



Specification

For

LCD Module

KD24064A-YG



- Module: 240 X 64 Dots
- Glass Type: STN, Yellow-green
- Display Mode: Positive; Transflective
- Viewing Direction: 6 O 'clock
- Driving Method: 1/64 Duty, 1/9 Bias
- Dot Size: 0.49mm x 0.49mm
- Dot Pitch: 0.53mm x 0.53mm
- Module Size: 180.0mm x 65.0mm x 14.2mm (WITH CCFL BACKLIGHT)
163.0mm x 62.0mm x 5.0mm (WITH LED BACKLIGHT)
- Viewing Area: 132.0mm x 39.0mm
- Backlight: LED
- Other option: CCFL or EL Backlight
With or Without DC/DC Convertor
With or Without Controller

The block diagram illustrates the T6963C LCD controller system. The T6963C is connected to a 68000 microprocessor via DB7, WR, RD, CE, C/D, RST, FS, and FG signals. It interfaces with SRAM (D0-D7, AD0-AD14, R/W, CE) and a COMMON DRIVER (3 lines). The COMMON DRIVER outputs 64 lines to the LCD PANEL (240 X 64 DOTS). The LCD PANEL is driven by three SEGMENT DRIVERS, each receiving 5 lines from the T6963C and outputting 80 lines. A POWER CIRCUIT is connected to Vdd, Vss, Vout, and Vo, and outputs 6 lines to the LSI.

Parameter	Symbol	Min	Max	Unit
Supply voltage for logic	VDD	-0.3	7.0	V
Supply voltage for LCD	VDD - VO	-0.3	28	V
Input voltage	VI	-0.3	VDD+0.3	V
Operating temperature	TOP	-20	70	°C
Storage temperature	TST	-30	80	°C



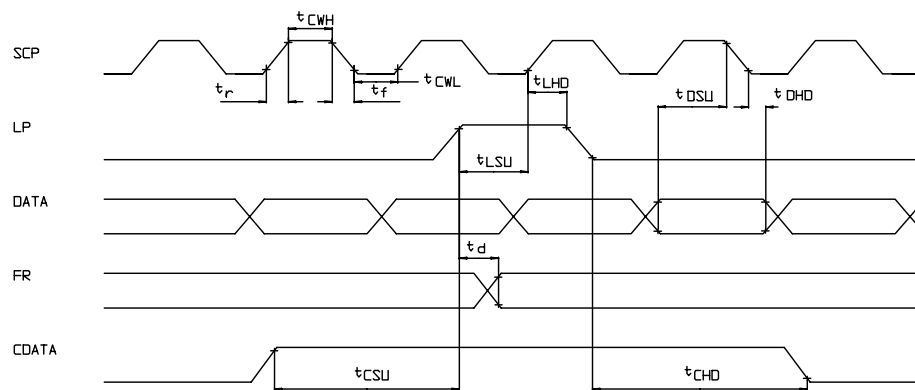
■ DC Characteristics (VDD = +5V±10% , VSS = 0V, Ta = 25°C)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Supply voltage for logic	VDD	---	4.5	5.0	5.5	V
Supply current for logic	IDD	No Including Backlight	---	16	22	mA
Operating voltage for LCD	VDD - VO	0°C	17.0	18.0	19.0	V
		25°C	16.5	17.5	18.5	V
		50°C	15.9	16.9	17.9	V
Input voltage ' H ' level	VIH	---	VDD - 2.2	---	VDD	V
Input voltage ' L ' level	VIL	---	0	---	0.8	V

■ AC Characteristics (VDD = +5V±10% , VSS = 0V, Ta = 25°C)

AC Characteristics (1)

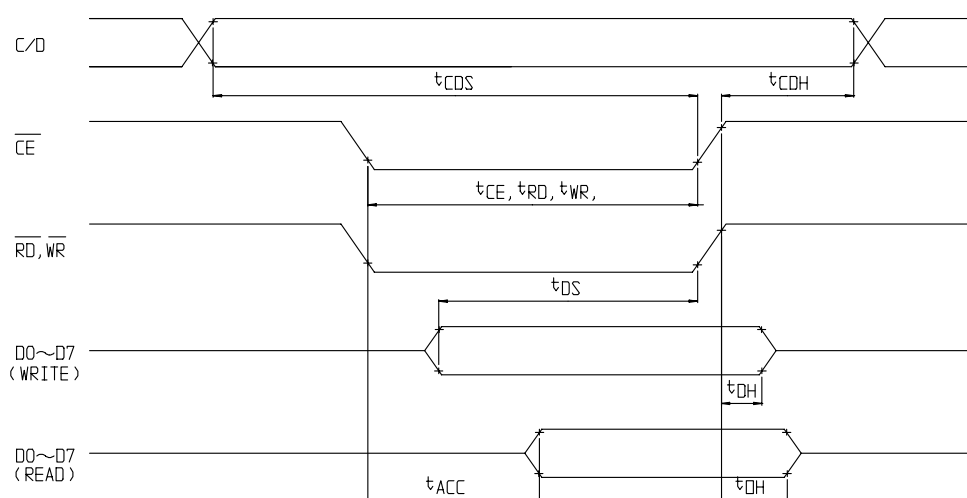
Parameter	Symbol	Min	Max	Unit
Operating frequency	f _{SCP}	---	2.75	MHz
SCP pulse width	t _{CWH} , t _{CWL}	150	---	ns
SCP rise/fall time	t _r , t _f	---	30	ns
LP set up time	t _{LSU}	150	290	ns
LP hold time	t _{LHD}	5	40	ns
Data set up time	t _{DSU}	170	---	ns
Data hold time	t _{DHD}	80	---	ns
FR delay time	t _d	0	90	ns
CDATA set up time	t _{CSU}	450	850	ns
CDATA hold time	t _{CHD}	450	950	ns





AC Characteristics (2)

Parameter	Symbol	Min	Max	Unit
C/D set up time	t_{CDS}	100	---	ns
C/D hold time	t_{CDH}	10	---	ns
CE, RD, WR pulse width	t_{CE}, t_{RD}, t_{WR}	80	---	ns
Data set up time	t_{DS}	80	---	ns
Data hold time	t_{DH}	40	---	ns
Access time	t_{ACC}	---	150	ns
Output hold time	t_{OH}	10	50	ns





■ PIN ASSIGNMENT

Pin No.	Symbol	Level	Description
1	FG	0V	Frame ground
2	VSS	0V	Ground
3	VDD	5.0V	Supply voltage for logic
4	VO	---	Input voltage for LCD
5	WR	L	Write signal
6	RD	L	Read signal
7	CE	L	Chip enable signal
8	C/D	H/L	H : Instruction Code, L : Data
9	NC	--	--
10	RST	L	Reset signal
11	DB0	H/L	Data bit 0
12	DB1	H/L	Data bit 1
13	DB2	H/L	Data bit 2
14	DB3	H/L	Data bit 3
15	DB4	H/L	Data bit 4
16	DB5	H/L	Data bit 5
17	DB6	H/L	Data bit 6
18	DB7	H/L	Data bit 7
19	FS	H/L	Font select signal (H : 6 x 8 dots, L : 8 x 8 dots)
20	VOUT	-15V	Output voltage for LCD



COMMAND DEFINITIONS

COMMAND	CODE	D1	D2	FUNCTION
REGISTERS SETTING	00100001 00100010 00100100	X address Data Low address	Y address 00H High address	Set Cursor Pointer Set Offset Register Set Address Pointer
SET CONTROL WORD	01000000 01000001 01000010 01000011	Low address Columns Low address Columns	High address 00H High address 00H	Set Text Home Address Set Text Area Set Graphic Home Address Set Graphic Area
MODE SET	1000X000 1000X001 1000X011 1000X100 10000XXX 10001XXX	— — — — — —	— — — — — —	OR mode EXOR mode AND mode Text Attribute mode Internal CG ROM mode External CG RAM mode
DISPLAY MODE	10010000 1001XX10 1001XX11 100101XX 100110XX 100111XX	— — — — — —	— — — — — —	Display off Cursor on, blink off Cursor on, blink on Text on,graphic off Text off,graphic on Text on,graphic on
CURSOR PATTERN SELECT	10100000 10100001 10100010 10100011 10100100 10100101 10100110 10100111	— — — — — — — —	— — — — — — — —	1- line cursor 2- line cursor 3- line cursor 4- line cursor 5- line cursor 6- line cursor 7- line cursor 8- line cursor
DATA AUTO READ/ WRITE	10110000 10110001 10110010	— — —	— — —	Set Data Auto Write Set Data Auto Read Auto Reset
DATA READ/WRITE	11000000 11000001 11000010 11000011 11000100 11000101	Data — Data — Data —	— — — — — —	Data Write and Increment ADP Data Read and Increment ADP Data Write and Decrement ADP Data Read and Decrement ADP Data Write and Nonvariable ADP Data Read and Nonvariable ADP
SCREEN PEEK	11100000	—	—	Screen Peek
SCREEN COPY	11101000			Screen Copy

X:invalid

COMMAND	CODE	D1	D2	FUNCTION
BIT SET/RESET	11110XXX 11111XXX 1111X000 1111X001 1111X010 1111X011 1111X100 1111X101 1111X110 1111X111	— — — — — — — — — —	— — — — — — — — — —	Bit Reset Bit Set Bit 0 (LSB) Bit 1 Bit 2 Bit 3 Bit 4 Bit 5 Bit 6 Bit 7 (MSB)

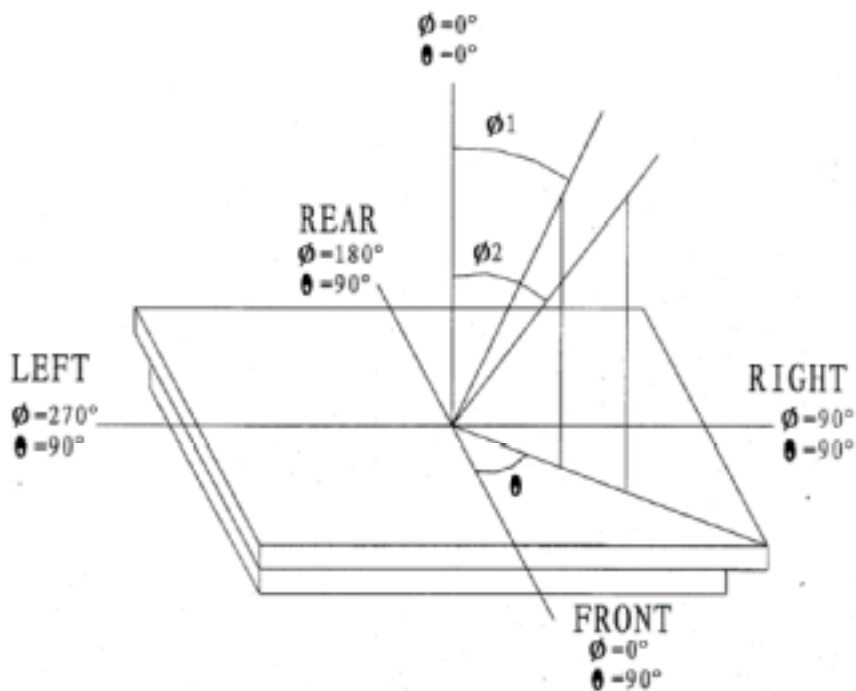
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NO	ITEM	SYMBOL	MIN	TYPE	MAX	UNIT	REMARK
1	DRIVING VOLTAGE	Vop		17.5		V	
2	RESPONSE TIME	Ton	150	180	220	ms	NOTE3
		Toff	120	140	180		
3	FRAME FREQUENCY	Fr		100		Hz	NOTE4
4	CURRENT CONSUMPTI ON			5		μ A	NOTE5
5	CONTRAST RATIO	Cr	3	8	10	θ	NOTE2
6	VIEWING ANGLE RANGE	ϕ (up-down)	$\phi_1=-30 \ \phi_2=30$			DEG	NOTE1
		θ (left-right)	$\theta_1=-30 \ \theta_2=30$				

Note: Test Instrument is LCD-500

NOTE 1 : DEFINITION OF VIEWING ANGLE

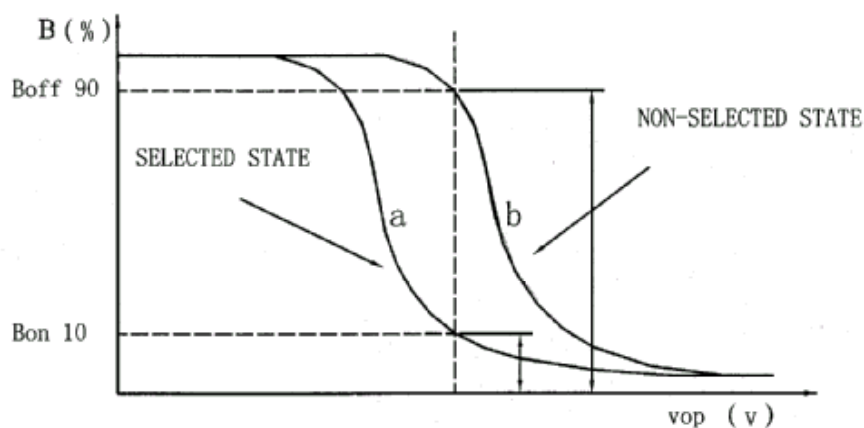




MEASUREMENT CONDITION OF VIEWING ANGLE RANGE

PARAMETER	SYMBOL	CONDITION	UNIT
AMBIENT TEMPERATURE	Top	25	℃
DRIVING VOLTAGE	Vop	17.5	V
VIEWING ANGLE	ϕ (up-down)	$\theta = 90, 90$	DEG
	θ (left-right)	$\phi = 30$	
FRAME FREQUENCY	Fr	100	Hz

NOTE 2: DEFINITION OF CONTRAST RATIO



MEASUREMENT CONDITION OF CONTRAST RATIO

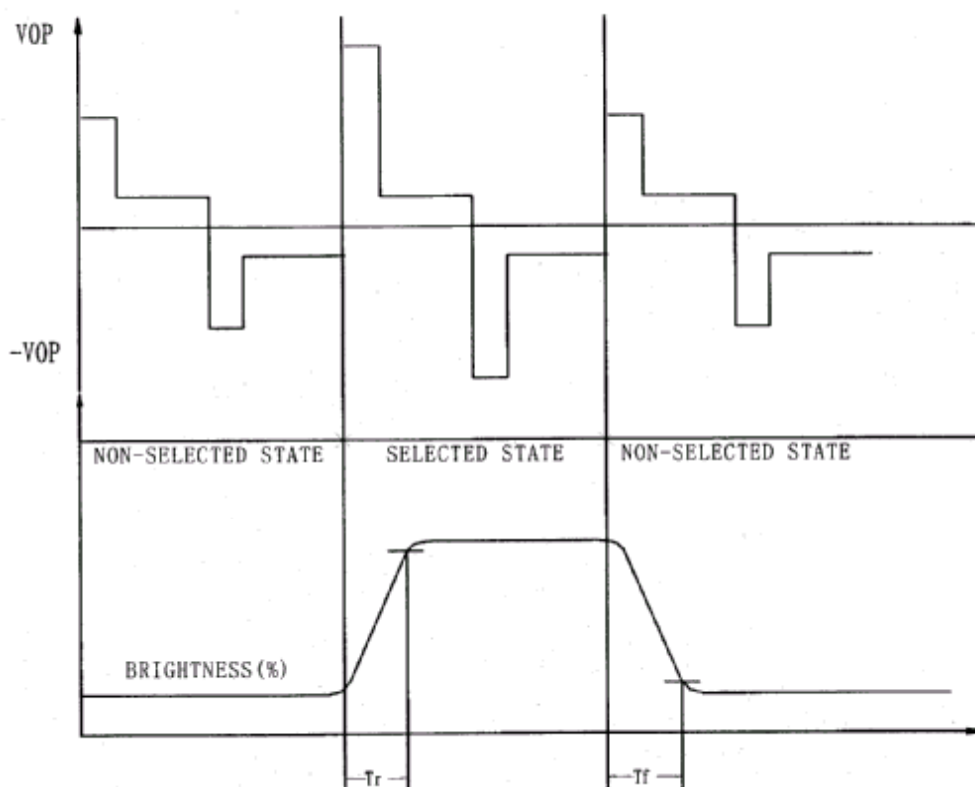
PARAMETER	SYMBOL	CONDITION	UNIT
AMBIENT TEMPERATURE	Top	25	℃
VIEWING ANGLE	ϕ, θ	$\phi = 30, \theta = 30$	DEG
FRAME FREQUENCY	Fr	100	Hz

$$\text{CONTRAST RATIO} = \frac{\text{BRIGHTNESS UNDER NON-SELECTED STATE}}{\text{BRIGHTNESS UNDER SELECTED STATE}}$$

$$\text{CROSS TALK} = \frac{\text{BRIGHTNESS UNDER NON-SELECTED STATE}}{\text{BRIGHTNESS UNDER OFF STATE}}$$



NOTE 3: DEFINITION OF RESPONSE TIME



MEASUREMENT CONDITION OF RESPONSE TIME

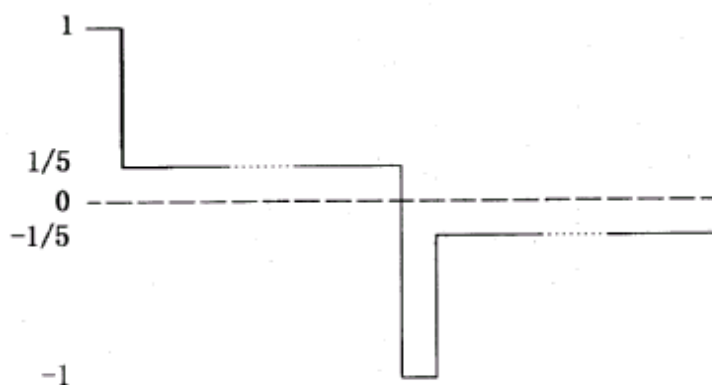
PARAMETER	SYMBOL	CONDITION	UNIT
AMBIENT TEMPERATURE	Top	25	℃
DRIVING VOLTAGE	Vop	17.5	V
VIEWING ANGLE	ϕ, θ	$\phi = 30, \theta = 30$	DEG
FRAME FREQUENCY	Fr	100	Hz



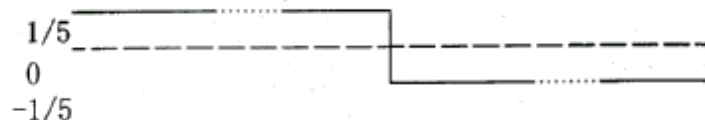
NOTE 4: FRAME FREQUENCY AND OPERATION WAVEFORM

A. FREQUENCY $f_r=100\text{Hz}$

B. SELECTED WAVEFORM



C. NON-SELECTED WAVEFORM



NOTE 5: MEASUREMENT CONDITION OF CURRENT CONSUMPTION

PARAMETER	SYMBOL	CONDITION	UNIT
WAVEFORM	SQUARE WAVE(DUTY 1/16,BIAS 1/5)		
FREQUENCY	F_r	100	Hz
MEASURING VOLTAGE	V_{rms}	17.5	V

[illegible]