



# **Solutions for Mobile Terminals**

**such as Phone, PDA, and Portable Media Players**

# Corporate Overview

- **Public U.S. Company**
  - Founded in 1990
  - IPO in 1997
  - NASDAQ: PSEM
- **Headquartered in San Jose, California (Silicon Valley)**
  - ~250 Employees
  - Global Sales & Support Offices
  - Design Centers in San Jose, Hong Kong, China, and Taiwan
  - Fabless Business Model





# Complete Interface Solutions

- **Leading Provider of High-Performance Integrated Circuits & FCP**

- Digital & Mixed Signal Digital/Analog
- Frequency Control

- **Over 1000 Products Available**

- We promote Lead-Free & Green

- **“Complete Interface Solutions”**

- Silicon**I**nterface
- Silicon**S**witch
- Silicon**C**lock
- Silicon**C**onnect
- **SaRonix FCP**
- DMP

Voltage Translation, Logic

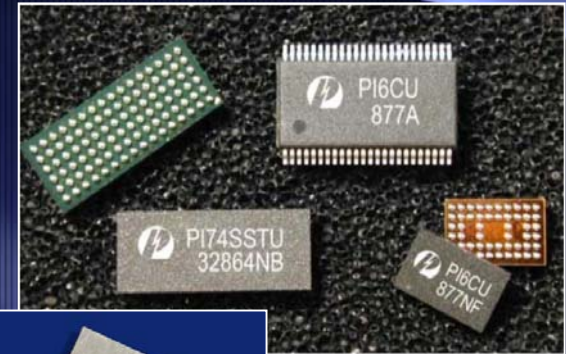
Digital, Analog & ASSP Switches

Clock IC & Timing Management

Bridges, LVDS, & SerDes

Quartz Based Frequency Control Products

Digital Media Products



# Pericom Portfolio Overview

## **SiliconInterface**

- Hi-Speed Logic (FCT to AVC+)
- Level Shifters/Transceivers
  - 1.5V/1.8V/2.5V to 3.3V
- Memory Module Buffers
- Supervisory Circuits
  - Watch Dog, etc.

## **SiliconSwitch**

- Analog Switches
- Application Specific Switches
  - LAN, USB2.0, Video, & more
- Hi-Performance Bus Switches
  - Market Leader

## **SiliconClock**

- Standard & Zero-Delay Drivers
- Programmable Clock Drivers
- Clock Generators
  - Servers, Desktop, Notebook
- Memory Module PLL
- VCXO Clocks

## **SaRonix Frequency Control**

- Timing Modules
- Crystal & SAW Oscillators
- VCXO, TCXO, (V)TCXO

## **SiliconConnect**

- Bridges
  - PCI, PCI-X, PCI Express
- LVDS
- SerDes



# Mobile Terminal Solutions Overview

- **Mobile Phone (Smart phone and PDA)**

- Analog Switch
- USB Switch
- Voltage Translator / Level Shifters
- Supervisory Circuits
- Real Time Clock Products



- **Portable Media Player**

- Analog Switch
- USB Switch
- Digital Bus Switch
- Supervisory Circuits
- Real Time Clock Products



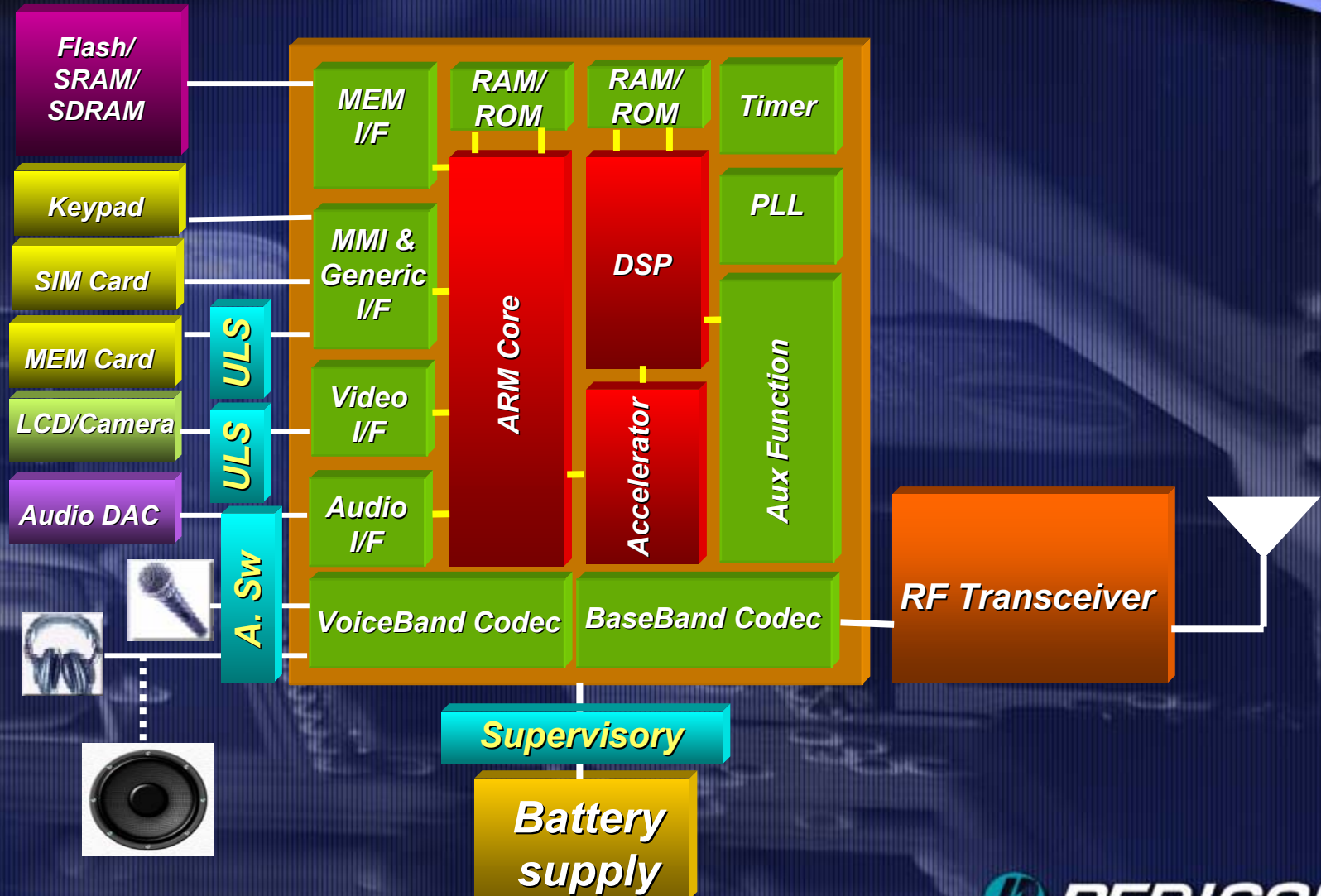


# **Mobile Phone Solutions**

## **(Smart Phone, PDA)**

# Broadcom Cell Phone Architecture

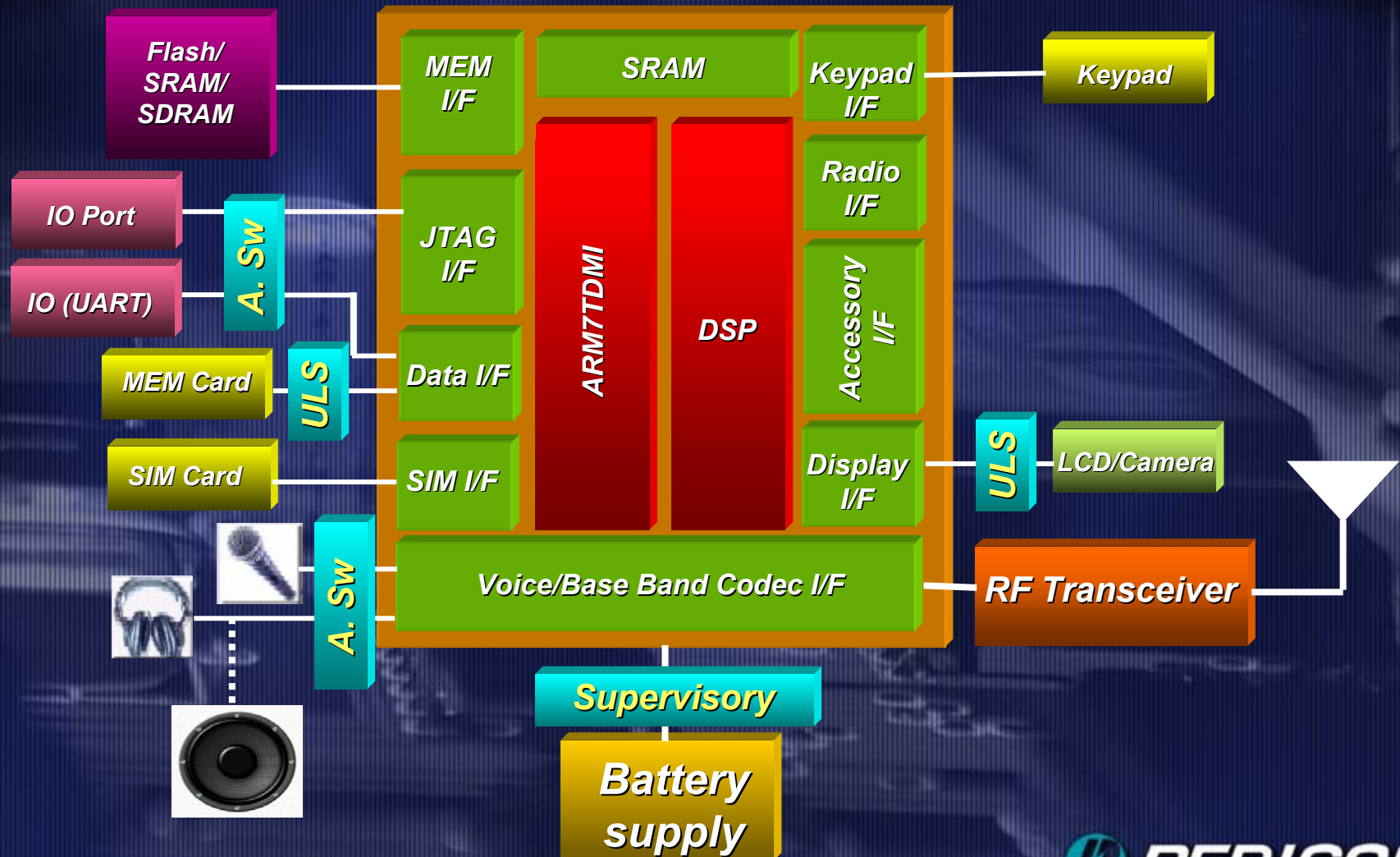
Using reference design BCM2132





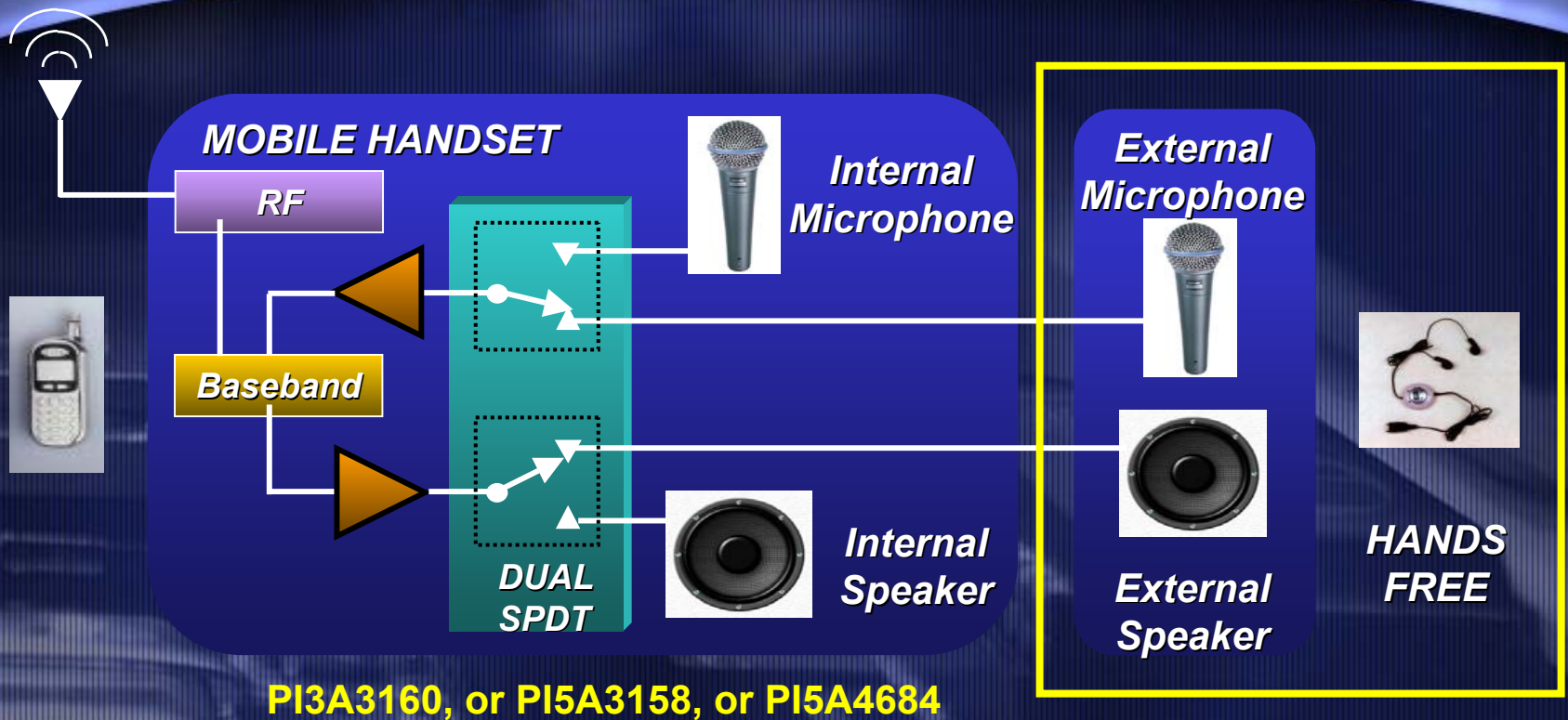
# Analog Device Cell Phone Architecture

Using reference Design AD6526



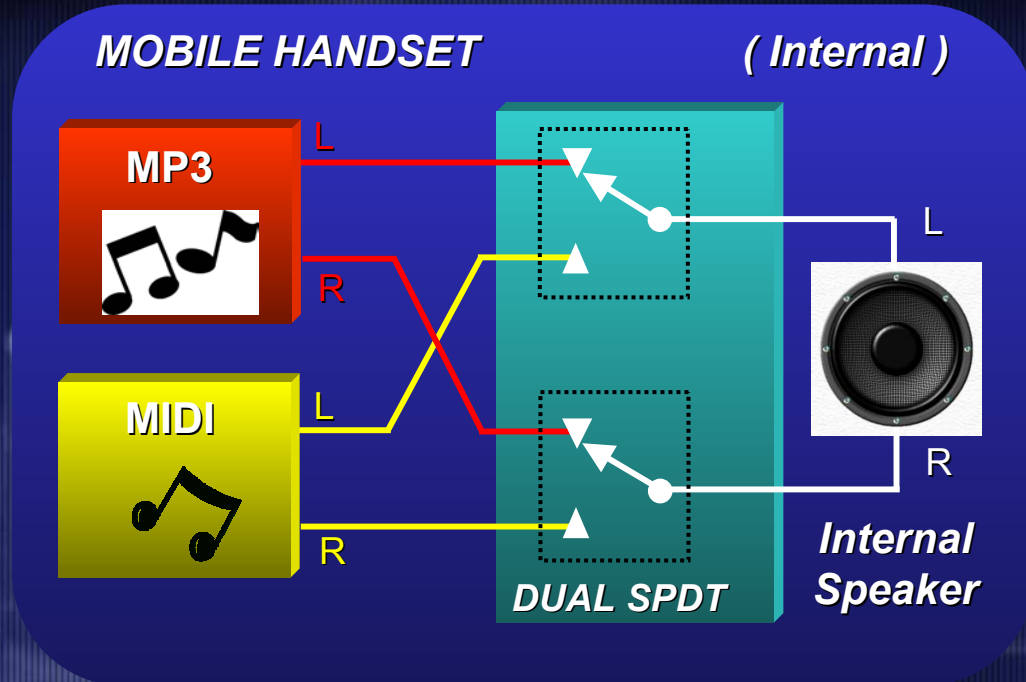


# AUDIO INTERNAL/EXTERNAL SWITCHING (Single & Dual SPDT)



*Application : Allow switching internal audio devices to external ones*

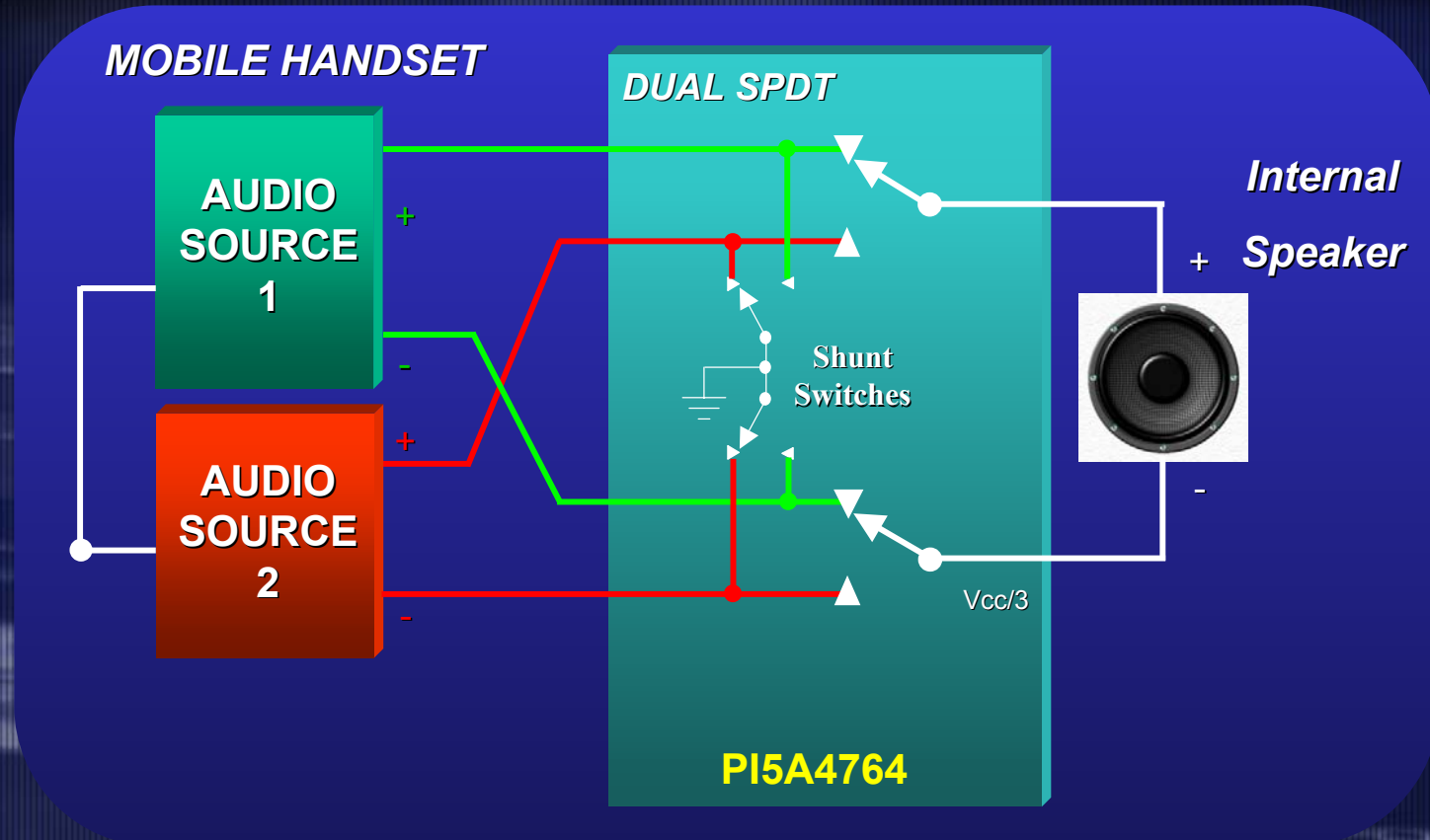
# DIFFERENTIAL 2:1 MUXING (Single & Dual SPDT)



**PI3A3160, or PI5A3158, or PI5A4684**

*Application : Allow internal speaker to switch between MP3 music and MIDI ring tone.  
Popular MP3 chip set is from Sigmatel (STMPxxx) and popular polytone  
ringtone chip set is from Yamaha (YMU765, YMU762)*

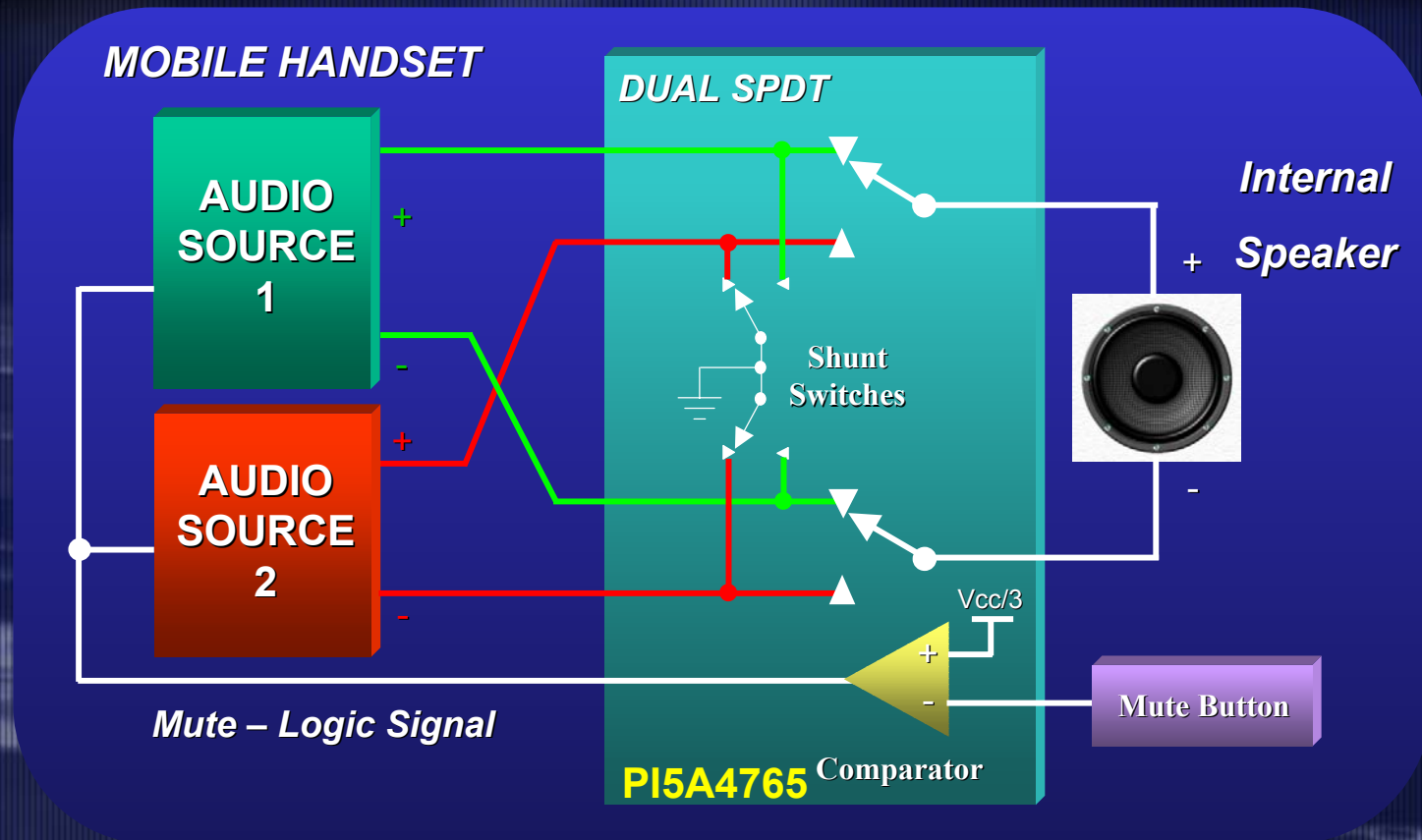
# DIFFERENTIAL 2:1 MUXING (Dual SPDT w/ Integrated Functions)



**Advantage:** On-Chip Shunt Switches to Ground Reduce Audio Popping & Clicking  
**Roadblock:** Speaker switching is being integrated into Base Band Processor, however, the integration will result in popping noise disadvantage. With our external switch, this popping sound is eliminated.

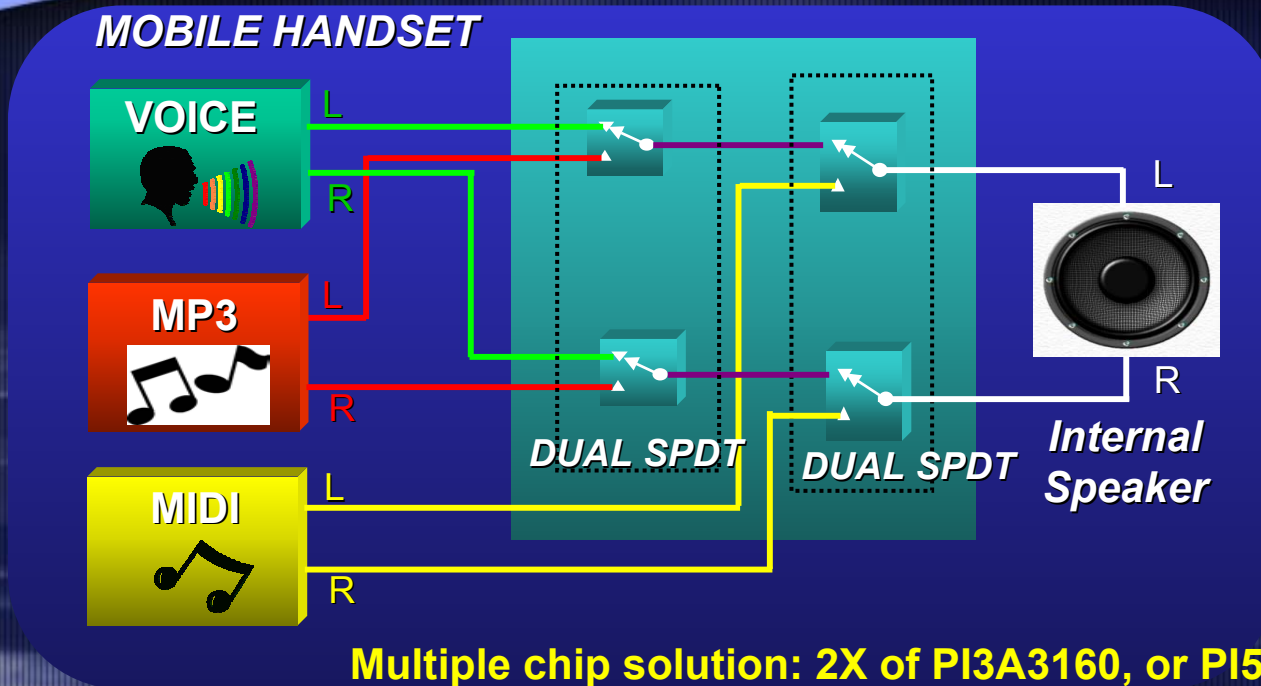


# DIFFERENTIAL 2:1 MUXING (Dual SPDT w/ Integrated Functions)



**Advantage:** On-Chip Comparator provides mute detection  
On-Chip Shunt Switches to Ground Reduce Audio Popping & Clicking

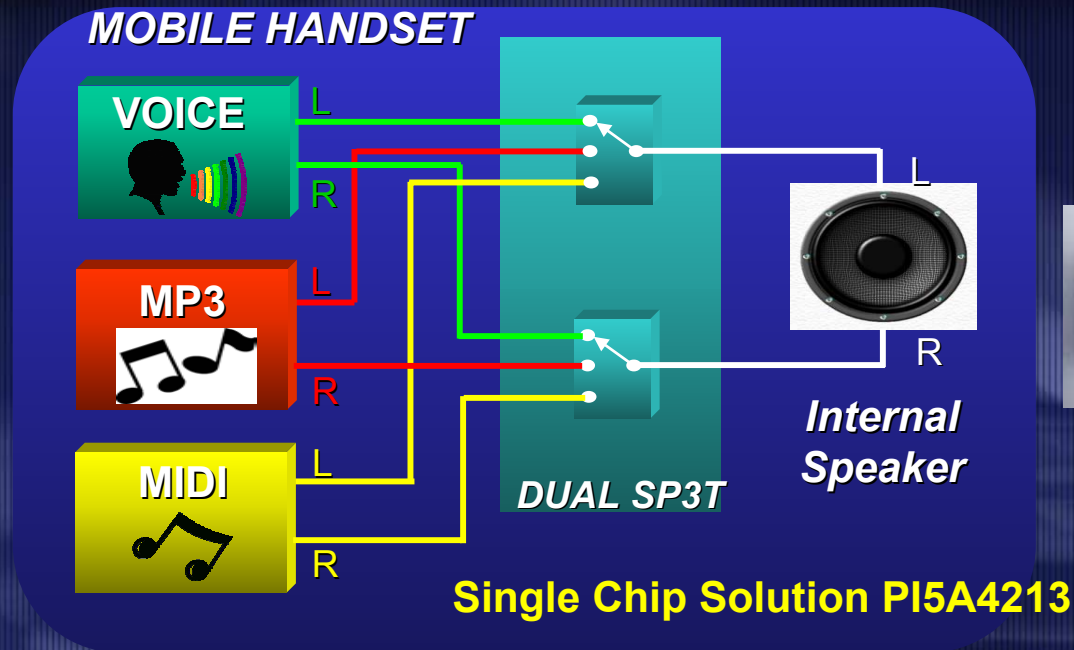
# DIFFERENTIAL 3:1 MUXING (Dual SPDT Solution)



*Application : Allow internal speaker to switch amount incoming voice, MP3 music and MIDI ring tone. Popular MP3 chip set is from Sigmatel (STMPxxx) and popular polytone ringtone chip set is from Yamaha (YMU765, YMU762)*

*> PI5A3158, PI3A3160 are the best Pericom offering for the Dual SPDT*

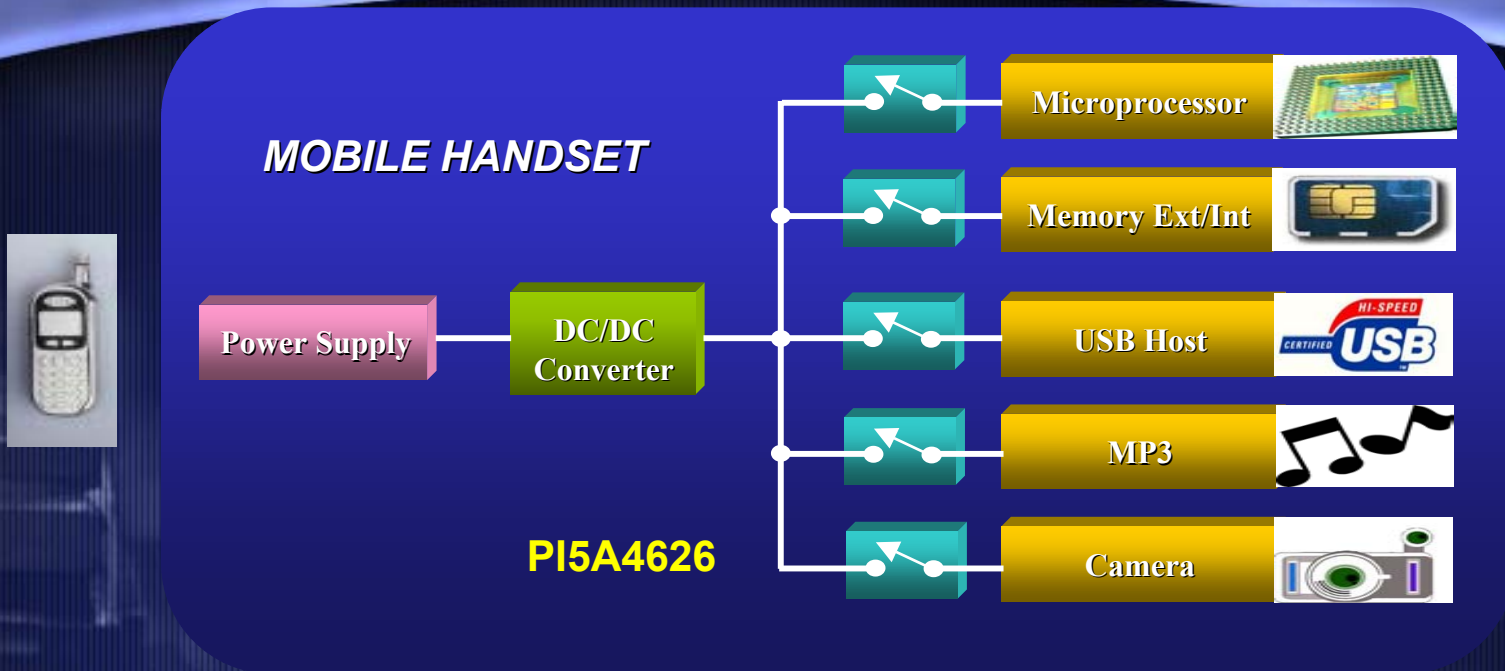
# DIFFERENTIAL 3:1 MUXING (Dual SP3T Solution)



*Application : Allow internal speaker to switch amount incoming voice, MP3 music and MIDI ring tone with one switch. Popular MP3 chip set is from Sigmatel (STMPxxx) and popular polytone ringtone chip set is from Yamaha (YMU765, YMU762)*



# Power Switching (SPST)



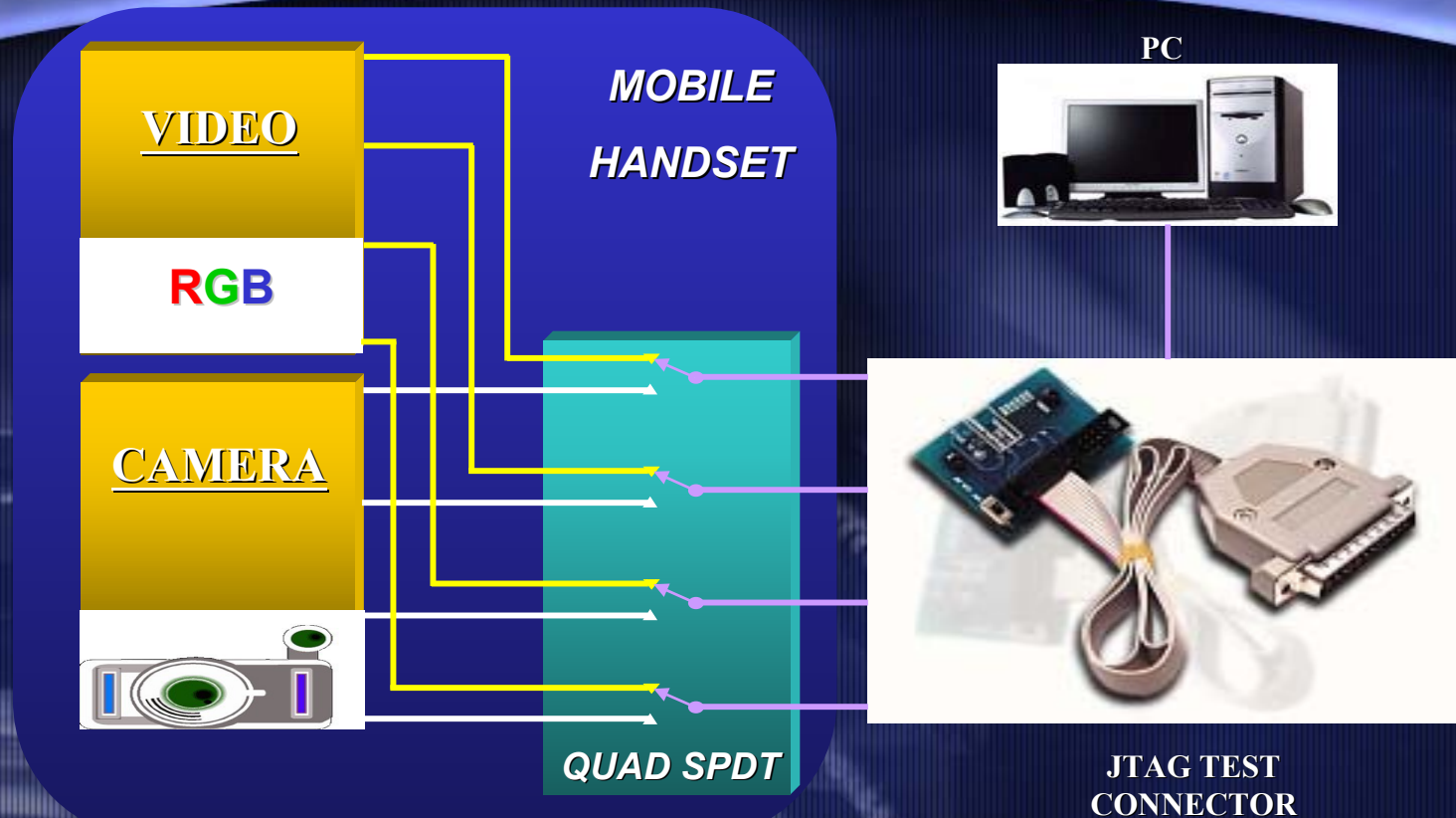
- **Battery Life is conserved by switching OFF unused devices**

*Application : Selectively switching (disconnect) inactive devices to save power and lengthen operation period. PI5A4626 (Single SPST) is available for this application*

*Advantage: Pericom SPST Analog Switches provide lower Ron compared to FET Switches*

- *Result → Increased Battery Life*

# JTAG Testing (Quad SPDT)

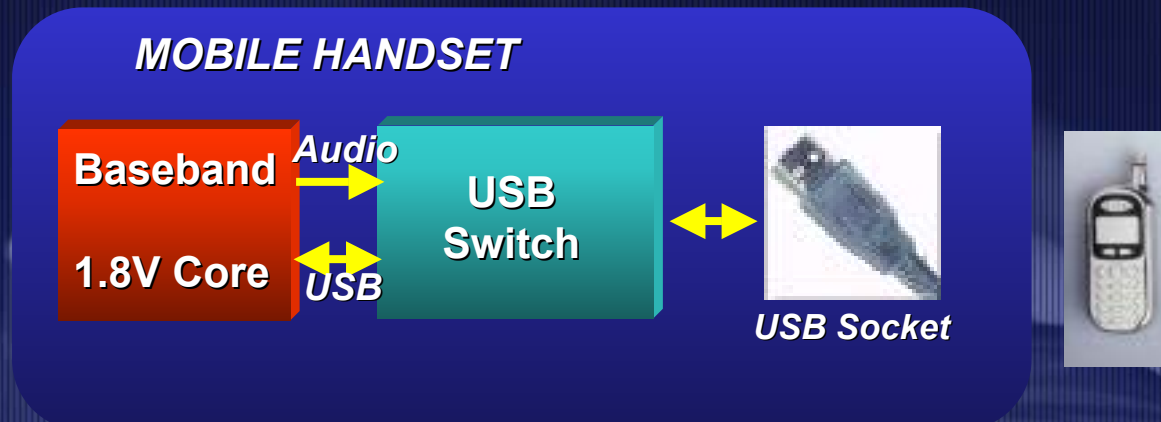


**2 x PI5A3158 or 2 x PI3A3160 or 1 x PI3A4780 or 1 x PI3A4784**

*Application : Share the JTAG testing pins for Camera module and Video display module. Other than testing, JTAG also able to act as debugging and firmware update function.*

*>PI5A3158, PI3A3160 (SPDT) are available*

# USB MUX

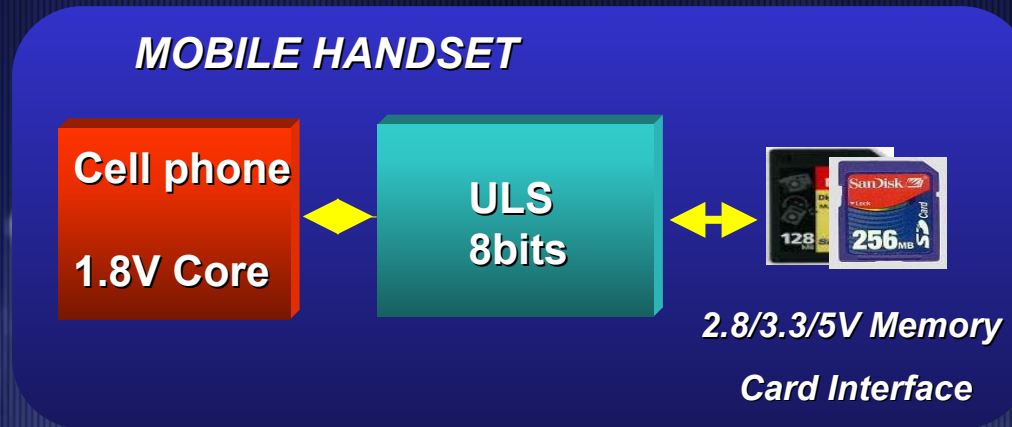


**PI5A3158 for USB 1.0 or PI3USB10 for USB 2.0**

*Application : Share audio and USB data signal for area optimization by reducing the USB socket.  
>PI5A3158 for USB1.0 data transfer, PI3USB10 for USB2.0 data transfer are available*



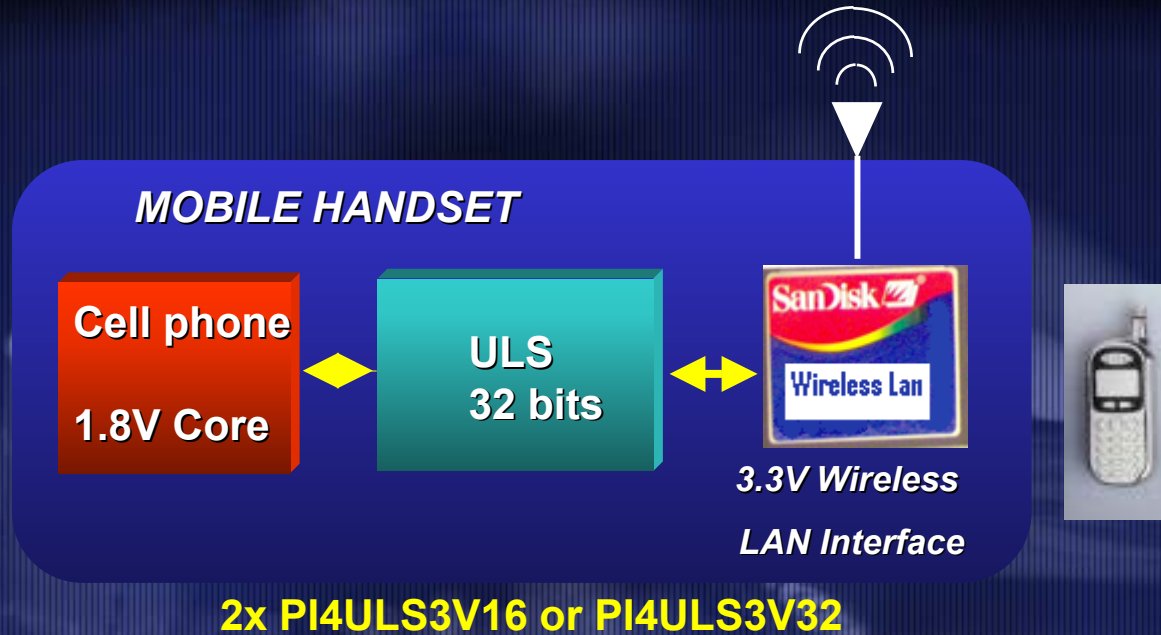
# Level translation (Memory Card Interface)



**PI4ULS3V16 or PI4ULS3V08**

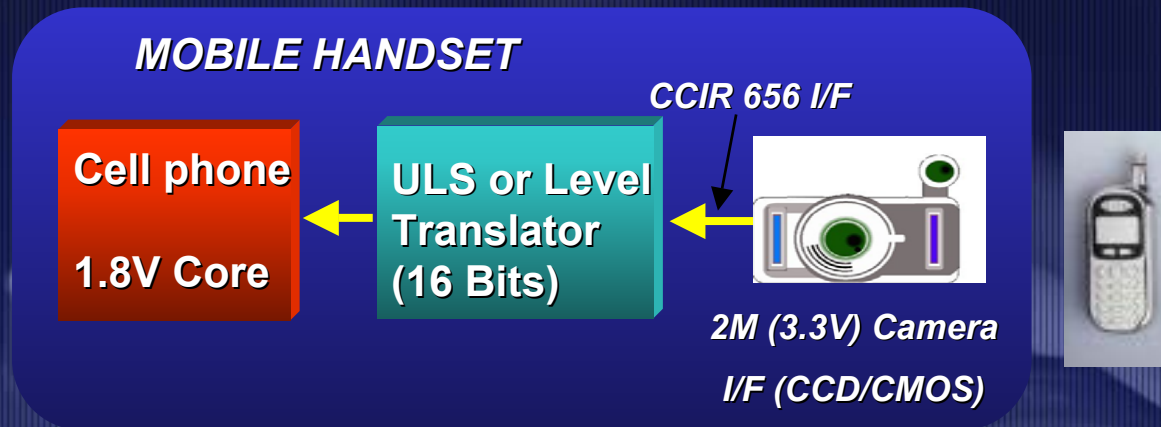
*Application: Data/Address bus voltage translation between 1.8V Baseband SOC and Memory Card.*

# Level translation (Wireless LAN Interface)



*Application : Data/Address bus voltage translation between 1.8V Baseband SOC and CF Card/type wireless LAN module.*

# Level translation (Camera I/F)

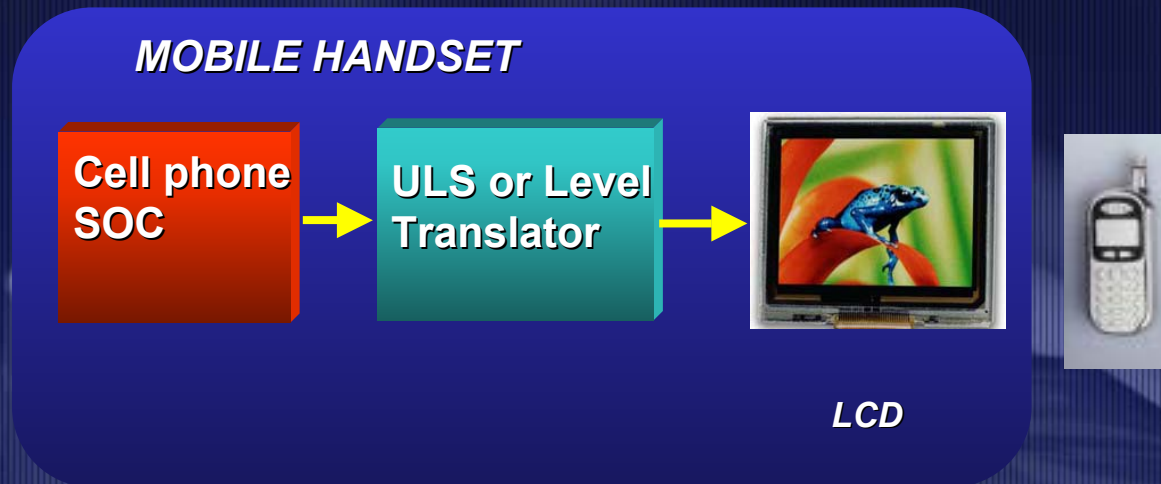


**PI74AVC164245, or PI4ULS3V16**

*Application : Data bus voltage translation between 3.3V camera and 1.8V Cell phone SOC. Common CCIR 656 Video interface speed around 270Mbps.*



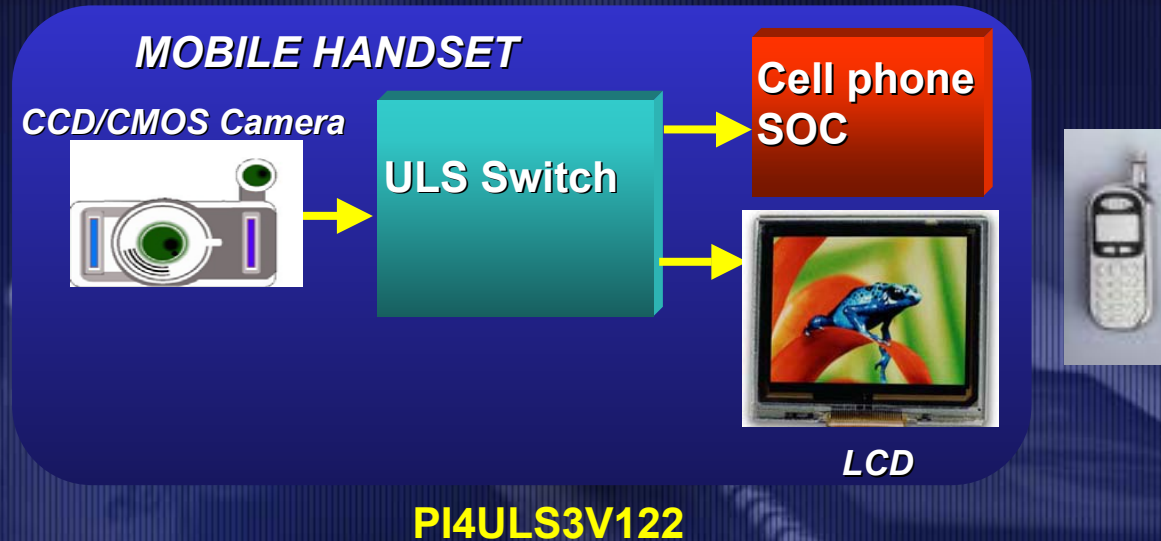
# Level translation (LCD I/F)



**PI74AVC164245, or PI4ULS3V08**

*Application : Voltage translation between Cell phone SOC and LCD module. Which depends on the LCD driver I/O capability*

# Level translation (LCD I/F, Camera MUX)



*Application : Multiplexing different devices (CCD/CMOS camera & LCD module) to share single video interface port. E.g. Bypass Cell phone for camera view to save power. Switch to Cell phone SOC for photo saving.*

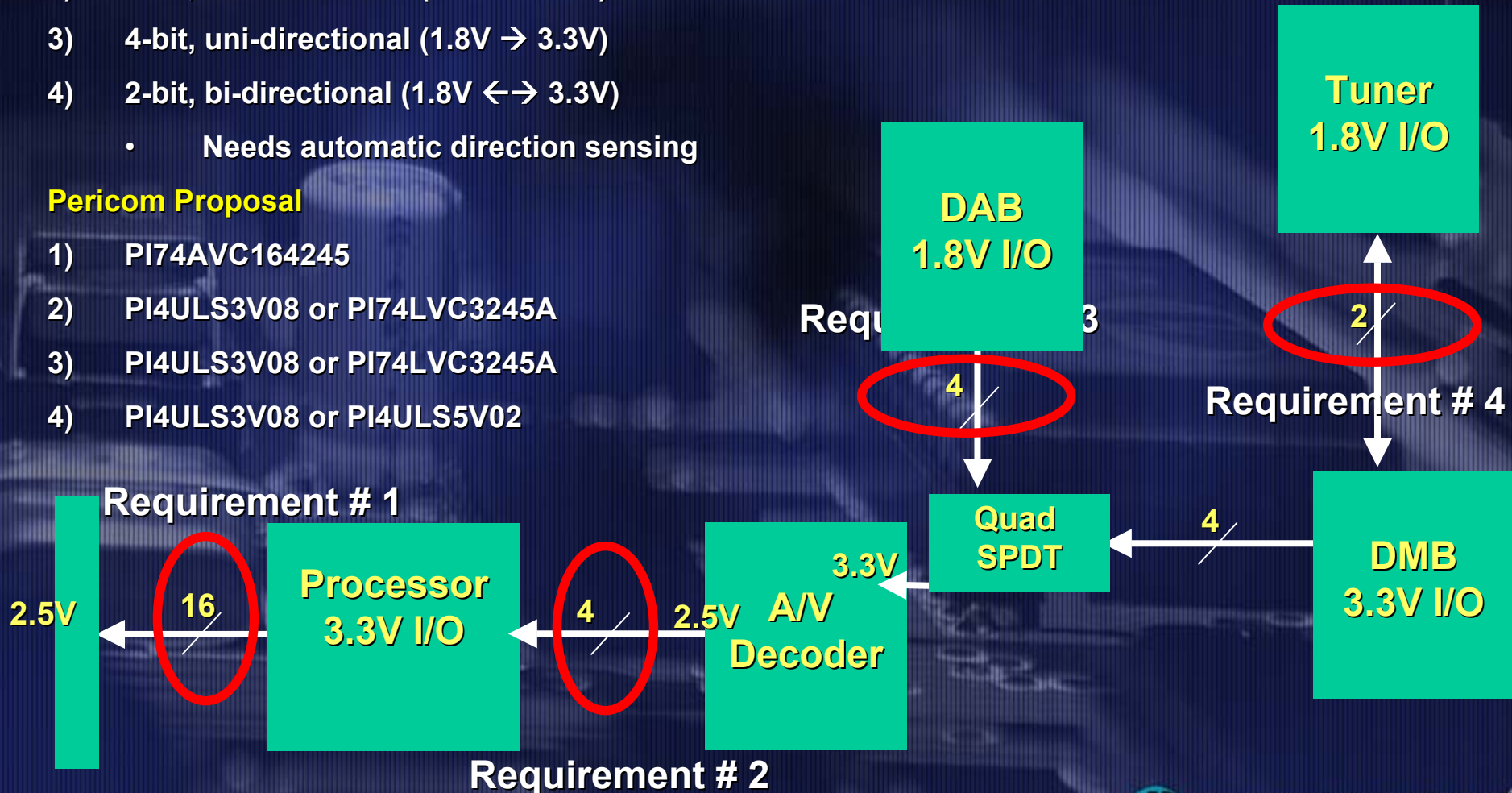
# MOBILE HANDSET APPLICATION

## Requirements

- 1) 16-bit, uni-directional (3.3V → 2.5V)
- 2) 4-bit, uni-directional (2.5V → 3.3V)
- 3) 4-bit, uni-directional (1.8V → 3.3V)
- 4) 2-bit, bi-directional (1.8V ↔ 3.3V)
  - Needs automatic direction sensing

## Pericom Proposal

- 1) PI74AVC164245
- 2) PI4ULS3V08 or PI74LVC3245A
- 3) PI4ULS3V08 or PI74LVC3245A
- 4) PI4ULS3V08 or PI4ULS5V02





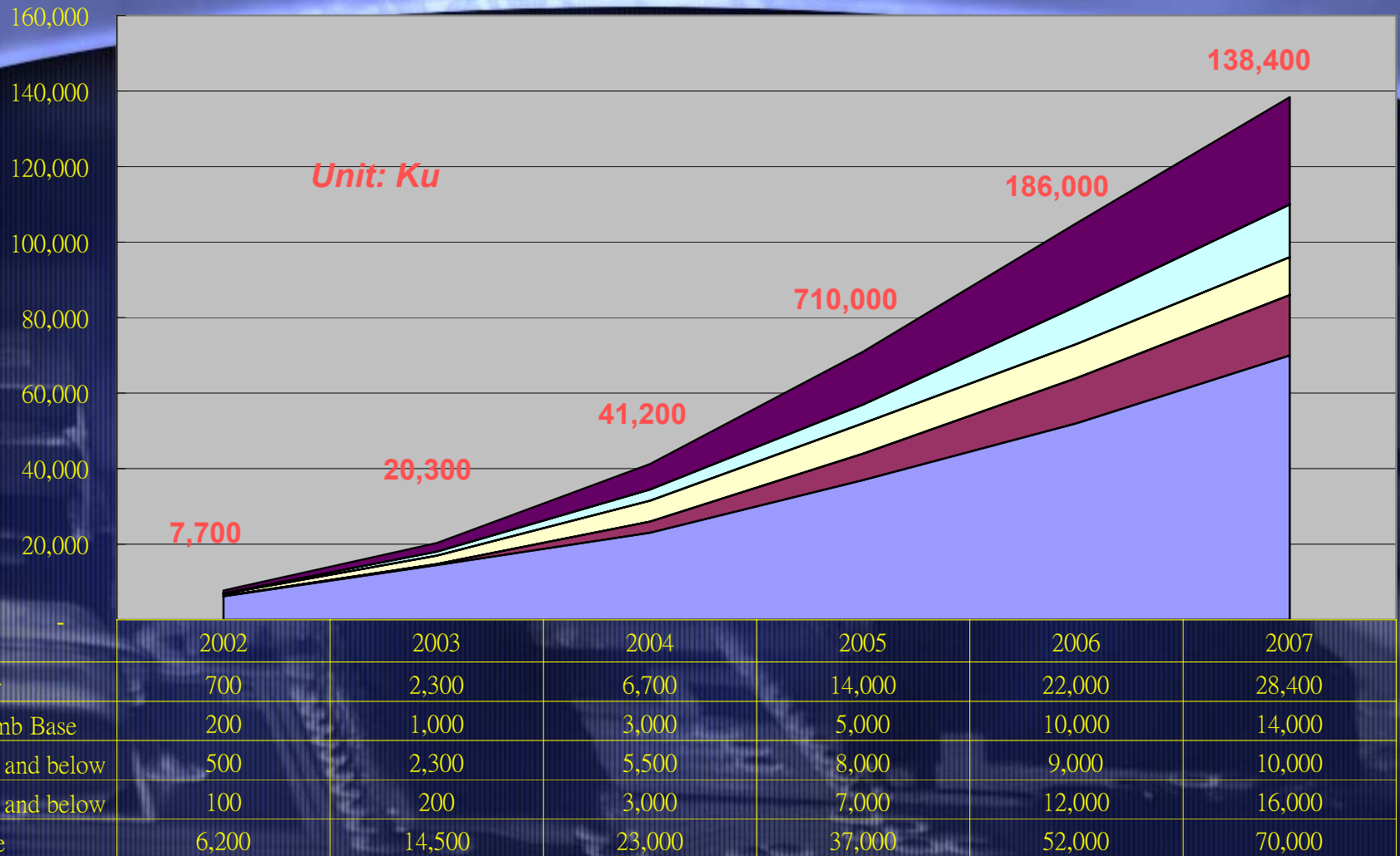
# Mobile Phone Product Solutions Overview

Function	Configuration	Available Parts
Analog Switch	SPDT	PI5A4626
	Dual SPDT	PI3A3160, PI5A3158
	Dual SP3T	
	Quad SPDT	
USB Switch	SPDT	PI3USB10
ULS	2-bits	PI74STX2G4245,
	8-bits	PI4ULS3V08
	16-bits	PI4ULS3V16, PI4ULS3V32
Supervisor	Reset	PT7M78XX



## **Solutions for Portable Media Player (PMP)**

# Digital Audio Market



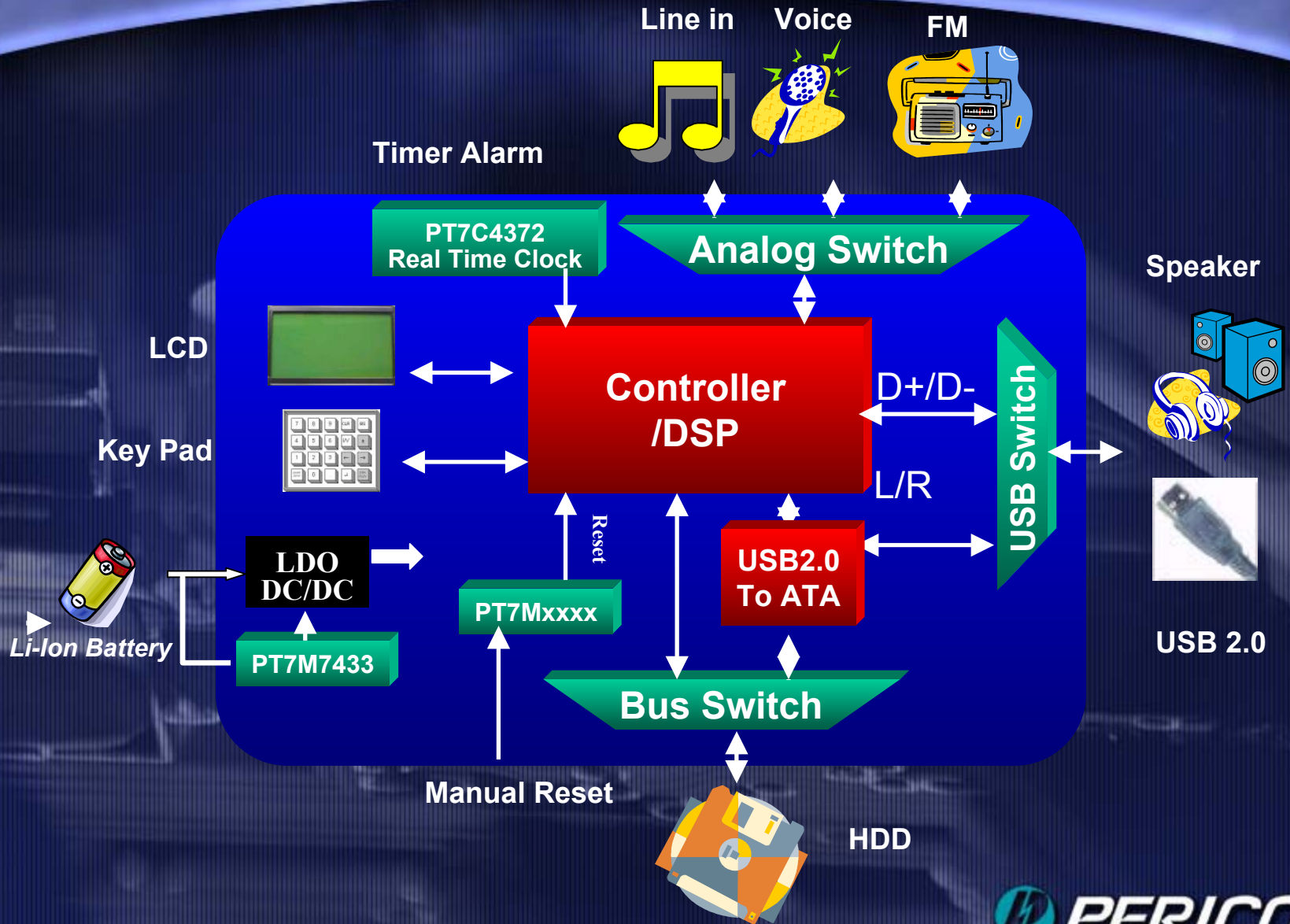
Source: CIBC World Market Corp. Apr/04



# Portable Media Player Product Trend

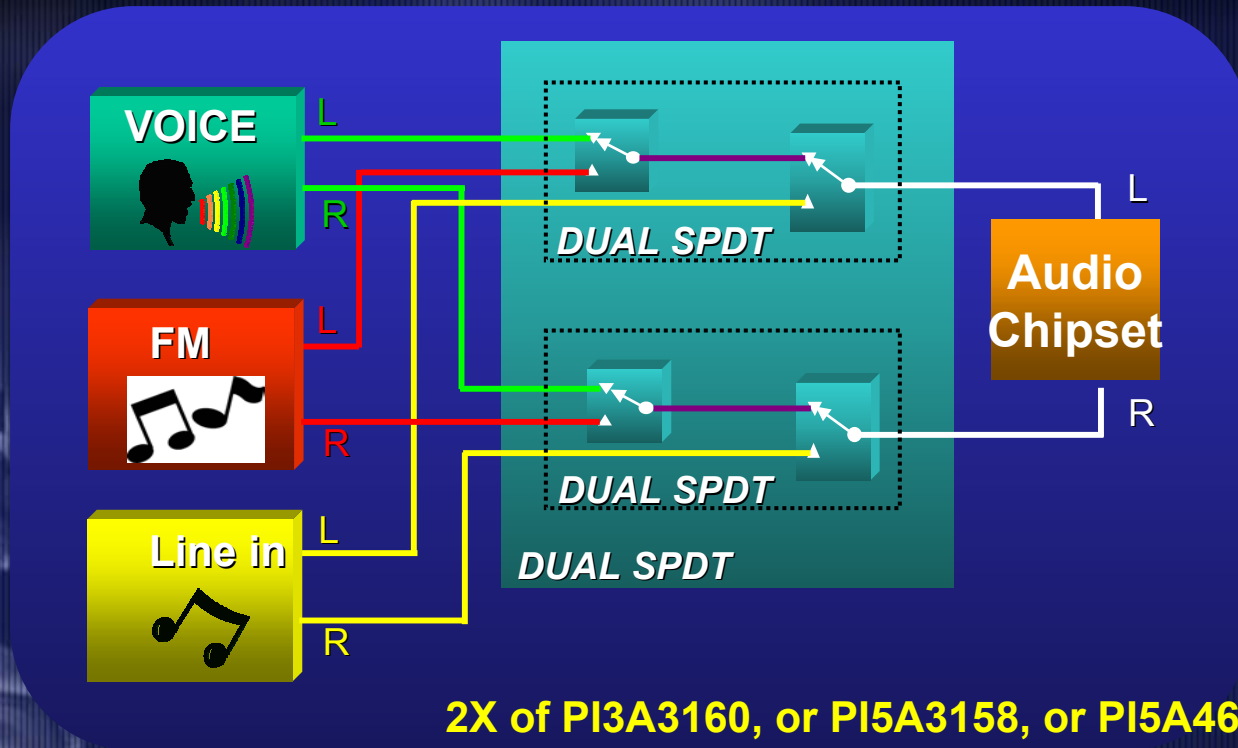


# Solutions for Portable Media Player



# MP3 Audio in and Recording

Stereo Voice, FM and Line in Recording Function

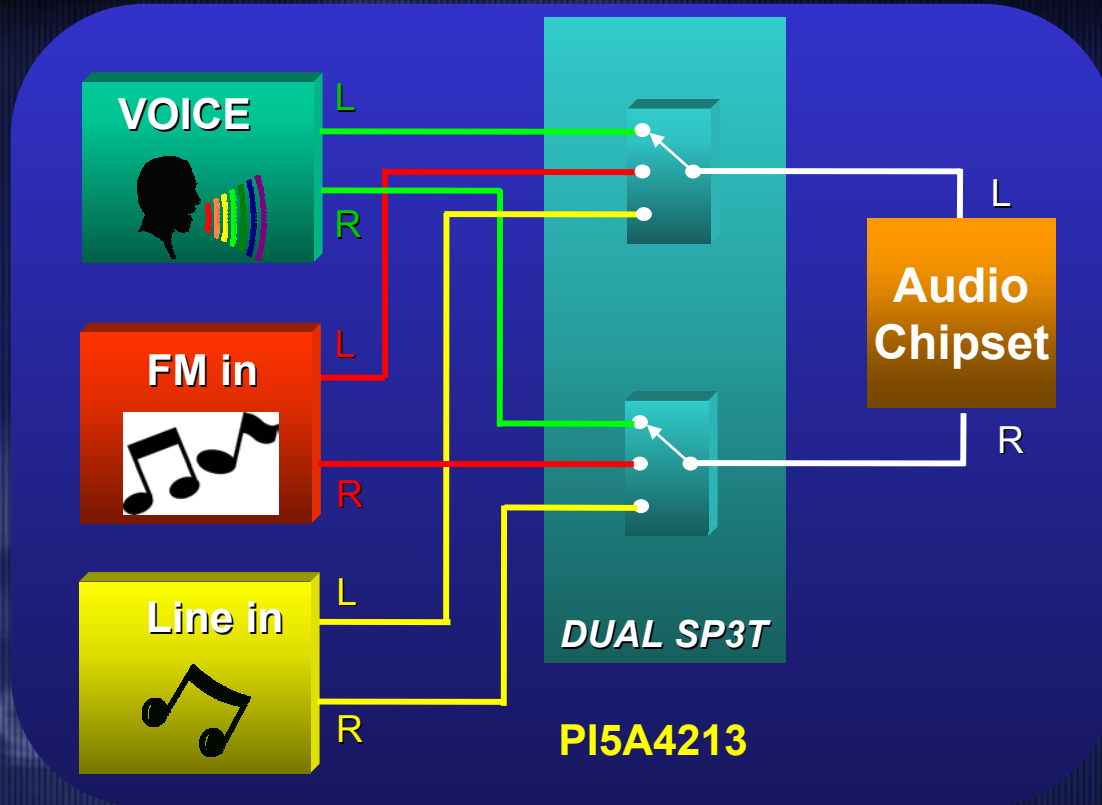


*Application : Allow Switching multi source audio in (FM in, Line in and Voice in)  
> PI5A3158, PI3A3160 are the best Pericom offering for the Dual SPDT*



# MP3 Audio in and Recording

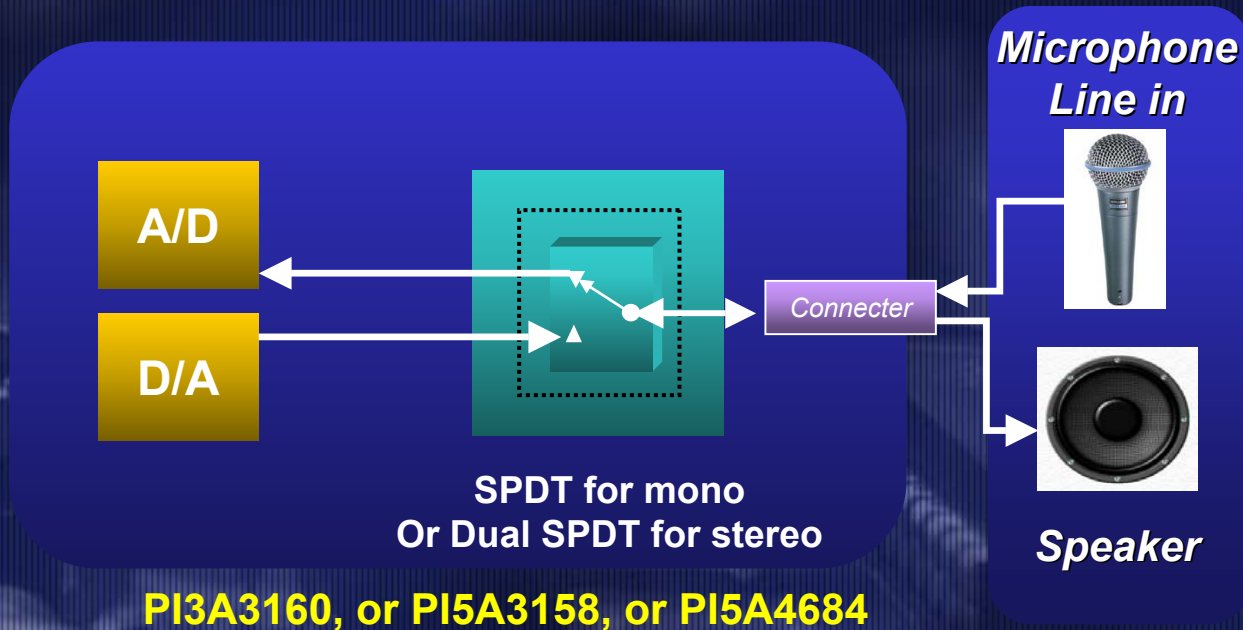
Stereo Voice, FM and Line in Recording Function



*Application : Application : Allow Switching multi source audio in (FM in, Line in and Voice in)  
> PI5A4213 (SP3T) are under developing*

# Small Size MP3

Line in and Speaker Signal Go Through One Header

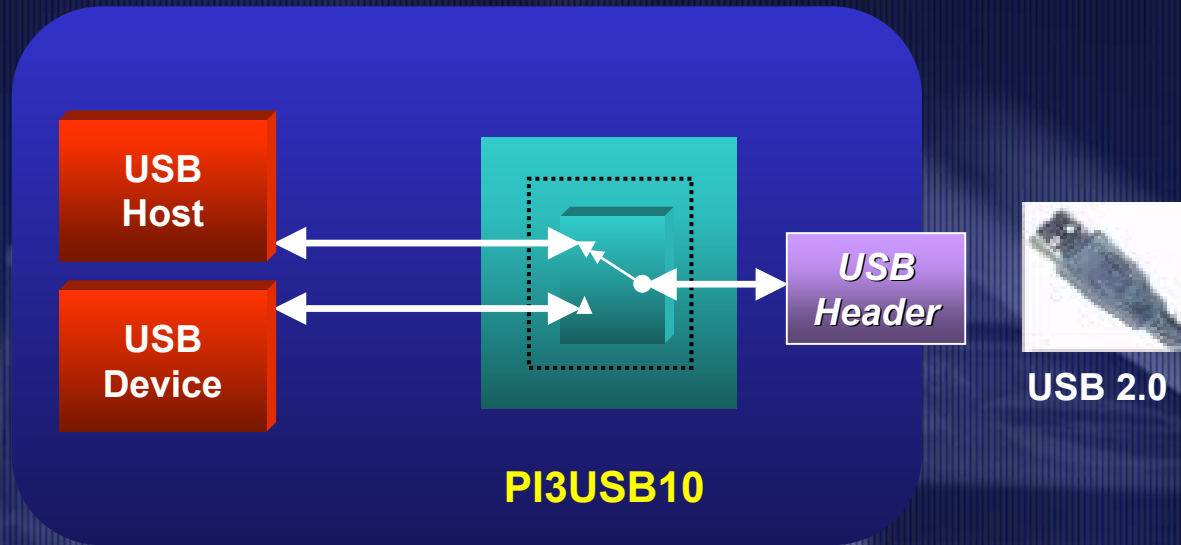


*Application : Allow MIC in and Speaker out through single connector  
> PI5A3158, PI3A3160 are the best Pericom offering for the Dual SPDT*

# USB Mini Host Solution

## USB Host and USB Device Two Chips Solution

For MP3 or Hard drive application

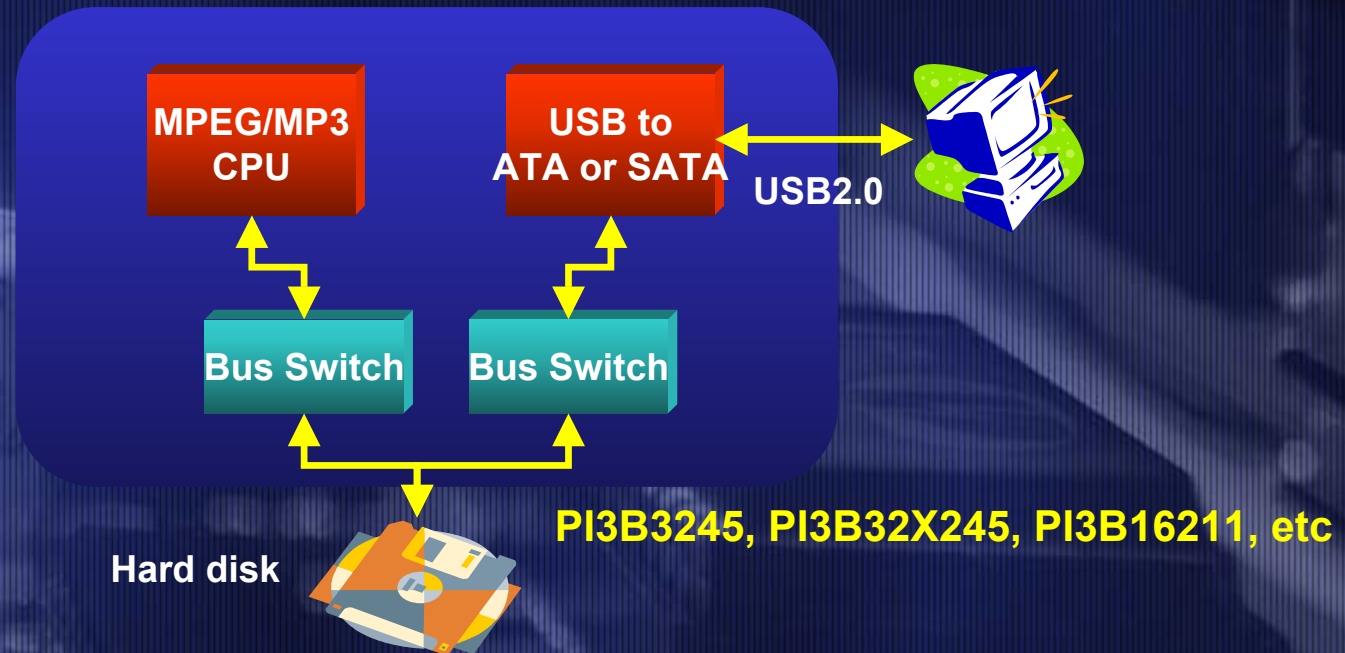


*Application : Share USB device and USB Host signal for area optimization by reducing the USB socket.  
>PI5A3158 for USB1.1 data transfer, PI3USB10 for USB2.0 data transfer are available*



# Portable Media Player with External USB Bridge

Switching between PC model and Stand alone model



*Application : Some of MPEG or MP3 chipset (as Sigma Design, TI, ESS, etc) without USB2.0 controller inside and need a external USB2.0 to ATA controller .*

*Pericom provide 8bits, 16bits, 20bits and 24bits bus switch*

# Portable Media Player Product Solutions Overview

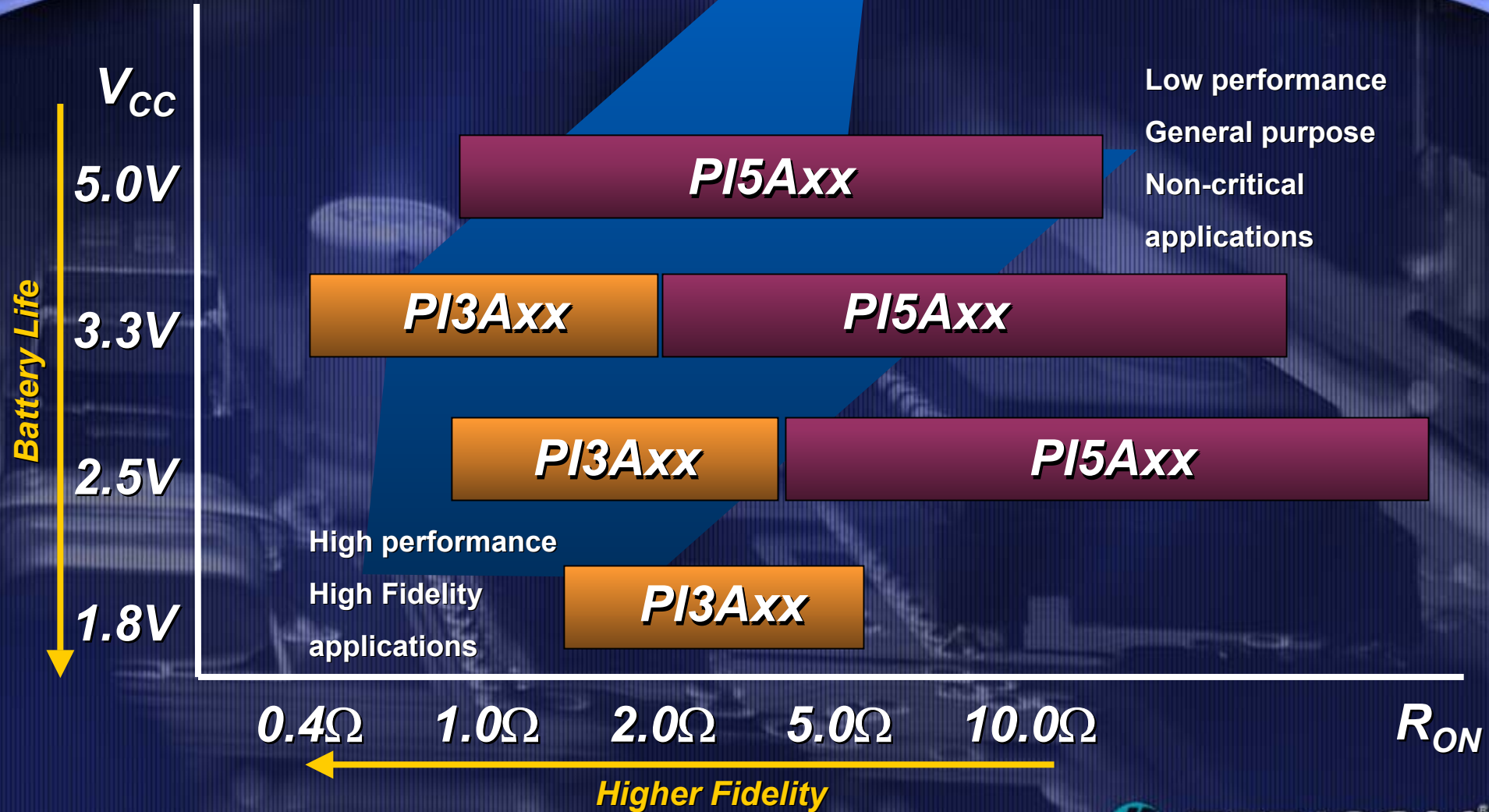
Function	Configuration	Available Parts
Analog Switch	SPDT	PI5A4626
	Dual SPDT	PI3A3160, PI5A3158
	Dual SP3T	
USB Switch	SPDT	PI3USB10
Bus Switch	8-bits	PI3B3245, PI5C3245
	16-bits	P3B32X245, PI5C32X245
	24-bits	PI3B16211, PI3CHxxx
Supervisor	Reset	PT7M78XX
RTC	Alarm	PT7C4372



## **Analog Switches for Mobile Terminals**



# ANALOG SWITCH PRODUCT OFFERING





## **Voltage Translation / Level Shifters for Mobile Terminals**

# Voltage & Signal Conversion

- **Allow devices of different voltage levels or signals to work together on the Notebook Motherboard**
  - Translation of Voltage & I/O Signals
- **Device:**
  - Voltage Converter and Switch Translators
  - ULS - Bi-Directional with no control Pins





# Voltage Translator Offerings

**Translators:**

Voltage supply Level



Uni-Directional Data & Clocks	Bi-Directional Bus I2C, SM, SPI, MICROWIRE, ISA, PCI-33 /66, AGP, PCI-X
<b>PI74LVC/Cxxxx</b> 3.3V / 5V	<b>PI4ULS5V02/04/08</b> 1.5V to 5V
<b>PI3VTxxxx (Zero Delay)</b> 1.8V / 3.3V	
<b>PI74AVC164245</b> 1.5V / 3.3V	<b>PI4ULS3V08/16 /32</b> 1.5V to 3.3V
<b>PI74STX2G4245</b> 1.65V / 5V	
<b>PI74AUC4245</b> 0.8V / 2.5V	

80 Mbps

160 Mbps

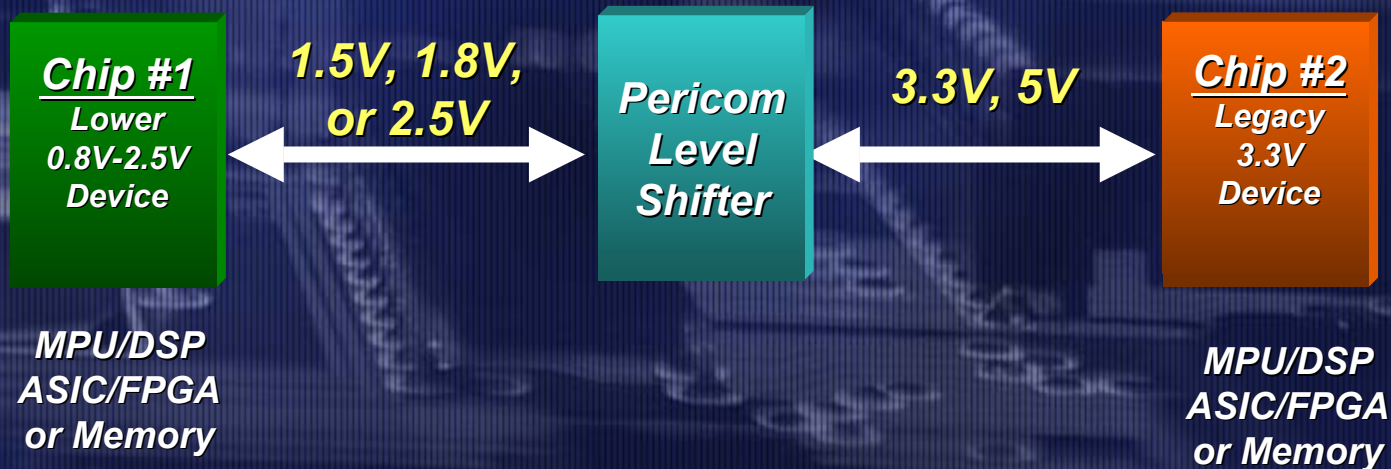
(With Direction Pin)

(No Direction Pin)

# Voltage Level Shifters

**PI74AUCxxx, PI74AVCxxx, PI49FCTxxx**

- **Great Chip-to-Chip Interface Between**
  - Different I/O Voltages
    - 1.5V/1.8V/2.5V/3.3V to 5V
    - 0.8V to 2.5V
  - Different I/O Standards
    - HSTL to LVTTTL / LVCMOS, SSTL to TTL, etc....



# Universal Level Shifter (ULS)

- **Allows Bi-directional Translation**

- **Voltage Translation from**

- 1.5V to 3.3V
- 1.5V to 5V



- **Universal Bus Translation**

- I<sup>2</sup>C, SM, SPI, Microwire, ISA, PCI-33, PCI-66, AGP

- **NO direction pin – transparent to the bus**

*\* In Development,  
Check on Availability*



# Universal Level Shifter (ULS)

## PI4ULS3Vxx

- **Features**

- |                   |                             |
|-------------------|-----------------------------|
| • 56 Contact TQFN | 11 x 5mm                    |
| • Vcc Range       | -0.5V to +4.6V              |
| • Voltage levels  | 1.1V to 3.6V on either port |
| • Configurations  | 32-bit, 16-bit, 8-bit       |
| • Bandwidth       | 160 Mbps                    |

- **Added Value**

- Voltage translation without direction pin
- Within bus applications, it is difficult to generate separate control signals.



## **USB 2.0 Switches for Mobile Terminals**

# USB 2.0 Switches



- **PI3USBxx Family supporting USB2.0**

- Allows an USB host controller to switch between two sets of ports
- Backward Compatible



- **Target Applications**

- Notebooks for docking
- USB device sharing & USB signal routing
- POS Equipment



USB 2.0 & Backward Compatible





# Pericom Complete USB Switch Line-Up

## UNIVERSAL SERIAL BUS

Voltage	Solution	Speeds	R-On	C-On	Configuration	-3dB BW
3.3V	<b>PI3USB10</b>	Low/Full/Hi	4 Ohms	6 pF	Differential 2-Channel 2:1 Mux/Demux	>500 MHz
3.3V	<b>PI3USB20</b>	Low/Full/Hi	4 Ohms	6 pF	Differential 4-Channel 2:1 Mux/Demux	>500 MHz
3.3V	<b>PI3USB40</b>	Low/Full/Hi	4 Ohms	6 pF	Differential 8-Channel 2:1 Mux/Demux	>500MHz
3.3V	<b>PI3USB14</b>	Low/Full/Hi	4 Ohms	15 pF	Differential 2-Channel 4:1 Mux/Demux	>300MHz

Note: R-On and C-On are typical values

**“First Unified Low/Full/Hi-Speed USB Switch in the World”**



## **Real-Time Clock (RTC) for Mobile Terminals**

# Real Time Clock - PT7C4372A/B

## Features

**Time keeping operation voltage: 1.45V~6V**

**Lower power consumption: 0.6uA Typ(Vcc=3V)**

**Interrupt to CPU**

**12-hour or 24-hour time display selectable**

**High precision time trimming circuit**

**Package: TSSOP8**

## Applications

- ✧ DVD+R/W(HDD)
- ✧ PVR
- ✧ GPS
- ✧ HDTV/LCD TV
- ✧ PMP(Portable Media Player)
- ✧ Media phone, Smart Phone

**Pin to Pin Compatible with RICOH RS5C372A/B**

Item	PT7C4372A/Ricoh RS5C372A	PT7C4372B/ Ricoh RS5C372B
Clock input	External clock input or crystal, 32.768kHz or 32.000kHz selectable	
Clock adjustment	Unit $\pm 3.051\text{ppm}$ for 32.768kHz crystal; $\pm 3.125\text{ppm}$ for 32.000kHz crystal	
Period interrupt	Output from /INTA and /INTB	Output from /INTA
Alarm output	/INTA: Alarm_A; /INTB: Alarm_B*	/INTA: Alarm_A or Alarm_B*
Oscillation detect	√	√
32-kHz clock output	Via /INTB output enabled by register	Via FOUT output enabled by register
Package	SSOP8	
Operating Voltage	1.4V~5.5V voltage for clock; 2V~5.5V for serial interface	
Low Power Consumption	0.5uA/3V(Typical)	



## Standard RTC Advantage VS RTC by CPU

- ✧ Ultra-low Power Consumption
- ✧ High Accuracy
- ✧ Hardware timer



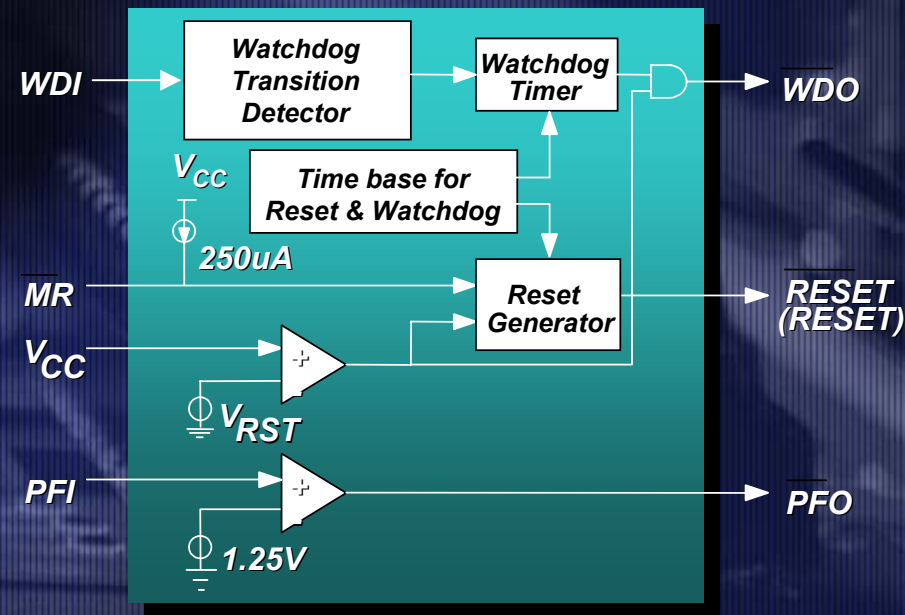


# **Microprocessor Supervisor Circuits for Mobile Terminals**

# Microprocessor Supervisor Circuits

**Microprocessor ( $\mu$ P) Supervisor Circuits, also called Power-good Circuits, or Reset Circuits, offer precision supply voltage monitoring.**

- **Precision Supply-Voltage Monitor**
  - 200ms Reset Pulse Width
- **Reset**
  - Active High & Active Low
- **Guaranteed RESET Valid at  $V_{CC} \geq 1.2V$**
- **Independent Watchdog Timer Output**
- **Power-Fail or Low Battery Detection**
- **De-bounced TTL/CMOS Compatible Manual Reset Input**



# Supervisor Circuits Summary

Features	PT7A75XX	PT7M78XX	PT7M74XX	PT7M61XX/64XX
Watchdog	V	V	X	X
Reset	V	V	External Adjustable	Fixed(100mV increment)
PFI	External Adjustable	External Adjustbale	External Adjustable	Fixed(100mV increment)
Manual Reset	V	V	X	X
Operation Current	10uA	5~10uA	0.9uA	0.9uA
Available Package	SOIC8/DIP8	SOT23-3,5,6, SOT143	SOT23-5,6	SC70, SOT23, TO92
Compatible part	MAX705/6/7/8,813	MAX809/10/11/12 MAX823/4/5	MAX64XX	MAX646X, XC61XXXX
Cost	High	Mid	High	Lowest
Application	Medical Instrument, Such as CO, AN, BSC, Router, SDH	Embedded CPU terminals, Such as xDSL, DVR, TV, POS, DSC,PDA	Battery Powered System, Such as MP3, PDA, PMP, Smartphone	Battery Power System, Such as DSC, MP3, PDA, PHS, Smartphone





**Thank You**

**End of Presentation**