

TUSB2036 and TUSB2077A EVM User's Guide

This document describes the main features and functionality of the TUSB2036 and TUSB2077A evaluation module (EVM) boards. The 3-port TUSB2036 and 7-port TUSB2077A are USB 2.0 full-speed hubs.

The TUSB20xx EVM family is a collection of evaluation modules built to evaluate the operation of the TI full-speed hubs. Each device has its own evaluation module which consist in one USB FS Upstream port and 3 or 7 USB FS downstream ports. The evaluation modules include all the required hardware to operate the TI hub on all the possible configuration modes.

No special software, firmware, or drivers are required to operate these EVMs; any operating system with USB stack support will support any of these hubs.

Contents

1	Hardware Equipment	2
2	EVM Block Diagram	2
3	Component Location	3
4	Hardware Description	4
5	LED Indicators	5
6	Configuration Options	6
7	Bill of Materials and Schematics	7

List of Figures

1	Hardware Required	2
2	TUSB2036/77A EVM Block Diagram.....	2
3	TUSB2077A EVM Component Location	3
4	TUSB2036 EVM Component Location	3
5	TUSB2036 EVM Schematics	10
6	TUSB2077A EVM Schematics.....	11

List of Tables

1	LED Indicators for TUSB2036 EVM	5
2	LED Indicators for TUSB2077A EVM	5
3	Jumper Configuration.....	6
4	TUSB2036 EVM Bill of Materials	7
5	TUSB2077A EVM Bill of Materials.....	8

1 Hardware Equipment

The following hardware is required for this EVM:

1. TUSB2036 or TUSB2077 EVM (TUSB2036/77A)
2. USB cable with a standard-A to standard-B connector
3. 5-V DC wall-wart
4. PC running any operating system with USB stack support

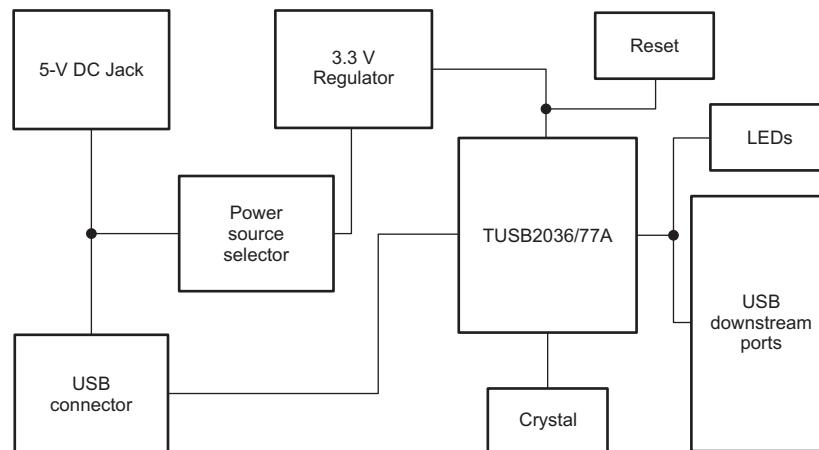
[Figure 1](#) illustrates the hardware setup.



Figure 1. Hardware Required

2 EVM Block Diagram

[Figure 2](#) represents the block diagram of the TUSB2036/77A EVM. The board is designed to be powered from either a 5-V DC wall-adapter or via USB cable power.



The TUSB2077A EVM only supports 4-downstream ports when using the USB cable power.

Figure 2. TUSB2036/77A EVM Block Diagram

3 Component Location

[Figure 3](#) shows the general location of major components on the TUSB2077A EVM board.

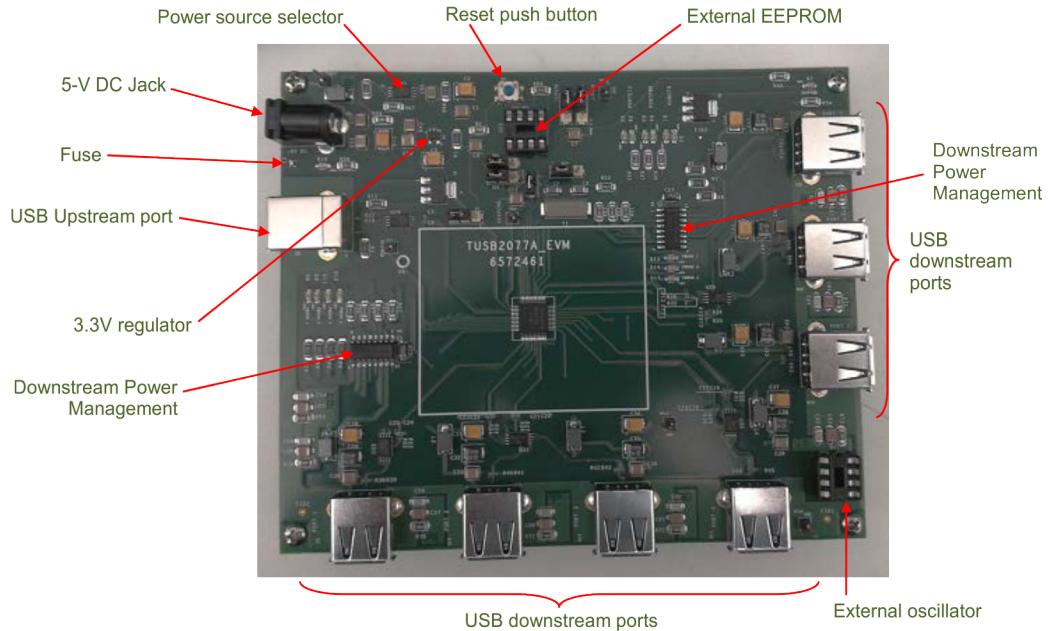


Figure 3. TUSB2077A EVM Component Location

[Figure 4](#) shows the general location of major components on the TUSB2036 EVM board.

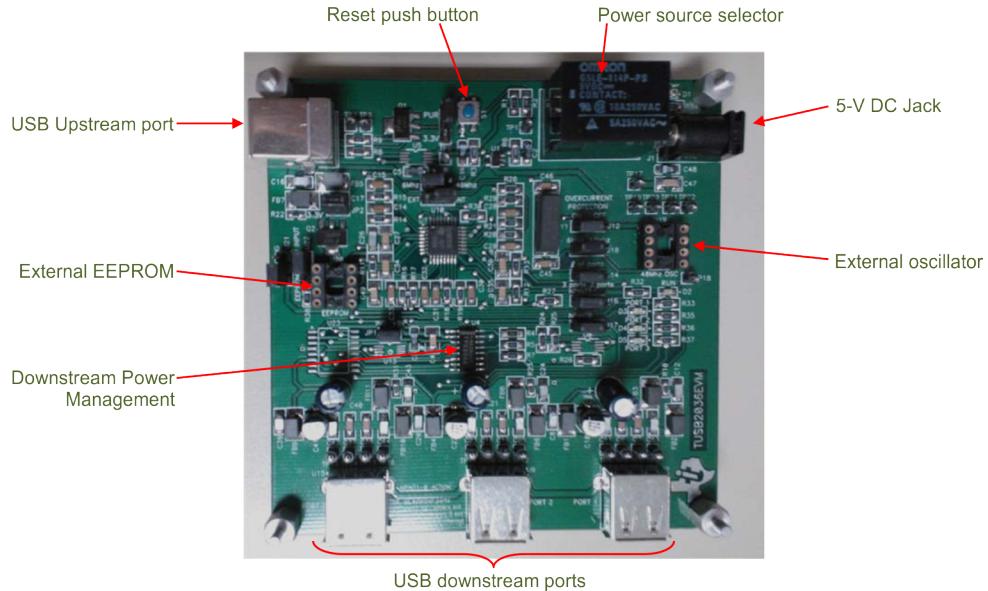


Figure 4. TUSB2036 EVM Component Location

4 Hardware Description

This section contains descriptions of the [external power source](#), [bus power versus self power](#), [voltage regulators](#), [USB downstream power management](#), [ESD protection](#), a [reset signal](#), an [external EEPROM](#), and [external oscillator](#).

4.1 External Power Source

The EVM can operate from a standard DC jack for connecting an external 5-V wall-wart. The wall-wart should be rated for 5 V with at least a 2-A current rating. The tip of the DC jack has positive polarity. A wall-wart is not supplied with this evaluation module, leaving it capable of bus power mode by default. In this mode, only a maximum of 4-downstream ports are supported. If more than 4-downstream ports are required, a wall-wart must be used.

High-power USB devices require the use of the wall-wart as well.

4.2 Bus Power versus Self Power

The EVM can be configured to operate off the USB cable power (VBUS) or a 5-V wall-wart.

The EVM uses the TPS2111 as a supervisory circuit to automatically switch from one source to another. If both sources are present at the same time, the EVM will switch to use the external power source.

When the EVM is using the cable power, only low-power USB devices are supported, these are devices that draw no more than 100 mA from VBUS.

When the EVM is using the external power, high-power devices drawing up to 500 mA are supported on every downstream port.

4.3 Voltage Regulator

The TPS76333 is used to step down the 5-V source (cable or wall-wart) to a 3.3-V voltage rail required to power the TUSB20XX.

4.4 USB Downstream Power Management

The USB Specification requires a power management circuit when the USB downstream ports are going to be actively attached or detached. The EVM uses the TPS2044B for power management, this circuit provides the 5-V (VBUS) signal to each USB downstream port and it also works as an over-current and over-temperature supervisor. The TUSB20XX controls the TPS2044B by asserting the PWRON# signals. When a USB downstream port is drawing more than 500 mA from VBUS, the TPS2044B triggers an OC# signal to the hub and this de-asserts the corresponding PWRON# signal which, in turn, removes the 5-V signal from the specific downstream port. The TPS2044B cannot be used as a “chip select” for downstream ports by controlling the state of the EN# and OE# signals. This is because when an over-current event is present the specification requires the USB host to decide whether or not to apply power to the downstream port.

4.5 ESD Protection

The EVM implements ESD protection on all the USB ports using the SN75240.

4.6 Reset

The TUSB20XX requires a Reset signal at power up for proper operation, the Datasheet specifies the timing requirements for the power-on Reset signal. The EVM implements this power-on reset by adding an RC circuit from the 3.3-V power rail to the RESET# input. The EVM also implements a Reset push button which can be used to bring the device to its default state at any time.

4.7 External EEPROM

The TUSB20xx hub is fully operational without any external EEPROM. The EVM; however, implements an option to populate an external EEPROM to store a custom product ID (PID). If an external EEPROM is used, jumpers U10 and U22 on the TUSB2036 and jumpers U11 and U25 on the TUSB2077A EVM have to be set accordingly. See [Table 3](#) for configuration options.

4.8 External Oscillator

The TUSB20xx requires a clock input which may come from a crystal or an external oscillator. See the device datasheet (TUSB2036 - [SLLS372](#), TUSB2077A - [SLLS414](#)) for more information about electrical specs. The EVM implements a crystal oscillator circuit, by default, and it is equipped with a socket for an external oscillator. See [Table 3](#) for configuration options.

5 LED Indicators

LED descriptions for the TUSB2036 EVM are shown in [Table 1](#) and the LED descriptions for the TUSB2077A EVM are shown in [Table 2](#).

Table 1. LED Indicators for TUSB2036 EVM

LED	LED Color	Default State	Indication when On
D1	Amber	Off	Presence of external power
D2	Green	On	Downstream port #1 is powered on
D3	Green	On	Downstream port #2 is powered on
D4	Green	On	Downstream port #3 is powered on

Table 2. LED Indicators for TUSB2077A EVM

LED	LED Color	Default State	Indication when On
D1	Red	Off	Hub is not configured, a hard Reset is required
D2	Green	On	Hub is configured
D3	Red	Off	All ports are powered off
D4	Green	On	Any port is powered On
D5	Red	Off	A downstream port is disabled
D6	Green	On	No downstream port is disabled
D7	Red	On	The hub is NOT on the SUSPEND state
D8	Green	On	Downstream port #1 is powered on
D9	Green	On	Downstream port #2 is powered on
D10	Amber	On	External power source is present
D11	Green	On	Downstream port #3 is powered on
D12	Green	On	Downstream port #4 is powered on
D13	Green	On	Downstream port #5 is powered on
D14	Green	On	Downstream port #6 is powered on
D15	Green	On	Downstream port #7 is powered on

6 Configuration Options

The TUSB2036 and TUSB2077A can be configured with several options like crystal or oscillator source, ganged or individual power management, and so forth. Refer to the datasheet for a complete list of configurable options.

The EVM implements a series of headers for all the configurable options, [Table 3](#) shows the default value and function of each header. The EVM is fully functional using the default settings.

Table 3. Jumper Configuration

Pin header	Function	
	TUSB2036 (SLLS372)	TUSB2077A (SLLS414)
J2	NA	(Default) Installed: Apply Vcc to the hub. Not installed: Removes Vcc from the hub
JP1	(Default) Installed: Apply +5 V to the power switch Not installed: Removes 5 V from switch	NA
JP2	(Default) Installed: Apply Vcc to the hub Not installed: Removes Vcc from the hub	NA
U1	NA	(Default) Position 1-2: 1.5 k pull-up is connected to 3.3 V Position 2-3: 1.5 k pull-up is connected to DP0PUR
U10	(Default) Position 2-3: Disable external EEPROM Position 1-2: Enable external EEPROM	NA
U11	(Default) Position 1-2: Selects 6-MHz crystal operation Position 2-3: Selects a 48-MHz external oscillator	(Default) Position 1-2: Disable external EEPROM Position 2-3: Enable external EEPROM
U12	(Default) Position 1-2: Enable over-current protection Position 2-3: Disable over-current protection	(Default) Position 1-2: Selects 6-MHz crystal operation Position 2-3: Selects 48-MHz external oscillator
U14	(Default) Position 1-2: 3 ports enabled Position 2-3: 2 ports enabled	NA
U16	(Default) Position 1-2: NPINT1 = 0 Position 2-3: NPINT1 = 1	(Default) Position 1-2: Uses 6-MHz crystal Position 2-3: Uses 48-MHz oscillator
U17	(Default) Position 1-2: NPINT0 = 0 Position 2-3: NPINT0 = 1	NA
U18	(Default) Position 1-2: Uses 6-MHz crystal Position 2-3: Uses 48-MHz oscillator	NA
U21	(Default) Position 1-2: Selects INDIVIDUAL mode Position 2-3: Selects GANGED port management	NA
U22	(Default) Position 2-3: Pin configuration option Position 1-2: Selects EEPROM configuration option	NA
U24	NA	(Default) Position 1-2: Selects GANGED mode Position 2-3: Selects Individual port management
U25	NA	(Default) Position 1-2: Pin configuration option Position 2-3: Selects EEPROM configuration option
U3	(Default) Position 2-3: 1.5-k pull-up is connected to 3.3 V Position 1-2: 1.5-k pull-up is connected to DP0PUR	NA

7 Bill of Materials and Schematics

This section contains the schematics and BOMs for the TUSB2036 and TUSB2077A EVMs.

7.1 Bill of Materials

[Table 4](#) is the BOM for the TUSB2036 EVM and [Table 5](#) is the BOM for the TUSB2077A EVM.

Table 4. TUSB2036 EVM Bill of Materials

Description	Supplier	Part number	Package	Qty	Reference Designator
USB connector Series A w/EMI Back Plate(Down-stream)	IO systems	18A121	4-pin thru hole	3	
USB connector Series B w/EMI Back Plate(Up-stream)	IO systems	18B121	4-pin thru hole	1	
TUSB2036	TI	TUSB2036	32-pin TQFP	1	
Dual USB transient suppressor	TI	SN75240PW	8-pin SOP	3	
Quad Power-distribution switch	TI	TPS2044D	16pin SOIC	1	
6MHz crystal	Digi-key	SE2501CT-ND	SMT	1	
10 ohm resistor	Digi-key	P10FTR-ND	1206	1	(p376)
30 ohm resistor	Digi-key	P30FTR-ND	1206	8	
169 ohm resistor	Digi-key	P169FTR-ND	1206	1	
348 ohm resistor	Digi-key	P348FTR-ND	1206	1	
510 ohm resistor	Digi-key	P510FTR-ND	1206	6	
1.0K ohm resistor	Digi-key	P1.0KFTR-ND	1206	1	
1.5K ohm resistor	Digi-key	P1.5KFTR-ND	1206	2	
15K ohm resistor	Digi-key	P15KFTR-ND	1206	14	
1M ohm resistor	Digi-key	P1.00MFTR-ND	1206	4	
22pF Capacitor	Digi-key	PCC220CCT-ND	1206	8	
33pF Capacitor	Digi-key	PCC330CCT-ND	1206	2	
47pF Capacitor	Digi-key	PCC470CCT-ND	1206	6	
0.01uF Capacitor	Digi-key	PCF1046CCT-ND	1206	15	
0.1uF Capacitor	Digi-key	PCF1088CCT-ND	1210	7	(p346)
1uF Capacitor	Digi-key	PCS3105CCT-ND	EIA size A (Y)	2	(p336)
4.7uF Capacitor	Digi-key	PCS3475CCT-ND	EIA size A (Y)	3	
47uF Capacitor	Digi-key	PCE3091CCT-ND	Size code C (p306)	3	
220uF Capacitor	Digi-key	P5604-ND	thru hole	3	
Amber LED	Digi-key	P517TR-ND	See datasheet	1	(p608)
Red LED	Digi-key	P490TR-ND	See datasheet	1	
Green LED	Digi-key	P494TR-ND	See datasheet	1	
Ferrite Bead Adams magnet products	Philips	CBD4.6/3/3-4S2	SMT	12	
Shunts	Digi-key	S9002-ND	Shorts	14	
3-pin jumper	Digi-key	S1012-03-ND	3-pin header	10	
2-pin jumper	Digi-key	S1012-02-ND	2-pin header	2	
Wall transformer female jack	LZR Electronics	RL30A	3-pin thru hole	1	

Table 4. TUSB2036 EVM Bill of Materials (continued)

Description	Supplier	Part number	Package	Qty	Reference Designator
Test points	Digi-key	5011K-ND	1-pin	19	
3.3V voltage regulator	TI	TPS76333	SOT-23	1	
Push button	Digi-key	7914G-000ETR-ND	See datasheet	1	
8pin Dip socket	Digi-key	ED60008-ND	8-pin Dip Socket	2	
2N3904	National Semiconductor	PZT3904	SOT-223	1	
2N3906	National Semiconductor	PZT3906	SOT-223	1	
2N3906	National Semiconductor	PZT3906	SOT-223	1	
2Micrel power switch	Micrel	MIC2524	16-pin SOIC	2	

Table 5. TUSB2077A EVM Bill of Materials

Item	Qty	Reference	Value	Vendor	Vendor Part#	Package
1	14	C1,C4,C7,C11,C30,C33,C36,C39,C42,C45,C48,C49,C50,C51	.1uF	Digi-Key	PCF1088CT-ND	1210
2	10	C2,C3,C10,C28,C31,C34,C37,C40,C43,C46	4.7uF	Digi-Key	718-1147-2-ND	1411
3	16	C5,C6,C12,C13,C14,C15,C16,C17,C18,C19,C20,C21,C22,C23,C24,C25	22pF	Digi-Key	445-10664-2-ND	0201
4	2	C8,C9	33pF	Digi-Key	490-5040-1-ND	1206
5	2	C26,C27	1uF	Digi-Key	718-1114-2-ND	1206
6	7	C29,C32,C35,C38,C41,C44,C47	22uF	Digi-Key	718-1314-2-ND	1411
7	9	C52,C55,C57,C59,C61,C63,C65,C67,C69	0.1uF	Digi-Key	PCF1088CT-ND	1210
8	1	C53	0.01uF	Digi-Key	PCF1341TR-ND	1210
9	8	C54,C56,C58,C60,C62,C64,C66,C68	0.001uF	Digi-Key	PCF1348TR-ND	1206
10	3	D1,D3,D5	LED(Red)	Digi-Key	P490TR-ND	0805
11	3	D2,D4,D6	LED (Green)	Digi-Key	P494CT-ND	0805
12	1	D7	RUN(Red)	Digi-Key	P490TR-ND	0805
13	7	D8,D9,D11,D12,D13,D14,D15	LED(Green)	Digi-Key	P494CT-ND	0805
14	1	D10	ExtPwr(Amber)	Digi-Key	P517TR-ND	0805
15	1	F1	Fuse	Digi-Key	0603SFF150F/32TR-ND	603
16	1	J1	SelfPower	Digi-Key	CP-013D-ND	3-Pin Thru Hole
17	1	J2	JP6	Digi-Key	S1012-02-ND	2-pin header
18	1	L1, L2, L3, L4, L5, L6, L7, L8	FB	Digi-Key	240-2435-2-ND	2-SMD, J-Lead
19	1	Q1	2N3904	Digi-Key	PZT3904	SOT-223
20	1	Q2	2N3906	Digi-Key	PZT3906	SOT-223
21	9	R1,R3,R4,R5,R6,R7,R8,R9,R10	15K	Digi-Key	P15KETR-ND	1206
22	14	R38,R39,R40,R41,R42,R43,R44,R45,R46,R47,R48,R49,R50,R51	15K	Digi-Key	P15KAGCT-ND	0201
23	1	R2	10	Digi-Key	P10EMG-ND	1206
24	2	R12,R53	1.5K	Digi-Key	P1.5KETR-ND	1206
25	16	R19,R21,R22,R23,R24,R25,R26,R27,R28,R29,R31,R32,R33,R34,R35,R36	30		P30AGTR-ND	0201
26	13	R30,R37,R52,R54,R55,R56,R57,R58,R59,R60,R61,R62,R63	510	Digi-Key	P510ETR-ND	1206
27	1	R64	1K	Digi-Key	P1.0KETR-ND	1206
28	1	R65	4.7K	Digi-Key	P4.7KETR-ND	1206

Table 5. TUSB2077A EVM Bill of Materials (continued)

Item	Qty	Reference	Value	Vendor	Vendor Part#	Package
29	1	R66	1.8K	Digi-Key	P1.8KETR-ND	1206
30	1	R67	412	Digi-Key	P412FTR-ND	1206
31	1	R68	51	Digi-Key	ERJ-B2AJ510V-ND	1206
32	8	R69,R70,R71,R72,R73,R74,R75,R76	1M	Digi-Key	541-1.00MFTR-ND	1206
33	1	S1	Reset Button	Digi-Key	7914G-000ETR-ND	.
34	9	TP1,TP2,TP3,TP4,TP5,TP6,TP7,TP8,TP9	TEST POINT	Digi-Key	A26541-ND	1-pin
35	1	TP10	BUSPWR	Digi-Key	A26541-ND	1-pin
36	3	TP11,TP12,TP13	GND	Digi-Key	A26541-ND	1-pin
37	1	TP14	PWR	Digi-Key	A26541-ND	1-pin
38	1	U1	JP7	Digi-Key	A31113-ND	3-pin header
39	1	U2	TPS76333	TI	TPS76333	SOT-23
40	1	U3	UsbPort1	Digi-Key	A31726-ND	4-Pin Thru Hole
41	2	U4,U5	TPS2044B	TI	TPS2044	16-Pin SOIC
42	1	U8	UpStreamUsbPort	Digi-Key	A98573-ND	4-Pin Thru Hole
43	1	U9	TUSB2077A	TI	TUSB2077A	48-Pin PT
44	1	U10	UsbPort2	Digi-Key	A31726-ND	4-Pin Thru Hole
45	1	U11	JP1	Digi-Key	A31113-ND	3-pin header
46	1	U12	JP5	Digi-Key	A31113-ND	3-pin header
47	1	U13	UsbPort3	Digi-Key	A31726-ND	4-Pin Thru Hole
48	1	U15	UsbPort4	Digi-Key	A31726-ND	4-Pin Thru Hole
49	1	U16	JP2	Digi-Key	A31113-ND	3-pin header
50	1	U17	DIP Socket for 48Mhz OSC	Digi-Key	A100204-ND	8-Pin Dip Socket
51	1	U18	UsbPort5	Digi-Key	A31726-ND	4-Pin Thru Hole
52	1	U20	UsbPort6	Digi-Key	A31726-ND	4-Pin Thru Hole
53	1	U21	UsbPort7	Digi-Key	A31726-ND	4-Pin Thru Hole
54	1	U23	DIP for 93LC46B	Digi-Key	A100204-ND	8-Pin Dip Socket
55	1	U24	JP3	Digi-Key	A31113-ND	3-pin header
56	1	U25	JP4	Digi-Key	A31113-ND	3-pin header
57	5	U28,U29,U30,U31,U32	SN75240	TI	SN75240	8-Pin SOP
58	1	U33	TPS2111	TI	TPS2111	TSSOP
59	1	Y1	6MHz Crystal	Digi-Key	631-1035-2-ND	Surface Mount

7.2 Schematics

Figure 5 and Figure 6 are the schematics for the TUSB2036 EVM and TUSB2077A EVM, respectively.

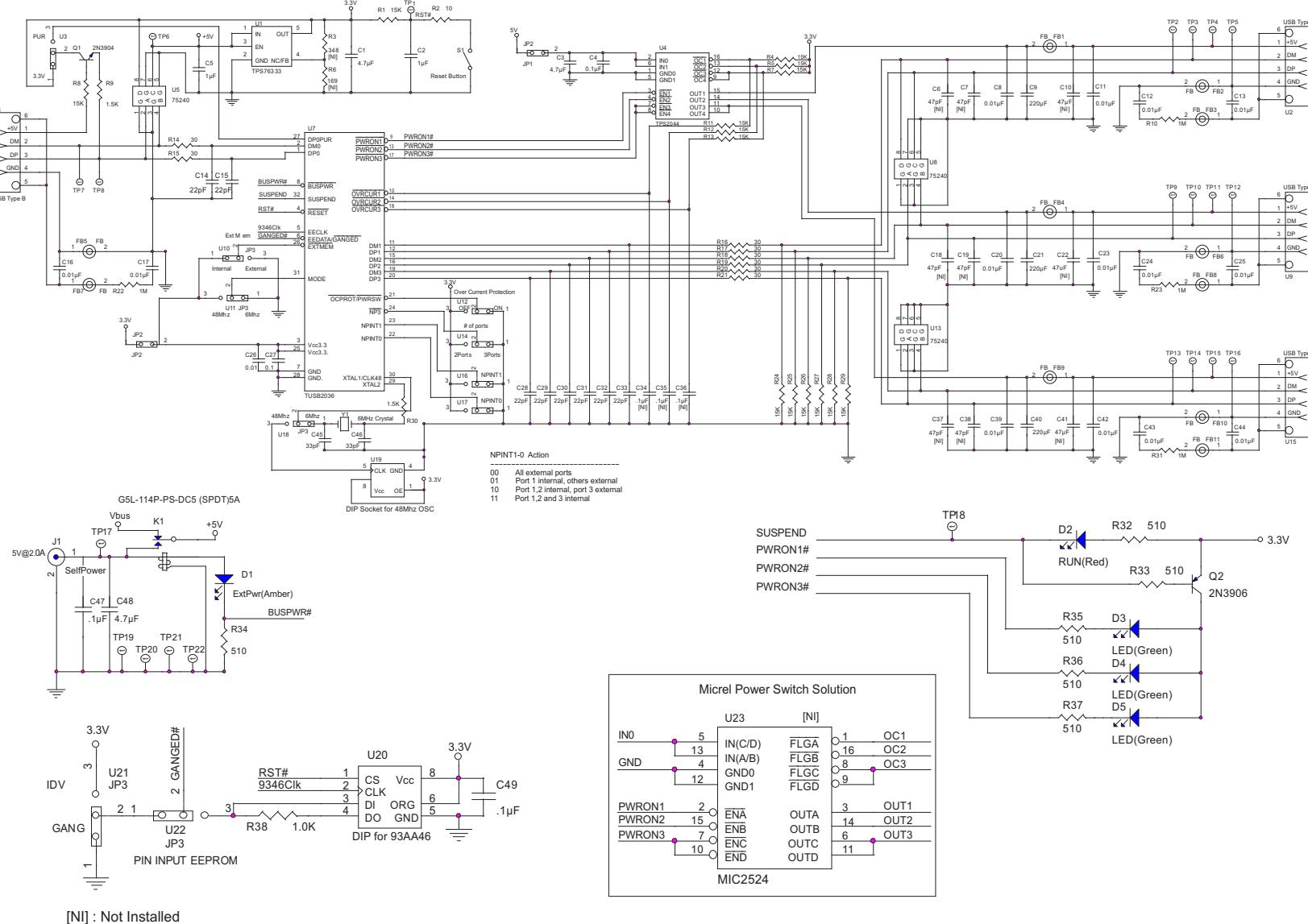
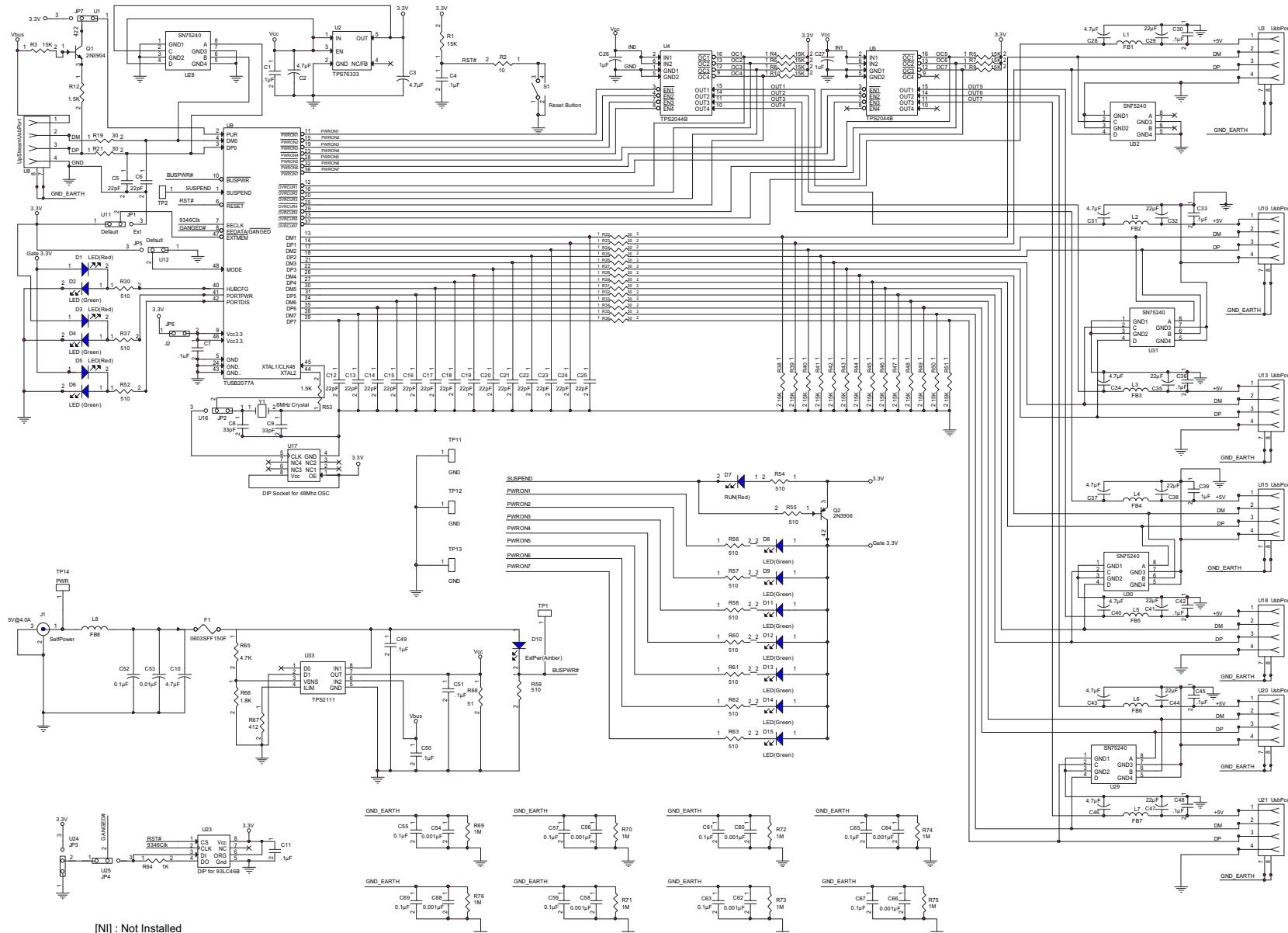


Figure 5. TUSB2036 EVM Schematics


Figure 6. TUSB2077A EVM Schematics

EVALUATION BOARD/KIT/MODULE (EVM) ADDITIONAL TERMS

Texas Instruments (TI) provides the enclosed Evaluation Board/Kit/Module (EVM) under the following conditions:

The user assumes all responsibility and liability for proper and safe handling of the goods. Further, the user indemnifies TI from all claims arising from the handling or use of the goods.

Should this evaluation board/kit not meet the specifications indicated in the User's Guide, the board/kit may be returned within 30 days from the date of delivery for a full refund. THE FOREGOING LIMITED WARRANTY IS THE EXCLUSIVE WARRANTY MADE BY SELLER TO BUYER AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED, IMPLIED, OR STATUTORY, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE. EXCEPT TO THE EXTENT OF THE INDEMNITY SET FORTH ABOVE, NEITHER PARTY SHALL BE LIABLE TO THE OTHER FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES.

Please read the User's Guide and, specifically, the Warnings and Restrictions notice in the User's Guide prior to handling the product. This notice contains important safety information about temperatures and voltages. For additional information on TI's environmental and/or safety programs, please visit www.ti.com/esh or contact TI.

No license is granted under any patent right or other intellectual property right of TI covering or relating to any machine, process, or combination in which such TI products or services might be or are used. TI currently deals with a variety of customers for products, and therefore our arrangement with the user is not exclusive. TI assumes no liability for applications assistance, customer product design, software performance, or infringement of patents or services described herein.

REGULATORY COMPLIANCE INFORMATION

As noted in the EVM User's Guide and/or EVM itself, this EVM and/or accompanying hardware may or may not be subject to the Federal Communications Commission (FCC) and Industry Canada (IC) rules.

For EVMs **not** subject to the above rules, this evaluation board/kit/module is intended for use for ENGINEERING DEVELOPMENT, DEMONSTRATION OR EVALUATION PURPOSES ONLY and is not considered by TI to be a finished end product fit for general consumer use. It generates, uses, and can radiate radio frequency energy and has not been tested for compliance with the limits of computing devices pursuant to part 15 of FCC or ICES-003 rules, which are designed to provide reasonable protection against radio frequency interference. Operation of the equipment may cause interference with radio communications, in which case the user at his own expense will be required to take whatever measures may be required to correct this interference.

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 isotope 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 EVMs for RF Products 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.

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

<http://www.tij.co.jp>

【無線電波を送信する製品の開発キットをお使いになる際の注意事項】

本開発キットは技術基準適合証明を受けておりません。

本製品のご使用に際しては、電波法遵守のため、以下のいずれかの措置を取っていただく必要がありますのでご注意ください。

1. 電波法施行規則第6条第1項第1号に基づく平成18年3月28日総務省告示第173号で定められた電波暗室等の試験設備でご使用いただく。
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。

上記を遵守頂けない場合は、電波法の罰則が適用される可能性があることをご留意ください。

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>

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. Since the EVM is not a completed product, it may not meet all applicable regulatory and safety compliance standards (such as UL, CSA, VDE, CE, RoHS and WEEE) which may normally be associated with similar items. You assume full responsibility to determine and/or assure compliance with any such standards and related certifications as may be applicable. 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.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2013, Texas Instruments Incorporated

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, enhancements, improvements and other changes to its semiconductor products and services per JESD46, latest issue, and to discontinue any product or service per JESD48, latest issue. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All semiconductor products (also referred to herein as "components") are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its components to the specifications applicable at the time of sale, in accordance with the warranty in TI's terms and conditions of sale of semiconductor products. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by applicable law, testing of all parameters of each component is not necessarily performed.

TI assumes no liability for applications assistance or the design of Buyers' products. Buyers are responsible for their products and applications using TI components. To minimize the risks associated with Buyers' products and applications, Buyers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right relating to any combination, machine, or process in which TI components or services are used. Information published by TI regarding third-party products or services does not constitute a license to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of significant portions of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI components or services with statements different from or beyond the parameters stated by TI for that component or service voids all express and any implied warranties for the associated TI component or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Buyer acknowledges and agrees that it is solely responsible for compliance with all legal, regulatory and safety-related requirements concerning its products, and any use of TI components in its applications, notwithstanding any applications-related information or support that may be provided by TI. Buyer represents and agrees that it has all the necessary expertise to create and implement safeguards which anticipate dangerous consequences of failures, monitor failures and their consequences, lessen the likelihood of failures that might cause harm and take appropriate remedial actions. Buyer will fully indemnify TI and its representatives against any damages arising out of the use of any TI components in safety-critical applications.

In some cases, TI components may be promoted specifically to facilitate safety-related applications. With such components, TI's goal is to help enable customers to design and create their own end-product solutions that meet applicable functional safety standards and requirements. Nonetheless, such components are subject to these terms.

No TI components are authorized for use in FDA Class III (or similar life-critical medical equipment) unless authorized officers of the parties have executed a special agreement specifically governing such use.

Only those TI components which TI has specifically designated as military grade or "enhanced plastic" are designed and intended for use in military/aerospace applications or environments. Buyer acknowledges and agrees that any military or aerospace use of TI components which have **not** been so designated is solely at the Buyer's risk, and that Buyer is solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI has specifically designated certain components as meeting ISO/TS16949 requirements, mainly for automotive use. In any case of use of non-designated products, TI will not be responsible for any failure to meet ISO/TS16949.

Products	Applications		
Audio	www.ti.com/audio	Automotive and Transportation	www.ti.com/automotive
Amplifiers	amplifier.ti.com	Communications and Telecom	www.ti.com/communications
Data Converters	dataconverter.ti.com	Computers and Peripherals	www.ti.com/computers
DLP® Products	www.dlp.com	Consumer Electronics	www.ti.com/consumer-apps
DSP	dsp.ti.com	Energy and Lighting	www.ti.com/energy
Clocks and Timers	www.ti.com/clocks	Industrial	www.ti.com/industrial
Interface	interface.ti.com	Medical	www.ti.com/medical
Logic	logic.ti.com	Security	www.ti.com/security
Power Mgmt	power.ti.com	Space, Avionics and Defense	www.ti.com/space-avionics-defense
Microcontrollers	microcontroller.ti.com	Video and Imaging	www.ti.com/video
RFID	www.ti-rfid.com	TI E2E Community	
OMAP Applications Processors	www.ti.com/omap	e2e.ti.com	
Wireless Connectivity	www.ti.com/wirelessconnectivity		