

# MW39640AE

## Diagonal 11 mm (type-2/3) IT CCD Area Image Sensor

### Overview

The MW39640AE is a type-2/3 600k-pixel CCD solid state image sensor.

This device uses photodiodes in the opto-electric conversion section and CCDs for signal read-out. The electronic shutter function allows for an exposure time of 1/10000 seconds. Further, it features high sensitivity, low noise, broad dynamic range and low smear level.

The device has a total of 595 728 pixels (1 008 horizontal × 591 vertical) and provides stable and clear images with a resolution of 700 horizontal and 420 vertical TV lines.

| Part Number | CCD size         | System | Color or B/W |
|-------------|------------------|--------|--------------|
| MW39640AE   | 11 mm (type-2/3) | CCIR   | B/W          |

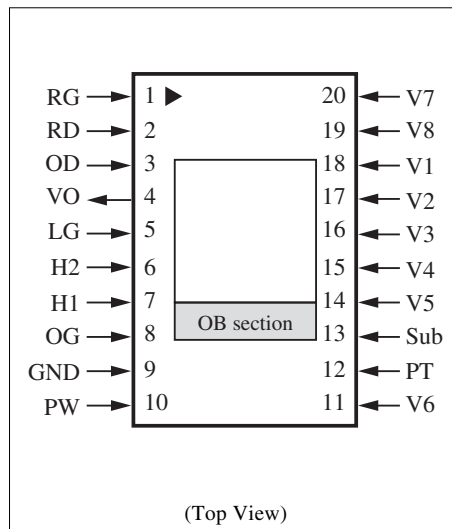
### Features

- Effective pixel number: 954 (horizontal) × 585 (vertical)
- High sensitivity
- High resolution
- Low smear level
- Continuously variable-speed electronic shutter function

### Applications

- Three-chip CCD color video camera supporting a widescreen-TV

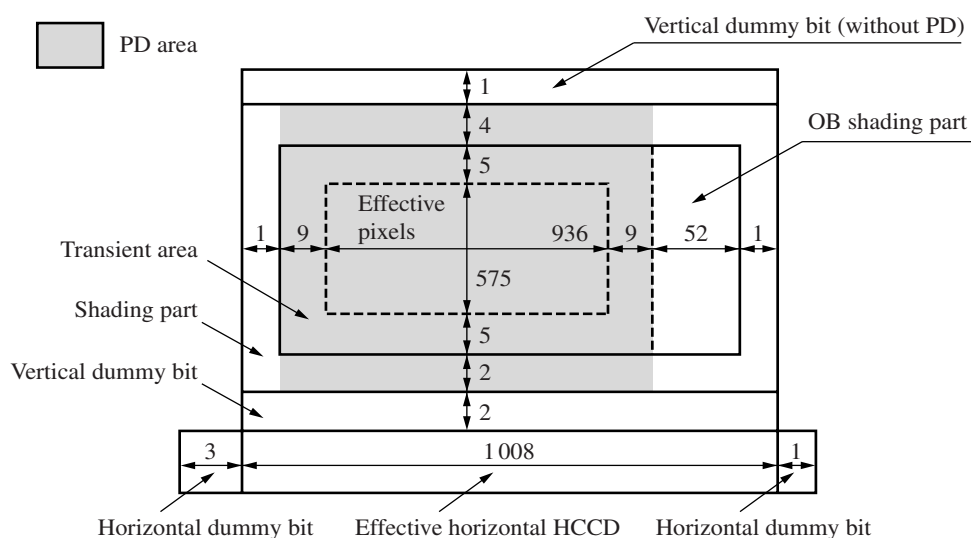
### Pin Assignments



## ■ Device Configuration

| Parameter                                         | Value                             | Unit            |
|---------------------------------------------------|-----------------------------------|-----------------|
| Horizontal drive frequency                        | $f_{CK} = 1\,152\, f_H = 18.0$    | MHz             |
| Total pixel number                                | $1\,008\, (H) \times 591\, (V)$   | Pixel           |
| Effective pixel number (including transient ones) | $954\, (H) \times 585\, (V)$      | Pixel           |
| Effective pixel number                            | $936\, (H) \times 575\, (V)$      | Pixel           |
| Pixel size                                        | $10.2\, (H) \times 9.4\, (V)$     | $\mu\text{m}^2$ |
| Effective image sensor size                       | $9.5472\, (H) \times 5.405\, (V)$ | $\text{mm}^2$   |
| Aspect ratio                                      | $16 : 9.058$                      | H : V           |
| Aspect ratio error                                | 0.64                              | %               |

## • Element Construction



## ■ Pin Descriptions

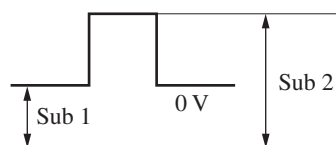
| Pin No. | Symbol | Description                             | Pin No. | Symbol | Description                           |
|---------|--------|-----------------------------------------|---------|--------|---------------------------------------|
| 1       | RG     | Reset gate                              | 11      | V6     | Vertical shift register clock pulse 6 |
| 2       | RD     | Reset drain                             | 12      | PT     | P-well for protection circuit         |
| 3       | OD     | Output drain                            | 13      | Sub    | Substrate                             |
| 4       | VO     | Video output                            | 14      | V5     | Vertical shift register clock pulse 5 |
| 5       | LG     | Output load transistor gate             | 15      | V4     | Vertical shift register clock pulse 4 |
| 6       | H2     | Horizontal shift register clock pulse 2 | 16      | V3     | Vertical shift register clock pulse 3 |
| 7       | H1     | Horizontal shift register clock pulse 1 | 17      | V2     | Vertical shift register clock pulse 2 |
| 8       | OG     | Output gate                             | 18      | V1     | Vertical shift register clock pulse 1 |
| 9       | GND    | P-well                                  | 19      | V8     | Vertical shift register clock pulse 8 |
| 10      | PW     | P-well                                  | 20      | V7     | Vertical shift register clock pulse 7 |

# Absolute Maximum Ratings and Operating Conditions

| Parameter             |        | Absolute maximum rating |             | Operating condition |                   |                   | Unit |
|-----------------------|--------|-------------------------|-------------|---------------------|-------------------|-------------------|------|
|                       |        | Lower limit             | Upper limit | Min                 | Typ               | Max               |      |
| RG                    | High   | 0                       | 9           | 4.7                 | 5.0               | 5.3               | V    |
|                       | Low    | 0                       | —           | 6.7                 | 7.0               | 7.3               | V    |
| RD                    |        | 0                       | 18          | 15.7                | 16.0              | 16.3              | V    |
| OD                    |        | 0                       | 18          | 15.7                | 16.0              | 16.3              | V    |
| VO                    |        | —                       | —           | —                   | —                 | —                 | V    |
| LG                    |        | 0                       | 5           | 2.7                 | 3.0               | 3.3               | V    |
| $\phi_{H2}$           | High   | —                       | 10          | 4.7                 | 5.0               | 5.3               | V    |
|                       | Low    | 0                       | —           | 0                   | 0                 | 0.3               | V    |
| $\phi_{H1}$           | High   | —                       | 10          | 4.7                 | 5.0               | 5.3               | V    |
|                       | Low    | 0                       | —           | 0                   | 0                 | 0.3               | V    |
| OG                    |        | 0                       | 5           | 0.3                 | 0.5               | 1.0               | V    |
| GND                   |        | Reference voltage       |             | —                   | 0                 | —                 | V    |
| PW                    |        | Reference voltage       |             | —                   | 0                 | —                 | V    |
| $\phi_{V6}$           | Middle | —                       | 5           | −0.3                | 0                 | 0.3               | V    |
|                       | Low    | −12                     | —           | −9.3                | −9.0              | −8.7              | V    |
| PT                    |        | −13.2                   | $\phi_{VL}$ | $\phi_{VL} - 1.2$   | $\phi_{VL} - 1.0$ | $\phi_{VL} - 0.7$ | V    |
| Sub 1 *               |        | 0                       | 18          | 5.0                 | adj.              | 14.5              | V    |
| Sub 2 *               |        | 0                       | 45          | 24.5                | 25 + Sub 1        | 40.0              | V    |
| $\phi_{V5}$           | High   | —                       | 18          | 15.7                | 16.0              | 16.3              | V    |
|                       | Middle | —                       | 5           | −0.3                | 0                 | 0.3               | V    |
|                       | Low    | −12                     | —           | −9.3                | −9.0              | −8.7              | V    |
| $\phi_{V4}$           | Middle | —                       | 5           | −0.3                | 0                 | 0.3               | V    |
|                       | Low    | −12                     | —           | −9.3                | −9.0              | −8.7              | V    |
| $\phi_{V3}$           | Middle | —                       | 5           | −0.3                | 0                 | 0.3               | V    |
|                       | Low    | −12                     | —           | −9.3                | −9.0              | −8.7              | V    |
| $\phi_{V2}$           | Middle | —                       | 5           | −0.3                | 0                 | 0.3               | V    |
|                       | Low    | −12                     | —           | −9.3                | −9.0              | −8.7              | V    |
| $\phi_{V1}$           | High   | —                       | 18          | 15.7                | 16.0              | 16.3              | V    |
|                       | Middle | —                       | 5           | −0.3                | 0                 | 0.3               | V    |
|                       | Low    | −12                     | —           | −9.3                | −9.0              | −8.7              | V    |
| $\phi_{V8}$           | Middle | —                       | 5           | −0.3                | 0                 | 0.3               | V    |
|                       | Low    | −12                     | —           | −9.3                | −9.0              | −8.7              | V    |
| $\phi_{V7}$           | Middle | —                       | 5           | −0.3                | 0                 | 0.3               | V    |
|                       | Low    | −12                     | —           | −9.3                | −9.0              | −8.7              | V    |
| Operating temperature |        | −10                     | 60          | —                   | 25                | —                 | °C   |
| Storage temperature   |        | −30                     | 70          | —                   | —                 | —                 | °C   |

## ■ Absolute Maximum Ratings and Operating Conditions (continued)

Note) \*: Sub pulse at the electronic shutter



## ■ Image Sensor Characteristics

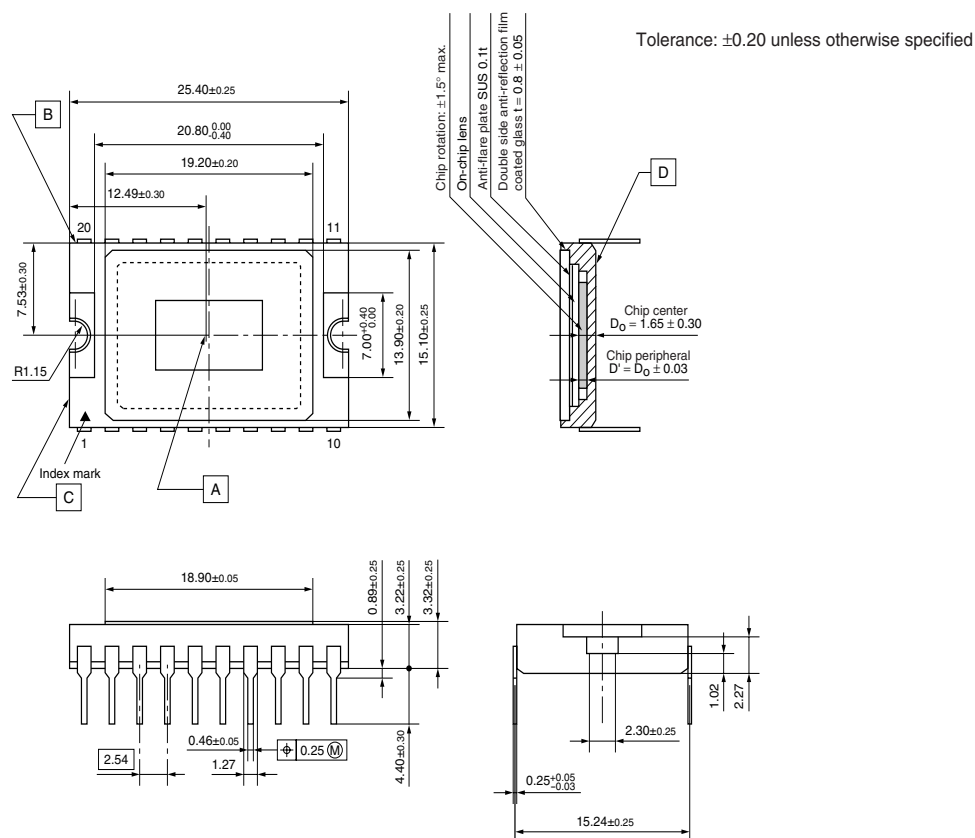
| Parameter           | Conditions                             | Min                                           | Typ  | Max  | Unit | Remarks                                    |
|---------------------|----------------------------------------|-----------------------------------------------|------|------|------|--------------------------------------------|
| S/N                 | 25°C, Dark condition                   | 63                                            | 64.5 | —    | dB   | Standard output                            |
| Saturation output   | 25°C, F value adjust                   | 1 500                                         | —    | —    | mV   | at CCD out                                 |
| Standard output     | 25°C, J chart standard light intensity | 560                                           | 620  | —    | mV   | at CCD out                                 |
| Image lag           | 25°C, 1/10 light intensity             | —                                             | 0    | —    | %    | Able to be swept out directly to substrate |
| Vertical smear      | 25°C, 1/10 V, F1.4                     | —                                             | −130 | −120 | dB   | Standard output                            |
| Transfer efficiency | 25°C, F11 + 1/32ND                     | Resolution should not be reduced              |      |      |      |                                            |
| Electronic shutter  | 25°C, Specified driving                | No abnormality within 1/100 to 1/2000 seconds |      |      |      |                                            |

Note) 1. The substrate voltage (Sub 1) should be adjusted to the minimum voltage that would not cause blooming, overflow and injection at image sensor of light input of 12 800 times the standard light intensity.

2. The standard light intensity is the one when the exposure is done at an aperture of F/11 using a light source of 2 856K and 920 nt and placing a color temperature conversion filter LB-40 (HOYA) and an IR cutting filter CAW-500S (t = 2.5 mm) in the light path.

# ■ Package Dimensions (unit: mm)

## • WDIP020-G-0600D (Lead-free package)



1. The package center does not meet the center of the effective pixel area.  
A is the center of the effective pixel area.
2. The reference of a vertical direction(V) is the side B.  
The reference of a horizontal direction(H) is the side C.  
The reference of a height direction is the package bottom D.
3. The rotation precision of the effective pixel area: maximum  $\pm 1.5^\circ$
4. The distance from the package bottom D to the effective pixel area  
:  $1.65 \text{ mm} \pm 0.3 \text{ mm}$
5. The tilt of the effective pixel area toward the package bottom D  
: Up to  $60 \mu\text{m}$  ( $D' = D_0 \pm \text{max. } 0.03 \text{ mm}$ )
6. The thickness of the seal glass:  $0.8 \text{ mm} \pm 0.1 \text{ mm}$ , and the refractive index: 1.50

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