CMOS Area Image Sensor

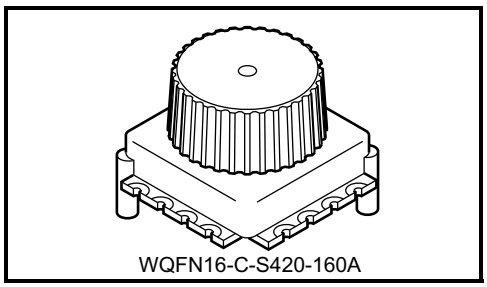
T C M 5 0 2 3 A L U

1/7 Inch 110 k Pixel CMOS Color Image Sensor

The TCM5023ALU is a CMOS color 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 also provides excellent color reproduction through its primary color filter, and it is perfect for use as an image input device for mobile equipments, PC cameras and other forms of multi-media.



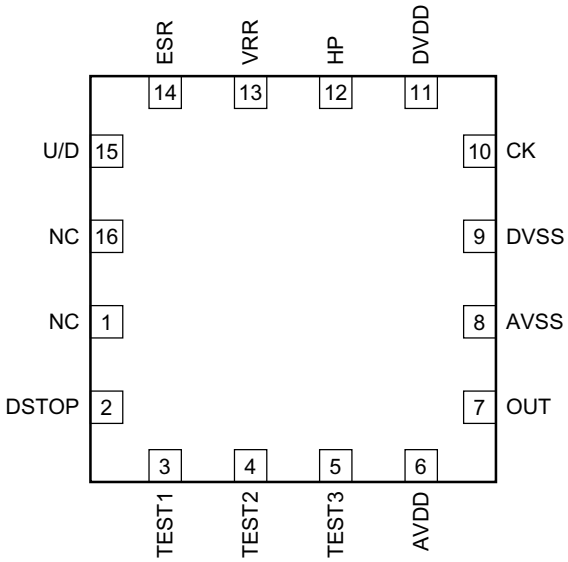
WQFN16-C-S420-160A

Weight: 0.5 g (typ.)

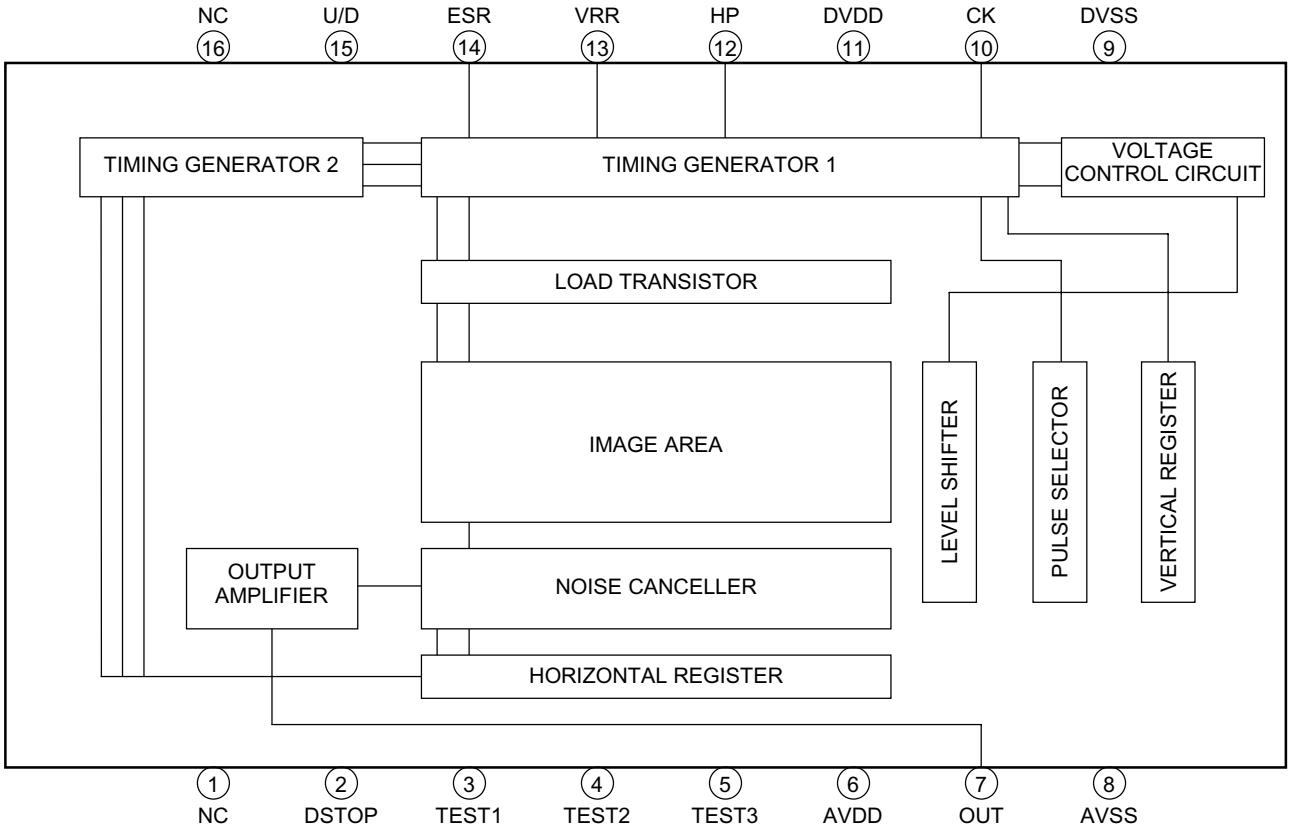
Features

- Optical size: 1/7 inch optical format
- Total pixel numbers: 382 (H) × 306 (V)
- Signal pixel numbers: 367 (H) × 290 (V)
- Pixel pitch: 5.6 μm (H) × 5.6 μm (V) (square pixel)
- Image size: 2.055 mm (H) × 1.624 mm (V)
- Package: 16-pin Optical lens unit
- Color filter: Primary color filter, Bayer arrangement (G check, R/B line in sequence)
- 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

Pin Connection (top view)



Circuit Diagram



Pin Functions

Pin No.	Symbol	I/O	Function
1	NC	I	No connection
2	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 μF)
4	TEST2	I	Test pin 2. Normally connected to GND through a capacitor (0.1 to 10 μF)
5	TEST3	I	Test pin 3. Normally connected to GND through a capacitor (0.1 to 10 μF)
6	AVDD	—	Analog power supply
7	OUT	O	Signal output
8	AVSS	—	Analog GND
9	DVSS	—	Digital GND
10	CK	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_{DD}	−0.5~4.2	V
Input voltage	V_{IN}	−0.5~ V_{DD} + 0.5	V
Input protection diode current	I_{IN}	±20	mA
Storage temperature	T_{stg}	−30~60	°C

Recommended Operating Conditions

Characteristics	Symbol	Rating	Unit
Power supply voltage	V_{AVDD} V_{DVDD}	2.6~3.0	V
Input voltage	V_{IN}	0~V_{DD}	V
Operating temperature	T_{opr}	−20~50	°C

Optical and Electrical Characteristics

Characteristics	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Sensitivity (G)	R(G)	—	Standard conditions (Note1) G output signal	120	150	—	mV
Saturation voltage	V_{SAT}	—	—	500	600	—	mV
Dark signal voltage	V_{DRK}	—	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	—	G output signal: 20 mV, 1st field	—	0	1	mV
Power supply current	I_{DD}	—	V_{DD} = 2.8 V	—	5	10	mA

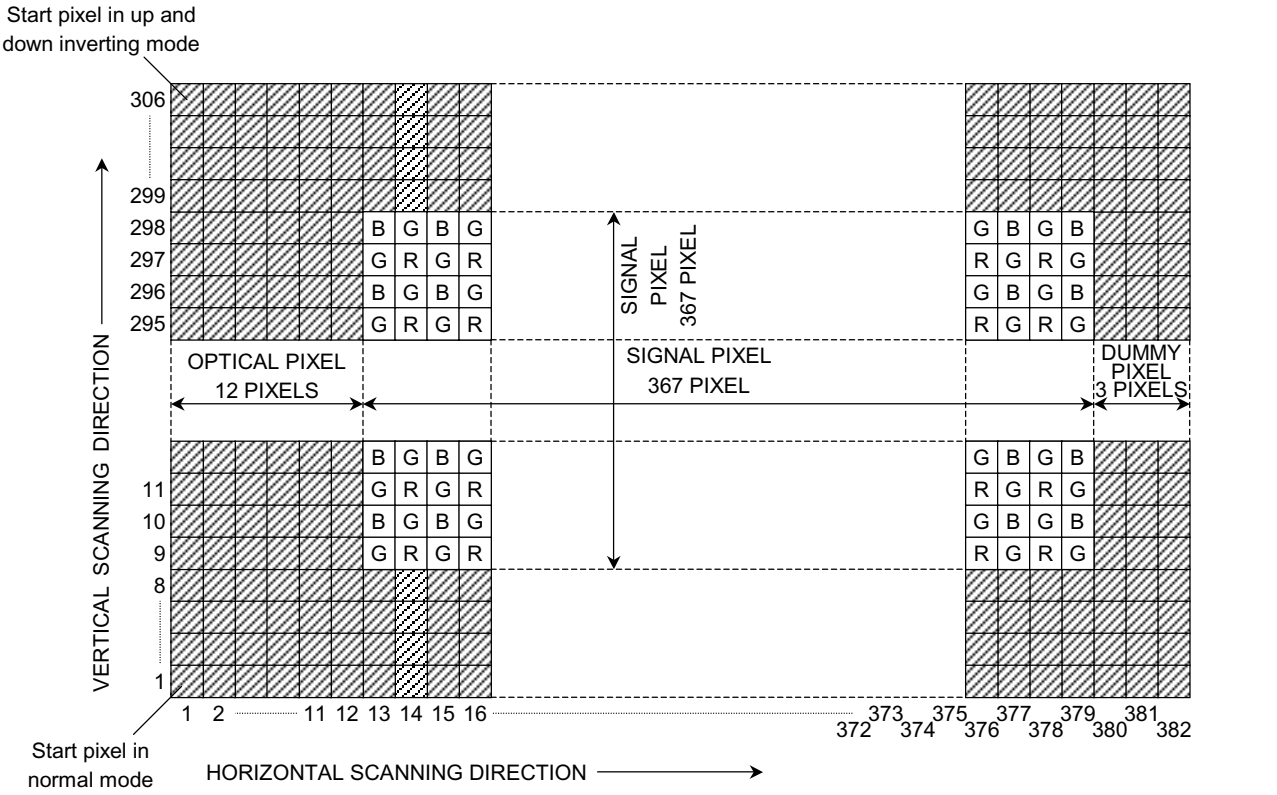
Note1: Standard conditions

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

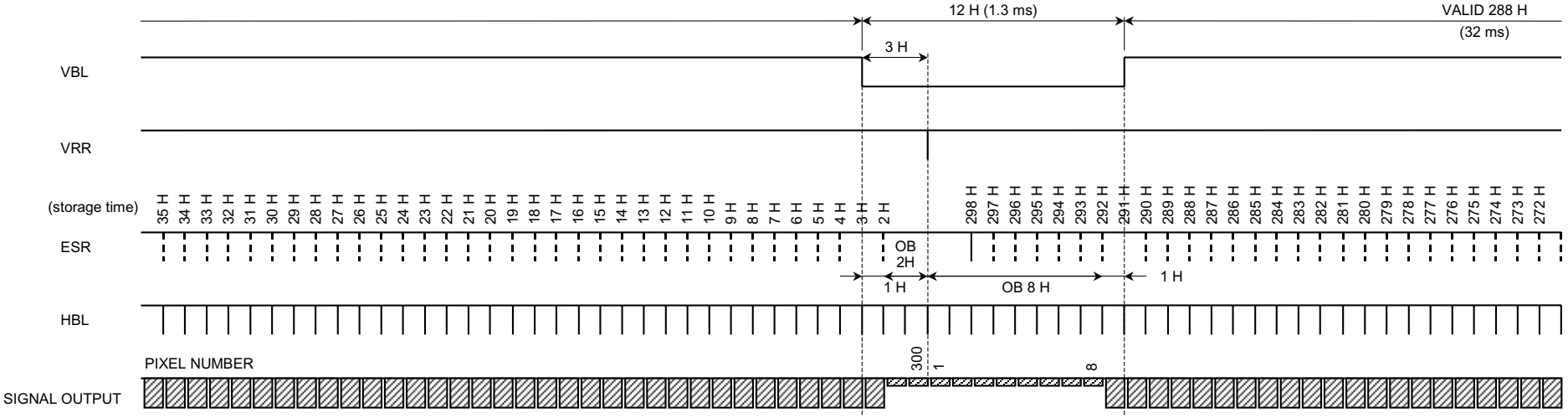


R: RED PIXELS G: GREEN PIXELS B: BLUE PIXELS : LIGHT SHIELDED PIXELS

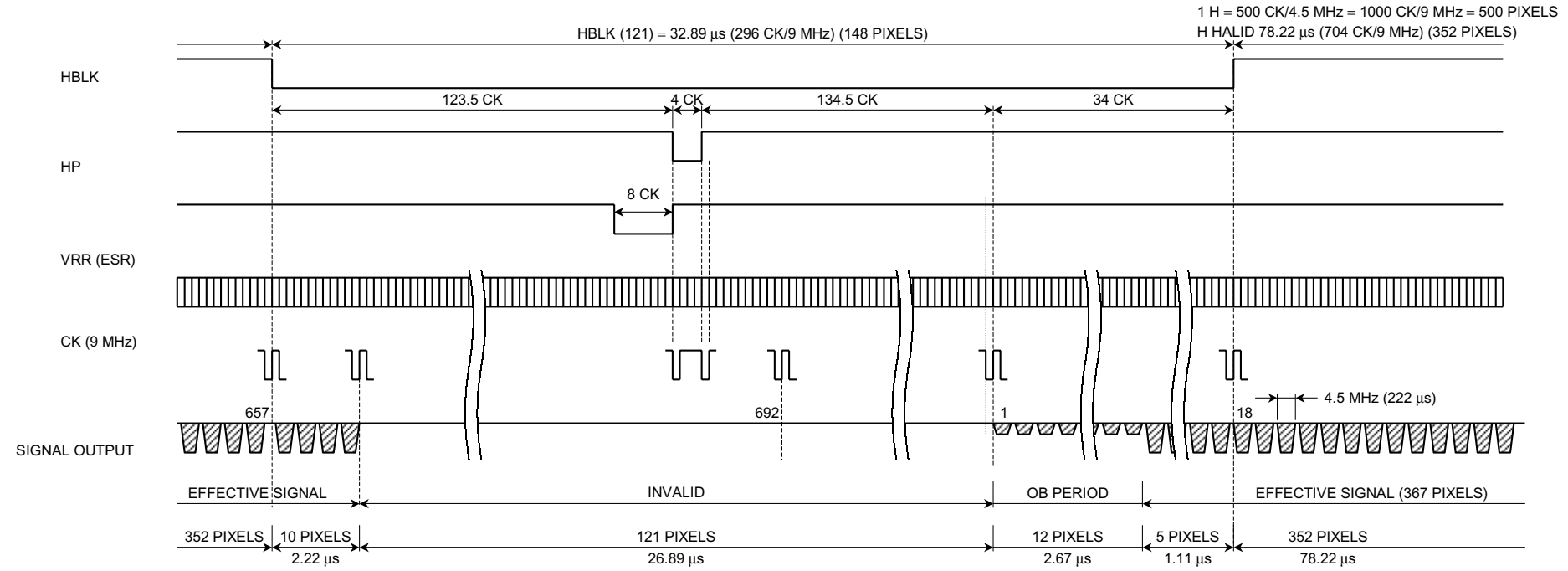
Note2: Indicates pixel arrangement on the chip.

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

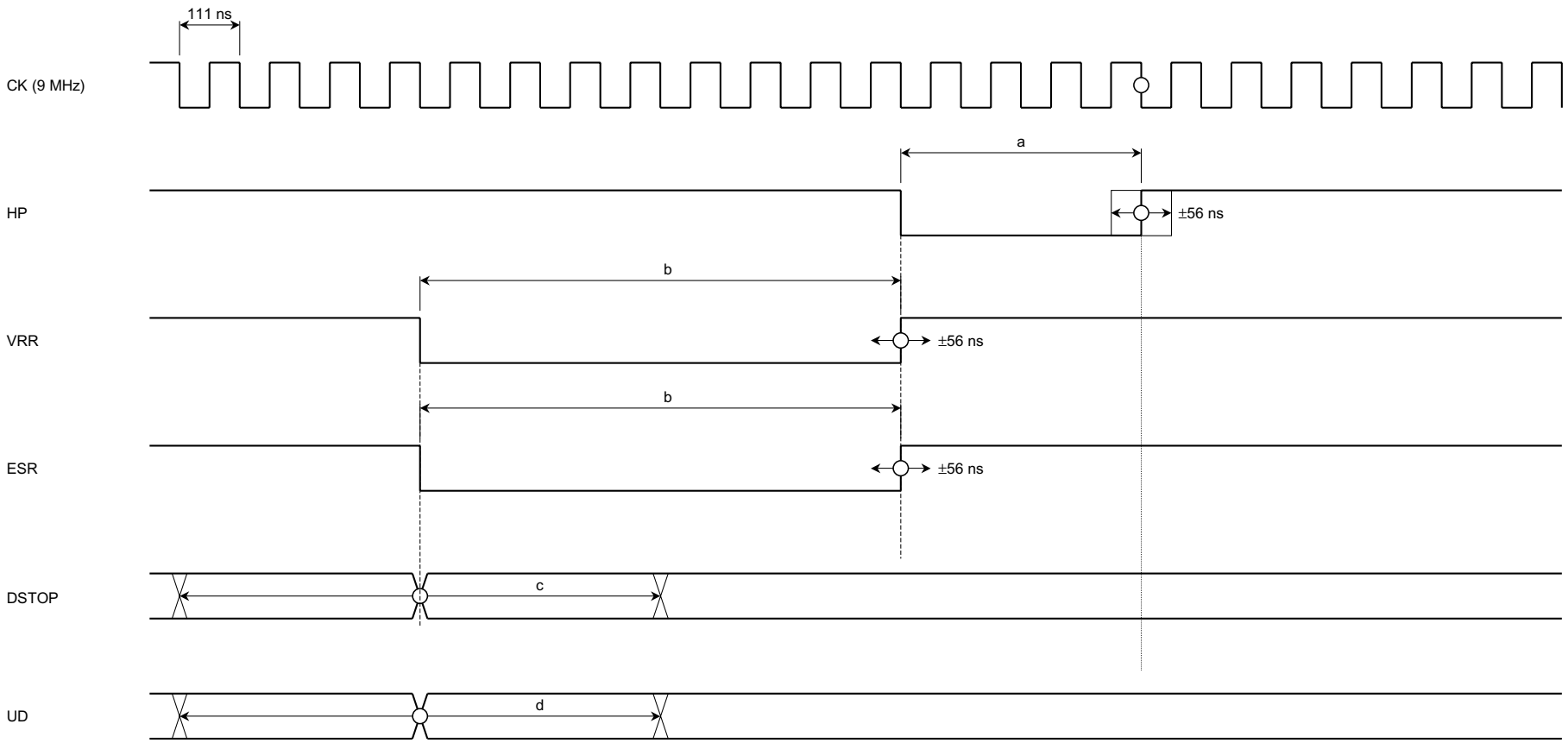
(1) V Blanking



(2) H Blanking



Drive Timing Diagram



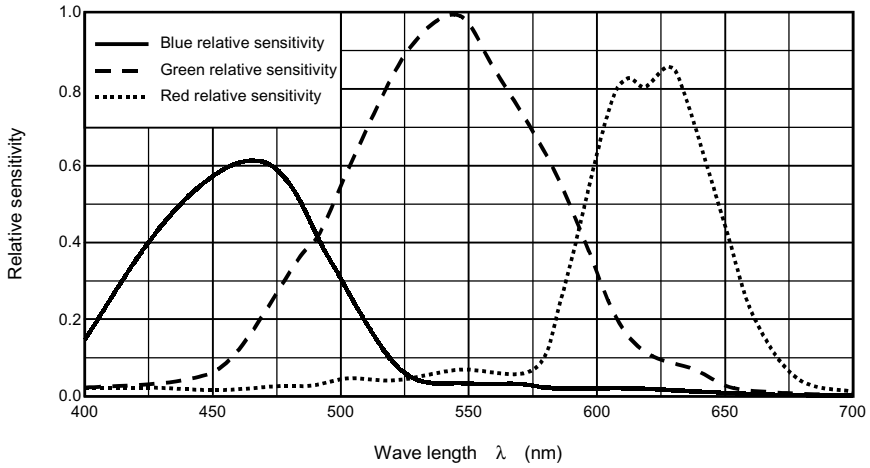
Note3: ○ is basic point.

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

Timing Margin (ns)

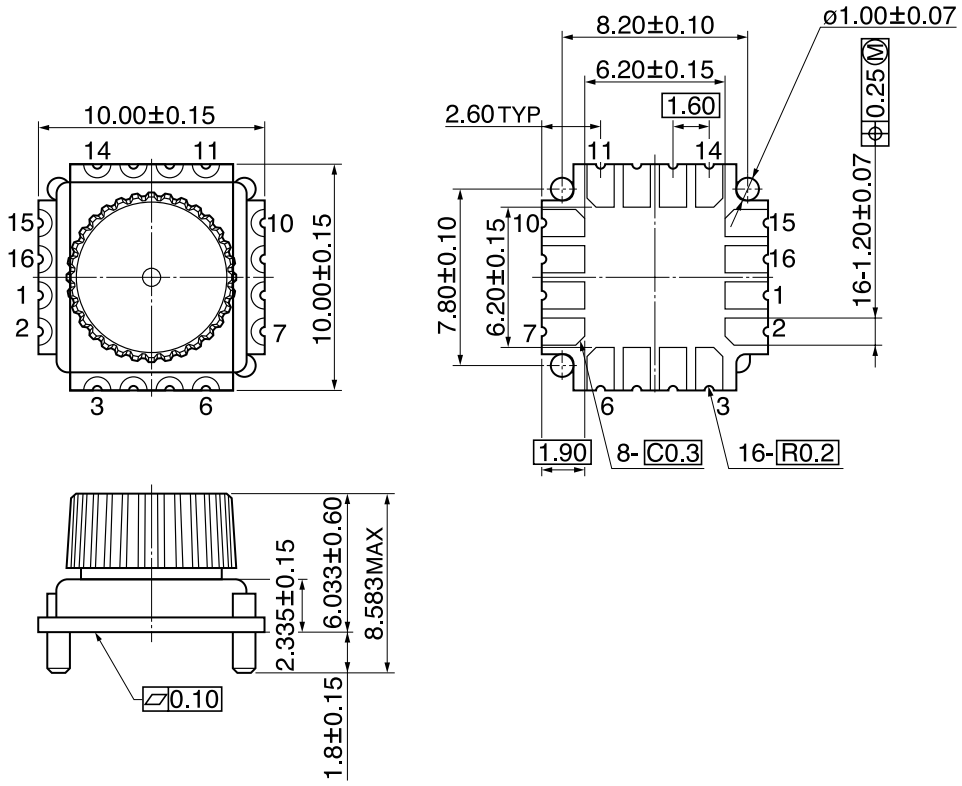
	Min	Typ.	Max
a	111	444	
b	222	888	
c	−444	0	444
d	−444	0	444

Spectral sensitivity characteristics



Package Dimensions

WQFN16-C-S420-160A Unit: mm



Weight: 0.5 g (typ.)

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