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PCAP

Mechanical design

Optical Bonding



☒ Preliminary Specifications

☐ Final Specifications

Title	13.3-inch LCM Product Specifications
Model Name	ET133FH01-R
Version	1

Customer

Approved by

Date

Notice: This Specification is subject to change without notice.

Approved By	Prepared By
Jim 2022-11-1	Aurice 2022-11-1



REVISION HISTORY

Version	Description of Changes	Date	Prepared
0	First Edition	2022-06-23	Aurice
1	Modify Backlight LED Connector, Current dissipation	2022-11-1	Aurice



Contents

1. General Description	4
2. Pin Assignment.....	5
3. Operation Specifications	7
3.1 Absolute Maximum Ratings	7
3.2 Electrical Specifications.....	8
3.2.1 TFT-LCD panel driving.....	8
3.2.2 Backlight Driving	9
3.3 Power Sequence.....	10
3.4 Timing Characteristics	12
4. Optical Specifications	14
5. Reliability Test Items	17
6. General Precautions.....	18
6.1. Safety.....	18
6.2. Handling	18
6.3. Static Electricity.....	18
6.4. Storage	18
6.5. Cleaning.....	18
7. Appendix	19
7.1. Mechanical Drawing.....	19



1. General Description

No.	Item	Specification	Remark
1	LCD size	13.3 inch (Diagonal)	
2	Driver element	a-Si TFT active matrix	
3	Resolution	1920 x 3 (RGB) x1080	
4	Display mode	Normally Black	
5	Pixel pitch	0.153(H) mm x 0.153(V) mm	
6	Active area	293.76(H) mm x 165.24(V) mm	
7	Module size	305.34(W) x 178.82(H) x 3.0(D) mm	Note 1
8	Surface treatment	Anti-Glare,3H	
9	Color arrangement	RGB-stripe	
10	Interface	eDP 1.4	
11	Backlight power consumption	4.7(Typ.) W	
12	Weight	218g(Typ.)	

Note 1 : Refer to Mechanical Drawing



2. Pin Assignment

Connector used : 20455-03E-76 (IPEX)

Corresponding connector : 20453-030T (IPEX)

Pin No.	Symbol	I/O	Function	Remark
1	NC	-	No Connection	Note 1
2	H_GND	P	Ground	Note 2
3	Lane 1_N	I	Complement Signal Link Lane 1	
4	Lane 1_P	I	The Signal Link Lane 1	
5	H_GND	P	High Speed Ground	Note 2
6	Lane 0_N	I	Complement Signal Link Lane 0	
7	Lane 0_P	I	The Signal Link Lane 0	
8	H_GND	P	High Speed Ground	Note 2
9	AUX_CH_P	I	The Signal Auxiliary Channel	
10	AUX_CH_N	I	Complement Signal Auxiliary channel	
11	H_GND	P	High Speed Ground	Note 2
12	LCD_VCC	P	LCD Logic and driver power (3.3V)	
13	LCD_VCC	P	LCD Logic and driver power (3.3V)	
14	NC	I	No Connection	Note 1
15	LCD_GND	P	LCD Logic and driver ground	
16	LCD_GND	P	LCD Logic and driver ground	
17	HPD	O	HPD Signal	Note 3
18	NC	-	No Connection	
19	NC	-	No Connection	
20	NC	-	No Connection	
21	NC	-	No Connection	
22	NC	-	No Connection	
23	NC	-	No Connection	
24	NC	-	No Connection	
25	NC	-	No Connection	
26	NC	-	No Connection	
27	NC	-	No Connection	
28	NC	-	No Connection	



29	NC	-	No Connection	
30	NC	-	No Connection	

I : input, O : output, P : Power

The shielding case is connected with signal GND

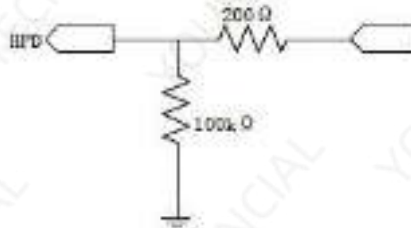
Connector used: 20455-030E-76 (I-PEX)

Corresponding connector: 20453-030T (I-PEX)

Note 1: Don't input any signals or any powers into a NC pin. Keep the NC pin Open.

Note 2: The shielding case is connected with signal GND.

Note 3: The equivalent circuit figure of the terminal.



(RCT is not responsible to its product quality, if the user applies a connector not corresponding to the above model.)

All terminals except NC terminal must be connected to input signal described as above or supply voltage or GND each.



3. Operation Specifications

3.1 Absolute Maximum Ratings

Item	Symbol	Values		Unit	Remark
		Min.	Max.		
Power Supply Voltage	V _{cc}	3.0	3.6	V	Ta=25°C
Operation Temperature	Top	-20	70	°C	Note 1
Storage Temperature	Tst	-30	80	°C	

Notes :

1. Permanent damage to the device may occur if maximum values are exceeded functional operation should be restricted to the condition described under normal operating conditions.
2. Temperature and relative humidity range : 90% RH Max. (40 °C ≥ Ta) Maximum wet - bulb temperature at 39 °C or less. (Ta > 40 °C) No condensation.



3.2 Electrical Specifications

3.2.1 TFT-LCD panel driving

DC Electrical Characteristics						
Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Power Supply voltage	V_{CC}	3.0	3.3	3.6	V	
Permissible input ripple voltage	V_{RF}	-	-	100	mVp-p	$V_{DD}=+3.3V$
Power Supply Current	I_{DD}	-	130		mA	
Positive-going Input Threshold Voltage	V_{IT+}	-		+100	mV	
Negative-going Input Threshold Voltage	V_{IT-}	-100		-	mV	
Power Consumption	P_D	-	1	1.2	W	
	P_{BL}	-	4.7	5	W	
	P_{total}	-	5.7	6.2	W	

TFT peak current will smaller than Inrush current.



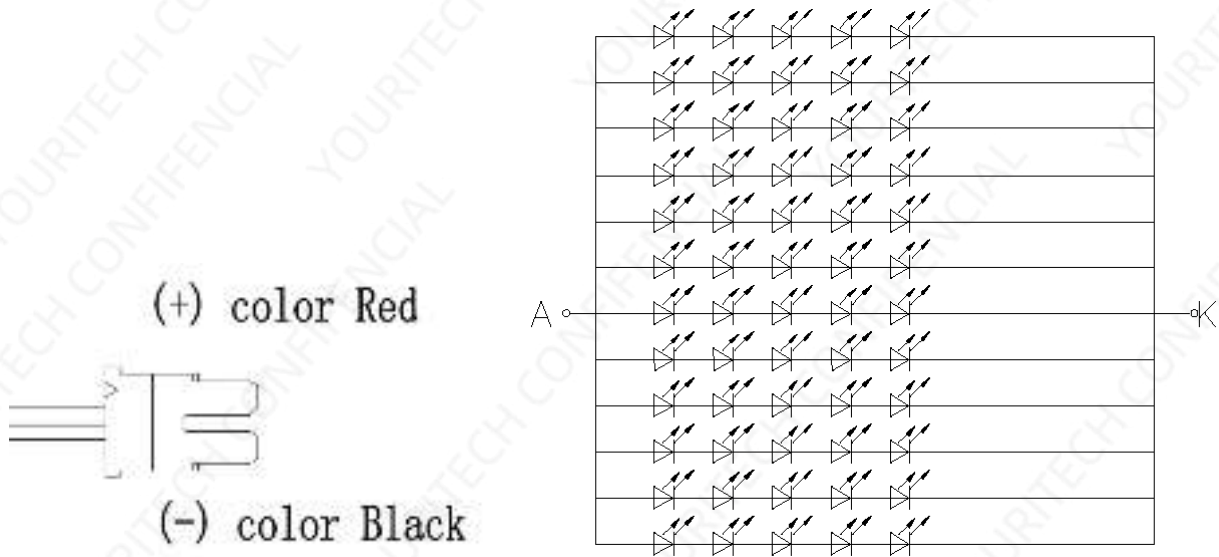
3.2.2 Backlight Driving

The backlight system is an edge-lighting type with white-LED.

(It is usually required to measure under the following condition: $T_a=25^{\circ}\text{C}\pm 2^{\circ}\text{C}$)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Supply voltage	V_{BL}	-	29	31	V	BL_PWR
Current dissipation	I_{BL}	-	160	-	mA	
Power consumption	P_{BL}	-	4.7	-	W	
Inrush Current	$I_{rush_{BL}}$	-	-	2	A	
LED Life time	-	30000	-	-	hrs	

Connector : JST BHSR-02VS-1

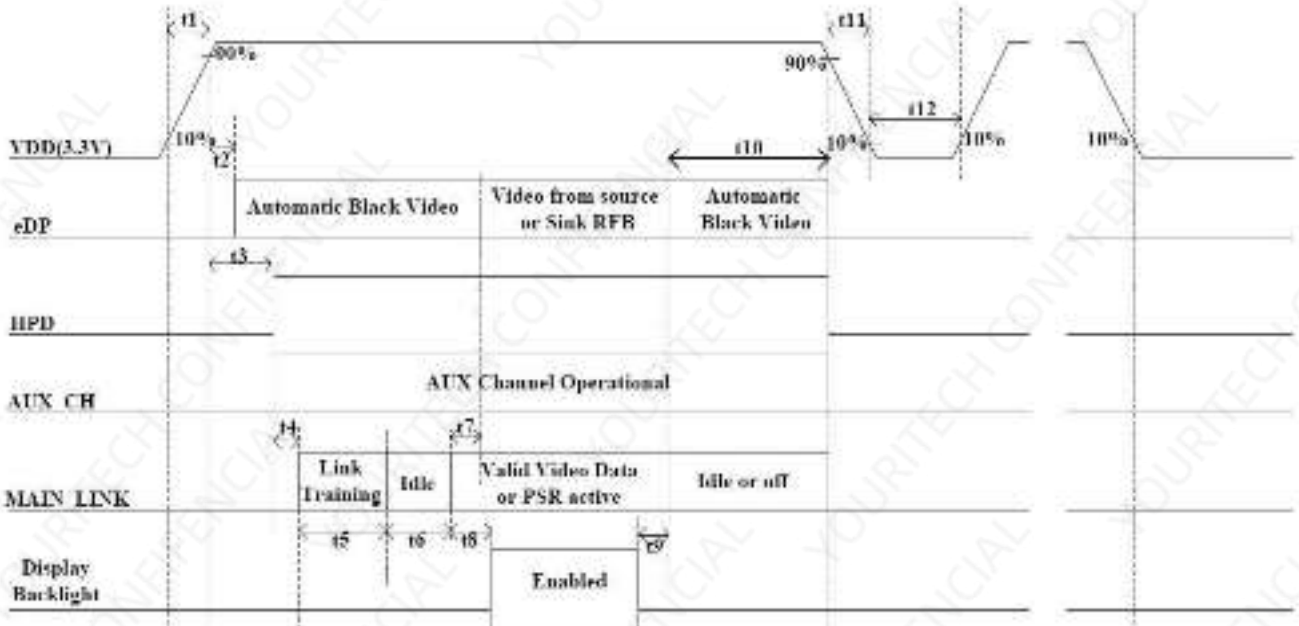


The backlight LED circuit 5S12P



3.3 Power Sequence

On-Off conditions for supply voltage



Note: Do not keep the interface signal high-impedance or unusual signal when power is on.

Symbol	Min.	Max.	Unit	Remark
t1	0.5	10	ms	
t2	0	200	ms	
t3	0	100	ms	
t4	-	-	ms	
t5	-	-	ms	
t6	-	-	ms	
t7	0	50	ms	
t8	-	-	ms	
t9	-	-	ms	
t10	0	500	ms	
t11	1	50	ms	Note 1
t12	500	-	ms	

Note 1: As for the power off sequence for VDD (t11), be sure to keep above mentioned timing.

If the VDD power off sequence timing is other than shown above, LCD may cause permanent damage.

*1 : As for the power sequence for backlight, it is recommended to apply above mentioned input timing.

If the backlight is light on and off at a timing other than shown above, displaying image maybe get disturbed.

VDD-dip-conditions

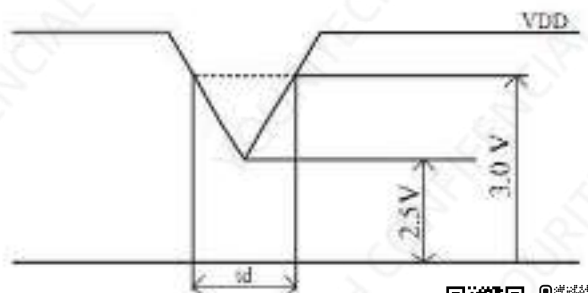
1) $2.5\text{ V} \leq \text{VDD} < 3.0\text{ V}$

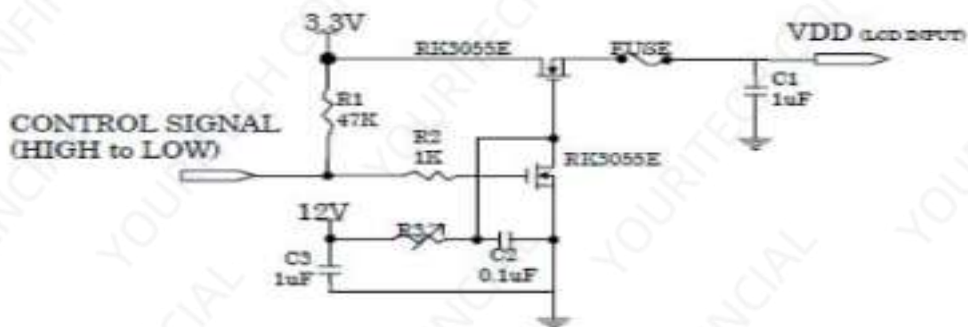
$t_d \leq 10\text{ ms}$

Under above condition, the display image should return to an appropriate figure after VDD voltage recovers.

2) $\text{VDD} < 2.5\text{ V}$

VDD-dip conditions should also follow the ON-OFF conditions for supply voltage.





3.4 Timing Characteristics

3.4.1 eDP Interface



Note. Transmitter : HX8876-F04 or equivalent.
Transmitter is not contained in Module.

3.4.2 eDP Input Signal

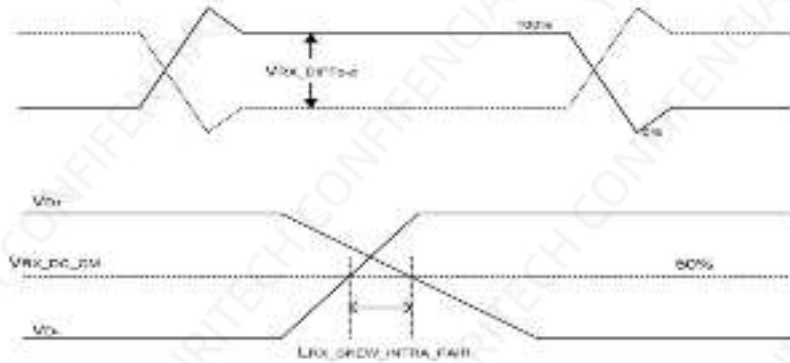
Lane 0	Lane 1
R0-7:0	R1-7:0
G0-7:0	G1-7:0
B0-7:0	B1-7:0
R2-7:0	R3-7:0
G2-7:0	G3-7:0
B2-7:0	B3-7:0
R4-7:0	R5-7:0
G4-7:0	G5-7:0
B4-7:0	B5-7:0



3.4.3 eDP Rx Interface Timing parameter

The Specification of the eDP Rx interface timing parameter is shown as below table.

Item	Symbol	Min	Typ	Max	Unit	Remark
Spread spectrum clock	SSC		0.5		%	
Differential peak-to-peak input voltage at package pins	VRX-DIFFp-p	500	0	1000	mV	
Rx input DC common mode voltage	VRX_DC_CM	-	GND	-	V	
Differential termination resistance	R _{RX-DIFF}	80	-	100	Ω	
Single-ended termination resistance	R _{RX-SE}	40	-	60	Ω	
Rx short circuit current limit	I _{RX_SHORT}	-	-	20	mA	
Intra-pair skew at Rx package pins (HBR)	L _{RX_SKEW_INTRA_PAIR}	-	-	150	ps	
Rx intra-pair skew tolerance at HBR						



3.4.4 Timing Condition

This model is operated by the DE only.

Parameter		Symbol	Values			Unit
			Min.	Typ.	Max.	
Clock frequency		1 / T _c	-	138.66	-	MHz
Frame Period			-	60	-	Hz
Vertical Section	Period	T _v	1103	1111	1200	lines
	Active	T _{VD}	1080			lines
	Blanking	T _{VB}	-	31	-	lines
Horizontal Section	Period	T _H	2020	2080	2400	clocks
	Active	T _{HD}	1920			clocks
	Blanking	T _{HB}	-	160	-	clocks



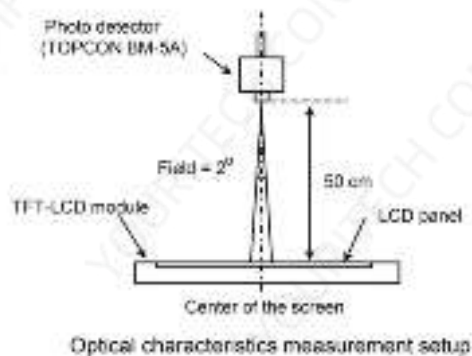
4. Optical Specifications

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing Angle	Horizontal	Θ_{21}	CR>10	80	89	-	Deg.	Note 1
		Θ_{22}		80	89	-	Deg.	
	Vertical	Θ_{11}		80	89	-	Deg.	
		Θ_{12}		80	89	-	Deg.	
Response time		T _{On} +T _{Off}	$\Theta=0^{\circ}$ (Center)	-	25	30	ms	Note 2 Note 3
Contrast ratio		CR		700	1000	-	-	Note 2 Note 4
Color chromaticity		W _x		0.252	0.292	0.332	-	Note 2 Note 5 Note 6
		W _y		0.279	0.319	0.359	-	
Luminance (AA Center)		L		900	1000	-	cd/m ²	
NTSC ratio		%		42	45	-		
Luminance uniformity 13pt		Yu		70	75	-	%	

Test Conditions: The ambient temperature is 25°C.

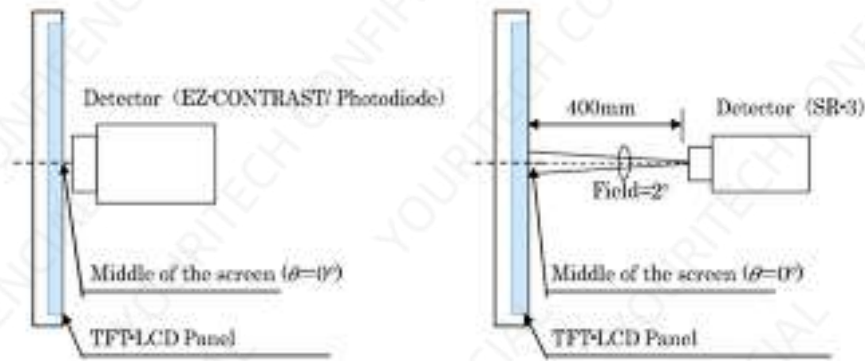
Note1: Definition of viewing angle range

Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing angles are determined for the horizontal or 3,9 o'clock direction and the vertical or 6,12 o'clock direction with respect to the optical axis which is normal to the LCD surface



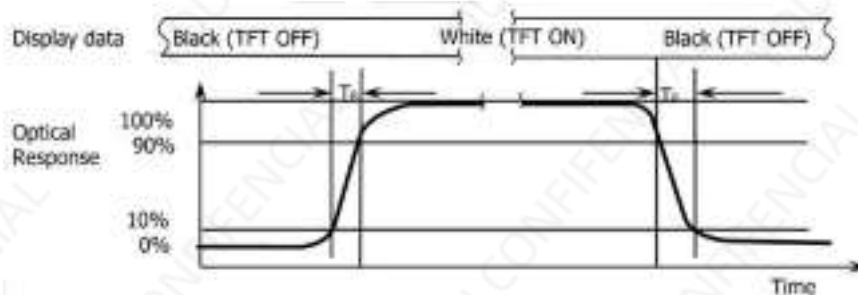
Note2: Definition of optical measurement system

The optical characteristic should be measured in darkroom. After 30 minutes operation, the optical properties are measured at the center point of the LCD screen. (Viewing angle is measured by EZ-CONTRASE, Response time is measured by Photodiode. The other items are measured by SR-3 Field of view: 2°/Height: 400mm.)



Note3: Definition of Response time

The response time is defined as the LCD optical switching time interval between "White" state and "Black" state. Rise time (TR) is the time between photo detector output intensity changed from 10% to 90%. And fall time (TF) is the time between photo detector output intensity changed from 90% to 10%.



Note4: Definition of contrast ratio

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD on the "White" state}}{\text{Luminance measured when LCD on the "Black" state}}$$

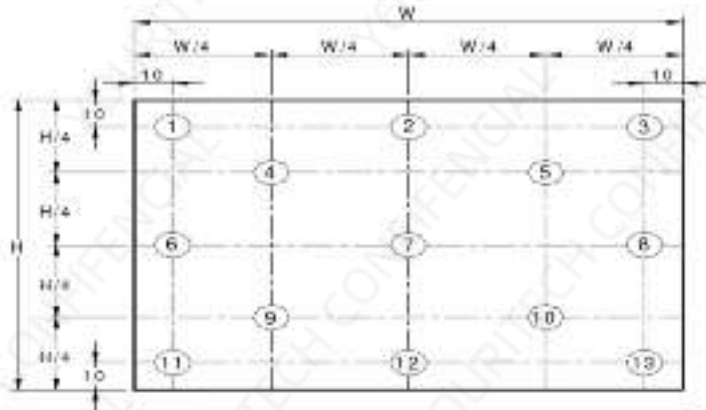
Note5: Definition of color chromaticity(CIE1931)

Color coordinates measured at center point of LCD.



Note6: Definition of Luminance Uniformity("White" state)

Active area is divided in to 13 measuring areas.(1~13)



Every measuring point is placed at the center of each measuring area.

$$(13pt) Y_u = \frac{\text{Maximum Luminance of 13 points (Brightness)}}{\text{Minimum Luminance of 13 points (Brightness)}}$$



5. Reliability Test Items

No.	Item	Test Conditions
1	High Temperature Storage	Ta=80°C, 240hrs
2	Low Temperature Storage	Ta=-30°C, 240hrs
3	High Temperature Operation	Ts=70°C, 240hrs
4	Low Temperature Operation	Ta=-20°C, 240hrs
5	Operate at High Temperature and Humidity	Ta=60°C, 90%RH, 240hrs
6	Thermal Shock	-30°C~+80°C 1hr/cycle 100 cycles

Result Evaluation Criteria: Under the display quality test condition with normal operation state.

Do not change the condition as such changes may affect practical display function.

Normal operation state temperature: 15~35°C, Humidity: 45~75%, Atmospheric pressure: 86~106kPa

6. General Precautions

6.1. Safety

Liquid crystal is poisonous. Do not put it in your mouth. If liquid crystal touches your skin or clothes, wash it off immediately by using soap and water.

6.2. Handling

1. The LCD panel is plate glass. Do not subject the panel to mechanical shock or to excessive force on its surface.
2. The polarizer attached to the display is easily damaged. Please handle it carefully to avoid scratch or other damages.
3. To avoid contamination on the display surface, do not touch the module surface with bare hands.
4. Keep a space so that the LCD panels do not touch other components.
5. Put cover board such as acrylic board on the surface of LCD panel to protect panel from damages.
6. Transparent electrodes may be disconnected if you use the LCD panel under environmental conditions where the condensation of dew occurs.
7. Do not leave module in direct sunlight to avoid malfunction of the ICs.

6.3. Static Electricity

1. Be sure to ground module before turning on power or operating module.
2. Do not apply voltage which exceeds the absolute maximum rating value.

6.4. Storage

1. Store the module in a dark room where must keep at $25\pm 10^{\circ}\text{C}$ and 65%RH or less.
2. Do not store the module in surroundings containing organic solvent or corrosive gas.
3. Store the module in an anti-electrostatic container or bag.

6.5. Cleaning

1. Do not wipe the polarizer with dry cloth. It might cause scratch.
2. Only use a soft sloth with IPA to wipe the polarizer, other chemicals might permanent damage to the polarizer.

7. Appendix

7.1. Mechanical Drawing

Unit : mm

