proteanTecs

proteanTecs RTSM™
Driving the Path to Zero Failures

Functional Safety
& Diagnostics

When Safety Is Non-negotiable

Software Defined, Electric, and Autonomous vehicles are driving new roadmaps for advanced electronics. Centralized architectures have introduced cutting-edge ECUs and SOCs.

Coupled with stringent standardization, automotive manufacturers and OEMs are tasked with achieving functional safety in an ever developing landscape. Maintaining safety standards without compromising performance and cost becomes a critical challenge.

Automotive Industry Grade Safety Layer

RTSM is a novel real-time safety monitoring application for predictive and prescriptive maintenance, allowing systems to stay always-on while receiving faster alerts on faults before they become failures. By integrating RTSM, automotive manufacturers and OEMs can achieve unprecedented levels of reliability and safety, aligning with evolving safety standards and industry expectations.

Predictive Maintenance

Monitors how close the device is to timing failures

Prescriptive Maintenance

Triggers realtime operational system adjustments to avoid failures

Fault Detection

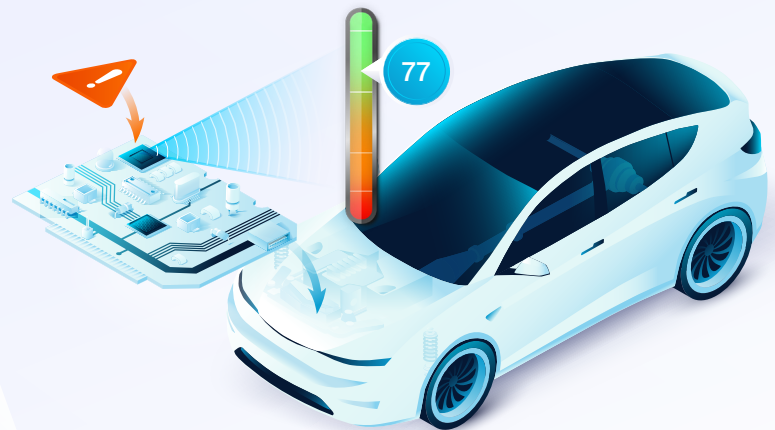Alerts on timing violations to prevent logical failures

+ Failure prevention
+ Risk severity assessment
+ Realtime alerts
+ Under real workloads
+ Non-stop monitoring
+ Customizable output

Deeper Insights for Smarter Prevention

Leveraging deep data from on-chip agents, algorithms automatically identify faults, and issue warning signals.

A predictive Performance Index grades the issue severity based on:

> Thresholds
> Affected areas
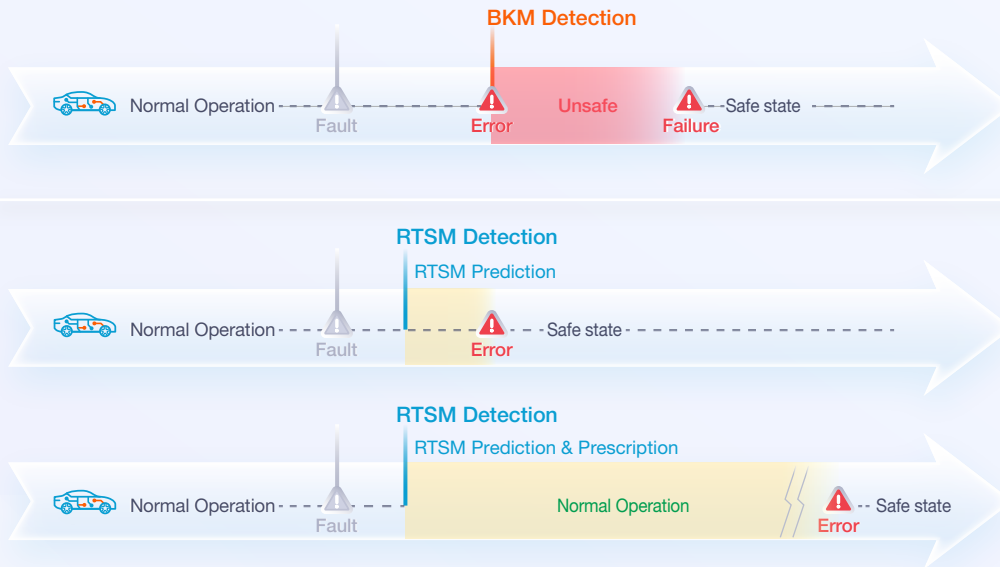> Clock domains

> Power domains
> Previous events
> Safety zones

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STANDARDIZATION & COMPLIANCE

ISO 26262 UCIe Universal Chiplet Interconnect Express IEEE SA STANDARDS ASSOCIATION EPS IEEE ELECTRONICS PACKAGING SOCIETY ASIL-B COMPLIANT

Prescriptive Maintenance at Hand

RTSM monitors the timing margin of millions of real paths in every chip at high coverage, under real workloads. It alerts the system before reaching the minimal point at which error-free functionality can be achieved.

Industry best known methods

BKM Detection

Normal Operation — Fault — Error — Unsafe — Failure — Safe state

With proteanTecs RTSM

RTSM Detection
RTSM Prediction

Normal Operation — Fault — Error — Safe state

RTSM Detection
RTSM Prediction & Prescription

Normal Operation — Fault — Normal Operation — Error — Safe state

- **+** Faster time-to-detection
- **+** Faster time-to-reaction
- **+** Failure prevention with predictive and prescriptive maintenance

RTSM Demonstrated in a 5nm SoC

proteanTecs   Realtime Safety Monitoring

Confidential   Pause   Reset

Monitors   Logs

Performance Index reflects how close the device is to failure

Performance Index
86% ↑

Minimal PI
37%

Event Counter
4

Event Counter
56.3 °C
45.4 °C

Event Counter
650 mV

Monitoring
Enabled

Counter measure
N/A

Diagnosis
✓ Fault prevention
⚠ Fault detection

Margin to Timing Failure

Predictive threshold
Prescriptive threshold
Safety threshold

Inferred Internal Voltage

# of agents: 7

Legend — Monitored Timing Margins — Protection Threshold — Monitored Value — Value at Minimum Timing Margin — VDDmin + Guardband = 650 [mV] — Safety Threshold (Interrupt) — VDDmin (Last Pass) = 585 [mV]

2 Scenario II
Permanent degradation, not followed by a voltage boost

1 Scenario I
When the worst timing margin drops below a threshold, an alert is issued and (in this case) the voltage was raised to mitigate

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White Paper
Real-Time Safety Monitoring for Predictive and Prescriptive Maintenance in Advanced Automotive Electronics