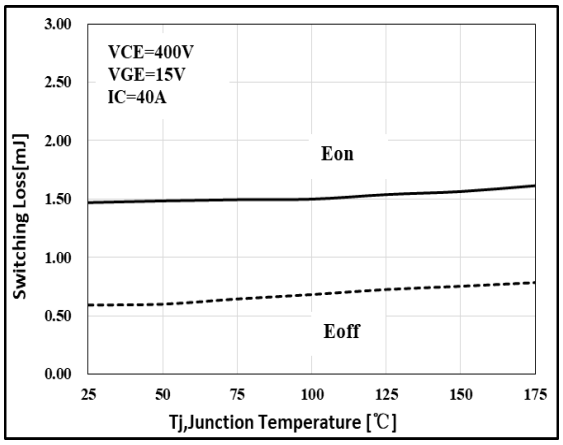


Figure 9.Switching Loss-T_j Characteristics

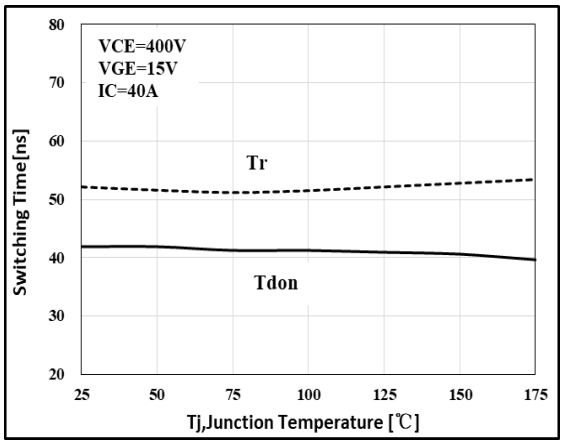


Figure 10.Switching Time-T_j Characteristics

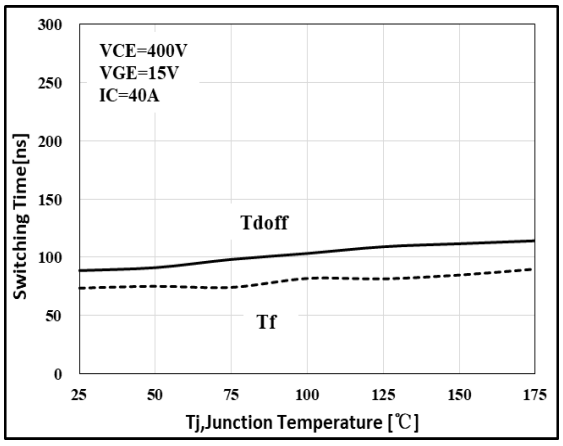


Figure 11.Switching Time-T_j Characteristics

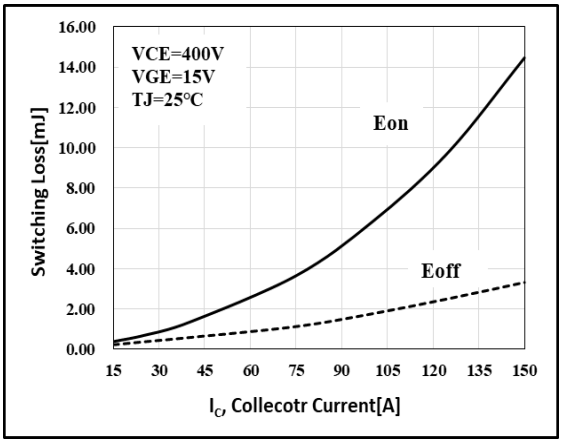


Figure 12.Switching Loss-I_C Characteristics

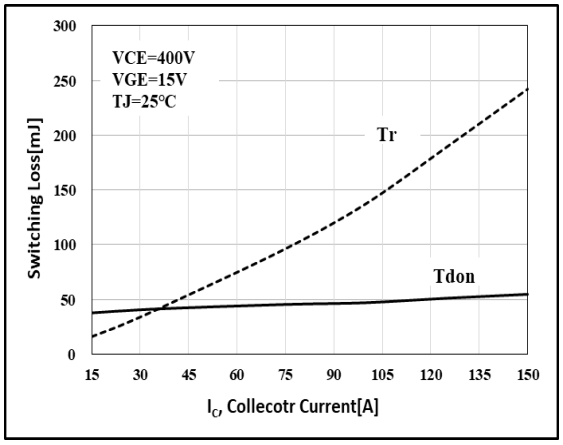


Figure 13.Switching Time-I_C Characteristics

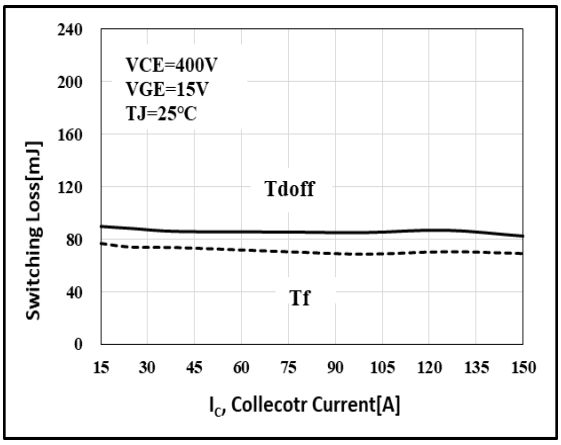


Figure 14.Switching Time-I_C Characteristics

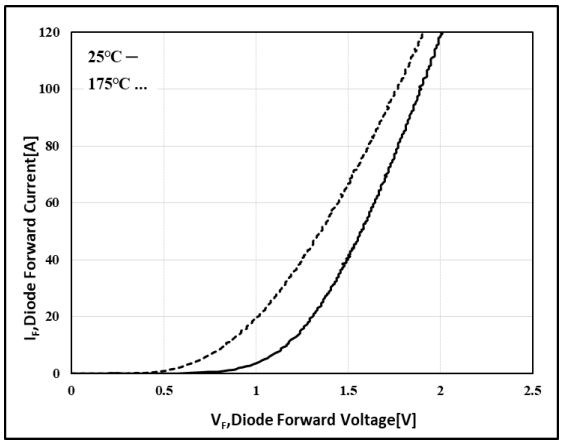


Figure 15.Diode Forward Characteristics

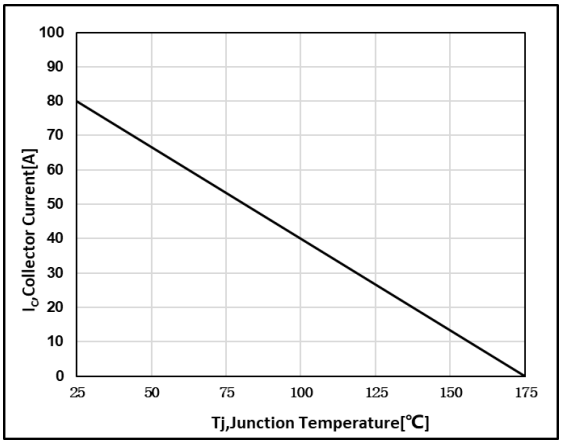


Figure 16.Collector Current-T_j Characteristics

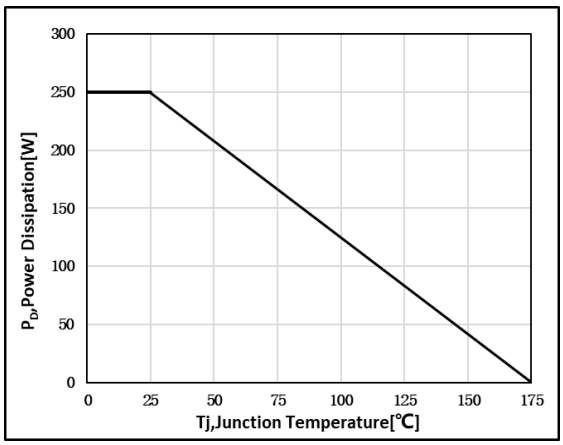


Figure 17.Power dissipation

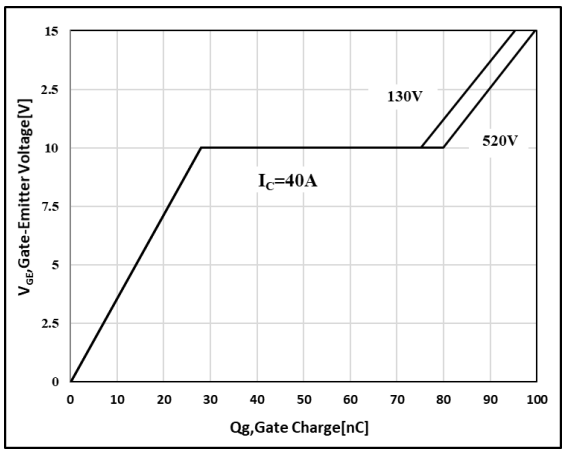


Figure 18.Gate Charge Characteristics

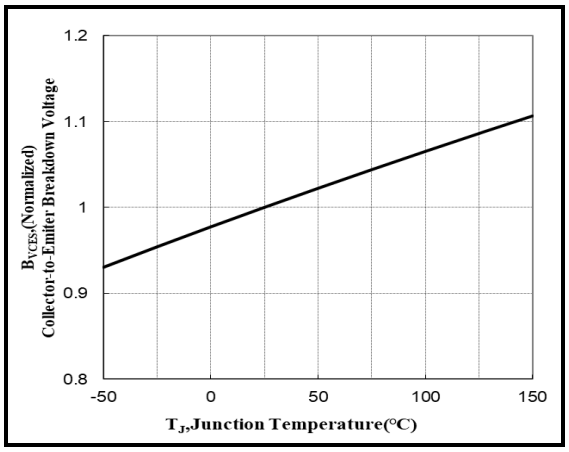


Figure 19. Breakdown Voltage vs Junction Temperature

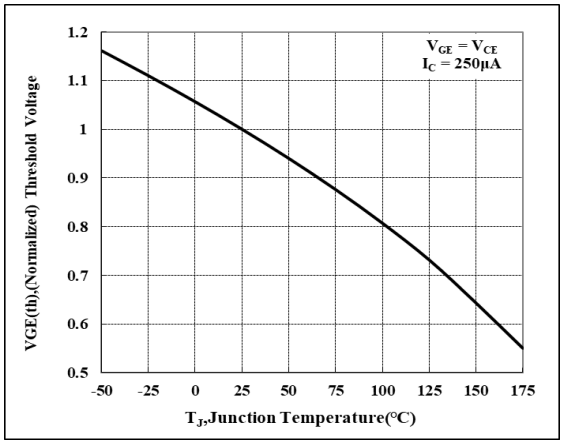


Figure 20. Threshold Voltage vs Junction Temperature

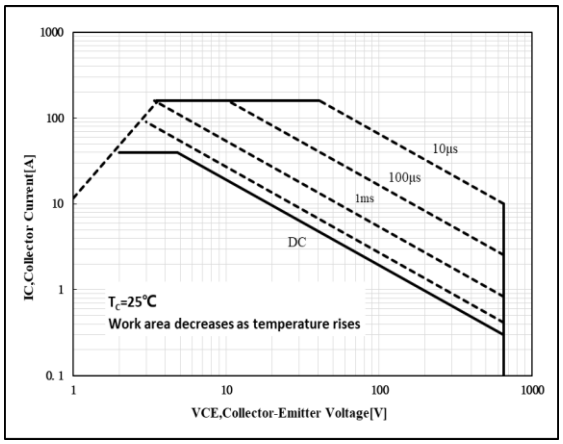


Figure 21.Forward Bias Safe Operating Area

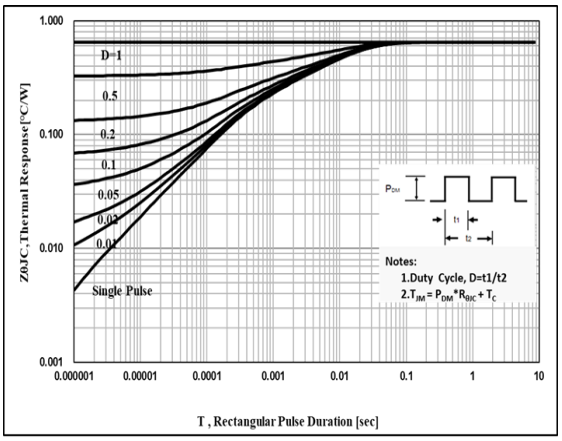
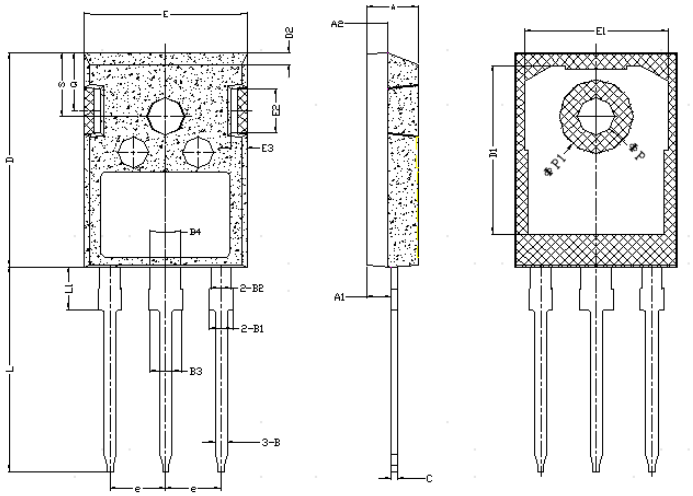


Figure 22. IGBT Transient Thermal Impedance

Package Information



项　目	规范(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
ΦP1	7.0	7.4
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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1. CRM reserves the right to change any product or information in this Specification at any time without prior notice.
2. The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics .The data contained in this document is exclusively intended for technically trained staff. It is the responsibility of customer's technical departments to evaluate the suitability of the product for the intended application and the completeness of the product information given in this document with respect to such application.
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Application and Service：Post：214061 Tel / Fax：0510-85807228-3399 / 2227

Modify ：

Version	Modify record
2024V01	Initial release
2024V02	Update Features and Applications