

### iPhone 6s Touch ID

The iPhone 6s home button is genuinely fascinating; just a straightforward touch can unlock access to the device's functionalities. The home button on the 9th generation of the Apple iPhone serves two purposes. It can direct the user back to the home screen. It has a built-in security feature that unlocks the device based on the user's fingerprint's mathematical representations.

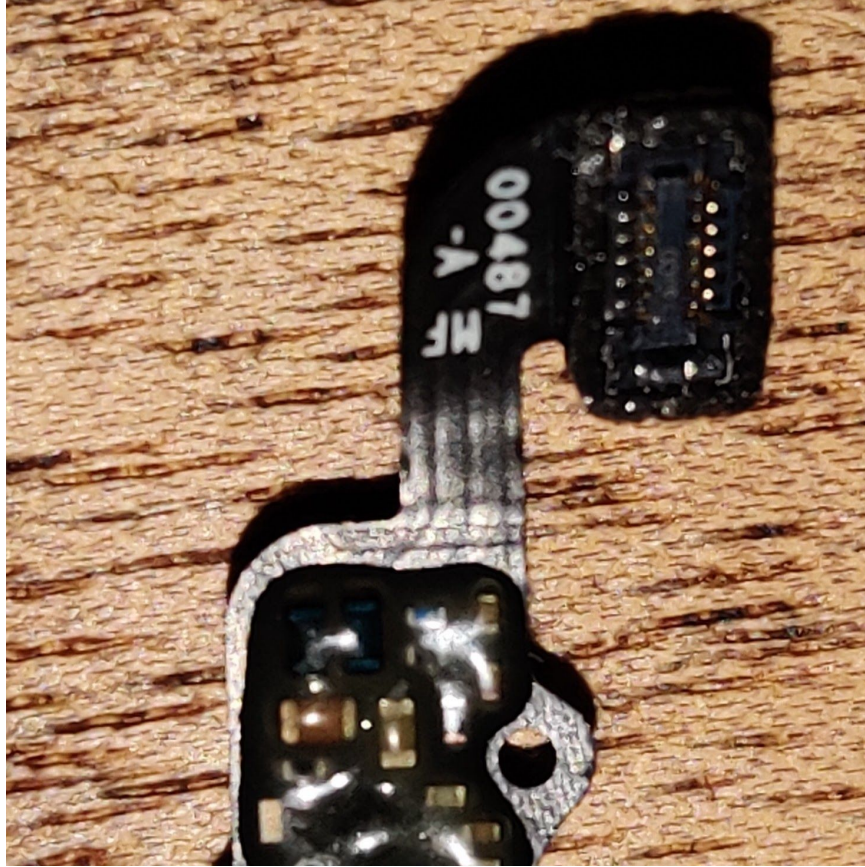
The home button consists of sapphire crystals, one of the most authentic, most rigid materials durable enough for daily use. It protects the fingerprint scanning sensor and acts as a lens to precisely focus it on the user's finger. The sensor is directly connected to the home button and powered by the Apple A9 system-on-chip, making the device performance more accurate and robust. The sensor has a thickness of 170  $\mu\text{m}$ , with 500 pixels per revolution. The sensor and the home button component are unique to each device, making repairs and modifications to the iPhone more challenging. Users may lose the fingerprint security function because of the flex cable that is unique to one Apple device.

The sensor has a steel ring surrounding the button, which detects your finger and starts reading your fingerprint, comparing it to the previously stored data in the A9 processor. It uses advanced capacitive touch to take a high-resolution image from small sections of the user's fingerprint from the skin's subepidermal layers, categorizing them into three fingerprint patterns. The fingerprint scanning to unlock the phone starts with reading the fingerprint in 360-degrees of orientation and creating a mathematical representation of the fingerprint. Then, it compares the mathematical model to enrolled fingerprint data to unlock the iPhone and updates the mathematical name of fingerprints over time to improve matching accuracy. The iPhone processes all these complicated directions in less than a second, unlocking an iPhone quickly and efficiently.



*The sapphire button and steel ring, as well as the ribbon assembly are pictured above.*

Secure Enclave security is a secure coprocessor that indicates a hardware-based key manager isolated from the central processor to provide an extra layer of protection. It protects the passcode and fingerprint data of the user, making the sensor completely safe and private. The fingerprint data can be stored in iCloud as well, a database that manages user information. The sensor can read multiple fingerprints and can store up to five fingerprints. A digitizer cable converts analog signals from touch commands to direct calls the device can read, making the process of unlocking an iPhone much more comfortable and faster than inputting a 4-6 digit passcode. If the fingerprint is unrecognizable, the sensor rejects the data and asks the user to try again

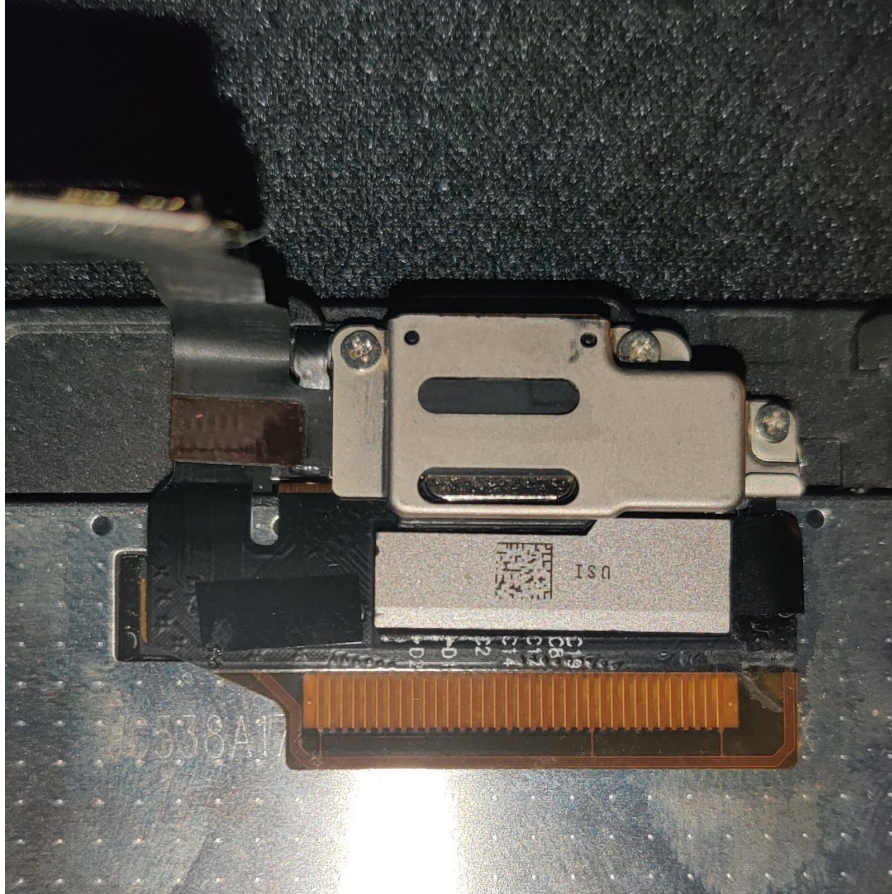


*The ribbon cable pictured above has what seem to be embedded capacitors, which may have to do with power delivery or amplifying the signal until it reaches the dac.*



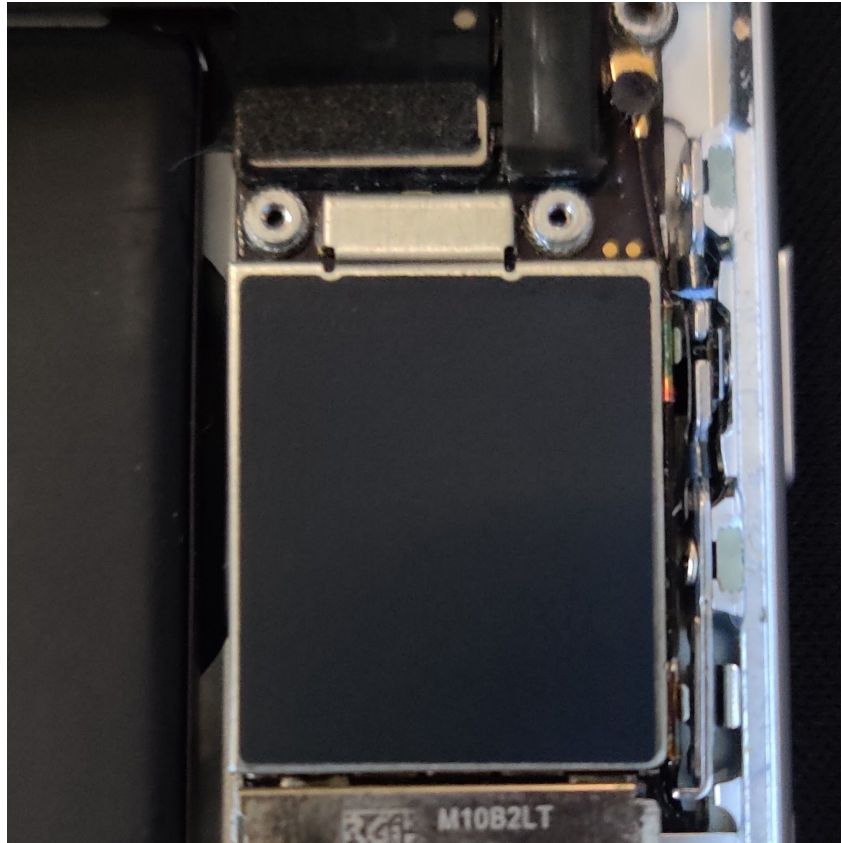


*The home button flex connects at the bottom left corner and runs up behind the lcd shield to the digitizer cable.*



*A part of the digitizer is shown above. It has multiple functions one of which is converting the analog signal to a digital one.*

All in all, the iPhone 6s home button is a fantastic feature that allows users to unlock their phones quickly and efficiently. It can create mathematical representations of a fingerprint and compare it to the previous data in less than a second. Although small, the sensor is composed of special hardware powered by Apple's A9 processing chip, making the process a breeze for users on the 9th generation iPhone.



*The A9 SOC is underneath the black heat spreader. Note how close the ribbons are, which reduces latency.*

Parts List:

- Touch ID sensor
- Ribbon cable capacitors
- Under-Display connecter
- Digitizer ribbon
- A9 SOC