

**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)

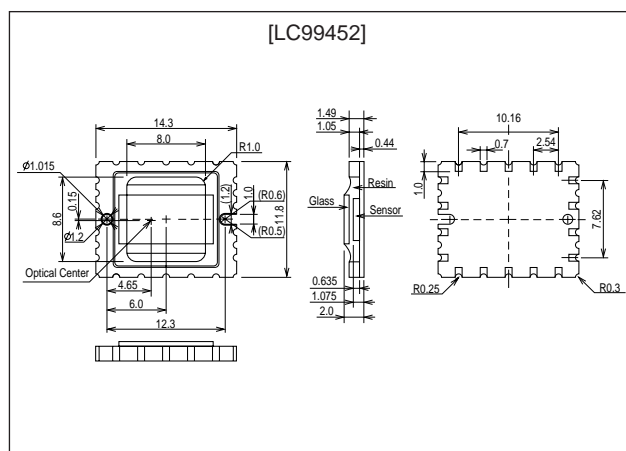
Number of dummy cells: 8/Front

Number of clock phase: 4

Output Stage: 3-stage source follower (open source)

Package Dimensions

unit: mm

3258

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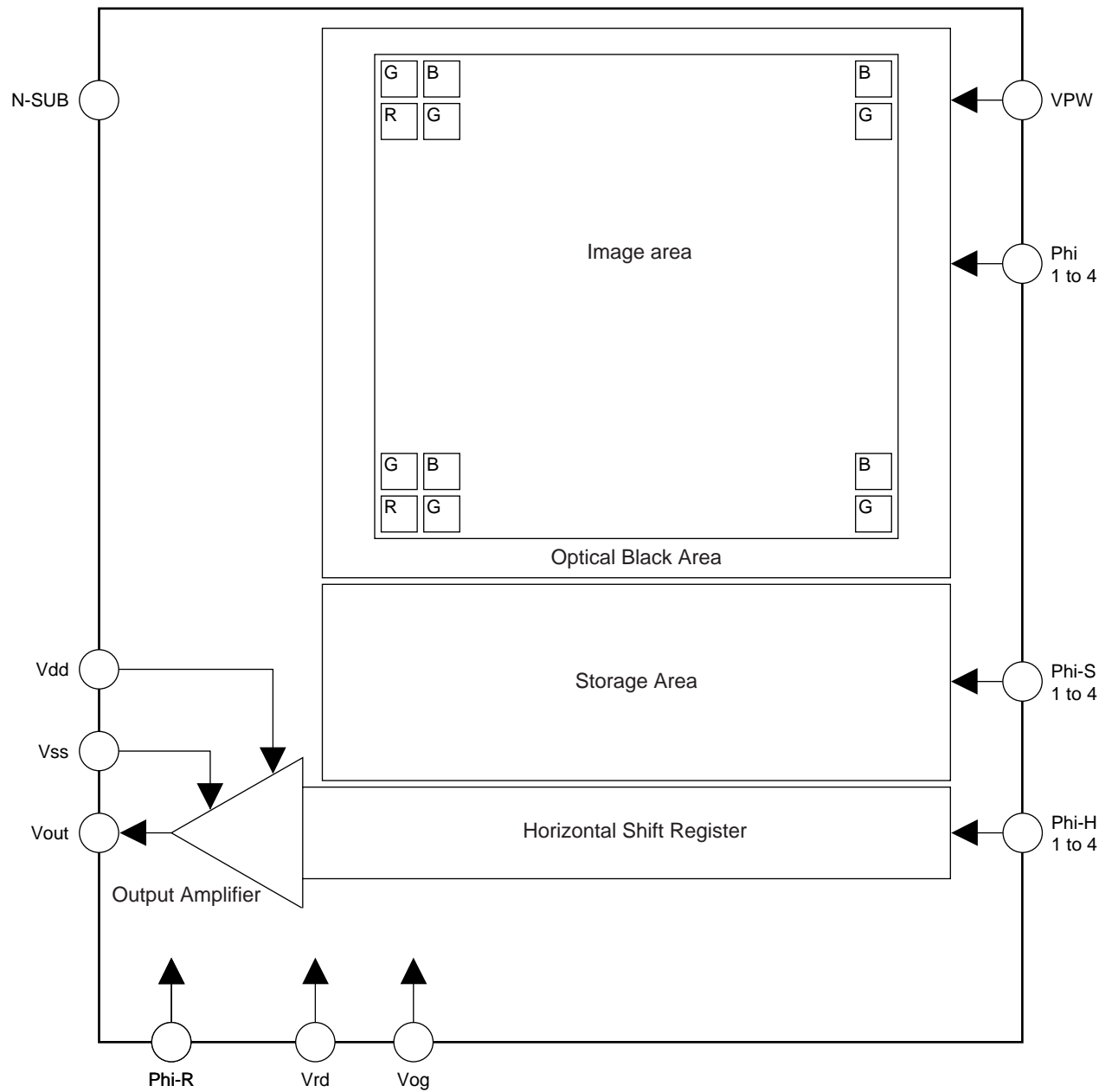
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Block Diagram and Pixel Arrangement



A12757

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 $1600 (H) \times 1280 (V)$ 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 $R_L = 3.3\ k\Omega$, 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 | | ($R_L = 3.3 \text{ k}\Omega$) | | 5.2 | | mA |
| Bandwidth | | ($R_L = 3.3 \text{ k}\Omega$, $C_L = 2 \text{ pF}$) | | 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 |

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