Ordering number:ENN2292B

CMOS IC

LC7583N

LCD Driver with Level Meter

Overview

The LC7583N is an LCD driver that can be microcomputer-controlled to provide segment display and level meter display.

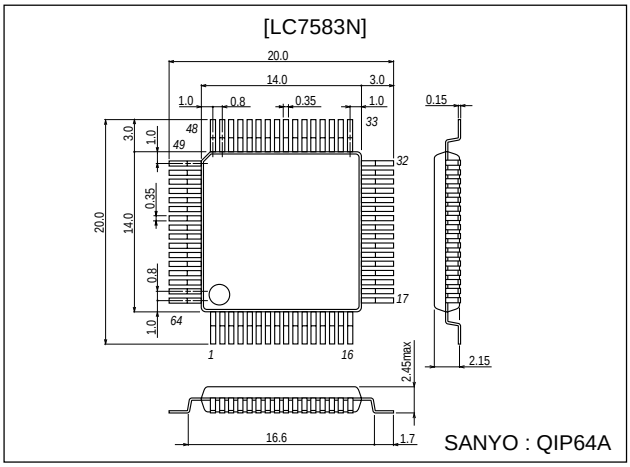
Features

- The serial data address is “5”.
- 1/2duty, 1/2bias, 66 segments (max) (Except ADC output, DSP input display).
- 5-bit AD converter and three selections of level output shown below.
  (1) 13 dots x 2ch Log scale
  (2) 13 dots x 2ch Linear scale
  (3) 26 dots x 1ch Linear scale
- 2 display ($\overline{\text{DSP}}$) pins for direct display.
- Microcomputer-controlled data input using 3 pins for serial data input and control.
- The full scale of the AD converter is 31/48Vref. The Vref is variable (with Vref pin).
- Available for increased use in general-purpose applications because no decoder is required to display the segment data.
- Control bits used to cause the segment output and AD output to be lighted/unlighted.
- $\overline{\text{RES}}$ pin used to cause the initial mode to be entered.

Package Dimensions

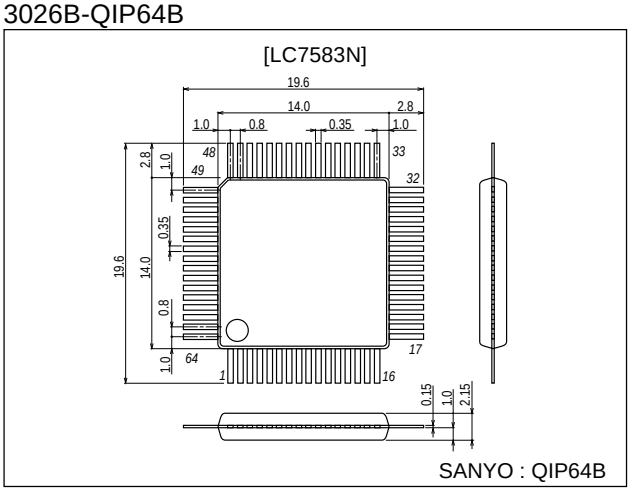
unit:mm

3057-QIP64A



unit:mm

3026B-QIP64B



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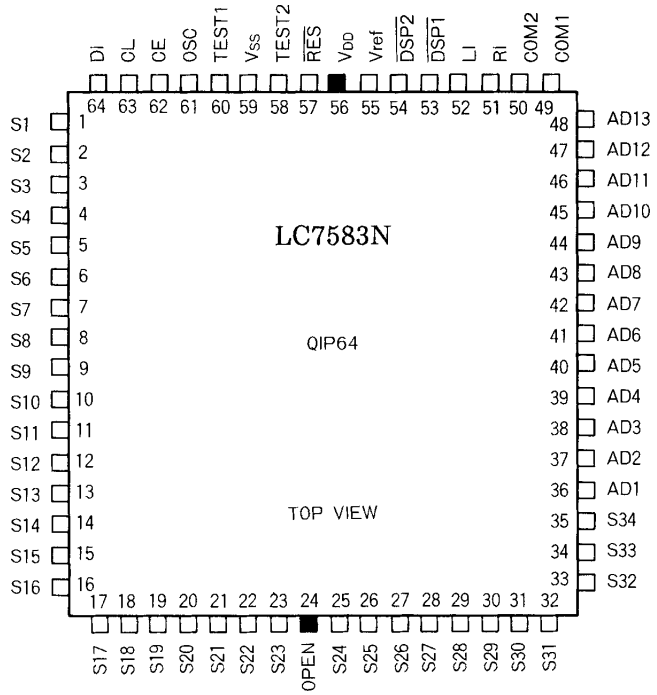
Pin Assignment



Specifications

Absolute Maximum Ratings at Ta = 25˚C, V_{SS}=0V

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V_{DD} max	V_{DD}	–0.3 to +7.0	V
Input voltage	$V_{IN}1$	CE, CL, DI. $\overline{RES}$, $\overline{DSP1}$, $\overline{DSP2}$	–0.3 to +7.0	V
			V_{DD}+0.3	V
	$V_{IN}2$	RI, LI	–0.3 to V_{DD}+0.3	V
	$V_{IN}3$	Vref	–0.3 to V_{DD}+0.3	V
	$V_{IN}4$	OSC output OFF	–0.3 to V_{DD}+0.3	V
Output voltage	V_{OUT}	OSC output OFF	–0.3 to V_{DD}+0.3	V
Output current	$I_{OUT}1$	S1 to S34, AD1 to AD13	500	µA
	$I_{OUT}2$	COM1, 2	1	mA
Allowable power dissipation	Pd max	Ta≤85°C	100	mW
Operating temperature	Topr		–40 to +85	˚C
Storage temperature	Tstg		–45 to +125	˚C

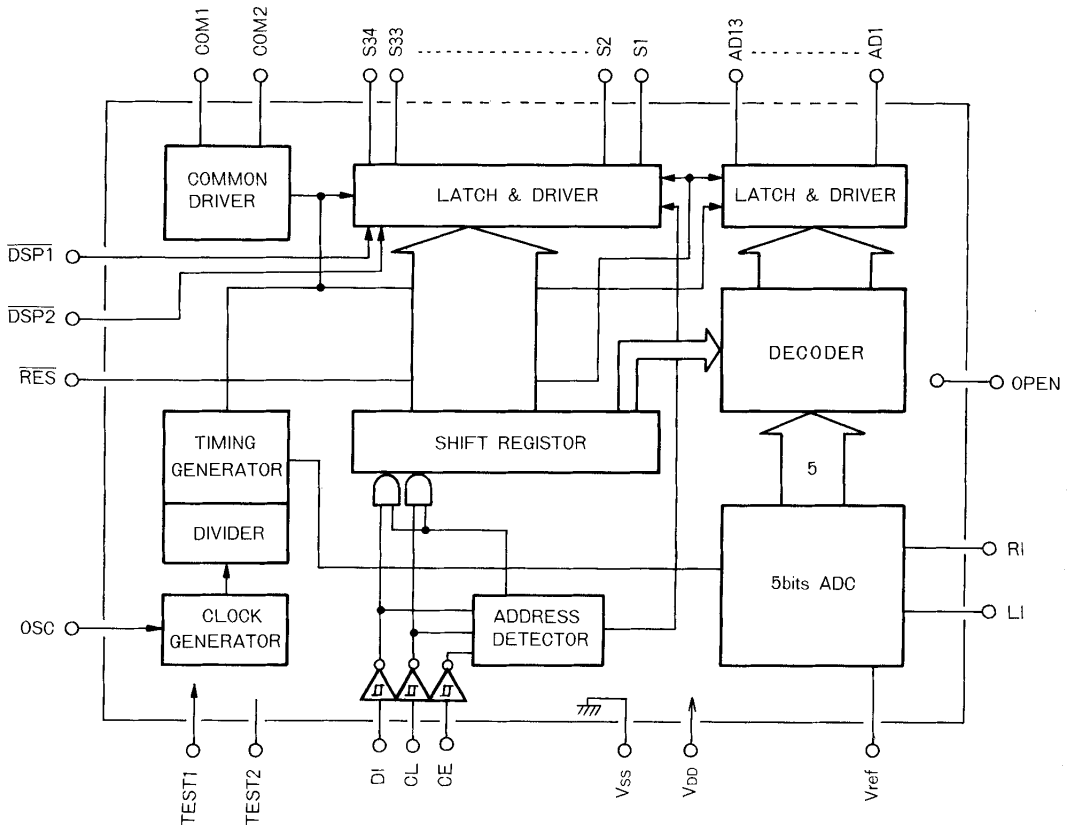
Allowable Operating Conditions at Ta = –40 to +85˚C, V_{SS}=0V

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Supply voltage	V_{DD}		4.5		6.5	V
Reference voltage	Vref	Vref≤V_{DD}	4.5		V_{DD}	V
Input high-level voltage	$V_{IH}1$	CE, CL, DI, $\overline{RES}$, $\overline{DSP1}$, $\overline{DSP2}$	0.7V_{DD}		6.5	V
Input low-level voltage	$V_{IL}1$	CE, CL, DI, $\overline{RES}$, $\overline{DSP1}$, $\overline{DSP2}$	0		0.3V_{DD}	V
Input hysteresis width	V_H	CE, CL, DI	0.05V_{DD}	0.10V_{DD}		V
Recommended external resistance	R	OSC		47		kΩ
Recommended external capacitance	C	OSC		1000		pF
OSC guaranteed range	f_{OSC}	OSC	10	32	50	kHz
Low-level clock pulse width	$t_{\phi L}$	CL, DI	0.5			µs
High-level clock pulse width	$t_{\phi H}$	CL, DI	0.5			µs
Setup time	t_{sup}	CL, DI	0.5			µs
Serial data pulse width	t_1	CL, CE see fig. A.	2			µs
	t_2	See fig. A.			3	µs
Data hold time	t_{dh}	CL, DI	0.5			µs
AD conversion time	t_{CONV}	RI, LI, per channel	200			µs
Input voltage	V_{IN}	RI, LI/V_{IN}≤Vref	0		V_{DD}	V

Electrical Characteristics at Ta = 25˚C, under Allowable Operating Conditions

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Input high-level current	I_{IH1}	CE, CL, DI, RI, LI, $\overline{RES}$, $\overline{DSP1}$, $\overline{DSP2}$, VI=6.5V			5	µA
Input low-level current	I_{IL1}	CE, CL, DI, RI, LI, $\overline{RES}$, $\overline{DSP1}$, $\overline{DSP2}$, VI=0V			5	µA
Output high-level voltage	V_{OH1}	S1 to S34, I_O=–10µA	V_{DD}–1.0			V
Output low-level voltage	V_{OL1}	AD1 to AD13, I_O=10µA			1.0	V
Output high-level voltage	V_{OH2}	COM1, COM2, I_O=–100µA	V_{DD}–0.6			V
Output low-level voltage	V_{OL2}	COM1, COM2, I_O=100µA			0.6	V
M-level voltage	V_{MID}	COM1, COM2, V_{DD}=6.5V, I_O=±100µA	2.65	3.25	3.85	V
M-level voltage	V_{MID}	COM1, COM2, V_{DD}=3.0V, I_O=±100µA	0.9	1.5	2.1	V
OSC frequency	f_{OSC}	OSC, R=47kΩ, C=1000pF		32		kHz
AD conversion linearity error	Err	Vref=4.5 to 6.5V≤V_{DD}	–1/2		+1/2	LSB
Supply current	I_{DD}	f_{OSC}=32kHz, input=V_{OD}, output=open		2	4	mA
Reference supply current	Iref	Vref		0.3	1	mA

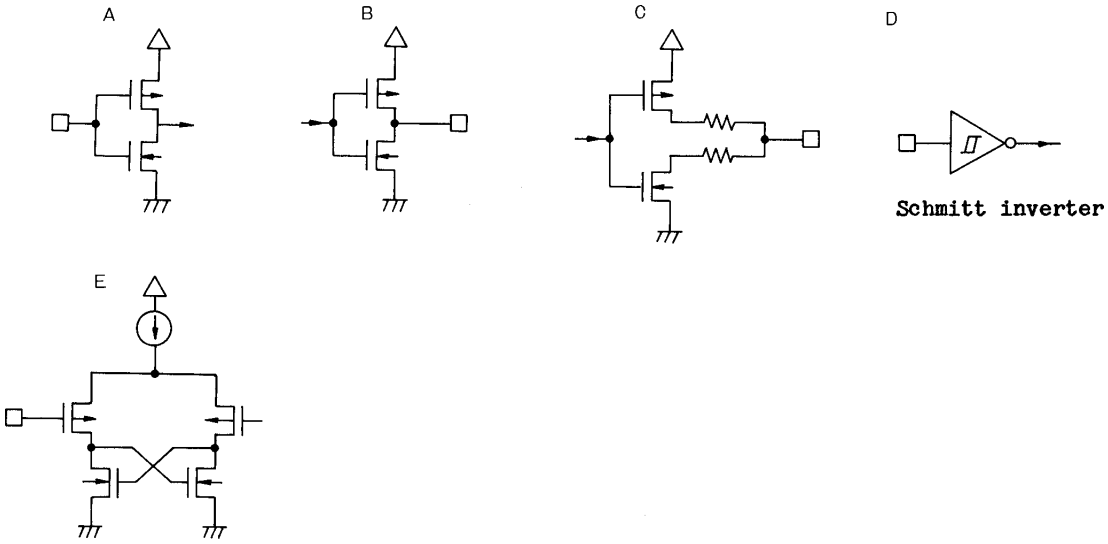
Block Diagram



Pin Function

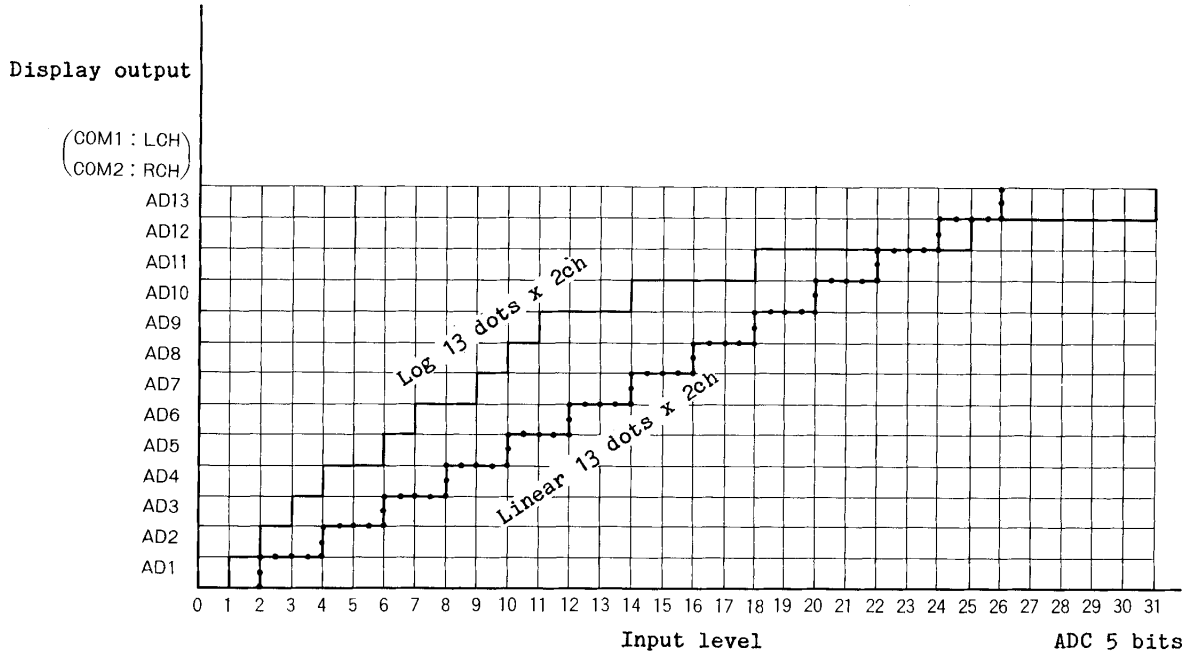
Pin Name	Pin No.	Description	Active	I/O	I/O Configuration
S1 to S33	1 to 34	Segment output pins used to display the data transferred from the serial data input pin.	–	O	B
S34	35	Segment output pin used to display the external input ($\overline{DSP1}$, $\overline{DSP2}$) data	–	O	
AD1 to AD13	36 to 48	Segment output pins used to display the ADC input (R1, L1) data. Control bits "A1", "A2" are used to provide 3 types of pattern. AD1 : Lowest lighting level, AD13 : Highest lighting level	–	O	
COM1 COM2	49 50	Common driver output pins. Frame frequency : f_{OSC}/512Hz	–	O	C
RI LI	51 52	AD converter input pins.	Analog	I	E
$\overline{DSP1}$ $\overline{DSP2}$	53 54	Direct (external input) display pins whose segment output is delivered at S34.	L	I	A
Vref	55	Pin used to supply the AD converter reference voltage.	–	–	–
V_{DD} V_{SS}	56 59	Power supply pin.	–	–	–
$\overline{RES}$	57	Pin used to force the display to be unlighted at the initial mode.	L	I	A
TEST2	58	Open	–	O	–
TEST1	60	Open or connected to V_{SS}.	–	I	A
CE	62	Serial data transfer pin. Connected to a controller (microcomputer). CE : Chip enable CL : Sync clock DI : Transfer data	H	I	D
CL	63		↑		
DI	64		–		
OPEN	24	No connection.	–	–	–

Equivalent Input/Output Configuration



ADC Display Mode

2ch (stereo) Display (shown for one channel only)

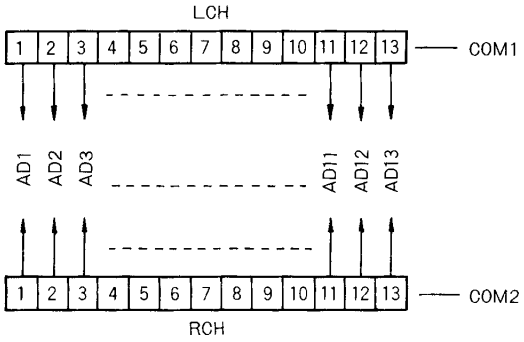


Lighting Level for Log Display

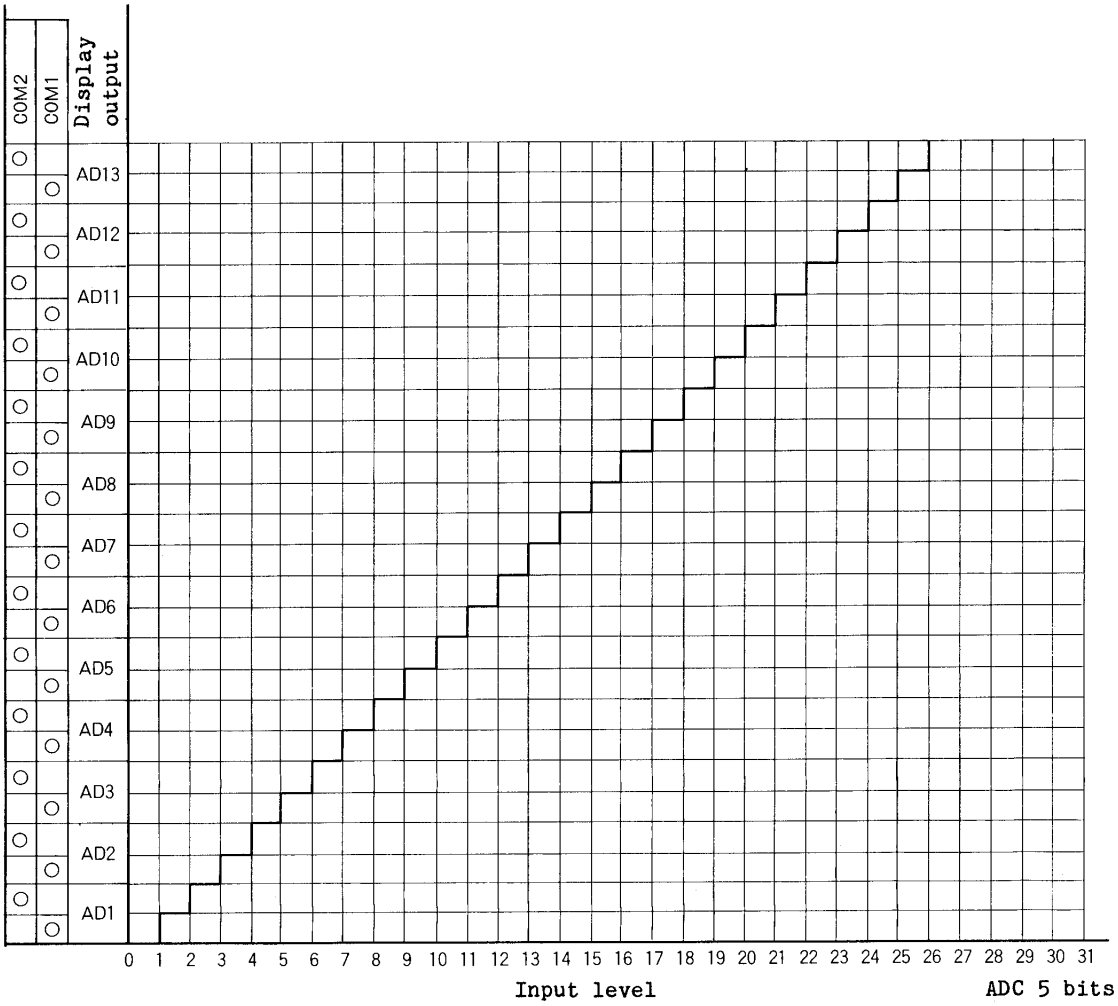
Display Output	dB Display (dB)	Display Output	dB Display (dB)
AD1	–20.0	AD8	0.0
AD2	–14.0	AD9	1.0
AD3	–10.5	AD10	3.0
AD4	–8.0	AD11	5.0
AD5	–4.5	AD12	8.0
AD6	–3.0	AD13	10.0
AD7	–1.0		

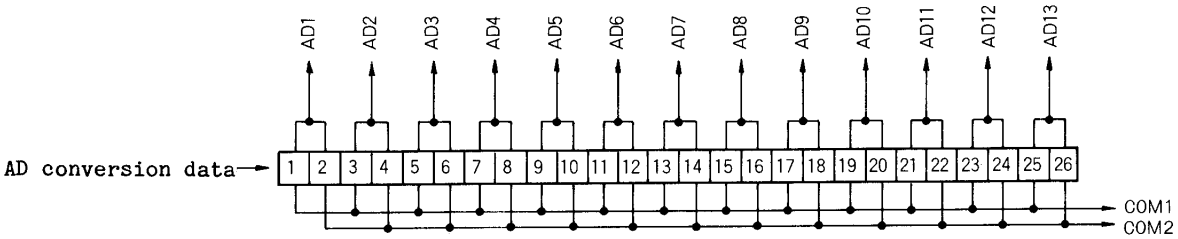
Note) The conversion error of the AD converter is ±1/2LSB.
When 0dB is taken as 1V (at Vref=4.95V), a conversion error of approximately ±3.5dB occurs at –20dB.

COMMON Connection



1ch (monaural) Display

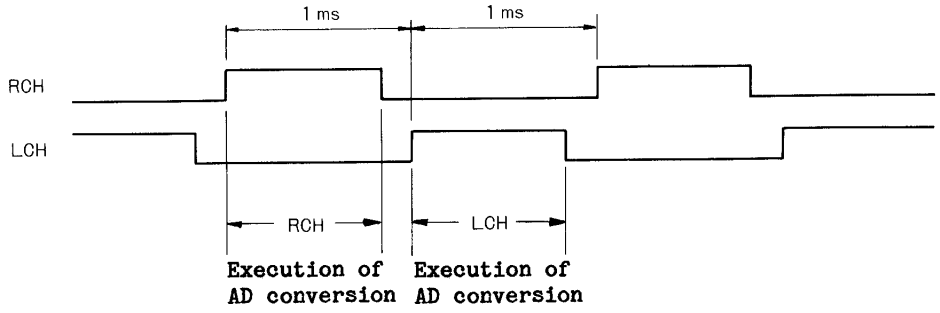




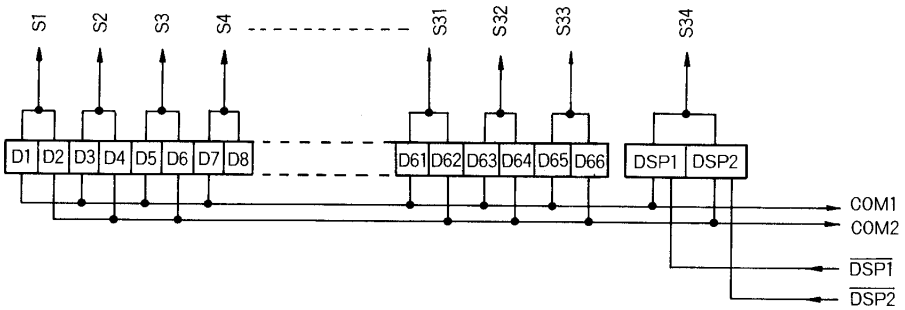
Connect the RI pin and LI pin at the monaural mode.

ADC Conversion Time

When the oscillation frequency is 32kHz, individual input signals at the RI pin, LI pin are sampling-processed alternately once every 1ms.

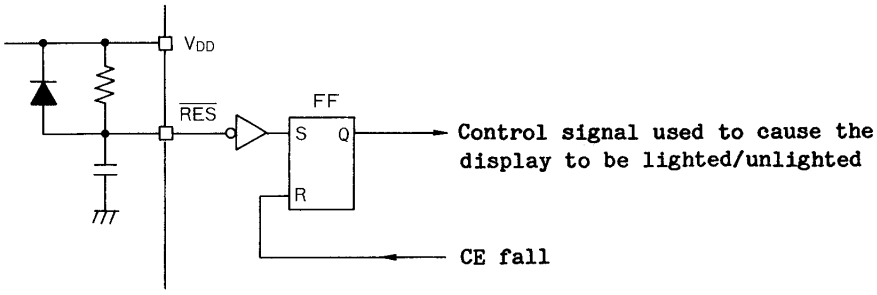


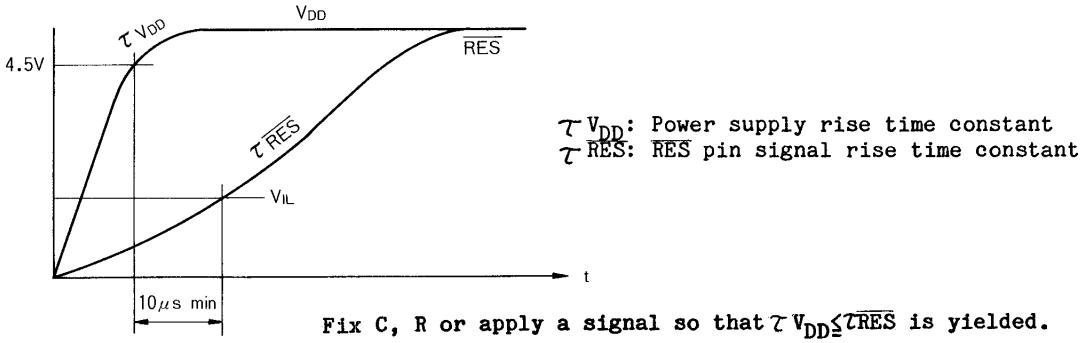
Connection of Serial Data, $\overline{\text{DSP}}$ Input Data

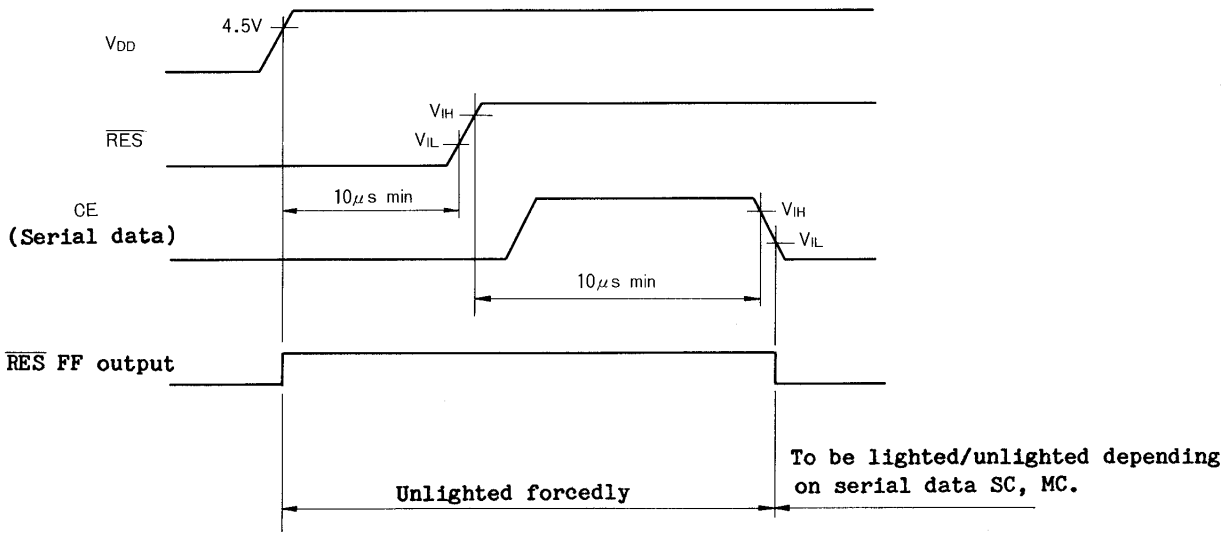


$\overline{\text{RES}}$ Pin and Display Control

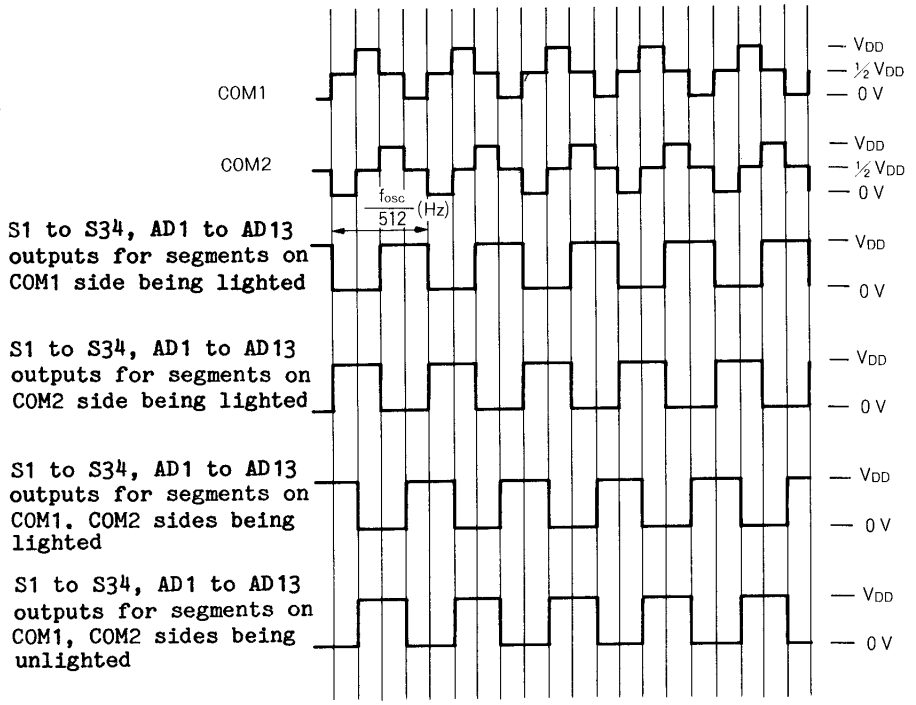
The internal circuit of the $\overline{\text{RES}}$ pin is shown below.



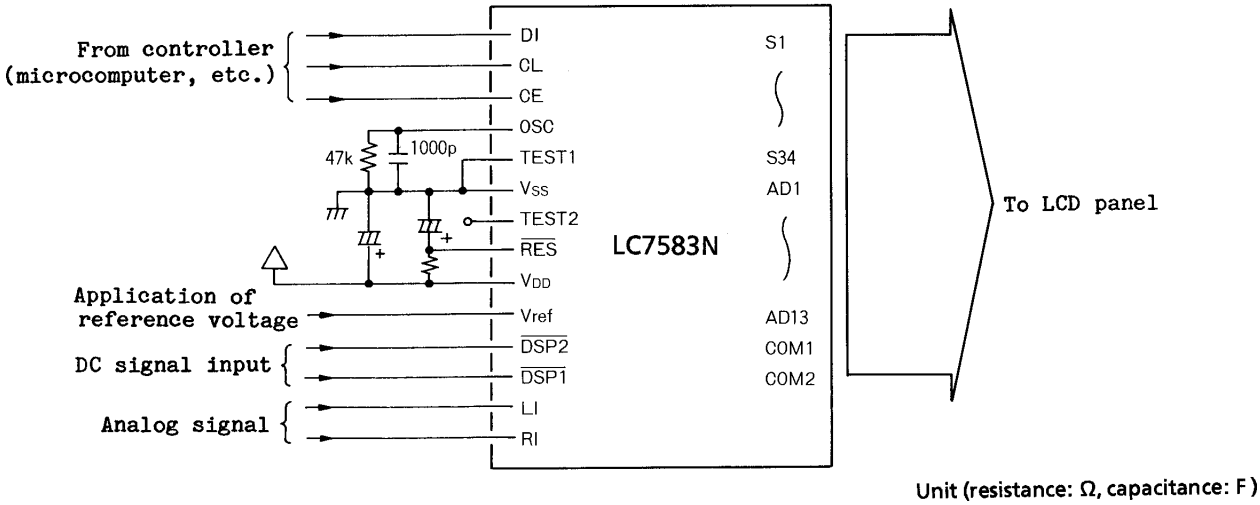




Output Waveforms (S1 to S34, AD1 to AD13)

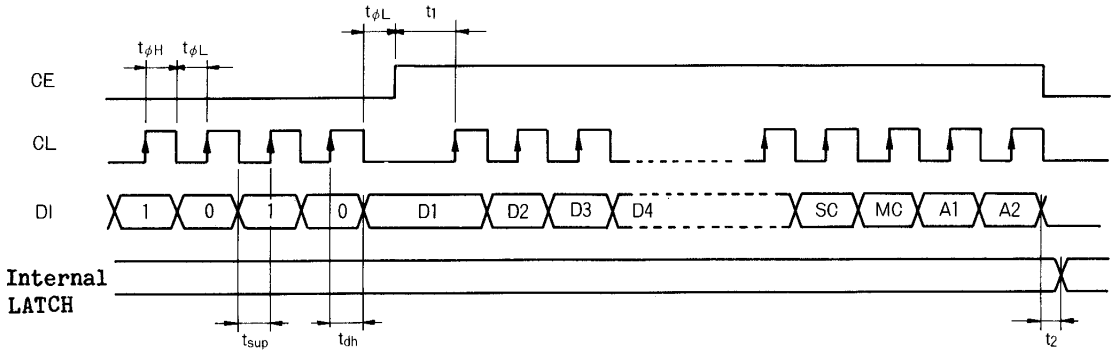


Sample Application Circuit

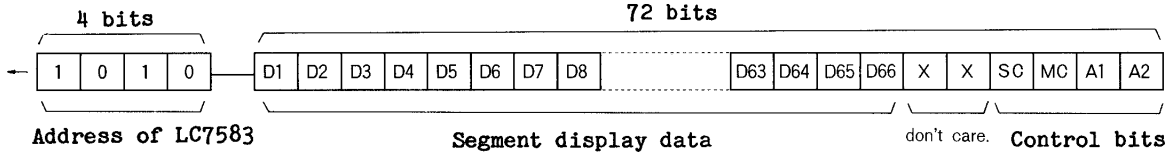


Unit (resistance: Ω, capacitance: F)

[Fig. A] : Data Transfer Mode (Transferred from a controller as shown below)



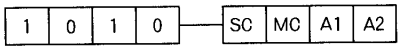
Serial Data



- Address of LC7583 : "1010" is transferred as shown above.
- D1 to D66 : Display data Lighted at "1"
  Unlighted at "0"
- X : don't care
- SC : Control bit used to cause S1 to S34 to be lighted/unlighted.
  Unlighted at "1"
  Lighted at "0"
- MC : Control bit used to cause AD1 to AD13 to be lighted/unlighted.
  Unlighted at "1"
  Lighted at "0"
- A1, A2 : Bits used to select the AD converter display mode.

A2	A1	Display Mode
0	0	Log scale 13 dots x 2ch
0	1	Linear scale 13 dots x 2ch
1	0	Linear scale 26 dots x 1ch
1	1	

- Sample transfer
  - Using ADC only



  - Using ADC and segment 10 bits (The segment outputs are delivered at S29 to S33.)