Crystal Touch: TRUE Multi-Touch

Detailed Product Line Specification

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Rev. K — July 31, 2014

Product descriptions and specifications are subject to change without notice.

1. General Description

TRUE Multi-Touch projected capacitive touch panels

For information on the theory of operation, communications protocol, user interface guidelines, touch controller specifications, etc., refer to the Atmel® controller-specific Datasheet and Protocol Guide. Contact Ocular to request copies of these documents.

The following data is based on typical findings from Ocular standard product testing. This data is representative only, contact Ocular for developing detailed specifications.

2. Panel Specification

Table 1

Model Number	Diagonal Size (inches)	Aspect Ratio	Outline Dimensions (mm)	Active Area (mm)	Total Thickness (mm)	Chip on Flex (COF) or PCB	Controller
F035-0112S-194	3.5	4:3	85 × 68	70 × 53	1.6	COF	mXT112S
F043-00224-000	4.3	16:9	109 × 67	95 × 54	1.6	PCB	mXT224
F043-00224-100	4.3	16:9	109 × 67	95 × 54	1.6	PCB	mXT224
F043-0224S-194	4.3	16:9	109 × 67	95 × 54	1.6	COF	mXT224S
F057-0224S-194	5.7	4:3	131 × 103	115 × 86	1.6	COF	mXT224S
F070-0384E-000	7.0	16:10	165 × 104	154 × 91	1.6	PCB	mXT384E
F070-0384E-100	7.0	16:10	165 × 104	154 × 91	1.6	PCB	mXT384E
F070-0336S-194	7.0	16:10	169 × 108	154 × 91	1.6	COF	mXT336S
F101-0768E-000	10.1	16:9	241 × 150	223 × 132	1.6	PCB	mXT768E
F101-0768E-100	10.1	16:9	241 × 150	223 × 132	1.6	PCB	mXT768E
F101-1188S-194	10.1	16:9	241 × 150	223 × 132	1.6	COF	mXT1188S
F104-01386-000	10.4	4:3	229 × 173	211 × 158	1.6	PCB	mXT1386
F104-01386-100	10.4	4:3	229 × 173	211 × 158	1.6	PCB	mXT1386
F104-1188S-194	10.4	4:3	231 × 177	211 × 158	1.6	COF	mXT1188S
F121-1188S-000	12.1	16:10	278 × 184	261 × 163	1.6	PCB	mXT1188S
F121-1188S-100	12.1	16:10	278 × 184	261 × 163	1.6	PCB	mXT1188S
F156-01386-000	15.6	16:9	366 × 218	344 × 194	1.6	PCB	mXT1386
F156-01386-100	15.6	16:9	366 × 218	344 × 194	1.6	PCB	mXT1386
F170-1716E-000	17.0	5:3	400 × 258	370 × 222	2.6	PCB	mXT1716E
F170-1716E-100	17.0	5:3	400 × 258	370 × 222	2.6	PCB	mXT1716E

Table 2

Parameter	Specification
Resolution	4096 × 4096
Accuracy	±2.0 mm
Transmissivity	90%
Operating Temperature [1]	−20°C to 80°C
Storage Temperature	−30°C to 80°C

Note 1: System level performance is determined by the overall system design and construction.

3. Electrical Specifications and Configuration

3.1. Electrical Characteristics

3.1.1. Chip on Flex with Atmel mXT112S; I²C Interface

Table 3: Chip on Flex with Atmel mXT112S; I²C Interface

Parameter	Min.	Typ.	Max.	Units	Remarks
Digital Power Supply (V_{DD})	3.0	3.3	3.6	V	
High level input voltage	0.7 * V_{DD}		V_{DD} + 0.3 V	V	
Low level input voltage	-0.3		0.3 * V_{DD}	V	
Active Current	—	8.36	—	mA	Note 1
Sleep Current	—	0.0013	—	mA	

Note 1: Active power varies based on a number of controllable parameters as well as the number of touches per second.

3.1.2. Control PCB with Atmel mXT224 or mXT384E; USB Interface

Table 4: Control PCB with Atmel mXT224 or mXT384E; USB Interface

Parameter	Min.	Typ.	Max.	Units	Remarks
Digital Power Supply (V_{BUS})	3.6	5.0	5.5	V	
Active Current	—	60	—	mA	Note 1
Sleep Current	—	60	—	mA	Note 2

Note 1: Active power varies based on a number of controllable parameters as well as the number of touches per second.
Note 2: The USB interface cannot be placed in a low power mode.

3.1.3. Control PCB with Atmel mXT224 or mXT384E; I²C Interface

Table 5: Control PCB with Atmel mXT224 or mXT384E; I²C Interface

Parameter	Min.	Typ.	Max.	Units	Remarks
Digital Power Supply (V_{DD})	3.0	3.3	3.6	V	
High level input voltage	0.7 * V_{DD}	V_{DD}	V_{DD} + 0.5 V	V	
Low level input voltage	-0.5	0	0.3 * V_{DD}	V	
Active Current	—	1.75	—	mA	Note 1
Sleep Current	—	94	—	µA	

Note 1: Active power varies based on a number of controllable parameters as well as the number of touches per second.

3.1.4. Chip on Flex with Atmel mXT224S; I²C Interface

Table 6: Chip on Flex with Atmel mXT224S; I²C Interface

Parameter	Min.	Typ.	Max.	Units	Remarks
Digital Power Supply (V_{DD})	3.0	3.3	3.6	V	
High level input voltage	0.7 * V_{DD}		V_{DD} + 0.5 V	V	
Low level input voltage	-0.5		0.3 * V_{DD}	V	
Active Current	—	18.21	—	mA	Note 1
Sleep Current	—	0.0035	—	mA	

Note 1: Active power varies based on a number of controllable parameters as well as the number of touches per second.

3.1.5. Chip on Flex with Atmel mXT336S; I²C Interface

Table 7: Chip on Flex with Atmel mXT336S; I²C Interface

Parameter	Min.	Typ.	Max.	Units	Remarks
Digital Power Supply (V_{DD})	3.0	3.3	3.6	V	
High level input voltage	0.7 * V_{DD}		V_{DD} + 0.5 V	V	
Low level input voltage	-0.5		0.2 * V_{DD}	V	
Active Current	—	20.7	—	mA	Note 1
Sleep Current	—	0.003	—	mA	

Note 1: Active power varies based on a number of controllable parameters as well as the number of touches per second.

3.1.6. Control PCB with Atmel mXT768E; USB Interface

Table 8: Control PCB with Atmel mXT768E; USB Interface

Parameter	Min.	Typ.	Max.	Units	Remarks
Digital Power Supply (V_{BUS})	3.6	5.0	5.5	V	
Active Current	—	60	—	mA	Note 1
Sleep Current	—	60	—	mA	Note 2

Note 1: Active power varies based on a number of controllable parameters as well as the number of touches per second.
Note 2: The USB interface cannot be placed in a low power mode.

3.1.7. Control PCB with Atmel mXT768E; I²C Interface

Table 9: Control PCB with Atmel mXT768E; I²C Interface

Parameter	Min.	Typ.	Max.	Units	Remarks
Digital Power Supply (V_{DD})	3.0	3.3	3.6	V	
High level input voltage	0.7 * V_{DD}	V_{DD}	V_{DD} + 0.5 V	V	
Low level input voltage	-0.5	0	0.3 * V_{DD}	V	
Active Current	—	6	—	mA	Note 1
Sleep Current	—	94	—	µA	

Note 1: Active power varies based on a number of controllable parameters as well as the number of touches per second.

3.1.8. Control PCB with Atmel mXT1188S; USB Interface

Table 10: Control PCB with Atmel mXT1188S; USB Interface

Parameter	Min.	Typ.	Max.	Units	Remarks
Digital Power Supply (V_{BUS})	4.5	5.0	5.5	V	
Active Current	—	38.2	—	mA	Note 1
Sleep Current	—	5.0	—	mA	Note 2

Note 1: Active power varies based on a number of controllable parameters as well as the number of touches per second.
Note 2: The USB interface cannot be placed in a lower power mode.

3.1.9. Control PCB with Atmel mXT1188S; I²C Interface

Table 11: Control PCB with Atmel mXT1188S; I²C Interface

Parameter	Min.	Typ.	Max.	Units	Remarks
Digital Power Supply (V_{DD})	3.0	3.3	3.6	V	
High level input voltage	2.0	3.3	3.6	V	
Low level input voltage	-0.3	0	0.8	V	
Active Current	—	36.4	—	mA	Note 1
Sleep Current	—	0.9	—	mA	

Note 1: Active power varies based on a number of controllable parameters as well as the number of touches per second.

3.1.10. Control PCB with Atmel mXT1386; USB Interface

Table 12: Control PCB with Atmel mXT1386; USB Interface

Parameter	Min.	Typ.	Max.	Units	Remarks
Digital Power Supply (V_{BUS})	3.6	5.0	5.5	V	
Active Current	—	30	—	mA	Note 1
Sleep Current	—	5	—	mA	

Note 1: Active power varies based on a number of controllable parameters as well as the number of touches per second.

3.1.11. Control PCB with Atmel mXT1386; I²C Interface

Table 13: Control PCB with Atmel mXT1386; I²C Interface

Parameter	Min.	Typ.	Max.	Units	Remarks
Digital Power Supply (V_{DD})	3.2	3.3	3.47	V	
High level input voltage	2.0	3.3	3.6	V	
Low level input voltage	-0.3	0	0.8	V	
Active Current	—	27	—	mA	Note 1
Sleep Current	—	94	—	µA	

Note 1: Active power varies based on a number of controllable parameters as well as the number of touches per second.

3.1.12. Control PCB with Atmel mXT1716E; USB Interface

Table 14: Control PCB with Atmel mXT1716E; USB Interface

Parameter	Min.	Typ.	Max.	Units	Remarks
Digital Power Supply (V_{BUS})	3.6	5.0	5.5	V	
Active Current	—	45	—	mA	Note 1
Sleep Current	—	5	—	mA	

Note 1: Active power varies based on a number of controllable parameters as well as the number of touches per second.

3.1.13. Control PCB with Atmel mXT1716E; I²C Interface

Table 15: Control PCB with Atmel mXT1716E; I²C Interface

Parameter	Min.	Typ.	Max.	Units	Remarks
Digital Power Supply (V_{BUS})	3.2	3.3	3.47	V	
High level input voltage	2.0	3.3	3.6	V	
Low level input voltage	-0.3	0	0.8	V	
Active Current	—	37	—	mA	Note 1
Sleep Current	—	95	—	µA	

Note 1: Active power varies based on a number of controllable parameters as well as the number of touches per second.

3.2. Touch Panel Interface Pinout

3.2.1. USB Interface Pinout

Table 16: USB Interface Pinout

Pin No.	Symbol	Description	Notes
1	V_{BUS}	USB Power	Nominal 5.0 V
2	D-	USB Data-	
3	D+	USB Data+	
4	GND	Ground	

Note 1: Mating connector part is Molex 051004-0400 or equivalent.

3.2.2. I²C Interface Pinout

Table 17: I²C Interface Pinout

Pin No.	Symbol	Description	Notes
1	SCL	Serial Interface Clock	Pull-up resistor on board
2	SDA	Serial Interface Data	Pull-up resistor on board
3	/RESET	Reset	Pull-up resistor on board
4	/CHG	State Change Interrupt	Pull-up resistor on board
5	NC	No Connect	
6	GND	Ground	
7	V_{DD}	Power	Nominal 3.3 V
8	NC	No Connect	
9	NC	No Connect	
10	NC	No Connect	

Note 1: Mating connector part is Molex 52207-1060 or equivalent.
Note 2: mXT112S & mXT224S (jumper installed) I²C bus address is 0x4A.
Note 3: mXT224, mXT224S (default), mXT336S & mXT1188S I²C bus address is 0x4B.
Note 4: mXT384E & mXT768E I²C bus address is 0x4D.
Note 5: mxT1386 & mXT1716E I²C bus address is 0x5B.

4. Microsoft® Windows 7 Digitizer Support

The USB version of the touch panel is configured for Windows 7 multi-touch digitizer support.

5. Mechanical Characteristics

Touch panel uses projected capacitive technology. No activation force is required. Top surface glass is chemical resistant with no wear from normal use. When placed in properly sealed enclosure, touch panel can be water tight and weather resistant. Glass surface is scratch and impact resistant.

6. Optical Characteristics

Table 18

Item	Specifications			Unit
	Min	Typ.	Max.	
Transmissivity	90	—	—	%

7. Quality Assurance

Table 19

No.	Test Description	Test Parameters	Remarks
1	High Temperature Storage Test	80°C for 250 h	Non-operating
2	Low Temperature Storage Test	-30°C for 250 h	Non-operating
3	High Temperature Operation Test	80°C for 24 h	Operating
4	Low Temperature Operation Test	-20°C for 24 h	Operating
5	High Temperature and High Humidity Operation Test	60°C @ 90%RH for 250 h	Operating
6	Electro Static Discharge Test	±6 kV Contact ±12 kV Air	Operating
7	Vibration Test (non-operating)	10 Hz to 50 Hz 1.5 mm Amplitude 2 hours on each axis	Non-operating

Note 1: Test samples are allowed a 2 hour recovery time at room temperature following non-operational tests before functional operation is verified.
Note 2: Data for touch sensor only.
Note 3: System level performance is determined by the overall system design and construction.

8. Precautions

The following precautions will ensure proper handling of Ocular's touch panels.

8.1. Mounting Precautions

- Any mounting configuration should ensure that there is no twisting force applied to the panel. Additionally the mounting should be such that large external forces are not directly transmitted to the panel.
- Use standard glass cleaning materials to clean the surface of the touch panel.

8.1.1. Bezel Mounting

- When mounting the touch panel underneath a bezel, the touch panel assembly should be mounted using a configuration that supports the back surface of the TFT module. The bezel edge must be positioned outside the active area of the touch panel. The bezel may cause false activation if the bezel edge is over the active area. A gap of 1.0 mm to 0.5 mm is needed between the bezel and the touch panel surface. A foam gasket, or similar material, should be used to compensate for the tolerance of the enclosure, compression from the screws, etc.

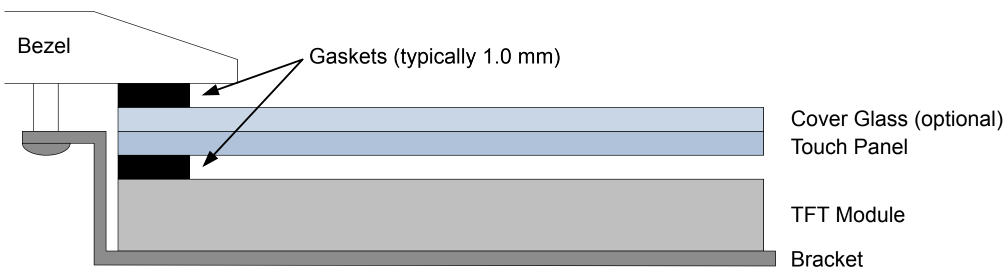

Figure 1: Mounting Diagram

8.1.2. Flush Mounting

- When flush mounting the cover glass with the top of the enclosure, the enclosure must have a ledge for attaching the overhang of the cover glass as well as a ledge for supporting the back of the TFT module.

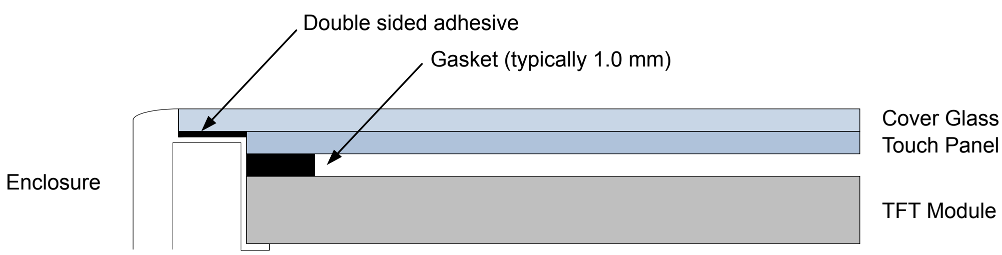

Figure 2: Mounting Diagram

8.1.3. Optical Bonding Agent

- The air gap between the TFT and touch panel can be eliminated by using an optical bonding agent such as DuPont™ Vertak®. Elimination of the air gap improves the electrical performance of the touch panel and enhances the clarity of the TFT image.

8.2. Operating Precautions

- A stable, low-noise power supply is necessary to avoid touch panel operational errors. Noise and voltage spikes should be lower than ±200 mV.
- Panel should be used with a power supply that is equipped with overcurrent protection. The panel does not include any current limiting protection circuitry.
- Temperature changes that may form moisture condensation can seriously damage the panel and result in permanent failure.
- Grounding and shielding is recommended to minimize the electromagnetic interference if the panel is to be used with high frequency circuits.

8.3. Electrostatic Discharge Control

- Although Ocular has considered ESD in the design of the panel, the panel has limited protection to electrostatic discharge. System designers must include ESD protection in the design to prevent panel damage due to ESD.
- Proper ESD protection must be followed when handling the panel. ESD discharge through the interface pins can seriously damage the panel. Wear an ESD grounding strap when handling the panel.
- When working with the panel, it is recommended that the operator's body and any electrical equipment that comes in contact with the panel be grounded. Ocular strongly recommends using anti-static mats to protect against the hazards of electrical shock.
- Removal of the protective film from the panel can generate static electricity. The film should be peeled off slowly and carefully by an electrically grounded operator in the presence of ionizing air blowoff guns or fans.

8.4. Handling Precautions for Glass

- The panel is made from glass. Avoid high impact or a large mechanical shock. If the glass should break, handle it with care.
- When the protection film is peeled off, static electricity is generated between the film and panel. Be sure to peel this film off in an ESD protected environment.
- Avoid excess or repeated bending of the FPC connector on the panel.