

NISIN

触摸显示模组产品规格承认书

Display Module Specifications for Approval

客户： 客户型号：			NS650FH4005AZ01		
批准 APPROVED	审核 CHECKED	拟制 DESIGNED	批准 APPROVED	审核 CHECKED	拟制 DESIGNED



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1.产品规格 (Product Specifications)

面板类型 (Panel Type)	TFT LCD
面板尺寸 (Panel Size)	6.53 inch
显示类型 (Display Type)	Normal Black
分辨率 (Resolution)	1080 (RGB) x 2340 (dot)
显示点间距 (Dot Pitch)	21.45um X 64.35um
显示色彩 (color)	16.7M
视角 (View Angle)	U/D/L/R: 80/80/80/80
显示驱动 IC (Display Driver IC)	FT8720M
接口类型 (Interface Type)	MIPI
触摸类型 (TP Type)	INCELL
触摸 IC (TP IC)	FT8720M
外形尺寸 (Dimensions)	76.35(H) X 163.55 (V) X 2.64(T) (mm)
显示区尺寸 (Display area)	69.5X 150.58 (mm)
模组亮度 (Module Brightness)	450cd/m ²
触摸点数 Touch points	10
触摸按键 Touch Key Number	0
触摸屏固件版本	Version:

3. 接口定义 (The Interface Definition)

见 CAD 图纸

4. 电性特性 (Electrical Characteristics)



Preliminary
FT8720

7. ELECTRICAL SPECIFICATION

7.1. Absolute Maximum Ratings

(AVDD = 4.5V ~ 6.5V, AVEE = -4.5V ~ -6.5V, VDDI = 1.65V ~ 1.95V, VDD_EXT=1.2V~1.5V Ta = -30°C ~ 87°C)

Parameter	Symbol	Rating	Unit	Note
Power Supply Voltage 1	VDDI-VSS	-0.3 ~ +1.95	V	
Power Supply Voltage 2	VDDAM-VSS	-0.3 ~ +1.95	V	
Power Supply Voltage 3	AVDD-VSS	-0.3 ~ +6.5	V	
Power Supply Voltage 4	VSS-AVEE	-0.3 ~ +6.5	V	
Power Supply Voltage 5	VDD_EXT-VSS	-0.3 ~ +1.5	V	
Input Voltage	Vt	-0.3 ~ VDDI+0.3	V	
Operating Temperature	Topr	-30 ~ +70	°C	
Storage Temperature	Tstg	-55 ~ +110	°C	

Note1. The maximum applicable voltage on any pin with respect to 0V.

Note2. Device is subject to be damaged permanently if stresses beyond those absolute maximum ratings listed above.

7.2. DC characteristic

7.2.1. Basic DC characteristic

(AVDD = 4.5V~6.5V,AVEE = -4.5V~-6.5V,VDDI = 1.65V~1.95V, VDD_EXT=1.2V~1.35V,Ta = -30°C ~ 87°C)

Parameter	Symbol	Conditions	Specification			Unit	Notes
			MIN	TYP	MAX		
Power & Operation Voltage							
Analog Operating voltage	AVDD	Operating Voltage	4.5	5.5	6.5	V	
Analog Operating voltage	AVEE	Operating Voltage	-6.5	-5.5	-4.5	V	
Logic Operating voltage	VDDI	I/O supply voltage	1.65	1.8	1.95	V	
Digital Operating voltage (4 power mode)	VDD_EXT	External Digital voltage	1.2	1.25	1.35	V	
Hissi interface Operating voltage	VDDAM	MIPI supply voltage	1.65	1.8	1.95	V	
Input / Output							
Logic High level input voltage	VIH	-	0.7*VDDI	-	VDDI	V	
Logic Low level input voltage	VIL	-	VSS	-	0.3*VDDI	V	
Logic High level output voltage	VOH	IOH = -1.0mA	0.8*VDDI	-	VDDI	V	
Logic Low level output voltage	VOL	IOL = +1.0mA	VSS	-	0.2*VDDI	V	
Logic High level input current	IIH	Vin = VDDI or VDDAM	-	-	1	uA	
Logic Low level input current	IIL	Vin = VDDI or VDDAM	-1	-	-	uA	
VCOM Operation							
VCOMDC output voltage	VCOM	-	-2.4	-	0.15	V	
Source Driver							

Source Driver							
Gamma positive reference voltage	VGMP	$VGMP < AVDD - 0.3V$	2.85	-	6.0	V	loading \leq 40pF/ channel
Gamma negative reference voltage	VGMN	$VGMN > AVEE + 0.3V$	-6.0	-	-2.85	V	
Source output voltage	VSD	-	VGMN	-	VGMP	-	
Output deviation voltage (Source positive output channel)	V _{dev}	$S_{out} \geq +4.2V,$ $S_{out} \leq +0.8V$	-	-	30	mV	
		$+4.2V > S_{out} > +0.8V$	-	-	20	mV	
Output deviation voltage (Source negative output channel)	V _{dev}	$S_{out} \leq -4.2V,$ $S_{out} \geq -0.8V$	-	-	30	mV	
		$-4.2V < S_{out} < -0.8V$	-	-	20	mV	
Output offset voltage	V _{offset}	-	-	-	100	mv	
Reference Voltage							
Internal reference voltage	V _{REF}	-	1.94	2.0	2.06	V	
Internal reference voltage	V _{REF_TP}	-	3	4	4.4	V	
Booster operation							

Pump output voltage	VGH	Range=(AVDD+AVDD) ~(2XAVDD- AVEE)	6	-	18	V	
Pump output voltage	VGL	Range=(AVEE+AVEE) ~(2AVEE-AVDD)	-18.0	-	-6	V	
Regulator output voltage	VCL	-	-3	-3.5	-3.75	V	

Note1. The maximum applicable voltage on any pin with respect to 0V.

Note2. Device is subject to be damaged permanently if stresses beyond those absolute maximum ratings listed above.

7.2.2. MIPI DC character

DC characteristics for MIPI-DSI

(Ta = -30°C ~ 87°C)

Parameter	Symbol	Conditions	Specification			Unit
			MIN	TYP	MAX	
Power supply voltage for MIPI interface						
Power supply voltage for MIPI interface	LVDSVDD	-	1.1	1.2	1.3	V
LPDT Input Characteristics						
Pad signal voltage range	VI	-	-50	-	1350	mV
Ground Shift	VGND _{SH}	-	-50	-	50	mV
Logic 0 input threshold	VIL	-	0	-	550	mV
Logic 1 input threshold	VIH	-	880	-	LVDSVDD	mV
Input hysteresis	VH _{YST}	-	25	-	-	mV
LPDT Output Characteristics						
Output low level	VOL	-	-50	-	50	mV
Output high level	VOH	-	1.1	1.2	1.3	V
Logic 1 contention threshold	VIL _{CD,MIN}	-	450	-	LVDSVDD	mV
Logic 0 contention threshold	VIH _{CD,MAX}	-	0	-	200	mV
Output impedance of LPDT	ZOLP	-	80	100	125	ohm
Hi-speed Input/Output Characteristics						
Single-end input low voltage	VIL _{HS}	-	-40	-	-	mV
Single-end input high voltage	VIH _{HS}	-	-	-	460	mV
Single-end threshold for HS termination enable	VTERM-EN	-	-	-	450	mV
Common mode voltage	VCM _{RXDC}	-	70	-	330	mV
Differential input low threshold	VID _{TL}	-	-70	-	-	mV
Differential input high threshold	VID _{TH}	-	-	-	70	mV
Hi-speed transmit voltage	VOD	-	140	200	250	mV
Differential input impedance	ZID	-	80	100	125	ohm

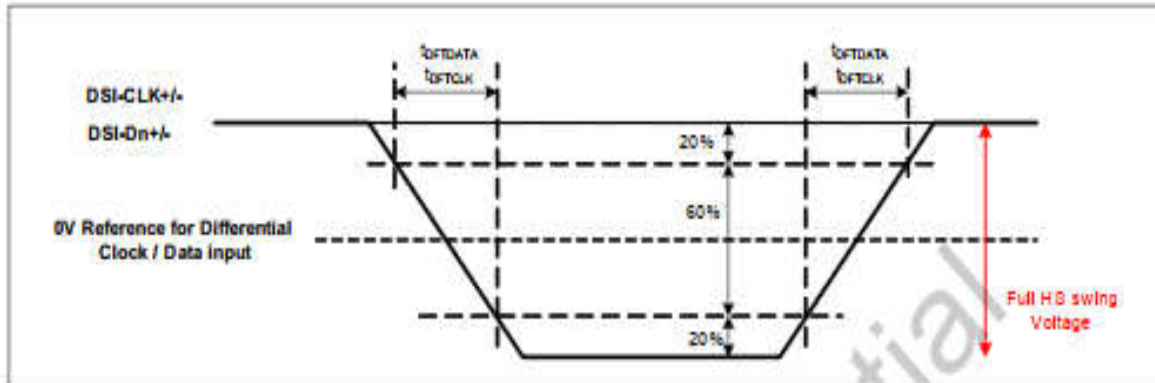


Figure: AC characteristics for MIPI-DSI High speed mode

7.3.2.2. DPHY Low power mode

Parameter	Symbol	Parameter	Specification			Unit
			MIN	TYP	MAX	
Low Power mode						
DSI-D0+/-	T_{LPXM}	Length of LP-00, LP-01, LP-10 or LP-11 periods MPU Display Module	50	-	-	ns
DSI-D0+/-	T_{LPXD}	Length of LP-00, LP-01, LP-10 or LP-11 periods Display Module MPU	58	-	-	ns
DSI-D0+/-	$T_{\text{TA-SURED}}$	Time-out before the MPU start driving	T_{LPXD}	-	$2T_{\text{LPXD}}$	ns
DSI-D0+/-	$T_{\text{TA-GETD}}$	Time to drive LP-00 by display module	$5T_{\text{LPXD}}$	-	-	ns
DSI-D0+/-	$T_{\text{TA-GOD}}$	Time to drive LP-00 after turnaround request - MPU	$4T_{\text{LPXD}}$	-	-	ns
DSI-D0+/-	Ratio T_{LPX}	Ratio of T_{LPXM} / T_{LPXD} between MCU and display module	2/3	-	3/2	-

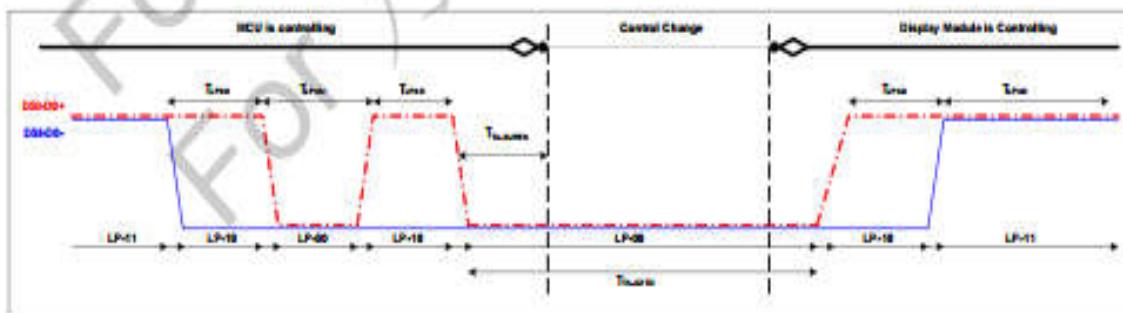
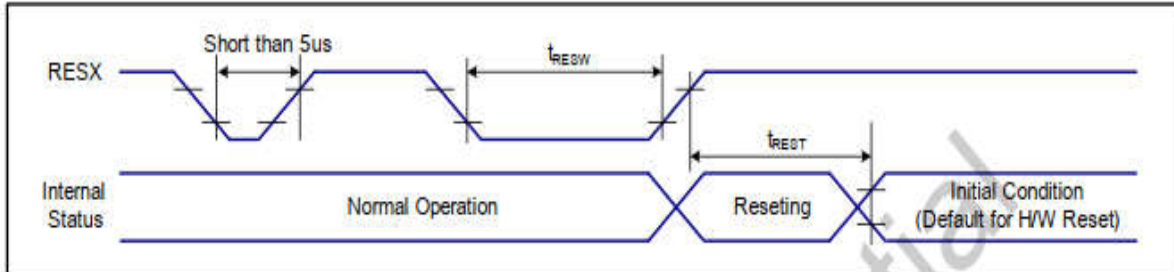


Figure: BTA from the MCU to the Display Module

7.3.1. Reset timing characteristics



VSS=0V, VDDI=1.65V to 3.6V, Ta = -30°C to 70°C

Symbol	Parameter	Related Pin	MIN	TYP	MAX	Note	Unit
t_{RESW}	*1) Reset low pulse width	RESX	10	-	-	Reset applied during Sleep-in mode	us
			70	-	-	Reset applied during Sleep-out mode	ms
t_{REST}	*2) Reset complete time	-	-	-	10	Reset applied during Sleep-in mode	ms
		-	-	-	120	Reset applied during Sleep-out mode	ms

Table: Reset input timing

Note 1. Spike due to an electrostatic discharge on RESX line does not cause irregular system reset according to the table below.

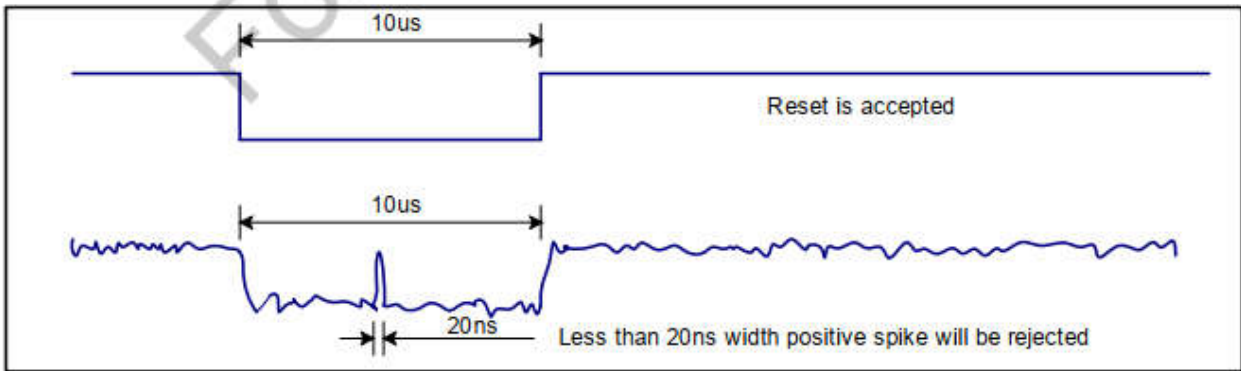
RESX Pulse	Action
Shorter than 5us	Reset Rejected
Longer than 10us	Reset
Between 5us and 10us	Reset starts (It depends on voltage and temperature condition.)

Note 2. During the resetting period, the display will be blanked (The display is entering blanking sequence, which maximum time is 120 ms, when Reset starts in Sleep-out mode. The display remains the blank state in Sleep-in mode) and then return to default condition for H/W reset.

Note 3. During Reset complete time, ID1/ID2/ID3 and VCOM value in OTP will be latched to internal register during this period. This loading is done every time when there is H/W reset complete time (t_{REST}) within 10ms after a rising edge of RESX.

Note 4. Spike Rejection also applies during a valid reset pulse as shown below:

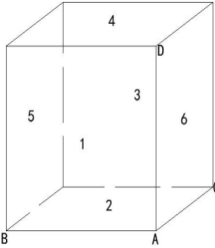
Note 4. Spike rejection also applies during a valid reset pulse as shown below.



Note 5. It is necessary to wait 10msec after releasing RESX before sending commands. Also Sleep Out command cannot be sent for 120 msec.

5.可靠性实验测试(Reliability Test Conditions And Methods)

序号	试验项目	试验条件及方法	试验设备	检验项目	检验工具
1	高温高湿(静、动态)试验	温度 $60^{\circ}\text{C} \pm 3^{\circ}\text{C}$, 湿度 $90\% \pm 3\%$, 要求选择时间分别为 96 小时, 静、动态(产品点亮)在室温下恢复 2 小时后进行外观, 显示功能检查。	恒温恒湿试验机	检验外观、功能、抗腐蚀性	目视/测试架/客户样机/显微镜
2	高、低温冲击试验	静态 -30°C (30 分钟) $\rightarrow 80^{\circ}\text{C}$ (30 分钟) $\rightarrow -30^{\circ}\text{C}$ (30 分钟), 24 个循环, 在室温下恢复 2 小时后进行外观, 显示功能检查。	冷热冲击试验机	检验外观、功能	
3	高温存贮试验	常温 $70^{\circ}\text{C} + 3^{\circ}\text{C}$ 、宽温 $80^{\circ}\text{C} + 3^{\circ}\text{C}$ 、96 小时后在室温状态下恢复 1 小时在 2 小时内完成外观、显示功能检查。	烤箱	检验外观、功能	目视/测试架/客户样机
4	低温存贮试验	常温 $-20^{\circ}\text{C} + 3^{\circ}\text{C}$ 、宽温 $-30^{\circ}\text{C} + 3^{\circ}\text{C}$ 、条件的试验箱内保存 96 小时后在室温状态下恢复 1 小时, 在 2 小时完成外观、显示功能检查, 特别注意检查是否有漏液、断线、腐蚀、偏光片不良现象。	低温冰箱	检验外观、功能	
5	低温存贮试验(动态)	常温 $-20^{\circ}\text{C} + 3^{\circ}\text{C}$ 、宽温 $-30^{\circ}\text{C} + 3^{\circ}\text{C}$ 条件的试验箱内点亮刷屏, 过程中每 1 小时观察一次, 检查显示功能, 如: 异常, 卡机, 花屏等。特别注意检查是否有漏液、断线、腐蚀、偏光片不良现象。	低温冰箱	检验外观、功能	目视/测试架/客户样机

<p>6</p>	<p>包装模组跌落试验</p>	<p>1、跌落重量及自由落体高度： (图二)</p>  <p>2、自由落体角度如下：</p> <table border="1" data-bbox="284 481 662 840"> <thead> <tr> <th>总重量</th> <th>自由落体高度</th> </tr> </thead> <tbody> <tr> <td>0-9kg</td> <td>92cm</td> </tr> <tr> <td>9-25kg</td> <td>76cm</td> </tr> <tr> <td>25-45kg</td> <td>53cm</td> </tr> <tr> <td>45-68kg</td> <td>46cm</td> </tr> <tr> <td>大于 68kg</td> <td>41cm</td> </tr> <tr> <td></td> <td></td> </tr> </tbody> </table> <p>1) 一角：A 角 2) 三菱：A-B, A-D, A-C 3) 六面：面 1, 面 2, 面 3, 面 4, 面 5, 面 6;</p>	总重量	自由落体高度	0-9kg	92cm	9-25kg	76cm	25-45kg	53cm	45-68kg	46cm	大于 68kg	41cm			<p>包装模组跌落架</p>	<p>测试电性能无异常、外观检验无破损，无脱离现象</p>	<p>目视/测试架/客户样机</p>
总重量	自由落体高度																		
0-9kg	92cm																		
9-25kg	76cm																		
25-45kg	53cm																		
45-68kg	46cm																		
大于 68kg	41cm																		
<p>7</p>	<p>盐雾试验</p>	<p>标准条件:中性盐雾试验 (NSS 试验)：5%的氯化钠盐水溶液, 溶液 PH 值中性 (6.5~7.2), 试验温度 $35 \pm 2^\circ\text{C}$, 盐雾的沉降率在 $1 \sim 2\text{ml}/80\text{cm}^2 \cdot \text{h}$ 之间, 时间 24h。2. 其它特殊要求条件:醋酸盐雾试验 (ASS 试验)：5%氯化钠溶液中配入冰醋酸, 溶液 PH 值为 3 左右, 试验温度 $35 \pm 2^\circ\text{C}$, 盐雾的沉降率在 $1 \sim 2\text{ml}/80\text{cm}^2 \cdot \text{h}$ 之间, 时间 24h。</p>	<p>盐雾试验设备</p>	<p>检验外观、功能, 盐雾试验结果的判定方法, 腐蚀物出现判定法: 定性判定, 试验后功能测试应 OK, 外观观察产品无腐蚀现象产生。</p>	<p>目视/测试架/客户样机/显微镜</p>														
<p>8</p>	<p>ESD 防静电试验</p>	<p>测试架测试状态下试验：接触 4KV, 非接触(空气) 8KV 放电测试</p>	<p>防静电枪 (尖头接触放电, 圆头空气放电)</p>	<p>检验外观、功能</p>	<p>目视/测试架</p>														

6. 光电参数 (Optical Characteristics)



XIAMEN TIANMA MICRO-ELECTRONICS

TL065FYMC01-00

4 Electrical Specification

4.1 Absolute maximum ratings

LEDK=GND=0V, Ta = 25°C

Item	Symbol	Min	Typ	Max	Unit	Remark
Power Voltage	AVDD	5.3	5.5	5.7	V	
	AVEE	-5.7	-5.5	-5.3	V	
	IOVCC	1.7	1.8	1.9	V	
	LED+	21.6	22.4	23.2	V	LED
Operating Temperature	TOPR	-30	-	75	°C	
Storage Temperature	TSTG	-40	-	85	°C	

4.2 Recommended Operating Condition

AVDD=5V,AVEE=-5V,IOVCC=1.8V,GND=0V, Ta = 25°C

Item	Symbol	Min.	Typ.	Max.	Unit	Remark	
Logic Supply Voltage	VIO	1.7	1.8	1.9	V		
Analog Supply Voltage	VSP	5.3	5.5	5.7	V		
	VSN	-5.7	-5.5	-5.3	V		
Input Signal Voltage	Low Level	VIL	0	-	0.3* IOVCC	mV	Note3'
	High Level	VIH	0.7* IOVCC	-	IOVCC	mV	
Output Signal Voltage	Low Level	VOL	0	-	0.2* IOVCC	V	Note4
	High Level	VOH	0.8* IOVCC	-	IOVCC	V	
Note3	Signals include MIPI_D0±, MIPI_D1±, MIPI_D2±, MIPI_D3±, MIPI_CLK± For DSI LP mode						
Note3'	Signals include RESET						
Note4	Signals include TE, LED_PWM						

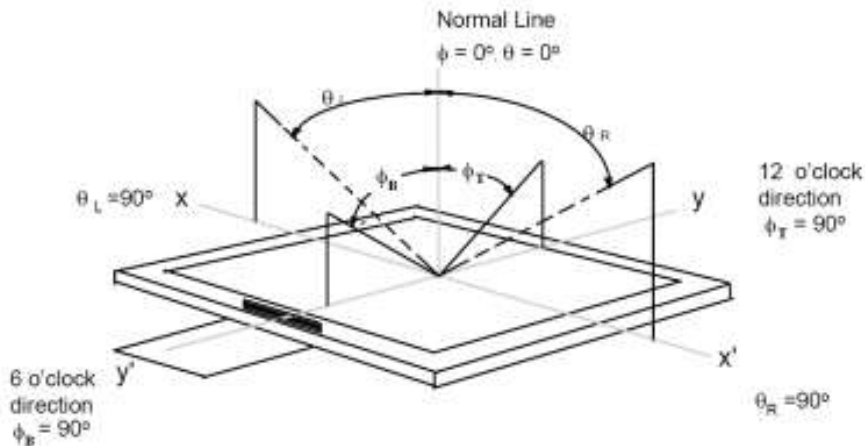
5 Optical Characteristics

Test condition : IOVCC=1.8V ,VSP=5.5V, VSN=-5.5V, Ta=25°C

Item	Symbol	Condition	Value			Unit	Note	
			Min	Typ	Max			
Luminance (with lens)	Bp	$\theta=0^\circ$ $\Phi=0^\circ$	400	480		cd/m ²	Note 1	
Uniformity	ΔBp		80	85	-	%	Note 2(Base on BL)	
Viewing Angle	Left	θ_L	Cr \geq 10	80	85	-	deg	Note 3
	Right	θ_R		80	85	-		
	Top	ψ_T		80	85	-		
	Bottom	ψ_B		80	85	-		
Contrast Ratio	Cr	$\theta=0^\circ$ $\Phi=0^\circ$	1200	1500	-	-	Note 4	
Response Time (without 3gamma@25°)	GTG		-	-	33	ms	Note 5	
Color Coordinate of CIE1976 (with lens)	Red	x	$\theta=0^\circ$ $\Phi=0^\circ$		0.65	+ 0.02/ - 0.01	Note 6 (Base on BL)	
		y			0.33	+ 0.01/ - 0.02		
	Green	x			0.30	+ 0.012/ - 0.02		
		y			0.65	+ 0.02/ - 0.01		
	Blue	x			0.15	+0.012 /-0.02		
		y			0.05			
	White	x			0.298			
		y			0.318	+/- 0.02		
NTSC Ratio	NTSC	CIE1931	76.5	81.5			Note 6 (Base on BL)	
Flicker	amount	-		-	-30	dB	Note 7	
Gamma (W)	-	-	2	2.2	2.4		G20-G220	

Note 1. Luminance measurement

- The test condition is at 25°C and measured on the surface of Display panel module.
- The data are measured after OLEDs are lighted on for more than 5 minutes and displays are fully white. The brightness is the average value of 17 mesured spots. Measurement equipment CS2000 or similar equipments (Field of view:1deg,Distance:50cm)
- Measuring surroundings: Dark room.
- Measuring temperature: Ta=25°C.
- A first measurement taken to each minimum content at the center of the display.



Note 4. The definition of Contrast Ratio (Test Display panel using CS2000 or similar equipments):

$$\text{Contrast Ratio(CR)} = \frac{\text{Luminance When Display panel is at "White" state}}{\text{Luminance When Display panel is at "Black" state}}$$

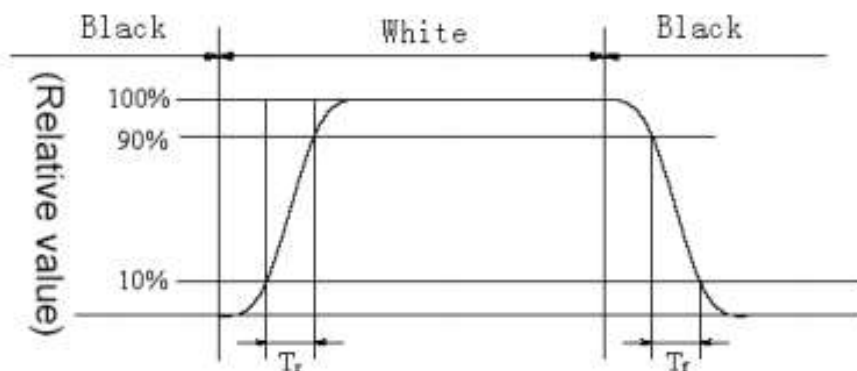
(Contrast Ratio is measured in optimum common electrode voltage)

This is target spec, The provider must do the best to achieve the target.

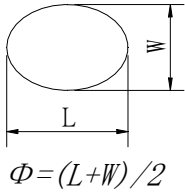
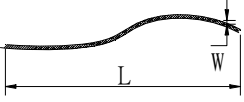
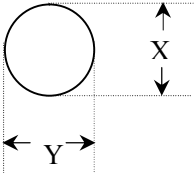
If the providers can't reach the target, Both side will review after 1st sample

Note 5. Definition of Response time(Test Display panel using DMS501 or similar equipments.):

The output signals of photo detector are measured when the input signals are changed from "black" to "white"(Voltage falling time) and from "white" to "black"(Voltage rising time), respectively. The response time is defined as the time interval between the 10% and 90% of amplitudes. Refer to figure as below.



7.检验标准 (Inspection standard)

项目	不良定义	不良现象	判定标准		检验方法		
9.3.1	外观尺寸	与图纸尺寸不相符	NG		卡尺		
9.3.2	功能	显示少线	NG		目视		
		无显示	NG		目视		
		显示异常	NG		目视	主	
		TP 功能不良, 无触摸	NG		目视/用手触摸	主	
9.3.3	点亮产品可见 及在 LCD 或 T/P 上有擦拭 不掉的点状物	偏光片刺伤、脏点、 圆形物、黑点 	LCM/总成 > 2.4 寸——6.0 寸		目视(用 菲淋卡比 对)	次	
			$\Phi \leq 0.10\text{mm}$				1、10mm 间距 内只允许 3 个
							2、显示区只 允许 10 个 点, 超过以 上任意一项 则 NG
			$0.1\text{mm} < \Phi \leq 0.15\text{mm}$				4 (TP、屏各 允许 2 个)
			$0.15\text{mm} < \Phi \leq 0.2\text{mm}$				2 (TP、屏各 允许 1 个)
$\Phi > 0.2\text{mm}$		NG					
9.3.4	点亮产品可见 及在 LCD 或 T/P 上有擦拭 不掉的线状物 /刮伤		LCM/总成 0.95 寸——6.0 寸		目视(用 菲淋卡比 对)	次	
			长(L)	宽(W)			允许个数
			$\leq 1\text{mm}$	$\leq 0.03\text{mm}$			2
			$\leq 2\text{mm}$	$0.03 < W \leq 0.05\text{mm}$			1
			$> 2\text{mm}$	$> 0.05\text{mm}$			NG
两条线毛之间必须距离 5mm 以上 (0.95 寸—3.0 寸). 两条线毛之间必须距离 10mm 以上 (3.1 寸—6.0 寸).							
9.3.5	偏光片气泡	$\Phi = (X+Y) / 2$ 	尺寸	允许个数	在日光台 灯下撕起 保护膜, 距待测物 30cm 目视	次	
			1、 $\Phi \leq 0.1\text{mm}$ 2、不超过边框 1/3	不计 (密集不 可)			
			$0.10 < \Phi \leq 0.2\text{mm}$	1			

			$\Phi > 0.2\text{mm}$	NG		
			0.95 寸-2.4 寸气泡间距大于 5mm 以上 >2.4 寸-6.0 寸气泡间距大于 10mm 以上			
9.3.6	T/P 及偏光片 凹凸点	T/P:LCD 偏光片上有凹 凸点	可视区有水纹（擦拭不掉）拒 收 未进入可视区允收，客户装机 后不见允收		在同一视 角下用样 品比对	次
9.3.7	<u>Mura</u>	边框四周或任一侧的色 差、较画面深、区域云状 不均、固定位置之图形凹 陷状、封口部分较画面深 的半圆形、一圈圈均匀的 色差、线状 mura、黑画 面可见因 spacer 聚集产 生的 mura、均匀的实斜 线、区域性斜线、Driver IC 与 TFT 匹配问题等原 因的 mura	1.判定示画面为 128 灰阶画面， 用 ND filter 盖住 mura 位置进行 判定。 2、ND1.3（ND5%可遮盖不见） 3、双方若有签 限度样品，优先 限度样品。		ND filter, 128 灰阶画 面	次