

富相科技股份有限公司
SOLOMON Goldentek Display Corp.


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PART NO : GG2416N0FSG1G(LM6690FWE)
 FOR MESSRS : _____

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Accepted by : _____

Proposed by : 
 Date : 09,13,2002

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RECORD OF REVISION

DATE	PAGE	SUMMARY
2002/06/10	5	1.IDD:1.0(TYP.)→0.1(TYP). 2.IEE: 2.5(TYP.)→0.2(TYP).
	10	1.CHANGED K:1.08(MIN)→2.0(TYP) ° 2.CHANGED EL COLOR: X -----(MIN) → 0.16(MIN) 0.17(TYP) → 0.19(TYP) -----(MAX) → 0.22(MAX) Y -----(MIN) → 0.41(MIN) 0.41(TYP) → 0.45(TYP) -----(MAX) → 0.49(MAX)
2002,09,13	ALL	CHANGE PART NO.LM6690FWE → GG2416N0FSG1G

3. GENERAL SPECIFICATIONS AND MECHANICAL DATA**3.1 GENERAL SPECIFICATIONS**

PLEASE REFER TO:

”CUSTOMER ACCEPTANCE STANDARD SPECIFICATIONS (SP-10-000)”.

3.2 THIS INDIVIDUAL SPECIFICATION IS PRIOR TO GENERAL SPECIFICATIONS.**3.3 MECHANICAL DATA**

- (1) NUMBER OF DOTS-----240W*160H DOTS
 (2) MODULE SIZE -----87.5W*71.1H*4.1D (MAX.) mm
 (3) VIEWING AREA-----41.4W*60.6H mm
 (4) DISPLAY AREA -----38.38W*57.58H mm
 (5) DOT SIZE-----0.22W*0.22H mm
 (6) DOT PITCH -----0.24W*0.24H mm
 (7) VIEWING DIRECTION -----6 O’CLOCK
 (8) LCD TYPE-----FSTN, BLACK/WHITE, POSITIVE,
 TRANSFLECTIVE
 (9) BACK LIGHT -----EL,(BLUE-GREEN)
 (10) DRIVE METHOD-----1/160 DUTY 1/13BIAS
 (11) DRIVER IC----- NT7703, NT7704

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4. ABSOLUTE MAXIMUM RATINGS

4.1 ELECTRICAL ABSOLUTE MAXIMUM RATINGS

ITEM		SYMBOL	MIN.	MAX.	UNIT	COMMENT
POWER SUPPLY FOR LOGIC		VDD-VSS	0	7.0	V	
POWER SUPPLY FOR LCD DRIVE		VEE-VSS	0	30.0	V	
INPUT VOLTAGE		VI	-0.3	VDD+0.3	V	
STATIC ELECTRICITY		—	—	100	V	NOTE (1)
POWER SUPPLY FOR EL	VOLTAGE	VELB-VELA	—	AC 120	Vrms	
	FREQUENCY	fEL	—	1.0	KHz	

NOTE(1) : TEST METHOD AND CONDITIONS :

AFTER CHARGING UP 200PF CAPACITOR BY STATED VOLTAGE , THE CAPACITOR IS CONNECTED WITH INTERFACE PINS OF THE MODULE.

4.2 ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS.

ITEM	OPERATING		STORAGE		COMMENT
	MIN.	MAX.	MIN.	MAX.	
AMBIENT TEMPERATURE	0°C	50°C	-20°C	70°C	NOTE (2)
HUMIDITY	NOTE(3)		NOTE(3)		WITHOUT CONDENSATION
VIBRATION	—	4.9 m/s ² (0.5G)	—	19.6 m/s ² (2G)	10~300HZ XYZ DIRECTIONS 1 Hr.EACH
SHOCK	—	29.4 m/s ² (3G)	—	49.0 m/s ² (5G)	10 mSEC XYZ DIRECTIONS 1 TIME EACH
CORROSIVE GAS	NOT ACCEPTABLE		NOT ACCEPTABLE		

NOTE(2) : Ta AT -20°C : 48HR MAX.
70°C : 168HR MAX.

NOTE(3) : Ta ≤ 40°C :90% RH MAX.

Ta > 40°C : ABSOLUTE HUMIDITY MUST BE LOWER THAN THE HUMIDITY OF 90%RH AT 40°C.

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5. ELECTRICAL CHARACTERISTICS.

Ta=25°C

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
LOGIC CIRCUIT POWER SUPPLY VOLTAGE	V _{DD} -V _{SS}	————	-----	5.0	-----	V
LCD DRIVER CIRCUIT POWER SUPPLY VOLTAGE	V _{EE} -V _{SS}	————	19.0	19.5	20.0	V
INPUT VOLTAGE NOTE (1)	V _{IH}	H LEVEL	0.8V _{DD}	——	——	V
	V _{IL}	L LEVEL	——	——	0.2V _{DD}	V
OUTPUT VOLTAGE NOTE (1)	V _{OH}	I _{OH} =-0.4mA	V _{DD} -0.4	——	——	V
	V _{OL}	I _{OL} =+0.4mA	——	——	0.4	V
LOGIC CIRCUIT POWER SUPPLY CURRENT NOTE (2)	I _{DD}	V _{DD} -V _{SS} =5.0V V _{EE} -V _{SS} =19.5V	——	0.1	——	mA
LCD DRIVER CIRCUIT POWER SUPPLY CURRENT NOTE (2)	I _{EE}	V _{DD} -V _{SS} =5.0V V _{EE} -V _{SS} =19.5V	——	0.2	——	mA
RECOMMENDED LCD DRIVING	V _{EE} - V _{SS} Φ=10° θ=0° DUTY = 1/160	Ta = 0°C	——	——	——	V
		Ta = 25°C	——	19.5	——	V
		Ta = 50°C	——	——	——	V
FLM FREQUENCY	f _{FLM}	————	70	75	80	Hz
POWER SUPPLY FOR EL DRIVING	Voltage	V _{EL}	——	100	——	V _{rms}
	Frequency	f _{EL}	——	400	——	Hz

NOTE(1) : APPEND TO TERMINALS D0~D3,FLM,CL1,CL2,M

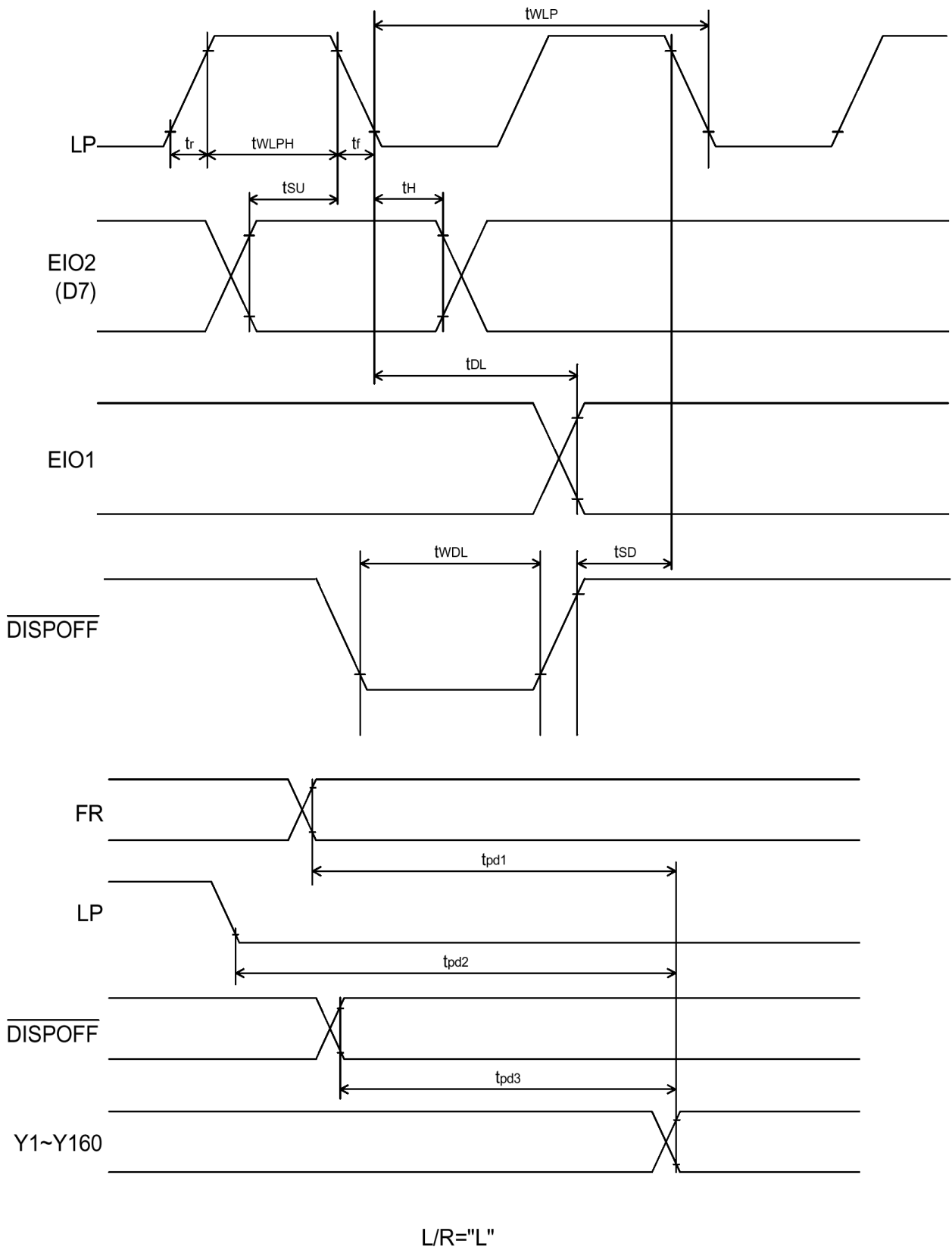
NOTE(2) : THE DISPLAY PATTERN IS ALL "Q"

6. TIMING CONTROL

6.1 TIMING CHARACTERISTICS OF COMMON MODE

Common Mode ($V_{SS}=V_S=0V$, $V_{DD}=2.5\sim 5.5V$, $V_0=15$ to $30V$ and $T_A=-20$ to $+85^\circ C$, unless otherwise noted.)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
Shift clock period	tWLP	250	-	-	ns	$t_r, t_f \leq 20ns$
Shift clock "H" pulse width	tWLPH	15	-	-	ns	$V_{DD}=+5.0V \pm 10\%$
		30	-	-	ns	$V_{DD}=+2.5\sim +4.5V$
Data setup time	t _{SU}	30	-	-	ns	
Data hole time	t _H	50	-	-	ns	
Input signal rise time	t _r		-	50	ns	
Input signal fall time	t _f		-	50	ns	
$\overline{DISPOFF}$ Removal time	t _{SD}	100	-	-	ns	
$\overline{DISPOFF}$ enable pulse width	t _{WDL}	1.2	-	-	μs	
Output delay time (1)	t _{DL}	-	-	200	ns	$C_L=15pF$
Output delay time (2)	t _{pd1} , t _{pd2}	-	-	1.2	μs	$C_L=15pF$
Output delay time (3)	t _{pd3}	-	-	1.2	μs	$C_L=15pF$



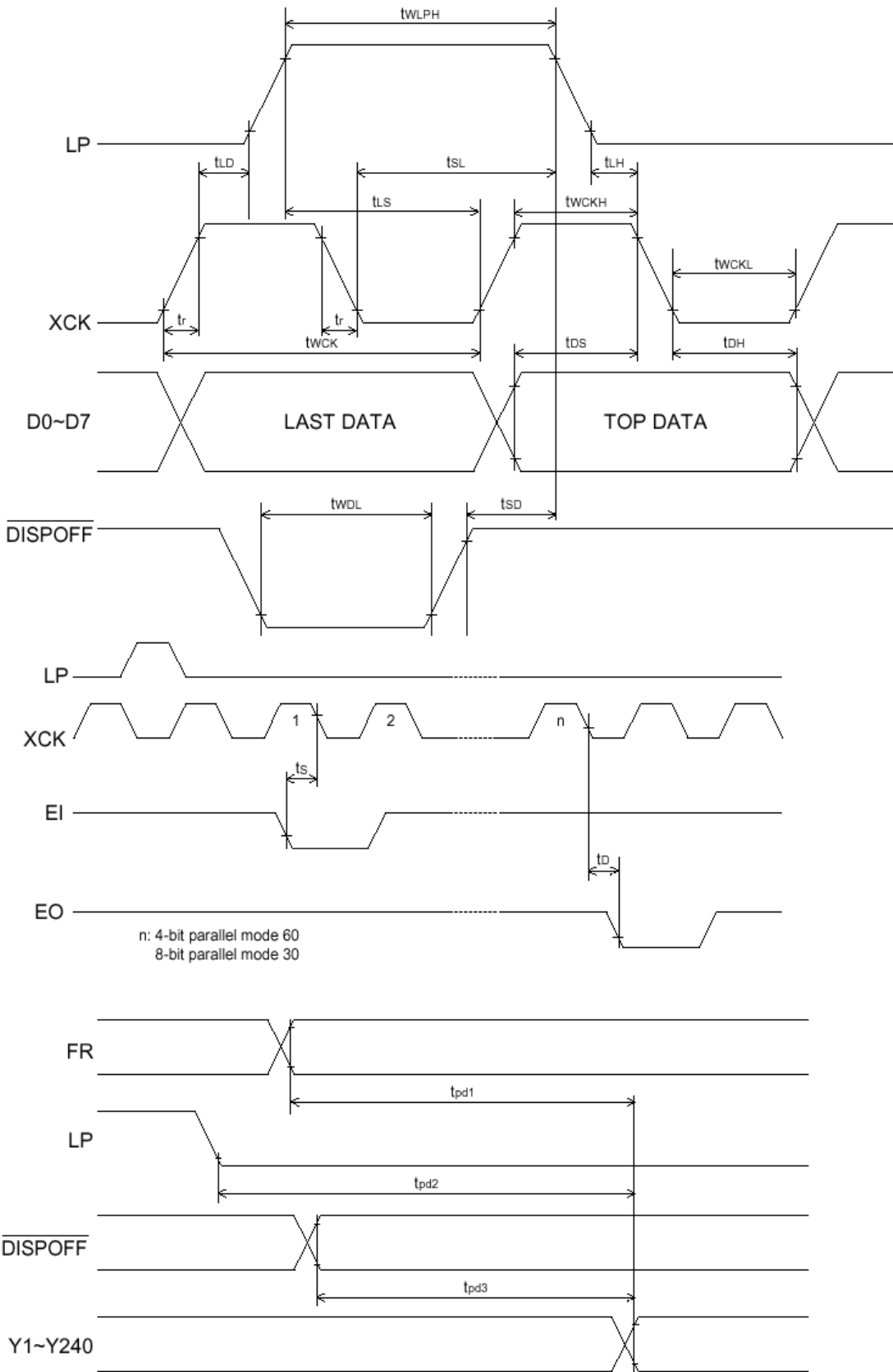
6.2 TIMING CHARACTERISTICS OF SEGMENT MODE

Segment Mode 2 (V_{SS}=0V, V_{DD}= 2.5~4.5V, V₀=15 to 30, and T_A=-20 to +85°C, unless otherwise noted.)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
Shift clock period	twck	125	-		ns	tr, tf ≤ 11ns, Note 1
Shift clock "H" pulse width	twckH	51	-		ns	
Shift clock "L" pulse width	twckL	51	-		ns	
Data setup time	tds	30	-		ns	
Data hold time	tdh	40	-		ns	
Latch pulse "H" pulse width	twlph	51	-		ns	
Shift clock rise to Latch pulse rise time	tld	0	-		ns	
Shift clock fall to Latch pulse fall time	tsl	51	-		ns	
Latch pulse rise to Shift clock rise time	tls	51	-		ns	
Latch pulse fall to Shift clock fall time	tlh	51	-		ns	
Input signal rise time	tr		-	50	ns	Note 2
Input signal fall time	tr		-	50	ns	Note 2
Enable setup time	ts	36	-		ns	
$\overline{\text{DISPOFF}}$ Removal time	tsd	100	-		ns	
$\overline{\text{DISPOFF}}$ enable pulse width	twdl	1.2	-		μs	
Output delay time (1)	td		-	78	ns	CL=15pF
Output delay time (2)	tpd1, tpd2		-	1.2	μs	CL=15pF
Output delay time (3)	tpd3		-	1.2	μs	CL=15pF

Note

1. Take the cascade connection into consideration.
2. $(t_{ck} - t_{wckH} - t_{wckL})/2$ is maximum in the case of high speed operation.



7. OPTICAL CHARACTERISTICS.

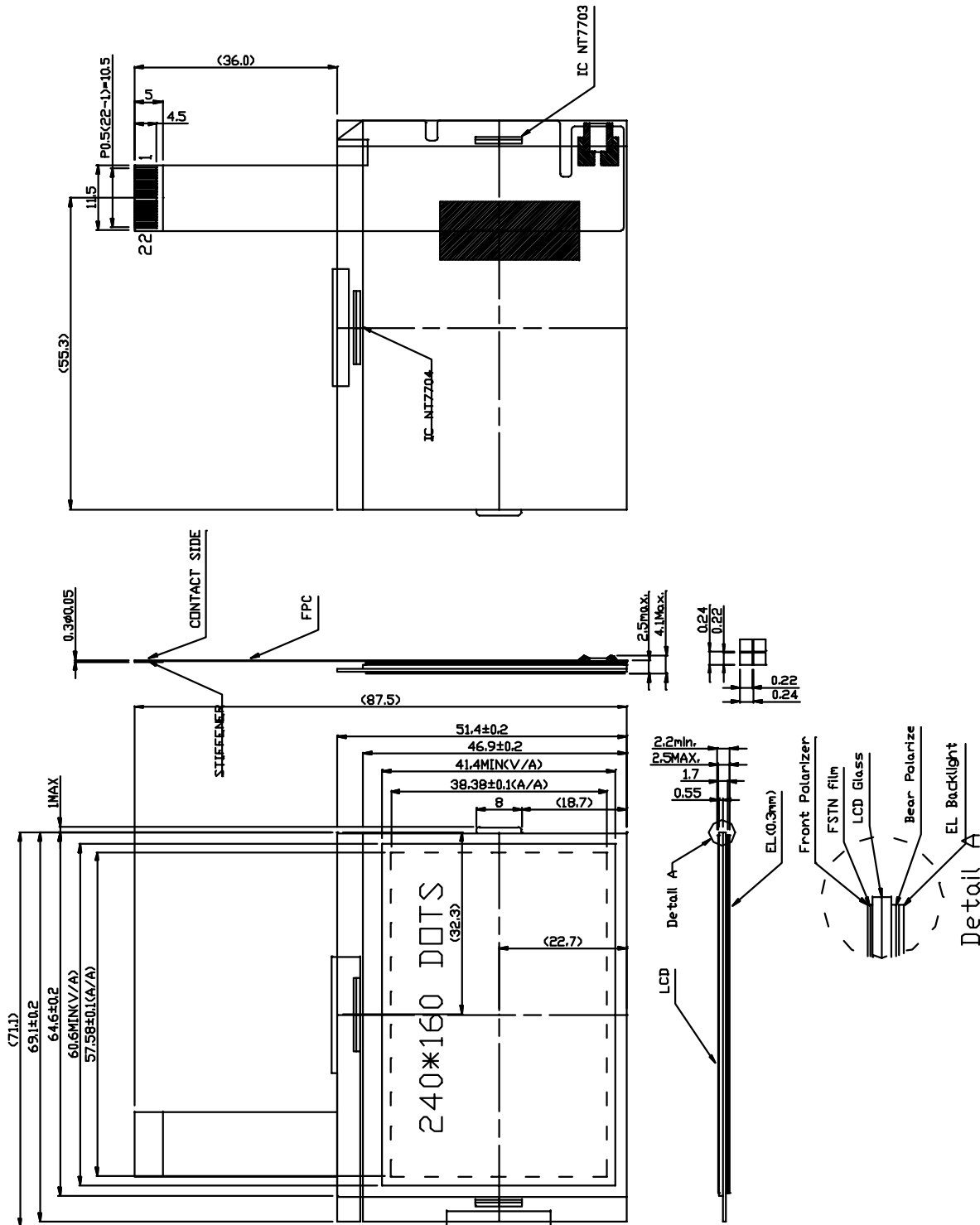
Ta = 25°C

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
VIEWING ANGLE	$\Phi_2 - \Phi_1$	$K \geq 1.4$	—	40	—	deg.	1
CONTRAST RATIO	K	$\Phi = 10^\circ$ $\theta = 0^\circ$	—	2.0	—	—	1
RESPONSE TIME	tr(rise)	$\Phi = 10^\circ$ $\theta = 0^\circ$	—	150	—	ms	1
	tf(fall)	$\Phi = 10^\circ$ $\theta = 0^\circ$	—	300	—	ms	1
THE BRIGHTNESS OF BACK-LIGHT	B	$\Phi = 0^\circ$ $\theta = 0^\circ$		4.0	—	cd/m ²	1
EL COLOR	X	—	(0.16)	(0.19)	(0.22)	—	
	Y	—	(0.41)	(0.45)	(0.49)	—	

NOTE (1) PLEASE REFER TO:

"CUSTOMER ACCEPTANCE STANDARD SPECIFICATIONS (SP-10-000)"

8. OUTLINE DIMENSION

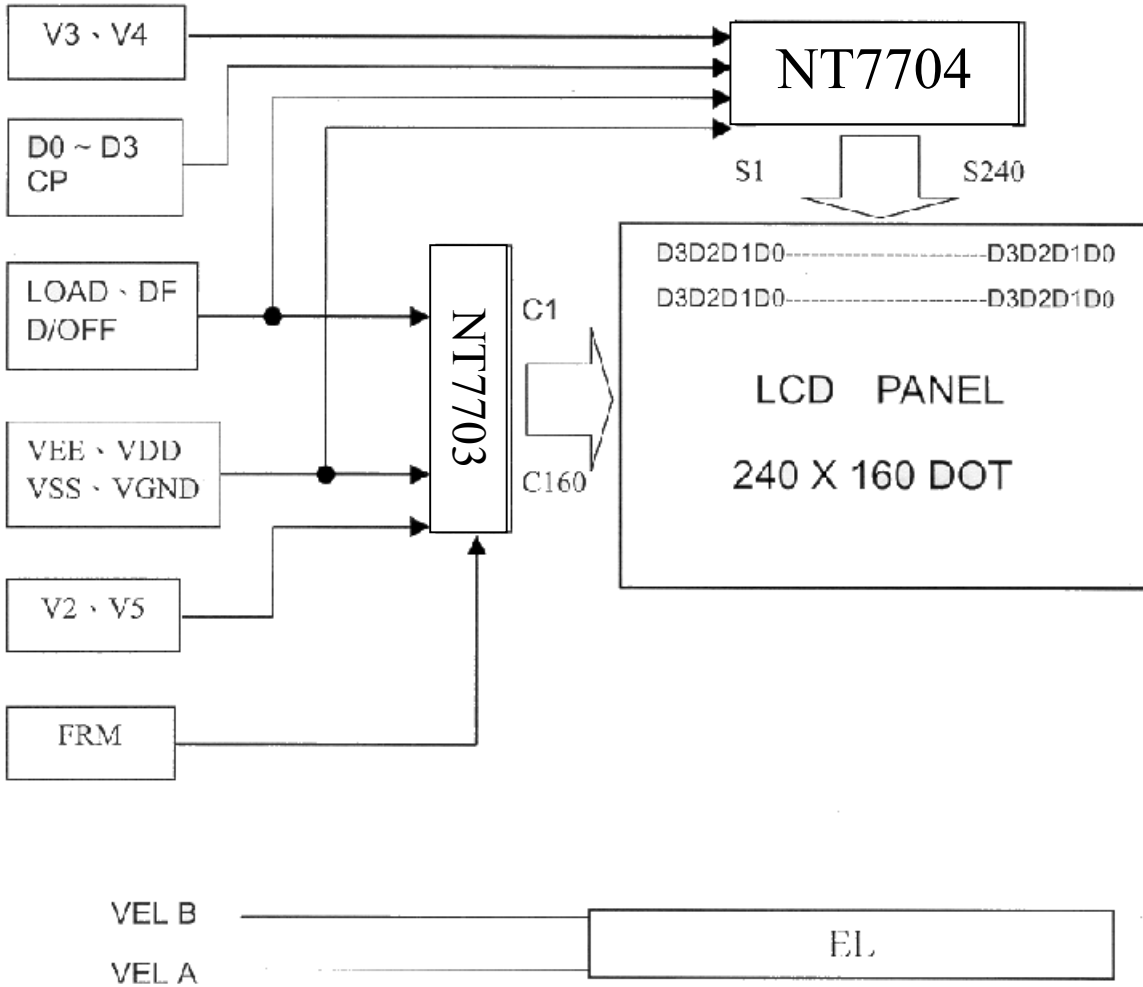


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9. BLOCK DIAGRAM

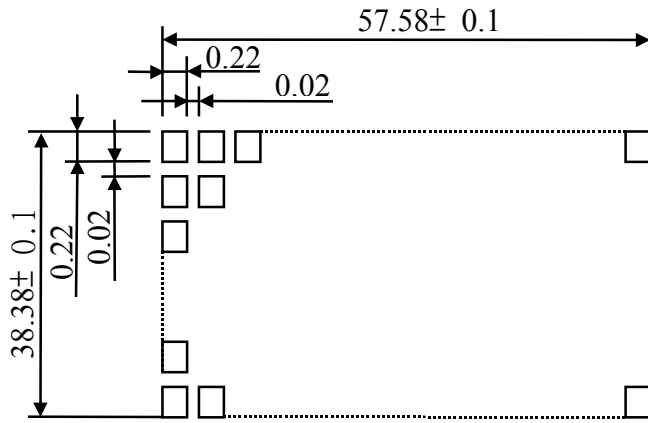


10. INTERFACE PIN CONNECTION

INTERFACE PIN CONNECTION:

PIN NO.	SYMBOL	LEVEL	FUNCTION
1	V5	—	COMMON NON-Select(COM DRIVER)
2	V2	—	COMMON NON-Select(COM DRIVER)
3	VEE	—	Power Supply for LCD (+V).
4	VDD	—	Power Supply for Logic.
5	FRM	H/L	Frame Signal.
6	VGND	—	GND.
7	LOAD	H/L	1.LATCH PULES OF DISPLAY DATA 2.SHIFT COLOCK FOR COMMON DRIVER..
8	VSS	—	GND.
9	DF	—	SWITCH SIGNAL TO CONVERT LCD DRIVE WAVEFORM INTO AC.
10	D/OFF	H/L	H: Display ON L: Display OFF.
11	CP	H/L	CLOCK PULES FOR SEGMENT SHIFT REGISTER.
12	V4	—	SEGMENT NON-Select(SEGMENT DRIVER)
13	V3	—	SEGMENT NON-Select(SEGMENT DRIVER)
14	D3	H/L	Display Data.
15	D2	H/L	Display Data.
16	D1	H/L	Display Data.
17	D0	H/L	Display Data.
18	VGND	—	GND
19	VSS	—	GND
20	VELB	—	POWER SUPPLY FOR EL+
21	VSS	—	GND
22	VELA	—	POWER SUPPLY FOR EL-

11. DISPLAY PATTERN.

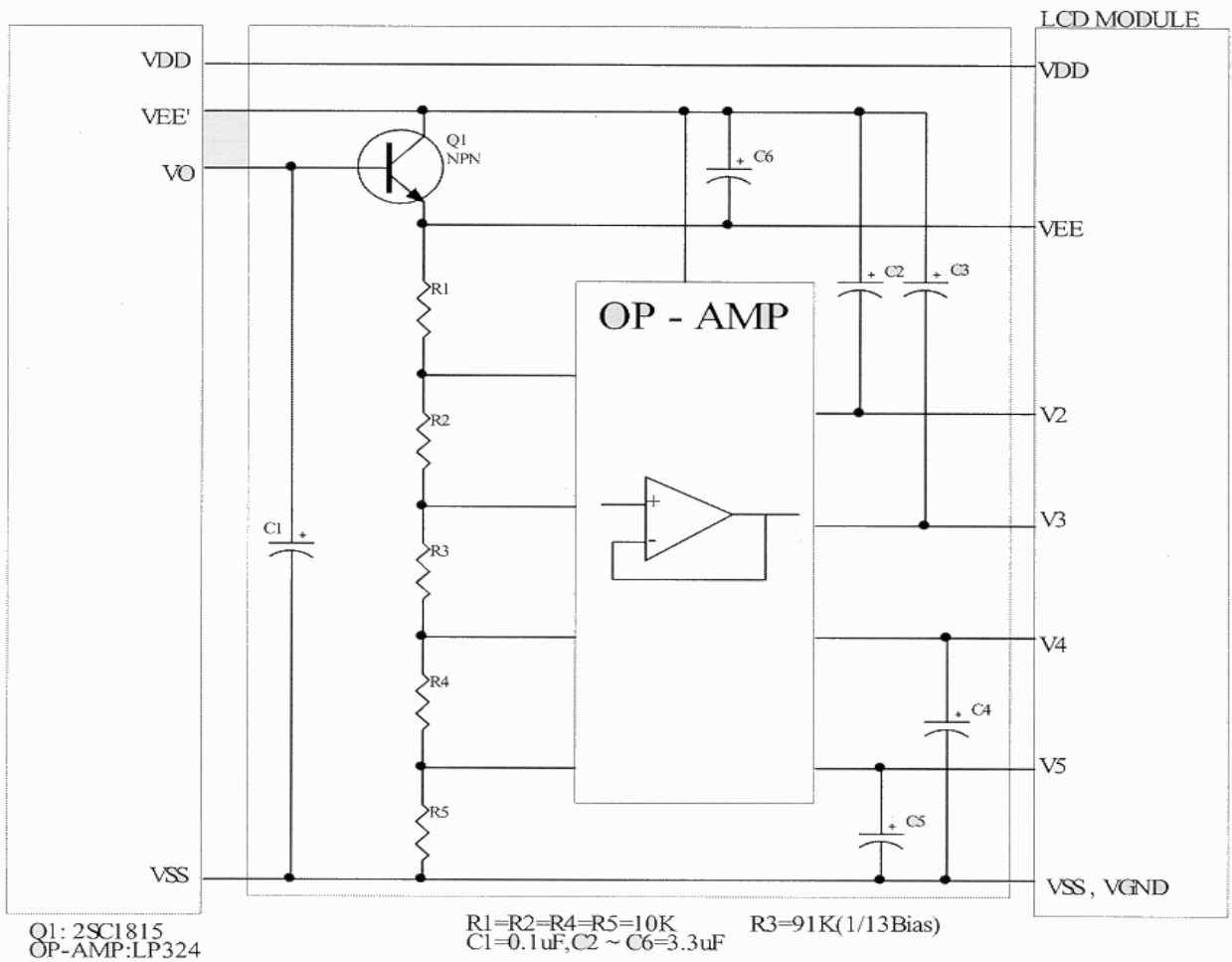


UNIT : mm

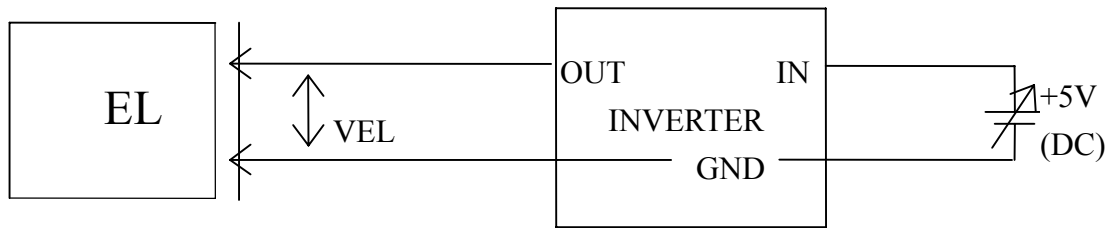
NOT SPECIFIED TOLERANCE: ± 0.01

12. POWER SUPPLY.

12.1 POWER SUPPLY FOR LCM



12.2 POWER SUPPLY FOR EL B/L



RECOMMENDED INVERTER : SKI - 020 - 05H (SUMITOMO)

NEL - D32 - 45 (NEC)

12.3 POWER AND INTERFACE TIMING SEQUENCE

