

EXAMINED BY :	EMERGING DISPLAY  TECHNOLOGIES CORPORATION	FILE NO . CAS-10252
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APPROVED BY:		TOTAL PAGE : 12
<i>Roger Yang</i>		VERSION : 2

CUSTOMER ACCEPTANCE SPECIFICATIONS

MODEL NO. :

ES32FB0(EL TYPES)

FOR MESSRS :

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CUSTOMER'S APPROVAL

DATE :

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BY :

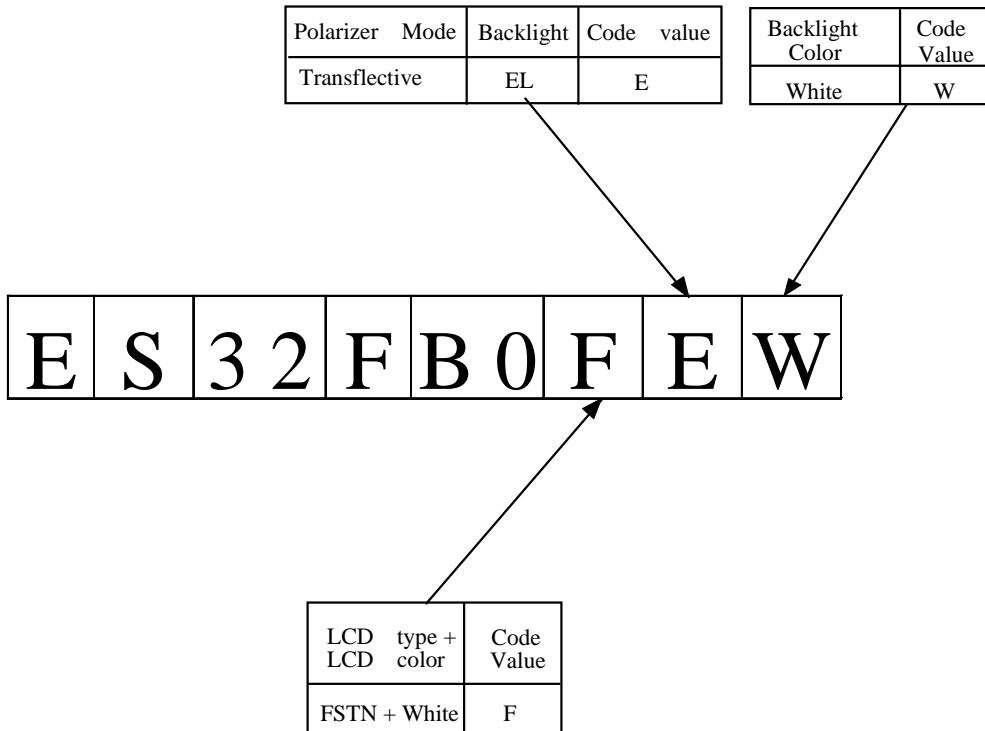
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NUMBERING SYSTEM



1. GENERAL SPECIFICATIONS

1.1 GENERAL SPECIFICATIONS  
PLEASE REFER TO :

CUSTOMER ACCEPTANCE STANDARD SPECIFICATIONS :

EU - 002 A

1.2 THIS INDIVIDUAL SPECIFICATIONS IS PRIOR TO GENERAL  
SPECIFICATIONS .

2. MECHANICAL SPECIFICATIONS

(1) NUMBER OF DOTS	-----	320W * 240H DOTS
(2) MODULE SIZE	-----	87.8W * 67.9H * 2.5D (max.) mm
(3) EFFECTIVE AREA	-----	78.8W * 59.6H mm
(4) ACTIVE AREA	-----	76.79W * 57.59H mm
(5) DOT SIZE	-----	0.23W * 0.23H mm
(6) DOT PITCH	-----	0.24W * 0.24H mm
(7) LCD TYPE	-----	FSTN, POSITIVE, BLACK/WHITE, TRANSFLECTIVE
(8) DRIVING METHOD	-----	1 / 240 DUTY MULTIPLEX DRIVE
(9) VIEWING DIRECTION	-----	6 O'CLOCK
(10) BACKLIGHT	-----	EL , COLOR : WHITE

### 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	7.0	V	
POWER SUPPLY FOR LCD DRIVING		VEE – VSS	0	3.0	V	
INPUT VOLTAGE		VI	VSS	VDD	V	
STATIC ELECTRICITY		—	—	100	V	NOTE (1)
POWER SUPPLY FOR EL BACKLIGHT	VOLTAGE	VEL	—	120AC	Vrms	fEL =1.0 KHz 60 SEC. MAX
	FREQUENCY	fEL	—	1K	KHz	AC115 Vrms 60 SEC. MAX

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 .

I T E M	OPERATING		STORAGE		REMARK
	MIN .	MAX .	MIN .	MAX .	
AMBIENT TEMPERATURE	-10 °C	50 °C	-20 °C	60 °C	NOTE (2), (3)
HUMIDITY	—	85 % RH	—	85 % RH	WITHOUT CONDENSATION
VIBRATION	—	2.45 m/S <sup>2</sup> (0.25 G)	—	11.76 m/S <sup>2</sup> (1.2 G)	10~100HZ XYZ DIRECTIONS 1 Hr.EACH
SHOCK	—	29.4 m/S <sup>2</sup> (3 G)	—	490 m/S <sup>2</sup> (50 G)	10 mSECONDS XYZ DIRECTIONS 1 TIME EACH
CORROSIVE GAS	NOT ACCEPTABLE		NOT ACCEPTABLE		

NOTE (2) : Ta AT -20°C : 48HR MAX .  
60°C : 168HR MAX .

NOTE (3) : BACKGROUND COLOR CHANGES SLIGHTLY DEPENDING ON AMBIENT  
TEMPERATURE THIS PHENOMENON IS REVERSIBLE .

4. ELECTRICAL CHARACTERISTICS

Ta = 25 °C

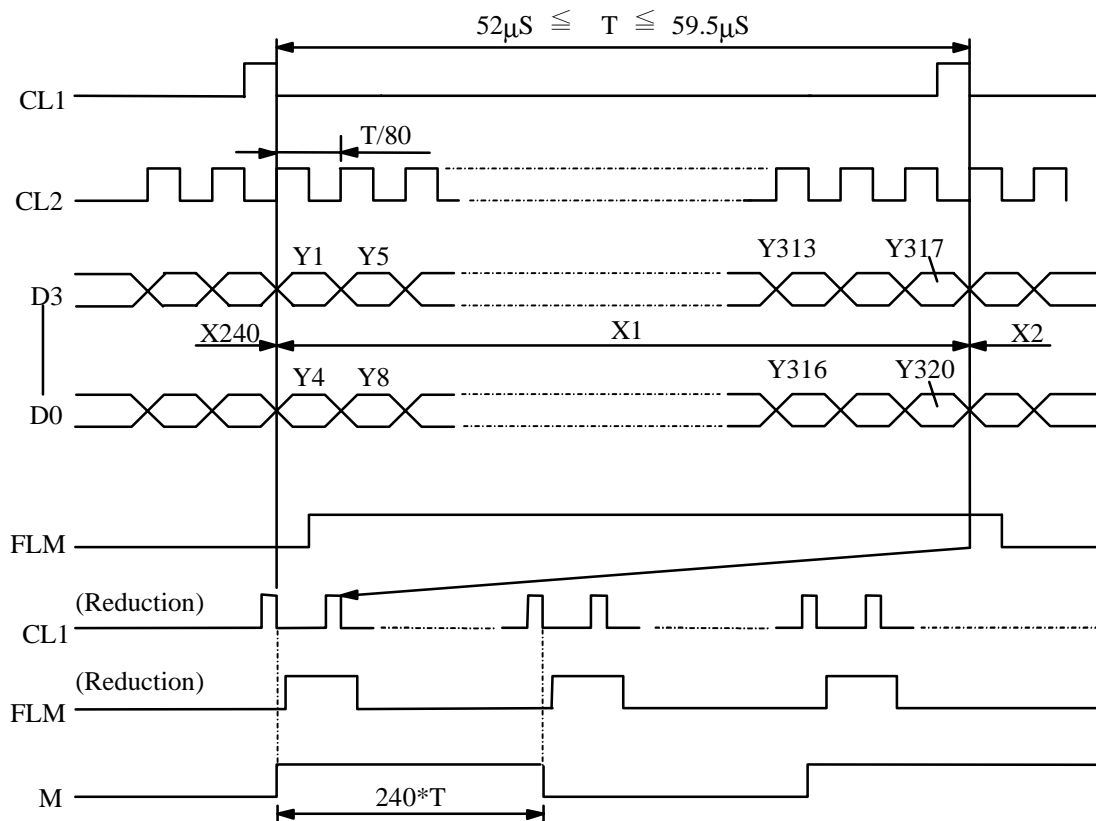
PARAMETER	SYMBOL	CONDITION	MIN .	TYP .	MAX .	UNIT
POWER SUPPLY VOLTAGE FOR LOGIC	VDD - VSS	—	2.5	—	5.0	V
POWER SUPPLY VOLTAGE FOR LCD DRIVE	VEE - VSS	—	+15	—	+27	V
INPUT VOLTAGE	VIH	H LEVEL	0.8VDD	—	—	V
NOTE ( 1 )	VIL	L LEVEL	—	—	0.2VDD	V
POWER SUPPLY CURRENT FOR LOGIC NOTE ( 2 )	IDD	VDD-VSS=5.0V VEE-VSS=21.5V	—	0.3	—	mA
POWER SUPPLY CURRENT FOR LCD DRIVE NOTE ( 2 )	IEE	VDD-VSS=5.0V VEE-VSS=21.5V	—	2.5	—	mA
CONTRAST ADJUST VOLTAGE	VEE - VSS ∅ = 10°, θ = 0° DUTY=1/240	Ta = -10 °C	—	( 23 )	—	V
		Ta = 25 °C	—	( 21.5 )	—	V
		Ta = 50 °C	—	( 19 )	—	V
CLOCK OSCILLATION FREQUENCY	fFLM	—	70	75	80	Hz
POWER SUPPLY FOR EL BACKLIGHT	VEL	fEL=400Hz	—	50	—	Vrms
	IEL	VEL=100V fEL=400Hz	—	3.5	—	mArms

NOTE ( 1 ) : APPLIED TO TERMINALS FLM , CL1, CL2, M, D0, D1, D2, D3.

NOTE ( 2 ) : THIS DISPLAY PATTERN IS ALL ON OR OFF.

NOTE ( 3 ) : RECOMMENDED LCD DRIVING VOLTAGE MAY FLUCTUATE ABOUT ± 1 . 0 V BY EACH MODULE.

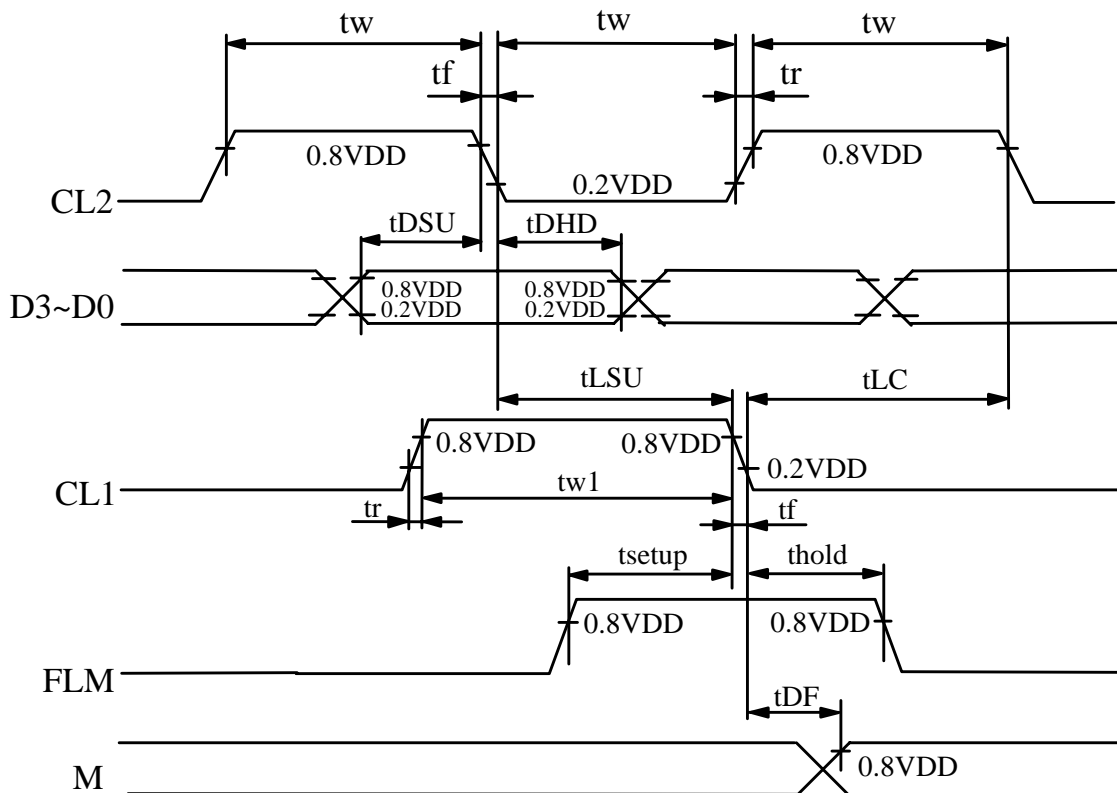
5. TIMING CHARACTERISTICS  
5.1 INTERFACE TIMING





5.2 SWITCHING CHARACTERISTICS

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT
CL1 PULSE WIDTH	tw1	30	—	—	ns
CL2 PULSE	tw	51	—	—	ns
RISE,FALL TIME	tr,tf	—	—	50	ns
DATA SETUP TIME	tDSU	30	—	—	ns
DATA HOLD TIME	tDHD	40	—	—	ns
CL1 SETUP TIME	tLSU	51	—	—	ns
CL1 TO CL2 TIME	tLC	51	—	—	ns
FLM SETUP TIME	tsetup	30	—	—	ns
FLM HOLD TIME	thold	50	—	—	ns
OUTPUT DELAY TIME	tDF	—	—	200	ns



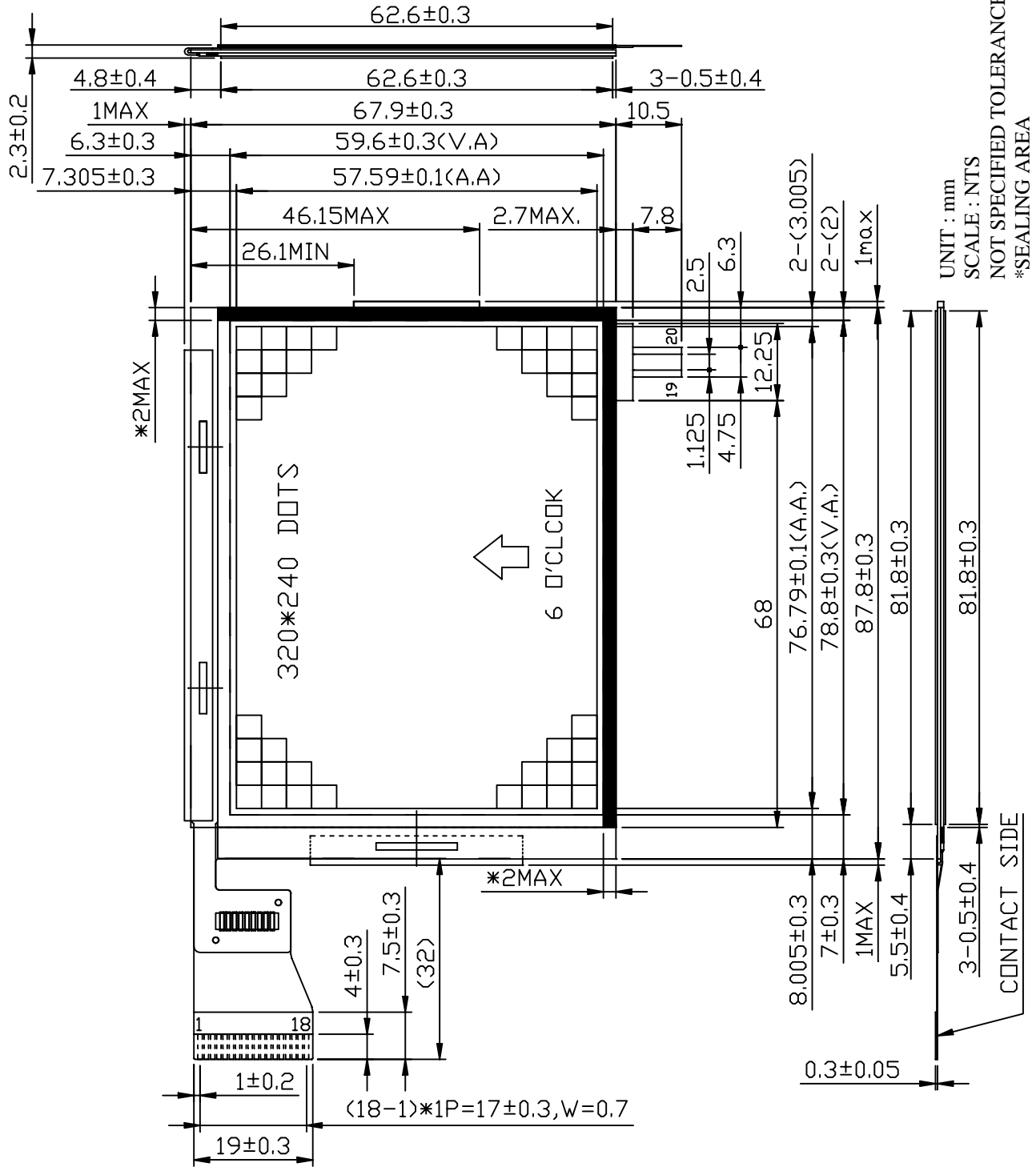
6. OPTICAL CHARACTERISTICS

Ta = 25 °C

I T E M	SYMBOL	CONDITION	MIN .	TYP .	MAX.	UNIT	NOTE
VIEWING AREA	$\varnothing 2 - \varnothing 1$	$K \geq 2.0$	50	—	—	d e g .	1
CONTRAST	K	$\varnothing = 10^\circ$	5	—	—	—	1
RESPONSE TIME	t r ( rise )	$\varnothing = 10^\circ$ $\theta = 0^\circ$	—	( 330 )	—	msec	1
	t f ( fall )	$\varnothing = 10^\circ$ $\theta = 0^\circ$	—	( 330 )	—	msec	1
THE BRIGHTNESS OF BACK-LIGHT	B	$\varnothing = 10^\circ$ $\theta = 0^\circ$	—	( 5 )	—	cd/m <sup>2</sup>	1

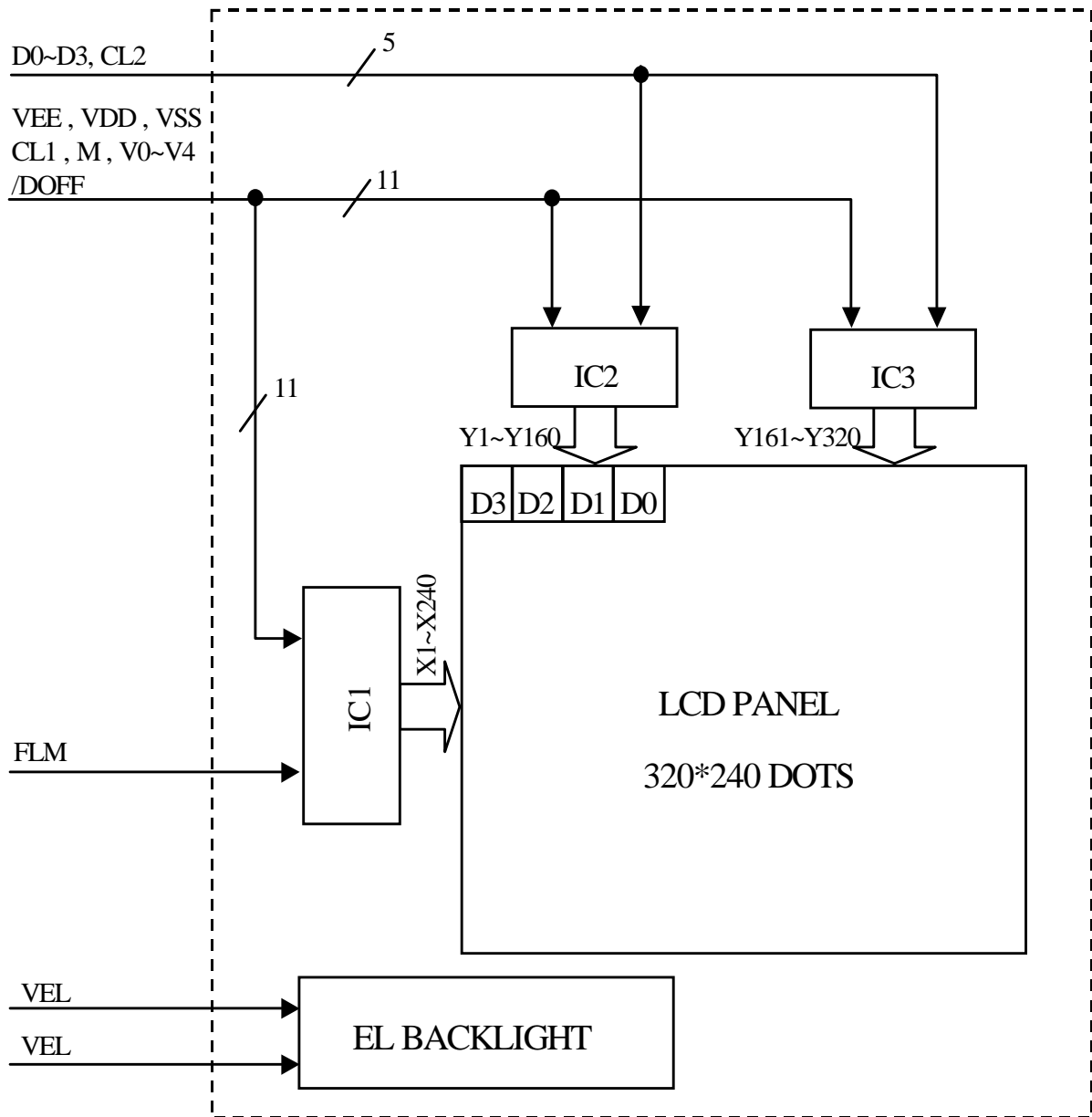
NOTE (1) : PLEASE REFER TO :  
CUSTOMER ACCEPTANCE STANDARD SPECIFICATIONS. ( EU - 002A)

7. OUTLINE DIMENSION

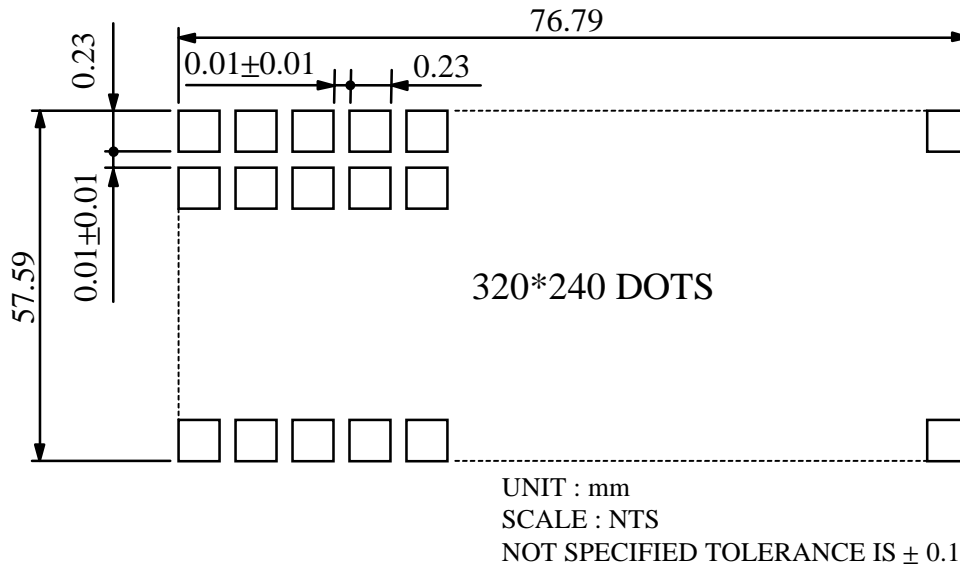


1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
VO	V1	V2	V3	V4	VSS	VSS	VDD	FLM	CL2	M	CL1	/DOFF	VSS	D3	D2	D1	D0	VEL	VEL

8. BLOCK DIAGRAM



9. DETAIL DRAWING OF DOT MATRIX



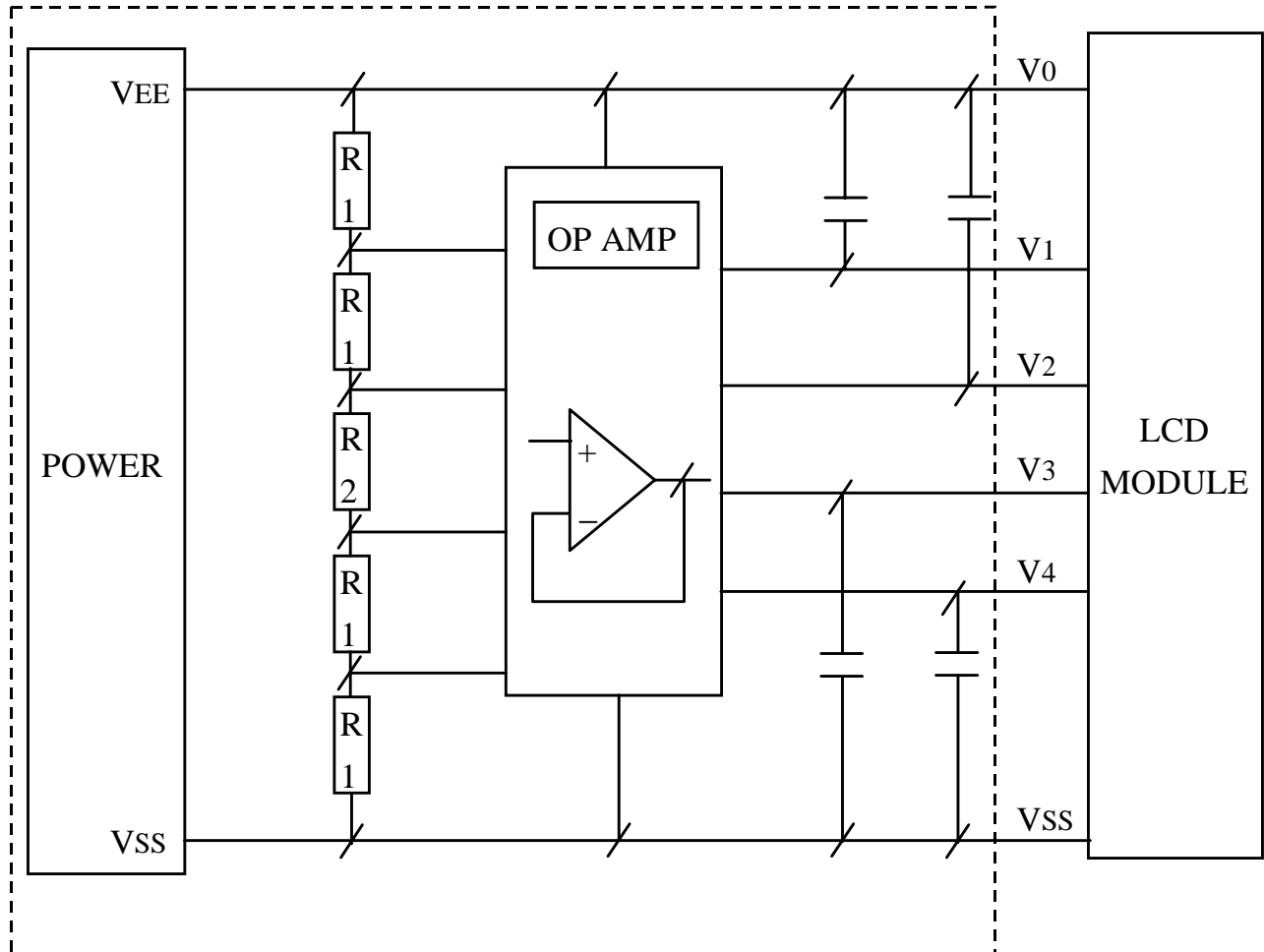
10. INTERFACE SIGNALS

FPC INTERFACE

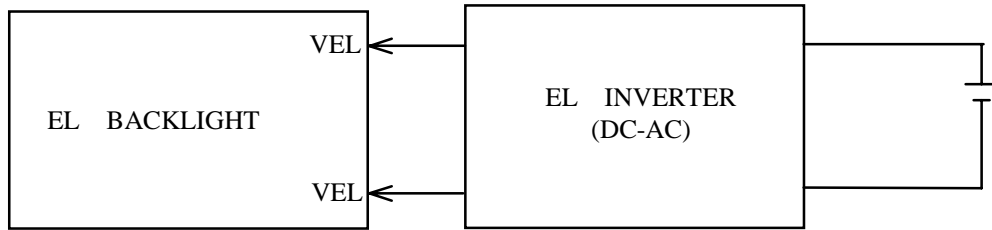
PIN NO.	SYMBOL	LEVEL	FUNCTION
1	V0	21.5V	OPERATING VOLTAGE FOR LCD
2	V1	—	BIAS VOLTAGE FOR NON-SELECT(COM DRIVER)
3	V2	—	BIAS VOLTAGE FOR NON-SELECT(SEG DRIVER)
4	V3	—	BIAS VOLTAGE FOR NON-SELECT(SEG DRIVER)
5	V4	—	BIAS VOLTAGE FOR NON-SELECT(COM DRIVER)
6	VSS	0V	GROUND
7	VSS	0V	GROUND
8	VDD	+3.3V	SUPPLY VOLTAGE FOR LOGIC
9	FLM(FRAME)	H/L	INDICATES THE BEGINNING OF EACH DISPLAY CYCLE
10	CP(CL2)	H , H→L	CLOCK PULSE FOR SEGMENT SHIFT REGISTER
11	M(DF)	H/L	SWITCH SIGNAL TO CONVERT LCD DRIVER WAVEFORM INTO AC
12	LP(CL1)	H , H→L	1) LATCH PULSE OF DISPLAY DATA 2)SHIFT CLOCK FOR COMMON DRIVER
13	/DOFF	H/L	H : DISPLAY ON , L : DISPLAY OFF
14	VSS	0V	GROUND
15	D3	H/L	DATA BIT 3 H:ON(WHITE) L : OFF(BLACK)
16	D2	H/L	DATA BIT 2 H:ON(WHITE) L : OFF(BLACK)
17	D1	H/L	DATA BIT 1 H:ON(WHITE) L : OFF(BLACK)
18	D0	H/L	DATA BIT 0 H:ON(WHITE) L : OFF(BLACK)
19	VEL	—	EL BACKLIGHT VOLTAGE
20	VEL	—	EL BACKLIGHT VOLTAGE

1 1 . POWER SUPPLY

1 1.1 POWER SUPPLY FOR LCM



1 1 . 2 POWER SUPPLY FOR EL BACKLIGHT



1 1 . 3 TIMING OF POWER SUPPLY AND INTERFACE SIGNAL

