### **General Description**

The MAX2839AS evaluation kit (EV kit) simplifies testing of the MAX2839AS receive and transmit performance in WiMAX<sup>TM</sup> applications operating in the 2.3GHz to 2.7GHz band. The EV kit provides 50 $\Omega$  SMA connectors for all RF and baseband inputs and outputs. Differential to singleended and single-ended to differential line drivers are provided to convert the differential I/Q baseband inputs and outputs to single ended.

#### **Component List**

DESIGNATION	QTY	DESCRIPTION
+5V, -5V, VBAT, VCCAUX	4	Test points, PCB red Keystone 5010
B0–B7, CSB, DIN, DOUT, ENABLE, LOAD, PABIAS, RSSI, RXBBIA+, RXBBIA-, RXBBIB+, RXBBIB-, RXBBQA+, RXBBQA-, RXBBQB+, RXBBQB-, RXHP, SCLK, TPCLKOUT, TUNEM, TUNEP, TXBBI+, TXBBI-, TXBBQ+, TXBBQ-, TXRX, VCM	34	Test points, PCB mini-red Keystone 5000
CLKOUT, FREF, RXBBIA, RXBBIB, RXBBQA, RXBBQB, RXINA, RXINB, TXBBI, TXBBQ, TXRF	11	SMA edge-mount connectors, round Johnson 142-0701-801
C1, C3, C8, C21, C22, C24, C30, C36, C38, C41, C42, C44, C49, C76	0	Open, ±10%, 0402 capacitors Leave site open
C2, C15	2	2.2pF ±0.1pF, 0402 capacitors Murata GRM1555C1H2R2B
C4–C7, C10, C13, C17, C18, C35, C40, C43, C45–C48, C50, C51, C52, C59, C60, C67	21	0.1µF ±10%, 0402 capacitors Murata GRM155R61C104K
C9, C16, C19, C70, C89	5	22pF ±5%, 0402 capacitors Murata GRM1555C1H220J

#### Features

- On-Board Line Drivers and Voltage References
- 50Ω SMA Connectors on All RF and Baseband Ports

### **Ordering Information**

PART	TYPE
MAX2839ASEVKIT+	EV Kit

+Denotes lead(Pb)-free and RoHS compliant.

DESIGNATION	QTY	DESCRIPTION
C11, C23, C26, C32, C74, C75, C87, C88	8	0.01µF ±10%, 0402 capacitors Murata GRM155R71C103K
C12, C53, C55, C66	4	10µF ±10%, 0805 capacitors Murata GRM21BR61A106K
C14	1	2200pF ±10%, 0402 capacitor Murata GRM155R71H222K
C25, C77	2	1000pF ±10%, 0402 capacitors Murata GRM155R71H102K
C27	1	2.2µF ±10%, 0805 capacitor Murata GRM21BR71A225K
C29, C86	2	1.0μF ±10%, 0402 capacitors Murata GRM155R60J105K
C33	1	100pF ±5%, 0402 capacitor Murata GRM155C1H101J
C37, C39	2	2.2µF ±10%, 0603 capacitors Murata GRM188R61A225K
C54, C56	2	1.8pF ±0.1pF, 0402 capacitors Murata GRM1555C1H1R8B
C68, C69	2	4.3pF ±0.1pF, 0402 capacitors Murata GRM1555C1H4R3B
C79	1	120pF ±5%, 0402 capacitor Murata GRM1555C1H121J
GND1, GND2	2	Test points, PCB black Keystone 5011
J17	0	Not installed, 2 x 13-pin header
J18	1	DB25 horizontal male PCB connector AMP 5747238-4



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### **Component List (continued)**

DESIGNATION	QTY	DESCRIPTION
JPB0–JPB7, JPENABLE, JPLOAD, JPRXHP, JPTXRX, RXBBBUF1, RXBBBUF2, VBAT_ LDO, SYNTH_LDO	16	1 x 3-pin headers Sullins PEC36SAAN
JPCSB, JPDIN, JPDOUT, JPSCLK	0	Not installed, 1 x 3-pin headers
L1, L6, L13–L16	0	Do not install, ±0%, 0402 inductors Murata LQP15MN2N7B02
L2, L4, L5, L7, L9, L10	0	Not installed, inductors
L3, L8	2	3.6nH ±0.1nH, 0402 inductors Murata LQP15MN3N6B02
R1, R7	2	200Ω ±1%, 0402 resistors*
R2, R5, R6, R38	4	205Ω ±1%, 0402 resistors*
R3, R10	2	226Ω ±1%, 0402 resistors*
R4, R26, R40, R57	4	49.9Ω ±1%, 0402 resistors*
R8, R11, R12, R14–R19, R24, R25, R28, R30, R31, R35, R42, R45, R47, R48, R50, R52, R53, R54, R58, R59, R60	0	Open, ±1%, 0402 resistors Leave site open
R9, R13, R23, R27, R29, R32, R39, R41, R55, R56	10	0Ω ±0%, 0402 resistors*
R20, R51	2	750Ω ±1%, 0402 resistors*
R21, R22	2	61.9Ω ±1%, 0402 resistors*
R33, R36	2	1kΩ ±0%, trimmer potentiometers Bourns 3296W-1-102LF
R34	1	$576\Omega \pm 1\%$ , 0402 resistor; use lead-free parts only
R37	1	$332\Omega \pm 1\%$ , 0402 resistor; use lead-free parts only
SYNTH_LDO	1	1 x 3-pin header Sullins PEC36SAAN

DESIGNATION	QTY	DESCRIPTION
SYNTH_LDO	1	Shorting jumper Sullins SSC02SYAN
T1, T2, T4	3	3.6GHz RF baluns Murata LDB182G5010G-120
U1, U3	2	Low-noise-differential ADC drivers ADI AD8139ARDZ
U2, U5, U6, U15	4	Maxim MAX4444ESE+ (16 SO)
U4	1	Maxim MAX2839ASEWO+T
U7	1	Low-dropout linear regulator Maxim MAX8887EZK29+ (5 SOT23)
U8, U9	2	SN74LVTH244ADB Texas Instruments SN74LVTH244ADBR
U10	1	Low-dropout voltage reference Maxim MAX6062AEUR+ (3 SOT23)
U11	1	40MHz TCXO Kyocera KT3225N40000ECV28ZAA
U13	1	Ultra-low-noise LDO Maxim MAX8510EXK29+ (5 SC70)
VCCCP, VCCLNA_A, VCCLNA_B, VCCRXBB1, VCCRXBB2, VCCRXMX, VCCTCXO, VCCTXMX, VCCVCO, VCCXTAL, VCC_DB, VCC_PAD, VCC_REF	0	Not installed, 1 x 2-pin headers
Y1	0	Not installed, quartz crystal
_	1	PCB: MAX2839AS EVALUATION KIT+

\*Use lead-free parts only.

### **Component Suppliers**

SUPPLIER	PHONE	WEBSITE
Analog Device	800-262-5643	www.analog.com
Digi-Key Corp.	800-344-4539	www.digikey.com
Keystone Electronics	800-221-5510	www.keyelco.com
Murata Americas	770-436-1300	www.murataamericas.com

Note: Indicate that you are using the MAX2839AS when contacting these component suppliers.

### **Quick Start**

The MAX2839AS EV kit is fully assembled and factory tested. Follow the instructions in the *Connections and Setup* section to test the devices.

#### **Recommended Test Equipment**

This section lists the recommended test equipment to verify the operation of the MAX2839AS. It is intended as a guide only and substitutions may be possible.

- DC supply capable of delivering +5V and 250mA of continuous current
- DC supply capable of delivering -5V and 250mA of continuous current
- DC supply capable of delivering +3.3V and 250mA of continuous current
- One HP 8648 or equivalent signal source capable of generating 0dBm up to 2.7GHz
- Two HP or equivalent arbitrary waveform generators
- One HP 8561E or equivalent RF spectrum analyzer with a minimum 100kHz to 3GHz frequency range
- One HP 437B power meter and power head
- PC laptop or tablet with Microsoft Windows XP<sup>®</sup>, Windows<sup>®</sup> 7, 8 OS and a USB port
- USB-A male to USB-B male cable
- US keyboard

#### **Connections and Setup**

The EV kit is fully assembled and factory tested. Follow the instructions below to test the devices. This section provides step-by-step instructions for getting the EV kit up and running in all modes:

 Install and run the MAX2839AS control software. Select MAX2839AS Ev.Kt for "select IC" under Options.

Windows and Windows XP are registered trademarks and registered service marks of Microsoft Corporation.

- Connect the PC to the INTF3000 interface board using the USB-A male to USB-B male cable. On INTF3000, place a jumper between pins 1-2 on JU1 (VBUS Pos). Connect the 25-pin connector of the INTF3000 (J4) directly to the 25-pin connector on the EV kit (J18).
- 3) With the power supply turned off, connect the +3.3V power supply to VBAT and VCCAUX. Connect the power-supply ground to the header labeled GND.
- 4) With the power supply turned off, connect the +5V power supply to the +5V pin and the -5V power supply to the -5V pin. Connect the power-supply ground to the header labeled GND. Connect all the power-supply grounds together.
- 5) Set the RXBBBUF jumper across pins 1-2 to enable the Rx baseband buffers.
- 6) Turn on the +3.3V power supply, and the +5V and -5V power supplies.
- 7) In the enables panel of the software, check the EN\_SPI box to enable the 3-wire interface.
- Adjust the Tx common-mode potentiometer (R36) until measuring 0.9V common-mode voltage at the VCM test point.
- In the register panel of the software, set ENABLE to 0, and set JPTXRX jumper across pins 1-2 to put the IC into standby mode.
- 10) In the synth panel of the software, set the LO frequency to 2500MHz.

#### **Receive Mode**

- Use the power meter to calibrate the RF signal generator to deliver -98dBm at 2501MHz. After calibration, turn the RF signal generator off, disconnect it from the power meter, and connect it to the RXINA port of the EV kit.
- Connect either the I or the Q baseband output of receiver A to a spectrum analyzer. Set the center frequency to 1MHz and the span to 1MHz.

- 3) In the register panel of the software, enter the recommended register setting shown in Figure 1 for operating the MAX2839AS in steady state receive mode bench measurement. This setup fixes the VGA highpass corner at 1kHz.
- 4) Press the Send All button.
- 5) In the register panel of the software, set ENABLE to be 1, and set JPTXRX jumper across pins 1-2 to activate the receive path.
- In the Rx panel of the software, toggle the LNA gain enable and the baseband VGA enable both to be SPI. Set both of the gain controls to be max.
- Turn on the RF signal source. The output CW tone at 1MHz should be approximately 0dBm.

#### **Transmit Mode**

- Connect the spectrum analyzer to the TXRF port. Set the center frequency to 2500MHz and the span to 5MHz.
- Connect a 1MHz I/Q signal to pins TXBBI and TXBBQ, respectively. Set the input amplitude of each channel to 90mV<sub>RMS</sub> with 90° phase shift.
- In the register panel of the software, set ENABLE to 1, and set JPTXRX jumper across pins 2-3 to activate the transmit path.
- 4) In the register panel of the software, enter the recommended register setting shown in Figure 2.
- 5) Press the Send All button.

<u>E</u> xit <u>O</u> ptions <u>H</u> elp	Setting	s					
Registers Enables	Synth	RX 1	TX Misc	Defaults	Send All	🔮 LOCK ? 🗖	
RXENABLE		000		000 Send	Block SPI En.	1600000011101 01 Send	
BXBF1		000		00C Send	FRAC1	17 0 1 0 1 0 1 0 1 0 1 1 155 Send	Control Pins:
BXRF2	200	100 765	00001 43210	081 Send	FRAC2	18010101010101155 Send	RX TXRX
RXRF & LPF			1 1 0 0 1 4 3 2 1 0	1B9 Send	INT DIV.	19010101010111153 Send	
LPF		1 1 1 7 6 5	0 0 1 1 0 4 3 2 1 0	3E6 Send	SYNTH1	201001001001 249 Send	0 RXHP
RX1 LPF & VGA		0 0 0   7 6 5	000000 43210	100 Send	SYNTH2	21 0 0 0 0 1 0 1 1 0 1 02 Send	Pulse "LOAD"
RX2 LPF & VGA	600 98	000  765	000000 43210	000 Send	VAS	2201110101011011 9876543210	
RSSI & VGA	710	000  765	0 1 0 0 0 4 3 2 1 0	208 Send	LO CONFIG.	2310010015011111124F Send	
RXTOP & BIAS	810 98	001	00010 43210	222 Send	XTAL	240110000000000 9876543210	
RX_TOP	900	001	0 1 0 0 0 4 3 2 1 0	028 Send	VCO	25000000000000000000000000000000000000	
TX_TOP		000	0 1 1 0 0 4 3 2 1 0	00C Send	LOGEN	26111110000000Send	
Temp. Sens.		101	10100 43210	OB4 Send	TXLO I/Q	27 1 0 1 0 0 0 0 0 0 0 Send	
HPFSM1		010 765	0 1 1 1 1 4 3 2 1 0	24F Send	PADAC	280011000000000000000000000000000000000	
HPFSM2	1301 98	010	10000 43210	150 Send	TX Gain	29 0 0 0 0 0 0 0 0 0 0 0 Send	<u>Help</u>
HPFSM3		110	0 0 1 0 1 4 3 2 1 0	1C5 Send	TX DC Cor. I	30110000000000000000000000000000000000	Send All
HPFSM4	15 <u>1 0</u>	001	1 1 0 0 1 4 3 2 1 0	239 Send	TX DC Cor. Q	31101100000000 9876543210	Read All

Figure 1. Receive Mode Register Setting

6) Enable the output of the baseband signal sources. The desired tone, LO leakage, and the sideband appear at 2501MHz, 2500MHz, and 2499MHz, respectively. Set the Tx VGA gain to be 3dB below the max gain. The power level of the desired tone is approximately -1dBm in the spectrum analyzer marker reading, assuming that the balun on board contributes 1dB of loss.

#### **Layout Considerations**

The EV kit can serve as a guide for board layout. Keep PCB trace lengths as short as possible to minimize parasitic inductance. Also, keep decoupling capacitors as close as possible to the IC with a direct connection to the ground plane.

#### **Power-Supply Layout**

To minimize coupling between different sections of the IC, use a "star" power-supply routing configuration with a large decoupling capacitor at a central  $V_{CC}$  node. 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 as possible to each supply pin. This arrangement provides local decoupling at each  $V_{CC}$  pin. Use at least one via per bypass capacitor for a low-inductance ground connection. Do not share the capacitor ground vias with any other branch.

Exit Options <u>H</u> elp Registers Enables			( Misc		Defaults	Send All		6	LOCK ?		
RXENABLE	987			000	Send	Block SPI En.	16000			01 Send	
BXBF1	1000		1100 3210	<u> 00C</u>	Send	FRAC1	17010			155 Send	Control Pins:
RXRF2	2001	0000 654	00001 3210	081	Send	FRAC2	18 <mark>010</mark> 987	101 654		155 Send	
BXRF & LPF	3011	011 654	1001 3210	189	Send	INT DIV.	19 <mark>010</mark> 987	101 654		153 Send	I O LOAD
LPF	987	654			Send	SYNTH1	987	6543	3210	249 Send	
RX1 LPF & VGA			3 2 1 0			SYNTH2		6543	3210		Pulse "LOAD"
RX2 LPF & VGA			3210		Send	VAS		654:	3210		
RSSI & VGA	987	654			Send	LO CONFIG.	23100	6543	3210		
RXTOP & BIAS	987	654			Send	XTAL		654	3210		
RX_TOP	987	654				LOGEN	987	654	3210	000 Send	-
TX_TOP Temp. Sens.	987	654				TXL01/Q	27101	6543	3210	3C0 Send	_
HPESM1	987	654	3 2 1 0		Send	PADAC	987	6543	3210	280 Send	_
HPFSM2	987 13010	654	3210			TX Gain	987 29000	6543 0000	) 2 1 0 0 0 0 0		_
HPFSM3	987	654	3210			TX DC Cor. I	987	654	3210	300 Seno	- Help
HPFSM4	987 15100	654 1000	3210 0001			TX DC Cor. Q	31101	100		2C0 Send	
	987	654	3210				987	654	3210		

Figure 2. Transmit Mode Register Setting

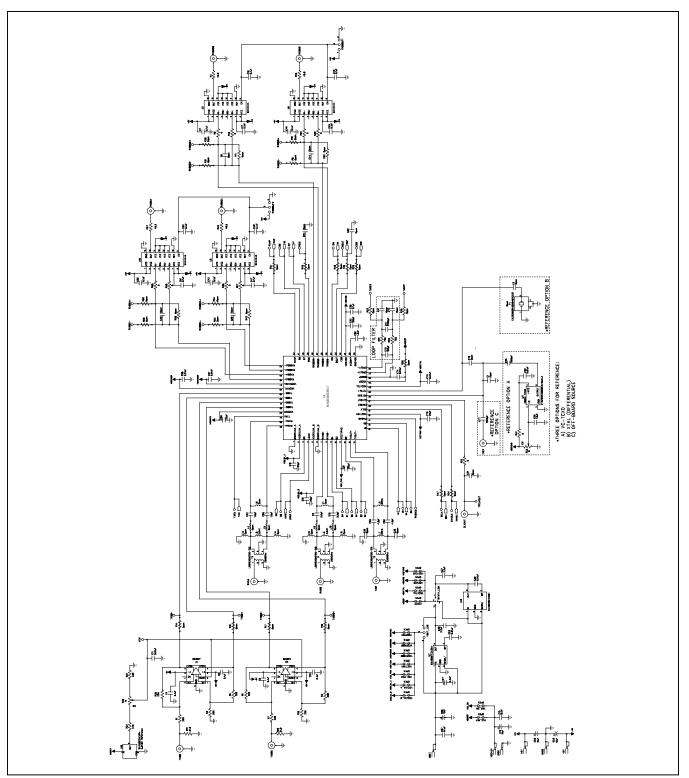


Figure 3a. MAX2839AS EV Kit Schematic (Sheet 1 of 2)

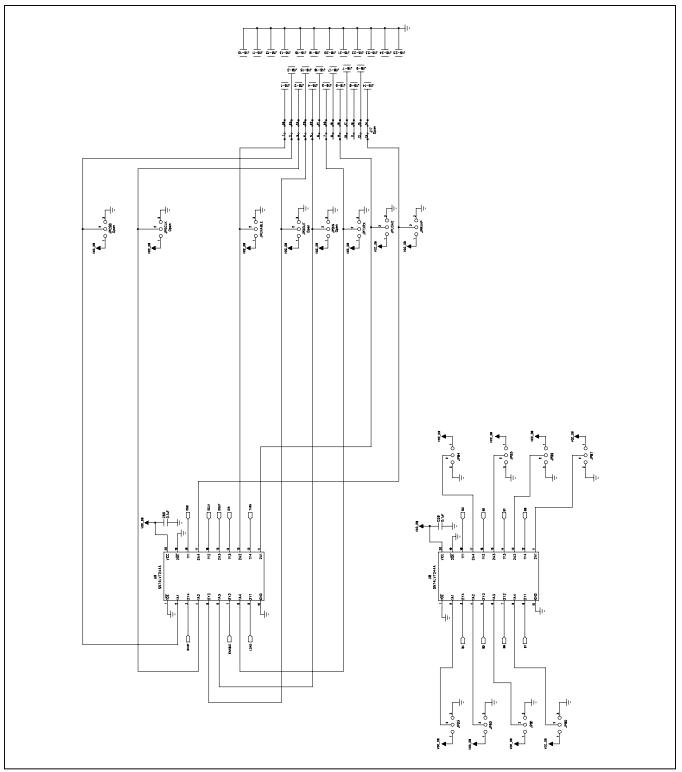
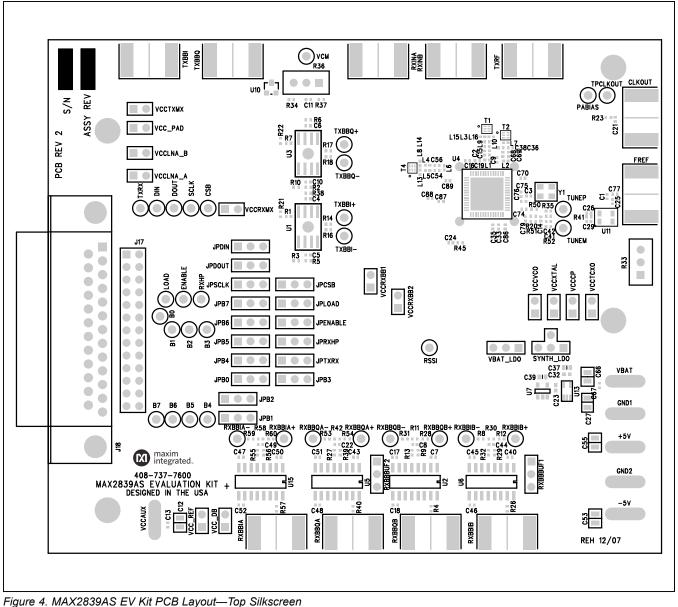


Figure 3b. MAX2839AS EV Kit Schematic (Sheet 2 of 2)



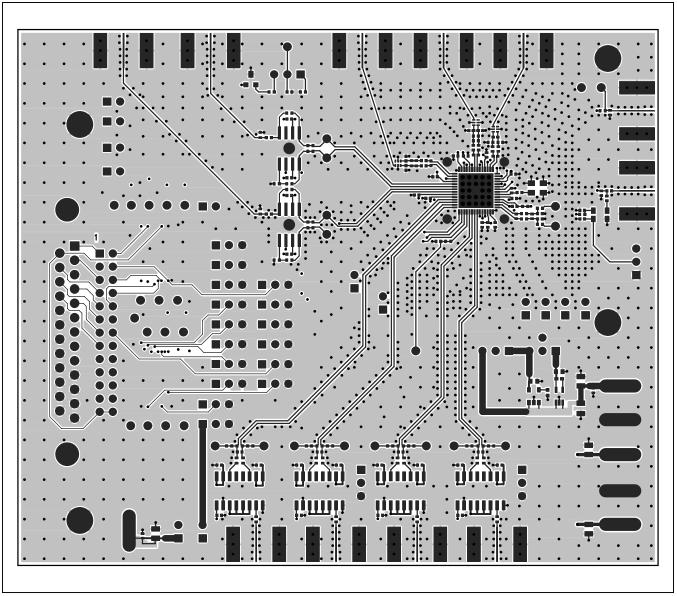


Figure 5. MAX2839AS EV Kit PCB Layout—Component Side

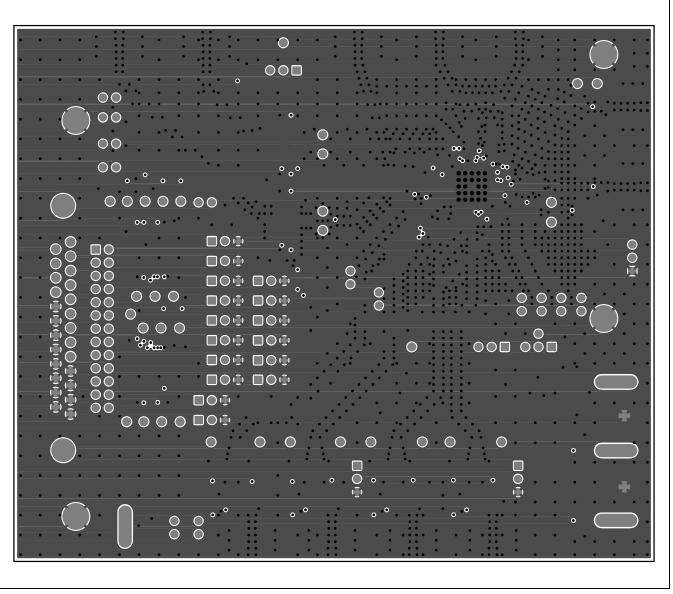


Figure 6. MAX2839AS EV Kit PCB Layout—Inner Layer 2 (Ground Layer)

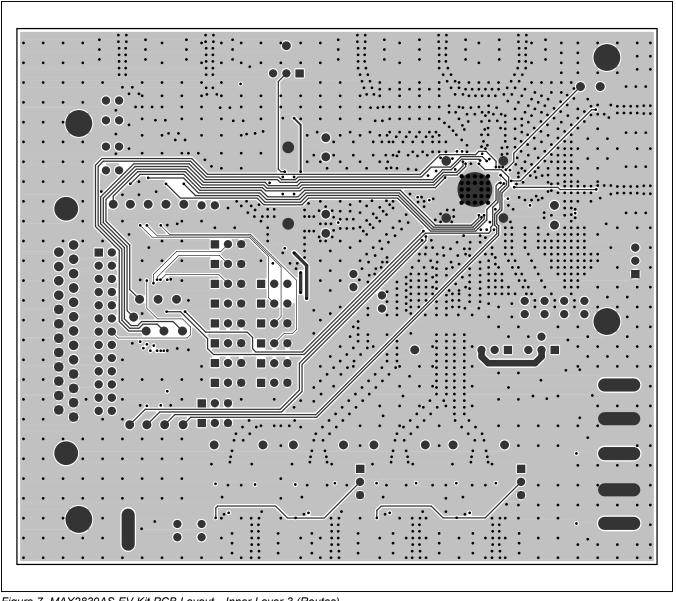


Figure 7. MAX2839AS EV Kit PCB Layout—Inner Layer 3 (Routes)

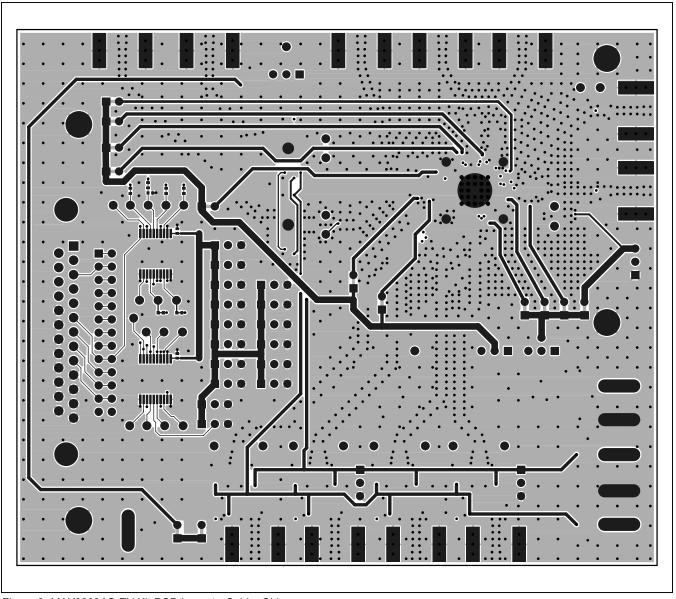


Figure 8. MAX2839AS EV Kit PCB Layout—Solder Side

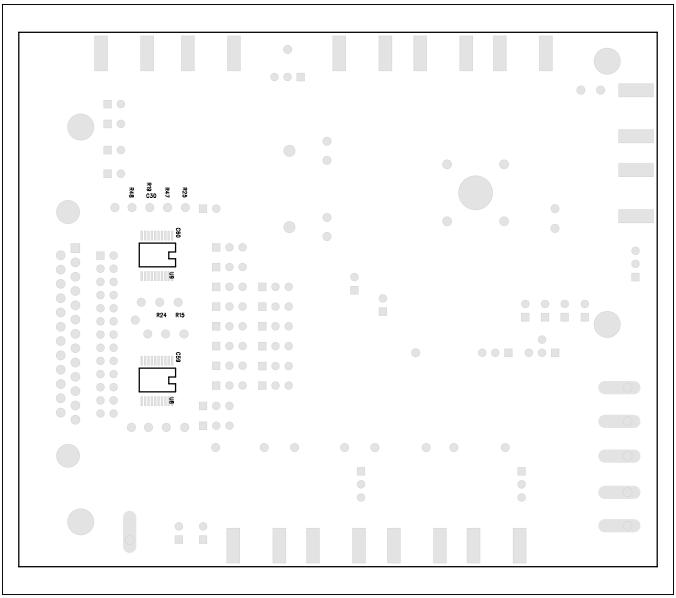


Figure 9. MAX2839AS EV Kit PCB Layout—Bottom Silkscreen

### Evaluates: MAX2839AS

### **Revision History**

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	4/09	Initial release	—
1	5/10	Changed the part number from MAX2839S to MAX2839AS	1–13
2	11/14	Updated Quick Start section	3

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.

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