MN3728MFE, MN3728MAE

6mm (1/3 inch) 768H High-Resolution CCD Area Image Sensors

■ Overview

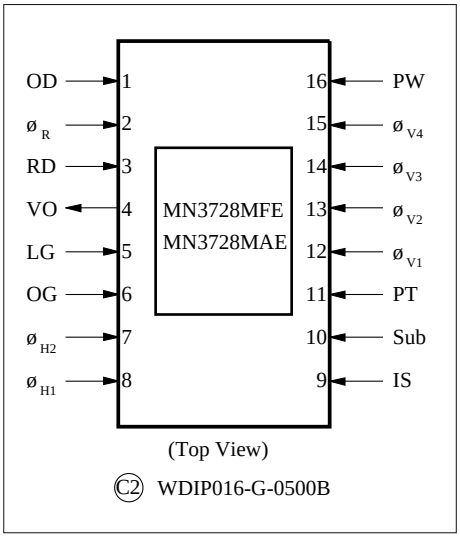
The MN3728MFE and MN3728MAE are 6mm (1/3 inch) Interline Transfer CCD (IT-CCD) solid state image sensor devices.

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 470K pixels (803 horizontal × 584 vertical) and provides stable and clear images with a resolution of 480 horizontal TV-lines and 420 vertical TV-lines.

Type No.	Size	System	Color or B/W
MN3728MFE	6mm (1/3 inch)	NTSC	Color
MN3728MAE		CCIR	B/W

■ Pin Assignments



(Top View)

C2 WDIP016-G-0500B

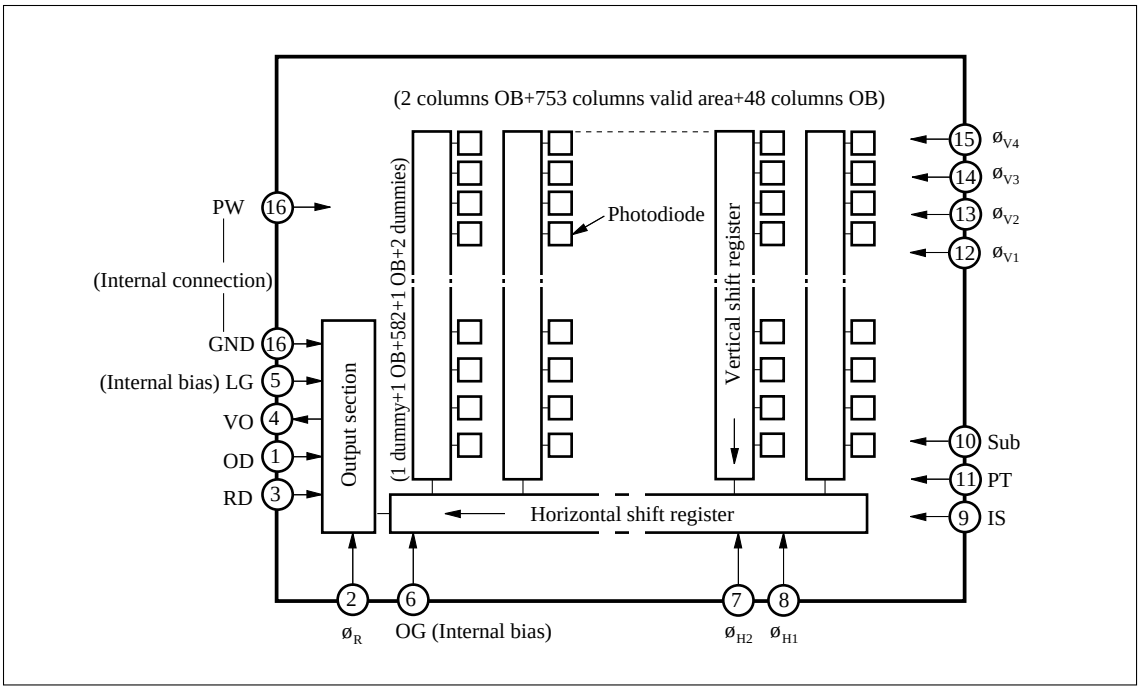
■ Features

- Total number of pixels: 803 (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 (cerdip)

■ Applications

- Compact lightweight camcoders
- Cameras for surveillance, measurement, and medical use

■ Block Diagram



■ Pin Descriptions

Pin No.	Symbol	Descriptions	Pin No.	Symbol	Descriptions
1	OD	Output drain	9	IS	Horizontal CCD input source
2	ø R	Reset pulse	10	Sub	Substrate
3	RD	Reset drain	11	PT	P-well for protection circuit
4	VO	Video output	12	ø V1	Vertical shift register clock pulse (1)
5	LG	Output load transistor gate	13	ø V2	Vertical shift register clock pulse (2)
6	OG	Output gate	14	ø V3	Vertical shift register clock pulse (3)
7	ø H2	Horizontal register clock pulse (2)	15	ø V4	Vertical shift register clock pulse (4)
8	ø H1	Horizontal register clock pulse (1)	16	PW	P-well

■ Absolute Maximum Ratings and Operating Conditions

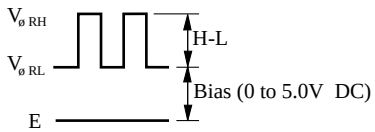
Parameter	Symbol	Rating Note 2)		Operating condition Note 1)			Unit
		min	max	min	typ	max	
Reset drain voltage	V_{RD}	– 0.2	18	14.5	15.0	15.5	V
Output drain voltage	V_{OD}	– 0.2	18	14.5	15.0	15.5	V
Output load transistor gate voltage Note 3)	V_{LG}	(Supplied internally)					V
Output gate voltage Note 3)	V_{OG}	(Supplied internally)					V
Horizontal CCD input source voltage	V_{IS}	– 0.2	18	14.5	15.0	15.5	V
Protection P well voltage	V_{PT}	–10.0	0.2	$ø_{V(L)}$ –1.2	$ø_{V(L)}$ –1.0	$ø_{V(L)}$ – 0.7	V
P well voltage	V_{PW}	Reference voltage		—	0	—	V
Reset pulse voltage H-L	$V_{øR(H-L)}$ * 1	—	18	4.7	5.0	5.3	V
Reset pulse voltage Bias	$V_{øR(Bias)}$ * 1	– 0.2	—	0	Adjust	5.0	V
Horizontal register clock pulse voltage 1	$V_{øH1(H)}$	—	18	4.7	5.0	5.3	V
	$V_{øH1(L)}$	– 0.2	—	0	0	0	V
Horizontal register clock pulse voltage 2	$V_{øH2(H)}$	—	18	4.7	5.0	5.3	V
	$V_{øH2(L)}$	– 0.2	—	0	0	0	V
Vertical shift register clock pulse voltage 1	$V_{øV1(H)}$	—	18	14.5	15.0	15.5	V
	$V_{øV1(M)}$	—	—	– 0.2	0	0.2	V
	$V_{øV1(L)}$	–9	—	–7.3	–7.0	–6.7	V
Vertical shift register clock pulse voltage 2	$V_{øV2(M)}$	—	15	0.8	1.0	1.2	V
	$V_{øV2(L)}$	–9	—	–7.3	–7.0	–6.7	V
Vertical shift register clock pulse voltage 3	$V_{øV3(H)}$	—	18	14.5	15.0	15.5	V
	$V_{øV3(M)}$	—	—	– 0.2	0	0.2	V
	$V_{øV3(L)}$	–9	—	–7.3	–7.0	–6.7	V
Vertical shift register clock pulse voltage 4	$V_{øV4(M)}$	—	15	0.8	1.0	1.2	V
	$V_{øV4(L)}$	–9	—	–7.3	–7.0	–6.7	V
Substrate voltage	V_{Sub} * 2	– 0.2	45	3.0	Adjust	14.5	V
	$ø V_{Sub}$ * 2			24.5	25.0	25.5	V
Operating temperature	T_{opr}	–10	70	—	25.0	—	˚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 an aperture of F/4 using a light source of 2856K and 1050nt, and placing a color temperature conversion filter LB-40 (Hoya) and an IR cutting filter CAW-500 (t=2.5mm) in the light path.

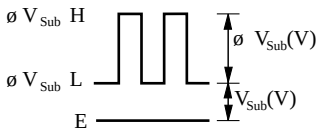
Note 2) Absolute maximum ratings: $– 0.2 < V_{Sub} – V_{PT} < +55$ (V)
$– 0.2 < V_{øV} – V_{PT} < +24.5$ (V)

Note 3) The LG and OG pins should each be grounded via a capacitor of 0.047µF or more.

* 1



* 2 V_{Sub} when using electronic shutter function

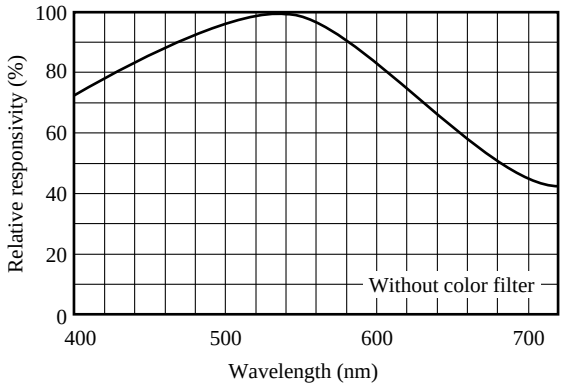


■ Optical Characteristics

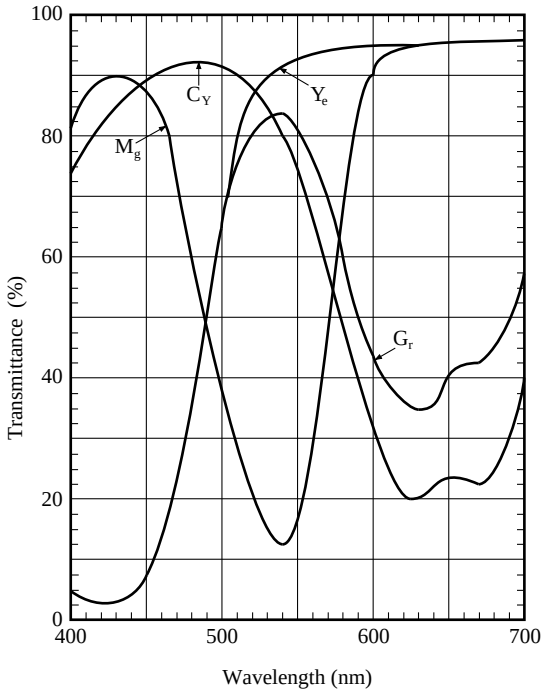
Type No.	Color or B/W	Valid pixels H	Valid pixels V	S/N typ. (dB)	Saturation output typ. (mV)	Sensitivity F8 typ. (mV)	Vertical smear Sm typ. (%)	Image lag typ. (%)	Horizontal resolution typ. (TV-lines)	Vertical resolution typ. (TV-lines)
MN3728MFE	Color	753	582	60	700	280	0.01	0	480	420
MN3728MAE	B/W	753	582	60	1,000	300	0.01	0	550	420

■ Graphs of Characteristics

CCD Spectral Characteristics



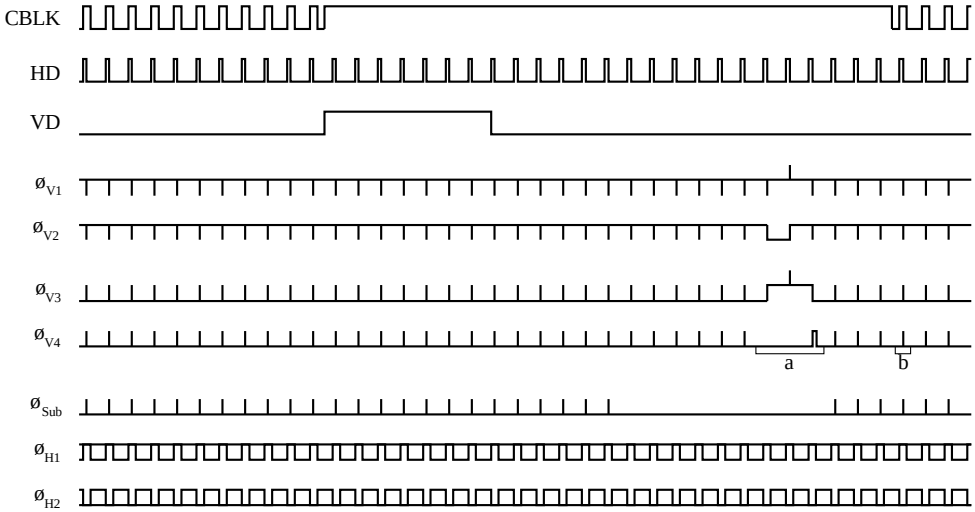
Color Filter Spectral Characteristics



■ Example of Recommended Driving Pulses

• V Rate timing

< Field A >



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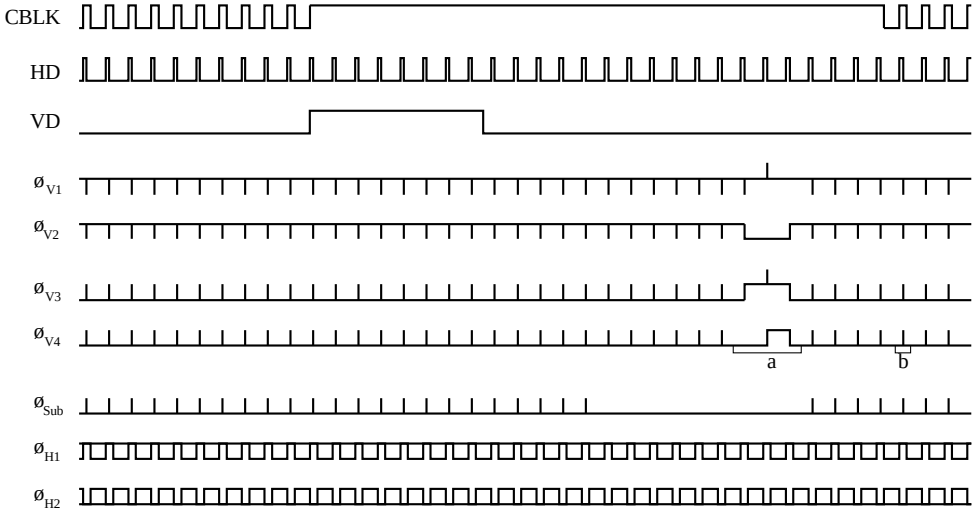
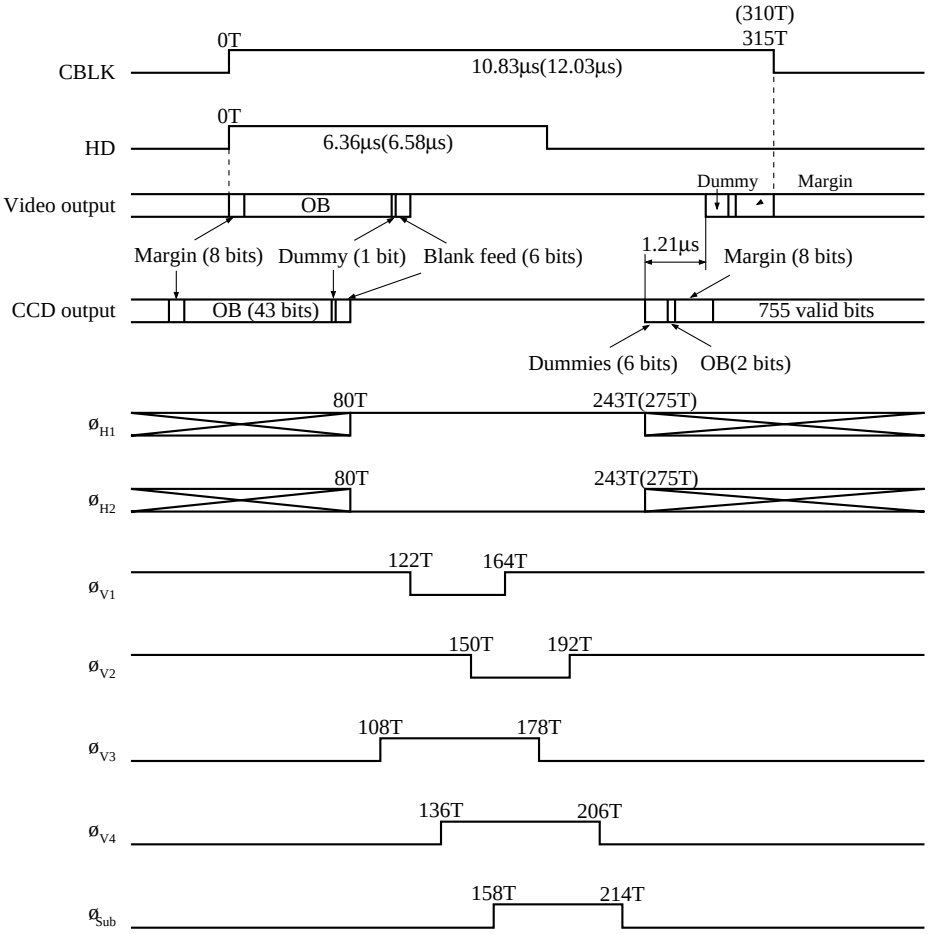


• H Rate timing



• High speed pulse timing