CHUNZHENG

High-end Power Semiconductor Manufacturer

CSIG-1200A1700V

Dual Switch IGBT

Key Parameters

V_{CES}		1700	V
$V_{CE(sat)}$	Typ.	1.80	V
I_C	Max.	1200	A
$I_{C(RM)}$	Max.	2400	A

Typical Applications

Traction drives

Motor Controllers

High Reliability Inverter

Features

AlSiC Baseplate

AlN Substrates

High Thermal Cycling Capability

10μs Short Circuit Withstand

Circuit Configuration

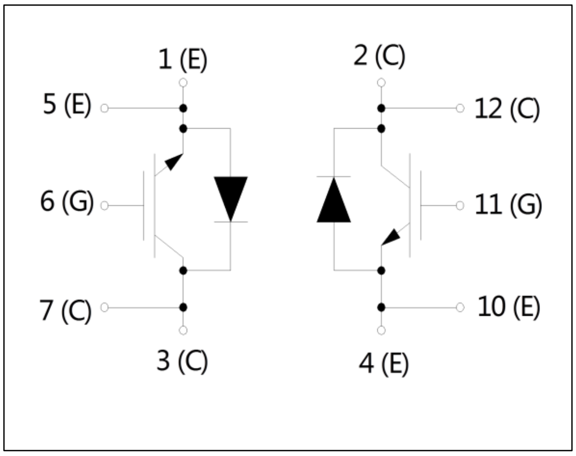

Fig. 1 Circuit configuration

Module Appearance

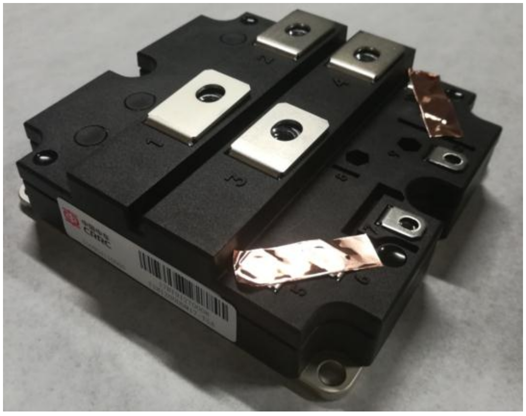

Fig. 2 Module appearance

Absolute Maximum Ratings

Symbol	Parameter	Test Conditions	Value	Unit
V_{CES}	Collector-emitter voltage	V_{GE} = 0V, T_C= 25 °C	1700	V
V_{GES}	Gate-emitter voltage	T_C= 25 °C	± 20	V
I_C	Collector-emitter current	T_C = 75 °C	1200	A
$I_{C(PK)}$	Peak collector current	t_P=1ms	2400	A
P_{max}	Max. transistor power dissipation	T_{vj} = 150°C, T_C = 25 °C	5.68	kW
I^2t	Diode I^2t	V_R =0V, t_P = 10ms, T_{vj} = 150 °C	130	kA^2s
V_{isol}	Isolation voltage – per module	(Commoned terminals to base plate), AC RMS,1 min, 50Hz,T_C= 25 °C	4000	V
Q_{PD}	Partial Discharge – per module	IEC1287. V1 = 1800V, V2 = 1300V，50Hz RMS	10	pC

Thermal & Mechanical Data

Symbol	Explanation	Value	Unit
Creepage distance	Terminal to terminal	20.0	mm
Clearance	Terminal to terminal	10.0	mm
CTI (Comparative Tracking Index)		>600	

Caution: This device is sensitive to electrostatic discharge. Users should follow ESD handling procedures.

Thermal & Mechanical Data

Symbol	Parameter	Test Conditions	Min.	Max.	Unit
$R_{th(J-C)\ IGBT}$	Thermal resistance – IGBT			22	K / kW
$R_{th(J-C)\ Diode}$	Thermal resistance – Diode			44	K / kW
$R_{th(C-H)\ IGBT}$	Thermal resistance – case to heatsink (IGBT)	Mounting torque 5Nm, with mounting grease 1W/m·°C		12	K / kW
$R_{th(C-H)\ Diode}$	Thermal resistance – case to heatsink (Diode)	Mounting torque 5Nm, with mounting grease 1W/m·°C		24	K / kW
$T_{vj\ op}$	Operating junction temperature	(IGBT)	-40	150	°C
		(Diode)	-40	150	°C
T_{stg}	Storage temperature range		-40	150	°C
M	Screw torque	Mounting – M6		5	Nm
		Electrical connections – M4		2	Nm
		Electrical connections – M8		10	Nm

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Electrical Characteristics

T_C= 25 °C unless otherwise stated

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{CES}	Collector cut-off current	V_{GE} = 0V,V_{CE} = V_{CES}			1	mA
		V_{GE} = 0V, V_{CE} = V_{CES}, T_C=125 ° C			20	mA
		V_{GE} = 0V, V_{CE} = V_{CES}, T_C=150 ° C			30	mA
I_{GES}	Gate leakage current	V_{GE} = ±20V, V_{CE} = 0V			0.5	μA
$V_{GE\ (TH)}$	Gate threshold voltage	I_C = 40mA, V_{GE} = V_{CE}	5.00	6.00	7.00	V
$V_{CE\ (sat)}^{(*1)}$	Collector-emitter saturation voltage	V_{GE} =15V, I_C = 1200A		1.80	2.20	V
		V_{GE} =15V, I_C = 1200A,T_{vj} = 125 ° C		2.10	2.50	V
		V_{GE} =15V, I_C = 1200A,T_{vj} = 150 ° C		2.20	2.6	V
I_F	Diode forward current	DC		1200		A
I_{FRM}	Diode peak forward current	t_P = 1ms		2400		A
$V_F^{(*1)}$	Diode forward voltage	I_F = 1200A, V_{GE} = 0		1.90	2.30	V
		I_F = 1200A, V_{GE} = 0, T_{vj} = 125 ° C		2.10	2.50	V
		I_F = 1200A, V_{GE} = 0, T_{vj} = 150 ° C		2.10	2.50	V
I_{SC}	Short circuit current	T_{vj} = 150° C, V_{CC} = 1000V, $V_{GE} \leqslant 15V$, $t_p \leqslant 10\mu s$, $V_{CE(max)} = V_{CES} - L^{(*2)} \times di/dt$, IEC 6074-9		4700		A

Note: (*1) indicates it is measured at the auxiliary busbar terminal)
(*2) indicates L is the circuit stray inductance plus L_M).

Electrical Characteristics

T_C= 25 °C unless otherwise stated

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
C_{ies}	输入电容 Input capacitance	V_{CE} = 25V, V_{GE} = 0V, f = 100kHz		109		nF
Q_g	栅极电荷 Gate charge	±15V		11.6		μC
C_{res}	反向传输电容 Reverse transfer capacitance	V_{CE} = 25V, V_{GE} = 0V, f = 100kHz		3.0		nF
L_M	模块电感 Module inductance			20		nH
R_{INT}	内阻 Internal transistor resistance			0.27		mΩ

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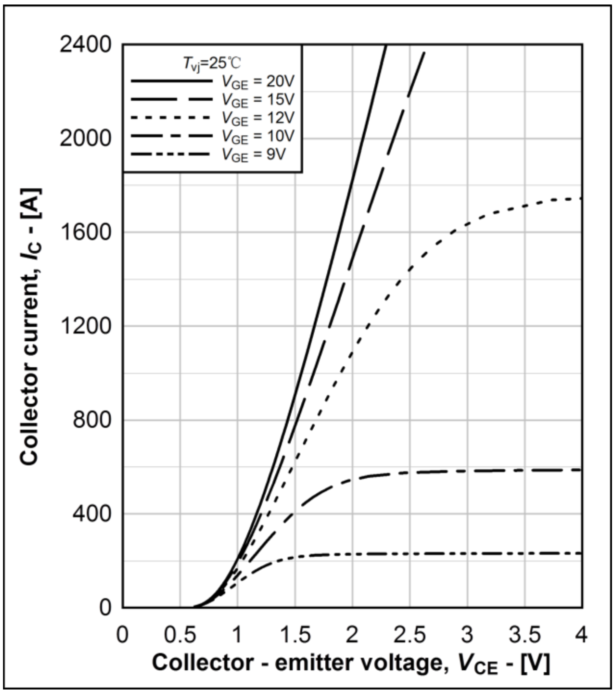
Electrical Characteristics

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
$t_{d(off)}$	Turn-off delay time	I_C =1200A, V_{CE} = 900V, V_{GE} = ±15V, $R_{G(OFF)}$ = 0.5Ω, L_S = 150nH, dv/dt =3500V/us (T_{vj}= 150 ° C).	T_{vj}= 25 ° C		1200		ns
			T_{vj}= 125 ° C		1250		
			T_{vj}= 150 ° C		1280		
t_f	Fall time		T_{vj}= 25 ° C		400		ns
			T_{vj}= 125 ° C		480		
			T_{vj}= 150 ° C		490		
E_{OFF}	Turn-off energy loss		T_{vj}= 25 ° C		570		mJ
			T_{vj}= 125 ° C		640		
			T_{vj}= 150 ° C		660		
$t_{d(on)}$	Turn-on delay time	I_C =1200A, V_{CE} = 900V, V_{GE} = ±15V, $R_{G(ON)}$ = 0.5Ω, L_S = 150nH, di/dt = 4500A/us (T_{vj}= 150 ° C).	T_{vj}= 25 ° C		480		ns
			T_{vj}= 125 ° C		480		
			T_{vj}= 150 ° C		480		
t_r	Rise time		T_{vj}= 25 ° C		230		ns
			T_{vj}= 125 ° C		240		
			T_{vj}= 150 ° C		240		
E_{ON}	Turn-on energy loss		T_{vj}= 25 ° C		83		mJ
			T_{vj}= 125 ° C		116		
			T_{vj}= 150 ° C		128		
Q_{rr}	Diode reverse recovery charge	I_F =1200A, V_{CE} = 900V, - di_F/dt = 4500A/us (T_{vj}= 150 ° C).	T_{vj}= 25 ° C		240		μC
			T_{vj}= 125 ° C		380		
			T_{vj}= 150 ° C		415		
I_{rr}	Diode reverse recovery current		T_{vj}= 25 ° C		710		A
			T_{vj}= 125 ° C		835		
			T_{vj}= 150 ° C		870		
E_{rec}	Diode reverse recovery energy		T_{vj}= 25 ° C		155		mJ
			T_{vj}= 125 ° C		265		
			T_{vj}= 150 ° C		295		



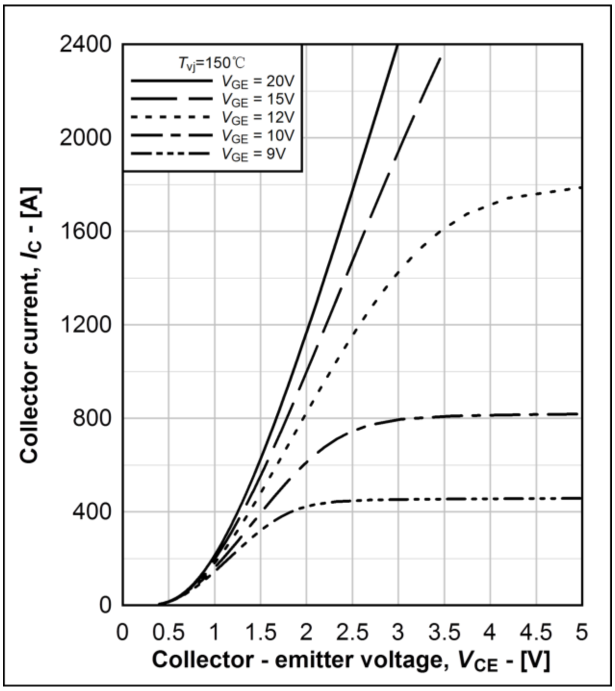
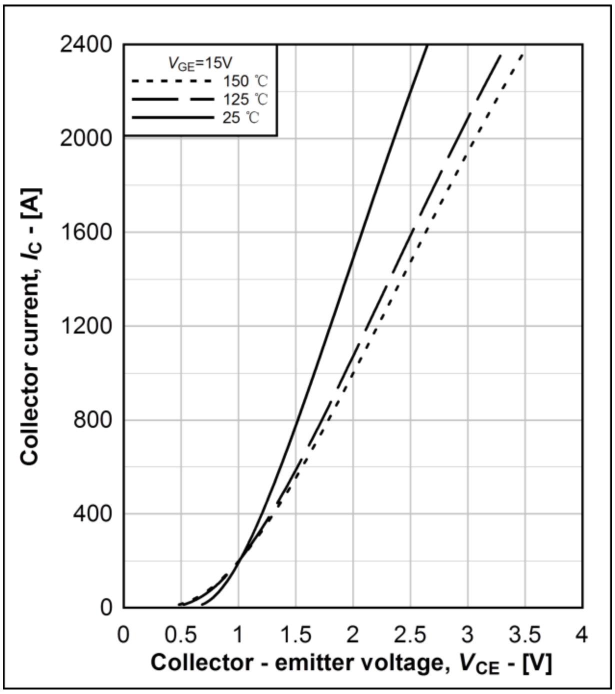


Fig.3 Typical IGBT output characteristics, I_C= f (V_{CE})

Fig.4 Typical IGBT output characteristics, I_C= f (V_{CE})



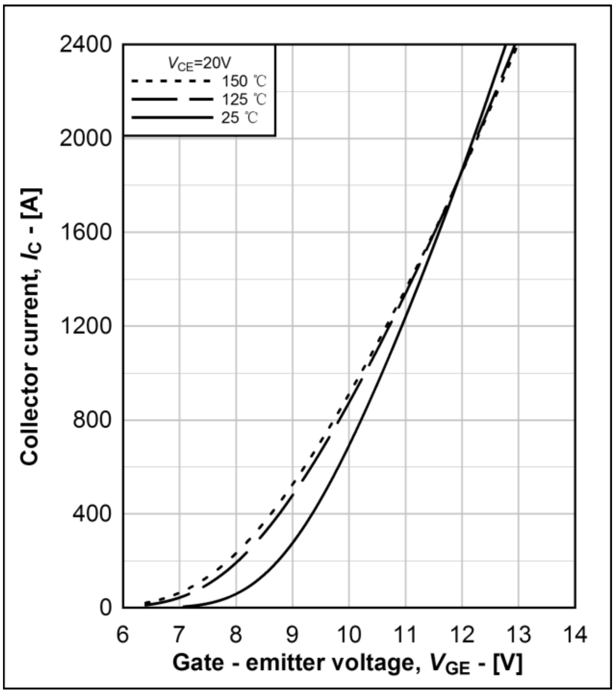


Fig.5 Typical IGBT output characteristics, I_C= f (V_{CE})

Fig.6 Typical IGBT transfer characteristics, I_C= f (V_{GE})

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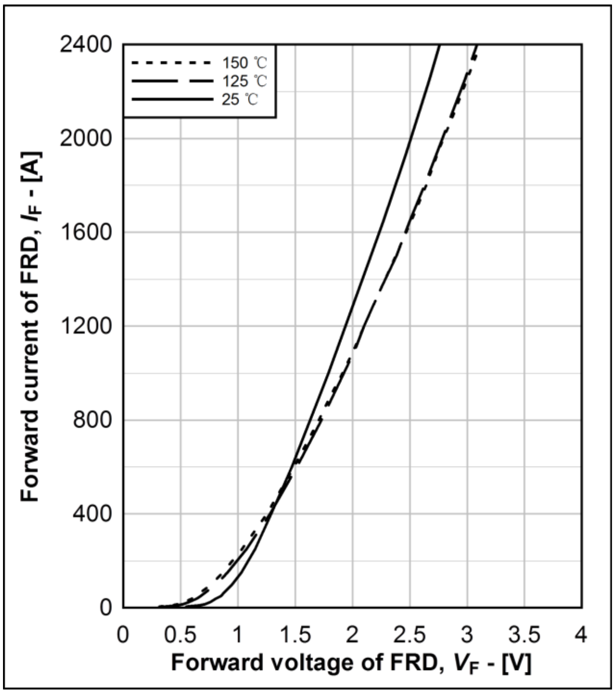


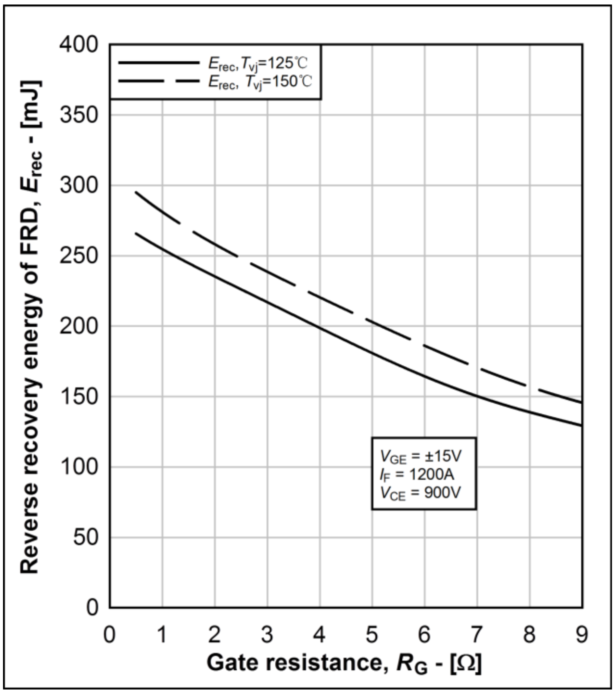
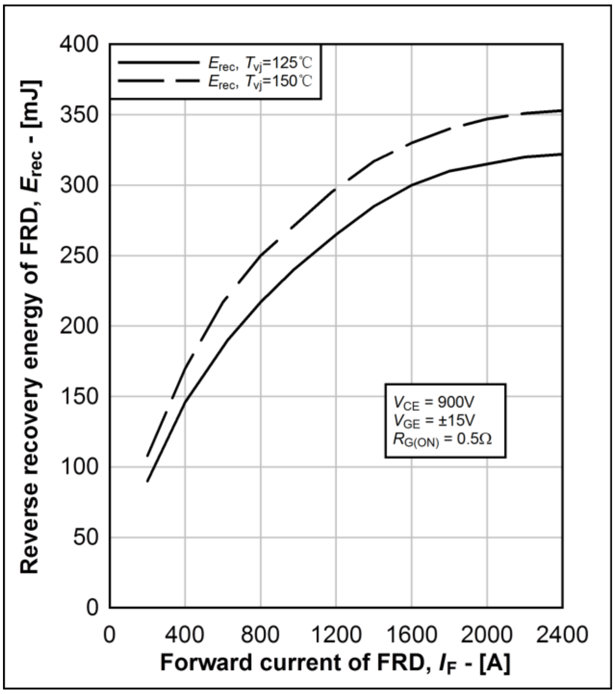


Fig.7 Typical FRD output characteristics, I_F = f (V_F)

Fig.8 Typical FRD E_{rec}, E_{rec}=f(R_G)



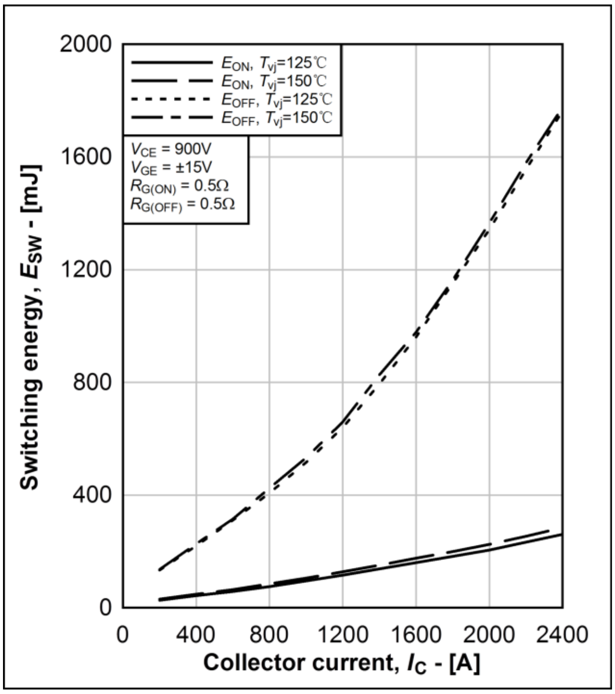


Fig.9 Typical FRD E_{rec}, E_{rec}=f(I_F)

Fig.10 Typical IGBT switching energy, E_{on}= f (I_C), E_{off}= f (I_C)

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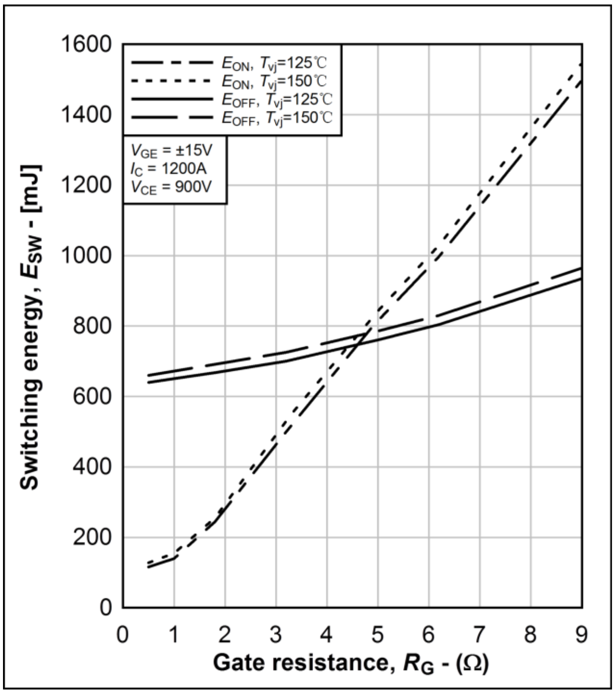


Fig.11 Typical IGBT switching energy,

E_{on}= f(R_G), E_{off}= f (R_G)

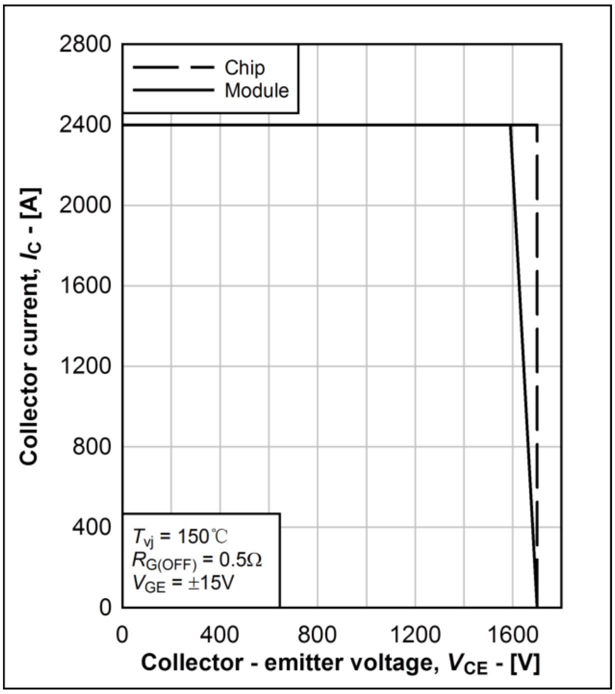
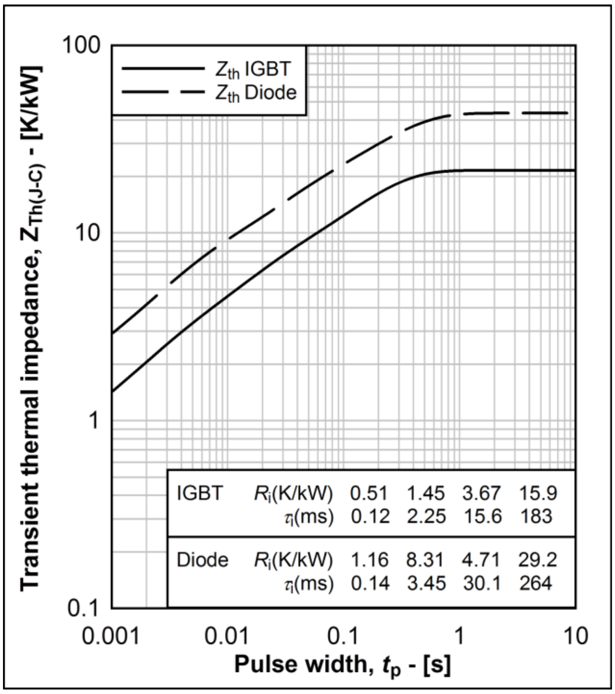


Fig.12 Reverse bias safe operating area of IGBT,

I_C = f (V_{CE})



IGBT	R_i(K/kW)	0.51	1.45	3.67	15.9
	τ_i(ms)	0.12	2.25	15.6	183
Diode	R_i(K/kW)	1.16	8.31	4.71	29.2
	τ_i(ms)	0.14	3.45	30.1	264

Fig.13 Transient thermal impedance,$Z_{Th(J-C)}$ = f (t)

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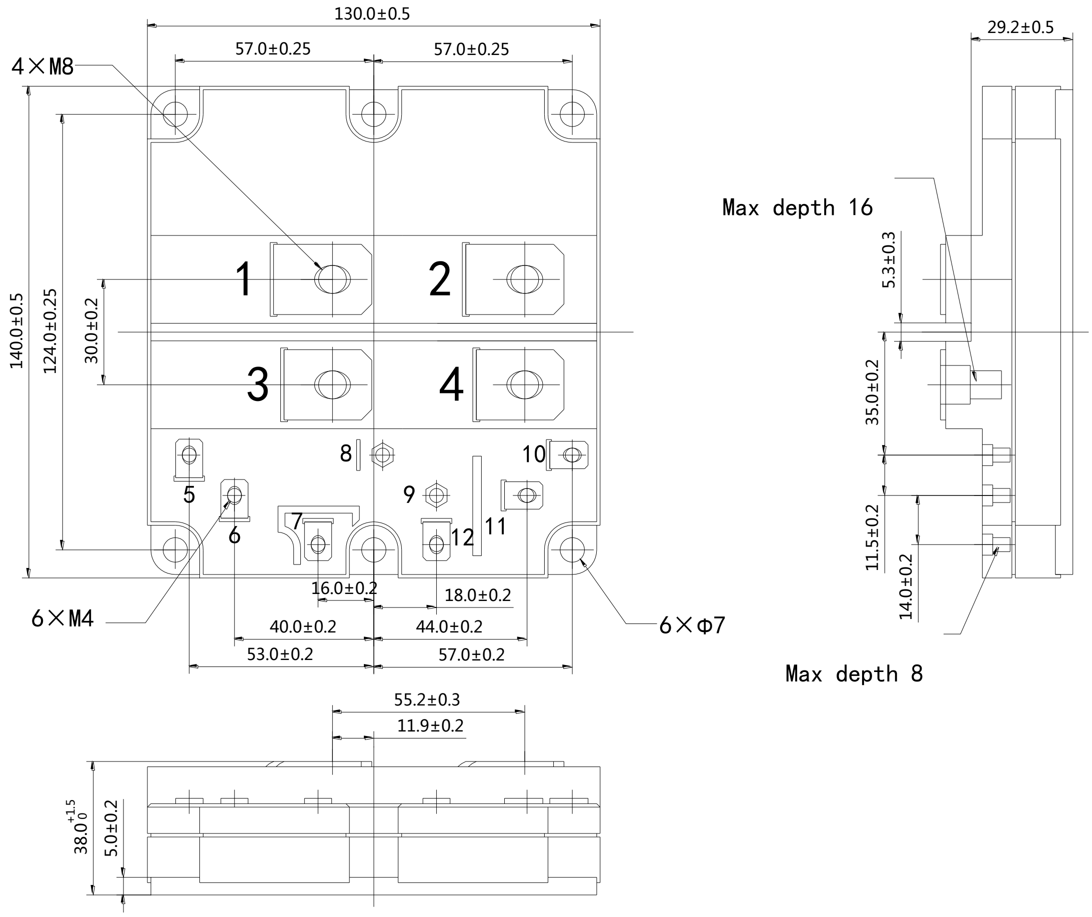

Weight：900g

Module outline code：D

Fig. 14 Module outlines

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