

Future Technology Devices International Limited Datasheet CleO-Camera Module



1 Introduction

The CleO-Camera module is a camera accessory for the *CleO* series – the smart TFT display for Arduino. It consists of an OV5640 sensor module and Flash LEDs. The OV5640 sensor is a low voltage, high-performance, 1/4-inch 5 megapixel CMOS image sensor that provides the full functionality of a single chip 5 megapixel (2592×1944) camera using OmniBSI™ technology in a small footprint package. It is controlled through the standard Serial Camera Control Bus (SCCB) interface.

The CleO-camera module is supplied with a standard 24 Pin 0.5mm pitch FFC cable.

1.1 Features

- 1.4 μm x 1.4 μm pixel with OmniBSI™ technology for high performance (high sensitivity, low crosstalk, low noise, improved quantum efficiency)
- Optical size 1/4"
- Embedded 1.5V regulator for core power
- On-board regulator for VDDA, VDDIO, only 3V3 supply needed
- Support for output format: RAW RGB, RGB565/555/444, YUV422/420, YCbCr422 and compression
- Image quality control: color saturation, hue, gamma, sharpness (edge enhancement), lens correction, defective pixel cancelling and noise cancelling
- Support for anti-shake
- Standard SCCB interface
- In built Flash light LED
- 24 pin 0.5mm pitch FFC cable interface

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2 Ordering Information

| Part No. | Description |
|-----------------|--|
| CleO-CAM1 | CleO-camera module, 5M Pixel HD CMOS camera module with adaptor board and FPC Flex |

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3 Pin Out and Signal Description

3.1 Module Description

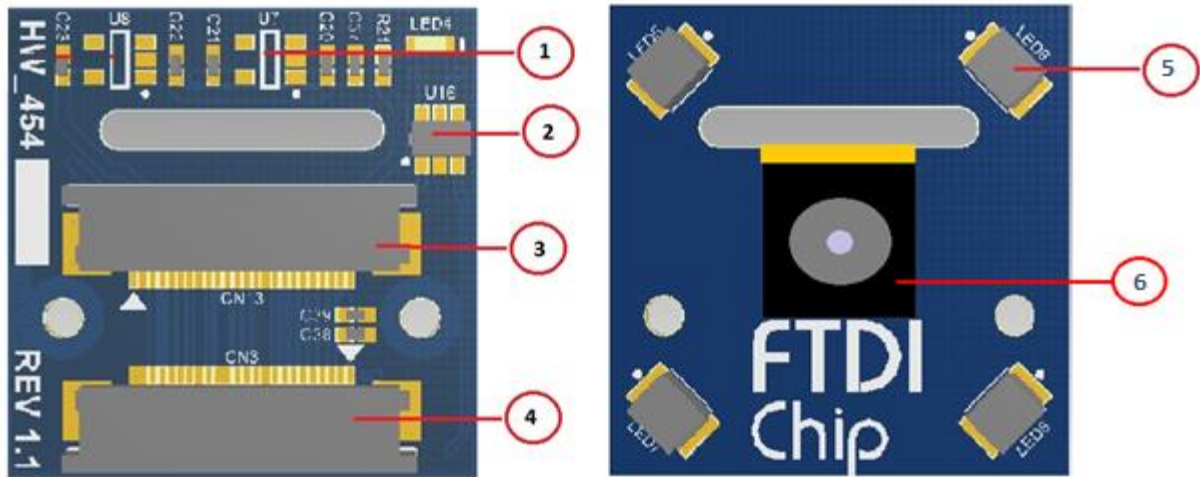


Figure 1 – Camera Module Features

| No | Feature | Reference Designator |
|----|---|------------------------|
| 1 | 2.8V fixed voltage LDO | U7 |
| 2 | LED driver | U16 |
| 3 | 24pin 0.5 mm pitch FFC connector interface to OV5640 module | CN13 |
| 4 | 24pin 0.5 mm pitch FFC connector interface to <i>CleO</i> | CN3 |
| 5 | White LED | LED5, LED6, LED7, LED8 |
| 6 | OV5640 camera module | - |

Table 1 - Camera Module Features & Description

3.2 Module Interface Signal Description

The pin description of **CN3** is given in **Table 2**.

| Pin No | Pin Name | Type | Description |
|--------|----------|--------|--|
| 1 | PWM0 | Input | Pulse Width Modulation to control LED brightness |
| 2 | CAM_5V | Power | 5V Supply |
| 3 | CAM_D2 | Output | Pixel Data Output 2 |
| 4 | CAM_D1 | Output | Pixel Data Output 1 |
| 5 | CAM_D3 | Output | Pixel Data Output 3 |

| Pin No | Pin Name | Type | Description |
|--------|----------|----------------|--|
| 6 | CAM_D0 | Output | Pixel Data Output 0 |
| 7 | CAM_D4 | Output | Pixel Data Output 4 |
| 8 | CAM_PCLK | Output | Pixel Clock Output from Sensor |
| 9 | CAM_D5 | Output | Pixel Data Output 5 |
| 10 | GND | Ground | Power Ground |
| 11 | CAM_D6 | Output | Pixel Data Output 6 |
| 12 | CAM_XCLK | Input | Master Clock into Sensor |
| 13 | CAM_D7 | Output | Pixel Data Output 7 |
| 14 | CAM_3V3 | Power | 3V3 Supply |
| 15 | CAM_3V3 | Power | 3V3 Supply |
| 16 | CAM_HD | Output | Active High: Line/Data Valid; indicates active pixels |
| 17 | CAM_PWDN | Input | Camera Power Down, active High <ul style="list-style-type: none"> • Always pull low enable the sensor |
| 18 | CAM_VD | Output | Active High: Frame Valid; indicates active frame |
| 19 | RESETn | Input | Camera Reset, Active low |
| 20 | I2C0_SCL | Input | Two-Wire Serial Interface Clock |
| 21 | CAM_5V | Power | 5V Supply |
| 22 | I2C0_SDA | Bi-Directional | Two-Wire Serial Interface Data I/O |
| 23 | GND | Ground | Power Ground |
| 24 | GND | Ground | Power Ground |

Table 2 - CN3 Pin Description

4 Devices Characteristics and Ratings

4.1 Electrical Specification

| Parameter | Value | Unit | Conditions |
|---|---------------|-----------|------------|
| Storage Temperature | -40°C to 95°C | Degrees C | |
| Ambient Operating Temperature (Power Applied) | -30°C to 70°C | Degrees C | |

Table 3 - Temperature Parameter

DC Characteristics (Ambient Temperature = -30°C to +70°C)

| Parameter | Description | Minimum | Typical | Maximum | Units | Conditions |
|-----------------|---------------------|---------|---------|---------|-------|------------|
| V _{dc} | 5V DC input | 4.75 | | 5.25 | V | |
| V _{dc} | 3V3 DC input | 3.0 | 3.3 | 3.6 | V | |
| V _{ih} | Input high voltage | 1.26 | | | V | |
| V _{il} | Input low voltage | | | 0.54 | V | |
| V _{oh} | output high voltage | 1.62 | | | V | |
| V _{ol} | output low voltage | | | 0.18 | V | |

Table 4 - Operating Voltage and Current

4.2 Sensor Key Specification

key specifications (typical)

- **active array size:** 2592 x 1944
- **power supply:**
 - core: 1.5V \pm 5% (with embedded 1.5V regulator)
 - analog: 2.6 ~ 3.0V (2.8V typical)
 - I/O: 1.8V / 2.8V
- **power requirements:**
 - active: 140 mA
 - standby: 20 μ A
- **temperature range:**
 - operating: -30°C to 70°C junction temperature
 - stable image: 0°C to 50°C junction temperature
- **output formats:** 8-/10-bit RGB RAW output
- **lens size:** 1/4"
- **lens chief ray angle:** 24°
- **input clock frequency:** 6~27 MHz
- **max S/N ratio:** 36 dB (maximum)
- **dynamic range:** 68 dB @ 8x gain
- **maximum image transfer rate:**
 - QSXGA (2592x1944): 15 fps
 - 1080p: 30 fps
 - 1280x960: 45 fps
 - 720p: 60 fps
 - VGA (640x480): 90 fps
 - QVGA (320x240): 120 fps
- **sensitivity:** 600 mV/Lux-sec
- **shutter:** rolling shutter / frame exposure
- **maximum exposure interval:** 1964 x t_{ROW}
- **pixel size:** 1.4 μ m x 1.4 μ m
- **dark current:** 8 mV/s @ 60°C junction temperature
- **image area:** 3673.6 μ m x 2738.4 μ m
- **package dimensions:** 5985 μ m x 5835 μ m

Figure 2- Sensor Key Specifications

5 Board Schematic

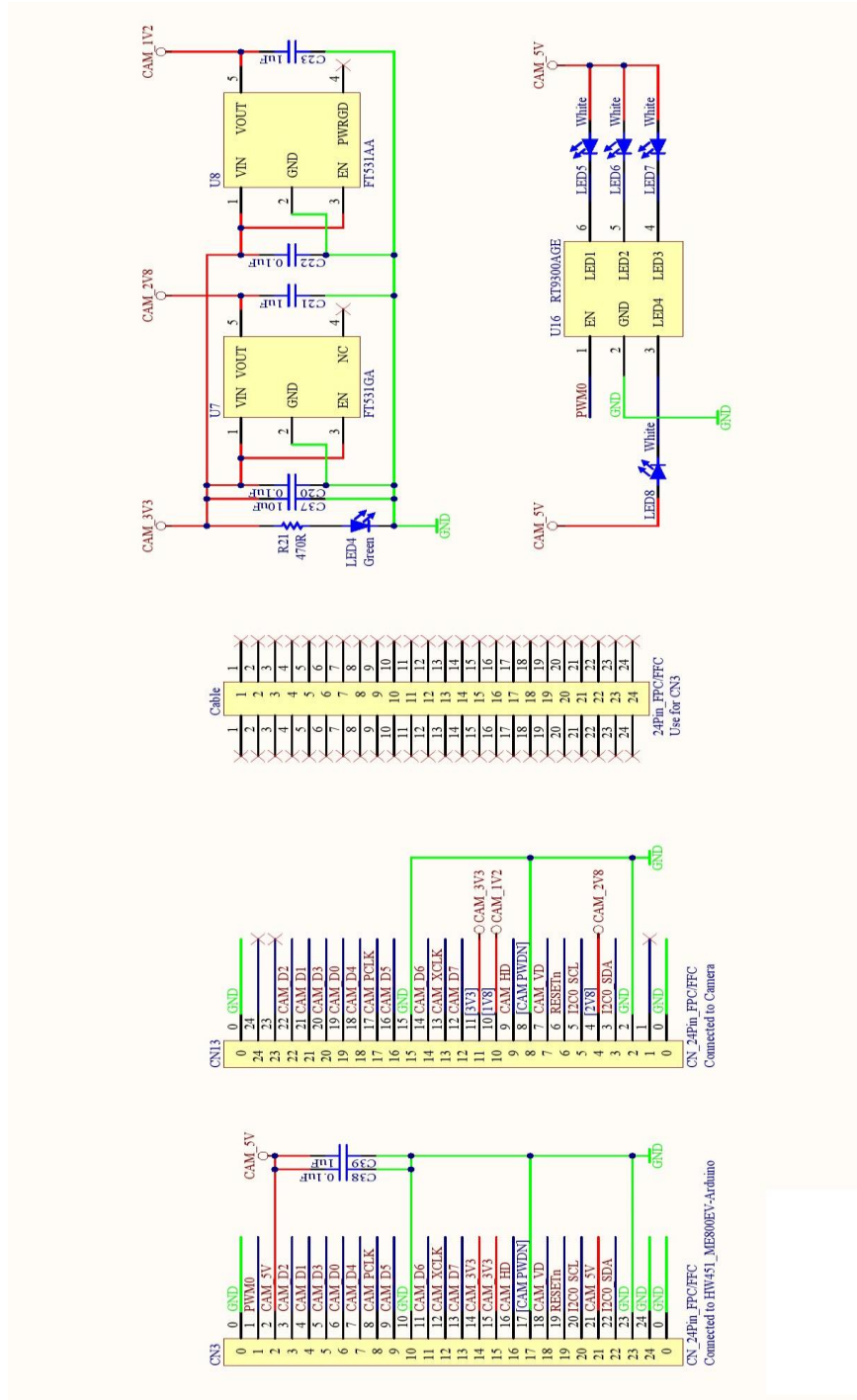


Figure 3 - Camera Schematic

6 Mechanical Dimensions

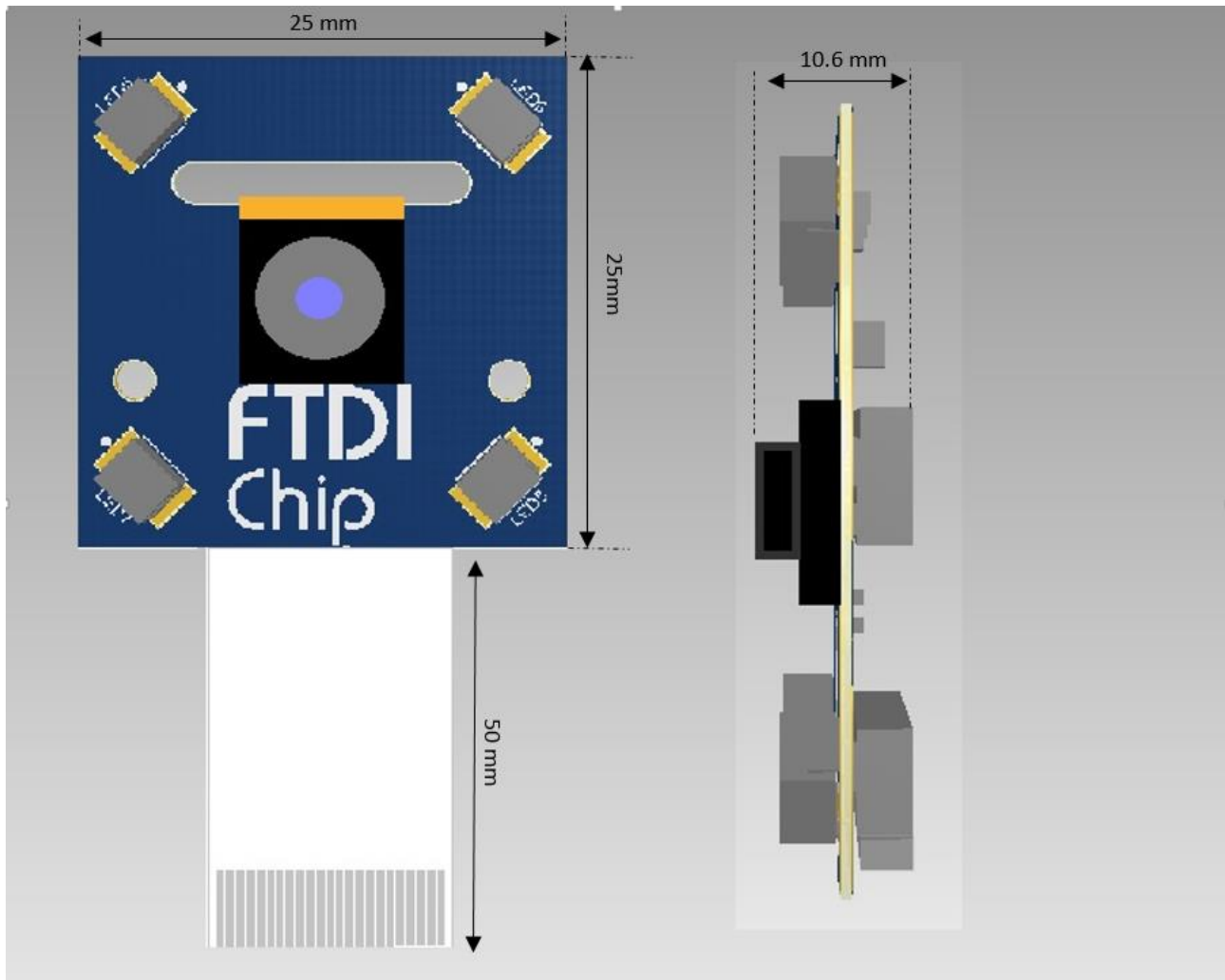


Figure 4 - CleO - Camera Module Dimensions

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Appendix A – References

Document References

For module documentations, please refer to URL below :

OV5640 datasheet: [OV5640 Datasheet](#)

LDO 2.8V Fixed Voltage datasheet: [FT531GA Datasheet](#)

Acronyms and Abbreviations

| Terms | Description |
|---------|--|
| DC | Direct Current |
| LED | Light-emitting diode |
| PWM | Pulse Width Modulation |
| SCCB | Serial Camera Control Bus |
| TFT | Thin Film Translator |
| FFC/FPC | Flexible Flat Cable/Flexible Printed Circuit |

Appendix B - List of Figures and Tables

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Appendix C – Revision History

Document Title: CleO-Camera Module Datasheet
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Product Page: <http://www.ftdichip.com/Products/Modules/CleO.htm>
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| Revision | Changes | Date |
|-------------|-----------------|------------|
| Version 1.0 | Initial Release | 2016-04-20 |