CMOS Area Image Sensor

# T C M 5 0 2 0 A L U

#### 1/7 Inch 110 k Pixel CMOS B/W Image Sensor

The TCM5020ALU is a CMOS b/w (= black and white) image sensor that meets with CIF format. It enables all pixel signals to be output in sequence each 1/30 s. (progressive scanning)

This element is equipped with 290 vertical and 367 horizontal signal pixels, and the image size meets with 1/7 inch optical format. The package with lens is applicable. This small lens unit package realize small-scaled system.

Use of the CMOS process enables low power-consumption operations with a single power voltage driving. It is perfect for use as an image input device for mobile equipments.

#### Features

- Optical size: 1/7 inch optical format
- Total pixel numbers:  $382 (H) \times 306 (V)$
- Signal pixel numbers: 367 (H) × 290 (V)
- Pixel pitch: 5.6  $\mu$ m (H) × 5.6  $\mu$ m (V) (square pixel)
- Image size: 2.055 mm (H)  $\times$  1.624 mm (V)
- Package: 16-pin Optical lens unit
- Frame frequency: 30 Hz
- Power voltage: 2.8 V
- Additional functions: Variable electronic shutter (1/30 to 1/4500 s) Inverse top-down read-out





# **TOSHIBA**

#### Pin Connection (top view)



#### **Circuit Diagram**



## **Pin Functions**

Pin No.	Symbol	I/O	Function	
1	NC	I	No connection	
2	DSTOP	DSTOP I	Operations suspension control pin.	
			H: Normal operations, L: Operations suspended	
3	TEST1	I	Test pin. Normally connected to GND through a capacitor (4.7 to 10 $\mu\text{F})$	
4	TEST2	I	Test pin 2. Normally connected to GND through a capacitor (0.1 to 10 $\mu\text{F})$	
5	TEST3	I	Test pin 3. Normally connected to GND through a capacitor (0.1 to 10 $\mu\text{F})$	
6	AVDD	_	Analog power supply	
7	OUT	0	Signal output	
8	AVSS	_	Analog GND	
9	DVSS	_	Digital GND	
10	СК	I	Clock pulse input. Double the frequency of signal output.	
11	DVDD	_	Digital power supply	
12	HP	I	Horizontal timing start pulse input	
13	VRR	I	Vertical timing start pulse input	
14	ESR	I	Electrical shutter start pulse input	
15	U/D	I	Reading mode switching pin. L: Normal operation H: Up and down inverting mode	
16	NC	I	No connection	

#### **Maximum Ratings**

Characteristics	Symbol	Rating	Unit
Power supply voltage	V <sub>DD</sub>	-0.5~4.2	V
Input voltage	V <sub>IN</sub>	–0.5~ V <sub>DD</sub> + 0.5	V
Input protection diode current	I <sub>IN</sub>	±20	mA
Storage temperature	T <sub>stg</sub>	-30~60	°C

# **Recommended Operating Conditions**

Characteristics	Symbol	Rating	Unit
Power supply voltage	V <sub>AVDD</sub> V <sub>DVDD</sub>	2.6~3.0	V
Input voltage	V <sub>IN</sub>	0~V <sub>DD</sub>	V
Operating temperature	T <sub>opr</sub>	-20~50	°C

#### **Optical and Electrical Characteristics**

Characteristics	Symbol	Test Circuit	Test Condition	Min	Тур.	Max	Unit
Sensitivity	R		Standard conditions (Note1)	400	450	_	mV
Saturation voltage	V <sub>SAT</sub>	_	—	500	600	—	mV
Dark signal voltage	V <sub>DRK</sub>		Ta = 60°C, Dark condition	—	1.0	2.0	mV
Blooming marjin	BLM	_	Standard light condition	500	_	—	times
S/N (dark)	S/N	_	Dark condition	55	57	—	dB
Smearing	SMR	_	1/10 V	_	_	-140	dB
Lag	LAG		Output signal: 20 mV, 1st field	—	0	1	mV
Power supply current	I <sub>DD</sub>	_	V <sub>DD</sub> = 2.8 V	_	5	10	mA

Note1: Standard conditions

- Light conditions: Color temperature 3200 K halogen light box. Surface brightness: 100 nt of equal white light.
- IR cut filter

٠	Optical lens:	Focal lengthf	f = 2.1 mm
		F number	F2.3
		Field of view	H52°/V42°
		MTF	90 lines in central 50 lines around
		TV distortion	-2.5%

• Frame frequency: 30 Hz continual operations, electronic shutter off (storage time = 1/30 s).

#### **Pixel Arrangement**

Start pixel in up and down inverting mode



Note2: Indicates pixel arrangement on the chip.

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#### Drive Timing Diagram Progressive Scanning Mode (30 Hz, 1 V = 300 H)





# **TOSHIBA**

#### Drive Timing Diagram



Note3: O is basic point.

Note4: DSTOP should be changed after VRR (ESR).

#### Timing Margin (ns)

	Min	Тур.	Max
а	111	444	
b	222	888	
С	-444	0	444
d	-444	0	444



Spectral sensitivity characteristics

#### **Package Dimensions**

WQFN16-C-S420-160A

Unit: mm



Weight: 0.5 g (typ.)

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