User's Guide
SLLU277–September 2017

TUSB1042 Evaluation Module

The TUSB1042EVM (EVM) is a VESA USB Type-C™ Alternate Mode redriving switch supporting data rates up to 10 Gbps for a downstream facing port (Host). This guide describes how to bring up the EVM and includes schematics that can be used as reference design for the alternate mode implementations of the host system with the TUSB1042 device.

Contents

List of Figures

List of Tables

Trademarks

1 TUSB1042EVM

Figure 1 illustrates the EVM board.

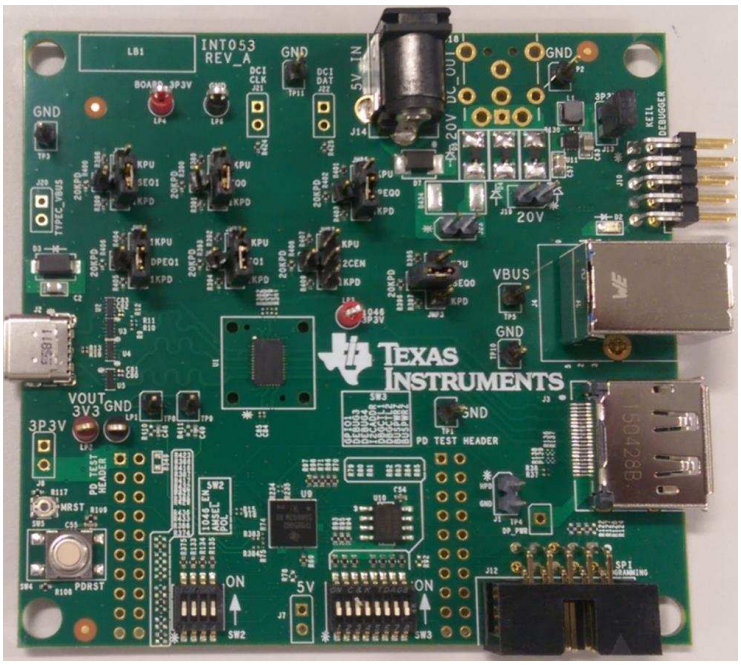


Figure 1. TUSB1042EVM

The TUSB1042EVM can be used with a legacy DP Source or USB Host system to evaluate the USB Type-C implementation. Figure 2 is a typical test set-up.

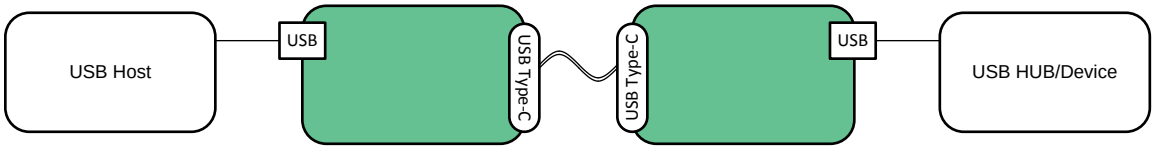


Figure 2. Test Board Setup

The EVM comes with a legacy Type B USB receptacle to connect to USB host systems. The TUSB1042 EVM uses the Texas Instruments TPS65982 (http://www.ti.com/product/TPS65982/product) controller for power delivery and CC pin control.

2 TUSB1042EVM Configuration

This section provides the configuration options available in the TUSB1042EVM.

2.1 TUSB1042 EVM Default EQ Configuration

The following headers are provided for TUSB1042 EQ configuration by default, configuration settings may need to be optimized depending on the amount of loss of each channel in the system.

Table 1. TUSB1042 Configuration Pins

Reference Designator	JMP Control	Configuration
JMP1	Downstream EQ0	No Connect
JMP2	Downstream EQ1	Shunt on pin 2–4 (20K PD)
JMP3	Upstream SSEQ0	Shunt on pin 2–1 (1K PU)
JMP4	Upstream SSEQ1	Shunt on pin 2–4 (20K PD)

2.2 TUSB1042 EQ Control

Each of the TUSB1042 receiver lanes has individual controls for receiver equalization. Table 2 and Table 3 detail the gain values for each available combination for downstream, upstream and all DisplayPort™ configurations.

Table 2. Configuration Pin-Level Definitions

Level	Settings
0	Option 1: Tie 1KΩ 5% to GND. Option 2: Tie directly to GND.
R	Tie 20K Ω 5% to GND.
F	Float (Leave pin open)
1	Option 1: Tie 1K Ω 5% to V_{CC}. Option 2: Tie directly to V_{CC}.

Table 3. USB 3.1 EQ Settings

USB 3.1 Downstream Facing Ports			USB 3.1 Upstream Facing Ports		
EQ1 Pin Level	EQ0 Pin Level	EQ Gain @ 5 GHz (dB)	SSEQ1 Pin Level	SSEQ0 Pin Level	EQ Gain @ 5 GHz (dB)
0	0	0	0	0	0
0	R	1	0	R	1
0	F	2	0	F	2
0	1	3	0	1	3
R	0	4	R	0	4
R	R	5	R	R	5
R	F	6	R	F	6
R	1	7	R	1	7
F	0	8	F	0	8
F	R	9	F	R	9
F	F	10	F	F	10
F	1	11	F	1	11
1	0	12	1	0	12
1	R	13	1	R	13
1	F	14	1	F	14
1	1	15	1	1	15

2.3 Power

The EVM is designed to operate off of the VBUS from a USB host connected via USB Type B J4. No external power to be applied via J14 unless standalone operation is desired.

If testing DisplayPort only, or if bypassing VBUS power, the EVM must be powered via J14 (5-V, 1-A input).

3 TUSB1042EVM Schematics

Figure 3 through Figure 7 illustrate the EVM schematics.

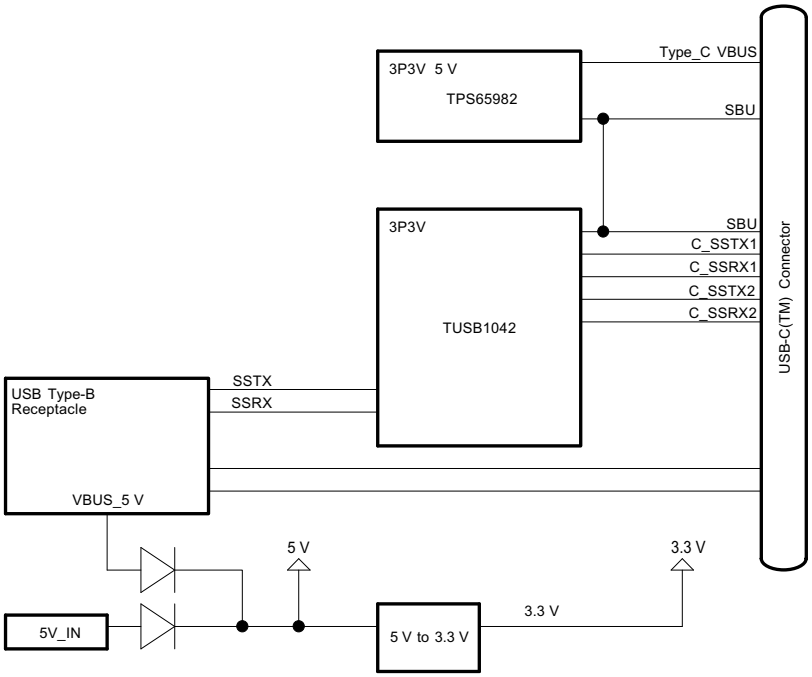
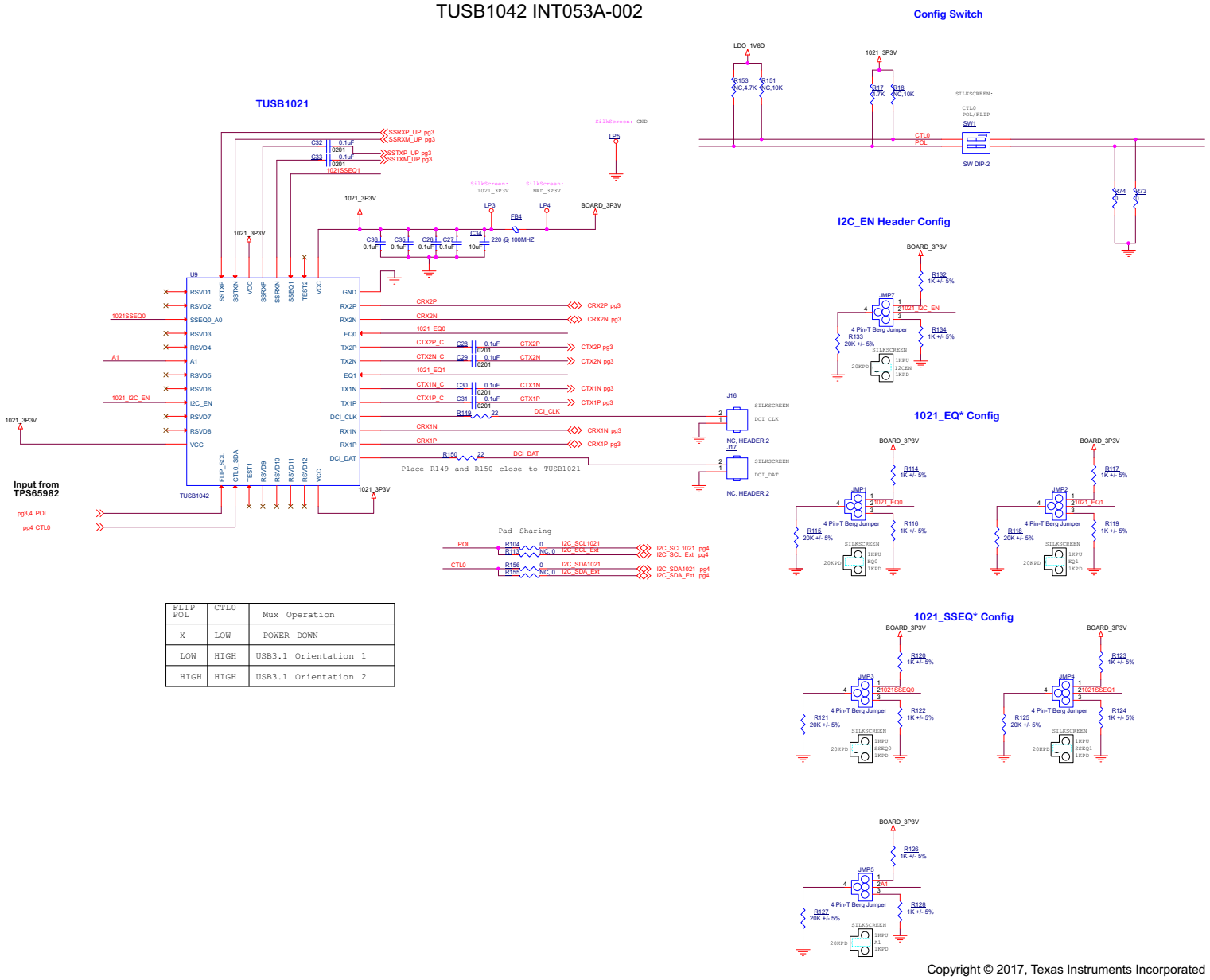


Figure 3. TUSB1042EVM Block Diagram



FLIP POL	CTL0	Mux Operation
X	LOW	POWER DOWN
LOW	HIGH	USB3.1 Orientation 1
HIGH	HIGH	USB3.1 Orientation 2

Figure 4. TUSB1042EVM (Schematic 1 of 4)

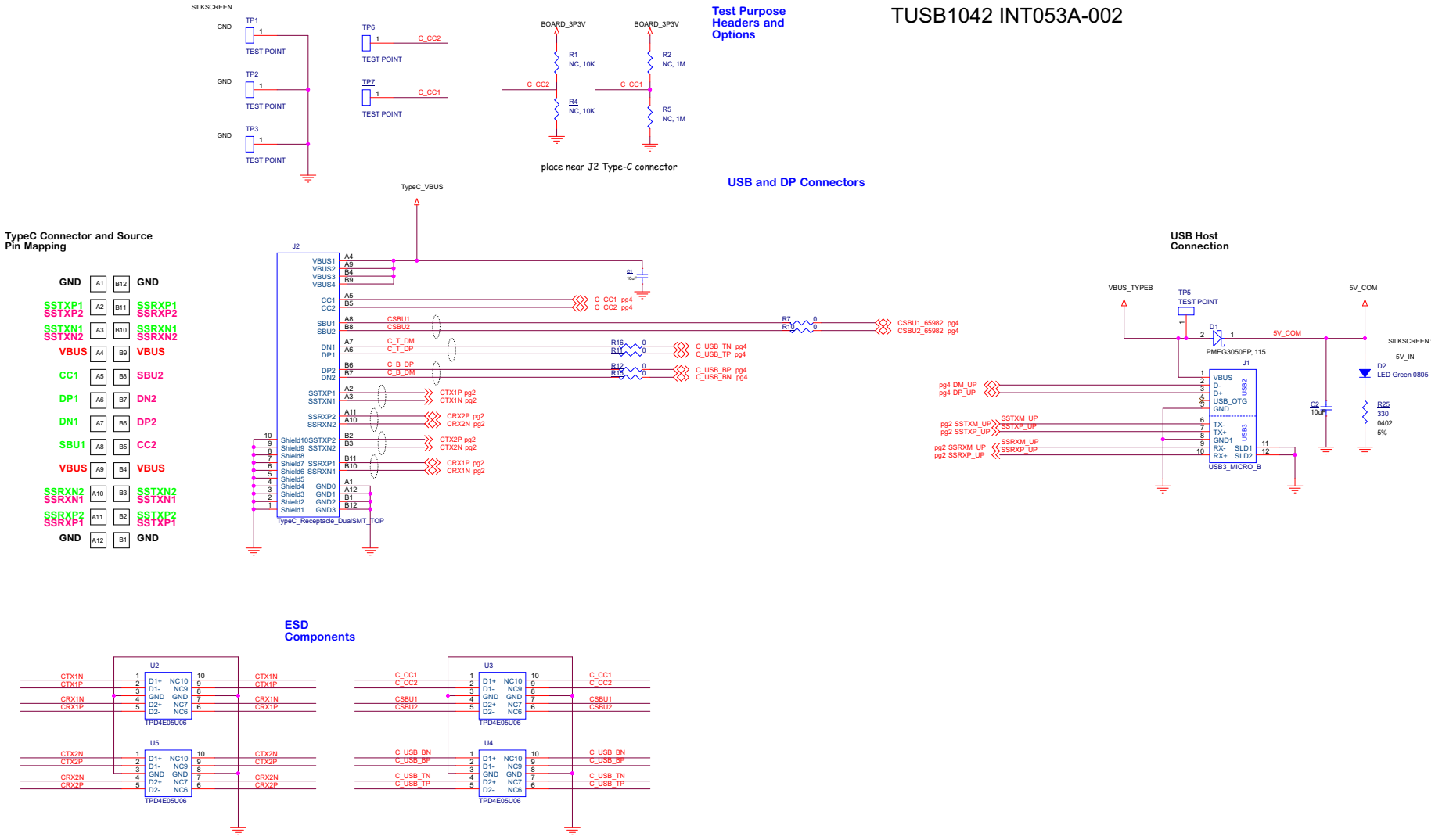


Figure 5. TUSB1042EVM (Schematic 2 of 4)

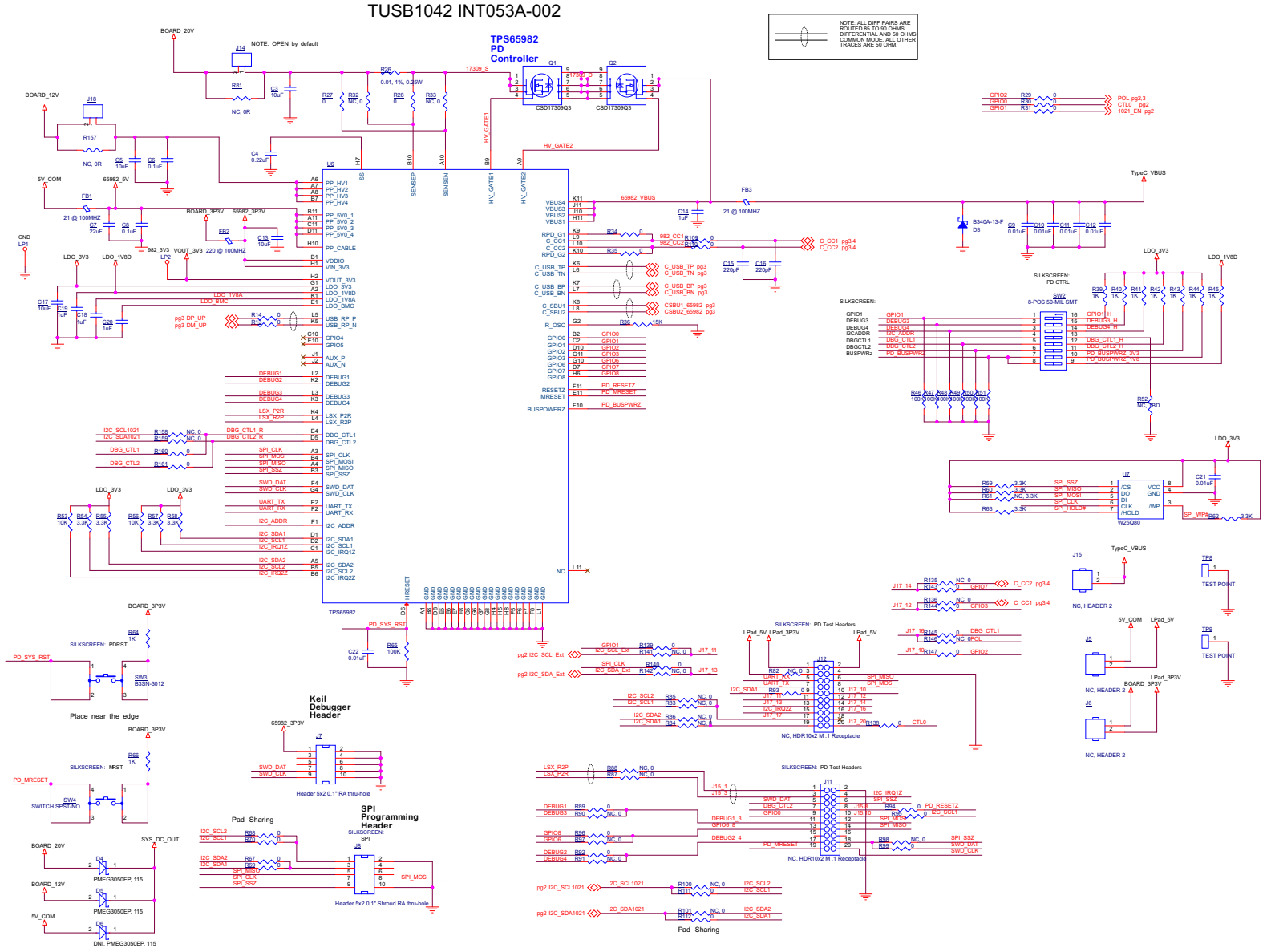


Figure 6. TUSB1042EVM (Schematic 3 of 4)

TUSB1042 INT053A-002

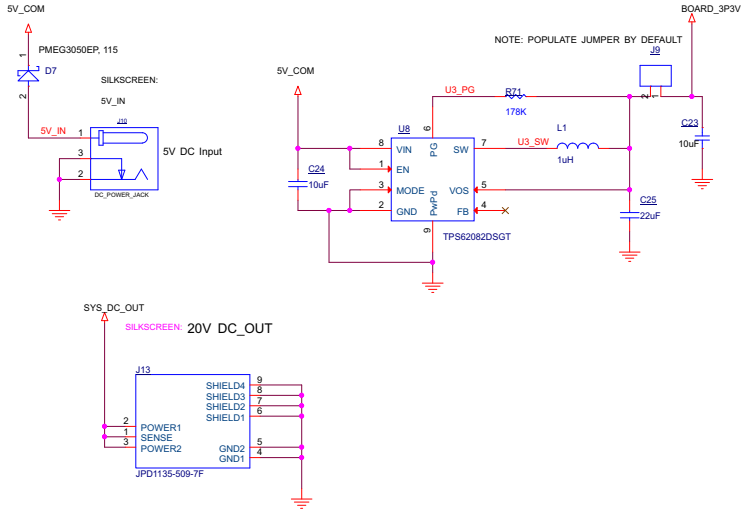


Figure 7. TUSB1042EVM (Schematic 4 of 4)

4 Bill of Materials

Table 4 lists the TUSB1042EVM bill of materials (BOM).

Table 4. TUSB1042EVM Bill of Materials

Item	Qty	Reference	Part	PCB Footprint	Manufacturer	Manufacturer Part Number	Description
1	6	C1,C2,C3,C23,C24,C34	10uF	805	Murata	GRM21BR61C106KE15K	CAP CER 10UF 16V X5R 0805
2	1	C4	0.22uF	402	Murata	GRM152R61A224KE19D	CAP CER 0.22UF 10V X5R 0402
3	2	C5,C17	10uF	603	Murata	GRM188R61C106MA73D	CAP CER 10UF 16V X5R 0603
4	2	C6,C8	0.1uF	402	Murata	GRM155R61A104KA01D	CAP CER 0.1UF 10V X5R 0402
5	1	C7	22uF	603	Murata	GRM188R60J226MEA0D	CAP CER 22UF 6.3V X5R 0603
6	6	C9,C10,C11,C12,C21,C22	0.01uF	402	Murata	GRM155R71C103KA01D	CAP CER 10000PF 16V X7R 0402
7	1	C13	10uF	402	Samsung	CL05A106MP8NUB8	CAP CER 10UF 10V X5R 0402
8	1	C14	1uF	603	Murata	GRM188R61C105KA93D	CAP CER 1UF 16V X5R 0603
9	2	C15,C16	220pF	402	Murata	GRM1555C1H221JA01D	CAP CER 220PF 50V NP0 0402
10	3	C18,C19,C20	1uF	402	Murata	GRM155R60J105ME19D	CAP CER 1UF 6.3V X5R 0402
11	1	C25	22uF	805	Samsung	CL21A226MOCLRNC	CAP CER 22UF 16V X5R 0805
12	10	C26,C27,C28,C29,C30,C31,C32,C33,C35,C36	0.1uF	201	Murata	GRM033R61C104KE84D	CAP CER 0.1UF 16V X5R 0201
13	4	D1,D4,D5,D6	SCHOTTKY	diode_smb	NXP	PMEG3050EP,115	DIODE SCHOTTKY 30V 5A SOD128
14	1	D2	LED Green 0805	805	Lumex	SML-LX0805GC-TR	LED GREEN CLEAR 0805 SMD
15	1	D3	B340A-13-F	SMA	Diodes Inc	B340A-13-F	DIODE SCHOTTKY 40V 3A SMA
16	1	D7	SCHOTTKY	DO-214AA	NXP	PMEG3050EP,115	DIODE SCHOTTKY 30V 5A SOD128
17	2	FB1,FB3	21 @ 100MHZ	805	Taiyo Yuden	FBMJ2125HM210NT	FERRITE BEAD 21 OHM 0805 1LN
18	2	FB2,FB4	220 @ 100MHZ	603	Murata	BLM18EG221SN1D	FERRITE BEAD 220 OHM 0603 1LN
19	6	JMP1,JMP2,JMP3,JMP4,JMP5,JMP7	4 Pin-T Berg Jumper	berg2x3tee	Samtec	HTSW-150-08-G-S	CONN HEADER 50POS .100" T/H GOLD
20	0	JMP6	DNI - 4 Pin-T Berg Jumper	berg2x3tee	Samtec	HTSW-150-08-G-S	CONN HEADER 50POS .100" T/H GOLD
21	3	J1,J14,J18	CON02	HDR_THVT_1X2_100_M	FCI	68001-402HLF	BERGSTIK II .100" SR STRAIGHT
22	1	J2	TypeC_Receptacle_DualSMT_TOP	USB_TYPEC_UT1211	Foxconn	UT12113-11601-7H	USB Type C Surface Mount Connector
23	0	J3	DNI - DP SINK-SIDE CONNECTOR	con_DP_SD-47272-001	Molex Inc	472720001	DisplayPort Receptacle Connector 20 Position Surface Mount, Right Angle, Horizontal
24	1	J4	USB3_TYPEB_CONNECTOR	usb3_typeb_ak4aa009	Amphenol Commercial Products	GSB4211311WEU	USB - B USB 3.1, Superspeed+ Receptacle Connector 9 Position Through Hole, Right Angle
25	0	J5,J6,J15,J16,J17	NC, HEADER 2	berg1x2	Omron Electronics Inc-EMC Div	XG8T-0231	JUMPER PLUG 2POS DOUBLE ROW
26	1	J7	Header 5x2 0.1" RA thru-hole	HDR_THRT_68020	Amphenol FCI	68021-210HLF	CONN HEADER 10POS .100 R/A 15AU
27	1	J8	Header 5x2 0.1" Shroud RA thru-hole	HDR_THRT_2X5_100	Amphenol FCI	67997-410HLF	CONN HEADER 10POS .100 STR TIN
28	1	J9	CON02	berg1x2	FCI	68001-402HLF	BERGSTIK II .100" SR STRAIGHT
29	1	J10	DC_PWR_JACK	pj-202ah	CUI Inc.	PJ-202AH	CONN PWR JACK 2.0X6.5MM HIGH CUR
30	0	J11,J12	NC, HDR10x2 M .1 Receptacle	HDR_THVT_2x10_100_F	Sullins Connector Solutions	PPPC102LFBN-RC	20 Position Header Connector 0.100" (2.54mm) Through Hole Gold

Table 4. TUSB1042EVM Bill of Materials (continued)

Item	Qty	Reference	Part	PCB Footprint	Manufacturer	Manufacturer Part Number	Description
31	1	J13	JPD1135-509-7F	Jack_THRT_JPD1135	Foxconn	JPD1135-509-7F	DC POWER PLUG OR JACK
32	2	LP1,LP5	LP	tp_thvt_060_rnd	Keystone Electronics	5011	TEST POINT PC MULTI PURPOSE BLK
33	3	LP2,LP3,LP4,	LP	tp_thvt_060_rnd	Keystone Electronics	5010	TEST POINT PC MULTI PURPOSE BLK
34	1	L1	1uH	IND_NR3015	Taiyo Yuden	NR3015T1R0N	FIXED IND 1UH 2.1A 36 MOHM SMD
35	2	Q1,Q2	MOS_P_4D_3S	Q3_SON-8	Texas Instruments	CSD17309Q3	MOSFET N-CH 30V 60A 8SON
36	0	R1,R4	NC, 10K	402	Panasonic Electronic Components	ERJ-2GEJ103X	RES SMD 10K OHM 5% 1/10W 0402
37	0	R2,R5	NC, 1M	402	Panasonic Electronic Components	ERJ-2GEJ105X	RES SMD 1M OHM 5% 1/10W 0402
38	0	R3,R6,R31,R32,R33,R38,R83,R84,R85,R86,R90,R91,R100,R101,R113,R135,R136,R141,R142,R146,R148,R155,R158,R159	NC, 0	402	Panasonic Electronic Components	ERJ-2GE0R00X	RES SMD 0.0OHM JUMPER 1/10W 0402
39	0	R7,R10,R79,R80,R87,R88,R97,R98,R105,R106,R107,R108	NC, 0	201	Panasonic Electronic Components	ERJ-1GN0R00C	RES SMD 0.0OHM JUMPER 1/20W 0201
40	16	R8,R9,R11,R12,R13,R14,R15,R16,R34,R35,R94,R95,R96,R99,R109,R110	0	201	Panasonic Electronic Components	ERJ-1GN0R00C	RES SMD 0.0OHM JUMPER 1/20W 0201
41	2	R17,R19	4.7K	402	Panasonic Electronic Components	ERJ-2GEJ472X	RES SMD 4.7K OHM 5% 1/10W 0402
42	0	R18,R103,R151	NC,10K	402	Panasonic Electronic Components	ERJ-2GEJ103X	RES SMD 10K OHM 5% 1/10W 0402
43	0	R20,R21	NC, 100k	402	Panasonic Electronic Components	ERJ-2GEJ104X	RES SMD 100K OHM 5% 1/10W 0402
44	0	R22,R23	DNI, 0	201	Panasonic Electronic Components	ERJ-1GN0R00C	RES SMD 0.0OHM JUMPER 1/20W 0201
45	0	R24	NC, 5M	201	Panasonic Electronic Components	ERJ-1GEF1004C	RES SMD 1M OHM 1% 1/20W 0201
46	1	R25	330	402	Panasonic Electronic Components	ERJ-2GEJ331X	RES SMD 330 OHM 5% 1/10W 0402
47	1	R26	0.01, 1%, 0.25W	805	Panasonic Electronic Components	ERJ-6BWFR010V	RES SMD 0.01 OHM 1% 1/2W 0805
48	32	R27,R28,R29,R30,R37,R67,R68,R69,R70,R72,R73,R74,R89,R92,R93,R102,R104,R111,R112,R137,R138,R139,R140,R143,R144,R145,R147,R156,R160,R161,R164,R165	0	402	Panasonic Electronic Components	ERJ-2GE0R00X	RES SMD 0.0OHM JUMPER 1/10W 0402
49	1	R36	15K	402	Panasonic Electronic Components	ERJ-2RKF1502X	RES SMD 15K OHM 1% 1/10W 0402
50	21	R39,R40,R41,R42,R43,R44,R45,R64,R66,R114,R116,R117,R119,R120,R122,R123,R124,R126,R128,R132,R134	1K	402	Panasonic Electronic Components	ERJ-2GEJ102X	RES SMD 1K OHM 5% 1/10W 0402
51	7	R46,R47,R48,R49,R50,R51,R65	100K	402	Panasonic Electronic Components	ERJ-2GEJ104X	RES SMD 100K OHM 5% 1/10W 0402
52	0	R52	NC, 100	402	Panasonic Electronic Components	ERJ-2GEJ101X	RES SMD 100 OHM 5% 1/10W 0402
53	3	R53,R56,R154	10K	402	Panasonic Electronic Components	ERJ-2GEJ103X	RES SMD 10K OHM 5% 1/10W 0402

Table 4. TUSB1042EVM Bill of Materials (continued)

Item	Qty	Reference	Part	PCB Footprint	Manufacturer	Manufacturer Part Number	Description
54	8	R54,R55,R57,R58,R59,R60,R62,R63	3.3K	402	Panasonic Electronic Components	ERJ-2GEJ332X	RES SMD 3.3K OHM 5% 1/10W 0402
55	0	R61	NC, 3.3K	402	Panasonic Electronic Components	ERJ-2GEJ332X	RES SMD 3.3K OHM 5% 1/10W 0402
56	1	R71	178K	402	Yageo	RC0402FR-07178KL	RES SMD 178K OHM 1% 1/16W 0402
57	0	R75,R76,R77,R78	NC, 1M	201	Panasonic Electronic Components	ERJ-1GEF1004C	RES SMD 1M OHM 1% 1/20W 0201
58	0	R81,R157	NC, 0R	2512	Vishay Dale	RCL12250000Z0EG	RES SMD 0.0 OHM 2W 2512 WIDE
59	0	R82	NC, 0	603	Yageo	RC0603JR-070RL	RES SMD 0.0OHM JUMPER 1/10W 0603
60	6	R115,R118,R121,R125,R127,R133	20K	402	Panasonic Electronic Components	ERJ-2GEJ203X	RES SMD 20K OHM 5% 1/10W 0402
61	0	R129,R130	DNI - 1K	402	Panasonic Electronic Components	ERJ-2GEJ102X	RES SMD 1K OHM 5% 1/10W 0402
62	0	R131	DNI - 20K	402	Panasonic Electronic Components	ERJ-2GEJ203X	RES SMD 20K OHM 5% 1/10W 0402
63	0	R149,R150	DNI, 20	402	Panasonic Electronic Components	ERJ-2GEJ200X	RES SMD 20 OHM 5% 1/10W 0402
64	0	R152,R153	NC,4.7K	402	Panasonic Electronic Components	ERJ-2GEJ472X	RES SMD 4.7K OHM 5% 1/10W 0402
65	0	R162	DNI, 0	402	Panasonic Electronic Components	ERJ-2GE0R00X	RES SMD 0.0OHM JUMPER 1/10W 0402
66	0	R163	DNI - 0	402	Panasonic Electronic Components	ERJ-2GE0R00X	RES SMD 0.0OHM JUMPER 1/10W 0402
67	1	SW1	4-POS 50-MIL SMT	sw_smvt_dip_4pos_8	C&K(ITT-CANNON)	TDA04H0SB1R	SWITCH DIP 4POS HALF PITCH 24V
68	1	SW2	8-POS 50-MIL SMT	SW_SMVT_SPST_TDA08	C&K(ITT-CANNON)	TDA08H0SB1R	SWITCH DIP 8POS HALF PITCH 24V
69	1	SW3	B3SN-3012	switch_b3sn	Omron Electronics Inc-EMC Div	B3SN-3012P	SWITCH TACTILE SPST-NO 0.05A 24V
70	1	SW4	SWITCH SPST-NO	kmt2_switch	C&K Components	KMT221G HF LFS	SWITCH TACTILE SPST-NO 0.05A 32V
71	8	TP1,TP2,TP3,TP5,TP6,TP7,TP8,TP9	TEST POINT	berg1x1	Samtec	HTSW-101-07-G-S	CONN HEADER 1POS .100" SGL GOLD
72	0	TP4	NC, TEST POINT	berg1x1	Keystone Electronics	1035	TERM TEST POINT SLOTTED .060"DIA
73	1	U1	TUSB1042	SKT_IRONWOOD_C14861_QFN-40	Texas Instruments	TUSB1042RNQR	VESA USB Type-C Alt Mode redriving switch supporting data rates up to 10 Gbps for down facing port (Host).
74	4	U2,U3,U4,U5	TPD4E05U06	DQA	Texas Instruments	TPD4E05U06DQAR	TVS DIODE 5.5VWM 14VC 10SON
75	1	U6	TPS65982	ZQZ_BGA_96	Texas Instruments	TPS65982ABZQZR	IC PWR MGMT CONV 3LDO 96BGA
76	1	U7	W25Q80	SOIC_8_197x157_50	WINBOND	W25Q80DVSNIG	IC FLASH 8MBIT 104MHZ 8SOIC
77	1	U8	TPS62082DSGT	dsg	Texas Instruments	TPS62082DSGT	IC REG BUCK 3.3V 1.2A SYNC 8WSON
78	5	SHUNT			Sullins Connector Solutions	SPC02SYAN	Place set as Table 1.
79	1	LB1	TUSB1042EVM INT053-002	PCB Label 0.650"H x 0.200"W	Texas Instruments	THT-14-423-10	Thermal Transfer Printable Labels, 0.650" W x 0.200" H - 10,000 per roll
80	1	PCB			ANY	INT053	Printed Circuit Board.

STANDARD TERMS FOR EVALUATION MODULES

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.

   1.1 EVMs are intended solely for product or software developers for use in a research and development setting to facilitate feasibility evaluation, experimentation, or scientific analysis of TI semiconductors products. EVMs have no direct function and are not finished products. EVMs shall not be directly or indirectly assembled as a part or subassembly in any finished product. For clarification, any software or software tools provided with the EVM (“Software”) shall not be subject to the terms and conditions set forth herein but rather shall be subject to the applicable terms that accompany such Software

   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.

2 *Limited Warranty and Related Remedies/Disclaimers*:

   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.

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/lsds/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/lsds/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.

【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】 開発キットの中には技術基準適合証明を受けていないものがあります。 技術適合証明を受けていないもの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

3.3.3 *Notice for EVMs for Power Line Communication:* Please see http://www.tij.co.jp/lsds/ti_ja/general/eStore/notice_02.page

電力線搬送波通信についての開発キットをお使いになる際の注意事項については、次のところをご覧ください。http://www.tij.co.jp/lsds/ti_ja/general/eStore/notice_02.page

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.

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.

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, INDEMITY 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.

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

IMPORTANT NOTICE FOR TI DESIGN INFORMATION AND RESOURCES

Texas Instruments Incorporated ('TI") technical, application or other design advice, services or information, including, but not limited to, reference designs and materials relating to evaluation modules, (collectively, "TI Resources") are intended to assist designers who are developing applications that incorporate TI products; by downloading, accessing or using any particular TI Resource in any way, you (individually or, if you are acting on behalf of a company, your company) agree to use it solely for this purpose and subject to the terms of this Notice.

TI's provision of TI Resources does not expand or otherwise alter TI's applicable published warranties or warranty disclaimers for TI products, and no additional obligations or liabilities arise from TI providing such TI Resources. TI reserves the right to make corrections, enhancements, improvements and other changes to its TI Resources.

You understand and agree that you remain responsible for using your independent analysis, evaluation and judgment in designing your applications and that you have full and exclusive responsibility to assure the safety of your applications and compliance of your applications (and of all TI products used in or for your applications) with all applicable regulations, laws and other applicable requirements. You represent that, with respect to your applications, you have all the necessary expertise to create and implement safeguards that (1) anticipate dangerous consequences of failures, (2) monitor failures and their consequences, and (3) lessen the likelihood of failures that might cause harm and take appropriate actions. You agree that prior to using or distributing any applications that include TI products, you will thoroughly test such applications and the functionality of such TI products as used in such applications. TI has not conducted any testing other than that specifically described in the published documentation for a particular TI Resource.

You are authorized to use, copy and modify any individual TI Resource only in connection with the development of applications that include the TI product(s) identified in such TI Resource. NO OTHER LICENSE, EXPRESS OR IMPLIED, BY ESTOPPEL OR OTHERWISE TO ANY OTHER TI INTELLECTUAL PROPERTY RIGHT, AND NO LICENSE TO ANY TECHNOLOGY OR INTELLECTUAL PROPERTY RIGHT OF TI OR ANY THIRD PARTY IS GRANTED HEREIN, including but not limited to any patent right, copyright, mask work right, or other intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information regarding or referencing third-party products or services does not constitute a license to use such products or services, or a warranty or endorsement thereof. Use of TI Resources 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.

TI RESOURCES ARE PROVIDED "AS IS" AND WITH ALL FAULTS. TI DISCLAIMS ALL OTHER WARRANTIES OR REPRESENTATIONS, EXPRESS OR IMPLIED, REGARDING TI RESOURCES OR USE THEREOF, INCLUDING BUT NOT LIMITED TO ACCURACY OR COMPLETENESS, TITLE, ANY EPIDEMIC FAILURE WARRANTY AND ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, AND NON-INFRINGEMENT OF ANY THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

TI SHALL NOT BE LIABLE FOR AND SHALL NOT DEFEND OR INDEMNIFY YOU AGAINST ANY CLAIM, INCLUDING BUT NOT LIMITED TO ANY INFRINGEMENT CLAIM THAT RELATES TO OR IS BASED ON ANY COMBINATION OF PRODUCTS EVEN IF DESCRIBED IN TI RESOURCES OR OTHERWISE. IN NO EVENT SHALL TI BE LIABLE FOR ANY ACTUAL, DIRECT, SPECIAL, COLLATERAL, INDIRECT, PUNITIVE, INCIDENTAL, CONSEQUENTIAL OR EXEMPLARY DAMAGES IN CONNECTION WITH OR ARISING OUT OF TI RESOURCES OR USE THEREOF, AND REGARDLESS OF WHETHER TI HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

You agree to fully indemnify TI and its representatives against any damages, costs, losses, and/or liabilities arising out of your non-compliance with the terms and provisions of this Notice.

This Notice applies to TI Resources. Additional terms apply to the use and purchase of certain types of materials, TI products and services. These include; without limitation, TI's standard terms for semiconductor products http://www.ti.com/sc/docs/stdterms.htm), evaluation modules, and samples (http://www.ti.com/sc/docs/sampterms.htm).

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