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DP83867E SGMII EVM

User's Guide

Literature Number: SNLU209
May 2016

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DP83867E SGMII EVM User's Guide

The DP83867E SGMII EVM (DP83867ERGZ-S-EVM) supports 1000/100/10 Mb/s and is compliant with the IEEE 802.3 standard. This reference design supports SGMII for MAC connections.

The DP83867ERGZ-S-EVM includes three onboard status LEDs, 5V connectors with onboard LDOs, and is JTAG accessible. The EVM is capable of providing a 125MHz reference clock from an onboard 25MHz crystal. Serial management interface, MDIO/MDC, is supported and can be used to access PHY registers for additional features. There are 4-level straps, which allow for system configurations without the need to directly access PHY registers. External power supplies can be connected to each specified voltage rail for additional system evaluation. The EVM supports Wake-on-LAN, Start of Frame Detect IEEE 1588 Time Stamp and configurable I/O voltages.

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1 Introduction

1.1 Purpose

This user guide details the characteristics, operation, and use of DP83867E SGMII EVM. The EVM enables Texas Instruments customers to quickly design and market systems using the DP83867E, DP83867IS and DP83867CS. This document also includes schematic diagrams, a printed-circuit board layout, board assembly, board marking drawings, and a bill of materials.

1.2 Key Features

- 1000BASE-T, 100BASE-TX and 10BASE-T IEEE 802.3 compliant
- SGMII MAC interfaces
- SFD IEEE 1588 Time Stamp
- JTAG interface
- Three status LEDs
- Low Power Modes
  - Active Sleep
  - Passive Sleep
  - IEEE Power Down
  - Deep Power Down
- Wake-on-LAN
- Variable I/O voltage range: 1.8V, 2.5V and 3.3V
- 1000BASE-T error free data transfer over 130 meters on CAT5 cable

1.3 Description

The DP83867E SGMII EVM has an RJ45 connector with discrete magnetics, jumper configurable straps for easy evaluation and can be operated from a single supply (5V DC Connectors). Customers are encouraged to use a design similar to the EVM circuit to expedite their product development. Serial management interface pins allow customers to also access additional features by directly controlling PHY registers.

1.4 Applications

- Industrial – Factory Automation
- Wireless Communications Infrastructure
  - Base Stations
  - Small Cell
  - Microwave Backhaul
- Wireline Communications
- Test and Measurements
- Network Printers and Servers
- Consumer Electronics

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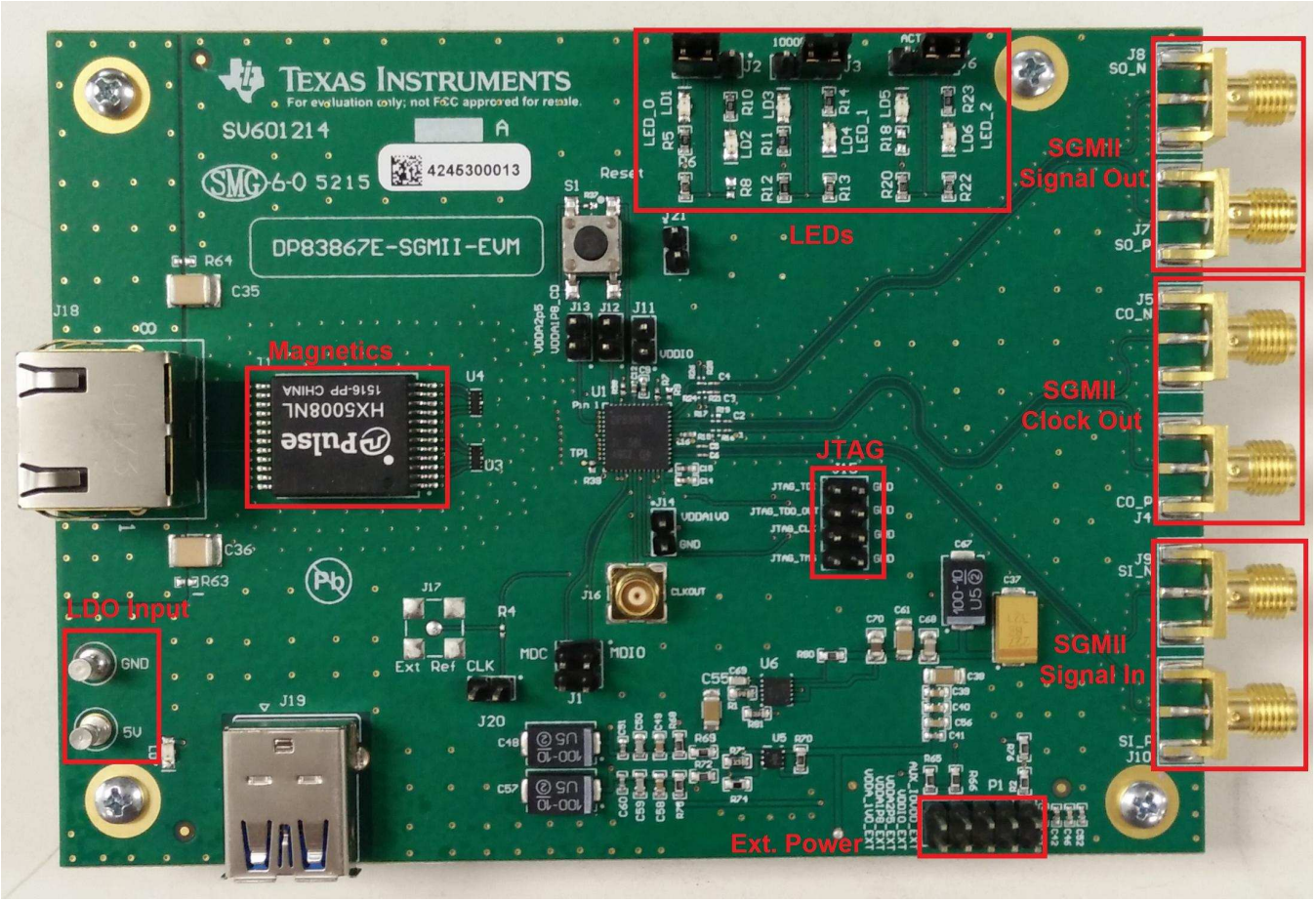


Figure 1. DP83867E SGMII EVM

1.5 Operation – Quick Setup

- Turn ON the PHY by plugging in a 5V DC source 5V and GND on the EVM. Alternatively, the EVM can be powered up through USB connector.
- Plug a CAT5, CAT5E or CAT6 cable into the integrated RJ45 connector (J18)
- Connect the far end of the Ethernet cable to a link partner
- Connect a MAC interface to J4-J5, J7-J8, and J9-J10 SMA Connectors.
- LED Indication
  - The 5V LED (LD7) will be illuminated if the 5V supply is connected
  - Look for the LINK LED to light up on the DP83867E EVM after the PHY links with a connected partner.
  - If the link partner supports 1000M mode and a 1000M link is established, then the 1000M LINK LED will light up

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2 Board Setup Details

2.1 Block Diagram

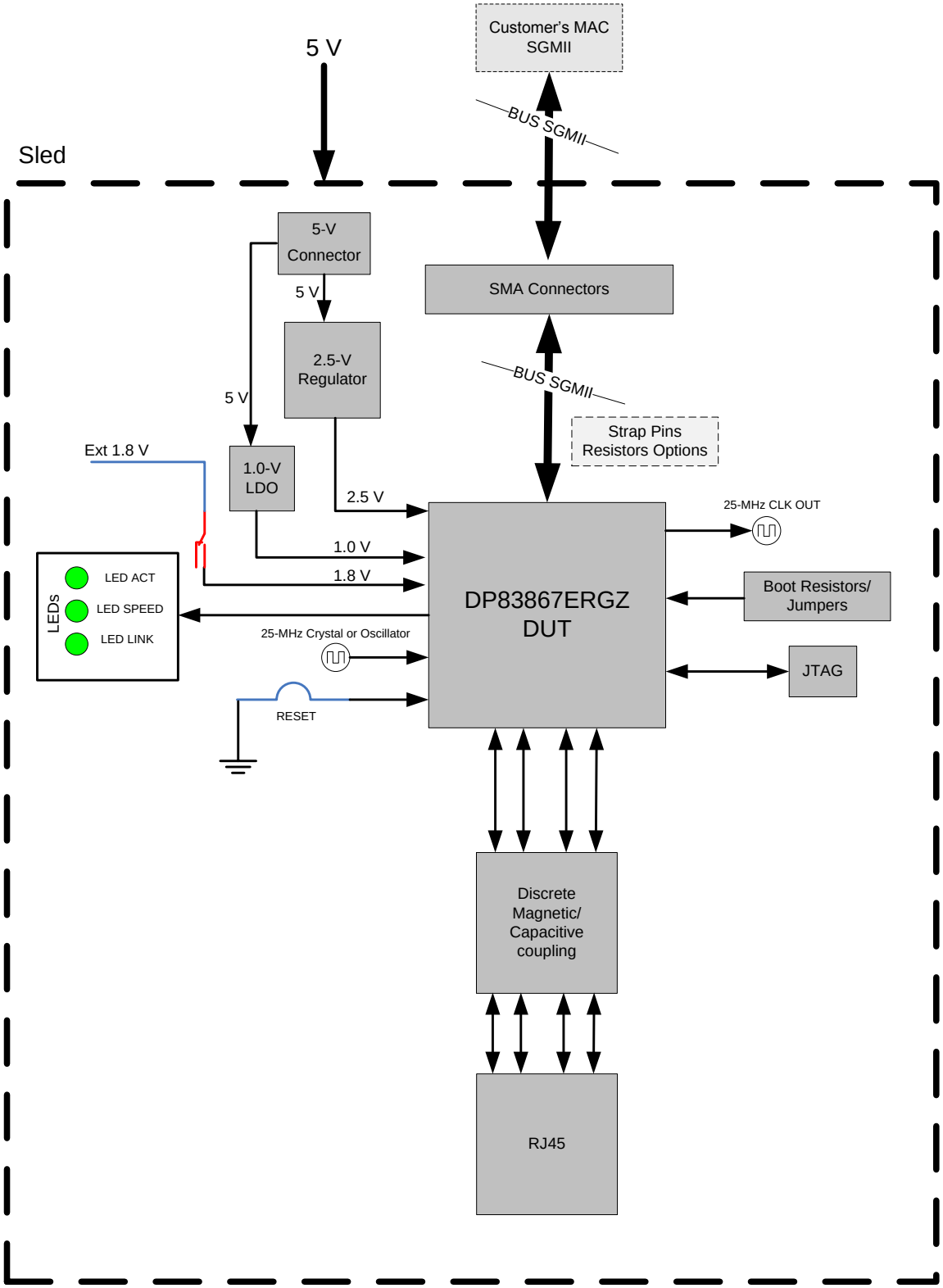


Figure 2. DP83867E SGMII EVM Block Diagram

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2.2 Power Supply Options

The DP83867E EVM power is supplied by a single 5V DC input. This option uses onboard LDOs to provide 2.5V and 1.0V voltage rails.

The DP83867E EVM can be operated from external supplies. Connect external supplies to P1:

- Pin 1 – AUX_IOVDD_EXT
- Pin 3 – VDDIO_EXT
- Pin 5 – VDDA2P5_EXT
- Pin 7 – VDDA1P8_AB and VDDA1P8_CD
- Pin 9 – VDDA_1V0_EXT

Do the following to enable external power operation:

- Remove R69, R72, R79
- Populate R65, R66, R68, R75, R77

2.3 Serial Management and MAC Interfaces

The DP83867E EVM supports serial management (MDIO/MDC) and SGMII MAC interfaces. Serial management interface is accessible though J1. MDIO is located at pin 1 and MDC is located at pin 3. Ground connection between the DP83867E EVM and serial interface controller is required for proper operation. DP83867E supports both clause 22 and clause 45 in the IEEE 802.3 specification.

NOTE: The default PHY_ID is '0'. PHY_ID can be changed via strap options found in the datasheet.

MAC interface pins are routed to SMA connectors. SGMII signals are routed via differential pairs, so two SMA connectors are required for each signal. SGMII Clock is routed on J4 and J5, SGMII Signal Out is routed to J7 and J8, SGMII Signal In is routed to J9 and J10. MAC configurations are located in the datasheet and can be configured by bootstrapping or direct register access through the serial management interface. This EVM is configured to directly boot-up in SGMII mode.Refer to the DP83867E datasheet (SNLS504) for specific pin requirements for each MAC interface.

2.4 LED Options

DP83867E supports up to four LEDs, Link/Speed/ACT/MLED indications. This EVM has three onboard status LEDs that can be controlled by direct register access using the serial management interface. LED pins can operate as either current sources (when connected to pull-down) or current sinks (when connected to pull-up). By default on this EVM, LEDs are configured as follows.

LED_0 - Valid Link

LED_1 - 1000B-T Link

LED_2 - Activity

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2.5 Bootstrap Options/Jumpers

Some DP83867E configurations are done through bootstrap options. Options can be selected with resistor population.

The DP83867E EVM supports the following resistor configurations:

- PHY_ID[4:0]
- SPEED_SEL
- Mirror Enable
- Auto-Negotiation Disable

2.6 JTAG Interface

The DP83867E EVM has JTAG accessible though J15:

- Pin 2 – TMS
- Pin 4– CLK
- Pin 6 – TDO
- Pin 8 – TDI

2.7 Clock Options

The DP83867E EVM supports three different clock options:

- 25MHz crystal (Default)
- 25MHz oscillator configured by onboard modifications
- External 25MHz reference clock connected to pin 1 on J20 or on SMA connector J17

2.7.1 Default Configuration

The DP83867E EVM default configuration has a 25MHz crystal. In this mode and external crystal resonator is connected across pins XO and XI.

The crystal must be 25MHz ±50ppm-tolerance crystal reference.

2.7.2 25MHz Oscillator Configuration

The DP83867E can also operate with a 25MHz external CMOS-level oscillator source connected to pin XI only.

Refer to the data sheet (SNLS504) for OSC requirement specifications.

In order to operate with a 25MHz OSC, the following modifications are required:

- U2 OSC should be mounted – Epson SG-210STF 25MHz ±50ppm
- Populate R40, R44, and R51 with 0 Ohm resistors. Populate C17-C19.
- Remove R45, R48

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2.7.3 External Configuration

External clock can be supplied to the DP83867E by using pin 1 on J20 or on SMA connector J17.

The external clock must meet the DP83867E datasheet requirements and to be within 25MHz ±50ppm-tolerance. For external clock configuration, X_O should be left floating.

Refer to the data sheet (SNLS504) for capacitor divider recommendations.

The following changes are required to route an external clock to the DP83867E for a 1.8V clock source:

- Populate R51, R52 with 0 Ohm resistors.
- Remove R53, R54, R45 and R48.

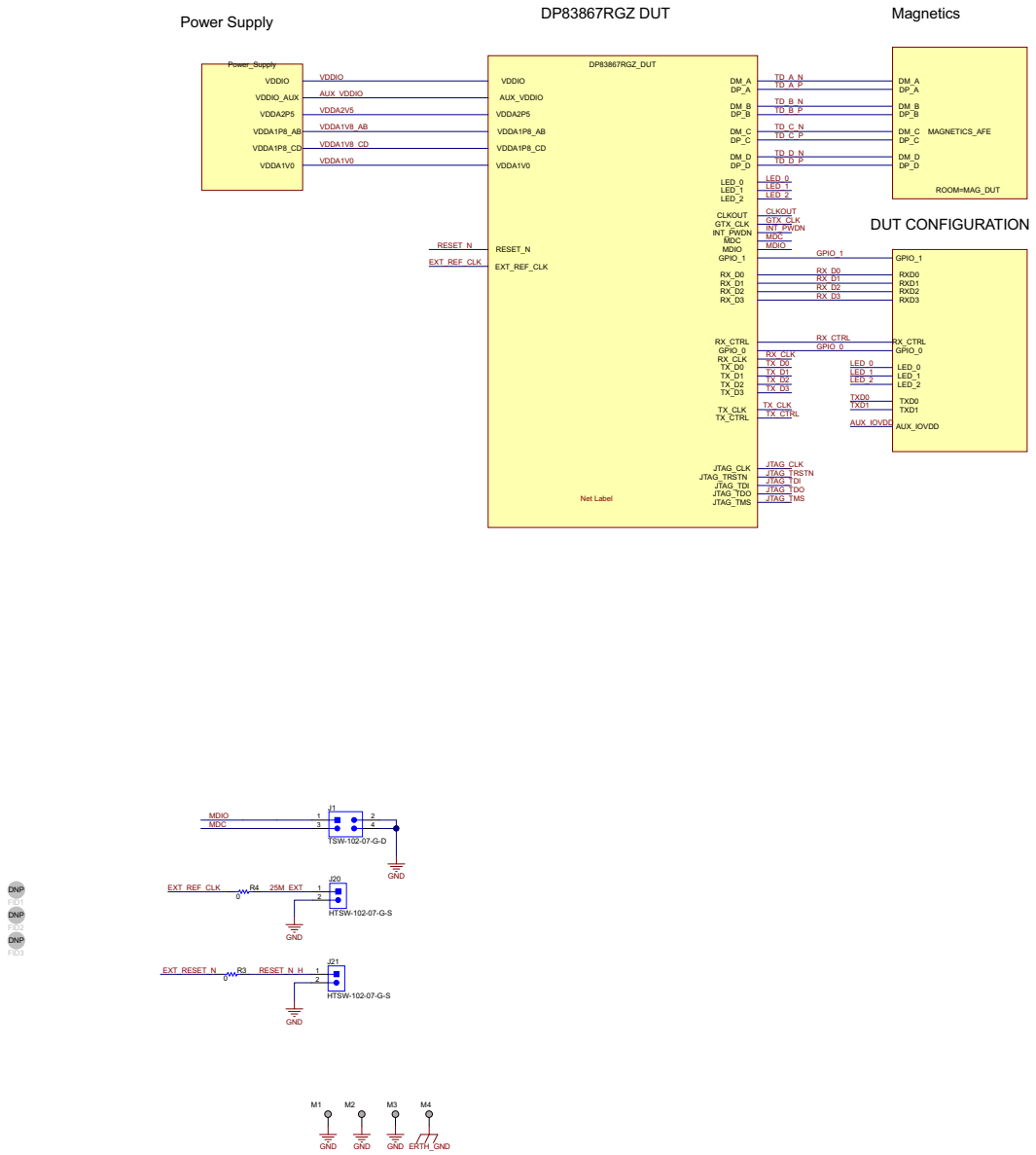
2.8 Capacitive Coupling

The EVM can be operated in capacitive coupling mode instead of the magnetic coupling mode. The following changes are required for capacitive coupling.

- Populate C22, C23, C25, C27, C28, C30, C31 C33, R27-R34.
- Remove T1.

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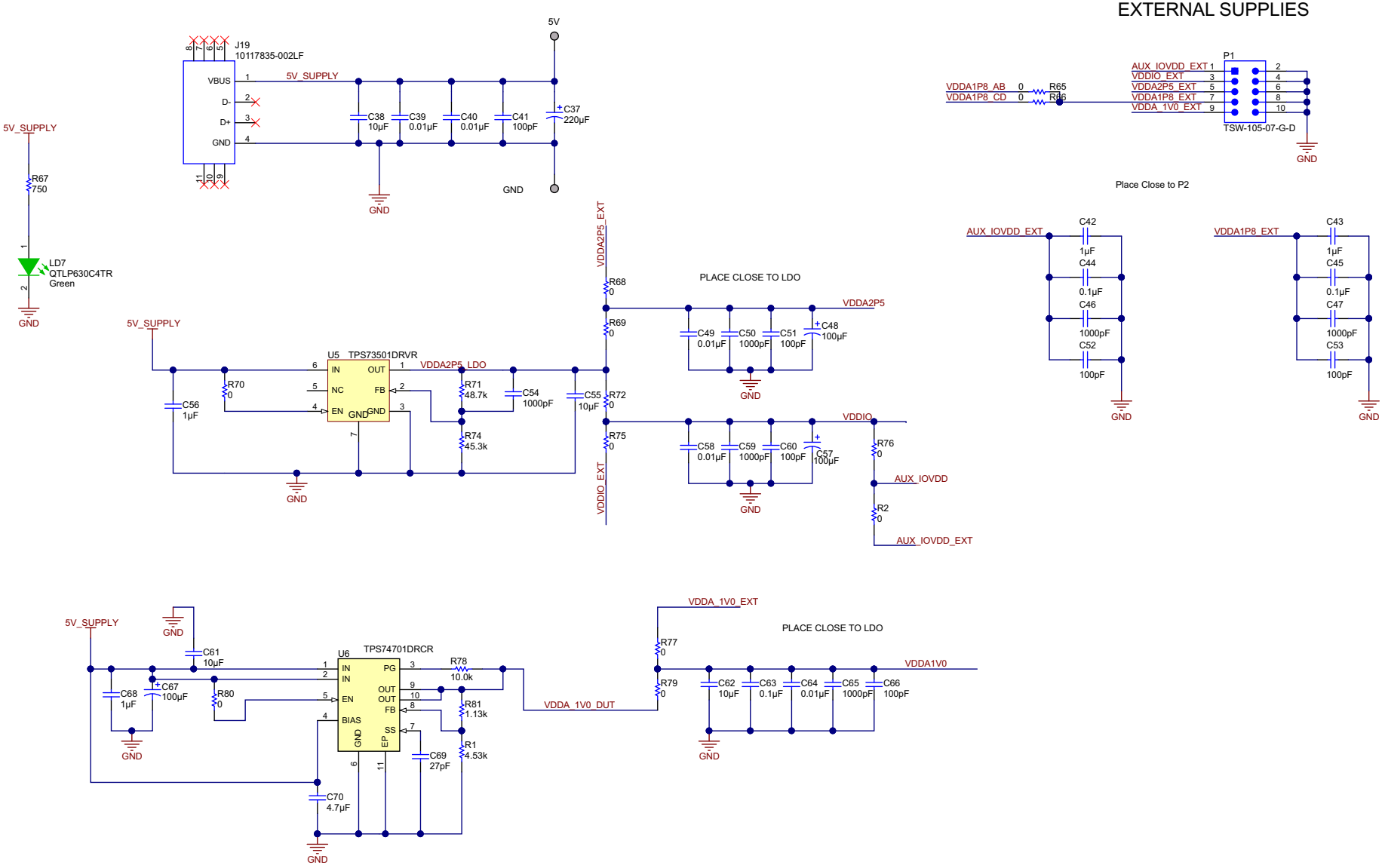
2.9 Schematics



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Figure 3. Schematic (1 of 5)

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Figure 4. Schematic (2 of 5)

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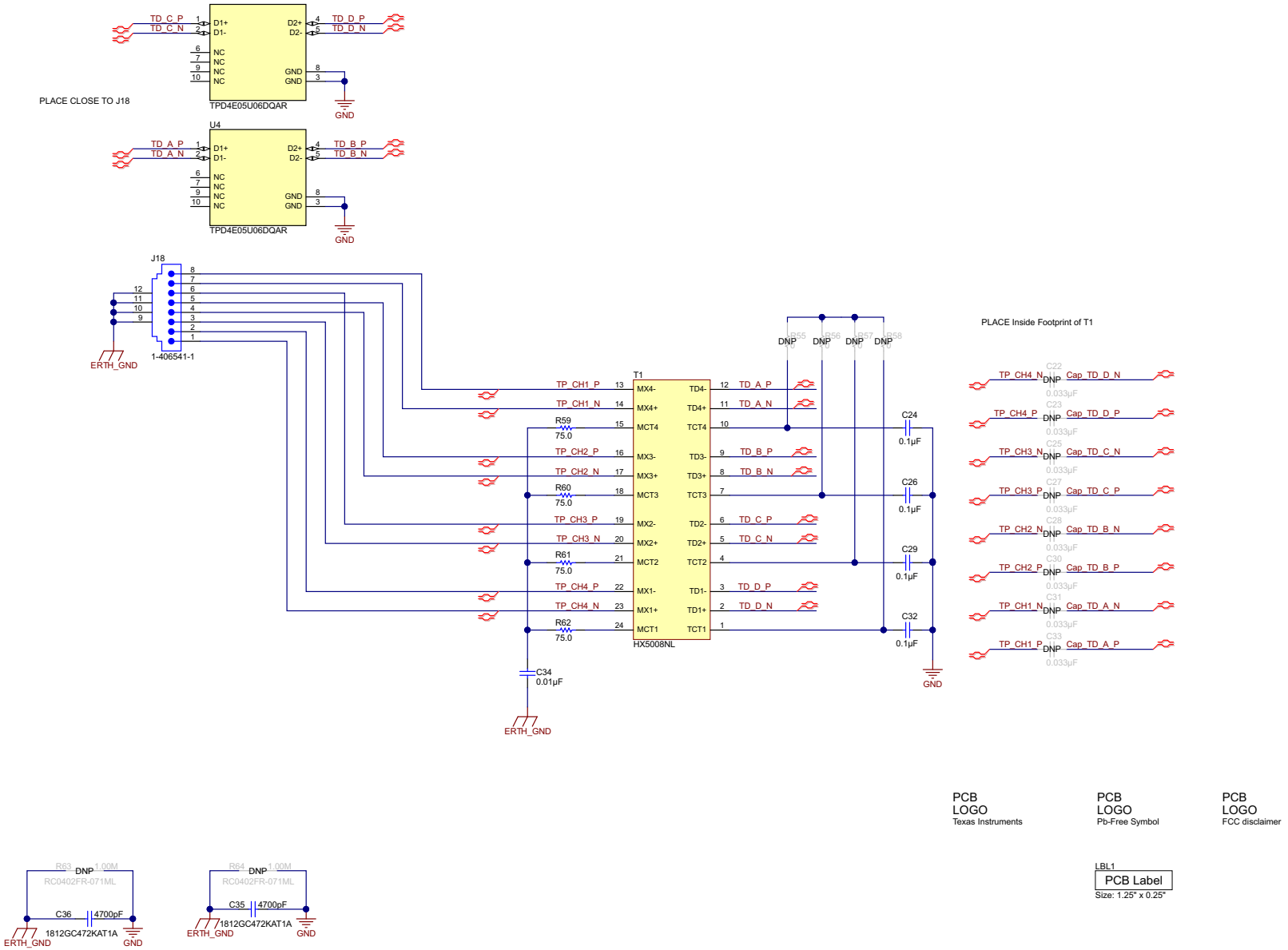
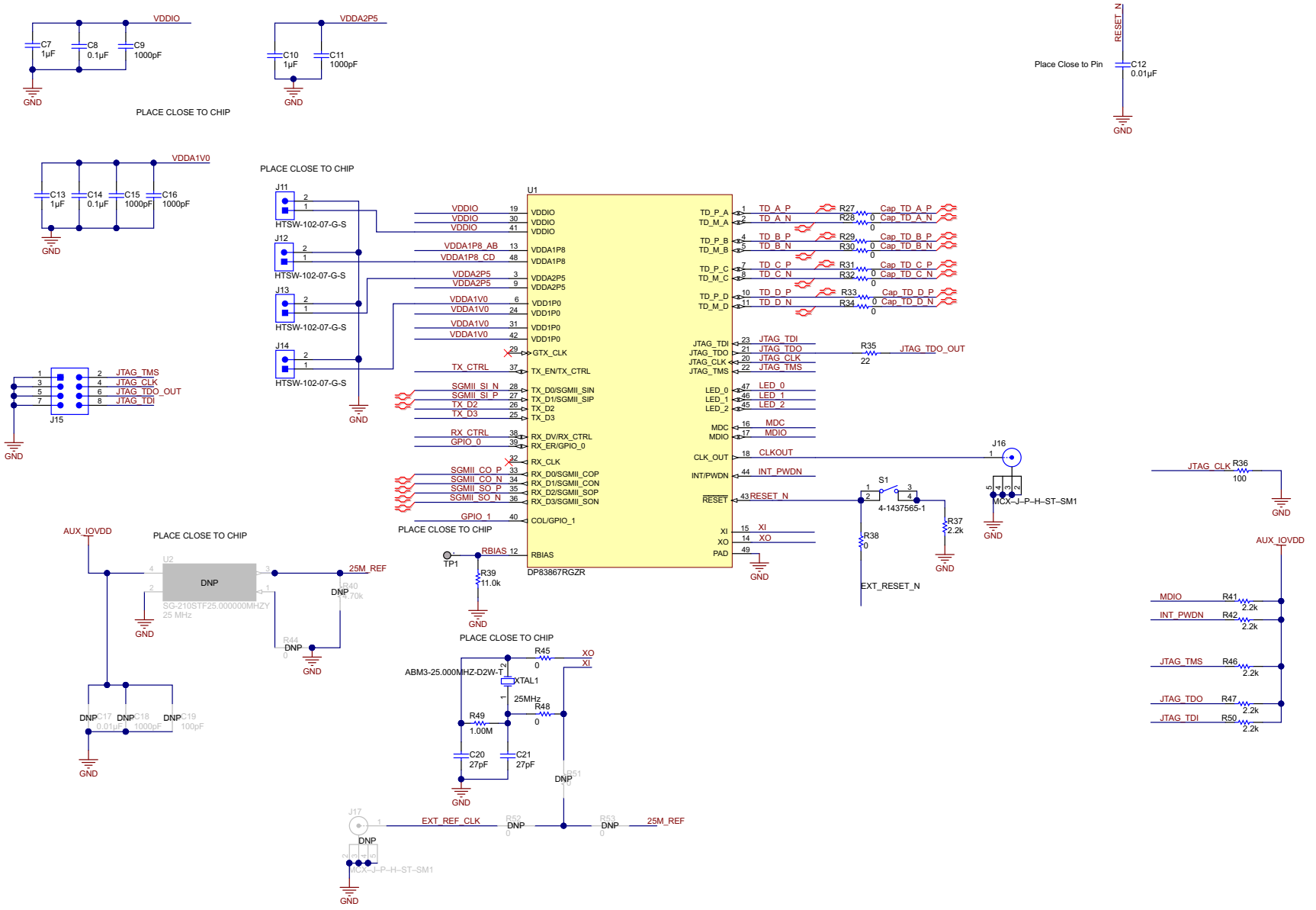


Figure 5. Schematic (3 of 5)

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Figure 6. Schematic (4 of 5)

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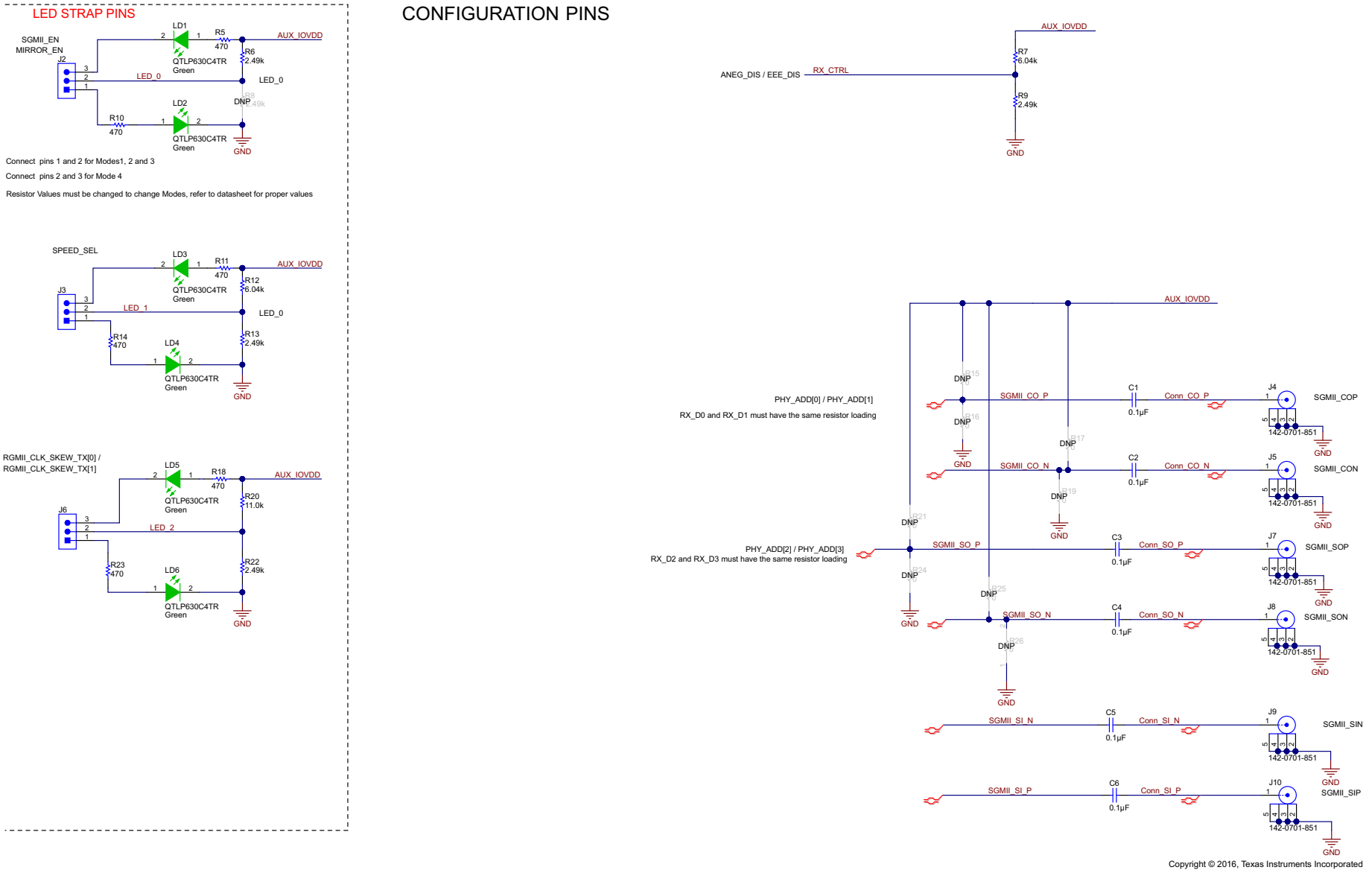


Figure 7. Schematic (5 of 5)

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2.10 Layout

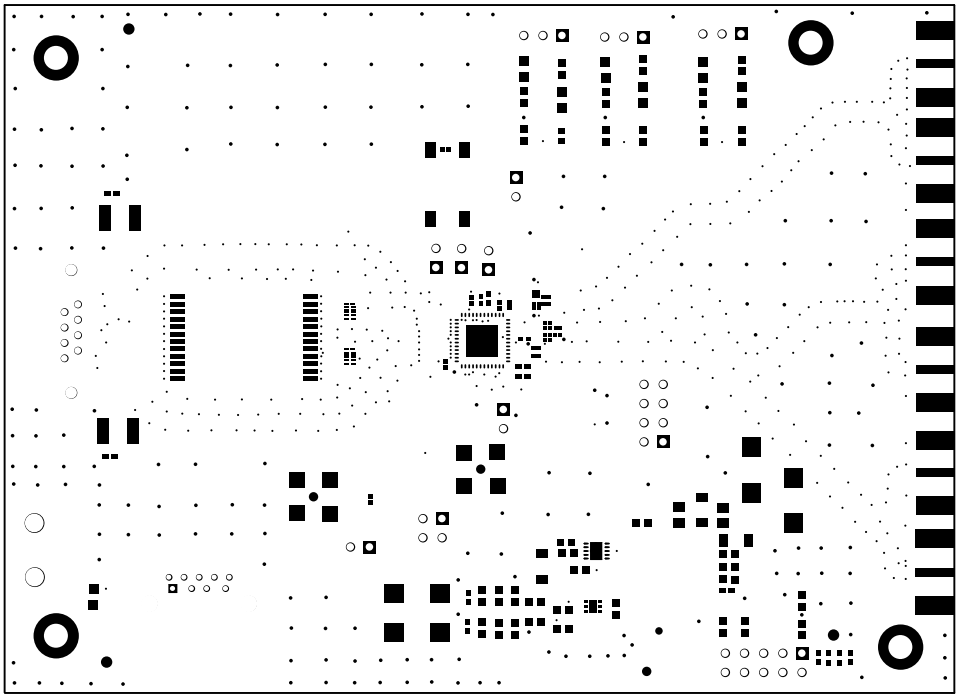


Figure 8. Top Solder

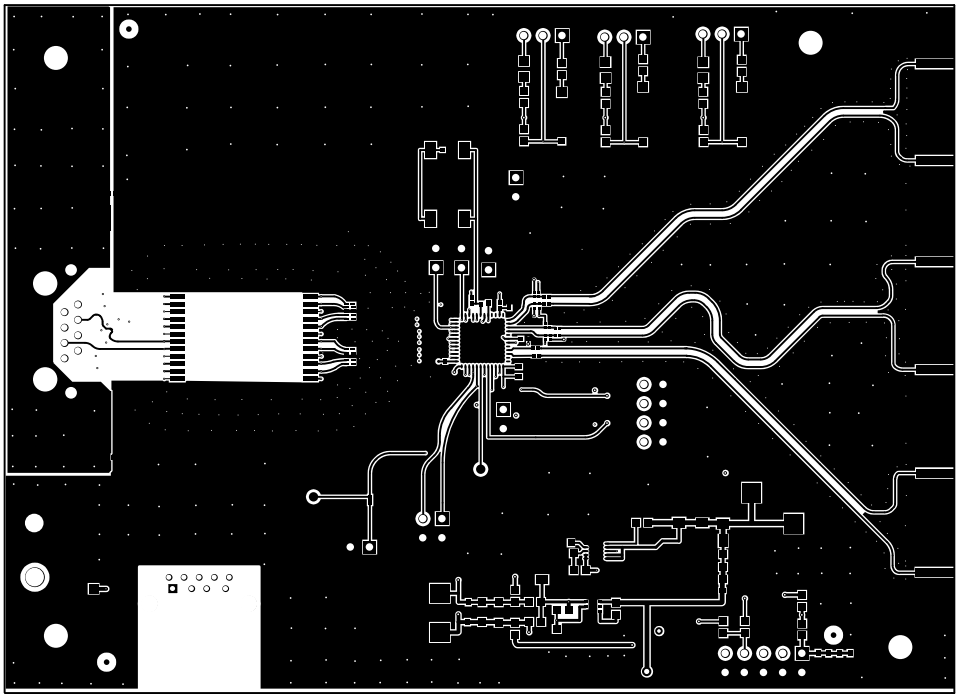


Figure 9. Top Layer

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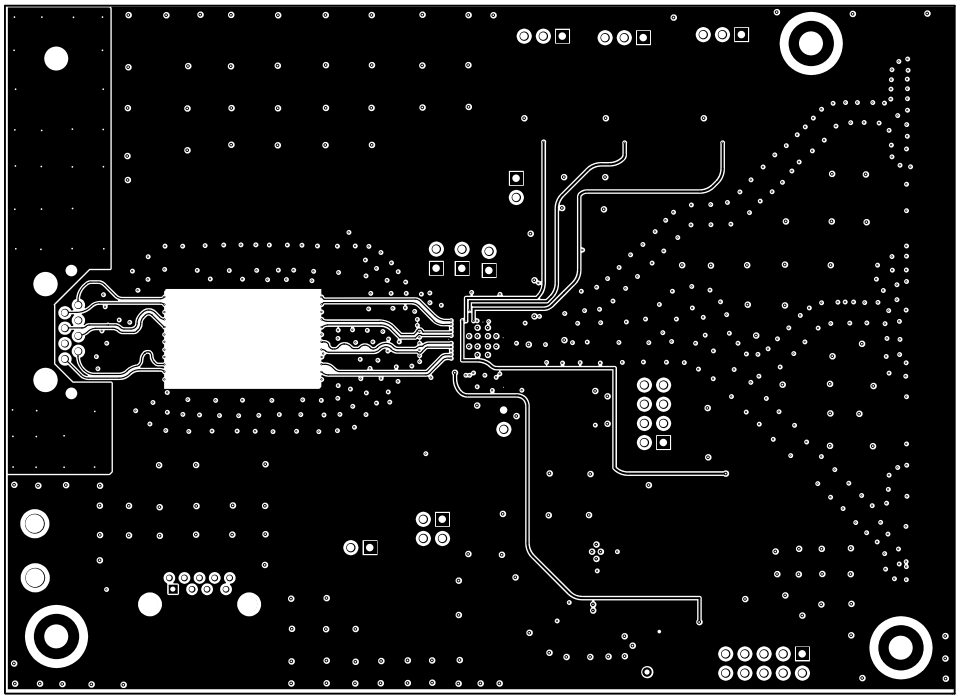


Figure 10. Signal Layer 1

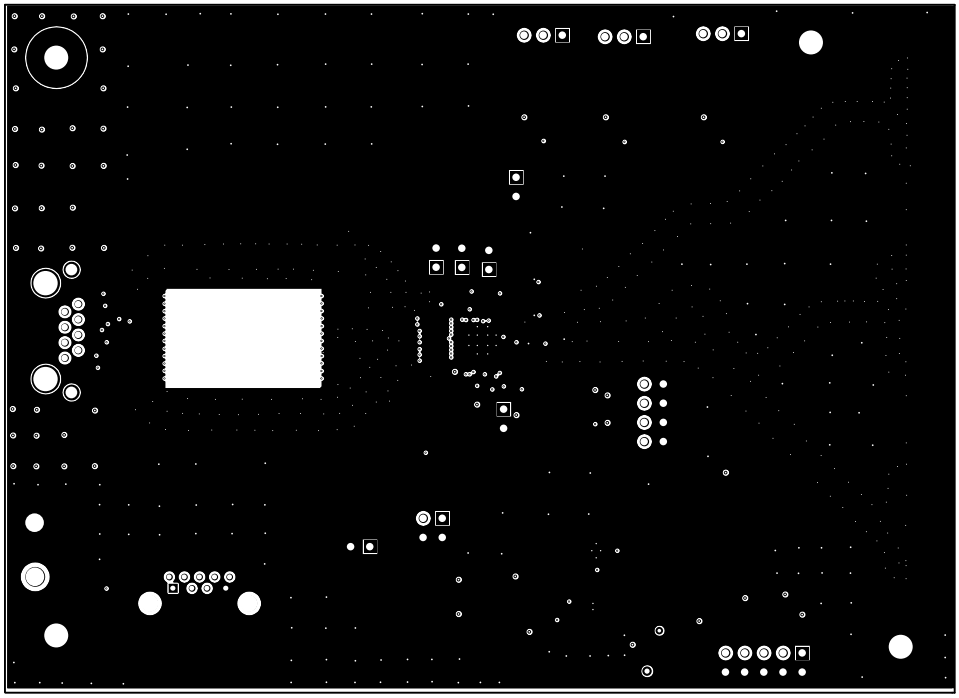


Figure 11. Signal Layer 2

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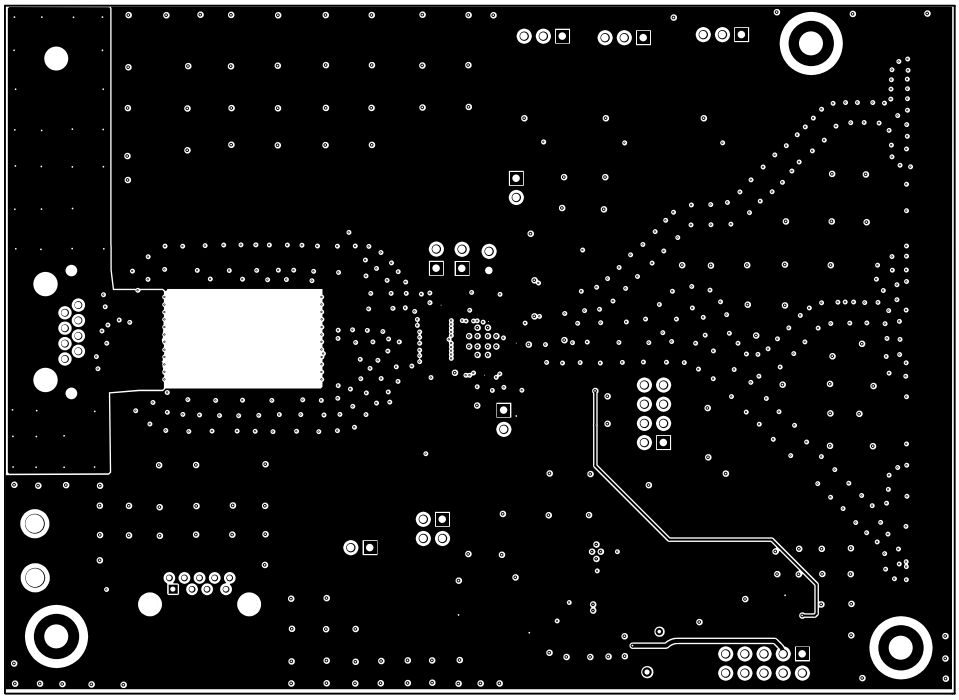


Figure 12. Signal Layer 3

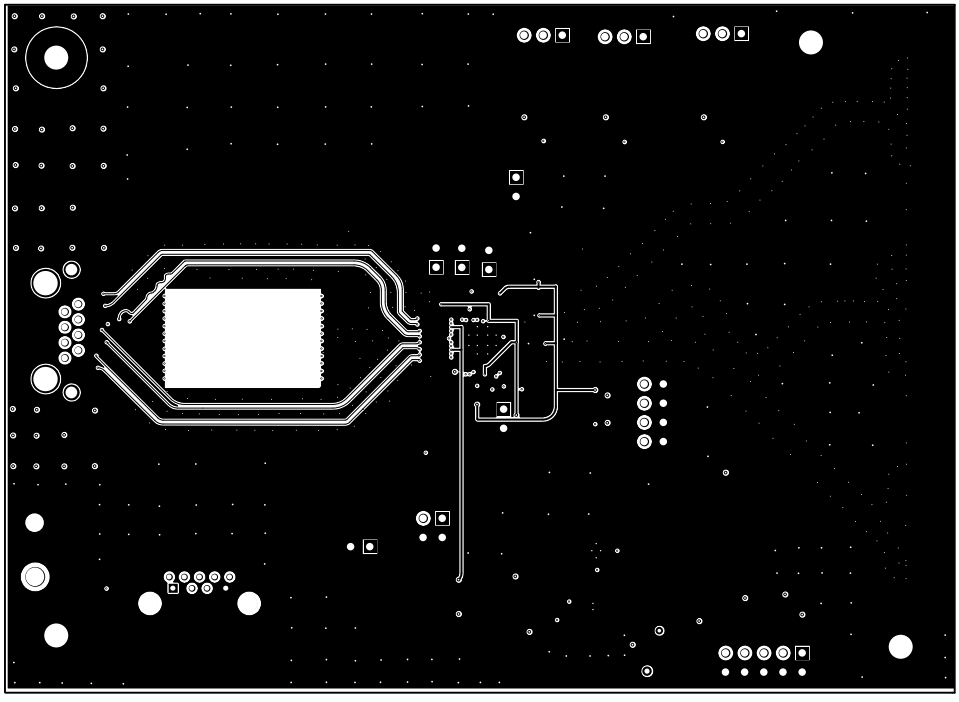


Figure 13. Signal Layer 4

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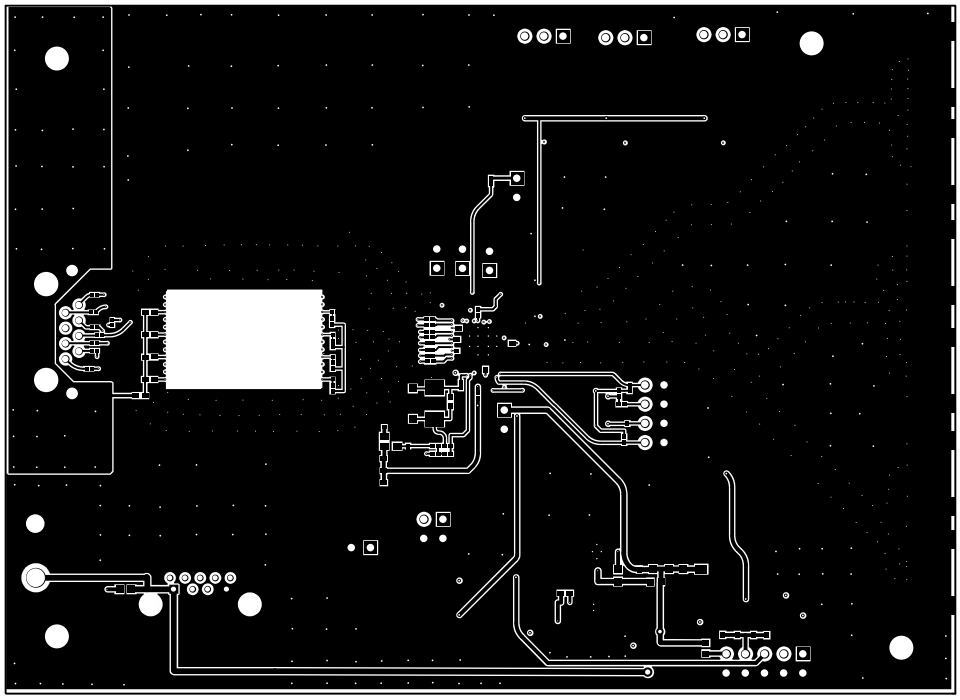


Figure 14. Bottom Layer

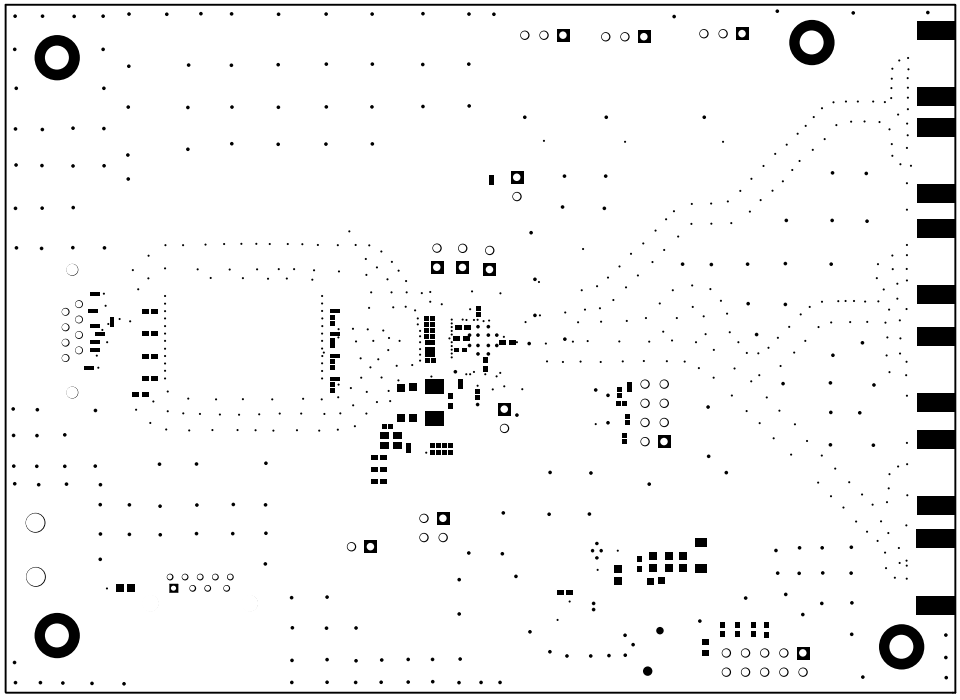


Figure 15. Bottom Solder Mask

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2.11 Board Assembly

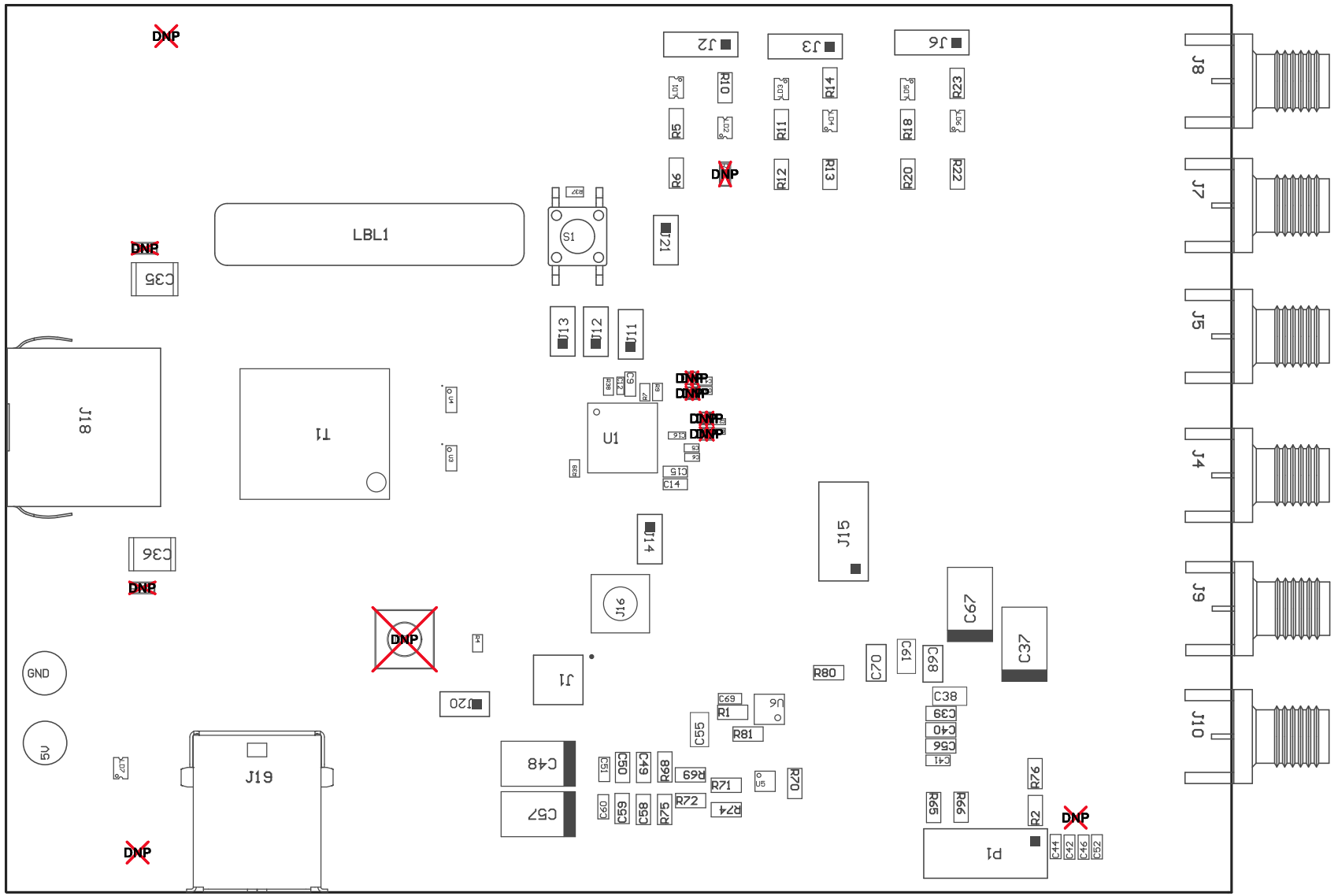


Figure 16. Board Assembly Top

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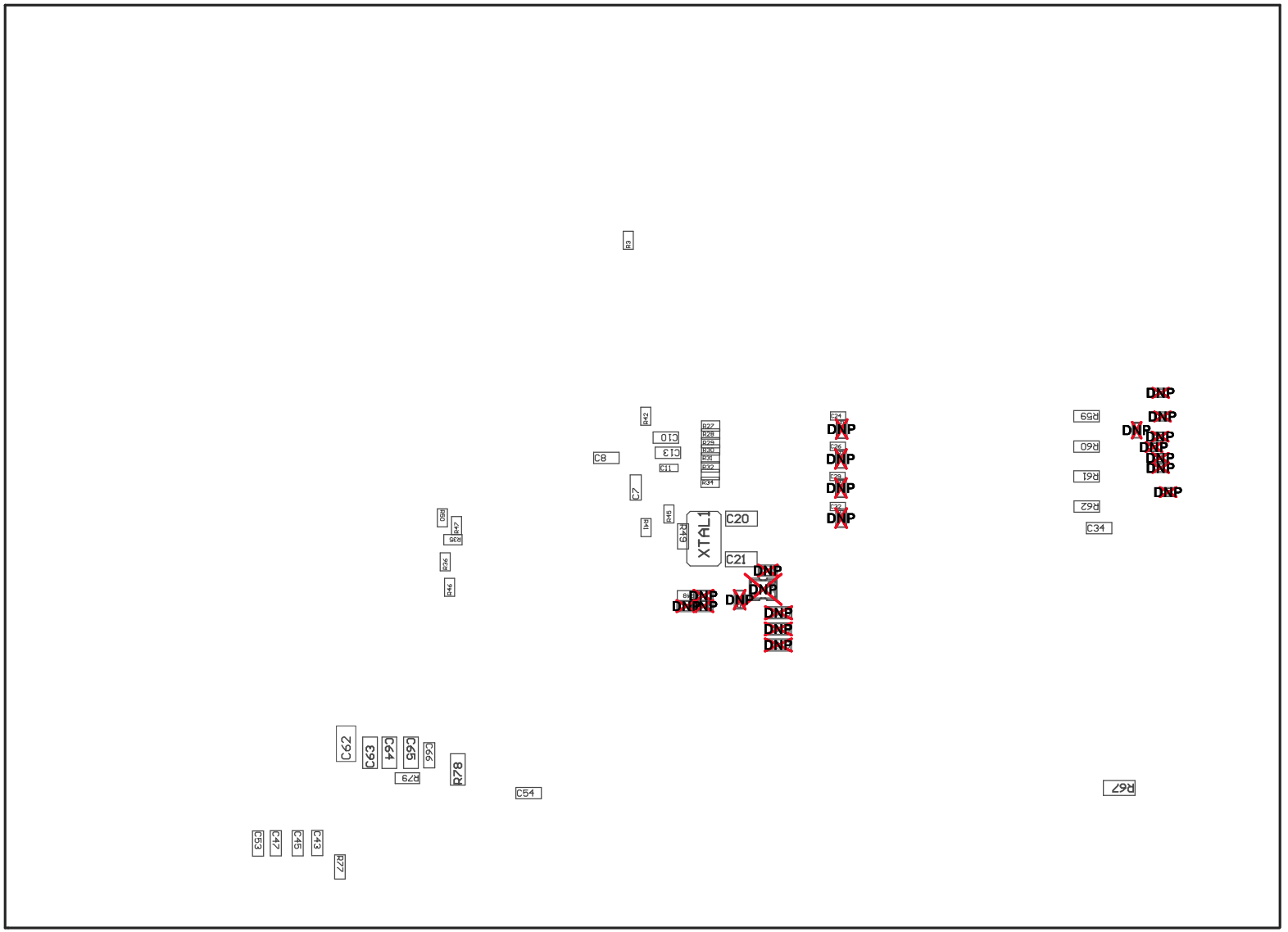


Figure 17. Board Assembly Bottom

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2.12 Board Marking (Silk)

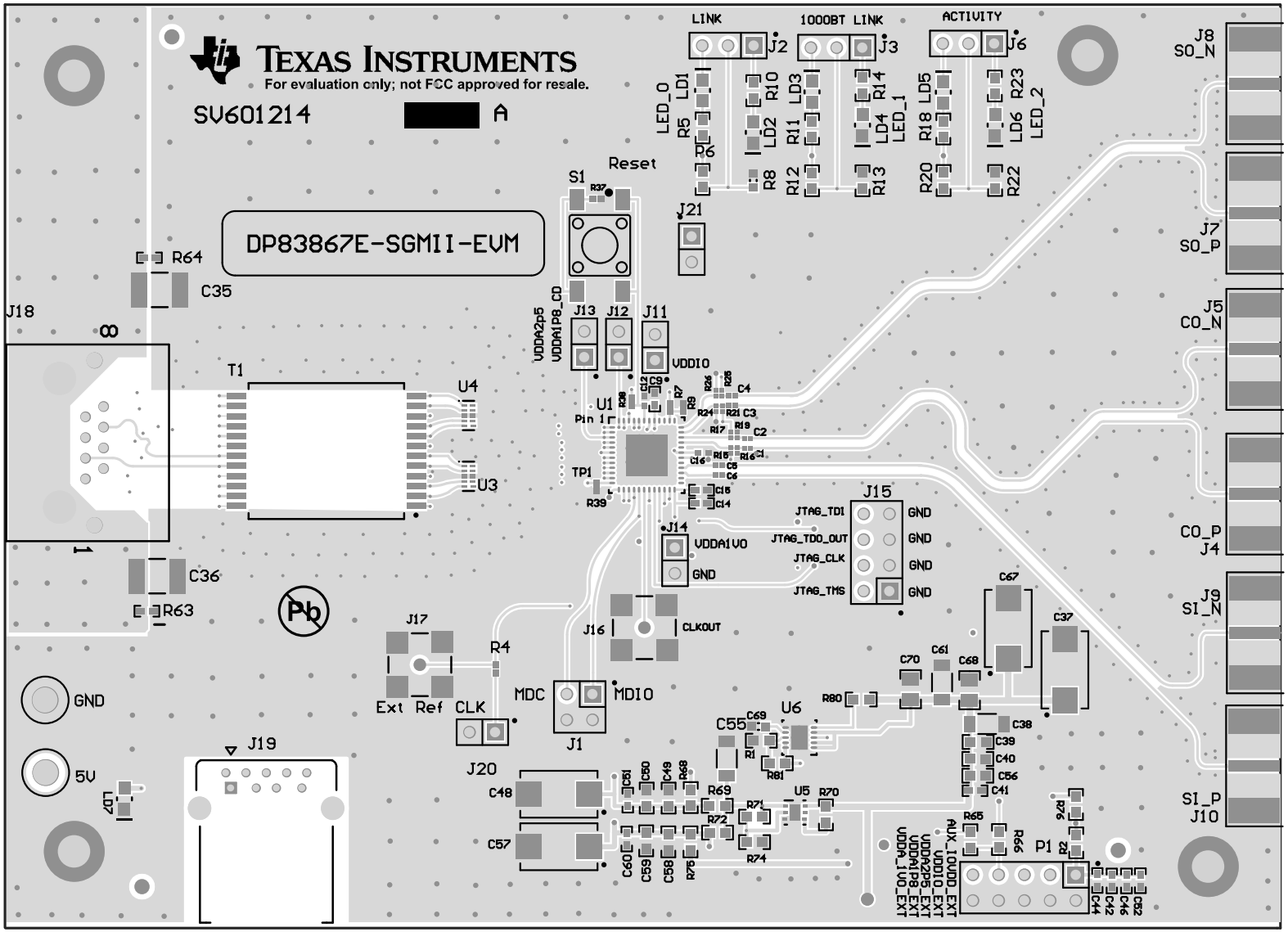


Figure 18. Top Overlay

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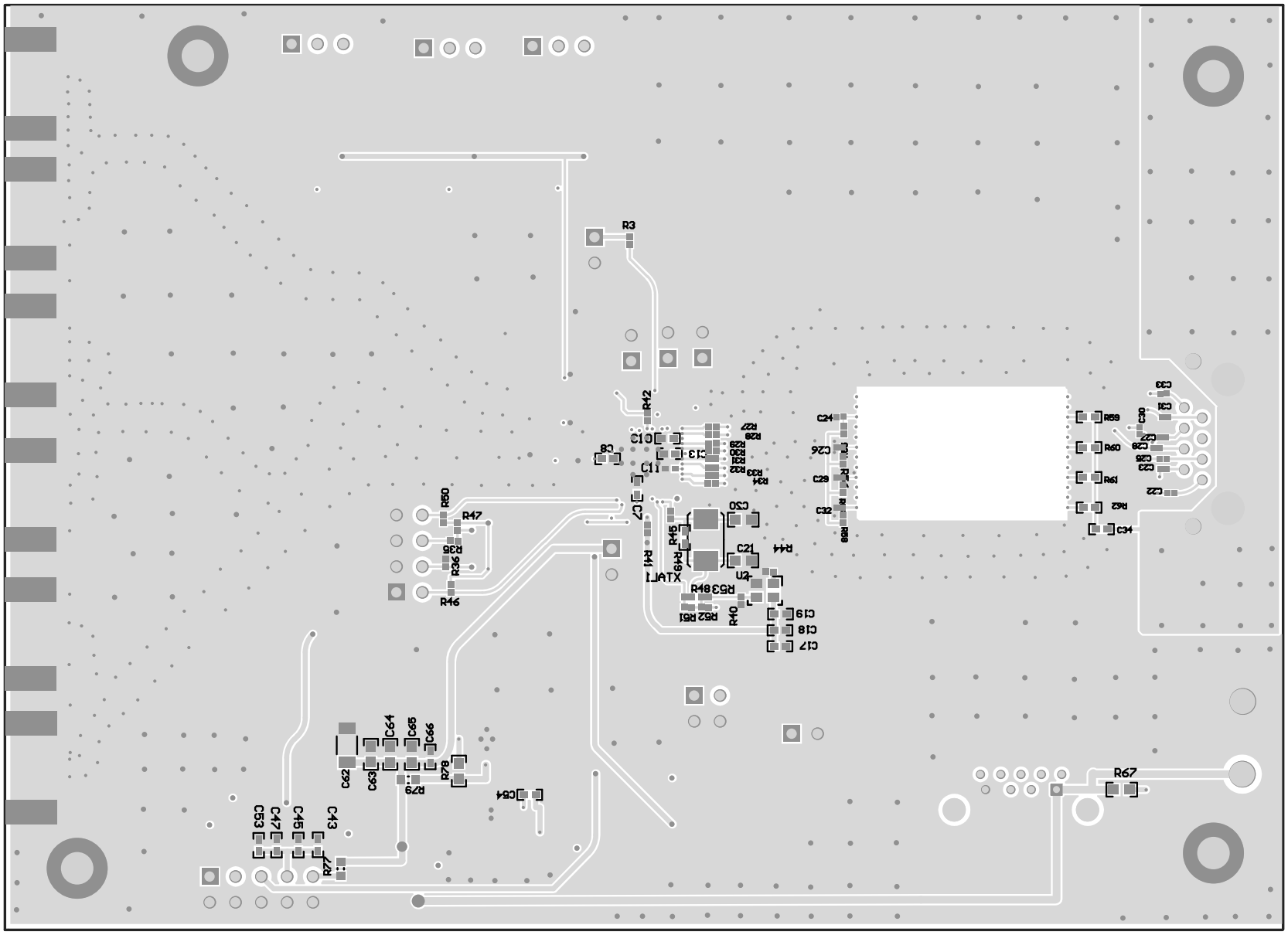


Figure 19. Bottom Overlay

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2.13 Bill of Materials (BOM)

DP83867E SGMII EVM BOM

Designator	Qty	Value	Description	Part Number	Manufacturer
5V, GND	2	Double	Terminal, Turret, TH, Double	1502-2	Keystone
C1, C2, C3, C4, C5, C6	6	0.1uF	CAP, CERM, 0.1 µF, 6.3 V, +/- 10%, X5R, 0201	C0603X5R0J104K030BC	TDK
C7, C10, C13, C42, C43	5	1uF	CAP, CERM, 1 µF, 10 V, +/- 10%, X5R, 0402	C1005X5R1A105K050BB	TDK
C8, C14, C44, C45	4	0.1uF	CAP, CERM, 0.1 µF, 10 V, +/- 10%, X5R, 0402	C1005X5R1A104K050BA	TDK
C9, C11, C15, C16, C54	5	1000pF	CAP, CERM, 1000 pF, 25 V, +/- 5%, X7R, 0402	C0402C102J3RACTU	Kemet
C12	1	0.01uF	CAP, CERM, 0.01 µF, 50 V, +/- 10%, X7R, 0402	GRM155R71H103KA88D	MuRata
C20, C21, C69	3	27pF	CAP, CERM, 27 pF, 50 V, +/- 1%, C0G/NP0, 0603	CL10C270FB8NNNC	Samsung Electro-Mechanics, Samsung Electro-Mechanics, Samsung
C24, C26, C29, C32	4	0.1uF	CAP, CERM, 0.1 µF, 10 V, +/- 10%, X5R, 0201	CL03A104KP3NNNC	Samsung Electro-Mechanics
C34	1	0.01uF	CAP, CERM, 0.01 µF, 50 V, +/- 5%, X7R, 0402	C0402C103J5RACTU	Kemet
C35, C36	2	4700pF	CAP, CERM, 4700 pF, 2000 V, +/- 10%, X7R, 1812	1812GC472KAT1A	AVX
C37	1	220uF	CAP, TA, 220 µF, 6.3 V, +/- 10%, 0.7 ohm, SMD	T491D227K006AT	Kemet
C38, C55, C61, C62	4	10uF	CAP, CERM, 10 µF, 35 V, +/- 20%, X7R, 1206_190	C3216X7R1V106M160AC	TDK
C39, C40, C49, C58, C64	5	0.01uF	CAP, CERM, 0.01 µF, 50 V, +/- 5%, X7R, 0603	C0603C103J5RACTU	Kemet
C41, C51, C52, C53, C60, C66	6	100pF	CAP, CERM, 100 pF, 50 V, +/- 5%, C0G/NP0, 0402	CC0402JRNPO9BN101	Yageo America
C46, C47	2	1000pF	CAP, CERM, 1000 pF, 25 V, +/- 10%, X5R, 0402	GRM155R61E102KA01D	MuRata
C48, C57, C67	3	100uF	CAP, TA, 100 µF, 10 V, +/- 20%, 0.1 ohm, SMD	593D107X0010D2TE3	Vishay-Sprague
C50, C59, C65	3	1000pF	CAP, CERM, 1000 pF, 50 V, +/- 10%, C0G/NP0, 0603	06035A102KAT2A	AVX
C56	1	1uF	CAP, CERM, 1 µF, 6.3 V, +/- 10%, X7R, 0603	CL10B105KQ8NNNC	Samsung
C63	1	0.1uF	CAP, CERM, 0.1 µF, 16 V, +/- 10%, X7R, 0603	CL10B104KO8NNNC	Samsung
C68	1	1uF	CAP, CERM, 1 µF, 16 V, +/- 10%, X5R, 0805	0805YD105KAT2A	AVX
C70	1	4.7uF	CAP, CERM, 4.7 µF, 10 V, +80/- 20%, Y5V, 0805	CC0805ZRY5V6BB475	Yageo America
J1	1		Header, 100mil, 2x2, Gold, TH	TSW-102-07-G-D	Samtec
J2, J3, J6	3		Header, 100mil, 3x1, Gold, TH	TSW-103-07-G-S	Samtec
J4, J5, J7, J8, J9, J10	6		Connector, End launch SMA, 50 ohm, SMT	142-0701-851	Emerson Network Power
J11, J12, J13, J14, J20, J21	6		Header, 100mil, 2x1, Gold, TH	HTSW-102-07-G-S	Samtec
J15	1		Header, 100mil, 4x2, Gold, TH	TSW-104-07-G-D	Samtec
J16	1		Mini-RFCable Connector 50 Ohm	MCX–J–P–H–ST–SM1	Samtec
J18	1		RJ-45, Right Angle, No LED, tab up	1-406541-1	AMP

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DP83867E SGMII EVM BOM (continued)

Designator	Qty	Value	Description	Part Number	Manufacturer
J19	1		Connector, Receptacle, USB Type A, 9 Pins, R/A, TH	10117835-002LF	FCI
LBL1	1		Thermal Transfer Printable Labels, 1.250" W x 0.250" H - 10,000 per roll	THT-13-457-10	Brady
LD1, LD2, LD3, LD4, LD5, LD6, LD7	7	Green	LED, Green, SMD	QTLP630C4TR	Everlight
P1	1		Header, 100mil, 5x2, Gold, TH	TSW-105-07-G-D	Samtec
R1	1	4.53k	RES, 4.53 k, 1%, 0.1 W, 0603	CRCW06034K53FKEA	Vishay-Dale
R2, R65, R66, R68, R69, R70, R72, R75, R76, R77, R79, R80	12	0	RES, 0, 5%, 0.1 W, 0603	RC0603JR-070RL	Yageo America
R3, R4, R27, R28, R29, R30, R31, R32, R33, R34, R38, R45, R48	13	0	RES, 0, 5%, 0.05 W, 0201	ERJ-1GE0R00C	Panasonic
R5, R10, R11, R14, R18, R23	6	470	RES, 470, 1%, 0.1 W, 0603	RC0603FR-07470RL	Yageo America
R6, R20	2	11.0k	RES, 11.0 k, 1%, 0.1 W, 0603	RC0603FR-0711KL	Yageo America
R7	1	6.04k	RES, 6.04 k, 1%, 0.05 W, 0201	ERJ-1GNF6041C	Panasonic
R9	1	2.49k	RES, 2.49 k, 1%, 0.05 W, 0201	CRCW02012K49FKED	Vishay-Dale
R12	1	6.04k	RES, 6.04 k, 1%, 0.1 W, 0603	CRCW06036K04FKEA	Vishay-Dale
R13, R22	2	2.49k	RES, 2.49 k, 1%, 0.1 W, 0603	RC0603FR-072K49L	Yageo America
R35	1	22	RES, 22, 5%, 0.05 W, 0201	ERJ-1GNJ220C	Panasonic
R36	1	100	RES, 100, 1%, 0.05 W, 0201	ERJ-1GEF1000C	Panasonic
R37, R41, R42, R46, R47, R50	6	2.2k	RES, 2.2 k, 5%, 0.05 W, 0201	CRCW02012K20JNED	Vishay-Dale
R39	1	11.0k	RES, 11.0 k, 1%, 0.05 W, 0201	CRCW020111K0FKED	Vishay-Dale
R49	1	1.00Meg	RES, 1.00 M, 1%, 0.063 W, 0402	RC0402FR-071ML	Yageo America
R59, R60, R61, R62	4	75.0	RES, 75.0, 1%, 0.063 W, 0402	CRCW040275R0FKED	Vishay-Dale
R67	1	750	RES, 750, 5%, 0.1 W, 0603	RC0603JR-07750RL	Yageo America
R71	1	48.7k	RES, 48.7 k, 1%, 0.1 W, 0603	CRCW060348K7FKEA	Vishay-Dale
R74	1	45.3k	RES, 45.3 k, 1%, 0.1 W, 0603	RC0603FR-0745K3L	Yageo America
R78	1	10.0k	RES, 10.0 k, 1%, 0.1 W, 0603	RC0603FR-0710KL	Yageo America
R81	1	1.13k	RES, 1.13 k, 1%, 0.1 W, 0603	CRCW06031K13FKEA	Vishay-Dale
S1	1		Switch, Tactile, SPST-NO, 0.05A, 12V, SMT	4-1437565-1	TE Connectivity
T1	1	325 uH	Transformer, 325 uH, SMT	HX5008NL	Pulse Engineering
U1	1		Robust, Low Power 10/100/1000 Ethernet Physical Layer Transceiver, RGZ0048B	DP83867RGZR	Texas Instruments
U3, U4	2		1, 4, 6 CHANNEL PROTECTION SOLUTION FOR SUPER-SPEED (UP TO 6 GBPS) INTERFACE, DQA0010A	TPD4E05U06DQAR	Texas Instruments

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DP83867E SGMII EVM BOM (continued)

Designator	Qty	Value	Description	Part Number	Manufacturer
U5	1		Single Output High PSRR LDO, 500 mA, Adjustable 1.25 to 6 V Output, 2.7 to 6.5 V Input, with Low IQ, 6-pin SON (DRV), -40 to 125 degC, Green (RoHS & no Sb/Br)	TPS73501DRVR	Texas Instruments
U6	1		Single Output LDO, 500 mA, Adjustable 0.8 to 3.6 V Output, 0.8 to 5.5 V Input, with Programmable Soft Start, 10-pin SON (DRC), -40 to 125 degC, Green (RoHS & no Sb/Br)	TPS74701DRCR	Texas Instruments
XTAL1	1		Crystal, 25 MHz, 18 pF, SMD	ABM3-25.000MHZ-D2W-T	Abracon Corportation
C17	0	0.01uF	CAP, CERM, 0.01 µF, 50 V, +/- 5%, X7R, 0402	C0402C103J5RACTU	Kemet
C18	0	1000pF	CAP, CERM, 1000 pF, 25 V, +/- 5%, X7R, 0402	C0402C102J3RACTU	Kemet
C19	0	100pF	CAP, CERM, 100 pF, 50 V, +/- 5%, C0G/NP0, 0402	CC0402JRNPO9BN101	Yageo America
C22, C23, C25, C27, C28, C30, C31, C33	0	0.033uF	CAP, CERM, 0.033 µF, 6.3 V, +/- 10%, X5R, 0201	GRM033R60J333KE01D	MuRata
FID1, FID2, FID3	0		Fiducial mark. There is nothing to buy or mount.	N/A	N/A
J17	0		Mini-RFCable Connector 50 Ohm	MCX–J–P–H–ST–SM1	Samtec
R8	0	2.49k	RES, 2.49 k, 1%, 0.1 W, 0603	RC0603FR-072K49L	Yageo America
R15, R16, R17, R19, R21, R24, R25, R26, R44, R51, R52, R53, R55, R56, R57, R58	0	0	RES, 0, 5%, 0.05 W, 0201	ERJ-1GE0R00C	Panasonic
R40	0	4.70k	RES, 4.70 k, 1%, 0.05 W, SMD, 2-Leads, Height 0.33mm	CRCW02014K70FKED	Vishay-Dale
R63, R64	0	1.00Meg	RES, 1.00 M, 1%, 0.063 W, 0402	RC0402FR-071ML	Yageo America
U2	0		OSC, 25 MHz, 1.6 to 3.6 V, SMD	SG-210STF25.000000MHZY	Epson

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   1.1 EVMs are intended solely for product or software developers for use in a research and development setting to facilitate feasibility evaluation, experimentation, or scientific analysis of TI semiconductors products. EVMs have no direct function and are not finished products. EVMs shall not be directly or indirectly assembled as a part or subassembly in any finished product. For clarification, any software or software tools provided with the EVM (“Software”) shall not be subject to the terms and conditions set forth herein but rather shall be subject to the applicable terms and conditions that accompany such Software

   1.2 EVMs are not intended for consumer or household use. EVMs may not be sold, sublicensed, leased, rented, loaned, assigned, or otherwise distributed for commercial purposes by Users, in whole or in part, or used in any finished product or production system.

2 *Limited Warranty and Related Remedies/Disclaimers*:

   2.1 These terms and conditions do not apply to Software. The warranty, if any, for Software is covered in the applicable Software License Agreement.

   2.2 TI warrants that the TI EVM will conform to TI's published specifications for ninety (90) days after the date TI delivers such EVM to User. Notwithstanding the foregoing, TI shall not be liable for any defects that are caused by neglect, misuse or mistreatment by an entity other than TI, including improper installation or testing, or for any EVMs that have been altered or modified in any way by an entity other than TI. Moreover, TI shall not be liable for any defects that result from User's design, specifications or instructions for such EVMs. Testing and other quality control techniques are used to the extent TI deems necessary or as mandated by government requirements. TI does not test all parameters of each EVM.

   2.3 If any EVM fails to conform to the warranty set forth above, TI's sole liability shall be at its option to repair or replace such EVM, or credit User's account for such EVM. TI's liability under this warranty shall be limited to EVMs that are returned during the warranty period to the address designated by TI and that are determined by TI not to conform to such warranty. If TI elects to repair or replace such EVM, TI shall have a reasonable time to repair such EVM or provide replacements. Repaired EVMs shall be warranted for the remainder of the original warranty period. Replaced EVMs shall be warranted for a new full ninety (90) day warranty period.

3 *Regulatory Notices:*

   3.1 *United States*

      3.1.1 *Notice applicable to EVMs not FCC-Approved:*

      This kit is designed to allow product developers to evaluate electronic components, circuitry, or software associated with the kit to determine whether to incorporate such items in a finished product and software developers to write software applications for use with the end product. This kit is not a finished product and when assembled may not be resold or otherwise marketed unless all required FCC equipment authorizations are first obtained. Operation is subject to the condition that this product not cause harmful interference to licensed radio stations and that this product accept harmful interference. Unless the assembled kit is designed to operate under part 15, part 18 or part 95 of this chapter, the operator of the kit must operate under the authority of an FCC license holder or must secure an experimental authorization under part 5 of this chapter.

      3.1.2 *For EVMs annotated as FCC – FEDERAL COMMUNICATIONS COMMISSION Part 15 Compliant:*

      CAUTION

      This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

      Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

      FCC Interference Statement for Class A EVM devices

      NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

FCC Interference Statement for Class B EVM devices

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- *Reorient or relocate the receiving antenna.*
- *Increase the separation between the equipment and receiver.*
- *Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.*
- *Consult the dealer or an experienced radio/TV technician for help.*

3.2 *Canada*

3.2.1 *For EVMs issued with an Industry Canada Certificate of Conformance to RSS-210*

Concerning EVMs Including Radio Transmitters:

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Concernant les EVMs avec appareils radio:

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Concerning EVMs Including Detachable Antennas:

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication. This radio transmitter has been approved by Industry Canada to operate with the antenna types listed in the user guide with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Concernant les EVMs avec antennes détachables

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante. Le présent émetteur radio a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés dans le manuel d'usage et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur

3.3 *Japan*

3.3.1 *Notice for EVMs delivered in Japan:* Please see http://www.tij.co.jp/lsds/ti_ja/general/eStore/notice_01.page 日本国内に輸入される評価用キット、ボードについては、次のところをご覧ください。
http://www.tij.co.jp/lsds/ti_ja/general/eStore/notice_01.page

3.3.2 *Notice for Users of EVMs Considered "Radio Frequency Products" in Japan:* EVMs entering Japan may not be certified by TI as conforming to Technical Regulations of Radio Law of Japan.

If User uses EVMs in Japan, not certified to Technical Regulations of Radio Law of Japan, User is required by Radio Law of Japan to follow the instructions below with respect to EVMs:

1. Use EVMs in a shielded room or any other test facility as defined in the notification #173 issued by Ministry of Internal Affairs and Communications on March 28, 2006, based on Sub-section 1.1 of Article 6 of the Ministry's Rule for Enforcement of Radio Law of Japan,
2. Use EVMs only after User obtains the license of Test Radio Station as provided in Radio Law of Japan with respect to EVMs, or
3. Use of EVMs only after User obtains the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to EVMs. Also, do not transfer EVMs, unless User gives the same notice above to the transferee. Please note that if User does not follow the instructions above, User will be subject to penalties of Radio Law of Japan.

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4 *EVM Use Restrictions and Warnings:*

4.1 EVMS ARE NOT FOR USE IN FUNCTIONAL SAFETY AND/OR SAFETY CRITICAL EVALUATIONS, INCLUDING BUT NOT LIMITED TO EVALUATIONS OF LIFE SUPPORT APPLICATIONS.

4.2 User must read and apply the user guide and other available documentation provided by TI regarding the EVM prior to handling or using the EVM, including without limitation any warning or restriction notices. The notices contain important safety information related to, for example, temperatures and voltages.

4.3 *Safety-Related Warnings and Restrictions:*

4.3.1 User shall operate the EVM within TI's recommended specifications and environmental considerations stated in the user guide, other available documentation provided by TI, and any other applicable requirements and employ reasonable and customary safeguards. Exceeding the specified performance ratings and specifications (including but not limited to input and output voltage, current, power, and environmental ranges) for the EVM may cause personal injury or death, or property damage. If there are questions concerning performance ratings and specifications, User should contact a TI field representative prior to connecting interface electronics including input power and intended loads. Any loads applied outside of the specified output range may also result in unintended and/or inaccurate operation and/or possible permanent damage to the EVM and/or interface electronics. Please consult the EVM user guide prior to connecting any load to the EVM output. If there is uncertainty as to the load specification, please contact a TI field representative. During normal operation, even with the inputs and outputs kept within the specified allowable ranges, some circuit components may have elevated case temperatures. These components include but are not limited to linear regulators, switching transistors, pass transistors, current sense resistors, and heat sinks, which can be identified using the information in the associated documentation. When working with the EVM, please be aware that the EVM may become very warm.

4.3.2 EVMs are intended solely for use by technically qualified, professional electronics experts who are familiar with the dangers and application risks associated with handling electrical mechanical components, systems, and subsystems. User assumes all responsibility and liability for proper and safe handling and use of the EVM by User or its employees, affiliates, contractors or designees. User assumes all responsibility and liability to ensure that any interfaces (electronic and/or mechanical) between the EVM and any human body are designed with suitable isolation and means to safely limit accessible leakage currents to minimize the risk of electrical shock hazard. User assumes all responsibility and liability for any improper or unsafe handling or use of the EVM by User or its employees, affiliates, contractors or designees.

4.4 User assumes all responsibility and liability to determine whether the EVM is subject to any applicable international, federal, state, or local laws and regulations related to User's handling and use of the EVM and, if applicable, User assumes all responsibility and liability for compliance in all respects with such laws and regulations. User assumes all responsibility and liability for proper disposal and recycling of the EVM consistent with all applicable international, federal, state, and local requirements.

5. *Accuracy of Information:* To the extent TI provides information on the availability and function of EVMs, TI attempts to be as accurate as possible. However, TI does not warrant the accuracy of EVM descriptions, EVM availability or other information on its websites as accurate, complete, reliable, current, or error-free.

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