

CMT-PLA1BL12300MA DATASHEET

Version: 1.3
3-Oct-25
(Last Modification
Date)

1200V/300A Half-Bridge IGBT Power Module

General description

The CMT-PLA1BL12300MA is a 1200V/300A half-bridge IGBT Power Module based on Trench Gate Field Stop (TG-FS) technology. Designed and qualified for demanding industrial applications, it features low saturation voltage and delivers a continuous DC collector current up to 450A. It also features fast switching and short tail currents, as well as a freewheeling diode optimized for fast and soft reverse recovery. The module is guaranteed for reliable operation across the full junction temperature range from -40°C to +175°C (Tj).

Benefits

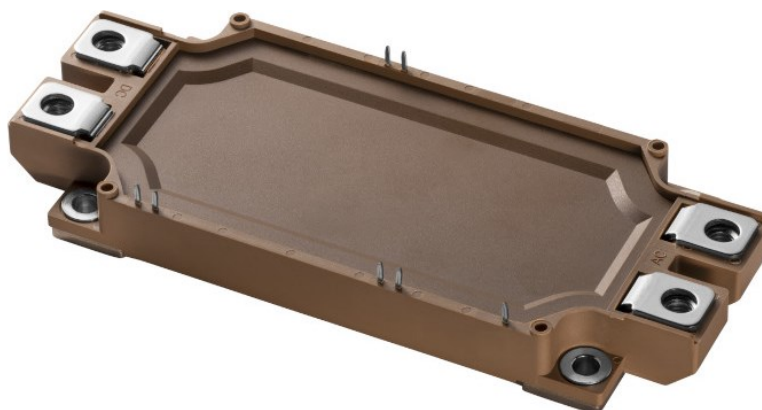
- Trench Gate Field Stop Technology
- $V_{CE(sat)}$ with positive temperature coefficient
- Fast switching and short tail current
- Free wheeling diodes with fast and soft reverse recovery
- Max Junction Temperature of 175°C
- Low Switching Losses

Features

- Specified from -40 to +175°C (Tj)
- Max Collector Voltage: 1200V
- DC Collector Current
 - @ $T_c=90^\circ\text{C}$: 450A
 - @ $T_c=125^\circ\text{C}$: > 300A
- Low Saturation Voltage
 - $V_{CE(sat)} = 1.56\text{V}$ @ $I_c=300\text{A}$, $T_j=25^\circ\text{C}$
 - $V_{CE(sat)} = 1.78\text{V}$ @ $I_c=300\text{A}$, $T_j=150^\circ\text{C}$
- Low Switching Energy
 - $E_{on} = 34\text{mJ}$ at $T_j=150^\circ\text{C}$
 - $E_{off} = 34.5\text{mJ}$ $T_j=150^\circ\text{C}$
- Gate charge: $Q_G=2.3\mu\text{C}$
- Package : CPAK-EDC

Applications

- High Frequency Switching
- Medical Applications
- Motion/Servo Control
- UPS Systems & Power Supplies



Absolute Maximum Ratings

IGBT

Parameter	Symbol	Condition	Value	Unit
Collector Emitter Voltage	V_{CES}	$T_J=25^{\circ}\text{C}$	1200	V
Gate Emitter Voltage	V_{GES}		+/-20	V
DC Collector Current	I_C	$T_C=25^{\circ}\text{C}, T_{Jmax}=175^{\circ}\text{C}$	660	A
DC Collector Current	I_C	$T_C=90^{\circ}\text{C}, T_{Jmax}=175^{\circ}\text{C}$	450	A
DC Collector Current	I_C	$T_C=125^{\circ}\text{C}, T_{Jmax}=175^{\circ}\text{C}$	330	A
Repetitive Peak Collector Current	I_{CM}	$T_p=1\text{ms}$	900	A
Power Dissipation per IGBT	P_{TOT}	$T_C=25^{\circ}\text{C}, T_{Jmax}=175^{\circ}\text{C}$	2142	W
Junction Temperature	T_{Jmax}		175	$^{\circ}\text{C}$

Diode

Parameter	Symbol	Condition	Value	Unit
Repetitive Reverse Voltage	V_{RSM}	$T_J=25^{\circ}\text{C}$	1200	V
Average Forward Current	$I_{F(AVG)}$		450	A
Repetitive Peak Forward Current	I_{FRM}	$T_p=1\text{ms}$	900	A
I^2t - value	I^2t	$T_J=150^{\circ}\text{C}, t=10\text{ms}, V_R=0\text{V}$	31.25	kA^2s
Junction Temperature	T_{Jmax}		175	$^{\circ}\text{C}$

THERMAL RESISTANCE

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Junction-to-case thermal resistance	R_{thJC}	Per IGBT			0.065	$^{\circ}\text{C/W}$
Junction-to-case thermal resistance	R_{thJFC}	Per Diode			0.1	

IGBT Electrical characteristics

Unless otherwise stated, $T_j = 25^\circ\text{C}$.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Gate Emitter Threshold Voltage	$V_{GE(TH)}$	$V_{CE} = V_{GE}$, $I_C = 18\text{mA}$	5.0	5.8	6.5	V
Collector Emitter Saturation Voltage	$V_{CE(Sat)}$	$I_C = 300\text{A}$, $V_{GE} = 15\text{V}$, $T_j = 25^\circ\text{C}$		1.56		V
		$I_C = 300\text{A}$, $V_{GE} = 15\text{V}$, $T_j = 150^\circ\text{C}$		1.78		
		$I_C = 450\text{A}$, $V_{GE} = 15\text{V}$, $T_j = 25^\circ\text{C}$		1.85		
		$I_C = 450\text{A}$, $V_{GE} = 15\text{V}$, $T_j = 150^\circ\text{C}$		2.2		
Collector Leakage Current	I_{CES}	$V_{CE} = 1200\text{V}$, $V_{GE} = 0\text{V}$, $T_j = 25^\circ\text{C}$			1	mA
		$V_{CE} = 1200\text{V}$, $V_{GE} = 0\text{V}$, $T_j = 150^\circ\text{C}$			10	
Gate Leakage Current	I_{GES}	$V_{CE} = 0\text{V}$, $V_{GE} = \pm 20\text{V}$, $T_j = 25^\circ\text{C}$	-400		400	nA
Integrated Gate Resistor	R_{gint}			1.2		Ω
Gate Charge	Q_G	$V_{CE} = 600\text{V}$, $I_C = 450\text{A}$,		2.3		μC
Input Capacitance	C_{IES}	$V_{CE} = 25\text{V}$, $V_{GE} = 0\text{V}$, $f = 1\text{MHz}$		33		nF
Reverse Transfer Capacitance	C_{RES}			1.7		
Turn-on delay time	$T_{d(ON)}$			120		ns
Rise time	T_r	$T_j = 25^\circ\text{C}$		150		
		$T_j = 150^\circ\text{C}$		80		
Turn-off delay time	$T_{d(OFF)}$	$T_j = 25^\circ\text{C}$		90		
		$T_j = 150^\circ\text{C}$		510		
Fall time	T_f	$T_j = 25^\circ\text{C}$		580		
		$T_j = 125^\circ\text{C}$		90		
Turn-On Switching Energy	E_{on}	$T_j = 125^\circ\text{C}$		200		mJ
Turn-Off Switching Energy	E_{off}	$T_j = 125^\circ\text{C}$		38		
		$T_j = 150^\circ\text{C}$		62.5		
Turn-On Switching Energy	E_{on}	$T_j = 125^\circ\text{C}$		45		mJ
Turn-Off Switching Energy		$T_j = 150^\circ\text{C}$		48.5		
Turn-On Switching Energy	E_{on}	$V_{CC} = 600\text{V}$; $V_{GE} = \pm 15\text{V}$; $I_C = 300\text{A}$; $R_G = 1.5\Omega$; $T_j = 150^\circ\text{C}$; Inductive load		34		mJ
Turn-Off Switching Energy				34.5		
Short Circuit Current	E_{off}	$t_{psc} \leq 10\mu\text{s}$, $V_{GE} = 15\text{V}$ $T_j = 150^\circ\text{C}$, $V_{CC} = 800\text{V}$		1500		A
Operating Junction temperature	T_{jop}		-40		150	$^\circ\text{C}$

Anti-Parallel Diode Electrical Characteristics

Unless otherwise stated, $T_j = 25^\circ\text{C}$.

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Diode Forward Voltage	V_F	$I_F = 300\text{A}$; $V_{GE} = 0\text{V}$; $T_j = 25^\circ\text{C}$;		1.58		V
		$I_F = 300\text{A}$; $V_{GE} = 0\text{V}$; $T_j = 125^\circ\text{C}$;		1.41		
		$I_F = 300\text{A}$; $V_{GE} = 0\text{V}$; $T_j = 150^\circ\text{C}$;		1.38		
		$I_F = 450\text{A}$; $V_{GE} = 0\text{V}$; $T_j = 25^\circ\text{C}$;		1.8		
		$I_F = 450\text{A}$; $V_{GE} = 0\text{V}$; $T_j = 125^\circ\text{C}$;		1.65		
		$I_F = 450\text{A}$; $V_{GE} = 0\text{V}$; $T_j = 150^\circ\text{C}$;		1.65		
Reverse Recovery Time	T_{rr}	$I_F = 450\text{A}$; $V_R = 600\text{V}$; $di_F/dt = -4700\text{A}/\mu\text{S}$; $T_j = 150^\circ\text{C}$;		500		ns
Peak Reverse Recovery Current	I_{RRM}			360		A
Reverse Recovery Charge	Q_{RR}			83.5		μC
Reverse Recovery Energy	E_{rec}			31		mJ
Operating Junction temperature	T_{jop}		-40		150	$^\circ\text{C}$

NTC Characteristics

Unless otherwise stated, $T_{NTC} = 25^{\circ}\text{C}$.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Resistance	R_{25}	$T_{NTC}=25^{\circ}\text{C}$		5		$\text{k}\Omega$
B Value	$B_{25/50}$	$R_{NTC}(T) = R_{25} \exp [B_{25/50}(1/T - 1/(298.15 \text{ K}))]$		3375		K

Module Characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Storage Temperature	T_{st}		-40		125	$^{\circ}\text{C}$
Isolation Breakdown Voltage	V_{isol}	AC, 50Hz(R.M.S), $t=1\text{minute}$		3		kV
Comparative Tracking Index	CTI		225			
Creepage distance	d_{Creep}	Terminal to heatsink		14.5		mm
		Terminal to terminal		12.7		mm
Clearance	d_{Clear}	Terminal to heatsink		12.5		Mm
		Terminal to terminal		10		mm
Mounting Torque		Baseplate to heatsink (M5 recommended)	2.5		5	Nm
		Terminal (M6 recommended)	3		5	Nm
Weight				350		g

Typical Performance Characteristics

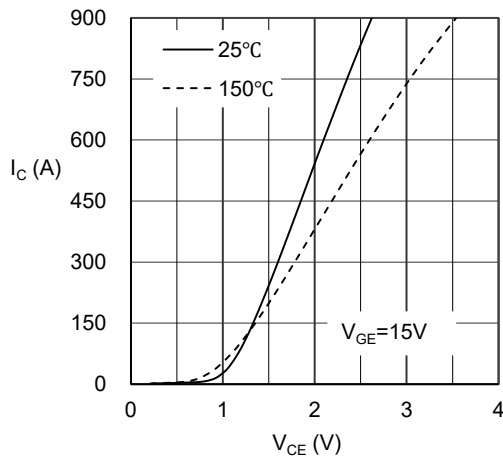


Figure 1: Typical Output Characteristics

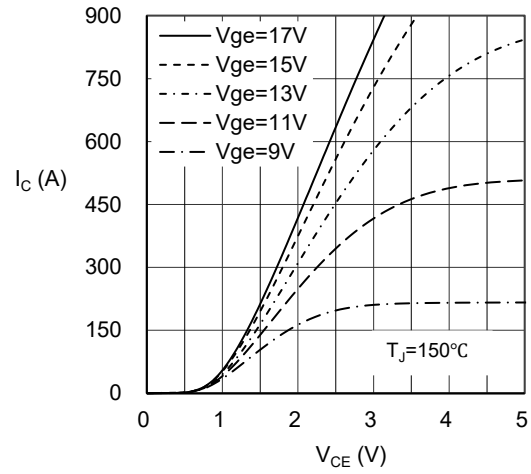


Figure 2: Typical Output Characteristics

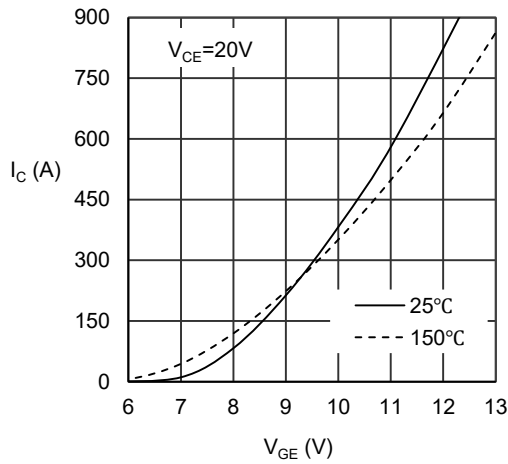


Figure 3: Typical Transfer characteristics

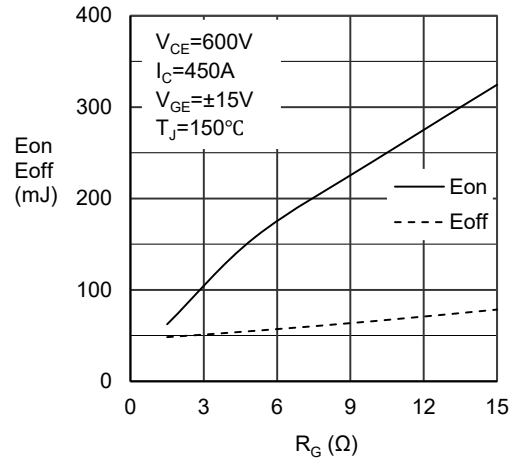


Figure 4: Switching energies vs R_G

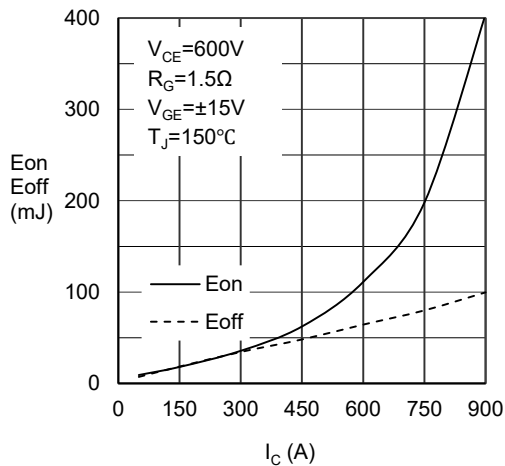


Figure 5: Switching energies
vs Collector Current

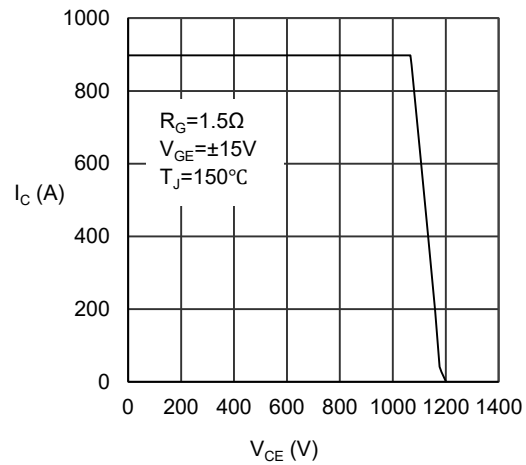


Figure 6: Reverse Bias
Safe Operating Area

Typical Performance Characteristics (cnt'd)

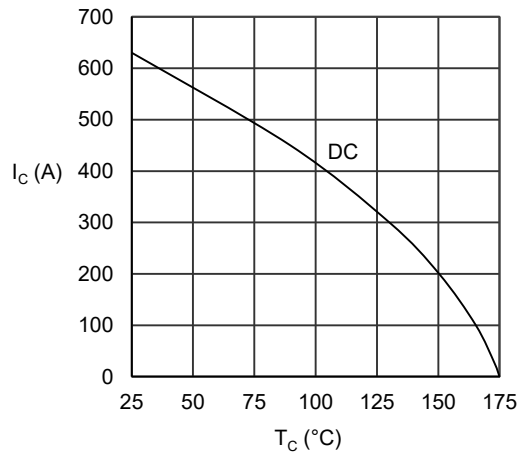


Figure 7: Collector Current vs T_{Case} - IGBT

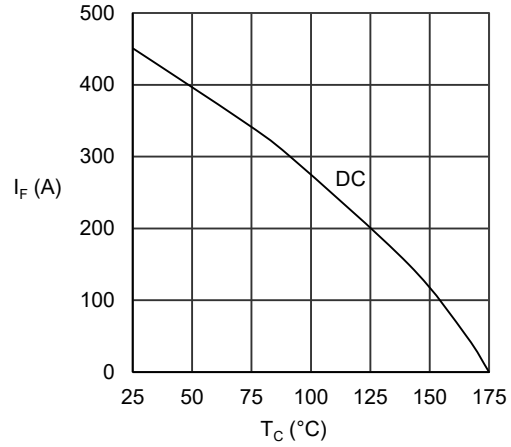


Figure 8: Forward Current vs T_{Case} - Diode

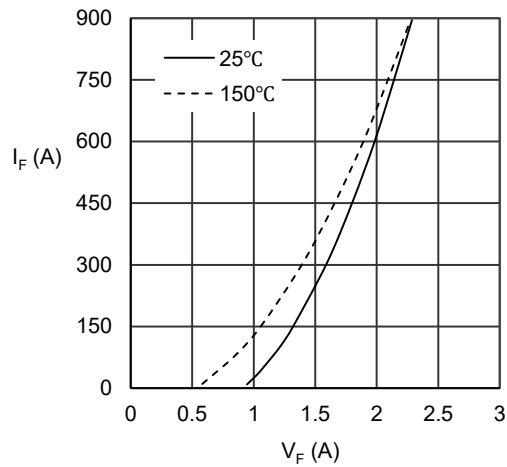


Figure 9: Diode Forward Characteristics

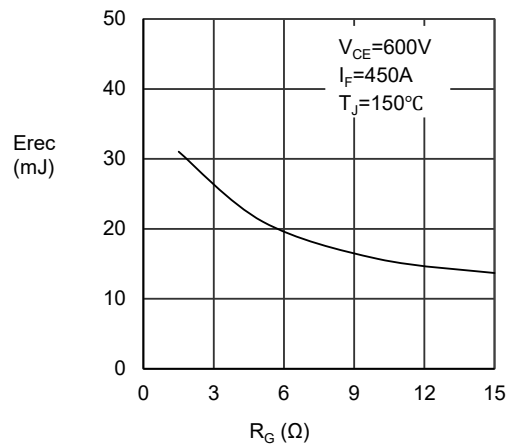


Figure 10: Transient Thermal Impedance

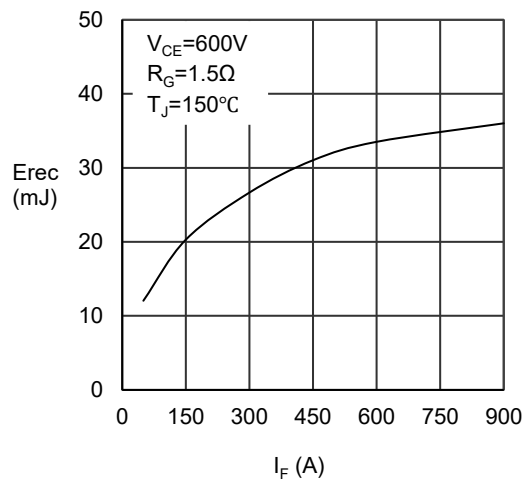


Figure 11: Reverse Recovery Energy vs I_F

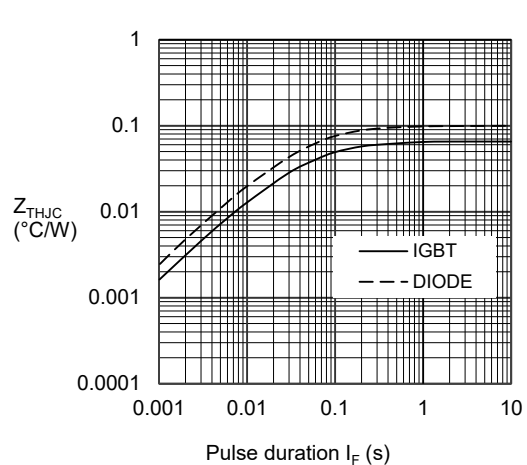


Figure 12: Transient Thermal Impedances

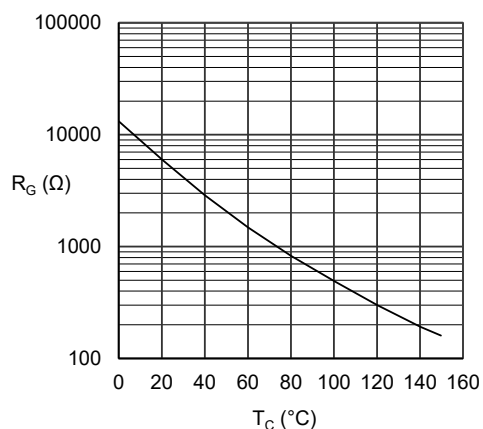
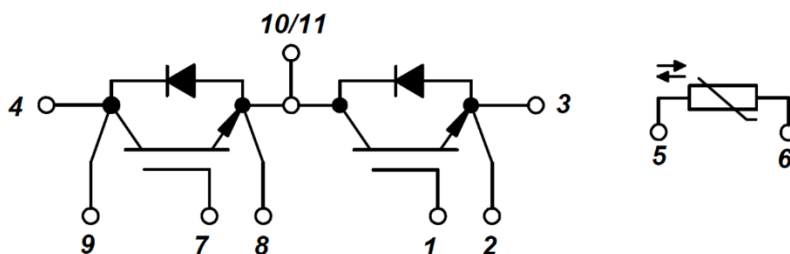
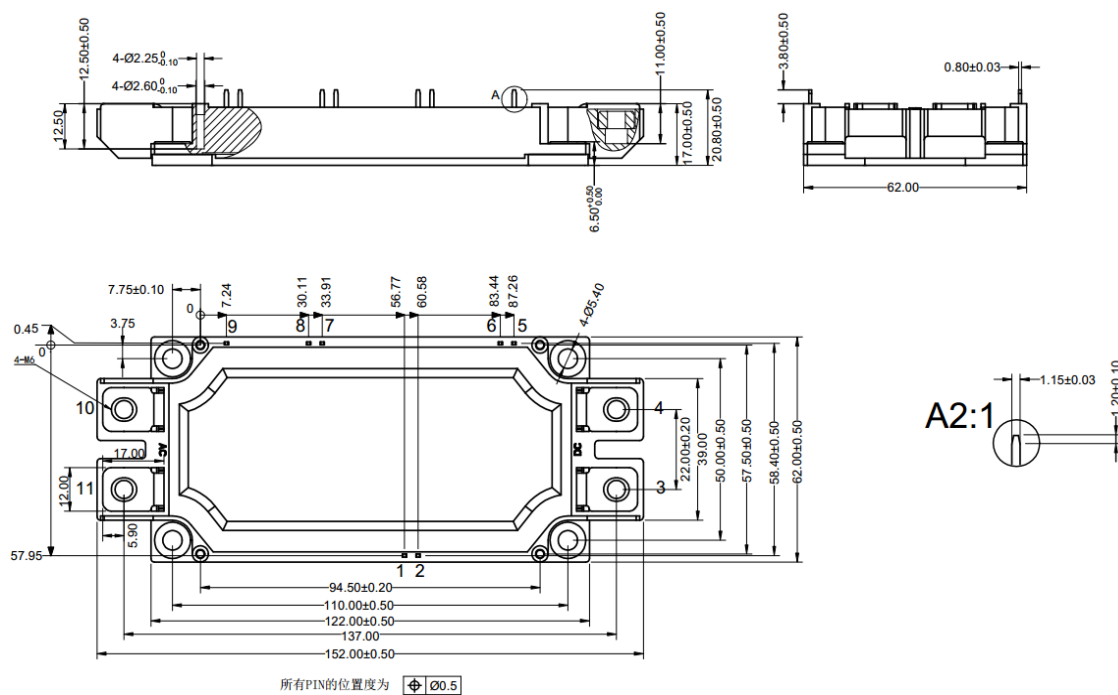


Figure 13: Reverse Recovery Energy vs I_F

Package Configuration



Package Dimensions (in mm)



Ordering Information

Product Name	Ordering Reference	Package	Marking
CMT-PLA1BL12300MA	CMT-PLA1BL12300MA	CPAK-EDC	CMT-PLA1BL12300MA

Contact & Ordering

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