



**MULTI-INNO TECHNOLOGY CO., LTD.**

[www.multi-inno.com](http://www.multi-inno.com)

## TOUCH PANEL SPECIFICATION

**Model : MI0500CCP-C**

This module uses ROHS material

### For Customer's Acceptance:

Customer	
Approved	
Comment	

This specification may change without prior notice in order to improve performance or quality. Please contact Multi-Inno for updated specification and product status before design for this product or release of this order.

Revision	1.0
Engineering	
Date	2013-07-22
Our Reference	





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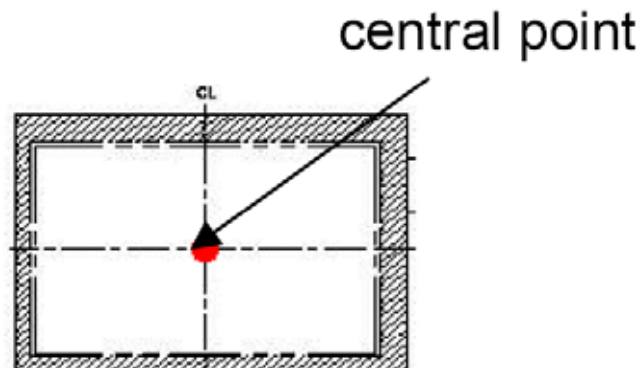
### 3. GENERAL SPECIFICATIONS

Composition: 5"inch Capacitive Touch Panel (CTP).

Interface: I<sup>2</sup>C for the CTP.

Item	Specification	Unit
Type	Transparent type projected capacitive touch panel	
Input mode	Human's finger	
Finger	2	
Outline Dimension	142(W) x 94(H) x 2.35(D)	mm
Active area	108.8(W) x 65.6(H)	mm
Transparency	≥ 85	%
Haze	≤ 1.0	%
Point hitting life time	T.B.D	Note 1
Weight	T.B.D	g
Our components and processes are compliant to RoHS standard		

Note 1: Use 8 mm diameter silicon rubber/force 3N to knock on central point twice per second (no-operating), function pass after test.



### 4. ELECTRICAL CHARACTERISTICS

Ta= 25°C

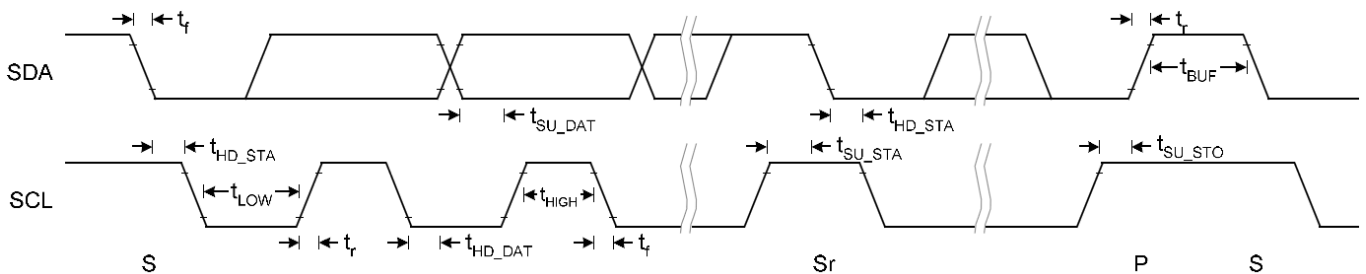
Parameter	Symbol	MIN.	Typ.	MAX.	Unit	Remark
Power Supply voltage	V <sub>CC</sub>	3.0	3.3	3.6	V	
Power Supply Current	I <sub>DD</sub>	--	TBD	--	mA	V <sub>CC</sub> =3.3V
"H" level logical input voltage	V <sub>IH</sub>	1.9	--	V <sub>CC</sub>	V	
"L" level logical input voltage	V <sub>IL</sub>	0	--	1.3	V	

## 5. Pin Connections

No.	Name	I/O	Description
1	V <sub>CC</sub>	-	Power; V <sub>CC</sub> =3.3V(typ.)
2	SCL	I	I <sup>2</sup> C Clock
3	SDA	I/O	I <sup>2</sup> C Data
4	/TP_INT	O	Active low when data output from touch panel
5	/TP_RST	I	CTP reset input pin, active low.
6	GND	-	Ground

## 6. Interface and Data Format (Slave address is 0x55H)

Communication protocol: I<sup>2</sup>C



I2C Fast Mode Timing

Symbol	Parameter	Rating			Unit
		Min.	Typ.	Max.	
f <sub>SCL</sub>	SCL clock frequency	0	-	400	kHz
t <sub>LOW</sub>	Low period of the SCL clock	1.3	-	-	us
t <sub>HIGH</sub>	High period of the SCL clock	0.6	-	-	us
t <sub>r</sub>	Signal falling time	-	-	300	ns
t <sub>r</sub>	Signal rising time	-	-	300	ns
t <sub>SU_STA</sub>	Set up time for a repeated START condition	0.6	-	-	us
t <sub>HD_STA</sub>	Hold time (repeated) START condition. After this period, the first clock pulse is generated.	0.6	-	-	us
t <sub>SU_DAT</sub>	Data set up time	100	-	-	ns
t <sub>HD_DAT</sub>	Data hold time	0	-	0.9	us
t <sub>SU_STO</sub>	Set up time for STOP condition	0.6	-	-	us
t <sub>BUF</sub>	Bus free time between a STOP and START condition	1.3	-	-	us
C <sub>b</sub>	Capacitive load for each bus line	-	-	400	pF

I2C Fast Mode Timing Characteristic

**6.1 Register Read**

For reading register value from I<sup>2</sup>C device, host has to tell I<sup>2</sup>C device the Start Register Address before reading corresponding register value.

I <sup>2</sup> C Start	I <sup>2</sup> C Header (W)	Start Reg. Addr. (a)	I <sup>2</sup> C Stop	I <sup>2</sup> C Start	I <sup>2</sup> C Header (R)	Value of Reg(a)	Value of Reg(a+1)	...	Value of Reg(a+n)	I <sup>2</sup> C Stop
------------------------	-----------------------------	----------------------	-----------------------	------------------------	-----------------------------	-----------------	-------------------	-----	-------------------	-----------------------

Figure 1 - Register Read Format.

The I<sup>2</sup>C host interface protocol supports Repeated Register Read. That is, once the Start Register Address has been set by host, consequent I<sup>2</sup>C Read(R) transactions will directly read register values starting from the Start Register Address without setting address first, as shown in Figure 2.

I <sup>2</sup> C Start	I <sup>2</sup> C Header (R)	Value of Reg(a)	Value of Reg(a+1)	...	Value of Reg(a+n)	I <sup>2</sup> C Stop	I <sup>2</sup> C Start	I <sup>2</sup> C Header (R)	Value of Reg(a)	Value of Reg(a+1)	...	Value of Reg(a+n)	I <sup>2</sup> C Stop
------------------------	-----------------------------	-----------------	-------------------	-----	-------------------	-----------------------	------------------------	-----------------------------	-----------------	-------------------	-----	-------------------	-----------------------

Figure 2 - Repeated Register Read.

**6.2 Register Write**

For writing register to I2C device, host has to tell I2C device the Start Register Address in each I2C Register Write transaction. Register values to the I2C device will be written to the address starting from the Start Register Address described in Register Write I2C transaction as shown in Figure 3.

I <sup>2</sup> C Start	I <sup>2</sup> C Header (W)	Start Reg. Addr. (a)	Value of Reg(a)	Value of Reg(a+1)	...	Value of Reg(a+n)	I <sup>2</sup> C Stop
------------------------	-----------------------------	----------------------	-----------------	-------------------	-----	-------------------	-----------------------

Figure 3.

**7. REPORT PAGE REGISTERS**

The provides a register set for host to configure device attributes and retrieve information about fingers, proximity, gestures or raw data through device host interface. Host interface registers are listed below.

Host Interface Registers (Report Page)									
Reg. Addr.	Name	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x00	Firmware Version	Version (RO)							
0x01	Status Reg.	Error Code (RO)				Device Status (RO)			
0x02	Device Control Reg.	Auto Tune (RW)	Flash Update Disable (RW)	Reserved		Gest. Enable (RW)	Proximity Enable (RW)	Power Down (RW)	Power Down (RW)



0x03	Timeout to Idle Reg.	Timeout to Idle (sec.) (RW)			
0x04	XY Resolution (High Byte)	X_Res_H (RW)		Y_Res_H (RW)	
0x05	X Resolution (Low Byte)	X_Res_L (RW)			
0x06	Y Resolution (Low Byte)	Y_Res_L (RW)			
0x07	Max Drift Threshold	Max Drift Threshold (RW)			
0x08	Touch Threshold (High Byte)	Touch_TH_H (RW)			
0x09	Touch Threshold (Low Byte)	Touch_TH_L (RW)			
0x0A	Noise Threshold	Noise_TH (RW)			
0x0B	Key Threshold	Key_TH (RW)			
0x0C	Firmware Revision 3	FW_Rev_3			
0x0D	Firmware Revision 2	FW_Rev_2			
0x0E	Firmware Revision 1	FW_Rev_1			
0x0F	Firmware Revision 0	FW_Rev_0			
0x10	Fingers / Gesture	Gesture Code (RO)		Fingers (RO)	
0x11	Keys Reg.	Keys (RO)			
0x12	XY0 Coord. (High Byte)	Valid 0 (RO)	X0_H (RO)	Reserved	Y0_H (RO)
0x13	X0 Coord. (Low Byte)	X0_L (RO)			
0x14	Y0 Coord. (Low Byte)	Y0_L (RO)			
0x15	XY1 Coord. (High)	Valid 1 (RO)	X1_H (RO)	Reserved	Y1_H (RO)



	Byte)			
0x16	X1 Coord. (Low Byte)		X1_L (RO)	
0x17	Y1 Coord. (Low Byte)		Y1_L (RO)	
0x18	Z0 Coord.		Z0 (RO)	
0x19	Z1 Coord.		Z1 (RO)	
0x1A ... 0x3F	...		<i>Reserved</i>	
0x40	Data [0] (High Byte)		Data _ H [0]	
0x41	Data [0] (Low Byte)		Data _ L [0]	
0x42	Data [1] (High Byte)		Data _ H [1]	
0x43	Data [1] (Low Byte)		Data _ L [1]	
0x44	Data [2] (High Byte)		Data _ H [2]	
0x45	Data [2] (Low Byte)		Data _ L [2]	
...	...		...	
0x7E	Raw Data[31] (High Byte)		Data _ H [31]	
0x7F	Raw Data [31] (Low Byte)		Data _ L [31]	
0x80 ... 0xFE	...		<i>Reserved</i>	
0xFF	Page Reg.		Page Number (RW)	



### 7.1 Firmware Version Register

Reg. Addr.	Name	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x00	Firmware Version	Version (RO)							

Firmware Version Register provides version information about current firmware. Host application can support version control in firmware upgrade function by reading Firmware Version Register and comparing with the version of new firmware binary.

### 7.2 Status Register

Reg. Addr.	Name	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x01	Status Reg.	Error Code (RO)				Device Status (RO)			

Status Register shows current status of the device to host, including Device Status and Error Code. Init status represents that the device is in Init state and not ready for host access. Host has to wait for the device to change into Normal state before accessing registers other than Status Register.

If Device Status shows Error, the Error Code field in the Status Register gives reason of the error.

Error Code	
0x0	No Error
0x1	Invalid Address
0x2	Invalid Value
0x3	Invalid Platform
0x4	Reserved
...	
0xF	

Device Status	
0x0	Normal
0x1	Init
0x2	Error
0x3	Auto Tuning
0x4	Idle
0x5	Power Down
0x6	Reserved
...	
0xF	

### 7.3 Device Control Register

Reg. Addr.	Name	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x02	Firmware Version	Auto Tune (RW)	Flash Update Disable (RW)	Reserved		Gest. Enable (RW)	Proximity Enable (RW)	Power Down (RW)	Reset (RW)

Device Control Register provides device control bits for host to reset the device, power down the device, enable/disable proximity detection, enable/disable gestures or data mode. Power Down state will be updated to Device Status field of Status Register, 0x01, after setting/clearing Power Down bit. Set Data Mode to 0x1 for Raw Data mode. Set Data Mode to 0x02 for Delta mode. Set Auto Tune to 0x1 will enable Auto Tune. Set Flash Update Disable to 0x00 will write the Auto Tune's result to flash.

### 7.4 Proximity Enable and Timeout to Idle Register

Reg. Addr.	Name	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x03	Timeout to Idle Reg.	Timeout to Idle (sec.) (RW)							

Timeout to Idle Register provides timeout control to enter Idle Mode for host. The touch controller will enter Idle Mode after the number of seconds specified in Timeout to Idle Register if there is no touch detected in this period. Set this field to 0xFF will disable Idle Mode. Set this field to 0 will enter Idle Mode immediately. Idle state will be updated to Device Status field of Status Register, 0x01, after entering Idle Mode automatically. The default value of Timeout to Idle Register is set to 0x08 for 8 seconds to Idle Mode.

### 7.5 XY Resolution Registers

Reg. Addr.	Name	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x04	XY Resolution (High Byte)	X_Res_H (RW)				Y_Res_H (RW)			
0x05	X Resolution (Low Byte)	X_Res_L (RW)							
0x06	Y Resolution (Low Byte)	Y_Res_L (RW)							

XY Resolution Registers represents resolution of X and Y coordinates of the touch screen. Host can change XY Resolution at run time by updating new resolution to these registers.

### 7.6 Threshold Setting

Reg. Addr.	Name	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x07	Max Drift Threshold	Max Drift Threshold (RW)							
0x08	Touch Threshold (High Byte)	Touch_TH_H (RW)							
0x09	Touch Threshold (Low Byte)	Touch_TH_L (RW)							
0x0A	Noise Threshold	Noise_TH (RW)							
0x0B	Key Threshold	Key_TH (RW)							

Max Drift Threshold field defines the largest allowable drift in reported coordinates before issuing a new interrupt. Setting this field to 0 will disable Max Drift Threshold function. The default setting is 0. Touch Threshold, Noise Threshold and Key Threshold define threshold of touch event detecting for Touch, Noise and Key sensors.

### 7.7 Firmware Revision Registers

Reg. Addr.	Name	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x0C	Firmware Revision 3	FW_Rev_3							
0x0D	Firmware Revision 2	FW_Rev_2							
0x0E	Firmware Revision 1	FW_Rev_1							
0x0F	Firmware Revision 0	FW_Rev_0							

Firmware Revision Registers provide revision information about current firmware.

### 7.8 Fingers and Gesture Register

Reg. Addr.	Name	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x10	Fingers / Gesture	Gesture Code (RO)				Fingers (RO)			

Fingers field represents number of fingers detected by touch controller. The coordinates of each finger detected are represents in X Coordinate and Y Coordinate fields. Gesture Register tells host which gesture is detected by the controller. Gesture Codes for each gesture are listed below.

Device Status	
0x0	No Detected
0x1	Single Touch Tap
0x2	Single Touch Double Tap
0x3	Single Touch Slide Up
0x4	Single Touch Slide Down
0x5	Single Touch Slide Left
0x6	Single Touch Slide Right
0x7	Two Finger Slide Up
0x8	Two Finger Slide Down
0x9	Two Finger Slide Left
0xA	Two Finger Slide Right
0x0B	Pinch In (Zoom In)
0x0C	Pinch Out (Zoom Out)
0x0D	Rotate CW (CCW, for Top Down Mapping)
0x0E	Rotate CCW (CW, for Top Down Mapping)
0x0F	Object Approaching
0x10	Object Leaving
0x11	Reserved
...	
0x1F	

### 7.9 Keys Register

Reg. Addr.	Name	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x11	Keys	Keys (RO)							

Key field represents which key is pressed or released. Each bit in the Key field represents the pressed or released state of one key. If the bit is set, it means that the corresponding key is pressed. Otherwise, the key is released.

### 7.10 XY Coordinate Registers

Reg. Addr.	Name	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x12	XY0 Coord. (High Byte)	Valid 0 (RO)	X0_H (RO)			Reserved	Y0_H (RO)		
0x13	X0 Coord. (Low Byte)	X0_L (RO)							
0x14	Y0 Coord. (Low Byte)	Y0_L (RO)							

XY Coordinate Registers represent the XY coordinates for each touch point ID. Valid bit field tells that this point ID is valid and the XY information represents a real touch point on touch sensor.

Z Coordinate Register indicates the touch strength of corresponding touch point ID.

### 7.11 Z Coordinate Registers

Reg. Addr.	Name	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x18	Z0 Coord.	Z0 (RO)							
0x19	Z1 Coord.	Z1 (RO)							

Z Coordinate Register indicates the touch strength of corresponding touch point ID. Z0 represents touch strength of point ID 0 and Z1 represents touch strength of point ID 1.

### 7.12 Data Registers

Reg. Addr.	Name	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x40	Data [0] (High Byte)	Data _ H [0]							
0x41	Data [0] (Low Byte)	Data _ L [0]							
0x42	Data [1] (High Byte)	Data _ H [1]							
0x43	Data [1] (Low Byte)	Data _ L [1]							
0x44	Data [2] (High Byte)	Data _ H [2]							
0x45	Data [2] (Low Byte)	Data _ L [2]							
...	...	...							
0x7E	Raw Data[31] (High Byte)	Data _ H [31]							
0x7F	Raw Data [31] (Low Byte)	Data _ L [31]							

Data Registers provide raw or delta data detected by touch sensor controller. If Data Mode of Device Control Register (0x02) is set to Raw Mode, Data Registers represent raw data. If Data Mode is set to Delta Mode, Data Registers represent delta data. Data Registers will be updated for each scan frame when in raw or delta mode. Otherwise, Raw Data Registers will not be updated.

### 7.13 Page Register

Reg. Addr.	Name	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0xFF	Page Reg.	Page Number (RW)							

Page Register provides changing page of Host Interface Register.  
Default page is Report Page.

Page Number	Description
0x00	Report Page
0x01	Auto Tune Page

## 8. SAMPLE CODES

### 8.1 Data Structures and APIs

```
typedef struct
{
    u8 y_h: 3,
    reserved: 1,
    x_h: 3,
    valid: 1;
    u8 x_l;
    u8 y_l;
}
xy_data_t;
typedef struct
{
    u8 fingers: 3,
    gesture: 5;
    u8 keys;
    xy_data_t xy_data[2];
}
stx_report_data_t;
// I2C Master sends count bytes data stored in buf to I2C Slave.
// I2C package: | S | I2C Addr | W | Data (buf) | P |
extern int i2c_master_send(const char *buf, int count);
// I2C Master reads count bytes data to buf from I2C Slave.
// I2C package: | S | I2C Addr | R | Data (buf) | Nak | P |
extern int i2c_master_recv(char *buf, int count);
```

### 8.2 Get Version

```
static int get_fw_version(u32 *ver)
{
    u8 buf[1];
    int ret = 0;
    buf[0] = 0x0; // Set Reg. address to 0x0 for reading FW Version.
    if (ret = i2c_master_send(buf, 1))
        goto err;
    if (ret = i2c_master_recv(buf, 1)) // Read 1 byte FW Version from Reg. 0x0 set previously.
        goto err;
    *ver = (u32) buf[0]; // Return FW Version.
    buf[0] = 0x10; // Set Reg. address back to 0x10 for Coordinates.
    if (i2c_master_send(buf, 1))
        goto err;
    err:
    return ret;
}
```



### 8.3 Set Power Down (PD)

```
static int set_power_down()
{
    u8 buf[2];
    int ret = 0;
    buf[0] = 0x2; // Set Reg. address to 0x2 for Device Control Reg.
    buf[1] = 0xA; // Keep Gesture bit and set PD bit to enter Power Down.
    if (ret = i2c_master_send(buf, 2))
        goto err;
    err:
    return ret;
}
```

### 8.4 Set XY Resolution

```
static int set_power_down()
{
    u8 buf[2];
    int ret = 0;
    buf[0] = 0x2; // Set Reg. address to 0x2 for Device Control Reg.
    buf[1] = 0xA; // Keep Gesture bit and set PD bit to enter Power Down.
    if (ret = i2c_master_send(buf, 2))
        goto err;
    buf[0] = 0x10; // Set Reg. address back to 0x10 for Coordinates.
    if (i2c_master_send(buf, 1))
        goto err;
    err:
    return ret;
}
```

### 8.5 Read XY Coordinates

The function, `get_coordinates()`, reads XY Coordinate registers from I2C Slave, extracts XY information from data buffer and returns to upper layer. This function shall be called from ISR each time when host receives and INT from device.

```
static int get_coordinates(u8 *count, u32 *x0, u32 *y0, u32 *x1, u32 *y1)
{
    u8 buf[8];
    stx_report_data_t *pdata;
    int ret = 0;
    *count = 0; // Set point detected count to 0.
    if (i2c_master_rcv(buf, 8)) // Read Coordinates from default Reg. address 0x10.
        goto err;
    pdata = (stx_report_data_t *) buf;
    if (pdata->fingers)
    {
        if (pdata->xy_data[0].valid)
        {
            *x0 = pdata->xy_data[0].x_h << 8 | pdata->xy_data[0].x_l;
            *y0 = pdata->xy_data[0].y_h << 8 | pdata->xy_data[0].y_l;
            (*count)++;
        }
        if (pdata->xy_data[1].valid)
        {
            *x1 = pdata->xy_data[1].x_h << 8 | pdata->xy_data[1].x_l;
            *y1 = pdata->xy_data[1].y_h << 8 | pdata->xy_data[1].y_l;
            (*count)++;
        }
    }
    err:
    return ret;
}
```

### 8.6 Set XY Resolution

```
static int set_resolution(u16 x_res, u16 y_res)
{
    u8 buf[4];
    int ret = 0;
    buf[0] = 0x4; // Set Reg. address to 0x4 for XY Resolution Registers.
    buf[1] = ((x_res & 0xF00) >> 4) | ((y_res & 0xF00) >> 8); // Set X_Res_H and Y_Res_H.
    buf[2] = x_res & 0xFF; // Set X_Res_L.
    buf[3] = y_res & 0xFF; // Set Y_Res_L.
    if (ret = i2c_master_send(buf, 4))
        goto err;
    buf[0] = 0x10; // Set Reg. address back to 0x10 for Coordinates.
    if (i2c_master_send(buf, 1))
        goto err;
    err:
    return ret;
}
```



**9. QUALITY ASSURANCE**

**9.1 Test Condition**

9.1.1 Temperature and Humidity(Ambient Temperature)

Temperature :  $25 \pm 5^{\circ}\text{C}$

Humidity :  $65 \pm 5\%$

9.1.2 Operation

Unless specified otherwise, test will be conducted under function state.

9.1.3 Container

Unless specified otherwise, vibration test will be conducted to the product itself without putting it in a container.

9.1.4 Test Frequency

In case of related to deterioration such as shock test. It will be conducted only once.

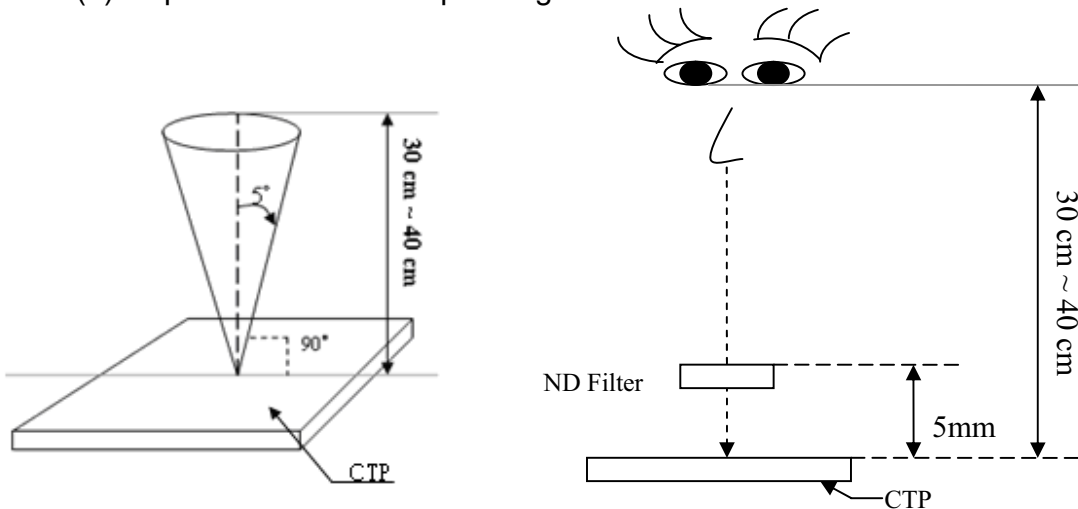
9.1.5 Test Method

No.	Item	Test Conditions	Remark
1	High Temperature Storage	Ta = 80 °C 240 hrs	IEC68-2-2
2	Low Temperature Storage	Ta = -30°C 240hrs	IEC68-2-1
3	High Temperature Operation	Ta = 70°C 240hrs	IEC68-2-2
4	Low Temperature Operation	Ta = -20°C 240hrs	IEC68-2-1
5	Operate at High Temperature and Humidity	+60°C , 90%RH 240 hrs	IEC68-2-3
6	Thermal Cycling Test (non operation)	-30°C (30 min) → + 80°C (30 min), 200 cycles	IEC68-2-14
7	Vibration Test(with carton)	Random Vibration : 0.015G <sup>2</sup> /Hz from 5-200HZ, -6dB/Octave from 200-400HZ 2 hours for each direction of X. Y. Z.	IEC68-2-6
8	Drop Test(with carton)	Height:60 cm 1 corner, 3 edges, 6 surfaces	JIS Z0202
9	Electro Static Discharge	± 200V, 200Pf(0Ω) 1 time/each terminal	IEC-61000-4-2

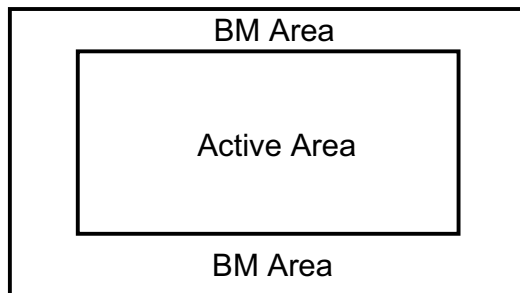
## 10. Appearance Specification

### 10.1 Inspection and Environment conditions

- 10.1.1 Temperature:  $25 \pm 5^\circ\text{C}$
- 10.1.2 Humidity:  $55 \pm 10\% \text{ RH}$
- 10.1.3 Light source: Fluorescent Light
- 10.1.4 Inspection: Viewing distance:  $35 \pm 5\text{cm}$
- 10.1.5 Ambient Illumination:
  - (1) Cosmetic Inspection: 500 ~ 800 lux
  - (2) Functional Inspection: 400 ~ 600 lux
- 10.1.6 Inspection View angle:
  - (1) Inspection under operating condition:  $\pm 5^\circ$
  - (2) Inspection under non-operating condition:  $\pm 45^\circ$



### 10.2 Definition of applicable Zones



### 10.3 Judgment standard

The Judgment of the above test should be made after exposure in room temperature for two hours as follow:

Pass: Normal display image with no obvious non-uniformity and no line defect.

Partial transformation of the module parts should be ignored.

Fail: No display image, obvious non-uniformity, or line defect.

**10.4 Cosmetic Specification and Inspection Items**

Inspection Item	Inspection Criteria	Illustration												
Display function	No Display malfunction													
Contrast ratio	Does not meet specified range in the spec.	(Major) (Note:2)												
Line Defect	No obvious Vertical and Horizontal line defect in black and White.													
Point Defect	<table border="1"> <thead> <tr> <th rowspan="2">Item</th> <th>Acceptable number</th> <th rowspan="2">Total</th> </tr> <tr> <th>Active Area</th> </tr> </thead> <tbody> <tr> <td>Bright</td> <td>2</td> <td rowspan="2">5</td> </tr> <tr> <td>Dark</td> <td>4</td> </tr> <tr> <td>Two adjacent dot</td> <td>2</td> <td>2</td> </tr> </tbody> </table>	Item	Acceptable number	Total	Active Area	Bright	2	5	Dark	4	Two adjacent dot	2	2	One Dot  Two adjacent dot 
Item	Acceptable number		Total											
	Active Area													
Bright	2	5												
Dark	4													
Two adjacent dot	2	2												
Foreign material (Black or White spots shape)	<table border="1"> <thead> <tr> <th>Zone / Dimension</th> <th>Acceptable number</th> <th>Class of Defects</th> </tr> </thead> <tbody> <tr> <td><math>D &gt; 0.5\text{mm}</math></td> <td>0</td> <td rowspan="3">Minor</td> </tr> <tr> <td><math>0.3\text{mm} &lt; D \leq 0.5\text{mm}</math></td> <td>5</td> </tr> <tr> <td><math>D \leq 0.3\text{mm}</math></td> <td>*</td> </tr> </tbody> </table>	Zone / Dimension	Acceptable number	Class of Defects	$D > 0.5\text{mm}$	0	Minor	$0.3\text{mm} < D \leq 0.5\text{mm}$	5	$D \leq 0.3\text{mm}$	*	 $D = (L + W) / 2$		
Zone / Dimension	Acceptable number	Class of Defects												
$D > 0.5\text{mm}$	0	Minor												
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$D \leq 0.3\text{mm}$	*													
Foreign Material (Line shape)	<table border="1"> <thead> <tr> <th>Zone / Dimension</th> <th>Acceptable number</th> <th>Class of Defects</th> </tr> </thead> <tbody> <tr> <td><math>W &gt; 0.1\text{mm}</math> or <math>L &gt; 5\text{mm}</math></td> <td>0</td> <td rowspan="3">Minor</td> </tr> <tr> <td><math>0.05\text{mm} &lt; W \leq 0.1\text{mm}</math> <math>L \leq 5\text{mm}</math></td> <td>5</td> </tr> <tr> <td><math>W \leq 0.05\text{mm}</math></td> <td>*</td> </tr> </tbody> </table>	Zone / Dimension	Acceptable number	Class of Defects	$W > 0.1\text{mm}$ or $L > 5\text{mm}$	0	Minor	$0.05\text{mm} < W \leq 0.1\text{mm}$ $L \leq 5\text{mm}$	5	$W \leq 0.05\text{mm}$	*	 L : Long W : Width		
Zone / Dimension	Acceptable number	Class of Defects												
$W > 0.1\text{mm}$ or $L > 5\text{mm}$	0	Minor												
$0.05\text{mm} < W \leq 0.1\text{mm}$ $L \leq 5\text{mm}$	5													
$W \leq 0.05\text{mm}$	*													
Non-uniformity	Visible through 5 %ND filter White, R, G, B and gray 50% pattern.	(Minor)												
Dimension	Outline	(Major)												
Bezel appearance	uneven	(Minor)												

<p>Scratch on the Touch panel</p>	<table border="1"> <thead> <tr> <th>Zone Dimension</th> <th>Acceptable number</th> <th>Class of Defects</th> </tr> </thead> <tbody> <tr> <td><math>W &gt; 0.1 \text{ mm}</math> or <math>L &gt; 5 \text{ mm}</math></td> <td>0</td> <td rowspan="2">Minor</td> </tr> <tr> <td><math>W \leq 0.1 \text{ mm}</math> <math>L \leq 5 \text{ mm}</math></td> <td>5</td> </tr> </tbody> </table>	Zone Dimension	Acceptable number	Class of Defects	$W > 0.1 \text{ mm}$ or $L > 5 \text{ mm}$	0	Minor	$W \leq 0.1 \text{ mm}$ $L \leq 5 \text{ mm}$	5	
Zone Dimension	Acceptable number	Class of Defects								
$W > 0.1 \text{ mm}$ or $L > 5 \text{ mm}$	0	Minor								
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<p>Dent on the Touch panel</p>	<table border="1"> <thead> <tr> <th>Zone Dimension</th> <th>Acceptable number</th> <th>Class of Defects</th> </tr> </thead> <tbody> <tr> <td><math>D &gt; 0.5 \text{ mm}</math></td> <td>0</td> <td rowspan="2">Minor</td> </tr> <tr> <td><math>0.3 \text{ mm} \leq D \leq 0.5 \text{ mm}</math></td> <td>5</td> </tr> </tbody> </table>	Zone Dimension	Acceptable number	Class of Defects	$D > 0.5 \text{ mm}$	0	Minor	$0.3 \text{ mm} \leq D \leq 0.5 \text{ mm}$	5	<p><math>D = (L + W) / 2</math></p>
Zone Dimension	Acceptable number	Class of Defects								
$D > 0.5 \text{ mm}$	0	Minor								
$0.3 \text{ mm} \leq D \leq 0.5 \text{ mm}$	5									
<p>Polarizer flaw or leak out resin</p>	<p>Defect is defined as the active area.</p>									
<p>Corner Chipping</p>	<p><math>X &lt; 3 \text{ mm}</math>, <math>Y &lt; 3 \text{ mm}</math>, <math>Z &lt; \text{Glass thickness}</math></p>									
<p>Edge Chipping</p>	<p><math>X &lt; 3 \text{ mm}</math>, <math>Y &lt; 3 \text{ mm}</math>, <math>Z &lt; \text{Glass thickness}</math></p>									
<p>Crack</p>	<p>reject</p>									

**10.5 Sampling Condition**

Unless otherwise agree in written, the sampling inspection shall be applied to the incoming inspection of customer.

Lot size: Quantity of shipment lot per model.

Sampling type: normal inspection, single sampling

Sampling table: MIL-STD-105E

Inspection level: Level II

		Definition	
Class of defects	Major	AQL 0.65%	It is a defect that is likely to result in failure or to reduce materially the usability of the product for the intended function.
	Minor	AQL 1.5%	It is a defect that will not result in functioning problem with deviation classified.

Note:1.(a)Bright point defect is defined as point defect of R,G,B with area >1/2 dot pectively

(b)Dark point defect is defined as visible in full white pattern.

(c)Definition of distribution of point defect is as follows:

-minumum separation between dark point defects should be larger than 5mm.

-minumum separation between bright point defects should be larger than 5mm.

(d)Definition of joined bright point defect and joined dark point defect are as follows:

- Three or more joined bright point defects must be nil.

- Three joined dark point defects must be nil.

- Two Joined dark point is counted as two dark points with 2 pair maximum.

(e) Line defect is defined as visible by using 5 % ND filter.

## 11. PRECAUTIONS IN USE CTP

### 1. ASSEMBLY PRECAUTIONS

- (1) Since Touch Panel is consist of glass, please be careful your hands to be injured during handing. You must wear gloves during handing.
- (2) Do not touch, push or rub the exposed touch panel, tweezers or anything harder than HB pencil lead. And please do not rub with dust clothes with chemical treatment.
- (3) Do not stack the touch panels together. Do not put heavy objects on touch panel.
- (4) Please do not take a CTP to pieces and reconstruct it. Resolving and reconstructing modules may cause them not to work well.
- (5) Please excessive force or strain to the panel or tail is prohibited, Do not lift touch panel by cable(FPC).
- (6) Use clean sacks or glove to prevent fingerprints and/or stains left on the panel. Extra attention and carefulness should be taken while handling the glass edge.
- (7) Please pay attention for the matters stated below at mounting design of touch panel enclosure.

Enclosure support to fix touch panel must be out of active area.(do not design enclosure presses the active area to protect from miss put)

### 2. OPERATING PRECAUTIONS

- (1) Please be sure to turn off the power supply before connecting and disconnecting signal input cable.
- (2) Please do not change variable resistance settings in CTP. They are adjusted to the most suitable value. If they are changed, it might happen CTP does not satisfy the characteristics specification
- (3) Be careful for condensation at sudden temperature change. Condensation makes damage to sensor or electrical contacted parts.
- (4) CTP has high frequency circuits. Sufficient suppression to the electromagnetic interference shall be done by system manufacturers. Grounding and shielding methods may be important to minimize the interference.
- (5) Touch the panel with your finger or stylus only to assure normal operation. Any sharp edged or hard objects are prohibited.
- (6) Operate the panel in a steady environment. Abrupt variation on temperature and humidity may cause malfunction of the panel.

### 3. ELECTROSTATIC DISCHARGE CONTROL

- (1) The operator should be grounded whenever he/she comes into contact with the CTP. Never touch any of the conductive parts such the copper leads on the FPC and the interface terminals with any parts of the human body.

- (2) The CTP should be kept in antistatic bags or other containers resistant to static for storage.
- (3) Only properly grounded soldering irons should be used.
- (4) If an electric screwdriver is used, it should be well grounded and shielded from commentator sparks.
- (5) The normal static prevention measures should be observed for work clothes and working benches; for the latter conductive (rubber) mat is recommended
- (6) Since dry air is inductive to statics, a relative humidity of 50-60% is recommended.

### 4. STORAGE PRECAUTIONS

- (1) When you store touch panel for a long time, it is recommended to keep the temperature between 0°C-40°C without the exposure of sunlight and to keep the humidity less than 90%RH.
- (2) Please do not leave touch panel in the environment of high humidity and high temperature such as 60°C 90%RH
- (3) Please do not leave touch panel in the environment of low temperature; below -20°C.

### 5. OTHERS

For the packaging box, please pay attention to the followings:

- (1) Please do not pile them up more than 5 boxes. (They are not designed so.) And please do not turn over.
- (2) Please handle packaging box with care not to give them sudden shock and vibrations. And also please do not throw them up.
- (3) Packing box and inner case for CTP are made of cardboard. So please pay attention not to get them wet. (Such like keeping them in high humidity or wet place can occur getting them wet.)

### 6. LIMITED WARRANTY

Unless otherwise agreed between MULTI-INNO and customer, MULTI-INNO will replace or repair any of its CTP which is found to be defective electrically and visually when inspected in accordance with MULTI-INNO acceptance standards, for a period on one year from date of shipment. Confirmation of such date shall be based on freight documents. The warranty liability of MULTI-INNO is limited to repair and/or replacement on the terms set forth above. MULTI-INNO will not responsible for any subsequent or consequential events.

12. OUTLINE DRAWING

