

**LC89610****Mini-Disk Decoder LSI****Preliminary****Overview**

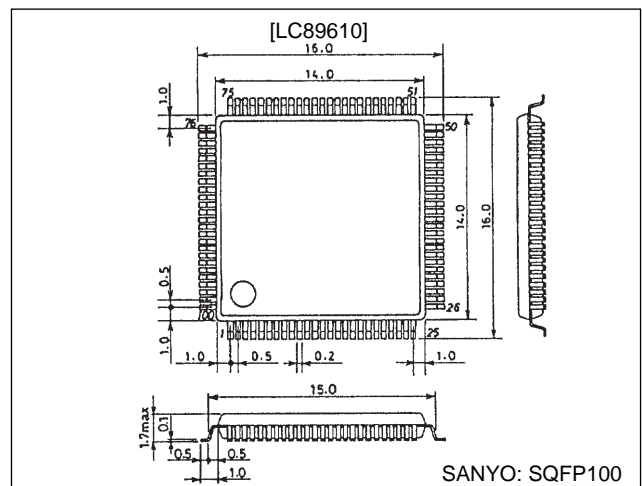
The LC89610 is a playback signal processing CMOS LSI that supports the mini-disk data format. Data that has been decoded by a CD decoder, an ACIRC decoder, or a CD-ROM decoder circuit is passed to a DRAM controller circuit and the LC89610 uses external DRAM to process shock proof. The shock proof processed data is passed to an audio data decoding LSI, the LC89602.

Features

- EFM decoder and PLL clock generator
- Detection, protection, and interpolation of the EFM frame synchronization signal
- Servo command control
- On-chip ACIRC decoder and ACIRC RAM
- ± 8 frame jitter margin
- Powerful error detection and correction (C1: dual errors, C2: quadruple errors)
- CLV control using EFM and ADIP signals
- Subcode Q decoding and CRC error checking
- Shock proof memory using 1, 4, 16, or 64 Mbits of external DRAM
- Buffering control and management for TOC and UTOC data
- Buffering control and management for subdata
- ADIP decoding and CRC error checking
- Low-power design using a 0.8 μm rule CMOS process
- Support for low-voltage operation ($V_{DD} = 3.0$ to 5.5 V)
- CCB based CPU interface

Package Dimensions

unit: mm

3181A-SQFP100

Specifications

Absolute Maximum Ratings at $V_{SS} = 0$ V

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V_{DD} max	$T_a = 25^\circ\text{C}$	-0.3 to +7.0	V
Input and output voltages	V_I , V_O	$T_a = 25^\circ\text{C}$	-0.3 to $V_{DD} + 0.3$	V
Operating temperature	T_{opr}		-30 to +70	$^\circ\text{C}$
Storage temperature	T_{stg}		-55 to +125	$^\circ\text{C}$
Soldering conditions		10 seconds (pins only)	260	$^\circ\text{C}$

Allowable Operating Ranges at $T_a = -30$ to $+70^\circ\text{C}$, $V_{SS} = 0$ V

Parameter	Symbol	Conditions	min	typ	max	Unit
Supply voltage	V_{DD}		3.0		5.5	V
Input voltage	V_{IN}		0		V_{DD}	V

DC Characteristics at $T_a = -30$ to $+70^\circ\text{C}$, $V_{SS} = 0$ V, $V_{DD} = 4.5$ to 5.5 V

Parameter	Symbol	Conditions	min	typ	max	Unit
Input high level voltage	V_{IH}	*1	$0.8 V_{DD}$			V
Input low level voltage	V_{IL}	*1			$0.2 V_{DD}$	V
Input high level voltage	V_{IH}	*2	$0.7 V_{DD}$			V
Input low level voltage	V_{IL}	*2			$0.3 V_{DD}$	V
Input high level voltage	V_{IH}	*3	$0.6 V_{DD}$			V
Input low level voltage	V_{IL}	*3			$0.4 V_{DD}$	V
Output high level voltage	V_{OH}	$I_{OH} = -1$ mA, *4	$V_{DD} - 0.1$			V
Output low level voltage	V_{OL}	$I_{OL} = 1$ mA, *4			0.1	V
Output high level voltage	V_{OH}	$I_{OH} = -1$ mA, *5	$V_{DD} - 1.0$			V
Output low level voltage	V_{OL}	$I_{OL} = 1$ mA, *5			1.0	V
Output high level voltage	V_{OH}	$I_{OH} = -3$ mA, *6	$V_{DD} - 2.1$			V
Output low level voltage	V_{OL}	$I_{OL} = 3$ mA, *7			0.4	V
Input leakage current	I_L	$V_I = V_{SS}, V_{DD}$	-10		+10	μA
Output leakage current	I_{OZ}	For high-impedance state outputs	-10		+10	μA
Pull-up resistance	R_{UP}	*8	10	20	40	$\text{k}\Omega$
Quiescent current	I_{DD}	*9		0.1	200	μA
Quiescent current	I_{DD}	*10		250	475	μA

Note: 1. HFL, TES, CE, CL, $\overline{\text{SUBREQ}}$, $\overline{\text{SREQ}}$, $\overline{\text{RESET}}$, ADIPCRI, BIDATAI, BICKI

2. Inputs other than *1, 2, and 4 XIN.

3. EFMIN

4. PDO

5. EFMO

6. Outputs other than *5 and *6 XOUT, AO, and DO (open-drain output).

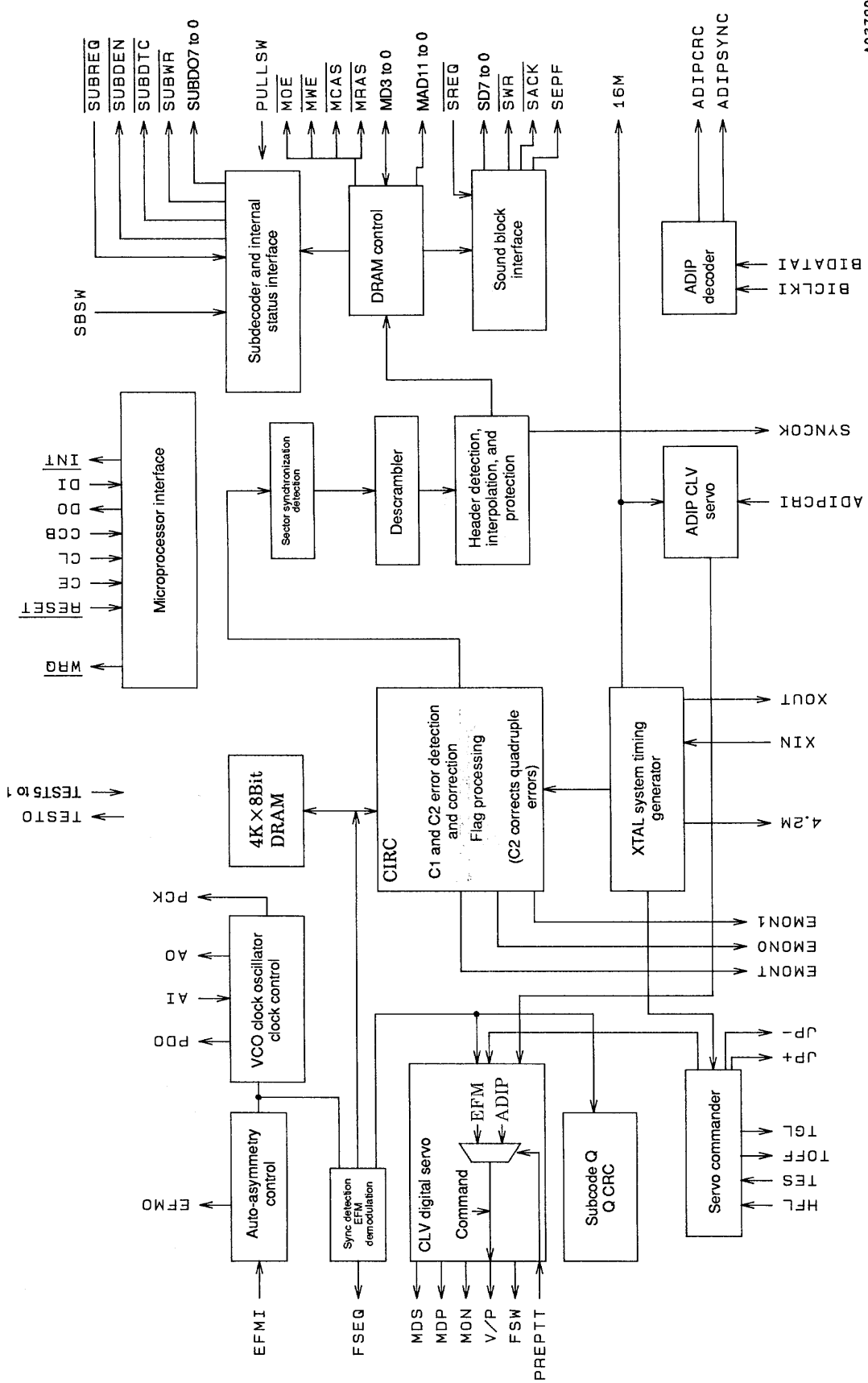
7. Outputs other than *5 and *6 XOUT, and AO.

8. For MD0 to MD3, TEST1 to TEST5. However, note that the pull-up resistors are not connected when the PULLSW pin is low.

9. When the PULLSW pin is low, outputs are open, and $V_I = V_{SS}$ or V_{DD} .

10. When the PULLSW pin is high, outputs are open, and $V_I = V_{SS}$ or V_{DD} .

Block Diagram



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Pin Functions

Pin No.	Symbol	I/O	Function
1	MDP	O	CLV servo signal output
2	MDS	O	CLV servo signal output
3	FSW	O	CLV servo signal output
4	V/P	O	CLV servo signal output
5	TES	I	Track jump signal input
6	TOFF	O	Track jump signal output
7	TGL	O	Track jump signal output
8	JP +	O	Track jump signal output
9	JP -	O	Track jump signal output
10	MAD3	O	DRAM address output
11	MAD2	O	DRAM address output
12	MAD1	O	DRAM address output
13	MAD0	O	DRAM address output
14	MAD9	O	DRAM address output
15	MAD10	O	DRAM address output
16	MAD11	O	DRAM address output
17	V _{SS}	—	Ground
18	$\overline{\text{MRAS}}$	O	DRAM $\overline{\text{RAS}}$ signal output
19	$\overline{\text{MWE}}$	O	DRAM $\overline{\text{WE}}$ signal output
20	MD1	I/O	DRAM data I/O
21	MD0	I/O	DRAM data I/O
22	MD3	I/O	DRAM data I/O
23	MD2	I/O	DRAM data I/O
24	$\overline{\text{MCAS}}$	O	DRAM $\overline{\text{CAS}}$ signal output
25	$\overline{\text{MOE}}$	O	DRAM $\overline{\text{OE}}$ signal output
26	MAD8	O	DRAM address output
27	MAD7	O	DRAM address output
28	MAD6	O	DRAM address output
29	MAD5	O	DRAM address output
30	MAD4	O	DRAM address output
31	SUBDO0	O	Subdata and internal status output
32	SUBDO1	O	Subdata and internal status output
33	SUBDO2	O	Subdata and internal status output
34	SUBDO3	O	Subdata and internal status output
35	SUBDO4	O	Subdata and internal status output
36	SUBDO5	O	Subdata and internal status output
37	SUBDO6	O	Subdata and internal status output
38	SUBDO7	O	Subdata and internal status output
39	16M	O	16.9344 MHz clock output
40	V _{SS}	—	V _{SS} ground
41	V _{DD}	—	Power supply
42	XIN	I	16.9344 oscillator input
43	XOUT	O	16.9344 oscillator output
44	$\overline{\text{SUBREQ}}$	I	Subdata request signal input
45	$\overline{\text{SUBWR}}$	O	Subdata transfer clock output
46	$\overline{\text{SUBDTC}}$	O	Subdata transfer complete signal output
47	$\overline{\text{SUBDEN}}$	O	Subdata enable output
48	TEST5	I	Test input (normally tied to V _{DD})
49	TEST4	I	Test input (normally tied to V _{DD})
50	TEST3	I	Test input (normally tied to V _{DD})
51	TESTO	I	Test output
52	SD0	O	Sound block data output
53	SD1	O	Sound block data output
54	SD2	O	Sound block data output
55	SD3	O	Sound block data output

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Pin No.	Symbol	I/O	Function
56	SD4	O	Sound block data output
57	SD5	O	Sound block data output
58	SD6	O	Sound block data output
59	SD7	O	Sound block data output
60	$\overline{\text{SWR}}$	O	Sound block data transfer clock output
61	$\overline{\text{SACK}}$	O	Sound block data acknowledge signal output
62	SEPF	O	Sound block data empty signal output
63	$\overline{\text{SREQ}}$	I	Sound block data request signal input
64	CL	I	CPU interface data transfer clock input
65	CE	I	CPU interface chip enable signal input
66	DI	I	CPU interface data input
67	DO	O	CPU interface data output
68	$\overline{\text{WRQ}}$	O	CPU interface interrupt signal output
69	$\overline{\text{INT}}$	O	CPU interface interrupt signal output
70	$\overline{\text{RESET}}$	I	System reset
71	CCB	I	CPU interface type switching input
72	SYNCOK	O	Sector synchronization detection signal output
73	EMONT	O	Error detection monitor signal output
74	EMON0	O	Error detection monitor signal output
75	EMON1	O	Error detection monitor signal output
76	PCK	O	4.3218 MHz monitor signal output
77	FSEQ	O	Frame synchronization detection signal output
78	V_{SS}	—	Ground (for the on-chip DRAM only)
79	ADIPSYN	O	ADIP synchronization timing signal output
80	ADIPCRC	O	ADIP data CRC flag output
81	PULLSW	I	Internal pull-up resistor switching signal input
82	SBSW	I	Subdata/internal status switching signal input
83	V_{DD}	—	Power supply (for the on-chip DRAM only)
84	4.2M	I	Test input (normally tied to V_{DD})
85	TEST2	I	Test input (normally tied to V_{DD})
86	PREPIT	I	CLV servo output signal switching input
87	EFMI	I	HF signal input
88	EFMO	O	EFM signal output
89	V_{DD}	—	Power supply
90	V_{SS}	—	Ground
91	ADIPCRI	I	ADIP carrier signal input
92	BICLKI	I	Bi-phase data transfer clock input
93	BIDATAI	I	Bi-phase data input
94	HFL	I	Track detection signal input
95	TEST1	O	4.2336 MHz output
96	AO	O	VCO control signal output
97	AI	I	VCO control signal input
98	V_{SS}	O	VCO control signal output
99	PDO	—	Ground
100	MON	O	CLV servo signal output

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