

## CHT-OPA DATASHEET

Revision: 02.1  
Nov. 10, 2010

### High-Temperature General-Purpose Quad Operational Amplifier

#### General Description

The CHT-OPA is a general-purpose quad operational amplifier for applications over the temperature range from -55 to 225°C.

The CHT-OPA can operate with both single and symmetrical power supplies. The supply voltages range goes from 4.5 to 20V.

The CHT-OPA uses internal metal lines presenting extremely high immunity to electromigration, improving product lifetime.

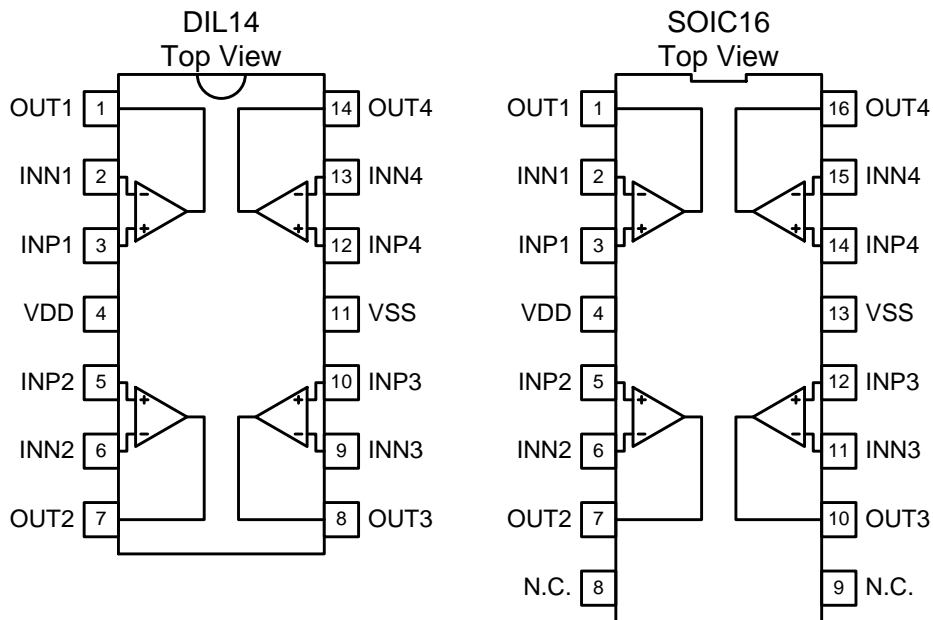
#### Features

- Qualified from -55 to +225°C (Tj)
- 4.5 to 20V supply voltages
- Single or symmetrical supply operation
- Latchup-free at any supply and temperature condition
- Available in DIL14 and SOIC16 hermetic ceramic standard packages

#### Applications

- Well logging, Automotive, Aeronautics & Aerospace
- Harsh Environments

#### Package Configurations<sup>1</sup>



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

**Absolute Maximum Ratings**

 Supply Voltage VDD to VSS -0.5 to 25V  
 Voltage on any Pin to VSS -0.5 to V<sub>DD</sub>+0.5V

**Operating Conditions**

 Supply Voltage VDD to VSS 4.5V to 20V  
 Junction temperature -55°C to +225°C

**ESD Rating (expected)**

Human Body Model 1kV

**DC Electrical Characteristics**

 Unless otherwise stated: VDD=10V, VSS=0V, T<sub>j</sub>=25°C. **Bold underlined** values indicate values over the whole temperature range (-55°C < T<sub>j</sub> < +225°C).

Parameter	Condition	Min	Typ	Max	Units
Supply voltage <b>VDD-VSS</b>		4.5		20	V
Supply current (full package) <b>I<sub>DD</sub></b>	T <sub>j</sub> =25°C			1.7	mA
	T <sub>j</sub> =-55 to 225°C			<b><u>2.2</u></b>	
Output voltage swing <b>V<sub>o</sub></b>	RL=2kΩ, THD <sup>1</sup> =1%	0.15		VDD-0.18	V
	RL=∞, THD=0.1%	0.03		VDD-0.02	
Output current <sup>2,3</sup> <b>I<sub>o</sub></b>	T <sub>j</sub> =-55 to 225°C			<b><u>±15</u></b>	mA
Common mode input range <b>V<sub>CM</sub></b>	T <sub>j</sub> =225°C	2.0		VDD-0.1	V
	T <sub>j</sub> =-55°C	1.5		VDD-0.2	
Input offset voltage <sup>4</sup> <b>V<sub>IOFF</sub></b>	T <sub>j</sub> =25°C		<±2.5	±8	mV
Input offset drift <sup>3</sup> <b>TC<sub>VIOFF</sub></b>	T <sub>j</sub> =25°C		<±5	±15	μV/°C
Input bias current <sup>5</sup> <b>I<sub>B</sub></b>	T <sub>j</sub> =-55 to 225°C			<b><u>±10</u></b>	nA
Input offset current <sup>4</sup> <b>I<sub>OFF</sub></b>	T <sub>j</sub> =25°C			±0.01	nA
	T <sub>j</sub> =225°C			±10	

<sup>1</sup> Total Harmonic Distortion.

<sup>2</sup> Source or sink.

<sup>3</sup> Output current is not internally limited. Value given indicate the maximum recommended conditions.

<sup>4</sup> The absolute value of the input offset voltage, |V<sub>IOFF</sub>|, decreases as temperature increases. TC<sub>VIOFF</sub> must be used so that |V<sub>IOFF</sub>| decreases with temperature, i.e. TC<sub>VIOFF</sub> has opposite sign than V<sub>IOFF</sub>.

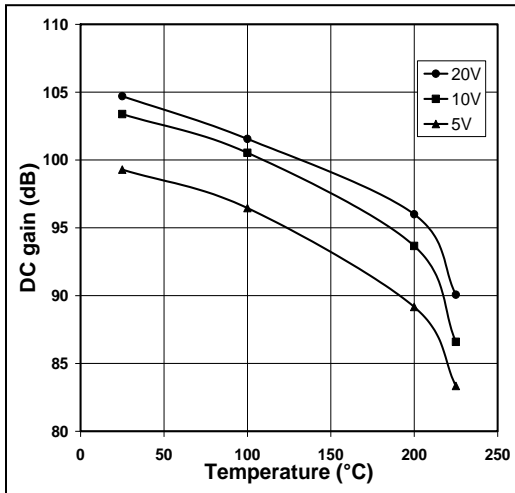
<sup>5</sup> Due to ESD structures. Under full characterization.

**AC Electrical Characteristics**

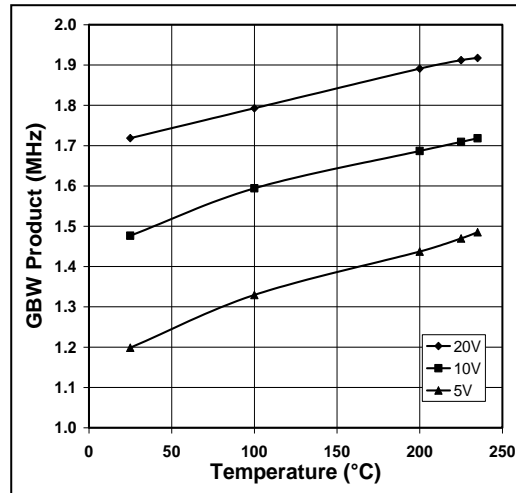
Unless otherwise stated: VDD=10V, VSS=0V, T<sub>j</sub>=25°C. **Bold underlined** values indicate values over the whole temperature range (-55°C < T<sub>j</sub> < +225°C).

Parameter	Condition	Min	Typ	Max	Units
DC gain <b>A<sub>o</sub></b>	RL=2kΩ, T <sub>j</sub> =25°C	90	100		dB
	RL=2kΩ, T <sub>j</sub> =225°C	80	87		
Gain-bandwidth product <b>GBW</b>	RL=2kΩ, CL=30pF	<b><u>1.3</u></b>	<b><u>1.5</u></b>		MHz
Common mode rejection ratio <b>CMRR</b>	DC to 1kHz	<b><u>86</u></b>			dB
Power supply rejection ratio <b>PSRR</b>	Positive or negative. DC to 100Hz	<b><u>78</u></b>			dB
Slew rate <b>SR</b>	RL=2kΩ, CL=30pF T <sub>j</sub> =25°C	1.0	1.2		V/μsec
	RL=2kΩ, CL=30pF T <sub>j</sub> =225°C	1.6	1.7		
Phase margin <b>Φ<sub>M</sub></b>	RL=2kΩ, CL=30pF	<b><u>50</u></b>	<b><u>&gt;60</u></b>		Degree
Input noise spectral density	F=1Hz		11.0		μV/√Hz
	F=100Hz		1.2		
	F=1kHz		0.43		
	F=10kHz		0.19		
Integrated input noise <b>e<sub>n</sub></b>	DC to 10Hz, T <sub>j</sub> =-55 to 225°C		25		μV <sub>RMS</sub>

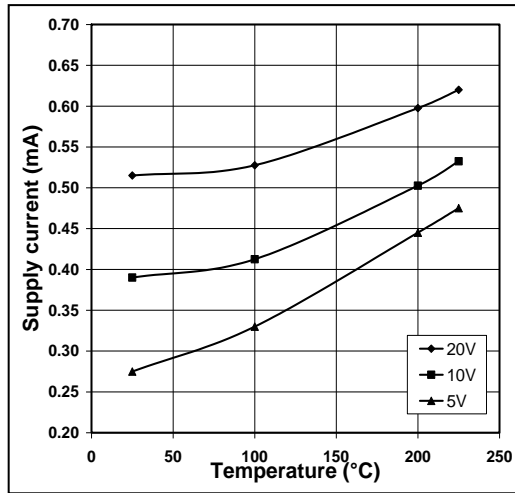
Typical Performance Characteristics



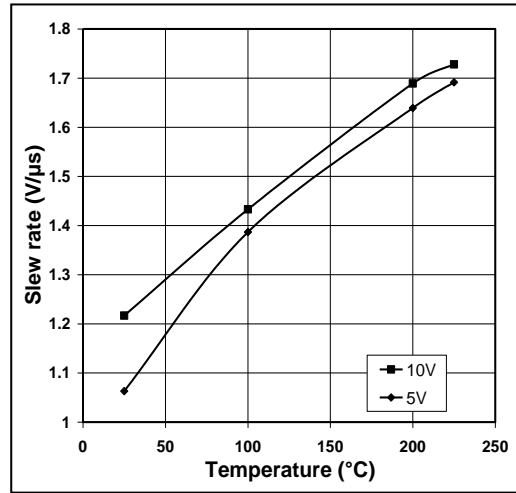
DC Gain vs. Temperature for V<sub>DD</sub> = 5/10/20V



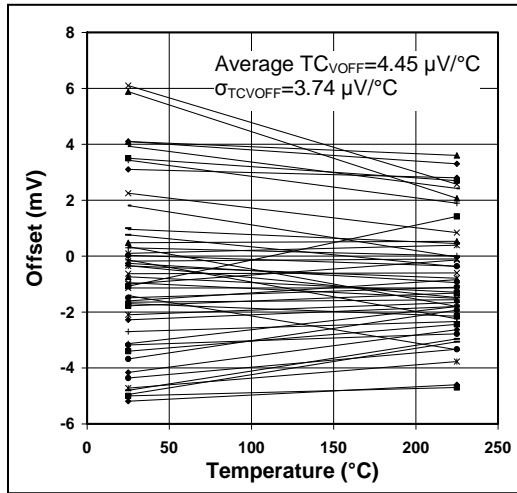
GBW vs. Temperature for V<sub>DD</sub> = 5/10/20V



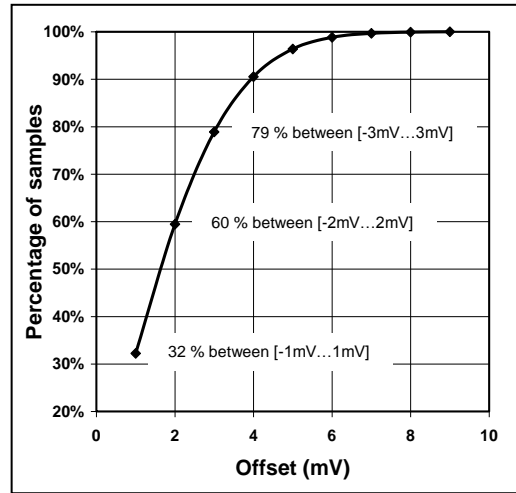
Current consumption per amplifier vs. Temperature for V<sub>DD</sub> = 5/10/20V



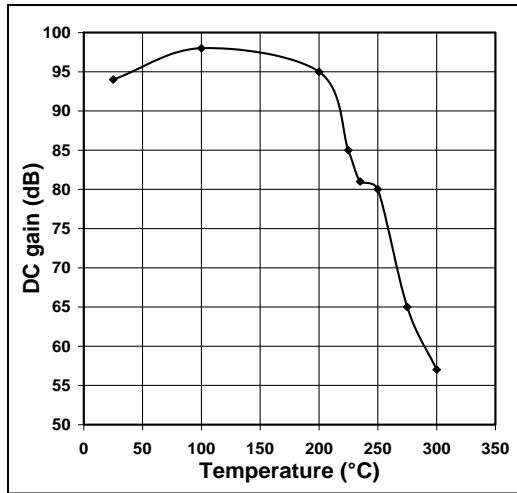
Slew Rate vs. Temperature for V<sub>DD</sub> = 5/10V



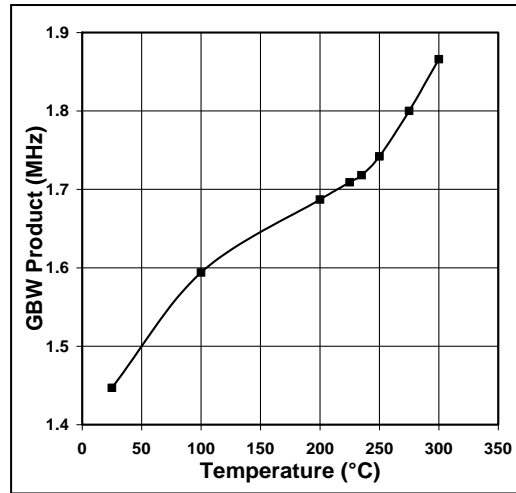
Offset voltage vs. Temperature



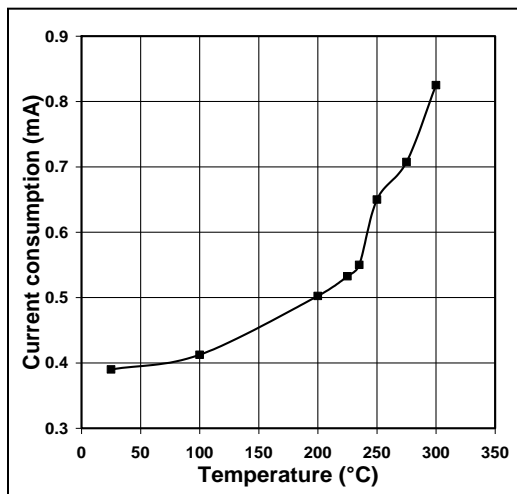
Sample size vs. Offset voltage



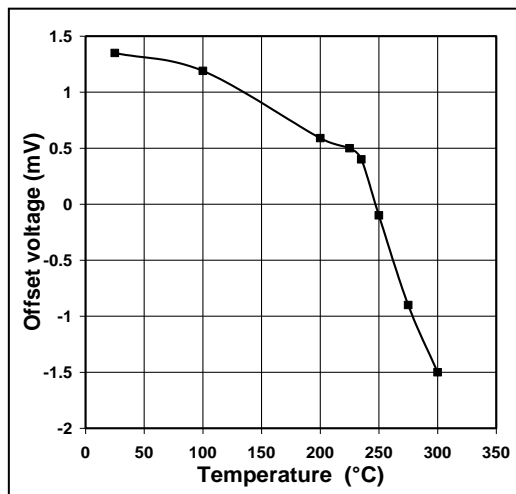
DC Gain vs. Temperature for  $V_{DD} = 10V$ . Typical



GBW vs. Temperature for  $V_{DD} = 10V$ . Typical



Current consumption per amplifier vs. Temperature for  $V_{DD} = 10V$ . Typical



Offset voltage vs. Temperature. Typical

## Circuit Functionality

### Operating conditions

The CHT-OPA has been qualified to operate with supply voltages ranging from 4.5V to 20V and temperatures from -55°C to 225°C. Device characteristics vary smoothly outside the qualification temperature range.

The CHT-OPA has been conceived to operate in closed loop configuration under linear regime. This limitation only applies for supply voltages above 5.5V. When operating with supply voltages above 5.5V, internal circuitry prevents exceeding "Safe Operating Area" conditions inside the circuit. Nevertheless, continuous or repetitive operation outside linear regime could permanently damage the part.

For supply voltages below 5.5V, no limitation on the operation regime exists and the part can even be used as comparator.

### Specific Operating Conditions

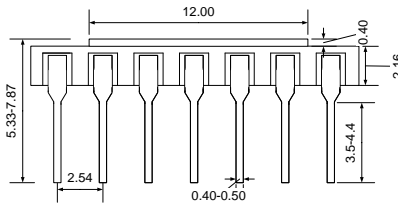
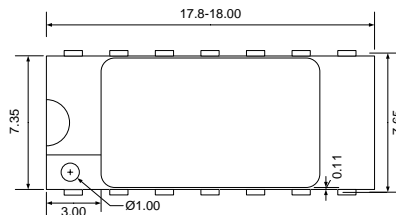
The CHT-OPA presents slightly different positive and negative slewing values. This makes that when a square wave is used as input signal, the output presents an additional DC offset due to the slight change of the output duty cycle.

Additionally, for square input signals with frequencies above 10kHz, the circuit presents an output DC offset which increases with the input frequency. At 30kHz, the input referred offset increases by about 20mV.

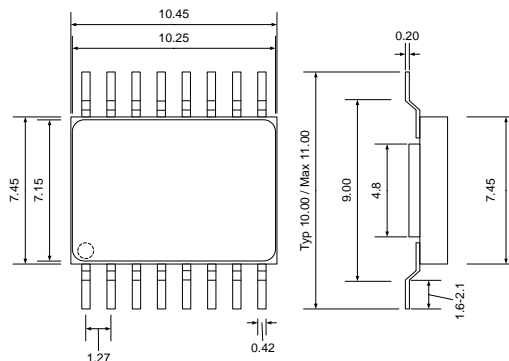
## Ordering Information

Ordering Reference	Package	Temperature Range	Marking
CHT-OPA-CDIL14-T	Ceramic DIL14	-55°C to +225°C	CHT-OPA
CHT-OPA-CSOIC16-T	Ceramic SOIC16	-55°C to +225°C	CHT-OPA

## Package Dimensions



Drawing CDIL14 (mm +/- 10%)



Drawing CSOIC16 (mm +/- 10%)

## Contact & Ordering

CISSOID S.A.

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