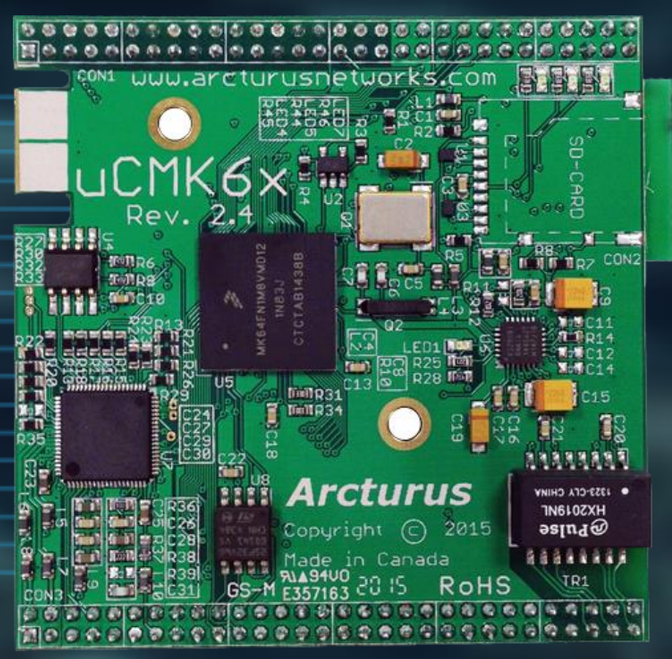
FACTSHEET

uCMK64-IoT

Secure IoT Endpoints



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Secure connected sensors and controls

OVERVIEW

The uCMK64-IoT is a turn-key solution for developing secure IoT devices. The 60 x 60mm module supports a combination of security, connectivity, control, configuration and telemetry. The hardware uses a 120MHz, NXP Kinetis K64 Arm® Cortex®-M4 microcontroller with Ethernet, Wi-Fi, TLS security, peripheral connectivity, 16 x I/O and optional audio.

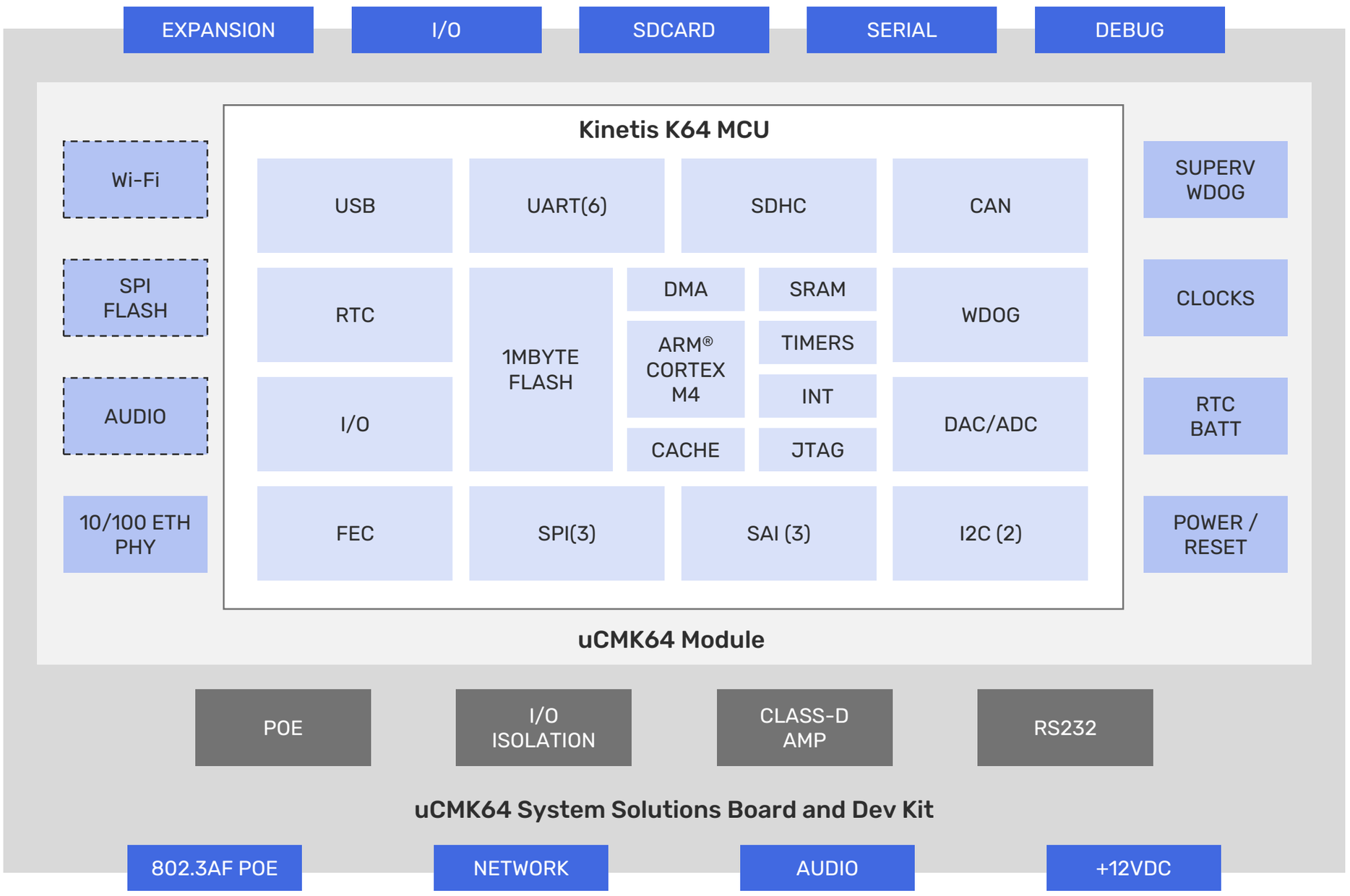
The uCMK64-IoT is controlled using dedicated I/O or the simple Mbarx™ Secure IoT host protocol. UART or secure TCP/IP connections provide options for both host-MCU or cloud-host integration. The protocol supports I/O, bi-directional UART-to-net communication and device settings. A “call home” feature can be used to automatically originate a secure connection to a predefined location, providing assured connectivity with a remote host.

The uCMK64-IoT is fully compatible with the Mbarx ecosystem of secure IoT tools and gateways making it possible to deploy and manage entire sites of devices no matter where in the world they are. The intuitive System Manager tool simplifies device management and provides direct access to uCMK64-VoIP firmware using a built-in apps store.

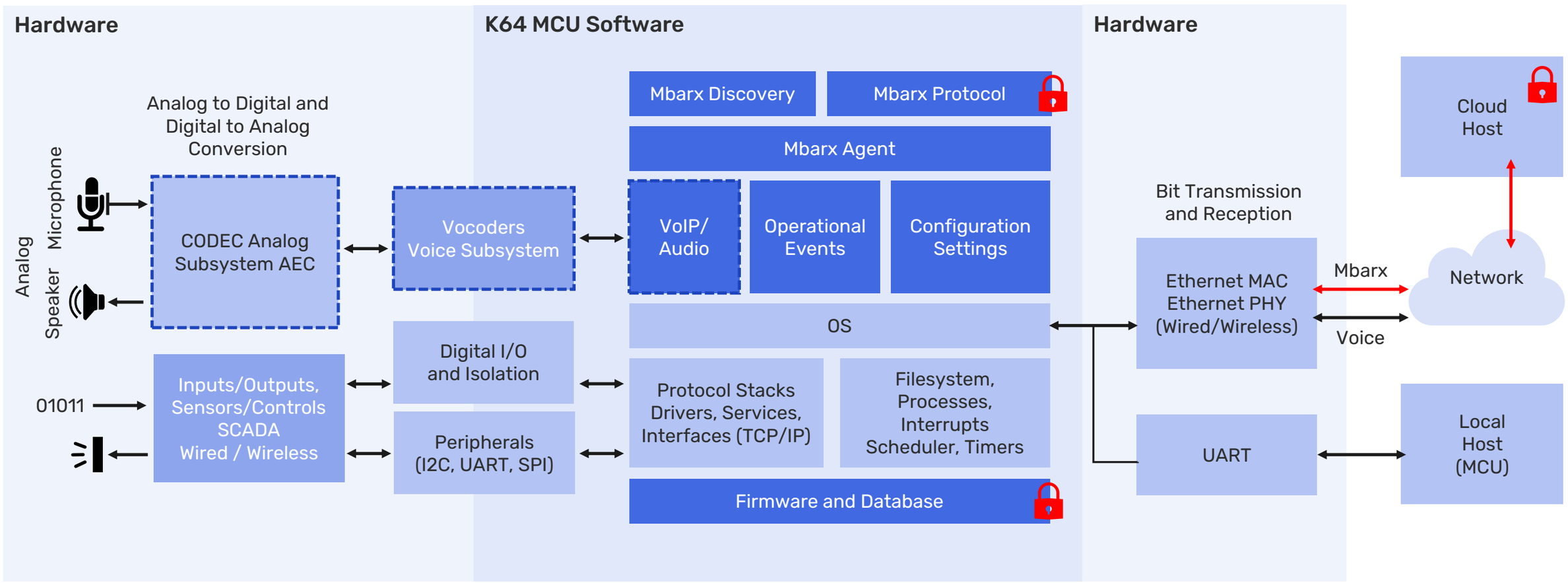
The uCMK64-IoT makes IoT easy, no complex BSP, expensive development tools or heavy up-front NRE. Hardware is available as a development kit, a board, or a module.

- ✔ SECURE TLS CONNECTIVITY
- ✔ WI-FI, ETHERNET, I/O, UART
- ✔ IOT TOOLS AND GATEWAYS ECOSYSTEM
- ✔ SIMPLE PROTOCOL INTEGRATION
- ✔ NO COSTLY NRE OR COMPLEX BSP

PLATFORM BLOCK DIAGRAM



SYSTEM DIAGRAM



FEATURES

Hardware Platform

- 120MHz NXP Kinetis Microcontroller
- ARM Cortex M4 Core
- 1Mbyte Flash / 256Kbyte SRAM internal to MCU
- RTC (realtime clock) with battery back up
- Class-D audio amplifier (up to 15W)
- 802.3af PoE Powered Device or 12VDC
- External watchdog controller
- SDcard slot RJ45, DB9, 3.5mm audio, speaker connectors
- Development headers for expansion
- Fast boot suitable for “wake-up” applications

Network, Connectivity and Peripherals

- 10/100BaseT Ethernet network with auto MDX
- IEEE1588 compatible network transceiver
- Network link / activity LED
- RS232 serial console (optional TTL or RS485)
- SDHC, USB, CAN, SPI, SAI(SSI), I2C, NAND, Analog

Special Signals and I/O

- Dedicated input signals for operation
- Dedicated output signals for event/status notification
- Up to 8 contact closure pairs with optical isolation
- Up to 8 loop closure detectors with TVS
- Up to 36 additional I/O signals
- Reset and restore buttons, power and network status LEDs

Analog Audio Interface

- 16-bit PCM with 8KHz, 16KHz sample rates
- Conexant CX20703 audio subsystem ASIC
- Headphones Out – Mono, 1.25 Vrms (3.5Vp-p) 16-32Ω
- Powered speaker out – Mono, 4/8Ω 15W (max)
- Powered speaker out (PoE) – Mono, 4/8Ω 4.7W (max)
- Line output – 1.0 Vrms (2.8Vp-p) @ >10 kΩ
- Line input – 1.0 Vrms (2.8Vp-p) @ 5-15 kΩ
- Mic input – adjustable bias and gain 2.6Vdc 5-15 kΩ

Base Software

- All program and middleware code internal to MCU
- Remote system logging, SNTP network time
- DHCP or static network configuration, MDNS device discovery
- No BSP or MCU firmware development required

Mbarx IoT Endpoint Firmware

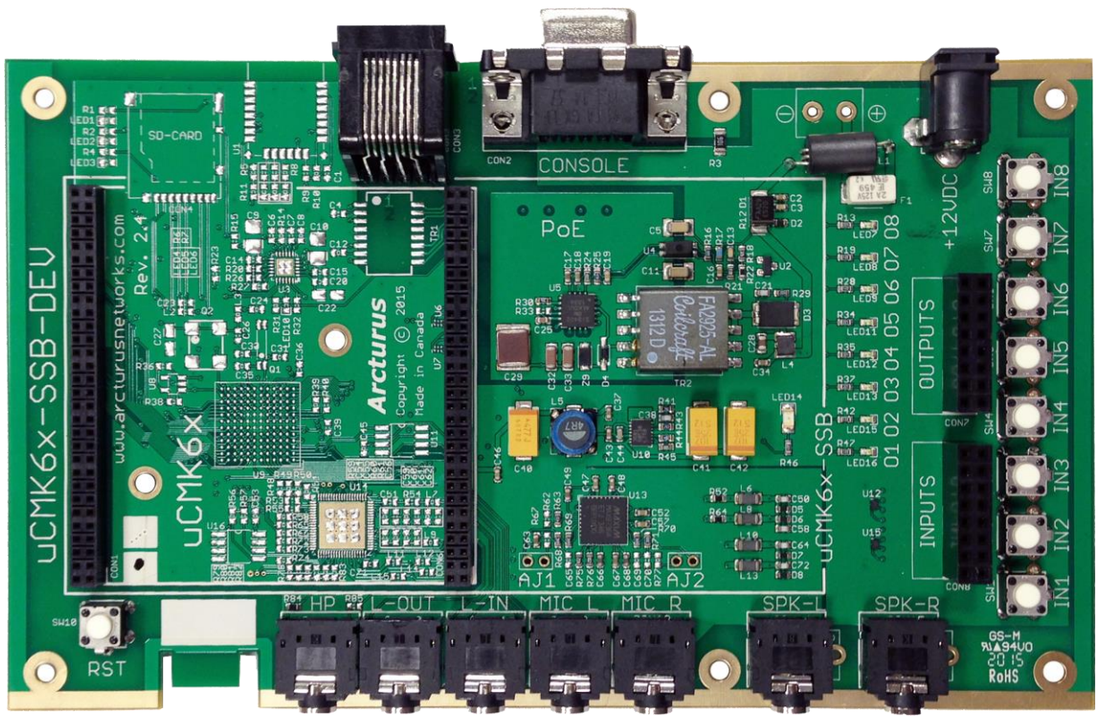
- MDNS service discovery announcement
- Announce name, type, location, firmware, template
- Simple Host protocol over TCP/IP (TLS) or UART
- Configuration of services; NTP, DHCP, VoIP, rsyslog…
- Configuration of network, administrative and control settings
- Operation of I/O, bi-directional,
- UART-to-net telemetry data pass-through
- Secure OTA firmware management
- Secure “Call Home” automatic connection origination
- Compatibility with ecosystem of Mbarx tools

Mbarx System Manager Tool

- Secure site-wide device management
- Compatible with Mbarx endpoints and gateways
- Active monitoring of devices
- GUI management of devices
- Configuration templates and repository
- Firmware repository
- OTA firmware updates
- Automatic “call home” firmware update service
- Windows® and Mac® compatible
- Free evaluation

Mbarx Virtual Control Panel

- Windows based development tool
- TCP/IP socket connection (TLS)
- GUI driven operation of device
- Console window for understanding Mbarx protocol
- Remote connection service
- Virtual push-buttons, LEDs and other
- Built using websockets, QT and python
- Source framework available



Additional Audio, VoIP and Intercom Firmware (optional)

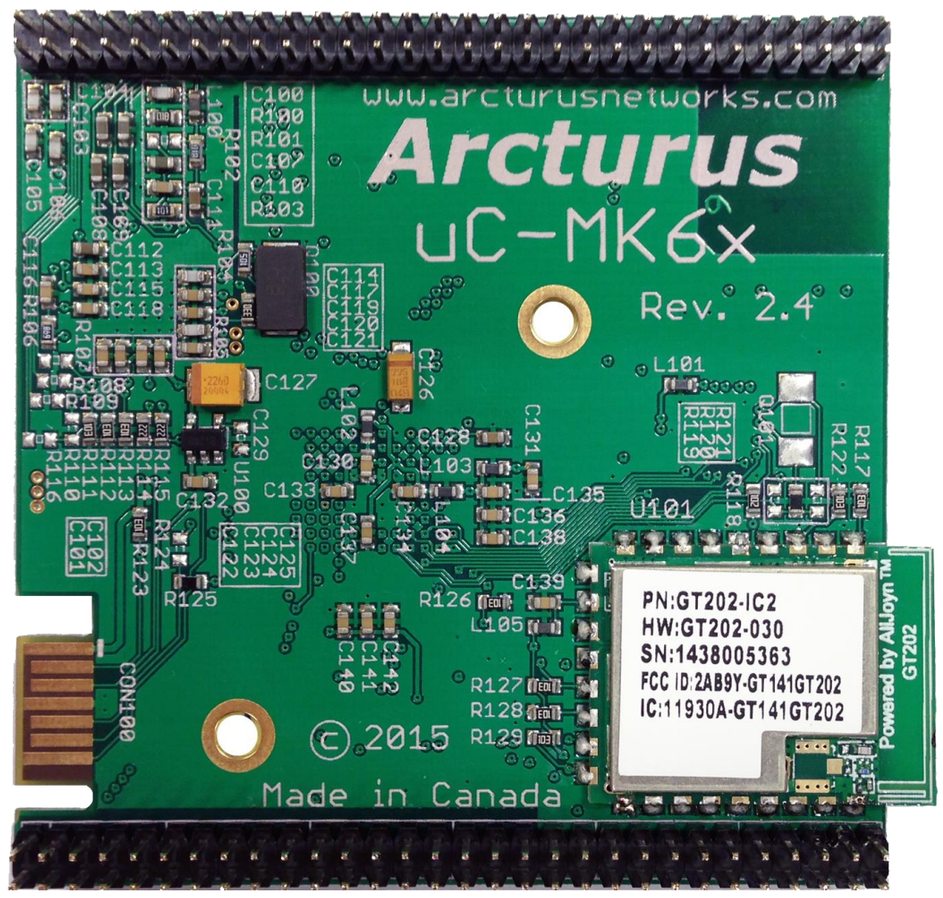
- SIP/RTP VoIP firmware and multicast PA system
- G.711ulaw, G.711alaw, G.722 (wideband) vocoders
- AEC - Acoustic Echo Cancellation
- ACG - Auto Gain Control
- Noise reduction
- Configurable call progress announcements

DEVELOPMENT KIT

- Common across uCMK64-VoIP / uCMK64-IoT parts
- uCMK64 Module + System Solutions Board
- Cable Kit, Headset with microphone, power supply, getting started guide
- Dedicated support site access (1 year)
- Schematics and documentation (download)
- Installation support (email)
- Mbarx-System Manager Free Evaluation (Windows / Mac)
- Mbarx-Virtual Control Panel for Windows (download)

SPECIFICATION

Features and Peripherals	Module	System Solution Board	Dev. Kit
RS232 transceiver	√	√	√
RS485 transceiver	Optional	Optional	-
10/100 network transceiver	√	√	√
Network link / activity LED	√	√	√
CX20703 audio subsystem ASIC	√	√	√
Class-D audio amplifier	-	Optional	√
I/O isolation / protection	-	√	√
(8) Push buttons inputs	-	-	√
(8) LED visual outputs	-	-	√
External watchdog	-	√	√
Reset button	-	Optional	√
802.3af PoE power input	-	-	√
12VDC power input	-	√	√
3.3VDC power input	√	-	-
-40˚C to +85˚C Operating range	√	√	√



External Interface	Module	System Solution Board	Dev. Kit
RTC BATT socket		√	√
MiniSD card slot	√	√	√
60pin signal header	√	Optional	√
60pin expansion header	√	Optional	√
16pin input header	-	solder or expansion	√
16pin output header	-	solder or expansion	√
3.5mm headset connector	-	solder or expansion	√
3.5mm microphone input	-	solder or expansion	√
3.5mm line input	-	solder or expansion	√
3.5mm line output	-	solder or expansion	√
AMP-A output screw term	-	solder or expansion	√
AMP-B output screw term	-	solder or expansion	√
3.5mm AMP-A output	-	solder or expansion	Optional
3.5mm AMP-B output	-	solder or expansion	Optional
DB9 serial connector	-	solder or expansion	√
RJ45 Ethernet connector	-	solder or expansion	√
JTAG SATA PCB	-	√	√

Dedicated Signal (PIP Firmware Mode) SSB/Dev Kit	I/O	Board Signal	MCU Signal	MCU Pin	Isolated
Push-to-call	I	IN1	PTB8	F10	√
Terminate	I	IN2	PTB9	F9	√
Volume +	I	IN3	PTB10	E12	√
Volume –	I	IN4	PTB11	E11	√
Mic Mute	I	IN5	PTD0	A5	√
Reset	I	IN6	PTD1	D4	√
Spare	I	IN7	PTD2	C4	√
Spare	I	IN8	PTD3	B4	√
Registered	O	OUT1	PTB4	G10	√
Call in Progress / Ringing	O	OUT2	PTB5	G9	√
Network Ready	O	OUT3	PTC16	A6	√
Alarm	O	OUT4	PTC17	D5	√
Ext. Amp Enable	O	OUT5	PTC18	C5	√
Supervised Mode	O	OUT6	PTC19	B5	√
Spare	O	OUT7	PTD4	A4	√
Spare	O	OUT8	PTD5	A3	√

Audio Interface	HP		SPKR-L	SPKR-R	Line Out		Line In		Mic L	Mic R
Description	Headphones		Speaker Out	Speaker Out	Line Output		Line Input		Bias Mic. Input	Bias Mic. Input
Connector	3.5mm Female Stereo		Terminal Mono	Terminal Mono	3.5mm Female Stereo		3.5mm Female Stereo		3.5mm Female Mono	3.5mm Female Mono
Channel (3.5mm)	Left	Right			Left	Right	Left	Right	Mono	Mono
Jack Pin (3.5mm)	Tip	Ring			Tip	Ring	Tip	Ring	Tip	Tip
I/O	-	Mono Output	Mono Output	Mono Output	Mono Output	Mono Output	Mono Output	-	Mono Input	Mono Input
Signal Level	-	Headphone	Class-D Amp	Class-D Amp	Line-level	Line-level	Line-level	-	Mic	Not Used
Rating	-	1.25 Vrms	20W @ 4Ω 15W @ 8Ω (4.7W max with POE)	20W @ 4Ω 15W @ 8Ω (4.7W max with POE)	1.0 Vrms (2.8Vp-p)	1.0 Vrms (2.8Vp-p)	1.0 Vrms (2.8Vp-p)	-	Bias 2.6Vdc	-
Impedance	-	16-32Ω	4-8Ω	4-8Ω	>10 kΩ	>10 kΩ	>10 kΩ	-	5-15 kΩ	-
Level Adjustment	-	Variable	Variable	Variable	Variable	Fixed	Fixed	-	Boost/Gain	Boost/Gain

RATINGS AND PARTS

Powered Direct (Non- PoE)	Specification
Supply voltage	12VDC (nominal)
Tolerance range	9VDC (min) - 15VDC (max)
Watts with Class-D amplifier (max)	9.36W@12VDC (amplifier @ 5W)

Powered Over Ethernet	Specification
PoE type	802.3af (802.3at type 1)
Supply voltage	48VDC
PoE - min. supply power	12.95W

Voltage Supply	Part	Condition	Consumption
802.3af PoE	uCMK64-IoT SSB Dev Kit	Class-D Amp Disabled	~2.0W
12VDC	uCMK64-IoT SSB Dev Kit	Class-D Amp Disabled	~1.7W
3.3VDC	uCMK64-IoT MOD	-	~1.2W

Input/Output	Specification
Dedicated inputs	(8) - single wire inputs (pulled to ground) TVS Suppression (+/- 8kV, IEC 61000-4-2 Level-4)
Dedicated outputs	(8) - loop closure pairs optically isolated - 1.5kV (min) with spark gap
Up to 36 additional signals available on expansion	TTL

Physical	Specification
Dimensions (Module)	61mm (l) x 61mm(w)
Module with PoE, Amp and Isolation	114mm (l) x 61mm (w)
System Solution Board and Dev Kit	155mm (l) x 100mm (w)
Recommended Enclosure	Hammond Manufacturing 1455 Series

Part Number	Specification
uCMK64 Dev Kit	Development Kit
uCMK64-IoT MOD	uCMK64 Module Only
uCMK64-IoT SSB	System Solution Board

EXPANSION

EXPANSION SIGNALS (CON6) - 2ROW60PIN-2MM

PIN	Board Signal	Description	I/O	PIN	Board Signal	Description	I/O
1	Reserved	-		31	VBAT	RTC Battery Source	
2	Reserved	-		32	AMP_EN	AMP Enable Input	I
3	Reserved	-		33	AMP_MU	AMP Mute Enable	I
4	Reserved	-		34	#MR	Master Reset Input	I
5	Reserved	-		35	#RSTO	Reset Output	O
6	HP_R	Headphone Right	O	36	IN1	GPIO Input 1	I
7	HP_VGND	Headphone Ground	O	37	IN2	GPIO Input 2	I
8	HP_L	Headphone Left	O	38	IN3	GPIO Input 3	I
9	LOUT_R	Line Out Right	O	39	IN4	GPIO Input 4	I
10	LOUT_L	Line Out Left	O	40	IN5	GPIO Input 5	I
11	LIN_R	Line In Right	I	41	IN6	GPIO Input 6	I
12	LIN_L	Line In Left	I	42	IN7	GPIO Input 7	I
13	MIC_B	Microphone Bias	O	43	IN8	GPIO Input 8	I
14	N/C	-		44	OUT1	GPIO Output 1	O
15	GND	Ground		45	OUT2	GPIO Output 2	O
16	GND	Ground		46	OUT3	GPIO Output 3	O
17	+3.3V	Power		47	OUT4	GPIO Output 4	O
18	+3.3V	Power		48	OUT5	GPIO Output 5	O
19	#S_CS0	SPI2_CS	I	49	OUT6	GPIO Output 6	O
20	SCLK	SPI2_CLK	O	50	OUT7	GPIO Output 7	O
21	MOSI	SPI2_Data Out		51	OUT8	GPIO Output 8	O
22	MISO	SPI2 Data In		52	P_LED	Ethernet LED	O
23	RP_IRQ	Wake Up IRQ		53	N/C	-	
24	U4_RTS	UART 4_RTS		54	N/C	-	
25	U4_CTS	UART 4_CTS		55	RXM	Ethernet RX-	
26	U4_RX	UART4 Receive	I	56	TRC	Ethernet Centre Tap	
27	U4_TX	UART4 Transmit	O	57	RXP	Ethernet RX+	
28	U0_RX	UART0 Receive	I	58	TXM	Ethernet TX-	
29	U0_TX	UART0 Transmit	O	59	TXC	Ethernet Centre Tap	
30	GND	Ground		60	TXP	Ethernet TX+	

EXPANSION SIGNALS (CON1) - 2ROW60PIN-2MM

PIN	MCV Signal	Description	PIN	MCV Signal	Board Signal
1	GND	Ground	31	PTB17	CAN1/UART3/1588
2	PGA3_DM	ADC	32	PTC8	ADC
3	PGA3_DP	ADC	33	PTC9	ADC
4	PGA2_DM	ADC	34	PTE28	ADC
5	PGA2_DP	ADC	35	GND	Ground
6	PGA1_DM	ADC	36	PTB2	I2C0_SCL
7	PGA1_DP	ADC	37	PTB3	I2C0_SDA
8	PGA0_DM	ADC	38	PTB18	CAN0
9	PGA0_DP	ADC	39	PTB19	CAN0
10	DAC1	DAC1	40	GND	Ground
11	DAC0	DAC0	41	PTC0	SPI0_CS4/ADC
12	ADC1	ADC1	42	PTC1	UART1/SPI0_CS3
13	ADC0	ADC0	43	PTC2	UART1/SPI0_CS2
14	GND	Ground	44	PTC3	UART1/SPI0_CS1
15	PTA6	ADC/USB	45	PTC4	UART1/SPI0_CS0
16	PTA7	ADC/USB	46	PTC10	I2S0/I2S1
17	PTA8	ADC/USB	47	PTC11	I2S0
18	PTA9	ADC/USB	48	GND	Ground
19	PTA10	ADC/USB	49	PTE8	I2S0/UART5
20	PTA11	ADC/USB	50	PTE9	I2S0/UART5
21	PTA24	ADC/USB	51	PTE24	CAN1/UART4/I2S1
22	PTA25	ADC/USB	52	PTE25	CAN1/UART4/I2S1
23	PTA26	ADC/USB	53	PTE26	1588/UART4/I2S1/RTC/USB
24	PTA27	ADC/USB	54	PTE27	UART4/I2S1
25	PTA28	ADC/USB	55	GND	Ground
26	PTA29	ADC/USB	56	USB_DM	USB
27	GND	Ground	57	USB_DP	USB
28	PTB6	ADC	58	VOUT33	USB VBUS
29	PTB7	ADC	59	VREGIN	USB VBUS
30	PTB16	CAN1/UART3/1588	60	GND	Ground

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