

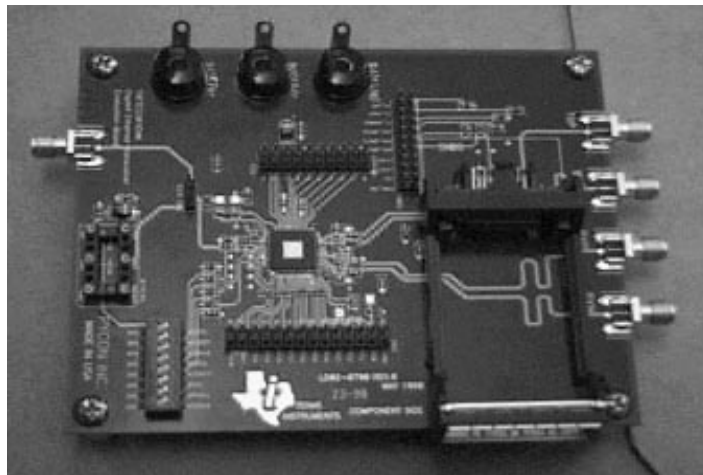
TNETE2201 EVM Kit Setup and Usage

Boyd Barrie

MSDS Applications Group

Abstract

The Texas Instruments (TI™) TNETE2201 EVM (evaluation module) kit is a tool used to evaluate and design high-speed prototypes using the TNETE2201 Ethernet Transceiver IC (10 mm x 10 mm TQFP plastic package). The EVM kit is used to evaluate device parameters while acting as a guide for high-speed board layout. The high-speed interface is selectable between a 50-Ω SMA connector and a GBIC standard interface. The GBIC standard also provides a 75-Ω copper interface module and various fiber optic options. Overall, the designer can use the EVM kit as a tool for successful evaluation and design of an end product.



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Introduction

The TNETE2201 EVM kit can act as a daughter board that plugs into new or existing designs. By providing the appropriate cabling, the EVM kit can interface with just about any test equipment or other reference designs. The EVM kit's high-speed serial interface can use either the GBIC (Gigabit Interface Converter) standard interface or a 50-ohm SMA connection. In addition, the GBIC specification allows the designer to choose either a 75-ohm copper module or a selection of fiber-optics modules.

As the frequency of operation increases, the board designer must take special care to ensure that the highest signal integrity is maintained. To achieve this, the board's impedance is controlled for both 50-ohm and 75-ohm high-speed transmission lines. In addition, the 50-ohm impedance mismatches are reduced by designing the component pad size to be as close as possible to the width of the connecting transmission line. Vias are minimized and, when necessary, placed as close as possible to the device drivers. Overall, the board layout is designed and optimized to support high-speed operation. Thus, understanding impedance control and transmission line effects are crucial when designing high-speed boards.

Some of the advanced features offered by the EVM kit include:

- PCB (printed circuit board) designed for speeds in excess of 1.25 Gbps
- Flexible—The EVM can be configured to operate with multiple device types and with copper or fiber interfaces.
- Integrated GBIC Interface eliminates the need for two boards.
- All input/output signals are accessible for rapid prototyping.
- Clock input is selectable for either 8/14 pin crystal or external clock input.
- Power can be supplied either by banana jacks or a 20-pin connector.
- Series terminated parallel outputs



Board Layout and Configuration

The TNETE2201 EVM kit is designed to give the developer many options for operation. Many of these options are selectable by DIP switch and others may require board component removal or additions. The following sections provide guidelines to configure the EVM kit for different modes of operation.

The EVM kit is normally delivered in a default configuration that requires external clock and data inputs. The high-speed serial input and output are routed through the 50-ohm transmission line path. The GBIC interface is not connected and would require some resistor modifications to be functional. The default setup is useful for testing the board and interface IC. The designer might consider testing the bit error rate, jitter, and eye-diagram characteristics of the system. The TNETE2201 EVM is shipped with certain components installed for default operation. Table 1 lists the default configuration.

Table 1. Default Setup as Shipped

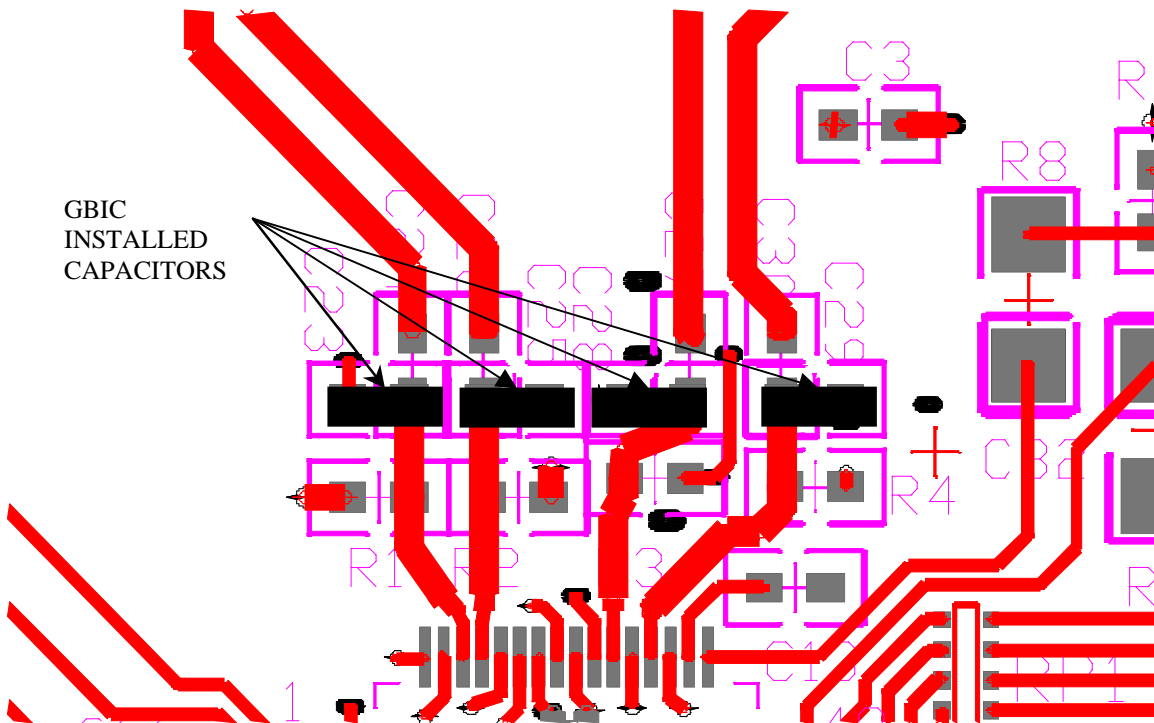
Designator	Function	Condition (TNETE2201)
P5	CLK SEL	Jumper installed between Pins 2 and 3
R1	TX Termination	200 ohm installed
R2	TX Termination	200 ohm installed
R5	Bias Net	365 ohm installed
R6	Bias Net	562 ohm installed
R8	WIZ OPTION	Not installed
R9	WIZ OPTION	Not installed
R16	CAP OPTION	Zero ohm installed
R17	Bias Net	Not installed
R21	WIZ OPTION	Not installed
R22	WIZ OPTION	Not installed
C13	Vcc Decouple	0.01 μ F installed
C23	GBIC OPTION	Not installed
C24	SMA OPTION	0.01 μ F installed
C25	GBIC OPTION	Not installed
C26	SMA OPTION	0.01 μ F installed
C27	SMA OPTION	0.01 μ F installed
C28	GBIC OPTION	Not installed
C29	GBIC OPTION	Not installed
C30	SMA OPTION	0.01 μ F installed
C31	RX Termination	0.01 μ F installed
C32	TX PLL Cap	0.0022 μ F installed
C33	REF CLK Bias Net	Zero Ohm installed
C34	TX PLL Cap	0.0022 μ F installed
L1	Filter/Bias	Ferrite installed
X1	OSC	Not installed (not provided)
DIP1-1	PRBSEN	X (OFF)
DIP1-2	TXRRAMP	X (OFF)
DIP1-3	TXDIR	X (OFF)

Designator	Function	Condition (TNETE2201)
DIP1-4	LCKREFN	X (OFF)
DIP1-5	TESTEN	ON
DIP1-6	SYNCEN	X (OFF)
DIP1-7	LOOPEN	ON
DIP1-8	CLKEN	X (OFF)

Note: X is a don't care state (default position).

The GBIC Configuration requires a modification of the steering capacitors C23 through C30. This requires removing C24, C26, C27, and C30 and soldering these capacitors in locations C23, C25, C28, and C29 (see Figure 1).

Figure 1. GBIC Setup Modifications



Test Configuration and Results

The serial Bit Error-rate Ratio Test (BERT) is useful for evaluating device and board characteristics. Using this test, we can determine the eye diagram characteristics of the system, as shown in Figure 3. The test setup is illustrated in Figure 2.

The HP71603B 3-Gbps Serial BERT outputs a high-speed serial stream to the test board where the data is converted by the TNETE part to a 10-bit parallel format. The parallel data is then looped back from the receiver to the transmitter. The pulse generator provides a clock input to the transmitter. The external clock source is necessary because the receiver's recovered clock is half the frequency necessary for transmission.



Both the pulse generator and the BERT are synchronized with an external clock source. The operator adjusts the variable phase delay to ensure that the clock meets the setup and hold time of the data. The parallel data along with the clock is routed to the transmitter where the data is serialized and captured by the oscilloscope. Figure 3 shows an example eye diagram taken using this technique.

Figure 2. Bit Error-Rate Ratio Test Configuration

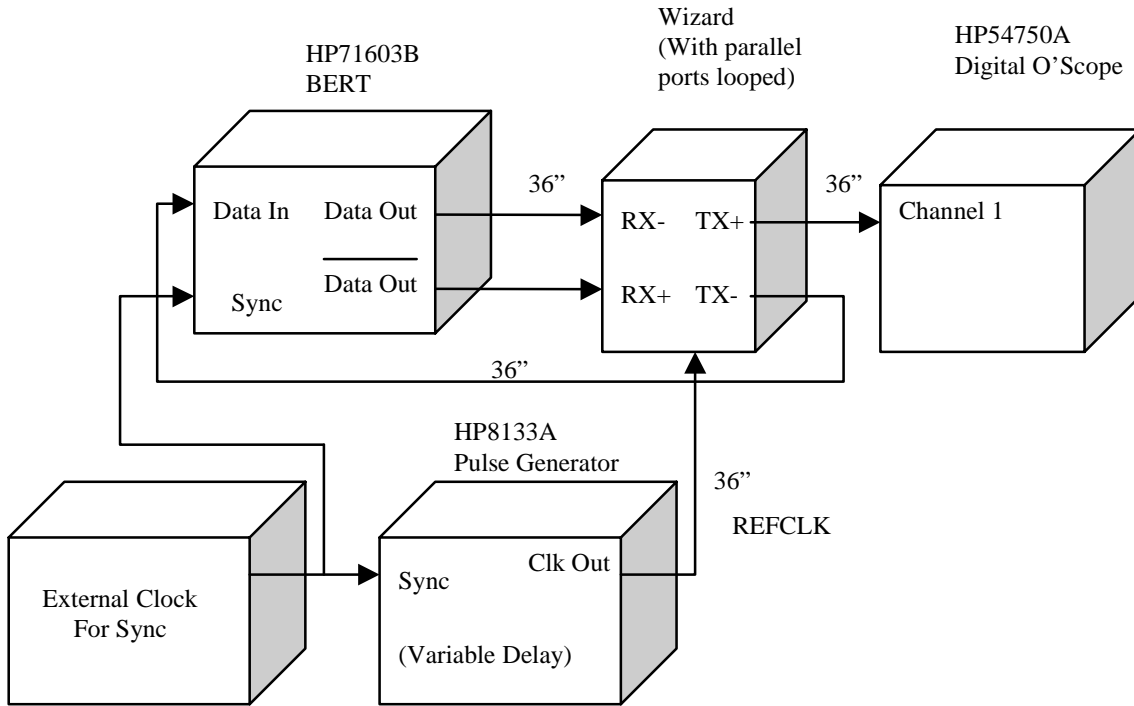
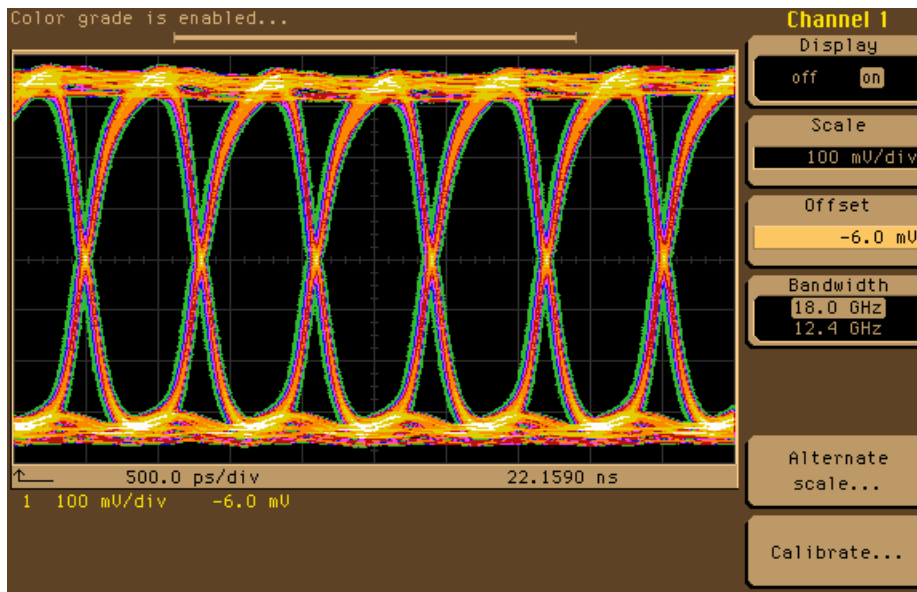


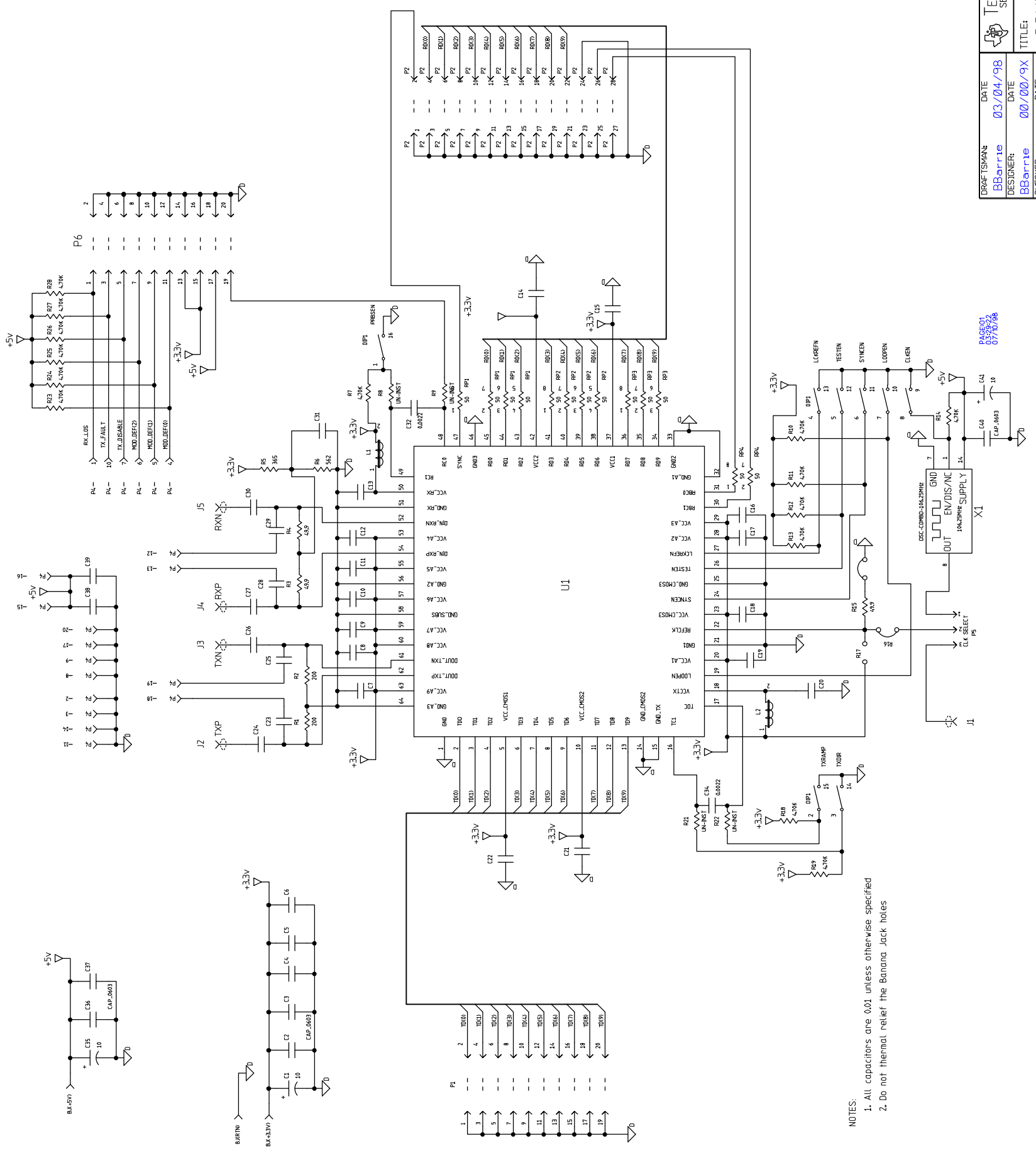
Figure 3. Eye Diagrams of High-Speed Serial Outputs





Board Layouts, Schematics, and Bill of Materials

SYM REVISIONS
A ECNXXXXX, 00/00/9X, MPK



NOTES:
 1. All capacitors are 0.01 unless otherwise specified
 2. Do not thermal relater the Banana Jack holes

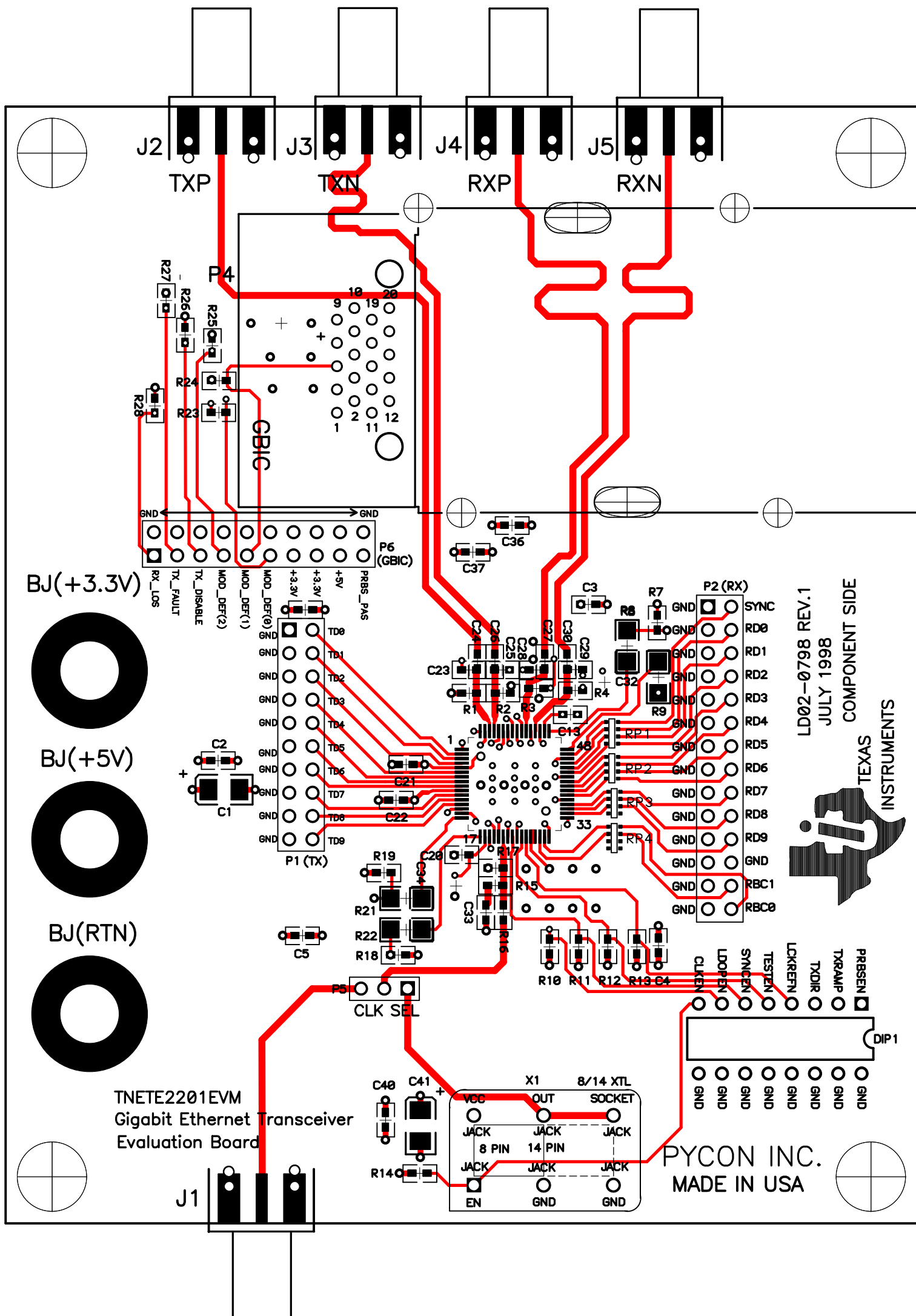
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CHECKER:	DATE	TENETE2201 EVM BOARD	
ICHKOIT	00/00/9X		
ENGINEER:	DATE		
BBarrrie	00/00/9X		
APPROVED:	DATE		
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MIKE KORSON	00/00/9X	N	01

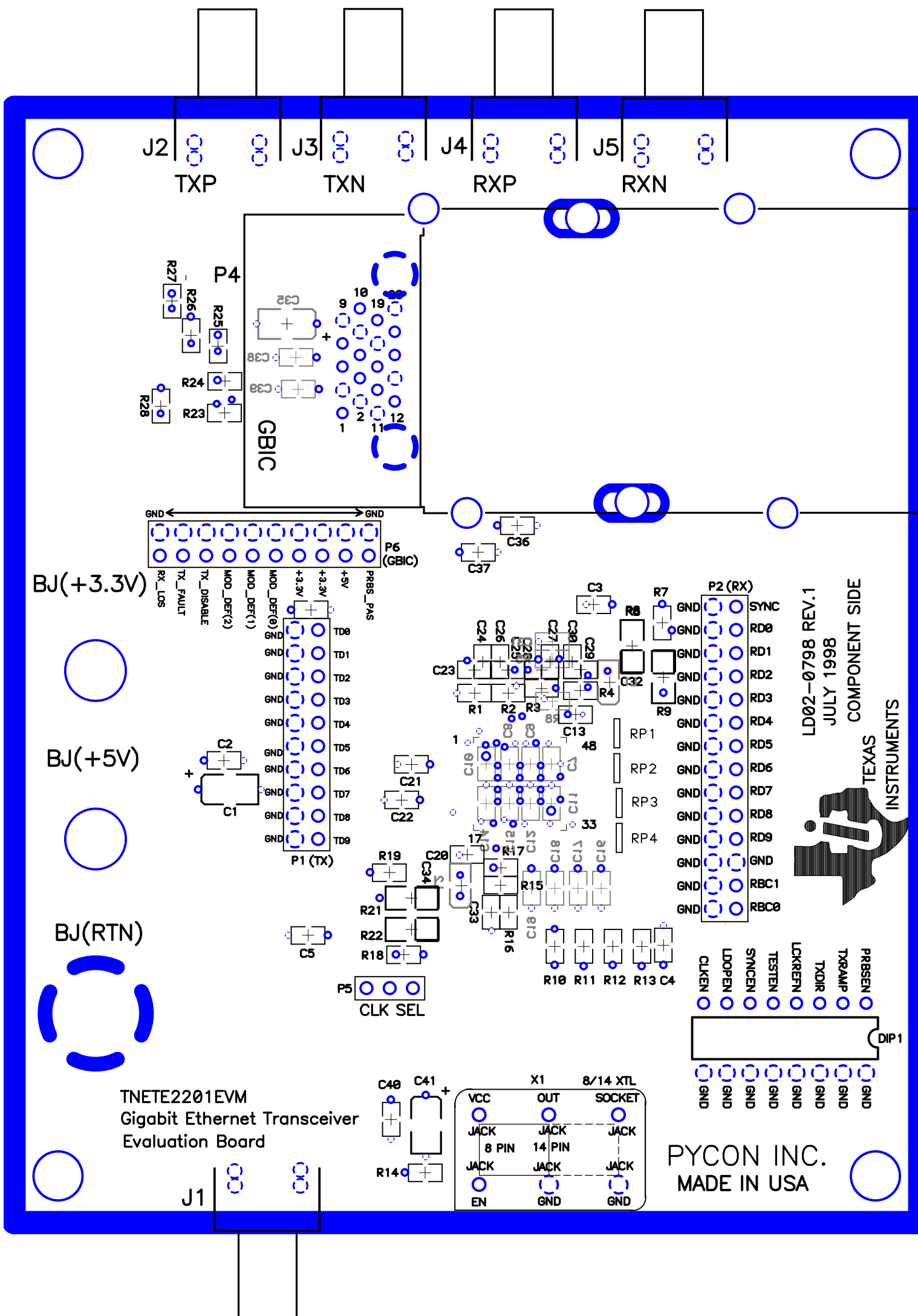
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 TEXAS INSTRUMENTS INCORPORATED
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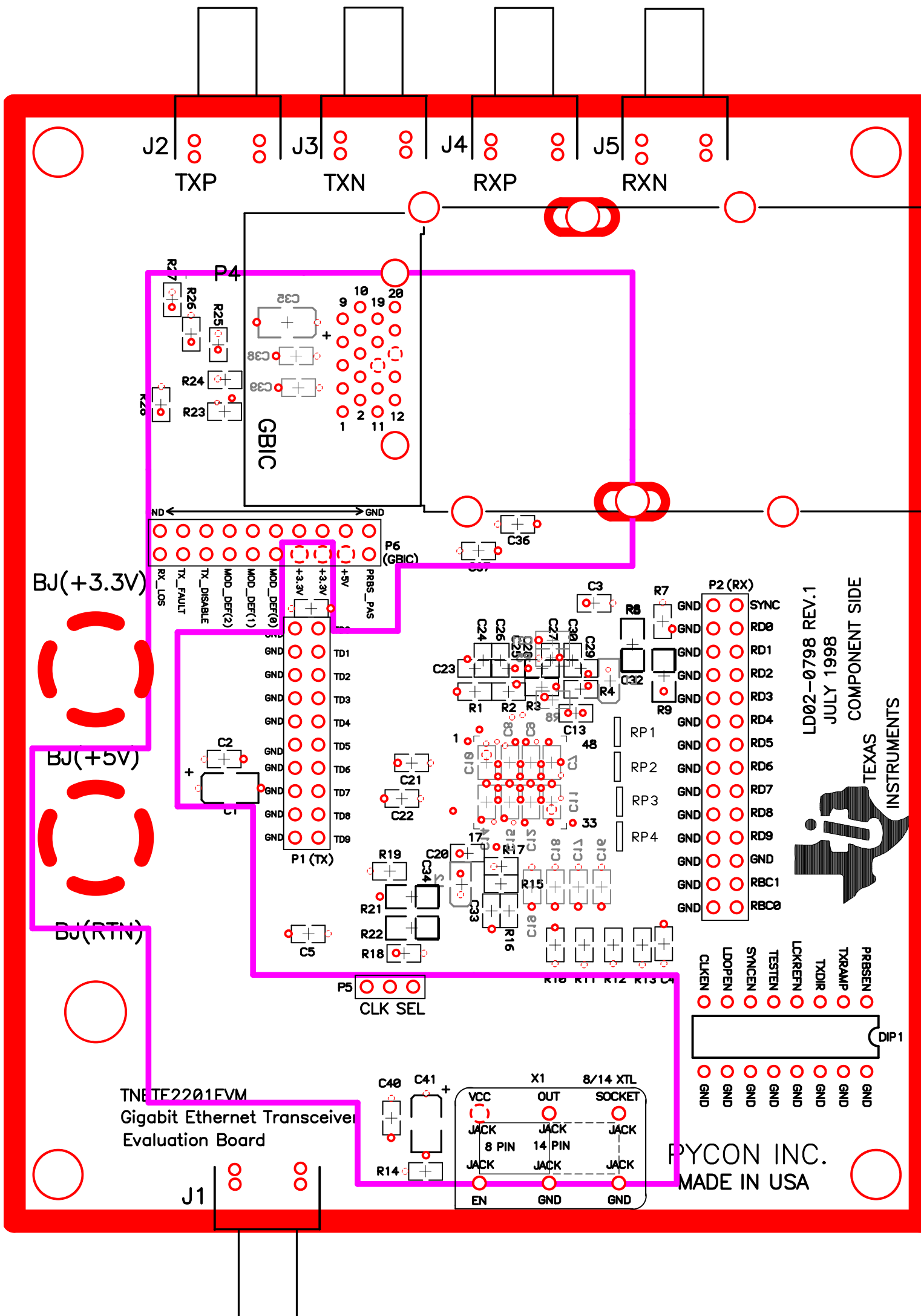
T.I. Internal Data ENGINEER: _____ RELEASED: _____

ITEM	QTY	MFG	MFG PART#	Ref Des	DESCRIPTION	VALUE or FUNCTION	SOCKET
1	3	PANASONIC	ECS-T1CX106R	C1,C35,C41	CAPACITOR,TANT,SMT	20%, 16V, 10uF	
2	2	AVX	12061C222JATMA	C32,C34	CAPACITOR,SMT1206	100V, 5%, 0.0022uF	
3	35	AVX	06033G103JATMA	C2-C31,C36,C37	CAPACITOR,SMT0603	25V,5%,0.01uF	
	*			C38-C40			
4	1	AMP	787653	P4	CONNECTOR,20PIN	RECEPT,R/A,20PIN,AMP	
5	3	CONCORD	01-2520-3-044	BJ(+5V)	CONNECTOR	BANANA,FEMALE,SWAGE MOUNT	
	*			BJ(RTN)			
	*			BJ(+3.3V)			
6	5	EFJOHNSON	142-0701-801	J1-J5	CONNECTOR	SMA JACK,END LAUNCH,.062P	
7	2	MURATA ERIE	BLM21B03-PT	L1,L2	FILTER,SMT0805	FERRITE,6 OHMS@100MHz	
8	2	SAMTEC	TSW-110-07-G-D	P1,P6	HEADER,2X10,.1CTRS	HEADER 2X 10 .1CTR	
9	1	SAMTEC	TSW-1-14-05-G-D	P2	HEADER,MALE,2X14	HEADER,MALE,2X14,.1CTRS	
10	1	ANY	HEADER,MALE,3PI	P5	HEADER	MALE,3PIN,.100CC	
11	1		DUT_PQFP_PJD64	U1	IC,TQFP,PJD,64PIN	DUT-USER DEFINED	
12	3	JUMPER	JUMPER-0603	R16,R17	JUMPER,SMT0603	USER DEFINED JUMPER 0603	
13	1	VARIES	OSC-COMBO-106.2	X1	OSCILLATOR,106.25MHz	OSC COMBO-106.25MHz	AMP/50935/X8
14	4		RES1206(UN)	R8,R9,R21,R22	RESISTOR,SMT,1206	UN-INST	
15	4	AVX/KYOCERA	CRA3A4E500GI	RP1-RP4	RES,SMT,8PIN,50OHM	SERIES CHIP RES ARRAY SMT	
16	14	DALE	CRCW06034701F	R7,R10-R14,R18	RESISTOR,SMT,1/16W,1	4.70K OHM	
	*			R19,R23,R24			
	*			R25-R28			
17	3	DALE	CRCW060349R9F	R3,R4,R15	RESISTOR,SMT,0603	49.9 OHM	
18	2	DALE	CRCW0603200F	R1,R2	RESISTOR,SMT,0603	200 OHM	
19	1	DALE	CRCW0603365F	R5	RESISTOR,SMT,0603	365 OHM	
20	1	DALE	CRCW0603562F	R6	RESISTOR,SMT,0603	562 OHM	
21	1	C&K	BD08	DIP1	SWITCH,SPST,DIP16	SWITCH,16P,SPST X 8	

Total Part Count: 90
 Total Parts Cost: 0







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PRODUCT INFORMATION CENTERS

Americas

Phone +1(972) 644-5580

Fax +1(972) 480-7800

Email sc-infomaster@ti.com

Europe, Middle East, and Africa

Phone

Deutsch +49-(0) 8161 80 3311

English +44-(0) 1604 66 3399

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Français +33-(0) 1-30 70 11 64

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Fax +44-(0) 1604 66 33 34

Email epic@ti.com

Japan

Phone

International +81-3-3457-0972

Domestic 0120-81-0026

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International +81-3-3457-1259

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Email pic-japan@ti.com

Asia

Phone

International +886-2-23786800

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Australia 1-800-881-011

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