EXAMINED BY : Tony Chen	EMERGING DISPLAY	FILE NO . CAS-10145
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APPROVED BY: David Chang	TECHNOLOGIES CORPORATION	TOTAL PAGE : 8
		VERSION : 2

CUSTOMER ACCEPTANCE SPECIFICATIONS

MODEL NO . :

24D70 (CCFL TYPES)

FOR MESSRS :

_____

CUSTOMER'S APPROVAL

DATE :

_____

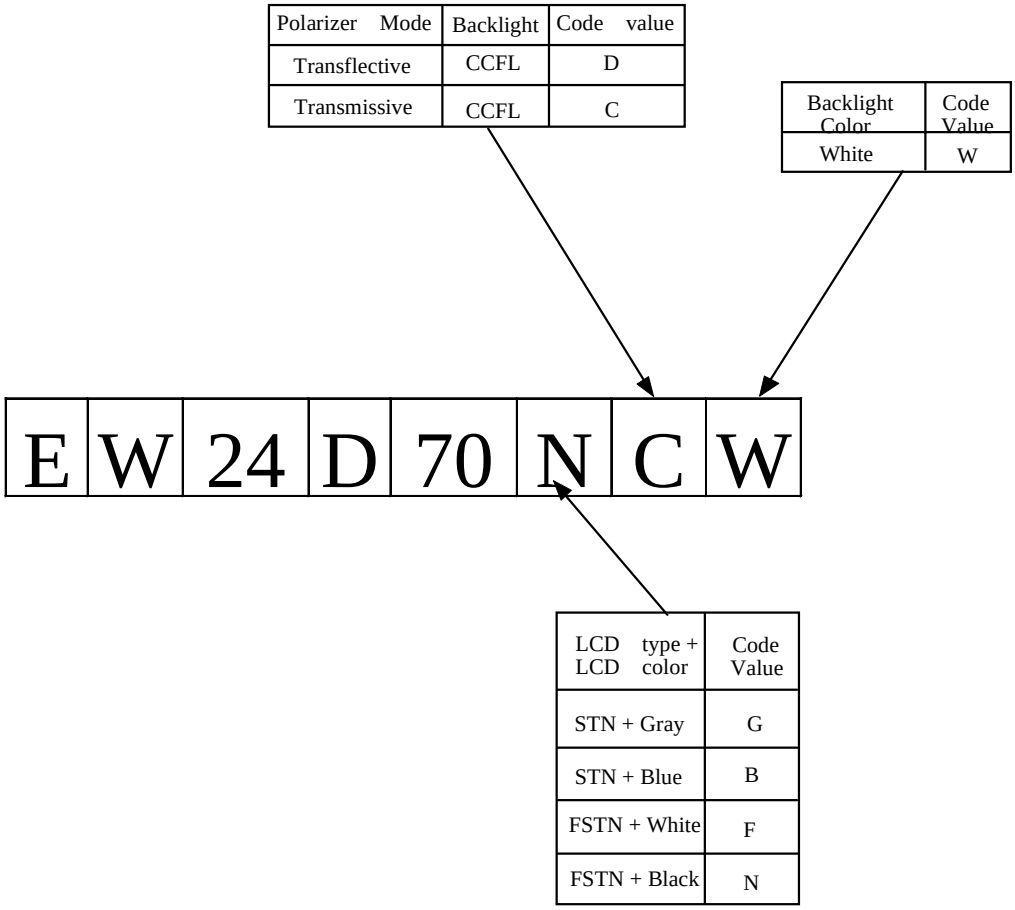
BY :

_____

EMERGING DISPLAY TECHNOLOGIES CORPORATION	MODEL NO. 24D70 (CCFL TYPES)	VERSION 2
RECORDS OF REVISION	DOC. FIRST ISSUE OCT.06,1998	

DATE	REVISED PAGE NO.	SUMMARY
NOV.11,1999	1 ~ 4	THE ENTIRE PAGES REVISED

NUMBERING SYSTEM



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1. GENERAL SPECIFICATIONS

1.1 GENERAL SPECIFICATIONS
PLEASE REFER TO :

CUSTOMER ACCEPTANCE STANDARD SPECIFICATIONS :

E U - 0 0 2 A

1.2 APPLICATION NOTES FOR CONTROLLER : T6963C
PLEASE REFER TO :

CUSTOMER ACCEPTANCE STANDARD SPECIFICATIONS :

E U - T 6 9 6 3 C

1.3 THIS INDIVIDUAL SPECIFICATION IS PRIOR TO GENERAL SPECIFICATIONS .

2. MECHANICAL SPECIFICATIONS

(1)	NUMBER OF DOTS	240W * 128H DOTS
(2)	MODULE SIZE	170.0W * 103.0H * 14.0D mm
(3)	EFFECTIVE AREA	126.0W * 70.0H mm
(4)	ACTIVE AREA	119.97W * 63.97H mm
(5)	DOT SIZE	0.47W * 0.47H mm
(6)	DOT PITCH	0.50W * 0.50H mm
(7)	LCD TYPE*	
(8)	DRIVING METHOD	1 / 128 DUTY MULTIPLEX DRIVE
(9)	BACKLIGHT	CCFL

* PLEASE REFER TO NUMBERING SYSTEM.

3. ABSOLUTE MAXIMUM RATINGS

3.1 ELECTRICAL ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	MIN.	MAX.	UNIT	REMARK
POWER SUPPLY FOR LOGIC	VDD – VSS	0	7.0	V	
LCD DRIVER CIRCUIT SUPPLY VOLTAGE	VDD – VEE	0	28.0	V	
INPUT VOLTAGE	VI	VSS	VDD	V	
STATIC ELECTRICITY	—	—	100	V	NOTE (1)

NOTE (1) : TEST METHOD AND CONDITIONS :
AFTER CHARGING UP 200 PF CAPACITOR BY STATED VOLTAGE, THE CAPACITOR IS CONNECTED WITH INTERFACE PINS OF THE MODULE.

3.2 ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS.

ITEM	OPERATING		STORAGE		REMARK
	MIN.	MAX.	MIN.	MAX.	
AMBIENT TEMPERATURE	-20 °C	70 °C	-30 °C	80 °C	NOTE (2), (3) ,(4)
HUMIDITY	—	90 % RH	—	90 % RH	WITHOUT CONDENSATION
VIBRATION	—	2.45 m/s^2 (0.25 G)	—	11.76 m/s^2 (1.2 G)	10 ~ 100 HZ XYZ DIRECTIONS 1 Hr. EACH
SHOCK	—	29.4 m/s^2 (3 G)	—	490.0 m/s^2 (50 G)	10 mSECONDS XYZ DIRECTIONS 1 TIME EACH
CORROSIVE GAS	NOT ACCEPTABLE		NOT ACCEPTABLE		

NOTE (2) : Ta AT -30°C : 48HR MAX.
80°C : 168HR MAX.
NOTE (3) : BACKGROUND COLOR CHANGES SLIGHTLY DEPENDING ON AMBIENT TEMPERATURE THIS PHENOMENON IS REVERSIBLE.
NOTE (4) CCFL BACKLIGHT IS NOT AVAILABLE TO FUNCTION BELOW 0°C.

4 . ELECTRICAL CHARACTERISTICS

Ta = 2 5 ℃ VDD = 5 . 0 V

PARAMETER		SYMBOL	CONDITION	MIN .	TYP .	MAX .	UNIT
POWER SUPPLY VOLTAGE FOR LOGIC		VDD – VSS	—	4 . 5	5.0	5 . 5	V
POWER SUPPLY VOLTAGE FOR LCD DRIVE		VEE – VSS	—	—	- 13.5	- 22.5	V
INPUT VOLTAGE		VIH	H LEVEL	VDD-2.2	—	VDD	V
NOTE (1)		VIL	L LEVEL	0	—	0 . 8	V
OUTPUT VOLTAGE		VIH	H LEVEL	VDD-0.3	—	VDD	V
NOTE (1)		VIL	L LEVEL	0	—	0 . 3	V
POWER SUPPLY CURRENT FOR LOGIC NOTE (2)		IDD	VDD –VSS = 5 . 0 V VEE – VSS = -13.5 V	—	9.0	24.0	mA
POWER SUPPLY CURRENT FOR LCD DRIVE NOTE (2)		IEE	VDD – VSS = 5 . 0 V VEE – VSS = -13.5 V	—	2.0	5.0	mA
RECOMMENDED		VDD – VEE	Ta = -20 ℃	—	18.5	—	V
LCD DRIVING		∅ = 10 °	Ta = 25 ℃	—	18.5	—	V
VOLTAGE NOTE (3)		θ = 0°	Ta = 70 ℃	—	15.5	—	V
CLOCK OSCILLATION FREQUENCY		f_{OSC}	—	—	6 . 0	—	MHZ
POWER	VOLTAGE	VCCFL	—	—	300	—	Vrms
SUPPLY FOR	FREQUENCY	fCCFL	—	—	30K	—	HZ
CCFL	CURRENT	IL	—	—	5	—	mA

NOTE (1) : APPLIED TO TERMINALS $\overline{WR}$, $\overline{RD}$, $\overline{CE}$, C/$\overline{D}$, $\overline{RST}$, FS , DB0~DB7.
NOTE (2) : THE DISPLAY PATTERN IS ALL " OFF " / " ON " .
NOTE (3) : RECOMMENDED LCD DRIVING VOLTAGE MAY FLUCTUATE ABOUT ±1 . 0V BY EACH MODULE .

5. OPTICAL CHARACTERISTICS

Ta = 25 °C VDD = 5.0 V

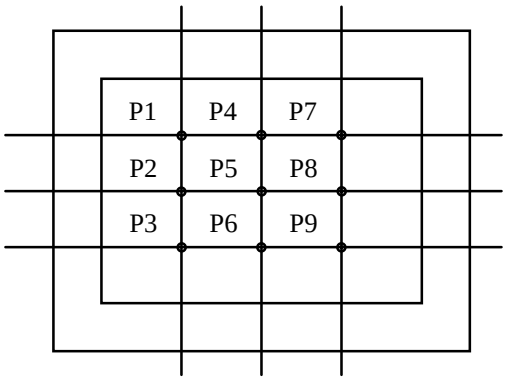
ITEM		SYMBOL	CONDITION		MIN.	TYP.	MAX.	UNIT	NOTE
VIEWING ANGLE	STN	∅2 - ∅1	K ≧ 1.4		—	40	—	deg.	1
	FSTN				—	50	—	deg.	1
CONTRAST RATIO	STN	K	∅ = 10° θ = 0°		—	10	—	—	1
	FSTN				—	20	—	—	1
RESPONSE TIME		tr (rise)	∅ = 10° θ = 0°	Ta = -20°C	—	5538	—	ms	1
				Ta = 25°C	—	228	—		
				Ta = 70°C	—	104	—		
		tf (fall)		Ta = -20°C	—	2316	—		
				Ta = 25°C	—	174	—		
				Ta = 70°C	—	85	—		
AVERAGE BRIGHTNESS OF BACKLIGHT		B	—		460	580	—	cd / m²	2, 3
RISE TIME OF BACKLIGHT		TC	—		—	5	—	MINUTE	
BRIGHTNESS UNIFORMITY		—	—		—	—	25	%	4, 5

NOTE (1) : PLEASE REFER TO :
CUSTOMER ACCEPTANCE STANDARD SPECIFICATIONS.
EU-002A

NOTE (2) : MEASUREMENT AFTER 10 MINUTES OF CCFL OPERATING.

NOTE (3) : BRIGHTNESS CONTROL : 100% AND DISPLAY ALL ON.

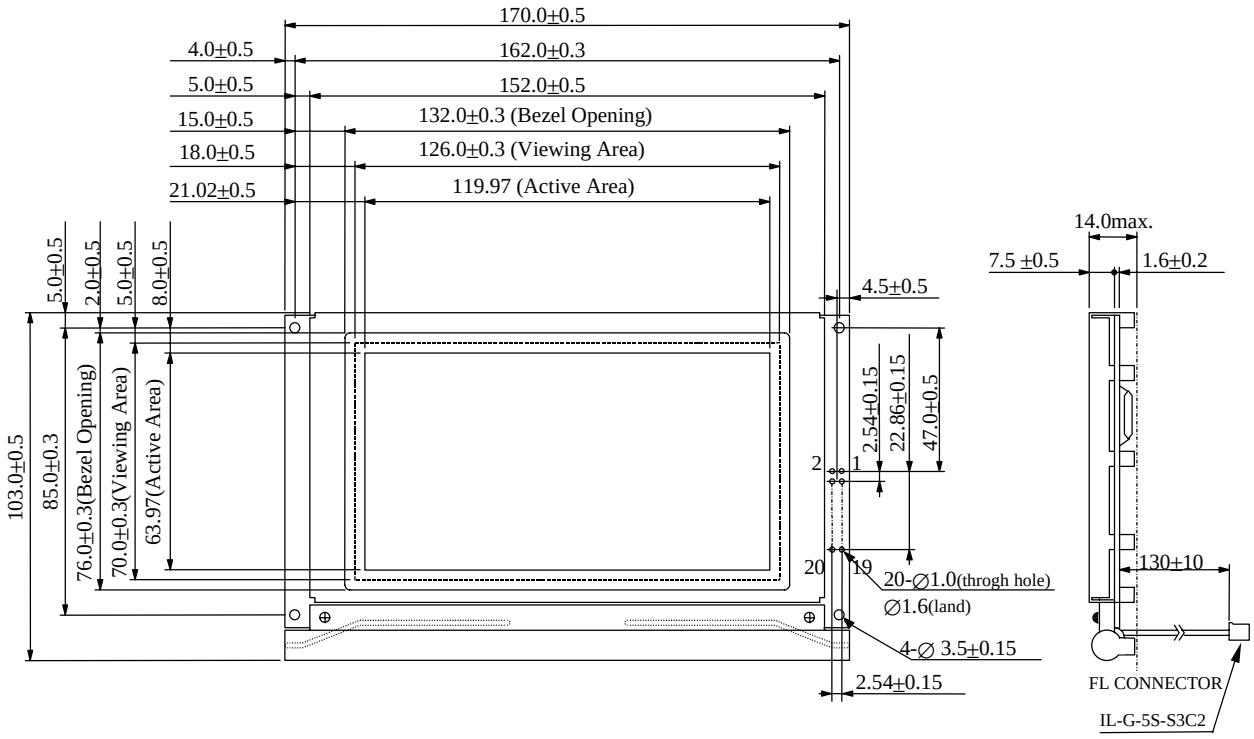
NOTE (4) : MEASUREMENT OF THE FOLLOWING 9 PLACES ON THE DISPLAY.
DEFINITION OF THE BRIGHTNESS UNIFORMITY.



NOTE (5) : BRIGHTNESS UNIFORMITY IS DEFINED AS FOLLOWING

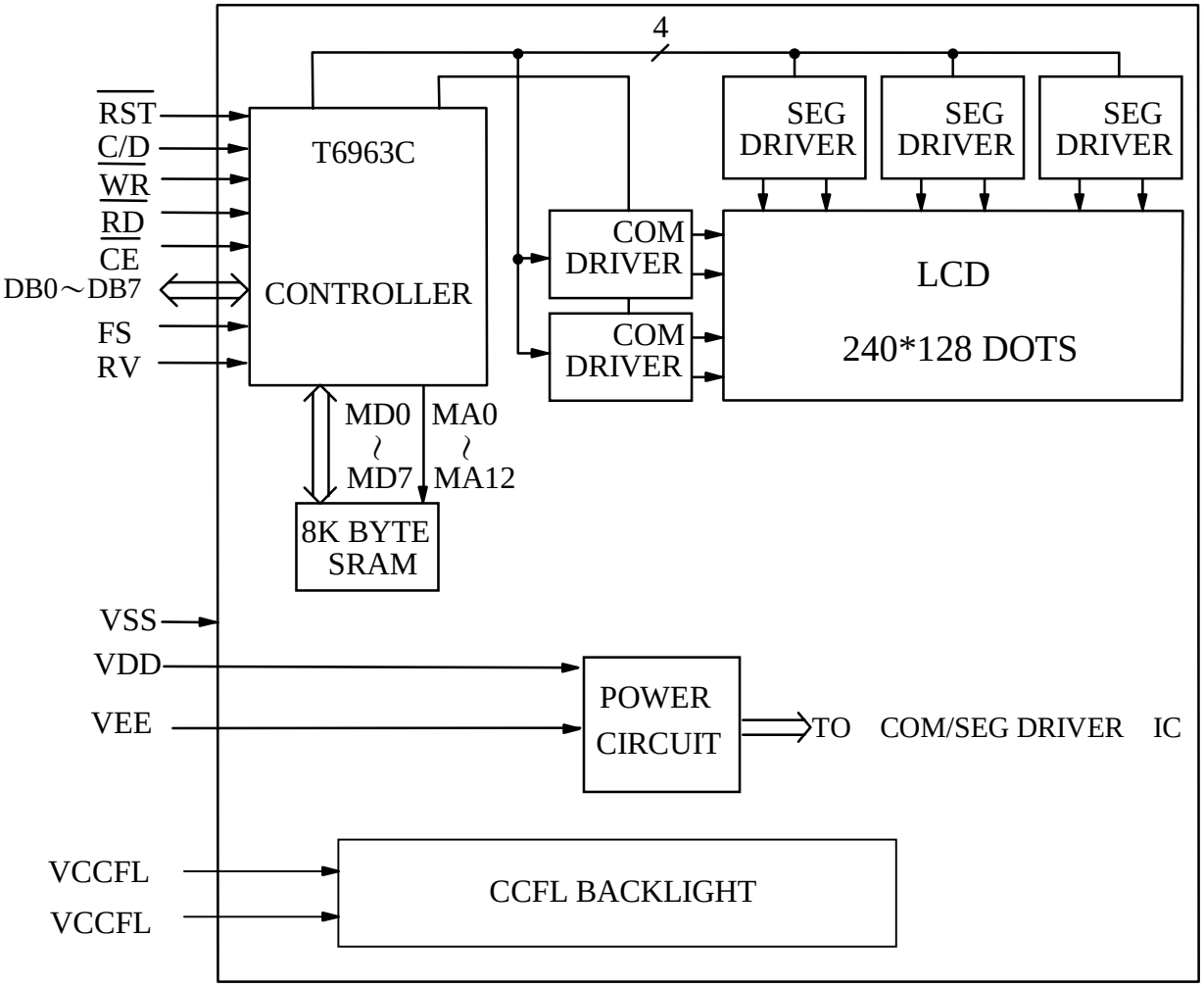
$$\sum X = \left[\frac{\left| \text{(MAXIMUN BRIGHTNESS OR MINIMUN BRIGHTESS)-AVERAGE BRIGHTNESS} \right|}{\text{AVERAGE BRIGHTNESS}} \right] \times 100\%$$

6. OUTLINE DIMENSION

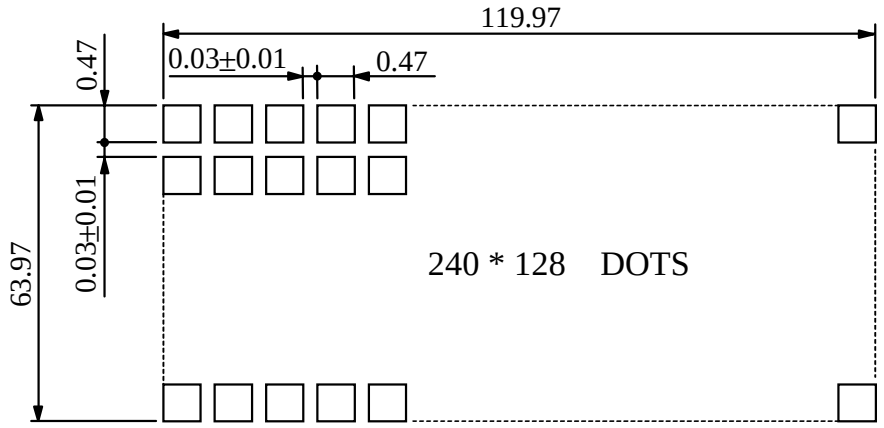


UNIT : mm
SCALE : NTS
NOT SPECIFIED TOLERANCE IS±0.5mm

7. BLOCK DIAGRAM



8. DETAIL DRAWING OF DOT MATRIX



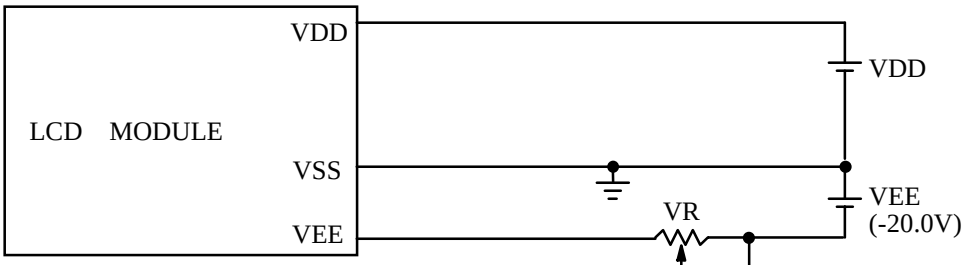
UNIT : mm
SCALE : NTS
NOT SPECIFIED TOLERANCE IS ± 0.1

9. INTERFACE SIGNALS

PIN NO	SYMBOL	LEVEL	FUNCTION
1	FGND	—	FRAME GROUND
2	GND	—	GROUND
3	VDD	—	POWER SUPPLY FOR LOGIC CIRCUIT
4	VEE	—	POWER SUPPLY FOR LCD DRIVING
5	$\overline{WR}$	L	DATA WRITE
6	$\overline{RD}$	L	DATA READ
7	$\overline{CE}$	H	CHIP ENABLE
8	C/$\overline{D}$	H/L	$\overline{WR}$="L",C/$\overline{D}$="H" : COMMAND WRITE C/$\overline{D}$="L" : DATA WRITE $\overline{RD}$="L", C/$\overline{D}$="H" : STATUS READ C/$\overline{D}$="L" : DATA READ
9	N.C.	—	NO CONNECTION
10	$\overline{RST}$	L	RESET
11 | 18	DB0 | DB7	H/L	DATA BUS LINE
19	FS	H/L	SELECT : "H" : 6*8 PIXEL/FONT "L" : 8*8 PIXEL/FONT
20	RV	H/L	H: BLACK CHARACTERS L : WHITE CHARACTERS

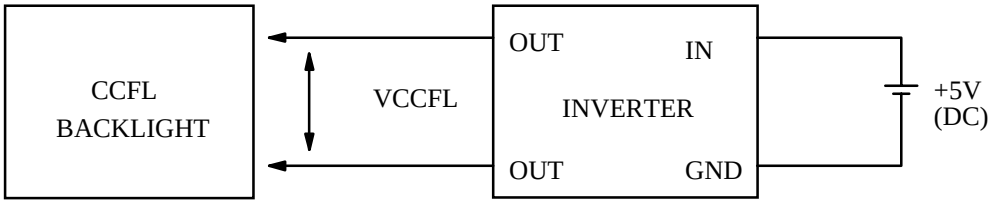
10. POWER SUPPLY

10.1 POWER SUPPLY FOR LCM



VR : 20KΩ

10.2 POWER SUPPLY FOR CCFL BACK - LIGHT



RECOMMENDED INVERTER : IA-EM04A

10.2 TIMING OF POWER SUPPLY AND INTERFACE SIGNAL