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## CHT-MARS-DATASHEET

Version: 1.7  
12-Nov-13  
(Last Modification Date)

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## High-Temperature Small-signal P-channel MOSFET

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### General description

The CHT-MARS is a high voltage 30V P-channel small-signal MOSFET designed to achieve high performance in an extremely wide temperature range: typical operation temperature goes from -55°C to 225°C.

### Applications

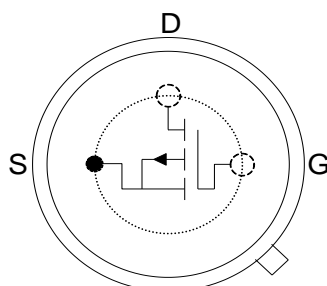
Sensor interfaces, such as piezoelectric sensor, guard amplifiers, switches of high and medium impedance loads, level-shifters and high temperature diodes.

### Features

- Qualified from -55 to +225°C (Tj)
- Operational up to +250°C (Tj)
- Drain voltage up to 30V
- Typ output current 310mA @ 225°C
- $R_{DSon} = 26\Omega @ 225^\circ\text{C}$
- VGS = +0.5V to -5.5V
- Validated at 225°C for 1000 hours (and still on-going)
- Available in TO39 and TO-18 packages (other packages available upon request).

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### Package configurations<sup>1</sup>



**TO39/TO18 (Top view)**  
**(case connected to source)**

<sup>1</sup> Other packages available upon request.

**(Last Modification Date)**
**Absolute Maximum Ratings**

Gate-to-Source voltage $V_{GS}$	+0.5V to -5.5V
Pulsed drain current $I_{DS}$ (T <sub>pulse</sub> ≤ 2μs)	480mA @ -55°C 420mA @ 25°C 310mA @ 225°C
Junction temperature $T_j$	300°C

**Operating Conditions**

Gate-to-Source voltage $V_{GS}$	0V to -5V
Drain-to-Source voltage $V_{DS}$	0V to -30V
Junction temperature	-55°C to +225°C

**ESD Rating**

Human Body Model CLASS1B

Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Frequent or extended exposure to absolute maximum rating conditions or above may affect device reliability.

**Electrical characteristics**
**DC Characteristics**

Unless otherwise stated,  $T_j = 25^\circ\text{C}$ . **Bold** figures point out values valid over the whole temperature range ( $T_j = -55^\circ\text{C}$  to  $+225^\circ\text{C}$ ).

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Threshold voltage	$V_{TH}$	$V_{DS} = -50\text{mV}$	<b>-1.3</b>		<b>-0.6</b>	V
Drain cut-off current	$I_{DSS}$	$V_{GS} = 0\text{V}$ , $V_{DS} = -30\text{V}$ , $T_j = -55^\circ\text{C}$		1		nA
		$V_{GS} = 0\text{V}$ , $V_{DS} = -30\text{V}$ , $T_j = 25^\circ\text{C}$		5		nA
		$V_{GS} = 0\text{V}$ , $V_{DS} = -30\text{V}$ , $T_j = 225^\circ\text{C}$		10		μA
Gate leakage current <sup>1</sup>	$I_{GSS}$	$V_{GS} = -5\text{V}$ , $V_{DS} = -50\text{mV}$ , $T_j = -55^\circ\text{C}$		33		pA
		$V_{GS} = -5\text{V}$ , $V_{DS} = -50\text{mV}$ , $T_j = 25^\circ\text{C}$		100		pA
		$V_{GS} = -5\text{V}$ , $V_{DS} = -50\text{mV}$ , $T_j = 225^\circ\text{C}$		0.4		μA
Static drain-to-source resistance	$R_{DS(on)}$	$V_{GS} = -5\text{V}$ , $V_{DS} = -50\text{mV}$ , $T_j = -55^\circ\text{C}$		12		Ω
		$V_{GS} = -5\text{V}$ , $V_{DS} = -50\text{mV}$ , $T_j = 25^\circ\text{C}$		15		Ω
		$V_{GS} = -5\text{V}$ , $V_{DS} = -50\text{mV}$ , $T_j = 225^\circ\text{C}$		26		Ω
Breakdown drain-to-source voltage <sup>2</sup>	$V_{BRDS}$	$V_{GS} = 0\text{V}$	<b>-30</b>			V

**Dynamic Characteristics**

Unless otherwise stated,  $T_j = 25^\circ\text{C}$ . **Bold** figures point out values valid over the whole temperature range ( $T_j = -55^\circ\text{C}$  to  $+225^\circ\text{C}$ ).

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Input capacitance	$C_{ISS}$	$V_{GS} = 0V_{DC}$ , $V_{DS} = -25V_{DC}$		14		pF
Output capacitance	$C_{OSS}$	$V_{GS} = 0V_{DC}$ , $V_{DS} = -25V_{DC}$		3.5		pF
Feedback capacitance	$C_{RSS}$	$V_{GS} = 0V_{DC}$ , $V_{DS} = -25V_{DC}$		1.5		pF

**Switching Characteristics**

Unless otherwise stated,  $T_j = 25^\circ\text{C}$ . **Bold** figures point out values valid over the whole temperature range ( $T_j = -55^\circ\text{C}$  to  $+225^\circ\text{C}$ ).

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Turn-on delay time	$T_{d(ON)}$	$V_{DS} = -15\text{V}$ , $V_{GS} = -5\text{V}$ 1μs pulse		<b>10.1</b>		ns
Rise time	$T_r$	$V_{DS} = -15\text{V}$ , $V_{GS} = -5\text{V}$ 1μs pulse		<b>13.2</b>		ns
Turn-off delay time	$T_{d(OFF)}$	$V_{DS} = -15\text{V}$ , $V_{GS} = -5\text{V}$ 1μs pulse		<b>10.9</b>		ns
Fall time	$T_f$	$V_{DS} = -15\text{V}$ , $V_{GS} = -5\text{V}$ 1μs pulse		<b>17.2</b>		ns
Drain current	$I_D$	$V_{DS} = -30\text{V}$ , $V_{GS} = -5\text{V}$ 2μs pulse, $T_j = -55^\circ\text{C}$		480		mA
		$V_{DS} = -30\text{V}$ , $V_{GS} = -5\text{V}$ 2μs pulse, $T_j = 25^\circ\text{C}$		420		mA
		$V_{DS} = -30\text{V}$ , $V_{GS} = -5\text{V}$ 2μs pulse, $T_j = 225^\circ\text{C}$		310		mA

<sup>1</sup> Includes ESD diode leakage current.

<sup>2</sup> Voltage for which the cut-off current evolution versus  $V_{DS}$  becomes exponential.

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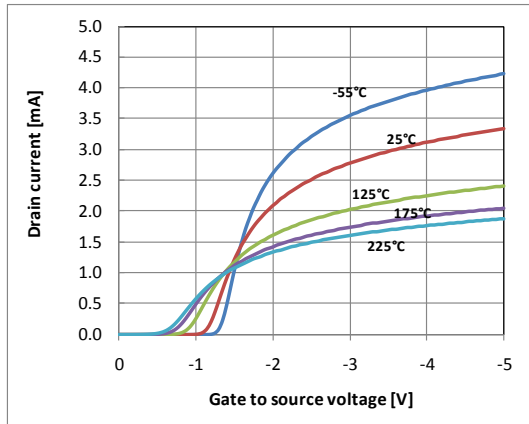
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**Thermal Characteristics**

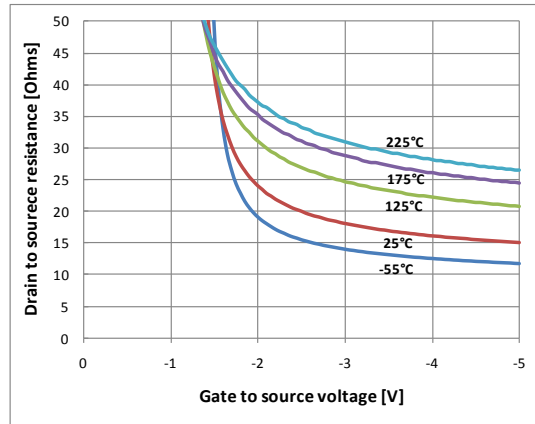
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Thermal resistance (junction to case, TO-39 package)	$\Theta_{JC}$			60		°C/W
Thermal resistance (junction to case, TO-18 package)	$\Theta_{JC}$			60		°C/W

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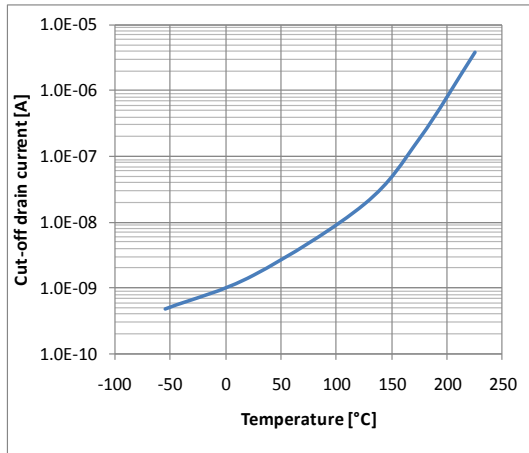
**Typical Performance Characteristics**



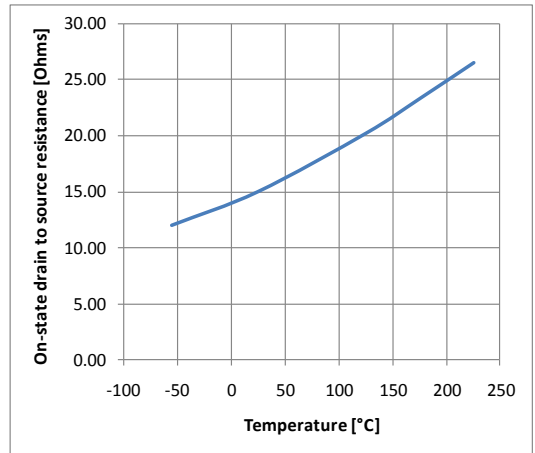
**Drain current vs. gate-source voltage ( $V_D=-50mV$ ).**



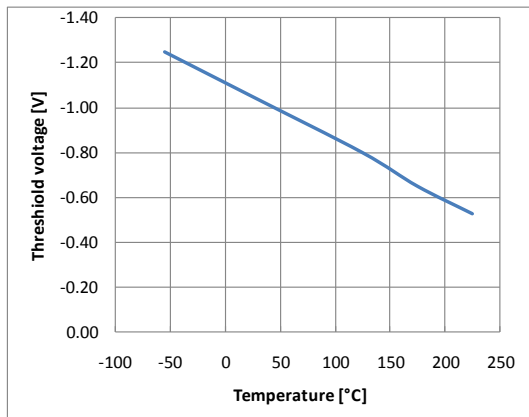
**Drain source resistance vs. gate-source voltage ( $V_D=-50mV$ ).**



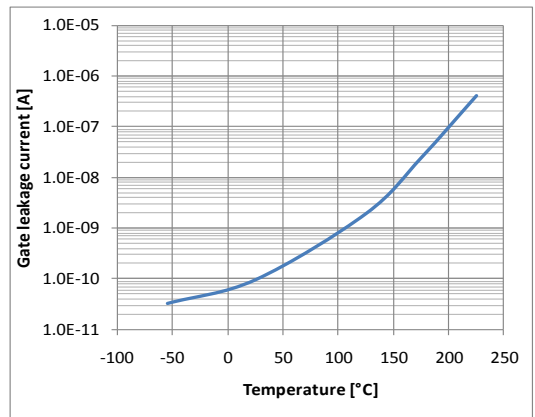
**Cut-off drain current vs. temperature ( $V_G=0V$ ,  $V_D=-30V$ ).**



**On-state drain source resistance vs. temperature ( $V_G=-5V$ ,  $V_D=-50mV$ ).**

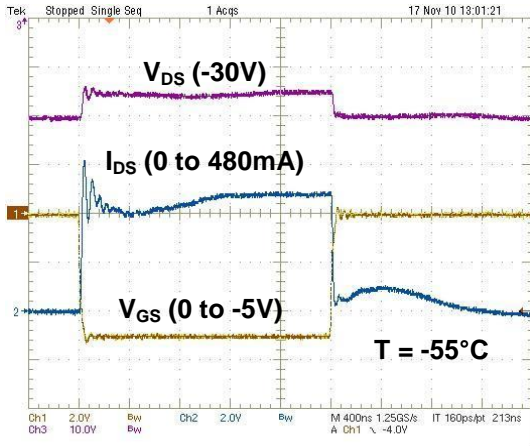


**Threshold voltage vs. temperature**

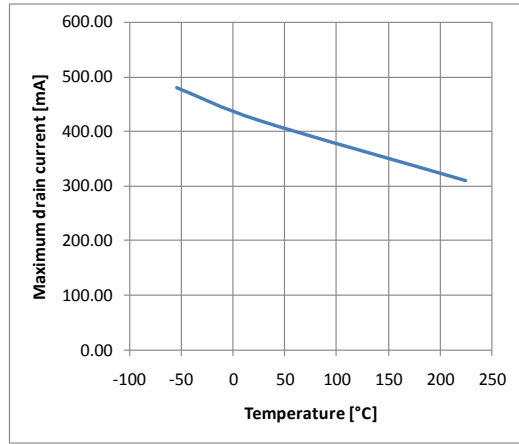


**Gate and ESD diode leakage current vs. temperature ( $V_G=-5V$ ,  $V_D=-50mV$ ).**

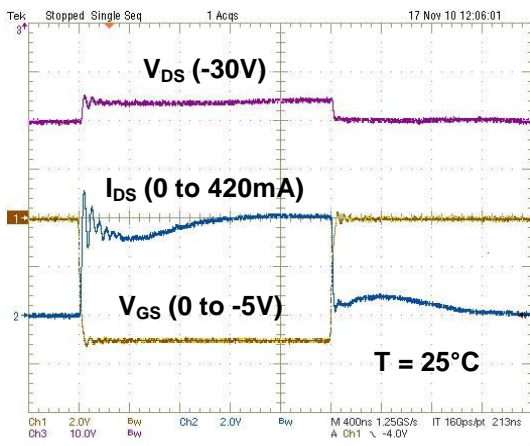
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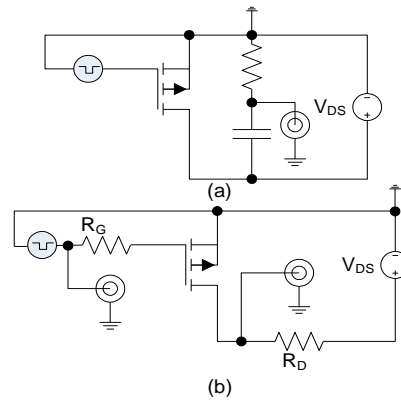
Maximum drain current pulse test (T=-55°C).



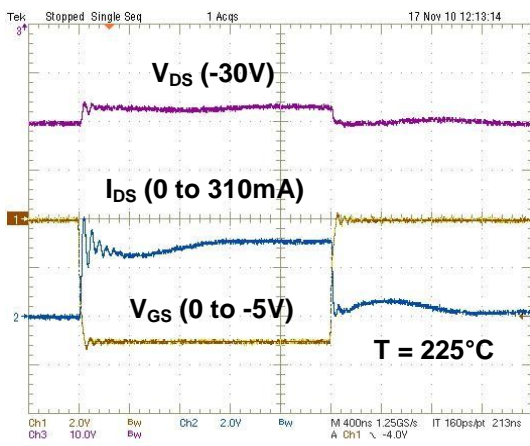
Peak drain current vs. temperature (V<sub>G</sub>=-5V, V<sub>D</sub>=-30V).



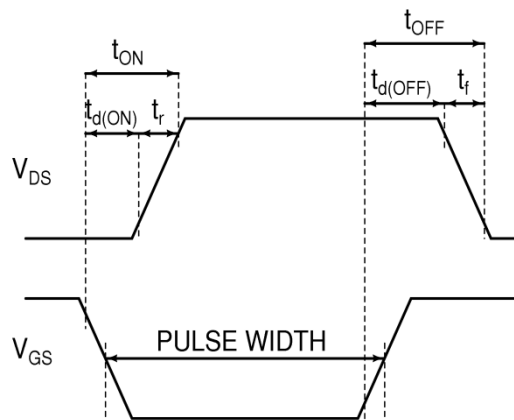
Maximum drain current pulse test (T=25°C).



(a) I<sub>D</sub><sup>MAX</sup> measurement scheme R=10Ω, C=100μF, Compliance (V<sub>DS</sub>=-30V)=100mA (b) Timing measurement scheme R<sub>G</sub>=0Ω, R<sub>D</sub>=68Ω, V<sub>DS</sub>=-15V.

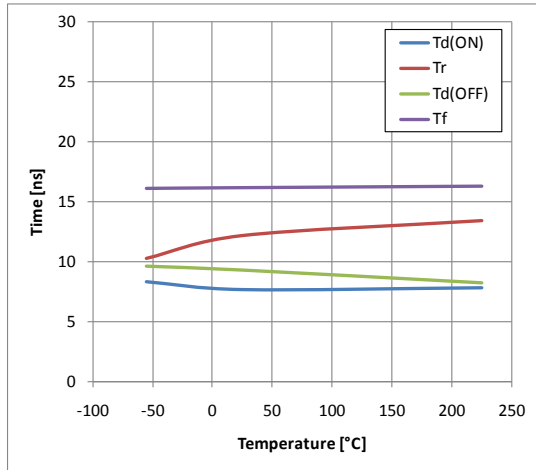


Maximum drain current pulse test (T=225°C).

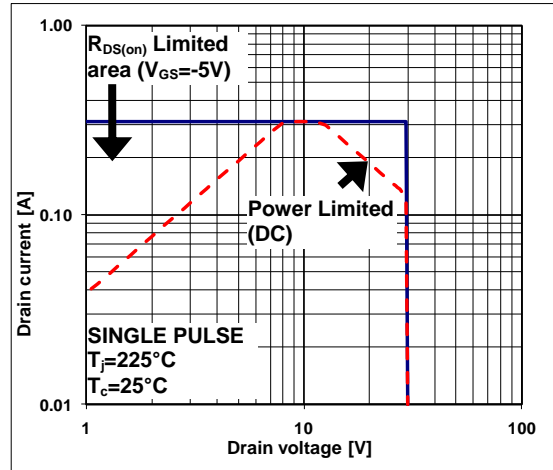


Timing definition diagram.

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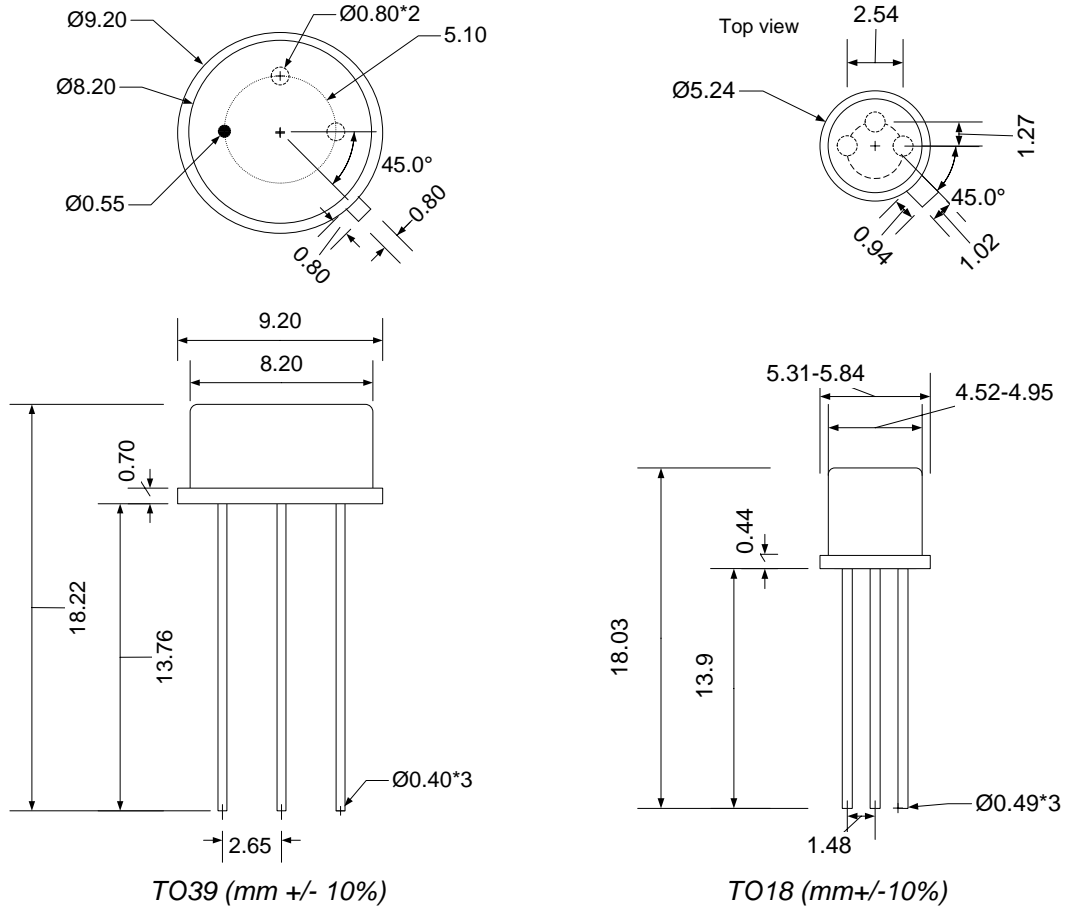
Timing parameters versus temperature.



Forward bias safe operating area

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**Package Dimensions**



**Ordering Information**

Ordering Reference	Package	Temperature Range	Marking
CHT-SPMOS30-TO39-T	TO-39 metal can	-55°C to +225°C	CHT-SPMOS30
CHT-SPMOS30-TO18-T	TO-18 metal can	-55°C to +225°C	CHT-SP3

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## Contact & Ordering

### CISSOID S.A.

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