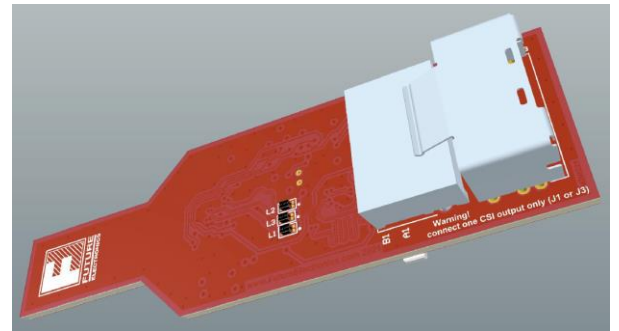


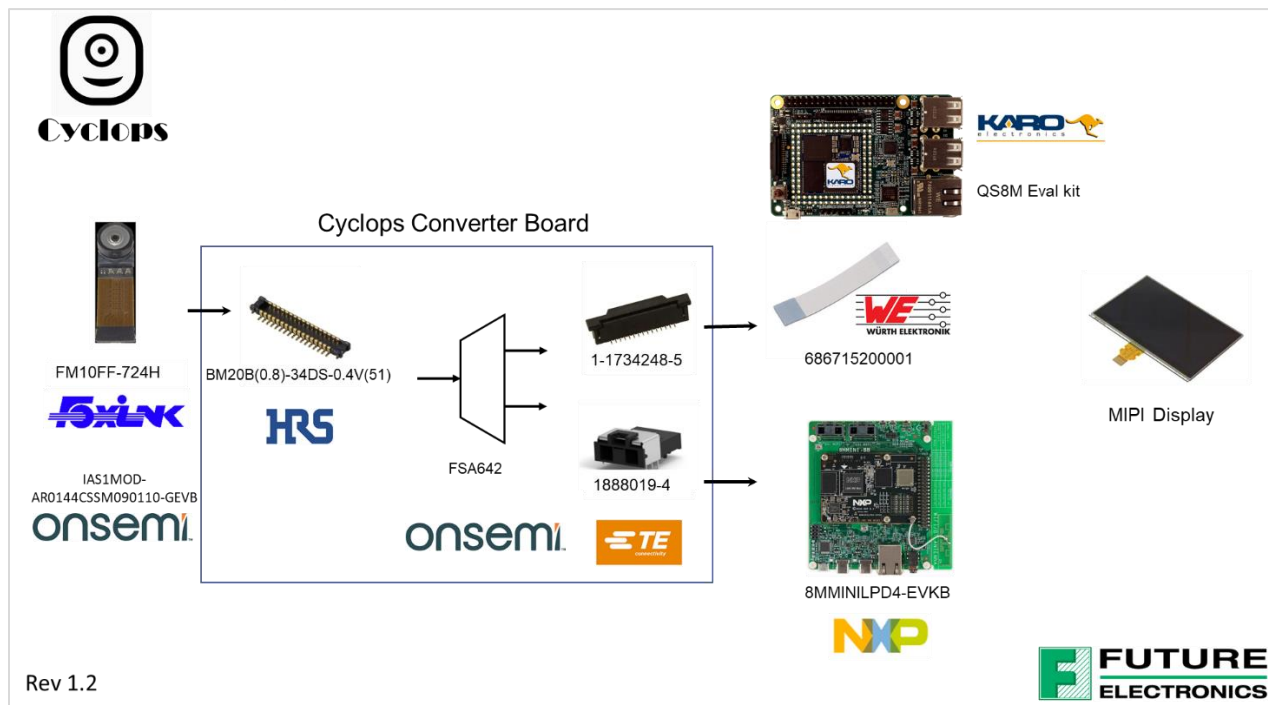
Overview

Cyclops is a converter board, designed by Future Electronics System Design Center, that connects the Foxlink [FM10FF-724H](#) camera module and the Ka-Ro [QS8M](#) QFN Style Solder-Down Computer On Module or the NXP i.MX8M Mini evaluation board [8MMINILPD4-EVKB](#) to form the Cyclops System, an easy evaluation platform for image processing applications like bar code scanner, machine vision, gesture recognition and biometrics.

The Foxlink [FM10FF-724H](#) is a 1.0Mp camera module equipped with **onsemi** [AR0144CSSM](#) CMOS image sensor. The [QS8M](#) is a Computer on Module with NXP i.MX8M as core processor with built-in Gb Ethernet and USB connections. The i.MX 8M Mini EVKB [8MMINILPD4-EVKB](#) provides a platform for comprehensive evaluation of the i.MX 8M Mini and i.MX 8M Mini Lite applications processors.



System Block Diagram



Cyclops System for Image Processing

Key Components

Function	Part Number	Description	Manufacturer
Camera Module	FM10FF-724H	1.0Mp camera module (production quantities)	Foxlink
	IAS1MOD-AR0144CSSM090110-GEVB	1.0Mp camera module (prototype quantities)	onsemi
	AR0144CSSM28SUD20	Image sensor used in the module (registration MPN)	onsemi
Processor Module or Processor Eval Kit	QS8M	QFN style solder-down computer-on-module	KaRo
	8MMINILPD4-EVKB	Evaluation kit for the i.MX 8M Mini applications processor	NXP
Connector	1-1734248-5	Flex to board FPC connector	TE
Connector	1888019-4	mini-SAS 2Row RA SM 2x18 0.8mm board lock	TE
Connector	BM20B(0.8)-34DS-0.4V(51)	2 row vertical connector	Hirose
Cable	686715100001	Type 2 flat flexible cable	Würth
Power	NCP170AXV	Fixed output LDO	onsemi
Clock	ASCO2-24.000MHZ-EK-T3	Timing Oscillator	Abracon
Interface	PCA9306DTR2G	Dual bidirectional I2C-bus and SMBus voltage-level translator	onsemi
Interface	FSA642UMX	MiPi switch	onsemi
Interface	74AVC4T245GU,115	4-bit dual supply translating transceiver	Nexperia
Passive	C1005X7R1H104K050BB	Multilayer ceramic chip capacitors	TDK
Passive	BLM18PG121SN1D	BLM series chip ferrite beads	Murata
Passive	RC0402FR	General purpose chip resistors	Yageo

Typical Applications

The Cyclops system can be used in development for applications like bar code scanner, 3D scanning, machine vision, gesture recognition, robotics, virtual reality, position tracking and biometrics.



Foxlink

FM10FF-724H Camera Module

The [FM10FF-724H](#) is a camera module using **onsemi** [AR0144CSSM](#) image sensor, offering 150° Diagonal Field of View, ¼ inch optical format, with 1 Mp Global shutter resolution. Prototypes are supported by **onsemi** part number [IAS1MOD-AR0144CSSM090110-GEVB](#) which allows for easy development. Part of the IAS module family from **onsemi**, the module includes standardized connectors, layout configuration and OTPM protocols. With the [AR0144CSSM](#) CMOS image sensor, big field of view mono imaging is achieved for applications including robotics, machine vision, AR/VR/MR and artificial intelligence. The innovative global shutter pixel design is optimized for accurate and fast capture of moving scenes. The sensor produces clear, low noise images in both low-light and bright scenes. It includes sophisticated camera functions such as auto exposure control, windowing, row skip mode, column-skip mode, pixel-binning and both video and single frame modes. It is programmable through a simple two-wire serial interface. The [AR0144CS](#) produces extraordinarily clear, sharp digital pictures, and its ability to capture both continuous video and single frames makes it the perfect choice for a wide range of applications.



Applications

- Bar Code Scanner
- Gesture Recognition
- 3D Scanning
- Positional Tracking
- Iris Scanning
- Augmented Reality
- Virtual Reality
- Biometrics
- Machine Vision

Key Features

- Based on the AR0144 Mono CMOS Image Sensor
- Compact size (9.0x 30.0 x 6.85)
- Wide 150° Diagonal Field of View
- Best Global Shutter Efficiency
- Superior Low-Light and IR Performance
- HD Video (720p60)
- ¼" optical format
- 3.0 µm pixel size
- Automatic Black Level Calibration (ABLCL)
- 2-lane MIPI or Parallel Data Interface
- Lower Operational Power



Ka-Ro

QS8M Computer-on-Module

The new [QS8M](#) Series is a QFN Style Solder-Down Computer-on-Module. The module with a small square size of 27mm and a height of 2.3mm is single-sided assembled. Its QFN type lead style has a 1mm pitch with 100 pads. The ground pad additionally acts as thermal pad.



Key Features

- NXP i.MX 8M Mini: Quad Cortex-A53 up to 1.6GHz
Cortex-M4 up to 400MHz
- NXP i.MX 8M Nano: Dual Cortex-A53 up to 1.4GHz
Cortex-M7 up to 600MHz
- RAM: 512MB/1GB DDR3L
- ROM: 4GB eMMC
- Grade: Industrial
- Temperature: -25°C to 85°C
- Display support:
 - 1x MIPI DSI (4-lane) display interface
 - i.MX 8M Mini: GC328 2D GPU,
GCNanoUltra 3D GPU,
1080p60 Video de-/encode
 - i.MX 8M Nano: GC7000UltraLite 3D GPU
- Connectivity
 - 1x MIPI CSI (4-lane) camera interface
 - 1x Gb Ethernet, 1x/2x USB2.0, 1x eMMC/SD
 - 4x UART, 3x I²C, 2x SPI, 4x PWM, SAI, SPDIF
 - Up to 70x 3.3V General Purpose I/O

OS Support

- Linux
- Windows 10 IoT



NXP

Cyclops System for Image Processing

NXP

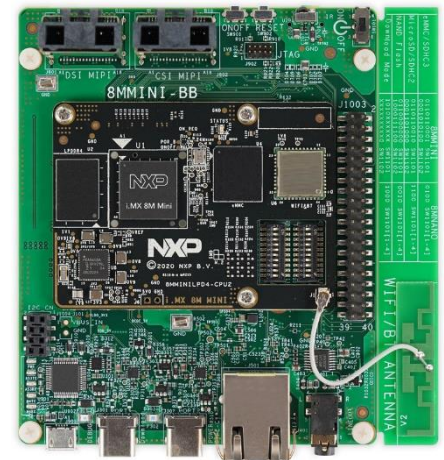
8MMINILPD4-EVKB: Evaluation Kit for the i.MX 8M Mini Applications Processor

The i.MX 8M Mini EVKB provides a comprehensive evaluation platform of the i.MX 8M Mini and i.MX 8M Mini Lite applications processors. It delivers high performance with power efficiency, multimedia interfaces, and Wi-Fi / Bluetooth for connectivity out-of-the box. The two-board solution consists of a compact 2"x2.7" compute module and a larger base board that brings out the broad connectivity that is needed for product evaluation.



Technical and Functional Specifications

Processor	<ul style="list-style-type: none">• i.MX 8M Mini Quad applications processor• 4x Cortex-A53 @ 1.8 GHz• 1x Cortex-M4 @ 400 MHz
Memory	<ul style="list-style-type: none">• 2GB 32-bit LPDDR4• 32GB eMMC 5.1• SD/MMC connector• 32MB QSPI Flash
Display Board Interface	<ul style="list-style-type: none">• MIPI-CSI Camera mini-SAS connector• MIPI-DSI Display mini-SAS connector
Wireless	<ul style="list-style-type: none">• SDIO Wi-Fi/Bluetooth: AW-CM358SM (NXP 88W8987), Wi-Fi5 (802.11ac) 1x1 Dual-Band (2.4/5 GHz) and Bluetooth 5.1• Onboard chip antenna• External antenna connector
Power Management	<ul style="list-style-type: none">• NXP PMIC PCA9450AA
Audio	<ul style="list-style-type: none">• Audio DAC 24-bit 192 kHz stereo• HP Jack 3.5 mm audio connector• Board expansion connector for audio interfaces
Connectivity	<ul style="list-style-type: none">• 10/100/1000 Ethernet• USB 2.0 Type C connector• M.2 connector (PCIe, UART, PCM)
Debug	<ul style="list-style-type: none">• JTAG connector• UART via USB
Tools & OS support	<ul style="list-style-type: none">• Linux• Android• FreeRTOS (Support for Cortex-M7)



8MMINILPD4-EVKB Content

- ✚ i.MX 8M Mini EVKB Board with LPDDR4 memory
- ✚ MIPI-DSI to HDMI Accessory Board
- ✚ Power Supply
- ✚ Mini-SAS cable
- ✚ USB Type-C Cable
- ✚ USB micro-B Cable
- ✚ USB Type-C to A Adapter
- ✚ Android BSP flashed in eMMC
- ✚ Quick Start Guide