

MN3727FE, MN3727AE

6mm (1/3 inch) 681H CCD Area Image Sensor

■ Overview

The MN3727FE and MN3727AE are 6mm (1/3 inch) Interline Transfer CCD (IT-CCD) solid state image sensor devices.

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

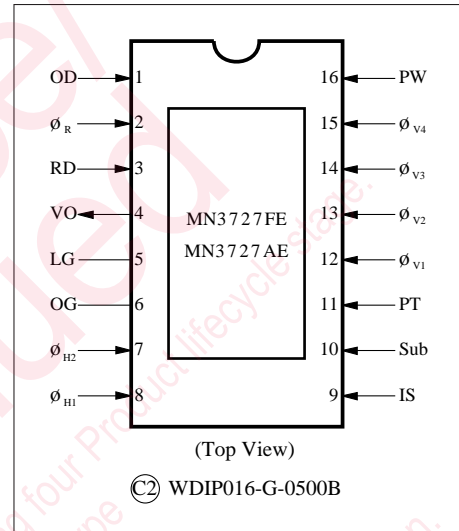
This device has a total of 420K pixels (721 horizontal × 584 vertical) and provides stable and clear images with a resolution of 430 horizontal TV-lines and 420 vertical TV-lines.

Type No.	Size	System	Color or B/W
MN3727FE	6mm (1/3 inch)	PAL	Color
MN3727AE		CCIR	B/W

■ Features

- Total number of pixels: 721 (horizontal) × 584 (vertical)
- High sensitivity
- Low noise
- Broad dynamic range
- Low smear
- Low image lag
- Electronic shutter function present
- No image distortion
- Small size enables design of compact equipment
- High reliability
- 16 Pin DIL ceramic package (surdip)

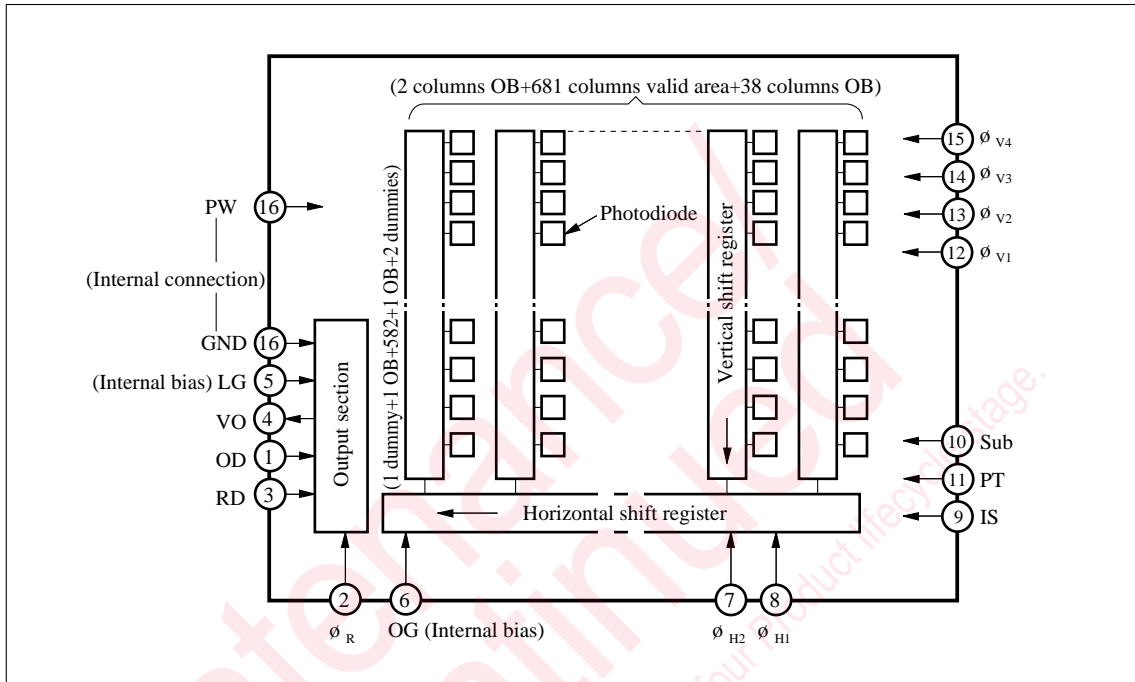
■ Pin Assignments



■ Applications

- Compact lightweight camcoders
- Communication television systems
- Door cameras
- Cameras for measurement use
- Cameras for medical use

■ Block Diagram



■ Pin Descriptions

Pin No.	Symbol	Descriptions	Pin No.	Symbol	Descriptions
1	OD	Output drain	9	IS	Input source
2	ϕ_R	Reset pulse	10	Sub	Substrate
3	RD	Reset drain	11	PT	P-well for protection circuit
4	VO	Video output	12	ϕ_{v1}	Vertical shift register clock pulse (1)
5	LG	Output load transistor gate	13	ϕ_{v2}	Vertical shift register clock pulse (2)
6	OG	Output gate	14	ϕ_{v3}	Vertical shift register clock pulse (3)
7	ϕ_{H2}	Horizontal register clock pulse (2)	15	ϕ_{v4}	Vertical shift register clock pulse (4)
8	ϕ_{H1}	Horizontal register clock pulse (1)	16	PW	P-well

■ Absolute Maximum Ratings and Operating Conditions

Parameter	Symbol	Rating		Operating condition			Unit
		min	max	min	typ	max	
Reset drain voltage	$V_{RD}^{*1,3}$	-0.2	18	15	15.5	16	V
Output drain voltage	$V_{OD}^{*1,3}$	-0.2	18	15	15.5	16	V
Output load transistor gate voltage	$V_{LG}^{*1,3,6}$	(Supplied internally)					V
Output gate voltage	$V_{OG}^{*1,3,6}$	(Supplied internally)					V
Horizontal CCD input source voltage	V_{HS}	-0.2	18	15	15.5	16	V
Protection P well voltage	V_{PT}	-10	0.2	$\phi_{V(L)}$ -1.2	$\phi_{V(L)}$ -1	$\phi_{V(L)}$ -0.7	V
P well voltage	V_{PW}	Reference voltage		—	0	—	V
Reset pulse voltage	$V_{\phi R(H)}^{*2}$	—	18	4.7	5.0	5.3	V
	$V_{\phi R(L)}^{*2}$	-0.5	—	0	Adjust	5	V
Horizontal register clock pulse voltage 1	$V_{\phi H1(H)}^{*2}$	—	18	4.7	5	5.3	V
	$V_{\phi H1(L)}^{*2}$	-0.2	—	0	0	0	V
Horizontal register clock pulse voltage 2	$V_{\phi H2(H)}^{*2}$	—	18	4.7	5	5.3	V
	$V_{\phi H2(L)}^{*2}$	-0.2	—	0	0	0	V
Vertical shift register clock pulse voltage 1	$V_{\phi V1(H)}^{*2,5}$	—	18	13.5	14	14.5	V
	$V_{\phi V1(M)}^{*2,5}$	—	—	-0.2	0	0.2	V
	$V_{\phi V1(L)}^{*2,5}$	-9	—	-6.3	-6	-5.7	V
Vertical shift register clock pulse voltage 2	$V_{\phi V2(M)}^{*2,5}$	—	18	0.8	1	1.2	V
	$V_{\phi V2(L)}^{*2,5}$	-9	—	-6.3	-6	-5.7	V
Vertical shift register clock pulse voltage 3	$V_{\phi V3(H)}^{*2,5}$	—	18	13.5	14	14.5	V
	$V_{\phi V3(M)}^{*2,5}$	—	—	-0.2	0	0.2	V
	$V_{\phi V3(L)}^{*2,5}$	-9	—	-6.3	-6	-5.7	V
Vertical shift register clock pulse voltage 4	$V_{\phi V4(M)}^{*2,5}$	—	18	0.8	1	1.2	V
	$V_{\phi V4(L)}^{*2,5}$	-9	—	-6.3	-6	-5.7	V
Substrate voltage	V_{Sub}^{*4}	-0.2	45	3	Adjust	14.5	V
Operating temperature	T_{opr}	-10	70	—	25	—	°C
Storage temperature	T_{stg}	-30	80	—	—	—	°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 a specified aperture 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.

Note 2) See pulse timing diagrams on the following page.

Note 3) Absolute maximum ratings:
 $-0.2 < V_{Sub} - V_{PT} < +55$ (V)
 $-0.2 < V_{\phi V} - V_{PT} < +24.5$ (V)

Note 4) V_{Sub} power supply impedance should be 100 Ohms or less.

Note 5) Output impedance of the ϕ_{V1} to ϕ_{V3} drivers should be 30 Ohms or more, while their power supply capacitance should be 10mA or less.

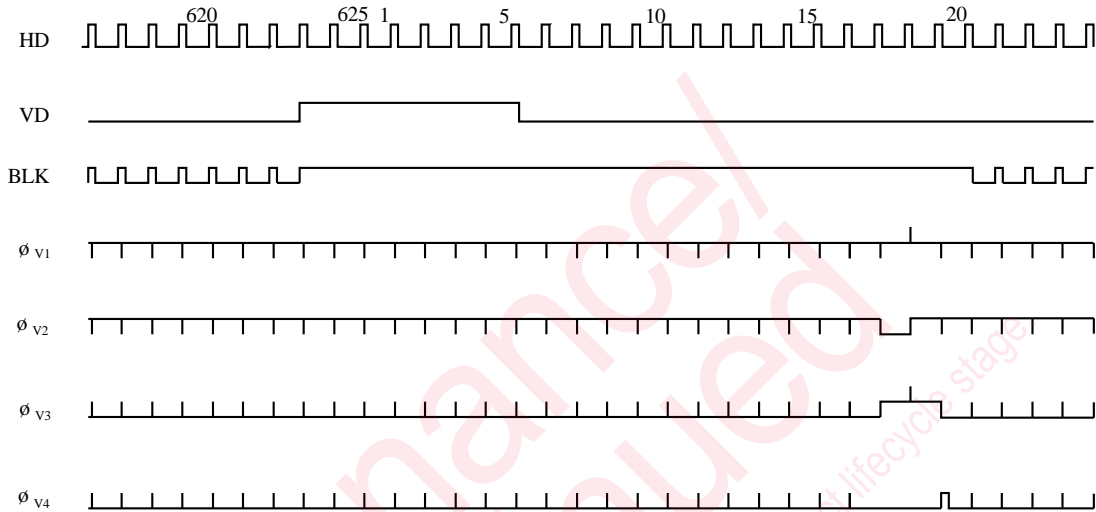
Note 6) The LG and OG pins should each be grounded via a capacitor of 0.047 μF or more.

■ Optical Characteristics

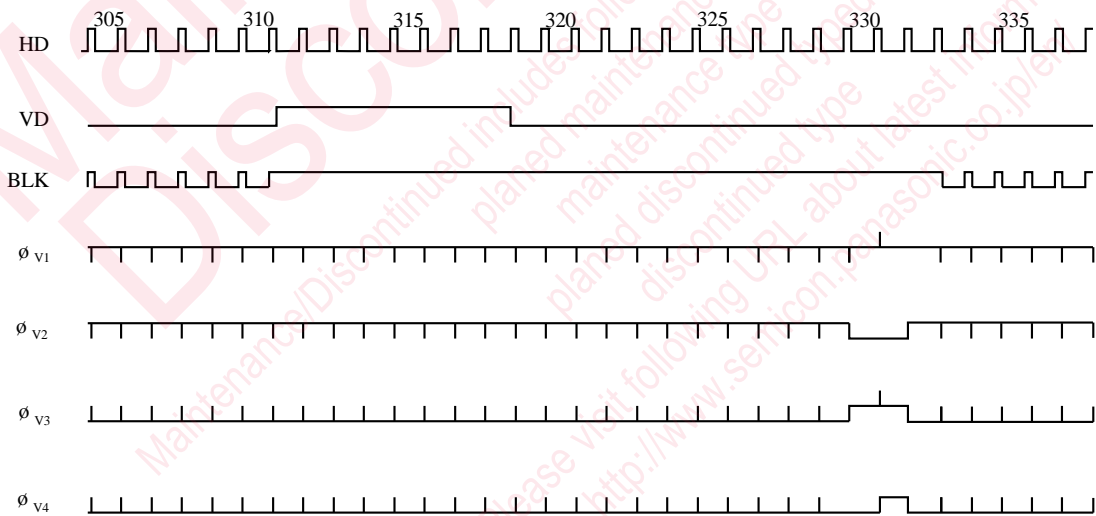
Type No.	Color or B/W	Valid pixels		S/N typ. (dB)	Saturation output typ. (mV)	Sensitivity F8 typ. (mV)	Vertical smear Sm typ. (%)	Image lag typ. (%)	Horizontal resolution typ. (TV-lines)	Vertical resolution typ. (TV-lines)
		H	V							
MN3727FE	Color	681	582	60	500	250	0.01	0	430	420
MN3727AE	B/W	681	582	60	1,000	380	0.01	0	480	420

■ Example of Recommended Driving Pulses

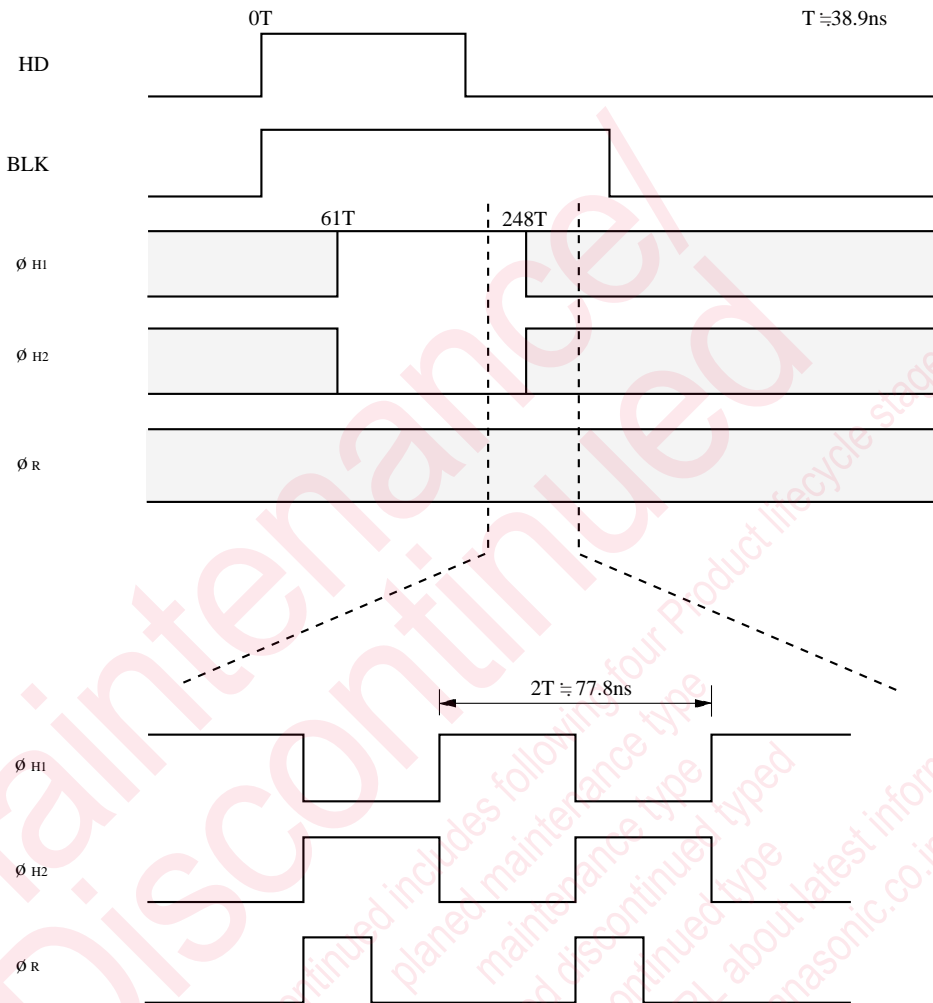
< Field A >



< Field B >



■ Example of Recommended Driving Pulses (continued)



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