CDCUN1208LP Evaluation Board

NEED AN ABSTRACT

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1 Features

- Easy-to-use evaluation module to buffer low phase noise clocks up to 400 MHz
- Easy device programming via host-powered USB port
- Easy device programming via control pins
- Rapid configuration through provided EVM Control Software
- Can be powered from the USB port, or by an external 3.3V/2.5V/1.8V power supply
- Single-ended or differential input
- Words shown in bold italics in this document show the same name and label on the EVM board itself

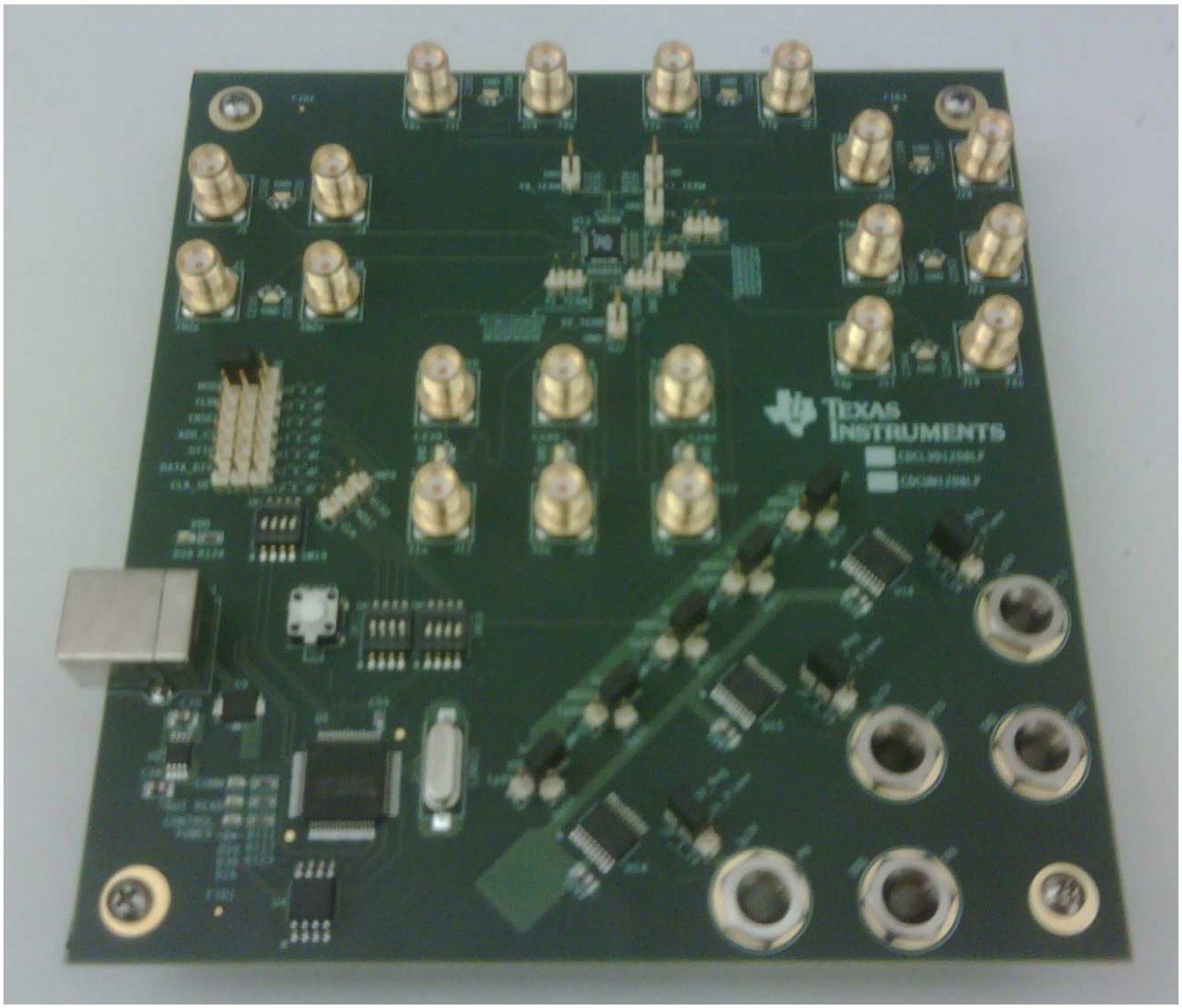


Figure 1. CDCUN1208 Evaluation Board

2 General Description

The CDCUN1208LP is a 2:8 fan-out buffer featuring a wide operating supply range, two universal differential/ single ended inputs, and universal outputs (HCSL, LVDS, or LVCMOS) with clock edge rate control. One of the device inputs includes a divider that provides divide values of /1, /2, /4, and /8. The device is offered in a 32 pin QFN package. The CDCUN1208LP is flexible and easy to use. The application configures the device by setting the state of certain pins at device power-up. Alternately, the application can configure the device via SPI/I^2C. The CDCUN1208LP delivers excellent additive jitter performance, and low power consumption. The output section includes four dedicated output supply pins enabling the operation of output ports from different power supply domains. This provides the ability to clock devices switching at different LVCMOS levels without the need for external logic level translation circuitry.

The evaluation module (EVM) demonstrates the electrical performance of the device. This fully-assembled, factory-tested evaluation board allows complete validation of all device functions. For optimum performance, the board is equipped with 50Ω SMA connectors and well-controlled 50Ω impedance micro strip transmission lines.

3 Signal Path and Control

The CDCUN1208LP provides two selectable inputs – IN1 and IN2. The IN1 and IN2 can accept either differential (HCSL, LVDS) signals up to 400 MHz or single ended LVCMOS signals up to 250 MHz. The CDCUN1208LP provides up to eight differential signals or sixteen single ended signals.

In pin mode the device option is selected by six control pins. In programming, mode options are selected by programming the on-chip registers. The CDCUN1208LP datasheet provides the detailed information needed to configure and use this device.

All outputs are connected to SMA with ac coupling. All outputs provide the options of 50 ohm to ground (for HCSL outputs).

4 Software Selectable Option

The provided EVM Control Software communicates with the CDCUN1208LP through a USB interface and the SPI port. The USB controller is normally powered over the USB cable. When the USB/SPI programming interface is available for use, the on-board LED D26 is illuminated.

The CDCUN1208LP GUI also allows device configurations to be saved into a configuration file (.INI), which can be loaded at a later time to restore the saved settings.

5 Installing the EVM Control Software and USB Driver

To start the installation of the EVM software, double-click on the file named "CDCUN1208LP_Installer.exe". This can be downloaded from www.ti.com/product/CDCUN1208LP/. If Microsoft .NET Framework is not already installed on the computer, it will automatically download and install on the computer. The installer will also attempt to install the EVM hardware driver.

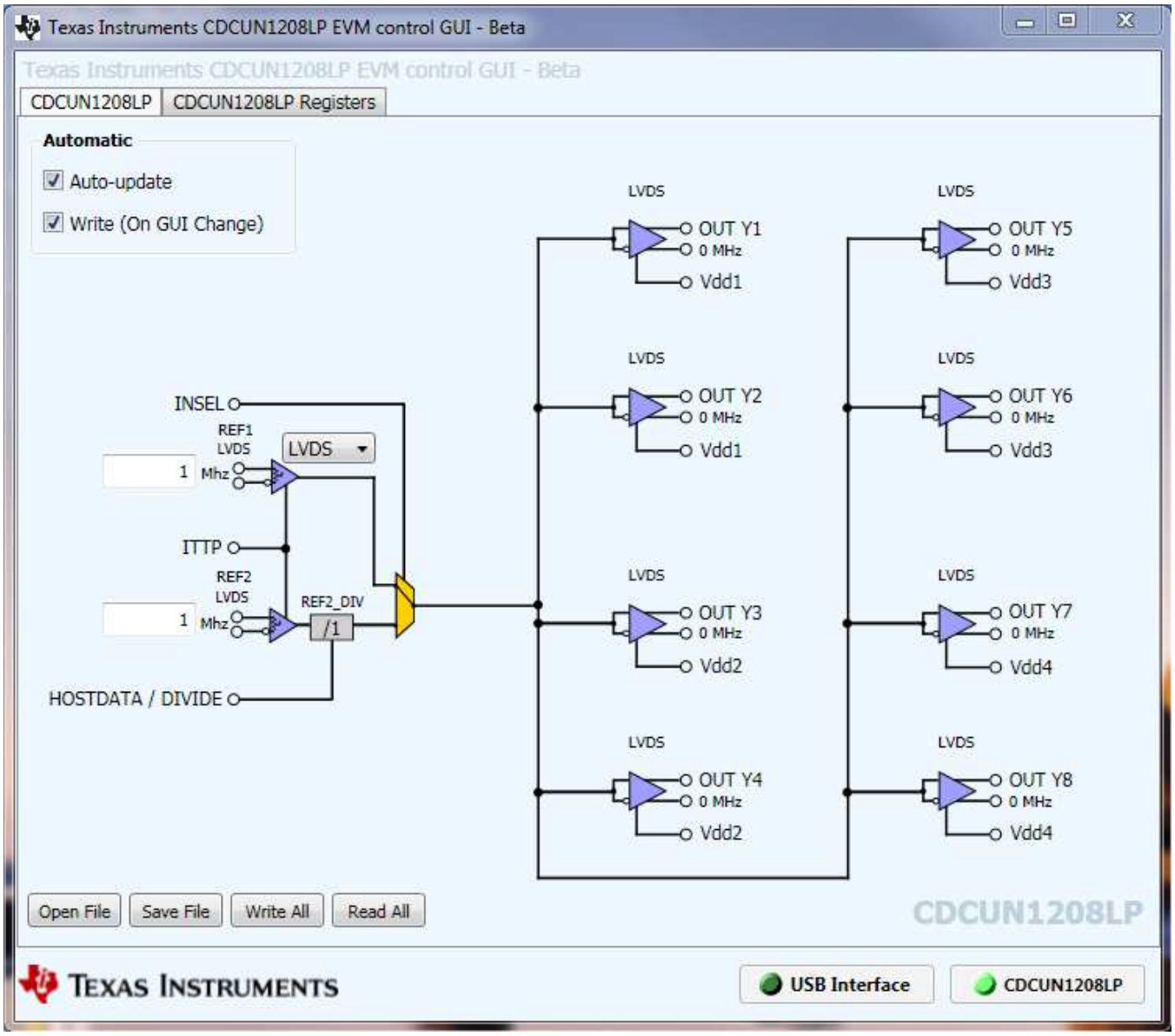


Figure 2. CDCUN1208LP Control User Interface

6 Using the EVM ontrol Software

The graphical layout of the programming software is based on the functional structure of the CDCUN1208LP. Using the tool, the user can select Input type, Input Divider, Input MUX and Output type.

IN1 and IN2 Reference Signal Type Selection
Input clock type can be selected using the pull-down menu (LVDS, HCSL, or LVCMOS)

Input divider (REF2_DIV) for IN2 Input Selection
The IN2 reference input has a divider (REF2_DIV)). Appropriate divider values (1, 2, 4, and 8) can be selected by clicking on the input divider block.

Input MUX Selection
The CDCUN1208LP employs a Smart Multiplexer that supports manual and automatic switching between IN1 and IN2. Toggling the input MUX box, the proper reference input or auto mode can be selected.

Output Signal Type Selection

Each output buffer can be selected as LVDS, HCSL or a pair of LVCMOS outputs. One of the signal types can be selected for each output or can be disabled by clicking on the output buffer box. If LVCMOS signal type is selected, Enable boxes need to be checked to enable the outputs individually.

7 Configuring the Board

The CDCUN1208LP is a programmable clock buffer with many options. The EVM was designed with the maximum flexibility so that the user can configure the EVM to operate in its desired mode.

Selecting the Interface Connection
The CDCUN1208LP can be configured via serial interface or through control pins. Switch SW17 should be turned on to enable communication through USB to the SPI interface. This switch must be turned off for Pin control mode. Switch SW18 must also be turned off.

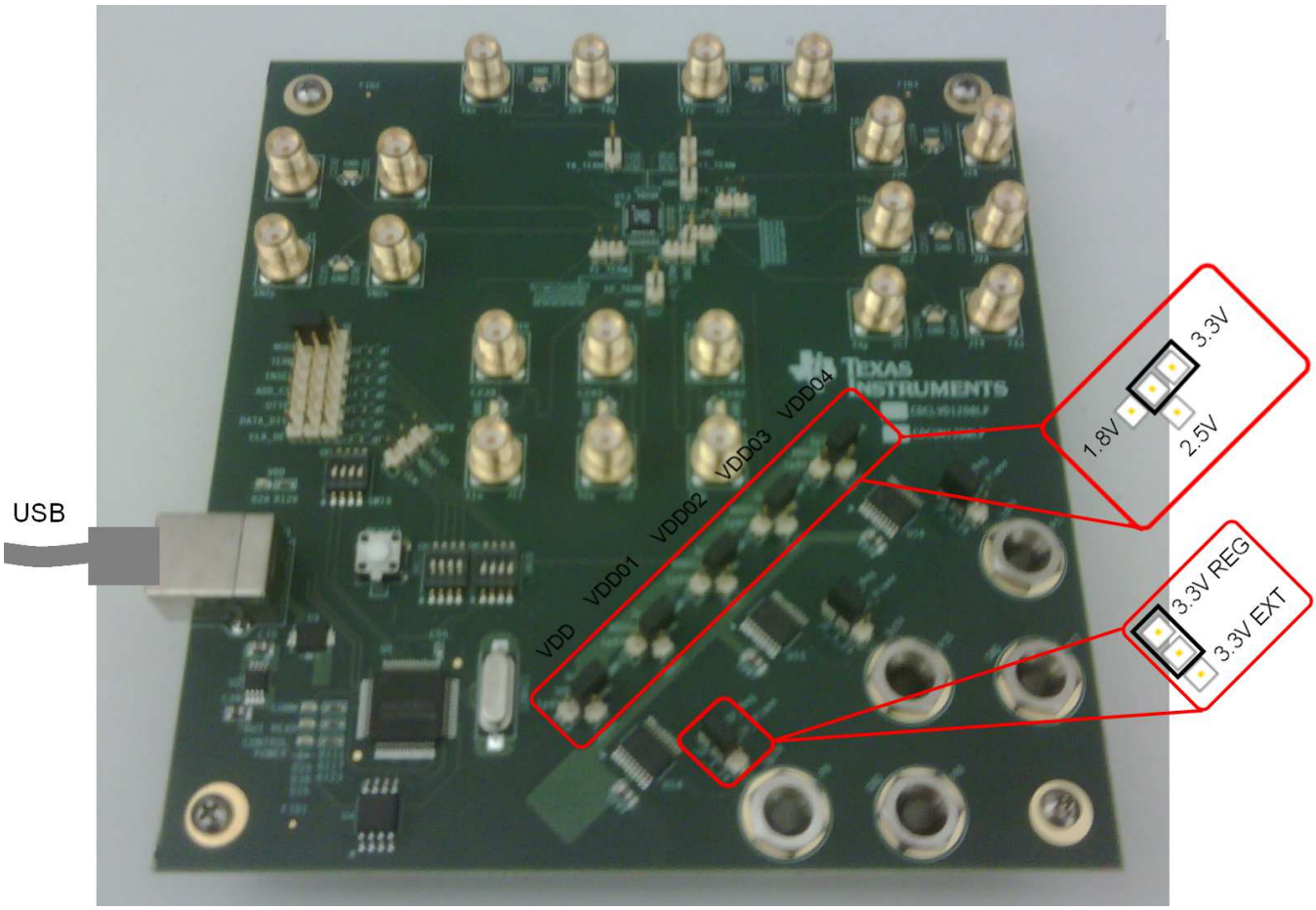
Header ***JMP6*** and ***JP_3_17*** can also be used to connect external host to SPI/I^2C.

Configuring the Power Supply
The device can be powered up with external power supply or on-board regulators powered by USB cable attached. The EVM has options for 1.8V, 2.5V and 3.3V power supplies. These supply voltages can be external or internal from the regulators. It has also five different rails – four for output power supplies and one for VDD.

The banana jacks ***P9, P10*** and ***P11*** are external 3.3V, 2.5V and 1.8V respectively. The banana jacks ***P8 and P12*** are for GND. The LDOs U14, U15 and U16 generate 3.3V, 2.5V and 1.8V respectively. The jumper on Header ***JP_3_24*** selects between external or internal 3.3V, the jumper on Header ***JP_3_25*** selects between external or internal 2.5V and the Jumper on Header ***JP_3_26*** selects between external or internal 1.8V.

The Jumpers on the Header ***JMP5*** selects for VDD power rail, ***JMP1*** selects for VDDOUT1, ***JMP2*** selects for VDDOUT2, ***JMP3*** selects for VDDOUT3 and ***JMP4*** selects for VDDOUT4 from 3.3V, 2.5V and 1.8V power supplies. Using these Headers, the power supplies can be mixed for the device operation.

The figure below is an example of the configuration of the power supplies – all supplies are chosen from 3.3V internal regulators.



Configuring the Reference Inputs

The CDCUN1208LP offers two inputs (IN1 and IN2). SMA ***J4*** and ***J5*** are dedicated for IN1 (IN1p and IN1n) and SMA ***J7*** and ***J8*** are dedicated for IN2 (IN2p and IN2n). Both inputs in the EVM are ac-coupled as default by using coupling capacitors (***C231*** and ***C232*** for IN1 and ***C235*** and ***C236*** for IN2). ***JMP7*** and ***JMP8*** are used to set the input biasing and termination and should be configured according to the Input Reference section of the EVM schematic.

All inputs have options for 50 Ω to GND. This 50 Ω to GND can be required if the signal generator is used as input clock source.

Configuring the Control Pins

The device has multiple dedicated pins to control and configure the operation. Setting of these pins is critical to operate the device correctly.

Mode Selection Pins (MODE): This pin will select the mode of device configuration. The Jumper on the Header ***MODE (JP_3_20)*** is required to set based on Table 1.

Table 1. Mode Selection Jumper Settings

Jumper on *MODE* Header	Mode of Configuration
GND	SPI Mode
VDD	I2C Mode
OPEN	Pin Mode

Output Control Pin (OE): This pin can used to enable (HIGH) or disable (LOW) all outputs. For normal operation, Header CLK_OE (JP_3_23) should be connected to ***VDD***. Connect the Jumper to ***GND*** to disable the outputs. This functionality is only available in pin mode.

Output Signaling Level Selection Pin (OTTP): This pin will select the signaling level of all outputs. The header OTTP (JP_3_18) is dedicated for this pin. This pin is only available in pin mode.

Table 2. Mode Selection Jumper Settings

Jumper on *OTTP* Header	Output Type
GND	LVDS
VDD	I2C Mode
OPEN	LVCMOS

Output Edge Rate Control Pin (ERC): This pin will select the edge rate for all outputs. The Header ADD_CS (JP_3_17) is dedicated for this pin. This pin is only available in pin mode.

Table 3. Edge Rate Control Jumper Settings

Jumper on *OTTP* Header	Output Type
GND	SLOW
VDD	Medium
OPEN	FAST

In I^2C mode, this pin is used to set the host interface address.

IN2 Divider Setting Pin (DIVIDE): This pin will select the divider value of the IN2 input. The Header DATA_DIV ***(JP_3_19)*** is dedicated for this pin. This pin is only available in pin mode.

Table 4. Edge Rate Control Jumper Settings

Jumper on *DATA_DIV* Header	Output Type
GND	/2
VDD	/4
OPEN	/1

Input Buffer Selection Pin (ITTP): The TERM pin will select the input buffer type of both IN1 and IN2 inputs. The header ITTP (***JP_3_22***) is dedicated for this pin.

Table 5. Input Buffer Settings

Jumper on *ITTP* Header	Output Type
GND	LVDS
VDD	HCSL
OPEN	LVCMOS

The LVDS differential buffers have external biasing and termination on the EVM. JMP7 and JMP8 should be configured based on the type of input selected (1.2V for LVDS, 0.9V for 1.8V LVDS, 0V for HCSL). For HCSL and LVCMOS dc coupled input should be used.

Smart Input Multiplexer Control pin (INSEL): The INSEL pin will select the input clock for buffering. The header INSEL (***JP_3_21***) is dedicated for this pin.

Table 6. Smart Mux Settings

Jumper on *INSEL* Header	IN1 Buffer Setting	IN2 Buffer setting
GND	ON and selected by INSEL Multiplexer	OFF
VDD	OFF	ON and selected by INSEL Mux
OPEN	Smart Multiplexer selects input. IN1 is the primary input (it has the highest priority, therefore if it is available, the smart multiplexer selects IN1)	

Configuring the Outputs

All eight differential outputs are connected to SMA through ac-coupling. Outputs are connected 50 Ω to GND through Headers. Each Header pin has an option of capacitor connected to ground (not populated). Each output also has option of series termination resistor (0 Ω populated) for LVCMOS and HCSL if needed.

The EVM output settings must be configured accordingly to generate the proper formats.

HCSL Outputs –	Place the jumpers in the Headers (J14/J15/J20/J21) and place series resistors if needed
LVDS Outputs –	Do not use jumpers on the Headers (J14/J15/J20/J21)
LVCMOS Outputs –	Remove all 50 Ω

8 CDCUN1208LP EVM Board Schematics

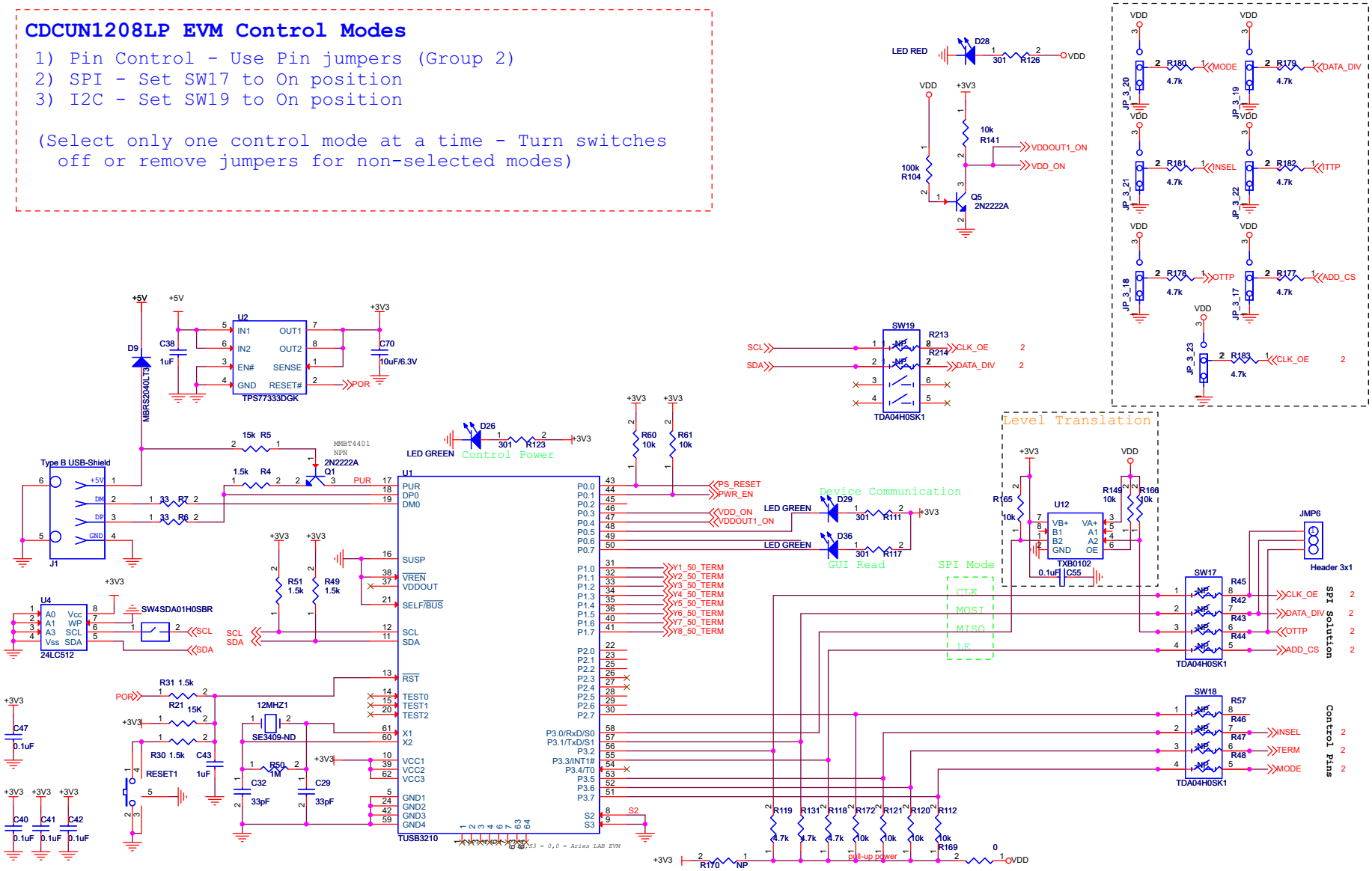


Figure 3. Schematic (1 of 6)

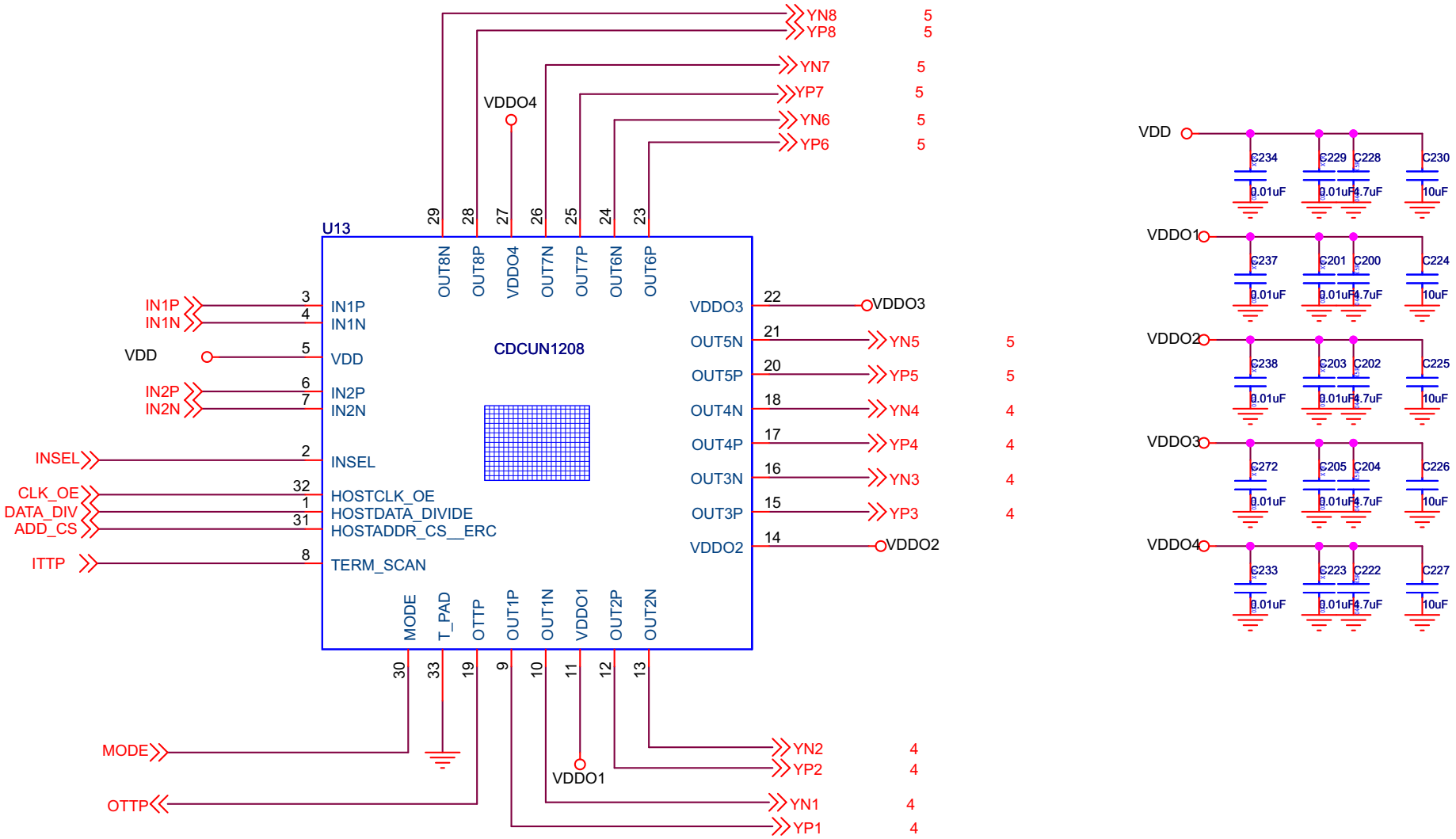


Figure 4. Schematic (2 of 6)

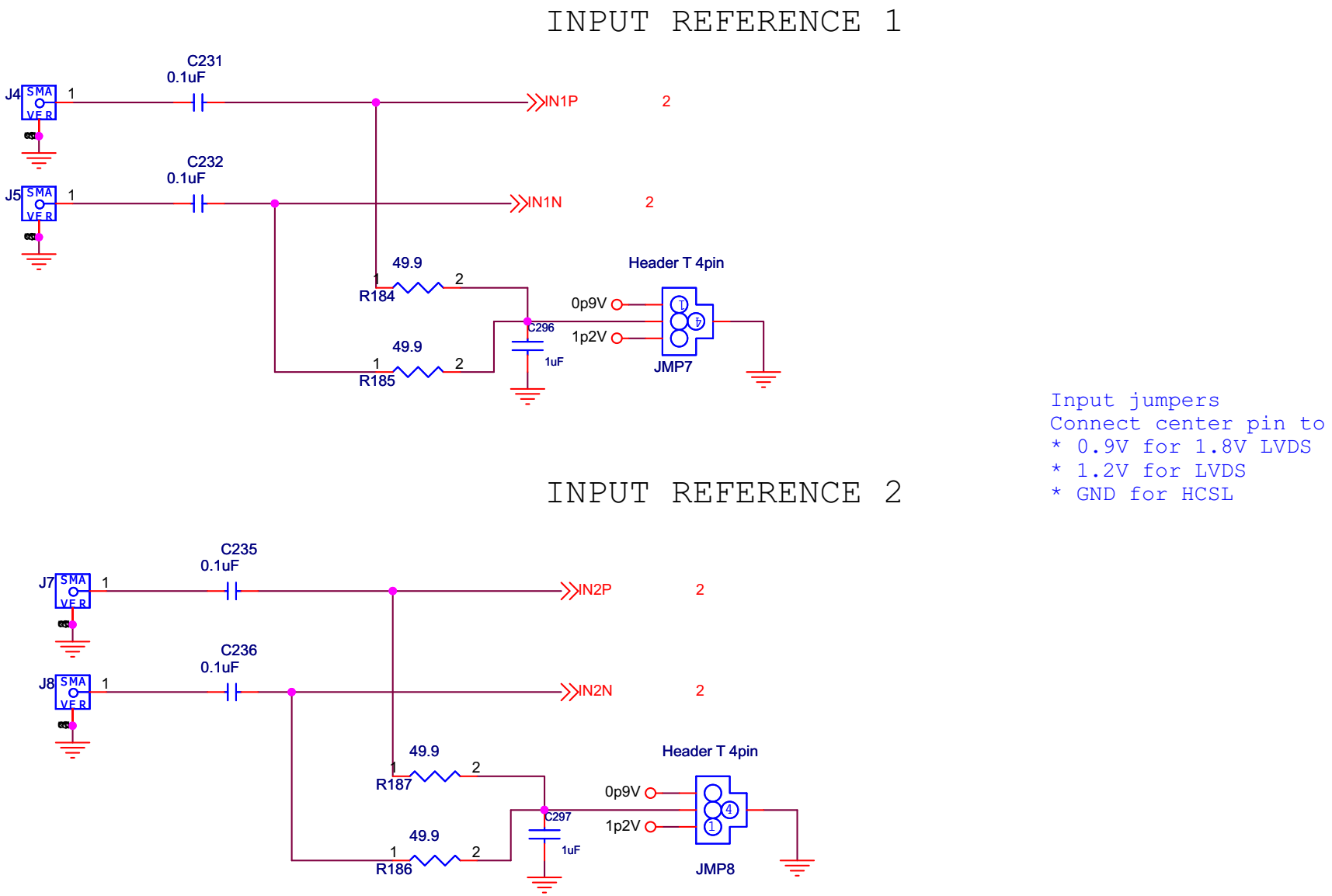


Figure 5. Schematic (3 of 6)

Output 1 to 4

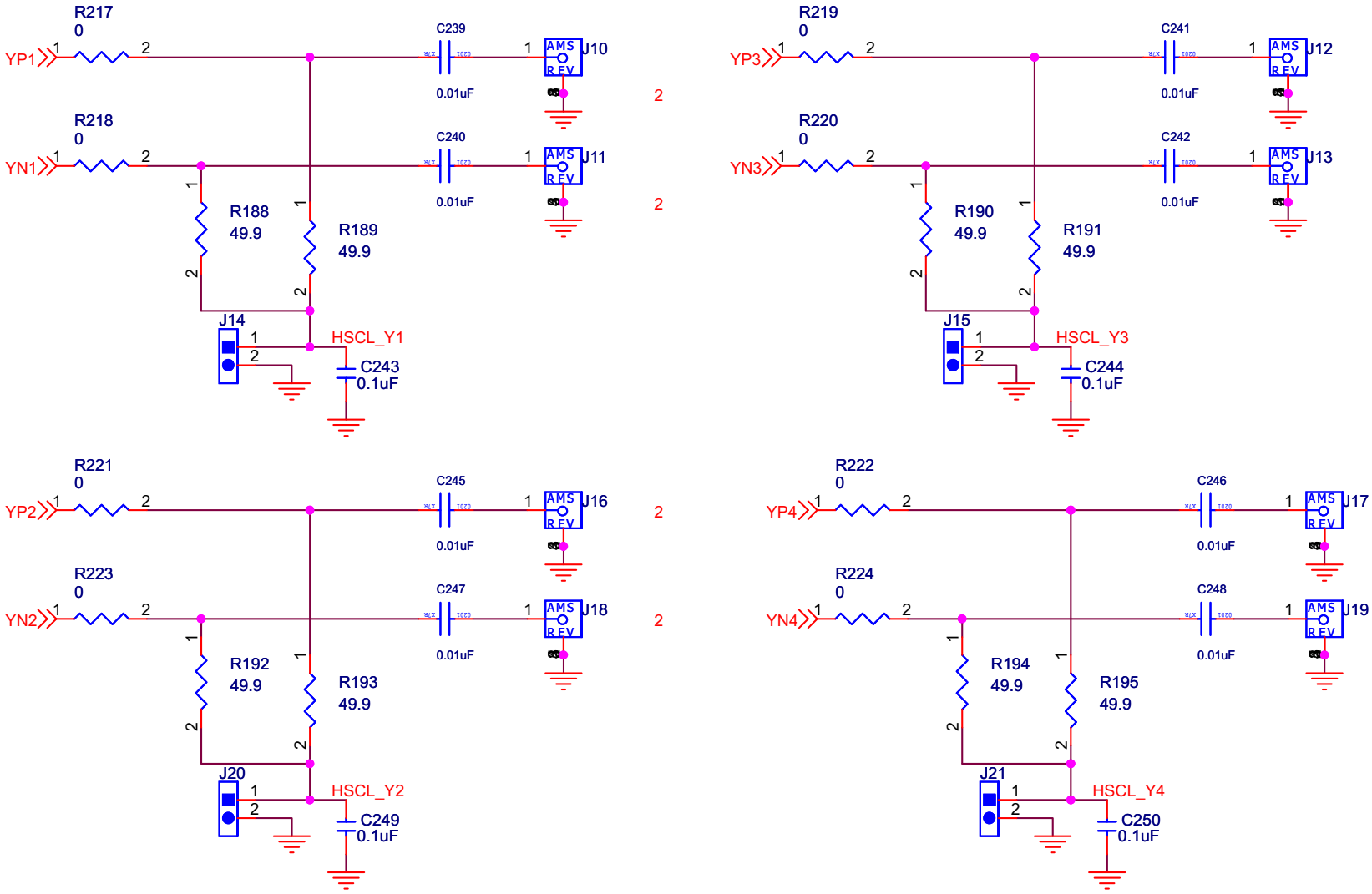


Figure 6. Schematic (4 of 6)

Output 5 to 8

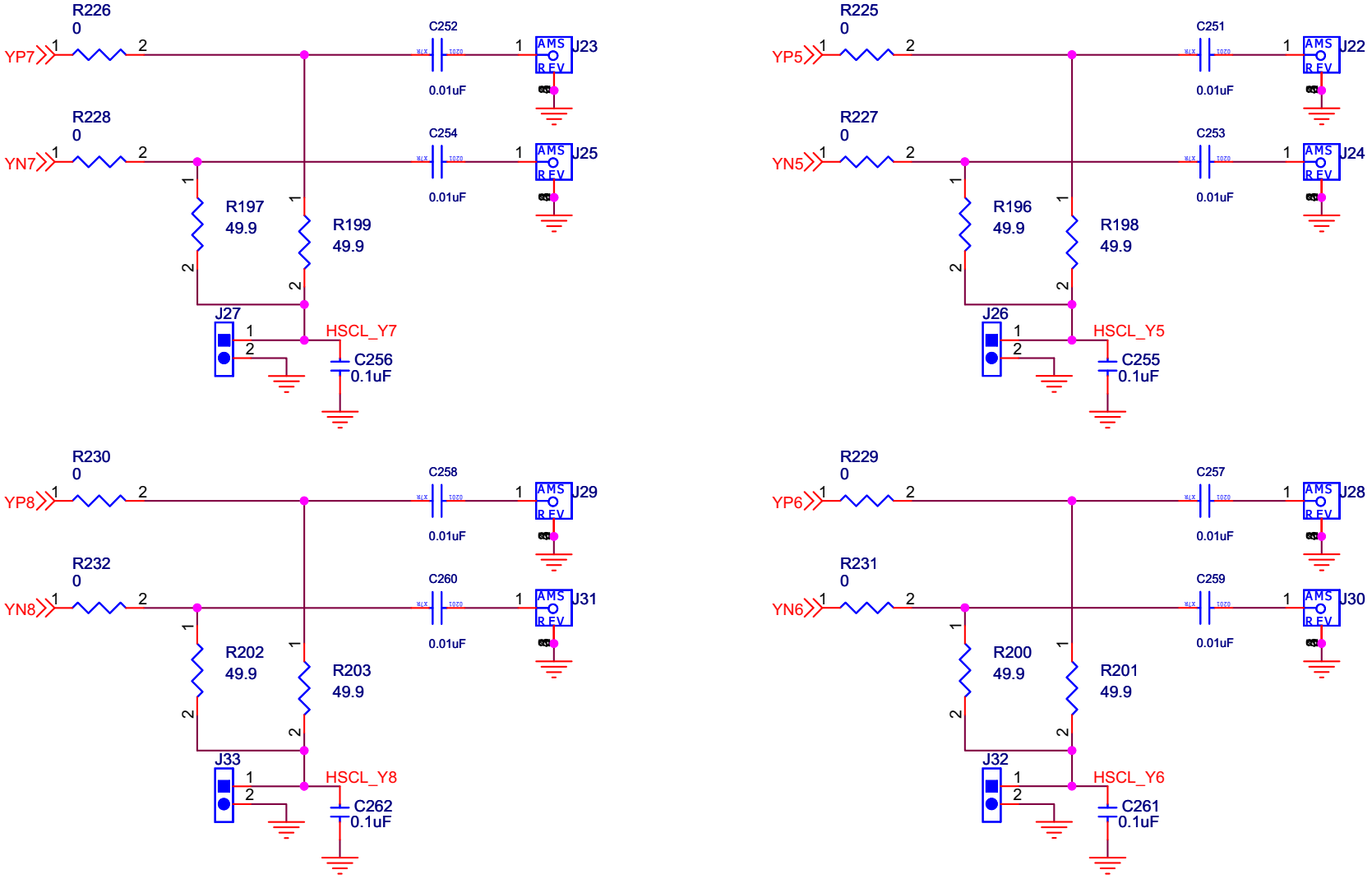


Figure 7. Schematic (5 of 6)

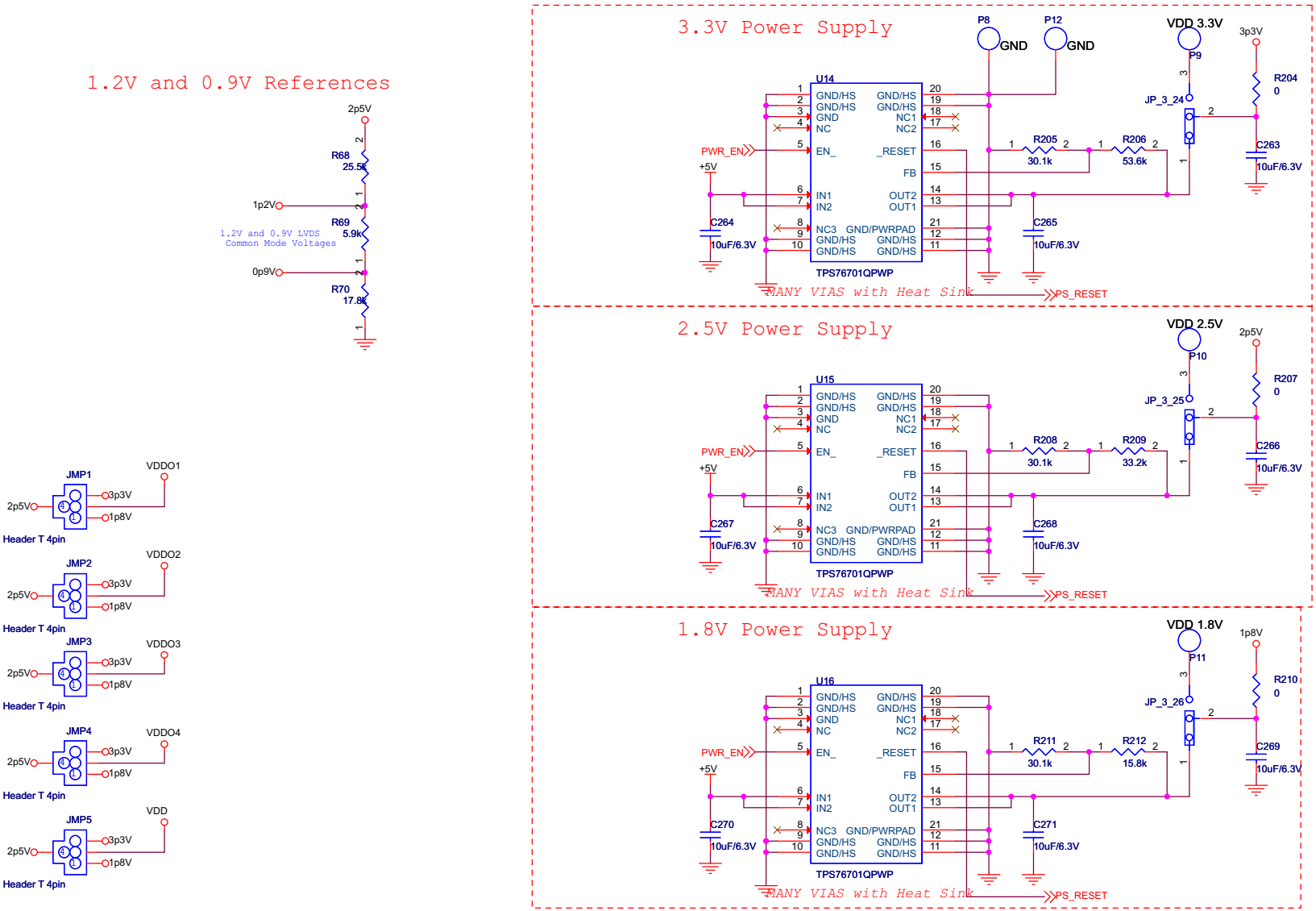


Figure 8. Schematic (6 of 6)

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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.

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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

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.

For EVMs annotated as IC – INDUSTRY CANADA Compliant

This Class A or B digital apparatus complies with Canadian ICES-003.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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This device complies with Industry Canada licence-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.

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.

Cet appareil numérique de la classe A ou B est conforme à la norme NMB-003 du Canada.

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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.

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General Statement for EVMs including a radio

User Power/Frequency Use Obligations: This radio is intended for development/professional use only in legally allocated frequency and power limits. Any use of radio frequencies and/or power availability of this EVM and its development application(s) must comply with local laws governing radio spectrum allocation and power limits for this evaluation module. It is the user's sole responsibility to only operate this radio in legally acceptable frequency space and within legally mandated power limitations. Any exceptions to this are strictly prohibited and unauthorized by Texas Instruments unless user has obtained appropriate experimental/development licenses from local regulatory authorities, which is responsibility of user including its acceptable authorization.

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

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

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.

For EVMs annotated as IC – INDUSTRY CANADA Compliant

This Class A or B digital apparatus complies with Canadian ICES-003.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Concerning EVMs including radio transmitters

This device complies with Industry Canada licence-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.

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.

Cet appareil numérique de la classe A ou B est conforme à la norme NMB-003 du Canada.

Les changements ou les modifications pas expressément approuvés par la partie responsable de la conformité ont pu vider l'autorité de l'utilisateur pour actionner l'équipement.

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.

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.

【Important Notice for Users of this Product in Japan】

This development kit is NOT certified as Confirming to Technical Regulations of Radio Law of Japan

If you use this product in Japan, you are required by Radio Law of Japan to follow the instructions below with respect to this product:

1. Use this product 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 this product only after you obtained the license of Test Radio Station as provided in Radio Law of Japan with respect to this product, or
3. Use of this product only after you obtained the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to this product. Also, please do not transfer this product, unless you give the same notice above to the transferee. Please note that if you could not follow the instructions above, you will be subject to penalties of Radio Law of Japan.

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http://www.tij.co.jp

EVALUATION BOARD/KIT/MODULE (EVM)
WARNINGS, RESTRICTIONS AND DISCLAIMERS

For Feasibility Evaluation Only, in Laboratory/Development Environments. Unless otherwise indicated, this EVM is not a finished electrical equipment and not intended for consumer use. It is intended solely for use for preliminary feasibility evaluation in laboratory/development environments by technically qualified electronics experts who are familiar with the dangers and application risks associated with handling electrical mechanical components, systems and subsystems. It should not be used as all or part of a finished end product.

Your Sole Responsibility and Risk. You acknowledge, represent and agree that:

1. You have unique knowledge concerning Federal, State and local regulatory requirements (including but not limited to Food and Drug Administration regulations, if applicable) which relate to your products and which relate to your use (and/or that of your employees, affiliates, contractors or designees) of the EVM for evaluation, testing and other purposes.
2. You have full and exclusive responsibility to assure the safety and compliance of your products with all such laws and other applicable regulatory requirements, and also to assure the safety of any activities to be conducted by you and/or your employees, affiliates, contractors or designees, using the EVM. Further, you are responsible to assure 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.
3. You will employ reasonable safeguards to ensure that your use of the EVM will not result in any property damage, injury or death, even if the EVM should fail to perform as described or expected.
4. You will take care of proper disposal and recycling of the EVM's electronic components and packing materials.

Certain Instructions. It is important to operate this EVM within TI's recommended specifications and environmental considerations per the user guidelines. Exceeding the specified EVM ratings (including but not limited to input and output voltage, current, power, and environmental ranges) may cause property damage, personal injury or death. If there are questions concerning these ratings please 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 result in unintended and/or inaccurate operation and/or possible permanent damage to the EVM and/or interface electronics. Please consult the EVM User's 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, some circuit components may have case temperatures greater than 60°C as long as the input and output are maintained at a normal ambient operating temperature. These components include but are not limited to linear regulators, switching transistors, pass transistors, and current sense resistors which can be identified using the EVM schematic located in the EVM User's Guide. When placing measurement probes near these devices during normal operation, please be aware that these devices may be very warm to the touch. As with all electronic evaluation tools, only qualified personnel knowledgeable in electronic measurement and diagnostics normally found in development environments should use these EVMs.

Agreement to Defend, Indemnify and Hold Harmless. You agree to 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 use of the EVM that is not in accordance with the terms of the agreement. This obligation shall apply whether Claims arise under law of tort or contract or any other legal theory, and even if the EVM fails to perform as described or expected.

Safety-Critical or Life-Critical Applications. If you intend to evaluate the components for possible use in safety critical applications (such as life support) where a failure of the TI product would reasonably be expected to cause severe personal injury or death, such as devices which are classified as FDA Class III or similar classification, then you must specifically notify TI of such intent and enter into a separate Assurance and Indemnity Agreement.

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