Version: 1.1

CHT-PLUTO-C1230
Preliminary Datasheet
High Temperature 1200V/30A Asynchronous Buck or Boost Module

General description

CHT-PLUTO-C1230 is a high temperature 1200V/30A Silicon Carbide module including one MOSFET switch and one Schottky diode in a single hermetic package. It is suitable to implement an asynchronous buck converter or a boost converter.. This product is guaranteed for normal operation on the full range -55°C to +210°C (Tj). Each MOSFET or diode has a breakdown voltage in excess of 1200V and is capable of switching current up to 30A. The MOSFET have a on-resistance of 45mΩ at 25°C and 100mΩ at 210°C at VGS=20V. The MOSFET has an intrinsic body diode.

Benefits

- High power density converters (support of high-frequency switching and reduced cooling)
- Extended lifetime and high reliability
- Harsh environments and high temperature power converters
- Seamless driving with HADES® gate driver solutions

Applications

- DC motor drives and actuator control
- DC-DC converters

Features (MOSFET)

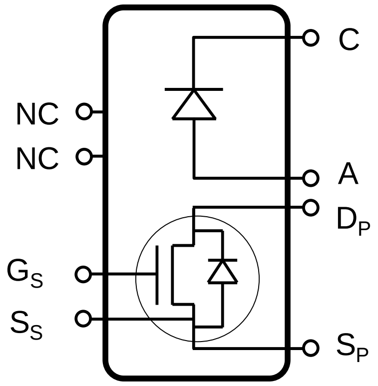
- Specified from -55 to +210°C (Tj)
- V_{DS} Max: 1200V
- Max Continuous Current:
  - 30A @ Tc≤160°C
  - 25A @ Tc=175°C
- Max Pulsed Current: 40A
- Typical MOSFET On-resistance:
  - R_{DSon}= 20 mΩ @ Tj=25°C
  - R_{DSon}= 60 mΩ @ Tj=210°C
- High Speed Switching
- Voltage control: V_{GS}=-5V/20V
- Low gate charge: : Q_{GS}: 44nC

Features (DIODE)

- Typ. Forward Voltage @30A : 1.35V
- Max Continuous Current: 30A
- Max Peak Rep Fwd Surge Current: 50A

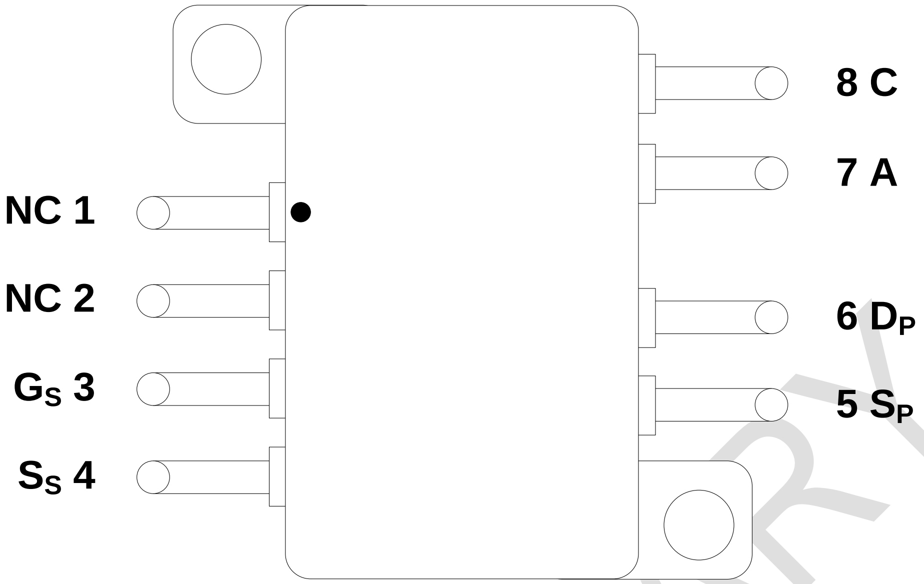
- Hermetic package with isolated case

Functional Block Diagram



Note: the schematic shows the intrinsic body diode of the MOSFET

Package configuration and Pin Description



Pin ID	Pin Name	Pin Description	Pin Finish
1	NC	Not connected Pin	Nickel
2	NC	Not connected Pin	Nickel
3	G_S	Gate of MOSFET (Signal Pin)	Nickel
4	S_S	Source of MOSFET (Signal Pin)	Nickel
5	S_P	Source of MOSFET (Power Pin)	Nickel
6	D_P	Drain of MOSFET (Power Pin)	Gold
7	A	Anode of Diode (Power Pin)	Nickel
8	C	Cathode of Diode (Power Pin)	Gold
	Body	Package body (isolated from Pins)	Nickel

MOSFET

Absolute Maximum Ratings

Gate-to-Source voltage V_{GS}	-5V to 22V
Drain-to-Source voltage V_{DS}	1200V
Max DC Drain current I_{DS}	30A
Max Junction temperature T_{jmax}	210°C
Power dissipation at Tc=175°C (*)	66W

Operating Conditions

Gate-to-Source voltage V_{GS}	-5V to 20V
Drain-to-Source voltage V_{DS}	1200V
Max DC drain current I_{DS} (Tc=175°C)	25A
Max DC drain current I_{DS} (Tc≤160°C)	30A
Max pulsed drain current	40A
Junction temperature	-55°C to +210°C

ESD Rating

Human Body Model	>1kV

DIODE

Absolute Maximum Ratings

DC Blocking Voltage	1200V
Continuous Forward Current	30A
Max Junction temperature T_{jmax}	210°C
Power dissipation at Tc=175°C (*)	66W

Operating Conditions

DC Blocking Voltage	1200V
Continuous Forward Current	30A
Rep. Peak Fwd Surge Current	50A
Junction temperature	-55°C to +210°C

ESD Rating

Human Body Model	>2kV

Electrical characteristics MOSFET

Unless otherwise stated, T_j =25°C. **Bold** figures point out values valid over the whole temperature range (T_j =-55°C to +210°C).

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Threshold voltage	V_{TH}	T_j=25°C ; I_D = 1mA; V_{DS} = 20V		4.45		V
		T_j=210°C ; I_D = 1mA; V_{DS} = 20V		3.82		V
Drain cut-off current	I_{DSS}	V_{GS} =0V, V_{DS}=1200V, T_j=25°C		80		nA
		V_{GS} =0V, V_{DS} =1200V, T_j=210°C		800		µA
Gate leakage current	I_{GSS}	V_{GS} =20V, V_{DS} =1200V, T_j=25°C		10		nA
		V_{GS} =20V, V_{DS} =1200V,T_j=210°C		40		nA
Static drain-to-source resistance	R_{DSon}	V_{GS} =20V, ID=25A, T_j=25°C		20		mΩ
		V_{GS} =20V, ID=25A, T_j=210°C		60		mΩ
Breakdown drain-to-source voltage (DC characterization)	V_{BRDS}	V_{GS} =0V; ID = 1 mA	**1200**			V
Input capacitance	C_{ISS}	V_{GS} =0V_{DC}, V_{DS} =600V f = 1 MHz V_{AC} = 25mV		2674		pF
Output capacitance (includes diode capacitance)	C_{OSS}			152		pF
Feedback capacitance	C_{RSS}			54		pF
Turn-on delay time	$T_{d(ON)}$	VDD=600V; VGS= -4/20V ID = 30A RG= 3.3Ω; L = 856µH		13		ns
Fall time	T_r			24		ns
Turn-off delay time	$T_{d(OFF)}$			40		ns
Rise time	T_f			38		ns
Turn-On Switching Loss	E_{on}			390		µJ
Turn-Off Switching Loss	E_{off}			430		µJ
Internal gate resistance	R_G	V_{GS} =0$V_{DC;}$ f = 1 MHz; V_{AC} = 25mV		2.5		Ω
Gate to Source Charge	Q_{GS}	Tj=25°C ;VDD= 600V; ID = 20A; VGS = -4/20V		44		nC
Gate to Drain Charge	Q_{GD}			82		nC
Total Gate Charge	Q_G			214		nC
Diode forward voltage	V_F	Tj=25°C; IF=30A		3.3		V
		Tj=210°C; IF=30A		3.1		V
Reverse recovery time	T_{rr}	Tj=25°C; V_{DS}=300V; V_{GS} = -5V; I_F=20A;dI_F/dt = 100A/µS		220		ns
Peak reverse recovery current	I_{prr}			2.3		A

Electrical characteristics Schottky Diode

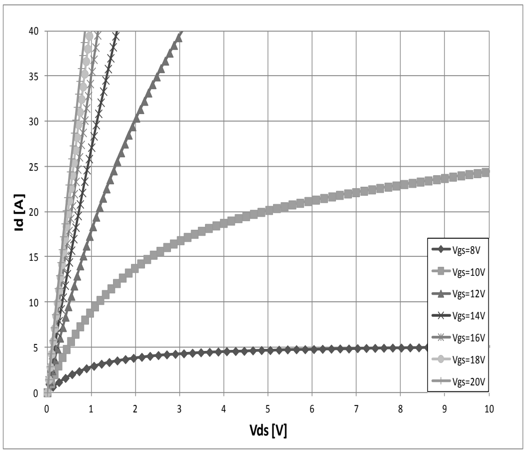
Unless otherwise stated, T_j =25°C. **Bold** figures point out values valid over the whole temperature range (T_j =-55°C to +210°C).

Parameter	Symbol	Condition	Min	Typ	Max	Unit
DC Blocking Voltage	V_{DC}		**1200**			V
Forward Voltage	V_F	Tj=25°C; I_F=30A		1.35		V
		Tj=210°C; I_F=30A		1.8		V
Reverse Current	I_R	Tj=25°C; V_R=1200A		80		µA
		Tj=210°C; V_R=1200A		800		µA
Total Capacitive Charge	Q_C	I=30A,V_R=600V,T_J =25°C,di/dt=500A/µs		122		nC
Total Capacitance	C	Tj=25°C; V_R =0V;f = 1 MHz		TBD		pF
		Tj=25°C; V_R =200V;f = 1 MHz		TBD		pF
		Tj=25°C; V_R =400V;f = 1 MHz		TBD		pF

Thermal Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Junction-to-Case Thermal resistance MOSFET	$R_{ΘJC}$			0.7		°C/W
Junction-to-Case Thermal resistance DIODE	$R_{ΘJC}$			0.7		°C/W

Typical performances (MOSFET)



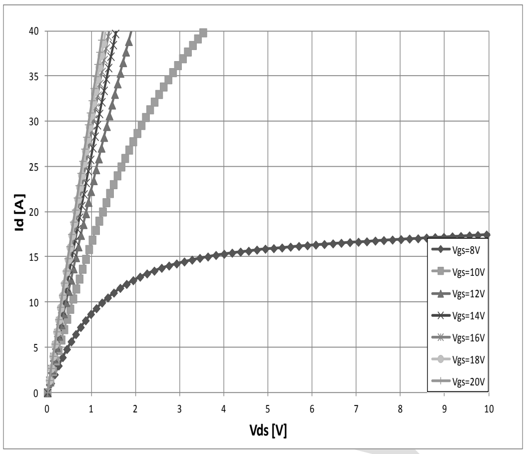
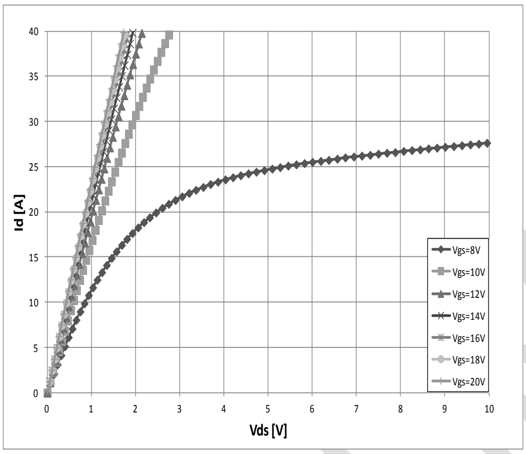


Figure 1: Drain current vs V_{DS} (T_j= 25°C)

Figure 2: Drain current vs V_{DS} (T_j= 125°C)



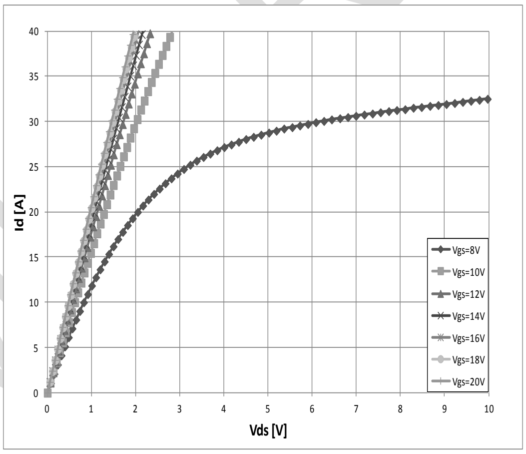


Figure 3: Drain current vs V_{DS} (T_j= 175°C)

Figure 4: Drain current vs V_{DS} (T_j= 210°C)

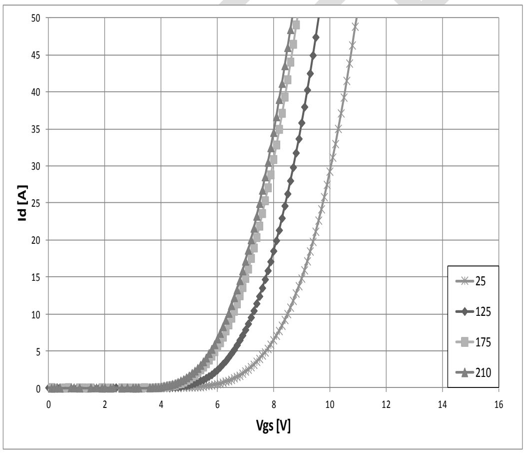


Figure 5: Drain current vs V_{GS} voltage

Typical performances (cnt'd)

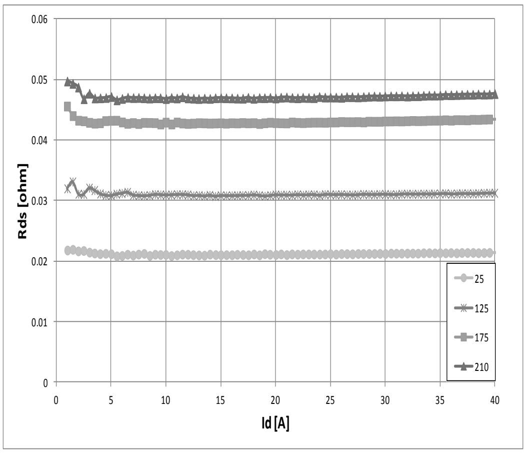


Figure 6: On-state drain source resistance vs. Drain current (V_{GS} =20V)

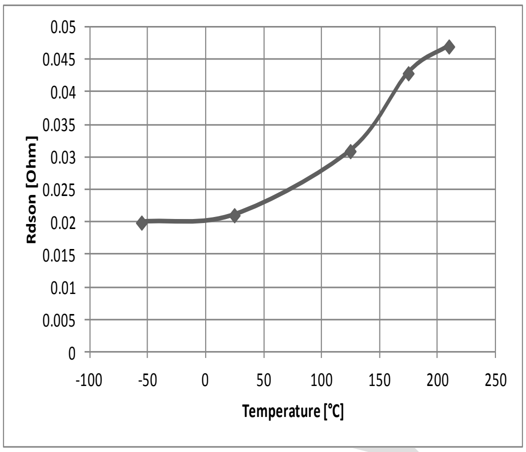


Figure 7: On-state drain source resistance vs. Temperature (V_{GS} =20V; I_{DS}=25A)

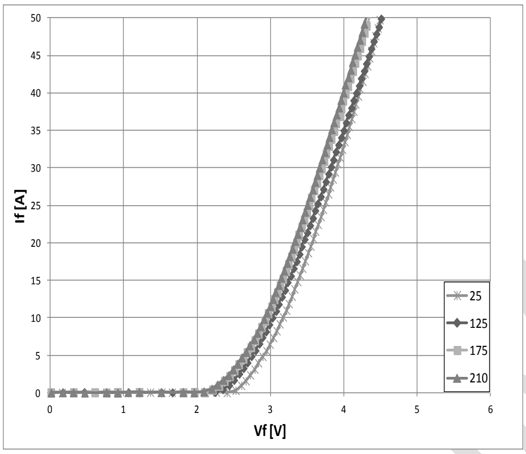


Figure 8: Diode I_{DS} vs V_{DS}
(3rd quadrant;VGS=-5V)

Figure 9: Diode I_{DS} vs V_{DS}
(3rd quadrant;VGS=-5V)

Typical performances (Diode)

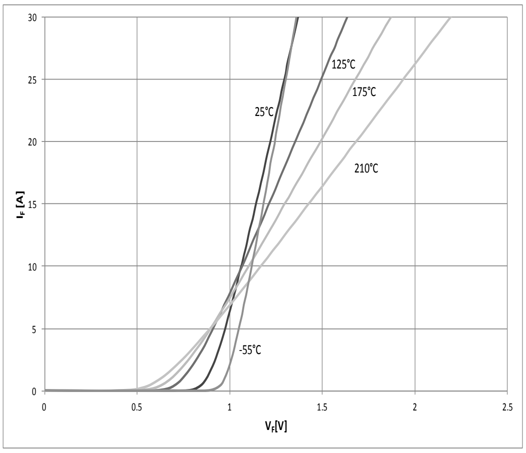


Figure 10: Diode I_F vs V_F

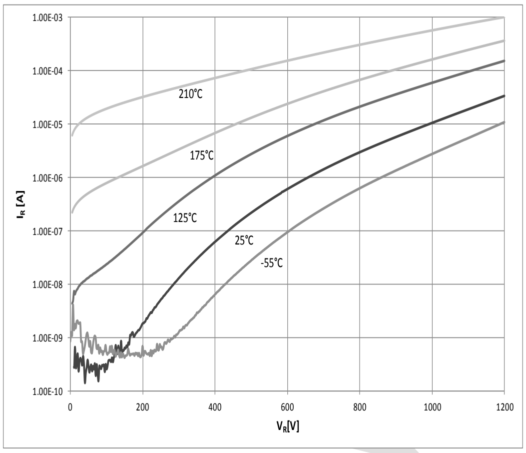
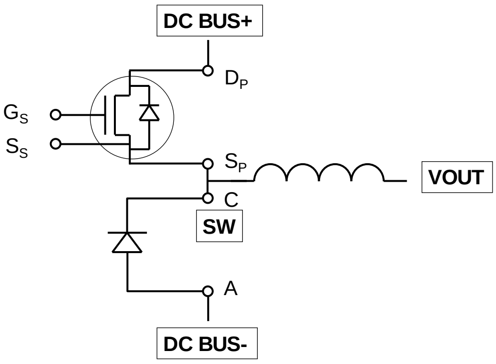


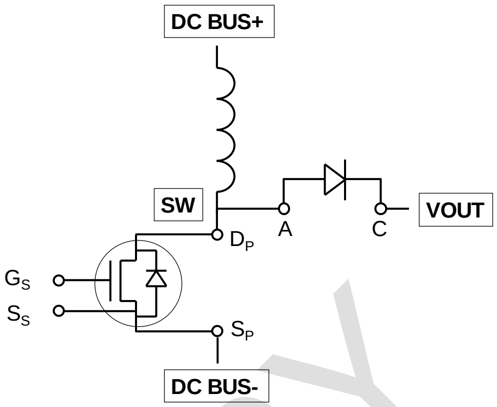
Figure 11: Diode I_R vs V_R

Typical applications

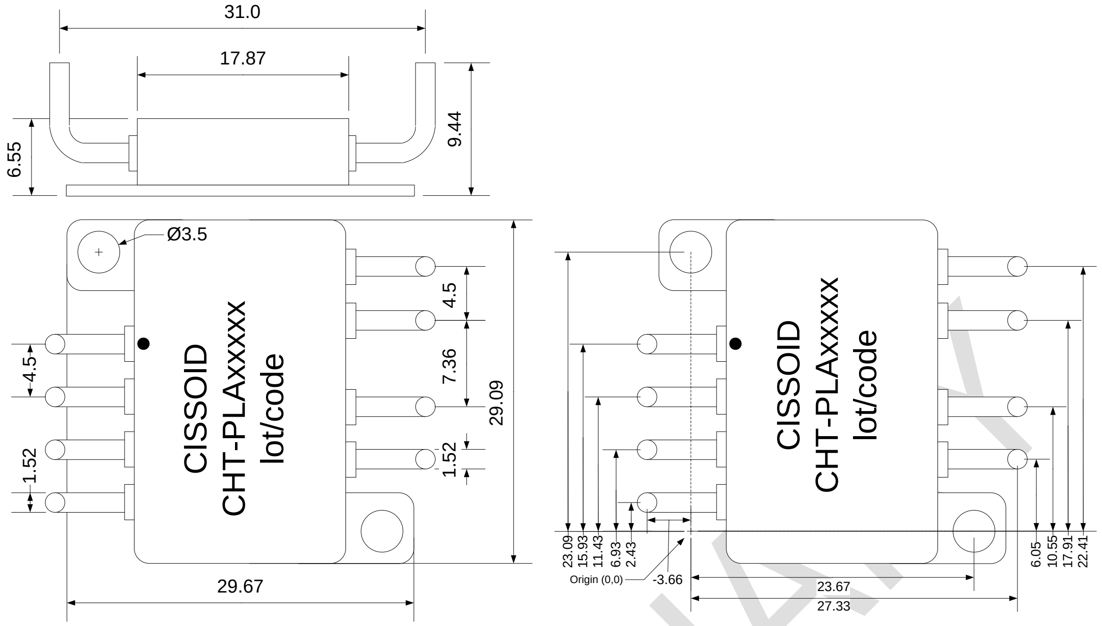
Buck Converter Application



Boost Converter Application



Package Dimensions



HM8A dimensions in mm (+/- 10%)

Ordering Information

Product Name	Ordering Reference	Package	Marking
CHT-PLUTO-C1230	CHT-PLA2228A-HM8A-T	HM8A	CHT-PLA2228A

Related products

Product Name	Function	Ordering Reference
CHT-PLUTO-B1230	Dual 1200V/30A SiC MOSFET Module	CHT-PLA2316A-HM8A-T
CHT-PLUTO-B1220	Dual 1200V/20A SiC MOSFET Module	CHT-PLA8294A-HM8A-T
CHT-PLUTO-C1220	1200V/20A SiC Async Buck or Boost Power Module	CHT-PLA3777A-HM8A-T

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