HM0360 / AR3XA0 Add-On for GAP9_EVK

User Manual

Rel.1.0

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Focus on HM0360 only, AR3XA0 to be added at a later step

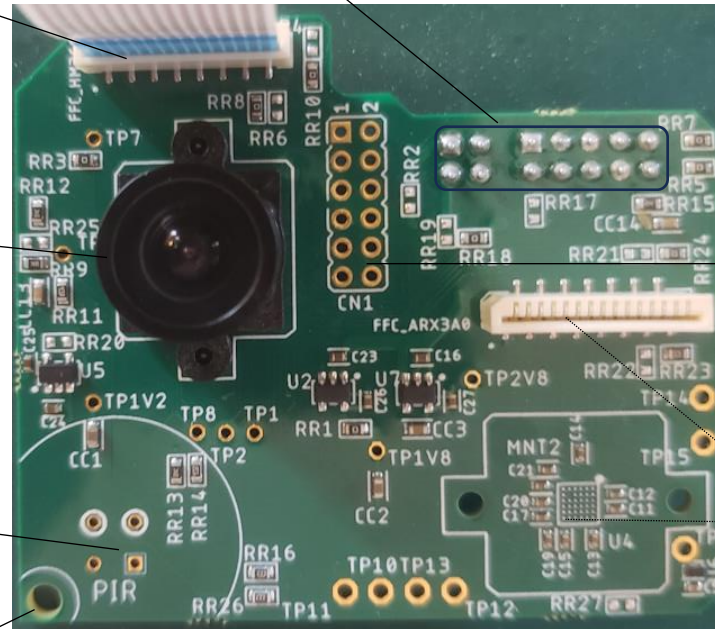# HM0360 Add-On Board Anatomy

Mated with GAP9_EVK

These connectors (on bottom face) to mate with CN8 and CN4 of GAP9_EVK

FFC connector HM0360 <> GAP9

S-Mount lens holder with interchangeable lens, mounted on top of HM0360 sensor. Select lens FOV according to application needs
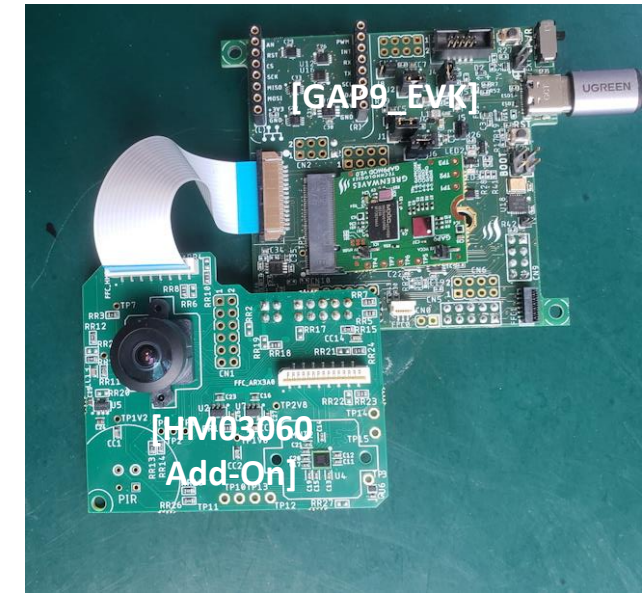
Optional PIR

Hole can be used to attach a supporting 'leg' for the board
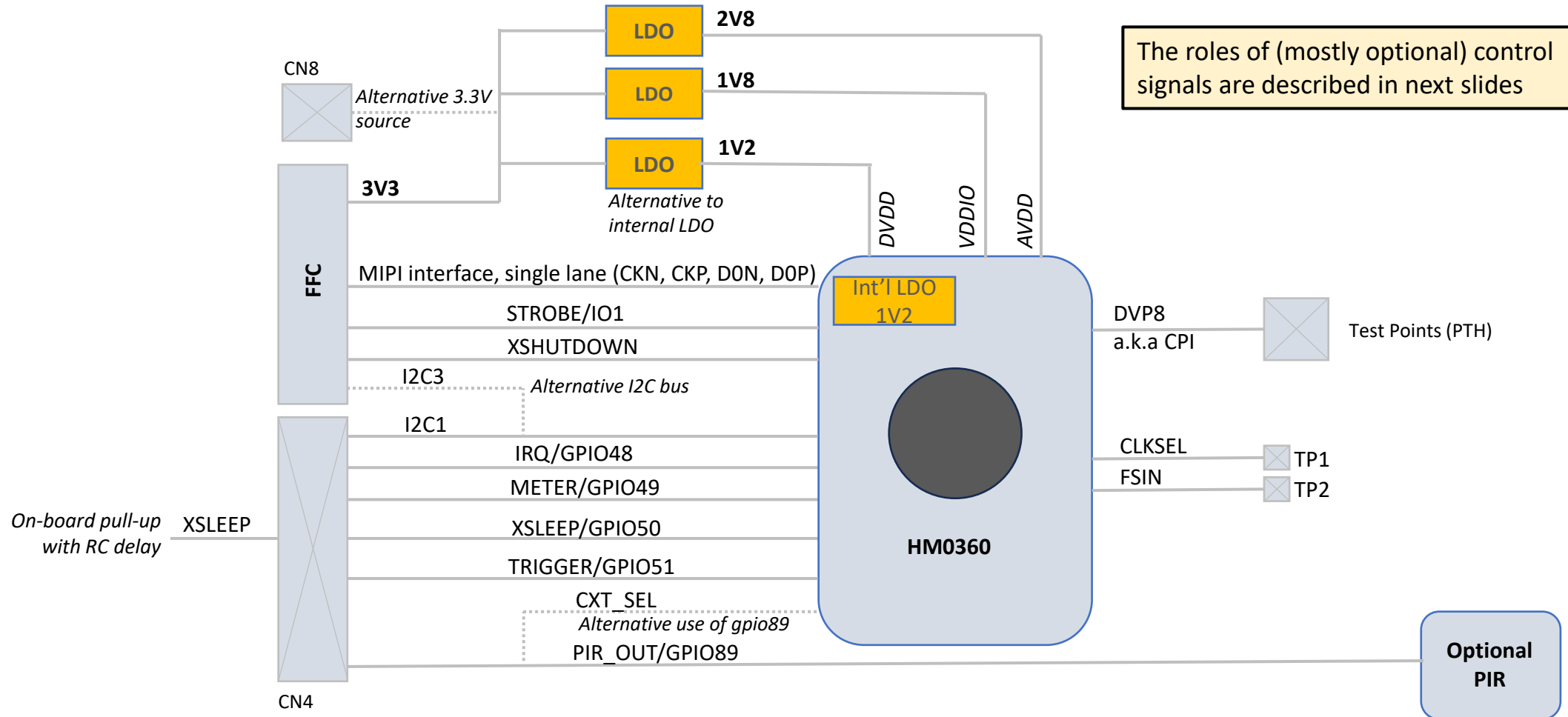
HM0360 DVP Test Points for debug

FFC and sensor footprint for alternative sensor, OnSemi ARX3A0

HM0360 Add-On Board Architecture Outline

This is intended as an overview of the power supply scheme and control options available on the board.
Refer to full schematic for details.

The roles of (mostly optional) control signals are described in next slides

HM0360 Default and Alternative Settings (1/2)

- **SOURCE POWER**:
  - **Default**: all on-board voltages derived from EVK's **3V3_CAM** (carried through FFC) → 3V3_CAM must be enabled on GAP9_EVK, controlled by GAP9's GPIO0 (and J1 must be fitted).
  - Alternative (swap RR18 and RR19): can instead use 3V3_PERIPH from EVK (carried trhough CN8) → 3V3_PERIPH must be enabled on GAP9_EVK, controlled by GAP9's GPIO35 (and J2 must be fitted).

- **HM0360 Power Supplies :**
  - 1.8V (I/Os) and 2.8V (analog core VCC) generated by on-board LDO
  - 1.2V (digital core VDD) can be generated internally by HM0360 (recommended default) or obtained from on-board LDO – Selection by I2C register [RR20 (0-ohm) must be mounted to use on-board LDO, do not mount if using internal generation]

- **XSHUTDOWN** (reset and power down control pin of HM0360, active low) : [BUG: should have been pulled high on-board by default]
  To be driven by GAP9 (high to enable the camera, low to shut it down/reset it) - Driven through **IO0 of FFC cable, controlled through GPIO expander on GAP9_EVK** (same as for RPi compatible modules – I0 of FXL6408) – Can be forced through TP9 if needed.

- **XSLEEP** (low power sleep mode, active low) : **Default**: **pulled high (inactive)** on board. Can be driven from GAP9 with GPIO50 (present on position 5 of CN4)

HM0360 Default and Alternative Settings (2/2)

- **CLOCKS**:
  - **HM0360 Master Clock: Default** - CLK_SEL pulled low on-chip → using **internally generated 48MHz clock**.
  Can be forced to any value through TP1. If driven to 1.8V, will use external clock MCLK_HM360, NC by default but 12MHz if populaint RR27 (0603) with 0-50ohm.

- **I2C control of HM0360:**
  Default: is **I2C1 of GAP9**, passed through pins 7 and 9 of CN8 **(**different from case of Rpi compatible module)
  Alternative (remove RR5+RR7, populate RR4+RR6 with 10K and RR8+RR10 with 0-ohm: I2C3 of GAP9, passed through camera FFC of GAP9_EVK (same as Rpi compatible module)

- Other HM0360 control I/Os (optional use) that can be driven from GAP9

  - **TRIGGER** (frame trigger input / optional use instead of s/w trigger): can be driven from **GPIO51** of GAP9

  - **METER** (exposure meter enable pin / optional use instead of s/w enable – useful for pre-metering feature, quickly setting exposure and gain): can be driven from **GPIO49** of GAP9

  - **INT** (HM0360 interrupt output, active high): can be monitored with **GPIO48** of GAP9

Other Features

- An optional **PIR** can be mounted on the board, providing a single bit digital output – typically Panasonic's digital output EKMB or EKMC series. The PIR ouput is connected to **GPIO89** of GAP9 (wake-up capable).

- The HM0360 can also output pictures through **a parallel DVP (Digital Video Port) interface**. This interface is made available, mostly for debug purposes, on the HM0360 Add-On board on a **through-hole connector footprint, CN1.**
  GAP9 (in WLCSP packge) cannot interface with a DVP (a.k.a CPI) interface – only CSI-2 is supported.

Lens Selection -   Effective FOV *vs.* Nominal SOV

- Most interchangeable lenses for S-Mounts are intended for sensors of size 1/3'' to 1/4''.
  However **the HM0360 is only 1/6''**.
  Therefore the image captured by the HM0360 will be a cropped version of the total picture provided by the lens.
  Therefore **the effective FOV (Field of View) seen by the HM0360 will be smaller than that advertized by the lens.**
  It is recommended to select a very large nominal FOV (very short focal length) to obtain a decently wide effective field of view.

- Example:

  - consider lens M40160M12 from Arducam: Focal Length 1.6mm, intended for optical format: 1/4'', with FOV (D/H/V): **145°/118°/92°**

  - With some trignonometry, one can calculate that the HM0360 1/6'' sensor will capture a (centered) fraction of the picture,
    with DFOV=**129°** (vs. 145° for full picture)

- For ARX3A0, the same holds, but the effective FOV reduction is even greater as this sensor is tiny, only 1/10.3 ''.
  It will hardly be usable for most applications (unless narrow FOV is acceptable), but the main rationale for having ARX3A0 on the baord is to facilitate driver development and validation.