

## General Description

The MAX2850 evaluation kit (EV kit) simplifies testing of the MAX2850's 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.

## 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](http://www.maximintegrated.com)

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

## Quick Start

The MAX2850 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 MAX2850. It is intended as a guide only, with substitutions possible.

- MAX2850 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 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

## 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 EV kit and the INTF2400 connector (J1) on the INTF3000+ interface board. Make sure pin 1 on EV kit matches with pin 1 on the INTF3000+ board.
- 2) Connect a USB cable between the INTF3000+ interface board and the PC with the MAX2850 control software.
- 3) Connect a jumper between  $V_{DEV}$  and center pin of JU1 header on the INTF3000+ interface board.
- 4) With the output disabled, connect the +5V supply to the +5V terminal (J7) on the MAX2850 EV kit.
- 5) With the output disabled, connect the -5V supply to the -5V terminal (J9) on the MAX2850 EV kit.
- 6) With the output disabled, connect a +2.85V supply to the VREG (J3) on the MAX2850 EV kit.
- 7) Connect all the supply grounds together and to any of the GND terminals (J4, J6, J8, J10) on the MAX2850 EV kit.
- 8) Turn on the +5V, -5V and +2.85V power supplies.
- 9) Connect a jumper between pin 1 and pin 2 of the RX-BBBUF2 header.
- 10) Make sure there are jumpers installed across JPRXBI+, JPRXBBI-, JPRXBBQ+, and JPRXBBQ+ headers.
- 11) Install and run the MAX2850 control software, available for download [HERE](#).

## Frequency Synthesizer Setup

- 1) All parameters related to frequency synthesis can be set under the 'Synth' page of the MAX2850 control software.
- 2) The 'Xtal Reference (MHz)' box allows the 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 the 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 the receiver input port (RXRF).
- 3) Connect the receiver baseband I/Q outputs (RXBBI and RXBBQ) to an oscilloscope.
- 4) On the 'Write' page of the MAX2850 control software, enter the receive register values shown in [Table 1](#) into the main and local registers.
- 5) At the bottom of the MAX2850 control software, make sure the ENABLE PIN box is set to '1' and 'RX' is selected from the 'Mode' drop-down menu.
- 6) Select the 5.3GHz~5.6GHz LNA band using the drop-down menu under 'LNA Band' box.
- 7) 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'.
- 8) Click on the SEND ALL tab. At this time the supply current for +2.85V supply is around 125mA.
- 9) At this point, there should be two 1MHz signals on the scope with roughly 90° phase offset. Use the 'Xtal Tune' box to fine tune to 1MHz, if needed.
- 10) 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.
- 11) The output baseband CW tone at 1MHz should be approximately -6dBm.
- 12) The sideband suppression can be optimized manually through SPI by 'RX LO IQ Calibration' value.

## Transmitter Mode Setup

- 1) Connect one of the four TXRF outputs 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 10dB and Ref Level of 0dB.
- 2) Connect a 1MHz sinusoid to the corresponding TXBBI and a 1MHz sinusoid with a 90° phase shift (or a cosine) to the corresponding TXBBQ ports. Set the input amplitude of each channel to  $100mV_{RMS}$ .

- 3) On the 'Write' page of the device control software, enter the transmit register values shown in [Table 2](#) into the Main and Local registers.
- 4) At the bottom of the MAX2850 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, select the transmitter being tested under 'MIMO PATH' block and also select it under 'VGA Settings' block.
- 6) Using the 'VGA Settings' block, maximize the output power by setting 'Attenuation Entry' to 63.
- 7) Click on the SEND ALL tab. At this time the supply current for +2.85V supply is around 204mA.
- 8) Measure the voltage at the VCM header on the MAX2850 and adjust R25 to get around 0.9V to 1.1V.
- 9) On the spectrum analyzer, the transmit output power at 5351MHz should be around -6.5dBm.
- 10) The LO leakage at 5350MHz can be optimized manually through SPI by adjusting the offset values shown in the 'DC Offset Corr. I' and 'DC Offset Corr. Q' boxes.
- 11) The sideband suppression at 5349MHz can be optimized manually through 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	3E8	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	02F	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

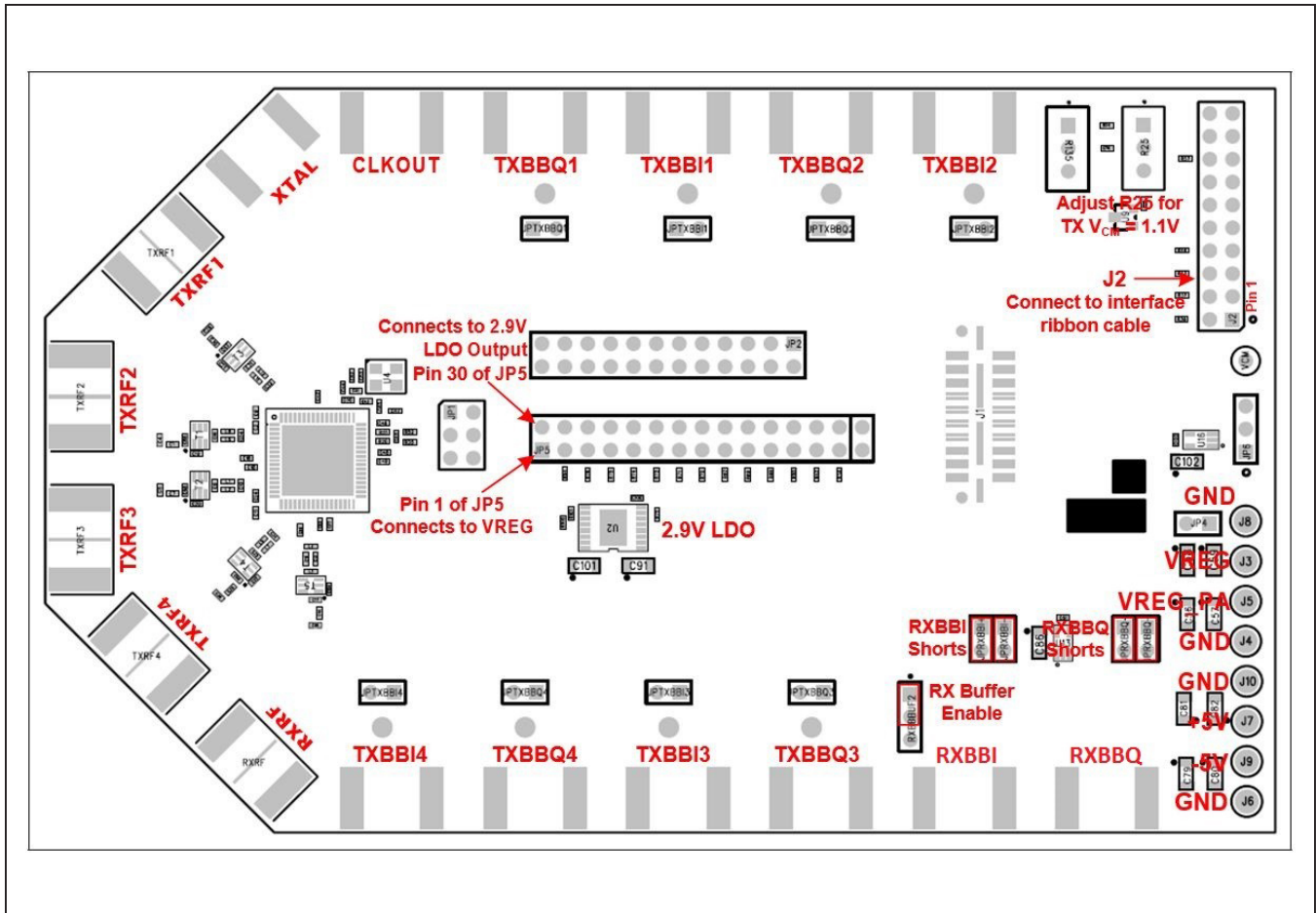


Figure 1. MAX2850 Hardware Connections

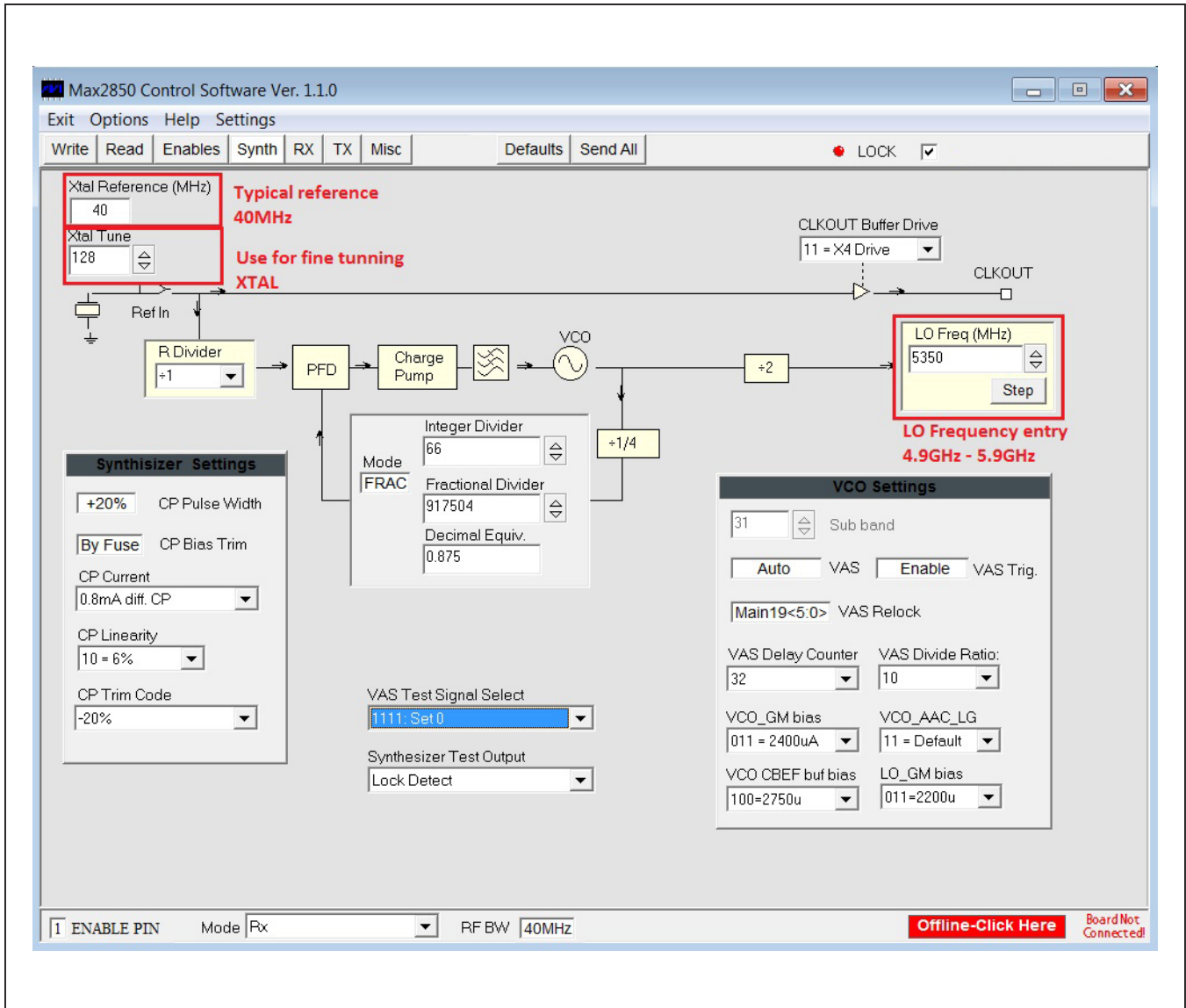


Figure 2. MAX2850 Control Software—Frequency Synthesizer Page

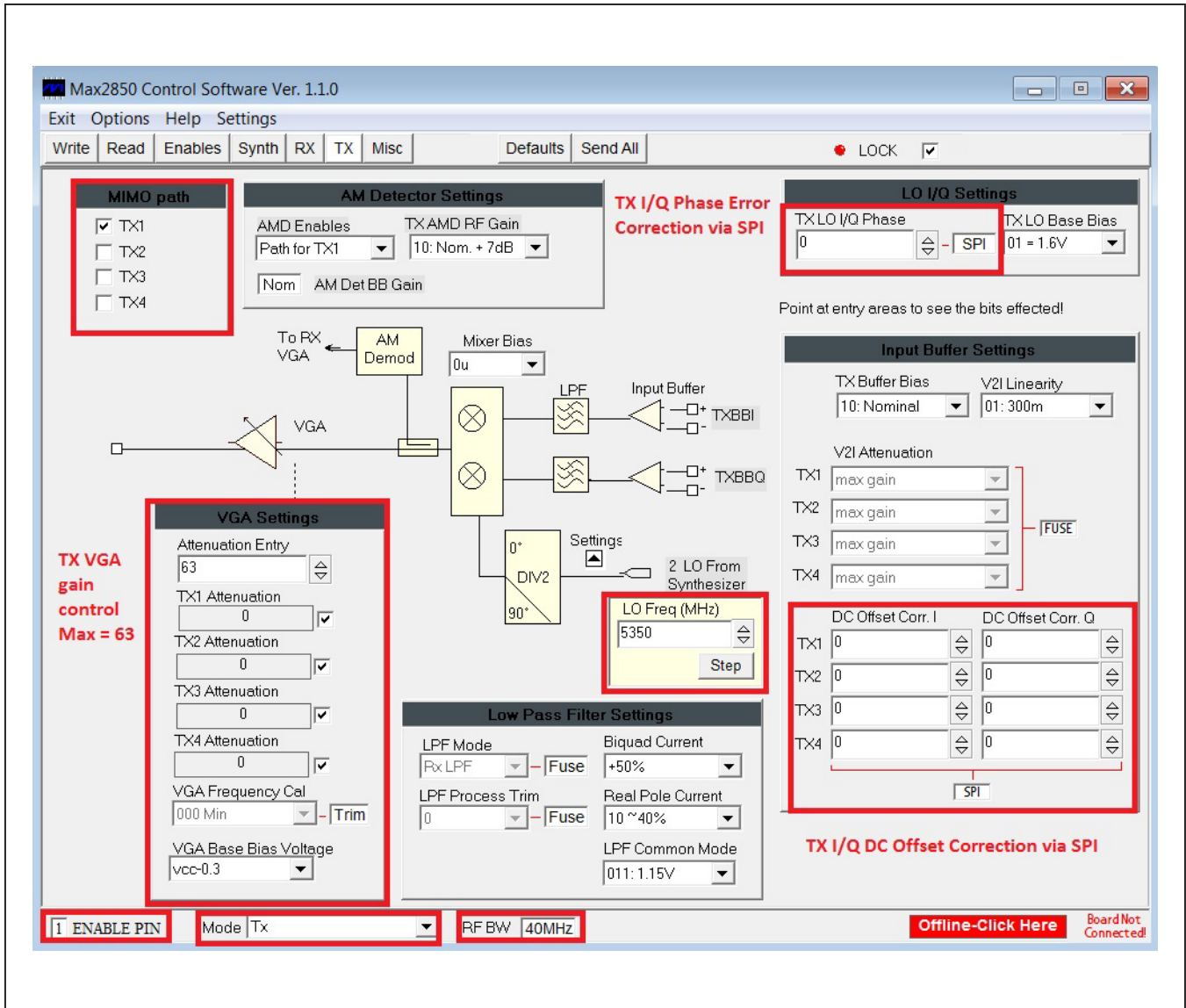


Figure 3. MAX2850 Control Software—TX Page



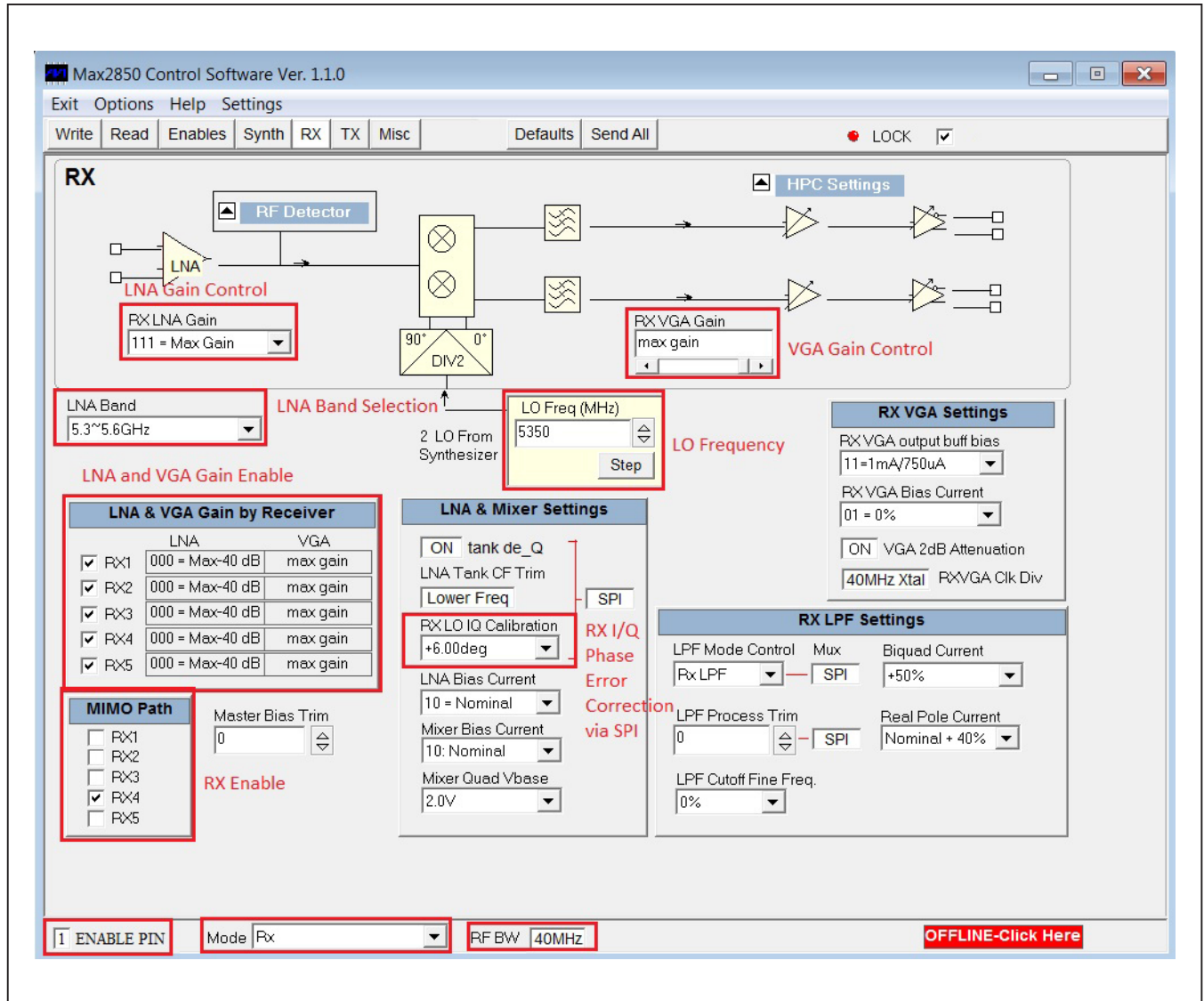


Figure 4. MAX2850 Control Software—RX Page



## 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 MAX2850 when contacting these component suppliers.

## Component List, PCB Layout, and Schematic

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

- [MAX2850 EV BOM](#)
- [MAX2850 EV PCB Layout](#)
- [MAX2850 EV Schematic](#)

## Ordering Information

PART	TYPE
MAX2850EVKIT+	EV Kit

## Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	3/16	Initial release	—

For pricing, delivery, and ordering information, please contact Maxim Direct at 1-888-629-4642, or visit Maxim Integrated's website at [www.maximintegrated.com](http://www.maximintegrated.com).

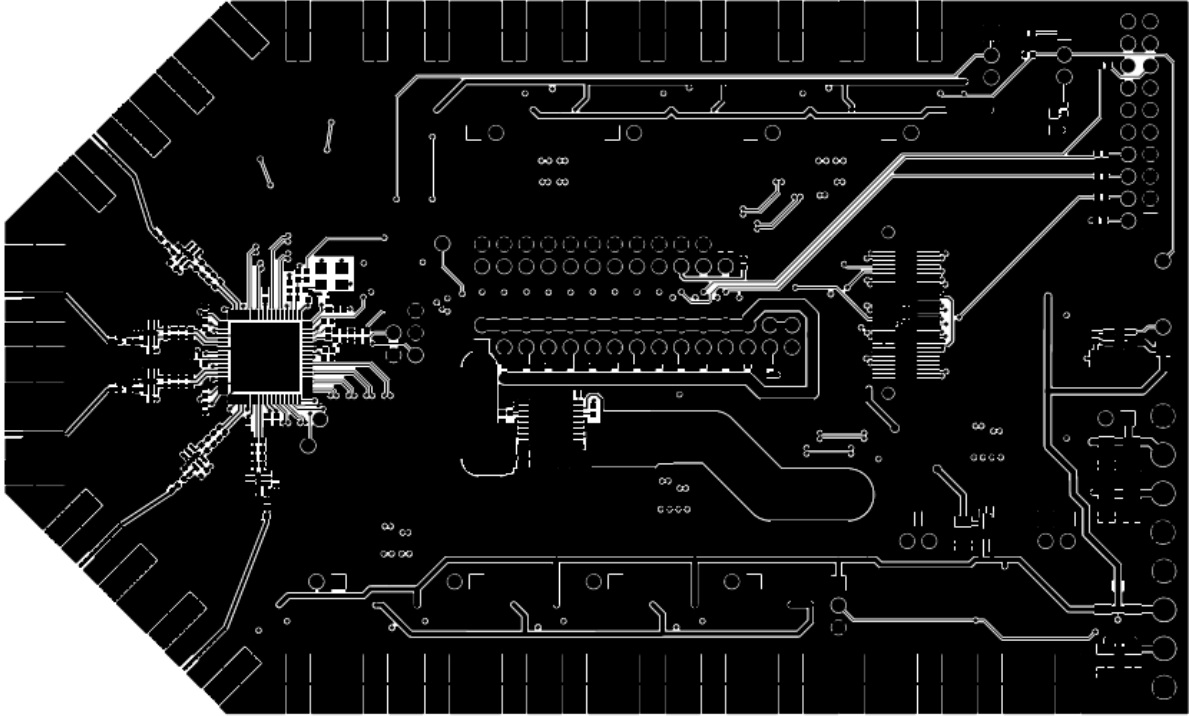
*Maxim Integrated cannot assume responsibility for use of any circuitry other than circuitry entirely embodied in a Maxim Integrated product. No circuit patent licenses are implied. Maxim Integrated reserves the right to change the circuitry and specifications without notice at any time.*

EVKit Part Number: MAX2850EVKIT+		Associated schematic: F					
Revision: G		Associated Layout: 2850_2					
Lead Designer:							
Lead Layout:							
Date Last Edited: 6-18-13							
Last Edited by (whom): Sue Harris							
Item	Reference	Qty	Value	Tolerance	Description	Manufacturer	Part Number
1	C1 C7	2	1.2pF	0.1pF	0402 Capacitor	Murata	GRM1555C1H1R2B
2	C2 C9 C11 C18 C24 C26 C49	7	1000pF	10%	0402 Capacitor	Murata	GRM155R71H102K
3	C3 C6 C25 C28 C40 C100	6	0.01uF	10%	0402 Capacitor	Murata	GRM155R71E103K
4	C4 C5 C36	3	2.4nH	0.1nH	0402 Inductor	Murata	LQP15MN2N4B02
5	C8 C39	2	3.9nH	0.1nH	0402 Inductor	Murata	LQP15MN3N9B02
6	C10 C12 C13 C17 C19 C20 C21 C22 C32 C34 C41 C47 C52 C53 C54 C61 C66 C67 C68 C69 C70 C83 C103 C104	0	<b>DNI</b>		0402 Capacitor		Leave Site Open
7	C14	1	1.0pF	0.25pF	0402 Capacitor	Murata	GRM1555C1H1R0C
8	C15	1	1.3nH	0.1nH	0402 Inductor	Murata	LQP15MN1N3B02
9	C16 C27 C42 C46 C62 C63 C64 C65 C71 C72 C73 C74 C75 C76 C77 C78 C84 C85 C87 C88 C89 C90 C93 C94 C95 C97 C98 C99	28	0.1uF	10%	0402 Capacitor	Murata	GRM155R61A104K
10	C23	1	33pF	5%	0402 Capacitor	Murata	GRM1555C1H330J
11	C29	1	2.0nH	0.1nH	0201 Inductor	Murata	LQP03TN2N0C00
12	C30 C35	2	1.0pF	0.1pF	0402 Capacitor	Murata	GRM1555C1H1R0B
13	C31	1	3.6nH	0.1nH	0402 Inductor	Murata	LQP15MN3N6B02
14	C33	1	4.3nH	0.1nH	0402 Inductor	Murata	LQP15MN4N3B02
15	C37 C38 C55 C60 C106	5	47pF	5%	0402 Capacitor	Murata	GRM1555C1H470J
16	C43 C48	2	1.0uF	10%	0402 Capacitor	Murata	GRM155R61A105K
17	C44	1	5.6pF	0.1pF	0402 Capacitor	Murata	GRM1555C1H5R6B
18	C45	1	2200pF	10%	0402 Capacitor	Murata	GRM155R71H222K
19	C50	1	39pF	5%	0402 Capacitor	Murata	GRM1555C1H390J
20	C51	1	1000pF	5%	0402 Capacitor	Murata	GRM1555C1H102J
21	C56 C59 C79 C82	4	10uF	10%	1206 Capacitor	Murata	GRM31CR60J106K

22	C57 C58 C80 C81 C91 C101	6	1.0uF	20%	1206 Capacitor	Murata	GRM31MR71C105M
23	C86 C102	0	<b>DNI</b>		1206 Capacitor		Leave Site Open
24	C92 C96	2	5.0pF	0.1pF	0402 Capacitor	Murata	GRM1555C1H5R0B
25	C105 C107 C108 C109 C110 C111 C112 C113	8	0.01uF	10%	0603 Capacitor	Murata	GRM188R71E03K
26	R1 R8 R9 R34 R35 R42 R52 R58 R59 R64 R65 R66 R67 R69 R70 R71 R72 R73 R74 R75 R76 R77 R78 R79 R80 R81 R82 R83 R84 R85 R86 R87 R88 R89 R90 R91 R92 R93 R94 R95 R96 R97 R98 R99 R102 R103 R104 R105 R106 R107 R108 R109 R110 R111 R112 R113 R114 R115 R116 R117 R118 R119 R120 R121 R122 R123 R124 R125 R126 R127 R128 R129 R130 R131 R132 R133 R134	0	<b>DNI</b>		0402 Resistor		Leave Site Open
27	R2 R7 R17 R19 R33 R40 R53 R55	8	200 ohm	1%	0402 Resistor		Use Lead-Free Parts Only
28	R3 R5 R6 R13 R15 R18 R23 R29 R31 R38 R39 R41 R47 R49 R54 R56	16	205 ohm	1%	0402 Resistor		Use Lead-Free Parts Only
29	R4 R10 R14 R16 R30 R32 R48 R50	8	226 ohm	1%	0402 Resistor		Use Lead-Free Parts Only
30	R11 R12 R21 R22 R27 R28 R45 R46	8	61.9 ohm	1%	0402 Resistor		Use Lead-Free Parts Only
31	R20 R51	2	392 ohm	1%	0402 Resistor		Use Lead-Free Parts Only
32	R24	1	301 ohm	1%	0402 Resistor		Use Lead-Free Parts Only
33	R25	1	1k		Potentiometer		3296W-1-102LF
34	R26	1	620 ohm	5%	0402 Resistor		Use Lead-Free Parts Only
35	R36 R37 R43 R44	1	5.1k	5%	0402 Resistor		Use Lead-Free Parts Only
36	R57	1	100 ohm	5%	0402 Resistor		Use Lead-Free Parts Only
37	R60 R62	2	49.9 ohm	1%	0402 Resistor		Use Lead-Free Parts Only
38	R61 R63 R68	3	10k	1%	0402 Resistor		Use Lead-Free Parts Only
39	R100	1	66.5k	1%	0402 Resistor		Use Lead-Free Parts Only
40	R101	1	25.5k	1%	0402 Resistor		Use Lead-Free Parts Only
41	L1 L2 L3 L4 L5 L6 L7 L8 L11 L12	0	<b>DNI</b>		0402 Inductor		Leave Site Open
42	T1 T2 T3 T4 T5	5	5400BL15B100		0805 Ceramic Balun 5400MHZ	Johanson Technology	5400BL15B100
43	U1	1	MAX2850		5GHz, 4-Channel MIMO Transmitter	Maxim Integrated	MAX2850ITK+
44	U2	0	<b>DNI</b>				MAX8869EUE33+ Leave Site Open

45	U3	0	<b>DNI</b>				KT3225R40000ECV28ZAA Leave Site Open
46	U4	1	40MHz		Crystal	Kyocera	CX2520SB40000H0WZK06
47	U5 U6 U7 U8 U11 U12 U14 U15	8	LMH6551MA		Differential Hi-Speed Op Amp	National Semiconductor	LMH6551MA/NOPB
48	U9	1	MAX6062		Precision, Micropower, Low-Dropout, High-Output-Current, SOT23 Voltage Reference	Maxim Integrated	MAX6062AEUR+
49	U13 U16	0	MAX8510 <b>DNI</b>			Maxim Integrated	MAX8510EXK33+ Leave Site Open
50	U17 U18	2	MAX4444		Ultra-High-Speed, Low-Distortion, Differential-to-Single-Ended Line Receivers with Enable	Maxim Integrated	MAX4444ESE+
51	RXBB1 RXBBQ TXBB1 TXBB2 TXBB3 TXBB4 TXBBQ1 TXBBQ2 TXBBQ3 TXBBQ4	10	Connector		SMA End Launch Jack Receptacle 0.062"	Johnson	142-0701-801 <b>Cut center pin of each SMA to 1/4" length before installing</b>
52	TXRF1 TXRF2 TXRF3 TXRF4 RXRF	5	Connector		SMA End Launch Jack Receptacle 0.062"	Johnson	142-0701-801 <b>Cut center pin of each SMA to 1/4" length before installing</b>
53	CLKOUT XTAL	0	Connector <b>DNI</b>		SMA End Launch Jack Receptacle 0.062"	Johnson	142-0701-801
54	J1	0	Connector <b>DNI</b>				QTH-020-01-L-D-DP-A-K Leave Site Open
55	J2	1	2X10 Pin Header		Dual In-Line Header, 100 mil centers	Sullins	PEC36DAAN
56	JP1	1	2X3 Pin Header		Dual In-Line Header, 100 mil centers	Sullins	PEC36DAAN
57	JP2	1	2X12 Pin Header		Dual In-Line Header, 100 mil centers	Sullins	PEC36DAAN
58	JP5	1	2X16 Pin Header		Dual In-Line Header, 100 mil centers	Sullins	PEC36DAAN
59	JP4 JPRXBB1+ JPRXBB1- JPRXBBQ+ JPRXBBQ- JPTXBB1 JPTXBB2 JPTXBB3 JPTXBB4 JPTXBBQ1 JPTXBBQ2 JPTXBBQ3 JPTXBBQ4	13	1X2 Pin Header		Single In-Line Header, 100 mil centers	Sullins	PEC36SAAN
60	RXBBBUF2	1	1X3 Pin Header		Single In-Line Header, 100 mil centers	Sullins	PEC36SAAN

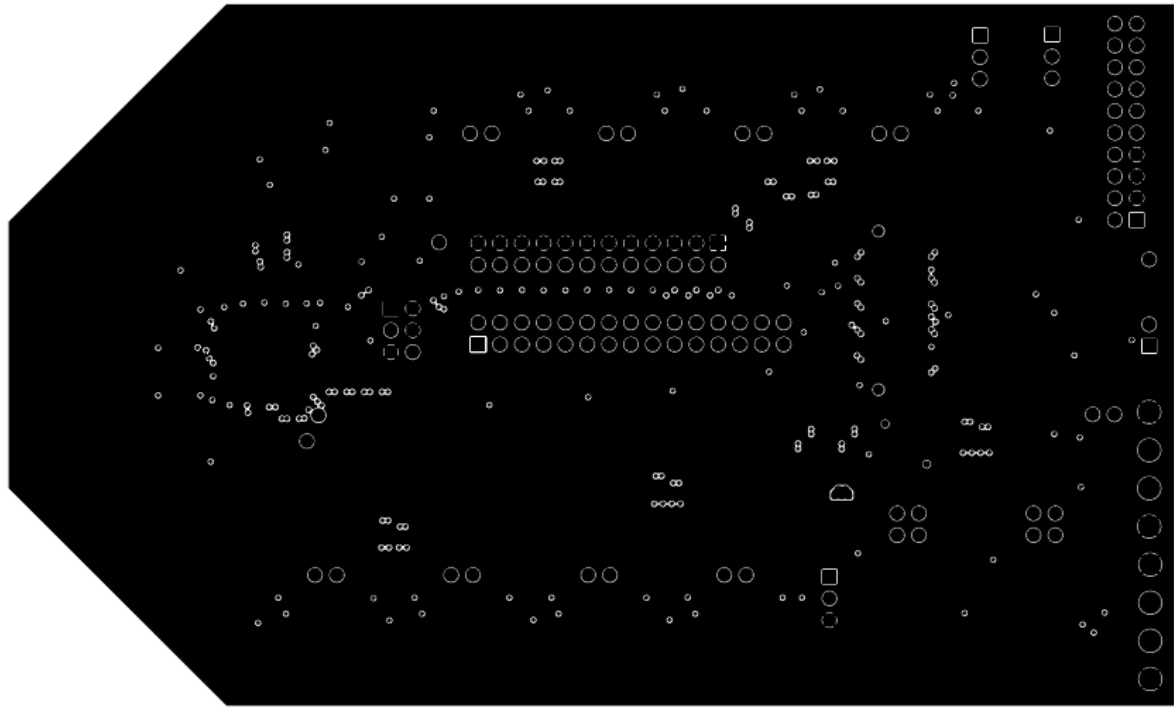
61	JP6	0	1X3 Pin Header <b>DNI</b>		Single In-Line Header, 100 mil centers	Sullins	PEC36SAAN Leave Site Open
62	VCM1 J7	2	Test Point		PC Mini - Red	Keystone	5000
63	J3 J5	2	Test Point		PC Mini - White	Keystone	5002
64	J4 J6 J8 J10	4	Test Point		PC Mini - Black	Keystone	5001
65	J9	1	Test Point		PC Mini - Yellow	Keystone	5004
66	JPRXBBI+ JPRXBBI- JPRXBBQ+ JPRXBBQ- RXBBBUF2 - Install on Pin 1 & 2	5	Shunt		Shorting Jumper	Kycon	SX1100-B
67	Pack-Out Instruction				Brown Box 9 3/16" x 7" x 1 1/4"		
68					ESD Bag 5"x8" w/ESD Logo		
69					Pink Foam 12"x12"x 5MM		
70					Web Instructions		
71					INTF3000+ Interface Board		
72					36" Socket Connector Ribbon Cable - 20 Contacts	3M	M3AAA-2036R



MAX2850 EVALUATION KIT  
LAYER(9)-LAYER 1 PRIMARY COMPONENT SIDE

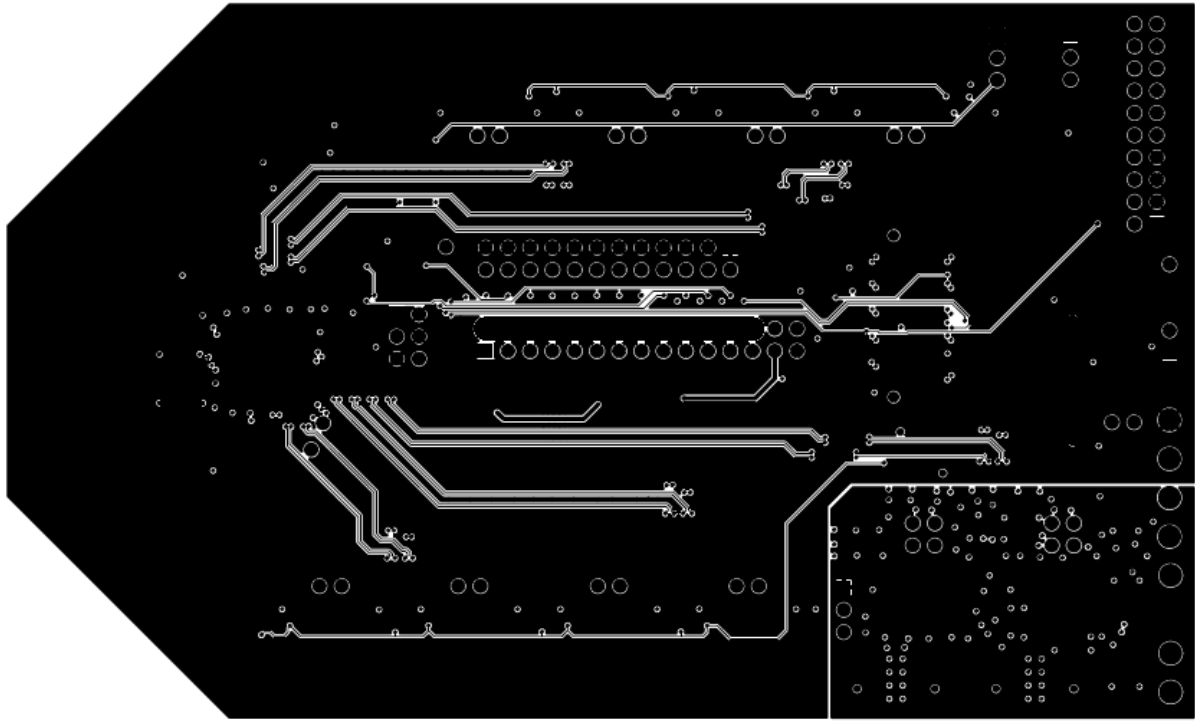
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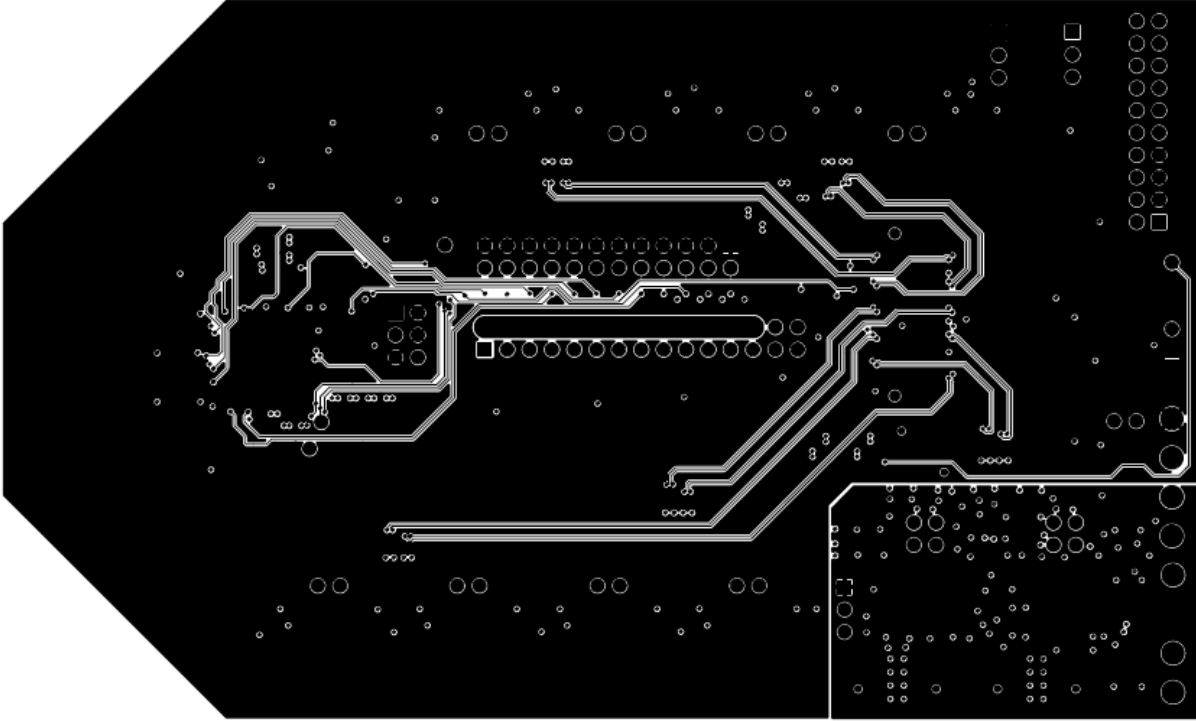
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REV 1  
SHEET: 2 OF 15



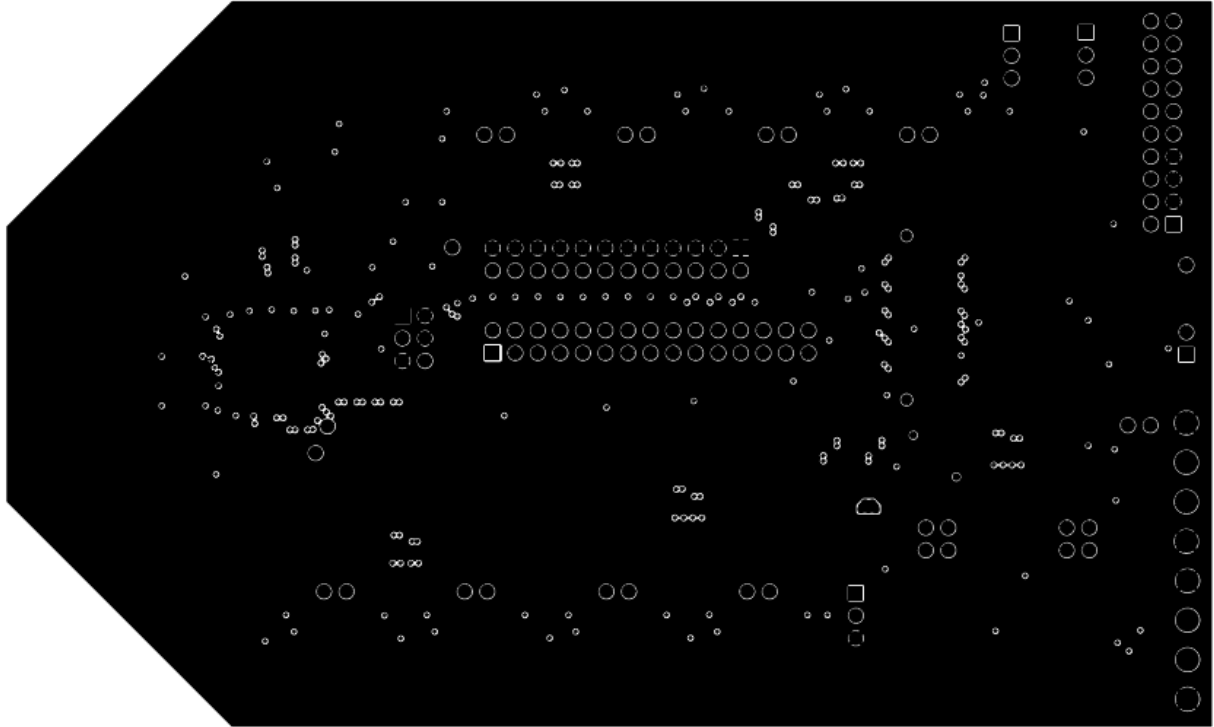
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SHEET: 3 OF 15



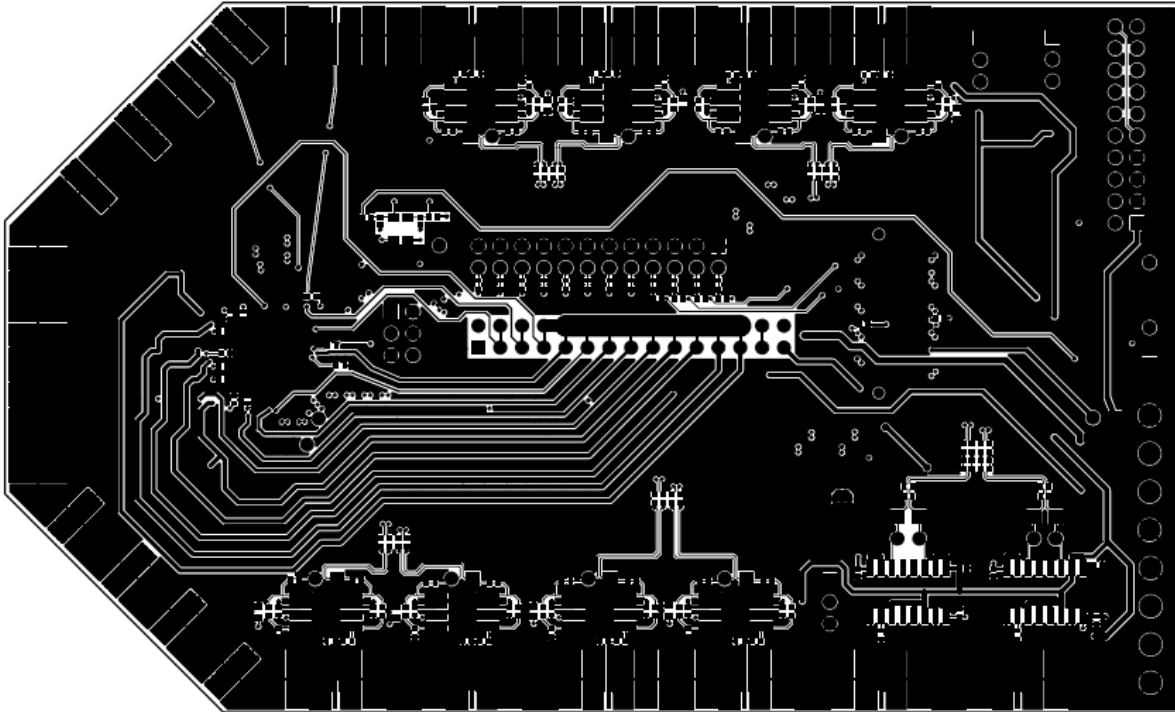
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REV 1  
SHEET: 4 OF 15



MAX2890 EVALUATION KIT  
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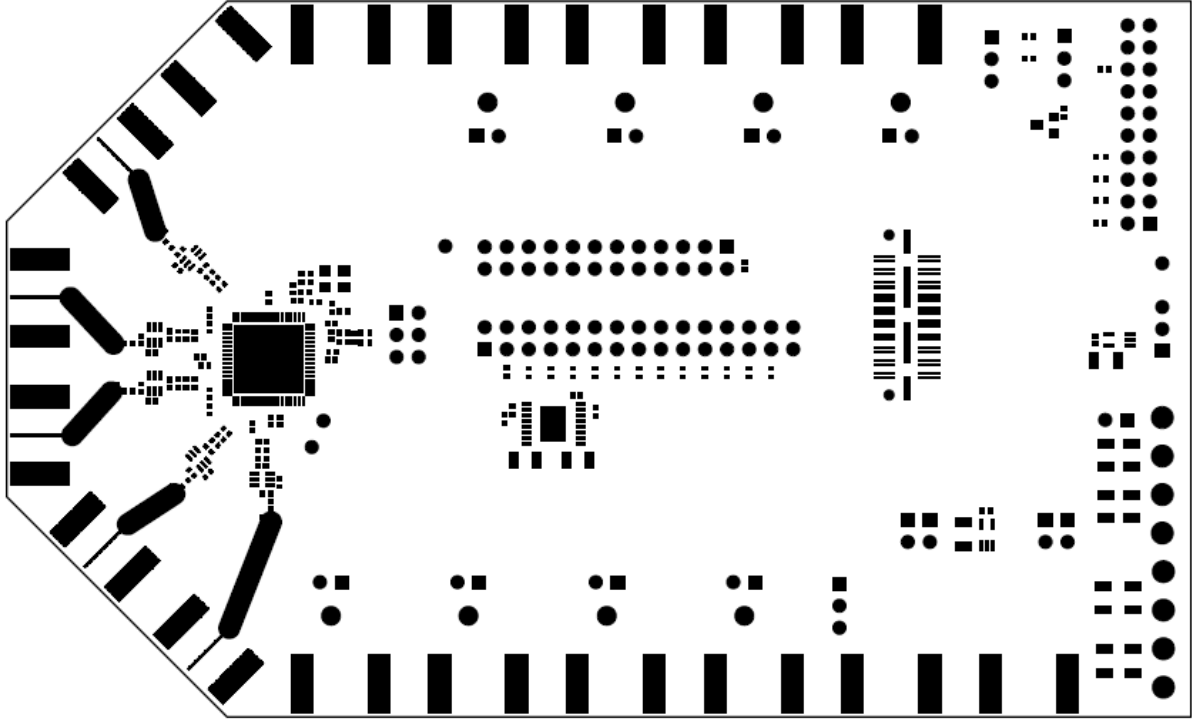
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MAX2850 EVALUATION KIT  
LAYER(6): LAYER 6 SECONDARY COMPONENT SIDE

REV 1  
SHEET: 6 OF 15



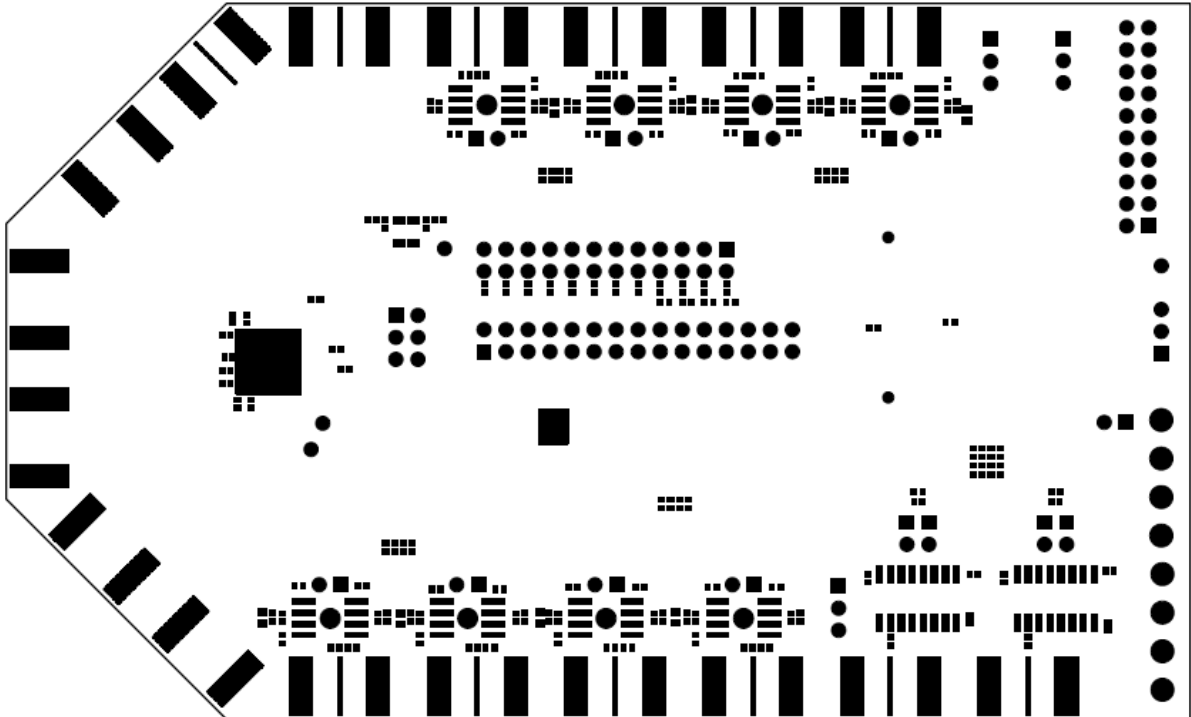


MAX2850 EVALUATION KIT  
LAYER(s): PRIMARY SIDE SOLDER MASK

REV 1  
SHEET: 6 OF 15







MAX2850 EVALUATION KIT  
LAYER(s):SECONDARY SIDE SOLDER MASK

REV 1  
SHEET: 12 OF 15

