Individual product specifications

Six-pack 650V 400A IGBT module data sheet

(Subject)

OPMD0650V0400A6PK-M

(PART No.)

大分デバイステクノロジー株式会社

Oita Device Technology Co.,Ltd

1660,Notsuharu,Oita-City,Oita,870-1203 Japan

TEL,+81-097-588-1153

FAX,+81-097-588-1156

1 Features / Description

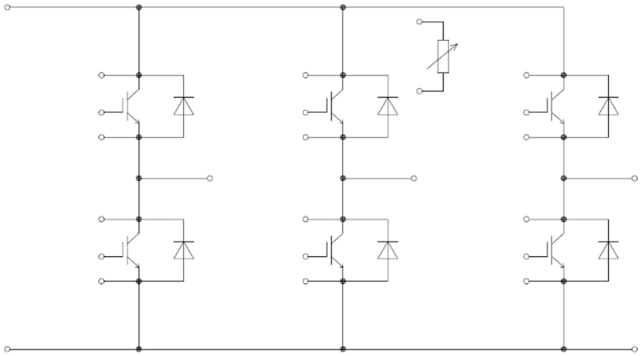
Six-pack 650V 400A IGBT module, 1module with Trench/Field stop IGBT and Fly wheel diode and NTC

1－1 Typical Applications

・Motor drives
・EV cart
・Inverter for Industrial
・Electrical Vehicles(EV)
(IGBT die and Diode die for EV are going to under development)

1－2 Electrical Features

・Operating temperature Tj_op=150℃
・Low VCEsat
・Fast switching
・Fast recovery



1－3 Mechanical Features

・2.5kV AC 1min Insulation
・Low Thermal Resistance
・Integrated NTC temperature sensor
・Copper Base Plate
・RoHS compliant
・High heat resistance silicone gel encapsulant
・Epoxy resin lid

1－4 Description

Oita device technology Co.,Lid(ODT)'s 6-pack 650V 400A IGBT module is a high reliability power module for electric vehicle applications or another.

Designed for a 150℃ junction operation temperature, the module accommodates a 3-phase Six-pack configuration of Trench-Field-Stop IGBT and fly wheel diode.

(IGBT and diode are made by Minebea Mitsumi of Japan)

The Six-pack 650V 400A IGBT module is suitable for air or liquid cooling. Thermal resistance of IGBT is less than 0.1K/W and has high heat dissipation capability.

Die bonding and wire bonding processes enhanced by ODT's assembly technology and over 40 years of semiconductor manufacturing technology provide higher thermal and power cycling capabilities.

2 IGBT , Inverter

2 － 1 Maximum rated value

Parameter	simbol	condition	Value	UNIT
Collector-emitter voltage	VCES	Tvj=25℃	650	V
Continuouse DC current	Ic_nom	Tvj=25℃,Tvj_max=150℃	400	A
Tatal power disspation	Ptot	Tc=25℃、Tvj=150℃	1388	W
Gate-emitter peak voltage	VGES		+/-20	V

2 － 2 Characteristic values

Parameter	simbol	condition	Tvj	MIN	TYP	MAX	UNIT
Collector-emitter saturation voltage	Vcesat	IC=400A、VGE=15V	25℃		1.7	2.4	V
			125℃		1.8		V
			150℃		1.9		V
Gate threshold voltage	Vth	VCE=VGE、IC=6.4mA	25℃	5.0	5.9	6.8	V
			125℃		4.7		V
			150℃		4.1		V
Gate charge	Qg	VCE=30V,VGE=15V	-		1.4		uQ
Input capacitance	Cies	VCE=25V、VGE=0V、f=1MHz	-		32		nF
Reverse transfer capacitance	Cres	VCE=25V、VGE=0V、f=100kHz	-		1.2		nF
Collector-emitter cutoff current	ICES	VCE=650V、VGE=0V	25℃			10	uA
Gate-emitter leakage current	+IGES	VGE=20V、VCE=0V	25℃			30	nA
Turn-on delay time,inductive load	td_on	IC=400A、VGE=±15V、VCE=300V RG=2Ω、L=20nH	25℃		75		ns
			125℃		76		ns
			150℃		77		ns
Rise time,inductive load	tr	IC=400A、VGE=±15V、VCE=300V RG=2Ω、L=20nH	25℃		80		ns
			125℃		80		ns
			150℃		80		ns
Turn-off delay time,inductive load	td_off	IC=400A、VGE=±15V、VCE=300V RG=2Ω、L=20nH	25℃		493		ns
			125℃		644		ns
			150℃		673		ns
Fall time,inductive load	tf	IC=400A、VGE=±15V、VCE=300V RG=2Ω、L=20nH	25℃		75		ns
			125℃		210		ns
			150℃		235		ns
Turn-on loss energy per pulse	Eon	IC=400A、VGE=±15V、VCE=300V RG=2Ω、L=20nH	25℃		2.6		mJ
			125℃		3.5		mJ
			150℃		3.8		mJ
Turn-off loss energy per pulse	Eoff	IC=400A、VGE=±15V、VCE=300V RG=2Ω、L=20nH	25℃		17.3		mJ
			125℃		20.7		mJ
			150℃		21.8		mJ
SC data	SC	IC=200A、VGE=±15V、VCE=360V VCEmax=VCE、tp<10us	150℃		2000		A
Thermal resistance, junction to case	Rth_j-c	IGBT	-			0.09	K/W
Temperature under switching conditions	Tvj_op	top continuous	-	-40		150	℃

3 Diode ,Inverter

3 － 1 Maximum rated value

Parameter	simbol	condition	Value	UNIT
Repetitive peak reverse voltage	VRRM	Tvj=25℃	650	V
Continuouse DC foward current	IF		400	A

3 － 2 Characteristic values

Parameter	simbol	condition	Tvj	MIN	TYP	MAX	UNIT
Forward voltage	VF	IC=400A、VGE=0V	25℃		2.1	2.5	V
			125℃		1.8		V
			150℃		1.7		V
Reverse recovery time	trr	IC=400A、VGE=±15V、VCE=300V RG=2Ω、L=20nH	25℃		87		ns
			125℃		107		ns
			150℃		117		ns
Recovered charge	Qr	IC=400A、VGE=±15V、VCE=300V RG=2Ω、L=20nH	25℃		10		uQ
			125℃		13		uQ
			150℃		14		uQ
Reverse recovery energy per pulse	Erec	IC=400A、VGE=±15V、VCE=300V RG=2Ω、L=20nH	25℃		2.7		mJ
			125℃		3.5		mJ
			150℃		3.8		mJ
Thermal resistance, junction to case	Rth_j-c	Diode	-			0.15	K/W
Temperature under switching conditions	Tvj_op	top continuous	-	-40		150	℃

4 NTC-thermistor

Parameter	simbol	condition	Tvj	MIN	TYP	MAX	UNIT
Rated resistance	R25	Tc=25℃	-		5.00		kΩ
Power dissipation	P25	Tc=25℃	-			125	mW

5 Module

Parameter	simbol	condition	Value	UNIT
Isolation test voltage	VisoL	RMS、1min、f=50Hz	2.5	kV
Material of module baseplate			Cu	
Internal isolation		basic insulation (class 1, IEC 61140)	ALN	
Creepage distance	dCreep	terminal to heatsink	12.0	mm
		terminal to terminal	6.1	mm
Clearance	dCear	terminal to heatsink	12.0	mm
		terminal to terminal	6.1	mm
Comperative tracking index CTI	CTI		> 200	

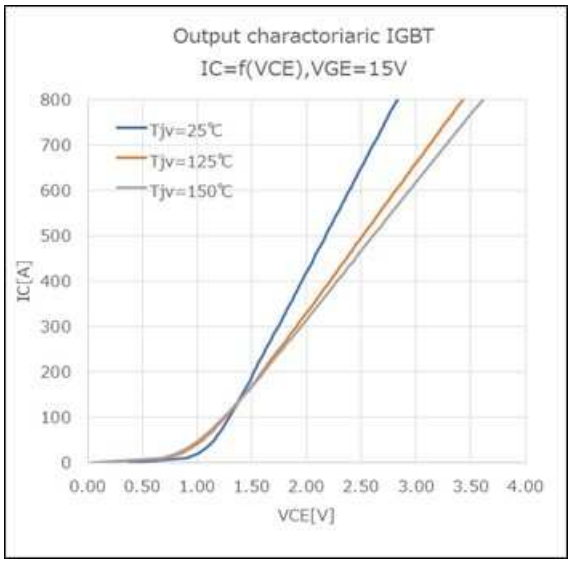
Parameter	simbol	condition	Tvj	MIN	TYP	MAX	UNIT
Stray inductance module	Ls_CE		-		60		nH
Module lead resistance, terminals - chip	RCC'+EE'	TC = 25 ° C, per switch	25°C		1		mΩ
Storage temperature	Tstg		-	-40		125	°C
Mounting torque for modul mounting	M	Screw M5 baseplate to heatsink	-	3.00		6.00	Nm
Terminal connection torque	M	Screw M6	-	3.0		6.0	Nm
Weight	G		-		480		g

DC-collector current / diode forward current limited by power terminal.

6 Characteristic Diagrams

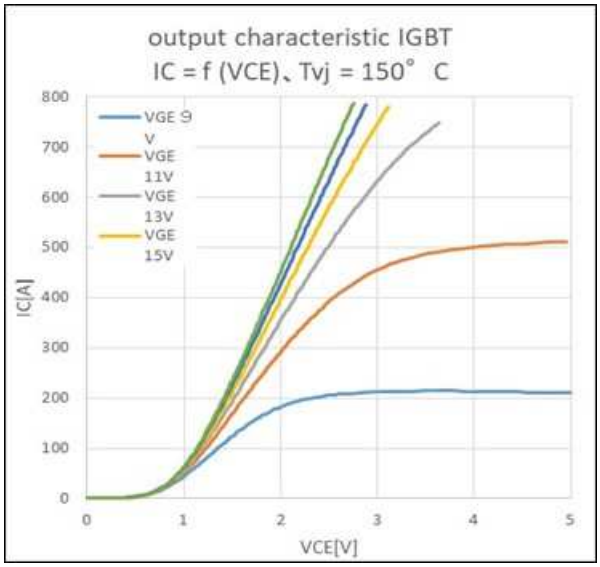
output characteristic IGBT,Inverter (typical)

IC = f (VCE)、VGE = 15 V



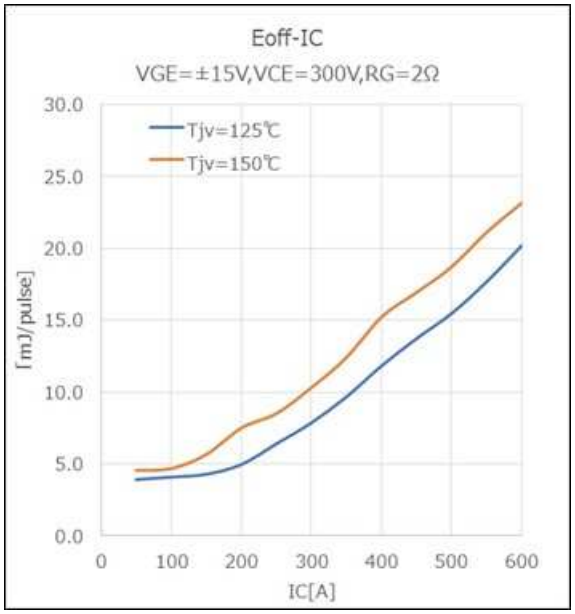
output characteristic IGBT,Inverter (typical)

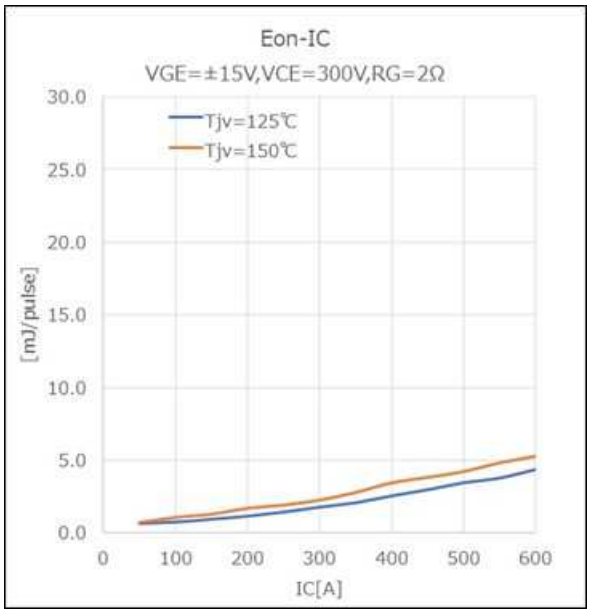
IC=f(VCE)、Tvj=150℃



switching losses IGBT,Inverter (typical)

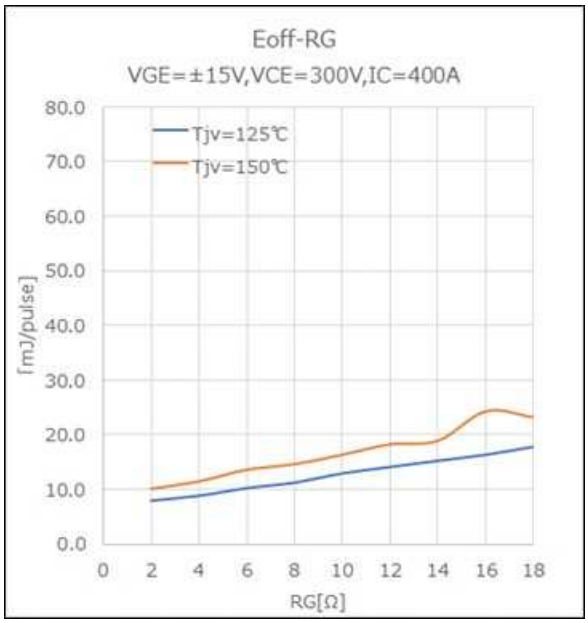
Eon = f (IC), Eoff = f (IC)、VGE = ±15 V, RGon = 2Ω, RGoff = 2 Ω, VCE = 300 V

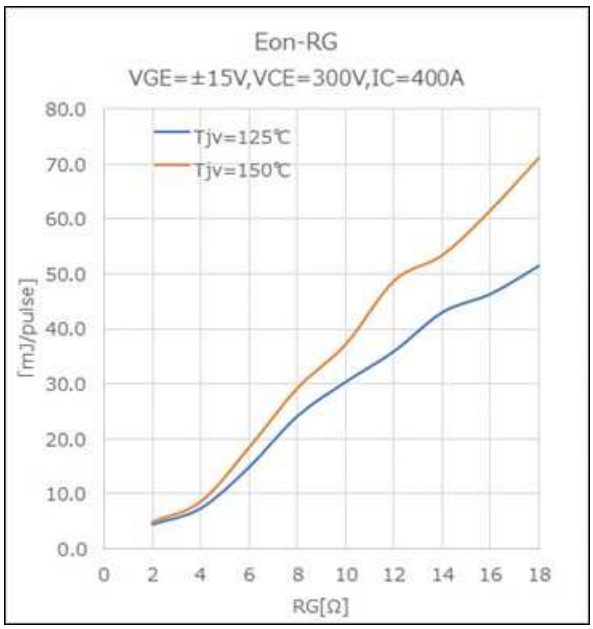




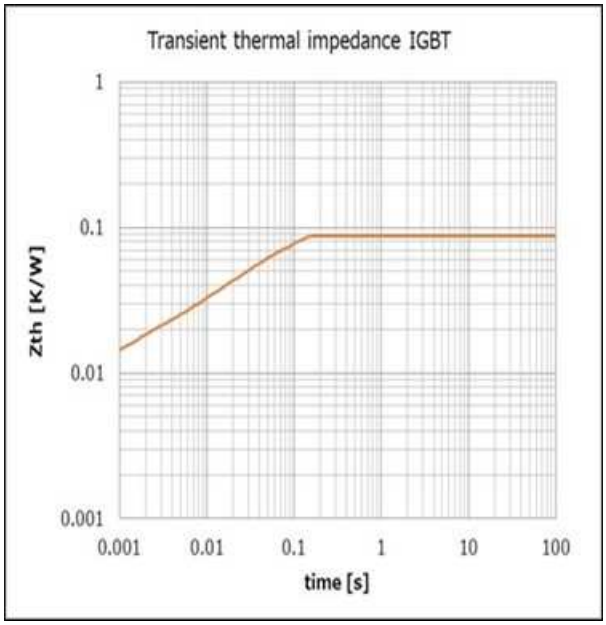
switching losses IGBT,Inverter (typical)

Eon = f (RG), Eoff = f (RG)、VGE = ±15 V, IC = 400 A, VCE = 300 V



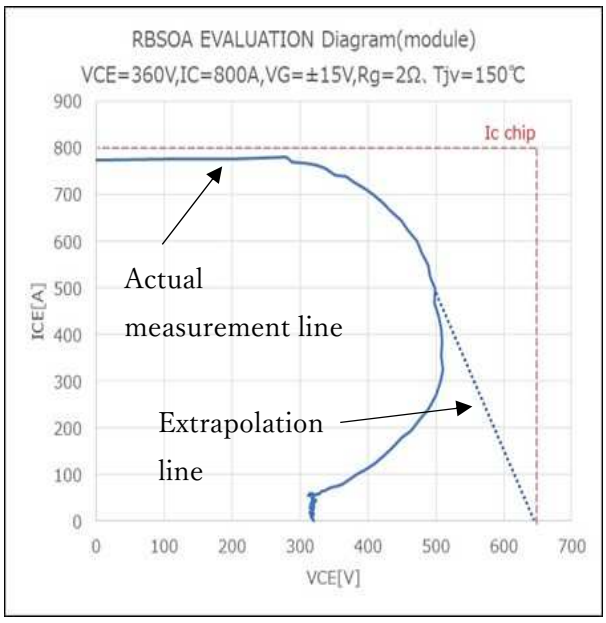


transient thermal impedance IGBT,Inverter



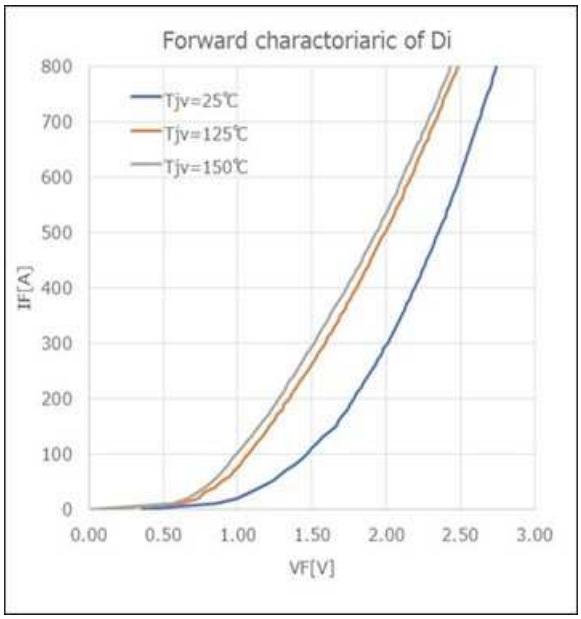
reverse bias safe operating area IGBT,Inverter (RBSOA)

VCE=360V,IC=800A,VG=±15V,Rg=2Ω、Tjv=150℃



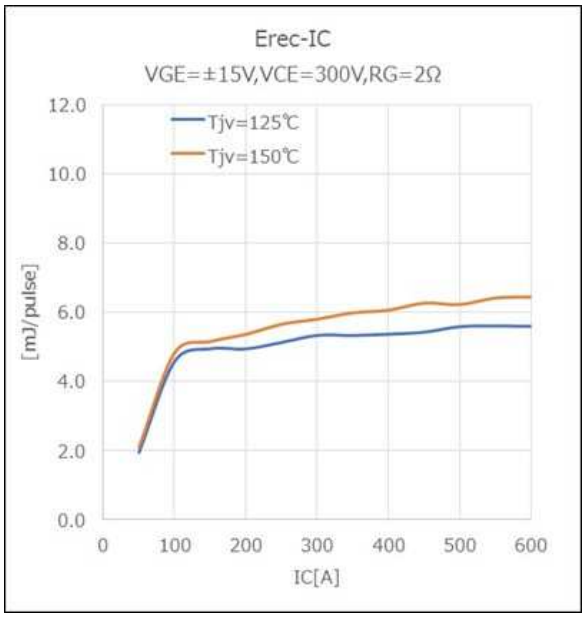
forward characteristic of Diode, Inverter (typical)

IF = f (VF)



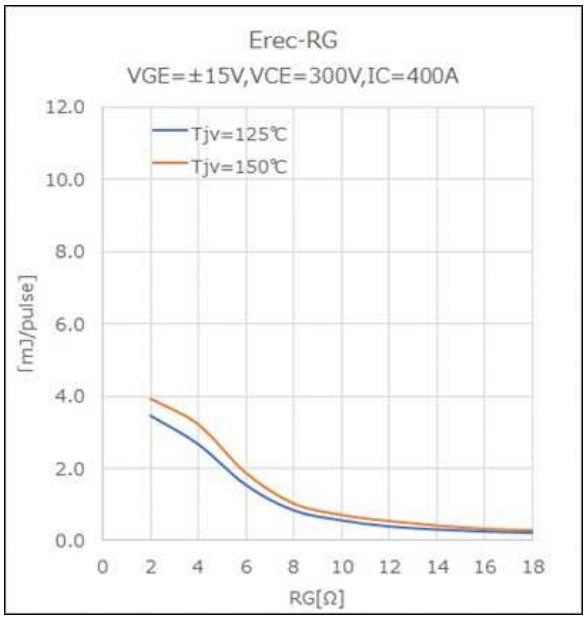
switching losses Diode, Inverter (typical)

Erec = f (IF)、RGon = 2Ω, VCE = 300 V

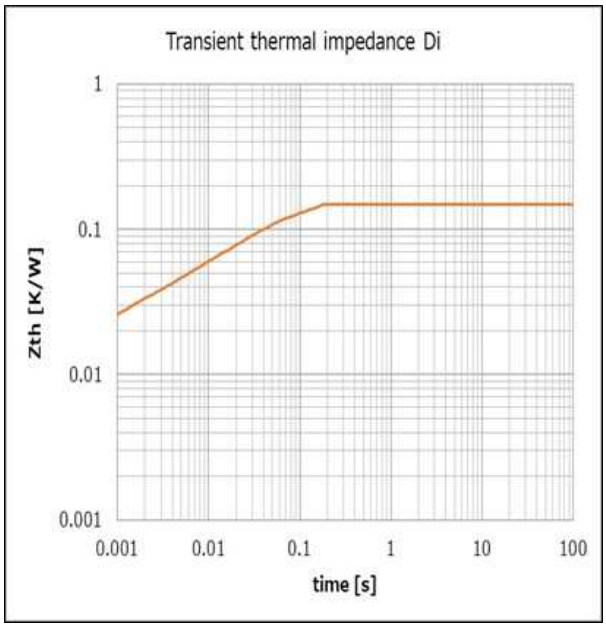


switching losses Diode, Inverter (typical)

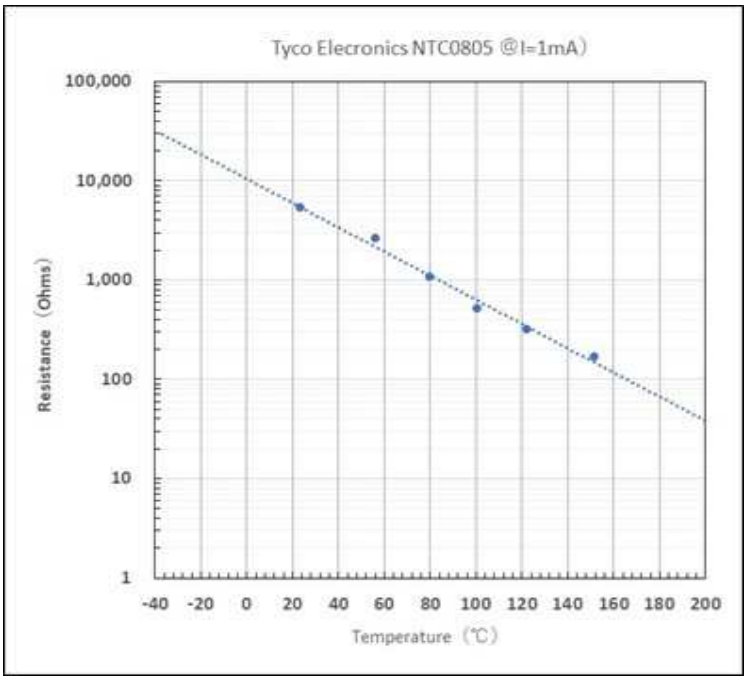
Erec = f (RG)、IF = 400 A, VCE = 300 V



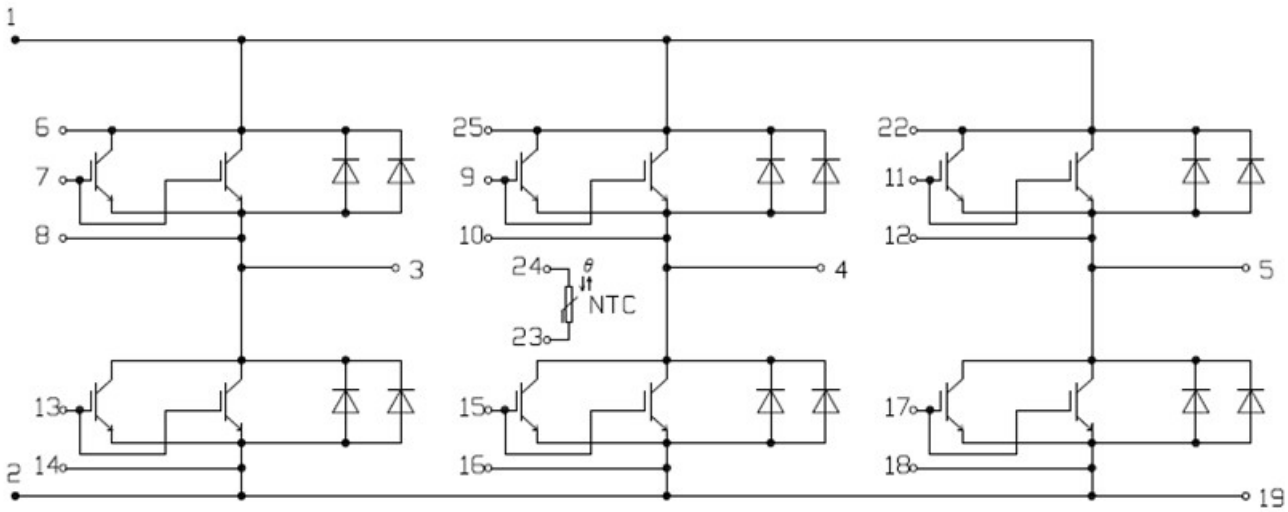
transient thermal impedance Diode, Inverter



NTC-Thermistor-temperature characteristic (typical)

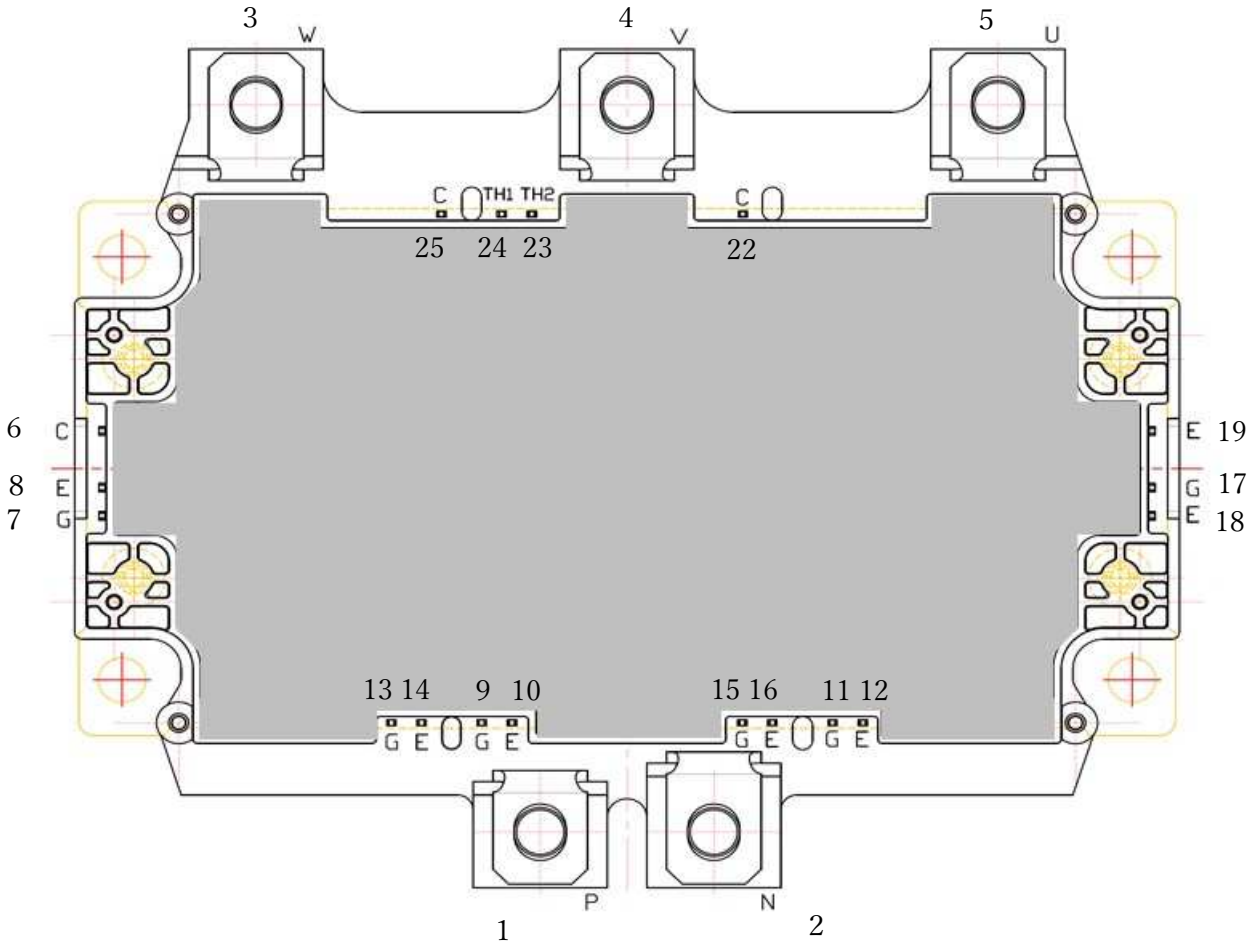


7 Circuit Diagrams

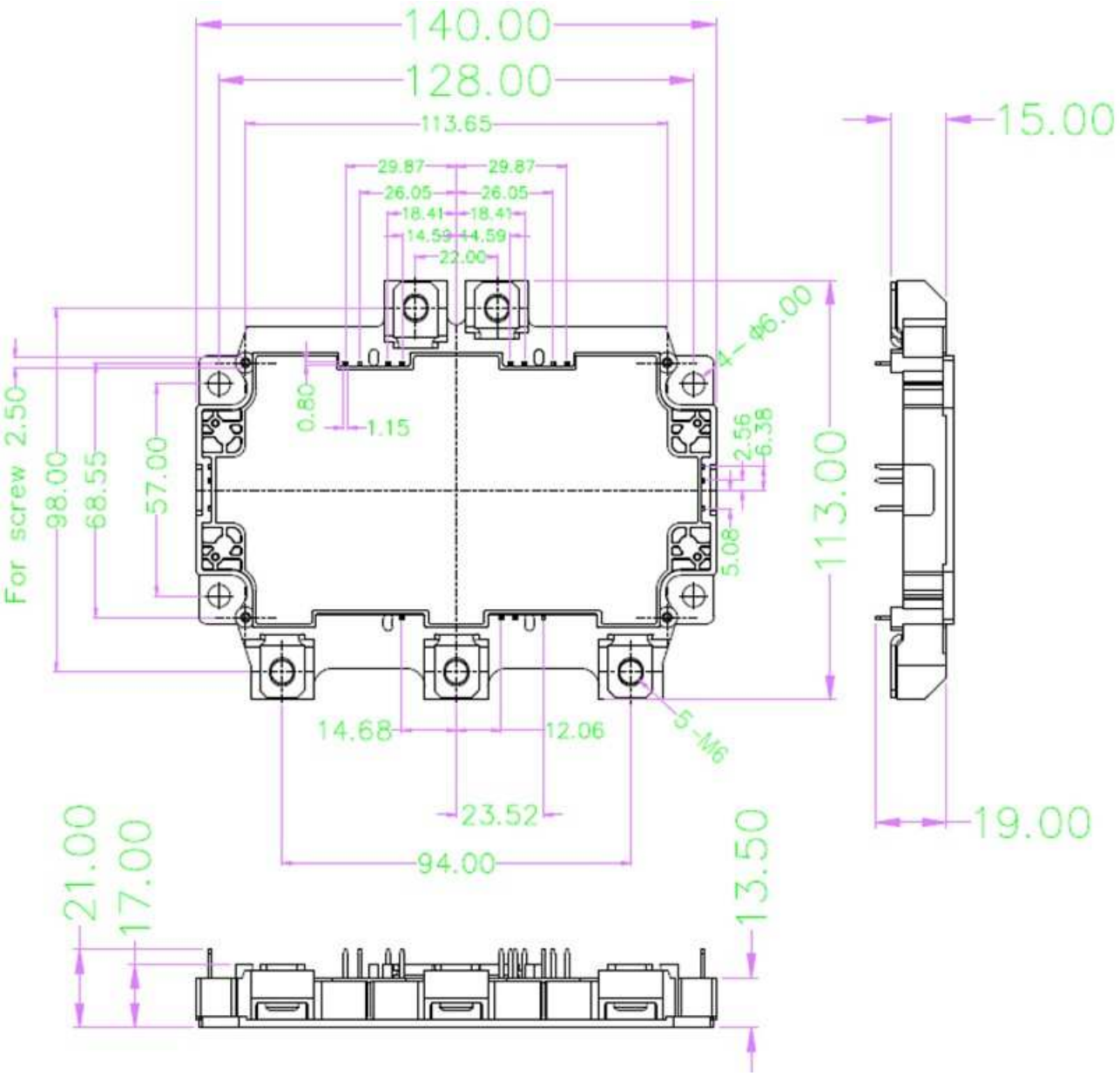


IGBT : MMJ65B0A00** 650V_200A
Di : MMK65B0A00** 650V_200A

8 Package pin assignment



9 Package outline



Label specification is under consideration.

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6 Revision history

VerNo	発行日	作成・改訂理由	承認	確認	作成
1	2019-7-12	Initial Version	杉木	梅木	宮澤