

EBL4600CI-EVALZ

QLx4600-S30 Evaluation Board

AN1513
Rev 1.00
June 24, 2016

Introduction

The [QLx4600-S30](#) lane extender evaluation board is a versatile stand-alone card developed to evaluate the performance of Intersil QLx4600-S30 series quad equalizer.

Items provided along with the board:

- This application note
- Power cable

References

- [QLx4600-S30](#) Datasheet

Ordering Information

PART NUMBER	DESCRIPTION
EBL4600CI-EVALZ	QLx4600-S30 evaluation board with power supply cable

Key Features

- QLx4600-S30 series IC
- Single 5V external power supply
- On-board regulators provide all voltages required for MCU and IC operation
- On-board DC/DC converter that provides the 1.2V supply to the IC
- Optional on-board boost selection for each channel via two sets of headers
- Adjustable detection threshold for quiescent modes
- 8 sets of SMA connectors for high speed signals input and output

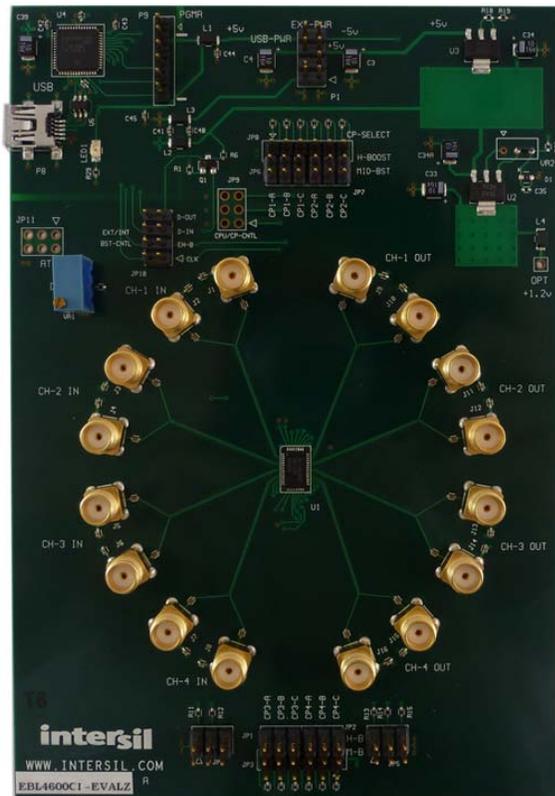


FIGURE 1. TOP OF BOARD

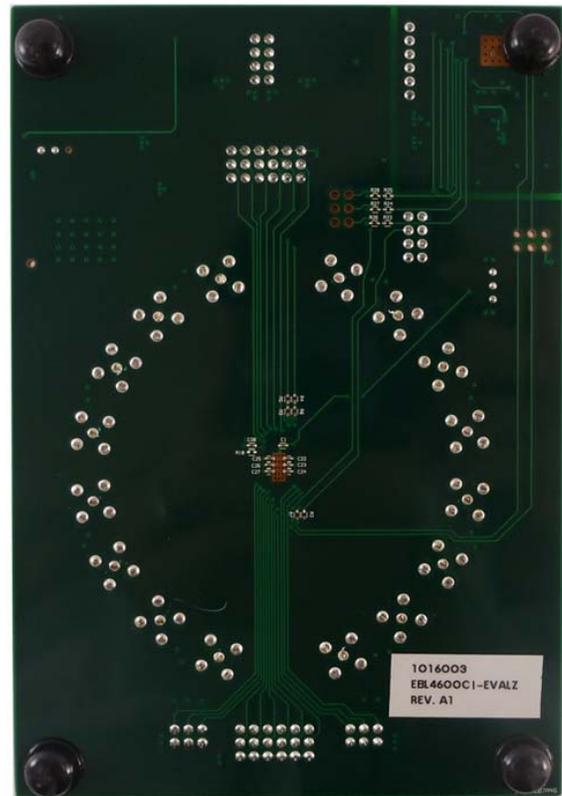


FIGURE 2. BOTTOM OF BOARD

Operation of Evaluation Board

After a brief description of the board design and layout, the different features and options to operate the board are highlighted.

- Providing power to the board through an external supply
- The eight high speed differential I/O
- The impedance select function
- The variable detection threshold
- Controlling the equalizer boost via control pins

QLx4600-S30 Evaluation Board

The QLx4600-S30 evaluation board is a 4-layer, 4”(w)x5.6”(h)x0.059”(t) in dimension, and fabricated with (Allied-Signal) FR-408 dielectric material. 100Ω differential signal traces are laid out with 0.0062” width and 0.0058” spacing. 50Ω single-ended traces are 0.009” wide. [Figure 3](#) shows the top view of the board.

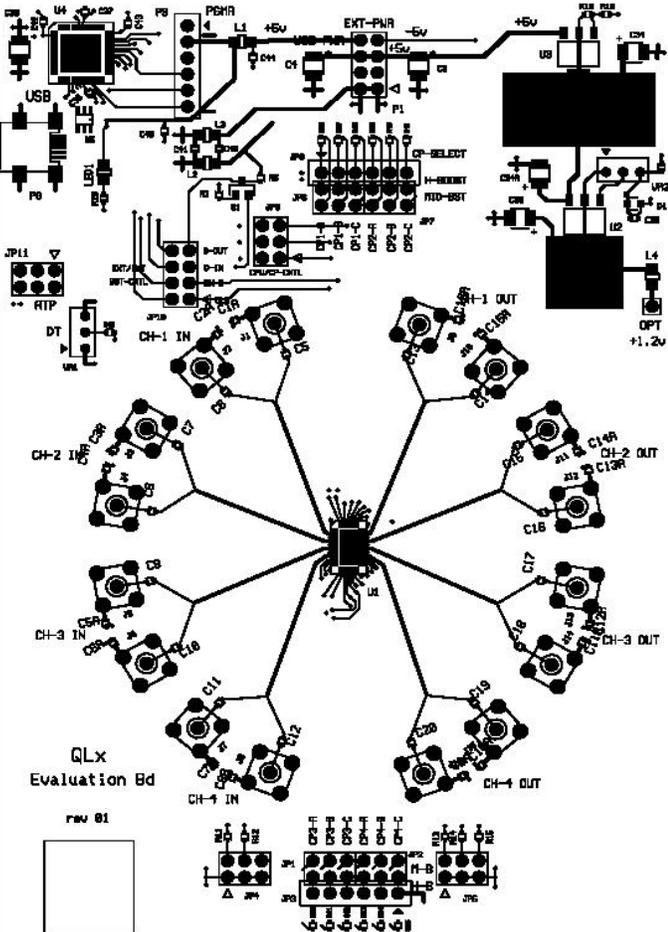


FIGURE 3. QLX4600-S30 EVALUATION BOARD PCB OUTLINE

Power Supply

Power can be supplied to the board by using an external power supply. On-board voltage regulators supply the appropriate 1.2V to the QLx4600-S30 IC.

PROVIDING POWER FROM EXTERNAL 5V POWER SUPPLY

The evaluation board can also be powered by an independent external 5.0V power supply via header P1 as highlighted on [Figure 4](#). The maximum current consumption for the board including the voltage regulators, microcontroller circuits and the IC together is approximately 245mA with all channels active.

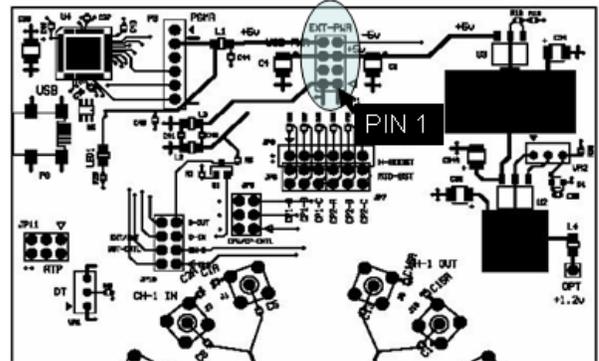


FIGURE 4. QLX4600-S30 EVALUATION BOARD EXTERNAL POWER SUPPLY POWER CONNECTOR

[Table 1](#) provides description of the connector P1. A power cable is provided with the evaluation board.

TABLE 1. P1 CONNECTOR DESCRIPTION

8 - NC	7 - NC
6 - 5.0V	5 - 5.0V
4 - NC	3 - NC
2 - GND	1 - GND

High Speed Data_I/O Interface Connectors

There are sixteen SMA connectors on the board, eight for the CML differential inputs and eight for the CML differential outputs. All the connections from the SMA connectors to the QLx4600-S30 series chip are AC-coupled with a 220nF broadband capacitor. [Figure 5 on page 3](#) shows each channel by their name, direction and their polarities.

Detection Threshold (DT)

The DT is another very important feature of the QLx4600-S30 series IC. On the evaluation board, the DT can be changed by adjusting the potentiometer VR1 ([Figure 6 on page 3](#)).

In normal operation, the potentiometer should be set so that the voltage across the adjacent 10k resistor is 0V.

For applications that need to adjust this level, it can be simply done by changing the potentiometer and reading the voltage across the 10k resistor in order to infer the current coming from the DT pin.

For example, measuring a voltage of -200mV across the 10k resistor indicates a 20μA current from the DT pin.

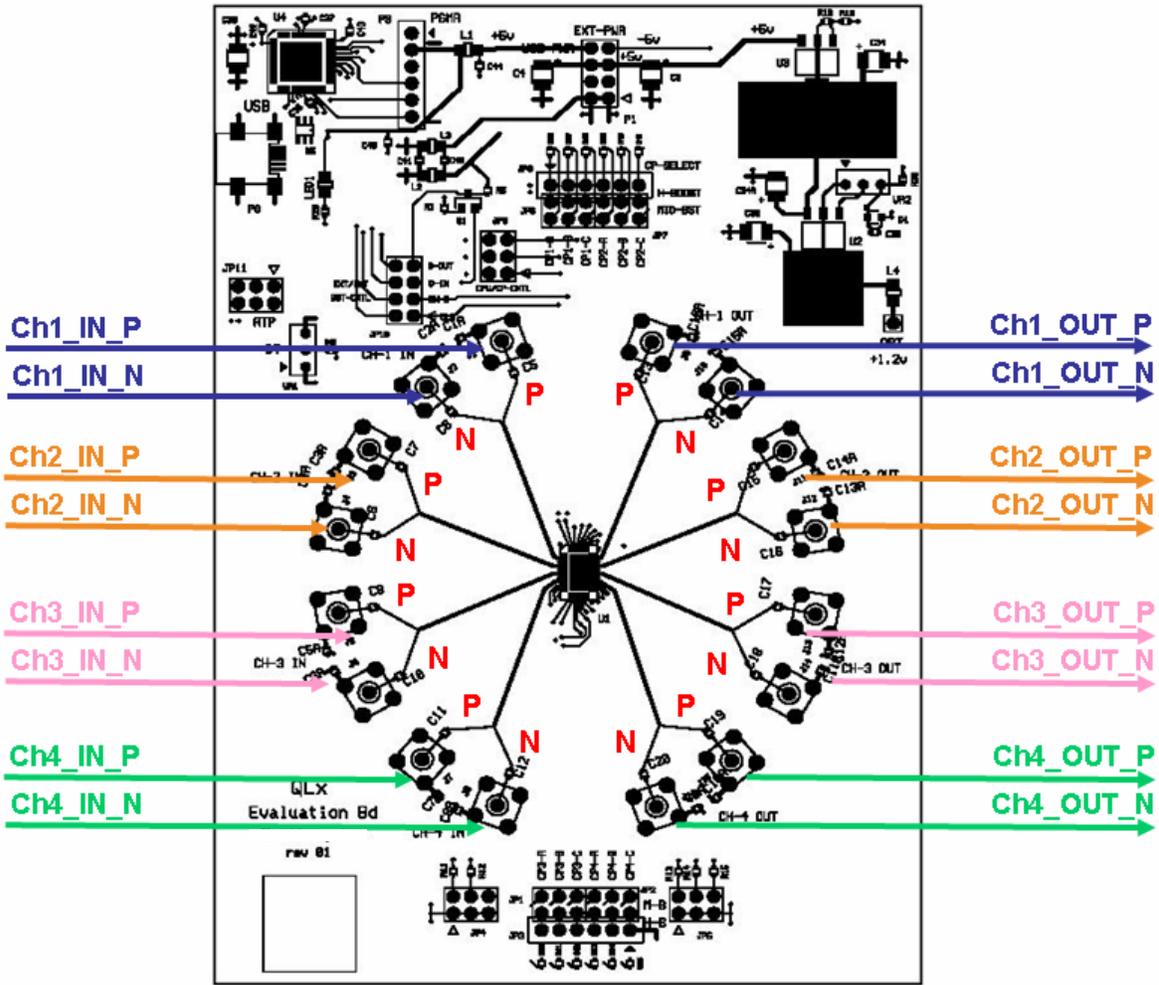


FIGURE 5. QX4600-S30 EVALUATION BOARD RF-I/O INTERFACE

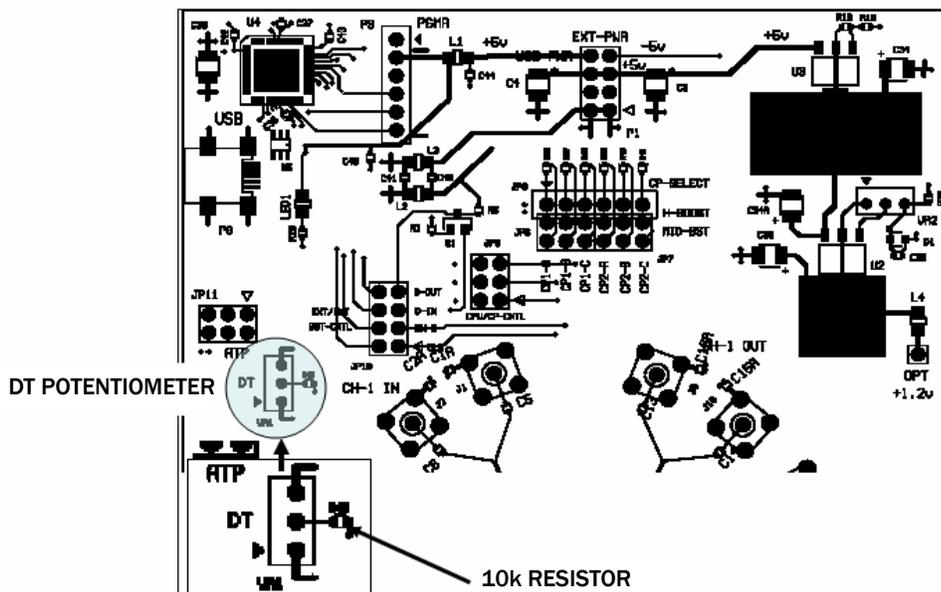


FIGURE 6. QX4600-S30 EVALUATION BOARD DT POTENTIOMETER

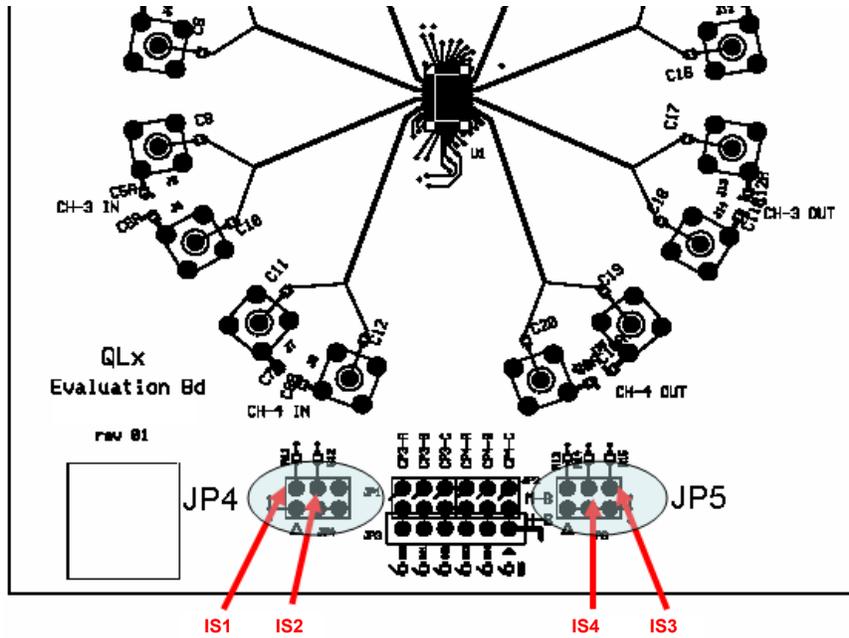


FIGURE 7. QLX4600-S30 EVALUATION BOARD IMPEDANCE SELECT

Impedance Select

Two 3x2 headers, JP4 and JP5, provide interfaces to the “impedance select” pins of the QLx4600-S30 series ICs. With this function, the user can put any equalizer channel into a standby or reset state by placing a jumper across the header for the selected channel. When in the reset state, the single-ended input impedance of the equalizer channel goes in excess of 200kΩ (from its nominal value of 50Ω) to indicate to a transmitter that the receiver channel is down and not passing data. Additionally, power consumption for a channel is reduced when in the standby state.

TABLE 2. DESCRIBES JP4 AND JP5 CONNECTIVITY

JP4			JP5		
2 - IS1	4 - IS2	6 - GND	2 - Mode	4 - IS4	6 - IS3
1 - GND	3 - GND	5 - GND	1 - GND	3 - GND	5 - GND

Boost Setting Control Pins

In order to enable boost setting control via the control pins, JP5-Pin 2 must be jumpered to ground.

The boost setting configuration (compensation setting) for each individual equalizer channel is done through a 3x3 header. There are four sets of headers, one for each equalizer channel. [Figure 8](#) illustrates the location of the headers.

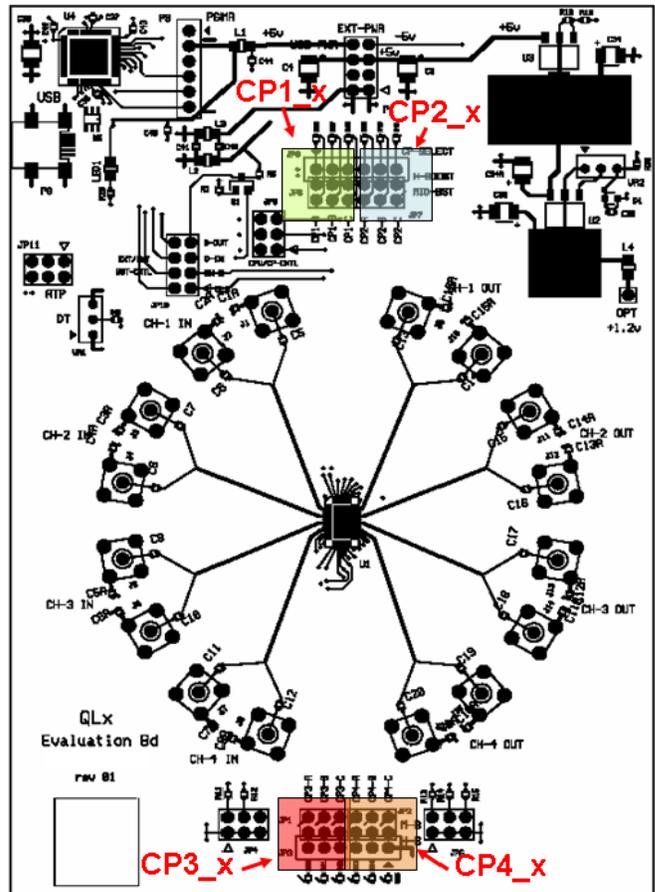


FIGURE 8. EQUALIZER BOOST CONTROL HEADERS

The notation CP[1-4]_[A - C] refers to the QLx4600-S30 quad equalizer CPs. They are associated with the 4 channels 3-digit number where 'A' is the MSB and 'C' is the LSB. Table 3 describes the relationship between the CPs and the equalizer boost setting. Bit A can only take one of two values, either Low (L) or High (H), while bit B and C can take one of three values, Low (L), Middle (M) and High (H). Hence, eighteen of the thirty-two different boost levels are accessible through the CPs for each equalizer channel.

TABLE 3. CP AND EQUALIZER BOOST SETTING RELATIONSHIP

CP[1-4]_A	CP[1-4]_B	CP[1-4]_C	BOOST
L	L	L	0
L	L	M	2
L	L	H	4
L	M	L	6
L	M	M	8
L	M	H	10
L	H	L	12
L	H	M	14
L	H	H	15
H	L	L	16
H	L	M	17
H	L	H	19
H	M	L	21
H	M	M	23
H	M	H	24
H	H	L	26
H	H	M	28
H	H	H	31

For Channels 1 and 2, the headers JP6-8 are used to set the CPs. High state is achieved by placing a jumper between the top two pins of the header and the middle state is achieved by placing a jumper between the bottom two pins. Low state is simply achieved by using no jumper at all. Figure 9 illustrates how one could set the CPs for a QLx4600-S30 Series IC boost value of 21 (H, M, L) on Channel 1 and a boost of 16 (H, L, L) on Channel 2.

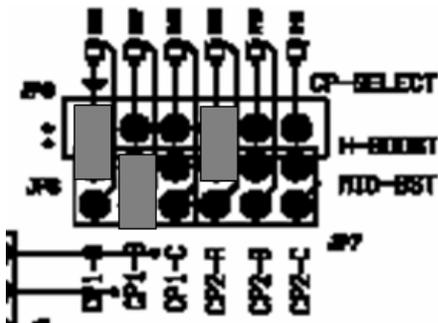


FIGURE 9. ILLUSTRATION OF SETTINGS FOR CP1 = (H, M, L) AND CP2 = (H, L, L)

For Channels 3 and 4, we use headers JP1-3 in a similar fashion except High is achieved using the bottom two pins and middle is achieved by using the top two pins. Figure 10 illustrates how one could set the CPs for a boost value of 18 (H, L, M) on Channel 3 and a value of 14 (L, H, M) on Channel 4.

On Figure 10 please also note how pin 2 on JP5 is jumpered to ground in order to enable the CP control feature.

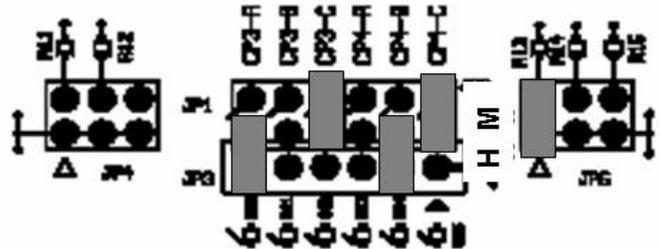


FIGURE 10. ILLUSTRATION OF SETTINGS FOR CP3 = (H, L, M) AND CP4 = (L, H, M)

Evaluation Board Schematic

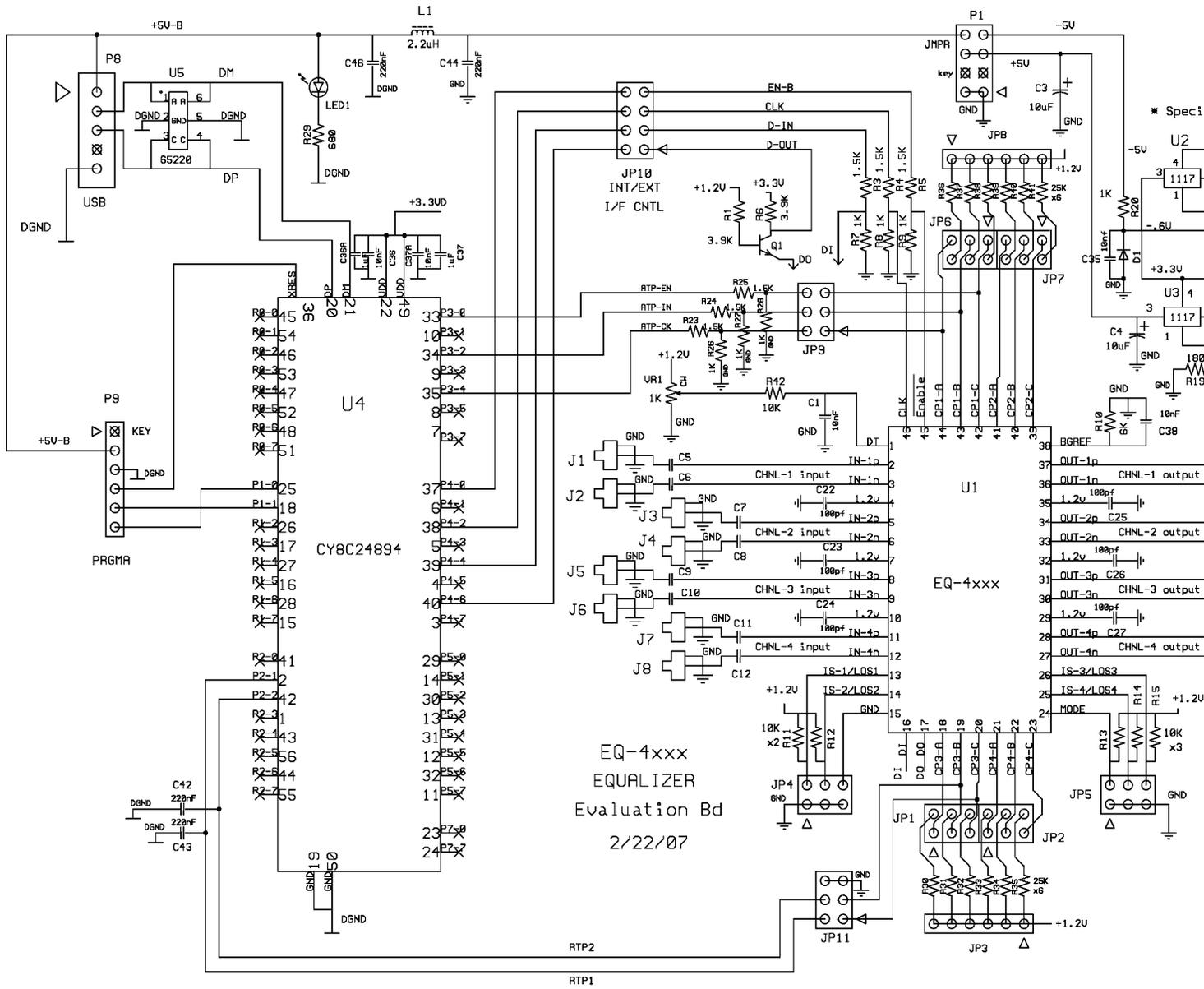


FIGURE 11. SCHEMATIC OF THE QLX4600-S30 EVALUATION BOARD

QLx4600-S30 Bill of Materials

MANUFACTURER PART	QTY	UNITS	REFERENCE DESIGNATOR	DESCRIPTION	MANUFACTURER
EBL4XXEVALZREVAPCB	1	ea	SEE LABEL-RENAME BOARD	PWB-PCB, EBL4XXEVALZ, REVA, ROHS	IMAGINEERING INC
MBB0502Y224MGP5N8 - (GLOBAL PN)	16	ea	C5-C20	CAP-BURIED, SMD, 0502, 220nF/82pF, 16V, +22-82%, Y5V, ROHS	PRESIDO COMPONENTS
GRM1555C1H101JZ01D	6	ea	C22, C23, C24, C25, C26, C27	CAP, SMD, 0402, 100pF, 50V, 5%, COG, ROHS	MURATA
C1005X7R1C103K	18	ea	C1, C38, C1A-C16A	CAP, SMD, 0402, 0.01μF, 16V, 10%, X7R, ROHS	TDK
ECJ-0EFOJ105Z	2	ea	C36, C37	CAP, SMD, 0402, 1μF, 6.3V, +80-20%, Y5V, ROHS	PANASONIC
LMK105F224ZV-F	6	ea	C40, C41, C42, C43, C44, C45	CAP, SMD, 0402, 0.22μF, 10V, +80-20%, Y5V, ROHS	TAIYO YUDEN
TA016TCR106KBR	6	ea	C3, C4, C33, C34, C34A, C39	CAP, TANT, SMD, B, 10μF, 16V, 10%, ROHS	VENKEL
LQH31CN2R2M03L	4	ea	L1, L2, L3, L4	COIL-INDUCTOR, CHOKE, SMD, 1206, 2.2μH, 20%, 430mA, ROHS	MURATA
10-89-7062	6	ea	JP1, JP2, JP4, JP5, JP6, JP7 -SEE LABEL-GENERIC.	CONN-HEADER, 2x3, BRKAWY, 2.54mm, 0.330x.107, ROHS	MOLEX
10-89-7082	2	ea	JP10, P1 NOTE: Cut keying pin on P1 per DWG.#1.	CONN-HEADER, 2x4, BRKAWY, 2.54mm, 0.330x.107, ROHS	MOLEX
22-28-4063	3	ea	JP3, JP8, P9 NOTE: Cut keying pin on P9 per DWG.#1.	CONN-HEADER, 1x6, BRKAWY, 2.54mm, 0.240x.125, ROHS	MOLEX
221789-1	16	ea	J1-J16 *(SEE ASSEMBLY-NOTE)	CONN-RF, SMA JACK, PCB MNT, 50Ω, GOLD, ROHS	AMP/TYCO
SPC02SYAN	12	ea	BAG and SHIP W/BOARD	CONN-JUMPER, SHORTING, 2PIN, BLACK, GOLD, ROHS	SULLINS
UX60-MB-5ST	1	ea	P8	CONN-RECEPTACLE, SMD, MINI USB 2.0, 5POS, ROHS	HIROSE ELECTRIC
597-3311-407F	1	ea	LED1	LED, SMD, 1206, GREEN, 75mW, 3mcd, PbFREE	DIALIGHT
CY8C24894-24LFXI	1	ea	U4	IC-PSoC MICROCONTROLLER, 8-BIT, 24MHz, 56P, QFN, ROHS	CYPRESS SEMICONDUCTOR
LM1117MP-ADJ/NOPB	2	ea	U2, U3	IC- ADJ. LDO REGULATOR, 3P, SOT-223, 800mA, ROHS	NATIONAL SEMICONDUCTOR
QLX4600SIQSR	1	ea	U1	IC-QLX4600-SI30, QUAD LANE EXTENDER, 46P, QFN, ROHS	INTERSIL
SN65220DBVR	1	ea	U5	IC-SINGLE USB PORT TVS, SMD, 6P, SOT-23-6, ROHS	TEXAS INSTRUMENTS
2SC248000L	1	ea	Q1	TRANSISTOR, NPN, SMD, SC-59, 3P, 30V, 50mA, 150mW, ROHS	PANASONIC
CT94EW102	1	ea	VR1	POT-TRIM, TH, 3P, 1k, 1/2W, 10%, 18TURN, TOP ADJ., ROHS	COPAL ELECTRONICS
CR0402-16W-1001FT	6	ea	R7, R8, R9, R26, R27, R28	RES, SMD, 0402, 1k, 1/16W, 1%, TF, ROHS	VENKEL
ERJ-2RKF1002X	6	ea	R11, R12, R13, R14, R15, R42	RES, SMD, 0402, 10k, 1/16W, 1%, TF, ROHS	PANASONIC
ERJ-2RKF1100X	1	ea	R18	RES, SMD, 0402, 110Ω, 1/16W, 1%, TF, ROHS	PANASONIC
CR0402-16W-1501FT	3	ea	R3, R4, R5	RES, SMD, 0402, 1.5k, 1/16W, 1%, TF, ROHS	VENKEL
CR0402-16W-1800FT	1	ea	R19	RES, SMD, 0402, 180Ω, 1/16W, 1%, TF, ROHS	VENKEL
CR0402-16W-2552FT	12	ea	R30-R41	RES, SMD, 0402, 25.5k, 1/16W, 1%, TF, ROHS	VENKEL
CR0402-16W-3901FT	2	ea	R1, R6	RES, SMD, 0402, 3.9k, 1/16W, 1%, TF, ROHS	VENKEL

QLx4600-S30 Bill of Materials (Continued)

MANUFACTURER PART	QTY	UNITS	REFERENCE DESIGNATOR	DESCRIPTION	MANUFACTURER
CR0402-16W-6041FT	1	ea	R10	RES, SMD, 0402, 6.04k, 1/16W, 1%, TF, ROHS	VENKEL
CR0402-16W-6800FT	1	ea	R29	RES, SMD, 0402, 680Ω, 1/16W, 1%, TF, ROHS	VENKEL
CR0603-10W-000T	1	ea	D1	RES, SMD, 0603, 0Ω, 1/10W, TF, ROHS	VENKEL
2841/1-100-BLK (TEFLON)	0.25	in	VR2 - Wire jumper from pin 2 to pin 3.	WIRE, 30AWG, SOLID T.C., INSULATED, BLACK, ROHS	ALPHA WIRE
WIREDPOWERCABLE1ZFG	1	ea	BAG and SHIP W/BOARD	CABLE-FG, WIREDPOWERCABLE1Z, ROHS	INTERSIL
SJ-5003SPBL	4	ea	Bottom four corners.	BUMPS, 0.44inW x 0.20inH, DOMETOP, BLACK	3M
212403-013	1	ea	Place assy in bag.	BAG, STATIC, 5x8, ZIPLOC, ROHS	INTERSIL
	1	ea	J1-J16 - Ignore silkscreen on component side of PCB. Mount SMA's on solder side (bottom) of PCB. Cut SMA post ends flush with the PCB.	ASSEMBLY NOTE	
	0	ea	C35	DO NOT POPULATE OR PURCHASE	
	0	ea	JP11	DO NOT POPULATE OR PURCHASE	
	0	ea	JP9	DO NOT POPULATE OR PURCHASE	
	0	ea	R20, R23, R24, R25	DO NOT POPULATE OR PURCHASE	
DWG#1_EBL4XXX_KEYPIN_CUT	1	ea	P1, P9	See attached drawing for visual and/or manual instruction.	INTERSIL
	1	ea	Place a LABEL marked H_M, in a vertical position between JP2 and JP5 so the "H" is located at the bottom and the "M" is at the top when looking at the label after installation.	LABEL, GENERIC	
LABEL-RENAME BOARD	1	ea	RENAME PCB TO: EBL4600CI-EVALZ.	LABEL, TO RENAME BOARD	INTERSIL
LABEL-SERIAL NUMBER	1	ea		LABEL-SERIAL #, LINE 1 = YRWK/REV#/SN; LINE 2 = BOM NAME	INTERSIL

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