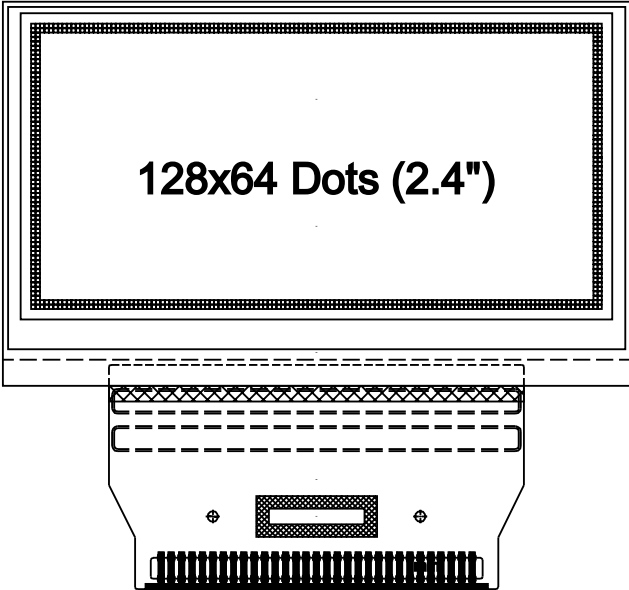




PRODUCT SPECIFICATION

# HDR12864-5

128 x 64 MONOCHROME GRAPHICS  
OLED DISPLAY MODULE



HANTRONIX, INC. 10080 BUBB RD. CUPERTINO, CA 95014	Q.A.:	REV:	HDR12864-5	SHEET 1 OF 18
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## **FEATURES**

- Small molecular organic light emitting diode.
- Color : Yellow
- Panel matrix : 128\*64
- Driver IC : SSD1303
- Excellent Quick response time : 10 $\mu$ s
- Extremely thin thickness for best mechanism design : 2.01 mm
- High contrast : 2000:1
- Wide viewing angle : 160°
- 8-bit 6800-series Parallel Interface, 8-bit 8080-series Parallel Interface, Serial Parallel Interface, I<sup>2</sup>C Interface.
- Strong environmental resistance
- Wide range of operating temperature : -40 to 85°C
- Anti-glare polarizer.

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## MECHANICAL DATA

NO	ITEM	SPECIFICATION	UNIT
1	Dot Matrix	128 (W) x 64 (H)	dot
2	Dot Size	0.4 (W) x 0.4 (H)	mm <sup>2</sup>
3	Dot Pitch	0.43 (W) x 0.43 (H)	mm <sup>2</sup>
4	Aperture Rate	86	%
5	Active Area	55.01 (W) x 27.49 (H)	mm <sup>2</sup>
6	Panel Size	60.5 (W) x 37 (H)	mm <sup>2</sup>
7	Panel Thickness	2.01 ± 0.1	mm
8	Module Size	60.5 (W) x 56.6 (H) x 2.01 (D)	mm <sup>3</sup>
9	Diagonal A/A size	2.4	inch
10	Module Weight	9.59 ± 10%	gram

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## MAXIMUM RATINGS

ITEM	MIN	MAX	UNIT	Condition	Remark
Supply Voltage ( $V_{DD}$ )	-0.3	+3.5	V	Ta = 25 °C	IC maximum rating
Supply Voltage ( $V_{CC}$ )	8	16	V	Ta = 25 °C	IC maximum rating
Operating Temp.	-40	85	°C		
Storage Temp	-40	85	°C		
Humidity		85	%		
Life Time	40,000	-	Hrs	100 cd/m <sup>2</sup> , 50% checkerboard	Note (1)
Life Time	50,000	-	Hrs	80 cd/m <sup>2</sup> , 50% checkerboard	Note (2)
Life Time	66,000	-	Hrs	60 cd/m <sup>2</sup> , 50% checkerboard	Note (3)

Note:

(A) Under VCC = 13V, Ta = 25°C, 50% RH.

(B) Life time is defined the amount of time when the luminance has decayed to less than 50% of the initial measured luminance.

(1) Setting of 100 cd/m<sup>2</sup> :

- Contrast setting : 0XC5
- Frame rate : 105Hz
- Duty setting : 1/64

(2) Setting of 80 cd/m<sup>2</sup> :

- Contrast setting : 0x8F
- Frame rate : 105Hz
- Duty setting : 1/64

(3) Setting of 60 cd/m<sup>2</sup> :

- Contrast setting : 0x4C
- Frame rate : 105Hz
- Duty setting : 1/64

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## ELECTRICAL CHARACTERISTICS

### D.C ELECTRICAL CHARACTERISTICS

SYMBOL	PARAMETERS	TEST CONDITION	MIN	TYP	MAX	UNIT
$V_{CC}$	Analog power supply (for OLED panel)	$T_a = -20\text{ }^{\circ}\text{C}$ to $+70\text{ }^{\circ}\text{C}$	12.5	13	13.5	V
$V_{DD}$	Digital power supply	$T_a = -20\text{ }^{\circ}\text{C}$ to $+70\text{ }^{\circ}\text{C}$	2.4	2.7	3.5	V
$I_{DD}$	Operating current for $V_{DD}$ $V_{DD} = 2.7\text{V}$ , $V_{CC} = 12\text{V}$ , $I_{REF} = 10\text{uA}$ No loading, All Display ON	Contrast=FF	-	190	300	$\mu\text{A}$
$I_{CC}$	Operating current for $V_{CC}$ $V_{DD} = 2.7\text{V}$ , $V_{CC} = 12\text{V}$ , $I_{REF} = 10\text{uA}$ All Display ON	Contrast=FF	-	550	1000	$\mu\text{A}$
$V_{IH}$	High logic input level		$0.8^* V_{DD}$	-	$V_{DD}$	V
$V_{IL}$	Low logic input level		0	-	$0.2^* V_{DD}$	V
$V_{OH}$	High logic output level		$0.9^* V_{DD}$	-	$V_{DD}$	V
$V_{OL}$	Low logic output level		0	-	$0.1^* V_{DD}$	V
$I_{SEG}$	Segment on output current $V_{DD} = 2.7\text{V}$ , $V_{CC} = 12\text{V}$ , $I_{REF} = 10\text{uA}$ , Display on, Segment pin under test is connected with a 20K resistive load to $V_{SS}$	Contrast=FF	285	320	355	$\mu\text{A}$
		Contrast=AF	-	220	-	$\mu\text{A}$
		Contrast=5F	-	120	-	$\mu\text{A}$
		Contrast=0F	-	20	-	$\mu\text{A}$

Note 1:  $V_{DD} = 2.7\text{V}$  ;  $V_{CC} = 13\text{V}$  ; Frame rate= 105Hz ; No panel attached.

Note 2: The  $V_{CC}$  input must keep in a stable value; ripple and noise are not allowed.

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## ELECTRO-OPTICAL CHARACTERISTICS

### PANEL ELECTRICAL SPECIFICATIONS

PARAMETER	MIN	TYP.	MAX	UNITS	COMMENTS
Normal mode current		22	25	mA	All pixels on (1)
Standby mode current		2	3	mA	Standby mode 10% pixels on (2)
Normal mode power consumption		286	325	mW	All pixels on (1)
Standby mode power consumption		26	39	mW	Standby mode 10% pixels on (2)
Normal mode Luminance	60	80		cd/m <sup>2</sup>	Display Average
Standby mode Luminance		30		cd/m <sup>2</sup>	
CIE <sub>x</sub> (Yellow)	0.43	0.47	0.51		x, y (CIE 1931)
CIE <sub>y</sub> (Yellow)	0.45	0.49	0.53		
Dark Room Contrast	2000:1				
Viewing Angle	160			degree	
Response Time		10		μs	

(1) Normal mode condition :

- Driving Voltage : 13V
- Contrast setting : 0x8F
- Frame rate : 105Hz
- Duty setting : 1/64

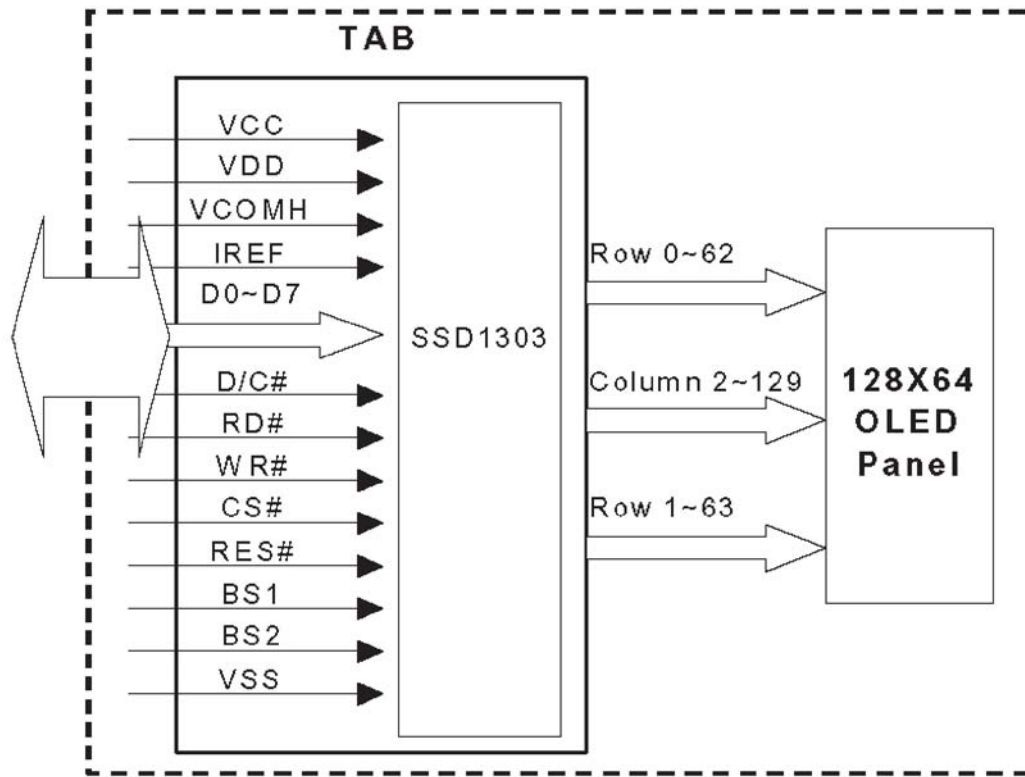
(2) Standby mode condition :

- Driving Voltage : 13V
- Contrast setting : 0x00
- Frame rate : 105Hz
- Duty setting : 1/64

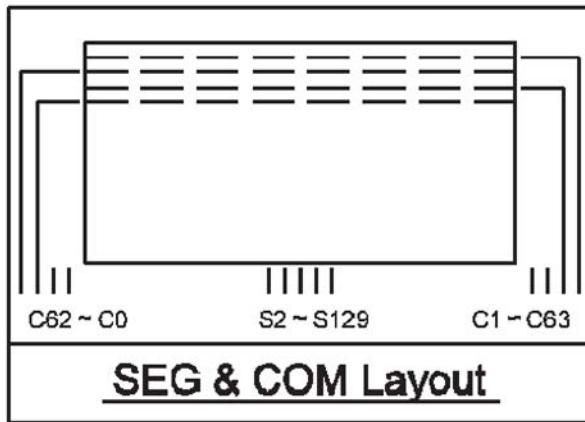
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# INTERFACE

## FUNCTION BLOCK DIAGRAM



## 7.2 PANEL LAYOUT DIAGRAM



### PIN ASSIGNMENTS

Pin No.	Pin Name	TYPE	Description
1	NC	-	No connection
2	VSS	I	This is a ground pin.
3	TEST0	-	Reserved pin; No connection and left float.
4	TEST1	-	
5	TEST2	-	
6	TEST3	-	
7	TEST4	-	
8	NC	-	No connection
9	NC	-	
10	NC	-	
11	VDD	I	Voltage Power supply for logic.
12	BS1	I	MCU interface selection input.
13	BS2	I	
14	NC	-	No connection
15	CS	I	This is Chip select Control pin.
16	RES	I	Hardware reset pin.
17	D/C	I	This is Data/Command Control pin. H:Data Input - L:Command Input.
18	WR	I	Data write operation is initiated when it's pull low
19	RD	I	Data read operation is initiated when it's pull low
20	D0	I/O	8 bits MPU data bus I/O
21	D1	I/O	
22	D2	I/O	
23	D3	I/O	
24	D4	I/O	
25	D5	I/O	
26	D6	I/O	
27	D7	I/O	
28	IREF	I	The Current reference input pin, a resistor should be connected between this pin and V <sub>SS</sub> .
29	VCOMH	I	The Com voltage reference input pin, a capacitor should be connected between this pin and V <sub>SS</sub> .
30	VCC	I	Analog power supply input.
31	NC	-	No connection

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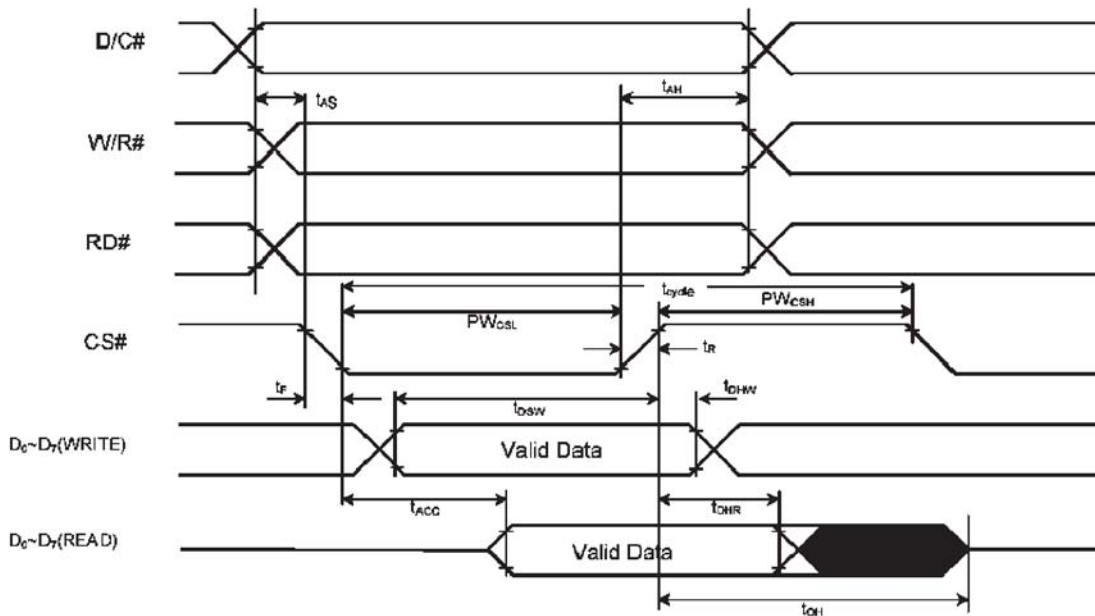
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## INTERFACE TIMING CHART

### 8080-Series MCU Parallel Interface Timing Characteristics

Symbol	Parameter	Min	Typ	Max	Unit
$t_{cycle}$	Clock Cycle Time	300	-	-	ns
$t_{AS}$	Address Setup Time	0	-	-	ns
$t_{AH}$	Address Hold Time	0	-	-	ns
$t_{DSW}$	Write Data Setup Time	40	-	-	ns
$t_{DHW}$	Write Data Hold Time	15	-	-	ns
$t_{DHR}$	Read Data Hold Time	20	-	-	ns
$t_{OH}$	Output Disable Time	-	-	70	ns
$t_{ACC}$	Access Time	-	-	140	ns
$PW_{CSL}$	Chip Select Low Pulse Width (read) Chip Select Low Pulse Width (write)	120 60	-	-	ns
$PW_{CSH}$	Chip Select High Pulse Width (read) Chip Select High Pulse Width (write)	60 60	-	-	ns
$t_R$	Rise Time	-	-	15	ns
$t_F$	Fall Time	-	-	15	ns



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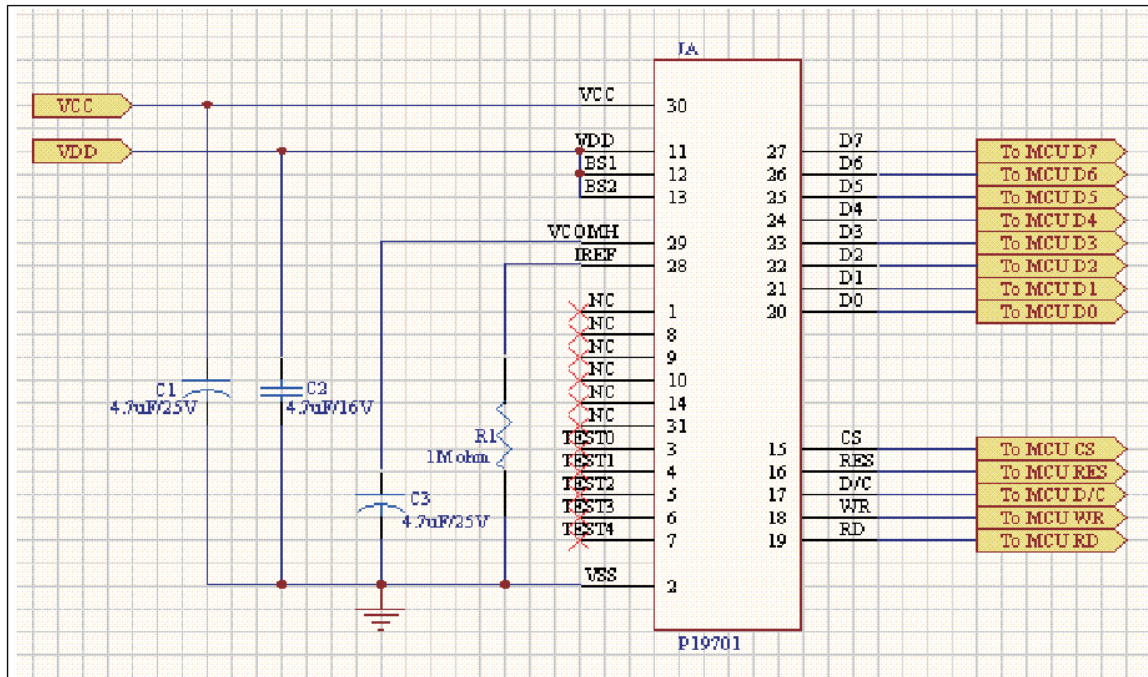
REV.:  
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## APPLICATION CIRCUIT

### APPLICATION CIRCUIT



#### Recommended components

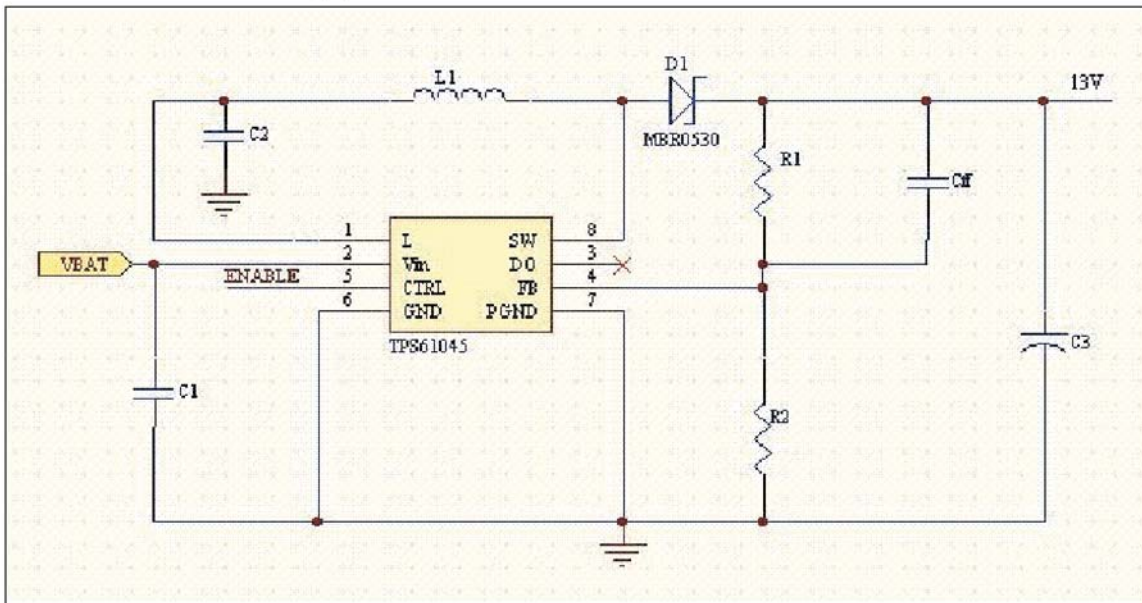
R1 : 1M ohm (0603), 1%.

C1 : 4.7uF (Tantalum Type) / 25V, C2 : 4.7uF (0805) / 16V ,

C3 : 4.7uF (Tantalum Type) / 25V.

**This circuit is designed for 8080 8-bits interface.**

## External DC-DC application circuit



### Recommended components

C1: 0.1uF(0603) / 25V, C2 : 4.7uF (Tantalum Type) / 25V,

C3 : 4.7uF (Tantalum Type) / 25V.

Cff : 22pF(0603) / 16V.

D1:Schottky Diode.

L1: 10uH.

R1: 1.2M ohm (0603), 1%, R2: 127K ohm (0603), 1%.

VBAT = 1.8V ~ 6.0V(The Detail Application,please refer the IC data sheet).

### 8.2 COMMAND TABLE

Refer to IC Spec.: SSD1303

## RELIABILITY TEST CONDITIONS

No.	Items	Specification	Quantity
1	High temp. (Non-operation)	85°C, 240hrs	5
2	High temp. (Operation)	85°C, 120hrs	5
3	Low temp. (Operation)	-40°C, 120hrs	5
4	High temp. / High humidity (Operation)	65°C, 90%RH, 120hrs	5
5	Thermal shock (Non-operation)	-40°C ~85°C (-40°C /30min; transit /3min; 85°C /30min; transit /3min) 1cycle: 66min, 100 cycles	5
6	Vibration	Frequency : 5~50HZ, 0.5G Scan rate : 1 oct/min Time : 2 hrs/axis Test axis : X, Y, Z	1 Carton
7	Drop	Height: 120cm Sequence : 1 angle 、 3 edges and 6 faces Cycles: 1	1 Carton
8	ESD (Non-operation)	Air discharge model, ±8kV, 10 times	5

### Test and measurement conditions

1. All measurements shall not be started until the specimens attain to temperature stability.
2. All-pixels-on is used as operation test pattern.
3. The degradation of Polarizer are ignored for item 1, 2, 4 & 5.

### Evaluation criteria

1. The function test is OK.
2. No observable defects.
3. Luminance: > 50% of initial value.
4. Current consumption: within  $\pm$  50% of initial value.

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## APPENDIXES

### APPENDIX 1: DEFINITIONS

#### A. DEFINITION OF CHROMATICITY COORDINATE

The chromaticity coordinate is defined as the coordinate value on the CIE 1931 color chart for R, G, B, W.

#### B. DEFINITION OF CONTRAST RATIO

The contrast ratio is defined as the following formula:

$$\text{Contrast Ratio} = \frac{\text{Luminance of all pixels on measurement}}{\text{Luminance of all pixels off measurement}}$$

#### C. DEFINITION OF RESPONSE TIME

The definition of turn-on response time  $T_r$  is the time interval between a pixel reaching 10% of steady state luminance and 90% of steady state luminance. The definition of turn-off response time  $T_f$  is the time interval between a pixel reaching 90% of steady state luminance and 10% of steady state luminance. It is shown in Figure 2.

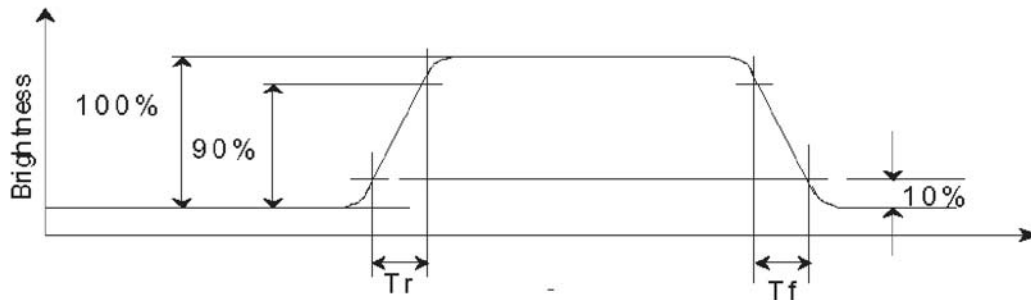


Figure 2 Response time

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## D. DEFINITION OF VIEWING ANGLE

The viewing angle is defined as Figure 3. Horizontal and vertical (H & V) angles are determined for viewing directions where luminance varies by 50% of the perpendicular value.

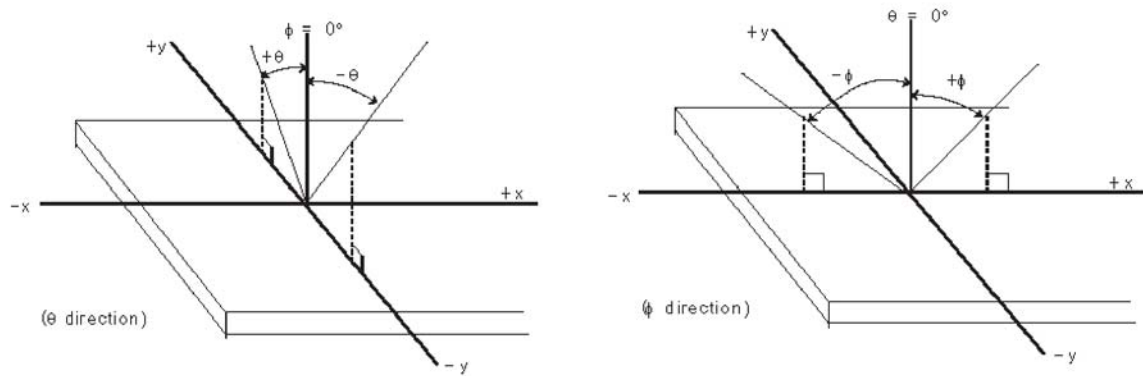


Figure 3 Viewing angle

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## APPENDIX 2: MEASUREMENT APPARATUS

### A. LUMINANCE/COLOR COORDINATE

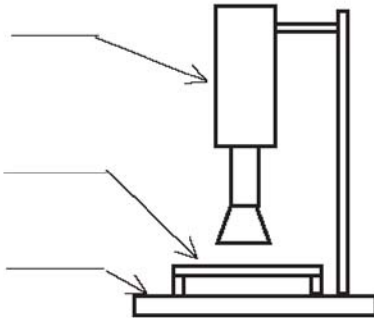
PHOTO RESEARCH PR-705, MINOLTA CS-100

**Measurement**

**Header**

**Panel**

**Plate Form**



**PR-705 /  
MINOLTA CS-100  
Color Analyzer**

### B. CONTRAST / RESPONSE TIME / VIEW ANGLE

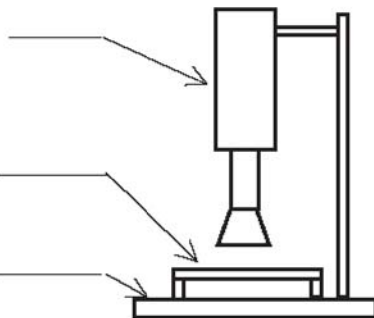
WESTAR CORPORATION FPM-510

**Measurement**

**Header**

**Panel**

**Plate Form**



**Westar FPM-510  
Display Contrast /  
Response time /  
View angle Analyzer**

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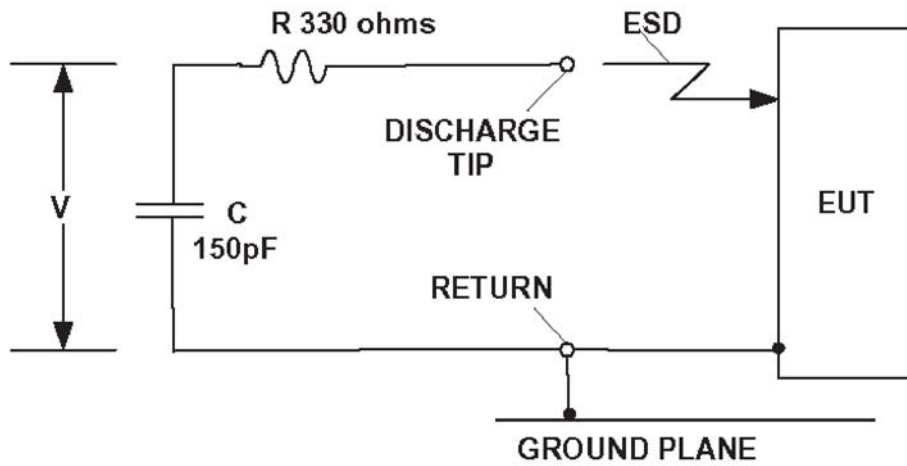
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C. ESD ON AIR DISCHARGE MODE



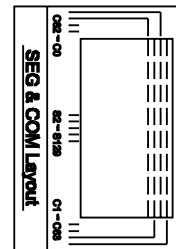
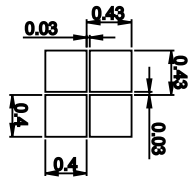
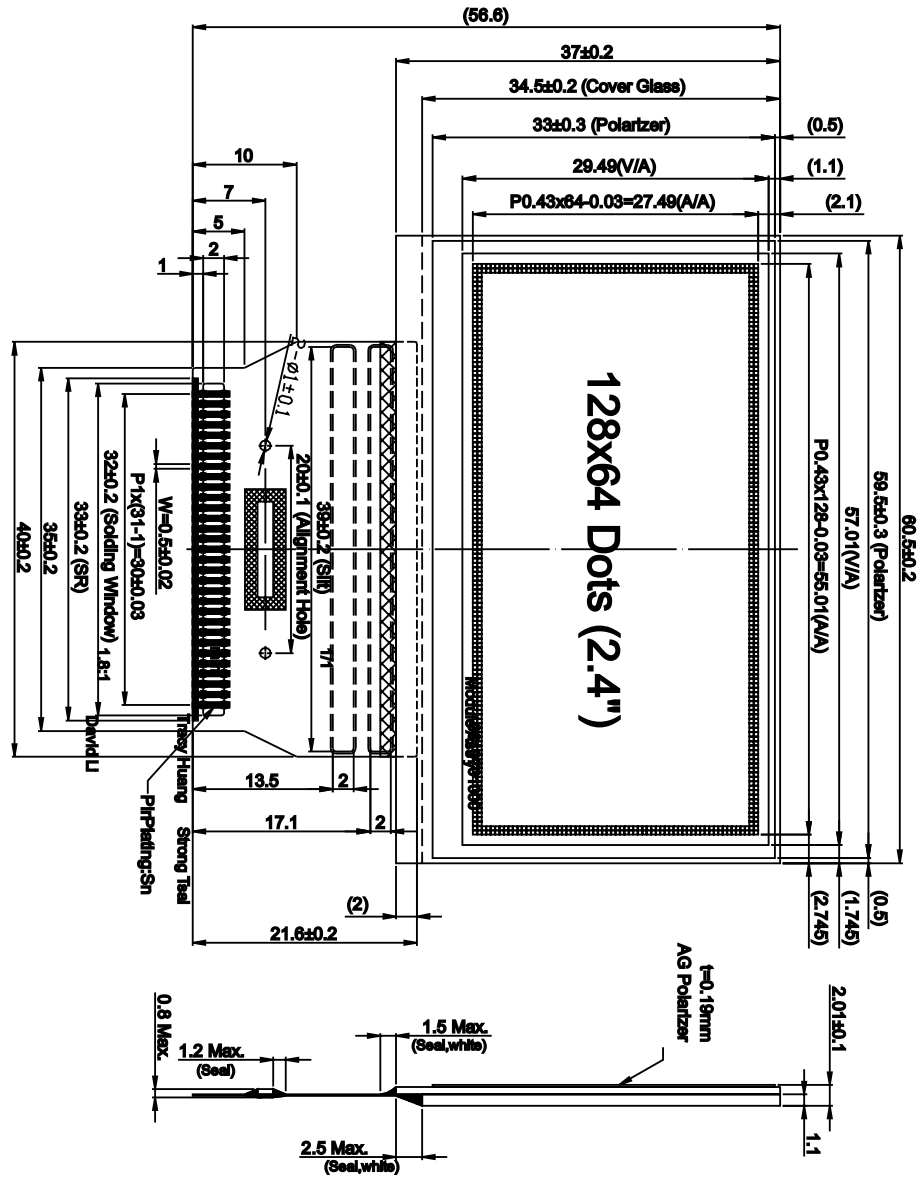
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