

**SANYO**

No.2294A

**LC7821, 7822, 7823**

**Analog Function Switch**

**Use**

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

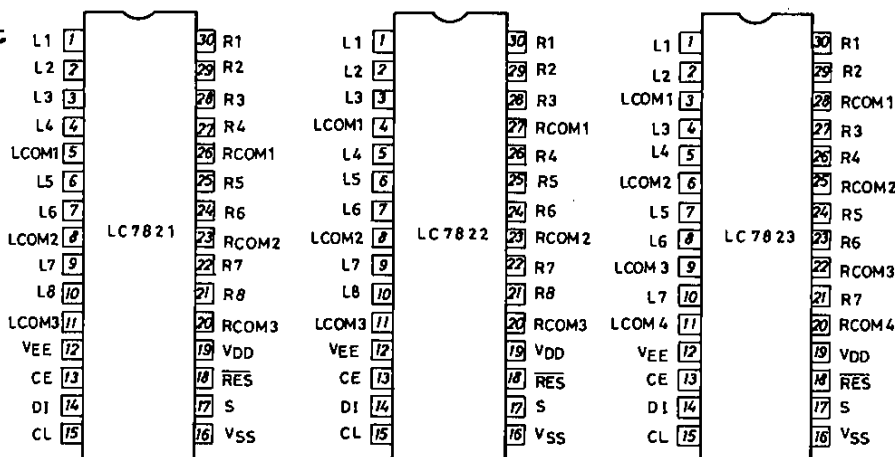
**Features**

- . 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

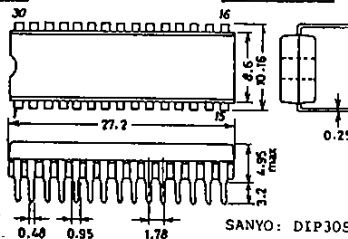
**Absolute Maximum Ratings at Ta=25°C**

|   |                 |  |             | unit        |
|---|-----------------|--|-------------|-------------|
| Maximum Supply Voltage                    | $V_{DDmax}$     | $V_{DD}$                                 | -0.3 to +20 | V           |
|   | $V_{EEmax}$     | $V_{EE}$                                 | -20 to +0.3 | V           |
| Maximum Input Voltage                     | $V_{I1}$        | DI, CL, CE, S, RES                       | -0.3 to +20 | V           |
|   | $V_{I2}$        | L1toL8, R1toR8, $V_{EE}-0.3toV_{DD}+0.3$ |             | V           |
|   |                 | LCOM1 to LCOM4, RCOM1 to RCOM4           |             |             |
| Analog Switch ON-State Voltage Difference | $\Delta V_{ON}$ | Switch ON                                | 0.5         | V           |
| Allowable Power Dissipation               | $P_{dmax}$      | Ta $\geq 75^{\circ}C$                    | 100         | mW          |
| Operating Temperature                     | $T_{opr}$       |  | -30 to +75  | $^{\circ}C$ |
| Storage Temperature                       | $T_{stg}$       |  | -40 to +125 | $^{\circ}C$ |

**Pin Assignment**



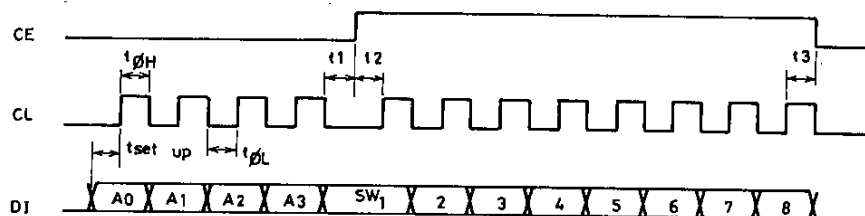
**Package Dimensions 3047A**  
(unit: mm)



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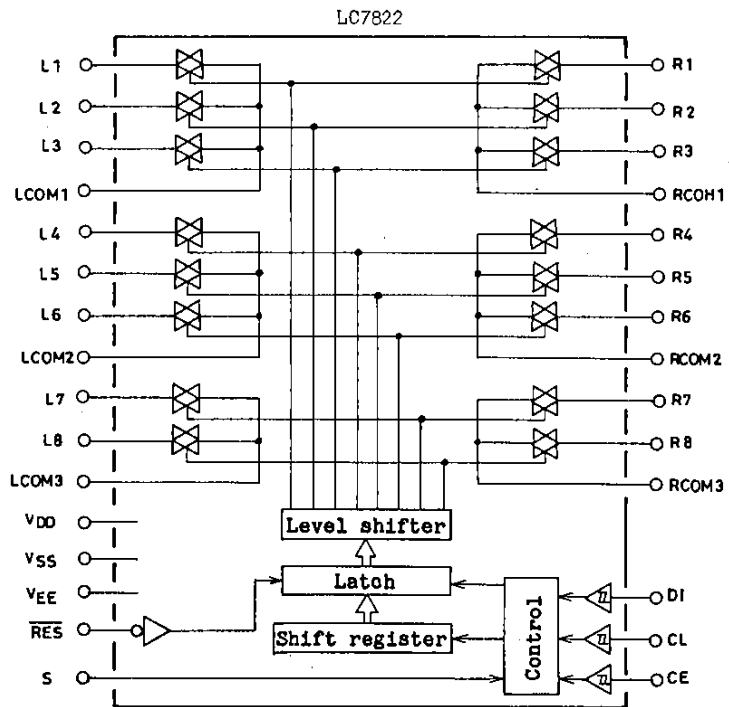
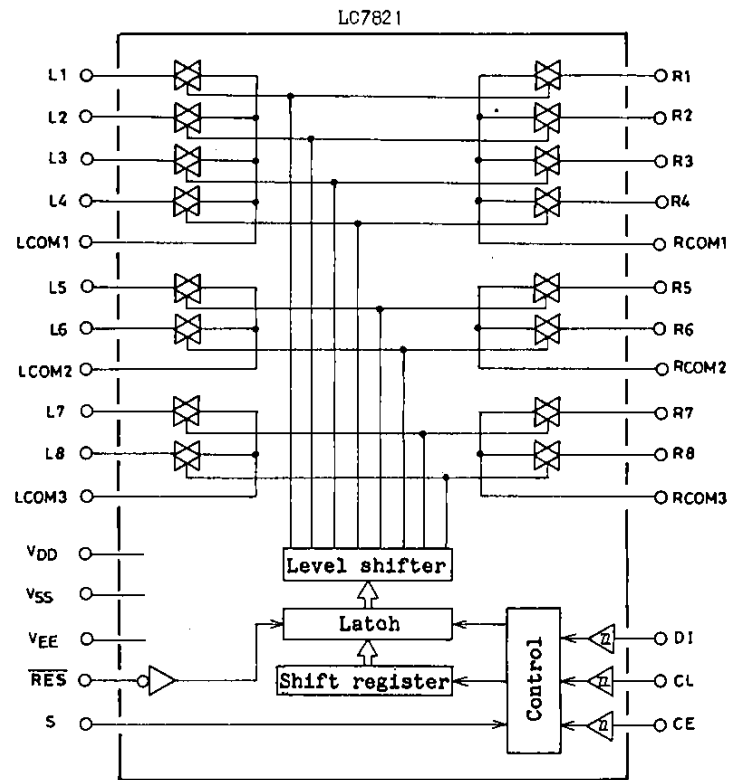
| Allowable Operating Conditions at Ta=25°C, V <sub>SS</sub> =0V,  V <sub>DD</sub>   ≥  V <sub>EE</sub> |                    | min   | typ                | max                | unit |
|---|--------------------|---|--------------------|--------------------|------|
| Maximum Supply Voltage  | V <sub>DD</sub>    | V <sub>DD</sub> -V <sub>EE</sub> ≥ 12V: V <sub>DD</sub> | 6.0                | 18.5               | V    |
|   | V <sub>EE</sub>    | V <sub>DD</sub> -V <sub>EE</sub> ≥ 12V: V <sub>EE</sub> | -18.5              | 0                  | V    |
| Input "H"-Level Voltage   | V <sub>IH1</sub>   | DI, CL, CE  | 4.0                | 18.5               | V    |
|   | V <sub>IH2</sub>   | S, RES  | 0.7V <sub>DD</sub> | V <sub>DD</sub>    | V    |
| Input "L"-Level Voltage   | V <sub>IL1</sub>   | DI, CL, CE  | 0                  | 0.7                | V    |
|   | V <sub>IL2</sub>   | S, RES  | 0                  | 0.3V <sub>DD</sub> | V    |
| Analog Switch Input Voltage Range   | V <sub>IN</sub>    | L1toL8, R1toR8, LCOM1toLCOM4, RCOM1toRCOM4              | V <sub>EE</sub>    | V <sub>DD</sub>    | V    |
| "L"-Level Clock Pulse Width   | t <sub>ϕL</sub>    | C <sub>L</sub>  | 0.5                |                    | μs   |
| "H"-Level Clock Pulse Width   | t <sub>ϕH</sub>    | C <sub>L</sub>  | 0.5                |                    | μs   |
| Setup Time  | t <sub>setup</sub> | CL, DI  | 0.5                |                    | μs   |
|   | t <sub>1</sub> *   | CL, CE  | 0.5                |                    | μs   |
|   | t <sub>2</sub> *   | CL, CE  | 0.5                |                    | μs   |
|   | t <sub>3</sub> *   | CL, CE  | 0.5                |                    | μs   |
| Reset Minimum Pulse Width   | t <sub>wRES</sub>  | V <sub>DD</sub> ≥ 6V: RES                               | 1.0                |                    | μs   |
| Hysteresis Width  | V <sub>H</sub>     | CL, CE, DI  | 0.3                |                    | V    |

\*: CE, CL, DI waveforms

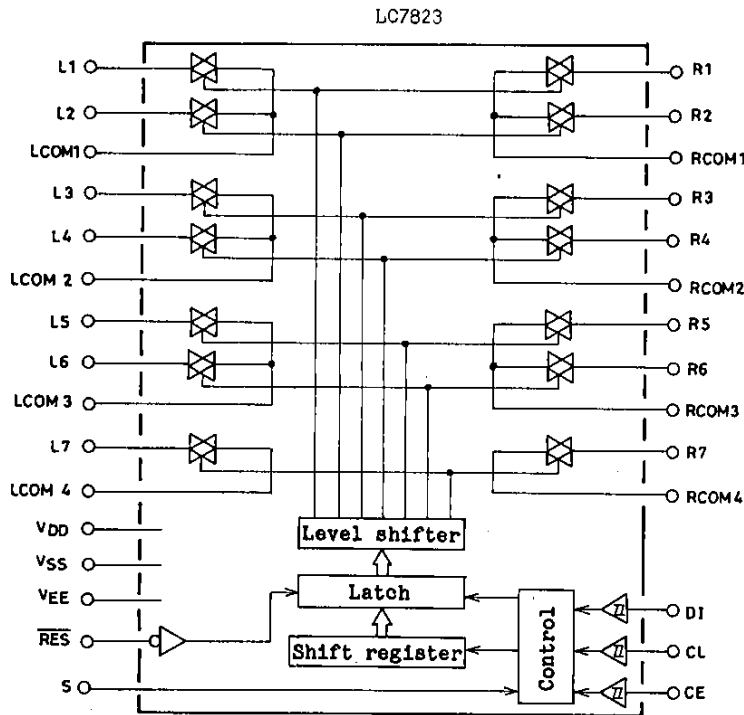


| Electrical Characteristics at Ta=25°C, V <sub>SS</sub> =0V |                  | min   | typ    | max  | unit |
|--|------------------|---|--------|------|------|
| Analog Switch ON-State Resistance                          | R <sub>ON1</sub> | I = 1mA, V <sub>DD</sub> -V <sub>EE</sub> = 12V: L1toL8, R1toR8, LCOM1toLCOM4, RCOM1toRCOM4                             |        | 150  | ohm  |
|  | R <sub>ON2</sub> | I = 1mA, V <sub>DD</sub> -V <sub>EE</sub> = 37V: L1toL8, R1toR8, LCOM1toLCOM4, RCOM1toRCOM4                             |        | 70   | ohm  |
| Total Harmonic Distortion                                  | THD1             | V <sub>IN</sub> = 1Vrms, f = 1kHz, V <sub>DD</sub> -V <sub>EE</sub> = 37V: L1toL8, R1toR8, LCOM1toLCOM4, RCOM1toRCOM4   | 0.0015 | 0.01 | %    |
|  | THD2             | V <sub>IN</sub> = 0.1Vrms, f = 1kHz, V <sub>DD</sub> -V <sub>EE</sub> = 37V: L1toL8, R1toR8, LCOM1toLCOM4, RCOM1toRCOM4 | 0.01   | 0.05 | %    |
| Feedthrough  | F <sub>TH</sub>  | V <sub>IN</sub> = 0dBV, f = 10kHz, V <sub>DD</sub> -V <sub>EE</sub> = 37V, L1toL8, R1toR8, LCOM1toLCOM4, RCOM1toRCOM4   |        | 55   | dB   |
| Crosstalk  | CT               | V <sub>IN</sub> = 0dBV, f = 10kHz, V <sub>DD</sub> -V <sub>EE</sub> = 37V: L1toL8, R1toR8, LCOM1toLCOM4, RCOM1toRCOM4   |        | 75   | dB   |
| Input "H"-Level Current                                    | I <sub>IH</sub>  | V <sub>I</sub> = 18.5V: DI, CL, CE, S, RES  |        | 10   | μA   |
| Input "L"-Level Current                                    | I <sub>IL</sub>  | V <sub>I</sub> = 0V: DI, CL, CE, S, RES   | -10    |      | μA   |
| Analog Switch OFF-State Leakage Current                    | I <sub>OFF</sub> | V <sub>I</sub> = V <sub>EE</sub> to V <sub>EE</sub> + 37V: L1toL8, R1toR8, LCOM1toLCOM4, RCOM1toRCOM4                   | -10    | 10   | μA   |
| Current Dissipation  | I <sub>DD</sub>  | V <sub>DD</sub>   |        | 1.0  | mA   |

Equivalent Circuit Block Diagram



**Equivalent Circuit Block Diagram**



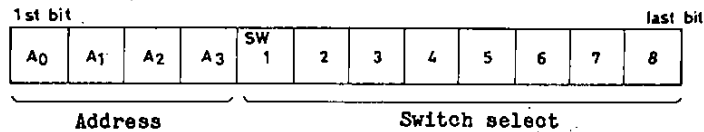
**Pin Description**

| Pin Name                                   | I/O   | Internal Equivalent Circuit | Function  |                |                |         |  |  |  |                |                |                |                |        |   |   |   |   |   |   |   |   |   |   |        |   |   |   |   |   |   |   |   |   |   |        |   |   |   |   |   |   |   |   |   |   |
|--|-------|-----------------------------|---|----------------|----------------|---------|--|--|--|----------------|----------------|----------------|----------------|--------|---|---|---|---|---|---|---|---|---|---|--------|---|---|---|---|---|---|---|---|---|---|--------|---|---|---|---|---|---|---|---|---|---|
| VDD, VSS, VEE                              |       |                             | 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)<br>CL --- Clock input pin<br>DI --- Data input pin<br>CE --- Chip enable pin  |                |                |         |  |  |  |                |                |                |                |        |   |   |   |   |   |   |   |   |   |   |        |   |   |   |   |   |   |   |   |   |   |        |   |   |   |   |   |   |   |   |   |   |
| S  | I     |                             | Select pin in the two ICs-used mode<br>When the S pin is brought to "L" or "H" level, the addresses will become as shown below.<br><table border="1" style="margin-left: auto; margin-right: auto;"> <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 rowspan="2">LC7821</td> <td>L</td> <td>0</td> <td>1</td> <td>0</td> <td>1</td> </tr> <tr> <td>H</td> <td>1</td> <td>1</td> <td>0</td> <td>1</td> </tr> <tr> <td rowspan="2">LC7822</td> <td>L</td> <td>0</td> <td>0</td> <td>1</td> <td>1</td> </tr> <tr> <td>H</td> <td>1</td> <td>0</td> <td>1</td> <td>1</td> </tr> <tr> <td rowspan="2">LC7823</td> <td>L</td> <td>0</td> <td>1</td> <td>1</td> <td>1</td> </tr> <tr> <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 |
| 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              |         |  |  |  |                |                |                |                |        |   |   |   |   |   |   |   |   |   |   |        |   |   |   |   |   |   |   |   |   |   |        |   |   |   |   |   |   |   |   |   |   |
| RES  | I     |                             | Reset pin<br>When power is applied, the state of the analog switches will be indeterminate.<br>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.

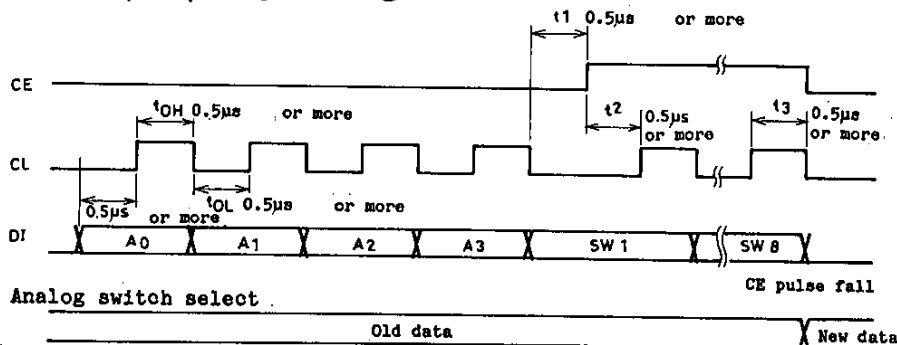
- 0 ----- OFF
- 1 ----- ON

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.

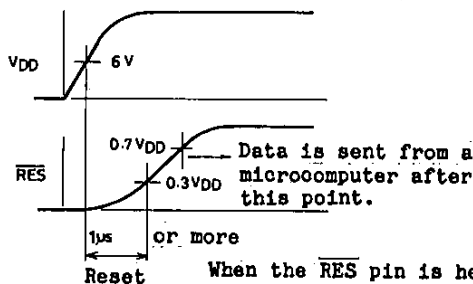
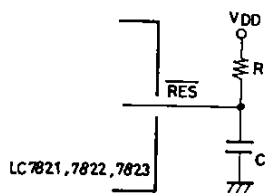
2. Timing of DI, CL, CE pulse signals



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.



When the RES pin is held at "L" level for 1µsec. or more, all analog switches will be turned OFF.

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