

MN3776PE

6mm (1/3 inch) Progressive-Scan CCD Area Image Sensor

■ Overview

The MN3776PE is a 6mm (1/3 inch) Interline Transfer CCD (IT-CCD) solid state image sensor device.

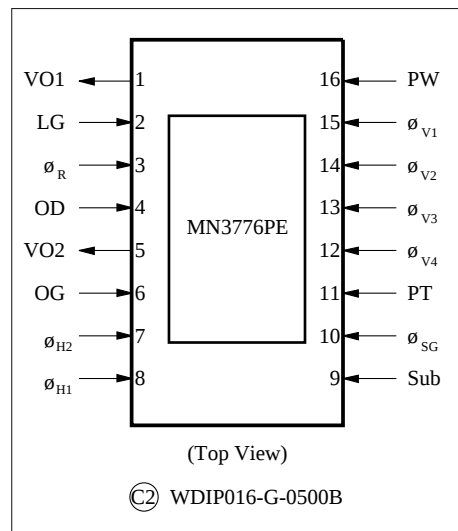
This device has square-shaped photodiodes (a total of 350K pixels arranged as 699 horizontal $\times$ 498 vertical) in the photoelectric conversion region, 4-phase drive vertical CCDs for signal read out, 2-channel horizontal CCD. This device permits progressive (non-interlaced) scanning. Further, because of the square-shaped photodiodes, it is possible to obtain identical resolution in the horizontal and vertical directions.

Type No.	Size	System	Color or B/W
MN3776PE	6mm (1/3 inch)	VGA	Color

■ Features

- Total number of pixels: 699 (horizontal) $\times$ 498 (vertical)
- VGA compatible
- Progressive (non-interlaced) scanning output
- Identically high resolution in both horizontal and vertical directions
- High color reproduction using the primary colors (R, G, B)
- High sensitivity
- Low noise
- Broad dynamic range
- Low smear
- Low image lag
- Electronic shutter function present
- No image distortion
- High reliability
- 16 Pin DIL ceramic package

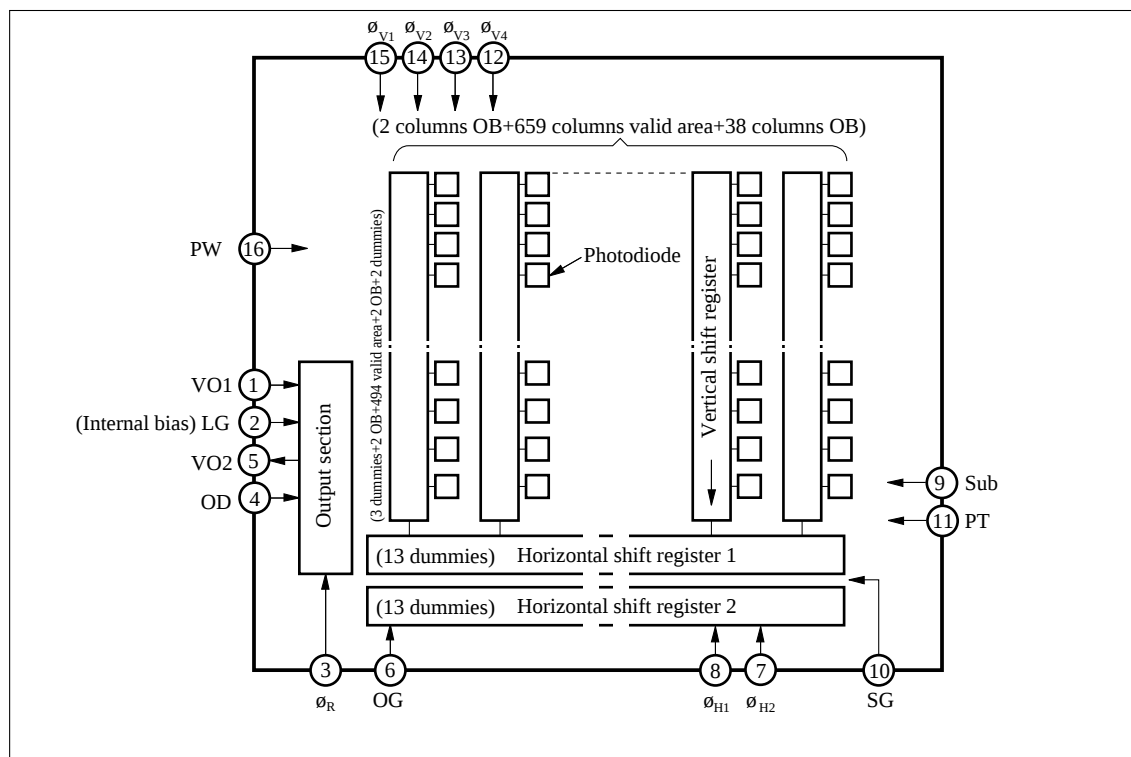
■ Pin Assignments



■ Applications

- Cameras for surveillance, and measurement use
- Image capturing for personal computers
- Electronic still cameras
- Video telephones and video conferencing system
- Image input device in factory automation

■ Block Diagram



■ Pin Descriptions

Pin No.	Symbol	Descriptions	Pin No.	Symbol	Descriptions
1	VO1	Video output (1)	9	Sub	Substrate
2	LG	Output load transistor gate	10	ϕ_{SG}	Shift gate
3	ϕ_R	Reset gate	11	PT	P-well for protection circuit
4	OD	Output drain	12	ϕ_{V4}	Vertical shift register clock pulse (4)
5	VO2	Video output (2)	13	ϕ_{V3}	Vertical shift register clock pulse (3)
6	OG	Output gate	14	ϕ_{V2}	Vertical shift register clock pulse (2)
7	ϕ_{H2}	Horizontal register clock pulse (2)	15	ϕ_{V1}	Vertical shift register clock pulse (1)
8	ϕ_{H1}	Horizontal register clock pulse (1)	16	PW	P-well

■ Absolute Maximum Ratings and Operating Conditions

Parameter	Symbol	Rating ^{Note 2)}		Operating condition ^{Note 1)}			Unit
		min	max	min	typ	max	
Output drain voltage	V_{OD}	-0.2	18	14.5	15.0	15.5	V
Output load transistor gate voltage ^{Note 3)}	V_{LG}	(Supplied internally)					V
Output drain voltage	V_{OG}	-0.2	18	2.2	2.5	2.8	V
Protection P well voltage	V_{PT}	-10.0	0.2	$\phi_{V(L)}$ -1.2	$\phi_{V(L)}$ -1.0	$\phi_{V(L)}$ -0.7	V
P well voltage	V_{PW}	Reference voltage		—	0	—	V
Reset gate voltage	H-L $V_{\phi R (H-L)}$ ^{*1}	—	18	7.5	8.0	8.5	V
	Bias $V_{\phi R (Bias)}$ ^{*1}	-0.2	—	3.0	3.5	4.0	V
Horizontal register clock pulse voltage 1	$V_{\phi H1 (H)}$	—	18	7.7	8.0	8.3	V
	$V_{\phi H1 (L)}$	-0.2	—	-0.2	0	0.3	V
Horizontal register clock pulse voltage 2	$V_{\phi H2 (H)}$	—	18	7.7	8.0	8.3	V
	$V_{\phi H2 (L)}$	-0.2	—	-0.2	0	0.3	V
Vertical shift register clock pulse voltage 1	$V_{\phi V1 (H)}$	—	18	14.5	15.0	15.5	V
	$V_{\phi V1 (M)}$	—	—	-0.2	0	0.2	V
	$V_{\phi V1 (L)}$	-9	—	-7.3	-7.0	-6.7	V
Vertical shift register clock pulse voltage 2	$V_{\phi V2 (M)}$	—	15	1.8	2.0	2.2	V
	$V_{\phi V2 (L)}$	-9	—	-7.3	-7.0	-6.7	V
Vertical shift register clock pulse voltage 3	$V_{\phi V3 (M)}$	—	15	-0.2	0	0.2	V
	$V_{\phi V3 (L)}$	-9	—	-7.3	-7.0	-6.7	V
Vertical shift register clock pulse voltage 4	$V_{\phi V4 (M)}$	—	15	1.8	2.0	2.2	V
	$V_{\phi V4 (L)}$	-9	—	-7.3	-7.0	-6.7	V
Substrate voltage	V_{Sub} ^{*2}	0.2	45	3.0	Adjust	14.5	V
	ΔV_{Sub} ^{*2}			24.2	25.0	25.8	V
Shift gate voltage	$V_{SG (H)}$	—	15	11.7	12.0	12.3	V
	$V_{SG (L)}$	-9.0	—	-7.3	-7.0	-6.7	V
Operating temperature	T_{opr}	-10	60	—	25	—	°C
Storage temperature	T_{stg}	-30	70	—	—	—	°C

Note 1) The initial setting of V_{Sub} shall be 8.0V and shall be adjusted to the minimum voltage at which no blooming is caused at a light input of 100 times the standard value. The standard light input is the one when the exposure is done at an aperture of F/5.6 using a light source of 2856K and 1050nt, and placing a color temperature conversion filter LB-40 (Hoya) and an IR cutting filter CAW-500S ($t=2.5\text{mm}$) in the light path.

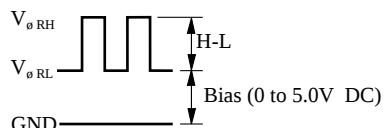
If any blooming is present at the minimum operating condition of V_{Sub} , it should be adjusted to 5.0V.

When any overflow charge is present, it should be adjusted to the minimum voltage at which the overflow charge is eliminated in the range under 13.5V.

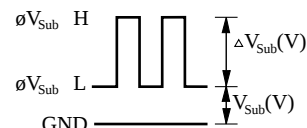
Note 2) Absolute maximum ratings:
 $-0.2 < V_{Sub} - V_{PT} < +55 \text{ (V)}$
 $-0.2 < V_{\phi V} - V_{PT} < +24.5 \text{ (V)}$

Note 3) The LG pin should be grounded via a capacitor of 0.047 μF or more.

* 1



* 2 V_{Sub} when using electronic shutter function

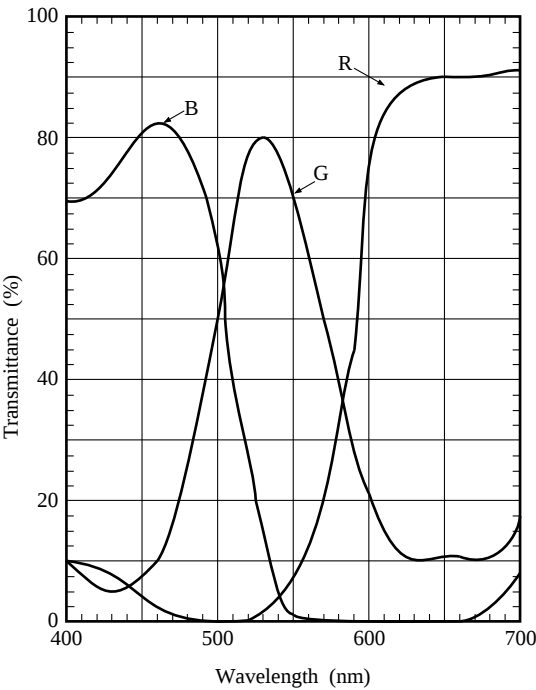


■ Optical Characteristics

Type No.	Color or B/W	Valid pixels		S/N typ. (dB)	Saturation output typ. (mV)	Sensitivity F8 typ. (mV)	Vertical smear Sm typ. (%)	Image lag typ. (%)	Horizontal resolution typ. (TV-lines)	Vertical resolution typ. (TV-lines)
		H	V							
MN3776PE	Color	659	494	58	400	100	0.02	0	350	350

■ Graphs of Characteristics

Color Filter Spectral Characteristics



CCD Spectral Characteristics (with color separation filter)

