EVM User's Guide: HDC3120EVM

HDC3120EVM Evaluation Module

Description

The HDC3120EVM is an analog evaluation module (EVM) designed to demonstrate the performance of the HDC3120: a highly accurate, ratiometric analog humidity and temperature sensor. The EVM offers flexibility for system-level evaluation and integration, allowing users to test the behavior of the sensor under various temperature, humidity, and power supply conditions. The EVM also features two on-board TLV9030 comparators, which provide analog alert outputs when the temperature or humidity analog output of the HDC3120 exceeds a user-defined threshold.

Get Started

1. Order the HDC3120EVM on ti.com
2. See Setup and Interface for detailed setup and connection guidance
3. Refer to the HDC3120 data sheet for sensor details
4. Visit our E2E™ forums for support or questions

Features

- Straightforward application to verify temperature and humidity functionality of HDC3120
- Included TLV9030 comparators enable switch-like function for further evaluation of sensor in end equipment design process
- Wide range of connection and test points for the convenience of the user

Applications

- Major appliances:
  - Dishwasher
  - Washer and dryer
  - Refrigerator and freezer
- Energy infrastructure:
  - Battery energy storage systems
  - Remote power distribution automation
- Data center
- Telecom power systems
- Automotive
  - Electronic Power Steering (EPS)
  - Battery Management System (BMS)
  - HVAC
  - Inverter

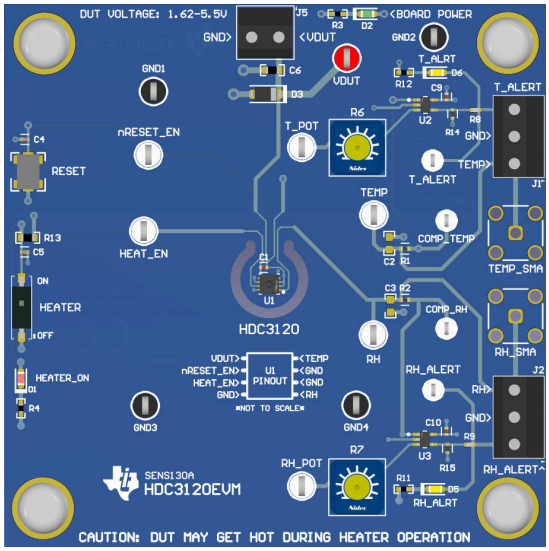

Figure 1-1. HDC3120EVM

1 Evaluation Module Overview

1.1 Introduction

This User's Guide describes the characteristics, operation, and use of the HDC3120 Evaluation Module (EVM). A full schematic, printed-circuit board layouts, and Bill of Materials (BOM) are included in this document. This User's Guide provides detailed steps to set up and operate the HDC3120EVM.

1.2 Kit Contents

Table 1-1 details the contents of the EVM kit. Contact TI's Customer Support Center for missing components. Refer to TI's website for the most recent kit revisions, RoHS compliance information, and User's Guide updates.

Table 1-1. Kit Contents

Item	Quantity
HDC3120EVM	1

1.3 HDC3120EVM Specifications

Table 1-2 defines the recommended thermal conditions of the EVM based off the recommendations for the HDC3120 and TLV9030 ICs. Consider the following recommendations when evaluating the performance of the device at varying operating conditions.

Table 1-2. Recommended Operating Conditions

EVM ICs	Recommended Ambient Temperature (°C)	Recommended Supply Voltage (V)
HDC3120 Temperature Sensing Element	-40°C - 125°C	1.62V - 5.5V
HDC3120 RH Sensing Element	-20°C - 80°C	
TLV9030	-40°C - 125°C	1.65V - 5.5V

1.4 Device Information

The HDC3120 is an integrated, capacitive based relative humidity (RH) and temperature sensor where the relative humidity and temperature sensor results are represented as ratiometric analog outputs. The HDC3120's analog signal output enables robust, long-distance signal transmission and simplifies integration in systems without digital support. For more information of the IC, please refer to the device data sheet. Table 1-3 includes some of the parameters of interest of the HDC3120 such as the operating ranges for the ambient environment and power supply. Table 1-4 includes similar parameters of the included TLV9030 comparators to consider when using this EVM.

Table 1-3. HDC3120 Device Specifications

Device Specifications	Values
Operating temperature range (temperature)	-40°C - 125°C
Operating temperature range (RH)	-20°C - 80°C
Operating supply range	1.62V - 5.5V

Table 1-4. TLV9030 Device Specifications

Device Specifications	Values
Operating temperature range	-40°C - 125°C
Operating supply range	1.65V - 5.5V

2 Hardware

The HDC3120EVM is an analog EVM and requires no software. This EVM is designed to provide the user with the flexibility to implement a temperature and humidity sensing design in any part of a system. The HDC3120EVM also includes footprints for a coaxial SMA connector for TEMP and RH output signals. Figure 2-1 highlights the various peripherals and some of the functions of the EVM which are explained in further detail in the following sections.

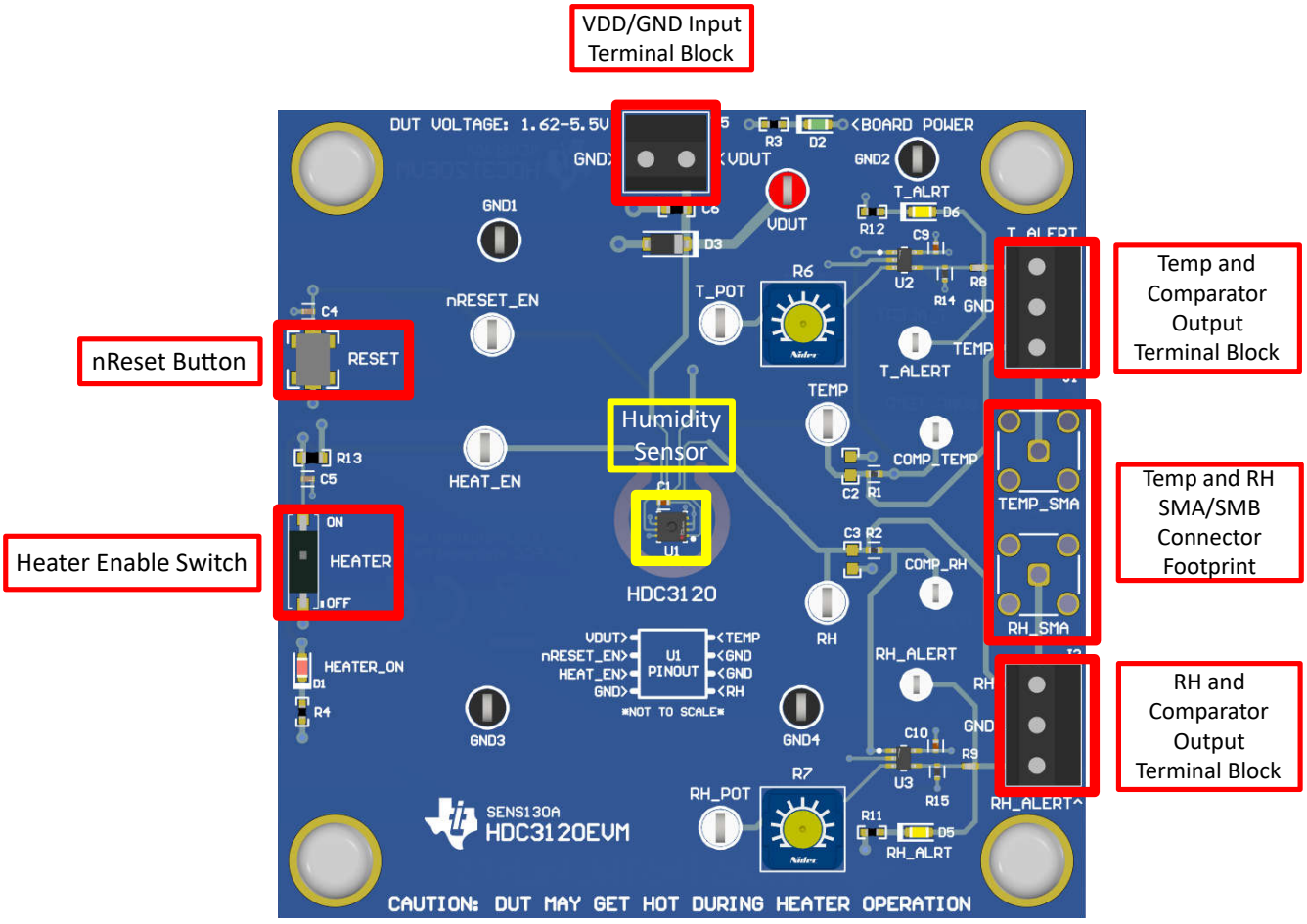

Figure 2-1. HDC3120EVM Board Sections

2.1 Setup and Interface

2.1.1 Setup Overview

The HDC3120EVM is powered using a 2-position terminal block located at the top-center of the board. A green LED (D2) indicates when power is successfully applied. The EVM accepts a supply voltage range of 1.62V to 5.5V DC. Two user-controllable switches on the left-side of the board allow manual activation of heater and reset functions. The heater switch is paired with a dedicated red LED (D1) to provide real-time visual feedback when the heater is activated. The HDC3120EVM also includes a printout of the pinout orientation of the HDC3120 sensor below the sensor so users can trace back to the appropriate pins on the device.

Temperature and humidity outputs from the HDC3120 can be accessed either through two 3-position terminal blocks, or optional SMA connectors which can be soldered to the provided footprints. Each terminal block includes a ground reference and provides access to the HDC3120 and TLV9030 analog outputs. Figure 2-2 illustrates how to connect the sensor and comparator output jumper cables.

2.1.2 Connecting Board Power and Ground

A flathead screwdriver with at least a 2.5mm head is required to loosen and tighten all terminal block screws.

To power the HDC3120EVM, connect a DC voltage source (1.62V - 5.5V) to the 2-position terminal block at the center-top of the board. First, loosen the terminal screws with a flathead screwdriver and fully insert the exposed copper tip of each jumper cable to provide stable connection. Next, tighten the terminal block screws just enough to prevent wires from unintentional removal during operation. Figure 2-2 illustrates VDD and GND connection using jumper cables.

CAUTION
Exceeding the 1.62V - 5.5V voltage range can damage the EVM.

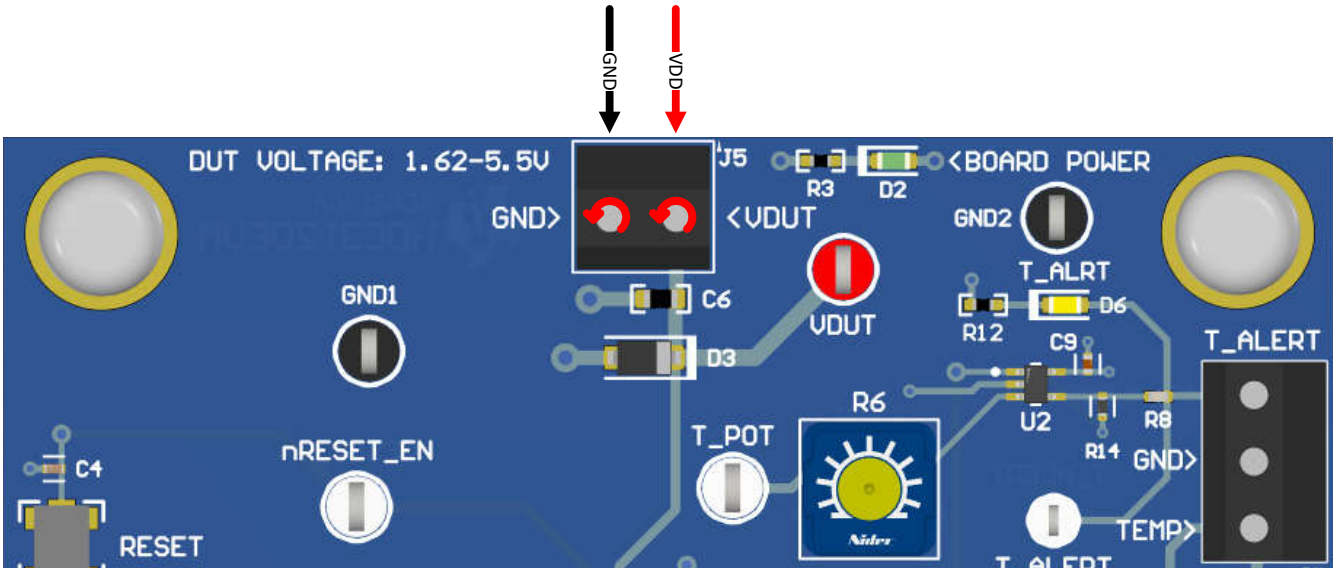

Figure 2-2. Input VDD and GND Insert

2.1.3 Connecting to the HDC3120 and Comparator Outputs

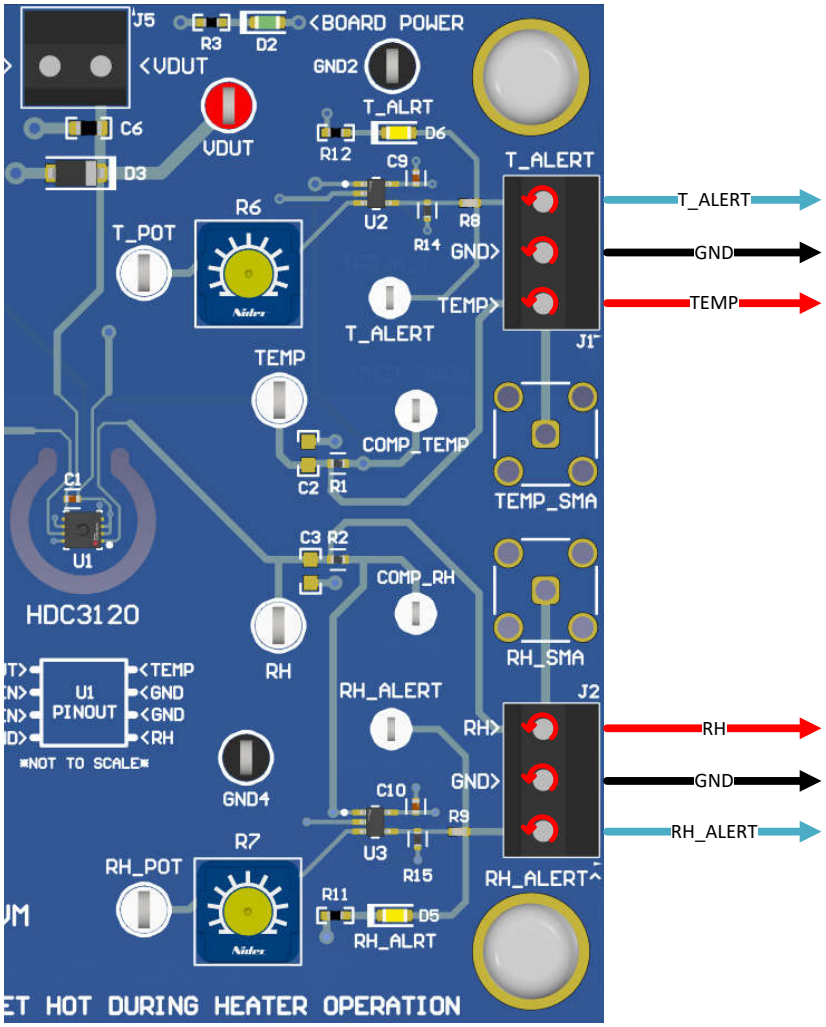

Figure 2-3. HDC3120EVM Outputs

The temperature (TEMP) and relative humidity (RH) outputs of the HDC3120 are available through either 3-position terminal blocks or optional SMA connectors. These outputs are represented as ratiometric analog voltages, meaning the outputs scale proportionally to the supply voltage (VDD). This design provides consistent measurements even in the presence of supply fluctuations. Figure 2-4 shows the temperature output profile of the HDC3120 based on the supply voltage of the device. Figure 2-5 shows the same for the relative humidity output profile.

Additionally, the equations for converting the temperature and relative humidity voltage outputs to physical units are included in the following sections.

2.1.4 Temperature

HDC3120 Temperature Output Conversion Equation

$$T(℃) = 218.75 \times \frac{V_{OUT}}{V_{DD}} - 66.875 \quad (1)$$

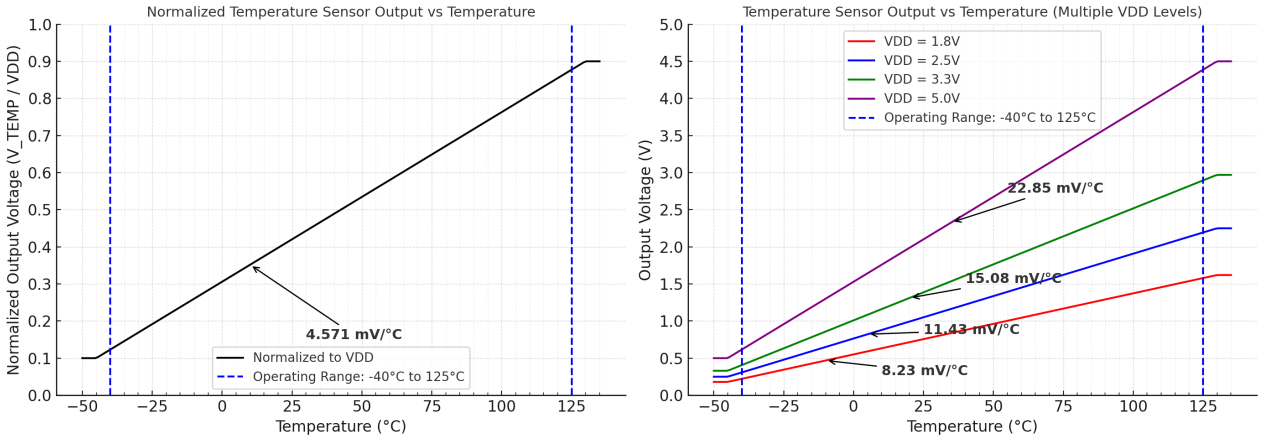

Figure 2-4. HDC3120 Temperature Output Profile

2.1.5 Relative Humidity (RH)

HDC3120 RH Output Conversion Equation

$$\%RH = 125 \times \frac{V_{OUT}}{V_{DD}} - 12.3 \quad (2)$$

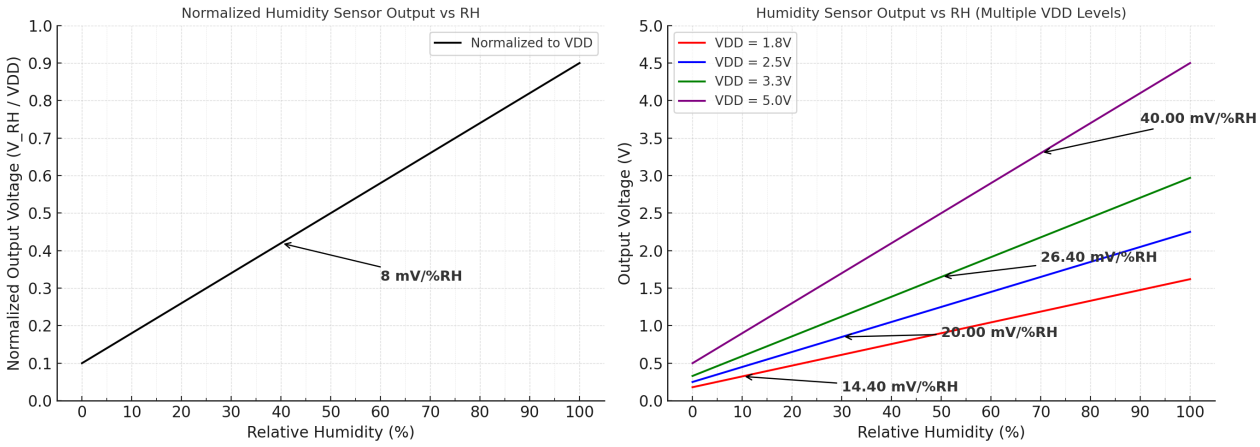

Figure 2-5. HDC3120 %RH Output Profile

2.1.6 HDC3120EVM Buttons

The HDC3120EVM includes two buttons to control the HDC3120 reset and heater functions. The heater and reset circuit portion of the board are highlighted in Figure 2-6.

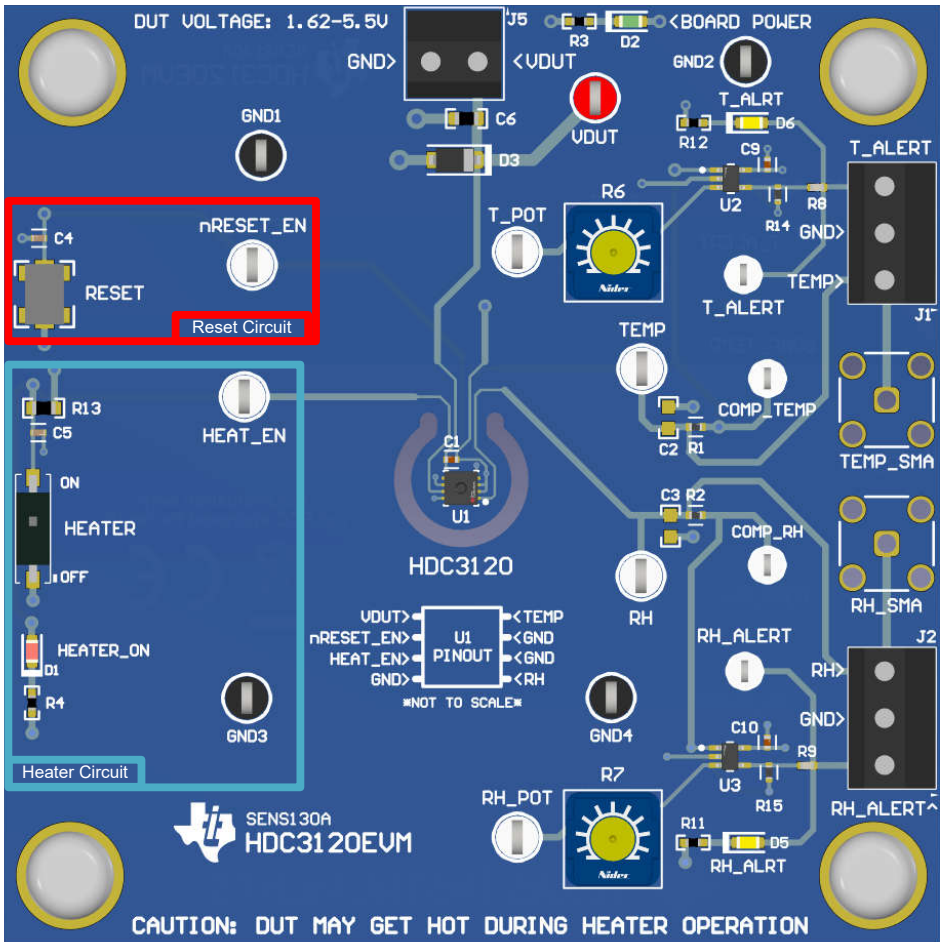

Figure 2-6. Heater and Reset Buttons

2.1.6.1 Reset Button (SW1)

A push-button which when pressed, the sensor outputs drops to zero and return to normal when the button is released.

2.1.6.2 Heater Enable Switch (S2)

The heater enable switch is a sliding style mechanism which when moved to the 'ON' position, a red LED (D1) illuminates to indicate the heater is running and the user must observe the temperature output increasing while humidity decreases. After the heater has been switched off, press the reset button (SW1) before reading temperature and humidity outputs to verify consistent readings.

> **CAUTION**
>
> During heater operation, avoid contact with the HDC3120 as the temperature can exceed 55°C. Additionally, running the heater for an extended period of time is not recommended to avoid potential damage to the sensor.

2.2 Comparator Function

The HDC3120EVM integrates two TLV9030 comparators which provide analog alert functionality. When the analog temperature or humidity outputs of the HDC3120 exceed a user-defined threshold (set using a potentiometer), the respective comparator swings high towards the positive supply rail. Two 10kΩ potentiometers (R6 and R7) are provided to set the comparator thresholds. Adjust the potentiometers using either a flathead or PHILLIPS® screwdriver.

To set up the HDC3120EVM comparator functionality of the HDC3120EVM, observe the following tips:

- Use a multimeter to measure the resistance across the potentiometers terminals before tuning (RH_POT and GND for RH_ALERT | T_POT and GND for T_ALERT).
- Each potentiometer includes 11 indexed markings. An arrow on the yellow adjustment screw indicates the current position of the wiper.
- Turning the screw clockwise increases the resistance (sets higher threshold), while turning counter-clockwise decreases the resistance(sets lower threshold).

Verify that the EVM is powered off prior to measuring or adjusting the output of the potentiometers.

Figure 2-7 illustrates a close-up of the potentiometer and Figure 2-8 illustrates the location of each test point. Table 2-1 is provided as reference for the potentiometer values based off the position of the arrow.

Actual resistance values vary due to component tolerances. This table is strictly intended for general guidance only.

Table 2-1. Potentiometer Resistance Values

Marker #	Resistance (Ω)
1 (Left-Side)	18 (±10%)
2	165 (±10%)
3	1.2k (±10%)
4	2.3k (±10%)
5	3.2k (±10%)
6 (Midpoint)	5k (±10%)
7	6.8k (±10%)
8	8.2k (±10%)
9	9.3k (±10%)
10	10.6k (±10%)
11 (Right-Side)	10.6k (±10%)

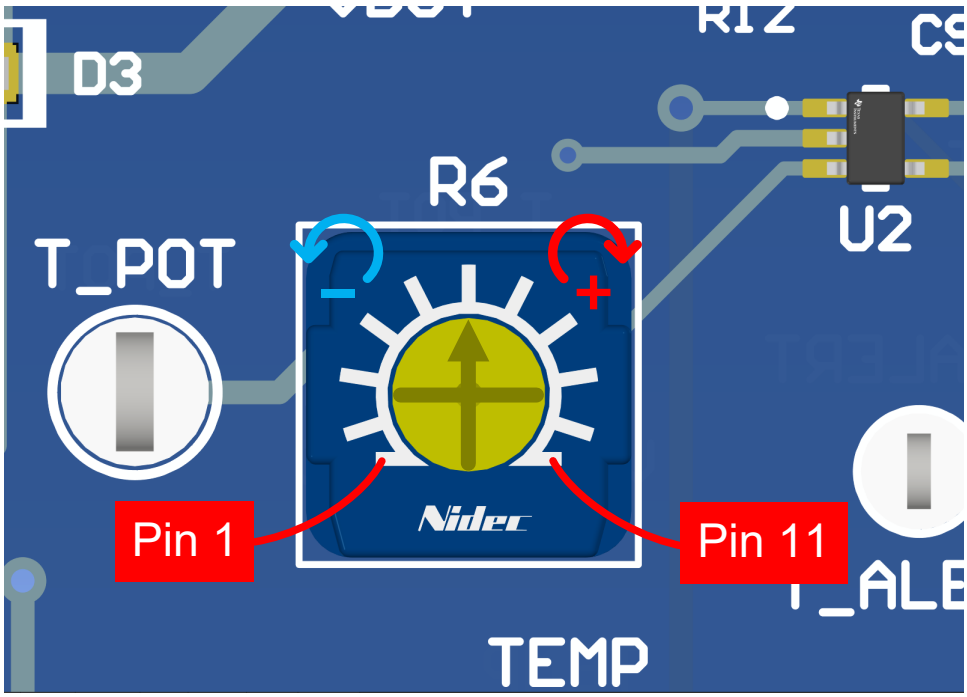

Figure 2-7. Potentiometer Close-up

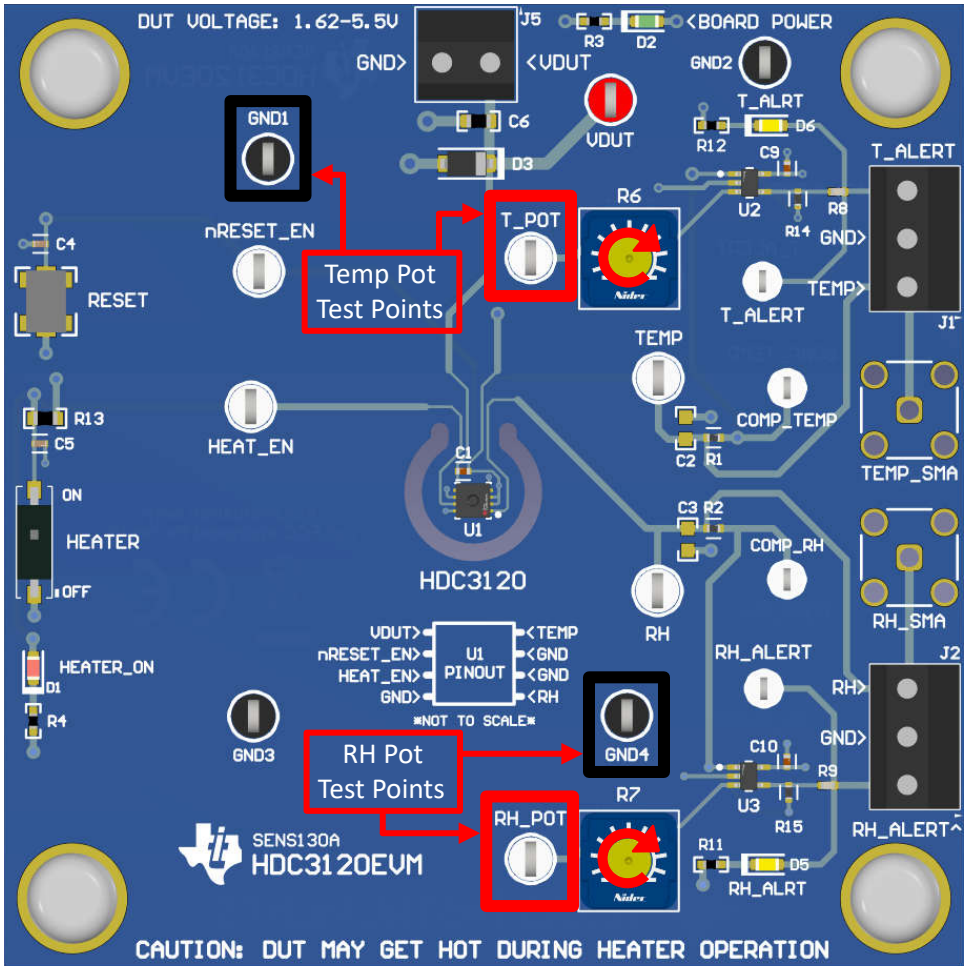

Figure 2-8. Potentiometer Multimeter Test Points

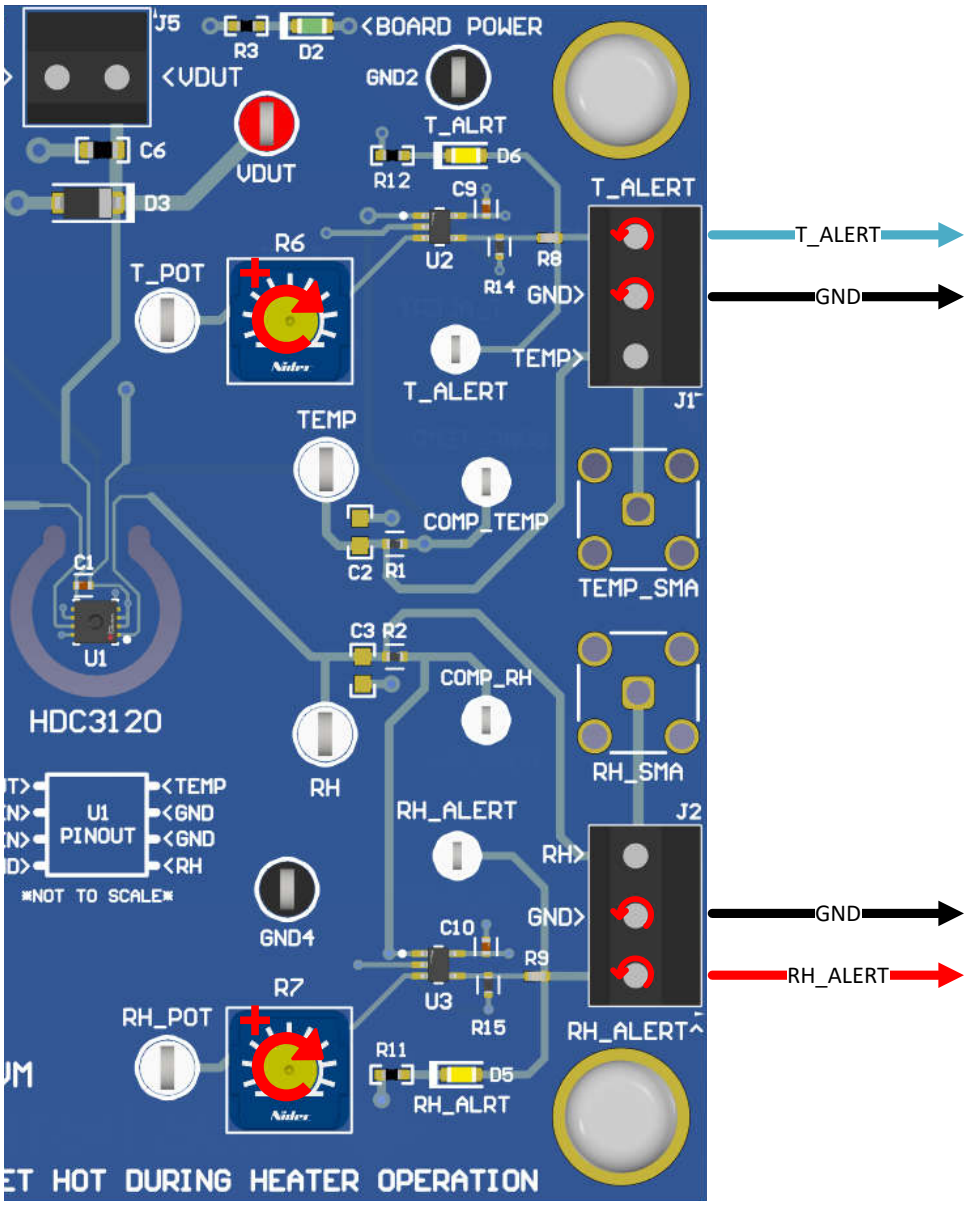

Figure 2-9. HDC3120EVM Comparator and Potentiometer Interface Points

3 Hardware Design Files

3.1 Schematics

Figure 3-1 illustrates the EVM schematic.

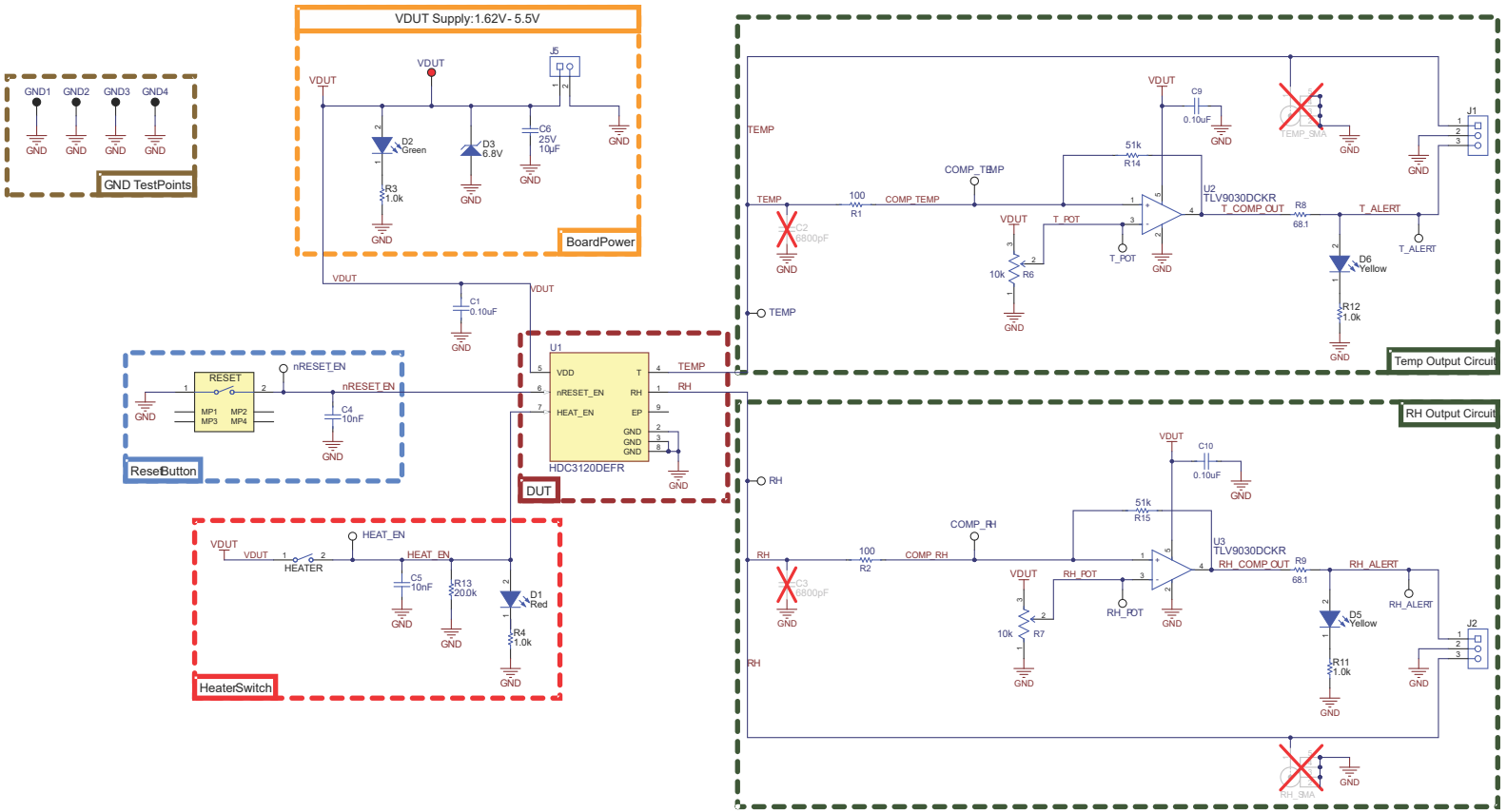

Figure 3-1. HDC3120EVM Schematic

3.2 PCB Layouts

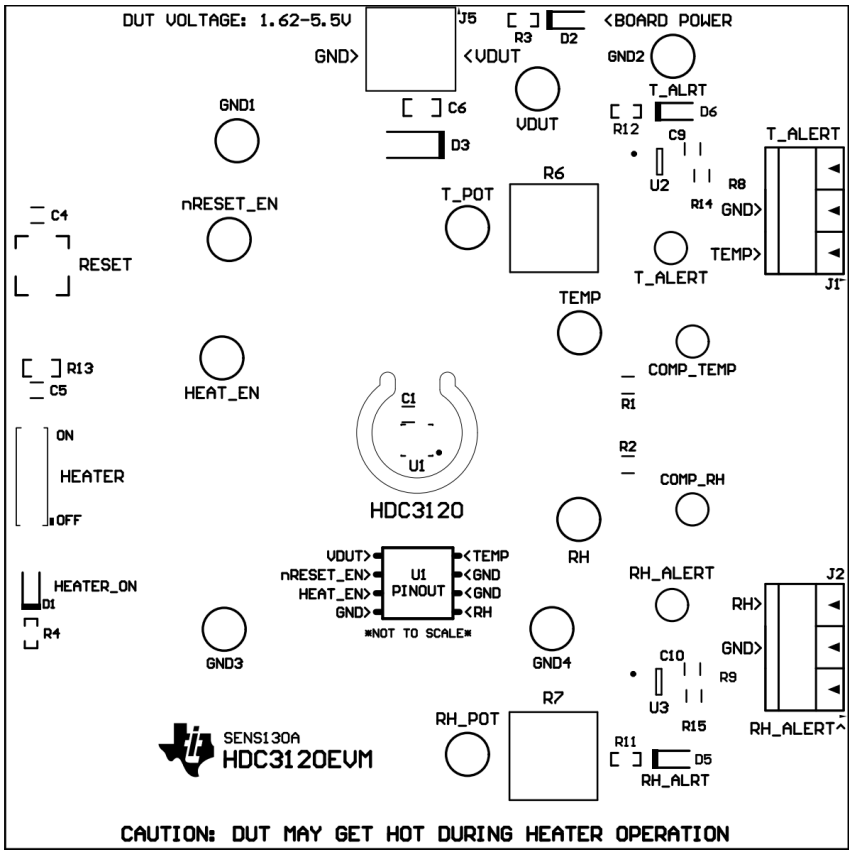

Figure 3-2. Top Solder Layer (1)

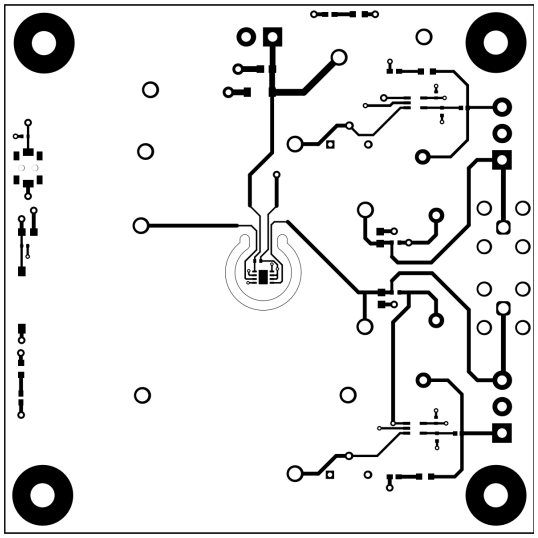

Figure 3-3. Top Layer PCB Layout (2)

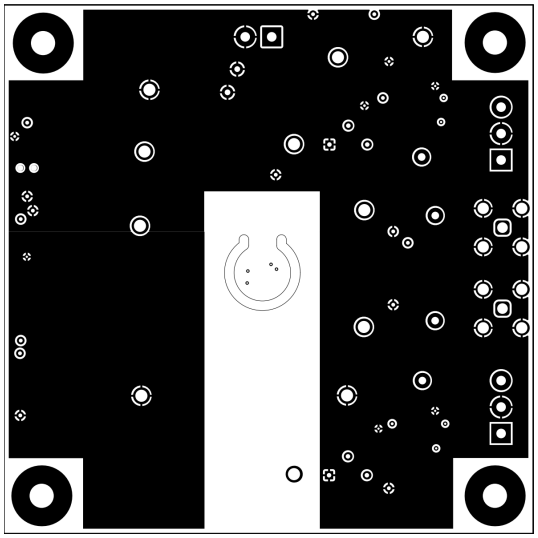

Figure 3-4. Ground Layer (3)

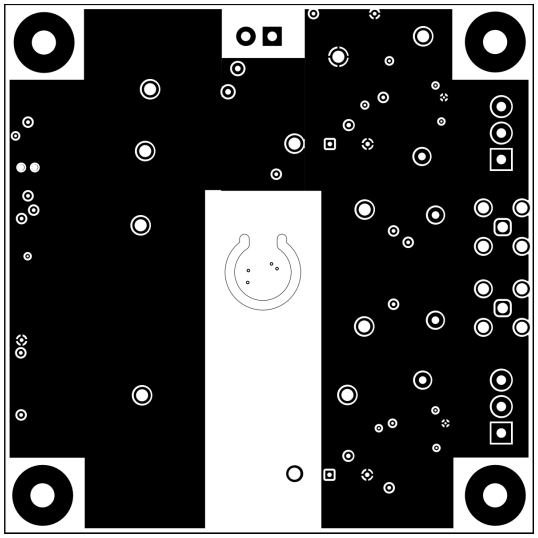

Figure 3-5. VDD Layer (4)

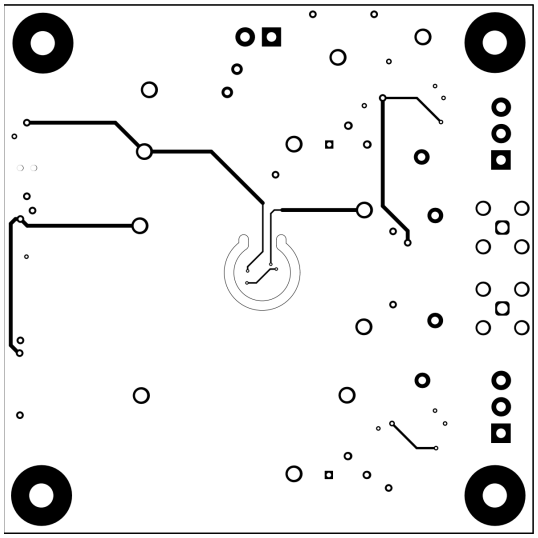

Figure 3-6. Bottom Layer (5)

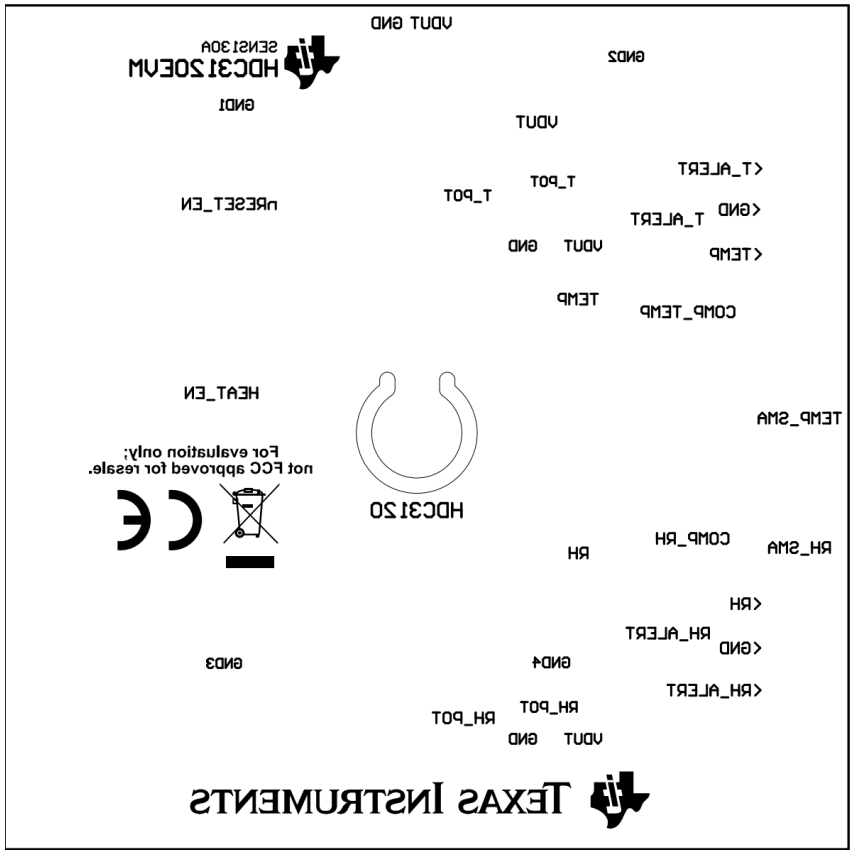

Figure 3-7. Bottom Solder Layer (6)

3.2.1 Layout Overview

The HDC3120EVM is a four-layer PCB appropriate for analog-signal integrity and thermal performance. The design includes a cutout around the HDC3120 device to reduce self-heating effects and improve measurement accuracy.

- Layer 1 (Top): Carries general analog signal traces
- Layer 2 (Internal): Dedicated ground (GND) copper plane
- Layer 3 (Internal): Dedicated VDD copper plane
- Layer 4 (Bottom): Carries additional analog signal routing

3.2.2 Layout Guidelines

Use the following considerations for HDC3120EVM layouts.

- To minimize second and other even-harmonic content, route traces as symmetrically as possible for both positive and negative feedback pathways.
- Place feedback components in close proximity to the output and input pins of the device.
- Position decoupling capacitors on the top layer as close as possible to the IC power supply pins.
- Place independent vias for each component ground pads to provide a low-impedance return path.

3.3 Bill of Materials (BOM)

Table 3-1. HDC3120EVM Bill of Materials

Designator	Quantity	Value	Description	Package Reference	Part Number	Manufacturer
!PCB?	2		Printed Circuit Board		SENS130	Any
C1, C9, C10	3	100nF	Chip Multilayer Ceramic Capacitors for General Purpose, 0402, 0.10uF, X7R, 15%, 10%, 50V	0402	GRM155R71H104KE14D	Murata
C4, C5	2	10nF	10000pF ±10% 25V Ceramic Capacitor X8R 0402 (1005 Metric)	0402	C1005X8R1E103K050BA	TDK Corporation
C6	1	10uF	CAP, CERM, 10 µF, 25 V,+/- 10%, X5R, 0603	0603	GRM188R61E106KA73D	MuRata
COMP_RH, COMP_TEMP, RH_ALERT, T_ALERT	4		Test Point, Miniature, White, TH	White Miniature Testpoint	5002	Keystone Electronics
D1	1	Red	LED, Red, SMD	LED_0603	150060RS75000	Wurth Elektronik
D2	1	Green	LED, Green, SMD	LED_0603	150060GS75000	Wurth Elektronik
D3	1	6.8V	Diode, Zener, 6.8 V, 500 mW, SOD-123	SOD-123	MMSZ4692T1G	ON Semiconductor
D5, D6	2	Yellow	LED, Yellow, SMD	LED_0603	150060YS75000	Wurth Elektronik
GND1, GND2, GND3, GND4	4		Test Point, Multipurpose, Black, TH	Black Multipurpose Testpoint	5011	Keystone Electronics
H1, H2, H3, H4	4		Standoff, Hex, 0.5"L #4-40 Nylon	Standoff	1902C	Keystone
H5, H6, H7, H8	4		Machine Screw, Round, #4-40 x 1/4, Nylon, Philips panhead	Screw	NY PMS 440 0025 PH	B&F Fastener Supply
HEAT_EN, nRESET_EN, RH, RH_POT, T_POT, TEMP	6		Test Point, Compact, White, TH	White Compact Testpoint	5007	Keystone Electronics
HEATER	1		Switch, Slide, SPST, Top Slide, SMT	Switch, Single Top Slide, 2.5x8x2.5mm	CHS-01TB	Copal Electronics
J1, J2	2		Terminal Block, 3.5mm Pitch, 3x1, TH	10.5x8.2x6.5mm	ED555/3DS	On-Shore Technology
J5	1		Terminal Block, 3.5mm Pitch, 2x1, TH	7.0x8.2x6.5mm	ED555/2DS	On-Shore Technology
R1, R2	2	100	Res Thin Film 0402 100 Ohm 0.1% 0.063W(1/16W) ±25ppm/C Pad SMD T/R	0402	RT0402BRD07100RL	Yageo

Table 3-1. HDC3120EVM Bill of Materials (continued)

Designator	Quantity	Value	Description	Package Reference	Part Number	Manufacturer
R3, R4, R11, R12	4	1.0k	RES, 1.0 k, 5%, 0.1 W, AEC-Q200 Grade 0, 0402	0402	ERJ-2GEJ102X	Panasonic
R6, R7	2	10k	10 kOhms 0.5W, 1/2W PC Pins Through Hole Trimmer Potentiometer Cermet 1.0 Turn Top Adjustment	PTH3	CT-6EP103	Nidec Copal
R8, R9	2	68.1				TE Connectivity / AMP
R13	1	20.0k	RES, 20.0 k, 1%, 0.1 W, AEC-Q200 Grade 0, 0603	0603	ERJ-3EKF2002V	Panasonic
R14, R15	2	51k	51 kOhms ±0.1% 0.063W, 1/16W Chip Resistor 0402 (1005 Metric) Automotive AEC-Q200 Thin Film	0402	ERA-2AEB513X	Panasonic Electronic Components
RESET	1		Switch, SPST-NO, Off-Mom, 0.05A, 12VDC, SMD	3.9x2.9mm	PTS820 J20M SMTR LFS	C&K Components
U1	1		Integrated Humidity and Temperature Sensor With Analog Outputs	WSON8	HDC3120DEFR	Texas Instruments
U2, U3	2		Single low-voltage comparator with push-pull output 5-SC70 -40 to 125	SC70-5	TLV9030DCKR	Texas Instruments
VDUT	1		Test Point, Compact, Red, TH	Red Compact Testpoint	5005	Keystone Electronics
C2, C3	DNP	6800pF	CAP, CERM, 6800 pF, 100 V,+/- 5%, C0G/NP0, AEC-Q200 Grade 0, 0603	0603	CGA3EANP02A682J080AC	TDK
RH_SMA, TEMP_SMA	DNP		JACK, SMA, 50 Ohm, Gold, R/A, TH	SMA Jack, 50 Ohm, R/A, TH	CONSMA002-G	Linx Technologies

4 Additional Information

4.1 Trademarks

E2E™ is a trademark of Texas Instruments.
PHILLIPS® is a registered trademark of Phillips Screw Company.
All trademarks are the property of their respective owners.

5 Related Documentation

The following document provides information regarding Texas Instruments integrated circuits used in the assembly of the HDC3120EVM. This user's guide is available from the TI website under literature number SBOU319. Any letter appended to the literature number corresponds to the document revision that is current at the time of the writing of this document. Newer revisions can be available from the TI website at http://www.ti.com/, or call the Texas Instruments Literature Response Center at (800) 477-8924 or the Product Information Center at (972) 644-5580. When ordering, identify the document by both title and literature number.

Table 5-1. Related Documentation

Document	Literature Number
HDC3120 Data sheet	SNAS758
HDC302x Silicon User's Guide	SNAU265

6 Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Changes from Revision * (November 2024) to Revision A (June 2025)	Page
• Updated the numbering format for tables, figures, and cross-references throughout the document	1
• Revised document to reflect updated design, highlight features and provide more detail for interpreting outputs	1
• Updated trademark information	19

STANDARD TERMS FOR EVALUATION MODULES

1. *Delivery:* TI delivers TI evaluation boards, kits, or modules, including any accompanying demonstration software, components, and/or documentation which may be provided together or separately (collectively, an “EVM” or “EVMs”) to the User (“User”) in accordance with the terms set forth herein. User's acceptance of the EVM is expressly subject to the following terms.

   1.1 EVMs are intended solely for product or software developers for use in a research and development setting to facilitate feasibility evaluation, experimentation, or scientific analysis of TI semiconductors products. EVMs have no direct function and are not finished products. EVMs shall not be directly or indirectly assembled as a part or subassembly in any finished product. For clarification, any software or software tools provided with the EVM (“Software”) shall not be subject to the terms and conditions set forth herein but rather shall be subject to the applicable terms that accompany such Software

   1.2 EVMs are not intended for consumer or household use. EVMs may not be sold, sublicensed, leased, rented, loaned, assigned, or otherwise distributed for commercial purposes by Users, in whole or in part, or used in any finished product or production system.

2 *Limited Warranty and Related Remedies/Disclaimers*:

   2.1 These terms do not apply to Software. The warranty, if any, for Software is covered in the applicable Software License Agreement.

   2.2 TI warrants that the TI EVM will conform to TI's published specifications for ninety (90) days after the date TI delivers such EVM to User. Notwithstanding the foregoing, TI shall not be liable for a nonconforming EVM if (a) the nonconformity was caused by neglect, misuse or mistreatment by an entity other than TI, including improper installation or testing, or for any EVMs that have been altered or modified in any way by an entity other than TI, (b) the nonconformity resulted from User's design, specifications or instructions for such EVMs or improper system design, or (c) User has not paid on time. Testing and other quality control techniques are used to the extent TI deems necessary. TI does not test all parameters of each EVM. User's claims against TI under this Section 2 are void if User fails to notify TI of any apparent defects in the EVMs within ten (10) business days after delivery, or of any hidden defects with ten (10) business days after the defect has been detected.

   2.3 TI's sole liability shall be at its option to repair or replace EVMs that fail to conform to the warranty set forth above, or credit User's account for such EVM. TI's liability under this warranty shall be limited to EVMs that are returned during the warranty period to the address designated by TI and that are determined by TI not to conform to such warranty. If TI elects to repair or replace such EVM, TI shall have a reasonable time to repair such EVM or provide replacements. Repaired EVMs shall be warranted for the remainder of the original warranty period. Replaced EVMs shall be warranted for a new full ninety (90) day warranty period.

WARNING

Evaluation Kits are intended solely for use by technically qualified, professional electronics experts who are familiar with the dangers and application risks associated with handling electrical mechanical components, systems, and subsystems.

User shall operate the Evaluation Kit within TI’s recommended guidelines and any applicable legal or environmental requirements as well as reasonable and customary safeguards. Failure to set up and/or operate the Evaluation Kit within TI’s recommended guidelines may result in personal injury or death or property damage. Proper set up entails following TI’s instructions for electrical ratings of interface circuits such as input, output and electrical loads.

NOTE:

EXPOSURE TO ELECTROSTATIC DISCHARGE (ESD) MAY CAUSE DEGREDATION OR FAILURE OF THE EVALUATION KIT; TI RECOMMENDS STORAGE OF THE EVALUATION KIT IN A PROTECTIVE ESD BAG.

3 *Regulatory Notices:*

3.1 *United States*

3.1.1 *Notice applicable to EVMs not FCC-Approved:*

FCC NOTICE: This kit is designed to allow product developers to evaluate electronic components, circuitry, or software associated with the kit to determine whether to incorporate such items in a finished product and software developers to write software applications for use with the end product. This kit is not a finished product and when assembled may not be resold or otherwise marketed unless all required FCC equipment authorizations are first obtained. Operation is subject to the condition that this product not cause harmful interference to licensed radio stations and that this product accept harmful interference. Unless the assembled kit is designed to operate under part 15, part 18 or part 95 of this chapter, the operator of the kit must operate under the authority of an FCC license holder or must secure an experimental authorization under part 5 of this chapter.

3.1.2 *For EVMs annotated as FCC – FEDERAL COMMUNICATIONS COMMISSION Part 15 Compliant:*

CAUTION

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

FCC Interference Statement for Class A EVM devices

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

FCC Interference Statement for Class B EVM devices

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- *Reorient or relocate the receiving antenna.*
- *Increase the separation between the equipment and receiver.*
- *Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.*
- *Consult the dealer or an experienced radio/TV technician for help.*

3.2 *Canada*

3.2.1 *For EVMs issued with an Industry Canada Certificate of Conformance to RSS-210 or RSS-247*

Concerning EVMs Including Radio Transmitters:

This device complies with Industry Canada license-exempt RSSs. Operation is subject to the following two conditions:

(1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Concernant les EVMs avec appareils radio:

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Concerning EVMs Including Detachable Antennas:

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication. This radio transmitter has been approved by Industry Canada to operate with the antenna types listed in the user guide with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Concernant les EVMs avec antennes détachables

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante. Le présent émetteur radio a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés dans le manuel d'usage et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur

3.3 *Japan*

3.3.1 *Notice for EVMs delivered in Japan:* Please see http://www.tij.co.jp/lsds/ti_ja/general/eStore/notice_01.page 日本国内に輸入される評価用キット、ボードについては、次のところをご覧ください。

https://www.ti.com/ja-jp/legal/notice-for-evaluation-kits-delivered-in-japan.html

3.3.2 *Notice for Users of EVMs Considered "Radio Frequency Products" in Japan:* EVMs entering Japan may not be certified by TI as conforming to Technical Regulations of Radio Law of Japan.

If User uses EVMs in Japan, not certified to Technical Regulations of Radio Law of Japan, User is required to follow the instructions set forth by Radio Law of Japan, which includes, but is not limited to, the instructions below with respect to EVMs (which for the avoidance of doubt are stated strictly for convenience and should be verified by User):

1. Use EVMs in a shielded room or any other test facility as defined in the notification #173 issued by Ministry of Internal Affairs and Communications on March 28, 2006, based on Sub-section 1.1 of Article 6 of the Ministry's Rule for Enforcement of Radio Law of Japan,
2. Use EVMs only after User obtains the license of Test Radio Station as provided in Radio Law of Japan with respect to EVMs, or
3. Use of EVMs only after User obtains the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to EVMs. Also, do not transfer EVMs, unless User gives the same notice above to the transferee. Please note that if User does not follow the instructions above, User will be subject to penalties of Radio Law of Japan.

【無線電波を送信する製品の開発キットをお使いになる際の注意事項】 開発キットの中には技術基準適合証明を受けていないものがあります。 技術適合証明を受けていないもののご使用に際しては、電波法遵守のため、以下のいずれかの措置を取っていただく必要がありますのでご注意ください。

1. 電波法施行規則第6条第1項第1号に基づく平成18年3月28日総務省告示第173号で定められた電波暗室等の試験設備でご使用いただく。
2. 実験局の免許を取得後ご使用いただく。
3. 技術基準適合証明を取得後ご使用いただく。

なお、本製品は、上記の「ご使用にあたっての注意」を譲渡先、移転先に通知しない限り、譲渡、移転できないものとします。

上記を遵守頂けない場合は、電波法の罰則が適用される可能性があることをご留意ください。 日本テキサス・インスツルメンツ株式会社

東京都新宿区西新宿 6 丁目 2 4 番 1 号

西新宿三井ビル

3.3.3 *Notice for EVMs for Power Line Communication:* Please see http://www.tij.co.jp/lsds/ti_ja/general/eStore/notice_02.page

電力線搬送波通信についての開発キットをお使いになる際の注意事項については、次のところをご覧ください。https://www.ti.com/ja-jp/legal/notice-for-evaluation-kits-for-power-line-communication.html

3.4 *European Union*

3.4.1 *For EVMs subject to EU Directive 2014/30/EU (Electromagnetic Compatibility Directive)*:

This is a class A product intended for use in environments other than domestic environments that are connected to a low-voltage power-supply network that supplies buildings used for domestic purposes. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

4 *EVM Use Restrictions and Warnings:*

4.1 EVMS ARE NOT FOR USE IN FUNCTIONAL SAFETY AND/OR SAFETY CRITICAL EVALUATIONS, INCLUDING BUT NOT LIMITED TO EVALUATIONS OF LIFE SUPPORT APPLICATIONS.

4.2 User must read and apply the user guide and other available documentation provided by TI regarding the EVM prior to handling or using the EVM, including without limitation any warning or restriction notices. The notices contain important safety information related to, for example, temperatures and voltages.

4.3 *Safety-Related Warnings and Restrictions:*

4.3.1 User shall operate the EVM within TI's recommended specifications and environmental considerations stated in the user guide, other available documentation provided by TI, and any other applicable requirements and employ reasonable and customary safeguards. Exceeding the specified performance ratings and specifications (including but not limited to input and output voltage, current, power, and environmental ranges) for the EVM may cause personal injury or death, or property damage. If there are questions concerning performance ratings and specifications, User should contact a TI field representative prior to connecting interface electronics including input power and intended loads. Any loads applied outside of the specified output range may also result in unintended and/or inaccurate operation and/or possible permanent damage to the EVM and/or interface electronics. Please consult the EVM user guide prior to connecting any load to the EVM output. If there is uncertainty as to the load specification, please contact a TI field representative. During normal operation, even with the inputs and outputs kept within the specified allowable ranges, some circuit components may have elevated case temperatures. These components include but are not limited to linear regulators, switching transistors, pass transistors, current sense resistors, and heat sinks, which can be identified using the information in the associated documentation. When working with the EVM, please be aware that the EVM may become very warm.

4.3.2 EVMs are intended solely for use by technically qualified, professional electronics experts who are familiar with the dangers and application risks associated with handling electrical mechanical components, systems, and subsystems. User assumes all responsibility and liability for proper and safe handling and use of the EVM by User or its employees, affiliates, contractors or designees. User assumes all responsibility and liability to ensure that any interfaces (electronic and/or mechanical) between the EVM and any human body are designed with suitable isolation and means to safely limit accessible leakage currents to minimize the risk of electrical shock hazard. User assumes all responsibility and liability for any improper or unsafe handling or use of the EVM by User or its employees, affiliates, contractors or designees.

4.4 User assumes all responsibility and liability to determine whether the EVM is subject to any applicable international, federal, state, or local laws and regulations related to User's handling and use of the EVM and, if applicable, User assumes all responsibility and liability for compliance in all respects with such laws and regulations. User assumes all responsibility and liability for proper disposal and recycling of the EVM consistent with all applicable international, federal, state, and local requirements.

5. *Accuracy of Information:* To the extent TI provides information on the availability and function of EVMs, TI attempts to be as accurate as possible. However, TI does not warrant the accuracy of EVM descriptions, EVM availability or other information on its websites as accurate, complete, reliable, current, or error-free.

6. *Disclaimers:*

6.1 EXCEPT AS SET FORTH ABOVE, EVMS AND ANY MATERIALS PROVIDED WITH THE EVM (INCLUDING, BUT NOT LIMITED TO, REFERENCE DESIGNS AND THE DESIGN OF THE EVM ITSELF) ARE PROVIDED "AS IS" AND "WITH ALL FAULTS." TI DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, REGARDING SUCH ITEMS, INCLUDING BUT NOT LIMITED TO ANY EPIDEMIC FAILURE WARRANTY OR IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF ANY THIRD PARTY PATENTS, COPYRIGHTS, TRADE SECRETS OR OTHER INTELLECTUAL PROPERTY RIGHTS.

6.2 EXCEPT FOR THE LIMITED RIGHT TO USE THE EVM SET FORTH HEREIN, NOTHING IN THESE TERMS SHALL BE CONSTRUED AS GRANTING OR CONFERRING ANY RIGHTS BY LICENSE, PATENT, OR ANY OTHER INDUSTRIAL OR INTELLECTUAL PROPERTY RIGHT OF TI, ITS SUPPLIERS/LICENSORS OR ANY OTHER THIRD PARTY, TO USE THE EVM IN ANY FINISHED END-USER OR READY-TO-USE FINAL PRODUCT, OR FOR ANY INVENTION, DISCOVERY OR IMPROVEMENT, REGARDLESS OF WHEN MADE, CONCEIVED OR ACQUIRED.

7. *USER'S INDEMNITY OBLIGATIONS AND REPRESENTATIONS.* USER WILL DEFEND, INDEMNIFY AND HOLD TI, ITS LICENSORS AND THEIR REPRESENTATIVES HARMLESS FROM AND AGAINST ANY AND ALL CLAIMS, DAMAGES, LOSSES, EXPENSES, COSTS AND LIABILITIES (COLLECTIVELY, "CLAIMS") ARISING OUT OF OR IN CONNECTION WITH ANY HANDLING OR USE OF THE EVM THAT IS NOT IN ACCORDANCE WITH THESE TERMS. THIS OBLIGATION SHALL APPLY WHETHER CLAIMS ARISE UNDER STATUTE, REGULATION, OR THE LAW OF TORT, CONTRACT OR ANY OTHER LEGAL THEORY, AND EVEN IF THE EVM FAILS TO PERFORM AS DESCRIBED OR EXPECTED.

8. *Limitations on Damages and Liability:*

   8.1 *General Limitations*. IN NO EVENT SHALL TI BE LIABLE FOR ANY SPECIAL, COLLATERAL, INDIRECT, PUNITIVE, INCIDENTAL, CONSEQUENTIAL, OR EXEMPLARY DAMAGES IN CONNECTION WITH OR ARISING OUT OF THESE TERMS OR THE USE OF THE EVMS , REGARDLESS OF WHETHER TI HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. EXCLUDED DAMAGES INCLUDE, BUT ARE NOT LIMITED TO, COST OF REMOVAL OR REINSTALLATION, ANCILLARY COSTS TO THE PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES, RETESTING, OUTSIDE COMPUTER TIME, LABOR COSTS, LOSS OF GOODWILL, LOSS OF PROFITS, LOSS OF SAVINGS, LOSS OF USE, LOSS OF DATA, OR BUSINESS INTERRUPTION. NO CLAIM, SUIT OR ACTION SHALL BE BROUGHT AGAINST TI MORE THAN TWELVE (12) MONTHS AFTER THE EVENT THAT GAVE RISE TO THE CAUSE OF ACTION HAS OCCURRED.

   8.2 *Specific Limitations.* IN NO EVENT SHALL TI'S AGGREGATE LIABILITY FROM ANY USE OF AN EVM PROVIDED HEREUNDER, INCLUDING FROM ANY WARRANTY, INDEMITY OR OTHER OBLIGATION ARISING OUT OF OR IN CONNECTION WITH THESE TERMS, , EXCEED THE TOTAL AMOUNT PAID TO TI BY USER FOR THE PARTICULAR EVM(S) AT ISSUE DURING THE PRIOR TWELVE (12) MONTHS WITH RESPECT TO WHICH LOSSES OR DAMAGES ARE CLAIMED. THE EXISTENCE OF MORE THAN ONE CLAIM SHALL NOT ENLARGE OR EXTEND THIS LIMIT.

9. *Return Policy.* Except as otherwise provided, TI does not offer any refunds, returns, or exchanges. Furthermore, no return of EVM(s) will be accepted if the package has been opened and no return of the EVM(s) will be accepted if they are damaged or otherwise not in a resalable condition. If User feels it has been incorrectly charged for the EVM(s) it ordered or that delivery violates the applicable order, User should contact TI. All refunds will be made in full within thirty (30) working days from the return of the components(s), excluding any postage or packaging costs.

10. *Governing Law:* These terms and conditions shall be governed by and interpreted in accordance with the laws of the State of Texas, without reference to conflict-of-laws principles. User agrees that non-exclusive jurisdiction for any dispute arising out of or relating to these terms and conditions lies within courts located in the State of Texas and consents to venue in Dallas County, Texas. Notwithstanding the foregoing, any judgment may be enforced in any United States or foreign court, and TI may seek injunctive relief in any United States or foreign court.

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