MAX32690FTHR

Evaluates: MAX32690

General Description

The MAX32690FTHR board is a rapid development platform to help engineers quickly implement battery optimized Bluetooth® 5.2 Low Energy (LE) solutions with the MAX32690 Arm® Cortex®-M4 processor.

The form factor is a small 0.9-inch by 2.47-inch dual-row header footprint compatible with Adafruit Feather Wing peripheral expansion boards.

The board features the MAX77654 PMIC for efficient battery and power management, a CAN transceiver with a dedicated interface connector, an RGB indicator LED, and two user pushbuttons.

MAX32690FTHR EV Kit Contents

- MAX32690FTHR Board
- MAX32625PICO Debugger with Cables
- Feather Form Factor Compatible 12-pin and 16-pin Male Headers
- USB Micro-B Cable
- Insert Card

Features

- MAX32690 Arm® Cortex® -M4F with FPU up to 120MHz
- 3.25MB Flash Memory
- 1MB SRAM
- Bluetooth 5.2 LE with Integrated PCB Antenna
- High-Speed USB 2.0
- QSPI, UART, CAN 2.0B, I^2C, I2S, 1-Wire Master® Interfaces
- 12-bit ADC
- PMIC
- RGB Indicator LED
- 2 General-purpose Pushbutttons

Ordering Information

PART	TYPE
MAX32690FTHR#	Evaluation Board

PRELIMINARY

One Analog Way, Wilmington, MA 01887-2356, U.S.A. | Tel: 781.329.4700 | ©2024 Analog Devices, Inc. All rights reserved.

MAX32690FTHR Board

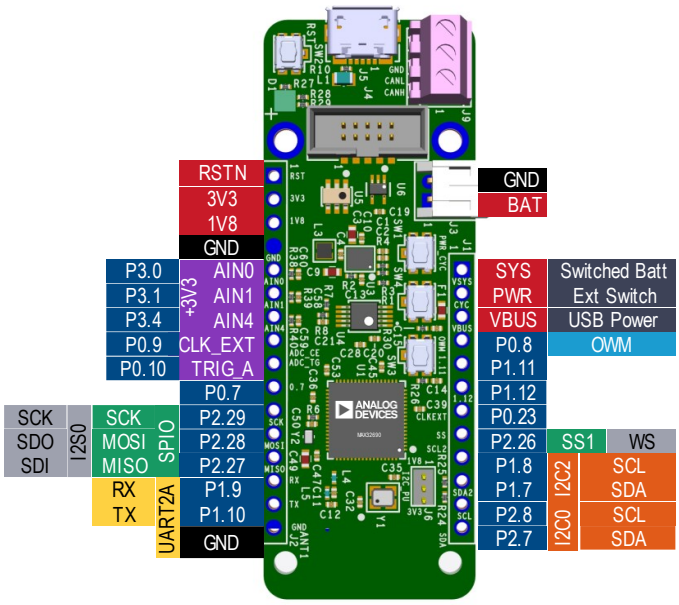


Figure 1. MAX32690FTHR Board – Top

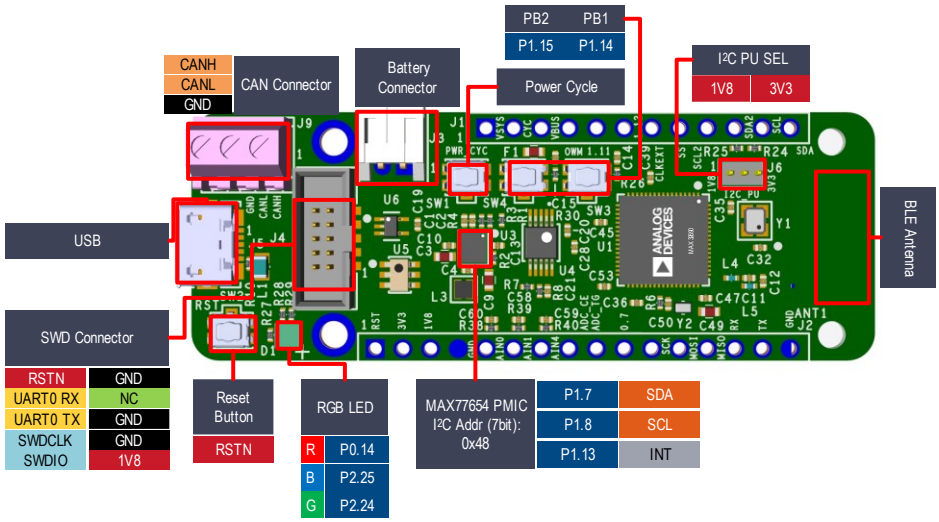


Figure 2. MAX32690FTHR Board - Bottom

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Quick Start

Required Equipment

- MAX32690FTHR Board containing a MAX32690 with a Preprogrammed Demo
- One USB Standard-A to USB Micro-B Cable

Procedure

The FTHR board is fully assembled and tested. Use the following steps to verify board operation:

1. While observing safe ESD practices, carefully remove the board from its packaging. Inspect the board to ensure that no damage occurred during shipment. Shunts are preinstalled before testing and packaging.
2. The target microcontroller is preprogrammed with the demo code. To run the demo, power up the board by plugging the USB cable into the Connector J5. Connect the other end of the USB cable to a computer or power adapter.
3. Once power is applied to the board, the demo automatically starts and begins flashing RGB LED D1. This indicates that the microcontroller is executing code and that the simple demo is running as expected. The demo also sends a "Hello World" message followed by a counter. To view this message, connect the MAX32625PICO (included in the box) to the SWD connector (J4) on the MAX32690FTHR board. Then, set up a serial terminal at 115200 baud rate on the MAX32625PICO board's COM port.

Now that the programmed demo has run successfully, the next step is to visit the MAX32690 solution center at developer.analog.com.

MAX32625PICO Debugger

A MAX32625PICO debugger is provided for programming and debugging the target microcontroller through the SWD interface. Furthermore, the MAX32625PICO also serves as a UART bridge, providing serial terminal functionality without the need of an additional USB cable.

This FTHR kit includes a USB cable for connecting the MAX32625PICO debugger to a PC and a ribbon cable for connecting the MAX32625PICO debugger to J4 of the EV kit.

For more detailed information about the MAX32625PICO, refer to the MAX32625PICO data sheet.

Detailed Description of Hardware

Power supply

The FTHR board is powered by +5V through V_{BUS} on the USB Micro-USB connector (J5), which sources the onboard PMIC and LDO regulators. The PMIC (MAX77654) generates the +1.8V, +3.3V, and BLE_LDO_IN voltages required by the MAX32690 using its integrated buck converters and LDO. It is also capable of charging a Li-ion battery (not included) connected to the J3.

In addition to the PMIC, two LDOs generate the +1.1V V_{CORE} and +3.3V V_{DDB} supplies for the MAX32690. Although the PMIC is capable of generating these voltage levels, additional LDOs are used to ensure proper USB functionality and power-up/power-down sequencing.

The MAX8511 (U6) ensures that the V_{DDB} rail of the MAX32690 is powered only when the V_{BUS} signal is present, while the MAX8561(U4) is used to ensure the correct sequencing of the V_{DDIO} and V_{CORE} supplies.

For more information on the supply sequencing, please check the latest MAX32690 Errata Sheet.

Bluetooth 5.2 Interface

The microcontroller's integrated Bluetooth Low Energy (BLE) 5.2 LE radio is connected to the onboard meandered printed inverted-F antenna (IFA), enabling efficient wireless communication.

CAN 2.0B

The three-screw lug terminal block (J9) allows for connection to a CAN communications bus through the LTC2875HS8 transceiver (U8).

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Clocking

The crystals provide a time base for the two internal oscillators. A 32MHz crystal (Y1) is the clock source for digital logic and peripherals, and a 32.768kHz crystal (Y2) is for RTC operations.

Serial Wire Debug (SWD)

An Arm® debug access port (DAP) provides an external interface for debugging during application development. The DAP is a standard Arm CoreSight® serial wire debug port, uses a two-pin serial interface (SWDCLK and SWDIO), and is accessed through 10-pin header (J4). In addition, the UART0A port can also be accessed through J4.

GPIO and Alternate Function Headers

General-purpose I/O (GPIO) and alternate function signals from the microcontroller can be accessed through the feather form factor compatible 12-pin (J1) and 16-pin (J2) headers. The MAX32690 has dual I/O supply rails, and all of the general-purpose digital I/O ports can be set individually to use either rail.

The primary V_{DDIO} rail is supplied from the 1.8V supply, and the V_{DDIOH} rail is connected to the 3.3V. The I^2C pullups can also be selected between 1.8V and 3.3V through the jumper J6.

Please refer to Table 1 and Table 2 for the pinout and detailed pin description of J1 and J2, respectively.

Table 1. J1 Pinout

Pin	Name	Description
1	V_{SYS}	SYS Switched Connection to the Battery. This is the primary system power supply and automatically switches between the battery voltage and the USB supply when available.
2	PWR_CYCLE_EN	Connects to PMIC's active low enable input. Acts as a manual reset for the PMIC and forces a power down/up sequence when asserted for 8 seconds.
3	V_{BUS}	USB VBUS Signal. This can be used as a 5V output when connected to USB. This pin can also be used as an input to power the board.
4	P0.8	GPIO; 1-Wire Controller Data (OWM_IO); Timer1 Port Map B Input/Output Upper 16-Bits Only (TMR1B_IOB)
5	P1.11	GPIO; SPI4 Port Map A Target Select 2 (SPI4A_SS2)
6	P1.12	GPIO; Pulse Train 5 (PT5)
7	P0.23	GPIO; Pulse Train 15 (PT15); I2S0 Port Map B External Clock Input (I2S0B_CLKEXT). This device pin can also be configured as an input to provide a clock source for the SYS_CLK.
8	P2.26	GPIO; SPI0 Port Map B Target Select 1 (SPI0B_SS1); I2S0 Port Map C Left/Right Word Select (I2S0C_WS)
9	P1.8	GPIO; UART2 Port Map A Request to Send (UART2A_RTS); Pulse Train 2; I2C2 Port Map C Serial Clock (I2C2C_SCL) Also connects to PMIC I2C interface.
10	P1.7	GPIO; UART2 Port Map A Clear to Send (UART2A_CTS); Pulse Train 1; I2C2 Port Map C Serial Data (I2C2C_SDA) Also connects to PMIC I2C interface.
11	P2.8	GPIO; I2C0 Port Map A Serial Clock (I2C0_SCL)
12	P2.7	GPIO; I2C0 Port Map A Serial Data(I2C0_SDA)

Table 2. J2 Pinout

Pin	Name	Description
1	RSTN	Master Reset Signal

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2	3.3V	3.3V Output. Typically used to provide 3.3V to peripherals connected to the expansion headers.
3	1.8V	1.8V Output. Typically used to provide 1.8V to peripherals connected to the expansion headers.
4	GND	Ground
5	P3.0	GPIO; ADC Input 0/Comparator 0 Negative Input (AIN0/AIN0N); Low-Power UART0 Port Map B Receive (LPUART0B_RX)
6	P3.1	GPIO; ADC Input 1/Comparator 0 Positive Input (AIN1/AIN0P); Low-Power UART0 Port Map B Transmit (LPUART0B_TX)
7	P3.4	GPIO; ADC Input 4/Comparator 2 Negative Input (AIN4/AIN2N); Low-Power Timer0 Port Map B Input/Output 32-Bits or Lower 16-Bits (LPTMR0B_IOA)
8	P0.9	GPIO; ADC External Clock Input (ADC_CLK_EXT); Timer0 Port Map C Input/Output 32-Bits or Lower 16-Bits Only Inverted Output (TMR0C_IOAN)
9	P0.10	GPIO; ADC Trigger Input (ADC_TRIG_A); Timer0 Port Map C Input/Output Upper 16-Bits Only Inverted Output (TMR0C_IOBN)
10	P0.7	GPIO; 1-Wire Controller Pull-up Enable (OWM_PE); Timer1 Port Map B Input/Output 32-Bits or Lower 16-Bits Only (TMR1B_IOA)
11	P2.29	GPIO; Pulse Train 0 (PT0); SPI0 Port Map B Serial Clock (SPI0B_SCK); I2S0 Port Map C Serial Clock (I2S0C_SCK)
12	P2.28	GPIO; Pulse Train 14 (PT14); SPI0 Port Map B Controller Out Target In/Data 0 (SPI0B_MOSI); I2S0 Port Map C Serial Data Out (I2S0C_SDO)
13	P2.27	GPIO; Pulse Train 13 (PT13); SPI0 Port Map B Controller In Target Out/Data 1 (SPI0B_MISO); I2S0 Port Map C Serial Data In (I2S0C_SDI)
14	P1.9	GPIO; UART2 Port Map A Receive (UART2A_RX); Pulse Train 3 (PT3)
15	P1.10	GPIO; UART2 Port Map A Transmit (UART2A_TX); Pulse Train 4 (PT4)
16	GND	Ground

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Reset Pushbutton

The reset pushbutton (SW2) momentarily pulls the RSTN pin low. RSTN is internally pulled up to V_{DDIO}. Refer to the Electrical Characteristics table in the device data sheet for resistance value R_{PU1} and R_{PU2}.

General-purpose Pushbuttons

General-purpose pushbuttons PB1 and PB2 are connected to GPIOs P1.14 and P1.15, respectively. If the pushbutton is pressed, the attached port pin is pulled low.

Power Cycle Pushbutton

Power cycle pushbutton (SW1) is connected to the PMIC's nEN enable input pin and it serves as a manual reset for the PMIC when pressed for 8 seconds. The enable pin is also connected to pin 2 of the J1 header.

For more information on the PMIC's manual reset, please check MAX77654 datasheet.

Indicator LED

The general-purpose indicator RGB LED (D1) is driven by the GPIOs P0.14 (Red), P2.25 (Blue), and P2.24 (Green).

UART Interface

There are three UART interfaces on the board. The first, UART0, can be accessed through the SWD connector (J4). When connected to this connector, the MAX32625PICO board provides a USB Communication Device Class (CDC) virtual serial port via the UART0 interface. The second and third interfaces, UART2 and LPUART0, are accessible through pins 14 and 15 and pins 5 and 6 of the J2 connector, respectively.

MAX32690FTHR Bill of Materials

ITEM	REF_DES	DNI/DNP	QTY	MFG PART #	MANUFACTURER	VALUE	DESCRIPTION
1	C1, C10, C21	-	3	ZRB15XR61A475ME01; CL05A475MP5NRN;GRM155R61A475MEAA; C1005X5R1A475M050BC	MURATA; SAMSUNG; MURATA; TDK	4.7UF	CAP; SMT (0402); 4.7UF; 20%; 10V; X5R; CERAMIC
2	C2, C6, C8, C18-C20, C28, C36, C39, C40, C42, C45-C48, C50-C53	-	19	C0402C105K8PAC; CC0402KRX5R6BB105	KEMET; YAGEO	1UF	CAP; SMT (0402); 1UF; 10%; 10V; X5R; CERAMIC
3	C3, C5, C7, C9	-	4	C1608X5R1A226M080AC; GRM188R61A226ME15; CL10A226MPCNUBE; CL10A226MPMNUB; GRM187R61A226ME15	TDK; MURATA; SAMSUNG; SAMSUNG; MURATA	22UF	CAP; SMT (0603); 22UF; 20%; 10V; X5R; CERAMIC
4	C4	-	1	GRM155R71H332KA01	MURATA	3300PF	CAP; SMT (0402); 3300PF; 10%; 50V; X7R; CERAMIC
5	C11	-	1	GJM1555C1HR30BB01	MURATA	0.3PF	CAP; SMT (0402); 0.3PF; +/-0.1PF; 50V; C0G; CERAMIC
6	C13-C17, C43, C61	-	7	GRM155R71E104KE14; C1005X7R1E104K050BB; TMK105B7104KVH; CGJ2B3X7R1E104K050BB	MURATA; TDK; TAIYO YUDEN; TDK	0.1UF	CAP; SMT (0402); 0.1UF; 10%; 25V; X7R; CERAMIC
7	C32, C35	-	2	C0402C0G500-120JNP	VENKEL LTD.	12PF	CAP; SMT (0402); 12PF; 5%; 50V; C0G; CERAMIC
8	C37	-	1	C0402C472J5RAC;0402B472J500C	KEMET; WALSIN TECHNOLOGY CORPORATION	4700PF	CAP; SMT (0402); 4700PF; 5%; 50V; X7R; CERAMIC
9	C49	-	1	GRM188D71A106MA73	MURATA	10UF	CAP; SMT (0603); 10UF; 20%; 10V; X7T; CERAMIC
10	C58-C60	-	3	C0402C300J5GAC; GRM1555C1H300JA01; CL05C300JB5NNN	KEMET; MURATA; SAMSUNG ELECTRONICS	30PF	CAP; SMT (0402); 30PF; 5%; 50V; C0G; CERAMIC
11	D1	-	1	SML-LX0404SIUPGUSB	LUMEX OPTO COMPONENTS INC	SML-LX0404SIUPGUSB	DIODE; LED; SML; FULL COLOR; WATER CLEAR LENS; RED-GREEN-BLUE; SMT; VF=2.95V; IF=0.1A

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12	F1	-	1	0494.500NRHF	LITTELFUSE	0.5A	FUSE; SMT (0603); FAST ACTING; IC=0.5A; VC=32V
13	J3	-	1	S2B-PH-K-S(LF)(SN)	JST MANUFACTURING	S2B-PH-K-S(LF)(SN)	CONNECTOR; MALE; THROUGH HOLE; 2.0MM PITCH; DISCONNECTABLE CRIMP STYLE CONNECTOR; SIDE ENTRY TYPE; RIGHT ANGLE; 2PINS
14	J4	-	1	3220-10-0300-00	CNC TECH LLC	3220-10-0300-00	EVKIT-PART - CONNECTOR; MALE; SMT; 3220 SERIES; 1.27MM PITCH; IDC BOX HEADER CONNECTOR; STRAIGHT; 10PINS
15	J5	-	1	47346-0001	MOLEX	47346-0001	CONNECTOR; FEMALE; SMT; 47346 SERIES; RIGHT ANGLE; 5PINS
16	J6	-	1	FTS-103-01-L-S	SAMTEC	FTS-103-01-L-S	CONNECTOR; MALE; THROUGH HOLE; MICRO LOW PROFILE TERMINAL STRIP; STRAIGHT; 3PINS
17	J9	-	1	282834-3	TE CONNECTIVITY	282834-3	CONNECTOR; FEMALE; THROUGH HOLE; 2.54MM PITCH; SIDE WIRE ENTRY STACKING TERMINAL BLOCK ; STRAIGHT; 3PINS
18	L1	-	1	BLM21PG221SN1	MURATA	220	INDUCTOR; SMT (0805); FERRITE-BEAD; 220; TOL=+/-25%; 0.2A
19	L2	-	1	HZ1206C202R-10	LAIRD TECHNOLOGIES	2000	INDUCTOR; SMT (1206); FERRITE-BEAD; 2000; TOL=+/-25%; 0.3A
20	L3	-	1	7.44E+10	WURTH ELECTRONICS INC	1.5UH	INDUCTOR; SMT; SHIELDED; 1.5UH; TOL=+/-30%; 0.95A
21	L4	-	1	LQG15WZ5N1B02	MURATA	5.1NH	INDUCTOR; SMT (0402); CERAMIC; 5.1NH; 0.1NH; 0.8A

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22	L5	-	1	LQG15WZ5N6B02	MURATA	5.6NH	INDUCTOR; SMT (0402); CERAMIC; 5.6NH; 0.1NH; 0.8A
23	R1, R2, R24, R25, R27-R29	-	7	CRCW04023K30FK	VISHAY DALE	3.3K	RES; SMT (0402); 3.3K; 1%; +/-100PPM/DEGC; 0.0630W
24	R3, R4	-	2	CRCW0402100KFK; RC0402FR-07100KL	VISHAY; YAGEO	100K	RES; SMT (0402); 100K; 1%; +/-100PPM/DEGC; 0.0630W
25	R5	-	1	CRCW1206120RFK; MCR18EZPF1200; ERJ-8ENF1200	VISHAY DALE; ROHM; PANASONIC	120	RES; SMT (1206); 120; 1%; +/-100PPM/DEGC; 0.2500W
26	R6	-	1	RC0402FR-071KL; MCR01MZPF1001	YAGEO; ROHM SEMICONDUCTOR	1K	RES; SMT (0402); 1K; 1%; +/-100PPM/DEGC; 0.0630W
27	R7	-	1	CRCW04021K37FK	VISHAY DALE	1.37K	RES; SMT (0402); 1.37K; 1%; +/-100PPM/DEGC; 0.0630W
28	R8	-	1	CR0402-16W-1651FT	VENKEL LTD.	1.65K	RES; SMT (0402); 1.65K; 1%; +/-100PPM/DEGC; 0.0630W
29	R10	-	1	ERJ-2RKF1004	PANASONIC	1M	RES; SMT (0402); 1M; 1%; +/-100PPM/DEGC; 0.1000W
30	R26, R30	-	2	ERJ-2RKF1000	PANASONIC	100	RES; SMT (0402); 100; 1%; +/-100PPM/DEGC; 0.1000W
31	R38-R40	-	3	CRCW040220K0FK	VISHAY DALE	20K	RES; SMT (0402); 20K; 1%; +/-100PPM/DEGC; 0.0630W
32	SU1	-	1	NPB02SVAN-RC	SULLINS ELECTRONICS CORP.	NPB02SVAN-RC	CONNECTOR; FEMALE; WIREMOUNT; MINI SHUNT; 0.050IN CC; CLOSED TOP; JUMPER; STRAIGHT; 2PINS
33	SW1-SW4	-	4	EVP-AA102K	PANASONIC	EVP-AA102K	SWITCH; SPST; SMT; 15V; 0.02A; EVPAA SERIES WITH GROUND TERMINAL; LIGHT TOUCH SWITCH; RCONTACT=0.1 OHM; RINSULATION=100M OHM; WITH SPECIAL

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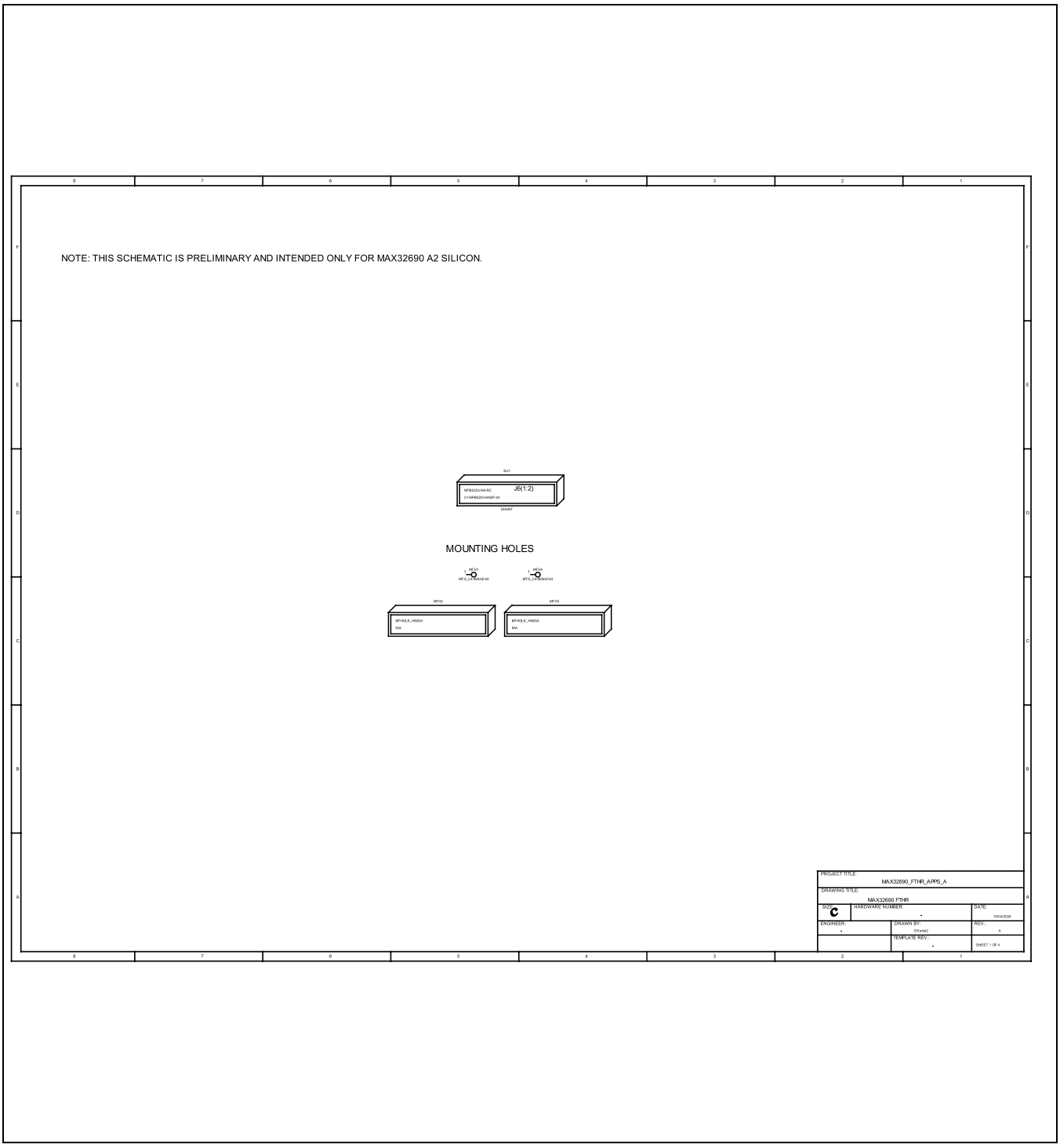
							ASSEMBLY INSTRUCTIONS
34	U1	-	1	MAX32690GTK+	ANALOG DEVICES	MAX32690GTK+	EVKIT PART - IC; UCON; ARM CORTEX-M4 WITH FPU MICROCONTROLLER AND BLE 5 FOR INDUSTRIAL AND WEARABLES; PACKAGE OUTLINE DRAWING: 21-0510; PACKAGE LAND PATTERN: 90-0354; PACKAGE CODE: T6888MK+2; TQFN68-EP
35	U2	-	1	MAX40200AUK+	MAXIM	MAX40200AUK+	IC; SWTC; ULTRA-TINY MICROPOWER; 1A IDEAL DIODE WITH ULTRA-LOW VOLTAGE DROP; SOT23-5
36	U3	-	1	MAX77654MENV+	MAXIM	MAX77654MENV+	EVKIT PART - IC; MAX77654MENV+; WLP30; PACKAGE CODE: N302C2+1; PACKAGE OUTLINE DRAWING: 21-100307
37	U4	-	1	MAX8516EUB+	MAXIM	MAX8516EUB+	IC; VREG; 1.425V TO 3.6V INPUT; 1A; 0.2V DROPOUT LDO REGULATOR; UMAX10-EP
38	U5	-	1	MAX3207EAUT+	MAXIM	MAX3207EAUT+	IC; PROT; DUAL, QUAD, AND HEX HIGH-SPEED DIFFERENTIAL ESD-PROTECTION IC; SOT23-6
39	U6	-	1	MAX8511EXK33+	MAXIM	MAX8511EXK33+	IC; VREG; ULTRA-LOW-NOISE, HIGH PSRR, LOW-DROPOUT, LINEAR REGULATOR; SC70-5
40	U8	-	1	LTC2875HS8#PBF	ANALOG DEVICES	LTC2875HS8#PBF	IC; TXRX; +/-60V FAULT PROTECTED 3.3V OR 5V 25KV ESD HIGH SPEED CAN FD TRANSCEIVER; NSOIC8

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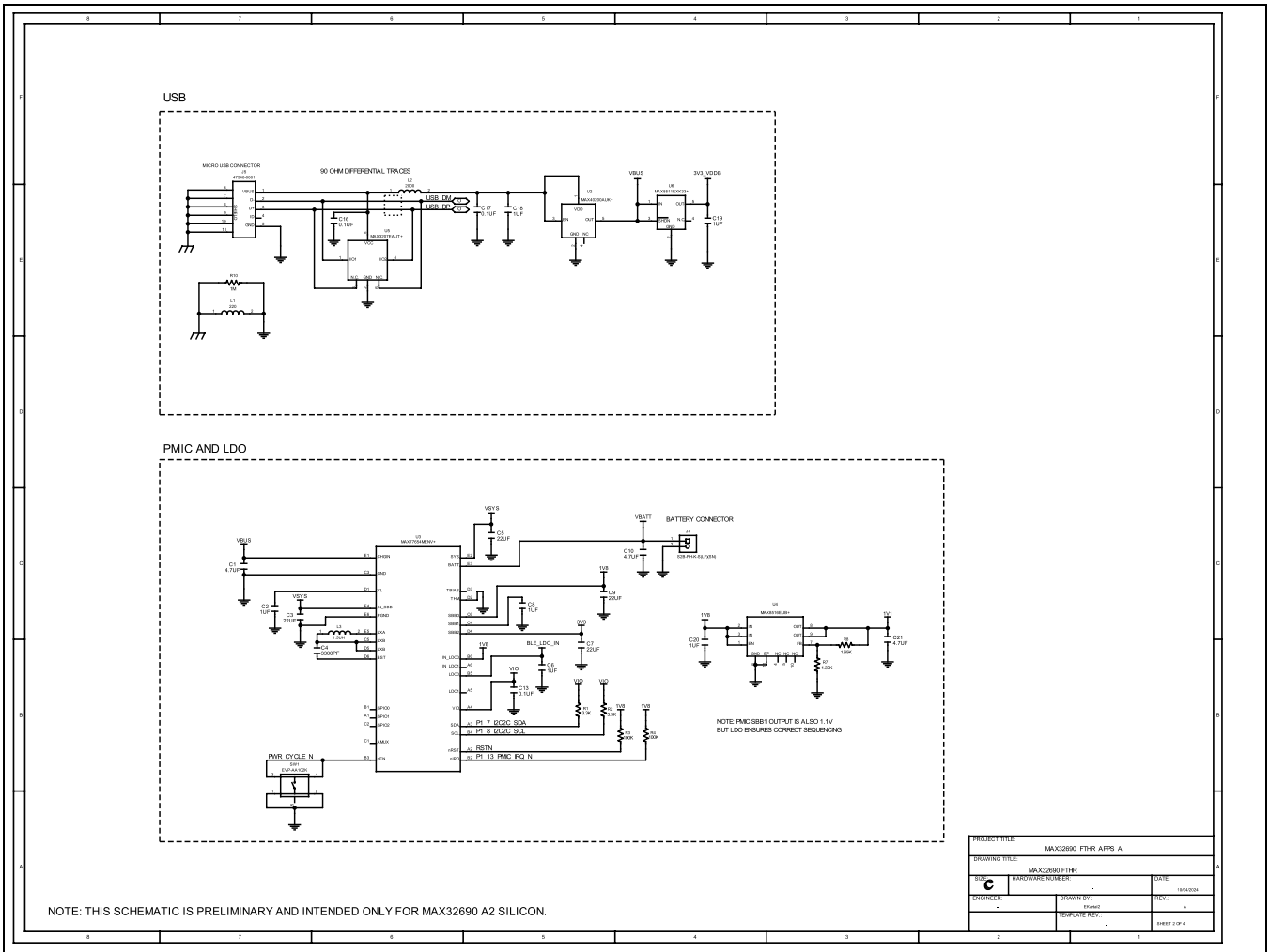
41	Y1	-	1	FA-20H 32.0000MF12Y-W3	EPSON	32MHZ	CRYSTAL; SMT; 32MHZ; TOL = +/-10PPM; STABILITY = +/-12PPM
42	Y2	-	1	ECS-.327-6-16R	ECS INC	32.768KHZ	CRYSTAL; SMT; 32.768KHZ; 6PF; TOL = +/-20PPM
43	PCB	-	1	MAX32690_FTHR_APPS_A	MAXIM	PCB	PCB: MAX32690_FTHR_APPS_A
44	J1	DNI	1	SSQ-112-03-G-S	SAMTEC	SSQ-112-03-G-S	CONNECTOR; FEMALE; THROUGH HOLE; 0.025IN SQ POST SOCKET; STRAIGHT;12PINS ;
45	J2	DNI	1	SSQ-116-03-G-S	SAMTEC	SSQ-116-03-G-S	CONNECTOR; FEMALE; THROUGH HOLE; 0.025IN SQUARE POST SOCKET; STRAIGHT; 16PINS;
46	ANT1	DNP	0	PCB_ANTENNA	ANALOG DEVICES	PCB_ANTENNA	ANTENNA; MAX32666 FEATHER BOARD; BLUETOOTH ANTENNA
47	C12	DNP	0	GJM1555C1HR30BB01	MURATA	0.3PF	CAP; SMT (0402); 0.3PF; +/-0.1PF; 50V; C0G; CERAMIC
48	C33, C34	DNP	0	GRM1555C1H6R0DA01	MURATA	6PF	CAP; SMT (0402); 6PF; 50V; C0G; CERAMIC
49	R9	DNP	0	RC0402FR-071KL;MCR01MZPF1001	YAGEO; ROHM SEMICONDUCTOR	1K	RES; SMT (0402); 1K; 1%; +/-100PPM/DEGC; 0.0630W

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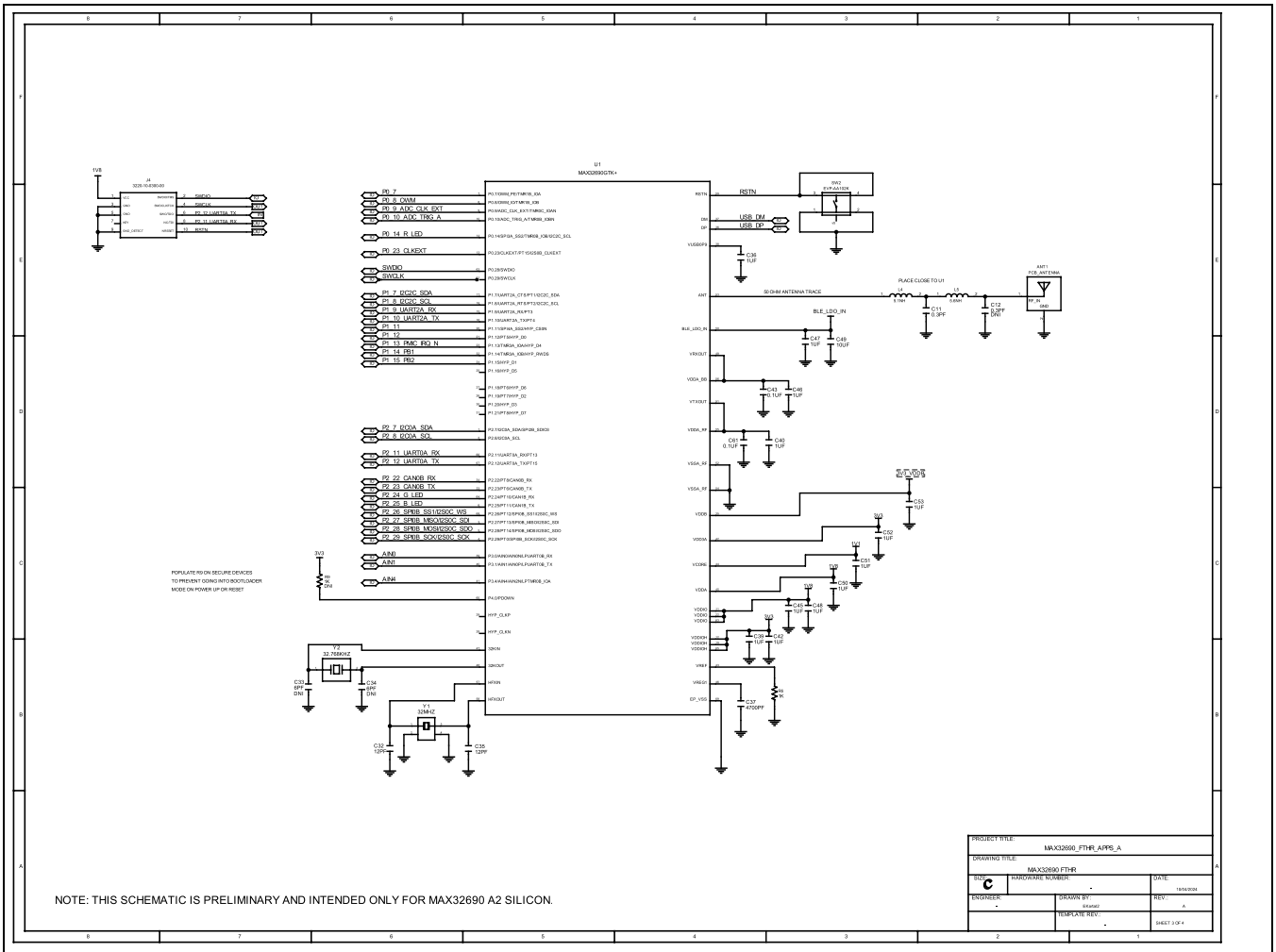
MAX32690FTHR Schematic



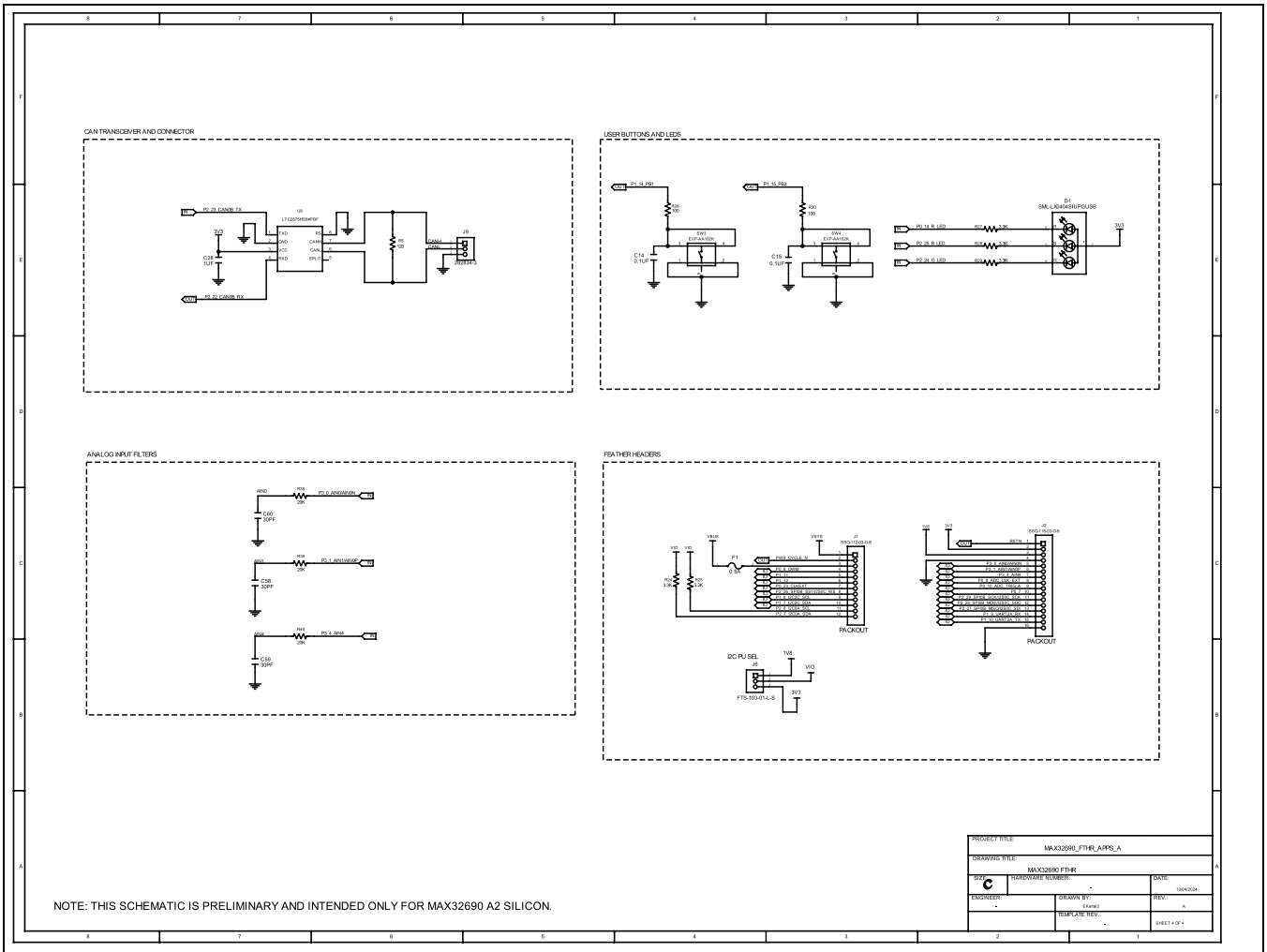
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Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	10/24	Initial release	—

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Notes

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