

CMT-PLA1BK12300MA DATASHEET

Version: 1.1
3-Oct-25
(Last Modification
Date)

1200V/300A Half-Bridge IGBT Power Module

General description

The CMT-PLA1BK12300MA is a 1200V/300A half-bridge IGBT Power Module utilizing advanced 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 free-wheeling diode optimized for fast and soft reverse recovery. The module is guaranteed for reliable operation across the full junction temperature range from -40 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
- 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
 - $E_{on} = 32\text{mJ}$ at $T_j=150^\circ\text{C}$
 - $E_{off} = 39.6\text{mJ}$ $T_j=150^\circ\text{C}$
- Gate charge: $Q_G=2.25\mu\text{C}$
- Package: CPAK-62

Applications

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



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	$T_C=25^{\circ}\text{C}, T_{Jmax}=175^{\circ}\text{C}$	630	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	$T_C=125^{\circ}\text{C}, T_{Jmax}=175^{\circ}\text{C}$	325	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	$I_{F(AVG)}$		400	A
Repetitive Peak Forward Current	I_{FRM}	$T_p=1\text{ms}$	800	A
I^2t - value	I^2t	$T_J=150^{\circ}\text{C}, t=10\text{ms}, V_R=0\text{V}$	39.2	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			0.07	$^{\circ}\text{C/W}$
Junction-to-case thermal resistance	R_{thJFC}	Per Diode			0.12	

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 =18mA		5.0	5.8	6.5	V
Collector Emitter Saturation Voltage	V _{CE(Sat)}	I _C =300A, V _{GE} =15V, T _J =25°C			1.56		V
		I _C =300A, V _{GE} =15V, T _J =150°C			1.78		
		I _C =450A, V _{GE} =15V, T _J =25°C			1.85		
		I _C =450A, V _{GE} =15V, T _J =150°C			2.2		
Collector Leakage Current	I _{CES}	V _{CE} =1200V, V _{GE} =0V, T _J =25°C				0.5	mA
		V _{CE} =1280V, V _{GE} =0V, T _J =25°C				1	
Gate Leakage Current	I _{GES}	V _{CE} =0V, V _{GE} =+/-20V, T _J =25°C		-400		400	nA
Integrated Gate Resistor	R _{gint}				1.4		Ω
Gate Charge	Q _G	V _{CE} =600V, I _C =450A,			2.25		μC
Input Capacitance	C _{IES}	V _{CE} =25V, V _{GE} =0V, f = 1 MHz			33.5		nF
Reverse Transfer Capacitance	C _{RES}				1.5		
					1.5		
Input Capacitance	C _{IES}	V _{CE} =50V, V _{GE} =0V, f = 1 MHz			31.5		nF
Reverse Transfer Capacitance	C _{RES}				1.5		
Turn-on delay time	T _{d(ON)}	V _{CC} =600V; V _{GE} = +/-15V; I _C = 450A; R _G = 2.0Ω; Inductive load	T _J =25°C		100		ns
			T _J =150°C		130		
Rise time	T _r		T _J =25°C		78		
			T _J =150°C		86		
Turn-off delay time	T _{d(OFF)}		T _J =25°C		550		
			T _J =125°C		590		
Fall time	T _f		T _J =25°C		120		mJ
			T _J =125°C		220		
Turn-On Switching Energy	E _{on}		T _J =125°C		39		
			T _J =150°C		42		
Turn-Off Switching Energy	E _{off}		T _J =125°C		52		
			T _J =150°C		56		
Turn-On Switching Energy	E _{on}	V _{CC} =600V; V _{GE} = +/-15V; I _C = 300A; R _G = 2.0Ω; T _J =150°C; Inductive load			32		mJ
Turn-Off Switching Energy					39.3		
Short Circuit Current	E _{off}	tpsc≤10μs , V _{GE} =15V T _J =125°C, V _{CC} =800V			1700		A
Operating Junction temperature	T _{jop}			-40		150	°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	$I_F = 300\text{A}$; $V_{GE} = 0\text{V}$; $T_J = 25^\circ\text{C}$;		1.66		V
		$I_F = 300\text{A}$; $V_{GE} = 0\text{V}$; $T_J = 125^\circ\text{C}$;		1.4		
		$I_F = 300\text{A}$; $V_{GE} = 0\text{V}$; $T_J = 150^\circ\text{C}$;		1.34		
		$I_F = 450\text{A}$; $V_{GE} = 0\text{V}$; $T_J = 25^\circ\text{C}$;		1.8		
		$I_F = 450\text{A}$; $V_{GE} = 0\text{V}$; $T_J = 125^\circ\text{C}$;		1.55		
		$I_F = 450\text{A}$; $V_{GE} = 0\text{V}$; $T_J = 150^\circ\text{C}$;		1.5		
Reverse Recovery Time	T_{rr}	$I_F = 450\text{A}$; $V_R = 600\text{V}$; $dl_F/dt = -5300\text{A}/\mu\text{s}$; $T_J = 150^\circ\text{C}$;		530		ns
Peak Reverse Recovery Current	I_{RRM}			485		A
Reverse Recovery Charge	Q_{RR}			133		μC
Reverse Recovery Energy	E_{rec}			59.5		mJ
Operating Junction temperature	T_{jop}		-40		150	$^\circ\text{C}$

Module Characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Storage Temperature	T _{st}		-40		125	°C
Isolation Breakdown Voltage	V _{isol}	AC, 50Hz(R.M.S), t=1minute		3		kV
Comparative Tracking Index	CTI		225			
Creepage distance	d _{Creep}	Terminal to heatsink		29		mm
		Terminal to terminal		23.3		mm
Clearance	d _{Clear}	Terminal to heatsink		23		Mm
		Terminal to terminal		10		mm
Mounting Torque		Baseplate to heatsink (M6 recommended)	3		5	Nm
		Terminal	2.5		5	Nm
Weight				300		g

Typical Performance Characteristics

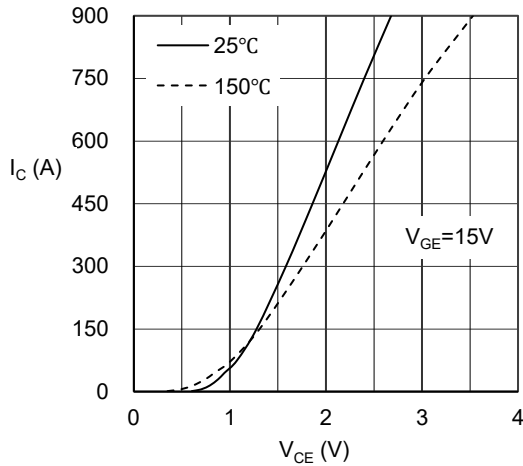


Figure 1: Typical Output Characteristics

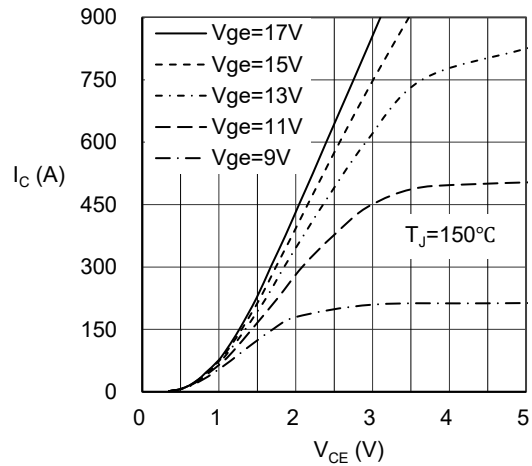


Figure 2: Typical Output Characteristics

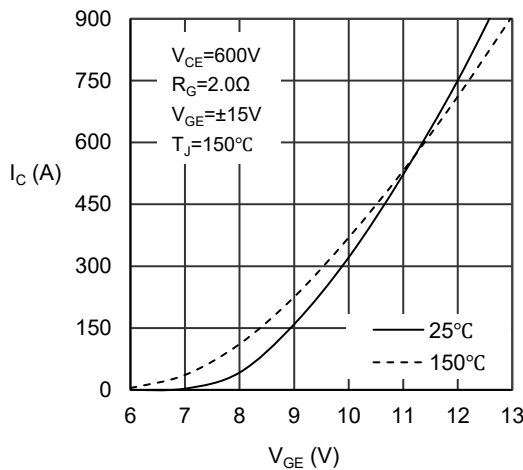


Figure 3: Typical Transfer characteristics

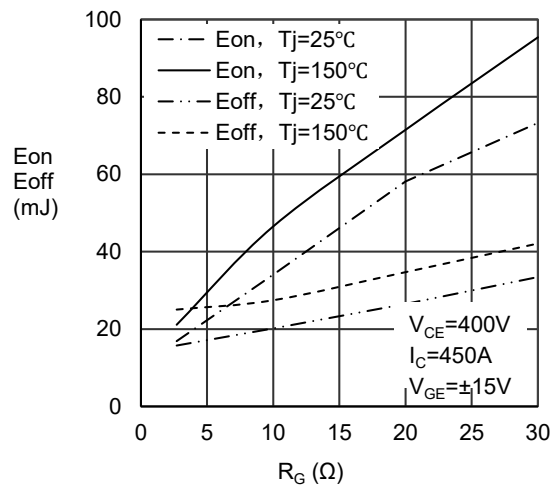


Figure 4: Switching energies vs R_G

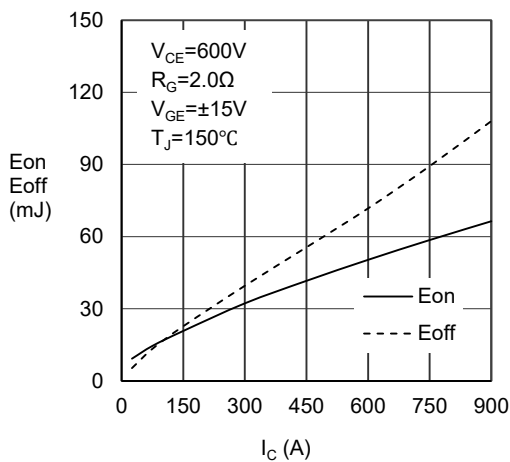


Figure 5: Switching energies
vs Collector Current

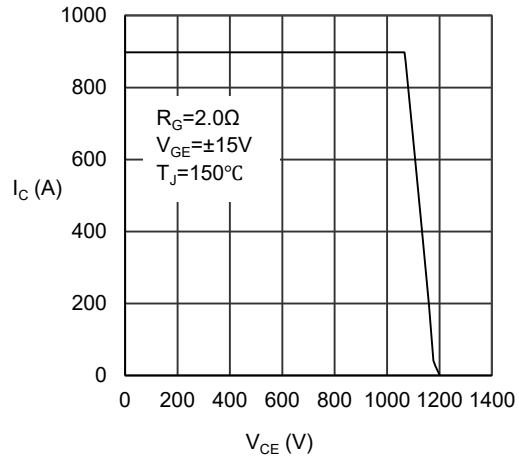


Figure 6: Reverse Bias
Safe Operating Area

Typical Performance Characteristics (cnt'd)

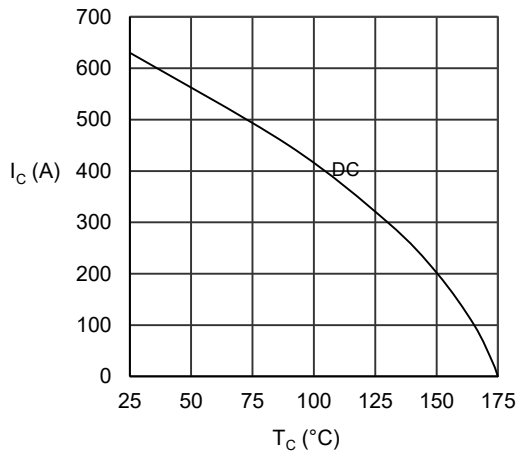


Figure 7: Collector Current vs T_{Case} - IGBT

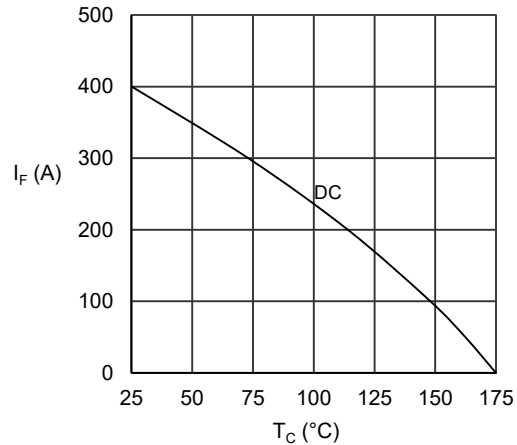


Figure 8: Forward Current vs T_{Case} - Diode

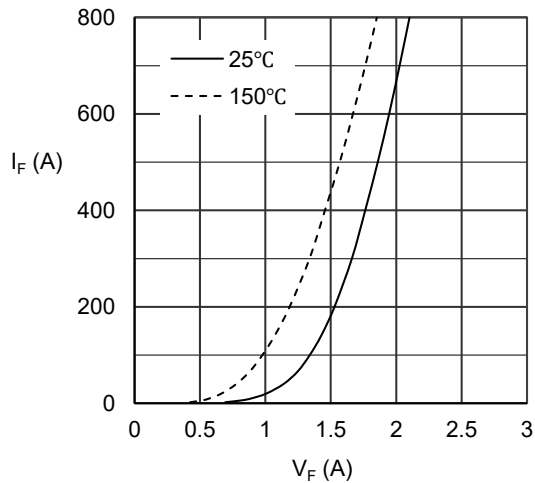


Figure 9: Diode Forward Characteristics

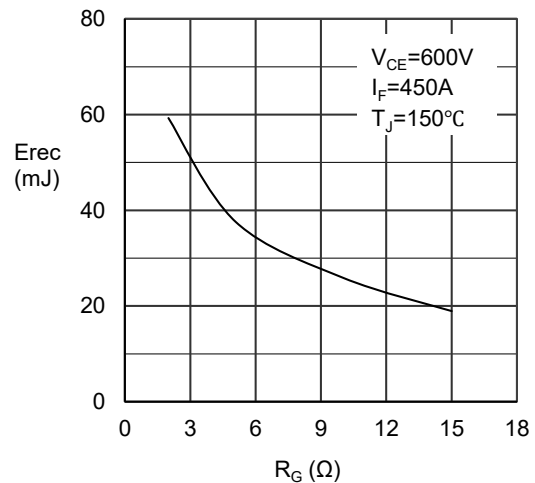


Figure 10: Transient Thermal Impedance

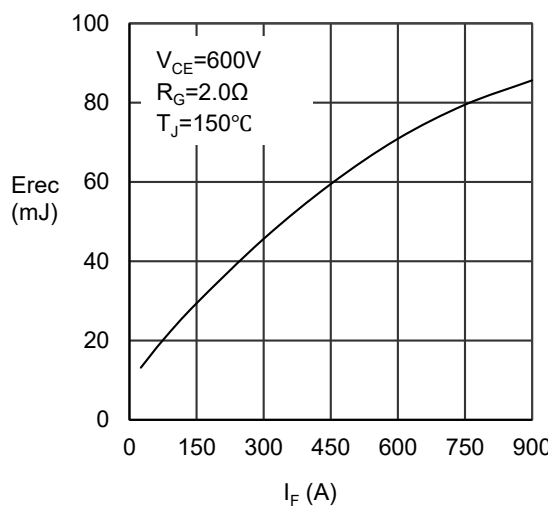


Figure 11: Reverse Recovery Energy vs I_F

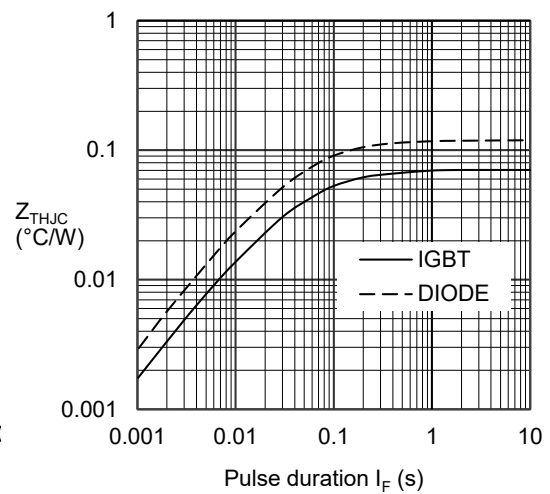
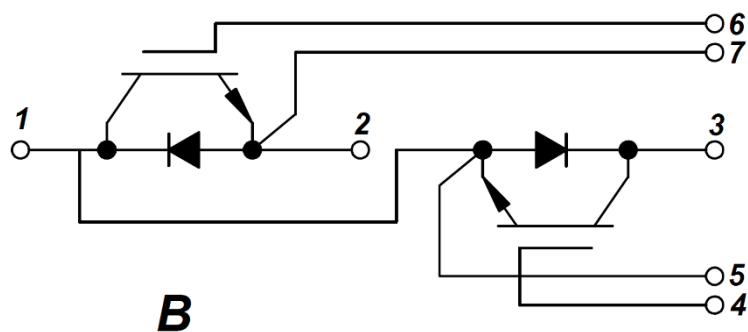
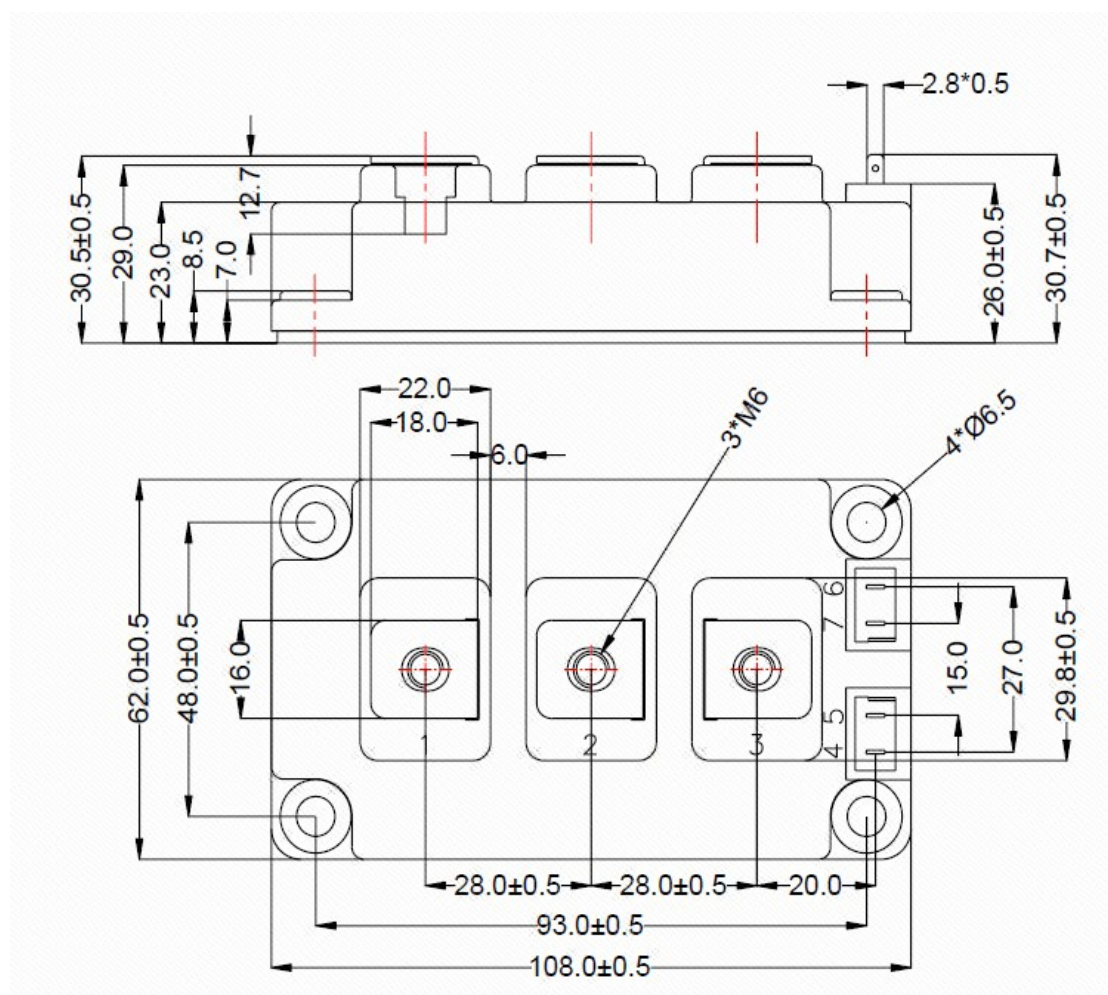


Figure 12: Transient Thermal Impedances

Package Configuration



Package Dimensions (in mm)



Ordering Information

Product Name	Ordering Reference	Package	Marking
CMT-PLA1BK12300MA	CMT-PLA1BK12300MA	CPAK-62	CMT-PLA1BK12300MA

Contact & Ordering

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