COMS IC

LC82104

Color Image Processing IC for Fax and Scanner Applications

Preliminary

Overview

The LC82104 converts analog image signals from a CCD and contact image sensor to precise multi-valued image data using a built-in 8-bit A/D converter and internal image-processing functions. The LC82104 includes a 6-bit reference potential setting D/A converter for the 8-bit A/D converter and CDS function, and produces high-quality multi-valued data by performing shading correction for all pixels, color balance adjustment, and gamma conversion with support for arbitrary gamma curves. It also includes a multi-value data resolution conversion function, and thus can support input from and output to systems with different resolutions. Furthermore, it can perform high-quality conversion to two-valued images from the green signal. The LC82104 can process up to 5400 pixels by three lines and requires no external memory whatsoever for use in distortion correction and other processing. Thus this IC can implement the image processing required for color scanners, FAX, copiers, OCRs and similar applications.

Features

- Number of pixels processed:
  2700 pixels × 3 lines
  (Both bright and dark correction applied to all pixels)
  5400 pixels × 3 lines
  (Only bright correction applied to all pixels)
- Processing speed:
  1,200 ns/pixel maximum (3-color CCD) (When CLKIN is 20 MHz)
  400 ns/pixel maximum (CIS and black-and-white CCD) (When CLKIN is 20 MHz)
- 8-bit A/D converter
  (Includes a sensor signal timing adjustment function.)
- 6-bit D/A converter for setting the A/D converter reference potential

- Sensor drive circuit
  (Supports all types of CCD and CIS sensors)
- Digital CDS (Correlated double sampling)
- Digital clamp circuit
  (Single-point clamping, even field clamping)
- Shading correction
  (Bright correction: all-pixel correction, dark correction: either all-pixel correction or set dark correction attenuation data)
- Gamma correction
  (Supports user-defined curves for each of R, G, and B using 8-bit data)
- Color balance (Gain control)
- Main scan direction multi-value resolution conversion
  (From 2/1 to 1/2, in units of 1/256)
- Binary coding
  (Simple binary coding (slicing), and 64-level error diffusion)
  *: The green signal is converted to a binary signal.
- Memory manager
  (Image data buffer memory controller)
- Fabricated in a CMOS process for 5-V single-voltage power supply operation.

Package Dimensions

unit: mm

3181B-SQFP100

SANYO: SQFP100
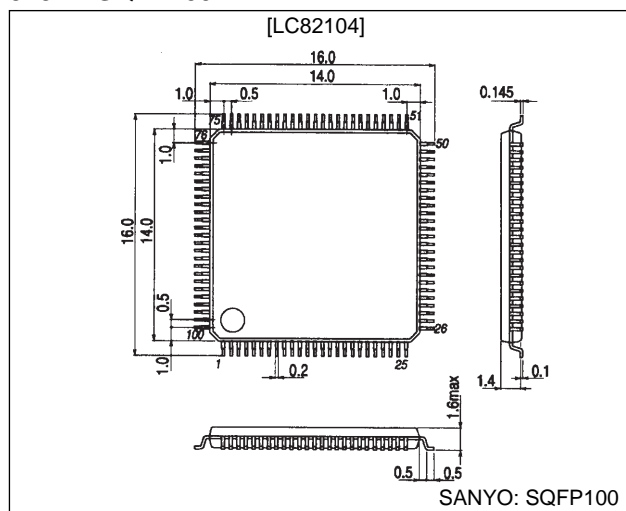
SANYO Electric Co.,Ltd. Semiconductor Bussiness Headquarters
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Specifications

Absolute Maximum Ratings at Ta = 25°C, GND = 0 V

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V_{DD} max		−0.3 to +7.0	V
I/O voltages	V_I, V_O		−0.3 to V_{DD} + 0.3	V
Allowable power dissipation	Pd max	Ta ≤ 70 °C	400	mW
Operating temperature	Topr		−30 to +70	°C
Storage temperature	Tstg		−55 to +125	°C
Soldering conditions		Hand soldering: 3 seconds	350	°C
		Reflow soldering: 10 seconds	235	°C

Allowable Operating Ranges at Ta = –30 to +70°C, GND = 0 V

Parameter	Symbol	Conditions	Ratings min	typ	max	Unit
Supply voltage	V_{DD}		4.75		5.25	V
Input voltage	V_{IN}		0		V_{DD}	V

Electrical Characteristics at Ta = –30 to +70°C, GND = 0 V, V_{DD} = 4.75 to 5.25 V

Parameter	Symbol	Conditions	Ratings min	typ	max	Unit
Input high-level voltage	V_{IH}		2.2			V
Input low-level voltage	V_{IL}				0.8	V
Input leakage current	I_I	V_{IN} = V_{DD}, V_{SS}	−10		+10	µA
Output high-level voltage	V_{OH}	I_{OH} = −3 mA	2.4			V
Output low-level voltage	V_{OL}	I_{OL} = 3 mA			0.4	V
Output leakage current	I_{OZ}	At high-impedance	−10		+10	µA

Analog Characteristics

Parameter	Symbol	Conditions	Ratings min	typ	max	Unit
[D/A Converter]						
Resolution				6		bit
[A/D Converter] When the low reference potential = 1.0 V, and the high reference potential = 3.0 V						
Resolution				8		bit
Linearity error					±1	LSB
Differential linearity error					±1	LSB

Block Diagram
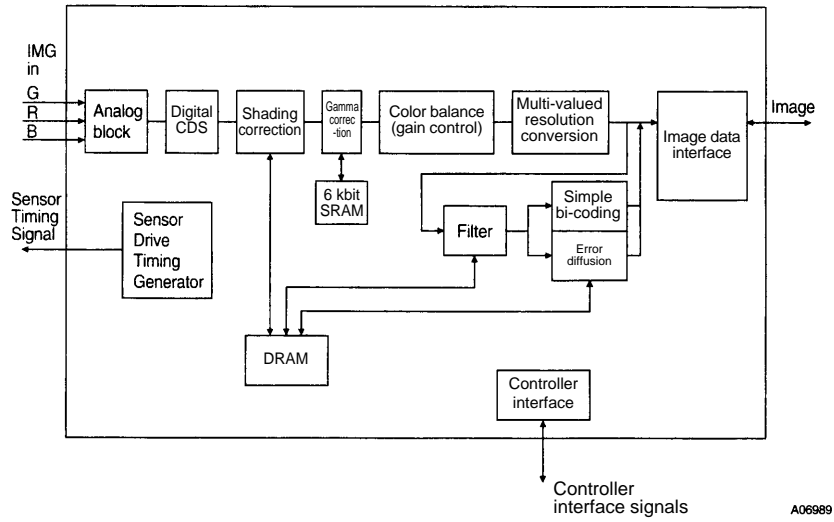
A06989

Pin Assignment
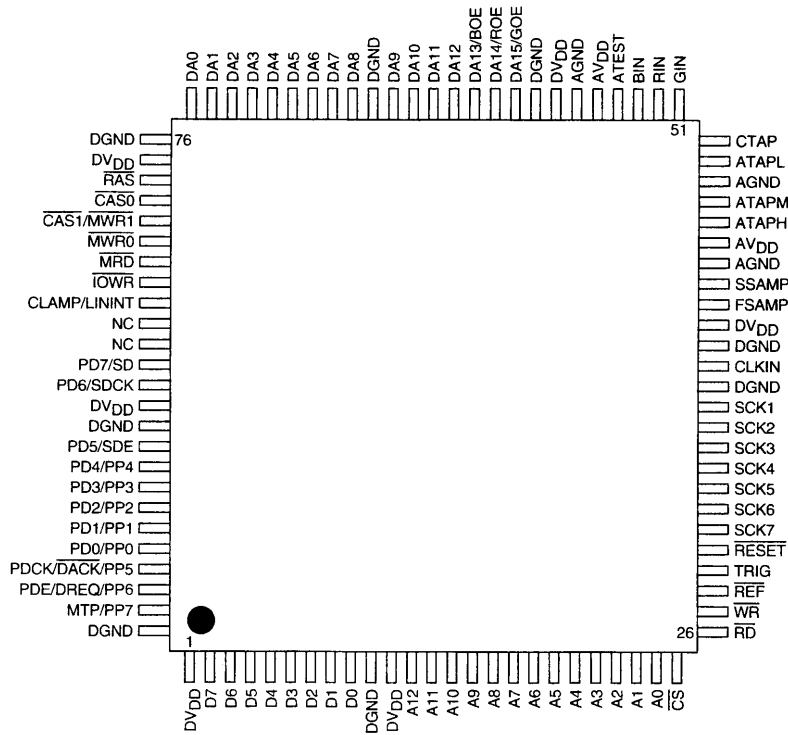
Top view

A06990

Pin Functions

	typ				
I	Input	B	Bidirection	NC	Not connected
O	Output	P	Power		

Pin No.	Pin	I/O	Function
1	DV$_{DD}$	P	Digital system power supply
2	D7	B	CPU interface data bus D7 is the MSB, D0 is the LSB.
3	D6	B	
4	D5	B	
5	D4	B	
6	D3	B	
7	D2	B	
8	D1	B	
9	D0	B	
10	DGND	P	Digital system ground
11	DV$_{DD}$	P	Digital system power supply
12	A12	I	CPU interface address bus A12 is the MSB, A0 is the LSB.
13	A11	I	
14	A10	I	
15	A9	I	
16	A8	I	
17	A7	I	
18	A6	I	
19	A5	I	
20	A4	I	
21	A3	I	
22	A2	I	
23	A1	I	
24	A0	I	
25	$\overline{CS}$	I	CPU interface chip select
26	$\overline{RD}$	I	CPU interface read signal
27	$\overline{WR}$	I	CPU interface write signal
28	$\overline{REF}$	I	DRAM refresh signal input
29	TRIG	I	External read signal input
30	$\overline{RESET}$	I	System reset
31	SCK7	O	Sensor driver signal outputs
32	SCK6	O	
33	SCK5	O	
34	SCK4	O	
35	SCK3	O	
36	SCK2	O	
37	SCK1	O	
38	DGND	P	Digital system ground
39	CLKIN	I	System clock input
40	DGND	P	Digital system ground
41	DV$_{DD}$	P	Digital system power supply
42	FSAMP	O	Floating data sampling point monitor signal output
43	SSAMP	O	Signal data sampling point monitor signal output
44	AGND	P	Analog system ground
45	AV$_{DD}$	P	Analog system power supply
46	ATAPH	O	A/D converter high-level reference analog output
47	ATAPM	O	A/D converter mid-level reference analog output
48	AGND	P	Analog system ground
49	ATAPL	O	A/D converter low-level reference analog output
50	CTAP	O	Analog clamp analog output

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Pin No.	Pin	I/O	Function
51	GIN	I	Green sensor signal input
52	RIN	I	Red sensor signal input
53	BIN	I	Blue sensor signal input
54	ATEST	O	Analog test output (Normally left open.)
55	AV_{DD}	P	Analog system power supply
56	AGND	P	Analog system ground
57	DV_{DD}	P	Digital system power supply
58	DGND	P	Digital system ground
59	DA15/GOE	O	/Green data valid period signal
60	DA14/ROE	O	/Red data valid period signal
61	DA13/BOE	O	/Blue data valid period signal
62	DA12	O	External memory address signal outputs
63	DA11	O	DA15 is the MSB, DA0 is the LSB.
64	DA10	O	
65	DA9	O	
66	DGND	P	Digital system ground
67	DA8	O	
68	DA7	O	
69	DA6	O	
70	DA5	O	External memory address signal outputs
71	DA4	O	DA15 is the MSB, DA0 is the LSB.
72	DA3	O	
73	DA2	O	
74	DA1	O	
75	DA0	O	
76	DGND	P	Digital system ground
77	DV_{DD}	P	Digital system power supply
78	$\overline{RAS}$	O	External memory $\overline{RAS}$ signal output
79	$\overline{CAS0}$	O	External memory $\overline{CAS}$ signal output
80	$\overline{CAS1}/\overline{MWR1}$	O	External memory $\overline{CAS0}$ signal output/External memory $\overline{MWR1}$ signal
81	$\overline{MWR0}$	O	External memory $\overline{MWR0}$ signal output
82	$\overline{MRD}$	O	External memory $\overline{MRD}$ signal output
83	$\overline{IOWR}$	O	I/O write signal output
84	CLAMP/LININT	O	Clamp point monitor signal output/Line signal output
85	NC	NC	
86	NC	NC	
87	PD7/SD	O	DMA output/serial data output
88	PD6/SDCK	O	DMA output/serial data transfer clock
89	DV_{DD}	P	Digital system power supply
90	DGND	P	Digital system ground
91	PD5/SDE	O	DMA output/Serial data output valid period signal output
92	PD4/PP4	B	
93	PD3/PP3	B	
94	PD2/PP2	B	DMA outputs/general-purpose I/O ports
95	PD1/PP1	B	
96	PD0/PP0	B	
97	PDCK/$\overline{DACK}$/PP5	B	Parallel data transfer clock/DMA data acknowledge signal input/general-purpose I/O port
98	PDE/DREQ/PP6	B	Parallel data output valid period signal/DMA data request signal output/general-purpose I/O port
99	MTP/PP7	B	Motor drive timing signal output/General-purpose I/O port
100	DGND	P	Digital system ground