SPEC

Spec No.	TQ3C-8EA00-E1DES04-00
Date	August 24, 2009

TYPE : TCG150XGLBA-A00

< 15.0 inch XGA transmissive color TFT with LED backlight>

CONTENTS

Issued
Date: Sep 14, 2009
KYOCERA
Hayato LCD Division

KYOCERA CORPORATION
KAGOSHIMA HAYATO PLANT
LCD DIVISION

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Consult Kyocera before ordering.

Original Issue Date	Designed by: Engineering dept.			Confirmed by: QA dept.	
	Prepared	Checked	Approved	Checked	Approved
August 24, 2009	Y. Ikeda	S. Kojima	Y. Matsumoto	J. Sakaguchi	

Warning

1. This Kyocera LCD module has been specifically designed for use only in electronic devices and industrial machines in the area of audio control, office automation, industrial control, home appliances, etc. The module should not be used in applications where the highest level of safety and reliability are required and module failure or malfunction of such module results in physical harm or loss of life, as well as enormous damage or loss. Such fields of applications include, without limitation, medical, aerospace, communications infrastructure, atomic energy control. Kyocera expressly disclaims any and all liability resulting in any way to the use of the module in such applications.

2. Customer agrees to indemnify, defend and hold Kyocera harmless from and against any and all actions, claims, damages, liabilities, awards, costs, and expenses, including legal expenses, resulting from or arising out of Customer's use, or sale for use, or Kyocera modules in applications.

Revision record

Date	Designed by : Engineering dept.			Confirmed by : QA dept.	
	Prepared	Checked	Approved	Checked	Approved

Rev.No.	Date	Page	Descriptions

1. General Description

TCG150XGLBA-A00 is a Color Active Matrix Liquid Crystal Display composed of a TFT-LCD display, a driver circuit, and a backlight system. The screen format is intended to support XGA (1024(H) x 768(V)) screen and 16.2M (RGB 8-bits) or 262k colors (RGB 6-bits). All input signals are LVDS interface compatible. All design rules of this module can correspond to PSWG standard. TCG150XGLBA-A00 is designed for industrial display applications

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1-1. Display Characteristics

The following items are characteristics summary on the table under 25℃condition:

Items	Unit	Specifications
Screen Diagonal	[inch]	15
Active Area	[mm]	304.128(H) * 228.096(V)
Pixels H * V		1024 * 3(RGB) * 768
Pixel Pitch	[mm]	0.297 * 0.297
Pixel Arrangement		R.G.B. Vertical Stripe
Display Mode		TN, Normally White
Nominal Input Voltage VDD	[V]	3.3 Typ.
Typical Power Consumption	[W]	8.8(64 Gray Bar Pattern)
Weight	[g]	1100g (max.)
Physical Size	[mm]	326.5(H) * 253.5(V) * 12.0(D) (max.)
Electrical Interface		1 channel LVDS
Surface Treatment		Anti-glare, Hardness 3H
Support Color		16.2M / 262K colors
Temperature Range Operating Storage(Non-Operating)	 [℃] [℃]	 0 to +65 (+65℃ as panel surface temperature) -20 to +65
RoHS Compliance		RoHS Compliance

1-2. Optical Characteristics

The optical characteristics are measured under stable conditions at 25°C(Room Temperature):

item	unit	Conditions	Min.	Typ.	Max.	Note
White Luminance	[cd/m^2]	I_F=80mA/1 LED Line (center point)	300	350	–	1
Uniformity	%	5 Points	75	80	–	1,2,3
Contrast Ratio	–	–	400	700	–	4
Cross talk	%			1.2	1.5	5
Response Time	[msec]	Rising	–	5.7	–	6
		Falling	–	2.3	–	
		Rising + Falling	–	8	–	
Viewing Angle	[degree]	Horizontal (Right)	70	80	–	7
		CR=10 (LEFT)	70	80	–	
		Vertical (Upper)	70	80	–	
		CR=10 (Lower)	50	60	–	
Color/Chromaticity Coordinates (CIE 1931)	–	Red x	0.584	0.634	0.684	–
		Red y	0.297	0.347	0.397	
		Green x	0.277	0.327	0.377	
		Green y	0.560	0.610	0.660	
		Blue x	0.102	0.152	0.202	
		Blue y	0.022	0.072	0.122	
		White x	0.263	0.313	0.363	
		White y	0.279	0.329	0.379	
Color Gamut	%	–	–	65	–	–

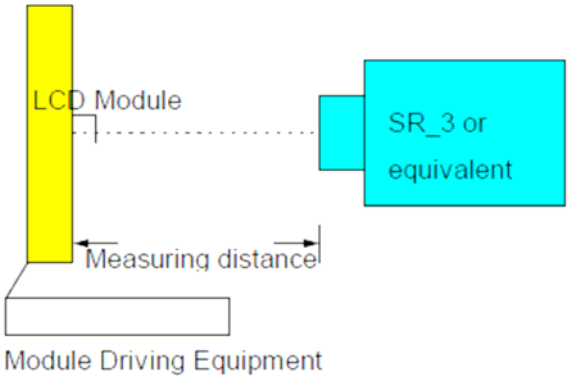
Note 1: Measurement method

Equipment: Pattern Generator, Power Supply, Digital Voltmeter, Luminance meter (SR_3 or equivalent)

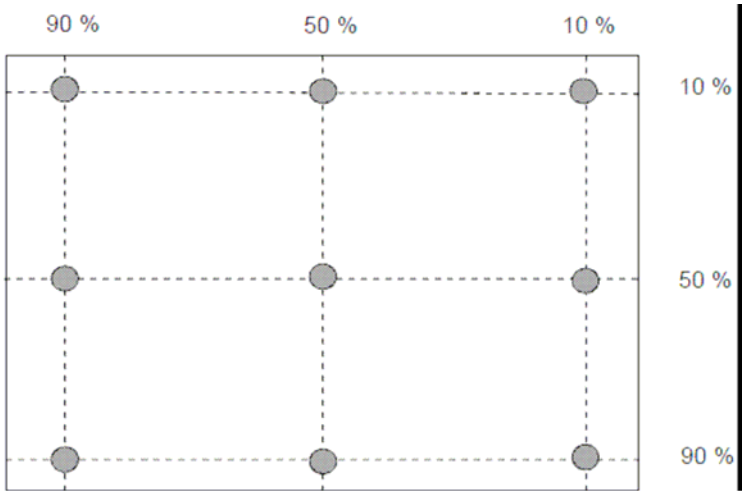
Aperture 1 ° with 50cm viewing distance

Test Point Center

Environment < 1 lux



Note 2: Definition of 5 points position (Display active area: 246mm (H) x 184.5mm (V))



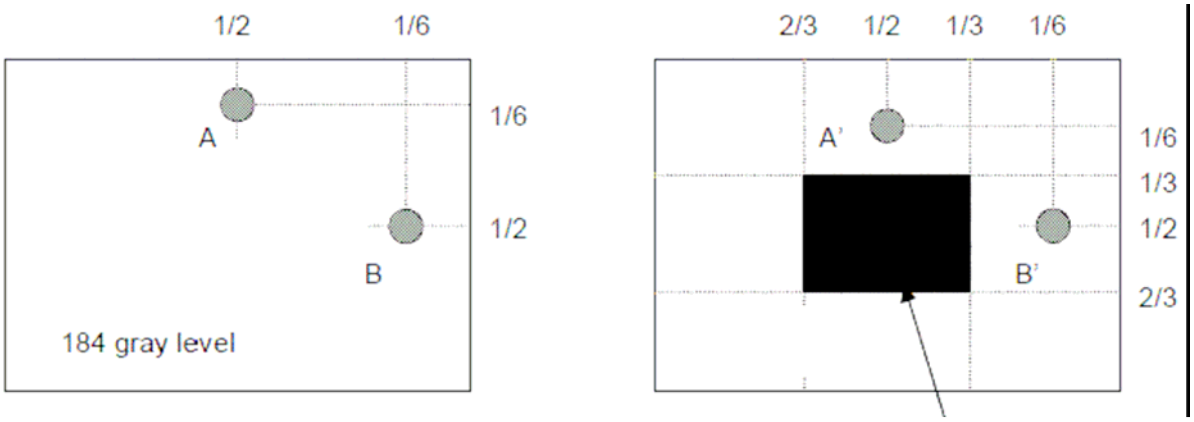
Note 3:
The luminance uniformity of 5 points is defined by dividing the minimum luminance values by the maximum test point luminance

$$\delta_{W9} = \frac{\text{Minimum Brightness of nine points}}{\text{Maximum Brightness of nine points}}$$

Note 4 : Definition of contrast ratio (CR):

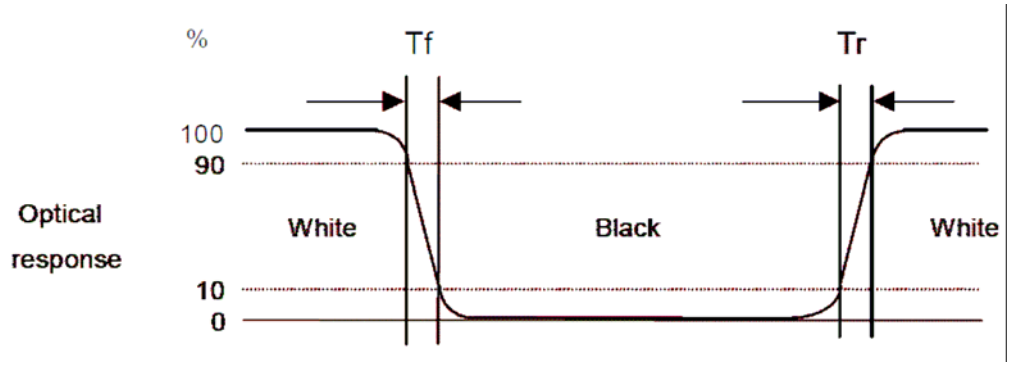
$$\text{Contrast ratio (CR)} = \frac{\text{Brightness on the "White" state}}{\text{Brightness on the "Black" state}}$$

Note 5: Definition of response time:
CT = | YB – YA | / YA × 100 (%)
Where
YA = Luminance of measured location without gray level 0 pattern (cd/m2)
YB = Luminance of measured location with gray level 0 pattern (cd/m2)



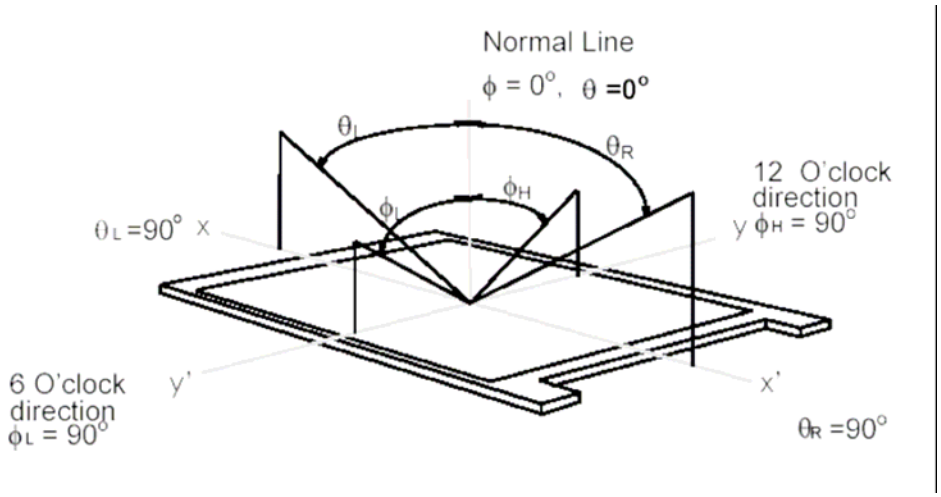
Note 6: Definition of response time:

The output signals of photo detector are measured when the input signals are changed from “White” to “Black”(falling time) and from “Black” to “White” (rising time), respectively. The response time interval is between 10% and 90% of amplitudes. Please refer to the figure as below.



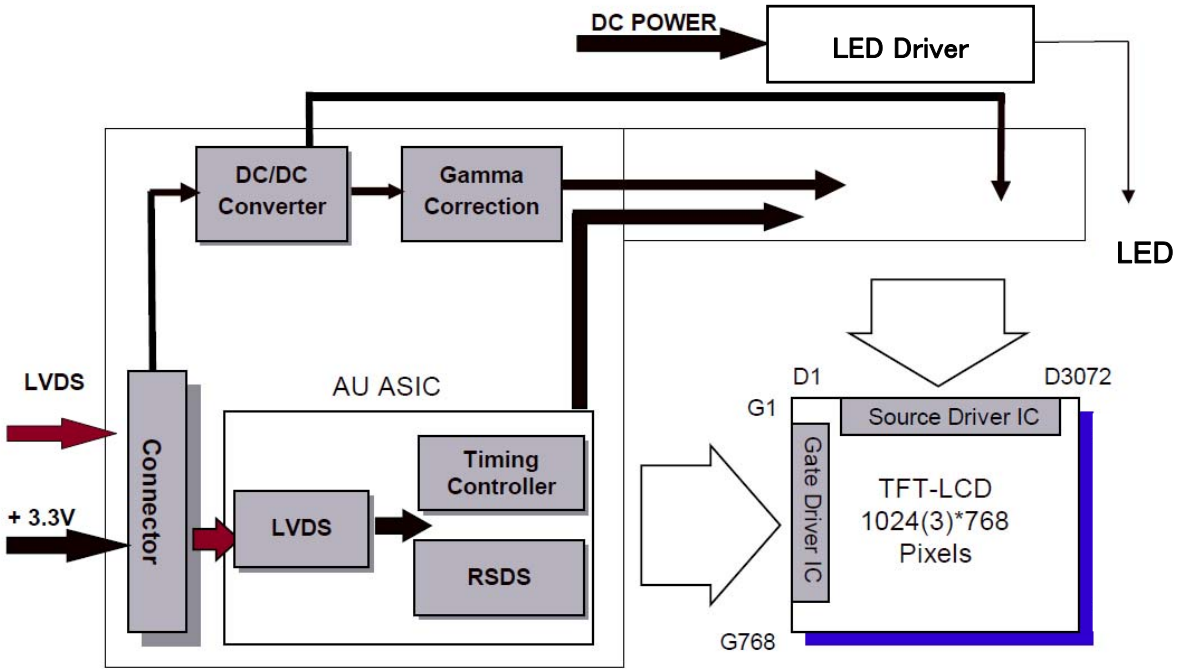
Note 7: Definition of viewing angle

Viewing angle is the measurement of contrast ratio ≧10, at the screen center, over a 180 ° horizontal and 180 ° vertical range (off-normal viewing angles). The 180° viewing angle range is broken down as below: 90° (θ)horizontal left and right, and 90° (Φ) vertical high (up) and low (down). The measurement direction is typically perpendicular to the display surface with the screen rotated to its center to develop the desired measurement viewing angle.



2. Functional Block Diagram

The following diagram shows the functional block of the 15 inch color TFT/LCD module:



3804-F20N-06R / MSB240420E

SM06B-SRSS-TB(LF)(SN)

Mating Type: HRS DF14-20S-1.25C

SHR-06V-S-B

3. Absolute Maximum Ratings

3-1. Absolute Ratings of TFT LCD Module

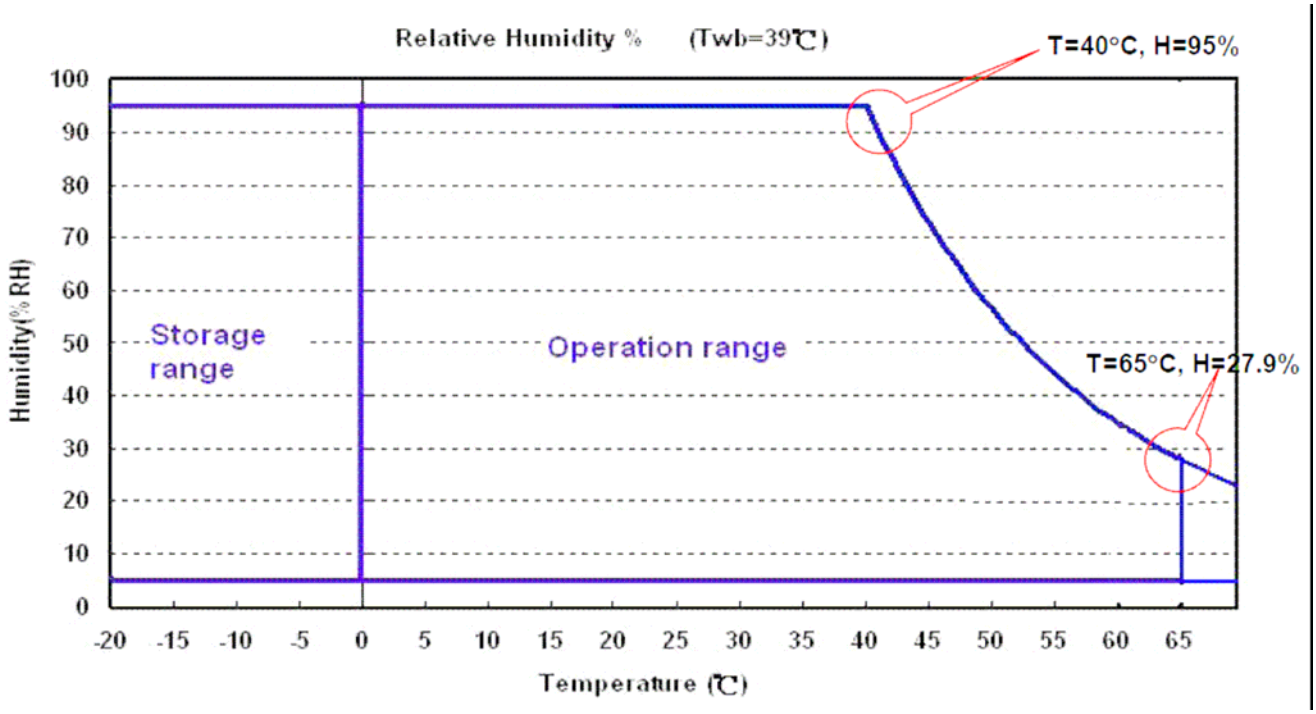
Item	Symbol	Min	Max	Unit
Logic/LCD Drive	Vin	- 0.3	+4.0	[Volt]

3-2. Absolute Ratings of Environment

Item	Symbol	Min	Max	Unit
Operating Temperature	TOP	0	+65	[°C]
Operation Humidity	HOP	8	90	[%RH]
Storage Temperature	TST	-20	+65	[°C]
Storage Humidity	HST	8	90	[%RH]

Note: Maximum Wet-Bulb should be 39°C and no condensation.

* 65 oC is panel surface temperature



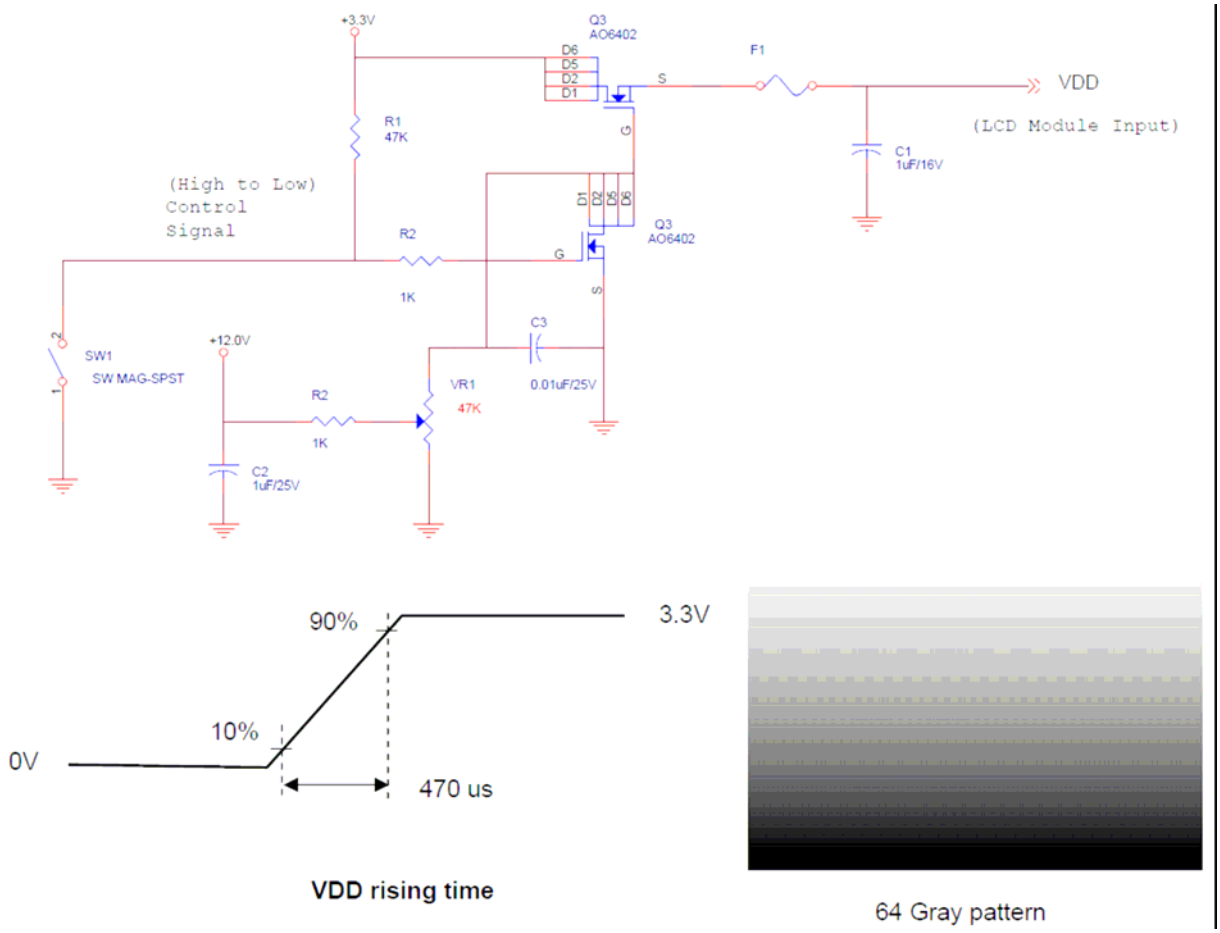
4. Electrical Characteristics

4-1. TFT LCD Module

4-1-1. Power Specification

Symbol	Parameter	Min	Typ	Max	Units	Remark
VDD	Logic/LCD Drive Voltage	3.0	3.3	3.6	[Volt]	±10%
IDD	VDD Current	-	550	660	[mA]	64 Gray Bar Pattern (VDD=3.3V, at 60Hz)
Irush	LCD Inrush Current	-	-	3	[A]	Note 1
PDD	VDD Power	-	1.9	2.2	[Watt]	64 Gray Bar Pattern (VDD=3.3V, at 60Hz)

Note 1: Measurement condition:

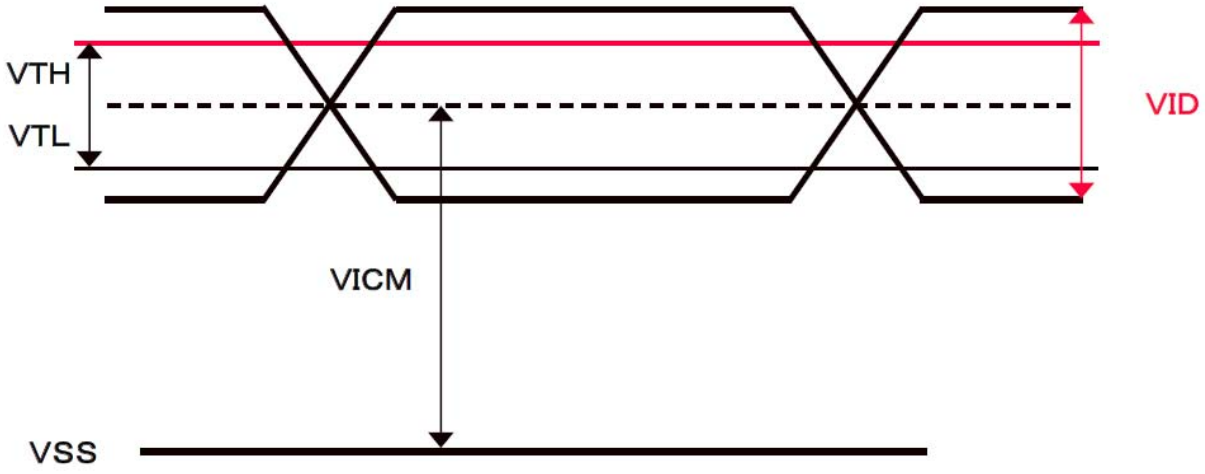


4-1-2. Signal Electrical Characteristics

Input signals shall be low or Hi-Z state when VDD is off.

Symbol	Item	Min.	Typ.	Max.	Unit	Remark
VTH	Differential Input High Threshold	-	-	100	[mV]	VCM=1.2V
VTL	Differential Input Low Threshold	-100	-	-	[mV]	VCM=1.2V
VID	Input Differential Voltage	100	400	600	[mV]	
VICM	Differential Input Common Mode Voltage	1.1		1.45	[V]	VTH/VTL=±100mV

Note: LVDS Signal Waveform.



4-2. Backlight Unit

4-2-1. Parameter guideline for LED

Following characteristics are measured under stable condition using a LED driving board at 25℃ (Room Temperafure)

Symbol	Parameter	Min.	Typ.	Max.	Units	Remark
I_F	LED Forward Current	–	80	84	[mA]	Ta = 25℃
V_F	LED Forward Voltage	–	30.6	–	[V]	IF = 80mA、Ta = −30℃
		–	28.8	32.85		IF = 80mA、Ta = 25℃
		–	27.9	–		IF = 80mA、Ta = 85℃
P_{LED}	LED Power	–	6.9	–	[W]	
Operating Life		50000	–	–	[H]	IF = 80mA、Ta = 25℃

Note 1: Ta means ambient temperature of TFT-LCD module.

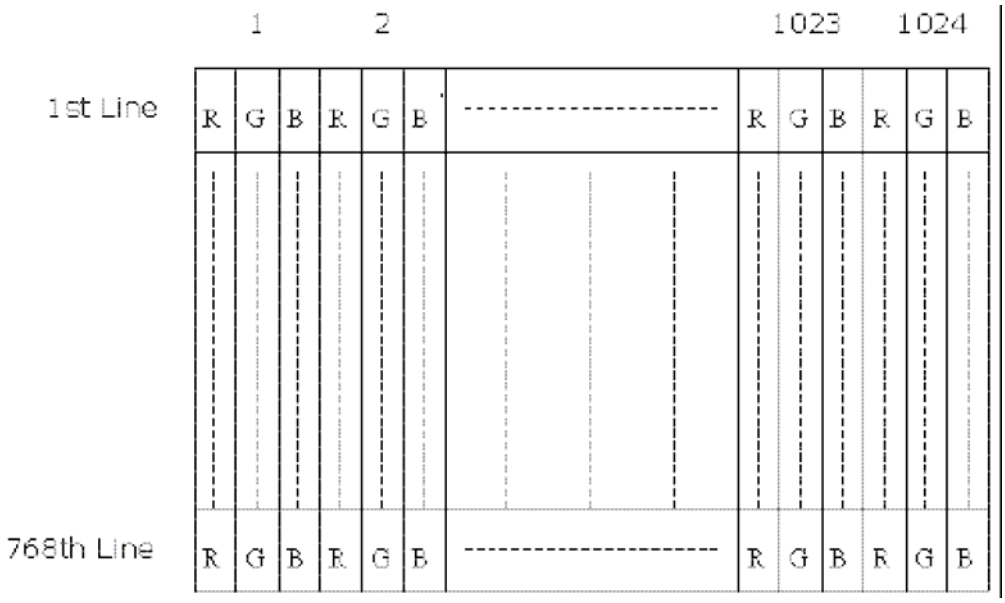
Note 2: If TCG150XGLBA-A00 module is driven by high current or at high ambient temperature & humidity condition. The operating life will be reduced.

Note 3: Operating life means brightness goes down to 50% initial brightness. Typical operating life time is estimated data.

5.Signal Characteristic

5-1. Pixel Format Image

Following figure shows the relationship between input signal and LCD pixel format.



5-2. Scanning Direction

The following figures show the image seen from the front view. The arrow indicates the direction of scan.

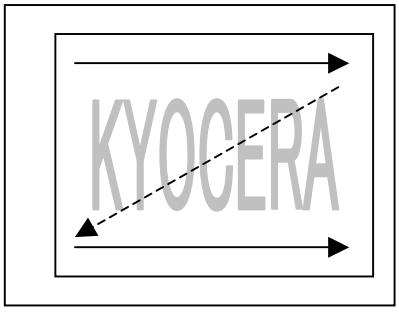


Fig.1 Normal scan (Pin4, REV = Low or NC)

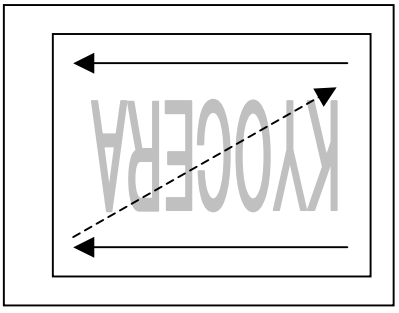


Fig.2 Reverse scan (Pin4, REV = High)

5-3. Signal Description

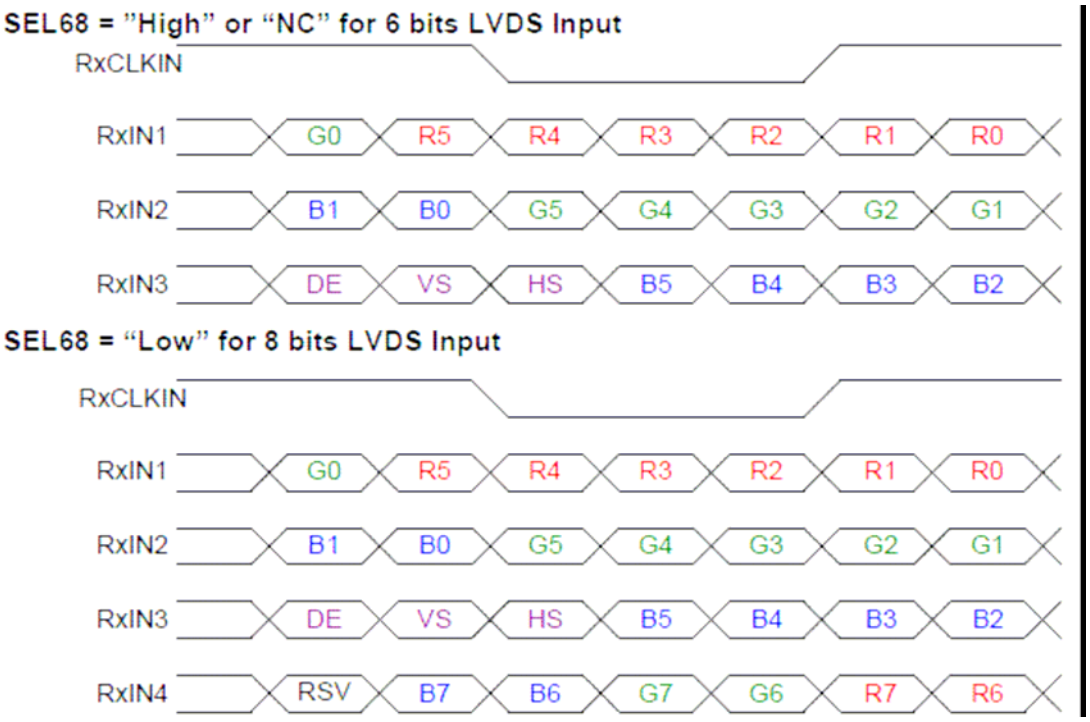
The module using a pair of LVDS receiver SN75LVDS82(Texas Instruments) or compatible. LVDS is a differential signal technology for LCD interface and high speed data transfer device. Transmitter shal be SN75LVDS83(negative edge sampling) or compatible. The first LVDS port(RxOxxx) transmits odd pixels while the second LVDS port(RxExxx) transmits even pixels.

3804-F20N-06R (E&T) / MSB240420E(STM)		
Pin No.	**Symbol**	**Description**
1	VDD	Power Supply, 3.3V (typical)
2	VDD	Power Supply, 3.3V (typical)
3	VSS	Ground
4	REV	Reverse Scan selection *.Note1
5	Rin1-	- LVDS differential data input (R0-R5, G0)
6	Rin1+	+ LVDS differential data input (R0-R5, G0)
7	VSS	Ground
8	Rin2-	- LVDS differential data input (G1-G5, B0-B1)
9	Rin2+	+ LVDS differential data input (G1-G5, B0-B1)
10	VSS	Ground
11	Rin3-	- LVDS differential data input (B2-B5, HS, VS, DE)
12	Rin3+	+ LVDS differential data input (B2-B5, HS, VS, DE)
13	VSS	Ground
14	ClkIN-	- LVDS differential clock input
15	ClkIN+	+ LVDS differential clock input
16	GND	Ground
17	Rin4-	- LVDS differential data input (R6-R7, G6-G7,B6-B7)
18	Rin4+	- LVDS differential data input (R6-R7, G6-G7,B6-B7)
19	VSS	Ground
20	SEL68	Selection for 6 bits/8bits LVDS data input *Note1

Note 1: Input Signals shall be in low status when VDD is off.

5-4. The Input Data Format

5-4-1. SEL68



Note1: Please follow PSWG.

Note2: R/G/B data7:MSB, R/G/B data0:LSB

Signal Name	Description	Remark
R7	Red Data 7	Red-pixel Data
R6	Red Data 6	
R5	Red Data 5	For 8Bits LVDS input
R4	Red Data 4	MSB: R7 ; LSB: R0
R3	Red Data 3	
R2	Red Data 2	For 6Bits LVDS input
R1	Red Data 1	MSB: R5 ; LSB: R0
R0	Red Data 0	
G7	Green Data 7	Green-pixel Data
G6	Green Data 6	
G5	Green Data 5	For 8Bits LVDS input
G4	Green Data 4	MSB: G7 ; LSB: G0
G3	Green Data 3	
G2	Green Data 2	For 6Bits LVDS input
G1	Green Data 1	MSB: G5 ; LSB: G0
G0	Green Data 0	
B7	Blue Data 7	Blue-pixel Data
B6	Blue Data 6	
B5	Blue Data 5	For 8Bits LVDS input
B4	Blue Data 4	MSB: B7 ; LSB: B0
B3	Blue Data 3	
B2	Blue Data 2	For 6Bits LVDS input
B1	Blue Data 1	MSB: B5 ; LSB: B0
B0	Blue Data 0	
RxCLKIN	LVDS Data Clock	
DE	Data Enable Signal	When the signal is high, the pixel data shall be valid to be displayed.
VS	Vertical Synchronous Signal	
HS	Horizontal Synchronous Signal	

Note: Output signals from any system shall be low or Hi-Z state when VDD is off.

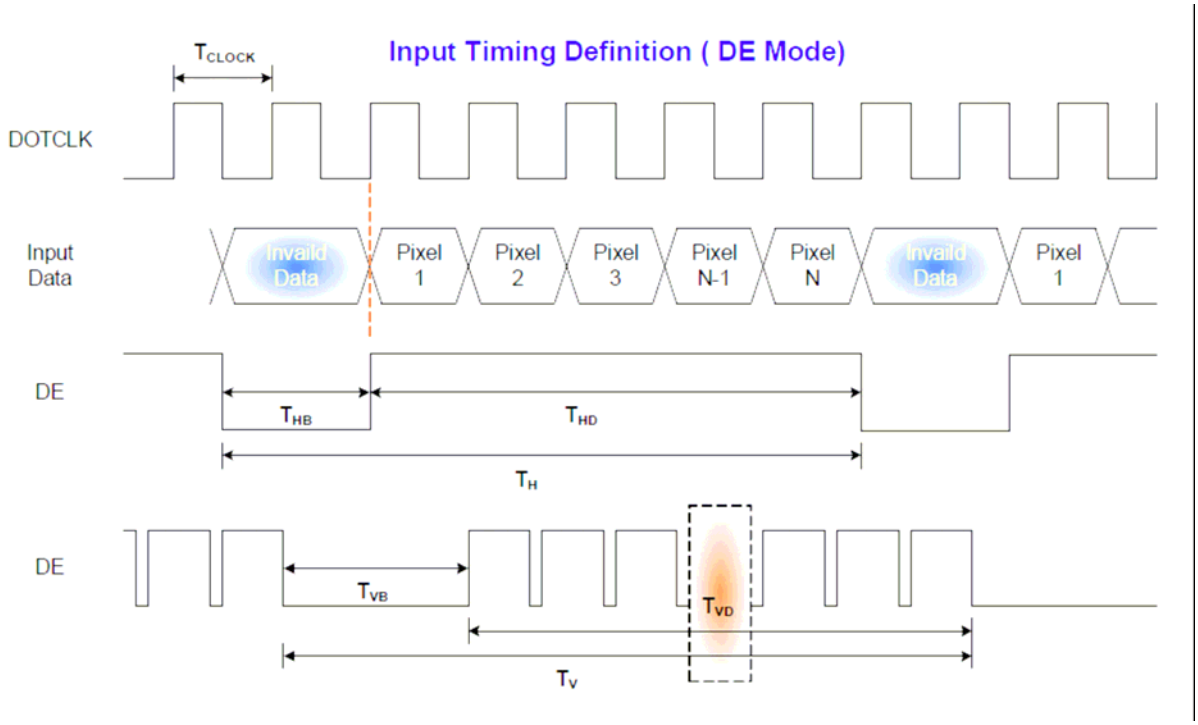
5-5. Interface Timing

5-5-1. Timing Characteristics

Signal	Parameter		Symbol	Min.	Typ.	Max.	Unit
Clock Timing	Clock frequency		1/ T_{Clock}	50	65	81	MHz
Vsync Timing	Vertical Section	Period	T_V	776	806	1024	T_{Line}
		Active	T_{VD}	768	768	768	
		Blanking	T_{VB}	8	38	256	
Hsync Timing	Horizontal Section	Period	T_H	1054	1344	2048	T_{Clock}
		Active	T_{HD}	1024	1024	1024	
		Blanking	T_{HB}	30	320	1024	

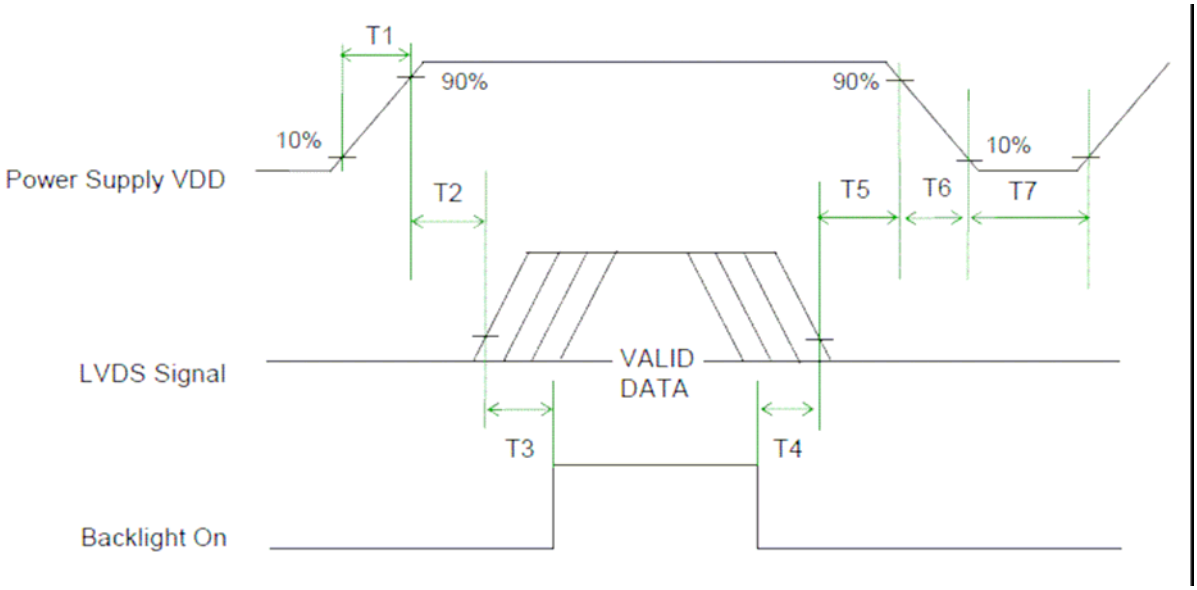
Note: Frame rate is 60 Hz.
Note: DE mode.
Note : Typical value refer to VESA STANDARD

5-5-2. Input Timing Diagram



5-6. Power ON/OFF Sequence

VDD power and backlight on/off sequence is as below. Interface signals are also shown in the chart. Signals from any system shall be Hi-Z state or low level when VDD is off.



Power ON/OFF sequence timing

Parameter	Value			Units
	Min.	Typ.	Max.	
T1	0.5	-	10	ms
T2	0	40	50	ms
T3	200	-	-	ms
T4	200	-	-	ms
T5	0	16	50	ms
T6	0	-	10	ms
T7	1000	-	-	ms

The above on/off sequence should be applied to avoid abnormal function in the display. Please make sure to turn off the power when you plug the cable into the input connector or pull the cable out of the connector.

6. Connector & Pin Assignment

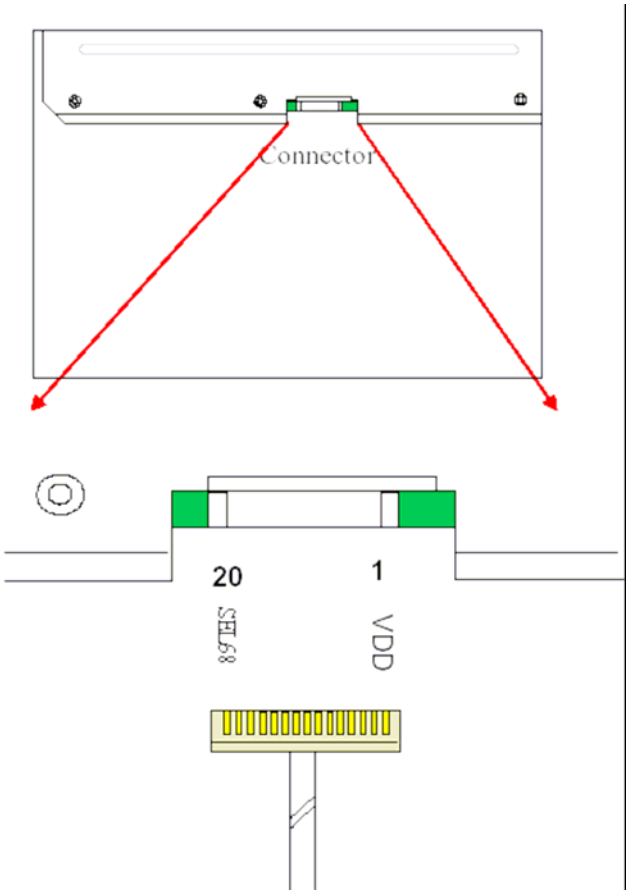
Physical interface is described as for the connector on module. These connectors are capable of accommodating the following signals and will be following components.

6-1. TFT LCD Signal (CN1): LVDS Connector

Connector Name / Designation	Signal Connector
Manufacturer	E&T or compatible
Connector Model Number	3804-F20N-06R / MSB240420E
Adaptable Plug	HRS DF14-20S-1.25C

Pin#	Signal Name	Pin#	Signal Name
1	VDD	2	VDD
3	VSS	4	REV
5	Rin1-	6	Rin1+
7	VSS	8	Rin2-
9	Rin2+	10	VSS
11	Rin3-	12	Rin3+
13	VSS	14	ClkIN-
15	ClkIN+	16	GND
17	Rin4-	18	Rin4+
19	VSS	20	SEL68

6.1.1 Connector Illustration



6.2 Backlight Unit: LED Connector

Connector Name / Designation	LED Connector
Manufacturer	JST or compatible
Connector Model Number	SM06B-SRKHFS-TB(LF)(SN) or compatible
Mating Model Number	SHR-06V-BKHF-B or compatible

6.3 LED Connector Pin Assignment

Pin#	Symbol	Signal Name
1	+ch3	Power supply for LED (Ch3 High voltage side)
2	+ch2	Power supply for LED (Ch2 High voltage side)
3	+ch1	Power supply for LED (Ch1 High voltage side)
4	-ch1	Power supply for LED (Ch1 Low voltage side)
5	-ch2	Power supply for LED (Ch2 Low voltage side)
6	-ch3	Power supply for LED (Ch3 Low voltage side)

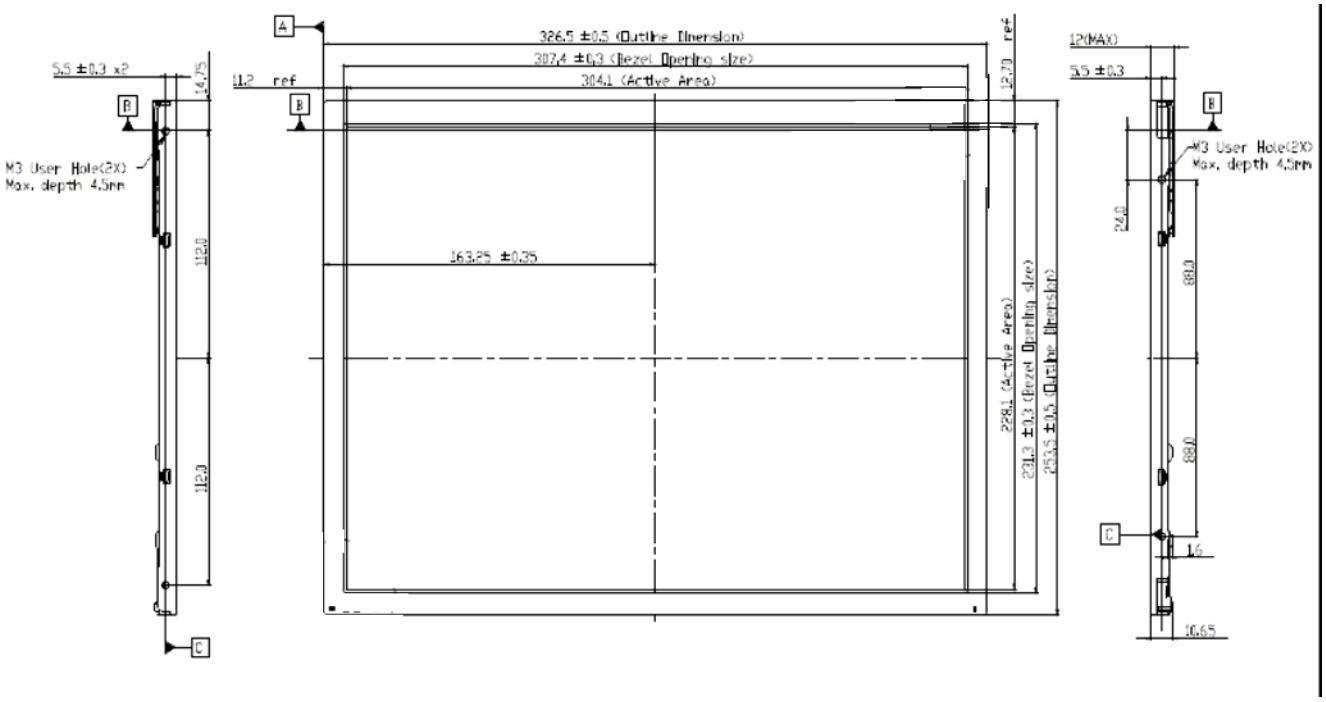
7. Reliability Test Criteria

Items	Required Condition	Note
Temperature Humidity Bias	50℃/80%,300 hours	
High Temperature Operation	60℃,300 hours	
Low Temperature Operation	0℃,300 hours	
Hot Storage	65℃,300 hours	
Cold Storage	-20℃,300 hours	
Thermal Shock Test	-20℃/30 min ,60℃/30 min ,100cycles	
Shock Test (Non-Operating)	50G,20ms,Half-sine wave,(±X, ±Y, ±Z)	
Vibration Test (Non-Operating)	1.5G, (10~200Hz, P-P) 30 mins/axis (X, Y, Z)	
On/off test	On/10 sec, Off/10 sec, 30,000 cycles	
ESD	Contact Discharge: ± 8KV, 150pF(330Ω) 1sec, 8 points, 25 times/ point Air Discharge: ± 15KV, 150pF(330Ω) 1sec, 8 points, 25 times/ point	Note 1

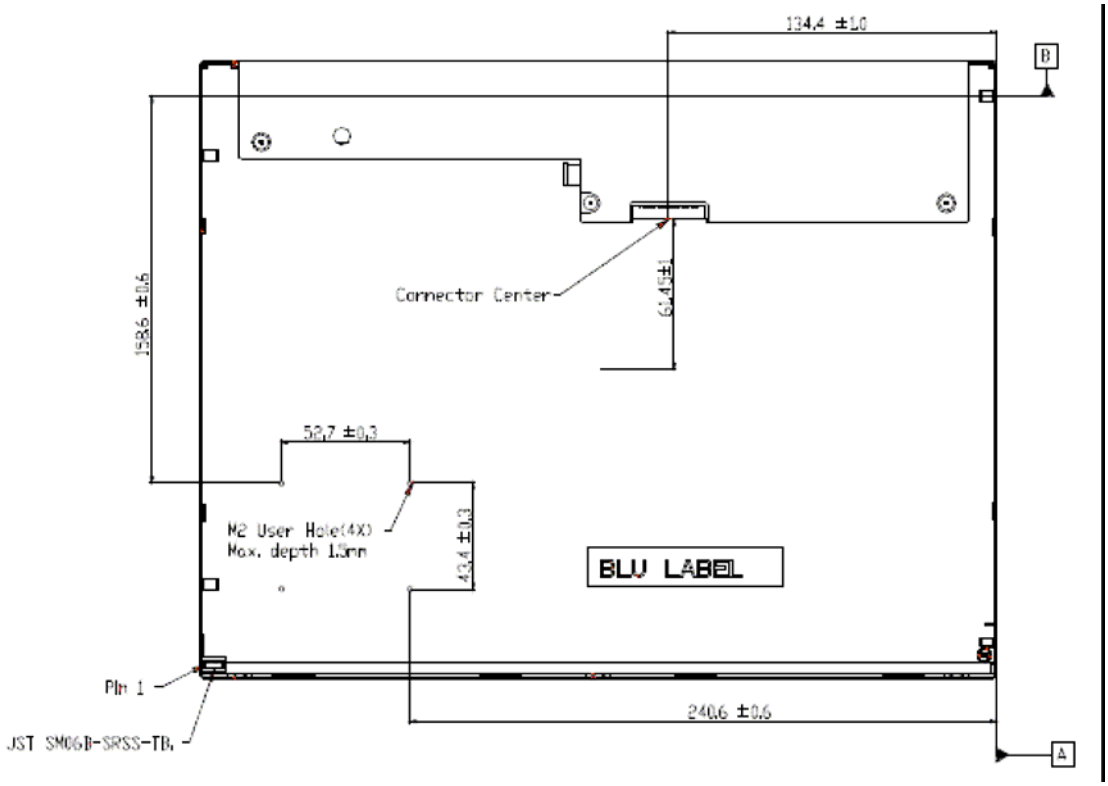
Note1: According to EN61000-4-2, ESD class B: Some performance degradation allowed. No data lost Self-recoverable. No hardware failures.

8. Mechanical Characteristics

8-1. LCM Outline Dimension (Front View)



8-2. LCM Outline Dimension (Rear View)



9. Lot number identification

The lot number shall be indicated on the back of the backlight case of each LCD.

TCG150XGLBA-A00 - □□ - □□ - □ MADE IN □□□□□
↓↓ ↓ ↓ ↓
1 2 3 4 5

No1. - No5. above indicate
1. Year code
2. Month code
3. Date
4. Version Number
5. Country of origin (TBD)

Year	2009	2010	2011	2012	2013	2014
Code	9	0	1	2	3	4

Month	Jan.	Feb.	Mar.	Apr.	May	Jun.
Code	1	2	3	4	5	6

Month	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Code	7	8	9	X	Y	Z

10. Warranty

10-1. Incoming inspection

Please inspect the LCD within one month after your receipt.

10-2. Production warranty

Kyocera warrants its LCD's for a period of 12 months from the ship date. Kyocera shall, by mutual agreement, replace or re-work defective LCD's that are shown to be Kyocera's responsibility.

11. Operating Precautions

1) Since front polarizer is easily damaged, please be cautious and not to scratch it.
2) Be sure to turn off power supply when inserting or disconnecting from input connector.
3) Wipe off water drop immediately. Long contact with water may cause discoloration or spots.
4) When the panel surface is soiled, wipe it with absorbent cotton or soft cloth.
5) Since the panel is made of glass, it may be broken or cracked if dropped or bumped on hard surface.
6) To avoid ESD (Electro Static Discharge) damage, be sure to ground yourself before handling TFT-LCD Module.
7) Do not open nor modify the module assembly.
8) Do not press the reflector sheet at the back of the module to any direction.
9) In case if a module has to be put back into the packing container slot after it was taken out from the container, do not press the center of the LED light bar edge. Instead, press at the far ends of the LED light bar edge softly. Otherwise the TFT Module may be damaged.
10) At the insertion or removal of the Signal Interface Connector, be sure not to rotate nor tilt the Interface Connector of the TFT Module.
11) TFT-LCD Module is not allowed to be twisted & bent even force is added on module in a very short time. Please design your display product well to avoid external force applying to module by end-user directly.
12) Small amount of materials without flammability grade are used in the TFT-LCD module. The TFT-LCD module should be supplied by power complied with requirements of Limited Power Source (IEC60950 or UL1950), or be applied exemption.
13) Severe temperature condition may result in different luminance, response time.
14) Continuous operating TFT-LCD display under low temperature environment may accelerate LED light bar exhaustion and reduce luminance dramatically.
15) The data on this specification sheet is applicable when LCD module is placed in landscape position.
16) Continuous displaying fixed pattern may induce image sticking. It's recommended to use screen saver or shuffle content periodically if fixed pattern is displayed on the screen.

SPEC

Spec No.	TQ3C-8EA00-E1BYD02-01
Date	July 10, 2009

TYPE : KTP150AGAC-C00

< Touch panel>

CONTENTS

Prototype

Issued
Date: Jul 10, 2009
KYOCERA
Hayato LCD Division

KYOCERA CORPORATION
KAGOSHIMA HAYATO PLANT
LCD DIVISION

This specification is subject to change without notice.
Consult Kyocera before ordering.

Original Issue Date	Designed by: Engineering dept.			Confirmed by: QA dept.	
	Prepared	Checked	Approved	Checked	Approved
June 24, 2009	S Ohtaka	W. Yano	M. Fujitani	J. Sakaguchi	

Warning

1. This Kyocera touch panel has been specifically designed for use only in electronic devices and industrial machines in the area of audio control, office automation, industrial control, home appliances, etc. The module should not be used in applications where the highest level of safety and reliability are required and module failure or malfunction of such module results in physical harm or loss of life, as well as enormous damage or loss. Such fields of applications include, without limitation, medical, aerospace, communications infrastructure, atomic energy control. Kyocera expressly disclaims any and all liability resulting in any way to the use of the touch panel in such applications.

2. Customer agrees to indemnify, defend and hold Kyocera harmless from and against any and all actions, claims, damages, liabilities, awards, costs, and expenses, including legal expenses, resulting from or arising out of Customer's use, or sale for use, or Kyocera touch panels in applications.

Caution

1. Kyocera shall have the right, which Customer hereby acknowledges, to immediately scrap or destroy tooling for Kyocera touch panels for which no Purchase Orders have been received from the Customer in a two-year period.

Revision record

Date	Designed by : Engineering dept.			Confirmed by : QA dept.	
	Prepared	Checked	Approved	Checked	Approved
Jul. 10, 2009	S. Ohtaka	W. Yano	M. Fujitani	J. Sakaguchi	

Rev.No.	Date	Page	Descriptions
01	Jul. 10, 2009	1	3-1. Mechanical specifications of touch panel ～Change “Outline dimensions”
		8	12. Outline drawing ～Change drawing “121A5099700” → “121A5099700-1”

1. Application

This document defines the specification of KTP150AGAC-C00. (RoHS Compliant)

2. Construction and outline

Touch panel : Analog type(Glass/Glass)
Surface film : Glare Anti-finger print treatment

3. Mechanical specifications

3-1. Mechanical specifications of touch panel

Item		Specification	Unit
Outline dimensions 1)		319.5 (W)× 243.5 (H) × 2.14 (D)	mm
Active area		305.9 (W) × 229.7 (H)	mm
Viewing area		307.9 (W) × 231.7 (H)	mm
Mass		TBD	g
Input		Radius-0.8 stylus or Finger	-
Actuation Force		0.1～2.0	N
Operating life	Striking(Finger-input) 2)	1 million	hits
	Sliding(Stylus–input) 3)	100 thousand	characters
Transmittance		Typ.80 (at full wavelength)	%
Reflectance		Typ.15(550nm)	%
Surface hardness		2H or more(Pencil hardness)	-

1) Please refer to outline drawing for details.
2) Striking test condition
Testing rod : Silicon rubber (Hardness:60°),Tip : R = 4.0,
Testing location : In active area
Input voltage : DC5V
Load : 2.94N
Cycle : 5hits/sec
Judgment : No defect in function
: No appearance defect which causes trouble to use.
*Dents, blurs and marks on surface film : neglected
3) Sliding test condition
Testing rod : Polyacetal resin, Tip : R = 0.8
Testing location : In active area
Input voltage : DC5V
Load : 2.45N
Input length : 10mm
Input speed : 50mm/sec
Sliding times : 10mm sliding (back and forth)counts as 2 times.
Judgment : No defect in function
: No appearance defect which causes trouble to use.
*Dents, blurs and marks on surface film : neglected

4. Absolute maximum ratings

4-1. Electrical absolute maximum ratings

Item	Symbol	Min.	Max.	Unit
Supply voltage for touch panel	V_{TP}	0	6.0	V
Input current of touch panel	I_{TP}	0	0.5	V

4-2. Environmental absolute maximum ratings

Item	Symbol	Min.	Max.	Unit
Operating temperature	T_{OP}	-30	85	°C
Storage temperature	T_{STO}	-40	95	°C
Operating humidity 1)	H_{OP}	10	2)	%RH
Storage humidity 1)	H_{STO}	10	2)	%RH
Vibration	-	3)	3)	-
Shock	-	4)	4)	-

1) Non-condensing.

2) Temp.≦40°C, 85%RH Max.
Temp.＞40°C, Absolute humidity shall be less than 85%RH at 40°C.

3) The touch panel is installed on the LCD using two sided tape.

Frequency	10～55 Hz	Acceleration value (0.3～9 m/s²)
Vibration width	0.15mm	
Interval	10-55-10 Hz 1 minutes	

2 hours in each direction X, Y, Z (6 hours total)
EIAJ ED-2531

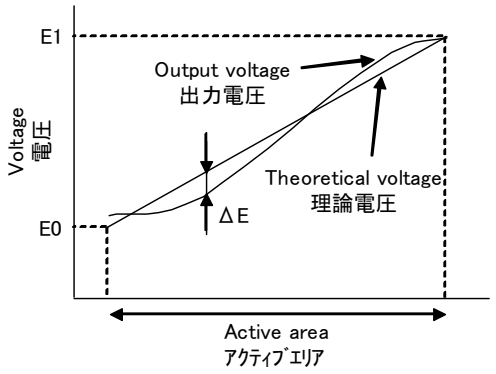
4) The touch panel is installed on the LCD using two sided tape.
Acceleration: 490 m/s², Pulse width: 11 ms
3 times in each direction: ±X, ±Y, ±Z
EIAJ ED-2531

5. Electrical characteristics

Item		Symbol	Condition	Min.	Typ.	Max.	Unit
Supply voltage for touch panel		V_{TP}	-	-	5.0	-	V
Terminal resistance	1)	xL-xR	-	TBD	-	TBD	Ω
		yU-yL	-	TBD	-	TBD	Ω
Linearity	2)	-	-	less than (±2.5)			%
Insulation resistance	3)	-	DC25V	50	-	-	MΩ
Chattering	4)	-	at ON/OFF	Less than 10			ms

1) Resistance between terminal xL and xR, or between yU and yL

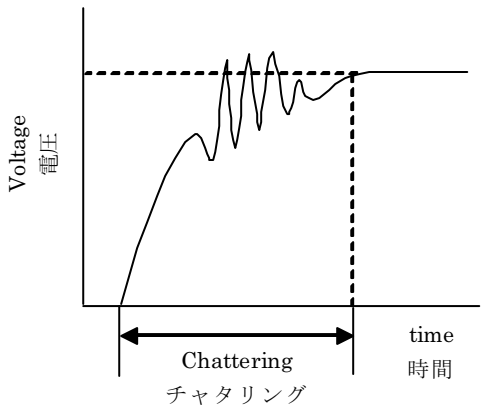
2) Apply 5VDC to the terminal xL-xR, and measure the output voltage at terminal y when a random input is applied in the active area. Measure the difference between the output and theoretical voltages. (Measure the actual voltage at the terminal using the same method.)



$$\text{Linearity リニアリティ}\ (\%) = \frac{\Delta Emax}{E1-E0}$$

3) Resistance between the upper and lower terminals.

4) Apply 5VDC to the terminal xL-xR, and measure the oscillation at terminal y when applying a random input in the active area. (Measure the oscillation at terminal x using the same method.)



6. Interface signals

No.	Symbol	Description
1	xR	x-Right terminal
2	yL	y-Lower terminal
3	xL	x-Left terminal
4	yU	y-Upper terminal

Touch panel side connector : 1mm pitch
Recommended matching connector : Series 9616 (IRISO)
: Series 9610 (IRISO)
: Series FMS (JST)

7. Design guidance for analog touch panel

7-1 Electrical (In customer's design, please remember the following considerations.)

1) Do not use the current regulated circuit.
2) Keep the current limit with top and bottom layer. (Please refer to “Electrical absolute maximum ratings” for details.)
3) Analog touch panel can not sense two points touching separately.
4) A contact resistance is appeared at the touch point between top and bottom layer. After this resistance has stable read of the touch panel position data.
5) Because noise of inverter or peripheral circuits may interfere signal of touch panel itself it is necessary to design carefully in advance to avoid these noise problem.

7-2 Software

1) Do the "User Calibration".
2) "User Calibration" may be needed with long term using. Include "User Calibration" menu in your software.
3) When drawing a line with a stylus, there may be a slight discontinuity when the stylus passes over a spacer-dot. If necessary, please provide a compensation feature within your software.

7-3 Mounting on display and housing bezel

1) Do not use an adhesive tape to bond it on the front of touch panel and hang it to the housing bezel.
2) This touch panel has an airtight but not watertight structure. Please not to use it for the applications requiring watertight or under the environments occurred condensation. If it is expected to be exposed to the environments that vapor, moisture or other liquids may seep inside a bezel, please be sure to take some measurements for drip-proof or waterproof by using sealing materials on the bezel.

8. Lot number identification

The lot number shall be indicated on the FPC tale.

KTP150AGAC-C00 - □□□□□□□□□ □□□

↓ ↓

1 2

No1. – No2. above indicate
1. Lot No. 9 digits
2. Serial 3 digits

9. Warranty

9-1. Incoming inspection

Please inspect the touch panel within one month after your receipt.

9-2. Production warranty

Kyocera warrants its touch panel's for a period of 12 months from the ship date. Kyocera shall, by mutual agreement, replace or re-work defective touch panel's that are shown to be Kyocera's responsibility

10. Precautions for use

10-1. Usage

1) DO NOT store in a high humidity environment for extended periods. Surface film degradation bubbles, and/or peeling off of the surface film may result.
2) Do not push or rub the touch panel's surface with hard to sharp objects such as knives, or the touch panel may be scratched.
3) When the touch panel is dirty, gently wipe the surface with a soft cloth, sometimes moistened by mild detergent or alcohol. If a hazardous chemical is dropped on the touch panel by mistake, wipe it off right away to prevent human contact.
4) Touch panel edges are sharp. Handle the touch panel with enough care to prevent cuts.
5) Always keep the touch panel free from condensation during testing. Condensation may permanently spot or stain the surface film.
6) Do not pull the touch panel FPC and do not bend the root of the wires. Housing should be designed to protect touch panel FPC from external stress.
7) This Kyocera touch panel has been specifically designed for use in general electronic devices, but not for use in a special environment such as usage in an active gas. Hence, when the touch panel is supposed to be used in a special environment, evaluate the touch panel thoroughly beforehand and do not expose the touch panel to chemicals such as an active gas.
8) The touch panel is made of glass. It may break when dropped, hit, or vibrated excessively. Please handle with care.

10-2. Installation of the touch panel

1) The touch panel shall be installed flat, without twisting or bending.
2) Please design the housing window so that its edges are between the active area and the effective area of the touch screen. Must maintain a gap between inside of bezel and touch panel to avoid malfunction or electrode damage of touch panel.
3) A transparent protection sheet is attached to the touch panel. Please remove the protection film slowly before use, paying attention to static electricity.
4) Do not scratch, or put any stress outside the active area of the touch panel when you install it on to an LCD, or it may damage the ITO pattern of the touch panel.

10-3. Operation

1) The touch panel shall be operated within the limits specified. Operation at values outside of these limits may shorten life, and/or harm display images.
2) Do not use the touch panel in environments conducive to the formation of condensation.

10-4. Storage

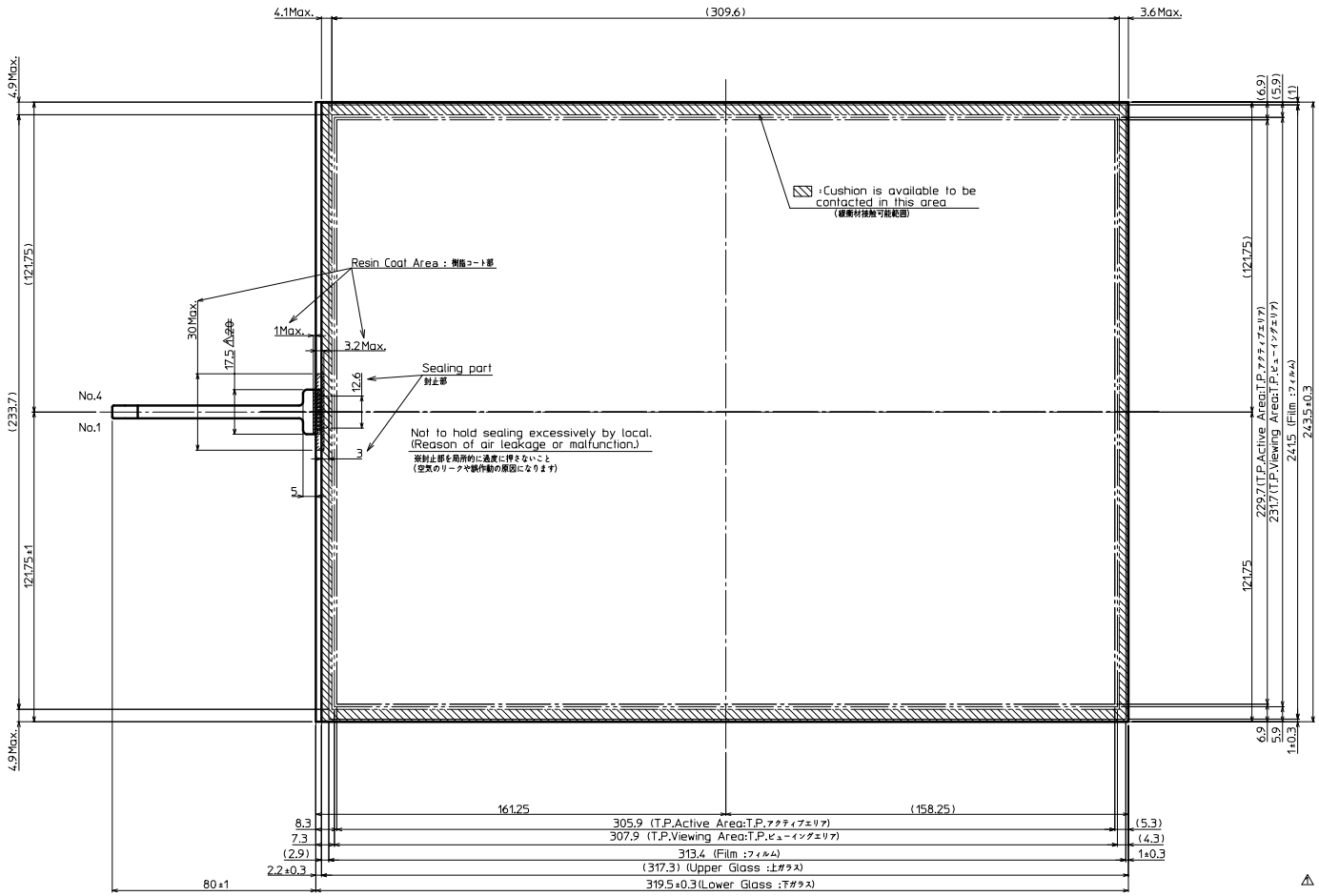
1) The touch panel shall be stored within the temperature and humidity limits specified. Store in a dark area, and protect the touch panel from direct sunlight or fluorescent light.
2) Always store the touch panel so that it is free from external pressure onto it. This will prevent the formation of Newton rings.

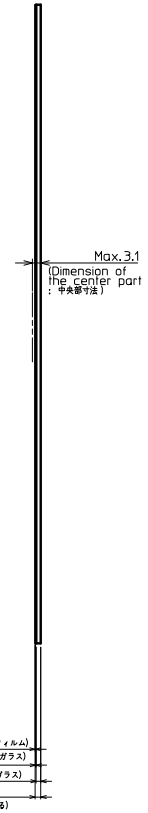
11. Reliability test data

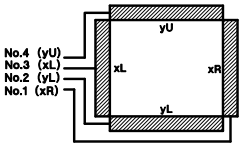
Test item	Test condition	Test time	Judgement
High temp. atmosphere	(95)°C	240h	Touch panel function : No defect Touch panel quality : No defect Current consumption : No defect
Low temp. atmosphere	(-40)°C	240h	Touch panel function : No defect Touch panel quality : No defect Current consumption : No defect
High temp. humidity atmosphere	(40)°C (90)% RH	240h	Touch panel function : No defect Touch panel quality : No defect Current consumption : No defect
Temp. cycle	(-40)°C 0.5h R.T. 0.5h (95)°C 0.5h	10cycles	Touch panel function : No defect Touch panel quality : No defect Current consumption : No defect
High temp. operation	(85)°C	500h	Touch panel function : No defect Touch panel quality : No defect Current consumption : No defect
Point activation	Silicon rubber R4, Hardness 60° Hitting force 2.9N Hitting speed 5 time/s	one million times	Touch panel function : No defect Terminal resistance : No defect Insulation resistance : No defect Linearity : No defect Actuation Force : No defect No appearance defect which affects touch panel function. 2)
Sliding	Polyacetal resin, Tip : R = 0.8 Hitting force 2.9N Hitting speed 5 time/s	one million times	Touch panel function : No defect Terminal resistance : No defect Insulation resistance : No defect Linearity : No defect Actuation Force : No defect No appearance defect which affects touch panel function. 2)

1) Test in active area.
2) Dents, blurs and marks on surface film: neglected.
3) 10mm sliding (back and forth) counts as 2 times.
4) Each test item uses a test touch panel only once. The tested touch panel is not used in any other tests.
5) The touch panel is tested in circumstances in which there is no condensation.
6) Temp. cycle test (Heat shock included): the LCD shall be tested after leaving it stabilize at room temperature for 2 hours after the last cycle.
7) An operational test was performed after the following conditions. First, the touch panel was left for a certain time under 5V voltages applied (without touch), Then it was left at room temperature (No VDC applied) for 2 hours.
8) The reliability test is not an out-going inspection.
9) The result of the reliability test is for your reference purpose only. The reliability test is conducted only to examine the touch panel's capability.

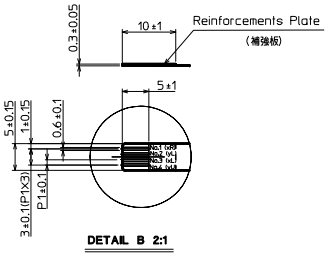
No	Description	Drawn	Checked	Checked	Approved
⚠	·Change Total Thickness & Tolerance. (2.1±0.2 → 2.14±0.25) ·Change Drawing Format size. (A2 → A1) ·Change Dimention (20→17.5)	'09.07.02 鶴崎	'09.07.03 矢野		'09.07.03 平川



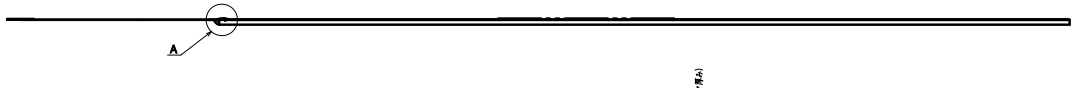


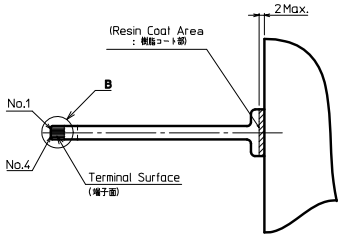


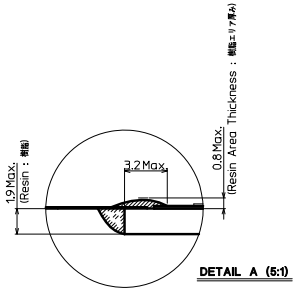
Touch Panel Pin-assign
(タッチパネル ピンアサイン)
※タッチ面側からのピンアサイン



DETAIL B 2:1



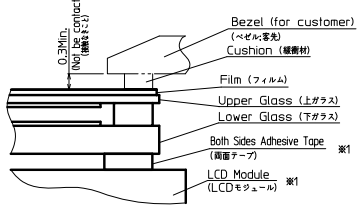




DETAIL A (5:1)

Note (注記)

	Name (名称)	Explanation (説明)
1	T.P.	Touch panel (タッチパネル)
2	T.P. Active Area (T.P.アクティブエリア)	Operating area of touch panel (タッチパネルの動作範囲)
3	T.P. Viewing Area (T.P.ビューイングエリア)	Warranty area of touch panel's appearance (タッチパネルの外観(傷・異物等)保証範囲)
		By giving pressure between the active area and the viewing area of the touch panel, there is a possibility that the touch panel will operate. (タッチパネルアクティブエリアとタッチパネルビューイングエリア間は荷重をかけた場合は、タッチパネルが動作する可能性があります。)



NTS

Precaution in use of touch panel.
(タッチパネル使用上の注意事項)
※1 In case of assemble to the LCD.
(LCDに取りつける場合)
1. Fix touch panel at LCD module and the rear side of touch panel.
(タッチパネルの固定はLCDモジュール側とタッチパネル裏面とで行なうこと)
2. Must maintain a gap between inside of bezel and touch panel to avoid malfunction or electrode damage of touch panel.
(ベゼル内側とタッチパネルの接触破壊、誤動作や電極破損の原因となります。)
3. Tolerance without indication: ±0.5
(指示無き公差)

Material 材質	Treatment 処理	Approved '09.06.25 平川	Checked	Checked '09.06.25 鶴崎	Drawn 木口	Scale 1:1 (2:1,5:1,NTS)	Title KTP150AGAC T.P. Outline Dimensions	KYOCERA	Year-Month-Day '09.06.16	Size 1
Quantity 製作数	Description; 備考 RoHS							Drawing No. 121A5099700-1		