

BEIJING ZHENZHONG ZHIYUAN DISPLAY TECH. LTD.

SPECIFICATIONS FOR LIQUID CRYSTAL DISPLAY MODULE

MODEL NO.: TNS-G12864FGDLB-IW DATE: JUN. 20, 2005

Approved	Checked	Department

CUSTOMER:

MODEL NO.:

DATE:

Approved	Checked	Department

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1. General Specifications

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1. Features

- A. Drive Method: 1/65 Duty, 1/9 Bias
- B. The Module Operating Voltage: 3V;
- C. The LCD Operating Voltage : 9.15V;
- D. Viewing Direction: 6:00h
- E. Operating Temperature: -20°C~70°C
- F. Storage Temperature: -30°C~80°C
- G. Display mode: FSTN mode, positive type display

2. Mechanical Data:

- (1) Module Size ----- 40.5 w * 34.35 h mm
- (2) Viewing Area ----- 33.8 w * 22.2 h mm
- (3) Dot Size ----- 0.225 w * 0.285 h mm
- (4) Dot Quality----- 128 * 64
- (5) Outline Dimensions----- See Attached Drawing

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3.Pin Connections:

Pin No.	Symbol	Function
1	VDD	Logic Supply Voltage(+3.0V)
2	C86	This is the MPU interface switch terminal.
3	VSS	Ground(0v)
4	V0	LCD driver supply voltages.
5	V4	
6	V3	
7	V2	
8	V1	
9	CAP2-	Capacitor 2- pad for internal DC/DC voltage converter
10	CAP2+	Capacitor 2+ pad for internal DC/DC voltage converter
11	CAP1+	Capacitor 1+ pad for internal DC/DC voltage converter
12	CAP1-	Capacitor 1- pad for internal DC/DC voltage converter
13	CAP3+	Capacitor 3+ pad for internal DC/DC voltage converter
14	VOUT	DC/DC voltage converter output
15	VSS	Ground(0v)
16-23	D7 ~D0	Data Bus Line
24	/RD(E)	Read/ Write Signal Select (Enable Signal)
25	/WR(R/W)	Read/ Write Signal Select (Read/Write Select)
26	A0	This is connected to the least significant bit of the normal MPU address bus,and it determines whether the data bits are data or a command.
27	RES	Reset Signal
28	Cs	Chip Select signal.

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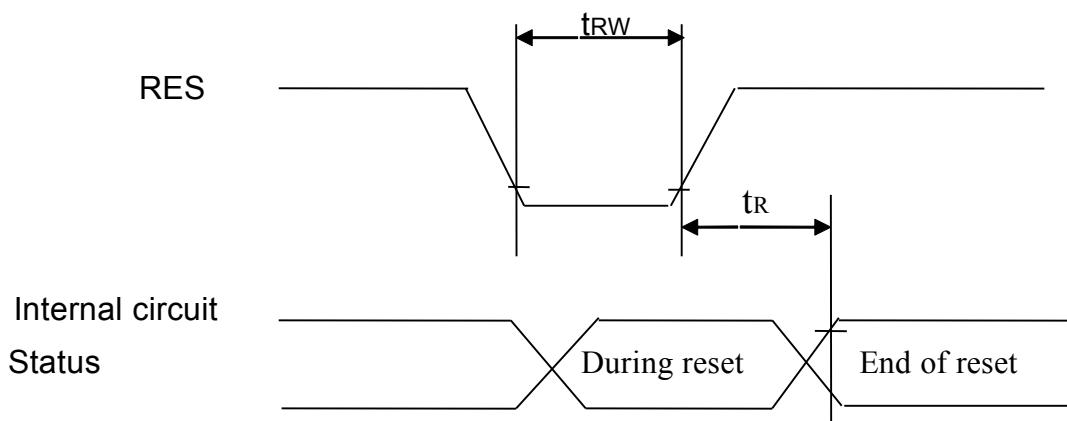
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4. Absolute Maximum Ratings

Characteristics	Symbol	Ratings
DC Supply Voltage	VDD, VDD2	-0.3V to +3.6V
DC Supply Voltage	VOOUT, V _o	-0.3V to +12V
Input Voltage Range	V _{IN}	-0.3V to VDD+0.3V

5. Reset timing



Symbol	Parameter	Min.	Typ.	Max.	Unit	Condition
T _R	Reset time			1.0	us	
T _W	Reset low pulse width	1.0			us	

6. Instruction Table

Command	A0	RD	WR	D7	D6	D5	D4	D3	D2	D1	D0	Function
Display ON/OFF	0	1	0	1	0	1	0	1	1	1	D	Turns on LCD panel when goes high, and Turns off when goes low
Set display start line	0	1	0	0	1	display start address					Specifies RAM display line for COM0	
Set page address	0	1	0	1	0	1	1	page address				Sets the display RAM page in page address register
Set column address 4 higher bits	0	1	0	0	0	0	1	higher column address				Sets 4 higher bits of column address of display RAM in register
Set column address 4 lower bits	0	1	0	0	0	0	0	lower column address				Sets 4 lower bits of column address of display RAM in register
Read status	0	0	1	status				0	0	0	0	Reads the status information
Write display data	1	1	0	Write data							Writes data in display RAM	
Read display data	1	0	1	Read data							Reads data from display RAM	
ADC select	0	1	0	1	0	1	0	0	0	0	D	Sets the display RAM address SEG output correspondence
Normal/Reverse display	0	1	0	1	0	1	0	0	1	1	D	Normal indication when low, but full indication when high
Entire display ON/OFF	0	1	0	1	0	1	0	0	1	0	0 1	Selects normal display (0) or entire display ON (1)
Set LCD bias	0	1	0	1	0	1	0	0	0	1	D	Sets LCD drive voltage bias ratio
Read- modify- Write	0	1	0	1	1	1	0	0	0	0	0	Increments column address counter during each write
End	0	1	0	1	1	1	0	1	1	1	0	Releases the read- modify- Write
Reset	0	1	0	1	1	1	0	0	0	1	0	Resets internal functions
Common output mode select	0	1	0	1	1	0	0	D	*	*	*	Selects COM output scan direction. *Invalid data
Set Power control	0	1	0	0	0	1	0	1	Operation status		Selects the power circuit operation mode	
V0 voltage regulator internal resistor ratio set	0	1	0	0	0	1	0	0	Resistor ratio		Select internal resistor ratio (Rb/Ra) mode	
Electronic volume mode set	0	1	0	1	0	0	0	0	0	0	1	Set the V0 output voltage electronic volume register
Electronic volume Register set	0	1	0	*	*	Electronic control value						
Set static indicator On/Off	0	1	0	1	0	1	0	1	1	0	D	Set static indicator On/Off 0: Off 1: ON
Set static indicator register	0	1	0	*	*	*	*	*	*	Mode		Set the flashing mode
Power save	-	-	-	-	-	-	-	-	-	-	-	Compound command of display OFF and entire display ON
NOP	0	1	0	1	1	1	0	0	0	1	1	Command for Non-Operation
Test command	0	1	0	1	1	1	1	*	*	*	*	IC test Command. Don't use!
Test mode reset	0	1	0	1	1	1	1	0	0	0	0	Command of test mode reset

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2.The Characteristics and The Reliability Test

1.Electro-Optic Characteristics:

Condition:TEMP=(23±3)°C Hum=(70±5)%RH

NO	Item	Symbol	Min	Typ.	Max	Unit	Condition
1	Supply Voltage(Logic)	Vdd-Vss		3.0		V	
2	Supply Current (Logic)	Idd				mA	Vdd=3V
3	LCD Operating Voltage	Vdd-V ₀		9.55		V	-10°C
				9.15			25°C
				8.75			60°C
4	Response Time	Ton		140		ms	
		Toff		256		ms	
5	Contrast	CR	3				
6	Viewing Angel	12H	θ 1		47	Deg	(CR≥3.0)
		6H	θ 2		51		
		3H	θ 3		50		
		9H	θ 4		50		
7	LCD Threshold Voltage	Vth		7.64		V	25°C

2. Characteristics of backlight (LED unit)

(1).Absolute Maximum Ratings:

Item	Symbol	Rating.	Unit	Condition
Forward Current	IFM	45	mA	VF=3.3V
Reverse Voltage	VR	5	V	
Power Dissipation	PD	0.148	W	VF=3.3V

(2).Electrical-optical Characteristics:

Item	Symbol	Min	Typ	Max	Unit	Condition
Forward Voltage	VF		3.3		V	
Reverse current	IR			0.3	mA	
Luminous	LV	70			cd/m ²	VF=3.3V
Color	BLUE					

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3. Reliability Test

No	Items	Test Condition	Equipment	Test Result
1	High TEMP Storage	TEMP: $80 \pm 2^{\circ}\text{C}$ Time: 96h Restore: 24h	Tenny	Passed
2	Low TEMP Storage	TEMP: $-30 \pm 3^{\circ}\text{C}$ Time: 96h Restore: 24h	Tenny	Passed
3	High TEMP Operating	TEMP: $70 \pm 2^{\circ}\text{C}$ Vop: 3V Timp: 24h Restore: 24h	Tenny	Passed
4	Low TEMP Operating	TEMP: $-20 \pm 2^{\circ}\text{C}$ Vop: 3V Timp: 24h Restore: 24h	Tenny	Passed
5	High TEMP High Hum Storage	TEMP: $40 \pm 2^{\circ}\text{C}$ Hum: 95%Rh Time: 96h Restore: 24h	Tenny	Passed
6	Thermal Shock	<p>TEMP: ($^{\circ}\text{C}$)</p> <p>The diagram shows a thermal shock profile with 5 cycles. Each cycle consists of a 30-minute dwell at 80°C, a 5-minute ramp down to -30°C, a 30-minute dwell at -30°C, and a 5-minute ramp up to 80°C. The total duration for 5 cycles is 5 minutes. The temperature levels are 80°C, 25°C, and -30°C. The test is performed on Tenny equipment and the result is Passed. Restore: 24h.</p>	Tenny	Passed

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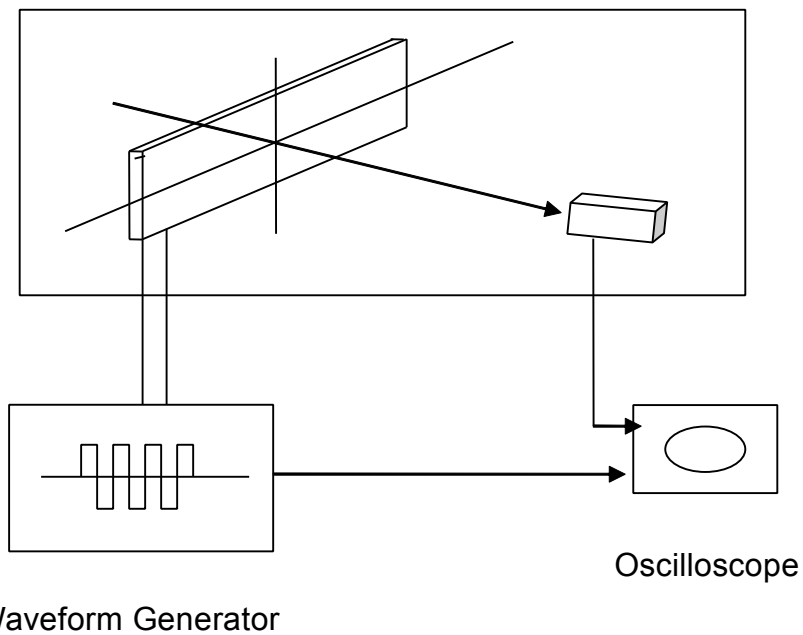
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3.The LCD Measuring Method and Equipment

1. Threshold Voltage and Response Time Measuring

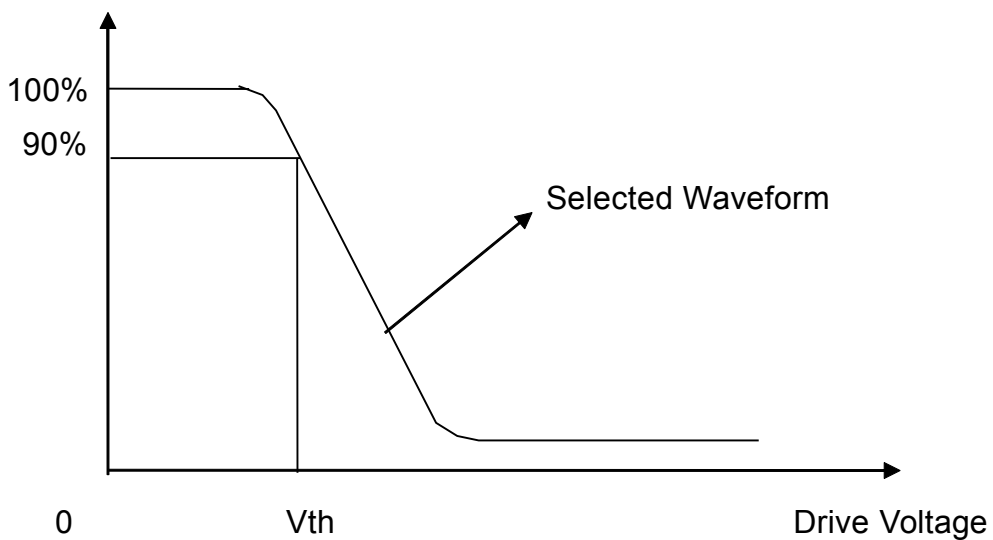
(1) Equipment



(2) Definition

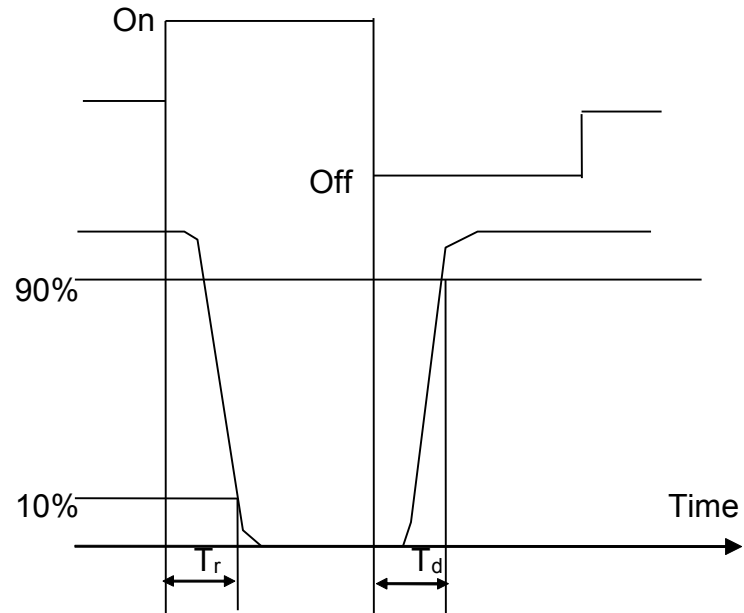
A. Threshold Voltage (V_{th})

Brightness



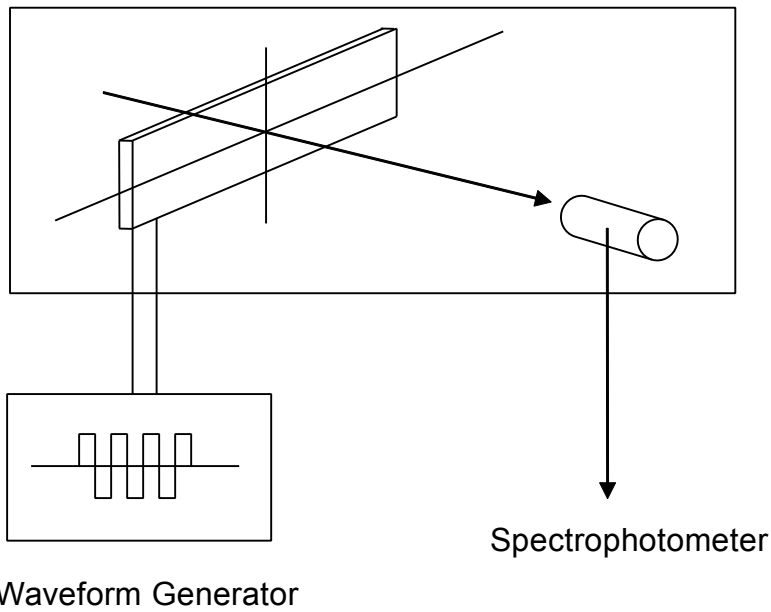
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B. Response Time



2. Contrast Measuring

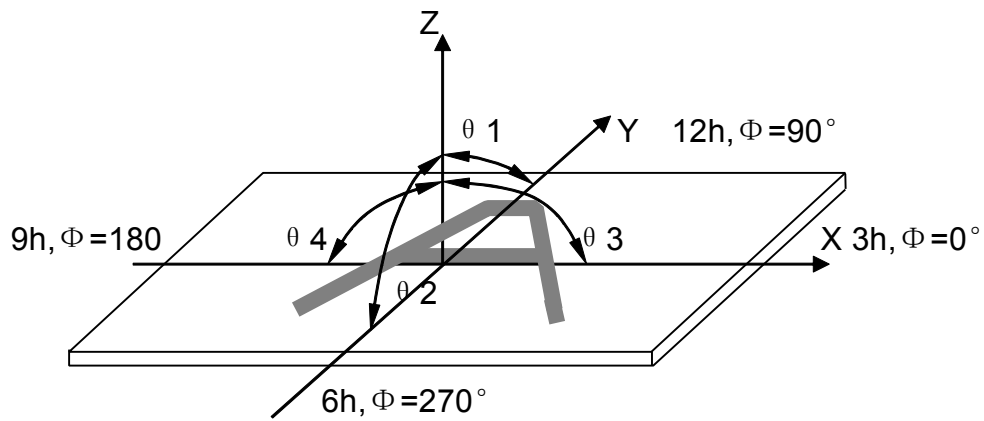
(1) Equipment



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(2)Definition:

A.Viewing Angle:



B. Contrast Ratio (Positive)

$$CR = \frac{\text{Brightness of non-selected wave-form}}{\text{Brightness of selected wave-form}}$$

3. Reliability Test:

Equipment : TENNY

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4. Standard Specifications for Product Quality

1. Manner of Test: :

1.1. The Test Must be Under 40w Fluorescent Light, and The Distance of View Must Be At 30cm.

1.2. The Test Direction Is Based On Around 15° - 45° of Vertical Line.

2. Definition of Defects

2.1 Major Defects

A: Non-Display

B: Segment Missing

C: Over Current

D: Segment Short

E: Sealant Dishardexn

F: Wrong Polarizer Direction

2.2 minor Defects: The Others.

3. Major Defects Should Be In AQL 0.25, And The Minor In AQL 1.00

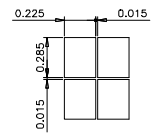
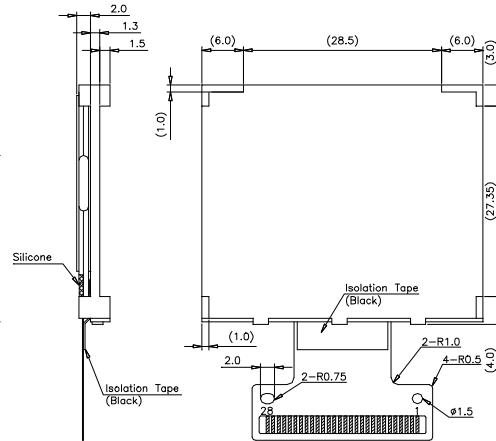
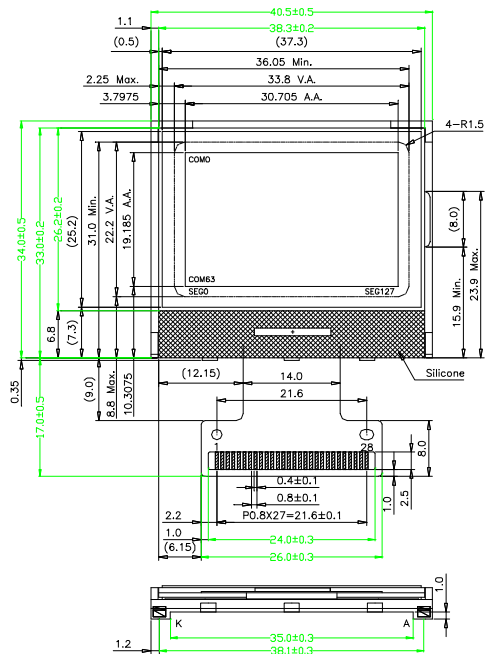
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4. Inspection Item and Standards

Item	The standard of quality inspection	Checking Manner	Quality Ratio
1.Frame	Smooth and even surface,no crack,no scratch,no rusty,and not be wrenched out of shape.the range between convex and concave is: $d \leq 0.35\text{mm}$,and the frame must be connected to the ground.	Checking With Eyes And Using Vernier Caliper, Multimeter	100%
2.LCD	1.The major defects would be reject. 2.No scratch and no dusty on the LCD glass surface. 3. $D \leq 0.15\text{mm}$ $n \leq 2$ diameter of bubble: $d \leq 0.5$ $n \leq 2$ damaged size of polarizer: $d \leq 0.15\text{mm}$, $n \leq 2$. 4.No scratch and dusty between the LCD and led.	Check It When Displaying	100%
3.The Relative Position of LCD and Frame	1.The LCD should not be twisted. 2.The LCD graphic should be in the middle position of the frame.	Checking With Eyes	100%
4.The Relative Position of PCB Panel and Frame	1.The frame installing direction must be correct. 2.The twisted angle of the pin is from 45° to 60° . 3.The pin is vertical to PCB panel and it should be in the middle position of the installing holes.	Checking With Eyes	100%
5.Function Test	1. The major defects must be reject. 2. Test flow chart (see attached chart) 3. Background changes evenly and no disorderly displaying phenomenon. 4. Display no shortage.	Check It When Displaying	100%

Note:D~Diameter N~Quantity Unit:mm

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128X64 Dots
SCALE=40:1
DOTS DETAIL

Note:

1. Operating Voltage: 3.0V
2. Drive method: 1/65 Duty, 1/9 Bias
3. Viewing Direction: 6:00
4. Operating Temp: -20°C~70°C
5. Storage Temp: -30°C~80°C
6. Display type: FSTN, Positive
7. VLED: 3.0V

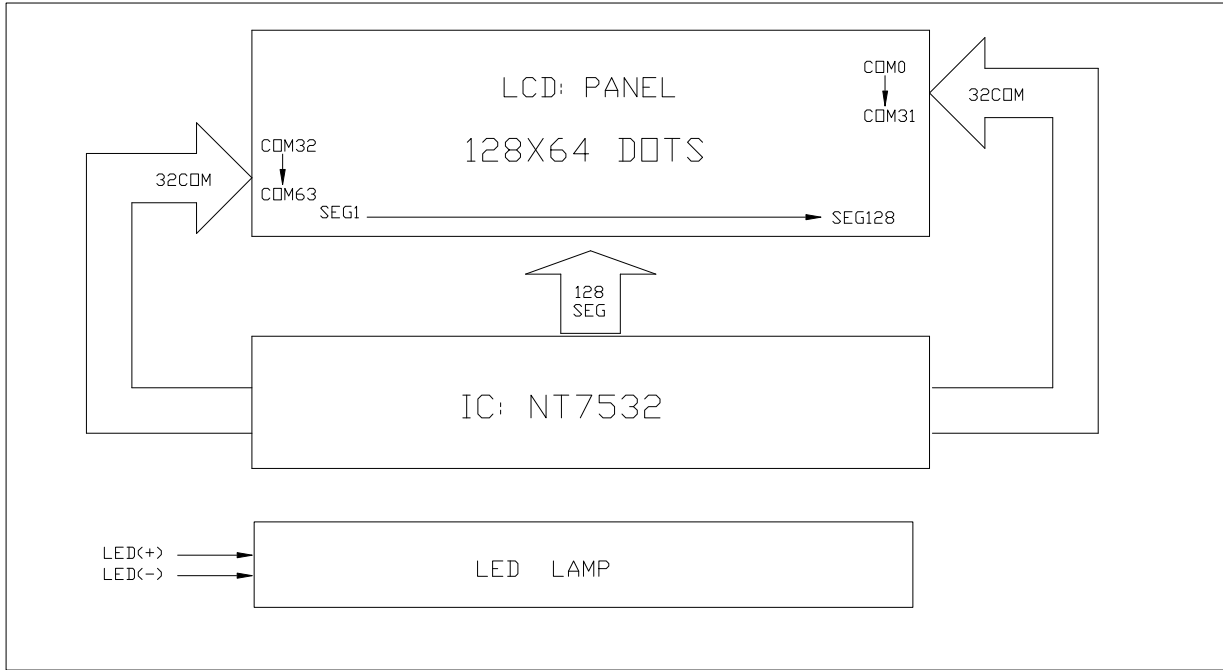
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PIN NO.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
SYMBOL	VDD	C86	VSS	V0	V4	V3	V2	V1	CAP2-	CAP2+	CAP1+	CAP1-	CAP3+	VDUT
PIN NO.	15	16	17	18	19	20	21	22	23	24	25	26	27	28
SYMBOL	VSS	D7	D6	D5	D4	D3	D2	D1	D0	/RD<E>	/WR<R/W>	A0	/RES	/CS

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