Ordering number: EN 2290C

CMOS LSI

SANYO No.2290C

LC7582,7582E,7582W

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.

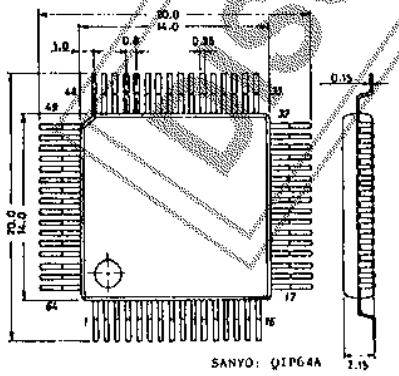
Features

- 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
- $\overline{INH}$ pin for blanking out display

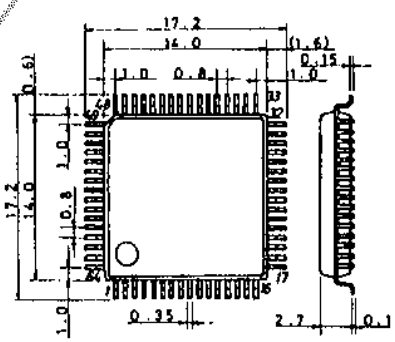
Absolute Maximum Ratings at Ta=25°C, V_{SS}=0V

					unit
Maximum Supply Voltage	V_{DD}max	V_{DD}		-0.3 to +7.0	V
		V_{LCD}		-0.3 to V_{DD}+0.3	V
Input Voltage	V_{IN}(1)	CE,CLK,DATA, $\overline{INH}$		-0.3 to +7.0	V
	V_{IN}(2)	S44 to S47	Output OFF(Used as AD1,AD2,DSP1,DSP2)	-0.3toV_{DD}+0.3	V
	V_{IN}(3)	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 S53		100	uA
	I_{OUT}(2)	COM1,2		1.0	mA
Allowable Power Dissipation	Pdmax	Ta=85°C		100	mW
Operating Temperature	Topg			-30 to +85	°C
Storage Temperature	Tstg			-40 to +125	°C

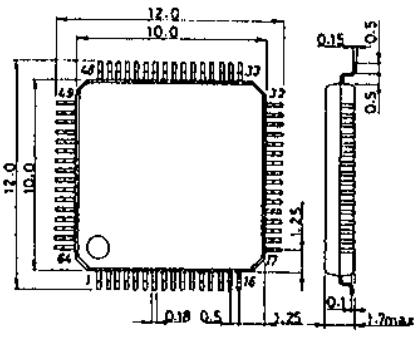
Case Outline 3057 [LC7582]
(unit: mm)



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_{SS}=0V

		Pin		min	typ	max	unit
Supply Voltage	V_{DD}	V_{DD}		3.0		6.5	V
	V_{LCD}	V_{LCD}		3.0		V_{DD}	V
Input "H"-Level Voltage	$V_{IH}(1)$	$\overline{INH}$		0.7V_{DD}		6.5	V
Input "L"-Level Voltage	$V_{IL}(1)$	"		0		0.3V_{DD}	V
Input "H"-Level Voltage	$V_{IH}(2)$	S44,S46	Output OFF(DSP1, DSP2-used mode)	0.7V_{DD}		V_{DD}	V
Input "L"-Level Voltage	$V_{IL}(2)$	"	"	0		0.3V_{DD}	V
Input "H"-Level Voltage	$V_{IH}(3)$	CE,CLK,DATA		0.8V_{DD}		6.5	V
Input "L"-Level Voltage	$V_{IL}(3)$	"		0		0.2V_{DD}	V
Recommended External Resistance	R	OSC			51		kohm
Recommended External Capacitance	C	OSC			680		pF
OSC Guaranteed Range	f_{OSC}	OSC		25	50	100	kHz
"L"-Level Clock Pulse Width	$t_{\phi L}$	CLK		0.25			usec
"H"-Level Clock Pulse Width	$t_{\phi H}$	"		0.25			usec
Setup Time	t_{sup}	CLK,DATA		0.25			usec
Data Hold Time	t_{dh}	"		0.25			usec
Serial Data Pulse Width	t_1	CE,DATA		1			usec
"	t_2	CE,CLK		1.25			usec
"	t_3					1	usec
"	t_4			4			usec

Electrical Characteristics under Allowable Operating Conditions

		Pin		min	typ	max	unit
Input "H"-Level Current	$I_{IH}(1)$	CE,CLK,DATA, $\overline{INH}$	V_I=6.5V			5	uA
Input "L"-Level Current	$I_{IL}(1)$	"	V_I=0V			5	uA
Input "H"-Level Current	$I_{IH}(2)$	S44,S46	V_I=V_{DD}			10	uA
Input "L"-Level Current	$I_{IL}(2)$	"	V_I=0V			10	uA
Input "H"-Level Current	$I_{IH}(3)$	AD1,AD2	V_I=V_{DD}			10	uA
Input "L"-Level Current	$I_{IL}(3)$	"	V_I=0V			10	uA
Output "H- Level Voltage	$V_{OH}(1)$	S1 to S53	Io=-10uA	V_{DD}-1.0			V
Output "L- Level Voltage	$V_{OL}(1)$	"	Io=10uA			1.0	V
Output "H"-Level Voltage	$V_{OH}(2)$	COM1,COM2	Io=-100uA	V_{LCD}-0.6			V
Output "L"-Level Voltage	$V_{OL}(2)$	"	Io=100uA			0.6	V

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		Pin		min	typ	max	unit
Center Level Voltage	V_{MID}	"	V_{LCD}=6.5V, Io=±100uA	2.65	3.25	3.85	V
"	V_{MID}	"	V_{LCD}=3.0V, Io=±100uA	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=51kohms,C=680pF	40	50	60	kHz
Supply Current	I_{DD}					1	mA
"	I_{LCD}	V_{LCD}				2	mA
Hysteresis Voltage	V_H	CE,CLK,DATA	V_{DD}=5V		0.3		V

Pin Assignment

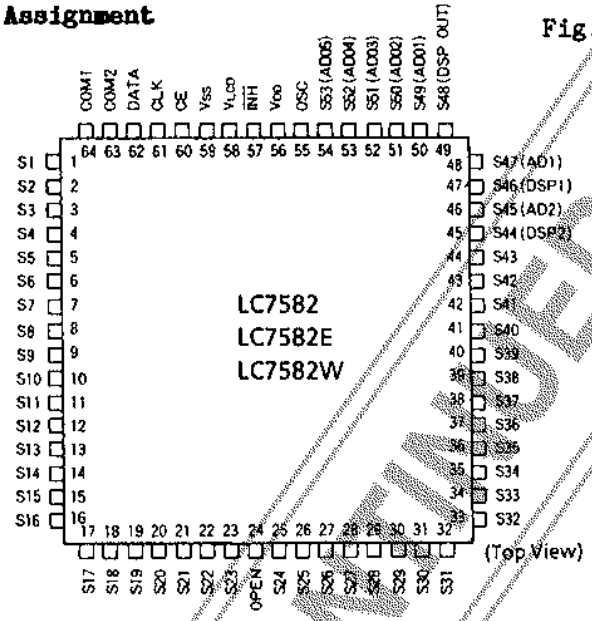
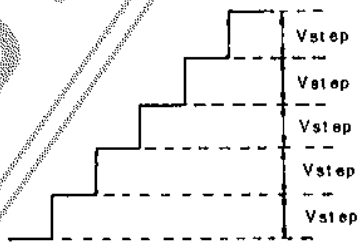
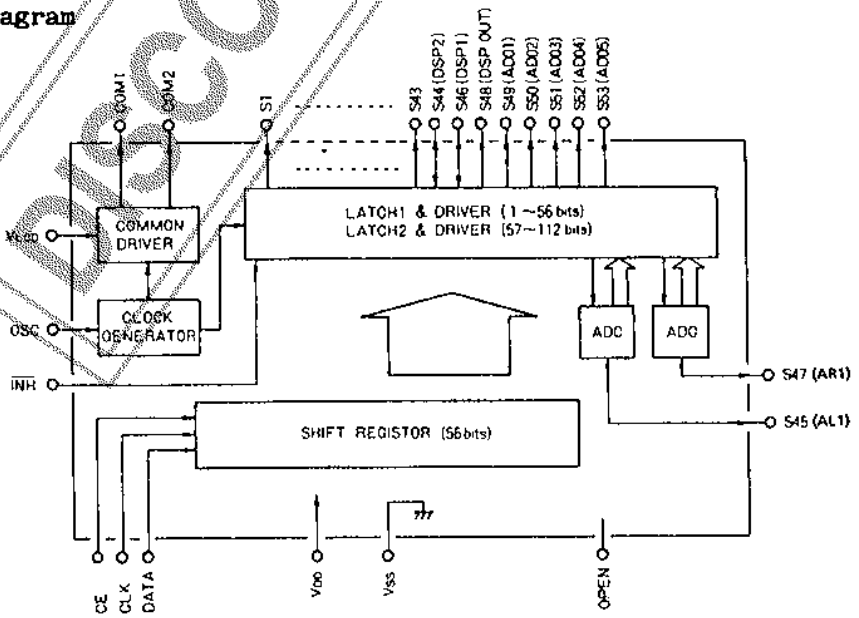


Fig.1 Step Voltage Difference Input voltage on S45(AD2),S47(AD1)



Block Diagram



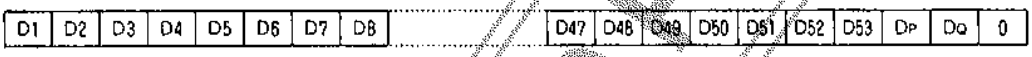
Pin Description

- 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 outut 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_{LCD} : LCD bias voltage setting pin
- OSC : OSC pin
- CE,CLK,DATA : Input pin for serial data transfer
- V_{SS},V_{DD} : Power supply pin
- $\overline{INH}$: Display blanking input pin (Available for output driver only. Therefore, serial data can be also transferred during unlighting.)
- OPEN : No connection

Data Transfer Mode

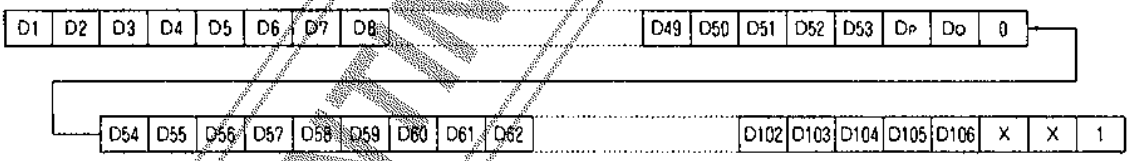
- 1/1duty

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_1 to D_{53} : Display data (1/1duty) Lighted at "1"
D_1 to D_{106} : 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_{DD} or V_{SS}.

Sample Transfers

. 1/1 duty

D1	D2	D3		D52	D53	0	Do	0

. 1/2 duty and 52 segments or less

D1	D2	D3		D52	D53	1	Do	0

. 1/2 duty and 52 segments or more

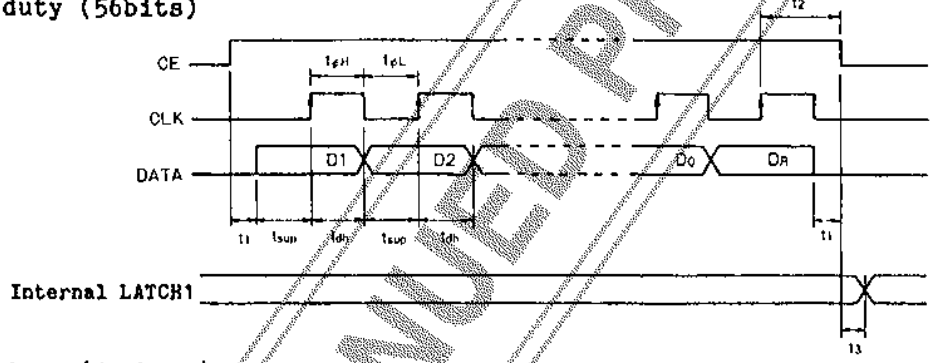
D1	D2	D3		D52	D53	1	Do	0	D54	D56	D57		D105	D106	X	X	1

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

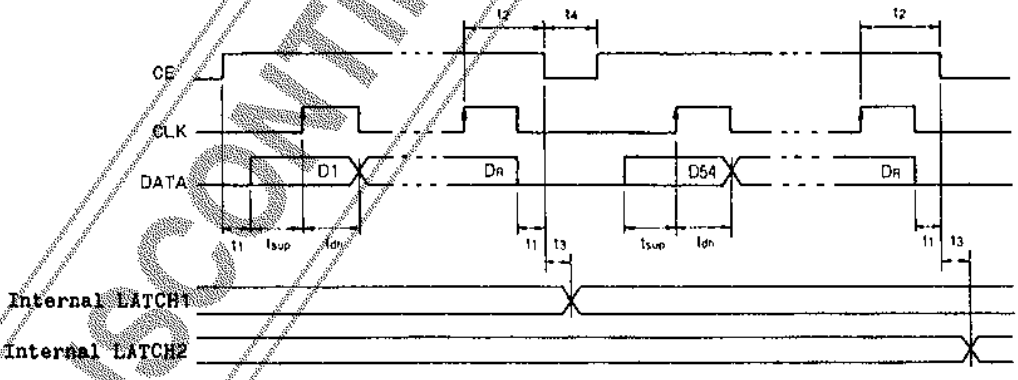
D54	D55	D56		D105	D106	X	X	1

Serial Data

. 1/1 duty (56bits)

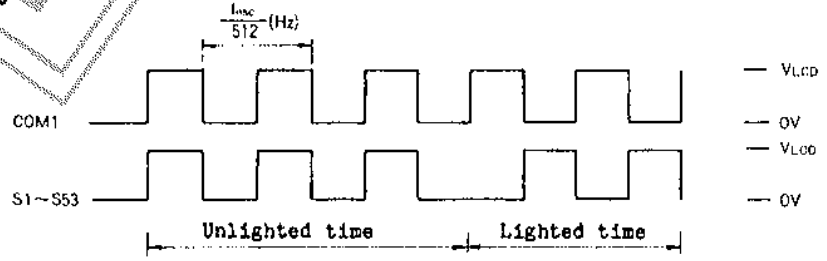


. 1/2 duty (112bits)

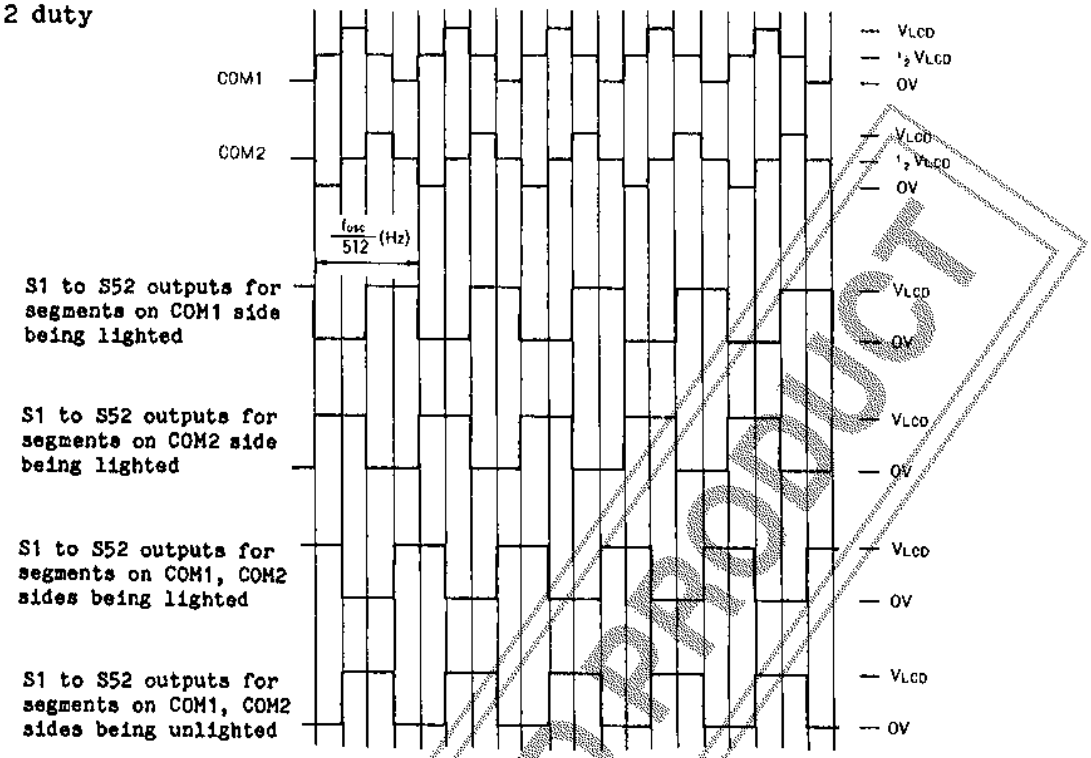


Output Waveforms

. 1/1 duty



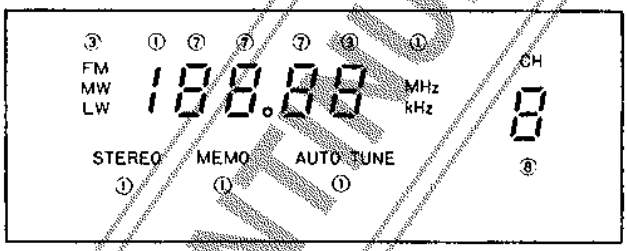
. 1/2 duty



Sample Display

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

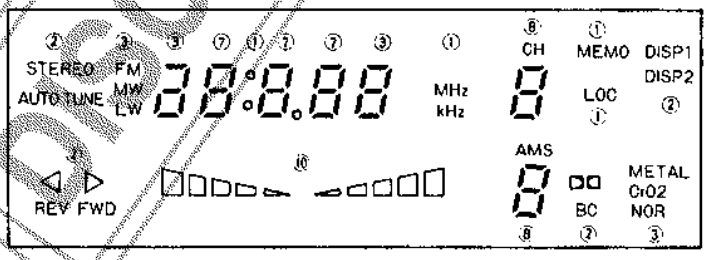
40 segments-used application (Up to 53 segments usable)



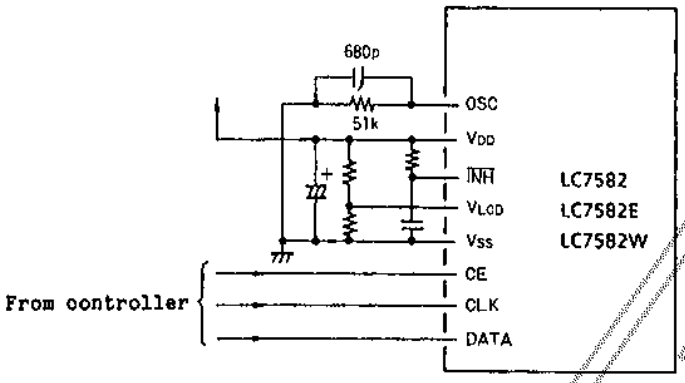
Note: ○ : Number of segments

. 1/2duty drive

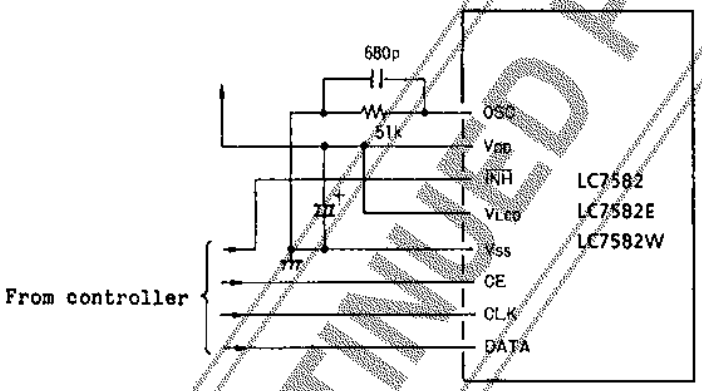
71 segments-used application (Up to 104 segments usable)



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.

Correspondence between Transfer (External Input) Data and Output Pin

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

OP / DQ / Output pin	0		1		COM1	COM2
	0	1	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	※DSPO1	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 DSPO1.
- DSPO1 : External display output data name. The input is DSP1.
- DSP2 : External display input data name. The outut is DSPO2.
- DSPO2 : 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

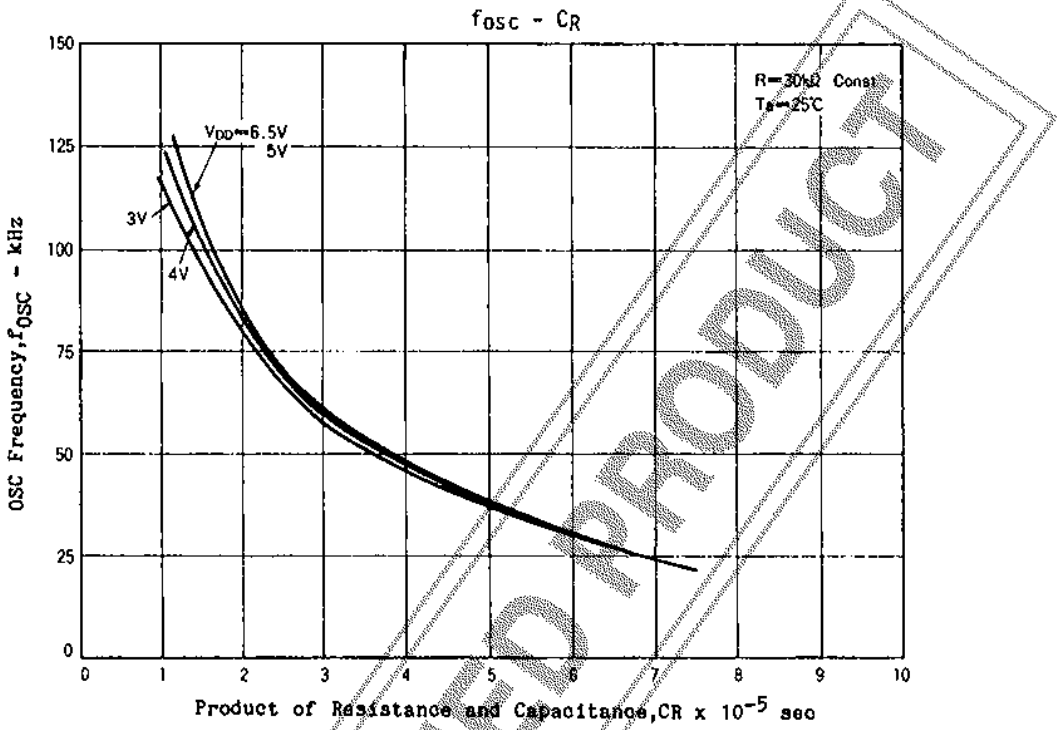
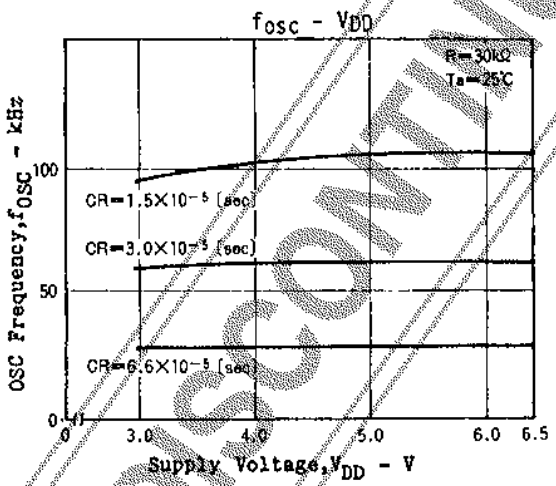
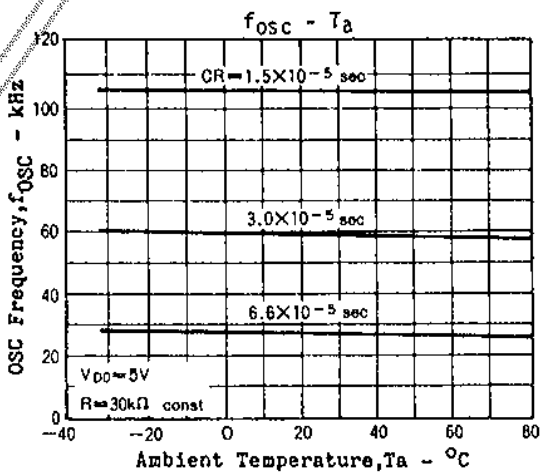


Fig. 2 OSC Frequency at OSC Pin vs. V_{DD}





Recommended external resistor value 10kohms to 100kohms (carbon)

Recommended external capacitor value 330pF to 3300pF
330pF to 820pF (ceramic, temperature coefficient: 0)
1000pF to 3300pF (polyester, temperature coefficient: plus)