

Product Introduction

The CIM1500T450PMDA is a single IGBT module primarily designed for motor control, smart grids, and high-reliability inverter applications. Featuring a dedicated form-factor design, it delivers excellent thermal cycling performance and a high withstand voltage of 4500V, making it a critical component for various high-voltage applications.

Features

AlSiC Baseplate

AlN Substrates

High Thermal Cycling Capability

10 μ s Short Circuit Withstand

Collector-emitter current up to 1500A (T_c=80°C)

Collector-emitter saturation Voltage is 2.55V (type)

Typical Applications

Traction Drives

Module appearance

Smart Grid

High Reliability Inverter

Circuit Configuration

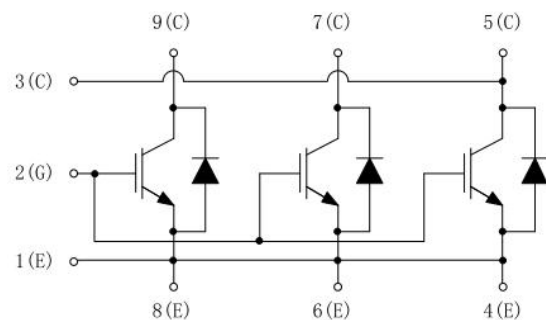


Figure 1 Circuit Configuration

Module Appearance



Figure 2. Module appearance

Absolute Maximum Ratings

Parameter	Symbol	Test Conditions	Value			Unit
			Min	Typ.	Max	
Collector-emitter voltage	V_{CES}	$V_{GE} = 0V, T_C = 25\text{ }^{\circ}C$			4500	V
Gate-emitter voltage	V_{GES}	$T_C = 25\text{ }^{\circ}C$			± 20	V
Collector-emitter current	I_C	$T_C = 80^{\circ}C, T_{vj} \text{ max} = 150^{\circ}C$			1500	A
Peak collector current	$I_{C(PK)}$	$t_P = 1ms$			3000	A
Max. transistor power dissipation	P_{max}	$T_{vj} = 150^{\circ}C, T_C = 25\text{ }^{\circ}C$			15.6	kW
Diode I^2t	I^2t	$V_R = 0V, T_P = 10ms, T_{vj} = 150\text{ }^{\circ}C$			1040	kA^2s
Isolation voltage - per module	V_{ISO}	(Connected terminals to base plate), AC RMS, 1 min, 50Hz, $T_C = 25\text{ }^{\circ}C$			10.2	kV
Partial discharge - per module	Q_{PD}	IEC1287. $V_1 = 6900V, V_2 = 5100V, 50Hz$ RMS			10	pC

Thermal & Mechanical Data

Parameter	Symbol	Test Conditions	Value			Unit
			Min	Typ.	Max	
Creepage distance		Terminal to heatsink	-	60.0	-	mm
		Terminal to terminal	-	56.0	-	mm
Clearance		Terminal to heatsink	-	26.0	-	mm
		Terminal to terminal	-	26.0	-	mm
CTI (Comparative Tracking Index)				> 600		
Thermal resistance - IGBT	$R_{th(J-C)}$ IGBT				8	K/kW
Thermal resistance - Diode	$R_{th(J-C)}$ Diode				11.7	K/kW
Thermal resistance -case to heatsink (IGBT)	$R_{th(C-H)}$ IGBT	Mounting torque 5Nm , with mounting grease $1W/m^{\circ}C$		7		K/kW
Thermal resistance -case to heatsink (Diode)	$R_{th(C-H)}$ Diode			8		K/kW
Operating junction temperature	$T_{vj\text{ op}}$	IGBT	-40		150	$^{\circ}C$
		Diode	-40		150	$^{\circ}C$
Storage temperature range	T_{stg}		-40		150	$^{\circ}C$
Screw torque	M	Mounting – M6			5	Nm
		Electrical connections –M4			2	Nm
		Electrical connections –M8			10	Nm

Electrical Characteristics($T_C=25\text{ }^{\circ}\text{C}$ unless otherwise stated)

Parameter	Symbol	Test Conditions		Value			Unit
				Min	Typ.	Max	
Collector cut-off current	I _{CES}	V _{GE} = 0V, V _{CE} = V _{CES}		-	-	1	mA
		V _{GE} = 0V, V _{CE} = V _{CES} , T _C =125 °C		-	-	90	mA
		V _{GE} = 0V, V _{CE} = V _{CES} , T _C =150 °C		-	-	120	mA
Gate leakage current	I _{GES}	V _{GE} = ±20V, V _{CE} = 0V		-	-	1	μA
Gate threshold voltage	V _{GE (th)}	I _C = 120mA, V _{GE} = V _{CE}		5.80	6.40	7.00	V
Collector-emitter saturation voltage	V _{CE (sat)} ^(*1)	V _{GE} =15V, I _C = 1500A		-	2.55	2.95	V
		V _{GE} =15V, I _C = 1500A, Tvj = 125 °C		-	3.10	-	V
		V _{GE} =15V, I _C = 1500A, Tvj = 150 °C		-	3.20	-	V
Diode forward current	I _F	DC		-	1500	-	A
Diode peak forward current	I _{FRM}	t _p = 1ms		-	3000	-	A
Diode forward voltage	V _F ^(*1)	V _{GE} =15V, I _C = 1500A		-	2.50	2.90	V
		V _{GE} =15V, I _C = 1500A, Tvj = 125 °C		-	2.95	-	V
		V _{GE} =15V, I _C = 1500A, Tvj = 150 °C		-	2.95	-	V
Short circuit current	I _{SC}	Tvj = 150°C, V _{CC} = 3400V, V _{GE} ≤15V, Tp ≤10μs, V _{CE(max)} = V _{CES} - L ^(*2) ×di/dt, IEC 60747-9		-	6800	-	A
Input capacitance	Ci _{es}	V _{CE} = 25V, V _{GE} = 0V, f = 100kHz			445		nF
Gate charge	Q _g	±15V			25.6		μC
Reverse transfer capacitance	Cr _{es}	V _{CE} = 25V, V _{GE} = 0V, f = 100kHz			0.27		nF
Module stray inductance	L _{sCE}				9		nH
Module lead resistance, terminal-chip	R _{CC+EE}				100		μΩ
internal gate resistor	R _{Gint}				1.5		Ω
Turn-off delay time	T _{d(off)}	I _C =1500A, V _{CE} =2800V, V _{GE} = ±15V, R _{G(OFF)} = 3.3Ω , C _{GE} = 330nF, L _S = 70nH, dv/dt =3000V/μs (Tvj= 150 °C).	Tvj= 25°C	-	3015	-	ns
			Tvj= 125°C	-	3630	-	
			Tvj= 150°C	-	3775	-	
Fall time	T _f		Tvj= 25°C	-	740	-	ns
			Tvj= 125°C	-	1565	-	
			Tvj= 150°C	-	1870	-	
Turn-off energy loss	E _{OFF}		Tvj= 25°C	-	2965	-	mJ
			Tvj= 125°C	-	4620	-	
			Tvj= 150°C	-	5230	-	

Electrical Characteristics($T_C = 25\text{ }^{\circ}\text{C}$ unless otherwise stated)

Parameter	Symbol	Test Conditions		Value			Unit
				Min	Typ.	Max	
Turn-on delay time	t _{d(on)}	I _C =1500A, V _{CE} =2800V, V _{GE} = ±15V, R _{G(ON)} = 1.0Ω , C _{GE} = 330nF, L _S = 70nH, di/dt =3600A/μs (T _{vj} = 150 °C).	T _{vj} = 25°C	-	1075	-	ns
			T _{vj} = 125°C	-	1135	-	
			T _{vj} = 150°C	-	1165	-	
Rise time	Tr		T _{vj} = 25°C	-	360	-	ns
			T _{vj} = 125°C	-	360	-	
			T _{vj} = 150°C	-	365	-	
Turn-on energy loss	E _{ON}		T _{vj} = 25°C	-	5415	-	mJ
			T _{vj} = 125°C	-	6710	-	
			T _{vj} = 150°C	-	7345	-	
Diode reverse recovery charge	Q _{rr}	T _{vj} = 25°C	-	1130	-	μC	
		T _{vj} = 125°C	-	1745	-		
		T _{vj} = 150°C	-	1990	-		
Diode reverse recovery current	I _{rr}	T _{vj} = 25°C	-	1295	-	A	
		T _{vj} = 125°C	-	1350	-		
		T _{vj} = 150°C	-	1365	-		
Diode reverse recovery energy	E _{rec}	T _{vj} = 25°C	-	1495	-	mJ	
		T _{vj} = 125°C	-	2665	-		
		T _{vj} = 150°C	-	3100	-		

Note:

- (*1) indicates it is measured at the auxiliary busbar terminal)
- (*2) indicates L is the circuit stray inductance plus L_{sCE}).

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