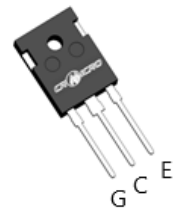
CRG40T60AK3SD

General Description：

Using HUAJING's proprietary 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℃）	336	W
$V_{CE(sat)}$	1.7	V

TO-247



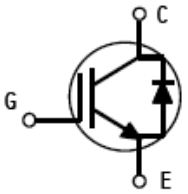
Features：

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

$V_{CE(sat)}$,TYP=1.7V @I_C=40A,V_{GE}=15V；

Applications

- Welding
- Frequency Converter
- Inverter
- UPS



Package Parameters

Type	Marking	Package	Packing
CRG40T60AK3SD	G40T60AK3SD	TO-247	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	V
I_C	Collector Current @T_C = 25 ℃	80	A
	Collector Current @T_C = 100 ℃	40	
I_{CM}[a1]	Pulsed Collector Current @T_C=25℃	120	A
I_F	Diode Continuous Forward Current @T_C = 100 ℃	40	A
	Diode Continuous Forward Current @T_C = 25 ℃	80	A
I_{FM}	Diode Maximum Forward Current	120	A
P_D	Power Dissipation @ T_C = 25 ℃	336	W
	Power Dissipation @T_C = 100 ℃	168	
T_{vjop}[a2]	Operating Junction	−40～175	℃
T_{stg}	Storage Temperature Range	−55～150	℃
T_L	Wave Soldering Temperature for 10 sec	270	℃

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

a2：Overload condition, it is allowed to operate under the maximum junction temperature Tvjop = 175℃, the maximum duty cycle is less than 20% (lasting for 60s at most)

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Thermal Resistance, Junction to case for IGBT	--	0.446	℃/W
$R_{\theta JC}$	Thermal Resistance, Junction to case for Diode	--	0.68	℃/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	--	--	1.0	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=40A ,V_{GE}=15V	--	1.7	2.3	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage @T_C = 125 ℃	I_C=40A ,V_{GE}=15V	--	2.1	--	V
$V_{GE(th)}$	Gate Threshold Voltage	I_C=1mA ,V_{CE}=V_{GE}	4.0	5.7	7.0	V
Pulse width tp≤300μs,δ≤2%						
Dynamic Characteristics						
C_{ies}	Input Capacitance	V_{CE}=30V,V_{GE}=0V	--	2758	--	pF

C_{oes}	Output Capacitance	f=1MHz	--	170	--	
C_{res}	Reverse Transfer Capacitance		--	88	--	
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℃	--	49	--	ns
t_r	Rise Time		--	60	--	
$t_{d(off)}$	Turn-Off Delay Time		--	217	--	
t_f	Fall Time		--	43	--	
E_{on}	Turn-On Switching Loss		--	2.19	--	mJ
E_{off}	Turn-Off Switching Loss		--	0.98	--	
E_{ts}	Total Switching Loss		--	3.17	--	
$t_{d(on)}$	Turn-on Delay Time	V_{CE}=400V,I_C=40A, R_g=10Ω,V_{GE}=15V, Inductive Load ,T_J=125℃	--	46	--	ns
t_r	Rise Time		--	61	--	
$t_{d(off)}$	Turn-Off Delay Time		--	252	--	
t_f	Fall Time		--	36	--	
E_{on}	Turn-On Switching Loss		--	2.32	--	mJ
E_{off}	Turn-Off Switching Loss		--	1.16	--	
E_{ts}	Total Switching Loss		--	3.48	--	
Qg	Total Gate Charge	V_{CE}=400V,I_C=40A, V_{GE}=15V,	--	165	--	nC
Qge	Gate to Emitter Charge		--	15	--	
Qgc	Gate to Collector Charge		--	96	--	

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

V_F	Diode Forward Voltage	I_F=40A	--	1.6	2.1	V
t_{rr}	Reverse Recovery Time	I_F=40A di/dt=200A/uS	--	48	--	ns
I_{rrm}	Reverse Recovery Current		--	2.0	--	A
Q_{rr}	Reverse Recovery Charge		--	106	--	nC

Typical Performance Characteristics

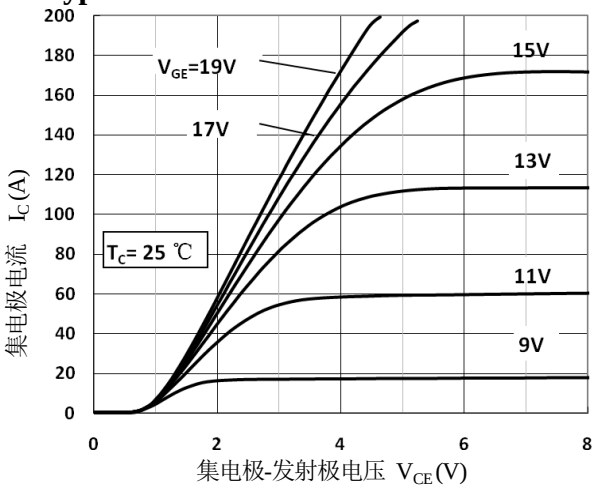


Figure 1.Output Characteristics

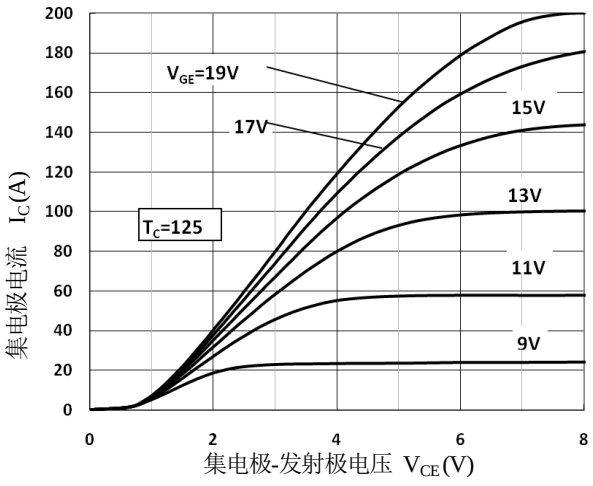


Figure 2.Output Characteristics

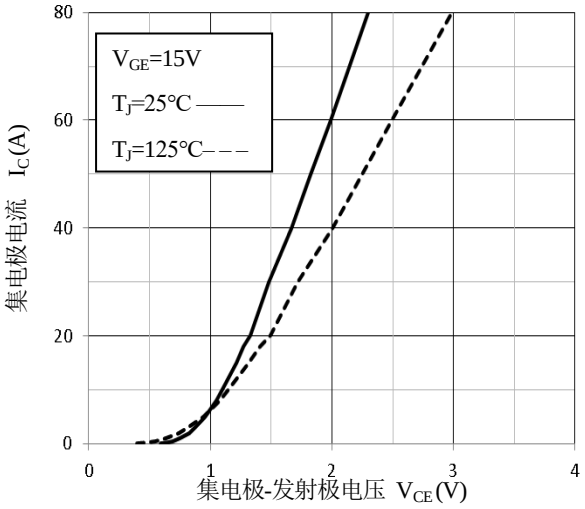


Figure 3.Saturation Voltage Characteristics

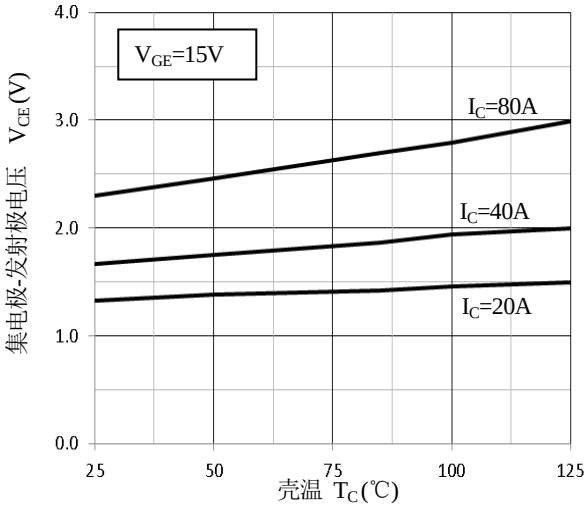


Figure 4.Saturation Voltage –T_C Characteristics

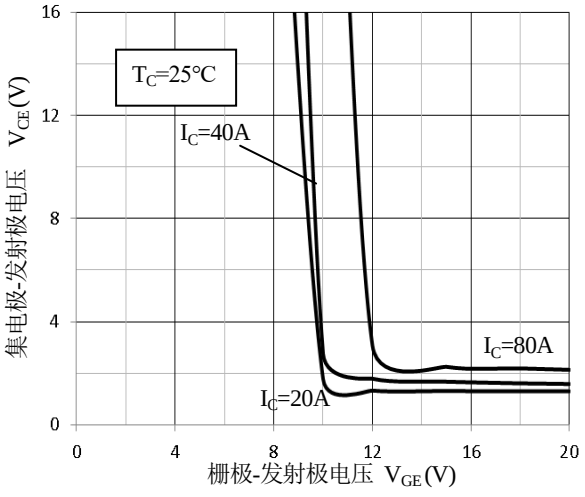


Figure 5.Saturation Voltage –VGE Characteristics

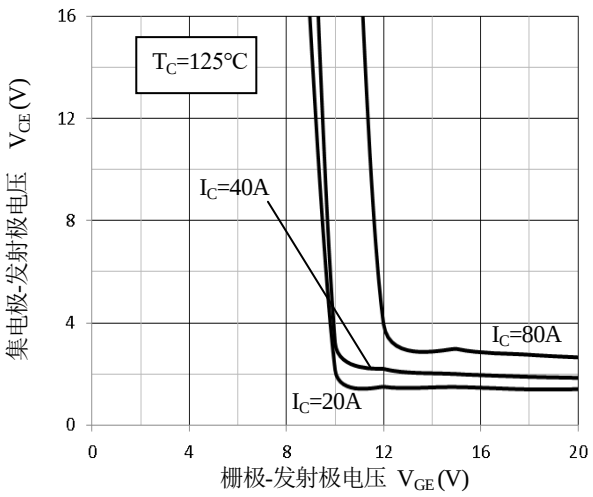


Figure 6.Saturation Voltage –VGE Characteristics

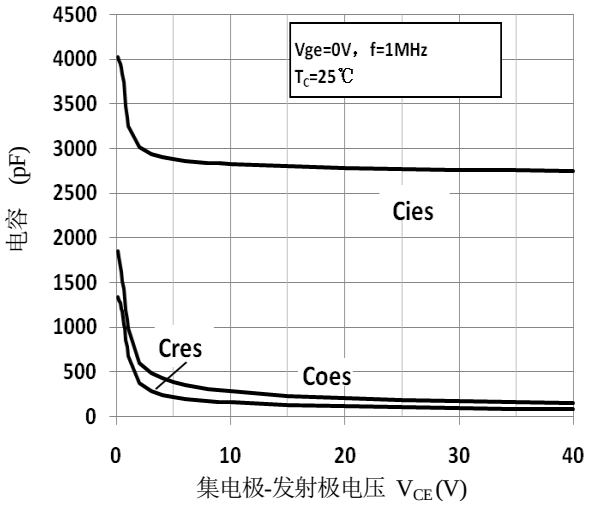


Figure 7.Capacitance Characteristics

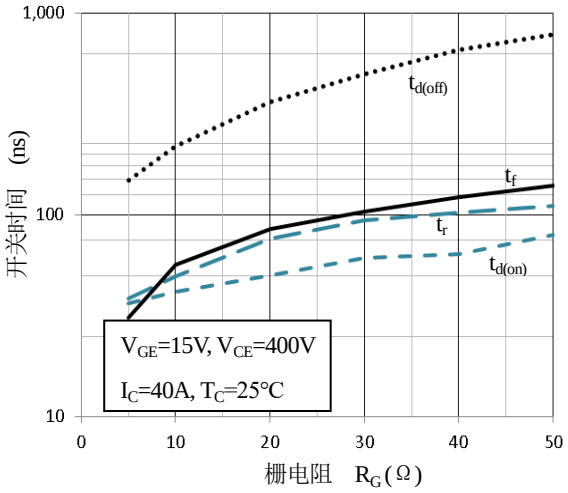


Figure 8.Switching Time-R_G Characteristics

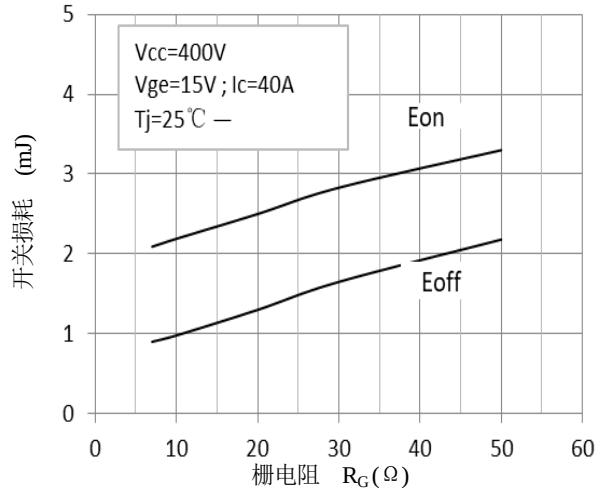


Figure 9.Switching Loss-R_G Characteristics

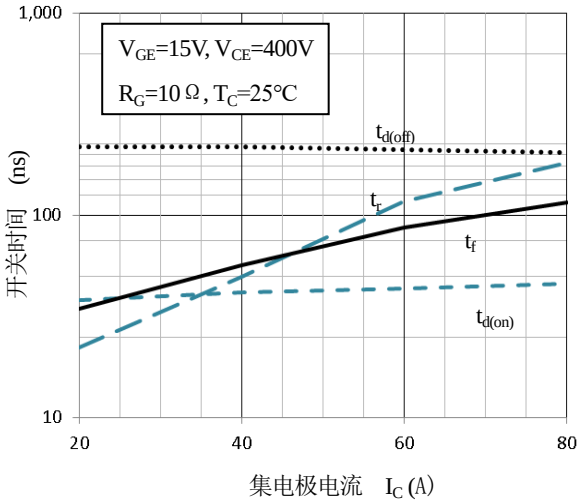


Figure 10.Switching Time -I_C Characteristics

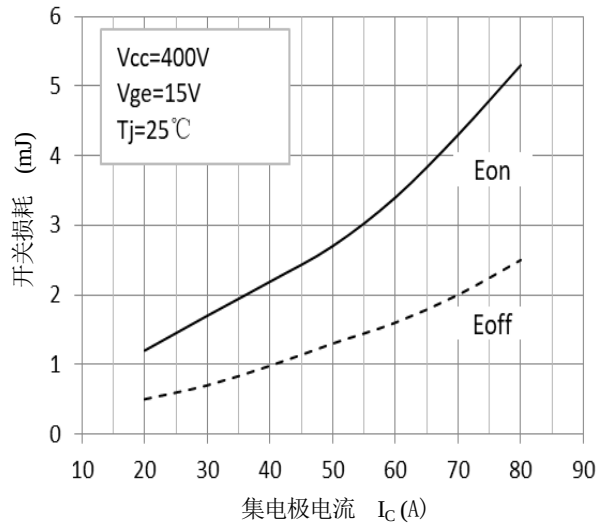


Figure 11.Switching Loss-I_C Characteristics

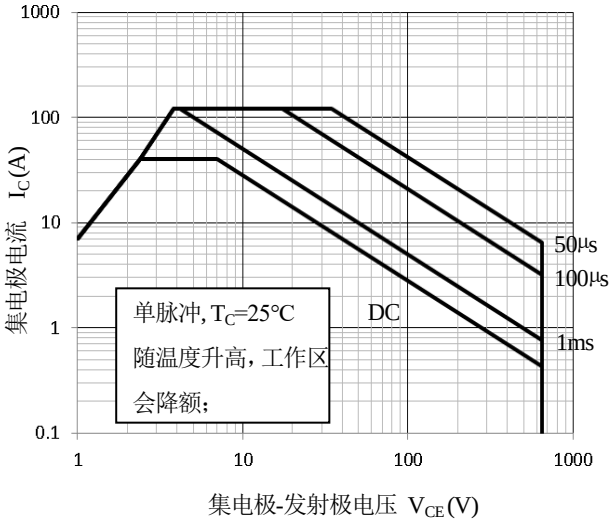


Figure 12.Forward Bias Safe Operating Area

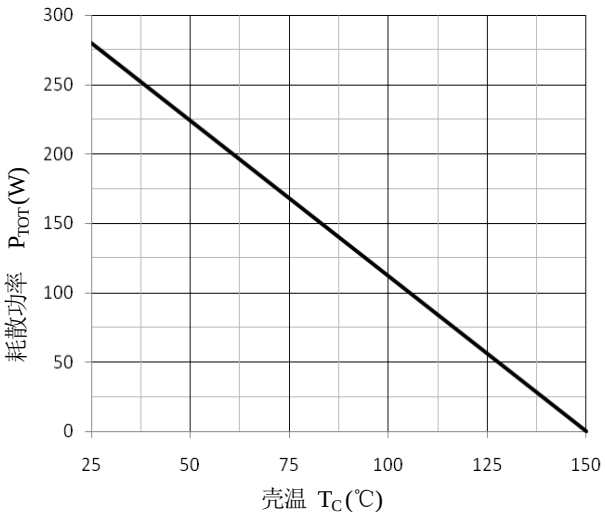


Figure 13.Power Dissipation–T_C Characteristics

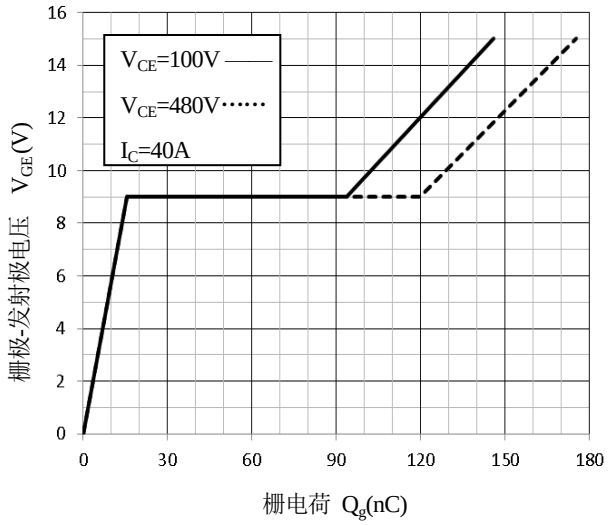


Figure 14.Gage Charge Characteristics

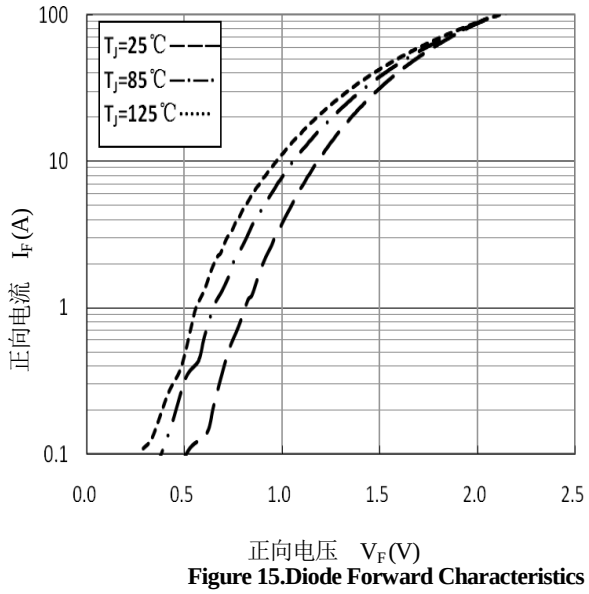


Figure 15.Diode Forward Characteristics

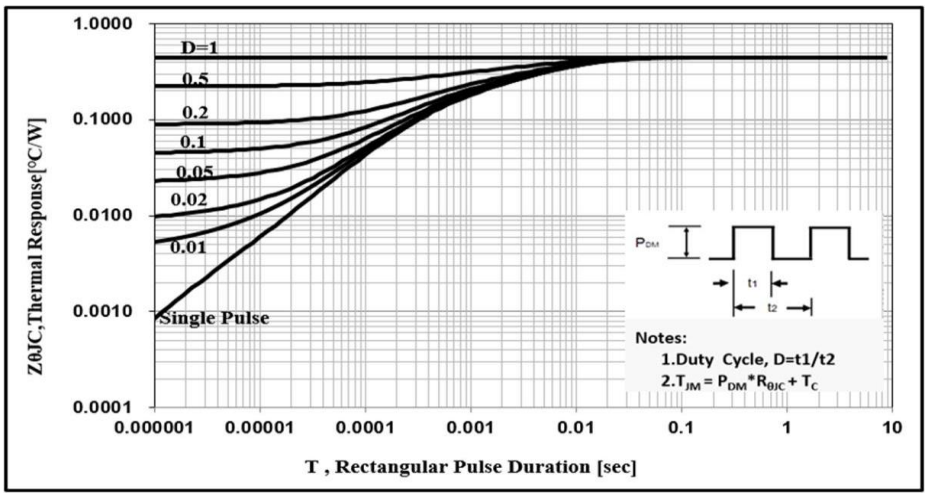
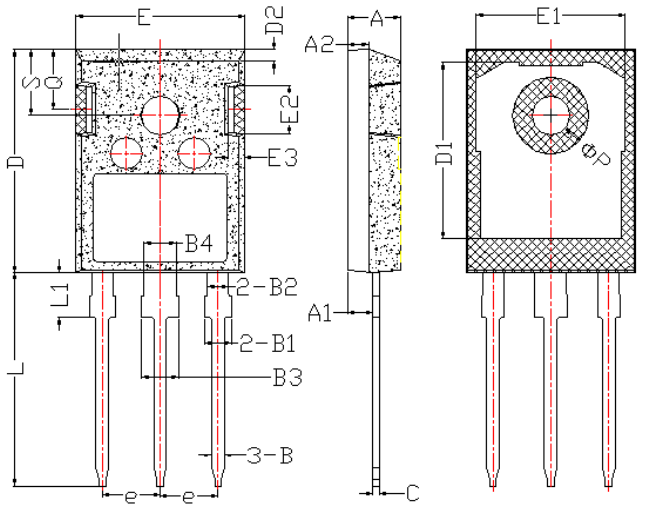


Figure 16.IGBT Transient Thermal Impedance

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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