

LC7583N

SANYO SEMICONDUCTOR CORP



3057

3026B

CMOS LSI

LCD Driver with Level Meter

©2292B

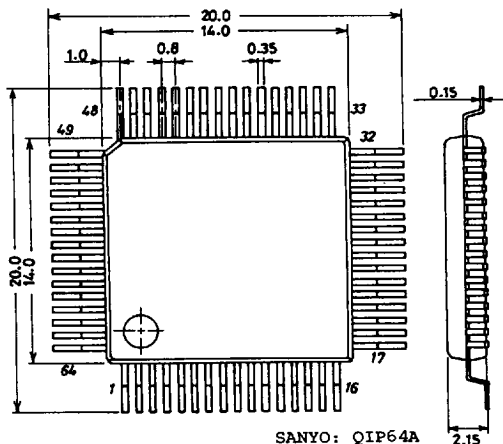
Overview

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

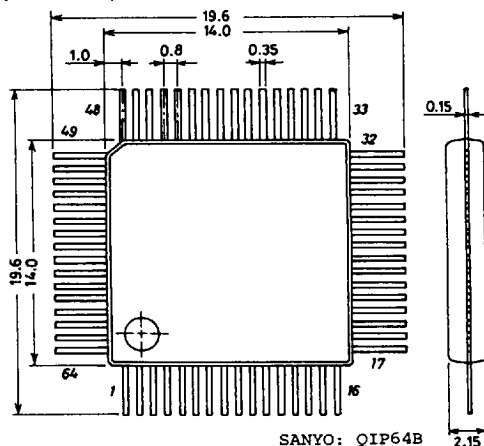
Features

- 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 (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
- RES pin used to cause the initial mode to be entered

Case Outline 3057
(unit:mm)



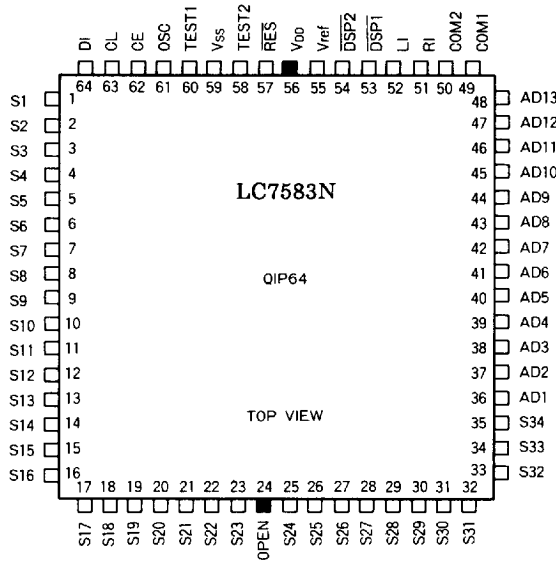
Case Outline 3026B
(unit:mm)



N111JN/3168KI/N266AT, TS No.2292-1/9

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Pin Assignment



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

Characteristic	Symbol	Conditions/Pins	min	typ	max	unit
Maximum Supply Voltage	V _{DDmax}	V _{DD}	-0.3		+7.0	V
Input Voltage	V _{IN(1)}	CE, CL, DI, RES, DSP1, DSP2	-0.3		+7.0	V
	V _{IN(2)}	RI, LI	-0.3		V _{DD} +0.3	V
	V _{IN(3)}	Vref	-0.3		V _{DD} +0.3	V
	V _{IN(4)}	OSC output OFF	-0.3		V _{DD} +0.3	V
Output Voltage	V _{OUT}	OSC output OFF	-0.3		V _{DD} +0.3	V
Output Current	I _{OUT(1)}	S1toS34, AD1toAD13			500	uA
	I _{OUT(2)}	COM1, 2			1	mA
Allowable Power Dissipation	Pdmax	Ta≥85°C			100	mW
Operating Temperature	Topg		-40		+85	°C
Storage Temperature	Tstg		-45		+125	°C

Allowable Operating Conditions at Ta=-40 to +85°C, VSS=0V

Characteristic	Symbol	Conditions/Pins	min	typ	max	unit
Supply Voltage	V _{DD}		4.5		6.5	V
Reference Voltage	V _{ref}	V _{ref} ≤ V _{DD}	4.5		V _{DD}	V
Input "H"-Level Voltage	V _{IH(1)}	CE, CL, DI, RES, DSP1, DSP2	0.7V _{DD}		6.5	V
Input "L"-Level Voltage	V _{IL(1)}	CE, CL, DI, RES, DSP1, 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		kohm
Recommended External Capacitance	C	OSC		1000		pF
OSC Guaranteed Range	f _{OSC}	OSC	10	32	50	kHz
"L"-Level Clock Pulse Width	t _{6L}	CL, DI	0.5			usec

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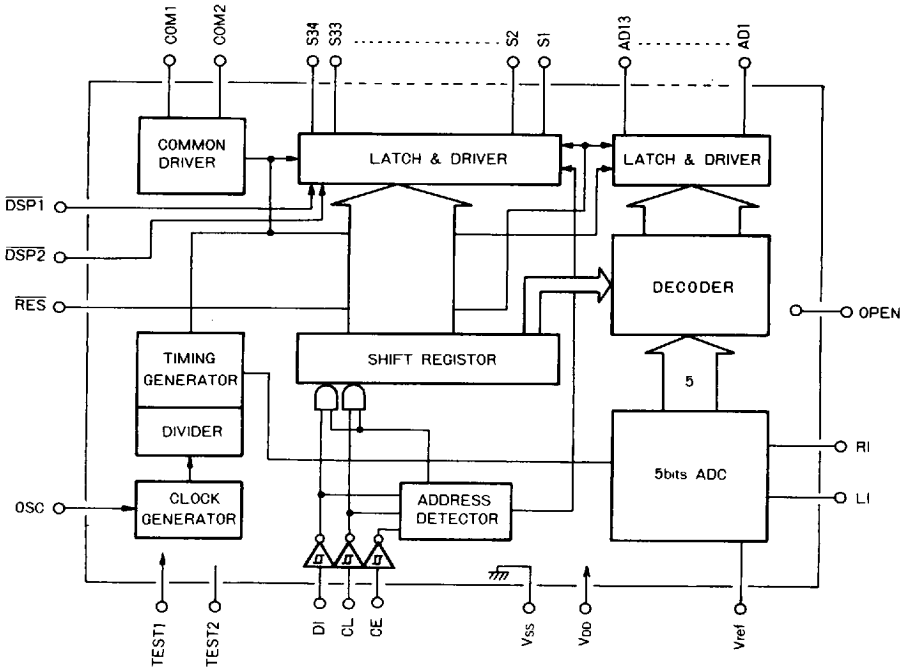
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			min	typ	max	unit
"H"-Level Clock Pulse Width	$t_{\phi H}$	CL,DI	0.5			usec
Setup Time	t_{sup}	CL,DI	0.5			usec
Serial Data Pulse Width	t_1	CL,CE See Fig.A.	2			usec
Data Hold Time	t_2	See Fig.A.				3 usec
AD Conversion Time	t_{CONV}	CL,DI RI,LI	0.5 200			usec usec
Input Voltage	V_{IN}	Per channel RI,LI/ $V_{IN} \leq V_{ref}$	0		V_{DD}	V

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

			min	typ	max	unit
Input "H"-Level Current	$I_{IH}(1)$	CE,CL,DI,RI,LI, $V_I=6.5V$ RES,DSP1,DSP2			5	uA
Input "L"-Level Current	$I_{IL}(1)$	" " $V_I=0V$			5	uA
Output "H"-Level Voltage	$V_{OH}(1)$	S1 to S34, $I_o=-10uA$	$V_{DD}-1.0$			V
Output "L"-Level Voltage	$V_{OL}(1)$	AD1 to AD13, $I_o=10uA$			1.0	V
Output "H"-Level Voltage	$V_{OH}(2)$	COM1,COM2, $I_o=-100uA$	$V_{DD}-0.6$			V
Output "L"-Level Voltage	$V_{OL}(2)$	COM1,COM2, $I_o=100uA$			0.6	V
"M"-Level Voltage	V_{MID}	COM1,COM2, $V_{DD}=6.5V$, $I_o=\pm 100uA$	2.65	3.25	3.85	V
"M"-Level Voltage	V_{MID}	COM1,COM2, $V_{DD}=3.0V$, $I_o=\pm 100uA$	0.9	1.5	2.1	V
OSC Frequency	f_{OSC}	OSC, R=47kohms, C=1000pF		32		kHz
AD Conversion Linearity Error	Err	$V_{ref}=4.5$ to $6.5V \geq V_{DD}$	-1/2		1/2	LSB
Supply Current	I_{DD}	$f_{OSC}=32kHz$, input= V_{OD} , output=open			4	mA
Reference Supply Current	I_{ref}	V_{ref}	0.3		1	mA

Block Diagram



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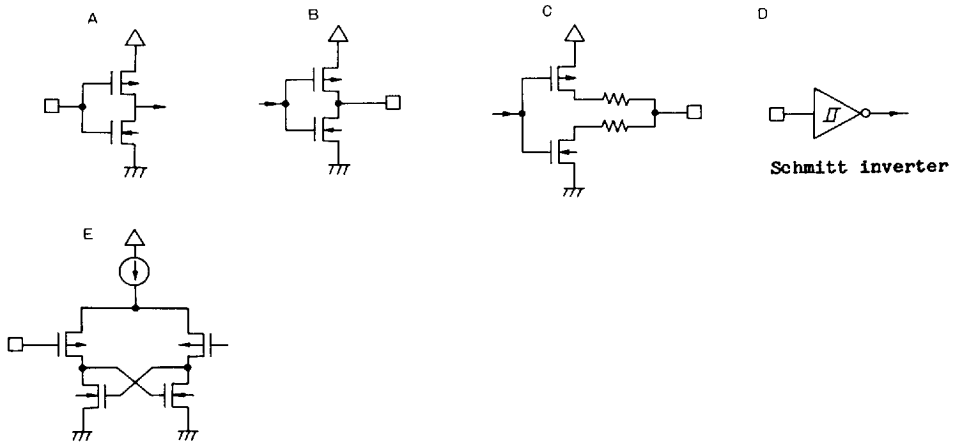
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Pin Description

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 (DSP1, 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: $f_{OSC}/512$ Hz	-	O	C
RI LI	51 52	AD converter input pins	Analog	I	E
DSP1 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	-	-	-
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		L		
DI	64		-		
OPEN	24	No connection	-	-	-

Equivalent Input/Output Configuration

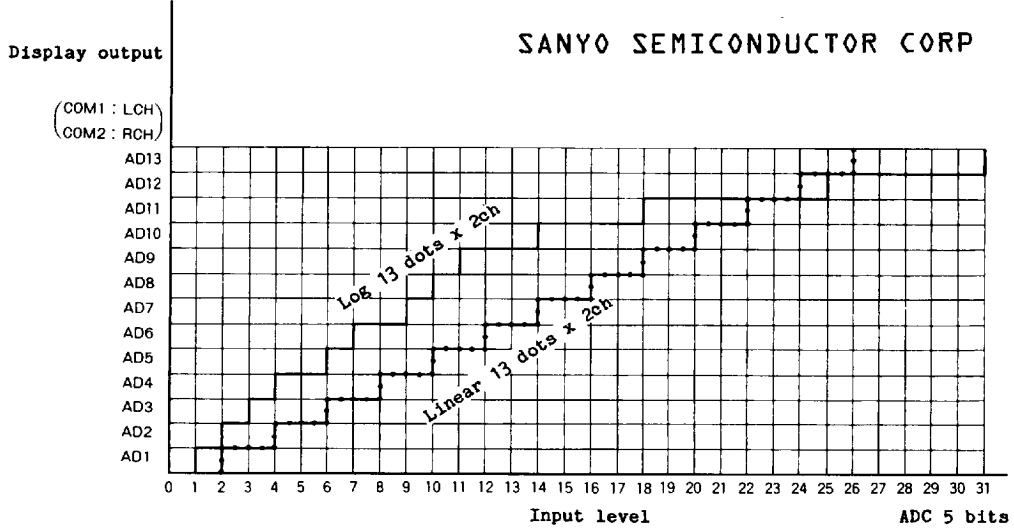
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ADC Display Mode

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

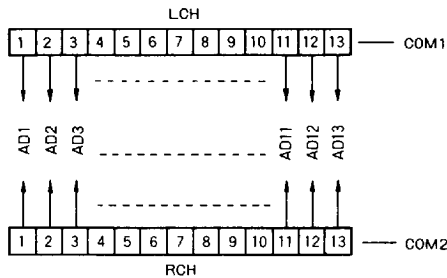


Lighting Level for Log Display

Display Output	dB Display (dB)	Display Output	dB Display (dB)
AD 1	-20.0	AD 8	0.0
AD 2	-14.0	AD 9	1.0
AD 3	-10.5	AD10	3.0
AD 4	-8.0	AD11	5.0
AD 5	-4.5	AD12	8.0
AD 6	-3.0	AD13	10.0
AD 7	-1.0		

Note) The conversion error of the AD converter is $\pm 1/2\text{LSB}$.
When 0dB is taken as 1V (at $V_{\text{ref}}=4.95\text{V}$), a conversion error of approximately $\pm 3.5\text{dB}$ occurs at -20dB .

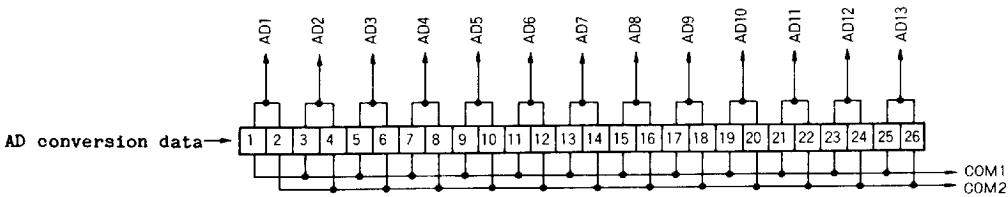
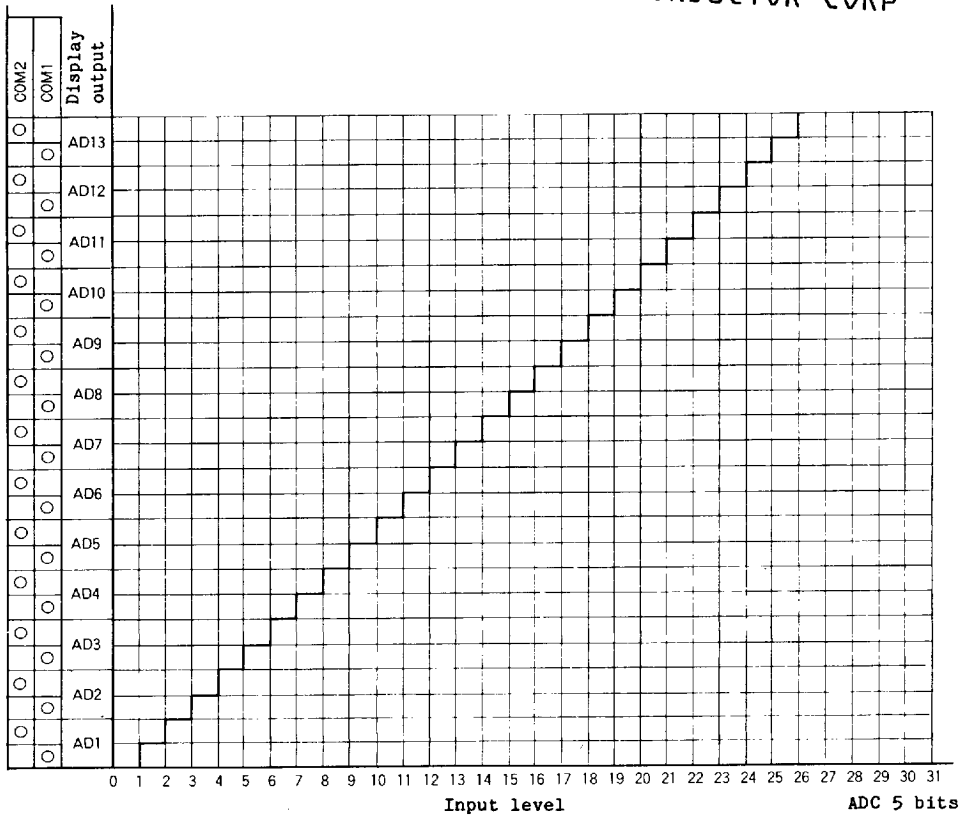
COMMON Connection



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1ch (monaural) Display

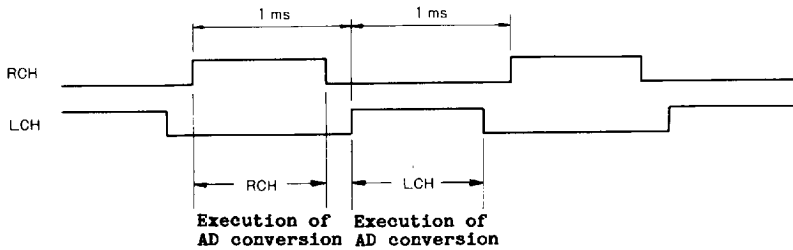
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Connect the RI pin and LI pin at the monaural mode.

ADC Conversion Time

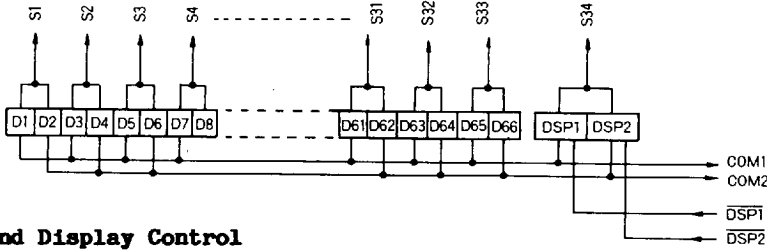
When the oscillation frequency is 32kHz, individual input signals at the RI pin, LI pin are sampling-processed alternately once every 1msec.



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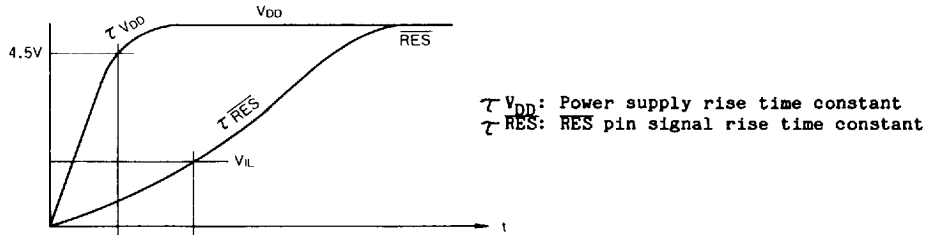
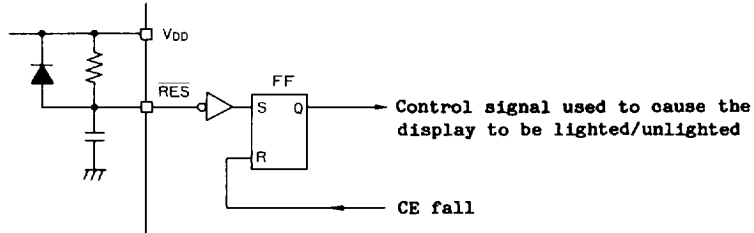
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Connection of Serial Data, DSP Input Data



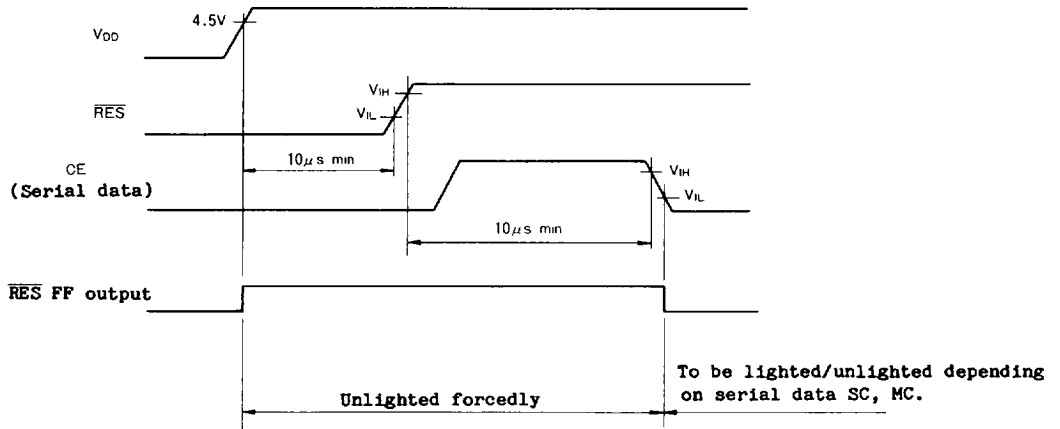
RES Pin and Display Control

The internal circuit of the RES pin is shown below.



$\tau_{V_{DD}}$: Power supply rise time constant
 τ_{RES} : RES pin signal rise time constant

Fix C, R or apply a signal so that $\tau_{V_{DD}} \leq \tau_{RES}$ is yielded.

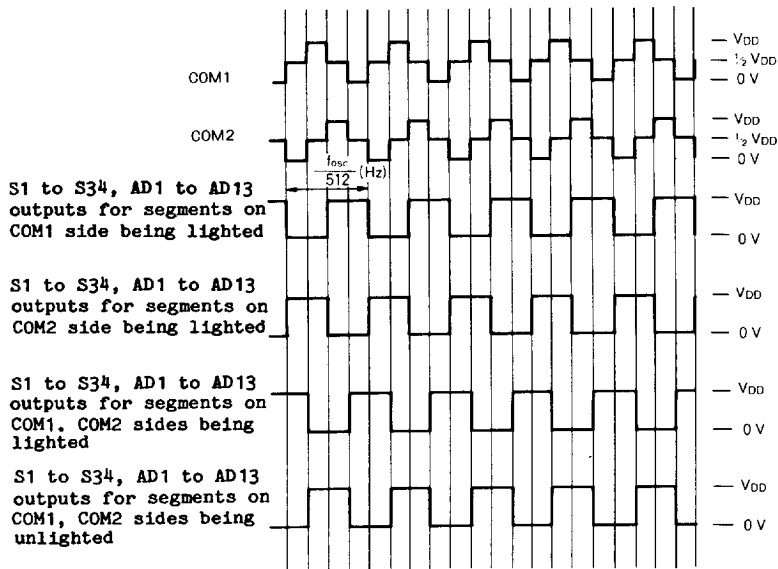


To be lighted/unlighted depending on serial data SC, MC.

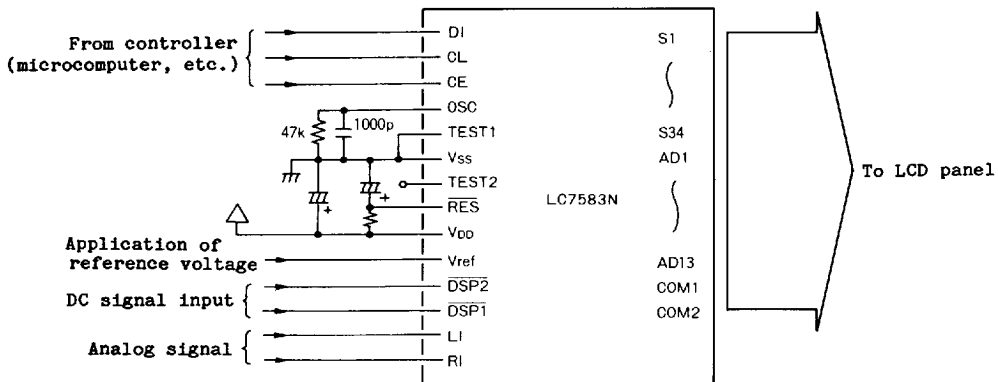
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Output Waveforms (S1 to S34, AD1 to AD13)

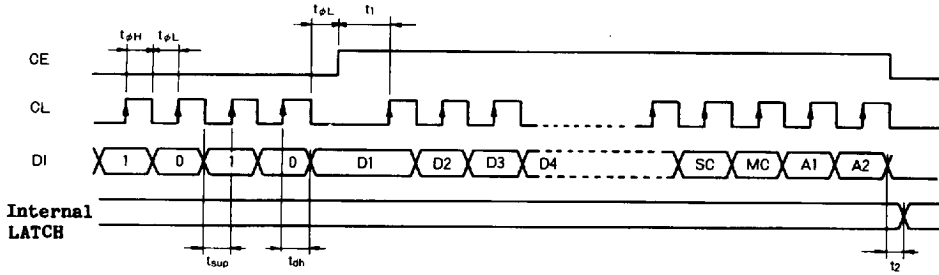


Sample Application Circuit



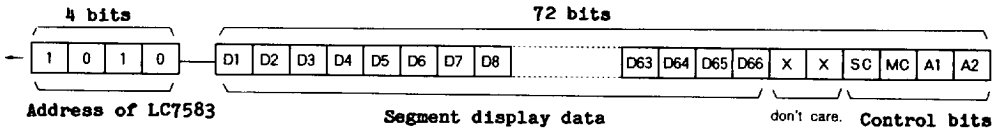
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[Fig.A]: Data Transfer Mode (Transferred from a controller as shown below)



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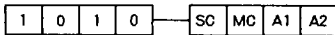
Serial Data



- . 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 2oh
0	1	Linear scale 13 dots x 2oh
1	0	Linear scale 26 dots x 1oh
1	1	

- . Sample transfer
- . Using ADC only



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

