General Description

The MAX2851 evaluation kit (EV kit) simplifies testing of the MAX2851 receive and transmit performance in 802.11a applications operating in the 4.9GHz to 5.9GHz ISM band. The EV kit provides 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 to single-ended.

Quick Start

The MAX2851 EV kit is fully assembled and factory tested. Follow the instructions in the *Connections and Setup* section to test the device.

Test Equipment Required

This section lists the recommended test equipment to verify the operation of the MAX2851. It is intended as a guide only, with substitutions possible:

- MAX2851 EV kit
- INTF3000+ interface board
- 20 pin ribbon cable
- DC supply capable of delivering +5V and 200mA of continuous current
- DC supply capable of delivering -5V and 200mA of continuous current
- DC supply capable of delivering +2.85V and 500mA of continuous current
- One signal source capable of generating up to 6GHz
- 802.11a CW I/Q waveform generator or two Agilent 33120A, or equivalent, signal generators
- HP8561E or equivalent RF spectrum analyzer with a minimum 100kHz to 6GHz frequency range
- TDS3012 or equivalent oscilloscope with 200MHz bandwidth
- Agilent 33120A or equivalent digital multimeter
- PC laptop or tablet with Microsoft Windows XP®, Windows® 7, 8 OS and a USB port
- USB-A male to USB-B male cable

Features

- On-Board Line Driver and Voltage Reference
- 50Ω SMA Connectors on All RF and Baseband Ports
- PC Control Software Available at **www.maximintegrated.com**

***Ordering Information* appears at end of data sheet.**

Connections and Setup

This section provides step-by-step instructions for getting the EV kit up and running in all modes:

1) Connect a 20 pin ribbon cable between the 20 pin connector (J2) on the MAX2851 EV kit and the INTF2400 connector (J1) on the INTF3000+ interface board. Make sure pin 1 on EV kit matches with pin 1 on INTF3000+ board.
2) Connect a USB cable between the INTF3000+ interface board and the PC with the MAX2851 control software.
3) Make sure JU1 on the INTF3000+ interface board is open with no jumper.
4) With the output disabled, connect a +2.85V supply to the V_{PULL} header on the INTF3000+ interface board.
5) With the output disabled, connect the +5V supply to the +5V terminal (J7) on the MAX2851 EV Kit.
6) With the output disabled, connect the -5V supply to the -5V terminal (J9) on the MAX2851 EV Kit.
7) With the output disabled, connect a +2.85V supply to the V_{REG} (J3) on the MAX2851 EV Kit.
8) Connect all the supply grounds together and to any of the GND terminals (J4, J6, J8, J10) on the MAX2851 EV Kit.
9) Turn on the +5V, -5V and +2.85V power supplies.
10) Connect a jumper between pin 1 and pin 2 of the RXBBBUF1 header.
11) Install and run the MAX2851 control software, available for download at **HERE**.
12) Note that the “Lock” indicator goes red when the PLL is locked. Also, ignore the “Board Not Connected!” message at the bottom of the GUI.

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Frequency Synthesizer Setup

1) All parameters related to frequency synthesis can be set under the ‘Synth’ page of the MAX2851 control software.
2) The ‘Xtal Reference (MHz)’ box enables user to enter the reference input frequency. Typical reference frequency is 40MHz, when using the on-board crystal.
3) The ‘Xtal Tune’ box enables user to fine tune the crystal frequency.
4) The ‘LO Freq (MHz)’ box allows user to enter the desired LO frequency. Enter 5350MHz as the operating frequency for testing purposes.

Receiver Mode Setup

1) Set the signal generator to accurately deliver -70dBm at 5351MHz.
2) With the generator output disabled, connect the output of signal generator to one of the five receiver input ports (RXRF).
3) Connect the corresponding receiver baseband I/Q outputs (RXBBI and RXBBQ) to an oscilloscope.
4) On the ‘Write’ page of the MAX2851 control software, enter the receive register values shown in Table 1 into the Main and Local registers.
5) At the bottom of the MAX2851 control software, ensure the ENABLE PIN box is set to ‘1’ and ‘RX’ is selected from the ‘Mode’ drop-down menu.
6) On the ‘RX’ page of the EV kit software, select the receiver being tested under ‘MIMO PATH’ and also select it under ‘LNA & VGA Gain by Receiver’’ block.
7) Select the 5.3GHz~5.6GHz LNA band using the drop-down menu under ‘LNA Band’ box.
8) Use the ‘RX LNA Gain’ drop down menu to select ‘111 = Max Gain’ and use the slider bar for ‘RX VGA Gain’ to set it to ‘max gain’.
9) Click on the SEND ALL tab. At this time the supply current for +2.85V supply is around 144mA.
10) At this point, there should be two 1MHz signals on the oscilliscope with roughly 90° phase offset. Use the ‘Xtal Tune’ box to fine-tune to 1MHz, if needed.
11) Alternatively, connect the spectrum analyzer to either RXBBI or RXBBQ. Set the center frequency to 1MHz with a 500kHz span. Other recommended spectrum analyzer settings are: Res BW of 1kHz and Ref Level of 10dB.
12) The output baseband CW tone at 1MHz should be approximately 0dBm.
13) The sideband suppression can be optimized manually through SPI by ‘RX LO IQ Calibration’ value.

Transmitter Mode Setup

1) Connect the TXRF output to a spectrum analyzer. Set the frequency of spectrum analyzer to 5350MHz and span to 10MHz. Other recommended spectrum analyzer settings are: Res BW of 3kHz, Attenuation of 0dB and Ref Level of 0dB.
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) On the ‘Write’ page of the MAX2851 control software, enter the transmit register values shown in Table 2 into the Main and Local registers.
4) At the bottom of the MAX2851 control software, make sure the ‘ENABLE PIN’ box is set to 1 and ‘TX’ is selected from the ‘Mode’ drop-down menu.
5) On the ‘TX’ page of the EV kit software, using the ‘VGA Settings’ block shown in Figure 4, maximize the output power by setting ‘Attenuation Entry’ to 63.
6) Click on the SEND ALL tab. At this time the supply current for +2.85V supply is around 170mA.
7) Measure the voltage at the VCM header on the MAX2851 and adjust R79 to get around 0.9V to 1.1V.
8) On the spectrum analyzer, the transmit output power at 5349MHz should be around -4dBm.
9) The LO leakage at 5350MHz can be optimized manually via SPI by adjusting the offset values shown in the ‘DC Offset Corr. I’ and ‘DC Offset Corr. Q’ boxes.
10) The sideband suppression at 5351MHz can be optimized manually via SPI by adjusting the value in the ‘TX LO I/Q Phase’ box.

Table 1. Typical Receive Register Settings

MAIN REGISTERS				LOCAL REGISTERS			
ADDRESS	HEX VALUE	ADDRESS	HEX VALUE	ADDRESS	HEX VALUE	ADDRESS	HEX VALUE
0	1EB	16	380	0	—	16	000
1	0EF	17	000	1	000	17	000
2	1C0	18	080	2	000	18	000
3	000	19	05F	3	000	19	000
4	31C	20	1EA	4	380	20	000
5	000	21	0BF	5	000	21	000
6	3E1	22	1B8	6	000	22	000
7	024	23	065	7	000	23	000
8	000	24	24F	8	1AA	24	0C4
9	3FF	25	3A8	9	114	25	12B
10	000	26	015	10	354	26	165
11	060	27	180	11	073	27	002
12	—	28	063	12	000	28	004
13	000	29	000	13	000	29	—
14	160	30	000	14	000	30	—
15	242	31	000	15	000	31	000

Table 2. Typical Transmit Register Settings

MAIN REGISTERS				LOCAL REGISTERS			
ADDRESS	HEX VALUE	ADDRESS	HEX VALUE	ADDRESS	HEX VALUE	ADDRESS	HEX VALUE
0	02E	16	380	0	---	16	000
1	0FF	17	000	1	000	17	000
2	1C0	18	080	2	000	18	000
3	000	19	05F	3	000	19	000
4	31C	20	1EA	4	380	20	000
5	000	21	0BF	5	000	21	000
6	3EB	22	1B8	6	000	22	000
7	024	23	065	7	000	23	000
8	000	24	24F	8	1AA	24	0C4
9	3FF	25	3A8	9	114	25	12B
10	000	26	015	10	354	26	165
11	060	27	180	11	073	27	002
12	—	28	063	12	000	28	004
13	000	29	000	13	000	29	—
14	160	30	000	14	000	30	—
15	242	31	000	15	000	31	000

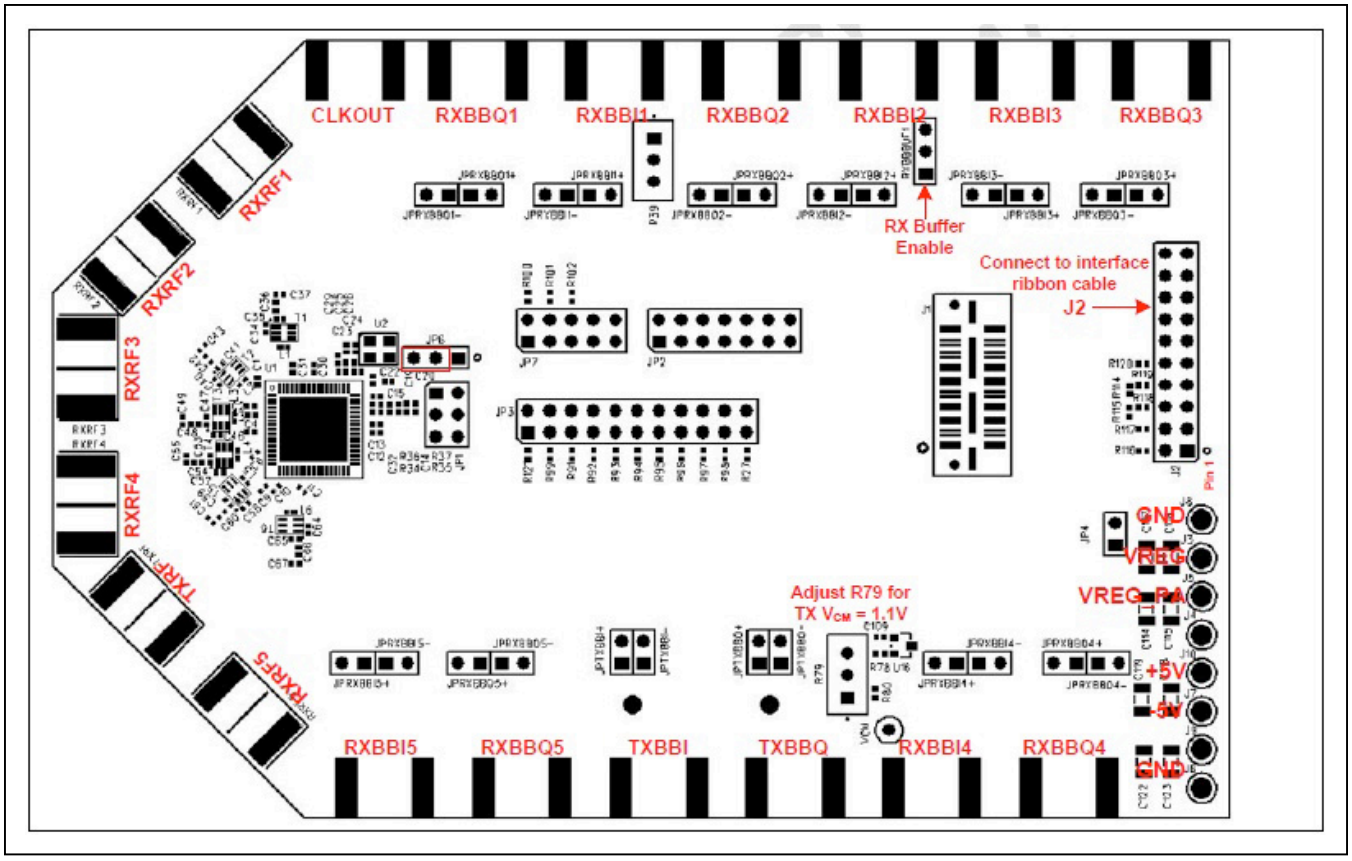


Figure 1. MAX2851 Hardware Connections

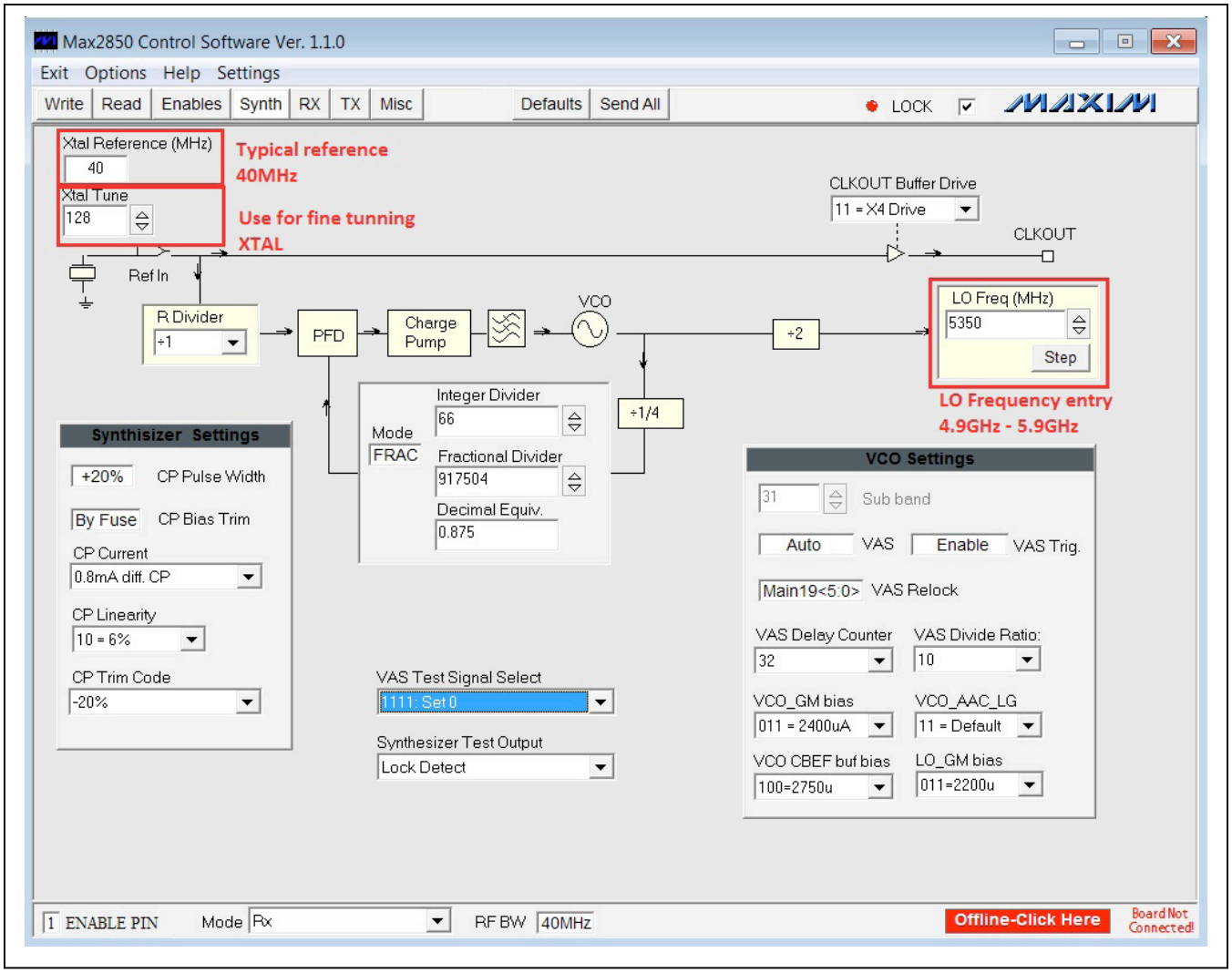


Figure 2. MAX2851 Control Software—Frequency Synthesizer Page

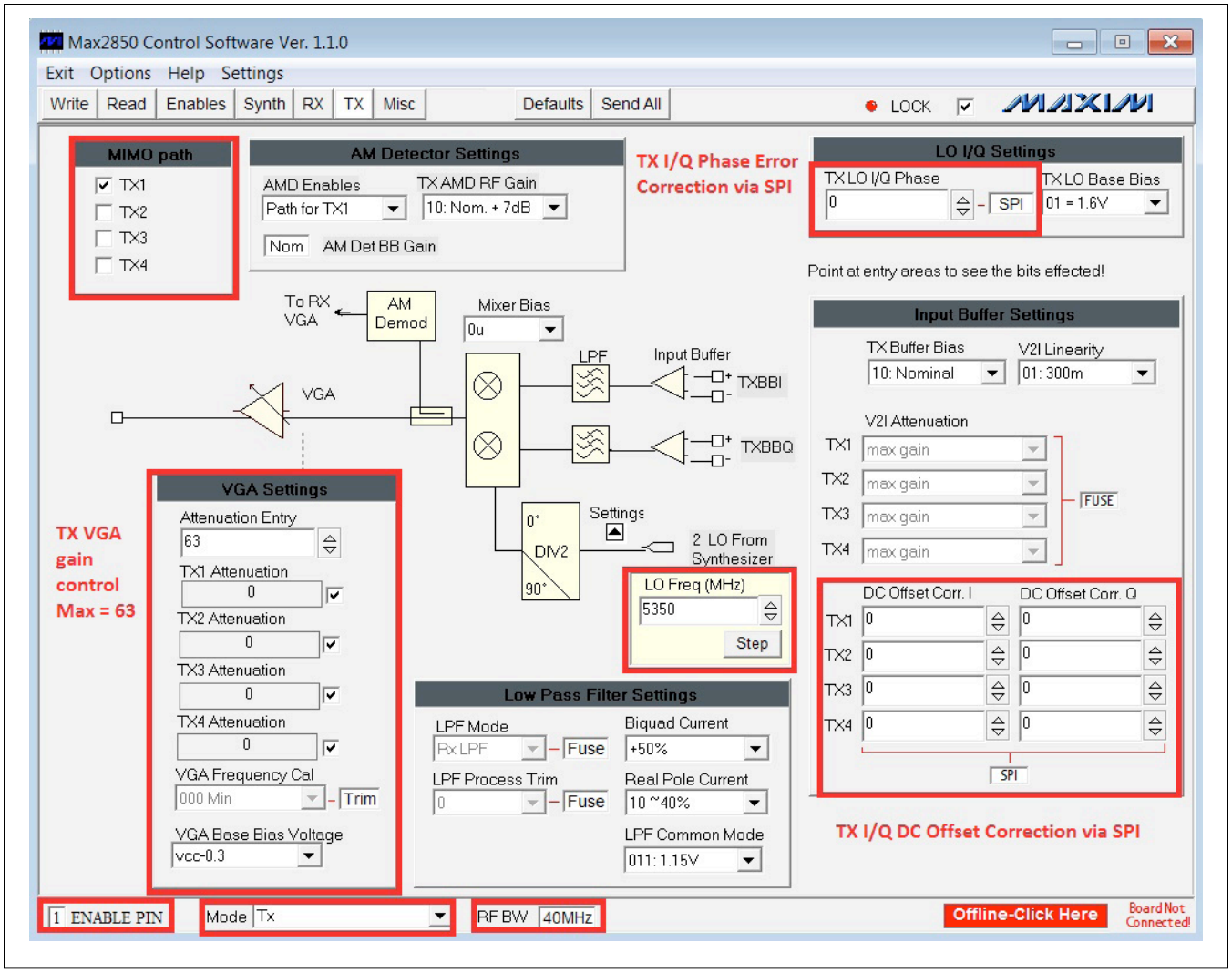


Figure 3. MAX2851 Control Software—TX Page

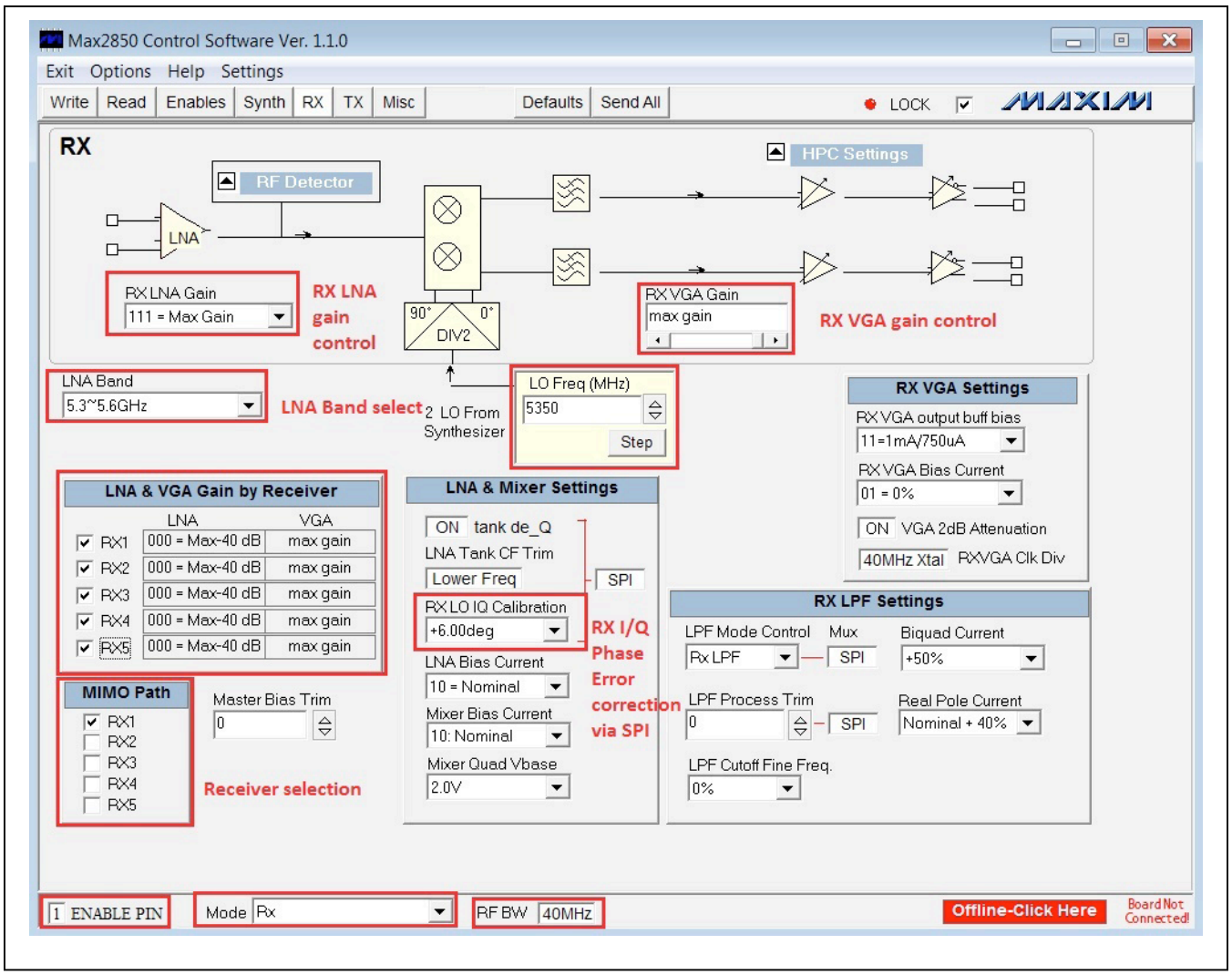


Figure 4. MAX2851 Control Software—RX Page

Component Suppliers

SUPPLIER	WEBSITE
Kyocera	www.americas.kyocera.com
Digi-Key	www.digikey.com
National Semiconductor	www.ni.com
Johnson/Cinch Connectivity Solutions	www.johnsoncomponents.com
Johanson Technology	www.johansontechnology.com
Sullins Corp.	www.sullinscorp.com
Keystone	www.keyelco.com

Note: *Indicate that you are using the MAX2851 when contacting these component suppliers.*

Component Information, PCB Layout, and Schematic

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

- **MAX2851 EV BOM**
- **MAX2851 EV PCB Layout**
- **MAX2851 EV Schematic**

Ordering Information

PART	TYPE
MAX2851EVKIT+	EV Kit

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	2/16	Initial release	—

EVKit Part Number: MAX2851EVKIT+

Revision: F

Date Last Edited: 6-18-13

Associated schematic: E

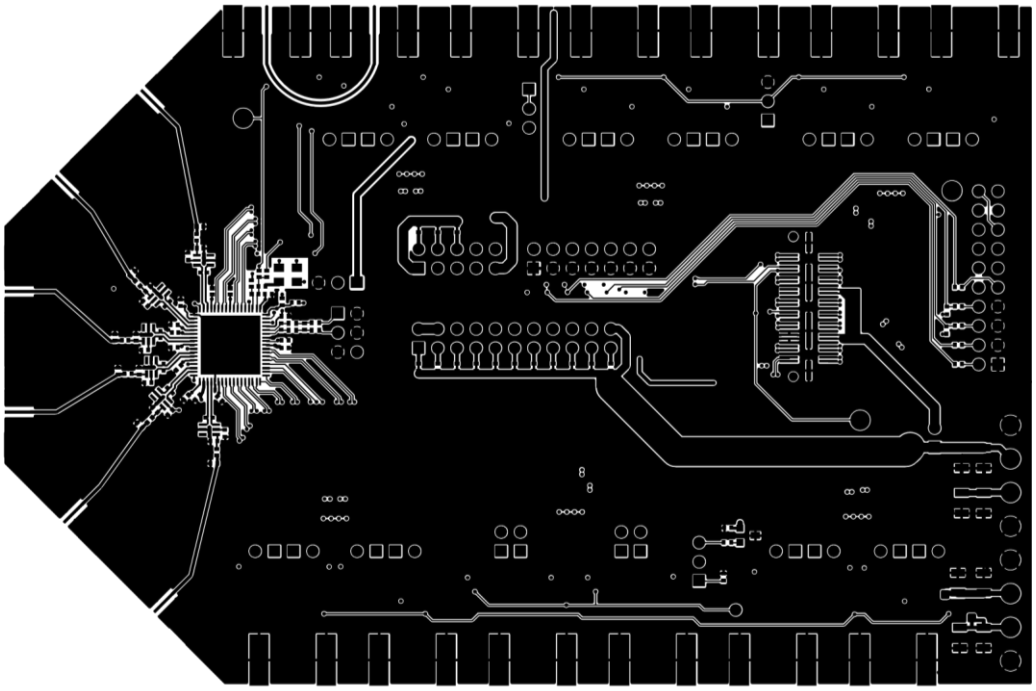
Associated Layout: 2851_2

Item	Reference	Qty	Value	Tolerance	Description	Manufacturer	Part Number
1	C1 C2 C3 C4 C6 C9 C10 C12 C31	9	1000pF	10%	0402 Capacitor	Murata	GRM155R71H102K
2	C5 C76	2	47pF	5%	0402 Capacitor	Murata	GRM1555C1H470J
3	C7 C24	2	0.01uF	10%	0402 Capacitor	Murata	GRM155R71E103K
4	C8 C11 C15 C30 C68 C70 C71 C72 C74 C75 C77 C79 C80 C81 C83 C84 C85 C87 C88 C89 C91 C92 C93 C95 C96 C97 C99 C100 C101 C103 C104 C105 C107 C108 C109 C110 C111 C112 C113 C127 C128	41	0.1uF	10%	0402 Capacitor	Murata	GRM155R61A104K
5	C13 C22	2	1.0uF	10%	0402 Capacitor	Murata	GRM155R61A105K
6	C14	1	2.2uF	20%	0402 Capacitor	Murata	GRM155R60J225M
7	C16 C18 C20 C21 C25 C26 C27 C28 C33 C34 C35 C37 C40 C41 C43 C46 C47 C49 C52 C53 C55 C58 C61 C64 C65 C67 C120 C124	0	**DNI**		0402 Capacitor		Leave Site Open
8	C17 C38 C121 C125	0	**DNI**		1206 Capacitor		Leave Site Open
9	C19	1	10pF	0.1pF	0402 Capacitor	Murata	GRM1555C1H100B
10	C23	1	39pF	5%	0402 Capacitor	Murata	GRM1555C1H390J
11	C29	1	5.6pF	0.1pF	0402 Capacitor	Murata	GRM1555C1H5R6B
12	C32	1	33pF	5%	0402 Capacitor	Murata	GRM1555C1H330J
13	C36 C42 C48 C54 C66	5	0 ohm	5%	0402 Resistor		Use Lead-Free Parts Only
14	C59	1	3.0nH	0.1nH	0402 Inductor	Murata	LQP15MN3N0B02
15	C60	1	1.2pF	0.1pF	0402 Capacitor	Murata	GRM1555C1H1R2B
16	C69 C73 C78 C82 C86 C90 C94 C98 C102 C106	10	5.0pF	0.1pF	0402 Capacitor	Murata	GRM1555C1H5R0B
17	C114 C116 C118 C122	4	10uF	10%	1206 Capacitor	Murata	GRM31CR60J106K
18	C115 C117 C119 C123	4	1.0uF	20%	1206 Capacitor	Murata	GRM31MR71C105M

19	R1 R2 R3 R4 R5 R6 R7 R8 R9 R10 R11 R12 R13 R14 R15 R16 R17 R18 R19 R20 R21 R22 R23 R24 R25 R26 R27 R28 R29 R30 R31 R32 R33 R35 R37 R38 R40 R42 R43 R44 R45 R46 R47 R48 R49 R50 R51 R52 R53 R54 R55 R56 R57 R91 R92 R93 R94 R95 R96 R97 R98 R100 R101 R102 R103 R104 R105 R106 R107 R108 R109 R110 R111 R112 R113 R114 R115 R121 R122 R123 R124 R125 R126 R127	0	**DNI**		0402 Resistor		Leave Site Open
20	R34 R36	2	390 ohm	5%	0402 Resistor		Use Lead-Free Parts Only
21	R39	0	1k **DNI**		Potentiometer		3296W-1-103LF Leave Site Open
22	R41 R58 R60 R62 R64 R66 R68 R70 R72 R74 R76	11	10k	1%	0402 Resistor		Use Lead-Free Parts Only
23	R59 R61 R63 R65 R67 R69 R71 R73 R75 R77	10	49.9 ohm	1%	0402 Resistor		Use Lead-Free Parts Only
24	R78	1	620 ohm	5%	0402 Resistor		Use Lead-Free Parts Only
25	R79	1	1k		Potentiometer		3296W-1-102LF
26	R80	1	301 ohm	1%	0402 Resistor		Use Lead-Free Parts Only
27	R81 R86	2	61.9 ohm	1%	0402 Resistor		Use Lead-Free Parts Only
28	R82 R87	2	200 ohm	1%	0402 Resistor		Use Lead-Free Parts Only
29	R83 R85 R89 R90	4	205 ohm	1%	0402 Resistor		Use Lead-Free Parts Only
30	R84 R88	2	226 ohm	1%	0402 Resistor		Use Lead-Free Parts Only
31	R99	1	20 ohm	5%	0402 Resistor		Use Lead-Free Parts Only
32	R116 R117 R118 R119	4	5.1k	5%	0402 Resistor		Use Lead-Free Parts Only
33	R120	1	100 ohm	5%	0402 Resistor		Use Lead-Free Parts Only
34	L1 L2 L3 L4 L5 L6	0	**DNI**		0402 Inductor		Leave Site Open
35	T1 T2 T3 T4 T5 T6	6	5400BL15B100		0805 Ceramic Balun 5400MHZ	Johanson Technology	5400BL15B100
36	U1	1	MAX2851		5GHz, 4-Channel MIMO Transmitter	Maxim Integrated	MAX2851ITK+
37	U2	1	40MHz		Crystal	Kyocera	CX2520SB40000H0WZK06
38	U3	0	**DNI**				KT3225R40000ECV28ZAA Leave Site Open

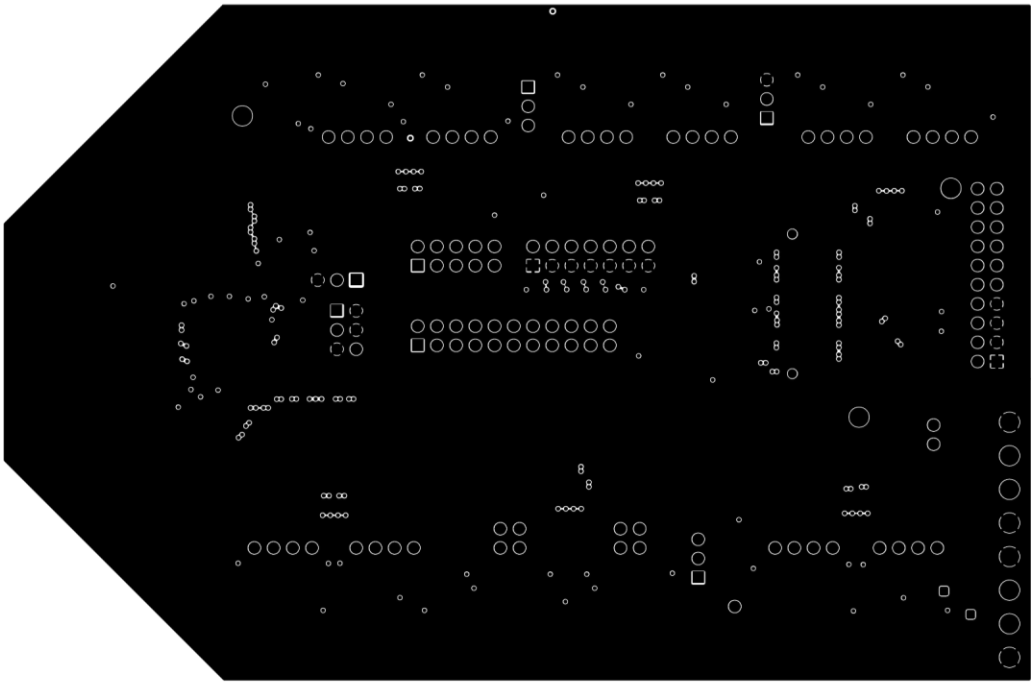
39	U4 U5 U6 U7 U8 U9 U10 U11 U12 U13	10	MAX4444		Ultra-High-Speed, Low-Distortion, Differential-to-Single-Ended Line Receivers with Enable	Maxim Integrated	MAX4444ESE+
40	U14 U15	2	LMH6551MA		Differential Hi-Speed Op Amp	National Semiconductor	LMH6551MA/NOPB
41	U16	1	MAX6062		Precision, Micropower, Low-Dropout, High-Output-Current, SOT23 Voltage Reference	Maxim Integrated	MAX6062AEUR+
42	U17 U18	0	MAX8510 **DNI**			Maxim Integrated	MAX8510EXK33+ Leave Site Open
43	U19	0	MAX8869 **DNI**			Maxim Integrated	MAX8869EUE33+ Leave Site Open
44	RXBBI1 RXBBI2 RXBBI3 RXBBI4 RXBBI5 RXBBQ1 RXBBQ2 RXBBQ3 RXBBQ4 RXBBQ5 RXRF1 RXRF2 RXRF3 RXRF4 RXRF5 TXBBI TXBBQ TXRF	18	Connector		SMA End Launch Jack Receptacle 0.062"	Johnson	142-0701-801 **Cut center pin of each SMA to 1/8" length before installing**
45	CLKOUT	0	Connector **DNI**		SMA End Launch Jack Receptacle 0.062"	Johnson	142-0701-801
46	J1	0	Connector **DNI**				QTH-020-01-L-D-DP-A-K Leave Site Open
47	J2	1	2X10 Pin Header		Dual In-Line Header, 100 mil centers	Sullins	PEC36DAAN
48	JP1	1	2X3 Pin Header		Dual In-Line Header, 100 mil centers	Sullins	PEC36DAAN
49	JP2	1	2X7 Pin Header		Dual In-Line Header, 100 mil centers	Sullins	PEC36DAAN
50	JP3	1	2X11 Pin Header		Dual In-Line Header, 100 mil centers	Sullins	PEC36DAAN
51	JP4	0	1X2 Pin Header **DNI**		Single In-Line Header, 100 mil centers	Sullins	PEC36DAAN Leave Site Open
52	JPRXBBI1+ JPRXBBI1- JPRXBBI2+ JPRXBBI2- JPRXBBI3+ JPRXBBI3- JPRXBBI4+ JPRXBBI4- JPRXBBI5+ JPRXBBI5- JPRXBBQ1+ JPRXBBQ1- JPRXBBQ2+ JPRXBBQ2- JPRXBBQ3+ JPRXBBQ3- JPRXBBQ4+ JPRXBBQ4- JPRXBBQ5+ JPRXBBQ5- JPTXBBI+ JPTXBBI- JPTXBBQ+ JPTXBBQ-	24	1X2 Pin Header		Single In-Line Header, 100 mil centers	Sullins	PEC36SAAN

53	RXBBBUF1	1	1X3 Pin Header		Single In-Line Header, 100 mil centers	Sullins	PEC36SAAN
54	JP6	0	1X3 Pin Header **DNI**		Single In-Line Header, 100 mil centers	Sullins	PEC36SAAN Leave Site Open
55	JP7 **NOTE: Install only 2-Pin header between Pin 9 & Pin 10**	1	1X2 Pin Header		Single In-Line Header, 100 mil centers	Sullins	PEC36SAAN
56	VCM J11 J12 J13	4	Test Point		PC Mini - Red	Keystone	5000
57	J3 J5	2	Test Point		PC Mini - White	Keystone	5002
58	J4 J6 J8 J10	4	Test Point		PC Mini - Black	Keystone	5001
59	J7 J9	2	Test Point		PC Mini - Yellow	Keystone	5004
60	JP7 RXBBBUF1 - Center Pin to +5V	5	Shunt		Shorting Jumper	Kycon	SX1100-B
61	Pack-Out Instruction				Brown Box 9 3/16" x 7" x 1 1/4"		
62					ESD Bag 5"x8" w/ESD Logo		
63					Pink Foam 12"x12"x 5MM		
64					Web Instructions		
65					INTF3000+ Interface Board		
66					36" Socket Connector Ribbon Cable - 20 Contacts	3M	M3AAA-2036R



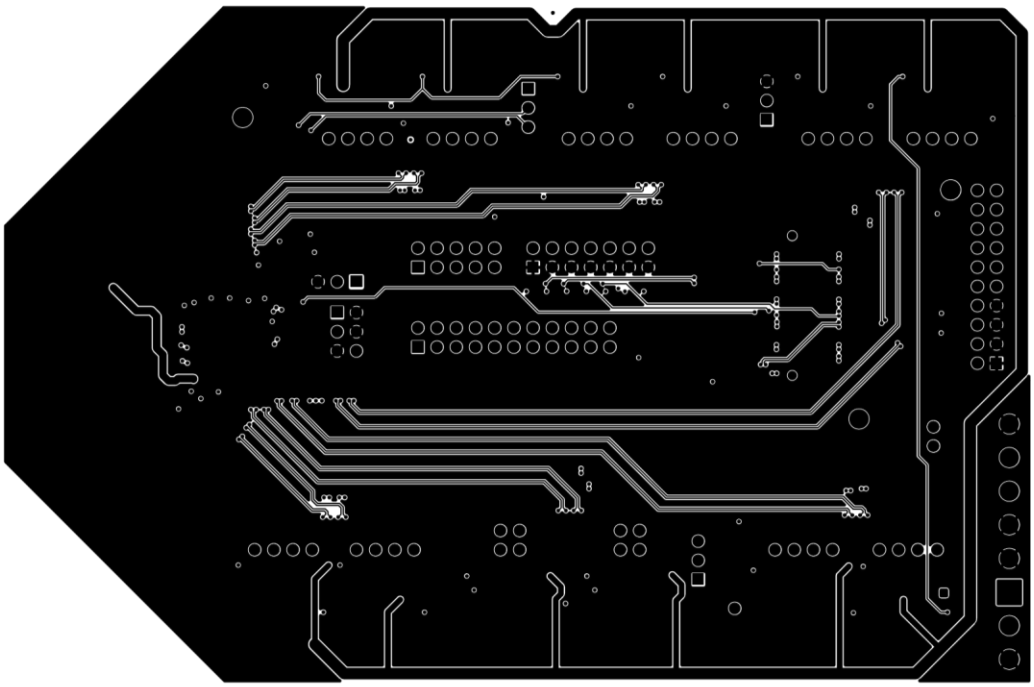
MAX2851 EVALUATION KIT
LAYER(s):LAYER 1 PRIMARY COMPONENT SIDE

REV 2
SHEET: 1 OF 15



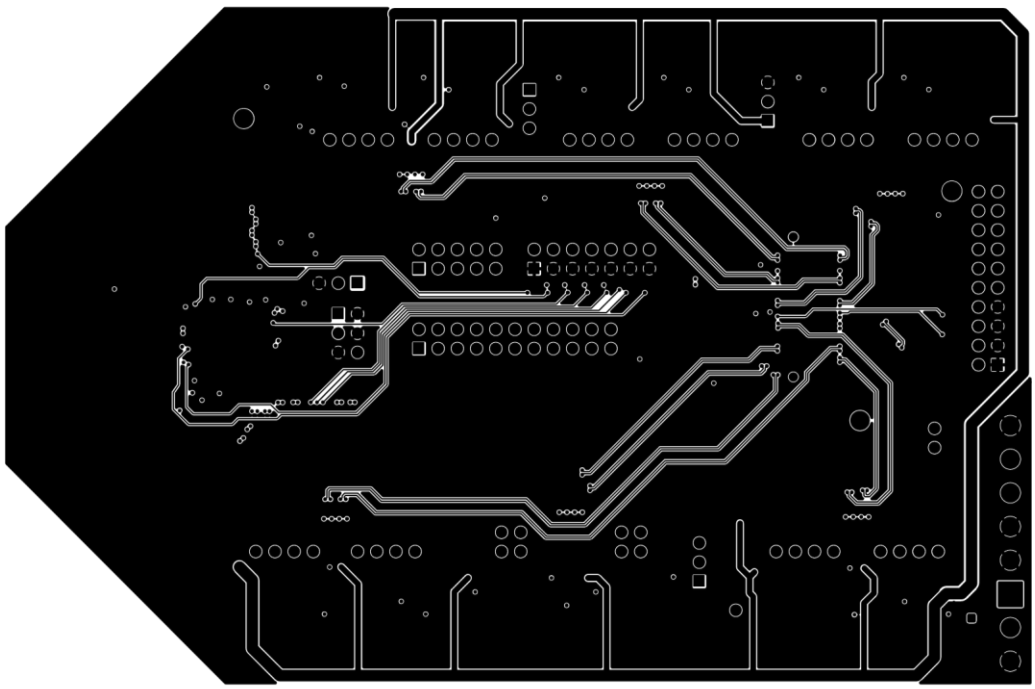
MAX2851 EVALUATION KIT
LAYER(s):LAYER 2

REV 2
SHEET: 2 OF 15



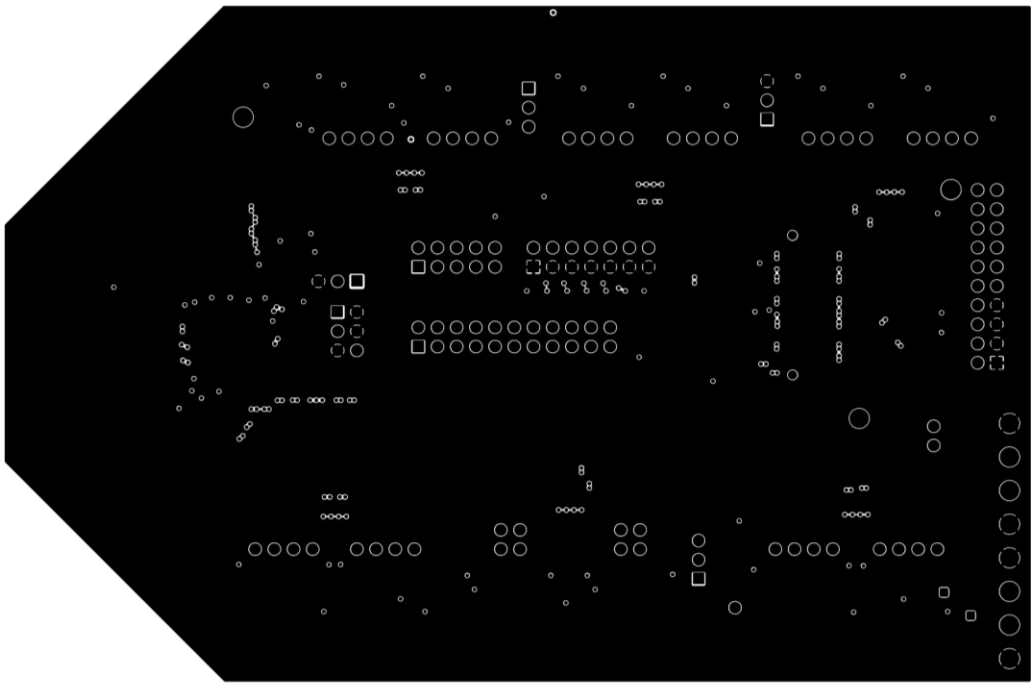
MAX2851 EVALUATION KIT
LAYER(s):LAYER 3

REV 2
SHEET: 3 OF 15



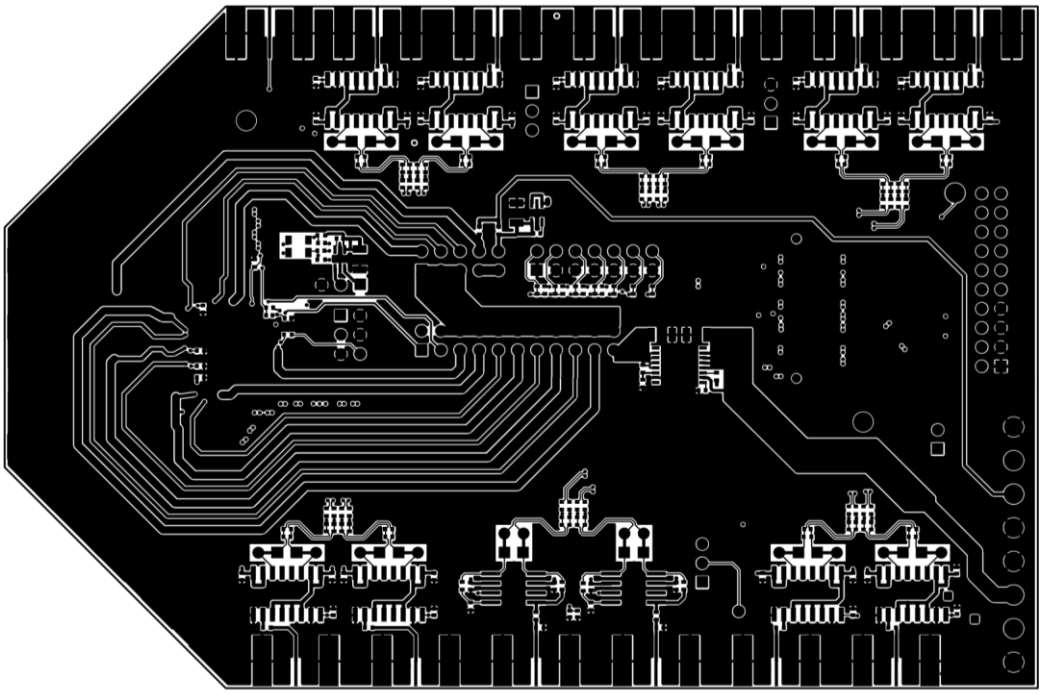
MAX2851 EVALUATION KIT
LAYER(s):LAYER 4

REV 2
SHEET: 4 OF 15



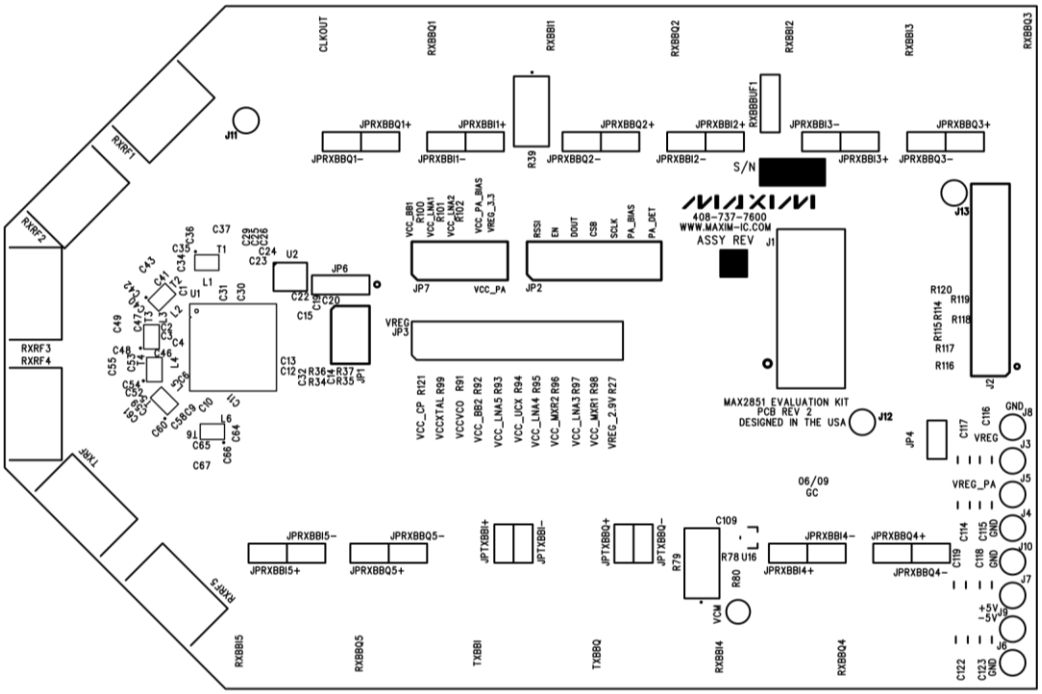
MAX2851 EVALUATION KIT
LAYER(s): LAYER 5

REV 2
SHEET: 5 OF 15



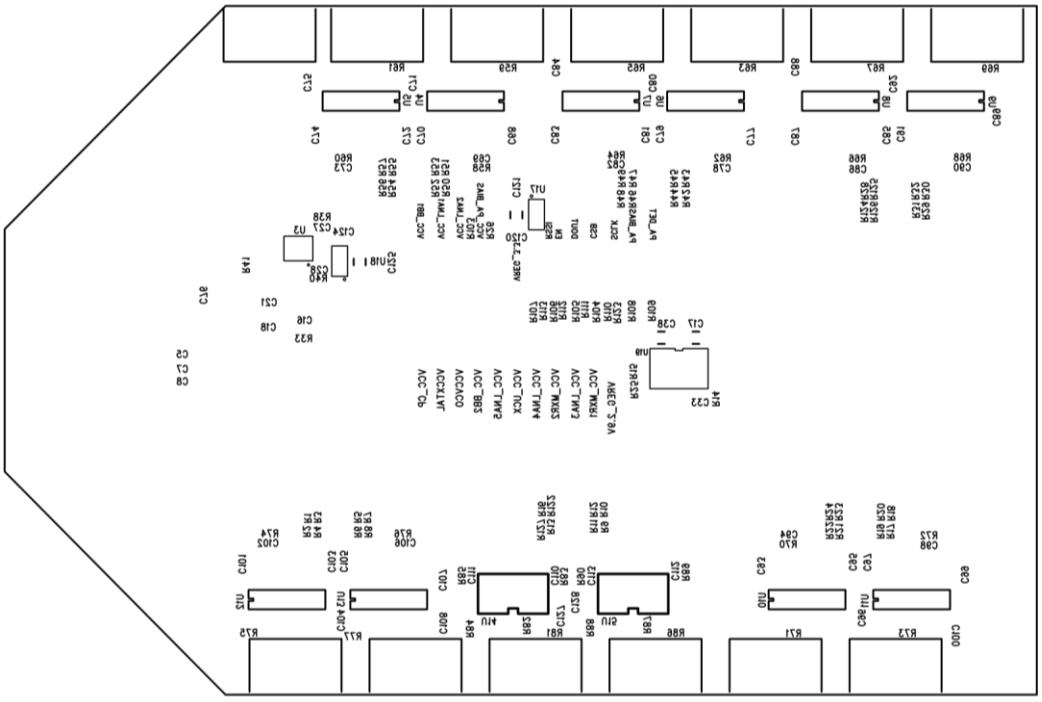
MAX2851 EVALUATION KIT
LAYER(s):LAYER 6 SECONDARY COMPONENT SIDE

REV 2
SHEET: 6 OF 15



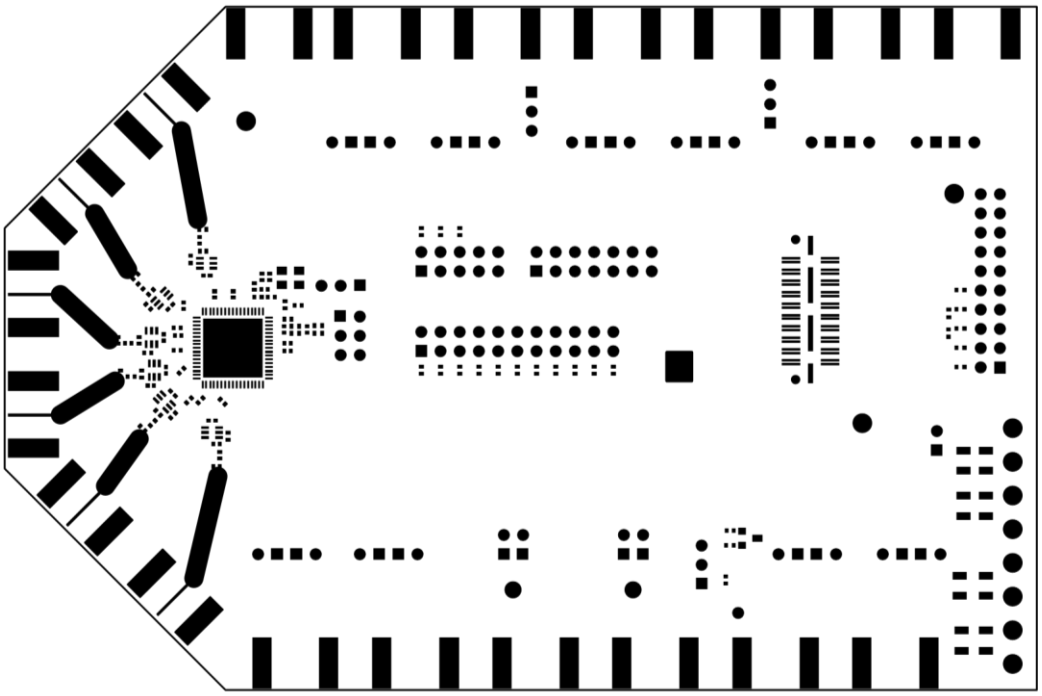
MAX2851 EVALUATION KIT
LAYER(s):PRIMARY SIDE SILKSCREEN

REV 2
SHEET: 7 OF 15



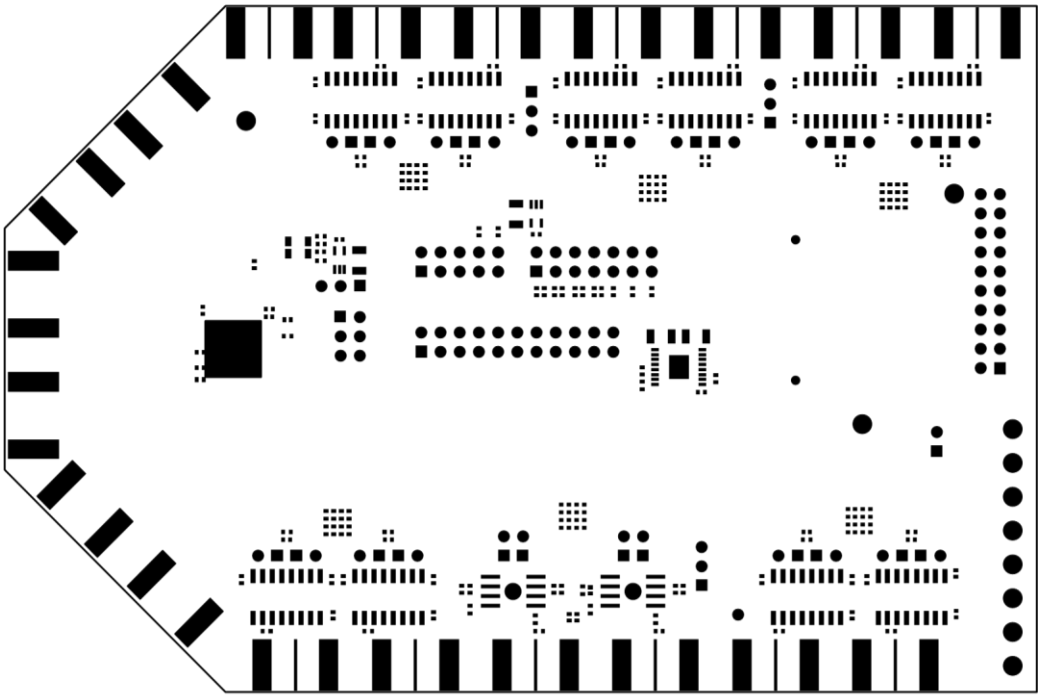
MAX2851 EVALUATION KIT
LAYER(s):SECONDARY SIDE SILKSCREEN

REV 2
SHEET: 11 OF 15

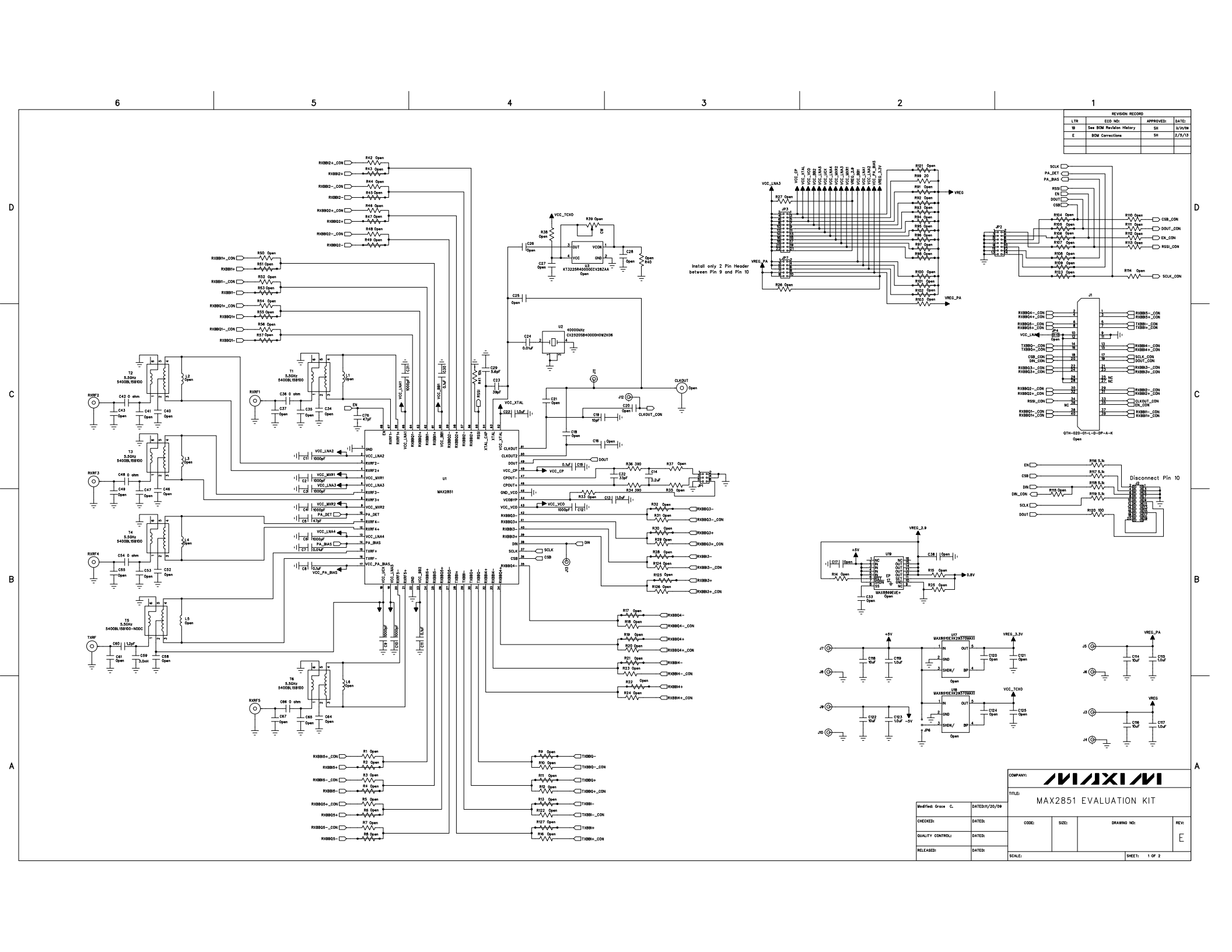


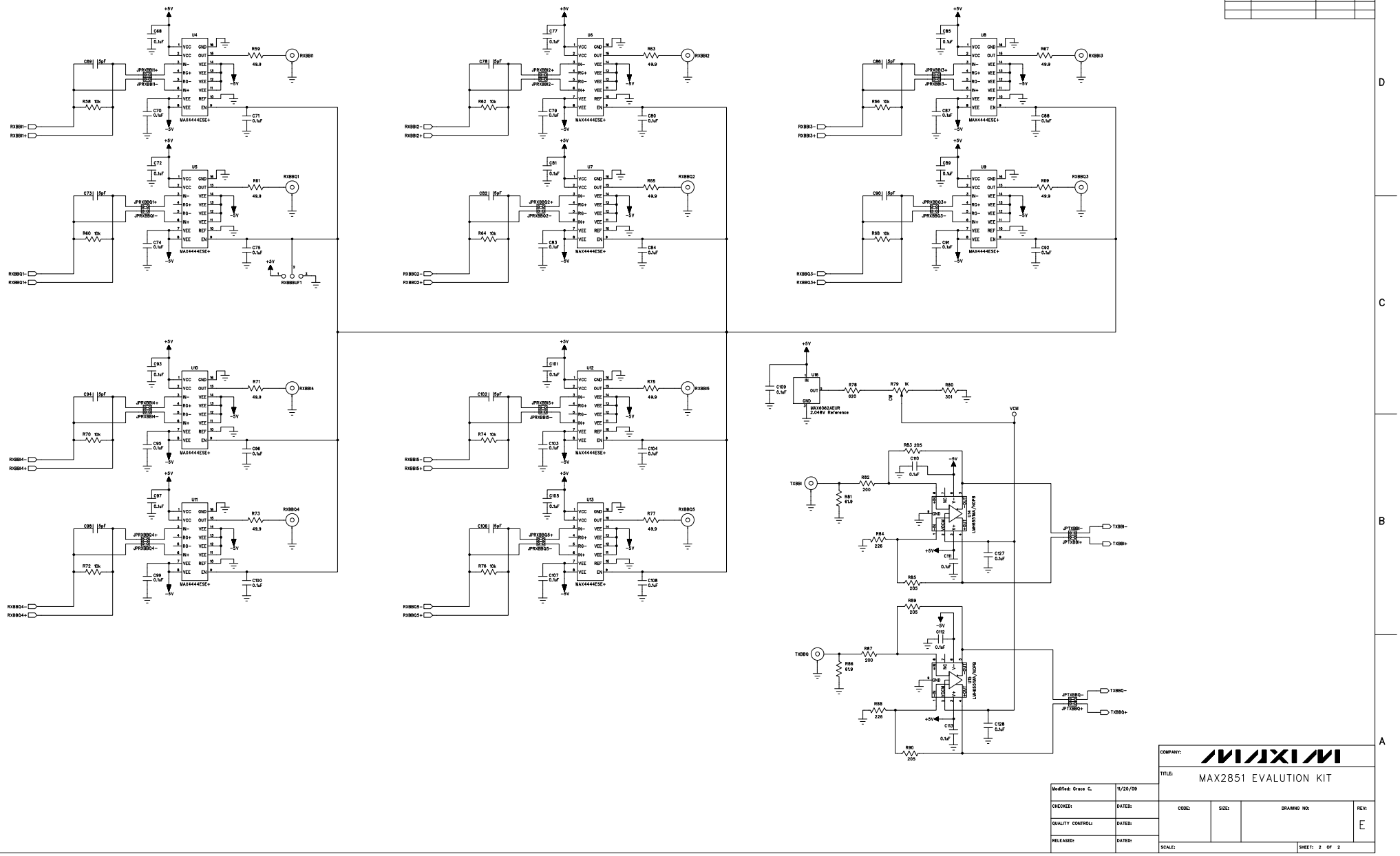
MAX2851 EVALUATION KIT
LAYER(s):PRIMARY SIDE SOLDER MASK

REV 2
SHEET: 8 OF 15



MAX2851 EVALUATION KIT REV 2
LAYER(s):SECONDARY SIDE SOLDER MASK SHEET: 12 OF 15


REVISION RECORD
LTR | ECO NO: | APPROVED: | DATE:
18 | See BOM Revision History | SH | 3/31/09
E | BOM Corrections | SH | 2/5/13
U1 MAX2851
U2 40000kHz CX2520SB40000H0WZK06
U3 KT3225R40000ECY28ZAA Open
T1 5.5GHz 5400BL15B100
T2 5.5GHz 5400BL15B100
T3 5.5GHz 5400BL15B100
T4 5.5GHz 5400BL15B100
T5 5.5GHz 5400BL15B100-NOBC
T6 5.5GHz 5400BL15B100
Install only 2 Pin Header between Pin 9 and Pin 10
QTH-020-01-L-D-DP-A-K
Disconnect Pin 10
MAX8510EXK29370MAXI
MAX8510EXK29370MAXI
MAX8869EUE+
COMPANY: MAXIM
TITLE: MAX2851 EVALUATION KIT
Modified: Grace C. DATED:11/20/09
CHECKED: DATED:
QUALITY CONTROL: DATED:
RELEASED: DATED:
CODE: SIZE: DRAWING NO: REV: E
SCALE: SHEET: 1 OF 2


REVISION RECORD
LTR
ECO NO:
APPROVED:
DATE:
MAX4444ESE+
MAX9063AEUR
2.048V Reference
LMH6559MA/NOPB
TXBBI
TXBBQ
VCM
JPTXBBI-
JPTXBBI+
JPTXBBQ-
JPTXBBQ+
COMPANY:
MAXIM
TITLE:
MAX2851 EVALUTION KIT
Modified: Grace C.
11/20/09
CHECKED:
QUALITY CONTROL:
RELEASED:
DATED:
CODE:
SIZE:
DRAWING NO:
REV:
E
SCALE:
SHEET: 2 OF 2