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SANYO Semiconductors

DATA SHEET

CMOS LSI

LC75822E/75822W — LCD Display Drivers

Overview

The LC75822E and LC75822W are general-purpose LCD display drivers that can be used for frequency display in microprocessor-controlled radio receivers and in other display applications.

Features

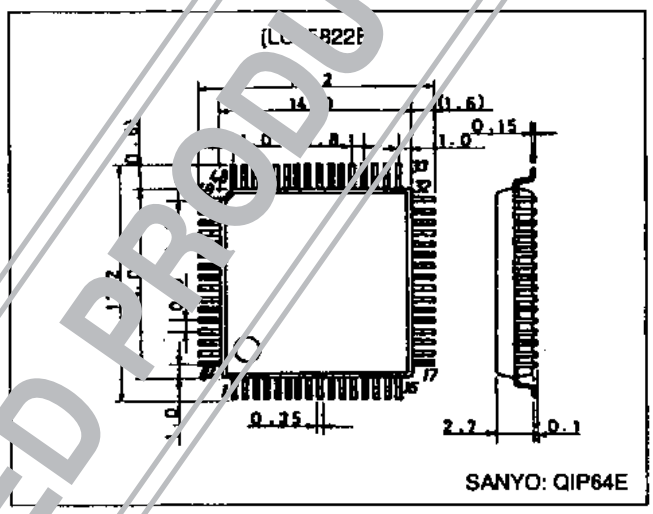
- 53 segment outputs (the maximum for static drive)
- Two drive types: static (1/1) duty (53 segments) and 1/2 duty (104 segments)
- Serial data input supports CCB* format communication with the system controller
- $\overline{\text{INH}}$ pin for turning off all display output
- The LC75822 is a CCB version of the LC75821 product.

- **CCB is a trademark of SANYO ELECTRIC CO., LTD.**
- **CCB is SANYO's original bus format and all the bus addresses are controlled by SANYO.**

Package Dimensions

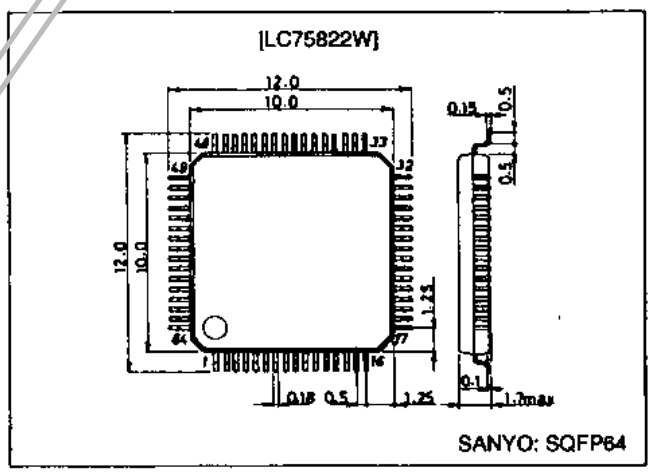
unit: mm

3159-QFP64E



unit: mm

3199-SQFP64



SANYO Electric Co.,Ltd. Semiconductor Company
TOKYO OFFICE Tokyo Bldg., 1-10, 1 Chome, Ueno, Taito-ku, TOKYO, 110-8534 JAPAN

Specifications

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

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V_{DD} max	V_{DD}	−0.3 to +7.0	V
	V_{LCD} max	V_{LCD}	−0.3 to V_{DD} + 0.3	V
Input voltage	$V_{IN}1$	CE, CL, DI, $\overline{INH}$	−0.3 to +7.0	V
	$V_{IN}2$	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	300	µA
	$I_{OUT}2$	COM1, COM2	1.0	mA
Allowable power dissipation	Pd max	Ta = 85°C	100	mW
Operating temperature	Topr		−40 to +85	°C
Storage temperature	Tstg		−55 to +125	°C

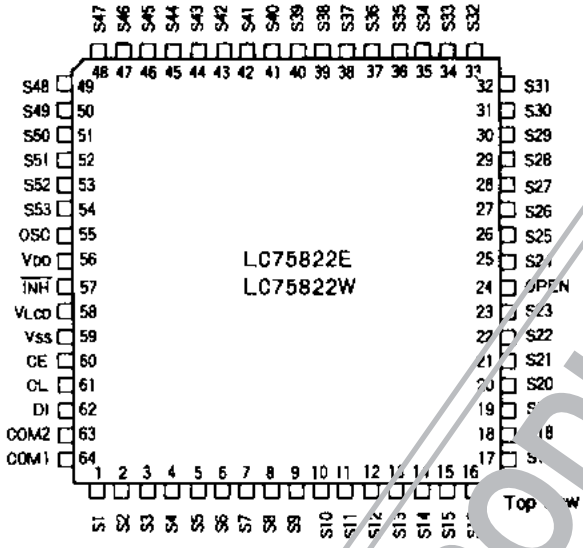
Allowable Operating Ranges at Ta = −40 to +85°C, V_{SS} = 0 V

Parameter	Symbol	Conditions	min	typ	max	Unit
Supply voltage	V_{DD}	V_{DD}	4.5		6.5	V
	V_{LCD}	V_{LCD}	3.0		V_{DD}	V
Input high-level voltage	$V_{IH}1$	$\overline{INH}$	0.7 V_{DD}		6.5	V
Input low-level voltage	$V_{IL}1$	$\overline{INH}$	0		0.3 V_{DD}	V
Input high-level voltage	$V_{IH}2$	CE, CL, DI	0.8 V_{DD}		6.5	V
Input low-level voltage	$V_{IL}2$	CE, CL, DI	0		0.2 V_{DD}	V
Recommended external resistance	R_{OSC}	OSC		51		kΩ
Recommended external capacitance	C_{OSC}	OSC		680		pF
Guaranteed oscillation range	f_{OSC}	OSC	25	50	100	kHz
Clock low-level pulse width	t_{wL}	CL	250			ns
Clock high-level pulse width	t_{wH}	CL	250			ns
Data setup time	t_{ds}	CL, DI	250			ns
Data hold time	t_{dh}	CL, DI	250			ns
CE wait time	t_{cp}	CE, CL	250			ns
CE setup time	t_{cs}	CE, CL	250			ns
CE hold time	t_{ch}	CE, CL	250			ns

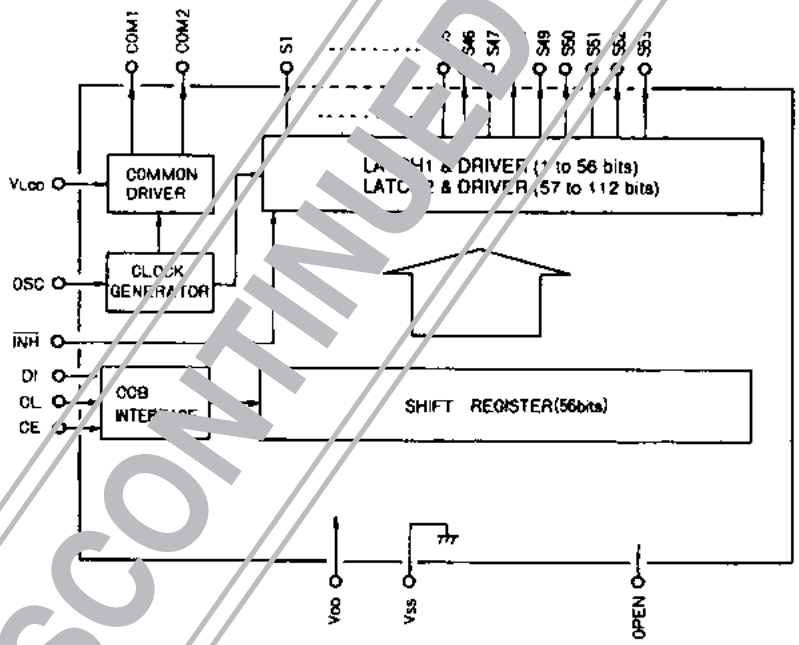
Electrical Characteristics for the Allowable Operating Ranges

Parameter	Symbol	Conditions	min	typ	max	Unit
Input high-level current	I_{IH}	CE, CL, DI, $\overline{INH}$: V_I = 6.5 V			5	µA
Input low-level current	I_{IL}	CE, CL, DI, $\overline{INH}$: V_I = 0 V	−5			µA
Output high-level voltage	$V_{OH}1$	S1 to S53: I_O = −10 µA	V_{DD} − 1.0			V
Output low-level voltage	$V_{OL}1$	S1 to S53: I_O = 10 µA			1.0	V
Output high-level voltage	$V_{OH}2$	COM1, COM2: I_O = −100 µA	V_{LCD} − 0.6			V
Output low-level voltage	$V_{OL}2$	COM1, COM2: I_O = 100 µA			0.6	V
Mid-level voltage	$V_{MID}1$	COM1, COM2: V_{LCD} = 6.5 V, I_O = ±100 µA	2.65	3.25	3.85	V
	$V_{MID}2$	COM1, COM2: V_{LCD} = 3.0 V, I_O = ±100 µA	0.9	1.5	2.1	V
Oscillator frequency	f_{OSC}	OSC: R = 51 kΩ, C = 680 pF	40	50	60	kHz
Hysteresis voltage	V_H	CE, CL, DI: V_{DD} = 5 V	0.3			V
Current drain	I_{DD}				0.6	mA
	I_{LCD}	V_{LCD}			2	mA

Pin Assignment



Block Diagram

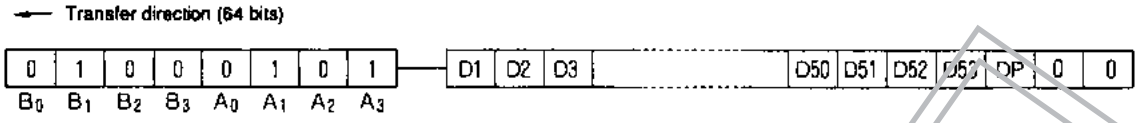


Pin Functions

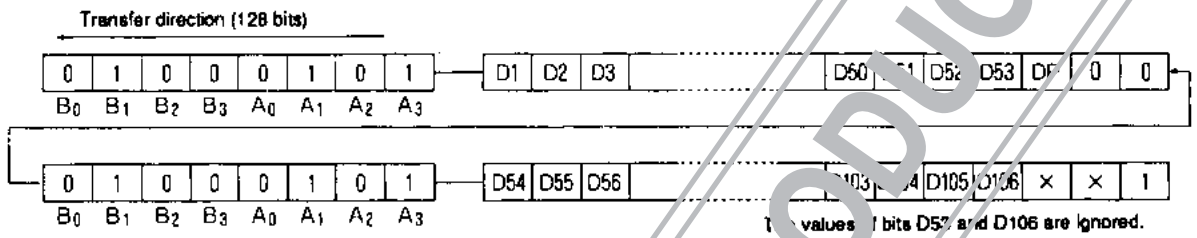
Pin	Function
S1 to S53	Segment output pins
COM1, COM2	Common output pins (Only COM1 is used in static (1/1) drive. COM2 must be left open in that mode.)
V_{LCD}	LCD bias voltage setting
OSC	Oscillator connection
CE, CL, DI	Serial data transfer inputs
V_{SS}, V_{DD}	Power supply
$\overline{INH}$	Display off control input $\overline{INH}$ = low (V_{SS}) .....Display off (S1 to S53, COM1, COM2 = low) $\overline{INH}$ = high (V_{DD}).....Display on Note that serial data transfers are still allowed when display output is turned off using this pin.
OPEN	Make no connections to this pin.

Data Transfer Format

1. Static (1/1) duty



2. 1/2 duty (Only 64 bits need to be transferred if there are no more than 52 display segments. The transfer format is identical to the static duty case. It is not possible to change the D54 to D106 data without specifying the D1 to D53 data.)



CCB address: $A2_H$

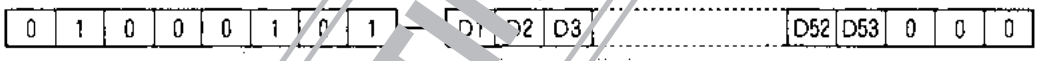
DP: Drive type selection bit
- DP = 0: 1/1 duty
- DP = 1: 1/2 duty

D1 to D106: Display data
- Dn (for n = 1 to 106) = 0: Segment off
- Dn (for n = 1 to 106) = 1: Segment on

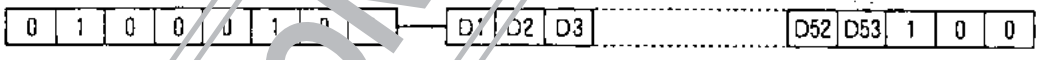
×: don't care

Data Transfer Examples

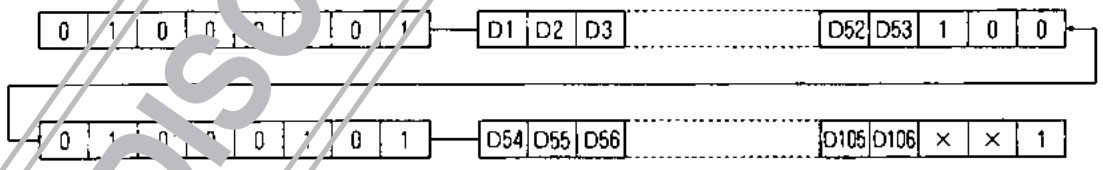
1. Static duty



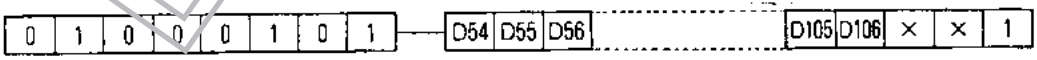
2. 1/2 duty with 52 or fewer segments



3. 1/2 duty with more than 52 segments

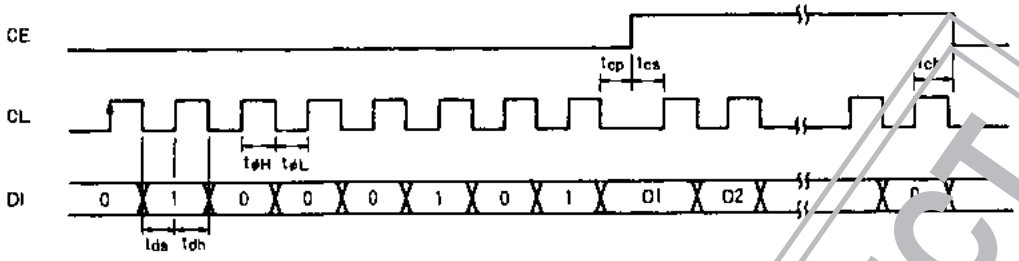


Note: The following transfer format is not allowed in 1/2 duty with 52 or fewer segments.

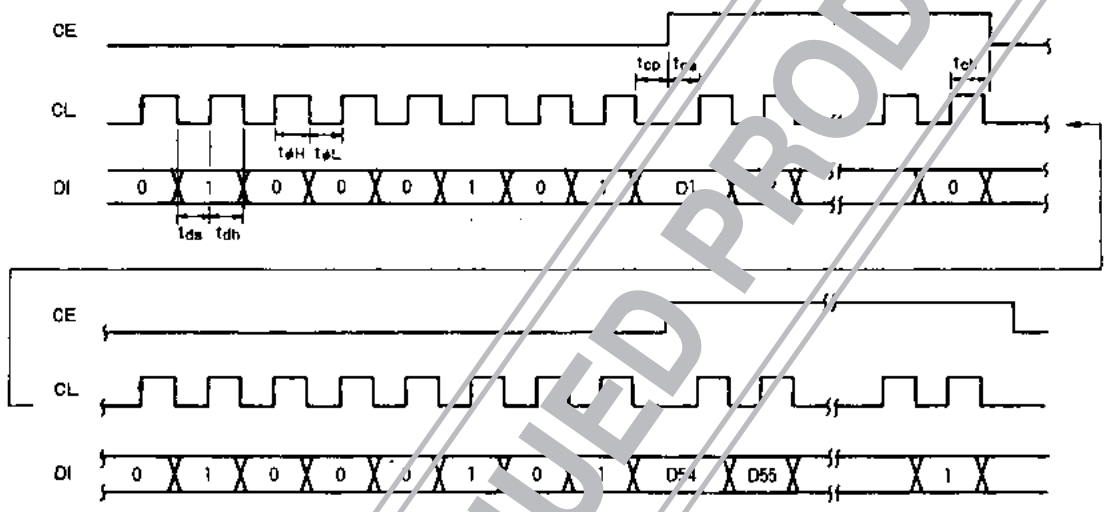


Serial Data

1. Static duty (64 bits)

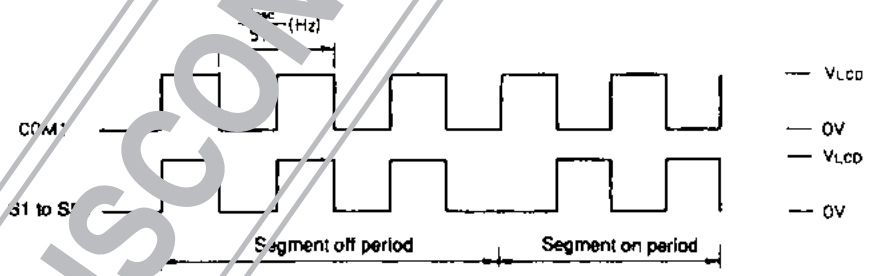


2. 1/2 duty (128 bits)

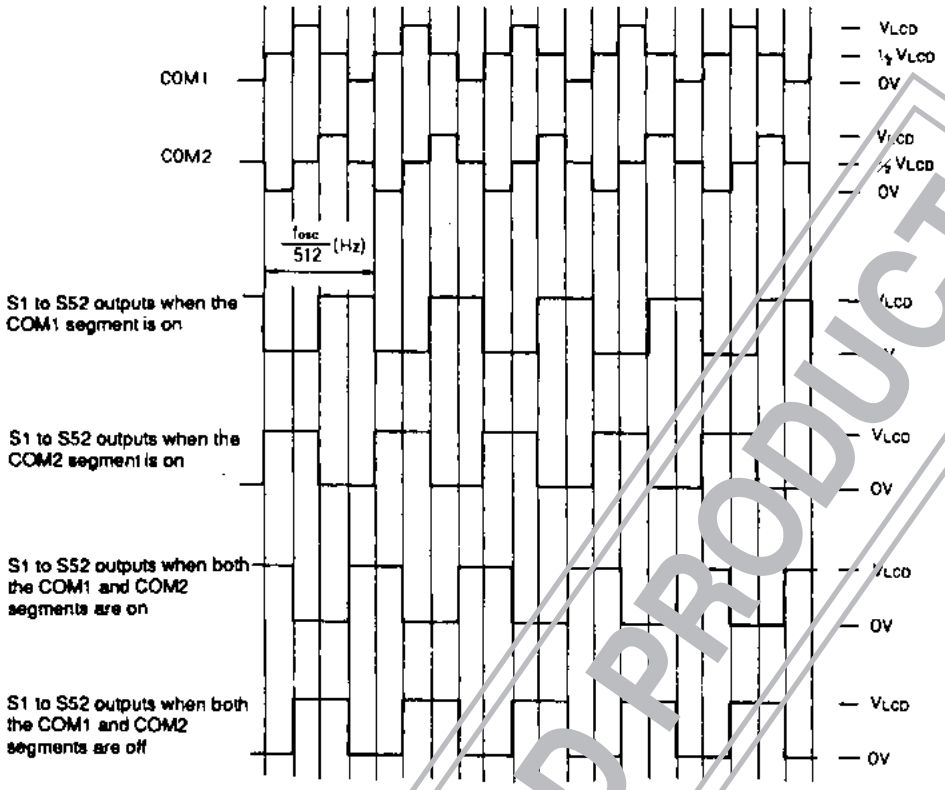


Output Waveforms

1. Static duty



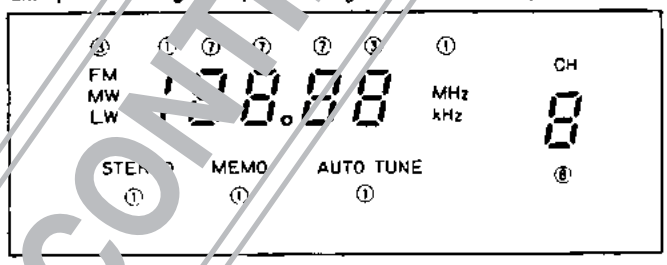
2. 1/2 duty



Display Examples

1. Static drive (1/1 duty)

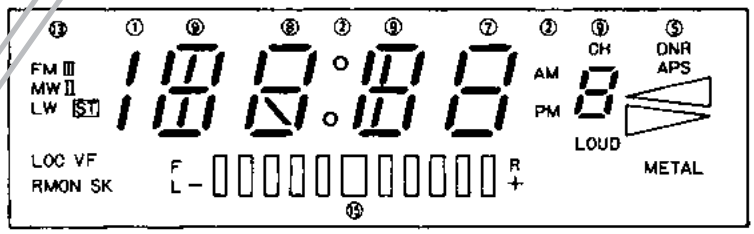
Example with 80 segments (Up to 104 segments can be driven.)



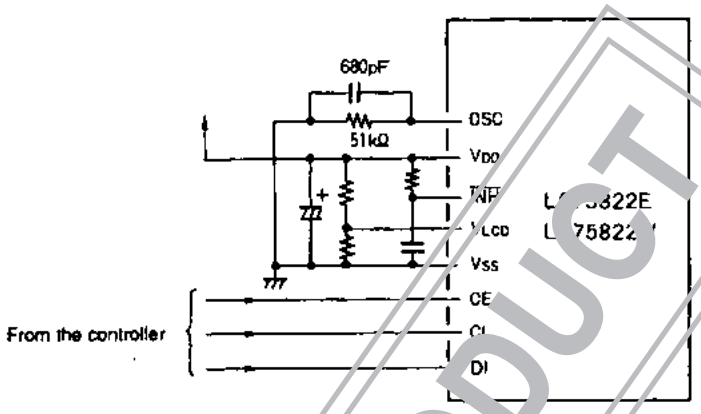
Note: Numbers in circles indicate the number of segments used.

2. 1/2 duty drive

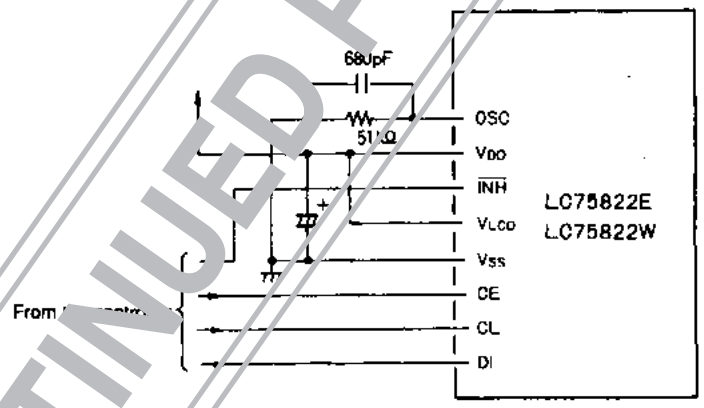
Example with 80 segments (Up to 104 segments can be driven.)



Sample Application Circuit 1



Sample Application Circuit 2



Note: The internal display data is undefined when power (V_{DD}) is first applied. Since a meaningless pattern will be displayed if the display is turned on in that state, the display should be turned off by setting $\overline{INH}$ low and turned on only after display data has been sent from the controller.

Transfer (external input) Data/Output Pin Correspondence

DP / Output pin	0	1	COM1	COM2
	1/1 duty	1/2 duty		
S1	D1	D1	O	
		D2		O
S2	D2	D3	O	
		D4		O
S3	D3	D5	O	
		D6		O
⋮	⋮	⋮	⋮	⋮
S26	D26	D51	O	
		D52		O
S27	D27	D54	O	
		D55		O
S28	D28	D56	O	
		D57		O
⋮	⋮	⋮	⋮	⋮
S43	D43	D86	O	
		D87		O
S44	D44	D88	O	
		D89		O
S45	D45	D90	O	
		D91		O
S46	D46	D92	O	
		D93		O
S47	D47	D94	O	
		D95		O
S48	D48	D96	O	
		D97		O
S49	D49	D98	O	
		D99		O
S50	D50	D100	O	
		D101		O
S51	D51	D102	O	
		D103		O
S52	D52	D104	O	
		D105		O
S53	D53	Always on	O	
		Always on		O

Note: Only COM1 is used in static (1/1 duty) drive.

Oscillator Frequency

Refer to the figure below when determining the oscillator frequency.

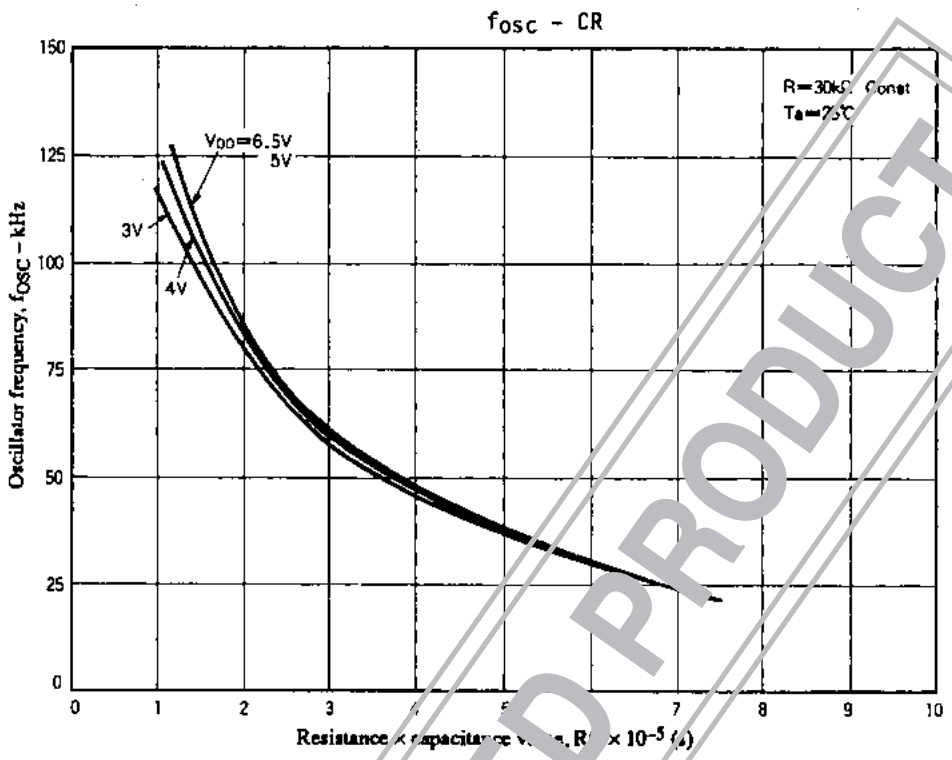


Figure 1 LC75822E, 75822W Oscillator Frequency vs. OSC Pin RC Constant

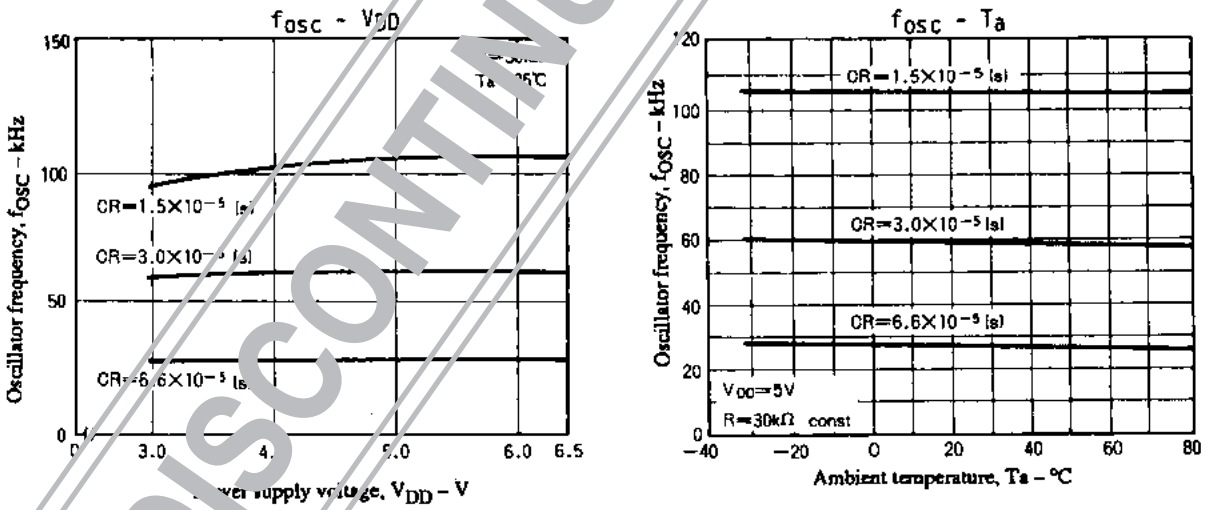


Figure 2 LC75822E, 75822W Oscillator Frequency vs. V_{DD}

Recommended range for external resistance: 10 to 100 kΩ (Carbon resistance)

Recommended range for external capacitance: 330 to 3300 pF

330 to 820 pF: (Ceramic capacitance with a zero temperature coefficient)

1000 to 3300 pF: (Mylar capacitance with a positive temperature coefficient)