

RTKA271041E00000BU

Cold Crank Boost and Buck Controller with Drivers Evaluation Board

Description

The RTKA271041E00000BU evaluation board (EVB) is for evaluating the operation and performance of the RAA271041, a cold crank boost and buck controller. The EVB evaluates the Channel 1 buck regulator that provides a system rail voltage and the Channel 2 boost that enables the system to stay in regulation during a cold crank or start-stop operation for a battery input as low as 2.1V.

The EVB features overcurrent protection, overvoltage and undervoltage protection, and fault indicators for each channel. The protection features include cycle-by-cycle current limit and thermal shutdown.

Features

- RAA271041 is qualified to [AEC-Q100](#) grade 1
- Test and measurement access to RAA271041
- Access for monitoring and test
- Access for design modification

Specifications

This board is configured and optimized for the following operating conditions:

- Input voltage V_{IN} : 2.1V to 42V, 12V (typical)
- Output voltage 1 V_{OUT1} : fixed 5V, 6A
- Output voltage 2 V_{BOOST} : 12V when activated
- Switching frequency: 2.2MHz

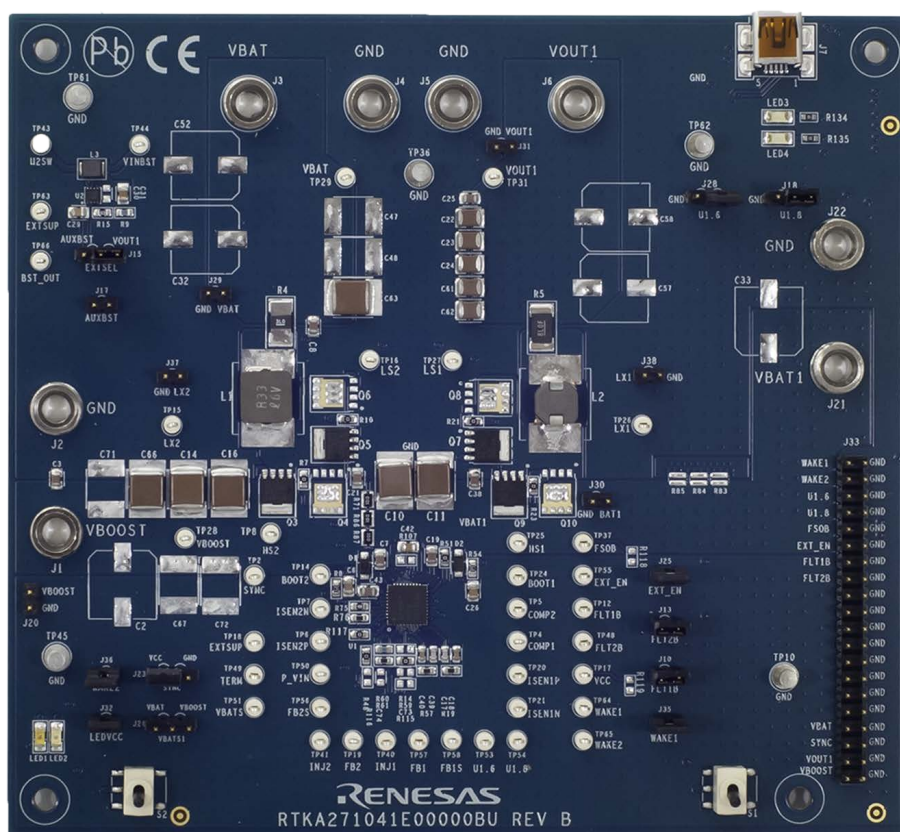


Figure 1. RTKA271041E00000BU Evaluation Board

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1. Functional Description

1.1 Overview

- V_{IN} 5.5V to 42V, extended down to 2.1V after initial startup
- V_{OUT1} fixed 3.3V, 5V or adjustable from 0.8V to 12V with external resistors
- V_{BOOST} adjustable from 5V to 40V with external resistors
- Low I_Q with ECM mode of 8 μ A typical (Buck)
- Programmable frequency to 440kHz or 2.2MHz
- External synchronization using SYNC pin
- WAKE1 or WAKE2 enables both channels
- Independent fault indicators for each channel
- Hiccup mode for sustained overload
- Jumpers and test points for simplified evaluation

1.2 Operational Characteristics

Table 1 lists the jumper and test point descriptions.

Table 1. Jumper and Test Point Description

Jumper	Default	Description
J1	-	VBOOST output terminal
J2	-	GND
J3	-	VBAT supply input terminal. Connect for Cold-crank mode
J4	-	GND
J5	-	GND
J6	-	VOUT1 output terminal
J10	1-2	FLTB1 pull-up resistor
J13	1-2	FLTB2 pull-up resistor
J15	1-2	EXTSUP input select. Leave open for internal LDO. Connect 1-2 for VOUT1 output, or 2-3 for ISL78113A output
J17	Open	ISL78113A input. Connect if using ISL78113A output for EXTSUP input
J18	1-2	Connect 1-2 for SGND. Connecting 2-3 is for internal use only.
J20	Open	VBOOST test point
J21	-	VBAT1 supply input terminal. Connect for Individual Buck/Boost mode
J22	-	GND
J23	1-2	SYNC input select. Connect 1-2 for FCCM, or 2-3 for ECM and DCM
J25	1-2	EXT_EN pull-up resistor
J26	1-2	VBATS voltage divider. Connect 1-2 for VBAT, or 2-3 for VBOOST
J28	1-2	Connect 1-2 for SGND. Connecting 2-3 is for internal use only.
J29	Open	VBAT supply test point
J30	Open	VBAT1 supply test point
J31	Open	VOUT1 test point
J32	1-2	FSOb LED fault monitor
J33	-	Signal monitor access
J35	1-2	WAKE1 pull-up resistor
J36	1-2	WAKE2 pull-up resistor
J37	Open	LX2 test point
J38	Open	LX1 test point

1.3 Setup and Configuration

1.3.1 Recommended Equipment

- 12V DC power supply or battery
- Digital multimeter (DMM)
- Electronic load

1.3.2 Procedure

1. Set the power supply voltage between 5.5V and 42V and adjust the current limit according to the expected load current.
2. Turn off the power supply before making any connections.
3. Connect the power supply to the VBAT and GND banana sockets.
4. Connect the load to the VOUT1 and GND banana sockets.
5. Connect the load to the VBOOST and GND banana sockets if using Individual Buck/Boost mode.
6. Turn WAKE1 and WAKE2 switches off for initial startup.
7. Turn on power supply.
8. Toggle either the WAKE1 or WAKE2 switch to enable both outputs.
9. Measure voltages at VOUT1 and VBOOST test points.

2. Board Design

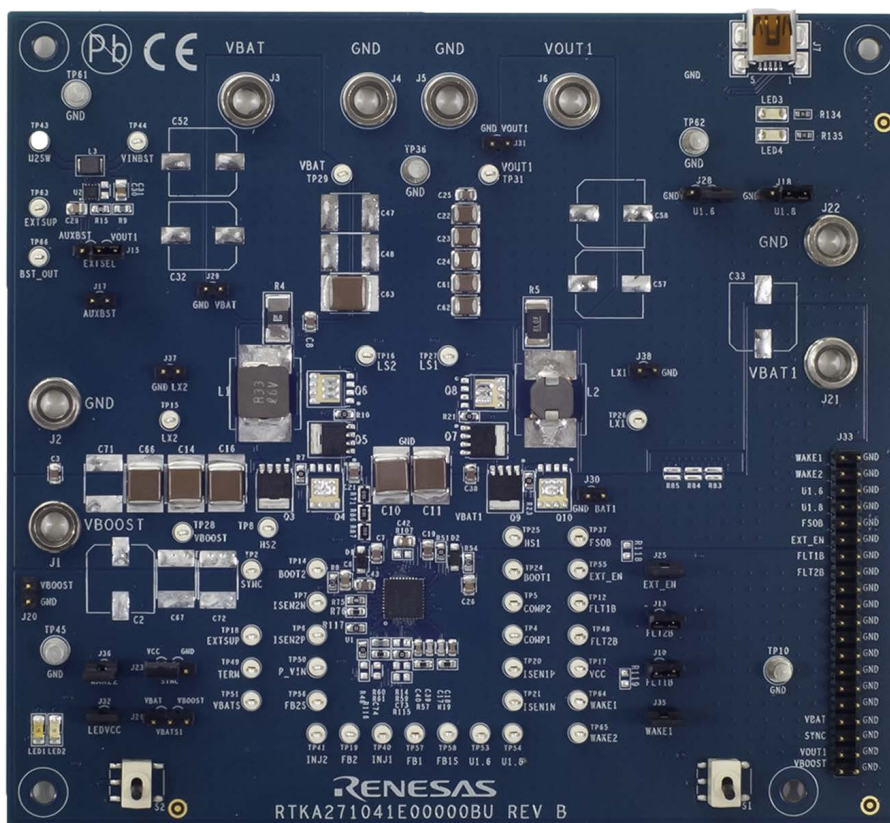


Figure 2. RTKA271041E00000BU Evaluation Board (Top)

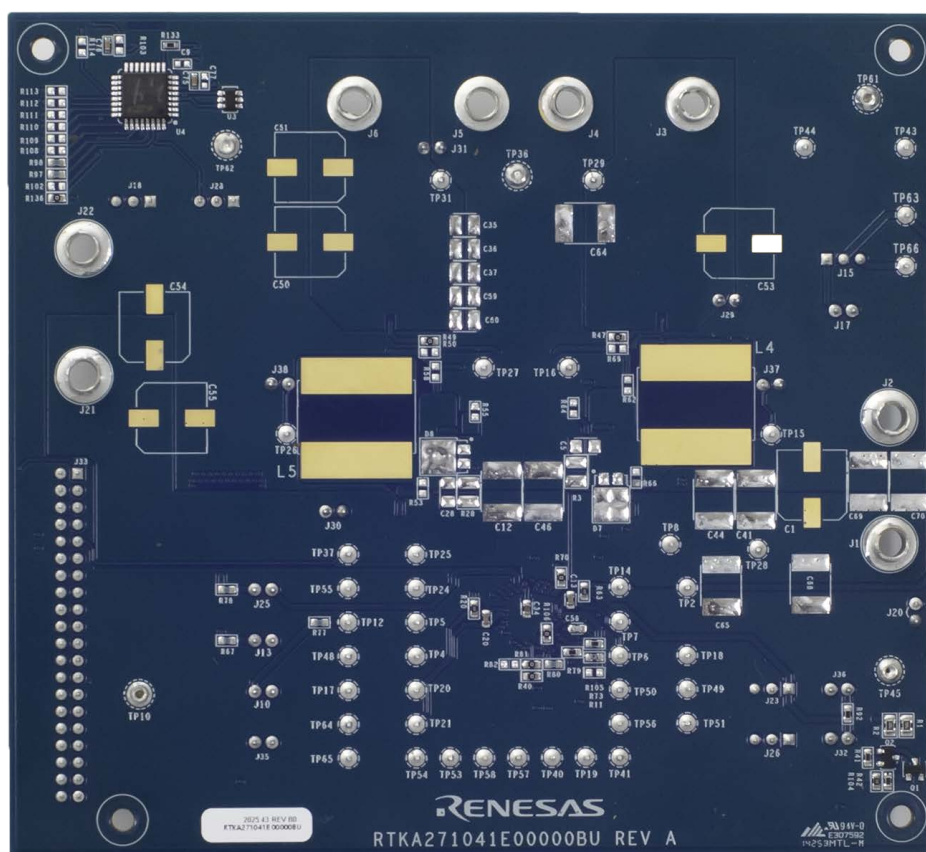


Figure 3. RTKA271041E00000BU Evaluation Board (Bottom)



Figure 4. Schematics

2.2 Bill of Materials

Qty	Reference Designator	Description	Manufacturer	Manufacturer Part Number
8	C3, C7 C8, C19, C21, C25, C38, C43	CAP - AEC-Q200, SMD, 0805, 0.1µF, 100V, 10%, X7R	TDK	CGA4J2X7R2A104K125AA
5	C6, C26, C29, C31, C42	CAP - AEC-Q200, SMD, 0805, 10µF, 10V, 10%, X7R	Murata	GCJ21BR71A106KE01L
6	C10, C11, C14, C16, C63, C66	CAP - AEC-Q200, SMD, 2220, 10µF, 50V, 10%, X7R	TDK	CGA9N3X7R1H106K230KB
2	C13, C20	CAP - AEC-Q200, SMD, 0603, 4700pF, 100V, 10%, X7R	Murata	GCM188R72A472KA37D
2	C17, C39	CAP - AEC-Q200, SMD, 0603, 68pF, 50V, 5%, C0G	TDK	CGA3E2C0G1H680J080AA
1	C18	CAP - AEC-Q200, SMD, 0603, 3300pF, 100V, 10%, X7R	Murata	GCM188R72A332KA37D
5	C22, C23, C24, C61, C62	CAP - AEC-Q200, SMD, 1210, 22µF, 16V, 20%, X7R	TDK	CGA6P1X7R1C226M250AC
1	C34	CAP, SMD, 0603, 1µF, 16V, 10%, X7R	TDK	C1608X7R1C105K
1	C40	CAP - AEC-Q200, SMD, 0603, 1200pF, 100V, 10%, X7R	Murata	GCJ188R72A122KA01D
1	C56	CAP - AEC-Q200, SMD, 0603, 220pF, 50V, 5%, C0G	TDK	CGJ3E2C0G1H221J080AA
2	C75, C76	CAP - AEC-Q200, SMD, 0603, 0.1µF, 50V, 10%, X7R	Murata	CGA3E2X7R1E104K080AA
1	D1	DIODE, SMD, SOD-123F, 75V, 215mA	Nexperia	BAS116H,115
1	D2	DIODE, SMD, SOD-123F, 60V, 1A	Nexperia	PMEG6010CEH-QX
8	J1, J2, J3, J4, J5, J6, J21, J22	CONN - BAN ANA JACK, TH, 0.175 PLUG, STANDARD, NON-INSULATED	Keystone	575-4
1	J7	CONN - RECEPTACLE, SMD, 5 CONTACT, MINI B, R/A	Molex	54819-0572
13	J10, J13, J17, J20, J25, J29, J30, J31, J32, J35, J36, J37, J38	CONN - HEADER, TH, 2 POS, 2.54mm	Amphenol	69190-202HLF
5	J15, J18, J23, J26, J28	CONN - HEADER, TH, 36 POS, 2.54mm	Amphenol	68000-236HLF
1	J33	CONN - HEADER, TH, 72 POS, 2.54mm	Amphenol	67996-272HLF
1	L1	COIL - AEC-Q200, PWR INDUCTOR, SMD, 8.6x8x3mm, 0.33µH, 20%, 25.8A	Kemet	MPXV1D0830LR33
1	L2	COIL - AEC-Q200, PWR INDUCTOR, SMD, 7x6.5x4.5mm, 1µH, 20%, 13.3A	TDK	SPM6545VT-1R0M-D
1	L3	COIL, PWR INDUCTOR, SMD, 1210, 2.2µH, 20%, 1.85A	Murata	LQH32PN2R2NNCL
1	LED1	LED, SMD, 1206, GREEN, 2.1V, 30mcd	Dialight	597-3311-407NF
1	LED2	LED, SMD, 1206, RED, 1.7V, 33.6mcd	Dialight	597-3111-407F
1	LED3	LED, SMD, 1206, GREEN, 2.2V, 10mcd	Lumex	SML-LX1206GW-TR
1	LED4	LED, SMD, 1206, RED, 2V, 6mcd	Lumex	SML-LX1206IW-TR
2	Q1, Q2	TRAN, MOSFET, N-CH, SOT-23, 60V, 0.115A	Diodes	2N7002-7-F
2	Q3, Q5	TRAN - AEC-Q101, PWR MOSFET, N-CH, LFPK56, 40V, 79A	Nexperia	BUK9Y7R6-40E,115
2	Q7, Q9	TRAN - AEC-Q101, PWR MOSFET, N-CH, LFPK56, 40V, 33A	Nexperia	BUK9Y21-40E,115
2	R1, R2	RES - AEC-Q200, SMD, 0805, 750Ω, 0.125W, 1%	Panasonic	ERJ-6ENF7500V

Qty	Reference Designator	Description	Manufacturer	Manufacturer Part Number
1	R4	RES - AEC-Q200, SMD, 2512, 0.003Ω, 1W, 1%	Vishay Dale	WSL25123L000FEA
1	R5	RES - AEC-Q200, SMD, 2512, 0.008Ω, 1W, 1%	Vishay Dale	WSL25128L000FEA
15	R7, R10, R21, R23, R40, R47, R48, R49, R51, R59, R70, R81, R106, R117, R136	RES, SMD, 0603, 0Ω, 0.1W	Yageo	RC0603JR-070RL
3	R8, R54, R73	RES - AEC-Q200, SMD, 0603, 1Ω, 0.1W, 1%	Panasonic	ERJ-3RQF1R0V
1	R9	RES - AEC-Q200, SMD, 0603, 150kΩ, 0.1W, 1%	Yageo	RK73H1JTDD1503F
1	R15	RES, SMD, 0603, 787kΩ, 0.1W	Yageo	RC0603FR-07787KL
1	R19	RES - AEC-Q200, SMD, 0603, 8.45kΩ, 0.1W, 1%	Panasonic	ERJ-3EKF8451V
3	R20, R63, R104	RES - AEC-Q200, SMD, 0603, 6.04Ω, 0.1W, 1%	Vishay Dale	CRCW06036R04FKEA
5	R41, R42, R76, R92, R105	RES - AEC-Q200, SMD, 0603, 100kΩ, 0.1W, 1%	Panasonic	ERJ-3EKF1003V
1	R57	RES - AEC-Q200, SMD, 0603, 8.06kΩ, 0.1W, 1%	Panasonic	ERJ-3EKF8061V
7	R60, R67, R77, R78, R80, R97, R98	RES - AEC-Q200, SMD, 0603, 10kΩ, 0.1W, 1%	Koa	RK73H1JTDD1002F
2	R61, R79	RES - AEC-Q200, SMD, 0603, 115kΩ, 0.1W, 1%	Panasonic	ERJ-3EKF1153V
3	R71, R86, R87	RES - AEC-Q200, SMD, 0508, 0.001Ω, 1W, 1%	Stackpole	CSS0508FT1L00
1	R75	RES, SMD, 0603, 806kΩ, 0.1W, 1%	Venkel	CR0603-10W-8063FT
1	R133	RES - AEC-Q200, SMD, 0603, 1kΩ, 0.1W, 1%	Panasonic	ERJ-3EKF1001V
2	R134, R135	RES - AEC-Q200, SMD, 0603, 300Ω, 0.125W, 1%	Yageo	RK73B1JTDD301J
2	S1, S2	SWITCH - TOGGLE, SMD, SPDT, 2 POS	C&K	GT11MSCBE
41	TP2, TP4, TP5, TP6, TP7, TP8, TP12, TP14, TP15, TP16, TP17, TP18, TP19, TP20, TP21, TP24, TP25, TP26, TP27, TP28, TP29, TP31, TP37, TP40, TP41, TP43, TP44, TP48, TP49, TP50, TP51, TP53, TP54, TP55, TP56, TP57, TP58, TP63, TP64, TP65, TP66	CONN - MINI TEST PT, VERTICAL, WHITE, ROHS	Keystone	5002
5	TP10, TP36, TP45, TP61, TP62	CONN - TURRET, TERMINAL POST, TH	Keystone	1514-2
1	U1	IC - 42V BOOST & BUCK CONTROLLER, 36P, SCQFN, 6x6mm	Renesas	RAA2710414071HNP#HA0
1	U2	IC - SYNCHRONOUS BOOST CONVERTER, 8P, DFN	Renesas	ISL78113AARAZ
1	U3	IC - SINGLE USB PORT TVS, SMD, 6P, SOT-23-6	Texas Instruments	SN65220DBVR
1	U4	IC - USB uCONTROLLER, 32P, LQFP	Silicon Labs	C8051F320-GQ

2.3 Board Layout

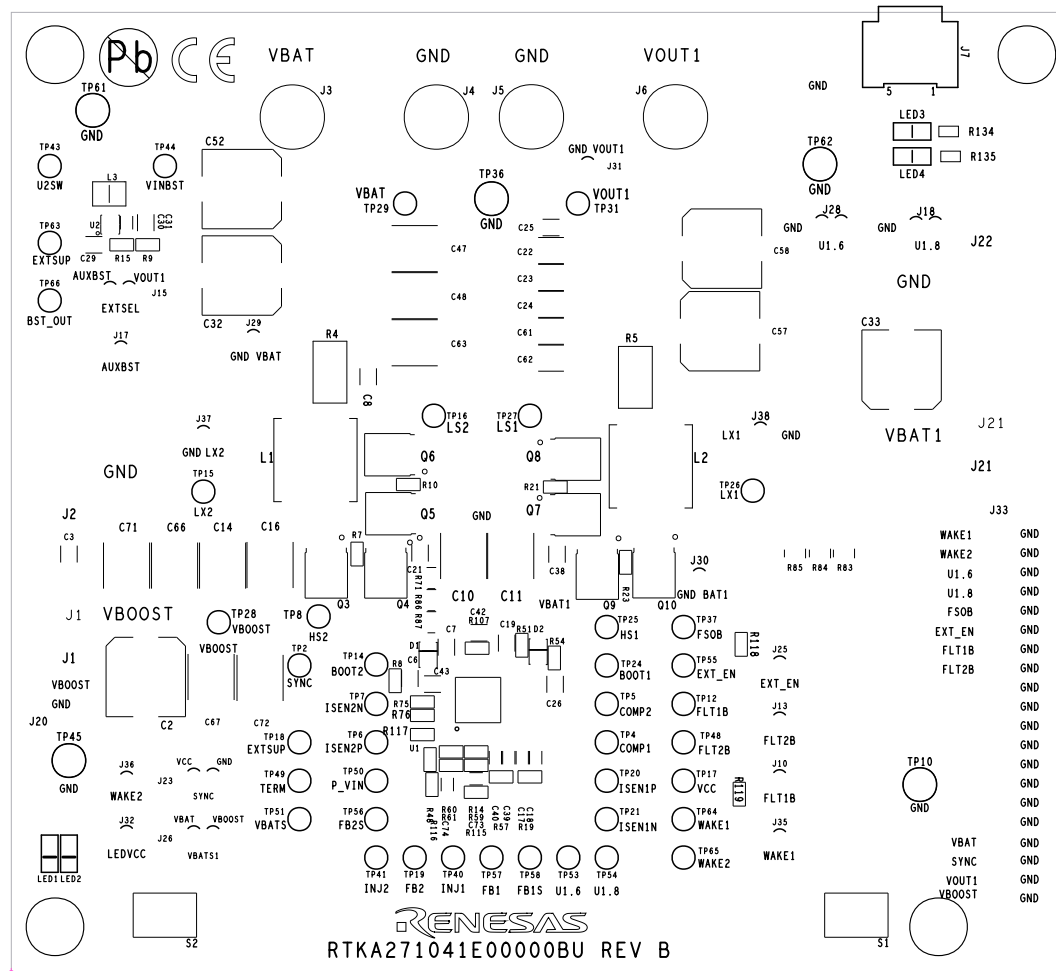


Figure 5. Top Silkscreen

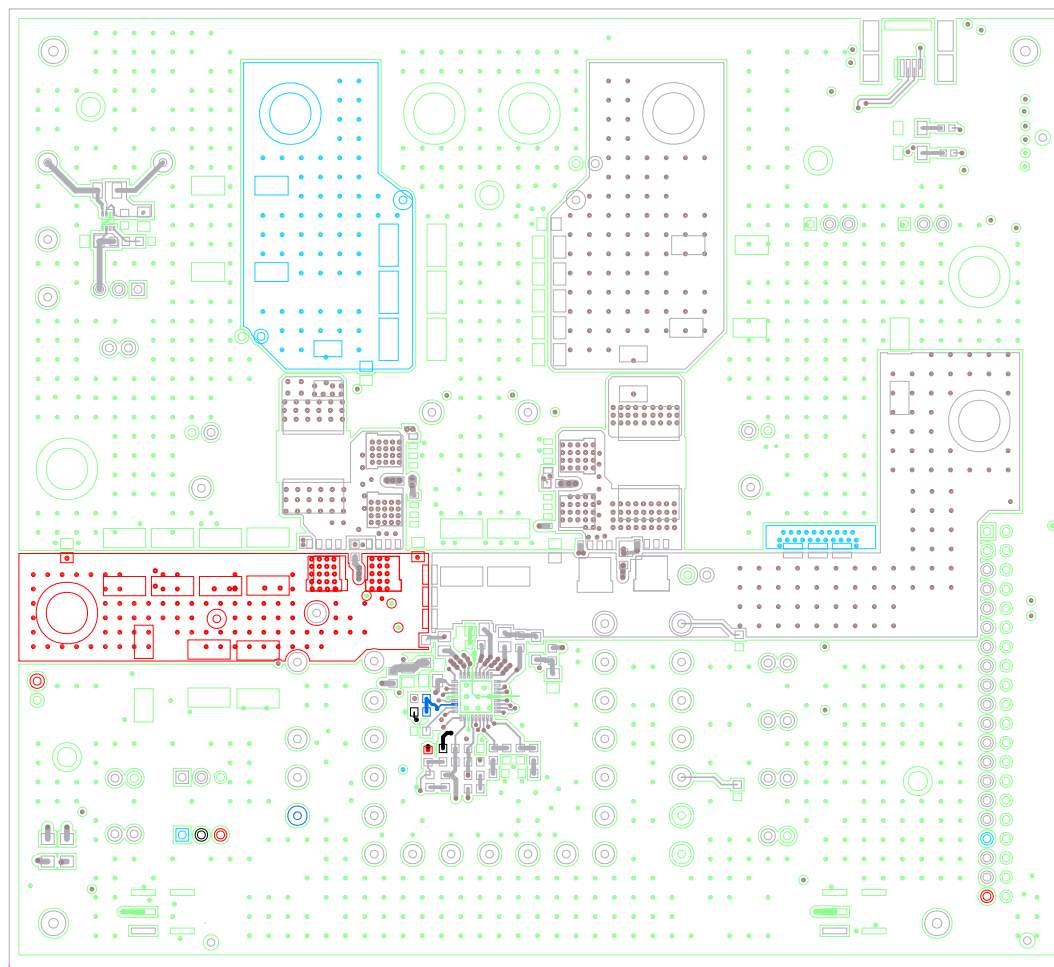


Figure 6. Top Layer



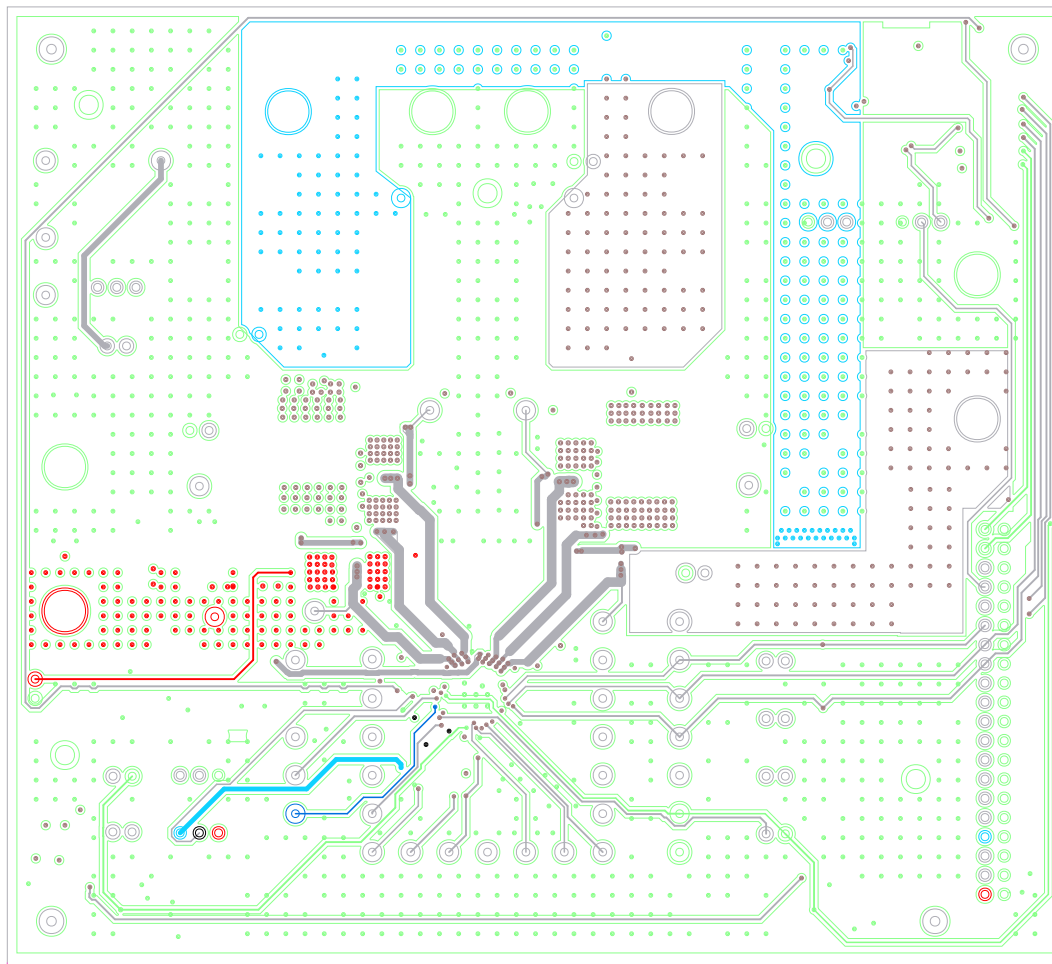


Figure 8. Internal Layer 3

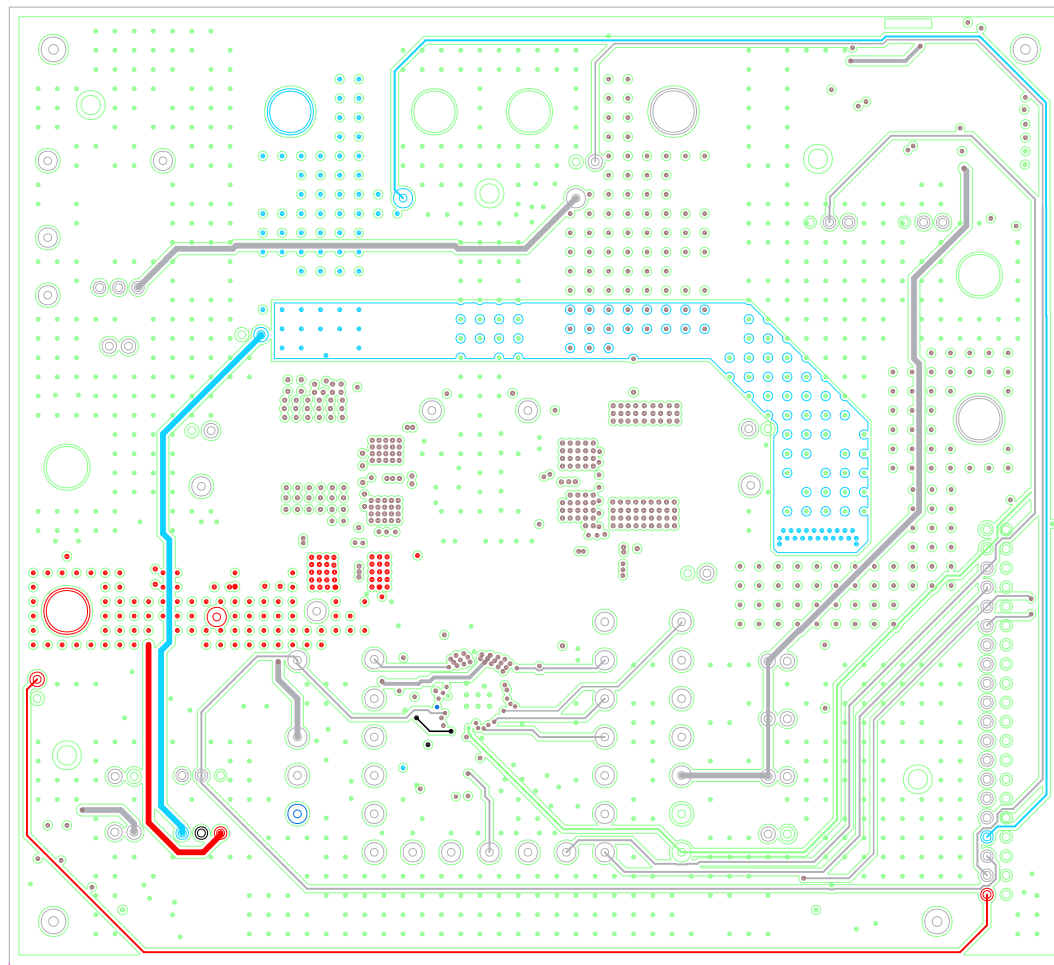


Figure 9. Internal Layer 4

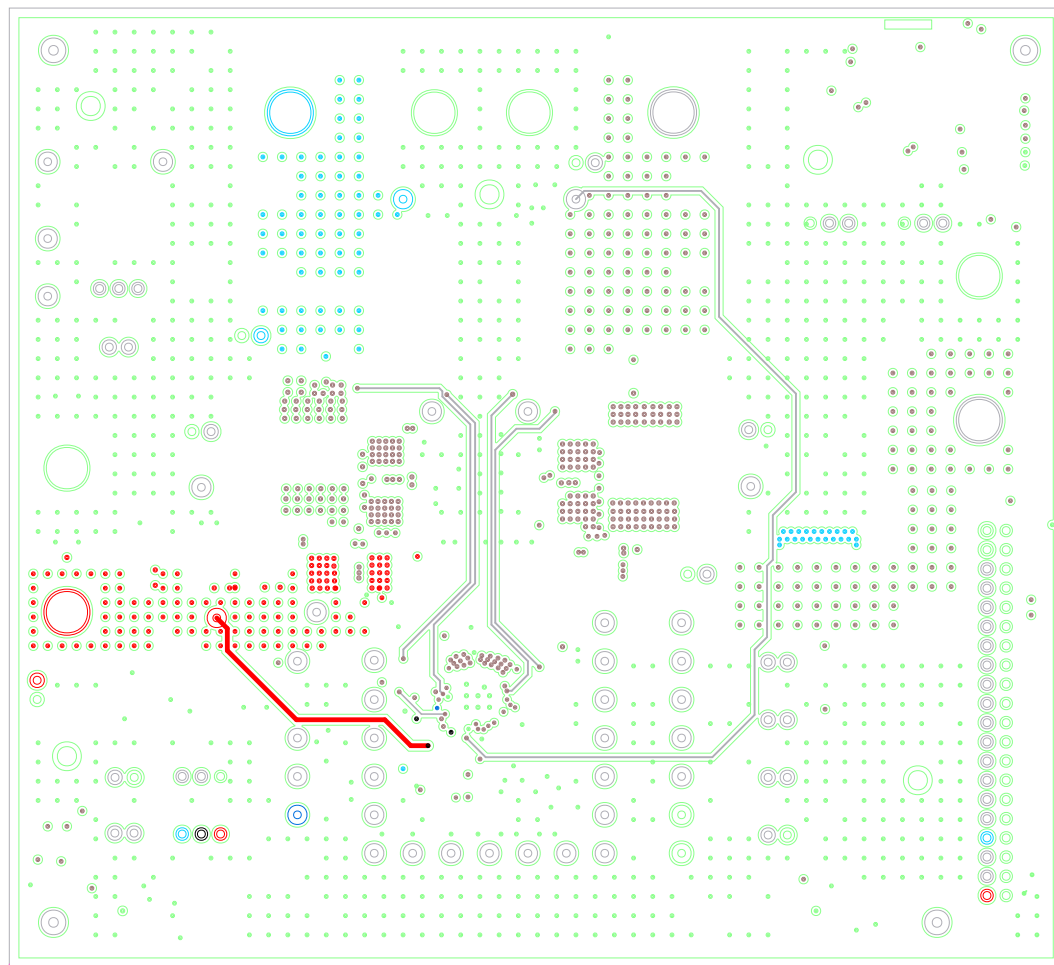


Figure 10. Internal Layer 5

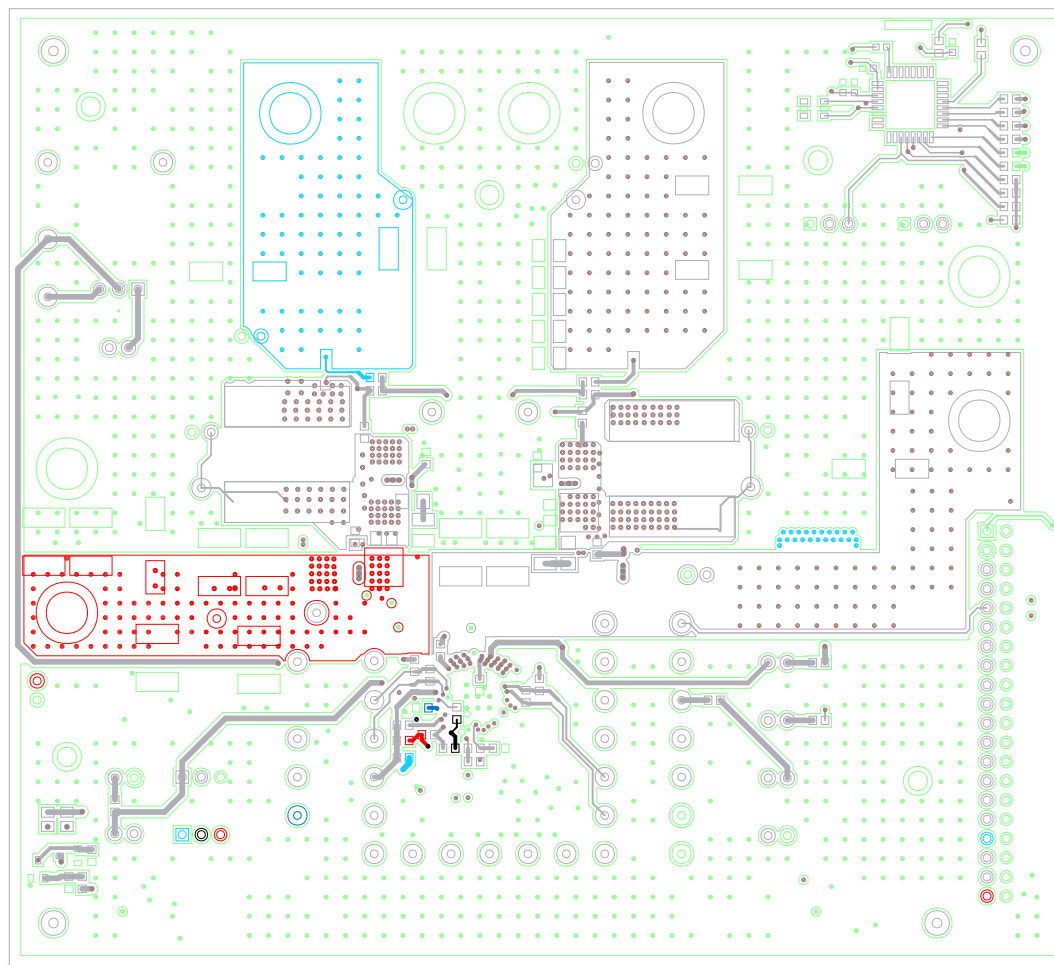


Figure 11. Bottom Layer

Figure 12. Bottom Silkscreen

3. Ordering Information

Part Number	Description
RTKA271041E00000BU	RAA271041 Evaluation Board

4. Revision History

Revision	Date	Description
1.00	Nov 11, 2025	Initial release.

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