

# CHT-BG3M-Datasheet

Version: 1.9  
20-Dec-23  
(Last Modification Date)

## High Temperature Voltage Reference 2.5V; 5V, 10V (3.3V; 9V; 12V) +/- 2%

### General Description

The CHT-BG3M is a bandgap voltage reference compatible with High Temperature environments. Typical operation temperature range extends from -55°C to 225°C. Its total precision (initial plus temperature drift plus line and load regulation) is better than 2%.

The CHT-BG3M has a quiescent current consumption of 700µA. The circuit can deliver an output current of up to 3mA into an external load at 225°C. It is stable throughout the whole temperature range for load capacitances between 0 and 3nF.

The minimum dropout voltage is 1.5V<sup>(1)</sup> with a load current lower than 1mA and 2.5V<sup>(1)</sup> at 3mA load current. The maximum acceptable dropout voltage ( $V_{in}-V_{out}$ ) is 15V.

The CHT-BG3M is available in TO-39 package and in bare die. Other packages are available upon request.

### Applications

Precise Voltage reference with low temperature drift for High Temperature electronic systems used in Well logging, Automotive, Aeronautics or Aerospace applications.

### Features

- 1.5V<sup>1</sup> to 15V<sup>2</sup> Dropout voltage @1mA
- 2.5V<sup>1</sup> to 15V<sup>2</sup> Dropout voltage @3mA
- Max. output current: 3mA @225°C
- Max. load capacitance 3nF
- Output voltage programmable by bonding option (bare die version)
- Available in TO-39 and bare die form (contact CISSOID). Other packages available on request.
- Validated at 225°C for 30000 hours (and still on-going)
- Start-up operational over the whole temperature range
- Latch-up free

### Standard voltages

- CHT-BG3M-025: 2.5V
- CHT-BG3M-050: 5.0V
- CHT-BG3M-100: 10.0V

### Special voltages<sup>3</sup>

- CHT-BG3M-033: 3.3V
- CHT-BG3M-090: 9.0V
- CHT-BG3M-120: 12.0V

<sup>1</sup> for CHT-BG3M-025, min dropout is 2V @1mA and 3V @3mA

<sup>2</sup> Input voltage cannot exceed 25V.

<sup>3</sup> Different lead times or MOQ may apply

### Absolute Maximum Ratings

Supply Voltage  $V_{in}$  -0.5 to 25V  
Junction temperature 315°C

### Operating Conditions

Dropout Voltage 1.5V<sup>(1)</sup> to 15V<sup>(2)</sup>  
Junction temperature -55°C to +225°C

### ESD Rating (expected)

Human Body Model 1kV

*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. During power up/restart without voltage regulator and depending on the quality of the power supply, peak voltage higher than 25V may be seen by the BG3M input, which exceeds the absolute maximum ratings and can cause permanent damage. This issue can be minimized by adding big decoupling capacitor (>10µF) close to the BG3M input.*

### Electrical Characteristics

Following table is relative to the 5V mode (CHT-BG3M-050).  
For other nominal voltage, see notes under this table.

Values over the whole temperature range (-55°C <  $T_j$  < 225°C) in bold.

Parameter	Condition	Min	Typ	Max	Units	note
Output voltage						
Initial accuracy	$I_L=1mA$ , $V_{in}=V_{out}+3V$ , $T_j = 25^\circ C$	-1		+1	%	(7)
Total accuracy	$I_L=[1mA..3mA]$ , $V_{in} = [V_{out}+3V .. V_{out}+15V]$	<b>-2</b>	<b>0</b>	<b>2</b>	%	
Drift with temperature	$I_L=1mA$ , $V_{in}=V_{out}+3V$	<b>0</b>		<b>70</b>	ppm	(3)
Line regulation	$I_L=1mA$ , $V_{in}=[V_{out}+2V..V_{out}+15V]$	<b>-1</b>		<b>1</b>	mV/V	(4)
Load regulation $R_{out}$	$I_L=0mA$ to 3mA $V_{in}=V_{out}+3V$ $T_j=25^\circ C$		-7		mV/mA	
	$I_L=0mA$ to 3mA $V_{in}=V_{out}+3V$ $T_j=225^\circ C$			<b>-16</b>		
Dropout $V_{in}-V_{out}$	$I_L=1mA$	<b>1.5</b>			V	(1)
	$I_L=3mA$	<b>2.5</b>			V	(1)
Quiescent Ground Pin current	$0 < I_L < 3mA$ ; $V_{in}=V_{out}+3V$		<b>700</b>	<b>800</b>	µA	
Power supply rejection ratio	$f=0Hz ..100Hz$ $V_{in}=V_{out}+2V$ ; $I_{load}=0mA$	<b>60</b>			dB	(5)
Output noise	0.1Hz-10Hz $I_L=0mA$ ; $T_j = 225^\circ C$		100		µV <sub>RMS</sub>	(6)

Note 1: for CHT-BG3M-025, min dropout is 2V @1mA and 3V @3mA

Note 2: Input voltage cannot exceed 25V.

Note 3: ppm are defined as  $[d(V_{out})/d(T)]/V_{out}$ . For 5V mode, 70ppm corresponds to 350µV/°C.

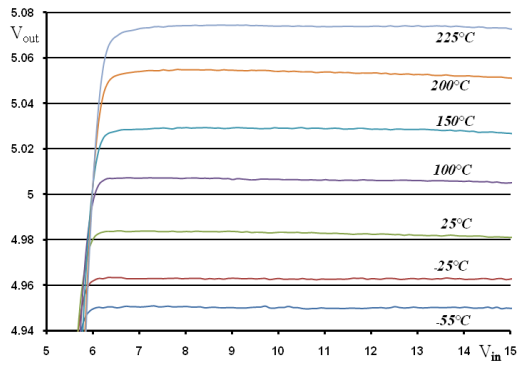
Note 4: Defining "x" as the nominal voltage, the line regulation is better than x/5 mV/V.

Note 5: Defining "x" as the nominal voltage, the minimum power supply rejection ratio is 66-1.2x .dB

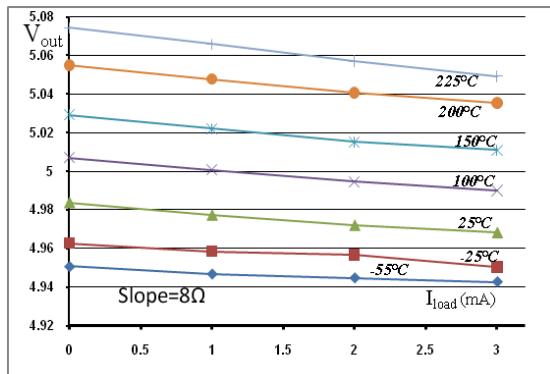
Note 6: Defining "x" as the nominal voltage, typical noise level is (x/5)\*240µV<sub>RMS</sub>

Note 7: For BG3M-25, limits are +/- 1.5%

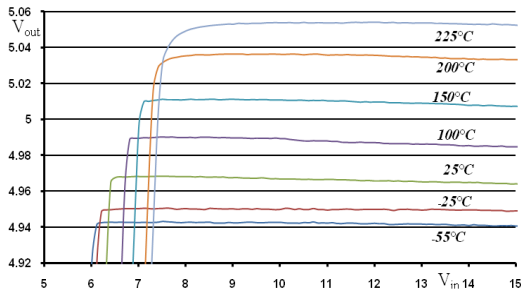
**Typical Performance Characteristics (5V mode)**



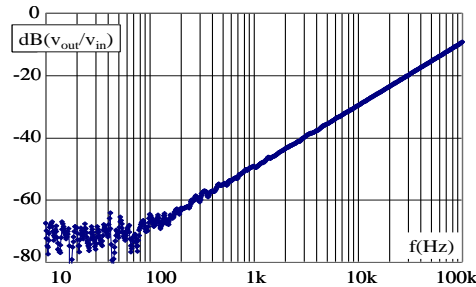
**Figure 1: CHT-BG3M-050 output voltage versus input voltage from -55°C up to 225°C ( $I_{load}=0mA$ ;  $C_{load}=1nF$ )**



**Figure 3: CHT-BG3M-050 output voltage versus load current from -55°C up to 225°C ( $V_{in}=8V$ ;  $C_{load}=1nF$ )**

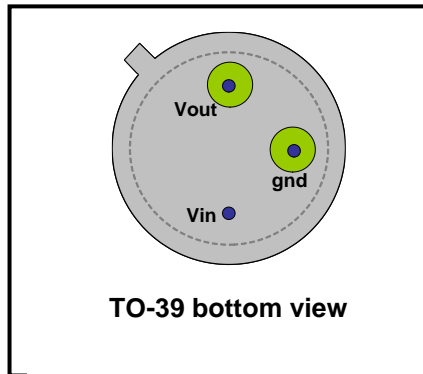


**Figure 2: CHT-BG3M-050 output voltage versus input voltage from -55°C up to 225°C ( $I_{load}=3mA$ ;  $C_{load}=1nF$ )**



**Figure 4: CHT-BG3M-050 input ripple rejection @ 25°C ( $V_{in}=7V$ ;  $I_{load}=0$ ;  $C_{load}=1nF$ )**

**Available Packaging Options**

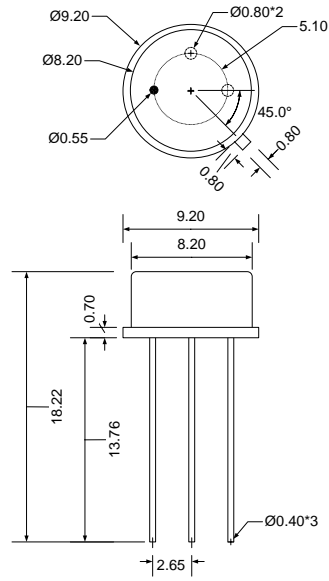


**Figure 1. CHT-BG3M in TO-39 package**

**NOTES:**

- The CHT-BG3M can also be ordered as die.
- Packaging options shown are only indicative. Other possibilities are also available.
- Ask CISSOID for other packaging configurations.

### Package Dimensions



Drawing TO39 (mm +/- 10%)

## Contact & Ordering

### Standard voltages

Ordering Reference	Package	Output Voltage	Temperature Range	Marking
CHT-BG3M-025-TO39-T	Metal TO39	2.5V	-55°C to +225°C	CHT-BG3M-025
CHT-BG3M-050-TO39-T	Metal TO39	5V	-55°C to +225°C	CHT-BG3M-050
CHT-BG3M-100-TO39-T	Metal TO39	12V	-55°C to +225°C	CHT-BG3M-100

### Special voltages<sup>4</sup>

Ordering Reference	Package	Output Voltage	Temperature Range	Marking
CHT-BG3M-033-TO39-T	Metal TO39	3.3V	-55°C to +225°C	CHT-BG3M-033
CHT-BG3M-090-TO39-T	Metal TO39	9V	-55°C to +225°C	CHT-BG3M-090
CHT-BG3M-120-TO39-T	Metal TO39	12V	-55°C to +225°C	CHT-BG3M-120

### CISSOID S.A.

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<sup>4</sup> Different lead times or MOQ may apply