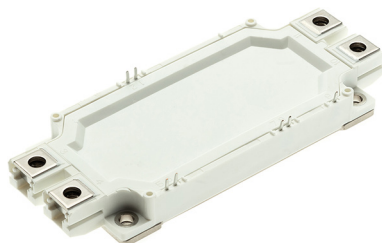


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RoHS
Compliant



Features

- Trench Gate, Generation 5, TMOS IGBT
- Cu Base with Al₂O₃ Substrates
- 10μs Short Circuit Withstand
- Compact Module

Key Parameters

V _{CES}	: 1200 V
V _{CE(sat)} * (typ)	: 1.65
I _C (max)	: 450 A
I _{C(PK)} (max)	: 900 A

* Measured at the auxiliary terminals

Applications

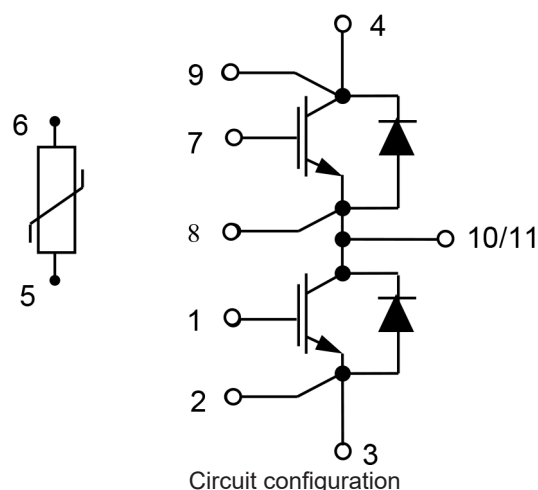
- Motor Drives
- Power Charging Equipment
- Renewable Energy Power Conversion
- High Reliability Inverters
- Electric Vehicles

The MP005806 is a half bridge 1200V, trench gate, insulated gate bipolar transistor (IGBT) module with enhanced field stop and implantation technology. The IGBT has a wide reverse bias safe operating area (RBSOA) plus 10μs short circuit withstand.

The module incorporates an electrically isolated base plate and low inductance construction enabling circuit designers to optimise circuit layouts and utilise grounded heat sinks for safety.

Absolute Maximum Ratings

Stresses above those listed under 'Absolute Maximum Ratings' may cause permanent damage to the device. In extreme conditions, as with all semiconductors, this may include potentially hazardous rupture of the package. Appropriate safety precautions should always be followed. Exposure to Absolute Maximum Ratings may affect device reliability.



T_{case} = 25°C unless stated otherwise.

Symbol	Parameter	Test Conditions	Max.	Units
V _{CES}	Collector-emitter voltage	V _{GE} = 0V, T _C = 25°C	1200	V
V _{GES}	Gate-emitter voltage	T _C = 25°C	±20	
I _C	Continuous collector current	T _C = 100°C	450	A
I _{C(PK)}	Peak collector current	t _P = 1ms,	900	
P _{max}	Max. transistor power dissipation	T _C = 25°C, T _{vj} = 175°C	2.8	kW
I ² t	Diode I ² t value	VR = 0, t _p = 10ms, T _{vj} = 150°C	27.2	kA ² s
V _{isol}	Isolation voltage – per module	Commoned terminals to base plate. AC RMS, 1 min, 50Hz	2500	V

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Thermal and Mechanical Ratings

Internal insulation material	: Al ₂ O ₃
Baseplate material	: Cu
Creepage distance – Terminal to heatsink	: 14.5mm
Creepage distance – Terminal to terminal	: 13.0mm
Clearance – Terminal to heatsink	: 12.5mm
Clearance – Terminal to terminal	: 10mm
CTI (Comparative Tracking Index)	: >200

Symbol	Parameter	Test Conditions	Min.	Max.	Units
R _{th(j-c)}	Thermal resistance – transistor	Continuous dissipation - junction to case	-	52	°C/kW
R _{th(j-c)}	Thermal resistance – diode			86	
R _{th(c-h)} IGBT	Thermal resistance – case to heatsink (IGBT)	Mounting torque 3Nm (with mounting grease 1W/m °C)	-	30	
R _{th(c-h)} Diode	Thermal resistance – case to heatsink (Diode)			45	
T _j	Junction temperature – under switching conditions	IGBT	-40	150	°C
		Diode			
F _{stg}	Storage temperature range	-			
	Screw torque	Mounting – M5	3	6	Nm
		Electrical connections – M6	3	6	

T_{case} = 25°C unless stated otherwise.

Symbol	Parameter	Test Conditions	Min.	Typ	Max.	Units
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	
		V _{GE} = 0V, V _{CE} = V _{CES} , T _C = 150°C			30	
I _{GES}	Gate leakage current	V _{GE} = ± 20V, V _{CE} = 0V			0.5	μA
V _{GE(TH)}	Gate threshold voltage	I _C = 15mA, V _{GE} = V _{CE}	5	6	6.4	V
V _{CE(sat)}	Collector-emitter saturation voltage	V _{GE} = 15V, I _C = 450A		1.65	2.25	
		V _{GE} = 15V, I _C = 450A, T _J = 125°C		1.95	2.6	
		V _{GE} = 15V, I _C = 450A, T _J = 150°C		2	2.7	
V _F	Diode forward current	DC		450		A
V _{IFM}	Diode maximum forward current	t _p = 1ms		900		
V _F	Diode forward voltage	I _F = 450A		1.65	2.2	V
		I _F = 450A, T _J = 125°C		1.75	2.3	
		I _F = 450A, T _J = 150°C				
C _{ies}	Input capacitance	V _{CE} = 25V, V _{GE} = 0V, f = 100kHz		62		nF
Q _g	Gate charge	±15V		4.6		μC
Q _{res}	Reverse transfer capacitance	V _{CE} = 25V, V _{GE} = 0V, f = 100kHz		0.82		nF
L _M	Module inductance			20		nH
R _{INT}	Internal transistor resistance			1.1		mΩ
SC _{Data}	Short circuit current, I _{sc}	T _J = 150°C, V _{CC} = 800V t _p ≤ 10μs, V _{GE} ≤ 15V V _{CE(max)} = V _{CES} – L* x di/dt IEC 60747-9		1900		A

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Note:

* L is the circuit inductance + L_M

NTC-Thermistor Data

Symbol	Parameter	Test Conditions	Min.	Typ	Max.	Units
R ₂₅	Rated Resistance	T _C = 25°C		5		kΩ
ΔR/R	Deviation of R ₁₀₀	T _C = 100°C, R ₁₀₀ = 493Ω	-5		5	%
P ₂₅	Power Dissipation	T _C = 25°C			20	m/W
B _{25/50}	B-value	$R_2 = R_{25} \exp [B_{25/50}(1/T_2 - 1/(298.15K))]$		3375		K
B _{25/80}		$R_2 = R_{25} \exp [B_{25/80}(1/T_2 - 1/(298.15K))]$		3411		
B _{25/100}		$R_2 = R_{25} \exp [B_{25/100}(1/T_2 - 1/(298.15K))]$		3433		

Electrical Characteristics

T_{case} = 25°C unless stated otherwise.

Symbol	Parameter	Test Conditions		Min.	Typ	Max.	Units
t _{d(off)}	Turn-off delay time	I _C = 450A V _{CE} = 600V V _{GE} = ±15V R _{G(OFF)} = 1Ω R _{G(ON)} = 1Ω L _S ~ 50nH	dv/dt = 4500V/μs		560		ns
t _f	Fall time				260		
E _{OFF}	Turn-off energy loss				52		
t _{d(on)}	Turn-on delay time		di/dt = 7000A/μs		220		ns
t _r	Rise time				70		
E _{ON}	Turn-on energy loss				8.3		
Q _{rr}	Diode reverse recovery charge	I _F = 450A V _{CE} = 600V di/dt = 7000A/μs			34		μC
I _{rr}	Diode reverse recovery current				415		A
E _{rec}	Diode reverse recovery energy				24		mJ

T_{case} = 125°C unless stated otherwise.

Symbol	Parameter	Test Conditions		Min.	Typ	Max.	Units
t _{d(off)}	Turn-off delay time	I _C = 450A V _{CE} = 600V V _{GE} = ±15V R _{G(OFF)} = 1Ω R _{G(ON)} = 1Ω L _S ~ 50nH	dv/dt = 4500V/μs		490		ns
t _f	Fall time				320		
E _{OFF}	Turn-off energy loss				62		
t _{d(on)}	Turn-on delay time		di/dt = 7000A/μs		224		ns
t _r	Rise time				74		
E _{ON}	Turn-on energy loss				12		
Q _{rr}	Diode reverse recovery charge	I _F = 450A V _{CE} = 600V di/dt = 7000A/μs			77		μC
I _{rr}	Diode reverse recovery current				475		A
E _{rec}	Diode reverse recovery energy				48		mJ

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$T_{case} = 150^{\circ}C$ unless stated otherwise.

Symbol	Parameter	Test Conditions		Min.	Typ	Max.	Units
t _{d(off)}	Turn-off delay time	I _C = 450A V _{CE} = 600V V _{GE} = ±15V R _{G(OFF)} = 1Ω R _{G(ON)} = 1Ω L _s ~ 50nH	dv/dt = 4500V/μs		600		ns
t _f	Fall time				330		
E _{OFF}	Turn-off energy loss				65		
t _{d(on)}	Turn-on delay time		di/dt = 7000A/μs		226		ns
t _r	Rise time				76		
E _{ON}	Turn-on energy loss				13		
Q _{rr}	Diode reverse recovery charge	I _F = 450A V _{CE} = 600V di/dt = 7000A/μs			90		μC
I _{rr}	Diode reverse recovery current				500		A
E _{rec}	Diode reverse recovery energy				55		mJ

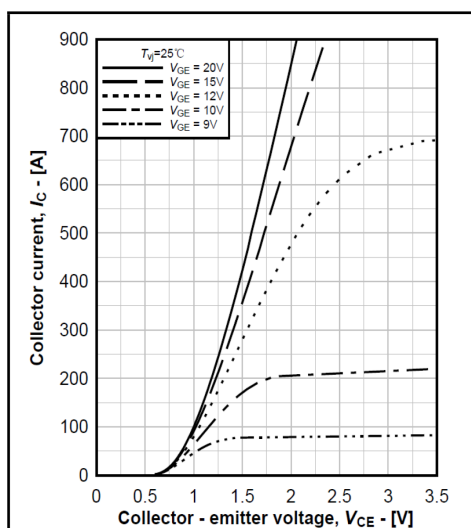


Fig. 3 Typical IGBT output characteristics, $I_C = f(V_{CE})$

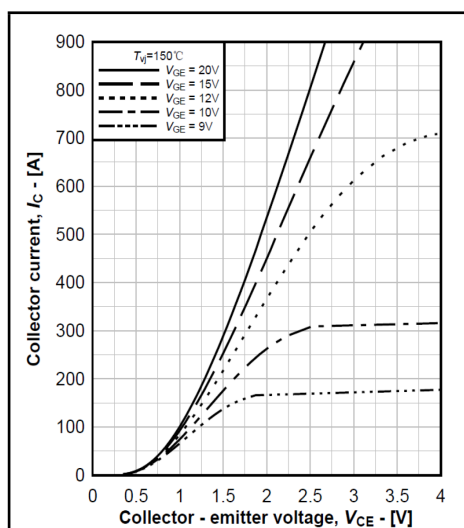


Fig. 4 Typical IGBT output characteristics, $I_C = f(V_{CE})$

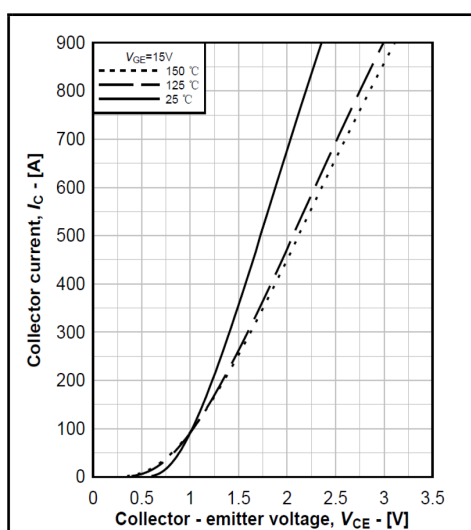


Fig. 5 Typical IGBT output characteristics, $I_C = f(V_{CE})$

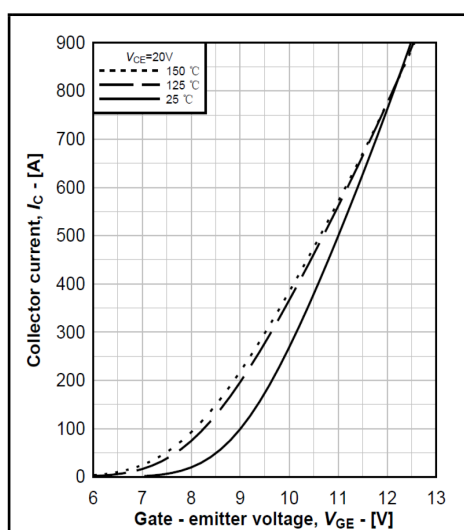


Fig. 6 Typical IGBT transfer characteristics, $I_C = f(V_{GE})$

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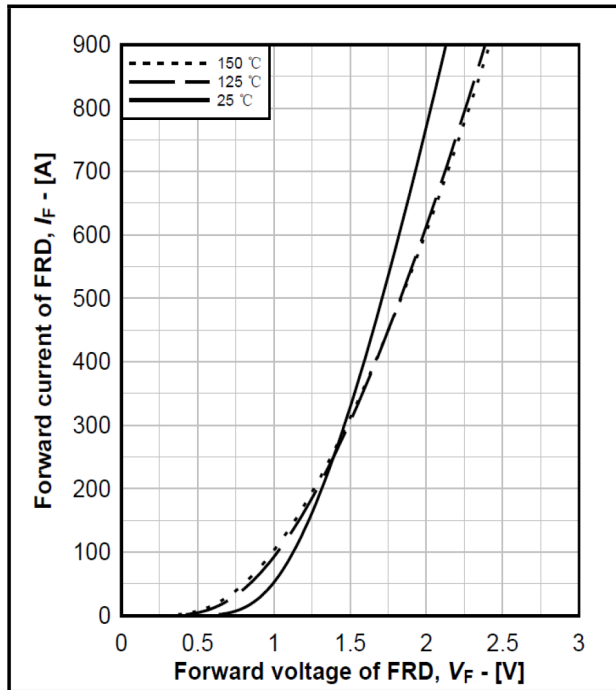


Fig. 7 Diode typical forward characteristics, $I_F = f(V_F)$

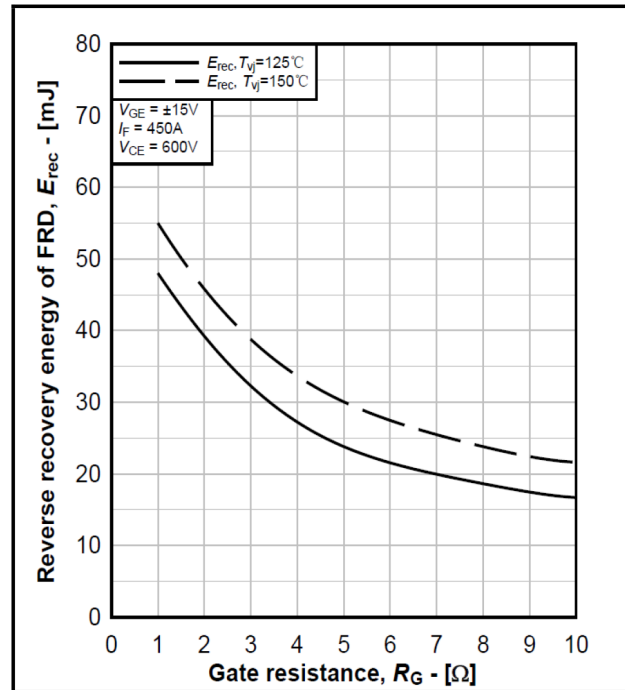


Fig. 8 Typical FRD E_{rec} , $E_{rec} = f(R_G)$

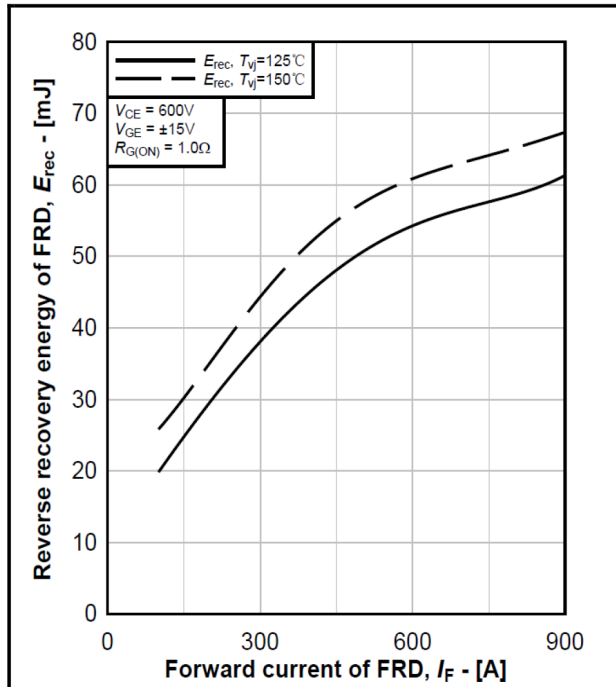


Fig. 9 Typical FRD E_{rec} , $E_{rec} = f(I_F)$

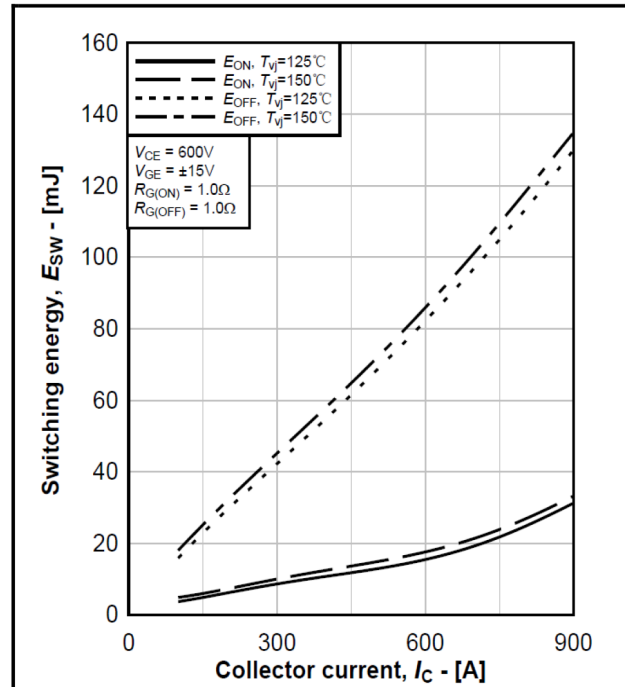


Fig. 10 Typical IGBT switching energy, $E_{ON} = f(I_C)$, $E_{OFF} = f(I_C)$

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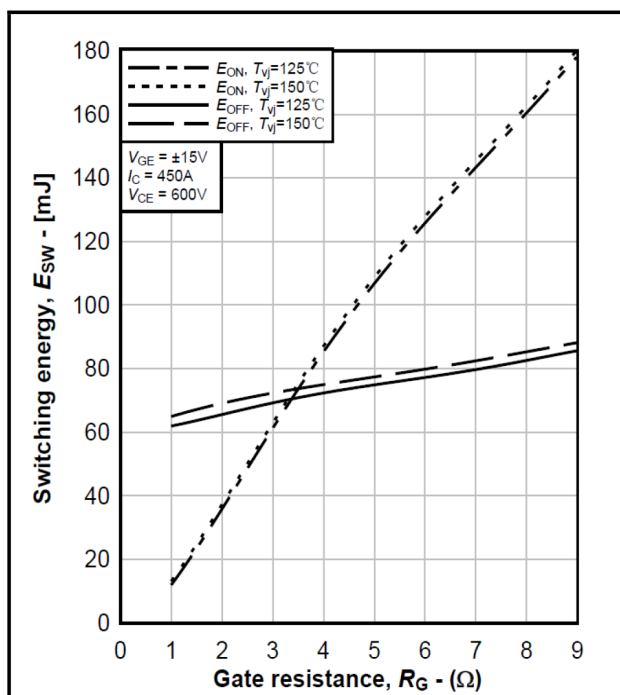


Fig. 11 Typical IGBT switching energy
 $E_{ON} = f(R_G)$, $E_{OFF} = f(R_G)$

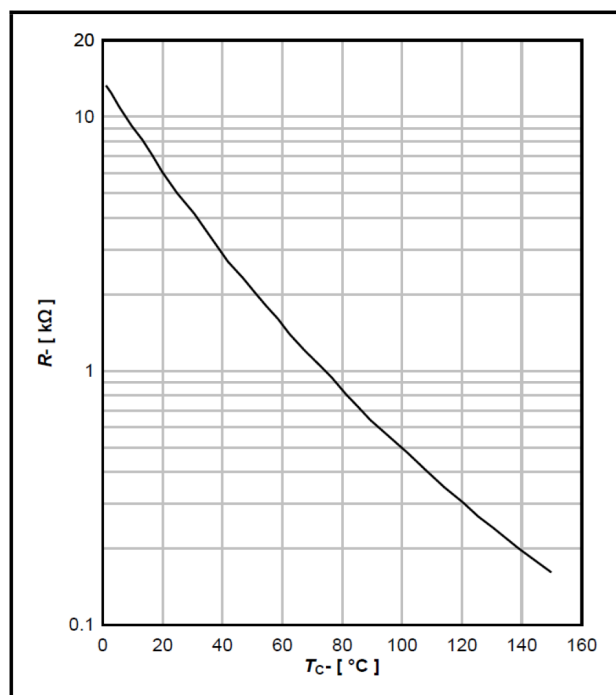


Fig. 12 Typical NTC thermistor characteristic, $R = f(T_C)$

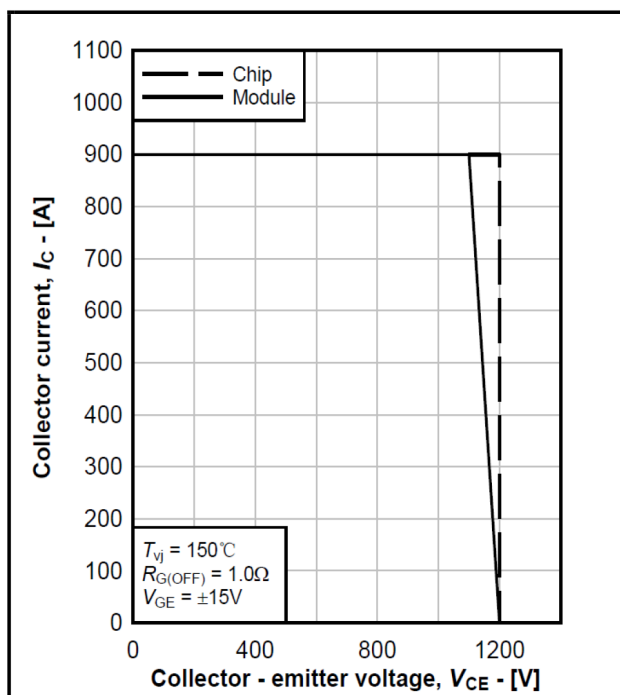


Fig. 13 Reverse bias safe operating area of IGBT,
 $I_C = f(V_{CE})$

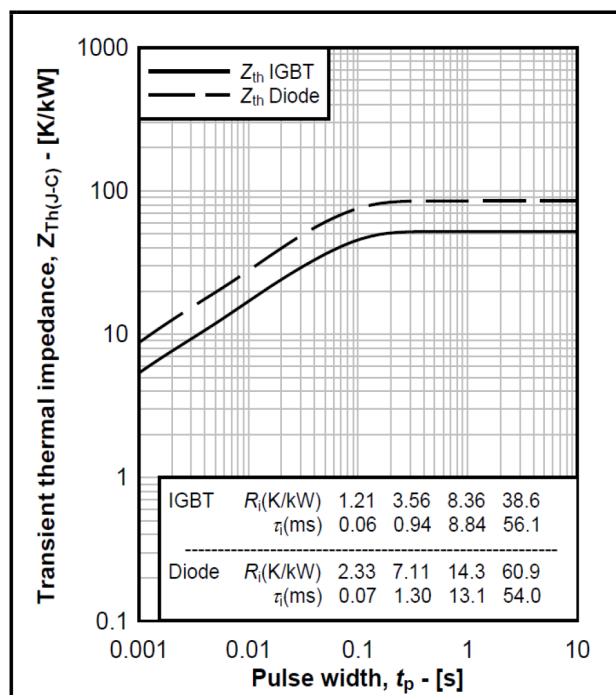
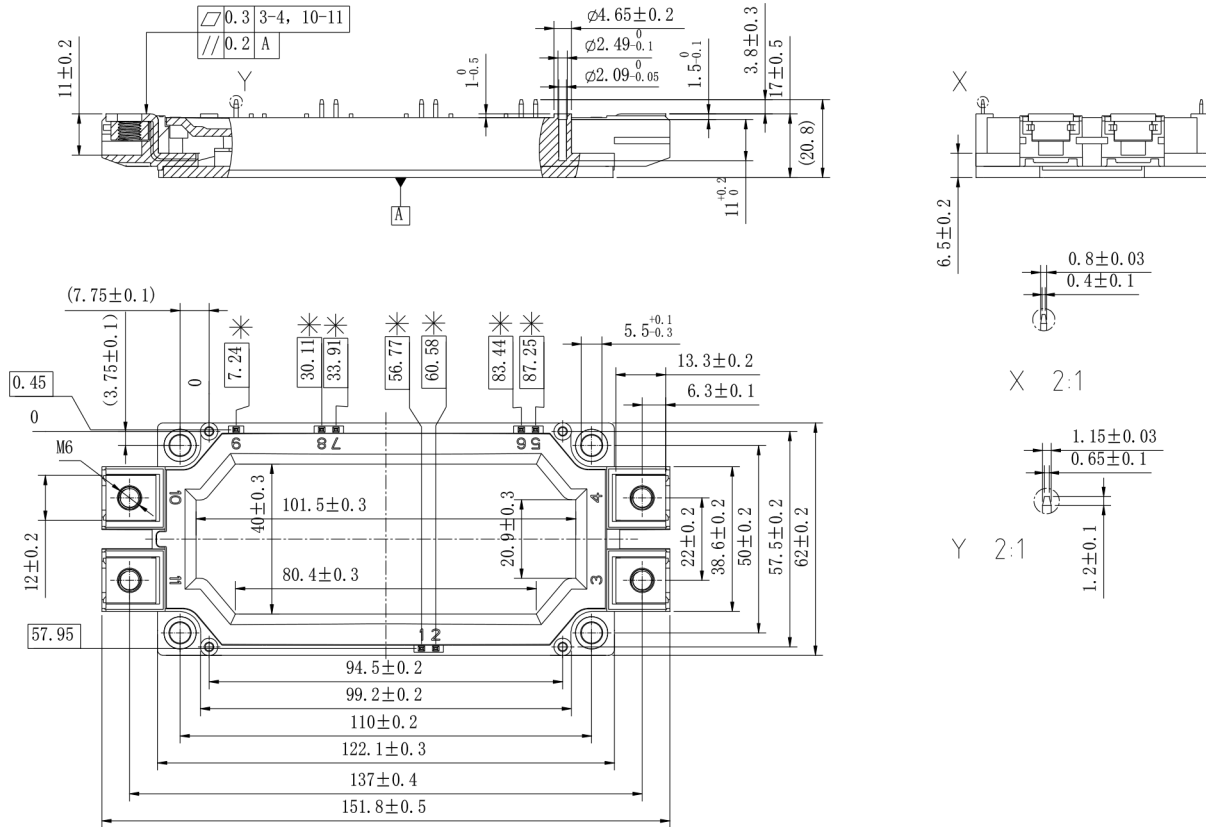


Fig. 14 Transient thermal impedance, $Z_{th(J-C)} = f(t)$

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Nominal Weight: 345g

Part Number Table

Description	Part Number
Half Bridge IGBT Module, 1200V, 450A, M1 Case Code	MPIM450M112TG5

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