MAX2828/MAX2829 Evaluation Kits

General Description

The MAX2828/MAX2829 evaluation kits (EV kits) simplify the testing of the MAX2828/MAX2829. The EV kits provide 50Ω SMA connectors for all RF and baseband inputs and outputs. Differential-to-single-ended and single-ended-to-differential line drivers are provided to convert the differential I/Q baseband inputs and outputs of the MAX2828/MAX2829 to single-ended ports.

The EV kits simplify evaluation of the receive and transmit performance in the corresponding 802.11x bands.

Features

- On-Board Line Drivers and Voltage Reference
- 50Ω SMA and BNC Connectors on All RF and Baseband Ports
- PC Control Software Available at **www.maximintegrated.com**
- 3-Wire Serial Interface

Quick Start

Each EV kit is fully assembled and factory tested. Follow the instructions in the *Connections and Setup* section to test the devices.

Test Equipment Required

This section lists the recommended test equipment to verify the operation of the MAX2828/MAX2829. It is intended as a guide only, and substitutions may be possible.

- MAX2828/MAX2829 EV Kit
- INTF3000+ Interface Board
- DC supply capable of delivering +5.0V and 200mA of continuous current
- DC supply capable of delivering -5.0V and 200mA of continuous current
- DC supply capable of delivering +3.6V and 300mA of continuous current
- HP 8663A or equivalent low-noise signal source capable of generating a 20MHz or 40MHz reference oscillator signal
- One HP 8648s or equivalent signal sources capable of generating 0dBm CW up to 6GHz
- 802.11x CW I/Q waveform generator (optional)
- HP 8561E or equivalent RF spectrum analyzer with a minimum 100kHz to 6GHz frequency range
- TDS3012 or equivalent oscilloscope with 200MHz bandwidth
- PC, laptop, or tablet with Microsoft Windows XP®, Windows 7, 8 OS and a spare USB port
- USB-A male to USB-B male cable

Connections and Setup

This section provides step-by-step instructions for getting the EV kits up and running in all modes (see Figure 1 for EV kit connections):

1) Connect the PC to the INTF3000 interface board using the USB cable. On INTF3000, remove jumper JU1 and connect a DC supply set to 2.7V to the VPULL connector. Connect the 25-pin connector of the INTF3000 (J4) directly to the 25-pin connector on the EV kit (J18).
2) With the power supply turned off, connect a +2.7V power supply to the header labeled VCC (J13). Connect the power-supply ground to the header labeled GND (J12).
3) With the power supply turned off, connect a +5V power supply to the header labeled +5V (J16), and a -5V power supply to the header labeled -5V (J14). Connect the power-supply ground to the header labeled GND (J15).
4) Connect the low-noise signal source to FREF (J9).
5) Turn on the +5V and -5V power supplies, followed by the +2.7V power supply. Set the low-noise signal source to 40MHz and 2dBm. Enable the signal source. The lock indicator should be green.
6) Install and run the MAX2828/MAX2829 control software **HERE**.

Receive Mode

To evaluate the devices in receive mode with CW signal:

1) Set the RXON jumper (JP22) to the ON position and the TXON jumper (JP21) to the OFF position. The supply current should be approximately 125mA.
2) Connect the RF signal source to either RXRFL (J4) for 802.11g frequencies or RXRFH (J3) for 802.11a frequencies. Set the RF frequency to 2437MHz or 5.25GHz. Set the signal power to -100dBm.
3) Set the register setting to the default values listed in the MAX2828/MAX2829 data sheet by selecting "Evaluation Defaults" from the Setup dropdown menu.
4) Use the software to select between 802.11g and 802.11a modes. In the program, set the frequency to either 2442MHz (802.11g) or 5.255GHz (802.11a).
5) Set the RX gain to maximum using either the slider bar or the control bits.
6) Connect the spectrum analyzer to either RXBBI or RXBBQ. Set the center frequency to 5MHz with a 1MHz span. Other recommended spectrum analyzer settings are: Res BW of 1kHz and Ref Level of 10dB.
7) Turn on the RF signal source. The output at 5MHz should be approximately -6dBm (for 802.11g frequencies) or -2dBm (for 802.11a frequencies).

Transmit Mode

To evaluate the devices in transmit mode with CW signal:

1) Set the TXON jumper (JP21) to the ON position and the RXON jumper (JP22) to the OFF position. The supply current should be approximately 130mA.
2) Connect a 1MHz sinusoid to TXBBI and a 1MHz sinusoid with a 90° phase shift (or a cosine) to TXBBQ. Set the input amplitude of each channel to $100mV_{RMS}$.
3) Set the register setting to the default values listed in the MAX2828/MAX2829 data sheet by selecting "Evaluation Defaults" from the Setup dropdown menu.
4) Use the software to select between 802.11g and 802.11a modes. In the program, set the frequency to either 2437MHz or 5.25GHz.
5) Set the TX gain to maximum using either the slider bar or the control bits. Keep the TX Baseband gain to its default value.
6) Connect the spectrum analyzer to either TXRFL (J1) (for 802.11g) or TXRFH (J2) (for 802.11a). Set the center frequency to either 2438MHz or 5251MHz and span to 1MHz. Other recommended spectrum analyzer settings are: Res BW of 3kHz, attenuation of 6dB, and Ref Level of 0dB.
7) Turn on the baseband signal sources. The output at 2438MHz should be approximately -3dBm (for 802.11g frequencies) or the output at 5251MHz should be approximately -5.5dBm (for 802.11a frequencies).

Note: CW signals can be replaced by modulated 802.11a/b/g signals.

Table 1. Jumper Functions

JUMPER	STATE	FUNCTION
JP21	ON	Enables transmit mode. Placing the jumper toward the DB25 connector (J18) puts the device in transmit mode.
JP22	ON	Enables receive mode. Placing the jumper toward the DB25 connector (J18) puts the device in receive mode.

Table 2. Test Points

TP	DESCRIPTION
TP1	This pin allows for direct injection or monitoring of pin TXBBI+.
TP2	This pin allows for direct injection or monitoring of pin TXBBI-.
TP3	This pin allows for direct injection or monitoring of pin RXBBI+.
TP4	This pin allows for direct injection or monitoring of pin RXBBI-.
TP6	This pin allows for direct injection or monitoring of pin TXBBQ+.
TP7	This pin allows for direct injection or monitoring of pin TXBBQ-.
TP10	This pin allows for monitoring of the VCO tune voltage.
TP11	This pin allows for direct injection or monitoring of pin RXBBQ+.
TP12	This pin allows for direct injection or monitoring of pin RXBBQ-.
TP13	This pin allows for monitoring of pin B3.
TP14	This pin allows for monitoring of pin B4.
TP15	This pin allows for monitoring of pin B2.
TP16	This pin allows for monitoring of pin B5.
TP17	This pin allows for monitoring of pin $\overline{SHDN}$.
TP18	This pin allows for monitoring of pin B1.
TP19	This pin allows for monitoring of pin B6.
TP20	This pin allows for monitoring of pin TXENA.
TP21	This pin allows for monitoring of pin RXENA.
TP22	This pin allows for monitoring of pin RXHP.
TP23	This pin allows for monitoring of pin B7.

Layout Considerations

The EV kits can be used as a starting point for layout. For best performance, take into consideration grounding and RF, baseband, and power-supply routing. Make connections from vias to the ground plane as short as possible. On the high-impedance ports, keep traces short to minimize shunt capacitance. EV kit Gerber files can be requested at www.maximintegrated.com.

Power-Supply Layout

To minimize coupling between different sections of the IC, a star power-supply routing configuration with a large decoupling capacitor at a central V_{CC} node is recommended. The V_{CC} traces branch out from this node, each going to a separate V_{CC} node in the circuit. Place a bypass capacitor as close to each supply pin as possible. This arrangement provides local decoupling at each V_{CC} pin. Use at least one throughput per bypass capacitor for a low-inductance ground connection. Do not share the capacitor ground vias with any other branch.

Matching Network Layout

The layout of a matching network is very sensitive to parasitic circuit elements. To minimize parasitic inductance, keep all traces short and place components as close to the IC as possible.

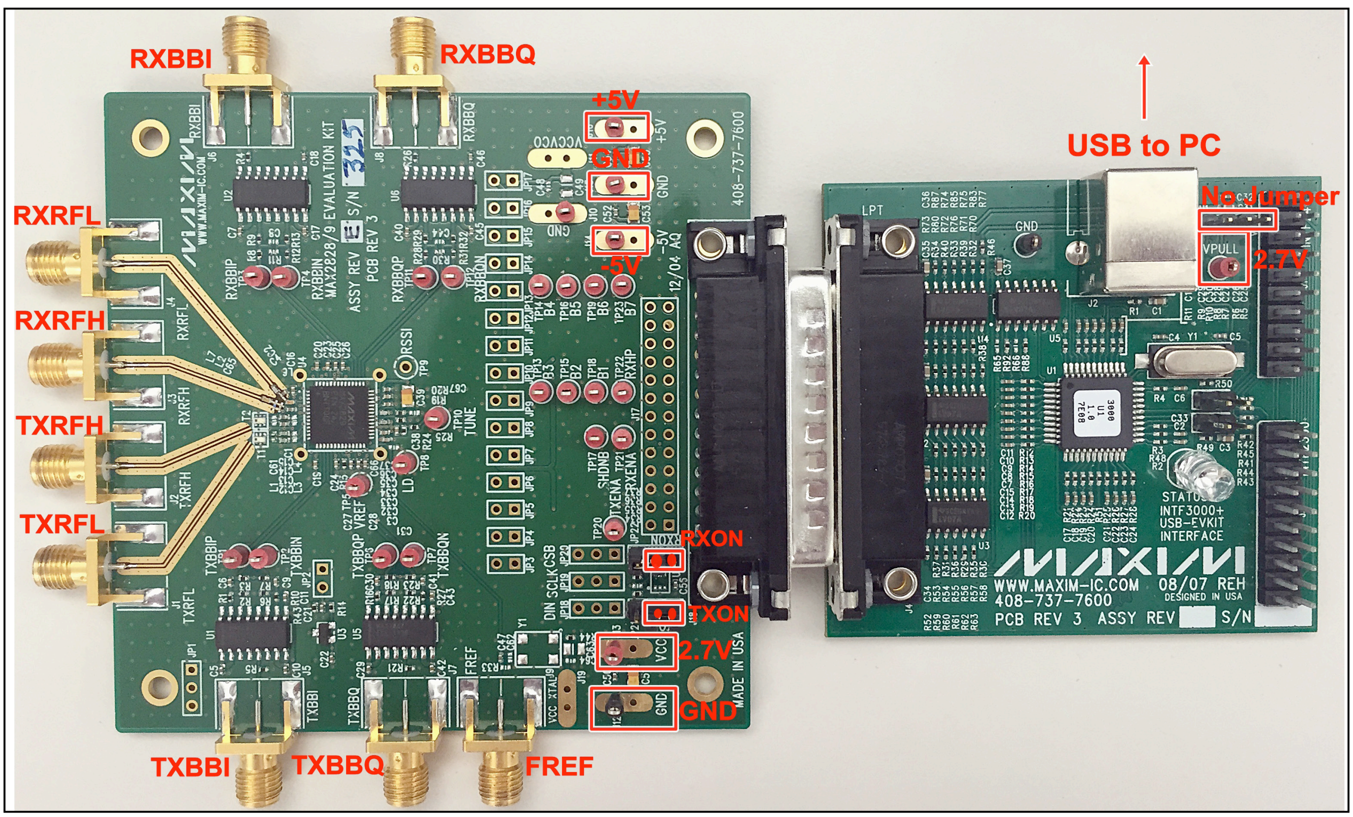


Figure 1. MAX2828/MAX2829 EV Kit Connections

Table 3. I/O Connectors

SIGNAL	DESCRIPTION
J1	802.11b/g Transmitter Output (2.4GHz to 2.5GHz)
J2	802.11a Transmitter Output (4.9GHz to 5.875GHz)
J3	802.11a Receiver Input (4.9GHz to 5.875GHz)
J4	802.11b/g Receiver Input (2.4GHz to 2.5GHz)
J5	Single-Ended Transmitter Baseband I Input
J6	Single-Ended Receiver Baseband I Output
J7	Single-Ended Transmitter Baseband Q Input
J8	Single-Ended Receiver Baseband Q Output
J12	Ground
J13	+2.7V Supply Input
J14	+5V Supply Input
J15	Ground
J16	-5V Supply Input
J18	SPI Interface Connector

Component Suppliers

SUPPLIER	WEBSITE
AVX North America	www.avx.com
Digi-Key Corp.	www.digikey.com
Johnson Components	www.johnsoncomponents.com
Murata Americas	www.murata.com
Texas Instruments Inc.	www.ti.com

Note: *Indicate that you are using the MAX2828/MAX2829 when contacting these component suppliers.*

Component Information, PCB Layout, and Schematic

See the following links for component information, PCB layout diagrams, and schematic.

- MAX2828/MAX2829 EV BOM
- MAX2828/MAX2829 EV PCB Layout
- MAX2828/MAX2829 EV Schematic

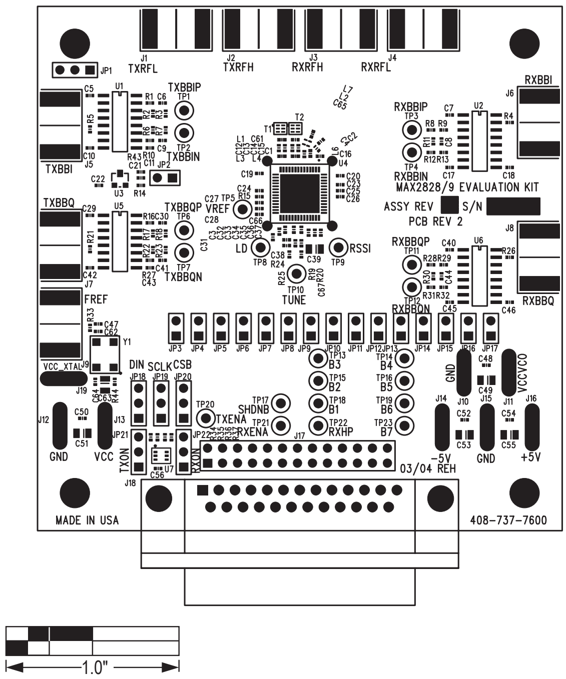
Ordering Information

PART	TYPE
MAX2828EVKIT	EV Kit
MAX2829EVKIT	EV Kit

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	10/04	Initial release	—
1	11/14	Updated *Quick Start* section	2
2	8/15	Updated the *Quick Start* section, added Figure 1	2–4
3	12/15	EV kit updated to reflect conversion to INTF3000 interface board/USB cable from parallel cable	1–5
4	1/16	Syntax errors corrected	1, 2, 4

DESIGNATION	QTY	DESCRIPTION
C1	1	0.5pF ±0.1pF 0402 capacitor Murata GRM1555C1HR50B
C2	1	8.2pF ±0.1pF 0402 capacitor Murata GRM1555C1H8R2B
C3, C66	2	1.0µF ±10% 0402 capacitors Murata GRM155R60J105K
C4	1	1.0pF ±0.1pF 0402 capacitor Murata GJM1555C1H1R0B
C5, C7, C10, C11, C17, C18, C21, C22, C29, C35, C37, C40, C42, C43, C45, C46, C50, C52, C54, C59, C60	21	0.1µF ±10% 0402 capacitors Murata GRM1555R61A104K
C6, C9, C16, C19, C20, C23–C28, C30, C32, C36, C38, C41, C56, C57, C58	19	0.01µF ±10% 0402 capacitors Murata GRM155R71C103K
C12, C13	2	1.8pF ±0.1pF 0402 capacitors Murata GRM1555C1H1R8B
C14, C15	2	1.2pF ±0.1pF 0402 capacitors Murata GJM1555C1H1R2B
C33	1	560pF ±5% 0402 capacitor Murata GRM1555C1H561J
C34	1	150pF ±5% 0402 capacitor Murata GRM1555C1H151J
C39, C51, C53, C55	4	10µF ±20% tantalum capacitors—R case AVX TAJR106M006R
C47	1	100pF ±5% 0402 capacitor Murata GRM1555C1H101J
C65	1	0.5pF ±0.1pF 0201 capacitor Murata GJM0335C1ER50B
J1–J9	9	Connectors—SMA end-launch jack receptacles 0.062in Johnson 142-0701-801
J12–J16, TP1–TP8, TP10–TP23	27	Test points 5000K-ND
J18	1	Connector DB25—right angle, male AMP 747238-4
JP21, JP22	2	1 x 3 headers, 3-pin in-line headers, 100 mils Sullins S1012-36-ND
L1	1	6.8nH ±5% 0402 inductor Murata LQG15HN6N8J00
L2	1	2.0nH ±0.2nH 0201 inductor Murata LQP03TN2N0C00
L6	1	3.6nH ±0.2nH 0402 inductor Murata LQP15MN3N6C00
L7	1	1.8nH ±0.1nH 0402 inductor Murata LQP15MN1N8B02
R1, R2, R6, R10, R16, R17, R22, R27	8	75Ω ±1% 0402 resistors
R3, R7, R18, R23, R25	5	10kΩ ±1% 0402 resistors
R4, R5, R21, R26	4	49.9Ω ±1% 0402 resistors
R8, R9, R12, R13, R19, R28, R29, R31, R32, R36, R42, R44	12	0Ω ±1% 0402 resistors
R14	1	267Ω ±1% 0402 resistor
R15	1	11kΩ ±1% 0402 resistor
R20	1	620Ω ±0.01 0402 resistor
R24	1	300Ω ±0.01 0402 resistor
R34, R37	2	100kΩ ±1% 0402 resistors
R39–R41	3	100Ω ±1% 0402 resistors
R43	1	1kΩ ±1% 0402 resistor
T1	1	HHM1711D1 balun TDK HHM1711D1
T2	1	HHM1732B1 balun TDK HHM1732B1
U1, U5	2	Maxim MAX4447ESE
U2, U6	2	Maxim MAX4444ESE
U3	1	Maxim MAX6061BEUR
U4	1	Maxim MAX2828ETN, MAX2829ETN
U8, U9	2	TI SN74LVTH244ADBR
—	1	PCB: MAX2828/9 EVALUATION KIT


TXRFL
TXRFH
RXRFH
RXRFL
TXBBIP
TXBBIN
TXBBI
RXBBIP
RXBBIN
RXBBI
MAX2828/9 EVALUATION KIT
ASSY REV
S/N
PCB REV 2
TXBBQ
TXBBQP
TXBBQN
VREF
LD
RSSI
TUNE
RXBBQP
RXBBQN
RXBBQ
FREF
VCC_XTAL
DIN
SCLK
CSB
TXENA
SHDNB
RXENA
RXHP
GND
VCC
TXON
RXON
-5V
GND
+5V
VCCVCO
03/04 REH
MADE IN USA
408-737-7600
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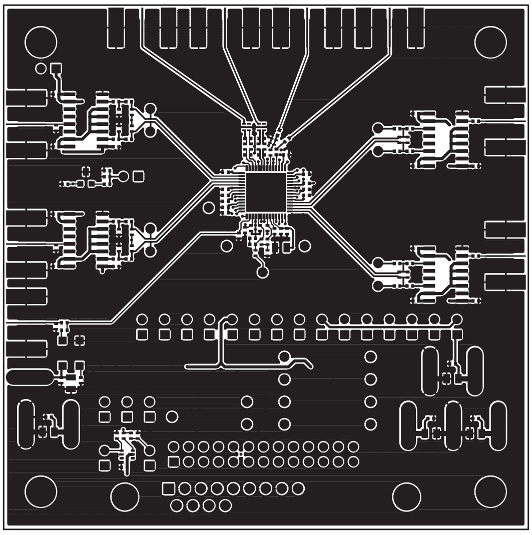

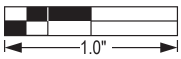
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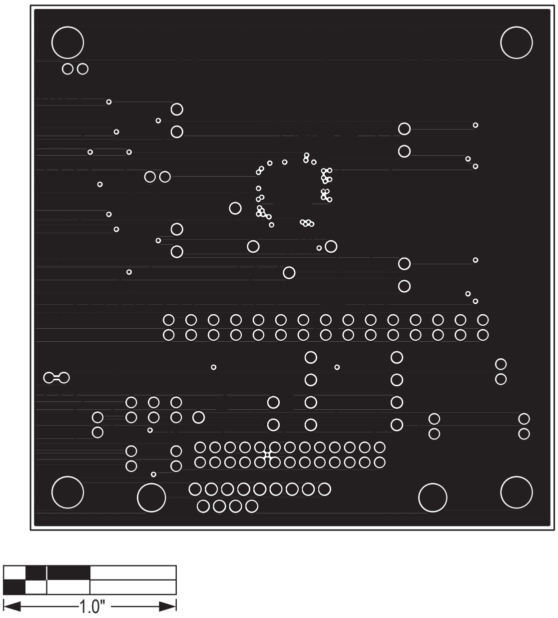
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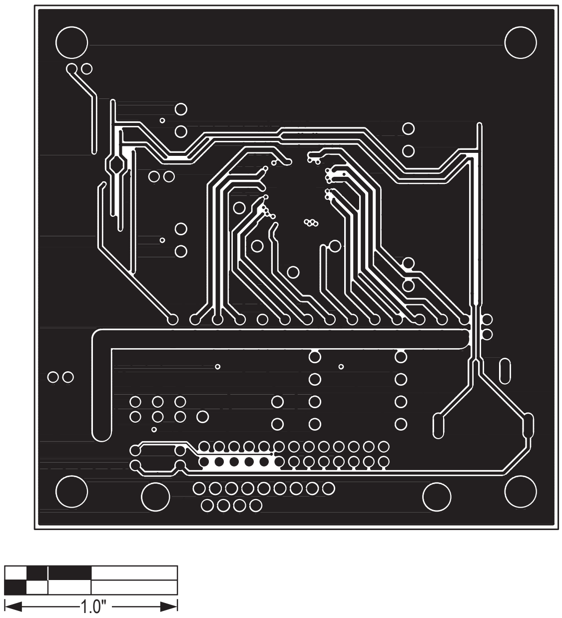
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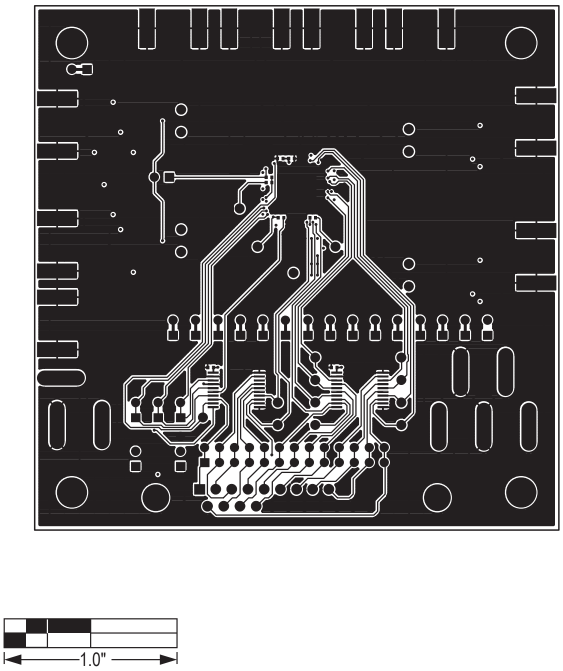

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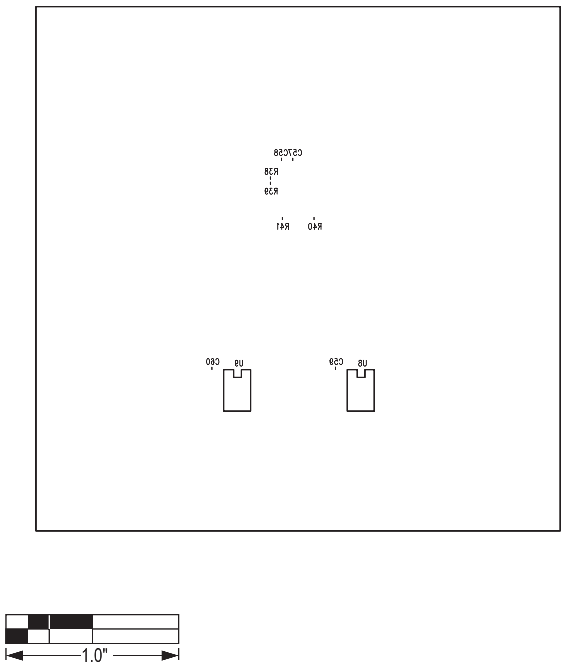
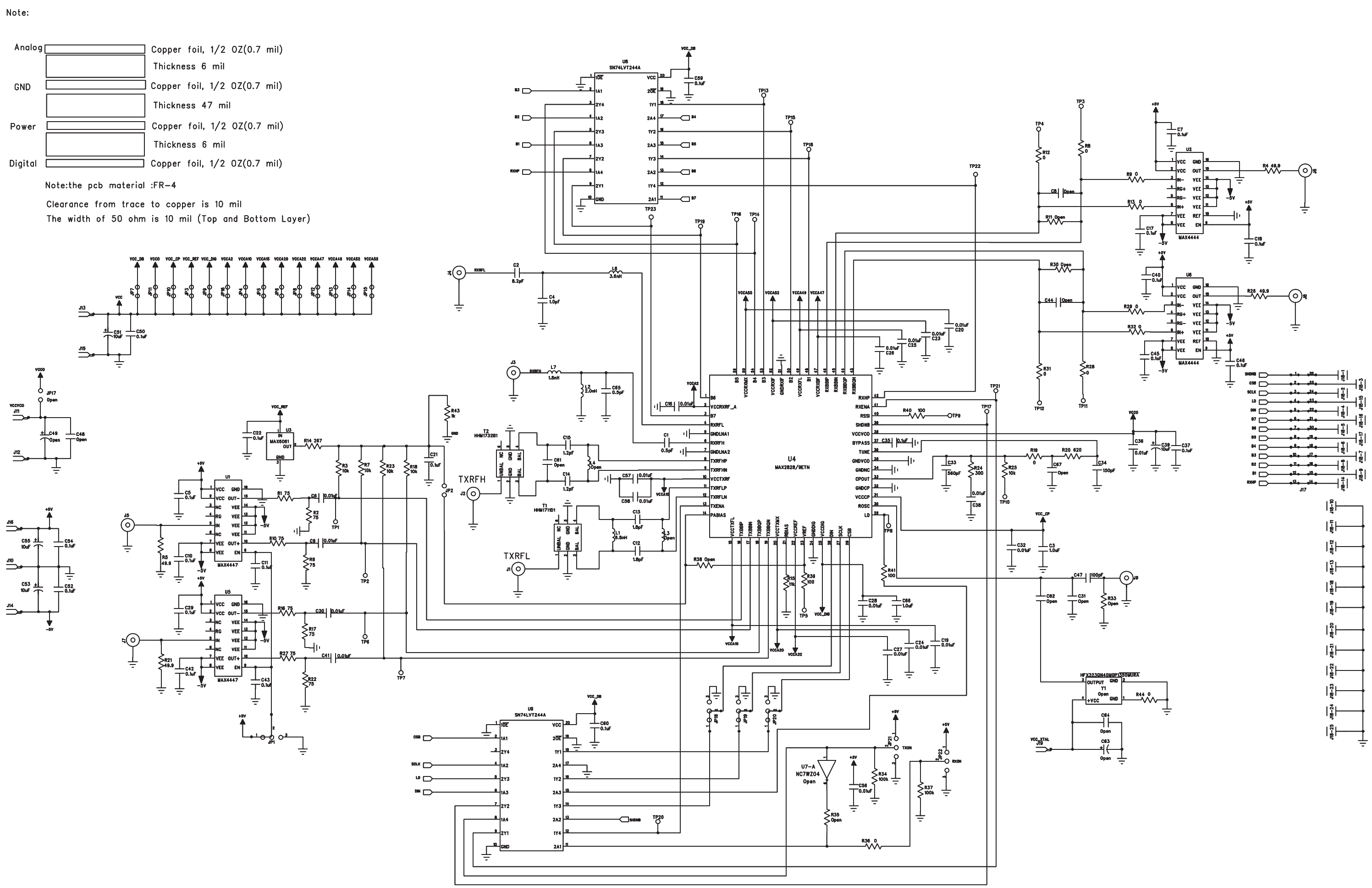

C57C58
R38
R39
R41
R40
C60
U9
C59
U8
1.0"


Note:
Analog — Copper foil, 1/2 OZ(0.7 mil)
Thickness 6 mil
GND — Copper foil, 1/2 OZ(0.7 mil)
Thickness 47 mil
Power — Copper foil, 1/2 OZ(0.7 mil)
Thickness 6 mil
Digital — Copper foil, 1/2 OZ(0.7 mil)
Note:the pcb material :FR-4
Clearance from trace to copper is 10 mil
The width of 50 ohm is 10 mil (Top and Bottom Layer)
TXRFH
TXRFL
U4
MAX2828/9ETN
MAX4444
MAX4447
SN74LVT244A
U7-A
NC7WZ04
Open