PRODUCT SPECIFICATION

Part Number

PG240128B-O Series

CUSTOMER	
CUSTOMER PART NUMBER	
DESCRIPTION	
APPROVED BY	
DATE	

Table of Contents

Record of Revisions

Rev.	Comments	Page	Date
1	Preliminary Specification was first issued.	All	8/8'14

1. Part number breakdown

P_ ___ - _ __ _ _ - _ _ _

1 2 3 4 5 6 7 8 9

Replace each Space (_) with the following letters and or numbers

1. P-tec LCD Type	**C** = Character **G** = Graphic **COG** = Chip On Glass **COF** = Chip On Flex **TAB** = Tape Automated Bonding **TFT** = Thin-film Transistor
2. LCD Model	Example for Character: **2002A** = 20 Characters x 2 Lines w/ Pins on Left side and 116mm x 37 x 12.7mm overall size Example for Graphic: **12864B** = 128 Dots per row x 64 Dots per Column w/ Pins on lower side and 93mm x 70 x 8.8mm overall size
3. Fluid Type	**T** = TN/Grey **Y** = STN/Yellow Green **G** = STN/ Grey **B** = STN/ Blue **F** = FSTN/ White **N** = FSTN/ Black
4. Backlight/polorizer	**NF** = None/Transflective **NM**= None/Transmissive **NR**=None/Reflective **EF**= EL/Transflective **EM**= EL/Transmissive **LF**= LED/Transflective **LM**= LED/Transmissive **CF**= CCFL/Transflective **CM**=CCFL=Transmissive
5. Backlight Color	(If no backlight provided move on to viewing angle [6.]) **B** = Blue/Green **Y** = Yellow **G** = Green **S** = Yellow/Green **O** = Orange **W** = White
6. Viewing Angle	**D** = 6:00 **U** = 12:00 **R** = 3:00 **L** = 9:00
7. Internal Number	Single Letter for internal purposes
8. Extended Temperature	This space is blank if operating temperature is standard 0°C to 50°C An X will be visible if the LCD is Extended operating temperature
9. Customer Specials or List of Value-added items	Usually blank unless customer requests some modifications. Can be several Letters long.

2. Precautions in use of LCD Modules

(1)Avoid applying excessive shocks to the module or making any alterations or modifications to it.
(2)Don't make extra holes on the printed circuit board, modify its shape or change the components of LCD module.
(3)Don't disassemble the LCM.
(4)Don't operate it above the absolute maximum rating.
(5)Don't drop, bend or twist LCM.
(6)Soldering: only to the I/O terminals.
(7)Storage: please storage in anti-static electricity container and clean environment.

3. General Specification

Item	Dimension	Unit
Number of Dots	240 x 128	—
Module dimension(None Backlight)	144.0 x 104.0 x 13.0（MAX）	mm
Module dimension(With Backlight)	144.0 x 104.0 x 15.0（MAX）	mm
View area	114.0 x 64.0	mm
Active area	107.95 x 57.55	mm
Dot size	0.40 x 0.40	mm
Dot pitch	0.45x 0.45	mm
LCD type	STN	
Duty	1/128	
View direction	6 o'clock or 12 o'clock	
Backlight Type	None, YELLOW-GREEN backlight	

4. Absolute Maximum Ratings

Item		Symbol	Min	Max	Unit
Input Voltage		V_I	-0.3	VDD+0.3	V
Supply Voltage For Logic		VDD-V_{SS}	-0.3	7.0	V
Supply Voltage For LCD		V_{DD}-V_0	Vdd-13.5	0	V
Standard Temperature LCM	Operating Temp.	Top	0	50	℃
	Storage Temp.	Tstr	-10	60	℃
Wide Temperature LCM	Operating Temp.	Top	-20	70	℃
	Storage Temp.	Tstr	-30	80	℃

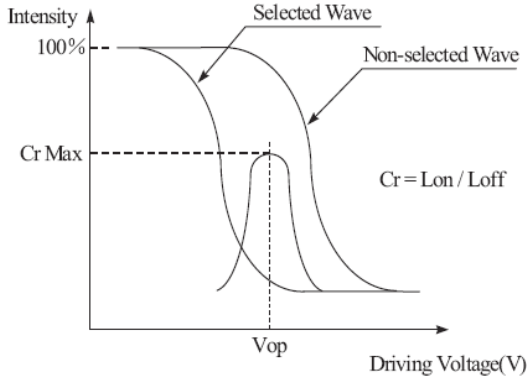
5. Electrical Characteristics

Item	Symbol	Condition	Min	Typ	Max	Unit
Supply Voltage For Logic	V_{DD}-V_{SS}	—	4.5	5.0	5.5	V
Supply Voltage For LCD	V_{DD}-V_0	Ta=25℃	18.0	18.5	19.0	V
Input High Volt.	V_{IH}	—	0.7 V_{DD}	—	V_{DD}	V
Input Low Volt.	V_{IL}	—	V_{SS}	—	0.3 V_{DD}	V
Supply Current	I_{DD}	V_{DD}=5V	8.5	9.5	12.5	mA
Supply Voltage of Yellow-green backlight	V_{LED}	Forward current =720 mA Number of LED die 2x72= 144	3.8	4.2	4.3	V
Supply Voltage of White backlight	V_{LED}	Forward current =90 mA	2.9	3.1	3.3	V

6. Optical Characteristics

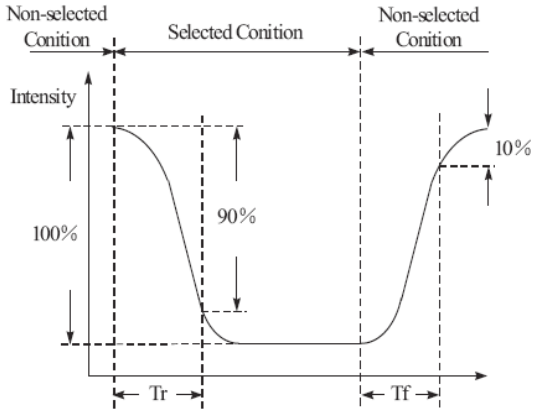
Item	Symbol	Condition	Min	Typ	Max	Unit
View Angle	(V)θ	CR≧2	-20	—	35	deg
	(H)φ	CR≧2	-30	—	30	deg
Contrast Ratio	CR	—	—	3	—	—
Response Time	T rise	—	—	—	250	ms
	T fall	—	—	—	250	ms

Definition of Operation Voltage (Vop)



[positive type]

Definition of Response Time (Tr , Tf)



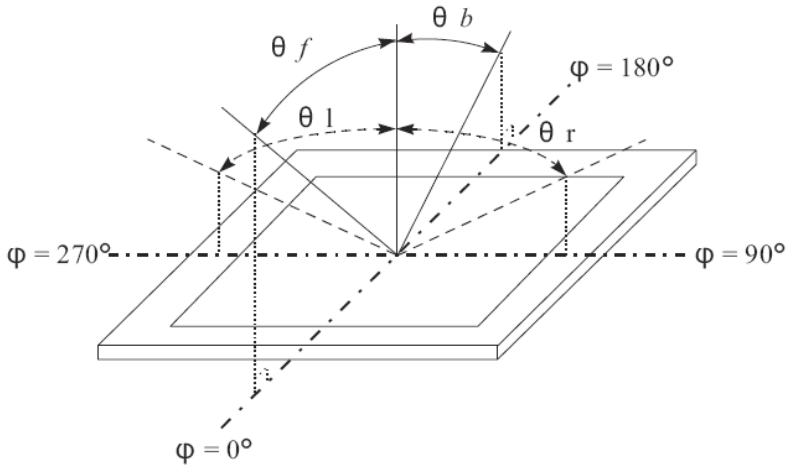
[positive type]

Conditions :

Operating Voltage : Vop　　Viewing Angle(θ , φ) : 0° , 0°

Frame Frequency : 64 HZ　　Driving Waveform : 1/N duty , 1/a bias

Definition of viewing angle(CR≧2)

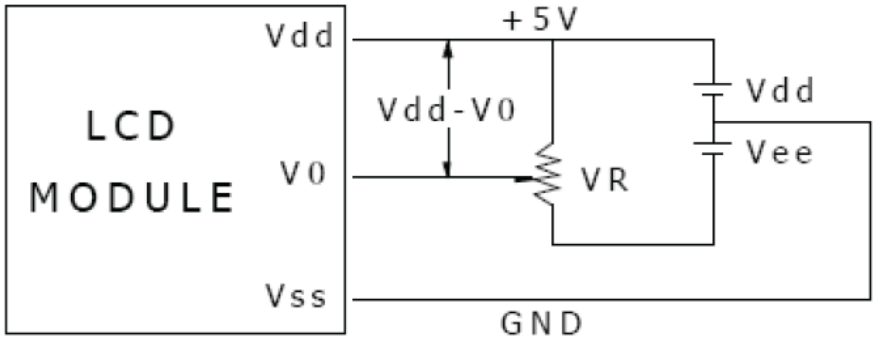


7. Interface Pin Function

Pin No.	Symbol	Level	Description
1	FGND		Frame GND
2	V_{SS}	0V	Ground
3	V_{DD}	5.0V	Supply Voltage for logic
4	V0		Supply voltage for LCD
5	/WR	H/L	Write Data into T6963C
6	/RD	H/L	Read Data from T6963C
7	/CS	H/L	Chip enable for T6963C
8	C/D	H/L	Command/Data
9	/RST	H/L	Reset signal
10	DB0	H/L	Data bit 0
11	DB1	H/L	Data bit 1
12	DB2	H/L	Data bit 2
13	DB3	H/L	Data bit 3
14	DB4	H/L	Data bit 4
15	DB5	H/L	Data bit 5
16	DB6	H/L	Data bit 6
17	DB7	H/L	Data bit 7
18	FS	H/L	Pins for selection of font
19	LED(+)		Anode of LED Backlight
20	LED(-)		Cathode of LED Backlight

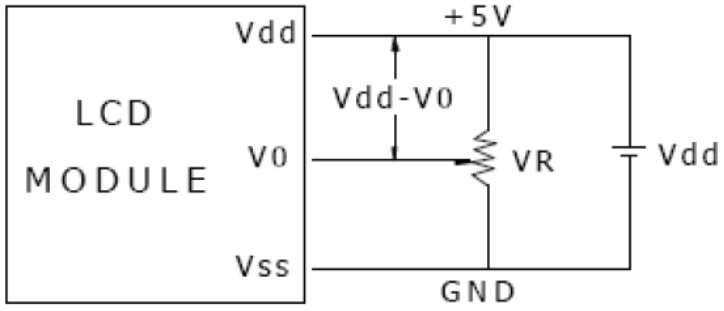
8. POWER SUPPLY

Without Negative Power on PCB



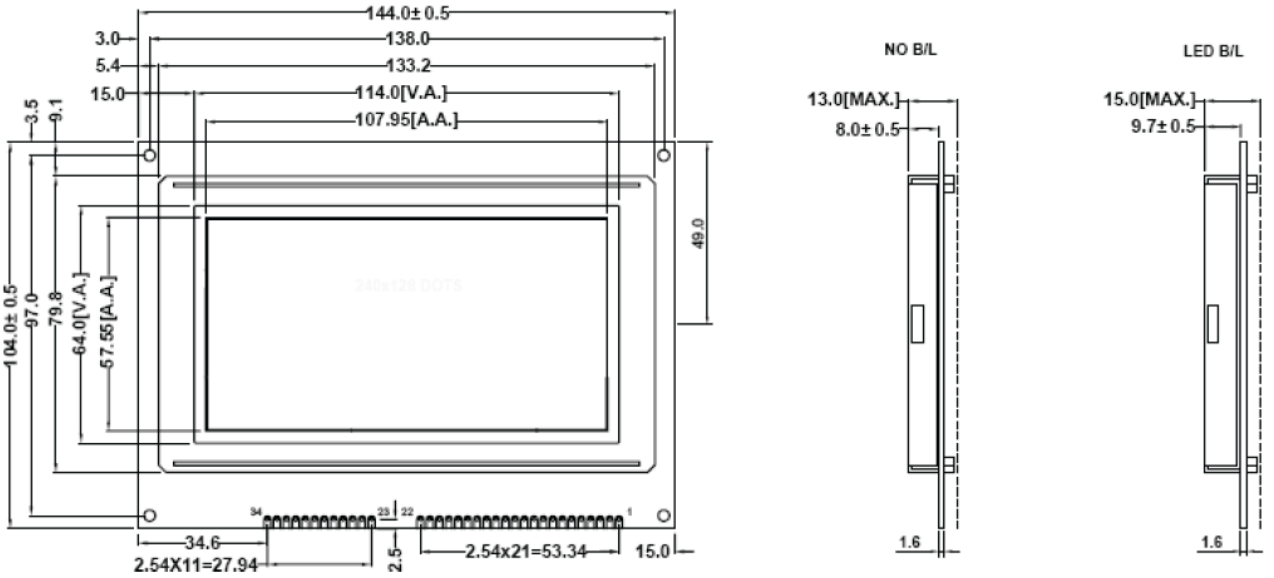
Vdd-V0: LCD Driving Voltage
VR: 10K - 20K

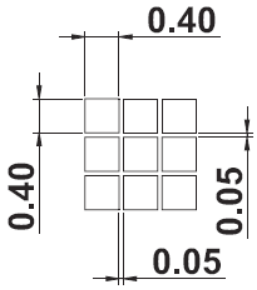
With Negative Power on PCB

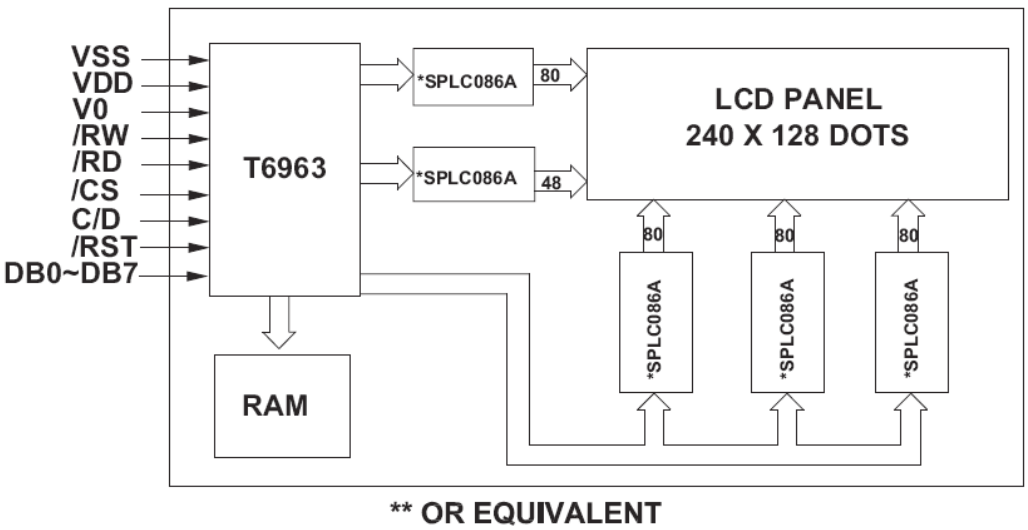


Vdd-V0: LCD Driving Voltage
VR: 10K - 20K

9. Contour Drawing &Block Diagram



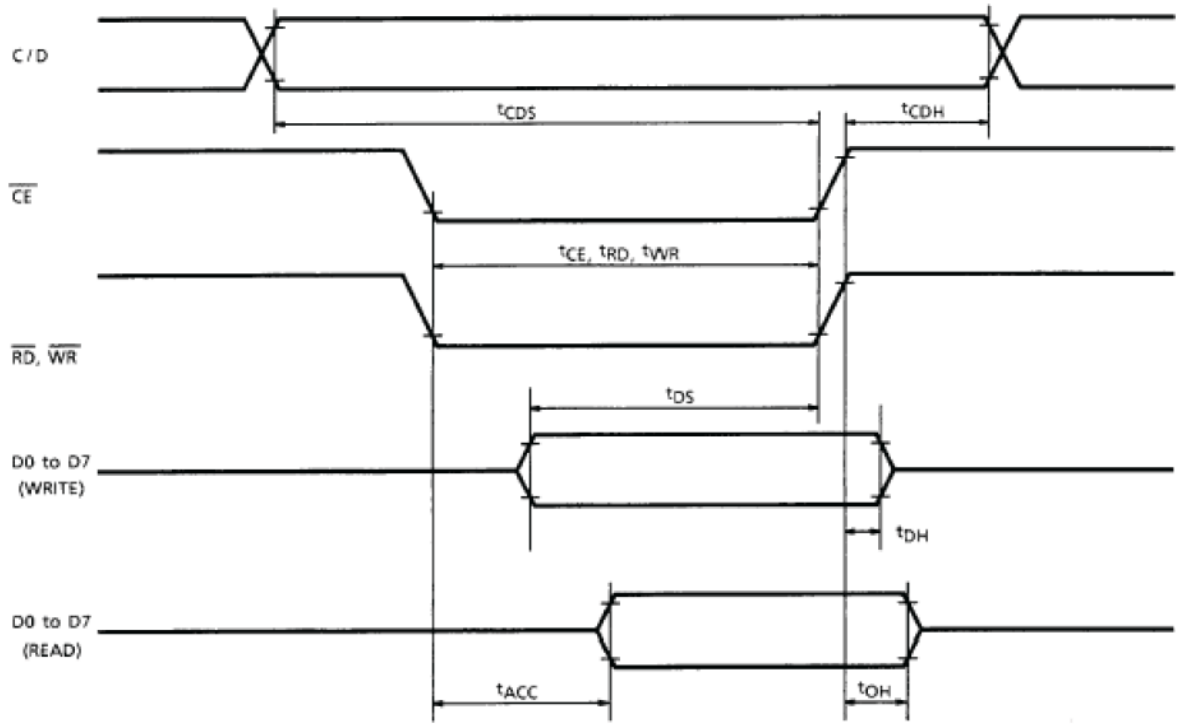




** OR EQUIVALENT

10.Timing Characteristics

Bus Timing



TEST CONDITIONS (Unless otherwise noted, V_{DD} = 5.0V ± 10%, V_{SS} = 0V, Ta = −20 to 75°C)

ITEM	SYMBOL	TEST CONDITIONS	MIN	MAX	UNIT
C/D Set-up Time	t_{CDS}	—	100	—	ns
C/D Hold Time	t_{CDH}	—	10	—	ns
$\overline{CE}$, $\overline{RD}$, $\overline{WR}$ 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

11. Table of T6963C Commands

COMMAND DEFINITIONS

COMMAND	CODE	D1	D2	FUNCTION
REGISTERS SETTING	00100001	X address	Y address	Set Cursor Pointer
	00100010	Data	00H	Set Offset Register
	00100100	Low address	High address	Set Address Pointer
SET CONTROL WORD	01000000	Low address	High address	Set Text Home Address
	01000001	Columns	00H	Set Text Area
	01000010	Low address	High address	Set Graphic Home Address
	01000011	Columns	00H	Set Graphic Area
MODE SET	1000X000	—	—	OR mode
	1000X001	—	—	EXOR mode
	1000X011	—	—	AND mode
	1000X100	—	—	Text Attribute mode
	10000XXX	—	—	Internal CG ROM mode
	10001XXX	—	—	External CG RAM mode
DISPLAY MODE	10010000	—	—	Display off
	1001XX10	—	—	Cursor on, blink off
	1001XX11	—	—	Cursor on, blink on
	100101XX	—	—	Text on, graphic off
	100110XX	—	—	Text off, graphic on
	100111XX	—	—	Text on, graphic on
CURSOR PATTERN SELECT	10100000	—	—	1-line cursor
	10100001	—	—	2-line cursor
	10100010	—	—	3-line cursor
	10100011	—	—	4-line cursor
	10100100	—	—	5-line cursor
	10100101	—	—	6-line cursor
	10100110	—	—	7-line cursor
	10100111	—	—	8-line cursor
DATA AUTO READ / WRITE	10110000	—	—	Set Data Auto Write
	10110001	—	—	Set Data Auto Read
	10110010	—	—	Auto Reset
DATA READ / WRITE	11000000	Data	—	Data Write and Increment ADP
	11000001	—	—	Data Read and Increment ADP
	11000010	Data	—	Data Write and Decrement ADP
	11000011	—	—	Data Read and Decrement ADP
	11000100	Data	—	Data Write and Nonvariable ADP
	11000101	—	—	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	—	—	Bit Reset
	11111XXX	—	—	Bit Set
	1111X000	—	—	Bit 0 (LSB)
	1111X001	—	—	Bit 1
	1111X010	—	—	Bit 2
	1111X011	—	—	Bit 3
	1111X100	—	—	Bit 4
	1111X101	—	—	Bit 5
	1111X110	—	—	Bit 6
	1111X111	—	—	Bit 7 (MSB)

X : invalid

12.Quality Assurance

Screen Cosmetic Criteria

Item	Defect	Judgment Criterion	Partition
1	Spots	A)Clear Size: d mm — Acceptable Qty in active area d ≦0.1 — Disregard 0.1<d≦0.2 — 6 0.2<d≦0.3 — 2 0.3<d — 0 Note: Including pin holes and defective dots which must be within one pixel size. B)Unclear Size: d mm — Acceptable Qty in active area d ≦0.2 — Disregard 0.2<d≦0.5 — 6 0.5<d≦0.7 — 2 0.7<d — 0	Minor
2	Bubbles in Polarizer	Size: d mm — Acceptable Qty in active area d≦0.3 — Disregard 0.3<d≦1.0 — 3 1.0<d≦1.5 — 1 1.5<d — 0	Minor
3	Scratch	In accordance with spots cosmetic criteria. When the light reflects on the panel surface, the scratches are not to be remarkable.	Minor
4	Allowable Density	Above defects should be separated more than 30mm each other.	Minor
5	Coloration	Not to be noticeable coloration in the viewing area of the LCD panels. Back-light type should be judged with back-light on state only.	Minor

13.Reliability

Content of Reliability Test

Environmental Test			
Test Item	**Content of Test**	**Test Condition**	**Applicable Standard**
High Temperature storage	Endurance test applying the high storage temperature for a long time.	60℃ 96hrs	——
Low Temperature storage	Endurance test applying the high storage temperature for a long time.	-10℃ 96hrs	——
High Temperature Operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.	50℃ 96hrs	——
Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time.	0℃ 96hrs	——
High Temperature/ Humidity Storage	Endurance test applying the high temperature and high humidity storage for a long time.	60℃,90%RH 96hrs	——
High Temperature/ Humidity Operation	Endurance test applying the electric stress (Voltage & Current) and temperature / humidity stress to the element for a long time.	50℃,90%RH 96hrs	——
Temperature Cycle	Endurance test applying the low and high temperature cycle. -10℃ 25℃ 60℃ 30min 5min 30min 1 cycle	-10℃/60℃ 10 cycles	——
Mechanical Test			
Vibration test	Endurance test applying the vibration during transportation and using.	10~22Hz→1.5mmp-p 22~500Hz→1.5G Total 0.5hrs	——
Shock test	Constructional and mechanical endurance test applying the shock during transportation.	50G Half sign wave 11 msedc 3 times of each direction	——

***Supply voltage for logic system=5V. Supply voltage for LCD system =Operating voltage at 25℃