Touch Panel Selection Criteria Should Include Structure and Materials

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The touch screen interface is increasingly becoming a standard requirement in today's electronic products. But how does one choose the right touch screen for the application? What are the basic considerations when sourcing a touch screen? This article will give a brief summary of the key selection factors.

There are several different types of touch panel technologies: Resistive, Capacitive, Projected Capacitive, (Pro-Cap) Acoustic (SAW), and Infra Red (IR). Selection of the right touch technology for a specific application requires a comprehensive evaluation, a subject that is well-covered in available publications from sources such as the Society for Information Display, better known as SID. In this article, we will concentrate on Resistive technology, because it can be used in the widest range of applications, has the lowest cost, and continues to evolve to meet market requirements.

Resistive touch panels can register input from virtually any object – a gloved or bare finger, a stylus, the edge of a credit card, etc. And with the recent advances in resistive touch technology, multi-input capability is now available so designers can implement various gesture interfaces such as the swipe, rotate, and zoom features standardized in the Windows 7 touch interface.

There are several types of resistive touch panels based on the construction: film-glass (FG), glass-glass (GG), film-film-plastic (FFP), film-film-glass (FFG), and glass-film-glass (GFG). The first letter of the acronym refers to the top layer material of the touch panel. The top layer is what the user will be touching and sensing. The last letter in the acronym indicates the last layer, or the "backer" layer, of the touch panel. For example, in an FG panel, the top layer is film and the backer is glass.

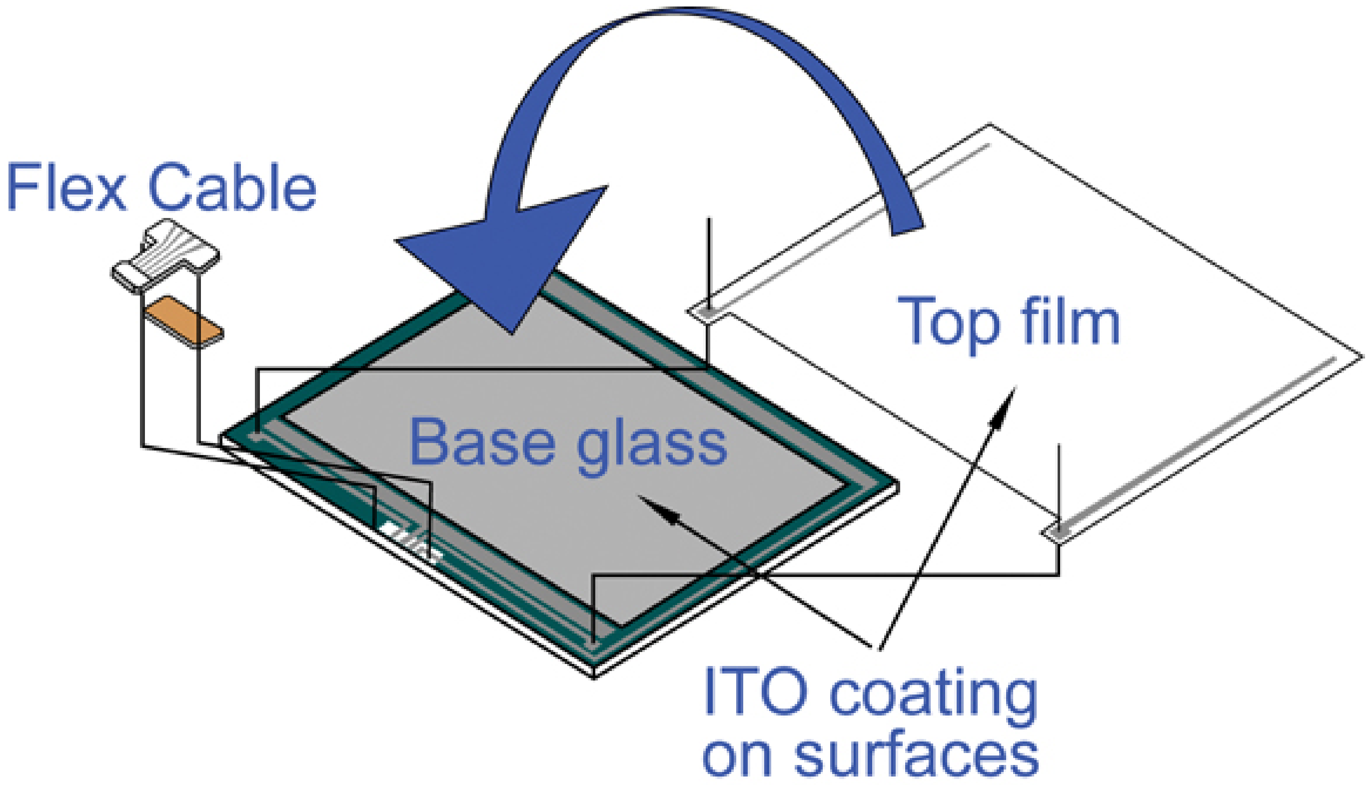

Figure 1. Film-Glass touch panels sandwich together a layer of glass (for stability) and a PET film, both coated internally with ITO. These are the most cost-effective type of touch panel.

Based on user interface requirements, resistive touch panels can be categorized by finger-input, pen-input, finger & pen-input, single-input and multi-input. Finger input-only touch panels have a guaranteed product life specific for finger-sized input activation, but cannot guarantee a standard product life for smaller-radius input devices, such as a stylus. Pen input-only touch panels only respond to a small-size (usually 0.8 mm radius) input device and will not register finger touch. Finger & Pen-input touch panels accept inputs of various sizes and are the most common type. Single-input touch panels only accept one point input at a time and can recognize swipe gestures, while multi-input ("Multi-Touch") panels recognize more than two simultaneous inputs at once, while also allowing the implementation of rotate, zoom in and out, and gesture functionality.

Depending on environmental requirements, resistive touch panels can be categorized into consumer grade, industrial grade, and automotive grade, although specific applications cross over traditional rating types. For consumer applications, the most important design considerations are cost, optical transparency, reflectivity and Industrial Design (ID) integration. One of the ways Resistive technology has evolved to support current ID needs is to offer a flush front surface - sometimes called a touch window - eliminating the usual need for a top bezel. A further example is the ability to provide more scratch-resistant top surfaces using cover films and very high-performance fingerprint and smudge resistance.

Based on the optical performance of the touch panel, ranging from 80 to 93 percent transparent, the cost delta can be greater than 50 percent. The most reliable way to decide on the transparency/reflectivity requirement is through actual or simulated field testing with a mock-up or prototype of the product design, because the actual optical stack-up is needed to make an accurate determination. Ultimately, it will be a compromise between LCD backlight power consumption, screen readability under different lighting conditions, the type of content that will be displayed on the screen, user input requirements, cost goals and market requirements – a significant undertaking.

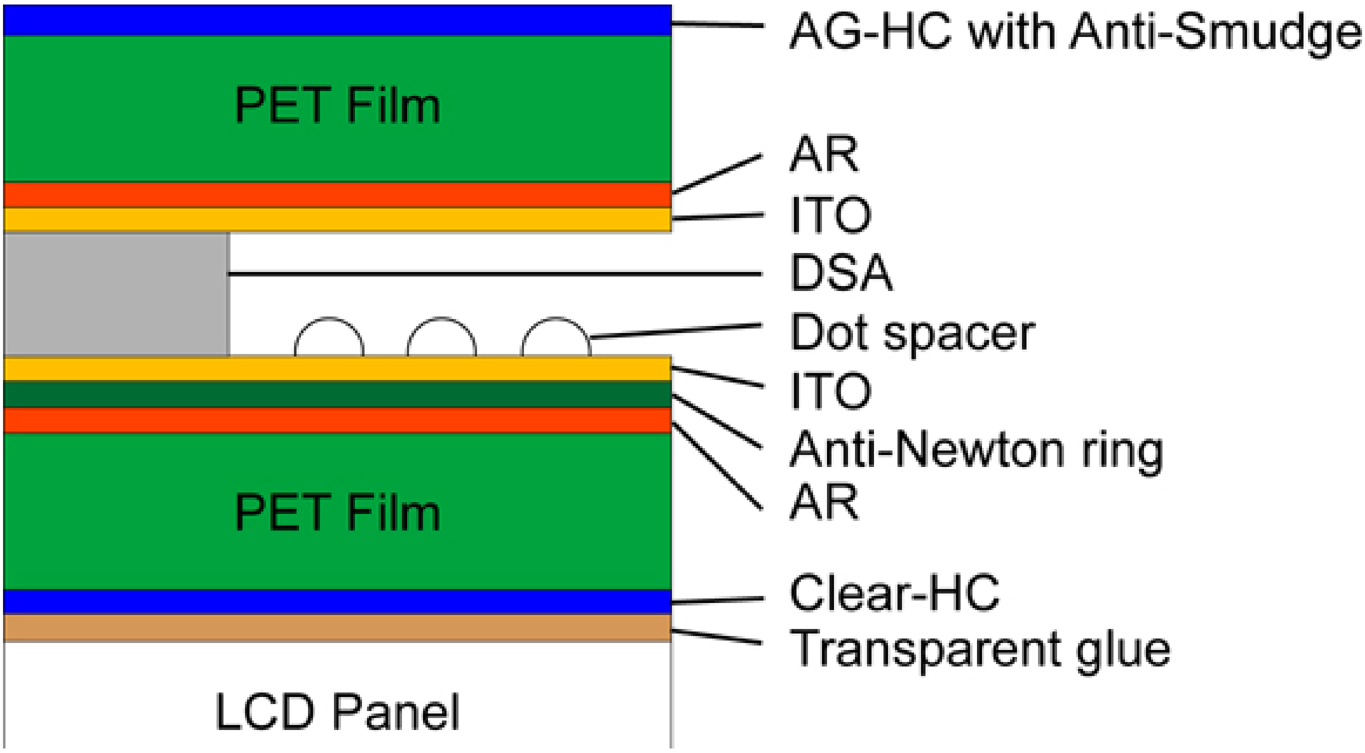

Figure 2. Film-Film-Plastic touch panels feature a flexible film for both top and bottom layers, supported by a plastic backer. These panels are rugged, yet lightweight and shatterproof.

Driven by cost requirements for consumer applications, the touch panel of choice is usually a film-glass type because it is the most cost effective product not only in the resistive touch category, but also when compared to all other touch technologies.

For industrial applications, design requirements concentrate primarily on ruggedness and extended temperature range for operation and storage. Ruggedness includes high resistance to impact, abuse, dropping, and proper ingress protection against water, moisture and dust.

Industrial operating temperature ranges are typically between -20°C to 70°C. As a result, the panels of choice are film-film-plastic or film-film-glass. A plastic backer is much better than standard glass at withstanding high impact. It also has better performance and shatter-resistance than standard glass at low temperatures.

For the film-film-glass type, the glass backer can be a chemically strengthened glass, such as Gorilla Glass from Corning. Film-film-glass touch screens are often used when high optical transparency is required and the higher material cost and weight are acceptable.

Automotive applications have the most stringent requirements for operating and storage temperatures. The standard automotive temperature requirement is -30°C to 85°C. To meet this extreme specification, the best touch panel is an automotive grade film-glass-glass, film-glass or glass-film-glass panel designed to meet automotive environment requirements. Each layer of material used in the touch panel construction is chosen to ensure reliable performance in the wide temperature range.

Medical applications usually require that the top surface of the touch panel must be resistant to a wide variety of chemical cleaning solutions. Lab testing is the only way to ensure that this requirement can be met with the materials of choice.

In conclusion, when selecting a resistive touch panel for your application, the underlying construction and structure of the touch panel needs to be carefully considered to assure the best compatibility to the design requirements and the operating environment. You’ll greatly reduce failure rates and extend the life of the end product.