

UM12469

NAFE33352-UIOM Analog Sensing and Control Platform

Rev. 1.0 — 27 April 2026

User manual

Document information

Information	Content
Keywords	NAFE33352-UIOM, MCX-N MCU, Arduino, universal input-output, analog input, analog output
Abstract	The NAFE33352-UIOM platform from NXP is a deployment-ready solution for analog input and output applications that helps engineers validate analog accuracy and diagnostics before scaling to production.



1 Introduction

The NAFE33352-UIOM platform from NXP is a deployment-ready solution for analog input and output applications that helps engineers validate analog accuracy and diagnostics before scaling to production. This compact board (90 mm x 50 mm) integrates seamlessly with NXP MCX-N MCU boards via Arduino connectors, offering plug-and-play flexibility for rapid prototyping.

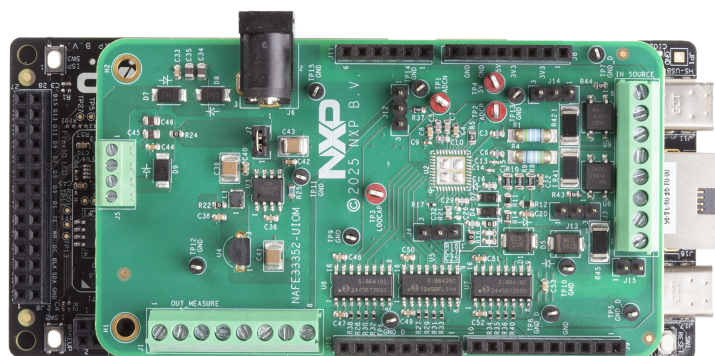


Figure 1. NAFE33352-UIOM board (horizontal view)

Key benefits include:

- Universal analog input for voltage, current, RTD, and thermocouple sensing
- Analog output up to ± 12.5 V and ± 25 mA for precise actuation
- Built-in calibration and diagnostics to reduce scale-up risk
- NAFE GUI and driver packs for fast configuration and development

The NAFE33352 AFE from NXP integrates a high-resolution sigma-delta ADC for precise sensing and DAC for accurate actuation. NAFE33352 enables seamless interaction between sensors and actuators in closed-loop systems. This integration reduces the need for multiple discrete components, saving board space and simplifying design. NAFE33352 offers premium performance without compromise, helping engineers accelerate development and optimize reliability.

NAFE33352 offers superior accuracy and a highly integrated architecture, supporting both analog input and analog output in a single device.

A graphical interface for this NAFE33352-UIOM platform allows the user to explore the different functions of the driver easily. The IC communicates to the host via the industry-standard SPI-bus port. The evaluation software runs under the Microsoft Windows 7, 8, 10, and 11 PC platforms.

2 NAFE33352 Arduino UIOM key features

Compact design:

- 90 mm x 50 mm size
- Arduino UNO connector connects to any NXP FRDM MCU platform
- FRDM compatible

Precision analog output and sensing:

- Precision analog output and two software configurable analog inputs to measure voltage, current, RTD, and thermocouple
- Embedded RTD for cold junction compensation
- 4-20 mA current sense resistors controlled by GPIO

Advanced analog features:

- Factory and user calibration support
- Advanced diagnostics and anomaly detection

Plug and play:

- Open-CMSIS driver pack
- NAFE GUI
- Code examples

3 Applications

- PLC or remote I/O
- Data acquisition
- Industrial instruments
- Servo control

4 Finding kit resources and information

NXP Semiconductors provides online resources for evaluation boards and its supported devices on <http://www.nxp.com>.

The information page for NAFE33352-UIOM evaluation board is available at <http://www.nxp.com/NAFE33352-UIOM>.

The information page provides overview information, documentation, software and tools, parametrics, ordering information, and a **Get Started** button. The **Get Started** button provides quick-reference information applicable to using the NAFE33352-UIOM evaluation board, including the downloadable assets referenced in this document.

4.1 Collaborate in the NXP community

The NXP community is for sharing ideas and tips, ask and answer technical questions, and receive input on just about any embedded design topic. The NXP community is at <http://community.nxp.com>.

5 Getting ready (GUI-based evaluation)

Working with the NAFE33352-UIOM requires the kit contents, an additional hardware, and a Windows PC workstation with installed software.

5.1 Evaluation kit components

- Assembled and tested evaluation board NAFE33352-UIOM in an antistatic bag
- USB 2.0 cable
- Spare jumpers
- FRDM MCXN947 evaluation board

5.2 Windows PC workstation

This evaluation board requires a Windows PC workstation for excellent results.

- A USB-enabled computer with Windows 7, Windows 8, Windows 10, or Windows 11

5.3 Power requirements

For NAFE33352 UIOM setup, connect a DC power adapter in +7 V to +15 V range to DC power jack (J6) on NAFE33352 UIOM board. Now, connect the PC to the USB port J17 (out of three USB ports J11, J16, and J17) to power up the FRDM MCXN-947 evaluation board.

6 Getting to know the hardware

This section gives a detailed description about the hardware and its related information.

6.1 Board features

Table 1 describes board features of NAFE33352-UIOM.

Table 1. Board features

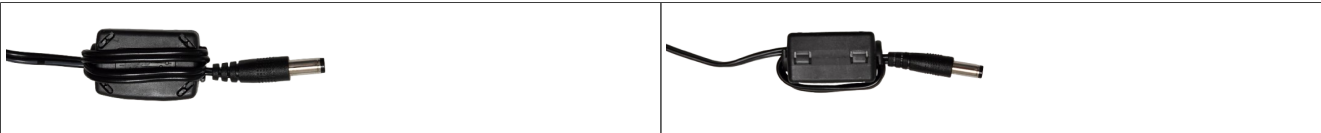
Device	Description	Location
Universal analog input/output SW configurable AIO-AFE	NAFE33352	U2
SPST analog switches	Switches	U8, U9
Linear drop-out regulator	LDO	U4
High-voltage, charge pump DC-DC converter	Charge pump	U3
Quad-channel digital isolators	Digital isolator	U6, U5, U7

6.2 Kit featured components

- A complete evaluation platform for the NAFE33352
- One SW-configurable universal analog input/output and two universal analog inputs
- Easy-to-use GUI-based software demonstrating the capabilities of NAFE33352
- An external power supply to power the NAFE33352 evaluation board
- Convenient test points for easy scope measurements and signal access
- USB interface to the host PC

Important: Proper installation of ferrite block for EMC compliance

- Locate the Würth Elektronik ferrite 74271132 (NXP part number 901-77262) included in your kit.
- The ferrite block must be installed on the end of the power supply output cable that mates to the NAFE33352-UIOM board.
- Open the ferrite block and wrap the power supply input cable around the center (3 turns).
- Ensure that the cable is placed securely and the ferrite block is completely closed.



Notice: The 901-77262 ferrite block must be installed on the board end of the power supply input cable to maintain EMC compliance of NAFE33352-UIOM as previously described. The end user assumes all EMC responsibility for NAFE33352-UIOM if the 901-77262 ferrite block is not used.

6.3 Jumpers

Table 2 describes description of jumpers associated with NAFE33352-UIOM.

Table 2. Jumpers

Setting (default)	Jumper	Comment
1-2 (Closed)	J7	External -15 V supply
Open	J12	RTD biasing supply selection on the board
1-2 (Closed)	J4	AFE address selection
Open	J13, J14	250 Ω resistor control
Open	J15	250 Ω resistor connected to GND

6.4 Configuring the hardware

The NAFE33352 Arduino UIOM kit includes the NAFE33352 evaluation board, an FRDM-MCXN 947, and a USB cable. To set up the hardware, perform the below steps:

Step 1: Firmly connect the NAFE33352 Arduino UIOM board to the FRDM MCXN-947 evaluation board using the Arduino connectors.

Step 2: To connect both boards, slide J8, J9, J10, and J11 male connectors at the bottom side of the NAFE33352 (AFE) evaluation board into the appropriate female connectors on the FRDM MCX-N 947 evaluation board (refer Figure 2).

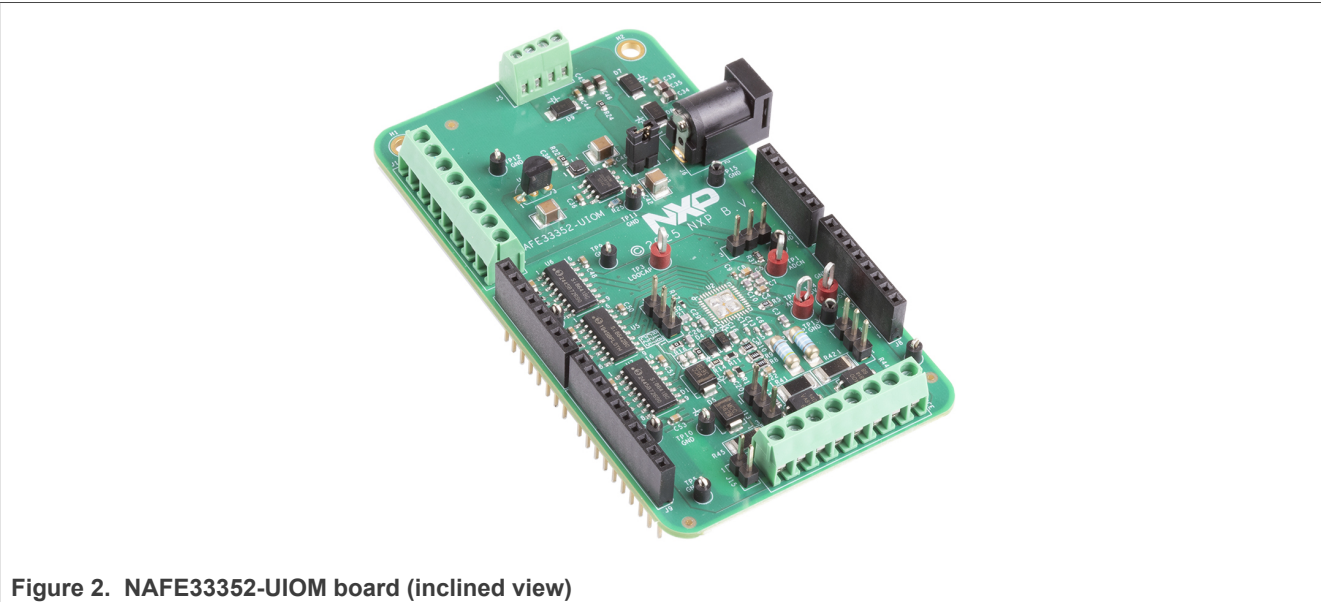


Figure 2. NAFE33352-UIOM board (inclined view)

Step 3: Connect an adapter supply in the +7 V to +15 V range on J6. An approximately 0.4 V accounts for the voltage drop across the Schottky diode for reverse polarity protection and voltage drop across the 5 Ω resistor because of the supply current flowing into the pin of the device.

Step 4: Use a USB to uUSB to connect the PC (USB) to the FRDM MCXN-947.

6.5 Schematics

The figures below depict the schematics for NAFE33352-UIOM.

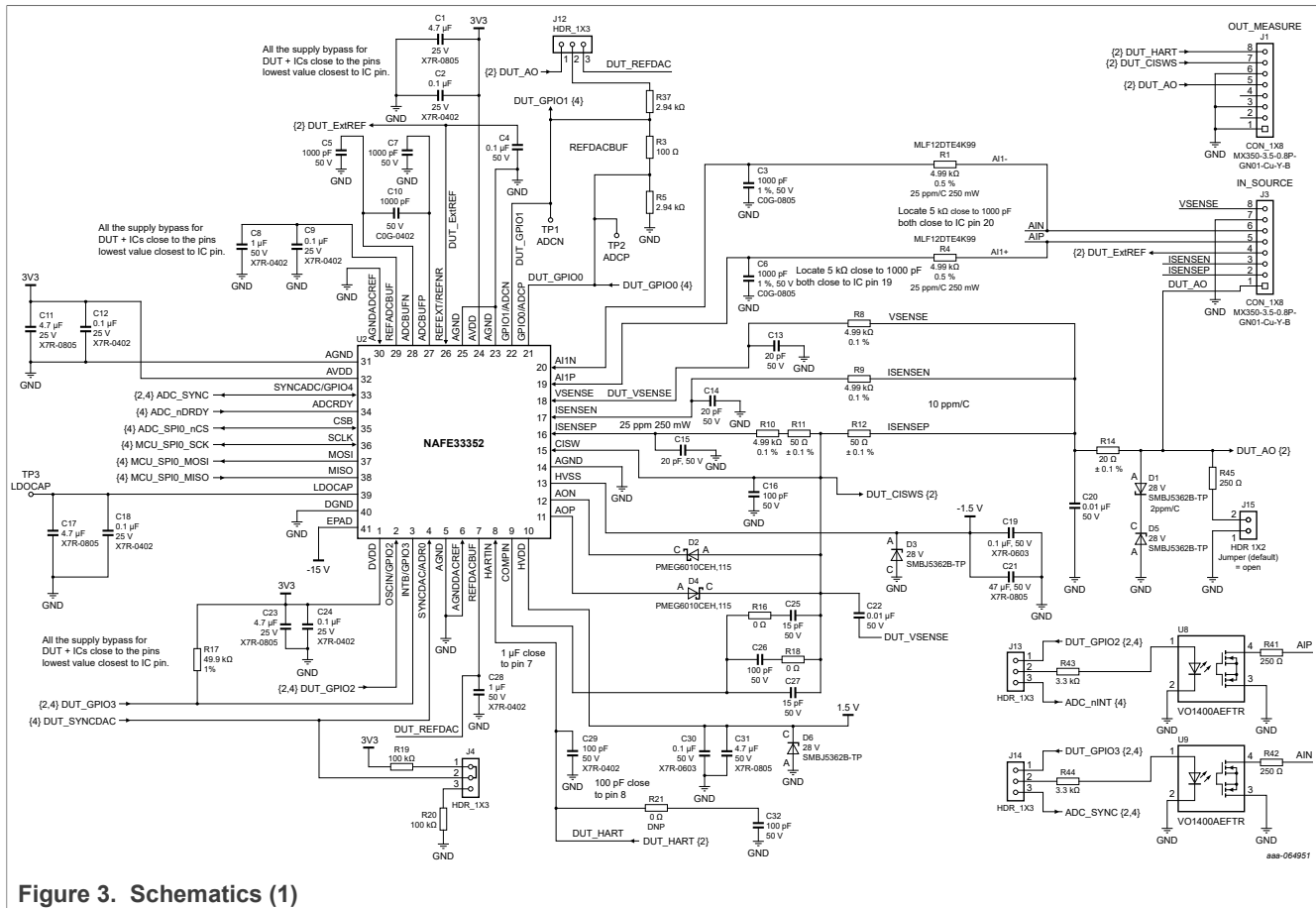


Figure 3. Schematics (1)

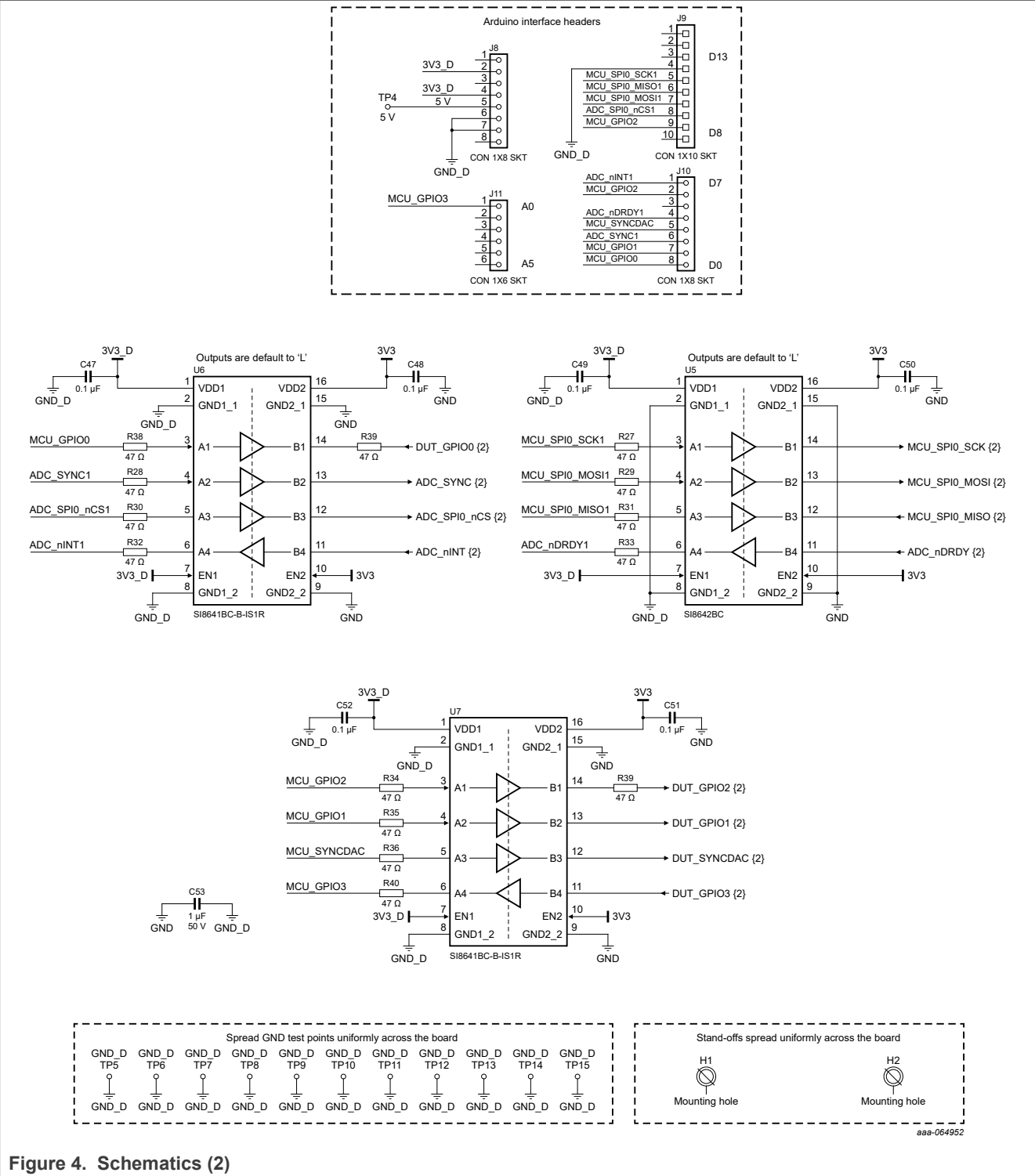


Figure 4. Schematics (2)

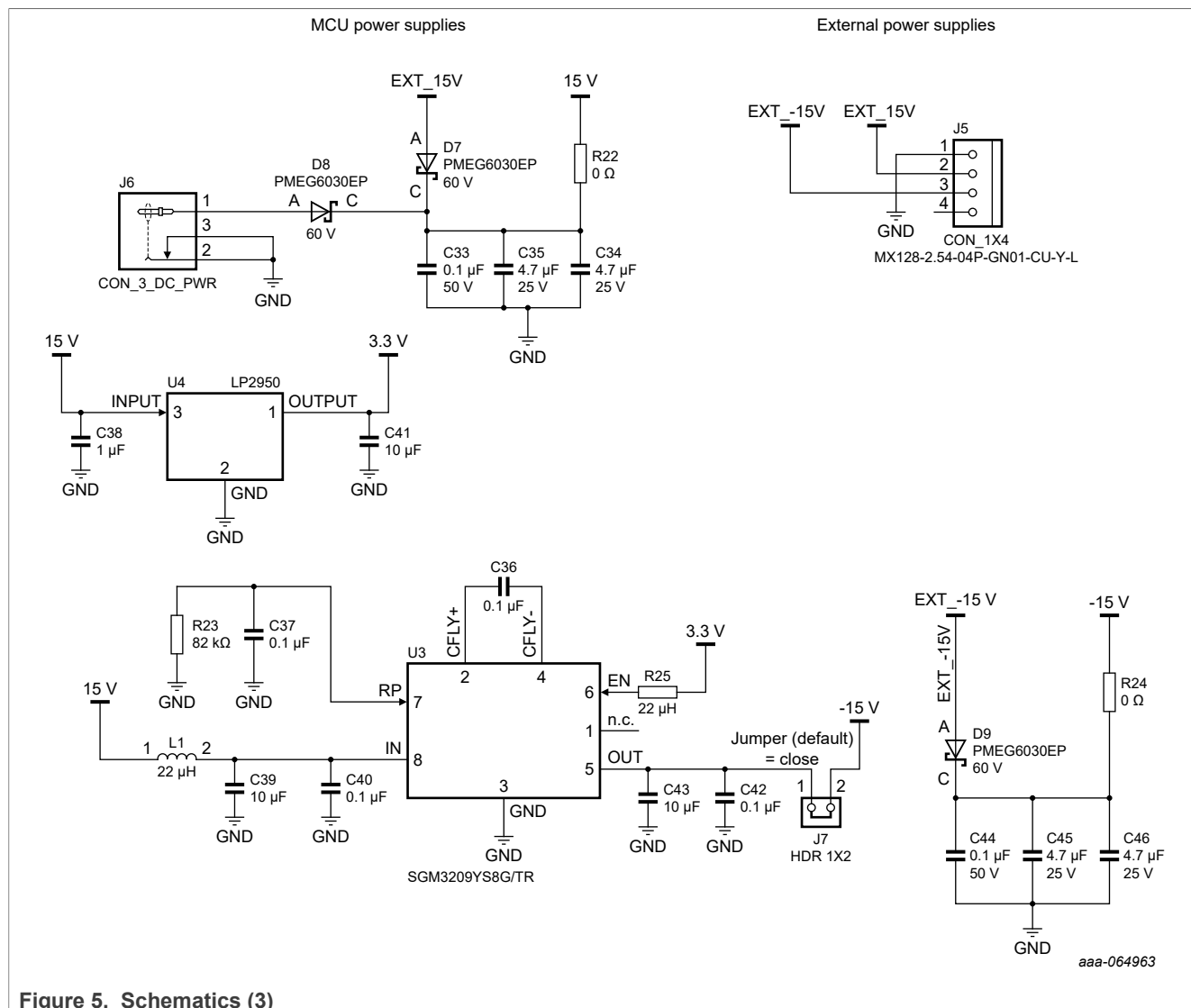
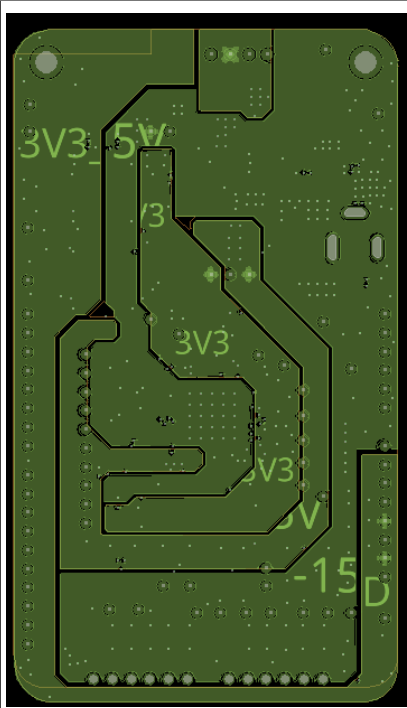
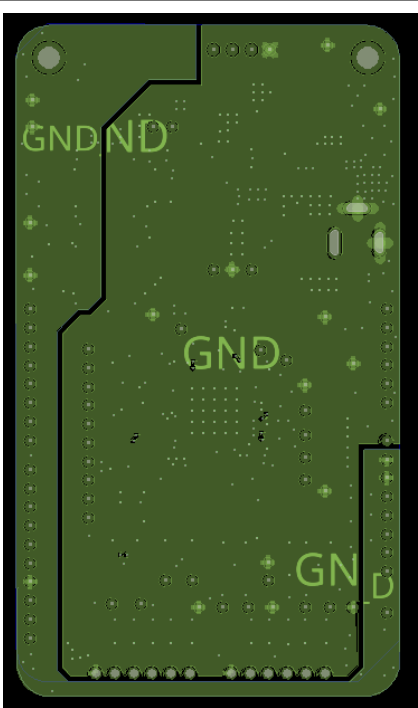
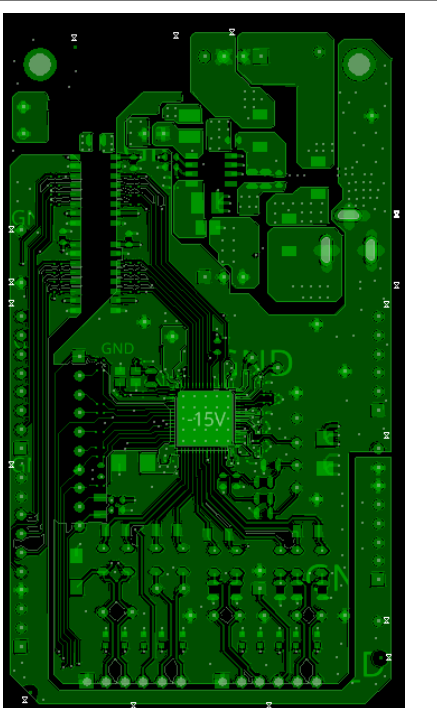
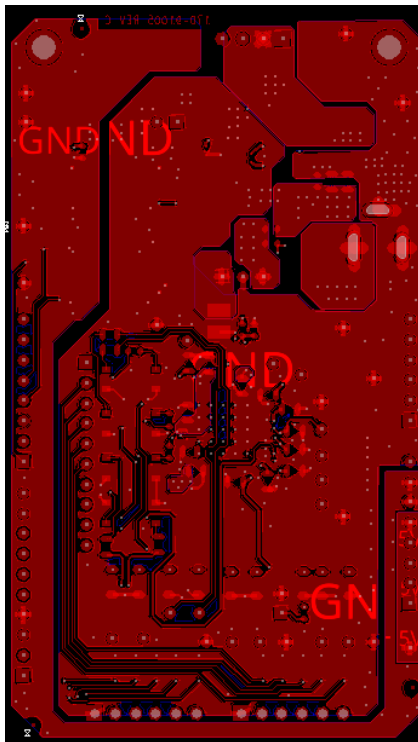


Figure 5. Schematics (3)

6.6 Board layout

This section contains figures that depict the board layout of NAFE33352-UIOM.

		
TOP	GND	PWR
		
BOTTOM		

6.7 Bill of materials

[Table 3](#) describes the bill of materials included in NAFE33352-UIOM.

Table 3. Bill of materials

Item	Quantity	AgilePN	MFG_PN01	MFG_NAME01	ASSY_OPT	Reference	PCB Footprint	Description
1	1	150-78698	06031C103 JAT2A	AVX		C1	CC0603_OV	CAP CER 0.01 μ F 100 V 5 % X7R 0603
2	13	150-81072	C2012X7R1 H475K125AE	TDK		C2, C4, C8, C16, C19, C24, C26, C27, C30, C155, C226, C244, C267	CC0805_OV	CAP CER 4.7 μ F 50 V 10 % X7R 0805
3	17	150-79069	GRM155R71 H104KE14D	MURATA		C3, C5, C7, C9, C11, C17, C18, C21, C23, C25, C28, C32, C227, C261, C263, C264, C265	CC0402_25	CAP CER 0.1 μ F 50 V 10 % X7R 0402
4	1	150-80619	C0805C105 K5RACTU	KEMET		C6	CC0805_OV	CAP CER 1 μ F 50 V 10 % X7R 0805
5	2	150-75680	NMC0402 NPO120J50 TRPF	NIC COMPONENTS CORP		C10, C14	CC0402_25	CAP CER 12 pF 50 V 5 % C0G 0402
6	2	150-79950	GRM1555C1 H102FA01D	MURATA	DNP	C12, C15	CC0402_25	CAP CER 1000 pF 50 V 1 % C0G 0402
7	1	150-79950	GRM1555C1 H102FA01D	MURATA		C13	CC0402_25	CAP CER 1000 pF 50 V 1 % C0G 0402
8	1	150-78520	GRM21BR71 H474KA88L	MURATA		C20	CC0805_OV	CAP CER 0.47 μ F 50 V 10 % X7R 0805
9	1	150-80613	C1005NP01 H101J050BA	TDK		C22	CC0402_25	CAP CER 100 pF 50 V 5 % C0G 0402
10	2	150-79772	CGA3E2 X7R2A103 M080AA	TDK		C33, C34	CC0603_OV	CAP CER 0.01 μ F 100 V 20 % X7R AEC-Q200 0603
11	9	150-81739	12065A102 JAT2A	AVX		C35, C36, C37, C38, C39, C40, C41, C42, C43	CC1206_OV	CAP CER 1000 pF 50 V 5 % C0G 1206
12	2	150-79251	CGA4C2C0 G1H103J060 AA	TDK		C44, C45	CC0805_OV	CAP CER 0.01 μ F 50 V 5 % C0G AEC-Q200 0805
13	6	150-75142	8.85012E+11	WURTH ELEKTRONIK EISOS GMBH and CO. KG (ELECTRONIC and ELE CTROMECHANICAL COMP)		C55, C56, C57, C58, C154, C266	CC0603_OV	CAP CER 0.1 μ F 50 V 10 % X7R 0603
14	2	150-81072	C2012X7R1 H475K125AE	TDK	DNP	C156, C268	CC0805_OV	CAP CER 4.7 μ F 50 V 10 % X7R 0805
15	4	150-78987	GRM31C5C1 H104JA01L	MURATA	DNP	C228, C230, C237, C238	1206_CC	CAP CER 0.1 μ F 50 V 5 % C0G 1206
16	1	150-81745	06035C105 KAT2A	KYOCERA AVX		C251	CC0603_OV	CAP CER 1 μ F 50 V 10 % X7R 0603
17	3	150-79919	CL32B106 KBJNNNE	SAMSUNG		C255, C260, C262	CC1210	CAP CER 10 μ F 50 V 10 % X7R 1210
18	1	150-80619	C0805C105 K5RACTU	KEMET	DNP	C269	CC0805_OV	CAP CER 1 μ F 50 V 10 % X7R 0805
19	1	480-80361	SMAJ30CA	LITTELFUSE	DNP	D10	do-214ac_bidir	DIODE TVS BIDIR 30 V 400 W DO-214AC
20	3	480-79979	RB058LAM-60TFTR	ROHM		D16, D27, D28	sod-128	DIODE SCH RECT 3 A 60V AEC-Q101 SOD128
21	2	480-80358	SMBJ5362 B-TP	MICRO COMMERCIAL COMPONENTS CORP		D17, D23	do-214aa	DIODE ZENER 28 V 5 W DO214AA
22	10	370-76629	LTST-C193 KGKT-5A	LITE ON		D22, D29, D30, D31, D32, D33, D34, D35, D36, D37	LED_0603	LED GRN SGL 30MA 0603
23	2	280-76950	MOUNTING HOLE	NA		H1, H2	MH180-125P	MOUNTING HOLE DRILL 125 PAD 180 PLATED TH, NO PART TO ORDER
24	2	210-83503	SSQ-108-24-G-S	Samtec Inc.		J1, J3	con_skt1x8_th_584l	CON 1X8 SKT TH 100MIL SP 340H AU 584L
25	1	210-83501	SSQ-110-24-G-S	Samtec Inc.		J2	con_skt1x10_th_584l	CON 1X10 SKT TH 100MIL SP 340H AU 584L
26	1	210-83500	SSQ-106-24-G-S	Samtec Inc.		J4	con_skt1x6_th_584l	CON 1X6 SKT TH 100MIL SP 340H AU 584L

NAFE33352-UIOM Analog Sensing and Control Platform

Table 3. Bill of materials...continued

Item	Quantity	AgilePN	MFG_PN01	MFG_NAME01	ASSY_OPT	Reference	PCB Footprint	Description
27	1	210-83228	KLDHCX-0202-A-LT	Kycon		J7	con3_dcpwr_jack_th_ra	CON 3 PWR JACK TH SP 447H -- 138L
28	1	210-81454	HTSW-110-07-G-S	SAMTEC		J81	hdr110	HDR 1X10 TH 100MIL SP 338H AU 100L
29	2	210-80836	OSTVN06 A150	ON-SHORE TECHNOLOGY		J82, J83	con_6p_tb_2p54mm_th	CON 1X6 TB TH 100MIL SP 346H SN 138L
30	1	210-10004	1546215-4	TE Connectivity		J89	con_4p_tb_2p54mm_th_a	CON 1X4 TB TH 2.54MM SP 394H SN 134L
31	2	210-75439	TSW-102-07-G-S	SAMTEC		J90, J91	hdr102_338h	HDR 1X2 TH 100MIL SP 339H AU 98L
32	1	180-81732	SPH252012 H220MT	SHENZHEN SUNLORD ELECTRONICS CO., LTD		L1	ind_sph2520	IND WW PWR 22 μ H@1MHZ 0.45 A 20 % 2520
33	22	470-30709	CR02FL6---47R	THYE MING TECH CO LTD		R2, R3, R4, R5, R6, R7, R8, R9, R26, R27, R28, R29, R30, R31, R72, R73, R74, R75, R79, R132, R141, R164	RC0402_25	RES MF 47 Ω 1/16W 1 % 0402
34	3	470-80526	RK73H1 JTDD1002F	KOA SPEER		R20, R21, R232	RC0603_OV	RES MF 10K 1/10W 1 % AEC-Q200 0603
35	1	470-82685	RNCF0805 TKY100R	STACKPOLE ELECTRONICS		R22	RC0805_OV	RES MF 100 Ω 1/8W 0.01 % AEC-Q200 0805
36	2	470-30801	RK73H1 ETP4300F	KOA SPEER		R24, R25	RC0402_25	RES MF 430 Ω 1/10W 1 % AEC-Q200 0402
37	2	470-10205	RT0603 BRB072K94L	YAGEO AMERICA		R32, R34	RC0603_OV	RES MF 2.94K 1/10W 0.1 % 0603
38	1	470-82687	32207605	Heraeus Sensor Technology GmbH		R33	rc_0805v_rtd	RES PLATINUM RTD SENSOR 100 Ω 0.3 % --- 0805
39	9	470-80878	RC1206FR-072K4L	YAGEO		R37, R38, R39, R40, R41, R42, R43, R44, R45	RC1206_OV	RES MF 2.4K 1/4W 1 % 1206
40	2	470-82688	RNCF0805 TKY1K00	STACKPOLE ELECTRONICS		R46, R47	RC0805_OV	RES MF 1K 1/8W 0.01 % AEC-Q200 0805
41	5	470-82761	CPF0805B2 M0E1	TE Connectivity Ltd	DNP	R48, R49, R50, R51, R52	RC0805_OV	RES MF 2.0M 1/10W 0.1 % 0805
42	3	470-81264	RC0603JR-070RL	YAGEO AMERICA		R183, R223, R235	RC0603_OV	RES TF ZERO Ω 1/10W 5 % 0603
43	4	470-82684	RNCF0805 TKY250R	STACKPOLE ELECTRONICS		R230, R238, R240, R242	RC0805_OV	RES MF 250 Ω 1/8W 0.01 % AEC-Q200 0805
44	1	470-83430	CR0603-FX-8202ELF	BOURNS		R233	RC0603_OV	RES MF 82K 1/10W 1 % 0603
45	4	470-81654	AC0603FR-073K3L	YAGEO AMERICA		R236, R237, R239, R241	RC0603_OV	RES MF 3.3K 1/10W 1 % AEC-Q200 0603
46	6	210-75684	5000	KEYSTONE ELECTRONICS		TP1, TP2, TP5, TP6, TP7, TP44	TEST_LOOP	TEST POINT RED 40 MIL DRILL 180 MIL TH 109L
47	10	210-80626	5116	KEYSTONE ELECTRONICS		TP9, TP10, TP11, TP12, TP13, TP14, TP15, TP16, TP21, TP22	TEST_LOOP	TEST POINT GREEN 40 MIL DRILL 180 MIL TH 120L
48	14	210-75683	5001	KEYSTONE ELECTRONICS		TP17, TP20, TP32, TP33, TP34, TP35, TP36, TP37, TP38, TP39, TP40, TP41, TP42, TP43	TEST_LOOP	TEST POINT BLACK 40 MIL DRILL 180 MIL TH 109L
49	1	TMP-CIP-7486	NAFE13388 B40BSE	NXP		U1	hvfqn64_0p5_9x9_ep7p1	IC MULTI CHANNEL ANALOG INPUT AFE 3-3.6V HVQFN64
50	1	312-83860	SI8641BC-B-IS1R	Skyworks Solutions Inc.		U7	soic16_1p27_10x4	IC DIGITAL ISOLATOR 4CH 2.5-5.5V AEC-Q100 SO16
51	1	312-82959	SI8642BC-B-IS1	SILICON LABORATORIES		U8	soic16_1p27_10x4	IC DIGITAL ISOLATOR 4CH 3.75 kV 2.5-5.5V AEC-Q100 SO16
52	1	315-10043	LP2950-33 LPRE3	Texas Instruments		U18	to92_2p6_formed	IC LIN VREG LDO 3.3 V 0.1 A 30 V 1.4 % TO92-3
53	1	315-84318	SGM3209 YS8G/TR	SG MICRO CORP		U20	SO8_1P27_4X5	IC DC-DC CHR9 PUMP -3 TO -18 V 0.1 A 3-18V SOIC8
54	4	315-10130	VO1400 AEFTR	VISHAY		U21, U22, U25, U26	sop-4	IC RELAY SPST NO 100 mA 60 V SOP4
55	1	230-78432	ECS-184-12-33Q-JES-TR	ECS		X1	xtlosc4_3p2x2p5mm_sm	XTAL 18.432 MHz 20 ppm 12 pF AEC-Q200 SMT

7 NAFE33352-UIOM evaluation with NAFE33352-UIOM GUI

This section provides NAFE33352-UIOM installation requisites and instructions to install the same.

7.1 Installing the software for GUI operation

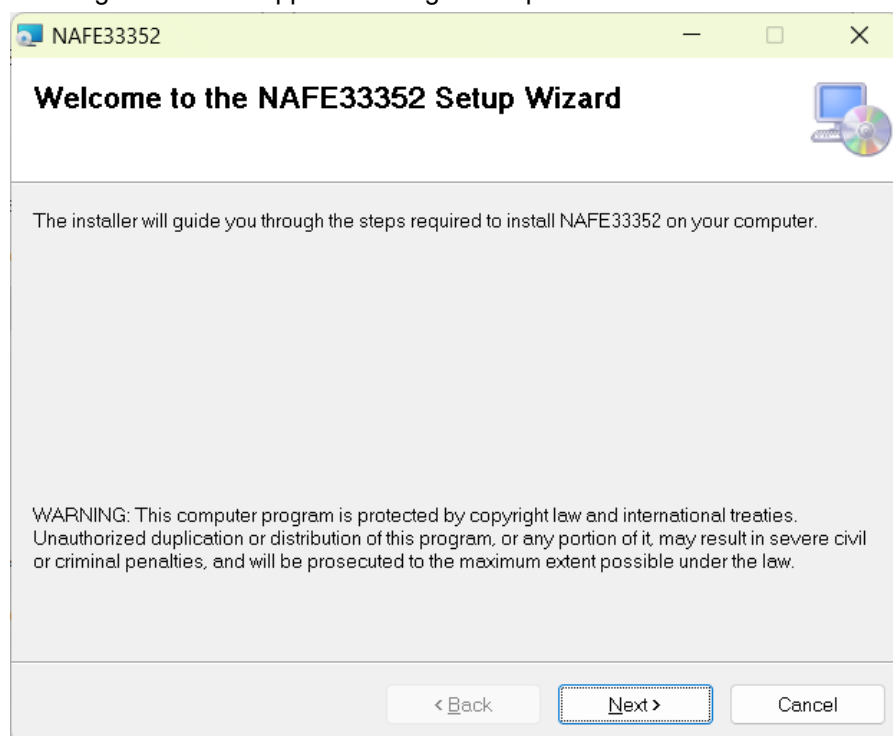
- Download and install the NAFE33352-UIOM GUI software.

7.2 NAFE33352-UIOM applications

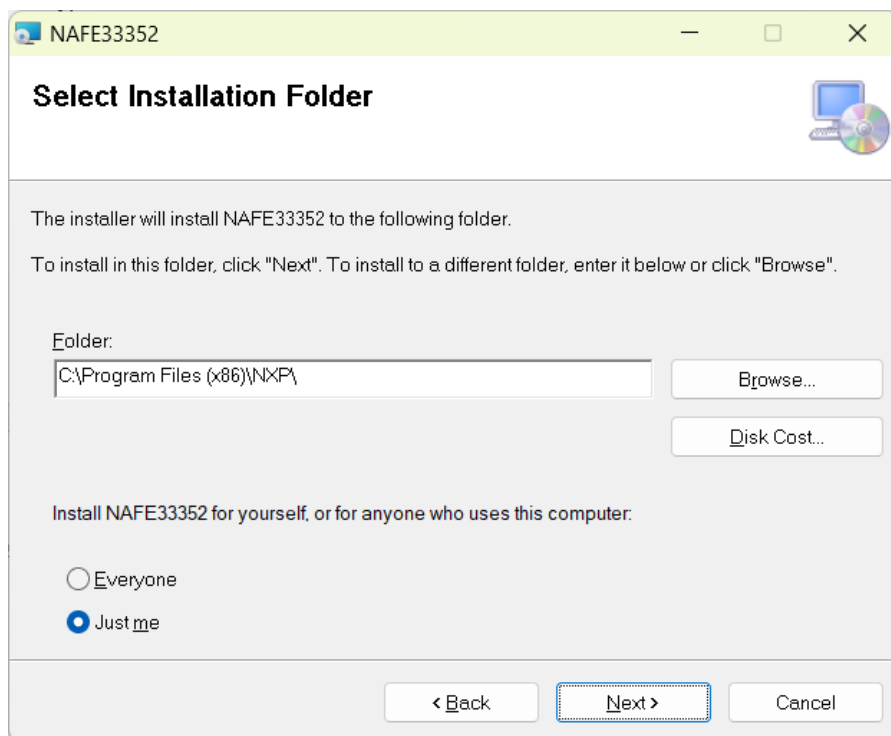
The GUI provides NAFE33352-UIOM example codes and a detailed overview about hardware and software steps to evaluate NAFE33352-UIOM.

Follow the steps given below to install the NAFE33352-UIOM GUI.

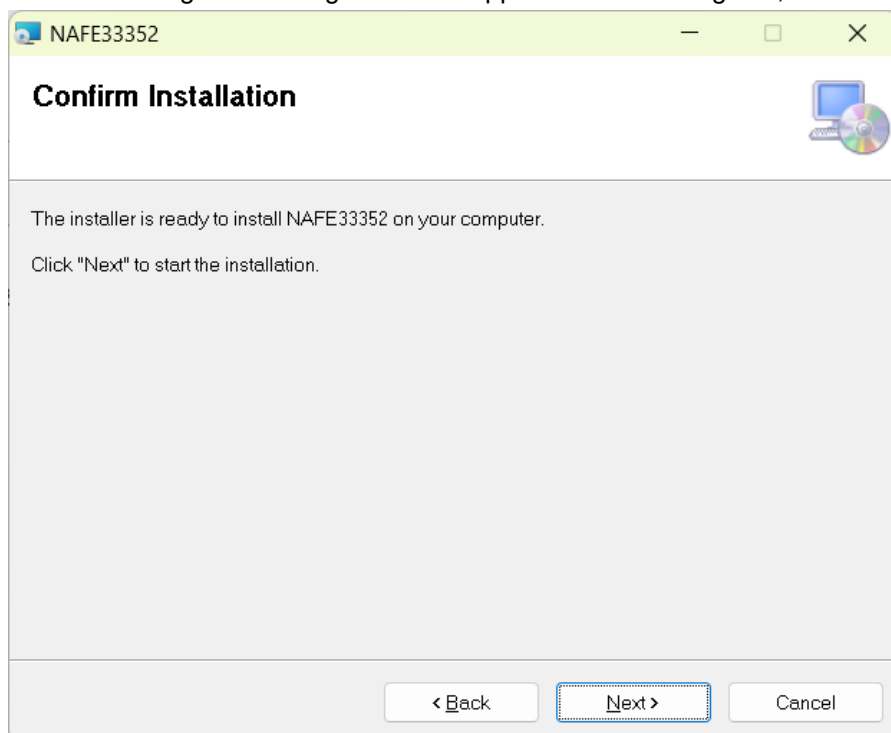
1. Running the installer application begins the process. Click **Next**.



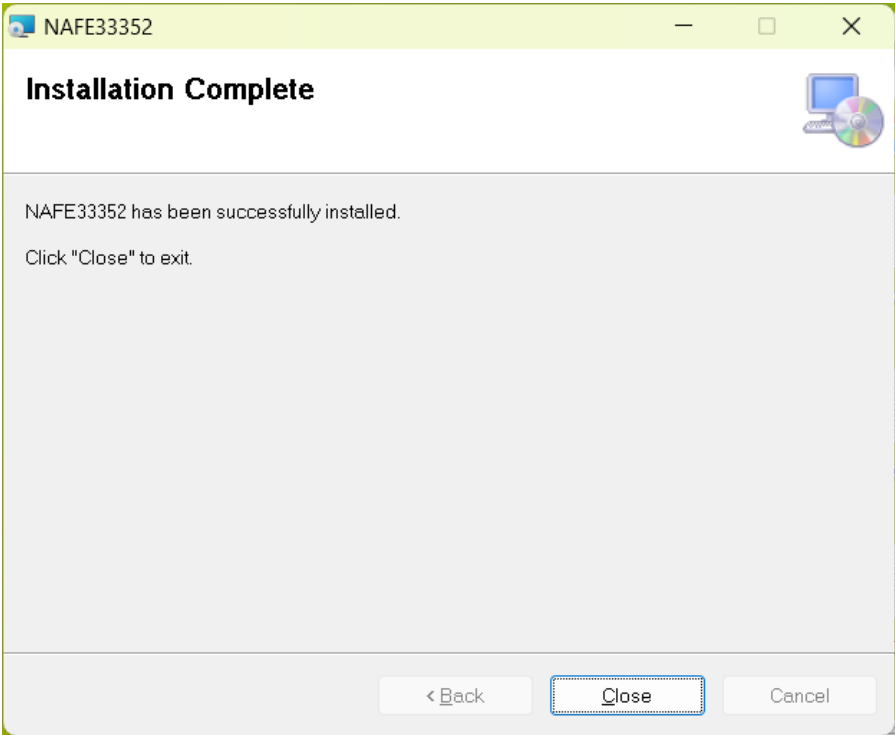
2. Select the installation location by clicking **Browse**. Select the user for NAFE33352-UIOM by selecting **Everyone/Just me** and click **Next**.



3. After confirming the message that now appears on the dialog box, click **Next** to begin the installation.



4. After the installation is complete, a dialog box displays the **Installation Complete** message. Click **Close** to close the dialog box.



5. After the installation is complete, check the NAFE33352-UIOM GUI guide to configure NAFE33352 and run different applications. For running on-board RTD applications, a few hardware modifications are needed. Remove resistor R39 and cut the trace connected to pin 13 of U7.
Note: When using an external -15 V supply, the polarity of diode D9 must be reversed for proper operation.

8 Acronyms

[Table 4](#) describes the acronyms used in this user manual.

Table 4. Acronyms

Acronym	Description
ADC	Analog-to-Digital Converter
AEC	Automotive Electronics Council
AFE	Analog Front End
CMSIS	Cortex Microcontroller Software Interface Standard
COMP	Comparator
DAC	Digital-to-Analog Converter
DNP	Do Not Populate
EMC	ElectroMagnetic Compatibility
GPIO	General-Purpose Input/Output
HDR	Header
LDO	Low Dropout Regulator
LIN	Local Interconnect Network
MF	Multi-Function

Table 4. Acronyms...continued

Acronym	Description
MIL	Military Standard
NIC	Network Interface Controller
PCB	Printed Circuit Board
RTD	Resistance Temperature Detector
SG	Strain Gauge
SMT	Surface-Mount Technology
SP	Single Pole
SPI	Serial Peripheral Interface
SPST	Single Pole Single Throw
TVS	Transient Voltage Suppressor

9 Revision history

[Table 5](#) summarizes the revisions to this document.

Table 5. Revision history

Document ID	Release date	Description
UM12469 v.1.0	27 April 2026	Initial public release

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