

Product Specification

NHD-7.0-800480EF-ASXV#-CTP

TFT (Thin-Film-Transistor) Color Liquid Crystal Display Module

| | |
|----------------|--|
| NHD- | Newhaven Display |
| 7.0- | 7.0" Diagonal |
| 800480- | 800xRGBx480 Pixels |
| EF- | Model |
| A- | Built-in Driver / No Controller |
| S- | High Brightness, White LED Backlight |
| X- | TFT |
| V- | MVA, Wide temperature |
| #- | RoHS Compliant |
| CTP- | Capacitive Touch Panel with Controller |

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Additional Resources

- **Support Forum:** <https://support.newhavendisplay.com/hc/en-us/community/topics>
- **GitHub:** <https://github.com/newhavendisplay>
- **Example Code:** <https://support.newhavendisplay.com/hc/en-us/categories/4409527834135-Example-Code/>
- **Knowledge Center:** https://www.newhavendisplay.com/knowledge_center.html
- **Quality Center:** https://www.newhavendisplay.com/quality_center.html
- **Precautions for using LCDs/LCMs:** <https://www.newhavendisplay.com/specs/precautions.pdf>
- **Warranty / Terms & Conditions:** <https://www.newhavendisplay.com/terms.html>



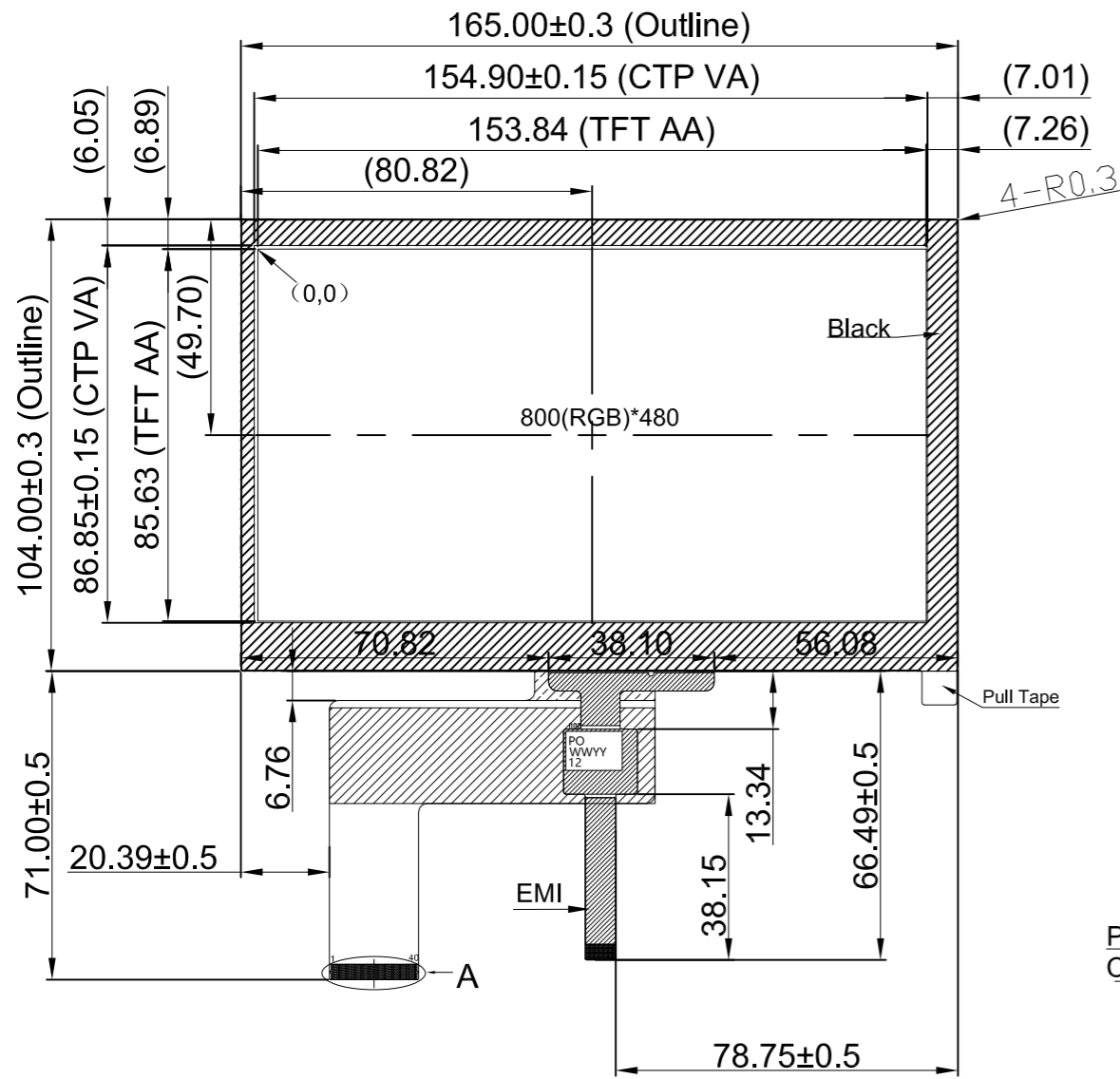
Document Revision History

| Revision | Date | Description | Changed By |
|----------|------------|--|------------|
| - | 03/10/2016 | Initial Release | SB |
| 1 | 07/05/2016 | Chromaticity Added | SB |
| 2 | 08/02/2017 | CTP Firmware Updated | SB |
| 3 | 08/14/2018 | Updated CTP Driver & Panel | SB |
| 4 | 12/11/2018 | Updated Mechanical Drawing | TM |
| 5 | 05/07/2019 | CTP Timing Note Added | SB |
| 6 | 03/09/2020 | LCD Driver Changed to EK9716 | SB |
| 7 | 06/04/2020 | Updated 2D Mechanical Drawing, Contrast Ratio, Quality Information | AS |
| 8 | 07/02/2020 | Corrected 'Gesture ID' Hex Values for CTP | AS |
| 9 | 09/15/2020 | Inclusion of CTP Pin Orientation in 2D Mechanical Drawing | AS |
| 10 | 03/23/2021 | Updated Silkscreen on FPC | AS |
| 11 | 05/24/2021 | Updated Mechanical Drawing | JT |
| 12 | 11/12/2021 | FT5426 CTP IC Version Update | ZP |
| 13 | 10/06/2022 | Updated Mechanical Drawing | TM |
| 14 | 02/08/2023 | Mechanical Drawing Format Updated | KL |

Mechanical Drawing

Newhaven Display
NHD-800480EF-ASXV#-CTP
Date Code

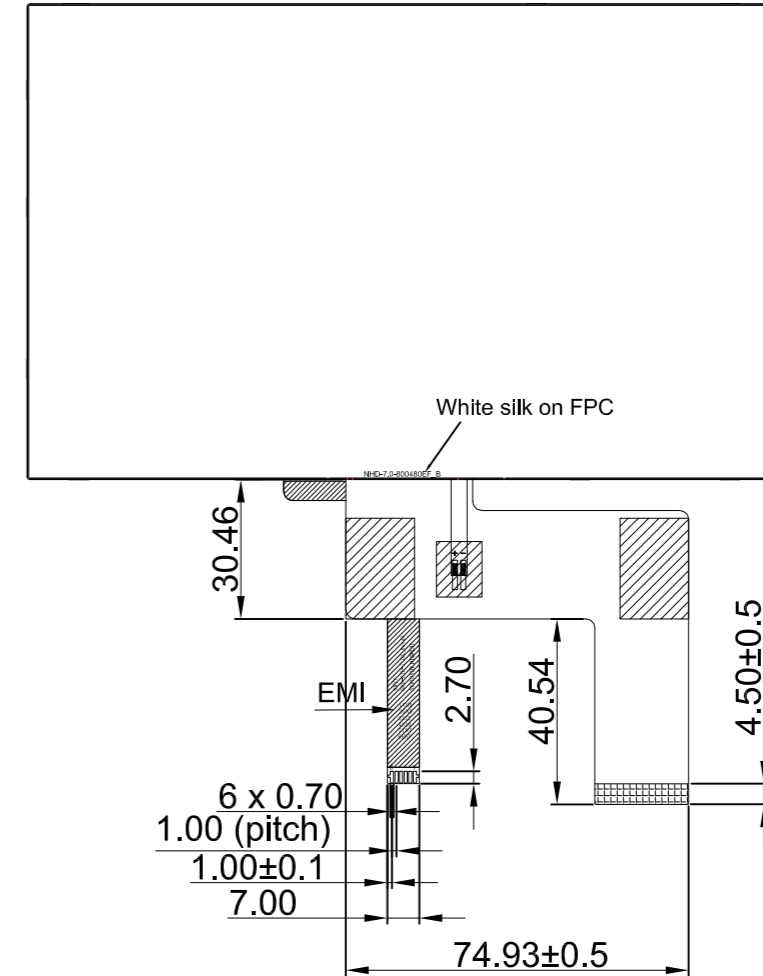
Part Label (type/format may vary)



Overall: 5.25±0.4
TFT: 3.50±0.3
CTP: 1.45
Adhesive: 3M5909
T=0.3mm

PI stiffener
Contact side
0.30±0.03

Contact side
PI stiffener
0.30±0.05

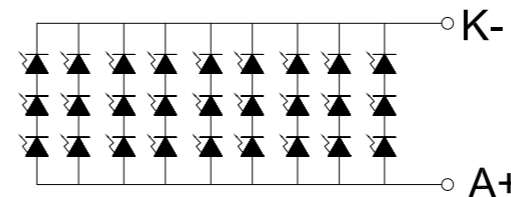
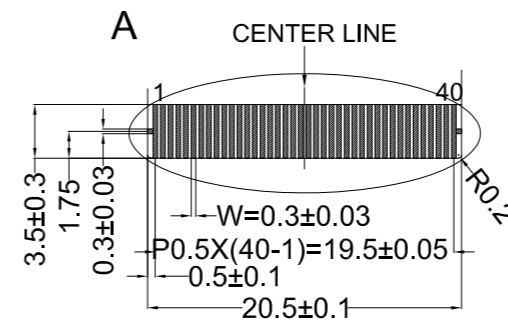


TFT

| PIN | SYMBOL |
|-----|--------|
| 1 | LED-K |
| 2 | LED-A |
| 3 | GND |
| 4 | VDD |
| 5 | R0 |
| 6 | R1 |
| 7 | R2 |
| 8 | R3 |
| 9 | R4 |
| 10 | R5 |
| 11 | R6 |
| 12 | R7 |
| 13 | G0 |
| 14 | G1 |
| 15 | G2 |
| 16 | G3 |
| 17 | G4 |
| 18 | G5 |
| 19 | G6 |
| 20 | G7 |
| 21 | B0 |
| 22 | B1 |
| 23 | B2 |
| 24 | B3 |
| 25 | B4 |
| 26 | B5 |
| 27 | B6 |
| 28 | B7 |
| 29 | GND |
| 30 | DCLK |
| 31 | DISP |
| 32 | HSYNC |
| 33 | VSYNC |
| 34 | DEN |
| 35 | NC |
| 36 | GND |
| 37 | NC(XR) |
| 38 | NC(YD) |
| 39 | NC(XL) |
| 40 | NC(YU) |

CTP

| PIN | SYMBOL |
|-----|--------|
| 1 | VDD |
| 2 | GND |
| 3 | SCL |
| 4 | SDA |
| 5 | INT |
| 6 | RESET |



LED CIRCUIT

Product Description: 7" 799x479 Premium TFT w/ Capacitive Touch

1. Driver IC: EK9716B TFT, FT5426-003 CTP
2. Interface: 24-Bit Parallel RGB, I²C CTP
3. Power Requirement: 3.3V TFT, 9.3V/180mA Backlight, 3.3V CTP
4. Optical Features: Normally White, Transmissive, 660cd/m²
5. Recommended FFC Connector:
TFT: 40pin 0.5mm pitch; Ex. Molex 54104-4031
CTP: 6pin 1.0mm pitch; Ex. Molex 52271-0679
6. EMI Shielded FPC

Standard Tolerance:
(Unless otherwise specified)
Linear: ±0.3mm

Unless otherwise specified:
• Dimensions are in Millimeters
• Third Angle Projection

NEWHAVEN DISPLAY INTERNATIONAL
Drawing/Part Number: NHD-7.0-800480EF-ASXV#-CTP
Revision: -

Drawn By: K. Lewis
Approved By: K. Lewis
Drawn Date: 02/08/2023
Approved Date: 02/08/2023

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Pin Description

TFT:

| Pin No. | Symbol | External Connection | Function Description |
|---------|-----------------|---------------------|--|
| 1 | LED-K | Power Supply | Ground for Backlight |
| 2 | LED-A | Power Supply | Backlight Power Supply (180mA @ 9.3V) |
| 3 | GND | Power Supply | Ground |
| 4 | V _{DD} | Power Supply | Power Supply (3.3V) |
| 5-12 | [R0-R7] | MPU | Red Data Signals |
| 13-20 | [G0-G7] | MPU | Green Data Signals |
| 21-28 | [B0-B7] | MPU | Blue Data Signals |
| 29 | GND | Power Supply | Ground |
| 30 | DCLK | MPU | Dot data Clock (Falling Edge Triggered) |
| 31 | DISP | MPU | Display on/off DISP=1: Display on; DISP=0: Display off |
| 32 | HSYNC | MPU | Line synchronization signal |
| 33 | VSYNC | MPU | Frame synchronization signal |
| 34 | DEN | MPU | Data Enable signal |
| 35 | NC | - | No Connect |
| 36 | GND | Power Supply | Ground |
| 37 | NC(XR) | - | No Connect |
| 38 | NC(YD) | - | No Connect |
| 39 | NC(XL) | - | No Connect |
| 40 | NC(YU) | - | No Connect |

LCD connector: 0.5mm pitch 40-Conductor FFC. Molex p/n: 54104-4031 (top contact)

Capacitive Touch Panel:

| Pin No. | Symbol | External Connection | Function Description |
|---------|-----------------|---------------------|---|
| 1 | V _{DD} | Power Supply | Power Supply (3.3V) |
| 2 | GND | Power Supply | Ground |
| 3 | SCL | MPU | Serial I2C Clock (Requires pull-up resistor) |
| 4 | SDA | MPU | Serial I2C Data (Requires pull-up resistor) |
| 5 | /INT | MPU | Interrupt signal from touch panel module to host |
| 6 | /RESET | MPU | Active LOW Reset signal. (Do not tie to V _{DD}) |

Recommended connector: 1.0mm pitch 6-Conductor FFC. Molex p/n: 52271-0679 (bottom contact)

Driver/Controller Information

TFT:

Built-in EK9716B Source Driver: https://support.newhavendisplay.com/hc/en-us/article_attachments/6066352840215/EK79716BD4.pdf

Built-in EK73002AB2 Gate Driver: https://support.newhavendisplay.com/hc/en-us/article_attachments/4414487925399/EK73002AB2.pdf

Capacitive Touch Panel:

Built-in FT5426-003 Controller: https://support.newhavendisplay.com/hc/en-us/article_attachments/4414386815639/FT5x26.pdf



Electrical Characteristics

TFT:

| Item | Symbol | Condition | Min. | Typ. | Max. | Unit |
|-----------------------------|------------------|------------------------------|----------------------|--------|----------------------|------|
| Operating Temperature Range | T _{OP} | Absolute Max | -20 | - | +70 | °C |
| Storage Temperature Range | T _{ST} | Absolute Max | -30 | - | +80 | °C |
| Supply Voltage | V _{DD} | - | 3.0 | 3.3 | 3.6 | V |
| Supply Current | I _{DD} | V _{DD} = 3.3V, 25°C | 45 | 90 | 135 | mA |
| "H" Level Input | V _{IH} | - | 0.7*V _{DD} | - | V _{DD} | V |
| "L" Level Input | V _{IL} | - | V _{SS} | - | 0.3*V _{DD} | V |
| "H" Level Output | V _{OH} | - | V _{DD} -0.4 | - | - | V |
| "L" Level Output | V _{OL} | - | V _{SS} | - | V _{SS} +0.4 | V |
| Backlight Supply Current | I _{LED} | - | - | 180 | 225 | mA |
| Backlight Supply Voltage | V _{LED} | I _{LED} = 180mA | 8.4 | 9.3 | 10.2 | V |
| Backlight Lifetime* | - | T _{OP} = 25° C | 20,000 | 50,000 | - | Hrs. |

*Backlight lifetime is rated as Hours until **half-brightness**, under normal operating conditions. The LED of the backlight is driven by current drain; drive voltage is for reference only. Drive voltage must be selected to ensure backlight current drain is below MAX level stated.

Capacitive Touch Panel:

| Item | Symbol | Condition | Min. | Typ. | Max. | Unit |
|-----------------------------|-----------------|------------------------|---------------------|------|---------------------|------|
| Operating Temperature Range | T _{OP} | Absolute Max | -20 | - | +70 | °C |
| Storage Temperature Range | T _{ST} | Absolute Max | -30 | - | +80 | °C |
| Supply Voltage | V _{DD} | - | 2.8 | 3.3 | 3.6 | V |
| Supply Current – Operating | I _{DD} | V _{DD} = 3.3V | - | 15.0 | - | mA |
| Supply Current – Hibernate | I _{DD} | T _{OP} = 25°C | - | 1.0 | - | µA |
| "H" Level Input | V _{IH} | - | 0.7*V _{DD} | - | V _{DD} | V |
| "L" Level Input | V _{IL} | - | V _{SS} | - | 0.3*V _{DD} | V |
| "H" Level Output | V _{OH} | - | 0.7*V _{DD} | - | V _{DD} | V |
| "L" Level Output | V _{OL} | - | V _{SS} | - | 0.3*V _{DD} | V |

Optical Characteristics

| Item | Symbol | Condition | Min. | Typ. | Max. | Unit | |
|------------------------|---------------------------------|---------------------------|-------|-------|-------|-------------------|---|
| Optimal Viewing Angles | Top | CR ≥ 10 | - | 70 | - | ° | |
| | Bottom | | - | 70 | - | ° | |
| | Left | | - | 70 | - | ° | |
| | Right | | - | 70 | - | ° | |
| Contrast Ratio | CR | - | - | 500 | - | - | |
| Luminance | L _V | I _{LED} = 180 mA | 530 | 660 | - | cd/m ² | |
| Response Time | T _R + T _F | T _{OP} = 25°C | - | 25 | - | ms | |
| Chromaticity | Red | X _R | - | 0.532 | 0.582 | 0.632 | - |
| | | Y _R | - | 0.292 | 0.342 | 0.392 | - |
| | Green | X _G | - | 0.285 | 0.335 | 0.385 | - |
| | | Y _G | - | 0.574 | 0.624 | 0.674 | - |
| | Blue | X _B | - | 0.104 | 0.154 | 0.204 | - |
| | | Y _B | - | 0.092 | 0.142 | 0.192 | - |
| White | X _W | - | 0.257 | 0.307 | 0.357 | - | |
| | Y _W | - | 0.334 | 0.384 | 0.434 | - | |

Capacitive Touch Panel Registers

| Register No. | Access | Register Name | Bits | Value | Description |
|--------------|--------|-------------------|-------|----------|---|
| 01h | RO | Gesture ID | [7:0] | 1Ch | Swipe Up |
| | | | | 14h | Swipe Down |
| | | | | 10h | Swipe Left |
| | | | | 18h | Swipe Right |
| | | | | 48h | Zoom In |
| | | | | 49h | Zoom Out |
| | | | | 00 | No gesture |
| 02h | RO | Touch Points | [7:0] | 0-Ah | 0: No touch detected A: 10 touch points detected |
| 03h | RO | TOUCH1_Event_Flag | [7:6] | 0 | Put Down |
| | | | | 1 | Put Up |
| | | | | 2 | Contact |
| | | | | 3 | Reserved |
| 03h | RO | TOUCH1_XH | [3:0] | 0-1 | Upper 4 bits of X touch coordinate |
| 04h | RO | TOUCH1_XL | [7:0] | 00 - FFh | Lower 8 bits of X touch coordinate |
| 05h | RO | TOUCH1_YH | [3:0] | 0-1 | Upper 4 bits of Y touch coordinate |
| 06h | RO | TOUCH1_YL | [7:0] | 00 - FFh | Lower 8 bits of Y touch coordinate |
| 07h | RO | TOUCH1_Weight | [7:0] | | Touch Weight |
| 08h | RO | TOUCH1_Misc | [3:0] | 00-0Fh | Touch Area |
| 09h | RO | TOUCH2_Event_Flag | [7:6] | 0 | Put Down |
| | | | | 1 | Put Up |
| | | | | 2 | Contact |
| | | | | 3 | Reserved |
| 09h | RO | TOUCH1_XH | [3:0] | 0-1 | Upper 4 bits of X touch coordinate |
| 0Ah | RO | TOUCH2_XL | [7:0] | 00 - FFh | Lower 8 bits of X touch coordinate |
| 0Bh | RO | TOUCH2_YH | [3:0] | 0-1 | Upper 4 bits of Y touch coordinate |
| 0Ch | RO | TOUCH2_YL | [7:0] | 00 - FFh | Lower 8 bits of Y touch coordinate |
| 0Dh | RO | TOUCH2_Weight | [7:0] | | Touch Weight |
| 0Eh | RO | TOUCH2_Misc | [3:0] | 00-0Fh | Touch Area |
| 0Fh | RO | TOUCH3_Event_Flag | [7:6] | 0 | Put Down |
| | | | | 1 | Put Up |
| | | | | 2 | Contact |
| | | | | 3 | Reserved |
| 0Fh | RO | TOUCH3_XH | [3:0] | 0-1 | Upper 4 bits of X touch coordinate |
| 10 | RO | TOUCH3_XL | [7:0] | 00 - FFh | Lower 8 bits of X touch coordinate |
| 11h | RO | TOUCH3_YH | [3:0] | 0-1 | Upper 4 bits of Y touch coordinate |
| 12h | RO | TOUCH3_YL | [7:0] | 00 - FFh | Lower 8 bits of Y touch coordinate |
| 13h | RO | TOUCH3_Weight | [7:0] | | Touch Weight |
| 14h | RO | TOUCH3_Misc | [3:0] | 00-0Fh | Touch Area |
| 15h | RO | TOUCH4_Event_Flag | [7:6] | 0 | Put Down |
| | | | | 1 | Put Up |
| | | | | 2 | Contact |
| | | | | 3 | Reserved |
| 15h | RO | TOUCH4_XH | [3:0] | 0-1 | Upper 4 bits of X touch coordinate |
| 16h | RO | TOUCH4_XL | [7:0] | 00 - FFh | Lower 8 bits of X touch coordinate |
| 17h | RO | TOUCH4_YH | [3:0] | 0-1 | Upper 4 bits of Y touch coordinate |
| 18h | RO | TOUCH4_YL | [7:0] | 00 - FFh | Lower 8 bits of Y touch coordinate |
| 1Ah | RO | TOUCH4_Misc | [3:0] | 00-0Fh | Touch Area |
| 1Bh | RO | TOUCH5_Event_Flag | [7:6] | 0 | Put Down |
| | | | | 1 | Put Up |
| | | | | 2 | Contact |
| | | | | 3 | Reserved |



| Register No. | Access | Register Name | Bits | Value | Description |
|--------------|--------|--------------------|-------|----------|------------------------------------|
| 1Bh | RO | TOUCH5_XH | [3:0] | 0 - 1 | Upper 4 bits of X touch coordinate |
| 1Ch | RO | TOUCH5_XL | [7:0] | 00 - FFh | Lower 8 bits of X touch coordinate |
| 1Dh | RO | TOUCH5_YH | [3:0] | 0 - 1 | Upper 4 bits of Y touch coordinate |
| 1Eh | RO | TOUCH5_YL | [7:0] | 00 - FFh | Lower 8 bits of Y touch coordinate |
| 1Fh | RO | TOUCH5_Weight | [7:0] | | Touch Weight |
| 20 | RO | TOUCH5_Misc | [3:0] | 00-0Fh | Touch Area |
| 21h | RO | TOUCH6_Event_Flag | [7:6] | 0 | Put Down |
| | | | | 1 | Put Up |
| | | | | 2 | Contact |
| | | | | 3 | Reserved |
| 21h | RO | TOUCH6_XH | [3:0] | 0 - 1 | Upper 4 bits of X touch coordinate |
| 22h | RO | TOUCH6_XL | [7:0] | 00 - FFh | Lower 8 bits of X touch coordinate |
| 23h | RO | TOUCH6_YH | [3:0] | 0 - 1 | Upper 4 bits of Y touch coordinate |
| 24h | RO | TOUCH6_YL | [7:0] | 00 - FFh | Lower 8 bits of Y touch coordinate |
| 25h | RO | TOUCH6_Weight | [7:0] | | Touch Weight |
| 26h | RO | TOUCH6_Misc | [3:0] | 00-0Fh | Touch Area |
| 27h | RO | TOUCH7_Event_Flag | [7:6] | 0 | Put Down |
| | | | | 1 | Put Up |
| | | | | 2 | Contact |
| | | | | 3 | Reserved |
| 27h | RO | TOUCH7_XH | [3:0] | 0 - 1 | Upper 4 bits of X touch coordinate |
| 28h | RO | TOUCH7_XL | [7:0] | 00 - FFh | Lower 8 bits of X touch coordinate |
| 29h | RO | TOUCH7_YH | [3:0] | 0 - 1 | Upper 4 bits of Y touch coordinate |
| 2Ah | RO | TOUCH7_YL | [7:0] | 00 - FFh | Lower 8 bits of Y touch coordinate |
| 2Bh | RO | TOUCH7_Weight | [7:0] | | Touch Weight |
| 2Ch | RO | TOUCH7_Misc | [3:0] | 00-0Fh | Touch Area |
| 2Dh | RO | TOUCH8_Event_Flag | [7:6] | 0 | Put Down |
| | | | | 1 | Put Up |
| | | | | 2 | Contact |
| | | | | 3 | Reserved |
| 2Dh | RO | TOUCH8_XH | [3:0] | 0 - 1 | Upper 4 bits of X touch coordinate |
| 2Eh | RO | TOUCH8_XL | [7:0] | 00 - FFh | Lower 8 bits of X touch coordinate |
| 2Fh | RO | TOUCH8_YH | [3:0] | 0 - 1 | Upper 4 bits of Y touch coordinate |
| 30 | RO | TOUCH8_YL | [7:0] | 00 - FFh | Lower 8 bits of Y touch coordinate |
| 31h | RO | TOUCH8_Weight | [7:0] | | Touch Weight |
| 32h | RO | TOUCH8_Misc | [3:0] | 00-0Fh | Touch Area |
| 33h | RO | TOUCH9_Event_Flag | [7:6] | 0 | Put Down |
| | | | | 1 | Put Up |
| | | | | 2 | Contact |
| | | | | 3 | Reserved |
| 33h | RO | TOUCH9_XH | [3:0] | 0 - 1 | Upper 4 bits of X touch coordinate |
| 34h | RO | TOUCH9_XL | [7:0] | 00 - FFh | Lower 8 bits of X touch coordinate |
| 35h | RO | TOUCH9_YH | [3:0] | 0 - 1 | Upper 4 bits of Y touch coordinate |
| 36h | RO | TOUCH9_YL | [7:0] | 00 - FFh | Lower 8 bits of Y touch coordinate |
| 37h | RO | TOUCH9_Weight | [7:0] | | Touch Weight |
| 38h | RO | TOUCH9_Misc | [3:0] | 00 - 0Fh | Touch Area |
| 39h | RO | TOUCH10_Event_Flag | [7:6] | 0 | Put Down |
| | | | | 1 | Put Up |
| | | | | 2 | Contact |
| | | | | 3 | Reserved |
| 39h | RO | TOUCH10_XH | [3:0] | 0 - 1 | Upper 4 bits of X touch coordinate |
| 3Ah | RO | TOUCH10_XL | [7:0] | 00 - FFh | Lower 8 bits of X touch coordinate |
| 3Bh | RO | TOUCH10_YH | [3:0] | 0 - 1 | Upper 4 bits of Y touch coordinate |
| 3Ch | RO | TOUCH10_YL | [7:0] | 00 - FFh | Lower 8 bits of Y touch coordinate |
| Register No. | Access | Register Name | Bits | Value | Description |



| | | | | | |
|-----|----|--------------------|-------|--------|---|
| 3Dh | RO | TOUCH10_Weight | [7:0] | 00-FFh | Touch Weight |
| 3Eh | RO | TOUCH10_Misc | [3:0] | 00-0Fh | Touch Area |
| A1h | RO | ID_G_LIB_VERSION_H | [7:0] | 00-FFh | App library version high-byte Default: 0 |
| A2h | RO | ID_G_LIB_VERSION_L | [7:0] | 00-FFh | App library version low-byte Default: 2h |
| A3h | RO | ID_G_CHIPER_HIGH | [7:0] | 00-FFh | Chip Vendor ID Default: 0x54 |
| A6h | RO | ID_G_FIRMID | [7:0] | 00-FFh | Firmware ID Number Default: 11 |
| A8h | RO | ID_G_VENODRID | [7:0] | 00-FFh | CTPM Vendor's Chip ID Default: 79h |

Capacitive Touch Panel Characteristics:

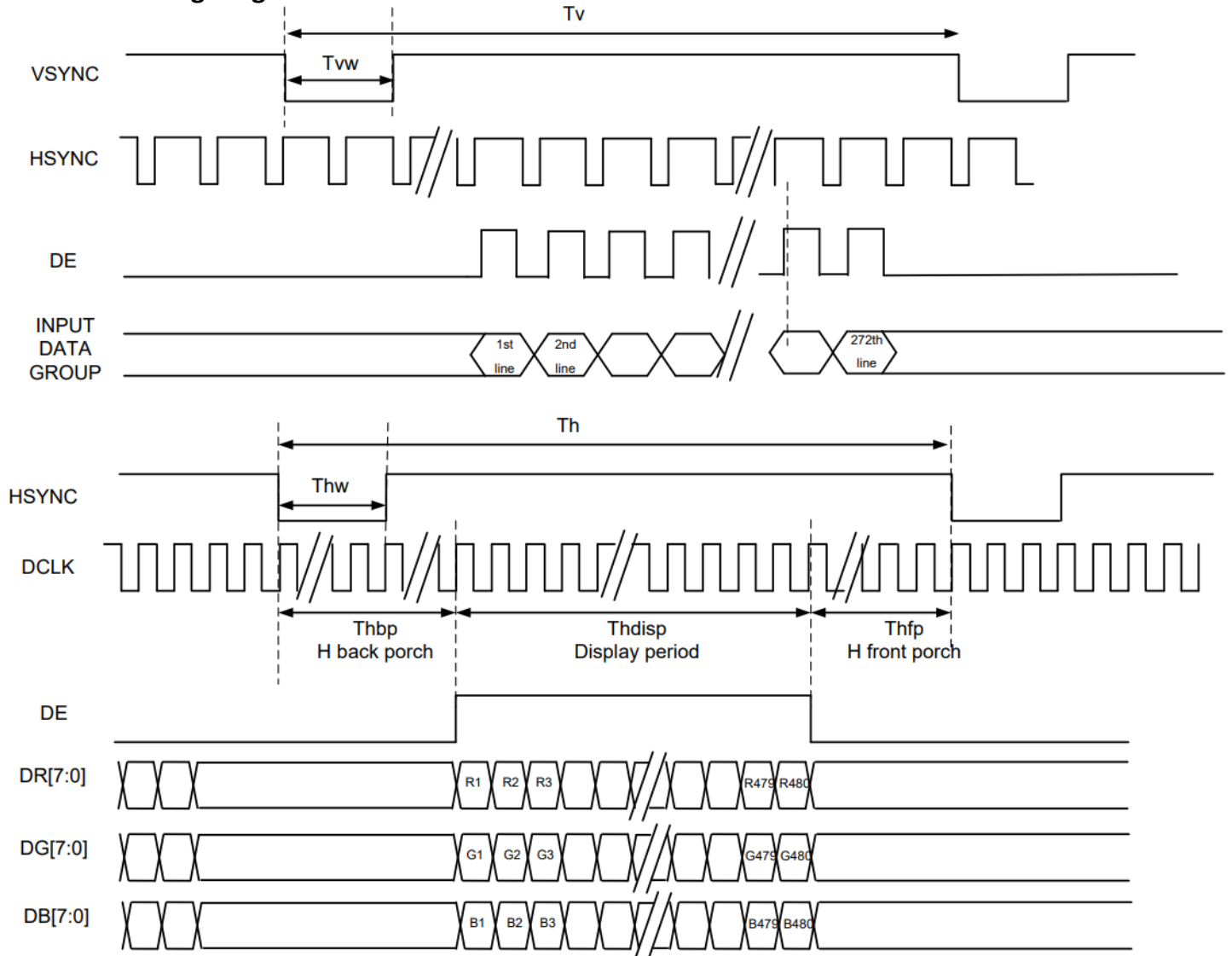
| Item | Value |
|-------------------|-------|
| Surface Hardness | ≥6H |
| Transmittance | 82% |
| Multitouch Points | 10 |

Timing Characteristics

Parallel RGB Input Timing Requirements

| Item | | Symbol | Min. | Typ. | Max. | Unit | Remark |
|----------------|----------------|-------------|------|------|------|------|---------------------------------------|
| DCLK Frequency | | F_{clk} | 28.2 | 29.2 | 40 | MHz | - |
| DLCK Period | | T_{clk} | 25 | 34 | - | ns | - |
| HSYNC | Period Time | T_h | 908 | 928 | 1088 | DCLK | $T_{hw} + T_{hbp} = 88$ DLCK is fixed |
| | Display Period | T_{hdisp} | 800 | | | DCLK | |
| | Pulse Width | T_{hw} | 1 | 48 | 87 | DCLK | |
| | Back Porch | T_{hbp} | 87 | 40 | 1 | DCLK | |
| | Front Porch | T_{hfp} | 20 | 40 | 200 | DCLK | |
| VSYNC | Display Period | T_{vdisp} | 480 | | | H | $T_{vw} + T_{vbp} = 32$ H is fixed |
| | Period Time | T_v | 517 | 525 | 613 | H | |
| | Pulse Width | T_{vw} | 1 | 1 | 3 | H | |
| | Back Porch | T_{vbp} | 31 | 31 | 29 | H | |
| | Front Porch | T_{vfp} | 5 | 13 | 101 | H | |

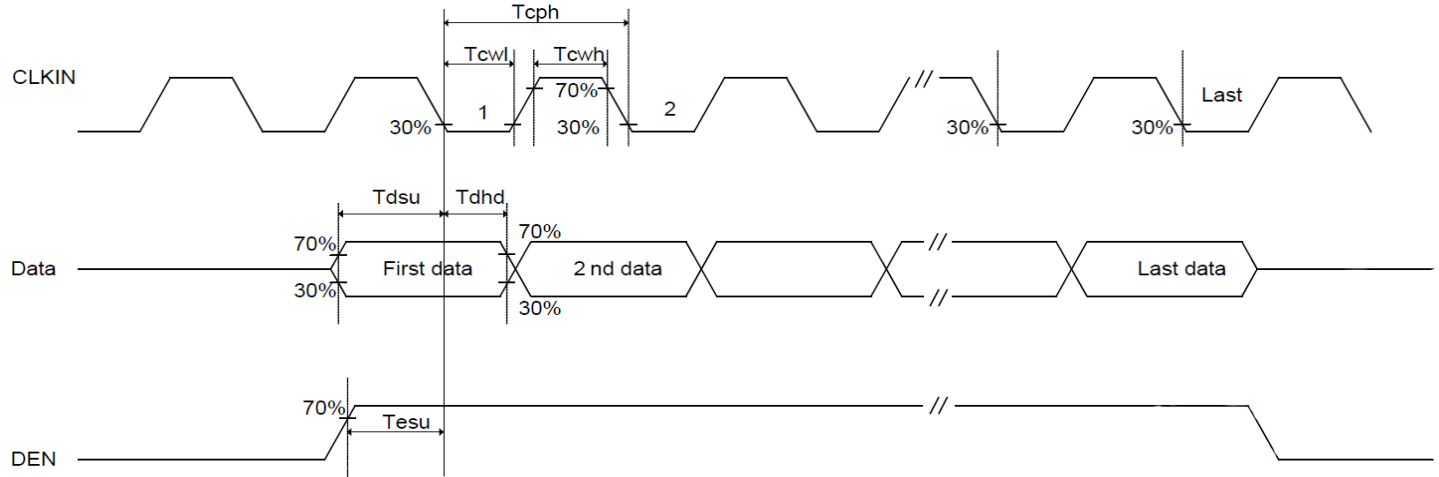
DE Mode Timing Diagram



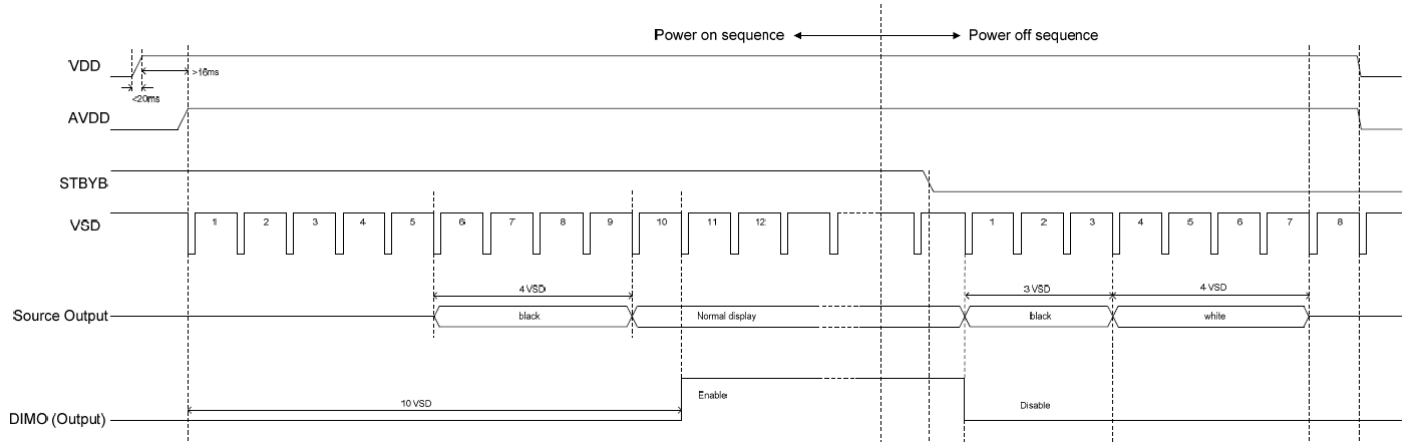
Input Setup Timing Requirements

| Item | Symbol | Min. | Typ. | Max. | Unit | Conditions |
|--|------------------|------|------|------|------|--------------------------------|
| V _{DD} Power Source Slew Time | T _{por} | - | - | 20 | ms | From 0V to 90% V _{DD} |
| CLK cycle time | T _{cph} | 20 | - | - | ns | - |
| CLK pulse duty | T _{cwh} | 40 | 50 | 60 | % | - |
| Data setup time | T _{dsu} | 8 | - | - | ns | - |
| Data hold time | T _{dhd} | 8 | - | - | ns | - |
| DEN setup time | T _{esu} | 8 | - | - | ns | - |
| DEN hold time | T _{ehd} | 8 | - | - | ns | - |

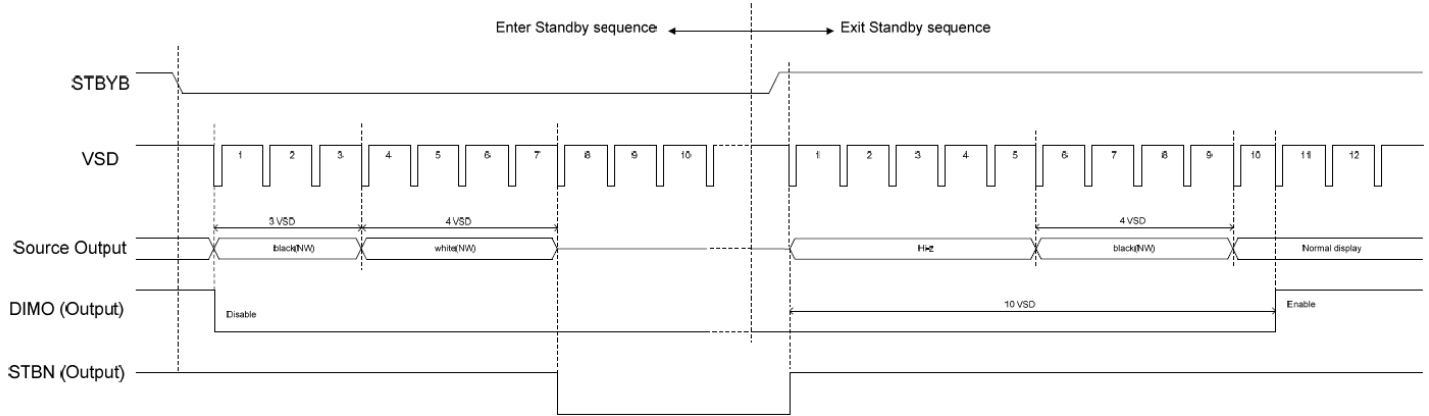
Input Setup Timing Diagram



Power ON/OFF Sequence

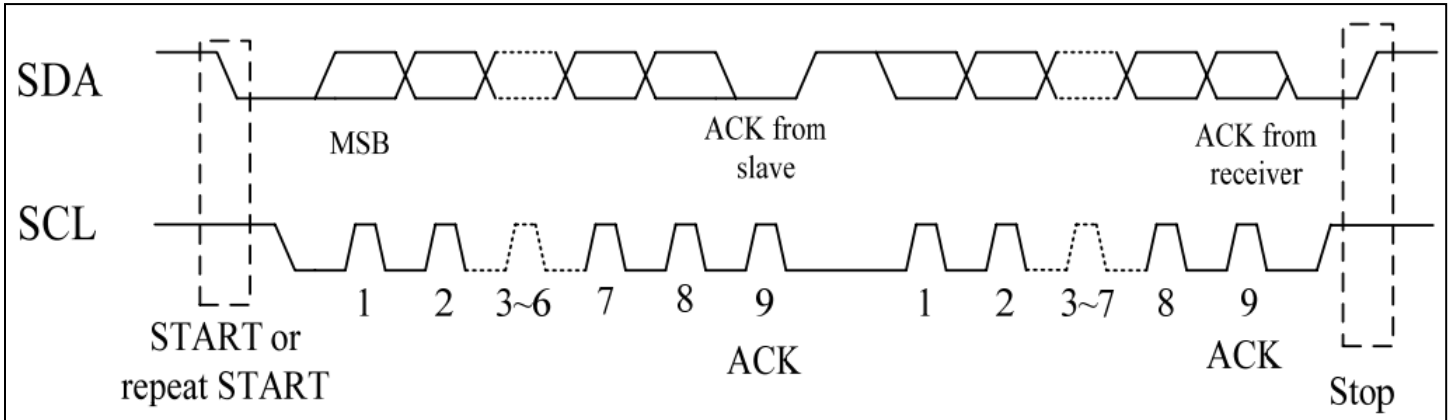


Enter/Exit Standby Mode Sequence

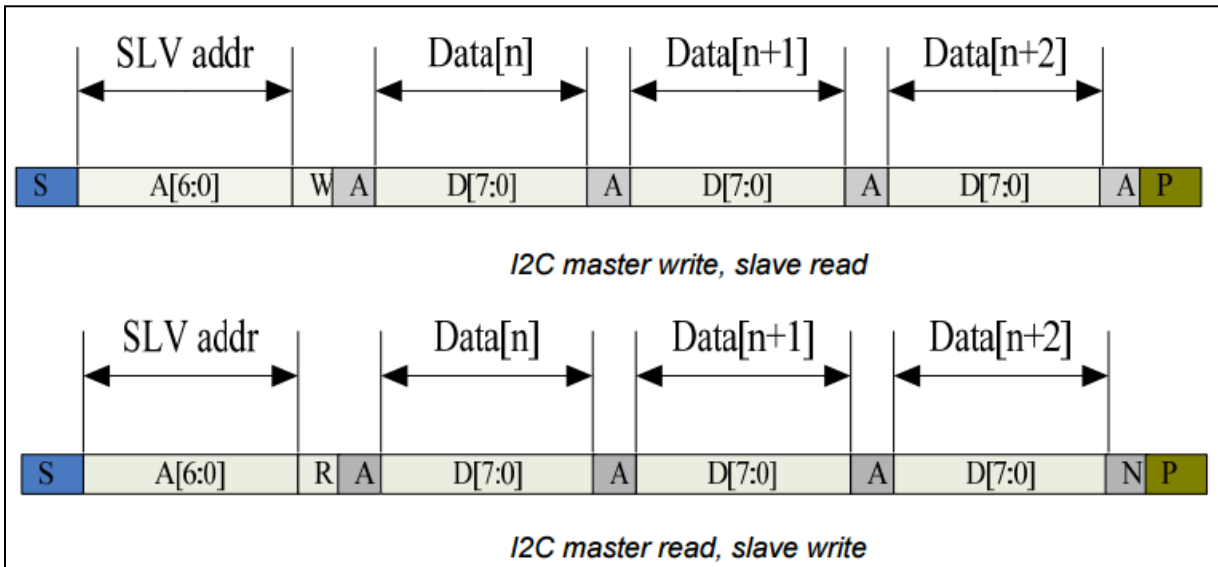


Timing Characteristics – Capacitive Touch Panel

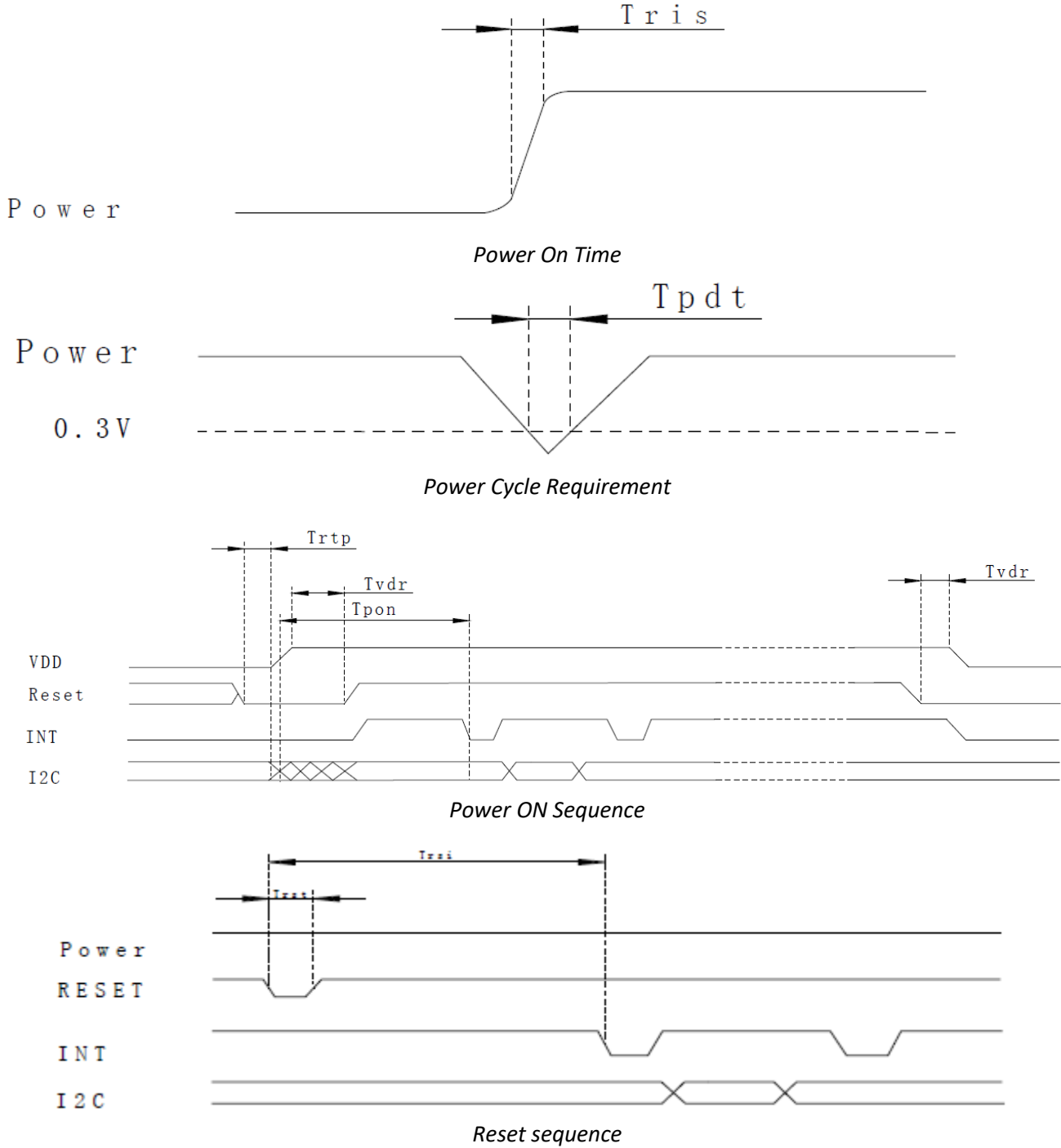
Data Transfer Format



| Parameter | Min | Max | Unit |
|--|-----|-----|------|
| SCL Frequency | 0 | 400 | KHz |
| Bus free time between a STOP & START condition | 1.3 | - | μs |
| Hold time Repeated START condition | 0.6 | - | μs |
| Data Setup Time | 100 | - | ns |
| Setup time for a repeated START condition | 0.6 | - | μs |
| Setup time for a STOP condition | 0.6 | - | μs |

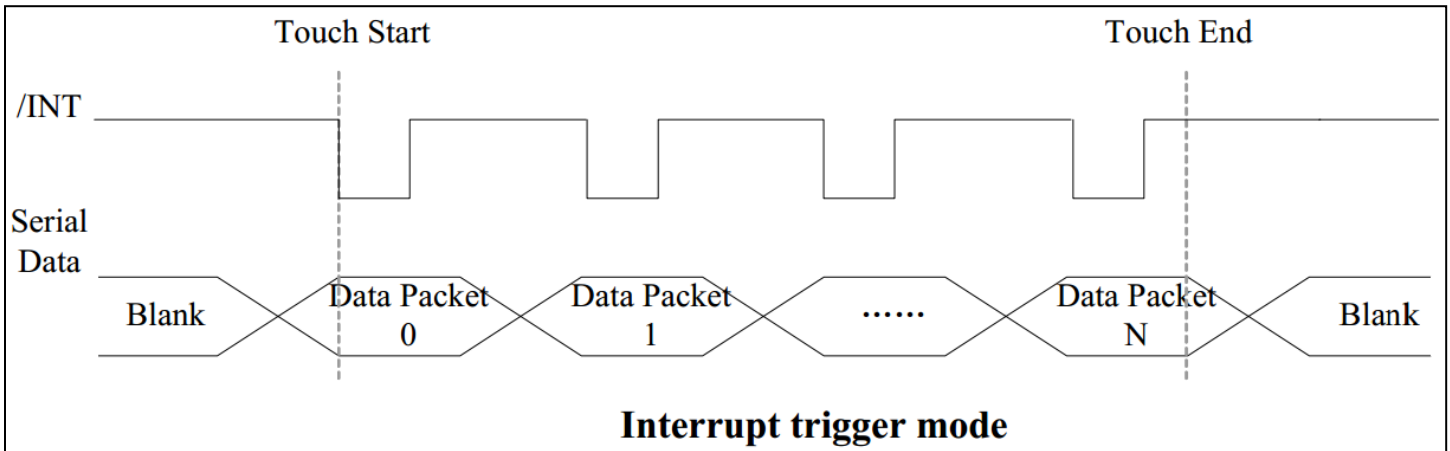


Power ON/Reset Sequence



| Parameter | Description | Min | Max | Unit |
|-----------|---|-----|-----|------|
| Tris | Rise time from 0.1V _{DD} to 0.9V _{DD} | - | 5 | ms |
| Tpdt | Time of the voltage of supply being below 0.3V | 5 | - | ms |
| Trtp | Time of resetting to be low before powering on | 100 | - | μs |
| Tpon | Time to start reporting after power on | - | 200 | ms |
| Tvdr* | Reset time after applying V _{DD} | 1 | - | ms |
| Trsi | Time to start reporting after reset | - | 200 | ms |
| Trst* | Reset Time | 1 | - | ms |

*Note: If Reset is tied to V_{DD} data corruption can occur



Sample code to read touch data:

```

i2c_start();
i2c_tx(0x70);           //Slave Address (Write)
i2c_tx(0x00);         //Start reading address
i2c_stop();

i2c_start();
i2c_tx(0x71);         //Slave Address (Read)
for(i=0x00;i<0x1F;i++)
{touchdata_buffer[i] = i2c_rx(1);}
i2c_stop();

```

Sample code to overwrite default register values:

```

i2c_start();
i2c_tx(0x70);         //Slave Address (Write)
i2c_tx(0xA4);         //ID_G_Mode
i2c_tx(0x01);         //Disable interrupt status to host
i2c_stop();

```

Quality Information

| Test Item | Content of Test | Test Condition | Note |
|-------------------------------------|---|--|------|
| High Temperature storage | Endurance test applying the high storage temperature for a long time. | +80°C, 96hrs | 2 |
| Low Temperature storage | Endurance test applying the low storage temperature for a long time. | -30°C, 96hrs | 1,2 |
| High Temperature Operation | Endurance test applying the electric stress (voltage & current) and the high thermal stress for a long time. | +70°C, 96hrs | 2 |
| Low Temperature Operation | Endurance test applying the electric stress (voltage & current) and the low thermal stress for a long time. | -20°C, 96hrs | 1,2 |
| High Temperature / Humidity Storage | Endurance test applying the electric stress (voltage & current) and the high thermal with high humidity stress for a long time. | +50°C, 90% RH, 96hrs | 1,2 |
| Thermal Shock resistance | Endurance test applying the electric stress (voltage & current) during a cycle of low and high thermal stress. | -20°C, 60min -> 70°C, 60min, = 1 Cycle For 20 cycles | |
| Vibration test | Endurance test applying vibration to simulate transportation and use. | 10-50Hz, 5G amplitude. 30min in each of 3 directions: X, Y, Z | 3 |
| Static electricity test | Endurance test applying electric static discharge. | Air: ±8KV 150pf/330Ω 5 Times | |
| | | Contact: ±4KV 150pf/330Ω 5 times | |

Note 1: No condensation to be observed.

Note 2: Conducted after 4 hours of storage at 25°C, 0%RH.

Note 3: Test performed on product itself, not inside a container.