Lets Make World Better

Rajesh Gupta
Director and CTO
GreenIPCore, PlusQO Corp. Pvt. Ltd
www.greenipcore.com
About PlusQO

PlusQO Corp. Pvt. Ltd is founded to develop State-of-Art Best Quality Products in the Different Established and New Emerging technological fields.

It has following Subsidiary focused and specialized on Silicon IP specific domains -

1. **GreenIPCore** – It is Focused on developing next generation Digital IPs which can empower Next Generation High Reliable and High Bandwidth Products.
Need for improvements in Silicon Devices-

Reliability is a term to earn. New Age Electronics need to ride on this to improve the products.

*Needs, Challenges and Innovations in Silicon Chips to make them Electromagnetic Noise and Hazards Resistant*
Decreasing Noise Immunity of Electronic System

- Integration Size
- New Field Exposure
- Operating Voltages inside Chips
- Technology Node

Decreasing Noise Immunity of Electronic System

- Noise remained same.
- Or even increased to as electronics start exposed to different fields.
- With increasing technology, effect of noise actually increased on electronic devices.
Impact of a Electromagnetic Noise/ Environmental Hazards On a Silicon Chip

- In a event of sever noise, there is fair amount of chance that logic/ data get corrupted and registered on a flip flop and start flowing in system on control or data path.
Demonstration of Noise Impacting Silicon Chips

https://www.youtube.com/watch?v=aoYdZBwsK2o&t=4s
Different Kind of Environmental Noise /Interference-

With the increasing use of Electronics and Electrical Equipments everywhere, the current environment is much noisier. Following are the Noise Current Electronic Infrastructure is Impacted from -

• Circuit to Circuit Noise
• Ambient Noise
• Equipment Generated Noise
• Power Quality degradation Noise
• Railroad and Mass Transit Noise
• High Powered Electromagnetic Pulses
Processor
Compound
Memories
Chip Control IPs
Backbone
Power Control
Power Supply
Accelerators
Off Chip Interfaces
Debug Control
Security Control
HW Layer

Loss of Function
Non-Recoverable
EFT, ESD
Surge, Dips, Interruptions, Variations
Ambient Noise

Suspicious Resets
Suspicious Data/Instruction
Suspicious Inputs
Suspicious Interrupts
Corrupt RAM
Corrupt PC
Corrupt Registers
Stack Overflow
Corrupt NVRAM/EEPROM
CMOS Latchup
Loss of Function
Recoverable
Loss of Function
Non-Recoverable
Corrupted System Functions
Over Infusion

Noisy Environment
Hardware Fence
Software Fence
Effect of Noise on a System -

- **Environment Noise**
  - SOC Hardware
    - 1. Suspicious Resets
    - 2. Data Corruptions
    - 3. Corrupted Registers
    - 4. Suspicious Inputs
    - 5. Data Repeat
    - 6. CMOS Latchup
  - SOC Software
    - 1. Wrong Calculation
    - 2. Additional Delay
    - 3. Wrong Jump Address
    - 4. Decryption Fail
    - 5. Wrong Authentications
  - Temporary Storages
    - 1. Corrupted RAM
    - 2. Corrupted PC
    - 3. Stack Overflow
  - Permanent Storage
    - 1. Corrupt Flash
    - 2. Corrupt NVRAM
    - 3. Corrupt EEPROM

**Temporary Loss**

**Permanent Loss**

**Effects**
The Figure shows that -

- The noise first affects hardware components.
- Then the error flows through non-Noise Immune paths to a temporary faulty states/Data or to a more impacting components and start affecting Software layer.
- These Software errors then move to either temporary loss of function or to a more impacting stage like getting into permanent storage and permanent loss of a function.
Electronics Devices Roadmap

- More In Dependent Electronics.
- More Autonomous Electronics.
- More User Independent Electronics.
- User Control is actually cutoff from next generation devices.

Level 1: Full Human Control
Level 2: Human + Machine Control
Level 3: Machine Control Manual Fixable
Level 4: Machine Action Non-Fixable
Electronic Devices Expansion

The Electronics applied in below application areas does not have any space to malfunction.

- Artificial Intelligence/ Machine Learning.
- Automotive Autonomous Driving.
- Robotics
- Aerospace.
- Banking and Security.
- Storage and Backup.
- Communication and IOT

Even a single error in its entire functional life period can make major impact.
Noise Rejection, Understanding the “Magnitude Of Challenge”

- Noise is a Random event.
- Even a fully synchronous silicon IP would have to deal with noise event.
- It can change behavior of even totally Synchronous IPs.
- Identifying all such random states in-between can be a much tricky and time consuming activity.
- A full random simulation would take years to prove that most of such conditions and precautions are taken care inside a design.
- Breaking the design into manageable small pieces and then making them noise resistant is the way to go.
Demonstration of Noise Resistant Technology

https://www.youtube.com/watch?v=7_x785A54Rw&t=2s
The Challenge – “Give Space In Application Improvement/Innovations” or to “Take Back Control”

- New Era of technology starts building product of next level where it starts sitting into the front row and cut-off all the user intervention on the application response/decision.
- These applications take out all the control from user and give it to these high end devices.
- The applications like –
  - **Automotive** ➔ Autonomous Driving, ADAS.
  - **Artificial Intelligence (AI)** ➔ Machine Learning, Handheld devices, Mobile applications, Big Data Processing.
  - **Medical Equipments** ➔ Pacemakers, Automated Operations, High Precision Surgery, Electronic controlled Human Parts and Prosthetics. Human helping Exo-Skeletons and much more.
  - **Security** ➔ Fully Automated Security like - Home Security, banking security, wireless pay, etc.
  - **Storage** ➔ Storage into Chips based Solid State Devices(SSDs). Large Storages inside Mobile phones.
  - **Banking** ➔ Single click payment, Fully automated banking system, Safety from Algo based hacking, Fault tolerant, Reverse Engineering Proof.
  - **IoT** ➔ Much More Reliable Applications.
Space for innovation/ Improvements

• Need New Technologies to improve electronics stability across different field.
• New methods need to be explored to improve Electronics.
• As of today, we can make following improvements in products with silicon chips –
  – Add up a Noise rejection layer at
    • Metal Shielding the Electronic Devices
    • SW Layer
    • Silicon IP Level
    • Silicon Reusable Component Level.
    • Silicon library Component Level.
  – Each of these methods have there pros and cons.
Way to go, What is world looking for

- With the new exposure of electronics, electronics start expanding into all fields and user start exploring possibilities to apply this autonomous electronic devices into their respective fields.
- Electronics is exposed into all kind of working environment making is more exposed towards Different kind of Noise and hazards.
- The Electronics should facilitate New Era application to ride Reliable platform.
- New platforms should ensure User Safety and Security at all times.
- New platforms should ensure application reliability at all times.
About GreenIPCore, PlusQO Corporation Private Limited

- GreenIPCore build Technological advance soft digital IPs and Component with following feature –
  - Noise Resistant.
  - High Stable.
  - Technology node Independent.

- GreenIPCore Also build Technological advance soft digital IPs and Component with following feature –
  - High bandwidth.
  - High Stable.
  - Technology node Independent.
Products and Benefits – Noise Resistant Digital IPs

**Noise Resistant Soft Digital IP**

- **Key Feature**
  - Noise Resistant
  - High Stable IPs
  - Fully Safety Compliant

- **Added Advantage**
  - Equivalent gate Count
  - Good Operating Freq
  - Fully Protocol Compliant
  - Fail Safe Recovery

**PlusQO**

**Green IP Core**

- **Soft Digital IPs**
Target Domains – Noise Resistant Digital IPs

- Artificial Intelligence
- Machine Learning
- Automotive
- Security
- Robotics
- Medical
- IOT
- Storage
- Banking
- Aerospace
- Industrial Automation
- Communication

Highly Recommended for Stability

Needed for New Tech Markets

Needed for Stable Operations
Noise Resistant Digital IPs – Benefits in AI/ML

Artificial Intelligence

Un Predictable learning

Un Explainable Results

Stability and High Processing

Full Autonomous Result

No Backtrace if Conflicting Results

Learning cannot be reversed

Artificial Intelligence

No Recovery

Noise Resistant

High Stable IPs

Fully Safety Compliant

Fail Safe Recovery

Equivalent gate Count

Good Operating Freq

Fully Protocol Compliant

Machine Learning
Noise Resistant Digital IPs – Benefits in Automotive

Automotive

Unreliable Automation
Exposed to all environment
Difficult to Fail Safe
Unable to Safety complaint
Single Fail in Lifetime has Sever Impact
Neavy Noise Exposure
High Reliability Needs

Noise Resistant
High Stable IPs
Fully Safety Compliant
Fail Safe Recovery
Equivalent gate Count
Good Operating Freq
Fully Protocol Compliant
Noise Resistant Digital IPs – Benefits in Autonomous Automotive and Drone technology

Autonomous Automotive
Drone Technology

Unreliable Automation
Exposed to all environment
Difficult to Fail Safe
Unable to Safety complaint
Single Fail in Lifetime has Sever Impact
No One takes responsibility
High Reliability Market Needs

Noise Resistant
High Stable IPs
Fully Safety Compliant
Fail Safe Recovery
Equivalent gate Count
Good Operating Freq
Fully Protocol Compliant

Automotive
Noise Resistant Digital IPs – Benefits in Security

Noise can influence Result
Exposed in all environment
Metal Shield Not Enough
Needs more light weight
Miss Important time if Failed
No One takes responsibility
Hacker also use Same tech to extract secrets

Noise Resistant
High Stable IPs
Fully Safety Compliant
Fail Safe Recovery
Equivalent gate Count
Good Operating Freq
Fully Protocol Compliant

Security
Noise Resistant Digital IPs – Benefits in IOT

- Noise can influence Operation
- Exposed in all environment
- Metal Shield Not Enough
- No Chance to Reset inbetween
- Miss Important Command if Failed
- Reliability and Security is a major Concurs
- Power and Gate count matters

- Noise Resistant
- High Stable IPs
- Fully Safety Compliant
- Fail Safe Recovery
- Equivalent gate Count
- Good Operating Freq
- Fully Protocol Compliant
Noise Resistant Digital IPs – Benefits in Robotics

- Noise can influence operation
- Exposed in all environment
- Metal shield not enough
- No chance to reset inbetween
- Miss important time if failed
- No one takes responsibility
- Reliability is concern to make general use robots

- Noise resistant
- High stable IPs
- Fully safety compliant
- Fail safe recovery
- Equivalent gate count
- Good operating freq
- Fully protocol compliant

Robotic
Products – Noise Resistant Digital IPs

- **Noise Resistant Soft Digital IP**
- **Soft Digital IPs**
- **Green IP Core**
  - PlusQO

- **Green IP Core**
  - Design with Innovation

- **Noise Resistant Soft Digital IP**
  - Digital Component IP
  - SOB Building Block IPs
  - Timers
    - Watch Dog
    - AHB Security Wrapper
    - AXI Security Wrapper
    - Memory Sec Controller
    - Interrupt Controller
    - Debug Controller
    - Clock and Reset Controller
    - Chip Security and Configuration
  - AHBM-to-AXIM
  - AXIS-to-AHBS
  - AXIS-to-APBS

- **FIFO**
- **Elastic Buffers**
- **CDC Components**
- **RDC Components**
Product – Noise Resistant SOC

3rd Party IP

Noise Resistant Soft Digital IP

FIFO
Elastic Buffers
CDC Components
RDC Components
Watch Dog
Timers

FIFO

3rd Party IP

Noise Resistant Soft Digital IP

FIFO

3rd Party IP

Noise Resistant Soft Digital IP

FIFO

3rd Party IP

Noise Resistant Soft Digital IP

FIFO
Products and Benefits – Soft Digital IPs

- Soft Digital IPs
  - Noise Resistant Soft Digital IP
  - Lowest gate Count
  - Very High Processing Elements
  - Safety Compliant
  - Very High bandwidth
  - High Stable IPs
  - Wide Protocol Support
  - Highest Operating Freq
  - PlusQO

- Green IP Core
  - Design with innovation
  - Key Feature
  - Added Advantage
  - WOW Feature

- Green IP Core
  - Design with innovation
  - Soft Digital IPs

- PlusQO
  - Safety Compliant
Target Domains – Soft Digital IPs

- Banking
- Security
- Artificial Intelligence
- Cryptography
- Storage
- Machine Learning
- IOT
- Robotics
- Banking
- Aerospace
- Medical
- Industrial Automation

Soft Digital IPs
- Noise Resistant Soft Digital IP
- PlusQO

Highly Recommended
Good for SW Stability
Good to Have
Products – Soft Digital IPs

Soft Digital IPs

PlusQO

Noise Resistant Soft Digital IP

Digital Components IP

SOC Building Block IPs

FIFO

Elastic Buffers

CDC Components

RDC Components

GPIO

Timers

Watchdog

Interrupt Controller

Debug Controller

Memory Controllers

Clock and Reset Controller

Chip Security and Configuration

AHBL-to-AHB

AHBM-to-AXIM

AXIS-to-AHBS

AXIS-to-APBS
Product – Soft Digital SOC

High BandWidth SOC

AHB Masters

AHBL-to-AHB
AHBM-to-AXIM

AHB Masters

Timers
Clock and Reset Controller
Debug Controller
Watchdog
Chip Security and Configuration
Interrupt Controller

Custom Backbone / CrossBar / FlexNOC / NIC

AXIS-to-AHBS
AXIS-to-AHBS
AXIS-to-APBS

AXI Masters

AXI Masters

AXI Slaves

AXI Slaves

AXI Slaves

AHB Slaves
AHB Slaves
APB Slaves

RDC Components
CDC Components
Elastic Buffers
Memory Controllers
FIFO
GPIO

3rd Party IP
Soft Digital IPs
Learn More – Published Online Media

For more details on our work and improvements we offer, please look into the Video Presentations published -

• Introduction to Company -
  https://www.linkedin.com/company/greenipcore

• Demonstration Videos -
  https://www.youtube.com/channel/UCIn59oopLYS7glvoQ3s4XVg

• Introduction to Noise resistant Technological Improvements –

• New Noise Resistant technology –
Learn More – Published Online Media

QR Links

Linkedin

Noise Resistant Tech Improvements

Youtube
Demonstration Videos

New Noise Resistant Technology
Thank you for your time

Questions Answers

• For Further Communication/ Query,
  – Write us at start@greenipcore.com
  – call us at
    • +91-9821330671

• Please visit us at www.greenipcore.com

Address:
GreenIPCore, PlusQO Corporation Private Limited.
805, OM-Towers, Alpha Commercial Belt, Grater Noida, U.P., India.