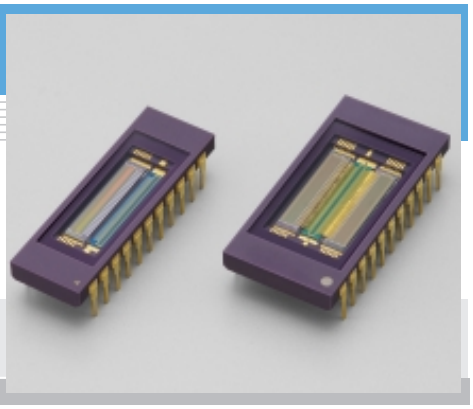
NEW

IMAGE SENSOR



InGaAs linear image sensor
G9494-256D/-512D

Near infrared image sensor (0.9 to 1.7 µm) with high-speed data rate

HAMAMATSU provides high-speed, near infrared image sensors designed for detectors used in on-line foreign object inspection equipment. These image sensors use square-shaped pixels that are ideally suited for software processing in pattern recognition systems.
The signal processing circuit employs CTIA (Charge Transfer Impedance Amplifier) method to perform simultaneous charge integration on all pixels, so there is no time lag among the pixel output signals.

Features

- High-speed data rate: 2 MHz Typ.
- Selectable conversion gain (Cf=0.1 pF, 1 pF)
- Pixel size
  G9494-256D: 50 × 50 µm
  G9494-512D: 25 × 25 µm
- CMOS readout circuit incorporated
- Low dark current
- Room temperature operation

Applications

- Foreign object detection monitors
- Near infrared spectroscopy

■ Selection guide

Type No.	Cooling	Number of pixels	Pixel pitch (µm)	Pixel size [µm (H) × µm (V)]	Spectral response range (µm)	Defective pixe
G9494-256D	Non-cooled	256	50	50 × 50	0.9 to 1.7 (25 °C)	Less than 1 %
G9494-512D		512	25	25 × 25		

■ Absolute maximum ratings

Parameter	Symbol	Value	Unit
Clock pulse voltage	Vϕmax.	5.5	V
Operating temperature *1	Topr	-20 to +70	°C
Storage temperature *1	Tstg	-20 to +85	°C

*1: No condensation

■ Electrical characteristics (Ta=25 °C)

Parameter		Symbol	Min.	Typ.	Max.	Unit
Supply voltage	G9494-256D	Vdd	4.5	5.0	5.5	V
	G9494-512D		4.5	5.0	5.5	
Supply voltage		Vref	-	1.26	-	V
Supply current	G9494-256D	IVdd	-	40	75	mA
	G9494-512D		-	80	150	
Supply current		IVref	-	-	1	mA
		IINP	-	-	1	mA
Ground		Vss	-	0	-	V
Element bias		INP	3.3	3.5	3.6	V
Clock frequency		f	0.1	2	-	MHz
Clock pulse voltage	High	Vϕ	4.5	5.0	5.5	V
	Low		-	-	0.4	
Clock pulse rise / fall times		trϕ, tfϕ	0	20	100	ns
Clock pulse width		tpwϕ	200	-	-	ns
Reset pulse voltage	High	V (RES)	4.5	5.0	5.5	V
	Low		-	-	0.4	
Reset pulse rise / fall times		tr (RES), tf (RES)	0	20	100	ns
Reset pulse width *2		tpw (RES)	6/f	-	-	µs
Video output voltage	High	VH	-	3.5	INP	V
	Low	VL	-	1.26	-	
Video output impedance		Zv	-	5	-	kΩ
A/D trigger voltage		Vtrig High	-	Vdd	-	V
		Vtrig Low	-	GND	-	
A/D trigger drive function		Vad	74HC244 1 ch	-	-	-
Data rate		fv	-	f	-	Hz

*2: 6 µs or more

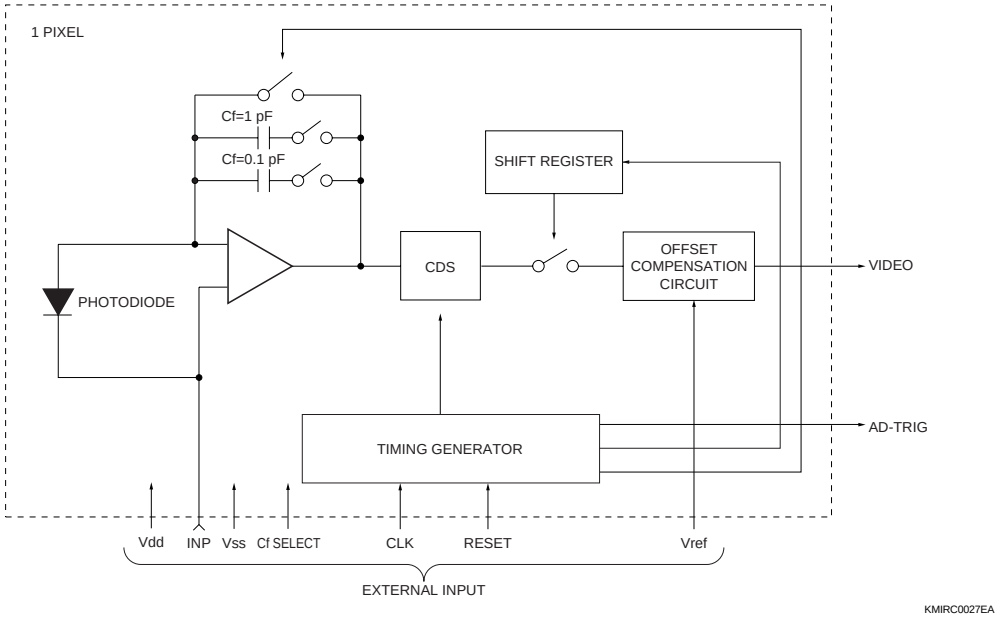
PRELIMINARY DATA
Jul. 2006

SOLID STATE DIVISION

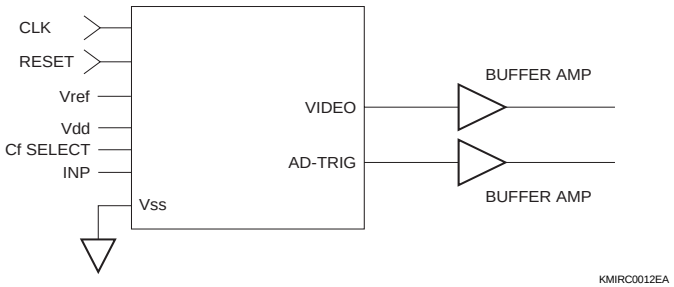
■ Specification (Ta=25 °C, Vdd=5 V, INP=3.5 V, Vref=1.26 V, Cf=0.1 pF, integration time 200 µs, per 1 element)

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit
Peak sensitivity wavelength		λp		-	1.55	-	µm
Saturation charge		Qsat	Vϕ=5 V	-	0.2	-	pC
Dark current	256 ch	ID		-	4	20	pA
	512 ch			-	1	5	
RMS noise voltage (readout noise)		N	Standard deriation Number of integration 50	-	900	2000	µV rms
Saturation voltage		Vsat		-	2	-	V
Photo response non uniformity		PRNU		-	±5	±20	%
Detective pixel		-		-	-	1	%

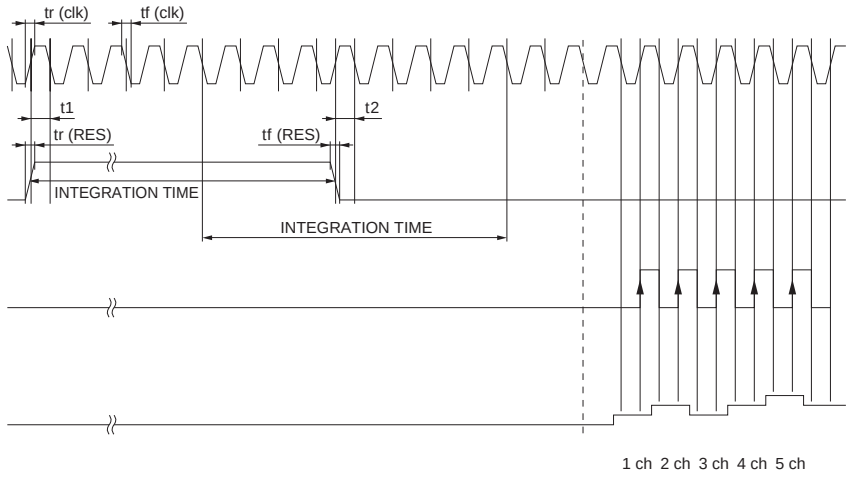
■ Equivalent circuit



■ Basic circuit connection



■ Timing chart

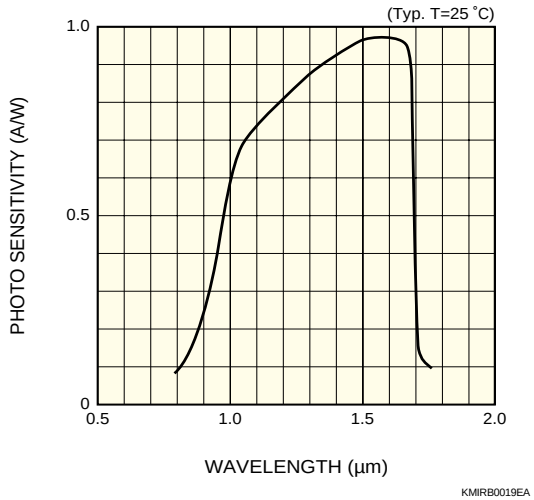


Note) Three clock pulses are required for a period from the last pixel to the rising edge of RESET pulse.

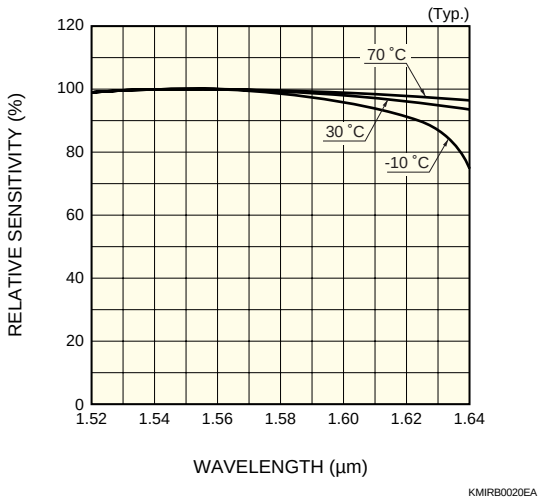
Parameter	Symbol	Min.	Typ.	Max.	Unit
Clock pulse frequency	-	0.1	2	-	MHz
Clock pulse width	tpw (clk)	200	-	-	ns
Clock pulse rise / fall times	tr (clk), tf (clk)	0	20	100	ns
Reset pulse width *3	tpw (RES)	6/f	-	-	µs
Reset pulse rise / fall times	tr (RES), tf (RES)	0	20	100	ns
Clock pulse to start pulse timing	t1, t2	50	-	-	ns
Video delay time	tvd	100	-	-	ns

*3: 6 µs or more

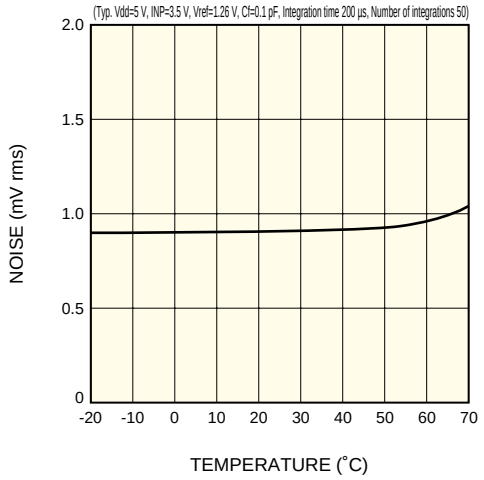
■ Spectral response



■ Photo sensitivity temperature characteristics

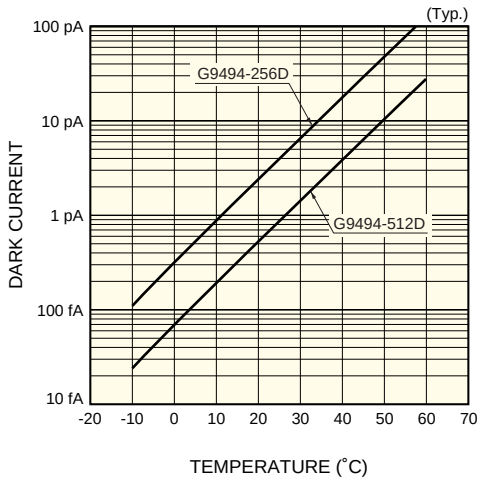


■ Noise vs. temperature



KMIRB0036EA

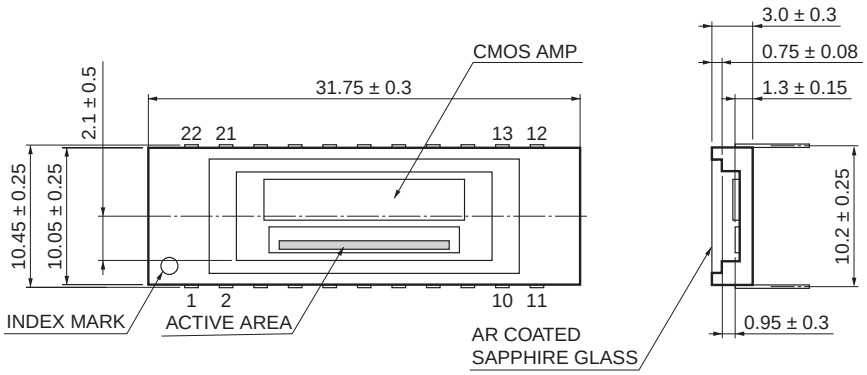
■ Dark current vs. temperature

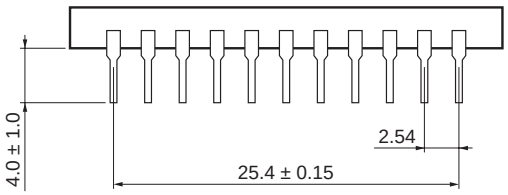


KMIRB0035EA

■ Dimensional outlines (unit: mm)

G9494-256D

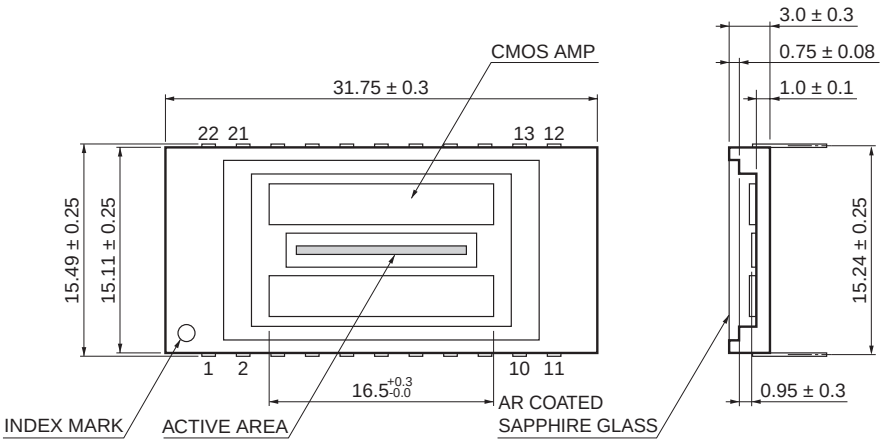


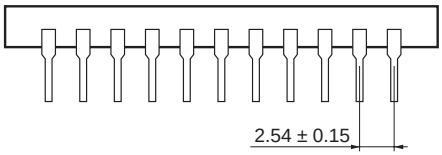


Pin No.	Pin connection	Pin No.	Pin connection
1	NC	12	VIDEO
2	NC	13	Vref
3	NC	14	CLK
4	NC	15	NC
5	NC	16	INP
6	NC	17	Vss
7	NC	18	Vdd
8	NC	19	NC
9	NC	20	AD-TRIG
10	NC	21	RESET
11	NC	22	Cf-SELECT

KMIRA0015EA

G9494-512D





Pin No.	Pin connection	Pin No.	Pin connection
1	NC	12	VIDEO-ODD
2	RESET-EVEN	13	Vref
3	AD-TRIG-EVEN	14	CLK-ODD
4	NC	15	NC
5	NC	16	INP
6	NC	17	Vss
7	NC	18	Vdd
8	NC	19	NC
9	CLK-EVEN	20	AD-TRIG-ODD
10	NC	21	RESET-ODD
11	VIDEO-EVEN	22	Cf-SELECT

KMIRA0016EA

HAMAMATSU PHOTONICS K.K., Solid State Division
1126-1 Ichino-cho, Hamamatsu City, 435-8558 Japan, Telephone: (81) 053-434-3311, Fax: (81) 053-434-5184, www.hamamatsu.com
U.S.A.: Hamamatsu Corporation: 360 Foothill Road, P.O.Box 6910, Bridgewater, N.J. 08807-0910, U.S.A., Telephone: (1) 908-231-0960, Fax: (1) 908-231-1218
Germany: Hamamatsu Photonics Deutschland GmbH: Arzbergerstr. 10, D-82211 Herrsching am Ammersee, Germany, Telephone: (49) 08152-3750, Fax: (49) 08152-2658
France: Hamamatsu Photonics France S.A.R.L.: 19, Rue du Saule Trapu, Parc du Moulin de Massy, 91882 Massy Cedex, France, Telephone: 33-(1) 69 53 71 00, Fax: 33-(1) 69 53 71 10
United Kingdom: Hamamatsu Photonics UK Limited: 2 Howard Court, 10 Tewin Road, Welwyn Garden City, Hertfordshire AL7 1BW, United Kingdom, Telephone: (44) 1707-294888, Fax: (44) 1707-325777
North Europe: Hamamatsu Photonics Norden AB: Smidesvägen 12, SE-171 41 Solna, Sweden, Telephone: (46) 8-509-031-00, Fax: (46) 8-509-031-01
Italy: Hamamatsu Photonics Italia S.R.L.: Strada della Moia, 1/E, 20020 Arese, (Milano), Italy, Telephone: (39) 02-935-81-733, Fax: (39) 02-935-81-741

Cat. No. KMIR1014E02
Sept. 2006 DN