



MULTI-INNO TECHNOLOGY CO., LTD.

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TOUCH PANEL SPECIFICATION

Model : MI0350CCP-C

Customer :

Approved	
Commont	

Revision	1.0
Engineering	
Date	2013-06-19
Our Reference	



REVISION RECORD

REV NO.	REV DATE	CONTENTS	REMARKS
1.0	2013-06-19	First Release	



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3. APPLICATION

DVD player, UMPC, POS, MID

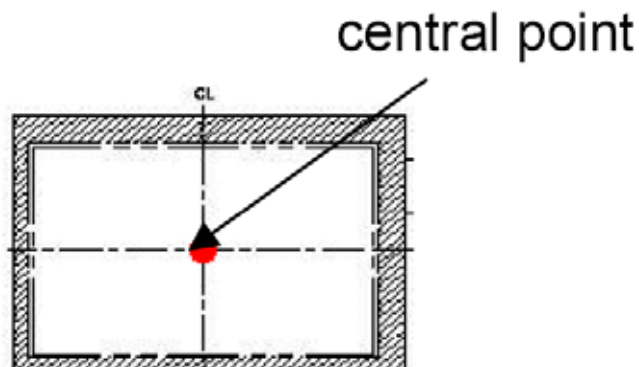
4. GENERAL SPECIFICATIONS

Composition: 3.5inch Capacitive Touch Panel (CTP).

Interface: I²C for the CTP.

Item	Specification	Unit
Type	Transparent type projected capacitive touch panel	
Input mode	Human's finger	
Multi touch	2	Point
Outline Dimension	79.9(W) x 68.9(H) x 1.125(D)	mm
Sensor Active Area	72.88(W)(typ.) x 55.36(H)(typ.)	mm
Transparency	≥ 85	%
Haze	≤ 1.0	%
Weight	TBD	g
Report rate	TBD	Points/sec
Response time	TBD	ms
Point hitting life time	1,000,000 times min.	Note 1
Our components and processes are compliant to RoHS standard		

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



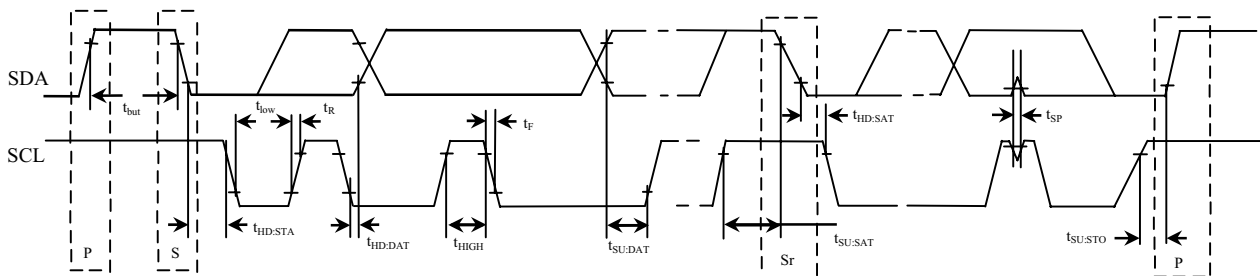
5. ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Min	Typ	Max	Unit	Notes
Supply voltage	VCC	-0.3	-	7	V	
Switch control signals output current	Output current	-	50	-	mA	
Enable control voltage range	Logic Input	-0.3	-	VCC+0.3	V	
Output Control Driver	Output voltage	-0.3	-	VCC	V	

6. ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Min	Typ	Max	Unit
Supply voltage	VCC	2.7	3.3	3.5	
Input high voltage	V _{IH}	0.7 * VCC	-	VCC	V
Input low voltage	V _{IL}	0	-	0.3 * VCC	V

7. TIMING SPECIFICATIONS



Parameter	Symbol	Standard-Mode I ² C-BUS		Fast-Mode I ² C-BUS		Unit
		Min.	Max.	Min.	Max.	
SCL clock frequency	f_{SCL}	0	100	0	400	KHz
Bus free time between STOP and START condition	t_{BUF}	4.7	-	1.3	-	μ s
Hold time (repeated) START condition. After this period, the first clock pulse is generated	$t_{HD:STA}$	4.0	-	0.6	-	μ s
LOW period of the SCL clock	t_{LOW}	4.7	-	1.3	-	μ s
HIGH period of the SCL clock	t_{HIGH}	4.0	-	0.6	-	μ s
Set-up time for a repeated START condition	$t_{SU:STA}$	4.7	-	0.6	-	μ s
Data hold time	$t_{HD:DAT}$	0	-	0	0.9	μ s
Data set-up time	$t_{SU:DAT}$	250	-	100	-	μ s
Rise time of both SDA and SCL signals	t_R	-	1000	$20+0.1C_b$	300	μ s
Fall time of both SDA and SCL signals	t_F	-	300	$20+0.1C_b$	300	μ s
Set-up time for STOP condition	$t_{SU:STO}$	4.0	-	0.6	-	μ s
Capacitive load for each bus line.	C_b	-	400	-	400	pF

Note:

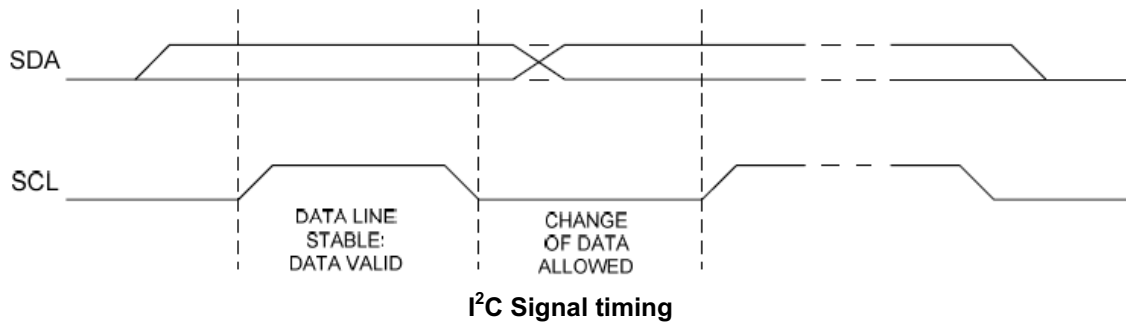
- (1) All values are referred to V_{IH} (0.7xVCC) and V_{IL} (0.3xVCC) level.
- (2) A device must internally provide a hold time of at least 300ns for the SDA signal (referred to the V_{IH} of the SCL signal) in order to bridge the undefined region of the falling edge of SCL.
- (3) The maximum $t_{HD:DAT}$ has only to be met if the device does not stretch the LOW period (t_{LOW}) of the SCL signal.
- (4) A fast-mode I²C-bus device can be used in a standard-mode I²C-bus system, but the requirement $t_{SU:DAT} \geq 250$ ns must then be met. This will automatically be the case if the device does not stretch the LOW period of the SCL signal. If such a device does stretch the LOW period of the SCL signal, it must output the next data bit to the SDA line $t_R \max t_{SU:DAT} = 1000+250=1250$ ns (according to the standard-mode I²C-bus specification) before the SCL line is released.
- (5) C_b = total capacitance of one bus line in pF.
- (6) If a spark or noise appear on SDA line and keep more than 25ns, Start or Stop condition will be identified if SCL line keep high at this time.

8. INTERFACE AND DATA FORMAT

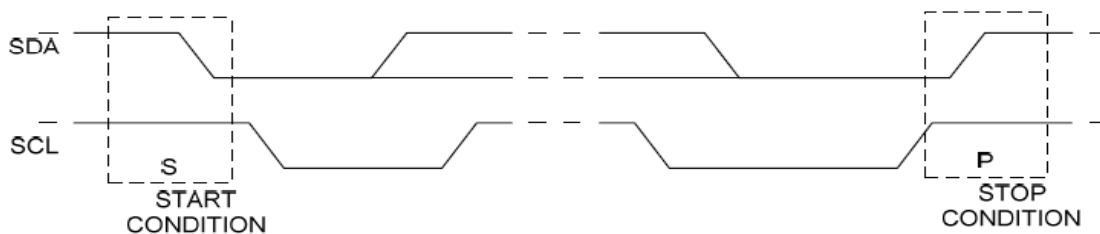
8.1 Transfer protocol (I²C interface)

MI0350CCP-C support I²C interface that need 2 hardware pin – serial data (SDA) and serial clock (SCL), carry information between the devices connected to the bus. The I²C bus supports serial, 8-bit oriented, bi-directional data transferred at a rate up to 100Kbit/s in the standard-mode, or up to 400Kbit/s in the fast-mode.

The data on the SDA line must be stable during the HIGH period of the clock. The HIGH or LOW state of the data line can only change when the clock signal on the SCL line is LOW.



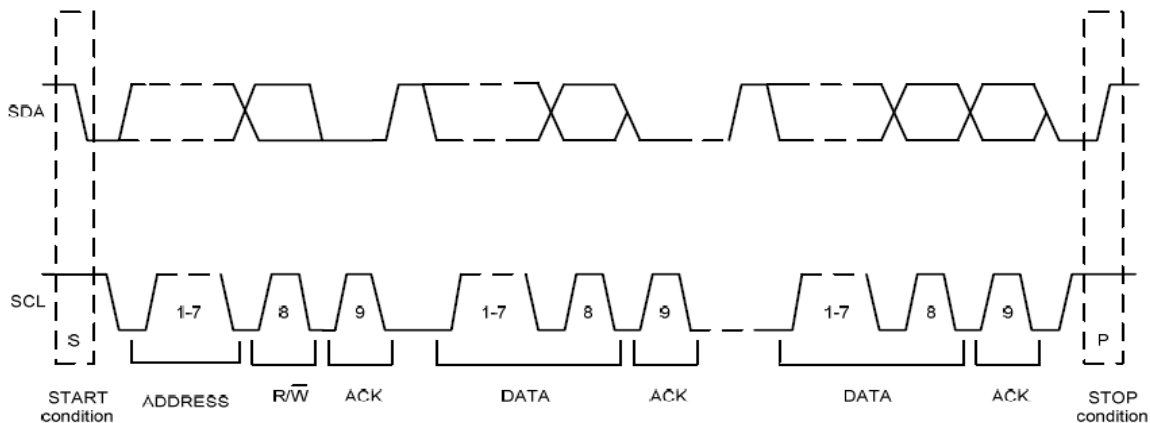
Within the procedure of the I²C -bus, unique situations arise which are defined as START and STOP conditions. A HIGH to LOW transition on the SDA line while SCL is HIGH is one such unique case. This situation indicates a START condition. A LOW to HIGH transition on the SDA line while SCL is HIGH defines a STOP condition. START and STOP conditions are always generated by the master. The I²C bus is considered to be busy after the START condition. The I²C bus is considered to be free again a certain time after the STOP condition.



8.2 I²C data transfer

The CTP MI0350CCP-C I²C address is **0x94H(write) · 0x95H(read)**

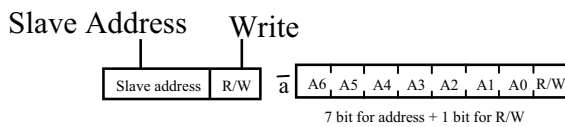
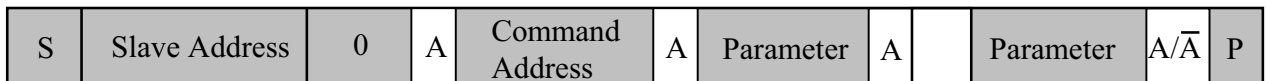
Each byte has to be followed by an acknowledge bit. Data is transferred with the most significant bit (MSB) first. Every byte put on the SDA line must be 8-bits long. The number of bytes that can be transmitted per transfer is unrestricted. If controller can't receive or transmit another complete byte of data until it has performed some other function, for example servicing an internal interrupt, it can hold the clock line SCL LOW to force the master into await state. Data transfer then continues when the controller is ready for another byte of data and releases clock line SCL.



I²C data transfer

8.3 Format of data frame (I²C interface)

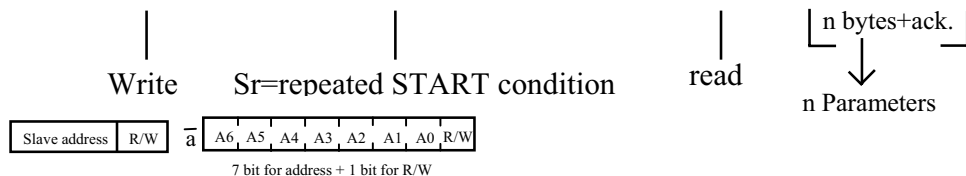
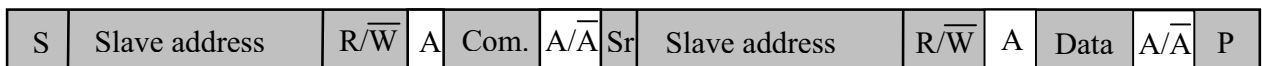
Write mode



\bar{A} = acknowledge (SDA LOW)
A = not acknowledge (SDA HIGH)
S = START condition
P = STOP condition

Data Format of writing mode

Read mode



\bar{A} = acknowledge (SDA LOW)
A = not acknowledge (SDA HIGH)
S = START condition
P = STOP condition

Data Format of reading mode

8.4 DATA FORMAT

When finger touch, enter event will occurred and coordinate data will be calculated, and than interrupt signal appear (TSIX pull low).

Baseband should receive data when interrupt occur.

Every point will contains 4 bytes, 2 bytes for X and 2 bytes for Y, it support point is 2, total point data : $2 \times 4 = 8$ bytes, and 8 bytes will be added for optional information (point count, ID information, hot key, etc.), so totally data length is (support points x 4)+ (8 bytes optional information)

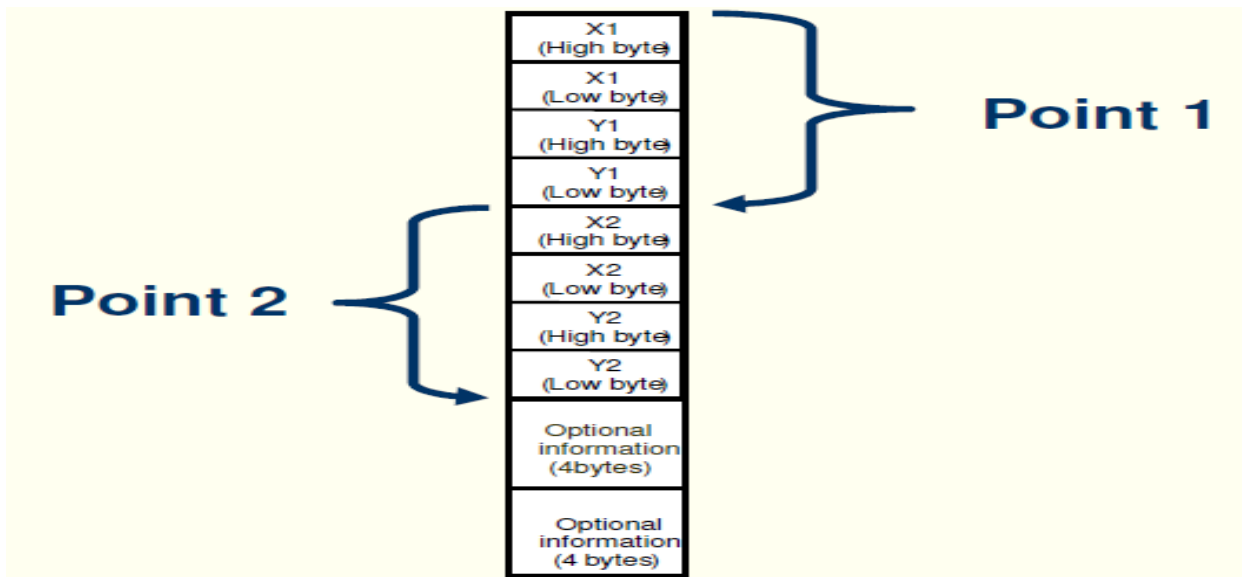


Figure 8.4.1

- When one or more points (but not all) have been touched, other points without touched will be fill **invalid data 0xFFFF** to let baseband distinguish which point has been touched or not.

Example 1: Support 2 points, one point has been touched.

X1 = 150 (0x0096H), Y1 = 230 (0x00E6H)

X2 = 65535 (0xFFFFH), Y2 = 65535 (0xFFFFH)

Point 1	Date[0] = 0x00	Date[8] = 0xFF	No use, invalid data
	Date[1] = 0x96	Date[9] = 0xFF	
	Date[2] = 0x00	Date[10] = 0xFF	
	Date[3] = 0xE6	Date[11] = 0xFF	
Point 2	Date[4] = 0xFF	Date[12] = 0xF1	1 point enter, point count = 0xF1
	Date[5] = 0xFF	Date[13] = 0x01	First point enter, Point ID = 0x01
	Date[6] = 0xFF	Date[14] = 0xFF	No use,
	Date[7] = 0xFF	Date[15] = 0xFF	invalid data

Figure8.4.2

9. COMMAND

9.1 Command list

ex	peration Code	D7	D6	D5	D4	D3	D2	D1	D0	unction
0	No operation	0	0	0	0	0	0	0	0	-
80	Sleep IN	1	0	0	0	0	0	0	0	-
81	Sleep Out	1	0	0	0	0	0	0	1	-
82	Sense Off	1	0	0	0	0	0	1	0	-
83	Sense On	1	0	0	0	0	0	1	1	-
85	Read Event	1	0	0	0	0	1	0	1	-
	1st parameter	B31	B30	B29	B28	B27	B26	B25	B24	-
	2nd parameter	B23	B22	B21	B20	B19	B18	B17	B16	-
	3rd parameter	B15	B14	B13	B12	B11	B10	B9	B8	-
	4th parameter	B7	B6	B5	B4	B3	B2	B1	B0	-
86	Read All Events	1	0	0	0	0	1	1	0	-
	1st parameter	B31	B30	B29	B28	B27	B26	B25	B24	-
	2nd parameter	B23	B22	B21	B20	B19	B18	B17	B16	-
	3rd parameter	B15	B14	B13	B12	B11	B10	B9	B8	-
	4th parameter	B7	B6	B5	B4	B3	B2	B1	B0	-
	5th parameter	E3	E2	E1	E0	F1	P2	P1	P0	-
	6th parameter	B23	B22	B21	B20	B19	B18	B17	B16	-
	...	:	:	:	:	:	:	:	:	-
(n+1)th parameter	B7	B6	B5	B4	B3	B2	B1	B0	-	
87	Read Latest Event	1	0	0	0	0	1	1	1	-
	1st parameter	B31	B30	B29	B28	B27	B26	B25	B24	-
	2nd parameter	B23	B22	B21	B20	B19	B18	B17	B16	-
	3rd parameter	B15	B14	B13	B12	B11	B10	B9	B8	-
	4th parameter	B7	B6	B5	B4	B3	B2	B1	B0	-
88	Clear Stack	1	0	0	0	1	0	0	0	-
9E	TS Software Reset	1	0	0	1	1	1	1	0	-

9.2 User define command list table

ex	peration Code	D7	D6	D5	D4	D3	D2	D1	D0	unction
31h	Device ID	0	0	1	1	0	0	0	1	Response Device ID Code
	1st parameter	85								
	2nd parameter	20								
	3rd parameter	00								
32h	Version ID	0	0	1	1	0	0	1	0	Read Firmware Version

10. COMMAND DESCRIPTION

10.1 NOP

00 H	NOP (No Operation)									
	DNC	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	0	0	0	0	0	0	0	0	0	00
Parameter	No parameter									
Description	This command is an empty command and it does not have any effect on the touch screen.									
Restriction										
Register Availability	Status					Availability				
	TS Sleep Out					Yes				
	TS Sleep In					Yes				
Default	Status					Default Value				
	Power Up Sequence					N/A				
	TS S/W Reset					N/A				
	H/W Reset					N/A				
Flow Chart										

10.2 TS sleep in (80h)

80H	TSSLPIN (Touch Screen Sleep In)									
	DNC	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	0	1	0	0	0	0	0	0	0	80
parameter	No parameter									
Description	This command causes the touch screen to enter the minimum power consumption mode. MCU interface are register are still working and keeps their contents.									
Restriction	This command has no effect when the touch screen is already in TS Sleep In mode. TS Sleep In Mode can only be left by the TS Sleep Out Command (81h). It will be necessary to wait 5msec before sending next command. This is to allow time for the supply voltages and clock circuits to stabilize. It will be necessary to wait 5msec after sending TS Sleep Out command (when in TS Sleep In Mode) before TS Sleep In command can be sent.									
Register Availability	Status					Availability				
	TS Sleep Out					Yes				
	TS Sleep In					Yes				
Default	Status					Default Value				
	Power Up Sequence					TS Sleep In Mode				
	TS S/W Reset					TS Sleep In Mode				
	H/W Reset					TS Sleep In Mode				
Flow Chart	<pre> graph TD TSSLPIN[TSSLPIN] --> StopDCDC(Stop DC/DC converter) StopDCDC --> StopOsc(Stop Internal Oscillator) StopOsc --> TSSleepIn([TS Sleep In Mode]) </pre>									

10.3 TS sleep out (81h)

81H	TSSLPOUT (Touch Screen Sleep Out)										
	DNC	D7	D6	D5	D4	D3	D2	D1	D0	HEX	
Command	0	1	0	0	0	0	0	0	1	81	
parameter	No parameter										
Description	This command turns off TS Sleep In mode.										
Restriction	This command has no effect when touch screen is already in TS Sleep Out mode. TS Sleep Out Mode can only be left by the TS Sleep In Command (80h). It will be necessary to wait 5msec before sending next command. This is to allow time for the supply voltages and clock circuits to stabilize. The touch screen loads all touch screen supplier's factory default values to the registers during this 5msec and there cannot be any abnormal effect on the touch screen functionality if factory default and register values are same when this load is done and when the touch screen is already TS Sleep Out – mode. It will be necessary to wait 5msec after sending TS Sleep In command (when in TS Sleep Out mode) before TS Sleep Out command can be sent.										
Register Availability	Status					Availability					
	TS Sleep Out					Yes					
	TS Sleep In					Yes					
Default	Status					Default Value					
	Power Up Sequence					TS Sleep In Mode					
	TS S/W Reset					TS Sleep In Mode					
	H/W Reset					TS Sleep In Mode					
Flow Chart	<pre> graph TD A[TSSLPOUT] --> B([Start Internal Oscillator]) B --> C([Start up DC/DC converter]) C --> D([TS Sleep Out Mode]) </pre>										

10.4 TS sense off (82h)

82H	TSSOFF (Touch Screen Sense Off)									
	DNC	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	0	1	0	0	0	0	0	1	0	82
parameter	No parameter									
Description	The touch screen is not sensing touches (= No new events), but the touch screen is still scanning.									
Restriction										
Register Availability	Status					Availability				
	TS Sleep Out					Yes				
	TS Sleep In					Yes				
Default	Status					Default Value				
	Power Up Sequence					TS Sense Off				
	TS S/W Reset					TS Sense Off				
	H/W Reset					TS Sense Off				
Flow Chart	<div style="border: 1px dashed black; padding: 10px;"> <p style="text-align: center;">Legend</p> <div style="display: flex; flex-direction: column; align-items: center;"> <div style="border: 1px solid black; width: 100px; height: 30px; margin-bottom: 5px;"></div> <div style="border: 1px solid black; width: 100px; height: 30px; margin-bottom: 5px; transform: rotate(-15deg);"></div> <div style="border: 1px solid black; width: 100px; height: 30px; margin-bottom: 5px; border-radius: 15px;"></div> <div style="border: 1px solid black; width: 100px; height: 30px; margin-bottom: 5px; border-top: none; border-bottom: none;"></div> <div style="border: 1px solid black; width: 100px; height: 30px; margin-bottom: 5px; border-radius: 15px;"></div> <div style="border: 1px solid black; width: 100px; height: 30px; margin-bottom: 5px; border-radius: 15px;"></div> </div> </div> <div style="text-align: center;"> <div style="border: 1px solid black; width: 100px; height: 30px; margin: 0 auto;"></div> <div style="margin: 5px 0 0 50px;">↓</div> <div style="border: 1px solid black; width: 150px; height: 40px; margin: 0 auto; border-radius: 20px;"></div> </div>									

10.5 TS sense on (83h)

83H	TSSON (Touch Screen Sense On)									
	DNC	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	0	1	0	0	0	0	0	1	1	83
parameter	No parameter									
Description	The touch screen is sensing touches (= No new events).									
Restriction										
Register Availability	Status					Availability				
	TS Sleep Out					Yes				
	TS Sleep In					Yes				
Default	Status					Default Value				
	Power Up Sequence					TS Sense Off				
	TS S/W Reset					TS Sense Off				
	H/W Reset					TS Sense Off				
Flow Chart	<div style="border: 1px dashed black; padding: 10px;"> <p style="text-align: center;">Legend</p> <div style="display: flex; flex-direction: column; align-items: center;"> <div style="border: 1px solid black; width: 100px; height: 30px; margin-bottom: 5px;"></div> <div style="border: 1px solid black; width: 100px; height: 30px; margin-bottom: 5px; transform: rotate(-15deg);"></div> <div style="border: 1px solid black; width: 100px; height: 30px; margin-bottom: 5px; border-radius: 15px;"></div> <div style="border: 1px solid black; width: 100px; height: 30px; margin-bottom: 5px; border-top: none; border-bottom: none;"></div> <div style="border: 1px solid black; width: 100px; height: 30px; margin-bottom: 5px; border-radius: 15px;"></div> <div style="border: 1px solid black; width: 100px; height: 30px; margin-bottom: 5px; border-radius: 15px;"></div> </div> <div style="margin-top: 20px; text-align: center;"> <pre> graph TD A[TSSON] --> B([TS Sense On]) </pre> </div> </div>									

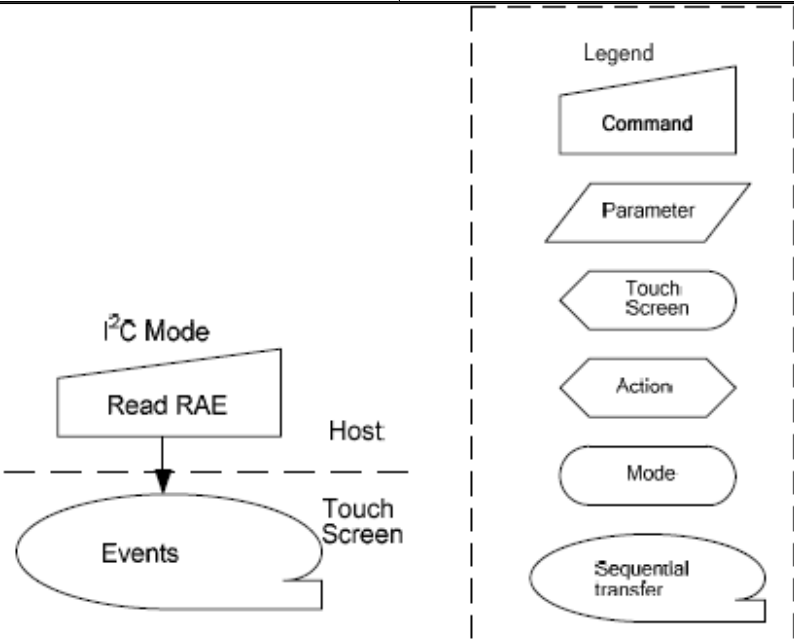
10.6 Read One Event (85h)

85H		ROE (Read One Event)									
		DNC	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command		0	1	0	0	0	0	1	0	1	85
1	parameter	-	B31	B30	B29	B28	B27	B26	B25	B24	xx
2	parameter	-	B23	B22	B21	B20	B19	B18	B17	B16	xx
3	parameter	-	B15	B14	B13	B12	B11	B10	B9	B8	xx
4	parameter	-	B7	B6	B5	B4	B3	B2	B1	B0	xx
Description		<p>This command returns one touch event what is the oldest co-ordinates or raw counter (dc) values information has been stored on the stock. The event stack is empty after this command.</p> <p>A returning value can be “No Event” if the stock is empty.</p> <p>co-ordinates and related touch information:</p> <p>Touch Width: Report the touched block. For example: if RX=15, TX=10, the total Block is 150 (96h). If it has three touched block, the report value is 03h.</p> <p>Point ID: Report the ID of touched points.</p> <p>Points number: Report the touch number.</p> <div style="text-align: center;"> </div>									
When one or more points (but not all) have been touched, other points without touched will be fill invalid data 0xFFFF to let baseband distinguish which point has been touched or not.											
Register Availability	Status	Availability									
	TS Sleep Out	Yes									
	TS Sleep In	Yes									

Default	Status	Default Value
	Power Up Sequence	0000 0000h
	TS S/W Reset	0000 0000h
	H/W Reset	0000 0000h
Flow Chart	<p>The flowchart illustrates the communication between the Host and the Touch Screen. The Host initiates the process by sending a Command (ROE) to the Touch Screen. The Touch Screen then sequentially sends four parameters: Send 1st parameter, Send 2nd parameter, Send 3rd parameter, and Send 4th parameter. A legend on the right defines the symbols used: Command (trapezoid), Parameter (parallelogram), Touch Screen (rounded rectangle), Action (hexagon), Mode (oval), and Sequential transfer (oval with tail).</p>	

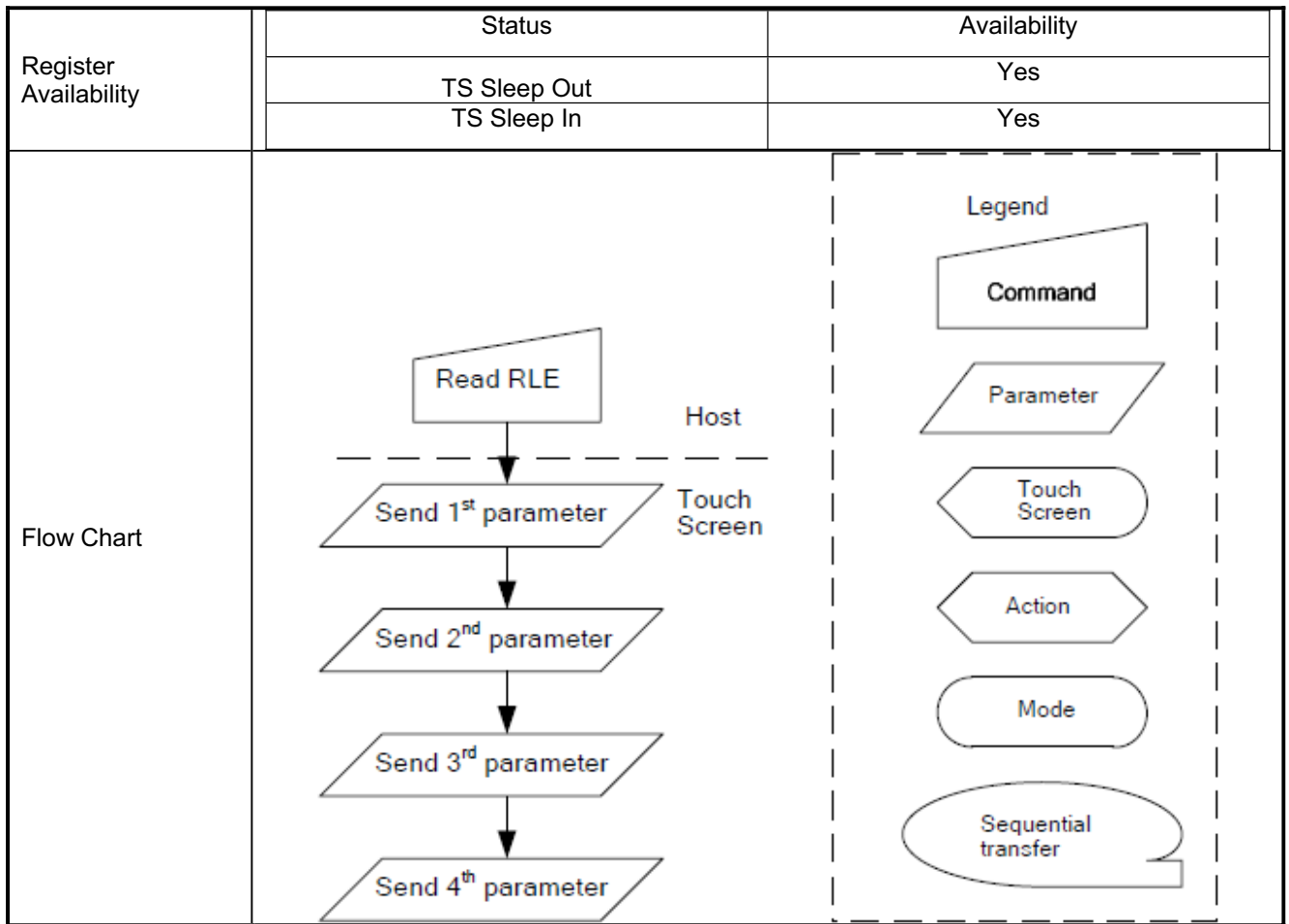
10.7 Read All Event (86h)

86H		RAE (Read All Events)									HEX
		DNC	D7	D6	D5	D4	D3	D2	D1	D0	
Command		0	1	0	0	0	0	1	1	0	86
1	parameter	-	B31	B30	B29	B28	B27	B26	B25	B24	xx
2	parameter	-	B23	B22	B21	B20	B19	B18	B17	B16	xx
3	parameter	-	B15	B14	B13	B12	B11	B10	B9	B8	xx
4	parameter	-	B7	B6	B5	B4	B3	B2	B1	B0	xx
5	parameter	-	E3	E2	E1	E0	F1	P2	P1	P0	xx
6	parameter	-	B23	B22	B21	B20	B19	B18	B17	B16	xx
:		-	:	:	:	:	:	:	:	:	:
(n+1) Parameter		-	B7	B6	B5	B4	B3	B2	B1	B0	xx
Description		<p>This command returns one touch event what is the oldest co-ordinates or raw counter (dc) values information has been stored on the stock. A returning value can be “No Event” if the stock is empty.</p> <p>co-ordinates and related touch information:</p> <p>Touch Width: Report the touched block. For example: if RX=15, TX=10, the total Block is 150 (96h). If it has three touched block, the report value is 03h.</p> <p>Point ID: Report the ID of touched points.</p> <p>Points number: Report the touch number.</p>									
		<p>When one or more points (but not all) have been touched, other points without touched will be fill invalid data 0xFFFF to let baseband distinguish which point has been touched or not.</p>									
Register Availability	Status		Availability								

	TS Sleep Out	Yes
	TS Sleep In	Yes
Default	Status	Default Value
	Power Up Sequence	All Values 0000 0000h
	TS S/W Reset	All Values 0000 0000h
Flow Chart	 <p>The flow chart illustrates the interaction between a Host and a Touch Screen. In I²C Mode, the Host sends a 'Read RAE' command (represented by a trapezoid) to the Touch Screen. The Touch Screen then returns 'Events' (represented by a rounded rectangle with a tail). A legend on the right defines the symbols used: a trapezoid for 'Command', a parallelogram for 'Parameter', a rounded rectangle for 'Touch Screen', a hexagon for 'Action', a rounded rectangle for 'Mode', and a rounded rectangle with a tail for 'Sequential transfer'.</p>	

10.8 Read Latest Event (87h)

87H		RLE (Read Latest Event)									
		DNC	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command		0	1	0	0	0	0	1	1	1	87
1	parameter	-	B31	B30	B29	B28	B27	B26	B25	B24	xx
2	parameter	-	B23	B22	B21	B20	B19	B18	B17	B16	xx
3	parameter	-	B15	B14	B13	B12	B11	B10	B9	B8	xx
4	parameter	-	B7	B6	B5	B4	B3	B2	B1	B0	xx
Description		<p>This command returns one touch event what is the oldest co-ordinates or raw counter (dc) values information has been stored on the stock. The event stack is empty after this command.</p> <p>A returning value can be "No Event" if the stock is empty.</p> <p>co-ordinates and related touch information:</p> <p>Touch Width: Report the touched block. For example: if RX=15, TX=10, the total Block is 150 (96h). If it has three touched block, the report value is 03h.</p> <p>Point ID: Report the ID of touched points.</p> <p>Points number: Report the touch number.</p> <div style="text-align: center;"> </div>									
		<p>When one or more points (but not all) have been touched, other points without touched will be fill invalid data 0xFFFF to let baseband distinguish which point has been touched or not.</p>									



10.9 Clear Event Stack (88h)

88H	CLRES (Clear Event Stack)									
	DNC	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	0	1	0	0	0	1	0	0	0	88
parameter	No parameter									
Description	This command clears event stack when the only return event can be "No Event".									
Restriction										
Register Availability	Status					Availability				
	TS Sleep Out					Yes				
	TS Sleep In					Yes				
Default	Status					Default Value				
	Power Up Sequence					Empty Stack				
	TS S/W Reset					Empty Stack				
	H/W Reset					Empty Stack				
Flow Chart	<div style="border: 1px dashed black; padding: 10px;"> <p style="text-align: center;">Legend</p> <div style="display: flex; flex-direction: column; align-items: center;"> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">Command</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">Parameter</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">Touch Screen</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">Action</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">Mode</div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">Sequential transfer</div> </div> <div style="margin-top: 20px; text-align: center;"> <pre> graph TD A[CLRES] --> B([Clear Event Stack]) </pre> </div> </div>									

10.10 TS Software Reset (9Eh)

9E H	TSSWRESET (Touch Screen Software Reset)									
	DNC	D7	D6	D5	D4	D3	D2	D1	D0	HEX
Command	0	1	0	0	1	1	1	1	0	9E
parameter	No parameter									
Description	When the Touch Screen Software Reset command is written, it causes a software reset. It resets the commands and parameters to their TS S/W Reset default values. (See default tables in each command description.) Note: The Memory contents are unaffected by this command									
Restriction	It will be necessary to wait 5msec before sending new command following software reset. The touch screen loads all touch screen supplier's factory default values to the registers during this 5msec. If Software Reset is applied during TS Sleep Out mode, it will be necessary to wait 5msec before sending TS Sleep Out command. Touch Screen Software Reset Command cannot be sent during TS Sleep Out sequence.									
Register Availability	Status					Availability				
	TS Sleep Out					Yes				
	TS Sleep In					Yes				
Default	Status					Default Value				
	Power Up Sequence					N/A				
	TS S/W Reset					N/A				
	H/W Reset					N/A				
Flow Chart	<pre> graph TD A[TSSWRESET] --> B{{Set Commands to TS S/W Default value}} B --> C([TS Sleep In Mode]) </pre>									

10.11 Device ID Command (31h)

31 H		Device ID									HEX
		DNC	D7	D6	D5	D4	D3	D2	D1	D0	
Command		0	0	0	1	1	0	0	0	1	31
1	parameter	1	85								00..FF
2	parameter	1	26								00..FF
3	parameter	1	00								00..FF
Description		When the Device ID command is written, IC will echo the device ID to master. The index of Device ID command is 31h									
Register Availability		Status					Availability				
		TS Sleep Out					Yes				
		TS Sleep In					Yes				
Default		Status					Default Value				
		Power Up Sequence					N/A				
		TS S/W Reset					N/A				
		H/W Reset					N/A				
Flow Chart											

10.12 Version ID Command (32h)

32 H		Device ID									HEX
		DNC	D7	D6	D5	D4	D3	D2	D1	D0	
Command		0	0	0	1	1	0	0	1	0	32
1	parameter	1	SF_Version[3:0]				F_Version[3:0]				00..FF
Description		This command will report the ID code of firmware Version. F_Version [3:0]: The firmware version of flash code. SF_Version [3:0]: The firmware version of self test code.									
Register Availability		Status					Availability				
		TS Sleep Out					Yes				
		TS Sleep In					Yes				
Default		Status					Default Value				
		Power Up Sequence					N/A				
		TS S/W Reset					N/A				
		H/W Reset					N/A				
Flow Chart											

10.13 INITIAL CONTROLLER

When want to initial controller, external MCU must execute wake-up command to let IC starting to work (sensing).
Command 0x81H is used to wake-up IC internal power.
Command 0x35H, parameter 0x02H is used to let internal MCU turn-on ready.
Command 0x36H, parameter1 0x0FH, parameter2 0x53H, is used to let flash turn-on ready.
Command 0xDDH, parameter1 0x04H, parameter2 0x02H, is used to turn on MCU fetch flash mode.
Command 0x83H is used to start sensing touch panel.
Command 0x88H is used to clear stack

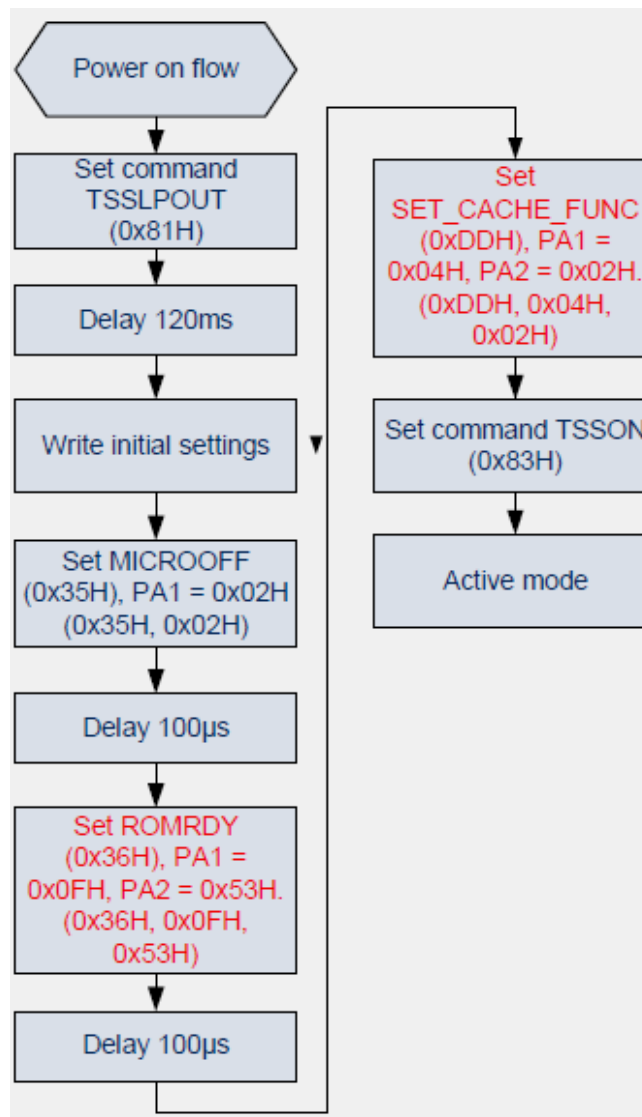
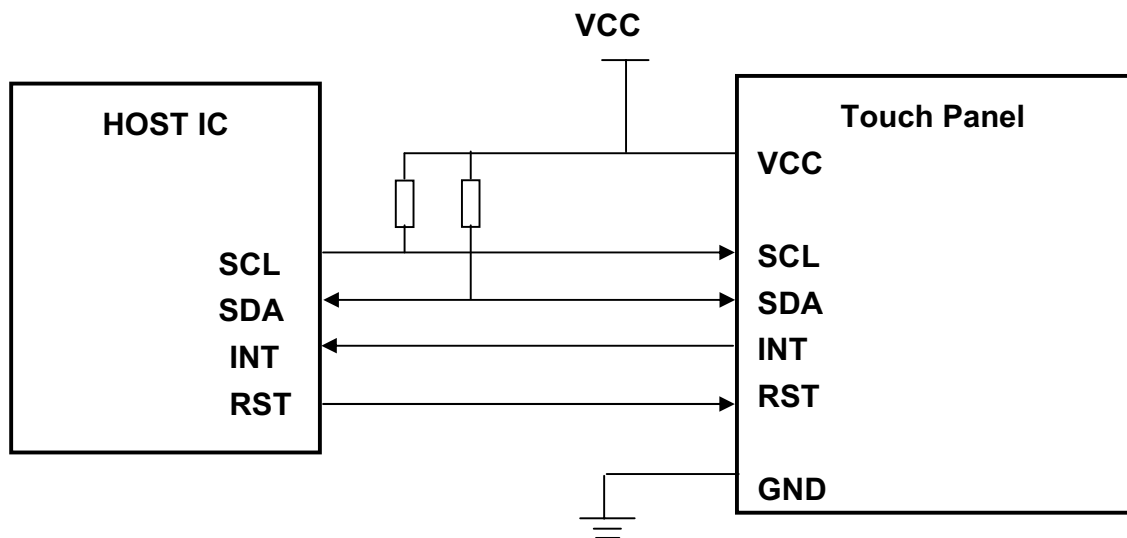


Figure 10.13

11. PIN CONNECTIONS

No.	Name	I/O	Description
1	VCC	-	Power supply voltage.
2	GND	-	Ground
3	INT	O	Touch Screen Interrupt. Touch Screen Interrupt line; Interrupt active when the line is low.
4	SCL	I	Serial clock line for I ² C interface.
5	SDA	I/O	Data line for I ² C interface.
6	/RESET	I	Reset, Active low

12. BLOCK DIAGRAM



Note : 1. USE APPROPRIATE RESISTOR VALUE DURING HIGH SPEED SCL CLOCK.

SUGGESTION : RESISTOR RECOMMENDATION : 1K ohm.

2. To reduce the noise from the power, we suggest you use the independent power for the touch panel (VDD)

13. Appearance Specification

13.1 Inspection and Environment conditions

13.1.1 Temperature: $22 \pm 2^\circ\text{C}$

13.1.2 Humidity: $55 \pm 5\% \text{RH}$

13.1.3 Light source: Fluorescent Light

13.1.4 Inspection: Viewing distance: $35 \pm 5 \text{cm}$

13.1.5 Ambient Illumination:

(1) Cosmetic Inspection: 500 ~ 800 lux

(2) Functional Inspection: 400 ~ 600 lux

13.1.6 Inspection View angle:

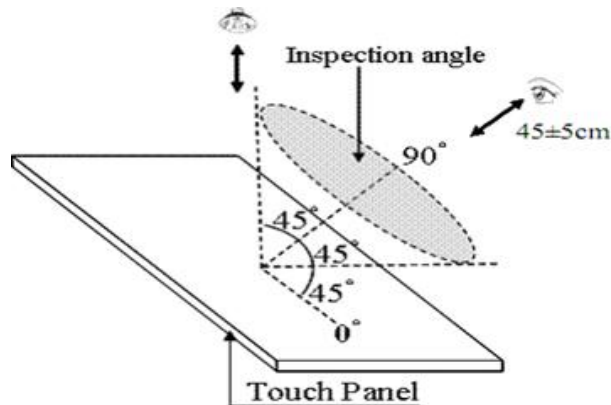
(1) Inspection under operating condition : $\pm 5^\circ$

(2) Inspection under non-operating condition : $\pm 45^\circ$

13.2 Appearance inspection

Appearance inspection method:

Front visual distance: 30-40CM



13.3 Judgment standard


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

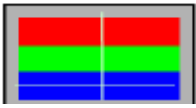


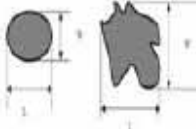
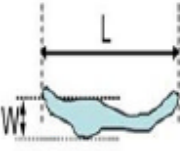



Pass: Normal display image with no obvious non-uniformity and no line defect.

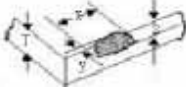
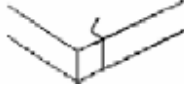
Partial transformation of the module parts should be ignored.

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

13.4 Cosmetic Specification and Inspection Items

Inspection item	Inspection standard	Description
Display function	No display function	
Contrast	Out of SPEC	

Line defect	No obvious vertical or horizontal line defect (black line or white line)													
Dot defect	<table border="1"> <thead> <tr> <th>Item</th> <th>Acceptable quantity</th> <th>Total quantity</th> </tr> </thead> <tbody> <tr> <td>Bright dot</td> <td>2</td> <td></td> </tr> <tr> <td>Dark dot</td> <td>4</td> <td></td> </tr> <tr> <td>Two adjacent dark dots</td> <td>2</td> <td>2</td> </tr> </tbody> </table>	Item	Acceptable quantity	Total quantity	Bright dot	2		Dark dot	4		Two adjacent dark dots	2	2	One Dot  Two adjacent dot 
Item	Acceptable quantity	Total quantity												
Bright dot	2													
Dark dot	4													
Two adjacent dark dots	2	2												
Dot of foreign material	<table border="1"> <thead> <tr> <th>SPEC</th> <th>Acceptable quantity</th> </tr> </thead> <tbody> <tr> <td>$D > 0.8\text{mm}$</td> <td>0</td> </tr> <tr> <td>$0.3\text{mm} \leq D \leq 0.8\text{mm}$</td> <td>5</td> </tr> <tr> <td>$D < 0.3\text{mm}$</td> <td>Ignorable</td> </tr> </tbody> </table>	SPEC	Acceptable quantity	$D > 0.8\text{mm}$	0	$0.3\text{mm} \leq D \leq 0.8\text{mm}$	5	$D < 0.3\text{mm}$	Ignorable	 $D = (L + W) / 2$				
SPEC	Acceptable quantity													
$D > 0.8\text{mm}$	0													
$0.3\text{mm} \leq D \leq 0.8\text{mm}$	5													
$D < 0.3\text{mm}$	Ignorable													
Line of foreign material	<table border="1"> <thead> <tr> <th>SPEC</th> <th>Acceptable quantity</th> </tr> </thead> <tbody> <tr> <td>$W > 0.1\text{mm}$ $L > 10\text{mm}$</td> <td>0</td> </tr> <tr> <td>$0.05\text{mm} \leq W \leq 0.1\text{mm}$ $L \leq 10\text{mm}$</td> <td>5</td> </tr> <tr> <td>$W < 0.05\text{mm}$</td> <td>Ignorable</td> </tr> </tbody> </table>	SPEC	Acceptable quantity	$W > 0.1\text{mm}$ $L > 10\text{mm}$	0	$0.05\text{mm} \leq W \leq 0.1\text{mm}$ $L \leq 10\text{mm}$	5	$W < 0.05\text{mm}$	Ignorable	 L : Long W : Width				
SPEC	Acceptable quantity													
$W > 0.1\text{mm}$ $L > 10\text{mm}$	0													
$0.05\text{mm} \leq W \leq 0.1\text{mm}$ $L \leq 10\text{mm}$	5													
$W < 0.05\text{mm}$	Ignorable													
Image uniformity	Through ND5%, invisible at R G B ,grey and white													
Size	According to SPEC													
TP scratch	<table border="1"> <thead> <tr> <th>SPEC</th> <th>Acceptable quantity</th> </tr> </thead> <tbody> <tr> <td>$W > 0.1\text{mm}$ $L > 10\text{mm}$</td> <td>0</td> </tr> <tr> <td>$W \leq 0.1\text{mm}$ $L \leq 10\text{mm}$</td> <td>5</td> </tr> </tbody> </table>	SPEC	Acceptable quantity	$W > 0.1\text{mm}$ $L > 10\text{mm}$	0	$W \leq 0.1\text{mm}$ $L \leq 10\text{mm}$	5							
SPEC	Acceptable quantity													
$W > 0.1\text{mm}$ $L > 10\text{mm}$	0													
$W \leq 0.1\text{mm}$ $L \leq 10\text{mm}$	5													
TP dent dot	<table border="1"> <thead> <tr> <th>SPEC</th> <th>Acceptable quantity</th> </tr> </thead> <tbody> <tr> <td>$D > 0.5\text{mm}$</td> <td>0</td> </tr> <tr> <td>$0.3 \leq D \leq 0.5\text{mm}$</td> <td>5</td> </tr> </tbody> </table>	SPEC	Acceptable quantity	$D > 0.5\text{mm}$	0	$0.3 \leq D \leq 0.5\text{mm}$	5	 $D = (L + W) / 2$						
SPEC	Acceptable quantity													
$D > 0.5\text{mm}$	0													
$0.3 \leq D \leq 0.5\text{mm}$	5													
TP glue overflow	$\pm 0.45\text{mm}$													
Surface damage	$X < 3\text{mm}$ $Y < 3\text{mm}$ $Z < \text{glass}$													

Edge damage	X<3mm Y<3mm Z<glass	
TP crack	prohibited	
Bubble in protective film	SPEC Acceptable quantity D>1.0mm N=0 0.5<D<1.0mm N=2 D<0.5 Ignorable	
TP deviation	According to customer drawing spec	
Bubble	D ≤ 0.2mm ignorable 0.2mm < D ≤ 0.5mm 2 bubbles accepted 0.5mm < D prohibited	
Printing ink	Light leak is prohibited. Printing serrated : S ≤ 0.1 ignorable S ≤ 0.15 NG Break line on LOGO NG Blur printing , inverse printing , print in wrong position	

13.5 Sampling plan

General problem	Definition		
	primary	AQL0.65%	Completely fail to be used due to defect.
	Secondary	AQL1.5%	Still can be used due to small defect.

14. QUALITY ASSURANCE

14.1 Test Condition

14.1.1 Temperature and Humidity(Ambient Temperature)

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

Humidity : $65 \pm 5\%$

14.1.2 Operation

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

14.1.3 Container

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

14.1.4 Test Frequency

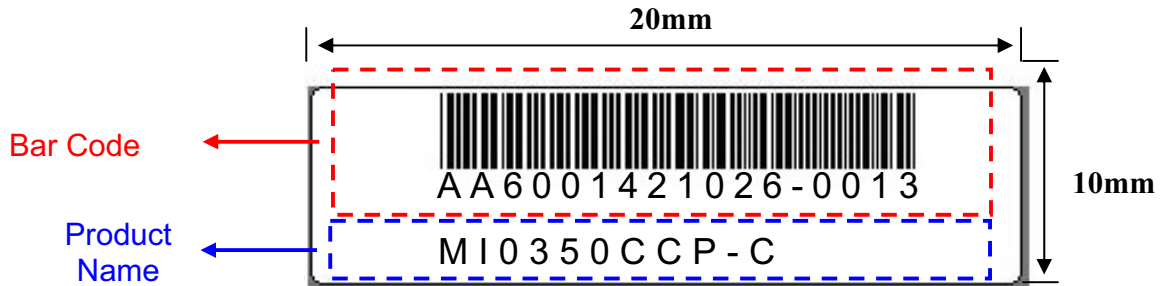
In case of related to deterioration such as shock test. It will be conducted only once.

14.1.5 Test Method

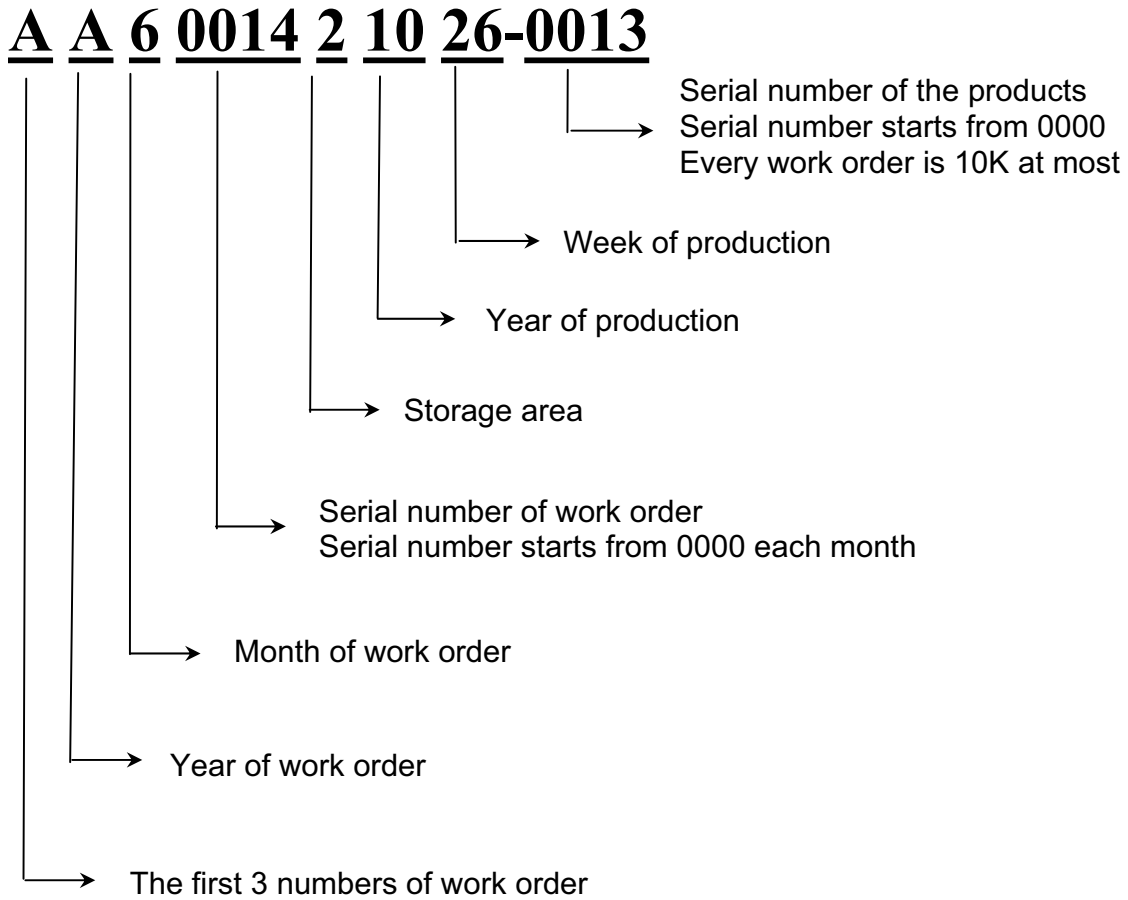
No.	Reliability Test Item & Level	Test Level	Remark
1	High Temperature Storage Test	T=70°C,240hrs	IEC68-2-2
2	Low Temperature Storage Test	T=-30°C,240hrs	IEC68-2-1
3	High Temperature and High Humidity Operation Test	T=60°C,90% RH,240hrs	IEC68-2-3
4	Temperature Cycle Test (No operation)	-30°C → +25°C → +70°C,50 Cycles 30 min 5min 30 min	IEC68-2-14
5	Vibration Test (No operation)	Frequency:10 ~ 55 Hz Amplitude:1.0 mm Sweep Time:11min Test Period:6 Cycles for each Direction of X,Y,Z	IEC68-2-6
6	Shock Test (No operation)	100G, 6ms Direction : ± X,± Y,± Z Cycle : 3 times	IEC68-2-27

15. PRODUCT LABEL DEFINE

CTP Product Label style:



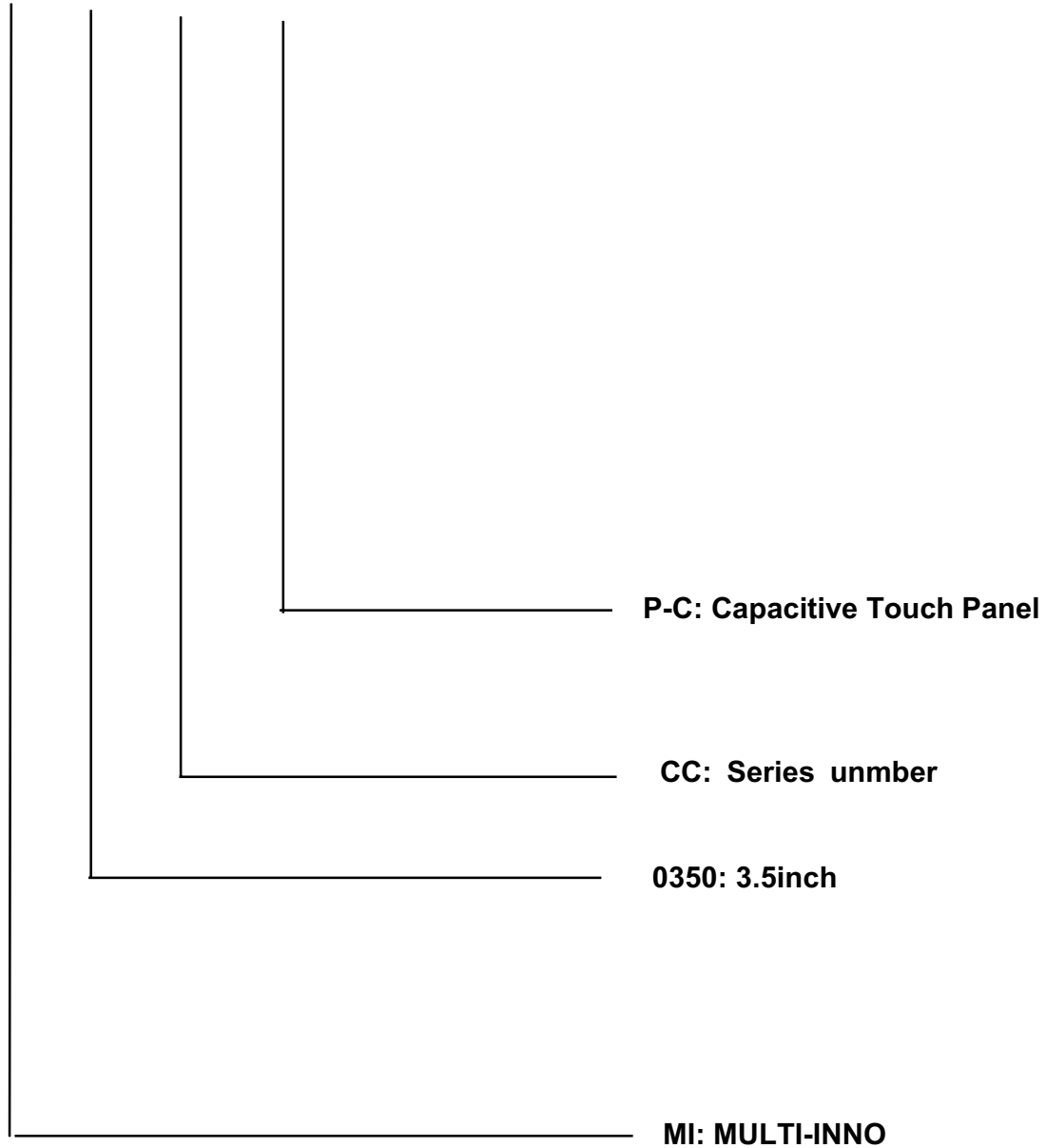
BarCode Define:





Product Name Define:

MI 0350 CC P-C



16. 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 snesor 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 commutator 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

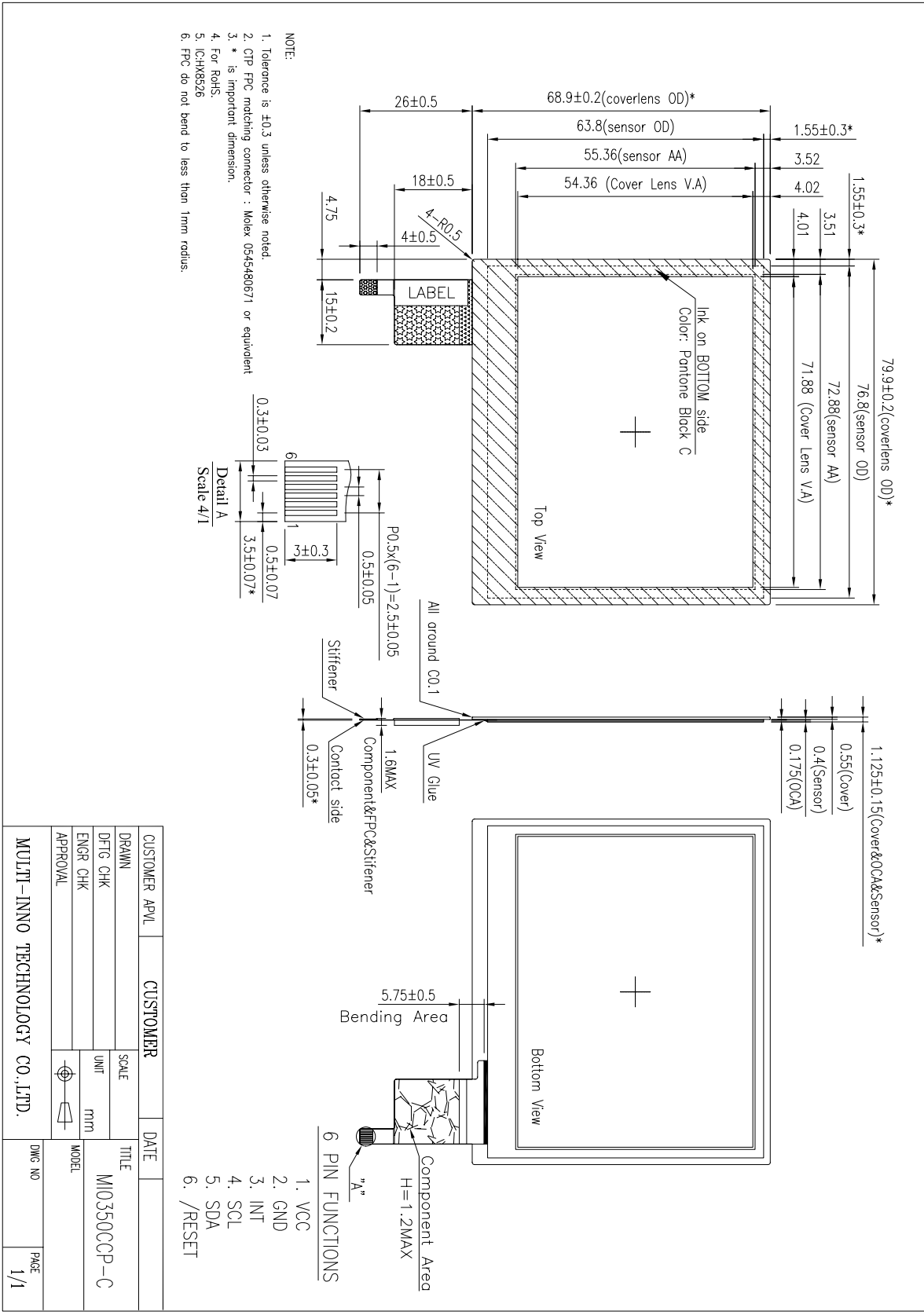
For the packaging box, please pay attention to the followings:

- (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.

17. OUTLINE DRAWING



CUSTOMER APVL	CUSTOMER	DATE	TITLE
DRAWN	SCALE		MI0350CCP-C
DTG CHK	UNIT	mm	
ENGR CHK	MODEL		
APPROVAL			
MULTI-INNO TECHNOLOGY CO.,LTD.			DWG NO
			PAGE
			1/1