DP83867 User's Guide

The DP83867 EVM supports 1000/100/10 Mb/s and is compliant with the IEEE 802.3 standard. This reference design supports RGMII, GMII and MII MAC interfaces.

The DP83867 EVM includes four onboard status LEDs, 5V jack with onboard LDOs, and is JTAG accessible. The DP83867 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 DP83867 EVM supports Wake-on-LAN, Start of Frame Detect IEEE 1588 Time Stamp and configurable I/O voltages.

Contents

1 Introduction

1.1 Purpose

This user guide details the characteristics, operation, and use of the Industrial Ethernet DP83867 EVM. The EVM enables Texas Instruments customers to quickly design and market systems using the DP83867. 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
- RGMII, GMII and MII MAC interfaces
- SFD IEEE 1588 Time Stamp
- JTAG interface
- Four 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 125 meters on CAT5 cable

1.3 Description

The Industrial Ethernet DP83867 EVM has an RJ45 connector with integrated magnetics, jumper configurable straps for easy evaluation and can be operated from a single supply (5V DC jack, J10). 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

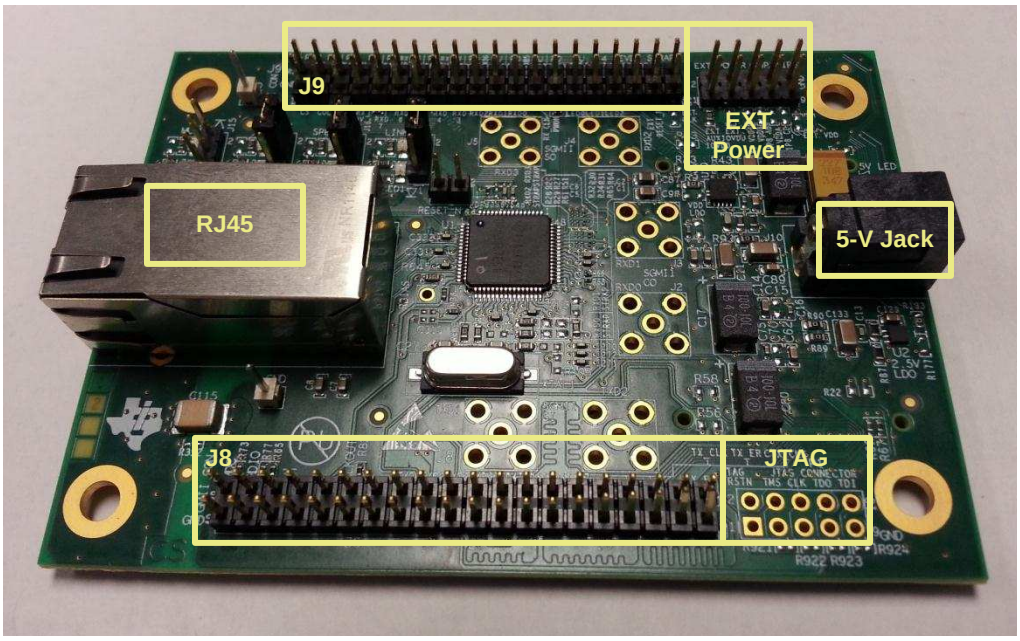
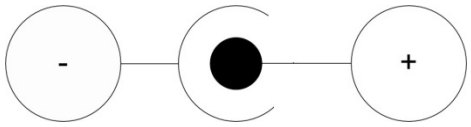


Figure 1. DP83867 EVM

1.5 Operation – Quick Setup

- Turn ON the PHY by plugging in a 5V DC source to J10
  - 5V DC adapter with minimum current output of 310mA
  - The adapter must be center positive polarity



- Plug a CAT5, CAT5E or CAT6 cable into the integrated RJ45 connector (J1)
- Connect the far end of the Ethernet cable to a link partner
- Connect a MAC interface to J9 and J8
- LED Indication
  - The 5V LED (LD17) will be illuminated if the 5V supply is connected
  - Look for the LINK LED to light up on the DP83867 EVM after the PHY links with a connected partner.

2 Board Setup Details

2.1 Block Diagram

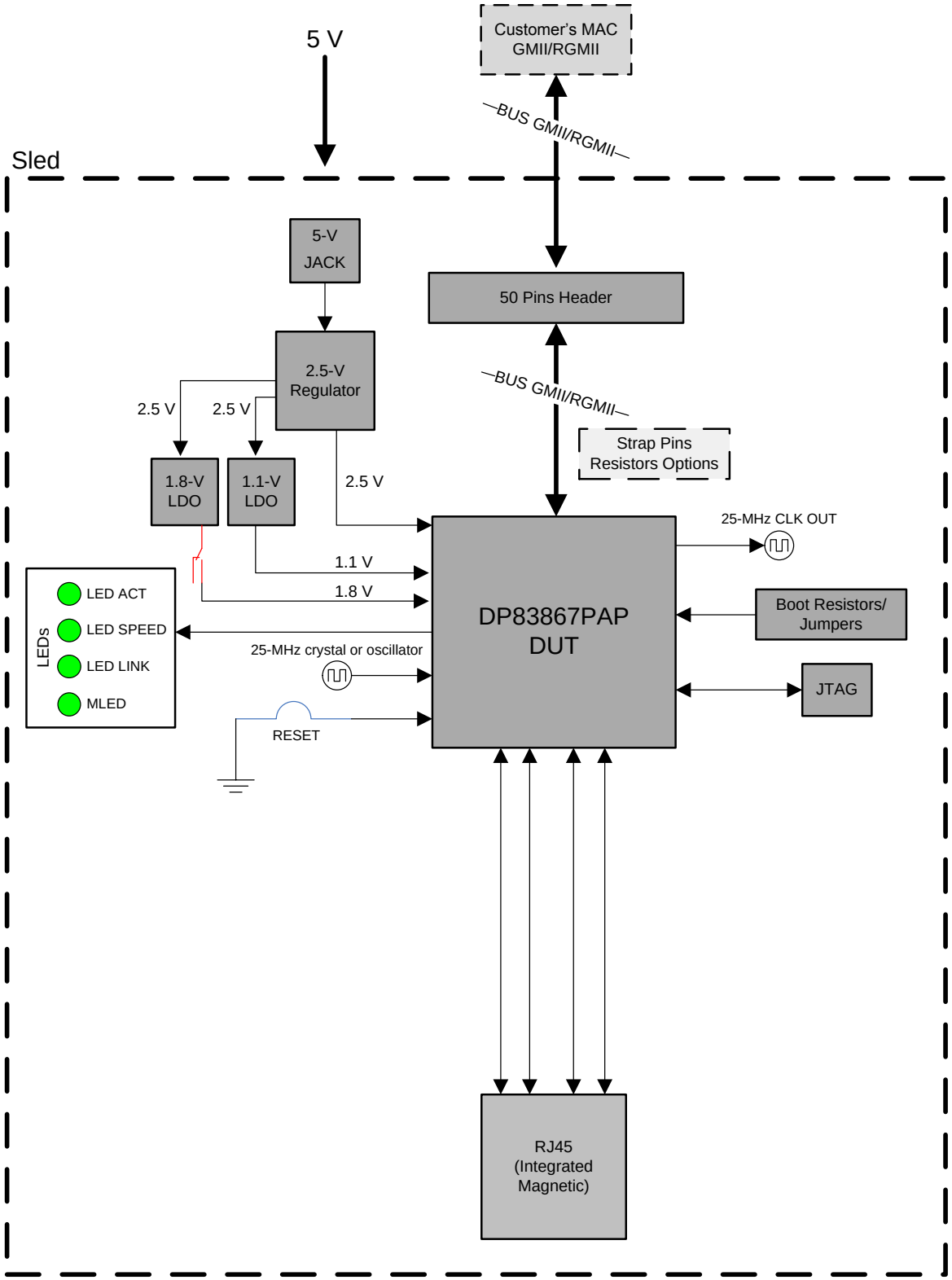


Figure 2. DP83867 EVM Block Diagram

2.2 Power Supply Options

The DP83867 EVM power is supplied by a single 5V DC jack. This option uses onboard LDOs to provide 2.5V, 1.1V and 1.8V voltage rails.

The DP83867 EVM can be operated from external supplies. Connect external supplies to P2:

- Pin 3 – VDDIO
- Pin 5 – VDDA2P5_EXT
- Pin 7 – VDDA1P8_AB and VDDA1P8_CD
- Pin 9 – VDDA_1V1_EXT

Do the following to enable external power operation:

- Remove R89, R90, R93
- Populate R88, R91, R92, R95, R96, R94

2.3 Serial Management and MAC Interfaces

The DP83867 EVM supports serial management (MDIO/MDC) and RGMII/GMII/MII MAC interfaces. Serial management interface is accessible though J8. MDIO is located at pin 37 and MDC is located at pin 39. Ground connection between the DP83867 EVM and serial interface controller is required for proper operation. DP83867 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 located on J9 and J8. RGMII/GMII/MII configurations are located in the datasheet and can be configured by bootstrapping or direct register access through the serial management interface. Refer to the DP83867 datasheet (SNLS484) for specific pin requirements for each MAC interface.

2.4 LED Options

DP83867 supports up to four LEDs, Link/Speed/ACT/MLED indications. The DP83867 EVM has four onboard 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).

2.5 Bootstrap Options/Jumpers

Some DP83867 configurations are done through bootstrap options. Options can be selected with jumpers or resistor population.

The DP83867 EVM supports the following jumper configurations:

- J16
  - Mirror Enable
- J23
  - SPEED Select[0]
- J15
  - Clock Out Disable
  - LINK Downshift Enable

The DP83867 EVM supports the following resistor configurations:

- PHY_ID[4:0]
- SPEED_SEL[1]
- Half-Duplex Enable (FD/HD)
- Force MDI/X
- RGMII Disable
- AMDIX Disable
- Auto-Negotiation Disable
- RGMII Clock Skew RX[2:0]
- Fast Link Detect

2.6 JTAG Interface

The DP83867 EVM has JTAG accessible though P1:

- Pin 2 – TRSTN
- Pin 4 – TMS
- Pin 6 – CLK
- Pin 8 – TDO
- Pin 10 – TDI

2.7 Clock Options

The DP83867 EVM supports three different clock options:

- 25MHz crystal (Default)
- 25MHz oscillator configured by onboard modifications
- External 25MHz reference clock connected to pin 39 on J9

2.7.1 Default Configuration

The DP83867 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 DP83867 can also operate with a 25MHz external CMOS-level oscillator source connected to pin XI only.

Refer to the data sheet (SNLS484) for OSC requirement specifications.

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

- U3 OSC should be mounted – Epson SG-210STF 25MHz ±50ppm
- Populate R650 and R660 with 0 Ohm resistors
- Remove R98, R653 and R654

2.7.3 External Configuration

External clock can be supplied to the DP83867 by using pin 39 on J9.

The external clock must meet the DP83867 datasheet requirements and to be within 25MHz ±50ppm-tolerance. For external clock configuration, X_O should be left floating. When operating with a 1.8V clock source, X_I should be directly tied to the clock source. When operating with a 3.3V or 2.5V clock source, a capacitor divider is recommended.

Refer to the data sheet (SNLS484) for capacitor divider recommendations.

The following changes are required to route an external clock to the DP83867 for a 1.8V clock source:

- Populate R98, R660 and R78 with 0 Ω resistors
- Remove R650, R654 and R653

The following changes are required to route an external clock to the DP83867 for a 3.3V or 2.5V clock source:

- Populate R98 and R78 with 0 Ω resistors
- Populate R660 and C274 with 33pF or 27pF capacitors
- Remove R650, R652, R653, C273 and XTAL

2.8 Schematics

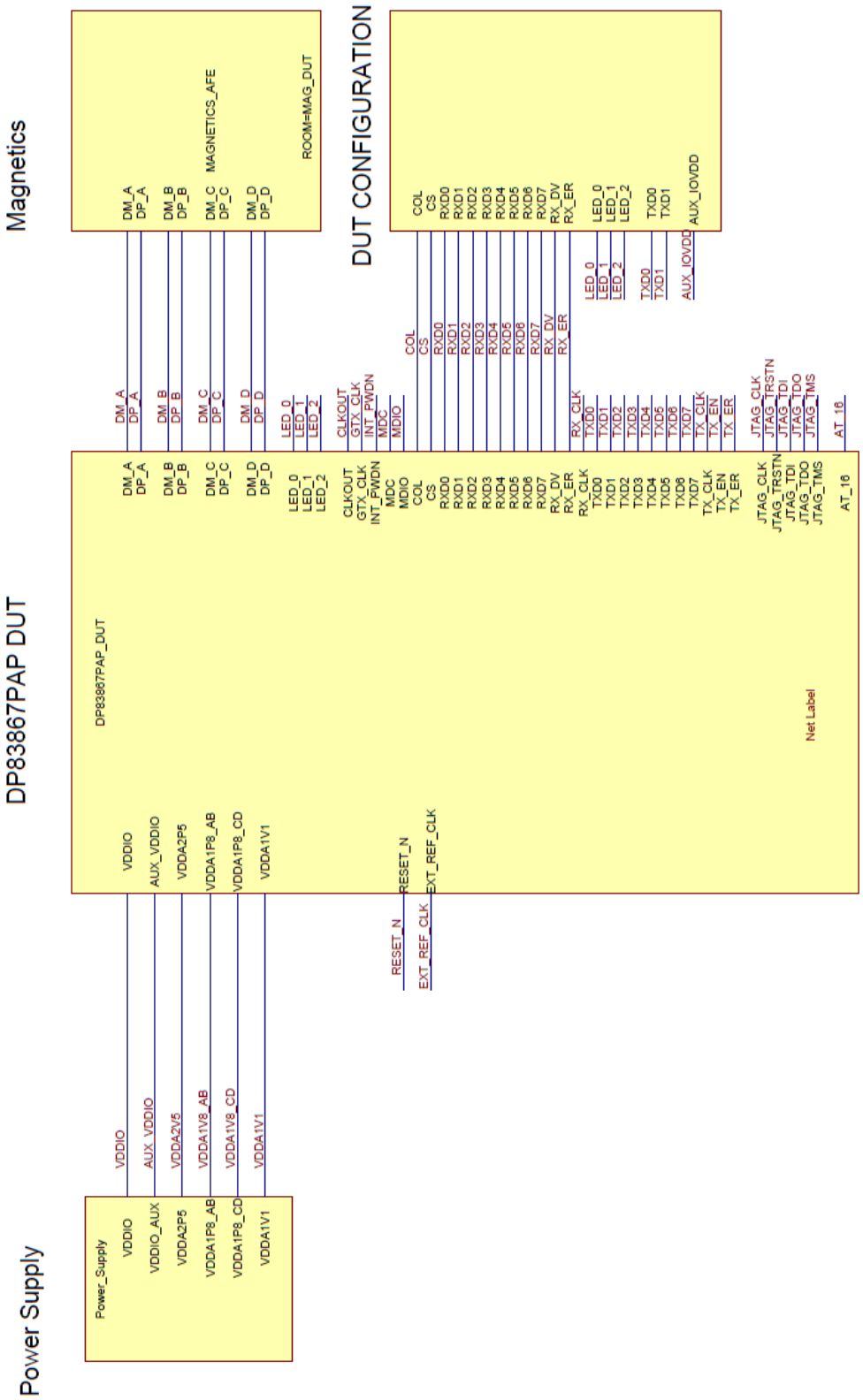


Figure 3. Schematic (1 of 14)

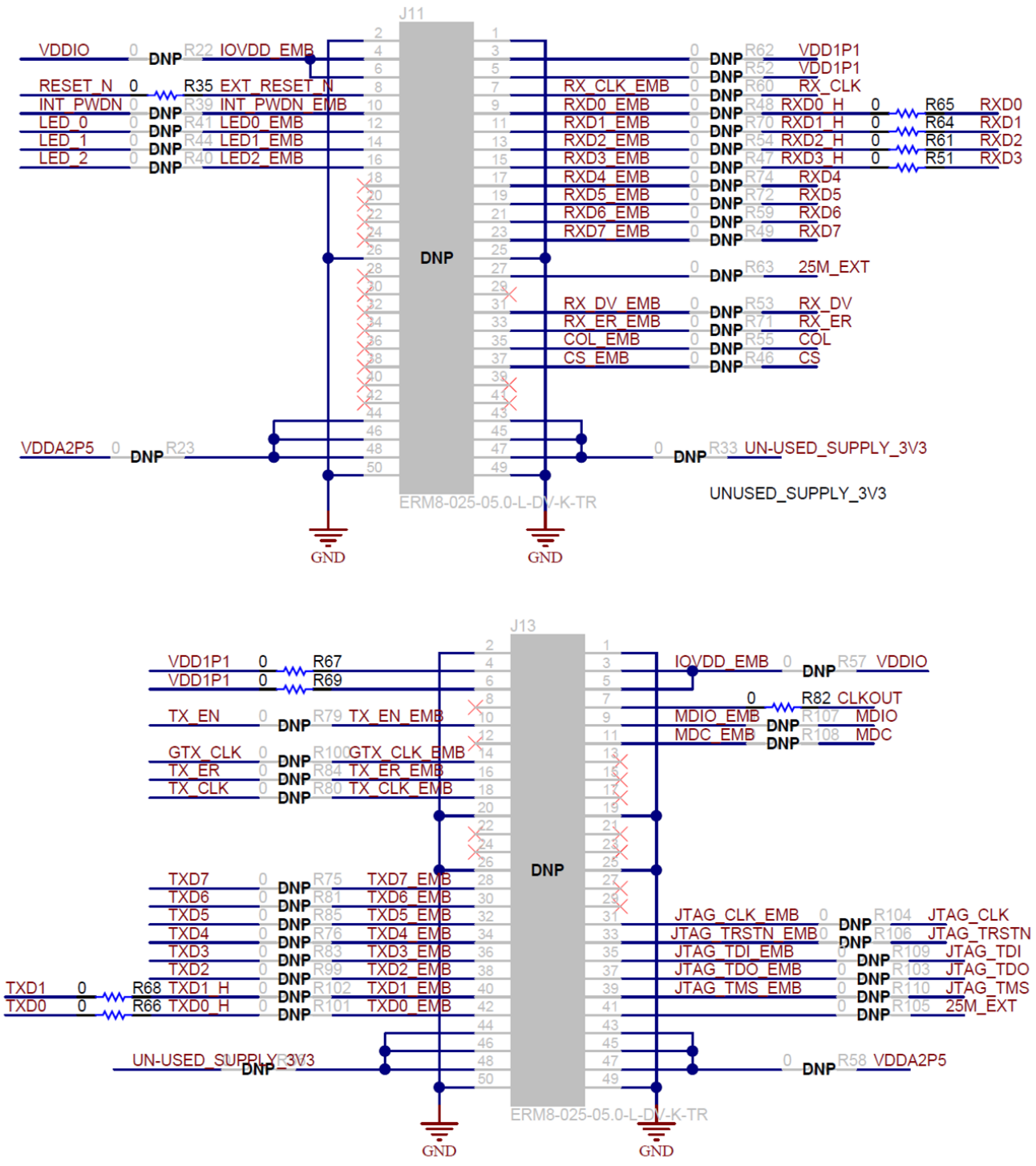


Figure 4. Schematic (2 of 14)

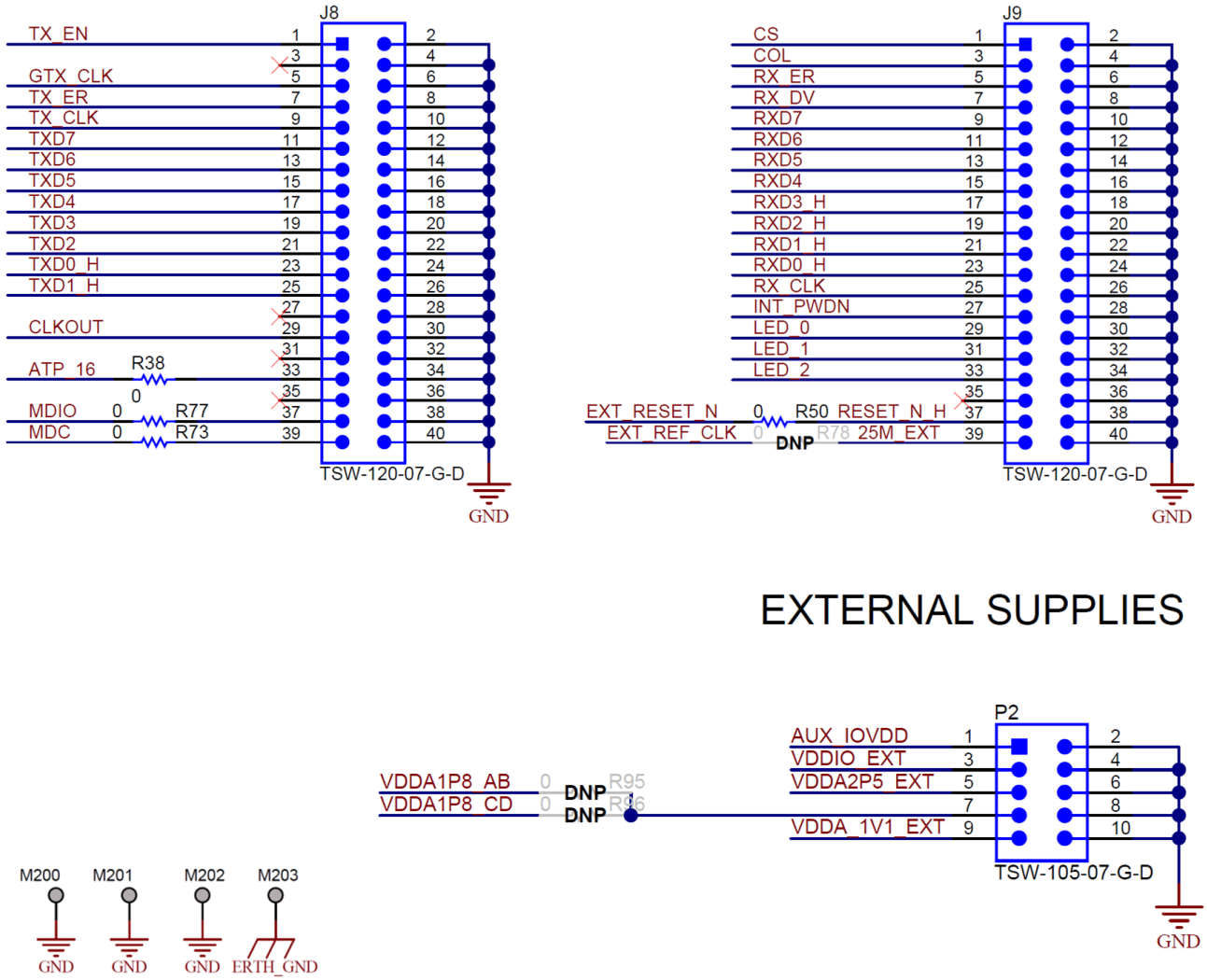


Figure 5. Schematic (3 of 14)

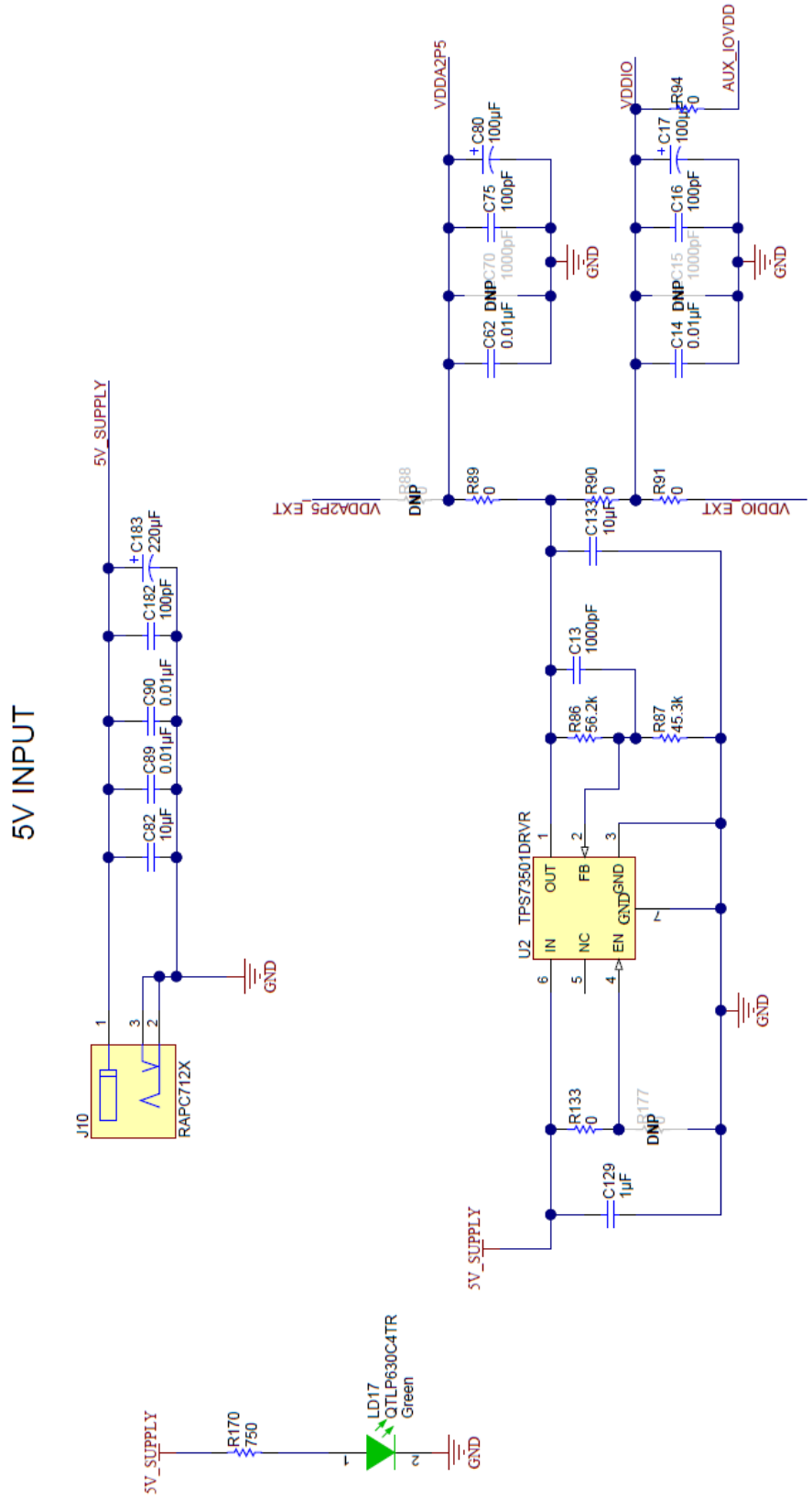


Figure 6. Schematic (4 of 14)

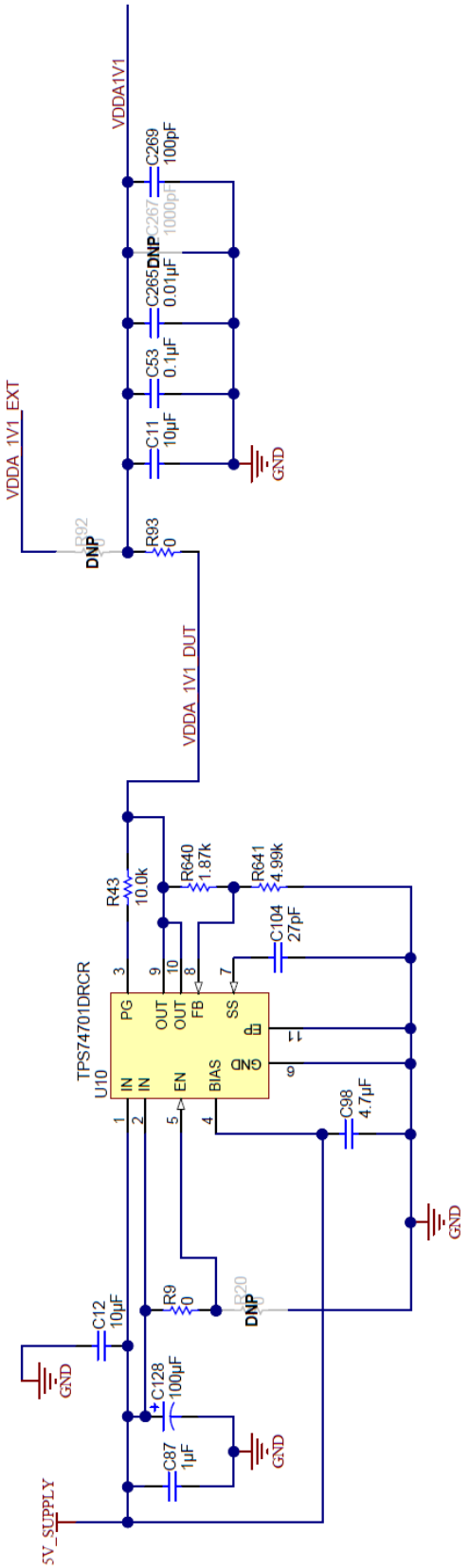


Figure 7. Schematic (5 of 14)

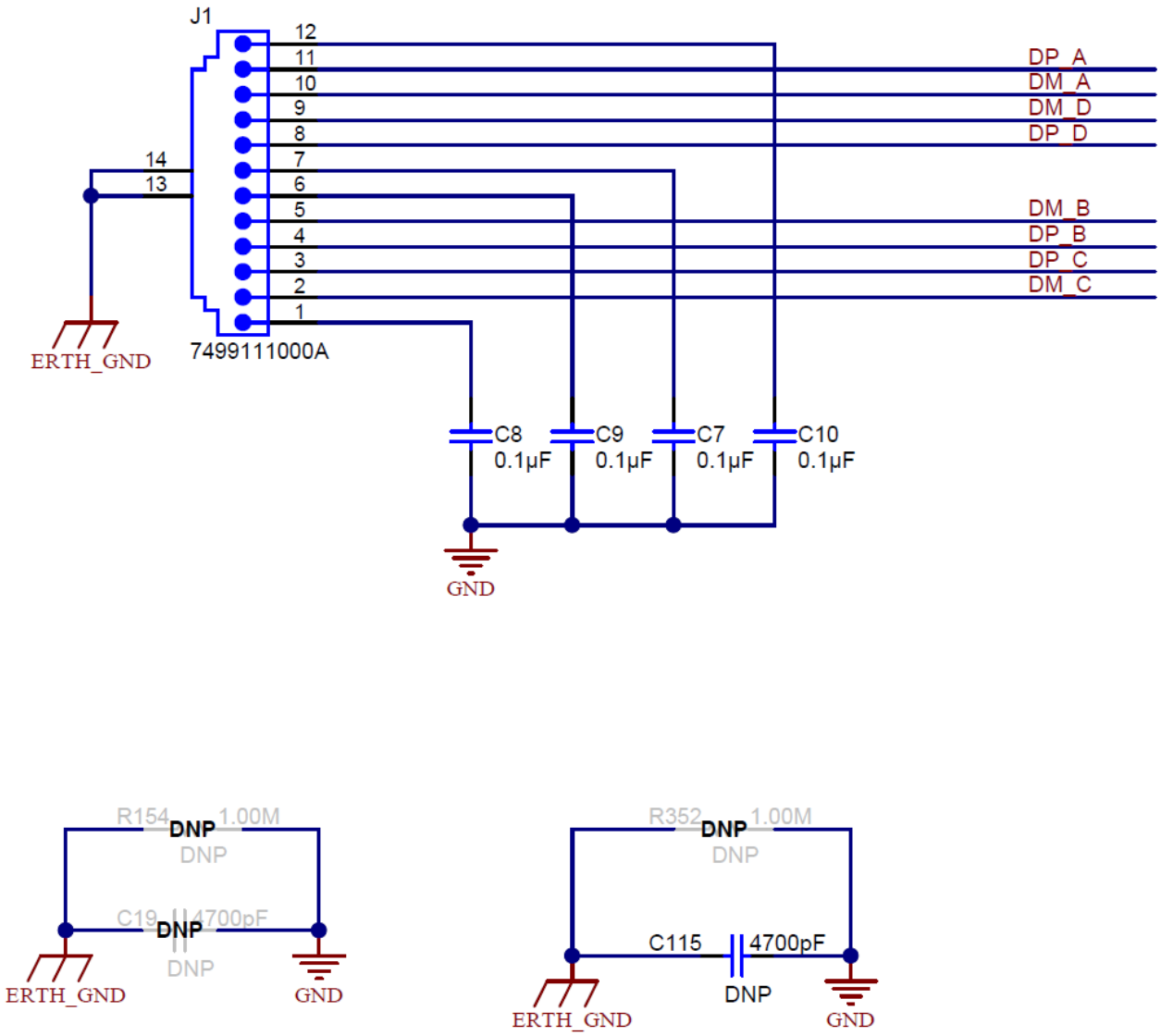


Figure 8. Schematic (6 of 14)

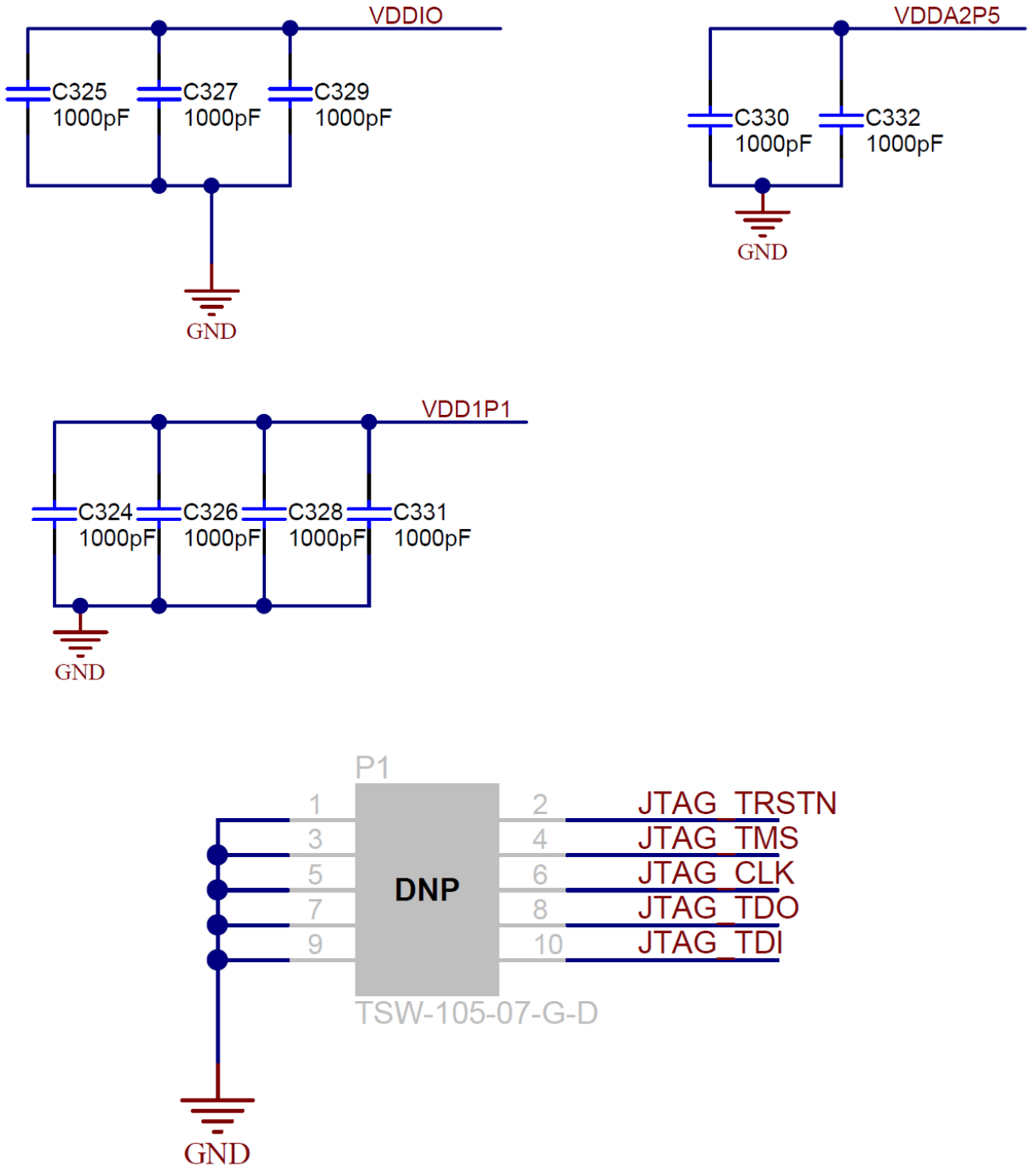


Figure 9. Schematic (7 of 14)

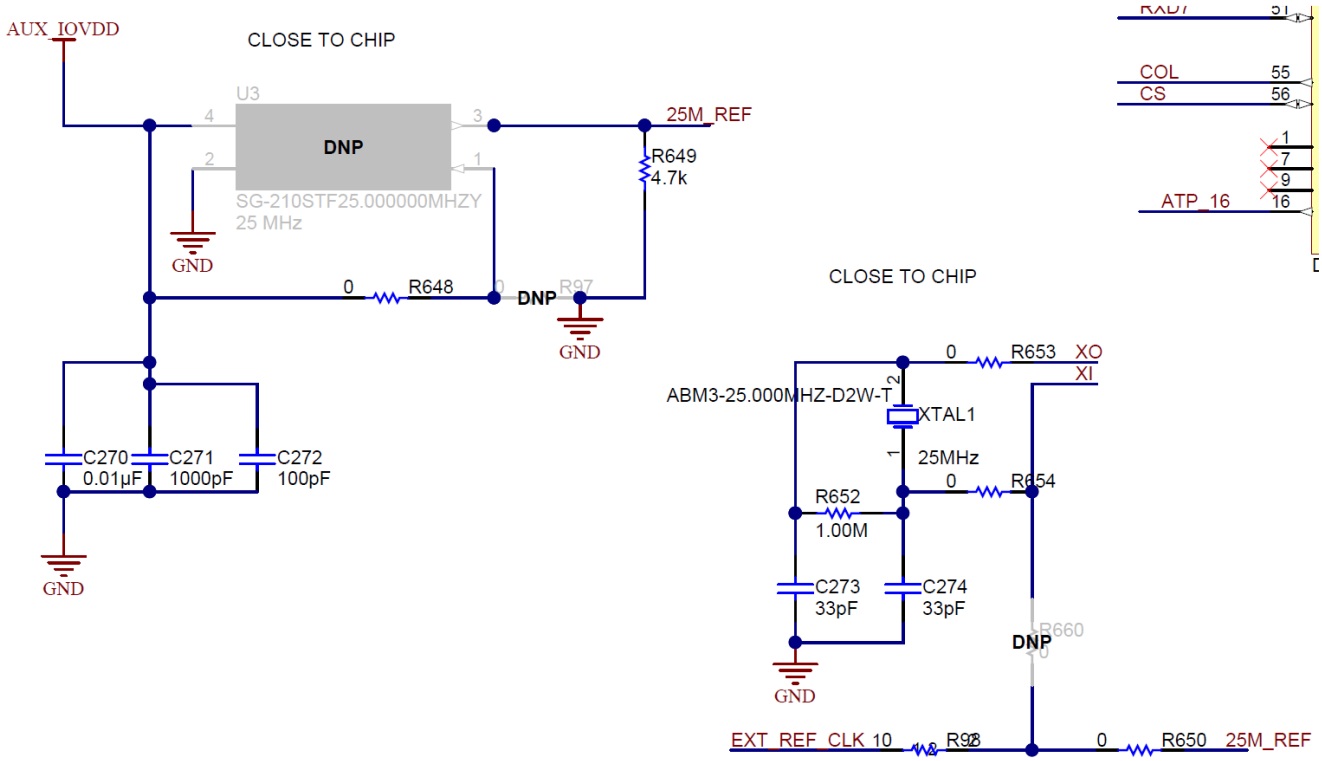


Figure 10. Schematic (8 of 14)

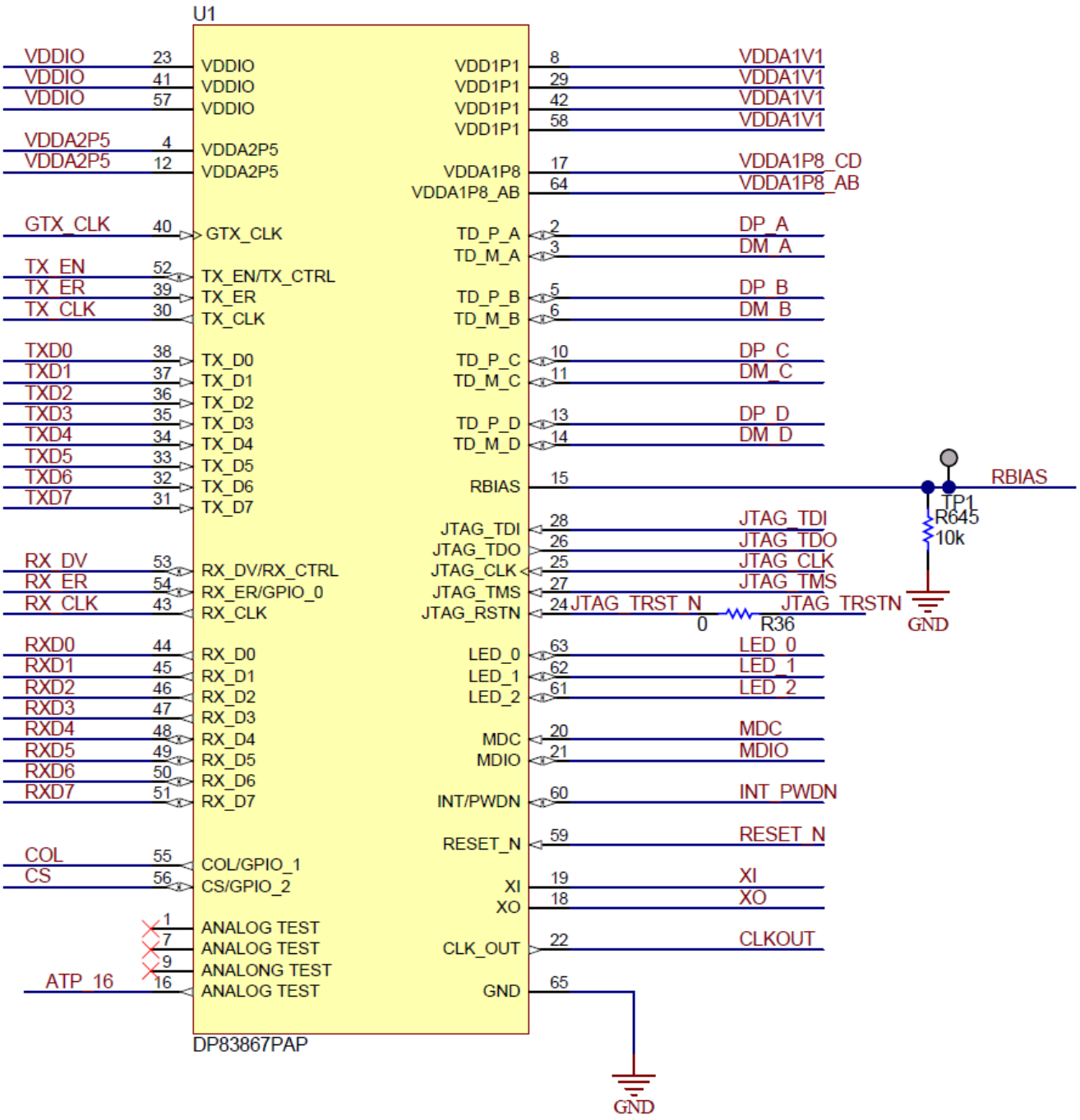


Figure 11. Schematic (9 of 14)

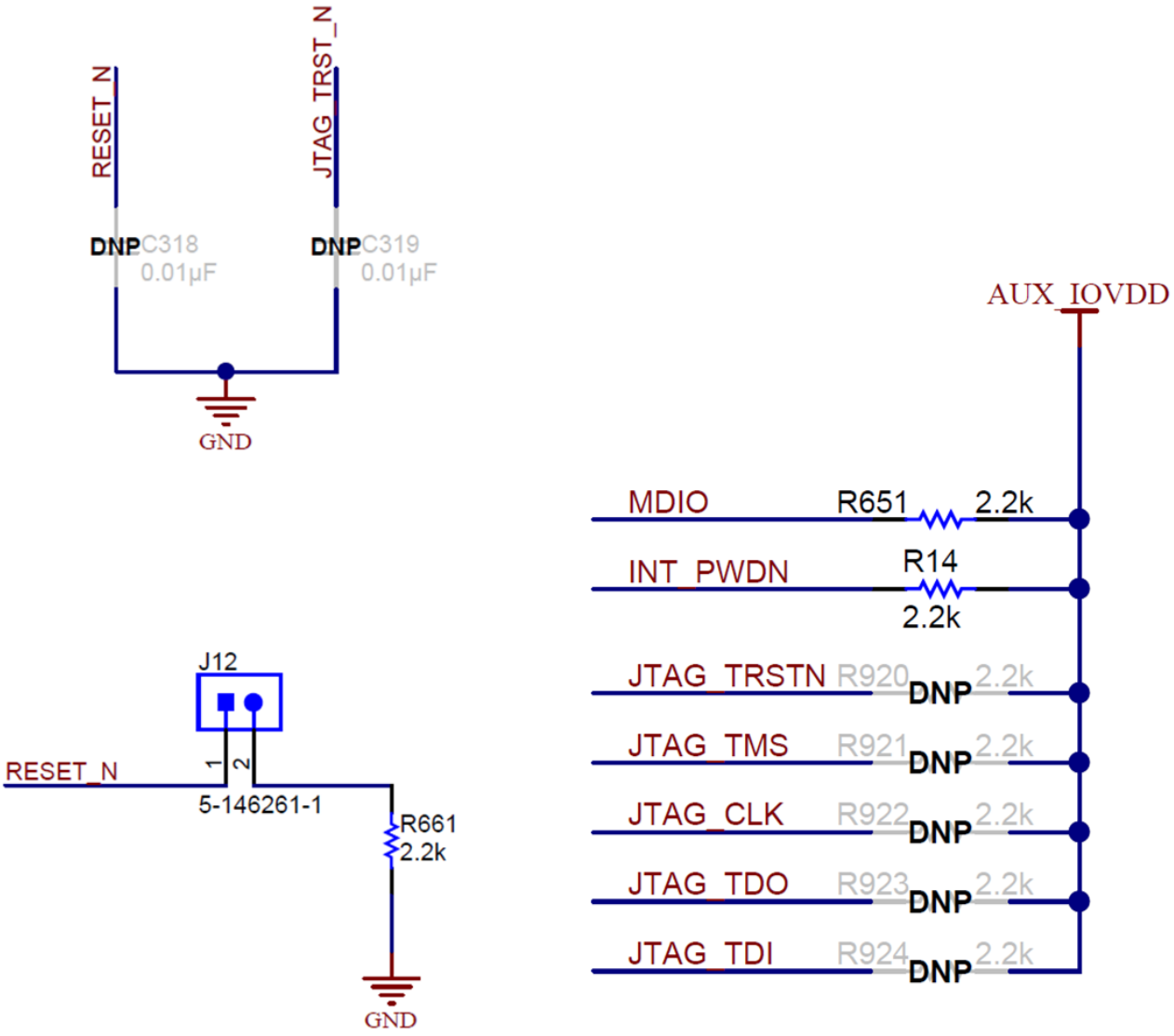


Figure 12. Schematic (10 of 14)

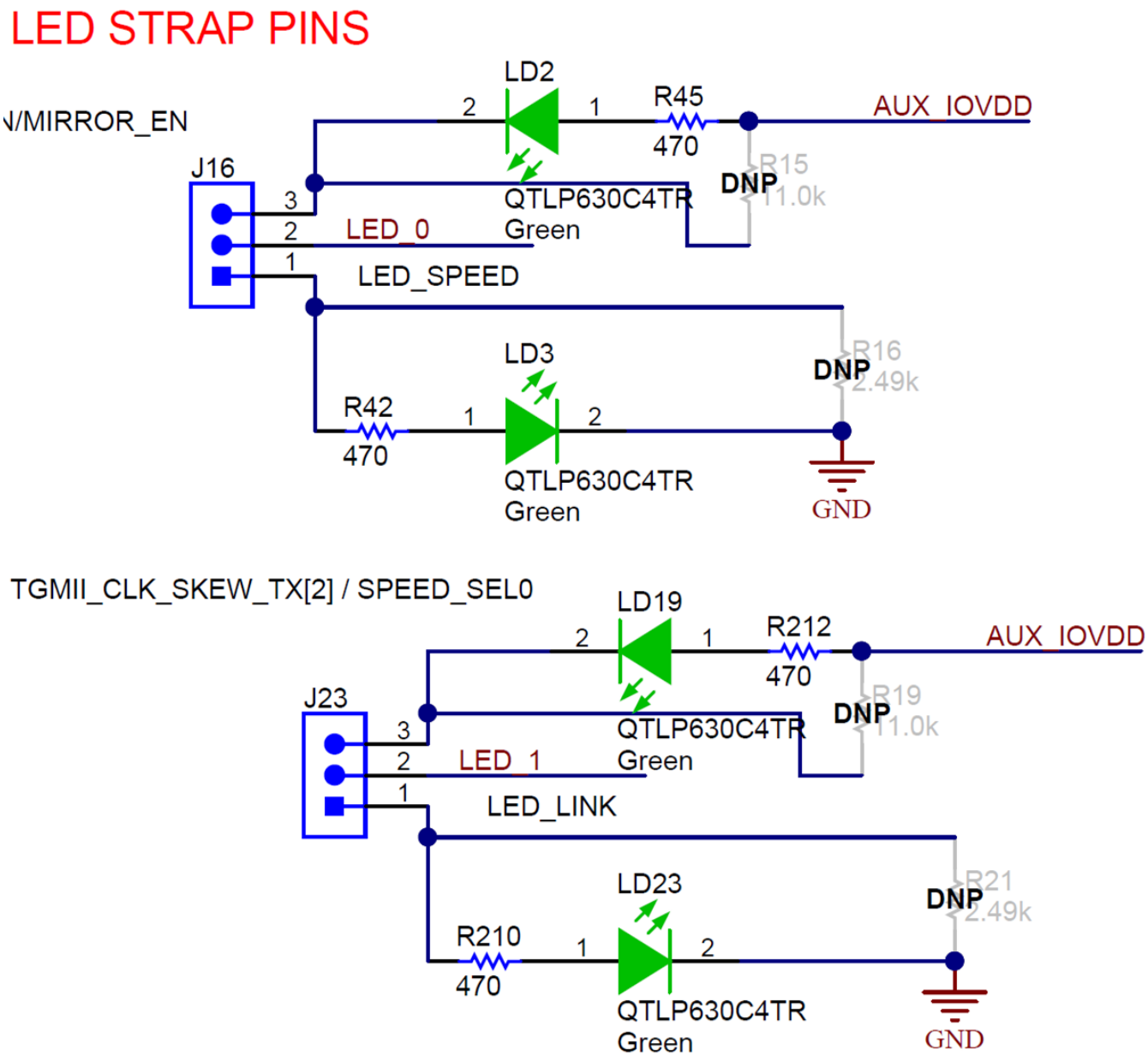


Figure 13. Schematic (11 of 14)

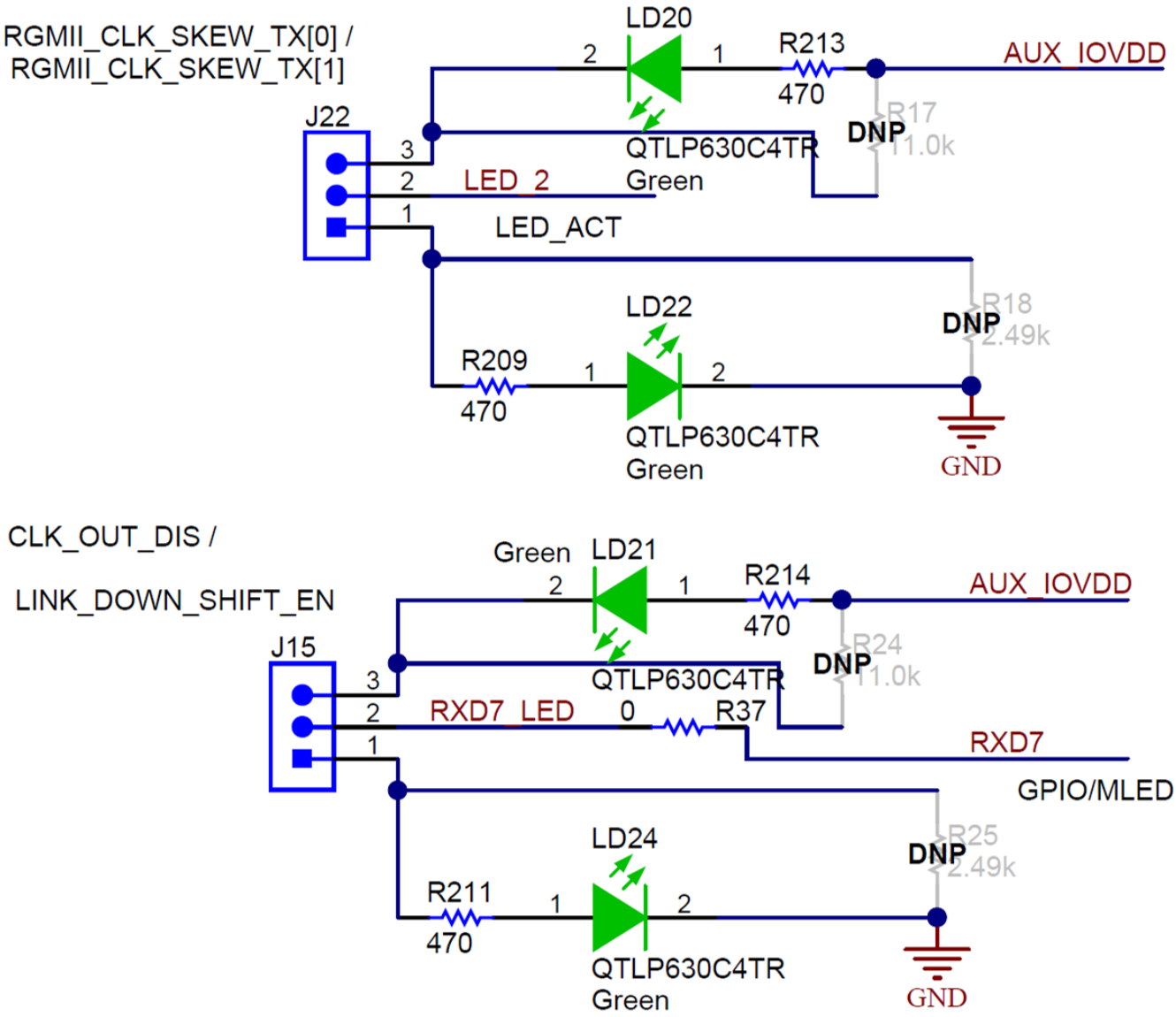


Figure 14. Schematic (12 of 14)

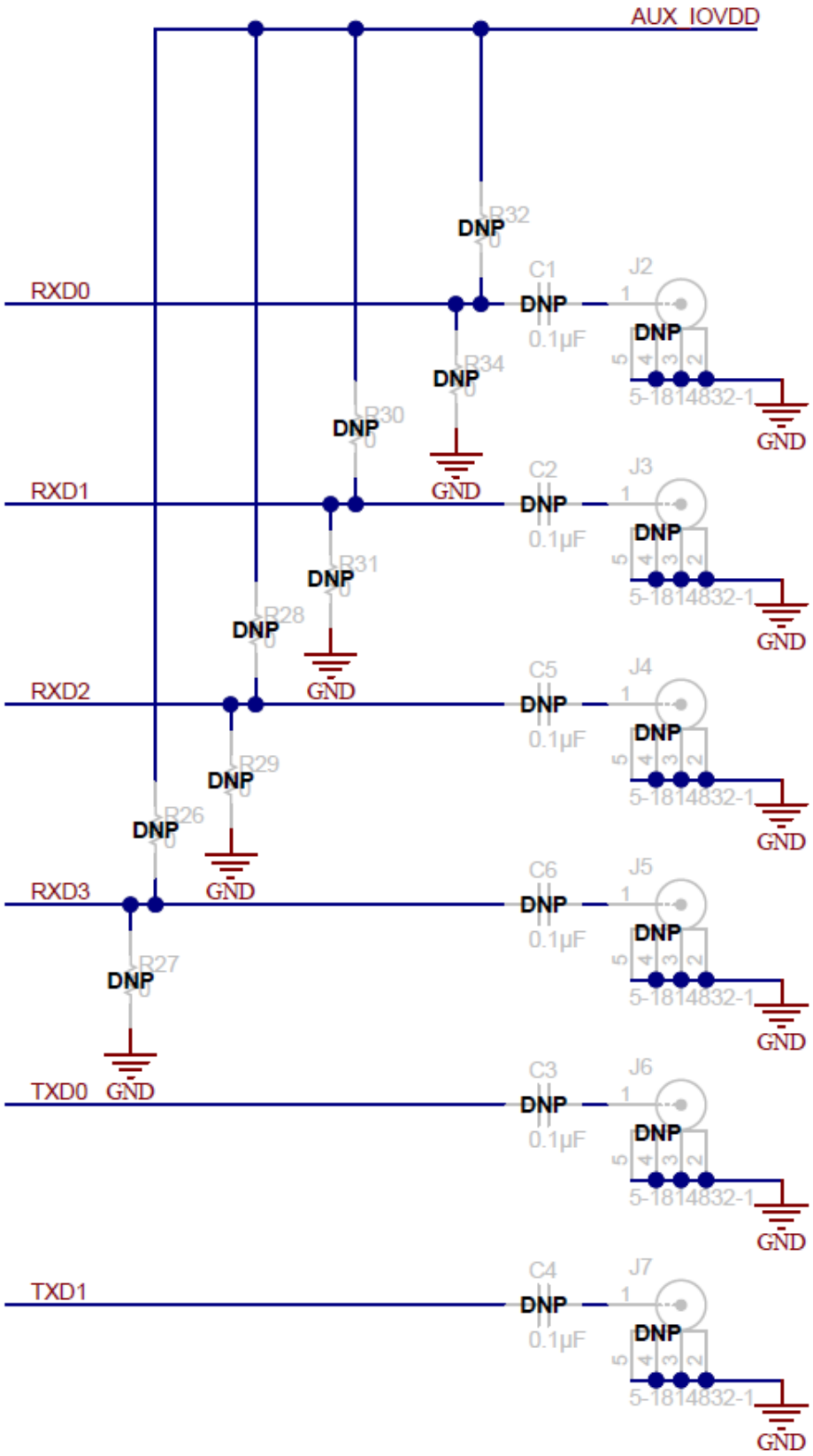


Figure 15. Schematic (13 of 14)

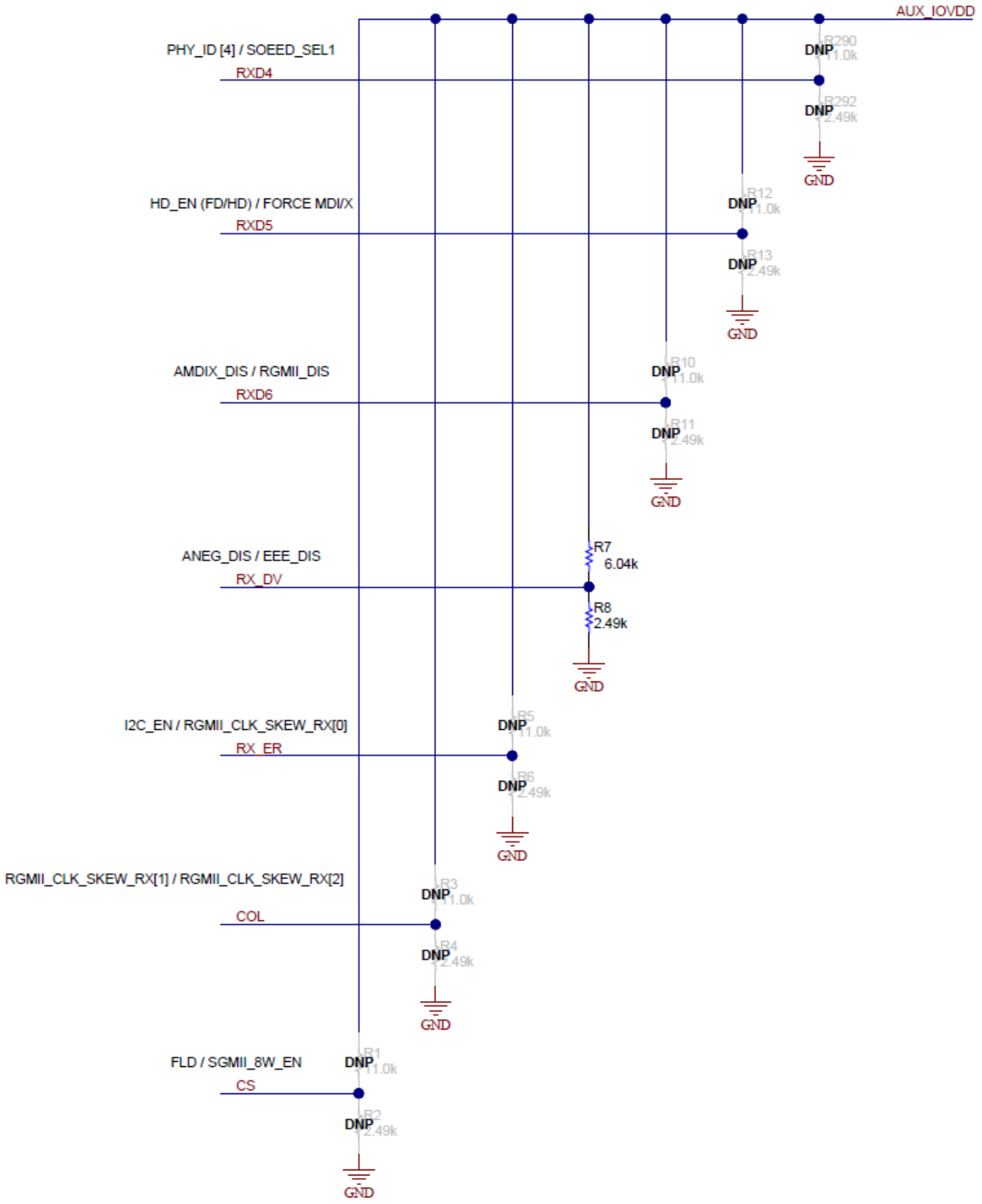


Figure 16. Schematic (14 of 14)

2.9 Layout

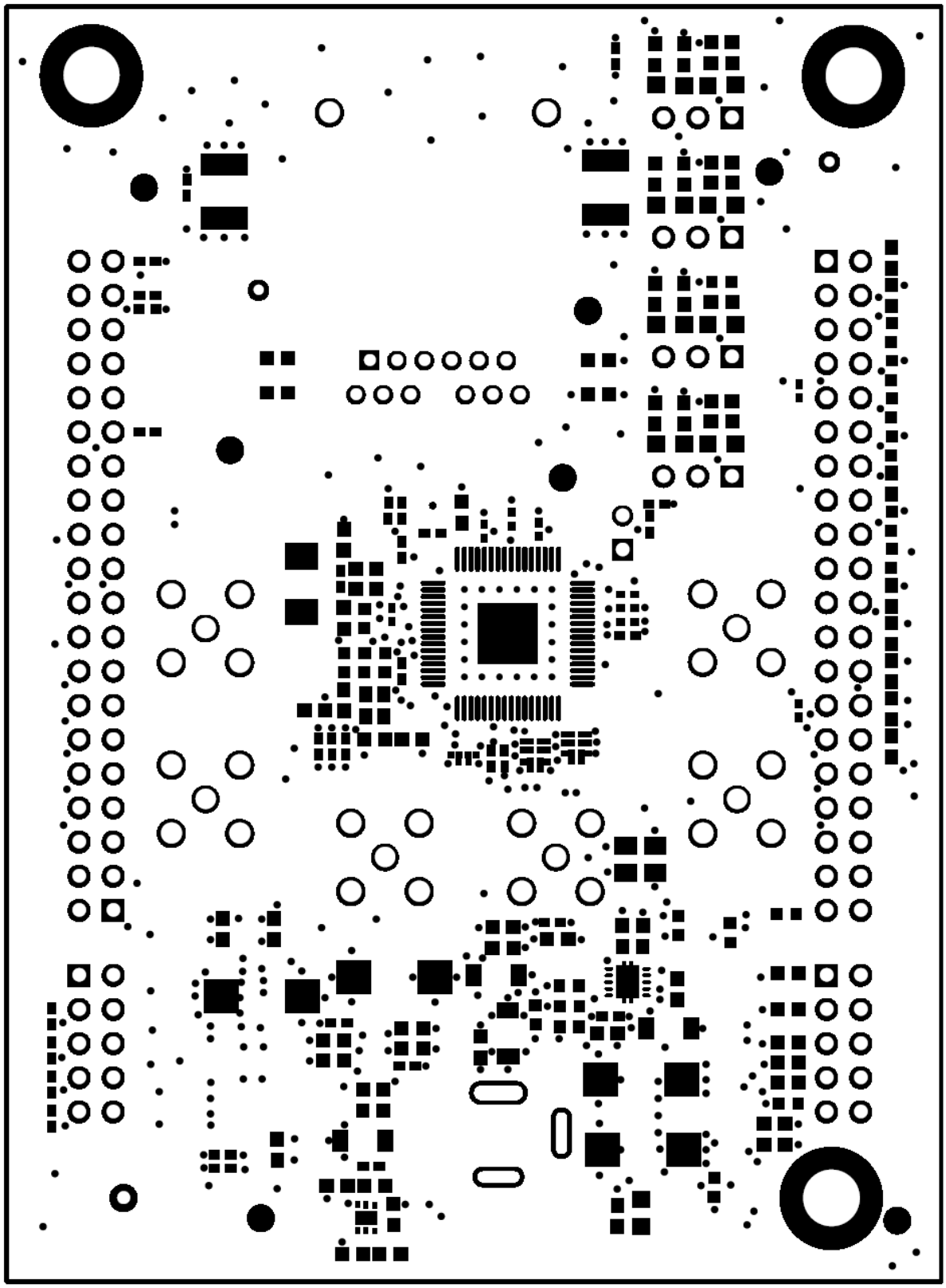


Figure 17. Top Solder Mask

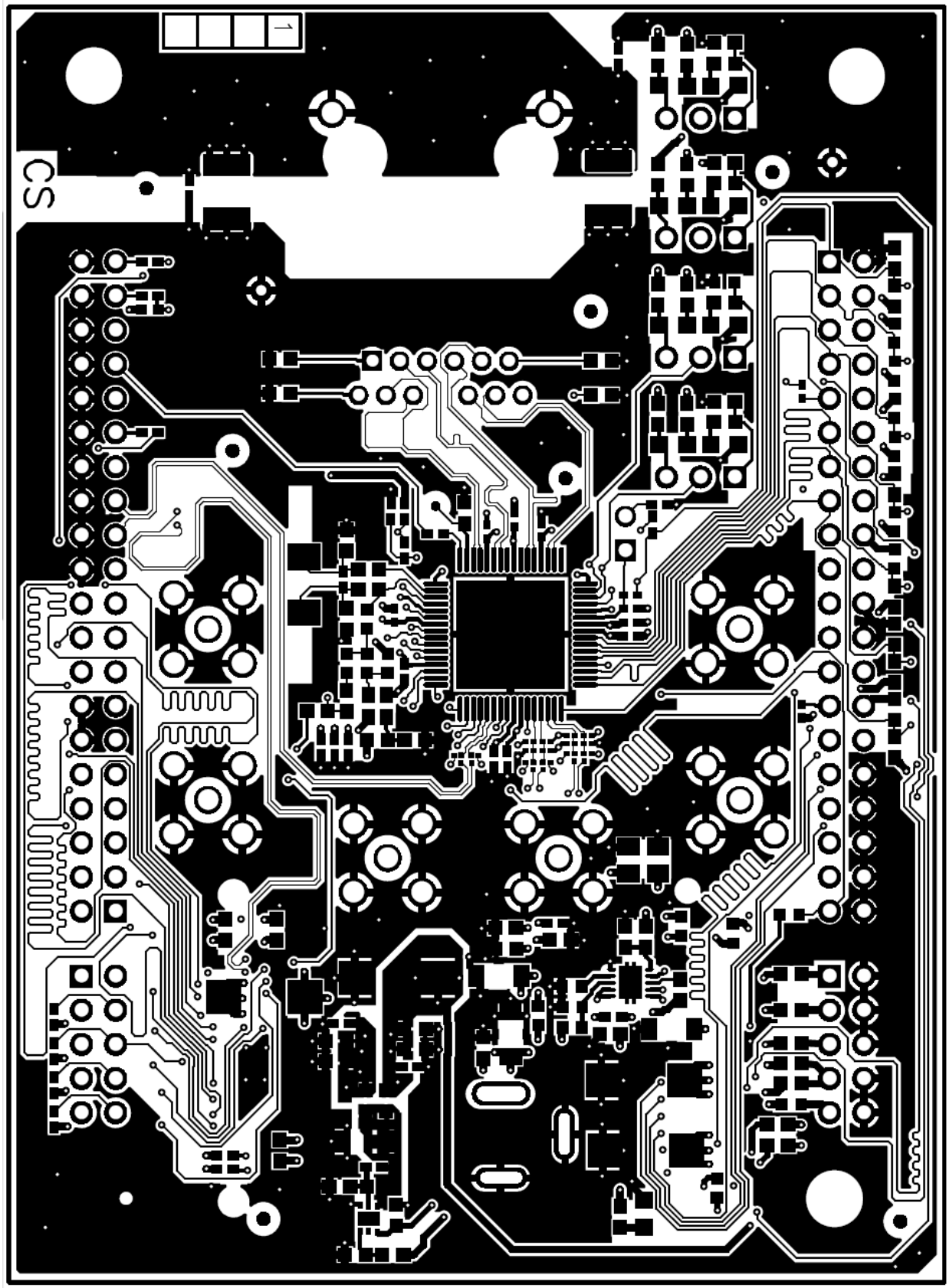


Figure 18. Top Layer

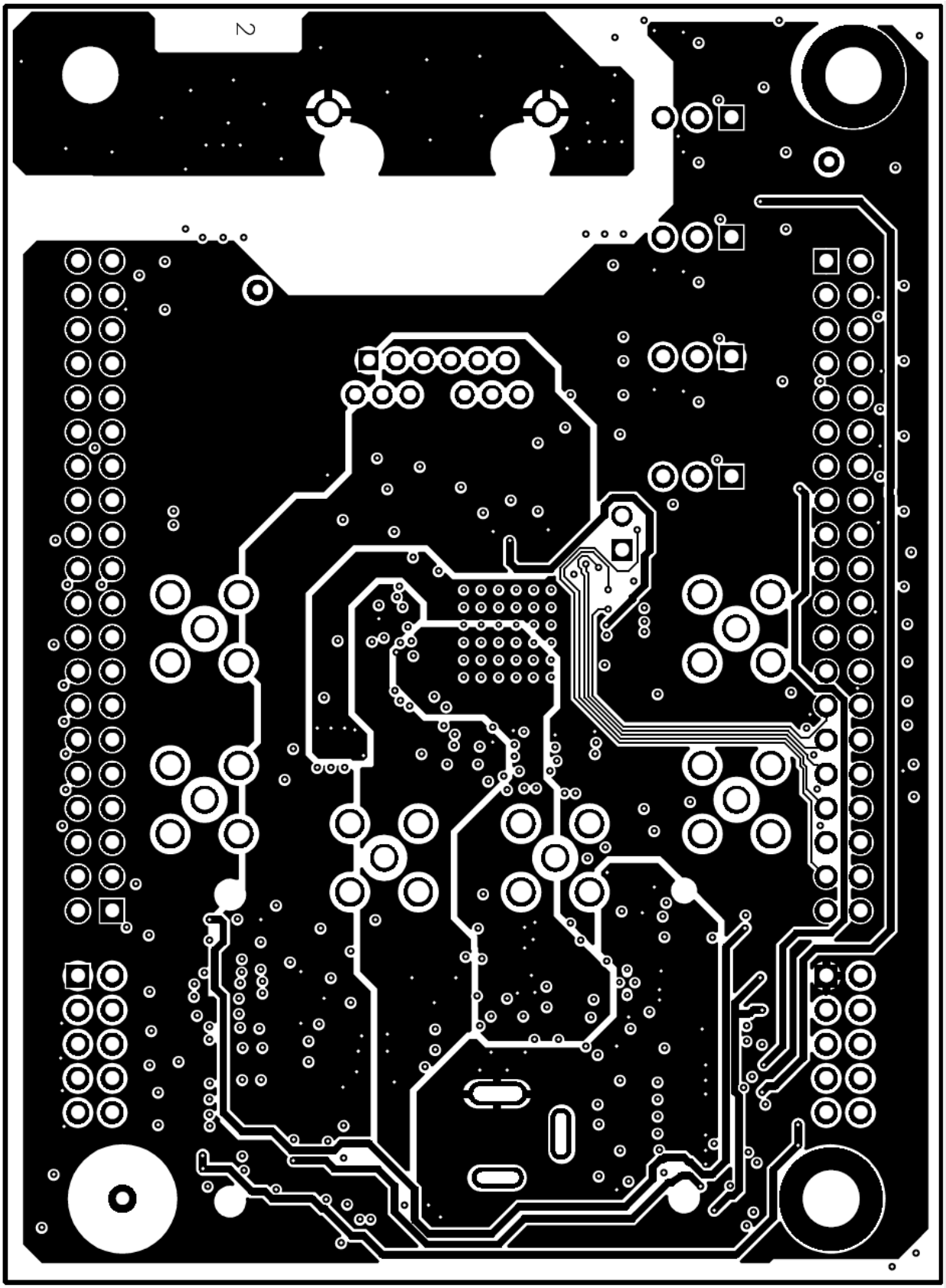


Figure 19. Mid Layer 1

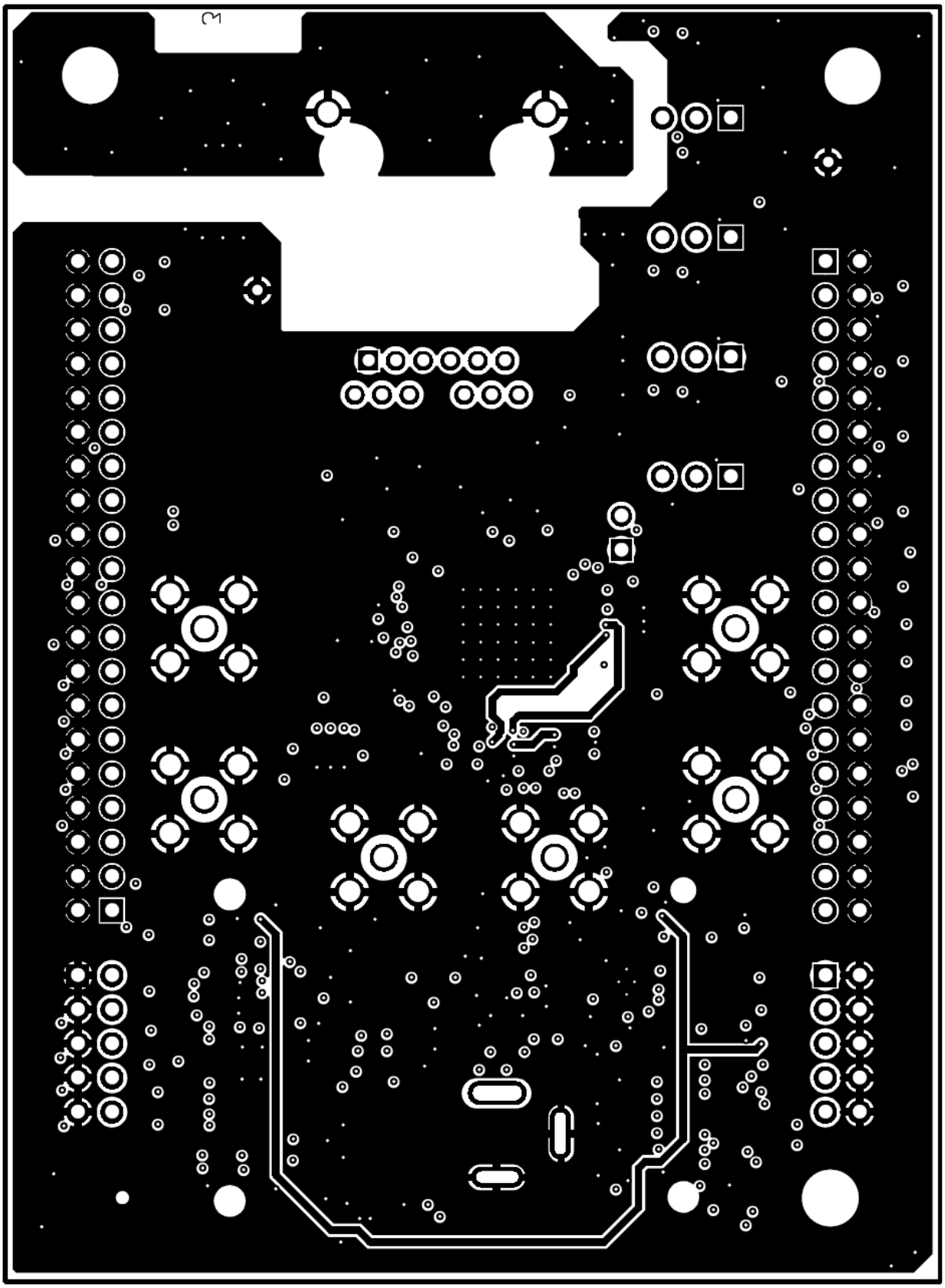


Figure 20. Mid Layer 2

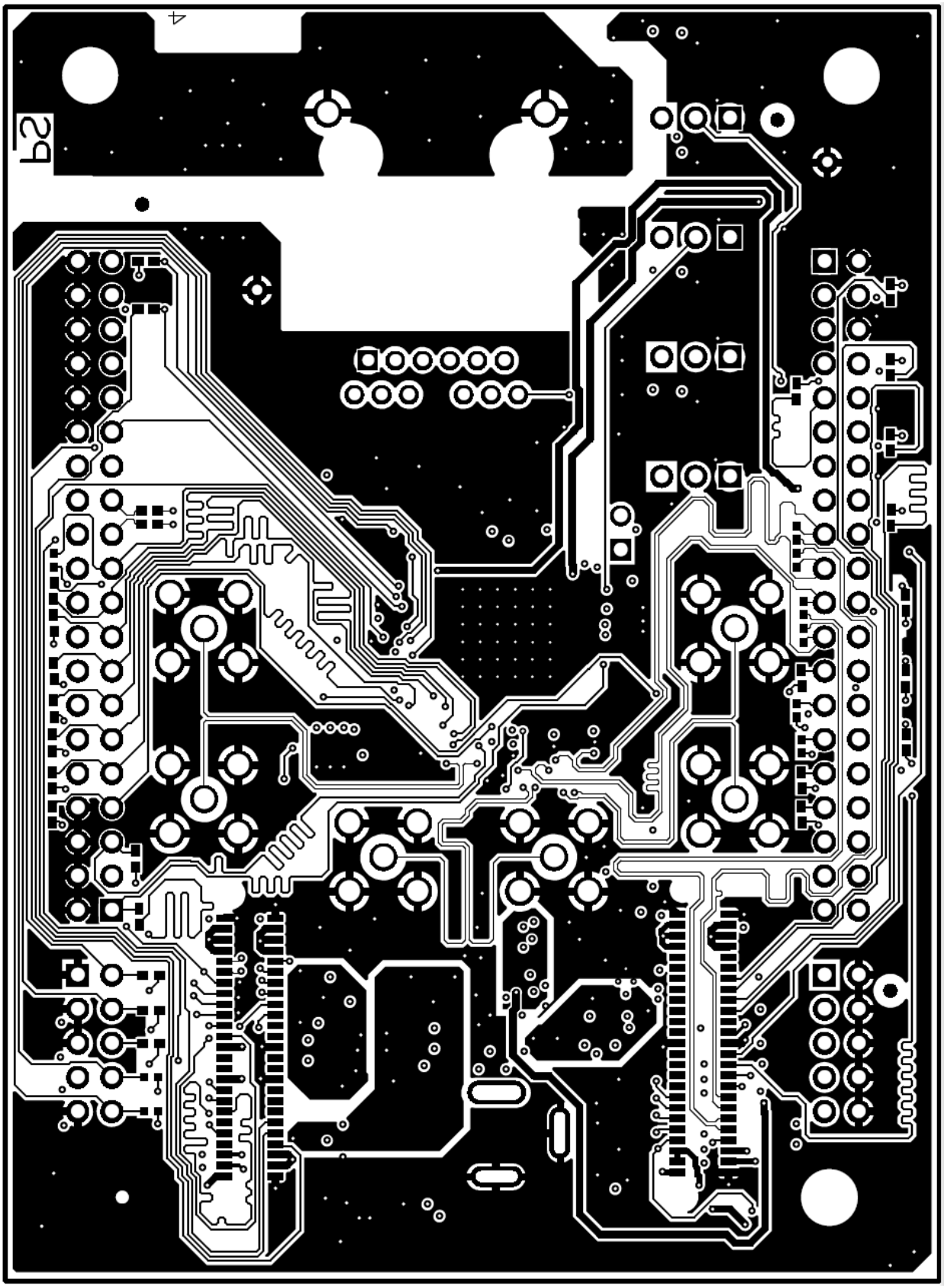


Figure 21. Bottom Layer

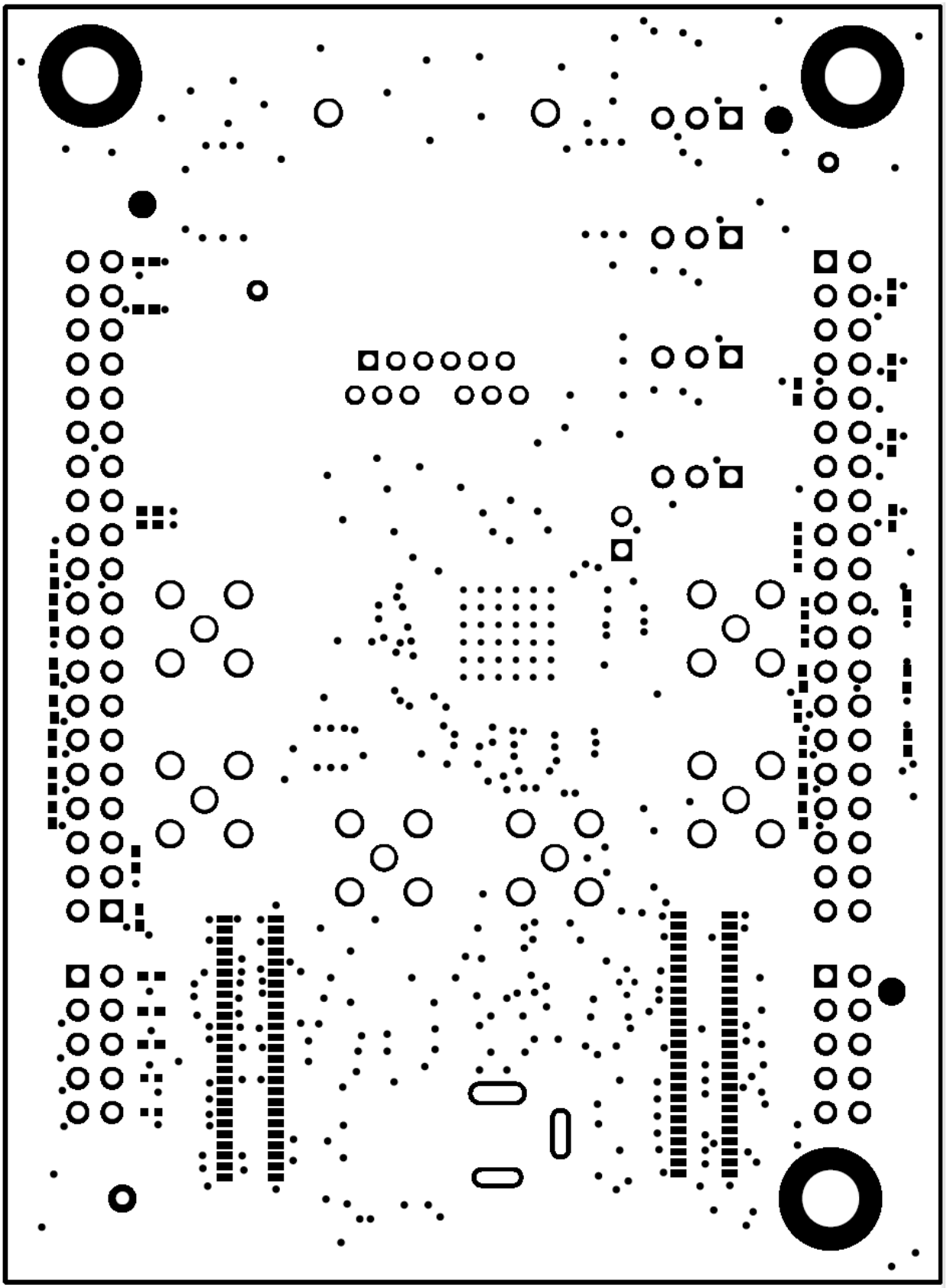


Figure 22. Bottom Solder Mask

2.10 Board Assembly

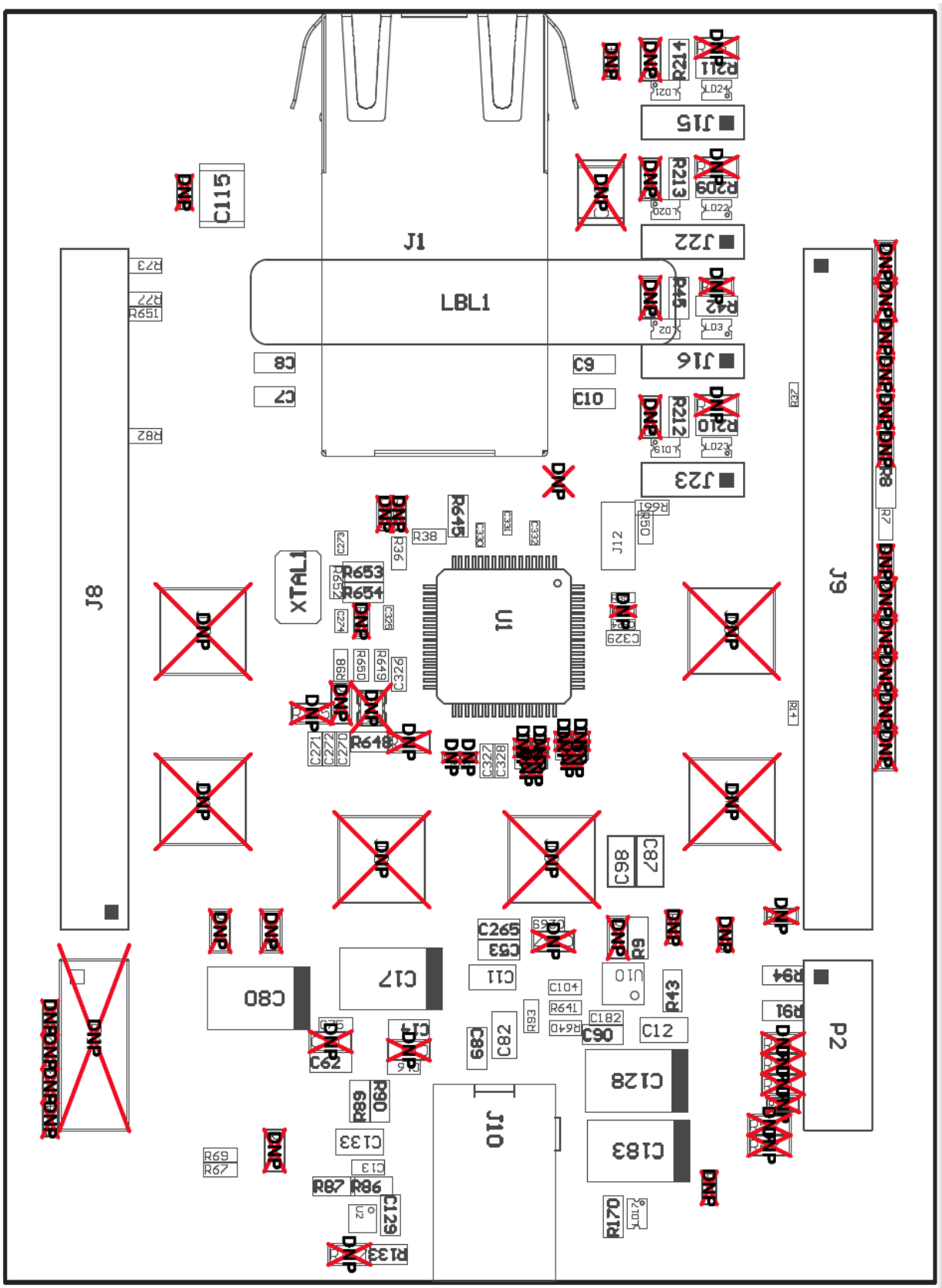


Figure 23. Board Assembly

2.11 Board Marking (Silk)

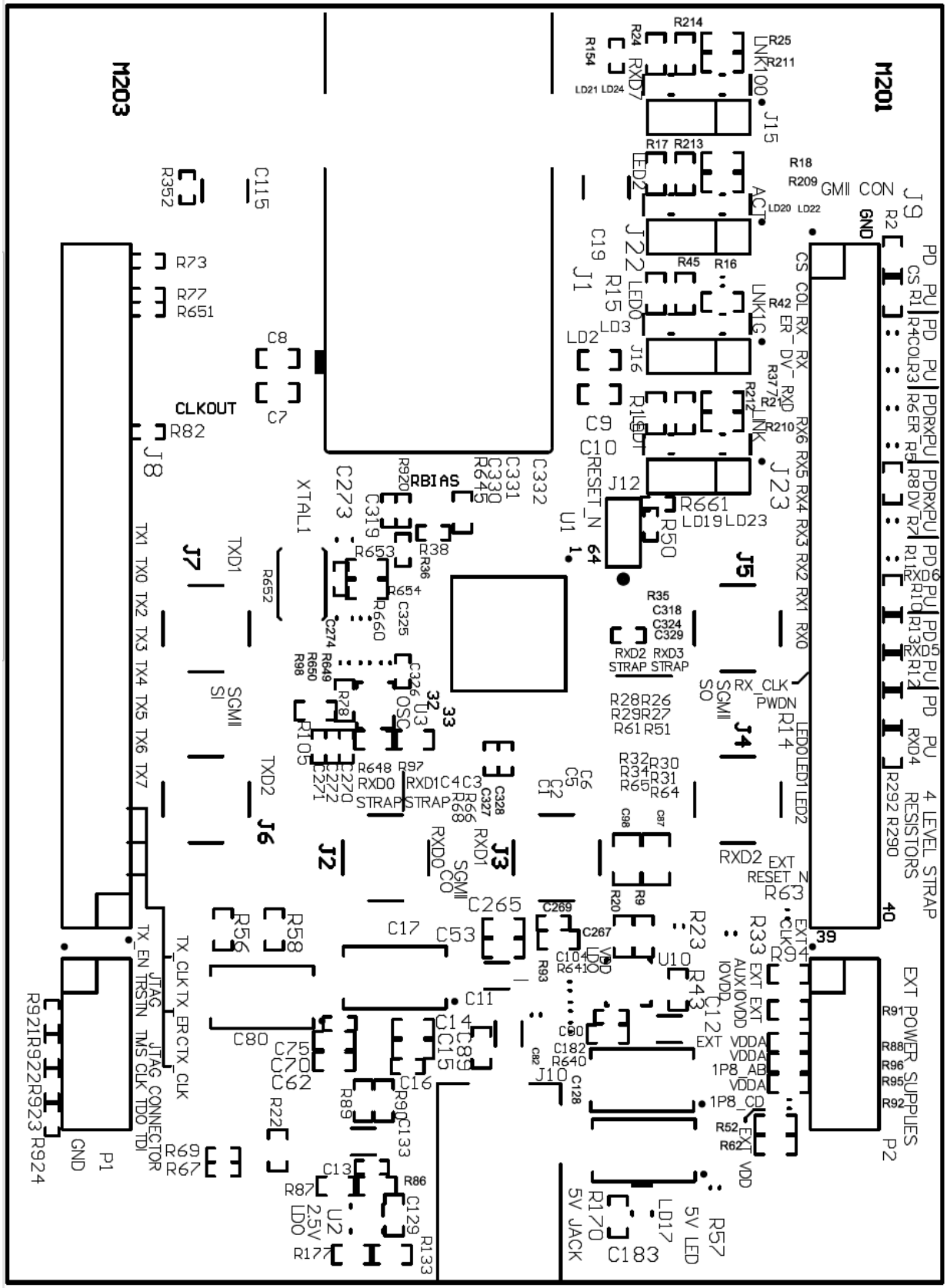


Figure 24. Top Marking

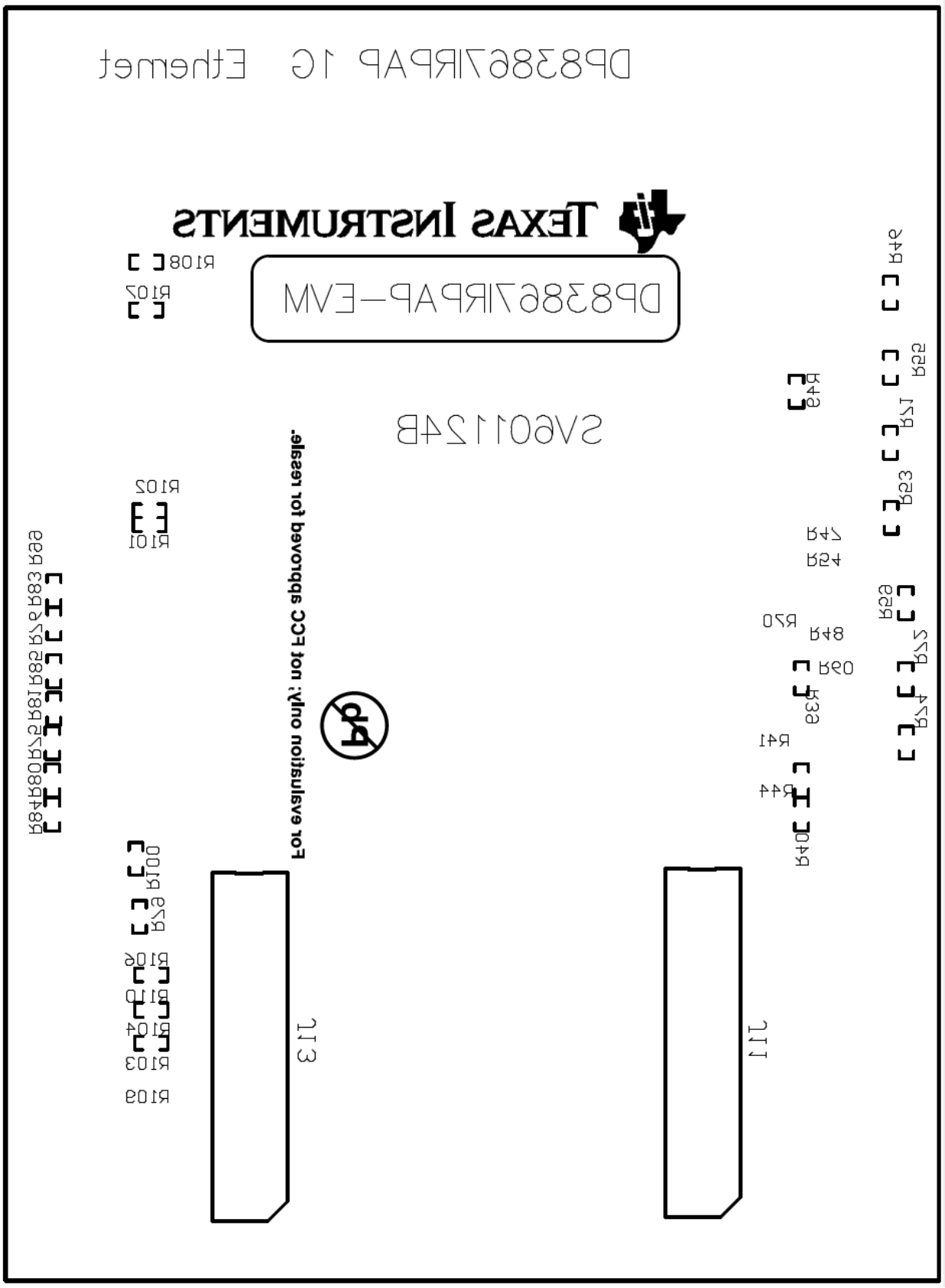


Figure 25. Bottom Marking

2.12 Bill of Materials (BOM)

Table 1. Bill of Materials

Item	Description	Manufacturer	Part Number
C1	CAP, CERM, 0.1 µF, 6.3 V, ±10%, X5R, 0201	TDK	C0603X5R0J104K030BC
C2	CAP, CERM, 0.1 µF, 6.3 V, ±10%, X5R, 0201	TDK	C0603X5R0J104K030BC
C3	CAP, CERM, 0.1 µF, 6.3 V, ±10%, X5R, 0201	TDK	C0603X5R0J104K030BC
C4	CAP, CERM, 0.1 µF, 6.3 V, ±10%, X5R, 0201	TDK	C0603X5R0J104K030BC
C5	CAP, CERM, 0.1 µF, 6.3 V, ±10%, X5R, 0201	TDK	C0603X5R0J104K030BC
C6	CAP, CERM, 0.1 µF, 6.3 V, ±10%, X5R, 0201	TDK	C0603X5R0J104K030BC
C7	CAP, CERM, 0.1 µF, 16 V, ±10%, X7R, 0603	Samsung	CL10B104KO8NNNC
C8	CAP, CERM, 0.1 µF, 16 V, ±10%, X7R, 0603	Samsung	CL10B104KO8NNNC
C9	CAP, CERM, 0.1 µF, 16 V, ±10%, X7R, 0603	Samsung	CL10B104KO8NNNC
C10	CAP, CERM, 0.1 µF, 16 V, ±10%, X7R, 0603	Samsung	CL10B104KO8NNNC
C11	CAP, CERM, 10 µF, 35 V, ±20%, X7R, 1206_190	TDK	C3216X7R1V106M160AC
C12	CAP, CERM, 10 µF, 35 V, ±20%, X7R, 1206_190	TDK	C3216X7R1V106M160AC
C13	CAP, CERM, 1000 pF, 25 V, ±5%, X7R, 0402	Kemet	C0402C102J3RACTU
C14	CAP, CERM, 0.01 µF, 50 V, ±5%, X7R, 0603	Kemet	C0603C103J5RACTU
C15	CAP, CERM, 1000 pF, 50 V, ±10%, C0G/NP0, 0603	AVX	06035A102KAT2A
C16	CAP, CERM, 100 pF, 50 V, ±5%, C0G/NP0, 0402	Yageo America	CC0402JRNPO9BN101
C17	CAP, TA, 100 µF, 10 V, ±20%, 0.1 Ω, SMD	Vishay-Sprague	593D107X0010D2TE3
C19	CAP, CERM, 4700 pF, 2000 V, ±10%, X7R, 1812	AVX	1812GC472KAT1A
C53	CAP, CERM, 0.1 µF, 16 V, ±10%, X7R, 0603	Samsung	CL10B104KO8NNNC
C62	CAP, CERM, 0.01 µF, 50 V, ±5%, X7R, 0603	Kemet	C0603C103J5RACTU
C70	CAP, CERM, 1000 pF, 50 V, ±10%, C0G/NP0, 0603	AVX	06035A102KAT2A
C75	CAP, CERM, 100 pF, 50 V, ±5%, C0G/NP0, 0402	Yageo America	CC0402JRNPO9BN101
C80	CAP, TA, 100 µF, 10 V, ±20%, 0.1 Ω, SMD	Vishay-Sprague	593D107X0010D2TE3
C82	CAP, CERM, 10 µF, 35 V, ±20%, X7R, 1206_190	TDK	C3216X7R1V106M160AC
C87	CAP, CERM, 1 µF, 16 V, ±10%, X5R, 0805	AVX	0805YD105KAT2A
C89	CAP, CERM, 0.01 µF, 50 V, ±5%, X7R, 0603	Kemet	C0603C103J5RACTU
C90	CAP, CERM, 0.01 µF, 50 V, ±5%, X7R, 0603	Kemet	C0603C103J5RACTU
C98	CAP, CERM, 4.7 µF, 10 V, +80/–20%, Y5V, 0805	Yageo America	CC0805ZRY5V6BB475
C104	CAP, CERM, 27 pF, 50 V, ±1%, C0G/NP0, 0603	Samsung	CL10C270FB8NNNC
C115	CAP, CERM, 4700 pF, 2000 V, ±10%, X7R, 1812	AVX	1812GC472KAT1A
C128	CAP, TA, 100 µF, 10 V, ±20%, 0.1 Ω, SMD	Vishay-Sprague	593D107X0010D2TE3
C129	CAP, CERM, 1 µF, 6.3 V, ±10%, X7R, 0603	Samsung	CL10B105KQ8NNNC
C133	CAP, CERM, 10 µF, 35 V, ±20%, X7R, 1206_190	TDK	C3216X7R1V106M160AC
C182	CAP, CERM, 100 pF, 50 V, ±5%, C0G/NP0, 0402	Yageo America	CC0402JRNPO9BN101
C183	CAP, TA, 220 µF, 6.3 V, ±10%, 0.7 Ω, SMD	Kemet	T491D227K006AT
C265	CAP, CERM, 0.01 µF, 50 V, ±5%, X7R, 0603	Kemet	C0603C103J5RACTU
C267	CAP, CERM, 1000 pF, 50 V, ±10%, C0G/NP0, 0603	AVX	06035A102KAT2A
C269	CAP, CERM, 100 pF, 50 V, ±5%, C0G/NP0, 0402	Yageo America	CC0402JRNPO9BN101
C270	CAP, CERM, 0.01 µF, 50 V, ±5%, X7R, 0402	Kemet	C0402C103J5RACTU
C271	CAP, CERM, 1000 pF, 25 V, ±5%, X7R, 0402	Kemet	C0402C102J3RACTU
C272	CAP, CERM, 100 pF, 50 V, ±5%, C0G/NP0, 0402	Yageo America	CC0402JRNPO9BN101
C273	CAP, CERM, 33 pF, 50 V, ±1%, C0G/NP0, 0603_950	Samsung	CL10C330FB8NNNC
C274	CAP, CERM, 33 pF, 50 V, ±1%, C0G/NP0, 0603_950	Samsung	CL10C330FB8NNNC
C318	CAP, CERM, 0.01 µF, 50 V, ±10%, X7R, 0402	MuRata	GRM155R71H103KA88D
C319	CAP, CERM, 0.01 µF, 50 V, ±10%, X7R, 0402	MuRata	GRM155R71H103KA88D
C324	CAP, CERM, 1000 pF, 25 V, ±5%, X7R, 0402	Kemet	C0402C102J3RACTU
C325	CAP, CERM, 1000 pF, 25 V, ±5%, X7R, 0402	Kemet	C0402C102J3RACTU
C326	CAP, CERM, 1000 pF, 25 V, ±5%, X7R, 0402	Kemet	C0402C102J3RACTU
C327	CAP, CERM, 1000 pF, 25 V, ±5%, X7R, 0402	Kemet	C0402C102J3RACTU

Table 1. Bill of Materials (continued)

Item	Description	Manufacturer	Part Number
C328	CAP, CERM, 1000 pF, 25 V, ±5%, X7R, 0402	Kemet	C0402C102J3RACTU
C329	CAP, CERM, 1000 pF, 25 V, ±5%, X7R, 0402	Kemet	C0402C102J3RACTU
C330	CAP, CERM, 1000 pF, 25 V, ±5%, X7R, 0402	Kemet	C0402C102J3RACTU
C331	CAP, CERM, 1000 pF, 25 V, ±5%, X7R, 0402	Kemet	C0402C102J3RACTU
C332	CAP, CERM, 1000 pF, 25 V, ±5%, X7R, 0402	Kemet	C0402C102J3RACTU
FID1	Fiducial mark. There is nothing to buy or mount.	N/A	N/A
FID2	Fiducial mark. There is nothing to buy or mount.	N/A	N/A
FID3	Fiducial mark. There is nothing to buy or mount.	N/A	N/A
FID4	Fiducial mark. There is nothing to buy or mount.	N/A	N/A
FID5	Fiducial mark. There is nothing to buy or mount.	N/A	N/A
FID6	Fiducial mark. There is nothing to buy or mount.	N/A	N/A
FID7	Fiducial mark. There is nothing to buy or mount.	N/A	N/A
FID8	Fiducial mark. There is nothing to buy or mount.	N/A	N/A
FID9	Fiducial mark. There is nothing to buy or mount.	N/A	N/A
FID10	Fiducial mark. There is nothing to buy or mount.	N/A	N/A
J1	RJ45, Gold, R/A, TH	Wurth Elektronik eiSos	7499111000A
J2	SMA Straight PCB Socket Die Cast, 50 Ω, TH	TE Connectivity	5-1814832-1
J3	SMA Straight PCB Socket Die Cast, 50 Ω, TH	TE Connectivity	5-1814832-1
J4	SMA Straight PCB Socket Die Cast, 50 Ω, TH	TE Connectivity	5-1814832-1
J5	SMA Straight PCB Socket Die Cast, 50 Ω, TH	TE Connectivity	5-1814832-1
J6	SMA Straight PCB Socket Die Cast, 50 Ω, TH	TE Connectivity	5-1814832-1
J7	SMA Straight PCB Socket Die Cast, 50 Ω, TH	TE Connectivity	5-1814832-1
J8	Header, 100mil, 20x2, Gold, TH	Samtec	TSW-120-07-G-D
J9	Header, 100mil, 20x2, Gold, TH	Samtec	TSW-120-07-G-D
J10	Power Jack, mini, 2.5mm OD, R/A, TH	Switchcraft	RAPC712X
J11	CONN MICRO HS TERM STRP HDR 50 POS	Samtec	ERM8-025-05.0-L-DV-K-TR
J12	Header, 100mil, 2x1, Gold, TH	TE Connectivity	5-146261-1
J13	CONN MICRO HS TERM STRP HDR 50 POS	Samtec	ERM8-025-05.0-L-DV-K-TR
J15	Header, 100mil, 3x1, Gold, TH	Samtec	TSW-103-07-G-S
J16	Header, 100mil, 3x1, Gold, TH	Samtec	TSW-103-07-G-S
J22	Header, 100mil, 3x1, Gold, TH	Samtec	TSW-103-07-G-S
J23	Header, 100mil, 3x1, Gold, TH	Samtec	TSW-103-07-G-S
LBL1	Thermal Transfer Printable Labels, 1.250" W x 0.250" H – 10,000 per roll	Brady	THT-13-457-10
LD2	LED, Green, SMD	Everlight	QTLP630C4TR
LD3	LED, Green, SMD	Everlight	QTLP630C4TR
LD17	LED, Green, SMD	Everlight	QTLP630C4TR
LD19	LED, Green, SMD	Everlight	QTLP630C4TR
LD20	LED, Green, SMD	Everlight	QTLP630C4TR
LD21	LED, Green, SMD	Everlight	QTLP630C4TR
LD22	LED, Green, SMD	Everlight	QTLP630C4TR
LD23	LED, Green, SMD	Everlight	QTLP630C4TR
LD24	LED, Green, SMD	Everlight	QTLP630C4TR
P1	Header, 100mil, 5x2, Gold, TH	Samtec	TSW-105-07-G-D
P2	Header, 100mil, 5x2, Gold, TH	Samtec	TSW-105-07-G-D
R1	RES, 11.0 k, 1%, 0.1 W, 0603	Yageo America	RC0603FR-0711KL
R2	RES, 2.49 k, 1%, 0.1 W, 0603	Yageo America	RC0603FR-072K49L
R3	RES, 11.0 k, 1%, 0.1 W, 0603	Yageo America	RC0603FR-0711KL
R4	RES, 2.49 k, 1%, 0.1 W, 0603	Yageo America	RC0603FR-072K49L
R5	RES, 11.0 k, 1%, 0.1 W, 0603	Yageo America	RC0603FR-0711KL
R6	RES, 2.49 k, 1%, 0.1 W, 0603	Yageo America	RC0603FR-072K49L
R7	RES, 6.04 k, 1%, 0.1 W, 0603	Yageo America	RC0603FR-076K04L

Table 1. Bill of Materials (continued)

Item	Description	Manufacturer	Part Number
R8	RES, 2.49 k, 1%, 0.1 W, 0603	Yageo America	RC0603FR-072K49L
R9	RES, 0, 5%, 0.1 W, 0603	Yageo America	RC0603JR-070RL
R10	RES, 11.0 k, 1%, 0.1 W, 0603	Yageo America	RC0603FR-0711KL
R11	RES, 2.49 k, 1%, 0.1 W, 0603	Yageo America	RC0603FR-072K49L
R12	RES, 11.0 k, 1%, 0.1 W, 0603	Yageo America	RC0603FR-0711KL
R13	RES, 2.49 k, 1%, 0.1 W, 0603	Yageo America	RC0603FR-072K49L
R14	RES, 2.2 k, 5%, 0.063 W, 0402	Vishay-Dale	CRCW04022K20JNED
R15	RES, 11.0 k, 1%, 0.1 W, 0603	Yageo America	RC0603FR-0711KL
R16	RES, 2.49 k, 1%, 0.1 W, 0603	Yageo America	RC0603FR-072K49L
R17	RES, 11.0 k, 1%, 0.1 W, 0603	Yageo America	RC0603FR-0711KL
R18	RES, 2.49 k, 1%, 0.1 W, 0603	Yageo America	RC0603FR-072K49L
R19	RES, 11.0 k, 1%, 0.1 W, 0603	Yageo America	RC0603FR-0711KL
R20	RES, 0, 5%, 0.1 W, 0603	Yageo America	RC0603JR-070RL
R21	RES, 2.49 k, 1%, 0.1 W, 0603	Yageo America	RC0603FR-072K49L
R22	RES, 0, 5%, 0.1 W, 0603	Yageo America	RC0603JR-070RL
R23	RES, 0, 5%, 0.1 W, 0603	Yageo America	RC0603JR-070RL
R24	RES, 11.0 k, 1%, 0.1 W, 0603	Yageo America	RC0603FR-0711KL
R25	RES, 2.49 k, 1%, 0.1 W, 0603	Yageo America	RC0603FR-072K49L
R26	RES, 0, 5%, 0.05 W, 0201	Panasonic	ERJ-1GE0R00C
R27	RES, 0, 5%, 0.05 W, 0201	Panasonic	ERJ-1GE0R00C
R28	RES, 0, 5%, 0.05 W, 0201	Panasonic	ERJ-1GE0R00C
R29	RES, 0, 5%, 0.05 W, 0201	Panasonic	ERJ-1GE0R00C
R30	RES, 0, 5%, 0.05 W, 0201	Panasonic	ERJ-1GE0R00C
R31	RES, 0, 5%, 0.05 W, 0201	Panasonic	ERJ-1GE0R00C
R32	RES, 0, 5%, 0.05 W, 0201	Panasonic	ERJ-1GE0R00C
R33	RES, 0, 5%, 0.1 W, 0603	Yageo America	RC0603JR-070RL
R34	RES, 0, 5%, 0.05 W, 0201	Panasonic	ERJ-1GE0R00C
R35	RES, 0, 5%, 0.063 W, 0402	Vishay-Dale	CRCW04020000Z0ED
R36	RES, 0, 5%, 0.063 W, 0402	Yageo America	RC0402JR-070RL
R37	RES, 0, 5%, 0.063 W, 0402	Vishay-Dale	CRCW04020000Z0ED
R38	RES, 0, 5%, 0.063 W, 0402	Vishay-Dale	CRCW04020000Z0ED
R39	RES, 0, 5%, 0.063 W, 0402	Vishay-Dale	CRCW04020000Z0ED
R40	RES, 0, 5%, 0.063 W, 0402	Vishay-Dale	CRCW04020000Z0ED
R41	RES, 0, 5%, 0.063 W, 0402	Vishay-Dale	CRCW04020000Z0ED
R42	RES, 470, 1%, 0.1 W, 0603	Yageo America	RC0603FR-07470RL
R43	RES, 10.0 k, 1%, 0.1 W, 0603	Yageo America	RC0603FR-0710KL
R44	RES, 0, 5%, 0.063 W, 0402	Vishay-Dale	CRCW04020000Z0ED
R45	RES, 470, 1%, 0.1 W, 0603	Yageo America	RC0603FR-07470RL
R46	RES, 0, 5%, 0.063 W, 0402	Vishay-Dale	CRCW04020000Z0ED
R47	RES, 0, 5%, 0.063 W, 0402	Vishay-Dale	CRCW04020000Z0ED
R48	RES, 0, 5%, 0.063 W, 0402	Vishay-Dale	CRCW04020000Z0ED
R49	RES, 0, 5%, 0.063 W, 0402	Vishay-Dale	CRCW04020000Z0ED
R50	RES, 0, 5%, 0.063 W, 0402	Vishay-Dale	CRCW04020000Z0ED
R51	RES, 0, 5%, 0.05 W, 0201	Panasonic	ERJ-1GE0R00C
R52	RES, 0, 5%, 0.1 W, 0603	Yageo America	RC0603JR-070RL
R53	RES, 0, 5%, 0.063 W, 0402	Vishay-Dale	CRCW04020000Z0ED
R54	RES, 0, 5%, 0.063 W, 0402	Vishay-Dale	CRCW04020000Z0ED
R55	RES, 0, 5%, 0.063 W, 0402	Vishay-Dale	CRCW04020000Z0ED
R56	RES, 0, 5%, 0.1 W, 0603	Yageo America	RC0603JR-070RL
R57	RES, 0, 5%, 0.1 W, 0603	Yageo America	RC0603JR-070RL
R58	RES, 0, 5%, 0.1 W, 0603	Yageo America	RC0603JR-070RL

Table 1. Bill of Materials (continued)

Item	Description	Manufacturer	Part Number
R59	RES, 0, 5%, 0.063 W, 0402	Vishay-Dale	CRCW04020000Z0ED
R60	RES, 0, 5%, 0.063 W, 0402	Vishay-Dale	CRCW04020000Z0ED
R61	RES, 0, 5%, 0.05 W, 0201	Panasonic	ERJ-1GE0R00C
R62	RES, 0, 5%, 0.1 W, 0603	Yageo America	RC0603JR-070RL
R63	RES, 0, 5%, 0.1 W, 0603	Yageo America	RC0603JR-070RL
R64	RES, 0, 5%, 0.05 W, 0201	Panasonic	ERJ-1GE0R00C
R65	RES, 0, 5%, 0.05 W, 0201	Panasonic	ERJ-1GE0R00C
R66	RES, 0, 5%, 0.05 W, 0201	Panasonic	ERJ-1GE0R00C
R67	RES, 0, 5%, 0.063 W, 0402	Vishay-Dale	CRCW04020000Z0ED
R68	RES, 0, 5%, 0.05 W, 0201	Panasonic	ERJ-1GE0R00C
R69	RES, 0, 5%, 0.063 W, 0402	Vishay-Dale	CRCW04020000Z0ED
R70	RES, 0, 5%, 0.063 W, 0402	Vishay-Dale	CRCW04020000Z0ED
R71	RES, 0, 5%, 0.063 W, 0402	Vishay-Dale	CRCW04020000Z0ED
R72	RES, 0, 5%, 0.063 W, 0402	Vishay-Dale	CRCW04020000Z0ED
R73	RES, 0, 5%, 0.063 W, 0402	Vishay-Dale	CRCW04020000Z0ED
R74	RES, 0, 5%, 0.063 W, 0402	Vishay-Dale	CRCW04020000Z0ED
R75	RES, 0, 5%, 0.063 W, 0402	Vishay-Dale	CRCW04020000Z0ED
R76	RES, 0, 5%, 0.063 W, 0402	Vishay-Dale	CRCW04020000Z0ED
R77	RES, 0, 5%, 0.063 W, 0402	Vishay-Dale	CRCW04020000Z0ED
R78	RES, 0, 5%, 0.1 W, 0603	Yageo America	RC0603JR-070RL
R79	RES, 0, 5%, 0.063 W, 0402	Vishay-Dale	CRCW04020000Z0ED
R80	RES, 0, 5%, 0.063 W, 0402	Vishay-Dale	CRCW04020000Z0ED
R81	RES, 0, 5%, 0.063 W, 0402	Vishay-Dale	CRCW04020000Z0ED
R82	RES, 0, 5%, 0.063 W, 0402	Vishay-Dale	CRCW04020000Z0ED
R83	RES, 0, 5%, 0.063 W, 0402	Vishay-Dale	CRCW04020000Z0ED
R84	RES, 0, 5%, 0.063 W, 0402	Vishay-Dale	CRCW04020000Z0ED
R85	RES, 0, 5%, 0.063 W, 0402	Vishay-Dale	CRCW04020000Z0ED
R86	RES, 56.2 k, 1%, 0.1 W, 0603	Yageo America	RC0603FR-0756K2L
R87	RES, 45.3 k, 1%, 0.1 W, 0603	Yageo America	RC0603FR-0745K3L
R88	RES, 0, 5%, 0.1 W, 0603	Yageo America	RC0603JR-070RL
R89	RES, 0, 5%, 0.1 W, 0603	Yageo America	RC0603JR-070RL
R90	RES, 0, 5%, 0.1 W, 0603	Yageo America	RC0603JR-070RL
R91	RES, 0, 5%, 0.1 W, 0603	Yageo America	RC0603JR-070RL
R92	RES, 0, 5%, 0.1 W, 0603	Yageo America	RC0603JR-070RL
R93	RES, 0, 5%, 0.1 W, 0603	Yageo America	RC0603JR-070RL
R94	RES, 0, 5%, 0.1 W, 0603	Yageo America	RC0603JR-070RL
R95	RES, 0, 5%, 0.1 W, 0603	Yageo America	RC0603JR-070RL
R96	RES, 0, 5%, 0.1 W, 0603	Yageo America	RC0603JR-070RL
R97	RES, 0, 5%, 0.1 W, 0603	Yageo America	RC0603JR-070RL
R98	RES, 0, 5%, 0.1 W, 0603	Yageo America	RC0603JR-070RL
R99	RES, 0, 5%, 0.063 W, 0402	Vishay-Dale	CRCW04020000Z0ED
R100	RES, 0, 5%, 0.063 W, 0402	Vishay-Dale	CRCW04020000Z0ED
R101	RES, 0, 5%, 0.063 W, 0402	Vishay-Dale	CRCW04020000Z0ED
R102	RES, 0, 5%, 0.063 W, 0402	Vishay-Dale	CRCW04020000Z0ED
R103	RES, 0, 5%, 0.063 W, 0402	Vishay-Dale	CRCW04020000Z0ED
R104	RES, 0, 5%, 0.063 W, 0402	Vishay-Dale	CRCW04020000Z0ED
R105	RES, 0, 5%, 0.1 W, 0603	Yageo America	RC0603JR-070RL
R106	RES, 0, 5%, 0.063 W, 0402	Vishay-Dale	CRCW04020000Z0ED
R107	RES, 0, 5%, 0.063 W, 0402	Vishay-Dale	CRCW04020000Z0ED
R108	RES, 0, 5%, 0.063 W, 0402	Vishay-Dale	CRCW04020000Z0ED
R109	RES, 0, 5%, 0.063 W, 0402	Vishay-Dale	CRCW04020000Z0ED

Table 1. Bill of Materials (continued)

Item	Description	Manufacturer	Part Number
R110	RES, 0, 5%, 0.063 W, 0402	Vishay-Dale	CRCW04020000Z0ED
R133	RES, 0, 5%, 0.1 W, 0603	Yageo America	RC0603JR-070RL
R154	RES, 1.00 M, 1%, 0.063 W, 0402	Yageo America	RC0402FR-071ML
R170	RES, 750, 5%, 0.1 W, 0603	Yageo America	RC0603JR-07750RL
R177	RES, 0, 5%, 0.1 W, 0603	Yageo America	RC0603JR-070RL
R209	RES, 470, 1%, 0.1 W, 0603	Yageo America	RC0603FR-07470RL
R210	RES, 470, 1%, 0.1 W, 0603	Yageo America	RC0603FR-07470RL
R211	RES, 470, 1%, 0.1 W, 0603	Yageo America	RC0603FR-07470RL
R212	RES, 470, 1%, 0.1 W, 0603	Yageo America	RC0603FR-07470RL
R213	RES, 470, 1%, 0.1 W, 0603	Yageo America	RC0603FR-07470RL
R214	RES, 470, 1%, 0.1 W, 0603	Yageo America	RC0603FR-07470RL
R290	RES, 11.0 k, 1%, 0.1 W, 0603	Yageo America	RC0603FR-0711KL
R292	RES, 2.49 k, 1%, 0.1 W, 0603	Yageo America	RC0603FR-072K49L
R352	RES, 1.00 M, 1%, 0.063 W, 0402	Yageo America	RC0402FR-071ML
R640	RES, 1.87 k, 1%, 0.1 W, 0603	Yageo America	RC0603FR-071K87L
R641	RES, 4.99 k, 0.1%, 0.063 W, 0603	TE Connectivity	CPF0603B4K99E
R645	RES, 10 k, 5%, 0.1 W, 0603	Yageo America	RC0603JR-0710KL
R648	RES, 0, 5%, 0.1 W, 0603	Yageo America	RC0603JR-070RL
R649	RES, 4.7 k, 5%, 0.1 W, 0603	Vishay-Dale	CRCW06034K70JNEA
R650	RES, 0, 5%, 0.1 W, 0603	Yageo America	RC0603JR-070RL
R651	RES, 2.2 k, 5%, 0.063 W, 0402	Vishay-Dale	CRCW04022K20JNED
R652	RES, 1.00 M, 1%, 0.063 W, 0402	Yageo America	RC0402FR-071ML
R653	RES, 0, 5%, 0.1 W, 0603	Yageo America	RC0603JR-070RL
R654	RES, 0, 5%, 0.1 W, 0603	Yageo America	RC0603JR-070RL
R660	RES, 0, 5%, 0.1 W, 0603	Yageo America	RC0603JR-070RL
R661	RES, 2.2 k, 5%, 0.063 W, 0402	Vishay-Dale	CRCW04022K20JNED
R920	RES, 2.2 k, 5%, 0.063 W, 0402	Vishay-Dale	CRCW04022K20JNED
R921	RES, 2.2 k, 5%, 0.063 W, 0402	Vishay-Dale	CRCW04022K20JNED
R922	RES, 2.2 k, 5%, 0.063 W, 0402	Vishay-Dale	CRCW04022K20JNED
R923	RES, 2.2 k, 5%, 0.063 W, 0402	Vishay-Dale	CRCW04022K20JNED
R924	RES, 2.2 k, 5%, 0.063 W, 0402	Vishay-Dale	CRCW04022K20JNED
U1	Robust, Low Power 10/100/1000 Ethernet Physical Layer Transceiver, PAP0064M	Texas Instruments	DP83867PAP
U2	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°C to 125°C, Green (RoHS & no Sb/Br)	Texas Instruments	TPS73501DRVR
U3	OSC, 25 MHz, 1.6 to 3.6 V, SMD	Epson	SG-210STF25.000000MHZY
U10	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°C to 125°C, Green (RoHS & no Sb/Br)	Texas Instruments	TPS74701DRCR
XTAL1	Crystal, 25 MHz, 18 pF, SMD	Abracon Corportation	ABM3-25.000MHZ-D2W-T

STANDARD TERMS AND CONDITIONS FOR EVALUATION MODULES

1. *Delivery:* TI delivers TI evaluation boards, kits, or modules, including any accompanying demonstration software, components, or documentation (collectively, an “EVM” or “EVMs”) to the User (“User”) in accordance with the terms and conditions set forth herein. Acceptance of the EVM is expressly subject to the following terms and conditions.

   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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1. 電波法施行規則第6条第1項第1号に基づく平成18年3月28日総務省告示第173号で定められた電波暗室等の試験設備でご使用いただく。
2. 実験局の免許を取得後ご使用いただく。
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3.3.3 *Notice for EVMs for Power Line Communication:* Please see http://www.tij.co.jp/lsds/ti_ja/general/eStore/notice_02.page

電力線搬送波通信についての開発キットをお使いになる際の注意事項については、次のところをご覧ください。http://www.tij.co.jp/lsds/ti_ja/general/eStore/notice_02.page

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.

6. *Disclaimers:*

   6.1 EXCEPT AS SET FORTH ABOVE, EVMS AND ANY WRITTEN DESIGN MATERIALS PROVIDED WITH THE EVM (AND THE DESIGN OF THE EVM ITSELF) ARE PROVIDED "AS IS" AND "WITH ALL FAULTS." TI DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, REGARDING SUCH ITEMS, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF ANY THIRD PARTY PATENTS, COPYRIGHTS, TRADE SECRETS OR OTHER INTELLECTUAL PROPERTY RIGHTS.

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7. *USER'S INDEMNITY OBLIGATIONS AND REPRESENTATIONS.* USER WILL DEFEND, INDEMNIFY AND HOLD TI, ITS LICENSORS AND THEIR REPRESENTATIVES HARMLESS FROM AND AGAINST ANY AND ALL CLAIMS, DAMAGES, LOSSES, EXPENSES, COSTS AND LIABILITIES (COLLECTIVELY, "CLAIMS") ARISING OUT OF OR IN CONNECTION WITH ANY HANDLING OR USE OF THE EVM THAT IS NOT IN ACCORDANCE WITH THESE TERMS AND CONDITIONS. THIS OBLIGATION SHALL APPLY WHETHER CLAIMS ARISE UNDER STATUTE, REGULATION, OR THE LAW OF TORT, CONTRACT OR ANY OTHER LEGAL THEORY, AND EVEN IF THE EVM FAILS TO PERFORM AS DESCRIBED OR EXPECTED.

8. *Limitations on Damages and Liability:*

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