



CUSTOMER APPROVAL SHEET

Company Name	
MODEL	C031VAN01.2
CUSTOMER APPROVED	Title : Name :

- ☐ APPROVAL FOR SPECIFICATIONS ONLY (Spec. Ver. 0.3)
- ☐ APPROVAL FOR SPECIFICATIONS AND ES SAMPLE (Spec. Ver.0.3)
- ☐ APPROVAL FOR SPECIFICATIONS AND CS SAMPLE (Spec. Ver.0.3)
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Version 0.3

Page: 2/25

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Product Specification

3.14" COLOR TFT-LCD MODULE

Model Name : C031VAN01.2

< ◆ > Preliminary Specification

< > Final Specification

Note: The content of this specification is subject to change.

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Record of Revision

Version	Revise Date	Page	Content
0.0	2019/03/26		First draft.
0.1	2019/07/19	7	an update of 2D drawing 1. the change of connector in MOBIS system note. Responding to MOBIS's requirement 2. the change of Driver IC note. For better IS performance 3. the change of LCD shipping label note. the change of connector in MOBIS system
		8	the change of connector in MOBIS system note. Responding to MOBIS's requirement
		11~17	Update the part of the electrical specifications -For the Driver IC NT51700
		18	an update of optical specifications
		22	Modify panel label information -For the change of system connector
		23	Adding the spectrum of C-light in Appendix
		24~25	Adding the Reference Optical Specifications in Appendix -based on the spectrum of MOBIS 2.6" BLU provided by MOBIS
0.2	2019/08/30	8	Update pin assignment
		9	Update Note description
0.3	2019/11/4	6	Update General Information Sheet
		15~17	Update power on/off timing
		9	Update Note description
		10	Update IVDD spec and test pattern
		24~25	Update reference optical specifications

Contents

A.	<u>General Description</u>	<u>5</u>
B.	<u>Features</u>	<u>5</u>
C.	<u>General Information</u>	<u>6</u>
D.	<u>Outline Dimension.....</u>	<u>7</u>
E.	<u>Electrical Specifications</u>	<u>8</u>
1.	Pin Assignment Recommended connector: TF38-30S-0.5SV(030)	8
2.	Absolute Maximum Ratings	9
3.	Electrical Characteristics	10
3.1	Power Specification	10
3.2	Differential Signal DC Electrical Characteristics	10
3.3	Differentia Differential Signal AC Electrical Characteristics	12
	Input AC characteristics.....	12
	Differential signal AC characteristics	12
4.	Timing.....	13
4.1	DE Mode Timing conditions (Tentative)	13
4.2	Input Timing Formart.....	14
4.3	Power on/off sequence	15
	Power on:	15
	Power off sequence.....	16
	VDD off to on timing	17
F.	<u>Optical specifications</u>	<u>18</u>
G.	<u>Reliability Test Items</u>	<u>20</u>
H.	<u>Packing Form and Marking.....</u>	<u>21</u>
1.	Packing Form.....	21
2.	Panel Label Information	22
3.	Carton Label Information	22
I.	<u>Appendix.....</u>	<u>23</u>
1.	C-light Spectrum	23
2.	Reference Optical Specifications	24

A. General Description

C031VAN01.2 is a Low Temperature poly-Si & Transmissive type Thin Film Transistor Liquid crystal Display (TFT-LCD) with AHVA technology. This model is composed of a TFT-LCD, a driver IC, a FPC (flexible printed circuit). TCON (timing controller) is also embedded in source driver IC.

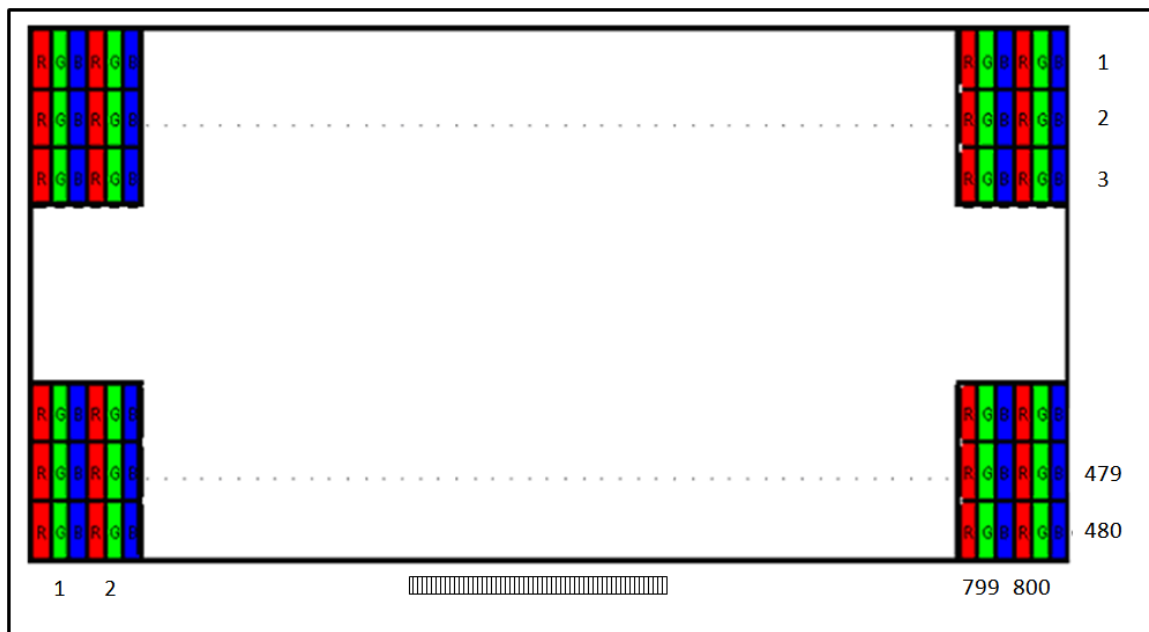
B. Features

- 3.14-inches (5:3) display
- 800RGB x 480 resolution in RGB stripe dot arrangement
- High transmittance
- Interfaces: OpenLDI 24-bit DE mode
- AHVA -- wide view technology
- RoHs compliance

C. General Information

NO.	Item	Unit	Specification	Remark
1	Display technology	--	Low temp poly-Si TFT, normally black, transmissive	
2	Display resolution	dot	800(W) x 480(H)	Note 1
3	Active area	mm	68.40 x 41.04	
4	Screen size	inch	3.14" (Diagonal)	
5	Subpixel pitch	mm	0.0285 x 0.0855	
6	Pixel configuration	--	R, G, B stripes	
7	Color Depth	--	16.7 M Colors	
8	Overall dimension	mm	82.86(W)x60.48(H)x2.8(D)	Note 2
9	Weight	g	14.5 ± 2	
10	Panel surface treatment	--	HC / 3H	
11	Data format	--	JEIDA	

Note 1: Below figure shows pixel configuration.



Note 2: Please refer to the drawing in page 7 for further information.

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E. Electrical Specifications

1. Pin Assignment

Recommended connector: TF38-30S-0.5SV(030)

Pin no	Symbol	I/O	Description	Remark
1	GND	G	Ground	
2	NTC1	-	Terminal 1 of Thermistor	
3	NTC2	-	Terminal 2 of Thermistor	
4	UPDN	I	Vertical scan direction control	Note 1
5	SHLR	I	Horizontal scan direction control	Note 1
6	SDI	I	Serial communication data input	Note 2
7	SCL	I	Serial communication clock input	Note 2
8	SDO	O	Serial communication data output	Note 2
9	CSB	I	Serial communication chip select	Note 2
10	GRB	I	Global reset pin	Note 4
11	STBYB	I	Standby mode control	Note 5
12	GND	G	Ground	
13	D0_N	I	LVDS Video data 0-	
14	D0_P	I	LVDS Video data 0+	
15	D1_N	I	LVDS Video data 1-	
16	D1_P	I	LVDS Video data 1+	
17	GND	G	Ground	
18	CLK_N	I	LVDS Video clock -	
19	CLK_P	I	LVDS Video clock +	
20	GND	G	Ground	
21	D2_N	I	LVDS Video data 2-	
22	D2_P	I	LVDS Video data 2+	
23	D3_N	I	LVDS Video data 3-	
24	D3_P	I	LVDS Video data 3+	
25	GND	G	Ground	
26	ASIL	O	ASIL function	Note 6
27	VDD	P	Power supply	
28	VDD	P	Power supply	
29	NC	-	AUO internal use, please floating	
30	GND	G	Ground	

I : Input, O : Output, P : Power, G : GND.

Note 1 :

UPDN = "H": Normal scanning (up-to-down); UPDN = "L": Invert vertical scanning (down-to-up).

SHLR = "H": Normal scanning (left-to-right); SHLR = "L": Invert horizontal scanning (right-to-left).

Note 2 : CSB, SDI, SDO, SCL are SPI signals.

Note 3 : Thermistor mode name/supplier: NCU15XH103F6SRC/Murata

Note 4 : GRB = "H": Normal operation; GRB = "L": The controller is in reset state.

Note 5 : STBYB = "H": Normal operation; STBYB = "L": Standby mode.

Note 6 : ASIL = "L": Abnormal; ASIL = "H": Normal.

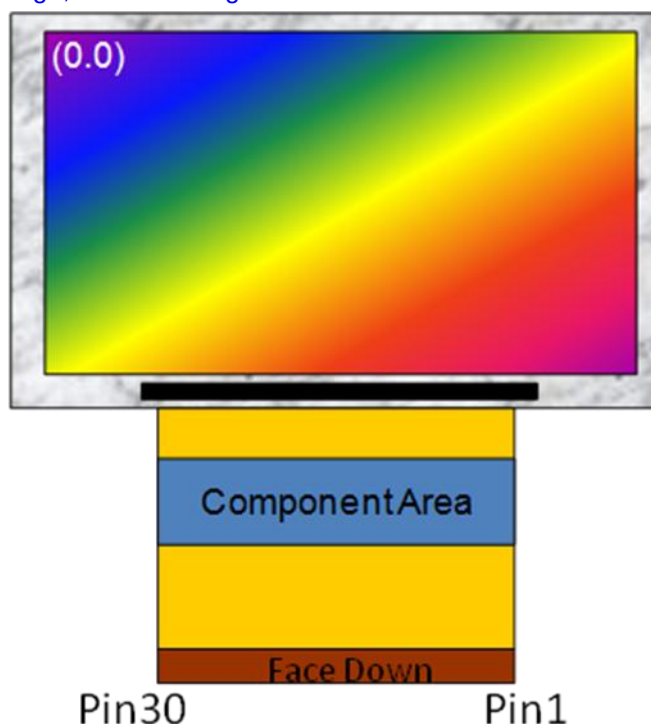
Note 7 :

SDI/SCL/STBYB : FPC→connect to IC, IC→pulled low

UPDN/SHLR/GRB/CSB : FPC→connect to IC, IC→pulled high

SDO : FPC→connect to IC, IC→floating

ASIL : FPC→pulled high, IC→floating



2. Absolute Maximum Ratings

Items	Symbol	Values		Unit	Condition
		Min.	Max.		
Power Voltage	VDD	-0.5	5	V	GND = 0 V
Operation Temperature	Topa	-30	+85	°C	Ambient
Storage Temperature	Tstg	-40	+95	°C	Ambient

Note : Functional operation should be restricted under normal ambient temperature.

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3. Electrical Characteristics

The following items are measured under stable condition and suggested application circuits.

3.1 Power Specification

(Tentative)

Parameter	Symbol	Min	Typ	Max	Unit	Notes
Power Supply	VDD	3	3.3	3.6	V	
	IVDD	-	50	64	mA	
Input high level voltage	V_{IH}	$0.7 \times VDD$	-	VDD	V	
Input low level voltage	V_{IL}	0	-	$0.3 \times VDD$	V	
High Level Output Voltage	V_{OH}	$VDD - 0.4V$	-	VDD	V	
Low Level Output Voltage	V_{OL}	GND	-	0.4V	V	

- 1 · All conditions should be set typical value.
- 2 · The panel can operate normally in the recommended operating condition
- 3 · Test pattern is as the following picture

Current test pattern

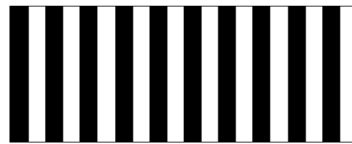


Fig. Test pattern for power specification

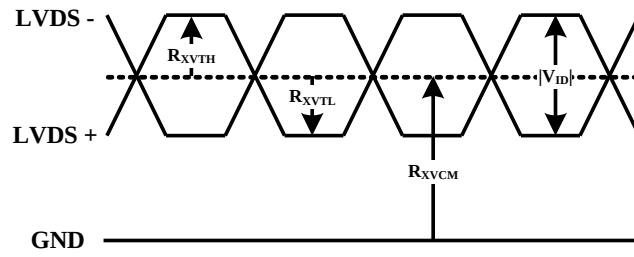
3.2 Differential Signal DC Electrical Characteristics

Parameter	Symbol	Min	Typ	Max	Unit	Notes
Single-end input high threshold	R_{XVTH}	-	-	100	mV	$R_{XVCM} = 1.2V$
Single-end input low threshold	R_{XVTL}	-100	-	-	mV	$R_{XVCM} = 1.2V$
Differential Input Common Mode Voltage	R_{XVCM}	1	1.2	1.4	V	
Differential Input voltage	$ V_{ID} $	0.2	0.4	0.6	V	

Note1 : TTL interface signal DC characteristics

Note2 : LVDS interface signal DC characteristic

Single-end Signal



Differential Signal

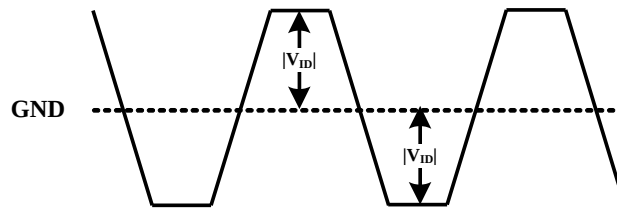


Fig. LVDS DC characteristics diagram

3.3 Differential Differential Signal AC Electrical Characteristics

Input AC characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
VDD power on slew time	T_{POR}	1	-	-	ms	From 0V to 90% VDD
GRB active pulse width	T_{GRB}	1			ms	

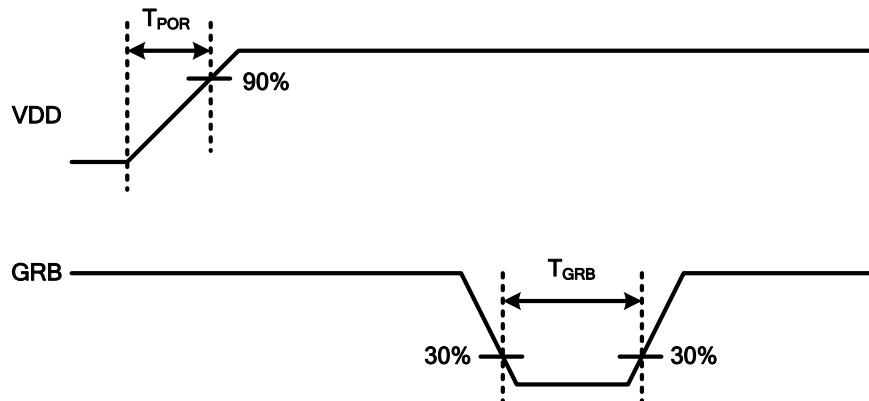


Fig. VDD/GRB timing diagram

Differential signal AC characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Clock frequency	$1/T_{CLK}$	25.1	-	34.7	MHz	
1 Data bit time	UI	-	1/7	-	T_{CLK}	
Input data skew margin	T_{RSKM}	-	-	0.2	UI	
Input data pulse position	T_{PPOSn}	n - 0.2	n	n + 0.2	UI	n = 0 to 6
Clock high time	T_{LVCH}	-	4	-	UI	
Clock low time	T_{LVCL}	-	3	-	UI	

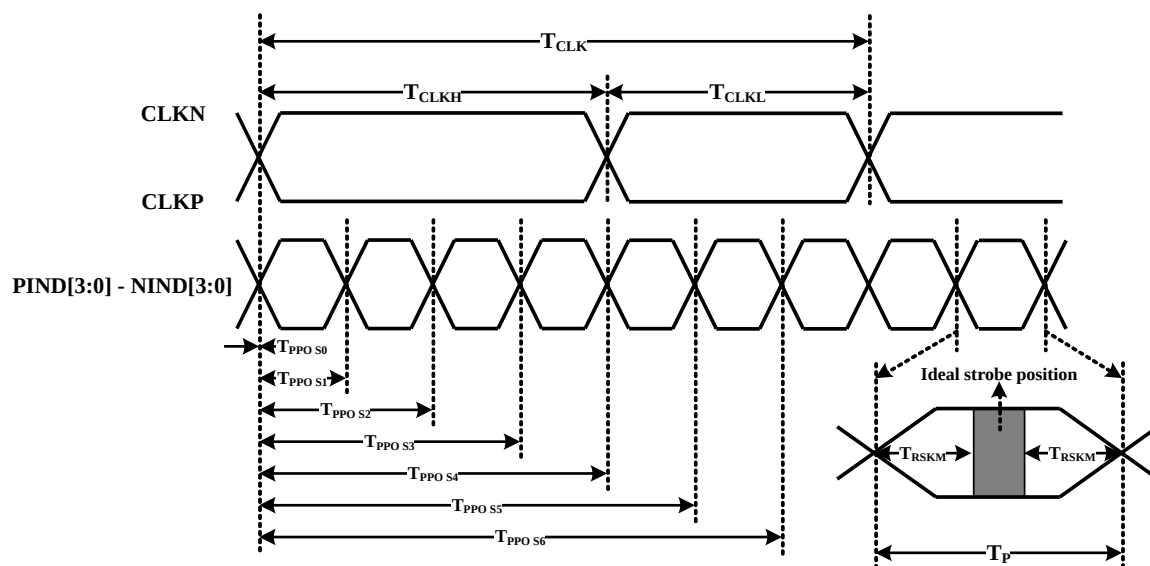
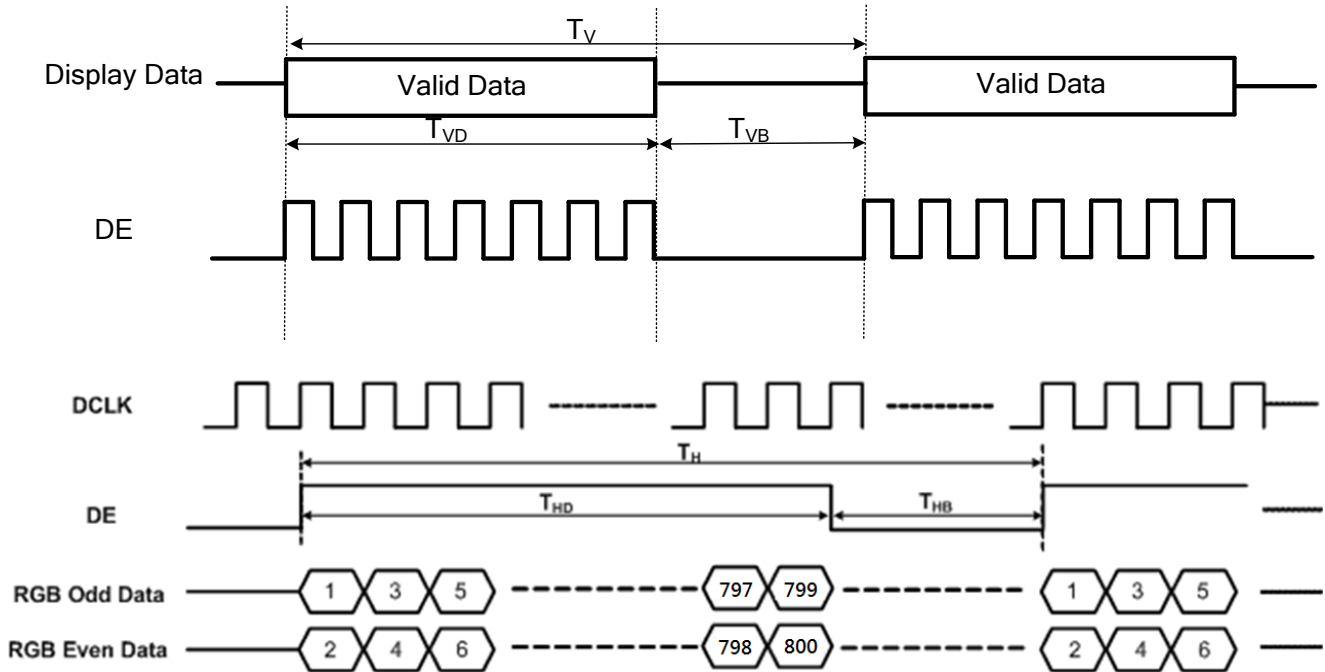


Fig. LVDS AC characteristics diagram

4. Timing

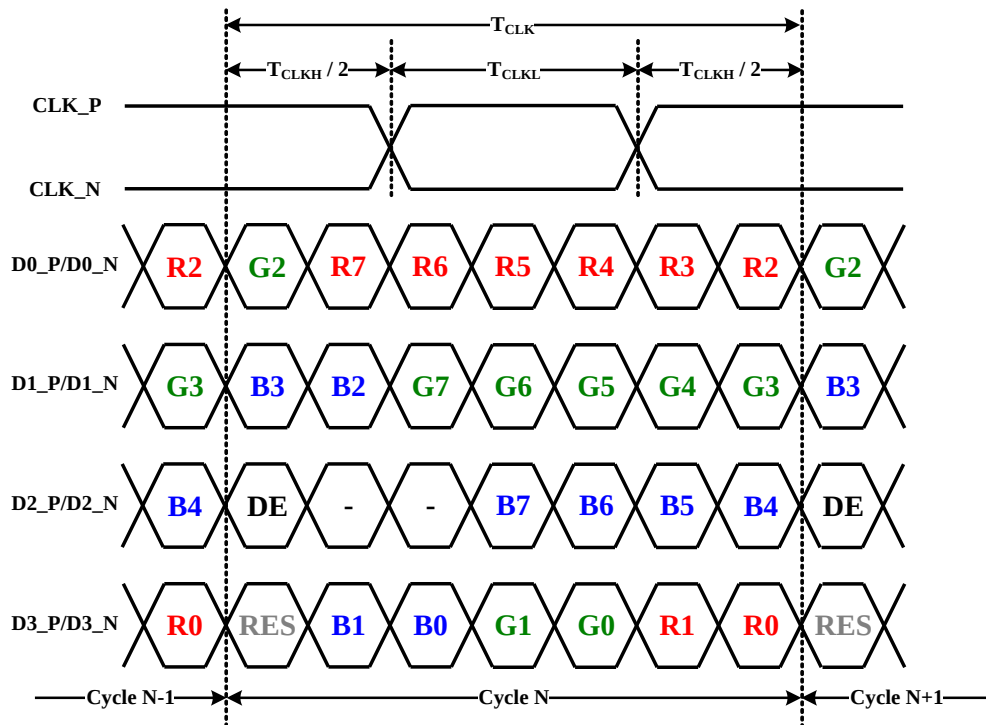
4.1 DE Mode Timing conditions (Tentative)



Parameter		Symbol	Min.	Typ.	Max.	Unit.	Remark
CLK Frequency		F_{CLK}	25.1	25.7	34.7	MHz	
HSYNC	Period	T_H	860	864	964	CLK	
	Horizontal display area	T_{HD}	800			CLK	
	Blanking	$T_{HBP} + T_{HFP}$	60	64	164	CLK	
VSYNC	Period	T_V	486	496	600	HS	
	Vertical display area	T_{VD}	480			HS	
	Blanking	$T_{VBP} + T_{VFP}$	6	16	120	HS	

4.2 Input Timing Formart

8-bit JEIDA format

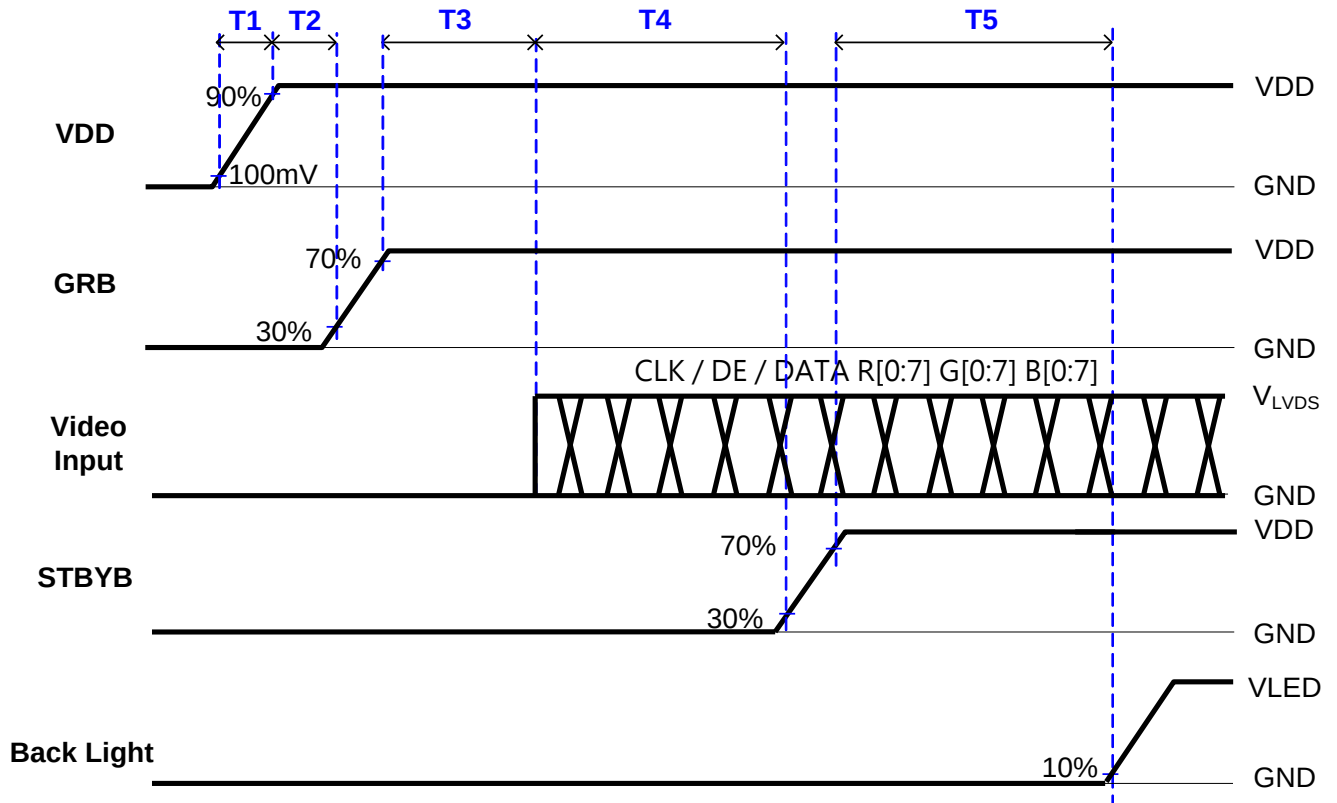


Symbol	Assignment	Remarks
R0	Red 0	Red LSB
R1	Red 1	-
R2	Red 2	-
R3	Red 3	-
R4	Red 4	-
R5	Red 5	-
R6	Red 6	-
R7	Red 7	Red MSB
G0	Green 0	Green LSB
G1	Green 1	-
G2	Green 2	-
G3	Green 3	-
G4	Green 4	-
G5	Green 5	-
G6	Green 6	-
G7	Green 7	Green MSB
B0	Blue 0	Blue LSB
B1	Blue 1	-
B2	Blue 2	-
B3	Blue 3	-
B4	Blue 4	-
B5	Blue 5	-
B6	Blue 6	-
B7	Blue 7	Blue MSB
DE	Disp_EN	Display Data Enable
RES	Reserved	Not used

4.3 Power on/off sequence

Power on:

VDD→GRB→SPI→Video Input(LVDS)→STBYB→Backlight



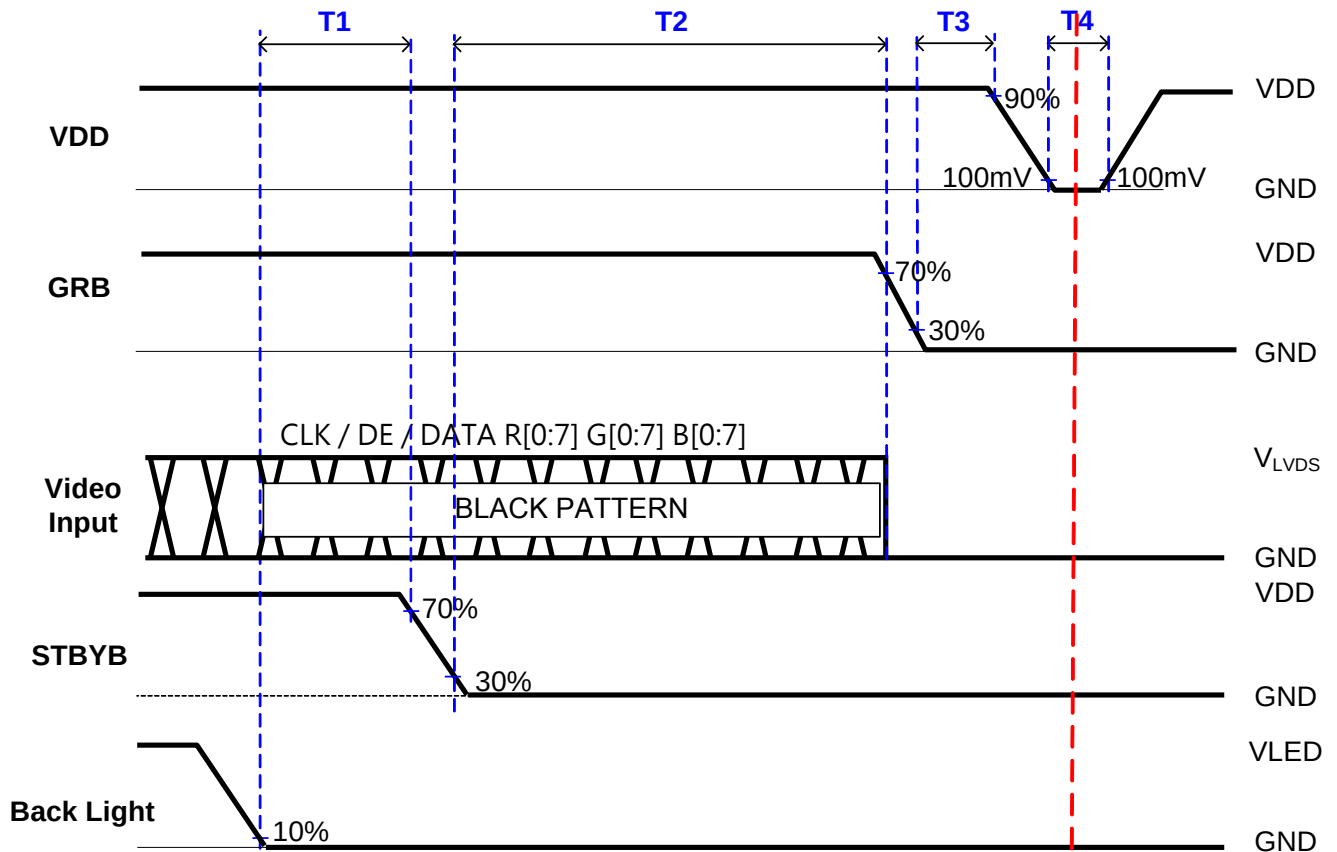
Power on timing:

Symbol	Value			Units
	Min.	Typ.	Max.	
T1	0.5	--	15	ms
T2	1.5	--	--	ms
T3	1	--	--	ms
T4	1	--	--	ms
T5	216	--	--	ms

Power off sequence

Backlight & SPI→STBYB→Video Input(LVDS)→GRB→VDD

Re-power on after all powers off (0V)



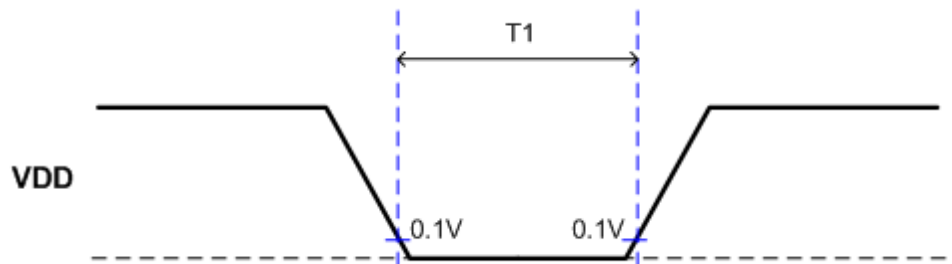
Power off timing:

Symbol	Value			Units
	Min.	Typ.	Max.	
T1	20	--	--	ms
T2	160	--	--	ms
T3	1	--	--	ms
T4	480	--	--	ms

VDD off to on timing

Parameter	Value			Unit	Remark
	Min.	Typ.	Max.		
T1	0.48		--	s	Note 1

* Note 1 : Before VDD turns ON, please make sure that AVDD; VGH; VGL; are all below intensity of 0.1V.



F. Optical specifications

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Contrast ratio	CR	$\theta=0^\circ$, AUO ref. BLU	1000	(1500)	-	-	Note 4,5
		$\theta=0^\circ$, HUD set	TBD	TBD	-	-	Note 4,5
Response Time (black <-> white)	Tr+Tf	$\theta=0^\circ$	-	20	30	ms	
Viewing Angle Top Bottom Left Right		$CR \geq 100$	70 70 70 70	80 80 80 80	- - - -	deg.	Note 4,5
Transmittance	Y_L	$\theta=0^\circ$	6.8	8		%	Note3
White Chromaticity	X	$\theta=0^\circ$ base on C-light	0.290	0.320	0.350	-	Note6
	Y		0.351	0.381	0.411	-	
Red Chromaticity	X		0.587	0.617	0.647	-	
	Y		0.310	0.340	0.370	-	
Green Chromaticity	X		0.286	0.316	0.346	-	
	Y		0.509	0.539	0.569	-	
Blue Chromaticity	X		0.118	0.148	0.178	-	
	Y		0.192	0.222	0.252	-	
Uniformity		25point, $\theta=0^\circ$	80	--	-	%	White, Note 7

Note 1: Measurement should be performed in the dark room, optical ambient temperature $\approx 25^\circ\text{C}$

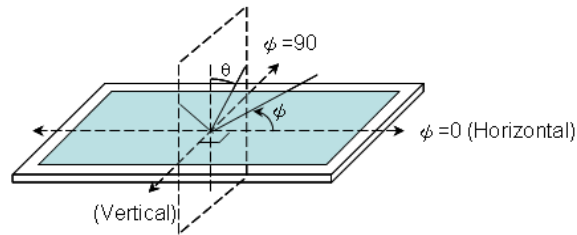
Note 2: To be measured on the center area of panel with a field angle of 1° by Topcon luminance meter BM-5, or SR3 or DMS-803 after 10 minutes operation.

Note 3: The Optical features are based on emissive spectrum of the reference light source by CIE1931 C-light. The LCD spectrum of transmission must be verified with the reference light-source to achieve the specified optical characteristics.

Note 4: Contrast ratio is calculated with the following formula.

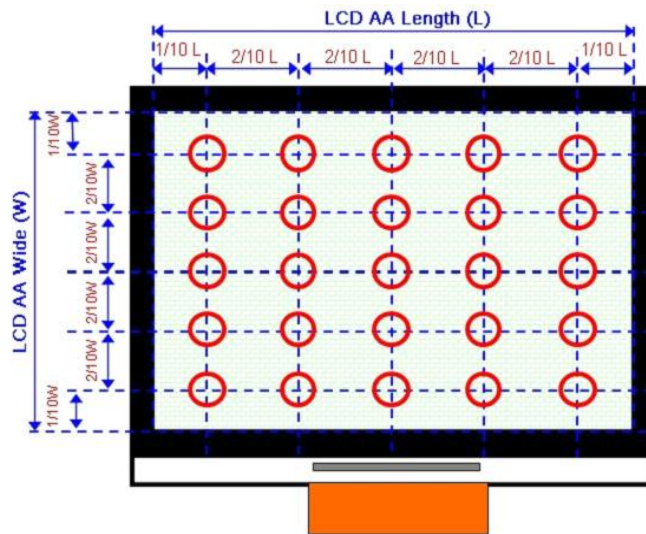
$$\text{Contrast ratio} = \frac{\text{Photo detector output when LCD is at "White" state}}{\text{Photo detector output when LCD is at "Black" state}}$$

Note 5. Definition of viewing angle: refer to figure as below (FPC direction is at $\psi=90^\circ$).



Note 6. The viewing angles are measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

Note 7. Transmittance Uniformity is defined as following within the 25 measurements (L1~L25),
 Transmittance Uniformity(%) = Minimum transmittance/ Maximum transmittance



G. Reliability Test Items

No.	Test items	Conditions		Remark
1	High temperature storage	Ta= 105℃	240Hrs	Note1 Note2
2	Low temperature storage	Ta= -40℃	240Hrs	
3	High temperature operation	Ts= 105℃	240Hrs	Note2 Note3
4	Low temperature operation	Ta= -40℃	240Hrs	Note1
5	High temperature and high humidity	Ta= 60℃ , 90% RH	240Hrs	Operation
6	Heat shock	-40℃~85℃/100 cycles 0.5Hrs/cycle		Non-operation
7	Vibration	Frequency range	8~33.3Hz	JIS D1601,A10 Condition A
		Stoke	1.3mm	
		Sweep	2.9G, 33.3~400Hz	
		Cycle	15min.	
		2 hours for each direction of X, Z 4 hours for Y direction		
8	Mechanical shock	100G, 6ms, ±X,±Y,±Z 3 times for each direction		
9	Vibration (with carton)	Random vibration: 0.015G ² /Hz from 5~200Hz -6dB/Octave from 200~500Hz		IEC 68-34
10	Drop (with carton)	Height: 60cm 1 corner, 3 edges, 6 surfaces		

Note 1: Ta: Ambient temperature.

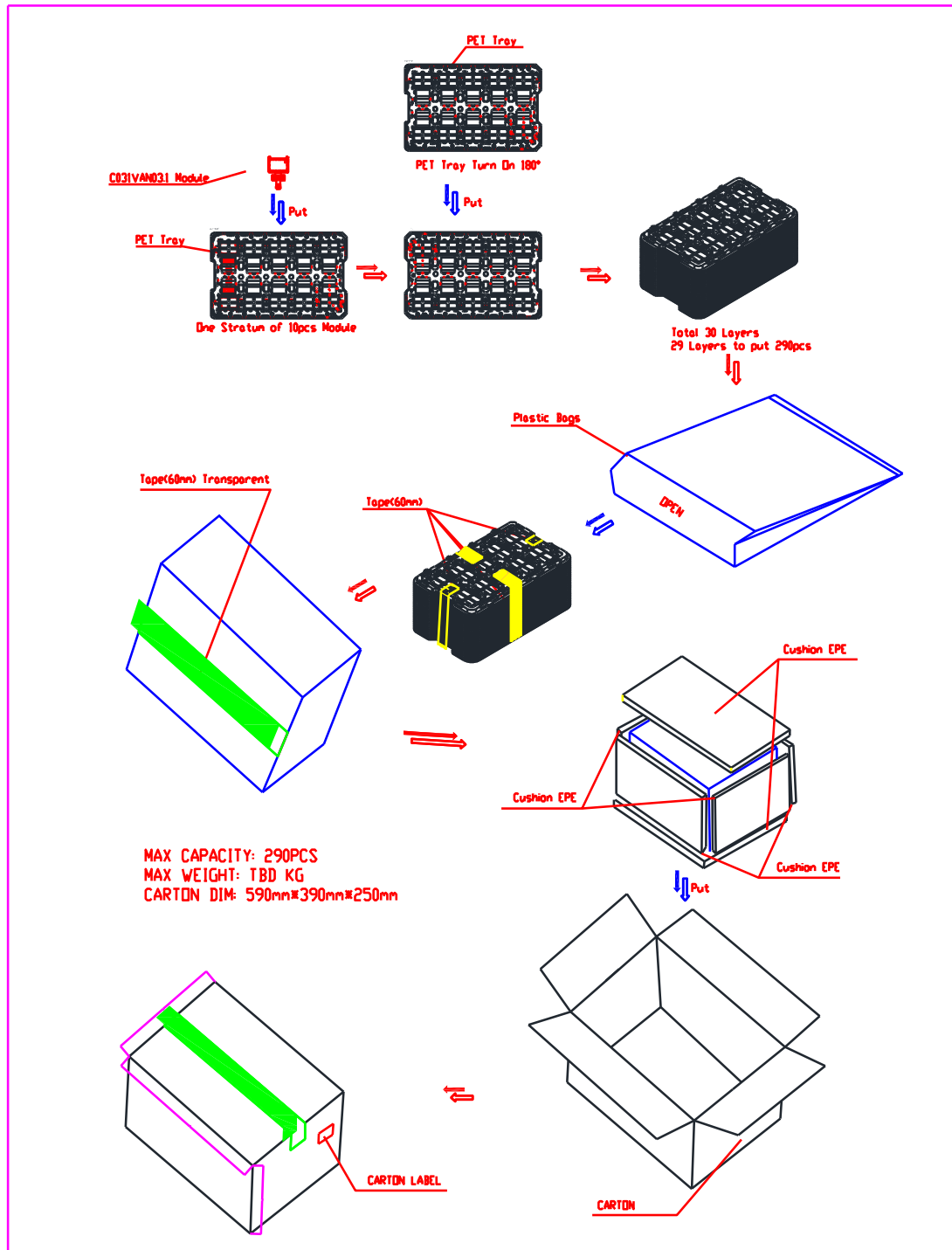
Note 2: In the standard condition, there is no display function NG issue occurred. All the cosmetic specification (ex. Polarizer) is judged before the reliability stress. After the reliability test, the product only guarantees operation, but don't guarantee all of the cosmetic specification.

Note 3: Ts: Panel surface temperature.

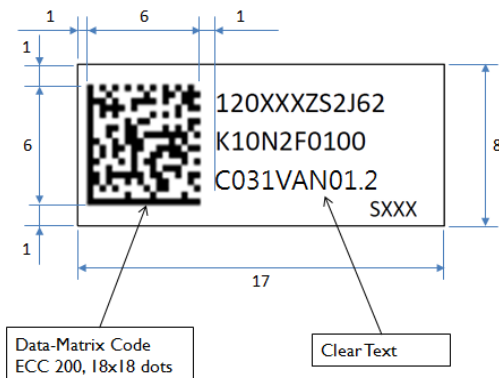
Note 4: Function judge→There is no abnormal shows after test.

H. Packing Form and Marking

1. Packing Form



2. Panel Label Information



1st row: AUO Serial No.

ABCDEFGHIJKL

- For AUO internal system usage and production serial number
- AUO module or panel factory code, represents the final production factory to complete the product
- Product version code, ranging from 0~9 or A~Z (for version after 9)
- Week code, the production week when product is finished at its production process

2nd row: Customer product number

3rd row: AUO Model name

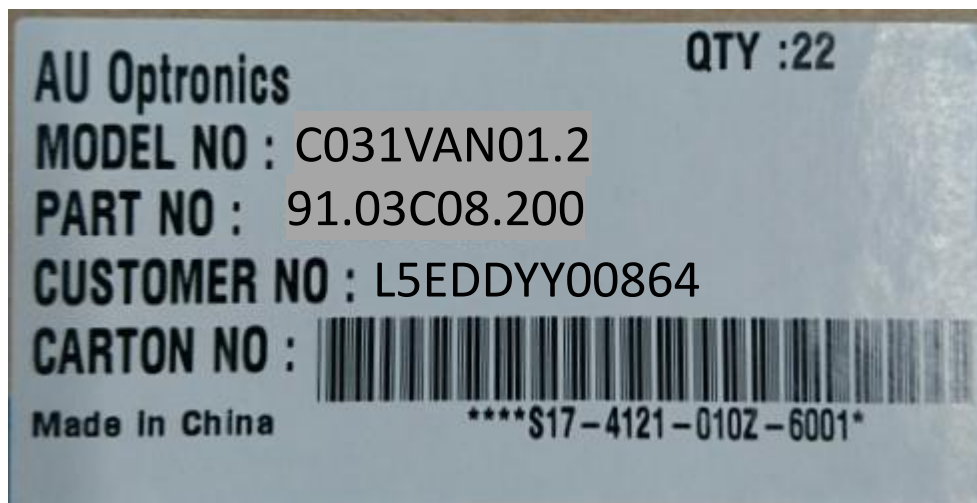
3. Carton Label Information

The packing carton will be attached with a carton label where packing Q'ty, AUO Model Name, AUO Part Number, Customer Part Number (Optional) and a series of Carton Number in 13 or 14 digits are printed. The Carton Number is appearing in the following format:

ABC-DEFG-HIJK-LMN

- DEFG appear after first "-" represents the packing date of the carton
- Date from 01 to 31
- Month, ranging from 1~9, A~C. A for Oct, B for Nov and C for Dec.
- A.D. year, ranging from 1~9 and 0. The single digit code represents the last number of the year

Refer to the drawing of packing format for the location and size of the carton label.



I. Appendix

1. C-light Spectrum

Wavelength (nm)	-
400	63.3
405	71.81
410	80.6
415	89.53
420	98.1
425	105.8
430	112.4
435	117.75
440	121.5
445	123.45
450	124
455	123.6
460	123.1
465	123.3
470	123.8
475	124.09
480	123.9
485	122.92
490	120.7
495	116.9
500	112.1
505	106.98
510	102.3
515	98.81
520	96.9
525	96.78
530	98
535	99.94
540	102.1
545	103.95
550	105.2

Wavelength (nm)	-
555	105.67
560	105.3
565	104.11
570	102.3
575	100.15
580	97.8
585	95.43
590	93.2
595	91.22
600	89.7
605	88.83
610	88.4
615	88.19
620	88.1
625	88.06
630	88
635	87.86
640	87.8
645	87.99
650	88.2
655	88.2
660	87.9
665	87.22
670	86.3
675	85.3
680	84
685	82.21
690	80.2
695	78.24
700	76.3

2. Reference Optical Specifications

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
White Chromaticity	X	$\theta=0^\circ$	0.280	0.310	0.340	-	Note1
	Y		0.315	0.345	0.375	-	
Red Chromaticity	X		0.556	0.586	0.616	-	
	Y		0.316	0.341	0.371	-	
Green Chromaticity	X		0.314	0.344	0.374	-	
	Y		0.539	0.569	0.599	-	
Blue Chromaticity	X		0.135	0.165	0.195	-	
	Y		0.122	0.152	0.182	-	

Note 1: The Reference Optical Specifications is based on the BLU provided by MOBIS
Which the spectrum of the BLU(for 2.6inch) is measured by AUO

-the spectrum of MOBIS 2.6" BLU measured by AUO:

Wavelength (nm)	-
400	0.2165
405	0.2554
410	0.4771
415	1.1892
420	3.1175
425	7.1012
430	13.7299
435	23.2146
440	37.0113
445	44.4201
450	27.9016
455	15.1688
460	10.0268
465	5.9918
470	3.5272
475	2.4643
480	1.8676
485	1.6196
490	1.9118
495	2.6366
500	3.6676
505	5.0953
510	6.5201
515	7.7154

Wavelength (nm)	-
555	10.7245
560	10.8329
565	10.7317
570	10.4839
575	10.2854
580	9.7905
585	9.3618
590	8.9066
595	8.5832
600	8.1961
605	7.7008
610	7.2423
615	6.7944
620	6.1069
625	5.6022
630	5.0907
635	4.6235
640	4.1475
645	3.7544
650	3.3844
655	3.0271
660	2.7442
665	2.4464
670	2.1539



520	8.9414
525	9.6139
530	10.2647
535	10.5525
540	10.7515
545	10.7437
550	10.8478

675	1.8851
680	1.6896
685	1.4835
690	1.2942
695	1.1518
700	1.0007