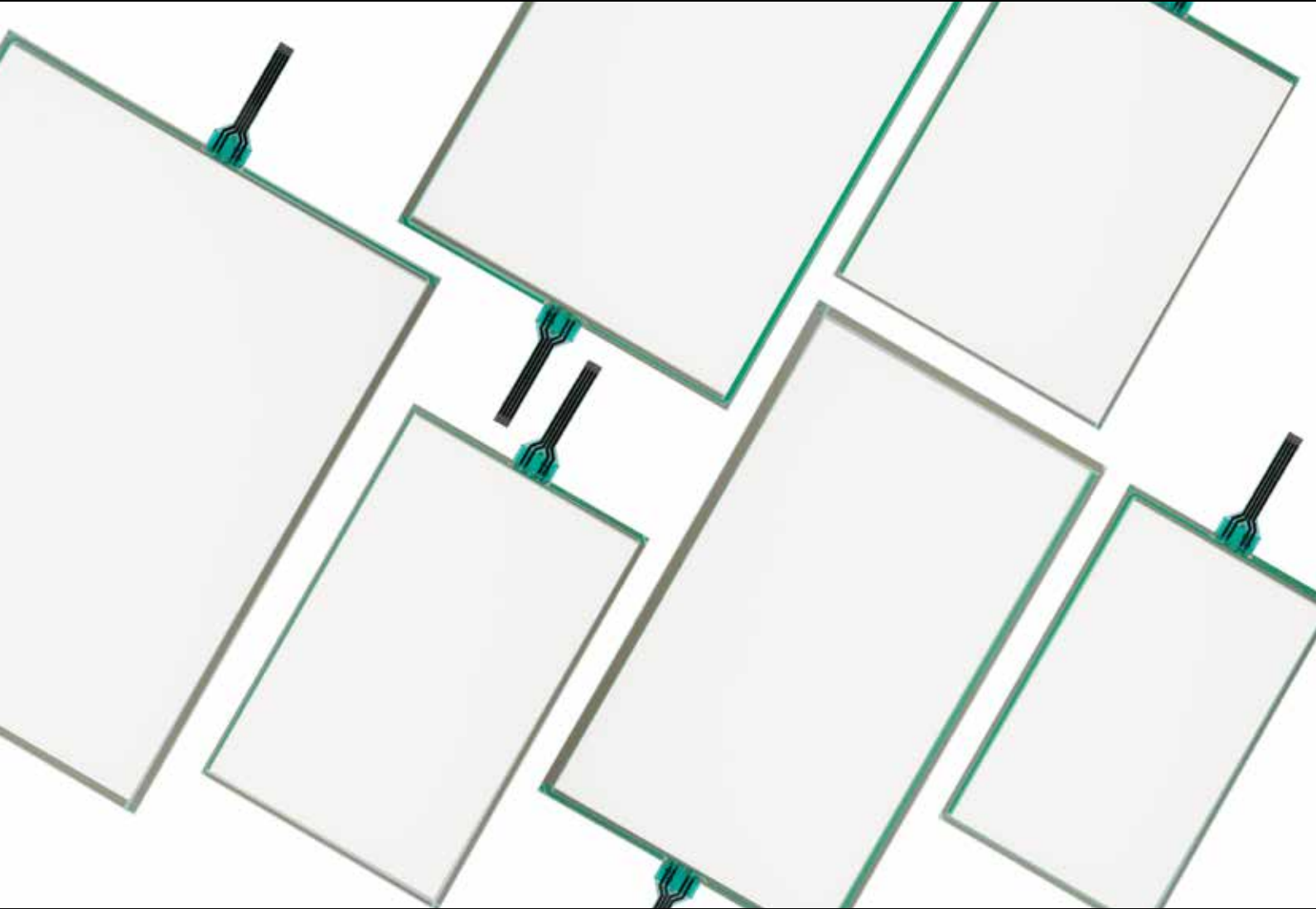NKK SWITCHES

Series FT
Expanded Size

4-Wire Analog Touch Screens

NKK SWITCHES CO., LTD.

New Variations are Now Available for the Wide and Large Size Product Series
Developing Switch Technology with Touch Screens

Standard product (film + glass)

☞ **Material Composition**
As for material composition, we take the most widely used "film+ glass" as the standard product.

☞ **Input Method**
Data can be input using a finger or pen.

☞ **Wide Variety of Compatible Screen Sizes**
Analog: 5.7", 6.5", 8.4", 10.4", 10.6" (Wide), 12.1", 12.1" (Wide), 15", 15.6" (Wide), 19"

☞ **Adoption of ANR Film**
Adoption of ANR (Anti Newton-Ring) film reduces the occurrence of interference fringe, increasing visibility. of the screen.

☞ **Adoption of Resistive Film Mode**
The FT series are resistive film touch screens that take full advantage of transparent conductive thin film technology. Incorporating these films into a wide variety of display equipment such as LCD screens and plasma EL enables simple, interactive input operation even for people who do not have specialist technical or computer knowledge.
Touch screens are currently used in a wide variety of applications. Resistive films represent a high degree of freedom for input methods (digital, analog), size, and design with for a relatively low cost.

☞ **Anti-Glare Surface Treatment**
By making anti-glare surface treatment toward the filmsurface, we made reflection of fluorescence soft.
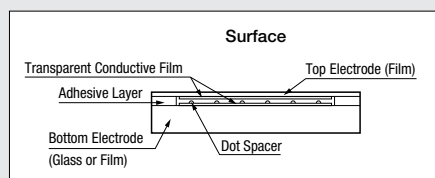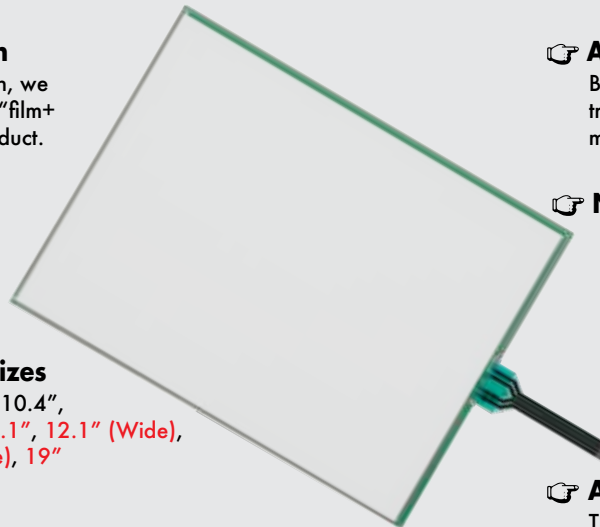
☞ **Narrow Frame Compatibility**
Our touch screens are now compatible with a wide range of narrow frame LCDs. (Narrow frame type)

☞ **Adoption of Adhesives**
The adoption of adhesives for attachment sections between the glass and film improve the environmental durability of our products.

☞ **Hard Coating**
Our hard coating (hard resin coating) provides superb protection to the surface of the films against scratches and damage from fingers and pens.

Surface
Transparent Conductive Film
Top Electrode (Film)
Adhesive Layer
Bottom Electrode (Glass or Film)
Dot Spacer

Flexible Compatibility for a Wide Range of Requirements.

Customized Products (Resistive film method)

☞ The size of resistive film products can be **adjusted according to your needs**, even down to palm-sized products.

☞ Can be incorporated into peripheral devices or **attached to LCDs**.

☞ The **material composition can be adjusted according to use**, such as film + film.

☞ **A wide range of films** such as fingerprint-resistant and high transmittance films are also **available**.

☞ **Input methods** such as pen input or finger input **can** also **be specified**.

☞ Metallic tail (copper pattern + gold plate, etc.) products **are** also **available.**

Analog Touch Screen Controller Boards
Combining an analog touch screen with a controller board device driver on a computer enables you to perform the same operations as you would with a mouse simply by touching the touch screen screen.

▶General Specifications

Series FT 4-Wire Analog Touch Screens		
Power level		1 mA 5 V DC (Resistive load)
XYResistive Value		250–850 Ω (Wide type: 120–1,500 Ω)
Linearity		±1.5% maximum
Insulation Resistance		10 MΩ minimum @ 25V DC
Expected Operating Life	Writing	50,000 maximum operations (approximately 30 mm movement with stylus)
	Tapping	1,000,000 operations minimums (using 60° silicone rubber)
Touch Activation Force		1.47 N maximum
Chattering Time		10 milliseconds maximum
Relative Humidity		+60°C (+140°F), 90% relative humidity, 240 hours
Operating Temperature Range		-20°C – +70°C (-4°F – +158°F)
Storage Temperature Range		-40–+80°C
Light Transmission		80% (TYP.) (Touch screen section)
Surface Hardness		2H or harder (JIS K5600) (Pencil hardness)

⚠ Each rated value/performance value is obtained through independent testing. Therefore, the same results are not guaranteed under complex conditions. Please refer to General Specifications page in General Catalog "Switch Guide" on specific models, ratings and ordering instructions.

▶Applications

- **OA Systems**
  Various OA devices for input systems, building management systems, business administration systems, schedule management systems
- **FA Systems**
  Production process management systems, production system control, input systems for various manufacturing equipment, plant control systems
- **Communication Systems**
  Reception guidance systems, restaurant automation systems, POS systems, traffic systems

- **Bank Online Systems**
  ATM, cash dispensers, foreign exchange systems
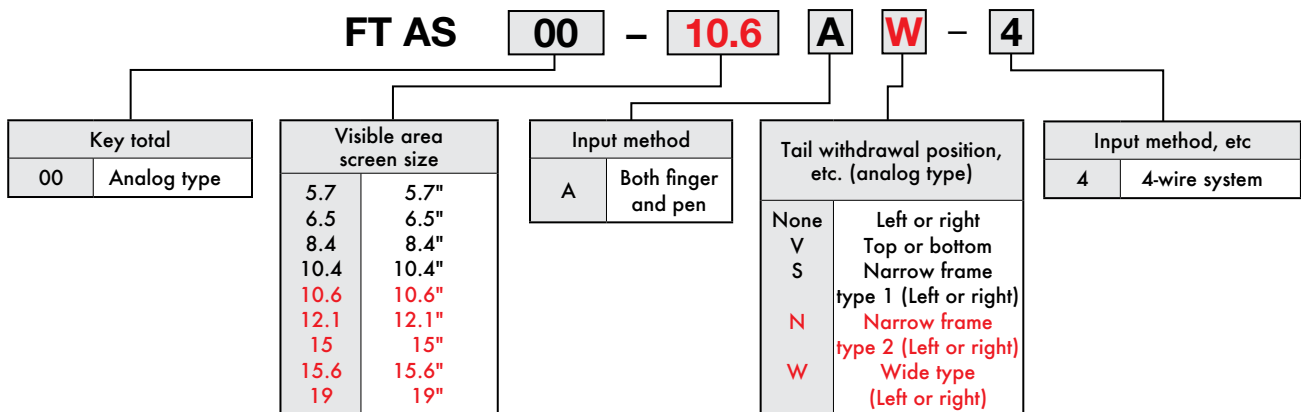- **Educational Systems**
  Home use/school education systems, audiovisual education systems, information processing education systems
- **Medical System**
  Medical chart management systems, medical data processing systems, physical treatment systems, bedside monitors
- **Amusement Equipment**

▶Typical Ordering Example

FT AS   00 – 10.6   A   W – 4

Key total	
00	Analog type

Visible area screen size	
5.7	5.7"
6.5	6.5"
8.4	8.4"
10.4	10.4"
10.6	10.6"
12.1	12.1"
15	15"
15.6	15.6"
19	19"

Input method	
A	Both finger and pen

Tail withdrawal position, etc. (analog type)	
None	Left or right
V	Top or bottom
S	Narrow frame type 1 (Left or right)
N	Narrow frame type 2 (Left or right)
W	Wide type (Left or right)

▶Narrow frame type screen aspect ratio is 4:3
  Wide type screen aspect ratio is 16:9

Input method, etc	
4	4-wire system

▶Part Numbers & Descriptions

FTAS00-12.1AN-4	FTAS00-15AN-4	FTAS00-19AN-4
FTAS00-10.6AW-4	**FTAS00-12.1AW-4**	**FTAS00-15.6AW-4**

Part Number	Screen Size in Inches	Input Methods	Key Area Dimensions (mm)	Viewing Area Dimensions (mm)	External Dimensions (mm)	Screen Thickness (mm)	Terminal Detail
FTAS00-12.1AN-4	12.1	Finger or pen	245.8×184.3	249.6×188.1	260×198	2.1	1.25 mm pitch 8 pin Length 80 mm
FTAS00-15AN-4	15	Finger or pen	304.1×228.1	308.1×232.1	321.8×245.5	2.1	1.25 mm pitch 8 pin Length 80 mm
FTAS00-19AN-4	19	Finger or pen	376.3×301	382×307.4	395.5×321	2.1	1.25 mm pitch 8 pin Length 80 mm
FTAS00-10.6AW-4	10.6	Finger or pen	230.4×138.2	233.4×141.3	247.8×154.8	2.1	1.25 mm pitch 8 pin Length 80 mm
FTAS00-12.1AW-4	12.1	Finger or pen	261.12×163.2	264.26×166.4	275×176	2.1	1.25 mm pitch 8 pin Length 80 mm
FTAS00-15.6AW-4	15.6	Finger or pen	344.2×193.5	347.5×196.8	362.6×214.2	2.1	1.25 mm pitch 8 pin Length 80 mm

▶Custom Orders

We can customize products according to your specifications. Digital (matrix) and analog products are available and can be designed according to your requirements such as key number and external dimensions. We can also provide additional services such as attachment to LCDs or incorporation into peripheral devices.

Flexible compatibility for a wide range of requirements.
• The size of resistive film products can be adjusted according to your needs, even down to palm-sized products.
• Can be incorporated into peripheral devices or attached to LCDs.
• The material composition can be adjusted according to use, such as film + film.
• A wide range of films such as fingerprint-resistant and high transmittance films are also available.
• Input methods such as pen input or finger input can also be specified.
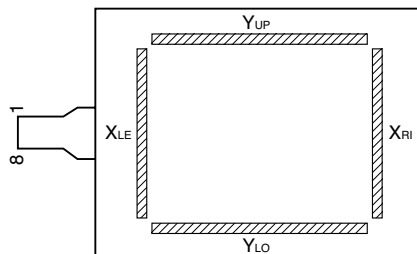
▶Sales Start Date

February 28 , 2017
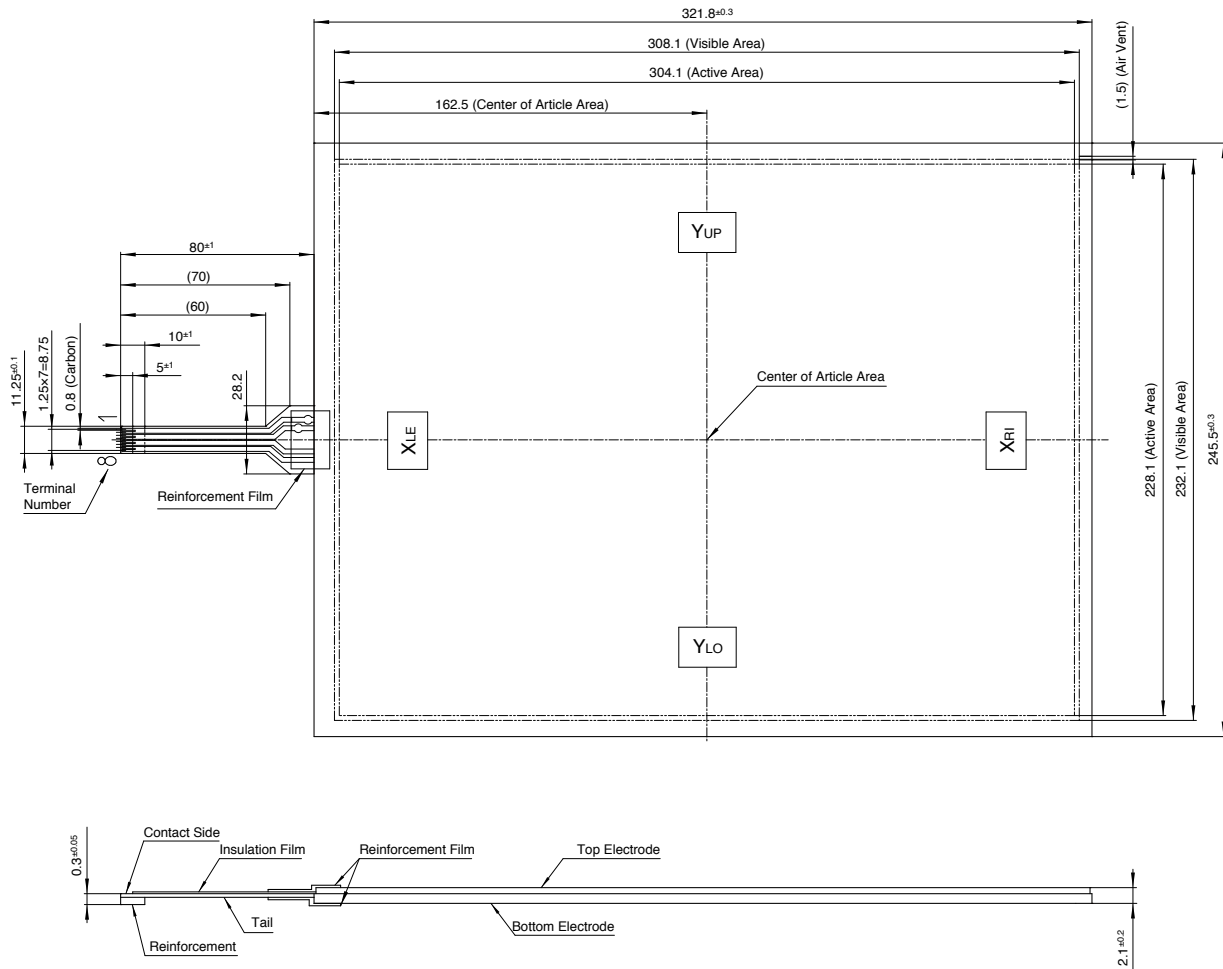
►General Specifications
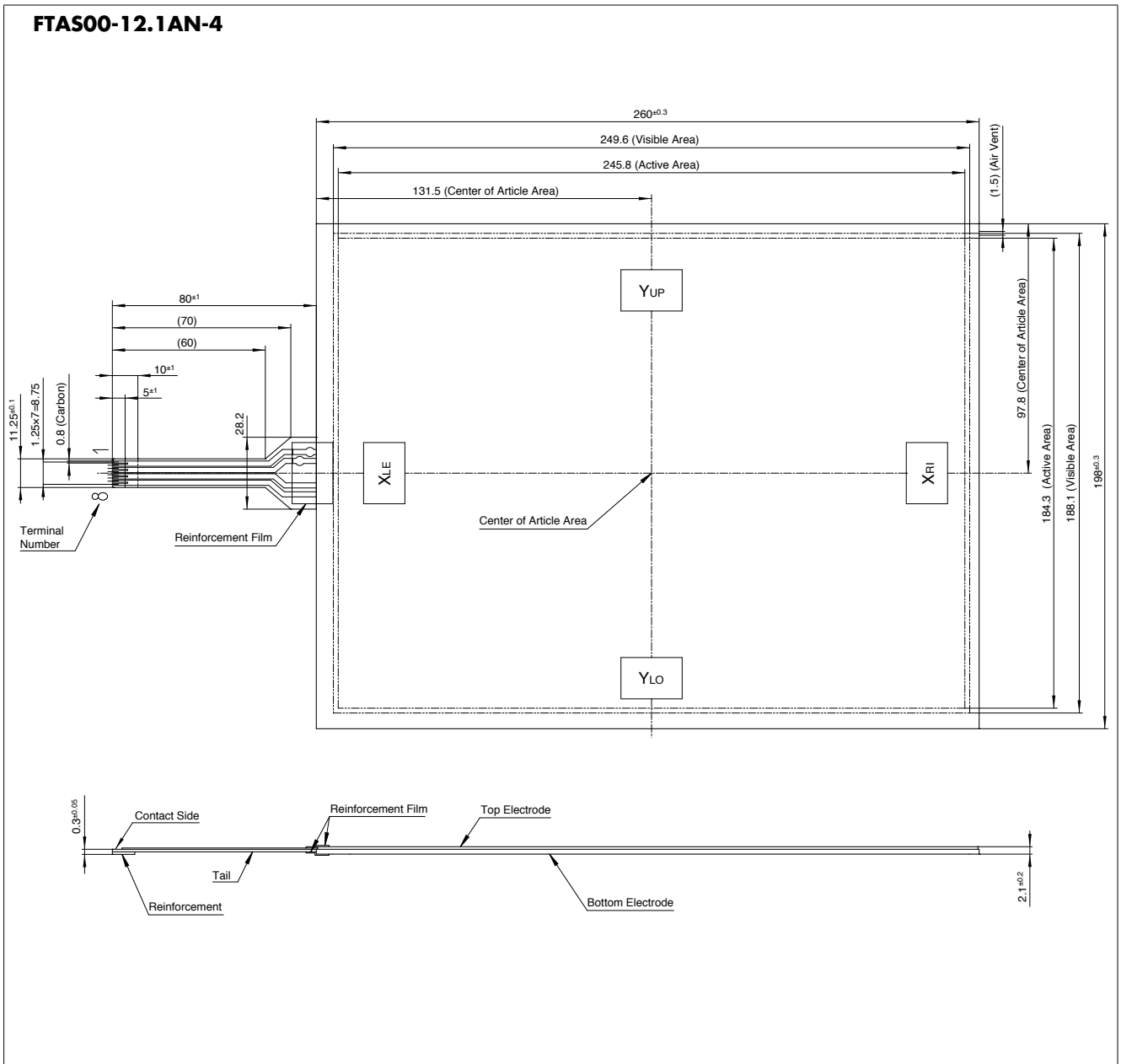
FTAS00-12.1AN-4

Specifying circuit

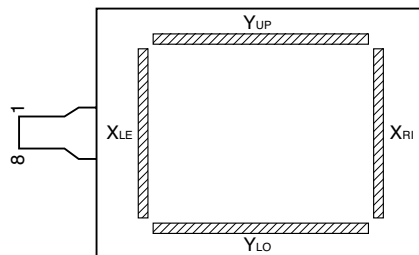| Pins	Signal
1 , 2	Y_{UP}
3 , 4	Y_{LO}
5 , 6	X_{LE}
7 , 8	X_{RI}

Y_{UP}, Y_{LO} : Bottom Electrode Contact
X_{LE}, X_{RI} : Top Electrode Contact

FTAS00-15AN-4

Specifying circuit

Pins	Signal
1 , 2	Y_{UP}
3 , 4	Y_{LO}
5 , 6	X_{LE}
7 , 8	X_{RI}

Y_{UP}, Y_{LO} : Bottom Electrode Contact
X_{LE}, X_{RI} : Top Electrode Contact

FTAS00-19AN-4
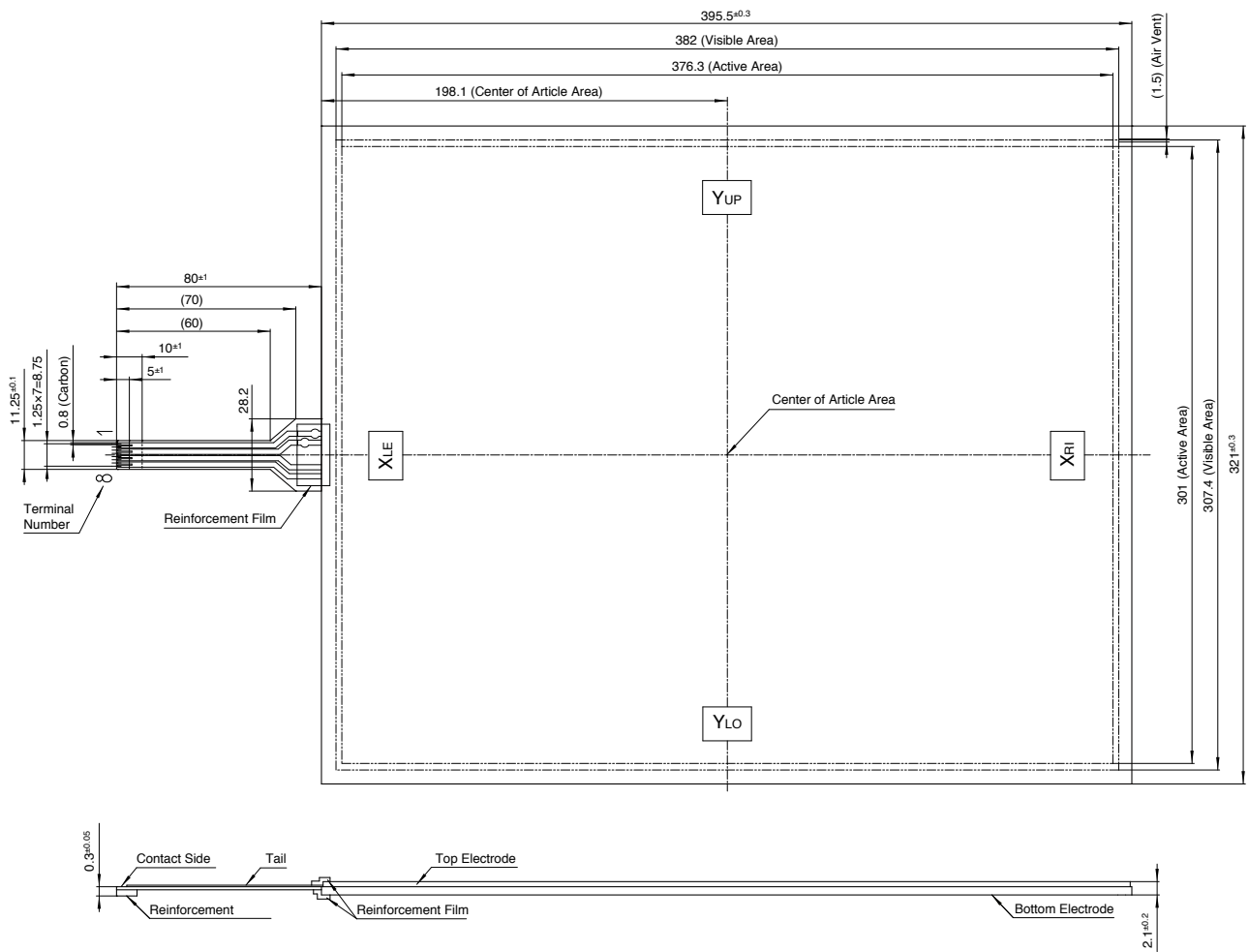
Specifying circuit

Pins	Signal
1 , 2	Y_{UP}
3 , 4	Y_{LO}
5 , 6	X_{LE}
7 , 8	X_{RI}

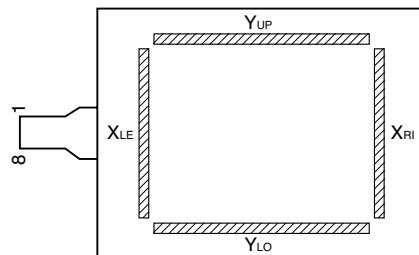Y_{UP}, Y_{LO} : Bottom Electrode Contact
X_{LE}, X_{RI} : Top Electrode Contact

FTAS00-10.6AW-4

Specifying circuit

Pins	Signal
1 , 2	Y_{UP}
3 , 4	Y_{LO}
5 , 6	X_{LE}
7 , 8	X_{RI}
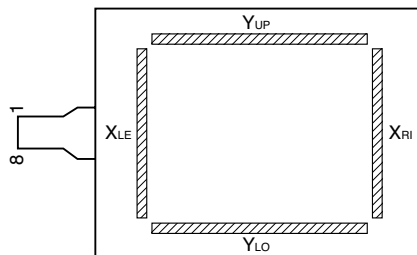
Y_{UP}, Y_{LO} : Bottom Electrode Contact
X_{LE}, X_{RI} : Top Electrode Contact

FTAS00-12.1AW-4
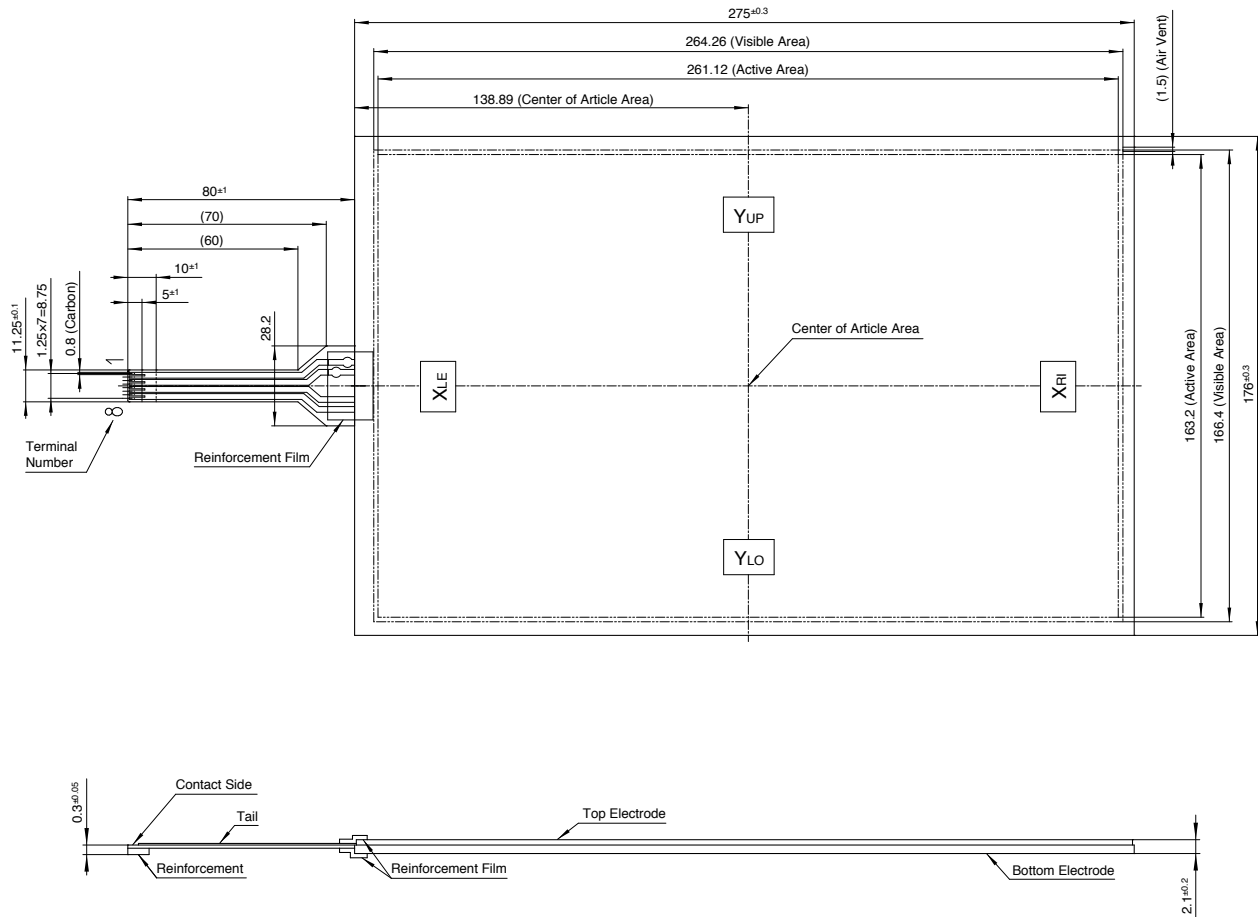
Specifying circuit

Pins	Signal
1 , 2	Y_{UP}
3 , 4	Y_{LO}
5 , 6	X_{LE}
7 , 8	X_{RI}

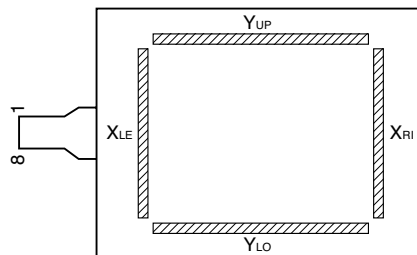Y_{UP}, Y_{LO} : Bottom Electrode Contact
X_{LE}, X_{RI} : Top Electrode Contact

FTAS00-15.6AW-4
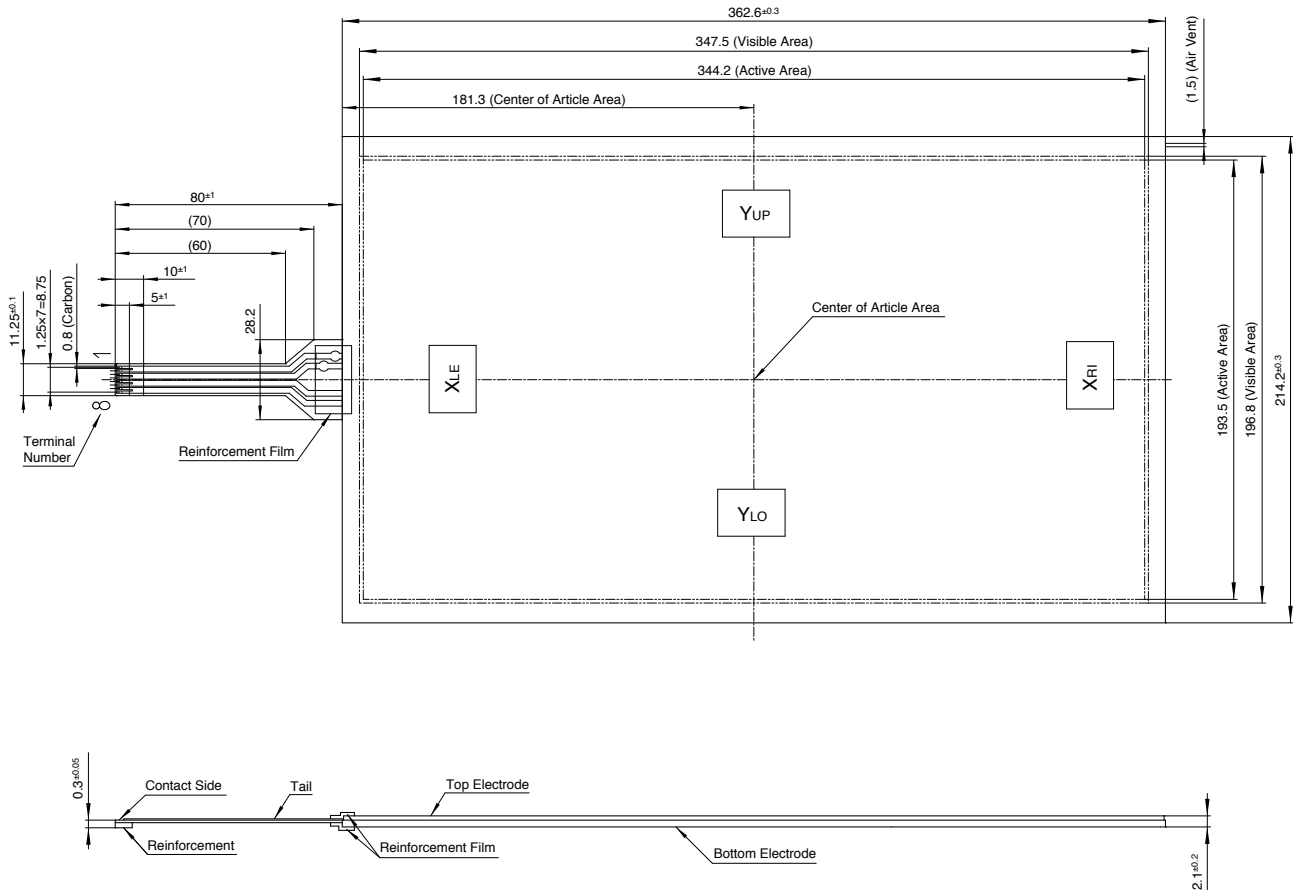
Specifying circuit

Pins	Signal
1, 2	Y_{UP}
3, 4	Y_{LO}
5, 6	X_{LE}
7, 8	X_{RI}

Y_{UP}, Y_{LO} : Bottom Electrode Contact
X_{LE}, X_{RI} : Top Electrode Contact

Unlimited Interfaces that Expand at A Touch

Combining an analog touch screen with a controller board device driver on a computer enables you to perform the same operations as you would with a mouse simply by touching the touch screen.

- Compatible with USB/RS-232C interfaces
- Equipped with EPROM for saving setting data (FTCS04B/FTCU04B)
- Device drivers are Windows 7 and 8 compatible

Controller Boards

Model	Interface	Type
FTCS04A/FTCS04A2	RS-232C	4-wire system
FTCS04B	RS-232C	4-wire system
FTCU04B	USB	4-wire system

System Configuration
(for USB compatible system)
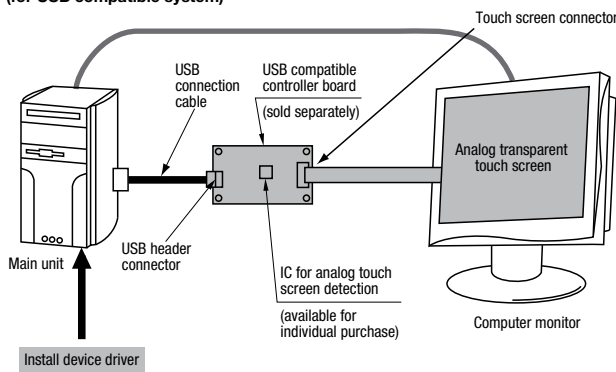
are products handled by NKK Switches Co., Ltd.

System Configuration
(for RS-232C compatible system)
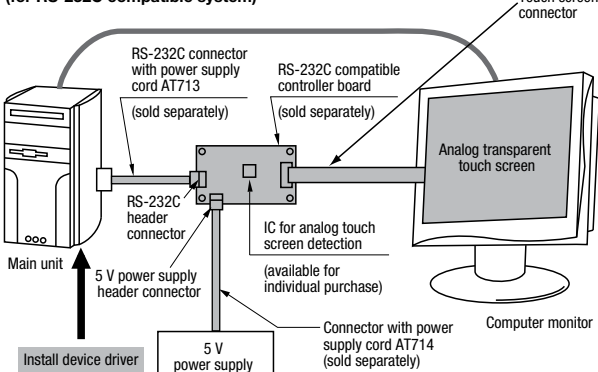
are products handled by NKK Switches Co., Ltd.

General Specifications

Item	Specs		
	FTCS04A/FTCS04A2	**FTCS04B**	**FTCU04B**
Interface	RS-232C Standards	RS-232C Standards	USB 2.0 Full Speed
Clock	10 MHz	6 MHz	6 MHz
Power supply	5.0V	5.0V	5.0V
Resolution	10-bit	10-bit	10-bit
Power consumption	40 mA maximum	40 mA maximum	100 mA maximum
Baud rate	1200, 2400, 4800, 9600, 19200bps* (Standards setting 9600bps)	9600 bps	
Communication format	Data length: 8-bit Parity bit: None, Even number, Odd number Stop bit: 1	Data length: 8-bit Parity bit: None Stop bit: 1	

***FTCS04A** only. **FTCS04A2** can be changed by command transmission from the host.

Maximum Rating

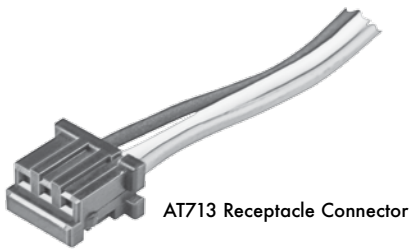| Items	Symbols	Rated value		Unit	Notes
		Min	Max		
Supply voltage	V_{CC}	-0.3	+5.5(+6)*[1]	[V]	
Input voltage	V_{TP}	–	V_{CC}(V_{CC}+0.3)*[1]	[V]	Touch screen imput
	*V_{RS}	-15(-25)*[1]	+15(+25)*[1]	[V]	RS-232C
Operating temperature	T_{OPR}	0	+70	[°C]	
Storage temperature	T_{STG}	-25	+85	[°C]	

V_{RS}: Only applies to RS-232C types, ()[1] are values for **FTCS04A/FTCS04A2**.

Recommended Operation Conditions

Items	Symbols	Rated value			Unit	Notes
		Min	Typ	Max		
Supply voltage	V_{CC}	+4.75(+4.5)*[2]	+5	+5.25(+5.5)*[2]	[V]	
Operating temperature	T_{OPR}	0	–	+70	[°C]	No condensation

()*[2] are values for **FTCS04A/FTCS04A2**.

▶ Controller Boards & Drivers

- Device Driver function: Emulation software that enables operation of the touch screen same as a PC mouse
- Device Driver features two types of button modes; can be operated simultaneously with PS/2 mouse
- Device Driver Compatible with Windows 7 and 8 Operating Systems
- RS-232C Controller Board consists of connector for 4-wire analog touch screen, RS-232C header connector, 5 V power supply header connector and helps simplify wiring RS-232C receptacle connector with wire assembly (AT713) and 5 V power receptacle connector with wire assembly (AT714), are available as accessories

Controller Board	Operating System	Availability
FTCS04B **FTCU04B**	Windows 7 and 8	Download from NKK Switches Website
FTCS04A	Windows 7 and 8	Download from NKK Switches Website
FTCS04A2	Device Driver Not Available	

AT713 Receptacle Connector
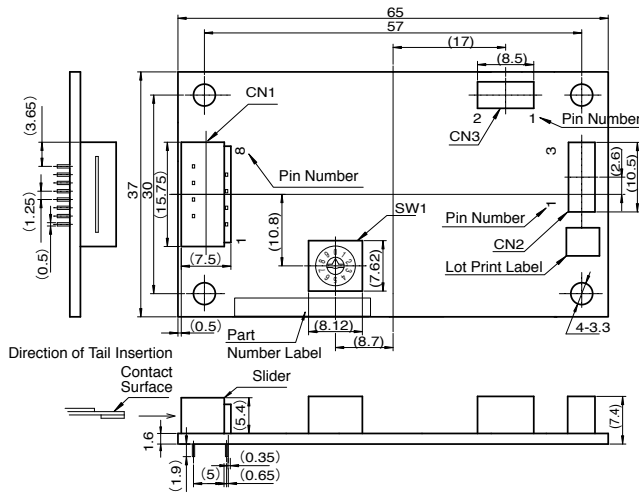

AT714 Receptacle Connector

NKK offers controller boards compatible with USB or RS-232C. Refer to data sheets for FTCS04A, FTCS04B or FTCU04B. See website or contact NKK Switches for specifications and technical data.
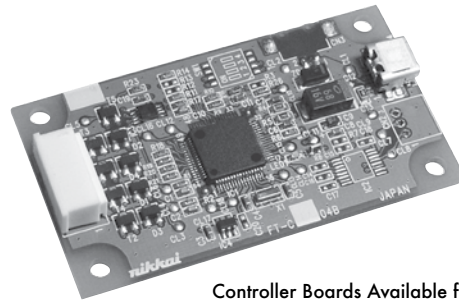
Controller Boards Available for USB and RS-232C

▶RS-232C Compatible Controller Board

FTCS04A (RS-232C compatible)
FTCS04A2 (RS-232C compatible)

CN1
For connecting to 4-wire system analog touch screen
(8-pin)

Pins	Symbol	Terminals
1,2	Y0	For analog touch screen Y_{UP} or Y_{LO}
3,4	Y1	
5,6	X0	For analog touch screen X_{Ri} or X_{Le}
7,8	X1	

CN2
Header connector for RS-232C (3-pin)

Pins	Symbol	Terminals
1	RD	Received data
2	SD	Sent data
3	GND	GND

CN3
Header connector for power supply (2-pin)

Pins	Symbol	Terminals
1	V_{CC}	Power supply voltage
2	GND	GND

FTCS04B (RS-232C compatible)
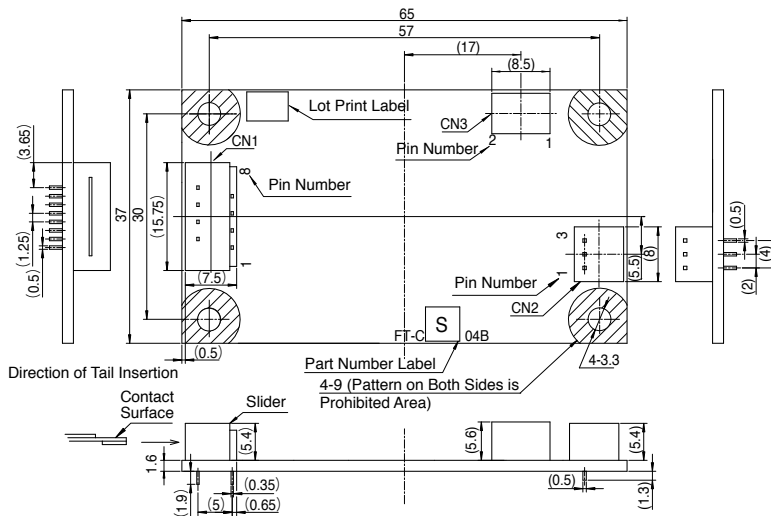
CN1
For connecting to 4-wire system analog touch screen
(8-pin)

Pins	Symbol	Terminals
1,2	Y0	For analog touch screen Y_{UP} or Y_{LO}
3,4	Y1	
5,6	X0	For analog touch screen X_{Ri} or X_{Le}
7,8	X1	

CN2
Header connector for RS-232C (3-pin)

	Controller board side		PC Side Connection Terminals
Pins	Symbol	Terminals	
1	RD	Received data (IN)	Received data
2	SD	Sent data (OUT)	Sent data
3	GND	GND	GND

CN3
Header connector for power supply (2-pin)

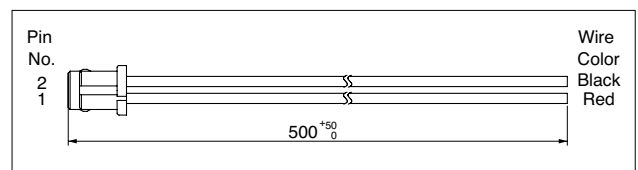| Pins	Symbol	Terminals
1	V_{CC}	Power supply voltage
2	GND	GND

Receptacle connector with RS-232C cord (AT713)

AT713 is a receptacle connector that is equipped with an RS-232C communication connecting cord used for connecting to FTCS04A, FTCS04A2 and FTCS04B controller boards. Cord length can be freely adjusted. Computer connectors are not included.
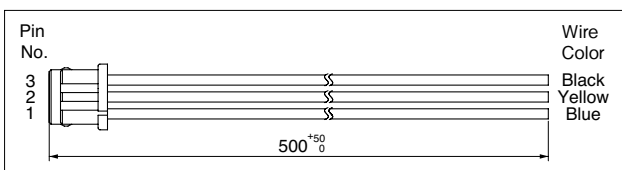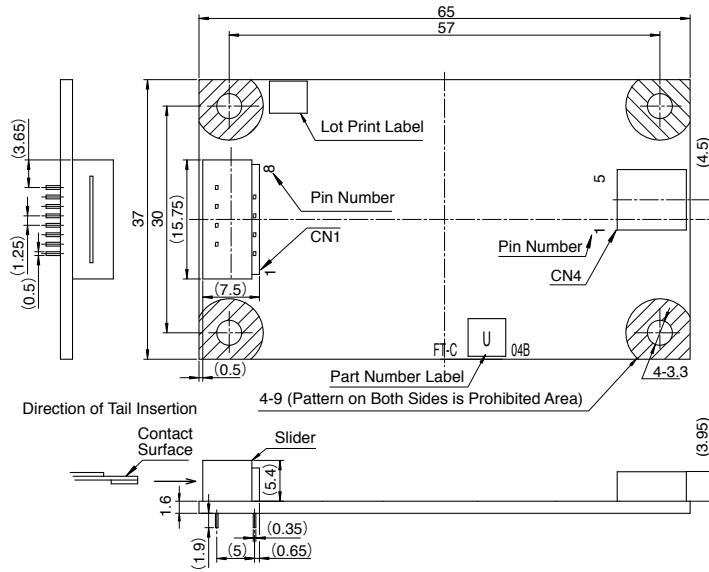

Receptacle connector with power cord (AT714)

AT714 is a receptacle connector that is equipped with a cord for connecting to the power supply of the FTCS04A, FTCS04A2 and FTCS04B controller boards. The cord length can be freely adjusted and connected to the power supply.

▶USB Compatible Controller Board

FTCU04B (USB Compatible)

CN1
For connecting to 4-wire system analog touch screen (8-pin)

Pins	Symbol	Terminals
1,2	Y0	For analog touch screen Y_{UP} or Y_{LO}
3,4	Y1	
5,6	X0	For analog touch screen X_{Ri} or X_{Le}
7,8	X1	

CN4
Header connector for USB (5-pin)

Pins	Symbol	Terminals
1	VCC	USB VCC
2	D-	USB D-
3	D+	USB D+
4	GND	USB GND
5	GND	Shield GND

▶Instructions

### Controller Board Handling Precautions

- This product is not guaranteed to operate when combined with a touch screen manufactured by any company other than NKK Switches.
- Be careful of static electricity when handling this product, and ensure workers and working areas where this product is handled are earthed.
- Do not turn on the power supply to this product until it is connected to both the host and touch screen. Turn on the power supply to this product before starting the host.
- When connecting or disconnecting the CN1 connector of this product and touch screen tail section, be sure that the CN1 connector slider is pulled back, and refrain from connecting or disconnecting more than 10 times.
- Never attempt to modify this product.
- The content of this product may be changed at the manufacturer's discretion without prior notification for improvement purposes.
- Do not use commands other than those prescribed in the specifications with this product.
- NKK Switches cannot accept any responsibility whatsoever for any damages that occur through the use of this product.
- The tail used to connect the touch screen unit and controller board is susceptible to noise, and should therefore be installed as far away as possible from noise sources (LCD drive inverter, etc.).
- This product is covered under warranty for 1 year from the date of purchase.

Precautions for installation

- Make sure that the case or housing do not place unnecessary stress on the product causing it to distort.
- The tail section is the weakest part of the product and may disconnect easily. Therefore, do not pull on or place stress on the tail section.
- Do not place excessive stress (sufficient to leave a bend line) on the tail section. Doing so may cause disconnection or increased resistance value.
- When installing glass products in particular, be sure to consider vibration and impact during installation.
- Install the touch screen securely so there is no looseness. Looseness may cause detection to become unstable. In particular, looseness has an adverse effect on detection performance of analog types during operation.
- Make sure there is no burring, etc. at the edges of the case and housing. Burring may cause misoperation. Furthermore, ensure that the edges of the case and housing do not enter the key area. Doing so may cause misoperation due to the edges of the case or housing.

- Leave a space (approx. 0.5 mm) between the case or housing and top electrode to ensure there is no differential shrinkage in the case, housing or top electrode, and no effects from distortion or deformation. When installing buffer material in the space, make sure that the top electrode is not forcibly pushed. Forcibly pushing the top electrode or fixing with double-sided tape, etc., may cause the top electrode to distort or flex, which has an adverse effect on the external appearance and functionality of the product. Install buffer material more than 0.6 mm to the inside of the A section.
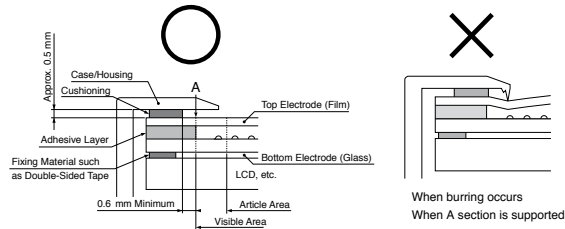
- In cases where external pressure may be placed on the periphery during operation such as the case or housing section being held by hand, make sure that the touch screen is not input due to distortion of the edges of the case or housing.
- When fixing the touch screen in place, fix it using the bottom section such as by fixing it to the LCD display. Fixing the top electrode to the case or housing with double-sided tape, etc. causes stress to be placed on the connection between the top and bottom electrodes, which may cause damage or distortion to the film or malfunctions.
- Some products have an air vent installed to ensure that the inner and outer pressure of the touch screen are the same. Make sure that this is not blocked when installing. Furthermore, ensure that liquids such as water and oil do not enter the product through the air vent or product exterior (connection section between the top and bottom electrodes).
- Avoid any situations where air pressure from a device attached to the touch screen could pass through the air vent and cause the top electrode to swell. Doing so may have a bad effect on the product such as reducing the lifespan of the product. Furthermore, reducing the pressure in the touch screen through the air vent may cause interference fringe or constant input to occur.
- Please note that moisture from condensation, etc. on the tail connection section or edges may result in migration, causing short circuit failure to occur.

Handling precautions
- When unpacking the product, make sure the product is facing in the correct vertical/horizontal orientation. Furthermore, glass edges have not been chamfered and may be sharp. Be sure to wear gloves when handling the products to avoid cuts.
- Do not use a clamp to lift or pull the tail section. Doing so may result in damage to the tail connection section.
- Wear gloves or fingerstalls to prevent the fingerprints or dirt from getting onto the product.
- When holding the product, hold it outside of the range of the visible area.
- To remove dirt from the surface of the product, wipe gently with a soft cloth soaked in ethanol. Do not use anything other than ethanol.
- When storing the product, wrap it in the same packaging as when it was purchased and within the temperature and humidity conditions prescribed in the specifications.
- Do not store the product in an acidic environment or near other corrosive gases.
- Do not store the product in locations where condensation may occur.
- Do not stack products or place other items on the products, as doing so places excess load on the products, which may result in deformation or bending of the products or scratches to the edges of the products.

- The product has a protective film attached. Do not remove this film until immediately before use to prevent the product from becoming scratched, etc. However, storing the product with the protective film attached for prolonged periods may result in the adhesive from the protective film becoming attached to the product.

Precautions for Operation
- Do not operate the product with anything other than your finger or a specialized input pen (commercially available polyacetal pen). In particular, do not use sharp objects such as a ballpoint pen or mechanical pencil. Doing so may cause scratches to the surface, malfunctions and cracked glass.
- The area between the visible area and key area is structurally weak. Do not rub harshly with a pen, etc.

Design Precautions
- The input position of analog type products may become misaligned due to resistance value differences between individual products, or changes to the resistance value due to age deterioration. Be sure to enable calibration using both hardware and software to calibrate the input position.
- When installed onto a display device such as an LCD, noise generated by the display device may cause malfunction. Implement noise countermeasures such as connecting the frame of the display device to ground.
- The contact resistance of the product changes when pressed by a finger or pen. Ensure that data is read when the contact resistance is stable, such as by ignoring data read when the contact resistance is unstable.
- When two points are pressed simultaneously, analog type products judge the input point as between the two points. Therefore, do not include any two-point operations in the software for analog type products.
- Data becomes broken on the dot spacer of analog type products when used for drawing lines, etc., and must be corrected using software.
- Be sure to evaluate sufficiently when using double-sided tape or adhesive to attach the top electrode to the surface sheet. Distortion, etc. of the top electrode or surface sheet may have an adverse effect on functionality.

Precautions for Use
- Do not use this product for systems that require a particularly high level of reliability, such as safety devices or control systems for atomic power, aviation, medical and on-board devices.
- Products are guaranteed based on the evaluation of product standards within the moisture tolerance and usage temperature range, but are not guaranteed to operate perpetually at this temperature.
- Use connectors designed for printed circuits to connect to the printed circuit tail. Please note that the incorrect type of connector may damage the print surface.
- Touch screens have individual differences. Therefore, calibration data from one touch screen should not be applied to other touch screens, and calibration should be implemented for each touch screen.
- If the connector is removed and reconnected from the tail after calibration, perform calibration again.
- The prescribed specifications are a guarantee of product quality on a single touch screen. When using the product, be sure to confirm and evaluate performance when attached to your own products.
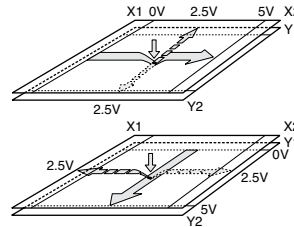
Analog Type

1. The product has a two-layer structure consisting of a polyester (PET) film that has an ITO membrane and a sheet of glass, and the total surface of top and bottom electrodes have a uniform resistive film. One electrode draws in the X axis direction and the other in the Y axis direction. When pressure is applied using a finger, etc., changes to the resistance value between X1 to X2 and Y1 to Y2 are read and converted to a digital value.
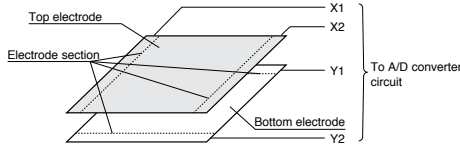

2. In order for the position touched by an input operation to be read, a voltage of 5 V is applied to the top electrode (X1 to X2). At this time, the voltage change in the direction of the arrow is uniform between 0 V to 5 V.
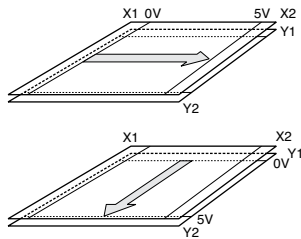
3. Assume that the center of the top electrode is touched. The position where the top electrode is touched comes into contact with the bottom electrode, and a voltage of 2.5 V is output to Y1 (or Y2). The output voltage can be converted to A/D and read as an Z coordinate value. In the same way as the X side, the Y coordinate between Y1 and Y2 on the bottom electrode is read, and the point where the X and Y coordinates overlap can be read as the touched position.

4. The resolution can be made comparatively higher than a digital type, and the degree of freedom in displaying button designs on the display screen also increases. As the normal concept for analog types is point detection as opposed to key numbers, text and drawing input can be achieved using a pen. The vertical and horizontal resolution (detection points) is 1024 when a 10-bit A/D converter is used.
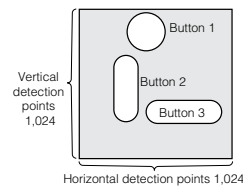
The key areas of each button do not interfere with each other.

▶Previous Applications

We can provide a wide range of custom-made orders manufactured to your size specifications in addition to our standard models. Please contact us to discuss your requirements further.

◎ : New Standard Size   ◎ : Standard Size   ○ : Custom Size

Type \ Size	3.5	5.7	6.2 Wide	6.5	7 Wide	8.4	8.5 Wide	10.4	10.5	10.6 Wide	12.1	12.1 Wide	14	15	15.6 wide	17	17.1 18.1	19
Digital	○	◎	○	○	○	○	○	○	○		○		○	○		○	○	○
Analog 4-wire system	○	◎	○	◎	○	◎	○	◎	○	◎	◎	◎	○	◎	◎	○	○	◎
Analog 5-wire system								◎			◎			◎				
Analog 8-wire system	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○

* Specifications presented here are subject to change without notice. Check with our staff for the latest specifications.