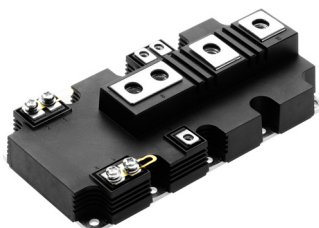


Half Bridge IGBT Module multicomp^{PRO}

RoHS
Compliant



Features

- Trench Gate, Generation 5, TMOS IGBT
- Cu Base with Al₂O₃ Substrates
- High Thermal Cycling Capability
- 10μs Short Circuit Withstand
- High Current Density

Key Parameters

V _{CES}	: 1700 V
V _{CE(sat)} * (typ)	: 1.85
I _C (max)	: 650 A
I _{C(PK)} (max)	: 1300 A

* Measured at the auxiliary terminals

The MP005810 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

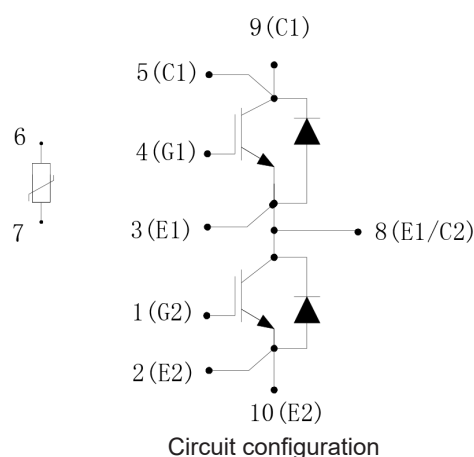
Stresses above those listed under 'Absolute Maximum Ratings' may cause permanent damage to the device. In extreme conditions, as with all semiconductors, this may include potentially hazardous rupture of the package. Appropriate safety precautions should always be followed. Exposure to Absolute Maximum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

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	1700	V
V _{GES}	Gate-emitter voltage	T _C = 25°C	±20	
I _C	Continuous collector current	T _C = 105°C	650	A
I _{C(PK)}	Peak collector current	t _P = 1ms	1300	
P _{max}	Max. transistor power dissipation	T _C = 25°C, T _{vj} = 150°C	4.16	kW
I ² t	Diode I ² t value	V _R = 0, t _p = 10ms, T _{vj} = 150°C	64	kA ² s
V _{isol}	Isolation voltage – per module	Commoned terminals to base plate. AC RMS, 1 min, 50Hz	4000	V

Applications

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



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Thermal and Mechanical Ratings

Internal insulation material	: Al ₂ O ₃
Baseplate material	: Cu
Creepage distance – Terminal to heatsink	: 33mm
Creepage distance – Terminal to terminal	: 33mm
Clearance – Terminal to heatsink	: 19mm
Clearance – Terminal to terminal	: 19mm
CTI (Comparative Tracking Index)	: >400

Symbol	Parameter	Test Conditions	Min.	Max.	Units
R _{th(j-c)}	Thermal resistance– IGBT	Continuous dissipation - junction to case	-	30	°C/kW
R _{th(j-c)}	Thermal resistance – diode			54	
R _{th(c-h)}	Thermal resistance – case to heatsink (IGBT)	Mounting torque 5Nm (with mounting grease 1W/m °C)	-	19.5	
R _{th(c-h)}	Thermal resistance – case to heatsink (Diode)			35	
T _j	Junction temperature	IGBT	-40	150	°C
		Diode			
F _{stg}	Storage temperature range	-			
	Screw torque	Mounting – M5	3	6	Nm
		Electrical connections – M8	8	10	

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 = 40mA, V _{GE} = V _{CE}	5.2	5.8	6.4	V
V _{CE(sat)}	Collector-emitter saturation voltage	V _{GE} = 15V, I _C = 650A		1.85	2.25	
		V _{GE} = 15V, I _C = 650A, T _J = 125°C		2.2	2.6	
		V _{GE} = 15V, I _C = 650A, T _J = 150°C		2.3	2.7	
I _F	Diode forward current	DC		650		A
I _{FM}	Diode maximum forward current	t _p = 1ms		1300		
V _F	Diode forward voltage	I _F = 650A		1.8	2.2	V
		I _F = 650A, T _J = 125°C		1.9	2.3	
		I _F = 650A, T _J = 150°C				
C _{ies}	Input capacitance	V _{CE} = 25V, V _{GE} = 0V, f = 100kHz		83		nF
Q _g	Gate charge	±15V		7.7		µC
C _{res}	Reverse transfer capacitance	V _{CE} = 25V, V _{GE} = 0V, f = 100kHz		1		nF
L _M	Module inductance			18		nH
R _{INT}	Internal transistor resistance			0.3		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		3300		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 = 650A V _{CE} = 900V V _{GE} = ±15V R _{G(OFF)} = 2.7Ω R _{G(ON)} = 1.8Ω L _S ~ 70nH	dv/dt = 4500V/μs		1055		ns
t _f	Fall time				360		
E _{OFF}	Turn-off energy loss				155		
t _{d(on)}	Turn-on delay time		di/dt = 4200A/μs		495		ns
t _r	Rise time				170		
E _{ON}	Turn-on energy loss				165		
Q _{rr}	Diode reverse recovery charge	I _F = 650A V _{CE} = 900V di/dt = 4200A/μs			155		μC
I _{rr}	Diode reverse recovery current				610		A
E _{rec}	Diode reverse recovery energy				100		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 = 650A V _{CE} = 900V V _{GE} = ±15V R _{G(OFF)} = 2.7Ω R _{G(ON)} = 1.8Ω L _s ~ 70nH	dv/dt = 4500V/μs		1145		ns
t _f	Fall time				450		
E _{OFF}	Turn-off energy loss				200		
t _{d(on)}	Turn-on delay time		di/dt = 4200A/μs		485		ns
t _r	Rise time				170		
E _{ON}	Turn-on energy loss				195		
Q _{rr}	Diode reverse recovery charge	I _F = 650A V _{CE} = 900V di/dt = 4200A/μs			250		μC
I _{rr}	Diode reverse recovery current				700		A
E _{rec}	Diode reverse recovery energy				165		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 = 650A V _{CE} = 900V V _{GE} = ±15V R _{G(OFF)} = 2.7Ω R _{G(ON)} = 1.8Ω L _S ~ 70nH	dv/dt = 4500V/μs		1170		ns
t _r	Fall time				550		
E _{OFF}	Turn-off energy loss				210		
t _{d(on)}	Turn-on delay time		di/dt = 4200A/μs		480		ns
t _r	Rise time				160		
E _{ON}	Turn-on energy loss				210		
Q _{rr}	Diode reverse recovery charge	I _F = 650A V _{CE} = 900V di/dt = 4200A/μs			280		μC
I _{rr}	Diode reverse recovery current				780		A
E _{rec}	Diode reverse recovery energy				190		mJ

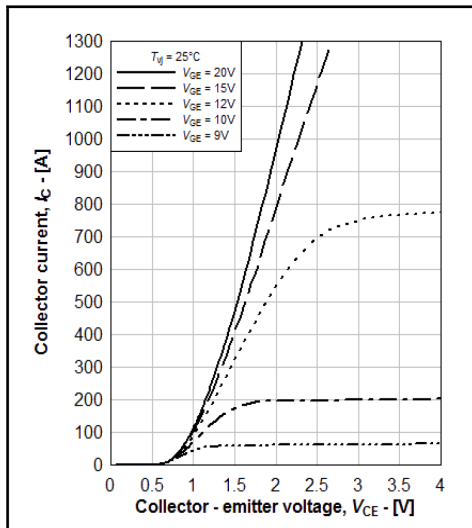


Fig. 3 Typical output characteristics

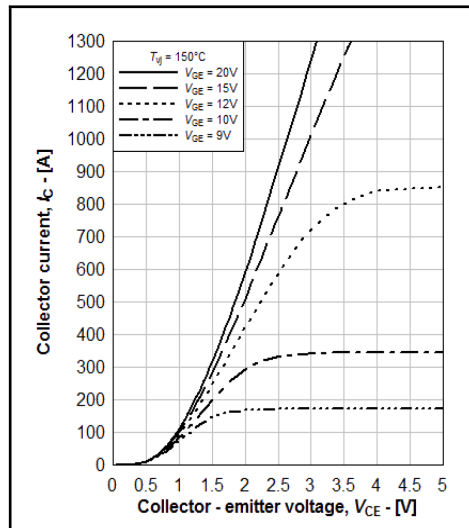


Fig. 4 Typical output characteristics

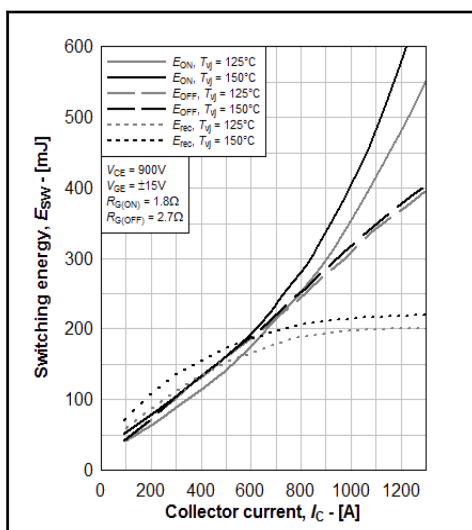


Fig. 5 Typical switching energy vs collector current

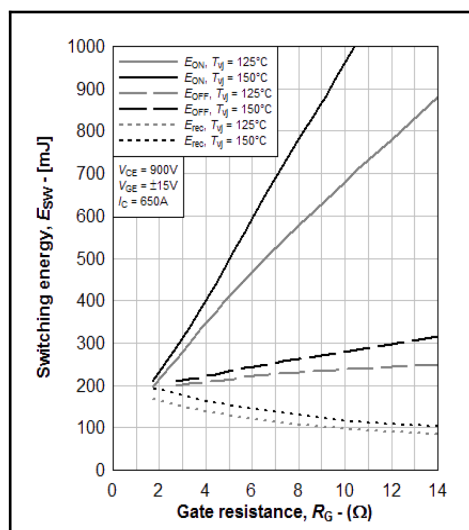


Fig. 6 Typical switching energy vs gate resistance

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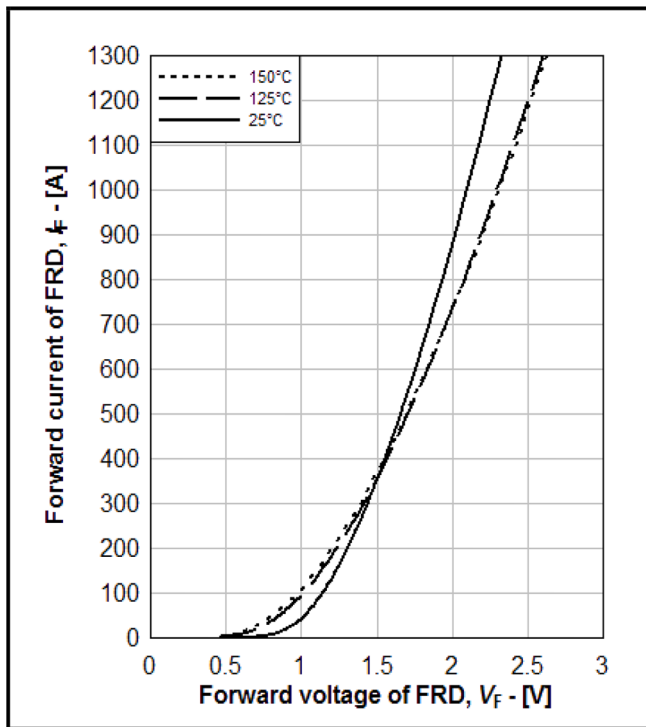


Fig. 7 Diode typical forward characteristics

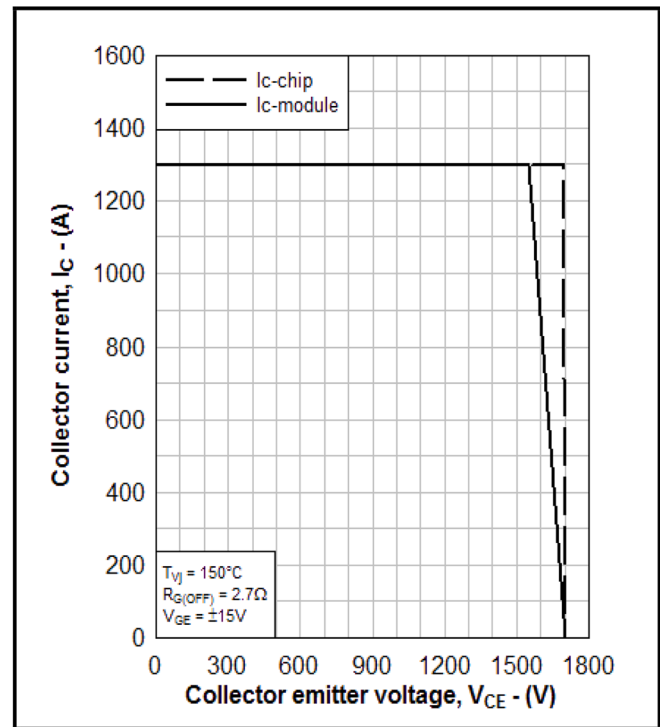


Fig. 8 Reverse bias safe operating area

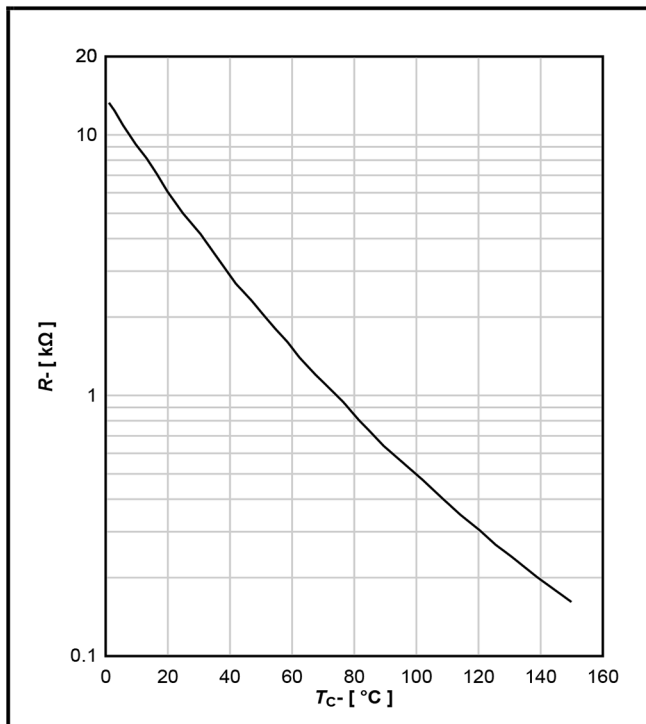


Fig. 9 Typical NTC thermistor characteristics

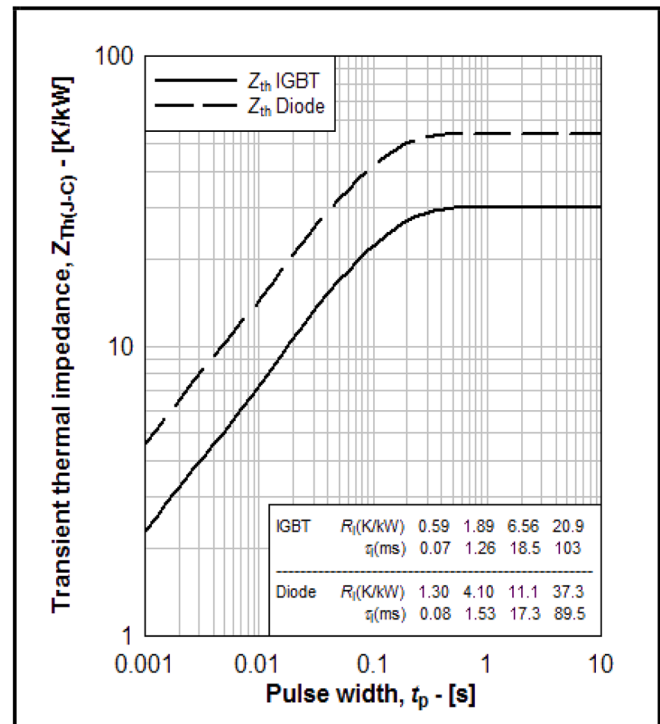
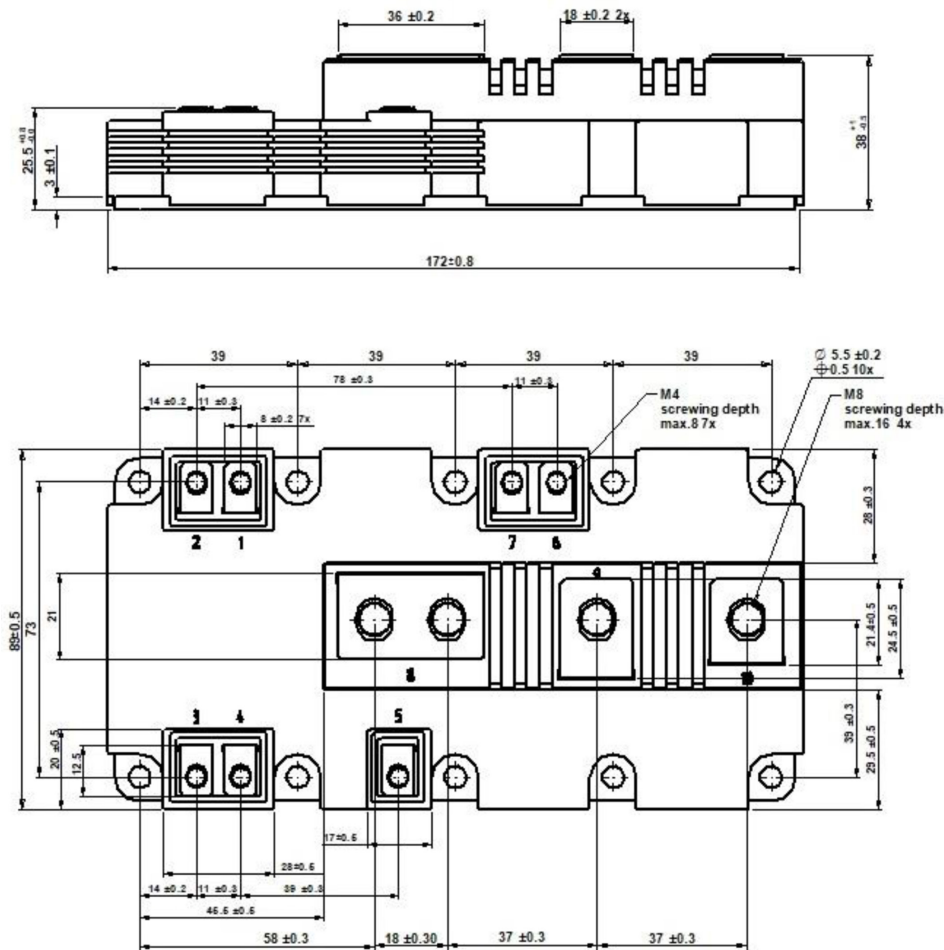


Fig. 10 Transient thermal impedance

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Nominal Weight: 900g

Part Number Table

Description	Part Number
Half Bridge IGBT Module, 1700V, 650A, H2 Case Code	MPIM650H217TG5

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