

# MN39116AT

## Diagonal 4.5 mm (type-1/4) 270k-pixel CCD Area Image Sensor

### ■ Overview

The MN39116AT is a 4.5 mm (type-1/4) interline transfer CCD (IT-CCD) solid state image sensor device.

This device uses photodiodes in the optoelectric conversion section and CCDs for signal readout. The electronic shutter function has made an exposure time of 1/10000 seconds possible. Further, this device has the features of high sensitivity, low noise, broad dynamic range, and low smear.

This device has a total of 267 206 pixels (542 horizontal × 493 vertical) and provides stable and clear images with a resolution of 360 horizontal TV-lines and 350 vertical TV-lines.

Part Number	Size	System	Color or B/W
MN39116AT	4.5 mm (type-1/4)	EIA	B/W

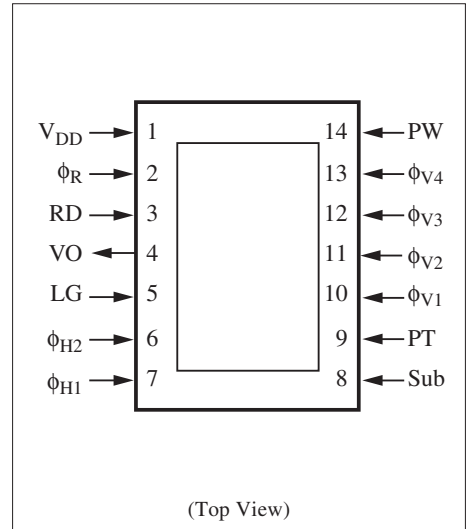
### ■ Features

- Effective pixel number 512 (horizontal) × 491 (vertical)
- High sensitivity
- Broad dynamic range
- Low smear
- Electronic shutter

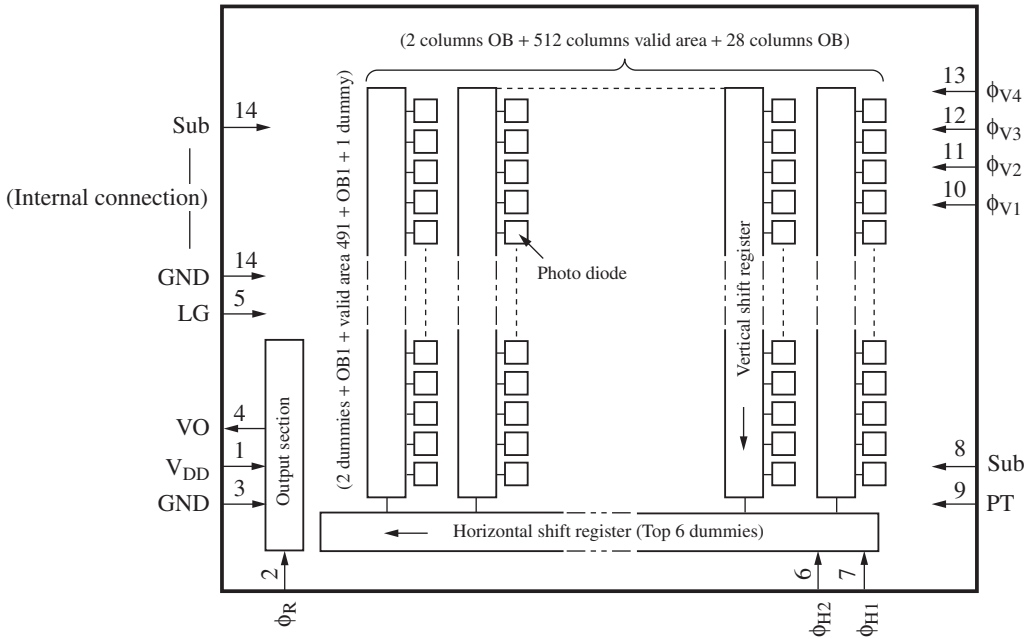
### ■ Applications

- Surveillance cameras
- FA, OA cameras

### ■ Pin Assignments



■ Block Diagram



■ Pin Descriptions

Pin No.	Symbol	Description	Pin No.	Symbol	Description
1	V <sub>DD</sub>	Power supply	8	Sub	Substrate
2	φ <sub>R</sub>	Reset pulse (RG)	9	PT	P-well for protection circuit
3	RD	Reset drain	10	φ <sub>V1</sub>	Vertical shift register clock pulse 1
4	VO	Video output	11	φ <sub>V2</sub>	Vertical shift register clock pulse 2
5	LG	Output load transistor gate	12	φ <sub>V3</sub>	Vertical shift register clock pulse 3
6	φ <sub>H2</sub>	Horizontal register clock pulse 2	13	φ <sub>V4</sub>	Vertical shift register clock pulse 4
7	φ <sub>H1</sub>	Horizontal register clock pulse 1	14	PW	P-well

■ Device Parameter (H × V)

Parameter	Value	Unit
Pixel number *	512 × 491	pixel
Image sensing block dimension	3.6144 × 2.716	mm <sup>2</sup>
Pixel dimension	7.2 × 5.6	μm <sup>2</sup>

Note) \*: OB columns are not included.

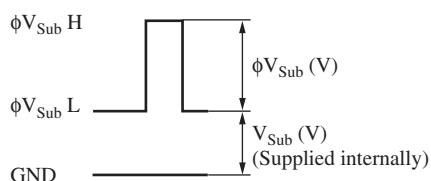
## ■ Absolute Maximum Ratings and Operating Conditions

Parameter		Absolute maximum rating		Operating condition			Unit
		Lower limit	Upper limit	Min	Typ	Max	
$V_{DD}$		-0.2	18.0	14.5	15.0	15.5	V
$V_{RD}$		-0.2	18.0	14.5	15.0	15.5	V
$V_{PT}^{*3, 4}$		-10.0	0.2	-8.3	-8.0	-7.7	V
GND		(Referene voltage)		—	0	—	V
$V_{LG}^{*6}$		(Supplied internally)					V
$V_{OG}$		(Supplied internally)					V
$V_{\phi R}$	High-Low	—	8.0	3.0	3.3	5.3	V
	Bias	(Supplied internally)					V
$V_{\phi H1}$	High	—	8.0	3.0	3.3	5.3	V
	Low	-0.2	—	-0.05	0	0.05	V
$V_{\phi H2}$	High	—	8.0	3.0	3.3	5.3	V
	Low	-0.2	—	-0.05	0	0.05	V
$V_{Sub}^{*2}$		(Supplied internally)					V
$\phi V_{Sub}^{*1}$		-0.2	45.0	22.5	23.0	23.5	V
$V_{\phi V1}^{*3, 4, 5}$	High	—	18.0	14.5	15.0	15.5	V
	Middle	—	—	-0.2	0	0.2	V
	Low	-9.0	—	-8.3	-8.0	-7.7	V
$V_{\phi V2}^{*3, 4, 5}$	Middle	—	15.0	-0.2	0	0.2	V
	Low	-9.0	—	-8.3	-8.0	-7.7	V
$V_{\phi V3}^{*3, 4, 5}$	High	—	18.0	14.5	15.0	15.5	V
	Middle	—	—	-0.2	0	0.2	V
	Low	-9.0	—	-8.3	-8.0	-7.7	V
$V_{\phi V4}^{*3, 4, 5}$	Middle	—	15.0	-0.2	0	0.2	V
	Low	-9.0	—	-8.3	-8.0	-7.7	V
Operating temperature		-10	60	—	25	—	°C
Storage temperature		-30	80	—	—	—	°C

Note) 1. Standard photo detecting condition

Standard photo detecting condition stands for detecting image with a light source of color temperature of 2856K, luminance of 1050 cd/m<sup>2</sup>, and using a color temperature conversion filter LB-40 (HOYA), infrared cut filter CAW-500S with thickness 2.5 mm for a light path and with F8 lens aperture. The quantity of the incidental light to a photo-detecting surface under the above condition is defined as the standard quantity of light.

2. \*1:  $V_{Sub}$  when using electronic shutter function



■ Absolute Maximum Ratings and Operating Conditions (continued)

Note) 2. \*2:  $V_{Sub}$  supplied internally is the voltage suppressing the blooming generation at  $\times 1\,000$  light quantity relative to the standard light quantity.

\*3: Relation between  $V_{PT}$  and  $V_{\phi VL}$

Set  $V_{PT}$  under the following condition against VL of a vertical transfer clock waveform.

$$V_{PT} \leq VL (V_{\phi V1L} \text{ to } V_{\phi V4L})$$

\*4: Absolute maximum ratings  $-0.2 < V_{Sub} - V_{PT} < 55 (V)$   
 $-0.2 < V_{\phi V} - V_{PT} < 24.5 (V)$

\*5: Ground LG pin with the capacitor of 0.047  $\mu F$  or more.

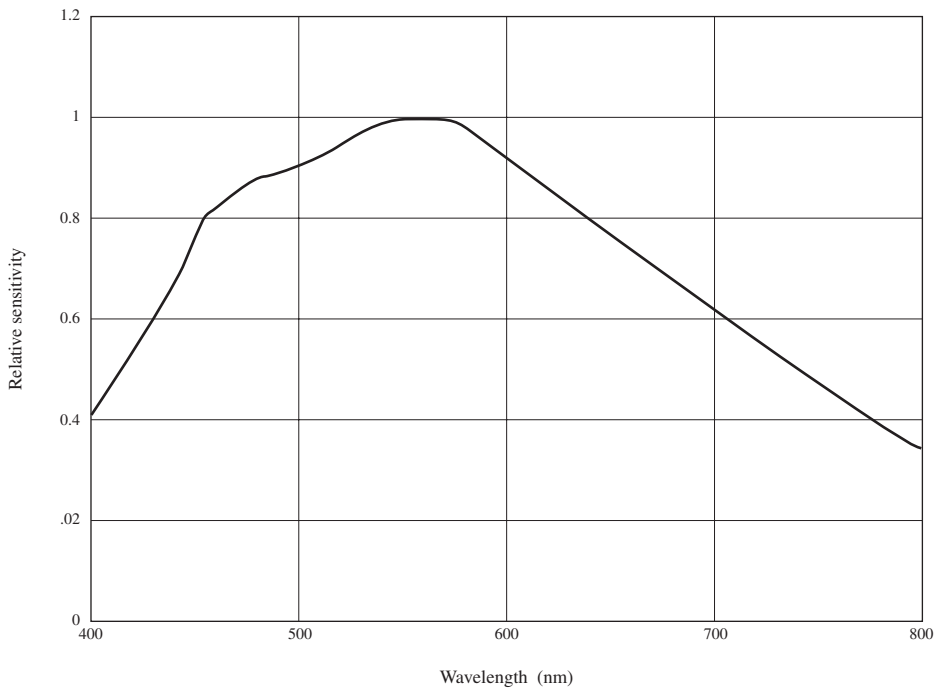
Ground  $\phi_R$  pin with the capacitor of 1 M $\Omega$ .

■ Optical Characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
S/N ratio (dark)	S/Nd	Dark condition	58	60	—	dB
Sensitivity	So	J chart F8	480	650	—	mV
Saturation output	Sc	Saturation maximum output	700	900	—	mV
Vertical smear	Sm	1/10 V chart, F2.8	—	—	0.01	%

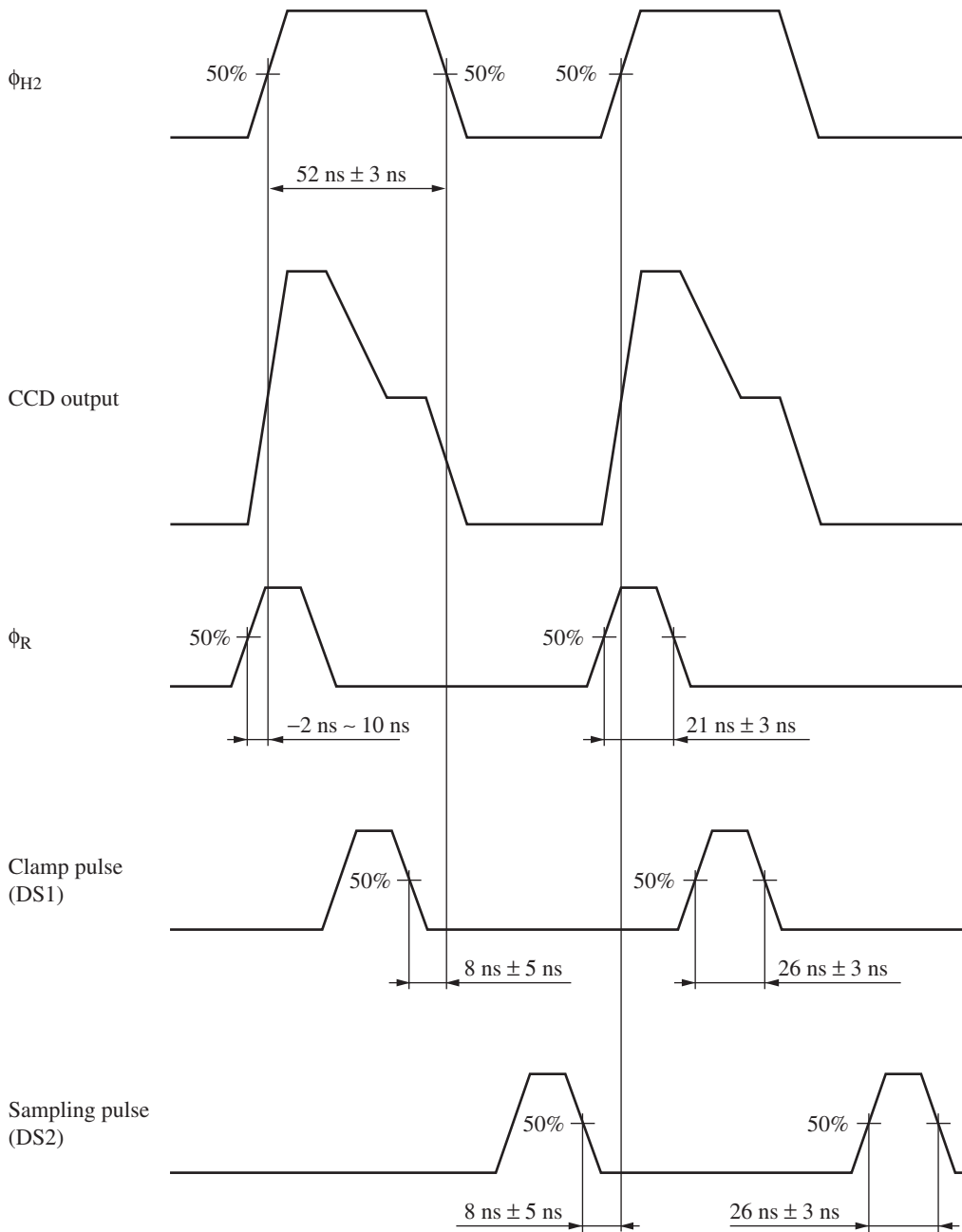
■ Graph of Characteristics

CCD spectral characteristics



■ Timing Diagram

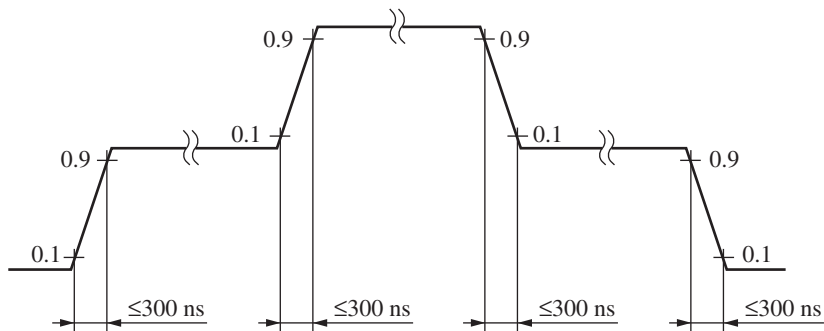
- High speed pulse timing



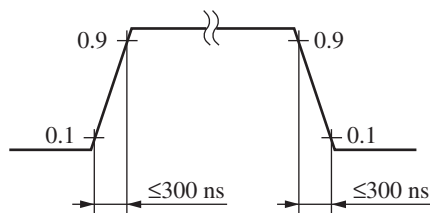
■ Timing Diagram (continued)

- Rise time and fall time of each pulse

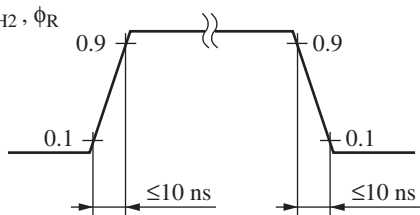
$\phi_{V1}, \phi_{V3}$



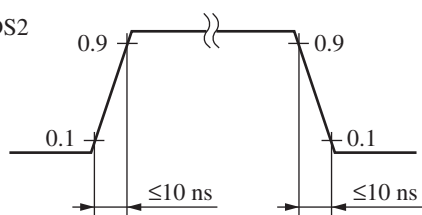
$\phi_{V2}, \phi_{V4}$



$\phi_{H1}, \phi_{H2}, \phi_R$

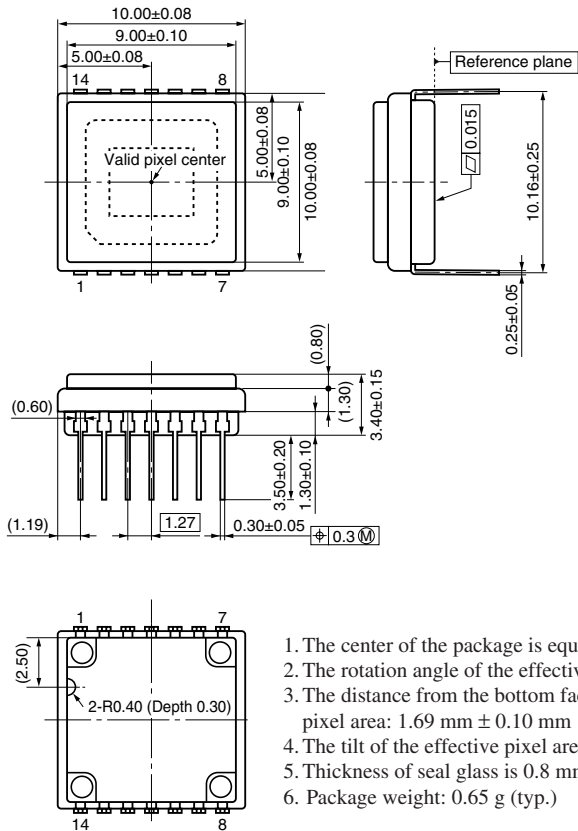


DS1, DS2



■ Package Dimensions (unit: mm)

- WDIP014-P-0400F



1. The center of the package is equal to the center of the effective pixel area.
2. The rotation angle of the effective pixel area: up to  $\pm 1.0$  degree
3. The distance from the bottom face of the package to the surface of the effective pixel area:  $1.69 \text{ mm} \pm 0.10 \text{ mm}$
4. The tilt of the effective pixel area for the bottom face of the package: up to  $25 \text{ } \mu\text{m}$
5. Thickness of seal glass is  $0.8 \text{ mm}$ , and the refractive index is  $1.50$ .
6. Package weight:  $0.65 \text{ g}$  (typ.)

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