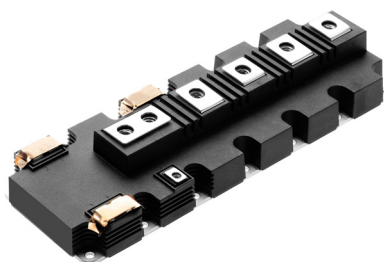


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RoHS
Compliant



Features

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

Key Parameters

V _{CES}	: 1700 V
V _{CE(sat)} * (typ)	: 1.85 A
I _C (max)	: 1000 A
I _{C(PK)} (max)	: 2000 V/μs

* Measured at the auxiliary terminals

The MP005812 is a Half Bridge 1700V, 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. This device is optimised for traction drives and other applications requiring high thermal cycling capability.

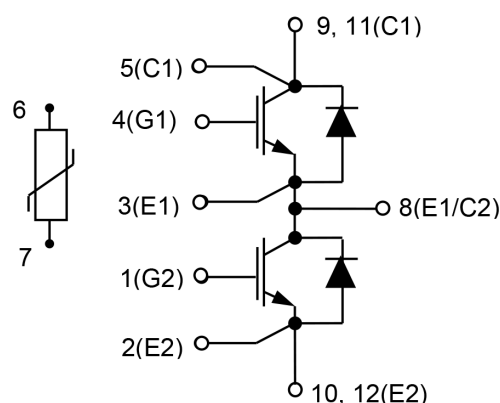
The module incorporates an electrically isolated base plate and low inductance construction enabling circuit designers to optimise circuit layouts and utilise grounded heat sinks for safety.

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.

Applications

- Motor Drives
- High Power Converters
- Renewable Energy Power Conversion
- High Reliability Inverters



Circuit configuration

Symbol	Parameter	Test Conditions	Max.	Units
V _{CES}	Collector-emitter voltage	V _{GE} = 0V, TC = 25°C	1700	V
V _{GES}	Gate-emitter voltage	TC = 25°C	±20	
I _C	Continuous collector current	TC = 104°C	1000	A
I _{C(PK)}	Peak collector current	t _P = 1ms TC = 135°C	2000	
P _{max}	Max. transistor power dissipation	TC = 25°C, T _{vj} = 150°C	6.25	kW
I ² t	Diode I ² t value	VR = 0, t _p = 10ms, T _{vj} = 150°C	145	kA ² s
V _{isol}	Isolation voltage – per module	Commoned terminals to base plate. AC RMS, 1 min, 50Hz	4000	V

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Thermal And Mechanical Ratings

Internal insulation material: Al₂O₃
 Baseplate material: Cu
 Creepage distance: 33mm
 Clearance: 19mm
 CTI (Comparative Tracking Index): >400

Symbol	Parameter	Test Conditions	Min.	Max.	Units
R _{th(j-c)}	Thermal resistance – transistor	Continuous dissipation - junction to case	-	20	°C/kW
R _{th(j-c)}	Thermal resistance – diode			36	
R _{th(c-h)} IGBT	Thermal resistance – case to heatsink (IGBT)	Mounting torque 5Nm (with mounting grease: 1W/mK)	-	12	
R _{th(c-h)} Diode	Thermal resistance – case to heatsink (Diode)				
T _j	Junction temperature	Transistor	-40	150	°C
		Diode			
F _{stg}	Storage temperature range	-			
	Screw torque	Mounting – M5	3	6	Nm
		Electrical connections – M8	8	10	

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 = 30mA, V _{GE} = V _{CE}	5.2	5.8	6.4	V
V _{CE(sat)}	Collector-emitter saturation voltage	V _{GE} = 15V, I _C = 1000A		1.85	2.25	
		V _{GE} = 15V, I _C = 1000A, T _J = 125°C		2.2	2.6	
		V _{GE} = 15V, I _C = 1000A, T _J = 150°C		2.3	2.7	
V _F	Diode forward current	DC		1000		A
V _{IFM}	Diode maximum forward current	t _p = 1ms		2000		
V _F	Diode forward voltage	I _F = 1000A		1.8	2.2	V
		I _F = 1000A, T _J = 125°C		1.9	2.3	
		I _F = 1000A, T _J = 150°C				
C _{ies}	Input capacitance	V _{CE} = 25V, V _{GE} = 0V, f = 100kHz		147		nF
Q _g	Gate charge	±15V		11.4		μC
Q _{res}	Reverse transfer capacitance	V _{CE} = 25V, V _{GE} = 0V, f = 100kHz		1.5		nF
L _M	Module inductance			10		nH
R _{INT}	Internal transistor resistance			0.2		mΩ
SC _{Data}	Short circuit current, I _{sc}	T _J = 150°C, V _{CC} = 1000V t _p ≤ 10μs, V _{GE} ≤ 15V V _{CE (max)} = V _{CES} – L* x di/dt IEC 60747-9		4400		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 = 1000A V _{CE} = 900V V _{GE} = ±15V R _{G(OFF)} = 1.8Ω R _{G(ON)} = 1.2Ω L _S ~ 20nH	dv/dt = 3000V/μs		1320		ns
t _f	Fall time				340		
E _{OFF}	Turn-off energy loss				280		
t _{d(on)}	Turn-on delay time		di/dt = 7200A/μs		500		ns
t _r	Rise time				145		
E _{ON}	Turn-on energy loss				340		
Q _{rr}	Diode reverse recovery charge	I _F = 1000A V _{CE} = 900V di/dt = 7200A/μs			285		μC
I _{rr}	Diode reverse recovery current				520		A
E _{rec}	Diode reverse recovery energy				110		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 = 1000A V _{CE} = 900V V _{GE} = ±15V R _{G(OFF)} = 1.8Ω R _{G(ON)} = 1.2Ω L _S ~ 20nH	dv/dt = 3000V/μs		1410		ns
t _f	Fall time				440		
E _{OFF}	Turn-off energy loss				350		
t _{d(on)}	Turn-on delay time		di/dt = 7200A/μs		470		ns
t _r	Rise time				145		
E _{ON}	Turn-on energy loss				370		
Q _{rr}	Diode reverse recovery charge	I _F = 1000A V _{CE} = 900V di/dt = 7200A/μs			315		μC
I _{rr}	Diode reverse recovery current				620		A
E _{rec}	Diode reverse recovery energy				210		mJ

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$T_{case} = 125^{\circ}C$ unless stated otherwise.

Symbol	Parameter	Test Conditions		Min.	Typ	Max.	Units
t _{d(off)}	Turn-off delay time	I _C = 1000A V _{CE} = 900V V _{GE} = ±15V R _{G(OFF)} = 1.8Ω R _{G(ON)} = 1.2Ω L _s ~ 20nH	dv/dt = 3000V/μs		1440		ns
t _f	Fall time				570		
E _{OFF}	Turn-off energy loss				360		
t _{d(on)}	Turn-on delay time		di/dt = 7200A/μs		460		ns
t _r	Rise time				140		
E _{ON}	Turn-on energy loss				385		
Q _{rr}	Diode reverse recovery charge	I _F = 1000A V _{CE} = 900V di/dt = 7200A/μs			340		μC
I _{rr}	Diode reverse recovery current				655		A
E _{rec}	Diode reverse recovery energy				235		mJ

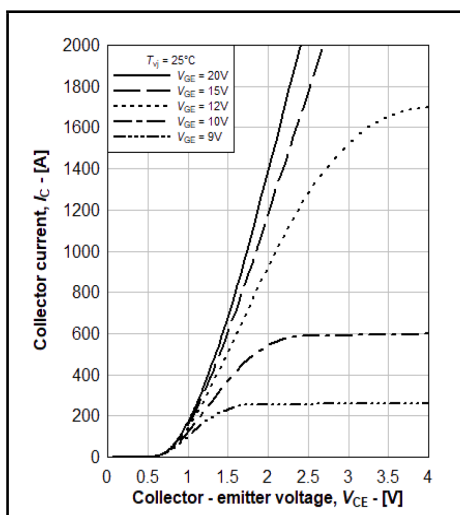


Fig. 3 Typical IGBT output characteristics, $I_C = f(V_{CE})$

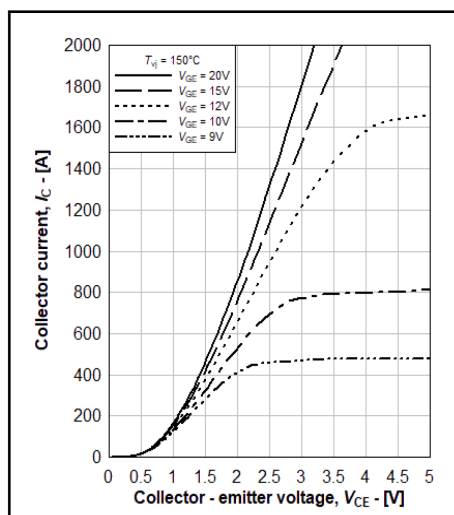


Fig. 4 Typical IGBT output characteristics, $I_C = f(V_{CE})$

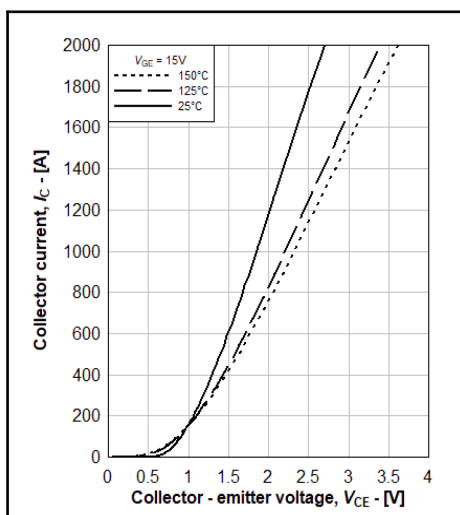


Fig. 5 Typical IGBT output characteristics, $I_C = f(V_{CE})$

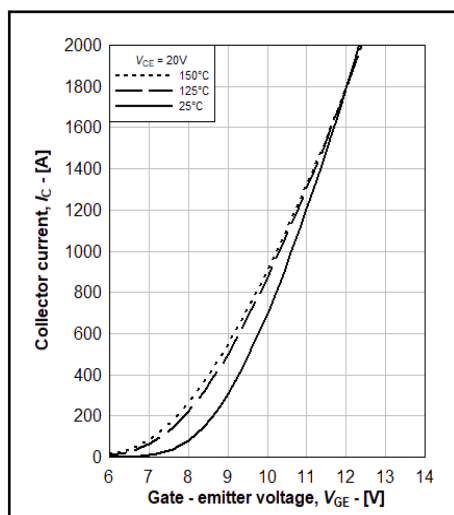


Fig. 6 Typical IGBT transfer characteristics, $I_C = f(V_{GE})$

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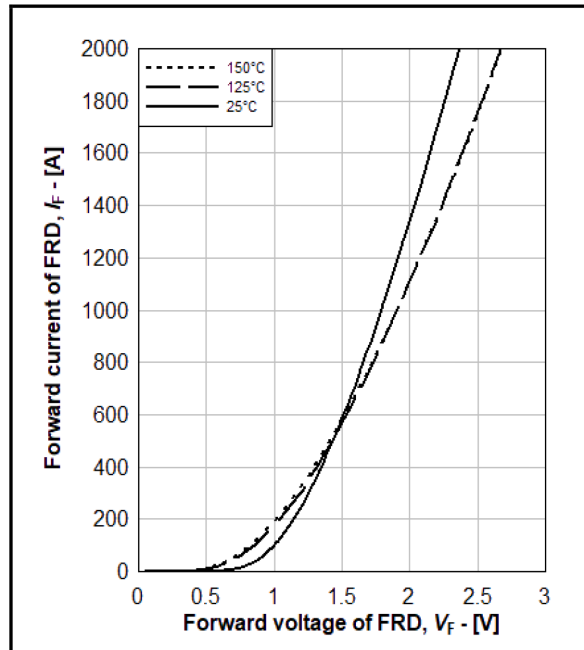


Fig. 7 Diode typical forward characteristics, $I_F = f(V_F)$

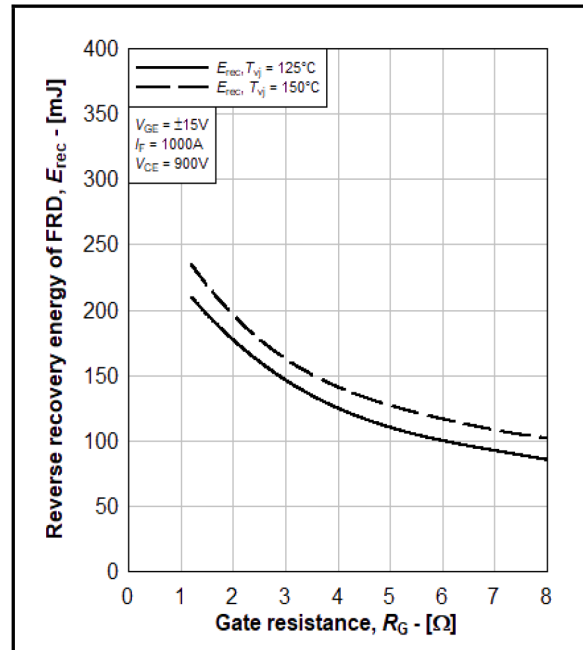


Fig. 8 Typical FRD E_{rec} , $E_{rec} = f(R_G)$

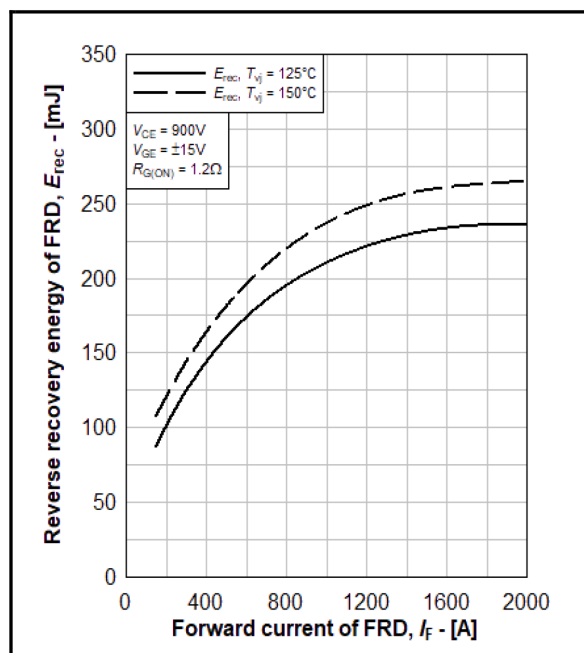


Fig. 9 Typical FRD E_{rec} , $E_{rec} = f(I_F)$

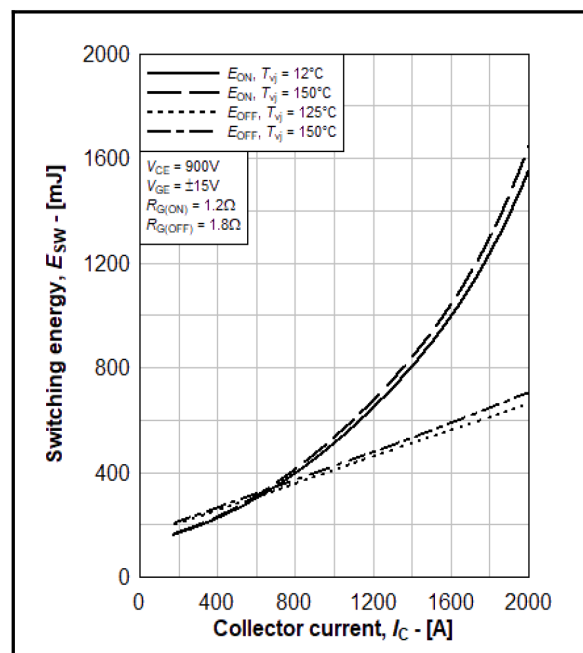


Fig. 10 Typical IGBT switching energy, $E_{ON} = f(I_C)$, $E_{OFF} = f(I_C)$

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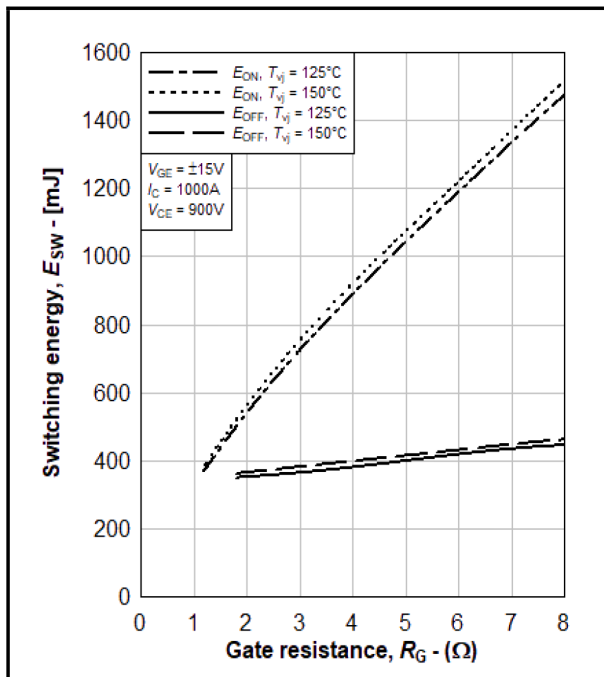


Fig. 11 Typical IGBT switching energy
 $E_{ON} = f(R_g)$, $E_{OFF} = f(R_g)$

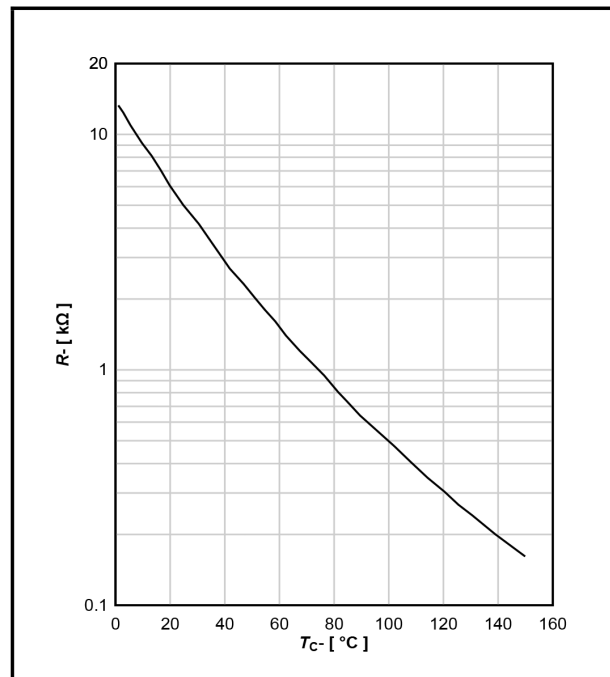


Fig. 12 Typical NTC thermistor characteristic, $R = f(T_c)$

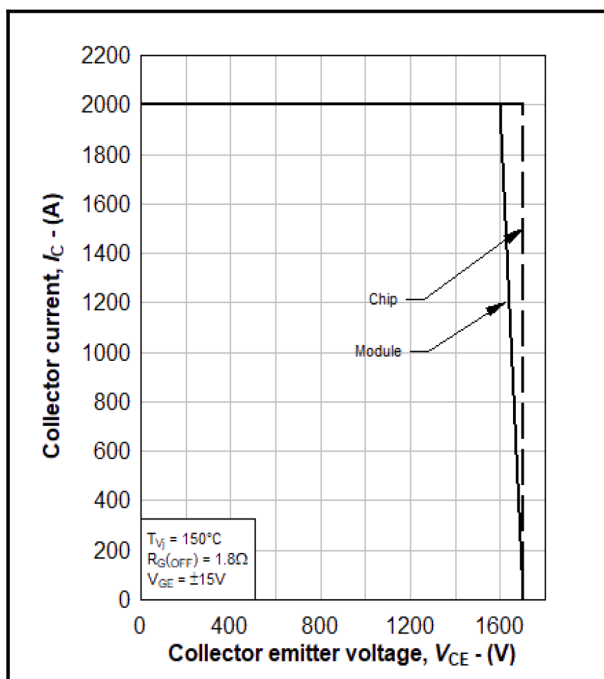


Fig. 13 Reverse bias safe operating area of IGBT,
 $I_C = f(V_{CE})$

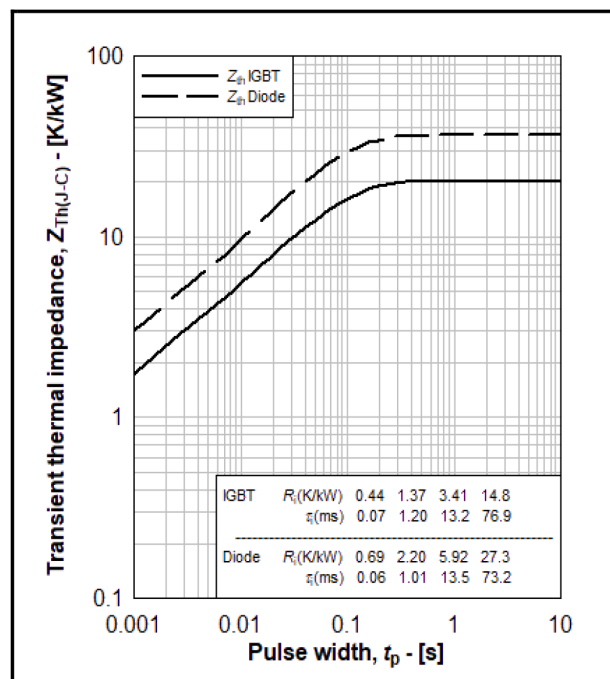
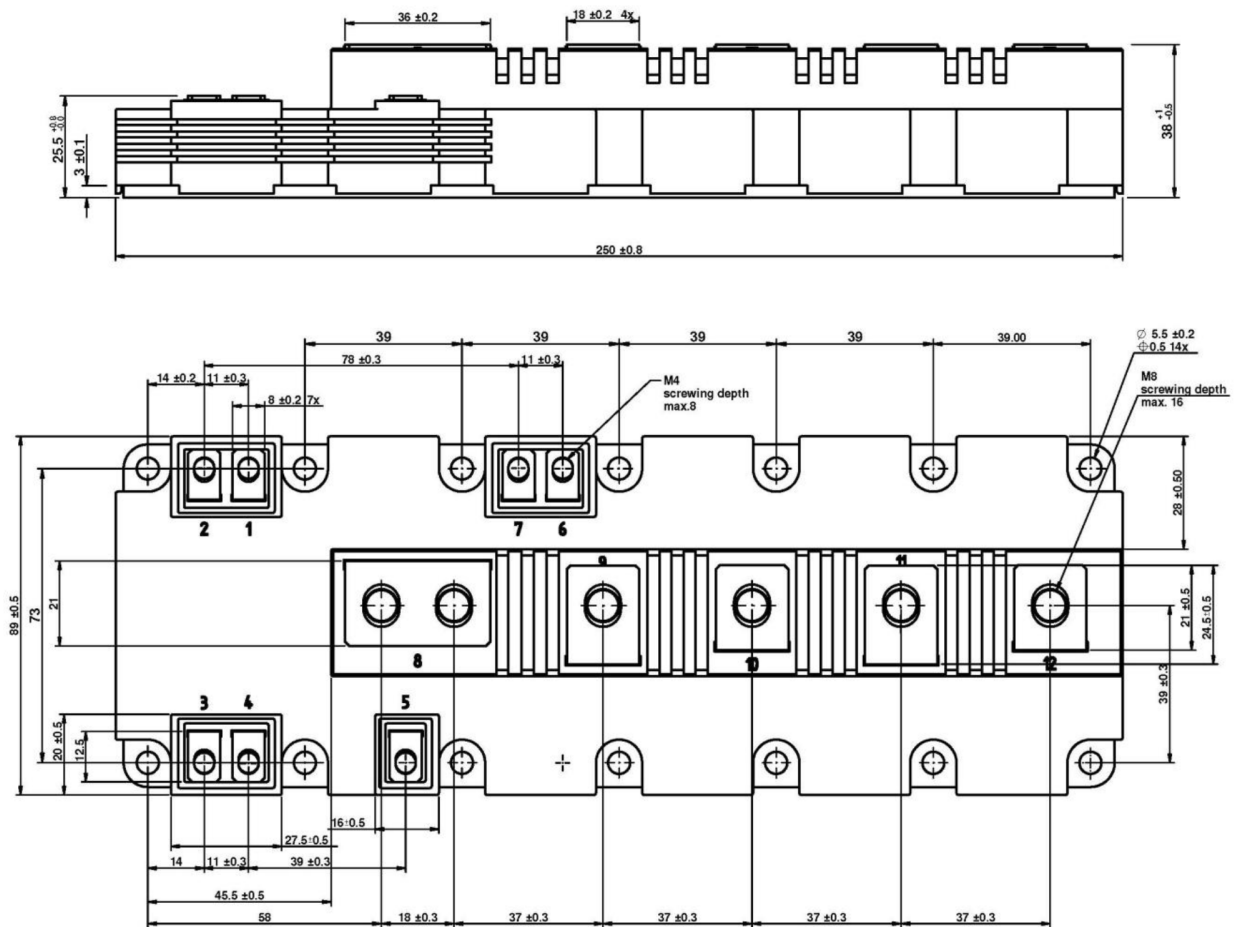


Fig. 14 Transient thermal impedance, $Z_{th(J-C)} = f(t)$

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Nominal Weight: 1200g

Part Number Table

Description	Part Number
Half Bridge IGBT Module, 1700V, 1000A, H1 Case Code	MPIM1000H117TG5

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