

FTG2-SLP, FingerTip

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Touch Screen Controllers

Overview

The FingerTip family of touch controllers provides an optimal mix of low power, small size, low external part counts and versatile features. With unmatched true multi-touch performance, it's a powerful single chip solution for thin, flexible, embedded touch panels.

ST's latest touch screen controllers enable advanced features to support the latest active-matrix organic light-emitting diode (AMOLED) displays. It promises more power savings and extended runtimes in smartphones with faultless detection.



Applications

ST's touch screen controllers are optimized for AMOLED display panels for smartphones, tablets, foldable and rollable phones.

ST's FingerTip technology supports advanced features thanks to the multimode sensing technology. Supported features include gloves, thick cover, water, custom gestures, grip rejection, proximity detection, force sensing and fast report rate for gaming applications.

FingerTip's main processor implements a powerful 32-bit Arm Cortex®-M4 core with SIMD DSP features. It provides a high level of overall touch performance and can detect, classify, and track as many as 10 finger touches at once.

Product types

The FingerTip portfolio of touch screen controllers includes:



Capacitive Multi-Touch Screen Controller for Thin Flexible Panels and LTPO Panels

The FingerTip FTG2-SLP provides an optimal mix of low power, small size, low external part counts and versatile features with unmatched true multi-touch performance in a single-chip touchscreen controller for thin flexible embedded display-touch panels.

Key benefits:

- **Touch panels**

Compatible with the latest thin flexible flat or curved panels
Works with low-temperature polycrystalline oxide (LTPO) display panels for power-saving features

- **Advanced analog front end (AFE)**

Leading-edge AFE techniques ensure faultless acquisition and provide large dynamic range to suit various panel stack-ups. The proprietary differential architecture maximizing the immunity against common mode noise and hence SNR is secured.

- **Noise immunity**

High signal-to-noise ratio provides robustness against display noise, wireless charger noise and various external noise sources.

- **Low power consumption**

ST proprietary low-power techniques and special hibernate mode ensure ultralow power consumption for maximizing battery life

- **Active Pen**

FingerTip supports active stylus on both phone and foldable

- **Fast report rate**

Up to 300Hz report rate for extremely fast response time and enhanced gaming experience

- **Multitouch**

Support for independent tracking with up to 10 simultaneous touches in real time provides full flexibility to implement advanced touch features for better user experience

- **Multimode sensing technology**

Water rejection, wet finger tracking and multi-finger glove recognition for the most advanced touch detection

- **Gesture mode**

Ability to detect specific customized gestures to exit idle mode as a power-saving feature

- **SYNC support**

Synchronous and asynchronous modes of operation enable dynamic refresh rates, making FingerTip compatible even with quad high definition (QHD) displays

- **SPI, I²C, and I³C interfaces**

Ensures compatibility with majority of application host interface in the market

Capacitive Multi-Touch Screen Controller for Thin Flexible Panels and LTPO Panels

Features



| Product status link | |
|--------------------------|--|
| FTG2-SLP | |

| Product summary | |
|-------------------|-----------------------------------------------------------|
| Order code | FTG2-SLP |
| Package | XFBGA87 (4.2x7x0.5mm pitchx0.47mm max thickness) |
| Packing | Tape and Reel |
| Channels | 40 Rx and 21 Tx |

- **True multi-touch**
 - Independent XY tracking with 10 simultaneous touches in real time
 - Supports 21TX and 40RX channels and 1 FLOAT pin
- **Single chip solution**
 - Supports 5.5 inch to 7 inch screen size with 4mm sensor pitch
 - Supports thin flexible touch-display highly capacitive panel types
 - Supports LTPO display panels with dynamic refresh rates
- **Advanced Analog Front End (AFE)**
 - Simultaneous mutual sensing and self-sensing support on all the channels
 - Support for thin flexible touch display modules through proprietary node compensation hardware
 - Differential architecture with ability to configure in single-ended mode
 - Multiple scanning methods with multi-TX drive for high SNR and provide high noise immunity
 - High drive capability charge-pump to drive high capacitive panels
- **High SNR**
 - Very low intrinsic noise to improve the device SNR and provide very high sensitivity
 - Extremely strong common mode charger noise rejection
 - Advanced filtering techniques for high noise immunity
- **SYNC support**
 - Supports SYNC Mode and Non-SYNC Mode of operation
 - Supports single SYNC pin that can be used as VSYNC, HSYNC or Embedded VSYNC
 - Useful for quad high definition display synchronization during both mutual-sensing and self-sensing
 - Seamless support of variable display rate from 1Hz to 120Hz
- **Digital Core and Memory**
 - ARM M4 core 96MHz core clock to implement all features with faster processing
 - 192KB Flash with GPIO6 dedicated pin for Flash Write enable for TEE framework
 - Advanced differential data processing for common mode noise immunity
 - 128KB RAM comprised of 64KB frame memory and 64KB data)
- **Advanced Features**
 - Multi finger thick gloves, 2.5mm passive stylus, wet finger touch, water rejection, cover mode support
 - Finger separation \leq 10mm
 - Capacitive proximity of 20mm
- **Fast report rate**
 - Flexible Report rate of 240Hz
- **Low Power**
 - ST proprietary Hardware and Firmware techniques to achieve low power

- **Touch panels**
 - Works with thin flexible flat or curved panels with touch embedded into high resolution displays
 - Works with LTPO display panels
- **Power supply scheme**
 - Dual supply operation 3.3 V and 1.8 V
- **Serial interface**
 - I2C compatible slave mode (100Kbps, 400Kbps, 1Mbps)
 - 3-wire and 4-wire Mode 0 SPI interface 12MHz (typ.)
 - 3.3V tolerant interface for I2C and SPI
 - I/Os: RESETB, INTB hardware pins to host interface, 4 Digital inputs and 2 GPIOs with full programmability
 - All digital pins are fail safe
- **ESD & TLP**
 - High ESD on RX and TX pins (± 8 KV HBM) and $> \pm 3$ KV HBM on all other pins
 - High ESD on RX and TX pins (± 1 KV CDM) and ± 500 V CDM on all other pins
 - > 4 A TLP on all pins
- **EMI**
 - Low EMI < -70 dBm average
 - Flicker avoidance techniques

Application

- Smartphones
- Phablets
- Foldable phones

Description

The FingerTip FTG2-SLP provides an optimal mix of low power, small size, low external part counts and versatile features with unmatched true multi-touch performance in a single-chip touchscreen controller for thin flexible embedded display-touch panels.

The FingerTip FTG2-SLP uses a dedicated differential architecture with capacitance to current acquisition engine to implement the touch sensing. Coupled with the internal processor the Fingertip touchscreen controller can detect, classify and track 10 fingers touch with fast report rate and response times with a configurable channel matrix consisting of total 21 TX and 40 RX channels.

The touch acquisition analog front end has a wide dynamic range able to cope with panels of different size and configuration. This offers great flexibility to use FingerTip with new technology of embedded display-touch panels that are thinner and flexible. The FingerTip FTG2-SLP provides support for flat or curved displays through proprietary differential and node compensation hardware coupled with differential data processing techniques in firmware.

The FingerTip FTG2-SLP low-noise differential capacitive analog front-end provides enhanced noise suppression capabilities for various noise sources such as high resolution display, 3-phase noise and severe common mode noise introduced by battery chargers.

The FingerTip FTG2-SLP uses hardware and firmware ST proprietary techniques to reduce power in active and idle modes.

The FingerTip FTG2-SLP device incorporates multiple TX driving methods that can further boost the SNR and report rate.

The FingerTip FTG2-SLP supports advanced features thanks to the multi-mode sensing technology. The water rejection algorithm can detect water on the top of the screen and the device can still track one finger moving in the water without false touch or line breaking. The device supports multi finger glove operation and 2.5mm passive stylus. The device supports 20mm stable capacitive proximity.



The device also incorporates hardware SYNC on GPI3 pin which enables the touch sampling to be synchronized with the display SYNC signal. This enables it to work even with Quad High Definition displays. The device can also work in Non-SYNC condition.

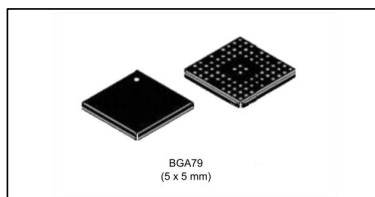
The main processor implements a powerful 32-bit ARM M4 core with 192KB Flash that is able to provide a high level of overall touch performance in terms of noise rejection, response time and power consumption. It is running concurrently to the analog front end and gives ample scope for implementation of complex sensing touch tracking algorithm, advanced shape based filtering and event reporting. The 192KB flash size provides enough free space in the Flash for further customization even after implementation of ST firmware for all the features.

The device supports I2C serial interface and SPI slave interface for more flexibility.



**Ultra low-power capacitive multi-touch screen controller
for 2" to 13" screens**

Data brief



- I²C, SPI and HID over I²C
- I²C master interface for connecting other peripherals

Applications

- Wearable devices
- Smartphones
- Phablets
- Tablets
- Notebooks

Features

- True multi-touch
 - Single chip for 2" to 13" screens with independent XY tracking for 10 simultaneous touches
- Multi-mode sensing support
 - Simultaneous mutual sensing and self-sensing support on all the channels on the same frame
- Advanced features
 - Multi-finger thick gloves, small 1 mm passive stylus, palm rejection, wet touch, water rejection, cover mode support, wakeup gestures
 - Supports on-cell, laminated, curved displays, film-based, touch-on lens, thin ITO-touch display panels
- Digital core
 - Optimized processing to reduce drag latency and increase response times
 - ARM M3 core with Flash to implement all features with space left for further customization
- High SNR and low power
 - Very low intrinsic noise to improve device SNR and provide very high sensitivity
 - ST proprietary hardware and firmware techniques to achieve ultra low power
- Fast report rate
 - >150 Hz under all conditions
- Serial interface

1 Description

FingerTip provides an optimal mix of low power, small size, low external part count and versatile features with unmatched true multi-touch performance in a single-chip touchscreen controller.

FingerTip uses a dedicated capacitance-to-voltage acquisition engine to implement the touch sensing. Coupled with the internal processor, the FingerTip touchscreen controller can detect, classify and track 10 finger touches with fast a report rate and response times.

The touch acquisition analog front-end has a wide dynamic range capable of coping with touchscreens of different sizes and configurations. This offers the flexibility to use FingerTip with multiple touchscreens using different ITO designs and overlay materials. One or two layer ITO sensors are supported using glass or PET substrates. FingerTip provides support for curved displays through proprietary node compensation hardware.

FingerTip's low-noise capacitive analog front-end provides enhanced noise suppression capabilities for various noise sources such as display, 3-phase noise and severe common mode noise introduced by battery chargers. The device utilizes ST proprietary hardware and firmware techniques to reduce power significantly in low power active mode and in low power idle mode, and incorporates multiple TX driving methods that can further boost the SNR and report rate.

FingerTip supports advanced features thanks to multi-mode sensing technology. The water rejection algorithm can detect water on the top of the screen and the device can still track one finger moving in the water without false touch or line breaking. The device supports multi-finger glove operation and small passive stylus.

The device also provides all types of SYNC mode (HSYNC and VSYNC) support, which enables touch sampling to be synchronized with the display SYNC signal. This enables it to work even with quad high definition displays.

The main processor implements a powerful 32-bit ARM M3 core with Flash that is capable of providing a high level of overall touch performance in terms of noise rejection, response time and power consumption. It runs concurrently with the analog front end and gives ample scope for implementation of complex touch-sensing tracking algorithms, advanced shape-based filtering and event reporting. The Flash size provides enough free space for further customization, even after implementation of ST firmware for all features.

The device supports I²C serial interface, I²C master interface, HID over I²C interface and SPI interface for greater flexibility.

2 Ordering information

Table 1: Ordering information

| Order code | Package | Packing | Screen size | Remarks |
|------------|---------|-------------|-------------|----------------------------|
| FINGERTIP | BGA | Tape & reel | 2" to 13" | Contact STMicroelectronics |
| | QFN | | | |

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