



High-Performance Switches

Analog, Digital, & Application Specific Switch

SiliconSwitch™ Overview



SiliconSwitch™ Family Overview

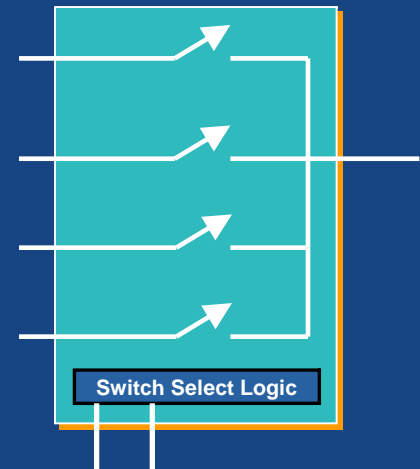
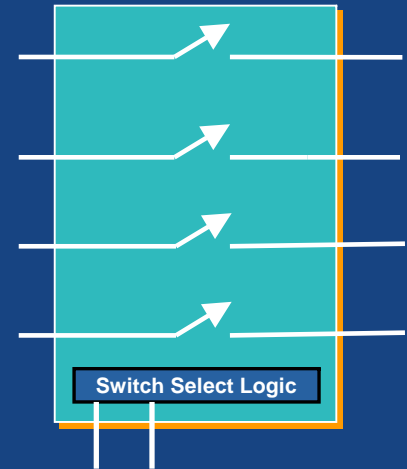
→ Executing Industry Leadership

- Number 1 Digital Bus Switch supplier in the world with 24% M/S
- Analog Switch portfolio offers the most optimized solution: Ron, Lower voltage & smaller packages
- Provide a wide variety of high speed differential switch products such as LAN, USB, Video, PCIe, HDMI, SATA
- World's first PCIe signal switch, providing bandwidth allocation solution for PCI Express lanes at 2.5Gbps
- World's first DVI/HDMI signal switch, providing the highest HDTV video resolution (1080p) at 1.65Gbps

Switch Introduction

→ Characteristics of a Pericom Switch

- Can quickly turn ON / OFF a bus or a line
- When it is ON
 - It has ZERO delay through it
 - It can pass 0 to 700 MHz signals
- When it is OFF
 - It can be used for HOT-PLUG
- Has full Bi-directional signal passing (no drive)
- Comes in 1 to 48-bit wide configurations
- Comes in the smallest packages available
- Costs less than a typical logic solution



Applications for Switch Products

→ Digital Bus Switch

- Server & Workstation
- Switch - Routers
- Memory Modules
- Notebook PCs & Hot Docking
- Live Insertion & Isolation
- Clock Selection and Fan out
- Voltage Translation

→ Analog Switch

- Consumer Audio
- Cell Phones
- Notebook PC's
- Handheld PC's
- Disk Drives
- Consumer Video
- Internet Appliances
- Industrial, Medical, Electronic Instrumentation





Digital Bus Switch Family



Features that put Pericom #1

→ Negligible Delay

- Offers “Zero” prop delay solution in critical applications

→ Low power consumption

- Lowest standby & active current in the industry

→ Hot Insertion Ready (All FET Families)

- Excellent Isolation / Excellent circuit protection

→ Low OFF & ON capacitance

- Minimizes capacitance loading and signal distortion

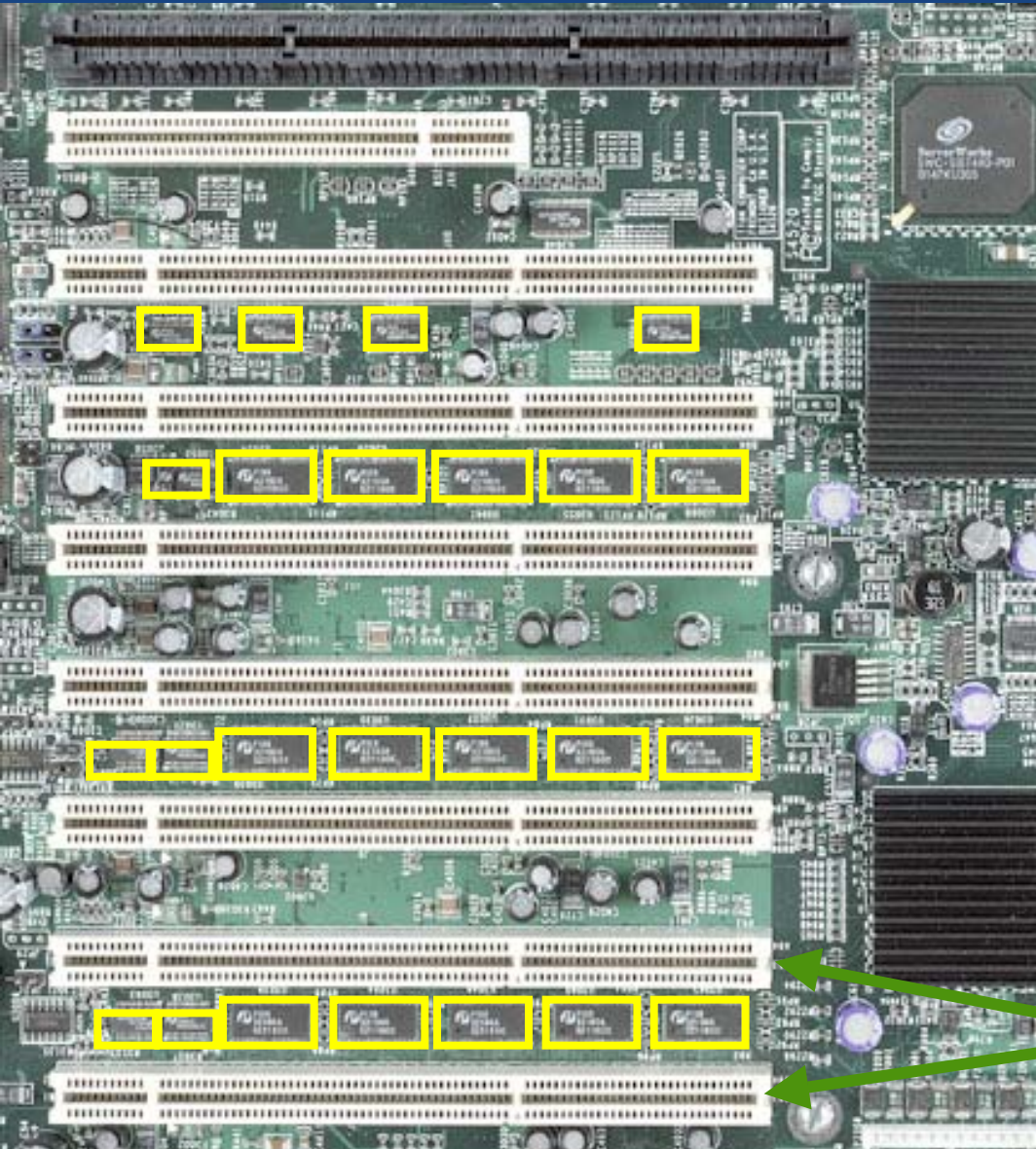
→ High OFF & Low ON resistance

- Maximizes isolation when OFF and minimizes loading when ON

PI3CH Family Performance

Required Performance for Leading Edge Signal Switching	PI3B Characteristics	PI3C Characteristics	PI3CH Characteristics
$V_{CC} = 2.5V$ or $3.3V$	3.3V only	2.5V or 3.3V	2.5V or 3.3V
$R_{ON} = 5$ Ohm	5 to 17 Ohm	5 to 15 Ohm	5 Ohm - Flat
$C_{ON} = 5pF$ to $10pF$	16pF	10pF	5pF to 10pF
5V I/O Tolerant	No	No	Yes
-2V Undershoot	No	No	Yes
Hot Insertion	No	No	Yes
Wide Bandwidth (>200 MHz)	< 133MHz	< 133MHz	200 to 500MHz
Rail-to-Rail Switching	No	Yes-Charge pump	Beyond (5V)
Power Sequencing Sensitivity	Yes - PMOS leakage requires $+V_{CC}$ prior to I/O	No	No

Pericom Switches on Server

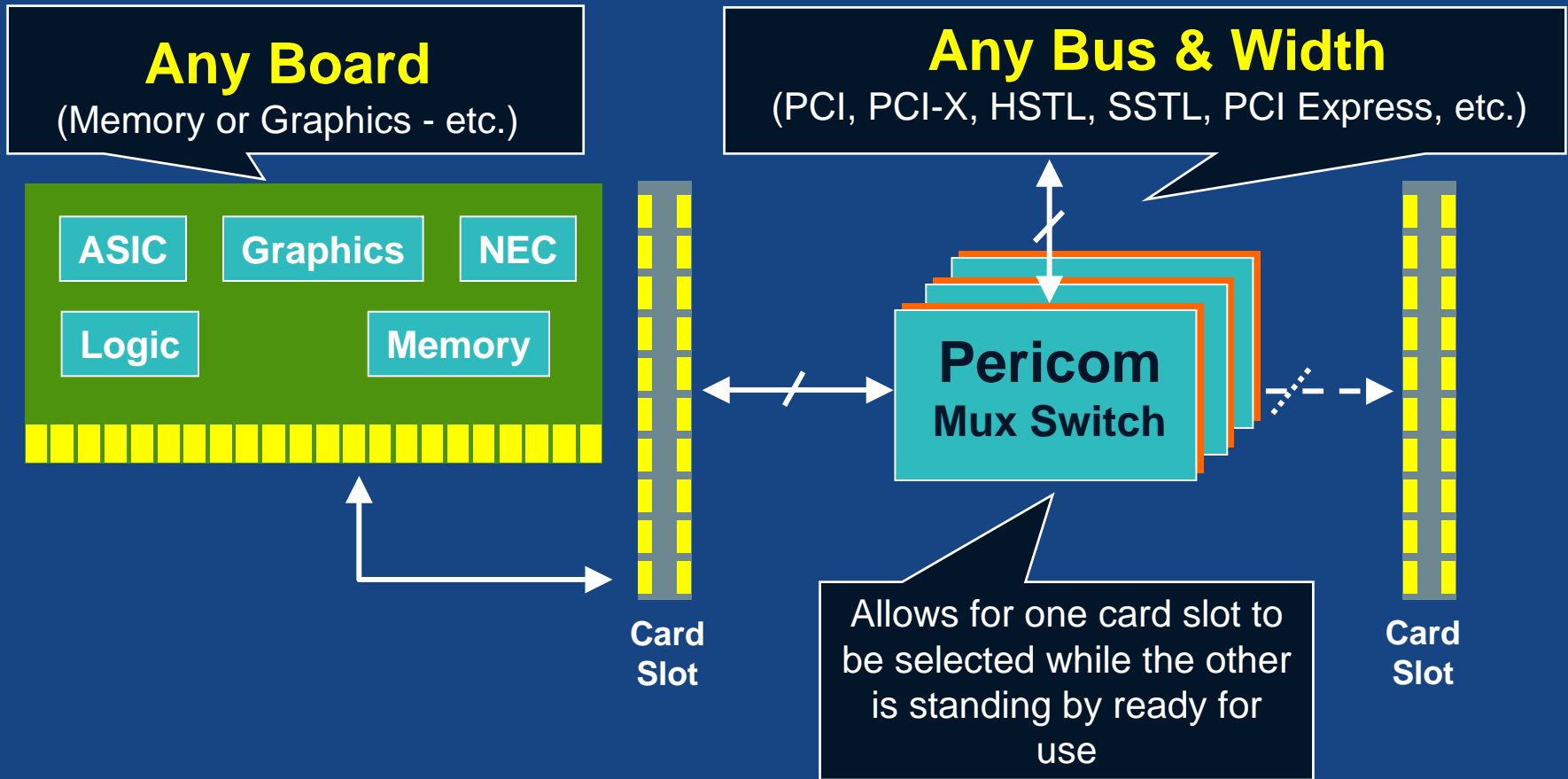


→ 24 Switches on this Server Motherboard

- More Pericom Logos than any other supplier

Switch Between PCI-X Slots

Hot-Plug & Bus Slot Selection





Analog Switch

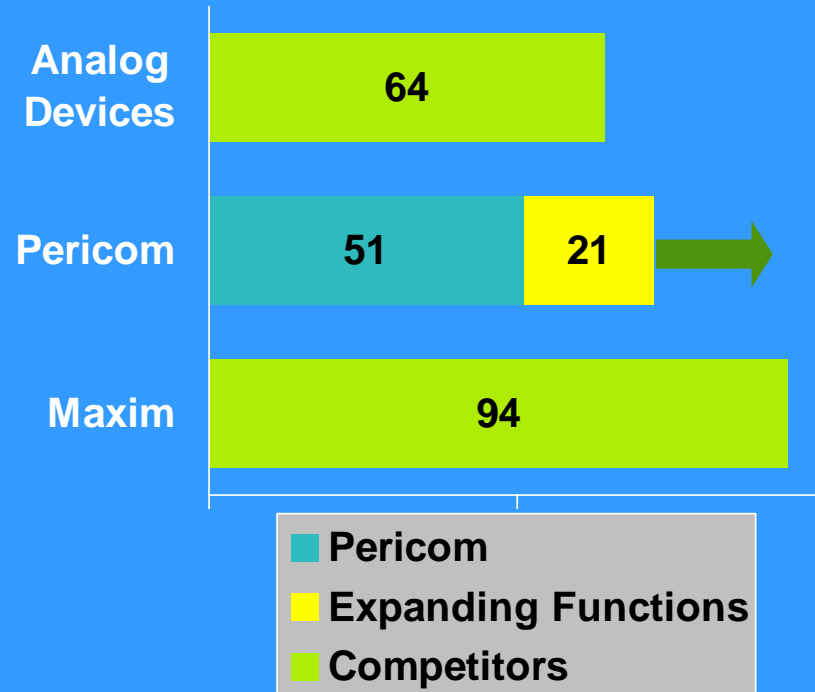


Analog Switch Overview

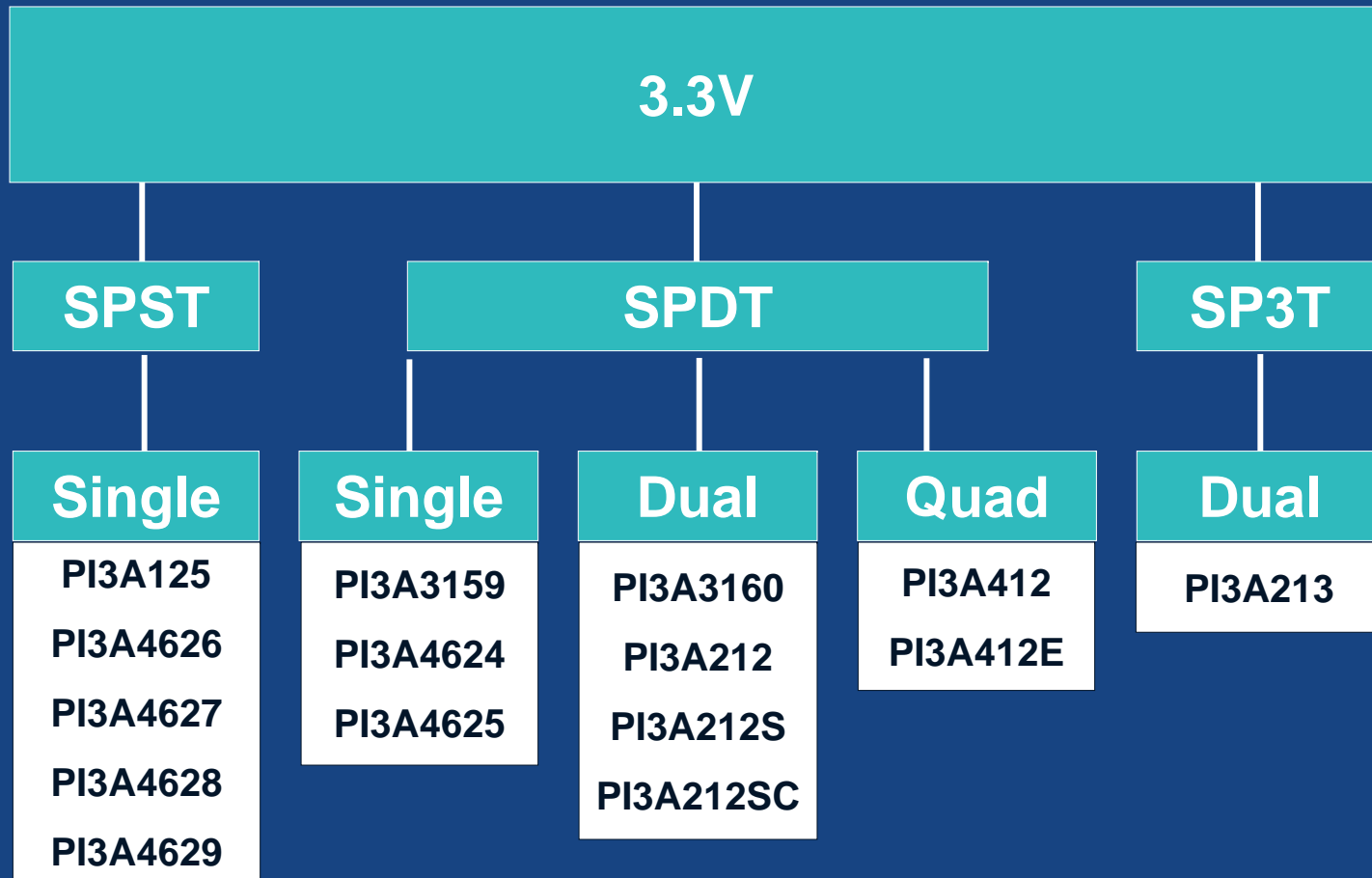
→ Competitive Offering

- Quickly Growing Product Line
- Targeting Low voltage, Low R-on, and Small package
- Characteristics
 - Wide Voltage Range: 1.65 to 17V
 - Low R-on: 0.4 to 10-Ohms
 - Fast Speed t_{on} : 10 to 30ns
 - Isolation: -20 to -80dB
 - Broadband: 200 to 300 MHz
 - Advanced Packaging:
 - TDFN, CSP, MSOP, SSOP, TSSOP, SC70, QSOP
 - 5-20 pin products representing a variety of single, dual, and quad switch and mux products

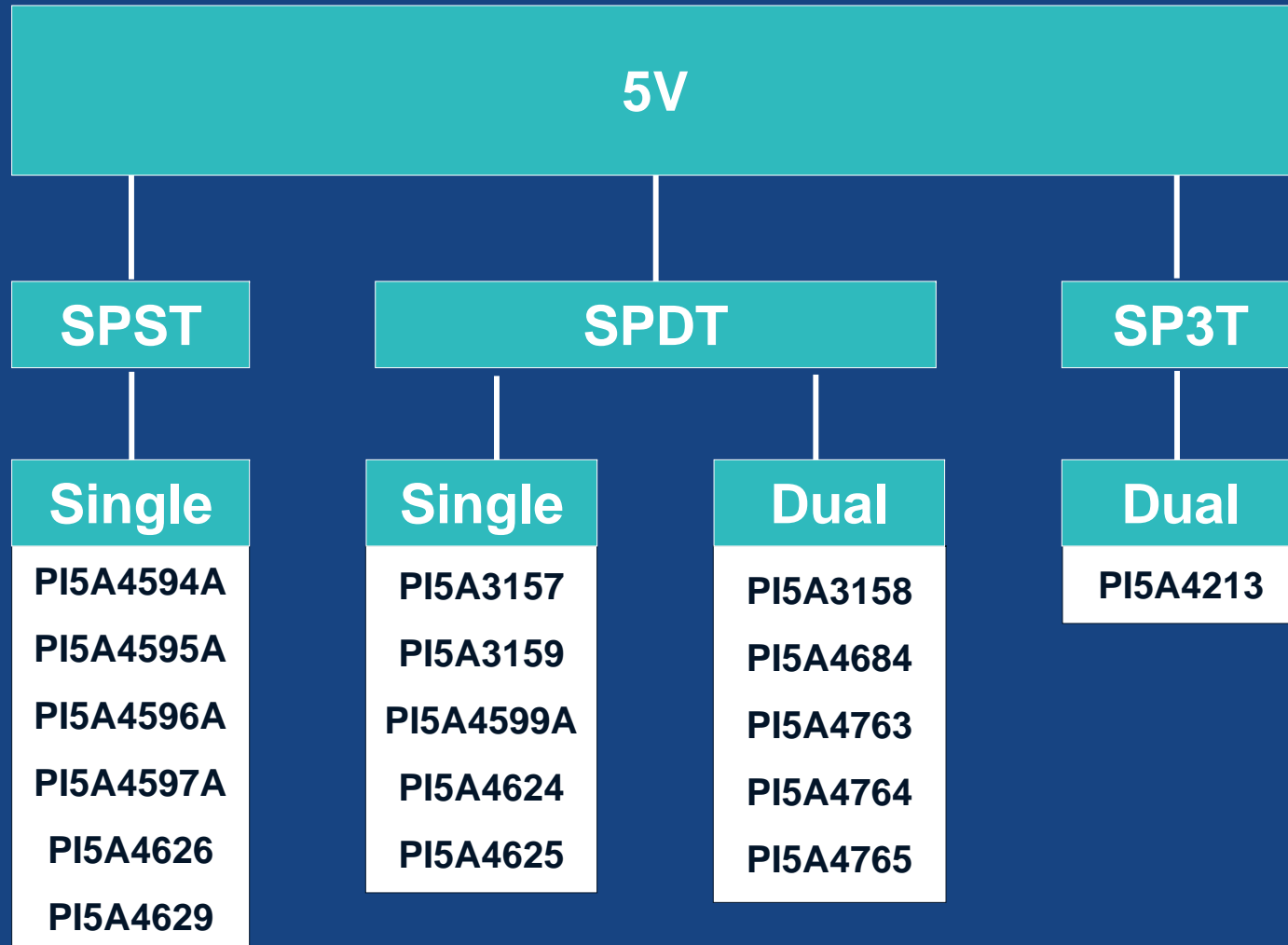
Analog Switch Functions



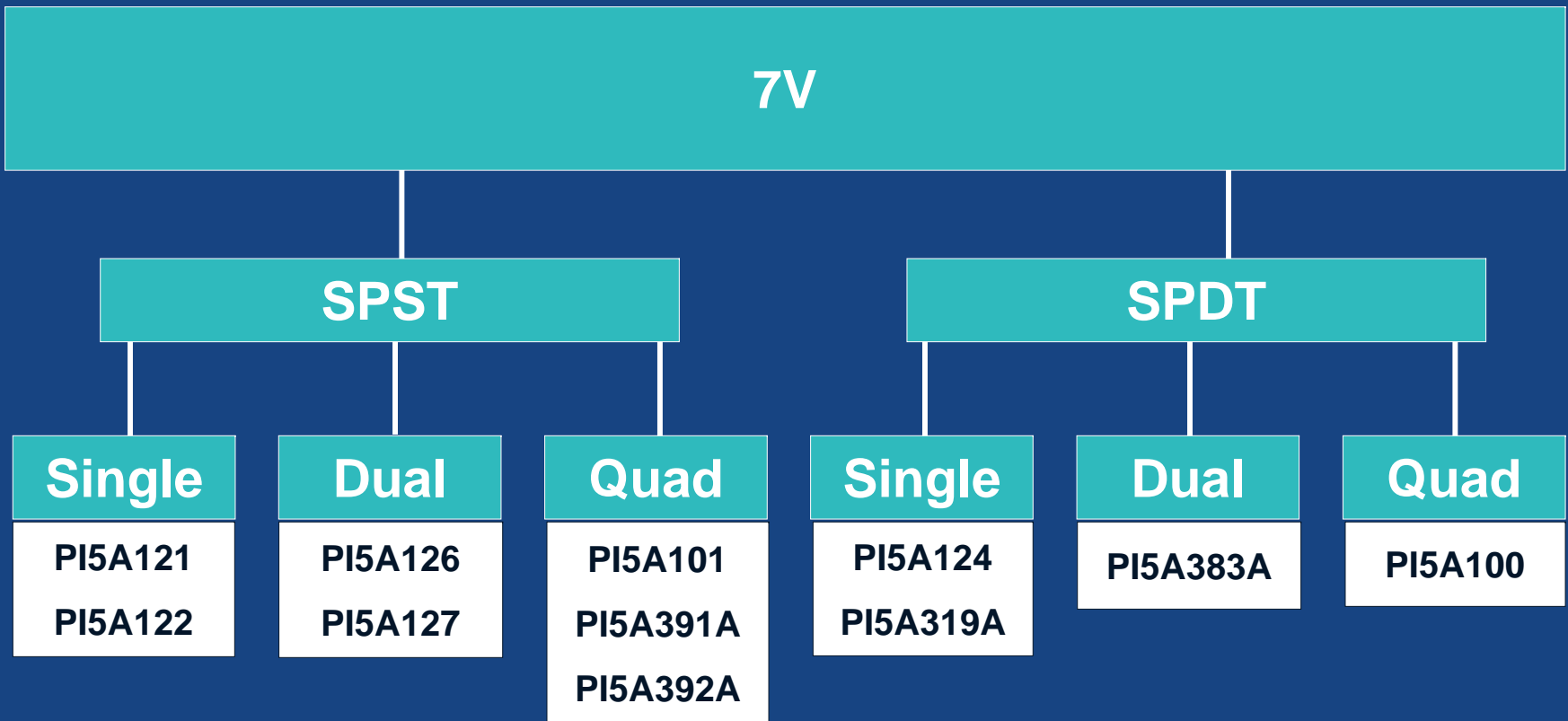
3.3V Analog Switch Products



5V Analog Switch Products



7V Analog Switch Products



17V Analog Switch Products

17V

SPST

Dual

PS320

PS323

PS381

Quad

PS391

PS392

PS393

PS4066

PS4066A

PS385

SPDT

Dual

PS383

Triple

PS4532

Quad

PS394

MUX

4:1

PS399

PS4531

8:1

PS4530

PS396

PS398

SPST & SPDT Applications

Data Acquisition

Medical Equipment

Process Control

Instrumentation

Industrial Control

Single Board Computers

Video

Cell Phones

Wireless Terminals

Computers/PCs

PDA's

Mass Storage

Cable Modems

Internet Gateways

DSL Routers

cPCI Bus Termination

Photographic
Processing Equipment

Smart Instruments

Automatic Test
Equipment

Home Networking

LAN Network Cards

Modems

Computer Peripherals

Switches are a basic analog building block. Many systems that use analog integrated circuits and Micro-controllers also use analog switches / Mux

<1-Ohm Analog Switch

→ We are an aggressive provider of Analog Switch & Multiplexer Products

- We specialize in < 1-Ohm Low Voltage operation
 - 1.8V/2.5V/3.3V/5V single supply voltages
- Offering includes improved Maxim and Fairchild compatible devices as well as sole source offerings
- SOTiny™ Packaging includes SOT23, SC70, TDFN, and CSP packages for PCB space savings
- Ideal for Portable Communications Designs

$R_{ON} < 1\text{-Ohm}$ Portfolio

0.4-Ohm @ 2.7V Analog Switch Products

Configuration	3.3V
1xSPST (NO)	PI3A4626 PI3A4628 PI3A4629
1xSPST (NC)	PI3A4627
1xSPDT	PI3A3159 PI3A4624
1xSPDT (MBB)	PI3A4625
2xSPDT	PI3A3160 PI3A212 PI3A212S PI3A212SC

1-Ohm @ 5.0V Analog Switch

Configuration	5V
1xSPST (NO)	PI5A4626 PI5A4629
1xSPST (NC)	
1xSPDT	PI5A3159 PI5A4624
1xSPDT (MBB)	PI5A4625
2xSPDT	PI5A4684 PI5A4763 PI5A4764 PI5A4765



Application Specific Switch Products (ASSP)



Application Specific Switches

→ Application Specific Switch Product (ASSP)

- Provides unique switch solutions
- Optimized to support particular applications
 - Performance
 - Cost

→ Integration of features

- Active termination or other signal integrity enhancements

→ High Value product solutions

- Minimize platform costs as compared to conventional solutions



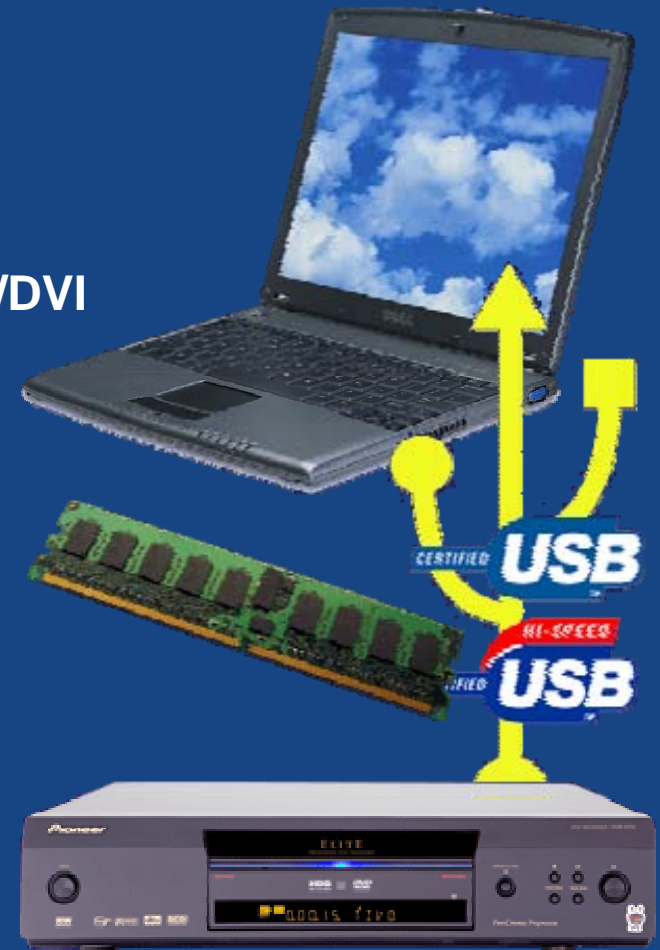
Application Specific Switches

→ Available Today

- LAN:
 - 10/100 & Gigabit Ethernet
- Video:
 - 135MHz to 825MHz including HDMI/DVI
- USB 2.0:
 - Backward Compatible
- Differential Broadband:
 - SATA & FC
- DDR Memory Expansion
- PCI Express
- Mobile

→ In Development

- GEN 2

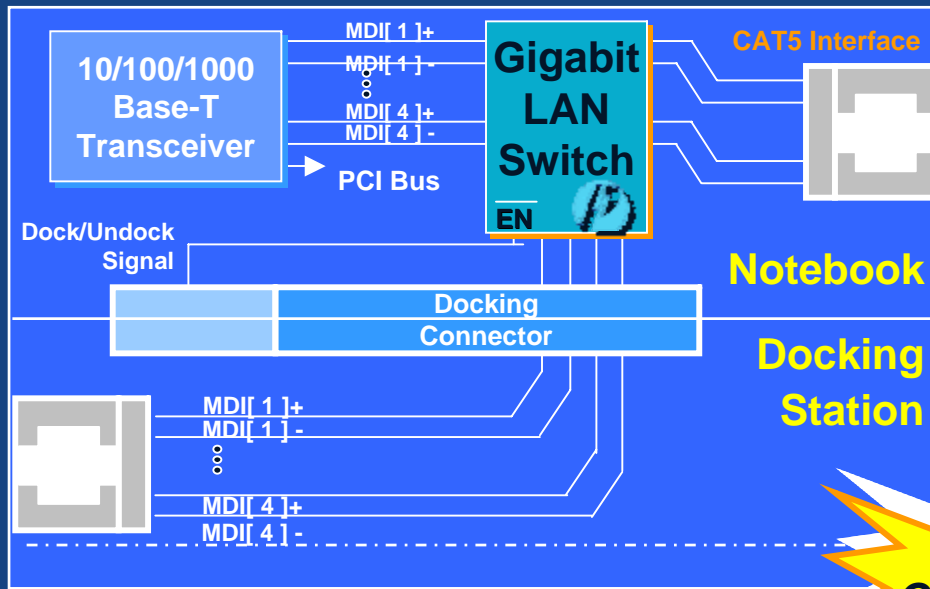




LAN Switch Overview



LAN Switch Snapshot



Notebook / Docking Station Application

2-Interface connectors to a single PHY design

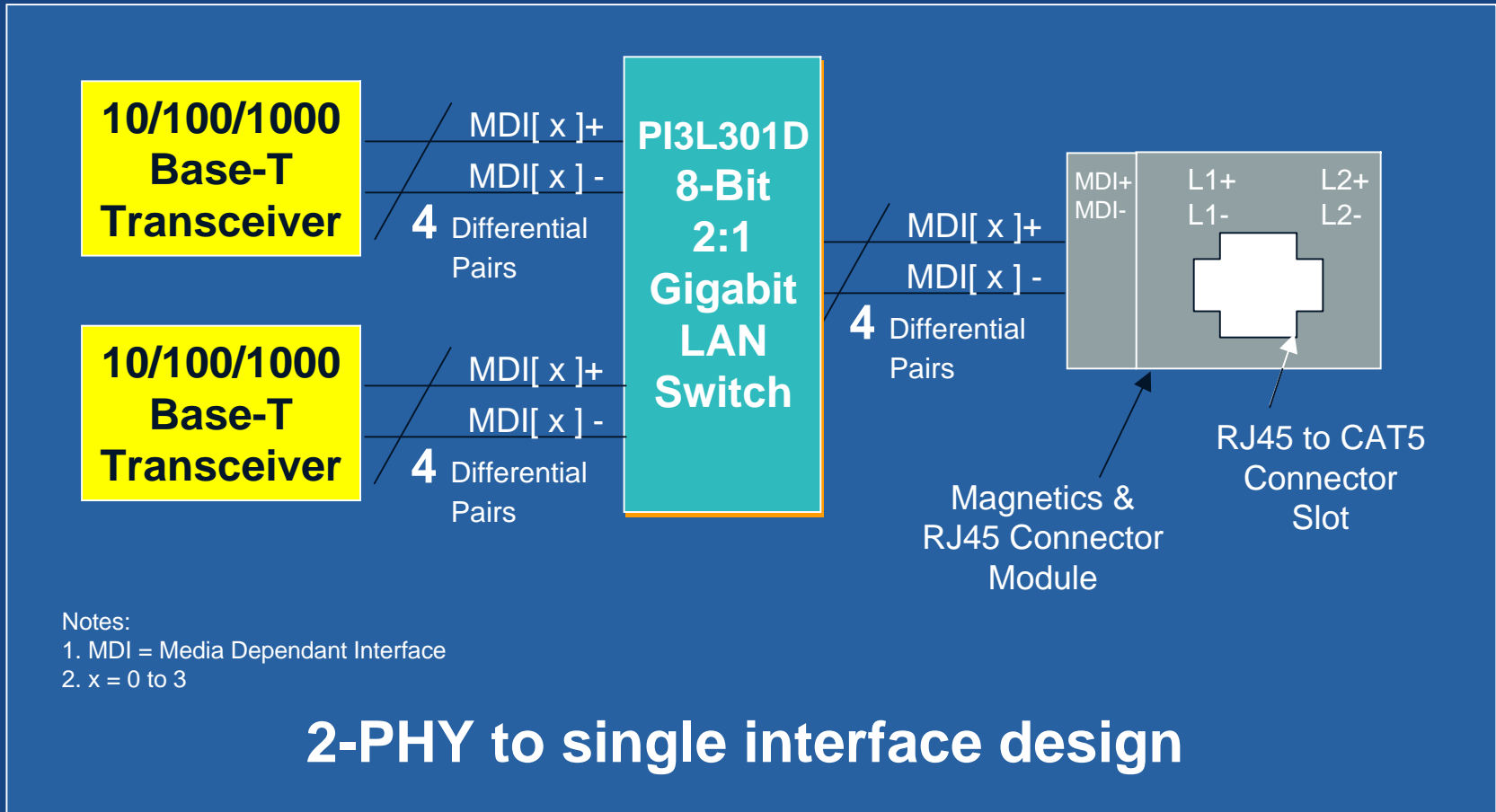
Only One PHY!

Supporting up to Gigabit Ethernet

- Backward Compatible to 10/100
- Bandwidths > 350 MHz per channel
- Low R-on: 4-Ohms
- Low C-on: Channel off: 6pf, Channel On: 10pf
- Excellent Isolation & Unwanted Signal Rejection
- Used by Major Notebook Manufacturers

LAN Switch

→ LAN Switch in Redundant Gigabit PHY Application






USB 2.0 Switch Overview



Pericom USB Switch Lineup

→ First Low/Full/High-Speed USB Switch in the World

UNIVERSAL SERIAL BUS

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

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

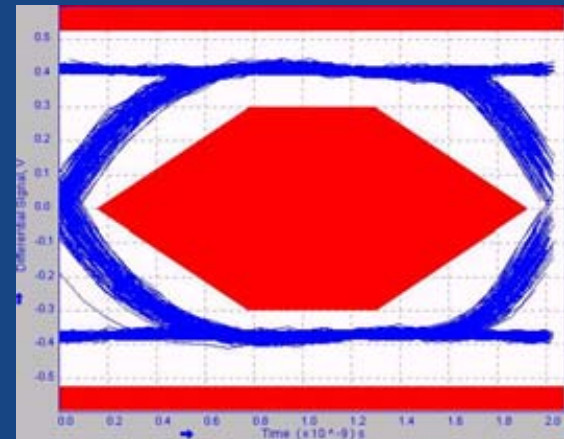
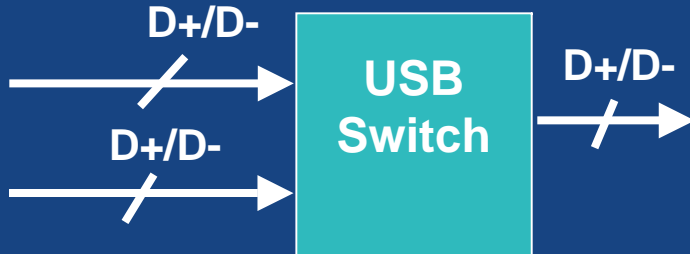
USB 2.0 Switch Benefits/Performance

→ Ability to switch USB 2.0 signals

- Meets eye-pattern template for USB 2.0 standard
 - See Application Note
<http://www.pericom.com/pdf/applications/AW067.pdf>

→ Allows BOM cost reduction

- Eliminates the need for larger port count host controllers or hub controllers



The eye pattern for the PI3USB20 measured at output connector of NB PC

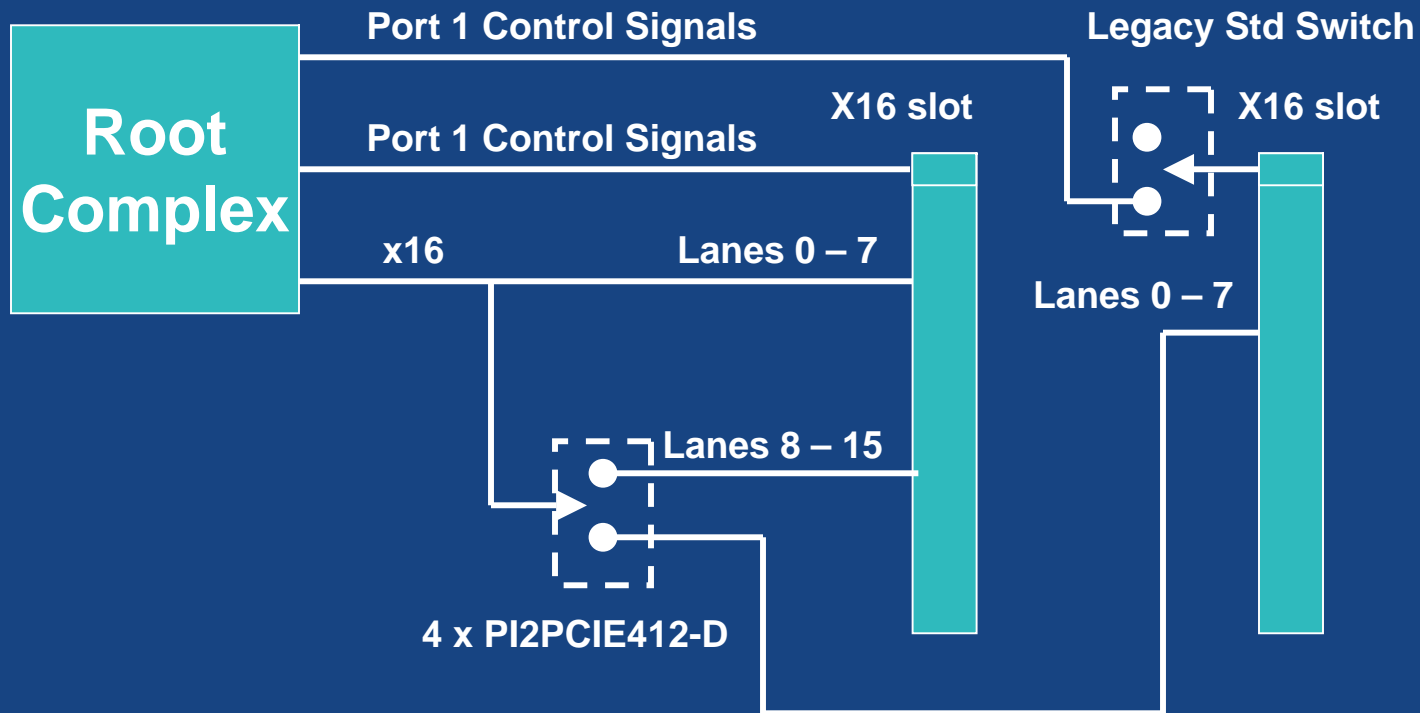


PCI Express Signal Switch



Example Signal Switch

→ Typical Application to split x16 lane to two x8 or Provide Redundant x16 or x8 Slots

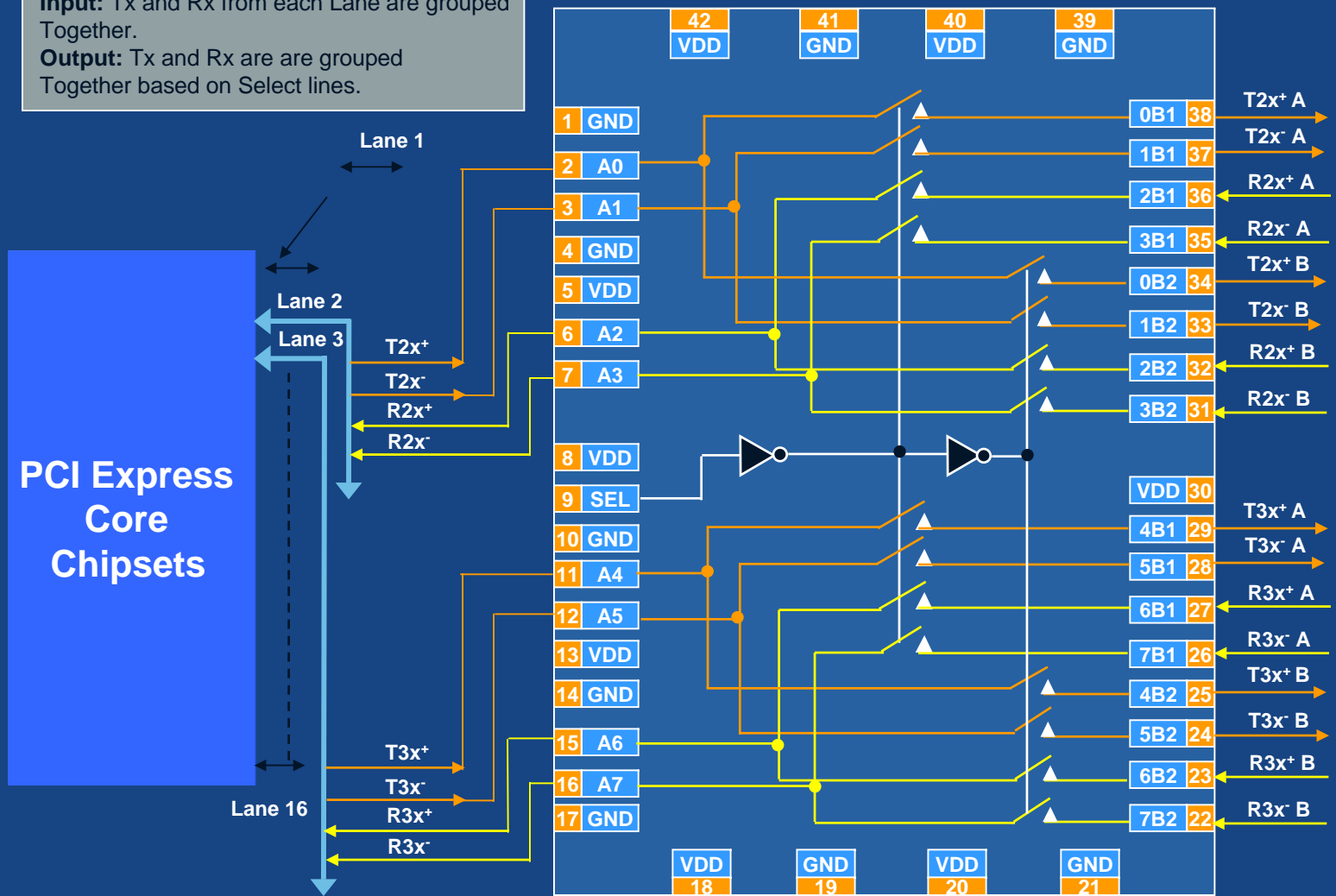


PI2PCIE412-C Pin Assignments for PCI-Express Applications

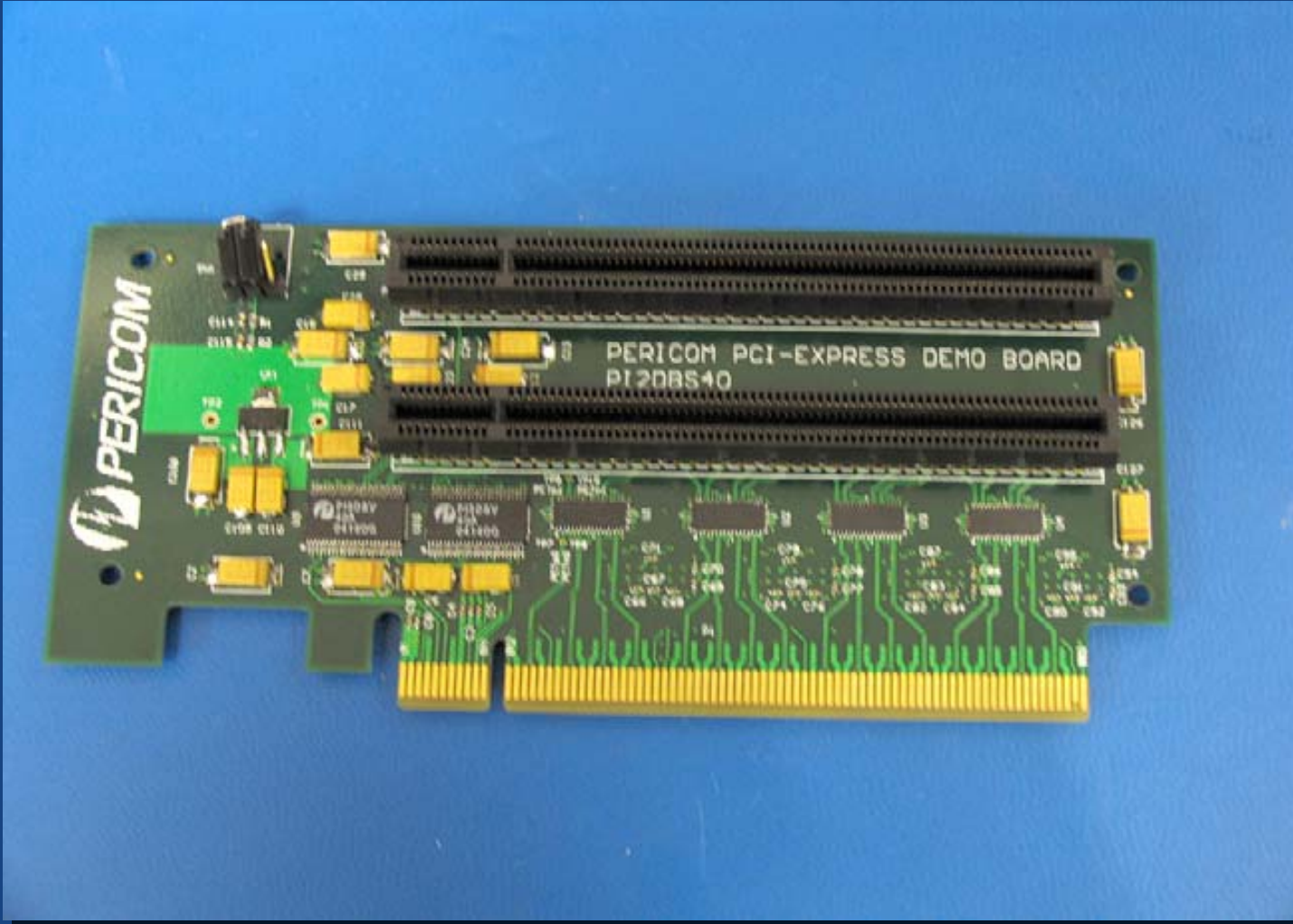
Pin-out Option 1

Input: Tx and Rx from each Lane are grouped Together.

Output: Tx and Rx are are grouped Together based on Select lines.



PI2PCIE412-D Evaluation Board



PI2PCIE412-D Switch Overview

→ PCI-Express Signal Compliant

→ Configurations

- 2 Complete PCI-Express Lanes
- Provides 100mV Eye-margins with 27” trace lengths of non-transition signals
- Provides 50mV Eye-margins with 27” trace lengths of transition signals

→ Covering Multiple Protocols

- PCI-Express
- SATA
- SAS
- Fibre Channel
- Gigabit Ethernet



Video Switch Products



Pericom Market Position

→ First to Market with TMDS Mux

- Already Obtained Multiple Design wins
- Shipping Full Production Orders
- Proven TMDS solution
- Penetration in following markets:
 - STB
 - TV
 - Monitor
 - Reference platforms
 - PC/NB

Pericom's HDMI/DVI Strategy

→ Supports TMDS signals

- Up to 1.65Gbps data rates for DVI and HDMI signals

→ Signal Switch available now

→ Signal Switch with Drive under Development

→ Provides a way to switch between multiple DVI/HDMI signal links

→ Supports the highest resolution specified in HDMI/DVI specifications

Video Standards/Resolution/Bandwidth

Graphics Resolution	Active Aspect Ratio	Pixel Aspect Ratio	Refresh Rate (Hz)	XCLK Frequency (MHz)	DVI Frequency (Mbits)
720 x 400	4:3	1.35:1.00	<85	<35.5	<355
640 x 400	8:5	1:1	<85	<31.5	<315
640 x 480	4:3	1:1	<85	<36	<360
720 x 480	4:3	9:8	59.94	27	270
720 x 576	4:3	15:12	50	27	270
800 x 600	4:3	1:1	<85	<57	<570
1024 x 768	4:3	1:1	<85	<95	<950
1280 x 720	16:9	1:1	<85	<110	<1100
1280 x 768	15:9	1:1	<85	<119	<1190
1280 x 1024	4:3	1:1	<85	<158	<1580
1366 x 768	16:9	1:1	<85	<140	<1400
1360 x 1024	4:3	1:1	<75	<145	<1450
1400 x 1050	4:3	1:1	<75	<156	<1560
1600 x 1200	4:3	1:1	<60	<165	<1650
1920 x 1080	16:9	1:1	<60	<165	<1650

Key Performance & Features to support market needs:

The maximum DVI/HDMI Bandwidth of 1.65Mbps provides the resolution required by the next Gen HDTV and PC graphics

With higher DVI bandwidths, designers can achieve high resolutions with lower refresh rates, resulting in less power dissipation

Differential Video Products

PI3DBV40 – Available NOW

- 4-differential channel, 2:1 Mux/DeMux (1Gbps Max)

PI3HDMI412-A – Available NOW

- 4-differential channel, HDMI Compliant 2:1 Mux/DeMux

PI2LVD412 – Available NOW

- 4-differential channel, LVDS compliant 2:1 Mux/DeMux

PI2LVD512 – Available NOW

- 5-differential channel, LVDS compliant 2:1 Mux/DeMux

PI3HDMI421AR – Available in Q1'06

- 4-differential channel, Active 2:1 Mux

PI3HDMI412AD – Available in Q1'06:

- 4-differential channel, Active 1:2 DeMux

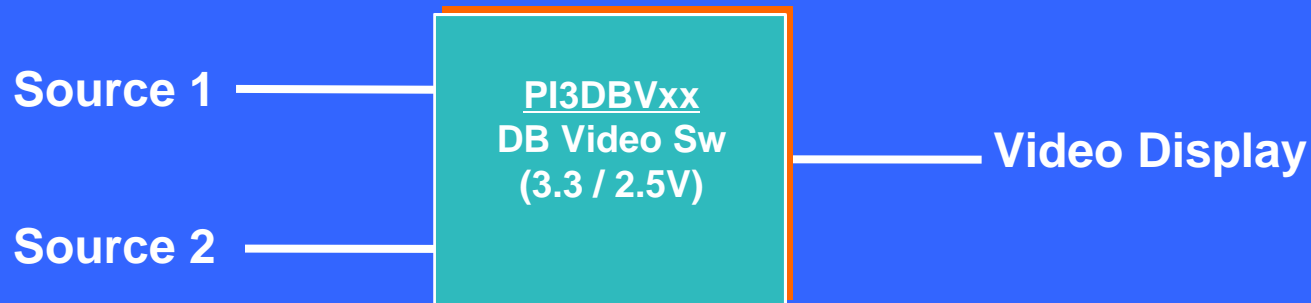
PI3HDMI422AD – Available in Q1'06:

- 4-differential channel, Active 2:2 Cross Point

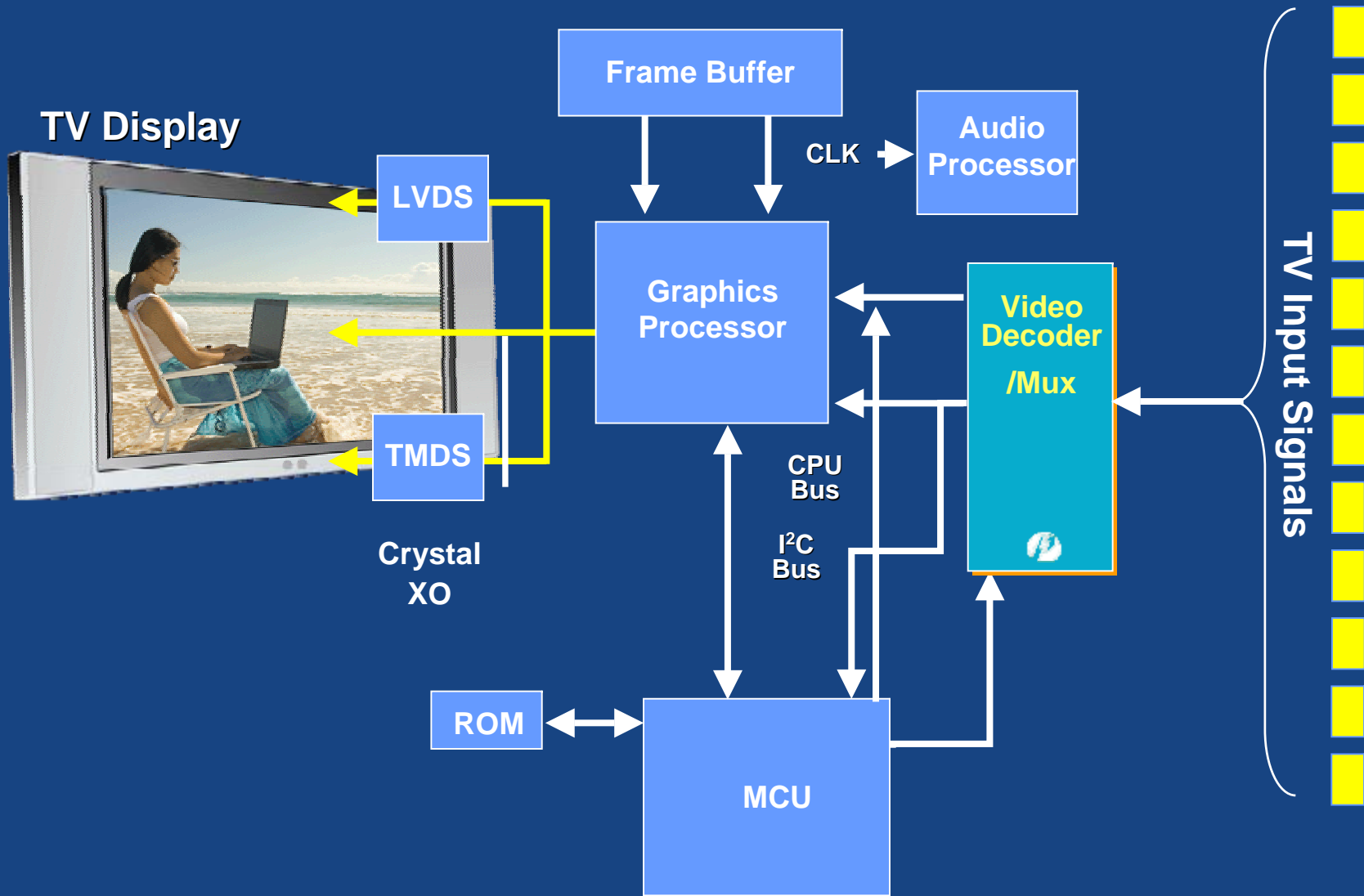
Differential Broadband Video Switch

Differential Broadband Video (DBV) Switches

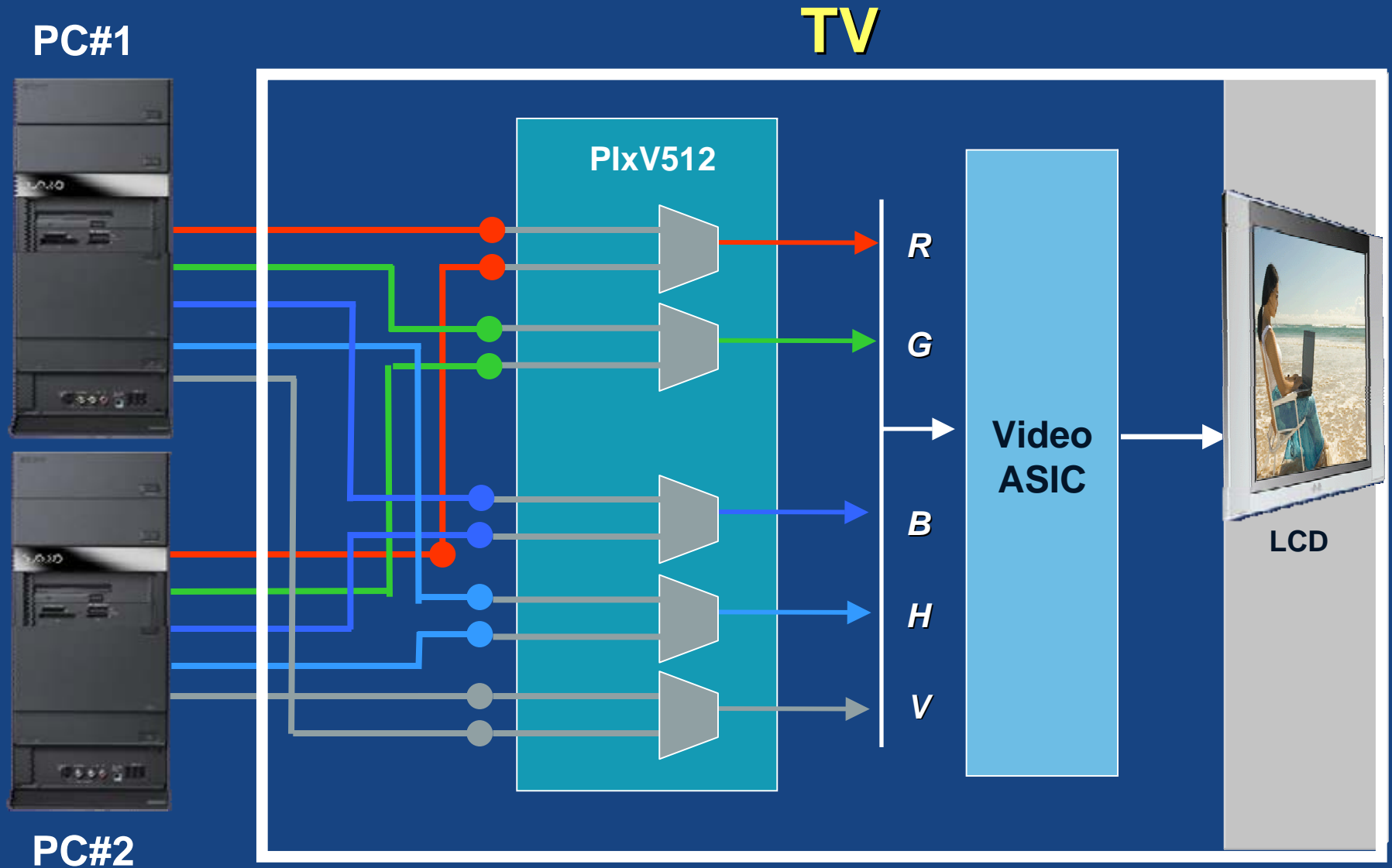
- Great for high speed switching needs
- Supports up to 500 MHz of bandwidth
 - See Application of the Week # 78
 - <http://www.pericom.com/pdf/applications/AW078.pdf>
- **PI3DBVxx Family**
 - PI3DBV10: 2-Channel, 2:1 Mux
 - PI3DBV14: 2-Channel, 4:1 Mux
 - PI3DBV20: 4-Channel, 2:1 Mux
 - PI3DBV40: 8-Channel, 2:1 Mux



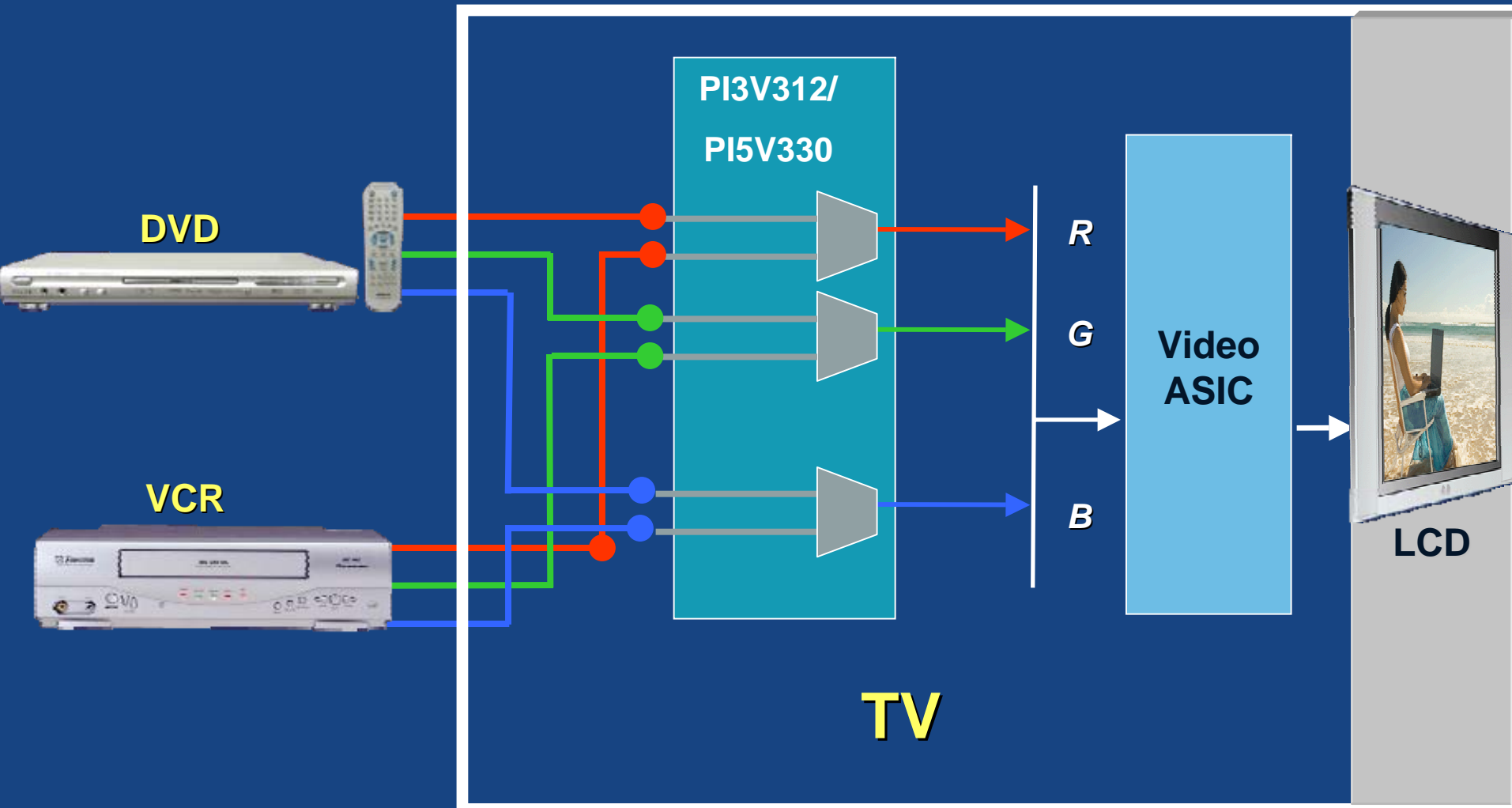
TV Architecture – Generic



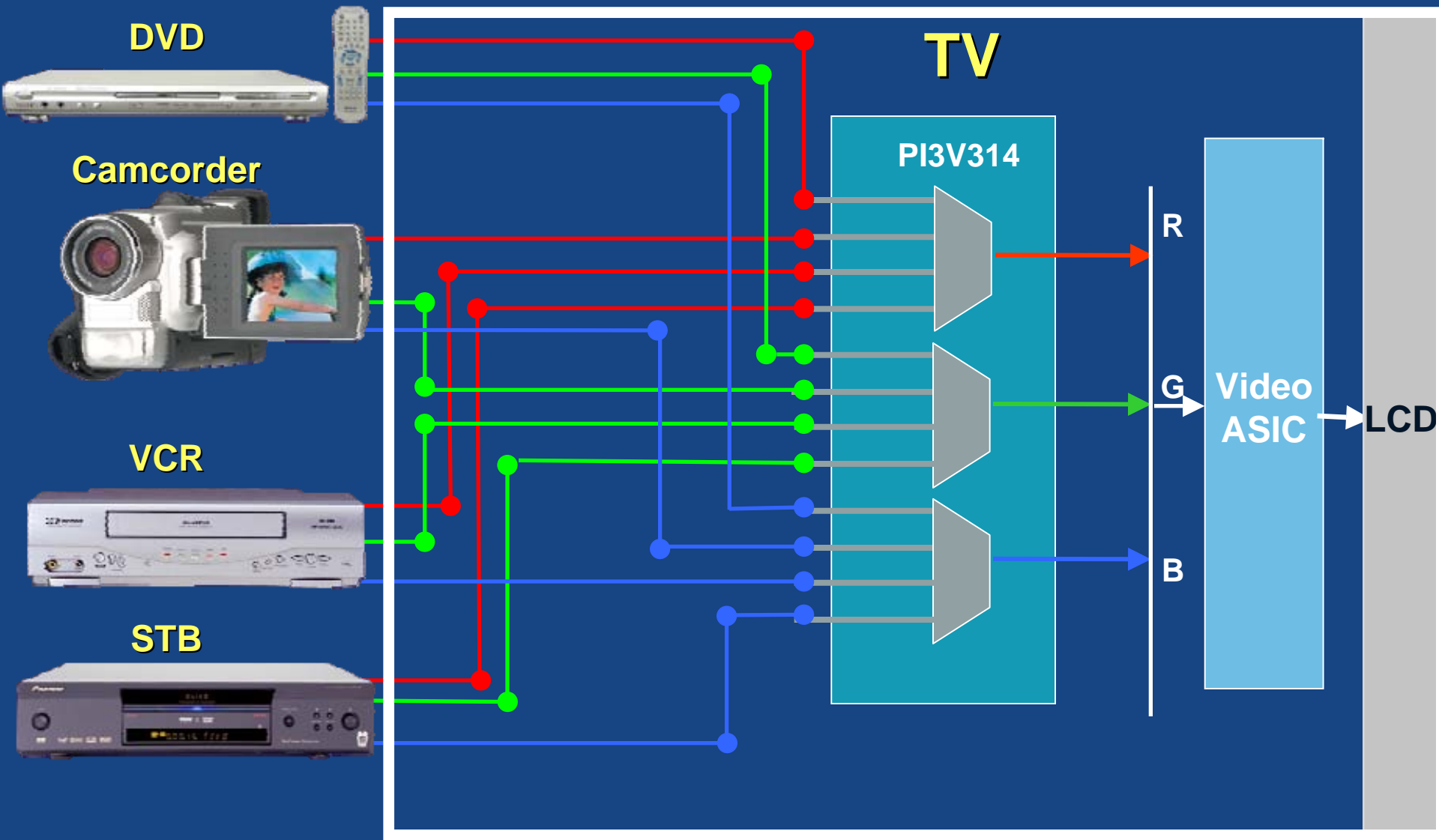
VGA Switch Solution



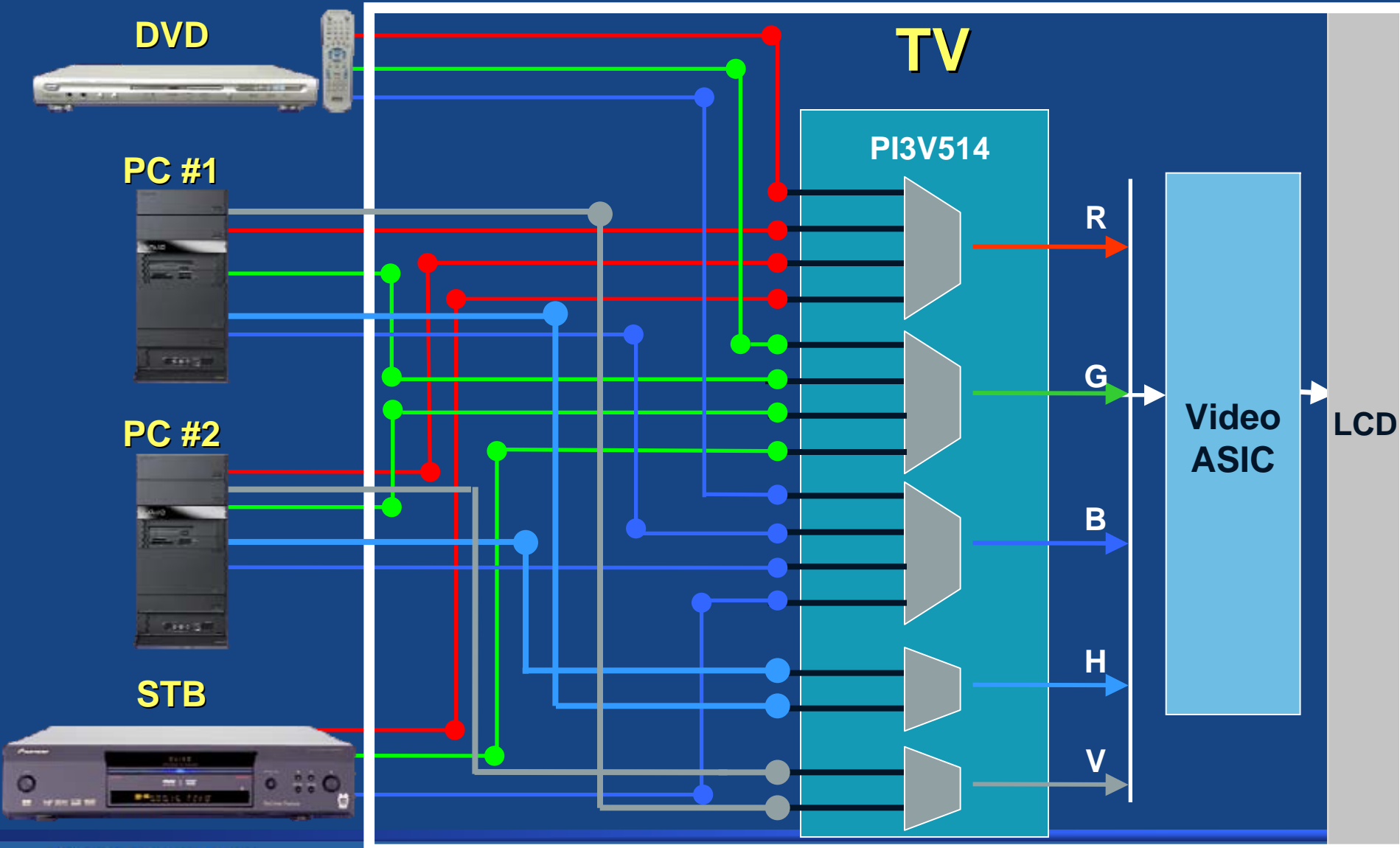
YPbPr Switch Solution



YPbPr Switch Solution

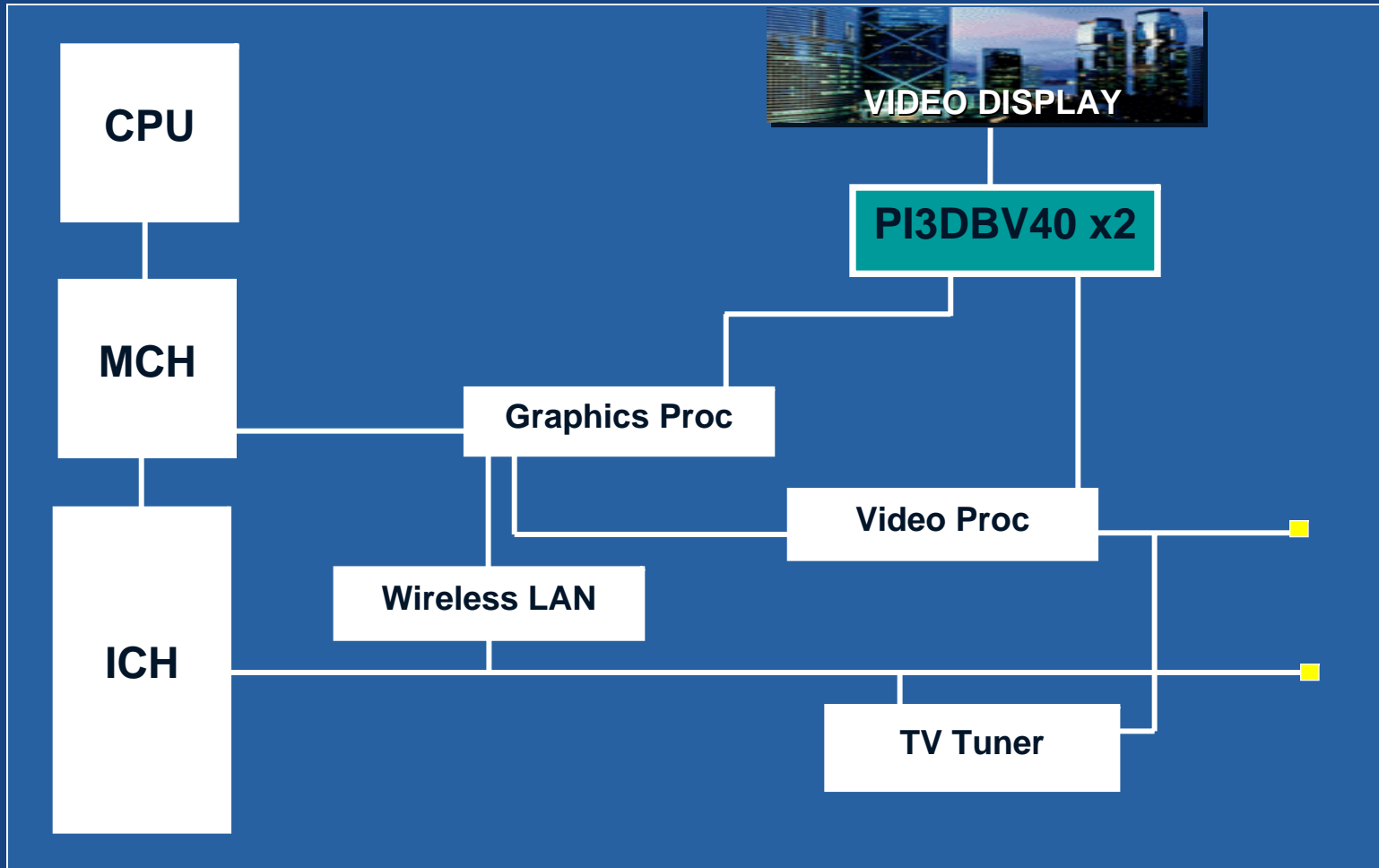


Combined YPbPr & VGA Switch Solution

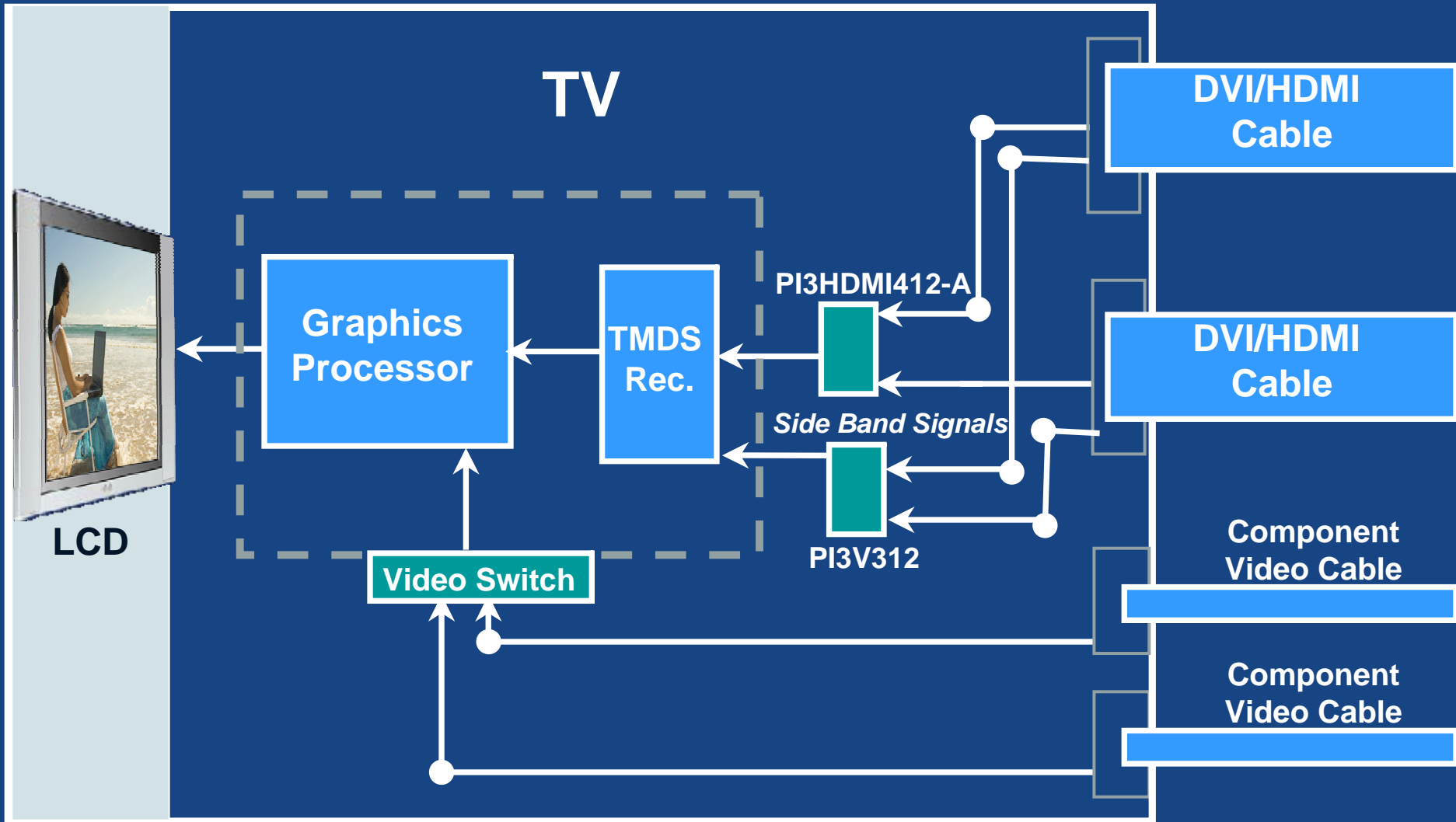


Application: DVD & Notebook One Touch

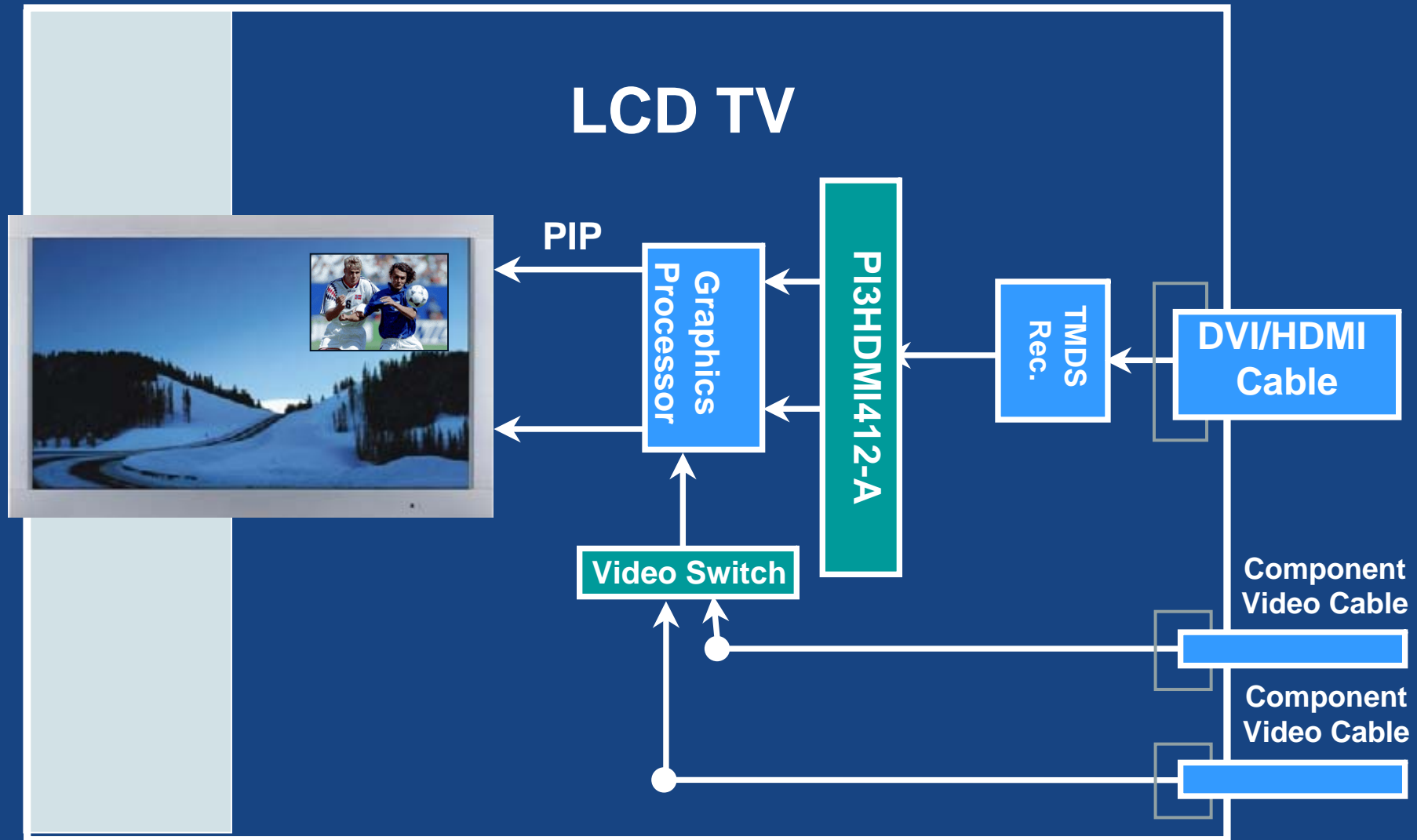
→ Saves Battery Life - Eliminates PC Boot up time



PI3HDMI412-A Application 2:1



PI3HDMI412-A Application

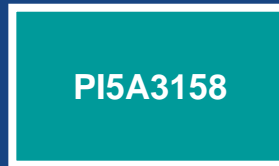


2:1 Side Band Signal Switch

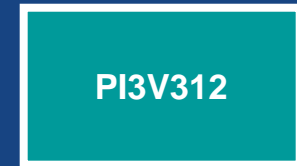
→ Side band signals

- SCL
- SDA
- HPD
- 5V
- CEC
- Reserved

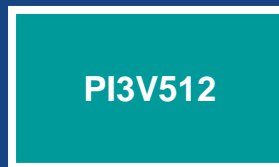
2-Channel 2:1 mux
Only switch SCL and SDA



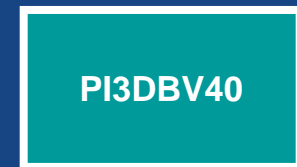
4-Channel 2:1 mux
Only switch SCL, SDA, HPD, & 5V



5-Channel 2:1 mux
Only switch SCL, SDA, HPD, 5V, CEC



8-Channel 2:1 mux
Switch ALL signals

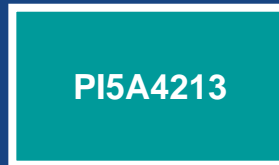


3:1 Side Band Signal Switch

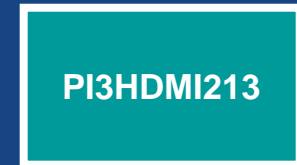
→ Side band signals

- SCL
- SDA
- HPD
- 5V
- CEC
- Reserved

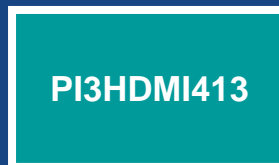
2-Channel 3:1 mux
Only switch SCL and SDA



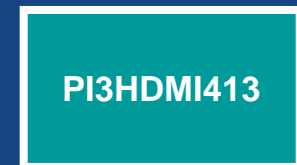
4-Channel 3:1 mux
Only switch SCL, SDA, HPD, & 5V



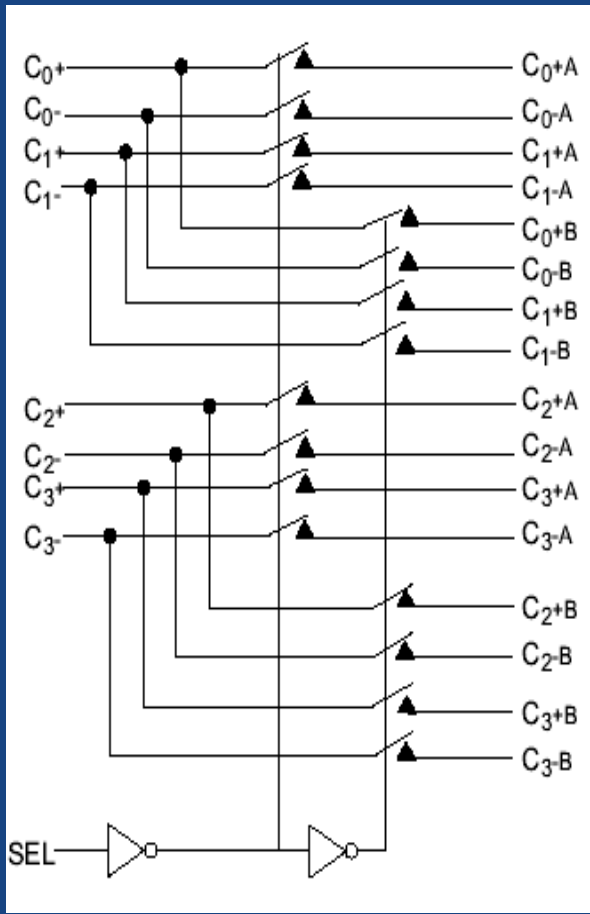
5-Channel 3:1 mux
Only switch SCL, SDA, HPD, 5V, CEC



6-Channel 3:1 mux
Switch ALL signals



PI3HDMI412-A Solution



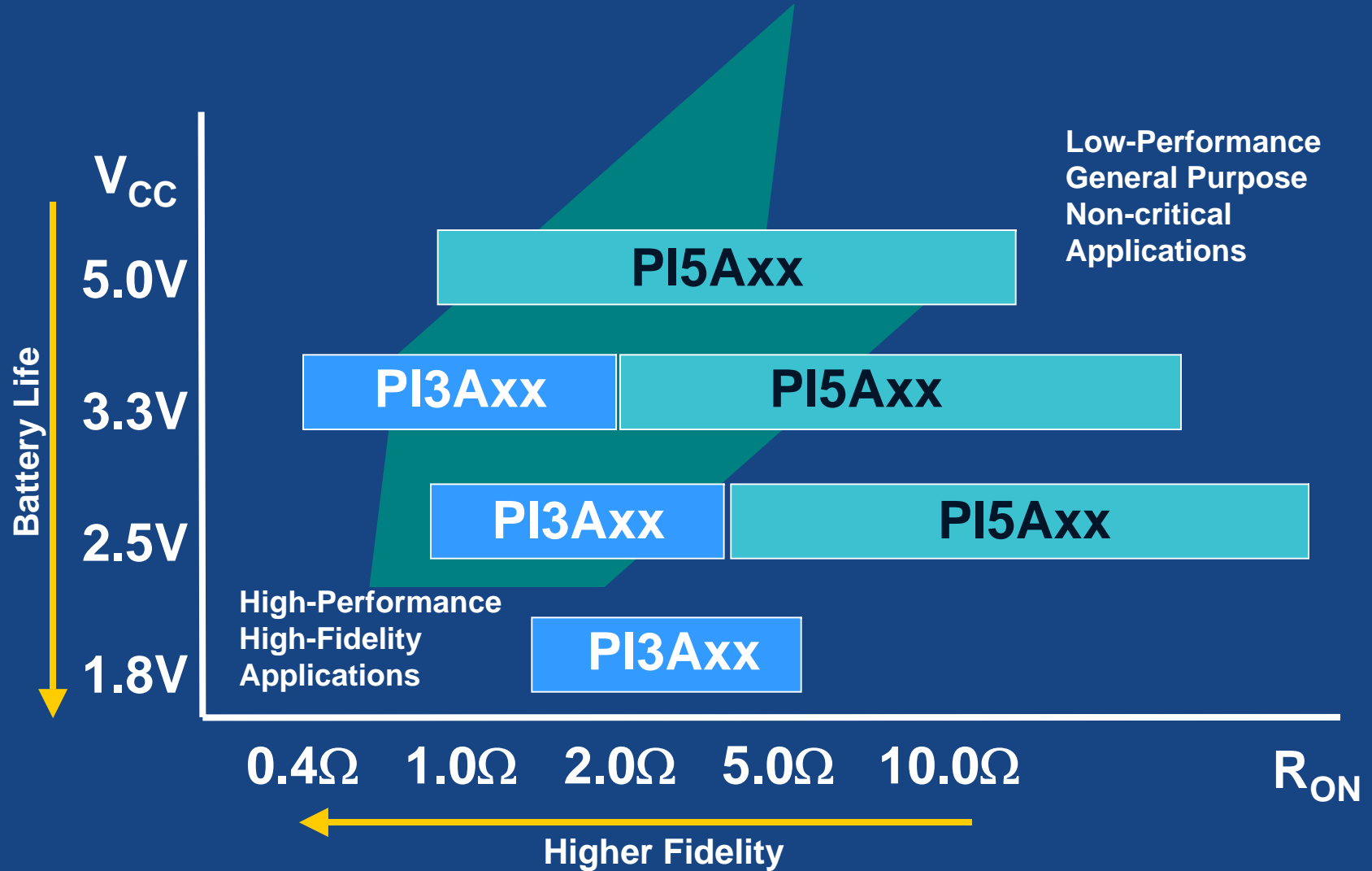
- **Xtalk:** -25dB @ 1.65Gbps
- **Off-Isolation:** -30dB @ 1.65Gbps
- **ESD:** 8kV HBM



Mobile Switch Product Family

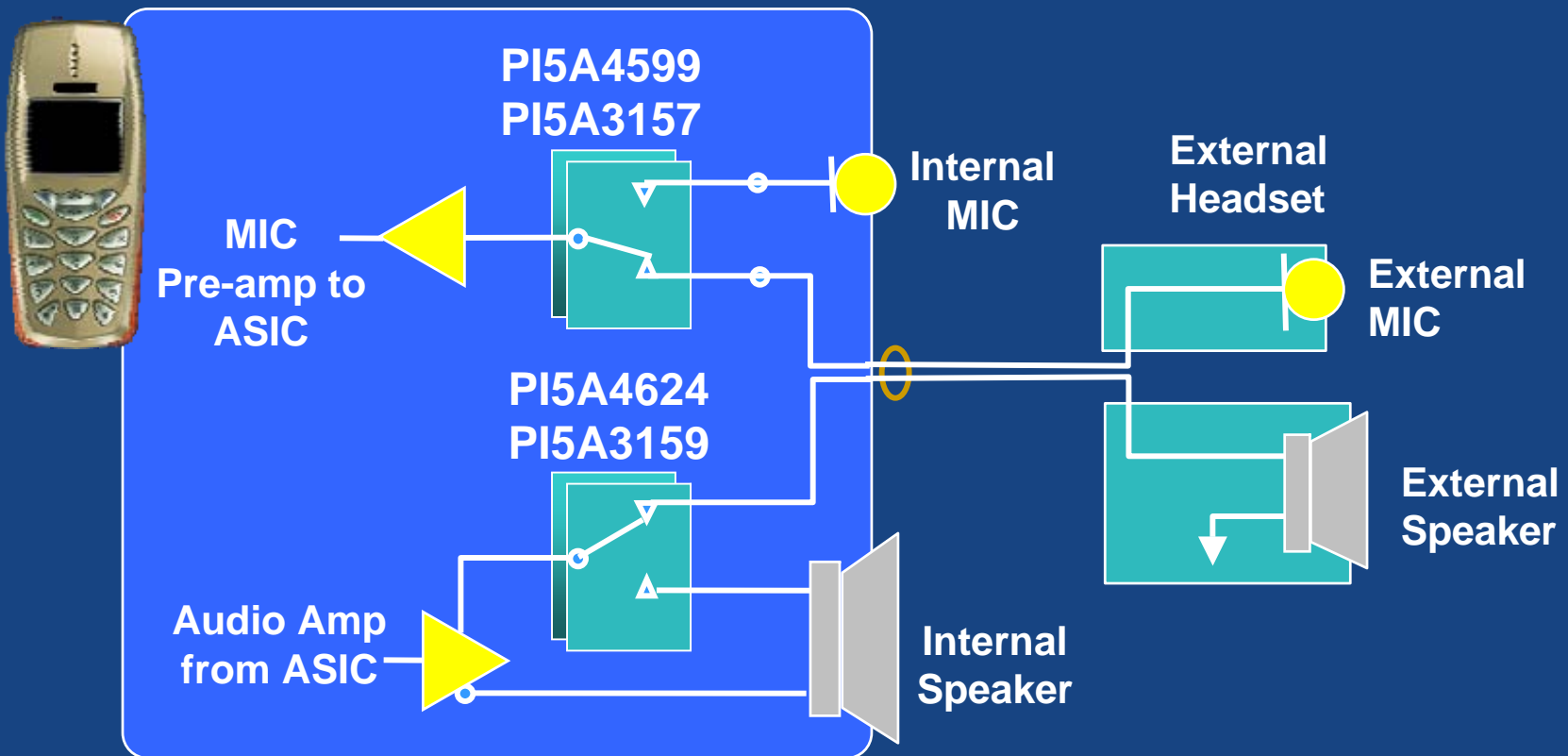


Cell Phone Product Offering – Past



Mobile Handset Application

→ Audio Internal/External Switching (PI5A3157)

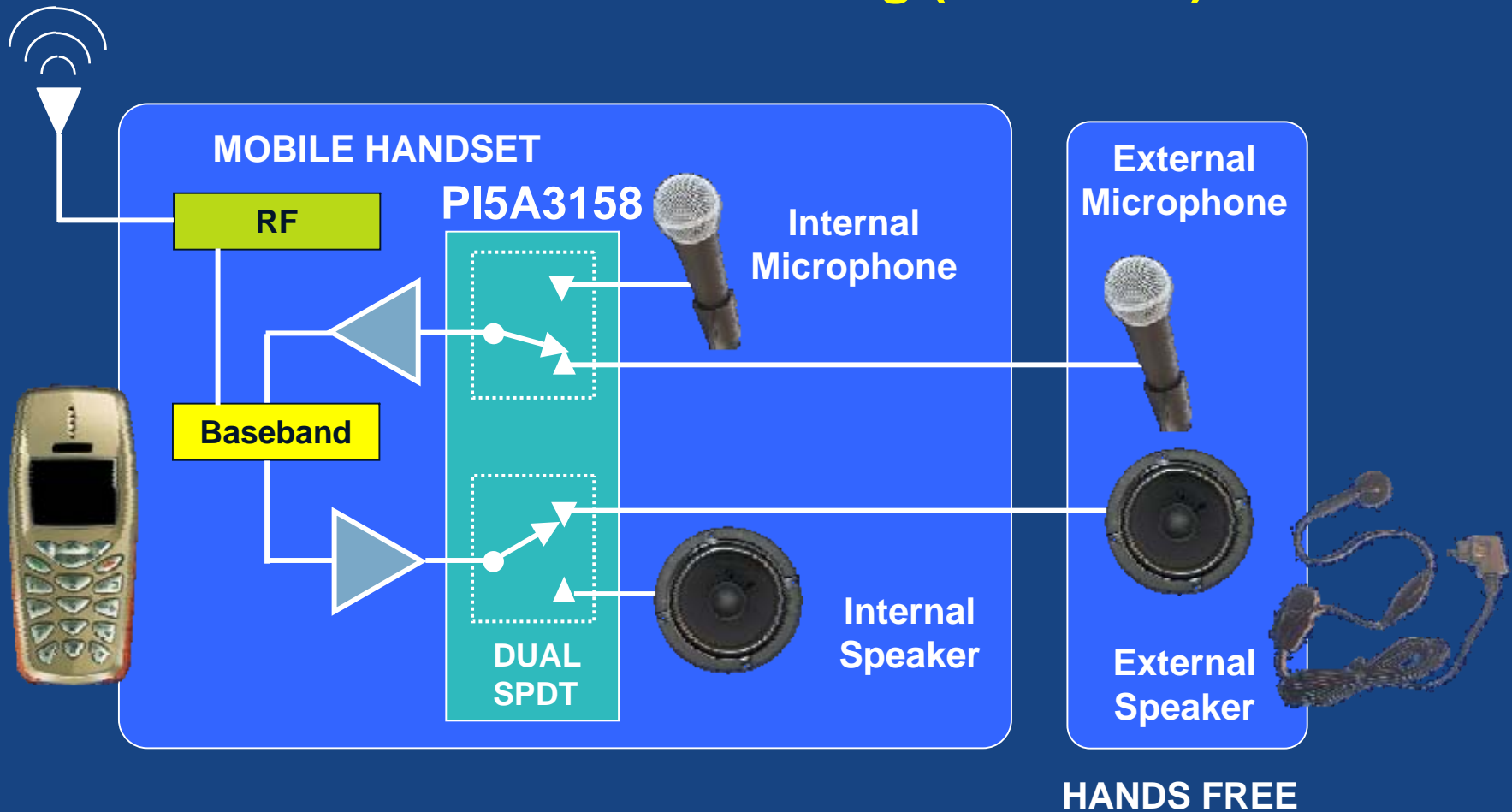


Pericom Product Analysis – PI5A3158

- Rank = #1, due to first to market
- FY05 – Revenue of \$3.7M w/ \$3.3M from Korea
- Dual SPDT
- ASP = <\$0.25
- Ron = 4 Ohm
- Package = 3mm x 1mm TQFN
- Market Stage:
 - Declining and will phase out soon for Cell Phones
- On-Semi = NLASB3158 pin compatible version

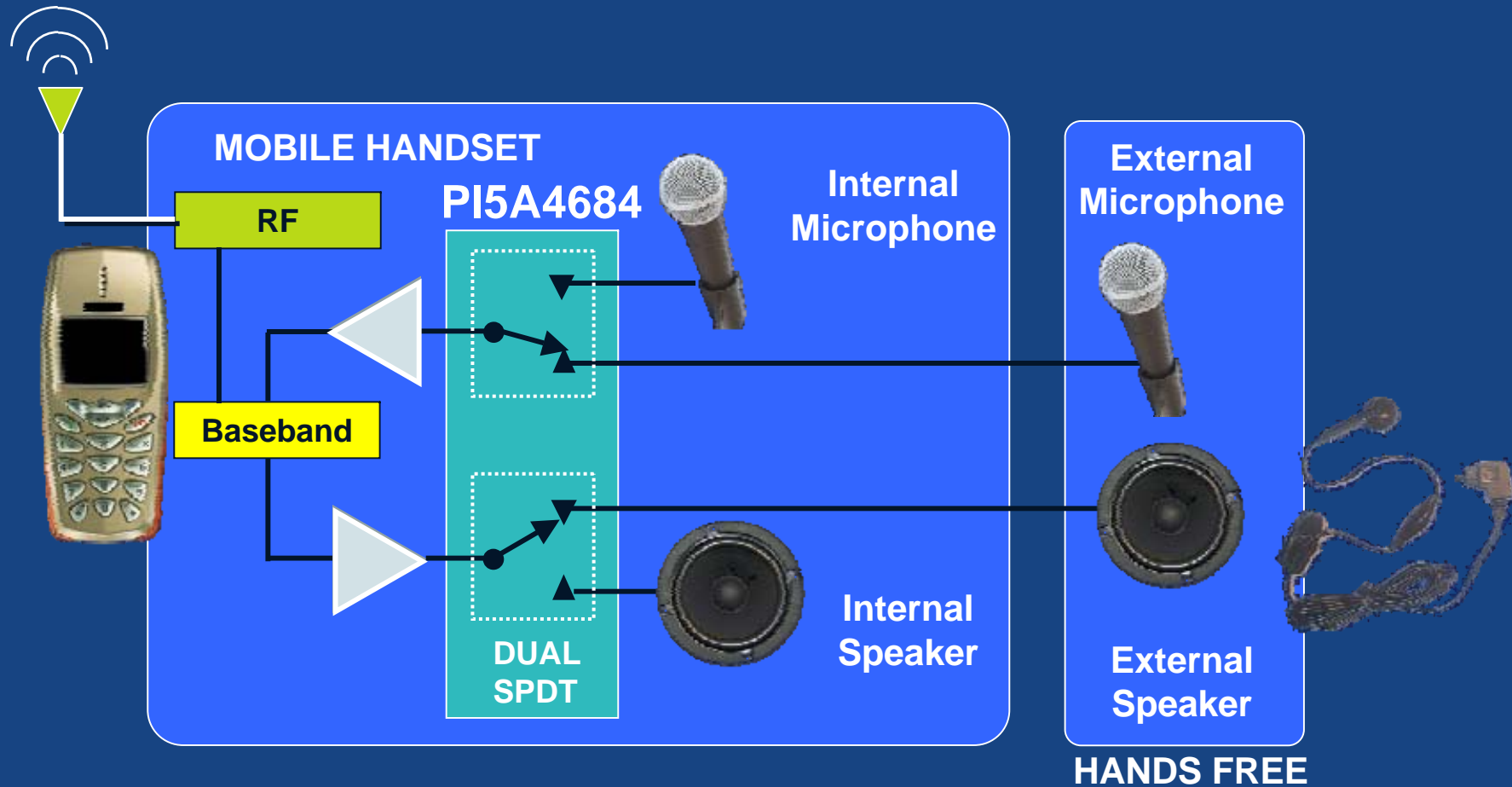
Mobile Handset Application

→ Audio Internal/External Switching (PI5A3158)

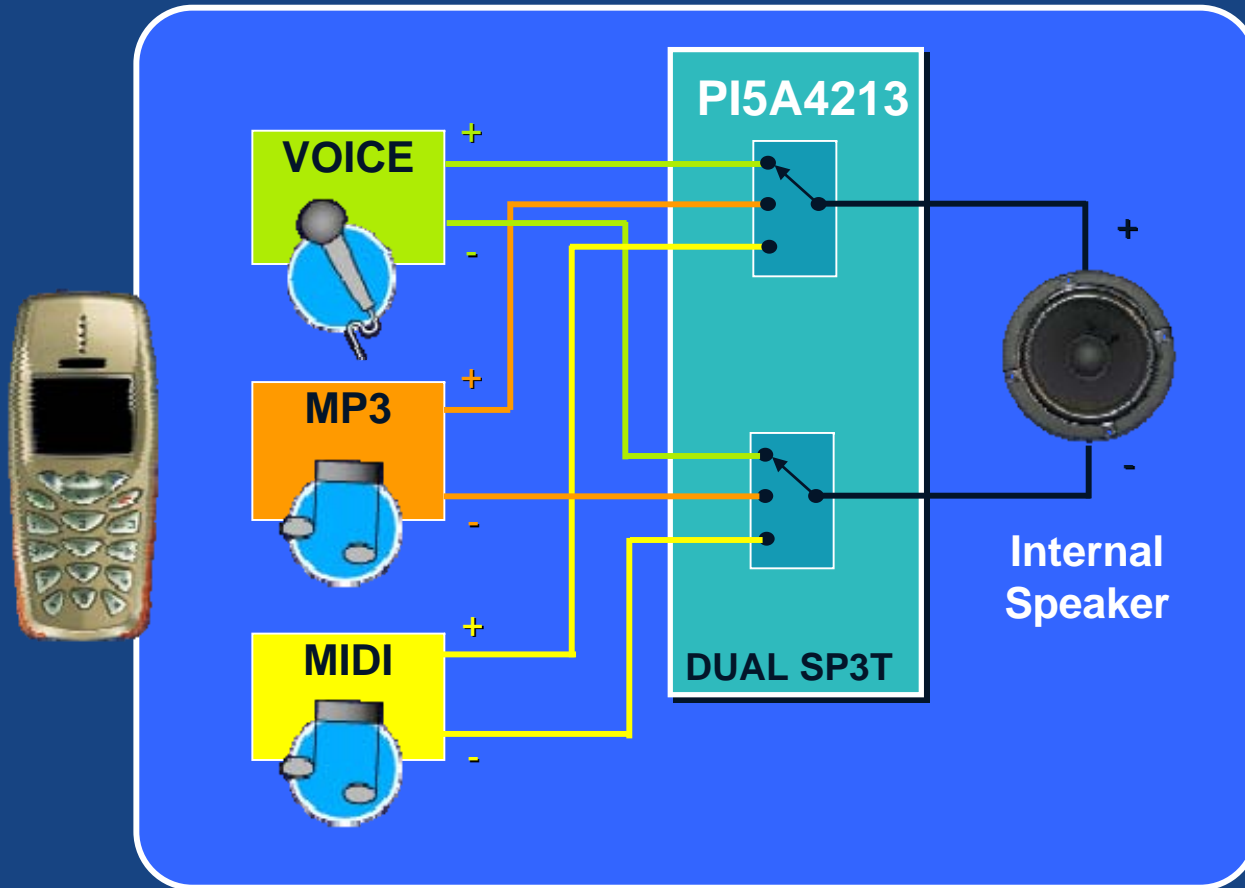


Mobile Handset Application PI5A4684

→ Hands-Free

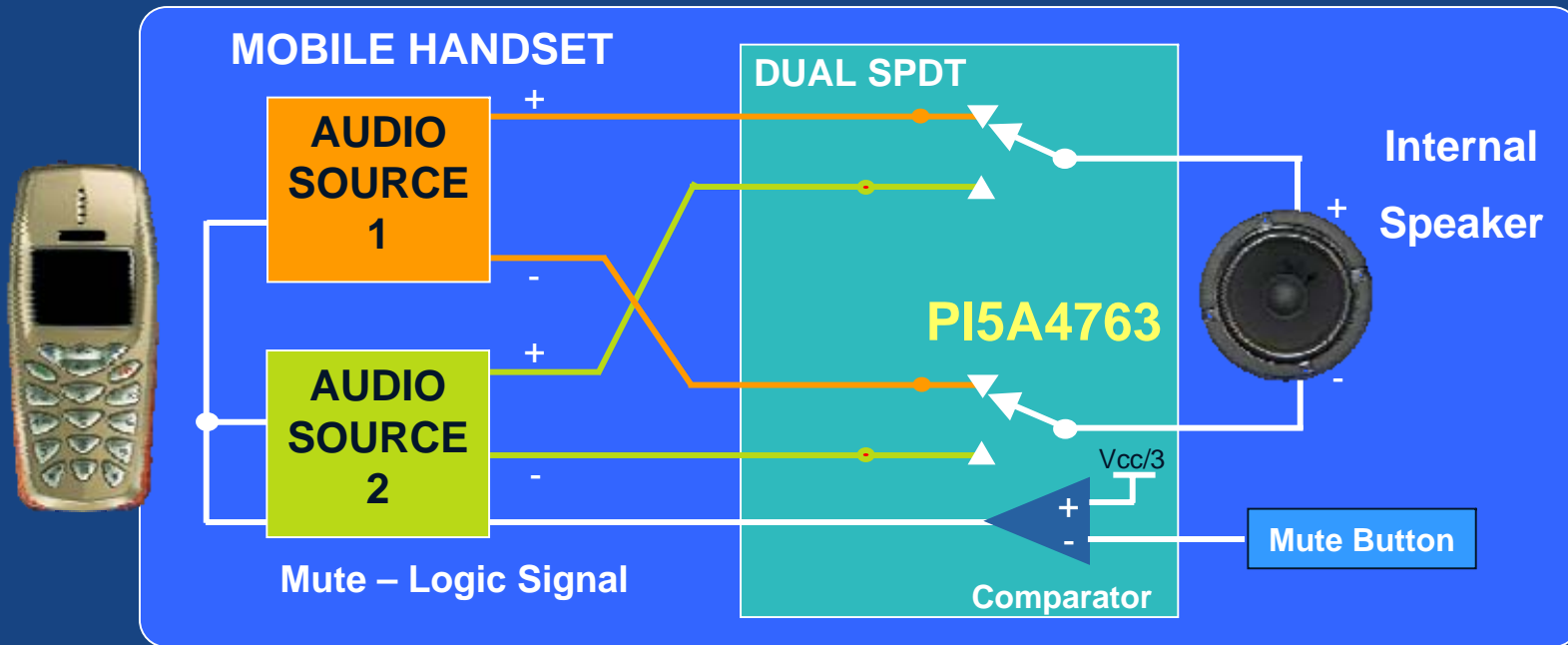


Mobile Handset Application PI5A4213



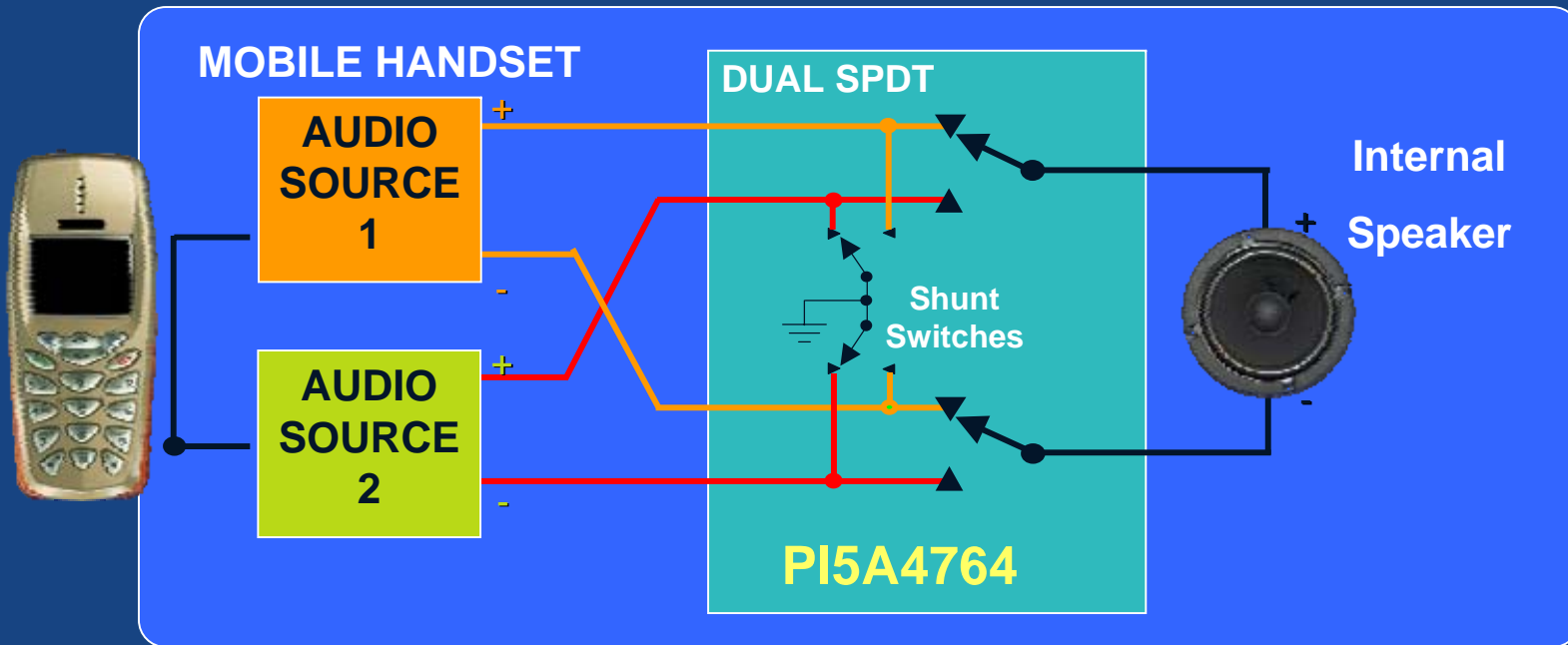
Requires 1 quantity Dual SP3T Analog Switch

Mobile Handset Application PI5A4763



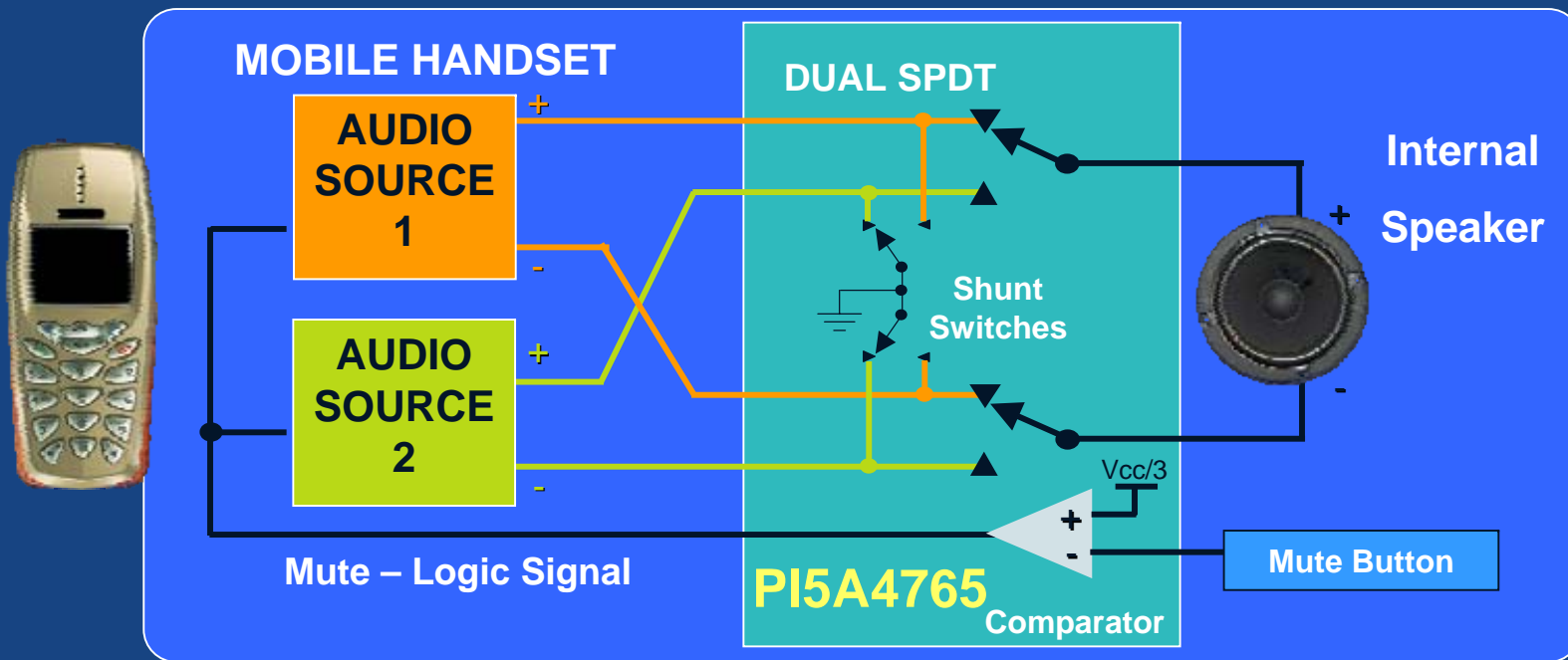
- Multi BB switching
- Poly-Phonic (MIDI) and BB switching
- Hands-free (Internal/External) switching
- FM Radio and BB switching
- MP3/MP4 Player and BB switching
- Memo Recorder and BB switching

Mobile Handset Application PI5A4764



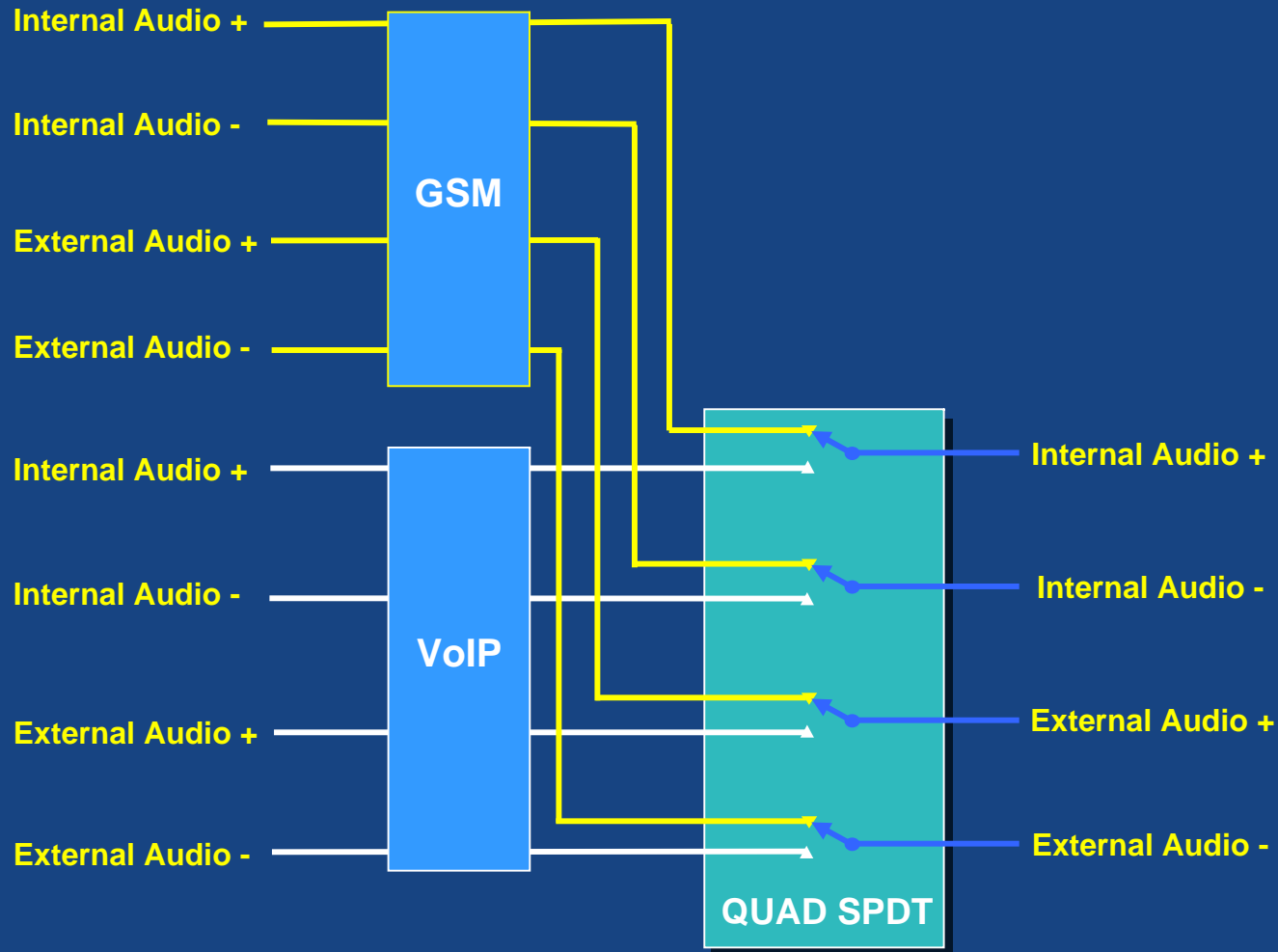
- Multi BB switching
- Poly-Phonic (MIDI) and BB switching
- Hands-free (Internal/External) switching
- FM Radio and BB switching
- MP3/MP4 Player and BB switching
- Memo Recorder and BB switching

Mobile Handset Application PI5A4765

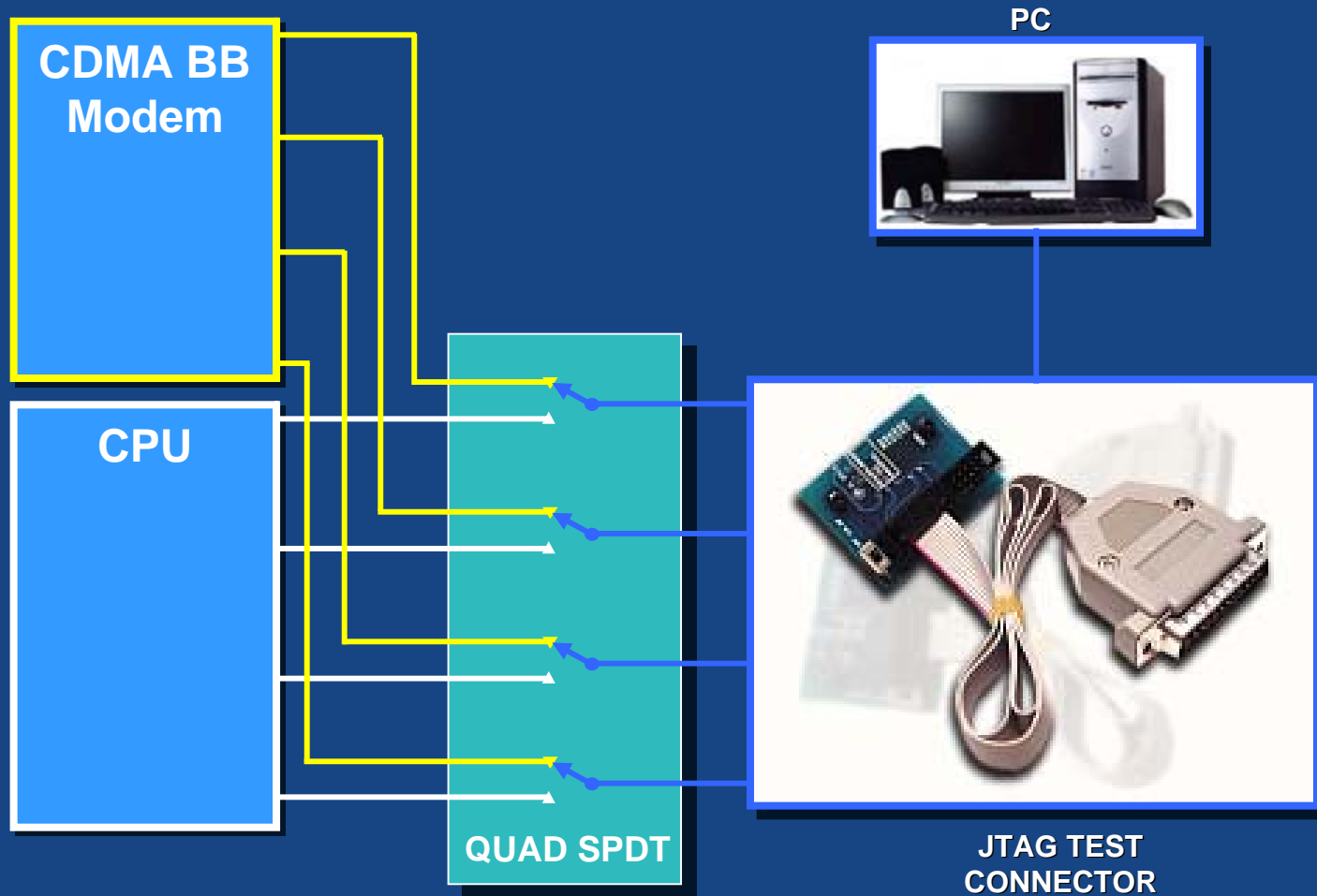


- Multi BB switching
- Poly-Phonic (MIDI) and BB switching
- Hands-free (Internal/External) switching
- FM Radio and BB switching
- MP3/MP4 Player and BB switching
- Memo Recorder and BB switching

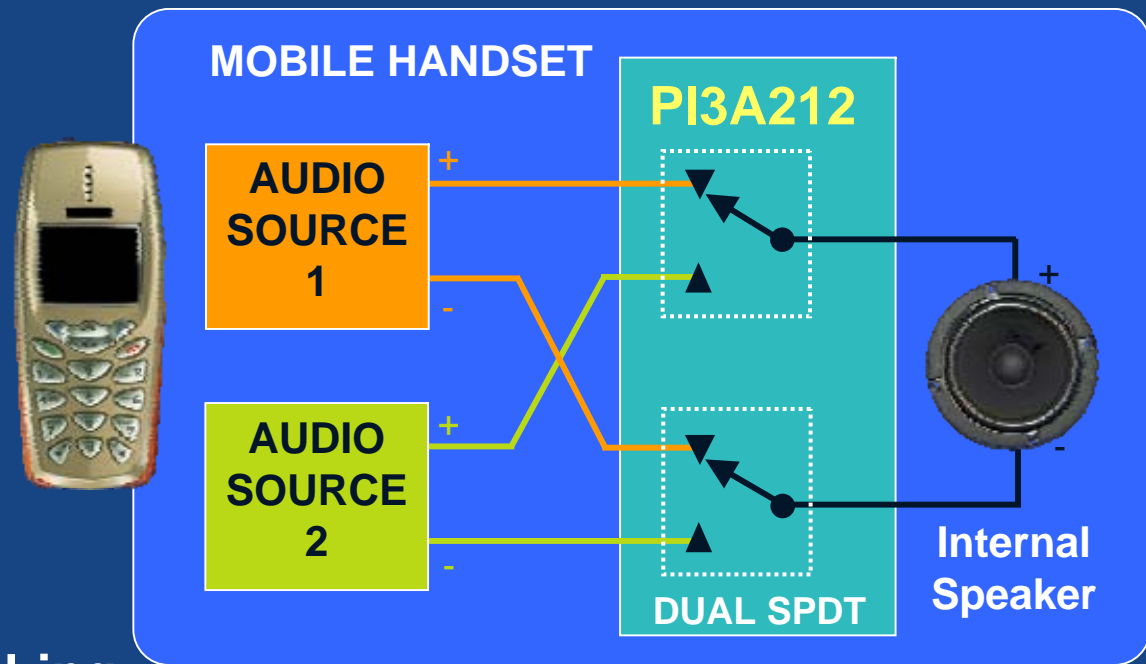
Mobile Handset Application PI3A412



Mobile Handset Application PI3A412E

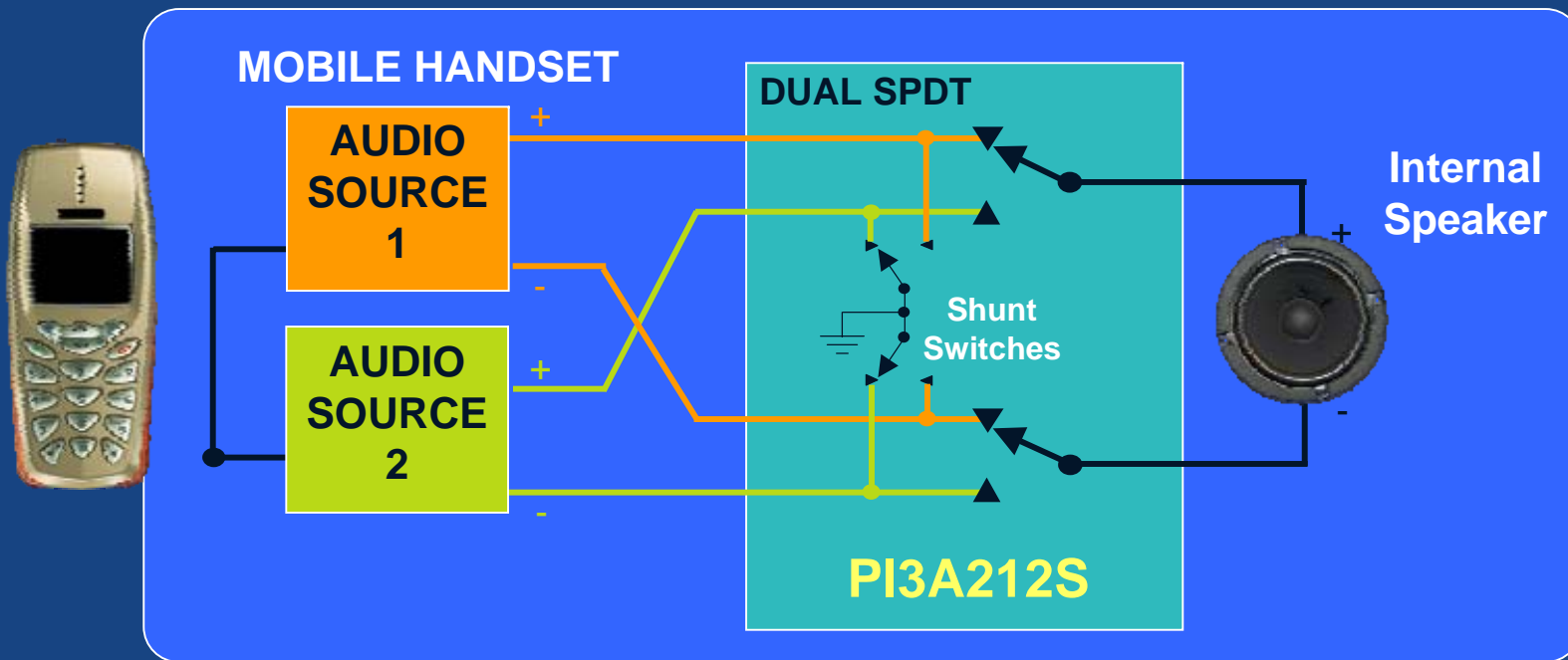


Mobile Handset Application PI3A212



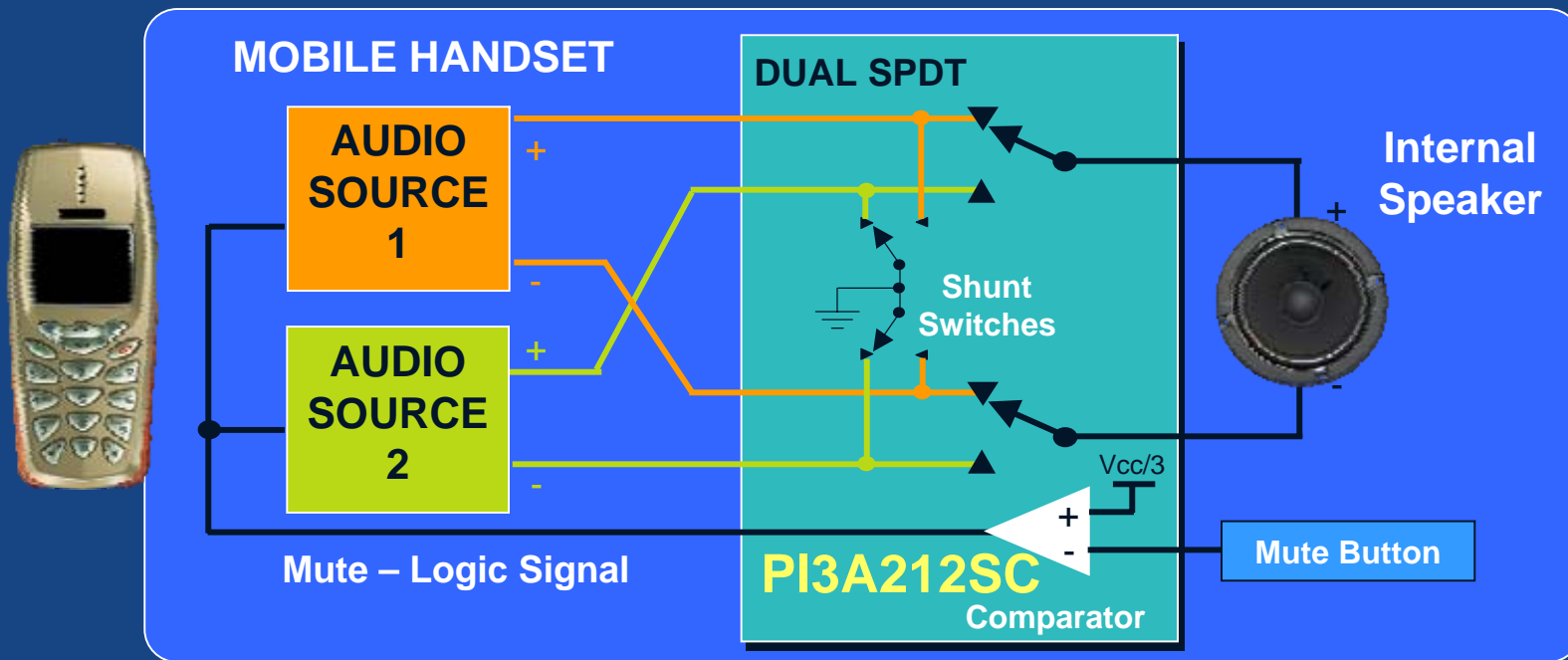
- Multi BB switching
- Poly-Phonic (MIDI) and BB switching
- Hands-free (Internal/External) switching
- FM Radio and BB switching
- MP3/MP4 Player and BB switching
- Memo Recorder and BB switching
- One touch entertainment & One Port Access

Mobile Handset Application PI3A212S



- Multi BB switching
- Poly-Phonic (MIDI) and BB switching
- Hands-free (Internal/External) switching
- FM Radio and BB switching
- MP3/MP4 Player and BB switching
- Memo Recorder and BB switching

Mobile Handset Application PI3A212SC



- Multi BB switching
- Poly-Phonic (MIDI) and BB switching
- Hands-free (Internal/External) switching
- FM Radio and BB switching
- MP3/MP4 Player and BB switching
- Memo Recorder and BB switching



Thank You
End of Presentation

