



CRG60T60AK3H

General Description:

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

Features:

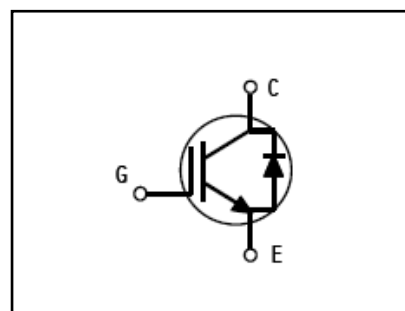
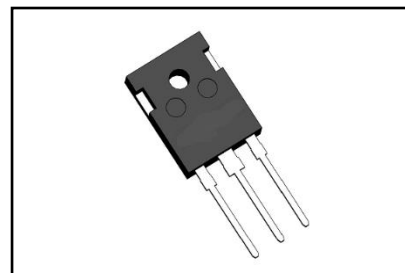
- FS Trench Technology, Positive temperature coefficient
- Low saturation voltage:

$V_{CE(sat)}$, TYP=1.85V @ $I_C=60A$, $V_{GE}=15V$;

Applications

- Welding
- Solar Inverter
- UPS

V_{CES}	600	V
I_C	60	A
P_{tot} ($T_C=25^{\circ}C$)	403	W
$V_{CE(sat)}$	1.85	V

**Package Parameters**

Type	Package	Marking
CRG60T60AK3H	TO-247	G60T60AK3H

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

Symbol	Parameter	Rating	Units
V_{CES}	Collector-Emitter Voltage	600	V
V_{GES}	Gate- Emitter Voltage	± 20	V
I_C	Collector Current @ $T_C = 25^\circ\text{C}$	120	A
	Collector Current @ $T_C = 100^\circ\text{C}$	60	
I_{CM}^{a1}	Pulsed Collector Current @ $T_C = 25^\circ\text{C}$	180	A
I_F	Diode Continuous Forward Current @ $T_C = 100^\circ\text{C}$	30	A
	Diode Continuous Forward Current @ $T_C = 25^\circ\text{C}$	60	A
I_{FM}	Diode Maximum Forward Current	90	A
P_D	Power Dissipation @ $T_C = 25^\circ\text{C}$	403	W
	Power Dissipation @ $T_C = 100^\circ\text{C}$	161	
T_J	Operating Junction	150	$^\circ\text{C}$
T_{sg}	Storage Temperature Range	$-55 \sim 150$	$^\circ\text{C}$
T_L	Maximum Temperature for Soldering	270	$^\circ\text{C}$

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

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Thermal Resistance, Junction to case for IGBT	--	0.31	$^\circ\text{C}/\text{W}$
$R_{\theta JC}$	Thermal Resistance, Junction to case for Diode	--	0.72	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	--	40.1	$^\circ\text{C}/\text{W}$

Electrical Characteristics of the IGBT ($T_C = 25^\circ\text{C}$ 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} =1mA	600	--	--	V
I _{CES}	Collector-Emitter Leakage Current	V _{GE} =0V,V _{CE} =600V	--	--	3.0	mA
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 =60A ,V _{GE} =15V	--	1.85	2.4	V
V _{GE(th)}	Gate Threshold Voltage	I _C =1mA ,V _{CE} =V _{GE}	4.0	5.4	7.0	V
Pulse width tp≤300μs,δ≤2%						
Dynamic Characteristics						
C _{ies}	Input Capacitance	V _{CE} =30V,V _{GE} =0V f=1MHz	--	3398	--	pF
C _{oes}	Output Capacitance		--	224	--	
C _{res}	Reverse Transfer Capacitance		--	44	--	

Switching Characteristics						
t _{d(on)}	Turn-on Delay Time	V _{CE} =400V,I _C =60A, R _g =10 Ω,V _{GE} =15V, Inductive Load,T _J =25℃	--	66	--	ns
t _r	Rise Time		--	124	--	
t _{d(off)}	Turn-Off Delay Time		--	152	--	
t _f	Fall Time		--	51	--	
E _{on}	Turn-On Switching Loss		--	4.79	--	mJ
E _{off}	Turn-Off Switching Loss		--	1.39	--	
E _{ts}	Total Switching Loss		--	6.18	--	
t _{d(on)}	Turn-on Delay Time	V _{CE} =400V,I _C =60A, R _g =10Ω,V _{GE} =15V, Inductive Load,T _J =125℃	--	66	--	ns
t _r	Rise Time		--	112	--	
t _{d(off)}	Turn-Off Delay Time		--	167	--	
t _f	Fall Time		--	50	--	
E _{on}	Turn-On Switching Loss		--	4.73	--	mJ
E _{off}	Turn-Off Switching Loss		--	1.5	--	
E _{ts}	Total Switching Loss		--	6.23	--	
Q _g	Total Gate Charge	V _{CE} =400V,I _C =60A, V _{GE} =15V	--	117	--	nC
Q _{ge}	Gate to Emitter Charge		--	35	--	
Q _{gc}	Gate to Collector Charge		--	47	--	
Electrical Characteristics of the DIODE (T _C = 25℃ unless otherwise specified):						
V _F	Diode Forward Voltage	I _F =30A	--	1.3	1.6	V
t _{rr}	Reverse Recovery Time	I _F =30A di/dt=200A/uS	--	80	--	ns
I _{rrm}	Reverse Recovery Current		--	6	--	A
Q _{rr}	Reverse Recovery Charge		--	240	--	nC

Typical Performance Characteristics

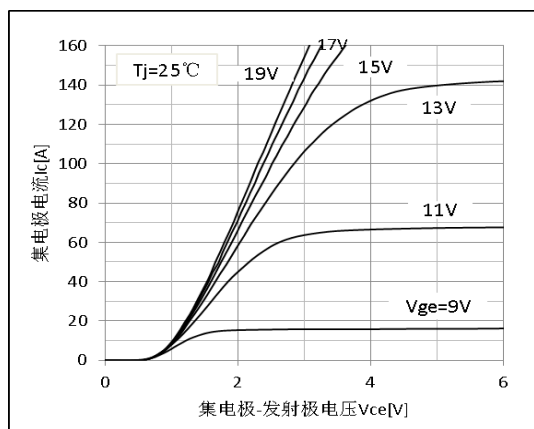


Figure 1. Output Characteristics

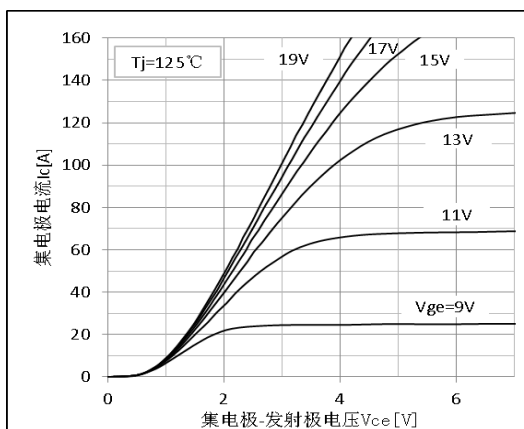


Figure 2. Output Characteristics

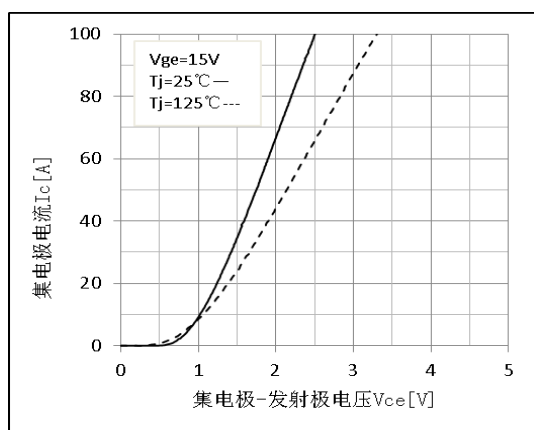


Figure 3. Saturation Voltage Characteristics

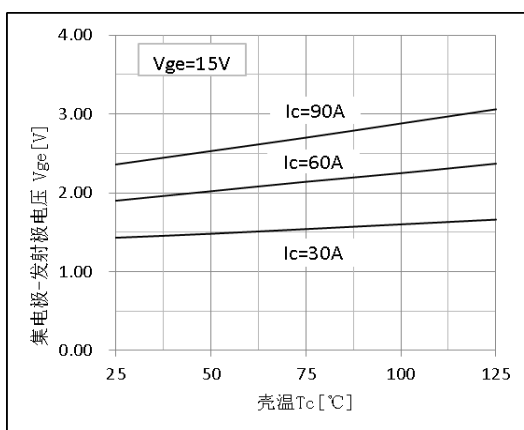


Figure 4. Saturation Voltage - T_c Characteristics



Figure 5. Capacitance Characteristics

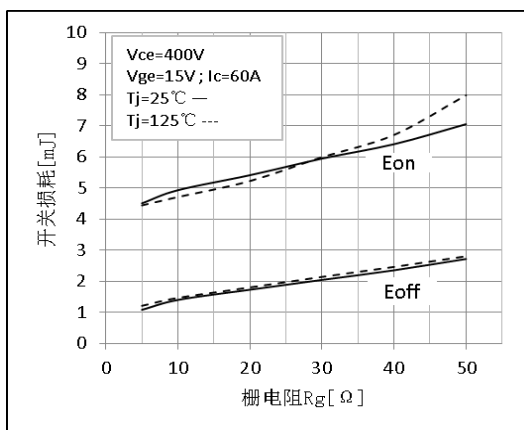


Figure 6. Switching Loss- R_g Characteristics

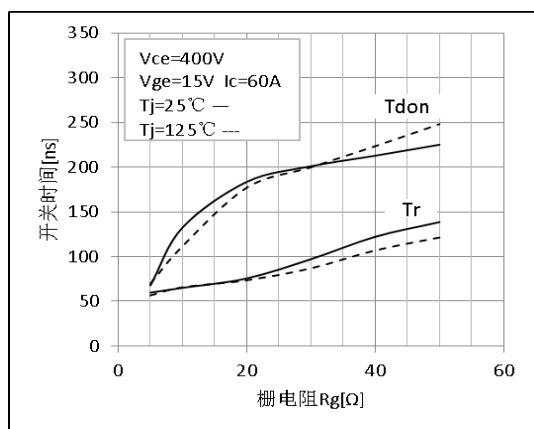


Figure 7.Switching Time- R_g Characteristics

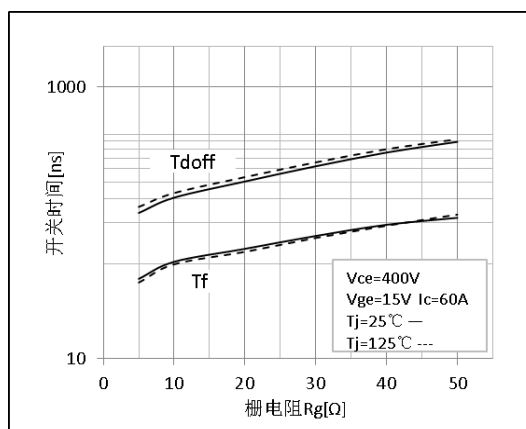


Figure 8.Switching Time- R_g Characteristics

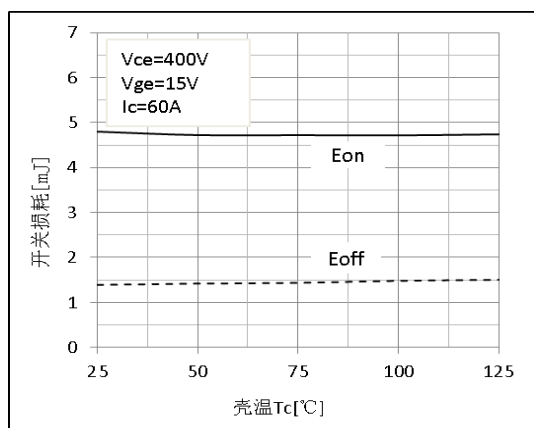


Figure 9.Switching Loss- T_c Characteristics

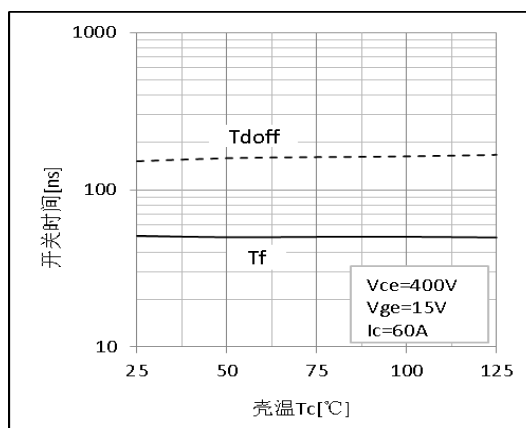


Figure 10. Turn-Off Time- T_c Characteristics

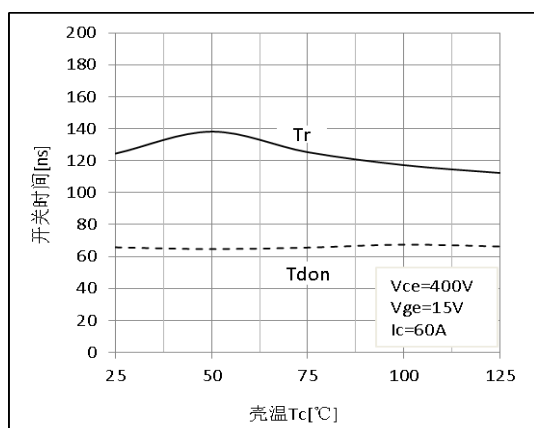


Figure 11. Turn-On Time- T_c Characteristics

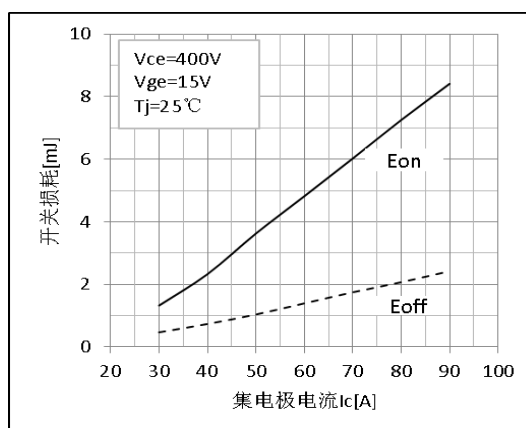


Figure 12.Switching Loss- I_c Characteristics

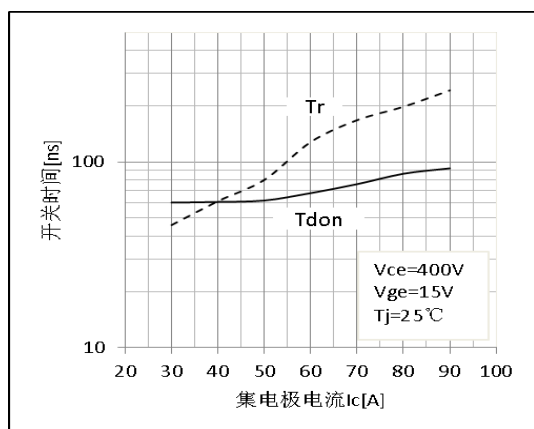


Figure 13. Switching Loss-Ic Characteristics

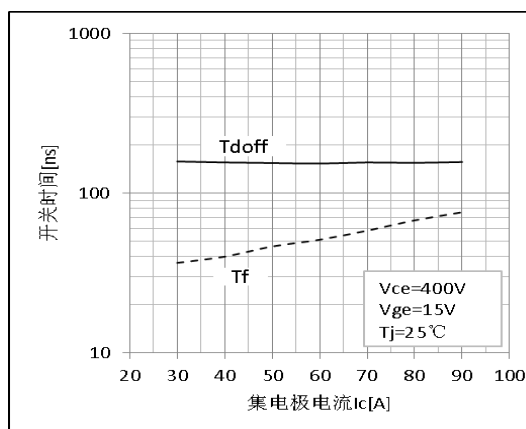


Figure 14. Turn-Off Time-Ic Characteristics

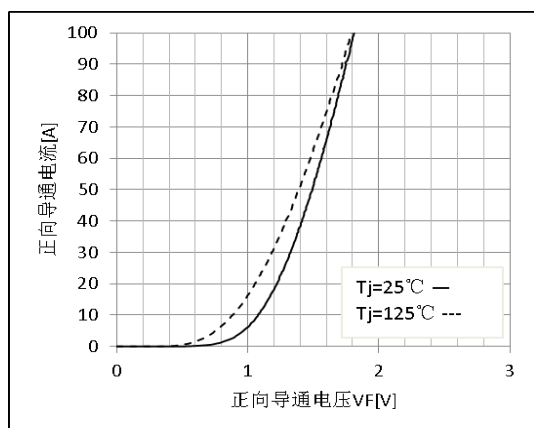


Figure 15. Diode Forward Characteristics

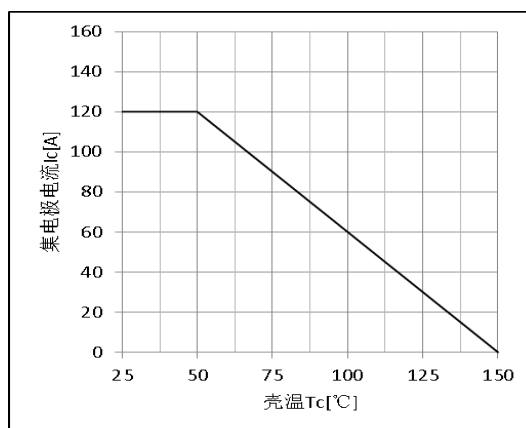


Figure 16. Collector Current-Tc Characteristics

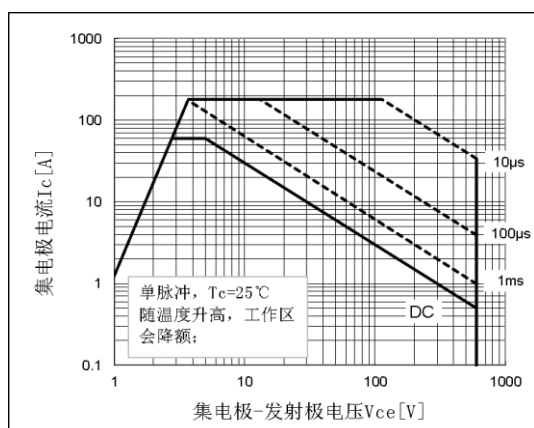


Figure 17. Forward Bias Safe Operating Area

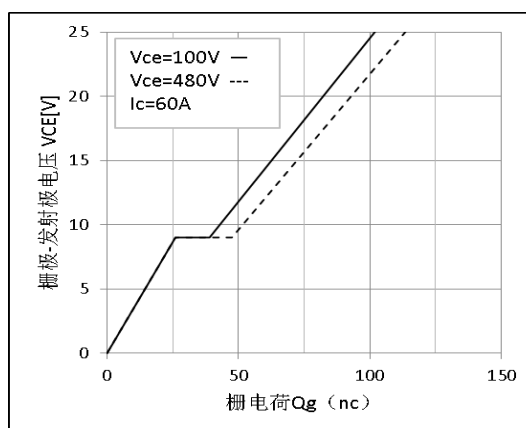


Figure 18. Gage Charge Characteristics

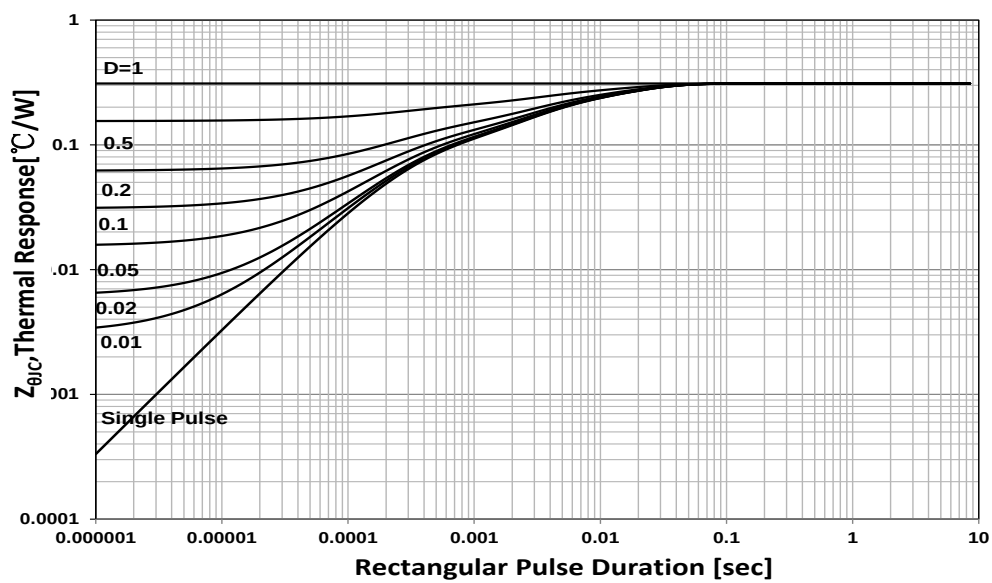
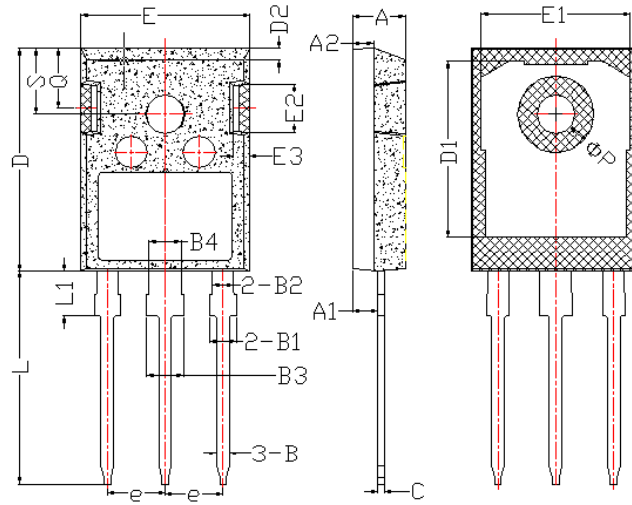


Figure 19.IGBT Transient Thermal Impedance

Package Information



Items	Values(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.									

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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