

# 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  $\mu\text{m}$  x 1.4  $\mu\text{m}$  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

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

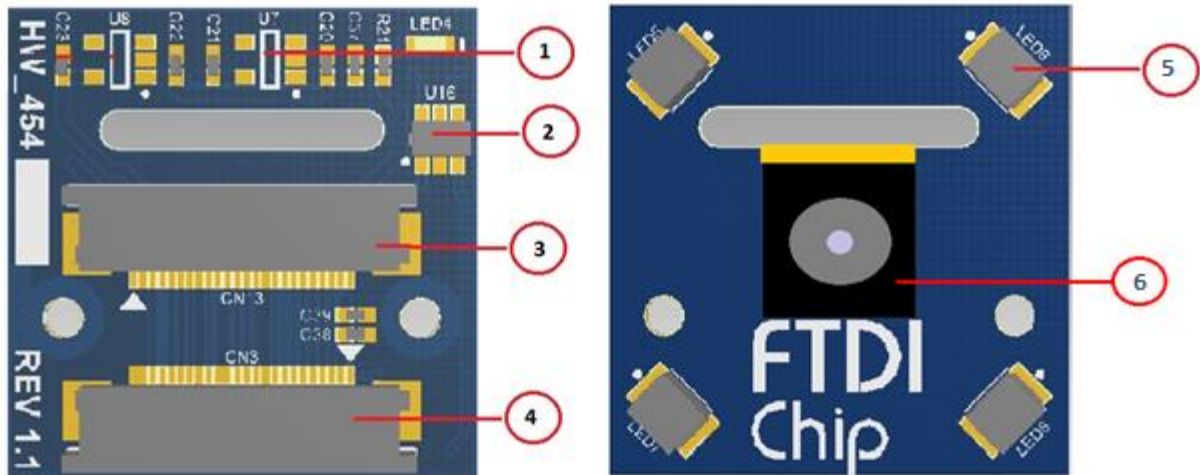
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### 3 Pin Out and Signal Description

#### 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"> <li>• Always pull low enable the sensor</li> </ul>
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 <sub>dc</sub>	5V DC input	4.75		5.25	V	
V <sub>dc</sub>	3V3 DC input	3.0	3.3	3.6	V	
V <sub>ih</sub>	Input high voltage	1.26			V	
V <sub>il</sub>	Input low voltage			0.54	V	
V <sub>oh</sub>	output high voltage	1.62			V	
V <sub>ol</sub>	output low voltage			0.18	V	

**Table 4 - Operating Voltage and Current**

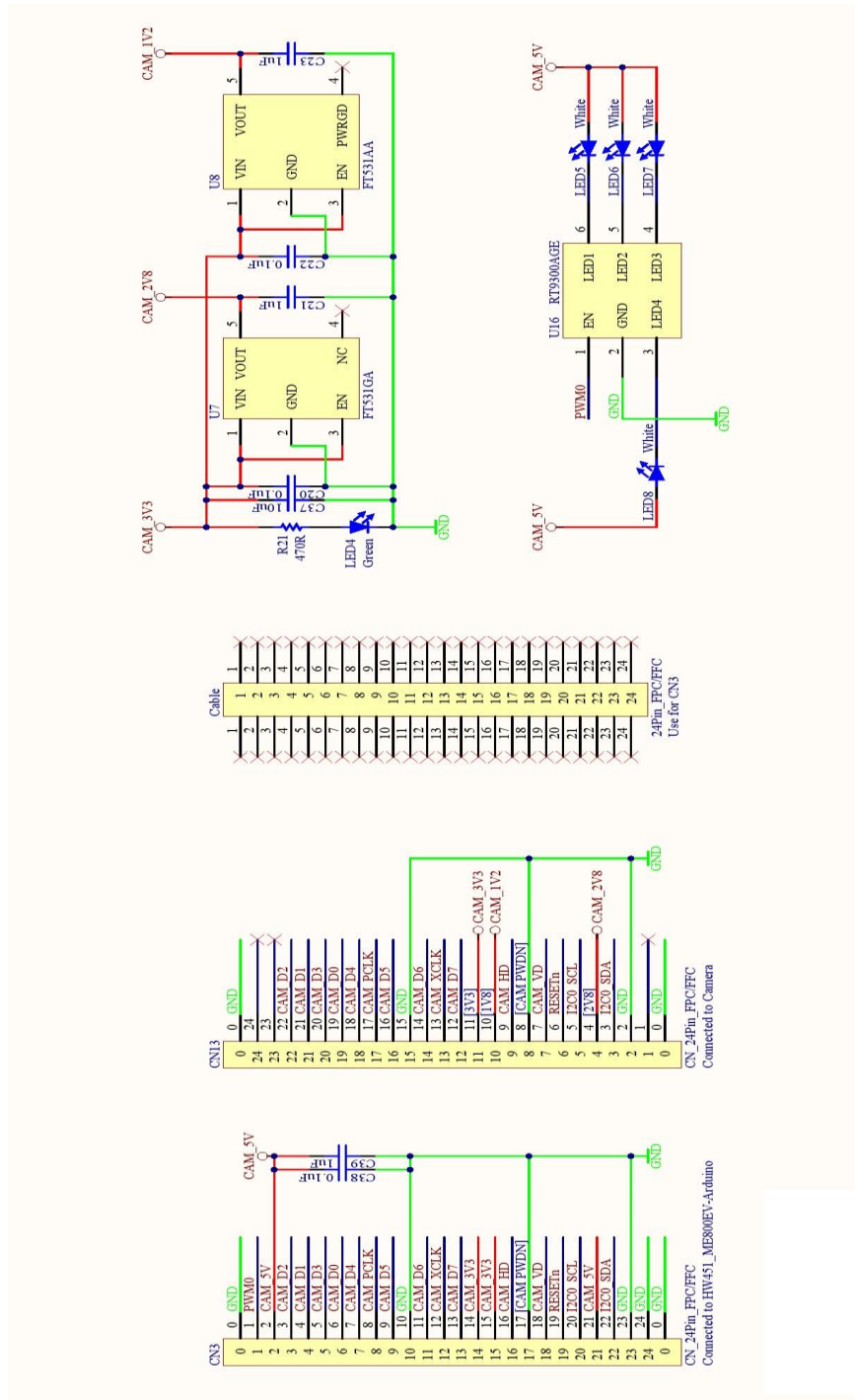
## 4.2 Sensor Key Specification

### 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  $\mu$ 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  $\mu$ m x 1.4  $\mu$ m
- **dark current:** 8 mV/s @ 60°C junction temperature
- **image area:** 3673.6  $\mu$ m x 2738.4  $\mu$ m
- **package dimensions:** 5985  $\mu$ m x 5835  $\mu$ m

**Figure 2- Sensor Key Specifications**

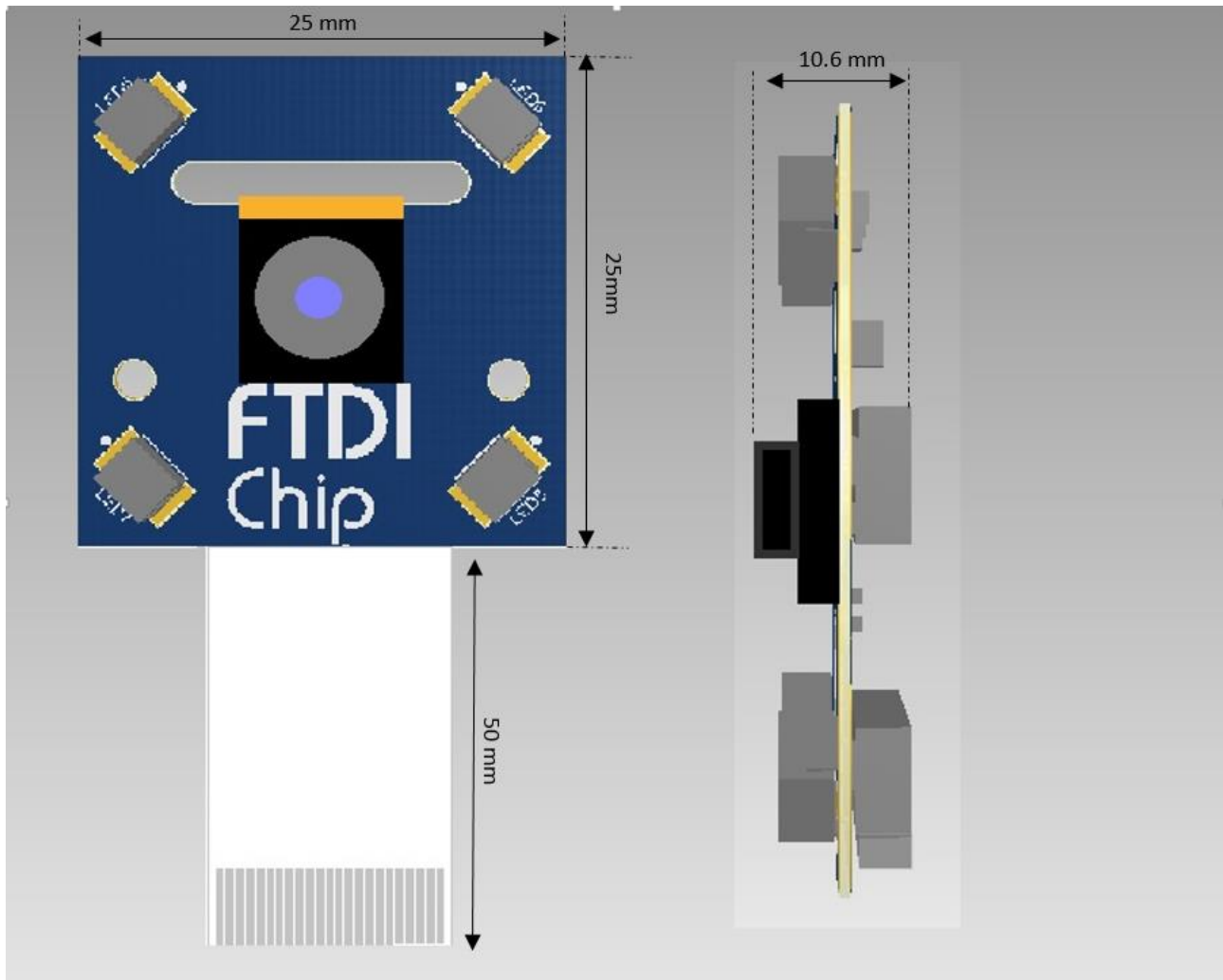
## 5 Board Schematic



**Figure 3 - Camera Schematic**



## 6 Mechanical Dimensions



**Figure 4 - CleO - Camera Module Dimensions**

## 7 Contact Information

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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 Transistor
FFC/FPC	Flexible Flat Cable/Flexible Printed Circuit

## **Appendix B - List of Figures and Tables**

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## Appendix C – Revision History

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Version 1.0	Initial Release	2016-04-20