

MN3716FT, MN3716AT

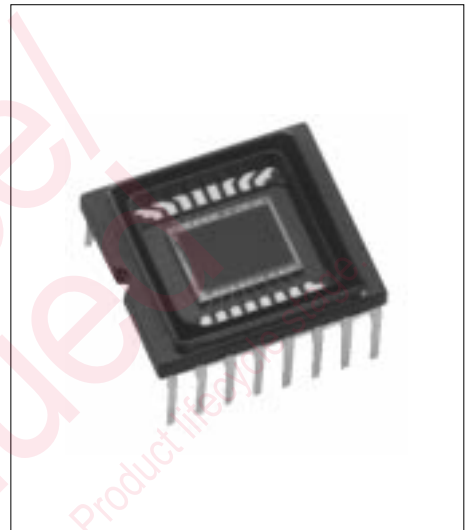
6mm (type-1/3) 512H High-Responsivity CCD Area Image Sensors

■ Overview

The MN3716FT and MN3716AT are 6mm (type-1/3) 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 an exposure time of 1/10000 seconds possible. Further, this device has the features of high sensitivity, low noise, broad dynamic range, and extremely low smear.

This device has a total of 267,748 pixels (542 horizontal × 494 vertical) and provides stable and clear images with a resolution of 330 horizontal TV-lines and 350 vertical TV-lines.



Part Number	Size	System	Color or B/W
MN3716FT	6mm(type-1/3)	NTSC	Color
MN3716AT		EIA	B/W

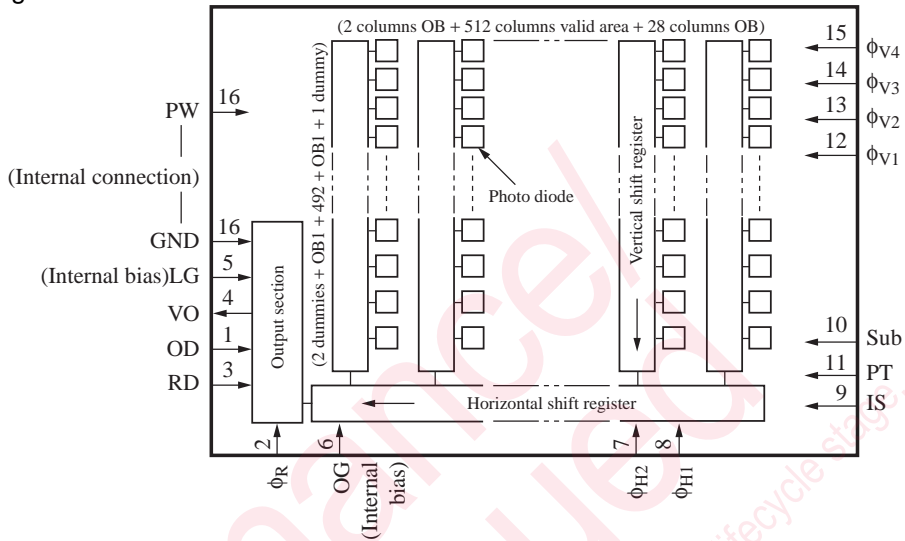
■ Features

- Total number of pixels: 542 (horizontal) × 494 (vertical)
- High sensitivity
- Low noise
- Broad dynamic range
- Low smear
- Low image lag
- Electronic shutter
- No image distortion
- Small size enables design of compact equipment
- High reliability
- 16-pin DIL plastic package

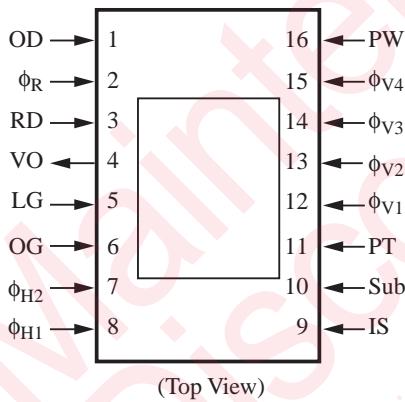
■ Applications

- Compact lightweight camcorders, Communication television systems, Door cameras, Cameras for measurement use, Cameras for medical use, Picture processing

■ Block Diagram



■ Pin Assignments



■ Pin Descriptions

Pin No.	Symbol	Descriptions	Pin No.	Symbol	Descriptions
1	OD	Output drain	11	PT	P-well for protection circuit
2	ϕ_R	Reset pulse	12	ϕ_{V1}	Vertical shift register clock pulse 1
3	RD	Reset drain	13	ϕ_{V2}	Vertical shift register clock pulse 2
4	VO	Video output			
5	LG	Output load transistor gate	14	ϕ_{V3}	Vertical shift register clock pulse 3
6	OG	Output gate			
7	ϕ_{H2}	Horizontal register clock pulse 2			
8	ϕ_{H1}	Horizontal register clock pulse 1	15	ϕ_{V4}	Vertical shift register clock pulse 4
9	IS	Horizontal CCD input source			
10	Sub	Substrate	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}	-0.2	18.0	14.5	15.0	15.5	V	
Output drain voltage	V_{OD}	-0.2	18.0	14.5	15.0	15.5	V	
Output load transistor gate voltage	V_{LG}	Supplied internally					V	
Output gate voltage	V_{OG}	Supplied internally					V	
Horizontal CCD input source voltage	V_{HS}	-0.2	18.0	14.5	15.0	15.5	V	
Protection P-well voltage	V_{PT}^{*2}	-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 pulse voltage	H-L	$V_{\phi R(H-L)}^{*3}$	—	18.0	4.7	5.0	5.3	V
	Bias	$V_{\phi R(Bias)}^{*3}$	-0.2	—	0	Adjust	5.0	V
Horizontal register clock pulse voltage 1	$V_{\phi H1(H)}$	—	18.0	4.5	5.0	5.5	V	
	$V_{\phi H1(L)}$	-0.2	—	-0.1	0	0.1		
Horizontal register clock pulse voltage 2	$V_{\phi H2(H)}$	—	18.0	4.5	5.0	5.5	V	
	$V_{\phi H2(L)}$	-0.2	—	-0.1	0	0.1		
Vertical shift register clock pulse voltage 1	$V_{\phi V1(H)}^{*2}$	—	18.0	14.5	15.0	15.5	V	
	$V_{\phi V1(M)}^{*2}$	—	—	-0.2	0	0.2		
	$V_{\phi V1(L)}^{*2}$	-9.0	—	-7.3	-7.0	-6.7		
Vertical shift register clock pulse voltage 2	$V_{\phi V2(M)}^{*2}$	—	15.0	0.8	1.0	1.2	V	
	$V_{\phi V2(L)}^{*2}$	-9.0	—	-7.3	-7.0	-6.7		
Vertical shift register clock pulse voltage 3	$V_{\phi V3(H)}^{*2}$	—	18.0	14.5	15.0	15.5	V	
	$V_{\phi V3(M)}^{*2}$	—	—	-0.2	0	0.2		
	$V_{\phi V3(L)}^{*2}$	-9.0	—	-7.3	-7.0	-6.7		
Vertical shift register clock pulse voltage 4	$V_{\phi V4(M)}^{*2}$	—	15.0	0.8	1.0	1.2	V	
	$V_{\phi V4(L)}^{*2}$	-9.0	—	-7.3	-7.0	-6.7		
Substrate voltage	V_{Sub}^{*1}	-0.2	45.0	3.0	Adjust	13.8	V	
	ϕV_{Sub}^{*4}	—	—	24.5	25.0	25.5		
Operating temperature	T_{opr}	-10	70	—	25	—	°C	
Storage temperature	T_{stg}	-30	80	—	—	—	°C	

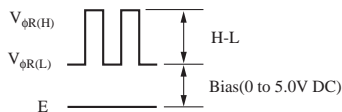
Note)1. Standard light input defines

Standard light input is the one when the exposure is done at a lens aperture of F8, using a light source of 2856 K and 1050 nt, and placing a color temperature conversion filter LB-40 (HOYA) and an IR cutting filter CAW-500 (t = 2.5 mm) in the light path.

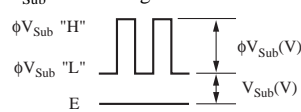
- *1: V_{Sub} internal settings guarantee blooming at 400 times light input of the standard light input.
- *2: V_{PT} is set so that the following conditions are set for VL of the vertical shift clock.

$$V_{PT} \leq VL$$

- *3:



- *4: V_{Sub} when using electronic shutter function

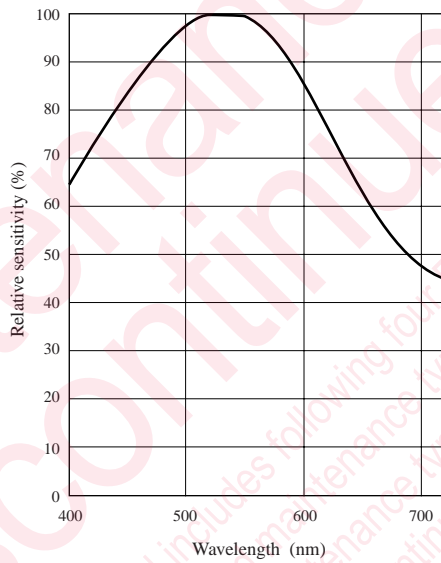


■ Optical Characteristics

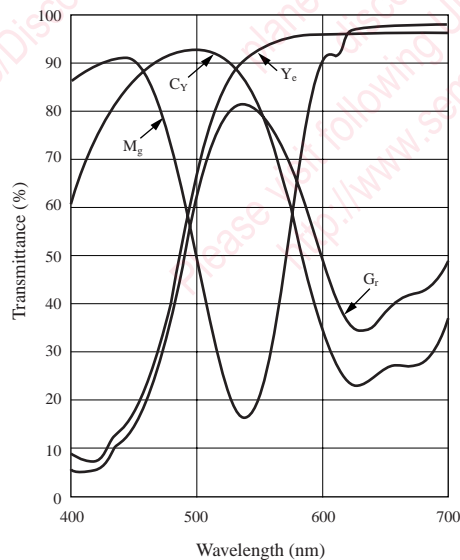
Part Number	Color or B/W	Effective pixels		S/N typ (dB)	Saturation output typ (mV)	Sensitivity F8 typ (mV)	Vertical smear Sm typ(%)	Image lag typ (%)	Horizontal resolution typ (TV-lines)	Vertical resolution typ (TV-lines)
		H	V							
MN3716FT	Color	512	492	—	900	350	0.002	—	330	350
MN3716AT	B/W	512	492	—	1,500	500	0.003	—	360	350

■ Graphs of Characteristics

CCD Spectral Characteristics (without color filter)



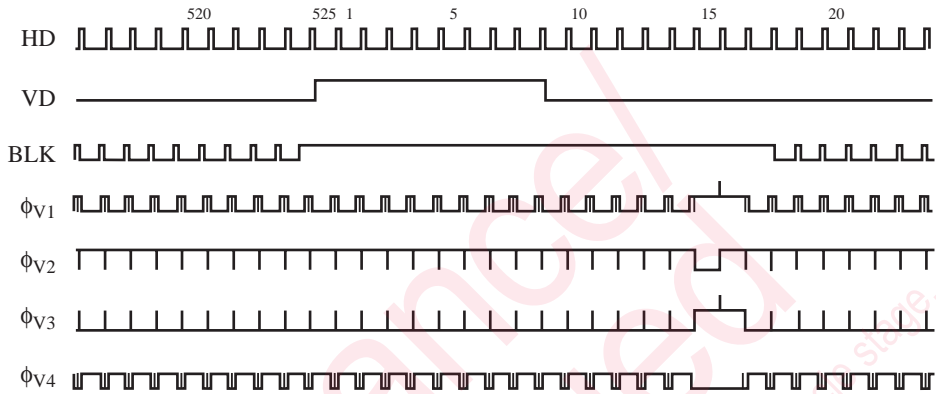
Color Filter Spectral Characteristics



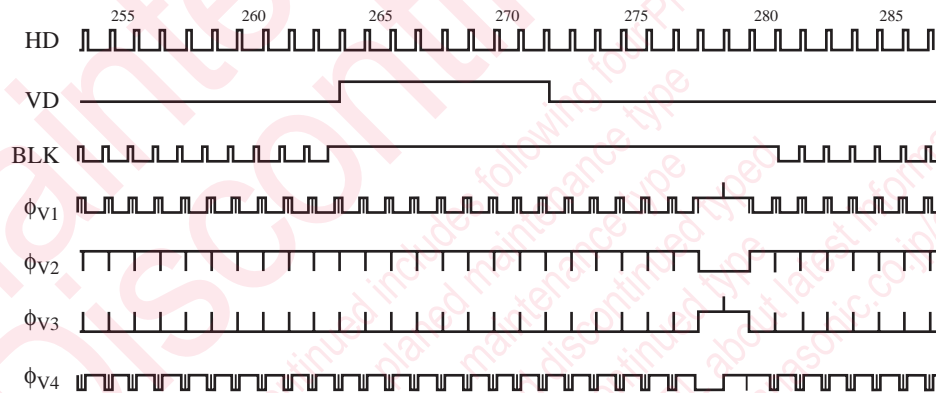
■ Timing Diagram

- V Rate timing

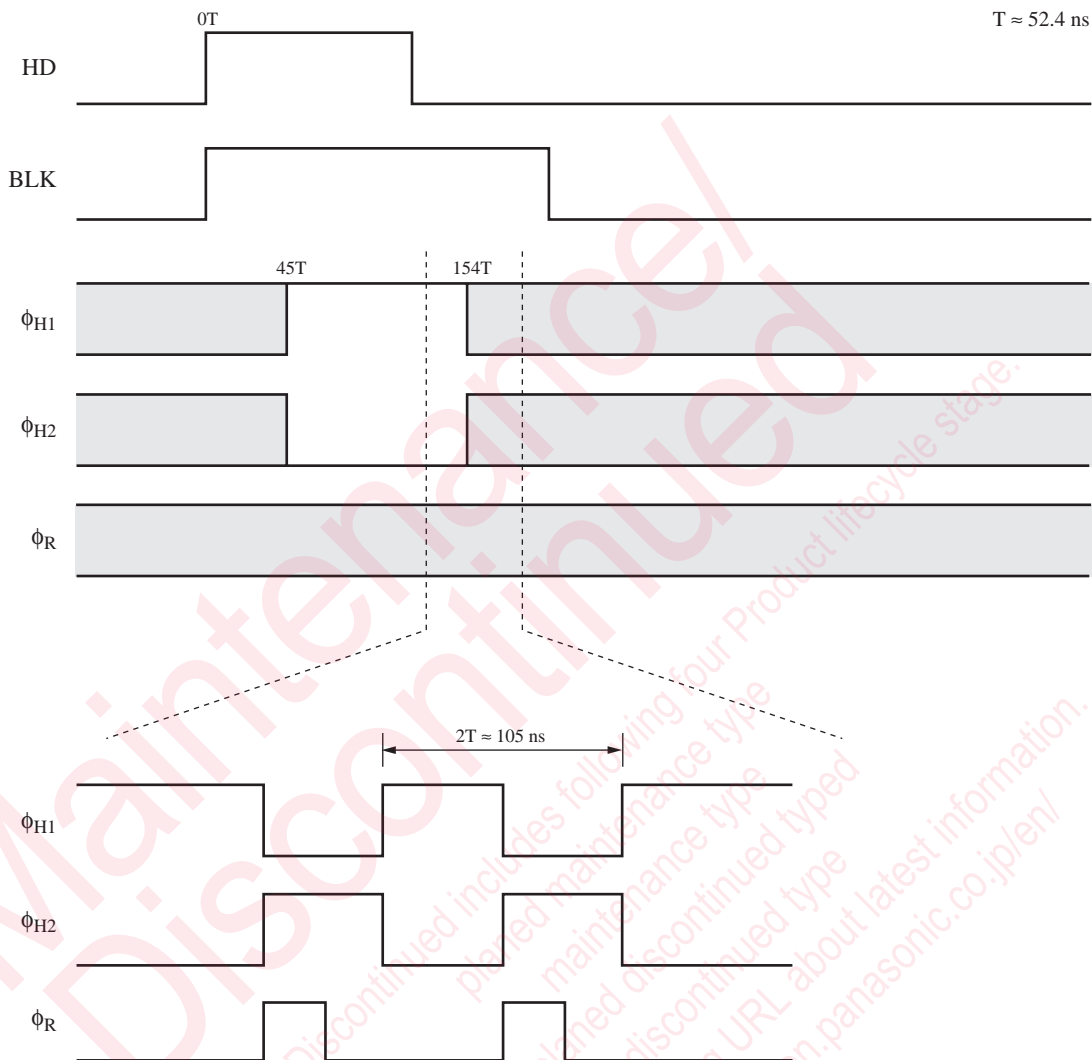
< Field A >



< Field B >

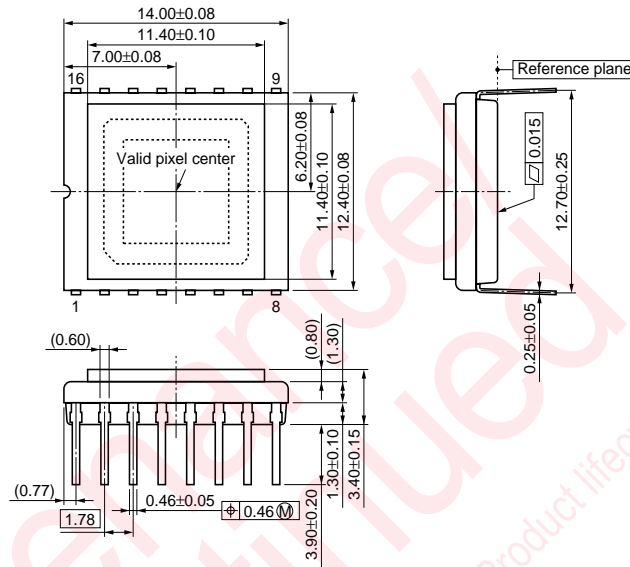


■ Timing Diagram (continued)



■ Package Dimensions (Unit: mm)

- WDIP016-P-0500C



Maintenance/Discontinued includes following four Product lifecycle stage.
 planned maintenance type
 maintenance type
 planned discontinued type
 discontinued type
 Please visit following URL about latest information.
<http://www.semicon.panasonic.co.jp/en/>

Request for your special attention and precautions in using the technical information and semiconductors described in this book

- (1) If any of the products or technical information described in this book is to be exported or provided to non-residents, the laws and regulations of the exporting country, especially, those with regard to security export control, must be observed.
- (2) The technical information described in this book is intended only to show the main characteristics and application circuit examples of the products, and no license is granted under any intellectual property right or other right owned by our company or any other company. Therefore, no responsibility is assumed by our company as to the infringement upon any such right owned by any other company which may arise as a result of the use of technical information described in this book.
- (3) The products described in this book are intended to be used for standard applications or general electronic equipment (such as office equipment, communications equipment, measuring instruments and household appliances).
Consult our sales staff in advance for information on the following applications:
 - Special applications (such as for airplanes, aerospace, automobiles, traffic control equipment, combustion equipment, life support systems and safety devices) in which exceptional quality and reliability are required, or if the failure or malfunction of the products may directly jeopardize life or harm the human body.
 - Any applications other than the standard applications intended.
- (4) The products and product specifications described in this book are subject to change without notice for modification and/or improvement. At the final stage of your design, purchasing, or use of the products, therefore, ask for the most up-to-date Product Standards in advance to make sure that the latest specifications satisfy your requirements.
- (5) When designing your equipment, comply with the range of absolute maximum rating and the guaranteed operating conditions (operating power supply voltage and operating environment etc.). Especially, please be careful not to exceed the range of absolute maximum rating on the transient state, such as power-on, power-off and mode-switching. Otherwise, we will not be liable for any defect which may arise later in your equipment.
 - Even when the products are used within the guaranteed values, take into the consideration of incidence of break down and failure mode, possible to occur to semiconductor products. Measures on the systems such as redundant design, arresting the spread of fire or preventing glitch are recommended in order to prevent physical injury, fire, social damages, for example, by using the products.
- (6) Comply with the instructions for use in order to prevent breakdown and characteristics change due to external factors (ESD, EOS, thermal stress and mechanical stress) at the time of handling, mounting or at customer's process. When using products for which damp-proof packing is required, satisfy the conditions, such as shelf life and the elapsed time since first opening the packages.
- (7) This book may be not reprinted or reproduced whether wholly or partially, without the prior written permission of Matsushita Electric Industrial Co., Ltd.