	E502650

IGBT Modules

650V 400A

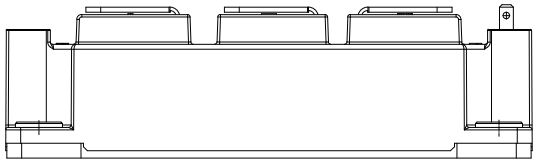
Features

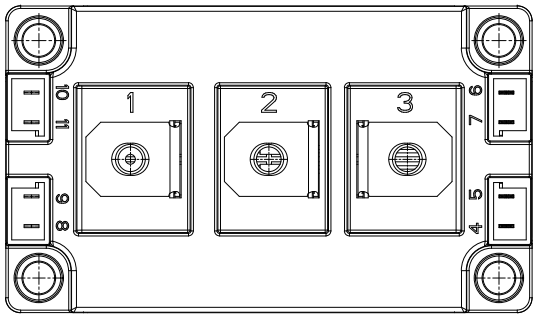
- Low $V_{CE(sat)}$ With Trench Technology
- Low Switching Losses
- $V_{CE(sat)}$ With Positive Temperature Coefficient
- High Short Circuit Capability(6us)
- Including Ultra Fast & Soft Recovery Anti-parallel FWD
- Low Inductance
- Maximum Junction Temperature 175℃
- Epoxy Meets UL 94 V-0 Flammability Rating
- Lead Free Finish/RoHS Compliant (Note1)("P" Suffix Designates RoHS Compliant. See Ordering Information)

Applications

- Motion/Sevo Control
- High Frequency Switching Application
- UPS(Uninterruptible Power Supplies)
- Welding Machine

C2

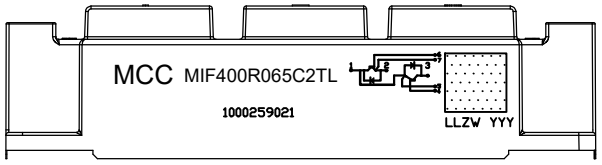




Parameter		Symbol	Rating	Unit
Collector-Emitter Voltage@V_{GE}=0V,I_C=1mA, T_{vj}=25ºC		V_{CES}	650	V
Continuous Collector Current @T_C=100ºC		I_C	400	A
Repetitive Peak Collector Current @t_p=1ms		I_{CRM}	800	A
Gate-Emitter Voltage@T_{vj}=25ºC		V_{GE}	±20	V
Isolation Voltage @f=50Hz, t=1min		V_{isol}	2500(Min)	V
Weight of Module		G	315	g
Module Electrodes Torque:M6		M_t	3~5	N*m
Module-to-Sink Torque :M6		M_S	3~5	N*m
Total Power Dissipation (IGBT-Inverter)	T_C=25°C T_{vjmax}=175°C	P_{tot}	1250	W

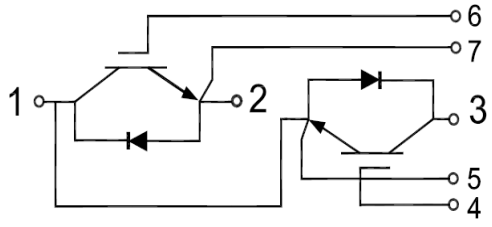
Note:

1. High Temperature Solder Exemptions Applied, see EU Directive Annex 7a.



Marking Code Contents:
Logo: MCC
Product Number:MIF400R065C2TL
Trace Code: 10 Digits
Circuit Diagram
2D Code format: Data Matrix

Circuit Diagram



Electrical Characteristics of IGBT @ 25°C (Unless Otherwise Specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Gate-emitter Threshold Voltage	$V_{GE(th)}$	I_C=10mA, V_{CE}=V_{GE}, T_{vj}=25°C	5.0	5.7	6.6	V
Collector-Emitter Cut-off Current	I_{CES}	V_{CE}=650V, V_{GE}=0V,T_{vj}=25°C			1.0	mA
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	I_c=400A,V_{GE}=15V, T_{vj}=25°C		1.70	2.0	V
		I_c=400A,V_{GE}=15V, T_{vj}=125°C		1.95		
Gate Charge	Q_G			4.6		μC
Internal Gate Resistance	R_{gint}			0.6		Ω
Input Capacitance	C_{ies}	V_{CE}=25V,V_{GE}=0V,f=1MHz,T_{vj}=25°C		37.9		nF
Reverse Transfer Capacitance	C_{res}			0.76		
Gate-Emitter leakage current	I_{GES}	V_{CE}=0 V, V_{GE}=20V,T_{vj} = 25°C			400	nA
Turn-On Delay Time	$td_{(on)}$	V_{CE}=300V, I_C=400A, V_{GE}=±15V, R_G=1.5Ω, T_{vj}=25°C		66		ns
Rise Time	t_r			125		
Turn-Off Delay Time	$td_{(off)}$			290		
Fall Time	t_f			121		
Turn-On Energy	E_{on}			6.1		mJ
Turn-Off Energy	E_{off}			8.5		
Turn-On Delay Time	$td_{(on)}$	V_{CE}=300V, I_C=400A, V_{GE}=±15V, R_G=1.5Ω, T_{vj}=125°C		80		ns
Rise Time	t_r			157		
Turn-Off Delay Time	$td_{(off)}$			341		
Fall Time	t_f			113		
Turn-On Energy	E_{on}			8.3		mJ
Turn-Off Energy	E_{off}			13.2		
SC Data	I_{sc}	t_p≤6us,V_{GE}=15V, T_{vj}=125℃,V_{cc}=300V, V_{CEM}≤650V		2000		A

Electrical Characteristics of DIODE @ 25°C (Unless Otherwise Specified)

Parameter	Symbol	Test Conditions	Value	Unit
Repetitive Peak Reverse Voltage	V_{RRM}	T_{vj}=25°C	650	V
Continuous DC Forward Current	I_F		400	A
Repetitive Peak Forward Current	I_{FRM}	t_p=1ms	800	A

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Forward Voltage	V_F	I_F=400A,T_{vj}=25°C		1.60		V
		I_F=400A,T_{vj}=125℃		1.45		
Recovered Charge	Q_{rr}	I_F =400 A V_R=300V -diF/dt =4000A/us T_{vj}=25°C		3.9		μC
Peak Reverse Recovery Current	I_{rr}			74		A
Reverse Recovery Energy	E_{rec}			2.6		mJ
Recovered Charge	Q_{rr}	I_F =400 A V_R=300V -diF/dt =4000A/us T_{vj}=125°C		10.4		μC
Peak Reverse Recovery Current	I_{rr}			137		A
Reverse Recovery Energy	E_{rec}			4.9		mJ

Module Characteristics

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Isolation Voltage	V_{isol}	t=1min,f=50Hz	2500			V
Maximum Junction Temperature	T_{jmax}				175	°C
Operating Junction Temperature	$T_{vj\ op}$		-40		150	°C
Storage Temperature	T_{stg}		-40		150	°C
Thermal Resistance Junction to Case	$R_{\theta JC}$	per IGBT			0.12	K/W
		per Diode			0.22	
Thermal Resistance Case-to Sink	$R_{\theta CS}$	Conductive grease applied		0.035		K/W

Curve Characteristics

Fig1.IGBT Output Characteristics

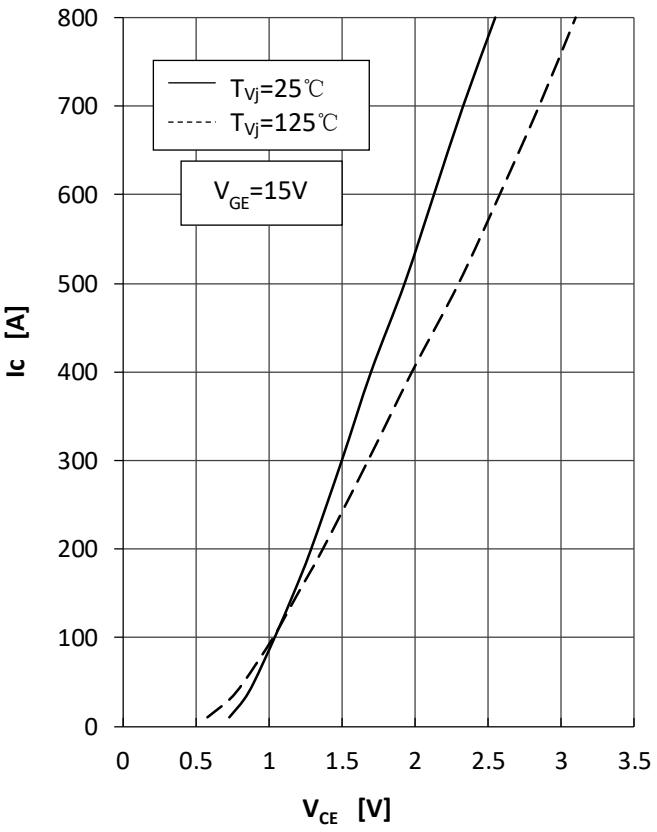


Fig2.IGBT Transfer Characteristics

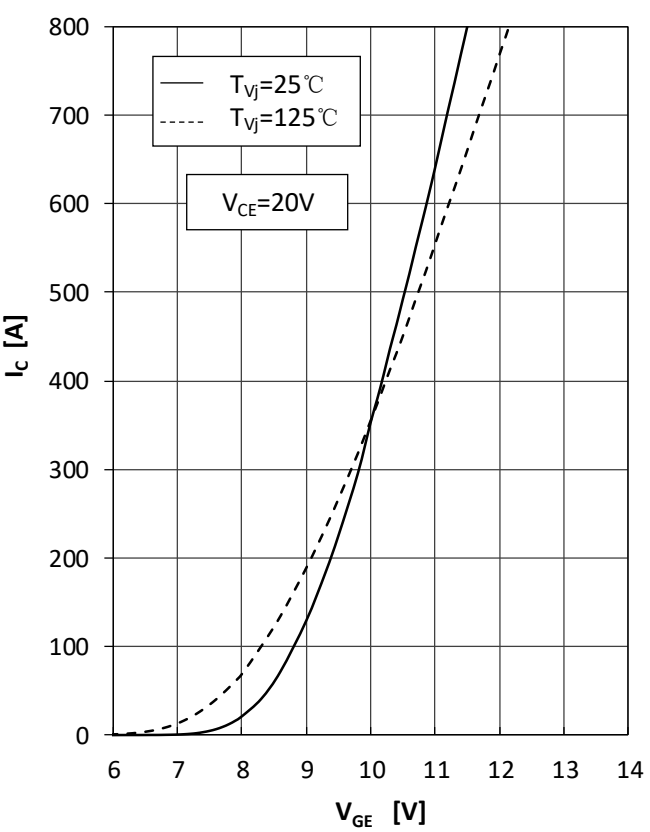


Fig3.IGBT Switching Loss vs.Ic

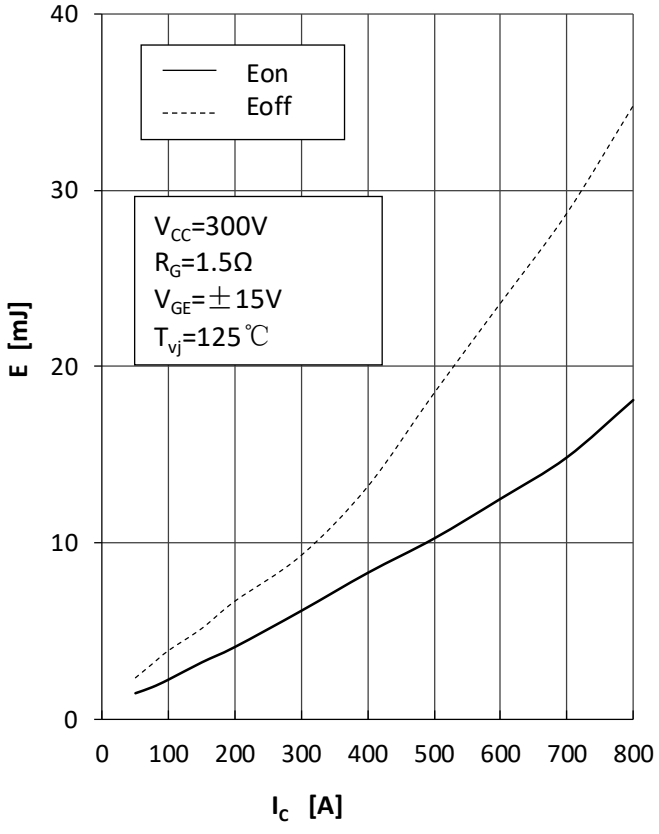
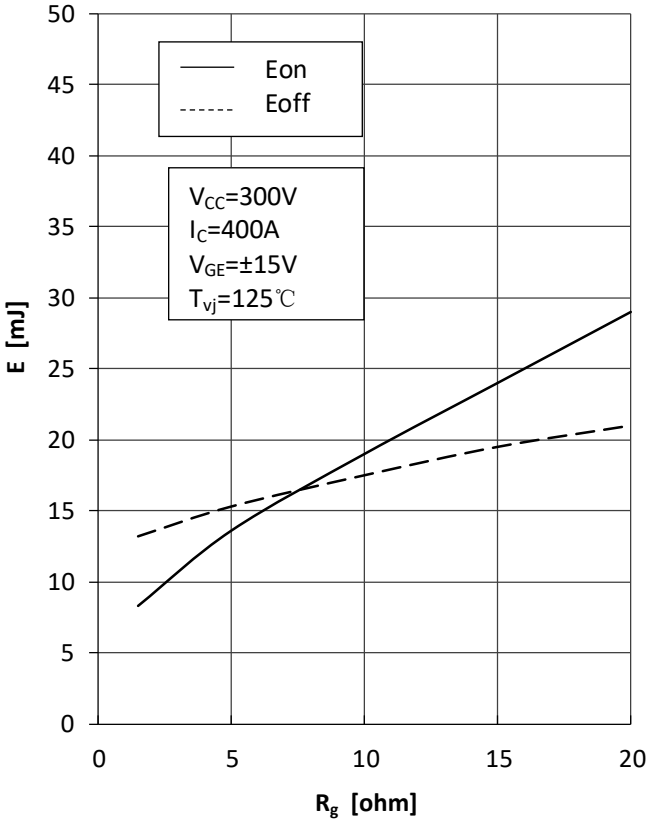


Fig4.IGBT Switching Loss vs.Rg



Curve Characteristics

Fig5. RBSOA

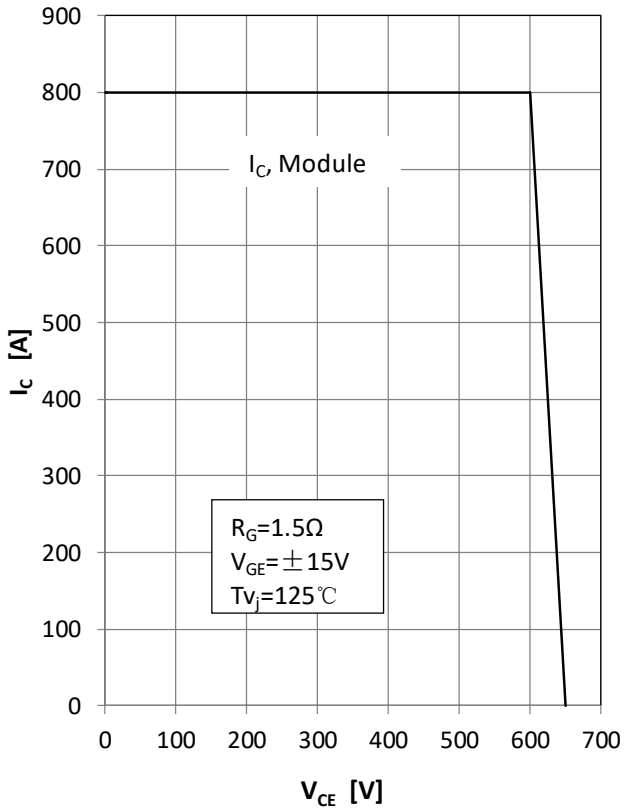


Fig 6. IGBT Transient Thermal Impedance

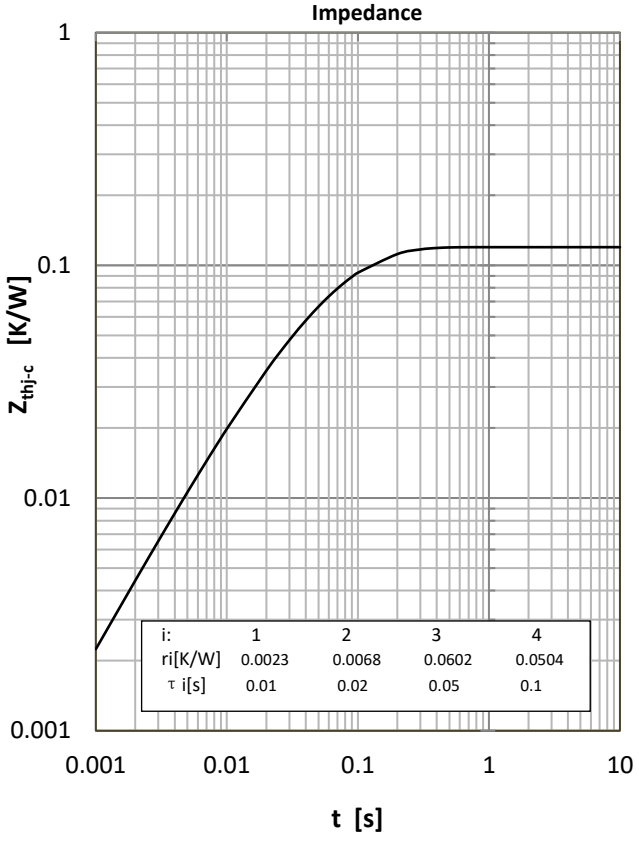


Fig7.Diode Foward Characteristics

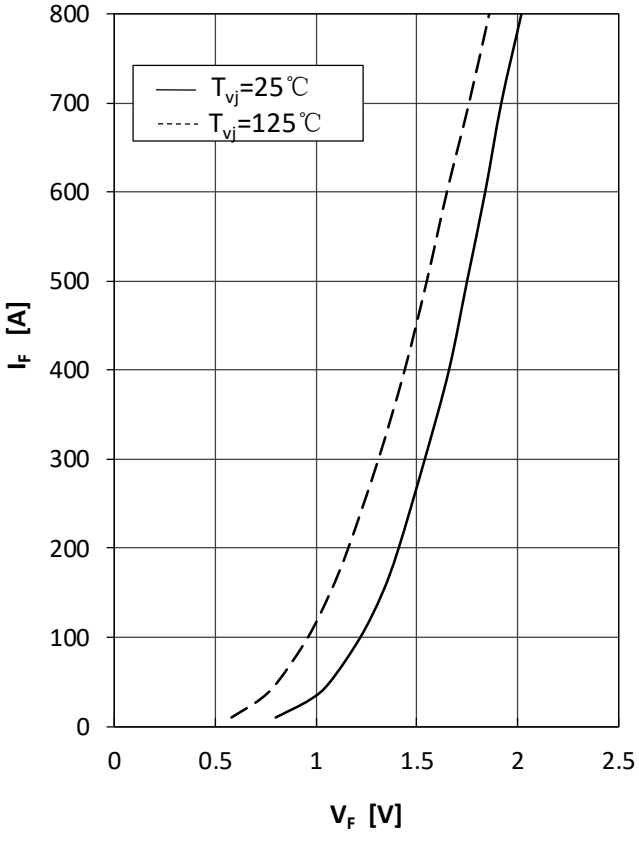
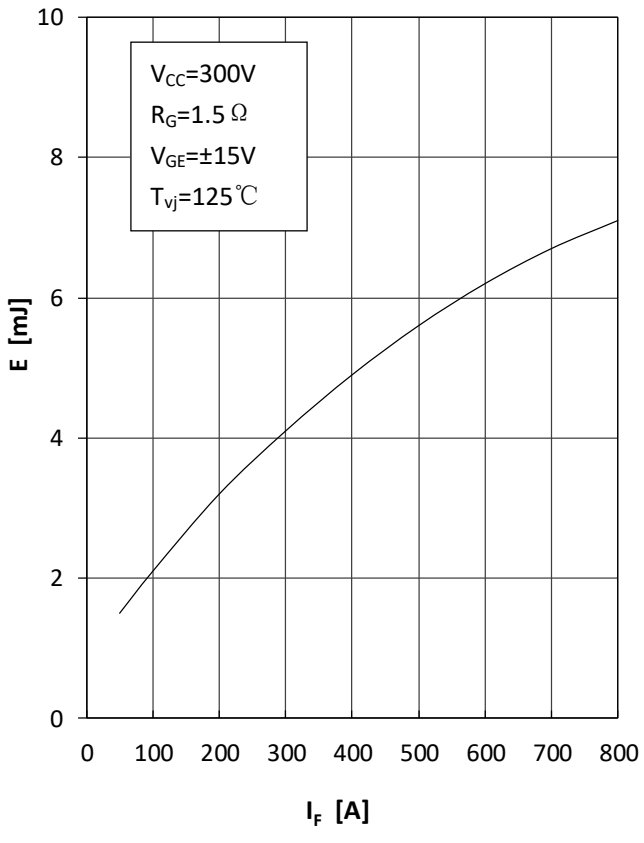


Fig8.Diode Switching Loss(E_{rec}) vs.I_F



Curve Characteristics

Fig9.Diode Switching Loss(E_{rec}) vs.R_g

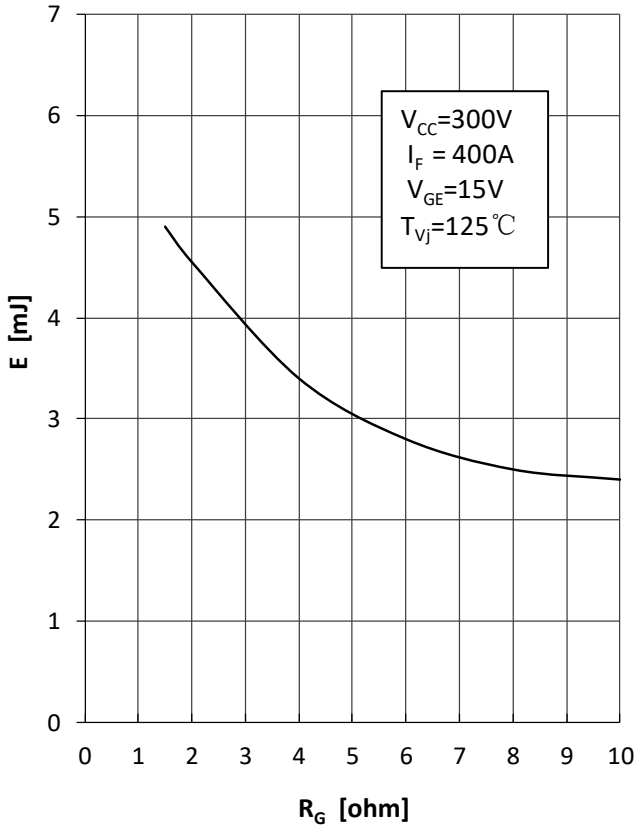
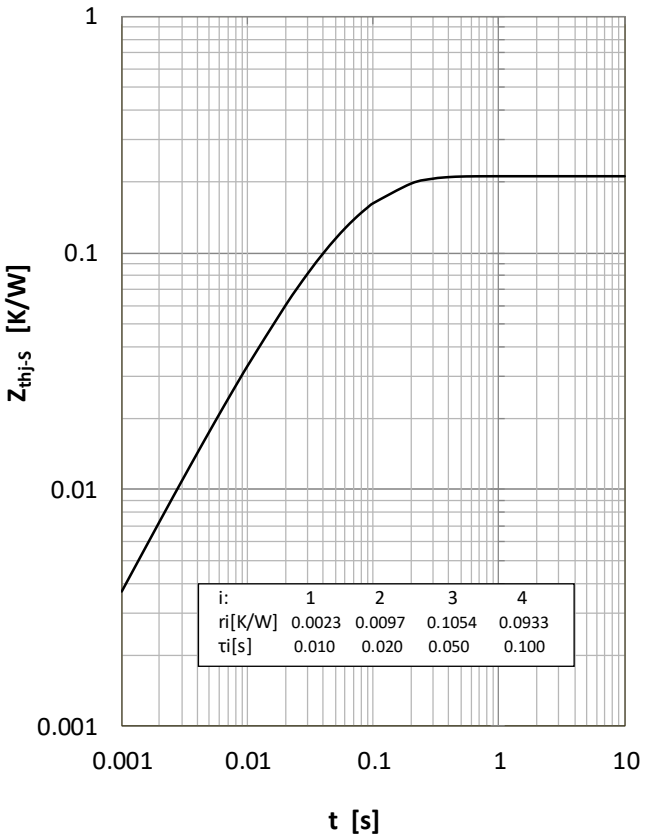


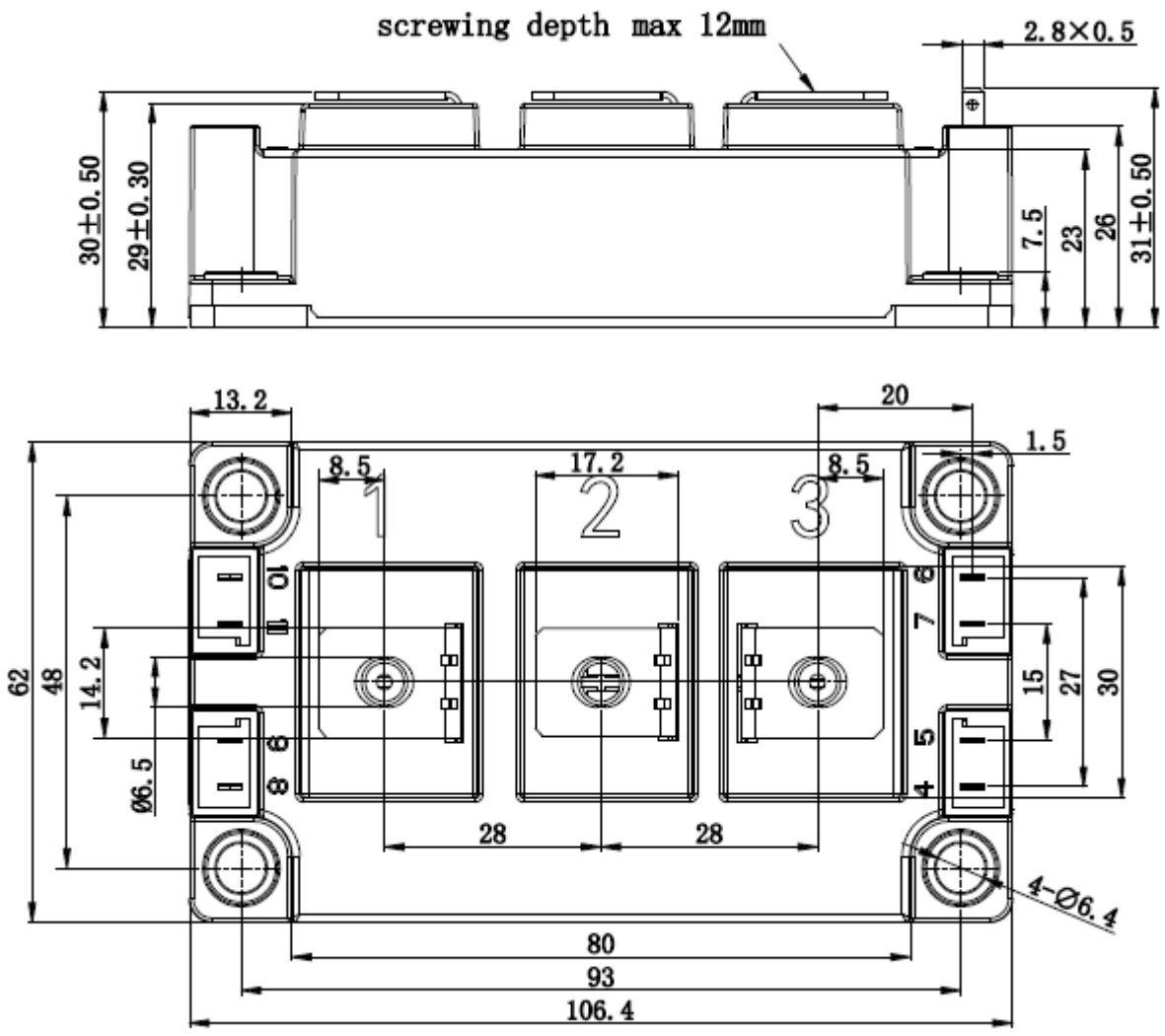
Fig10.Diode Transient Thermal Impedance



Package Dimensions

C2

Dimensions in Millimeters



Ordering Information

Device	Packing
Part Number-BP	Bulk: 6pcs/Box ; 30pcs/Ctn

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