

General Description:

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

Features:

- FS Trench Technology, Positive temperature coefficient
- Low saturation voltage:

$V_{CE(sat)}$, TYP=1.70V @ $I_C=40A$, $V_{GE}=15V$;

Applications

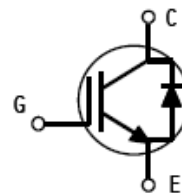
- Solar Inverter
- ESS
- UPS

V_{CES}	1200	V
I_C	40	A
P_{tot} ($T_C=25^\circ C$)	294	W
$V_{CE(sat)}$	1.70	V

Outline : TO-247



Inner Circuit:



Package Parameters

Type	Marking	Package	Packing
CRG40T120AK5HDZ	G40T120AK5HDZ	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
P_D	Power Dissipation @ $T_C = 25^\circ\text{C}$	294	W
	Power Dissipation @ $T_C = 100^\circ\text{C}$	147	
T_{vjop}^{a2}	Operating Junction temperature range	$-40 \sim 175$	$^\circ\text{C}$
T_{stg}	Storage Temperature Range	$-55 \sim 150$	$^\circ\text{C}$
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	--	0.51	$^\circ\text{C}/\text{W}$
$R\theta_{JC}$	Thermal Resistance, Junction to case for Diode	--	0.85	$^\circ\text{C}/\text{W}$
$R\theta_{JA}$	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} =0V,I _{CE} =250uA	1200	--	--	V
I _{CES}	Collector Cut-off Current	V _{GE} =0V,V _{CE} =1200V	--	--	1	mA
I _{GES(F)}	Gate-Emitter Forward Leakage Current	V _{GE} =+20V	--	--	+250	nA
I _{GES(R)}	Gate-Emitter Reverse Leakage Current	V _{GE} =-20V	--	--	-250	nA
ON Characteristics						
V _{CE(sat)}	Collector-Emitter Saturation Voltage	I _C =40A ,V _{GE} =15V @ T _C = 25 °C	--	1.70	2.4	V
		I _C =40A ,V _{GE} =15V @ T _C =175 °C	--	2.25	--	V
V _{GE(th)}	Gate - Emitter Threshold	I _C =0.64mA ,V _{CE} =V _{GE}	4.0	5.5	7.5	V

	Voltage					
Pulse width $t_p \leq 300\mu s, \delta \leq 2\%$						
Dynamic Characteristics						
C_{ies}	Input Capacitance	$V_{CE}=30V, V_{GE}=0V$ $f=1MHz$	--	4821	--	pF
C_{oes}	Output Capacitance		--	90	--	
C_{res}	Reverse Transfer Capacitance		--	21	--	
Switching Characteristics						
$t_{d(on)}$	Turn-on Delay Time	$V_{CE}=600V, I_C=40A,$ $R_g=10\Omega, V_{GE}=15V,$ Inductive Load, $T_J=25^\circ C$	--	48	--	ns
t_r	Rise Time		--	40	--	
$t_{d(off)}$	Turn-Off Delay Time		--	177	--	
t_f	Fall Time		--	102	--	
E_{on}	Turn-On Switching Loss		--	2.22	--	mJ
E_{off}	Turn-Off Switching Loss		--	1.24	--	
E_{ts}	Total Switching Loss		--	3.46	--	
$t_{d(on)}$	Turn-on Delay Time	$V_{CE}=600V, I_C=40A,$ $R_g=10\Omega, V_{GE}=15V,$ Inductive Load, $T_J=175^\circ C$	--	42	--	ns
t_r	Rise Time		--	41	--	
$t_{d(off)}$	Turn-Off Delay Time		--	246	--	
t_f	Fall Time		--	142	--	
E_{on}	Turn-On Switching Loss		--	2.55	--	mJ
E_{off}	Turn-Off Switching Loss		--	1.91	--	
E_{ts}	Total Switching Loss		--	4.46	--	
Qg	Total Gate Charge	$V_{CE}=960V, I_C=40A,$ $V_{GE}=15V$	--	200	--	nC
Qge	Gate to Emitter Charge		--	38	--	
Qgc	Gate to Collector Charge		--	96	--	
Electrical Characteristics of the DIODE						
V_F	Diode Forward Voltage	$I_F=40A \quad TC=25^\circ C$	--	2.55	3.2	V
		$I_F=40A \quad TC=175^\circ C$	--	2.2	--	V
t_{rr}	Reverse Recovery Time	$I_F=40A$ $di/dt=100A/\mu s$	--	84	--	ns
I_{rrm}	Reverse Recovery Current		--	3.6	--	A
Q_{rr}	Reverse Recovery Charge		--	153	--	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

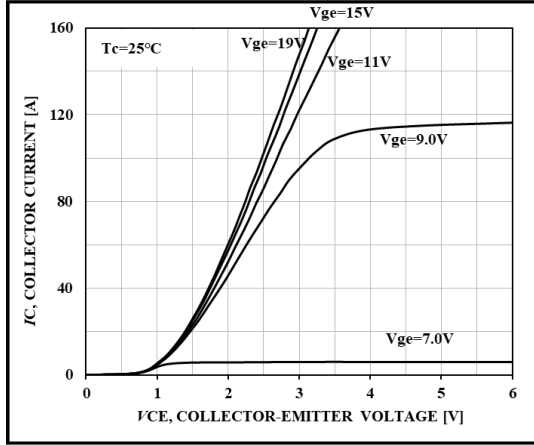


Figure 1. Output Characteristics

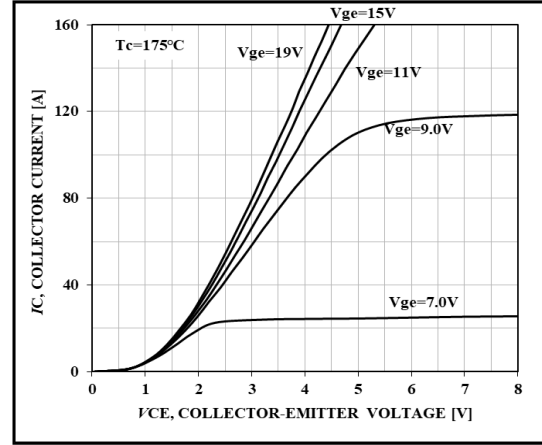


Figure 2. Output Characteristics

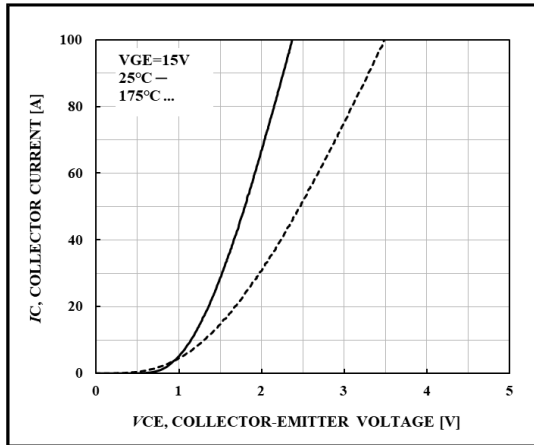


Figure 3. Saturation Voltage Characteristics

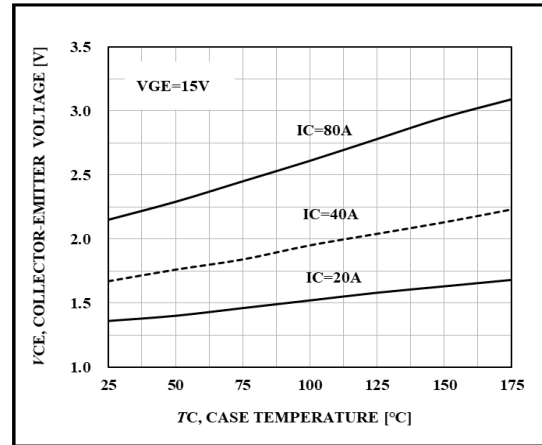


Figure 4. Saturation Voltage - T_c Characteristics

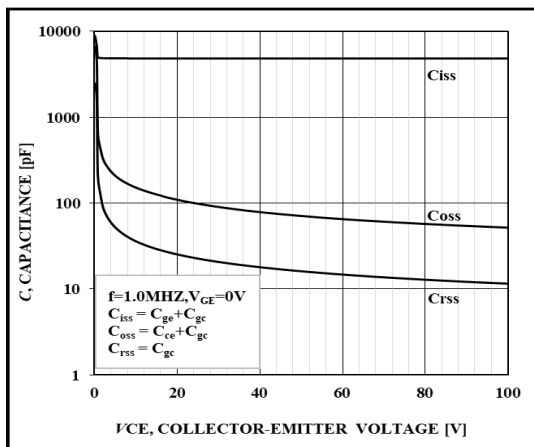


Figure 5. Capacitance Characteristics

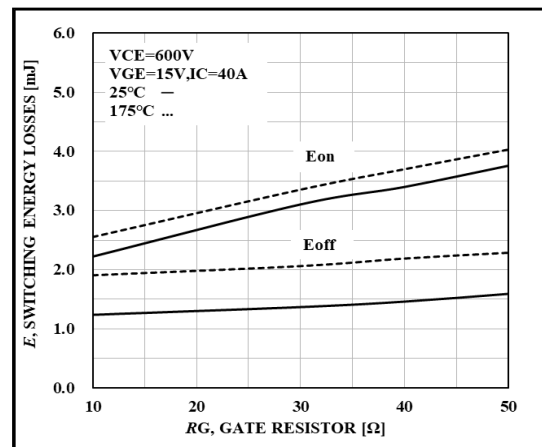


Figure 6. Switching Loss- R_G Characteristics

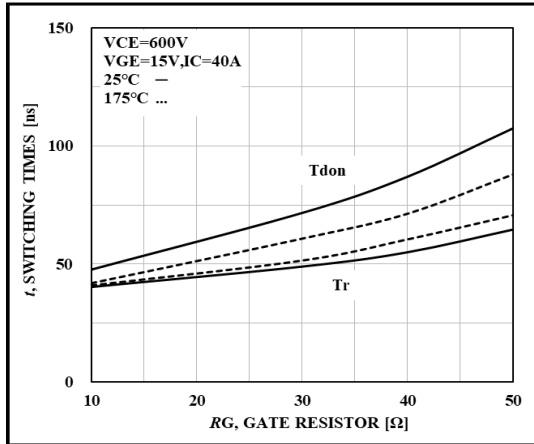


Figure 7. Switching Time- R_G Characteristics

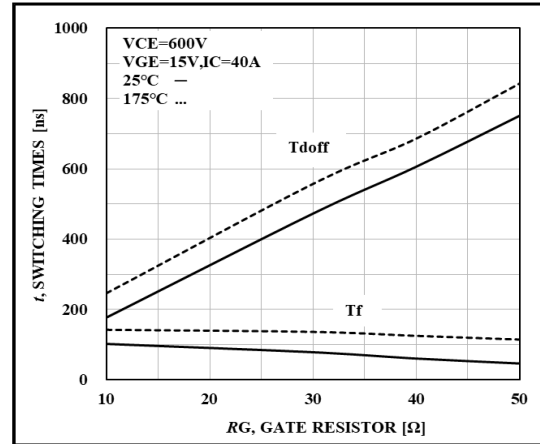


Figure 8. Switching Time- R_G Characteristics

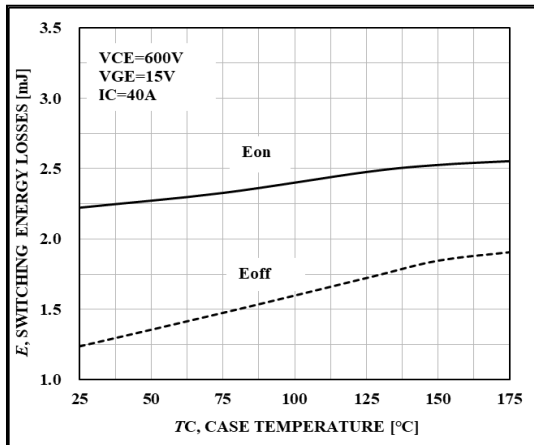


Figure 9. Switching Loss- T_c Characteristics

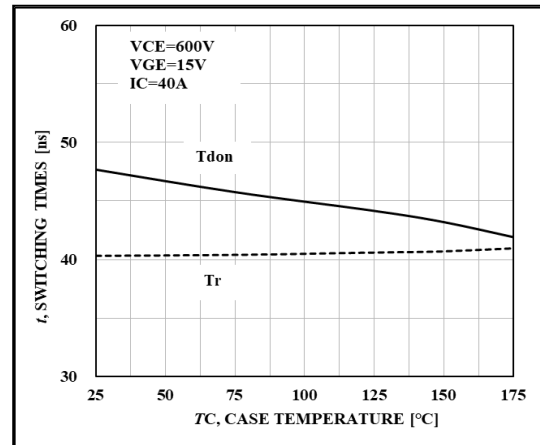


Figure 10. Switching Time- T_c Characteristics

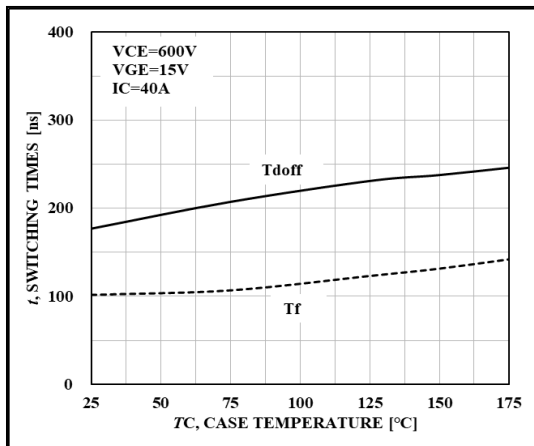


Figure 11. Switching Time- T_c Characteristics

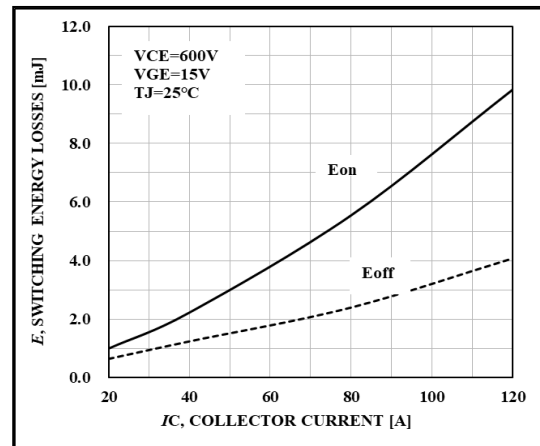


Figure 12. Switching Loss- I_C Characteristics

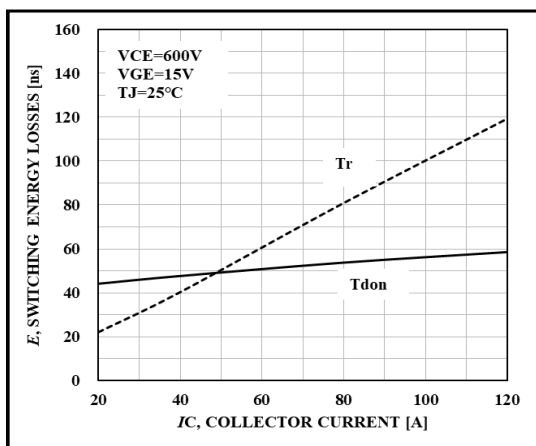


Figure 13. Switching Time- I_C Characteristics

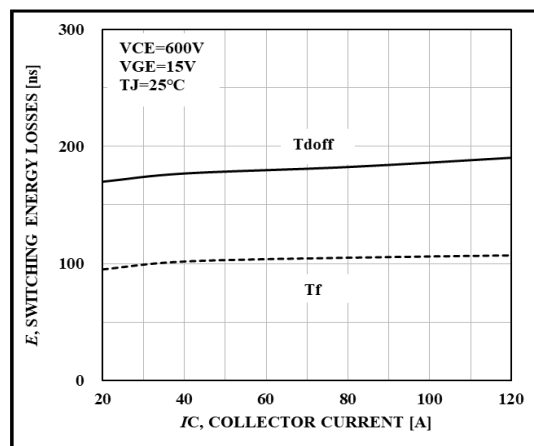


Figure 14. Switching Time- I_C Characteristics

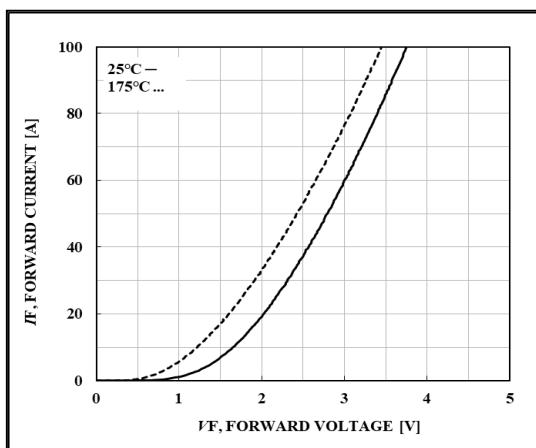


Figure 15. Diode Forward Characteristics

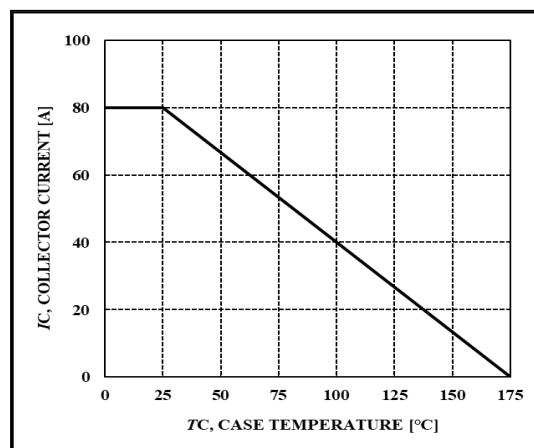


Figure 16. Collector Current- T_c Characteristics
($T_j \leq 175^\circ\text{C}$)

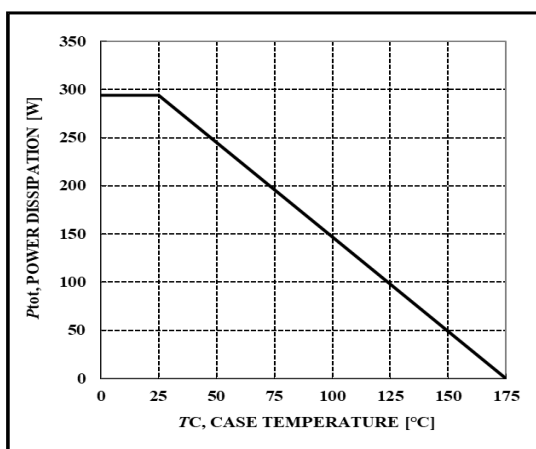


Figure 17. Power Dissipation- T_c Characteristics
($T_j \leq 175^\circ\text{C}$)

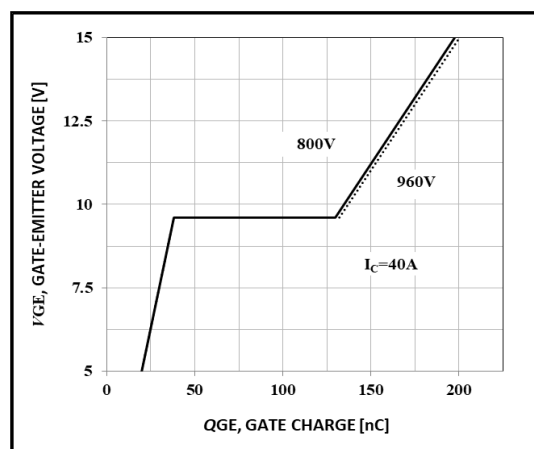


Figure 18. Gate Charge Characteristics

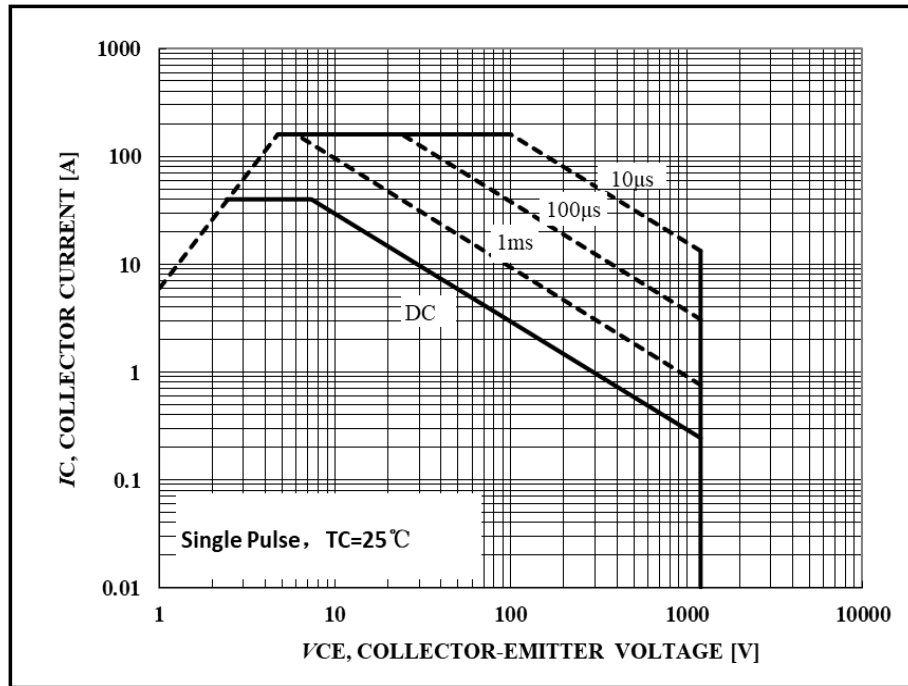


Figure 19. Forward Bias Safe Operating Area

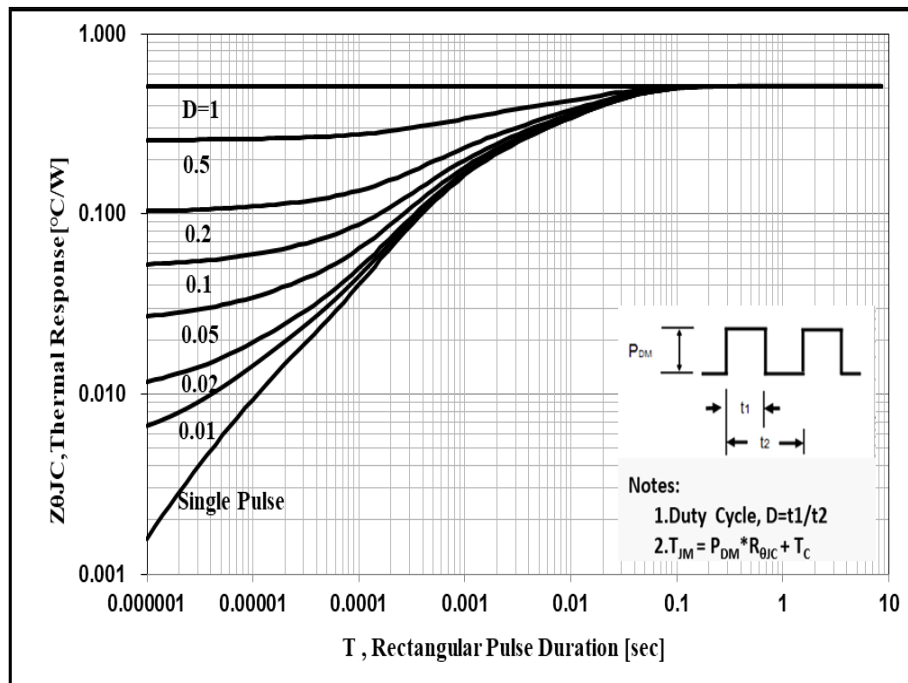
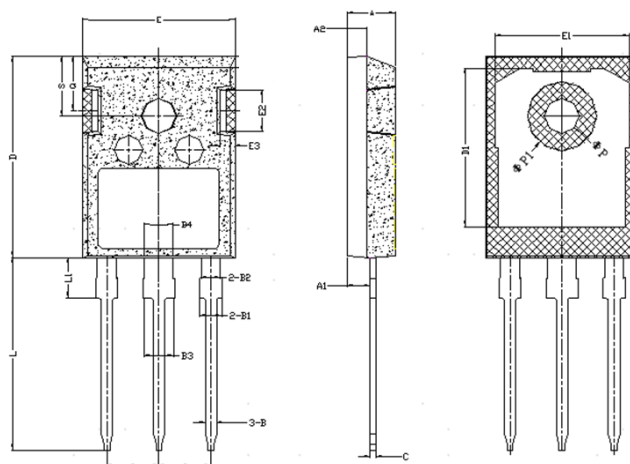


Figure 20. IGBT Transient Thermal Impedance

Package Information



项 目	规范(mm)	
	MIN	MAX
A	4.6	5.2
A1	2.2	2.6
A2	1.85	2.17
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.									

Warnings

1. Exceeding the maximum ratings of the device in performance may cause damage to the device, even the permanent failure, which may affect the dependability of the machine. It is suggested to be used under 80 percent of the maximum ratings of the device.
2. When installing the heat sink, please pay attention to the torsional moment and the smoothness of the heat sink.
3. IGBTs is the device which is sensitive to the static electricity, it is necessary to protect the device from being damaged by the static electricity when using it.
4. This publication is made by Huajing Microelectronics and subject to regular change without notice.

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 0510-85800360 (Fax)

Application and Service: **Post:** 214061 **Tel / Fax:** 0510-85807228-3399 / 2227

Modify :

Version	Modify record
2024V01	Initial release
2025V02	Update $V_{GE(th)}$ parameters