

LIQUID CRYSTAL DISPLAY MODULE

Product Specification

| | |
|--------------------------|-----------------|
| CUSTOMER | |
| CUSTOMER PART NO. | |
| PRODUCT NUMBER | LMR67802 |

| Product Mgr | Quality Mgr | Engineering | Document Control |
|-------------|-------------|-------------|------------------|
| | | | |
| Date: | Date: | Date: | Date: |

TABLE OF CONTENTS

| | | |
|----------|---------------------------------------------|-----------|
| 1 | MAIN FEATURES | 4 |
| 2 | MECHANICAL SPECIFICATION..... | 5 |
| 2.1 | MECHANICAL CHARACTERISTICS | 5 |
| 2.2 | LABELLING & MARKING..... | 5 |
| 2.3 | MECHANICAL DRAWING | 6 |
| 3 | ELECTRICAL SPECIFICATION..... | 7 |
| 3.1 | ABSOLUTE MAXIMUM RATINGS | 7 |
| 3.2 | ELECTRICAL CHARACTERISTICS | 7 |
| 3.3 | INTERFACE PIN ASSIGNMENT | 8 |
| 3.4 | BLOCK DIAGRAM | 9 |
| 3.5 | POWER SUPPLY CIRCUIT | 9 |
| 3.6 | ROM ADDRESS..... | 10 |
| 3.7 | RAM ADDRESS..... | 10 |
| 3.8 | TIMING CHARACTERISTICS | 10 |
| 3.9 | CHARACTER FONT | 11 |
| 4 | OPTICAL SPECIFICATION..... | 13 |
| 4.1 | OPTICAL CHARACTERISTICS..... | 13 |
| 5 | BACKLIGHT SPECIFICATION | 15 |
| 5.1 | EDGE CCFL B/L OPERATING RANGE..... | 15 |
| 6 | QUALITY ASSURANCE SPECIFICATION..... | 16 |
| 6.1 | CONFORMITY | 16 |
| 6.2 | DELIVERY ASSURANCE | 16 |
| 7 | RELIABILITY SPECIFICATION | 21 |
| 7.1 | RELIABILITY TESTS | 21 |
| 7.2 | LIFE TIME..... | 21 |
| 8 | HANDLING PRECAUTIONS..... | 22 |

REVISION RECORD

| Rev. | Date | Page | Chapt. | Comment | ECN no. |
|------|----------|------|--------|--------------------------------------|---------|
| A | 05/04/06 | -- | -- | Initial DCA Release, ROHS Compliant | E3116 |
| B | 07/06/06 | 4 | 1 | Update dimensions and main features. | E3176 |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

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1 MAIN FEATURES

UNIT=MM

| ITEM | CONTENTS |
|-----------------------|----------------------------------|
| Display Format | 320 x RGB x 234 Dots |
| Colour | R.G.B. Stripe, 32K |
| Overall Dimensions | 148.0 (W) x 120.0 (H) x 19.4 Max |
| Viewing Area | 115.48 (W) x 86.91 (H) |
| LCD Type | TFT |
| Mode | Transmissive - Negative |
| Viewing Angle | 6:00 |
| Duty Ratio | 1/234 |
| IC Controller/Driver | Hit1270 |
| Backlight Type | Edge CCFL |
| DC/DC Converter | Built-In |
| Operating Temperature | 0°C ~ +60°C |
| Storage Temperature | -25°C ~ +80°C |
| ROHS Compliant | Yes |

2 MECHANICAL SPECIFICATION

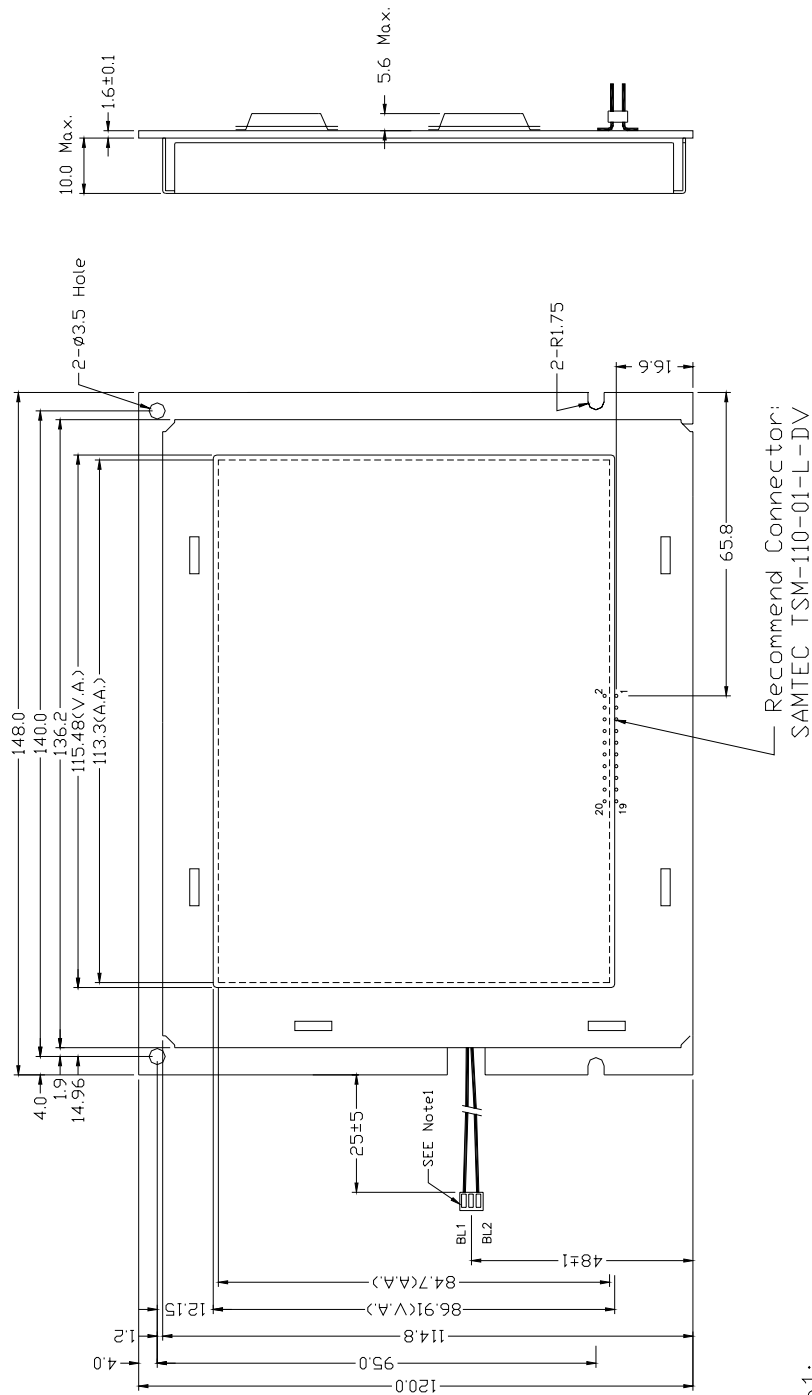
2.1 MECHANICAL CHARACTERISTICS

| ITEM | CHARACTERISTIC | UNIT |
|----------------------|----------------------------------|------|
| Display Format | 320 x RGB x 234 Dots | -- |
| Overall Dimensions | 148.0 (W) x 120.0 (H) x 19.4 Max | mm |
| Viewing Area | 115.48 (W) x 86.91 (H) | mm |
| Active Area | 113.3 (W) x 84.7 (H) | mm |
| Dot Pitch | 0.118 (W) x 0.362 (H) | mm |
| IC Controller/Driver | Hit1270 | |

2.2 LABELLING & MARKING

| |
|--------------------------------------|
| DENSITRON LMR67802 TAIWAN YYMM |
|--------------------------------------|

2.3 MECHANICAL DRAWING



Note 1:
HOUSING :JST XHP-3
BASE POST:JST B3B-XH-A(180°)
BASE POST:JST S3B-XH-A(90°)

| | | |
|-------------|----------|--------|
| Product No. | LMR67802 | REV. B |
|-------------|----------|--------|

| | |
|------|--------|
| Page | 6 / 22 |
|------|--------|

3 ELECTRICAL SPECIFICATION

3.1 ABSOLUTE MAXIMUM RATINGS

VSS = 0 V, Ta = 25 °C

| Item | Symbol | Min | Max | Unit | Note |
|-----------------------|-----------------|-----|-----|------|--------|
| Power Supply Voltage | V _{DD} | 0 | 5.5 | V | |
| Operating Temperature | Top | 0 | +60 | °C | |
| Storage Temperature | Tst | -25 | +80 | °C | Note 1 |

Note 1: <48 hrs @20~90% RH, <1000 hrs @20~65% RH.

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3.2 ELECTRICAL CHARACTERISTICS

VSS = 0 V, Ta = 25 °C

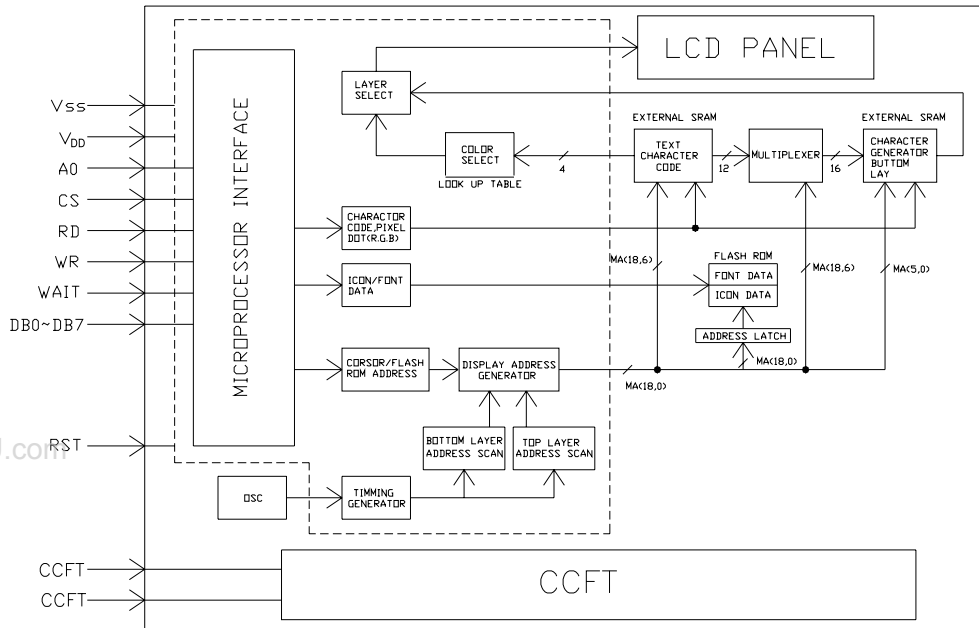
| Item | Symbol | Condition | Min | Typ | Max | Unit |
|----------------------------|---------------------------------|----------------------|--------------------|-----|--------------------|------|
| Power Supply for Logic | V _{DD} | Ta = 25°C | 4.8 | 5.0 | 5.2 | V |
| Input Voltage | V _{IHC} | Ta = 25°C | 0.8V _{DD} | -- | V _{DD} | V |
| | V _{ILC} | Ta = 25°C | 0 | -- | 0.2V _{DD} | V |
| LCD Module Driving Voltage | V _{DD} -V _O | Ta = 25°C | 0 | -- | 10.0 | V |
| Current Consumption | * I _{DD} | V _{DD} = 5V | -- | 550 | -- | mA |

* I_{DD} measurement condition is for all patterns ON

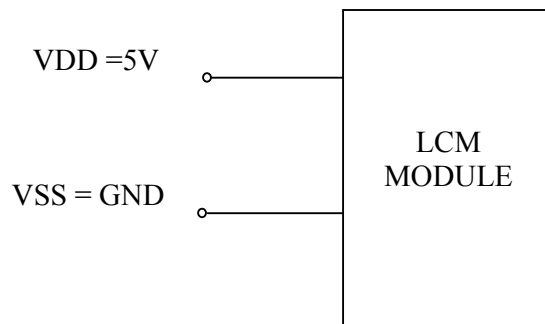
3.3 INTERFACE PIN ASSIGNMENT

| Pin No. | Function | Level | Description |
|---------|----------|-------|------------------------------------------------|
| 1 | Vss | --- | Power Supply (OV,GND) |
| 2 | Vdd | --- | Power Supply for Logic |
| 3 | N/C | --- | No connection |
| 4 | /RD | H/L | Read signal |
| 5 | /WR | H/L | Write signal |
| 6 | A0 | H/L | H : parameter register L : command register |
| 7 | DB0 | H/L | Display Data 0 |
| 8 | DB1 | H/L | Display Data 1 |
| 9 | DB2 | H/L | Display Data 2 |
| 10 | DB3 | H/L | Display Data 3 |
| 11 | DB4 | H/L | Display Data 4 |
| 12 | DB5 | H/L | Display Data 5 |
| 13 | DB6 | H/L | Display Data 6 |
| 14 | DB7 | H/L | Display Data 7 |
| 15 | /CS | H/L | Chip select |
| 16 | /RST | L | Reset signal |
| 17 | N/C | --- | No connection |
| 18 | FG | --- | Frame Ground |
| 19 | /Wait | H/L | H : release command L : busy |
| 20 | N/C | --- | No connection |

3.4 BLOCK DIAGRAM



3.5 POWER SUPPLY CIRCUIT



3.6 ROM ADDRESS

- 8M bit ROM (512K x 16 bit)
- Address: 0~3FFF: 5x8 character font like English and Japanese (can't be erased)
- Address: 4000~7FFF: 5x8 character font like English European character (can't be erased)
- Address: 8000~BFFF: 5x8 character font like English European character (can't be erased)
- Address: C000~13FFF: 16x16 character font like English and number (can't be erased)
- Address: 14000~17FFF: Reserved (can't be erased)
- Address: 18000~1FFFF: report.txt to describe the starting and ending address of every picture (photo) and character (controlled by software)
- Address: 20000~7FFFF: developed by user (can be erased)

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3.7 RAM ADDRESS

- Text Mode: 0h ~ 487Fh
- Graphics Mode: 18000h ~ 24A7Fh

3.8 TIMING CHARACTERISTICS

Note: Please reference the manufacturer's datasheet for the Hit1270 controller.

3.9 CHARACTER FONT

3.9.1 Address: 0 ~ 3FFF ----- 5X8 character font like English and Japanese.

| | | Lower[3..0] | | | | | | | | | | | | | | | |
|-------------|---|-------------|---|---|---|----|---|---|---|---|---|---|---|---|---|---|---|
| | | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
| Lower[7..4] | 0 | | | | | | | | | | | | | | | | |
| | 1 | | | | | | | | | | | | | | | | |
| | 2 | | ! | " | # | \$ | % | & | ' | (|) | * | + | , | - | . | / |
| | 3 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | : | ; | < | = | > | ? |
| | 4 | @ | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O |
| | 5 | P | Q | R | S | T | U | V | W | X | Y | Z | [| \ |] | ^ | _ |
| | 6 | ` | a | b | c | d | e | f | g | h | i | j | k | l | m | n | o |
| | 7 | p | q | r | s | t | u | v | w | x | y | z | { | | } | ~ | + |
| | 8 | | | | | | | | | | | | | | | | |
| | 9 | | | | | | | | | | | | | | | | |
| | A | ア | カ | サ | シ | ス | セ | ソ | タ | チ | ツ | テ | ト | ナ | ニ | ノ | フ |
| | B | ヘ | フ | ブ | パ | ピ | プ | ペ | ポ | マ | ミ | ム | メ | モ | ヤ | ユ | ヨ |
| | C | ラ | リ | ル | レ | ロ | ワ | ヰ | ヱ | ヰ | ヱ | ヰ | ヱ | ヰ | ヱ | ヰ | ヱ |
| | D | ヰ | ヱ | ヰ | ヱ | ヰ | ヱ | ヰ | ヱ | ヰ | ヱ | ヰ | ヱ | ヰ | ヱ | ヰ | ヱ |
| | E | ヰ | ヱ | ヰ | ヱ | ヰ | ヱ | ヰ | ヱ | ヰ | ヱ | ヰ | ヱ | ヰ | ヱ | ヰ | ヱ |
| | F | | | | | | | | | | | | | | | | |

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3.9.2 Address: 4000 ~ 7FFF ----- 5X8 character font like English European character.

| | | Lower[3..0] | | | | | | | | | | | | | | | |
|-------------|---|-------------|---|---|---|----|---|---|---|---|---|---|---|---|---|---|---|
| | | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
| Lower[7..4] | 0 | | | | | | | | | | | | | | | | |
| | 1 | | | | | | | | | | | | | | | | |
| | 2 | | ! | " | # | \$ | % | & | ' | (|) | * | + | , | - | . | / |
| | 3 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | : | ; | < | = | > | ? |
| | 4 | @ | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O |
| | 5 | P | Q | R | S | T | U | V | W | X | Y | Z | [| \ |] | ^ | _ |
| | 6 | ` | a | b | c | d | e | f | g | h | i | j | k | l | m | n | o |
| | 7 | p | q | r | s | t | u | v | w | x | y | z | { | | } | ~ | + |
| | 8 | | | | | | | | | | | | | | | | |
| | 9 | | | | | | | | | | | | | | | | |
| | A | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | : | ; | < | = | > | ? |
| | B | @ | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O |
| | C | P | Q | R | S | T | U | V | W | X | Y | Z | [| \ |] | ^ | _ |
| | D | ` | a | b | c | d | e | f | g | h | i | j | k | l | m | n | o |
| | E | p | q | r | s | t | u | v | w | x | y | z | { | | } | ~ | + |
| | F | | | | | | | | | | | | | | | | |

3.9.3 Address: 8000 ~ BFFF ----- 5X8 character font like English European character.

Lower[3..0]

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | | | | | | | | |
| 1 | | | | | | | | | | | | | | | | |
| 2 | Б | Г | Д | Е | Ж | З | И | Й | Л | П | У | Ф | Ч | Ш | Ъ | Ы |
| 3 | Ю | Я | б | в | г | д | е | ж | з | и | й | к | л | м | н | п |
| 4 | т | ш | щ | ъ | ы | э | ю | я | и | л | п | у | ф | ч | ш | ъ |
| 5 | ь | ы | э | ю | я | и | л | п | у | ф | ч | ш | ъ | ы | э | ю |
| 6 | я | и | л | п | у | ф | ч | ш | ъ | ы | э | ю | я | и | л | п |
| 7 | у | ф | ч | ш | ъ | ы | э | ю | я | и | л | п | у | ф | ч | ш |
| 8 | ъ | ы | э | ю | я | и | л | п | у | ф | ч | ш | ъ | ы | э | ю |
| 9 | ы | э | ю | я | и | л | п | у | ф | ч | ш | ъ | ы | э | ю | я |
| A | и | л | п | у | ф | ч | ш | ъ | ы | э | ю | я | и | л | п | у |
| B | л | п | у | ф | ч | ш | ъ | ы | э | ю | я | и | л | п | у | ф |
| C | п | у | ф | ч | ш | ъ | ы | э | ю | я | и | л | п | у | ф | ч |
| D | у | ф | ч | ш | ъ | ы | э | ю | я | и | л | п | у | ф | ч | ш |
| E | ф | ч | ш | ъ | ы | э | ю | я | и | л | п | у | ф | ч | ш | ъ |
| F | ч | ш | ъ | ы | э | ю | я | и | л | п | у | ф | ч | ш | ъ | ы |

Lower[7..4]

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3.9.4 Address: C000 ~ 13FFF ----- 16X16 character font like English character and number.

Lower[5..0]

| | 00-03 | 04-07 | 08-0B | 0C-0F | 10-13 | 14-17 | 18-1B | 1C-1F | 20-23 | 24-27 | 28-2B | 2C-2F | 30-33 | 34-37 | 38-3B | 3C-3F |
|---|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0 | | | | | | | | | | | | | | | | |
| 1 | | | | | | | | | | | | | | | | |
| 2 | | ! | " | # | \$ | % | & | ' | (|) | * | + | , | - | . | / |
| 3 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | : | ; | < | = | > | ? |
| 4 | @ | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O |
| 5 | P | Q | R | S | T | U | V | W | X | Y | Z | [| \ |] | ^ | _ |
| 6 | , | a | b | c | d | e | f | g | h | i | j | k | l | m | n | o |
| 7 | p | q | r | s | t | u | v | w | x | y | z | { | | } | ~ | |

Lower[8..6]

Page 4

Page 5

4 OPTICAL SPECIFICATION

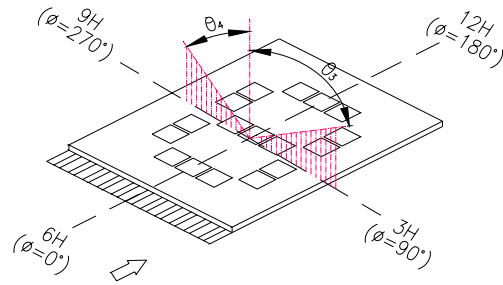
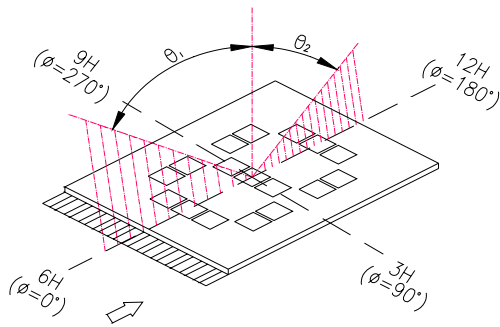
4.1 OPTICAL CHARACTERISTICS

Ta = 25 °C

| Item | Symbol | Condition | Min | Typ | Max | Unit | Note |
|-------------------|---------------------------------|------------|------|-----|-----|------|----------|
| Viewing Angle | 0° | θ1 Down | CR≥2 | -- | 50 | -- | deg 1 |
| | 180° | θ2 Up | CR≥2 | -- | 30 | -- | deg 1 |
| | 90° | θ3 Right | CR≥2 | -- | 50 | -- | deg 2 |
| | 270° | θ4 Left | CR≥2 | -- | 30 | -- | deg 2 |
| Contrast Ratio | CR | Ta = 25 °C | -- | 250 | -- | - | 3 |
| Response Time | Tr | Ta = 25 °C | -- | 15 | 30 | ms | 4 |
| | Tf | Ta = 25 °C | -- | 20 | 40 | | |
| Driving Method | Duty | 1/234 | | | | | |
| LCD Type | TFT – (Negative / Transmissive) | | | | | | |
| Viewing Direction | 6:00 | | | | | | |

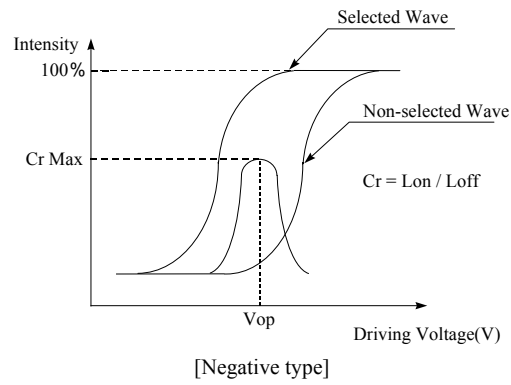
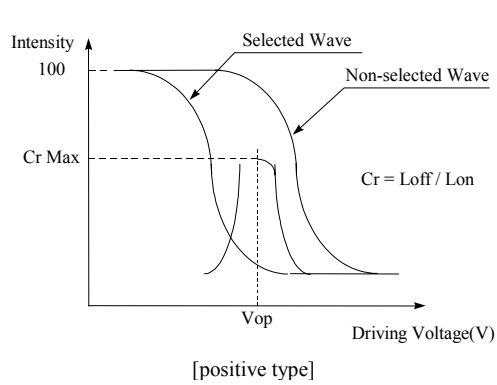
Note 1: definition of viewing angle θ_1 & θ_2

Note 2: definition of viewing angle θ_3 & θ_4

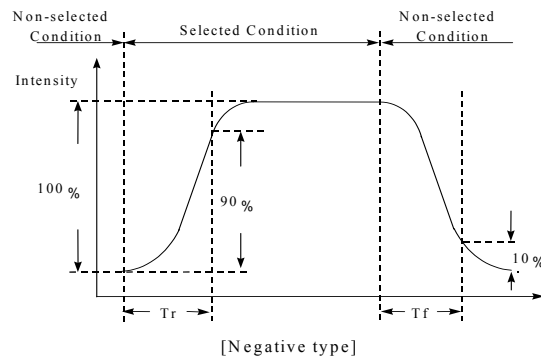
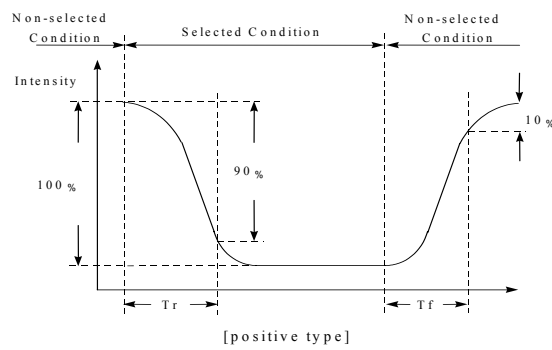


Note 3: definition of contrast ratio (CR)

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Note 4: definition of response time



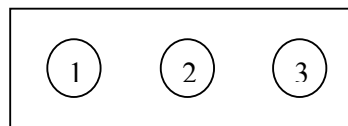
5 BACKLIGHT SPECIFICATION

5.1 Edge CCFL B/L Operating Range

| Item | Conditions | Standard | | | Unit | Remark |
|-----------------------------|---------------------------------------------------|----------|--------|------|------|--------|
| | | Min. | Typ. | Max. | | |
| Starting voltage | Ta = 0 C | --- | --- | 910 | Vrms | |
| | Ta = 25 C | --- | --- | 650 | Vrms | |
| Lamp voltage | Ta = 25 C | --- | 470 | 528 | Vrms | |
| Lamp current | Ta = 25 C | 5.9 | 6.0 | 6.1 | mA | |
| Oscillation frequency | Ta = 25 C | --- | 60.0 | 80.0 | KHz | |
| Lamp life | Ta = 25 C , IL = 6 mA Humidity : 30%RH ~ 85%RH | --- | 20,000 | --- | Hrs | Note 3 |
| Operating Temp. | Humidity : 30%RH ~ 85%RH | 0 | --- | 60 | C | |
| Storage Temp. | Humidity : 30%RH ~ 85%RH | -30 | --- | 80 | C | |
| Brightness uniformity | Ta = 25 C , IL = 6 mA | 80 | --- | --- | % | Note 1 |
| Average brightness of white | Ta = 25 C , IL = 6 mA | 250 | 300 | --- | | Note 2 |

Note :

- 1 : Average brightness of 3 points when B/L is used at the beginning.
- 2 : Brightness uniformity = (MIN / MAX) x 100 %
- 3 : Half of the original average brightness.



6 QUALITY ASSURANCE SPECIFICATION

6.1 CONFORMITY

The performance, function and reliability of the shipped products conform to the Product Specification.

6.2 DELIVERY ASSURANCE

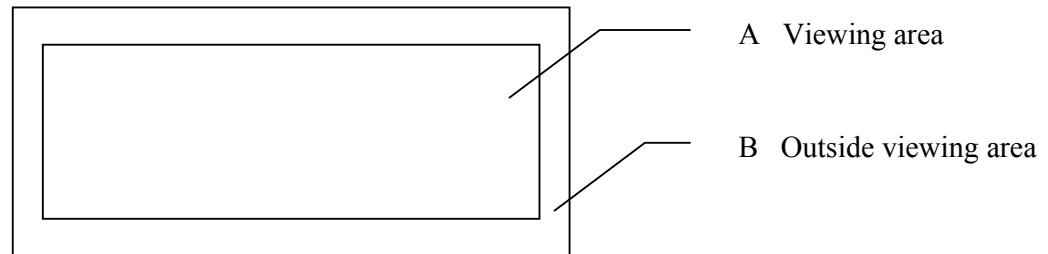
6.2.1 Delivery inspection standards

- MIL-STD-105E, general inspection level II, single sampling level;
- IPC-AA610 rev. C, class 2 electronic assemblies standard

The quality assurance levels are shown below:

| Class | AQL (%) |
|-----------------|---------|
| Critical defect | 0.5% |
| Major defect | 1.0% |
| Minor defect | 1.5% |
| TOTAL | 2.0% |

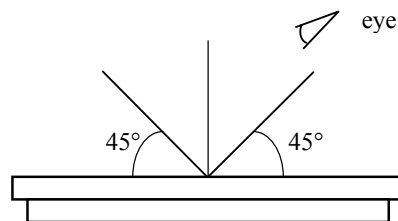
6.2.2 Zone definition



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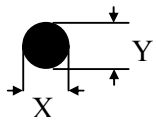
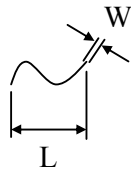
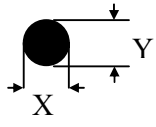
6.2.3 Visual inspection

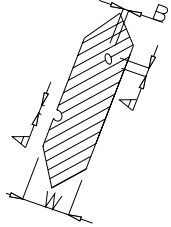
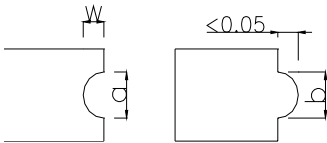
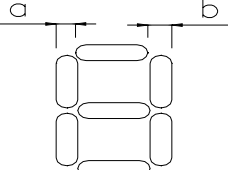
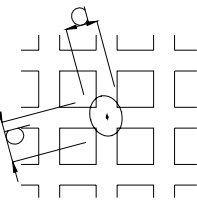
- Inspect under 2x20W or 40W fluorescent lamp (approximately 3000 lux) leaving 25 to 30 cm between the module and the lamp and 30 cm between the module and the eye (measuring position).
- Appearance is inspected at the best contrast voltage (best contrast is adjusted considering clearness and crosstalk on screen).
- Inspect the module at 45° right and left, top and bottom.
- Use the optimum viewing angle during the contrast inspection.

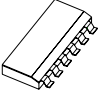


6.2.3.1 Standard of appearance inspection

Units: mm

| Class | Item | Criteria | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------------------|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|--|--|------|--------|--------|---------------------|------------|------------|---------------------------|---|----------------------------|---|----------------------|---|---------------------|--|--|--|--------|-------|--------|--------|----|---------------|------------|------------|--------------|----------------------|---|--------------|----------------------|----|------------|---------------|
| Minor | Packing & Label | Outside & inside package Presence of product no., lot no., quantity | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Critical | | Product must not be mixed with others and quantity must not be different from that indicated on the label | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Major | Dimension | Product dimensions must be according to specification and drawing | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Major | Electrical | Product electrical characteristics must be according to specification | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Critical | LCD Display | Missing lines or wrong patterns on LCD display are not allowed | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Minor | Black spot, white spot, dust | <p>Round type: as per following drawing $\varnothing = (X+Y)/2$</p>  <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="3">Acceptable quantity</th> </tr> <tr> <th>Size</th> <th>Zone A</th> <th>Zone B</th> </tr> </thead> <tbody> <tr> <td>$\varnothing < 0.1$</td> <td>Any number</td> <td rowspan="4">Any number</td> </tr> <tr> <td>$0.1 < \varnothing < 0.2$</td> <td>2</td> </tr> <tr> <td>$0.2 < \varnothing < 0.25$</td> <td>1</td> </tr> <tr> <td>$0.25 < \varnothing$</td> <td>0</td> </tr> </tbody> </table> <p>Line type: as per following drawing</p>  <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="4">Acceptable quantity</th> </tr> <tr> <th>Length</th> <th>Width</th> <th>Zone A</th> <th>Zone B</th> </tr> </thead> <tbody> <tr> <td>--</td> <td>$W \leq 0.02$</td> <td>Any number</td> <td rowspan="4">Any number</td> </tr> <tr> <td>$L \leq 3.0$</td> <td>$0.02 < W \leq 0.03$</td> <td rowspan="2">2</td> </tr> <tr> <td>$L \leq 2.5$</td> <td>$0.03 < W \leq 0.05$</td> </tr> <tr> <td>--</td> <td>$0.05 < W$</td> <td>As round type</td> </tr> </tbody> </table> <p style="text-align: center;">Total acceptable quantity: 3</p> | Acceptable quantity | | | Size | Zone A | Zone B | $\varnothing < 0.1$ | Any number | Any number | $0.1 < \varnothing < 0.2$ | 2 | $0.2 < \varnothing < 0.25$ | 1 | $0.25 < \varnothing$ | 0 | Acceptable quantity | | | | Length | Width | Zone A | Zone B | -- | $W \leq 0.02$ | Any number | Any number | $L \leq 3.0$ | $0.02 < W \leq 0.03$ | 2 | $L \leq 2.5$ | $0.03 < W \leq 0.05$ | -- | $0.05 < W$ | As round type |
| Acceptable quantity | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Size | Zone A | Zone B | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $\varnothing < 0.1$ | Any number | Any number | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $0.1 < \varnothing < 0.2$ | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $0.2 < \varnothing < 0.25$ | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $0.25 < \varnothing$ | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Acceptable quantity | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Length | Width | Zone A | Zone B | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| -- | $W \leq 0.02$ | Any number | Any number | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $L \leq 3.0$ | $0.02 < W \leq 0.03$ | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $L \leq 2.5$ | $0.03 < W \leq 0.05$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| -- | $0.05 < W$ | As round type | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Minor | Polariser scratch | Scratch on protective film is permitted Scratch on polariser: same as No. 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Minor | Polariser bubble | <p>$\varnothing = (X+Y)/2$</p>  <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="3">Acceptable quantity</th> </tr> <tr> <th>Size</th> <th>Zone A</th> <th>Zone B</th> </tr> </thead> <tbody> <tr> <td>$\varnothing < 0.2$</td> <td>Any number</td> <td rowspan="4">Any number</td> </tr> <tr> <td>$0.2 < \varnothing < 0.5$</td> <td>2</td> </tr> <tr> <td>$0.5 < \varnothing < 1.0$</td> <td>1</td> </tr> <tr> <td>$1.0 < \varnothing$</td> <td>0</td> </tr> </tbody> </table> <p style="text-align: center;">Total acceptable quantity: 3</p> | Acceptable quantity | | | Size | Zone A | Zone B | $\varnothing < 0.2$ | Any number | Any number | $0.2 < \varnothing < 0.5$ | 2 | $0.5 < \varnothing < 1.0$ | 1 | $1.0 < \varnothing$ | 0 | | | | | | | | | | | | | | | | | | | | |
| Acceptable quantity | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Size | Zone A | Zone B | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $\varnothing < 0.2$ | Any number | Any number | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $0.2 < \varnothing < 0.5$ | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $0.5 < \varnothing < 1.0$ | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $1.0 < \varnothing$ | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Class | Item | Criteria | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------------------|-----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|--|-------|---------------|--------------|----------------------------------------------------|--------------------|-----------------------------------------------------|---------------------------|---|------------|--|------------|----------------|---------|-------------|---------------------|--|------|--|------------------------|------------|------------------------------|---|------------------------------|---|------------------------------|---|
| Minor | Segment deformation | <p>1.a. Pin hole on segmented display</p> <p>W: segment width $\varnothing = (A+B)/2$</p>  <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="2">Acceptable quantity</th> </tr> <tr> <th>Width</th> <th>\varnothing</th> </tr> </thead> <tbody> <tr> <td>$W \leq 0.4$</td> <td>$\varnothing \leq 0.2$ and $\varnothing \leq 1/2W$</td> </tr> <tr> <td>$W > 0.4$</td> <td>$\varnothing \leq 0.25$ and $\varnothing \leq 1/3W$</td> </tr> </tbody> </table> <p>Total acceptable quantity: 1 defect per segment Pin holes with \varnothing under 0.10 mm are acceptable</p> | Acceptable quantity | | Width | \varnothing | $W \leq 0.4$ | $\varnothing \leq 0.2$ and $\varnothing \leq 1/2W$ | $W > 0.4$ | $\varnothing \leq 0.25$ and $\varnothing \leq 1/3W$ | | | | | | | | | | | | | | | | | | | | |
| Acceptable quantity | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Width | \varnothing | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $W \leq 0.4$ | $\varnothing \leq 0.2$ and $\varnothing \leq 1/2W$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $W > 0.4$ | $\varnothing \leq 0.25$ and $\varnothing \leq 1/3W$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Minor | Segment deformation | <p>1b. Pin hole on dot matrix display</p>  <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="2">Acceptable quantity</th> </tr> <tr> <th>Size</th> <th></th> </tr> </thead> <tbody> <tr> <td>$a, b < 0.1$</td> <td>Any number</td> </tr> <tr> <td>$(a+b)/2 \leq 0.1$</td> <td>Any number</td> </tr> <tr> <td>$0.5 < \varnothing < 1.0$</td> <td>3</td> </tr> </tbody> </table> <p>Total acceptable quantity: 7</p> <p>2. Segments / dots with different width</p>  <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="2">Acceptable</th> </tr> </thead> <tbody> <tr> <td>$a \geq b$</td> <td>$a/b \leq 4/3$</td> </tr> <tr> <td>$a < b$</td> <td>$a/b > 4/3$</td> </tr> </tbody> </table> <p>3. Alignment layer defect</p> <p>$\varnothing = (a+b)/2$</p>  <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="2">Acceptable quantity</th> </tr> <tr> <th>Size</th> <th></th> </tr> </thead> <tbody> <tr> <td>$\varnothing \leq 0.4$</td> <td>Any number</td> </tr> <tr> <td>$0.4 < \varnothing \leq 1.0$</td> <td>5</td> </tr> <tr> <td>$1.0 < \varnothing \leq 1.5$</td> <td>3</td> </tr> <tr> <td>$1.5 < \varnothing \leq 2.0$</td> <td>2</td> </tr> </tbody> </table> <p>Total acceptable quantity: 7</p> | Acceptable quantity | | Size | | $a, b < 0.1$ | Any number | $(a+b)/2 \leq 0.1$ | Any number | $0.5 < \varnothing < 1.0$ | 3 | Acceptable | | $a \geq b$ | $a/b \leq 4/3$ | $a < b$ | $a/b > 4/3$ | Acceptable quantity | | Size | | $\varnothing \leq 0.4$ | Any number | $0.4 < \varnothing \leq 1.0$ | 5 | $1.0 < \varnothing \leq 1.5$ | 3 | $1.5 < \varnothing \leq 2.0$ | 2 |
| Acceptable quantity | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Size | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $a, b < 0.1$ | Any number | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $(a+b)/2 \leq 0.1$ | Any number | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $0.5 < \varnothing < 1.0$ | 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Acceptable | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $a \geq b$ | $a/b \leq 4/3$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $a < b$ | $a/b > 4/3$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Acceptable quantity | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Size | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $\varnothing \leq 0.4$ | Any number | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $0.4 < \varnothing \leq 1.0$ | 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $1.0 < \varnothing \leq 1.5$ | 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $1.5 < \varnothing \leq 2.0$ | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Minor | Colour uniformity | Level of sample for approval set as limit sample | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Critical | Backlight | The backlight colour should correspond to the product specification | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Critical | | Flashing and or unlit backlight is not allowed | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Minor | | Dust larger than 0.25 mm is not allowed | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Major | COB | Exposed wire bond pad is not allowed | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Major | | Insufficient covering with resin is not allowed (wire bond line exposed) | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Minor | | Dust or bubble on the resin are not allowed | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Class | Item | Criteria | | | | | | | | | | | | | |
|------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|------|----------|---------|---------------------|------------|----------------------|---|------------|-------------------------|---|-------|---|
| Major |  | No unmelted solder paste should be present on PCB | | | | | | | | | | | | | |
| Critical | | Cold solder joints, missing solder connections, or oxidation are not allowed | | | | | | | | | | | | | |
| Minor | | No residue or solder balls on PCB are allowed | | | | | | | | | | | | | |
| Critical | | Short circuits on components are not allowed | | | | | | | | | | | | | |
| Minor | Tray particles | <table border="1"> <thead> <tr> <th></th> <th>Size</th> <th>Quantity</th> </tr> </thead> <tbody> <tr> <td rowspan="2">On tray</td> <td>$\varnothing < 0.2$</td> <td>Any number</td> </tr> <tr> <td>$\varnothing > 0.25$</td> <td>4</td> </tr> <tr> <td rowspan="2">On display</td> <td>$\varnothing \geq 0.25$</td> <td>2</td> </tr> <tr> <td>L = 3</td> <td>1</td> </tr> </tbody> </table> | | Size | Quantity | On tray | $\varnothing < 0.2$ | Any number | $\varnothing > 0.25$ | 4 | On display | $\varnothing \geq 0.25$ | 2 | L = 3 | 1 |
| | | Size | Quantity | | | | | | | | | | | | |
| On tray | | $\varnothing < 0.2$ | Any number | | | | | | | | | | | | |
| | | $\varnothing > 0.25$ | 4 | | | | | | | | | | | | |
| On display | $\varnothing \geq 0.25$ | 2 | | | | | | | | | | | | | |
| | L = 3 | 1 | | | | | | | | | | | | | |

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7 RELIABILITY SPECIFICATION

7.1 RELIABILITY TESTS

| Test Item | Test Condition | Evaluation and assessment |
|-------------------------------|------------------------------------------------------------------------------------|------------------------------------------------|
| Operation at high temperature | 60°C±2°C for 240 hours | No abnormalities in function* and appearance** |
| Low temperature | 0°C±2°C for 240 hours | No abnormalities in function* and appearance** |
| Heat Shock | -30°C (30 min.) ->25°C (5 min.) ->80°C (30 min.) ->->25°C (5 min.) 5 cycle | No abnormalities in function* and appearance** |
| Vibration | 10Hz ~ 55Hz 0.3mm / 1 Octave 55Hz ~ 500Hz 3g / 1 Octave 20 cycles / per axis | No abnormalities in function* and appearance** |
| Drop Shock | Drop Shock | No abnormalities in function* and appearance** |
| Current Consumption | < 3 times initial value | No abnormalities in function* and appearance** |
| Contrast | > ½ time initial value | No abnormalities in function* and appearance** |

7.2 LIFE TIME

| Item | Description |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Function, performance, appearance, etc. shall be free from remarkable deterioration within 50,000 hours under ordinary operating and storage conditions of room temperature (25±10 °C), normal humidity (45±20% RH), and in area not exposed to direct sunlight. |

8 HANDLING PRECAUTIONS

Safety

If the LCD panel breaks, be careful not to get the liquid crystal fluid in your mouth or in your eyes. If the liquid crystal touches your skin or clothes, wash it off immediately using soap and plenty of water.

Mounting and Design

Place a transparent plate (e.g. acrylic, polycarbonate or glass) on the display surface to protect the display from external pressure. Leave a small gap between the transparent plate and the display surface. When assembling with a zebra connector, clean the surface of the pads with alcohol and keep the surrounding air very clean. Design the system so that no input signal is given unless the power supply voltage is applied.

Caution during LCD cleaning

Lightly wipe the display surface with a soft cloth soaked with Isopropyl alcohol, Ethyl alcohol or Trichlorotrifluoroethane. Do not wipe the display surface with dry or hard materials that will damage the polariser surface. Do not use aromatic solvents (toluene and xylene), or ketonic solvents (ketone and acetone).

Caution against static charge

As the display uses C-MOS LSI drivers, connect any unused input terminal to VDD or VSS. Do not input any signals before power is turned on.

Also, ground your body, work/assembly table and assembly equipment to protect against static electricity.

Packaging

Displays use LCD elements, and must be treated as such. Avoid strong shock and drop from a height. To prevent displays from degradation, do not operate or store them exposed directly to sunshine or high temperature/humidity.

Caution during operation

It is indispensable to drive the display within the specified voltage limit since excessive voltage shortens its life. Direct current causes an electrochemical reaction with remarkable deterioration of the display quality. Give careful consideration to prevent direct current during ON/OFF timing and during operation. Response time is extremely delayed at temperatures lower than the operating temperature range while, at high temperatures, displays become dark. However, this phenomenon is reversible and does not mean a malfunction or a display that has been permanently damaged. If the display area is pushed on hard during operation, some graphics will be abnormally displayed but returns to a normal condition after turning off the display once. Even a small amount of condensation on the contact pads (terminals) can cause an electro-chemical reaction which causes missing rows and columns. Give careful attention to avoid condensation.

Storage

Store the display in a dark place where the temperature is $25^{\circ}\text{C} \pm 10^{\circ}\text{C}$ and the humidity below 50%RH. Store the display in a clean environment, free from dust, organic solvents and corrosive gases. Do not crash, shake or jolt the display (including accessories).

| | | |
|-------------|----------|--------|
| Product No. | LMR67802 | REV. B |
|-------------|----------|--------|

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| Page | 22 / 22 |
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