

HITACHI

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FOR MESSRS. _____

DATE. Mar.06,2009

CUSTOMER'S ACCEPTANCE SPECIFICATIONS

SP14Q002-A1

C O N T E N T S

| No. | ITEM | SHEET No. | PAGE |
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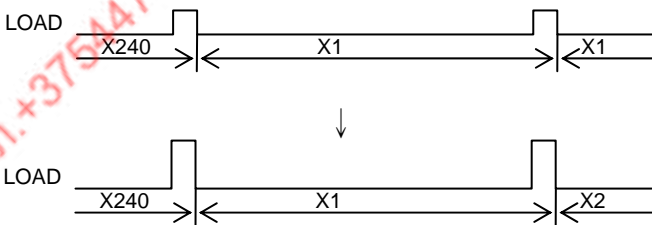
* WHEN PRODUCTS WILL BE DISCONTINUED , CUSTOMERS WILL BE INFORMED BY HITACHI WITH TWELVE MONTHS PRIOR ANNOUNCEMENT.

ACCEPTED BY; _____

PROPOSED BY; Dan Chung

| | | | | |
|---|------------|---------------------------|------|-------|
| KAOHSIUNG HITACHI ELECTRONICS CO.,LTD. | Sh. No. | 7B64PS 2701-SP14Q002-A1-6 | PAGE | 1-1/1 |
|---|------------|---------------------------|------|-------|

RECORD OF REVISION

| DATE | SHEET No. | SUMMARY | | | | | | | | | | | | | | | | | | | | |
|------------|--|--|--------|------|------|------|---|---|-----|---|--------|------|------|------|--------|---|--------|---|--------|---|-------|----|
| '99.03.18 | 7B64PS 2709- SP14Q002-A1-2 PAGE 9-2/2 | CHANGED: FPC:PITCH 1.0mm 16PINS ↓ PITCH 1.25mm 14PINS | | | | | | | | | | | | | | | | | | | | |
| '00.03.01 | 7B64PS 2704- SP14Q002-A1-3 PAGE 4-1/1 | CHANGED: STATIC ELECTRICITY <table border="1" style="margin: 5px auto; border-collapse: collapse;"> <thead> <tr> <th>SYMBOL</th> <th>MIN.</th> <th>MAX.</th> <th>UNIT</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">-</td> <td style="text-align: center;">-</td> <td style="text-align: center;">100</td> <td style="text-align: center;">-</td> </tr> </tbody> </table> <table border="1" style="margin: 5px auto; border-collapse: collapse;"> <thead> <tr> <th>SYMBOL</th> <th>MIN.</th> <th>MAX.</th> <th>UNIT</th> </tr> </thead> <tbody> <tr> <td>VESD 0</td> <td style="text-align: center;">-</td> <td style="text-align: center;">+/-100</td> <td style="text-align: center;">V</td> </tr> <tr> <td>VESD 1</td> <td style="text-align: center;">-</td> <td style="text-align: center;">+/-10</td> <td style="text-align: center;">KV</td> </tr> </tbody> </table> | SYMBOL | MIN. | MAX. | UNIT | - | - | 100 | - | SYMBOL | MIN. | MAX. | UNIT | VESD 0 | - | +/-100 | V | VESD 1 | - | +/-10 | KV |
| SYMBOL | MIN. | MAX. | UNIT | | | | | | | | | | | | | | | | | | | |
| - | - | 100 | - | | | | | | | | | | | | | | | | | | | |
| SYMBOL | MIN. | MAX. | UNIT | | | | | | | | | | | | | | | | | | | |
| VESD 0 | - | +/-100 | V | | | | | | | | | | | | | | | | | | | |
| VESD 1 | - | +/-10 | KV | | | | | | | | | | | | | | | | | | | |
| | 7B64PS 2705- SP14Q002-A1-3 PAGE 5-1/1 | CHANGED: 5.1 ELECTRICAL CHARACTERISTICS NOTE4 D0~D3=0,1,0,1.... ↓ NOTE4 TEST PATTERN IS ALL "Q". | | | | | | | | | | | | | | | | | | | | |
| | 7B64PS 2708- SP14Q002-A1-3 PAGE 8-1/3 | CHANGED: LOAD SEQUENCE:  | | | | | | | | | | | | | | | | | | | | |
| Feb.25,'04 | 7B64PS 2706- SP14Q002-A1-4 PAGE 6-1/2 | 8.3 TIMING OF POWER SUPPLY AND INTERFACE SIGNAL Added tDLD min. 50 Revised tCH max. 0~50 → 30 | | | | | | | | | | | | | | | | | | | | |
| May.14.'04 | 7B64PS 2704- SP14Q002-A1-5 PAGE 4-1/1 | 4.2 ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS CHANGED NOTE 2 0°C → -20°C ADDED NOTE 6. ADDED NOTE 7. | | | | | | | | | | | | | | | | | | | | |
| | 7B64PS 2705- SP14Q002-A1-5 PAGE 5-1/1 | 5.2 ELECTRICAL CHARACTERISTICS OF BACKLIGHT ADDED NOTE 1~4 | | | | | | | | | | | | | | | | | | | | |
| | 7B64PS 2710- SP14Q002-A1-5 PAGE 10-1/3 | 10.1 APPEARANCE INSPECTION CONDITION CHANGED ALL | | | | | | | | | | | | | | | | | | | | |

RECORD OF REVISION

| DATE | SHEET No. | SUMMARY | | | | | | | | | | | | | | | | | | | |
|--|---|---|------|--------|------|------|-----|----------------------------|---------|-----|-----|-----|------------------------------|--------|------|------|------|------|------|------|------|
| May.14.'04 | 7B64PS 2705- SP14Q002-A1-5 PAGE 5-1/1 | 5.1 ELECTRICAL CHARACTERISTICS ADDED | | | | | | | | | | | | | | | | | | | |
| | | <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%;">ITEM</th> <th style="width: 15%;">SYMBOL</th> <th style="width: 10%;">MIN.</th> <th style="width: 10%;">TYP.</th> <th style="width: 10%;">MAX</th> </tr> </thead> <tbody> <tr> <td>POWER SUPPLY VOLTAGE LOGIC</td> <td>VDD-VSS</td> <td>3.2</td> <td>3.3</td> <td>3.4</td> </tr> <tr> <td rowspan="3">RECOMMEND LC DRIVING VOLTAGE</td> <td rowspan="3">VDD-VO</td> <td>21.0</td> <td>22.0</td> <td>23.0</td> </tr> <tr> <td>20.0</td> <td>21.0</td> <td>22.0</td> </tr> <tr> <td>19.0</td> <td>20.0</td> <td>21.0</td> </tr> </tbody> </table> | ITEM | SYMBOL | MIN. | TYP. | MAX | POWER SUPPLY VOLTAGE LOGIC | VDD-VSS | 3.2 | 3.3 | 3.4 | RECOMMEND LC DRIVING VOLTAGE | VDD-VO | 21.0 | 22.0 | 23.0 | 20.0 | 21.0 | 22.0 | 19.0 |
| ITEM | SYMBOL | MIN. | TYP. | MAX | | | | | | | | | | | | | | | | | |
| POWER SUPPLY VOLTAGE LOGIC | VDD-VSS | 3.2 | 3.3 | 3.4 | | | | | | | | | | | | | | | | | |
| RECOMMEND LC DRIVING VOLTAGE | VDD-VO | 21.0 | 22.0 | 23.0 | | | | | | | | | | | | | | | | | |
| | | 20.0 | 21.0 | 22.0 | | | | | | | | | | | | | | | | | |
| | | 19.0 | 20.0 | 21.0 | | | | | | | | | | | | | | | | | |
| | 7B64PS 2706- SP14Q002-A1-5 PAGE 6-2/2 | 6.2 OPTICAL CHARACTERISTICS OF BACKLIGHT ADDED THE LCD DRIVING VOLTAGE SHOULD BE ADJUSTED AT THE VOLTAGE WHERE THE PEAK CONTRAST IS OBTAINED. | | | | | | | | | | | | | | | | | | | |
| Mar.06,'09 | 7B64PS 2712 SP14Q002-A1-6 PAGE 12-1/1 | 12. DESIGNATION OF LOT MARK Revised reversion from REV. — to REV.B | | | | | | | | | | | | | | | | | | | |
| <div style="color: red; font-size: 24px; transform: rotate(-45deg); opacity: 0.5; position: absolute; top: 50%; left: 50%; pointer-events: none;"> в Беларуси Заказ г.Минск vibeg и тел. +375447584780 email: minsk@vibeg.by www.vibeg.by </div> | | | | | | | | | | | | | | | | | | | | | |

3. GENERAL SPECIFICATIONS

| | |
|----------------------------|---|
| (1) PART NAME | SP14Q002-A1 |
| (2) MODULE SIZE | 167.0(W)mm×109.0(H)mm×10.0(D)mm (max.) |
| (3) EFFECTIVE DISPLAY AREA | 120 mm min×89 mm min. |
| (4) DOT SIZE | 0.345(W)min.×0.345(H)min |
| (5) DOT PITCH | 0.360(W)mm×0.360(H)mm |
| (6) DOT NUMBER | 320 (W) ×240 (H) |
| (7) DUTY RATIO | 1/240 |
| (8) LCD TYPE | FSTN BLACK / WHITE TYPE (NEGATIVE TYPE) THE UPPER POLARIZER IS ANTI-GLARE TYPE. THE BOTTOM POLARIZER IS TRANSMISSIVE TYPE. |
| (9) VIEWING DIRECTION | 6 O'CLOCK |
| (10) BACK LIGHT | COLD CATHODE FLUORESCENT LAMP. |

4. ABSOLUTE MAXIMUM RATINGS

4.1 ELECTRICAL ABSOLUTE MAXIMUM RATINGS.

VSS=0V:STANDARD

| ITEM | SYMBOL | MIN. | MAX. | UNIT | COMMENT |
|-----------------------------|---------|------|---------|------|------------|
| POWER SUPPLY FOR LOGIC | VDD-VSS | 0 | 6 | V | |
| POWER SUPPLY FOR LC DRIVING | VDD-VEE | 0 | 27.5 | V | |
| INPUT SIGNAL VOLTAGE | V_i | -0.3 | VDD+0.3 | V | NOTE 1 |
| INPUT SIGNAL CURRENT | i_i | 0 | 1 | A | |
| STATIC ELECTRICITY | VESD0 | - | ±100 | V | NOTE 2,3,4 |
| | VESD1 | - | ±10 | KV | NOTE 2,3,5 |

NOTE 1. DISP.OFF , FRAME , LOAD , CP , D0~D3.

NOTE 2. MAKE CERTAIN YOU ARE GROUNDED WHEN HANDLING LCM.

NOTE 3. ENERGY STORAGE CAPACITANCE 200PF , DISCHARGE RESISTANCE 250Ω
Ta=25°C , 60%RH.

NOTE 4. CONTACT DISCHARGE TO I/F CONNECTOR PINS.

NOTE 5. CONTACT DISCHARGE TO FRONT METAL BEZEL.

4.2 ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS.

| ITEM | OPERATING | | STORAGE | | OMMNT |
|---------------------|----------------|---------------------------------|----------------|---|----------------------|
| | MIN. | MAX. | MIN. | MAX. | |
| AMBIENT TEMPERATURE | 0°C | 50°C NOTE 5 | -20°C | 60°C | NOTE 2,3 |
| HUMIDITY | NOTE 1 | | NOTE 1 | | WITHOUT CONDENSATION |
| VIBRATION | - | 2.45m/s ² (0.25G) | - | 11.76m/s ² (1.2G) NOTE 5 | NOTE 4 |
| SHOCK | - | 29.4m/s ² (3 G) | - | 490.0m/s ² (50 G) NOTE 5 | XYZ DIRECTIONS |
| CORROSIVE GAS | NOT ACCEPTABLE | | NOT ACCEPTABLE | | |

NOTE 1 Ta ≤ 40°C : 85%RH max.

Ta > 40°C : ABSOLUTE HUMIDITY MUST BE LOWER THAN THE HUMIDITY OF 85% RH AT 40°C

NOTE 2 Ta AT -20°C < 48HRS, AT 60°C < 168HRS.

NOTE 3 BACKGROUND COLOR CHANGES SLIGHTLY DEPENDING ON AMBIENT TEMPERATURE. THE PHENOMENON IS REVERSIBLE.

NOTE 4 5Hz~100Hz (EXCEPT RESONANCE FREQUENCY AND X,Y,Z EACH DIRECTION WITHIN 1 HOUR)

NOTE 5 THE MODULE SHOULD OPERATED NORMALLY AFTER FINISH THE TEST.

NOTE 6 WHEN LCM WILL BE OPERATED AT 0°C , THE LIFE TIME OF CFL WILL BE REDUCED.

PLEASE MAKE SURE THAT THE CHARACTERISTICS OF THE INVERTER MEET THE CFL SPECIFICATION.

NOTE 7 OPERATION TEMPERATURE NOT INCLUDE CFL .

5. ELECTRICAL CHARACTERISTICS

5.1 ELECTRICAL CHARACTERISTICS

| ITEM | SYMBOL | CONDITION | MIN. | TYP. | MAX. | UNIT |
|--|---------|--------------------------------|--------|-------|--------|------|
| POWER SUPPLY VOLTAGE FOR LOGIC | VDD-VSS | - | 4.75 | 5.0 | 5.25 | V |
| | | | 3.2 | 3.3 | 3.4 | |
| POWER SUPPLY VOLTAGE FOR LC DRIVING | VEE-VSS | - | -23.1 | -22.0 | -20.9 | V |
| INPUT SIGNAL VOLTAGE NOTE 1 | Vi | H LEVEL | 0.8VDD | - | VDD | V |
| | | L LEVEL | 0 | - | 0.2VDD | V |
| POWER SUPPLY CURRENT FOR LOGIC NOTE 2 | IDD | VDD-VSS=5.0V VEE-VSS=-22.0V | - | 6.0 | - | mA |
| POWER SUPPLY CURRENT FOR LC DRIVING NOTE 2 | IEE | VDD-VSS=5.0V VEE-VSS=-22.0V | - | 5.0 | - | mA |
| RECOMMENDED LC DRIVING VOLTAGE NOTE 3 | VDD-V0 | Ta= 0°C , φ= 0° | 21 | 22 | 23 | V |
| | | Ta=25°C , φ= 0° | 20 | 21 | 22 | V |
| | | Ta=40°C , φ= 0° | 19 | 20 | 21 | V |
| FRAME FREQUENCY NOTE4 | fFRAME | - | 70 | 75 | 80 | Hz |

NOTE 1 : DISP.OFF , FRAME , LOAD , CP , D0~D3.

NOTE 2 : FLM=75HZ , TEST PATTERN IS ALL "Q". VDD-V0=21.0V , TA=25°C

NOTE 3 : RECOMMENDED LC DRIVING VOLTAGE MAY FLUCTUATE ABOUT ±1.0V BY EACH MODULE. TEST PATTERN IS ALL "Q"

NOTE 4 : PLEASE SET THE FRAME FREQUENCY SO AS TO AVOID FLICKER AND RIPPLING ON THE DISPLAY.

5.2 ELECTRICAL CHARACTERISTICS OF BACKLIGHT

| ITEM | SYMBOL | MIN. | TYP. | MAX. | UNIT | NOTE |
|----------------------------|--------|--------|------|------|------|---------|
| LAMP VOLTAGE | VL | - | 300 | - | V | Ta=25°C |
| FREQUENCY | fL | - | 70 | 85 | kHz | Ta=25°C |
| LAMP CURRENT | IL | 4 | 5 | 6 | mA | Ta=25°C |
| STARTING DISCHARGE VOLTAGE | VS | (1000) | - | - | V | Ta=25°C |

NOTE 1 : PLEASE MAKE SURE THAT YOUR INVERTER IS DESIGNED TO MEET THE ABOVE SPECIFICATIONS.

NOTE 2 : STARTING DISCHARGE VOLTAGE IS INCREASED WHEN LCM IS OPERATING AT LOWER TEMPERATURE , PLEASE CHECK THE CHARACTERISTICS OF YOUR INVERTER , SO AS TO ENSURE DISCHARGE AT LOW TEMPERATURE.

NOTE 3 : AVERAGE LIFE TIME OF CFL WILL BE DECREASED WHEN LCM IS OPERATING AT LOWER TEMPERATURE.

NOTE 4 : LOWER DRIVING FREQUENCY OF CFL INVERTER MAY CAUSE MECHANICAL NOISE OF THE BACKLIGHT SYSTEM . BEFORE DESIGNING THE INVERTER , PLEASE CONSIDER THE DRIVING FREQUENCY OF NOISE .

6. OPTICAL CHARACTERISTICS

6.1 OPTICAL CHARACTERISTICS OF LCD

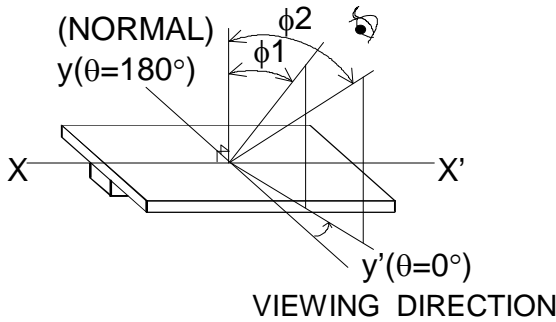
Ta=25°C(BACKLIGHT ON)

| ITEM | SYMBOL | CONDITIONAL | MIN. | TYP. | MAX. | UNIT | NOTE |
|----------------------|-----------------|--------------------------------|------|------|------|------|------|
| VIEWING AREA | $\phi 2-\phi 1$ | $K \geq 2.0$ | - | 40 | - | deg | 1,2 |
| CONTRAST RATIO | K | $\phi=0^\circ, \theta=0^\circ$ | - | 25 | - | - | 3 |
| RESPONSE TIME (RISE) | tr | $\phi=0^\circ, \theta=0^\circ$ | - | 120 | - | ms | 4 |
| RESPONSE TIME (FALL) | tf | $\phi=0^\circ, \theta=0^\circ$ | - | 150 | - | ms | 4 |

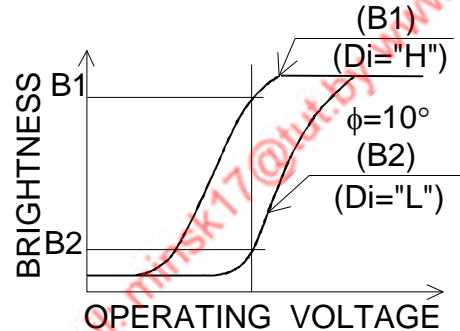
(MEASURE CONDITION BY HITACHI)

NOTE 1. DEFINITION OF θ AND ϕ

NOTE 3. DEFINITION OF CONTRAST "K"

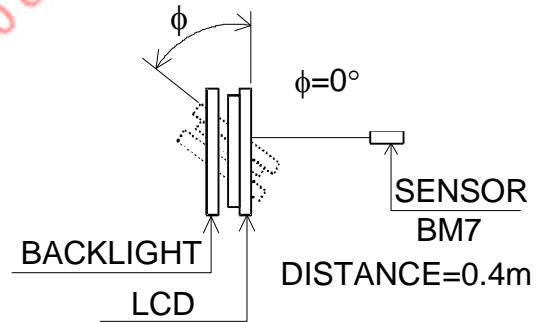
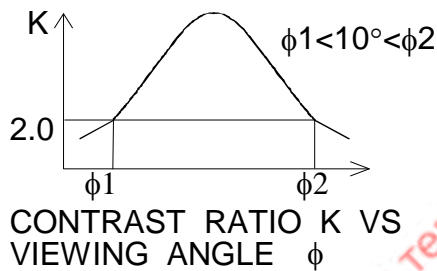


$$K = \frac{\text{BRIGHTNESS ON SELECTED DOT (B1)}}{\text{BRIGHTNESS ON NON-SELECTED DOT (B2)}}$$

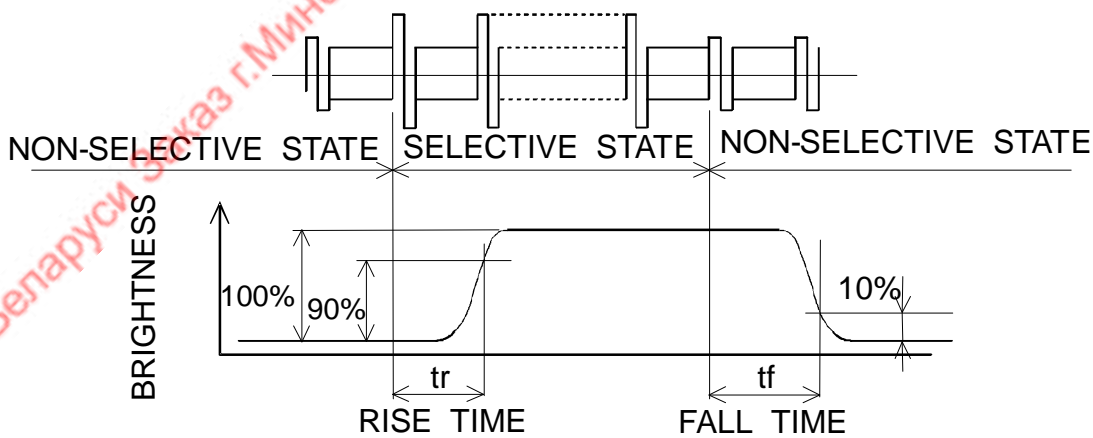


NOTE 2. DEFINITION OF VIEWING ANGLE

$\phi 1$ AND $\phi 2$.



NOTE 4. DEFINITION OF OPTICAL RESPONSE



6.2 OPTICAL CHARACTERISTICS OF BACKLIGHT

| I T E M | MIN. | TYP. | MAX. | UNIT | NOTE |
|-----------------------|------|------|------|-------------------|--------------------------|
| BRIGHTNESS | - | 140 | - | cd/m ² | IL=5mA NOTE 1,2 |
| RISE TIME | - | 5 | - | MINUTE | IL=5mA BRIGHTNESS 80% |
| BRIGHTNESS UNIFORMITY | - | - | ±30 | % | NOTE 1,3 |

CFL : INITIAL, Ta=25°C

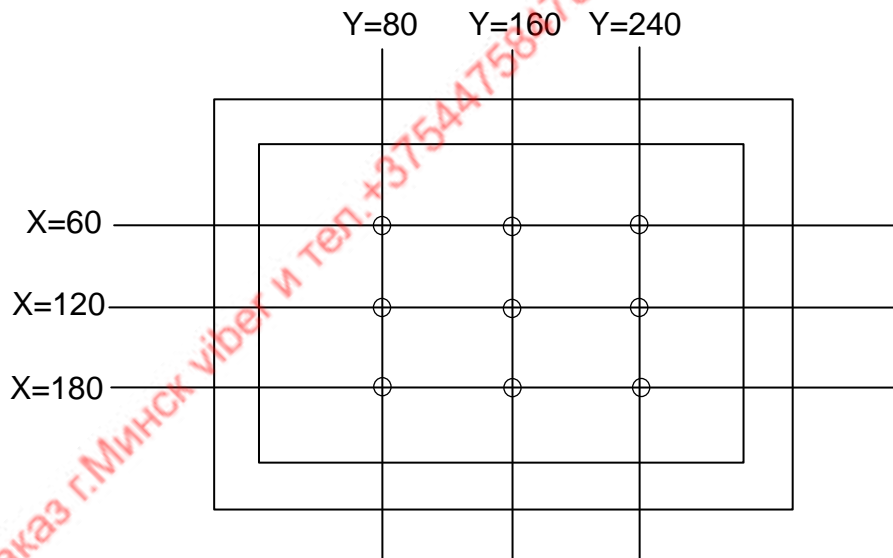
DISPLAY DATA SHOULD BE ALL "ON".

THE LCD DRIVING VOLTAGE SHOULD BE ADJUSTED AT THE VOLTAGE WHERE THE PEAK CONTRAST IS OBTAINED.

NOTE 1. MEASUREMENT AFTER 10 MINUTES OF CFL OPERATING.

NOTE 2. BRIGHTNESS CONTROL : 100%

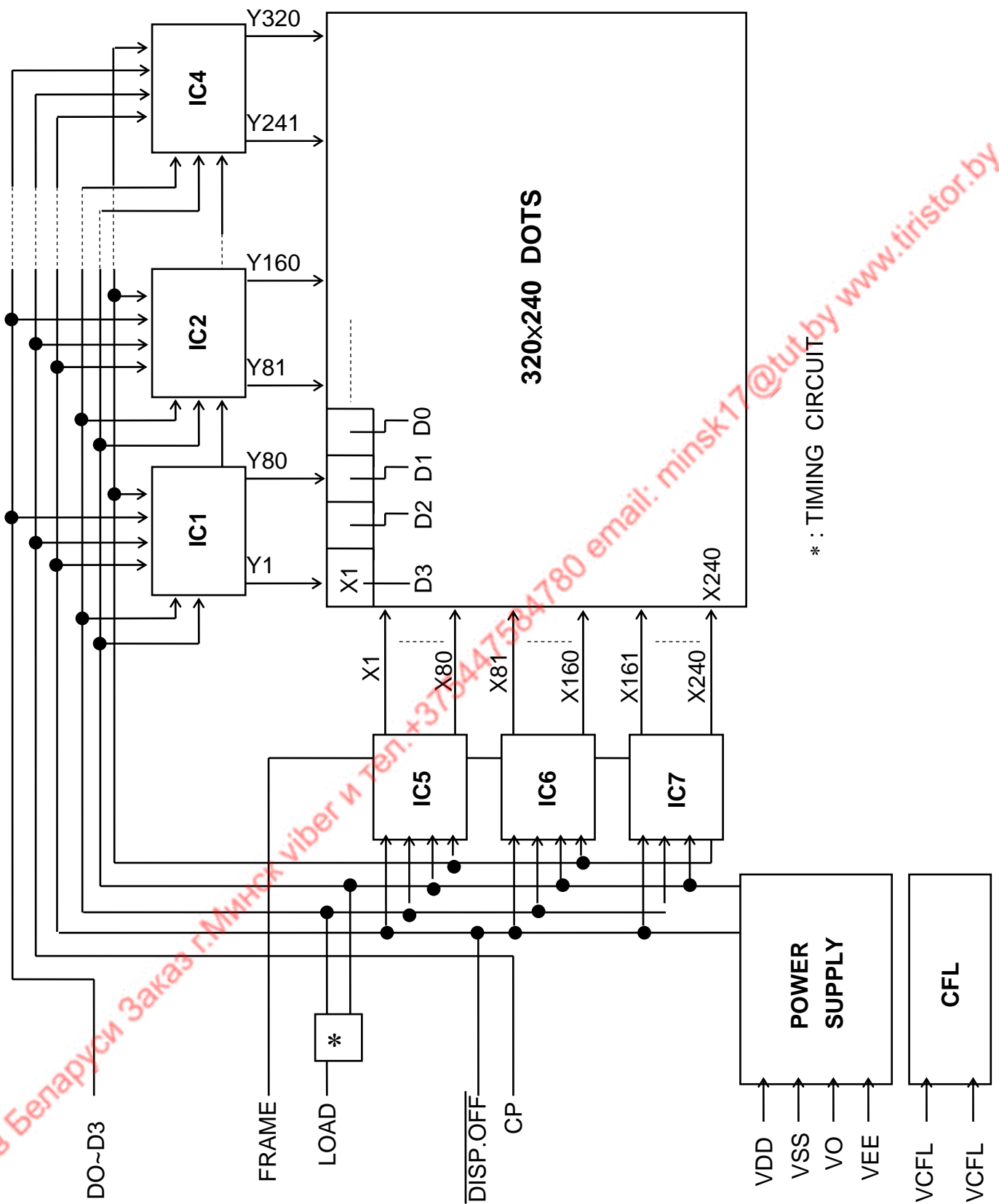
NOTE 3. MEASURE OF THE FOLLOWING 9 PLACES ON THE DISPLAY.



DEFINITION OF THE BRIGHTNESS TOLERANCE.

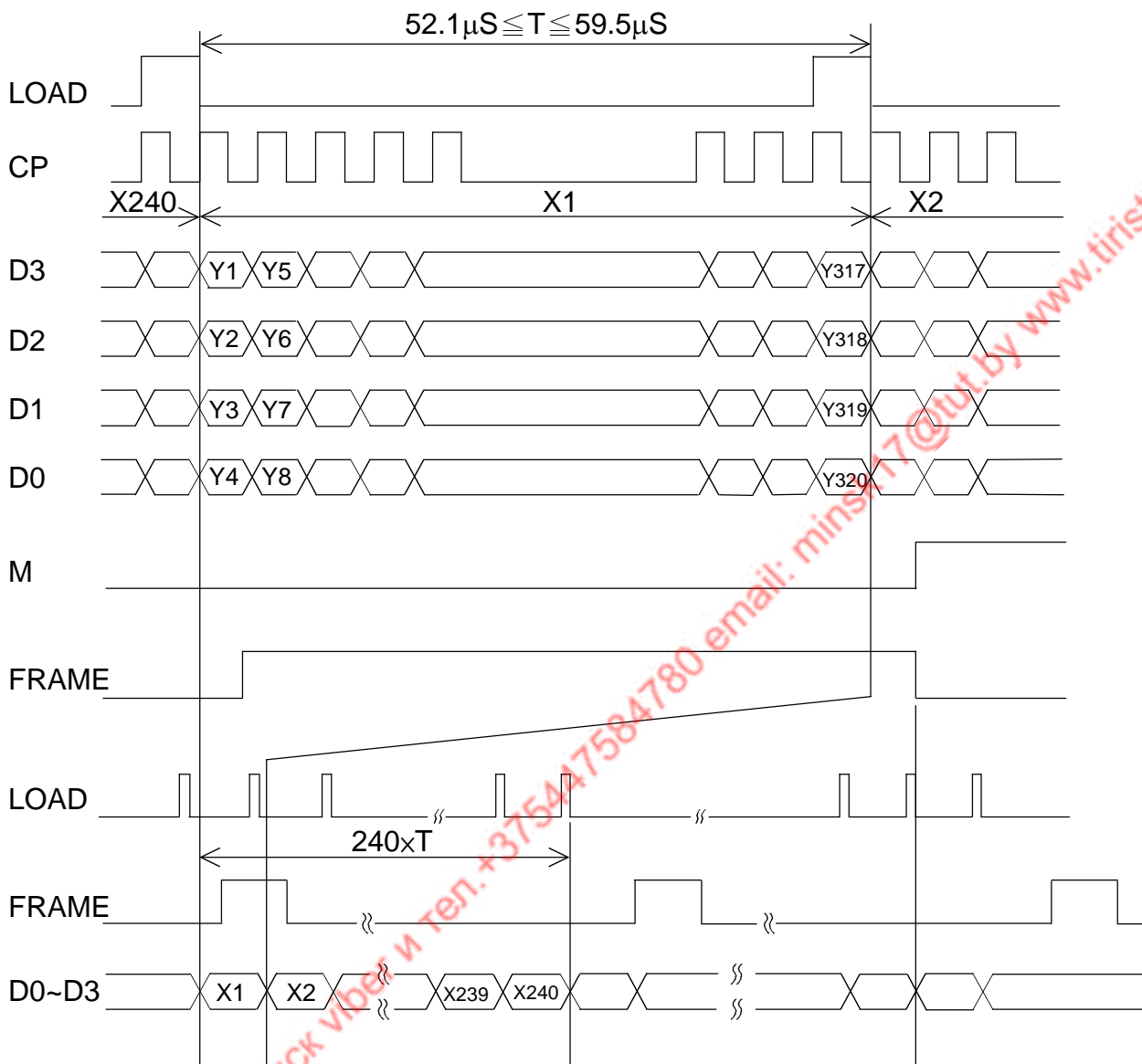
$$\left(\frac{\text{MAX OR MIN BRIGHTNESS} - \text{AVERAGE BRIGHTNESS}}{\text{AVERAGE BRIGHTNESS}} \right) \times 100\%$$

7. BLOCK DIAGRAM



8. INTERFACE TIMING CHART

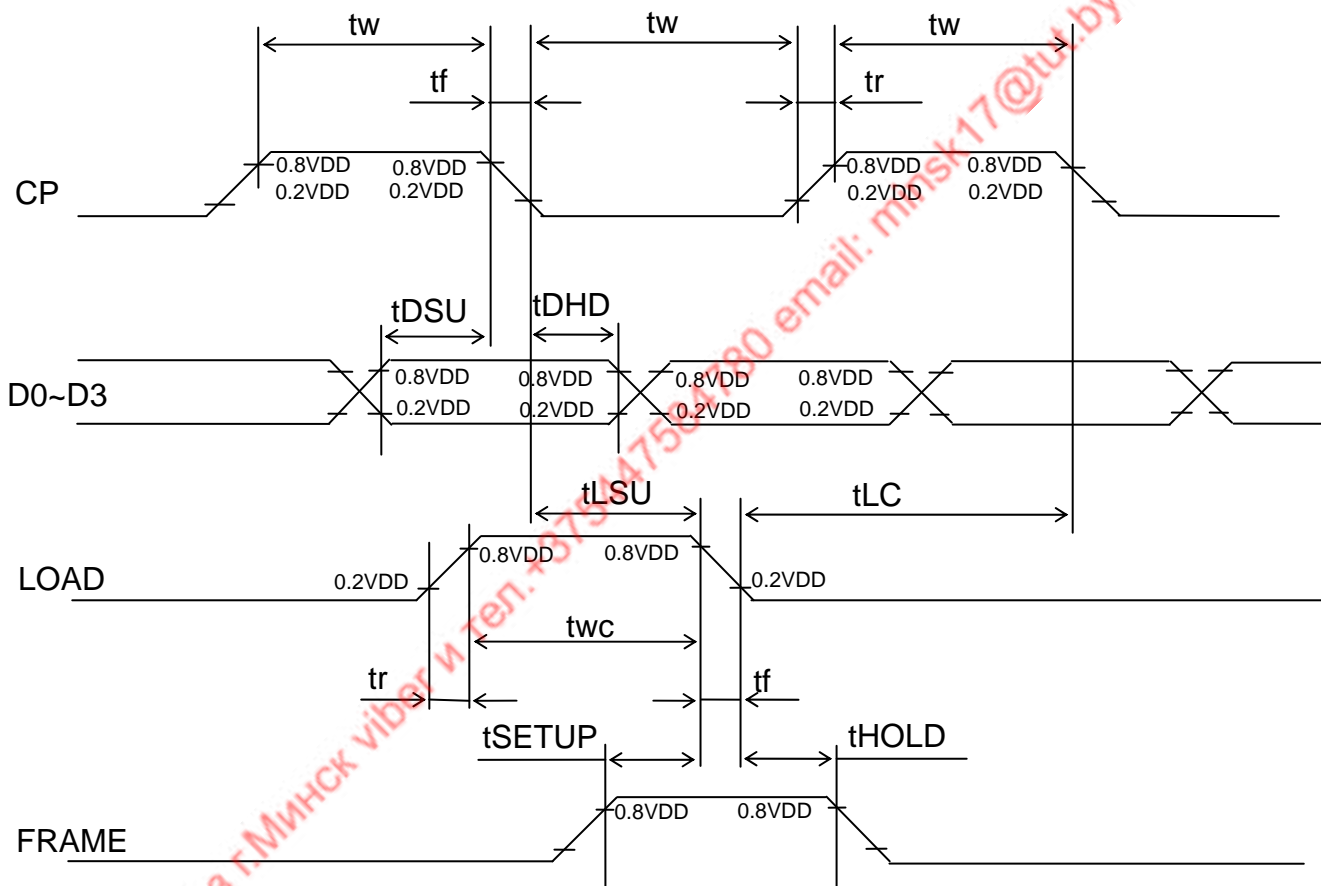
8.1 INTERFACE TIMING CHART



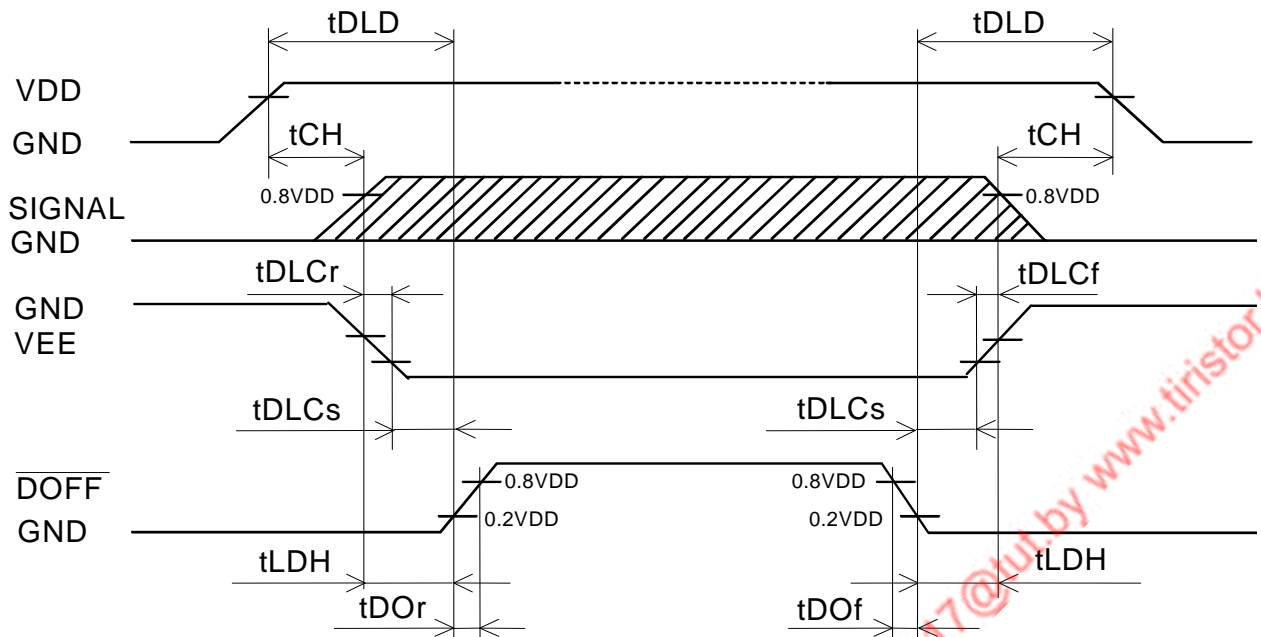
в Беларуси Заказ г.Минск вiber и тел. +375447584780 email: minsk17@tut.by www.tiristor.by

8.2 TIMING CHARACTERISTICS

| ITEM | SYMBOL | MIN. | TYP. | MAX. | UMIT |
|-----------------------|--------|------|------|------|------|
| CLOCK FREQUENCY | fCP | - | - | 6.5 | MHz |
| CLOCK PULSE WIDTH | tW | 63 | - | - | ns |
| CLOCK RISE, FALL TIME | tr,tf | - | - | 20 | ns |
| DATA SET UP TIME | tDSU | 50 | - | - | ns |
| DATA HOLD TIME | tDHD | 50 | - | - | ns |
| LOAD SET UP TIME | tLSU | 80 | - | - | ns |
| LOAD CLOCK TIME | tLC | 100 | - | - | ns |
| “FRAME” SET UP TIME | tSETUP | 100 | - | - | ns |
| “FRAME” HOLD TIME | tHOLD | 100 | - | - | ns |
| “LOAD” PULSE WIDTH | tWC | 125 | - | - | ns |



8.3 POWER ON/OFF TIMING SEQUENCE

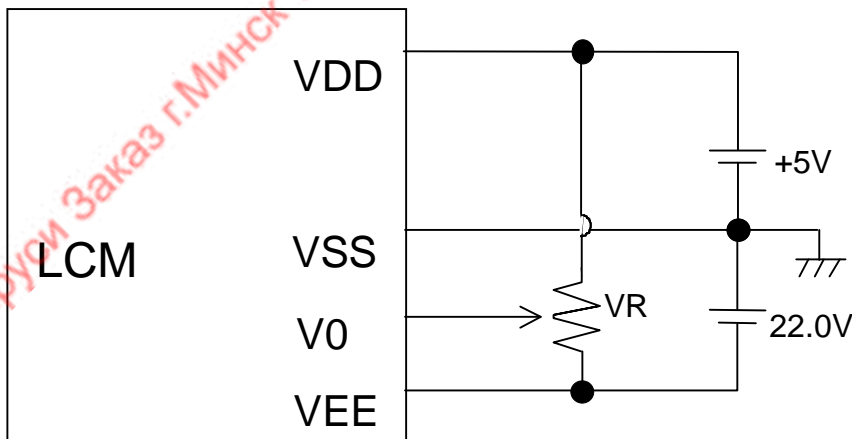


| SYMBOL | MIN. | MAX. | UNIT | COMMENT |
|--------|------|------|------|----------|
| tDLd | 50 | - | ms | (Note 1) |
| tCH | 0 | 30 | ms | |
| tLDH | 0 | - | ms | |
| tDOr | - | 100 | ns | (Note 2) |
| tDOF | - | 100 | ns | |
| tDLCr | 0 | - | ms | |
| tDLCf | 0 | - | ms | |
| tDLCs | 20 | - | ms | |

Note 1 Please keep the specified sequence because wrong sequence may cause permanent damage to the LCD panel.

Note 2 HITACHI recommends you to use $\overline{\text{DOFF}}$ function. display quality may deteriorate if you don't use $\overline{\text{DOFF}}$ function.

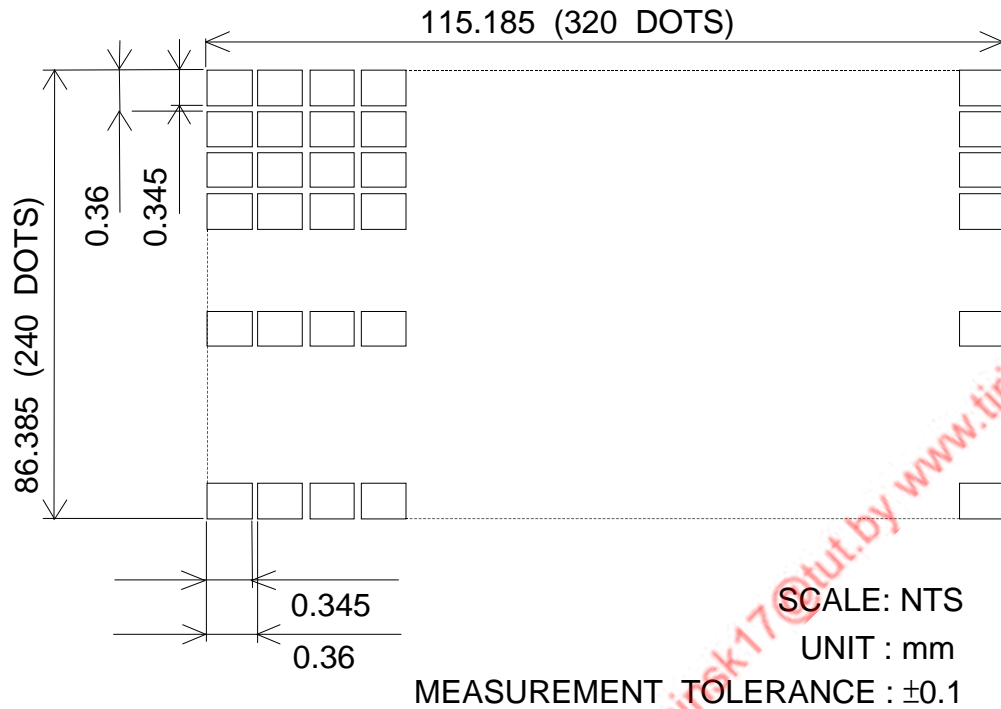
8.4 POWER SUPPLY FOR LCM



NOTE (1) VR : 10kOHM

NOTE (2) WE RECOMMEND TO ADD FUSE (1A) TO VDD LINE.

9.2 DISPLAY PATTERN



9.3 INTERFACE PIN CONNECTION

FFC : PITCH 1.25mm 14 PINS

| INTERFACE | PIN No. | SIGNAL | LEVEL | FUNCTION | |
|-----------|---------|----------|-------|------------------------------|--------------|
| LCM | I/F1 | 1 | D0 | H/L | DISPLAY DATA |
| | | 2 | D1 | | |
| | | 3 | D2 | | |
| | | 4 | D3 | | |
| | 5 | DISP.OFF | H/L | H : ON / L : OFF | |
| | 6 | FRAME | H | FIRST LINE MARKER | |
| | 7 | N.C | - | - | |
| | 8 | LOAD | H→L | DATA LATCH | |
| | 9 | CP | H→L | DATA SHIFT | |
| | 10 | VDD | - | POWER SUPPLY FOR LOGIC | |
| | 11 | VSS | - | GND | |
| | 12 | VEE | - | POWER SUPPLY FOR LC | |
| | 13 | V0 | - | OPERATING VOLTAGE LC DRIVING | |
| | 14 | VSS | - | GND | |

| INTERFACE | PIN No. | SIGNAL | LEVEL | FUNCTION | |
|-----------|------------|--------|-------|----------|----------------------|
| CFL | CFL I/F | 1 | VCFL | - | POWER SUPPLY FOR CFL |
| | | 2 | N.C | - | - |
| | | 3 | N.C | - | - |
| | | 4 | VCFL | - | CFL GND |

CFL I/F : J. A. E. / IL - G - 4S - S3C2

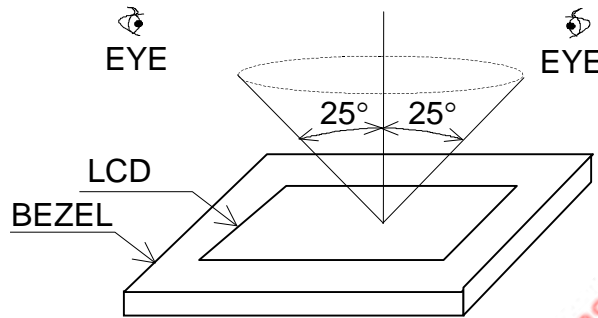
10. APPEARANCE STANDARD

10.1 APPEARANCE INSPECTION CONDITIONS

VISUAL INSPECTION SHOULD BE DONE UNDER THE FOLLOWING CONDITION.

- (1) THE INSPECTION SHOULD BE DONE UNDER IN THE DARK ROOM.
- (2) THE CFL SHOULD BE LIGHTED WITH THE PRESCRIBED INVERTER.
- (3) THE DISTANCE BETWEEN EYES OF AN INSPECTOR AND THE LCD MODULE IS 25 cm.
- (4) THE VIEWING ZONE IS SHOWN THE FIGURE .

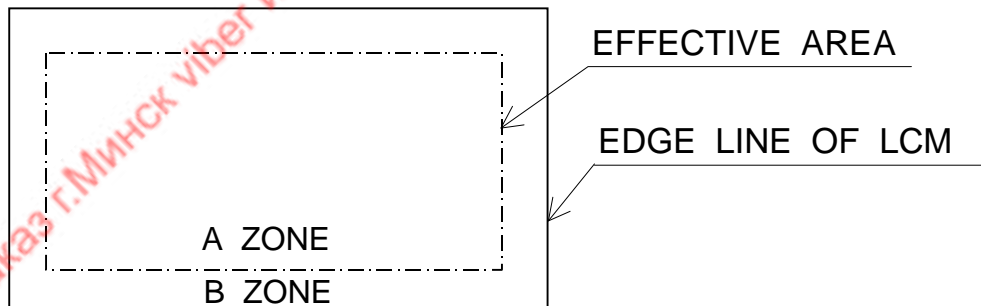
VIEWING ANGLE $\leq 25^\circ$



10.2 DEFINITION OF EACH ZONE

A ZONE : WITHIN THE VIEWING AREA SPECIFIED AT PAGE 9-1/2 OF THIS DOCUMENT.

B ZONE : AREA BETWEEN THE EDGE LINE OF LCD GLASS AND THE VIEWING AREA LINE SPECIFIED AT PAGE 9-1/2 OF THIS DOCUMENT.



10.3 APPEARANCE SPECIFICATION

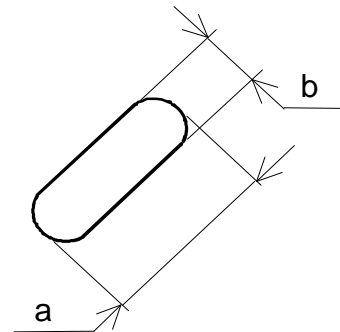
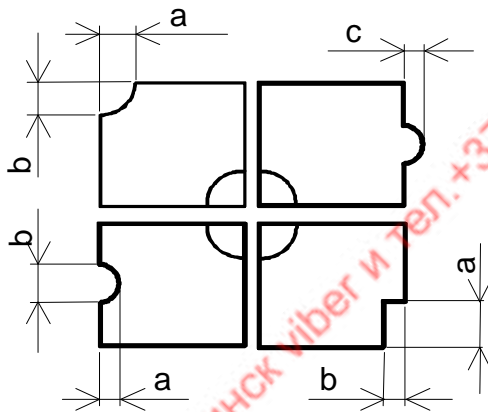
*) IF THE PROBLEM OCCURESS ABOUT THIS ITEM, THE RESPONSIBLE PERSON OF BOTH PARTY (CUSTOMER AND HITACHI) WILL DISCUSS MORE DETAIL.

| No. | ITEM | CRITERIA | | | A | B | |
|------------------------------------|--|---|---------------------------------|------------------------------|---|---|---|
| L C D | SCRATCHES | DISTINGUISHED ONE IS NOT ACCEPTABLE (TO BE JUDGED BY HITACHI LIMIT SAMPLE) | | | * | - | |
| | DENT | SAME AS ABOVE | | | * | - | |
| | WRINKLES IN POLARIZER | SAME AS ABOVE | | | * | - | |
| | BUBBLES | AVERAGE DIAMETER D(mm) | | MAXIMUM NUMBER ACCEPTABLE | | 0 | - |
| | | $D \leq 0.2$ | | IGNORE | | | |
| | | $0.2 < D \leq 0.3$ | | 12 | | | |
| | | $0.3 < D \leq 0.5$ | | 3 | | | |
| | | $0.5 < D$ | | NONE | | | |
| | STAINS, FOREIGN MATERIALS DARK SPOT | FILAMENTOUS | | | 0 | - | |
| | | LENGTH L(mm) | WIDTH W(mm) | MAXIMUM NUMBER ACCEPTABLE | | | |
| | | $L \leq 2.0$ | $W \leq 0.03$ | IGNORE | | | |
| | | $L \leq 3.0$ | $0.03 < W \leq 0.05$ | 6 | | | |
| | | $L \leq 2.5$ | $0.05 < W \leq 0.01$ | 1 | | | |
| | | ROUND | | | 0 | - | |
| | | AVERAGE DIA- METER D(mm) | MAXIMUM NUMBER ACCEPTABLE | MINIMUM SIZE | | | |
| | | $D < 0.2$ | IGNORE | - | | | |
| | | $0.2 \leq D < 0.33$ | 8 | 10mm | | | |
| | | $0.33 \leq D$ | NONE | - | | | |
| | TOTAL | | FILAMENTOUS + ROUND = 10 | | | | |
| | THOSE WIPED OUT EASILY ARE ACCEPTABLE | | | | 0 | 0 | |
| COLOR TONE | TO BE JUDGED BY HITACHI LIMIT SAMPLE | | | 0 | - | | |
| COLOR UNIFORMITY | SAME AS ABOVE | | | 0 | - | | |
| PINHOLE | AVERAGE DIAMETER D(mm) | | MAXIMUM NUMBER ACCEPTABLE | | 0 | - | |
| | $D \leq 0.15$ | | IGNORE | | | | |
| | $0.15 < D \leq 0.3$ | | 10 | | | | |
| | $C \leq 0.015$ | | IGNORE | | | | |
| CONTRAST IRREGULARITY (SPOT) | AVERAGE DIAMETER D(mm) | CONTRAST | MAXIMUM NUMBER ACCEPTABLE | MINIMUM SPACE | 0 | - | |
| | $D \leq 0.25$ | TO BE JUDGED BY HITACHI | IGNORE | - | | | |
| | $0.25 < D \leq 0.35$ | | 10 | 20mm | | | |
| | $0.35 < D \leq 0.5$ | | 4 | 20mm | | | |
| | $0.5 < D$ | | NONE | - | | | |

| No. | ITEM | CRITERIA | | | | A | B |
|-------------|---|----------------------------------|-----------------|---------------------------------|-----------------|---|---|
| L C D | CONTRAST IRREGULARITY (LINE) (FILAMENTOUS) | WIDTH D(mm) | LENGTH L(mm) | MAXIMUM NUMBER ACCEPTABLE | MINIMUM SIZE | 0 | - |
| | | $W \leq 0.25$ | $L \leq 1.2$ | 2 | 20mm | | |
| | | $W \leq 0.2$ | $L \leq 1.5$ | 3 | 20mm | | |
| | | $W \leq 0.15$ | $L \leq 2.0$ | 3 | 20mm | | |
| | | $W \leq 0.1$ | $L \leq 3.0$ | 4 | 20mm | | |
| | TOTAL | 6 | | | | | |
| | RUBBING SCRATCH | TO BE JUDGED BY HITACHI STANDARD | | | | 0 | - |

| No. | ITEM | CRITERIA | | |
|-----|--|--------------------|---------------|----------|
| | DARK SPOTS, WHITE SPOTS) FOREIGN MATERIALS (SPOT) | $D \leq 0.4$ | IGNORE | |
| | | $D > 0.4$ | NONE | |
| | FOREIGN MATERIALS (LINE) | $W \leq 0.2$ | $L < 2.5$ | ≤ 1 |
| | | $W \leq 0.2$ | $L > 2.5$ | NONE |
| | | $W > 0.2$ | NONE | |
| | SCRATCHES | $W \leq 0.1$ | IGNORE | |
| | | $0.1 < W \leq 0.2$ | $L \leq 11.0$ | ≤ 1 |
| | | $0.1 < W \leq 0.2$ | $L \leq 11.0$ | NONE |
| | | $W > 0.2$ | NONE | |

NOTE (1)



$$\frac{a+b}{2} = D \dots \text{AVERAGE DIAMETER}$$

$$C \dots \text{SALIENT}$$

(1) DEFINITION OF LENGTH L AND WIDTH W



11. PRECAUTION IN DESIGN

11.1 LC DRIVING VOLTAGE (VEE) AND VIEWING ANGLE RANGE.

SETTING VEE OUT OF THE RECOMMENDED CONDITION WILL BE A CAUSE FOR A CHANGE OF VIEWING ANGLE RANGE.

11.2 PRECAUTIONS AGAINST STATIC CHARGE

AS THIS MODULE CONTAINS C-MOS LSIS , IT IS NOT STRONG AGAINST ELECTROSTATIC DISCHARGE.

MAKE CERTAIN THAT THE OPERATOR'S BODY IS CONNECTED TO THE GROUND THROUGH A LIST BAND ETC. AND DON'T TOUCH I/F PINS DIRECTLY.

11.3 POWER ON SEQUENCE

INPUT SIGNALS SHOULD NOT BE APPLIED TO LCD MODULE BEFORE POWER SUPPLY VOLTAGE IS APPLIED AND REACHES TO SPECIFIED VOLTAGE (VDD).

IF ABOVE SEQUENCE IS NOT KEPT, C-MOS LSIS OF LCD MODULES MAY BE DAMAGED DUE TO LATCH UP PHENOMENON.

11.4 PACKAGING

(1) NO LEAVING PRODUCTS IS PREFERABLE IN THE PLACE OF HIGH HUMIDITY FOR A LONG PERIOD OF TIME. FOR THEIR STORAGE IN THE PLACE WHERE TEMPERATURE IS 35°C OR HIGHER, SPECIAL CARE TO PREVENT THEM FROM HIGH HUMIDITY IS REQUIRED. A COMBINATION OF HIGH TEMPERATURE AND HIGH HUMIDITY MAY CAUSE THEM POLARIZATION DEGRADATION AS WELL AS BUBBLE GENERATION AND POLARIZER PEEL-OFF. PLEASE KEEP THE TEMPERATURE AND HUMIDITY WITHIN THE SPECIFIED RANGE FOR USE AND STORAGE.

(2) SINCE POLARIZERS TEND TO BE EASILY DAMAGED, THEY SHOULD BE HANDLED FULL WITH CARE SO AS NOT TO GET THEM TOUCHED, PUSHED OR RUBBED.

(3) AS THE ADHESIVES USED FOR ADHERING POLERIZERS ARE MADE OF ORGANIC SUBSTANCES WHICH WILL BE DETERIORATED BY A CHEMICAL REACTION WITH SUCH CHEMICALS AS ACETONE, TULUENE, ETHANOL AND ISOPROPYL ALCOHOL. THE FOLLOWING SOLVENTS ARE RECOMMENDED FOR USE:

NORMAL HEXANE

PLEASE CONTACT US WHEN IT IS NECESSARY FOR YOU TO USE CHEMICALS.

(4) LIGHTLY WIPE TO CLEAN THE DIRTY SURFACE WITH ABSORBENT COTTON WASTE OR OTHER SOFT MATERIAL LIKE CHAMOIS , SOAKED IN THE CHEMICALS RECOMMENDED WITHOUT SCRUBBING IT HARDLY. TO PREVENT THE DISPLAY SURFACE FROM DAMAGE AND KEEP THE APPEARANCE IN GOOD STATE, IT IS SUFFICIENT, IN GENERAL, TO WIPE IT WITH ABSORBENT COTTON.

- (5) IMMEDIATELY WIPE OFF SALIVA OR WATER DROP ATTACHED ON THE DISPLAY AREA BECAUSE ITS LONG PERIOD ADHERANCE MAY CAUSE DEFORMATION OR FADED COLOR ON THE SPOT.
- (6) FOGGY DEW DEPOSITED ON THE SURFACE AND DUE TO COLDNESS WILL BE CAUSE FOR POLARIZER DAMAGE, STAIN AND DIRT ON PRODUCT. WHEN NECESSARY TO TAKE OUT THE PRODUCTS FROM SOME PLACE AT LOW TEMPERATURE FOR TEST, ETC.
IT IS REQUIRED FOR THEM TO BE WARMED UP IN A CONTAINER ONCE AT THE TEMPERATURE HIGHER THAN THAT OF ROOM.
- (7) TOUCHING THE DISPLAY AREA AND CONTACT TERMINALS WITH BARE HANDS AND CONTAMINATING THEM ARE PROHIBITED, BECAUSE THE STAIN ON THE DISPLAY AREA AND POOR INSULATION BETWEEN TERMINALS ARE OFTEN CAUSED BY BEING TOUCHED BY BARE HANDS. (THERE ARE SOME COSMETICS DETRIMENTAL TO POLARIZERS.)
- (8) IN GENERAL THE QUALITY OF GLASS IS FRAGILE SO THAT IT TENDS TO BE CRACKED OR CHIPPED IN HANDLING, SPECIALLY ON ITS PERIPHERY. BE CAREFUL NOT TO GIVE IT SHARP SHOCK CAUSED BY DROPPING DOWN, ETC.

11.5 CAUTION FOR OPERATION

- (1) IT IS AN INDISPENSABLE CONDITION TO DRIVE LCDS WITHIN THE SPECIFIED VOLTAGE LIMIT SINCE THE HIGHER VOLTAGE THAN THE LIMIT CAUSES THE SHORTER LCD LIFE . AN ELECTROCHEMICAL REACTION DUE TO DIRECT CURRENT CAUSES LCDS UNDESIRABLE DETERIORATION, SO THAT THE USE OF DIRECT CURRENT DRIVER SHOULD BE AVOIDED.
- (2) RESPONSE TIME WILL BE EXTREMELY DELAYED AT LOWER TEMPERATURE THAN THE SPECIFIED OPERATING TEMPERATURE RANGE AND ON THE OTHER HAND AT HIGHER TEMPERATURE LCD'S SHOW DARK BULE COLOR IN THEM . HOWEVER THOSE PHENOMENA DO NOT MEAN MALFUNCTION OR OUT OF ORDER WITH LCD'S WHICH WILL COME BACK IN THE SPECIFIED OPERATING TEMPERATURE RANGE.
- (3) IF THE DISPLAY AREA IS PUSHED HARD DURING OPERATION , SOME FONT WILL BE ABNORMALLY DISPLAYED BUT IT RESUMES NORMAL CONDITION AFTER TURNING OFF ONCE.
- (4) A SLIGHT DEW DEPOSITING ON TERMINALS IS A CAUSE FOR ELECTROCHEMICAL REACTION RESULTING IN TERMINAL OPEN CIRCUIT. USAGE UNDER THE RELATIVE CONDITION OF 40°C 50%RH OR LESS IS REQUIRED.

11.6 STORAGE

IN CASE OF STORING FOR A LONG PERIOD OF TIME (FOR INSTANCE, FOR YEARS) FOR THE PURPOSE OF REPLACEMENT USE , THE FOLLOWING WAYS ARE RECOMMENDED.

- (1) STORAGE IN A PLOYETHYLENE BAG WITH THE OPENING SEALED SO AS NOT TO ENTER FRESH AIR OUTSIDE IN IT , AND WITH NO DESICCANT.
- (2) PLACING IN A DARK PLACE WHERE NEITHER EXPOSURE TO DIRECT SUNLIGHT NOR LIGHT IS, KEEPING TEMPERATURE IN THE RANGE FROM 0 DEGREE C TO 35 DEGREE.
- (3) STORING WITH NO TOUCH ON POLARIZER SURFACE BY ANYTHING ELSE. (IT IS RECOMMENDED TO STORE THEM AS THEY HAVE BEEN CONTAINED IN THE INNER CONTAINER AT THE TIME OF DELIVERY FROM US.)

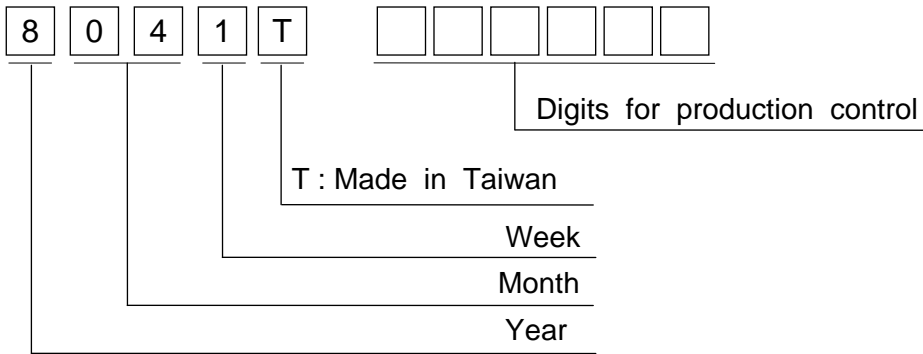
11.7 SAFETY

- (1) IT IS RECOMMENDABLE TO CRASH DAMAGED OR UNNECESSARY LCDS INTO PIECES AND WASH OFF LIQUID CRYSTAL BY EITHER OF SOLVENTS SUCH AS ACETONE AND ETHANOL, WHICH SHOUD BE BURNED UP LATER.
- (2) WHEN ANY LIQUID LEAKED OUT OF A DAMAGED GLASS CELL COMES IN CONTACT WITH YOUR HANDS, PLEASE WASH IT OFF WELL WITH SOAP AND WATER.

12. DESIGNATION OF LOT MARK

12.1 LOT MARK

Lot mark is consisted of 5 digits for production lot and 6 digits for production control.



| Year | Figure in lot mark |
|------|--------------------|
| 2009 | 9 |
| 2010 | 0 |
| 2011 | 1 |
| 2012 | 2 |
| 2013 | 3 |

| Month | Figure in lot mark | Month | Figure in lot mark |
|-------|--------------------|-------|--------------------|
| Jan. | 01 | Jul. | 07 |
| Feb. | 02 | Aug. | 08 |
| Mar. | 03 | Sep. | 09 |
| Apr. | 04 | Oct. | 10 |
| May | 05 | Nov. | 11 |
| Jun. | 06 | Dec. | 12 |

| Week (day in calendar) | Figure in lot mark |
|------------------------|--------------------|
| 1~7 | 1 |
| 8~14 | 2 |
| 15~21 | 3 |
| 22~28 | 4 |
| 29~31 | 5 |

12.2 SERIAL No.

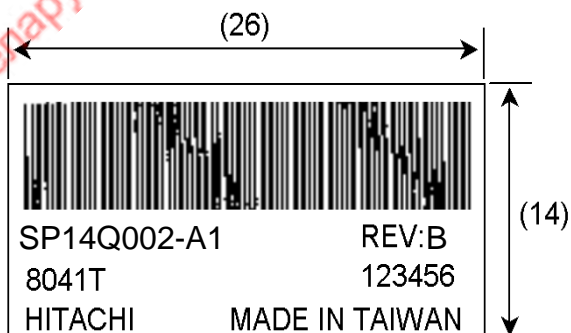
Serial No. is consisted of 6 digits number (000001~999999).

12.3 LOCATION OF LOT MARK

Label is bring attached on the back side of module.

12.4 REVISION(Rev.) CONTROL

| Rev No. | ITEM |
|---------|--|
| — | Mcount IC:MN73099HED(Panasonic) Transistor:2SA1036K(ROHM) |
| B | Mcount IC:IT7001M(ITE) Transistor:2SA1576(ROHM) |



13. PRECAUTION FOR USE

- (1) A LIMIT SAMPLE SHOULD BE PROVIDED BY THE BOTH PARTIES ON AN OCCASION WHEN THE BOTH PARTIES AGREED ITS NECESSITY. JUDGEMENT BY A LIMIT SAMPLE SHALL TAKE EFFECT AFTER THE LIMIT SAMPLE HAS BEEN ESTABLISHED AND CONFIRMED BY THE BOTH PARTIES.
- (2) ON THE FOLLOWING OCCASIONS, THE HANDLING OF THE PROBLEM SHOULD BE DECIDED THROUGH DISCUSSION AND AGREEMENT BETWEEN RESPONSIBLE PERSONS OF THE BOTH PARTIES.
 - (1) WHEN A QUESTION IS ARISEN IN THE SPECIFICATIONS.
 - (2) WHEN A NEW PROBLEM IS ARISEN WHICH IS NOT SPECIFIED IN THIS SPECIFICATIONS.
 - (3) WHEN AN INSPECTION SPECIFICATIONS CHANGE OR OPERATING CONDITION CHANGE IN CUSTOMER IS REPORTED TO HITACHI, AND SOME PROBLEM IS ARISEN IN THIS SPECIFICATION DUE TO THE CHANGE.
 - (4) WHEN A NEW PROBLEM IS ARISEN AT THE CUSTOMER'S OPERATING SET FOR SAMPLE EVALUATION IN THE CUSTOMER SITE.

THE PRECAUTION THAT SHOULD BE OBSERVED WHEN HANDLING LCM HAVE BEEN EXPLAINED ABOVE. IF ANY POINTS ARE UNCLEAR OR IF YOU HAVE ANY REQUESTS , PLEASE CONTACT HITACHI.