Spansion Automotive Business and MCU Solution

Takeshi Fuse, SVP, MCU Business Group

OCTOBER 3RD, 2014

スパンション会社概要

スパンション (NYSE: CODE)

売上 : $1.3B

従業員数 : 4,000

製品数 : 10,000+

特許件数 : 5,000

顧客数 : 10,000+

Flash 世界一のNORフラッシュメモリ・サプライヤ

MCU ARM /オリジナル・コア – 日本 2位

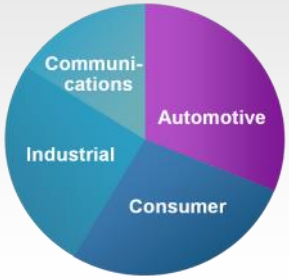
Analog PMICs, LED照明, エナジーハーベスティング(EH)

4/30/'13 → **8/1/'13**

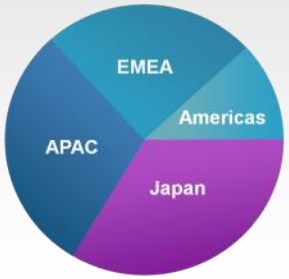
AM事業統合発表 – 契約調印

統合完了 – "Cash Register Works"

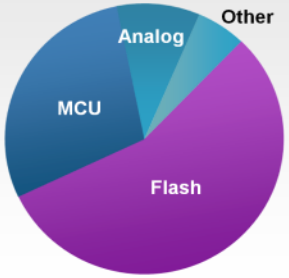
セグメント別



リージョン別



ソリューション別



特徴 Global footage + 豊富な国内サポートリソース

Spansionのグローバル拠点

SUNNYVALE, CA
- *Headquarters*
- *Automotive Center of Excellence*

LANGEN and MUNICH, GERMANY
- *Automotive Center of Excellence*

TOKYO, JAPAN
- *Automotive Center of Excellence*

BANGKOK, THAILAND
- *Final Manufacturing*

AUSTIN, TX
- *Fab 25*

PENANG, MALAYSIA
- *PPAP Team*
- *KGD testing*

HongKong, Chengdu, CHINA

CERTIFICATE

UL DQS Inc.
Management Systems Solutions
hereby certifies that the company

Spansion LLC
Fab 25
5204 East Ben White Blvd.
Austin, TX 78741
U.S.A.

has implemented and maintains a Quality Management System.

Scope:
The design, manufacture and distribution of single power supply Flash memory products to ISO/TS 16949 requirements. The design of packages and packing & the manufacture of integrated circuits for subscribers to the ISO/TS 16949 specification.

An audit, conducted and documented in a report, has verified that this quality management system fulfils the requirements of the following ISO Technical Specification:

ISO/TS 16949 : 2002
(with product design)

Original Certification Date	2004-01-19
Certification decision	2010-01-07
This certificate is valid until	2013-01-06
Certificate Registration No.	10003632 TS2
IATF No.	0095074
Main Certificate Registration No.	10000649 TS2
Buffalo Grove, IL, USA	2010-01-07

Ganesh Rao
President

1130 West Lake Cook Road, Suite 340, Buffalo Grove, IL 60089 USA

1/2

Spansion Operations & Manufacturing
All sites are ISO/TS certified

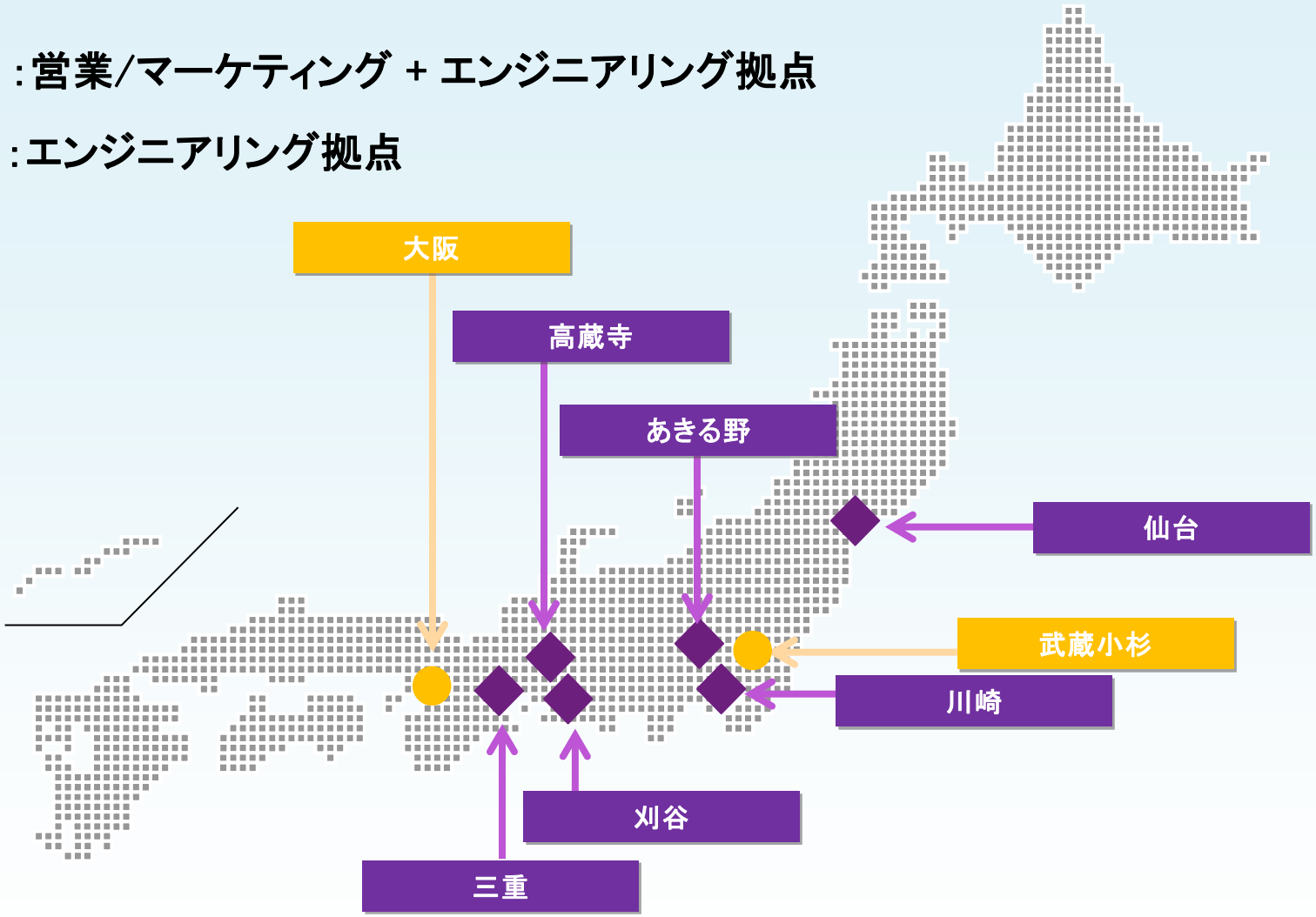
Dedicated Automotive Field Support
Detroit, Michigan
Indianapolis, Indiana
Milan, Italy
Munich, Germany
Paris, France
Shanghai, China
Chengdu, China
Seoul, Korea
Sunnyvale, California
Tokyo, Japan

Design Centers of Excellence
Langen & Munich, Germany
Sunnyvale, California
Tokyo, Japan
Penang, Malaysia (PPAP)

Spansionの国内拠点

●：営業/マーケティング + エンジニアリング拠点

◆：エンジニアリング拠点



車載テクノロジーの進化

3W Vehicle (Benz)
4W Vehicle (Daimler)

1886

Gasoline

Electronic Fuel Injection

1960

HVAC

AT

1980

4bit MCU

Electronic Windows

8bit MCU

Airbag

ABS

1990

16 / 32bit MCU

Navi

Benz S-class (CAN)

1991

CAN MCU

PRIUS (HEV)

1997

LIN MCU

FlexRay MCU

EyeSight (PSS)

2008

MCU

LEAF (EV)

2009

Dual Core MCU for Twin motor

2014

FCV

CAN FD MCU

Traveo™ Graphics

2017

Spansion: 車載分野への ARM® コア導入を主導

Spansion TRAVEO™ 車載向け MCU ファミリー

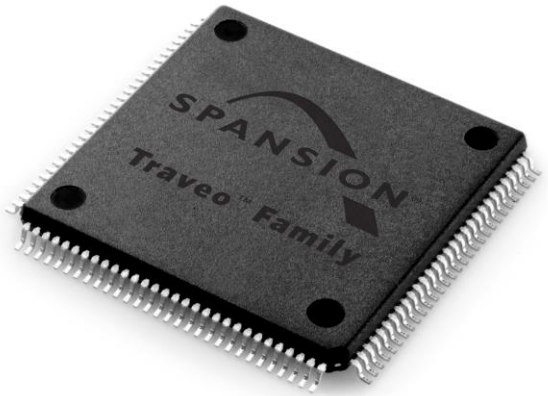
ARMコアを採用

2014年 5月	**ツインモータ制御**	**業界初のデュアル・コア ARM® Cortex®-R5車載MCU**
2014年6月	**ボディ制御**	**高速社内ネットワークを主導する、CAN および CAN-FD に対応**
2014年10月	**グラフィックス・クラスタ MCU**	**業界初の 3D対応 ARM® Cortex®- R5 コア採用クラスタ MCU**

本日の発表: Traveo™ファミリに、3D対応グラフィックスMCUを拡充

**Spansionの新しい車載向けMCU Traveoファミリに、独自開発の3D対応グラフィックス・エンジンとHyperBus™メモリ・インタフェースを搭載した製品シリーズを発表。
幅広い車種へのクラスタ導入を支援。**

- リッチなグラフィックス表示を可能とする、業界初の3D対応ARM® Cortex®-R5コア採用、車載MCU。
- 革新的なSpansionのHyperBus™インタフェースを搭載したMCU。
- 多様な通信プロトコルとグラフィクス・インタフェースをサポート。
- 先進の音声処理機能。



Traveo™ New Automotive MCU Family for Graphics and HMI technologies

Nobuhiko Akasaka, VP, Automotive Business

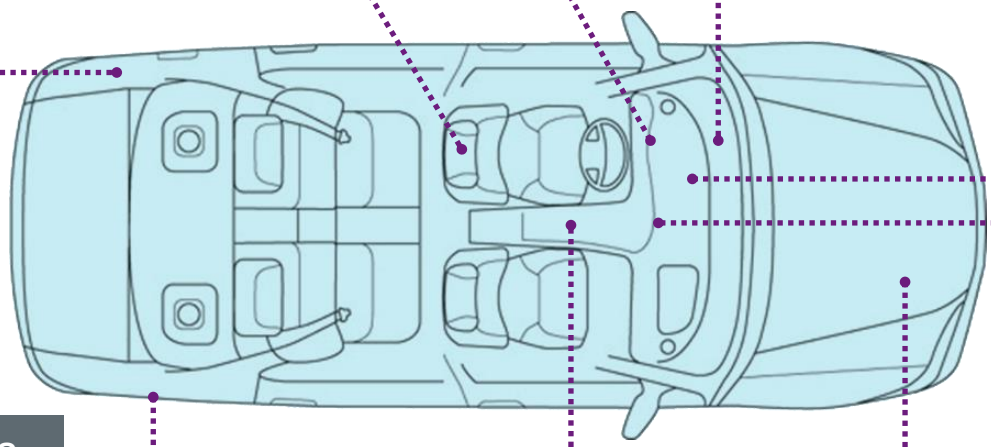
OCTOBER 3RD, 2014

Spansion Success in Automotive

Flash | MCU | Analog

Instrument Cluster
- Rear-Seat Display
- Head up Display
- Instrument Cluster

ADAS
- Telematics
- Reverse Camera
- Multi-Camera Systems



Voice Recognition

Touch & Character Recognition

Climate Control / HVAC

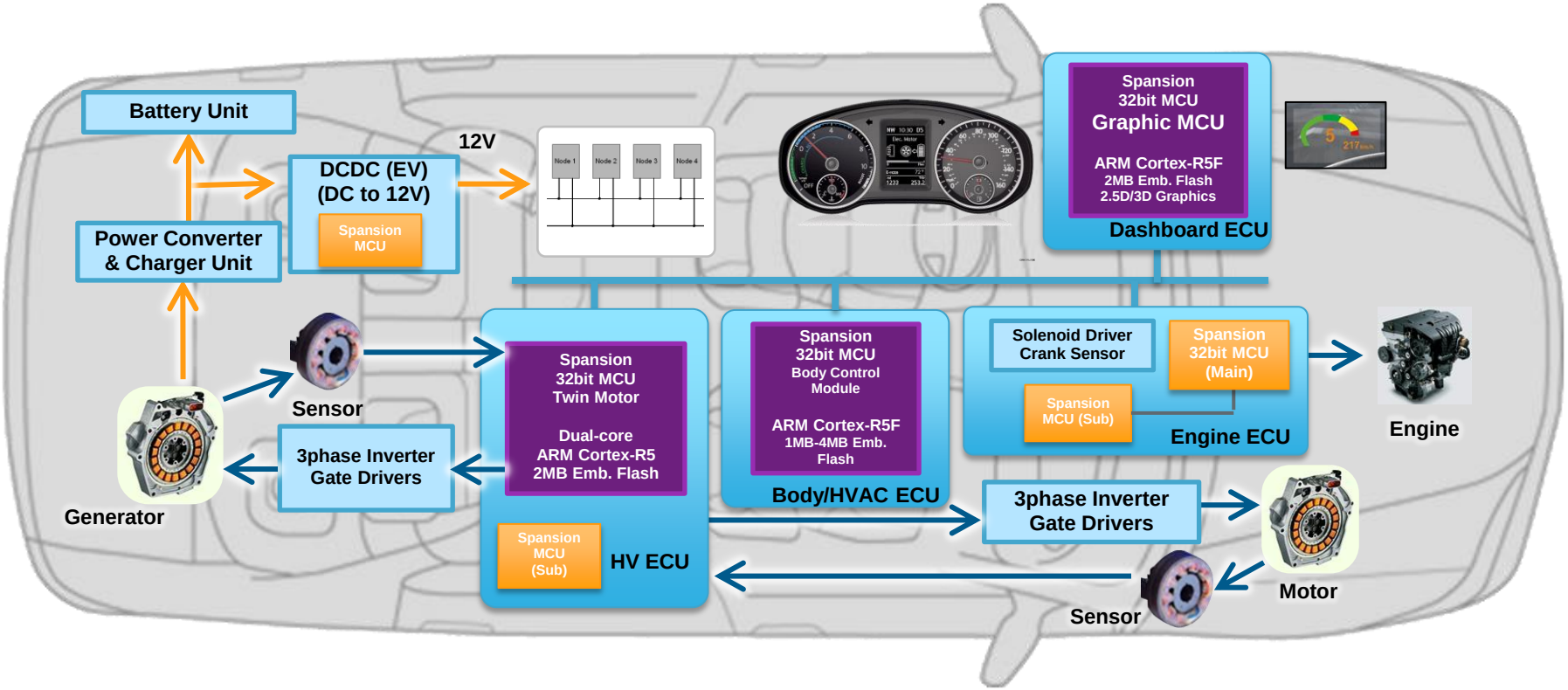
Body Electronics & Chassis
- Power Steering
- Braking System
- Doors
- Window
- Lights
- Mirror
- Seats
- Entry

Infotainment
- GPS & Navigation
- Satellite Radio
- Internet Access
- Audio Systems
- DVD Player
- Mobile Phones
- Central Information Display

Engine
- Battery Charging Control (H / EV)
- Power Train
- HeV Motor Control

Traveo™ Family of Automotive MCUs

First ARM® Cortex®-R5 in Automotive – Delivers Fast Start, Easy Design and High Quality



Software Driver

Evaluation Board

Green Hills SOFTWARE

ARM DS Development Tools

IAR SYSTEMS

Evaluation IDE

SPANSION

Traveo™ Family: Overview

AUTOMOTIVE

- CAN-FD, Ethernet AVB
- Multi-functional serial I/F
- 12-bit ADC with range comparator
- Base Timer
- Real Time Clock, Timers

ARM CORTEX®-R5 CORE

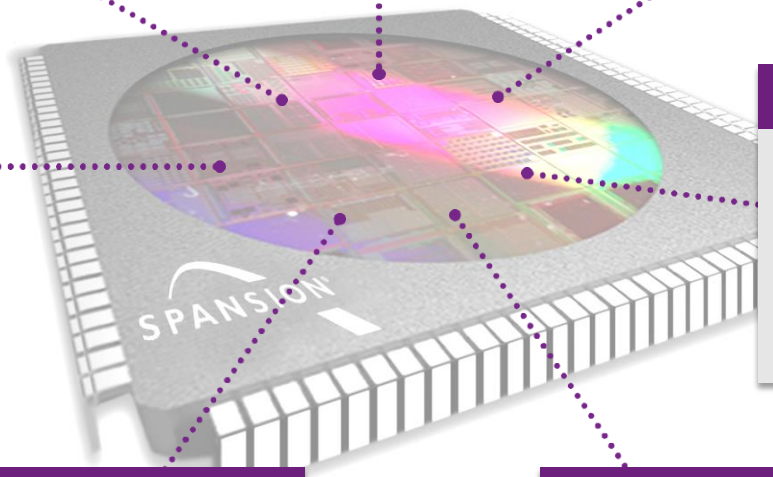
- >400DMIPS core performance
- High-Speed instruction & data cache
- Coresight JTAG Debug and Trace
- Memory Safety Extensions
- Prefetch & Branch Prediction

EMBEDDED MEMORIES

- Up to 8 MB main flash
- Up to 256 kB work flash
- up to 640 KB RAM
- ECC (SECDED) for flash and RAM
- High performance Flash access
- On-Chip E2PROM emulation

SAFETY / SECURITY

- Chip Security
  - Debug,Trace & Test access
- Flash Security
- eSHE
- Memory & Timing Protection Units
- Peripheral Protection
- CRC and Window Watchdog
- Low voltage detection



2D/3D GRAPHICS ENGINE

- 2 D Graphic Engine
- New features:
  - Warping, Compression
  - Vector Drawing Engine
- 3D Graphic Engine – New !
  - High efficient memory usage

INNOVATION

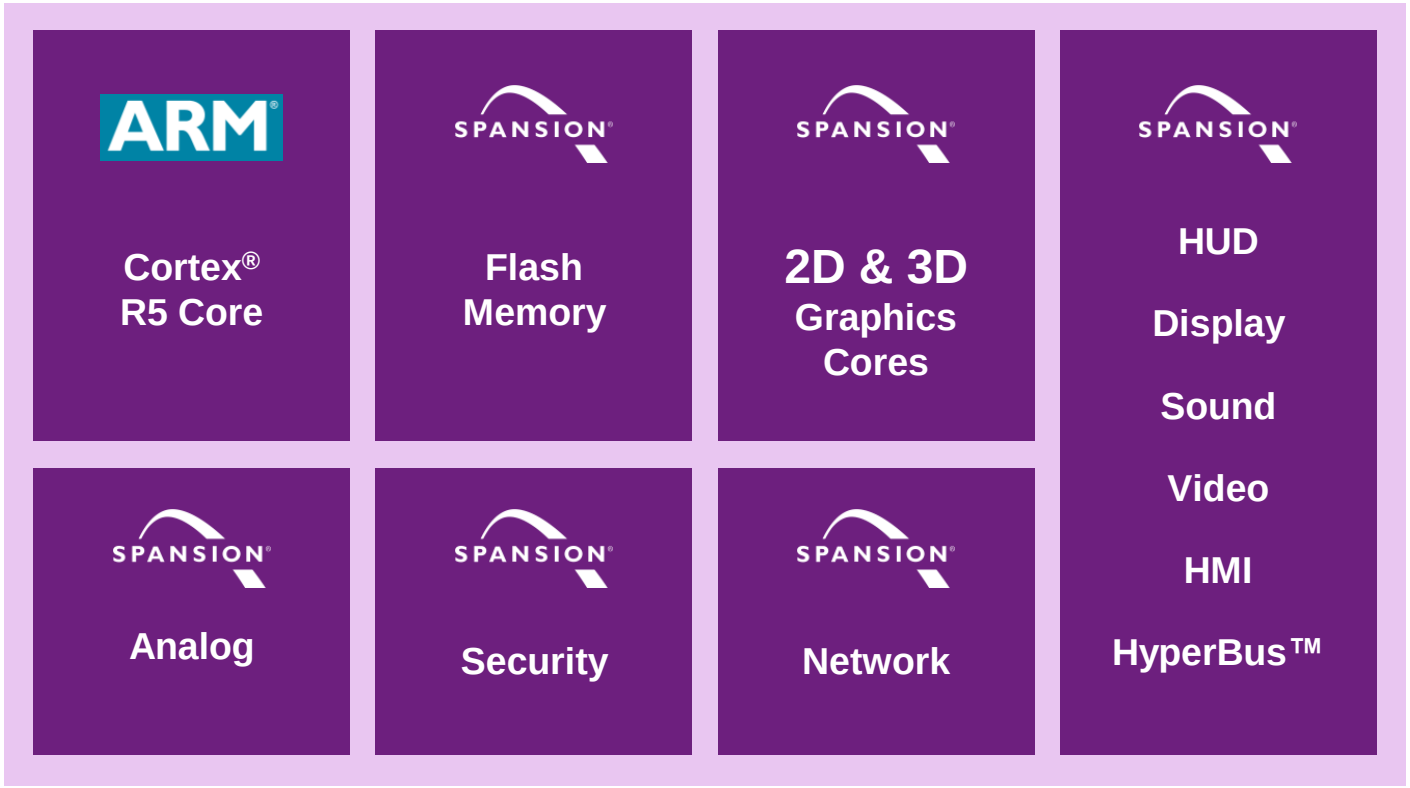
- CAN-FD
- Pretended CAN operation
- HyperBus™
- Ethernet AVB
- ADC improvements

POWER SAVING

- Power domains
- Pretended CAN
- Flexible clock distribution

Introducing Today: Traveo™ Graphics Cluster MCU

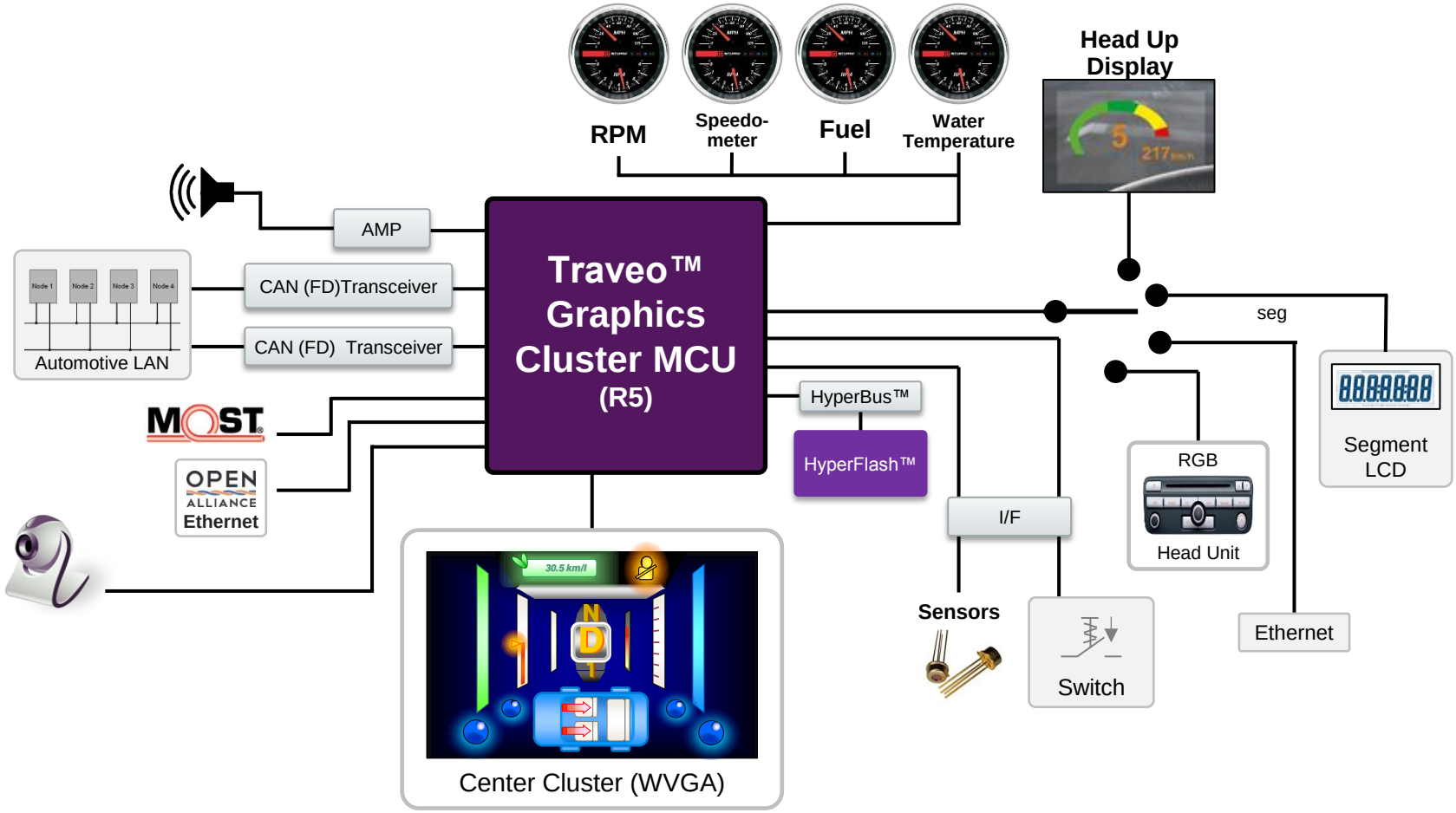
GRAPHICS CLUSTER MCU



Traveo™ Graphics Cluster MCU Series Concept

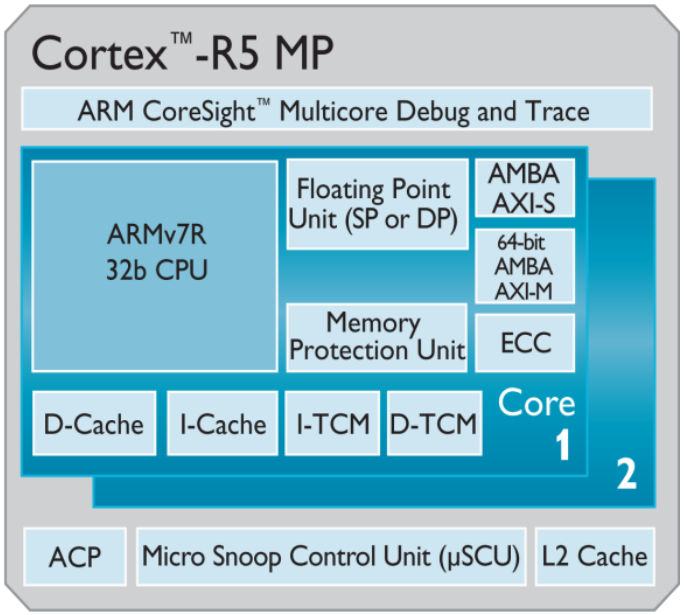
- State-of-the-art 2D and 3D graphics
- Decreased external memory chips
- Shrink PCB
- Rich I/F and Connectivity + HyperBus™ I/F
- Support cutting edge sound system
- Universal Footprint and pin-outs

The World's First
Single Chip 3D Capable Graphics Cluster MCU

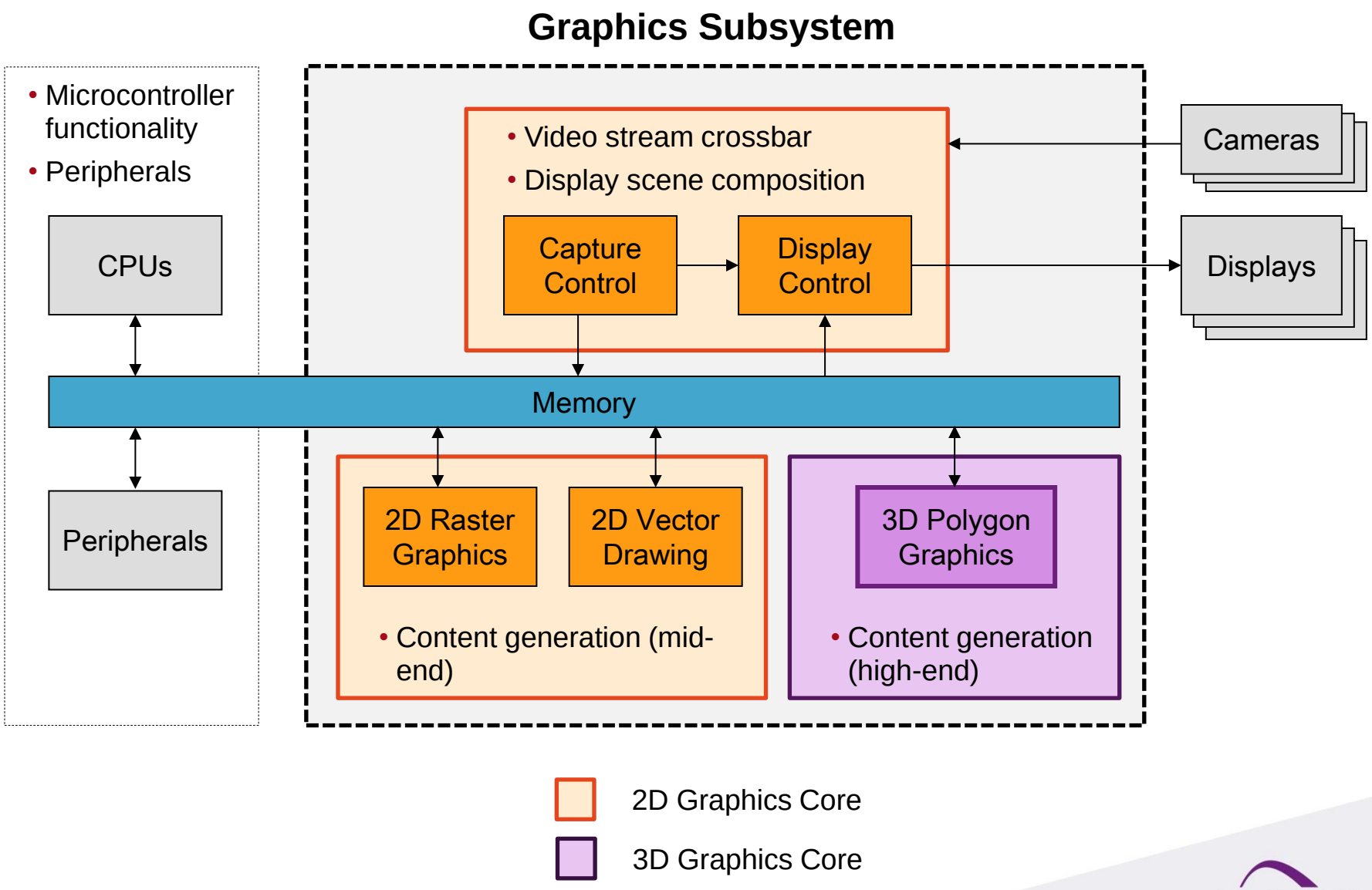


Why ARM® Cortex®? Why Cortex-R5 ?

- Cortex-R best for **hard real time** processing
  - Deterministic interrupt response
  - Branch prediction
  - Instruction pre-fetch
  - Dual issue pipeline
  - Optional FPU
  - Low latency for interrupts and ports
- Cortex-R for safety requirements
  - ASIL-A to ASIL-D
  - MPU, ECC and parity for Cache, TCM, bus ports
  - Watchdog
  - Lock-step configuration
- Cortex-R prepared for multi core usage
- Scalable performance
- Widely available tools and ecosystems



Graphics Subsystem – 2D and 3D



Spansion Embedded 2D Graphics Engine

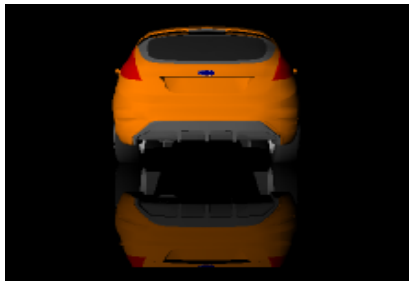
- Leading 2D graphics with 3D effects dedicated to automotive/embedded applications

General Features

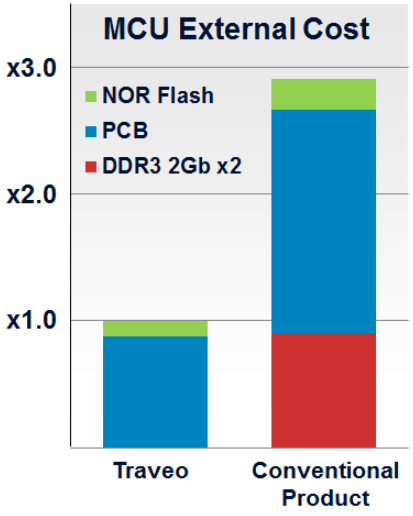
- Fast rendering of 2D and 3D effects
- Vector drawing (e.g. font rendering)
- Warping on-the-fly (head-up displays)
- Safety features (ASIL compliance)
- Reduced memory footprint (BOM simplification)
- High quality re-sampling filters (anisotropic, anti-strobe)

Spansion 3D Graphic Engine

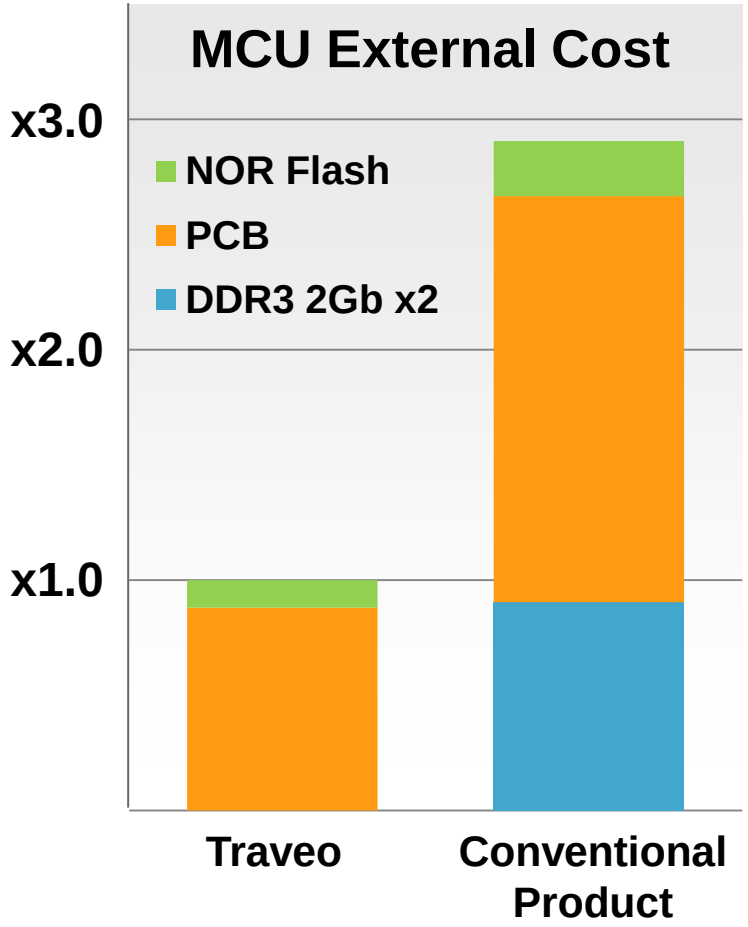
Graphics Engine → Display Engine →

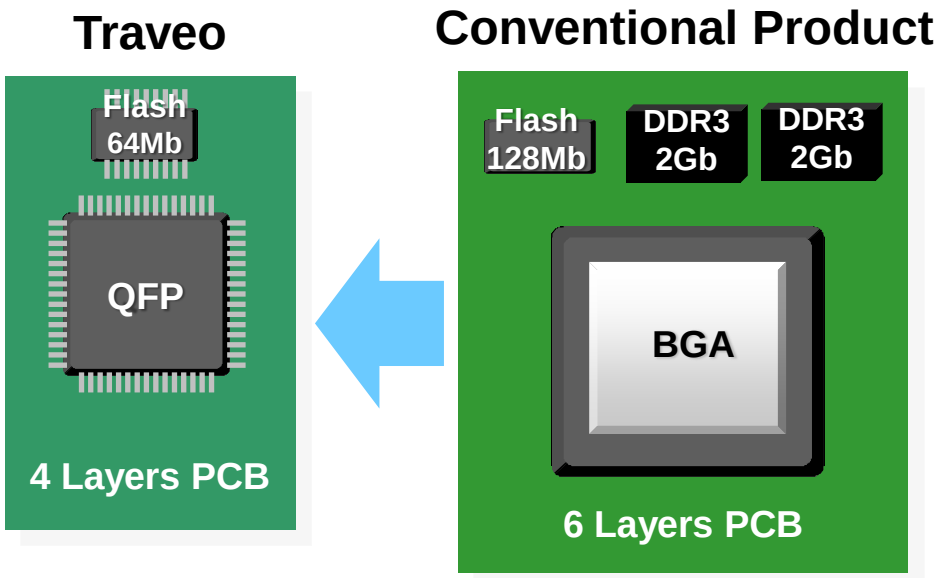


3D Content is directly passed to Display Engine
No external RAM

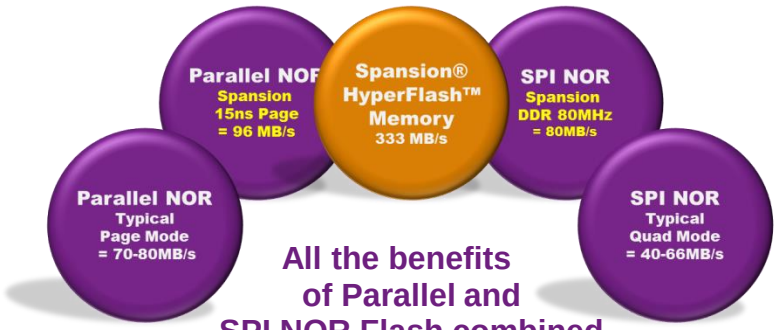


Reducing System Cost of High-Resolution LCD



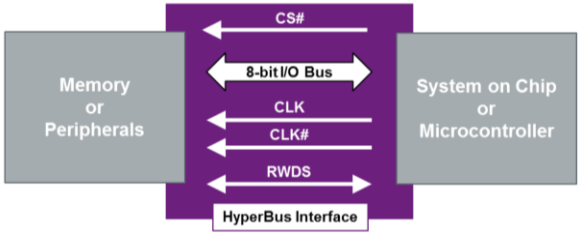


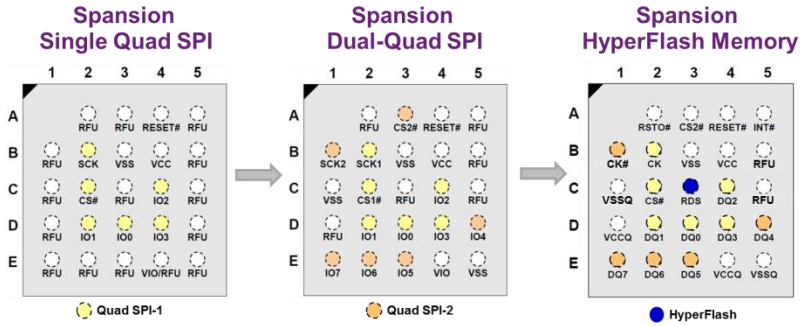
Spansion HyperFlash™ Memory

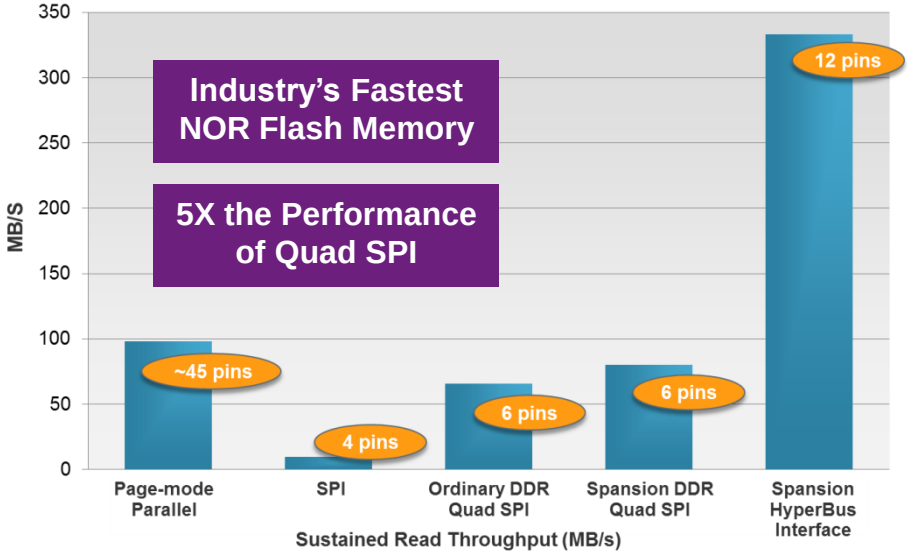


All the benefits of Parallel and SPI NOR Flash combined for advanced memory systems

12-pin Spansion® HyperBus™ Interface







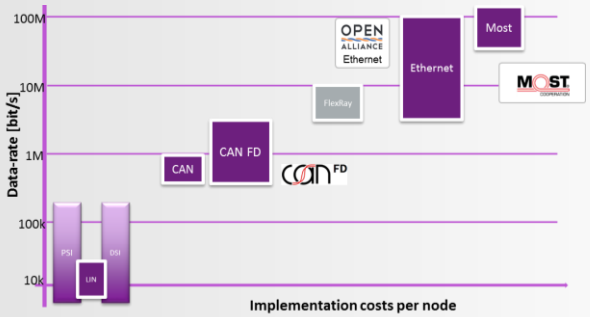
HyperFlash™ Memory

- HyperFlash memory and HyperBus™ interface
- Introduced Feb 2014
- High-speed, low-pin-count

Rich Interfaces and Security

Automotive Networks

- LIN
- CAN
- CAN-FD
- MOST
- Ethernet-AVB

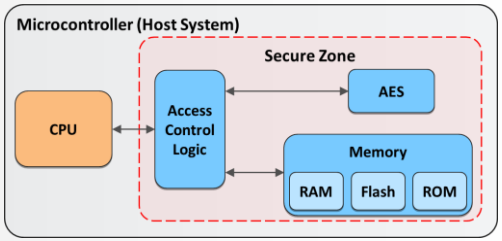


Display Interfaces

- Digital RGB
- RSDS
- LVDS (FPD-Link)

Secure Hardware Extension (SHE)

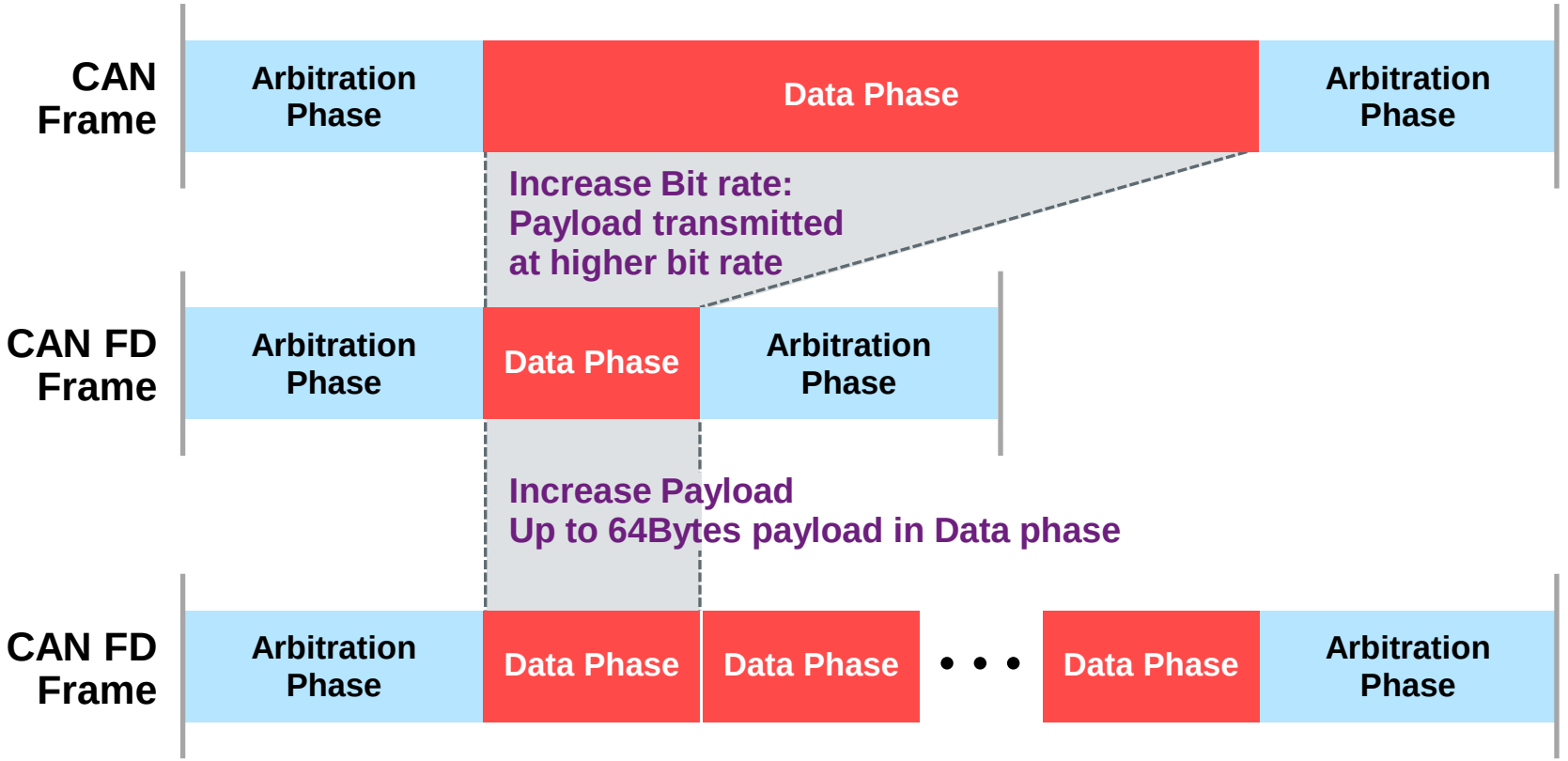
- AES engine to encrypt / decrypt data stream
- MAC (Message Authentication Code) & Hash
- Random Number Generation
- Secure boot



Basic Interfaces for Dashboard Application

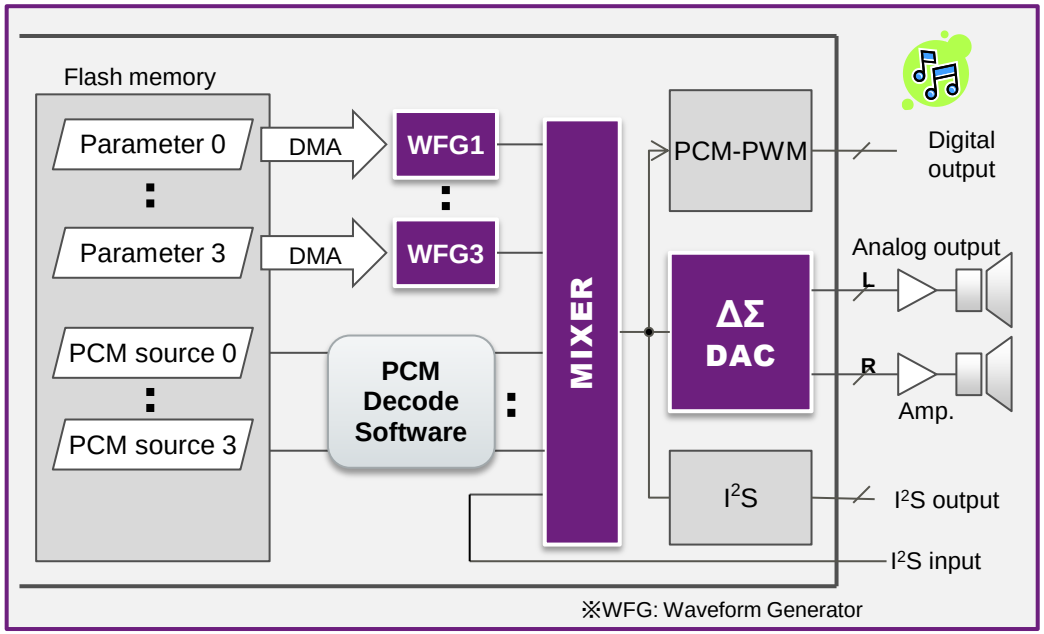
- Stepper Motor Control
- Segment LCD Control
- A/D Converter
- Various Timers

CAN-FD



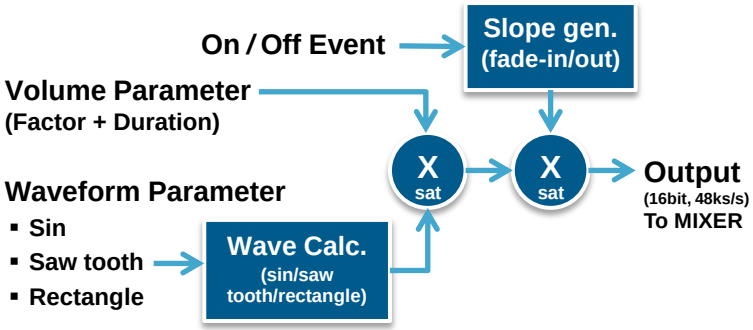
Sound System – High Quality Sound Better Than CD

Block Diagram of New Sound System



Issue: Growing sound data
Solution: New WFG

- Generate sin/saw tooth/rectangle wave by small parameter
- Fade-in/out function to direct sound effect like reverberation



Issue: Synthesizing multiple sound source
Solution: New MIXER

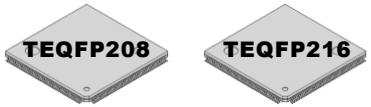
- Mixing different frequency sound sources
- Support I2S to synthesize external sound
- Saturation calculation keeps high quality after synthesis

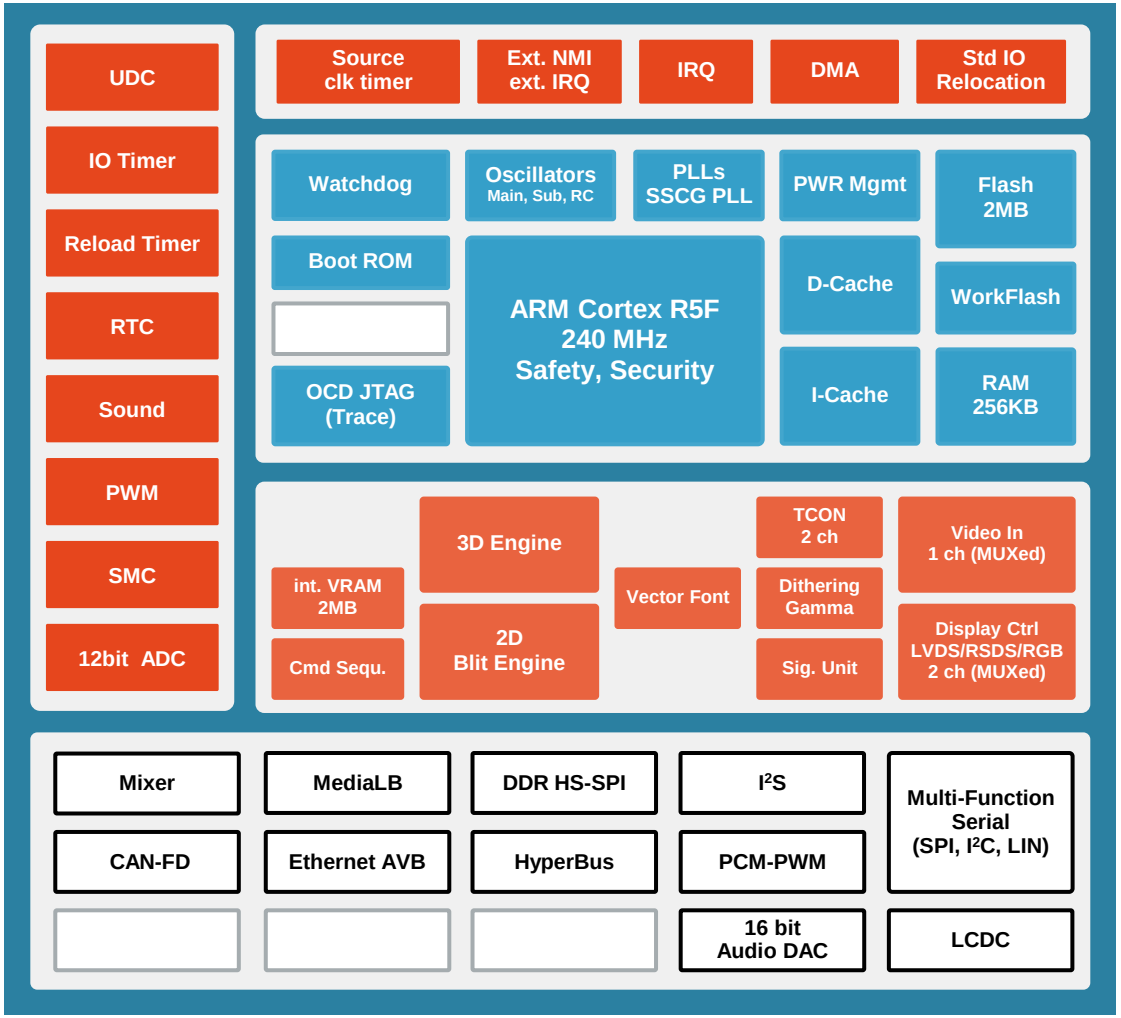
Issue: Lots of external circuits, effort for tuning
Solution: Implement ⊿ΣDAC

- Audio DAC which has been implemented in mobile phones
- Analog output with 48KHz, 24bit data for more than CD quality
- Dedicated pin (COM) to connect capacitor for noise tolerance
- ΔΣ modulation with noise shaping effect to simplify external circuit to just low cost LPF

S6J326C Overview

	Cluster
CPU	ARM CR5F
Memory (Flash/RAM)	Flash 2MB RAM 256KB
Memory (WorkFlash)	112KB
VRAM	Internal: 2MB
3D	Spansion 3D Graphic engine
2D	Spansion 2D Graphic Engine
Video-Out	2ch (multiplexed)
Video-In	1ch (multiplexed)
Display I/F	Digital RGB, RSDS, LVDS
Serial I/F	12ch
HyperBus I/F	Yes
CAN-FD	4ch
Media I/F	MediaLB Ethernet AVB
Security	Device Security (SHE)





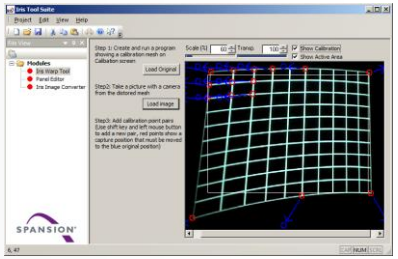
Software, Ecosystem

AUTOSAR

- MCAL 4.x available
- BSW will be provided by third parties

Graphic

- Spansion 2D Graphic Engine library available
- Spansion 3D Graphic Engine library available
- Warping support tool available
- Authoring tool will be supported by third parties

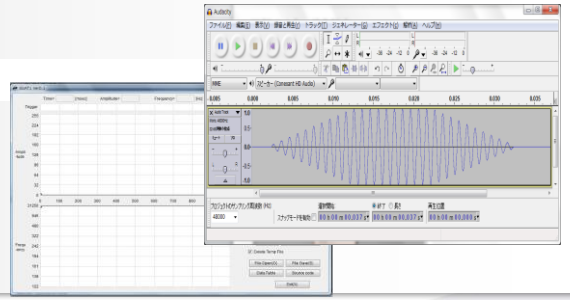


SHE

- CRY library available

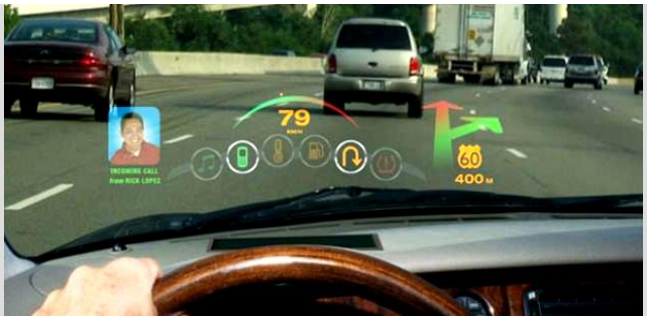
Sound

- Waveform editor & simulator available



Semiconductors Enabling Advanced Automotive Technology

Advanced Graphical User Interfaces, HMI and Head Up Displays

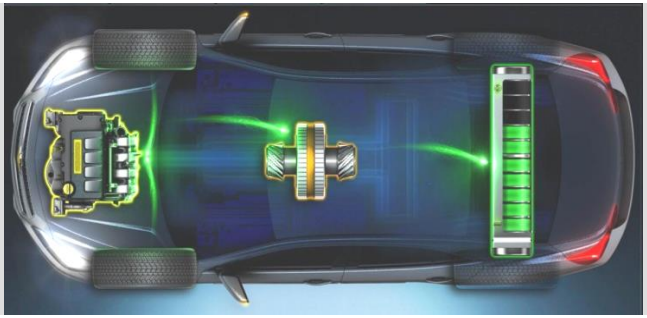


Advanced Driver Assistant Systems and 4G Telematics

Expansive infotainment and comfort electronics, displays going to 4K

High speed automotive networks including Ethernet

Electricfication, zero and low emissions



Environment, Social and Regulatory impact

www.spansion.com

Spansion 2D Graphics Engine

For Acceleration of 2D Graphics – Typical Use Cases

- Fast rotating elements with temporal filter (anti-strobe)
- Fast 2D/2.5D menu rendering
- Drawing Engine (e.g. font rendering, vector drawing)
- Color space convertions (e.g. YUV → RGB)
- “Cover flow” – like multimedia selections
- Fast visualizations and 2D effects
- Safe display of tell-tales, warnings etc
- Ultra-fast BLT operations and buffer clears
- Direct warping support for HuD