Ordering number : ENN*6298

LC99452

2M pixel 2/3-inch Progressive Scan CCD Image Sensor with Square Pixel

Preliminary

Features

- Very high resolution: 1616 × 1296 (H × V) pixels. progressive scan
- 2/3 inch image area: 8.24mm × 6.61mm. Image diagonal 10.56mm
- Square pixel: 5.1µm × 5.1µm
- Color filter: R-G-B primary mosaic filter
- High sensitivity
- High dynamic range
- Low dark current
- Low noise
- Fast readout: 25 MHz horizontal drive frequency. 5 full-resolution images/s
- Electronic shuttering
- Supports monitoring modes
- Compact package: 20-pin leadless ceramic chip-carrier (LCC)

Device Structure

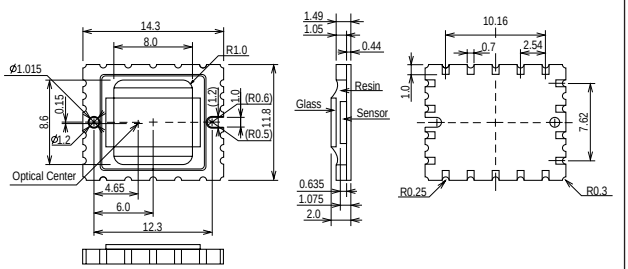
- General
  Frame-Transfer CCD with reduced storage section
  Chip size: 9.49 mm (H) × 9.32 mm (V)
  Package dimension
- Image Area
  Unit cell size: 5.1 µm (H) × 5.1 µm (V)
  Number of effective pixels: 1616 (H) × 1296 (V)
  approx. 2094 k pixels.
  Optical black: 12/Top + 12/Bottom 2/Left + 70/Right
  Number of dummy lines: 4 /Bottom
  Total number of pixels: 1688 (H) × 1324 (V)
  approx. 2235k pix.
  Effective Image size: 8.24 mm (H) × 6.61 mm (V)
  Image diagonal: 10.56 mm (2/3 inch format)
  Aspect ratio: 5:4 (or 4:3)
  Color filter pattern: R-G-B; Bayer
  Number of clock phase: 4
- Storage Area
  Unit cell size: 5.1 µm (H) × 5.1 µm (V)
  Number of cells: 1688 (H) × 298 (V)
  Number of clock phase: 4
- Horizontal Register and Output Stage
  Number of cells: 1696 (H) × 1 (V)
  Number of dummy cells: 8/Front
  Number of clock phase: 4
  Output Stage: 3-stage source follower (open source)

Package Dimensions

unit: mm

3258

[LC99452]



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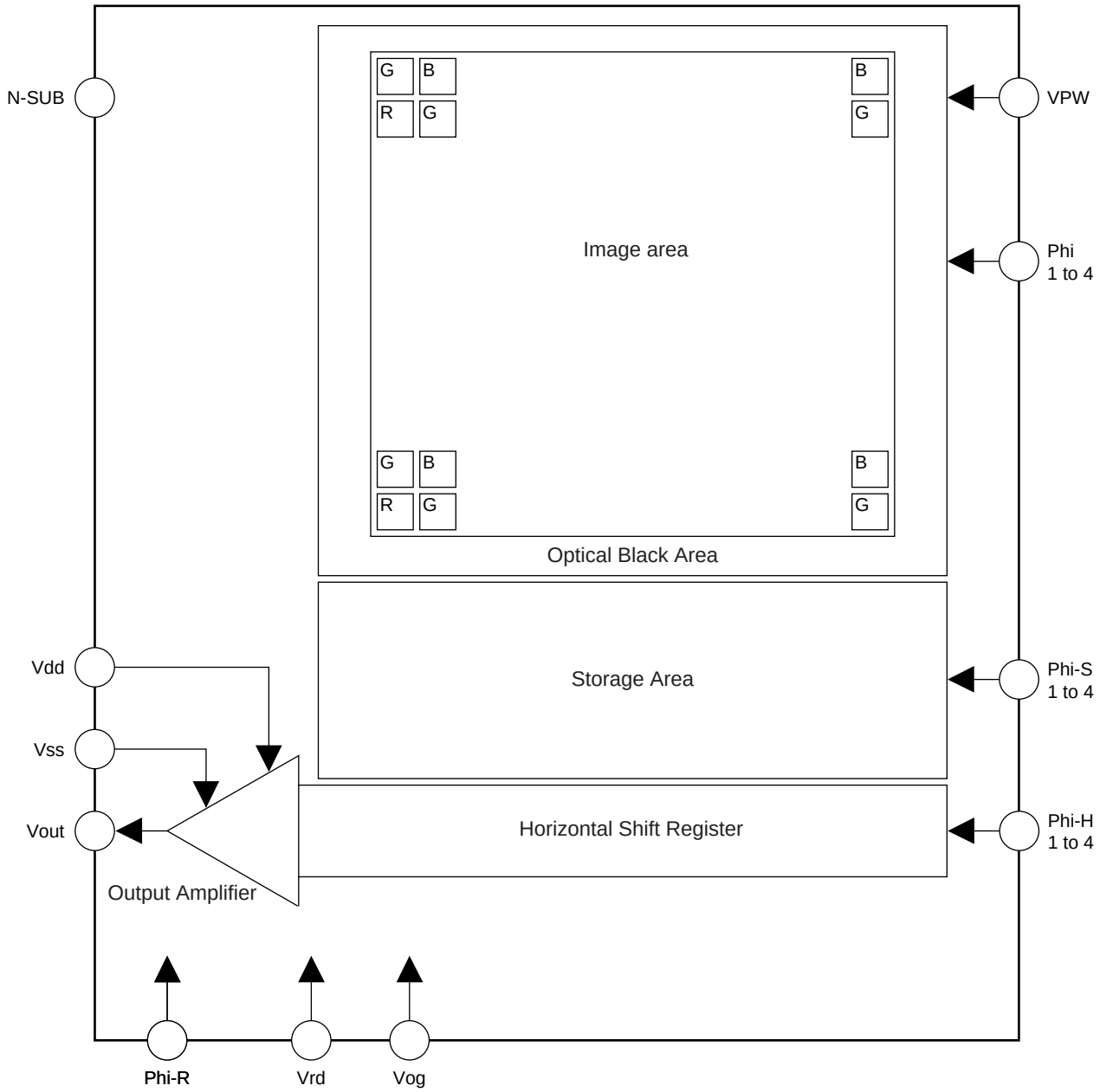
Block Diagram and Pixel Arrangement



Pin Function

Symbol	Description	Symbol	Description
N-sub	N-Substrate	Phi 1 to 4	Image area clock
Vpw	P-Well	Phi-S 1 to 4	Storage area clock
Vdd	Power supply	Phi-H 1 to 4	Horizontal register clock
Vss	Power supply Source	Phi-R	Reset gate
Vog	CCD output gate		
Vrd	Reset drain		
Vout	CCD output		

Modes of Operation

The LC99452 has been especially designed for high-resolution low cost digital photography in color full 1600 × 1280 resolution and real-time monitoring (preview) mode in color at reduced resolution. Two main modes of operation are possible:

Still picture mode (mode-1)

In still picture mode, a 1600 (H) × 1280 (V) progressive scan image can be read out. A 'single shot' mechanical shutter is required to obtain a 100% smear free image.

Preview mode (mode-2)

In preview mode, image with a reduced vertical resolution by on-chip data compression can be obtained. Progressive scan images (mode-2), e.g. 120, 240 or 288 lines at up to 40 images/s, suitable for LCD displays can be selected by the timing generator.

Clock Voltage Conditions

Parameter		Symbol	Ratings			Unit	Cap per phase
			min	typ	max		
Input resistanImage area pulses Phi 1 to 4	Pulse amplitude	V_{PIF}	11	12	13	V	5.5 nF
	Low level	V_{LIF}		0		V	
Storage area pulses Phi-S 1 to 4	Pulse amplitude	V_{PSL}	11	12	13	V	1.5 nF
	Low level	V_{LSL}		0		V	
Horizontal register pulses Phi-H 1 to 4	Pulse amplitude	V_{PH}	4.5	5.0	5.25	V	60 pF
	Low level C1,C3	$V_{LH\ 13}$		0		V	
	Low level C2,C4	$V_{LH\ 24}$	2.5	3	3.5	V	
Reset gate pulses Phi-R	Pulse amplitude	V_{PR}	4.5	5	5.25	V	15 pF *1
	High level	V_{HR}	21	22	23	V	
Charge reset pulse on Nsub		V_{PSUB}	4.5	5	5.5	V	

Note: *1. DC setting depends on RG clock-swing.

DC Electrical Characteristics

Parameter	Symbol	Ratings			Unit	I (mA)
		min	typ	max		
N-sub bias	V_{LSUB}	20	24	28	V	2 *1
P-well bias	V_{PW}	6	7	9	V	2
Output circuit power supply	V_{DD}	19	20	21	V	5.5 *2
	V_{SS}	0	0	0	V	1 *2
OG bias	V_{OG}	3.5	4.0	4.5	V	*3
Reset drain bias	V_{RD}	19	20	21	V	

Notes: 1. V_{LSUB} is set for optimal anti-blooming operation.
2. with RL = 3.3 kΩ, V_{DD} should be adjusted at the same voltage as V_{RD}.
3. OG setting depends on horizontal clock amplitude.

AC Electrical Characteristics

Parameter		Conditions	Ratings			Unit
			min	typ	max	
Transport frequency:	- horizontal				25	MHz
	- vertical			1.56 *1	3.125	MHz
Power consumption	mode 1					mW
	mode 2					mW
Output impedance				400		Ω
Amplifier supply current		(R_L = 3.3 kΩ)		5.2		mA
Bandwidth		(R_L = 3.3 kΩ, C_L = 2pF)		90		MHz
RMS readout noise		@ 5 MHz BW (after CDS)		0.240	0.330	mV
Power supply rejection ratio at DC		*2		0.15	0.2	V/V

Notes: 1. Typical value for preview and movie mode.
2. V_{DD} must be decoupled properly with a 100 nF decoupling capacitor close to the pin.

Performance Characteristics

Test conditions: Typical conditions
Image capture mode (mode-1) of operation
Integration time = 1/30 sec.(unless specified differently)
Test temperature 60°C; light source 3200 K; IR filter 1.7 mm BG40; F = 16

Parameter		Ratings			Unit
		min	typ	max	
Sensitivity	green pixels		295		mV / lux•s
	red pixels		240		mV / lux•s
	blue pixels		175		mV / lux•s
Saturation signal		840	1150	1320	mV / lux•s
Qmax		40	50	60	k-electrons
Blooming suppression			100		x Qmax
Dark conditions: Average number of dark signal electrons per pixel after 1/30 sec integration			25		electrons
Dark signal shading			1		mV