High Side Switch Motherboard Evaluation Module

The HSS-MOTHERBOARDEVM evaluation module is designed to evaluate the <50-mΩ Ron devices in TI's high side switch portfolio. These devices include TPS1HA08-Q1, TPS2HB08-Q1, TPS2HB16-Q1, TPS2HB35-Q1, and TPS2HB50-Q1. This board does not come with the devices populated but allows any of the devices to be soldered down on the sample daughter card and used in the main motherboard. This user's guide provides the connectors and test point description, schematic, bill of materials (BOM), and board layout of the EVM.

NOTE: This EVM does **NOT** come with devices populated on the board. The user **MUST** order samples separately.

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1 Introduction

Texas Instruments' HSS-MOTHERBOARDEVM evaluation module has a central socket for the supporting daughtercard with the high side switch device to be populated. The EVM supports the entire single-channel and dual channel low Ron (≤50-mΩ) high-side driver applications. The purpose of this EVM is to facilitate evaluation of the low Ron high side switches for the diagnostic features and drive resistive, capacitive, and inductive loads.

The EVM is a combination of a central motherboard and a row of daughterboards. The mother board has all connectors, jumpers, and test points. The daughter board has different footprints to support the low Ron family of TI's high side switch portfolio. The daughter board also has limiting resistors for the channel devices (TPS**2**HBxx-Q1) and since the 1 channel device (TPS**1**HA08-Q1) has a NC pin in that location the daughtercards will work for all of the devices.

The daughterboards have 2 different footprints: 24 pin PWP and 16 pin PWP. For installation, a single board from the panel has to broken, a device soldered down onto the main footprint, and connected to the motherboard.

NOTE: Caution must be taken when soldering down the device as the main power pad on the back needs to be soldered correctly as to not affect performance. Please see PowerPAD Thermally Enhanced Package app note for more details about the solder profile and techniques.

The current-limiting resistors are on the bottom side of the daughterboard. They are all 10-kΩ, 0805 package. For the desired current limit value, the resistor can be replaced with different value. Also for the single channel devices the second resistor should be depopulated.

The jumpers are not installed. Refer to Table 1 and Table 2 for installation.

1.1 Descriptions

The Texas Instruments HSS-MOTHERBOARDEVM helps designers evaluate the operation and performance of the TPS1HA08-Q1, TPS2HB08-Q1, TPS2HB16-Q1, TPS2HB35-Q1 and TPS2HB50-Q1 devices.

These devices are fully-protected high-side switches, with an integrated NMOS power FET, and charge pump. Full diagnostics and high-accuracy current sense features enable intelligent control of the load.

The device diagnostic reporting supports load current status and device temperature on an analog sense output pin SNS. The SNS pin sources a current proportional to the selected parameter. By adding a pulldown resistor on the SNS pin, the developed voltage is proportional to the selected parameter as well. The diagnostics can be disabled for multiplexing the sense pin between different devices.

1.2 Applications

The EVM is used in the following applications:

- High-side relay drivers
- High-side power switch for submodule power supply
- Bulb driver
- General resistive, inductive, and capacitive loads
- Replace electromechanical relays and fuses

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1.3 Features

The EVM supports the following features:

- Single or Dual-channel high-side power switches, tested according to AECQ100-12
- Operating voltage 3 V to 18V
- Operating temperature: –40ºC to 125ºC
- Microcontroller input control: 3.3-V and 5-V logic compatible
- High-accuracy current sense
  - Analog current sense as a ratio of the load current or device temperature
- Protection:
  - Reverse battery protection with external ground network
  - Short-circuit protection
  - Overvoltage protection
  - Thermal shutdown and thermal swing with self-recovery
  - ESD protection
- Diagnostic:
  - On and off state output open or short to battery detection
  - Overload and short-to-ground detection and power limiting
  - Thermal shutdown and thermal swing diagnostic
  - Immediate shutdown or continuous clamping during fault current condition
  - Diagnostic enable function for multiplexing of MCU analog or digital port

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2 HSS-MOTHERBOARDEVM Schematic

Figure 1 and Figure 2 illustrate the TPS2HB08-50EVM motherboard and daughterboard schematics, respectively.

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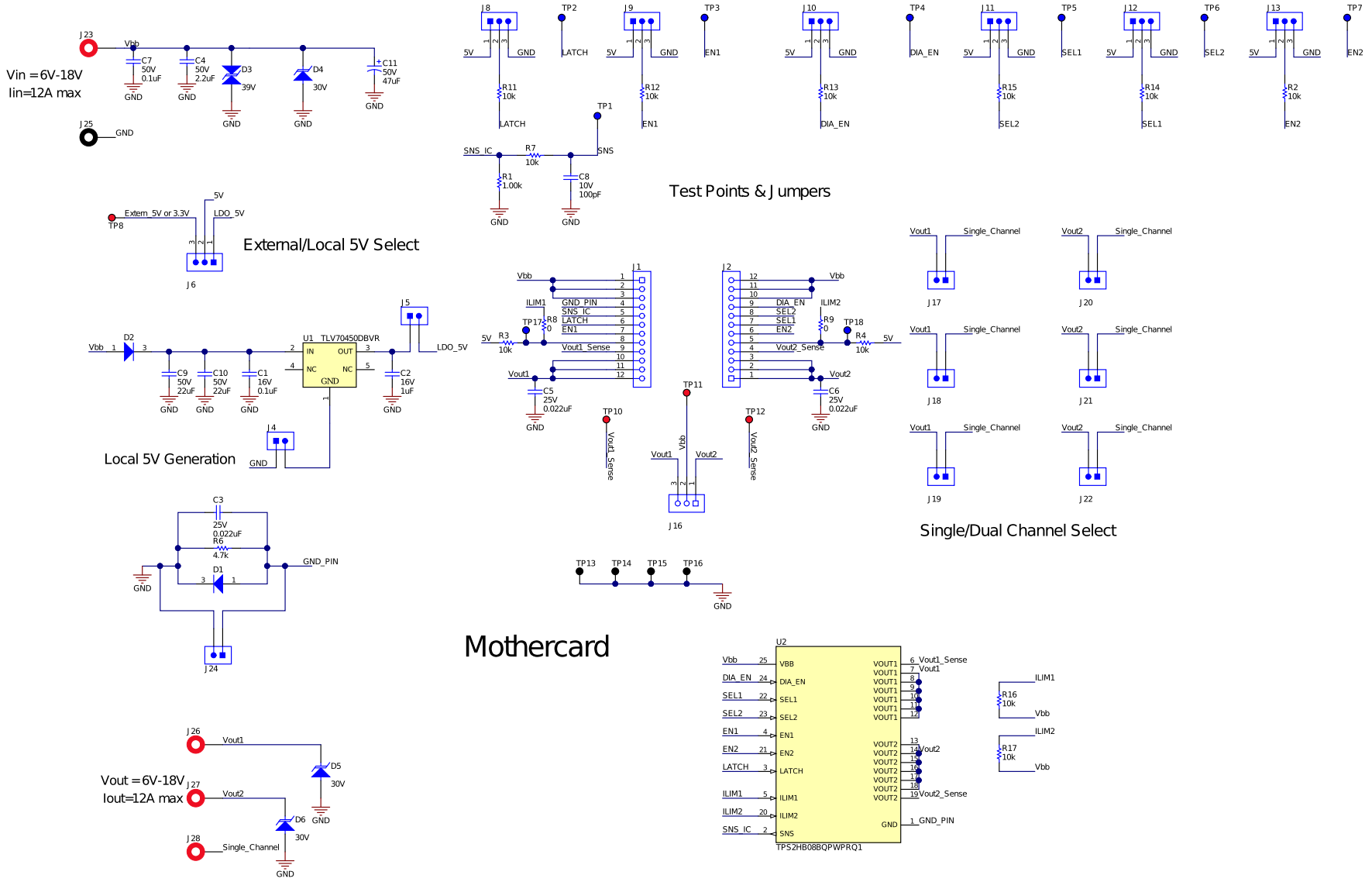


Figure 1. HSS-MOTHERBOARDEVM Motherboard Schematic

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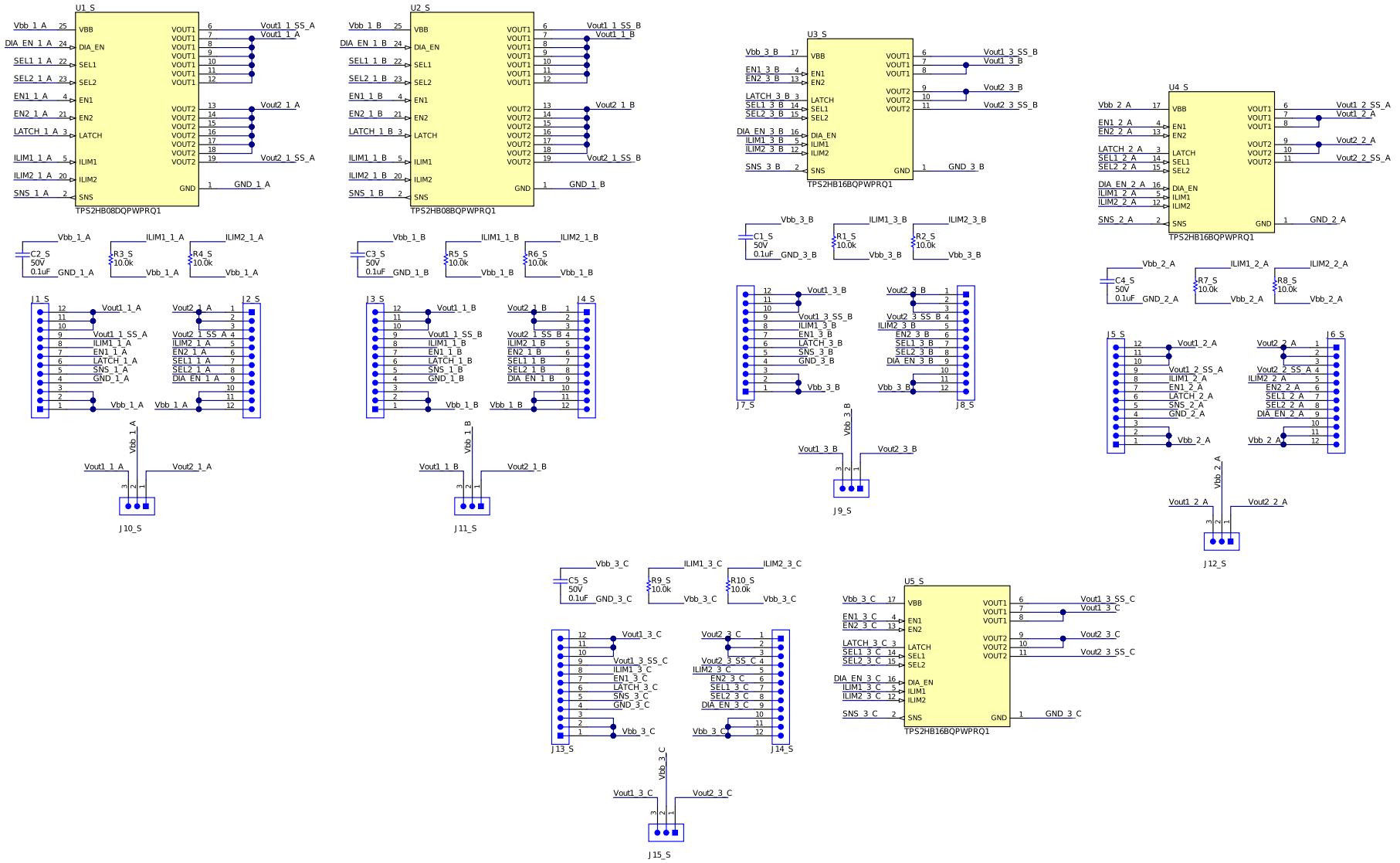


Figure 2. HSS-MOTHERBOARDEVM Sample Daughter Card Schematic

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3 Connections Descriptions

3.1 Connectors and Test Points

Table 1 lists the EVM connector and test point descriptions.

Table 1. Connector and Test Point Descriptions

Connectors and Test Points	Descriptions
J23	High-current input terminal for VBB
J26	High-current output for VOUT1
J27	High-current output for VOUT2
J28	High-current output for paralleling 2 channels into single channel VOUT
J25	High-current input terminal for GND
Vbb_Sense (TP11)	Test point used to measure VBB Votlage
Vout1_Sense (TP10)	Test point to measure VOUT1 Voltage
Vout2_Sense (TP12)	Test point to measure VOUT2 Voltage
EN1 (TP3)	Test point used to apply power to EN1, only use when J9 is not connected to 5V or GND
EN2 (TP7)	Test point used to apply power to EN2, only use when J13 is not connected to 5V or GND. Only for 2 channel devices.
DIA_EN (TP4)	Test point used to apply power to DIA_EN, only use when J10 is not connected to 5 V or GND
SEL1 (TP5)	Test point used to apply power to SEL1, only use when J12 is not connected to 5 V or GND
SEL2 (TP6)	Test point used to apply power to SEL2, only use when J11 is not connected to 5 V or GND
LATCH (TP2)	Test point used to apply power to LATCH, only use when J8 is not connected to 5 V or GND
SNS (TP1)	Test point used to measure SNS
TP17	Connects to ISNS1 on the daughtercard
TP18	Connects to ISNS2 on the daughtercard. Only for 2 channel devices.
TP8	5-V external input terminal for 5-V EVM
TP13, TP14, TP15, TP16	This is a direct connection to the GND plane of the EVM

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3.2 Jumpers

Table 2 lists the EVM jumper descriptions.

Table 2. Jumper Descriptions

Jumpers	Description
J9	This jumper is used to connect the EN1 pin to 5 V (1-2) or GND (2-3).
J13	This jumper is used to connect the EN2 pin to 5V (1-2) or GND (2-3). Only for 2 channel devices
J10	This jumper is used to connect the DIA_EN pin to 5 V (1-2) or GND (2-3)
J12	This jumper is used to connect the SEL1 pin to 5 V (1-2) or GND (2-3).
J11	This jumper is used to connect SEL2 pin to 5 V (1-2) or GND (2-3)
J4	This jumper connects the TLV70450DBVR ground pin 1 to EVM GND. This with J5 enables LDO
J24	This jumper is used to bypass the ground network used for reverse polarity protection
J3	This jumper is used to power the 5-V TLV70450DBVR LDO with the VBB input for the EVM
J8	This jumper is used to connect the LATCH pin to 5 V (1-2) or GND (2-3)
J5	This jumper connects TLV70450DBVR output to LDO_5V. This with J4 enables LDO.
J6	This jumper connects LDO_5V to the 5-V supply net on the EVM (1-2) or Extern_5V (2-3)
J1, J2, J16	These jumpers connect the motherboard to the daughterboard
J17, J18, J19	Connect Vout1 to single channel
J20, J21, J22	Connect Vout2 to single channel

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4 TPS2HB08-50EVM EVM Assembly Drawings and Layout

Figure 3 show the design of the HSS-MOTHERBOARDEVM and daughterboard PCB. The EVM was designed using FR4 material on a two-layer board. All components are located in an active area on the top side and active traces are provided in the top and bottom layers to allow the user to easily view, probe, and evaluate. Moving components to both sides of the PCB can offer additional size reduction for space-constrained systems.

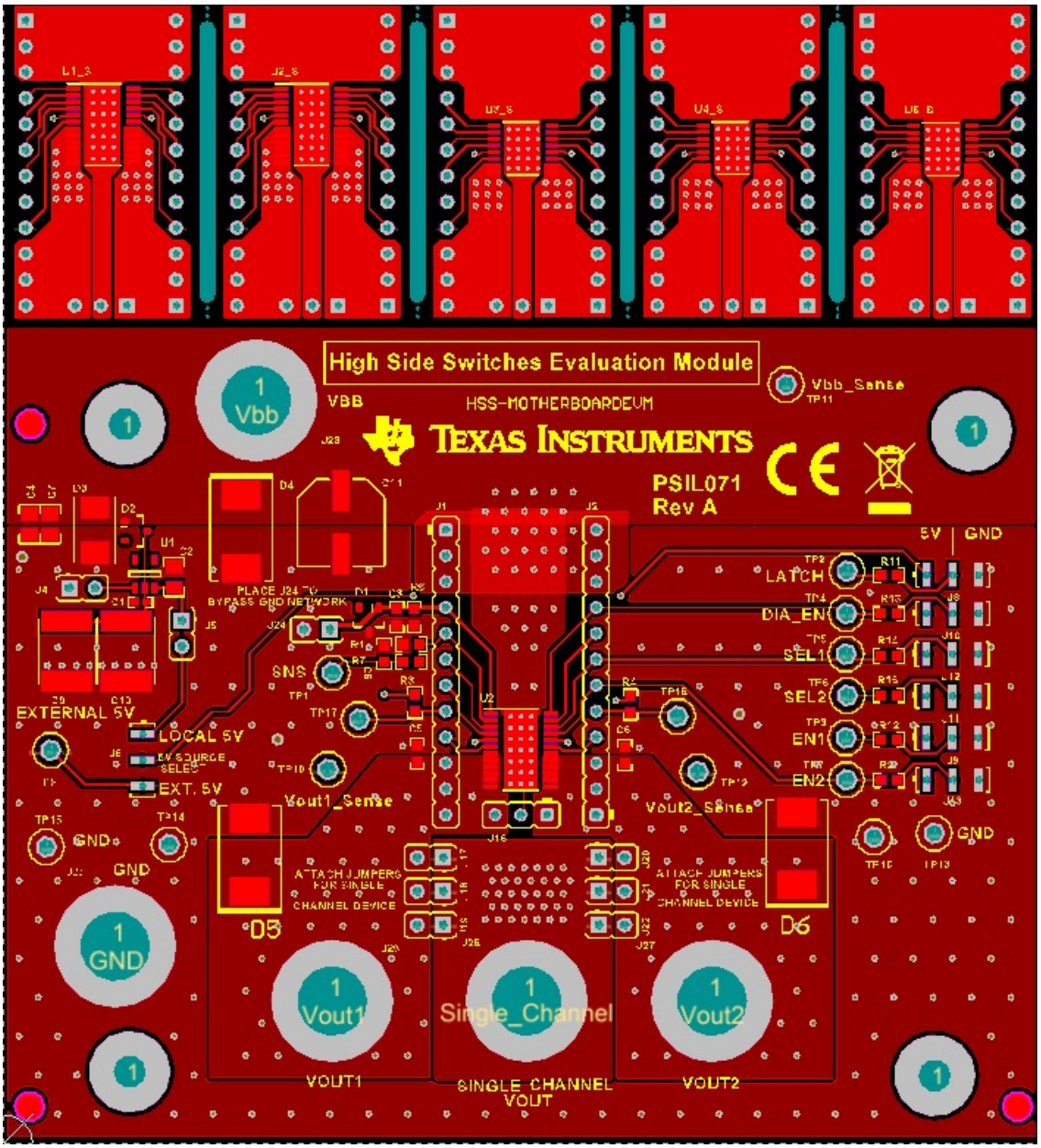


Figure 3. HSS-MOTHERBOARDEVM Layout and Routing (Top View)

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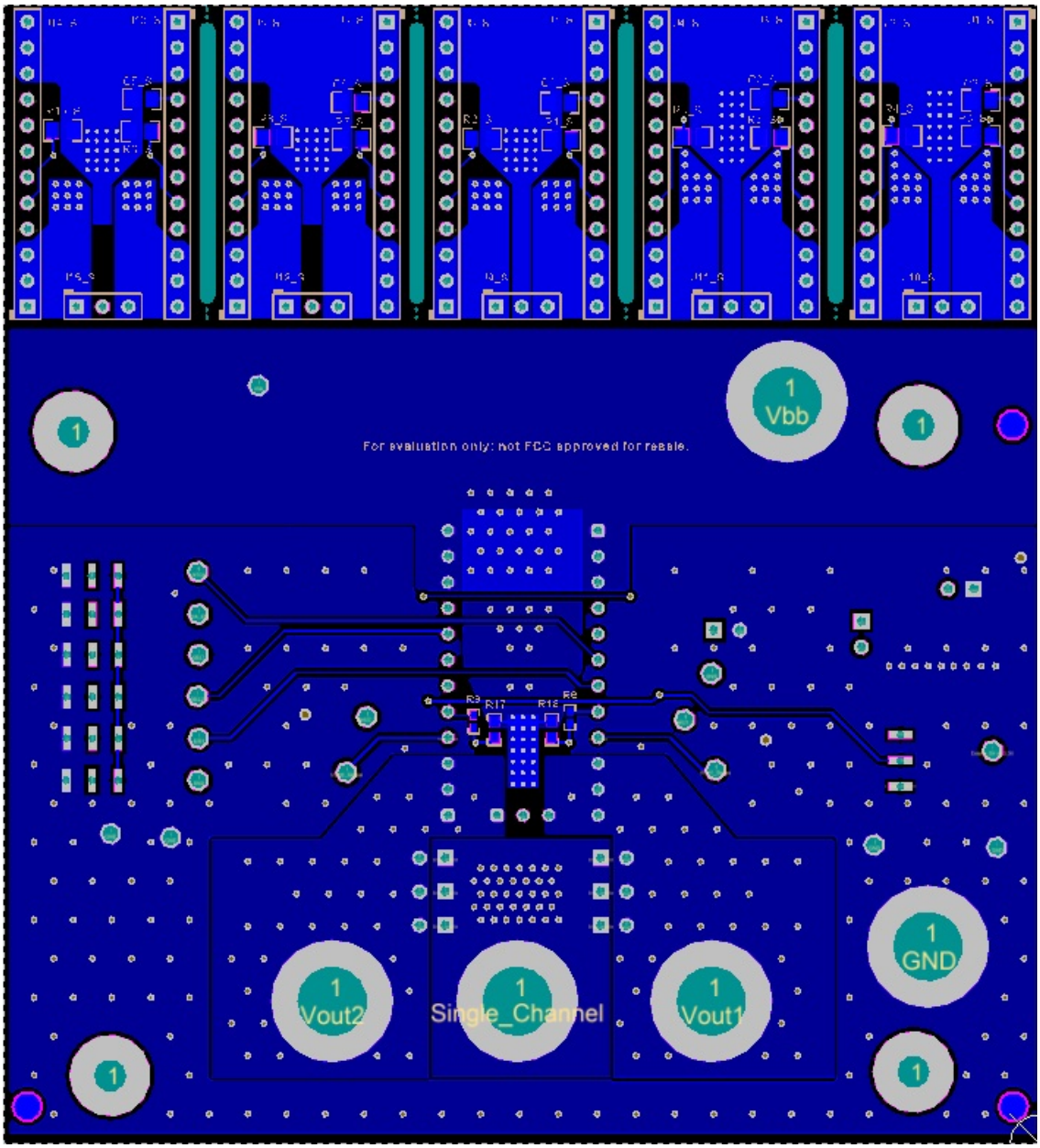


Figure 4. HSS-MOTHERBOARDEVM Layout and Routing (Bottom View)

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5 Current Limit

When I_{OUT} reaches the current limit threshold, I_{CL}= K_{CL} / R_{ILIM}, the device can switch off immediately, or the device can remain enabled and limit I_{OUT}. The HSS-MOTHERBOARDEVM enables multiple variants use case as any device can be populated in the snap-off daughtercards or on the footprint directly on the board. In the case that the device remains enabled (and limits I_{OUT}), the thermal shutdown or energy limit protection feature may be triggered due to the high amount of power dissipation in the device. Check the datasheet for the device being used to see what the range of current limit can be.

6 Current Sense

High-accuracy current sensing allows real-time monitoring and more diagnostics without further calibration. A current mirror is used to source a 1/5000 of the load current on SNS pin. The 1-kΩ R1 resistor is connected to the SNS pin to convert the current source into a voltage:

$V_{SNS} = 1000 \times I_{OUT} / 5000$

For multiple channel devices see the datasheet for the SELx configuration to know which channel is being monitored.

7 Transient Protection

The HSS-MOTHERBOARDEVM comes with large footprints for TVS diodes if they are needed for any transient testing. D3 is an SMB footprint while D4, D5, and D6 are SMC footprints. In addition, there are also some capacitor footprints that can be populated if need be such as C4 or C11.

8 Soldering Down U2

The HSS-MOTHERBOARDEVM allows the user to solder down a device directly to the board without going through the daughtercard. As noted in the Section 1, care must be taken when soldering down the device.

9 Bill of Materials

Designator	Quantity	Value	Description	PackageReference	PartNumber	Manufacturer
C1	1	0.1uF	CAP, CERM, 0.1 uF, 16 V, +/- 10%, X5R, 0402	0402	160R07X104KV4T	Johanson Technology
C1_S, C2_S, C3_S, C4_S, C5_S, C7	6	0.1uF	CAP, CERM, 0.1 uF, 50 V, +/- 10%, X7R, AEC-Q200 Grade 1, 0805	0805	GCM21BR71H104KA37K	MuRata
C2	1	1uF	CAP, CERM, 1 uF, 16 V, +/- 10%, X5R, 0805	0805	0805YD105KAT2A	AVX
C5, C6	2	0.022uF	CAP, CERM, 0.022 uF, 25 V, +/- 10%, X7R, 0603	0603	C0603C223K3RACTU	Kemet
C8	1	100pF	CAP, CERM, 100 pF, 10 V, +/- 10%, X7R, 0603	0603	0603ZC101KAT2A	AVX
C9, C10	2	22uF	CAP, CERM, 22 uF, 50 V, +/- 20%, X5R, 6x5x5mm	6x5x5mm	CKG57NX5R1H226M500JH	TDK
D1, D2	2	200V	Diode, Switching, 200 V, 0.2 A, SOT-23	SOT-23	BAS21-7-F	Diodes Inc.
H1, H2, H3, H4	4		Machine Screw, Round, #4-40 x 1/4, Nylon, Philips panhead	Screw	NY PMS 440 0025 PH	B&F Fastener Supply
H5, H6, H7, H8	4		Standoff, Hex, 0.5"L #4-40 Nylon	Standoff	1902C	Keystone
J1, J2	2		Receptacle, 2.54mm, 12x1, Gold, TH	Receptacle, 2.54mm, 12x1, TH	801-47-012-10-012000	Mill-Max

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J1_S, J2_S, J3_S, J4_S, J5_S, J6_S, J7_S, J8_S, J13_S, J14_S	10		Header, 100mil, 12x1, TH	Header, 12x1, 100mil, TH	800-10-012-10-001000	Mill-Max
J4, J5, J17, J18, J19, J20, J21, J22, J24	9		Header, 2.54mm, 2x1, Tin, TH	Header, 2.54mm, 2x1, TH	22284023	Molex
J6, J8, J9, J10, J11, J12, J13	7		Header, 2.54mm, 3x1, Gold, TH	Header, 2.54mm, 3x1, TH	5-146280-3	TE Connectivity
J9_S, J10_S, J11_S, J12_S, J15_S	5		Header, 100mil, 3x1, TH	Header, 3x1, 100mil, TH	800-10-003-10-001000	Mill-Max
J16	1		Receptacle, 2.54mm, 3x1, Tin, TH	Receptacle, 2.54mm, 3x1, TH	801-47-003-10-012000	Mill-Max
J23, J26, J27, J28	4		BANANA JACK, SOLDER LUG, RED, TH	Red Insulated Banana Jack	SPC15363	Tenma
J25	1		BANANA JACK, SOLDER LUG, BLACK, TH	Black Insulated Banana Jack	SPC15354	Tenma
R1	1	1.00k	RES, 1.00 k, 1%, 0.1 W, AEC-Q200 Grade 0, 0603	0603	CRCW06031K00FKEA	Vishay-Dale
R1_S, R2_S, R3_S, R4_S, R5_S, R6_S, R7_S, R8_S, R9_S, R10_S	10	10.0k	RES, 10.0 k, 0.5%, 0.125 W, 0805	0805	RT0805DRE0710KL	Yageo America
R2, R7, R11, R12, R13, R14, R15	7	10k	RES, 10 k, 5%, 0.1 W, 0603	0603	RC1608J103CS	Samsung Electro-Mechanics
R6	1	4.7k	RES, 4.7 k, 5%, 0.1 W, AEC-Q200 Grade 0, 0603	0603	CRCW06034K70JNEA	Vishay-Dale
R16, R17	2	10k	RES, 10 k, 5%, 0.1 W, AEC-Q200 Grade 0, 0603	0603	CRCW060310K0JNEA	Vishay-Dale
SH-J1, SH-J2, SH-J3, SH-J4, SH-J5, SH-J6, SH-J7, SH-J8, SH-J9, SH-J10	10	1x2	Shunt, 100mil, Gold plated, Black	Shunt	SNT-100-BK-G	Samtec
TP1, TP2, TP3, TP4, TP5, TP6, TP7, TP17, TP18	9		Test Point, Multipurpose, Blue, TH	Blue Multipurpose Testpoint	5127	Keystone
TP8, TP10, TP11, TP12	4		Test Point, Multipurpose, Red, TH	Red Multipurpose Testpoint	5010	Keystone
TP13, TP14, TP15, TP16	4		Test Point, Multipurpose, Black, TH	Black Multipurpose Testpoint	5011	Keystone
U1	1		Single Output LDO, 150 mA, Fixed 5 V Output, 2.5 to 24 V Input, with Ultra-Low IQ, 5-pin SOT-23 (DBV), -40 to 125 degC, Green (RoHS & no Sb/Br)	DBV0005A	TLV70450DBVR	Texas Instruments
C3	0	0.022uF	CAP, CERM, 0.022 uF, 25 V, +/- 10%, X7R, 0603	0603	C0603C223K3RACTU	Kemet
C4	0	2.2uF	CAP, CERM, 2.2 uF, 50 V, +/- 10%, X6S, 0805	0805	C2012X6S1H225K125AB	TDK
C11	0	47uF	CAP, AL, 47 uF, 50 V, +/- 20%, 0.68 ohm, AEC-Q200 Grade 2, SMD	SMT Radial E	EEE-FK1H470P	Panasonic
D3	0	39V	Diode, TVS, Bi, 39 V, SMB	SMB	SM6T39CA	STMicroelectronics
D4, D5, D6	0	30V	Diode, TVS, Uni, 30 V, SMC	SMC	SMCJ30A	Fairchild Semiconductor

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R3, R4	0	10k	RES, 10 k, 5%, 0.1 W, 0603	0603	RC1608J103CS	Samsung Electro-Mechanics
R8, R9	0	0	RES, 0, 5%, 0.063 W, AEC-Q200 Grade 0, 0402	0402	CRCW04020000Z0ED	Vishay-Dale
U1_S	0		40-V, 8-mOhm Dual-Channel Smart High-Side Switch, PWP0024L (TSSOP-24)	PWP0024L	TPS2HB08DQPWPRQ1	Texas Instruments
U2, U2_S	0		40-V, 8-mOhm Dual-Channel Smart High-Side Switch, PWP0024L (TSSOP-24)	PWP0024L	TPS2HB08BQPWPRQ1	Texas Instruments
U3_S, U4_S, U5_S	0		40-V, 16-mOhm Dual-Channel Smart High-Side Switch, TPS1HA08-Q1 (TSSOP-16)	TPS1HA08-Q1	TPS2HB16BQPWPRQ1	Texas Instruments

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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.

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。
http://www.tij.co.jp/lsds/ti_ja/general/eStore/notice_01.page

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。
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。

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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。http://www.tij.co.jp/lsds/ti_ja/general/eStore/notice_02.page

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.

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