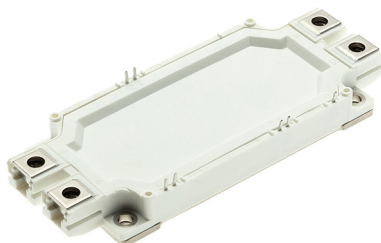


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RoHS
Compliant



Features

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

Key Parameters

V _{CES}	: 1700 V
V _{CE(sat)} * (typ)	: 1.8
I _C (max)	: 450 A
I _{C(RM)} (max)	: 900 A

* Measured at the auxiliary terminals

Applications

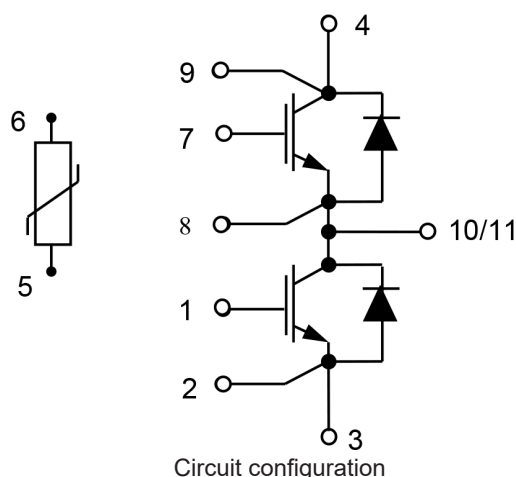
- Motor Drives
- Power Charging Equipment
- Reactive Compensation
- High Reliability Inverters

The MP005807 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.

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, TC = 25°C	1700	V
V _{GES}	Gate-emitter voltage	TC = 25°C	±20	
I _C	Continuous collector current	TC = 95°C	450	A
I _{C(PK)}	Peak collector current	t _P = 1ms, TC = 125°C	900	
P _{max}	Max. transistor power dissipation	TC = 25°C, T _{vj} = 150°C	2270	kW
I ² t	Diode I ² t value	V _R = 0, t _p = 10ms, T _{vj} = 150°C	16.2	kA ² s
V _{isol}	Isolation voltage – per module	Commoned terminals to base plate. AC RMS, 1 min, 50Hz	3400	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– IGBT	Continuous dissipation - junction to case	-	55	°C/kW
R _{th(j-c)}	Thermal resistance – diode			95	
R _{th(c-h)}	Thermal resistance – case to heatsink (IGBT)	Mounting torque 3Nm (with mounting grease: 1W/mK)	-	28	
R _{th(c-h)}	Thermal resistance – case to heatsink (Diode)			48	
T _j	Junction temperature	IGBT	-40	150	°C
		Diode			
F _{stg}	Storage temperature range	-			
	Screw torque	Mounting – M5	3	6	Nm
		Electrical connections – M6	3	6	

Electrical Characteristics

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		1.8	2.25	
		V _{GE} = 15V, I _C = 450A, T _j = 125°C		2.1	2.6	
		V _{GE} = 15V, I _C = 450A, T _j = 150°C		2.2	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		2.1	2.2	V
		I _F = 450A, T _j = 125°C		2.2	2.3	
		I _F = 450A, T _j = 150°C				
C _{ies}	Input capacitance	V _{CE} = 25V, V _{GE} = 0V, f = 100kHz		42		nF
Q _g	Gate charge	±15V		4.4		µC
Q _{res}	Reverse transfer capacitance	V _{CE} = 25V, V _{GE} = 0V, f = 100kHz		1.2		nF
L _M	Module inductance			20		nH
R _{INT}	Internal transistor resistance			0.9		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		2000		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} = 900V V _{GE} = ±15V R _{G(OFF)} = 2.7Ω R _{G(ON)} = 2.7Ω L _S ~ 40nH	dv/dt = 4500V/μs		890		ns
t _f	Fall time				560		
E _{OFF}	Turn-off energy loss				155		
t _{d(on)}	Turn-on delay time		di/dt = 6400A/μs		165		ns
t _r	Rise time				65		
E _{ON}	Turn-on energy loss				53		
Q _{rr}	Diode reverse recovery charge	I _F = 450A V _{CE} = 900V di/dt = 6400A/μs			85		μC
I _{rr}	Diode reverse recovery current				425		A
E _{rec}	Diode reverse recovery energy				65		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} = 900V V _{GE} = ±15V R _{G(OFF)} = 2.7Ω R _{G(ON)} = 2.7Ω L _S ~ 40nH	dv/dt = 450V/μs		940		ns
t _f	Fall time				730		
E _{OFF}	Turn-off energy loss				185		
t _{d(on)}	Turn-on delay time		di/dt = 6400A/μs		155		ns
t _r	Rise time				75		
E _{ON}	Turn-on energy loss				80		
Q _{rr}	Diode reverse recovery charge	I _F = 450A V _{CE} = 900V di/dt = 6400A/μs			125		μC
I _{rr}	Diode reverse recovery current				436		A
E _{rec}	Diode reverse recovery energy				94		mJ

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

Symbol	Parameter	Test Conditions		Min.	Typ	Max.	Units
t _{d(off)}	Turn-off delay time	I _C = 450A V _{CE} = 900V V _{GE} = ±15V R _{G(OFF)} = 2.7Ω R _{G(ON)} = 2.7Ω L _S ~ 40nH	dv/dt = 4500V/μs		960		ns
t _r	Fall time				760		
E _{OFF}	Turn-off energy loss				190		
t _{d(on)}	Turn-on delay time		di/dt = 6400A/μs		150		ns
t _r	Rise time				75		
E _{ON}	Turn-on energy loss				86		
Q _{rr}	Diode reverse recovery charge	I _F = 450A V _{CE} = 900V di/dt = 6400A/μs			145		μC
I _{rr}	Diode reverse recovery current				455		A
E _{rec}	Diode reverse recovery energy				105		mJ

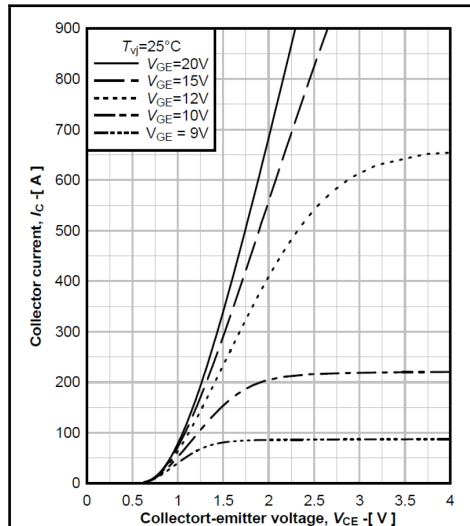


Fig. 3 Typical IGBT output characteristics, $I_C = f(V_{CE})$

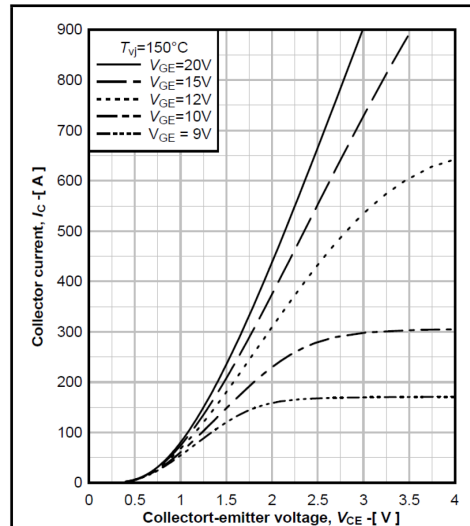


Fig. 4 Typical IGBT output characteristics, $I_C = f(V_{CE})$

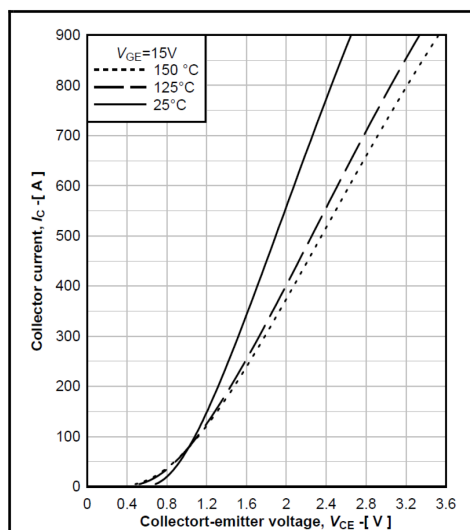


Fig. 5 Typical IGBT output characteristics, $I_C = f(V_{CE})$

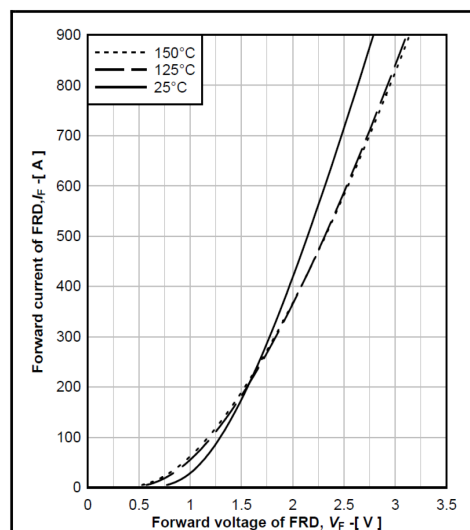


Fig. 6 Diode typical forward characteristics, $I_F = f(V_F)$

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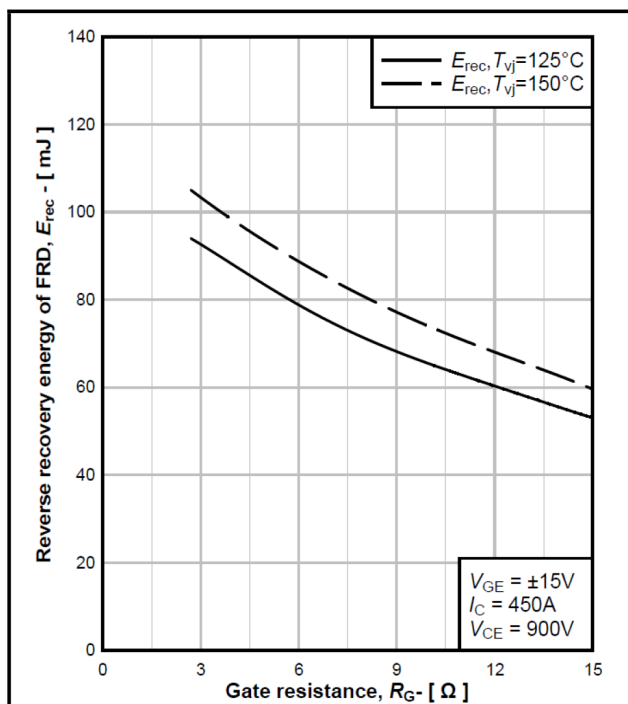


Fig. 7 Typical FRD $E_{rec}, E_{rec} = f(R_G)$

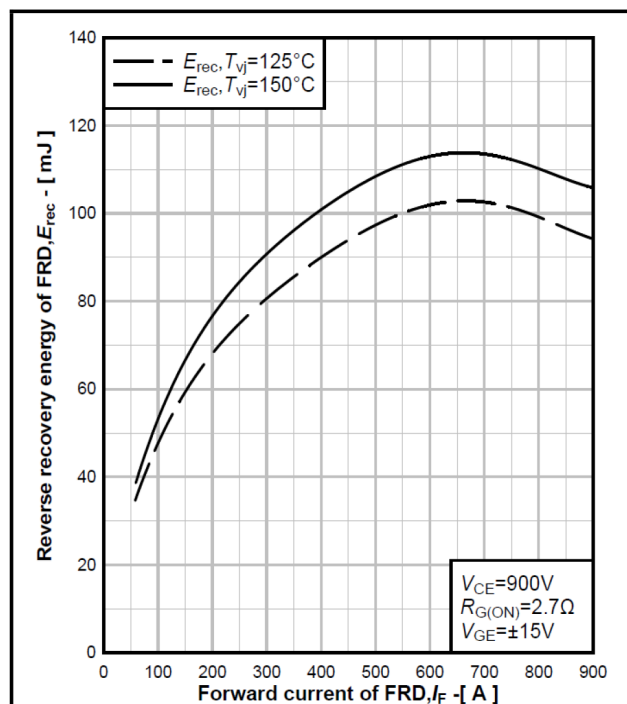


Fig. 8 Typical FRD $E_{rec}, E_{rec} = f(I_F)$

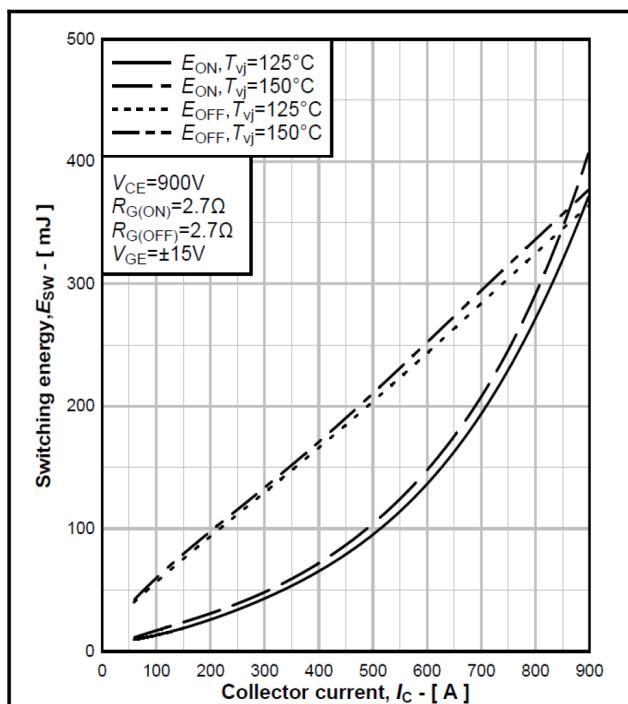


Fig. 9 Typical IGBT switching energy,
 $E_{ON} = f(I_C), E_{OFF} = f(I_C)$

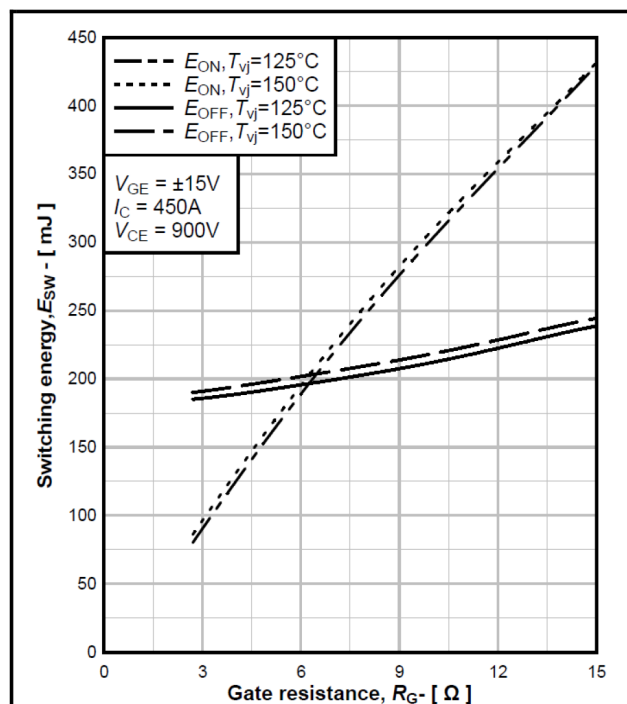


Fig. 10 Typical IGBT switching energy
 $E_{ON} = f(R_G), E_{OFF} = f(R_G)$

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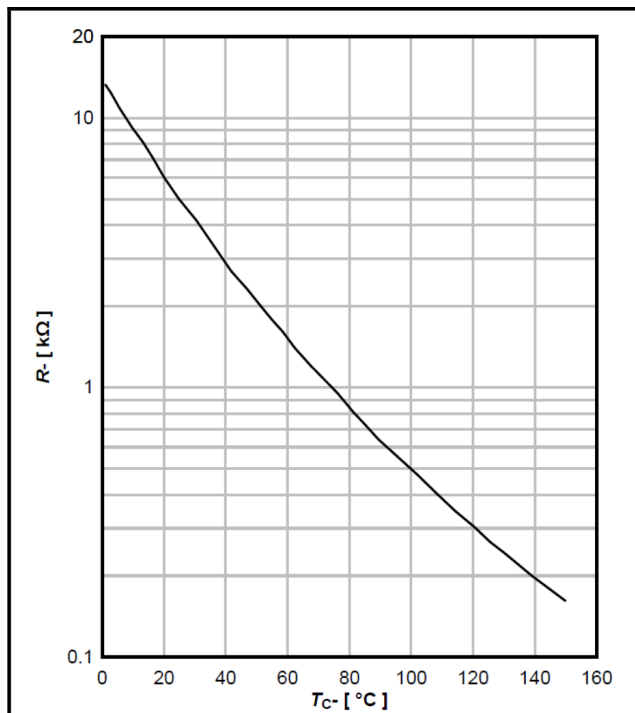


Fig. 11 Typical NTC thermistor characteristic, $R = f(T_c)$

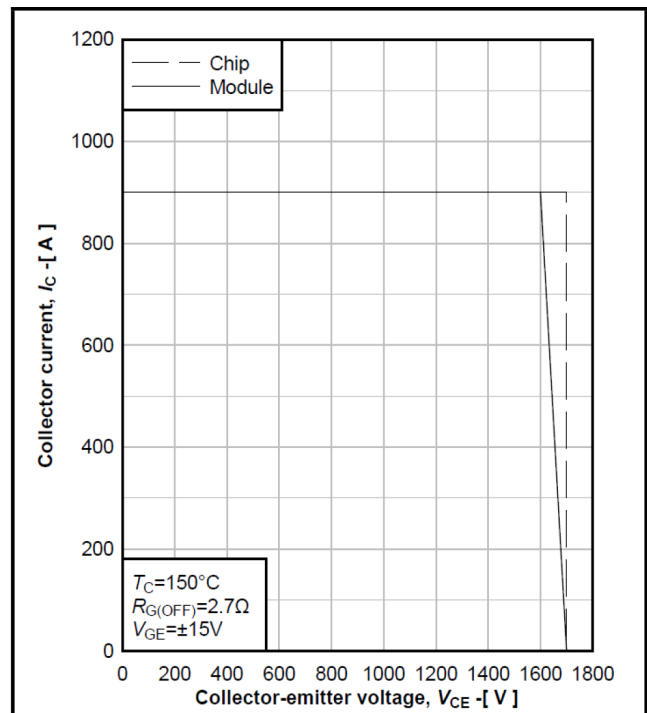


Fig. 12 Reverse bias safe operating area of IGBT, $I_c = f(V_{ce})$

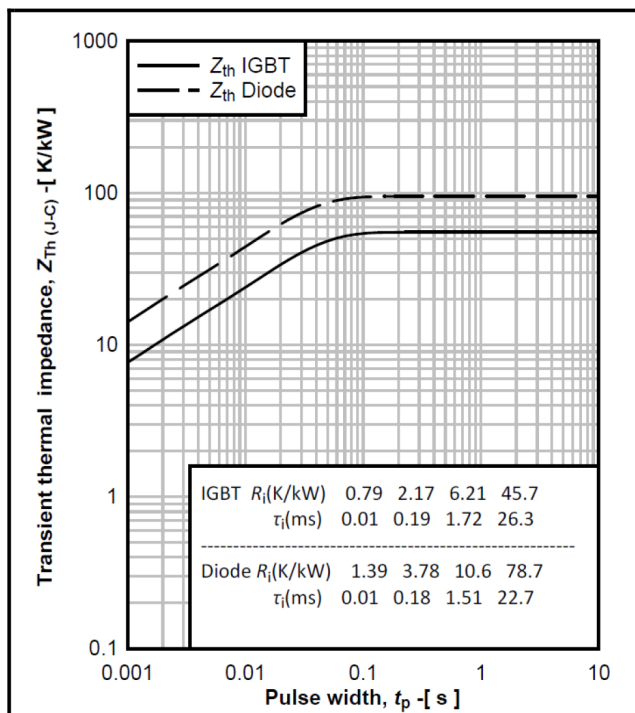
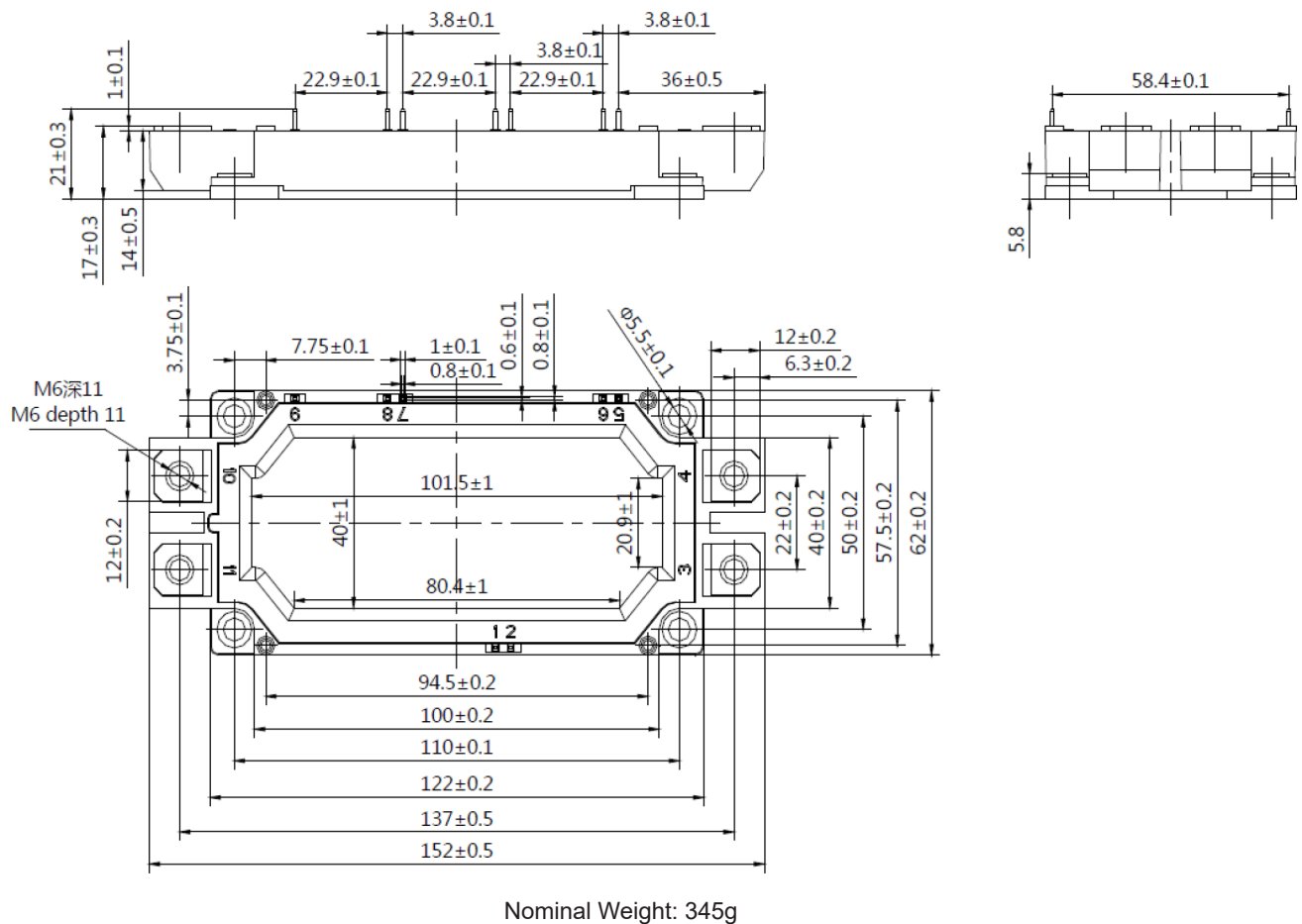


Fig. 13 Transient thermal impedance, $Z_{th(j-c)} = f(t)$

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Part Number Table

Description	Part Number
Half Bridge IGBT Module, 1700V, 450A, M1 Case Code	MPIM450M117TG5

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