Cypress Roadmap: TrueTouch® Touchscreen Controllers

Q2 2015
## TrueTouch® Portfolio

<table>
<thead>
<tr>
<th>Wearables</th>
<th>Mobile Phones (Full-feature/Low-cost)</th>
<th>Mobile Phones (Advanced Features)</th>
<th>E-readers, Tablets, Digital Still Cameras, Printers, GPS, Industrial</th>
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<tbody>
<tr>
<td>CYTMA525</td>
<td>CYTMA448 58 I/O, 8.3”, 10 F¹, 110-Hz RR² DualSense⁴, H₂O⁶, 35-Vpp CA⁵ SLIM⁶, AMS⁷, Glove</td>
<td>CYTMA568 58 I/O, 8.3”, 10 F¹, 110-Hz RR² DualSense⁴, H₂O⁶, 60-Vpp CA⁵, SLIM⁶ AMS⁷, Passive Stylus, Glove, Hover</td>
<td>CYTMA568 58 I/O, 8.3”, 10 F¹, 110-Hz RR² DualSense⁴, H₂O⁶, 60-Vpp CA⁵, SLIM⁶ AMS⁷, Passive Stylus, Glove</td>
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<td>CYTMA525 25 I/O, 3.6”, 4 F¹, 100-Hz RR² DualSense™⁵, H₂O⁴, 60-Vpp CA⁵, SLIM⁶ AMS⁷, Passive Stylus, Glove</td>
<td>CYTMA545 36 I/O, 5.2”, 10 F¹, 100-Hz RR² DualSense³, H₂O⁴, 60-Vpp CA⁵, SLIM⁶ AMS⁷, Passive Stylus, Glove</td>
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</tbody>
</table>

### Market Segments

1. **Number of finger locations reported**
2. **Refresh rate**
3. **Self-Capacitance (capacitance of a row or column in a touchscreen sensor) + Mutual-Capacitance (capacitance of the intersection between a row or column in a touchscreen sensor)**
4. **Water rejection and wet-finger tracking**
5. **Charger Armor™: Cypress proprietary charger noise mitigation technology**
6. **Low-cost Single-Layer Independent Multi-Touch sensor**
7. **Automatic Mode Switching**
8. **Capacitance of a row or column in a touchscreen sensor**

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### Status Availability

- **Production**
- **Sampling**
- **Development**
- **Concept**

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### Available Models

- **CYTMA568**
- **CYTMA448**
- **CYTMA525**
- **CYTMA525A**
- **CY8CTST241/42**
- **CY8CTMG240**

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### Additional Details

- **8”-12”**
- **3”-8”**

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### Notes

- **CYTMA568**
- **CYTMA448**
- **CYTMA525**
- **CYTMA525A**
- **CY8CTST241/42**
- **CY8CTMG240**

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### Technical Specifications

- **CYTMA568**
- **CYTMA448**
- **CYTMA525**
- **CYTMA525A**
- **CY8CTST241/42**
- **CY8CTMG240**

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### Contact Information

- **Owner: PKS**
- **BUM: JDMZ**

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### Revision History

- **001-89690**
- **Rev *G**

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### Development Cycle

- **Q215**

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### Development Timeline

- **Available**
- **Production**
- **Sampling**
- **Development**
- **Concept**
## TrueTouch® Software

<table>
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<th>PSoC® Designer™</th>
<th>TrueTouch System Development Kit</th>
<th>TrueTouch Host Emulator</th>
<th>TrueTouch Driver for Android</th>
<th>TrueTouch Driver for Windows Phone 8</th>
<th>Manufacturing Test Kit</th>
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<tr>
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<td>5.1</td>
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<td>3.5</td>
<td>4.0</td>
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<td>Legacy Driver Rev3-2M-28</td>
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<td>Production</td>
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</tr>
</tbody>
</table>

Contact Sales for the latest TrueTouch software, drivers and tools.

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1. PSoC Designer, TTHE and MTK releases are backward-compatible. The latest version is recommended for new designs.
2. TrueTouch System Development Kit (TTSDK) enables engineers to configure and develop touchscreen system designs.
3. TrueTouch Host Emulator (TTHE) is a software tool used to perform register configuration and demonstrate TrueTouch system designs.
4. TrueTouch Driver for Android (TTDA) is the driver for Android phones that translates touch information into operating system touch events.
5. TrueTouch Driver for Windows Phone 8 (TTDW) is the driver for Windows Phone 8 (WP8) that translates touch information into human interface device descriptors.
6. TrueTouch Manufacturing Test Kit (MTK) enables customers and ITO partners to test touch panels using Cypress TrueTouch controllers at various stages of manufacturing.
# TrueTouch® Sensor Portfolio

## Market Segments

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<tr>
<th>Wearables</th>
<th>Mobile Phones (Full-feature/Low-cost)</th>
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<td><strong>Diamond Pattern</strong>&lt;sup&gt;1&lt;/sup&gt; 3.6&quot;, 4 F&lt;sup&gt;1&lt;/sup&gt;, OGS&lt;sup&gt;3&lt;/sup&gt;, GG&lt;sup&gt;7&lt;/sup&gt;, On-cell&lt;sup&gt;6&lt;/sup&gt;, DualSense&lt;sup&gt;3&lt;/sup&gt;, H&lt;sub&gt;2&lt;/sub&gt;O&lt;sub&gt;4&lt;/sub&gt;, Passive Stylus, Glove, Hover, 0.5-1.5 mm cover lens</td>
<td><strong>Diamond Pattern</strong> 8.0&quot;, 10 F&lt;sup&gt;1&lt;/sup&gt;, OGS&lt;sup&gt;3&lt;/sup&gt;, GG&lt;sup&gt;7&lt;/sup&gt;, On-cell&lt;sup&gt;6&lt;/sup&gt;, DualSense&lt;sup&gt;3&lt;/sup&gt;, H&lt;sub&gt;2&lt;/sub&gt;O&lt;sub&gt;4&lt;/sub&gt;, Glove, Face Detect, 0.5-1.5 mm cover lens</td>
<td><strong>Diamond Pattern</strong> 8.0&quot;, 10 F&lt;sup&gt;1&lt;/sup&gt;, OGS&lt;sup&gt;3&lt;/sup&gt;, GG&lt;sup&gt;7&lt;/sup&gt;, On-cell&lt;sup&gt;6&lt;/sup&gt;, DualSense&lt;sup&gt;3&lt;/sup&gt;, H&lt;sub&gt;2&lt;/sub&gt;O&lt;sub&gt;4&lt;/sub&gt;, Glove, Hover, Passive Stylus, 0.5-1.5 mm cover lens</td>
<td><strong>Manhattan Pattern</strong> 12.0&quot;, 10 F&lt;sup&gt;1&lt;/sup&gt;, GFF&lt;sup&gt;2&lt;/sup&gt;, DualSense&lt;sup&gt;3&lt;/sup&gt;, H&lt;sub&gt;2&lt;/sub&gt;O&lt;sub&gt;4&lt;/sub&gt;, Glove, Passive Stylus, Active Stylus, 0.5-1.5 mm cover lens</td>
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<tr>
<td><strong>Low-Cost SLIM&lt;sup&gt;8&lt;/sup&gt; Pattern</strong> 3.6&quot;, 4 F&lt;sup&gt;1&lt;/sup&gt;, GF1&lt;sup&gt;9&lt;/sup&gt;, On-cell&lt;sup&gt;6&lt;/sup&gt;, Single-Layer, DualSense&lt;sup&gt;3&lt;/sup&gt;, H&lt;sub&gt;2&lt;/sub&gt;O&lt;sub&gt;4&lt;/sub&gt;, Glove, 0.5-1.5 mm cover lens</td>
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<td><strong>Low-Cost Backgammon Pattern</strong> 3.6&quot;, 1F&lt;sup&gt;1&lt;/sup&gt;, GF1&lt;sup&gt;9&lt;/sup&gt;, Multi-Finger Gesture, Single-Layer, Self-Capacitance&lt;sup&gt;10&lt;/sup&gt;, 0.7-1.2 mm cover lens</td>
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### Notes:
1. Number of finger locations reported
2. Glass, Film, Film touchscreen sensor stack-up
3. Self-Capacitance (capacitance of a row or column in a touchscreen Sensor) + Mutual-Capacitance (capacitance of the intersection between a row or column in a touchscreen sensor)
4. Water rejection
5. One Glass Sensor stack-up
6. A type of touchscreen sensor stack-up in which the touch sensor is inside the LCD module on top of the color-filter glass
7. Glass, Glass touchscreen sensor stack-up
8. Low-cost Single-Layer Independent Multi-touch sensor
9. Glass, Film touchscreen sensor stack-up
10. Capacitance of a row or column in a touchscreen sensor
**Applications**

Mobile phones  
Digital cameras  
Wearables  
Printers

**Features**

**Low-Cost User Interface**  
Low-cost “backgammon” sensor (U.S. patent 8,121,283)  
Two-finger “zoom” gestures decoded on chip (TST242)  
Single-click, double-click and pan gestures decoded on chip  
Waterproofing: No false touches with water droplets  
Supports capacitive and virtual buttons

**Proprietary Analog Front End**

Low-noise self-capacitance sensing (patented analog multiplexer: U.S. patent 8,067,948)

**System Solutions**

Lowest-cost capacitive touchscreen available  
Manufacturing test kits for production testing  
Tiny 2.2-mm x 2.32-mm WLCSP package  
Operates from a single supply: 1.71-5.5 V  
Ultra-low power: 3.6 mW in active mode

**Collateral**

Datasheets and Design Guides:  
Contact Sales or truetouch@cypress.com

**Availability**

Full production

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1 Analog circuit in the touchscreen controller used to measure self-capacitance (capacitance of a row or column in a touchscreen sensor)

2 Interrupt

3 A sensor that can detect changes in capacitance caused by contact with a conductive object
TrueTouch CYTT21XXX
Full-featured Solution (Touchscreens up to 7.0 inches)

Applications
Mass market mobile phones
Mass market tablets

Features
Advanced User Interface
Face detection\(^1\): infrared proximity sensor replacement
Automatic Mode Switching (AMS\(^2\)) for advanced sensing modes
Waterproofing with DualSense™\(^3\)
(U.S. patents 8,358,142; 8,319,505; and 8,067,948)
10-finger tracking with 1-mm-thick gloves
2-finger tracking with 5-mm-thick gloves

Proprietary Analog Front End\(^4\) with ChargerArmor™\(^5\)
True 5-V TX-Boost™ with up to 24 multi-phase transmit lines
(reduces noise by 3x compared to single-phase transmit line)
Up to 35-Vpp charger noise immunity (1-500 kHz, 9-mm finger)

System Solutions
Android and Windows Phone operating systems
Wireless tuning with a TrueTouch Host Emulator mobile tuner
Manufacturing test kits for production testing

Collateral
Datasheets and Design Guides:
Contact Sales or truetouch@cypress.com

Availability
Full production

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\(^1\) A feature allowing the detection of a face approaching a touchscreen sensor, providing the function of a proximity sensor (a sensor that can detect nearby objects without a touch)
\(^2\) The feature of a touch-enabled device to automatically switch between standard and advanced modes (e.g., glove) without requiring manual changes to system settings by the user (e.g., by having to remove gloves)
\(^3\) Cypress’s proprietary technology to measure both self-capacitance (the capacitance of a row or column line in a touchscreen sensor) and mutual-capacitance (the capacitance between a row and a column in a touchscreen sensor) on the same chip
\(^4\) Analog circuit in the touchscreen controller used to measure self-capacitance and mutual-capacitance
\(^5\) Cypress proprietary charger noise mitigation technology
\(^6\) Interrupt
\(^7\) A sensor that can detect changes in capacitance caused by contact with a conductive object
TrueTouch CYTT31XXX
Advanced Features Solution (Touchscreens up to 7.0 inches)

Applications
- Premium market mobile phones
- E-readers

Features

**Advanced User Interface**
Automatic Mode Switching (AMS) for advanced sensing modes
Passive stylus support with palm rejection and AMS
Waterproofing with DualSense™
(U.S. patents 8,358,142; 8,319,505; and 8,067,948)
10-finger tracking with 1-mm-thick gloves
2-finger tracking with 5-mm-thick gloves

**Proprietary Analog Front End** with ChargerArmor™
True 5-V TX-Boost™ with up to 24 multi-phase transmit lines
(reduces noise by 3x compared to single-phase transmit line)
Up to 35-Vpp charger noise immunity (1-500 kHz, 9-mm finger)

**System Solutions**
Android and Windows Phone operating systems
Wireless tuning with a TrueTouch Host Emulator mobile tuner
Manufacturing test kits for production testing

Datasheets and Design Guides:
Contact Sales or truetouch@cypress.com

Collateral

Block Diagram

Touch Sequencer

Applications

Full production

Availability

1 The feature of a touch-enabled device to automatically switch between standard and advanced modes (e.g., glove) without requiring manual changes to system settings by the user (e.g., by having to remove gloves)
2 Cypress’s proprietary technology to measure both self-capacitance (the capacitance of a row or column line in a touchscreen sensor) and mutual-capacitance (the capacitance between a row and a column in a touchscreen sensor) on the same chip
3 Analog circuit in the touchscreen controller used to measure self-capacitance and mutual-capacitance
4 Cypress proprietary charger noise mitigation technology
5 Interrupt
6 A sensor that can detect changes in capacitance caused by contact with a conductive object
CYTMA448
Full-featured Solution (Touchscreens up to 8.3 inches)

Applications
- Mass market mobile phones
- Mass market tablets

Features

**Advanced User Interface**
Waterproofing and wet-finger tracking with DualSense™
(U.S. patents 8,358,142; 8,319,505; and 8,067,948)
10-finger tracking with 1-mm-thick gloves
2-finger tracking with 5-mm-thick gloves
Automatic Mode Switching for advanced sensing modes

**Proprietary Analog Front End with 35-V Charger Armor™**
True 10-V TX-Boost™ with 37 multi-phase transmit lines
(reduces noise by 6x compared to single-phase transmit line)
35-Vpp charger noise immunity (1-500 kHz, 9-mm finger)
Display synchronization

**System Solutions**
Android and Windows Phone operating systems
Wireless tuning with TrueTouch Host Emulator mobile tuner
Manufacturing test kits for production testing

Collateral

Datasheets and Design Guides:
[Contact Sales](#) or [truetouch@cypress.com](mailto:truetouch@cypress.com)

Availability

Full production

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1 Analog circuit in the touchscreen controller used to measure self-capacitance (capacitance of a row or column in a touchscreen sensor) and mutual-capacitance (capacitance of the intersection between a row or column in a touchscreen sensor)

2 Cypress proprietary charger noise mitigation technology

3 Interrupt

4 A sensor that can detect changes in capacitance caused by contact with a conductive object
CYTMA525
Advanced Features Solution for On-cell and SLIM®¹ (Touchscreens up to 3.6 inches)

Applications
Wearables

Features

Advanced User Interface
Waterproofing and wet-finger tracking with DualSense™ (U.S. patents 8,358,142; 8,319,505; and 8,067,948)
Passive Stylus support with palm rejection
Low-power look-for-touch scan mode
Multiple gloved-finger tracking: works with 5-mm-thick ski gloves
Hover sensing: Tracks a hovering finger above the touchscreen

Proprietary Analog Front End² with 60-V Charger Armor™³
True 10-V TX-Boost™ with 8 multi-phase transmit lines (reduces noise by 3x compared to a single-phase transmit line)
60-Vpp charger noise immunity (1-500 kHz, 9-mm finger)

System solutions
Supports on-cell and direct-laminated ITO⁴ stack-ups, SLIM¹ and metal mesh sensors
Android and Windows Phone operating systems
Manufacturing test kits for production testing

Collateral
Datasheets and Design Guides:
Contact Sales or truetouch@cypress.com

Availability
Full production

¹ Low-cost Single-Layer Independent Multi-Touch sensor
² Analog circuit in the touchscreen controller used to measure self-capacitance (capacitance of a row or column in a touchscreen sensor) and mutual-capacitance (capacitance of the intersection between a row or column in a touchscreen sensor)
³ Cypress proprietary charger noise mitigation technology
⁴ Indium tin oxide
⁵ Interrupt
⁶ A sensor that can detect changes in capacitance caused by contact with a conductive object
CYTMA525A
Advanced Features Solution for On-cell and SLIM®¹ (Touchscreens up to 3 inches)

Applications
Wearables

Features
Advanced User Interface
Waterproofing and wet-finger tracking with DualSense™
(U.S. patents 8,358,142; 8,319,505; and 8,067,948)
Low-power look-for-touch scan mode
Multiple gloved-finger tracking; works with 5-mm-thick ski gloves

Proprietary Analog Front End² with Charger Armor™³
True 5-V TX-Boost™ with 24 multi-phase transmit lines (reduces noise by 5x compared to a single-phase transmit line)
35-Vpp charger noise immunity (1-500 kHz, 9-mm finger)

System solutions
Supports on-cell and direct-laminated ITO⁴ stack-ups; SLIM¹ and metal mesh sensors
Android and Windows Phone operating systems
Manufacturing test kits for production testing

Collateral
Datasheets and Design Guides:
Contact Sales or truetouch@cypress.com

Availability
Sampling: Q2 2015
Production: Q2 2015

¹ Low-cost Single-Layer Independent Multi-Touch sensor
² Analog circuit in the touchscreen controller used to measure self-capacitance (capacitance of a row or column in a touchscreen sensor) and mutual-capacitance (capacitance of the intersection between a row or column in a touchscreen sensor)
³ Cypress proprietary charger noise mitigation technology
⁴ Indium tin oxide
⁵ Interrupt
⁶ A sensor that can detect changes in capacitance caused by contact with a conductive object
CYTMA545
Advanced Features Solution for On-cell and SLIM®1 (Touchscreens up to 5.2 inches)

Applications
Premium market mobile phones

Features

Advanced User Interface
Waterproofing and wet-finger tracking with DualSense™
(U.S. patents 8,358,142; 8,319,505; and 8,067,948)
Passive stylus support with palm rejection
Multiple gloved-finger tracking; works with 5-mm-thick ski gloves
Hover sensing: Tracks a hovering finger above the touchscreen

Proprietary Analog Front End2 with 60-V Charger Armor™3
True 10-V TX-Boost™ with 8 multi-phase transmit lines (reduces noise by 3x compared to a single-phase transmit line)
60-Vpp charger noise immunity (1-500 kHz, 9-mm finger)

System Solutions
Supports on-cell and direct-laminated ITO4 stack-ups;
SLIM®1 and metal mesh sensors
Android and Windows Phone operating systems
Manufacturing test kits for production testing

Collateral
Datasheets and Design Guides:
Contact Sales or truetouch@cypress.com

Availability
Full production

Block Diagram

1 Low-cost Single-Layer Independent Multi-Touch sensor
2 Analog circuit in the touchscreen controller used to measure self-capacitance (capacitance of a row or column in a touchscreen sensor) and mutual-capacitance (capacitance of the intersection between a row or column in a touchscreen sensor)
3 Cypress proprietary charger noise mitigation technology
4 Indium tin oxide
5 Interrupt
6 A sensor that can detect changes in capacitance caused by contact with a conductive object
CYTMA568
Advanced Features Solution for In-cell and On-cell (Touchscreens up to 8.3 inches)

Applications
Premium market mobile phones
Industrial

Features

Advanced User Interface
Waterproofing and wet-finger tracking with DualSense™
(U.S. patents 8,358,142; 8,319,505; and 8,067,948)
Multiple gloved-finger tracking; works with 5-mm-thick ski gloves
Passive stylus support with palm rejection
Hover sensing: Tracks a hovering finger above the touchscreen

Proprietary Analog Front End¹ with 60-V Charger Armor⁴ with 37 multi-phase transmit lines
(reduces noise by 6x compared to a single-phase transmit line)
60-Vpp charger noise immunity (1-500 kHz, 9-mm finger)

System Solutions
Supports in-cell³, on-cell and direct-laminated ITO⁴ stack-ups
and metal mesh sensors
Android and Windows Phone operating systems
Manufacturing test kits for production testing

Collateral
Datasheets and Design Guides:
Contact Sales or truetouch@cypress.com

Availability
Full production

¹ Analog circuit in the touchscreen controller used to measure self-capacitance (capacitance of a row or column in a touchscreen sensor) and mutual-capacitance (capacitance of the intersection between a row or column in a touchscreen sensor)
² Cypress proprietary charger noise mitigation technology
³ A type of sensor stack-up in which the touch sensor is inside the LCD module under the color-filter glass
⁴ Indium tin oxide
⁵ Interrupt
⁶ A sensor that can detect changes in capacitance caused by contact with a conductive object

Block Diagram
**CYTT41XXX Touchscreen Controller**

**Applications**

Premium market Android tablets

**Features**

**Advanced User Interface**

- 2.5-mm passive stylus\(^1\) support with palm rejection
- Tracking with 3-mm-thick gloves
- Automatic Mode Switching (AMS\(^2\)) for advanced sensing modes
- Waterproofing and wet-finger tracking with DualSense\(^3\)TM
  
  (U.S. patents 8,358,142; 8,319,505; and 8,067,948)

**Proprietary Analog Front End\(^4\) with ChargerArmor\(^5\)TM**

- True 5-V TX-Boost\(^6\)TM with multi-phase transmit (reduces noise compared to a single-phase transmit line)
- 15-Vpp Charger noise immunity (1-500 kHz, 9-mm finger)

**System Solutions**

- Android operating system
- Wireless tuning with a TrueTouch Host Emulator mobile tuner
- Manufacturing test kits for production testing

**Collateral**

Datasheets and Design Guides:

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1. A simple low-cost instrument made of conductive material that allows a user to write or draw on a touchscreen
2. The feature of a touch-enabled device to automatically switch between standard and advanced modes (e.g., glove) without requiring manual changes to system settings by the user (e.g., by having to remove gloves)
3. Cypress’s proprietary technology to measure both Self-Capacitance (the capacitance of a row or column line in a touchscreen sensor) and Mutual-Capacitance (the capacitance between a row and a column in a touchscreen sensor) on the same chip
4. Analog circuit in the touchscreen controller used to measure Self-Capacitance and Mutual-Capacitance
5. Cypress proprietary charger noise mitigation technology
6. Interrupt
7. A sensor that can detect changes in capacitance caused by contact with a conductive object