Version: 4.0

CHT-NEPTUNE PRELIMINARY DATASHEET

High Temperature 1200V/10A, Silicon Carbide MOSFET

General description

CHT-NEPTUNE is an High Temperature, High Voltage, Silicon Carbide MOSFET switch. It is available in a metal TO-257 package – the metal case being electrically isolated from the switch terminals. The product is guaranteed for normal operation on the full range -55°C to +225°C. The device has a breakdown voltage in excess of 1200V and is capable of switching currents up to 10A at the maximum temperature (225°C). The device features a body diode that can be used as free-wheeling diode.

This new version D (PLA8543D), replacing obsolete version C (PLA8543C), offers lower On Resistance with equivalent switching energies.

Benefits

- High Temperature Operation
- Extended lifetime and high reliability
- Low Switching Energy enabling High Frequency Switching
- Pins electrically isolated from the case easing mechanical and thermal integrationSeamless driving with HADES® gate driver solutions

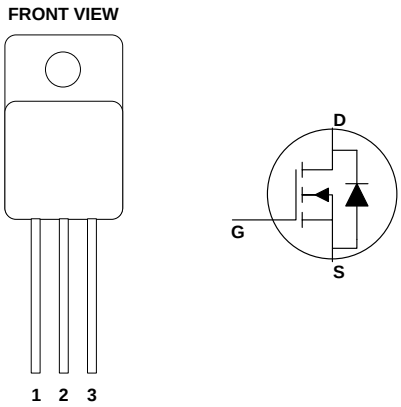
Features

- Specified from -55 to +225°C (Tj)
- V_{DS} Max: 1200V
- I_{DS} Max (continuous):
  - 10A @ 225°C (Tj)
- Typical On-resistance:
  - R_{DSon}= 40 mΩ @ 25°C
  - R_{DSon}= 120 mΩ @ 225°C
- Low Switching Energy
  - Eon= 240µJ
  - Eoff= 140µJ
- Voltage control: V_{GS}=-4V/20V
- Gate charge: Q_{GS}=22nC
- Low capacitance: C_{OSS}=76 pF
- Package: TO-257

Applications

- High Temperature, High Power Density and Extended Lifetime Power Converters
- DC-AC Converters for motor drives & actuator controls
- DC-DC converters
- AC-DC converters and battery chargers

Package Configuration



TO-257 (Pin1= Drain; Pin2= Source; Pin3= Gate) (case floating)

Absolute Maximum Ratings

Gate-to-Source voltage V_{GS}	-5V to 22V
Drain-to-Source voltage V_{DS}	-0.5V to 1200V
Max DC Drain current I_{DS}	12A
Max Junction temperature T_{jmax}	225°C
Power dissipation (*)	30W

Operating Conditions

Gate-to-Source voltage V_{GS}	-4V to 20V
Drain-to-Source voltage V_{DS}	-0.5V to 1200V
Max DC drain current I_{DS}	10A
Max pulsed drain current	10A
Junction temperature	-55°C to +225°C

ESD Rating (expected)

Human Body Model	>1kV

(*): including switching losses

Electrical characteristics

Unless otherwise stated, T_j =25°C. **Bold** figures point out values valid over the whole temperature range (T_j =-55°C to +225°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=225°C ; I_D = 1mA; V_{DS} =20V		3.28		V
Drain cut-off current	I_{DSS}	V_{GS} =0V, V_{DS}=1200V, T_j=25°C		20		nA
		V_{GS} =0V, V_{DS} =1200V, T_j=225°C		10		µA
		V_{GS} =-5V, V_{DS} =1200V, T_j=225°C		0.5		µA
Gate leakage current	I_{GSS}	V_{GS} =20V, V_{DS} =0V, T_j=25°C		5		nA
		V_{GS} =20V, V_{DS} =0V,T_j=225°C		20		nA
Static drain-to-source resistance	R_{DSon}	V_{GS} =20V, ID=10A, T_j=25°C		40		mΩ
		V_{GS} =20V, ID=10A, T_j=225°C		120		mΩ
Breakdown drain-to-source voltage (DC characterization)	V_{BRDS}	V_{GS} =0V; ID = 100 µA	**1200**			V
Input capacitance	C_{ISS}	V_{GS} =0V_{DC}, V_{DS} =600V_{DC} f = 1 MHz V_{AC} = 25mV		1337		pF
Output capacitance	C_{OSS}			76		pF
Feedback capacitance	C_{RSS}			27		pF
Turn-on delay time	$T_{d(ON)}$	VDS=600V; VGS= -4/20V; ID = 10A; RG= 6.8Ω; L = 856µH		21		ns
Rise time	T_r			39		ns
Turn-off delay time	$T_{d(OFF)}$			49		ns
Fall time	T_f			24		ns
Turn-On Switching Loss	E_{on}			240		µJ
Turn-Off Switching Loss	E_{off}			140		µJ
Internal gate resistance	R_G	V_{GS} =0$V_{DC;}$ f = 1 MHz, V_{AC} = 25mV		7		Ω
Gate to Source Charge	Q_{GS}	Tj=25°C ;VDS= 600V; ID = 10A; VGS = -4/20V		22		nC
Gate to Drain Charge	Q_{GD}			41		nC
Total Gate Charge	Q_G			107		nC

Thermal Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Junction-to-Case Thermal resistance	RΘJC			1.1		°C/W

Reverse Diode Characteristics

Unless otherwise stated, T_j =25°C. **Bold** figures point out values valid over the whole temperature range (T_j =-55°C to +225°C). Timing definitions according to JEDEC 24 page 27

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Diode forward voltage	V_F	Tj=25°C; VGS=-5V; IF=10A		3.6		V
		Tj=25°C; VGS=0V; IF=10A		2.7		V
Reverse recovery time	T_{rr}	Tj=25°C; VDS=600V; I_F=20A;dI_F/dt = 1100A/µS		25		ns
Peak reverse recovery current	I_{prr}			9		A

Typical Performance Characteristics

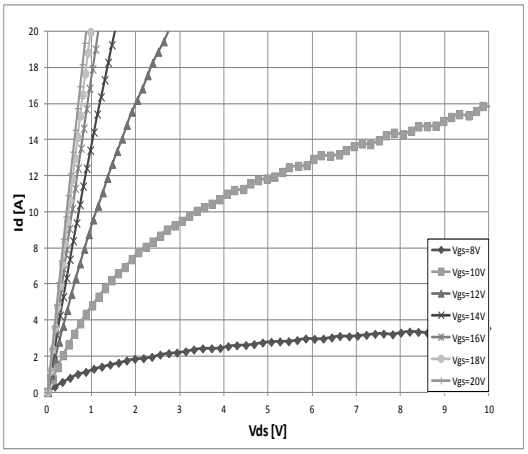


Figure 1: Drain current vs V_{DS} (T_j=25°C)

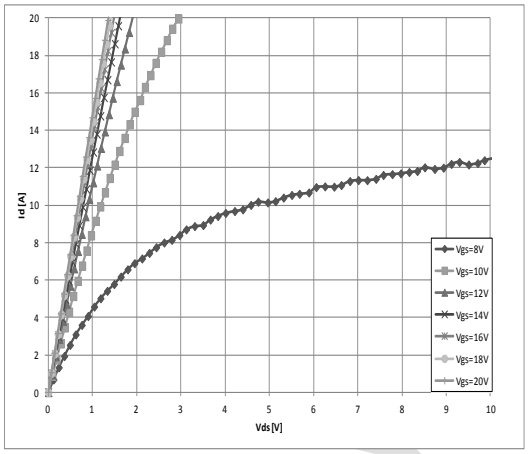


Figure 2: Drain current vs V_{DS} (T_j=125°C)

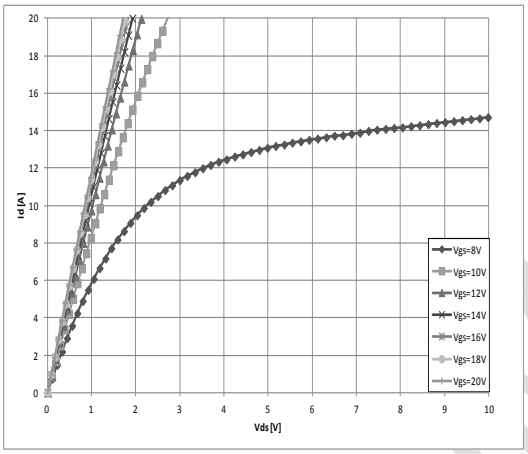


Figure 3: Drain current vs V_{DS} (T_j=175°C)

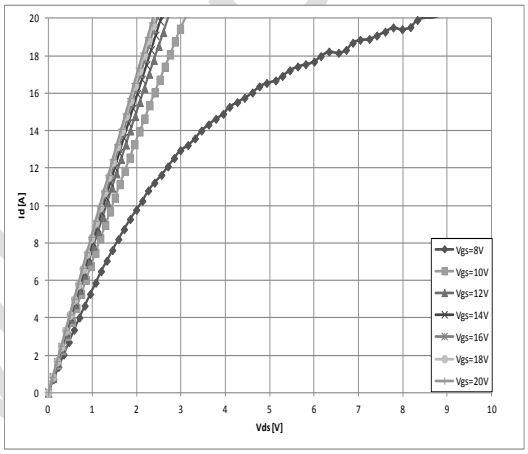


Figure 4: Drain current vs V_{DS} (T_j=225°C)

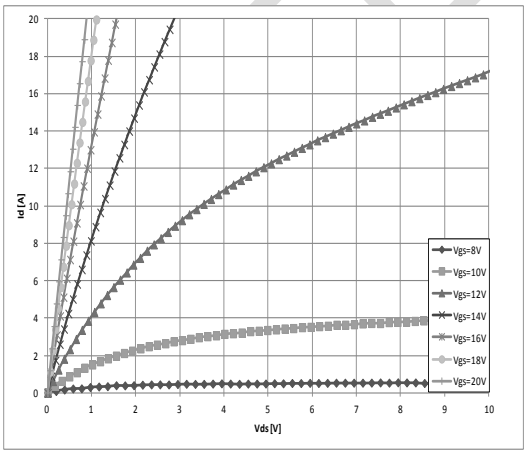


Figure 5: Drain current vs V_{DS} (T_j=-55°C)

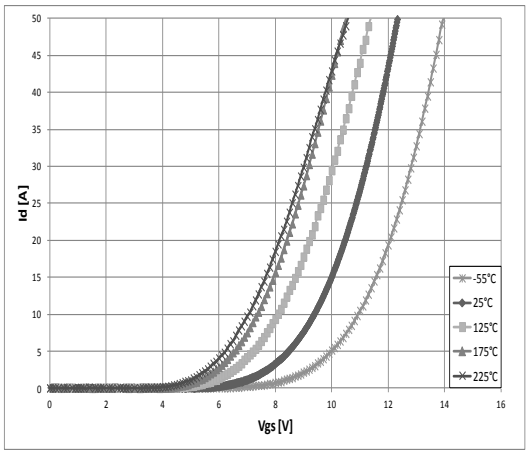


Figure 6: Drain current vs V_{GS} voltage (V_{DS}= 10V)

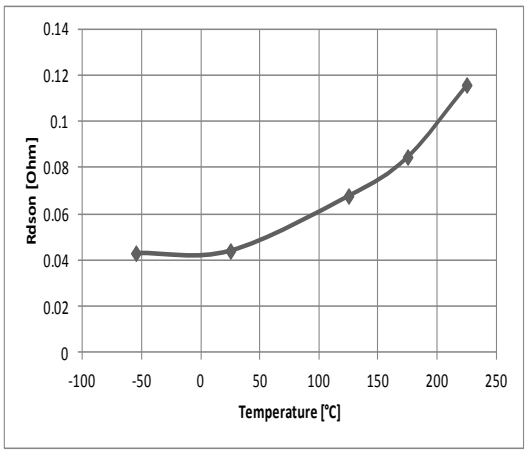


Figure 7: On-state drain source resistance vs. Temperature (V_{GS} =20V; I_{DS}=10A)

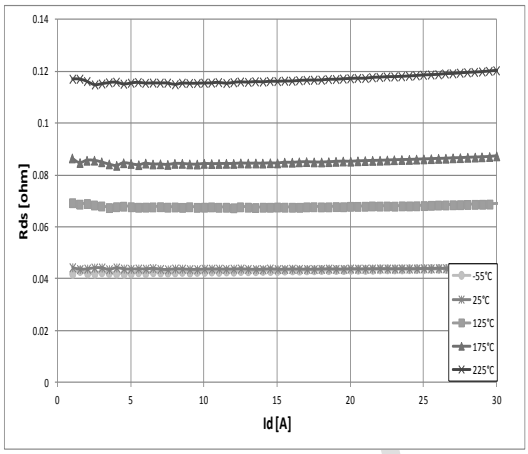


Figure 8: On-state drain source resistance vs. Drain current and temperature (V_{GS} =20V)

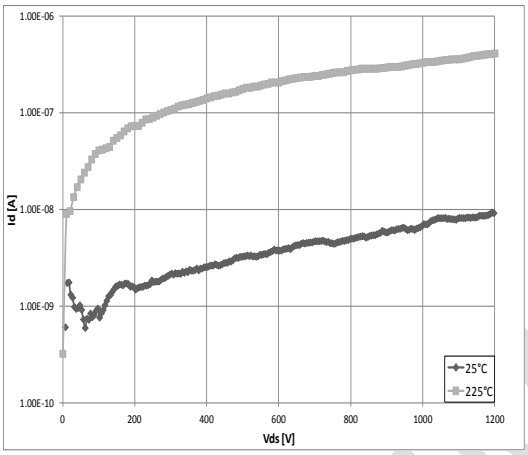


Figure 9: Drain current vs V_{DS} (V_{GS}= -5V)

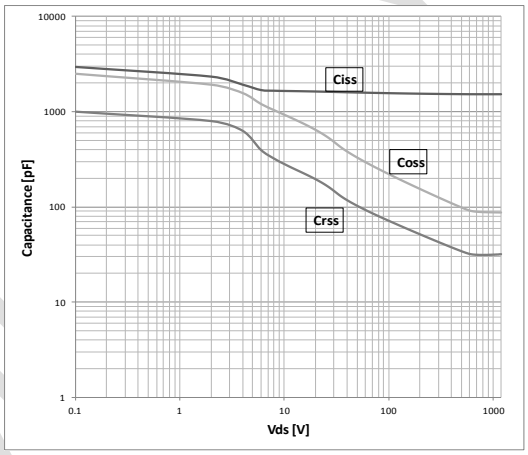


Figure 10:Typical capacitances vs V_{DS} (T_j=25°C)

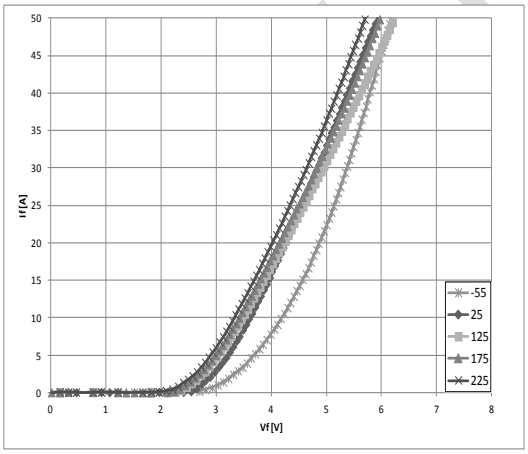
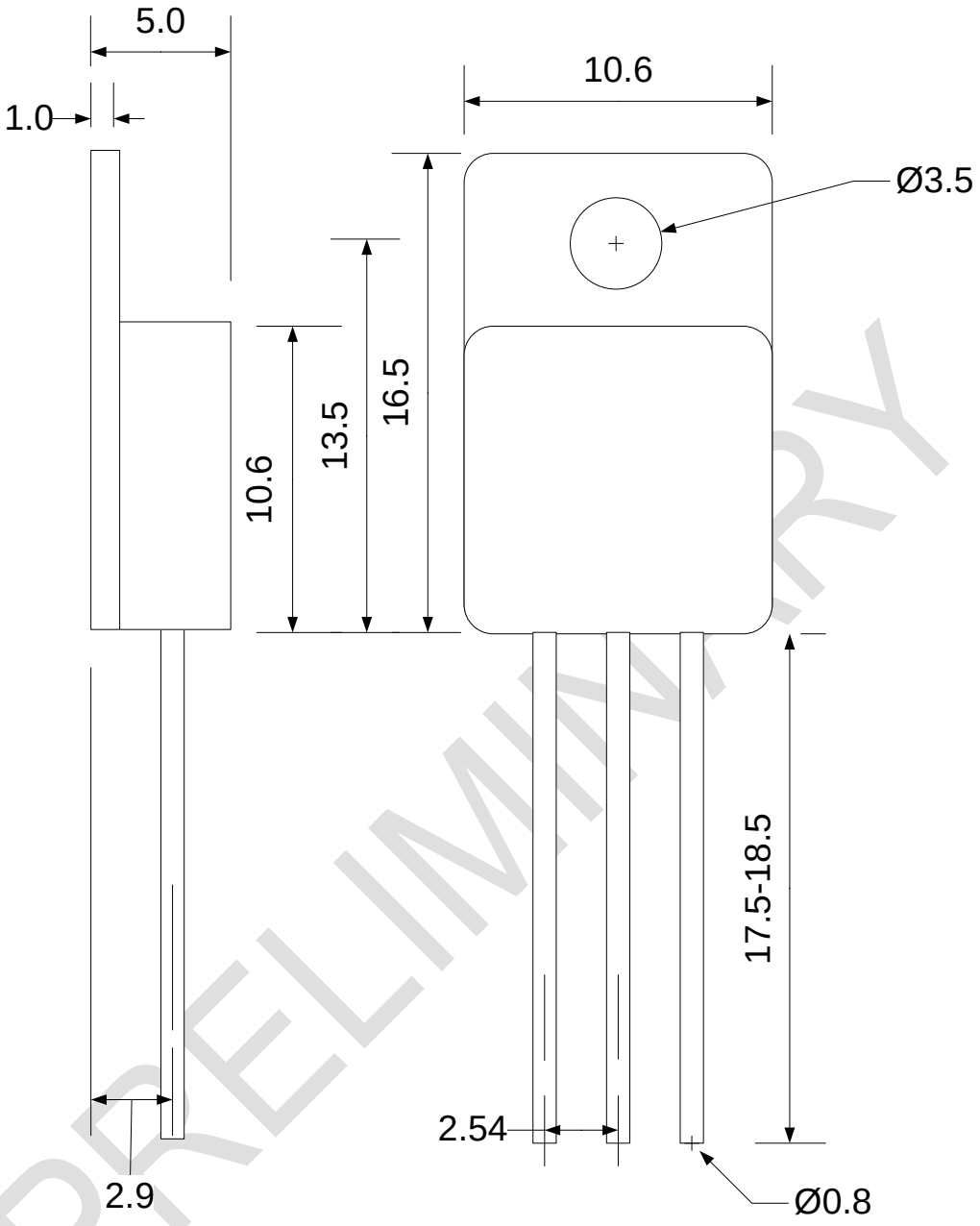


Figure 11: Diode I_F vs V_F (VGS=-5V)

Package Dimensions



Drawing TO257 (mm)

Ordering Information

Product Name	Ordering Reference	Package	Marking
CHT-NEPTUNE	CHT-PLA8543D-TO257-T	TO-257 metal can	CHT-PLA8543D

Contact & Ordering

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