TSC2013EVM User's Guide

1 Introduction

This user's guide describes the characteristics, operation, and use of the TSC2013 evaluation module (EVM). This EVM, featuring the TSC2013 resistive dual-touch controller, is a fully-functional USB-powered platform that allows 4-wire resistive touch-screen panels to be connected to the USB port of a PC or laptop for evaluation. A complete circuit description, schematic diagram, and bill of materials are included in this document.

The following related documents are available through the Texas Instruments web site at www.ti.com.

The following lists devices and corresponding device data sheets of devices that are compatible with this EVM:

- TSC2013, SLVSC89
- DRV2605, SLOS825
- REG1117-33, SBVS001
- MSP430F247, SLAS547I

2 EVM Overview

2.1 Features

The TSC2013EVM is a complete evaluation and demonstration kit that includes a USB-based board and evaluation software for use with a personal computer running Microsoft Windows® operating systems (OS).

3 Analog Interface

The TSC2013EVM is designed for easy interfacing to 4-wire resistive touch screen panels.

Table 1. Analog Interface Pinout

PIN NUMBER	SIGNAL	DESCRIPTION
J300.1	Y–	Touch screen Y- electrode
J300.2	X–	Touch screen X- electrode
J300.3	Y+	Touch screen Y+ electrode
J300.4	X+	Touch screen X+ electrode

4 Digital Interface

The TSC2013EVM is designed to easily interface with multiple control platforms.

Table 2. Digital Interface Pinout

PIN NUMBER	SIGNAL	DESCRIPTION
J202.1	GND	
J202.2	$\overline{\text{RST}}$	Hardware reset input
J202.3	SDA_A	Serial data I/O
J202.4	SCL_A	Serial clock
J202.5	$\overline{\text{INT\_TSC}}$	Interrupt output (for host systems)
J202.6	GND	
J201.1	RXD_Debug	Receiving asynchronous data input. For debug purpose.
J201.2	GND	
J201.3	TXD_Debug	Transmit Asynchronous Data Output. For debug purpose.

5 Power Supplies

The USB connection supplies the TSC2013EVM with power. Onboard regulators generate the required supply voltages and no further power supplies are necessary. The power-supply voltage has an LED (LED502) that lights up when the power supplies are active.

6 EVM Operation

The following section provides information on the analog input, digital control, and general operating conditions of the TSC2013EVM.

6.1 Analog Input

The analog input sources (touch screen) can be applied directly to pin J300.

6.2 Digital Control

The digital control signals are applied through the USB connection and no other connections are required. The TSC2013EVM can also be connected to a DSP or microcontroller interface board through the J202 pin. If external I^2C control is desired, remove the following resisters: R231, R232, and R233.

7 Kit Operation

The following section provides information on using the TSC2013EVM, including setup, program installation, and program usage.

7.1 TSC2013EVM-PDK Block Diagram

Figure 1 shows a block diagram of the TSC2013EVM. The TSC2013 and DRV2605 device are both controlled by an MSP430™ microcontroller (MCU) through an I^2C interface. One resistive touch panel is connected to the TSC2013 device by a 4-pin FPC connector and an LRA motor is attached as an actuator. The FT232 device is a USB-to-serial UART interface and is used to transfer data from the MSP430 MCU to the host PC or is used to receive commands from the host PC.

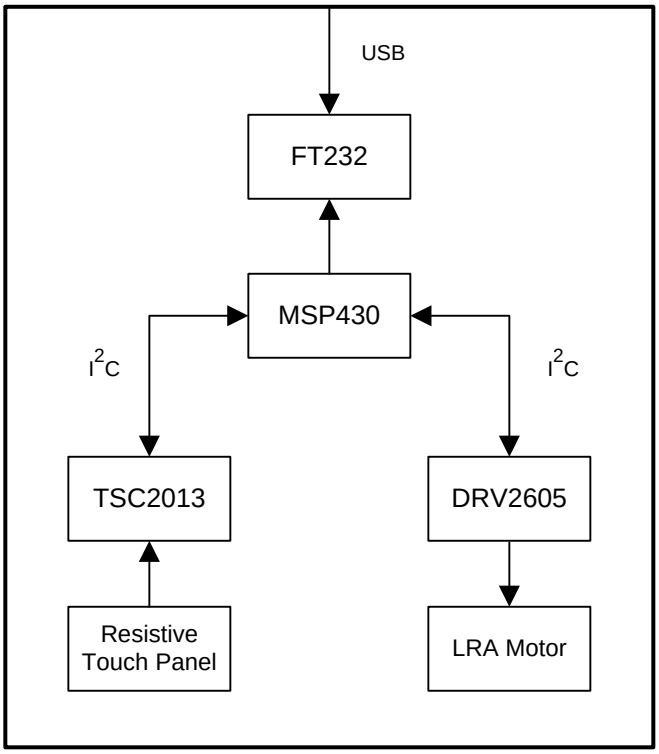

Figure 1. TSC2013EVM Block Diagram

7.2 Quick Start

Place the CD-ROM into CD-ROM drive of the PC. Locate the Setup.exe program on the disk and execute the program. The setup program installs the TSC2013 evaluation software on the PC. Follow the instructions and prompts given to correctly install the software.

After the software is installed, a dialog box appears with instructions for installing the FTDI CDM drivers which are a self-extracting archive. Click the *Extract* button to proceed. The archive extracts the files and automatically runs the installer for the FTDI CDM Drivers which is shown in Figure 2.

When the driver installation is complete, attach a USB cable from the PC to the TSC2013EVM board. The board receives power from the USB interface and therefore the power-indicator LED (LED502) on the TSC2013EVM should light up when the USB cable is attached. When the USB cable is connected to the PC and the EVM board, launch the TSC2013 evaluation software on the PC. A screen similar to the one in Figure 4 should appear when the software is launched.

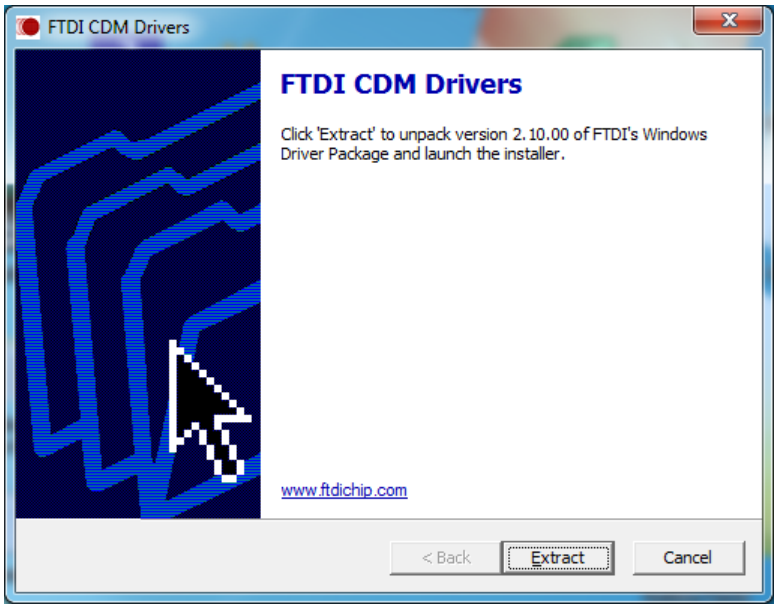

Figure 2. FTDI CMD Drivers Installer Screen

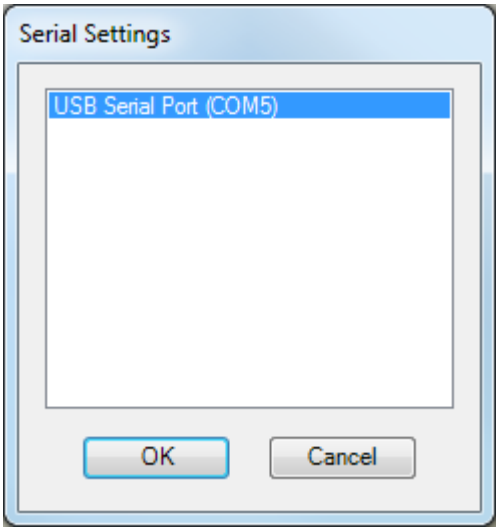

Figure 3. Serial Settings Screen

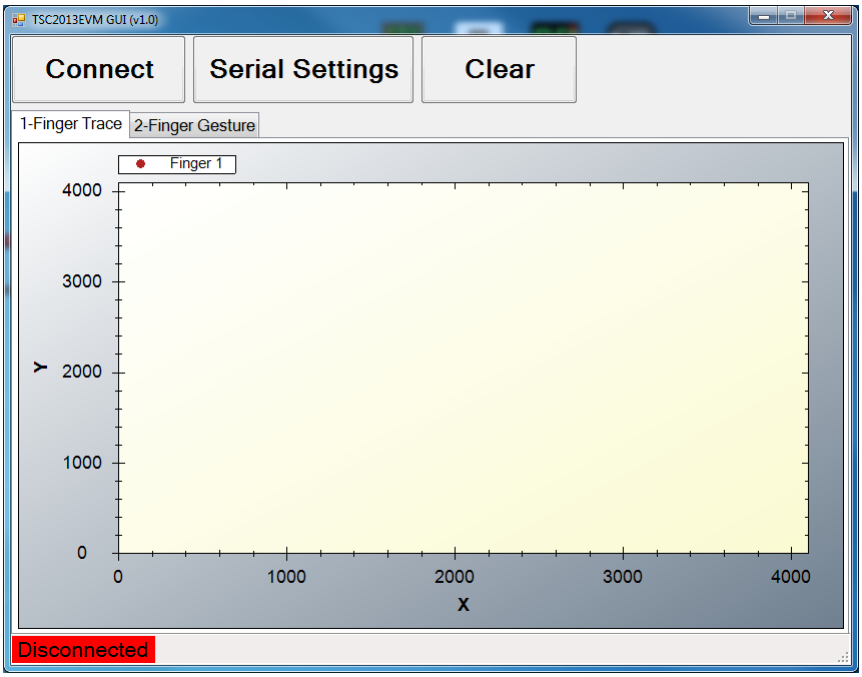

Figure 4. Default Software Screen

In order to use the touch-screen features, a 4-wire resistive-touch screen must be connected to the J300 pin of the TSC2013EVM, as previously described.

Click the *Serial Settings* button and the window shown in Figure 3 opens. Select the correct port and click the *OK* button. Click the *Connect* button and the word ***Connected*** appears with a green background in the bottom left of the screen. Figure 4 shows the word ***Disconnected*** with a red background.

If the port number is unknown, navigate to the PC *Device Manager* from the *Control Panel* that is located on the *Start Menu* of a PC running a Windows OS. Expand the *Ports (COM & LPT)* list to view the ports. Select the port that has an annotation beginning with *USB Serial Port* as shown in Figure 5.

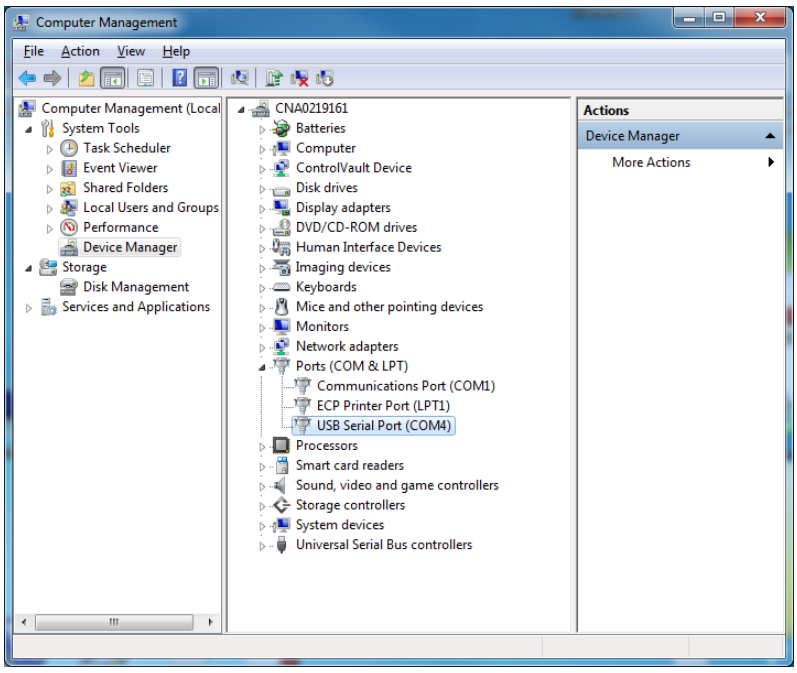

Figure 5. Device Manager Screen

7.3 Program Description

After the TSC2013EVM software is installed, the EVM board can be used to evaluate and develop the TSC2013 device.

7.3.1 1-Finger Trace Panel

The touch-screen box in the *1-Finger Trace Panel* is updated when a touch is detected on the touch screen (see Figure 6). When the touch screen is drawn on, the drawing motion on the touch screen is translated into pixels on this box.

The display can be cleared by pressing the *Clear* button on the screen.

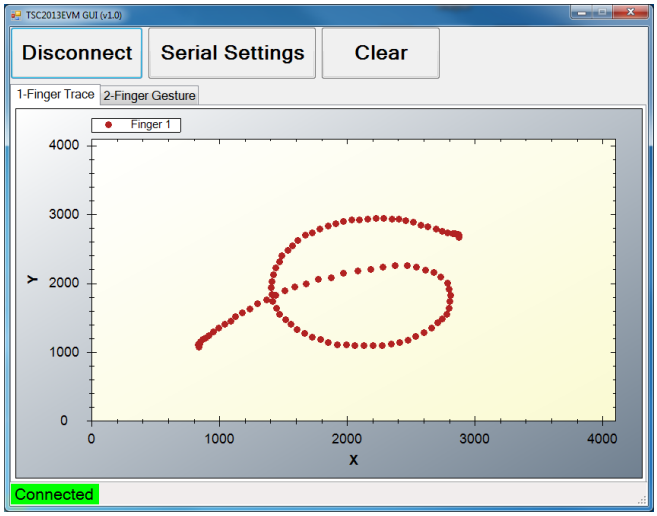

Figure 6. 1-Finger Trace Screen

7.3.2 2-Finger Gesture Panel

The TSC2013EVM supports three types of gestures which are zoom in or out, rotation, and 1-finger flick. Pictures are updated when a gesture is detected by the firmware in the MSP430 device (see Figure 7). For example, if a user performs a zoom in or zoom out gesture on the touch panel, the picture on the screen zooms in or out at the same time that the gesture is performed.

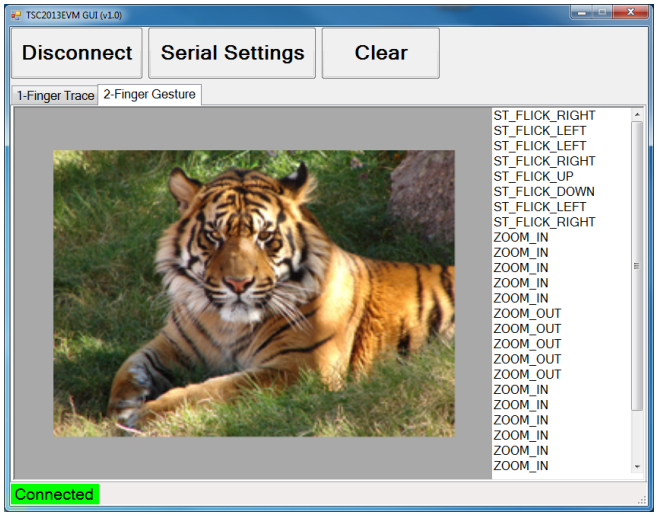

Figure 7. 2-Finger Gesture Screen

8 EVM Bill of Materials (BOM) and Schematic

Table 3 lists the complete BOM for the modular TSC2013EVM.

Table 3. TSC2013EVM Bill of Materials

DESIGNATORS	DESCRIPTION	MANUFACTURER	PART NUMBER
C100, C101, C102, C103, C104, C300, C303, C501	10-µF, capacitor,10%,SMT0805	AVX	0805YD106KAT2A
C200, C202	1-µF, capacitor,10%,SMT0603	KEMET	C0603C102K3GACTU
C201	1-nF, capacitor,10%,SMT0603	TDK	C0603X5R1E102K030BA
C203, C503	10-nF, capacitor,SMT0603	KEMET	C0603C103K4RACTU
C204, C205	12-pF, capacitor,5%,SMT0603	TDK	C0603C0G1E120J030BA
C301, C302, C305, C404, C405, C500, C502, C504	100-nF, capacitor,10%,SMT0603	AVX	06033C104KAT2A
FB200, FB500	Ferrite bead, 100-Ω at 100 MHz,SMT0805	Fair-Rite	2508051017Y0
F500	Fuse, 0.5-A, SMT0805	Multicomp	MCF0805B0R50FSTR
J200	Connector, header, 2 rows, 14-pin	TE Connectivity / AMP	1-1634688-4
J201	Connector, header, right angle, single row, 3-pin	TE Connectivity / AMP	826947-3
J202	Connector, header, right angle, single row, 6-pin	TE Connectivity / AMP	826949-6
J300	Receptacle FPC, 1-MM	Molex	52271-0479
J400	LRA Motor	AAC	AAC1030
J500	Mini-USB type-B receptacle	Würth Elektronik	65100516121
LED500, LED501, LED502	LED, Green, SMT0805	Würth Elektronik	150080GS75000
R231, R232, R233, R300, R405, R407	Resistor, 0, 5%, 0.1-W, SMT0603	Panasonic	ERJ-3GEY0R00V
R200	Resistor, 47-kΩ,5%, 0.1-W, SMT0603	Panasonic	ERJ3GEYJ473V
R201, R202, R207, R208, R222, R223	Resistor, 4.7-kΩ, 5%, 0.1-W, SMT0603	Panasonic	ERJ3GEYJ472V
R203, R204, R205, R206, R209, R212, R213, R214, R224, R302, R303, R308, R408, R505	Resistor, 100-Ω, 5%, 0.1-W, SMT0603	Panasonic	ERJ3GEYJ101V
R228, R229, R230, R404, R406	Resistor, 10-kΩ, 5%, 0.1-W, SMT0603	Panasonic	ERJ3GEYJ103V
R309	Resistor, 47-Ω, 5%, 0.1-W, SMT0603	Panasonic	ERJ3GEYJ470V
R500, R501, R502	Resistor, 22-Ω, 5%, 0.1-W, SMT0603	Panasonic	ERJ3GEYJ220V
R503, R504, R506	Resistor, 1-kΩ, 5%, 0.1-W, SMT0603	Panasonic	ERJ3GEYJ102V
SW200	DIP switch	OMRON	A6S-3104-H
U100, U101	Single output LDO, 800-mA, fixed (3.3-V)	Texas Instruments	REG1117-3.3
U200	16-bit MCU, 32-KB Flash, 4-KB RAM	Texas Instruments	MSP430F247TPMR
U300	Resistive dual-touch controller	Texas Instruments	TSC2013QPWRQ1
U401	Haptic driver for ERM-LRA	Texas Instruments	DRV2605YZFR
U500	USB to serial UART	FTDI Chip	FT232RL
Y200	Crystal, 11.0592-MHz, SMD	TXC CORPORATION	9C-11.0592MAAJ-T
—	LCD touch panel	Fujitsu	T010-1301-T320

9 TSC2013EVM Schematics

The schematic diagrams are provided for reference.

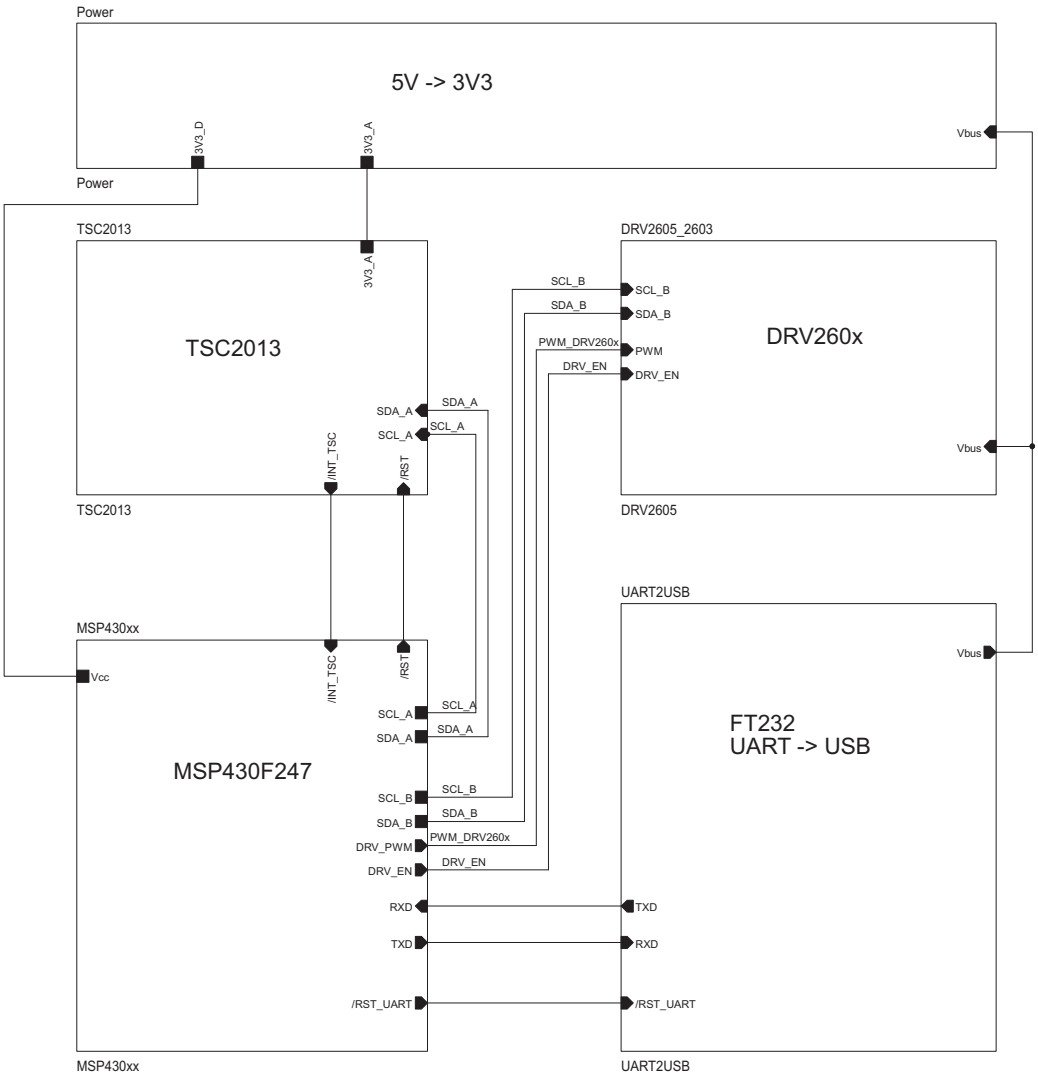

Figure 8.

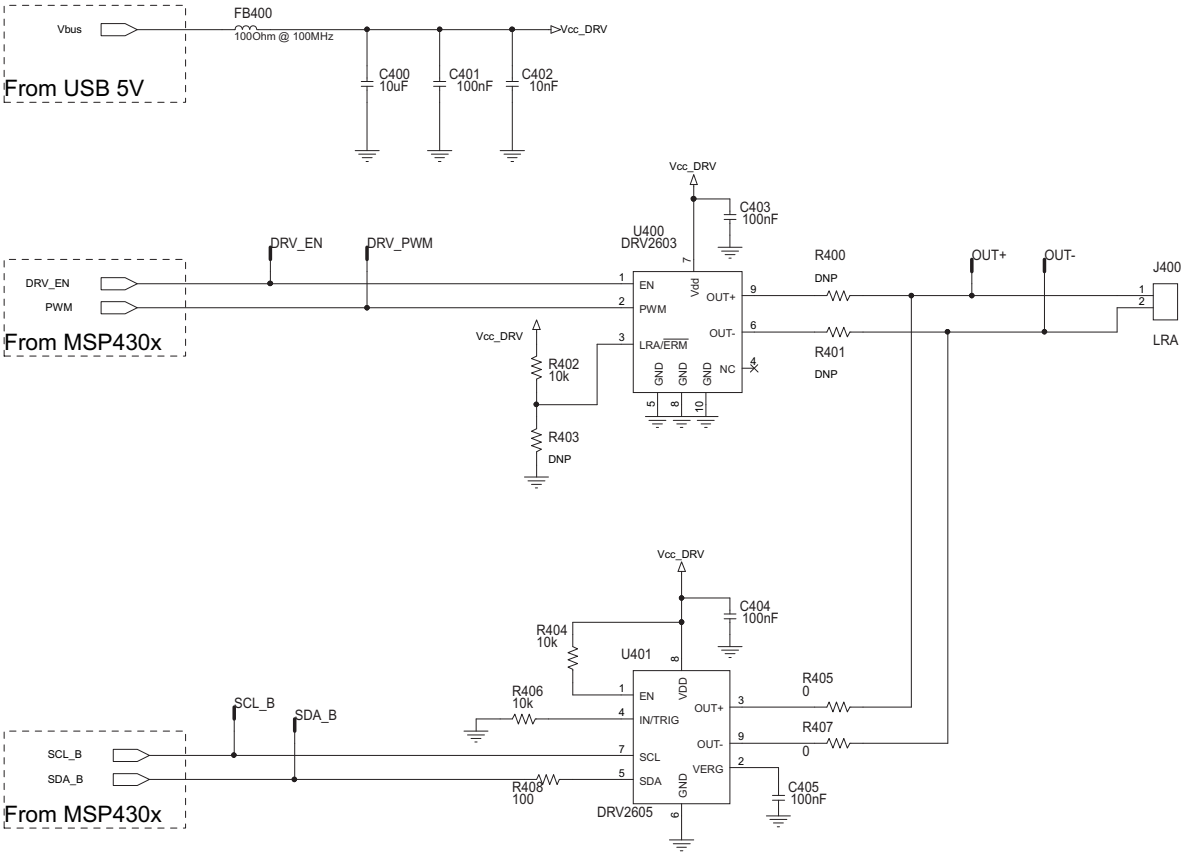

Figure 9.

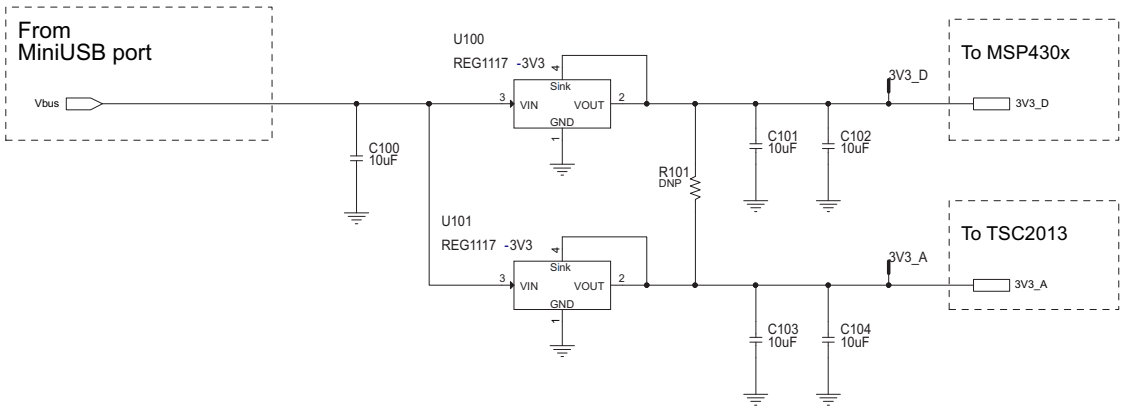

Figure 10.

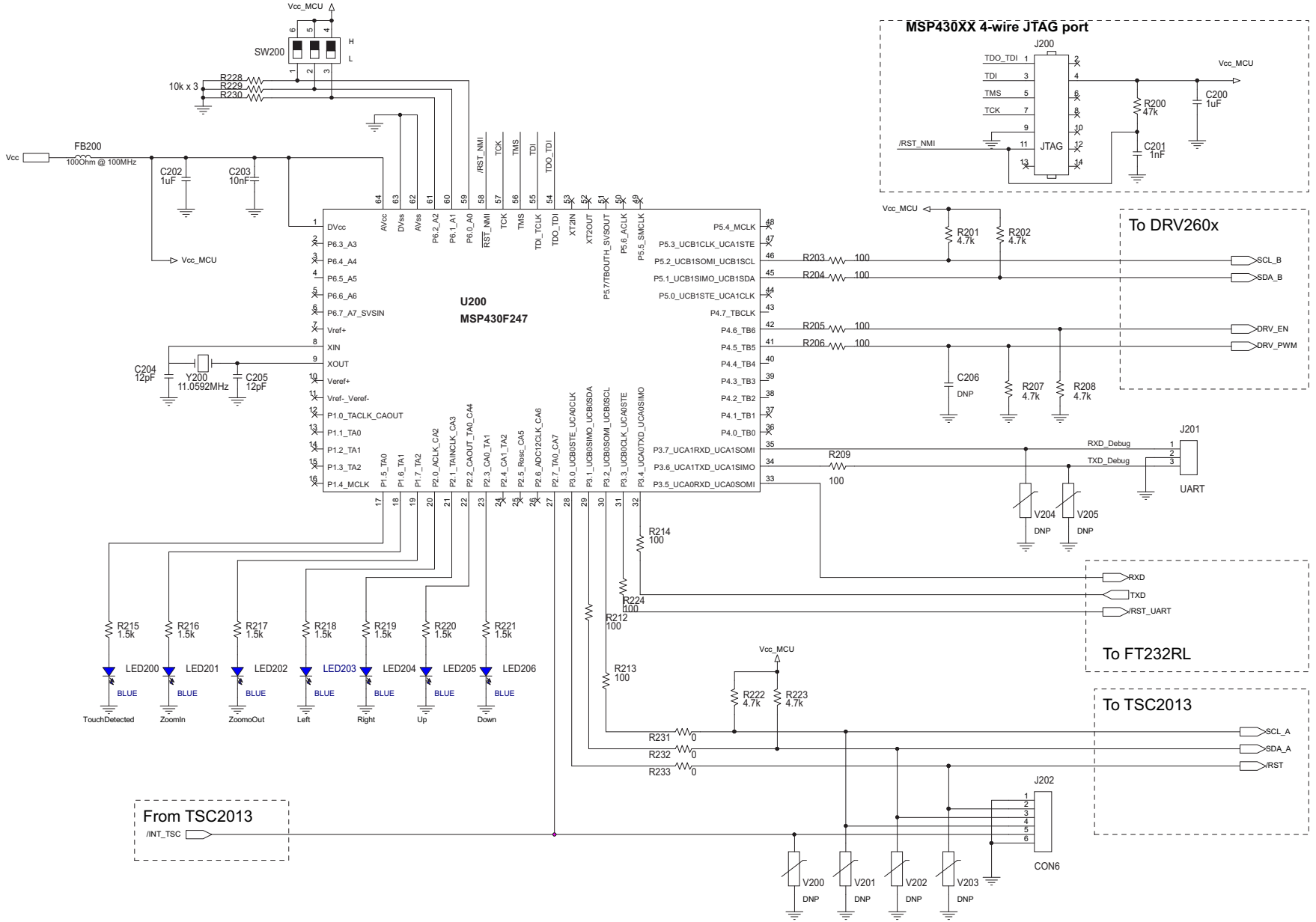

Figure 11.

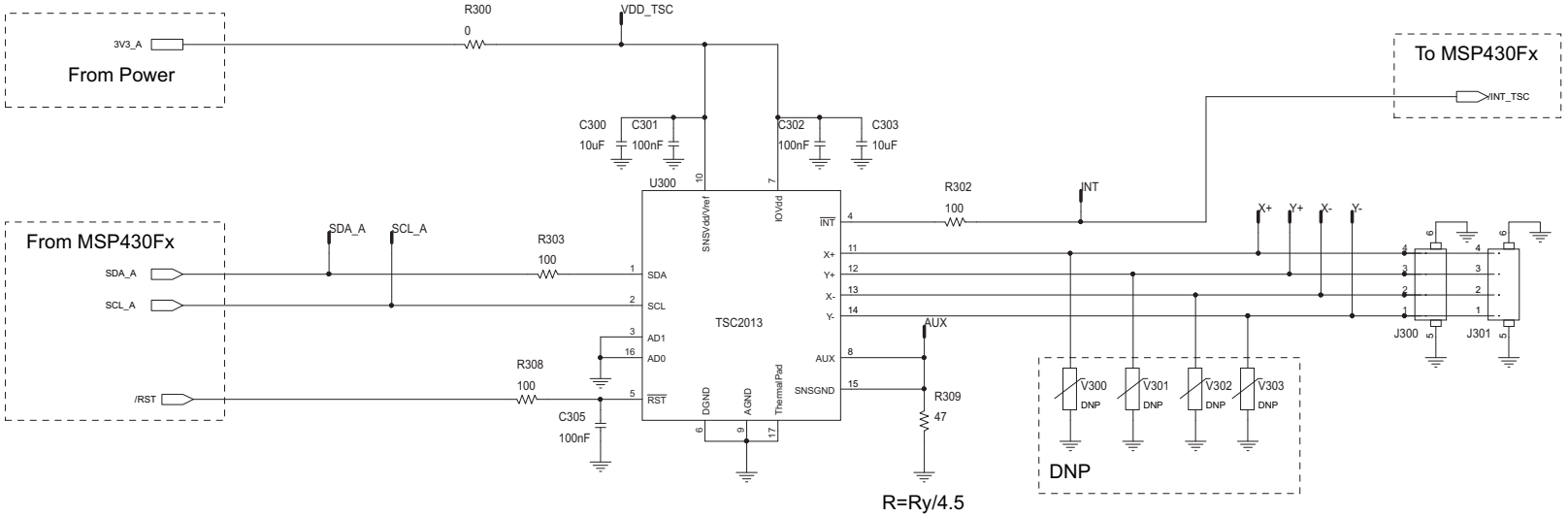

Figure 12.

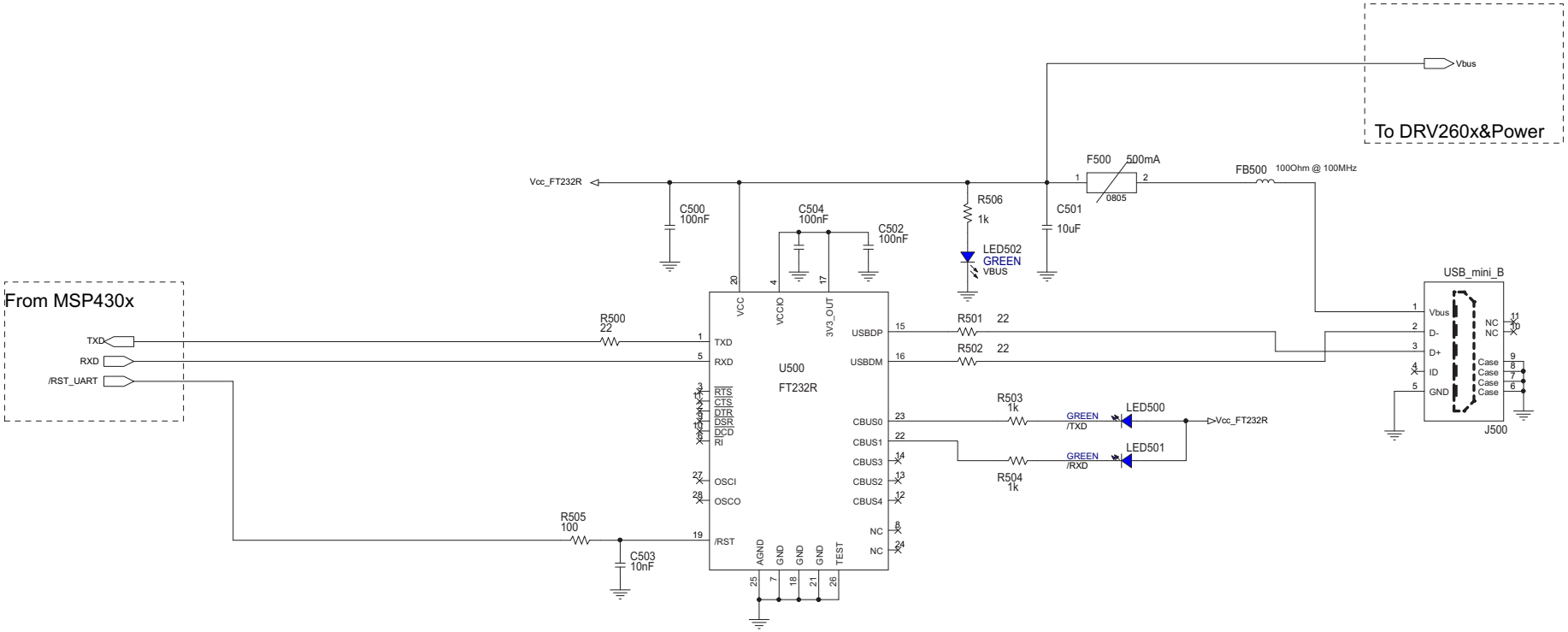

Figure 13.

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General Statement for EVMs including a radio

User Power/Frequency Use Obligations: For EVMs including a radio, the radio included in such EVMs is intended for development and/or professional use only in legally allocated frequency and power limits. Any use of radio frequencies and/or power availability in such EVMs and their development application(s) must comply with local laws governing radio spectrum allocation and power limits for such EVMs. 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 TI unless user has obtained appropriate experimental and/or development licenses from local regulatory authorities, which is the sole responsibility of the user, including its acceptable authorization.

U.S. Federal Communications Commission Compliance

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 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 its 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.

Industry Canada Compliance (English)

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.

Canada Industry Canada Compliance (French)

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.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265

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EVMs entering Japan are NOT certified by TI as conforming to Technical Regulations of Radio Law of Japan.

If user uses EVMs in 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.

http://www.tij.co.jp

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日本テキサス・インスツルメンツ株式会社
東京都新宿区西新宿６丁目２４番１号
西新宿三井ビル
http://www.tij.co.jp

Texas Instruments Japan Limited
(address) 24-1, Nishi-Shinjuku 6 chome, Shinjuku-ku, Tokyo, Japan

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