Shenzhen Cinpro Technology Co., Ltd

**Key Features:**

Sony CMSO Image Sensor IMX377
Diagonal 7.81mm (Type 1/2.3”)

**Color Sensor**

**Total number of pixels:**
4152(H) x 3062(V) 12.71 M pixels

**Active Pixels:**
1/2.3”
4024(H) x 3036(V) 12.22M pixels, Dia 7.81mm
1/2.5”
4120(H) x 2168(V) 8.93M pixels, Dia 7.22mm

**Recommend recording pixels:**
1/2.3”
4000(H) x 3000(V) 12.00M pixels, aspect ratio 4:3
1/2.5”
4096(H) x 2160(V) 8.93M pixels, aspect ratio 17:9

**Support M12 Lens** (S mount lens)

**Module Size:** 28mm x 28mm

**Interface:** Mipi 4 Lane

**Lens Spec:**

**Model No:**

**Effective Focal Length:**

**M.O.D:**

**Aperture ratio:**

**FOV (D/H/V):**

**Distortion:**

**Mount:**

**Module image wit lens:**

**Dimensions:**

![Module Dimensions Diagram]
Interface:

Connector: 0.5 pitch (H2.0)

Number of Pins: 26
Absolute Maximum Ratings:

- Supply voltage (Analog) \( V_{\text{ADD}} \): -0.3 to +3.3 V
- Supply voltage (Digital 1) \( V_{\text{DDD1}} \): -0.5 to +2.0 V
- Supply voltage (Digital 2) \( V_{\text{DDD2}} \): -0.5 to +3.3 V
- Input voltage (Digital) \( V_I \): -0.3 to \( V_{\text{DDD2}} + 0.3 \) V
- Output voltage (Digital) \( V_O \): -0.3 to \( V_{\text{DDD2}} + 0.3 \) V

Recommended Operating Conditions:

- Supply voltage (Analog) \( V_{\text{ADD}} \): 2.8 ± 0.1 V
- Supply voltage (Digital 1) \( V_{\text{DDD1}} \): 1.2 ± 0.1 V
- Supply voltage (Digital 2) \( V_{\text{DDD2}} \): 1.8 ± 0.1 V
- Input voltage (Digital) \( V_I \): -0.1 to \( V_{\text{DDD2}} + 0.1 \) V
- Output voltage (Digital) \( V_O \): -0.1 to \( V_{\text{DDD2}} + 0.1 \) V

Spectral Sensitivity Characteristics:

![Spectral Sensitivity Characteristics](Excludes lens characteristics and light source characteristics)

DC Characteristics:
Current Consumption and Gain Variable Range

\( V_{DD} = 2.9 \, \text{V}, \, V_{GDO1} = 1.3 \, \text{V}, \, V_{GDO2} = 1.9 \, \text{V}, \, T_j = 60 \, ^\circ \text{C}, \, \text{Reference Gain (0 dB)}, \) approximately 12.35 M pixels readout (MODE0), 34.97 frame/s

<table>
<thead>
<tr>
<th>Item</th>
<th>Symbol</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Unit</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current consumption (Analog)</td>
<td>( I_{ADDO} )</td>
<td>—</td>
<td>—</td>
<td>91</td>
<td>mA</td>
<td></td>
</tr>
<tr>
<td>Current consumption (Digital 1)</td>
<td>( I_{GDO1} )</td>
<td>—</td>
<td>—</td>
<td>256</td>
<td>mA</td>
<td></td>
</tr>
<tr>
<td>Current consumption (Digital 2)</td>
<td>( I_{GDO2} )</td>
<td>—</td>
<td>—</td>
<td>1</td>
<td>mA</td>
<td></td>
</tr>
<tr>
<td>Standby current (Analog)</td>
<td>( I_{ADDO1STB} )</td>
<td>—</td>
<td>—</td>
<td>150</td>
<td>( \mu \text{A} )</td>
<td>In the dark</td>
</tr>
<tr>
<td>Standby current (Digital 1)</td>
<td>( I_{GDO1STB} )</td>
<td>—</td>
<td>—</td>
<td>40</td>
<td>mA</td>
<td>In the dark</td>
</tr>
<tr>
<td>Standby current (Digital 2)</td>
<td>( I_{GDO2STB} )</td>
<td>—</td>
<td>—</td>
<td>50</td>
<td>( \mu \text{A} )</td>
<td>In the dark</td>
</tr>
<tr>
<td>PGA gain variable range</td>
<td>( PGAG )</td>
<td>0</td>
<td>—</td>
<td>27</td>
<td>dB</td>
<td></td>
</tr>
</tbody>
</table>

Supply Voltage and I/O Voltage

<table>
<thead>
<tr>
<th>Item</th>
<th>Pins</th>
<th>Symbol</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage</td>
<td>Analog</td>
<td>( V_{DOSUB}, , V_{DOSHCM}, , V_{DOSHPX}, , V_{DOSHDA}, , V_{DOSHCAP} )</td>
<td>( V_{ADDO} )</td>
<td>2.70</td>
<td>2.80</td>
<td>2.90</td>
</tr>
<tr>
<td></td>
<td>Digital 1</td>
<td>( V_{DO}LCN1 ) to 2, ( V_{DO}LSC1 ) to 2, ( V_{DO}LPL1 ) to 3, ( V_{DO}LIF1 ) to 2</td>
<td>( V_{GDO1} )</td>
<td>1.10</td>
<td>1.20</td>
<td>1.30</td>
</tr>
<tr>
<td></td>
<td>Digital 2</td>
<td>( V_{DO}MIO )</td>
<td>( V_{GDO2} )</td>
<td>1.70</td>
<td>1.80</td>
<td>1.90</td>
</tr>
<tr>
<td>Digital input voltage</td>
<td>SDA, SCL</td>
<td>( V_{SLH1} )</td>
<td>( 0.7 \times V_{GDO2} )</td>
<td>—</td>
<td>1.9</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( V_{SL1} )</td>
<td>—</td>
<td>—</td>
<td>0.3 \times V_{GDO2}</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>XCLR, INCK</td>
<td>( V_{SLH2} )</td>
<td>( 0.65 \times V_{GDO2} )</td>
<td>—</td>
<td>V_{GDO2} + 0.3</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( V_{SL2} )</td>
<td>—</td>
<td>—</td>
<td>0.35 \times V_{GDO2}</td>
<td>V</td>
</tr>
</tbody>
</table>

AC Characteristics:
INCK, XCLR:

![INCK, XCLR Diagram]

**INCK, XCLR AC Characteristics**

<table>
<thead>
<tr>
<th>Item</th>
<th>Symbol</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>INCK clock frequency</td>
<td>( f_{\text{INCK}} )</td>
<td>6</td>
<td>—</td>
<td>27</td>
<td>MHz</td>
</tr>
<tr>
<td>INCK Low level pulse width</td>
<td>( t_{\text{twl}} )</td>
<td>5</td>
<td>—</td>
<td>—</td>
<td>ns</td>
</tr>
<tr>
<td>INCK High level pulse width</td>
<td>( t_{\text{twh}} )</td>
<td>5</td>
<td>—</td>
<td>—</td>
<td>ns</td>
</tr>
<tr>
<td>Clock duty</td>
<td>—</td>
<td>40</td>
<td>50</td>
<td>60</td>
<td>%</td>
</tr>
<tr>
<td>XCLR Low level pulse width</td>
<td>( t_{\text{tLOW}} )</td>
<td>100</td>
<td>—</td>
<td>—</td>
<td>ns</td>
</tr>
</tbody>
</table>

**I²C Communication:**

![I²C Communication Diagram]

**I²C Communication Characteristics**

**I²C Communication Protocol**

Data is transferred serially, MSB first in 8-bit units. After each data byte is transferred, A (Acknowledge) is transferred. Data is transferred at the clock cycle of SCL. SDA can change only while SCL is Low, so the SDA value must be held while SCL is High. The Start condition is defined by SDA changing from High to Low while SCL is High. When the Stop condition is not generated in the previous communication phase and Start condition for the next communication
After transfer of each data byte, the Master or the sensor transmits an Acknowledge and release (does not drive) SDA.

### I²C Specification

<table>
<thead>
<tr>
<th>Item</th>
<th>Symbol</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Unit</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low level input voltage</td>
<td>$V_{IL}$</td>
<td>-0.3</td>
<td>—</td>
<td>$0.3 \times V_{DDO2}$</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>High level input voltage</td>
<td>$V_{IH}$</td>
<td>$0.7 \times V_{DDO2}$</td>
<td>—</td>
<td>1.9</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>Low level output voltage</td>
<td>$V_{OL}$</td>
<td>0</td>
<td>—</td>
<td>$0.2 \times V_{DDO2}$</td>
<td>V</td>
<td>$V_{DDO2} &lt; 2$ V, Sink 3 mA</td>
</tr>
<tr>
<td>Output fall time</td>
<td>$t_{OF}$</td>
<td>—</td>
<td>—</td>
<td>250</td>
<td>ns</td>
<td>Load 10 pF to 400 pF,</td>
</tr>
<tr>
<td>Item</td>
<td>Symbol</td>
<td>Min.</td>
<td>Typ.</td>
<td>Max.</td>
<td>Unit</td>
<td></td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>--------</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td></td>
</tr>
<tr>
<td>SCL clock frequency</td>
<td>$f_{SCL}$</td>
<td>0</td>
<td>—</td>
<td>400</td>
<td>kHz</td>
<td></td>
</tr>
<tr>
<td>Hold time (Start Condition)</td>
<td>$t_{HOLD,STA}$</td>
<td>0.6</td>
<td>—</td>
<td>—</td>
<td>µs</td>
<td></td>
</tr>
<tr>
<td>Low period of the SCL clock</td>
<td>$t_{LOW}$</td>
<td>1.3</td>
<td>—</td>
<td>—</td>
<td>µs</td>
<td></td>
</tr>
<tr>
<td>High period of the SCL clock</td>
<td>$t_{HIGH}$</td>
<td>0.6</td>
<td>—</td>
<td>—</td>
<td>µs</td>
<td></td>
</tr>
<tr>
<td>Set-up time (Repeated Start Condition)</td>
<td>$t_{SU,STA}$</td>
<td>0.6</td>
<td>—</td>
<td>—</td>
<td>µs</td>
<td></td>
</tr>
<tr>
<td>Data hold time</td>
<td>$t_{HOLD,DAT}$</td>
<td>0</td>
<td>—</td>
<td>0.9</td>
<td>µs</td>
<td></td>
</tr>
<tr>
<td>Data set-up time</td>
<td>$t_{SU,DAT}$</td>
<td>100</td>
<td>—</td>
<td>—</td>
<td>ns</td>
<td></td>
</tr>
<tr>
<td>Rise time of both SDA and SCL signals</td>
<td>$t_r$</td>
<td>—</td>
<td>—</td>
<td>300</td>
<td>ns</td>
<td></td>
</tr>
<tr>
<td>Fall time of both SDA and SCL signals</td>
<td>$t_f$</td>
<td>—</td>
<td>—</td>
<td>300</td>
<td>ns</td>
<td></td>
</tr>
<tr>
<td>Set-up time (Stop Condition)</td>
<td>$t_{SU,STD}$</td>
<td>0.6</td>
<td>—</td>
<td>—</td>
<td>µs</td>
<td></td>
</tr>
<tr>
<td>Bus free time between a STOP and START Condition</td>
<td>$t_{BUF}$</td>
<td>1.3</td>
<td>—</td>
<td>—</td>
<td>µs</td>
<td></td>
</tr>
</tbody>
</table>