EVM User's Guide:

HALL-ADAPTER-EVM User's Guide

Description

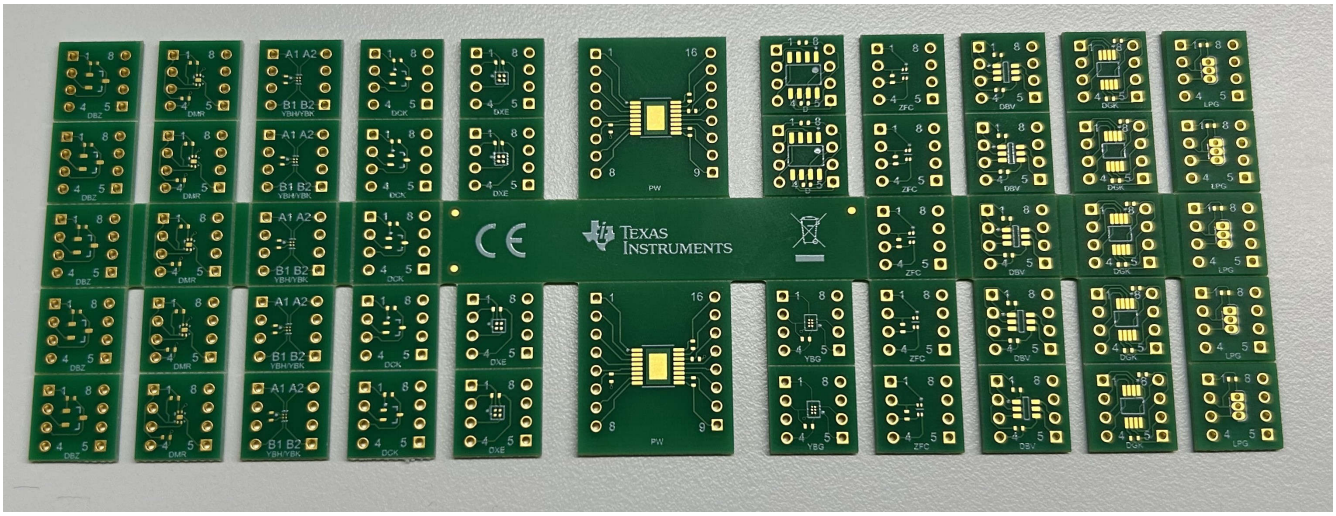
The HALL-ADAPTER-EVM is an evaluation module (EVM) intended to facilitate rapid, convenient use of Texas Instruments' Hall-effect sensors that use the DBZ (3), DMR (4), YBH (4), YBK (4), YBG (6), DCK (3), PW (16), D (8), DXE (4), ZFC (4), DBV (5), DBV (6), DGK (8), or LPG (3) packages.

Get Started

1. Order the HALL-ADAPTER-EVM and a TI magnetic position sensor in a package supported by the EVM
2. Install the device and bypass capacitor on the appropriate coupon board
3. Install the headers on the coupon board
4. Evaluate the device

Features

- Evaluation of Hall-effect sensor devices in DBZ (3), DMR (4), YBH (4), YBK (4), YBG (6), DCK (3), PW (16), D (8), DXE (4), ZFC (4), DBV (5), DBV (6), DGK (8), or LPG (3) packages at all sensitivity and measurement ranges
- Header pins to allow ease of access to all device pins
- Component pads to allow for proper power supply bypassing
- Score lines allow individual coupon boards to be easily broken off



1 Evaluation Module Overview

CAUTION

The HALL-ADAPTER-EVM does not include a Hall-effect sensor. To use this evaluation module, a TMAG or DRV Hall-effect sensor using the DBZ (3), DMR (4), YBH (4), YBK (4), YBG (6), DCK (3), PW (16), D (8), DXE (4), ZFC (4), DBV (5), DBV (6), DGK (8), or LPG (3) package must be ordered and soldered onto the evaluation board.

1.1 Introduction

This user's guide describes the characteristics, operation, and use of the HALL-ADAPTER-EVM evaluation module. This EVM is designed to evaluate the performance of TMAG and DRV Hall-effect sensors in the DBZ (3), DMR (4), YBH (4), YBK (4), YBG (6), DCK (3), PW (16), D (8), DXE (4), ZFC (4), DBV (5), DBV (6), DGK (8), or LPG (3) packages. Throughout this document, the terms evaluation board, evaluation module, and EVM are synonymous with the HALL-ADAPTER-EVM. This document includes a schematic, reference printed circuit board (PCB) layouts, and a complete bill of materials (BOM).

The TMAG and DRV Hall-effect sensors sense magnetic flux passing through the device package.

The HALL-ADAPTER-EVM simplifies prototyping SMT ICs. The HALL-ADAPTER-EVM supports the package types listed in Table 1-2.

1.2 Kit Contents

Table 1-1 lists the contents of the HALL-ADAPTER-EVM kit. Contact the nearest Texas Instruments Customer Support Center if any component is missing. TI highly recommends checking the family product folder on the TI website at www.ti.com for further information regarding the TMAG or DRV device under evaluation.

Table 1-1. HALL-ADAPTER-EVM Kit Contents

Item	Part Number	Quantity	Manufacturer
HALL-ADAPTER-EVM Printed Circuit Board	SENS023C	1	Texas Instruments
Header, 100mil, 24x1, TH	TSW-124-07-L-S	4	Samtec Inc
Magnet, Axial Cylinder, N35, 3/16" Diameter, 1" Thickness	8182	1	Radial Magnet Inc.

1.3 Specification

The HALL-ADAPTER-EVM allows for evaluation of numerous package types. Each adapter board has the corresponding package designator on the back of the PCB and TI package designator on the front of the PCB. The following table shows each corresponding package designator, TI package designator, and pin count.

Table 1-2. Supported Package Types

Package Designator	TI Package Designator	Pin Count
TO-92	LPG	3
VSSOP	DGK	8
SOT-23	DBV	5/6
X1LGA	ZFC	4
SOIC	D	8
DSBGA	YBG	6
TSSOP	PW	16
X2QFN	DXE	4
SOT-SC70	DCK	3
DSBGA	YBH	4
DSBGA	YBK	4

Table 1-2. Supported Package Types (continued)

Package Designator	TI Package Designator	Pin Count
X2SON	DMR	4
SOT-23	DBZ	3

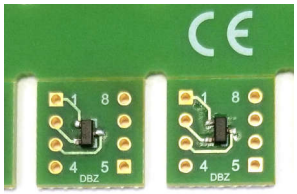
1.4 Device Information

The TMAG and DRV Hall-effect sensors sense magnetic flux passing through the device package. The HALL-ADAPTER-EVM is a blank PCB intended to provide basic, functional evaluation of all TMAG and DRV devices in DBZ (3), DMR (4), YBH (4), YBK (4), YBG (6), DCK (3), PW (16), D (8), DXE (4), ZFC (4), DBV (5), DBV (6), DGK (8), or LPG (3) packages. The HALL-ADAPTER-EVM is not laid out for electromagnetic compatibility (EMC) testing. The EVM consists of a single printed circuit board (PCB) that has not been populated with any electrical components and must be assembled before use. Included in the EVM kit are 100mil headers that can be assembled for accessing the device pins.

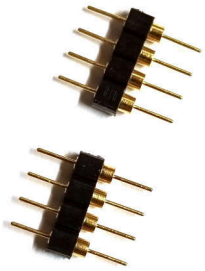
2 Hardware

2.1 Setup

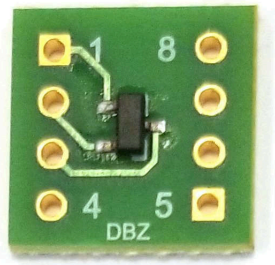
This EVM is an easy-to-use platform for evaluating the main features and performance of a wide variety of TI's magnetic position sensors.



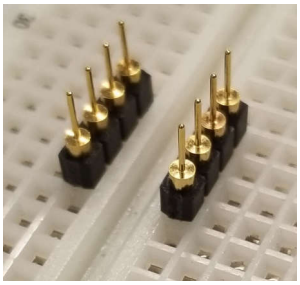
Step 1: Solder the IC to adapter PCB. Also solder any necessary decoupling capacitor needed for the device. Refer to the device data sheet for appropriate decoupling capacitor values. ICs may be hand-soldered or attached with IR or hot air reflow techniques.



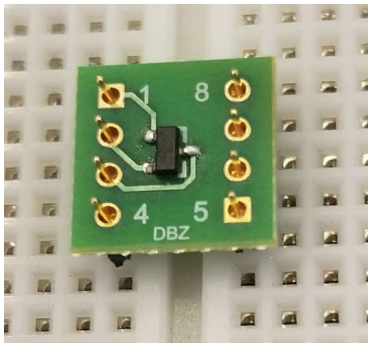
Step 2: Use long nose pliers to snap terminal strips (Samtec part number TSW-124-07-L-S) into 4 position lengths.



Step 3: Gently flex panel at score lines to separate boards.



Step 4: Insert terminal strips into a breadboard or spare DIP socket to align pins.



Step 5: Position board over pins and solder the connections. Carefully remove from breadboard or DIP socket and complete.

3 Hardware Design Files

Note

Board layouts are not to scale. These figures are intended to show how the board is laid out. The figures are not intended to be used for manufacturing EVM PCBs.

3.1 Schematics

Figure 3-1 through Figure 3-3 show the EVM schematic. Note that all components are marked as "do not populate".

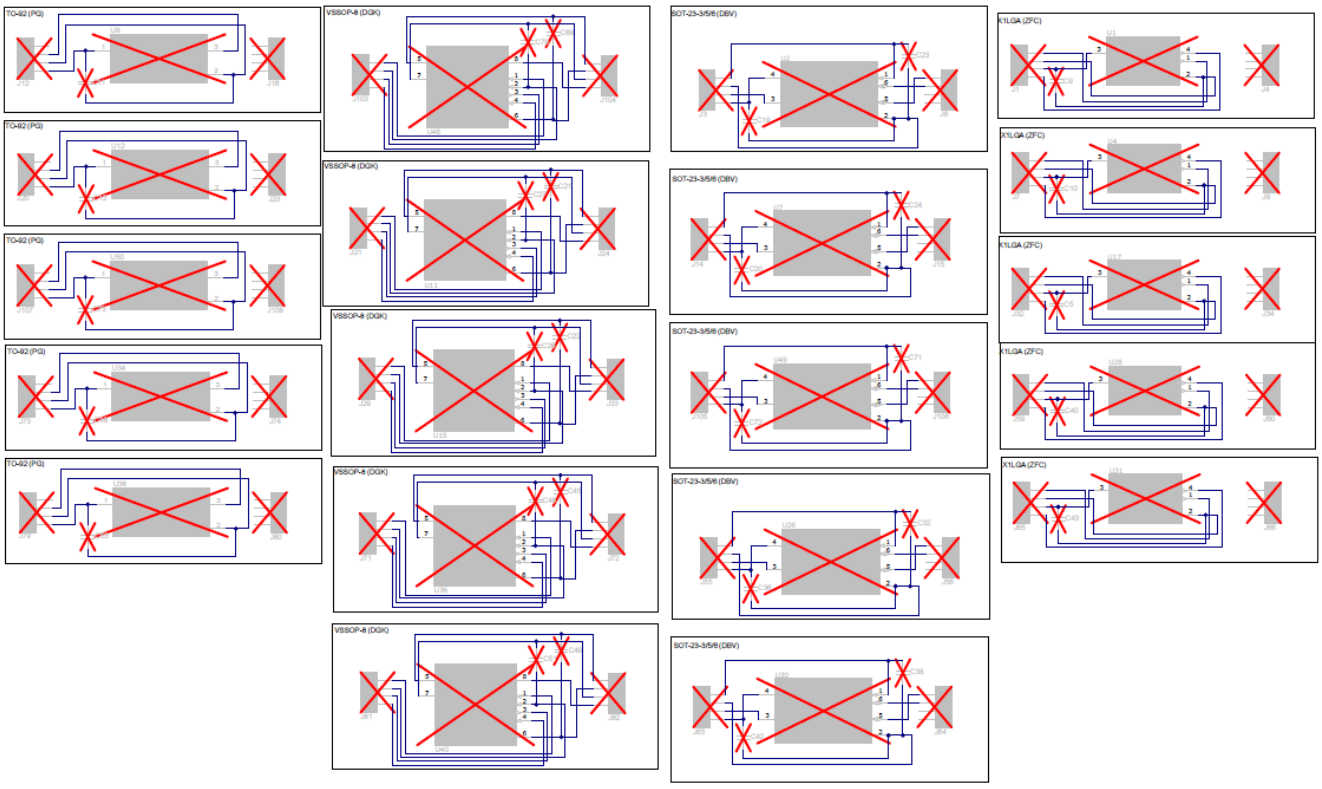


Figure 3-1. HALL-ADAPTER-EVM Schematic Page 1

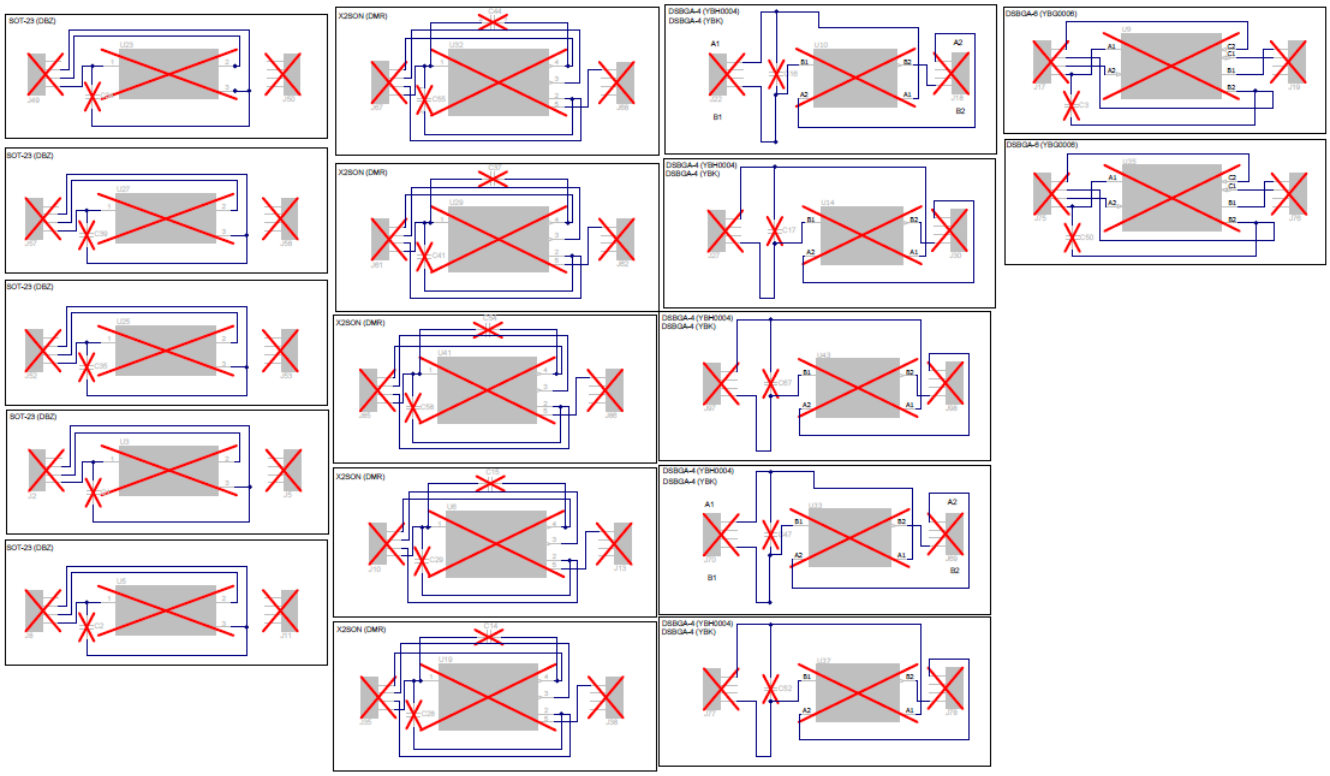


Figure 3-2. HALL-ADAPTER-EVM Schematic Page 2

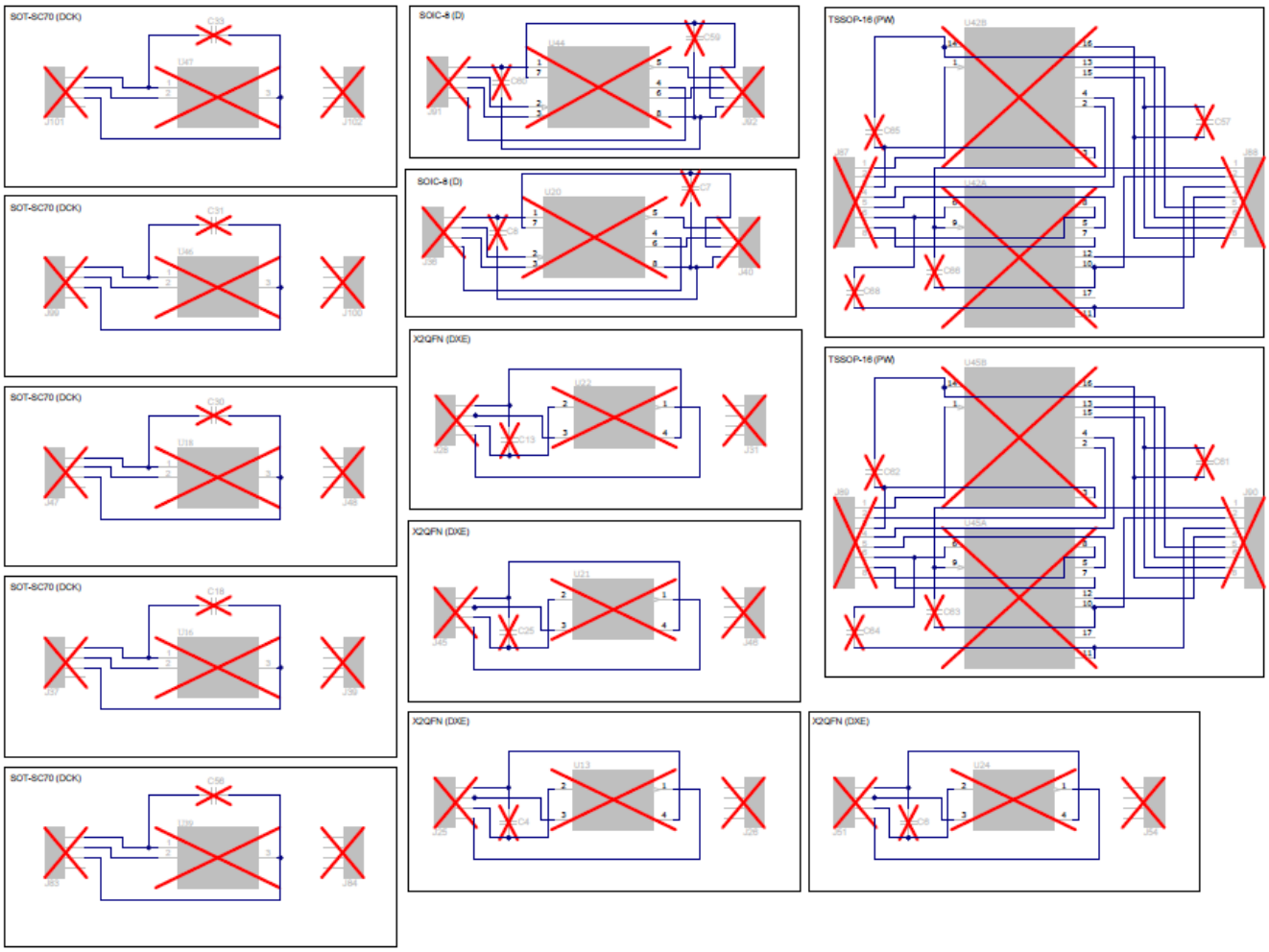


Figure 3-3. HALL-ADAPTER-EVM Schematic Page 3

3.2 PCB Layouts

Figure 3-4 and Figure 3-5 show the PCB layers of the EVM.

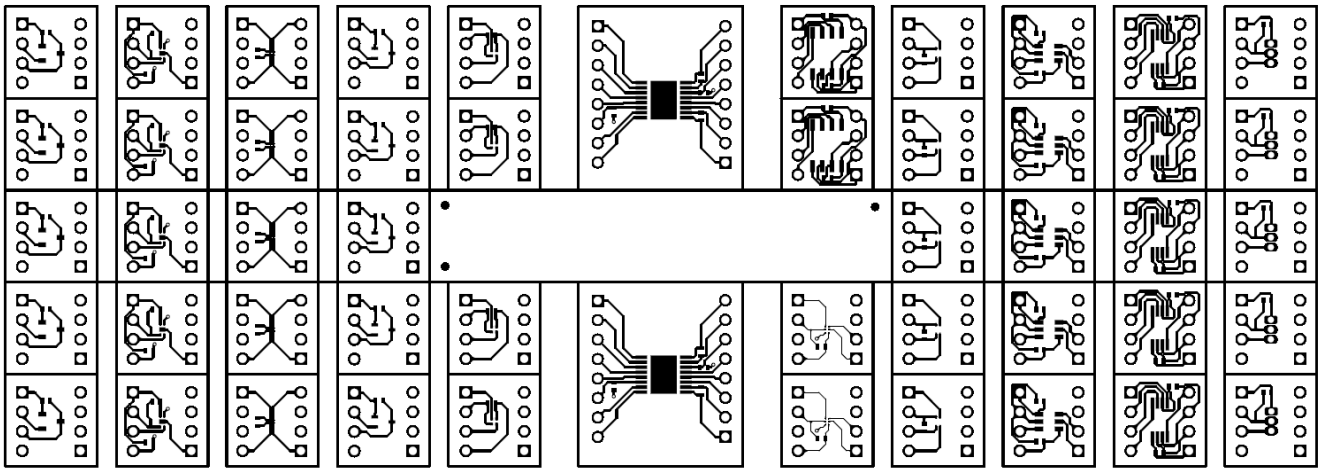


Figure 3-4. Top Layer

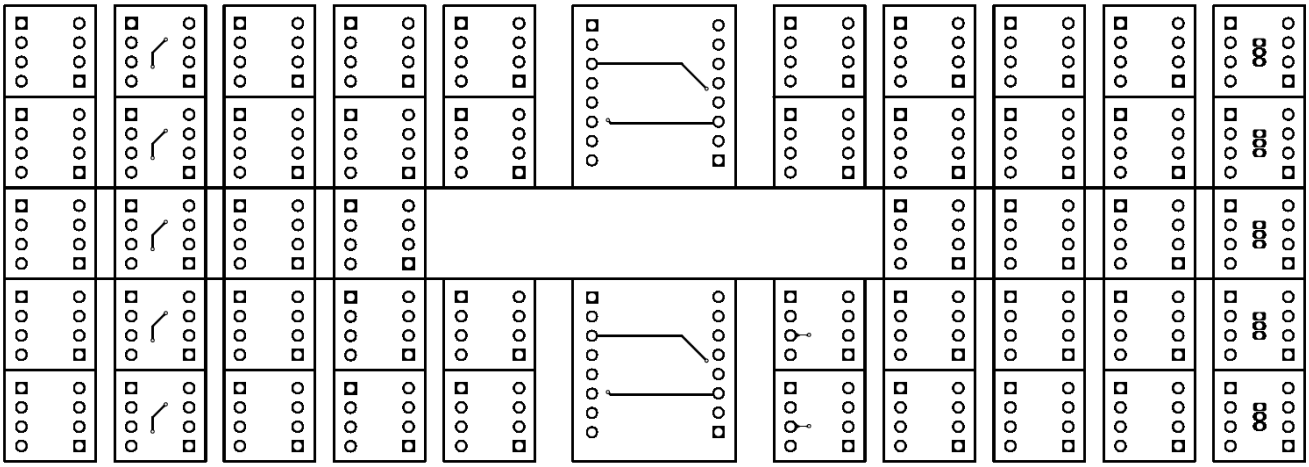


Figure 3-5. Bottom Layer

3.3 Bill of Materials (BOM)

Table 3-1 provides the parts list for the EVM.

Table 3-1. Bill of Materials

Designator	Quantity	Value	Description	Package Reference	Part Number	Manufacturer
!PCB1	1		Printed Circuit Board		SENS023	Any

4 Additional Information

4.1 Trademarks

All trademarks are the property of their respective owners.

5 Revision History

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

Changes from Revision C (October 2021) to Revision D (May 2025)	Page
• Added D, DCK, DXE, PW, YBG, YBK, and ZFC package support	1
• Added kit contents, specifications, and device information to the document	2
• Added hardware design files to the document	6

Changes from Revision B (July 2021) to Revision C (October 2021)	Page
• Changed Step 1 of the *HALL-ADAPTER-EVM Usage Instructions*	4

Changes from Revision A (April 2020) to Revision B (July 2021)	Page
• Updated the numbering format for tables, figures and cross-references throughout the document	4

Changes from Revision * (November 2017) to Revision A (April 2020)	Page
• Changed *Usage Instructions* format to follow other ADAPTER-EVM guides	4

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.

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   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.

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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。
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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:*

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8. *Limitations on Damages and Liability:*

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   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.

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