Safety & Power Management Solutions Overview

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SECURE CONNECTIONS FOR A SMARTER WORLD

A New Development Paradigm For Carmakers & Auto Suppliers

10X MCU performance
of today's best performing safe automotive platforms[1]

Delivers new levels of automotive safety, security and over-the-air (OTA) capabilities

Reduces risk and time-to-market

→ High current

→ Fault tolerant

→ Demonstrated robust solution with BSP

NXP’s Next-Generation Power Management Solutions

Future Proof

- **Support MCU’s power and safety scalability platform requirement**
- **Co-developed** with the MCU for an optimized solution

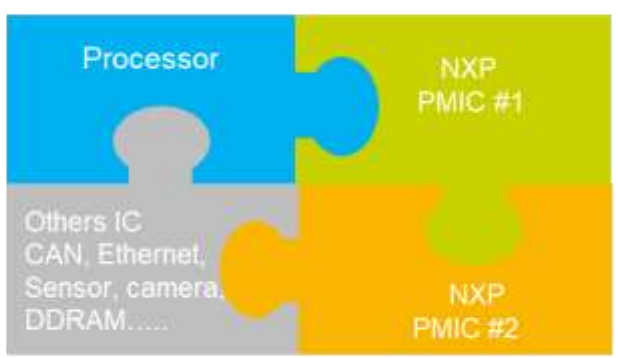
Leading features

- **High-efficiency, low EMC** via multi mode converters
- **Safe**. Up to ASIL D level capable, with enhanced failure mechanisms
- **Secure** (Controlled Register access)
- **Quality and reliability**. Full automotive temperatu reliability & robustness (zero defect target)

Product Longevity

SAFE ASSURE by NXP

One System = Multi-PMIC Solution



NXP's next generation power management: Simplicity of safety power management IC family

Scalable + Expandable + Safe = Unlimited combinations

Power Management Portfolio
Docus on Power Efficiency and Functional Safety

Advanced Power Management

- Accuracy & radiated emission performance
- Advanced system integration
- Safety processes, architectures, products
- Extended robust system solutions like EMC, Cranking ISO, non ISO pulses

S32

FSBC

MC33907/8
FS6500, FS8500

i.MX

Integrated PMIC

PF0100, PF3000
PF8200

Layerscape

High Perf Regulators

VR500
VR5100

PMIC w/ I.MX

Infotainment
E-Cockpit, HUD
Driver Awareness
Cluster
Telematics
Cameras

SBC in Body

Body Control
Lighting
HVAC

SAFETY ASSPs for Airbag and Braking

Valves driver
Airbag ECU
Motor pump predriver
Wheel Speed decoding

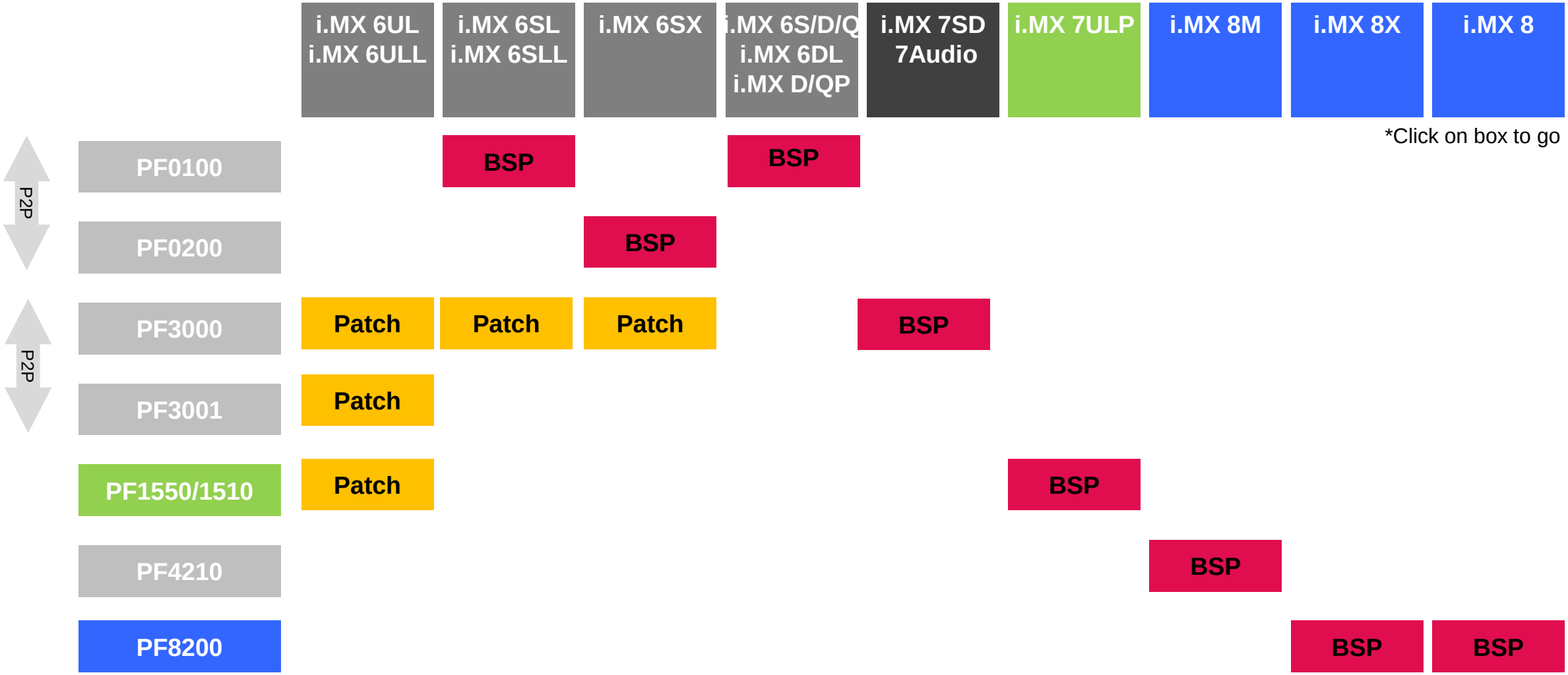
FSBC in ADAS

Lane Departure Warning
Radar
ADAS – Vision
ADAS – Data Fusion

FSBC in Drive Train

Engine Management
Transmission
EV/HEV – Inverters, DC/DC
BMS, Battery Cell Controller
Steering, Suspension

i.MX & PMIC Match



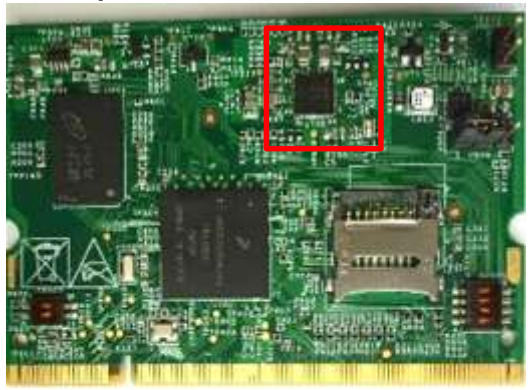
B = BSP Available or Under Development
P = Patch Available or under Development from apps support

i.MX 6UL/ULL + PF1550/PF1510 Application Diagram

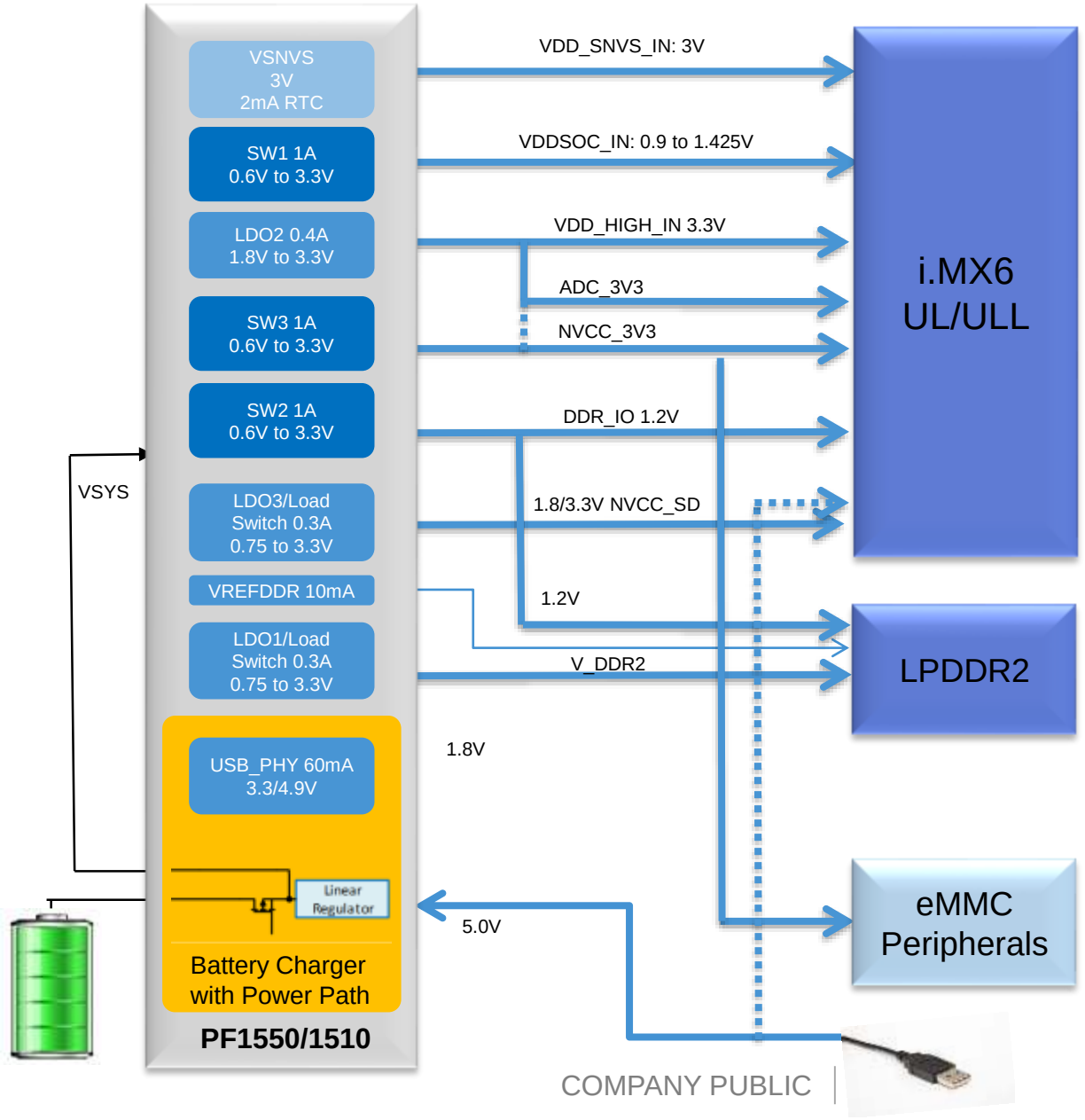
Benefits

- Ref Design available from NXP Analog BSP from VVDN (Free)
- Also support Battery less application with compatible PF1510
- Multiple SOM Module from partner

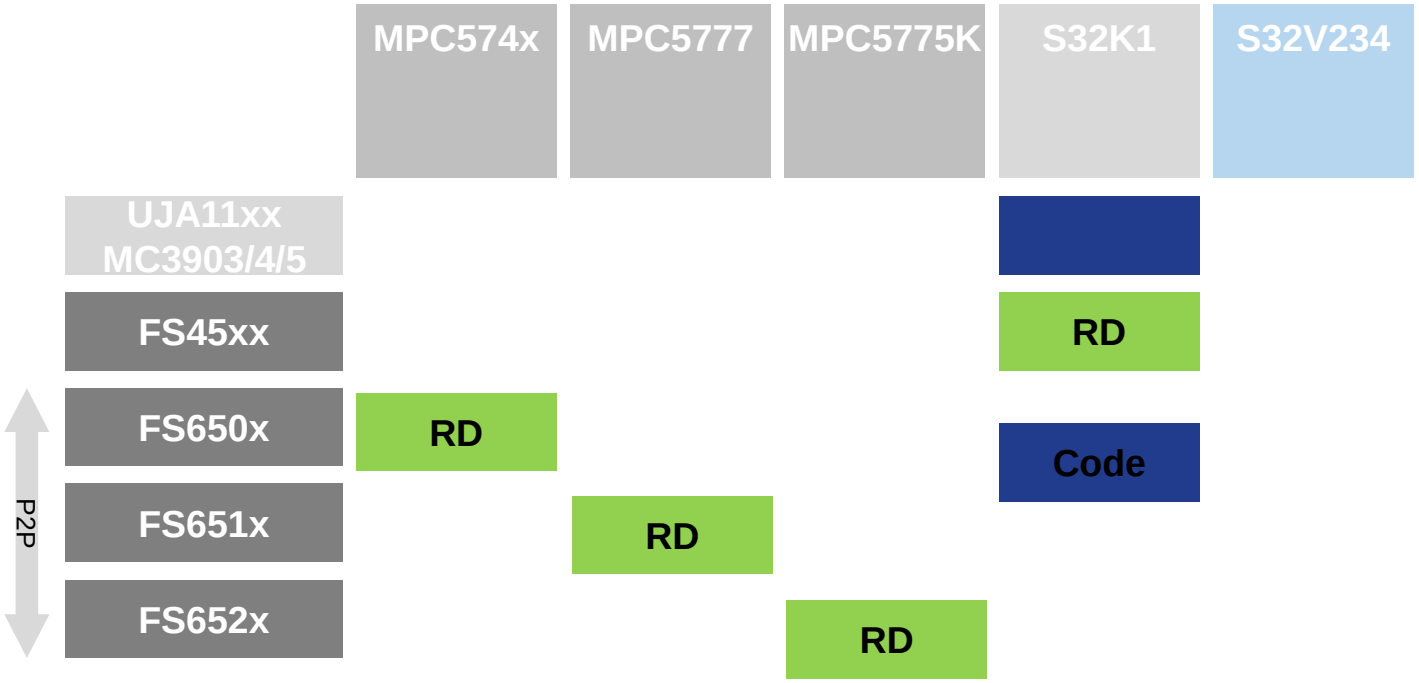
SOM Reference design compatible with carrier board



i.MX	Typical max power measurement
i.MX6 UL	SOC_IN: 900 mA HIGH_IN: 125 mA



AMCU + Safety Power Management Match



BSP = BSP Available or Under Development
RD = Reference design from 3rd party/NXP
Code: Code example from NXP
* Coming in 2018

Safety Everywhere

8 Drive Train—Safety & Chassis
Transmission, Transfer Case – **ASIL D**
FS650x with other MCU

7 Drive Train—Safety & Chassis
Suspension/Dumping – **ASIL C**
FS65 with other MCU

6 Drive Train—Safety & Chassis
Electric Power Steering with Fail Safe & Fail Operational strage-gies - FS65 or FS45 with MPC5744P – **ASIL D**

5 Drive Train—Safety & Chassis
Engine Management Unit – **ASIL B**
FS651x with MPC5777C

4 Drive Train—Electrification
Hybrid Vehicle Controller – **ASIL D** FS66 with S32S2

3 Drive Train—Electrification
Inverter, DC-DC converter - **ASIL D** FS650x or FS45
Vepco high-voltage inverter RD - **ASIL D**
MPC5775 with FS651x & GD3100

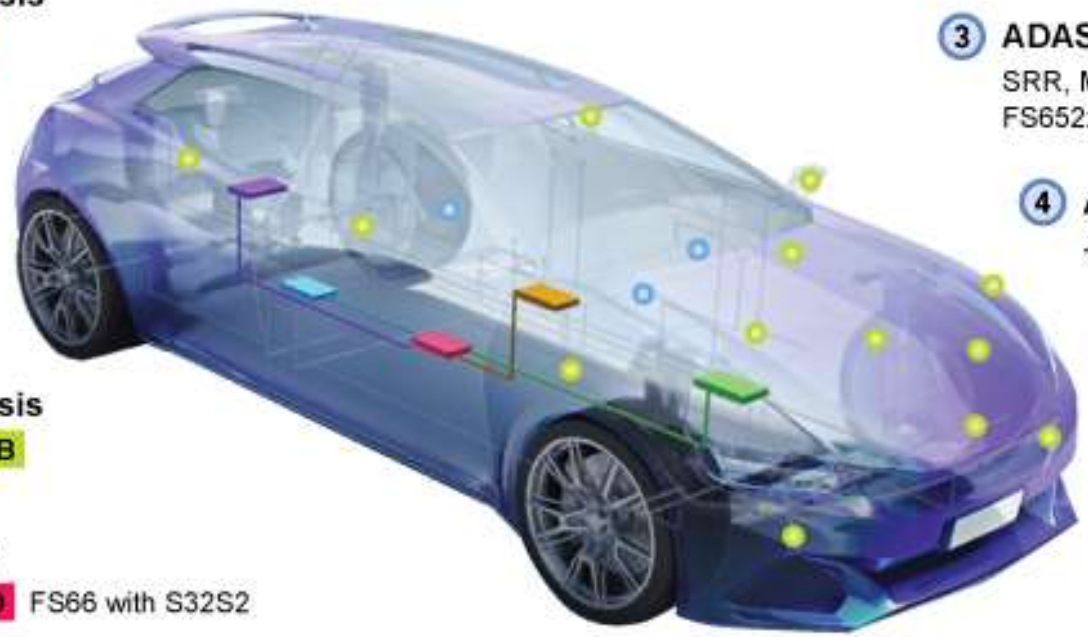
1 ADAS-Gateway
Bluebox development platform- **ASIL D**
S32V234, S32R27, LS2084A + FS65

2 ADAS—Vision
Data Fusion – **ASIL D**
(Autonomous Drive) FS652x attach with MPC5777C or other MCU

3 ADAS—Radar
SRR, MRR, LRR – **ASIL D**
FS652x with S32R2

4 ADAS—Camera Sensor
-S32V + FS85 + PF82 – **ASIL B**

5 ADAS—ACC
Adaptive Cruise Control – **ASIL C**
FS652x with MPC5744P



2 Drive Train—Electrification
Electric Motor (Alterno Starter, eAxel drive…) – **ASIL C** FS45

1 Drive Train—Electrification
Battery Management (12 V, 48 V, HV) FS650x with MPC5744P & MC33771 – **ASIL C**
NewTec RD: S32K with FS45 – **ASIL C**
MPC577x with FS650x – **ASIL D**

ASIL QM A B C D

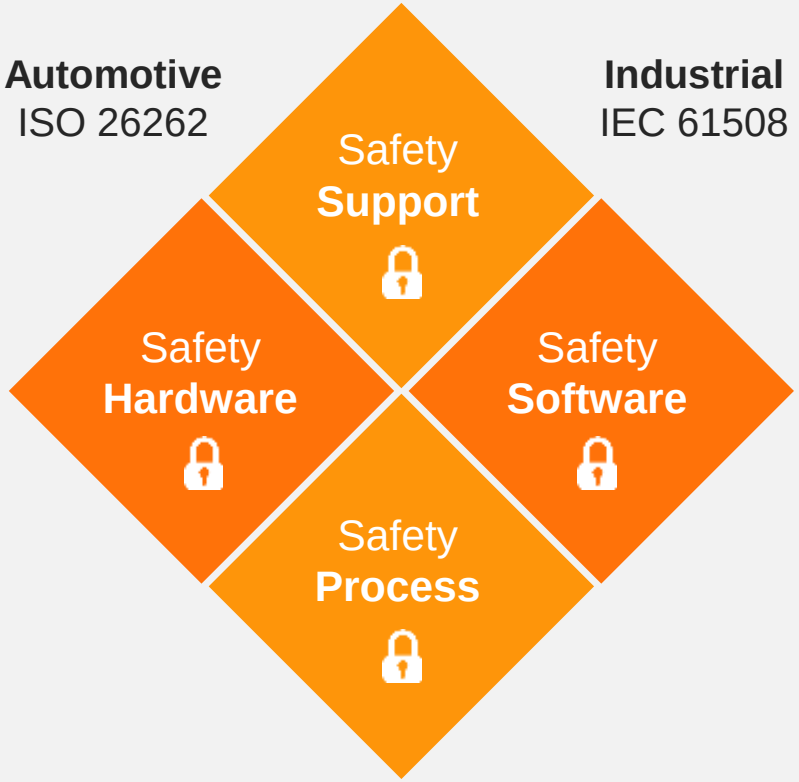
SAFE ASSURE by NXP

NXP's Safe Assure Program

Functional Safety Standards

Automotive
ISO 26262

Industrial
IEC 61508



NXP Quality Foundation

SAFE ASSURE by NXP

Simplify Customer experience

ISO26262 system compliance process

Optimize Customer R&D efficiency

Reduces time and complexity required to develop ISO26262 safety systems

Reduce risk of Harm

Supports the most stringent Automotive Safety Integrity Levels (ASILs)

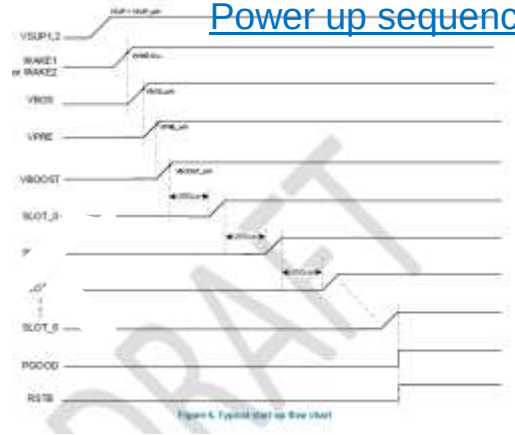
Safety starts with Quality

Zero defect methodology from design to manufacturing to help ensure our products meet the stringent demands of safety applications

PMIC Solution To Customer's Challenge

- Flexible product through OTP configuration
- Board thermal performance and size with multiphase Smart Point of Load aproach
- Third generation of safety PMICs

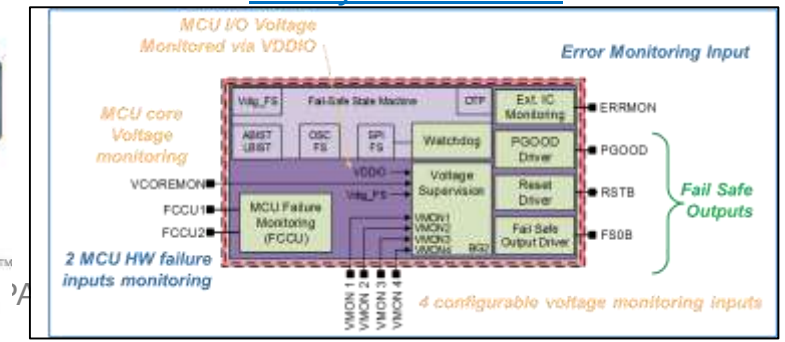
Power up sequencing



Performance

	Input Pi filter	Output filter
Single-phase	C_{BAT} L_{IN} C_{IN}	L_{OUT} C_{OUT}
Multi-phase	C_{BAT} L_{IN} C_{IN}	C_{OUT} $L_{O1,...O5}$

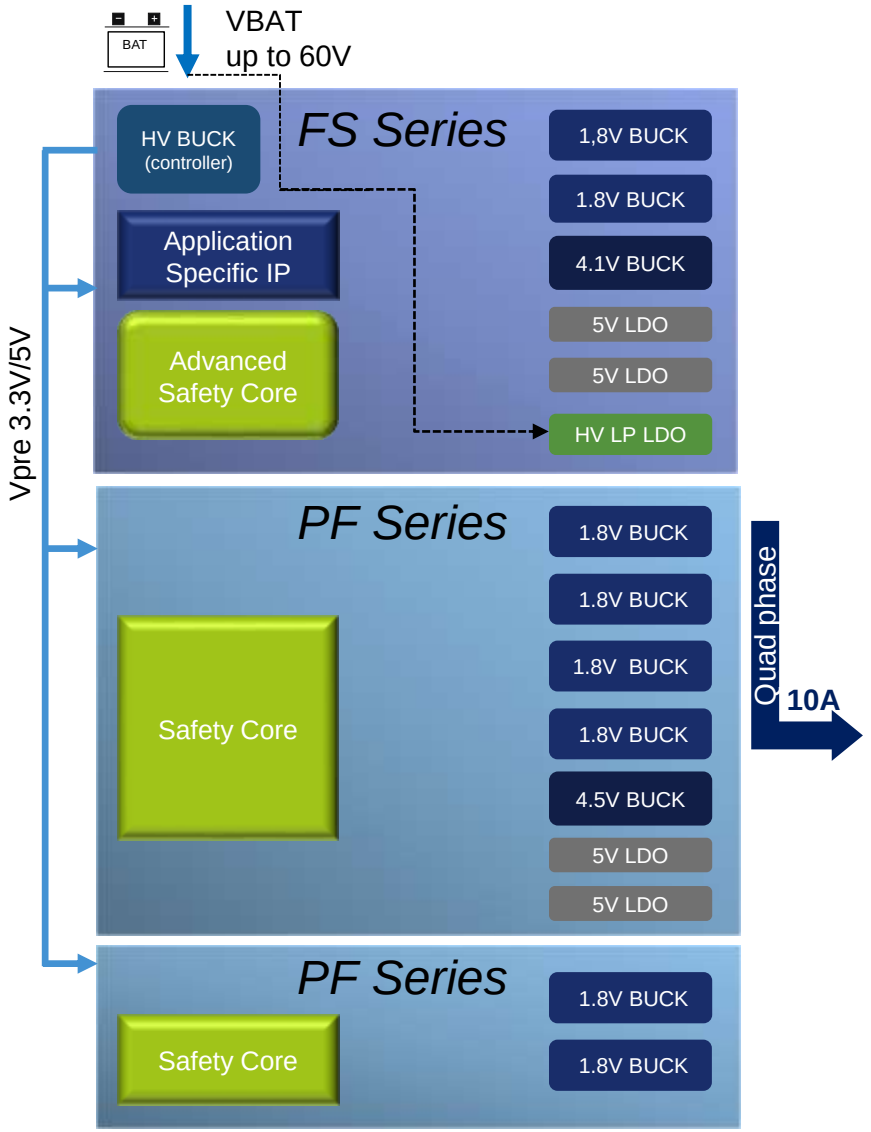
Safety Architecture



Safety and Power Management

System power solutions for the next generation processor

- Higher power for higher performance
- Advanced functional safety and security
- Proven robustness with NXP processors for less development risk and time
- Scalable and expandable portfolio
  - Advanced power and safety management concepts
  - Common architecture platform
  - Unified IP reusable for unlimited combinations



System Power Concept

PMIC Selector Guide (Low Voltage Input)

Part Number	Voltage Input (V)	DC/DC	LDO	Current Total (A)	Max (A) Current on one output	MCU Support	Other Features	Package (LxW mm)
PF8100/8200	2.8- 5.5V	7	4	19A	2.5 A	I;MX 8QM, 8X	Multiphase, OTP, ASIL B	QFN56 8x8 mm
PF4210	2.8 - 4.5	6	8	11.7	4.5	i.MX 8M	OTP programmable, I2C	QFN56 8x8 mm
MMPF0100	2.8 - 4.5	6	8	11.7	4.5	i.MX 6S/D/Q/QP/SL/SX	OTP programmable, I2C	QFN56 8x8 mm
MMPF0200	2.8 - 4.5	5	8	7.5	4.5	i.MX SL/SX	OTP programmable, I2C	QFN56 8x8 mm
PF3000	2.8 – 5.5	4	6	6.6	2.75	I.MX 7S/D; i.MX 6UL	OTP programmable, I2C	QFN 48 7x7 mm
PF3001	2.8 – 5.5	3	6	6.6	2.75	i.MX 6UL	OTP programmable, I2C	QFN 48 7x7 mm
PF1550/PF1510	2.8 – 5.5V (USB)	3	3	4A	1A	i.MX 7ULP, 6UL/6ULL	Batt Charger, Low Quiescent current No Batt Charger for PF1510	QFN 32 5x5mm
VR500	2.8 - 4.5	4	7	11.7	4.5	LS1021/23	OTP programmable, I2C	QFN 48 7x7 mm
VR5100	2.8 – 4.5	3	8	6.6	3.9	LS1012	OTP programmable, I2C	QFN 48 7x7 mm
MC13892	2.8 – 4.65	4	12	6.0	1.05	i.MX 5	Battery charger, LED driver	BGA139 /186 7x7 / 12x12 mm
MC34704A	2.7 - 5.5	8	0	2.5	0.55	i.MX 5	2MHz DC/DC	QFN56 7x7 mm
MC34704B	2.7 - 5.5	5	0	1.9	0.55	Generic	2MHz DC/DC	QFN56 7x7 mm

FSBC Selector Guide (Medium Voltage Input)

Part Number	Voltage Input (V)	DC/DC	LDO	Current Total (A)	Max (A) Current on one output	PHY	ASIL	Other Features	Package (LxW mm)
MC34903	4 - 28	0	2	0.4	0.15 – 0.4	SPI, CAN	B	Medium Functional Safety AMUX, Low Power	SOIC32eP 11x10 mm
MC34904	4 - 28	0	2 + 1	1	0.15 – 0.4	SPI, CAN	B	Medium Functional Safety AMUX, Low Power	SOIC32eP 11x10 mm
MC34905	4 - 28	0	2 + 1	1	0.15 – 0.4	SPI, CAN, LIN	B	Medium Functional Safety AMUX, Low Power	SOIC32eP 11x10 mm
MC33907 Auto FS6407 Indus	2.7 – 40 (2.7 – 36)	2	3	2	0.8	SPI, CAN	D	High Functional Safety, AMUX, Low Power	QFP48eP 7x7 mm
MC33908 Auto FS6407 Indus	2.7 – 28 (2.7 – 36)	2	3	2	1.5	SPI, CAN	B	High Functional Safety, AMUX, Low Power	QFP48eP 7x7 mm
MC34910	5.5 - 18	0	1	0.1	0.1	SPI, LIN	D	High Side Drivers, I/O	QFP32 7x7 mm
FS4500	2.7 – 36	2	3 + 1 track	2	0.8/2.2	SPI, CAN, LIN	D	High Flexible Functional Safety, AMUX, Long Duration Timer Low Power	QFP48eP 7x7 mm
FS6500	2.7 – 40	2	3 + 1 track	2	0.8/2.2	SPI, CAN, LIN	D	High Flexible Functional Safety, AMUX, Long Duration Timer Low Power	QFP48eP 7x7 mm

Point of Load Selector Guide (Low Voltage Input)

Part Number	Voltage Input (V)	DC/DC	LDO	Current Total (A)	Max (A) Current on one output	MCU Support	Other Features	Package (LxW mm)
MC34712	3.0 - 6.0	1	0	3.0	3.0	Generic	½ Vin voltage tracking	QFN24 4x4 mm
MC34713	3.0 - 6.0	1	0	5.0	5.0	Generic	Fault Protection	QFN24 4x4 mm
MC34716	3.0 - 6.0	2	0	8.0	5.0	Generic	½ Vin voltage tracking	QFN26 5x5 mm
MC34717	3.0 - 6.0	2	0	10.0	5.0	Generic	½ Vin voltage tracking	QFN26 5x5 mm

Point of Load Selector Guide (Medium Voltage Input)

Part Number	Voltage Input (V)	DC/DC	LDO	Current Total (A)	Max (A) Current on one output	PHY	Other Features	Package (LxW mm)
MC34700	9 - 18	3	1	4.4	1.5	-	Fault Protection	QFN32 5x5 mm

SECURE CONNECTIONS
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