

# MN39116AT

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

## ■ Overview

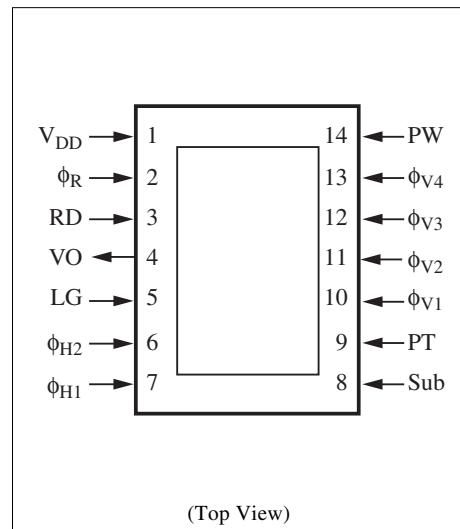
The MN39116AT is a 4.5 mm (type-1/4) interline transfer CCD (IT-CCD) solid state image sensor device.

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 267206 pixels (542 horizontal  $\times$  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

## ■ Pin Assignments



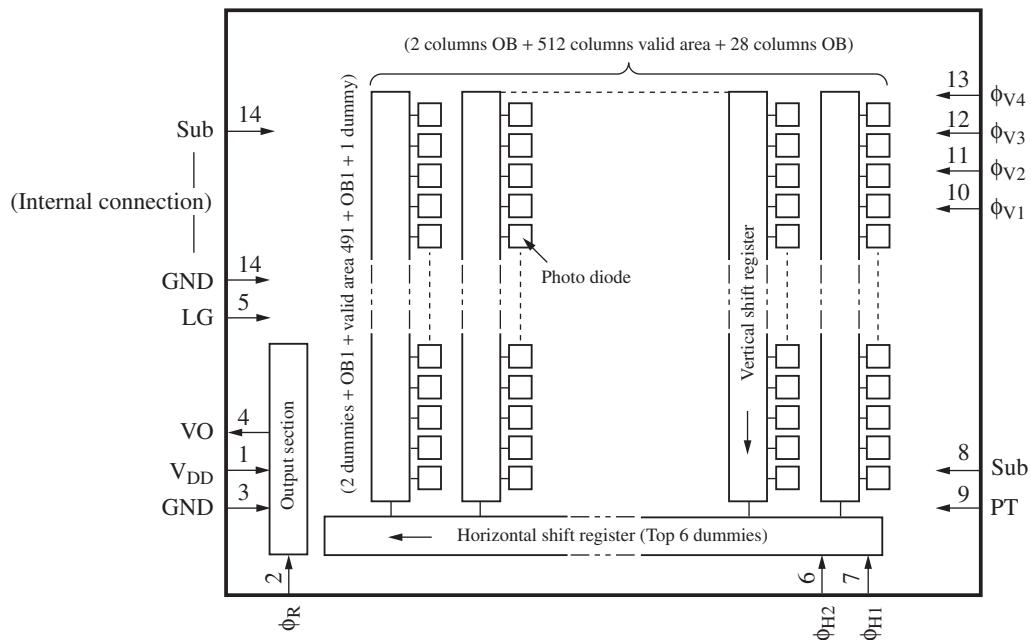
## ■ Features

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

## ■ Applications

- Surveillance cameras
- FA, OA cameras

## ■ Block Diagram



## ■ Pin Descriptions

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

## ■ Device Parameter (H × V)

Parameter	Value	Unit
Pixel number *	$512 \times 491$	pixel
Image sensing block dimension	$3.6144 \times 2.716$	$\text{mm}^2$
Pixel dimension	$7.2 \times 5.6$	$\mu\text{m}^2$

Note) \*: OB columns are not included.

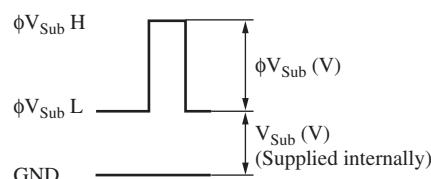
## ■ Absolute Maximum Ratings and Operating Conditions

Parameter	Absolute maximum rating		Operating condition			Unit
	Lower limit	Upper limit	Min	Typ	Max	
V <sub>DD</sub>	−0.2	18.0	14.5	15.0	15.5	V
V <sub>RD</sub>	−0.2	18.0	14.5	15.0	15.5	V
V <sub>PT</sub> <sup>*3, 4</sup>	−10.0	0.2	14.5	15.0	15.5	V
GND	(Referene voltage)		—	0	—	V
V <sub>LG</sub> <sup>*6</sup>	(Supplied internally)					V
V <sub>OG</sub>	(Supplied internally)					V
V <sub>φR</sub>	High-Low	—	8.0	3.0	3.3	V
	Bias	(Supplied internally)				
V <sub>φH1</sub>	High	—	8.0	3.0	3.3	V
	Low	−0.2	—	−0.05	0	0.05
V <sub>φH2</sub>	High	—	8.0	3.0	3.3	V
	Low	−0.2	—	−0.05	0	0.05
V <sub>Sub</sub> <sup>*2</sup>	(Supplied internally)					V
φV <sub>Sub</sub> <sup>*1</sup>	−0.2	45.0	22.5	23.0	23.5	V
V <sub>φV1</sub> <sup>*3, 4, 5</sup>	High	—	18.0	14.5	15.0	V
	Middle	—	—	−0.2	0	0.2
	Low	−9.0	—	−8.3	−8.0	−7.7
V <sub>φV2</sub> <sup>*3, 4, 5</sup>	Middle	—	15.0	−0.2	0	V
	Low	−9.0	—	−8.3	−8.0	−7.7
V <sub>φV3</sub> <sup>*3, 4, 5</sup>	High	—	18.0	14.5	15.0	V
	Middle	—	—	−0.2	0	0.2
	Low	−9.0	—	−8.3	−8.0	−7.7
V <sub>φV4</sub> <sup>*3, 4, 5</sup>	Middle	—	15.0	−0.2	0	V
	Low	−9.0	—	−8.3	−8.0	−7.7
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 2 856K, luminance of 1 050 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>Sub</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  $\times 1000$  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.

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

\*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.

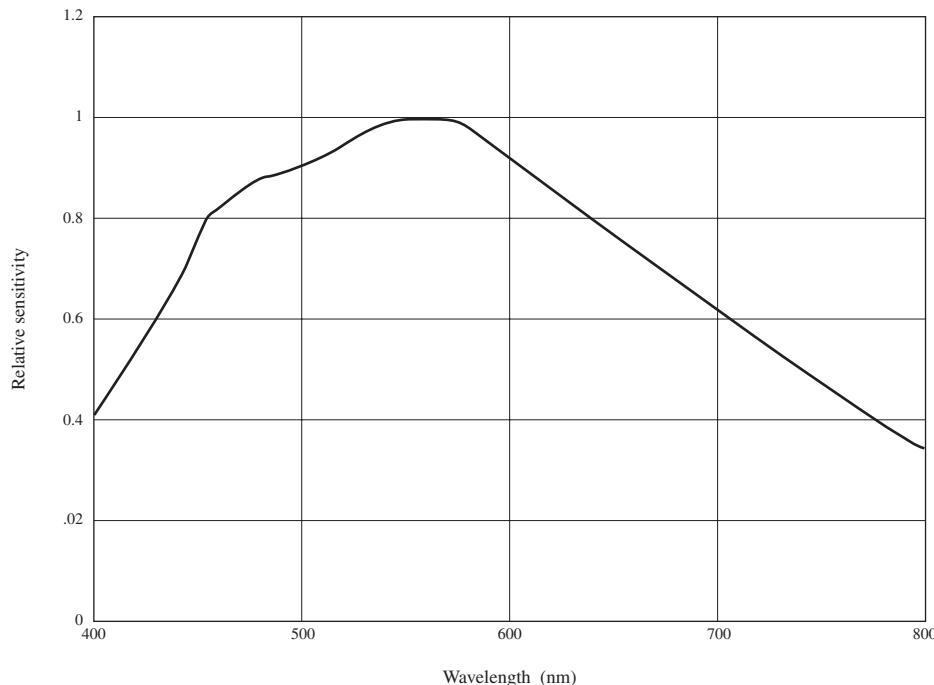
Ground  $\phi_R$  pin with the capacitor of  $1 M\Omega$ .

## ■ 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	%

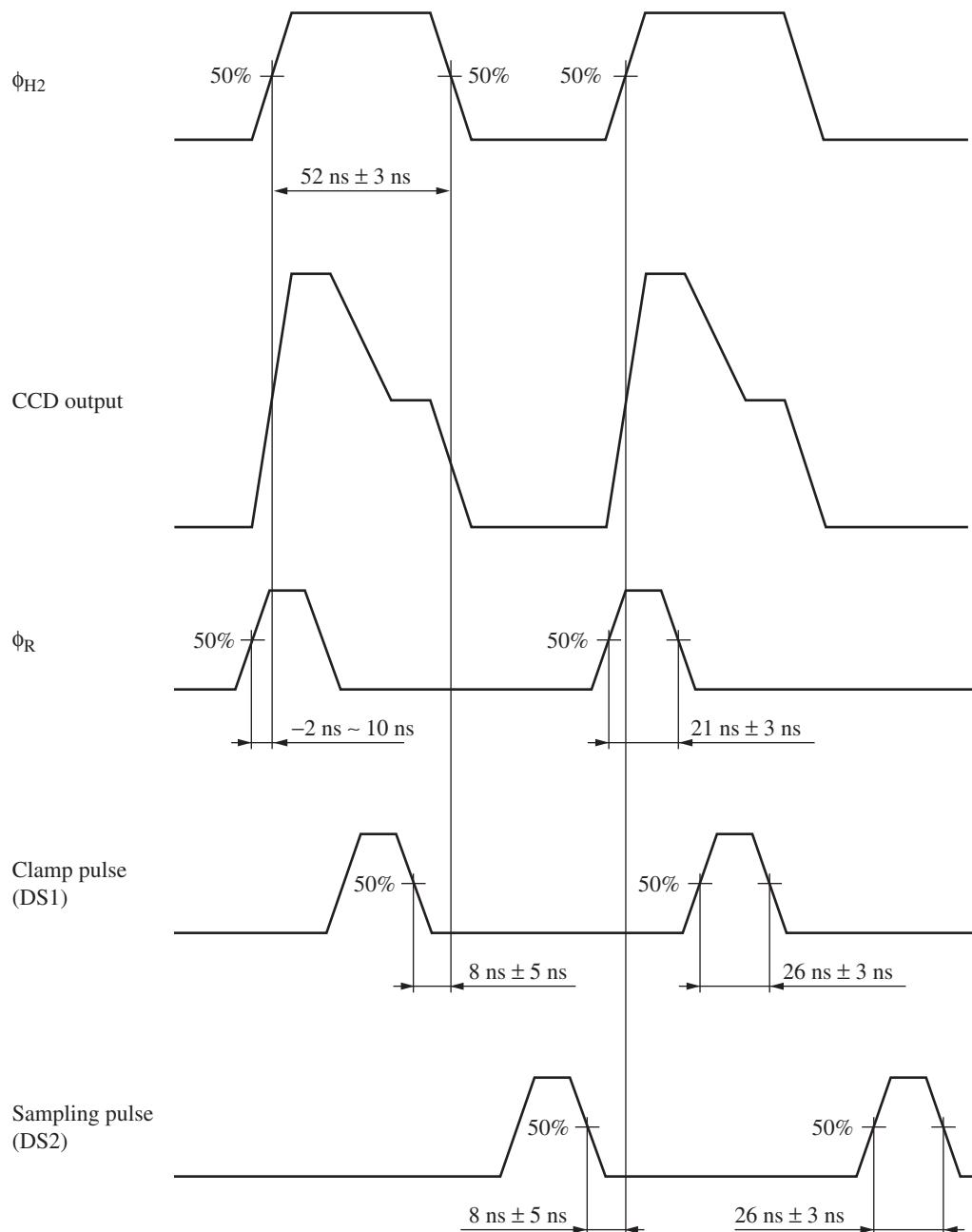
## ■ Graph of Characteristics

CCD spectral characteristics



## ■ Timing Diagram

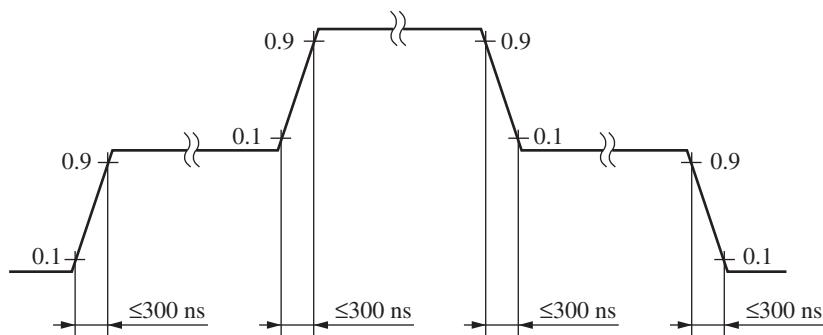
- High speed pulse timing



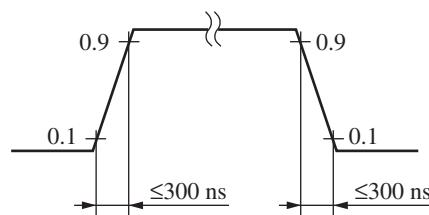
### ■ Timing Diagram (continued)

- Rise time and fall time of each pulse

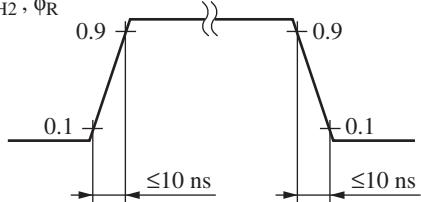
$\phi_{V1}, \phi_{V3}$



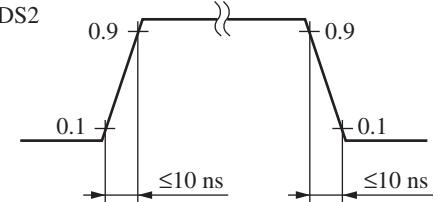
$\phi_{V2}, \phi_{V4}$



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

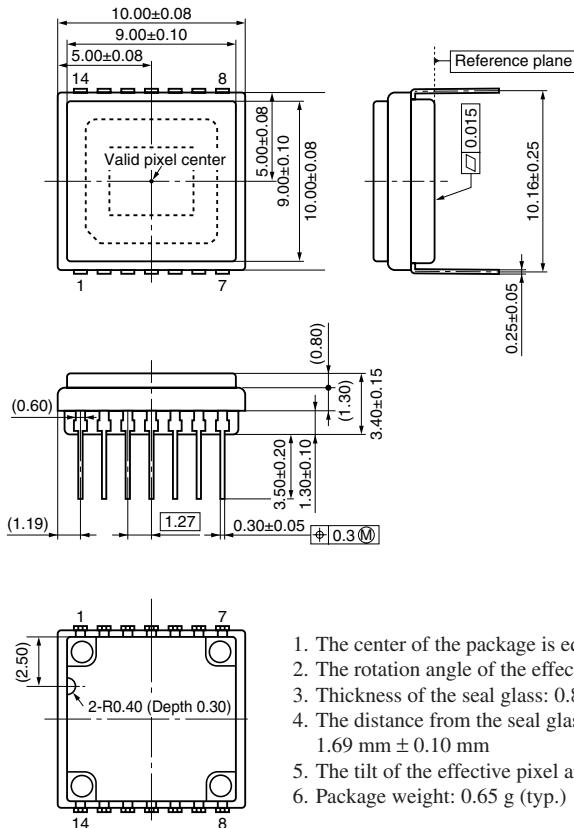


DS1, DS2



## ■ 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. Thickness of the seal glass: 0.8 mm, and the refractive index: 1.50
4. The distance from the seal glass surface to the surface of the effective pixel area: 1.69 mm  $\pm 0.10$  mm
5. The tilt of the effective pixel area for the seal glass surface: up to 25  $\mu$ m
6. Package weight: 0.65 g (typ.)

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