



MCU-based Machine Vision for Cost-Effective Face Recognition

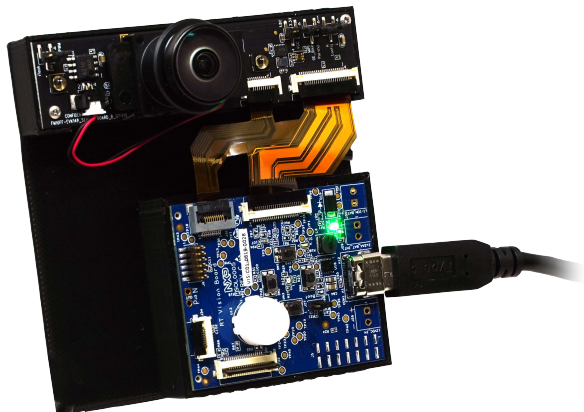
MCU-Based Solution for Face Recognition

NXP's MCU-based machine vision solution leverages the i.MX RT106F crossover MCU enabling developers to quickly and easily add face recognition capabilities to their products. This ultra-small form-factor, production ready hardware design comes with fully integrated software running on FreeRTOS, for quick out-of-the-box implementation. This turnkey solution minimizes time to market, risk, and development effort enabling OEMs to easily add machine vision to their smart home and smart appliance products without the need for an expensive Linux-based MPU implementation, and without Wi-Fi and cloud connectivity, addressing the privacy concerns of many consumers.

OVERVIEW

NXP's MCU-based face recognition solution provides OEMs with a fully integrated, self-contained, software and hardware platform. The solution is based on the i.MX RT106F, an EdgeReady member of the i.MX RT crossover MCU family. It includes the NXP Oasis face and emotion recognition run-time library, a set of pre-integrated machine learning algorithms, as well as required drivers for peripherals such as camera, memories and optional connectivity features.

From an optimized, small form factor reference hardware to fully tested, documented and supported software, the solution is designed to accelerate time to market and reduce complexity for OEMs and ODMs.



TARGET APPLICATIONS

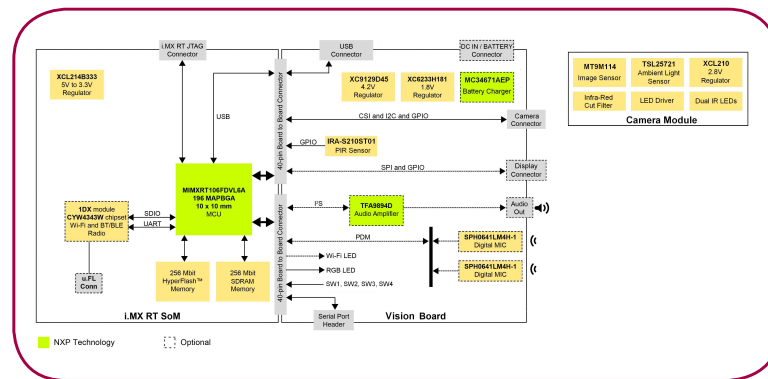
The i.MX RT106F MCU-based solution for Face Recognition enables designers to integrate facial recognition into a wide variety of smart home, appliance, security and industrial products.

- ▶ Smart appliances:
 - Washing machines, dryers, ovens, refrigerators, stoves, and dishwashers
- ▶ Home comfort devices:
 - Thermostats, HVAC and lighting control
- ▶ Counter top appliances:
 - Microwaves, coffee machines, and rice cookers
- ▶ Safety/Security/Alarm devices:
 - Alarm panels and automated access
- ▶ Smart industrial devices:
 - Power tools, ergonomic stations, industrial workstations



The i.MX RT106F is an EdgeReady member of the i.MX RT1060 family of crossover MCUs, targeting low cost embedded face recognition applications. It features NXP's advanced implementation of the Arm® Cortex®-M7 core, which operates at speeds up to 600 MHz to provide high CPU performance and real-time response. In addition to the face recognition capability, the i.MX RT106F has plenty of horsepower and peripherals, making it suitable to be the main processor in many applications. The i.MX RT106F processor is licensed to run NXP's Oasis run-time library for face recognition which includes:

- ## FACE RECOGNITION EVALUATION HARDWARE



The diagram illustrates a system architecture with the following components and layers:

- Platform Source Code** (indicated by a vertical arrow on the left)
- Customer/NXP Application and Control** (top layer, containing):
 - Device Control
 - Wi-Fi AP & BLE Pairing
 - Discovery
 - Onboarding
- Inference framework** (middle layer, containing):
 - Connectivity & Host Control/ Messaging
 - File System
 - GUI Tasking
 - Floating F32
 - Quantized INT8
 - Face Recognition (AI model)
 - Face Alignment
 - Anti-Spoofing
 - Face Detection (AI model)
 - Mini CV
- Sensor Sampling/Data Pre-processing** (bottom layer, containing):
 - FreeRTOS
- Driver Layer** (bottom layer, containing):
 - Flash
 - Bootstrap/ Loader
 - Wi-Fi/BLE
 - LCD Display
 - Camera
 - UART/SPI
 - GPIO

PART NUMBER	DESCRIPTION	FEATURES	DIMENSIONS
SLN-VIZN-IOT	MCU-based Friction Free Interface solution evaluation and development kit	Out-of-box evaluation and prototyping for face recognition solutions including: <ul style="list-style-type: none">• i.MX RT106F crossover processor• 802.11 b/g/n Wi-Fi• Bluetooth/Bluetooth LE 4.2• Digital MEMS microphones (x2)• TFA9894 audio amplifier (Optional)• MC3461 Battery Charger• PCAL6524EV I/O Expander• FXOS8700CQ Motion Sensor (Optional)• PIR Sensor	50 x 40 mm
MIMXRT106FDVL6A	i.MX RT106F Vision crossover processor	<ul style="list-style-type: none">• 600 MHz Arm® Cortex®-M7 MCU with complete voice solution software• 1 MB On-chip RAM	10 x 10 mm 0.65 mm pitch 196-pin MAPBGA
TFA9894DUKN2Z (Optional)	5 W Class Dsmart audio amplifier	<ul style="list-style-type: none">• SPK Class-D• 10 V Adaptive DC-DC Boost• Embedded Speaker Boost Algorithm	3.55 x 2.51 mm 0.4 mm pitch WLCSP48
FXOS8700CQ (Optional)	Digital Motion Sensor Accelerometer	<ul style="list-style-type: none">• Wide dynamic range $\pm 1200 \mu\text{T}$• Embedded vector magnitude detection• Embedded autonomous hard iron calibration• Low-power consumption• Embedded autonomous hard iron calibration	3 x 3 mm
PCAL6524EV (Optional)	Ultra-low-voltage I/O expander	<ul style="list-style-type: none">• I²C-bus to parallel port expander• 1 MHz Fast-mode Plus I²C-bus• Operating power supply voltage range of 0.8 V to 3.6 V on the I²C-bus side• Allows bidirectional voltage-level translation and GPIO expansion between 0.8 V to 3.6 V SCL/SDA and 1.8 V, 2.5 V, 3.3 V, 5.5 V Port P• Low standby current consumption: 2.0 μA typical at 3.3 V VDD(P)	5 x 5 x 0.56 mm