

CMOS Area Image Sensor

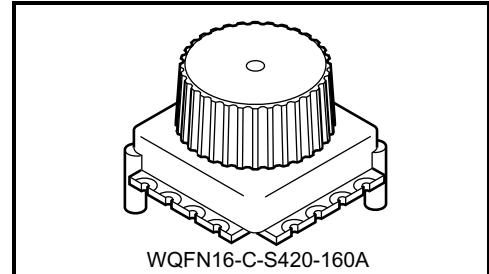
# TCM5020ALU

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.



Weight: 0.5 g (typ.)

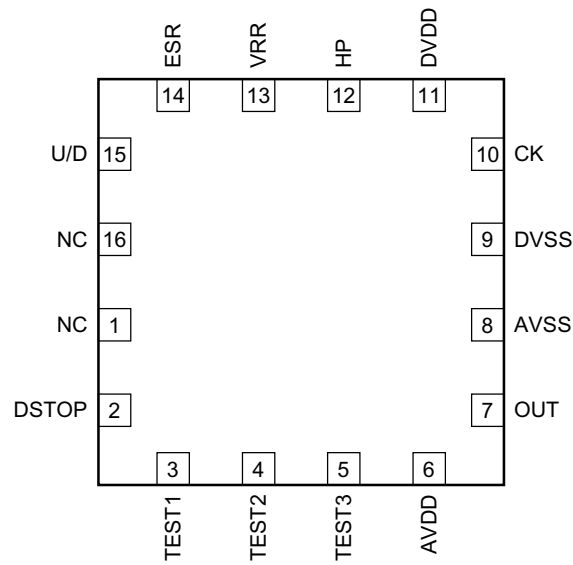
## Features

- 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
- 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

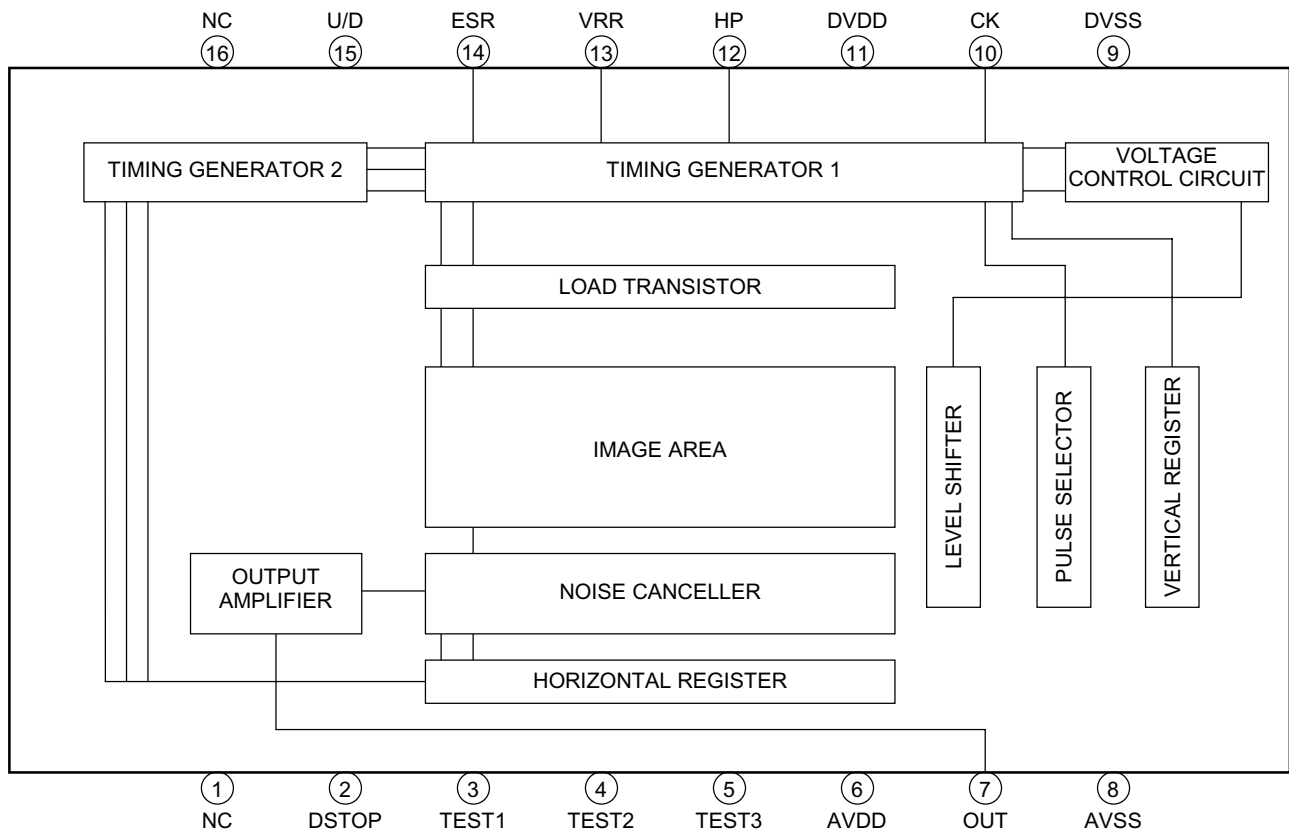
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## Pin Connection (top view)



## 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 $\mu$ F)
4	TEST2	I	Test pin 2. Normally connected to GND through a capacitor (0.1 to 10 $\mu$ F)
5	TEST3	I	Test pin 3. Normally connected to GND through a capacitor (0.1 to 10 $\mu$ F)
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	$I_{IN}$	$\pm 20$	mA
Storage temperature	$T_{stg}$	-30~60	$^{\circ}$ 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	$^{\circ}$ C

## Optical and Electrical Characteristics

Characteristics	Symbol	Test Circuit	Test Condition	Min	Typ.	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 margin	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

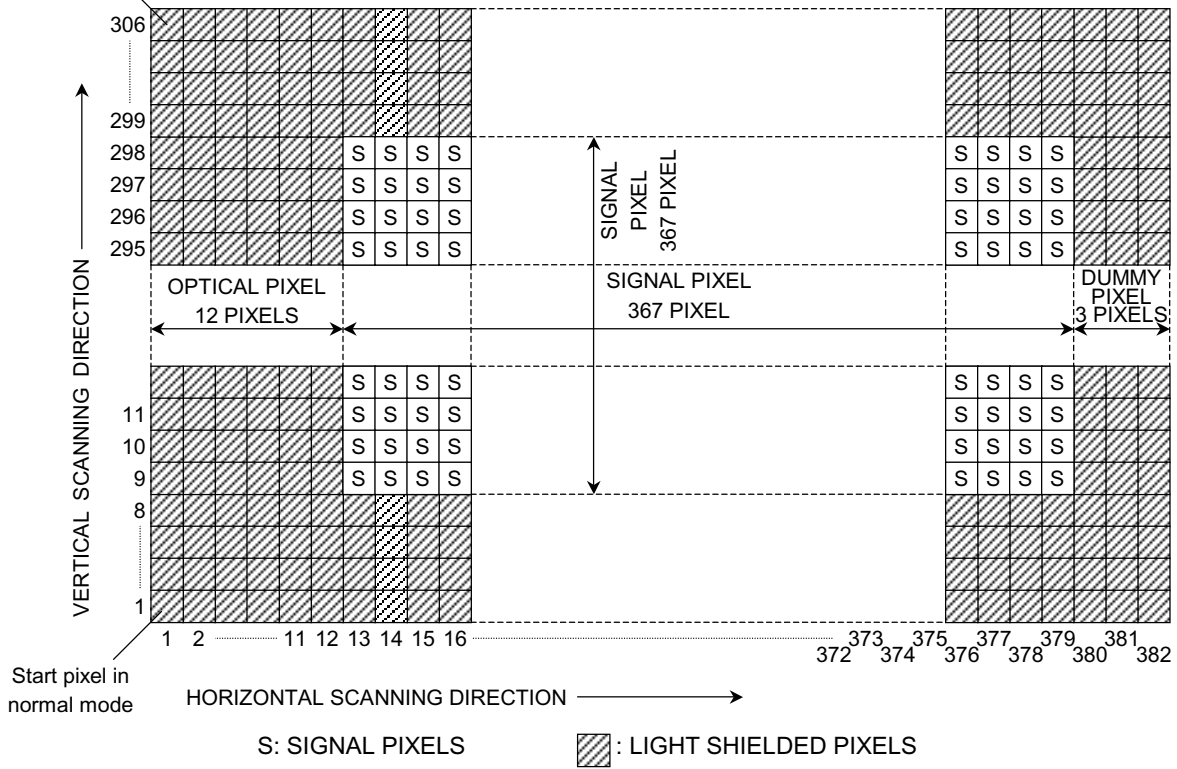
Note1: Standard conditions

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

Focal length	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

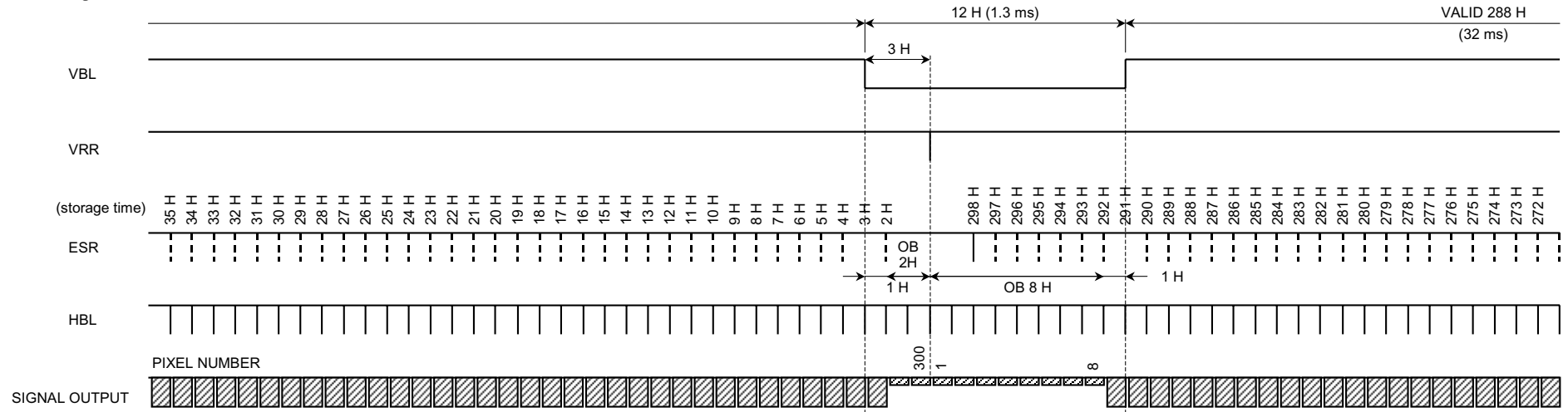
Start pixel in up and down inverting mode



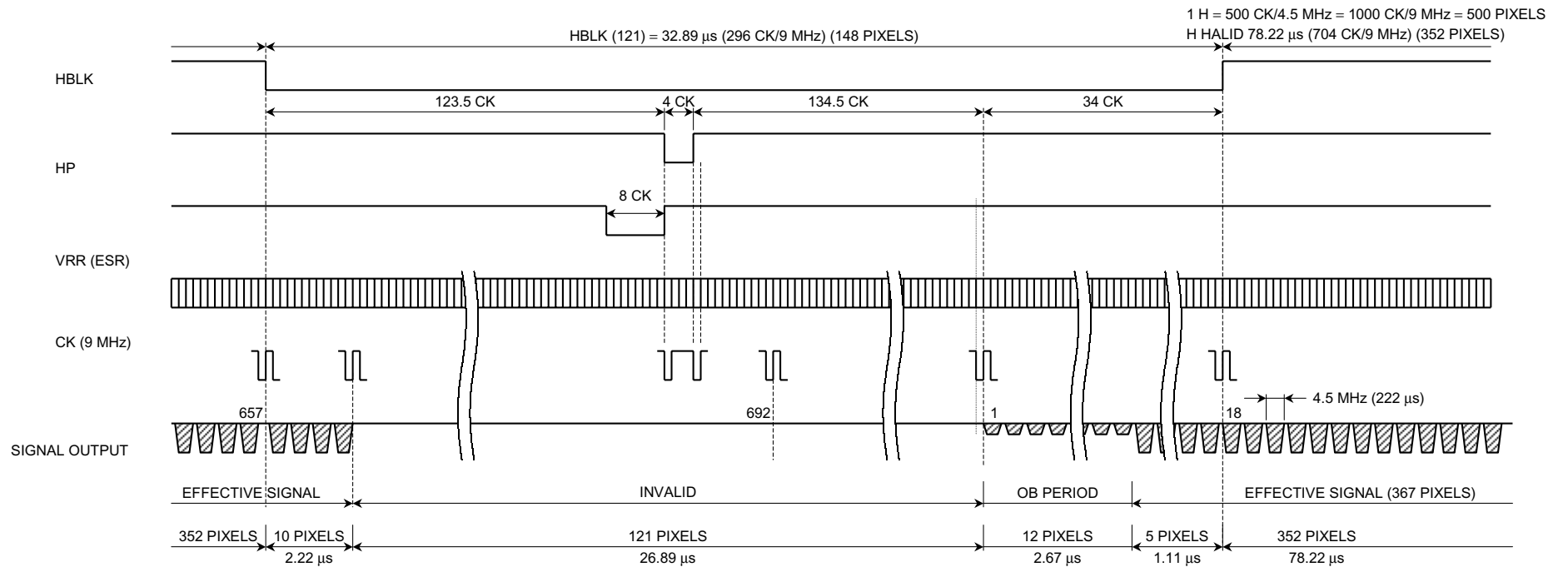
Note2: Indicates pixel arrangement on the chip.

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

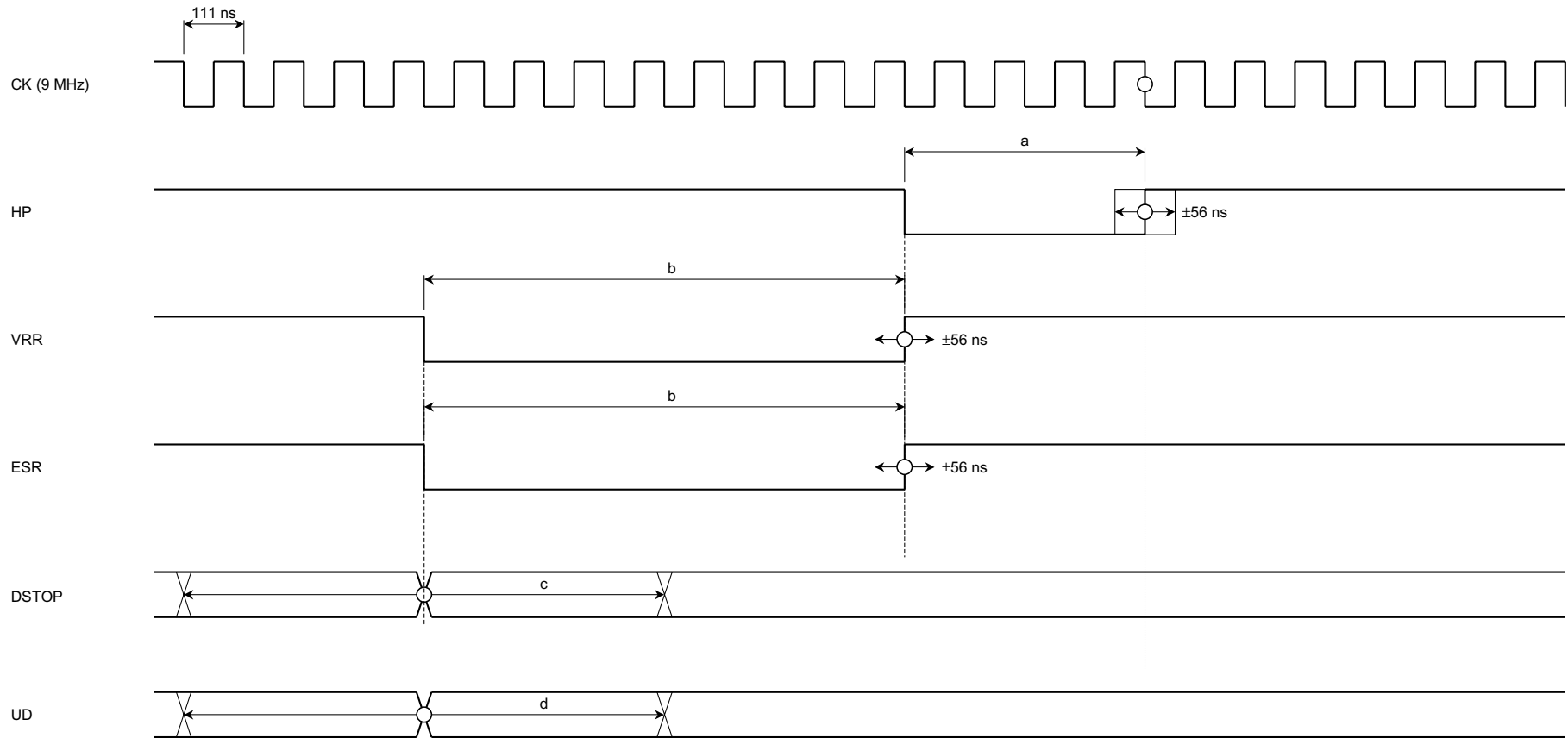
(1) V Blanking



(2) H Blanking



**Drive Timing Diagram**

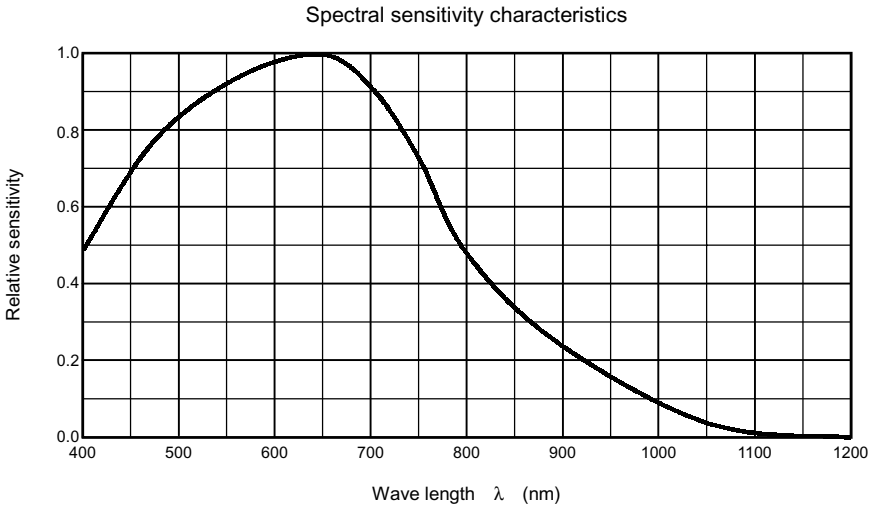


Note3: is basic point.

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

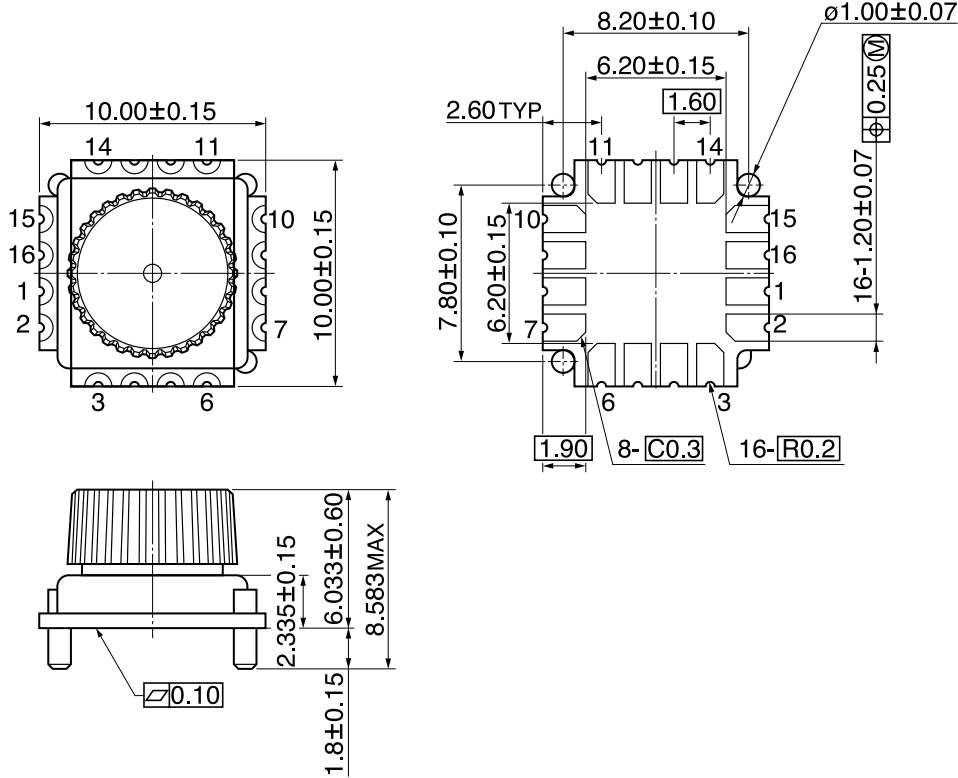




**Package Dimensions**

WQFN16-C-S420-160A

Unit: mm



Weight: 0.5 g (typ.)