MODEL NO : TM133VDGP01-00

MODEL VERSION: 00

SPEC VERSION : 1.0

ISSUED DATE: 2020-04-27

■**Preliminary Specification**
□**Final Product Specification**

Customer :

Approved by	Notes

TIANMA Confirmed :

Prepared by	Checked by	Approved by
Mingxu_Xiao	Guangkun_An	**XiaoXing_Ding**

This technical specification is subjected to change without notice

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Record of Revision

Rev	Issued Date	Description	Editor
1.0	2020-04-27	Preliminary release.	Mingxu xiao

1 General Specifications

Feature		Spec
Display Spec.	Size	13.3inch
	Resolution	1920×1080
	Technology Type	a-Si TFT
	Pixel Configuration	R.G.B. Vertical Stripe
	Pixel pitch(mm)	0.153*0.153
	Display Mode	Transmissive, Normally Black
	Surface Treatment	AG
	Viewing Direction	All
	Gray Scale Inversion Direction	NA
Mechanical Characteristics	LCM (W x H x D) (mm)	305.35*178.56*3.7mm
	Active Area(mm)	293.76*165.24
	With /Without TSP	Without TSP
	Matching Connection Type	IPEX 20455-030E-76
	LED Numbers	64
	Weight (g)	TBD
Electrical Characteristics	Interface	EDP1.2
	Color Depth	16.7 M
	Driver IC	RM91M39FB

2 Input / Output Terminals

Pin No.	Symbol	I/O	Function	Remark
1	NC	-	No connect	
2	GND	P	Ground	
3	D1-	I	eDP Rx lane 1, negative	
4	D1+	I	eDP Rx lane 1, positive	
5	GND	P	Ground	
6	D0-	I	eDP Rx lane 0, negative	
7	D0+	I	eDP Rx lane 0, positive	
8	GND	P	Ground	
9	AUX+	I/O	Edp AUX ch, positive	
10	AUX-	I/O	Edp AUX ch, negative	
11	GND	P	Ground	
12	VCC	P	Power for LCD 3.3V	
13	VCC	P	Power for LCD 3.3V	
14	NC	-	No connect	
15	GND	P	Ground	
16	GND	P	Ground	
17	Edp_HPD	I/O	Hot Plug Detection	
18	PWM	I	BLU Diming	
19	NC	-	No connect	
20	VCC_LED-	P	BL Ground	
21	VCC_LED-	P	BL Ground	
22	VCC_LED-	P	BL Ground	
23	VCC_LED-	P	BL Ground	
24	VCC_LED-	P	BL Ground	
25	VCC_LED-	P	BL Ground	
26	EDP_LED_EN	I	BLU Enable	
27	NC	-	No connect	
28	VCC_LED+	P	Power for BLU (12V type)	
29	VCC_LED+	P	Power for BLU (12V type)	
30	NC	-	No connect	

Note1：Please add the FPC connector type and matched one if necessary .
Note2：I——Input, O——Output, P——Power/Ground

3 Absolute Maximum Ratings

GND=0V

Item	Symbol	MIN	MAX	Unit	Remark
Power Voltage	VCC	0.3	4.5	V	
BL_POWER Input	VCC_LED+	-0.3	28	V	
BL_PWM signal input	PWM	-0.3	5.5	V	
BL ENABLE	EDP_LED_EN	-0.3	5.5	V	
Operating Temperature	Top	-20	70	℃	
Storage Temperature	Tst	-30	80	℃	

Table 3 Absolute Maximum Ratings

4 Electrical Characteristics

4.1 Driving TFT LCD Panel

GND=0V, Ta=25℃

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Power Supply for LCD	VCC	3.2	3.3	34	V	
Hot plug Detect	Edp_HPD	-	3.3		V	TCON output HPD 3.3Vtyp
LCD Power Consumption	P_VDD		TBD		W	Test at White pattern

Note1: Input voltage include all MIPI data and clock

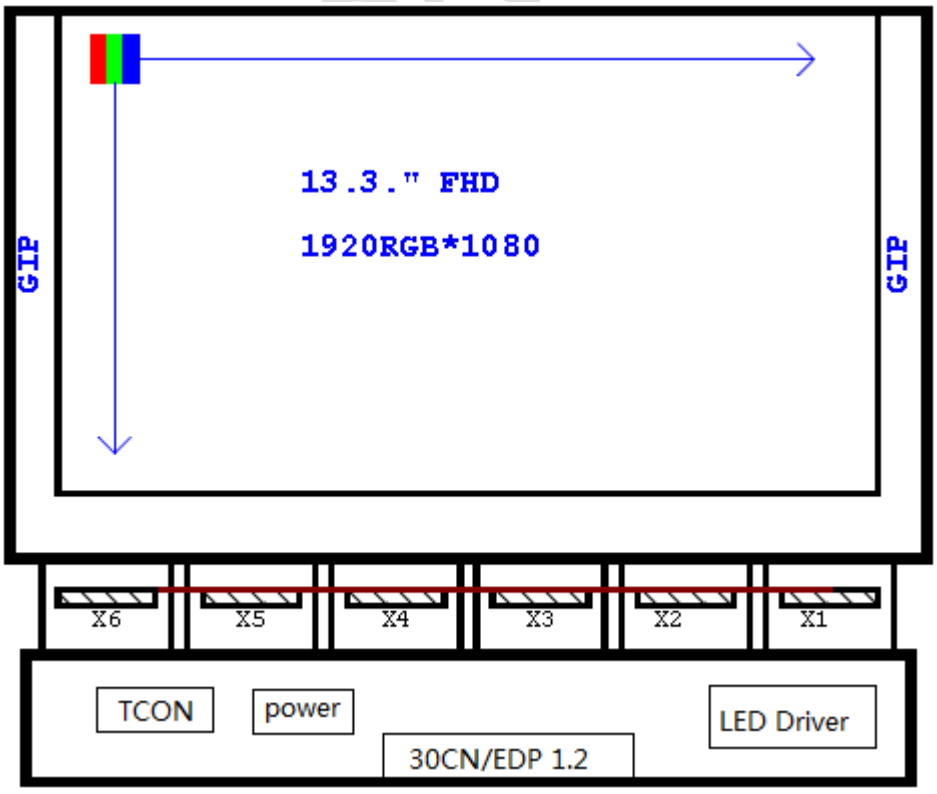
4.2 Backlight Unit Driving Condition

ND=0V, Ta=25℃

Item		Symbol	Min	Typ	Max	Unit	Remark	
Backlight power supply voltage		VCC_LED+	11.5	12	12.5	V		
Backlight power supply current		I VCC_LED+	-	TBD		A		
Backlight power consumption		P_LED	-	TBD		W		
Input voltage for PWM signal	High level	-	1.3	-	5	V		
	Low level	-	0	-	0.15	V		
Input voltage for VLED_EN	High level	-	1.6	-	5	V		
	Low level	-	0	-	1	V		
VLED_PWM frequency		Fpwm	100	-	20k	HZ		
VLED_PWM duty		D	1		100	%	Note1	
LED life time				30000		H		

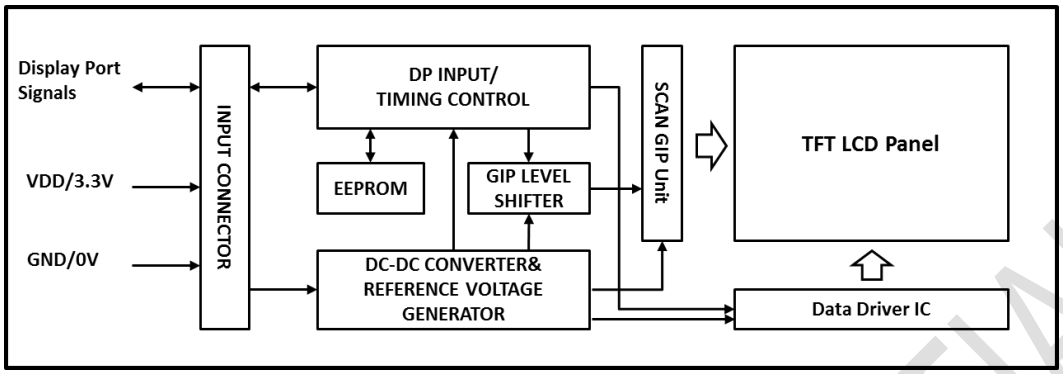
Note 1: If LED is driven by high current, high ambient temperature & humidity condition. The life time of LED will be reduced.Operating life means brightness goes down to 50% initial brightness. Typical operating life time is estimated data

4.3 BLOCK DIAGRAM



5 Timing Chart

5.1 Display Edp1.2 Reference Circuit

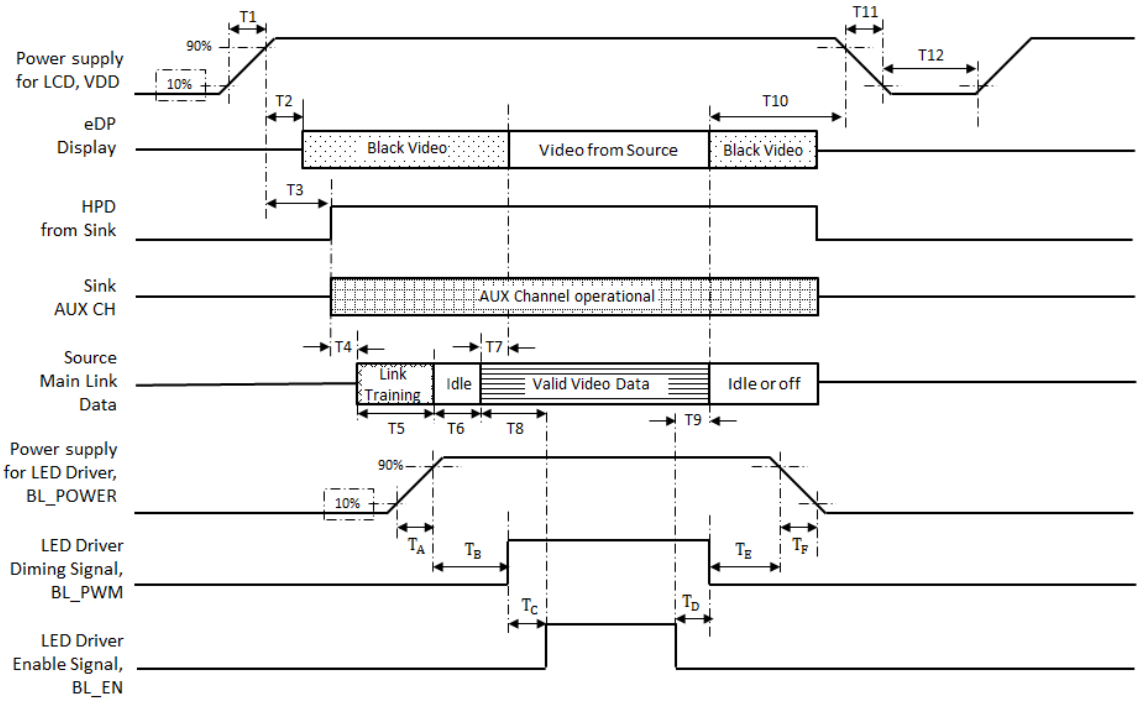


5.2 eDP1.2 Data Format

24 bpp RGB Mapping to a Two Lane Main Link

Lane 0	Lane 1
R0-7:0	R1-7:0
G0-7:0	G1-7:0
B0-7:0	B1-7:0
R2-7:0	R3-7:0
G2-7:0	G3-7:0
B2-7:0	B3-7:0
R4-7:0	R5-7:0
G4-7:0	G5-7:0
B4-7:0	B5-7:0

5.3 POWER ON/OFF SEQUENCE



Parameters	Description	Reqd. by	Value		Unit	Notes
			Min	Max		
T1	Power tail rise time, 10% to 90%	Source	0.5	10	ms	-
T2	Delay from LCD VDD to black video generation	Sink	0	200	ms	Automatic Black Video generation prevents display noise until valid video data is received from the Source
T3	Delay from LCD VDD to HPD high	Sink	0	200	ms	Sink AUX Channel must be operational upon HPD high
T4	Delay from HPD high to link training initialization	Source	-	-	ms	Allows for source to read Link capacity and initialize
T5	Link training duration	Source	-	-	ms	Dependent on Source link training Protocol
T6	Link Idle	Source	-	-	ms	Min Accounts for required BS-Idle pattern. Max allows for Source frame synchronization
T7	Delay from valid video Data from Source to video on display	Sink	0	50	ms	Max value allows for Sink to valid video Data and Timing. At the end of T7, Sink will indicate the detection of valid video data by setting SINK_STATUS bit to logic 1(DPCD 00205h, bit 0), and Sink will no longer generate automatic Black video
T8	Delay from valid video Data from Source to Backlight on	Source	-	-	ms	Source must assure display video is stable
T9	Delay from Backlight off to end of valid video Data	Source	-	-	ms	Source must assure backlight is no longer illuminated. At the end of T9, Sink will indicate the detection of no valid video data by setting the SINK_STATUS bit to logic 0 (DPCD 00205h, bit 0), and Sink will automatically display Black Video.
T10	Delay from end of valid video data from Source to Power off	Source	0	500	ms	Black video will be displayed after receiving idle or off signals from Source
T11	LCD VDD power rail fall time, 90% to 10%	Source	-	10	ms	-
T12	LCD VDD Power off time	Source	500	-	ms	-
T_A	BL_POWER rail rise time, 10% to 90%	Source	0.5	10	ms	-
T_F	BL_POWER rail fall time, 90% to 10%	Source	-	10	ms	-
T_B	Delay from BL_POWER to Dimming signal BL_PWM on	Source	0	-	ms	-
T_E	Delay from Dimming signal BL_PWM off to BL_POWER off	Source	0	-	ms	-
T_C	Delay from diming signal BL_PWM on to Enable signal BL_EN on	Source	0	-	ms	-
T_D	Delay from Enable signal BL_EN off to diming signal BL_PWM off	Source	0	-	ms	-

5.4 DP Characteristics

5.4.1 Aux Channel Characteristics

Symbol and Parameter		Test Conditions	Min	Typ[2]	Max	Unit
UI:	Unit Interval for AUX channel		0.4	0.5	0.6	μs
$V_{AUX-TX\_DIFF-p-p}$:	AUX differential peak-to-peak voltage when driving (TX)		400		1000	mV
$V_{AUX-RX\_DIFF-p-p}$:	AUX differential peak-to-peak voltage when receiving (RX)		250		1360	mV
$V_{AUX-DC-CM-RX}$:	AUX common mode voltage when receiving			GND		V
$V_{AUX-DC-CM-TX}$:	AUX common mode voltage when transmitting			0.15		V
$I_{AUX-SHORT}$:	AUX channel short circuit current				20	mA
$R_{AUX-DIFF}$:	Differential termination resistance		80	100	120	Ω
R_{AUX-SE}:	Single-ended termination resistance		40	50	60	Ω
C_{AUX}:	AUX AC coupling capacitor		75		200	nF

5.4.2 Main Link Characteristics

Symbol and Parameter	Test Conditions	Min	Typ[2]	Max	Unit
Spread spectrum clock, down-spreading by SOURCE			0.5		%
$V_{RX-DIFFp-p}$: Differential peak-to-peak input voltage at package pins		100		1320	mV
Maximum adaptive/programmable equalization level at 1.35GHz			9		dB
$V_{RX\_DC\_CM}$: Rx input DC common mode voltage			GND		V
$R_{RX-DIFF}$: Differential termination resistance		80	100	120	Ω
R_{RX-SE}: Single-ended termination resistance		40		60	Ω
I_{RX_SHORT}: Rx short circuit current limit				20	mA
$L_{RX\_SKEW\_INTRA\_PAIR}$: Intra-pair skew at Rx package pins (HBR)				150	ps
RX intra-pair skew tolerance at HBR					
$L_{RX\_SKEW\_INTRA\_PAIR}$: Intra-pair skew at Rx package pins (RBR)				300	ps
RX intra-pair skew tolerance at RBR					
Receiver Jitter Tolerance for High Bit Rate (HBR)					
Total jitter tolerance at 2MHz		1227			mUI
Total jitter tolerance at 10MHz		548			mUI
Total jitter tolerance at 20MHz		505			mUI
Total jitter tolerance at 100MHz		491			mUI
Receiver Jitter Tolerance for Reduced Bit Rate (RBR)					
Total jitter tolerance at 2MHz		1648			mUI
Total jitter tolerance at 10MHz		778			mUI
Total jitter tolerance at 20MHz		747			mUI

6 Optical Characteristics

Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles		θT	CR≧10		80	-	Degree	Note2
		θB			80	-		
		θL			80	-		
		θR			80	-		
Contrast Ratio		CR	θ=0°		1000	-	-	Note1,3
Response Time		T_{ON}	25℃	-	25	35	ms	Note 4
		T_{OFF}						
Chromaticity	White	x	Backlight is on	0.259	0.309	0.359	-	
		y		0.275	0.325	0.375		
	Red	x		0.586	0.636	0.686	-	
		y		0.291	0.341	0.391		
	Green	x		0.28	0.33	0.38	-	
		y		0.575	0.625	0.675		
	Blue	x		0.103	0.153	0.203	-	
		y		0.024	0.074	0.124		
Uniformity		U	-	75		-	%	Note1,5
NTSC		-	-	67	72	-	%	
Luminance				270	320			

Test Conditions:

1. The ambient temperature is 25℃.
2. The test systems refer to Note 1 (Excluding viewing angle and response time test).
3. Viewing Angle and Response Time test method follow the normal LCD test method.

Note 1: (1) Definition of optical measurement system.

The optical characteristics should be measured in dark room. After 5 minutes operation, the optical properties are measured at the center point of the LCD screen (Excluding Uniformity test). All input terminals LCD panel must be ground when measuring the center area of the panel.

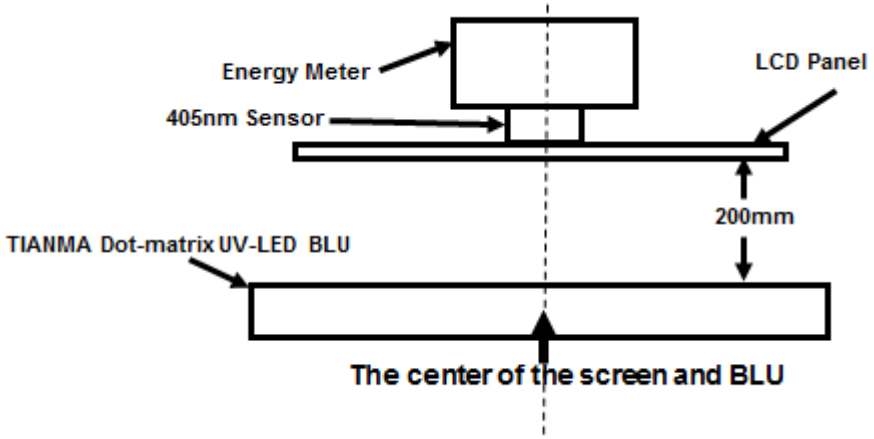


Fig.1

(2)Test instrument and recipe.

As shown in the Fig.1, all optics are measured under a collimating dot-matrix LED backlight, which emitting a wave of 405nm. Energy meter AccuMAX^{TM} –XS-405 is used to measure the following mentioned energy value, the LCD panel is 200mm away from the UV-LED surface. The transmissive energy value of LCD at white state is 2mW/cm^2.(Fig.1)

Note 2: Definition of viewing angle range and measurement system.

viewing angle is measured at the center point of the LCD.(Fig.2)

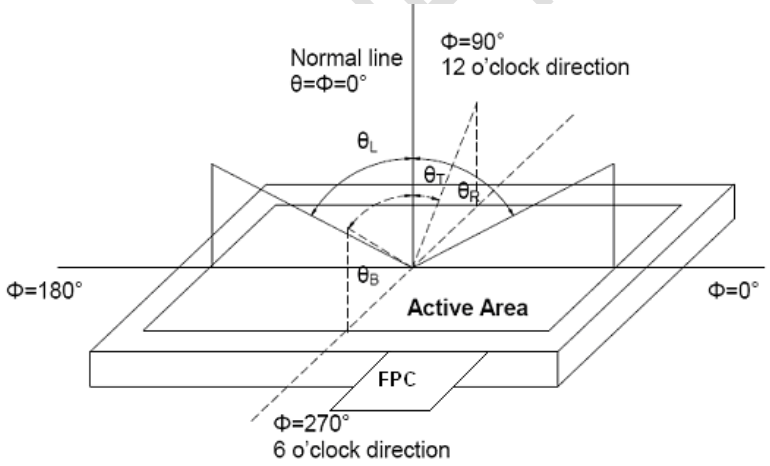


Fig.2

Note 3: Definition of contrast ratio

$$\text{Contrast Ration(CR)} = \frac{\text{Energy value measured when LCD is on the “White” state}}{\text{Energy value measured when LCD is on the “Black” state}}$$

“White state “: The state is that the LCD should be driven by Vwhite.

“Black state”: The state is that the LCD should be driven by Vblack.

Vwhite: To be determined Vblack: To be determined.

Note 4: Definition of Response time

The response time is defined as the LCD optical switching time interval between “White” state and “Black” state. Rise time (T_{ON}) is the time between photo detector output intensity changed from 90% to 10%. And fall time (T_{OFF}) is the time between photo detector output intensity changed from 10% to 90%.(Fig.3)

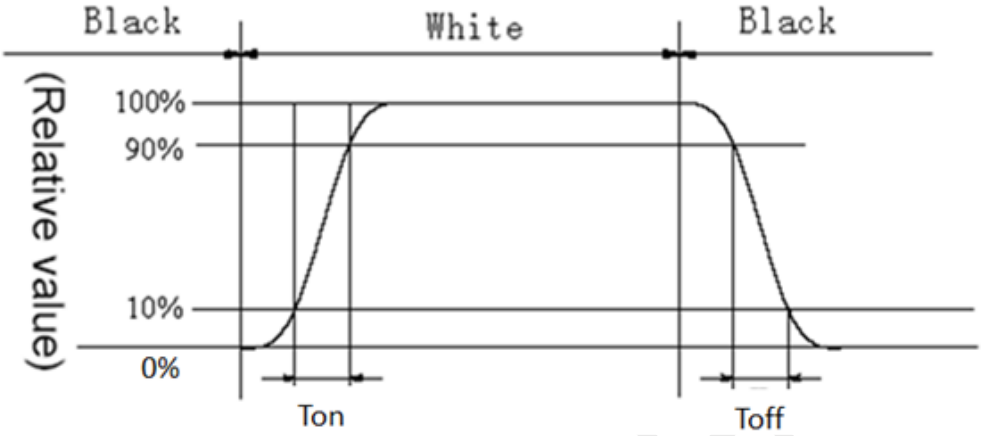


Fig.3

Note 5: Definition of Energy Uniformity

Active area is divided into 9 measuring areas (Fig. 4). Every measuring point is placed at the center of BLU center.

Energy Uniformity (U) = Emin / Emax

L-------Active area length W----- Active area width

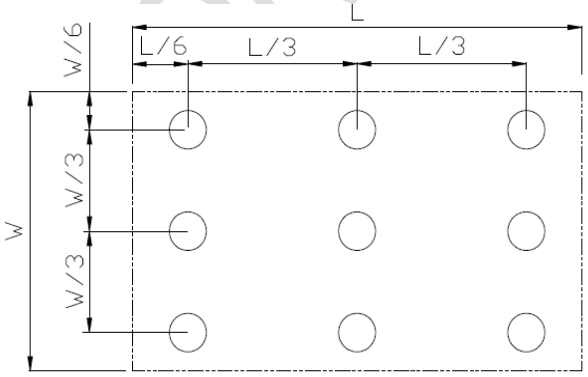


Fig.4

Emax: The measured Maximum Energy value of all the measurement positions.

Emin: The measured Minimum Energy value of all the measurement positions.

Note 6: Definition of transmittance:

$$\text{Transmittance} = \frac{\text{Energy value measured when LCD is on the “White” state}}{\text{Energy value measured from BLU}}$$

7 Environmental / Reliability Test

No	Test Item	Condition	Remarks
1	High Temperature Operation	Ts=70℃,240H	IEC60068-2-1:2007,GB 2423.2-2008
2	Low Temperature Operation	Ta=-20℃,240H	IEC60068-2-1:2007 GB2423.1-2008
3	High Temperature Storage	Ta=80℃,240H	IEC60068-2-1:2007 GB2423.2-2008
4	Low Temperature Storage	Ta=-30℃,240H	IEC60068-2-1:2007 GB2423.1-2008
5	Operation at High Temperature and Humidity	60℃90%RH/240H	IEC60068-2-78 :2001 GB/T2423.3—2006
6	Thermal Shock (non-operation)	'-30℃/30min、80℃/30min 100cycles、1H/Cycle，5min	IEC60068-2-14:1984,GB2423.22-2002
7	Electro Static Discharge (operation)	C=150pF,R=330Ω; Contact:±4Kv, 5times; Air:±8KV,5times;	IEC61000-4-2:2001 GB/T17626.2-2006
8	Vibration (non-operation)	Frequency range:10～55Hz, Stroke:1.5mm Sweep:10Hz ～ 55Hz ～ 10Hz 2hours for each direction of X.Y.Z (6 hours total)	IEC60068-2-6:1982 GB/T2423.10—1995
9	Shock (non-operation)	60G 6ms, ±X,±Y,±Z 3 times for each direction	IEC60068-2-27:1987 GB/T2423.5—1995
8	Package Drop Test	Height:60 cm,1 corner, 3 edges, 6 surfaces	IEC60068-2-32:1990 GB/T2423.8—1995

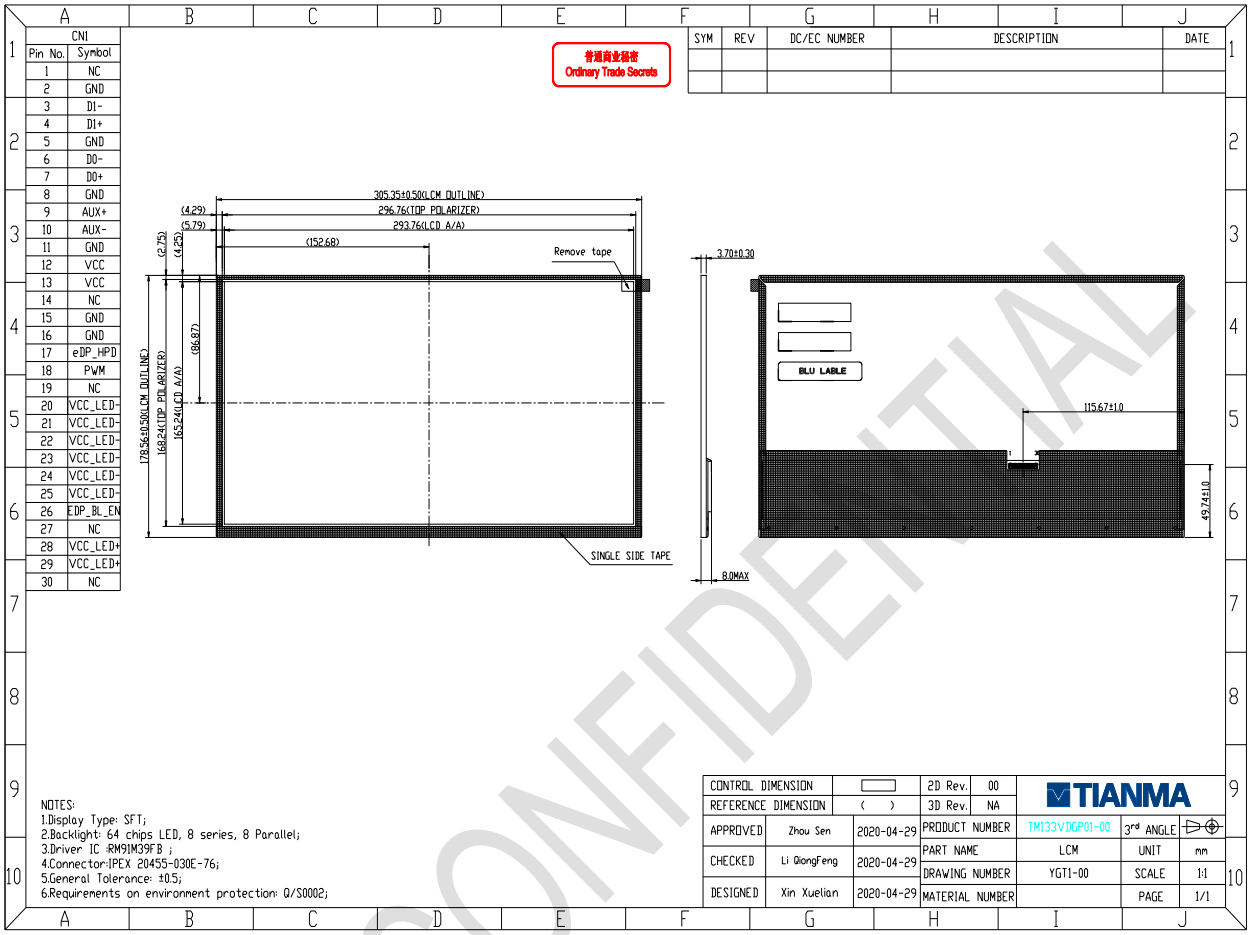
Note1: Ts is the temperature of panel's surface.

Note2: Ta is the ambient temperature of sample.

Note3: Before cosmetic and function test, the product must have enough recovery time, at least 24 hours at room temperature.

Note4: In the standard condition, there shall be no practical problem that may affect the display function. After the reliability test, the product only guarantees operation, but don't guarantee all of the cosmetic specification.

8 Mechanical Drawing



9 Packing Drawing TBD

10 Precautions for Use of LCD Modules

10.1 Handling Precautions

10.1.1 The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.

10.1.2 If the display panel is damaged and the liquid crystal substance inside it leaks out, be sure not to get any in your mouth, if the substance comes into contact with your skin or clothes, promptly wash it off using soap and water.

10.1.3 Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.

10.1.4 The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.

10.1.5 If the display surface is contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If still not completely clear, moisten cloth with one of the following solvents:

- Isopropyl alcohol
- Ethyl alcohol

Solvents other than those mentioned above may damage the polarizer. Especially, do not use the following:

- Water
- Ketone
- Aromatic solvents

10.1.6 Do not attempt to disassemble the LCD Module.

10.1.7 If the logic circuit power is off, do not apply the input signals.

10.1.8 To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

10.1.8.1 Be sure to ground the body when handling the LCD Modules.

10.1.8.2 Tools required for assembly, such as soldering irons, must be properly ground.

10.1.8.3 To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.

10.1.8.4 The LCD Module is coated with a film to protect the display surface. Be care when peeling off this protective film since static electricity may be generated.

10.2 Storage precautions

10.2.1 When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.

10.2.2 The LCD modules should be stored under the storage temperature range. If the LCD modules will be stored for a long time, the recommend condition is:

Temperature : 0℃ ～ 40℃ Relatively humidity: ≤80%

10.2.3 The LCD modules should be stored in the room without acid, alkali and harmful gas.

10.3 Transportation Precautions

10.3.1 The LCD modules should be no falling and violent shocking during transportation, and also should avoid excessive press, water, damp and sunshine.