

MERCURY: CHT-SNMOS80 DATASHEET

Version: 2.8
5-Mar-15
Last Modified Date

High-Temperature Small-signal N-channel MOSFET

General description

The CHT-SNMOS-80 is a high voltage 80V N-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.

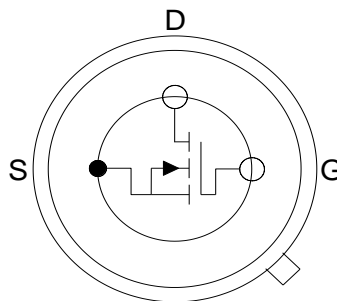
Applications

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)
- Drain voltage up to 80V
- Typ output current 300mA @ 225°C
- $R_{DSon} = 15\Omega @ 225^\circ\text{C}$
- VGS = -0.5V to +5.5V
- Reverse ESD diode between gate and source.
- Validated at 225°C for 1000 hours (and still on-going)
- Available in TO18 package (other packages available upon request).

Package configurations¹



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

¹ Other packages available upon request.

Absolute Maximum Ratings

| | |
|--|--|
| Gate-to-Source voltage V_{GS} | -0.5V to 5.5V |
| Pulsed drain current I_{DS} (Tpulse \leq 2 μ s) | 500mA @ -55°C 450mA @ 25°C 300mA @ 225°C |
| Power dissipation $T_c=25^\circ\text{C}$ | 3.75W |
| 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 80V |
| Power dissipation $T_c=25^\circ\text{C}$ | 3.3W |
| Junction temperature | -55°C to +225°C |

ESD Rating

Human Body Model CLASS1C

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} | $V_{DS} = 50\text{mV}$ | 1 | 1.65 | 1.9 | V |
| Drain cut-off current | I_{DSS} | $V_{GS} = 0\text{V}$, $V_{DS} = 80\text{V}$, $T_j = 25^\circ\text{C}$ | | 5 | | nA |
| | | $V_{GS} = 0\text{V}$, $V_{DS} = 80\text{V}$, $T_j = 225^\circ\text{C}$ | | 4 | | uA |
| Gate leakage current ¹ | I_{GSS} | $V_{GS} = 5\text{V}$, $V_{DS} = 50\text{mV}$, $T_j = 25^\circ\text{C}$ | | 100 | | pA |
| | | $V_{GS} = 5\text{V}$, $V_{DS} = 50\text{mV}$, $T_j = 225^\circ\text{C}$ | | 400 | | nA |
| Static drain-to-source resistance | R_{Dson} | $V_{GS} = 5\text{V}$, $V_{DS} = 50\text{mV}$, $T_j = -55^\circ\text{C}$ | | 5.93 | | Ω |
| | | $V_{GS} = 5\text{V}$, $V_{DS} = 50\text{mV}$, $T_j = 25^\circ\text{C}$ | | 7.54 | | Ω |
| | | $V_{GS} = 5\text{V}$, $V_{DS} = 50\text{mV}$, $T_j = 225^\circ\text{C}$ | | 15.22 | | Ω |
| Breakdown drain-to-source voltage ² | V_{BRDS} | $V_{GS} = 0\text{V}$ | 80 | | | 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} | $V_{GS} = 0V_{DC}$, $V_{DS} = 25V_{DC}$ | | 23 | | pF |
| Output capacitance | C_{OSS} | $V_{GS} = 0V_{DC}$, $V_{DS} = 25V_{DC}$ | | 8.6 | | pF |
| Feedback capacitance | C_{RSS} | $V_{GS} = 0V_{DC}$, $V_{DS} = 25V_{DC}$ | | 1.8 | | 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 | $T_{d(ON)}$ | $V_{DS} = 40\text{V}$, $V_{GS} = 5\text{V}$ 1 μs pulse | | 20 | | ns |
| Rise time | T_r | $V_{DS} = 40\text{V}$, $V_{GS} = 5\text{V}$ 1 μs pulse | | 6.5 | | ns |
| Turn-off delay time | $T_{d(OFF)}$ | $V_{DS} = 40\text{V}$, $V_{GS} = 5\text{V}$ 1 μs pulse | | 19 | | ns |
| Fall time | T_F | $V_{DS} = 40\text{V}$, $V_{GS} = 5\text{V}$ 1 μs pulse | | 8.1 | | ns |
| Drain current | I_D | $V_{DS} = 80\text{V}$, $V_{GS} = 5\text{V}$ 2 μs pulse, $T_j = -55^\circ\text{C}$ | | 500 | | mA |
| | | $V_{DS} = 80\text{V}$, $V_{GS} = 5\text{V}$ 2 μs pulse, $T_j = 25^\circ\text{C}$ | | 450 | | mA |
| | | $V_{DS} = 80\text{V}$, $V_{GS} = 5\text{V}$ 2 μs pulse, $T_j = 225^\circ\text{C}$ | | 300 | | mA |

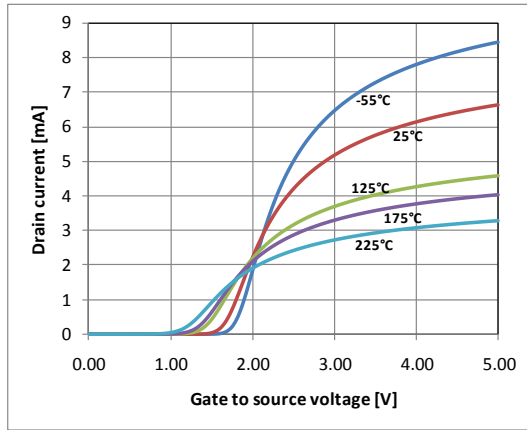
Thermal Characteristics

| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|---|---------------|-----------|-----|-----|-----|--------------------|
| Thermal resistance (junction to case, TO-18 package) | Θ_{JC} | | | 60 | | $^\circ\text{C/W}$ |

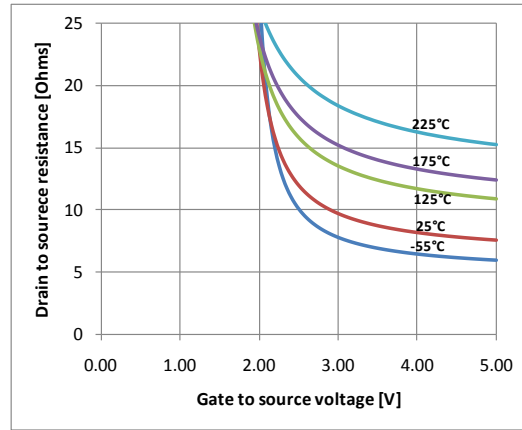
¹ Includes ESD diode leakage current.

² Voltage for which the cut-off current evolution versus V_{DS} becomes exponential.

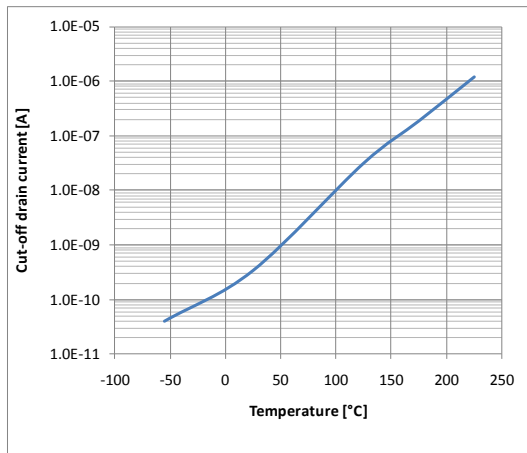
Typical Performance Characteristics



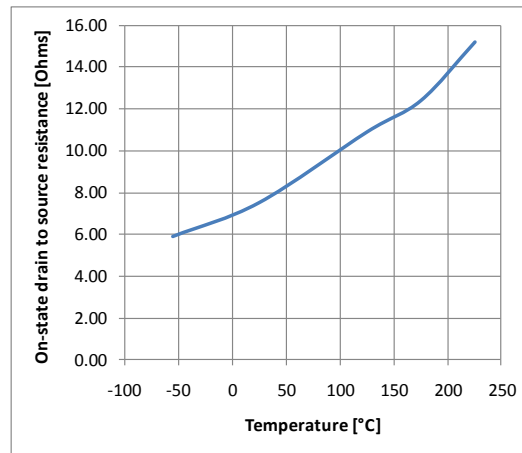
Drain current vs. gate-source voltage ($V_D=50mV$).



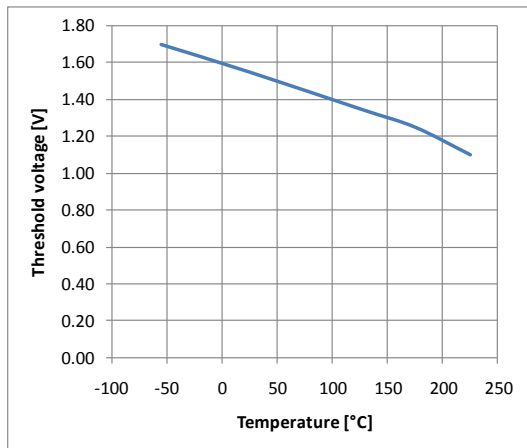
Drain source resistance vs. gate-source voltage ($V_D=50mV$).



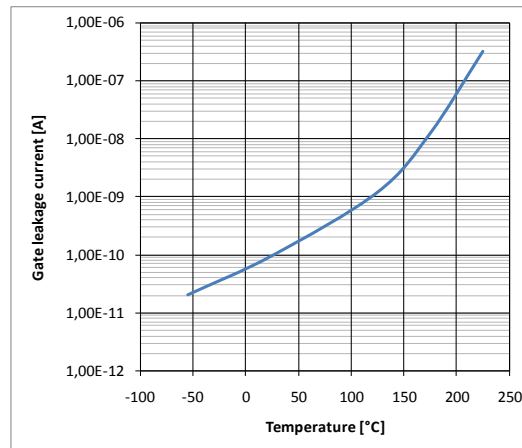
Cut-off drain current vs. temperature ($V_G=0V$, $V_D=80V$).



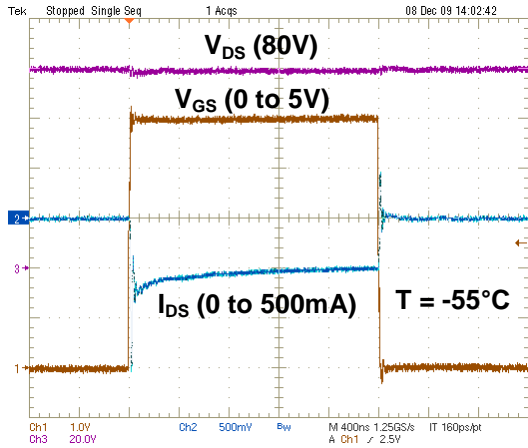
On-state drain source resistance vs. temperature ($V_G=5V$, $V_D=50mV$).



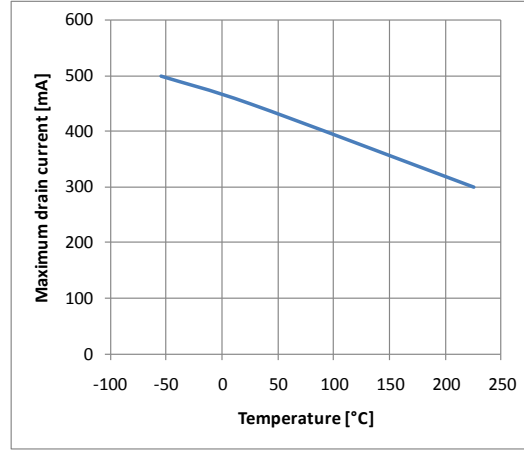
Threshold voltage vs. temperature.



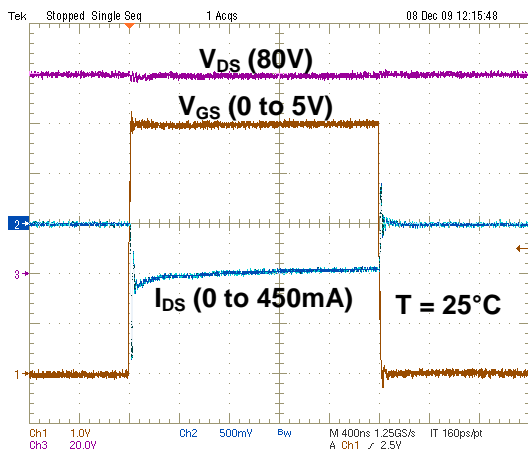
Gate and ESD diode leakage current vs. temperature ($V_G=5V$, $V_D=50mV$).



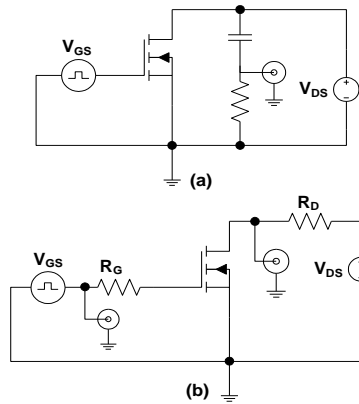
Maximum drain current pulse test (T=-55°C).



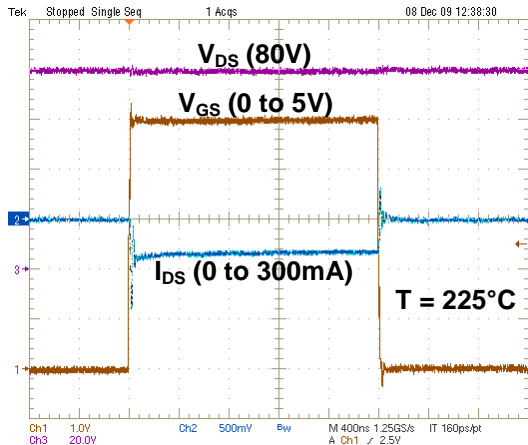
Peak drain current vs. temperature (V_G=5V, V_D=80V).



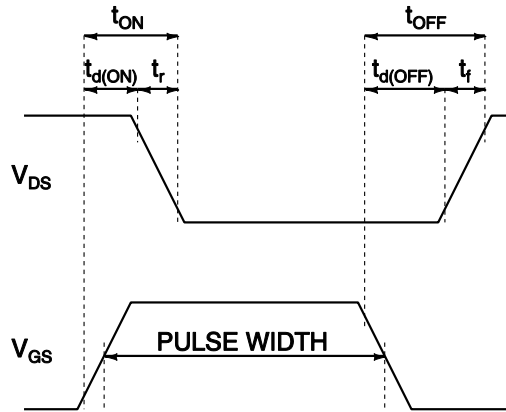
Maximum drain current pulse test (T=25°C).



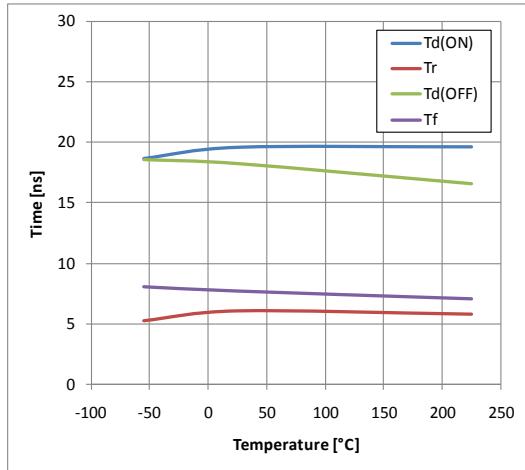
(a) I_D^{MAX} measurement scheme R=1Ω, C=100μF, Compliance (V_{DS}=80V)=100mA (b) Timing measurement scheme R_G=0Ω, R_D=82Ω, V_{DS}=40V.



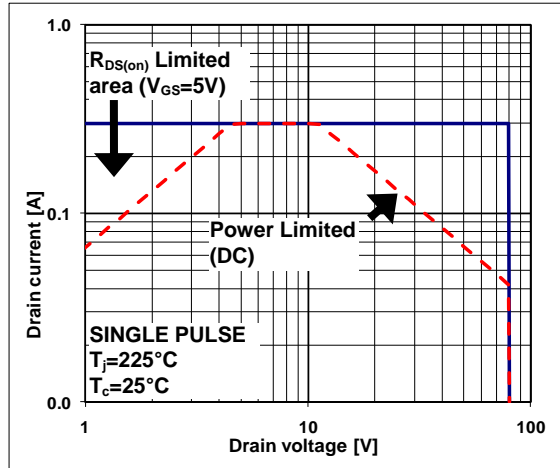
Maximum drain current pulse test (T=225°C).



Timing definition diagram.



Timing parameters versus temperature.



Forward bias safe operating area

**Application Note:
CHT-SNMOS80 used as a diode**

General description

CHT-SNMOS80 can be used as high temperature general purpose diode able to sustain reverse voltages of up to 80V. The typical operation temperature range goes from -55°C to 225°C.

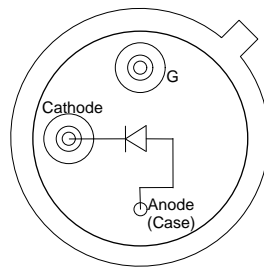
Features

- Qualified from -55 to +225°C (Tj)
- Operational up to +250°C (Tj)
- Reverse voltage up to 80V
- Forward surge current 200mA @ 225°C
- Low reverse leakage current 4 µA @ 225°C
- Available in TO18 package (other packages available upon request).

Applications

Rectification, voltage blocking, general purpose switching.

Package configuration



TO18 (Top view)

G pin to be connected to Anode externally!

Absolute Maximum Ratings

| | |
|--|-------|
| Reverse voltage V_R | 80V |
| Forward surge current I_{FSM} | 200mA |
| Power dissipation $T_c=25^\circ\text{C}$ | 300mW |
| Junction temperature T_j | 300°C |

Operating Conditions

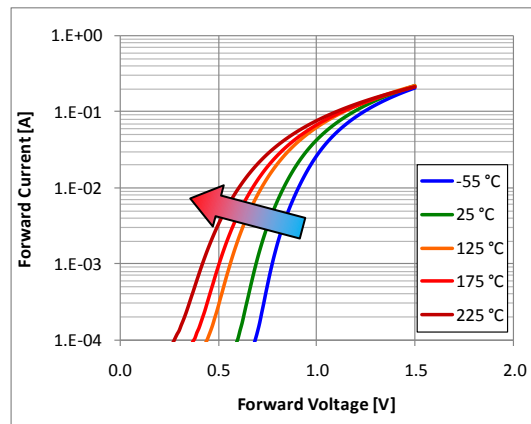
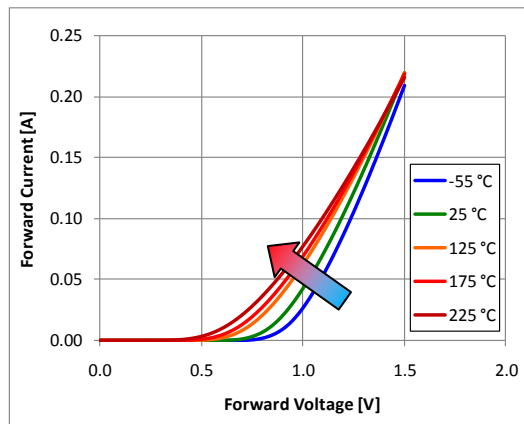
| | |
|--|-----------------|
| Reverse voltage V_R | 0V to 80V |
| Continuous forward current I_F | 0mA to 150mA |
| Forward voltage V_F | 0V to 1.25V |
| Power dissipation $T_c=25^\circ\text{C}$ | 200mW |
| Junction temperature | -55°C to +225°C |

Electrical 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 $+225^\circ\text{C}$).

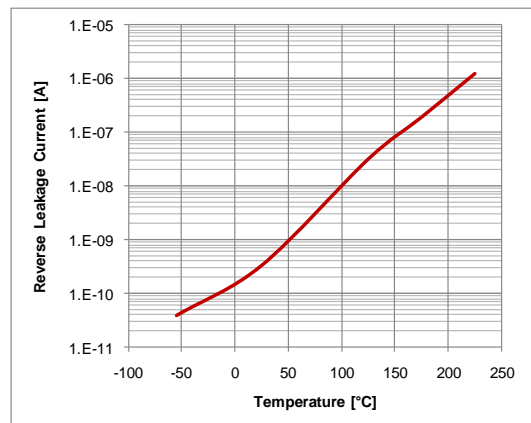
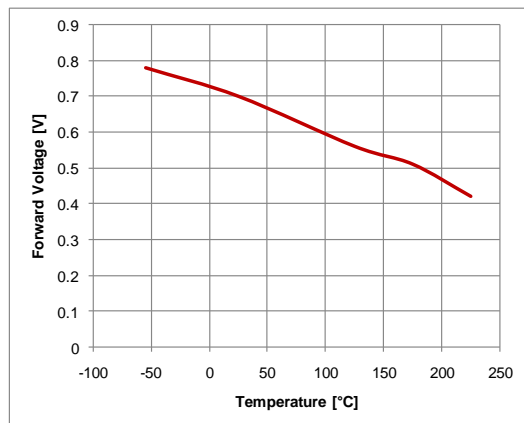
| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|---------------------------|-----------|--|-----------|-----|------------|------|
| Forward voltage | V_F | $I_F=1\text{mA}$, $T_j=25^\circ\text{C}$ | | 0.7 | | V |
| Forward surge current | I_{FSM} | | | | 200 | mA |
| Reverse leakage current | I_{RM} | $V_R=80\text{V}$, $T_j=25^\circ\text{C}$ | | 5 | | nA |
| | | $V_R=80\text{V}$, $T_j=225^\circ\text{C}$ | | 4 | | uA |
| Breakdown reverse voltage | V_R | | 80 | | | V |
| Junction capacitance | C_j | $V_R=25\text{V}$ | | 8.6 | | pF |

Typical Performance Characteristics



Forward current vs. forward voltage and temperature (linear scale).

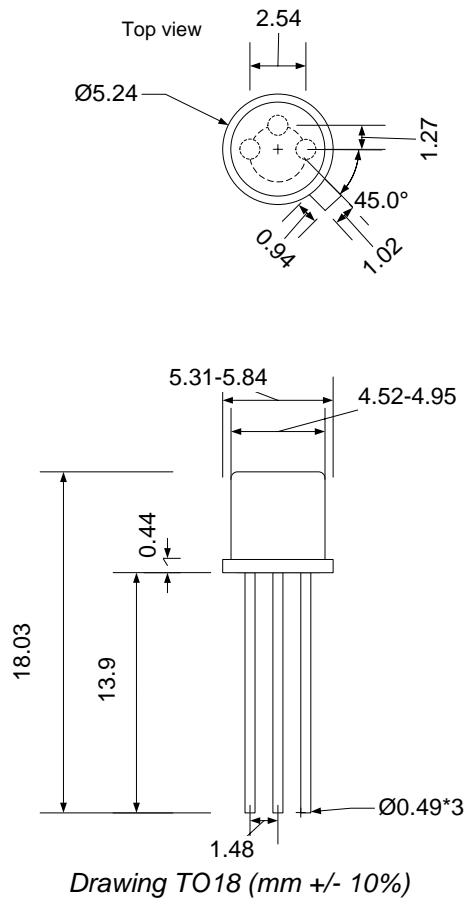
Forward current vs. forward voltage and temperature (log₁₀ scale).



Forward voltage (at forward current $I_F=1\text{mA}$) vs. temperature.

Reverse leakage current (at reverse voltage $V_R=80\text{V}$) vs. temperature.

Package Dimensions



Ordering Information

| Ordering Reference | Package | Temperature Range | Marking |
|--------------------|-----------------|-------------------|---------|
| CHT-SNMOS80-TO18-T | TO-18 metal can | -55°C to +225°C | CHT-SN8 |

Contact & Ordering

CISSOID S.A.

| | |
|---------------------------------------|---|
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