

Two touch detectable IC with conventional 4-wire resistive touch screen

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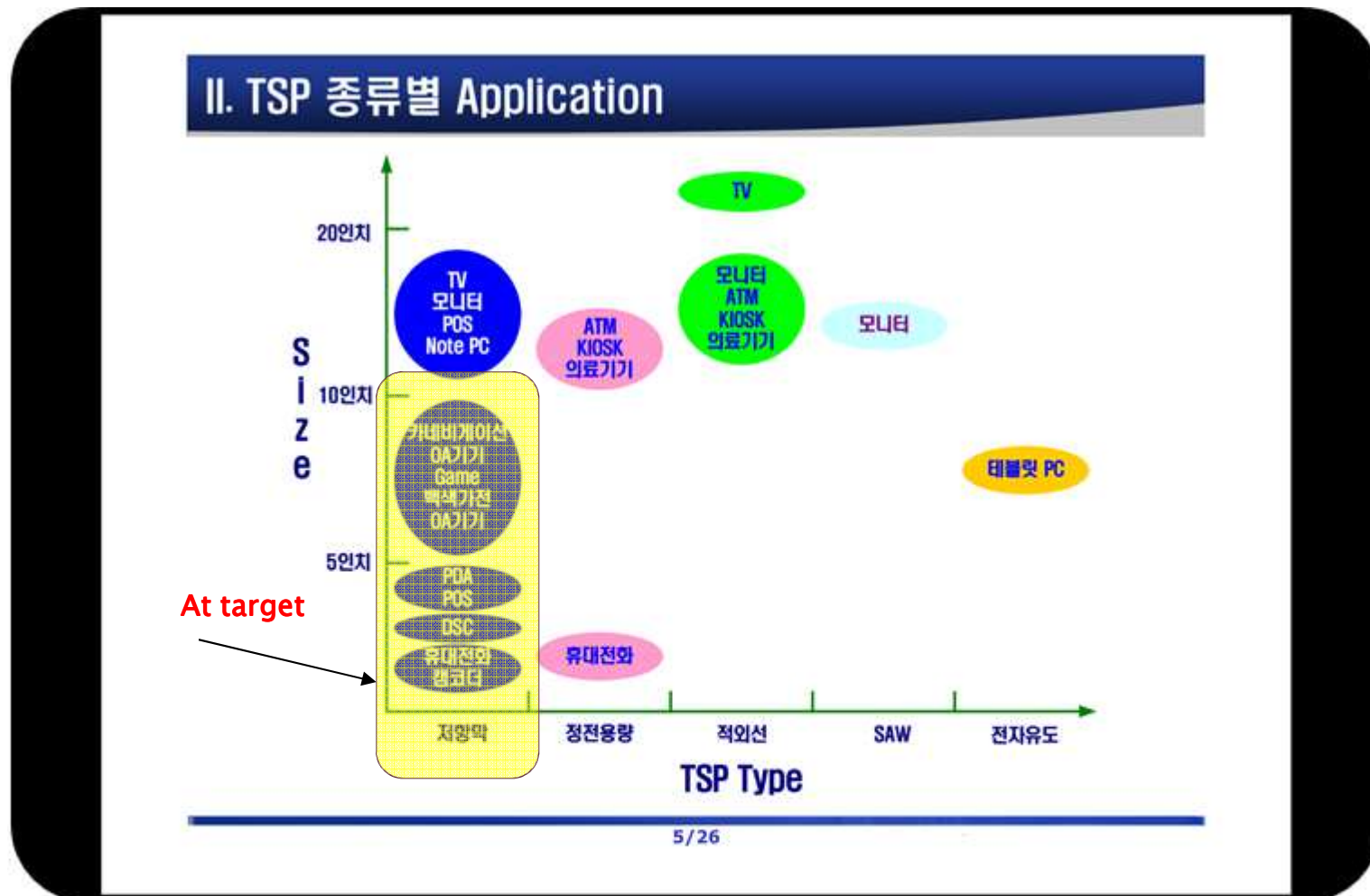


1 Objectives

1. Need to supply a new most cost-effective multi-touch IC
2. An UI and UX with multi-touch capability is a basic prerequisite for the current multimedia market such as Windows 7, Android and etc.
3. Manufacturers should have strong competence in market that has multi-touch utility in default.
4. Therefore, this new multi-touch IC can enable manufactures to be satisfied with the cost-effective high performance.

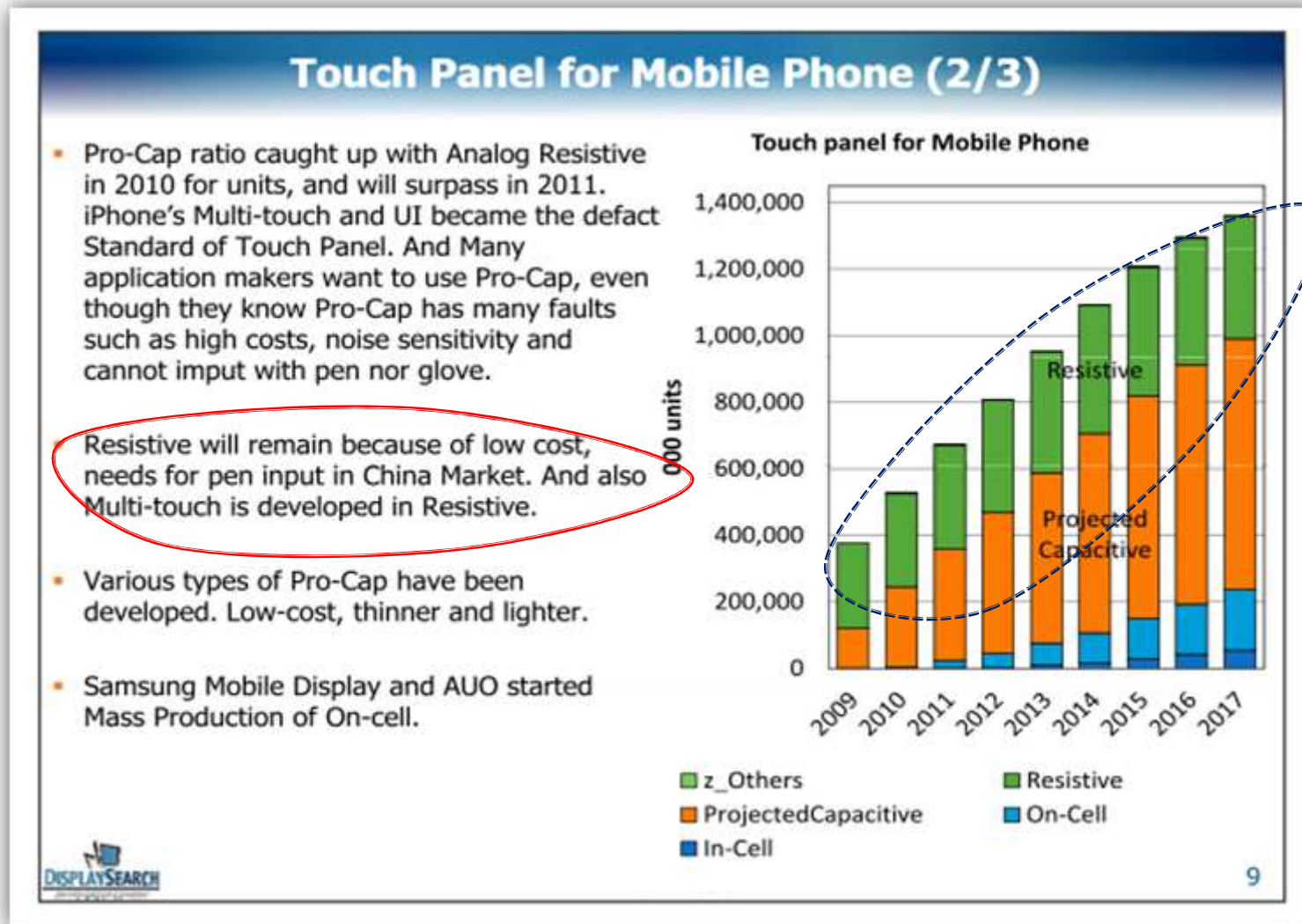


2 Target Markets(fields)



Specially targeted for the markets below 10 inch resistive touch screens

2 Target Markets(fields)



2 Target Markets(fields)

Touch Panel Technology Topics			
Technology	Topics	Company	
Pro-Cap	Spread of Penetration	With the Impact of iPhone, other Smart Phone start to use Pro-Cap. Pro-Cap surpassed Analog Resistive for Mobile Phone by Area.	
	Film Sensor	Film ITO is thinner and lighter than Glass. Especially Tablet PC needs those spec.	Nissha, Gunze, Young fast, Alps, Sony Chem., etc.
	Single layer Sensor	Single Layer is lower cost than Multi-Layer Pro-Cap. That can only gesture, not Multi-touch. It may increase for Low-end Smart Phone.	EELY, Tyco, Young fast etc.
	Sensor on Cover Glass AS lighter, cheaper solution, Some develop ITO Sensor on Cover Glass .	Micro Tech, Corning, EELY, CMI, AUO	
Resistive	Multi- Touch	With developing Multi-touch, Analog Resistive will be sustain their domestic position.	Fujitsu
On-Cell/In-Cell	On-Cell	AUO, Samsung Mobile Display(OLED) provide On- Cell touch panel.	AUO, Samsung Mobile etc.

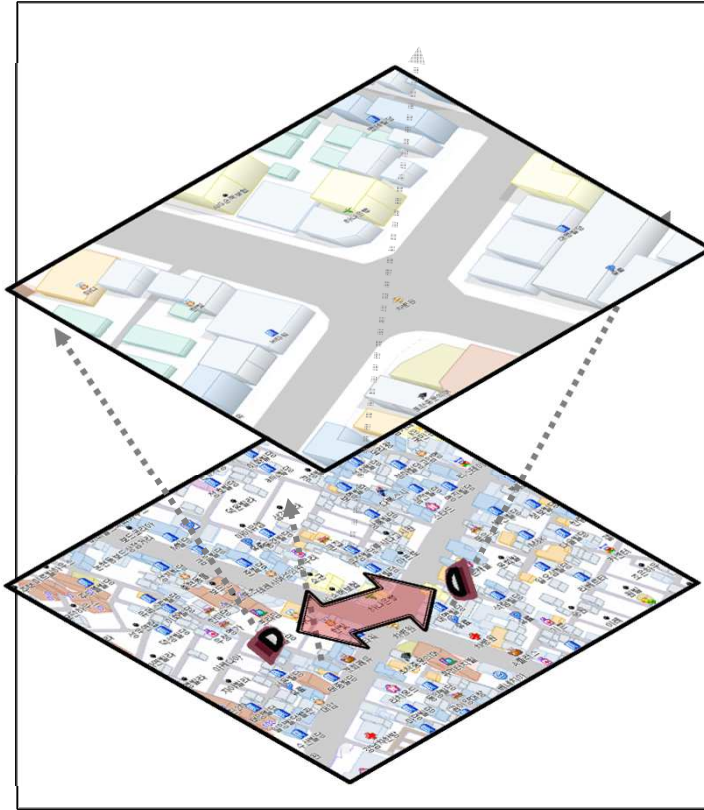
2 Target Markets(fields)

Resistive vs. Pro-Cap						
		Resistive (Analog) F/ G, F/F/P	Projected Capacitive (Grid Type)			
			G/ G 2 Layer	G 2 Layer	F/F 2 Layer	G or F Single Layer
Multi-Touch		Δ	OK	10 points	OK	gesture
Activation force		>20g	< 5g			
Transmissivity		<80%-83%	< 90%	> 90%	< 80%-87%	< 80%
Thickness		< 1 mm	< 0.7mm		< 0.3-0.4mm	Depends on Substrate
Input Method		Anything	Δ	Finger		
Cost	Sensor	< \$ /1-in.	\$ to \$ /3.5 to 4in.			\$ to
	Control IC	< \$	\$ to \$			
	Others	yield >90%	Extra Cost: Cover glass > \$ Yield 75 to 90%			ITO on CG
		Fujitsu started to sell Multi-touch Analog Resistive	Hitachi Displays	Apple	Nissha→Prada Phone, Galaxy	EELY, Tyco. DNP has Film ITO on the oposite side.

2 Target Markets(fields)

Touch Panel Regional Topics	
<p>Japan</p> <p>Japanese Touch Panel Suppliers have provided High quality Resistive for FA, POS, KIOSK, Automotive. They released Pro-Cap first of the world. But took behind as Module manufacturing place in Cost and Capacity. But Suppliers of Many Materials such as ITO Film are Japanese company. If they get more capacity, they may keep their presence in the market. And Japanese company has advantage to R&D of next Gen's materials.</p>	<p>Taiwan</p> <p>There are LCD companies and OEM/ODMs in Taiwan and the most Big Touch panel market .And Taiwan is also the biggest production place because many Small to Medium LCD company and CF maker enter to Touch panel. So that Taiwan is ideal place of Touch panel supply chain. In future, They will spread to China with collaboration with LCM or EMS which has fab in China.</p>
<p>China</p> <p>Resistive.is domestic. China record YoY 39% in 2010 mostly for Mobile Phone. Not for Tier1 brands, but China local brands. In China market, demand of Resistive will be strong in the point of Cost, pen-input. Famous company are Top Touch, B-Touch, BYD and KD Touch.</p>	<p>USA, Europe, ROW</p> <p>R&D and License business company such as N-trig, Stantum. Semiconductor companies provides Controller IC for Touch. TI, Cypress, Atmel. Synaptics sells Touch module with their IC and Sensor pattern.</p>

3 New Technology Overview



An example for navigation application

- 1) A single touch detection (As conventional IC)
- 2) Two touch detection(New additional function)
- 3) Real-time Zoom-in/out for graphic object
- 4) Arbitrary angle rotation of object on screen
- 5) Varying gestural functions with identifying single and dual touch

3 New Technology for Navigation and PMP



**Full HD 급 영상 강화유리
스마트 터치스크린**

**모든 메뉴를 간단한 터치 한번으로 컨트롤 할수 있는
고감도 터치센서와 스크롤 터치!**

빛과 같은 반응 속도 고성능 CPU 와 고감도 터치 센서의 최적화된 조합은 사용자에게 가벼운 손끝이 닿는 순간 부드럽게 반응하고 스크롤 되는 경쾌한 반응을 선사합니다.

3 New Technology for Game Terminals



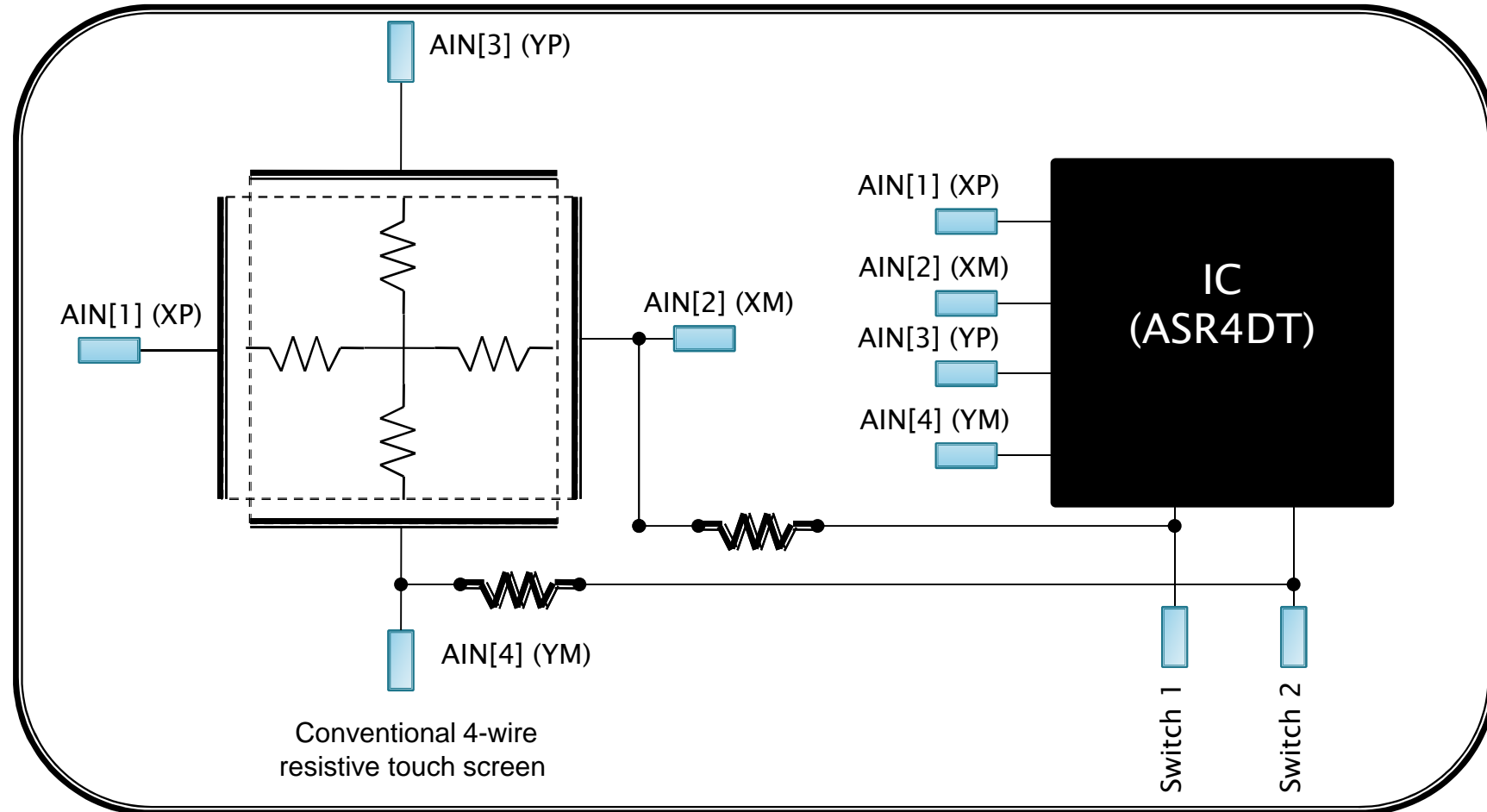
3 New Technology for Gesture Function



3 New Technology for Digital Camera UI/UX



3 New Technology (Circuit)



Few external element in need can give low cost and little space on PBA

3 New Technology (IC)

4-Wire Resistive Touch Screen Controller for Dual Touch

GENERAL DESCRIPTION

The **ASR4DT11** is a 4-wire resistive touch screen controller that integrates a **12bit SAR A/D converter**, and supports dual touch position detection. The R4DT11 can detect single and dual touch location and touch pressure. It can also detect the dual touch center location and the parameter that related to two touch points distance. The ASR4DT11 is available in 16pin QFN, and Its best application is for cellular phone, DSC, Tablet PC, eBook, smart phone, and other portable devices.

FEATURES

[4-wire Touch Screen Touch Position Extraction](#)

[I 2 C Serial Interface](#)

12bit SAR A/D Converter with S/H circuit

Dual Touch Functions

- Dual Touch Judgment
- Dual Touch Information Outputs
 - (1) [Two Touch Locations](#)
 - (2) [Center Location](#)
 - (3) [Parameter that Related to Dual Touch Distance and Vector](#)

[Pen Pressure Measurement](#)

Continuous Read Function

Integrated Internal Osc (Sequence Mode)

Integrated Median Averaging Filter

Low Voltage Operation: VDD = 2.7V ~ 3.6V

PENIRQN Buffer Output

Low Power Consumption: TBDmA

Auto Power Down

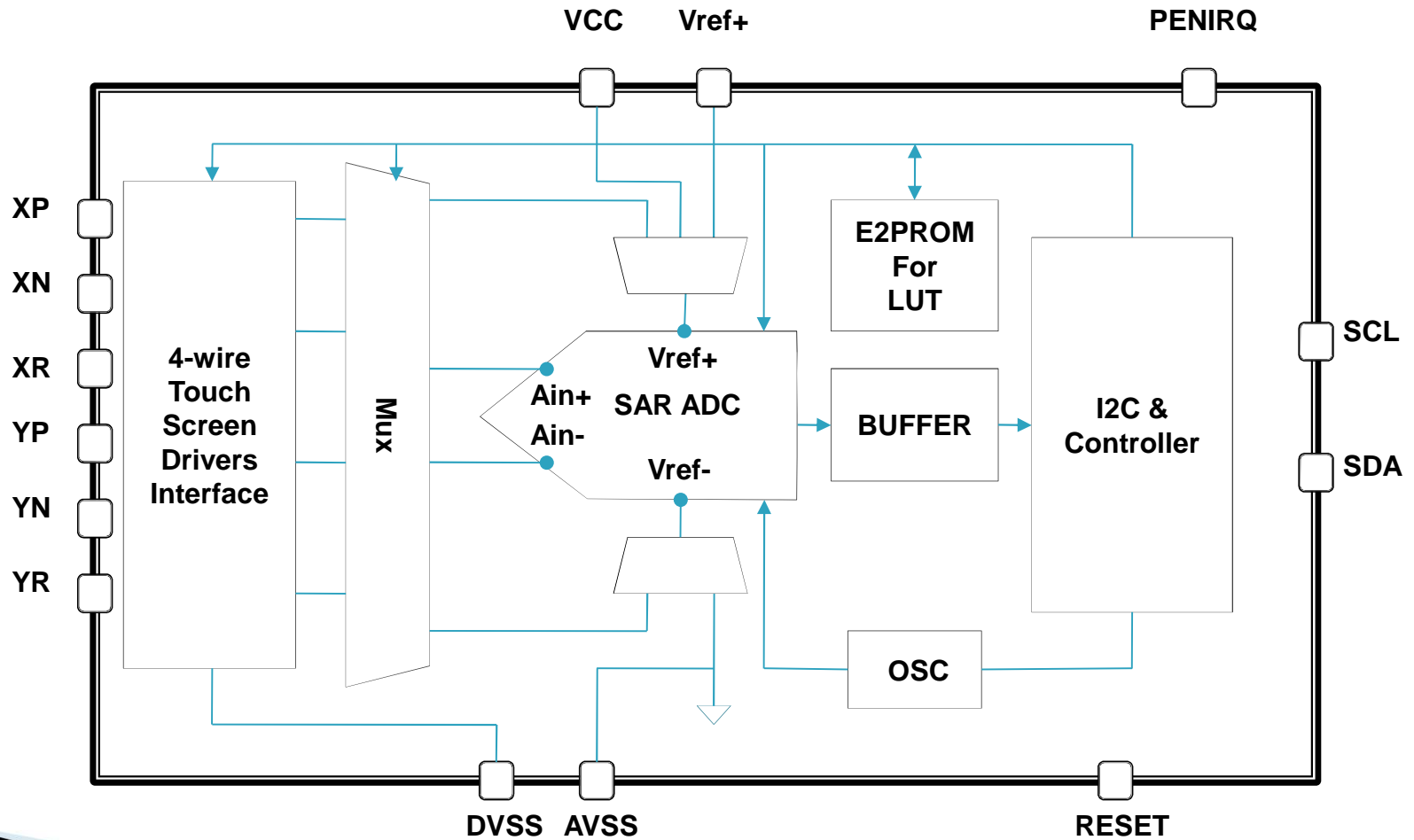
Ta = -40 ~ 85 °C

[Package: 16pin QFN \(3.0mm x 3.0mm, pitch 0.5mm\)](#)



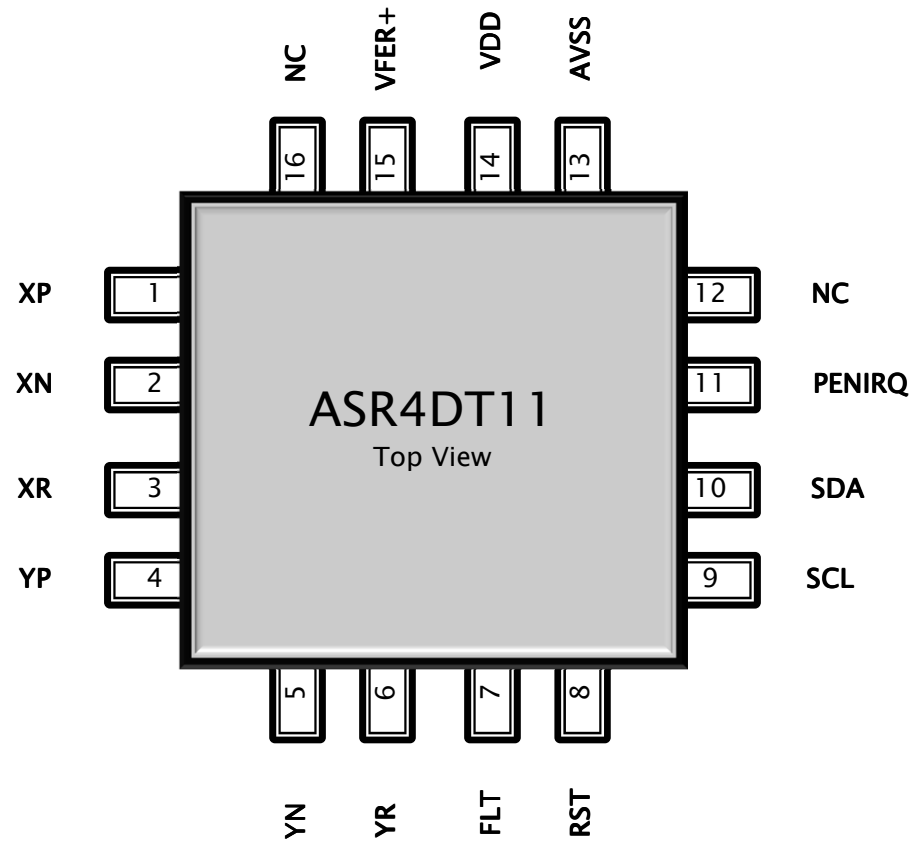
3 New Technology (IC)

BLOCK DIAGRAM



3 New Technology (IC)

PIN MAP for ASR4DT



3 New Technology (IC)

PIN NUMBER AND FUNCTION for ASR4DT

Pin no	Pin name	I/O	Functions
1	XP	IO	Touch Panel X+ Input Touch Panel X+ Driver pin
2	XN	IO	Touch Panel X- Input Touch Panel X- Driver pin
3	XR	I	Reference resistor for dual touch in X-axis
4	YP	IO	Touch Panel Y+ Input Touch Panel Y+ Driver pin
5	YN	IO	Touch Panel Y- Input Touch Panel Y- Driver pin
6	YR	I	Reference resistor for dual touch in Y-axis
7	VCC	I	Power Supply and External Reference Input: 2.7V ~ 3.6V
8	DVSS	I	Digital Ground
9	FLT	I	Touch Bounce Stable Capacitance
10	SCL	I	I 2 C Serial Clock Input
11	SDA	IO	I 2 C Serial Data Input/ Output
12	PENIRQ	O	Pen Interrupt Output (CMOS output) The PENIRQ pin is "L" Then touch-screen press is detected. This pin is always "H" or "Hi-z" irrespective of touch-press in sleep mode. And, This pin act as "Busy"(Low Active) in internal calculations.
13	AVSS	I	Digital Ground
14	VREF+	I	External positive reference voltage for ADC

3 New Technology (IC)

Detected Value		Symbol	Resister	
			address	bit
X center location of dual touch (12bit)	Upper 8bit	Xc12	1H	D11-D4
	Lower 4bit		1H	D3-D0
Y center location of dual touch (12bit)	Upper 8bit	Yc12	2H	D11-D4
	Lower 4bit		2H	D3-D0
Parameter that related to dual touch X distance (12bit)	Upper 8bit	Dx	3H	D11-D4
	Lower 4bit		3H	D3-D0
Parameter that related to dual touch Y distance (12bit)	Upper 8bit	Dy	4H	D11-D4
	Lower 4bit		4H	D3-D0
X location of dual touch (12bit)	Upper 8bit	X1	5H	D11-D4
	Lower 4bit		5H	D3-D0
Y location of dual touch (12bit)	Upper 8bit	Y1	6H	D11-D4
	Lower 4bit		6H	D3-D0
X location of dual touch (12bit)	Upper 8bit	X2	7H	D11-D4
	Lower 4bit		7H	D3-D0
Y location of dual touch (12bit)	Upper 8bit	Y2	8H	D11-D4
	Lower 4bit		7H	D3-D0
Status bit for insufficient pressure in single touch 0: Sufficient pressure 1: Insufficient pressure			9H	D0
Status bit of insufficient pressure in dual touch 0: Sufficient pressure 1: Insufficient pressure			9H	D1
Status bit of dual touch direction. The sign bit of Δy , if $\Delta x \geq 0$. $\Delta x = (x2-x1)$, $\Delta y = (y2-y1)$ 0: $\Delta y \geq 0$ 1: $\Delta y < 0$			9H	D2
Dual touch detection bit 0: Single Touch Detection 1: Dual Touch Detection			9H	D3

3 New Technology (IC)

Sequence Command Description

Bits	Name	Description
D2-D0	SMT0-2	Sampling interval times. 000: 0 μ s (default) 001: 5 μ s 010: 10 μ s 011: 20 μ s 100: 50 μ s 101: 100 μ s 110: 200 μ s 111: 500 μ s
D2-D5	SEQ3-SEQ0	Sequence Mode 0000: Xc12 \rightarrow Yc12 Scan (default) 0001: X1 \rightarrow Y1 Scan 0010: Z1 \rightarrow Z2 Scan 0011: X1 \rightarrow Y1 \rightarrow Z1 \rightarrow Z2 0100: Z1 \rightarrow Z2 Scan 0101: Xc12 \rightarrow Yc12 \rightarrow X(Y)1 \rightarrow X(Y)2 scan 0110: Reserved 1000 - 1111: Table 10
D3	COUNT	ADC Conversion count 0: 6 times AD Conversion (default) 1: 10 times AD Conversion

3 New Technology (IC)

Sequence Mode for Dual Touch

SEQ3-SEQ0 bits	Function
1000	Dual Touch Initialization. After power up the ASR4DT11, the parameter for dual touch R_XT0 and R_YT0. (Addr0x20-0x23) must be initialized while the PENIRQN pin is "H".
1001	Dual Touch Calibration. This value must be written when the PENIRQN pin is "H". DXYS is initialized and R_XT0 and R_YT0 are updated by this setting.
1010	Dual Touch Measurement It must be executed when the PENIRQN pin is "L". The ASR4DT11 measures the dual touch center location and the parameter that related to dual touch distance. If Panel touch is single touch, the single touch location is set to the data register.
1011-1111	Reserved



4 Expectation

- 1) The 4-wire resistive touch screen will increasingly share the world market
- 2) New multi-touch technique of ASR4DT does not require new touch screen but only the popular 4-wire resistive touch screen.
- 3) Multi-touch function will be rapidly placed as a default within multi-media products in near future.
- 4) This new technology of ASR4DT will give the system manufacturers the cost-effective competence and the best difference in the market.
- 5) A future 7-inch navigations and e-book terminals will have the basic functions-zoom-in, zoon-out and rotation of graphical objects - in before market.
- 6) ASR4DT is now open to the system developers who desire to create different applications with the low-cost solution.

