

CXT-PLA3BG07820RA DATASHEET

Version: 1.2
2-Oct-25
(Last Modification
Date)

750V/820A 3-Phase IGBT Power Module

General description

CXT-PLA3BG07820RA is a 750V/820A 3-Phase IGBT Power Module based on Trench Gate Field Stop (TG-FS) technology made and qualified for the most stringent automotive applications. The product offers fast switching, short tail currents and easy paralleling. It also features a freewheeling diode with fast and soft reverse recovery.

The innovative heatsink features a dense and ellipsoid pin fin grid, providing improved thermal performance and reduced flow resistance, significantly boosting the cooling capacity of the module. The power module is AQC-324 automotive qualified and guaranteed to operate over the full -40°C to +175°C (Tj) temperature range.

Applications

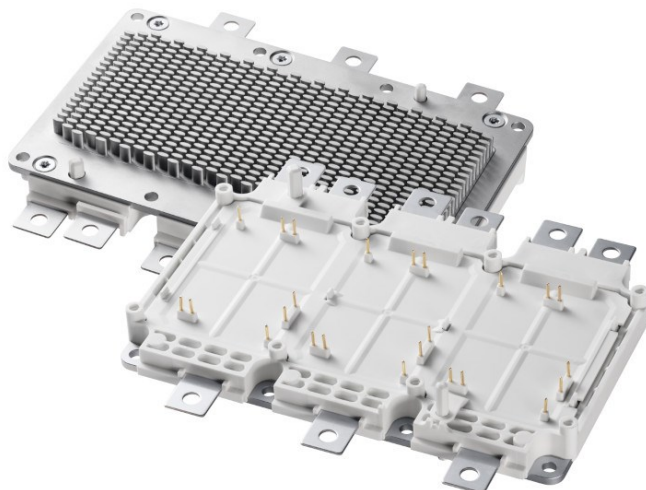
- Traction inverters
- Auxiliary inverters
- Automotive, E-Mobility, e-Trucks, Off-Road Vehicles, Agriculture, e-Boats

Features

- Specified from -40 to +175°C (Tj)
- Max Collector Voltage: 750V
- Implemented Collector Current: 820A
- Low Saturation Voltage
 - $V_{CE(sat)} = 1.15V$ @ $I_c=450A$, $T_j=25^\circ C$
 - $V_{CE(sat)} = 1.25V$ @ $I_c=450A$, $T_j=175^\circ C$
- Low Switching Energy
 - $E_{on} = 16.8mJ$ at $T_j=25^\circ C$
 - $E_{off} = 15.7mJ$ at $T_j=25^\circ C$
- Gate charge: $Q_G=1.2\mu C$
- Package: CPAK-HPC

Benefits

- Trench Gate Field Stop technology
- Low $V_{CE(sat)}$ with positive temperature coefficient
- Fast switching and short tail current
- Free wheeling diodes with fast and soft reverse recovery
- Direct Liquid Cooled Pin Fin Base Plate
- Embedded NTC temperature sensor



Absolute Maximum Ratings

IGBT

Parameter	Symbol	Condition	Value	Unit
Collector Emitter Voltage	V_{CES}	$T_J=25^{\circ}\text{C}$	750	V
Gate Emitter Voltage	V_{GES}		+/-20	V
Implemented Collector Current	I_{CN}		820	A
DC Collector Current	I_C	$T_F=80^{\circ}\text{C}$, $T_{Jmax}=175^{\circ}\text{C}$	450	A
Repetitive Peak Collector Current	I_{CM}	$T_p=1\text{ms}$	1640	A
Power Dissipation per IGBT	P_{TOT}	$T_F=25^{\circ}\text{C}$, $T_{Jmax}=175^{\circ}\text{C}$	1154	W
Junction Temperature	T_{Jmax}		175	$^{\circ}\text{C}$

Diode

Parameter	Symbol	Condition	Value	Unit
Repetitive Reverse Voltage	V_{RSM}	$T_J=25^{\circ}\text{C}$	750	V
Implemented Forward Current	I_F		100	A
Average Forward Current	$I_{F(AVG)}$		450	A
Repetitive Peak Forward Current	I_{FRM}	$T_p=1\text{ms}$	1640	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-fluid thermal resistance	R_{thJF}	IGBT: Junction to cooling fluid, $\Delta V/\Delta t = 10 \text{ dm}^3/\text{min}$, $T_F = 25^{\circ}\text{C}$ (Per IGBT)			0.13	$^{\circ}\text{C}/\text{W}$
Junction-to-fluid thermal resistance	R_{thJFD}	Diode : Junction to cooling fluid, $\Delta V/\Delta t = 10 \text{ dm}^3/\text{min}$, $T_F = 25^{\circ}\text{C}$ (Per Diode)			0.19	

IGBT Electrical characteristics

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

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Gate Emitter Threshold Voltage	$V_{GE(TH)}$	$V_{CE} = V_{GE}$, $I_C = 9.6\text{mA}$	4.6	5.4	6.2	V
Collector Emitter Saturation Voltage	$V_{CE(Sat)}$	$I_C = 450\text{A}$, $V_{GE} = 15\text{V}$, $T_J = 25^\circ\text{C}$		1.15		V
		$I_C = 450\text{A}$, $V_{GE} = 15\text{V}$, $T_J = 150^\circ\text{C}$		1.25		
		$I_C = 450\text{A}$, $V_{GE} = 15\text{V}$, $T_J = 175^\circ\text{C}$		1.25		
		$I_C = 820\text{A}$, $V_{GE} = 15\text{V}$, $T_J = 25^\circ\text{C}$		1.35		
		$I_C = 820\text{A}$, $V_{GE} = 15\text{V}$, $T_J = 150^\circ\text{C}$		1.55		
		$I_C = 820\text{A}$, $V_{GE} = 15\text{V}$, $T_J = 175^\circ\text{C}$		1.6		
Collector Leakage Current	I_{CES}	$V_{CE} = 750\text{V}$, $V_{GE} = 0\text{V}$, $T_J = 25^\circ\text{C}$			1	mA
		$V_{CE} = 750\text{V}$, $V_{GE} = 0\text{V}$, $T_J = 150^\circ\text{C}$			5	
		$V_{CE} = 750\text{V}$, $V_{GE} = 0\text{V}$, $T_J = 175^\circ\text{C}$		4.5	5	
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}			1.4		Ω
Gate Charge	Q_G	$V_{CE} = 400\text{V}$, $I_C = 450\text{A}$,		1.2		μC
Input Capacitance	C_{IES}	$V_{CE} = 25\text{V}$, $V_{GE} = 0\text{V}$, $f = 1\text{MHz}$		33.5		nF
Output Capacitance	C_{OES}			3.2		
Reverse Transfer Capacitance	C_{RES}			0.63		
Input Capacitance	C_{IES}	$V_{CE} = 50\text{V}$, $V_{GE} = 0\text{V}$, $f = 1\text{MHz}$		33.2		nF
Output Capacitance	C_{OES}			2.3		
Reverse Transfer Capacitance	C_{RES}			0.46		
Turn-on delay time	$T_{d(ON)}$	$V_{CC} = 400\text{V}$; $V_{GE} = \pm 15\text{V}$; $I_C = 450\text{A}$; $R_G = 2.7\Omega$; Inductive load	$T_J = 25^\circ\text{C}$	98		ns
			$T_J = 150^\circ\text{C}$	104		
Rise time	T_r		$T_J = 25^\circ\text{C}$	58		
			$T_J = 150^\circ\text{C}$	62		
Turn-off delay time	$T_{d(OFF)}$		$T_J = 25^\circ\text{C}$	480		
			$T_J = 125^\circ\text{C}$	540		
Fall time	T_f		$T_J = 25^\circ\text{C}$	70		mJ
			$T_J = 125^\circ\text{C}$	130		
Turn-On Switching Energy	E_{on}		$T_J = 125^\circ\text{C}$	16.8		
			$T_J = 150^\circ\text{C}$	21.1		
Turn-Off Switching Energy	E_{off}		$T_J = 125^\circ\text{C}$	15.7		mJ
			$T_J = 150^\circ\text{C}$	25		
Short Circuit Current	I_{SC}	$t_{psc} \leq 3\mu\text{s}$, $V_{GE} = 15\text{V}$ $T_J = 150^\circ\text{C}$, $V_{CC} = 400\text{V}$		4500		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	$I_F = 450\text{A}$; $V_{GE} = 0\text{V}$; $T_J = 25^\circ\text{C}$;		1.27	1.53	V
		$I_F = 450\text{A}$; $V_{GE} = 0\text{V}$; $T_J = 150^\circ\text{C}$;		1.29		
		$I_F = 450\text{A}$; $V_{GE} = 0\text{V}$; $T_J = 175^\circ\text{C}$;		1.29		
		$I_F = 820\text{A}$; $V_{GE} = 0\text{V}$; $T_J = 25^\circ\text{C}$;		1.50		
		$I_F = 820\text{A}$; $V_{GE} = 0\text{V}$; $T_J = 150^\circ\text{C}$;		1.64		
		$I_F = 820\text{A}$; $V_{GE} = 0\text{V}$; $T_J = 175^\circ\text{C}$;		1.70		
Reverse Recovery Time	T_{rr}	$I_F = 450\text{A}$; $V_R = 400\text{V}$; $dI_F/dt = -6900\text{A}/\mu\text{s}$; $T_J = 150^\circ\text{C}$;		230		ns
Peak Reverse Recovery Current	I_{RRM}			460		A
Reverse Recovery Charge	Q_{RR}			63.4		μC
Reverse Recovery Energy	E_{rec}			20.6		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		k Ω
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}	RMS, $f = 0 \text{ Hz}$, $t = 1 \text{ sec}$		4.2		kV
Comparative Tracking Index	CTI		200			
Creepage distance	d_{Creep}	Terminal to heatsink		9		mm
		Terminal to terminal		9		mm
Clearance	d_{Clear}	Terminal to heatsink		4.5		Mm
		Terminal to terminal		4.5		mm
Mounting Torque		Baseplate to heatsink (M3 recommended)	1.8		2.2	Nm
		PCB to frame	0.65		0.75	Nm
Weight				775		g

Typical Performance Characteristics

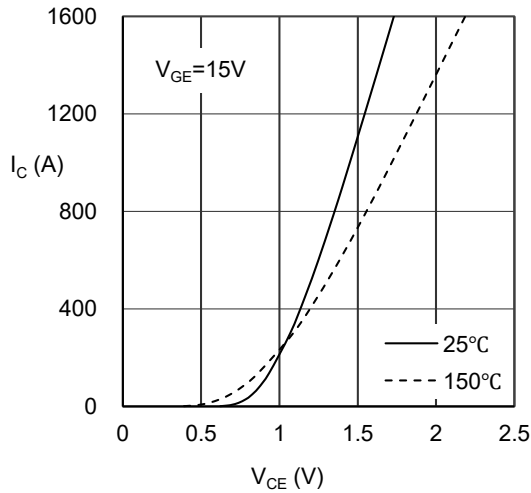


Figure 1: Typical Output Characteristics

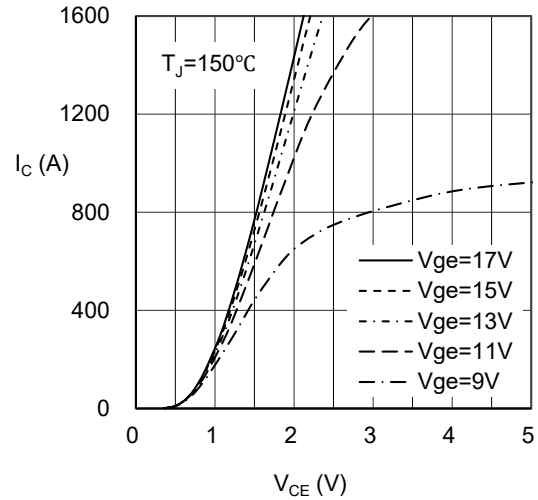


Figure 2: Typical Output Characteristics

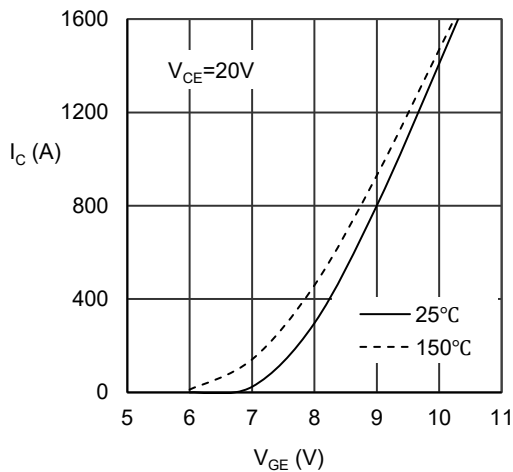


Figure 3: Typical Transfer characteristics

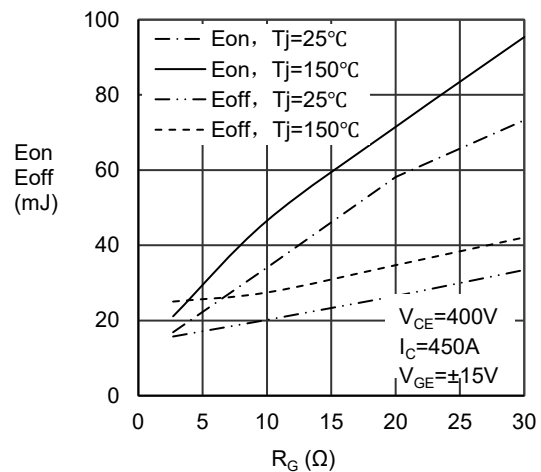


Figure 4: Switching energies vs R_G

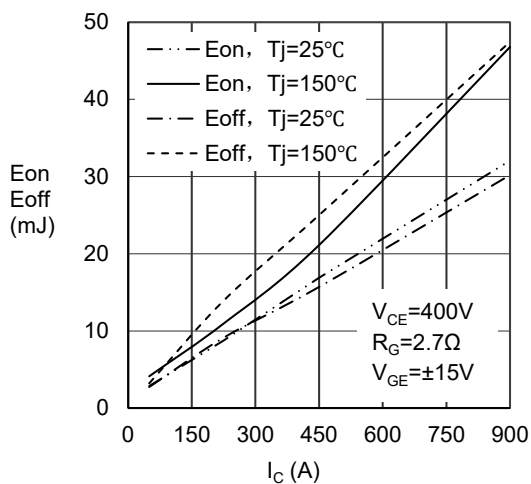


Figure 5: Switching energies vs Collector Current

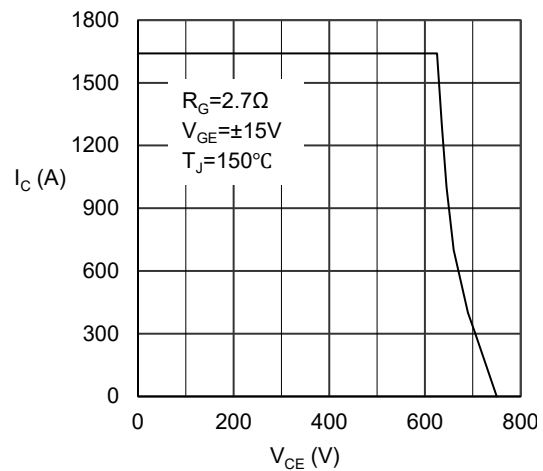


Figure 6: Reverse Bias Safe Operating Area

Typical Performance Characteristics (cnt'd)

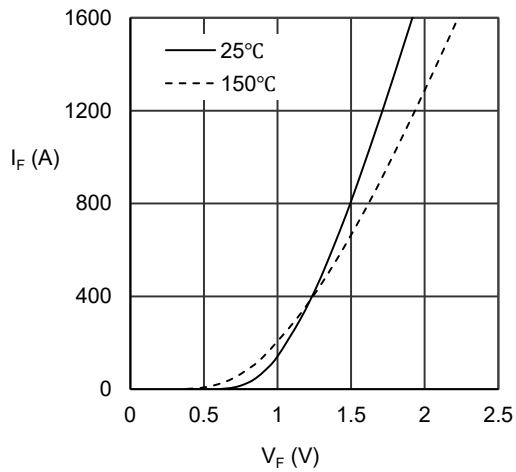


Figure 7: Diode Forward Characteristics

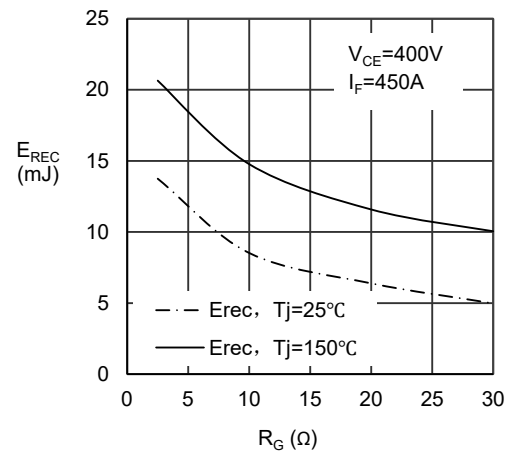


Figure 8: Switching Energy vs Gate Resistor

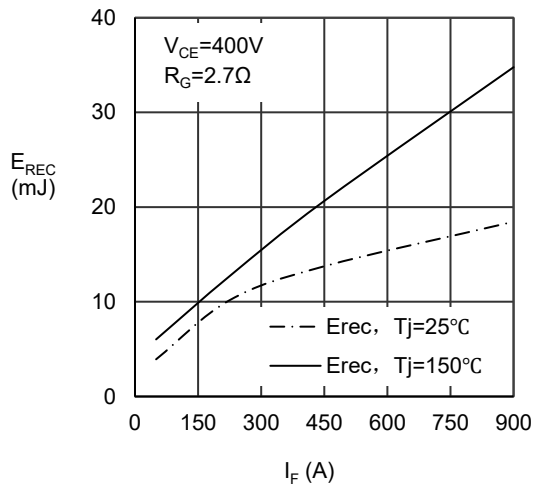


Figure 9: Switching Energy vs Forward Current

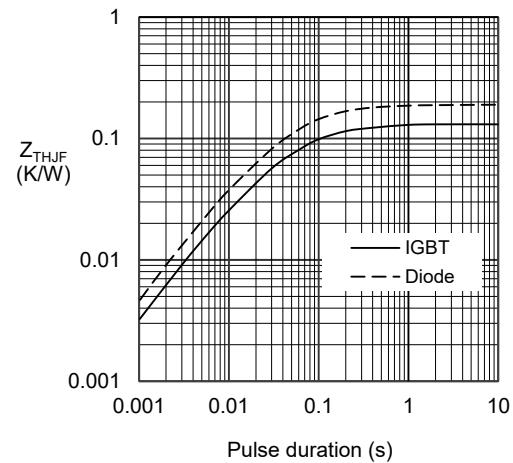


Figure 10: Transient Thermal Impedance

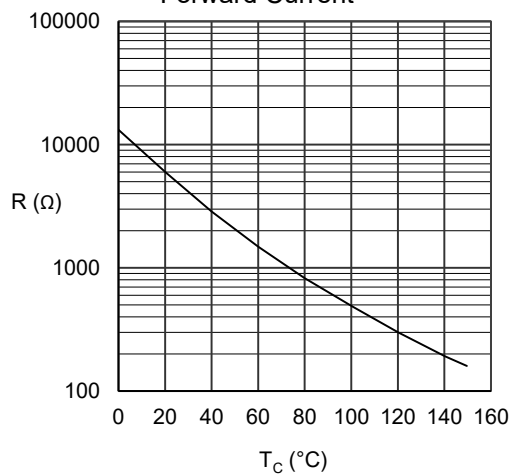


Figure 11: NTC Characteristics

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Ordering Information

Product Name	Ordering Reference	Package	Marking
CXT-PLA3BG07820RA	CXT-PLA3BG07820RA	CPAK-HPC	CXT-PLA3BG07820RA

Contact & Ordering

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