EXAMINED BY :	EMERGING DISPLAY	FILE NO . CAS-10322
		ISSUE : MAR.24,2003
APPROVED BY:	TECHNOLOGIES CORPORATION	TOTAL PAGE : 11
		VERSION : 2

CUSTOMER ACCEPTANCE SPECIFICATIONS

MODEL NO. :

2 4 H A 0 (LED TYPES)

FOR MESSRS :

CUSTOMER'S APPROVAL

DATE :

BY :

ACDS 175-177 route de Genas - 69100 VILLEURBANNE - France
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EMERGING DISPLAY TECHNOLOGIES CORPORATION	MODEL NO. 24HA0 (LED TYPES)	VERSION 2
RECORDS OF REVISION	DOC . FIRST ISSUE JAN.24,2003	

DATE	REVISED PAGE NO.	SUMMARY
MAR.24,2003	3	4. ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	CONDITION	MIN .	TYP .	MAX .	UNIT
OPERATION VOLTAGE FOR CONTRAST	VOP ∅=10°,θ=0° DUTY=1/16 0	Ta = -10°C	14.3	15.3	16.3	V
		Ta = 25°C	13.8	14.8	15.8	
		Ta = 60°C	13.3	14.3	15.3	

↓

PARAMETER	SYMBOL	CONDITION	MIN .	TYP .	MAX .	UNIT
OPERATION VOLTAGE FOR CONTRAST	VOP ∅=10°,θ=0° DUTY=1/16 0	Ta = -10°C	14.7	15.7	16.7	V
		Ta = 25°C	14.2	15.2	16.2	
		Ta = 60°C	13.7	14.7	15.7	

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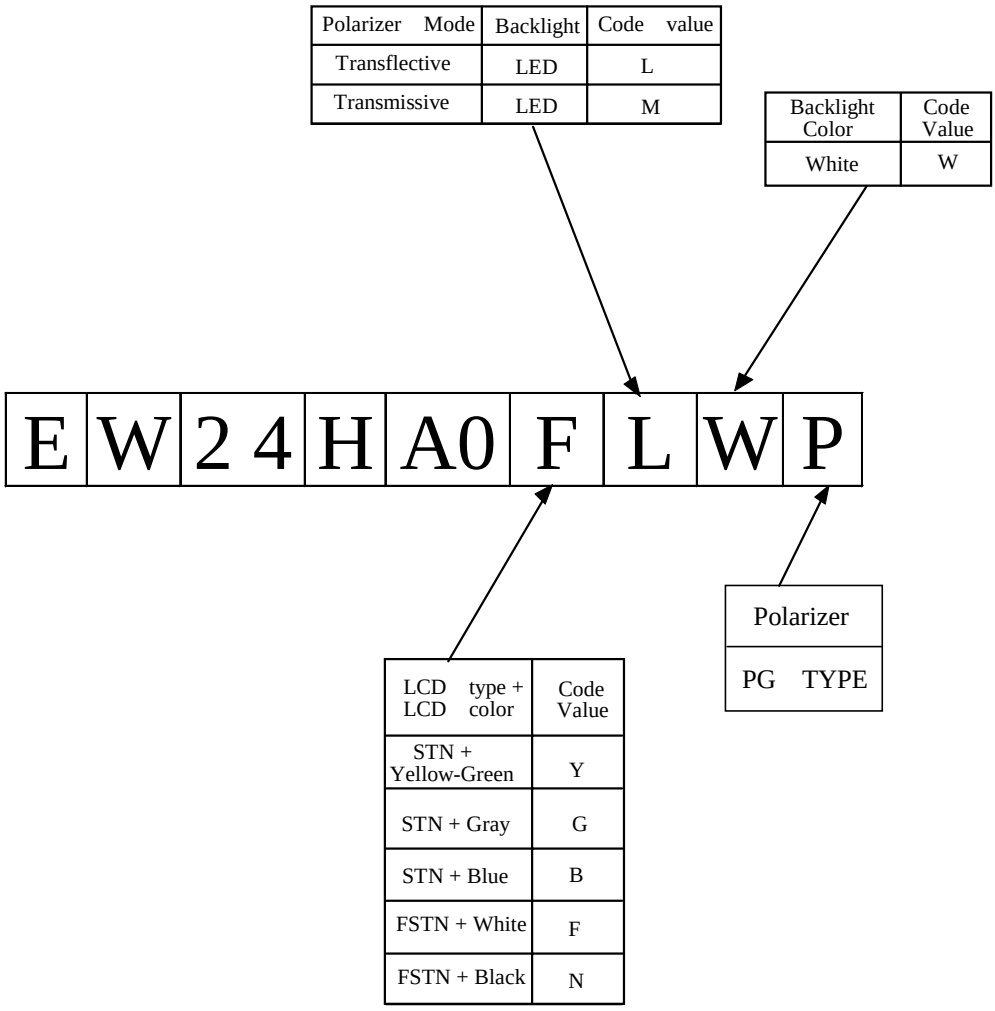
NUMBERING SYSTEM



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1. GENERAL SPECIFICATIONS

1.1 GENERAL SPECIFICATIONS

PLEASE REFER TO :

CUSTOMER ACCEPTANCE STANDARD SPECIFICATIONS :

EU-002A

1.2 APPLICATION NOTES FOR CONTROLLER / DRIVER . SPECIFICATIONS .

PLEASE REFER TO : LCD DRIVER / UC1611

2. MECHANICAL SPECIFICATIONS

(1)	NUMBER OF DOTS	240W * 160H DOTS
(2)	MODULE SIZE	75.6W * 55.1H * 7D (max.) mm
(3)	EFFECTIVE AREA	62W * 45.7H mm
(4)	ACTIVE AREA	55.19W * 41.59H mm
(5)	DOT SIZE	0.22W * 0.25H mm
(6)	DOT PITCH	0.23W * 0.26H mm
(7)	LCD TYPE *	
(8)	DRIVING METHOD	1 / 160 DUTY MULTIPLEX DRIVE
(9)	VIEWING DIRECTION	6 O'CLOCK
(10)	BACK LIGHT *	

* PLEASE REFER TO NUMBERING SYSTEM .

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3. ABSOLUTE MAXIMUM RATINGS

3.1 ELECTRICAL ABSOLUTE MAXIMUM RATINGS. (AT Ta = 25 °C)

PARAMETER	SYMBOL	MIN.	MAX.	UNIT	REMARK
POWER SUPPLY FOR LOGIC	VDD – VSS	-0.3	4.0	V	
POWER SUPPLY FOR LCD DRIVING	VLCD	-0.3	18.0	V	
ANY INPUT / OUTPUT	VIN / VOUT	-0.3	VDD+0.3	V	
STATIC ELECTRICITY	—	—	100	V	NOTE (1)
LED POWER DISSIPATION	PD	—	0.375	W	
LED FORWARD CURRENT	IF	—	75	mA	
LED REVERSE VOLTAGE	VR	—	5	V	

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	-10 °C	60 °C	-20 °C	70 °C	NOTE (2), (3)
HUMIDITY	—	50 % RH	—	50 % RH	WITHOUT CONDENSATION
VIBRATION	—	2.45 m/S^2 (0.25 G)	—	11.76 m/S^2 (1.2 G)	10~100HZ XYZ DIRECTIONS 1 Hr.EACH
SHOCK	—	29.4 m/S^2 (3 G)	—	490 m/S^2 (50 G)	10 mSECONDS XYZ DIRECTIONS 1 TIME EACH
CORROSIVE GAS	NOT ACCEPTABLE		NOT ACCEPTABLE		

NOTE (2) : Ta AT -20°C : 240HR MAX.
70°C : 240HR MAX.
NOTE (3) : BACKGROUND COLOR CHANGES SLIGHTLY DEPENDING ON AMBIENT TEMPERATURE THIS PHENOMENON IS REVERSIBLE.

4. ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
POWER SUPPLY VOLTAGE FOR LOGIC	VDD–VSS	—	1.8	3.0	—	V
H LEVEL INPUT VOLTAGE (NOTE1)	VIH	—	0.8*VDD	—	VDD	V
L LEVEL INPUT VOLTAGE (NOTE1)	VIL	—	VSS	—	0.2*VDD	V
H LEVEL OUTPUT VOLTAGE (NOTE2)	VOH	–IOH= - 0.5 mA	0.8*VDD	—	VDD	V
L LEVEL OUTPUT VOLTAGE (NOTE2)	VOL	IOL = 0.5 mA	VSS	—	0.2*VDD	V
INPUT LEAKAGE CURRENT	IIL	VIN = VDD OR VSS	-1.0	—	1.0	μA
OUTPUT LEAKAGE CURRENT	IOZ		-3.0	—	3.0	μA
OPERATION VOLTAGE FOR CONTRAST	VOP ∅=10°,θ=0° DUTY=1/160	Ta = -10°C	14.7	15.7	16.7	V
		Ta = 25°C	14.2	15.2	16.2	
		Ta = 60°C	13.7	14.7	15.7	
POWER SUPPLY CURRENT FOR LCD DRIVE	IDD	VDD = 3.0V	—	2.0	5.0	mA
POWER SUPPLY FOR LED BACKLIGHT	VLED-VLSS	IF = 60mA	—	5.0	—	V

NOTE (1) : PINS : DATA0 ~ DATA7 , RST , $\overline{CS1}$, LD , WR0 , WR1 ,BM0 .

NOTE (2) : PINS DATA0 ~ DATA7

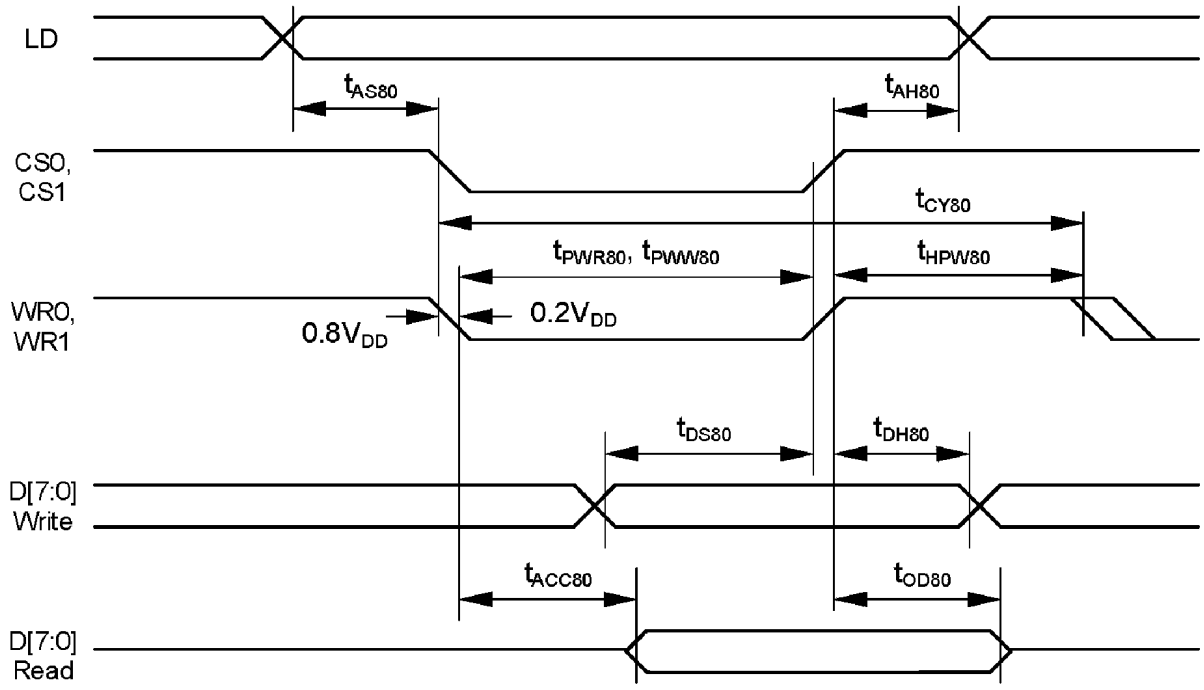
5. TIMING CHARACTERISTICS

5.1 INTERFACE TIMING

5.1.1 8080 SERIES MPU

SYMBOL	SIGNAL	DESCRIPTION	CONDITION	MIN.	MAX.	UNITS
t_{AS80} t_{AH80}	LD	ADDRESS SETUP TIME ADDRESS HOLD TIME		20 40	—	ns
t_{CY80}		SYSTEM CYCLE TIME		100	—	ns
t_{PWR80}	WR1	PULSE WIDTH (READ)		45	—	ns
t_{PWW80}	WR0	PULSE WIDTH (WRITE)		45	—	ns
t_{HPW80}	WR0 , WR1	HIGH PULSE WIDTH		40	—	ns
t_{ACC80}	D0~D7	DATA SETUP TIME DATA HOLD TIME		30 10	—	ns
t_{OD80}		READ ACCESS TIME OUTPUT DISABLE TIME	C_L = 100 pF	—	50 50	ns

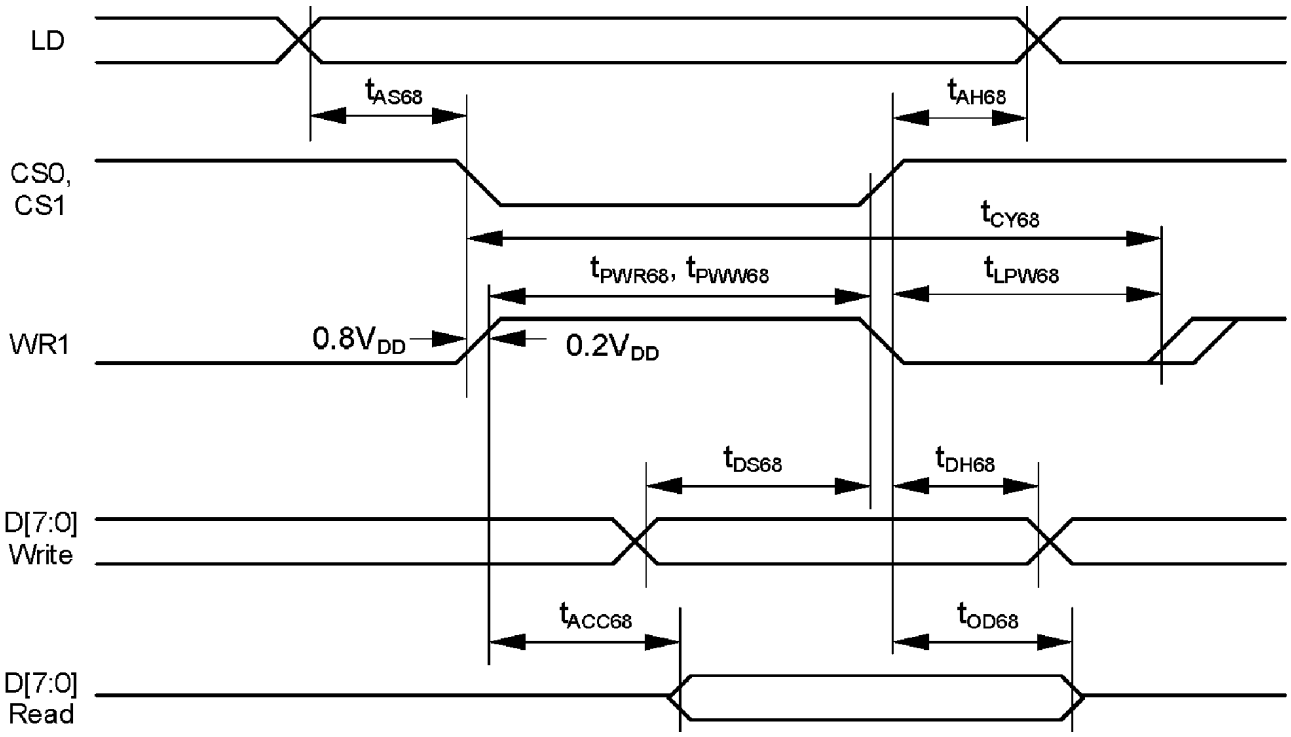
AC CHARACTERISTICS



Parallel Bus Timing Characteristics (for 8080 MCU)

5.1.2 6800 SERIES MPU

Symbol	Signal	Description	Condition	Min.	Max.	Units
t_{AS68} t_{AH68}	LD	Address setup time Address hold time		20 40	–	ns
T_{CY68}		System cycle time		100	–	ns
t_{PWR68}	WR1	Pulse width (read)		45	–	ns
t_{PWW68}		Pulse width (write)		45	–	ns
t_{LPW68}		Low pulse width		40	–	ns
t_{DS68} t_{DH68}	D0~D7	Data setup time Data hold time		30 10	–	ns
t_{ACC68} t_{OD68}		Read access time Output disable time	C_L = 100pF	– 10	50 50	ns



Parallel Bus Timing Characteristics (for 6800 MCU)

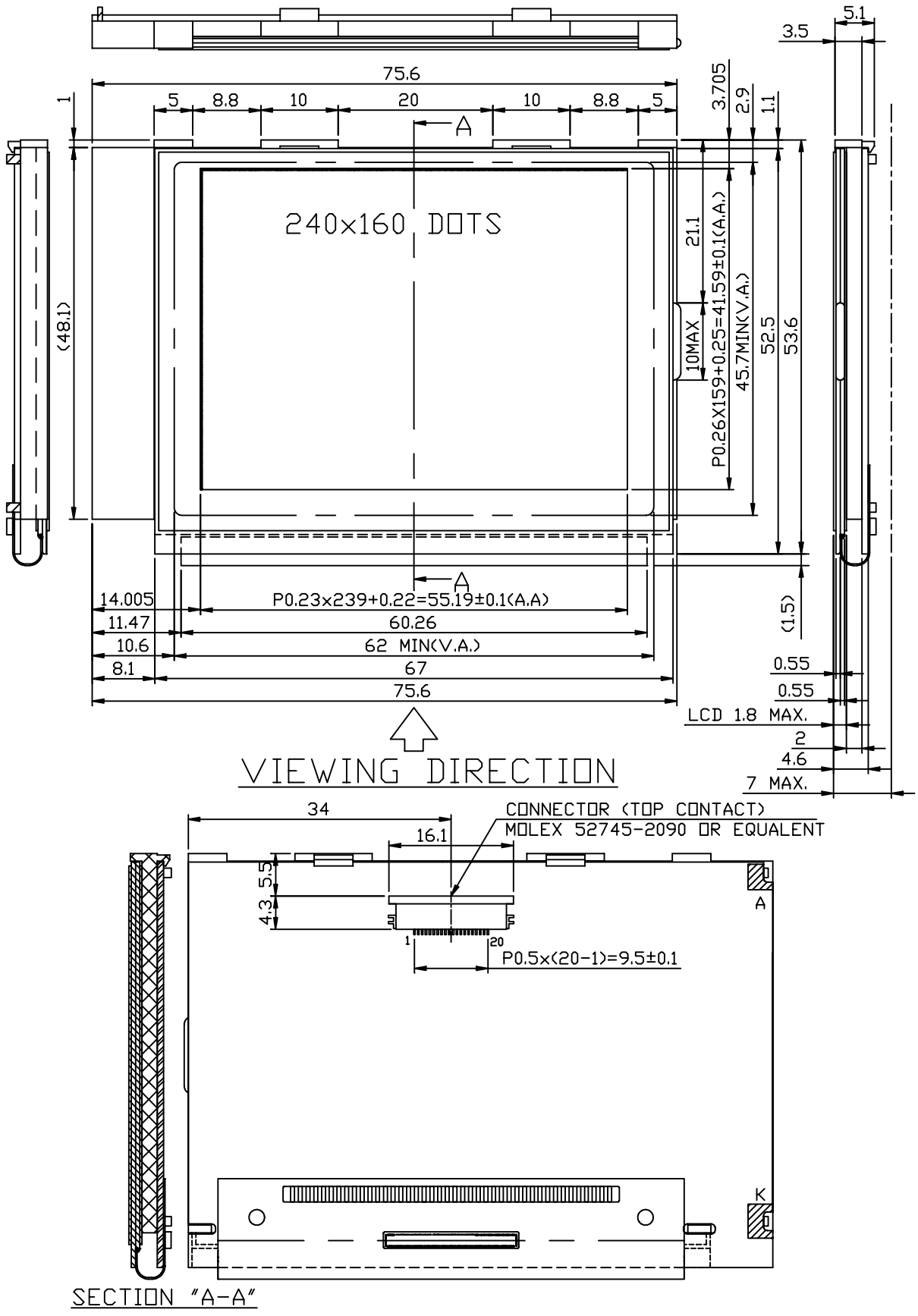
6. OPTICAL CHARACTERISTICS

Ta = 25 °C

ITEM		SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
VIEWING AREA	STN	∅2 – ∅1	K ≥ 2.0	—	(40)	—	deg.	1
	FSTN			(30)	—	—		
CONTRAST	STN	K	∅ = 10 ° θ = 0 °	—	2	—	—	1
	FSTN			—	3.5	—		
RESPONSE TIME		t r (rise)	∅ = 10 ° θ = 0 °	—	290	400	msec	1
		t f (fall)	∅ = 10 ° θ = 0 °	—	170	300	msec	1
THE BRIGHTNESS OF MODULE	B	TRANSMISSIVE	IF=60mA	(8)	(10)	—	cd/m^2	1
		TRANSFLECTIVE		(6)	(8)	—		

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

7 . OUTLINE DIMENSION



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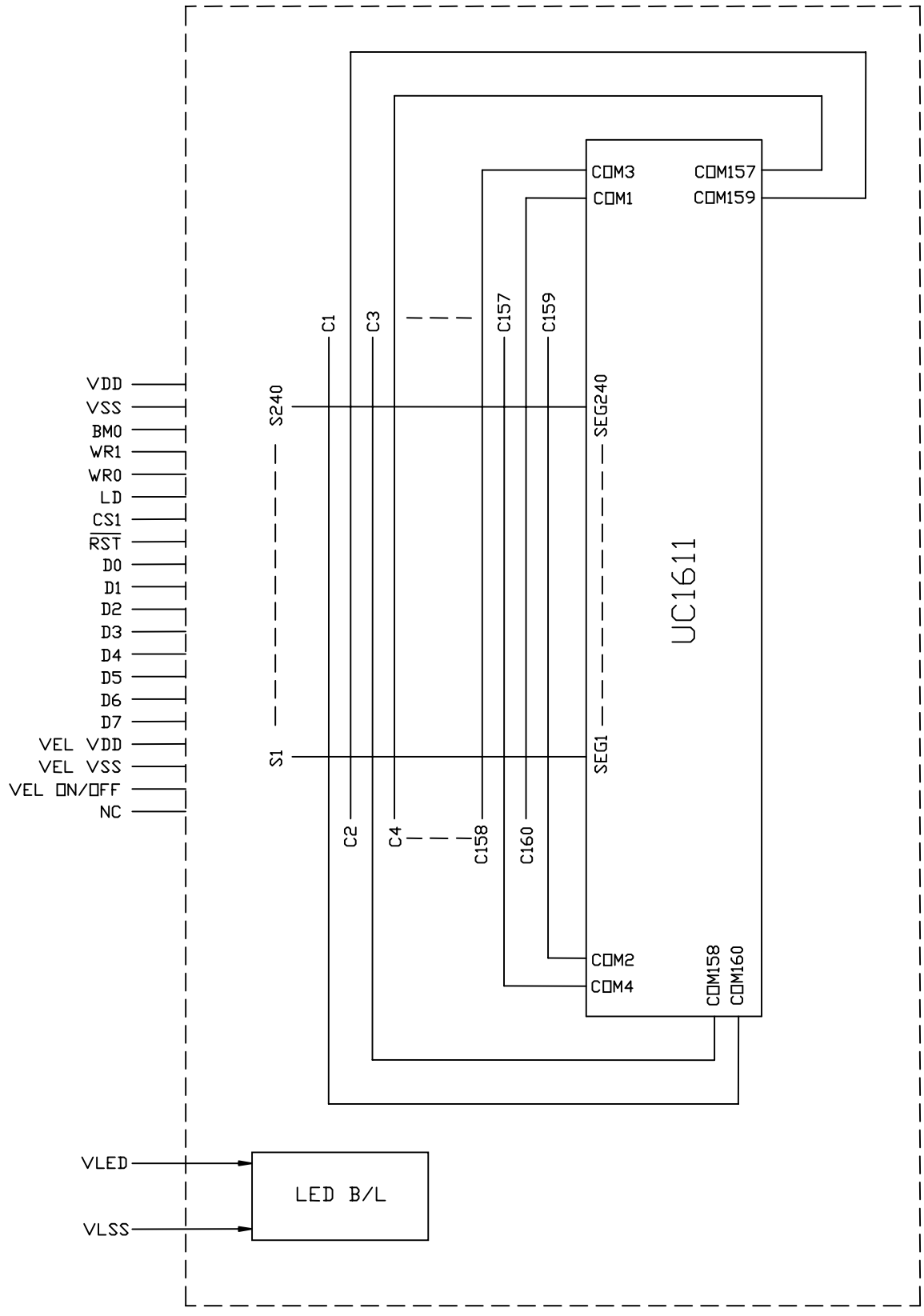
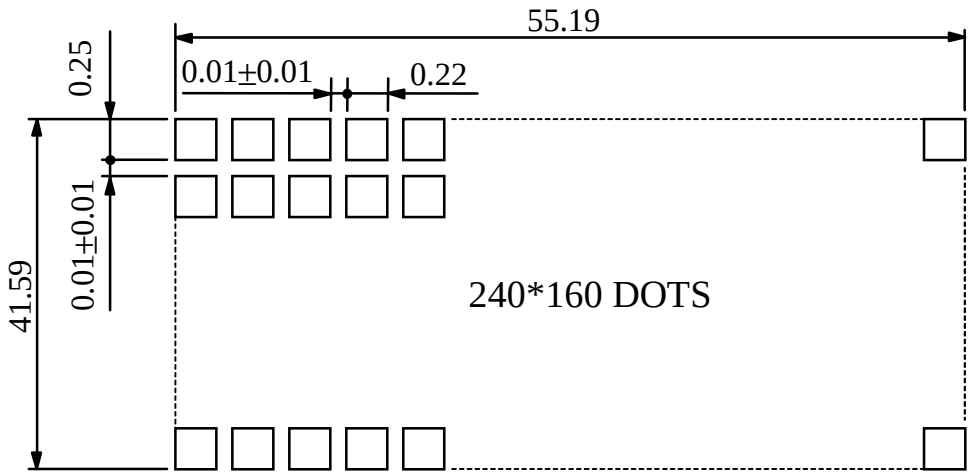
8. BLOCK DIAGRAM



9. DETAIL DRAWING OF DOT MATRIX



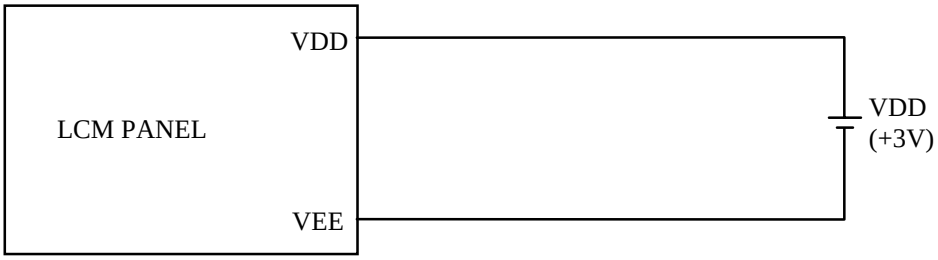
UNIT : mm
SCALE : NTS
NOT SPECIFIED TOLERANCE IS ± 0.1

10. INTERFACE SIGNALS

PIN NO.	SYMBOL	FUNCTION
1	VDD	POWER SUPPLY FOR LOGIC
2	VSS	GROUND
3	BM0	" L " : 8080 SERIES MPU " H " : 6800 SERIES MPU
4	WR1	SERIES MPU TYPE / WR0 / WR1 8080 SERIES MPU / $\overline{WR}$ / $\overline{RD}$ 6800 SERIES MPU / R/$\overline{W}$ / E
5	WR0	
6	CD	REGISTER SELECT INPUTS
7	CS1	CHIP ENBLE INPUTS , "H " : ENABLE "L" : DISABLE
8	$\overline{RST}$	HARDWARE RESET INPUT
9	D0	DISPLAY DATA
10	D1	
11	D2	
12	D3	
13	D4	
14	D5	
15	D6	
16	D7	
17	VLED	LED BACKLIGHT DRIVER VOLTAGE (+)
18	VLSS	LED BACKLIGHT DRIVER VOLTAGE (-)
19	NC	NO CONNECTION
20	NC	

11. POWER SUPPLY

11.1 POWER SUPPLY FOR LCM



11.2 POWER SUPPLY FOR LED BACK-LIGHT