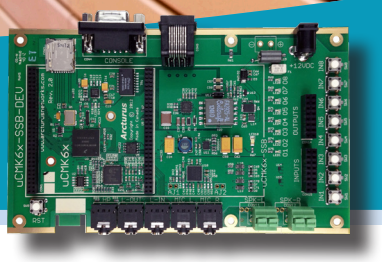


uCMK60-VoIP

VoIP and IP Audio Platform

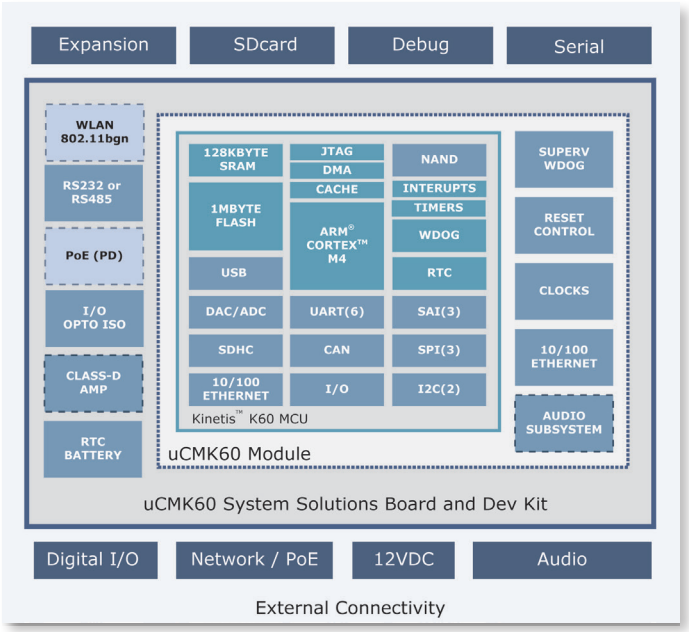
overview

The uCMK60-VoIP is designed to simplify VoIP integration and provide a cost effective replacement to legacy analog equipment. It is suitable for various IP audio applications including VoIP, telephony handsets, intercoms, speakerphones, or audio distribution such as mass notification, PA paging and IP speakers. The system consists of a microcontroller (MCU) coupled with an audio subsystem to deliver best-in class audio intelligibility within a highly integrated solution.

The core MCU is an NXP Kinetis K60, 120MHz Arm® Cortex®-M4 core with internal memory, network, various serial, I/O and peripheral capabilities. The audio subsystem delivers codec, audio intelligibility and psychoacoustic functions, including AEC, noise reduction and AGC. The system supports two-way realtime voice at 16KHz samples with full rate AEC.

The system is operated using dedicated I/O controls or can be integrated into an overall system using the Mbarx-M2M operational protocol via network socket or serial UART connection. Access to an ecosystem of Mbarx tools is included as part of the development kit. Mbarx tools support site-wide firmware, configuration and maintenance activities.

Hardware is available as a development kit, a PCB level board, a low-cost module or a component microcontroller. There is no complex BSP to install, no expensive development tools or heavy up-front NRE.



ARM CONNECTED

NXP

VoIP, Intercom, PA, IP Speaker

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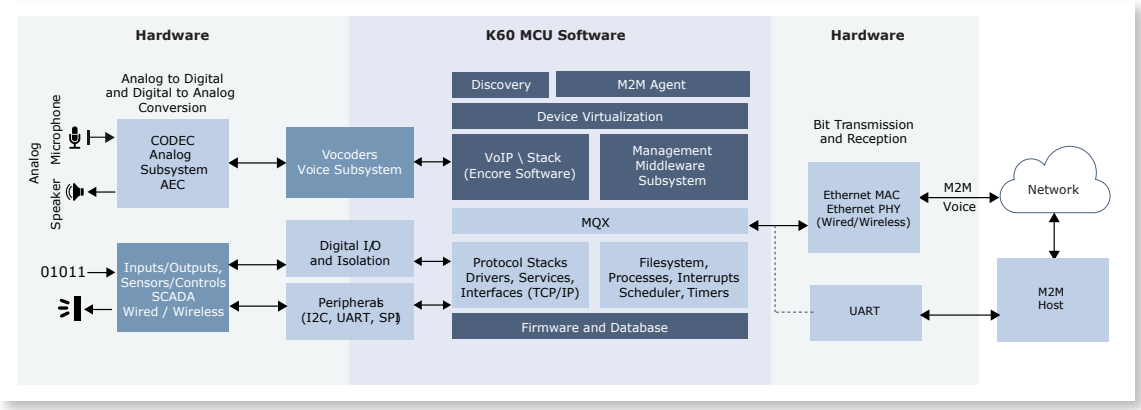
system solution



features

Hardware Platform

- 120MHz NXP Kinetis Microcontroller
- Arm Cortex-M4 Core
- 1Mbyte Flash / 128Kbyte SRAM internal to MCU
- RTC (realtime clock) with battery back up
- Class-D audio amplifier (up to 15W)
- 802.11af PoE Powered Device or 12VDC
- External watchdog controller
- SDcard slot RJ45, DB9, 3.5mm audio, speaker connectors
- Development headers for expansion
- Fast boot (~10 seconds) suitable for “wake-up” applications

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

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

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

VoIP and Intercom Firmware - PIP Mode

- SIP/RTP VoIP stack
- Full duplex, low latency voice communication
- SIP infrastructure and P2P modes
- Call originate / call receive, caller-ID
- Call hold and retrieve, call transfer
- G.711ulaw, G.711alaw, G.722 (wideband) vocoders
- Dedicated inputs/outputs for autonomous operation
- Supervision and controlled operation via Mbarx protocol

Audio Intelligibility / Psychoacoustics

- AEC - Acoustic Echo Cancellation
- ACG - Auto Gain Control
- Noise reduction
- Configurable call progress announcements

Multicast Audio Paging Firmware (MCPG) - PAS Mode

- Multicast audio paging receiver mode
- Audio distribution of one source-to-many listeners
- Up to 100, dynamically configurable, unique paging groups
- Late arrival and “stuck mic” protection
- Last-in-wins arbitration and automatic keep alive
- Definable command packet port/address
- Co-existence with other SIP elements
- Dedicated inputs/outputs for operation
- Linux library available to support MCPG transmit source
- VoIP-to-MCPG rebroadcaster (transmit source) available
- Separate firmware load (PAT) to support MCPG transmit

Mbarx-M2M Protocol Support

- M2M protocol for supervision and operation
- MDNS service discovery broadcast
- TCP/IP socket or dedicated UART protocol
- Transmits events, receives control commands
- Supports call control, I/O operation and system events
- Autonomous, supervised and controlled operating paradigms
- Host-side QT example implementation available (Windows®)
- Mbarx-Operations Controller for HTML5 integration (optional)

Mbarx-M2M Maintenance and Configuration Tools

- Mbarx System Manager utility for Windows or Mac®
- Supports system wide firmware deployment and configuration

- *VoIP with M2M and I/O Controls*
- *Dedicated VoIP MCU*
- *Full System Solution Hardware*
- *No Costly NRE or Complex BSP*
- *Cost-Effective Analog Replacement*

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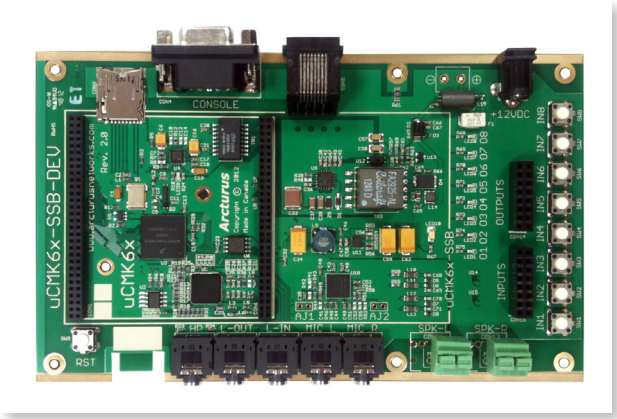
specification

Features and Peripherals	Module	System Solution Board	Development 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	-	-	√
802.3af PoE power input	-	optional	√
12VDC power input	-	√	√
3.3VDC power input	√	-	-
-40˚C to +85˚C Operating range	√	√	√



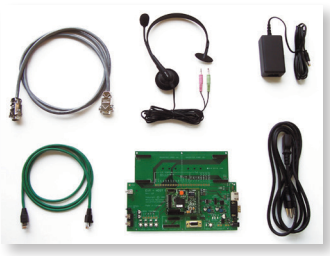
External Interface	Module	System Solution Board	Development Kit
RTC BATT socket		√	√
MiniSD card slot	√	√	√
60pin signal header	√	optional	√
60pin expansion header	√	optional	√
16pin input header	-	solder or expansion	√
16pin output header	-	solder or expansion	√
3.5mm headset connector	-	solder or expansion	√
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)	I/O	Board Signal	MCU Signal	MCU Pin	Isolated SSB/Dev Kit
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	Non-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 Input	-	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 (3,5Vp-p)	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

development kit

- uCMK60 - System Solutions Board Development Kit
- Cable Kit, Headset with microphone, power supply, getting started guide
- Dedicated support site access (1 year)
- Schematics and documentation (download)
- Installation support (email)
- Mbarx-M2M System Manager Free Evaluation (Windows / Mac)
- Mbarx-M2M QT host example implementation for Windows (download)



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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	MCU Signal	Description	Pin	MCU Signal	Description
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

ratings & 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)

Power 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	uCMK60-VoIP SSB Dev Kit	Class-D Amp Disabled	~2.0W
12VDC	uCMK60-VoIP SSB Dev Kit	Class-D Amp Disabled	~1.7W
3.3VDC	uCMK60-VoIP MOD	-	~1.2W

Inputs and Outputs	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	Description
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	Description
uCMK60-VoIP SSB Dev Kit	System Solution Board Development Kit
uCMK60-VoIP MOD	uCMK60 Module Only
uCMK60-VoIP SSB	System Solution Board

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