

<b>SANYO</b>	No.2290C	<b>LC7582,7582E,7582W</b>
		LCD Driver

**Overview**

The LC7582,7582E,7582W is a general-purpose LCD driver designed for use in electronic tuning frequency display or microcomputer-controlled system applications.

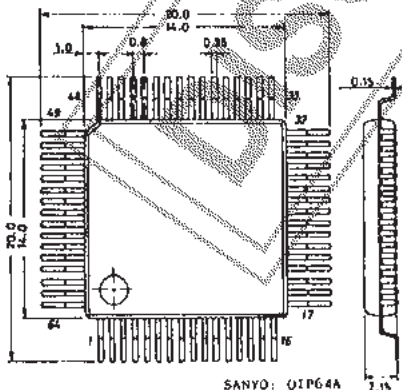
**Features**

- . 53 segments (max.) output (Static display)
- . Drive system: 1/1duty (53 segments), 1/2duty (104 segments)
- . Data input: 3 serial input pins
- . 2 pins for 5-level AD converter (Level meter use, etc.)
- . 2 display (DSP) pins for direct display
- . INH pin for blanking out display

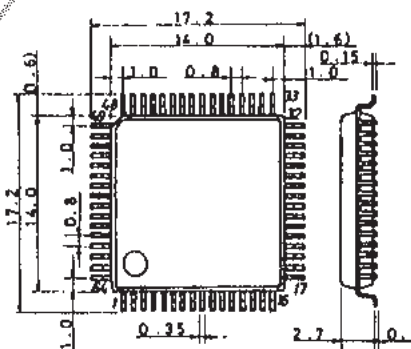
**Absolute Maximum Ratings** at Ta=25°C, V<sub>SS</sub>=0V

				unit
Maximum Supply Voltage	V <sub>DDmax</sub>	V <sub>DD</sub>	-0.3 to +7.0	V
Input Voltage	V <sub>LCD</sub>	V <sub>LCD</sub>	-0.3 to V <sub>DD</sub> +0.3	V
	V <sub>IN(1)</sub>	CE, CLK, DATA, INH	-0.3 to +7.0	V
Output Voltage	V <sub>IN(2)</sub>	S44 to S47	Output OFF (Used as AD1, AD2, DSP1, DSP2)	-0.3 to V <sub>DD</sub> +0.3
	V <sub>IN(3)</sub>	OSC	Output OFF	-0.3 to V <sub>DD</sub> +0.3
Output Current	I <sub>OUT(1)</sub>	S1 to S53	Output OFF	100 uA
Allowable Power Dissipation	I <sub>OUT(2)</sub>	COM1,2	Output OFF	1.0 mA
	P <sub>dmax</sub>	Ta=85°C		100 mW
Operating Temperature	T <sub>opg</sub>			-30 to +85 °C
Storage Temperature	T <sub>stg</sub>			-40 to +125 °C

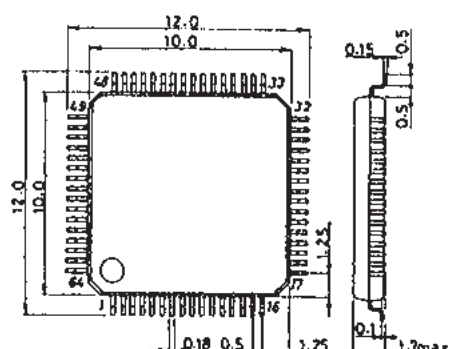
Case Outline 3057 [LC7582]  
(unit: mm)



Case Outline 3159 [LC7582E]  
(unit: mm)



Case Outline 3190 [LC7582W]  
(unit: mm)



Specifications and information herein are subject to change without notice.

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Allowable Operating Conditions at Ta=-30 to +85°C, V<sub>SS</sub>=0V

		Pin	min	typ	max	unit
Supply Voltage	V <sub>DD</sub>	V <sub>DD</sub>	3.0		6.5	V
	V <sub>LCD</sub>	V <sub>LCD</sub>	3.0		V <sub>DD</sub>	V
Input "H"-Level Voltage	V <sub>IH</sub> (1)	INH	0.7V <sub>DD</sub>		6.5	V
Input "L"-Level Voltage	V <sub>IL</sub> (1)	"	0		0.3V <sub>DD</sub>	V
Input "H"-Level Voltage	V <sub>IH</sub> (2)	S44, S46	0.7V <sub>DD</sub>		V <sub>DD</sub>	V
			[Output OFF(DSP1, DSP2-used mode)]			
Input "L"-Level Voltage	V <sub>IL</sub> (2)	"	0		0.3V <sub>DD</sub>	V
Input "H"-Level Voltage	V <sub>IH</sub> (3)	CE, CLK, DATA	0.8V <sub>DD</sub>		6.5	V
Input "L"-Level Voltage	V <sub>IL</sub> (3)	"	0		0.2V <sub>DD</sub>	V
Recommended External Resistance	R	OSC		51		kohm
Recommended External Capacitance	C	OSC		680		pF
OSC Guaranteed Range	f <sub>OSC</sub>	OSC	25	50	100	kHz
"L"-Level Clock Pulse Width	t <sub>∅L</sub>	CLK	0.25			usec
"H"-Level Clock Pulse Width	t <sub>∅H</sub>	"	0.25			usec
Setup Time	t <sub>sup</sub>	CLK, DATA	0.25			usec
Data Hold Time	t <sub>dh</sub>	"	0.25			usec
Serial Data Pulse Width	t <sub>1</sub>	CE, DATA	1			usec
"	t <sub>2</sub>	CE, CLK	1.25			usec
"	t <sub>3</sub>				1	usec
"	t <sub>4</sub>		4			usec

Electrical Characteristics under Allowable Operating Conditions

		Pin	min	typ	max	unit
Input "H"-Level Current	I <sub>IH</sub> (1)	CE, CLK, DATA, INH			5	uA
Input "L"-Level Current	I <sub>IL</sub> (1)	"			5	uA
Input "H"-Level Current	I <sub>IH</sub> (2)	S44, S46			10	uA
Input "L"-Level Current	I <sub>IL</sub> (2)	"			10	uA
Input "H"-Level Current	I <sub>IH</sub> (3)	AD1, AD2			10	uA
Input "L"-Level Current	I <sub>IL</sub> (3)	"			10	uA
Output "H"-Level Voltage	V <sub>OH</sub> (1)	S1 to S53	I <sub>o</sub> =-10uA	V <sub>DD</sub> -1.0		V
Output "L"-Level Voltage	V <sub>OL</sub> (1)	"	I <sub>o</sub> =10uA		1.0	V
Output "H"-Level Voltage	V <sub>OH</sub> (2)	COM1, COM2	I <sub>o</sub> =-100uA	V <sub>LCD</sub> -0.6		V
Output "L"-Level Voltage	V <sub>OL</sub> (2)	"	I <sub>o</sub> =100uA		0.6	V

Continued on next page.

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	Pin	min	typ	max	unit
Center Level Voltage	$V_{MID}$	"	$V_{LCD}=6.5V,$ $I_o=100\mu A$	2.65 3.25	3.85 V
"	$V_{MID}$	"	$V_{LCD}=3.0V,$ $I_o=100\mu A$	0.9 1.5	2.1 V
1st Step Lighting Voltage	$V_{A1}$	S45, S47		$0.07V_{DD}$ $0.1V_{DD}$ $0.13V_{DD}$	V
2nd	$V_{A2}$	"		$0.17V_{DD}$ $0.2V_{DD}$ $0.23V_{DD}$	V
3rd	$V_{A3}$	"		$0.27V_{DD}$ $0.3V_{DD}$ $0.33V_{DD}$	V
4th	$V_{A4}$	"		$0.37V_{DD}$ $0.4V_{DD}$ $0.43V_{DD}$	V
5th	$V_{A5}$	"		$0.47V_{DD}$ $0.5V_{DD}$ $0.53V_{DD}$	V
Step Voltage Diff.	$V_{step}$	"	See Fig.1	$0.09V_{DD}$ $0.1V_{DD}$ $0.11V_{DD}$	V
OSC Frequency	$f_{osc}$	osc	$R=51k\Omega, C=680pF$	40 50	60 kHz
Supply Current	$I_{DD}$				1 mA
"	$I_{LCD}$				2 mA
Hysteresis Voltage	$V_H$	$V_{LCD}$ CE, CLK, DATA	$V_{DD}=5V$	0.3	V

## Pin Assignment

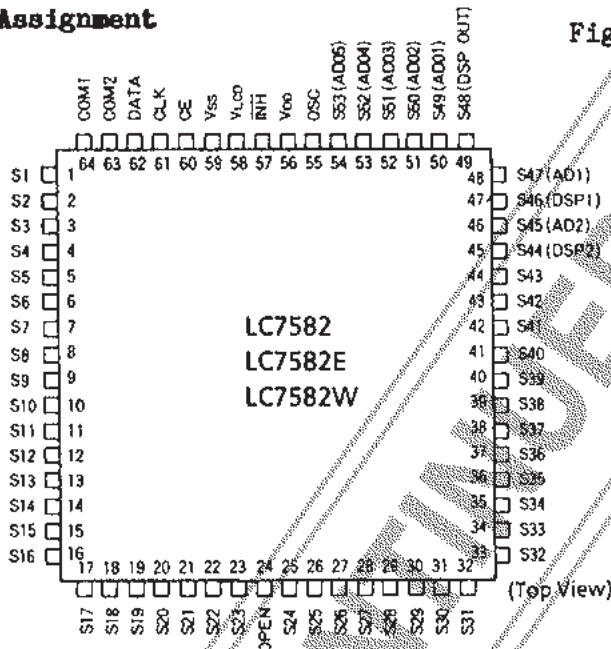
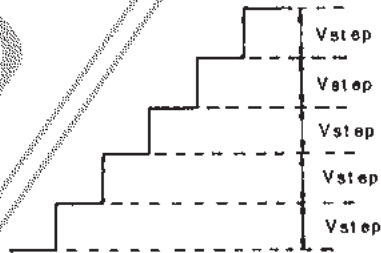
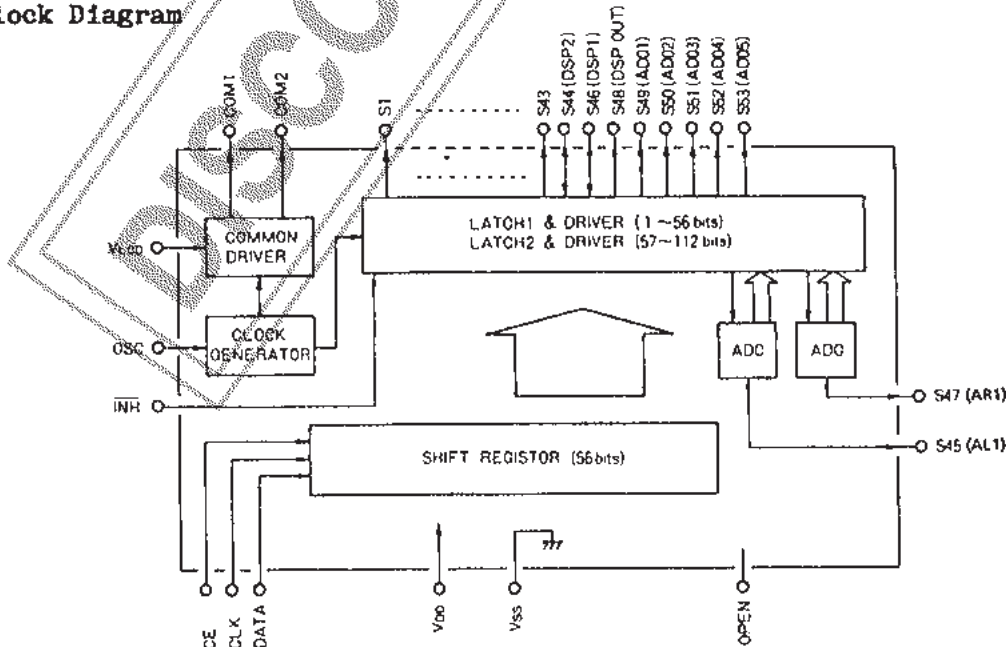


Fig.1 Step Voltage Difference  
Input voltage on S45(AD2), S47(AD1)



## Block Diagram



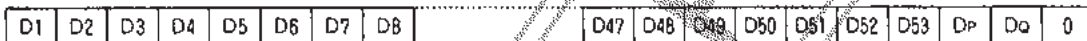
**Pin Description**

- . S1 to S43 : Segment output pin
- . S46(DSP1),S44(DSP2) : Segment output or DSP input pin
- . S47(AD1),S45(AD2) : Segment output or AD input pin
- . S48(DSPOUT) : Segment output or DSP output pin
- . S49 to S53(AD01to5) : Segment output or AD output pin
- . COM1,2 : Common output pin (COM1 only is used for 1/1duty and in this case COM2 is open.)
- . V<sub>LCD</sub> : LCD bias voltage setting pin
- . OSC : OSC pin
- . CE,CLK,DATA : Input pin for serial data transfer
- . V<sub>SS</sub>,V<sub>DD</sub> : Power supply pin
- . INH : Display blanking input pin (Available for output driver only. Therefore, serial data can be also transferred during unlighting.)
- . OPEN : No connection

**Data Transfer Mode**

- . 1/1duty

Transfer direction (56 bits)



- . 1/2duty (When the number of display segments does not exceed 52, transfer data is 56 bits long. Transfer mode is the same as for 1/1 duty. Data of D54 to D106 only cannot be changed.)

Transfer direction (112 bits)



D53, D106: Dummy bit (don't care)

- D<sub>1</sub> to D<sub>53</sub> : Display data (1/1duty)                   Lighted at "1"
- D<sub>1</sub> to D<sub>106</sub> : Display data (1/2duty)               Unlighted at "0"
- (Note) When the AD, DSP functions are selected:
- 1/1duty : D46 to D53 ----- Dummy bit (don't care)
- 1/2duty : D88 to D106 ----- Dummy bit (don't care)
- DP : Drive mode select bit  
    1/2duty at "1"
- 1/1duty at "0"
- DQ : AD, DSP function select bit  
    AD, DSP function at "1"
- Segment output at "0"
- X : Don't care

(Note) When the AD, DSP functions selected are not used, fix the AD1,AD2,DSP1,DSP2 pins at V<sub>DD</sub> or V<sub>SS</sub>.

**Sample Transfers**

. 1/1 duty



. 1/2 duty and 52 segments or less



. 1/2 duty and 52 segments or more

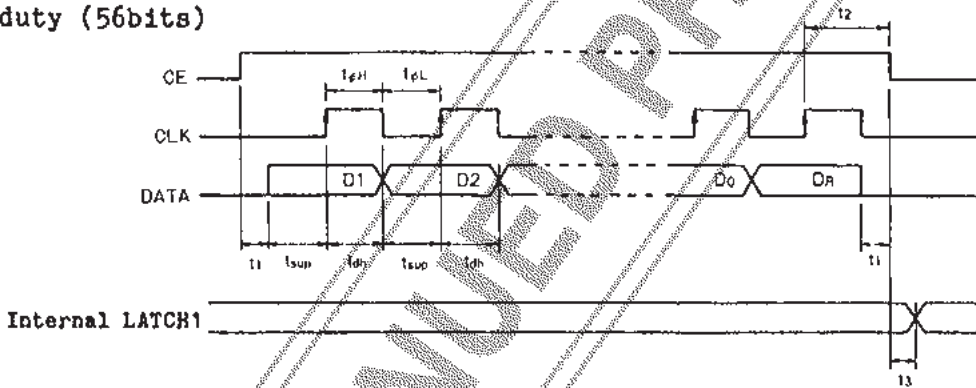


(Note) 1/2 duty and 52 segments or less do not allow transfer shown below.

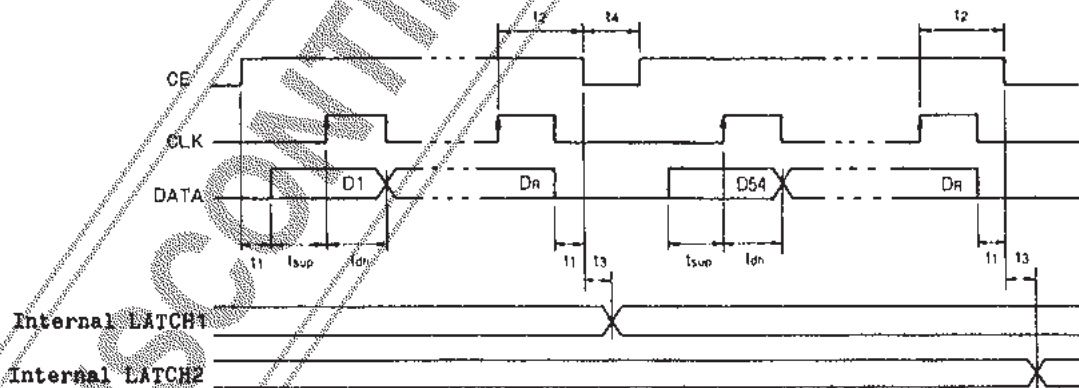


**Serial Data**

. 1/1 duty (56bits)

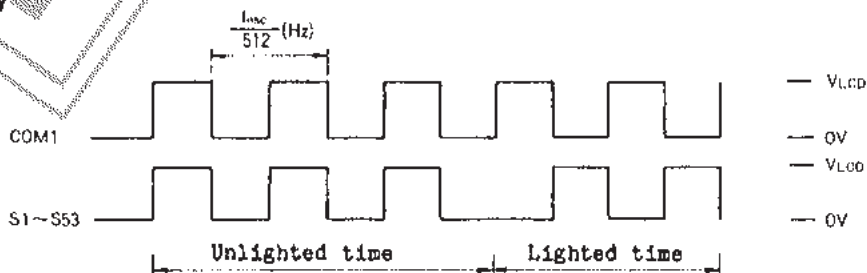


. 1/2 duty (112bits)



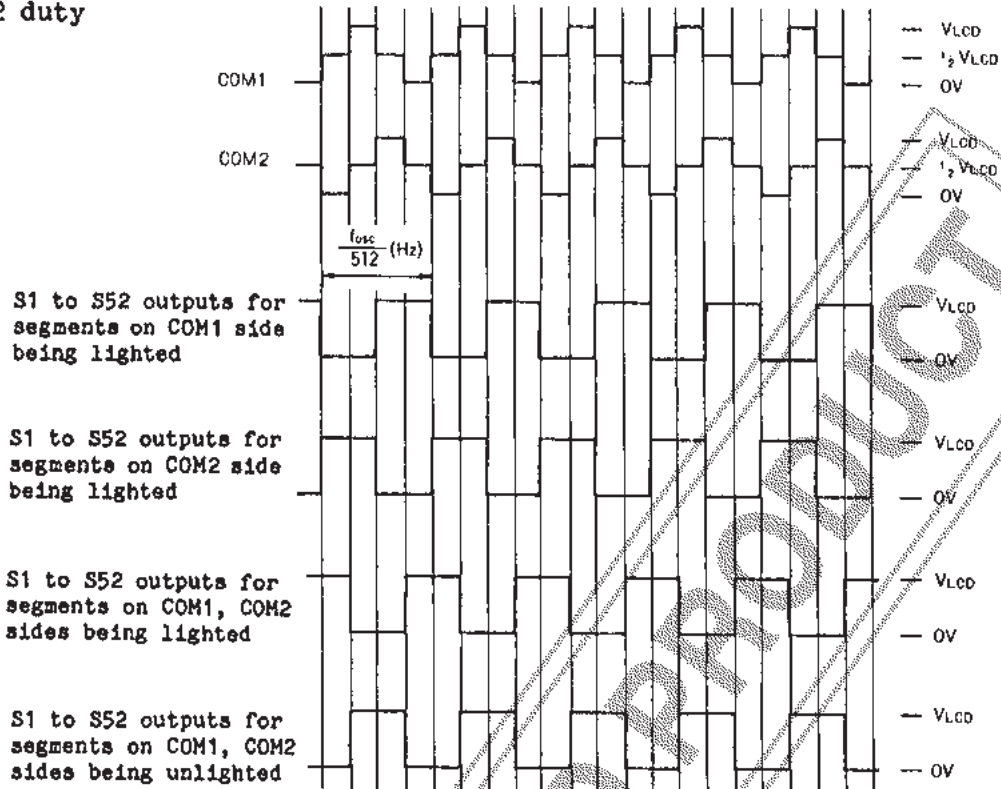
**Output Waveforms**

. 1/1 duty



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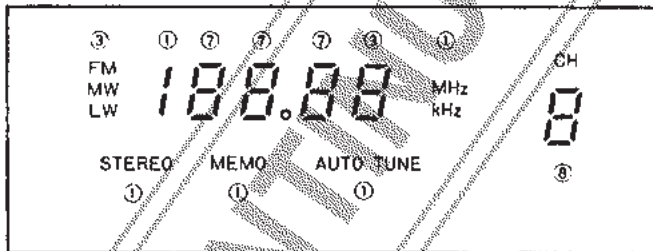
. 1/2 duty



Sample Display

. Static drive (1/1duty) (AD, DSP pins are not used.)

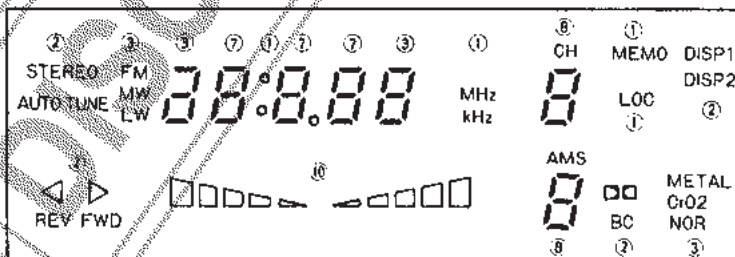
40 segments-used application (Up to 53 segments usable)



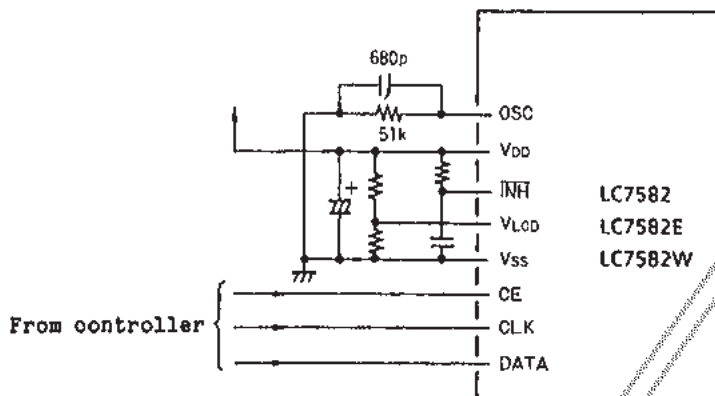
Note: ○ : Number of segments

. 1/2duty drive

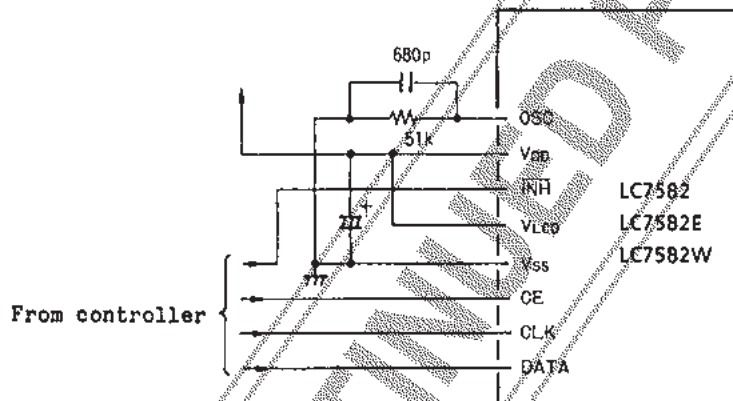
71 segments-used application (Up to 104 segments usable)



Sample Application Circuit 1



Sample Application Circuit 2



Note) The internal display data is indeterminate immediately after  $V_{DD}$  rise. If the display is kept lighted as it is, the display will have no meaning. The display is forced to be unlighted when the  $\overline{INH}$  is at "L" level. Do not release ("H") until the transfer of display data from the controller is completed.

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Correspondence between Transfer (External Input) Data and Output Pin

(Note) COM1 only is used at 1/1 duty.

Output pin	DP		0		1		COM1	COM2
	DQ	0		1				
		1/1 duty		1/2 duty				
S1	D1	D1	D1	D1			○	
			D2	D2				
S2	D2	D2	D3	D3			○	
			D4	D4				
S3	D3	D3	D5	D5			○	
			D6	D6				
S26	D26	D26	D51	D51			○	
			D52	D52				
S27	D27	D27	D54	D54			○	
			D55	D55				
S28	D28	D28	D56	D56			○	
			D57	D57				
S43	D43	D43	D86	D86			○	
			D87	D87				
S44	D44	D44	D88	※DSP 2			○	
			D89					○
S45	D45	D45	D90	※ALI			○	
			D91					○
S46	D46	※DSP 1	D92	※DSP 1			○	
			D93					○
S47	D47	※ARI	D94	※ARI			○	
			D95					○
S48	D48	※DISPO1	D96	※DSPO1			○	
			D97	※DSPO2				
S49	D49	※ARO1	D98	※ARO1			○	
			D99	※ALO1				
S50	D50	※ARO2	D100	※ARO2			○	
			D101	※ALO2				
S51	D51	※ARO3	D102	※ARO3			○	
			D103	※ALO3				
S52	D52	※ARO4	D104	※ARO4			○	
			D105	※ALO4				
S53	D53	※ARO5	Always lighting	※ARO5			○	
			Always lighting	※ALO5				

Note

- . DSP1 : External display input data name. The output is DSP01.
- . DSP01 : External display output data name. The input is DSP1.
- . DSP2 : External display input data name. The output is DSP02.
- . DSP02 : External display output data name. The input is DSP2.
- . ARI : AD converter input data name. The output is ARO1 to 5.
- . ARO1 to 5 : AD converter output data name. The input is ARI.
- . ALI : AD converter input data name. The output is ALO1 to 5.
- . ALO1 to 5 : AD converter output data name. The input is ALI.



**OSC Frequency**

When determining the OSC frequency, see below.

Fig. 1 OSC Frequency at OSC Pin vs. CR

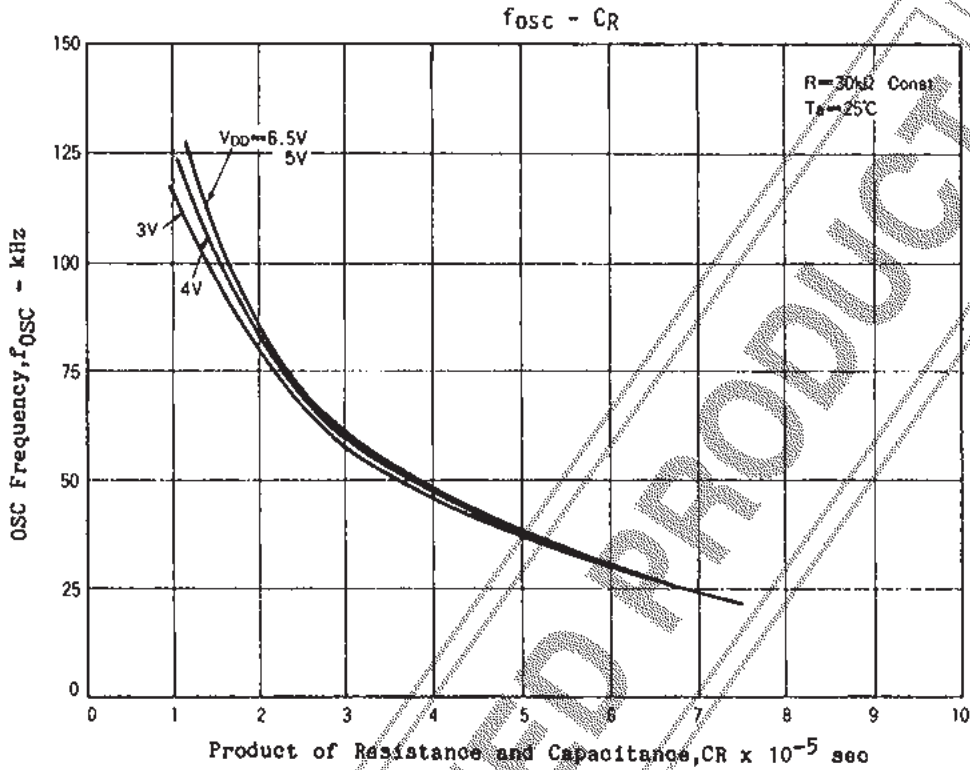
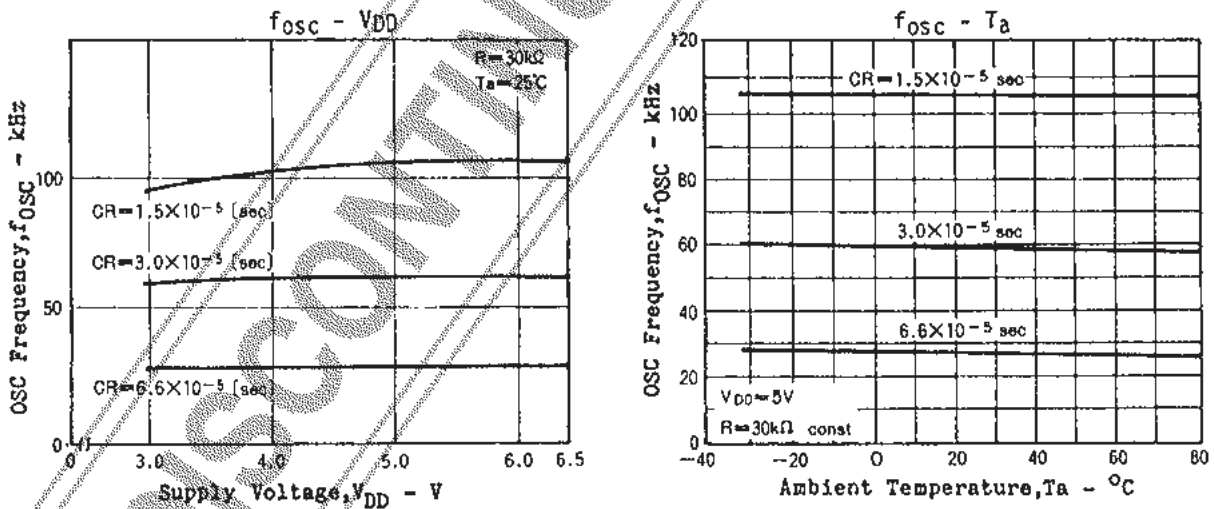


Fig. 2 OSC Frequency at OSC Pin vs.  $V_{DD}$



Recommended external resistor value  
Recommended external capacitor value

- 10kohms to 100kohms (carbon)
- 330pF to 3300pF
- 330pF to 820pF (ceramic, temperature coefficient: 0)
- 1000pF to 3300pF (polyester, temperature coefficient: plus)

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