ROHM 车载产品介绍 for ADAS/智能驾舱

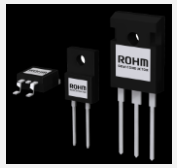
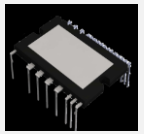
Jossie
Automotive Marketing

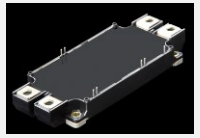
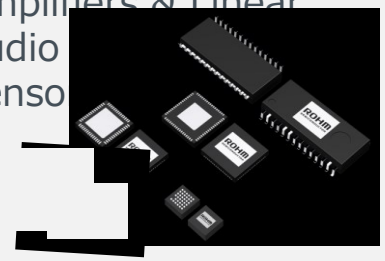
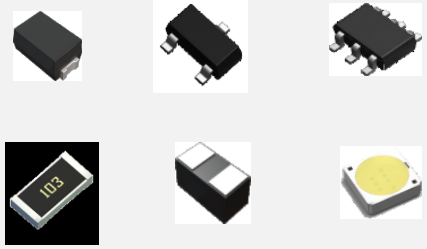
以解决方案的形式提案罗姆大力发展的3大产品群 (功率器件、模拟IC、通用器件)

Customer

Solution

Power Devices	Analog ICs	Standard Products
SiC MOSFETs SiC SBDs SiC Modules IGBTs Super Junction MOSFETs IPMs Si MOSFETs Si Diodes Shunt Resistors	Isolated Gate Drivers Power Management LED Drivers Motor / Actuator Drivers IPD (High / Low side Switch) Interface / Communication TN/STN LCD Drivers Supervisor (Voltage Monitor) EEPROM Amplifiers & Linear Audio Senso	Small Signal MOSFETs Digital Transistors Bipolar Transistors Small Signal Diodes (Zener, TVS, SBD, FRD etc) Resistors LEDs

罗姆针对xEV汽车的解决方案

车载马达
- 电泵
- 机械驱动用马达驱动器

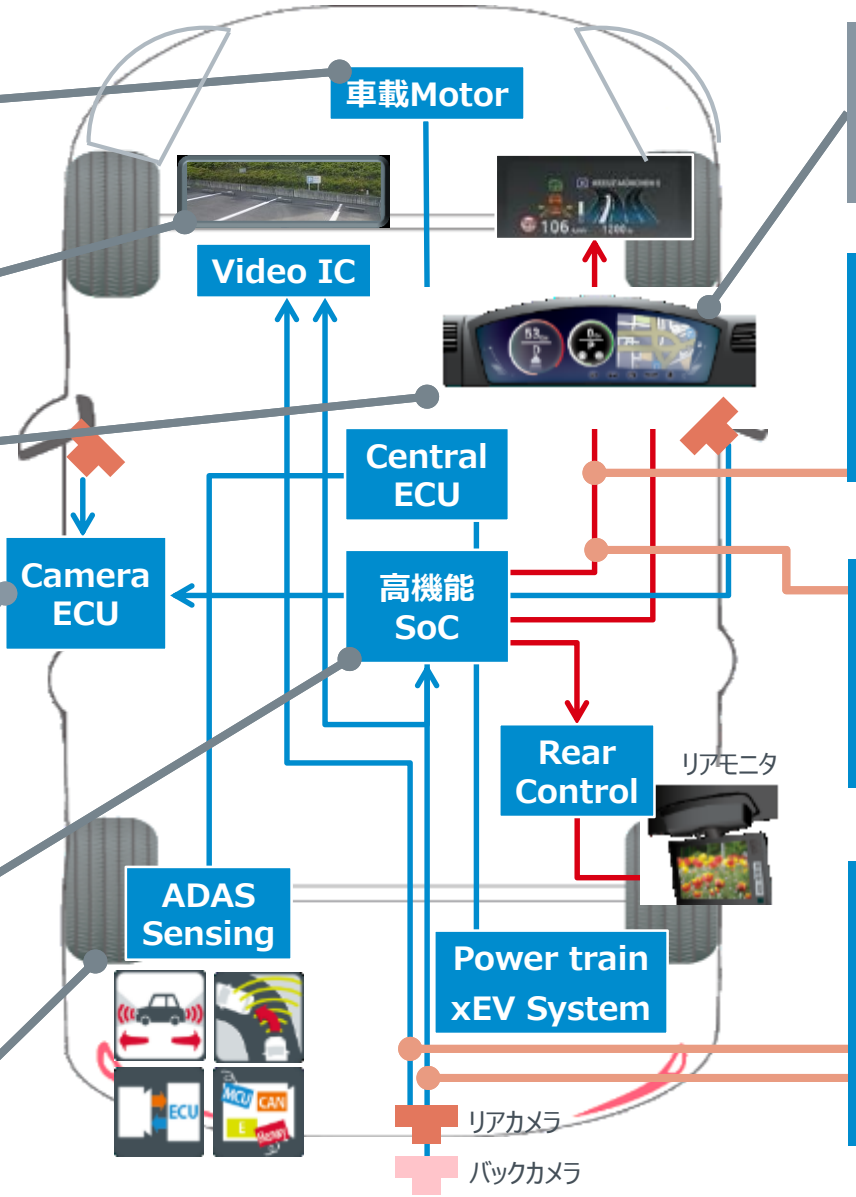
图形芯片
- 图像合成/补正

网关 车内通信
- LIN/CAN/CXPI

摄像头系统的PMIC
- 电子后视镜
- 后置摄像头
- ADAS摄像头

ADAS系统的电源
- 小型、高效复合电源 IC
- SoC电源

超声波雷达 AFE IC
- 超声波雷达 传感器

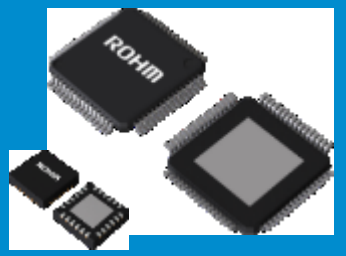


液晶芯片组，LED驱动器
- 车载信息娱乐
- meter cluster

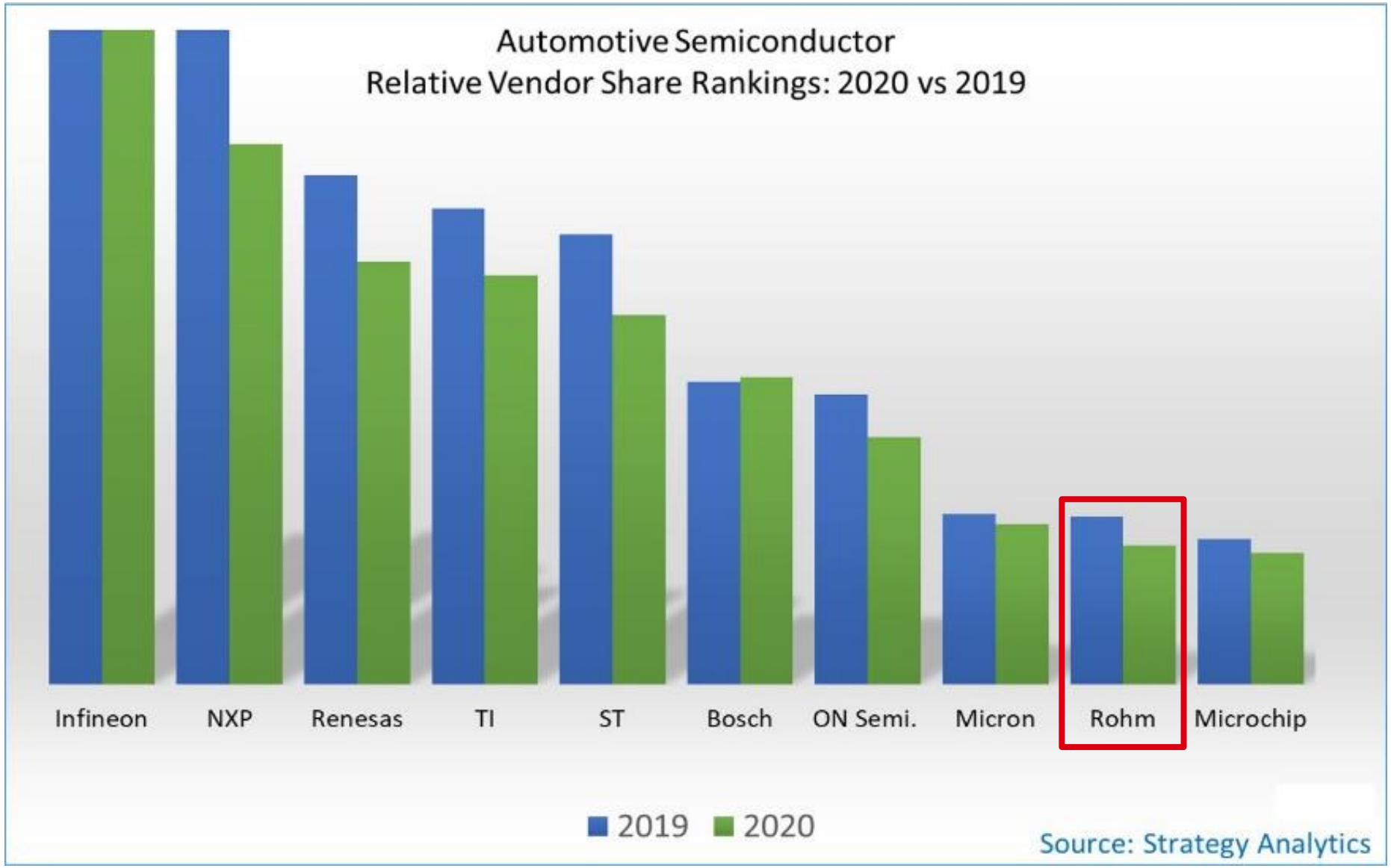
显示屏的Interface IC
- 车载信息娱乐
- meter cluster
- HUD(head-up display)

显示屏的SerDes IC
- 车载信息娱乐
- 仪表盘
- HUD(head-up display)

摄像头的SerDes IC
- 电子后视镜
- 后置摄像头
- ADAS摄像头



2020年汽车半导体前十大排名



ROHM 车载市场实绩 (LSI)

ROHM模拟IC被所有的汽车单元所采用
获得了高可靠性和稳定供给性的评价，在车载市场上占有很高的市场份额。

LDO	**车载市场　出货实绩** **累计 30亿个以上**	MCU用
开关 **稳压器**	**车载市场　出货实绩** **累计 4亿个以上**	MCU用 Display用
LED **驱动**	**车载市场　出货实绩** **年間 2亿个以上**	室外灯 室内灯

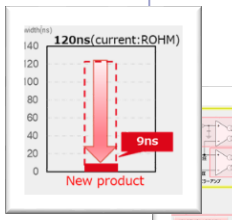
ROHM 车载产品全球/中国销售额

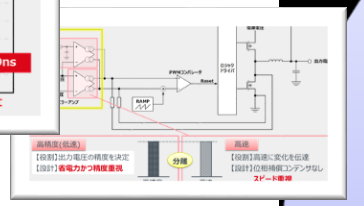
单位：MUSD

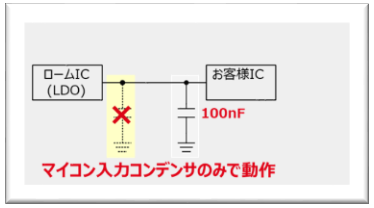
	FY2019	FY2020	FY2021
全球车载	1194	1209	1526

ROHM可以为ADAS解决方案做出贡献

- Nano Pulse Control™
- QuiCur™
- Nano Cap LDO





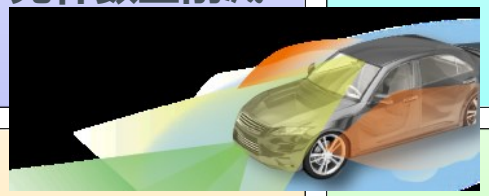


减小实装面积

元件数量削减

SoC参考

PMIC的提供



安全

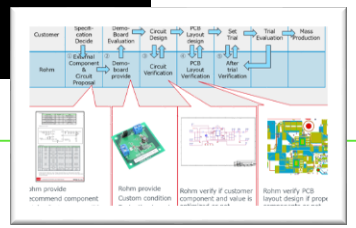
技术支持

- 通过与SoC制造商的合作
  [redacted]参考化
  [redacted]证的最佳电源，
  [redacted]设计时间

[redacted]

- 支持功能安全
- 根据搭载自我诊
  电源监视IC系统
  以被检出

[redacted]件选择
[redacted]价支持



罗姆对功能安全规格的努力

获得ISO 26262的研发流程认证

2018年获得第三方认证机构

TUV Rheinland (德国)的研发流程认证。

ISO 26262的品牌「ComfySIL」

2021年制定功能安全品牌“ComfySIL”。

罗姆为了使设计功能安全的客户能够Comfy(舒适)地使用SIL (Safety Integrity Level, 安全水准)对应的产品。并且, 罗姆能够通过产品为社会系统的安全、安心、舒适做出贡献。在这样的想法下, 创立了ComfySILTM品牌。

ComfySIL™ 特设网站:
https://www.rohm.co.jp/functional-safety

ISO 26262是指

汽车电器、电子相关的“功能安全”国际标准。遵守需要很多资源。

“符合”ISO 26262标准的产品

➡ 因为设备制造商可以证明,
所以可以大幅削减应用设计时的工时！

符合ISO 26262时所需的对应示例

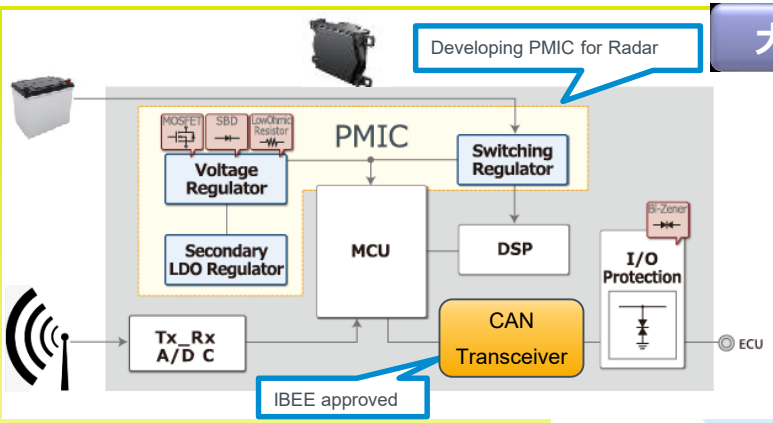
- 为实现功能安全追加电路
- 准备超过100项工作成果
- 构建严格的管理体制，制作账簿。

ADAS领域的解决对策

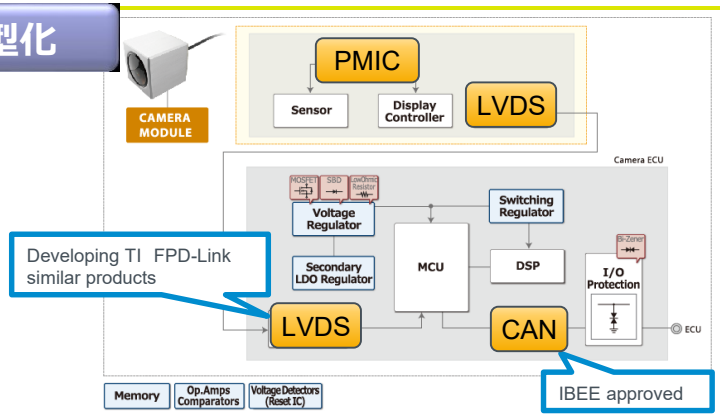
ROHM为实现ADAS自动驾驶车辆周边环境感知的解决方案做出贡献。

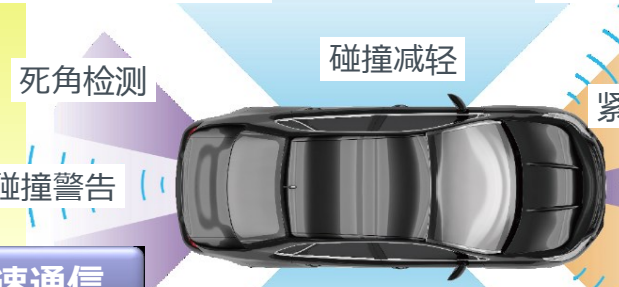
大电流化　小型化　高效率

【Radar】



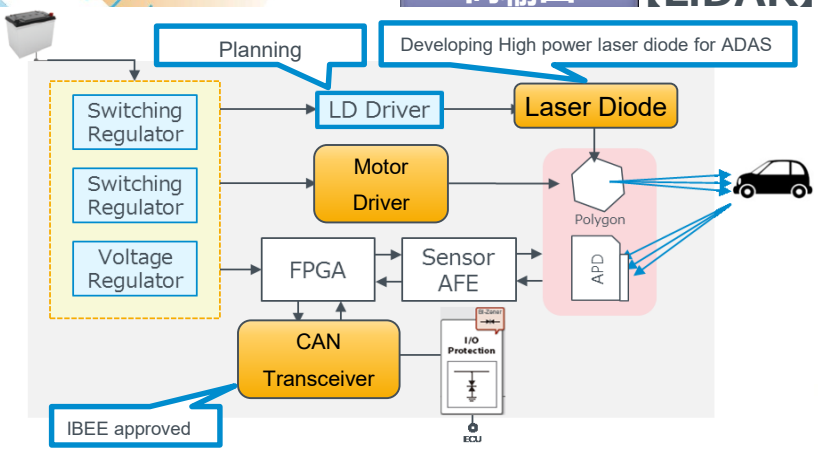
【Camera】



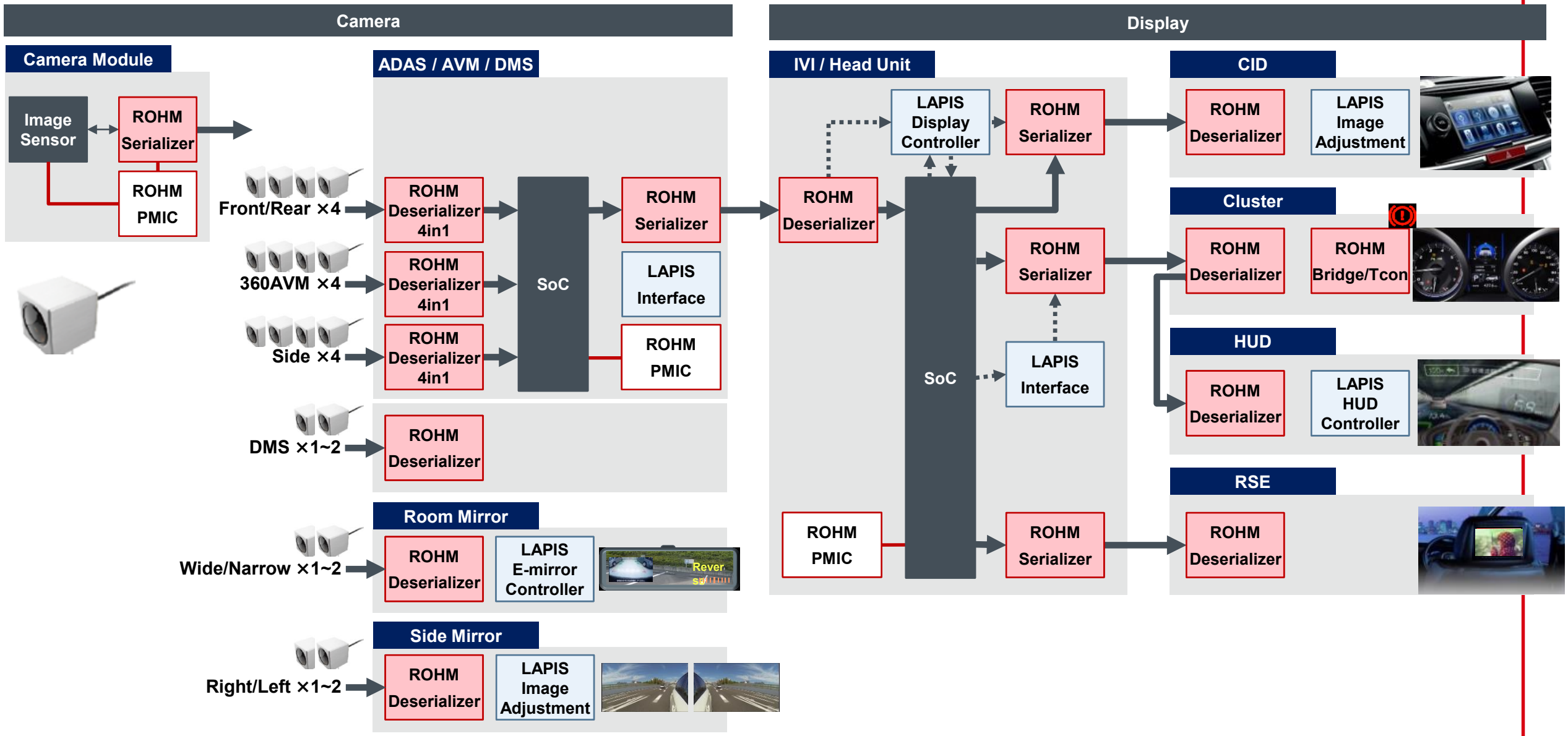


【Sonar】 长距离对应　高速通信

高输出　【LiDAR】



Application Example



ROHM PMIC 产品概述

ROHM的优势　提供电源管理解决方案

SoC
リファレンス
PMICの提供

与SoC供应商合作，
正在研发能够发挥最大性能的PMIC

与SoC制造商的合作

RENESAS R-Car系列

最适合车载面板的SoC解决方案

◆ 采用案例


Infotainment


仪表盘

◆ 参考板 (BD9571MWF-M)

主要性能:
- 16A DCDC控制器
- 高效率DCDC转换器
- 最适合的启动时序

BD9571
200-250K/M

intel Atom系列

车载、打印机、PC等高功能·
高性能SoC解决方案

◆ 采用案例


Infotainment


打印机


PC

◆ 参考板 (BU9617GW-M)

主要性能:
- 21A 4相DCDC控制器
- 高效率DCDC转换器
- 最适合的启动时序

NXP i.MX系列

从便携式到娱乐设备
适用的SoC解决方案

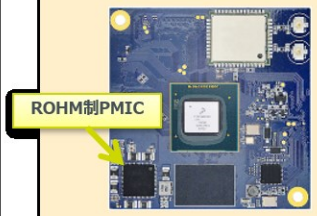
◆ 采用案例


电子字典


电子书


网络扬声器

◆ 参考板 (BD71837MWV)



主要性能:
- 低功耗·高效率 4A DCDC转换器
- 32kHz 晶振
- 最适合的启动时序

Concept of BD9680* Automotive Power Solution

Any SoC can be supported by combining the three ICs of Main PMIC, Sub PMIC, and Driver MOS.

Automotive PMIC for SoC

Main PMIC
BD96801

- DCDC×2ch
  2A or Driver MOS(20A)
- DCDC×2ch
  4A
- LDO×3ch
  0.3A
- Secure Functional
  Safety as a system

Sub PMIC
BD96802

- DCDC×2ch
  5A or Driver MOS(20A)
- Additional output,
  Safety architecture

Driver MOS
BD96340

- 10A～20Aoutput
  Temperature feedback
  Current feedback
- Large current for high
  power system

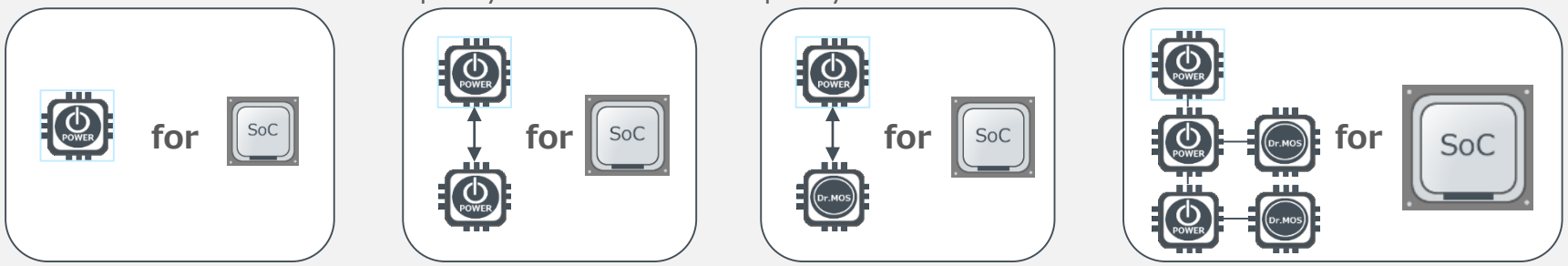
Application example

Reasonable ECU ：
Main PMIC, 1pc system

Mid power ECU ：
Main and Sub PMIC
2pcs system

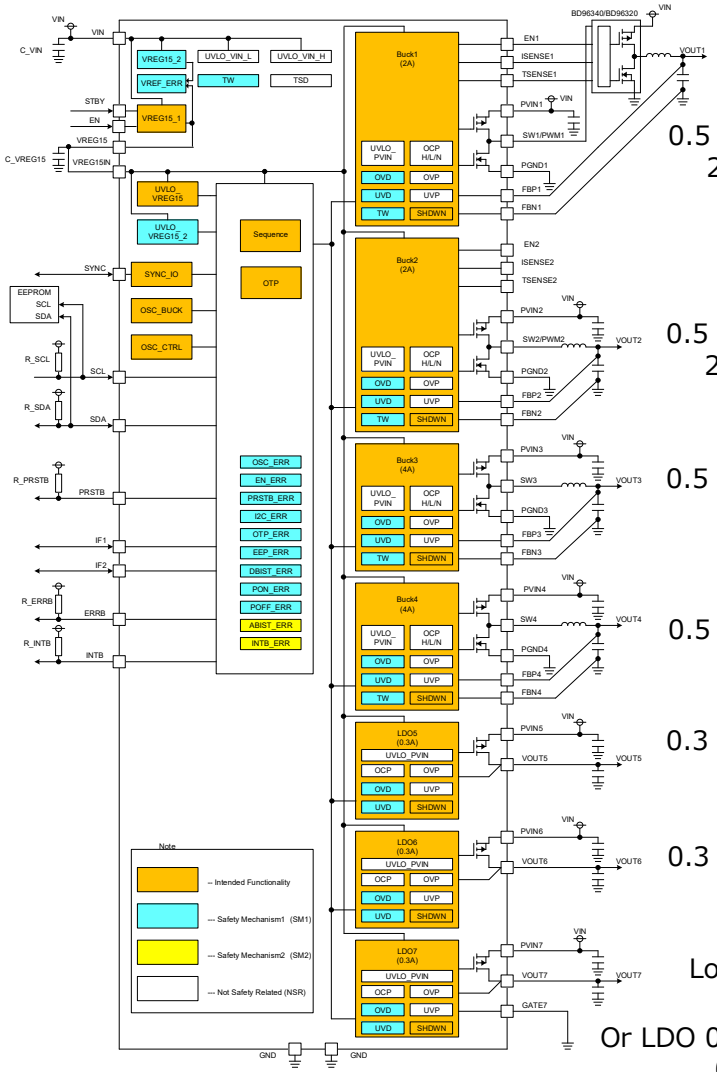
High power ECU ：
Main PMIC and Driver MOS,
2pcs system

Complex and high power ECU ：
5～7pcs system



Main PMIC : BD96801XXX-C

Application Circuit



0.5 V to 3.3 V 2A~20A

0.5 V to 3.3 V 2A~20A

0.5 V to 3.3 V 4A

0.5 V to 3.3 V 4A

0.3 V to 3.3 V 0.3A

0.3 V to 3.3 V 0.3A

Load SW 0.3A

Or LDO 0.3 V to 3.3 V 0.3A

Features

- Built-in 2A MOSFETs or External Driver MOS selectable for Buck1 and Buck2.
- Built-in 4A MOSFETs for Buck3 and Buck4.
- Dual Phase Operation for Buck1 and Buck2.
- Dual Phase Operation for Buck3 and Buck4.
- Multipurpose LDO for LDO5,6
- Load Switch or LDO selectable for LDO7 output.
- Programmable power sequencer by OTP/I2C/EEPROM
- Switching Frequency selectable (2.25/4/8MHz)
- Built-in protection (UVLO,OCP,OVP,UVP,TSD)
- Built-in detection (OVD,UVD, Thermal Warming)
- Built-in Q&A Watchdog
- Built-in SYNC function (SYNC)
- Internal Spread Spectrum OSC
- ASIL-B(D) support

Key specifications

- Input voltage range :2.7V ~ 5.5V
- Operating temperature range :-40ºC ~ 125ºC
- Output voltage DC accuracy :±1.2%

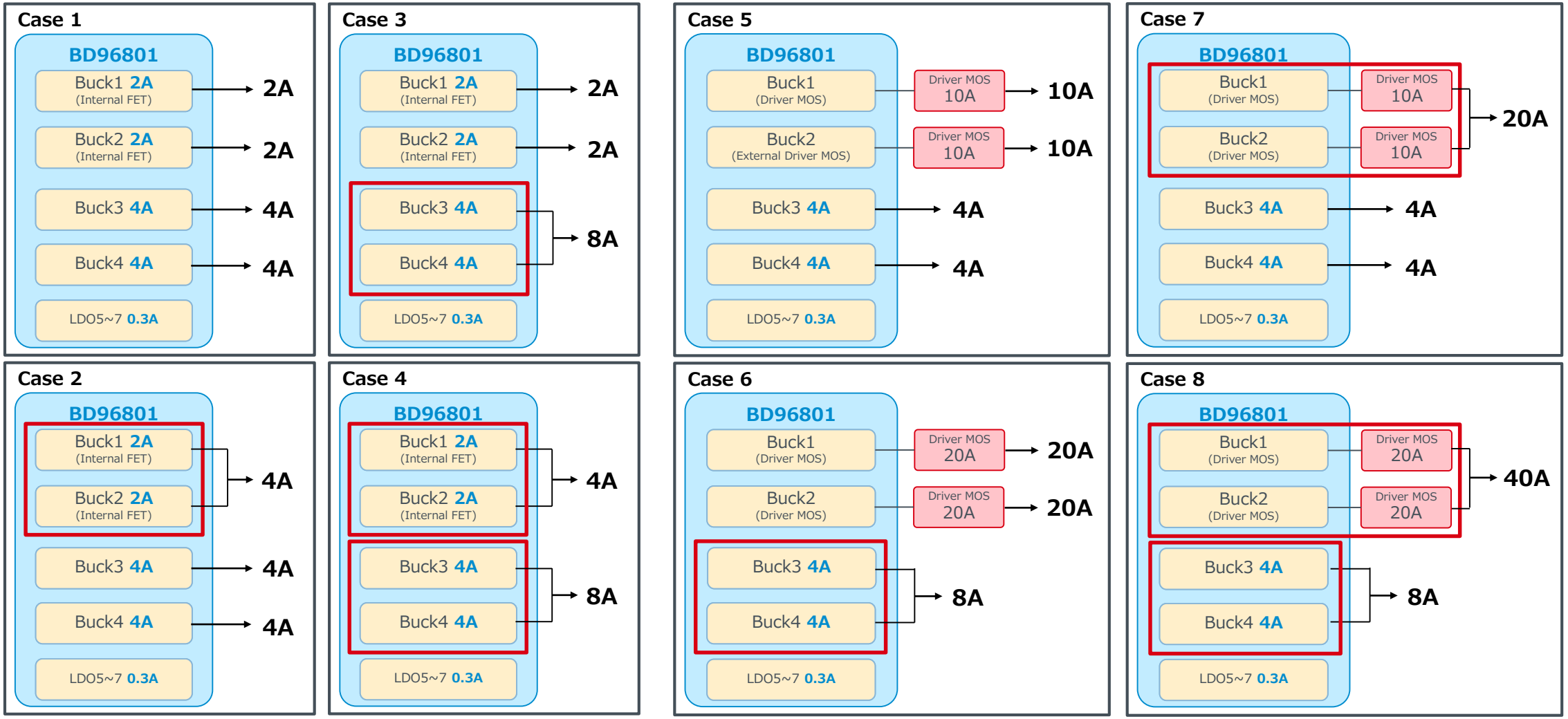
Package

UQFN48FV6060 6.0mm x 6.0mm x 1.0mm

Use cases: Main PMIC BD96801

The combination of Buck1&2 and Buck3&4 can be used in multiple phases.
Furthermore, Buck1 and 2 can support up to 20A per channel by using Driver MOS.
These combinations can be applied to various specifications of SoCs.

2 phase output

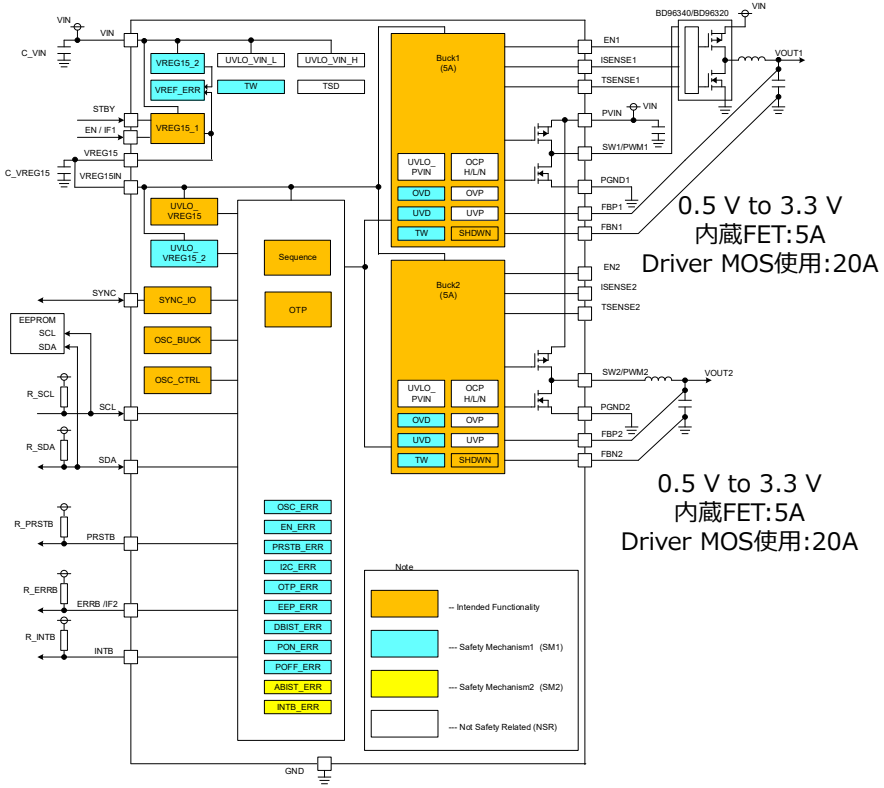


--- Main PMIC BD96801
--- Sub PMIC BD96802
--- Driver MOS BD96340

Sub PMIC : BD96802QXX-C

BD96802 can be applied to supply core power of various SoCs by using multi-phase and Driver MOS. Furthermore, it can be used in combination with the Main PMIC BD96801.
Integrated Buck DCDC2ch(5A×2ch or 20A×2ch)

Application Circuit



0.5 V to 3.3 V
内蔵FET:5A
Driver MOS使用:20A

0.5 V to 3.3 V
内蔵FET:5A
Driver MOS使用:20A

Features

- Built-in 5A MOSFETs or External Driver MOS selectable for Buck1 and Buck2.
- Programmable power sequencer by OTP/I2C/EEPROM
- Switching Frequency selectable (2.25/4MHz)
- Built-in protection (UVLO,OCP,OVP,UVP,TSD)
- Built-in detection (OVD,UVD, Thermal Warming)
- Built-in SYNC function (SYNC)
- Internal Spread Spectrum OSC
- Sequence linkage with BD96801 is possible
- ASIL-D support

Key specifications

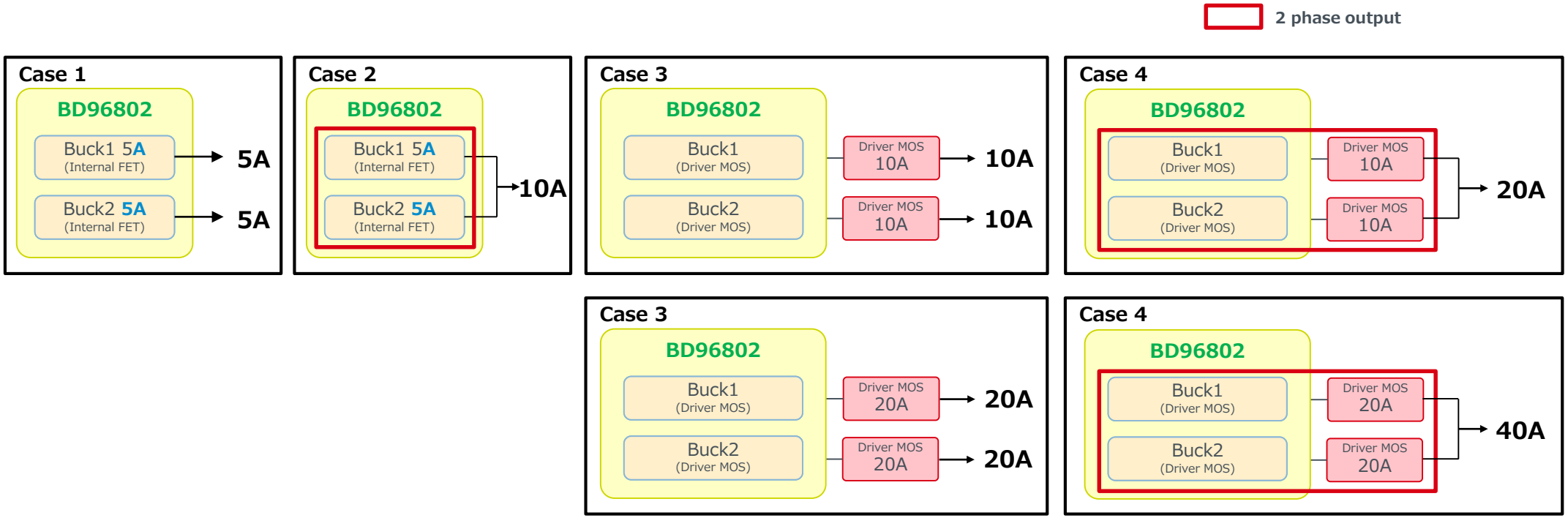
- Input voltage range :2.7V ~ 5.5V
- Operating temperature range :-40ºC ~ 125ºC
- Output voltage DC accuracy :±1.2%

Package

UQFN40FV5050 5.0mm x 5.0mm 1.0mm

Use Cases: Sub PMIC BD96802

The combination of Buck1&2 can be used in multiple phases.
Furthermore, Buck1 and 2 can support up to 20A per channel by using Driver MOS.
It can be applied to more SoCs by combining with BD96801.

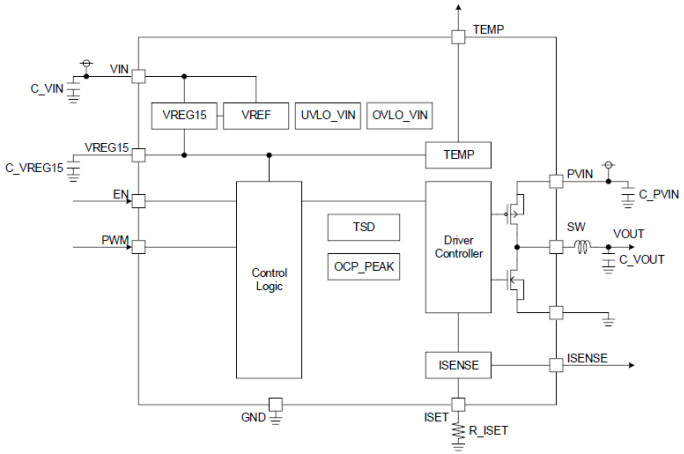


--- Main PMIC BD96801 --- Sub PMIC BD96802 --- Driver MOS BD96340

Driver MOS : BD96340MFF-C Driver + MOSFET

BD96340 can be used in combination with BD96801 / BD96802, which is a 1-chip MOSFET and driver. A flip chip PKG realizes low ON resistance and can supply a large current of 20A.

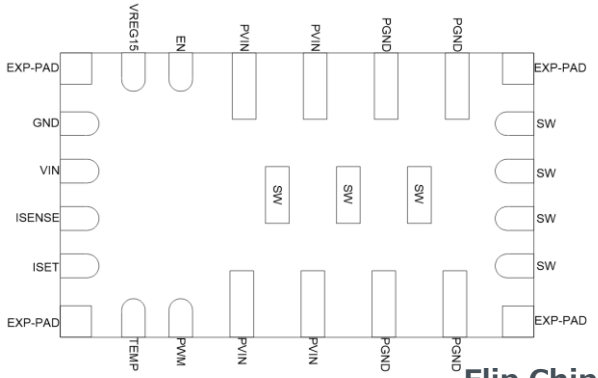
Application Circuit



Features

- AEC-Q100 Qualified
- Built-in MOSFETs of Max continuous current 20A, peak **30A** per channel.
- Built-in protection (UVLO,OVLO,OCP,TSD)
- Current Monitor Output(ISENSE)
- Die Temperature Monitor Output(TEMP)
- Automatic Phase Number Recognition Function

Package[Tentative]



(TOP View)

Flip Chip QFN
(23pin, 5.0mm x 3.0mm)

Key specifications

Input voltage range	:2.7V ~ 5.5V
Operating temperature range	:-40ºC ~ 125ºC
Quiescent Current	:0uA
High Side FET On-Resistance	:4mΩ(Tentative)
Low Side FET On-Resistance	:2.5mΩ(Tentative)

SEMIDRIVE（芯馳）

公司背景

芯驰科技为未来智慧出行提供高性能、高可靠的车规芯片，是国内首个“四证合一”的车规芯片企业。芯驰科技产品和解决方案覆盖**智能座舱、自动驾驶、中央网关和高性能MCU**四大业务，面向未来智能汽车各项核心应用场景。芯驰的车规芯片已实现大规模量产，服务客户超过260家，覆盖中国80%以上的车厂。

Established Time	2018Y
Location	南京，上海，北京，深圳
OEM Project	一汽红旗/上汽/BYD/奇瑞/长安
R&D	400+

Cockpit **ADAS** **Gateway** **MCU**

与ROHM合作

The Strategic Cooperation

ROHM SEMICONDUCTOR　SEMIDRIVE 芯驰科技

SEMIDRIVE（芯驰）

PMIC　DR.MOS　SerDes

已量产SoC平台

X9H

BD96801
BD96802
BD96802

BU18TM41
BU18RM84
BU18TL82
BU18RL82

- **PMIC:** 性能验证OK，基本高低温完成。
- **Serdes**：已调试完成，支持Cam*4+Display*4

X9U

BD96801
BD96801

BD96802
BD96802
BD96340

- **PMIC**：性能验证OK。
- **Serdes**：需要支持8M产品。

X9M

BD96801
BD9SA01

BU18TL82
BU18RL82

- **PMIC**：时序已确认，等待做板验证。
- **Serdes**：先直连ROHM serdes板测试性能。

- 此平台为面向日本低成本的中控方案
- 可能客户：日本松下

下一代SoC平台

X9SP

23年Q4MP

BD96801
BD96802

BD96802
BD96802

- **PMIC**：已进行电源方案对应和报参考价格。
- **Serdes**：需要支持8M CAM 产品。

X9CC

24年Q1MP

BD96801
BD96801

BD9S100*3
BD9S201*2
BD96340*4

- **PMIC**：已进行电源方案对应和报参考价格。
- **Serdes**：需要支持8M CAM 产品。

E3

23年Q4MP

BD390A0

- **PMIC**：已送EVB，正在测试中，已有最终客户深圳艾贝在询问资料。

问题点：PMIC量产时间与芯片量产时间不符。

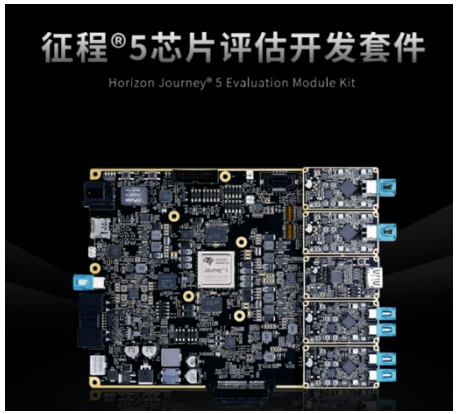
※白文字は採用確定、灰文字は拡販中

HORIZON（地平線）

PMIC　DR.MOS　SerDes

公司背景

2020年，地平线正式开启中国汽车智能芯片的前装量产元年，实现从0到1的突破，时至今日，地平线征程芯片累计出货量已突破150万片，与超过20家车企签下了超过70款车型前装量产项目定点，携手合作伙伴实现从1到N的价值共探。



主要客户和IDH

上汽集团 SAIC MOTOR　广汽集团 GAC GROUP　长城汽车　比亚迪汽车　中国一汽　G-PULSE 金脉

CHERY　intel　SK　SK hynix　星宇股份 XINGYU CO.,LTD.　TZTEK 天准

LUXSHARE ICT　BAILLIE GIFFORD　云锋基金　5Y CAPITAL 五源资本　映驰科技 Enjoy Move

已量产SoC平台

G-Pulse 設計

J3

BD96803　BU18RM41

BD96803　BU18RM84

- Serdes正在上海金脉调试中
- PMIC方案已做完对应，等待项目验证中。

J5

BD96801　BD96802

BD96801　BD96802

BD96340*6

- PMIC已作为整体方案在J5　EVM板中搭载，完成全部的性能以及高低温测试。

下一代SoC平台

J6

- 客户要求大电流DR　MOS，我们暂时无法对应。

重点案件

Continental上海 ➡ BYD「宋」　24年Q1 MP　BYD　J5

上海映驰已完成ROHM　PMIC设计，电源调试OK，在调试软件。

※白文字は採用確定、灰文字は拡販中

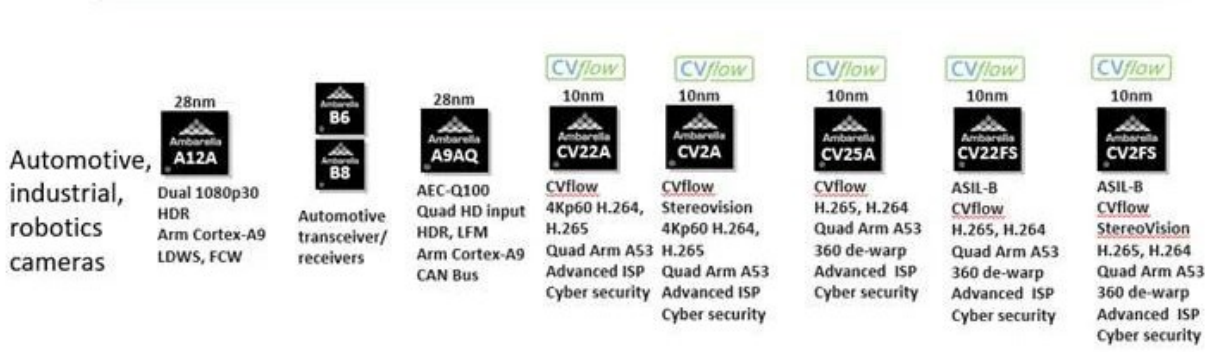
Ambarella（安霸）

PMIC

公司背景

安霸的产品广泛应用于人眼和计算机视觉应用，包括视频监控、高级驾驶辅助系统（ADAS）、电子后视镜、行车记录仪、驾驶员/舱内监控、无人驾驶和机器人应用。

Established Time	2007Y
Location	美国，中国上海，中国台湾
OEM Project	长安/广汽/吉利
R&D	1000+



平台合作

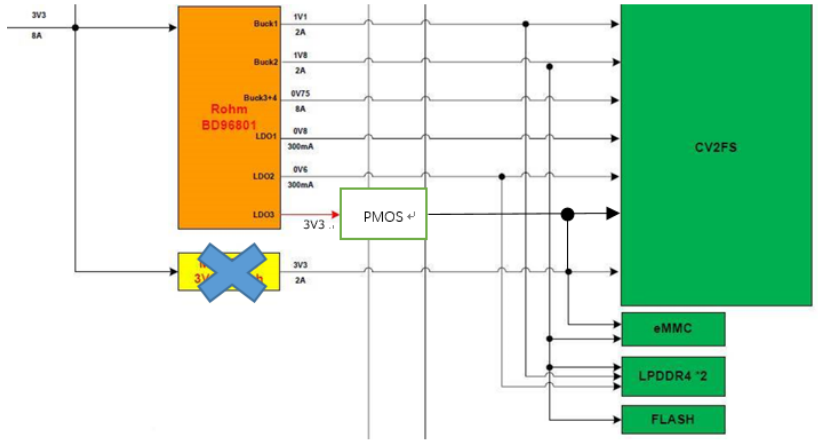
目前已经和Tier1 在CV2FS上使用ROHM PMIC进行设计。

样机：2023年3月　　量产：2024年Q1

CV2FS　　**BD96801**

	core current
CV2FS	5A peak
CV22	5A peak
CV25	2.5A peak

电源方案可兼容CV2全系列



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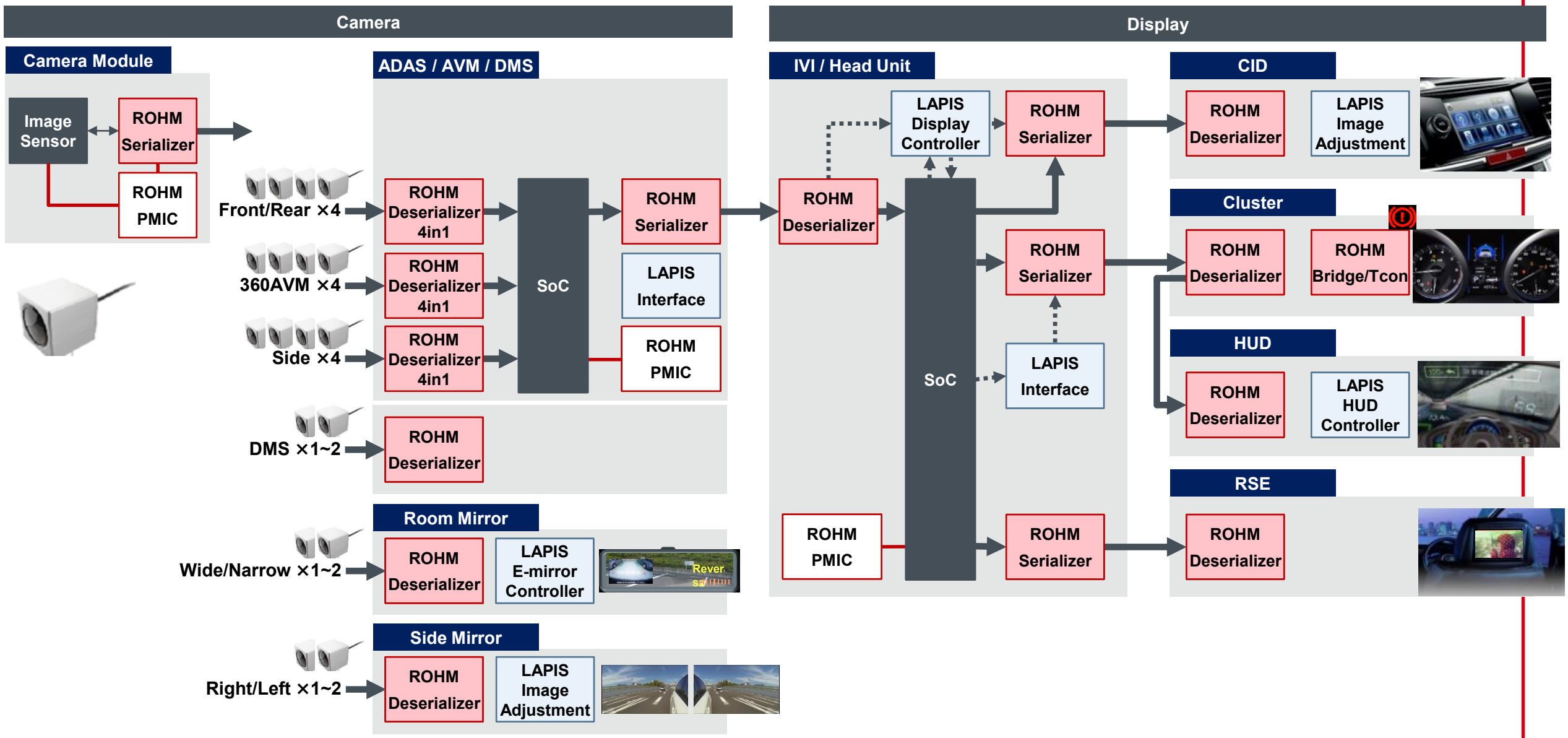
ROHM Serdes产品简介

Application Example



ROHM SerDes Roadmap

Camera SerDes

3Gbps (2M)
BU18TM41-C
BU18RM41-C
BU18RM84-C

- ISO 26262 FS implemented

MP Status

4.5Gbps (8M)
BU19TM41-C
BU19RM84-C
BU19RM82-C

- **ISO 26262 Compliant**

ES : ’23/Jun
MP : ‘23/Dec

12Gbps (15M-)
BU19ATxxx
BU19ARxxx

- ISO 26262 Compliant
- **Standardization**

ES : ’24/Q2
MP : ‘24/Q4

mipi alliance **MIPI A-PHY**

Motion Link

3G/6Gbps (2/8M)
BU18Pxxx

- ISO 26262 Compliant
- Standardization
- **Ser + PMIC (Space Saving)**

Display SerDes

3Gbps (FHD)
BU18TL82-M
BU18RL82-M

- ISO 26262 FS implemented
- **Daisy Chain**
- MIPI-DSI / LVDS support

MP Status

ES : ’23/Q4
MP : ‘24/Q2

6Gbps (4K1K)
BU19HTL82/RL82

- **ISO 26262 Compliant**
- **eDP/MIPI-DSI/LVDS support**
- **I2S/TDM Support**

6Gbps (4K1K)
BU19HFRL82

- **ISO 26262 Compliant**
- **LVDS support**
- **I2S/TDM Support**
- **OSD Support (FuSa)**

12Gbps (4K2K)
BU19Axxx

- ISO 26262 Compliant
- **Standardization**

6Gbps (4K2K)
BU19Cxxx

- ISO 26262 Compliant
- **Standardization**
- **Data Compress (1/3) (VESA DSC V1.1)**

All of Display SerDes support Daisy Chain function

Year	～2021	2022	2023	2024～2026

ROHM SerDes Product Line Up

Camera SerDes

Resolution	Data Rate	I/F	Serializer	Deserializer	Deserializer (2 in 1)	Deserializer (4 in 1)
15M~	12Gbps	MIPI CSI-2	BU19ARM41		BU19ARM42	BU19ARM84
8M	4.5Gbps	MIPI CSI-2	BU19TM41		BU19RM42	BU19RM84
2M	3.6Gbps	MIPI CSI-2	BU18TM41A	BU18RM41		BU18RM84

Available

Under Development

Planning

ISO26262 Compliant (ASIL-B)

Display SerDes

Resolution	Data Rate	LVDS (oLDI) Ser	LVDS (oLDI) Des	MIPI-DSI Ser	MIPI-DSI Des	eDP Ser	eDP Des
4K2K	12Gbps					BU19ATxx	BU19ARxx
	6Gbps w/ DSC					BU19CTxx	BU19CRxx
2K/3K 1080P	6Gbps	BU19HTL82	BU19HRL82	BU19HTL82		BU19HTL82	
	3.6Gbps 2lane	BU18TL82	BU18RL82	BU18TL82			
720P	3.6Gbps						

Same product

Same product

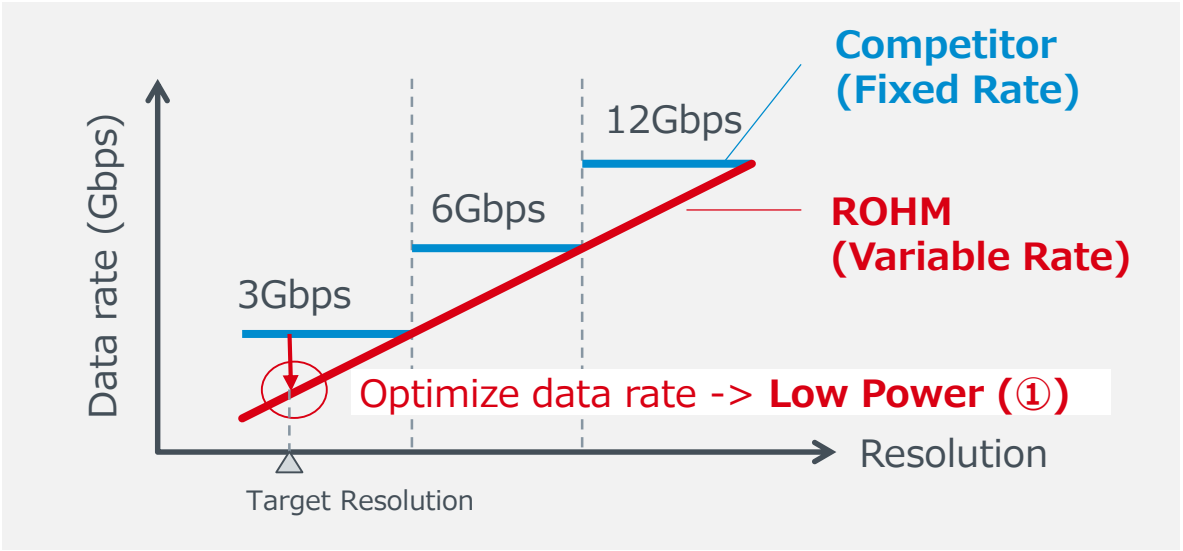
New Product

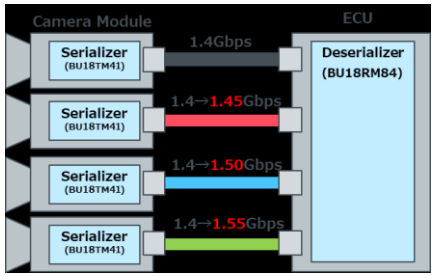
Why ROHM SerDes

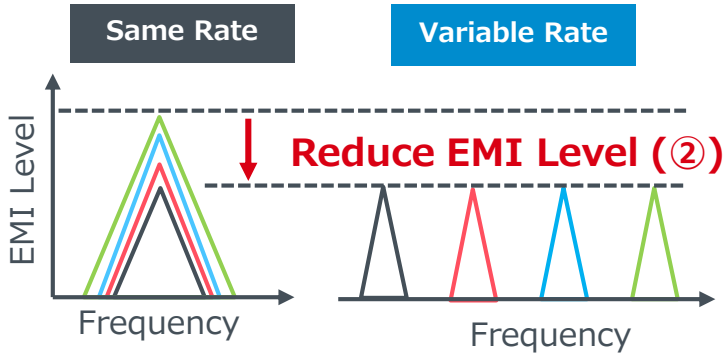
■ Variable Data Rate

① Low Power : -27%

② Low EMI : -20dB

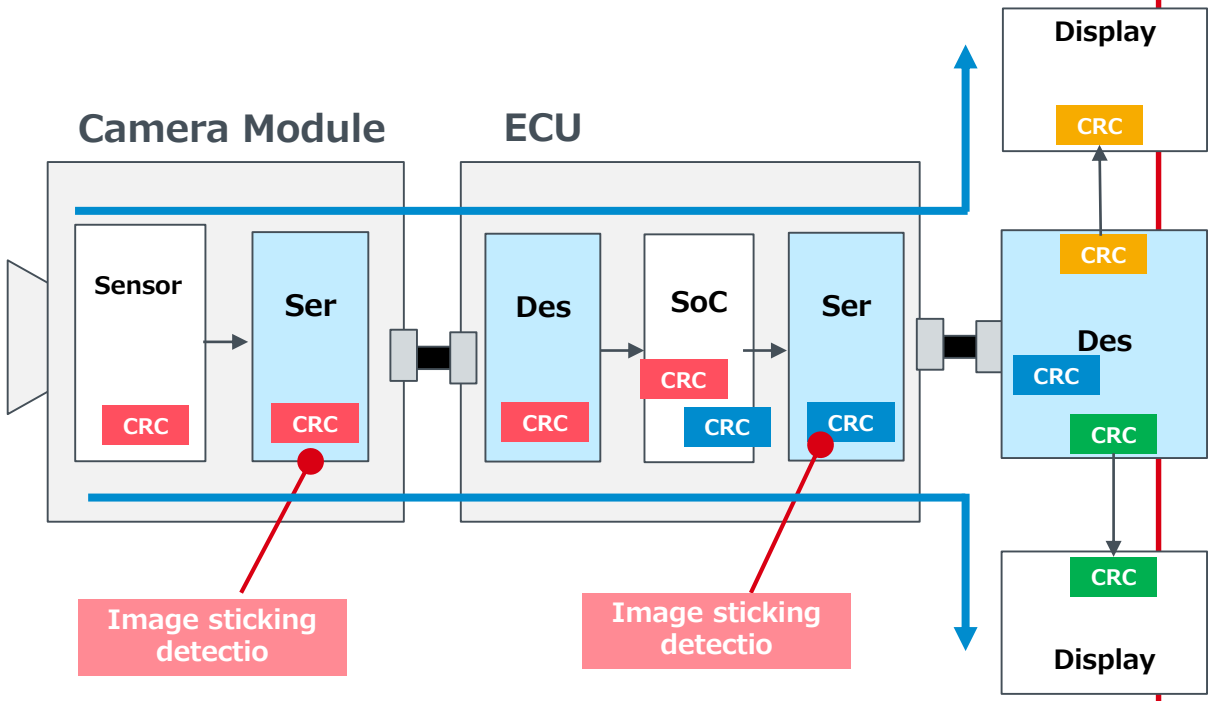






■ Functional Safety

- Image sticking detection
- High traceability of transmission data



Confirm the transmission data by CRC

Rohm SerDes 合作伙伴（MP＆Under Development, Promotion）

OEM

- 长安汽车 CHANGAN
- 北汽新能源 BAIC BJEV
- SAIC 上汽集团 SAIC MOTOR
- 上汽通用汽车 SAIC-GM
- FOTON DAIMLER AUTOMOTIVE 福田戴姆勒汽车
- 红旗
- 理想
- mazda
- ISUZU 庆铃汽车

- BYD
- 广汽集团 GAC GROUP

SoC

- SEMIDRIVE 芯驰科技
- HISILICON
- Rockchip
- 地平线 Horizon Robotics
- SigmaStar

- MEDIATEK

Tier1

- HUAWEI
- ADAYO 华阳集团
- FORVIA Inspiring mobility
- 北斗星通 BDStar Navigation
- VIKEER 威奇尔 VIKEER ELECTRONICS
- 雅迅网络 YAXONNETWORK
- ULTRONIX
- 江苏旭顺东明 JiangSu XuShun DongMin
- JVC

- DESAY 德赛

Camera Module

- [redacted]
- TRULY 信利
- OFILM 欧菲光
- SUNNY 舜宇智能
- SHINE SHINETECH
- iRay
- ULTRONIX

Image Sensor

- OmniVision
- SONY
- SMARTSENS
- GALAXYCORE

ROEWE：荣威eRX5

仪表/CID　BU18TL82　BU18RL82

SoC　SemiDrive X9

AVATR：长安-华为-宁德

ADAS域控　BU18RM84

高清摄像头　13个　BU18TM41

ARCFOX：北京新能源

ADAS域控　BU18RM84

高清摄像头　13个　BU18TM41

Camera Module / Image Sensor

Camera Module	Image Sensor					
	1.3M	2M	3M	5M	8M	other
SUNNY 舜宇		IMX390		IMX490	IMX728* OX08B40*	
Ofilm 欧菲光		IMX390	ISX031	IMX490		
Truly 信利		IMX390 OV2775		IMX490		
Zongmu 纵目		ISX021				
Sensing-world 森云		IMX390 OV2311 OV9752				
ShineTech 盛泰		OV2718 GC2093				
Brolink/Yeestek 贻盛	SC120AT	OV2718 SC200AI				
XSDM 旭順東明	OX01F10 SC120AT		ISX031			
Infiray 英睿						(夜视)

* Under Development

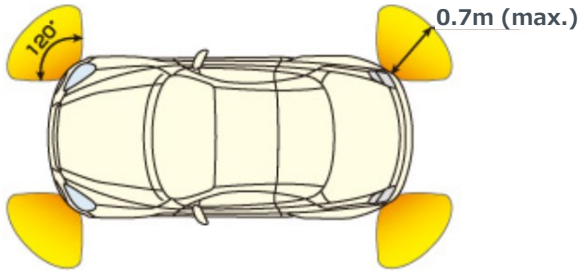
针对于超声波AFE产品

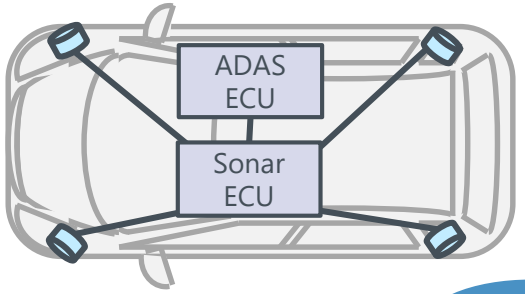
Ultrasonic Sonar AFE Market Trend

Automatic Driving Assist beyond Conner Sense and Parking Assist

ROHM to achieve future requirement for:
Increasing # of modules, Extended measurement range and High-speed serial interface

Corner Sense



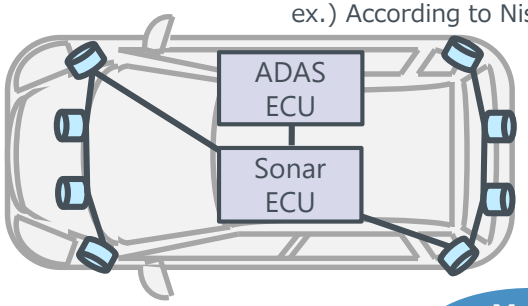


System Requirement (Mass Production)

# of modules per vehicle : 4pcs
Distance : 0.2m ~ 3.0m
I/F : 1 wire (Parallel), 20kbps

Parking Assist

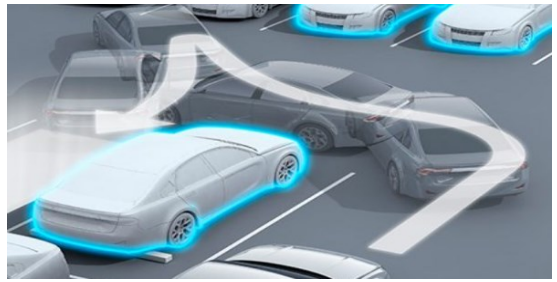
ex.) According to Nissan



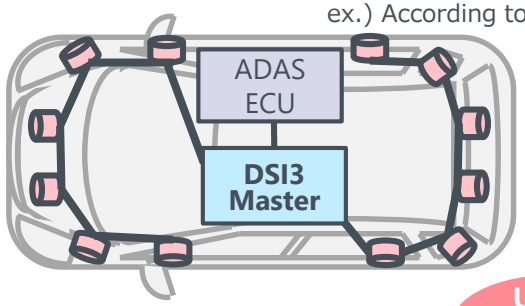
System Requirement (Mass Production)

# of modules per vehicle : 8pcs
Distance : 0.2m ~ 5.0m
I/F : LIN (Serial BUS), 20kbps

Automatic Driving Assist



ex.) According to DENSO



System Requirement (Under Development)

# of modules per vehicle : **12pcs**
Distance : **0.15m ~ 6.0m**
I/F : **DSI3 (Serial BUS), 400kbps**

Capability of Longer Distance Measurement

BD40012MUV : Type of Transformer-less Driving

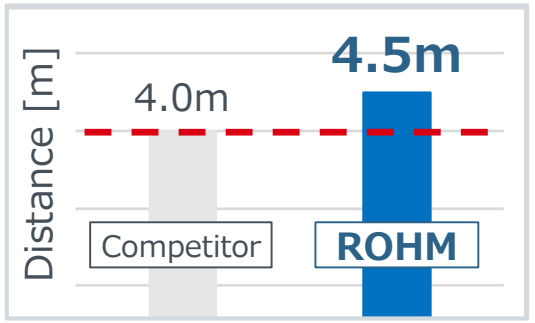
- ✓ Built-in voltage booster circuit for 35V sensor drive
- ✓ Well reduced noise for 4.5m Long-distance measurement

20% advanced **Drive Voltage** for sensor

Competitor	ROHM
30.0V	35.7V

Advantage!

Over 4m detection
suitable for Parking Assist



BD40011MUV : Type of Transformer Driving

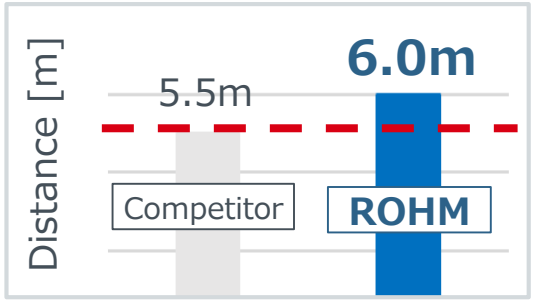
6.0m Long-distance measurement
due to 10% advanced Current Drive Capability than competitor

10% advanced **Drive Current** for sensor

Competitor	ROHM
354mA	390mA

Advantage!

Over 5m detection
Conforming to Driving Assist Rqmt.



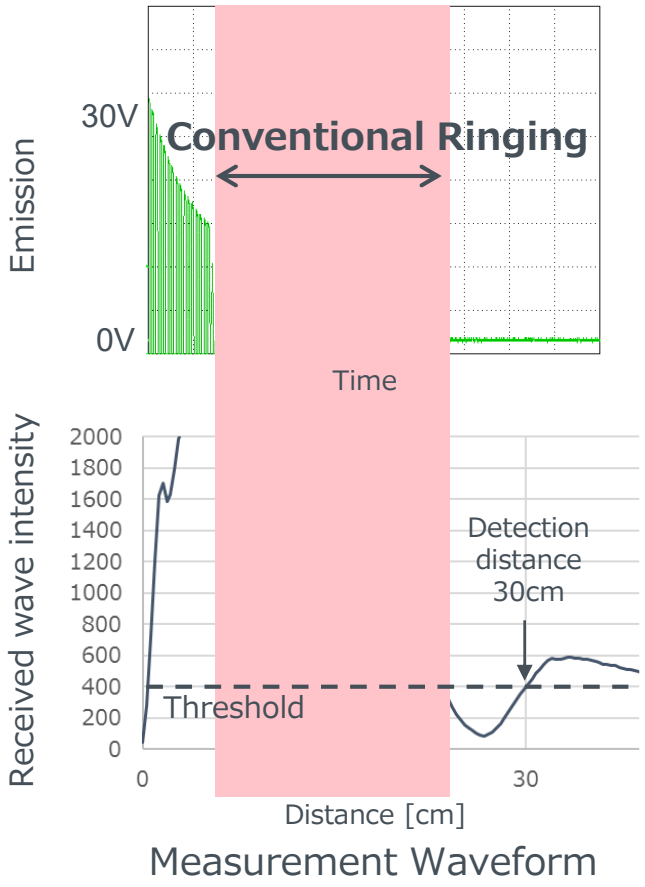
Capability of Shorter Distance Measurement

- ✓ Advanced Reverberation Reduction feature in Ultrasonic sonar AFE
- ✓ Achieved 0.2m short distance measurement for automatic parking

Advantage!

Competitor

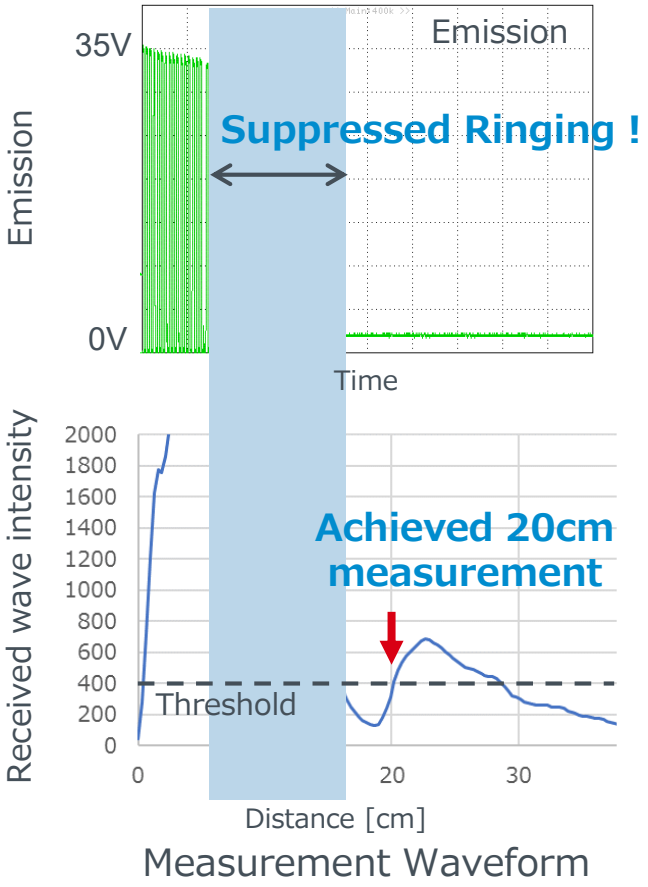
Sensor drive waveform



Measurement Waveform

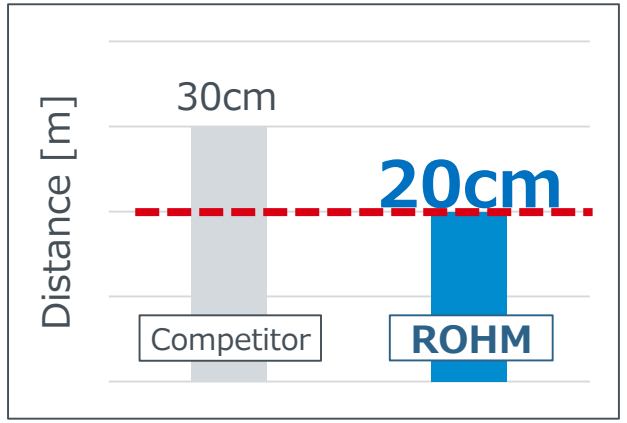
ROHM

Sensor drive waveform



Measurement Waveform

BD40012MUV / BD40011MUV



20cm measurement Conforming to Automatic Parking Standard

Comparisons of characteristics

Confidential

Requirement	Block Diagram	ROHM			
		BD40011 Transformer Driving	BD40012 Transformer-less Driving	BD40013 Transformer Driving	BD40014 Transformer-less Driving
Long Distance	PGA	analog 39 ~ 56dB 2.4dB/step digital 0 ~ 48dB	analog 39 ~ 56dB 2.4dB/step digital 0 ~ 48dB	analog 39 ~ 72dB 2.4dB/step digital 0 ~ 48dB	analog 39 ~ 56dB 2.4dB/step digital 0 ~ 48dB
	Transformer-less driving	×	○	×	○
	Driving Spec	168 ~ 354mA 6mA/step	15 ~ 30V 13 step	190 ~ 740mA 64 step	15 ~ 70V 32 step
	ADC	10bit	10bit	12bit	12bit
Short Distance	Echo Detection	○	○	○	○
Function	Echo Identification	×	×	○	○
High speed I/F	I/F	1 wire	1 wire	LIN	LIN
Custom Logic	CPU	×	×	×	×
Others	Irreversible Memory	OTP	OTP	OTP	OTP
	Temp Sensor	○	○	○	○
	Package	VQFN20 4mm□	VQFN20 4mm□	VQFN20 4mm□	VQFN20 4mm□

Ultrasonic AFE Lineup

Driver	ECU I/F	Measurement range		
		4m	6m	8m
Transformer	P2P		E524.09 ⇔ BD40011	
	LIN		E524.14 ⇔ BD40013	
Transformer-Less	P2P	E524.33 ⇔ BD40012		
	LIN	E524.16 ⇔ BD40014		

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Roadmap - Automotive Ultrasonic Sonar AFE

			Y2020	Y2021	Y2022	Y2023
Market Requirement			Distance 0.2 to 6m			Distance 0.2 to 8m
				Transformer-less Driving		
						Echo Identification
						Function Safety
Roadmap	Technology	Long Distance	Sensor Drive 40V Charge Pump	Sensor Drive 80V Charge Pump		
		Short Distance	- 0.2m	Transformer Less Ringing Reduction		
		ECU I/F	P2P	LIN	DSI3	
		Echo Identification		Echo Identification	Drive signal Coding	
		Function Safety			ASIL-B	
	Product Development		**BD40011MUV** Transformer-Drive (0.2 to 6m)	**BD40013MUV** Transformer-Drive (0.2 to 8m)	**BD40020MUV** DSI3 Slave/ASIL-B Drive signal Coding Transformer-less (0.2 to 6m)	
			BD40012MUV Transformer-less (0.2 to 4m)	**BD40014MUV** Transformer-less (0.2 to 6m)	**BD40050MUV** DSI3 Master/ASIL-B	

ROHM 面板功能安全芯片简介

ROHM面板功能安全的应用实例

罗姆安全芯片组当
信号链路失效时能
产生安全符号

⇒Demo动画演示

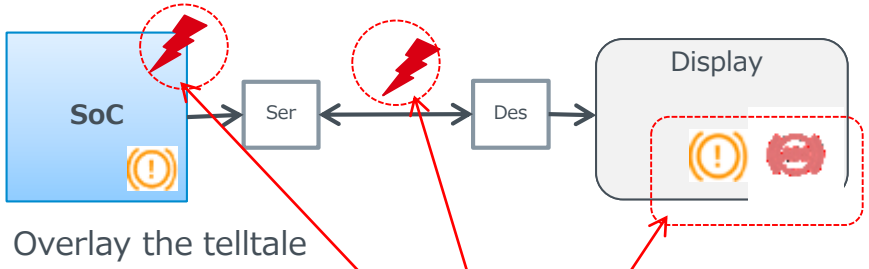
正常状态

错误状态

重要图标显示（挡位，速度等）

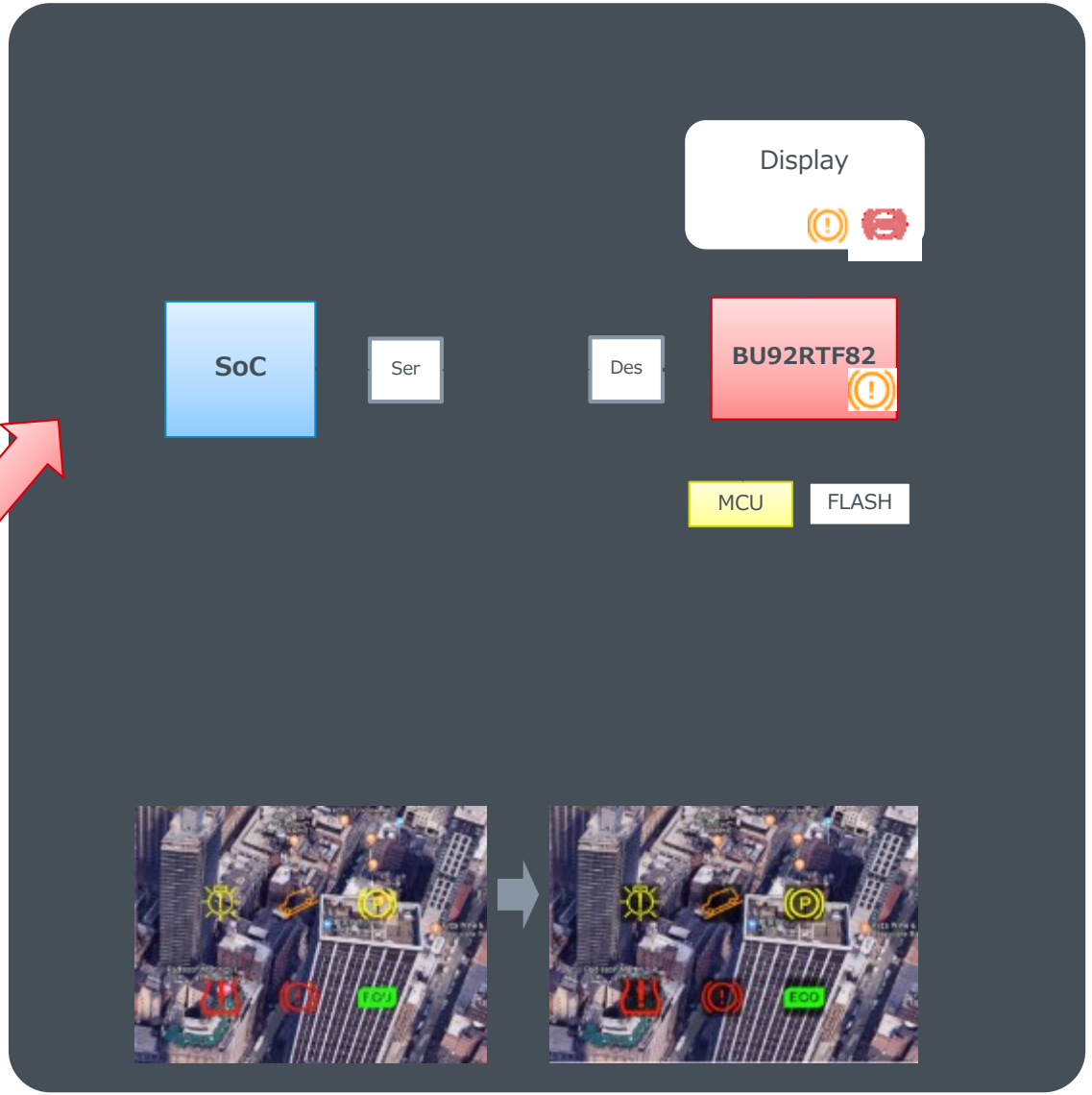
What is OSD Function for functional safety ?

Issue in the current configuration (Functional Safety)



Issue

- SoC Error → Telltale Error
- SerDes transmission error → Telltale Error
- Need much SOC processing power



ROHM Panel Interface LSI Roadmap（OSD功能IC）

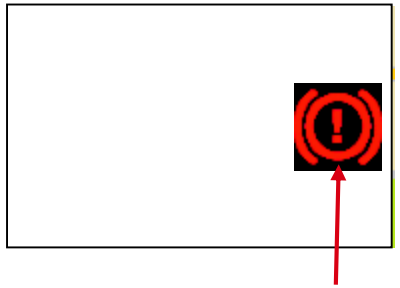
製品	2019年3月 量産	2022年6月 量産開始	2023年Q1 样品出货	
	3K Panel **BU92RTF82-M** • ISO 26262 FS implemented • openLDI Input • **OSD Function Support**	**5K Panel** **BU92RE44-M** • ISO 26262 Support • **eDP 2.7Gbps Input** • **Touch Panel Connection Support**	**7K Panel** **BU92REF44-M** • **ISO 26262 Compliant** • eDP 2.7Gbps Input • Touch Panel Connection Support • **OSD Function Support**	SerDes产品加OSD功能
Year	*～ 2021*	*2022*	*2023~*	

Pin Compatible

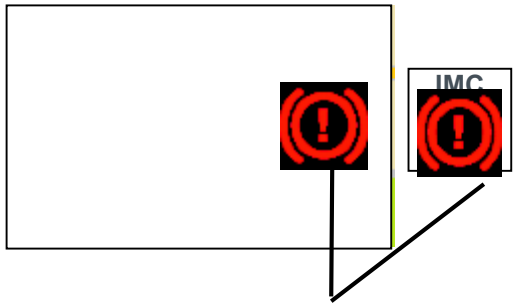
Data Monitor Function and Quick Start Function

SoC Data Monitor (IMC) + OSD Overwrite

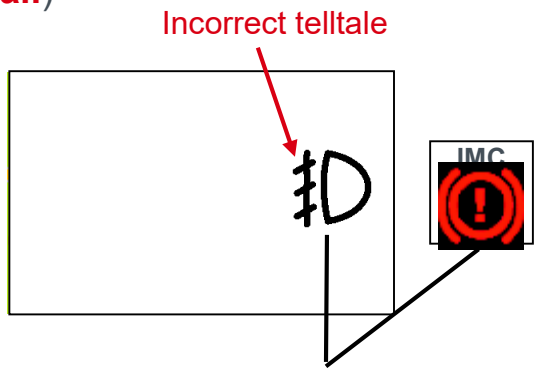
1. Telltale Display from SoC



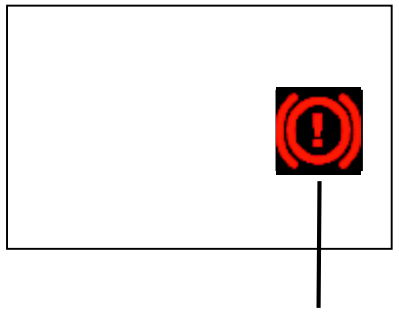
2. Check telltale by IMC Function **(Pass)**



3. Check telltale by IMC Function (**Fail**)



4. Receive OSD commands from MCU (SPI I/F)

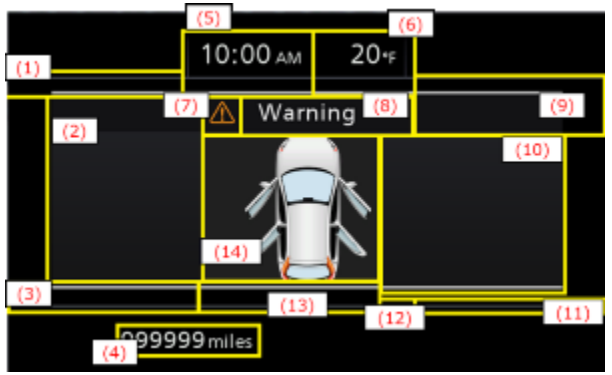


Quick Start Display

System Power On (5ms) → Keep Black Display → SoC Output Start (**2s～10s**)

System Power On (5ms) → Interface LSI OSD On (**173ms**) → Soc Output Start (**2s～10s**)

Display by OSD characters before SoC start up



14 Characters

BU92RTF82上车实绩

ARCFOX

SAIC 上汽集团 SAIC MOTOR

长城汽车

GEELY

*以上只是部分车款，一般都是平台项目，其他车型上陆续使用

ROHM 针对ADAS的其他产品简介

Primary Switching Regulator N/N Line up

Type		Buck						
Series		BD9Pxx5xxx-C		BD9P2x6xxx-C		BD9Pxx8xxx-C	BD9Pxx9xxx-C	BD9PAxx-C
Built-in FET		Nch/Nch						
VIN		3.5V to 40V		3.5V to 40V			3.0V to 36V	3.0V to 36V
freq		2.2MHz		440kHz		2.2MHz	2.0MHz	2.0MHz
Icc(typ)		10μA		10μA			T.B.D	100μA
*SSCG		✓						
Vout		0.8V to 8.5V	3.3V to 5V	0.8V to 8.5V	3.3V to 5V	0.8V to 8.5V	0.8V to 9.0V	0.8V to 9.0V
Nano Pulse Control™		✓						
Output Current	1A	BD9P105EFV-C BD9P105MUF-C	BD9P135EFV-C BD9P155EFV-C BD9P135MUF-C BD9P155MUF-C	–	–	BD9P108MUF-C	★ BD9P109NUF-C (2.0MHz/400kHz Selectable)	–
	2A	BD9P205EFV-C BD9P205MUF-C	BD9P235EFV-C BD9P255EFV-C BD9P235MUF-C BD9P255MUF-C	★ BD9P206EFV-C	★ BD9P236EFV-C ★ BD9P256EFV-C	BD9P208MUF-C	★ BD9P209NUF-C (2.0MHz/400kHz Selectable)	–
	3A / 3.5A	BD9P305EFV-C (2.2MHz/440kHz Selectable)	–	–	–	BD9P308MUF-C (2.2MHz/440kHz Selectable)	★ BD9P309NUF-C (3A) ※BD9P409MFF-C (3.5A) (2.0MHz/400kHz Selectable)	–
	6A	–	–	–	–	BD9P608MFF-C (2.2MHz/440kHz Selectable)	★ BD9P609MFF-C (2.0MHz/400kHz Selectable)	–
	10A	–	–	–	–	–	–	★ BD9PA00EFV-C ※ BD9PA01MFF-C

*SSCG: Spread Spectrum Clock Generator

No mark…Available in the market ★…In development ※…In Planning

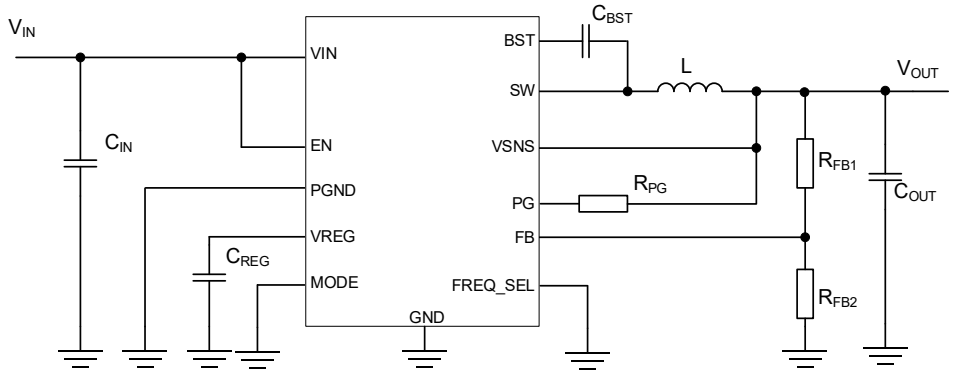
Primary 2.0MHz Low Iq SMPS
BD9PA0xxxx-C

In Development

Features

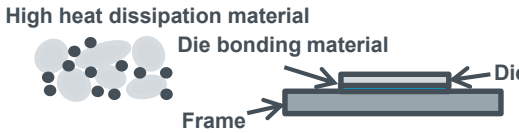
- **Nano Pulse Control™**
- Integrated N-channel and N-channel output MOSFE
- **Multi-phase operation between the ICs (12A x 2 = 24A capable)**
- **Spread spectrum function**
- Integrated Power Good function
- External synchronization
- Built-in phase compensation
- Soft start function : 3.0ms (f = 2.0MHz)
- Selectable light load mode (LLM) or Forced PWM mode
- Selectable switching frequency
- OCP, SCP, TSD, OVP, UVLO
- AEC-Q100 Planned to be supported

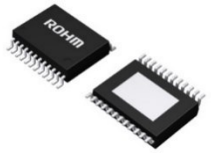
Application Circuit



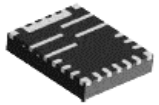
Key Specifications

- Input voltage range : 3.0V to 36V (Start up is over 3.5V)
- Output current : **12A (Max) at single**
- Output voltage : 0.8V to 9.0V
- Quiescent current : **100µA (Typ)**
- Switching frequency : 2.0MHz (400 kHz is also available)
- Output voltage accuracy : **±1.0%**
- Shut down current : 0.7µA (Typ)
- Operating temperature : -40°C to +125°C





High heat dissipation PKG
NEW HTSSOP-B24
7.8 mm x 7.6 mm x 1.0 mm (Max)



Small size
FLIP CHIP PKG
VFNxxFVxxxx
xx mm x xx mm x xx mm (Max)
Wettable Flank

Applications

- Cluster, meter panel, Car infotainment
- Automotive equipment
- Consumer power supply

*Designing/planning, spec, schedule etc. could change depending on the market trend.

Secondary Switching Regulator Line up

Type		Buck (1ch)					
Series		BD9Sx0xNUX-C	BD9Sx1xNUX-C	BD9Sx0xMUF-C	BD9Sx4xMFF-CZ	BD9Sx4xNUX-C	BD9SA01xFx-C
VIN		2.7V to 5.5V					
freq		2.2MHz					2.25MHz
Vout		0.8V to VIN	Fixed	0.8V to VIN × 0.8V 0.6V to VIN × 0.75V (303/402)	0.5V to VIN × 0.8V	0.5V to VIN × 0.8V	0.75V to 3.3V
Package		SON 2mm × 2mm	SON 2mm × 2mm	QFN 3mm × 3mm QFN 3.5mm x 3.5mm	VFN07FV2015A 2.0mm × 1.5mm	SON 2mm × 2mm	VFN14FV3035 3.0mm x 3.5mm
Output Current	0.6A	BD9S000NUX-C	BD9S012NUX-C (1.1V) BD9SD11NUX-C (1.15V)	-	-	-	-
	1A	BD9S100NUX-C	BD9S110NUX-C (1.2V) BD9S111NUX-C (1.8V)	-	-	※ BD9S14xNUX-C	-
	2A	BD9S201NUX-C BD9S231NUX-C	-	BD9S200MUF-C	※ BD9S24xMFF-CZ	※ BD9S24xNUX-C	-
	3A	-	-	BD9S300MUF-C ★ BD9S303MUF-C	※ BD9S34xMFF-CZ	※ BD9S34xNUX-C	-
	4A	-	-	BD9S400MUF-C BD9S402MUF-C	※ BD9S44xMFF-CZ	-	-
	6A	-	-	-	※ BD9S64xMFF-CZ	-	
	12A	-	-	-	-	-	★ BD9SA01Fx-C

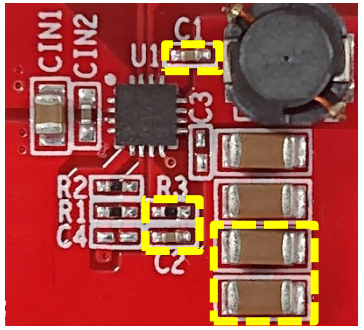
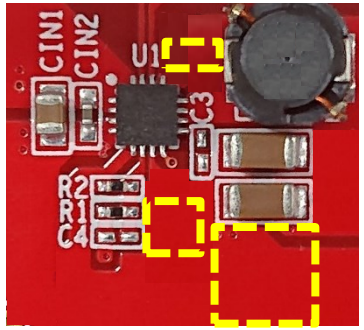
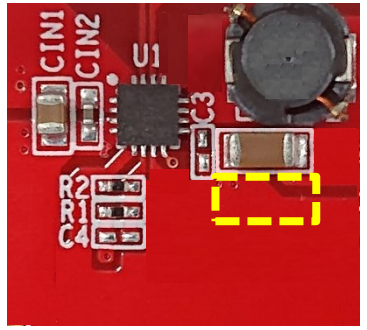
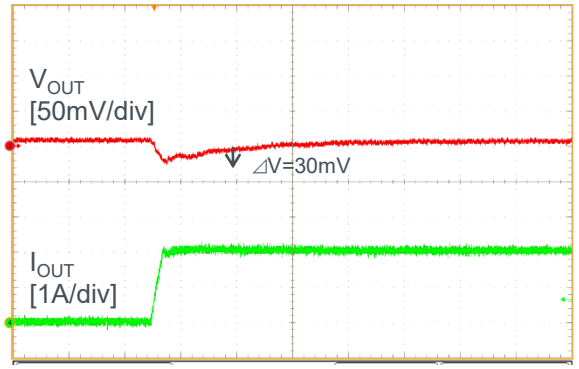
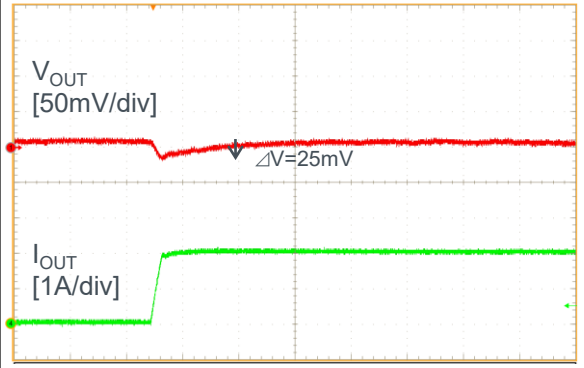
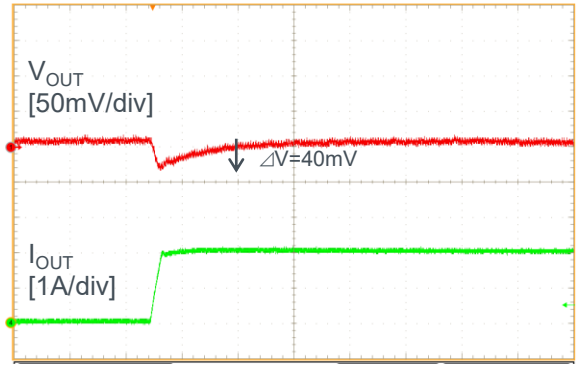
No mark…Available in the market ★…In development ※…In Planning

Quick Load Transient Response

In Development

QuiCur™

～Secondary DCDC converter ～ BD9S402MUF-C

ROHM Conventional Co=22μF x 4	BD9S402MUF-C Co=22μF x 2 (GAIN=H)	BD9S402MUF-C Co=22μF x 1 (GAIN=L)
		
 VIN=5.0V, V_{OUT}=1.0V,I_{OUT} =0A→2A (1A/μs)	 VIN=5.0V, V_{OUT}=1.0V,I_{OUT} =0A→2A (1A/μs)	 VIN=5.0V, V_{OUT}=1.0V,I_{OUT} =0A→2A (1A/μs)

New product can achieve quick load transient response with ½ size of capacitance !!

Secondary 12A DCDC
BD9SA01FXX-C

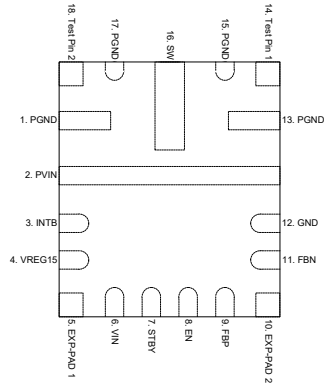
In Development

Features

- **Nano Pulse Control™**
- P/N power FET integrated
- Compact flip chip package
- Forced PWM mode
- Integrated Power Good function
- OCP, SCP, TSD, OVP, UVLO
- AEC-Q100 Planned to be supported

Key Specifications

- Input voltage range : 2.7V to 5.5V (Maximum rating : 6V)
- Output voltage range : 0.5V to 2.0V
- Reference voltage : ±1.2%
- Output current : 12A (Max) / 15A (at peak)
- Switching frequency : 2.25MHz
- Operating temperature : -40°C to +125°C



Flip Chip QFN
18 pin, 0.5mm pitch, 3.5mm x 3.0mm (T.B.D.)
wettable Flank

Application Circuit

Applications

- Cluster, meter panel, Car infotainment
- Automotive equipment
- Consumer power supply

*Designing/planning, spec, schedule etc. could change depending on the market trend.

Linear Regulator Family for Automotive

xx=Output Voltage yy=Package

Red: in Development Blue: in Planning Light blue: under Concept

1ch LDO Series for Automotive

Standard LDOs (Standard Series) | Nano Energy™ LDO (Nano Energy) | Nano Cap™ LDO (Nano Cap)

Voltage / Current	Up to 0.1A	0.2A	0.3A	0.5A	1.0A and over
42V to 50V	[Low Quiescent Current and Small Type LDO Series] **BD7xxL05G-C** *0.05A output items [Nano Energy™ LDO Series] **BD9xxL1yy-C** *0.1A output items	[Low Quiescent Current LDO Series] **BD7xxL2yy-C** [Standard LDO Series] **BD4xxM2yy-C** **BD4xxS2yy-C** **BD6xxM2yy-C** [Nano Energy™ LDO Series] **BD9xxL2yy-C** [Nano Cap™ LDO Series] **BD9xxN1yy-C** *0.15A output items	[Standard LDO Series] **BD6xxM3yy-C**	[Low Quiescent Current LDO Series] **BD7xxL5yy-C** [Standard LDO Series] **BD4xxM5yy-C** **BD4xxS5yy-C** **BD6xxM5yy-C** **BD800M5yy-C** **BD9xxM5yy-C(QuiCur™)** [Nano Energy™ LDO Series] **BD9xxL5yy-C** [Nano Cap™ LDO Series] **BD9xxN5yy-C**	[Standard LDO Series] **BD6xxC0yy-C** (Temporary) *1A output items **BD6xxD0yy-C** (Temporary) *2A output items
30V to 36V	**BD50FA1MG-M**		**BD3650FP-M**		**BDxxC0Ayy-C**
15V to 20V			**BDxxGA3VEFJ-M** **BDxxGA3MEFJ-C** **BDL00A3yy-C**	**BDxxGA5VEFJ-M** **BDL00A5yy-C**	**BDxxGC0VEFJ-M**
10V			**BDxxHA3VEFJ-M** **BDxxHA3MEFJ-C**	**BDxxHA5VEFJ-M**	**BDxxHC0VEFJ-M** **BDxxHC5VEFJ-M**
6.5V to 7V		**BUxxSD2MG-M** **BUxxJA2VG-C** **BUxxJA2DG-C** **BUxxJA2MNVX-C**	[New Secondary LDO Series] **BUxxJA3DG-C**	**BDxxIA5VEFJ-M** **BD00IA5MHFV-M**	**BDxxIC0VEFJ-M** **BD00JC0MNUX-M**

(Note) Schedules, specifications, and model names under development/planning may change depending on the market trend and developing situation.

Linear Regulator Family for Automotive

xx=Output Voltage yy=Package

Red: in Development Blue: in Planning Light blue: under Concept

Voltage Tracker Series for Automotive

Standard LDOs
Standard Series

Vin / Io	0.05A	0.07A	0.25A	0.40A
45V to 50V	BD42500G-C BD92500G-C	BD42540FJ-C BD92540FJ-C	BD42530FPJ/FP2/UEFJ-C BD92530yy-C	BD92510yy-C

Multi-Function LDO Series for Automotive

Multi-Function LDOs
Multi-Function Series

Vin / Io	0.2A	0.5A
45V to 50V	[Multi-Function Standard Series] **BD3010AFV-M** : 5V LDO + 4.25V RESET + WDT(T/O) **BD4269FJ/UEFJ-C** : 5V LDO + 2ch Adjustable RESET [Multi-Function Nano Series] **BD9xxF2yy-C** : 3.3V / 5.0V / Adj. LDO + RESET + WDT(T/O) [Low Quiescent Current Series] **BD820F5UEFJ-C** : 5V LDO + 4.20V RESET + WDT(T/O)	[Multi-Function Standard Series] **BD3020HFP-M** : 5V LDO + Adjustable RESET + WDT(T/O) **BD3021HFP-M** : 5V LDO + 4.50V RESET + WDT(T/O) **BD4271HFP/FP2/EFJ-C** : 5V LDO + 4.65V RESET + WDT(T/O) **BD42754HFP/FP2-C** : 5V LDO + 4.62V RESET [Multi-Function Nano Series] **BD9xxF5yy-C** : 3.3V / 5.0V / Adj. LDO + RESET + WDT(T/O)

WDT + RESET Series for Automotive

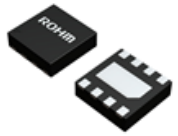
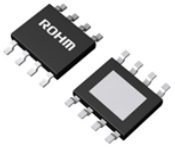
Vin / Io	WDT + RESET
40V	**BD87BxxFVM-C** : 2.3V to 4.6V Fixed RESET＋WDT(T/O) **BD37BxxFVM-C** : 2.3V to 4.6V Fixed RESET＋WDT(T/O) **BD87B00FVM-C** : Adjustable RESET＋WDT(T/O) **BD87BxxG-C** : Adjustable RESET＋WDT(T/O) **BD87Cxxyy-C** : 2.3V to 4.6V Fixed RESET＋WDT(W)

RESET: Voltage Monitoring and Reset Function
WDT: Watch-Dog-Timer Function
T/O: Timeout-type (Watch-Dog-Timer)
W: Window-type (Watch-Dog-Timer)

(Note) Schedules, specifications, and model names under development/planning may change depending on the market trend and developing situation.

Extensive Package Lineup to Match Thermal Design

Confidential

Classification		VSON008X2020		HVSOF6		SSOP5		SOP8		SOT223		HTSOP-J8		TO252		HRP5/7		TO263	
ROHM Name	Product code	VSON008 X2020	NUX	HVSOF6	HFV	SSOP5	G	SOP-J8	FJ	SOT223-4	FP3	HTSOP-J8	EFJ	TO252-3	FP	HFP5	HFP	TO263-3	FP2
														TO252-5				TO263-5	
														TO252-J5	FPJ	HFP7		TO263-7	
													Low height	TO252S-3	FPS				
													Low height	TO252S-5					
Package																			
Size		Small ← Package Size *with certain exceptions																	
		2.0mm x 2.0mm x 0.6mm		1.6mm x 3.0mm x 0.75mm		2.9mm x 2.8mm		4.9mm x 6.0mm		6.53mm x 7.00mm		4.9mm x 6.0mm		6.5mm x 9.5mm ※FPJ: 6.6mm x 10.1mm		9.395mm x 10.54mm		10.16mm x 15.10mm	
θja		Heat Dissipation Performance → High																	
		77.1°C/W		65.2°C/W		185.4°C//W		76.9°C/W		70.5°C/W		33.3°C/W		23.3°C/W		22.0°C/W		20.3°C/W	

(Note1) □□□ at the end of series name indicates the product packaging.
e.g., Series: BD733L2□□□−C, Package: HTSOP-J8 → Product name: BD733L2EFJ-C

(Note2) θja is representative value measured using 4-layer board (Rohm standard / JEDEC Compliant). Confirm datasheet of each product for details regarding measurement conditions and thermal resistance values. In addition, the characteristics may differ depending on the actual board. To calculate junction temperature in more detail, confirming using actual machine is necessary.

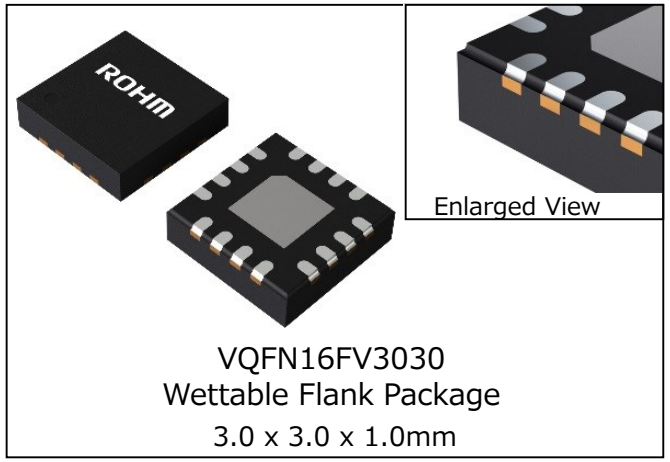
8ch 12bit SAR A/D converter
BD79104MUF-M

Under Developme

Features

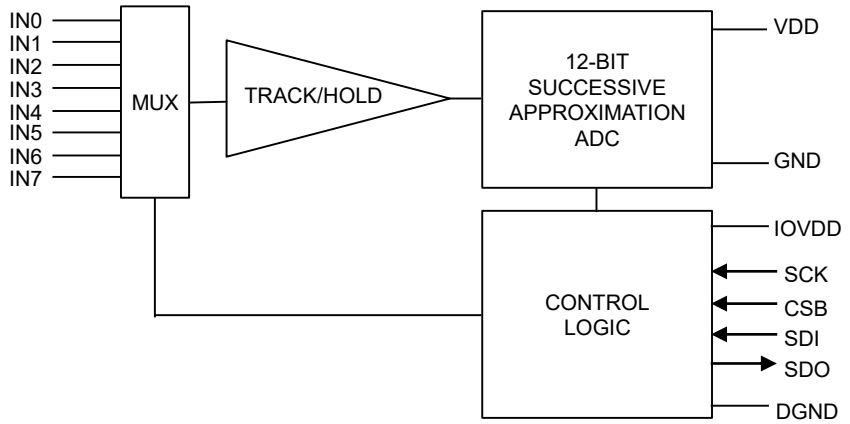
- AEC Q100 Qualified
- 8 input channels
- 1MSPS sampling rate
- Low power consumption
  - 5V power supply 11.0mW (typ)
  - 3V power supply 3.0mW (typ)
- QFN16pin 3.0mm□ wettable flank package
- Single-end input type
- SPI™/QSPI™/MICROWIRE™ Compatible

Package



VQFN16FV3030
Wettable Flank Package
3.0 x 3.0 x 1.0mm

Block Diagram

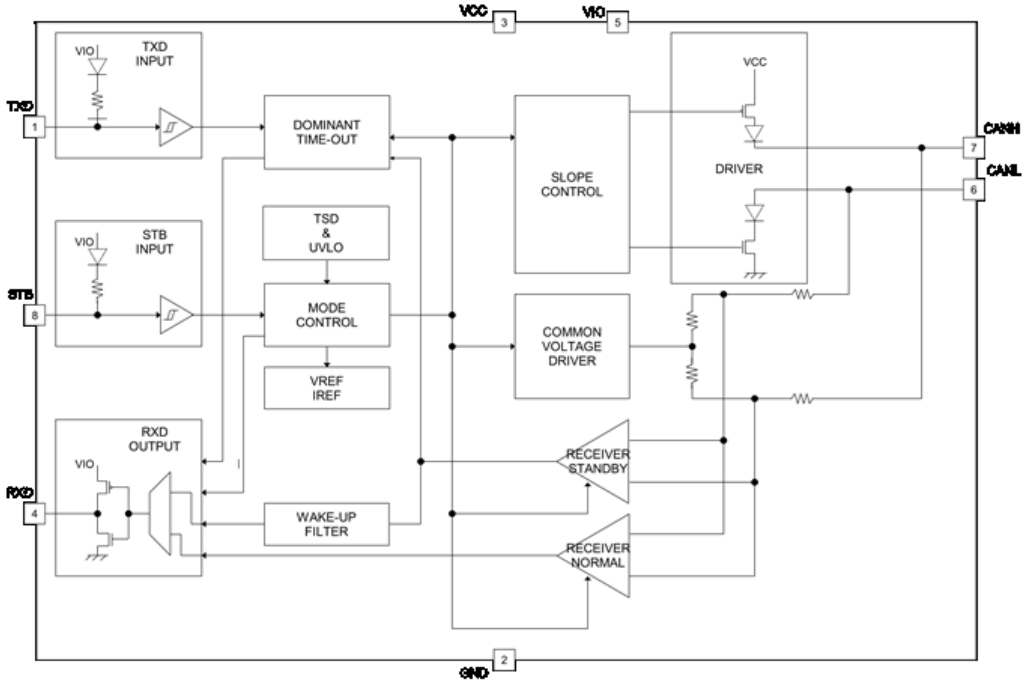


Characteristics

PARAMETER	ROHM BD79104MUF-M
Power supply	Analog : 2.7~5.25V IO : 1.65~5.25V
Operational temp.	-40~+125℃
Input channel no	8ch
Resolution	12bit
Sampling rate	0.5M~1MSPS
DNL [LSB]	-0.99~+1.0
INL [LSB]	-1.0~+1.0
SINAD	73.0dB
THD	-80.0dB

CAN-FD Transceiver BD41047FJ-C/HFN-C

对应待机模式时的低消耗电流
IBEE(EMC)/C&S(Inter Operability)/VeLIO(TOYOTA) 各种认证取得



BD41047FJ-C(SOP-J8)

ES release plan : Aug.2020
MP ready plan : Dec.2020

BD41047HFN-C(HSON8)

ES release plan : Oct.2020
MP ready plan : Feb.2021

Features of BD41047FJ-C/HFN-C

- ISO11898-2:2016 standards compliant
- SAE J2284-1 to -5 standards compliant
- IBEE test requirements
- C&S test requirements
- VeLIO test requirements
- VCC terminal : 5V
- VIO terminal : 3.3V or 5V
- CANH/CANL terminal : -42 to 42V
- Responded to low current consumption by Stand-by Mode：
  Max. 10μA (VIO) (TBD)
- Communication speed : to 5Mbps
- WUP(Wake-Up-Pattern)
  (long filter time, timeout function)
- Dominant time-out function
- Fail Safe functions
  Thermal Shut Down
  Under Voltage Lock Out
- High EMC ability
- Package：SOP-J8 （JEDEC standard）
  HSON8

SOP-J8
4.9mm(W)×6.0mm(D)×1.65 mm(H)

HSON8
2.9mm(W)×3.0mm(D)×0.6 mm(H)

under Development