

CMOS LSI

No.2294A

LC7821,7822,7823

SANYO

Analog Function Switch

**Use**

- Serial data-controlled function select switch suited for use in amplifiers, receivers.

**Features**

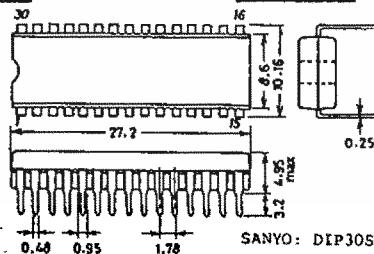
- Analog switches of 8 channels x 2 (LC7823: 7 channels x 2) are contained. Three types are available according to the internal connection.
- Control is exercised by serial data. The LC7821,7822,7823 may be interfaced with a microcomputer (5V-operated) easily.
- Even if two ICs of the same type are used, they may be connected to the common bus line because the S (selector) pin is provided.
- Reset pin used to turn OFF all analog switches
- Wide dynamic range because of  $\pm 20V$  breakdown voltage

**Absolute Maximum Ratings at  $T_a=25^{\circ}\text{C}$** 

			unit
Maximum Supply Voltage	$V_{DD\max}$	$V_{DD}$	-0.3 to +20 V
Maximum Input Voltage	$V_{EE\max}$	$V_{EE}$	-20 to +0.3 V
	$V_{I1}$	DI, CL, CE, S, RES	-0.3 to +20 V
	$V_{I2}$	L1 to L8, R1 to R8, $V_{EE}-0.3 \text{ to } V_{DD}+0.3$	V
Analogue Switch ON-State Voltage Difference	$\Delta V_{ON}$	LCOM1 to LCOM4, RCOM1 to RCOM4	
Allowable Power Dissipation	$P_{dmax}$	Switch ON	0.5 V
Operating Temperature	$T_{opr}$		100 mW
Storage Temperature	$T_{stg}$	$T_a \leq 75^{\circ}\text{C}$	-30 to +75 $^{\circ}\text{C}$
			-40 to +125 $^{\circ}\text{C}$

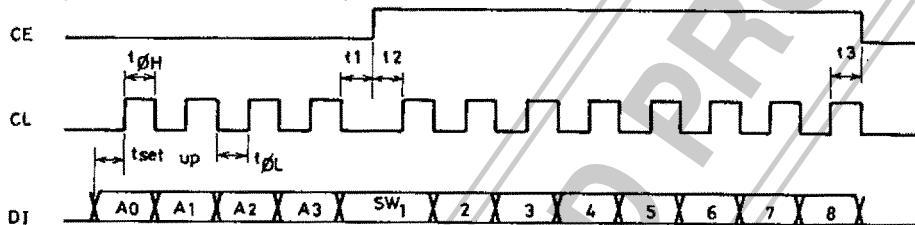
**Pin Assignment**

LC7821	1 L1	2 L2	3 L3	4 L4	5 LCOM1	6 L5	7 L6	8 LCOM2	9 L7	10 L8	11 LCOM3	12 VEE	13 CE	14 DI	15 CL	16 VSS
LC7822	1 L1	2 L2	3 L3	4 L4	5 L5	6 L6	7 L7	8 L8	9 LCOM3	10 LCOM4	11 LCOM5	12 VDD	13 VEE	14 CE	15 DI	16 VSS
LC7823	1 L1	2 L2	3 LCOM1	4 L3	5 L4	6 LCOM2	7 L5	8 L6	9 LCOM3	10 L7	11 LCOM4	12 VDD	13 VEE	14 CE	15 DI	16 VSS

Package Dimensions 3047A  
(unit: mm)

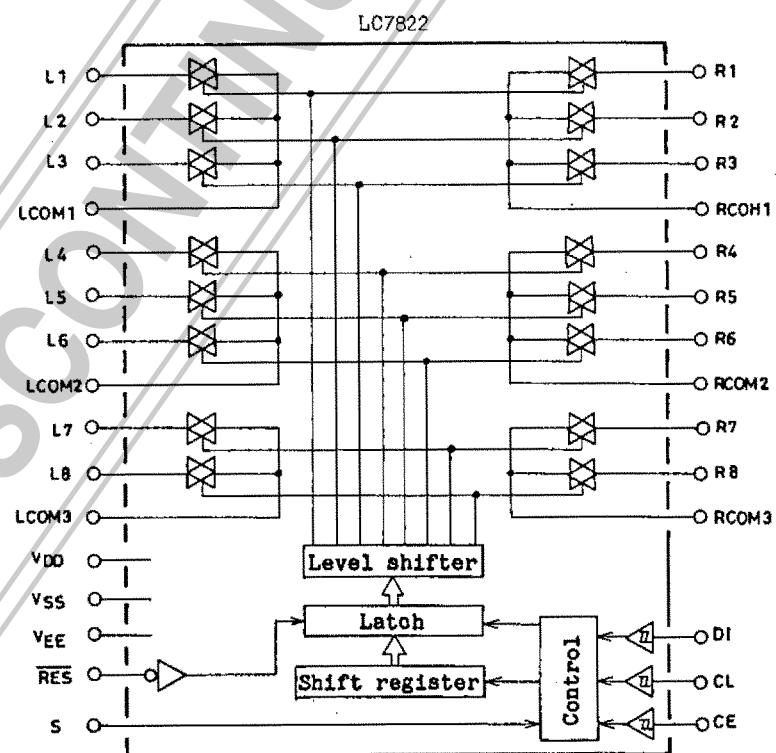
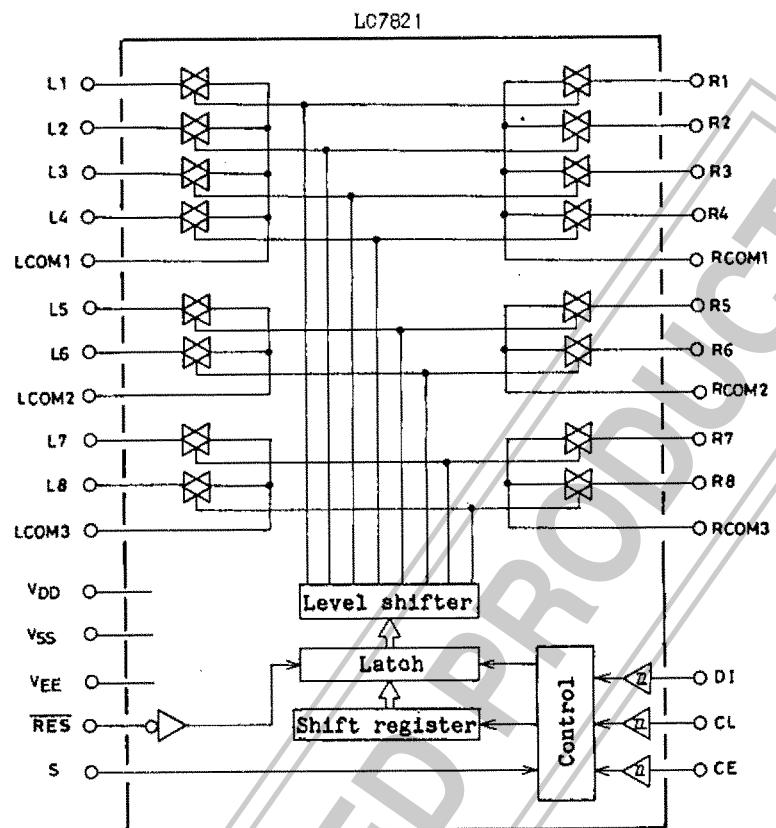
Allowable Operating Conditions at $T_a=25^\circ C$ , $V_{SS}=0V$ , $ V_{DD}  \geq  V_{EE} $		min	typ	max	unit
Maximum Supply Voltage	$V_{DD}$	$V_{DD}-V_{EE} \geq 12V: V_{DD}$	6.0	18.5	V
	$V_{EE}$	$V_{DD}-V_{EE} \geq 12V: V_{EE}$	-18.5	0	V
Input "H"-Level Voltage	$V_{IH1}$	DI, CL, CE	4.0	18.5	V
	$V_{IH2}$	S, RES	0.7 $V_{DD}$	$V_{DD}$	V
Input "L"-Level Voltage	$V_{IL1}$	DI, CL, CE	0	0.7	V
	$V_{IL2}$	S, RES	0	0.3 $V_{DD}$	V
Analog Switch Input Voltage Range	$V_{IN}$	$L1 \text{to} L8, R1 \text{to} R8, LCOM1 \text{to} LCOM4, RCOM1 \text{to} RCOM4$	$V_{EE}$	$V_{DD}$	V
"L"-Level Clock Pulse Width	$t_{\phi L}$	$C_L$	0.5		μs
"H"-Level Clock Pulse Width	$t_{\phi H}$	$C_L$	0.5		μs
Setup Time	$t_{\text{setup}}$	$CL, DI$	0.5		μs
	$t_1^*$	$CL, CE$	0.5		μs
	$t_2^*$	$CL, CE$	0.5		μs
	$t_3^*$	$CL, CE$	0.5		μs
Reset Minimum Pulse Width	$t_{WRES}$	$V_{DD} \geq 6V: RES$	1.0		μs
Hysteresis Width	$V_H$	$CL, CE, DI$	0.3		V

\*: CE, CL, DI waveforms

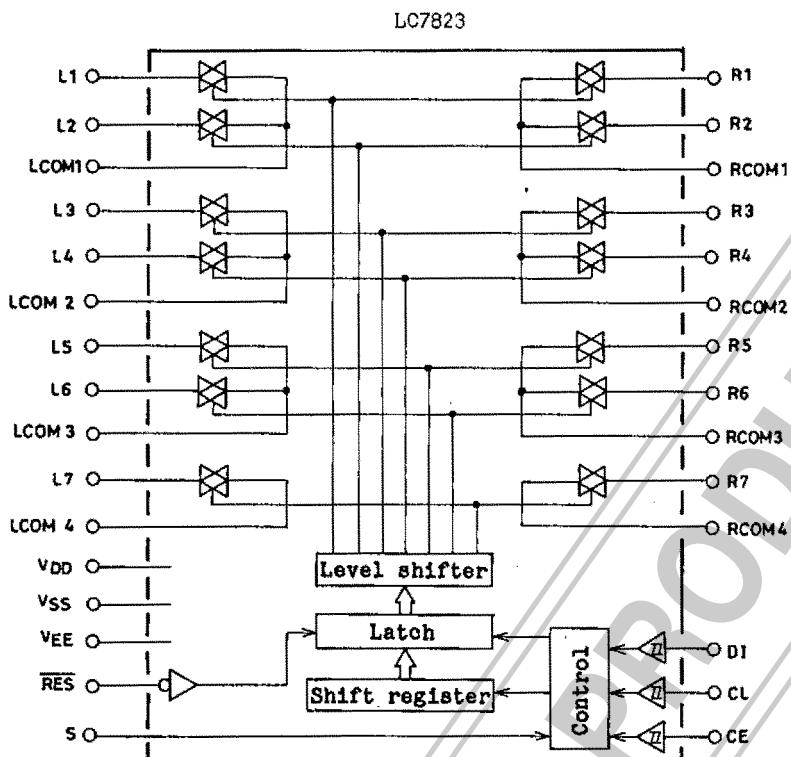


Electrical Characteristics at $T_a=25^\circ C$ , $V_{SS}=0V$		min	typ	max	unit
Analog Switch ON-State Resistance	$R_{ON1}$	$I=1mA, V_{DD}-V_{EE}=12V: L1 \text{to} L8, R1 \text{to} R8, LCOM1 \text{to} LCOM4, RCOM1 \text{to} RCOM4$		150	ohm
	$R_{ON2}$	$I=1mA, V_{DD}-V_{EE}=37V: L1 \text{to} L8, R1 \text{to} R8, LCOM1 \text{to} LCOM4, RCOM1 \text{to} RCOM4$		70	ohm
Total Harmonic Distortion	THD1	$V_{IN}=1V_{rms}, f=1kHz, V_{DD}-V_{EE}=37V: L1 \text{to} L8, R1 \text{to} R8, LCOM1 \text{to} LCOM4, RCOM1 \text{to} RCOM4$	0.0015	0.01	%
	THD2	$V_{IN}=0.1V_{rms}, f=1kHz, V_{DD}-V_{EE}=37V: L1 \text{to} L8, R1 \text{to} R8, LCOM1 \text{to} LCOM4, RCOM1 \text{to} RCOM4$	0.01	0.05	%
Feedthrough	$F_{TH}$	$V_{IN}=0dBV, f=10kHz, V_{DD}-V_{EE}=37V, L1 \text{to} L8, R1 \text{to} R8, LCOM1 \text{to} LCOM4, RCOM1 \text{to} RCOM4$		55	dB
Crosstalk	CT	$V_{IN}=0dBV, f=10kHz, V_{DD}-V_{EE}=37V: L1 \text{to} L8, R1 \text{to} R8, LCOM1 \text{to} LCOM4, RCOM1 \text{to} RCOM4$		75	dB
Input "H"-Level Current	$I_{IH}$	$V_I=18.5V: DI, CL, CE, S, RES$		10	uA
Input "L"-Level Current	$I_{IL}$	$V_I=0V: DI, CL, CE, S, RES$	-10		uA
Analog Switch OFF-State Leakage Current	$I_{OFF}$	$V_I=V_{EE} \text{to} V_{EE}+37V: L1 \text{to} L8, R1 \text{to} R8, LCOM1 \text{to} LCOM4, RCOM1 \text{to} RCOM4$	-10	10	uA
Current Dissipation	$I_{DD}$	$V_{DD}$		1.0	mA

**Equivalent Circuit Block Diagram**



## Equivalent Circuit Block Diagram



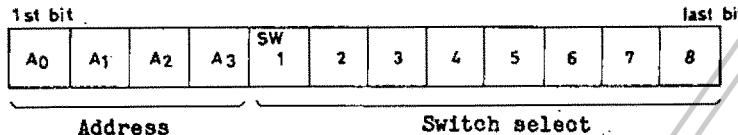
## Pin Description

Pin Name	I/O	Internal Equivalent Circuit	Function																																														
V <sub>DD</sub> , V <sub>SS</sub> , V <sub>EE</sub>			Power supply pins																																														
L1toL8, R1toR8, LCOM1toLCOM4, RCOM1toRCOM4		See Block Diagram.	Input/output pins for analog switches.																																														
CL,DI,CE	I		Serial data input pins (Schmitt buffer) CL --- Clock input pin DI --- Data input pin CE --- Chip enable pin																																														
S	I		Select pin in the two ICs-used mode When the S pin is brought to "L" or "H" level, the addresses will become as shown below.																																														
		<table border="1"> <thead> <tr> <th rowspan="2">Type No.</th> <th rowspan="2">S Pin</th> <th colspan="4">Address</th> </tr> <tr> <th>A<sub>0</sub></th> <th>A<sub>1</sub></th> <th>A<sub>2</sub></th> <th>A<sub>3</sub></th> </tr> </thead> <tbody> <tr> <td>LC7821</td> <td>L</td> <td>0</td> <td>1</td> <td>0</td> <td>1</td> </tr> <tr> <td></td> <td>H</td> <td>1</td> <td>1</td> <td>0</td> <td>1</td> </tr> <tr> <td>LC7822</td> <td>L</td> <td>0</td> <td>0</td> <td>1</td> <td>1</td> </tr> <tr> <td></td> <td>H</td> <td>1</td> <td>0</td> <td>1</td> <td>1</td> </tr> <tr> <td>LC7823</td> <td>L</td> <td>0</td> <td>1</td> <td>1</td> <td>1</td> </tr> <tr> <td></td> <td>H</td> <td>1</td> <td>1</td> <td>1</td> <td>1</td> </tr> </tbody> </table>		Type No.	S Pin	Address				A <sub>0</sub>	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	LC7821	L	0	1	0	1		H	1	1	0	1	LC7822	L	0	0	1	1		H	1	0	1	1	LC7823	L	0	1	1	1		H	1	1	1	1
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RES	I		Reset pin When power is applied, the state of the analog switches will be indeterminate. When this pin is brought to "L" level, all analog switches will be turned OFF.																																														

## Operation Description

## 1. Data input method

The LC7821, 7822, 7823 are controlled by inputting serial data to the CL, DI, CE pins. Data consists of 12 bits in all (address: 4 bits, data: 8 bits).



Each switch No. corresponds to analog switches L1 to L8, R1 to R8. Set the bit of a switch to be turned ON to 1.

0 ----- OFF

1 ----- ON

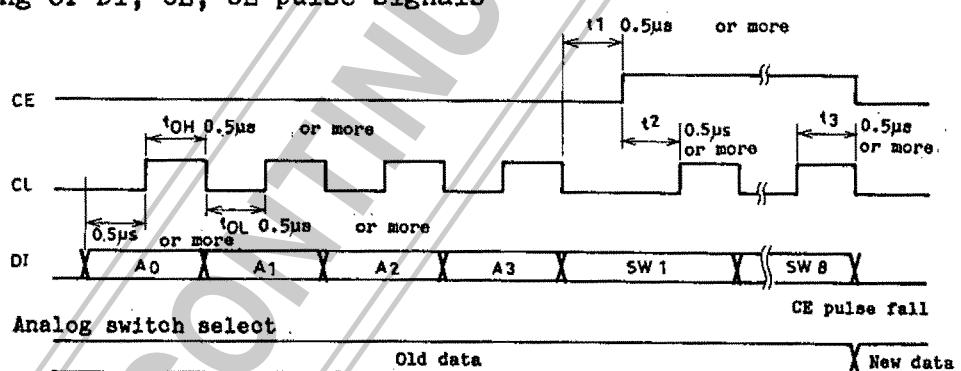
The address is used for chip select when connected to the common bus line. When the S pin is brought to "L" or "H" level, the transmit data will become as shown below.

Type No.	S Pin	Address			
		A0	A1	A2	A3
LC7821	L	0	1	0	1
	H	1	1	0	1
LC7822	L	0	0	1	1
	H	1	0	1	1
LC7823	L	0	1	1	1
	H	1	1	1	1

Note: For the LC7823, the bit of switch 8 becomes "don't care" (0 or 1).

The reason for this is that the LC7823 contains 7 channels x 2 of analog switches.

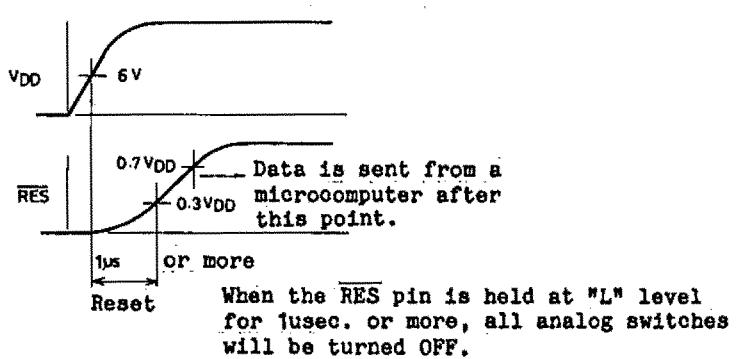
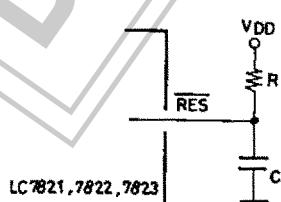
## 2. Timing of DI, CL, CE pulse signals



Data is fetched into the inside on the positive transition of the CL pulse and latched on the negative transition of the CE pulse.

## 3. Reset pin

When power is applied, the state of the analog switches will be indeterminate. All analog switches may be turned OFF by connecting C, R to this pin externally.



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