

Advances in Touch Controller Technology

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The touchscreen is rapidly becoming the user interface technology of choice in applications ranging from retail, industrial and automotive, to medical, digital signage and gaming. Their growing popularity has been fuelled in part by the phenomenal success of the iPhone and its highly user-friendly, all touchscreen controls – which has set the expectation levels for interactive displays in all other environments.

Clearly touch-based displays offer many benefits when compared with more traditional keyboard and mouse control formats. As well as enabling deployment of intuitive user interfaces, well executed touchscreens can also simplify and reduce the size of an overall system design, lower bill of materials (BoM) costs and cut maintenance during operating life.

Don't forget the controller

Engineering teams looking to integrate touchscreens into their designs often spend considerable time assessing which touch sensing technology should be selected depending upon application and operating environment. This is not surprising - there are many different types and an incorrect selection can significantly impact the success of the end product.

For example, resistive and normal capacitive solutions may initially appear attractive due to their low cost, but as the active sensing components are on the screens front surface they are typically unsuitable for outdoor applications or designs requiring resistance to accidental damage or liquid spillage. Technologies such as infrared, optical and surface acoustic wave, which require bezel structures around the perimeter of the screen to house receivers and transducers may not be appropriate because of the aesthetic impact on the end product; the possibility that dust and grease can accumulate in bezel recesses, impairing operation over time; and the fact that sudden shocks or sustained vibrations can cause misalignment of the sensor elements. With this in mind designers increasingly seek out solutions that allow the touch sensor to be fully protected within or behind a durable protective overlay – projected capacitive systems fall within this category.

An example of such a solution is Zytronic's proprietary Projected Capacitive Technology (PCT) - which uses a matrix of micro-fine (10µm thick) copper capacitors

arranged into an XY grid and embedded into a laminated substrate (see Figure 1). Since the substrate is embedded behind an overlay (usually made of glass or polycarbonate) of up to 20mm, the capacitors are not susceptible to damage which may be caused by dust, scratches, temperature extremes and water ingress.

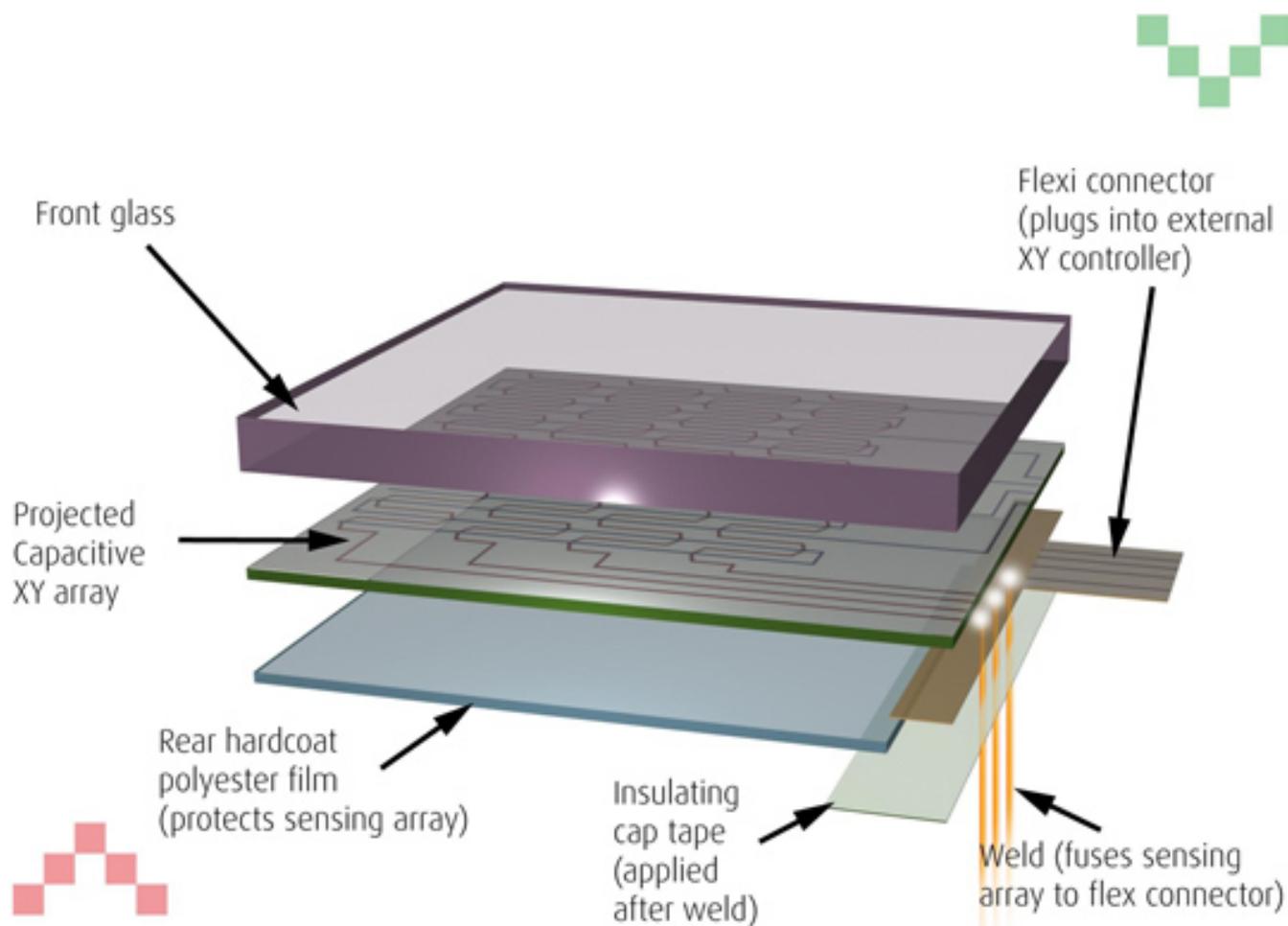
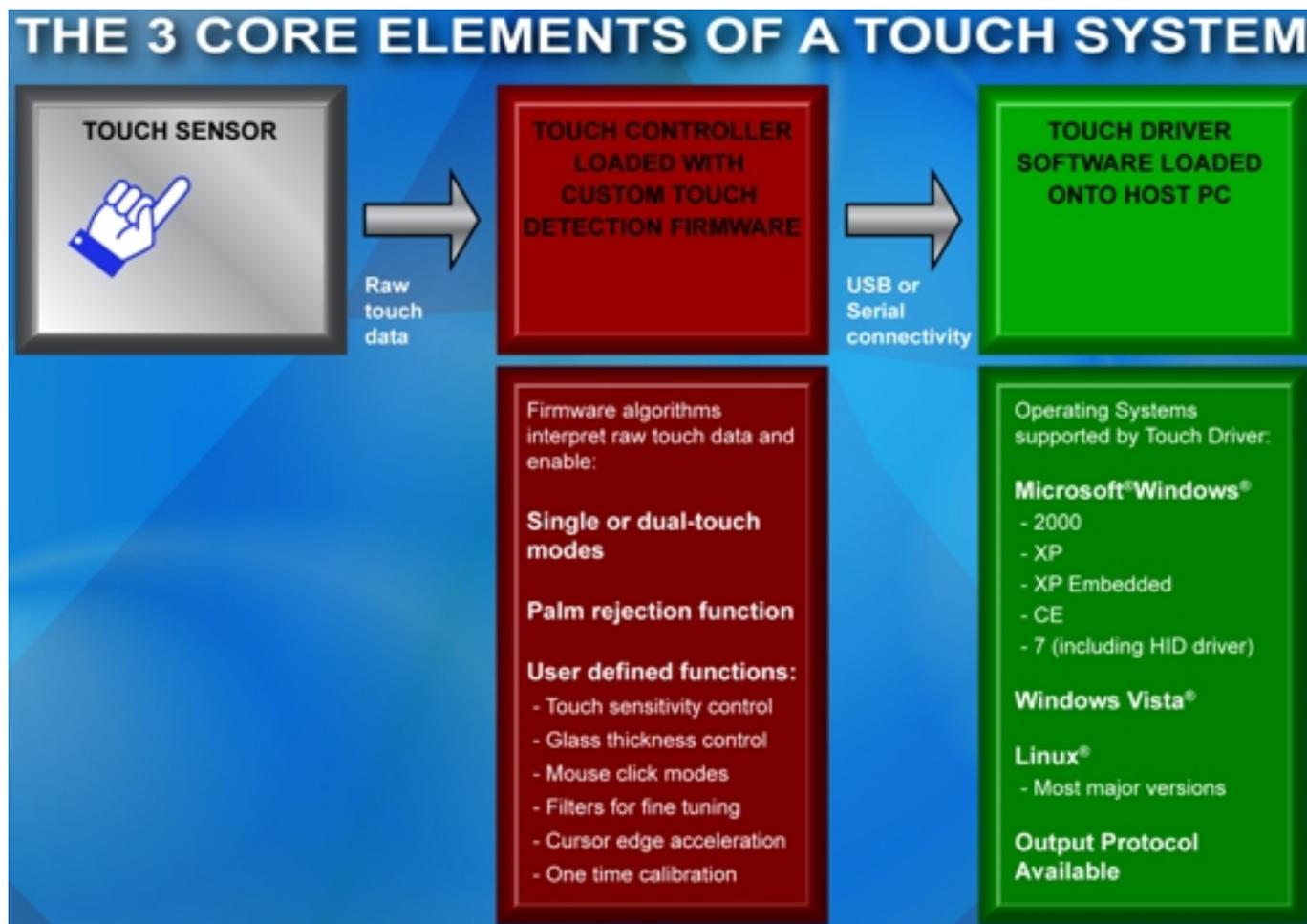


Figure 1. Construction of Zytronic's Projected Capacitive Touch (PCT) technology

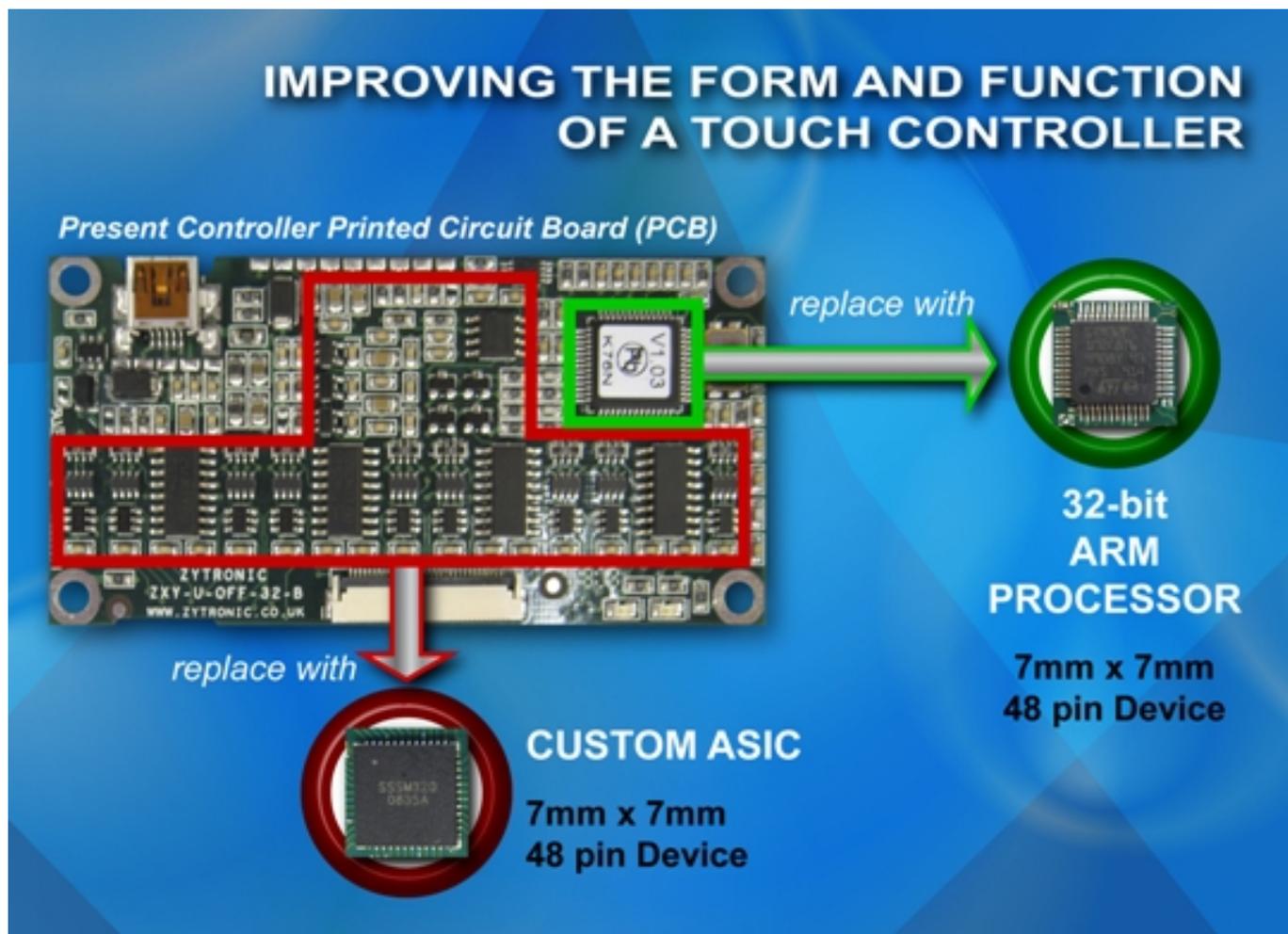
However, while the suitability of the sensor is a critical part of the design process, there are many other elements to consider, not least the capabilities of the associated touch controller. As the 'brains' of any touch system, this critical component is responsible for gathering and interpreting data from the screen and outputting co-ordinates to the host PC (see Figure 2). Touch systems incorporating the highest grade LCDs, the most powerful PCs and the most advanced and robust touch sensor designs can still be compromised if the touch controller is not up to the job.



Touch controller developments

As touch technology becomes increasingly commonplace, ever more sophisticated touch controllers need to be developed to meet demands for higher levels of performance and compelling new features. Factors fuelling the development of new and emerging controller technologies include the ability to realize faster response times on larger screens, so that the speed that users can interact with the end product through the touchscreen is optimized; improved screen resolutions and touch accuracy; demands for complex multi-touch data processing; and the streamlining of system design through lowering component counts.

Use of more integrated controller solutions, where many of the discrete components have been incorporated onto a single ASIC (application specific integrated circuit), can help to reduce the device footprint (see Figure 3), at the same time simplifying the design through increased flexibility in terms of device placement and more straightforward testing. Depending on the level of integration, customers may even be able to incorporate the controller chipset onto their own motherboards, while reduced component count means fewer potential points of failure, leading to improved reliability.



Meanwhile, controller developments that help improve the system's signal to noise ratio (SNR) can contribute to increased levels of touch sensitivity. In the case of the PCT touchscreens mentioned previously, for example, this could help support designs with thicker overlays, meaning that even greater levels of display protection can be provided (Figure 4 shows a PCT-based touchscreen being employed in an interactive shop-front window).



Alongside higher levels of integration there is also a trend to building controllers using higher performance microprocessors, featuring large capacity onboard Flash memory. The improved processing performance that results can be used to deliver faster response times, enhanced precision and to accommodate the performance overhead of the advanced algorithms needed to support features such as 'simultaneous multi-touch' operation.

The benefits of multi-touch functionality are already being witnessed in the portable consumer electronics space, while the recently released Microsoft® Windows® 7 operating system has multi-touch and gesture recognition support built in. As a result the demand for multi-touch support in other industry sectors is growing and will continue to grow. Through multi-touch, users will be able to drag-and-drop icons and files, cut and paste text, and reshape graphics, while the gesture recognition that multi-touch facilitates also makes it possible to carry out screen panning, zooming and rotational movements for applications such as photo-viewing or 3D design.

Summary

The evolution of both the sensor solutions and associated controllers will quicken as the demand for touchscreen technology continues to grow. New and emerging high-performance and highly integrated touch controllers are set to deliver a marked improvement in touchscreen system performance, with faster and more accurate

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operation, better use of PCB board space, simplification of product sourcing /inventory management, and a more simplified manufacture and test process. The next generation of controllers will also enable new levels of functionality to be offered, including multiple simultaneous touch and in-field firmware upgrades, leading to the advent of more feature-rich methods of human-machine interaction.

About Zytronic

Zytronic designs and manufactures a range of technologies that optimise the performance of electronic display applications. The company's principle products include award-winning touchscreen technologies, optical filters for enhanced performance and protection, and special filters to minimize electromagnetic emissions. In addition, the company can offer complex shaped glass composites for specialized applications.

Zytronic products are used in electronic displays for information kiosks, web phones, ATMs and gaming machines, as well as by military, computer, telecommunications, medical and lighting OEMs, and are available from its network of worldwide distributors.

The company is headquartered at its state-of-the-art manufacturing facility in Blaydon, Tyne & Wear in the UK. In addition to ISO-approved manufacturing, this facility is responsible for ongoing product development in composite technology and is home to Zytronic's team of lamination, material science and electronics specialists.

For more company information, visit Zytronic's web site at: www.zytronic.co.uk [1]

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