WE-I Plus EVB

>> **Technical Document**

Revision History

Version	Date	Description of changes
01	2020/07/29	New setup.

List of Contents

1. Description

Endpoint AI applications are everywhere in our life soon. Endpoint AI devices will connect with local Edge AI server or connect with Cloud AI server directly via 5G wireless network. There are some TinyML algorithm development requirements from Internet of Things "IoT" applications – Low frame rate "Vision" watching for object detection and classification, Always-on "Voice" listening for wakeup word detection and voice command recognition, Always-on "Vibration" monitoring for anomaly detection.

In collaboration with Google TensorFlow Lite for Microcontrollers framework and Synopsys embARC MLI library, Himax WE-I Plus EVB provides a complete development environment to deploy all TensorFlow Lite for Microcontrollers examples, "Person detection", "Micro speech", and "Magic wand", for "Vision", "Voice" and "Vibration" applications.
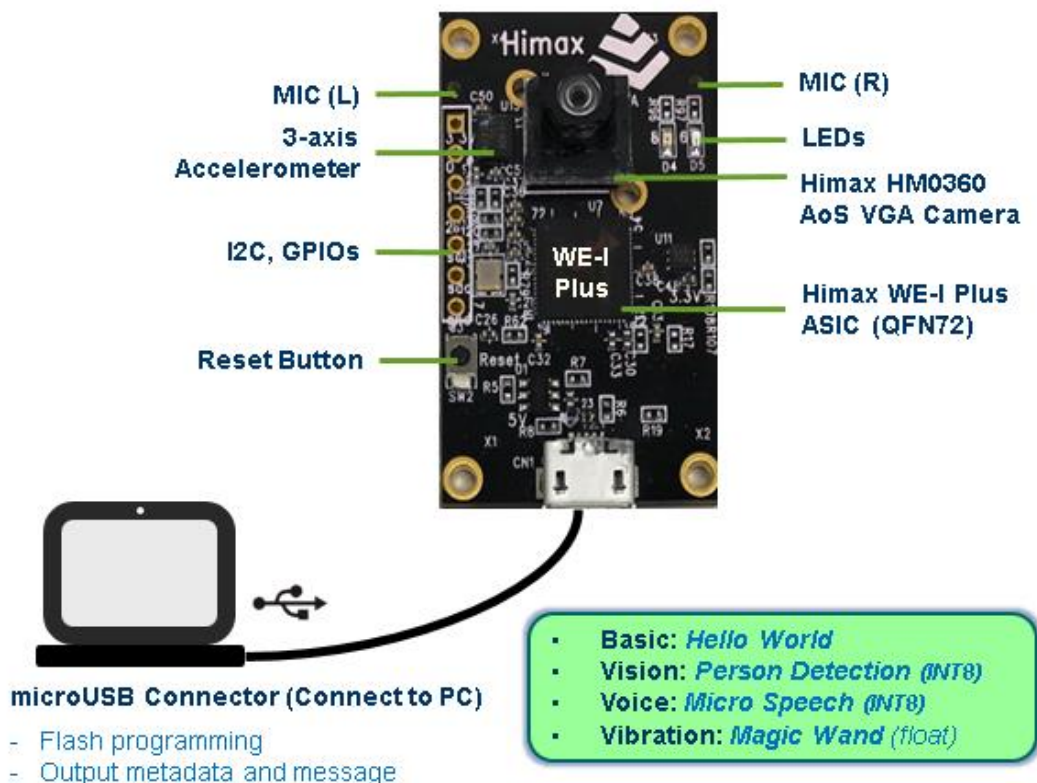
WE-I Plus EVB built-in WE-I Plus ASIC (HX6537-A) that embedded Synopsys ARC EM9D DSP running at 400MHz and 2MB internal SRAM and 2MB Flash for larger Neuro Network model deployment. To support "Vision" applications, this board features a Himax HM0360 ultra-low-power VGA mono camera. The inference time of 250KB weight size TensorFlow Lite for Microcontrollers "Person detection" example is only 40ms. To support "Voice" applications, this board features two MEMS microphones. The inference time of 20KB weight size TensorFlow Lite for Microcontrollers "Micro speech" example is only 6ms. To support "Vibration" applications, this board features a STM LSM9DS1 IMU for 3-axis accelerometer function. The WE-I Plus ASIC embedded EM9D DSP Floating-Point-Unit (FPU) will be enabled when inference 20KB weight size TensorFlow Lite for Microcontrollers "Magic Wand" example.

Besides examples deployment, WE-I Plus EVB has 2 LEDs to indicate classification result and built-in FTDI USB to SPI/I2C/UART bridge for Flash programming and metadata or message output. It also provides expansion header with I2C and GPIOs interface to add external sensors or devices.

2. Features

- WE-I Plus ASIC (HX6537-A)
  - ARC 32-bit EM9D DSP with FPU
  - 400MHz clock frequency
  - 2MB SRAM
  - 2MB Flash

- On board
  - Himax HM0360 AoS ™ ultra-low power VGA CCM
  - FTDI USB to SPI/I2C/UART bridge
  - LDO power supply (3.3/2.8/1.8/1.2V)
  - 3-asix accelerometer
  - 1x reset button
  - 2x microphones (L/R)
  - 2x user LEDs
  - microUSB connector

- Expansion header
  - 1x I2C master
  - 3x GPIOs
  - Power/Ground

(Board size: 40mm x 27mm)

MIC (L)
3-axis Accelerometer
I2C, GPIOs
Reset Button

MIC (R)
LEDs
Himax HM0360 AoS VGA Camera
Himax WE-I Plus ASIC (QFN72)

microUSB Connector (Connect to PC)
- Flash programming
- Output metadata and message

- Basic: *Hello World*
- Vision: *Person Detection (INT8)*
- Voice: *Micro Speech (INT8)*
- Vibration: *Magic Wand (float)*

3. Documents

- Schematics
- EVB user guide
- TensorFlow Lite for Microcontrollers
- WE-I Plus ASIC (HX6537-A) preliminary datasheet (as attached)
- HM0360 preliminary datasheet (as attached)

4. Examples

- TensorFlow Lite for Microcontrollers examples
  - Hello World
  - Micro speech -> TensorFlow GitHub PR on-going
  - Person detection
  - Magic wand -> TensorFlow GitHub PR on-going

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