Version: 3.0

CHT-NEPTUNE PRELIMINARY DATASHEET

High-Temperature High Voltage, Silicon Carbide MOSFET

General description

CHT-NEPTUNE is a high-temperature, high-voltage, Silicon Carbide MOSFET switch. It is available in a metal TO-257 package – the metal case being isolated from the switch voltages. 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.

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 CHT-Themis-Atlas and HADES® gate driver solutions

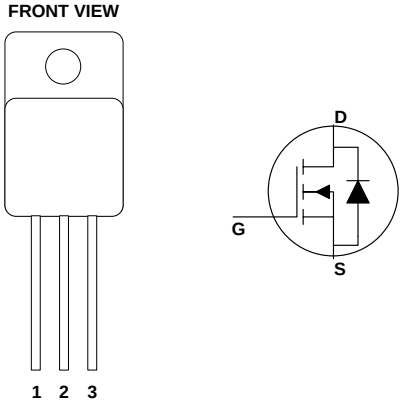
Features

- Specified from -55 to +225°C (Tj)
- V_{DS} Max: 1200V
- I_{DS} Max (continuous):
  - 10A @ 225°C (Tj)
- Typical On-resistance:
  - R_{DSon}= 90 mΩ @ 25°C
  - R_{DSon}= 150 mΩ @ 225°C
- High Speed Switching
- Voltage control: V_{GS}=-2V/20V
- Low capacitance: C_{GS}=1915 pF
- Package: TO257

Applications

- Power inverters including DC-AC power supplies, motor drives & actuator controls
- DC-DC converters
- AC-DC converters and battery chargers

Package Configuration



TO257 (Pin1= Drain; Pin2= Source; Pin3= Gate) (case floating)

Absolute Maximum Ratings

Gate-to-Source voltage V_{GS}	-5V to 25V
Drain-to-Source voltage V_{DS}	-0.5V to 1200V
Drain current I_{DS} (cont.)	12A
Max Junction temperature T_{jmax}	225°C
Power dissipation (*)	30W

Operating Conditions

Gate-to-Source voltage V_{GS}	-2V 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		2.5		V
		T_j=225°C ; I_D = 1mA; V_{DS} =20V		1		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		0.27		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=225°C		100		nA
Static drain-to-source resistance	R_{DSon}	V_{GS} =20V, ID=10A, T_j=25°C		90		mΩ
		V_{GS} =20V, ID=10A, T_j=225°C		150		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		1915		pF
Output capacitance	C_{OSS}			120		pF
Feedback capacitance	C_{RSS}			10		pF
Turn-on delay time	$T_{d(ON)}$	VDS=600V; VGS= -4/20V; ID = 10A; RG= 6.8Ω; L = 856µH		17		ns
Rise time	T_r			14		ns
Turn-off delay time	$T_{d(OFF)}$			62		ns
Fall time	T_f			36		ns
Turn-On Switching Loss	E_{on}			205		µJ
Turn-Off Switching Loss	E_{off}			173		µJ
Internal gate resistance	R_G	V_{GS} =0$V_{DC;}$ f = 1 MHz, V_{AC} = 25mV		5		Ω
Gate to Source Charge	Q_{GS}	Tj=25°C ;VDS= 600V; ID = 10A; VGS = -2/20V		23		nC
Gate to Drain Charge	Q_{GD}			43		nC
Total Gate Charge	Q_G			90		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		3.5		V
		Tj=25°C; VGS=-2V; IF=10A		3.1		V
Reverse recovery time	T_{rr}	Tj=25°C; VDS=300V; VGS = -5V; I_F=2A;dI_F/dt = 100A/µS		50		ns
Peak reverse recovery current	I_{prr}			2.3		A

Typical Performance Characteristics

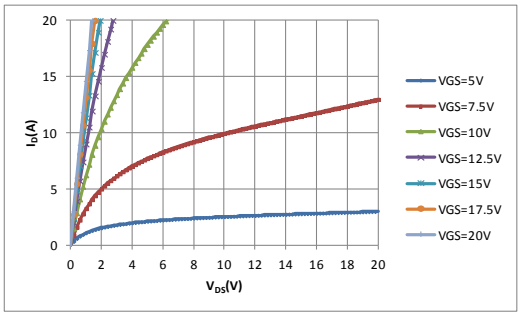


Figure 1: Drain current vs V_{DS} (TJ=25°C)

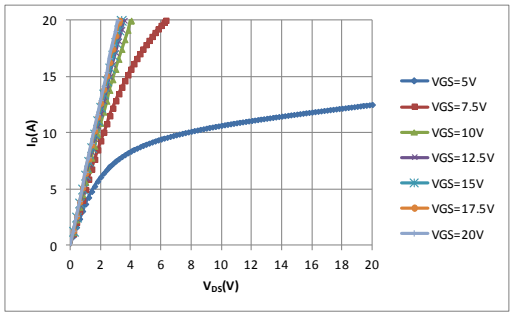


Figure 2: Drain current vs V_{DS} (T_J=225°C)

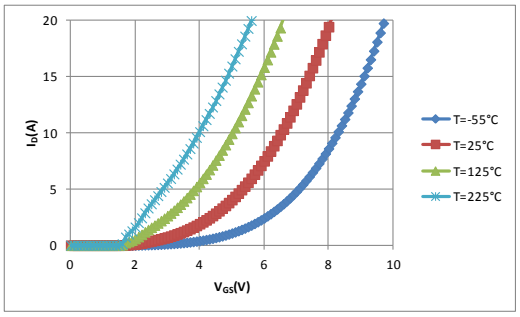


Figure 3: Drain current vs V_{GS} voltage

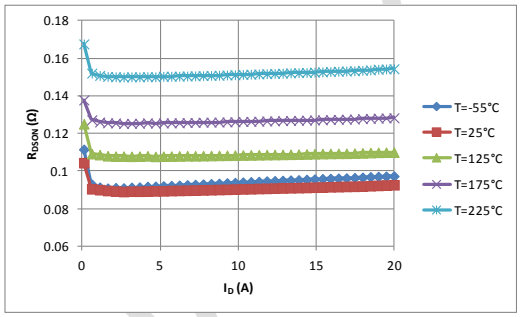


Figure 4: On-state drain source resistance vs. temperature (V_{GS} =20V)

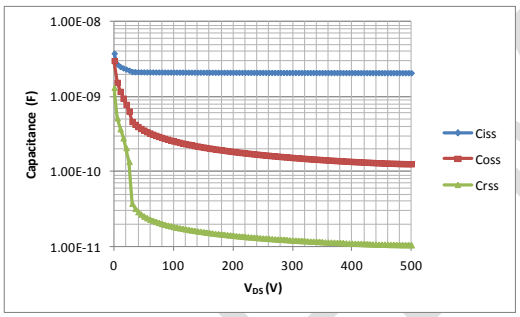
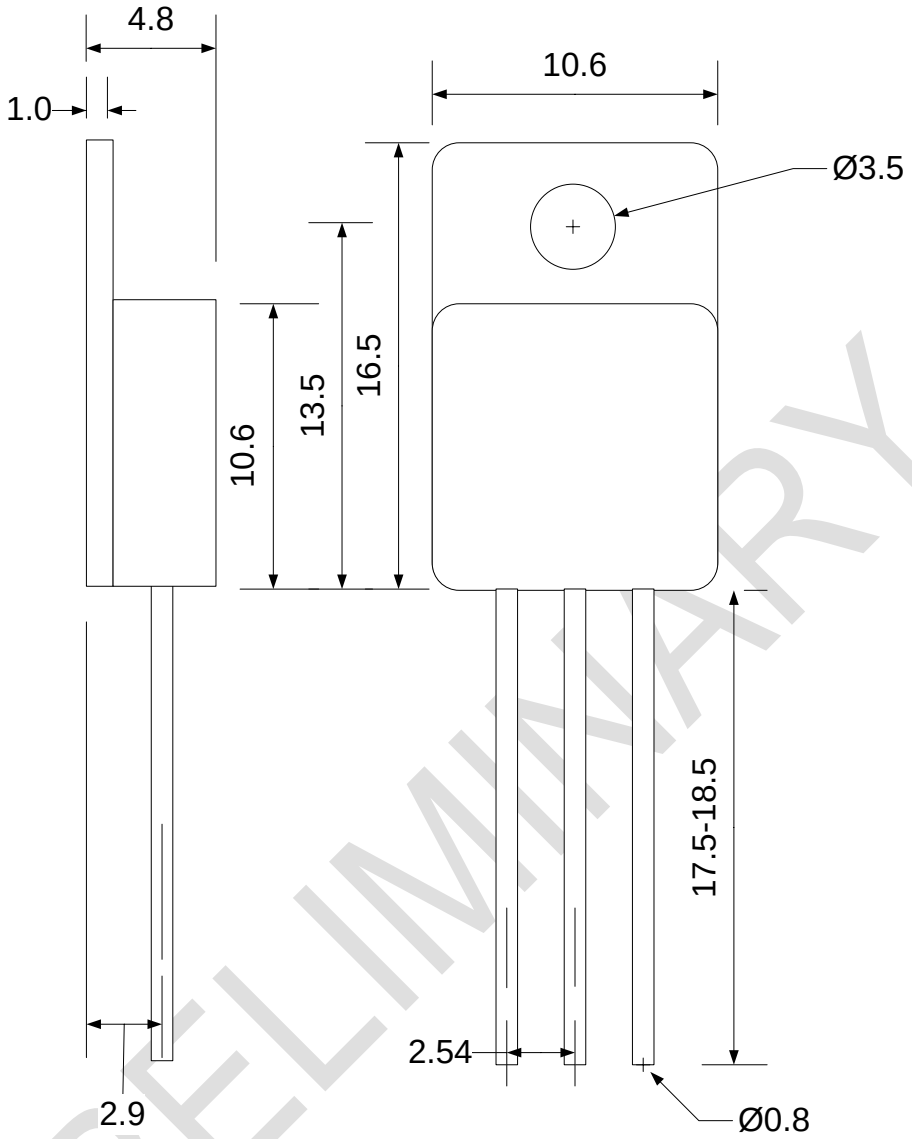


Figure 5:Typical capacitances vs V_{DS} (T_j=25°C)

Package Dimensions



Drawing TO257 (mm)

Ordering Information

Product Name	Ordering Reference	Package	Marking
CHT-NEPTUNE	CHT-PLA8543C-TO257-T	TO-257 metal can	CHT-PLA8543C

Contact & Ordering

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