EVM User's Guide: TMUX4827YBHEVM

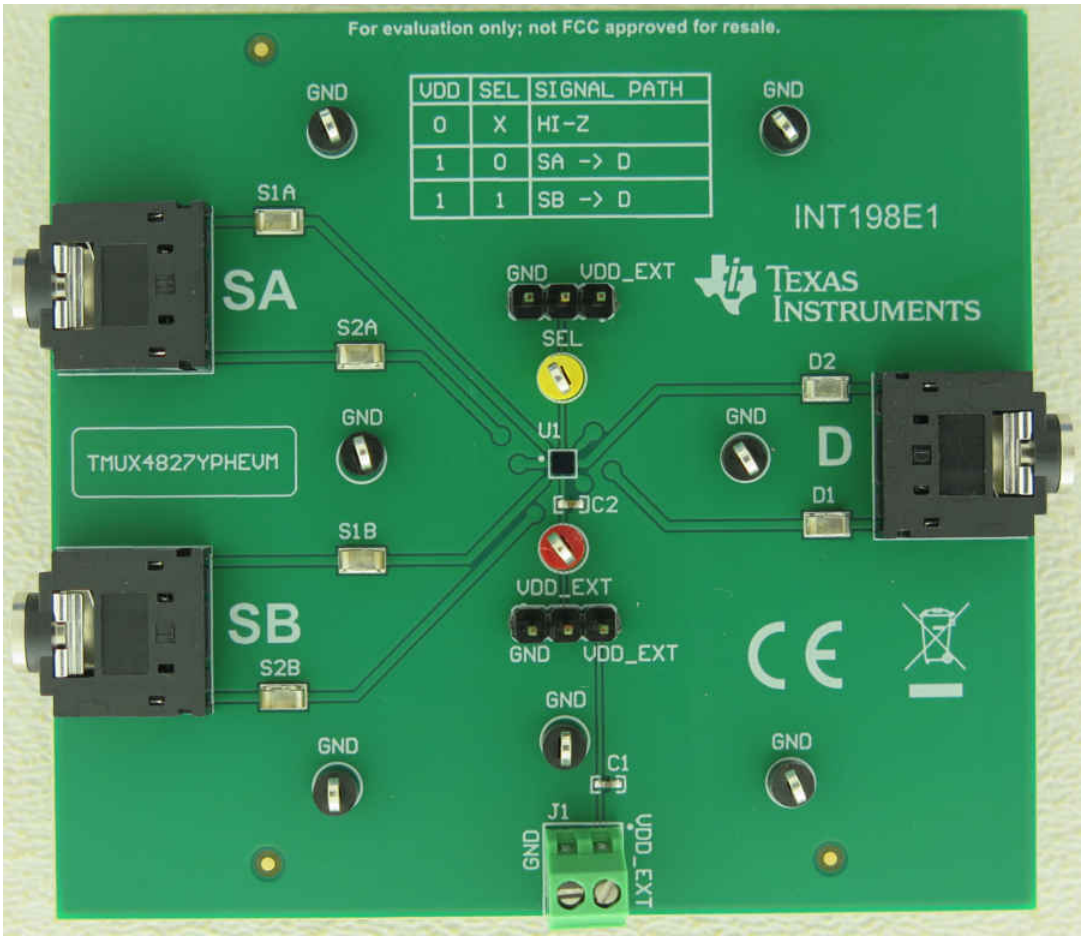
TMUX4827YBH Evaluation Module

Description

The TMUX4827YBHEVM is used to evaluate the performance of the TMU4827. The evaluation module (EVM) comes with a TMUX4827YBH device soldered on. The EVM allows for an easy way for engineers to evaluate the TMUX4827 with audio signals by using on board audio jacks. Additionally, test points on board are provided to allow for the capability to test for signals that aren't audio signals as well.

Features

- TMUX4827YBH pre-soldered on board
- 2 power supply decoupling capacitor from VDD to Ground (1µF 0402; 0.1µF 0402)
- 6 test points on I/O's supporting TMUX4827 full current capabilities
- 7 additional GND test points for easy of probing
- 1 3-pin header for connecting/disconnecting device from external power
- 1 3-pin header to change signal path state of device



TMUX4827YBHEVM (Top View)

1 Evaluation Module Overview

1.1 Introduction

This user's guide describes the TMUX4827YBHEVM evaluation module (EVM) and the intended use. This board allows for the quick prototyping and characterization of TI's TMUX4827 multiplexers in an 9-Pin YBH package. This EVM allows for evaluation of the signal path along with the power sequencing flexibility of the TMUX4827.

1.2 Kit Contents

The EVM kit includes the following :

- TMUX4827YBHEVM board

1.3 Specification

The TMUX4827YBHEVM is used for quick prototyping of the TMUX4827 in the YBH package. The EVM has two 3-pin headers. One header for toggling the SEL pin to switch control the signal path routing of the device. The other 3-pin header allows for the VDD supply to be connected to an external source, to the board ground or left floating.

The EVM has test points on each I/O for a total of six total test points that are rated up to 2 A to support testing the TMUX4827 at the fullest current carrying capabilities. Seven extra ground test points are provided to allow for easy testing of the board.

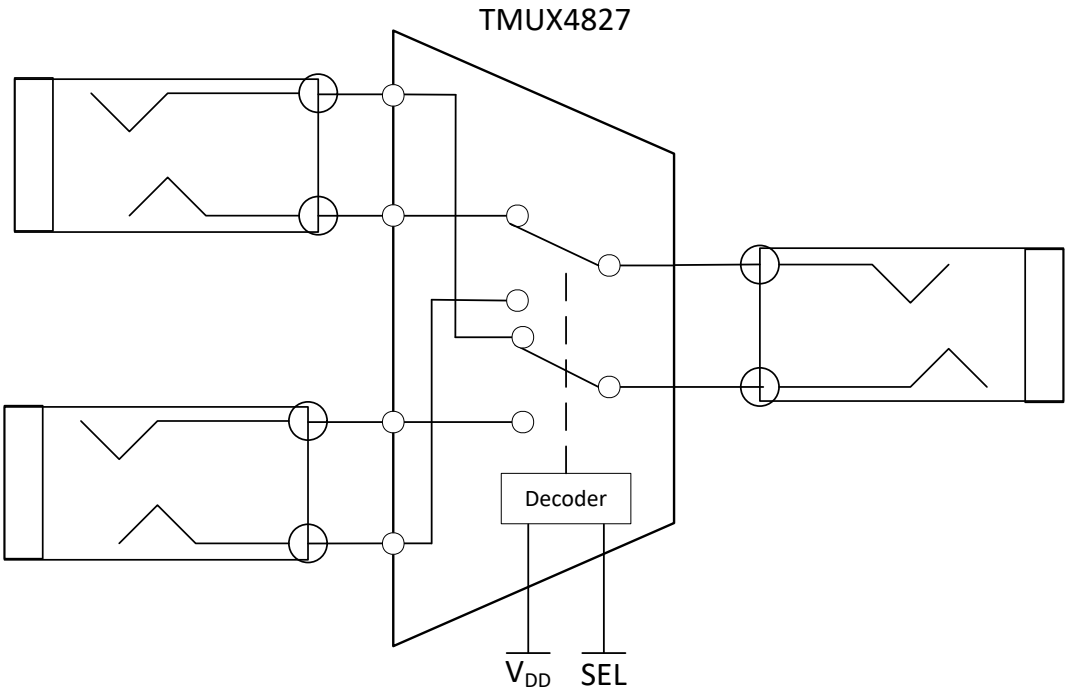


Figure 1-1. TMUX4827YBHEVM Simplified Circuit

1.4 Device Information

The TMUX4827 is a complementary metal-oxide semiconductor (CMOS) multiplexer with two independently selectable 2:1, single-pole, doublethrow (SPDT) switch channels. This device works with a single supply (1.8 to 5.5 V), but can pass bidirectional analog and digital signals beyond the supply from -12 V to 12 V.

The TMUX4827 also features powered off protection up to ±12 V, which isolates the Dx from a voltage on the Sx even when there is no supply voltage present (VDD = 0 V). Without this protection feature, any voltage on the switch can back-power the supply rail through an internal ESD diode and cause potential damage to the rest of the system.

With 0.001% THD+N and 1 mΩ RON-flatness, the TMUX4827 is an excellent choice for passing precision analog and audio signals without adding distortion.

2 Hardware

2.1 Power Requirements

TMUX4827YPHEVM requires a 1.8V to 5.5V supply provided either through the J1 terminal, or directly hooked to the red VDD_EXT test point to provide a passive signal pathway between the Sx and Dx pins in according to the logic selected.

2.2 Header and Jumper Information

The TMUX4827YBHEVM has two 3-pin headers to control the power supply connection, location C2 of the TMUX4827, and the control inputs, location A2.

1. **Supply Header J2**

   Header J2 connects the VDD pin to either the external power or to ground via a jumper. If Header J2 is not connected, then the devices supply is left floating. Figure 2-1 shows header J2.

   a. To connect to the external supply, short the J2-2 location on the header to J2-3. The VDD_EXT terminal is now supplying the device power.
   b. To connect to ground, short the J2-2 location on the header to J2-1. The device supply pin is now grounded.
   c. To leave the device supply pin floating, leave J2-2 unconnected and floating.

2. **Control Header J7**

   Header J7 connects the SEL pin to either the external power or ground via a jumper. If Header J7 is not connected, then the devices SEL pin are left floating.

   a. To connect to the external supply, short the J7-2 location on the header to J7-1. The VDD_EXT terminal is now connected to the devices SEL pin.
   b. To connect to ground, GND, short the J7-2 location on the header to J7-3. The device SEL pin is now grounded.
   c. Leaving J7-2 unconnected leaves the SEL pin floating. Doing this is not recommended as the device is in an unknown state.

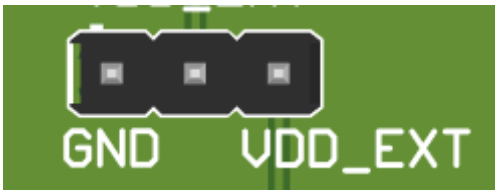


Figure 2-1. Header J2 : J2-1(GND), J2-2(Connection to device VDD), J2-3 (VDD_EXT)

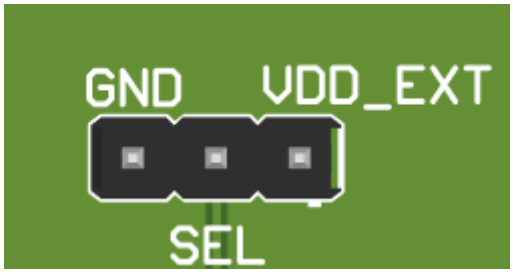
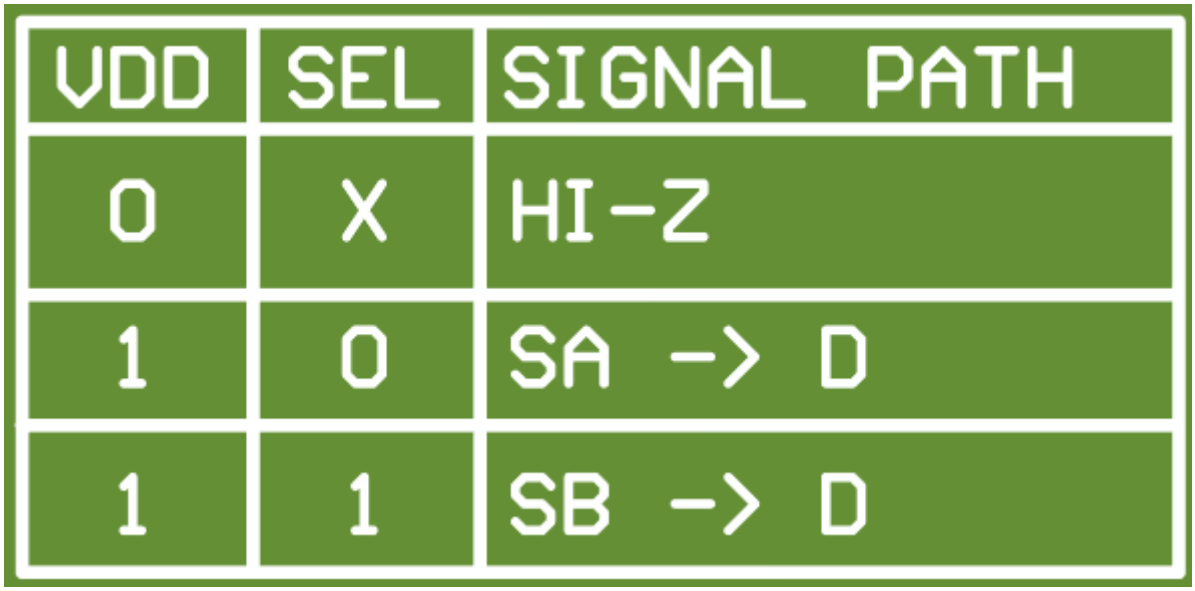


Figure 2-2. Header J7 : J7-1(VDD_EXT), J7-2(Connection to device SEL), J7-3 (GND)

The logic of headers J2(VDD) and J7(SEL) are shown at the top side of the TMUX4827YPHEVM.



VDD	SEL	SIGNAL PATH
0	X	HI-Z
1	0	SA -> D
1	1	SB -> D

Figure 2-3. TMUX4827YBHEVM Truth Table

2.3 Test Points

The board has a total of 15 test points. 7 GND, 1 SEL, 1 VDD, and 6 I/O.

Test Point ID	Description	Signal
S1A	Surface Mount	S1A
S1B	Surface Mount	S1B
S2A	Surface Mount	S2A
S2B	Surface Mount	S2B
D1	Surface Mount	D1
D2	Surface Mount	D2
VDD_EXT	Red	VDD
SEL	Yellow	SEL
GND	Black	GND
GND	Black	GND
GND	Black	GND
GND	Black	GND
GND	Black	GND
GND	Black	GND
GND	Black	GND

3 Hardware Design Files

The following section includes hardware design files for TMUX4827YBHEVM. This section includes the board level schematic, PCB layout and Bill of materials (BOM).

3.1 Schematics

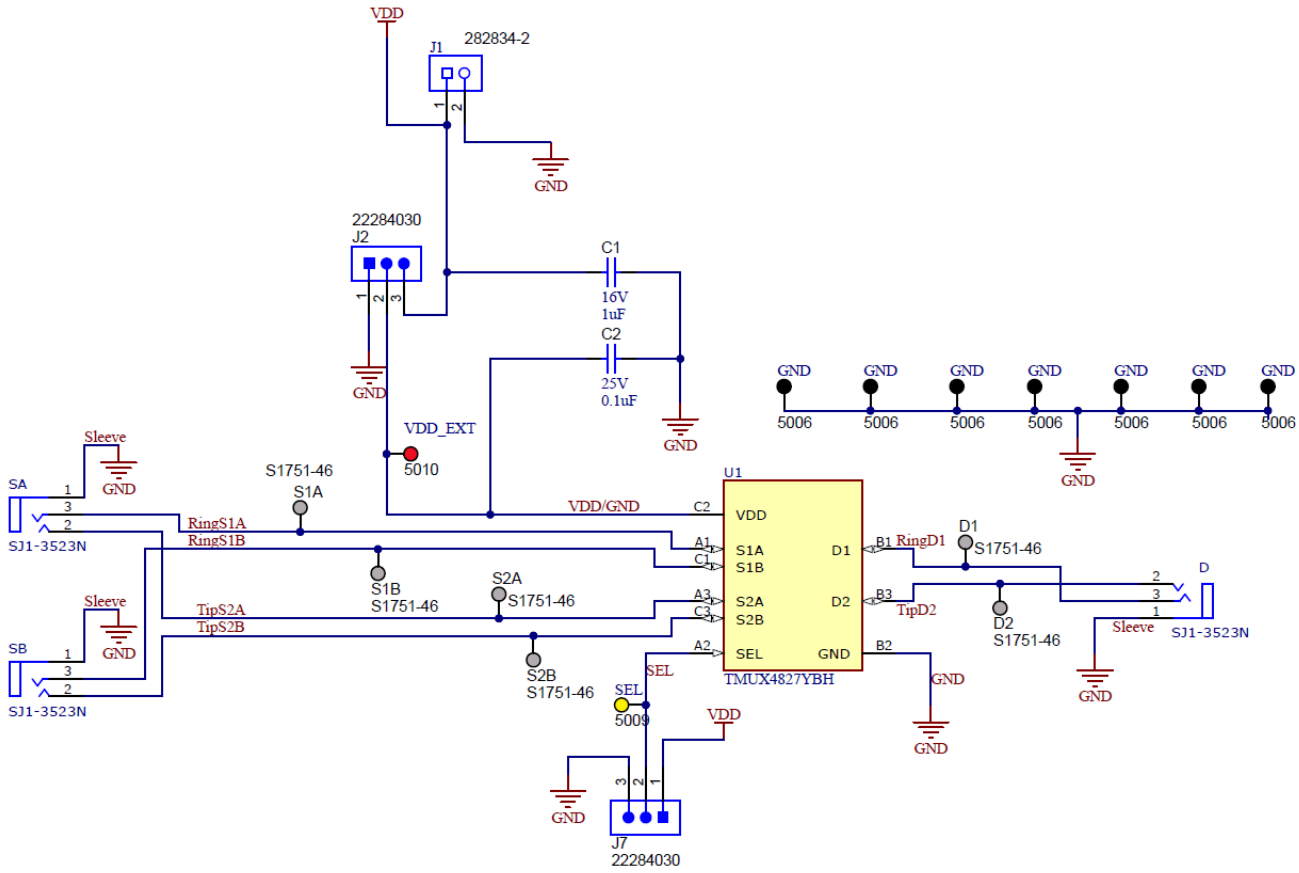


Figure 3-1. TMUX4827YBHEVM Schematic

3.2 PCB Layouts

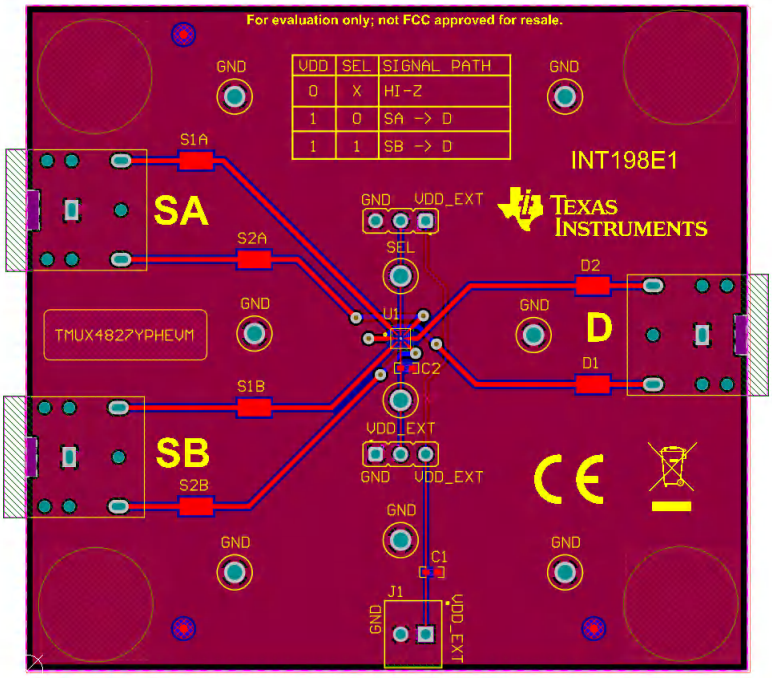


Figure 3-2. TMUX4827YBHEVM Top Layer Layout

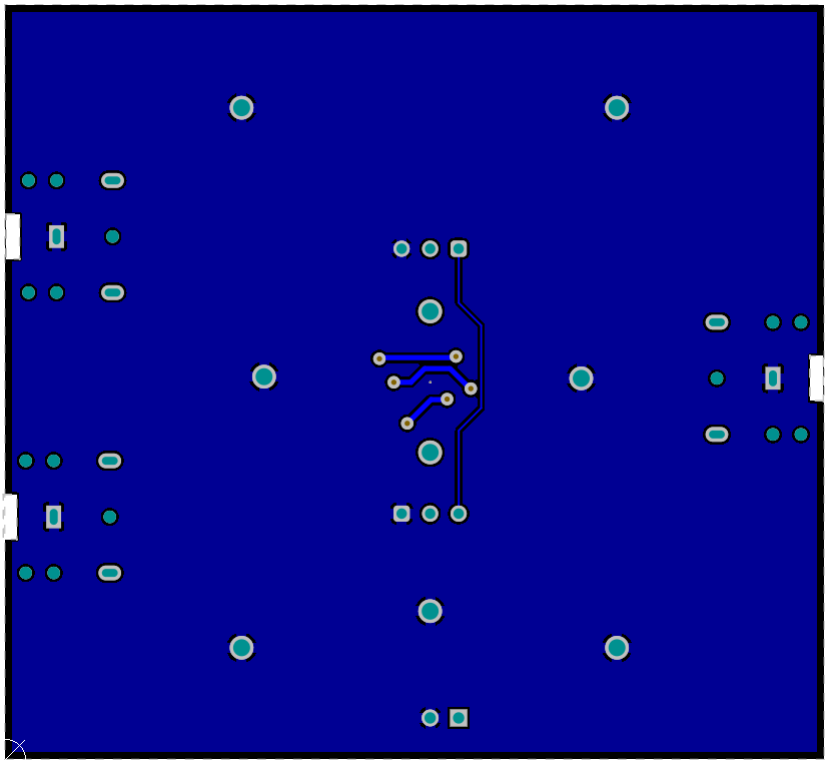


Figure 3-3. TMUX4827YBHEVM Bottom Layer Layout

3.3 Bill of Materials (BOM)

Table 3-1. Bill of Materials

Designator	Qty	Value	Description	Manufacturer	Part Number
		1uF			
C1	1		CAP, CERM, 1 uF, 16 V, +/- 10%, X5R, 0402	Taiyo Yuden	EMK105BJ105KVHF
C2	1	0.1uF	CAP, CERM, 0.1 uF, 25 V, +/- 10%, X5R, 0402	MuRata	GRM155R61E104KA87D
D	1		3.5 mm, Stereo, Right Angle, Through Hole, 3 Conductors, 0 Internal Switches, Audio Jack Connector	CUI Devices	SJ1-3523N
D1	1		Test Lead clips and hooks, SMT	Harwin	S1751-46
D2	1		Test Lead clips and hooks, SMT	Harwin	S1751-46
GND	1		Test Point, Compact, Black, TH	Keystone	5006
GND	1		Test Point, Compact, Black, TH	Keystone	5006
GND	1		Test Point, Compact, Black, TH	Keystone	5006
GND	1		Test Point, Compact, Black, TH	Keystone	5006
GND	1		Test Point, Compact, Black, TH	Keystone	5006
GND	1		Test Point, Compact, Black, TH	Keystone	5006
GND	1		Test Point, Compact, Black, TH	Keystone	5006
H9	1		Bumpon, Hemisphere, 0.44 X 0.20, Clear	3M	SJ-5303 (CLEAR)
H10	1		Bumpon, Hemisphere, 0.44 X 0.20, Clear	3M	SJ-5303 (CLEAR)
H11	1		Bumpon, Hemisphere, 0.44 X 0.20, Clear	3M	SJ-5303 (CLEAR)
H12	1		Bumpon, Hemisphere, 0.44 X 0.20, Clear	3M	SJ-5303 (CLEAR)
J1	1		Terminal Block, 2x1, 2.54mm, TH	TE Connectivity	282834-2
J2	1		Header, 2.54mm, 3x1, Tin, TH	Molex	22284030
J7	1		Header, 2.54mm, 3x1, Tin, TH	Molex	22284030
S1A	1		Test Lead clips and hooks, SMT	Harwin	S1751-46
S1B	1		Test Lead clips and hooks, SMT	Harwin	S1751-46
S2A	1		Test Lead clips and hooks, SMT	Harwin	S1751-46
S2B	1		Test Lead clips and hooks, SMT	Harwin	S1751-46
SA	1		3.5 mm, Stereo, Right Angle, Through Hole, 3 Conductors, 0 Internal Switches, Audio Jack Connector	CUI Devices	SJ1-3523N
SB	1		3.5 mm, Stereo, Right Angle, Through Hole, 3 Conductors, 0 Internal Switches, Audio Jack Connector	CUI Devices	SJ1-3523N
SEL	1		Test Point, Compact, Yellow, TH	Keystone Electronics	5009
TMUX4827YPHEVM	1		Thermal Transfer Printable Labels, 0.650" W x 0.200" H - 10,000 per roll	Brady	THT-14-423-10
U1	1		±12-V Beyond the Supply, 2:1 (SPDT) 2-channel, Power-Off Protection Switch, with 0.2-Ω Ron and 1.8-V Compatible Logic	Texas Instruments	TMUX4827YBH
VDD_EXT	1		Test Point, Multipurpose, Red, TH	Keystone Electronics	5010

4 Additional Information

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NOTE:

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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.

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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.

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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

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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,
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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.

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