Process Node Migration
22 January 2020

SECURE CONNECTIONS
FOR A SMARTER WORLD

Agenda

- What is process migration?
- Why it’s so essential?
- What are the drawbacks
- How to overcome them?
- What are the solutions from NXP?
- What are the advantages of NXP’s solutions?

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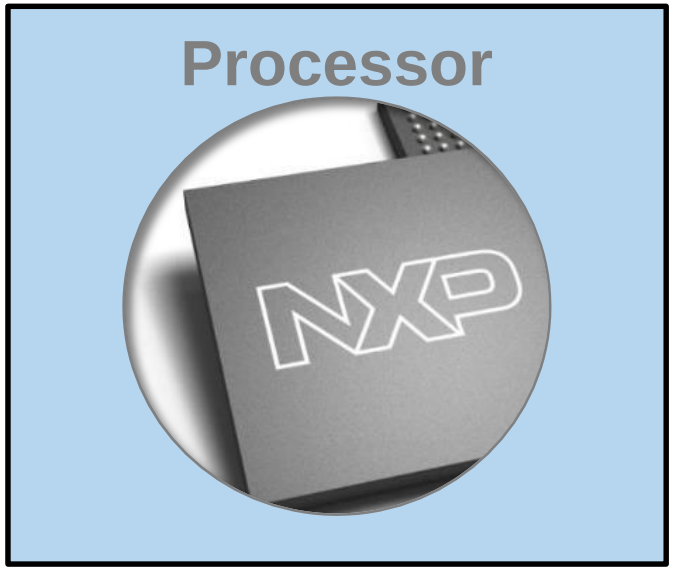
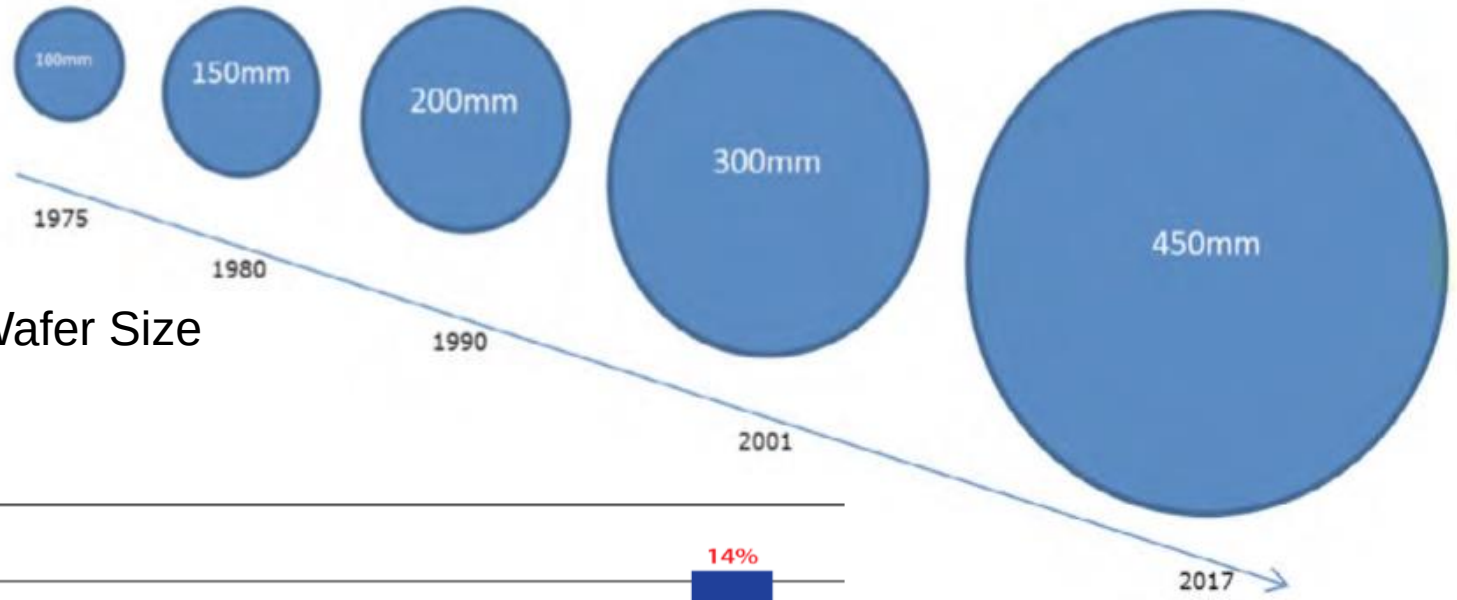
BU Advanced Analog,
High-Performance Analog

Emmanuel Nana
Technical Marketing Manager
BU Advanced Analog

Process Migration - Overview





Geometry	I/O Voltages
40 nm	5 V
28 nm	3 V
14 nm	1.8 V
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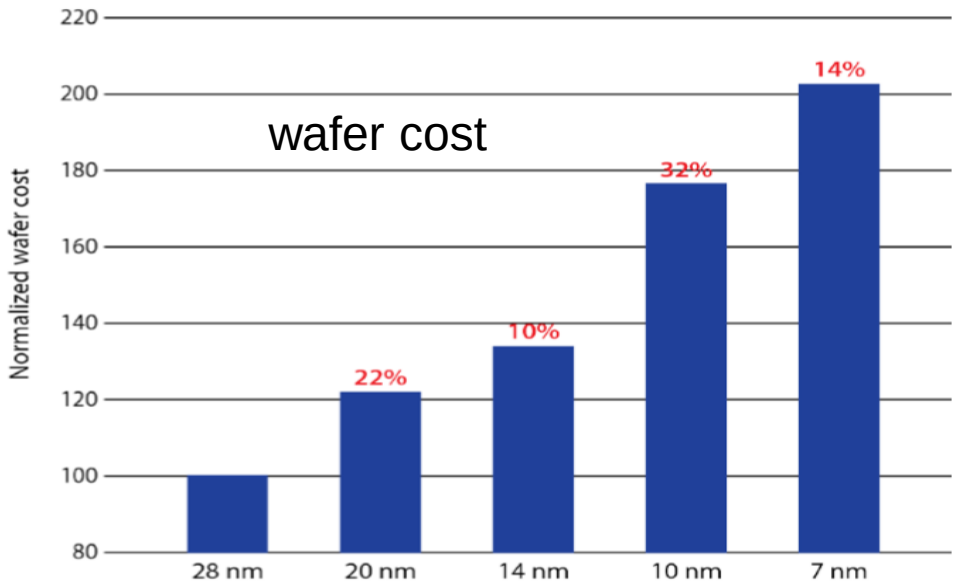
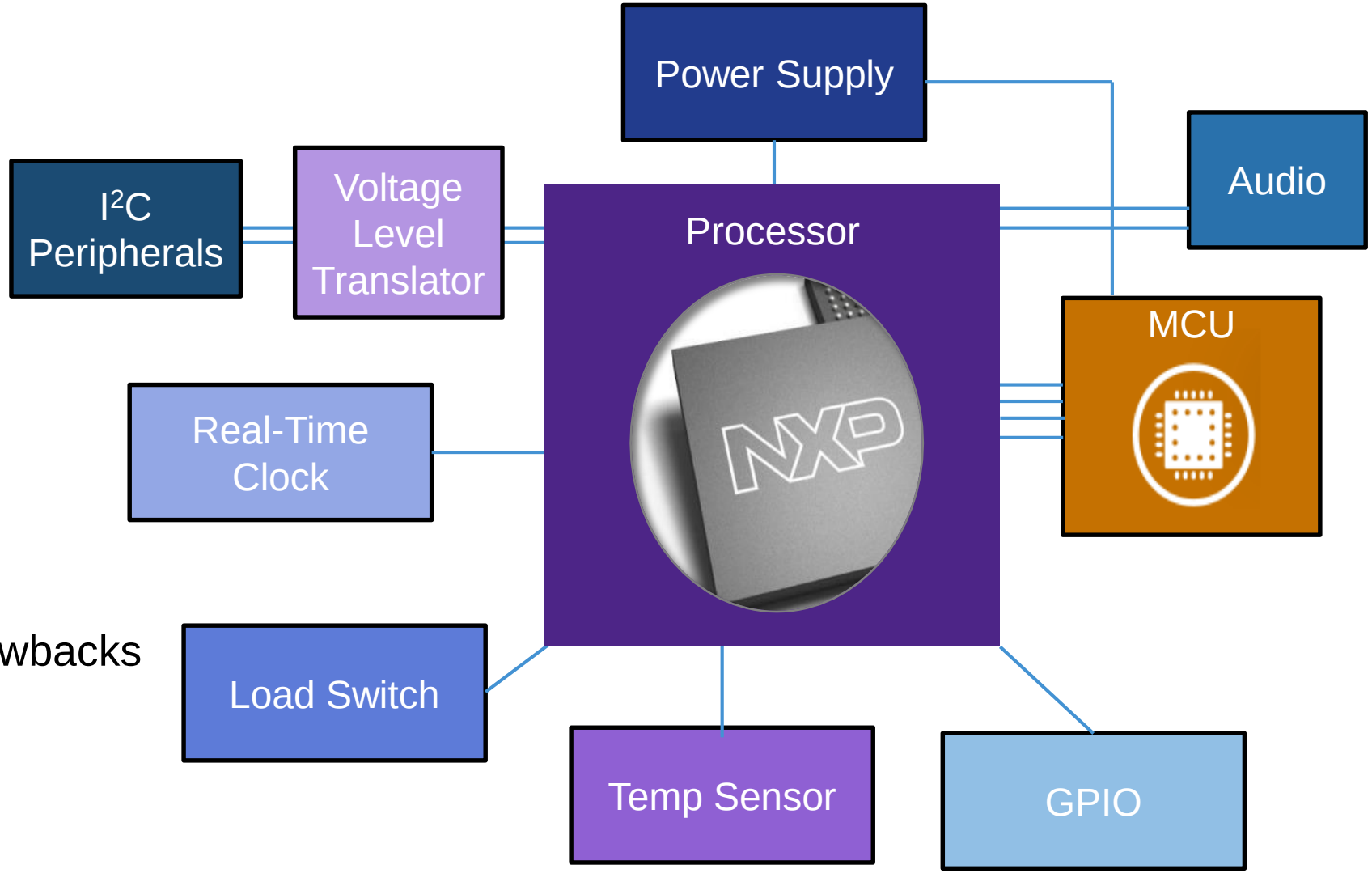


THE TRUE COSTS OF PROCESS NODE MIGRATION JOHN FERGUSON Mentor MASB 08-17 SSCAL-0020

Processors Connect to External Digital + Analog

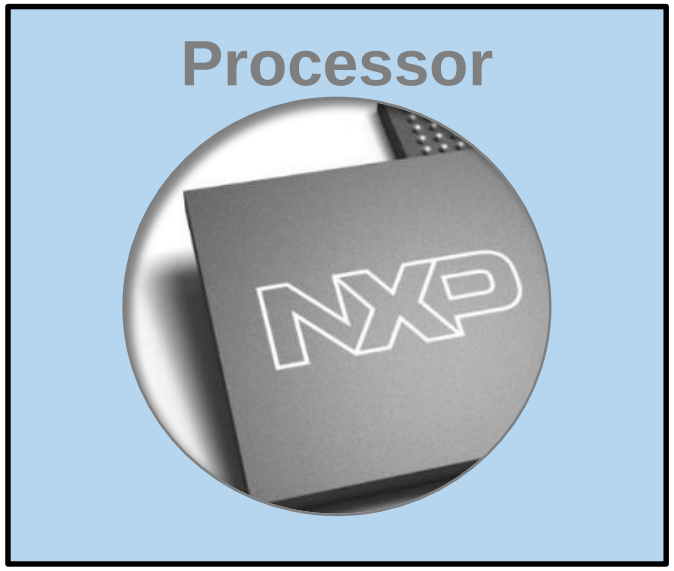


Process Node Migration Drawbacks

- Voltage Level Translation
- External GPIO
- Higher Leakage Current

Processor Trends – Lower Voltage Level Nodes

Big processors going towards smaller geometries for higher processing power



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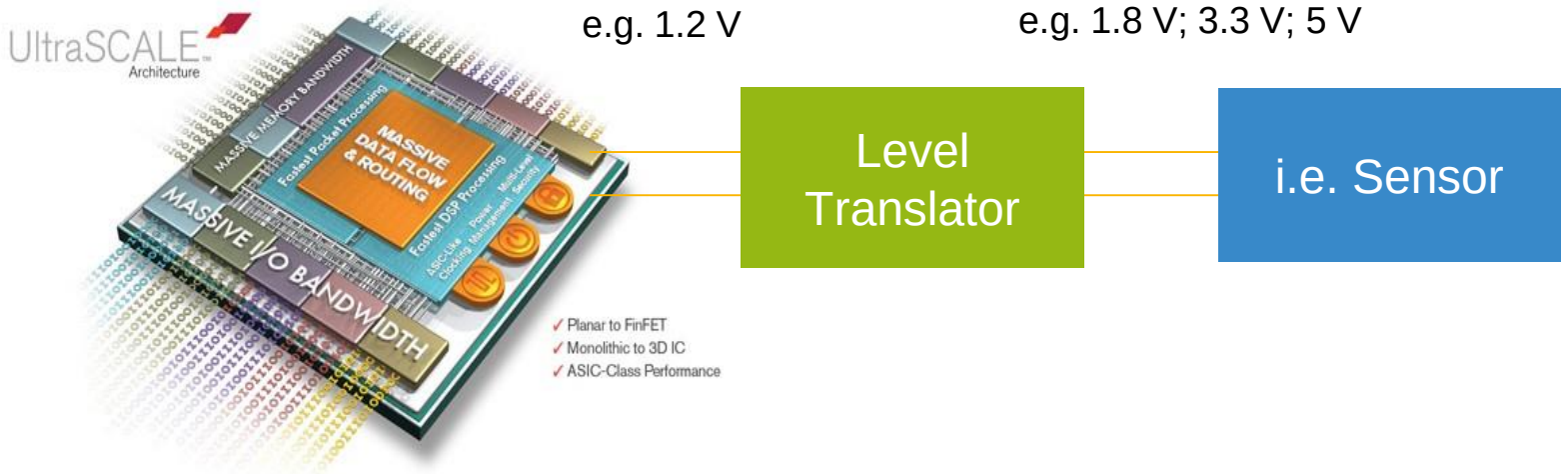
Smaller process geometries support lower voltages
→ more need for **voltage level translators (VLT)** to drive the peripherals still supplied at 1.8 V, 3.3 V or 5 V



Lower Voltage FPGAs/ASICs

NTS0304: 4-Ch Level Translators Offer Wider Voltage Ranges

Features

- VCC(A): 0.95 V to 3.6 V and VCC(B): 1.65 V to 5.5 V
- Family of 1, 2, 4 and 8-ch level translators
- 8 kV ESD protection (B-port)
- “Smart” one-shot with 50 ns pulse and EMI rejection

Benefits

- Wide voltage ranges match up with low-voltage μC’s/FPGAs
- Pin compatible packages with industry-standard footprint
- Highly robust for driving high capacitance cables or across boards

Applications

- Consumer
- Communications
- Smart cards
- Interface to low-voltage systems

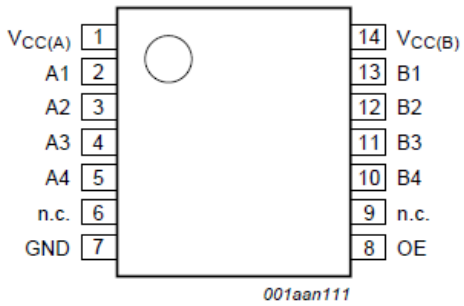


Fig 2. NTS0304PW Pin configuration

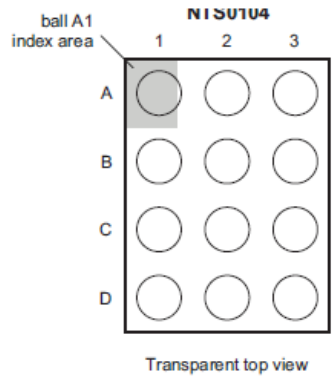
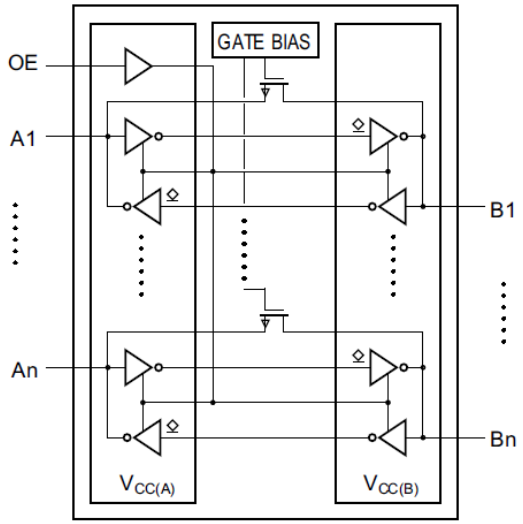


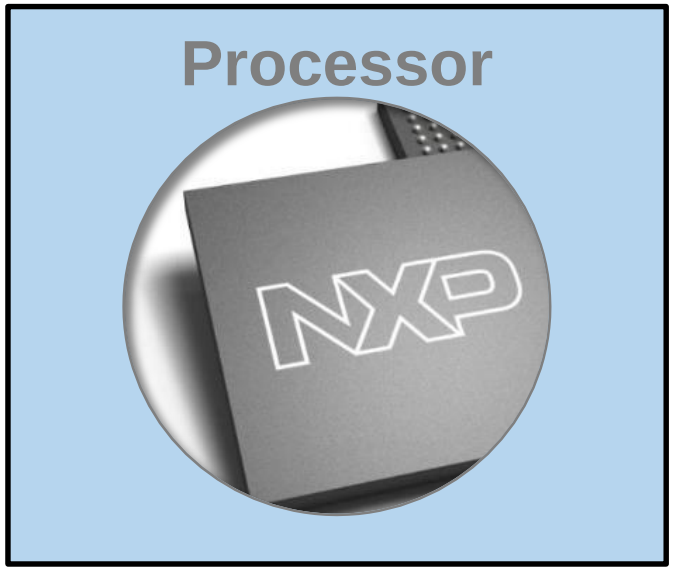
Fig 3. NTS0304UK Pin configuration WLCSP12



NTS0302JK 2-ch also in production

Processor Trends – High Voltage IO more expensive

Big processors going towards smaller geometries for higher processing power



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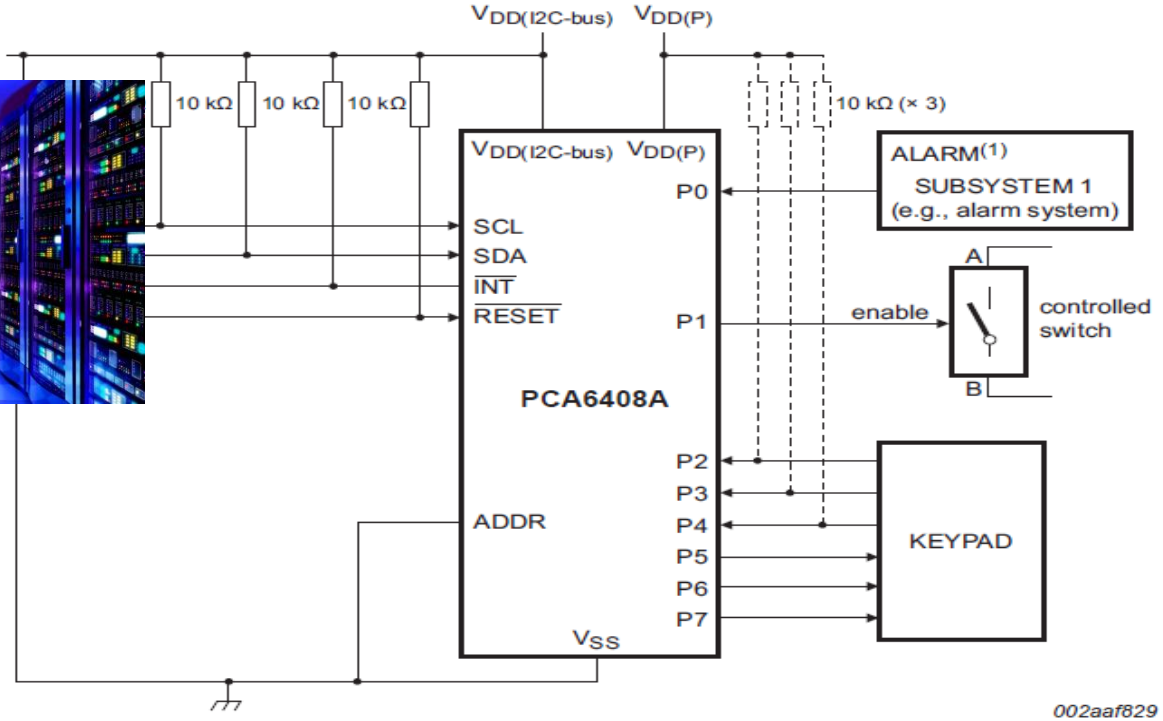
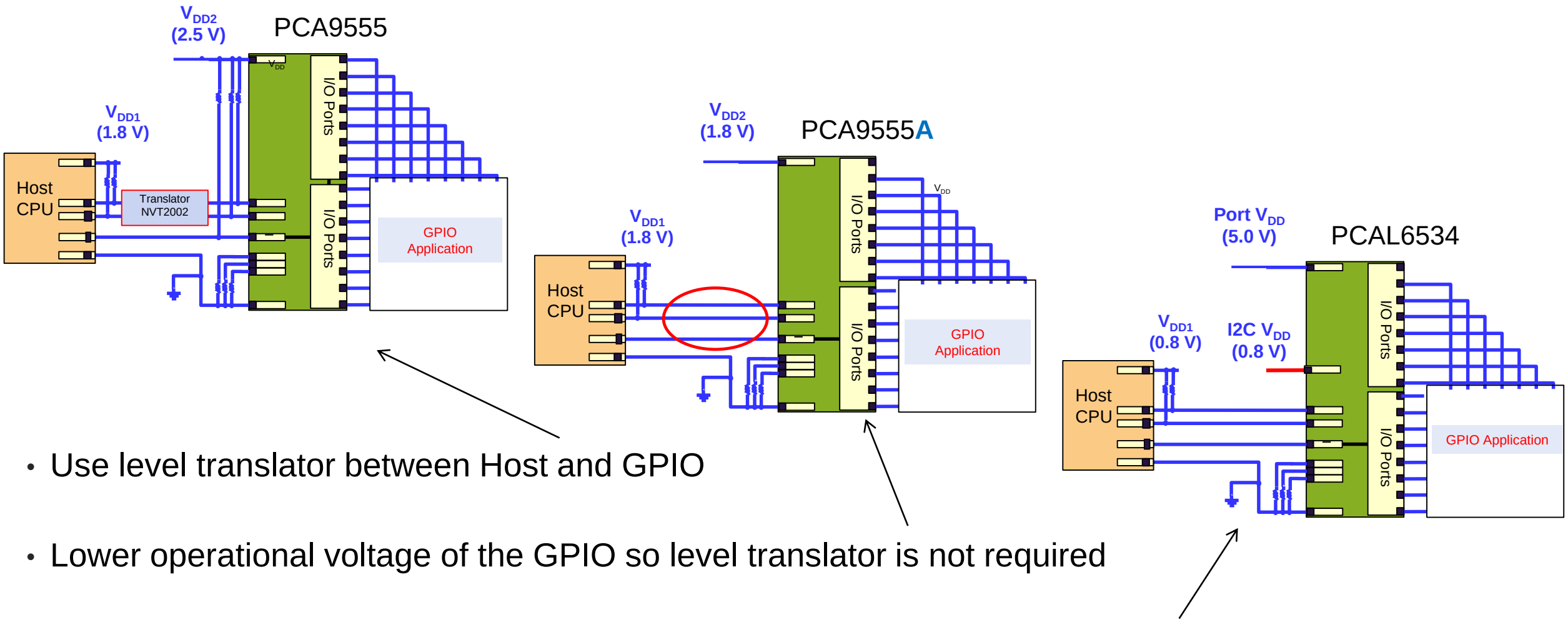
Cost of silicon for smaller process geometries is increasing and implementing ‘high voltage’ (3 V or 5 V) IOs is expensive
→ simpler functions like **GPIOs moving off the processor ICs**

More IO Channels



Level Translating - Two Supply GPIO



- Use level translator between Host and GPIO
- Lower operational voltage of the GPIO so level translator is not required
- Two supply pins so that I^2C interface and GPIO port operate at different voltages

PCAL6534EV: 34-Bit GPIO Expander Operates Down to 0.8 V

Features

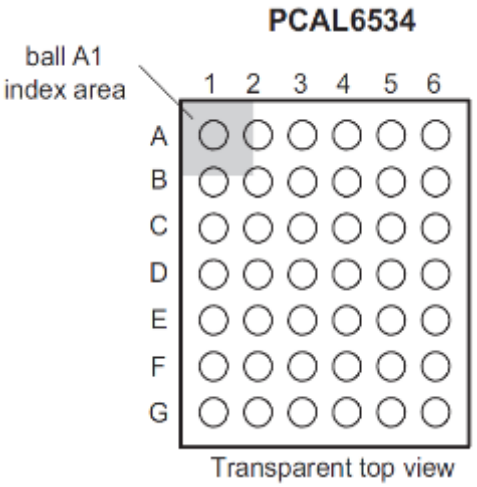
- Level translating 0.8 to 5.5 V range
- 2.6 mm x 3 mm VFBGA-42 package
- Agile IO: input latch, programmable output current, integrated resistors

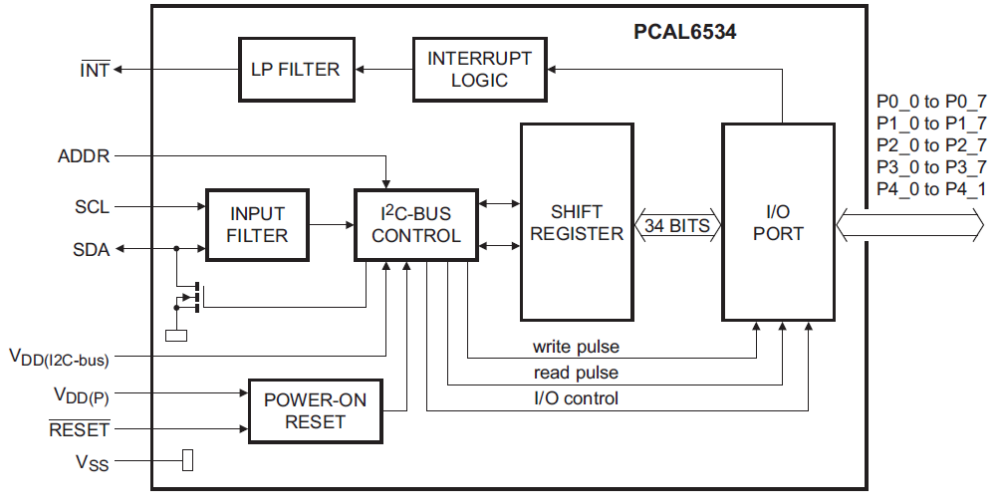
Benefits

- Wide voltage range matching with the newer process FPGAs/ processors
- Tiny BGA package saves cost and size of additional IO's in processor & simplifies routing

Applications

- Consumer phones and game controllers
- IO buttons
- Networking switches & routers
- Automotive window control





24-pin (SOT137-1) "D"

24-pin (SOT355-1) "PW"

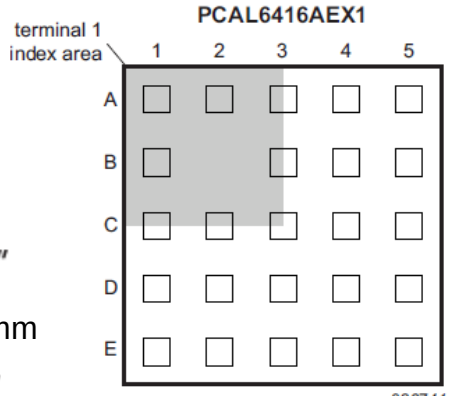
3 x 3 mm

24-pin (SOT905-1) "BS"

1.6 x 1.6 mm

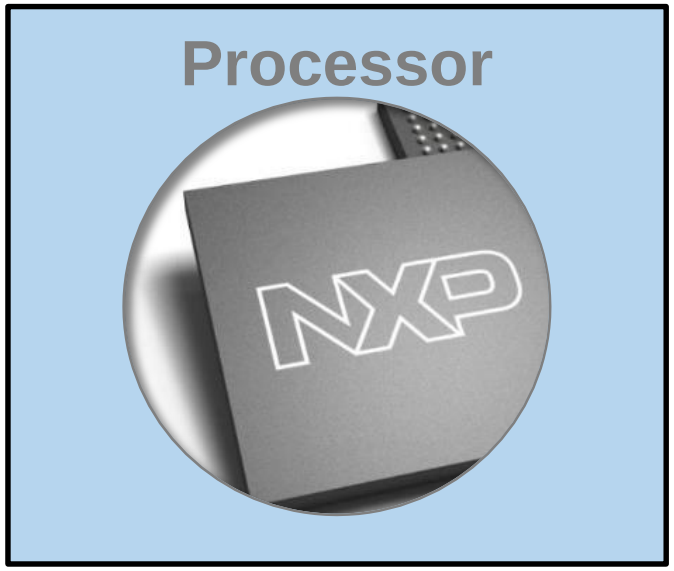
8-pin (SOT902-1) "GM"

Land Grid Array



Processor Trends – Higher Leakage Current

Big processors going towards smaller geometries for higher processing power



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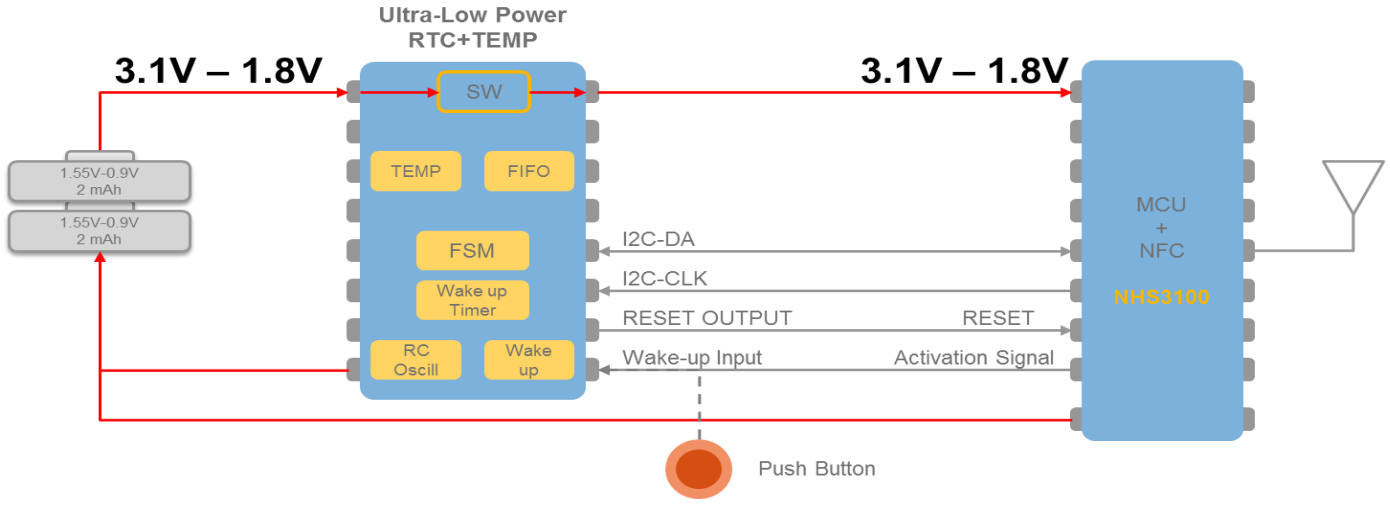
Smaller process geometries are characterized by higher leakage currents

→ more opportunities for **Ultra-low power ICs** to reduce the system stand-by power. This is particularly relevant for system that work periodically, i.e. wireless burst transmissions for smart meters



In Development PCF2131: Nanopower RTC with Integrated Crystal

Features

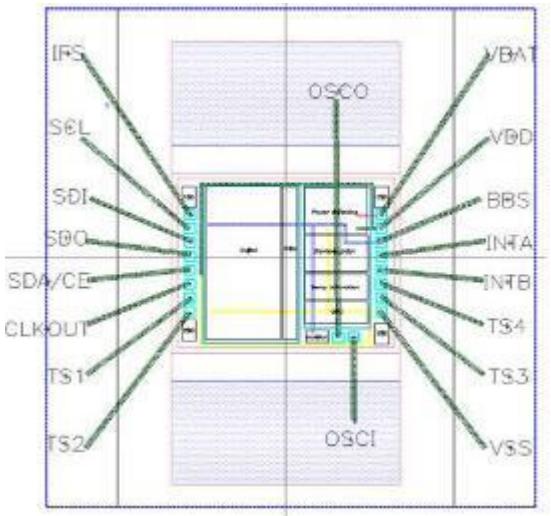
- 50 nA I_Q w/o temperature compensation, 100 nA I_Q with temperature compensation
- 3 ppm (max) temp comp. over -40° C to +85° C
- Four tamper protection inputs

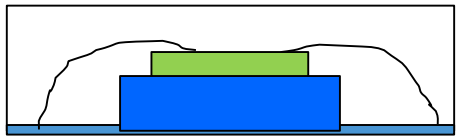
Benefits

- Ultra-low-power extends battery life
- Highly accurate for replacing µC/processor clocks
- High integration with crystal saves space
- Highly secure

Applications

- Gas meters
- Water meters
- Wearables
- IoT sensors
- Portable instruments





Sampling now – release end of 2020

In Development PCF85263UK: RTC Operates Down to 0.9 V - WLCSP

Features

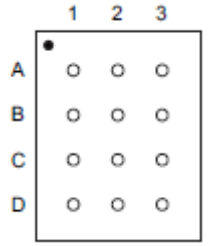
- Level translating 0.9 to 5.5 V range
- 1.2 x 0.94 x 0.22 mm WLCSP12 package
- Low current; typical 280 nA at V_{DD} = 3.0 V and T_{amb} = 25° C

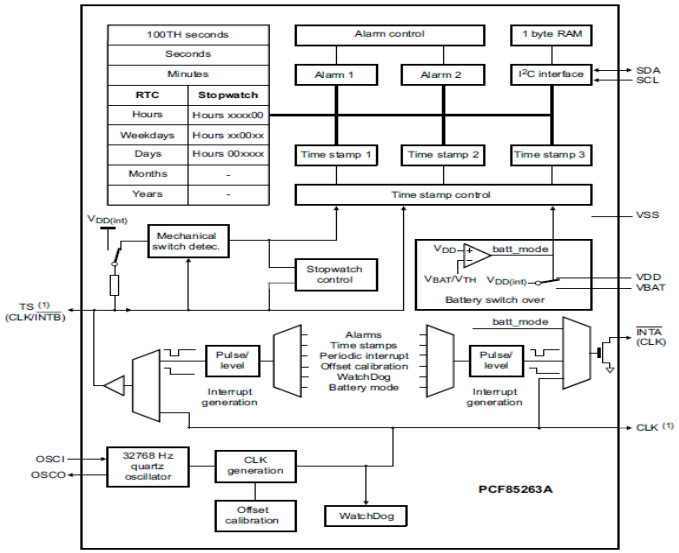
Benefits

- Wide voltage range
- Low power consumption
- Battery back up
- Tiny package for very small module applications

Applications

- Consumer phones
- Smart Watch
- 5G Network Modules



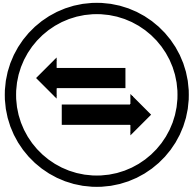


Sampling 1Q 2020 – release end of 2Q 2020

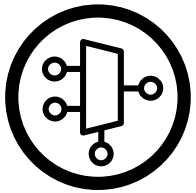
High Performance Analog offers "*Solutions Around The Core*"

General Purpose Analog: I^2C peripherals and building blocks

Lower Voltage (0.8 V + 1.65 V supply)

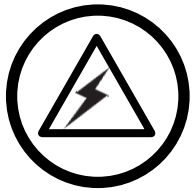


GPIO Expanders



Muxes & Switches

Lower Voltage (0.95 V + 1.65 V supply)

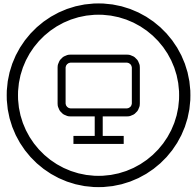


Level translators

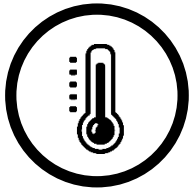
Lower Voltage (1.2V)

Real-Time Clocks

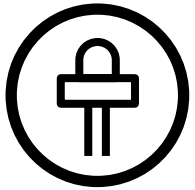
Higher Voltage (2.3 V)



LCD Drivers



Temp Sensors



LED Drivers

Additional Resources

Voltage Level Translator –

https://www.nxp.com/products/peripherals-and-logic/voltage-level-translators:VOLTAGE-LEVEL-TRANSLATORS

GPIO –

https://www.nxp.com/products/interfaces/ic-spi-serial-interface-devices/ic-general-purpose-i-o:MC_41850

RTC –

https://www.nxp.com/products/peripherals-and-logic/signal-chain/real-time-clocks:MC_71246

Q&A

FOR MORE INFO PLEASE CONTACT

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