Evaluation Board User Guide
UG-ADRF6612/14

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700 MHz to 3000 MHz Rx Dual Mixer with Integrated Fractional-N PLL and VCO

FEATURES

Full featured evaluation board for the ADRF6612/14
Single Supply: +5V operation

EQUIPMENT NEEDED

Rohde and Schwarz SMA100 CW Generator (3x)
Minicircuits ZFSC-2-2500-S splitter combiner (or equivalent)
Spectrum Analyzer, Keysight PSA series or equivalent
Power supply (5.0 V, 1.0 A)
PC running Windows 7
USB 2.0 port, recommended (USB 1.1 compatible)
ADRF6612/14 evaluation board

SOFTWARE REQUIRED

ADI ADRF6612/14 Software GUI (available at www.analog.com, ADRF6612/14 product page)

INTRODUCTION

This guide is intended to allow the user to quickly power up and run the software for the ADRF6612/14 integrated synthesizer and mixer. It is intended to complement the ADRF6612/14 datasheet. After following the instructions in this guide, the user should be able to operate the ADRF6612/14 evaluation board to obtain optimal performance.

POWER, RF, IF, USB CONNECTIONS

Figure 1 shows the ADRF6612/14 evaluation board with all required connections for proper operation. All of the following connections should be made with power turned off. When all power, RF, IF and USB connections are made, the +5V supply can then be turned on. When power is turned on initially, the 5V supply should draw approximately 500ma. When the device is initially programmed via the ADRF6612/14 GUI and USB interface, this current will change, as described later.

The red and black clips represent +5V and GND. In the upper left, there is an SMA cable which connects to an external PLL reference source. The dual single ended RF inputs (RF1 and RF2) are located on the right side of the board. The IF outputs are located on the top right and bottom right of the board. In the default ADRF6612/14 eval board configuration, the IF outputs are being run single ended by using the baluns on the board so there is only one SMA connected for each IF output.

The USB connector for software interface is located on the lower left side of the eval board. A standard USB cable, PC to mini USB is required to connect this evaluation board to a PC.

The ADRF6612/14 evaluation board provides all of the support circuitry required to operate the ADRF6612/14 in its various modes and configurations. Figure 2 shows the typical bench setup used to evaluate the performance of the ADRF6612/14.

APPLYING POWER

When the +5V supply is first connected and turned on, the eval board will draw about 500ma. When the ADRF6612/14 is programmed through the software GUI and the device is fully operational, this should increase to about 600ma

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REVISION HISTORY

6/15—Revision 0: Initial Version

EVALUATION BOARD HARDWARE

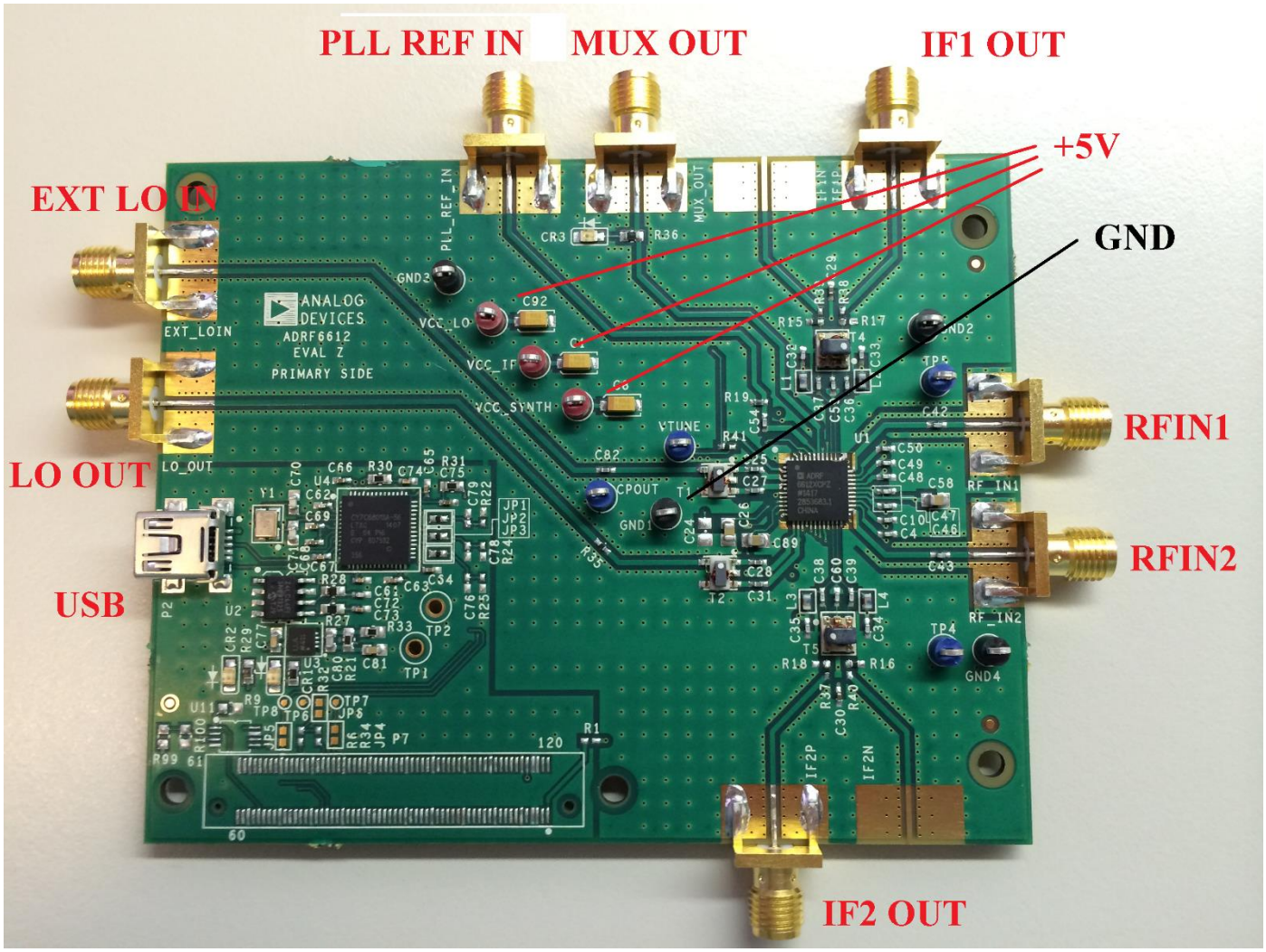

Figure 1. ADRF6612/14 Eval Board with Connections

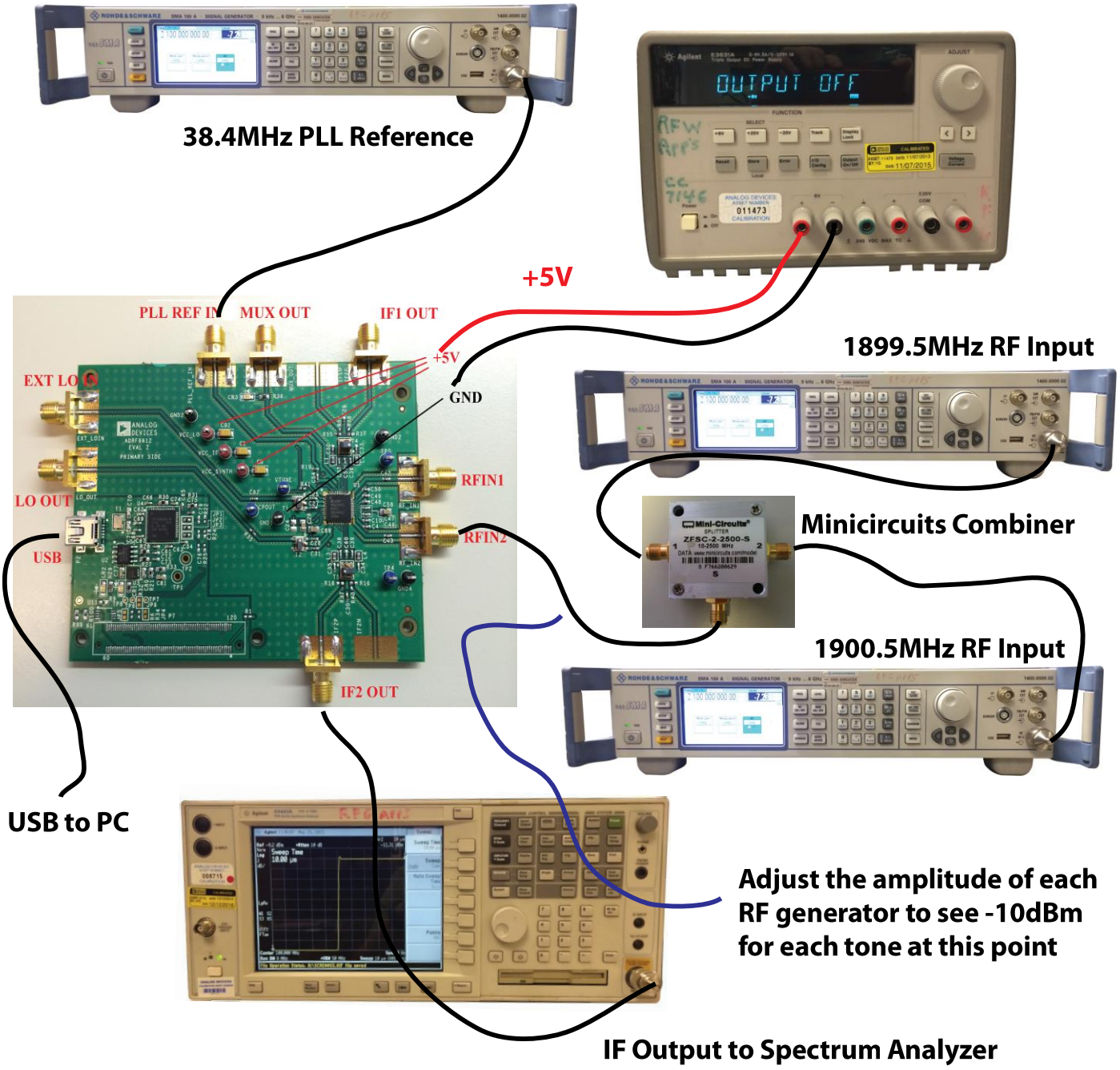

Figure 2. ADRF6612/14 Typical Measurement Setup

SOFTWARE DIRECTORY STRUCTURE

The software comes in the following .zip file;

(ADRF6612_14_rev_2p0p0_customer_install.zip).

When extracted, the included readme file describes how to install the driver for Windows XP, Vista, and Windows 7. This software is compatible with 32 bit and 64 bit systems. When the software installs, the default installation directory should look like Figure 3.

The GUI itself loads its initial values from a .txt file located in the device_save_states subdirectory, as shown in Figure 4. This .txt file can be edited by the user or saved to a different file name in order to modify the start up conditions.

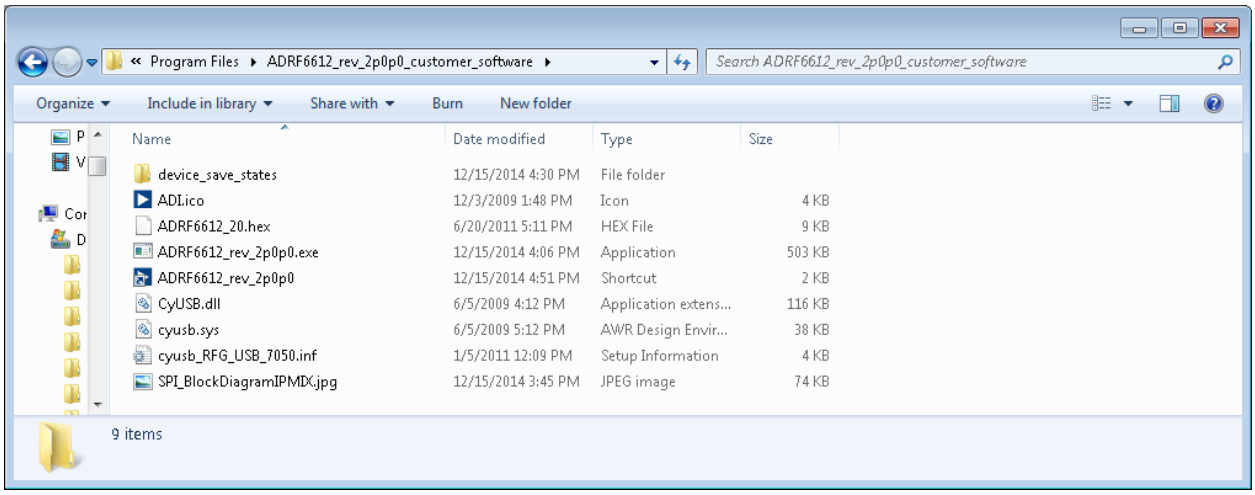

Figure 3. Default Installation Directory for ADRF6612/14 Software

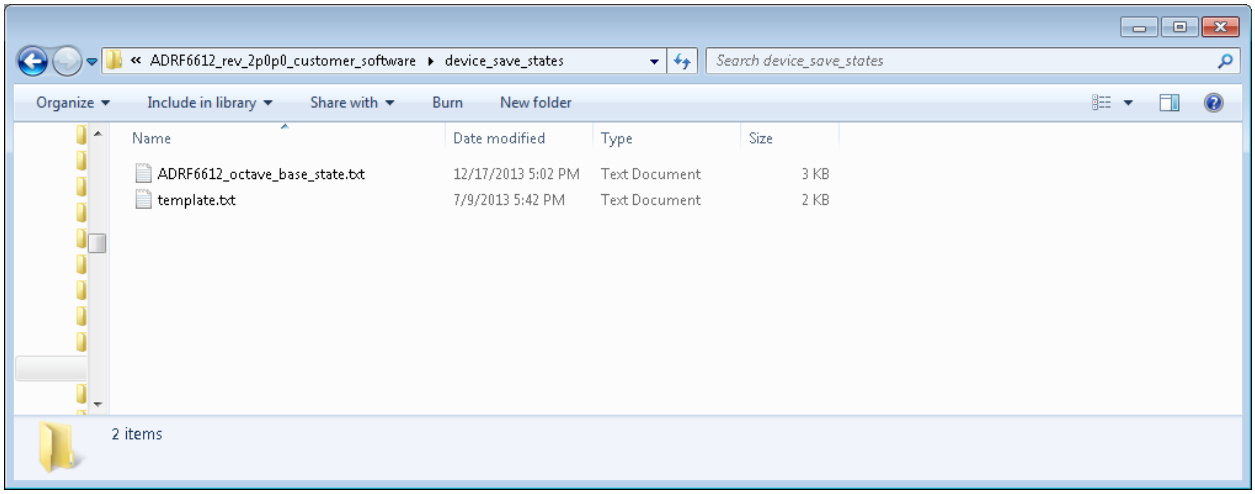

Figure 4. Device_Save_States Subdirectory

SOFTWARE GUI OPERATION, TESTING A NUMBER OF EVAL BOARDS

IMPORTANT – When entering data into any of the text fields in this GUI, the ENTER key must be pressed when the input is complete. This updates the variables in the software so that the ADRF6612/14 is programmed with these values during the next programming step (I.e., selecting a new value from any of the drop down boxes or clicking on the INIT button.

When the software starts, it will load initial values from the .txt files described previously. As an example, when the GUI starts, it should appear as shown in Figure 5. The sequence for setting up the test and programming the ADRF6612/14 for proper operation is as follows;

1. If it hasn't already been done, adjust the amplitude of each generator so that each tone on the output of the combiner is at -10dBm. Ideally, an SMA barrel should be used to connect the combiner output to the RF input of the ADRF6612/14. If this isn't possible, a short as cable as possible should be used to minimize cable loss at this point.
2. Set the spectrum analyzer to a center frequency of 203MHz, with a span of 25MHz, input attenuation = 30dB, VBW and RBW set to auto.
3. Click on the INIT button (lower right). This will load most of the default conditions into the ADRF6612/14 registers.
4. Select the Auto VCO button in the center of the GUI
5. Enter 38.4 in the field (center left) for PLL reference frequency.
6. Enter the value '1' in the first PLL Ref Divider field under the PLL reference field.
7. Click on the button to the right of the PLL Ref Divider field. This selects the divider value of '1' just entered. The PFD frequency field to the right of this button should then change to read 38.4.
8. Click on the Synthesizer Divider Settings in the middle of the GUI. This will bring up the Synthesizer Dialog Box as shown in Figure 6.
9. Set the DIV_MODE field to FRAC mode. Set the LO output frequency to 1697MHz.
10. Click on the SET button.

At this point, if everything has been set up correctly, the spectrum analyzer display should be similar to Figure 7.

This completes the testing of channel 2. To test channel 1, remove the RF connection from RF port 2 and connect it to RF port 1. Also disconnect the IF connection from IF port 2 and connect it to IF port 1. The spectrum analyzer display should be very similar to that seen in Figure 7.

TESTING THE NEXT EVAL BOARD

To test the next evaluation board, disconnect and reconnect all signal, power and USB connections. It is not necessary to close the software GUI. Reconnect all connections on the next board to be tested. When all connections are made, it is only necessary to click on the INIT button to put the next ADRF6612/14 eval board into the completely operational state and again the output spectrum should be visible as shown in Figure 7.

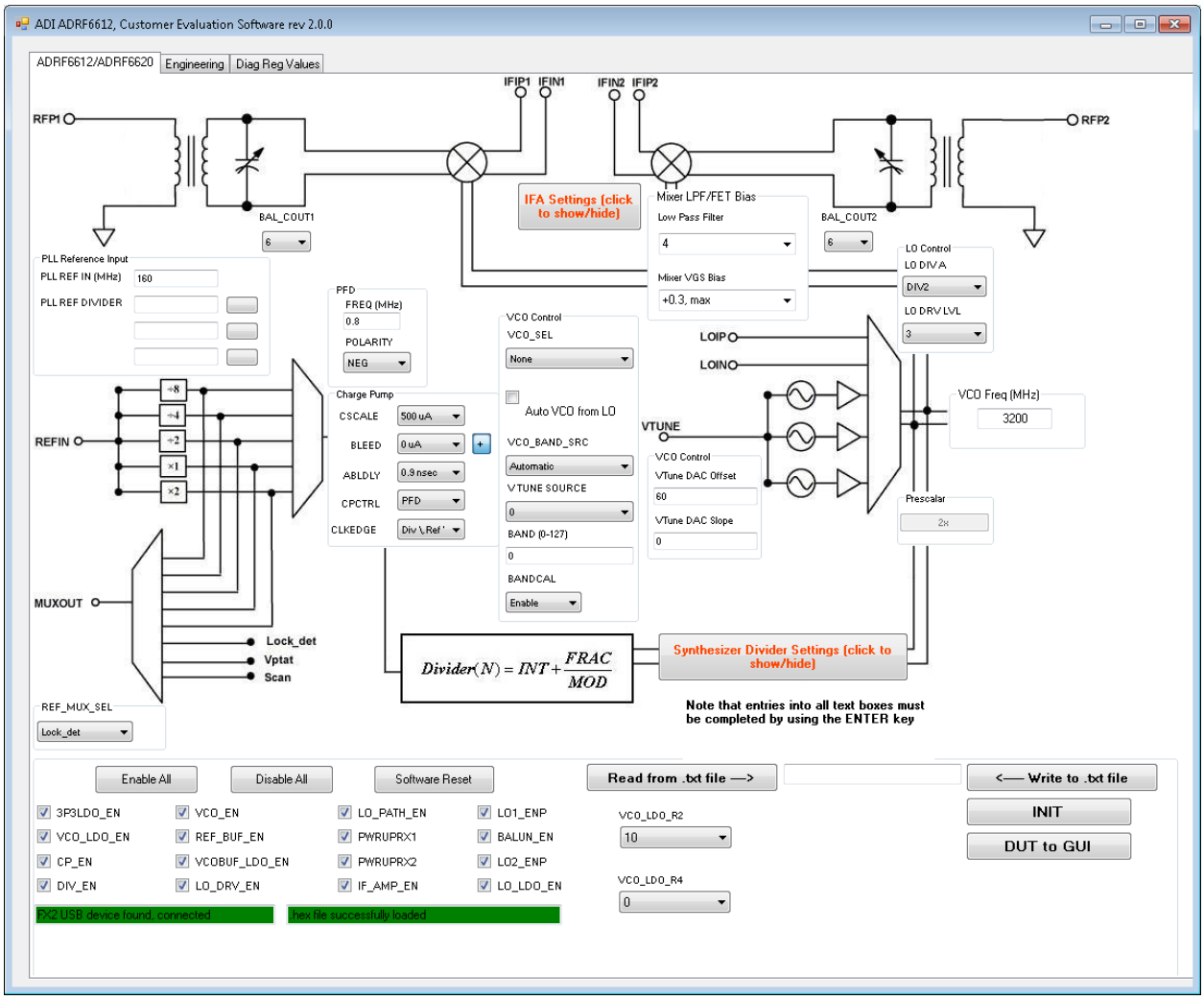

Figure 5. Software GUI for ADRF6612/14, Note that Green Indicators show Proper USB Connection

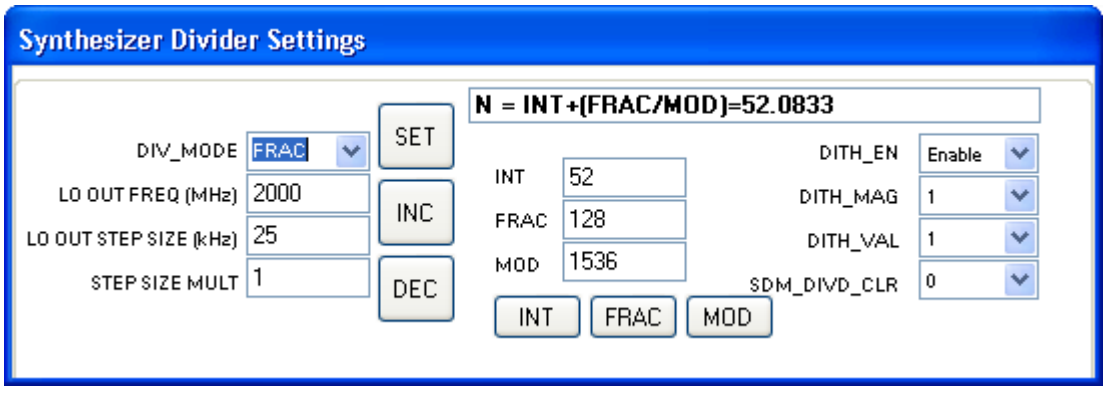

Figure 6. Synthesizer Divider Settings, LO Frequency Dialog Box

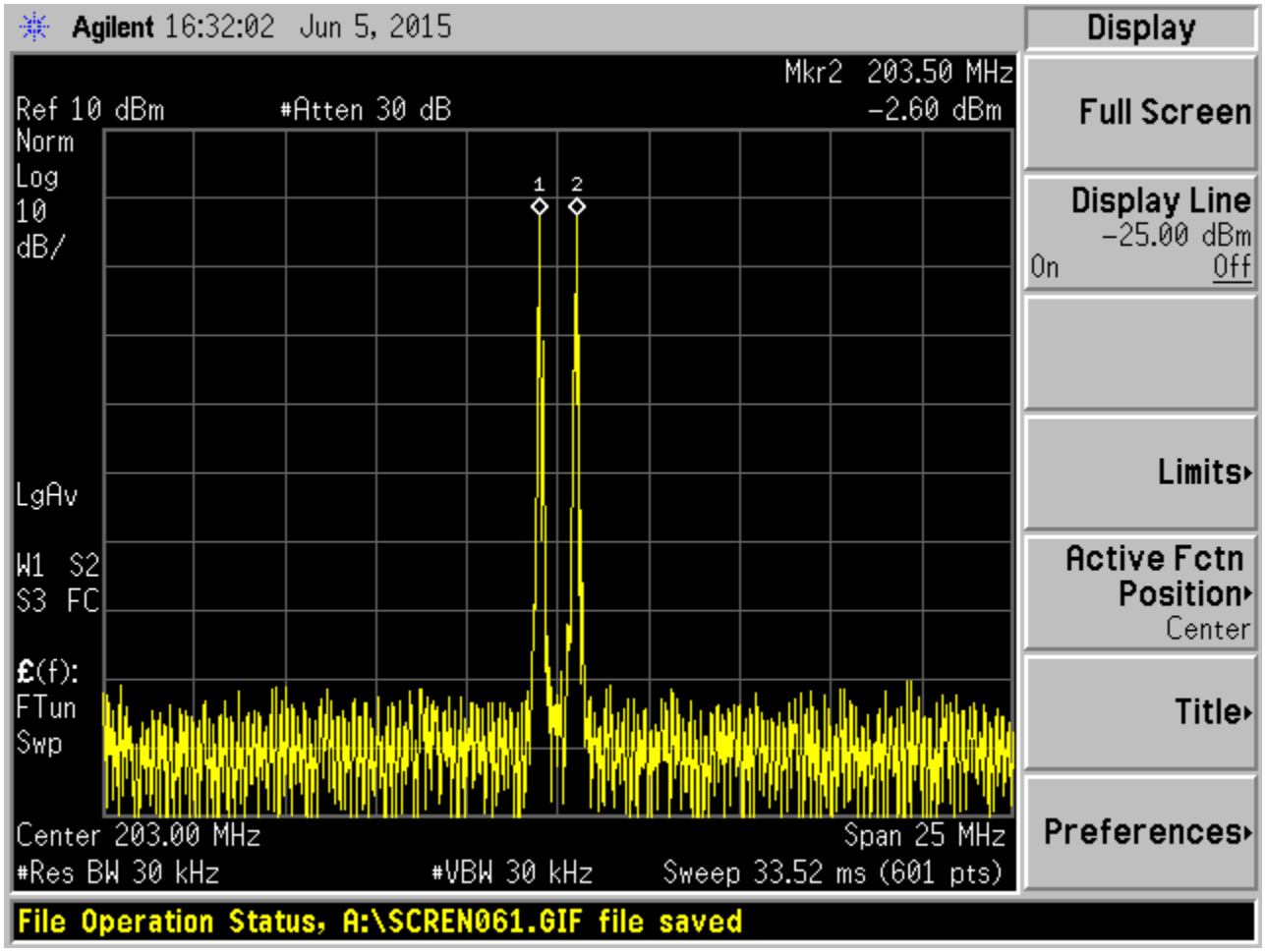

Figure 7. ADRF6612/14 Two Tone Spectral Output

EVALUATION BOARD SCHEMATIC

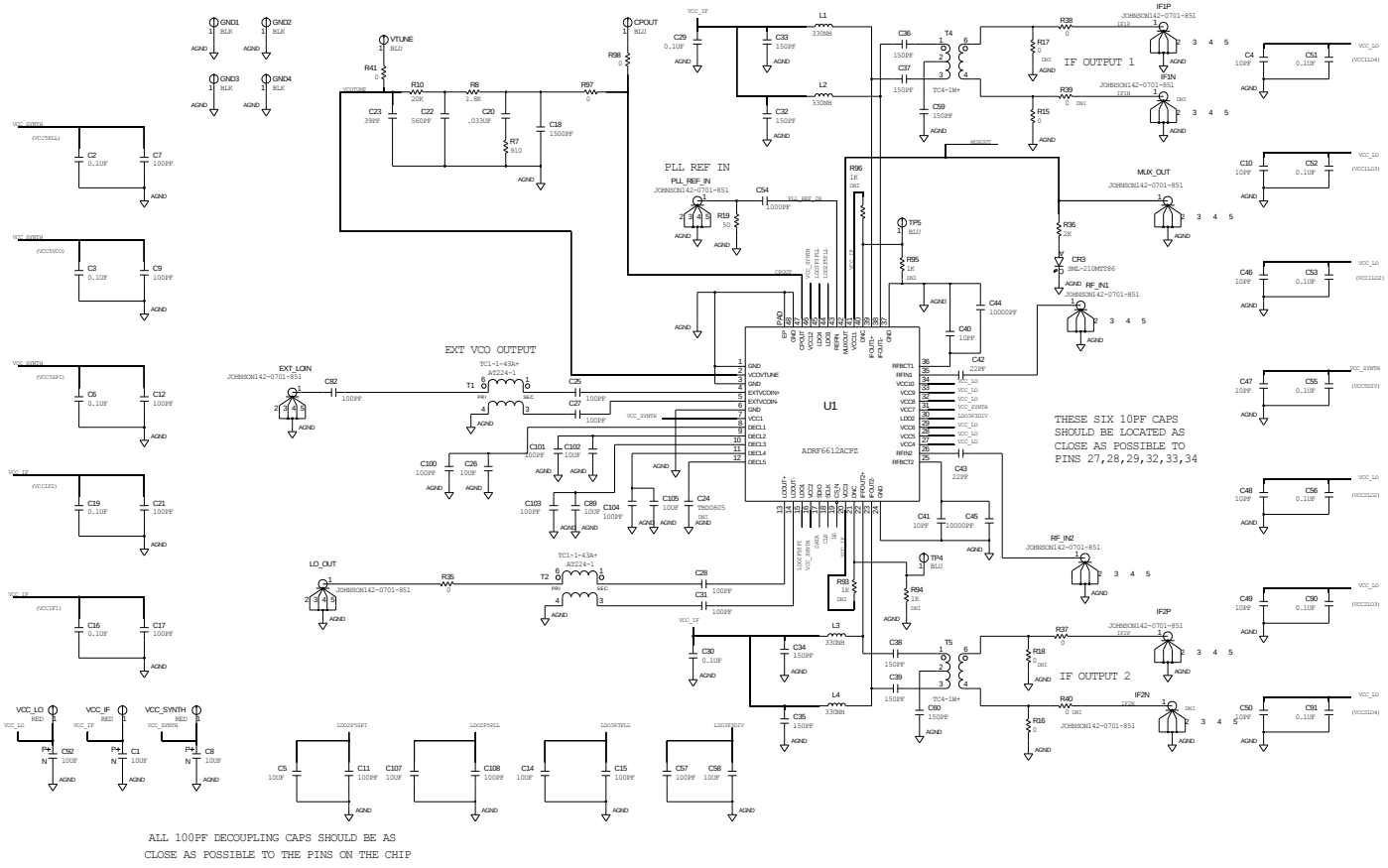

Figure 8. ADRF6612/14 Evaluation Board Schematic, Main Circuitry

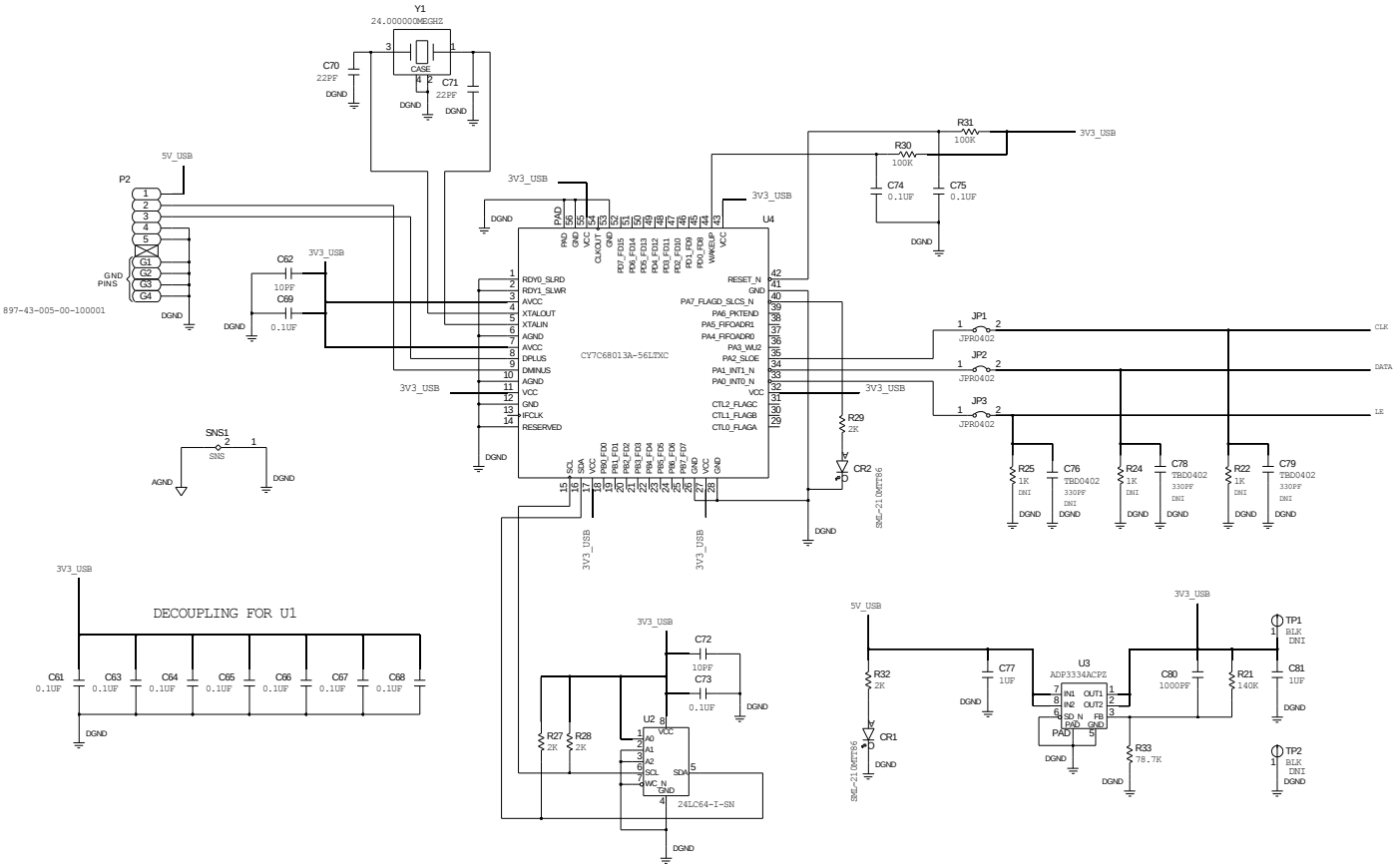

Figure 9. ADRF6612/14 Evaluation Board Schematic, Cypress USB Interface

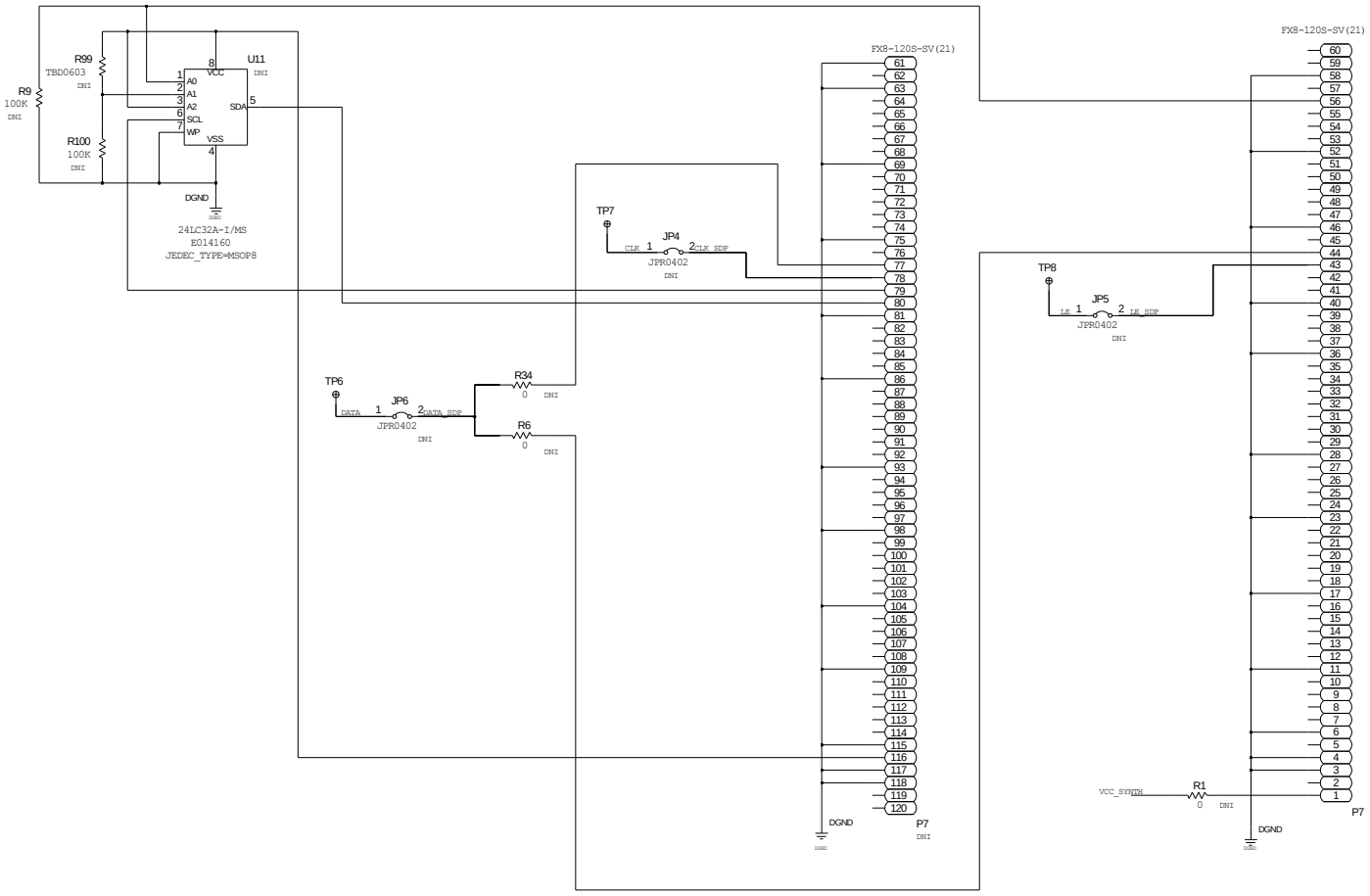

Figure 10. ADRF6612/14 Evaluation Board Schematic, SDP Interface (not presently used)

BILL OF MATERIAL

Table 1.

Qty	Reference Designator	DESCRIPTION	VALUE	MFG	MFG_PN
1	?	PCB	?	Analog Devices Supplied	08_035817c
3	C1,C8,C92	CAP TANT	10UF	AVX	TAJA106K010RNJ
11	C4,C10,C40,C41,C46-C50,C62,C72	CAP CER MULTILAYER NP0 0402	10pF	PHYCOMP (YAGEO)	CC0402JRNP09BN100
18	C7,C9,C11,C12,C15,C17,C21,C25,C27,C28,C31,C57,C82,C100,C101,C103,C104,C108	CAP CHIP MONO CER C0G 0402	100pF	MURATA	GRM1555C1H101JD01D
8	C5,C14,C26,C58,C89,C102,C105,C107	CAP CER MONOLITHIC	10UF	MURATA	GRM21BR61C106KE15L
25	C2,C3,C6,C16,C19,C29,C30,C51-C53,C55,C56,C61,C63-C69,C73-C75,C90,C91	CAP CER X7R 0402	0.1UF	MURATA	GRM155R71C104KA88D
1	C18	CAP CER X7R	1500PF	PHYCOMP (YAGEO)	2238 586 15625
1	C20	CAP CER	.033UF	KEMET	C0603C333J3RACTU
1	C22	CAP MONOLITHIC CER NP0	560pF	MURATA	GRM1885C1H561JA01D
1	C23	CAP CER NP0	39PF	PHYCOMP (YAGEO)	2238 867 15399
10	C32-C39,C59,C60	CAP CER C0G 0402	150pF	MURATA	GRM1555C1H151JA01D
2	C42,C43	CAP CER	22PF	PHYCOMP (YAGEO)	0402CG220J9B200
2	C44,C45	CAP CER CHIP X7R 0402	10000pF	TDK	C1005X7R1E103K
1	C54	CAP CER C0G 0402	1000pF	MURATA	GRM1555C1H102JA01
2	C70,C71	CAP CER NP0	22PF	PHYCOMP (YAGEO)	CC0603JRNP09BN220
2	C77,C81	CAP MONO CER X5R	1UF	MURATA	GRM188R61E105KA12D
1	C80	CAP CHIP MONO CER C0G 0603	1000pF	MURATA	GRM1885C1H102JA01D
4	TP4,TP5,CPOUT,VTUNE	CONN-PCB TST PNT BLU	BLU	COMPONENTS_CORPORATION	TP104-01-06
3	CR1-CR3	LED 570NM WTR CLR 0805 SMD (GREEN)	SML-210MTT86	ROHM	SML-210MTT86
8	IF1P,IF2P,LO_OUT,RF_IN1,RF_IN2,MUX_OUT,EXT_LOIN,PLL_REF_IN	CONN-PCB COAX SMA END LAUNCH	JOHNSON142-0701-851	JOHNSON	142-0701-851
4	GND1-GND4	CONN-PCB TST PNT BLK	BLK	COMPONENTS_CORPORATION	TP-104-01-00
4	L1-L4	INDUCTOR SM	330nH	COILCRAFT	0603CS-R33XJLW
1	P2	CONN-PCB RECEPT MINI-USB TYPE B SMT	897-43-005-00-100001	MILL MAX	897-43-005-00-100001
1	R10	RES PREC THICK FILM CHIP R0402	20K	PANASONIC	ERJ-2RKF2002X

9	R15-R17,R35,R37,R38,R41,R97,R98	USE E003438 FROM CELL RESJMPROPEN OR RESJMPRSHRT	0	PANASONIC	ERJ-2GE0R00X
1	R19	RES HIGH FREQUENCY CHIP 0402	50	VISHAY	FC0402E50R0FST 1
1	R21	RES FILM CHIP THICK	140K	NIC COMP CORP	NRC06F1403TRF
5	R27-R29,R32,R36	RES FILM SMD 0603	2K	YAGEO-PHYCOMP	9C06031A2001FK HFT
2	R30,R31	RES PREC THICK FILM CHIP	100K	PANASONIC	ERJ-3EKF1003V
1	R33	RES PREC THICK FILM CHIP 0603	78.7K	PANASONIC	ERJ-3EKF7872V
1	R7	RES CHIP SMD 0603	910	PANASONIC	ERA-3YEB911V
1	R8	RES THICK FILM CHIP	1.8K	PANASONIC	ERJ-2GEJ182X
2	T1,T2	XFMR RF SMT	TC1-1-43A+	MINI-CIRCUITS	TC1-1-43A+
2	T4,T5	XFMR RF WITH CUSTOMIZED PAD	TC4-1W+	MINI CIRCUITS	TC4-1W+
1	U1	IC-ADI DUAL PASSIVE RECEIVE MIXER PREL	ADRF6612/14ACPZ	ADI	ADRF6612/14ACP Z
1	U2	IC 64KBIT EEPROM	24LC64-I-SN	MICROCHIP	24LC64-I-SN
1	U3	IC-ADI HIGH ACC. LOW IQ ADJ LOW DROP REG	ADP3334ACPZ	ADI	ADP3334ACPZ
1	U4	IC HS USB PERIPHERAL	CY7C68013A-56LTXC	CYPRESS SEMICONDUCTOR	CY7C68013A-56LTXC
3	VCC_IF,VCC_LO,VCC_SYNTH	CONN-PCB TST PNT RED	RED	COMPONENTS_CORPO RATION	TP-104-01-02
1	Y1	IC CRYSTAL SMD	24.000000MEGHZ	NDK	NX3225SA-24.000000MHZ
Qty	LOCATION	DESCRIPTION	VALUE	MFG	MFG_PN
1	C24 (DNI)	DO NOT INSTALL (TBD_C0805)	TBD0805	TBD0805	TBD0805
3	C76,C78,C79 (DNI)	DO NOT INSTALL (TBD_C0402)	TBD0402	TBD0402	TBD0402
2	IF1N,IF2N (DNI)	CONN-PCB COAX SMA END LAUNCH	JOHNSON142-0701-851	JOHNSON	142-0701-851
1	P7 (DNI)	CONN-PCB VERT TYPE RCPT SMD	FX8-120S-SV(21)	HRS	FX8-120S-SV(21)
6	R1,R6,R18,R34,R39,R40 (DNI)	USE E003438 FROM CELL RESJMPROPEN OR RESJMPRSHRT	0	PANASONIC	ERJ-2GE0R00X
2	R9,R100 (DNI)	RES PREC THICK FILM CHIP	100K	PANASONIC	ERJ-3EKF1003V
7	R22,R24,R25,R93-R96 (DNI)	RES PREC THICK FILM CHIP R0402	1K	PANASONIC	ERJ-2RKF1001X
1	R99 (DNI)	DO NOT INSTALL (TBD_R0603)	TBD0603	TBD0603	TBD0603
2	TP1,TP2 (DNI)	CONN-PCB TST PNT BLK	BLK	COMPONENTS_CORPO RATION	TP-104-01-00
1	U11 (DNI)	IC 32KBIT SERIAL EEPROM	24LC32A-I/MS	MICROCHIP	24LC32A-I/MS

NOTES

ESD Caution

ESD (electrostatic discharge) sensitive device. Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

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