

TPS657095 Evaluation Module

This user's guide describes the characteristics, operation, and use of the TPS657095 Evaluation Module (EVM). A complete schematic diagram, printed-circuit board layouts (PCB), and bill of materials (BOM) are included in this document.

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1 Introduction

The TPS657095 is a power management solution for embedded camera modules or other portable low-power consumer end equipment. Features on the TPS657095 include:

- Two 75-mA LDOs
- LED driver with PWM dimming
- 1 GPO
- 1 GPIO
- 4KB user OTP memory
- I2C™ interface

2 Requirements

2.1 Software

IPG-UI software is used for communicating with the TPS657095, with support for Microsoft® Windows® XP, Windows 7, and Windows 8. The EVM will power-up and operate without use of software. However, in order to make I2C commands, check the [TPS657095EVM-122](#) product folder of the TI website for the necessary software. Please see the IPG-UI user's guide ([SLVUAH9](#)) for more details.

2.2 Host Computer

A computer with an available USB port is required to make use of the EVM software. The EVM software runs on the computer and communicates with the EVM via the USB2ANY interface.

2.3 Power Supply

A DC power supply capable of delivering up to 6 V and 3 A is required to operate this EVM.

2.4 EVM Kit

[Figure 1](#) shows the TPS657095 EVM kit.



Figure 1. TPS657095 EVM Kit

3 Schematic

Figure 2 shows the TPS657095 EVM schematic.

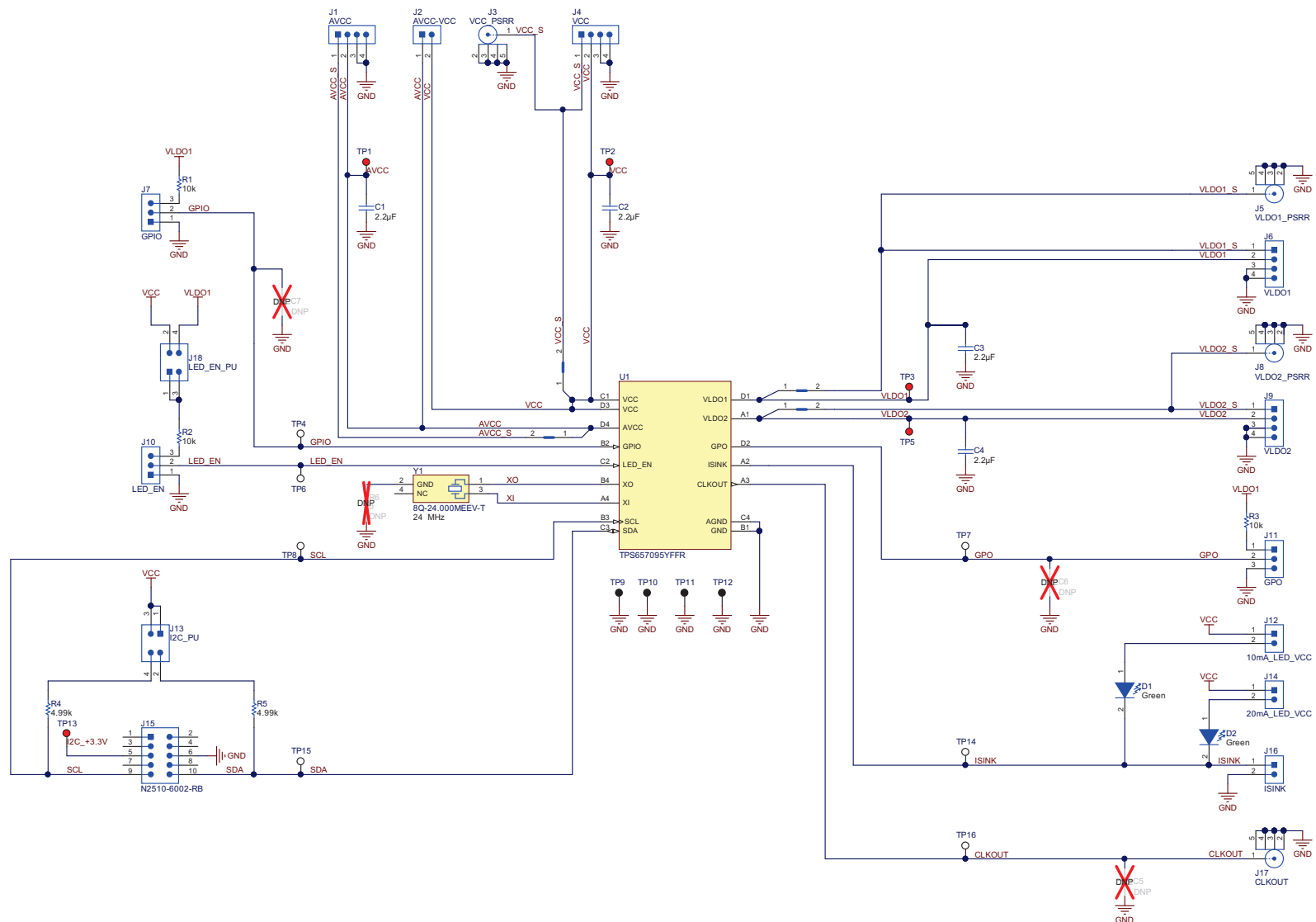


Figure 2. TPS657095 EVM Schematic

4 Terminal Block Description

Table 1 lists the terminal blocks and their descriptions.

Table 1. Terminal Blocks

Connector		Description
J1	AVCC_S	Analog supply input sense
	AVCC	Analog supply input
	GND	Ground
	GND	Ground
J2	VCC-AVCC	Connects analog supply and input supply externally
J4	GND	Ground
	GND	Ground
	VCC	Supply input
	VCC_S	Supply input sense
J6	VLDO1_S	Sense for output voltage for LDO1
	VLDO1	Output voltage of LDO1
	GND	Ground
	GND	Ground
J7	Pull up	Connects GPIO to VLDO1 voltage
	GPIO	General Purpose Input Output pin
	GND	Ground
J9	VLDO2_S	Sense for output voltage for LDO2
	VLDO2	Output voltage of LDO2
	GND	Ground
	GND	Ground
J10	Pull up	Pulls LED_EN pin to either VLDO1 or VCC
	LED_EN	LED enable pin (0 = disabled, 1 = enabled)
	GND	Ground
J11	VLDO1	Pulls GPO pin to output voltage of LDO1
	GPO	General purpose output
	GND	Ground
J12	10-mA LED	Connects anode of diode to VCC
J13	I2C_Pull-Up	Pulls SLC and SDA to VCC
J14	20-mA LED	Connects anode of diode to VCC
J15	I2C connector	Where I2C ribbon cable is connected to USB
J16	ISINK	Open drain current sink; connected to the cathode of LED

5 Test Point Descriptions

Table 2 lists the EVM test points and their descriptions.

Table 2. Test Point Descriptions⁽¹⁾⁽²⁾

Test Point	Description
AVCC	Analog input voltage
VCC	Input voltage
VLDO1	LDO1 output voltage
GPIO	General Purpose Input/Output
VLDO2	LDO2 output voltage
LED_EN	LED enable pin
GPO	General Purpose Output
SCL	Clock input for the I2C compatible interface
GND	Ground
I2C_+3.3V	External 3.3-V supply
ISINK	Open drain current sink
SDA	Data input for the I2C compatible interface
CLKOUT	Clock output

⁽¹⁾ Test points are not designed to carry current, they are intended for measuring voltage.

⁽²⁾ The test points for high current nodes (BAT, AC, USB, DCDC1, DCDC2, and DCDC3) are designed to measure voltage at their respective input/output capacitor.

6 Jumper Descriptions

The EVM jumper descriptions are shown in the following list:

- J2 – Place jumper to connect pins 1 and 2
- J7 – Place jumper to connect pins 1 and 2
- J10 – Place jumper on pins 2 and 3
- J11 – Place jumper on pins 1 and 2
- J12 – Place jumper on pins 1 and 2
- J13 – Place jumpers on all pins, in vertical orientation, with respect to the Texas instruments symbol on the board (as shown in [Figure 1](#))
- J18 – Connect horizontally next to VLDO1 label, the jumper connection next to VCC label is left open

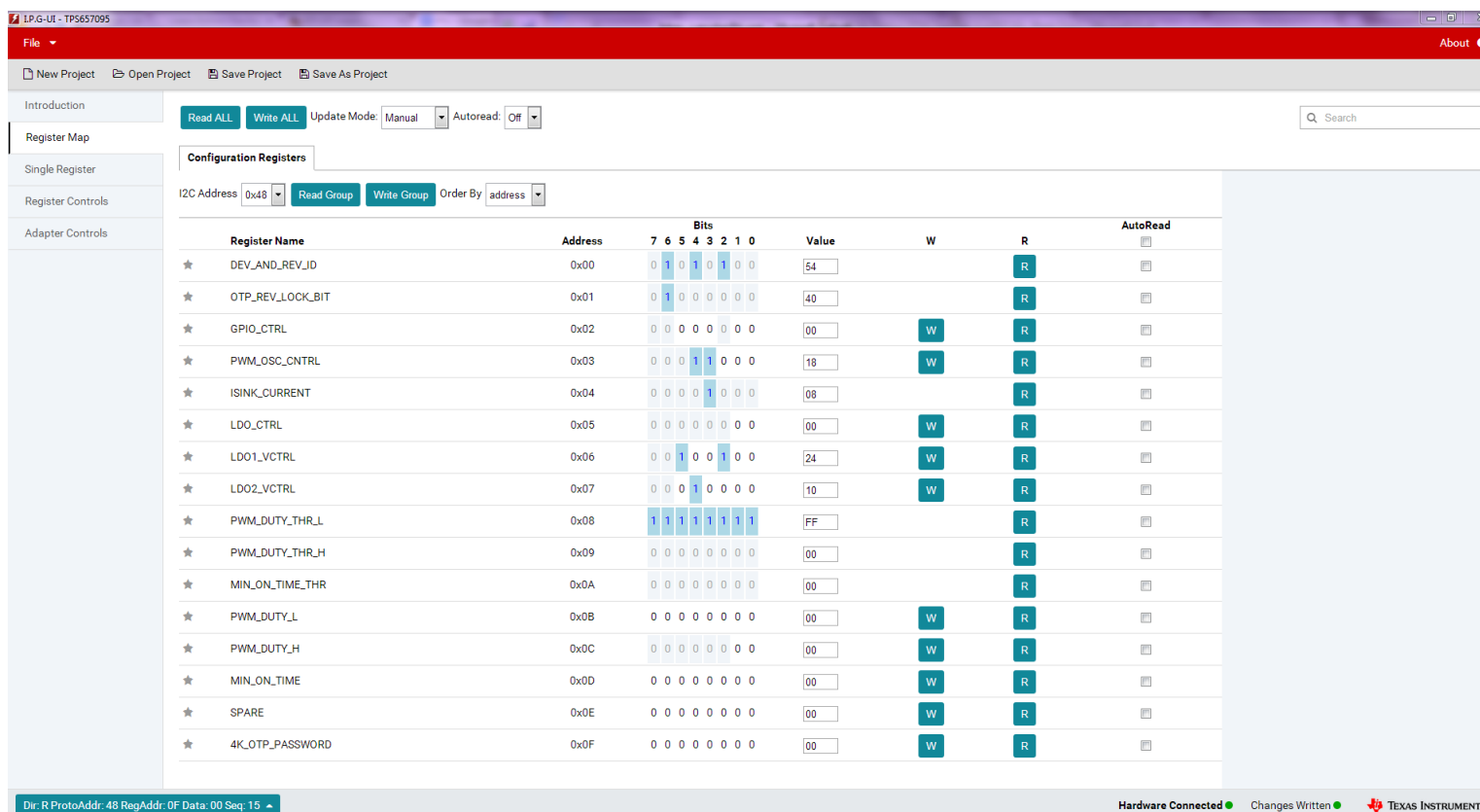
NOTE: If jumper is not mentioned here, leave uninstalled.

7 Software

7.1 Software Installation Instructions

This section explains the procedure for installing the Graphical User Interface (GUI) onto a Windows-based PC. (See the IPG GUI user's guide ([SLVUAH9](#)) for Mac® and Linux® instructions). A USB interface adapter is required to connect the EVM to a PC and is provided with the EVM.

Additional interfaces can be ordered by contacting [TI](#). Please see the IPG GUI users guide ([SLVUAH9](#)) to install the GUI. Once you have selected the TPS657095 and pressed the create project button, you will be taken to the introduction tab. Select the Register map tab on the left of the screen and press read all, you should see the following screen:



Register Name	Address	7	6	5	4	3	2	1	0	Value	W	R	AutoRead
★ DEV_AND_REV_ID	0x00	0	1	0	1	0	1	0	0	54		R	☐
★ OTP_REV_LOCK_BIT	0x01	0	1	0	0	0	0	0	0	40		R	☐
★ GPIO_CTRL	0x02	0	0	0	0	0	0	0	0	00	W	R	☐
★ PWM_OSC_CNTRL	0x03	0	0	0	1	1	0	0	0	18	W	R	☐
★ ISINK_CURRENT	0x04	0	0	0	0	1	0	0	0	08		R	☐
★ LDO_CTRL	0x05	0	0	0	0	0	0	0	0	00	W	R	☐
★ LDO1_VCTRL	0x06	0	0	1	0	0	1	0	0	24	W	R	☐
★ LDO2_VCTRL	0x07	0	0	0	1	0	0	0	0	10	W	R	☐
★ PWM_DUTY_THR_L	0x08	1	1	1	1	1	1	1	1	FF		R	☐
★ PWM_DUTY_THR_H	0x09	0	0	0	0	0	0	0	0	00		R	☐
★ MIN_ON_TIME_THR	0x0A	0	0	0	0	0	0	0	0	00		R	☐
★ PWM_DUTY_L	0x0B	0	0	0	0	0	0	0	0	00	W	R	☐
★ PWM_DUTY_H	0x0C	0	0	0	0	0	0	0	0	00	W	R	☐
★ MIN_ON_TIME	0x0D	0	0	0	0	0	0	0	0	00	W	R	☐
★ SPARE	0x0E	0	0	0	0	0	0	0	0	00	W	R	☐
★ 4K_OTP_PASSWORD	0x0F	0	0	0	0	0	0	0	0	00	W	R	☐

Figure 3. Default Settings for TPS657095 Shown on IPG-GUI GUI

8 Layout

Figure 4 and Figure 5 illustrate the EVM PCB layout.

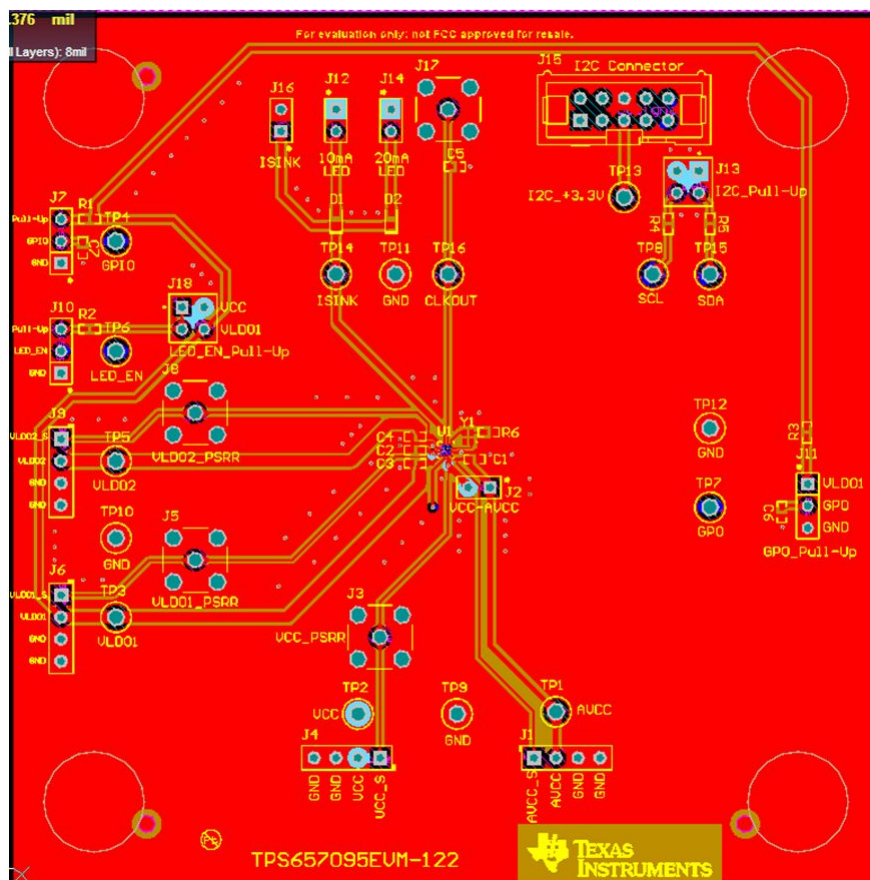


Figure 4. Top Overlay

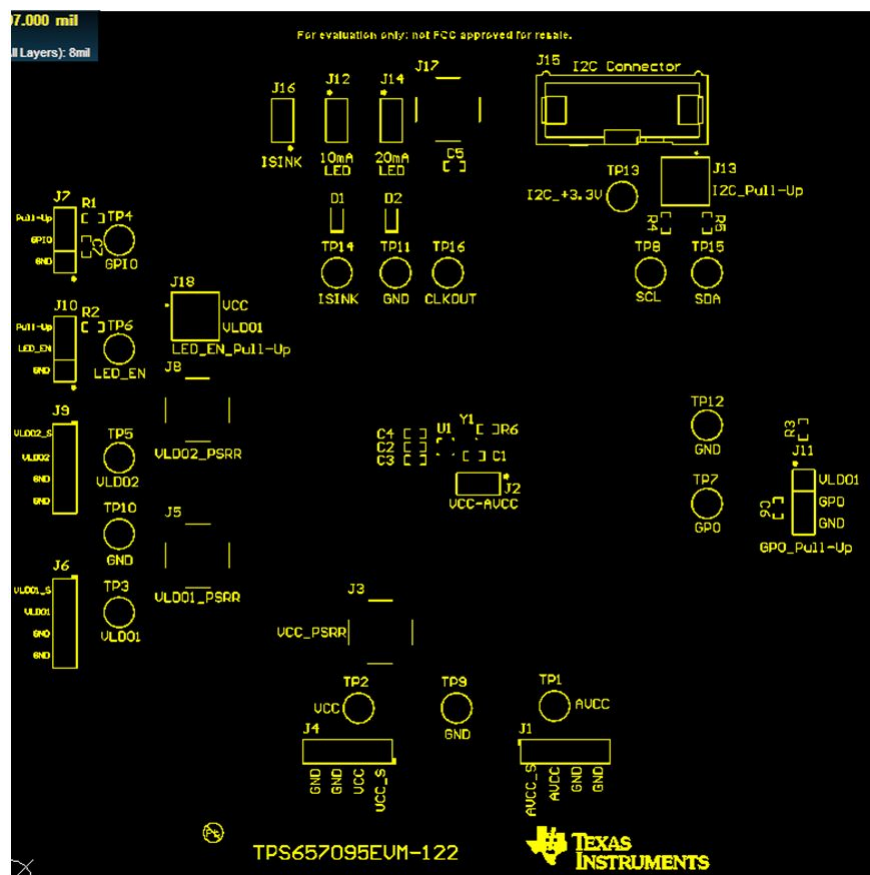


Figure 5. Caption

9 Bill of Materials

Table 3 lists the TPS657095 EVM BOM.

Table 3. TPS657095 EVM Bill of Materials

Designator	Qty	Value	Description	Package Reference	Part Number	MFR
!PCB	1		Printed Circuit Board		HVL122	Any
C1, C2, C3, C4	4	2.2uF	CAP, CERM, 2.2 μ F, 10 V, +/- 10%, X5R, 0402	0402	C1005X5R1A225K050BC	TDK
D1	1	Green	LED, Green, SMD	1.6x0.8x0.8mm	LTST-C190GKT	Lite-On
D2	1	Green	LED, Green, SMD	LED_0603	LTST-C191TGKT	Lite-On
H9, H10, H11, H12	4		Bumpon, Hemisphere, 0.44 X 0.20, Clear	Transparent Bumpon	SJ-5303 (CLEAR)	3M
J1, J4, J6, J9	4		Header, 100mil, 4x1, Tin, TH	Header, 4x1, 100mil, TH	PEC04SAAN	Sullins Connector Solutions
J2, J12, J14, J16	4		Header, 100mil, 2x1, Tin, TH	Header, 2 PIN, 100mil, Tin	PEC02SAAN	Sullins Connector Solutions
J7, J10, J11	3		Header, 100mil, 3x1, Tin, TH	Header, 3 PIN, 100mil, Tin	PEC03SAAN	Sullins Connector Solutions
J13, J18	2		Header, 100mil, 2x2, Tin, TH	Header, 2x2, 2.54mm, TH	PEC02DAAN	Sullins Connector Solutions
J15	1		Header (shrouded), 100mil, 5x2, High-Temperature, Gold, TH	5x2 Shrouded header	N2510-6002-RB	3M
R1, R2, R3	3	10k	RES, 10 k, 5%, 0.063 W, 0402	0402	CRCW040210K0JNED	Vishay-Dale
R4, R5	2	4.99k	RES, 4.99 k, 1%, 0.063 W, 0402	0402	CRCW04024K99FKED	Vishay-Dale
SH1, SH2, SH3, SH4, SH5, SH6	6	1x2	Shunt, 2mm, Gold plated, Black	2mm Shunt, Closed Top	2SN-BK-G	Samtec
TP1, TP2, TP3, TP5, TP13	5	Red	Test Point, Compact, Red, TH	Red Compact Testpoint	5005	Keystone
TP4, TP6, TP7, TP8, TP14, TP15, TP16	7	White	Test Point, Compact, White, TH	White Compact Testpoint	5007	Keystone
TP9, TP10, TP11, TP12	4	Black	Test Point, Compact, Black, TH	Black Compact Testpoint	5006	Keystone
U1	1		PMU for Embedded Camera Module, YFF0016AFAP	YFF0016AFAP	TPS657095YFFR	Texas Instruments
Y1	1		Crystal, 24 MHz, 8 pF, SMD	1.6x1.2mm	8Q-24.000MEEV-T	TXC Corporation
C5, C6, C7	0	15pF	CAP, CERM, 15 pF, 16 V, +/- 2%, C0G/NP0, 0402	0402	GRM0222C1C150GD05	MuRata
FID1, FID2, FID3	0		Fiducial mark. There is nothing to buy or mount.	Fiducial	N/A	N/A
J3, J5, J8, J17	0		SMA Straight Jack, Gold, 50 Ohm, TH	SMA Straight Jack, TH	901-144-8RFX	Amphenol RF
R6	0	0	RES, 0, 5%, 0.063 W, 0402	0402	CRCW04020000Z0ED	Vishay-Dale

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- 3 *Regulatory Notices:*

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

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

Concerning EVMs Including Radio Transmitters:

This device complies with Industry Canada license-exempt RSS standard(s). 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.

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

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If User uses EVMs in Japan, not certified to Technical Regulations of Radio Law of Japan, User is required by Radio Law of Japan to follow the instructions below with respect to EVMs:

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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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.

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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.

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