General Description

The MAX14890E evaluation kit (EV kit) is a fully assembled and tested PCB that contains the MAX14890E incremental encoder interface. The MAX14890E incremental encoder receiver contains four differential receivers and two single-ended receivers for RS-422, HTL, TTL, and digital signals.

Power for the transceiver can be provided from a single +5V source or from an on-board 24V to 5V step-down circuit. The MAX14890E EV kit includes terminal blocks for motor and power connections.

On-board switches and jumpers are included to configure the MAX14890E in pin-control mode. The evaluation board is also designed with the Arduino® form-factor for easy software evaluation and development.

Features

- Four Configurable Differential or Single-Ended Receivers
- SPI or Pin-Controlled Operation USB-PC Connection
- Proven PCB Layout
- Fully Assembled and Tested

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

Quick Start

Recommended Equipment

- MAX14890E EV kit
- 5V, 500mA power supply
- Function generator or logic signal generator
- Oscilloscope

Procedure

The EV kit is fully assembled and tested. Follow the steps below to verify board operation before exercising the full features of the device:

1) Verify that all the jumpers are in their default positions, as shown in Table 1.
2) Set the DC power supply to +5V and connect between the VCC and GND test points on the EV kit.
3) Connect the function generator to the Z input on the T3 block terminator. Connect the $\overline{Z}$ input to ground. Set the function generator to generate a ±2V 100kHz signal.
4) Connect the oscilloscope to the ZO output.
5) Turn on the power supply.
6) Turn on the function generator.
7) Verify that ZO is switching as expected.
8) Repeat with the A, $\overline{A}$, B, $\overline{B}$, DIY, and $\overline{Y}$ inputs.

Arduino is a registered trademark of Arduino, LLC.

maxim integrated™

Detailed Description

The MAX14890E EV kit is a fully tested circuit board demonstrating the capabilities of the MAX14890E incremental encoder interface.

The EV kit includes an on-board 24V-to-5V step-down supply, fault indicator LEDs, jumpers for pin-mode control, and SPI-connections. The board is designed to operate either as a stand-alone board or with an external mbed® or Arduino board (Figure 2).

Powering the Board

The MAX14890E operates from a single +5V supply. A separate logic-supply (V_L) is also available. Apply +5V to VCC (TP1) to power the board using a single supply. Shunt the J1 jumper to connect V_L to VCC, or apply a separate voltage as low as 1.62V to V_L (TP2) for a separate logic-supply.

The EV kit also includes a 24V step-down circuit. To power the board from an external +24V source, ensure that the J1 jumper is open and connect the +24V supply and GND lead to the T6 terminal block. Put a shunt across the J2 jumper to power VCC with the +5V generated from the step-down circuit.

Table 1. Jumper Descriptions

JUMPER	SHUNT POSITON	DESCRIPTION
J1	Open	VL is not connected to VCC
	Closed*	VL is connected to VCC
J2	Open*	Output of 24V step-down circuit is not connected to VCC
	Closed	Output of 24V step-down circuit is connected to VCC
J4	Open	220Ω termination is connected between A and $\overline{A}$
	Closed*	220Ω termination is not connected between A and $\overline{A}$
J5	Open	220Ω termination is connected between B and $\overline{B}$
	Closed*	220Ω termination is not connected between B and $\overline{B}$
J6	Open	220Ω termination is connected between Z and $\overline{Z}$
	Closed*	220Ω termination is not connected between Z and $\overline{Z}$
J7	Open	220Ω termination is connected between DI/Y and $\overline{Y}$
	Closed*	220Ω termination is not connected between DI/Y and $\overline{Y}$
J8	1-2	DI/TTLY is high. See Table 2.
	2-3*	DI/TTLY is low. See Table 2.
J9	1-2	DI/TTL2 is high. RxD2 is in TTL mode.
	2-3*	DI/TTL2 is low. RxD2 is in DI mode.
J10	1-2	DI/TTL3 is high. RxD3 is in TTL mode.
	2-3*	DI/TTL3 is low. RxD3 is in DI mode.
J11	1-2	HITH/CSB is high.
	2-3*	HITH/CSB is low
J12	1-2	SNGL/CLK is high. See Table 2.
	2-3*	SNGL/CLK is low. See Table 2.
J13	1-2*	TTL/SDI is high. See Table 2.
	2-3	TTL/SDI is low. See Table 2.

**Default position.*

mbed is a registered trademark of ARM Limited LLC.

Mode Selection

The MAX14890E operates in either pin-control or SPI mode. The MAX14890E EV kit is designed to operate as a stand-alone board in pin-control mode, but can also be evaluated in SPI mode. Pin-control mode is the default state of the board.

Ensure that all switches are in the off state (to the left) for pin-control mode.

To evaluate the board in SPI mode, set all of the switches on the S1 switch to the on state (to the right). The MAX14890E EV kit has been designed to connect directly to an Arduino or mbed LPC1549Xpress board for easy software evaluation. See Maxim Integrated's website for sample code and application notes.

Pin-Control Mode

Configuring the RxA, RxB, RxZ, and RxY Receivers

On-board jumpers are available for pin-control mode configuration. J12 sets the SNGL/CLK input. J13 sets the TTL/SDI input. J8 sets the DI/TTLY input. See Table 2 for receiver configuration settings.

Configuring the RxD2 and RxD3 Receivers

On-board jumpers are used to set the DI/TTL2 (J9) and DI/TTL3 (J10) inputs in pin-control mode. These inputs configure the D2 and D3 receivers, respecitively (Table 3).

Cable Termination

Transmission line termination is required for RS-422, HTL, and TTL high-speed signals on long cables. The EV kit includes selectable termination for each of the the RxA, RxB, RxZ, and RxY receivers. For HTL signals, 100pF/270Ω AC-termination with a series RC is available. For RS-422 and TTL signal levels, close the associated jumper (Table 4) to enable the on-board 200Ω termination for each receiver.

Fault Indicators

The MAX14890E detects common RS-422/HTL/TTL/DI faults. These faults include low differential input signals, open-wire, short-circuits, and inputs voltages that are outside the normal operating voltage range (below -18V and +18V). The EV kit includes on-board LEDs for visual indicators when a fault condition occurs on any of the RxA, RxB, RxZ, RxY, RxD2, and RxD3 receivers. LEDs turn on when a fault condition occurs.

Table 2. RxA, RxB, RxZ, RxY Receiver Mode Settings (Pin-Control Mode)

INPUTS			RECEIVER OPERATION	
SINGL	TTL	DI/TTLY	RxA, RxB, RxZ	RxY
L	L	L	D-HTL	TTL
L	L	H	D-HTL	DI
L	H	L	RS-422	RS-422
L	H	H	RS-422	DI
H	L	L	SE-HTL	TTL
H	L	H	SE-HTL	DI
H	H	L	TTL	TTL
H	H	H	TTL	DI

Table 3. RxD2/RxD3 Receiver Input Modes

DI/TTL2	RxD2 MODE OF OPERATION
L	TTL
H	DI

Table 4. Enable Receiver Input Termination

JUMPER	RECEIVER
J4	RxA
J5	RxB
J6	RxZ
J7	RxY

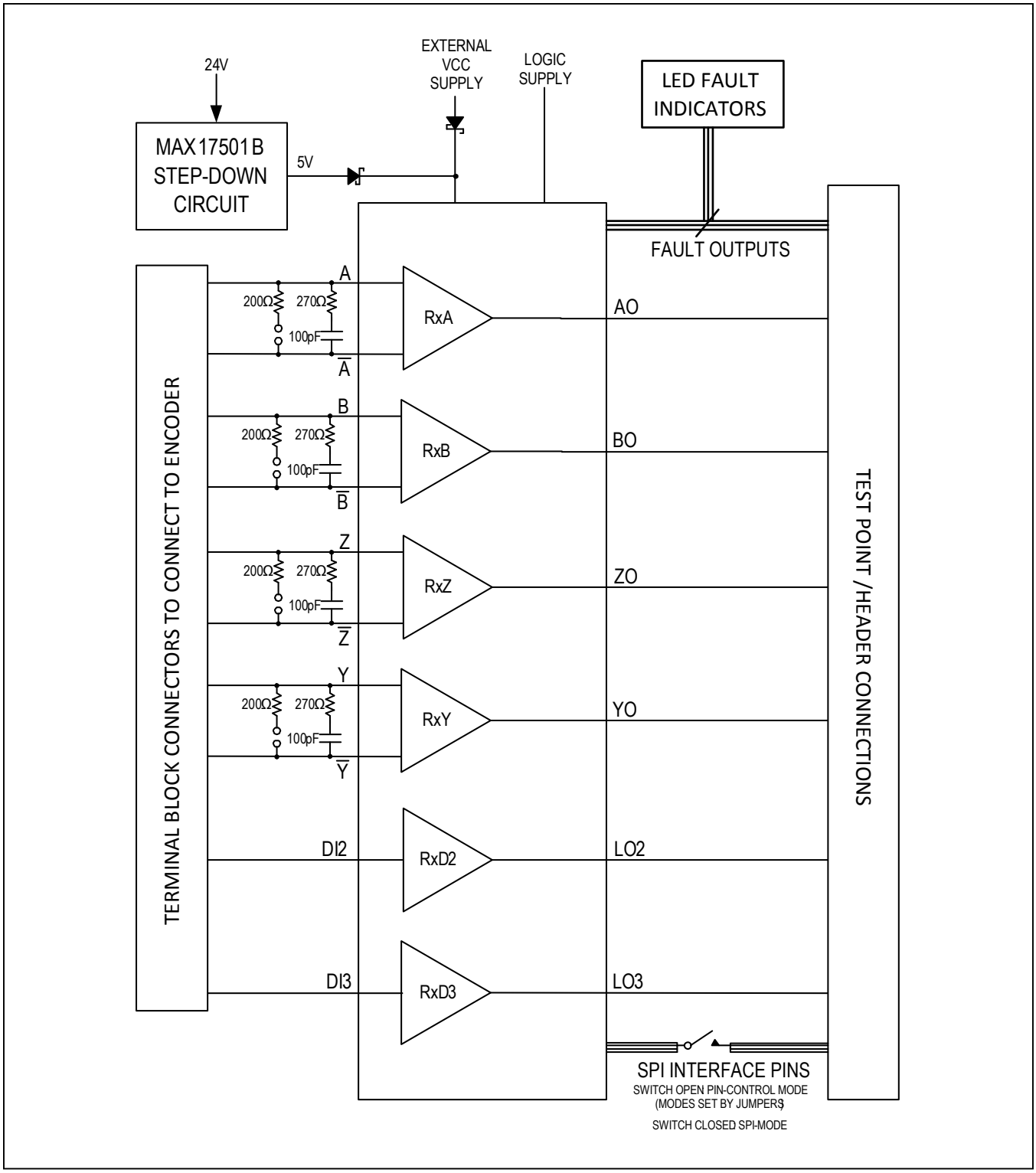

Figure 1. MAX14890E EV Kit Block Diagram

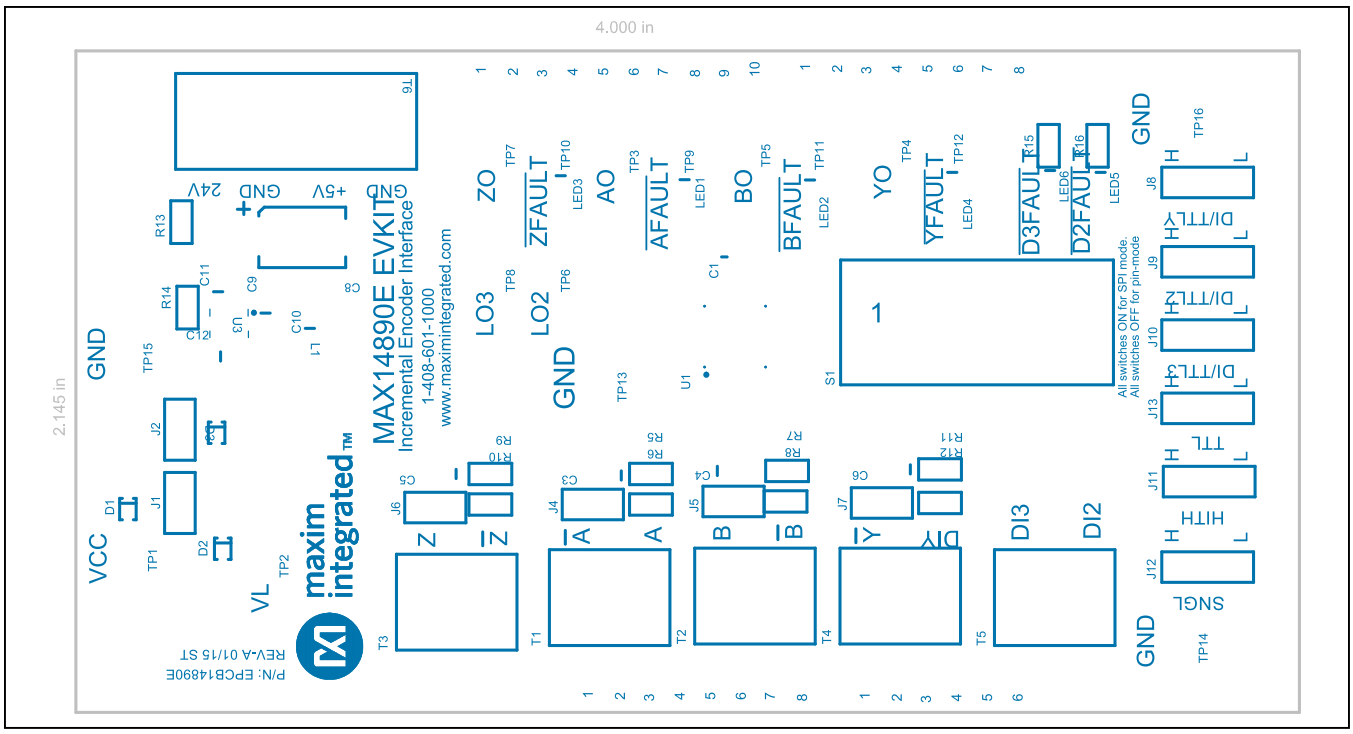

Figure 2. MAX14890E EV Kit Component Placement Guide—Top Silkscreen

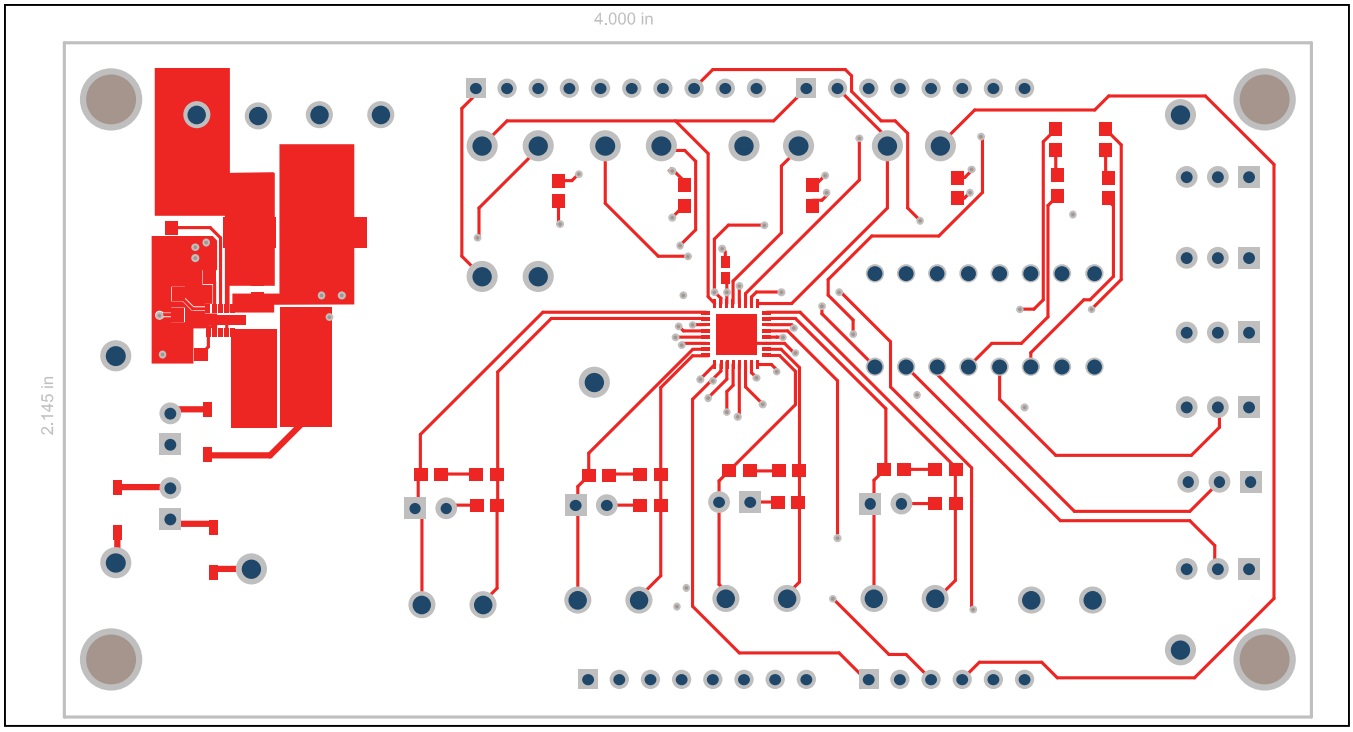

Figure 3. MAX14890E EV Kit PCB Layout—Top Layer

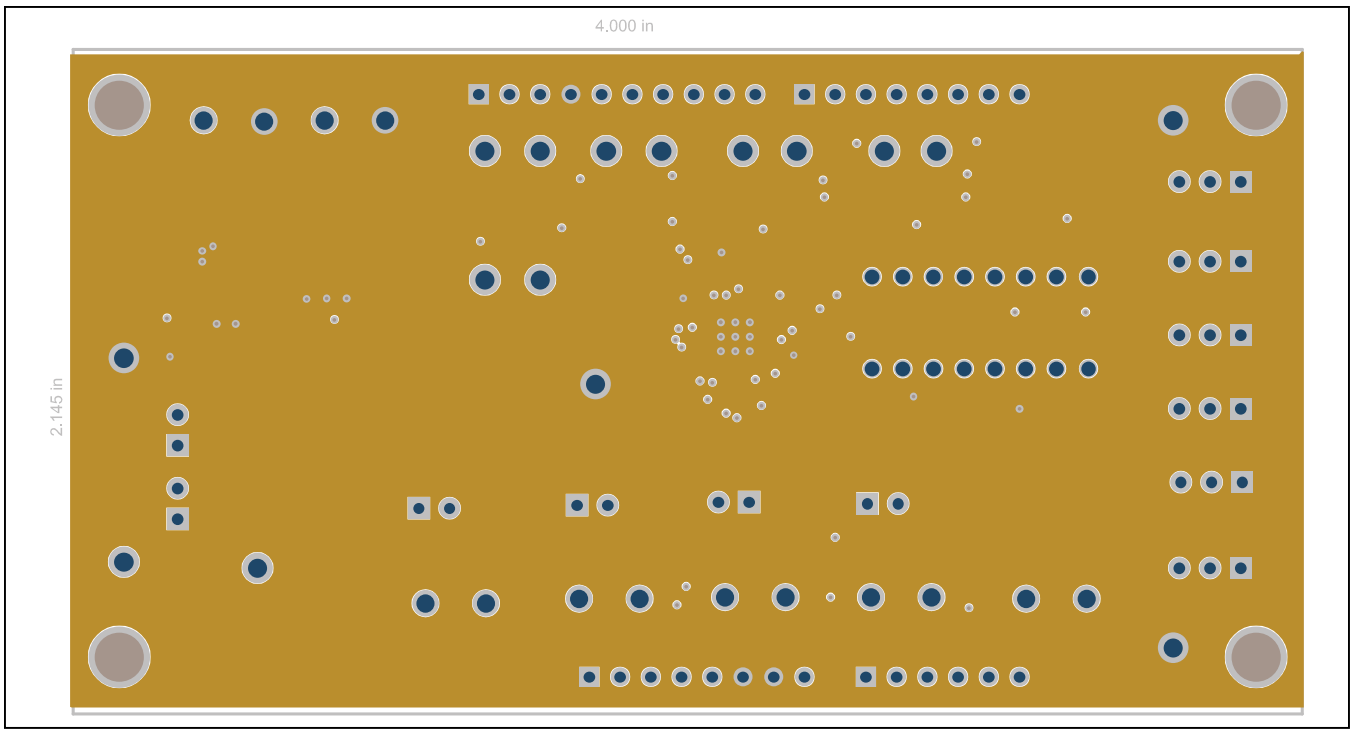

Figure 4. MAX14890E EV Kit PCB Layout—Ground

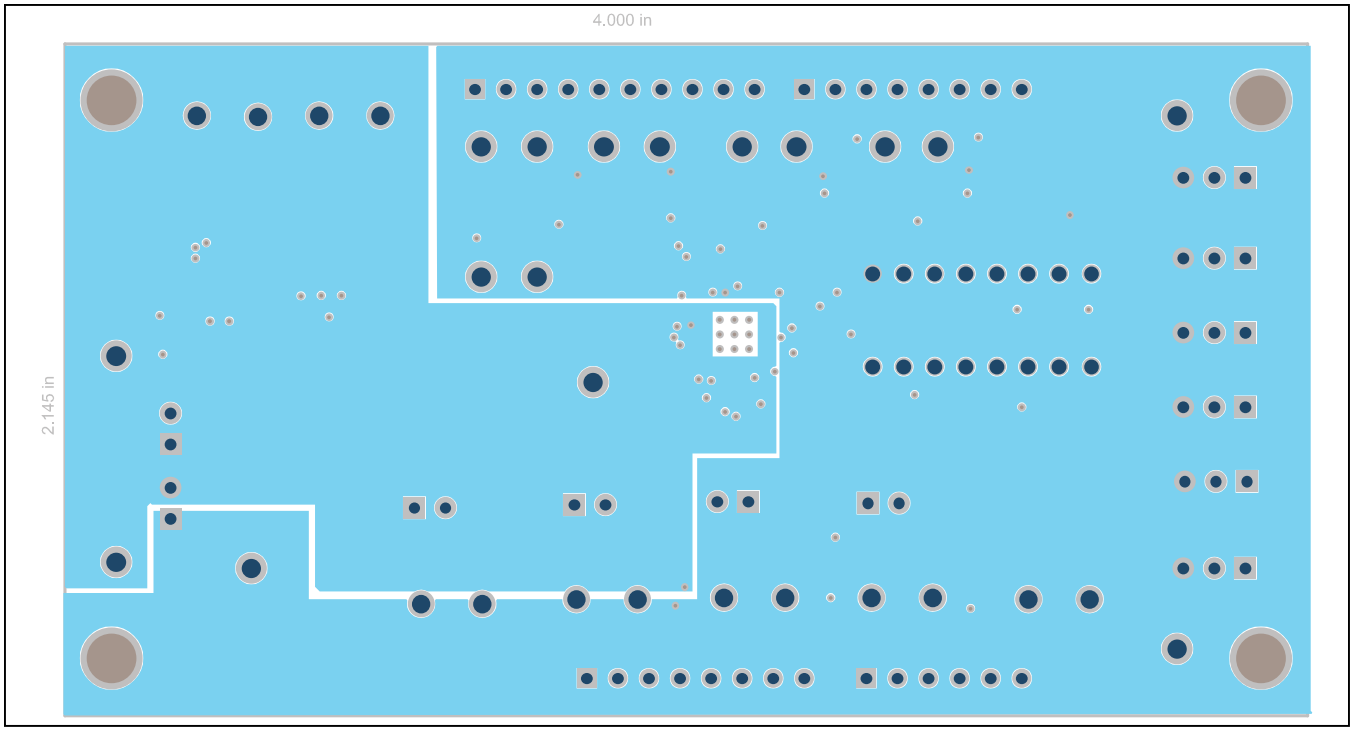

Figure 5. MAX14890E EV Kit PCB Layout—Power

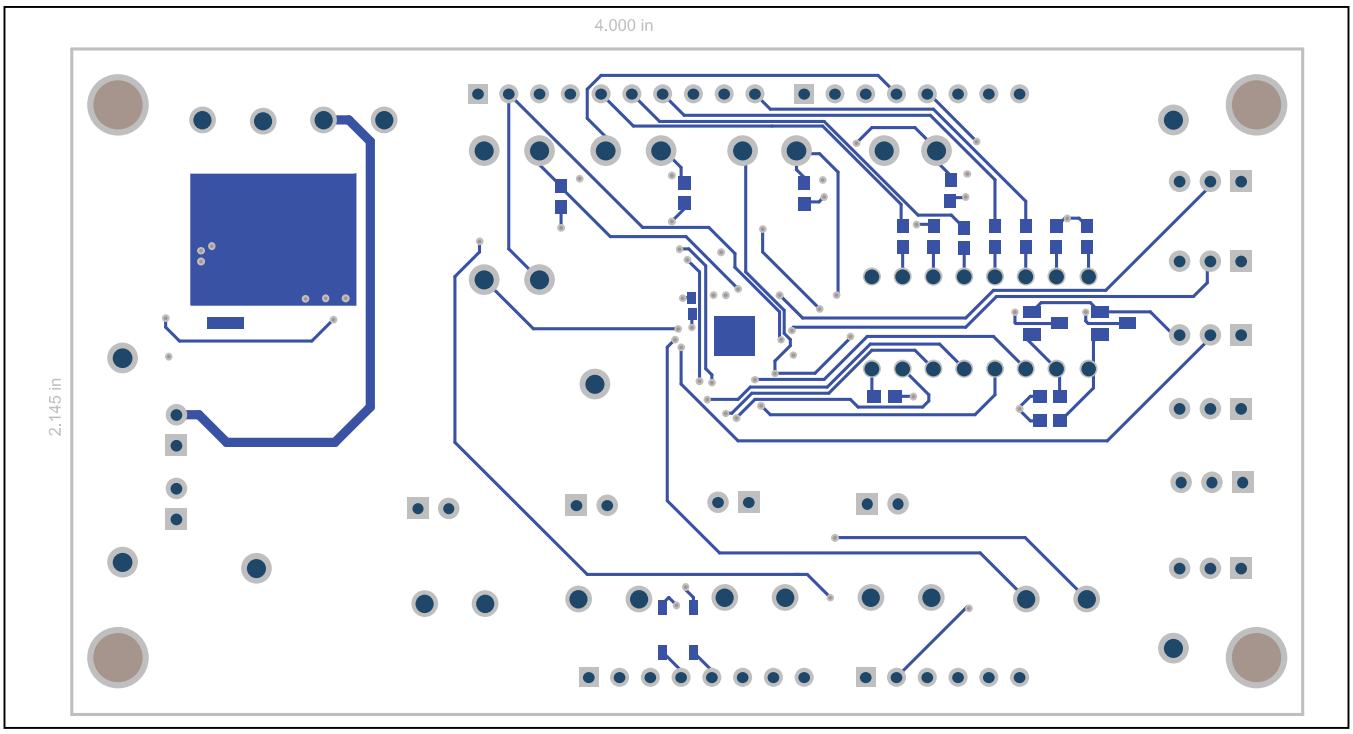

Figure 6. MAX14890E EV Kit PCB Layout—Bottom Layer

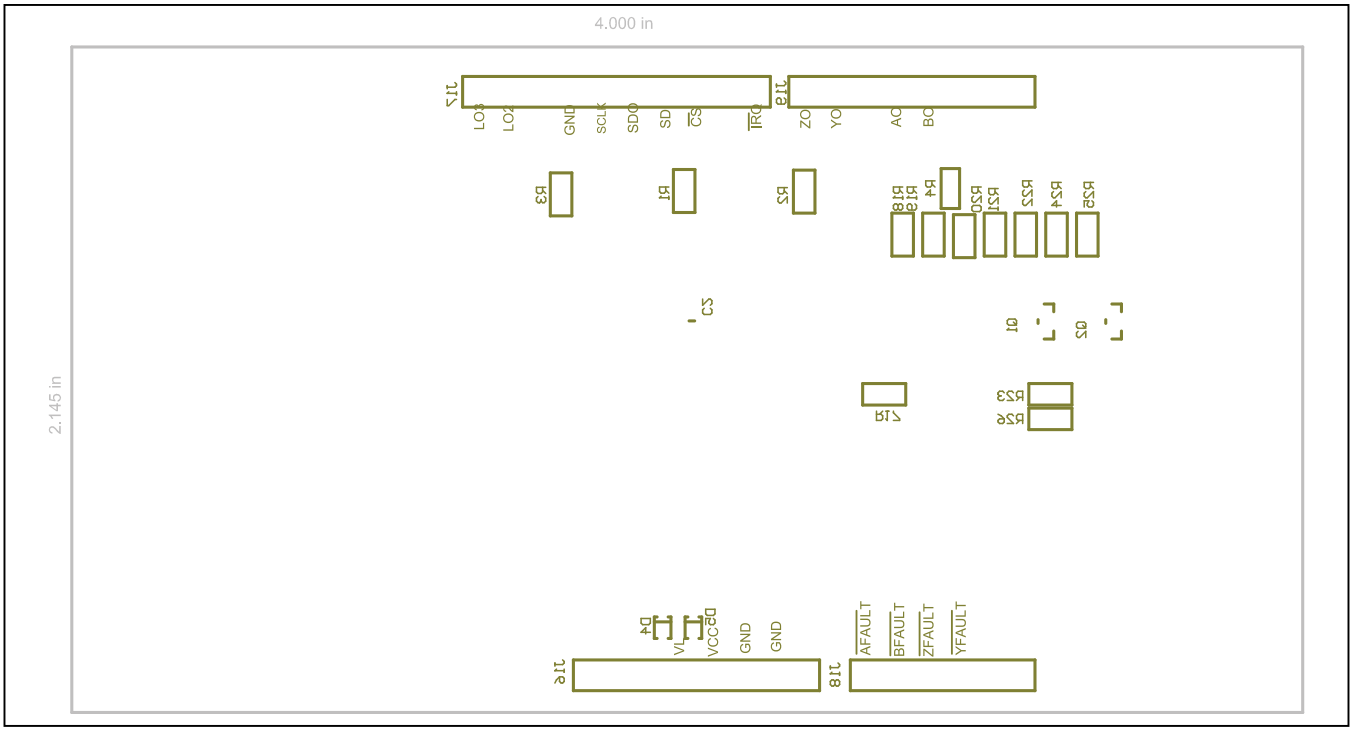

Figure 7. MAX14890E EV Kit Component Placement Guide—Bottom Silkscreen

Component Information and Schematic

See the following links for component information and schematic:

- **MAX14890E EV BOM**
- **MAX14890E EV Schematic**

Ordering Information

PART	TYPE
MAX14890EEVKIT#	EV Kit

#Denotes RoHS compliant.

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	3/15	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.

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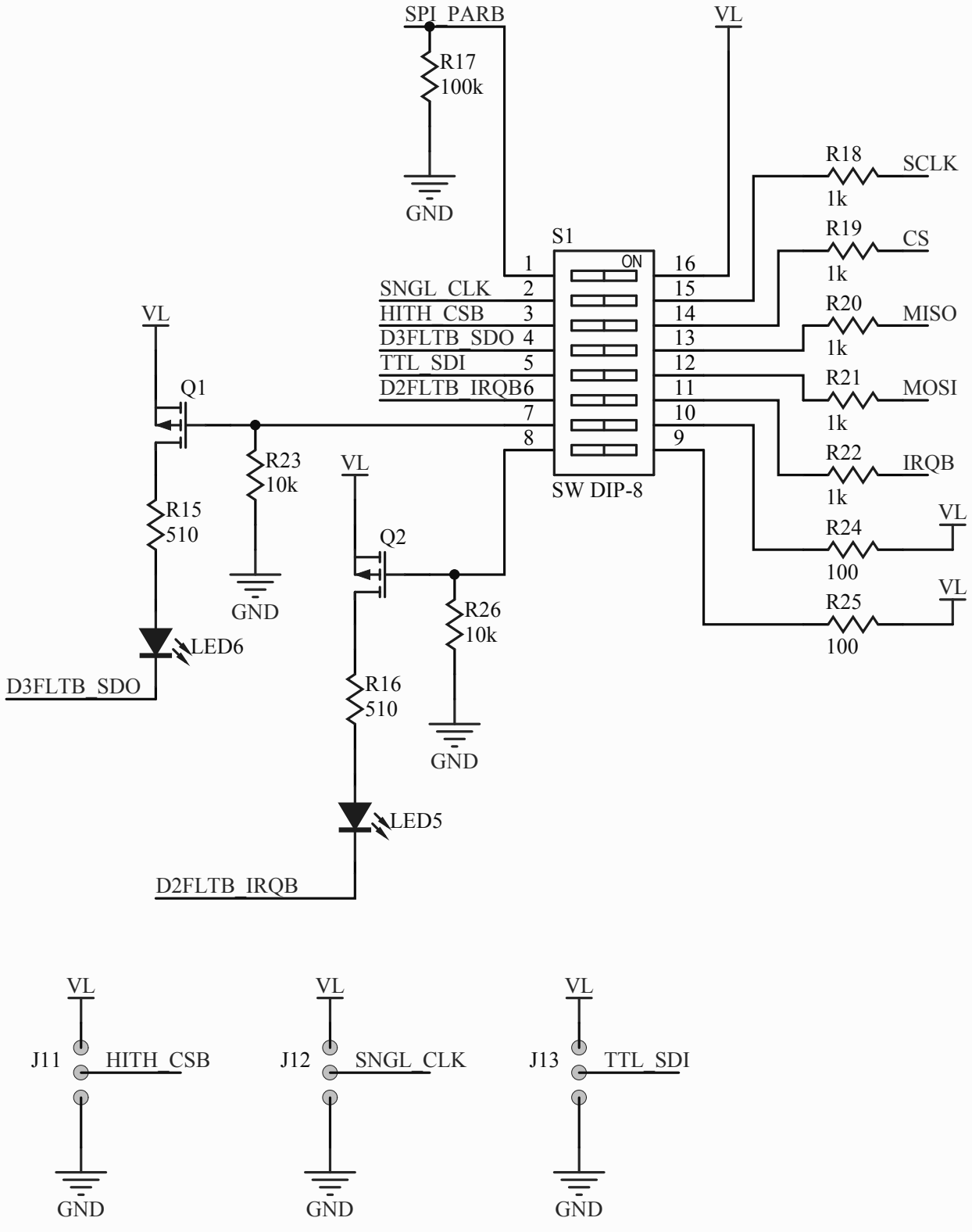
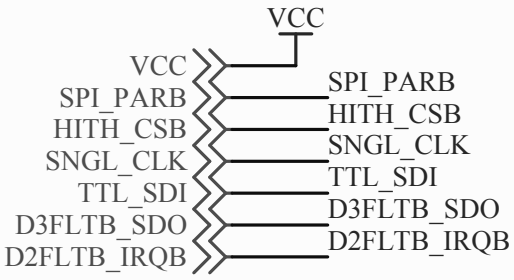
HITH_CSB
SNGL_CLK
TTL_SDI
D3FLTB_SDO
D2FLTB_IRQB

SNGL_CLK
TTL_SDI
D3FLTB_SDO
D2FLTB_IRQB

LOGIC CIRCUITRY

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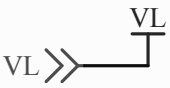
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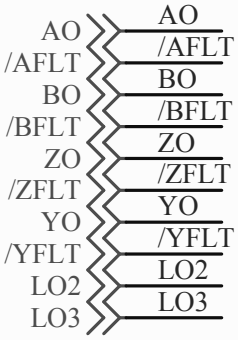
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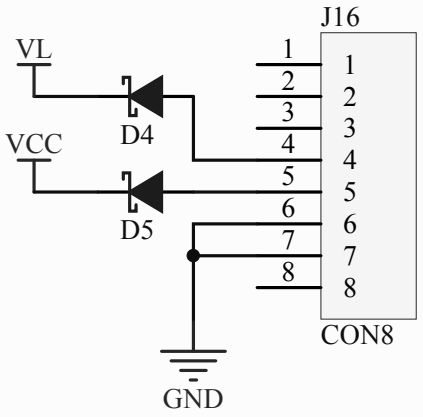
LO3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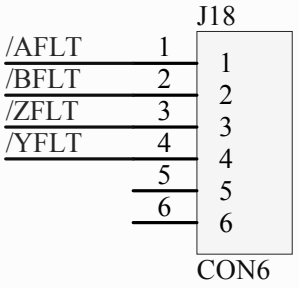
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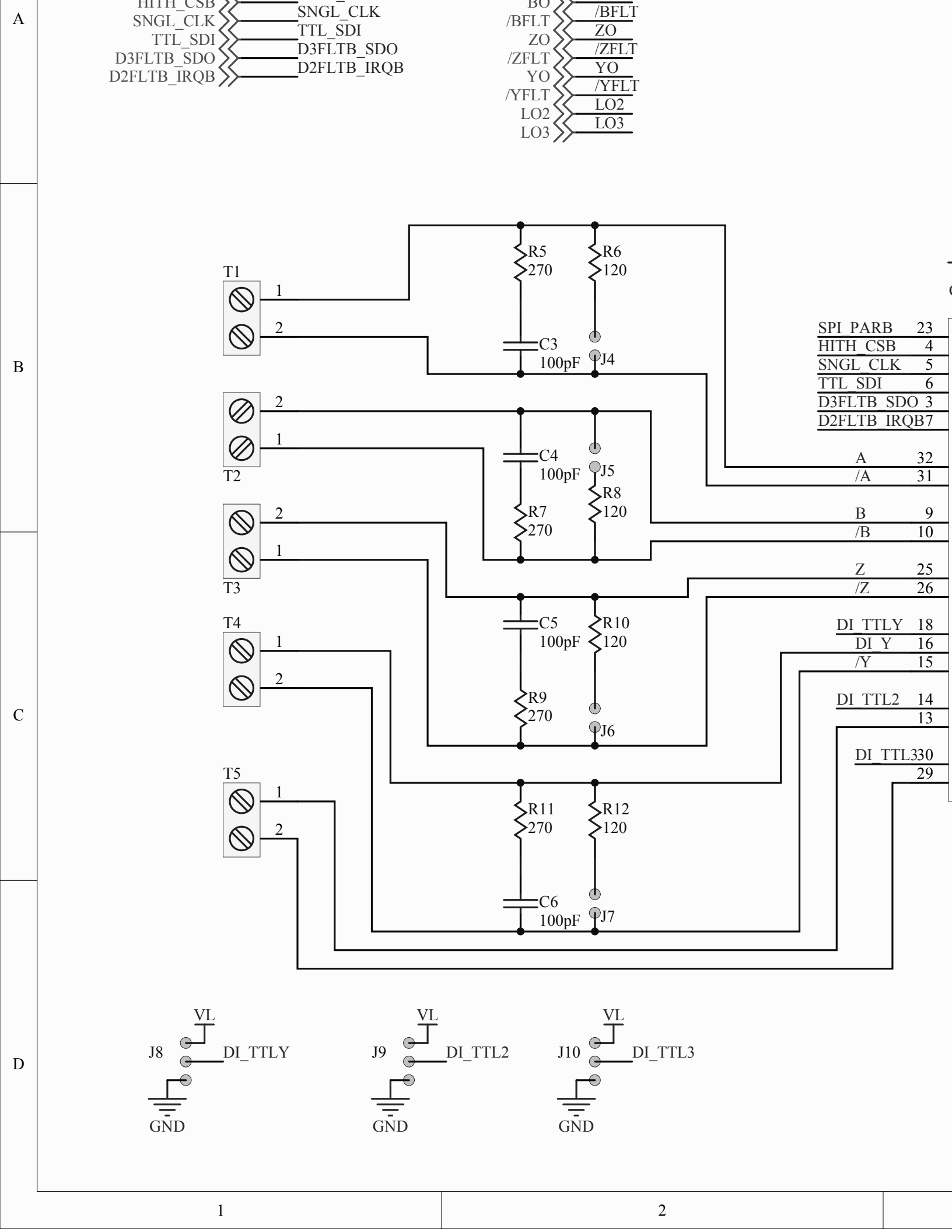
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J5
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R8 120
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J6
R11 270
R12 120
C6 100pF
J7
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D2FLTB_IRQB 7
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/A 31
B 9
/B 10
Z 25
/Z 26
DI_TTLY 18
DI_Y 16
/Y 15
DI_TTL2 14
13
DI_TTL3 30
29
VL
J8
DI_TTLY
J9
DI_TTL2
J10
DI_TTL3
GND

Bill of Materials (BOM)

DATE: 1/17/2015

DESIGN: max14890_evkit_A

CALLOUT:

Revision_Type : PROTOTYPE

ITEM	QTY	REF DES	MFG PART #	MANUFACTURER	VALUE	DESCRIPTION
1	2	C1,C2	C1005X7R1E104K050BB	TDK	0.1UF	(0402); CERAMIC CHIP; 0.1UF; 25V;
2	4	C3, C4, C5, C6	C1608C0G1H101J080AA	TDK	100PF	(0603); CERAMIC CHIP; 100PF; 50V;
3	1	C8	UQT1H330MCL1GS	NICHICON	33UF	ALUM ELECT; 33UF; 50V; TOL=20%; TG=-
4	2	C9, C11	C1608X5R1H105K080AB	TDK	1UF	(0603); CERAMIC CHIP; 1UF; 50V;
5	1	C10	C1608X5R1A106K	TDK	10UF	(0603); CERAMIC CHIP; 10UF; 10V;
6	1	C12	C0603C332K1RAC	KEMET	3300PF	(0603); CERAMIC CHIP; 3300PF;
7	5	D1, D2, D3, D4, D5	MBRX120	MICRO COMMERCIAL COMPONENTS		STANDARD; 20V,1A; SMT (SOD-
8	6	J1, J2, J4, J5, J6, J7	PEC02SAAN	SULLINS ELECTRONICS CORP		MALE; THROUGH HOLE; BREAKAWAY;
9	6	J8, J9, J10, J11,J12, J13	PCC03SAAN	SULLINS ELECTRONICS CORP		MALE; THROUGH HOLE; BREAKAWAY;
10	1	L1	VLP6045LT-470M	TDK		FERRITE; 200mohm; TOL=+/-20%; 1.4A
11	6	LED1, LED2, LED3, LED4, LED5, LED6	LTST-C193KRKT-2A	Lite-On Technology		LED; RED; SMT (603); PIV=1.9V;
12	2	Q1, Q2	NTR1P02LT1-D	On Semi		SIGNAL SURFACE MOUNT
13	4	R1, R2, R3, R4			1.8k	1.8K OHM; 1%; 100PPM; 0.0125W;
14	4	R5, R7, R9, R11			270	270 OHM; 1%; 100PPM; 0.0125W;
15	4	R6, R8, R10, R12			220	OHM; 1%; 100PPM; 0.0125W; THICK
16	2	R13, R17			100k	100K OHM; 1%; 100PPM; 0.0125W;
17	3	R14, R24, R25			100	100 OHM; 1%; 100PPM; 0.0125W;
18	2	R15, R16			510	510 OHM; 1%; 100PPM; 0.0125W;
19	5	R18, R19, R20, R21, R22			1k	OHM; 1%; 100PPM; 0.0125W; THICK
20	2	R23, R26			10k	10K OHM; 1%; 100PPM; 0.0125W;
21	1	S1	1825057-7	TE CONNECTIVITY		SPST; 24V; 0.1A; SLIDE-ACTUATED
22	12	SU1-SU12	STC02SYAN	SULLINS ELECTRONICS CORP.	STC02SYAN	JUMPER; STR; TOTAL
23	5	T1, T2, T3, T4, T5	1935161	PHOENIX CONTACT		CONNECTER; TERM; FEMALE; 2-PIN
24	1	T6	1935187	PHOENIX CONTACT		TERM; FEMALE; 4-PIN
25	2	TP1, TP2	5010	KEYSTONE		0.125D; 0.445L; 0.063 BOARD HOLE;
26	10	TP3-TP12	5014	KEYSTONE		0.125D; 0.445L; 0.063 BOARD HOLE;

27	4	TP13, TP14, TP15, TP16	5011	KEYSTONE		0.125D; 0.445L; 0.063 BOARD HOLE;
28	1	U1	MAX14890EATJ+	MAXIM		INCREMENTAL ENCODER
29	1	U3	MAX17501BATB+	MAXIM		CONVERTER; 10 TDFN-EP; MAXIM
30	100					

PURCHASE(DNP)

TOTAL	QTY	REF DES	Var Status	MAXINV	MFG PART #	MANUFACTURER	VALUE
	2	J16, J19	DNP				
	1	J17	DNP				
	1	J18	DNP				
	4						

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