

## **TL16C750EEVM User's Guide**

This document covers how the user can set up and use the TL16C750EEVM.

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### **Trademarks**

All trademarks are the property of their respective owners.

# 1 Introduction

## 1.1 Features

- 8x sampling mode for 2x Baud rate support
- Fractional Baud rate support
- 128 Byte FIFO depth
- 5V processor to 3.3V DUT level translation

## 1.2 Description

This document will cover how to set up the TL16C750EEVM for evaluation.

## 2 5 V Processor to 3.3 V V<sub>CC</sub> on TL16C750E

The below sections describes how to set up the EVM when using a 5 V digital logic processor to interface with the TL16C750E used at a 3.3 V logic.

### 2.1 Using the 5 V to 3.3 V level shifters

To set up and use the EVM with 5 V to 3.3 V level shifting feature, a few adjustments need to be made in terms of the jumper connections. Shunts should be applied to J9, J31 position 1 and 2, J30 position 2 and 3, J29 position 2 and 3, J24, and J19. An example highlighting this set up is seen in [Figure 1](#).

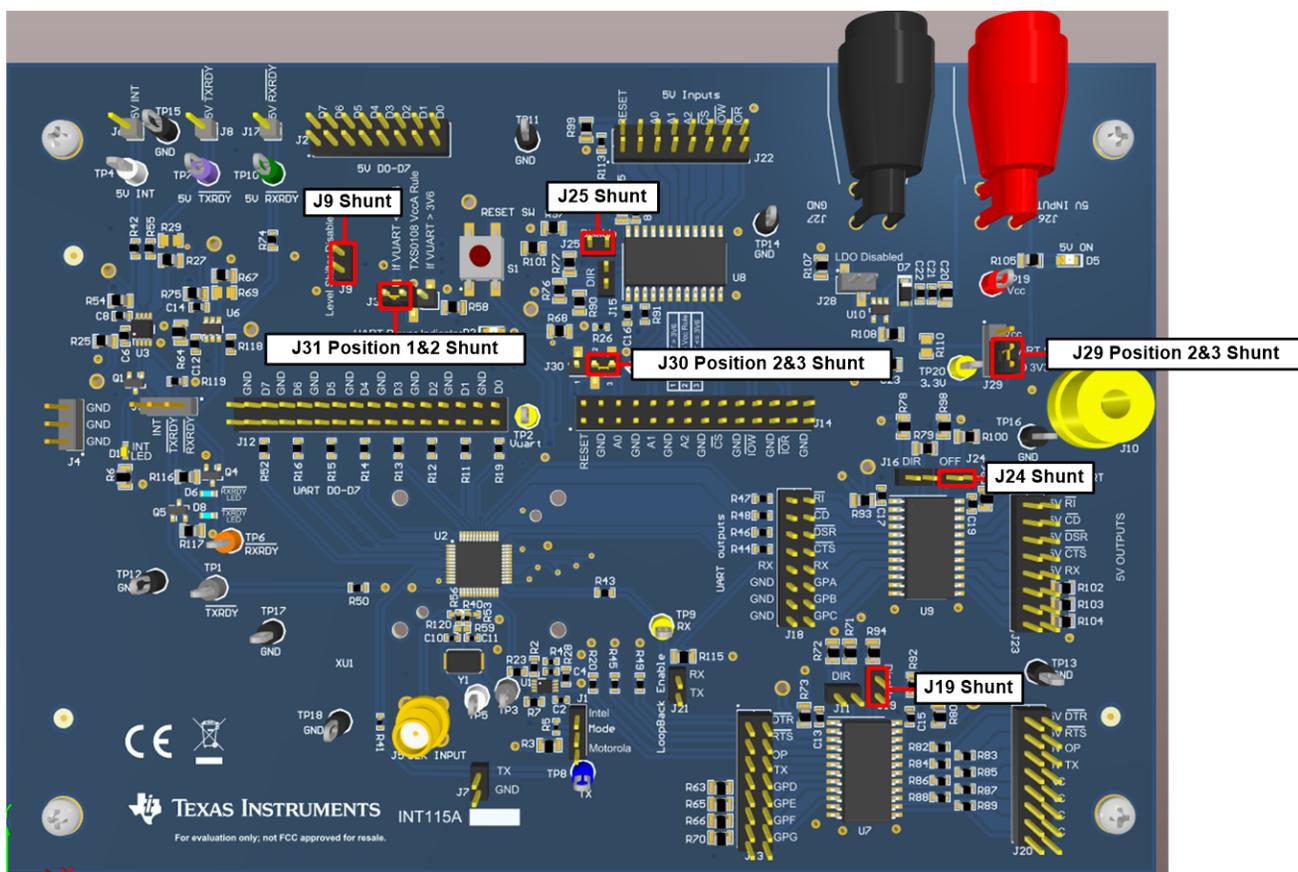


Figure 1. High to low shunt image

2x8 male headers are provided to connect between a processor and the EVM for the level translation. Header denoted as J2 allows for the bidirectional data pins (D0-D7) to be accessed. The 5 V input pins RESET, A0, A1, A2, CS, IOW, and IOR can be accessed at J22. The INT, TXRDY, and RXRDY lines each have their own 1x1 headers denoted as J6, J8, and J17 respectively. The 5 V inputs RI, CD, DSR, CTS, and RX can be found at J23. The 5 V outputs DTR, RTS, OP, and TX can be located at J20. The 5 V interfacing headers are highlighted in Figure 2.

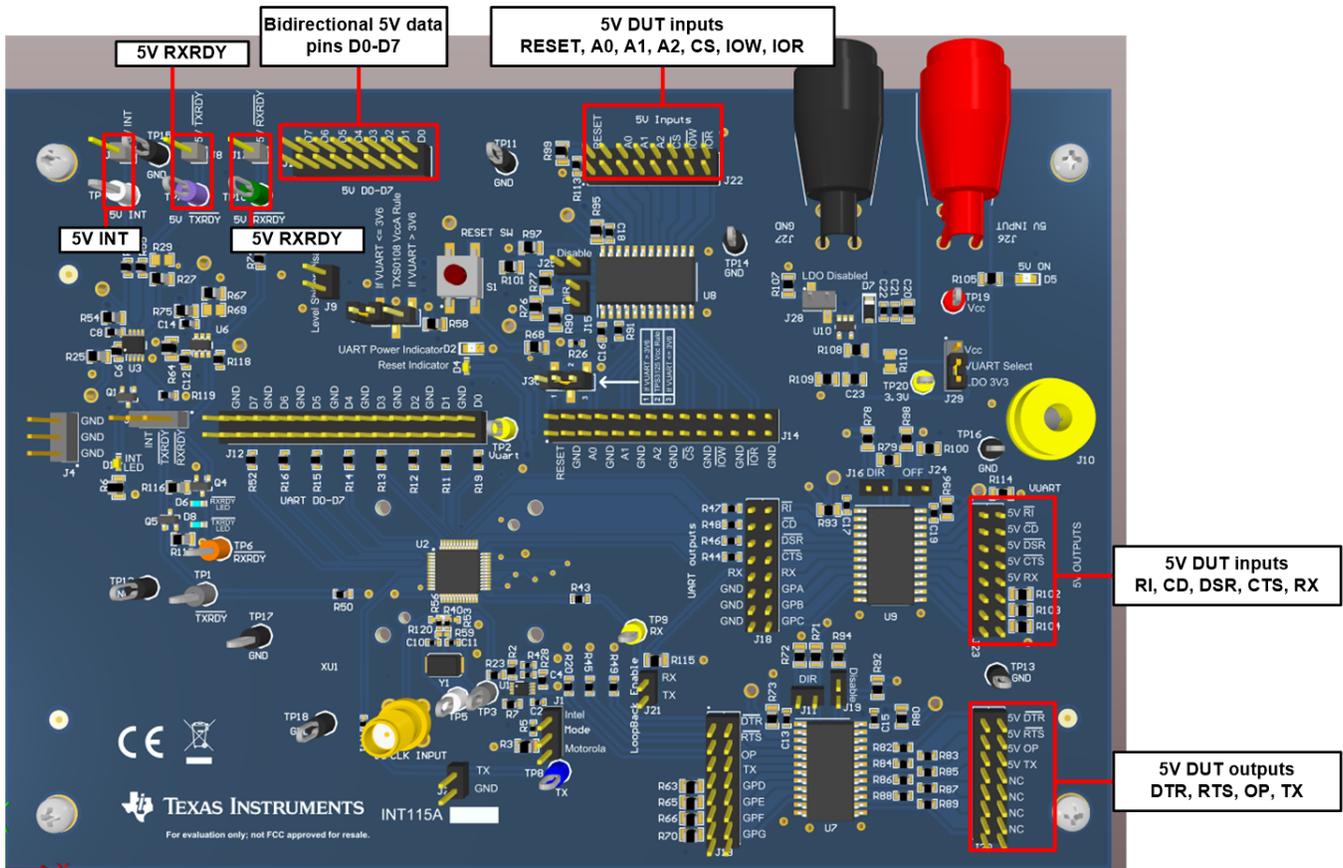


Figure 2. 5 V to 3.3 V interface image

### 3 Input Power

The EVM receives its power through the banana jack inputs denoted as J27 for ground and J26 for a 5 V input to a power supply. When power is applied to the EVM through these banana jacks, LED D5 lights up to signify that power is present. The expected voltage on the input power J26 is 5 V as this is a common processor voltage range (a larger voltage should not be used). The input voltage can be lower depending on  $V_{DO}$  of the LDO (this is output current dependent).  $V_{INPUT}$  should be greater than  $V_{LDO} + V_{DO} + V_F$  if the LDO is being used.  $V_{DO}$  is the drop out voltage of the LDO,  $V_{LDO}$  is the regulated voltage of the LDO, and  $V_F$  is the forward voltage of the schottky diode in front of the LDO denoted as D7. If more than 70 mA is being sourced by the LDO then D7 should be removed, and the connection between D7 can be shorted.

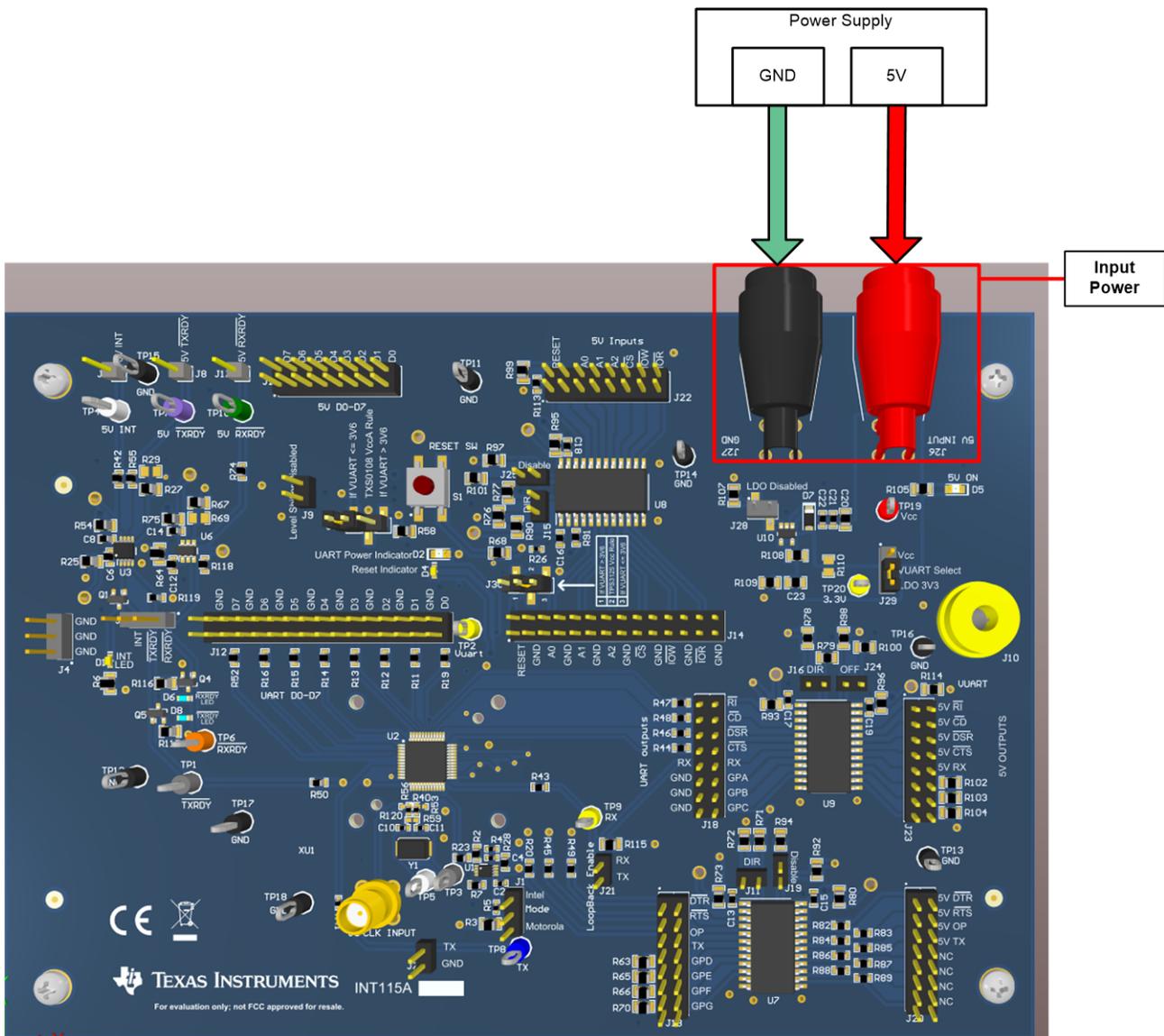


Figure 3. Input Power Image

#### 4 Onboard 3.3 V LDO Regulator

This EVM uses the TPS70633 for 3.3 V regulation denoted on the EVM as U10. For the 3.3 V regulator to be selected to provide power to the TL16C750E and onboard level shifters, J29 must be configured such that position 2 and position 3 are shunted together, see Figure 4. If the onboard LDO is selected to be used, banana jack J10 should not be used as J10 is connected directly to the 3.3 V LDO net. The figure above shows J10 as *do not use* when the LDO is being used.

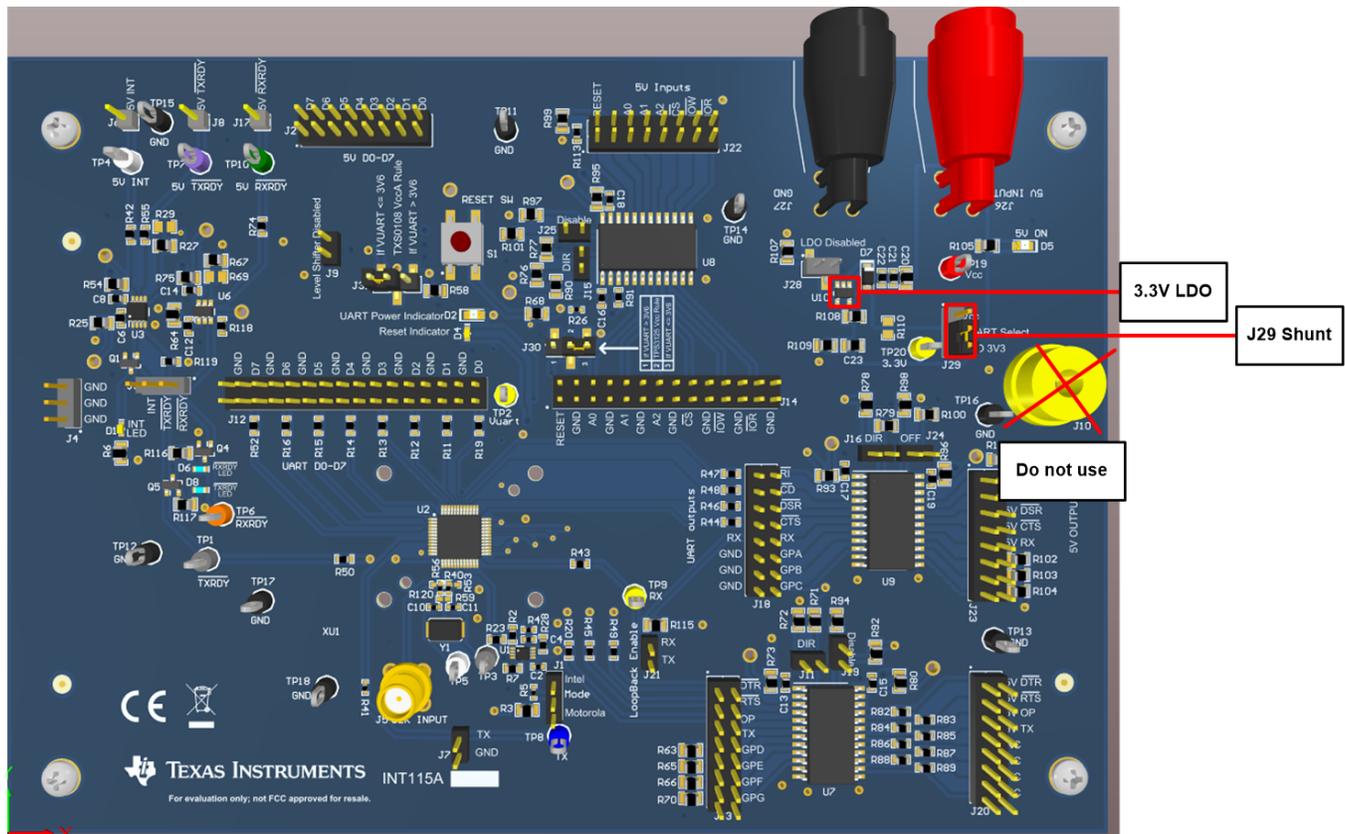


Figure 4. 3.3 V LDO highlight image

## 5 Using the EVM with the DUT at 3.3 V or lower

When the TL16C750E device needs to be tested at lower than 3.3 V, the jumper at J29 should be removed and a power supply can be connected to J10 instead. J31 should also include a shunt from position 1 and 2 where the board denotes if  $V_{UART} \leq 3V6$ . J30 should be shunted from position 2 and 3 where the board denotes if  $V_{UART} \leq 3V6$ . Jumpers denoted as J9, J25, J29, J24, and J19 should not have shunts. Figure 5 provides example.

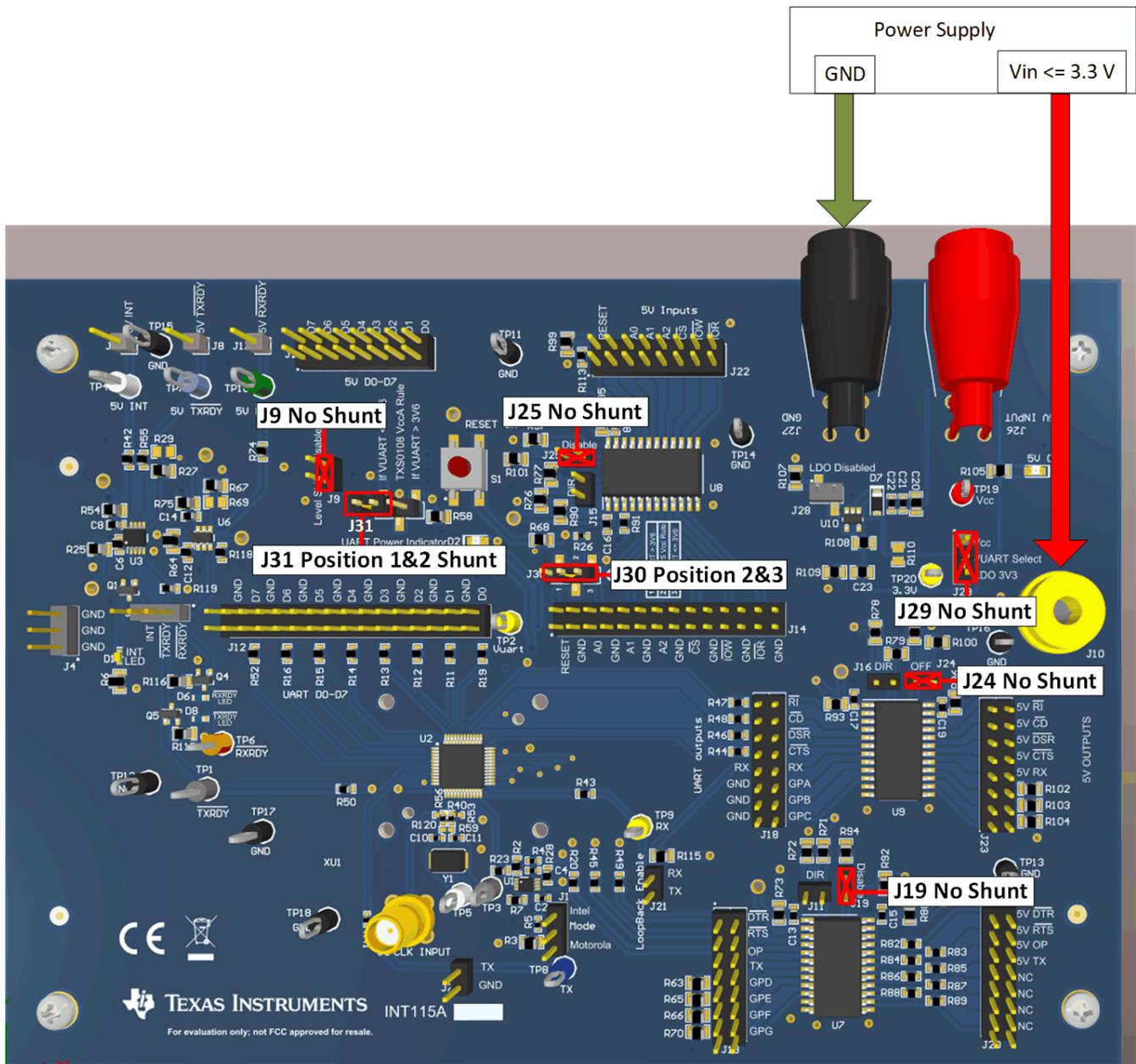


Figure 5. DUT below 3.3 V

If used at 3.3 V, the configuration mention above can be used with the power supply set to 3.3 V or J29 can be shunted to positions 2 and 3 so that the onboard LDO can be used. The 5 V input should be used in this instance as well to power the LDO but J10 would be removed if the 5 V input is to be used. The jumper positions described previously and in Figure 5 still apply.

When the EVM is used in the 3.3 V and lower set up, the processor interface headers used should be the ones located towards the center of the PCB. J3 provides access to output pins INT, TXRDY, and RXRDY. J12 allow access to the bidirectional data pins D0-D7. J14 are for the input pins RESET, A0, A1, A2, CS, IOW, and IOR. J18 provides access to the inputs RI, CD, DSR, CTS, and RX. Finally J13 allows access to DTR, RTS, OP, and TX. The [Figure 6](#) highlights all the jumper locations for connecting the processor pins.

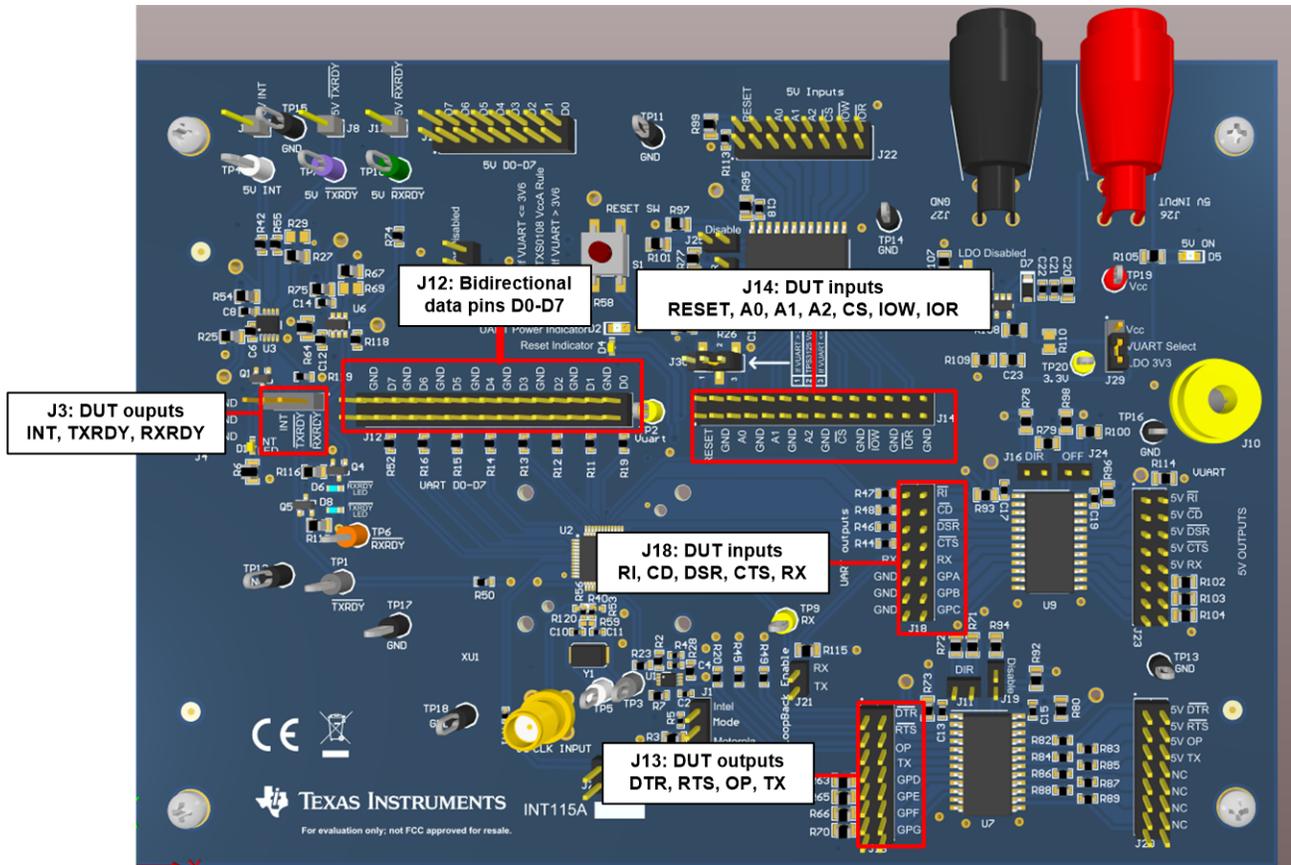


Figure 6. 3.3 V only control image

## 6 Loopback mode

While TL16C750E does include an option to perform a loopback test through software, a hardware loopback test can be performed by shunting J21 like the [Figure 7](#).

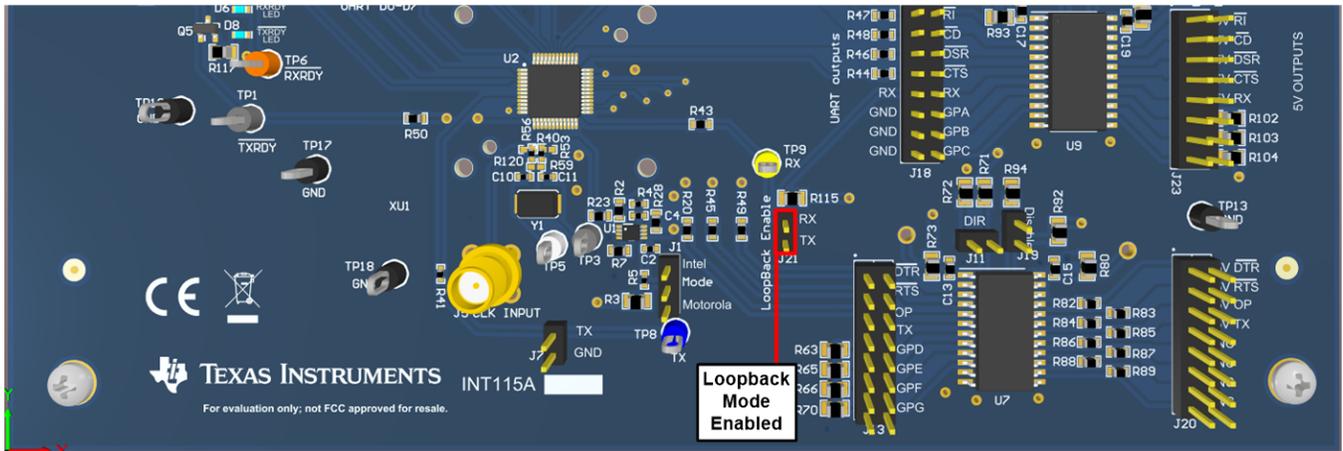


Figure 7. Loopback mode

## 7 Mode Select

This EVM allows for the device to switch from interfacing modes. When J1 is left unshunted or shunted at position 2 and 3, the TL16C750E is in Intel mode. This requires lines CS, IOW, and IOR to be used to read or write from the device. If positions 1 and 2 are shunted on J1, Motorola mode is selected and the TL16C750E requires CS and IOW to toggle for communication. Note that the IOR pin needs to be held in a logic high state to avoid any device issues (this is done through the pull up resistor R2 on the PCB).

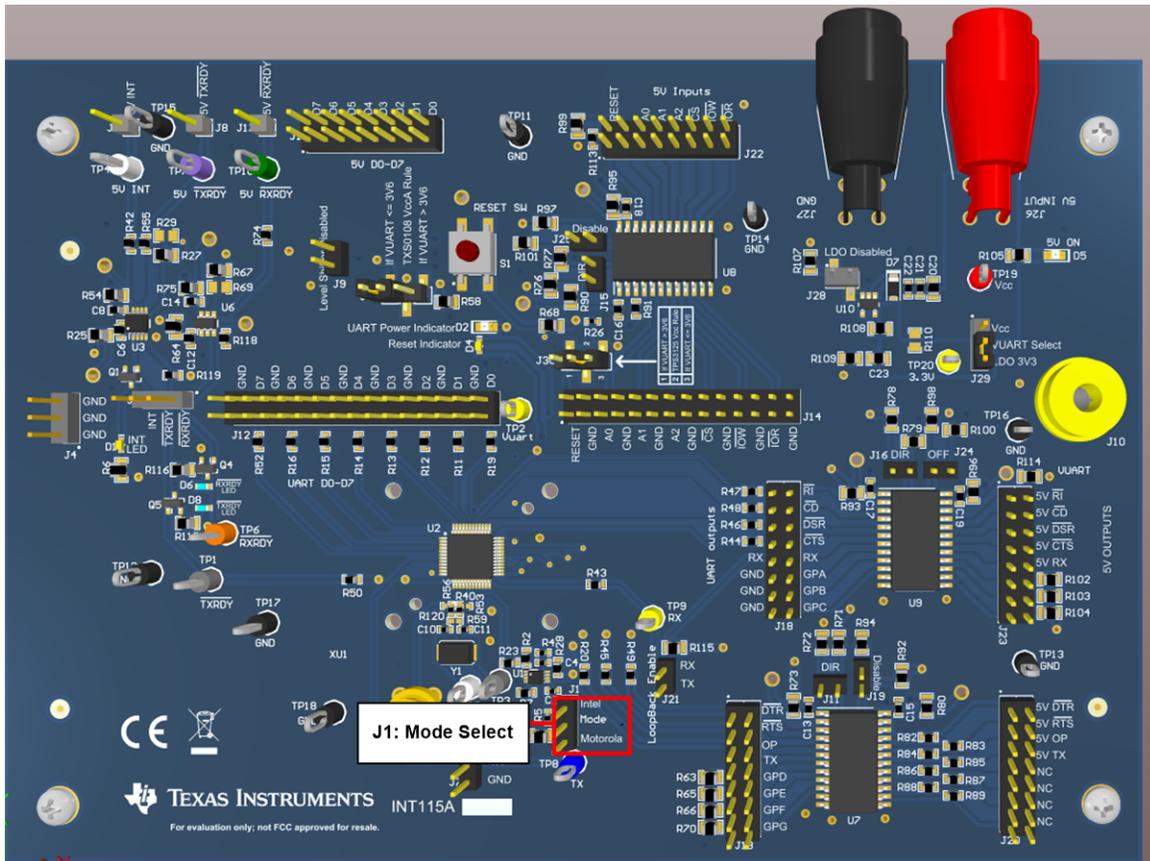


Figure 8. Mode select

## 8 Reset

Resetting the TL16C750E can be done at J22 position 1 and 2 and J14 position 1 and 2 by toggling the logic level. Driving the logic level low places the device in reset.

Alternatively, a hardware reset switch is provided and denoted as S1. A reset is observed by D4 turning on.

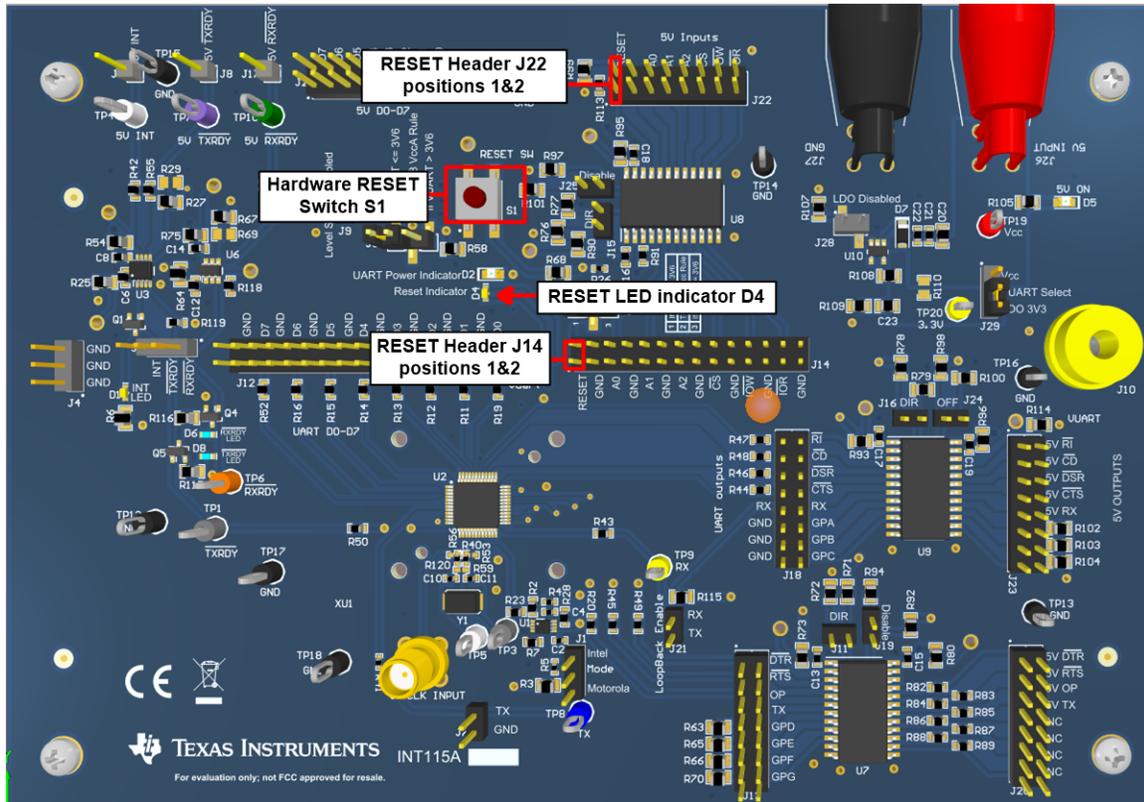


Figure 9. Reset image

## 9 Silkscreen Errors on EVM

Location	Current Error	Should Read
J9	Level Shifter Disabled	Level Shifter Enabled
J25	Disable	Enable
J24	OFF	ON
J19	Disable	Enable

## 10 Board Layout

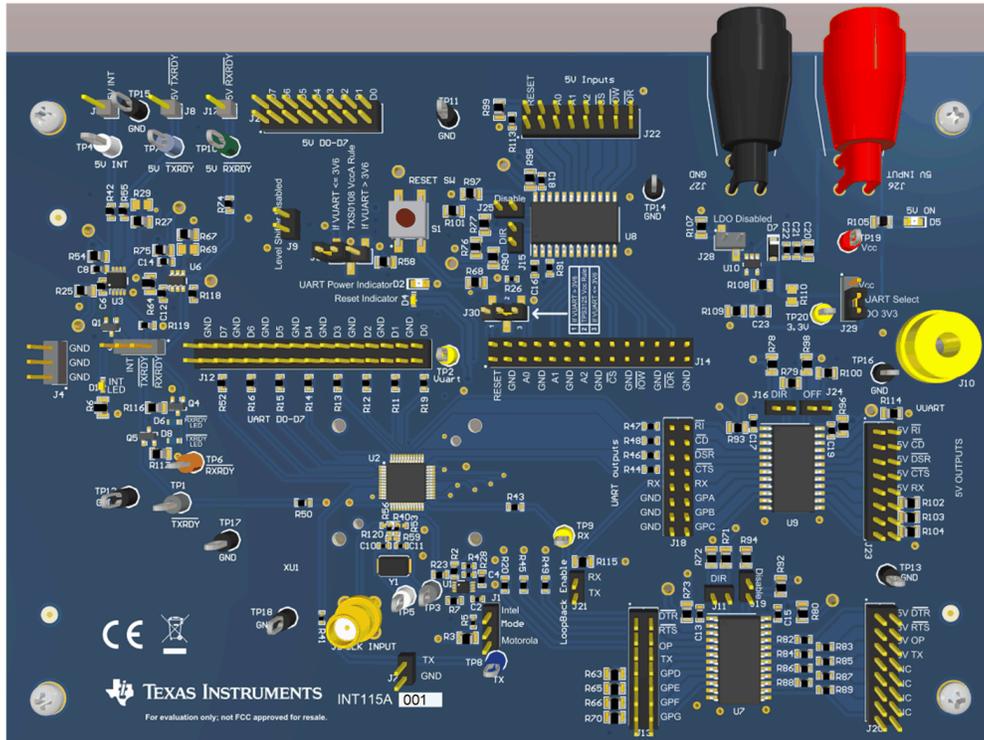


Figure 10. EVM top

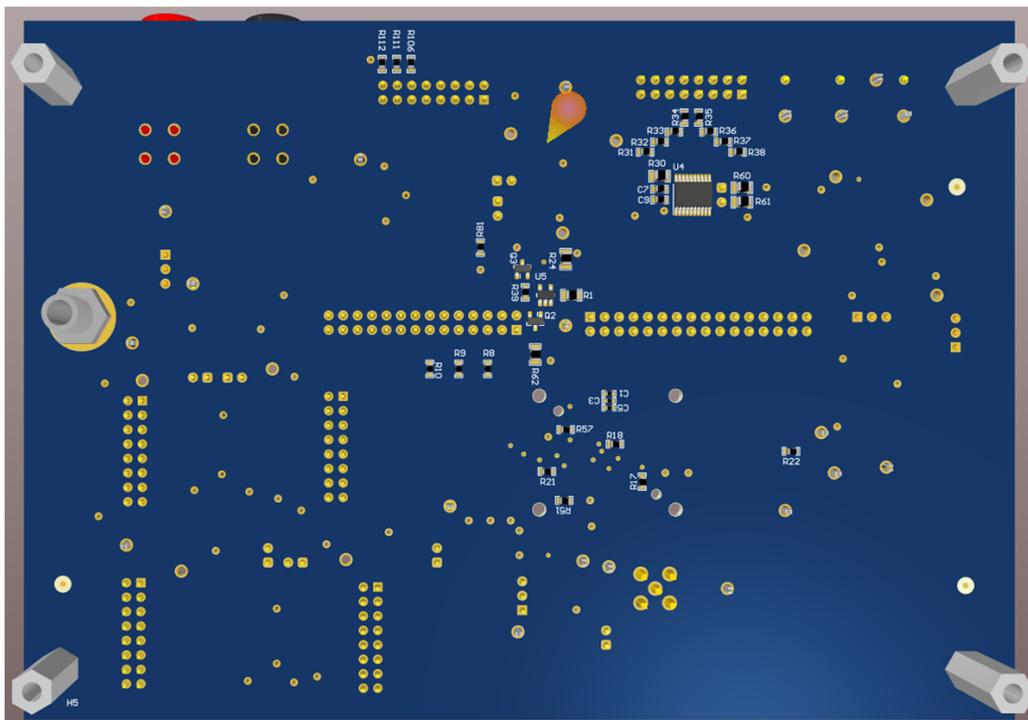


Figure 11. EVM bottom

# 11 Schematic and Bill of Materials

## 11.1 Schematic

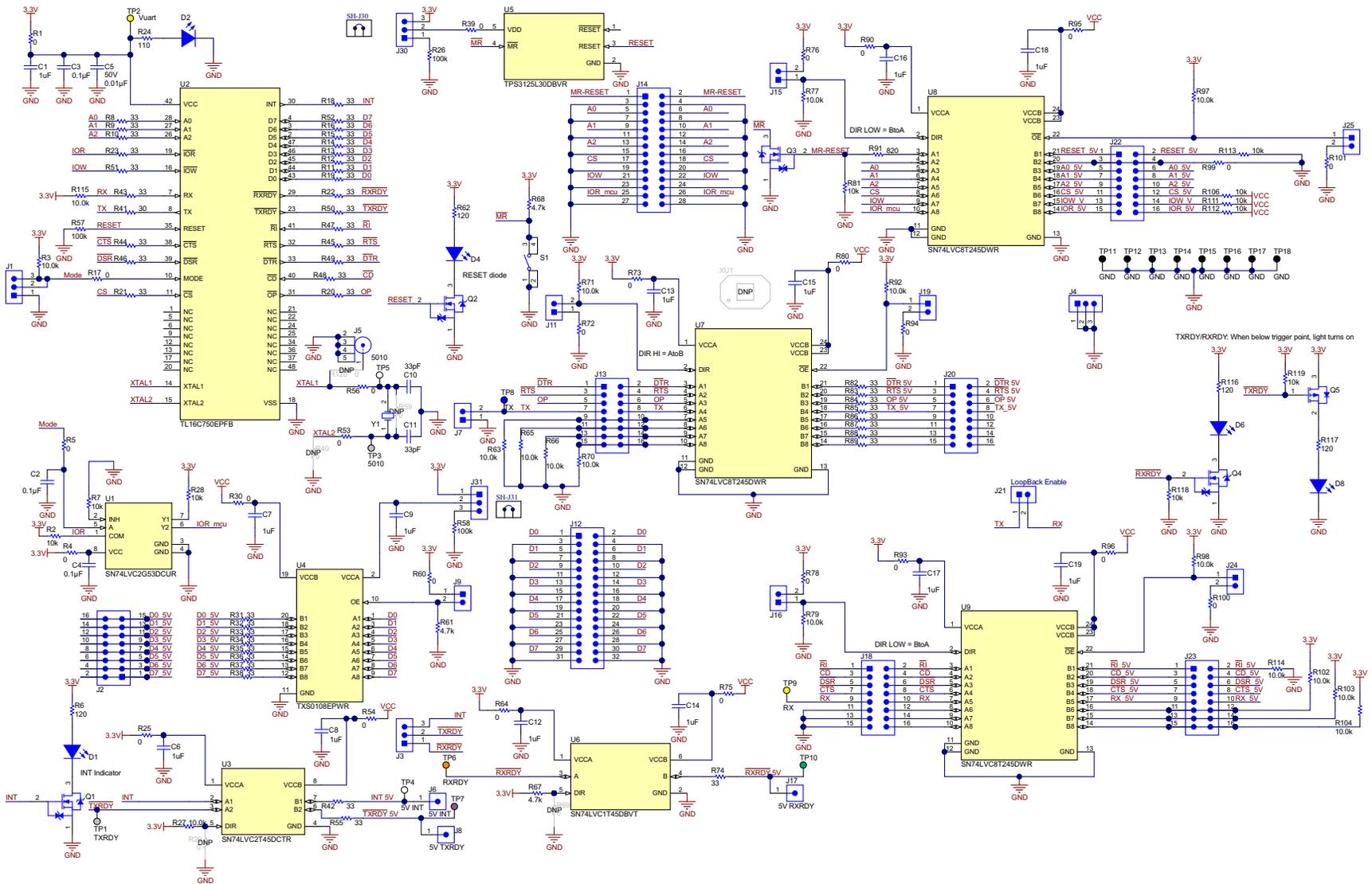


Figure 12. Schematic page 1

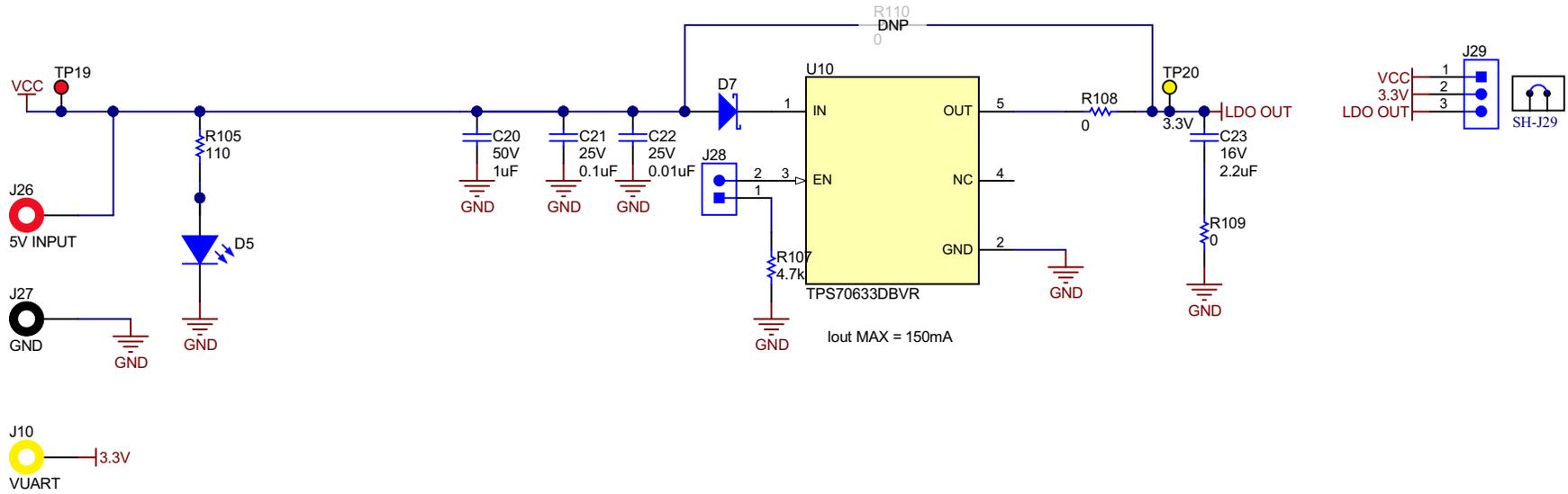


Figure 13. Schematic page 2

## 11.2 Bill of Materials

**Table 1. Bill of Materials**

Designator	Qty	Value	Description	Package Reference	Part Number	Manufacturer	Alternate Part Number	Alternate Manufacturer
!PCB1	1		Printed Circuit Board		INT115	Any		
C1	1	1uF	CAP, CERM, 1 uF, 6.3 V,+/- 10%, X7R, 0402	0402	GRM155R70J105KA12D	MuRata		
C2, C3, C4	3	0.1uF	CAP, CERM, 0.1 μF, 16 V,+/- 10%, X7R, 0402	0402	CL05B104KO5NNNC	Walsin		
C5	1	0.01uF	CAP, CERM, 0.01 μF, 50 V,+/- 10%, X7R, 0402	0402	0402B103K500CT	Walsin		
C6, C7, C8, C9, C12, C13, C14, C15, C16, C17, C18, C19	12	1uF	CAP, CERM, 1 uF, 25 V, +/- 10%, X7R, 0603	0603	06033C105KAT2A	AVX		
C10, C11	2	33pF	CAP, CERM, 33 pF, 50 V,+/- 5%, C0G/NP0, AEC-Q200 Grade 1, 0402	0402	GCM1555C1H330JA16D	MuRata		
C20	1	1uF	CAP, CERM, 1 uF, 50 V, +/- 10%, X7R, 0805	0805	C0805C105K5RACTU	Kemet		
C21	1	0.1uF	CAP, CERM, 0.1 uF, 25 V, +/- 10%, X8R, AEC-Q200 Grade 0, 0603	0603	CGA3E2X8R1E104K080A A	TDK		
C22	1	0.01uF	CAP, CERM, 0.01 uF, 25 V, +/- 5%, C0G/NP0, 0603	0603	C0603H103J3GACTU	Kemet		
C23	1	2.2uF	CAP, CERM, 2.2 uF, 16 V, +/- 10%, X5R, 0805	0805	EMK212BJ225KG-T	Taiyo Yuden		
D1, D4	2	Yellow	LED, Yellow, SMD	LED, 1.3x0.65x0.8mm	LY L29K-J1K2-26-Z	OSRAM		
D2, D5	2	Green	LED, Green, SMD	2x1.25mm	LG R971-KN-1	OSRAM		
D6, D8	2	Blue	LED, Blue, SMD	BLUE 0603 LED	LB Q39G-L2N2-35-1	OSRAM		
D7	1	70V	Diode, Schottky, 70 V, 0.07 A, SOD-123F	SOD-123F	BAS70H,115	Nexperia		
FID1, FID2, FID3, FID4, FID5, FID6	6		Fiducial mark. There is nothing to buy or mount.	N/A	N/A	N/A		
H1, H3, H5, H7	4		Standoff, Hex, 0.5"L #4-40 Nylon	Standoff	1902C	Keystone		
H2, H4, H6, H8	4		MACHINE SCREW PAN PHILLIPS 4-40	Machine Screw, 4-40, 1/4 inch	PMSSS 440 0025 PH	B and F Fastener Supply		
J1	1		Header, 100mil, 3x1, Gold, TH	PBC03SAAN	PBC03SAAN	Sullins Connector Solutions		
J2, J13, J18, J20, J22, J23	6		Header, 100mil, 8x2, Gold, TH	PBC08DAAN	PBC08DAAN	Sullins Connector Solutions		
J3, J4, J29	3		Header, 100mil, 3x1, Gold, TH	Header, 100mil, 3x1, TH	HTSW-103-07-G-S	Samtec		
J5	1		Connector, SMA, TH	SMA	142-0701-201	Cinch Connectivity		
J6, J8, J17	3		Header, 2.54mm, 1x1, Gold, TH	Header, 2.54mm, 1x1, TH	HTSW-101-07-G-S	Samtec		
J7, J9, J11, J15, J16, J19, J21, J24, J25	9		Header, 100mil, 2x1, Gold, TH	2x1 Header	TSW-102-07-G-S	Samtec		

**Table 1. Bill of Materials (continued)**

Designator	Qty	Value	Description	Package Reference	Part Number	Manufacturer	Alternate Part Number	Alternate Manufacturer
J10	1		BANANA JACK, SOLDER LUG, YELLOW, TH	Yellow Insulated Banana Jack	SPC15390	Tenma		
J12	1		Header, 100mil, 16x2, Gold, TH	16x2 Header	TSW-116-07-G-D	Samtec		
J14	1		Header, 100mil, 14x2, Gold, TH	14x2 Header	TSW-114-07-G-D	Samtec		
J26	1		Banana Jack Insul Nylon Red, R/A, TH	CTE_CT3151SP-2	CT3151SP-2	Cal Test Electronics		
J27	1		Banana Jack Insul Nylon Black, R/A, TH	CTE_CT3151SP-0	CT3151SP-0	Cal Test Electronics		
J28	1		Header, 100mil, 2x1, Tin, SMD	SMD, 2-Leads, Body 200x100mil	TSM-102-01-T-SV-P-TR	Samtec		
J30, J31	2		Header, 2.54mm, 3x1, Gold, SMT	Header, 2.54mm, 3x1, SMT	TSM-103-01-L-SV-P-TR	Samtec		
Q1, Q2, Q3, Q4	4	50V	MOSFET, N-CH, 50 V, 0.2 A, SOT-23	SOT-23	RUC002N05T116	Rohm		None
Q5	1	-8V	MOSFET, P-CH, -8 V, -5.3 A, SOT-23	SOT-23	Si2329DS	Vishay-Semiconductor		None
R1, R25, R30, R54, R60, R64, R72, R73, R75, R76, R78, R80, R90, R93, R94, R95, R96, R99, R100, R101, R108	21	0	RES, 0, 5%, 0.333 W, AEC-Q200 Grade 0, 0805	0805	CRCW08050000Z0EAHP	Vishay-Dale		
R2, R7, R28, R81, R106, R111, R112, R113, R118, R119	10	10k	RES, 10 k, 5%, 0.1 W, 0603	0603	RC0603JR-0710KL	Yageo		
R3, R27, R63, R65, R66, R70, R71, R77, R79, R92, R97, R98, R102, R103, R104, R114, R115	17	10.0k	RES, 10.0 k, 1%, 0.125 W, AEC-Q200 Grade 0, 0805	0805	ERJ-6ENF1002V	Panasonic		
R4, R5, R53, R56	4	0	RES, 0, 0%, 0.2 W, AEC-Q200 Grade 0, 0402	0402	CRCW04020000Z0EDHP	Vishay-Dale		
R6, R62, R116, R117	4	120	RES, 120, 5%, 0.5 W, 0805	0805	ERJ-P06J121V	Panasonic		
R8, R9, R10, R11, R12, R13, R14, R15, R16, R18, R19, R20, R21, R22, R23, R31, R32, R33, R34, R35, R36, R37, R38, R42, R43, R44, R45, R46, R47, R48, R49, R50, R51, R52, R55, R74, R82, R83, R84, R85, R86, R87, R88, R89	44	33	RES, 33, 5%, 0.1 W, AEC-Q200 Grade 0, 0603	0603	CRCW060333R0JNEA	Vishay-Dale		
R17, R39	2	0	RES, 0, 5%, 0.125 W, 0603	0603	MCT06030Z0000ZP500	Vishay/Beyschl ag		
R24, R105	2	110	RES, 110, 5%, 0.125 W, 0805	0805	ERJ-6GEYJ111V	Panasonic		

**Table 1. Bill of Materials (continued)**

Designator	Qty	Value	Description	Package Reference	Part Number	Manufacturer	Alternate Part Number	Alternate Manufacturer
R26	1	100k	RES, 100 k, 5%, 0.1 W, AEC-Q200 Grade 0, 0402	0402	ERJ-2GEJ104X	Panasonic		
R41	1	30	RES, 30, 5%, 0.063 W, AEC-Q200 Grade 0, 0402	0402	CRCW040230R0JNED	Vishay-Dale		
R57	1	100k	RES, 100 k, 5%, 0.1 W, 0603	0603	CRCW0603100KJNEAC	Vishay-Dale		
R58	1	100k	RES, 100 k, 5%, 0.125 W, AEC-Q200 Grade 0, 0805	0805	CRCW0805100KJNEA	Vishay-Dale		
R61, R67, R68, R107	4	4.7k	RES, 4.7 k, 5%, 0.125 W, 0805	0805	ERJ-6GEYJ472V	Panasonic		
R91	1	820	RES, 820, 5%, 0.1 W, AEC-Q200 Grade 0, 0603	0603	CRCW0603820RJNEA	Vishay-Dale		
R109	1	0	RES, 0, 5%, 0.125 W, 0805	0805	ERJ-6GEY0R00V	Panasonic		
S1	1		Switch, Tactile, SPST-NO, 12 V, SMD	Switch, Body 6.2x6.3mm	MJTPSMWBTR	APEM		
SH-J29, SH-J30, SH-J31	3	1x2	Shunt, 100mil, Gold plated, Black	Shunt	SNT-100-BK-G	Samtec	969102-0000-DA	3M
TP1, TP3	2		Test Point, Multipurpose, Grey, TH	Grey Multipurpose Testpoint	5128	Keystone		
TP2, TP9, TP20	3		Test Point, Multipurpose, Yellow, TH	Yellow Multipurpose Testpoint	5014	Keystone		
TP4, TP5	2		Test Point, Multipurpose, White, TH	White Multipurpose Testpoint	5012	Keystone		
TP6	1		Test Point, Multipurpose, Orange, TH	Orange Multipurpose Testpoint	5013	Keystone		
TP7	1		Test Point, Multipurpose, Purple, TH	Purple Multipurpose Testpoint	5129	Keystone		
TP8	1		Test Point, Multipurpose, Blue, TH	Blue Multipurpose Testpoint	5127	Keystone		
TP10	1		Test Point, Multipurpose, Green, TH	Green Multipurpose Testpoint	5126	Keystone		
TP11, TP12, TP13, TP14, TP15, TP16, TP17, TP18	8		Test Point, Multipurpose, Black, TH	Black Multipurpose Testpoint	5011	Keystone		
TP19	1		Test Point, Multipurpose, Red, TH	Red Multipurpose Testpoint	5010	Keystone		
U1	1		Single Pole, Double-Throw (SPDT) Analog Switch or 2:1 Analog Multiplexer/Demultiplexer, DCU0008A (VSSOP-8)	DCU0008A	SN74LVC2G53DCUR	Texas Instruments		
U2	1		UART with 128-Byte FIFO, PFB0048A (TQFP-48)	PFB0048A	TL16C750EPFB	Texas Instruments		Texas Instruments
U3	1		Dual-Bit Dual Supply Transceiver with Configurable Voltage Translation and 3-State Outputs, DCT0008A, LARGE T&R	DCT0008A	SN74LVC2T45DCTR	Texas Instruments		
U4	1		8-Bit Bidirectional Voltage-Level Shifter For Open-Drain And Push-Pull Application, PW0020A (TSSOP-20)	PW0020A	TXS0108EPWR	Texas Instruments		Texas Instruments
U5	1		ULTRA-LOW VOLTAGE PROCESSOR SUPERVISORY CIRCUIT, DBV0005A (SOT-23-5)	DBV0005A	TPS3125L30DBVR	Texas Instruments	TPS3125L30DBVT	Texas Instruments

**Table 1. Bill of Materials (continued)**

Designator	Qty	Value	Description	Package Reference	Part Number	Manufacturer	Alternate Part Number	Alternate Manufacturer
U6	1		Single-Bit Dual-Supply Bus Transceiver with Configurable Voltage Translation and 3-State Outputs, DBV0006A, SMALL T&R	DBV0006A	SN74LVC1T45DBVT	Texas Instruments	SN74LVC1T45DBVR	Texas Instruments
U7, U8, U9	3		8-Bit Dual-Supply Bus Transceiver with Configurable Voltage-Level Shifting and Three-State Outputs, DW0024A (SOIC-24)	DW0024A	SN74LVC8T245DWR	Texas Instruments		Texas Instruments
U10	1		150-mA, 6.5-V, 1-uA IQ Voltage Regulators with Enable, DBV0005A (SOT-23-5)	DBV0005A	TPS70633DBVR	Texas Instruments	TPS70633DBVT	Texas Instruments
Y1	1		Crystal, 24 MHz, 18 pF, SMD	ABM3	ABM3-24.000MHZ-D2Y-T	Abracon Corporation		
R29, R69, R110	0	0	RES, 0, 5%, 0.125 W, 0805	0805	MCR10EZPJ000	Rohm		
R40, R59, R120	0	0	RES, 0, 0%, 0.2 W, AEC-Q200 Grade 0, 0402	0402	CRCW04020000Z0EDHP	Vishay-Dale		
XU1	0		Socket, QFP-48, 0.5 mm	Socket, QFP-48	SK02-0048QFP-CS-02A	RS Tech Incorporated		
Note: Unless otherwise noted in the Alternate Part Number and/or Alternate Manufacturer columns, all parts may be substituted with equivalents.								

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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.
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  - 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.

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**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 DEGRADATION 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/lstds/ti\\_ja/general/eStore/notice\\_01.page](http://www.tij.co.jp/lstds/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/lstds/ti\\_ja/general/eStore/notice\\_01.page](http://www.tij.co.jp/lstds/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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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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東京都新宿区西新宿 6 丁目 2 4 番 1 号  
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3.3.3 *Notice for EVMs for Power Line Communication:* Please see [http://www.tij.co.jp/lstds/ti\\_ja/general/eStore/notice\\_02.page](http://www.tij.co.jp/lstds/ti_ja/general/eStore/notice_02.page)  
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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.

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- 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.
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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, INDEMNITY 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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