


| | | | |
|----------------------|-------------|---|------------|
| MDT0700F1IHHHC-MIPI | 1200 x 1920 | MIPI Interface | TFT Module |
| Specification | | | |
| Version: 2 | | Date: 03/11/2021 | |
| Revision | | | |
| 1 | 28/04/2021 | First issue | |
| 2 | 02/11/2021 | Updated backlight connetor to ZHR-2, Update block diagram and mechanical drawing. | |

| Display Features | | | | |
|-----------------------|--|--------------------------|---|------------------|
| Display Size | | 7.0" |  | |
| Resolution | | 1200 x 1920 | | |
| Orientation | | Landscape | | |
| Appearance | | RGB | | |
| Logic Voltage | | 1.8V | | |
| Interface | | MIPI | | |
| Brightness | | 2500 cd/m ² | | |
| Touchscreen | | CTP | | |
| Module Size | | 115.70 X 177.06 X 5.40mm | | |
| Operating Temperature | | -20°C ~ +70°C | | |
| Pinout | | 40 way FFC | | Box Quantity |
| Pitch | | 0.5mm | | Weight / Display |
| | | | | --- |
| | | | | --- |

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| Display Accessories | |
|---------------------|---|
| Part Number | Description |
| MPBV6 | 40 Way FFC to cable and wires. Driven by any driver board that can be wired to a 1mm pitch SHDR-40V-S-B receptacle. |
| MDIB-CC1 | The MDIB-CC1 is a interconnect board for standard pitch pinouts to fine pitch wires. Ideal for prototyping of TFT and COG LCDs. |
| | |

| Optional Variants | |
|-------------------|---------|
| Appearances | Voltage |
| | |

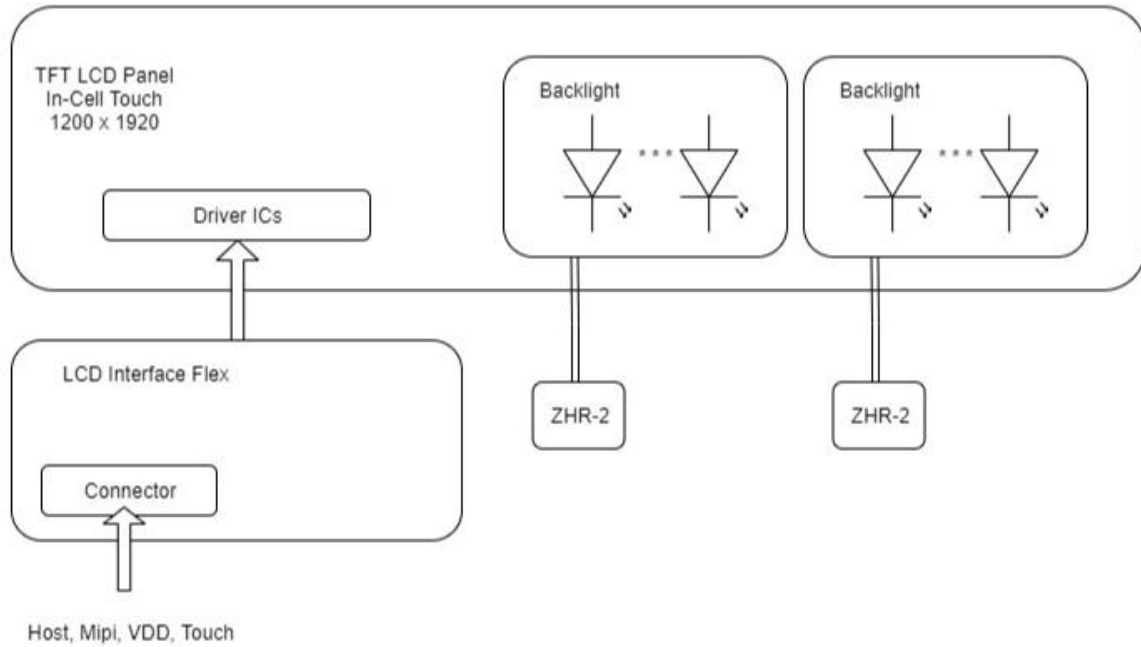


General Specifications

| Item | Specification | Unit |
|-----------------------|-------------------------------------|-------------------|
| Outline Dimensions | 115.7 X 177.06 X 5.4 | mm |
| Display Size | 7.02 Diagonal | inches |
| Active Area | 94.50 X 151.20 | mm |
| Pixel Pitch | 0.07875 X 0.07875 | mm |
| Number of Dots | 1200 X 1920 | - |
| LCD Type | ADS 8bit + 2bit FRC | - |
| Backlight Type | LED White | - |
| Viewing Direction | Free | - |
| Touch Panel | Capacitive Touch (In-Cell) – FT7250 | - |
| Luminance | 2500 | cd/m ² |
| Interface | MIPI | - |
| Surface Treatment | Cover Lens w/AR | - |
| Operating Temperature | -20..70 | °C |



Block Diagram



D I S P L A Y S

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Pin Out - LCD

External pull up resistor required for TP_SDA and TP_SCL.

| Number | Pin Name | I/O | Description |
|--------|----------|-----|----------------------------------|
| 1 | NC | - | No connection – Must not connect |
| 2 | IOVCC | P | Power supply for system (1.8V) |
| 3 | IOVCC | P | Power supply for system (1.8V) |
| 4 | GND | P | Ground |
| 5 | LCD_RSTN | I | LCD reset signal, Active Low |
| 6 | NC | - | No connection |
| 7 | GND | P | Ground |
| 8 | MIPI_0N | I | MIPI Negative data inputs |
| 9 | MIPI_0P | I | MIPI Positive data inputs |
| 10 | GND | P | Power ground |
| 11 | MIPI_1N | I | MIPI Negative data inputs |
| 12 | MIPI_1P | I | MIPI Positive data inputs |
| 13 | GND | P | Power ground |
| 14 | MIPI_CKN | I | MIPI Negative clock inputs |
| 15 | MIPI_CKP | I | MIPI Positive clock inputs |
| 16 | GND | P | Power ground |
| 17 | MIPI_2N | I | MIPI Negative data inputs |
| 18 | MIPI_2P | I | MIPI Positive data inputs |
| 19 | GND | P | Power ground |
| 20 | MIPI_3N | I | MIPI Negative data inputs |



| | | | |
|----|---------|-----|--|
| 21 | MIPI_3P | I | MIPI Positive data inputs |
| 22 | GND | P | Power ground |
| 23 | TP_SCL | I | TP I2C Clock 1.8V |
| 24 | TP_SDA | I/O | TP I2C Data 1.8V |
| 25 | GND | P | Power ground |
| 26 | TE | O | Tear output |
| 27 | PWMO | O | PWM control signal for LED driver (CABC) |
| 28 | TP_INT | O | Touch Interrupt 1.8V |
| 29 | TP_RST | I | TP reset signal 1.8V |
| 30 | GND | P | Power ground |
| 31 | NC | - | No connection – Must not connect |
| 32 | NC | - | No connection – Must not connect |
| 33 | NC | - | No connection |
| 34 | VSN | P | Analog supply negative voltage (-5~-6V) |
| 35 | VSN | P | Analog supply negative voltage (-5~-6V) |
| 36 | NC | - | No connection |
| 37 | VSP | P | Analog supply positive voltage (5~6V) |
| 38 | VSP | P | Analog supply positive voltage (5~6V) |
| 39 | NC | - | No connection – Must not connect |
| 40 | NC | - | No connection – Must not connect |



Absolute Max Ratings - LCD

| Item | Symbol | Value | Unit |
|--------------------------------|--------|------------|------|
| Power Supply Voltage for Logic | IOVCC | -0.3 - 4.5 | V |
| Power for Analog Negative | VSN | 0 ~ -6.6 | V |
| Power for Analog Positive | VSP | 0 ~ +6.6 | V |
| Operating Temperature | Topr | -20 to 70 | °C |
| Storage Temperature | Tstg | -30 to 80 | °C |

Electrical Characteristics – LCD

LCD includes in-cell touch. IOVCC is the system power for both the LCD IO and the Touch IO.

| Item | Symbol | Min | Typ | Max | Unit | Test Condition |
|-----------------------------|------------|----------|------|----------|------|----------------|
| Operating Voltage | IOVCC | 1.65 | 1.8 | 1.95 | V | - |
| Voltage for Analog Negative | VSN | -6.5 | -5.5 | -4.5 | V | - |
| Voltage for Analog Positive | VSP | 4.5 | 5.5 | 6.5 | V | - |
| Supply Current | IDD(IOVCC) | - | - | 50 | mA | Ta = 25 °C |
| Supply Current | IDD(VSN) | - | - | 75 | mA | Ta = 25 °C |
| Supply Current | IDD(VSP) | - | - | 75 | mA | Ta = 25 °C |
| Input Voltage | Vih | 0.7IOVCC | - | IOVCC | V | - |
| | Vil | 0 | - | 0.3IOVCC | V | - |
| Input Leakage Current | IiL | -1.0 | - | 1.0 | μA | Vin = IOVCC |

Backlight Specifications

The backlight wiring is 28AWG and has been pinned into a JST-ZH series connector. The part number is ZHR-2. An example mating part number is, S2B-ZR-SM2-TF. The design has 2 LED rails to achieve maximum brightness at high efficiency. The supply current mentioned below is the sum, i.e., 150mA per backlight connector is required for a total of 300mA(typical) for 1500 nits.

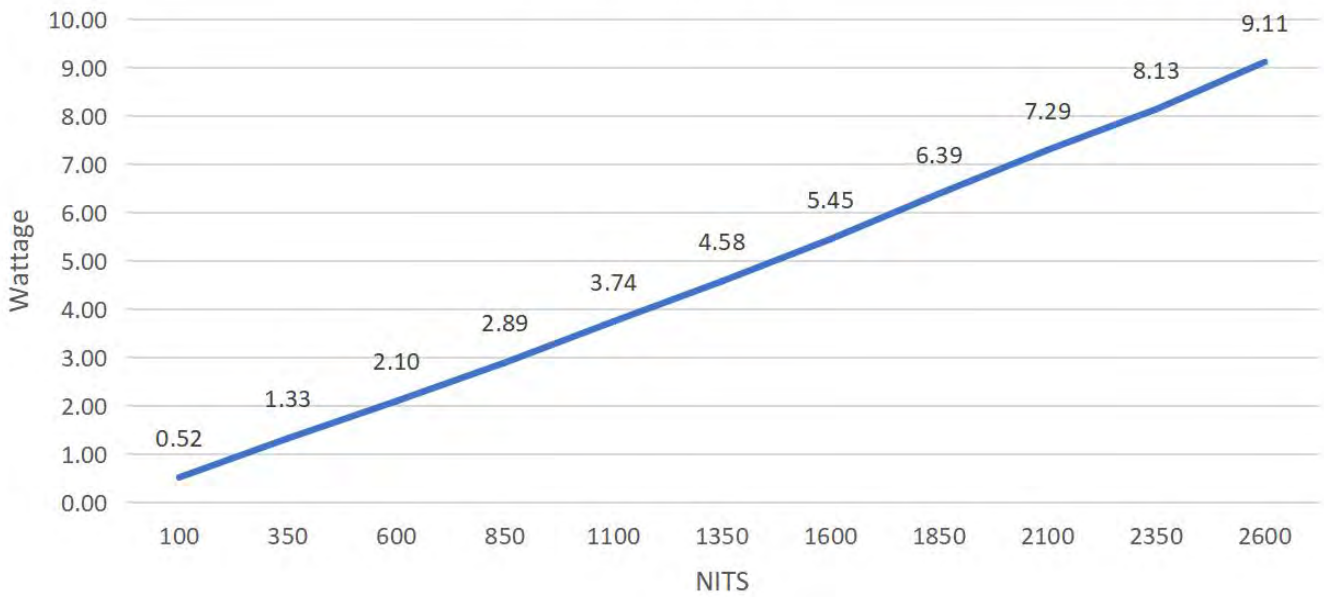
| Number | Pin Name | I/O | Description |
|--------|----------|-----|--------------------------|
| 1 | LEDA | P | LED Anode + connection |
| 2 | LEDK | P | LED Cathode - connection |

| Item | Symbol | Min | Typ | Max | Unit | Test Condition |
|----------------|--------|-----|------|------|------|----------------------|
| Supply Voltage | Vf | - | 16 | 19.2 | v | If = 240mA |
| Supply Current | If | - | 200 | - | mA | Ta = 25C°, 1000 NITS |
| | | - | 300 | - | | Ta = 25C°, 1500 NITS |
| | | - | 400 | - | | Ta = 25C°, 2000 NITS |
| | | - | 500* | - | | Ta = 25C°, 2500 NITS |

*Thermal considerations apply – DUT stable at room temperature, open air in upright position.



Wattage vs NITS



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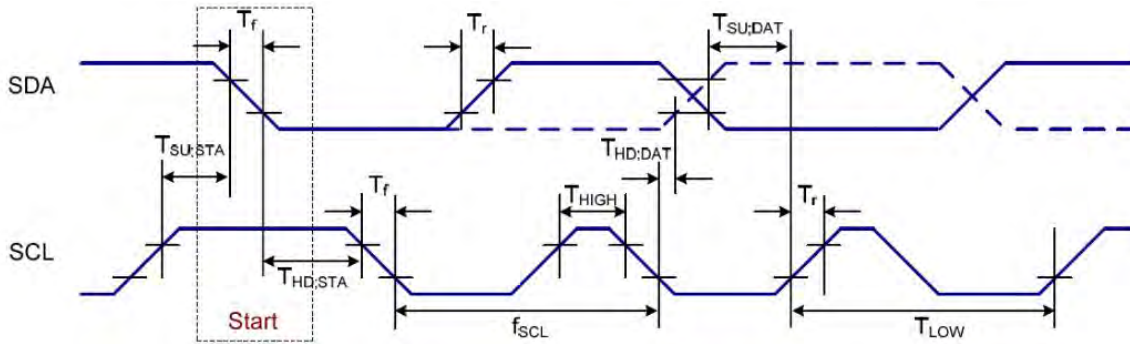
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Timing Specifications - LCD

Refer to Focal Tech FT7250

Timing Specifications – PCAP



| Symbol | Parameter | Min | Typ | Max | Unit |
|---------------|--|-----|-----|------|------|
| f_{SCLK} | SCL clock frequency | 10 | - | 400 | kHz |
| T_{LOW} | SCL clock LOW period | 1.2 | - | - | us |
| T_{HIGH} | SCL clock HIGH period | 0.6 | - | - | us |
| $T_{SU:DATA}$ | Data set-up time | 250 | - | - | ns |
| $T_{HD:DATA}$ | Data hold time | 0 | - | 0.9 | us |
| T_r | SCL and SDA rise time | 20 | - | 300 | ns |
| T_f | SCL and SDA fall time | 20 | - | 300 | ns |
| T_f | SDA fall time for read out | 20 | - | 1000 | ns |
| C_b | Capacitive load represented by each bus line | - | - | 400 | pF |
| $T_{SU:STA}$ | Setup time for a repeated START condition | 0.6 | - | - | us |
| $T_{HD:STA}$ | START condition hold time | 0.6 | - | - | us |



| Symbol | Parameter | Min | Typ | Max | Unit |
|--------------|--|-----|-----|-----|------|
| $T_{SU:STO}$ | Setup time for STOP condition | 0.6 | - | - | us |
| T_{SW} | Tolerable spike width on bus | - | - | 50 | ns |
| T_{BUF} | BUS free time between a STOP and START condition | 4.7 | - | - | us |

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ID Register Bit Definitions

Example:

| | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|-----|---|-------|-------|-------|-------|-------|-------|-------|
| ID0 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 1 |
| | Decimal Panel part number (157,0x9D) | | | | | | | |
| ID1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| | BCD Year code: 0x21 | | | | | | | |
| ID2 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 1 |
| | BCD Week code: 0x01-0x53 | | | | | | | |
| ID3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Unused register, for future use in case of major rev. | | | | | | | |
| ID4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | W_d |
| | W_d = Bin code for LED | | | | | | | |

MIPI Init

The MIPI initialization sequence consists of 2 commands. This initializes touch and graphics.

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```
DCS_NoParam(0x11); //Sleep out
delay(300); //Delay 300ms
DCS_NoParam(0x29); //Display On
delay(200); //Delay 200ms
```



Optical Characteristics

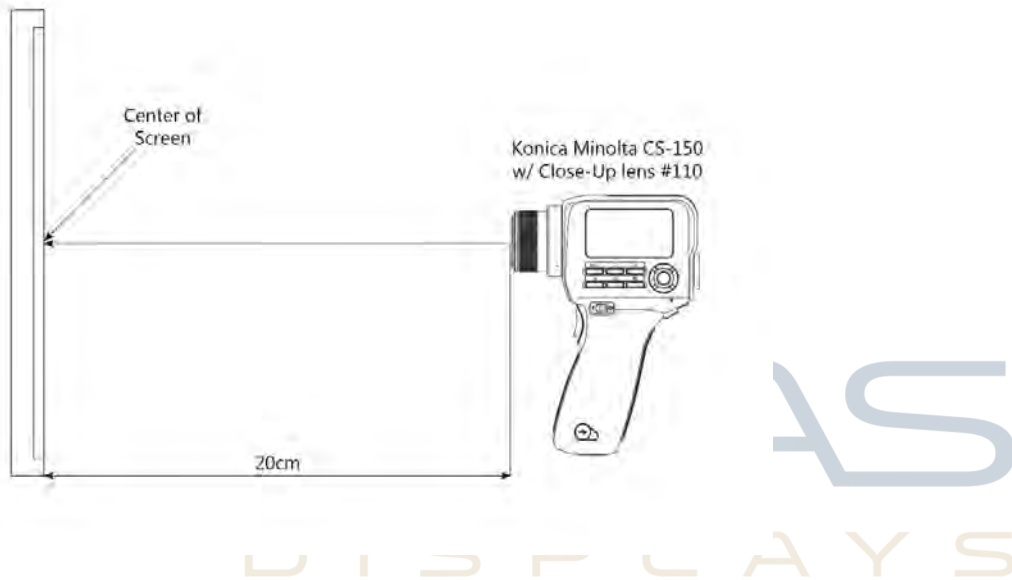
All measurements taken at t=0. Measurements are native with no LUT.

| Item | Symbol | Conditions | Specification | | | Unit | Note | |
|-----------------------------|--------|----------------------|---------------|--------|-----|-------|-----------|--------|
| | | | Min | Typ | Max | | | |
| Response Time | Tr Tf | Ta = 25°C | - | 25 | - | ms | (1)(4) | |
| Contrast Ratio | CR | Normal Viewing Angle | 1200 | - | - | - | (1)(3)(5) | |
| Viewing Angle | Hor. | X- | CR>10 | 70 | 80 | - | Deg | (3)(5) |
| | | X+ | | 70 | 80 | - | Deg | |
| | Ver. | Y+ | | 70 | 80 | - | Deg | |
| | | Y- | | 70 | 80 | - | Deg | |
| Chromaticity | Red | Rx | - | 0.6627 | - | - | | |
| | | Ry | - | 0.3391 | - | - | | |
| | Green | Gx | - | 0.2659 | - | - | | |
| | | Gy | - | 0.6706 | - | - | | |
| | Blue | Bx | - | 0.1525 | - | - | | |
| | | By | - | 0.0956 | - | - | | |
| | White | Wx | - | 0.3106 | - | - | | |
| | | Wy | - | 0.3584 | - | - | | |
| Luminance | L | Ta = 25 °C | - | 2500 | - | cd/m2 | (1) | |
| Color Gamut Coverage - NTSC | | | - | 80 | - | % | | |
| Uniformity | U | | 80 | 90 | - | % | (2) | |



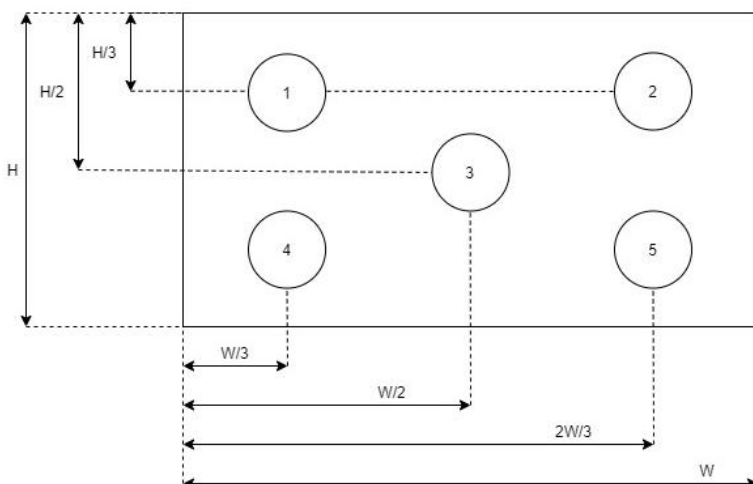
Note 1: Measurement setup

The LCD module should be stabilized at a given temperature for 25 minutes to avoid abrupt temperature change during measurement. After temperature saturation measurement should be executed. Probe is orthogonal to LCD surface.



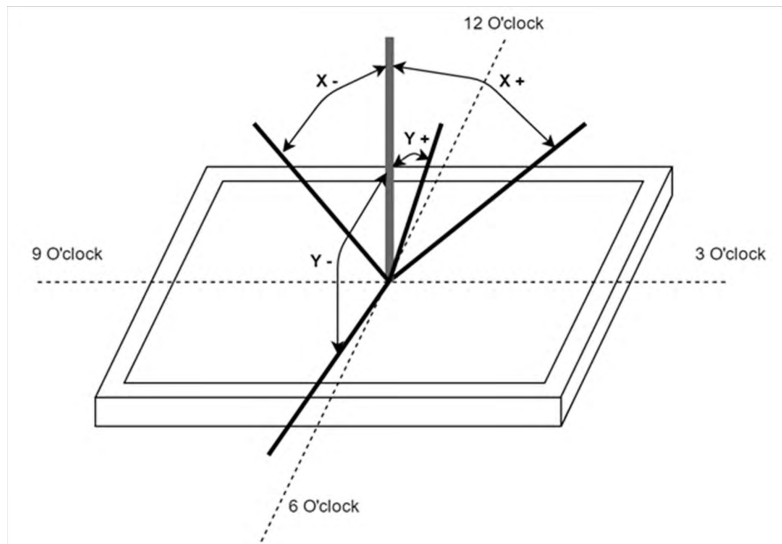
Note 2: Brightness Uniformity

Brightness uniformity = (Minimum Luminance of 5 points / Max Luminance of 5 points) * 100



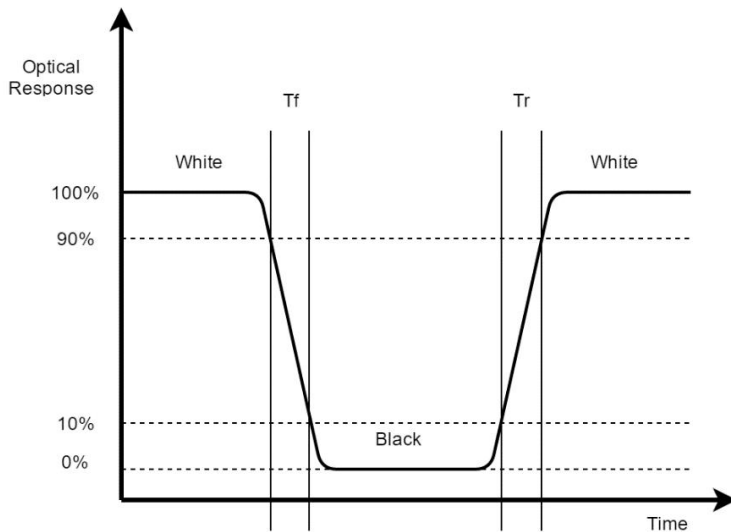
Note 3: Viewing Angle

Definition of viewing angle for Y+/- and X+/- is as follows.



Note 4: Response Time

Definition of response time as follows below.



Note 5: Contrast Ratio

Definition of Contrast Ratio is as follows.

Contrast measurements shall be made at a viewing angle of 0° at the center of the surface.

$$CR = \frac{\text{Luminance when displaying White}}{\text{Luminance when displaying Black}}$$

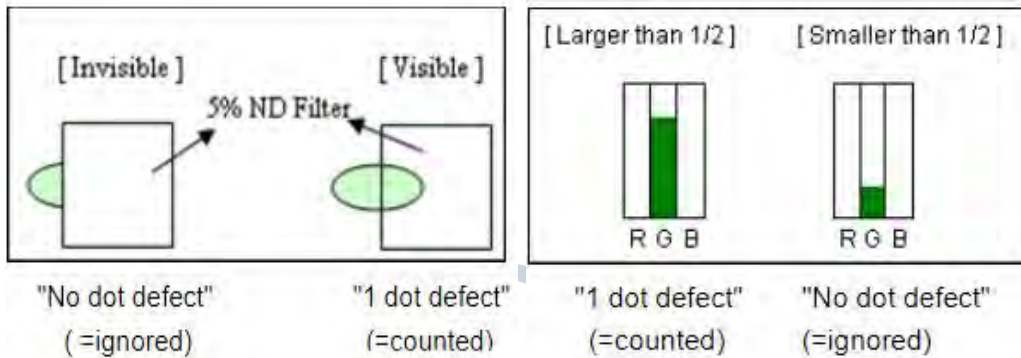


Quality & Inspection Criteria

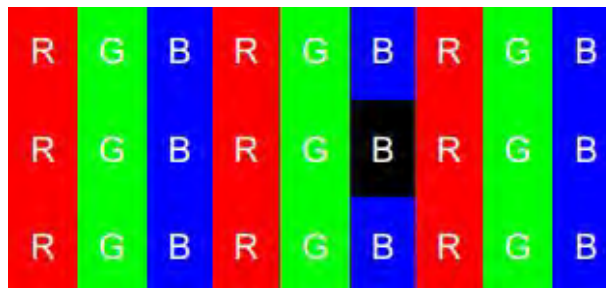
Terminologies:

LCD: Liquid Crystal Display; Each pixel contains three dots of R, G, and B (sub-pixel).

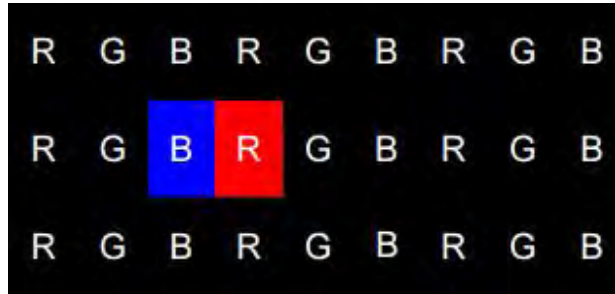
Bright Dot: 1 sub-pixel is a dot. Defects should be larger than 1/2 of a sub-pixel. Dots that are not visible through a 5% ND filter or smaller than 1/2 of sub-pixel size will not be counted as a dot defect.



Dark Dot: Any single sub-pixel that does not light up in a white screen or another non-black screen is called a dark dot.



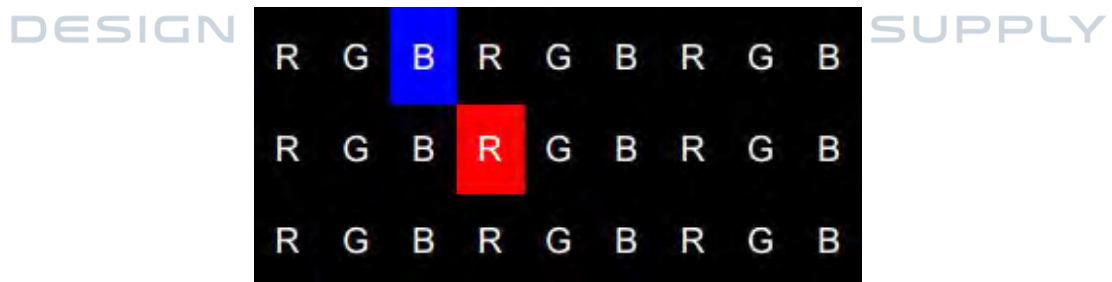
Two adjacent dots (horizontal direction): Use the bright dot illustration as an example to demonstrate two horizontal consecutive dots.



Two adjacent dots (vertical direction): Use the bright spot illustration as an example to demonstrate two vertical consecutive dots.



Two adjacent dots (bevel direction): Use the bright spot illustration as an example to demonstrate two consecutive dots in the bevel direction.



Three or more adjacent dots (horizontal): Use the bright spot illustration as an example to demonstrate three or more consecutive horizontal and vertical dots.

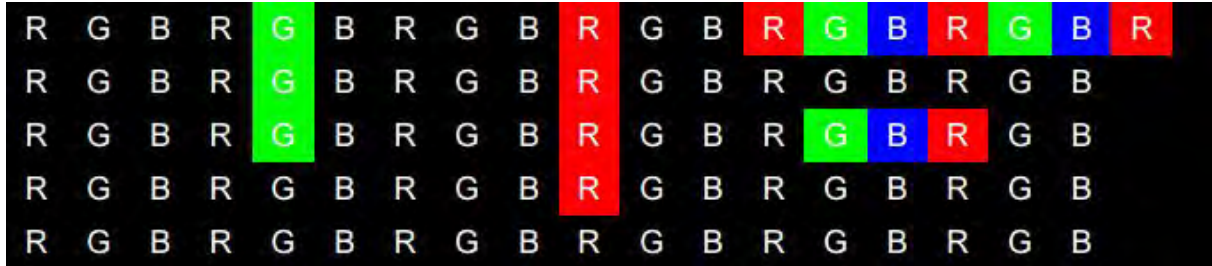
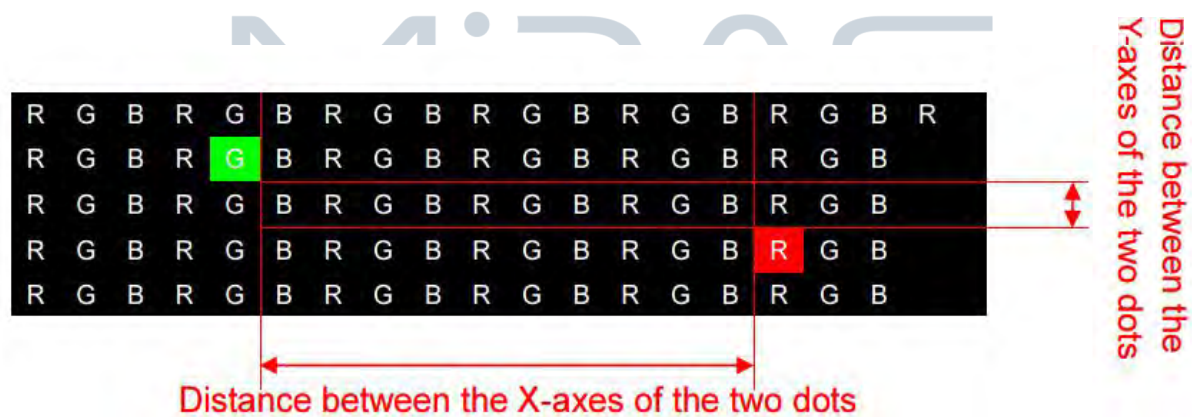


Illustration of spacing between two dots: (Distance is the relative distance between the X-axes of the two dots or the relative distance between the Y-axes of the two dots, whichever is larger)



Functional Test

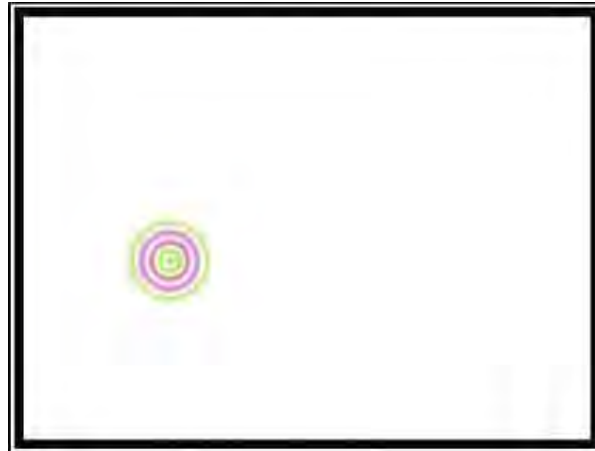
The LCD display testing program should display the following screens in order: all red, all green, all blue, all white, all gray, all black.

Inspection Requirements

After booting the system (single illumination), there are no non-display, unlit backlight, dark backlight, blinking, or other abnormal signs, and there are no bright lines, dark lines, or bright rims/leakage of light close to the LCD bezel.



Newton's Ring



Under high temperature and high humidity conditions, uneven deformations caused by heat in different layers of the LCD module will result in the display of an all-white screen. However, this condition can be recovered when temperature is resumed under normal circumstances. A specific determination can be conducted according to the operating conditions and storage conditions defined in the product's technical specifications. Any exception will be negotiated and mutually agreed by both parties. (Ripples are not permitted at fixed locations. For ripples at non-fixed locations, they are OK if they disappear within two seconds.)

LCD blaze

Uneven internal LCD installation, surface deformation of the LCD polarizer, internal structural interference of the LCD module, damaged LCD backlight plates, and other factors may cause partial fading of color on the LCD display. When observed from a certain incident angle (upper 10°, lower 3°, 40° on both sides), they will appear as white cicatrices, typically about the size of a grain of rice. In serious cases, they accumulate in large patches or stripes, appear in different degrees under various colors (red, blue, green, black, gray, white), and are especially obvious under an all-gray screen. Blazes with diameters $\geq 0.5\text{mm}$ are not allowed: for those with diameters under 0.5 mm, 2 are acceptable if the space between them is $\geq 15\text{mm}$. Card chromatic aberration ratio versus ND Filter: $1.0 + 0.3 \text{ standard} = 5\% \text{ ND Filer}$ (see definition of Mura).



Mura

Mura refers to the unevenness and irregularity that is visible in the image. It is difficult for visual inspection to recognize the non-uniform brightness or mura. Mura detection is subjective and therefore doesn't have pass/fail criteria. There are several precautions to take which can avoid mura. Avoid high ambient temperatures around the module, frame warpage and high temperature operation over long periods of time. Utilize screen savers to avoid mura.

Inspection Conditions

Inspection distance should be $35\text{cm} \pm 5\text{cm}$ with a FujiFilm ND-LCD 5% filter approximately 5cm from the backlight surface.

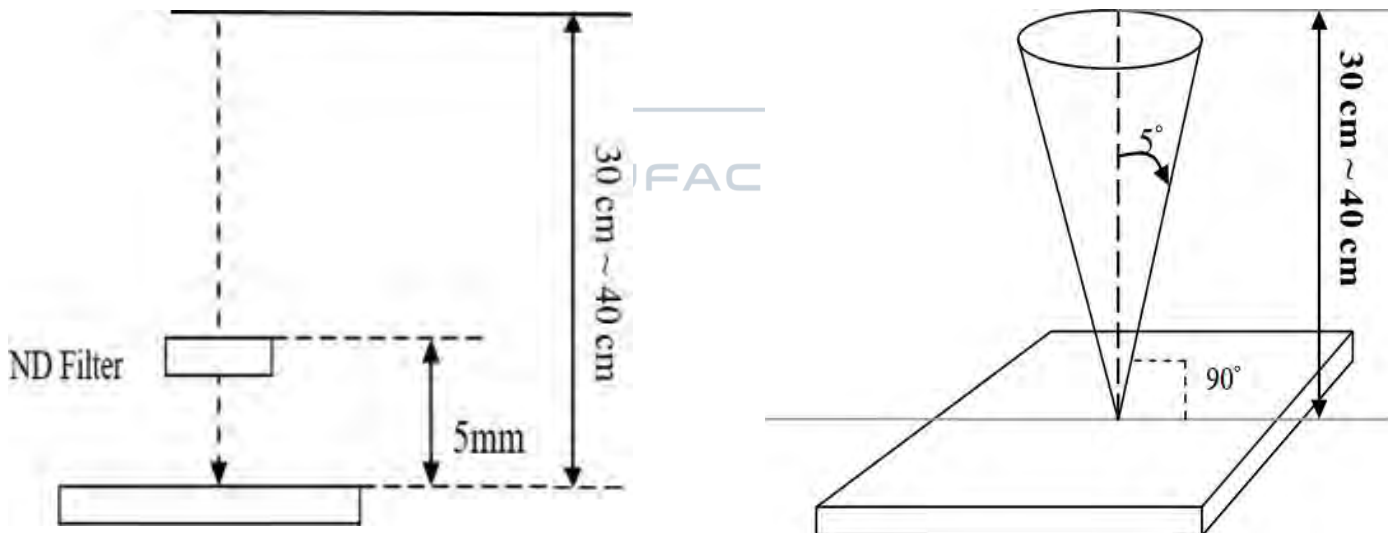
Viewing angle: $90^\circ \pm 5^\circ$.

Room temperature: $23 \pm 2^\circ\text{C}$

Humidity: $60 \pm 10\%$

Inspection Ambient Illumination: 300-700 LUX

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Acceptance Criteria Table:

There should be no corrosion or cracking, or an uneven coating layer on LCD display surface, and there should be no sign of coagulation, flaking, cracking, or wear. The definition of minor defects and acceptance criteria are shown in the following table:

| Item | Size | Unit | Acceptance qty. |
|--|---|------|-----------------|
| Unfelt scratch visible with backlight off. | $W < 0.05$ | mm | Ignore |
| | $W > .05$ and $< .10$ $L > .3$ and < 3.0 | mm | 4 |
| | $W > .10$ or $L > 3.0$ | mm | none |
| | Visible with backlight on | | none |
| Felt scratch | None allowed | | |
| Dent visible with backlight off | $D < .2$ | mm | Ignore |
| | $D > .2$ and $< .5$ | mm | 5 |
| | Spacing between defects must be $> 30\text{mm}$ | | |
| | $D > .5$ | mm | none |
| | Visible with backlight on | | none |
| Bubble visible with backlight off | $D < .2$ | mm | Ignore |
| | $D > .2$ and $< .5$ | mm | 5 |
| | $D > .5$ | mm | none |
| | Visible with backlight on | | none |
| | $W < .05$ | | Ignore |

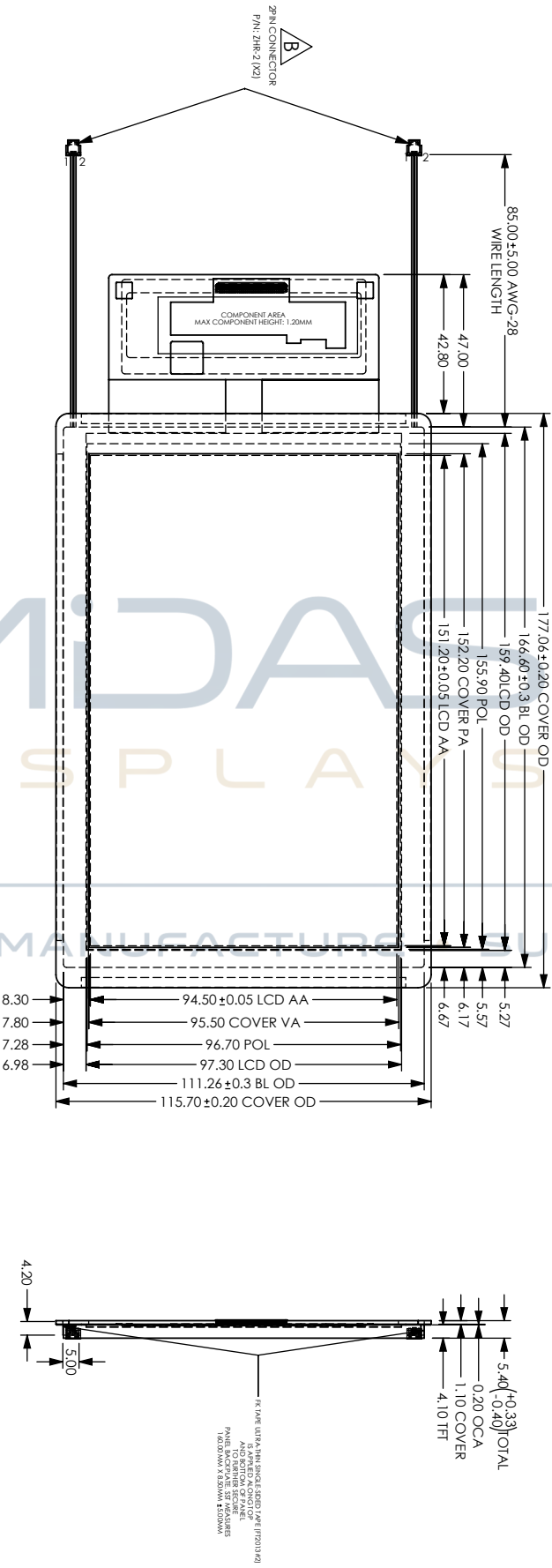


| Item | Size | Unit | Acceptance qty. |
|--|---------------------------------------|------|-----------------|
| Foreign material (line shape) visible with backlight on | | mm | |
| | W > .05 and < .10 L > .3 and < 2.0 | mm | 4 |
| | W > .10 or L > 2.0 | mm | none |
| Foreign material (dot shape) visible with backlight on | D < .2 | mm | Ignore |
| | D > .2 and < .5 | mm | 5 |
| | D > .5 | mm | none |
| Bright dot defect(lit) | 1 dot | - | 4 |
| | 2 adjacent dots | - | 0 |
| Dark dot defect (not lit) | 1 dot | - | 5 |
| | 2 adjacent dots | - | 2 |
| | 3 adjacent dots | - | 0 |



| GENERAL TOLERANCE TABLE (±MM) | |
|-------------------------------|------|
| L ≤ 20 | 0.1 |
| 20 < L ≤ 50 | 0.2 |
| 50 < L ≤ 200 | 0.25 |
| 100 < L ≤ 200 | 0.3 |
| 200 < L | 0.5 |

| ZONE | REV. | DESCRIPTION | DATE | APPROVED |
|-------------|------|---|-----------|----------|
| | A | INITIAL ISSUE | 2/1/2021 | JK |
| C8-248-2-D3 | B | UPDATED CONNECTOR, REVISED PIN 31, 32, 39 AND 40 PIN DEFINITIONS, REVISED DOUBLE-SIDED TAPE LENGTH. | 11/2/2021 | JK |



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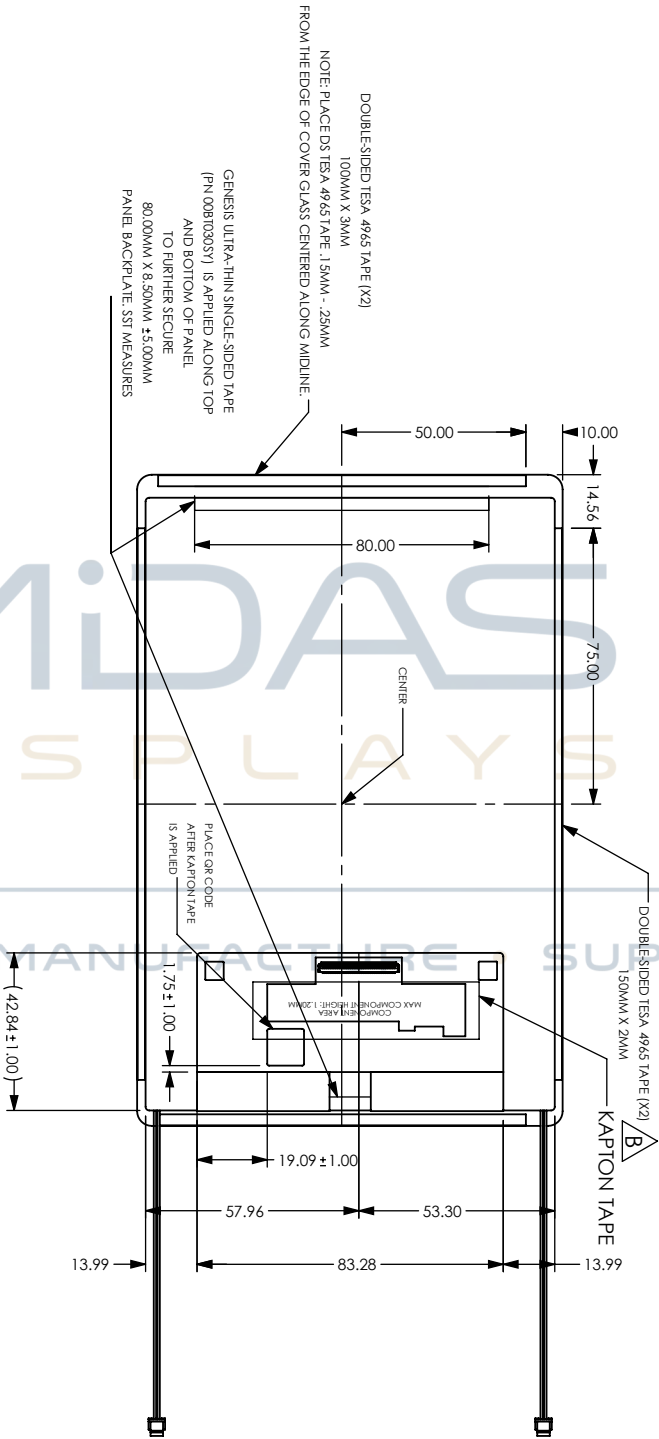
| | | | |
|-------------|------------------------------------|------|-----------|
| DRAWN BY: | DAT | DATE | 11/2/2021 |
| CHECKED BY: | JK | DATE | 11/2/2021 |
| MATERIAL: | N/A | | |
| FINISH: | N/A | | |
| COMMENTS: | ALL DIMENSIONS ARE IN MILLIMETERS. | | |

| | |
|-------------------------------|--------------------|
| | |
| design • manufacture • supply | |
| PART NO. | MD10700F11HHC-M1P1 |
| REV. | B |

SCALE: 1:2 SHEET 1 OF 2
DO NOT SCALE DRAWING

| GENERAL TOLERANCE TABLE (MM) | |
|------------------------------|------|
| L ≤ 20 | 0.1 |
| 20 < L ≤ 50 | 0.2 |
| 50 < L ≤ 200 | 0.25 |
| 100 < L ≤ 200 | 0.3 |
| 200 < L | 0.5 |

| ZONE | REV. | DESCRIPTION | DATE | APPROVED |
|--------------|------|---|-----------|----------|
| | A | INITIAL ISSUE | 2/1/2021 | JK |
| 1-C8, 88, D3 | B | UPDATED CONNECTOR, REVISED PIN 31, 32, 39 AND 40 PIN DEFINITIONS, REVISED DOUBLE-SIDED TAPE LENGTH. | 11/2/2021 | JK |



LCD PINOUT TABLE

| PIN DEFINITION | PIN DEFINITION | PIN DEFINITION | PIN DEFINITION | PIN DEFINITION |
|----------------|----------------|----------------|----------------|----------------|
| 1 NC | 11 MIPL_1N | 21 MIPL_3P | 31 NC | |
| 2 IOVCC | 12 MIPL_1P | 22 GND | 32 NC | |
| 3 IOVCC | 13 GND | 23 TP_SCL | 33 NC | |
| 4 GND | 14 MIPL_CKN | 24 TP_SDA | 34 VSN | |
| 5 LCD_RSTN | 15 MIPL_CKP | 25 GND | 35 VSN | |
| 6 NC | 16 GND | 26 TE | 36 NC | |
| 7 GND | 17 MIPL_2N | 27 PWM0 | 37 VSP | |
| 8 MIPL_ON | 18 MIPL_2P | 28 TP_INT | 38 VSP | |
| 9 MIPL_OP | 19 GND | 29 TP_RST | 39 NC | |
| 10 GND | 20 MIPL_3N | 30 GND | 40 NC | |

| | | | | | | |
|---|---------------------|---|--|---|------------------------------------|---------------|
| <p>SCALE: 1:2</p> <p>DO NOT SCALE DRAWING</p> | <p>SHEET 2 OF 2</p> | <p>DRAWN BY: DAT</p> <p>DATE: 11/2/2021</p> | <p>CHECKED BY: JK</p> <p>DATE: 11/2/2021</p> | <p>MATERIAL: N/A</p> <p>FINISH: N/A</p> <p>COMMENTS: ALL DIMENSIONS ARE IN MILLIMETERS.</p> | <p>PART NO. MDT0700FI1HHC-MIPI</p> | <p>REV. B</p> |
|---|---------------------|---|--|---|------------------------------------|---------------|

