

# Specifications for

## **Blanview TFT-LCD Monitor**

**( 2.7" QVGA 240 x RGB x 320 Portrait)**

Version 1.0

(Please be sure to check the specifications latest version. )

**MODEL COM27H2P38UTC**

Customer's Approval

Signature:

Name:

Section:

Title:

Date:

# ORTUSTECH

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## Contents

1. Application	.....	3
2. Outline Specifications		
2.1 Features of the Product	.....	4
2.2 Display Method	.....	4
3. Dimensions and Shape		
3.1 Dimensions	.....	6
3.2 Outward Form	.....	7
3.3 Serial № print (S-print)	.....	9
4. Pin Assignment	.....	10
5. Absolute Maximum Rating	.....	11
6. Recommended Operating Conditions	.....	11
7. Characteristics		
7.1 DC Characteristics	.....	12
7.2 AC Characteristics	.....	13
8. Switching waveform	.....	14
9. Input timing		
9.1 Input Timing Characteristics	.....	15
9.2 Input Timing Chart	.....	16
9.3 Input Timing example	.....	17
10. Power-ON / Power-OFF sequence	.....	18
11. Display-ON / Display-OFF sequence	.....	19
12. Reset sequence	.....	19
13. LED Circuit	.....	20
14. Touch Panel Circuit	.....	20
15. Characteristics		
15.1 Optical Characteristics	.....	21
15.2 Temperature Characteristics	.....	22
16. Criteria of Judgment		
16.1 Defective Display and Screen Quality	.....	23
16.2 Screen and Other Appearance	.....	24
17. Reliability Test	.....	25
18. Packing Specifications	.....	27
19. Handling Instruction		
19.1 Cautions for Handling LCD panels	.....	28
19.2 Precautions for Handling	.....	29
19.3 Precautions for Operation	.....	29
19.4 Storage Condition for Shipping Cartons	.....	30
19.5 Precautions for Peeling off the Protective film	.....	31
19.6 Warranty	.....	31
APPENDIX	.....	32



## 1. Application

This Specification is applicable to 68.4mm (2.7 inch) Blanview TFT-LCD monitor with TP for non-military use.

- ◎ ORTUS TECHNOLOGY makes no warranty or assume no liability that use of this Product and/or any information including drawings in this Specification by Purchaser is not infringing any patent or other intellectual property rights owned by third parties, and ORTUS TECHNOLOGY shall not grant to Purchaser any right to use any patent or other intellectual property rights owned by third parties. Since this Specification contains ORTUS TECHNOLOGY's confidential information and copy right, Purchaser shall use them with high degree of care to prevent any unauthorized use, disclosure, duplication, publication or dissemination of ORTUS TECHNOLOGY'S confidential information and copy right.
- ◎ If Purchaser intends to use this Products for an application which requires higher level of reliability and/or safety in functionality and/or accuracy such as transport equipment (aircraft, train, automobile, etc.), disaster-prevention/security equipment or various safety equipment, Purchaser shall consult ORTUS TECHNOLOGY on such use in advance.
- ◎ This Product shall not be used for application which requires extremely higher level of reliability and/or safety such as aerospace equipment, telecommunication equipment for trunk lines, control equipment for nuclear facilities or life-support medical equipment.
- ◎ It must be noted as an mechanical design manner, especial attention in housing design to prevent arcuation/flexure or caused by stress to the LCD module shall be considered.
- ◎ ORTUS TECHNOLOGY assumes no liability for any damage resulting from misuse, abuse, and/or miss-operation of the Product deviating from the operating conditions and precautions described in the Specification.
- ◎ It shall be mutually conferred if nonconforming defect which result from unspecified cause in this specification arises.
- ◎ If any issue arises as to information provided in this Specification or any other information, ORTUS TECHNOLOGY and Purchaser shall discuss them in good faith and seek solution.
- ◎ ORTUS TECHNOLOGY assumes no liability for defects such as electrostatic discharge failure occurred during peeling off the protective film or Purchaser's assembly process.
- ◎ This Product is compatible for RoHS directive.

Object substance	Maximum content [ppm]
Cadmium and its compound	100
Hexavalent Chromium Compound	1000
Lead & Lead compound	1000
Mercury & Mercury compound	1000
Polybrominated biphenyl series (PBB series)	1000
Polybrominated biphenyl ether series (PBDE series)	1000



## 2. Outline Specifications

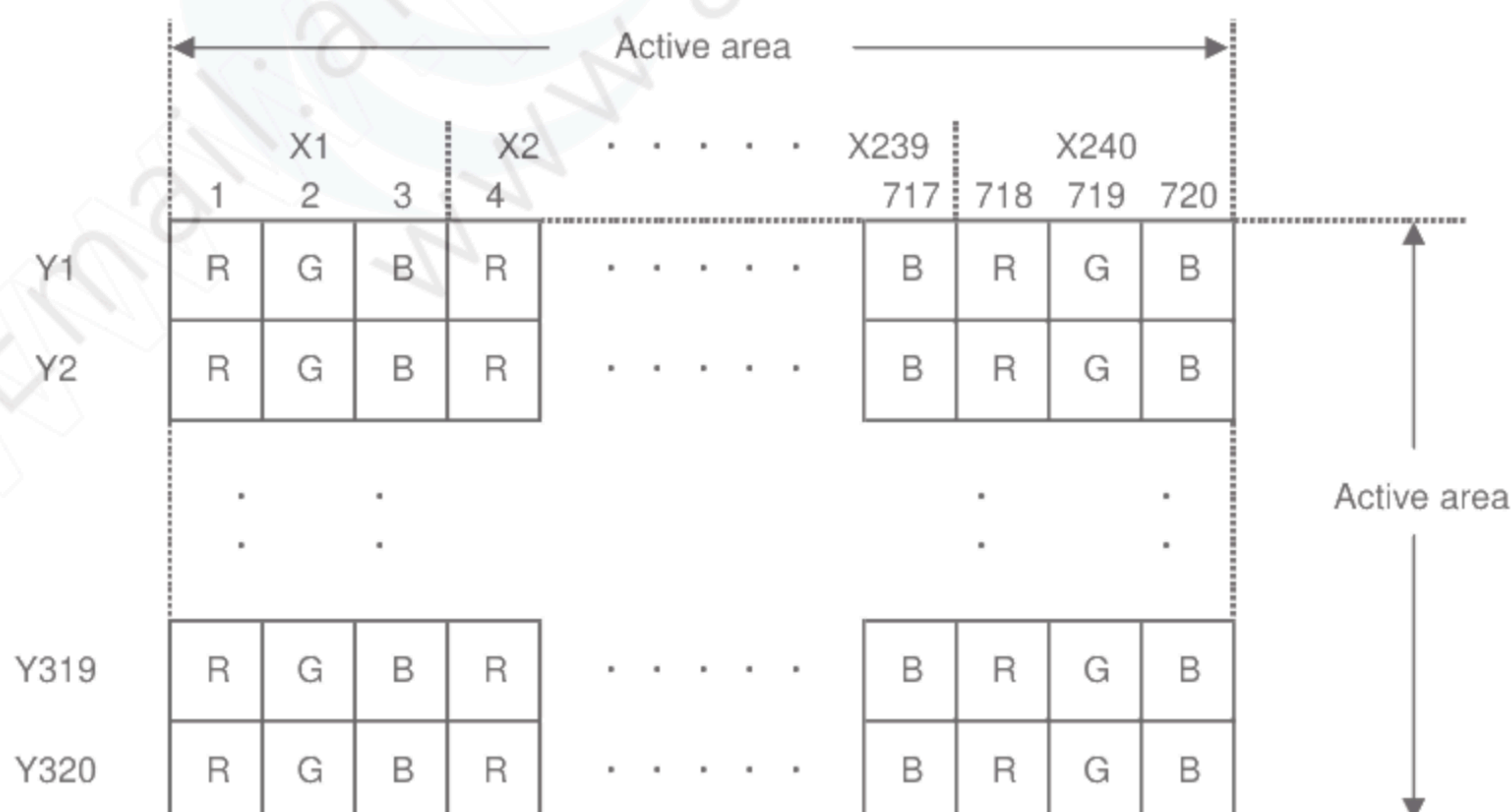
### 2.1 Features of the Product

- 2.7 inch diagonal display, 720 [H] x 320 [V] dots. 240RGB x 320 pixel.
- 6-bit / 262,144 colors.
- Single power supply operation of 3.0V.
- Timing generator [TG], Counter-electrode driving circuitry, Built-in power supply circuit.
- Long life & High bright white LED back-light and Touch panel operation monitor.
- Blanview TFT-LCD, improved outdoor visibility.

	Indoor		Outdoor	
	Visibility	Power Efficiency (Battery Life)	Visibility	Power Efficiency (Battery Life)
Transmissive	Good	Good	Fair	Poor
Transflective	Fair	Poor	Good	Good
Blanview	Good	Good	Good	Good

### 2.2 Display Method

Items	Specifications	Remarks
Display type	VA type 262,144 colors Blanview, Normally Black	
Driving method	a-Si TFT Active matrix Line-scanning, Non-interlace	
Dot arrangement	RGB stripe arrangement	Refer to "Dot arrangement"
Signal input method	6-bit Data : Paralell interface	
Backlight type	Long life & High bright white LED	
Touch panel	Resistance type,transmissive analog tablet	Surface finishing:Clear
NTSC ratio	50%	

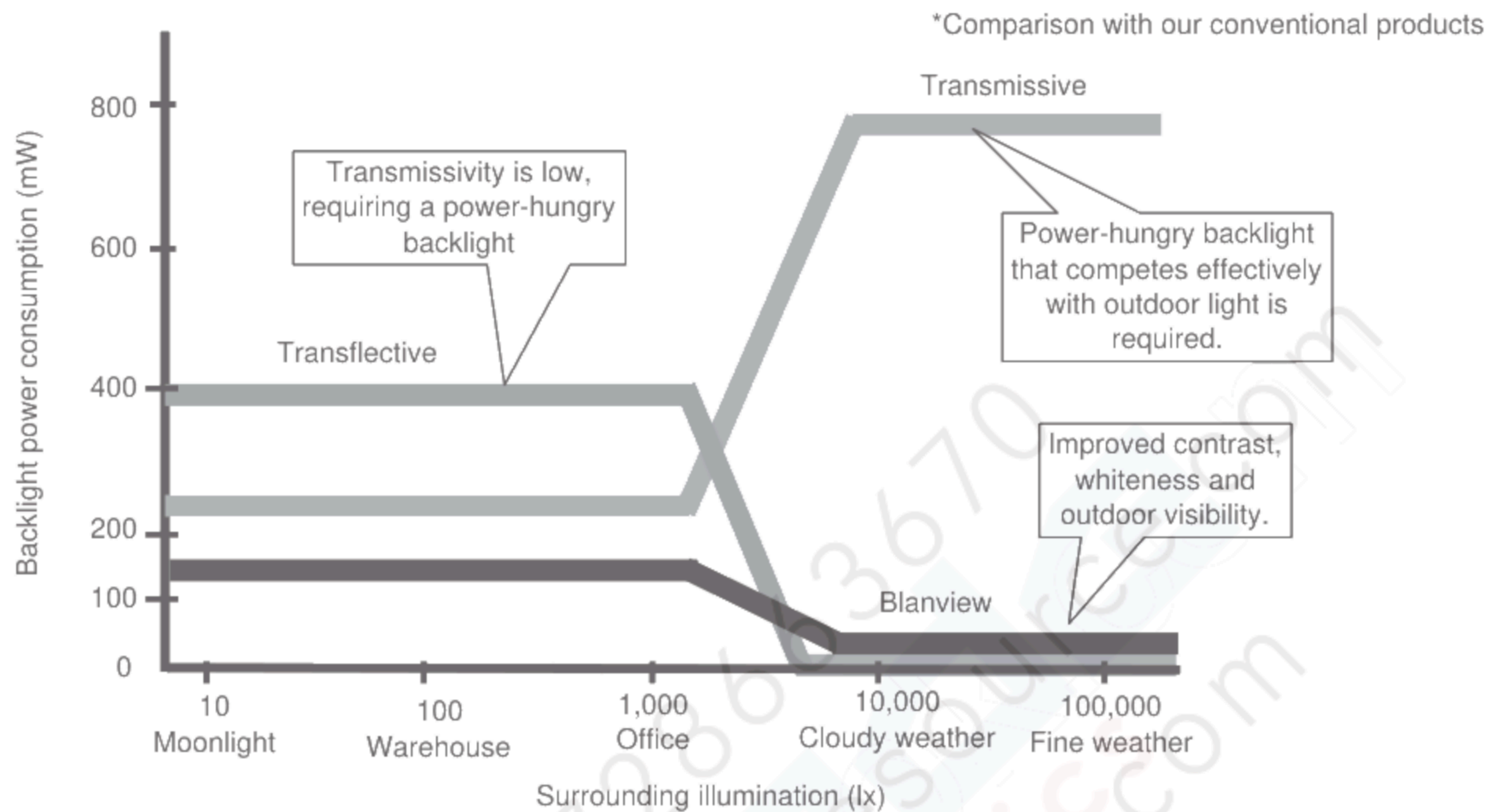


Dot arrangement (FPC cable placed lower side)



## &lt;Features of Blanview&gt;

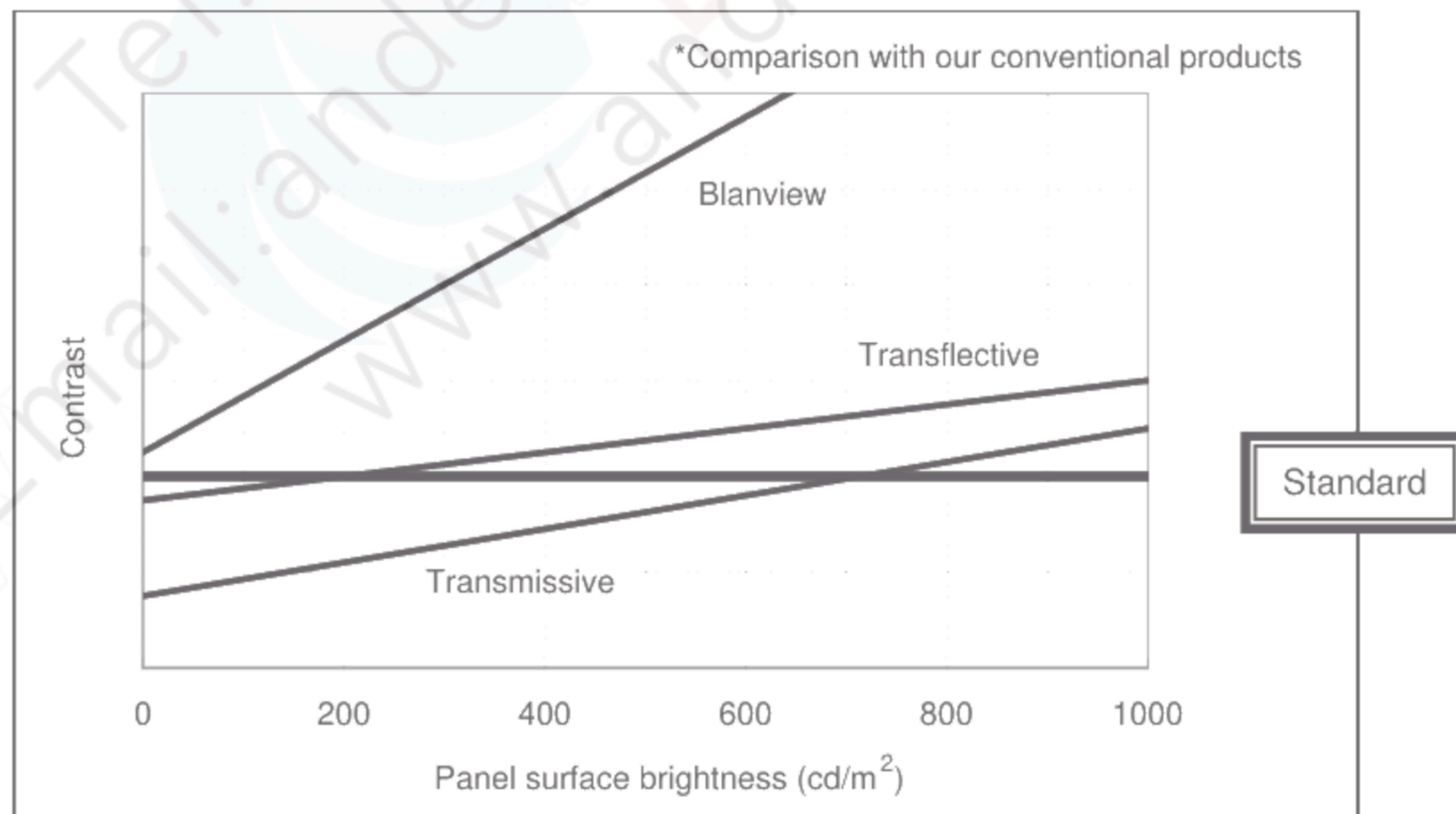
- Backlight power consumption required to assure visibility. (equivalent to 3.5"QVGA )



- Contrast characteristics under 100,000lx. (same condition as direct sunlight.)

With better contrast (higher contrast ratio), Blanview TFT-LCD has the best outdoor visibility in three different types of TFT-LCD.

Below chart shows contrast value against panel surface brightness. (Horizontal: Panel surface brightness/ Vertical: Contrast value) LCD panel has enough outdoor visibility above our Standard line. (ORTUS TECHNOLOGY criteria)





## 3. Dimensions and Shape

## 3.1 Dimensions

Items	Specifications	Unit	Remarks
Outline dimensions	47.00[H] × 66.00[V] × 4.19[D]	mm	exclude FPC and components on the FPC
Active area	41.04[H] × 54.72[V]	mm	68.4mm diagonal
Number of dots	720[H] × 320[V]	dot	
Dot pitch	57.0[H] × 171.0[V]	um	
Hardness of Touch Panel surface	3	H	
Weight	25.0	g	Include FPC cable



[illegible]

Note 2. Reconverted to corrects

Location in care of the recipient of the shall be +.5 m. 0.1e 10

1941 10:00 30:00 1942 1943 1944 1945 1946 1947 1948 1949 1950 1951 1952 1953 1954 1955 1956 1957 1958 1959 1960 1961 1962 1963 1964 1965 1966 1967 1968 1969 1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030 2031 2032 2033 2034 2035 2036 2037 2038 2039 2040 2041 2042 2043 2044 2045 2046 2047 2048 2049 2050 2051 2052 2053 2054 2055 2056 2057 2058 2059 2060 2061 2062 2063 2064 2065 2066 2067 2068 2069 2070 2071 2072 2073 2074 2075 2076 2077 2078 2079 2080 2081 2082 2083 2084 2085 2086 2087 2088 2089 2090 2091 2092 2093 2094 2095 2096 2097 2098 2099 2100 2101 2102 2103 2104 2105 2106 2107 2108 2109 2110 2111 2112 2113 2114 2115 2116 2117 2118 2119 2120 2121 2122 2123 2124 2125 2126 2127 2128 2129 2130 2131 2132 2133 2134 2135 2136 2137 2138 2139 2140 2141 2142 2143 2144 2145 2146 2147 2148 2149 2150 2151 2152 2153 2154 2155 2156 2157 2158 2159 2160 2161 2162 2163 2164 2165 2166 2167 2168 2169 2170 2171 2172 2173 2174 2175 2176 2177 2178 2179 2180 2181 2182 2183 2184 2185 2186 2187 2188 2189 2190 2191 2192 2193 2194 2195 2196 2197 2198 2199 2200 2201 2202 2203 2204 2205 2206 2207 2208 2209 2210 2211 2212 2213 2214 2215 2216 2217 2218 2219 2220 2221 2222 2223 2224 2225 2226 2227 2228 2229 2230 2231 2232 2233 2234 2235 2236 2237 2238 2239 2240 2241 2242 2243 2244 2245 2246 2247 2248 2249 2250 2251 2252 2253 2254 2255 2256 2257 2258 2259 2260 2261 2262 2263 2264 2265 2266 2267 2268 2269 2270 2271 2272 2273 2274 2275 2276 2277 2278 2279 2280 2281 2282 2283 2284 2285 2286 2287 2288 2289 2290 2291 2292 2293 2294 2295 2296 2297 2298 2299 2300 2301 2302 2303 2304 2305 2306 2307 2308 2309 2310 2311 2312 2313 2314 2315 2316 2317 2318 2319 2320 2321 2322 2323 2324 2325 2326 2327 2328 2329 2330 2331 2332 2333 2334 2335 2336 2337 2338 2339 2340 2341 2342 2343 2344 2345 2346 2347 2348 2349 2350 2351 2352 2353 2354 2355 2356 2357 2358 2359 2360 2361 2362 2363 2364 2365 2366 2367 2368 2369 2370 2371 2372 2373 2374 2375 2376 2377 2378 2379 2380 2381 2382 2383 2384 2385 2386 2387 2388 2389 2390 2391 2392 2393 2394 2395 2396 2397 2398 2399 2400 2401 2402 2403 2404 2405 2406 2407 2408 2409 2410 2411 2412 2413 2414 2415 2416 2417 2418 2419 2420 2421 2422 2423 2424 2425 2426 2427 2428 2429 2430 2431 2432 2433 2434 2435 2436 2437 2438 2439 2440 2441 2442 2443 2444 2445 2446 2447 2448 2449 2450 2451 2452 2453 2454 2455 2456 2457 2458 2459 2460 2461 2462 2463 2464 2465 2466 2467 2468 2469 2470 2471 2472 2473 2474 2475 2476 2477 2478 2479 2480 2481 2482 2483 2484 2485 2486 2487 2488 2489 2490 2491 2492 2493 2494 2495 2496 2497 2498 2499 2500 2501 2502 2503 2504 2505 2506 2507 2508 2509 2510 2511 2512 2513 2514 2515 2516 2517 2518 2519 2520 2521 2522 2523 2524 2525 2526 2527 2528 2529 2530 2531 2532 2533 2534 2535 2536 2537 2538 2539 2540 2541 2542 2543 2544 2545 2546 2547 2548 2549 2550 2551 2552 2553 2554 2555 2556 2557 2558 2559 2560 2561 2562 2563 2564 2565 2566 2567 2568 2569 2570 2571 2572 2573 2574 2575 2576 2577 2578 2579 2580 2581 2582 2583 2584 2585 2586 2587 2588 2589 2590 2591 2592 2593 2594 2595 2596 2597 2598 2599 2600 2601 2602 2603 2604 2605 2606 2607 2608 2609 2610 2611 2612 2613 2614 2615 2616 2617 2618 2619 2620 2621 2622 2623 2624 2625 2626 2627 2628 2629 2630 2631 2632 2633 2634 2635 2636 2637 2638 2639 2640 2641 2642 2643 2644 2645 2646 2647 2648 2649 2650 2651 2652 2653 2654 2655 2656 2657 2658 2659 2660 2661 2662 2663 2664 2665 2666 2667 2668 2669 2670 2671 2672 2673 2674 2675 2676 2677 2678 2679 2680 2681 2682 2683 2684 2685 2686 2687 2688 2689 2690 2691 2692 2693 2694 2695 2696 2697 2698 2699 2700 2701 2702 2703 2704 2705 2706 2707 2708 2709 2710 2711 2712 2713 2714 2715 2716 2717 2718 2719 2720 2721 2722 2723 2724 2725 2726 2727 2728 2729 2730 2731 2732 2733 2734 2735 2736 2737 2738 2739 2740 2741 2742 2743 2744 2745 2746 2747 2748 2749 2750 2751 2752 2753 2754 2755 2756 27

[illegible]

Notes: - consistency is guaranteed in the proposed algorithm.

Please choose a value to enter the test.

[illegible] $\mathcal{O}_1$ [illegible][illegible]







## 3.3 Serial № print (S-print)

## 1) Display Items

S-print indicates the least significant digit of manufacture year (1 digit), manufacture month with below alphabet (1 letter), model code (5 characters), serial number (6 digits).

## \* Contents of Display

*	*	*****	*****
—	—	—	—
a	b	c	d

	Contents of display			
a	The least significant digit of manufacture year			
b	Manufacture month	Jan-A Feb-B Mar-C Apr-D	May-E Jun-F Jul-G Aug-H	Sep-I Oct-J Nov-K Dec-L
c	Model code	27GGC (Made in Japan) 27GHC (Made in Malaysia)		
d	Serial number			

## \* Example of indication of Serial № print (S-print)

## • Made in Japan

7J27GGC000125

means "manufactured in October 2017, 2.7" GG type, C specifications, serial number 000125"

## • Made in Malaysia

7J27GHC000125

means "manufactured in October 2017, 2.7" GH type, C specifications, serial number 000125"

## 2) Location of Serial № print (S-print)

Refer to 3.2 "Outward Form".

## 3) Others

Please note that it is likely to disappear with an organic solvent about the Serial print.



## 4. Pin Assignment

No.	Symbol	Function	I/O
1	VSS	GND	P
2	VSS	GND	P
3	VDD	Power supply	P
4	VDD	Power supply	P
5	VSS	GND	P
6	RESETB	Reset signal (Lo-active)	I
7	HSYNC	Horizontal synchronization signal (Negative polarity)	I
8	VSYNC	Vertical synchronizing signal (Negative polarity)	I
9	CLK	Display clock (Falling read)	I
10	VSS	GND	P
11	D00	Display data (B) input	I
12	D01	It becomes black display in 00h. D00:LSB D05:MSB  gamma conversion internally driver.	I
13	D02		I
14	D03		I
15	D04		I
16	D05		I
17	D10	Display data (G) input	I
18	D11	It becomes black display in 00h. D10:LSB D15:MSB  gamma conversion internally driver.	I
19	D12		I
20	D13		I
21	D14		I
22	D15		I
23	D20	Display data (R) input	I
24	D21	It becomes black display in 00h. D20:LSB D25:MSB  gamma conversion internally driver.	I
25	D22		I
26	D23		I
27	D24		I
28	D25		I
29	VSS	GND	P
30	DE	Input data valid signal (Hi-active)	I
31	STBYB	Standby control signal (Lo:Standby, Hi:Normal-operation)	I
32	TEST1	MODE1 (GND connection)	I
33	XL	X-axis left terminal	I/O
34	YD	Y-axis down terminal	I/O
35	XR	X-axis right terminal	I/O
36	YU	Y-axis up terminal	I/O
37	TEST2	MODE2 (GND connection)	I
38	BLH	LED drive power source. (Anode side)	P
39	BLL	LED drive power source. (Cathode side)	P

## Note :

- Recommended connector : Hirose FH23 series "FH23-39S-0.3SHW(05) "
  - Terminal arrangement, please refer to "3.2 Outward Form".
  - FPC of the terminal has been decorated with gold-plated.
- Connector contact terminals is recommended the use of gold-plated products.



## 5. Absolute Maximum Rating

VSS=0V

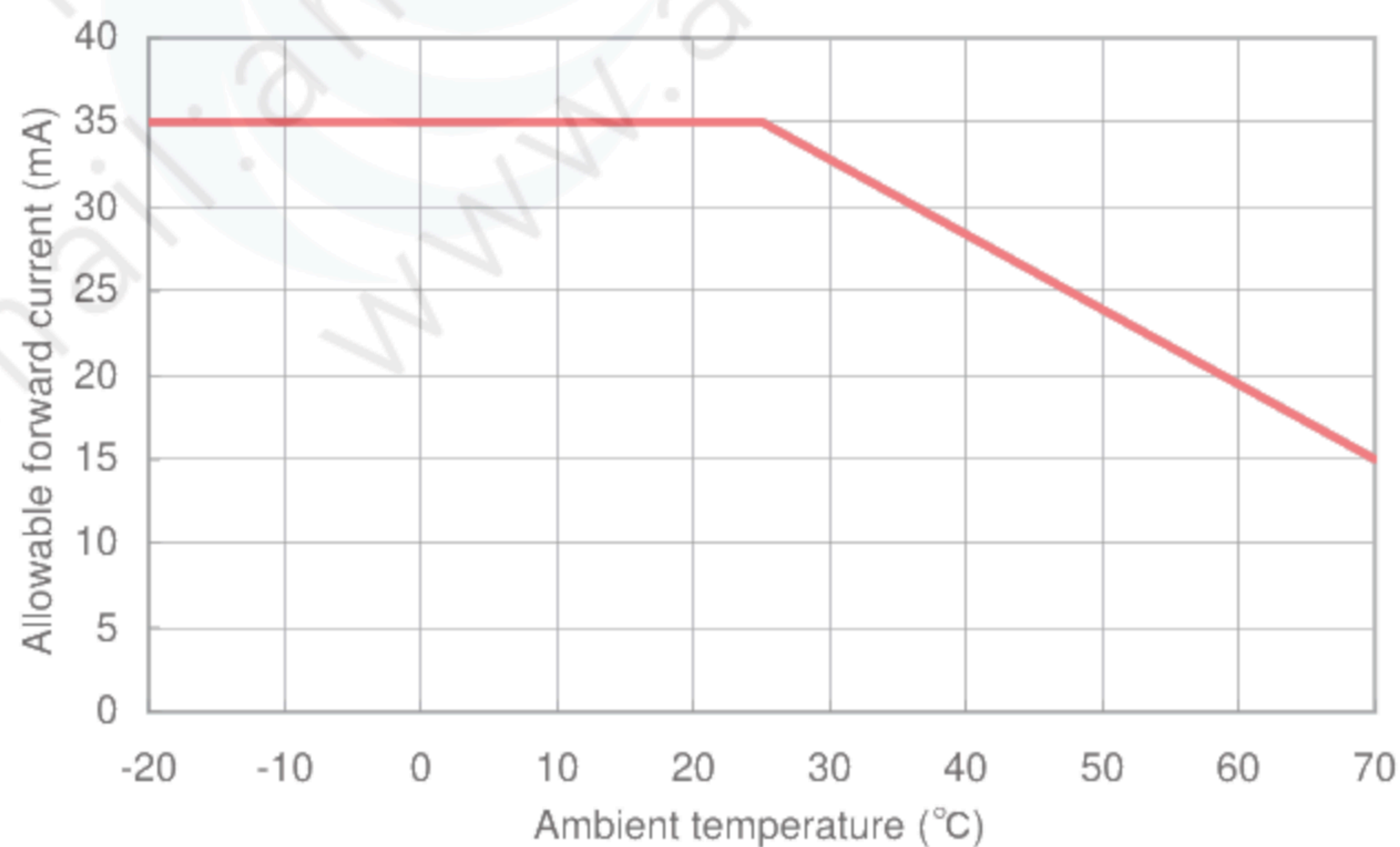
Item	Symbol	Condition	Rating		Unit	Applicable terminal
			MIN	MAX		
Supply voltage	VDD	Ta=25°C	-0.3	4.6	V	VDD
Input voltage for logic	VI		-0.3	VDD+0.3	V	CLK, VSYNC, HSYNC, DE, D[05:00], D[15:10], D[25:20], STBYB, RESETB, TEST1, TEST2
LED Forward current	IL	Ta = 25°C	—	35.0	mA	BLH - BLL
		Ta = 70°C	—	15.0		
Touch Panel input voltage	VIT		—	7.0	V	XR, XL, YU, YD
Storage temperature range	Tstg		-30	80	°C	
Storage atmospheric range	Hstg	40°C90%RH or less of moisture content with no condensation				

## 6. Recommended Operating Conditions

VSS=0V

Item	Symbol	Condition	Rating			Unit	Applicable terminal
			MIN	TYP	MAX		
Supply voltage	VDD		2.7	3.0	3.6	V	VDD
Input voltage for logic	VI		0	—	VDD	V	CLK,VSYNC,HSYNC,DE, D[05:00],D[15:10],D[25:20], STBYB,RESETB, TEST1,TEST2
Operational temperature range	Top	*note	-20	+25	+70	°C	Touch Panel surface temperature
Operating humidity range	Hop	Ta≤40°C	20	—	85	%	
		Ta> 40°C	40°C85%RH or less of moisture content with no condensation				

note : The maximum value of LED Forward current "IL", do not exceed the following allowable current value.





## 7. Characteristics

## 7.1 DC Characteristics

## 7.1.1 Display section

(Unless otherwise noted, Ta=25°C, VDD=3.0V, VSS=0V)

Item	Symbol	Condition	Rating			Unit	Applicable terminal
			MIN	TYP	MAX		
Input Signal Voltage	VIH		0.7×VDD	—	VDD	V	CLK, VSYNC, HSYNC, DE, STBYB, RESETB
	VIL		0	—	0.3×VDD	V	D[05:00], D[15:10], D[25:20] TEST1, TEST2
Operating Current	IDD	fCLK=6.25MHz Color bar display	—	9.2	18.4	mA	VDD

## 7.1.2 Backlight section

Item	Symbol	Condition	Rating			Unit	Applicable terminal
			MIN	TYP	MAX		
Forward current	IL25	Ta=25°C	—	7.0	35.0	mA	BLH — BLL
	IL70	Ta=70°C	—	—	15.0	mA	
Forward voltage	VL	Ta=25°C, IL=7.0mA	—	8.0	8.5	V	
Estimated Life of LED	LL	Ta=25°C, IL=7.0mA *note	—	50,000	—	hr	

- note :
- The lifetime of the LED is defined as a period till the brightness of the LED decreases to the half of its initial value.
  - This figure is given as a reference purpose only, and not as a guarantee.
  - This figure is estimated for an LED operating alone.
- As the performance of an LED may differ when assembled as a monitor together with a TFT panel due to different environmental temperature.
- Estimated lifetime could vary on a different temperature and usually higher temperature could reduce the life significantly.

## 7.1.3 Touch Panel

Ta=25°C

Item	Symbol	Condition	Rating			Unit	Applicable terminal
			MIN	TYP	MAX		
Linearity	LE	Note	-1.5	--	1.5	%	
Insulation resistance	RI	DC 25V	20	--	--	MΩ	XR,XL-YU,YD
Terminal resistance		X	200	--	900	Ω	XR,XL
		Y	200	--	900		YU,YD
Rated voltage		DC	--	5.0	7.0	V	XR,XL,YU,YD
on/off chattering		R0.8mm Polyacetal pen.	--	--	10	ms	

Note: -Linearity Measurement: Refer to the APPENDIX of "Reference Method for Measuring Optical Characteristics and Performance".

Load: 2.45N

## Mechanical Characteristics

Item	Rating			Unit	Remark
	MIN	TYP	MAX		
Detectable activation force	0.05	--	0.80	N	R0.8mm Polyacetal pen or finger. Resistance between X and Y axis must be equal or lower than 2KΩ.
Keystroke durability	1,000,000	--	--	times	key the same part by silicon rubber. (Touch panel Active area only) -Rubber tip part: R8mm -Load: 2.45N -speed: 2times/second



## 7.2 AC Characteristics

(Unless otherwise noted, Ta=25°C, VDD=3.0V, VSS=0V)

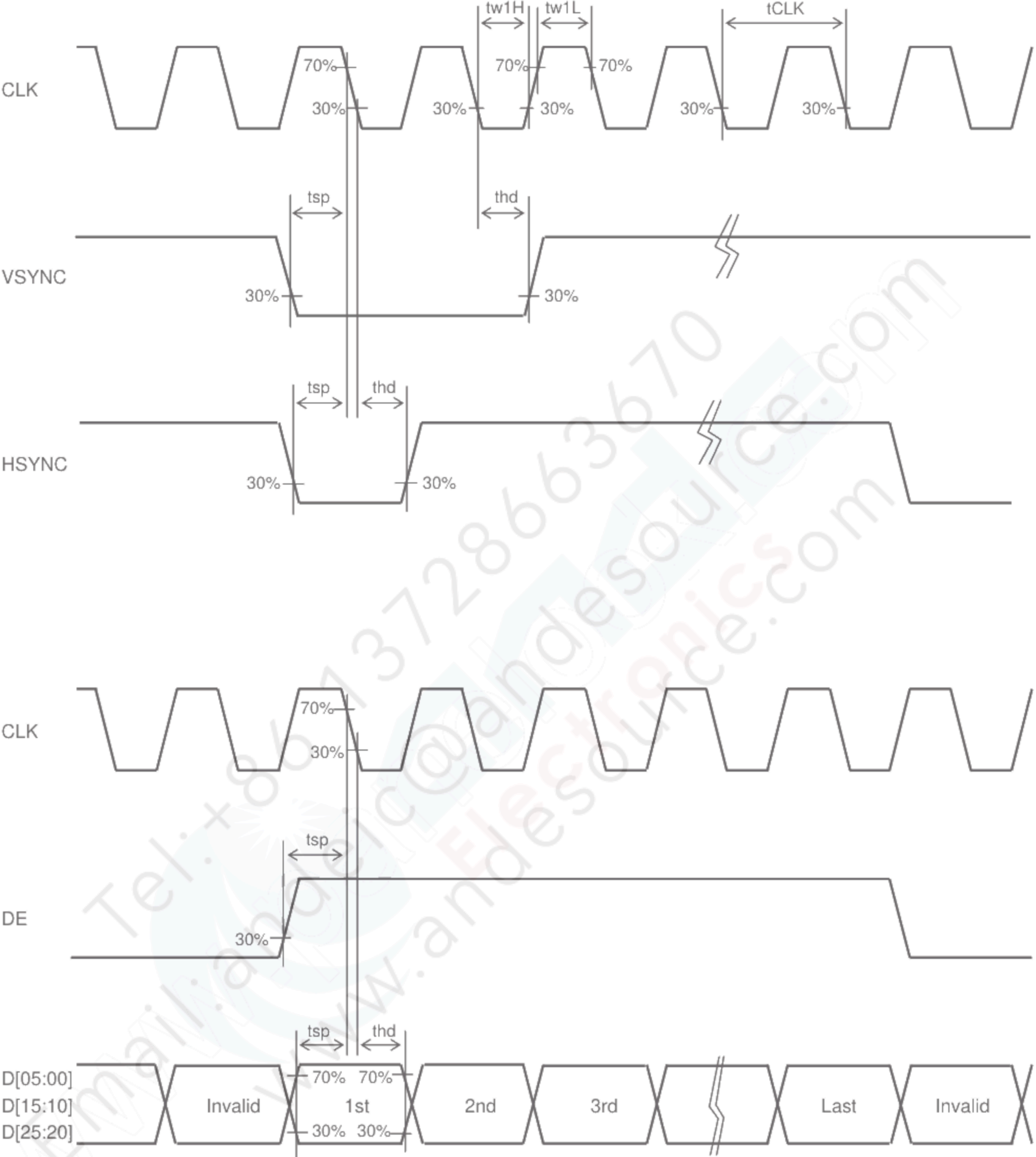
Item	Symbol	Condition	Rating			Unit	Applicable terminal
			MIN	TYP	MAX		
CLK frequency	fCLK		4.4	5.6	7.0	MHz	CLK
CLK Lo period	tw1L	0.3×VDD or less of the period	15	—	—	ns	CLK
CLK Hi period	tw1H	0.7×VDD or less of the period	15	—	—	ns	CLK
Input setup time	tsp		15	—	—	ns	HSYNC, VSYNC, CLK, DE
Input hold time	thd		15	—	—	ns	D[05:00], D[15:10], D[25:20]

note :

- All timing is specified in 30-70% of VDD.
- Tf / tf of the input signal is specified in the 15ns or less.



8. Switching waveform





## 9. Input timing

## 9.1 Input timing characteristics

(Unless otherwise noted, Ta=25°C, VDD=3.0V, VSS=0V)

Item	Symbol	Rating			Unit	Applicable terminal
		MIN	TYP	MAX		
CLK frequency	fCLK	4.4	5.6	7.0	MHz	CLK
VSYNC frequency *note	fVSYNC	54	60	66	Hz	VSYNC
VSYNC signal period	tv	324	325	348	H	VSYNC, HSYNC
VSYNC pulse width	tw2H	1	—	—	H	VSYNC, HSYNC
Vertical back porch	tvb	2	—	14	H	VSYNC, HSYNC, D[05:00], D[15:10], D[25:20]
Vertical display period	tvdP	—	320	—	H	VSYNC, HSYNC, D[05:00], D[15:10], D[25:20]
HSYNC frequency	fHSYNC	—	19.5	—	kHz	HSYNC
HSYNC signal period	th	—	287	402	CLK	HSYNC, CLK
HSYNC pulse width	tw3H	1	—	-	CLK	HSYNC, CLK
Horizontal back porch	thb	2	—	14	CLK	HSYNC, CLK, D[05:00], D[15:10], D[25:20]
DE pulse width	tw4H	—	240	—	CLK	DE, CLK
Horizontal display period	thdp	—	240	—	CLK	D[25:00], CLK

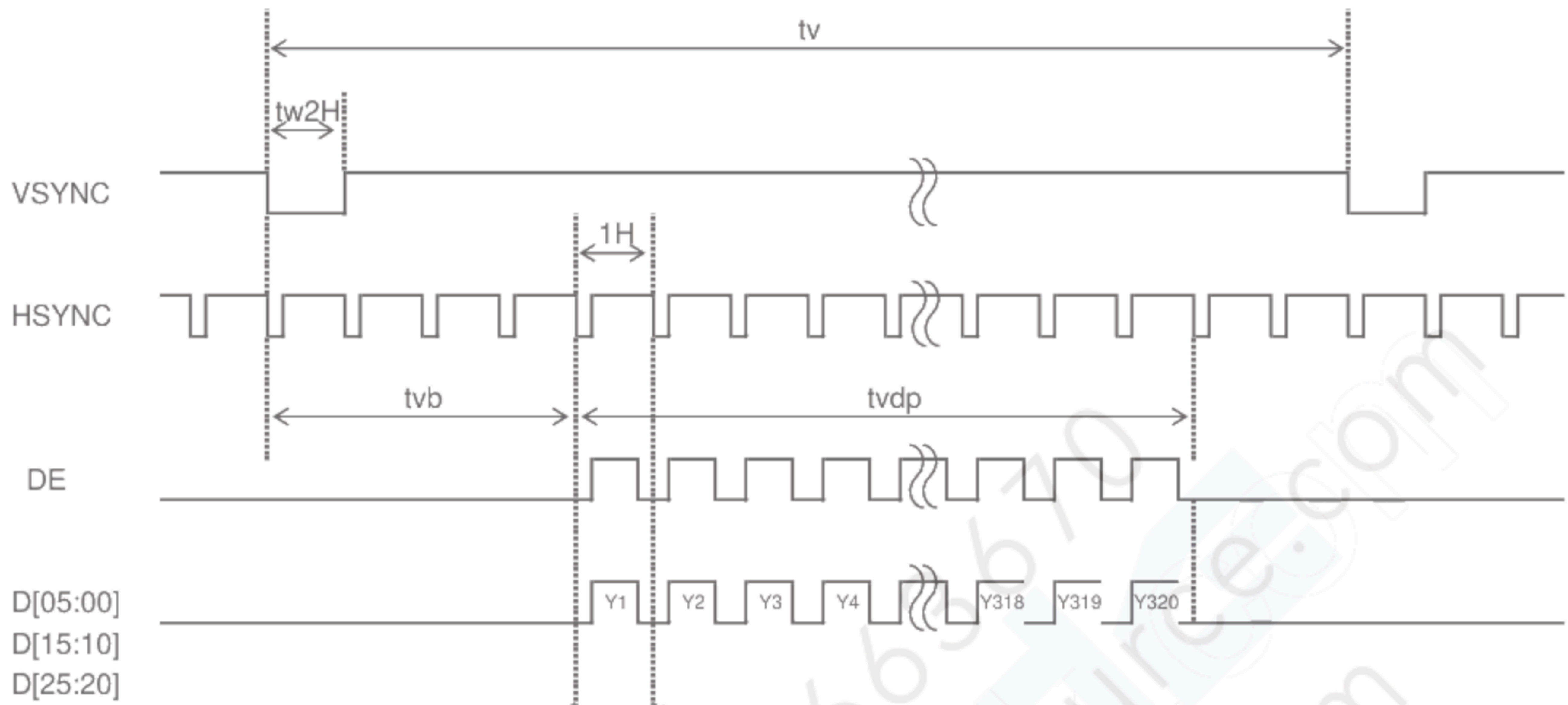
note : Characteristic of this item is the recommended standard.

When used in outside this property, Please use after confirming a sufficient display quality, etc.

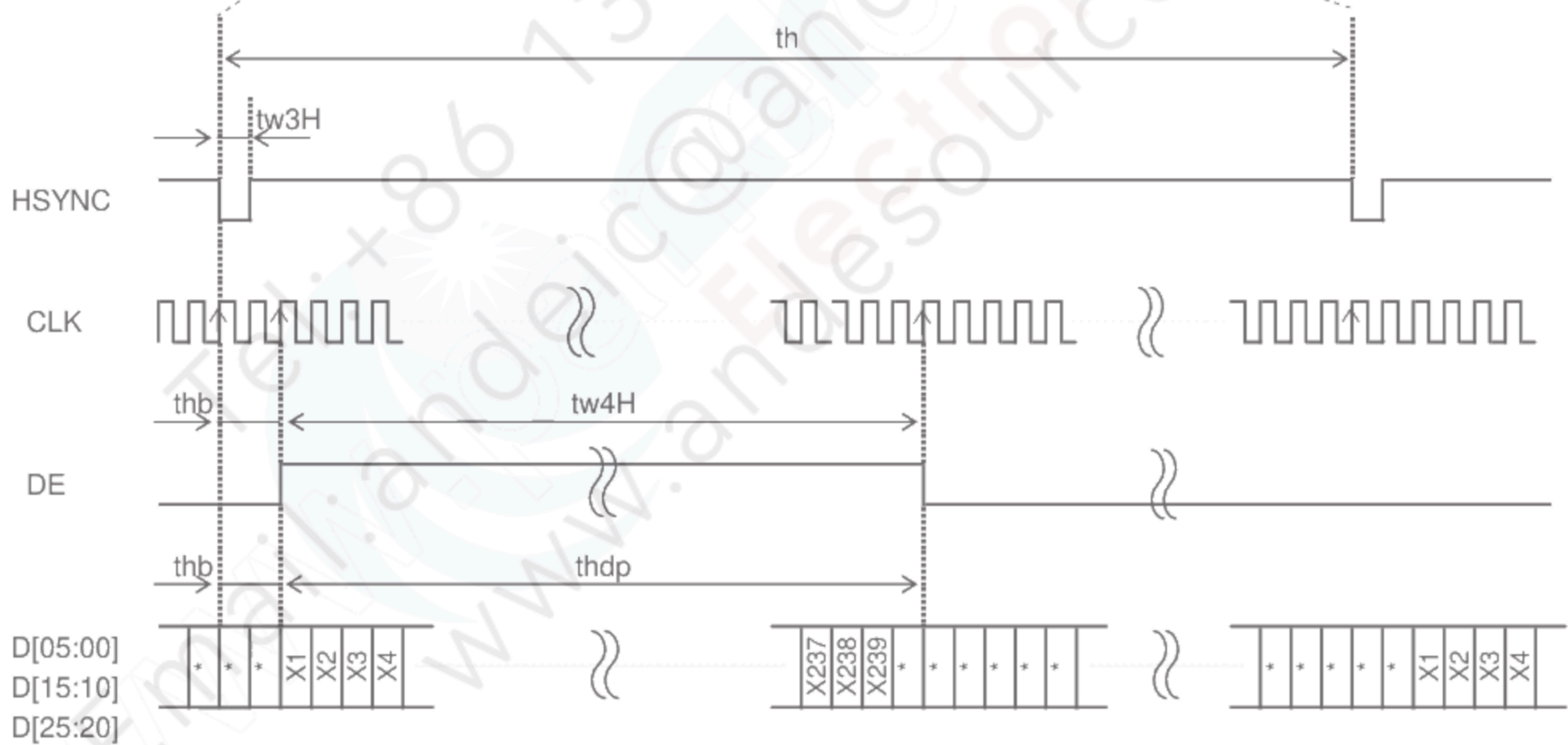


## 9.2 Input timing chart

## I . Vertical drive timing



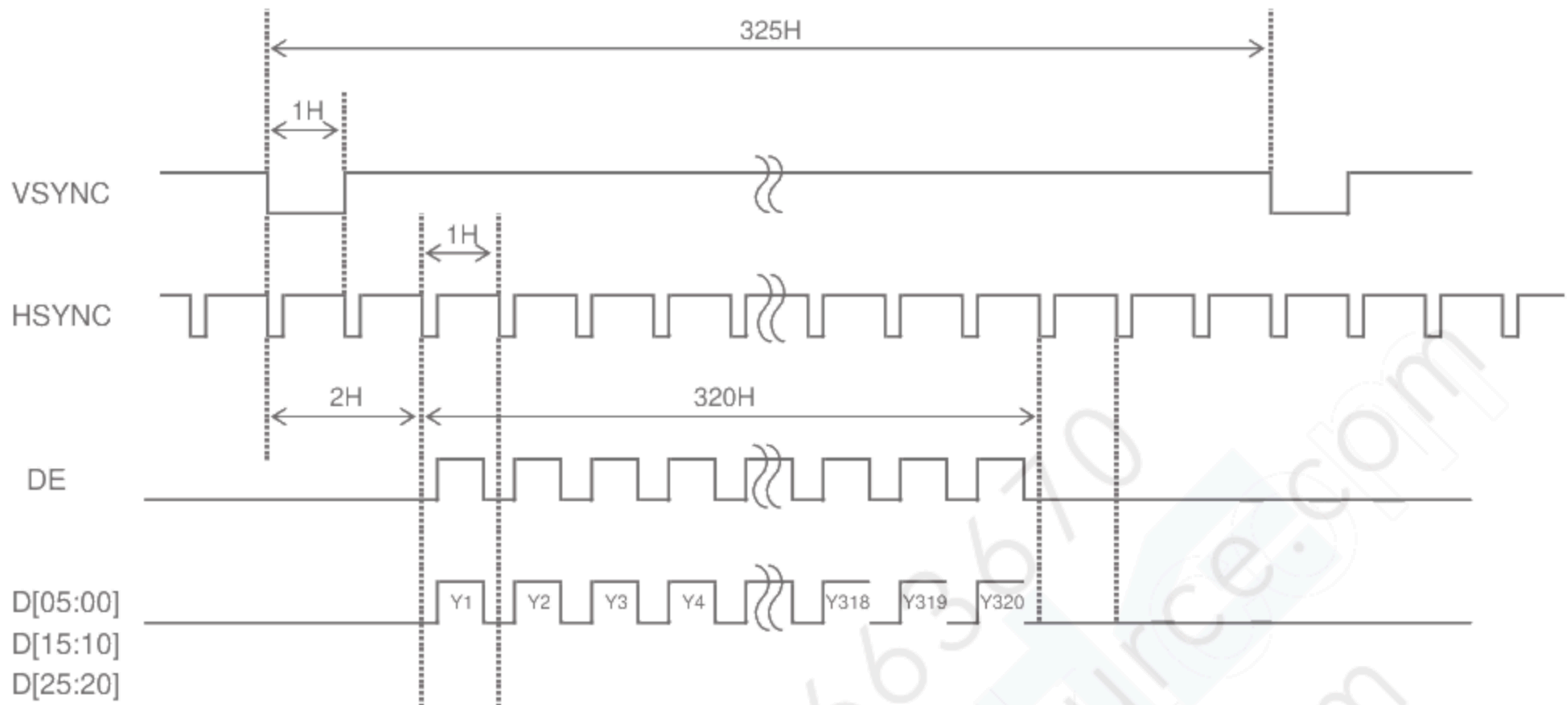
## II . Horizontal drive timing



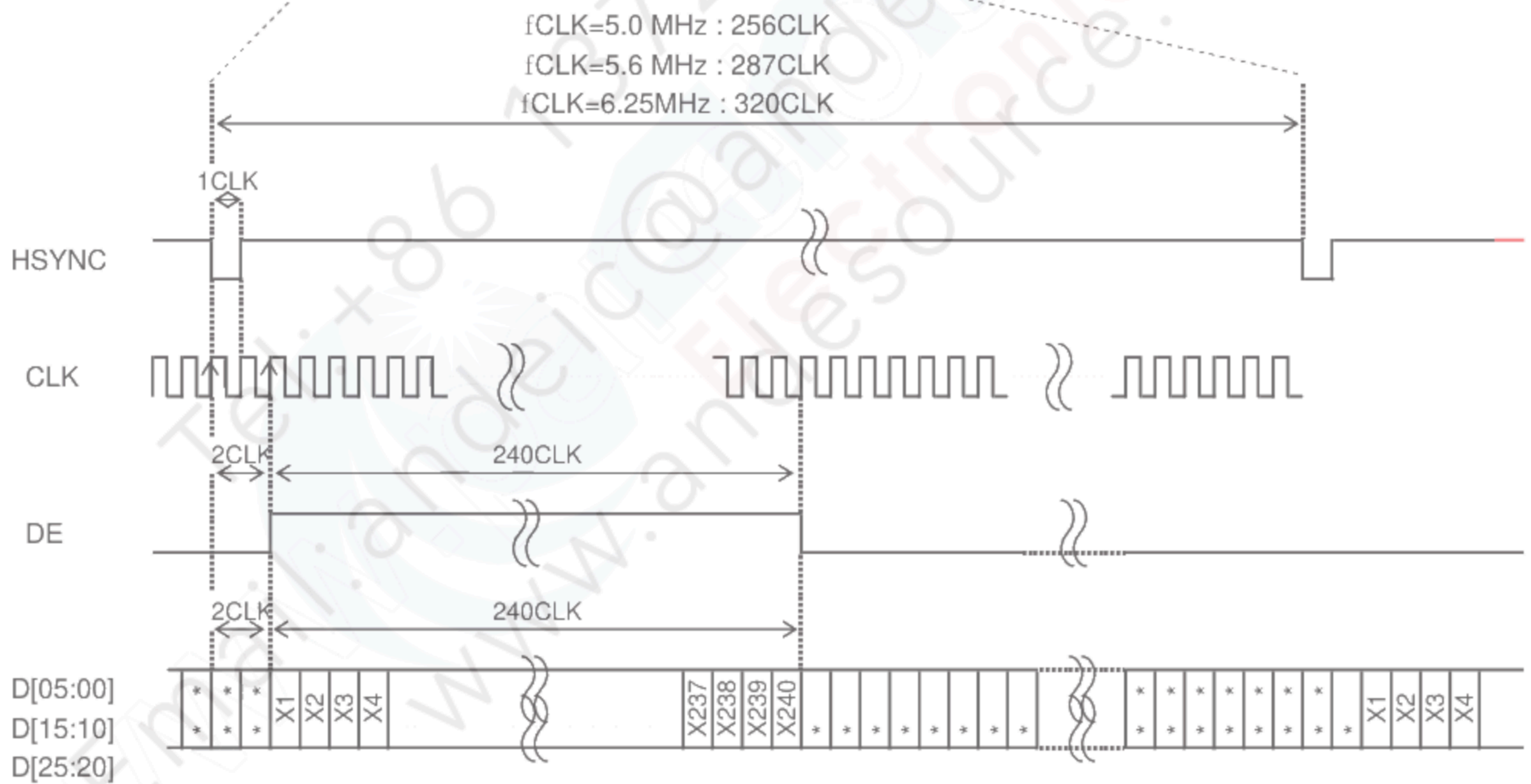


## 9.3 Input timing example (fCLK = 5.0MHz、5.6MHz、6.25MHz)

## I . Vertical drive timing

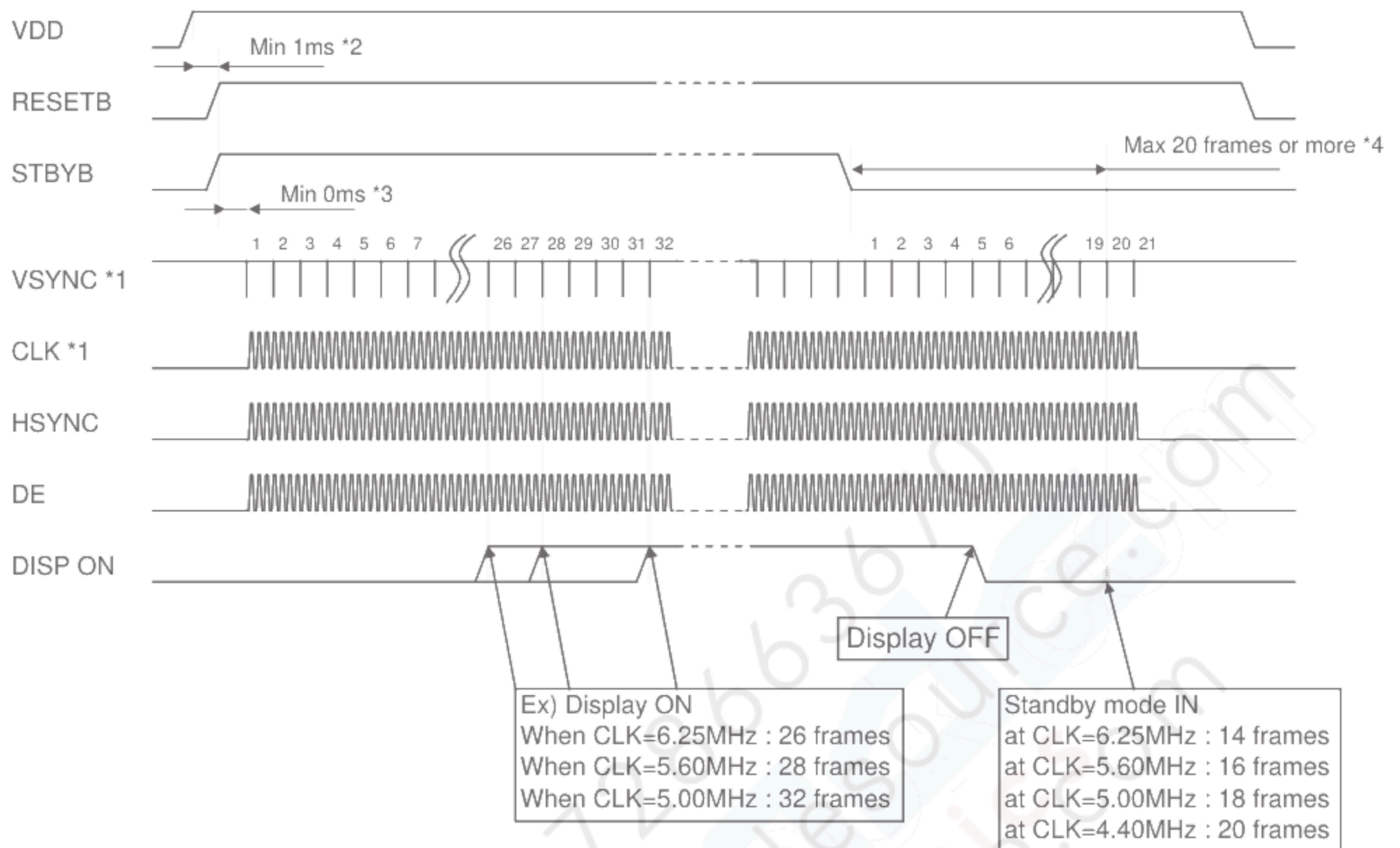


## II . Horizontal drive timing





## 10. Power-ON / Power-OFF sequence



\*1 Operation CLK of GA (gate array) on the FPC uses the CLK (DOTCLK).

In addition, the internal counter of GA also uses VSYNC.

It will start the operation after the CLK and VSYNC is input

\*2 After the power is turned on, run the RESETB sure. (Please refer to "12.Reset sequence")

\*3 Although there are no provisions in the time from RESETB "H" to each signal is inputted, each signal of that period must be fixed to "Hi" or "Lo" level.

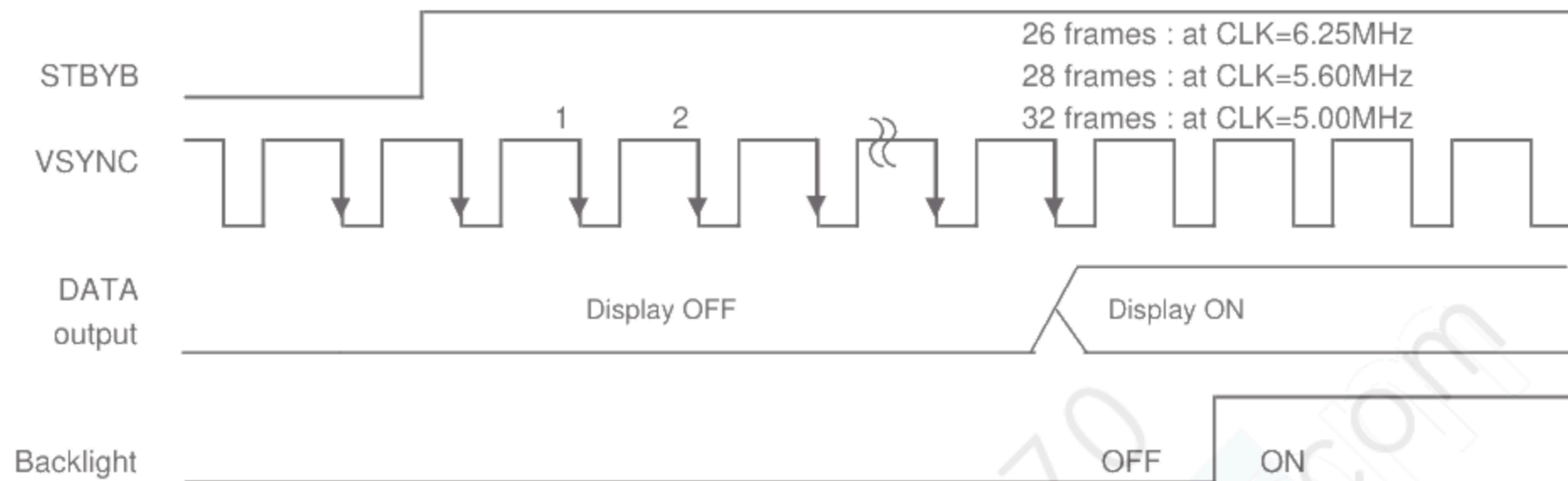
\*4 To turn OFF the power supply so that there is no afterimage, up to 20 frames or more of the period from STBYB "Low", is required supply of VSYNC and CLK(DOTCLK).



## 11. Display-ON / Display-OFF sequence

We'll explain about the display sequence at the time of display ON / OFF by STBYB signal

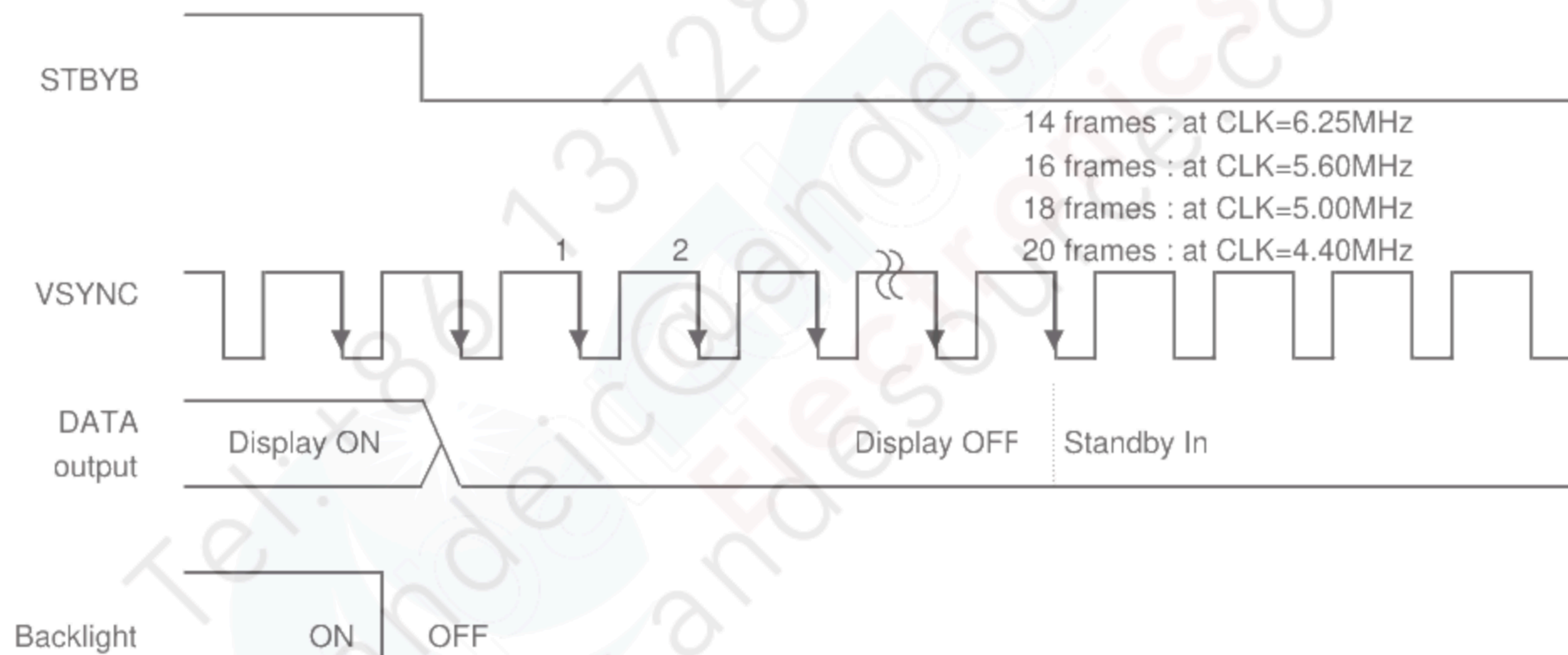
From the standby release until the display is started, according to the CLK period, you will need time below.



From the standby setting to standby sequence end, depending on the CLK period, you will need time below.

That period, there is a need to continue to supply the DOTCLK and VSYNC signal.

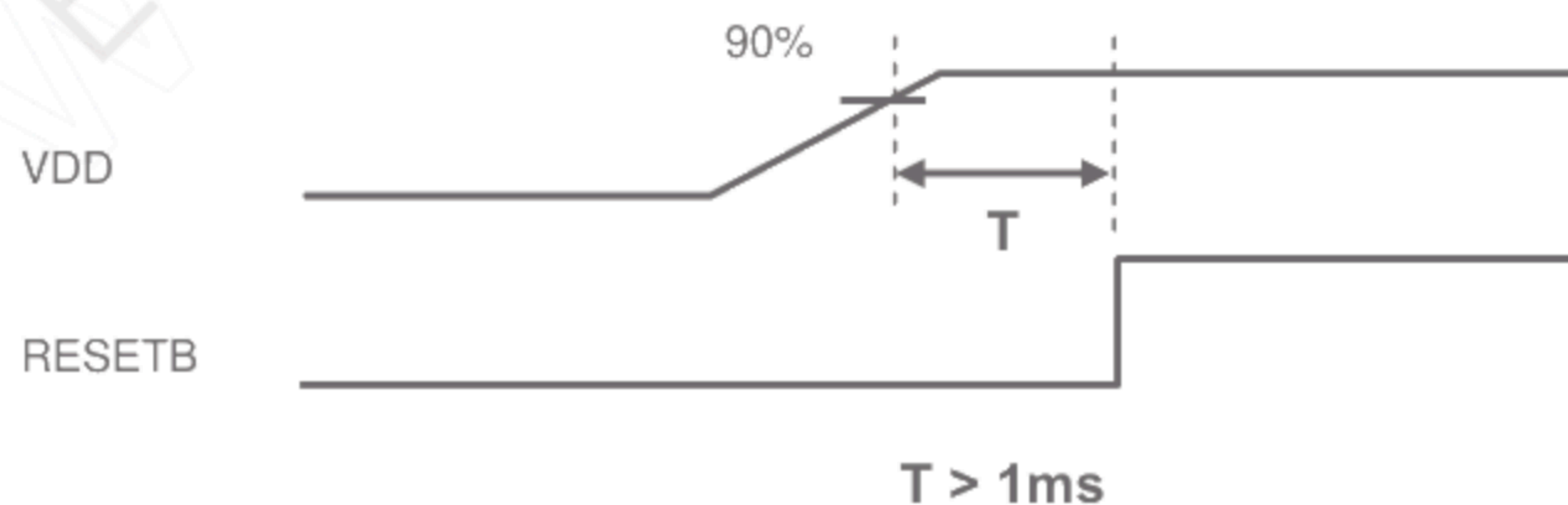
Within the provisions frame, if you stop the DOTCLK and VSYNC signal or turn OFF the power, there is a possibility that afterimage occurs.



## 12. Reset sequence

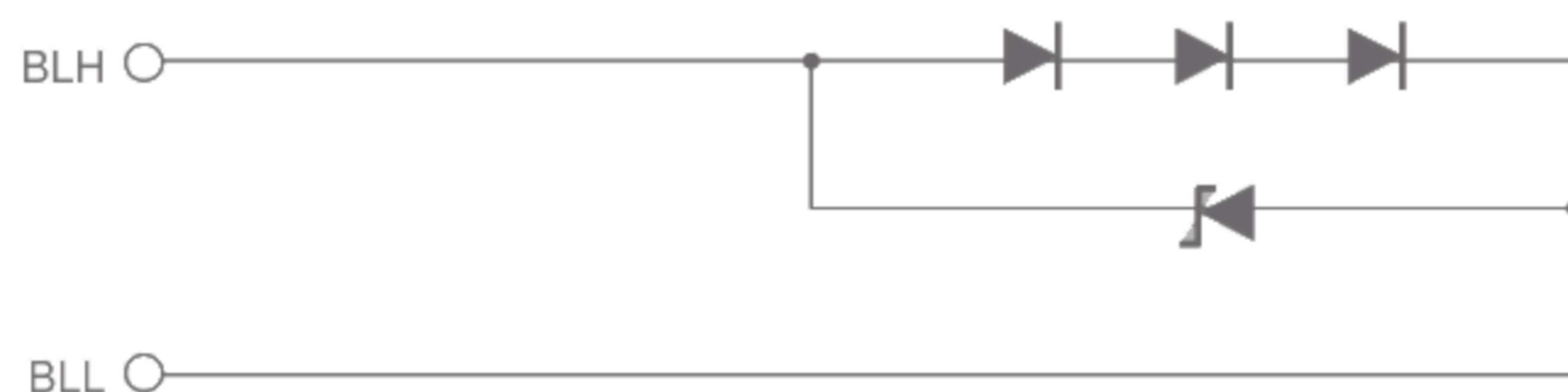
Between the power is turned on and the RESET input is limited.

Please be sure to meet the following conditions.

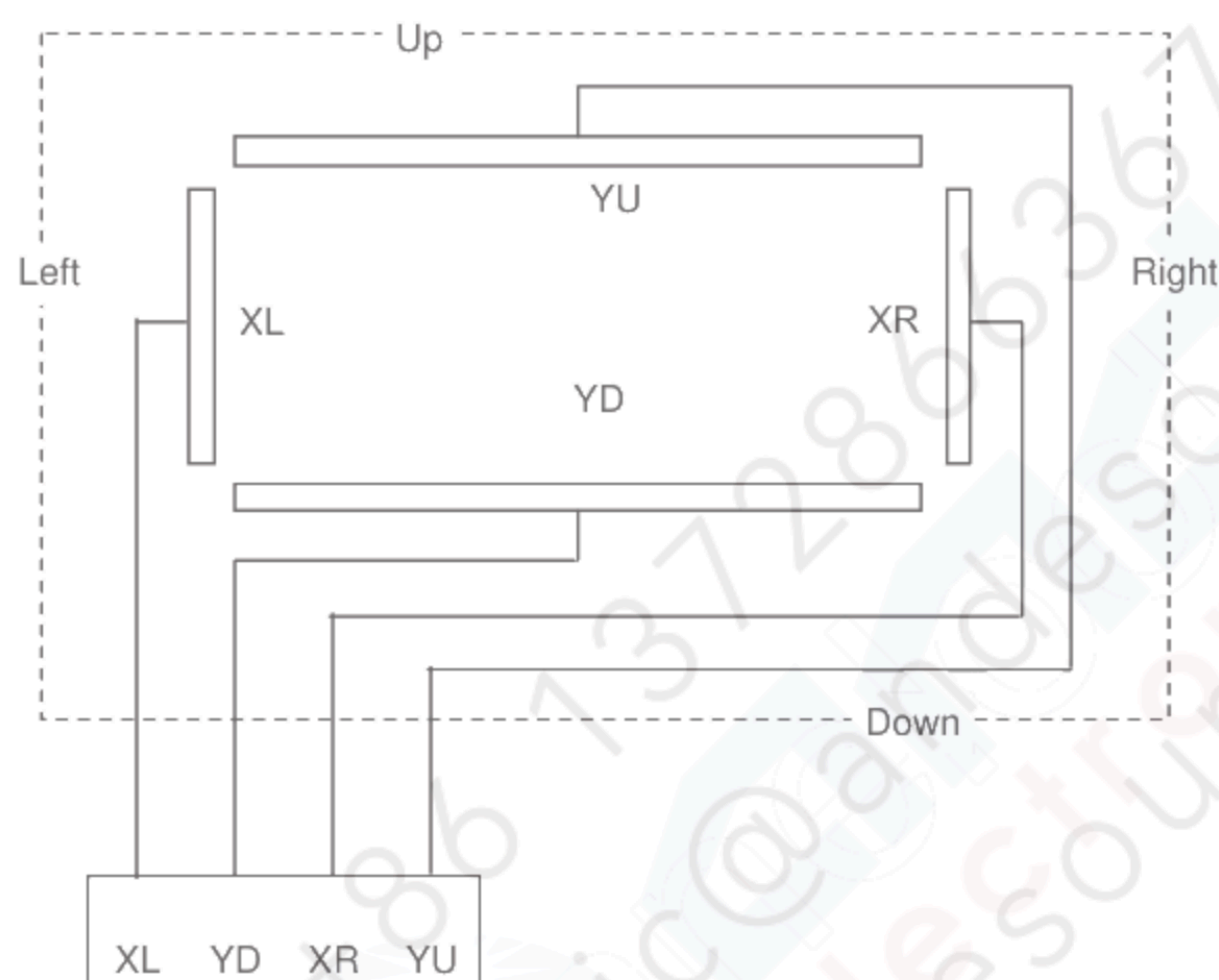




## 13. LED Circuit



## 14. Touch Panel Circuit





## 15. Characteristics

## 15.1 Optical Characteristics

&lt; Measurement Condition &gt;

Measuring instruments: CS1000 (KONICA MINOLTA) , LCD7200(OTSUKA ELECTRONICS) ,  
EZcontrast160D (ELDIM)

Driving condition: VDD = 3.0V, VSS = 0V  
Optimized VCOMDC

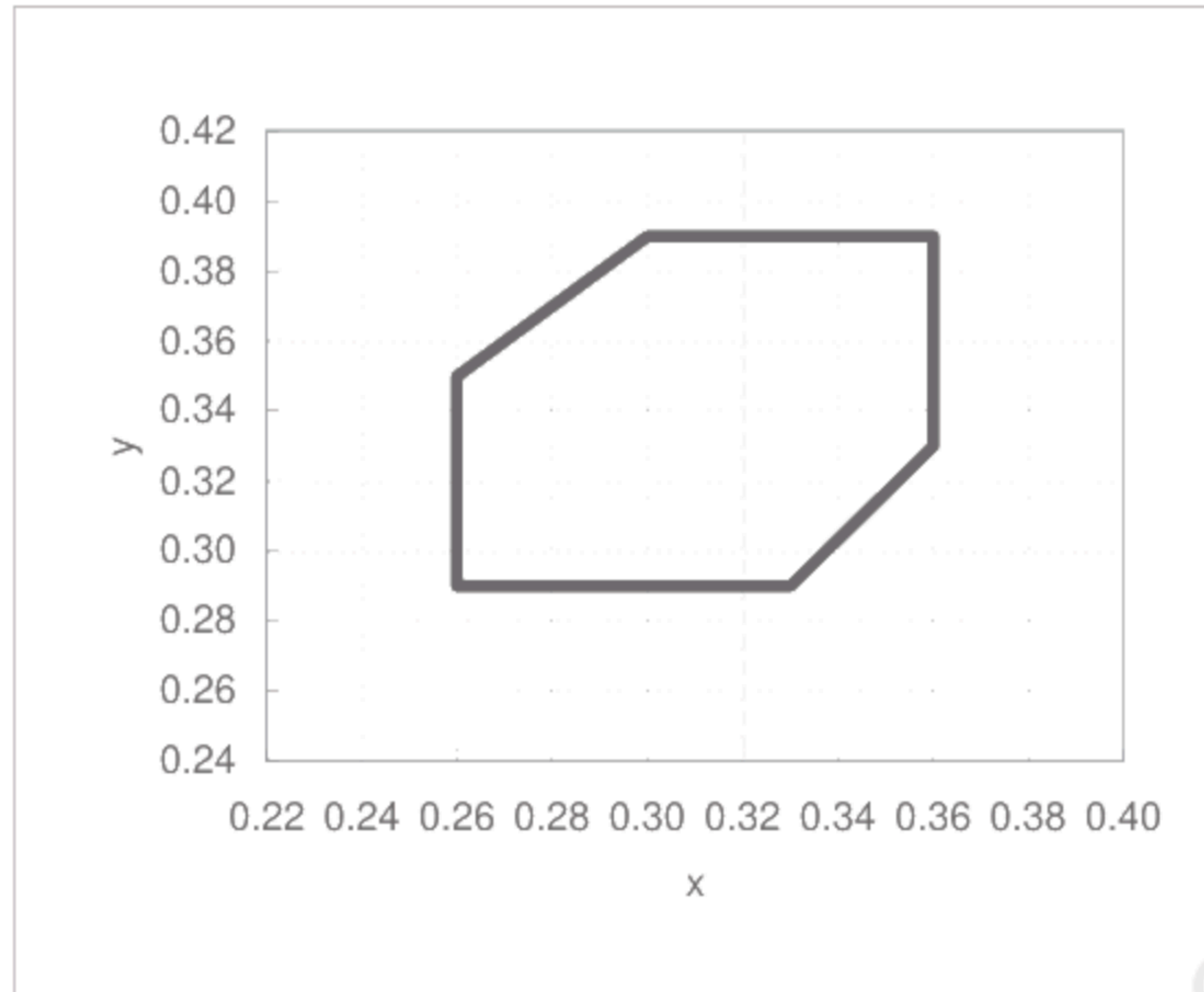
Backlight: IL=7.0mA

Measured temperature: Ta=25° C

Item	Symbol	Condition	MIN	TYP	MAX	Unit	Note No.	Remark
Response time	Rise time	TON	[Data]= 00h → 3Fh	—	—	60	ms	1
	Fall time	TOFF	[Data]= 3Fh → 00h	—	—	40	ms	
Contrast ratio	Backlight ON	CR	[Data]= 3Fh / 00h	400	800	—		2
	Backlight OFF			—	2	—		
Viewing angle	Left	θL	[Data]= 3Fh / 00h CR ≥ 10	80	—	—	deg	3
	Right	θR		80	—	—	deg	
	Up	φU		80	—	—	deg	
	Down	φD		80	—	—	deg	
White Chromaticity	x			Refer to White chromaticity range			4	
	y							
Burn-in				No noticeable burn-in image shall be observed after 2 hours of window pattern display.			5	
Center brightness		[Data]=3Fh	200	280	—	cd/m <sup>2</sup>	6	
Brightness distribution		[Data]=3Fh	70	—	—	%	7	

\* Note number 1 to 7: Refer to the APPENDIX of "Reference Method for Measuring Optical Characteristics and Performance".





White Chromaticity Range

【White Chromaticity Range】

x	y
0.30	0.39
0.26	0.35
0.26	0.29
0.33	0.29
0.36	0.33
0.36	0.39

## 15.2 Temperature Characteristics

&lt; Measurement Condition &gt;

Measuring instruments: CS1000 (KONICA MINOLTA) , LCD7200(OTSUKA ELECTRONICS)

Driving condition: VDD = 3.0V, VSS = 0V

Optimized VCOMDC

Backlight: IL=7.0mA

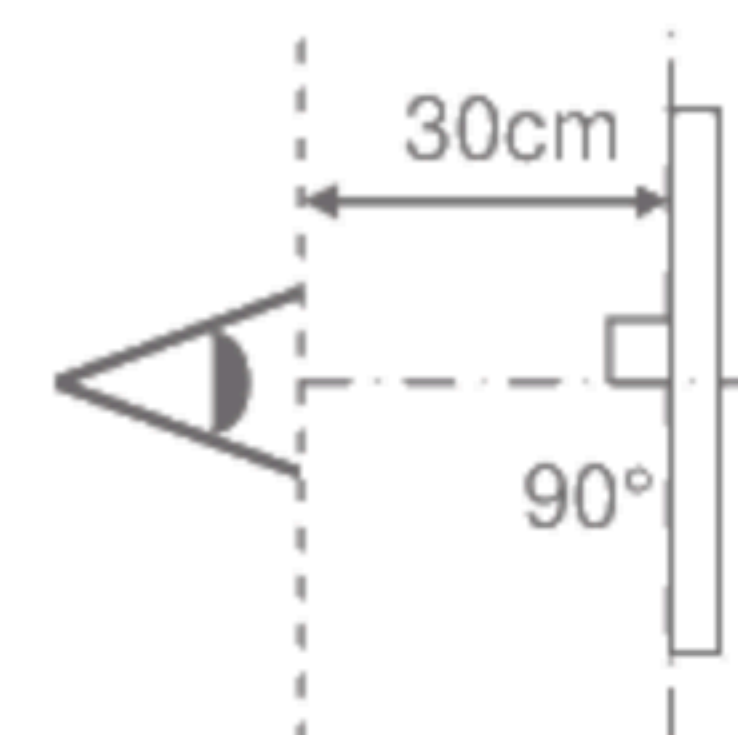
Item			Specification		Remark
			Ta=-20°C	Ta=70°C	
Contrast ratio		CR	200 or more	200 or more	Backlight ON
Response time	Rise time	TON	600 msec or less	50 msec or less	
	Fall time	TOFF	400 msec or less	30 msec or less	
Display Quality			No noticeable display defect or ununiformity should be observed.		



## 16. Criteria of Judgment

## 16.1 Defective Display and Screen Quality

Test Condition:	Observed TFT-LCD monitor from front during operation with the following conditions
Driving Signal	Raster Pattern (RGB, white, black)
Signal condition	[Data]: 00h, 28h, 3Fh (3steps)
Observation distance	30 cm
Illuminance	200 to 350 lx
Backlight	IL=7.0mA



Defect item		Defect content		Criteria
Display Quality	Line defect	Black, white or color line, 3 or more neighboring defective dots		Not exists
	Dot defect	Uneven brightness on dot-by-dot base due to defective TFT or CF, or dust is counted as dot defect (brighter dot, darker dot) High bright dot: Visible through 2% ND filter at [Data]=00h Low bright dot: Visible through 5% ND filter at [Data]=00h Dark dot: Appear dark through white display at [Data]=28h		Refer to table 1
		Invisible through 5% ND filter at [Data]=00h		Acceptable
		Dirt	Uneven brightness (white stain, black stain etc)	
Screen Quality	Foreign particle	Point-like	0.25mm< φ	N=0
			0.20mm< φ ≤0.25mm	N≤2
			φ ≤0.20mm	Acceptable
	Liner	3.0mm<length and 0.08mm<width	N=0	
		length≤3.0mm or width≤0.08mm	Acceptable	
	Flaw	Flaw on the surface of the Touch panel	0.05mm<W	Conform to the criteria of point-like foreign particles.
		0.03<W ≤0.05mm	2<L ≤5mm	N≤5
			L ≤2mm	Acceptable
			W ≤0.03mm	Acceptable
	Others	Use boundary sample for judgment when necessary		

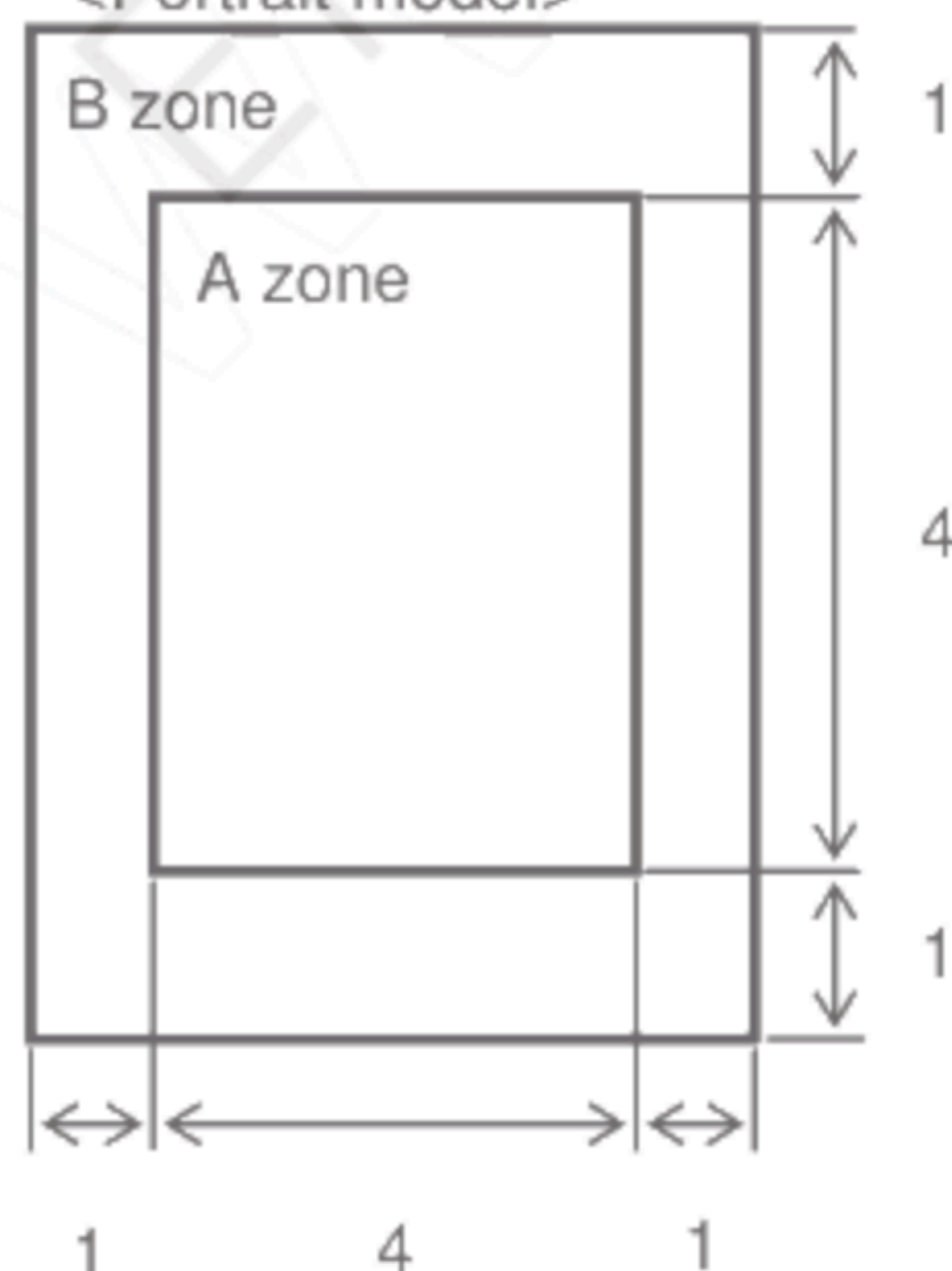
 $\phi$ (mm): Average diameter = (major axis + minor axis)/2

Permissible number: N

Table 1

Area	High bright dot	Low bright dot	Dark dot	Total	Criteria
A	0	2	2	3	Permissible distance between same color bright dots (includes neighboring dots): 3 mm or more
B	2	4	4	5	Permissible distance between same color high bright dots (includes neighboring dots): 5 mm or more
Total	2	4	4	5	

&lt;Portrait model&gt;



Division of A and B areas

B area: Active area

Dimensional ratio between A and B areas: 1: 4: 1 (Refer to the left figure)



## 16.2 Screen and Other Appearance

## Testing conditions

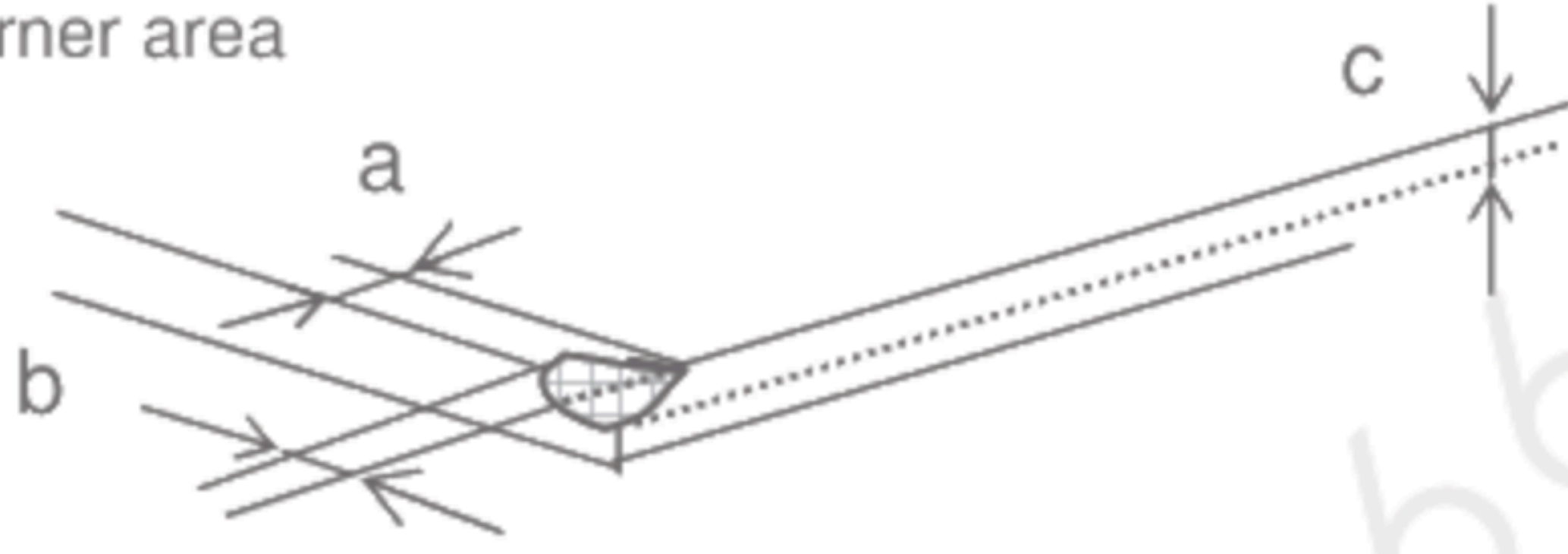
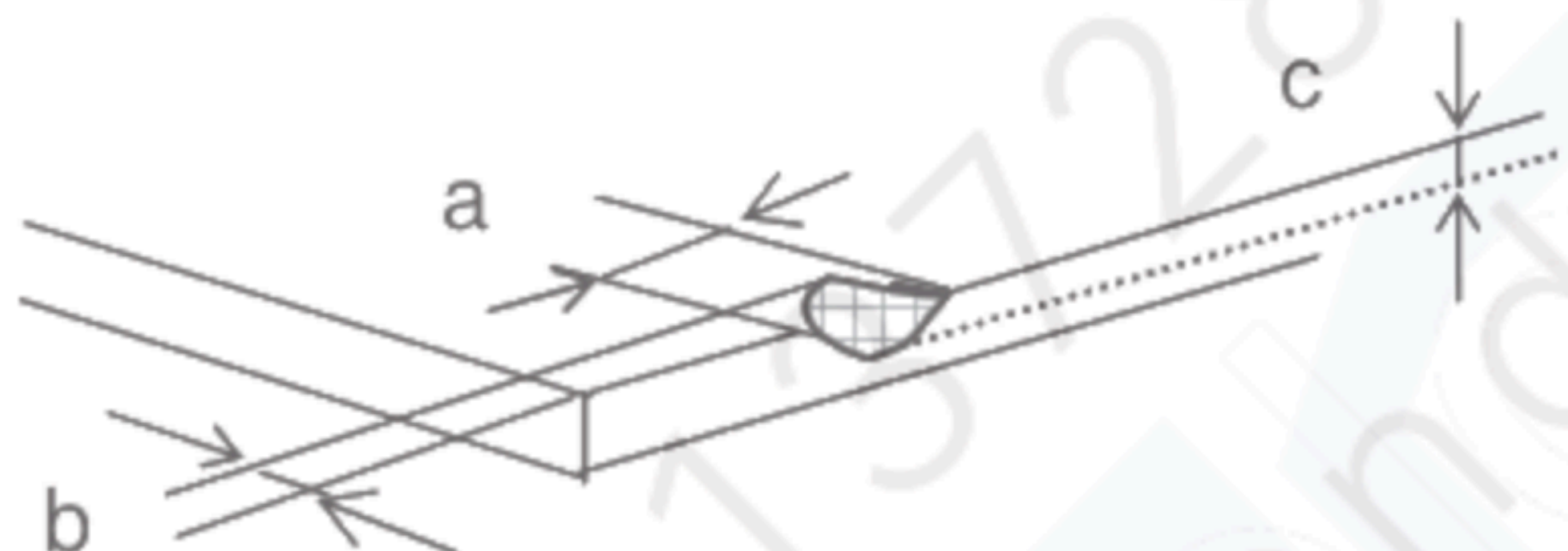
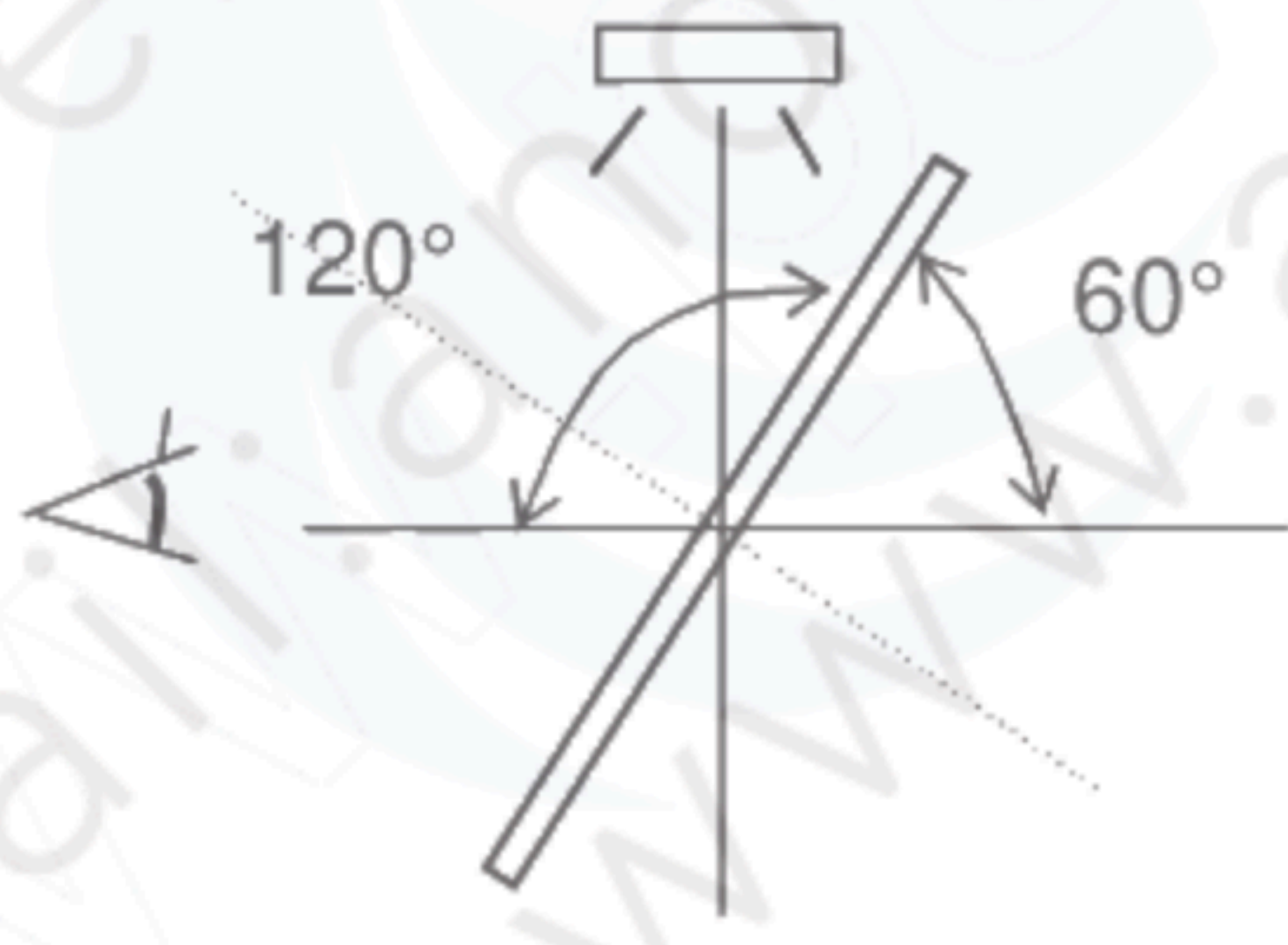
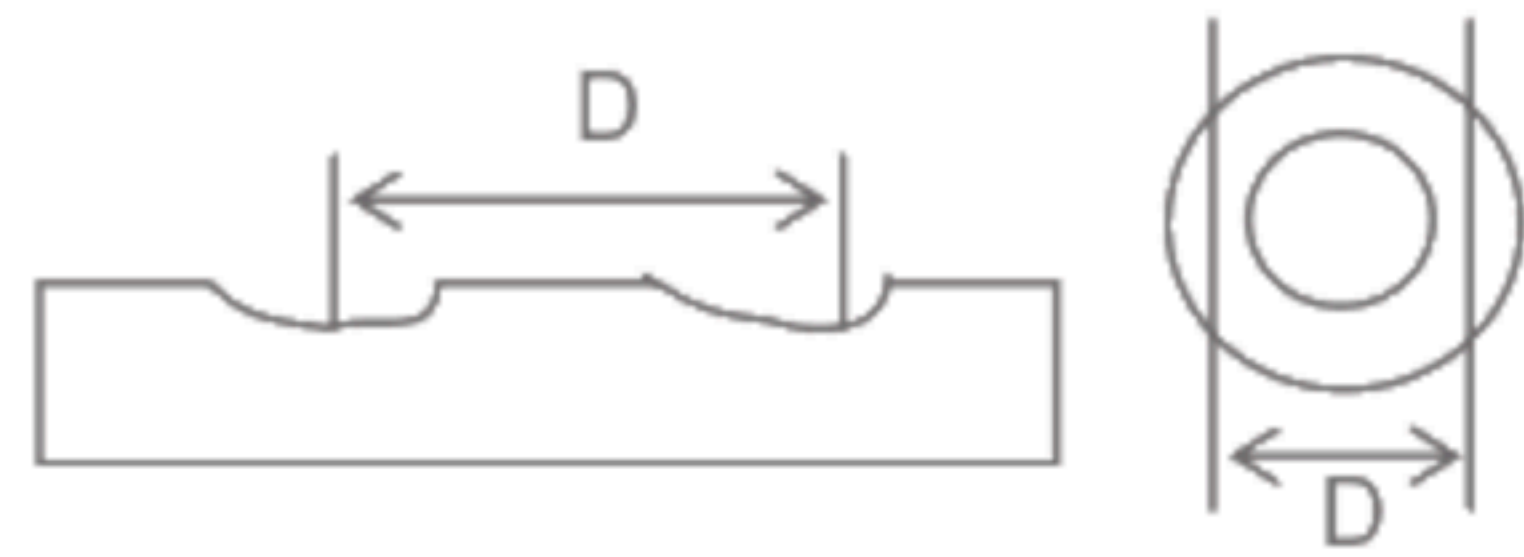
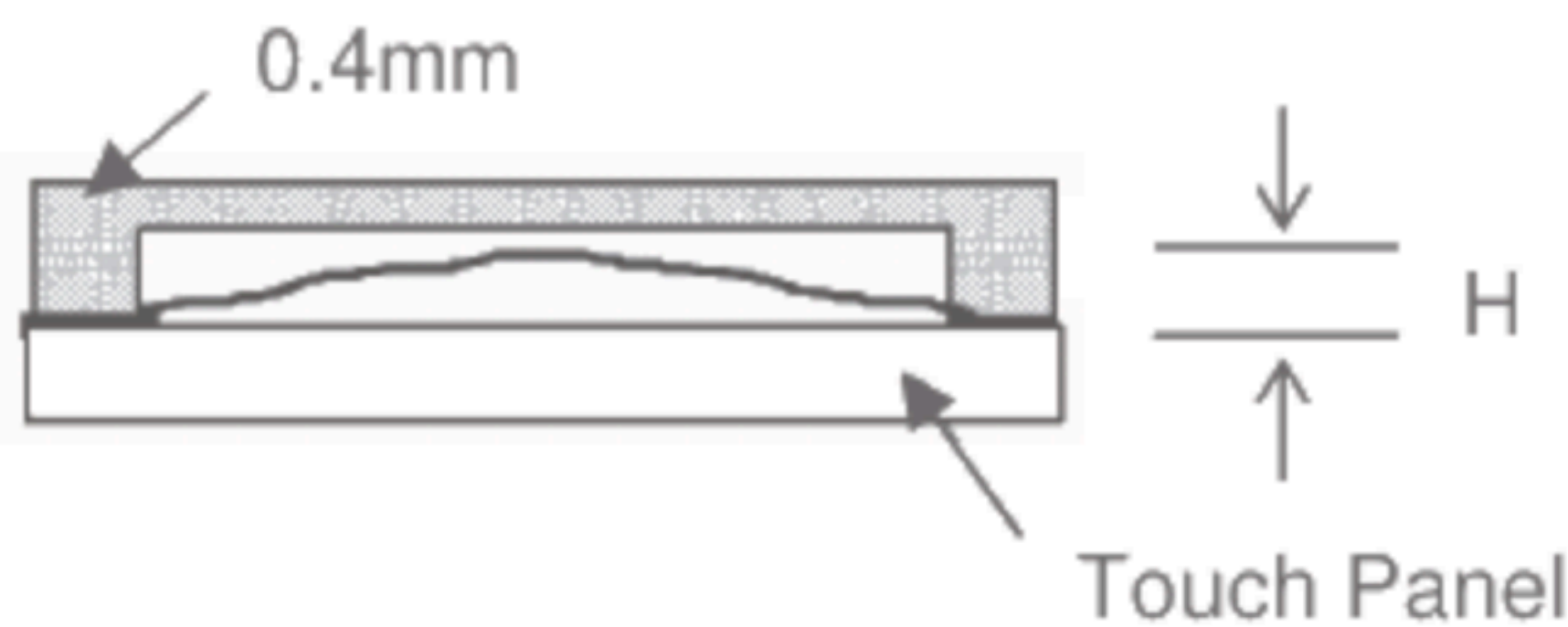
Observation distance

30cm

Illuminance

1200~2000 lx

Item		Criteria	Remark
Polarizer	Flaw	Ignore invisible defect when the backlight is on.	Applicable area: Active area only (Refer to the section 3.2 "Outward form")
	Stain		
	Bubble		
	Dust		
	Dent		
S-case		No functional defect occurs	
FPC cable		No functional defect occurs	

Item		Appearance	Criteria
Touch Panel	Glass chipping	Corner area 	Unit:mm $a \leq 3$ $b \leq 3$ $c \leq t$ (t: glass thickness) $a, b \leq 0.5$ is acceptable. $n \leq 2$
		Others 	Unit:mm $a \leq 5$ $b \leq 1$ $c \leq t$ (t:glass thickness) $a, b \leq 0.5$ is acceptable Maximum permissible number of chipping off on a side is 5.
		Progressive crack	None
	Interference fringe	Concentric interference fringe (Test method) Observe the Panel surface from 60 degrees angle to the surface under white fluorescent lamp (Triple band fluorescent lamp) 	Average diameter : $D \leq 8\text{mm}$ is acceptable. Darkness: comply with the boundary sample
	Fisheye Film surface	 (D: Average diameter of valley part)	$D \leq \phi 0.2\text{mm}$ Acceptable $\phi 0.2 < D \leq \phi 0.6\text{mm}$ $N \leq 2$ $\phi 0.6\text{mm} < D$ $N=0$
	Puffiness	 Touch Panel	$H \leq 0.4\text{mm}$ is acceptable.



## 17. Reliability Test

Test item		Test condition		number of failures /number of examinations
Durability test	High temperature storage	Ta=80° C	240hr	0 / 3
	Low temperature storage	Ta=-30° C	240hr	0 / 3
	High temperature & high humidity storage	Ta=60° C, RH=90% non condensing	240hr ※	0 / 3
	High temperature operation	Tp=70° C	240hr	0 / 3
	Low temperature operation	Tp=-20° C	240hr	0 / 3
	High temp & humid operation	Tp=40° C, RH=90% non condensing	240hr ※	0 / 3
	Thermal shock storage	-30←→80° C(30min/30min)	100 cycles	0 / 3
Mechanical environmental test	Electrostatic discharge test (Non operation)	Confirms to EIAJ ED-4701/300 C=200pF, R=0Ω, V=±200V Each 3 times of discharge on and power supply and other terminals.		0 / 3
	Surface discharge test (Non operation)	C=250pF, R=100Ω, V=±12kV Each 5 times of discharge in both polarities on the center of screen with the case grounded.		0 / 3
	Vibration test	Total amplitude 1.5mm, f=10~55Hz, X,Y,Z directions for each 2 hours		0 / 3
	Impact test	Use ORTUS TECHNOLOGY original jig (see next page)and make an impact with peak acceleration of 1000m/s <sup>2</sup> for 6 msec with half sine-curve at 3 times to each X, Y, Z directions in conformance with JIS C 60068-2-27-2011.		0 / 3
Packing test	Packing vibration-proof test	Acceleration of 19.6m/s <sup>2</sup> with frequency of 10→55→10Hz, X,Y, Zdirection for each 30 minutes		0 / 1 packing
	Packing drop test	Drop from 75cm high. 1 time to each 6 surfaces, 3 edges, 1 corner		0 / 1 packing

Note: Ta=ambient temperature Tp=Panel temperature

※ The profile of high temperature/humidity storage and High Temperature/humidity operation  
(Pure water of over 10MΩ·cm shall be used.)

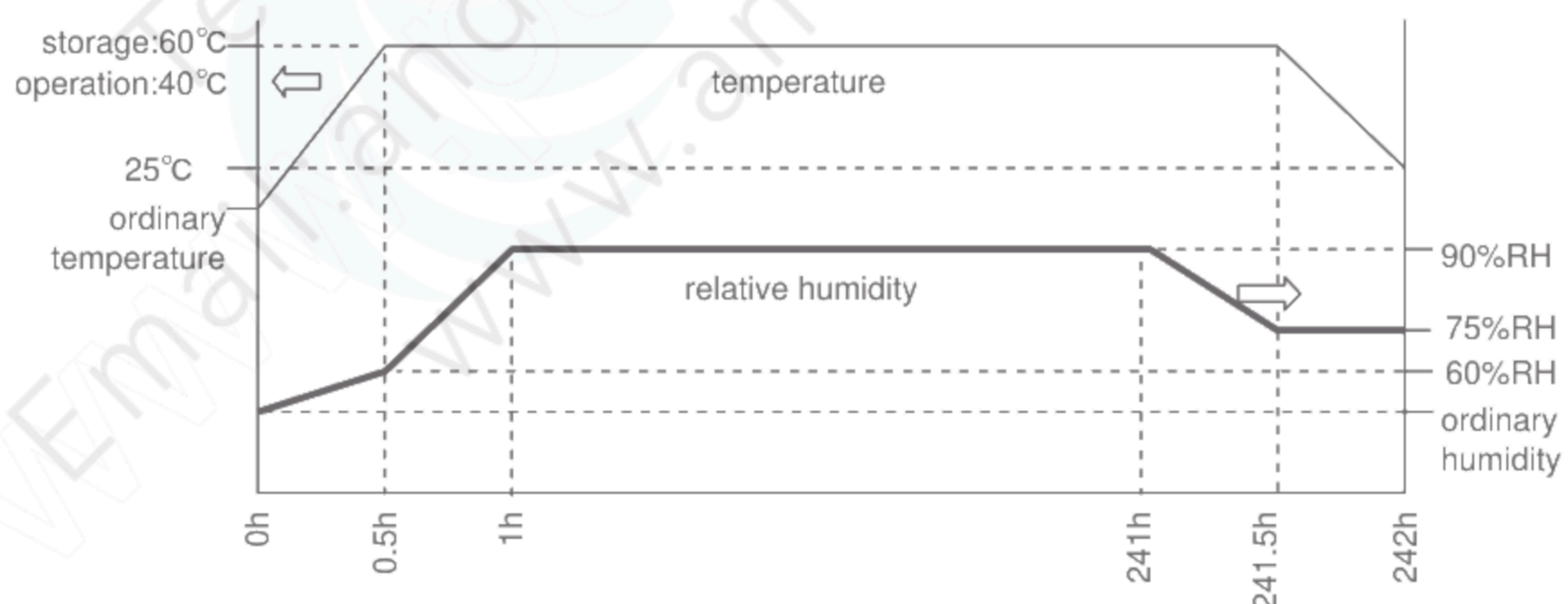


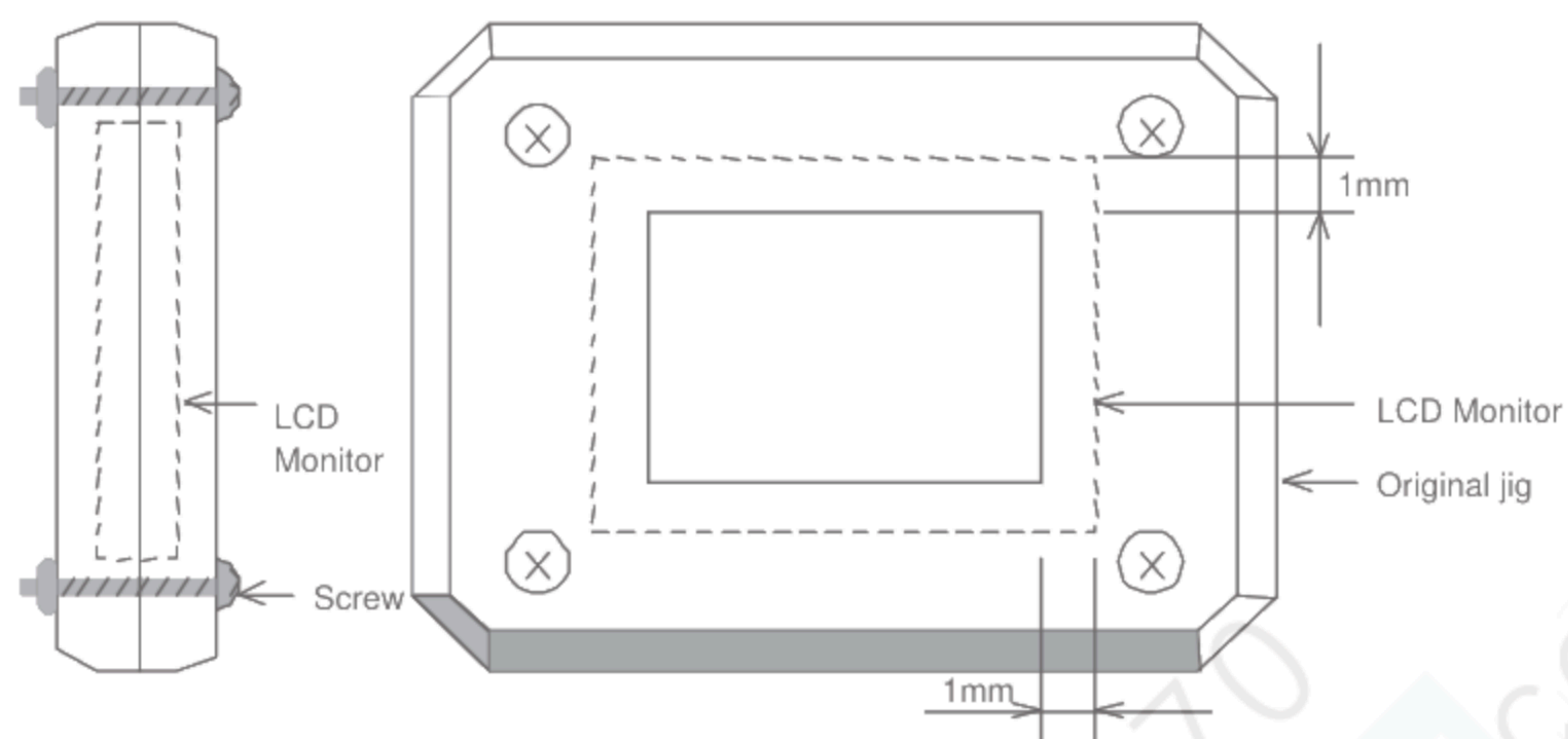
Table2. Reliability Criteria

The parameters should be measured after leaving the monitor at the ordinary temperature for 24 hours or more after the test completion.

item	Standard	Remarks
Display quality	No visible abnormality shall be seen. (Except for unevenness by Pol deterioration.)	
Contrast ratio	200 or more	Backlight ON

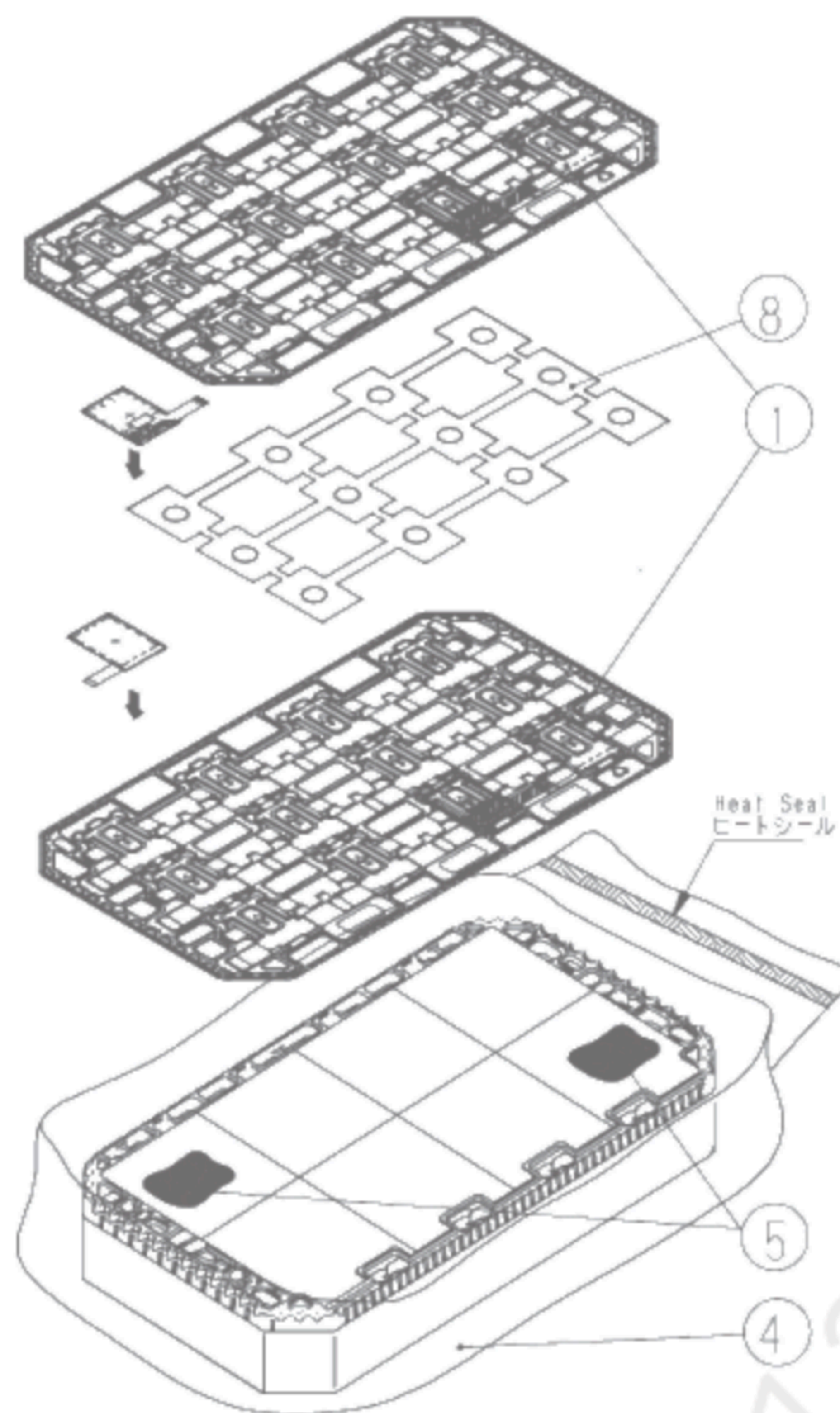


## ORTUS TECHNOLOGY Original Jig





## 18. Packing Specifications



Step 1. Each product is to be placed in one of the cut-outs of the tray with the display surface facing upward.  
Foam sheet A are to be placed on the products in the tray.  
Each product is to be placed in one of the cut-outs of the tray with the display surface facing downward.(24products per tray)

Step 2. Each tray is to be piled up in same orientation and the trays be in a stack of 6.  
One empty tray is to be put on the top of stack of 6 trays.

Step 3. 2 packs of moisture absorbers are to be placed on the top tray as shown in the drawing.  
Put piled trays into a sealing bag.

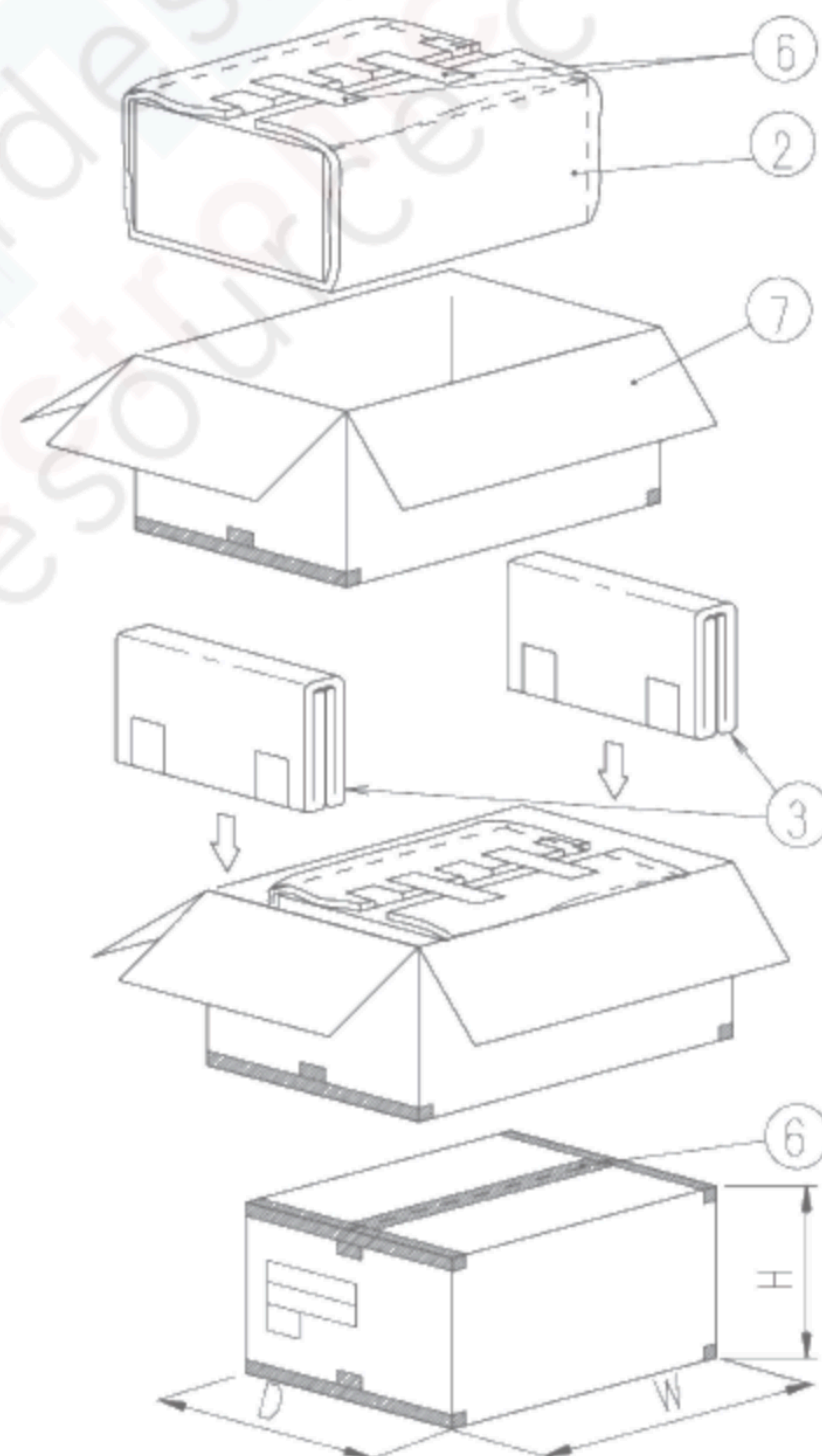
Step 4. Vacuum and seal the sealing bag with the vacuum sealing machine.

Step 5. The stack of trays in the plastic back is to be wrapped with B SHEET A.

Step 6. The wrapped trays are placed in the carton.

Step 7. B SHEET B are to be inserted into a outer carton with same orientation.  
The outer carton is to be sealed in H-shape with packing tape as shown in the drawing.

Step 8. The model number, quantity of products, and shipping date are to be printed on the outer carton.  
If necessary, shipping labels or impression markings are to be put on the outer carton.



Remark: The return of packing materials is not required.

Packing item name	Specs., Material
① Tray	A-PET
② B SHEET A	Anti-static air babble sheet
③ B SHEET B	Anti-static air babble sheet
④ Sealing bag	
⑤ Drier	Moisture absorber
⑥ Packing tape	
⑦ Outer carton	Corrugated cardboard
⑧ FOAM SHEET A	Anti-static polyethilene

Dimension of outer carton	
D : Approx.	( 337mm )
W : Approx.	( 618mm )
H : Approx.	( 179mm )
Quantity of products packed in one carton:	144
Gross weight : Approx.	6.0 Kg



## 19. Handling Instruction

## 19.1 Cautions for Handling LCD panels

**Caution**

- (1) Do not make an impact on the LCD panel glass because it may break and you may get injured from it.
- (2) If the glass breaks, do not touch it with bare hands.  
(Fragment of broken glass may stick you or you cut yourself on it.)
- (3) If you get injured, receive adequate first aid and consult a medial doctor.
- (4) Do not let liquid crystal get into your mouth.  
(If the LCD panel glass breaks, try not let liquid crystal get into your mouth even toxic property of liquid crystal has not been confirmed.)
- (5) If liquid crystal adheres, rinse it out thoroughly.  
(If liquid crystal adheres to your cloth or skin, wipe it off with rubbing alcohol or wash it thoroughly with soap. If liquid crystal gets into eyes, rinse it with clean water for at least 15 minutes and consult an eye doctor.)
- (6) If you scrap this products, follow a disposal standard of industrial waste that is legally valid in the community, country or territory where you reside.
- (7) Do not connect or disconnect this product while its application products is powered on.
- (8) Do not attempt to disassemble or modify this product as it is precision component.
- (9) If a part of soldering part has been exposed, and avoid contact (short-circuit) with a metallic part of the case etc. about FPC of this model, please.  
Please insulate it with the insulating tape etc. if necessary.  
The defective operation is caused, and there is a possibility to generation of heat and the ignition.
- (10) Since excess current protection circuit is not built in this TFT module, there is the possibility that LCD module or peripheral circuit become feverish and burned in case abnormal operation is generated.  
We recommend you to add excess current protection circuit to power supply.
- (11) The end part of glass and film of touch panel has conductivity, and avoid contact (short-circuit) with electroconductive case etc.. There is a possibility of setting up a defective touch panel, and insulate it for the case suppression (cushion etc.) if necessary, please.
- (12) The devices on the FPC are damageable to electrostatic discharge, because the terminals of the devices are exposed.  
Wear grounded wrist-straps and use electrostatic neutralization blowers to prevent static charge and discharge when handling the TFT monitors.  
Designate an appropriate operating area, and set equipment, tools, and machines properly when handling this product.

**Caution**

**This mark is used to indicate a precaution or an instruction which, if not correctly observed, may result in bodily injury, or material damages alone.**



## 19.2 Precautions for Handling

- 1) Wear finger tips at incoming inspection and for handling the TFT monitors to keep display quality and keep the working area clean.  
Do not touch the surface of the monitor as it is easily scratched.
- 2) Wear grounded wrist-straps and use electrostatic neutralization blowers to prevent static charge and discharge when handling the TFT monitors as the LED in this TFT monitors is damageable to electrostatic discharge.  
Designate an appropriate operating area, and set equipment, tools, and machines properly when handling this product.
- 3) Avoid strong mechanical shock including knocking, hitting or dropping to the TFT monitors for protecting their glass parts. Do not use the TFT monitors that have been experienced dropping or strong mechanical shock.
- 4) Do not use or storage the TFT monitors at high temperature and high humidity environment.  
Particularly, never use or storage the TFT monitors at a location where condensation builds up.
- 5) Avoid using and storing TFT monitors at a location where they are exposed to direct sunlight or ultraviolet rays to prevent the LCD panels from deterioration by ultraviolet rays.
- 6) Do not stain or damage the contacts of the FPC cable .  
FPC cable needs to be inserted until it can reach to the end of connector slot.  
During insertion, make sure to keep the cable in a horizontal position to avoid an oblique insertion.  
Otherwise, it may cause poor contact or deteriorate reliability of the FPC cable.
- 7) Do not bend or pull the FPC cable or carry the TFT monitor by holding the FPC cable.
- 8) Peel off the protective film on the TFT monitors during mounting process.  
Refer to the section 19.5 on how to peel off the protective film.  
We are not responsible for electrostatic discharge failures or other defects occur when peeling off the protective film.

## 19.3 Precautions for Operation

- 1) Since this TFT monitors are not equipped with light shielding for the driver IC, do not expose the driver IC to strong lights during operation as it may cause functional failures.
- 2) In case of powering up or powering off this LCD module, be sure to comply the sequence as instructed in this specification.
- 3) Do not plug in or out the FPC cable while power supply is switch on.  
Plug the FPC cable in and out while power supply is switched off.
- 4) Do not operate the TFT monitors in the strong magnetic field. It may break the TFT monitors.
- 5) Do not display a fixed image on the screen for a long time.  
Use a screen-saver or other measures to avoid a fixed image displayed on the screen for a long time.  
Otherwise, it may cause burn-in image on the screen due the characteristics of liquid crystal.



## 19.4 Storage Condition for Shipping Cartons

### Storage environment

- Temperature 0 to 40° C
- Humidity 60%RH or less  
No-condensing occurs under low temperature with high humidity condition.
- Atmosphere No poisonous gas that can erode electronic components and/or wiring materials should be detected.
- Time period 1 year
- Unpacking To prevent damages caused by static electricity, anti-static precautionary measures (e.g. earthing, anti-static mat) should be implemented.  
After unpack, keep product in the appropriate condition, otherwise bubble seal of Protective film may be printed on Polarizer.
- Maximum piling up 7 cartons

### \*Conditions to storage after unpacking

#### Storage environment

- Temperature 0 to 40° C
- Humidity 60%RH or less  
No-condensing occurs under low temperature with high humidity condition.
- Atmosphere No poisonous gas that can erode electronic components and/or wiring materials should be detected.
- Time period 1 year (Shelf life)
- Others Keep/ store away from direct sunlight  
Storage goods on original tray made by ORTUS.



### 19.5 Precautions for Peeling off the Protective film

The followings work environment and work method are recommended to prevent the TFT monitors from static damage or adhesion of dust when peeling off the protective films.

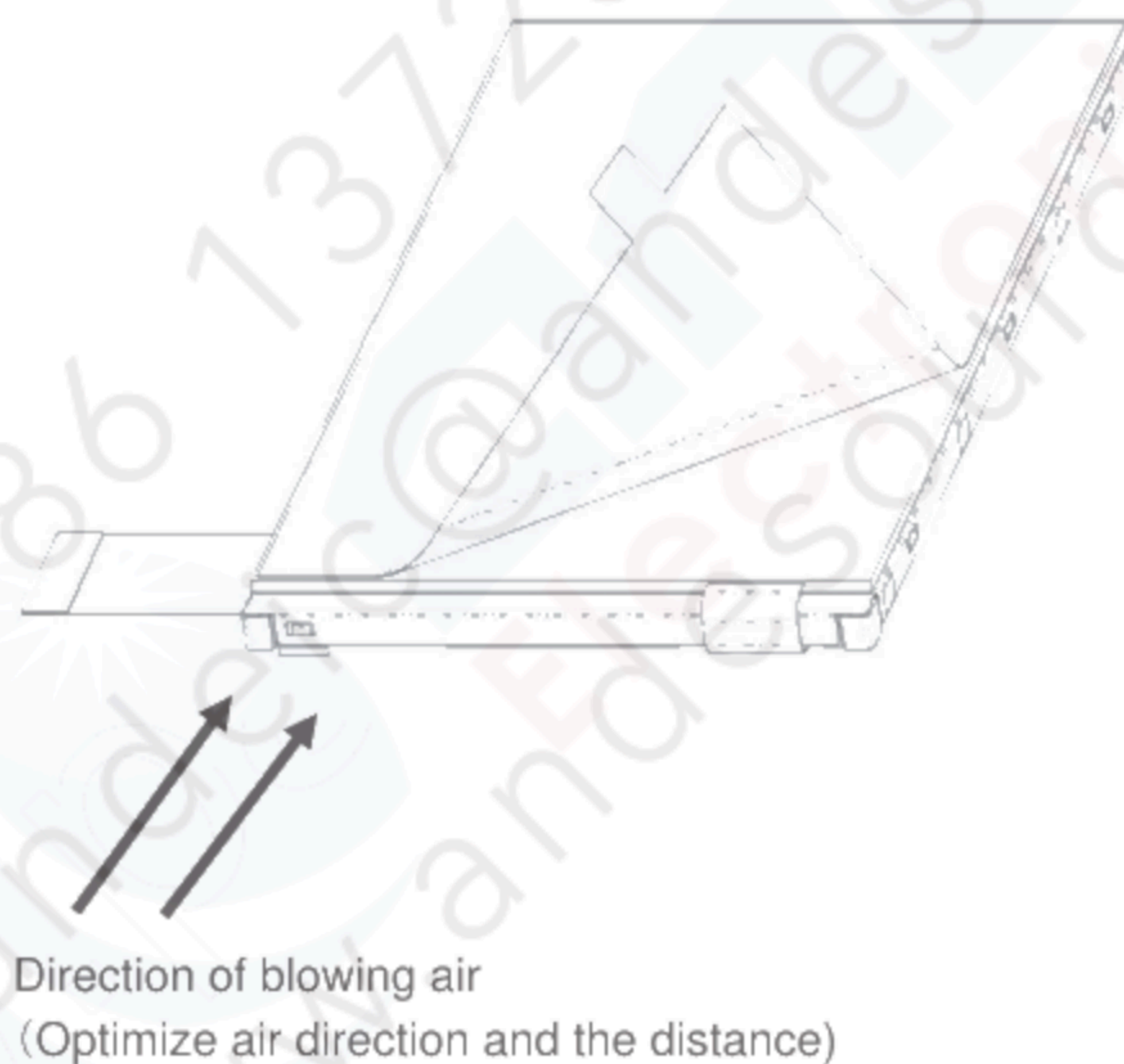
#### A) Work Environment

- a) Humidity: 50 to 70 %RH, Temperature 15 to 27 °C
- b) Operators should wear conductive shoes, conductive clothes, conductive finger tips and grounded wrist-straps.  
Use an electrostatic neutralization blower.  
Anti-static treatment should be implemented to work area's floor.
- c) Use a room shielded against outside dust with sticky floor mat laid at the entrance to eliminate dirt.

#### B) Work Method

The following procedures should be taken to prevent the driver ICs from charging and discharging.

- a) Use an electrostatic neutralization blower to blow air on the TFT monitors to its lower left FPC is placed at the left.  
Optimize direction of the blowing air and the distance between the TFT monitors and the electrostatic neutralization blower.
- b) Peel off the tab slowly (spending more than 2 secs to complete) by pulling it to opposite direction.



### 19.6 Warranty

ORTUS is only liable to defective goods which is stored and used under the condition complying with this specifications and returned within 1 (one) year.

Warranty caused by manufacturing defect shall be conducted by replacement of goods or refundment at unit price.



**APPENDIX**

## Reference Method for Measuring Optical Characteristics and Performance

## 1. Measurement Condition (Backlight ON)

Measuring instruments: CS1000 (KONICA MINOLTA) , LCD7200(OTSUKA ELECTRONICS) ,EZcontrast160D (ELDIM)

Driving condition: Refer to the section "Optical Characteristics"

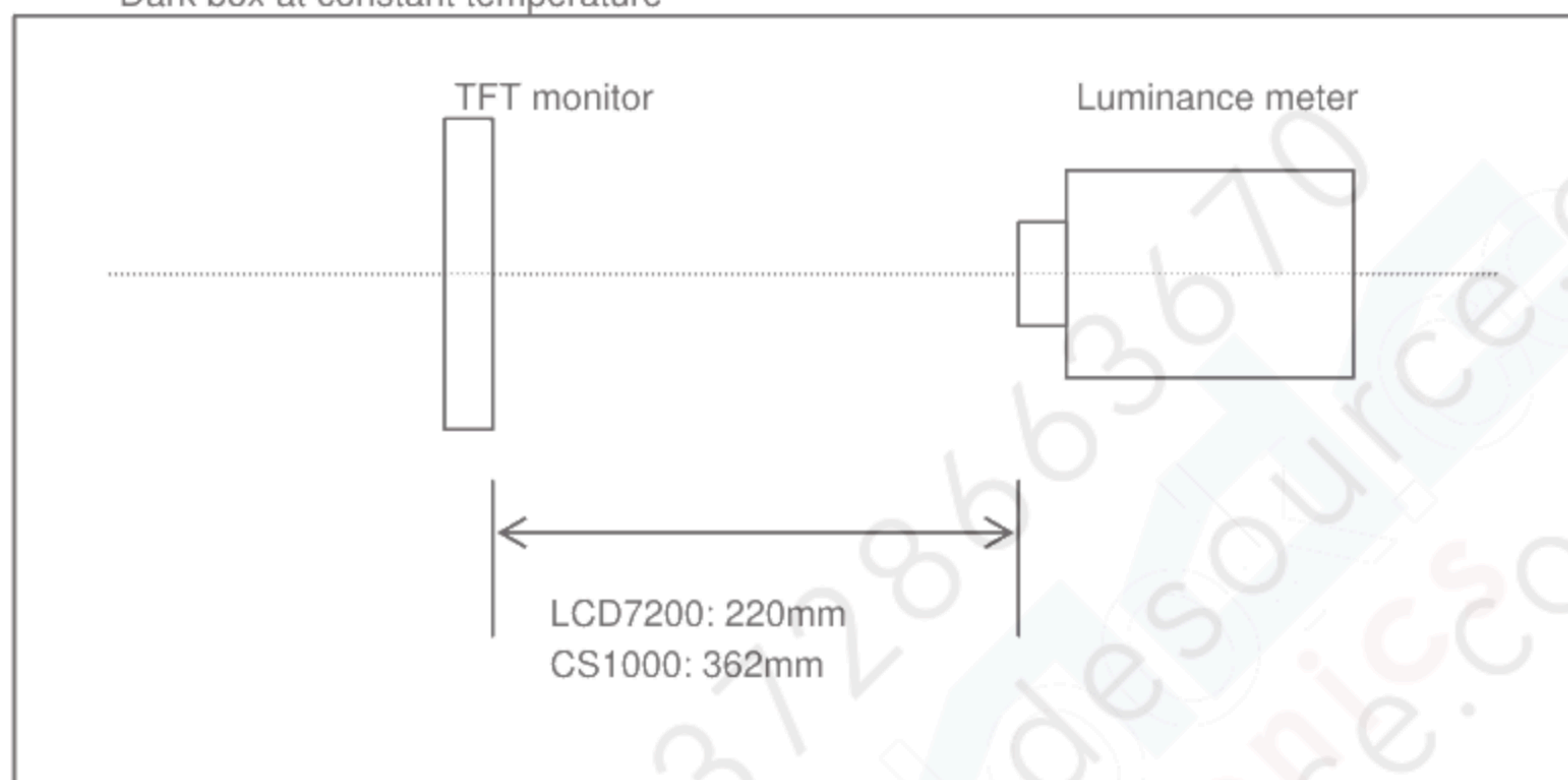
Measured temperature: 25° C unless specified

Measurement system: See the chart below.

The luminance meter is placed on the normal line of measurement system.

Measurement point: At the center of the screen unless otherwise specified

Dark box at constant temperature

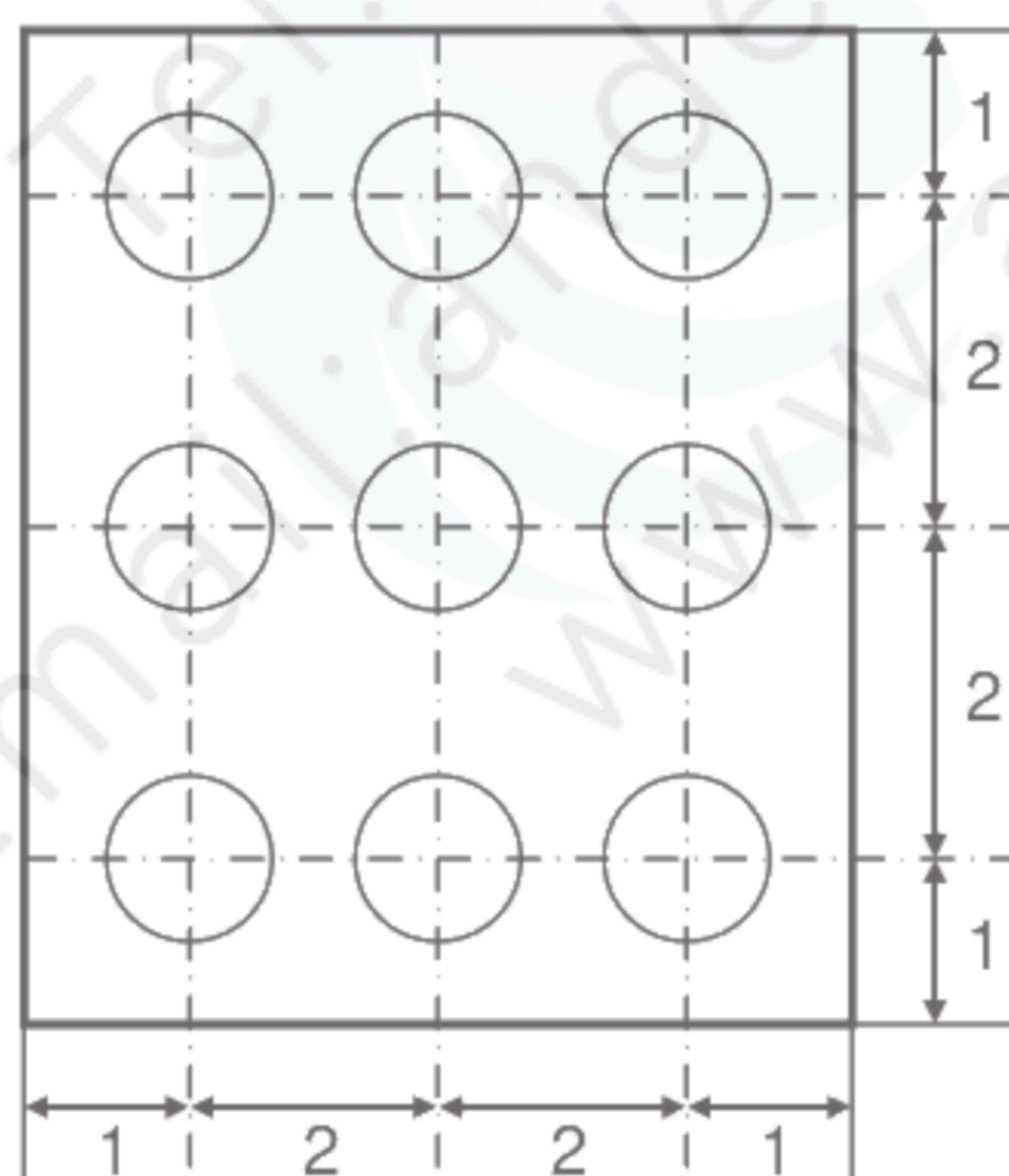


Measurement is made after 30 minutes of lighting of the backlight.

Measurement point: At the center point of the screen

Brightness distribution: 9 points shown in the following drawing.

<Portrait model>



Dimensional ratio of active area

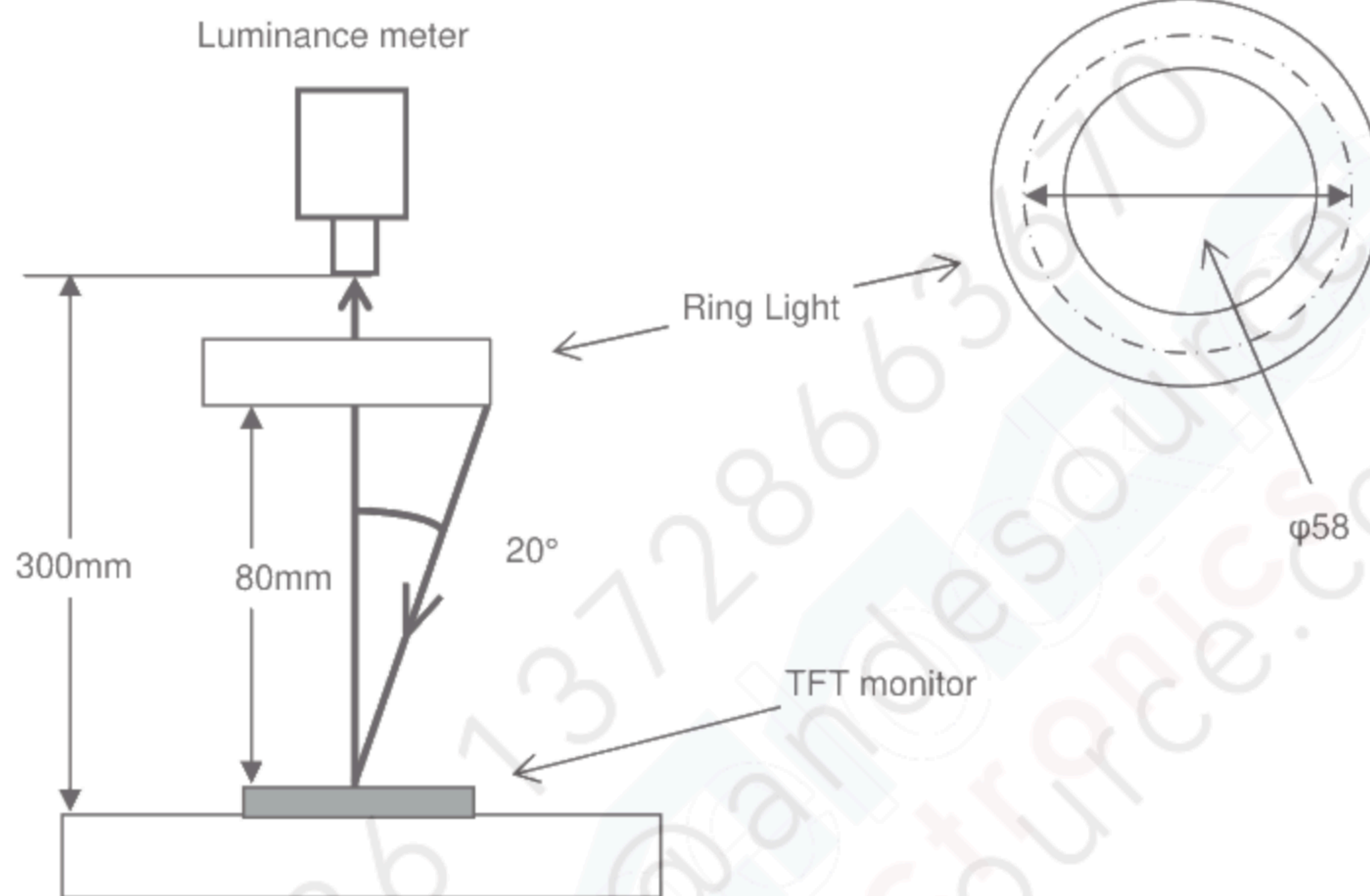
Backlight

IL=7.0mA



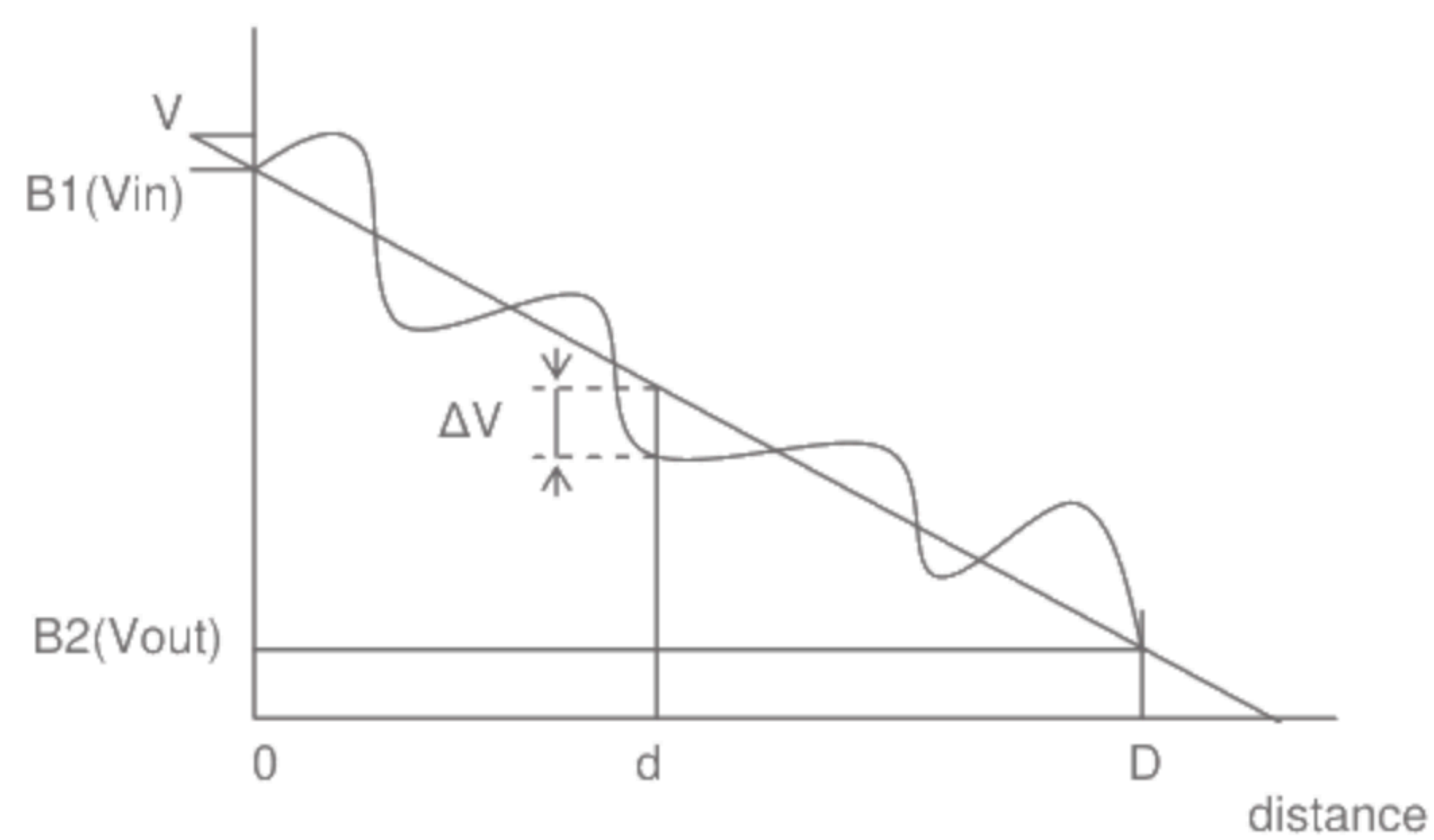
## Measurement Condition (Contrast ratio Backlight OFF only)

Measuring instruments: LCD7200(OTSUKA ELECTRONICS), Ring Light(40,000 lx,  $\phi 58$ )  
 Driving condition: Refer to the section "Optical Characteristics"  
 Measured temperature: 25° C unless specified  
 Measurement system: See the chart below.  
 Measurement point: At the center of the screen.





\* Linearity Measurement of Touch Panel



$$LE(\%) = \Delta V / (V_{in} - V_{out}) \times 100$$

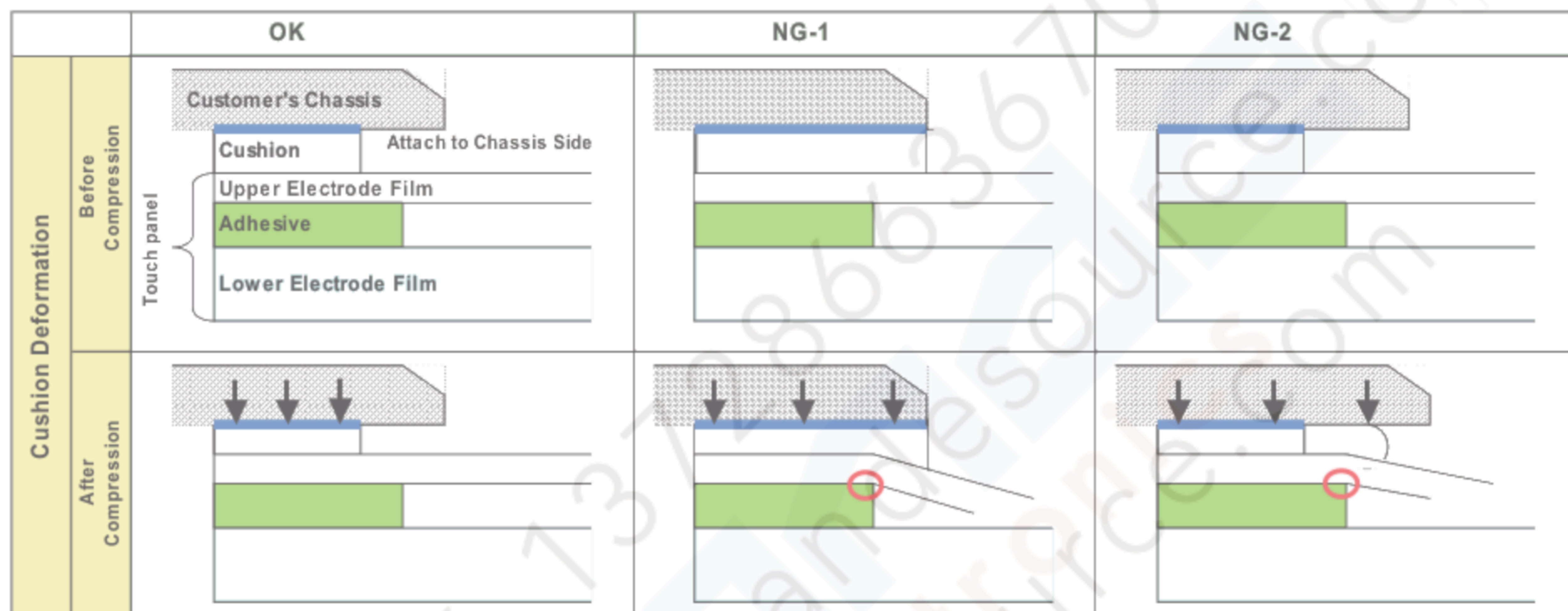
$$LE_{max}(\%) = \Delta V_{max} / (V_{in} - V_{out}) \times 100$$



■ Cautionary instruction to handle a Touch-panel

● Cushion (between Touch Panel Chassis) Design

- 1) A cushion is required to be placed between Touch Panel and customer's chassis and there is a designated area to attach it. Attachment at area inside Input Prohibition Area must be forbidden.  
If cushion was located inside Input Prohibition Area, Upper Electrode may be push constantly and which may cause the electrode breakage at the position falling on the edge of adhesive; it eventually results in Touch Panel malfunction in the future. (Please see "NG-1")
- 2) Be attention to the cushion material you use. In the case that too soft cushion was used, the cushion may protrude into Prohibition Area by being push strongly; which may result in the electrode breakage. Eventually there is a chance that the electrode breakage leads to the malfunction of Touch Panel in the future. (Please see "NG-2")
- 3) Cushion is required to be attached at the side of Customer's chassis.  
Attaching a cushion at the side of Upper Electrode Film has a chance to deform the film and lead to the malfunction of Touch Panel in the future.

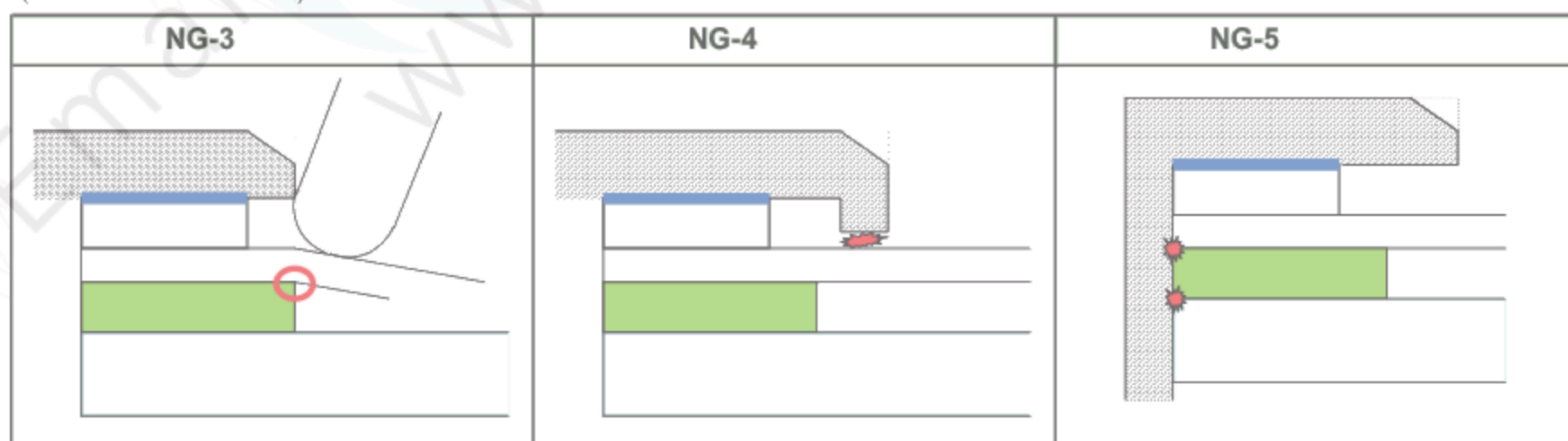


● Design Guidance of Chassis (Front Part)

- 4) Be attention to stay Input Prohibition Area away from touching and/or drawing by a stylus pens in order to avoid the electrode breakage and potential malfunction of Touch Panel. (Please see "NG-3")  
We recommend customers to design chassis (front case) being able to protect Input Prohibition Area.
- 5) Clearance between customer's chassis and Touch Panel surface is certainly required in order to avoid erroneous input caused by a collision of the edge of chassis. (Please see "NG-4")  
A clearance of 0.3 to 0.7mm is recommended.

● Design Guidance of Chassis (Side Part)

- 6) Upper Electrode and Lower Electrode fall on the edge of Touch Panel outline.  
Redundant design having enough clearance to avoid electric short with chassis is highly recommended. (Please see "NG-5")



● Example of Recommended Chassis Design

Refer to "3.2 Outward Form".

- As a terminal resistance has individual specificity, calibration to align the displaying and the sensing position one each is mandatory before use.



## 2. Test Method

Notice	Item	Test method	Measuring instrument	Remark
1	Response time	<p>Measure output signal waves with a brightness meter when the raster or window pattern is changed over from Black to White and from White to Black</p> <p>Black                      White                      Black</p> <p>White brightness</p> <p>100%</p> <p>90%</p> <p>10%</p> <p>0%</p> <p>Black brightness</p> <p>TON</p> <p>TOFF</p>	LCD7200	<p>Black display [Data]=00h</p> <p>White display [Data]=3Fh</p> <p>TON</p> <p>Rise time</p> <p>TOFF</p> <p>Fall time</p>
2	Contrast ratio	<p>Measure maximum luminance Y1([Data]=3Fh) and minimum luminance Y2([Data]=00h) at the center of the screen by displaying raster or window pattern. Then calculate the ratio between these two values.</p> <p>Contrast ratio = Y1/Y2</p> <p>Diameter of measuring point: 8mmφ(CS1000)</p> <p>Diameter of measuring point: 3mmφ(LCD7200)</p>	CS1000 LCD7200	Backlight ON Backlight OFF
3	Viewing angle Horizontalθ Verticalφ	Move the luminance meter from right to left and up and down and determine the angles where contrast ratio is 10.	EZcontrast160D	
4	White chromaticity	<p>Measure chromaticity coordinates x and y of CIE1931 colorimetric system at [Data] = 3Fh</p> <p>Color matching function: 2°view</p>	CS1000	
5	Burn-in	Visually check burn-in image on the screen after 2 hours of "window display" ([Data]=00h/3Fh).	At optimized VCOMDC	
6	Center brightness	Measure the brightness at the center of the screen.	CS1000	
7	Brightness distribution	<p>(Brightness distribution) = 100 x B/A %</p> <p>A : max. brightness of the 9 points</p> <p>B : min. brightness of the 9 points</p>	CS1000	



Ver.	Date	Page	Description
1.0	May. 12, 2016	-	- First issue