

MPS Automotive Electronics Power Solution

03/2020

Eddie



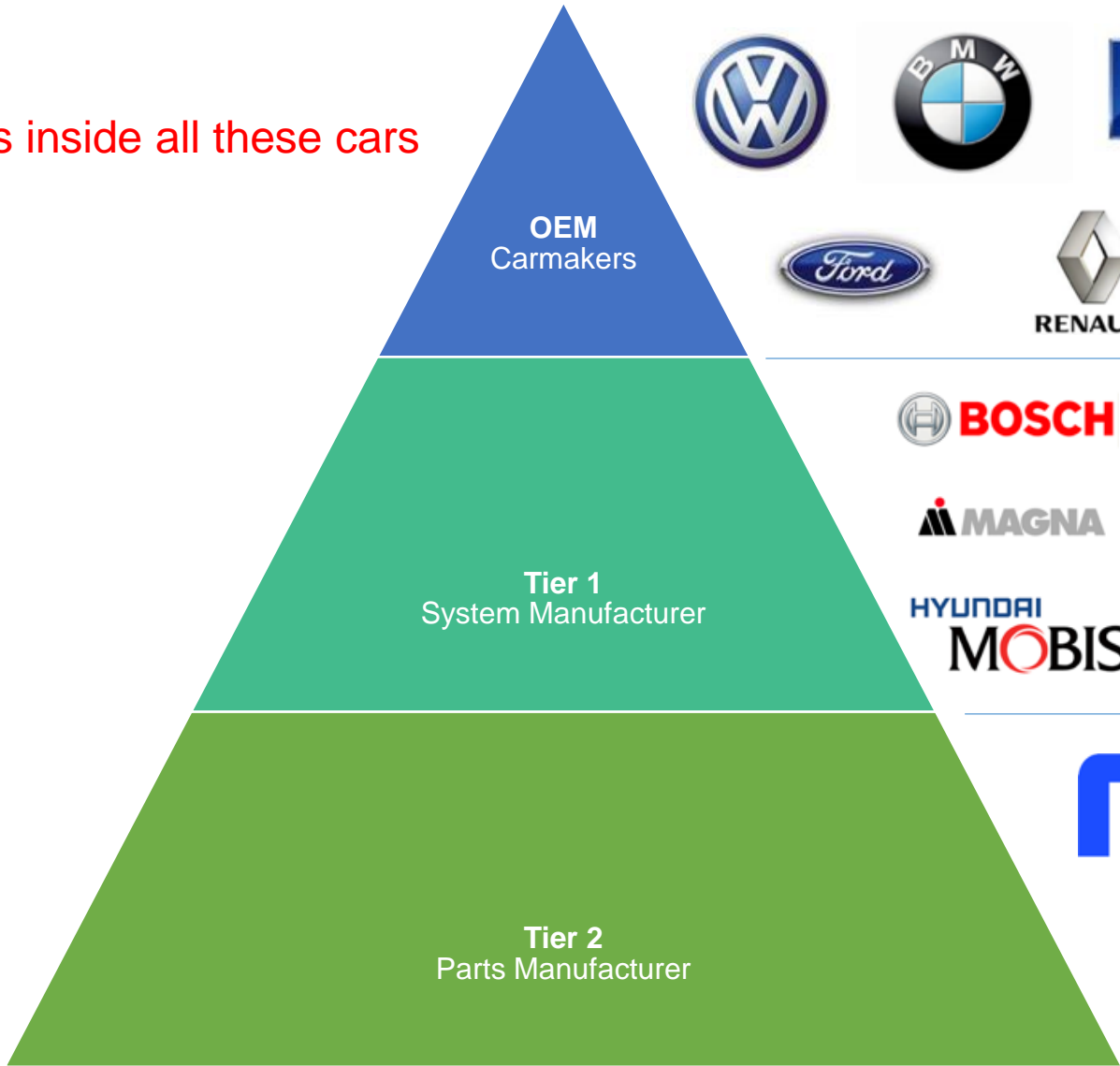
Automotive Electronics application

Where We've Won



The Automotive Market

MPS is inside all these cars



Automotive PL: Our Key Applications



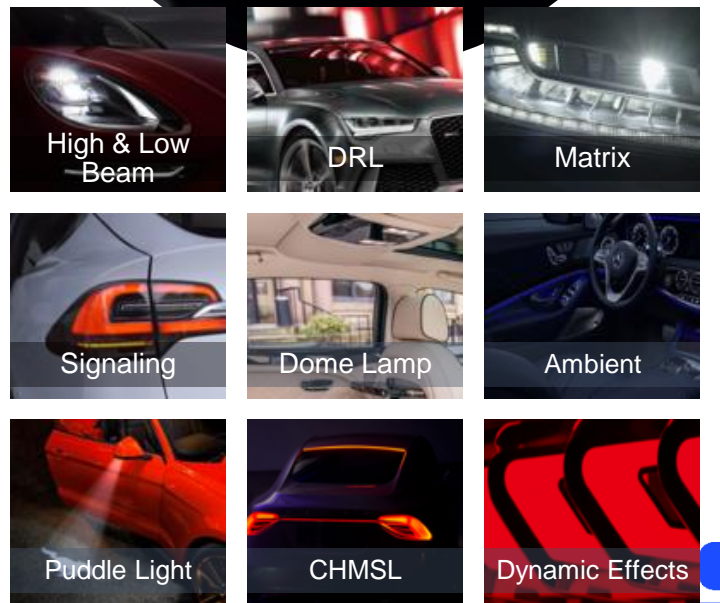
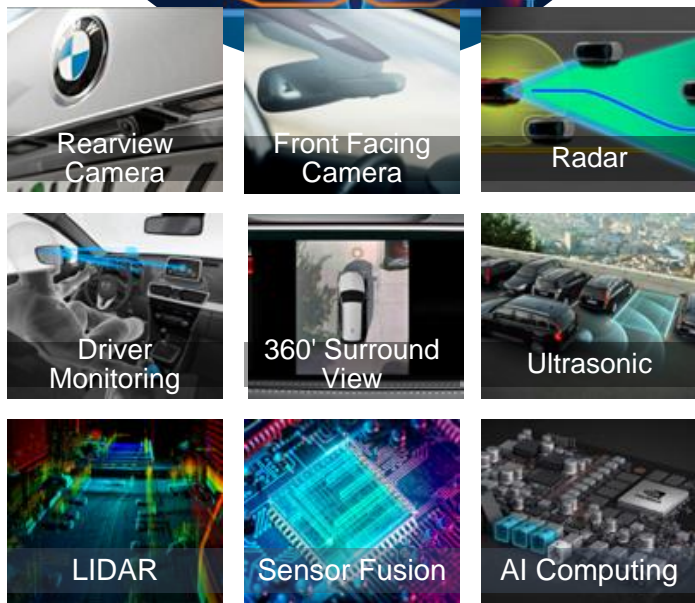
**Digital
Cockpit**



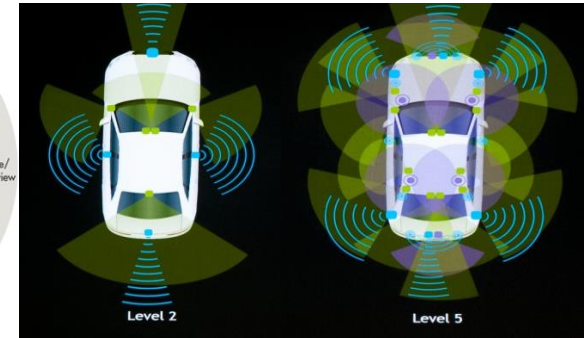
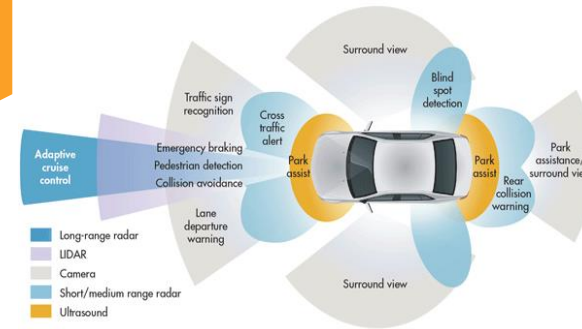
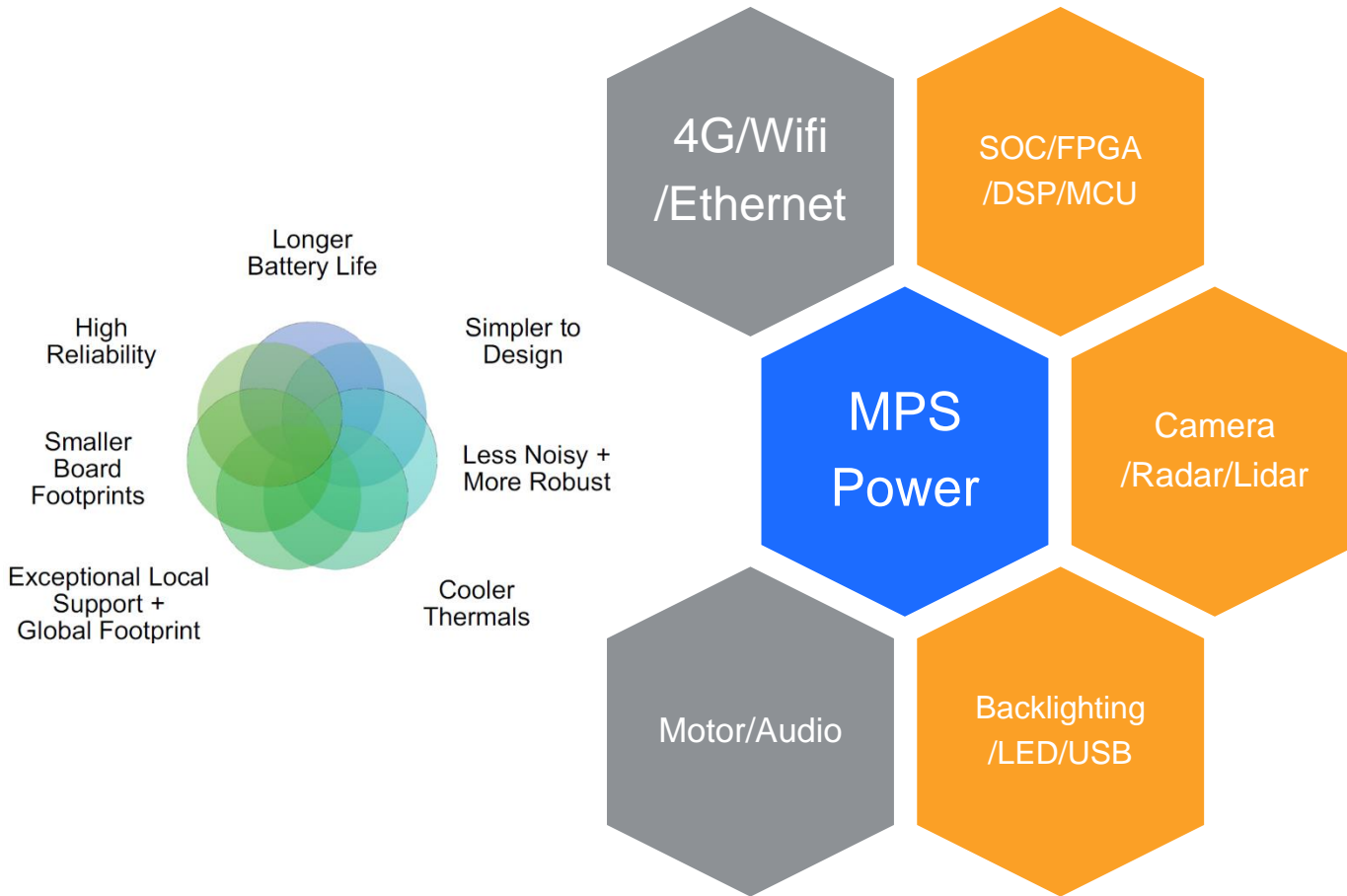
**ADAS
A/V**



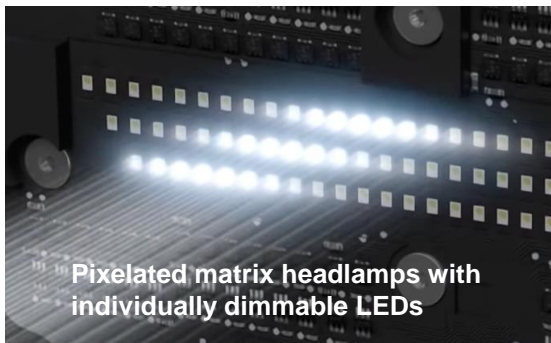
Lighting



What We Focus On

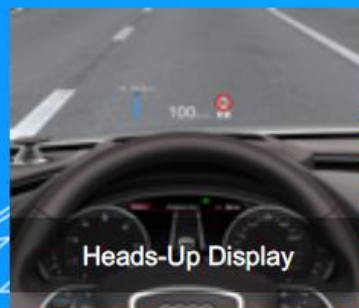
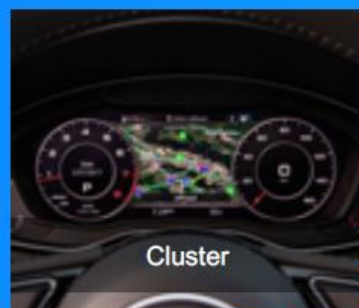
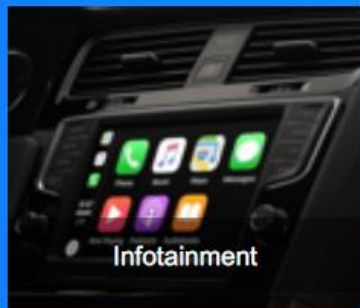


Advanced Driver Assistance Systems (ADAS) has enabled Autonomous Driving (AD)

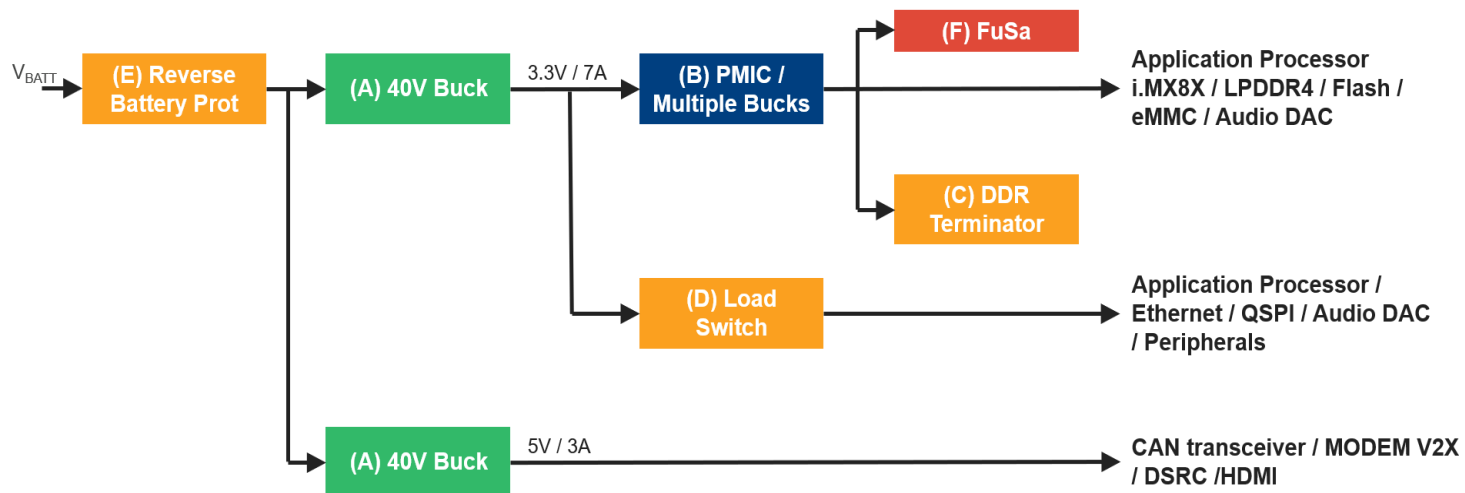


MPS Power Solution

Digital Cockpit Applications



i.MX8X



Symbol	Value	Unit	Comments
VDD_A72	3500	mA	Value based on max current delivered by PMIC
VDD_A53	2500	mA	Value based on max current delivered by PMIC
VDD_GPU0	3500	mA	Value based on max current delivered by PMIC
VDD_GPU1	3500	mA	Value based on max current delivered by PMIC
VDD_MAIN	5000	mA	Value based on max current delivered by PMIC
VDD_MEMC	3200	mA	Value based on max current delivered by PMIC
VDD_DDR_CH0_VDDQ	800	mA	Does not include current used by external memory.
VDD_DDR_CH0_VDDQ_CKE	200	mA	Does not include current used by external memory.
VDD_DDR_CH0_VDDA_PLL_1P8	20	mA	
VDD_DDR_CH1_VDDQ	800	mA	Does not include current used by external memory.
VDD_DDR_CH1_VDDQ_CKE	200	mA	Does not include current used by external memory.

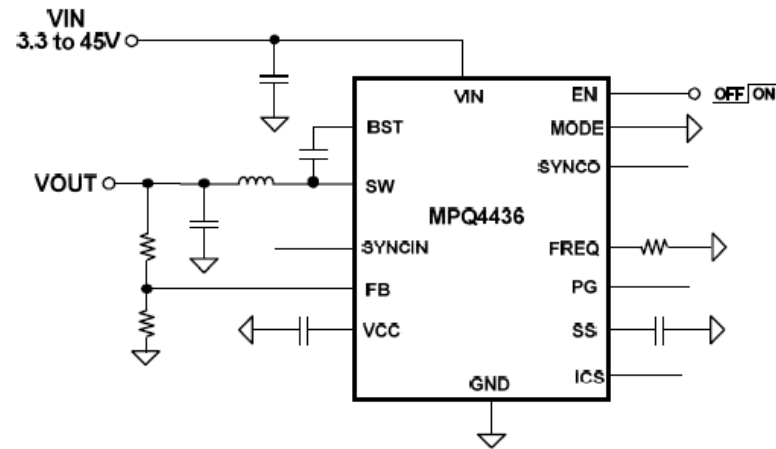
Block	Category	Key Reqs.	Parts (<u>Featured</u> , *Sampling, **Development)
A	40V Buck	Low Iq, Light Load Efficiency, Low EMI,	<u>MPQ4430</u> , <u>MPQ4317</u> *, MPQ4313*, MPQ4436*,
B	PMIC / Multiple Bucks	High Integration, Small Package, Multiple LDO, Sequencing	PMIC: <u>MPQ7920</u> * Dual Buck: MPQ2166, MPQ2169 Single Buck: MPQ2167A, MPQ2171, MPQ2172, MPQ2179*
C	DDR Terminator		<u>MPQ20073</u>
D	Load Switch	Small Package	<u>MPQ5073</u>
E	Reverse Battery Protection	Load Dump, Low Drop, Low Iq	<u>MPQ5850</u> ** , MPQ3445**
F	FuSa	Fail-Safe engine and monitoring, Programmability, ASIL-D, Small Package	<u>MPQ7950</u> **

MPQ4436 45V 6A Low Iq Multiphase Sync Buck

FEATURES

- Wide 3.3V to 45V Input Voltage Range
- 6A Output Current w/ Multiphase Capability
- Frequency Spread Spectrum for MPQ4436A
- Low Iq: 10 μ A Sleep Mode, 1 μ A Shutdown
- Resistor-Programmable Frequency or External Clock Sync
- Output Clock with 180° Phase Shift
- Optional 3.3V, 3.8V, 5V Fixed Outputs
- Symmetric Vin Layout for Better EMI
- Selectable AAM or Forced CCM
- Power Good
- External Soft-Start
- Low Dropout Mode
- Hiccup Over Current Protection
- QFN20 (4mmx4mm) with Wettable Flank

TYPICAL APPLICATION



Available in a QFN20 (4mmx4mm) with Wettable Flank

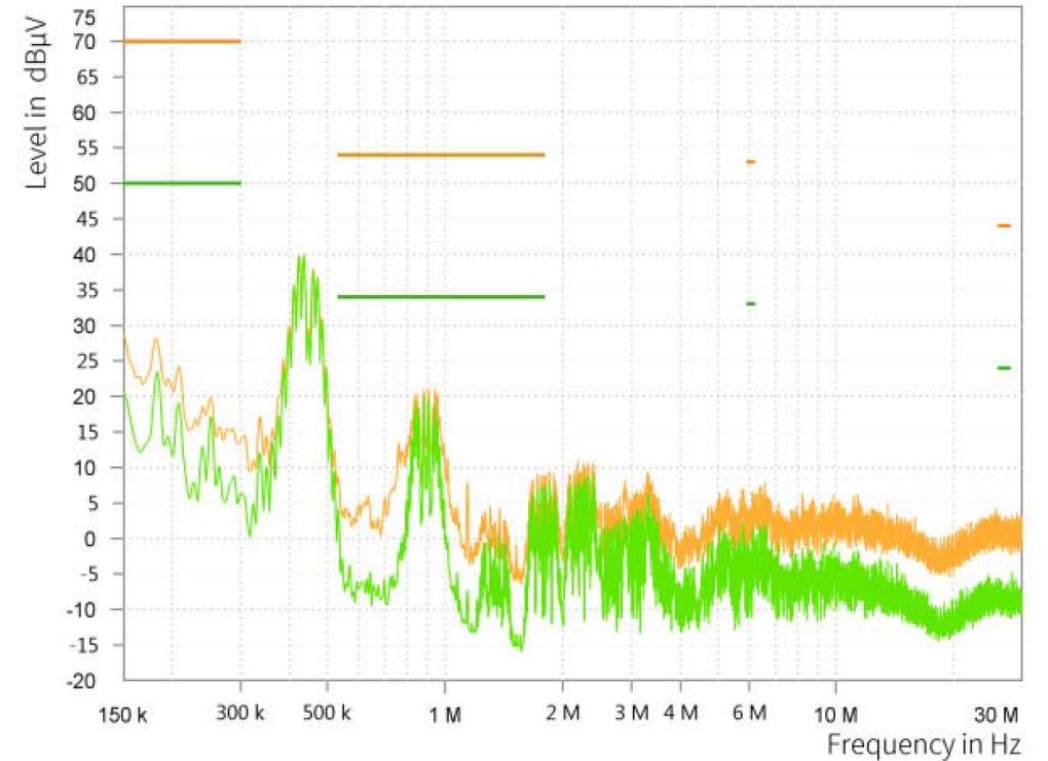
Key Specs

Input Voltage	3.3V – 45V
Output Current	6A
Switching Freq.	420K
HS/LS FET Rdson	40m Ω /17m Ω
Package	QFN20 (4mm x 4mm)

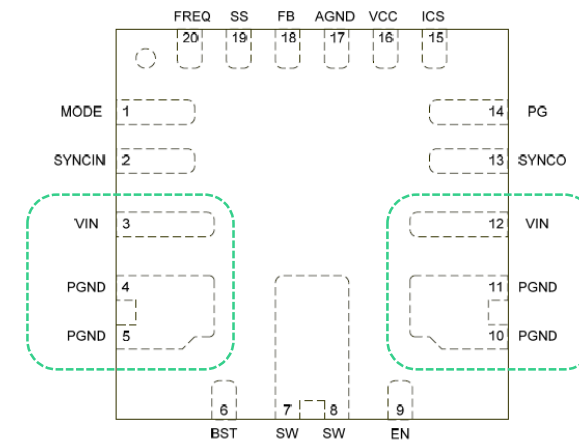
Good EMI Performance

1. Frequency Spread Spectrum.
spread the internal oscillator frequency over a 20% ($\pm 10\%$) window.
2. Symmetric Layout Minimizes EMI.
3. Output Clock with 180° Phase Shift.

P/N	Vin	Iout	Iq	Fixed Versions	Fsw	Fss (Frequency spread Spectrum)	Multi-Capability
MPQ4436	45V	6A	18uA	3.3V, 5V	350 – 530KHz	N	Y
MPQ4436A	45V	6A	18uA	3.3V, 5V	350 – 530KHz	Y	Y
MPQ4436B	45V	6A	18uA	5V only	350 – 2MHz	N	N
MPQ4317	45V	7A	18uA	3.3V, 5V	350 – 530KHz	Y	N
MPQ4316	45V	6A	18uA	3.3V, 5V	350 – 530KHz	Y	N



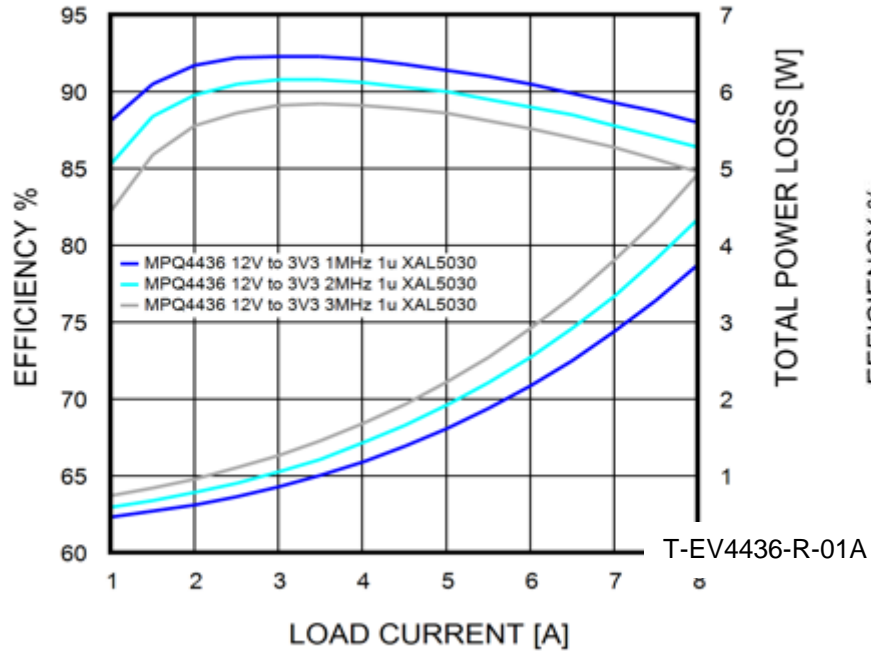
▲ AVG Level @Overview
▲ PK+ Level @Overview
▲ AVG Limit @CE(150kHz-108MHz) CISPR25 Class5
▲ PK+ Limit @CE(150kHz-108MHz) CISPR25 Class5



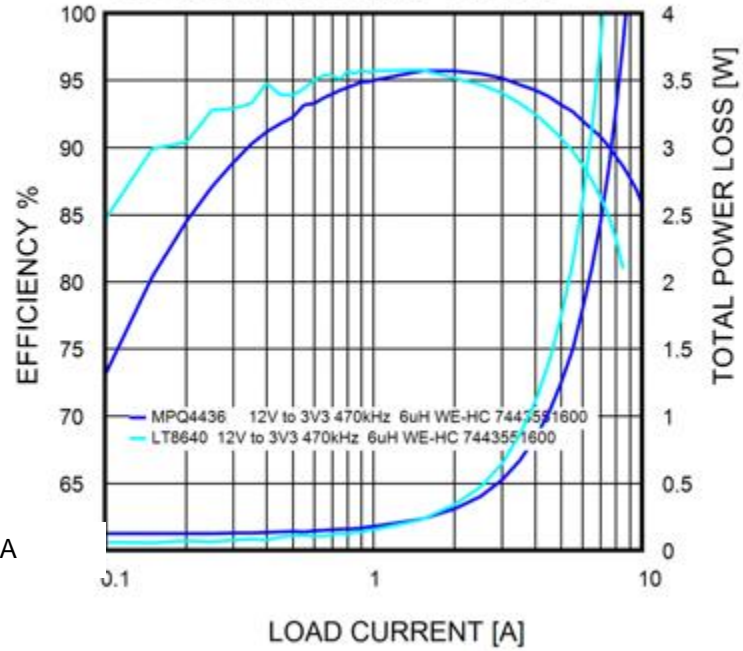
Symmetric Layout Minimizes EMI

High Efficiency and Excellent Thermal Performance

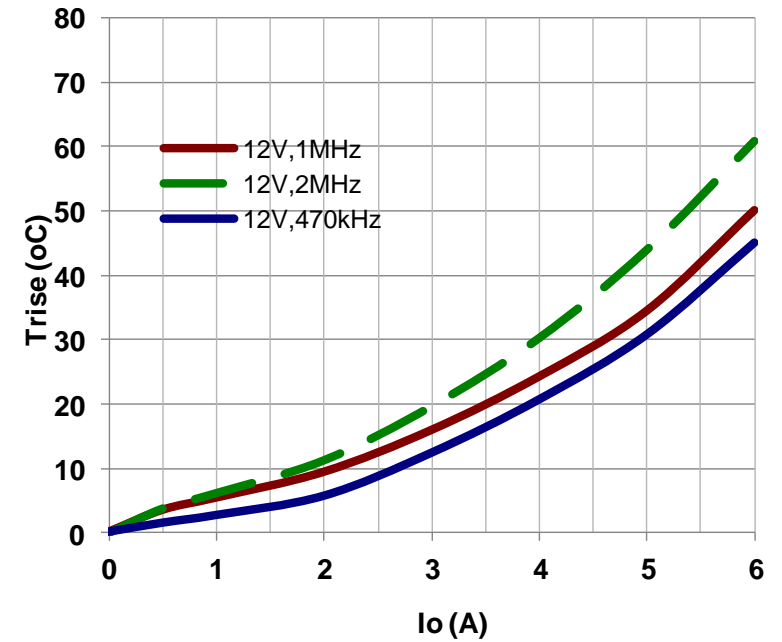
MPQ4436 12V to 3V3 1MHz 1u XAL5030
Efficiency vs Output Current



MPQ4436 12V to 3V3 470kHz 6uH WE-H
Efficiency vs Output Current



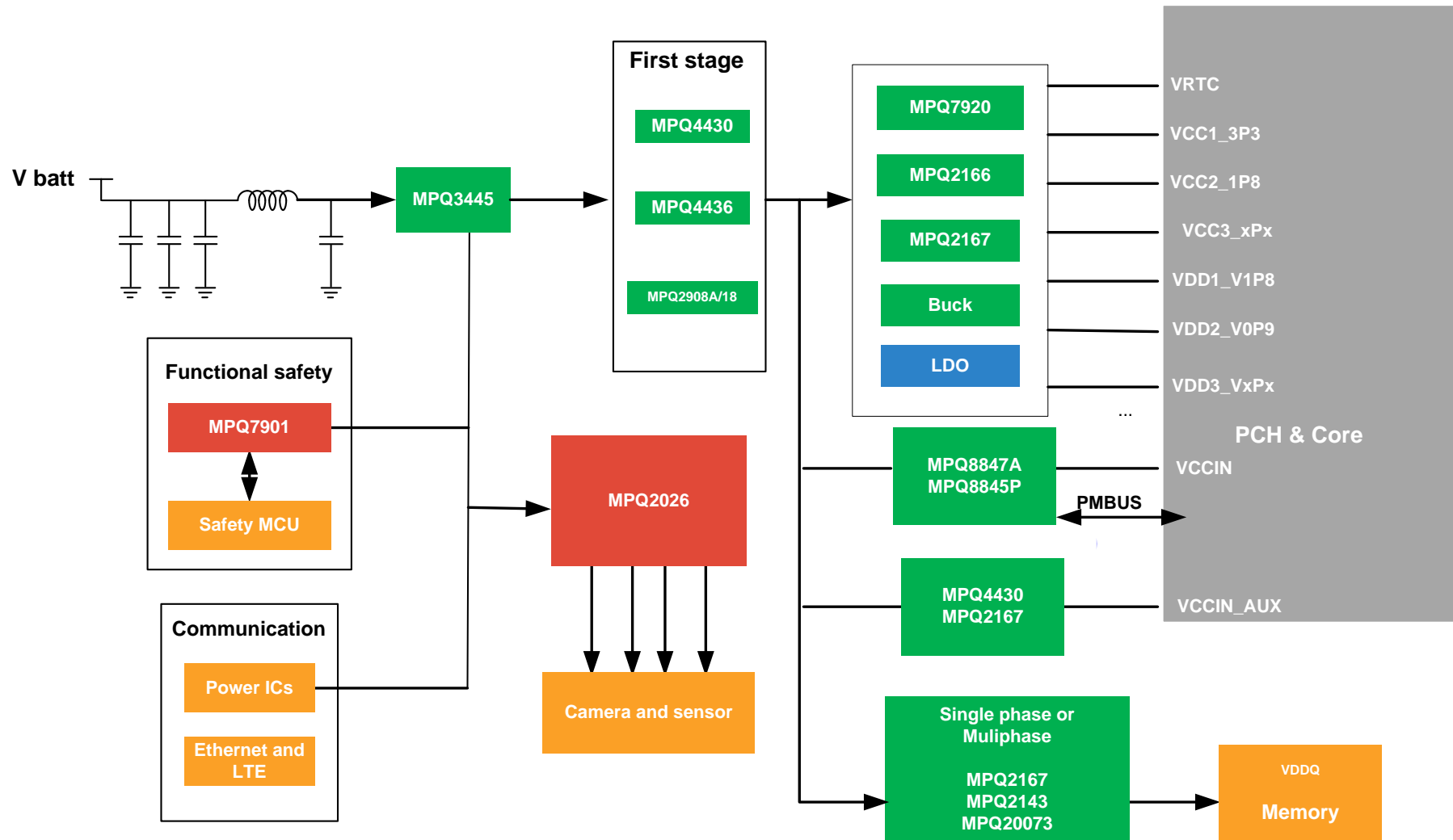
Package Top Trise vs. Load current



Junction to bottom thermal resistance

Vin	Iload @3.3V	Pv total	Dice Temp	GND in Temp	Tjc
12V	5.2A	2W	55C	41.5C	6.75C/W
12V	7.8A	4W	85C	58C	6.75C/W

Solution for Infotainment : Scalable and Modular



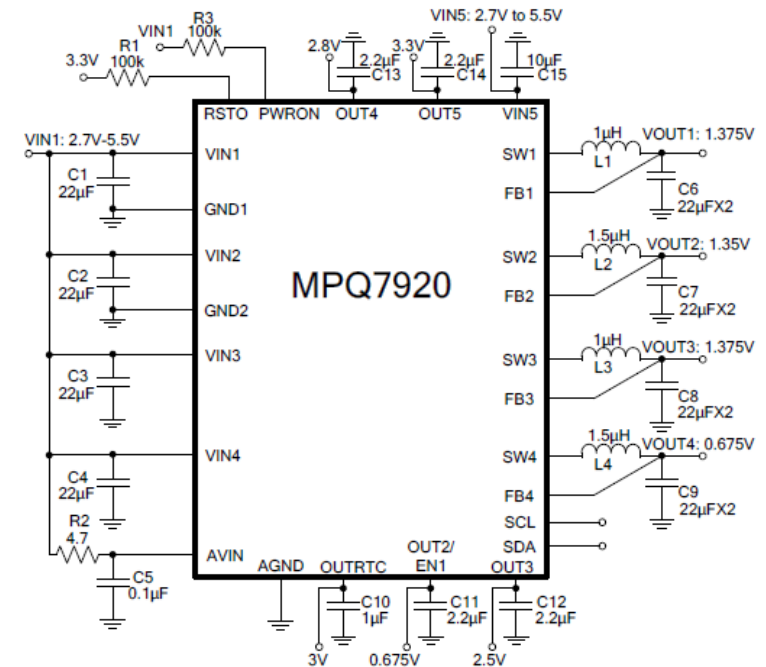
MPQ7920 (5V PMIC, 4 BUCKs +5 LDO)

FEATURES

- **High Efficiency Step-Down Converters**
 - 4 Bucks: 2A/2.5A/4.5A/4.5A, Buck1&Buck3 can parallel
 - Adjustable f_{SW} , SS Time, Phase Delay
 - Programmable Forced PWM/Auto PFM/PWM Mode
 - Output OCP, OVP
- **Low Dropout Regulators**
 - One RTC Dedicate LDO + 4 Low Noise LDOs
 - Two Separate Input Power Supplies
 - 50mV Dropout at 300mA Load
- **System**
 - I2C Bus and 2 Times Programmable MTP
 - Power On/off Control
 - Multi Function pin LDO2/EN1 (EN1 input logic level \leq 3.3V)
 - Power On Reset Output
 - Flexible Power On/off Sequence via MTP(0.5ms/2ms/8ms/16ms time slot selectable)
 - Flexible DC/DC, LDO On/off via MTP
 - ± 4 kV HBM and ± 2 kV CDM ESD Rating for all pins

Application

- Automotive Infotainment
- Automotive Video Recorder
- Automotive Display Electronics

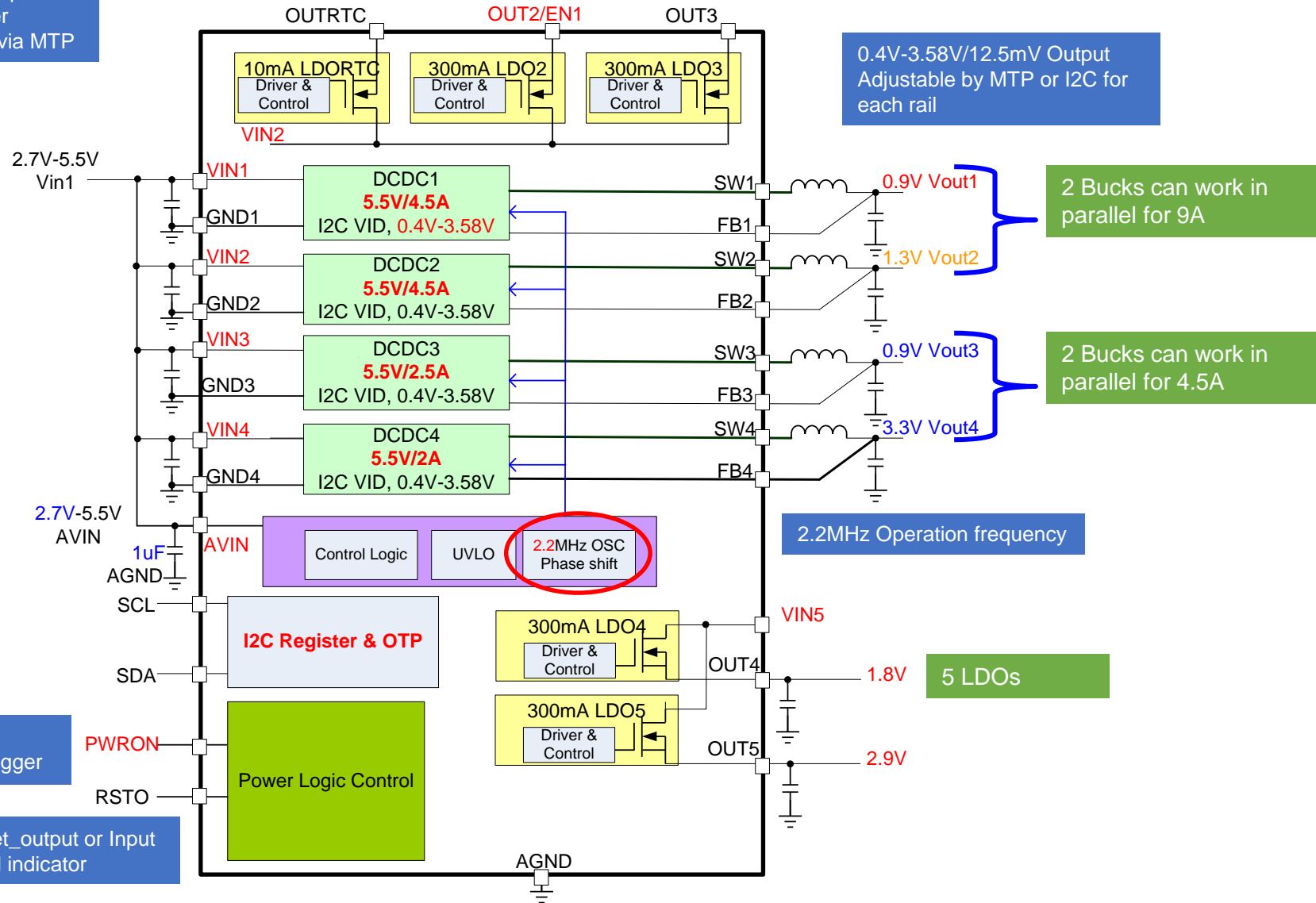


Available in a QFN-26 (3.5mmx4.5mm)

MPQ7920 Block Diagram

Option EN1 pin to have Low Iq state with one buck and one LDO active.
($<50\mu\text{A}$ for both)

Flexible power Up/Down sequence – user Programmable via MTP



EN pin with level trigger or edge trigger

PG, Reset_output or Input power fail indicator

Target Applications

- **Charging-only Port**

- Type-A Port
- Type-C 5V@3A DFP Port
- QC 3.0
- Type-C with Power Delivery (PD)



- **Data Port (Supporting BC1.2 CDP)**

- Type-A Port
- Type-C/PD Charging with USB 2.0 Data

- **Wireless Charging**



USB PD Solution Summary

USB PD Charging Port Controller

P/N	BC1.2 CDP (data)	BC 1.2 DCP	1.2V/1.2V mode	Divider mode 3	QC2.0 QC3.0	PD3.0 PPS	Type C DFP (w/o PD)	Type-A Mode	Load shedding	Short to Battery protection	Int. USB switch	Line Drop Compensation	I2C Interface	EN Shutdown discharge	USB discharge	Fault Indication	Load Shedding send Alert	Client mode
MPQ5031	√	√	√	√	√	√	√		√	√			√	√	√	√		

Buck-Boost for USB PD

P/N	BC1.2 CDP (data)	BC 1.2 DCP	1.2V/1.2V mode	Divider mode 3	QC2.0	QC3.0	Type C DFP (w/o PD)	Type-A Mode	USB PD	Load shedding	Battery short protection	Low dropout mode	Frequency Spread Spectrum	Int. USB switch	Line Drop Compensation	I2C Interface	EN Shutdown discharge	USB discharge	Fault Indication	Load Shedding send Alert
MPQ4214 (Controller)									√		√		√	√ (adj.)		√	√			
MPQ4230 (Converter)									√		√		√	√ (adj.)	√ (adj.)	√	√			√

Buck for Dual USB PD

P/N	BC1.2 CDP (data)	BC 1.2 DCP	1.2V/1.2V mode	Divider mode 3	QC2.0	QC3.0	Type C DFP (w/o PD)	Type-A Mode	USB PD	Load shedding	Battery short protection	Low dropout mode	Frequency Spread Spectrum	Int. USB switch	Line Drop Compensation	I2C Interface	EN Shutdown discharge	USB discharge	Fault Indication	Load Shedding send Alert
MPQ4272									√	√	√	√	√	√ (adj.)	√ (adj.)	√	√			√

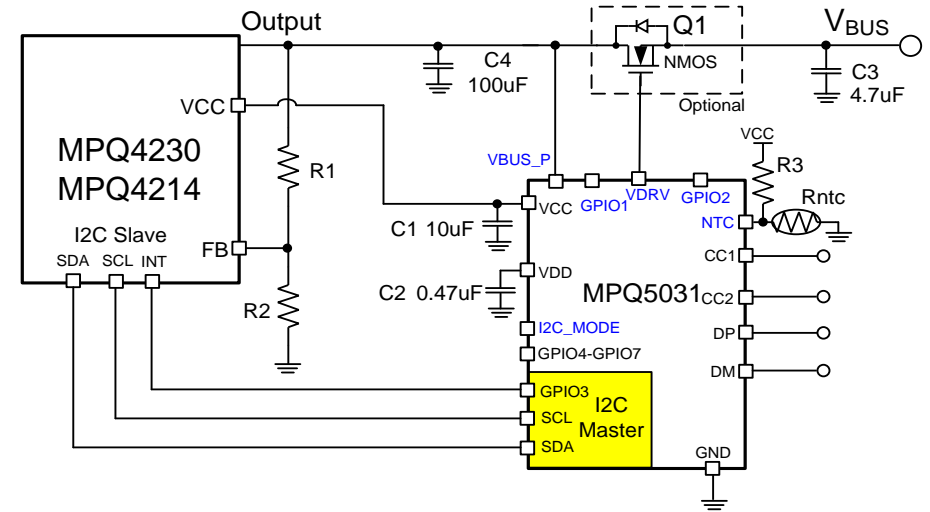
Complete USB-PD Solution (MPQ5031 + MPQ4230/MPQ4214)

MPQ5031 FEATURES

- USB PD3.0 Controller Supports PPS (Provider)
- Wide 2.7V to 21V Operating Input Range
- Integrated Physical Layer for BMC
- Integrated Protocol Layer
- Integrated Policy Engine
- Support USB Type-C and PD3.0 PPS
- Support USB2.0 BC1.2 CDP and DCP Mode
- Support QC4.0, QC2.0/3.0, BC1.2 Short Mode, Apple Charging, Huawei FCP
- High voltage I/O pins: Vbus/CCx/Dp/Dm
- Vbus power path isolation NMOSFET driver
- Two NTC thermal protection pins
- Integrated Vconn Switch and OCP
- Support I2C Master
- 7 GPIO outputs support multiple function

APPLICATIONS

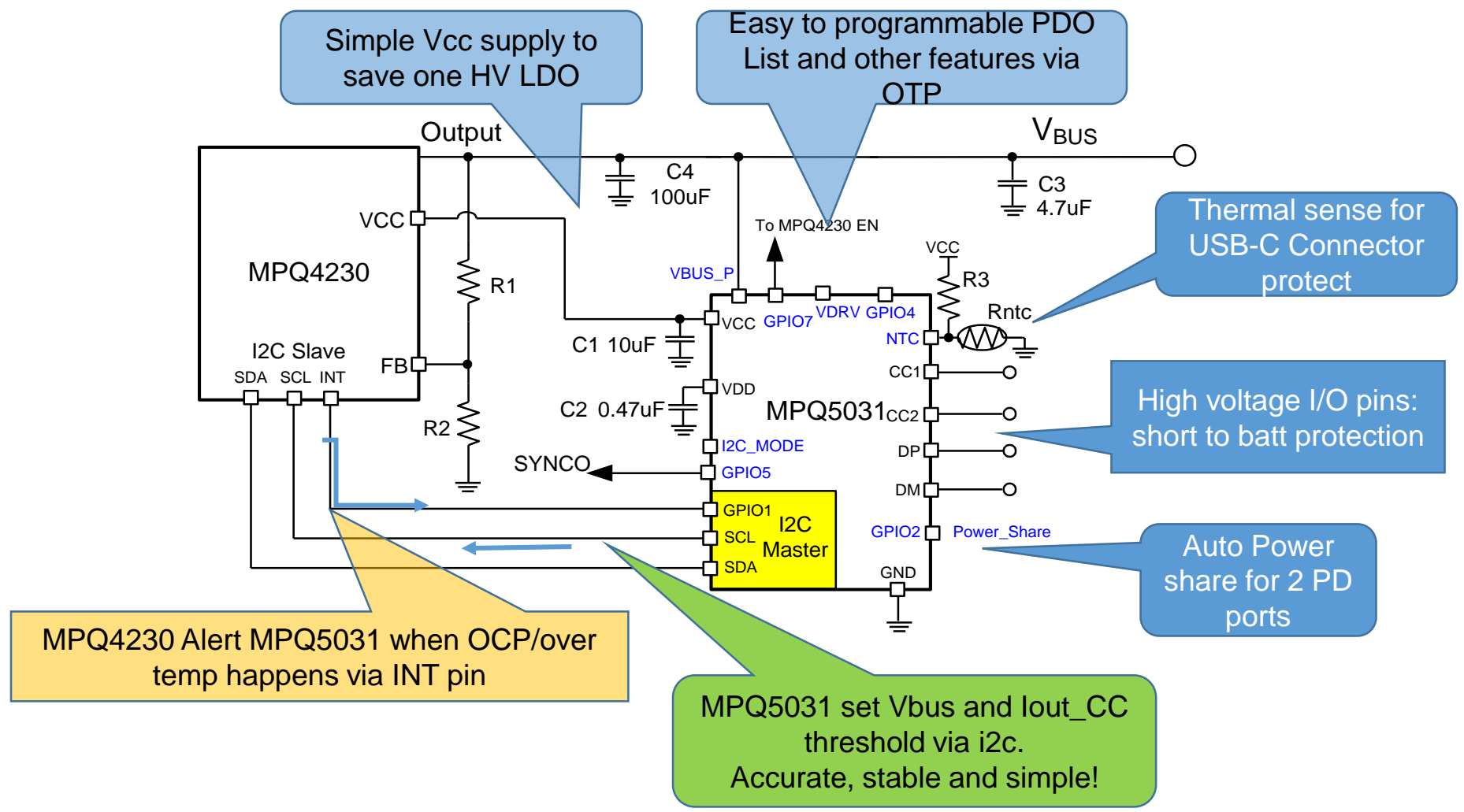
- USB Power Delivery for Automotive charging port
- USB Hub/Head unit



MPQ5031 Available in a QFN (4mmx4mm) Package



Typical App 1: 60W USB-PD 3.0 + PPS



All-in-One USB-C, -A Charging-Only Port Product Summary

Dual USB C & A Charging Port Solutions (Buck with integrated CLS, protocol detection)

P/N	BC 1.2.1.2 CDP (data)	BC 1.2V mode	1.2V/Divider mode 3	Q C2 .0	Q C3 .0	Type C DFP (w/o PD)	Type-A Mode	USB PD Mode	Load shedding	Battery short protection	Low dropout mode	Frequency Spread Spectrum	Int. USB switch	Line Drop Compensation	I2C	EN PIN	EN Shutdown discharge	USB discharge	Fault Indication	Load Shedding send Alert	Other Features
MPQ4487						✓	✓		✓			✓	✓	✓					✓	✓	
MPQ4276						✓			✓				✓	✓		✓		✓	✓		Auto switch between CDP/DCP
MPQ4488/T/N		✓	✓	✓		✓	✓		✓			✓	✓	✓					✓	T:135C	N:no load shd
MPQ4488B		✓	✓	✓		✓	✓		✓			✓	✓	✓					✓		Better eff
MPQ4253		✓	✓	✓		✓	✓		✓ (type C)				✓	✓					✓		Low Iq (type A/C)

Single USB C & A Charging Port Solution (Buck with integrated CLS, protocol detection)

P/N	BC 1.2 CDP (data)	BC 1.2 DCP	1.2V/Divider mode	QC 3.2.0	QC 3.0	Type C DFP (w/o PD)	Type-A Mode	USB PD Mode	Load shedding	Battery short protection	Low dropout mode	Frequency Spread Spectrum	Int. USB switch	Line Drop Compensation	I2C Interface	EN Shutdown discharge	USB discharge	Fault Indication	Load Shedding send Alert	Other Features
MPQ4475-E		✓	✓	✓			✓					✓	✓	✓		✓	✓	✓		
MPQ4481		✓	✓	✓			✓	✓	✓		✓		✓	✓			✓	✓		
MPQ4490		✓	✓	✓			✓	✓	✓				✓	✓			✓			Low Iq
MPQ4482		✓	✓	✓			✓	✓	✓	✓			✓	✓			✓			
MPQ4482-Q		✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓			✓			



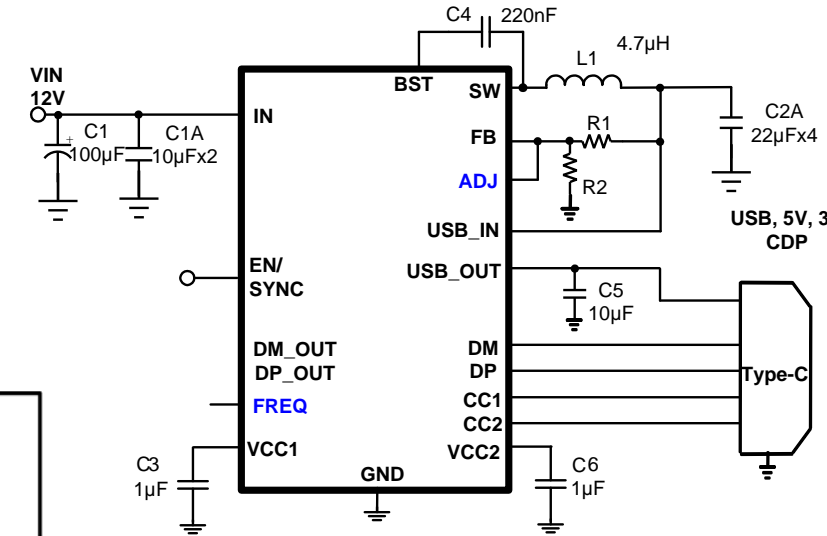
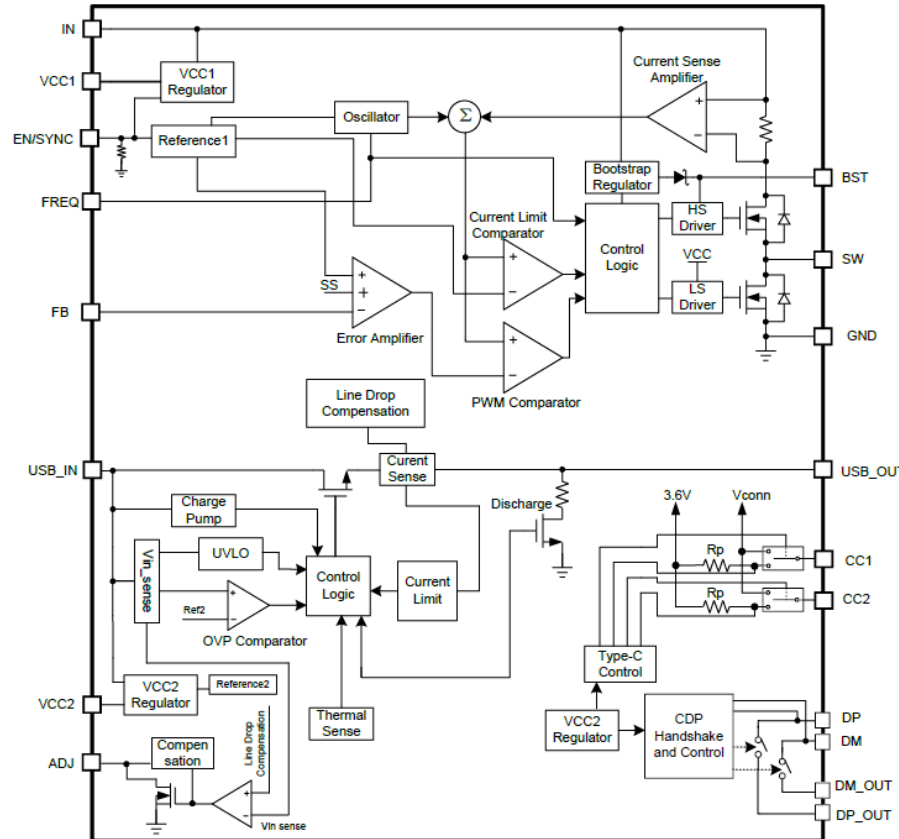
MPQ4482-C: USB-C with CDP

FEATURES

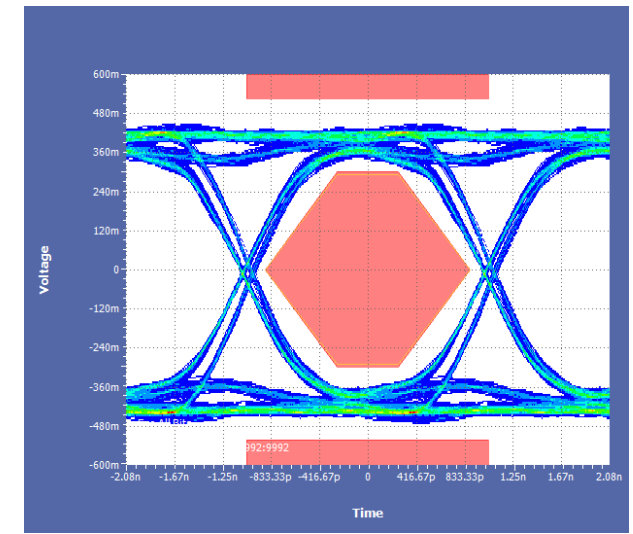
- All-in-One Solution: Buck + USB SW + One Type-C DFP (w/o USB PD) 5V @ 3A + CDP/DCP Type-A mode
- 6 - 36V Operation, 40V Transient Voltage SYNC Buck
- 3A Output Current
- Selectable **FREQ** and **SYNC** In
- **Vbus, CC lines and DP/DM Short to Battery Protect**
- Support CDP Mode
- Integrated 480MHz USB2.0 Data Switch
- Precision OCP: 3.55A
- Line Drop Compensation
- Adjust Output Voltage
- Thermal Foldback
- OCP with Hiccup Mode

APPLICATIONS

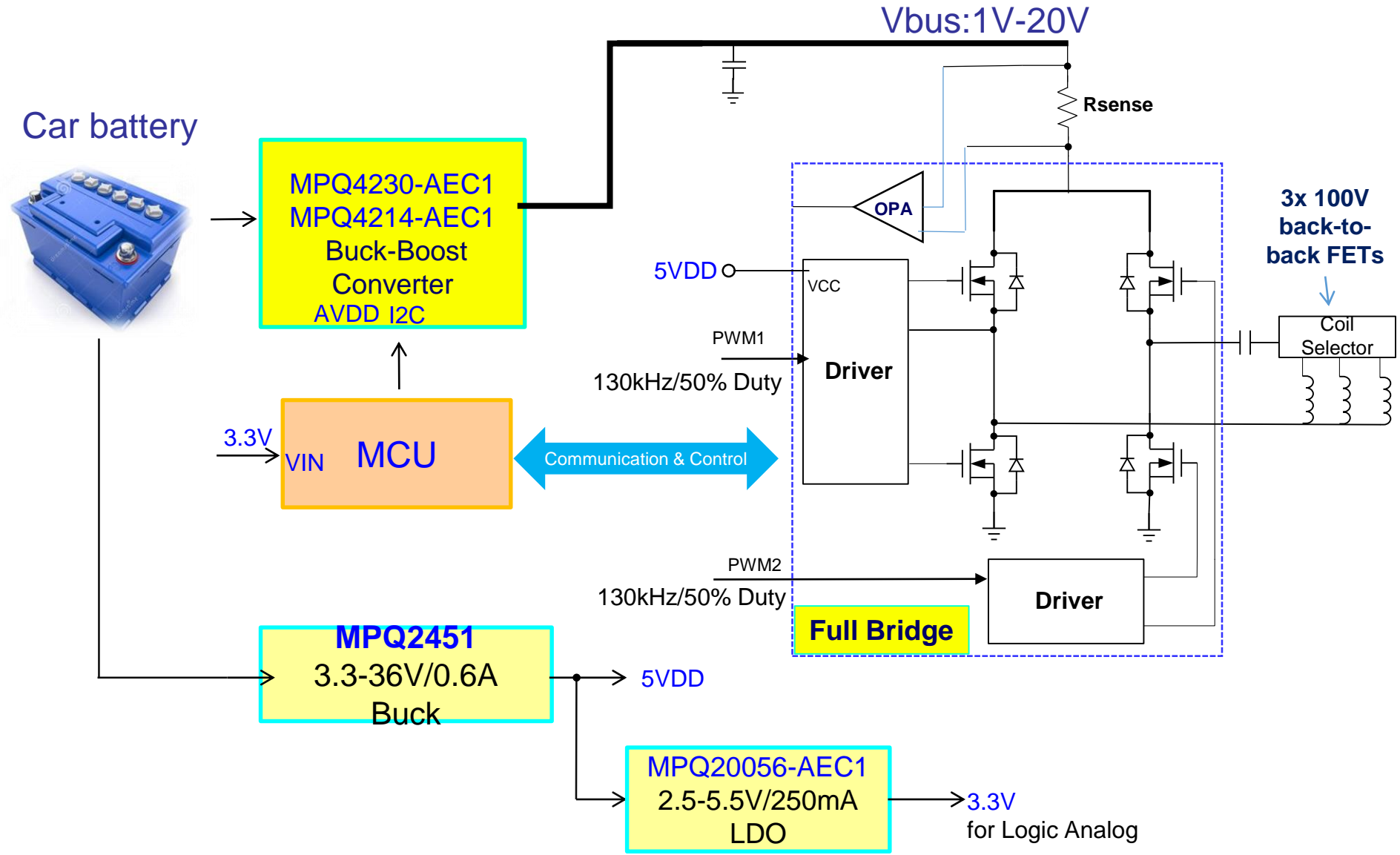
- Infotainment
- USB Hub



Available in a QFN (4mmx4mm) Package



Wireless Charger: : 1x Integrated Full Bridge Power Stage



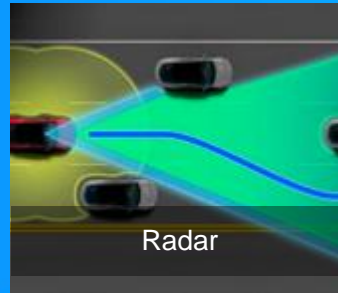
ADAS Applications



Rearview Camera



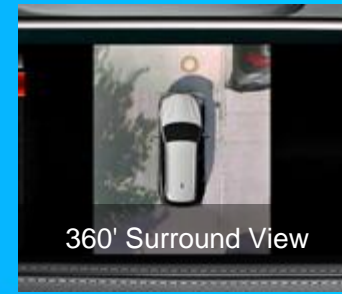
Front Facing Camera



Radar



Driver Monitoring



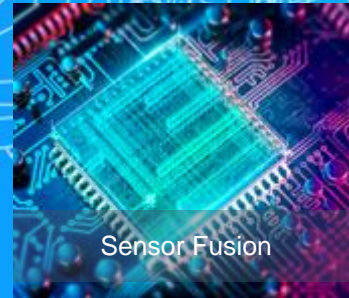
360' Surround View



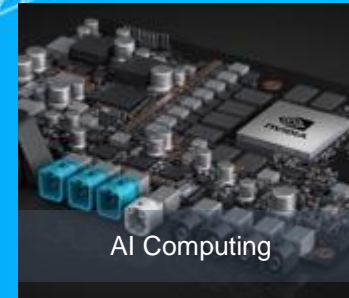
Ultrasonic



LIDAR

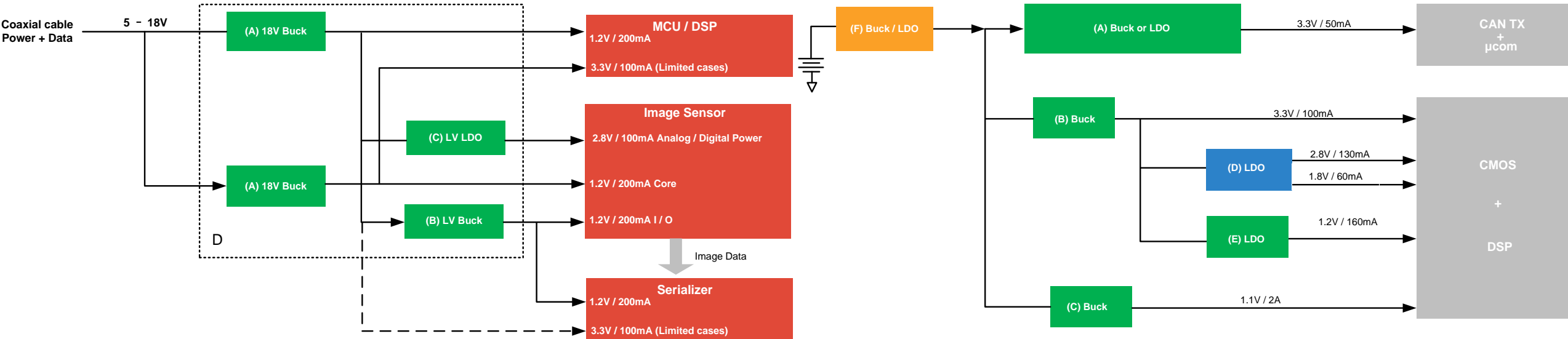


Sensor Fusion



AI Computing

360' Surround View Camera



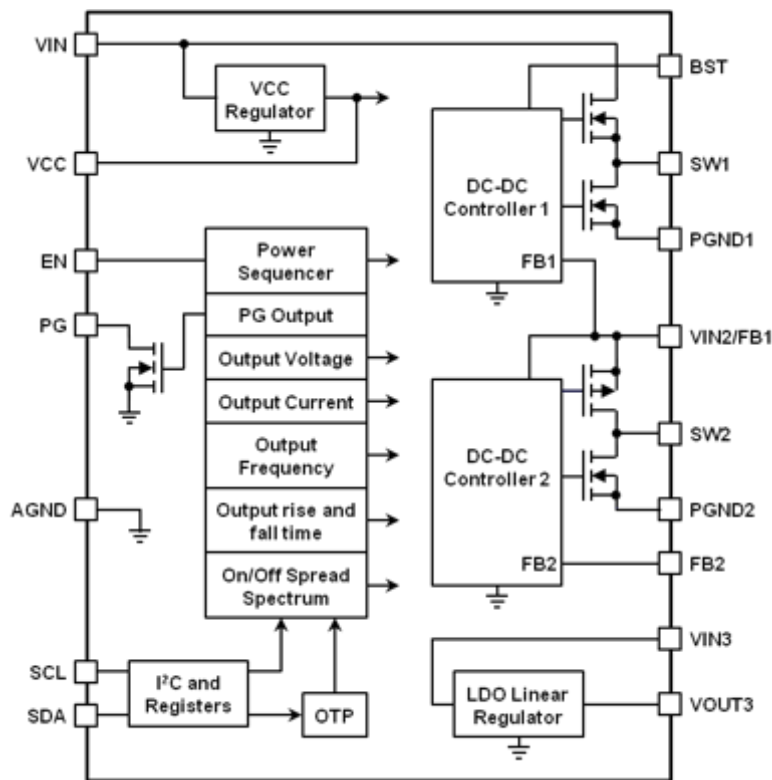
Block	Category	Key Reqs.	Parts (Featured, *Sampling, **Development)
A	40V Buck or LDO	Load Dump, Low Iq, Small Package, Low EMI	Buck: MPQ4431 , MPQ4300 LDO: MPQ2013A , MPQ2019
B	40V Buck	Load Dump, Low Iq, Small Package, Low EMI	MPQ4431 , MPQ4432 , MPQ4303* , MPQ4300* , MPQ4301 , MPQ4420 , MPQ4415A
C	40V Buck	Load Dump, Low Iq, Small Package, Low EMI	MPQ4432 , MPQ4420 , MPQ4302*
D	LV LDO	High PSRR	MPQ20056 , MPQ20051 , MPQ8904
E	LV Buck	Small Package	MPM3805A , MPQ2171
F	Reverse Battery Protection	Load Dump, Low Drop, Low Iq	MPQ5850**

Block	Category	Key Reqs.	Parts (Featured, *Sampling, **Development)
A	18V Buck	Small package, high efficiency, low EMI	MPQ4415A , MPQ4420
B	LV Buck	Small package, high efficiency	MPQ2171 , MPM3805
C	LV LDO	Small package, High PSRR	MPQ20056
D	PMIC	Small package	MPQ7908**

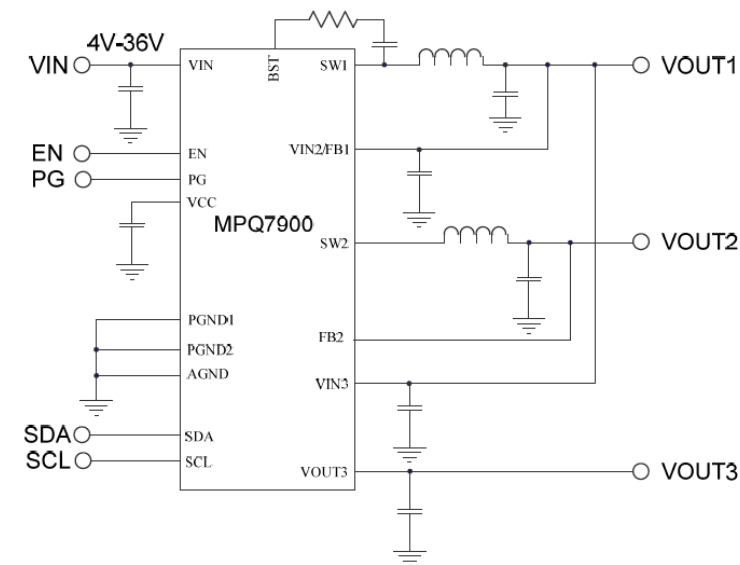
MPQ7900(L) 40V/18V 1.5A Dual Buck + LDO PMIC

FEATURES

- Wide 4V to 36V Input Voltage Range (40V Load Dump)
- PMIC with 1 High Voltage Synchronous BUCK, 1 Low Voltage Synchronous BUCK and 1 LDO
- Synchronous Mode Operation
- 1.5A Continuous Output Current (Total)
- I2C Logic Interface
- OTP for Permanent Storage
- Digitally Adjustable via I2C:
 - Switching Frequency
 - Frequency Spread Spectrum
 - Switching Slew Rate
 - Ton Delay Time
 - Output Discharge On/Off
 - Output Voltage
 - Current Limit
 - Over Current Protection
 - Forced CCM or AAM
- Power Good
- QFN16 (2.5mmx3.5mm)



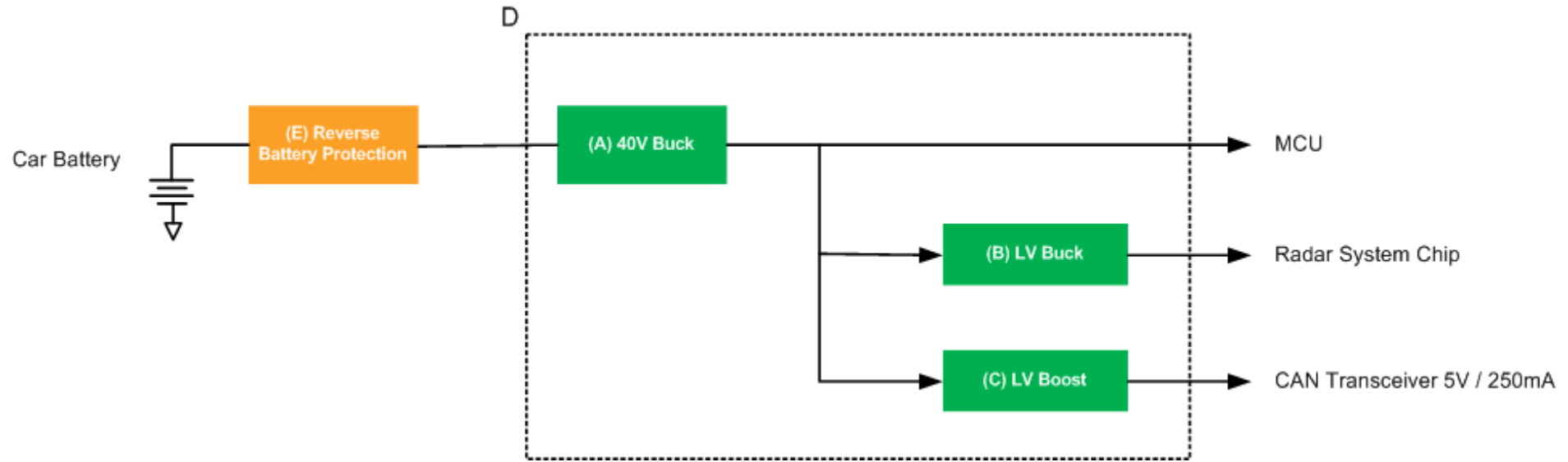
Block Diagram



Key Specs

BUCK1 Input Voltage	4V – 36V
BUCK2 Input Voltage	2.5V – 5.5V
LDO Input Voltage	1.7V – 4.5V
Output Current	1.5A (3 Rails Together)
Switching Freq.	2.2MHz/1.1MHz
Package	QFN-16 (2.5mm x 3.5mm)

77GHz Radar



Block	Category	Key Reqs.	Parts (Featured, *Sampling, **Development)
A	40V Buck	Functional Safety (ASIL), Load Dump, Fault Detection, Protections	MPQ4432, MPQ4302
B	LV Buck	Functional Safety (ASIL)	MPQ2171
C	LV Boost	Functional Safety (ASIL)	MPQ3410, MPQ3414B
D	PMIC	Functional Safety (ASIL), Load Dump, Fault Detection, Protections	<u>MPQ7901</u> **
E	Reverse Battery Protection	Load Dump, Low Drop, Low Iq	<u>MPQ5850</u> **

MPQ7901: Safety PMIC for Safety MCU, Radar and Lidar

Power Stages

Functional Safety

Communication

4.5V to 42V Input Range

HV Buck 2A

2.3V-5.45V with 50mV step

LV Buck 1.5A

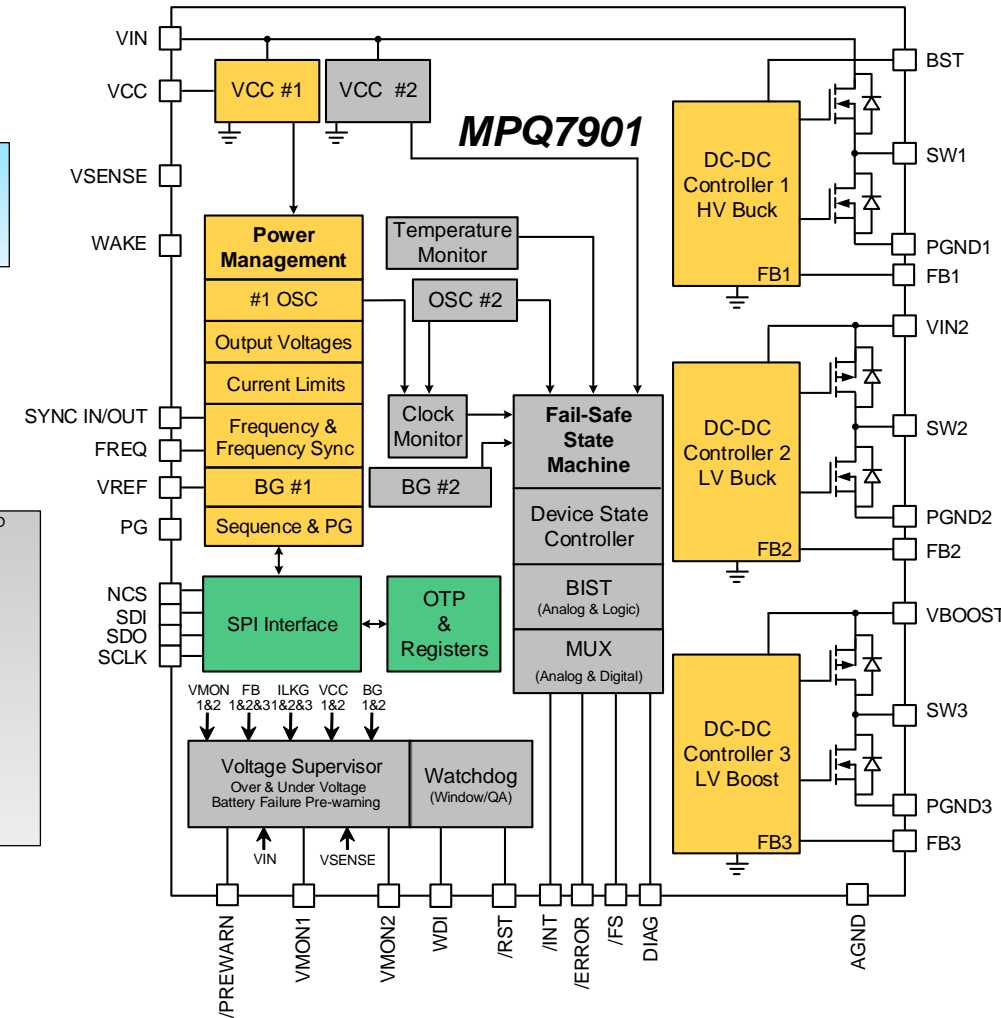
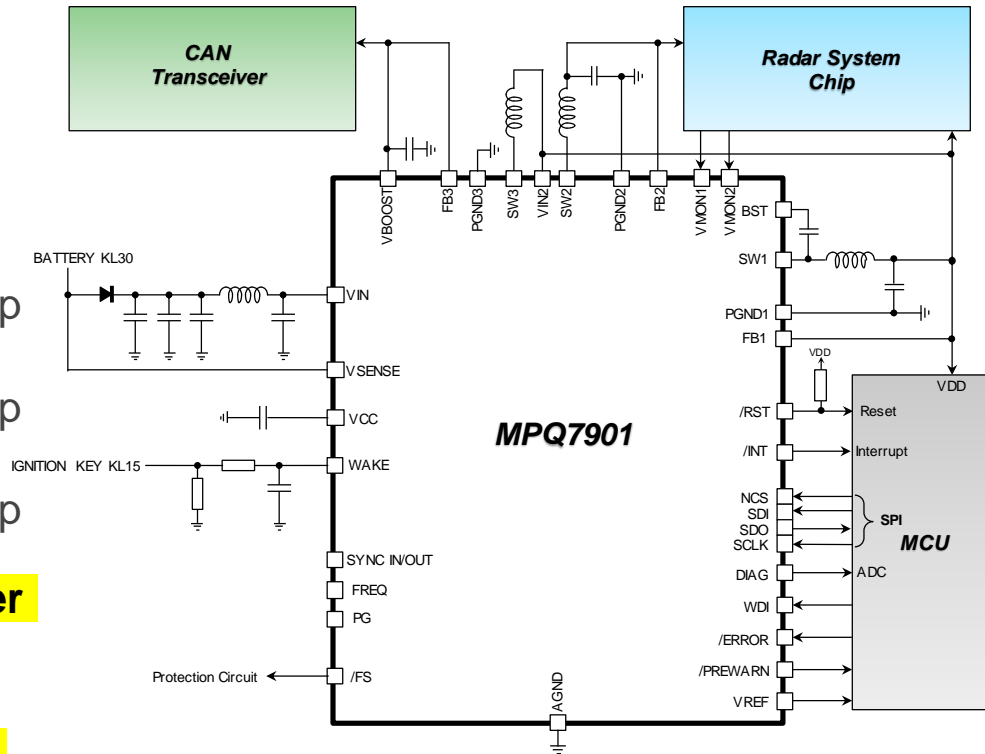
0.6V-3.75V with 50mV step

Boost 250mA

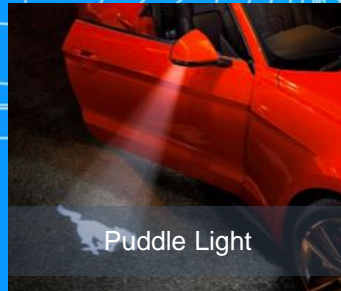
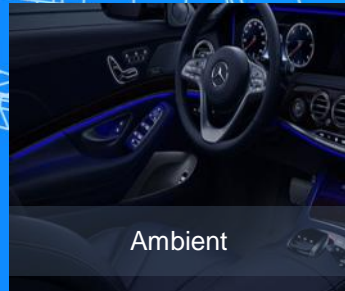
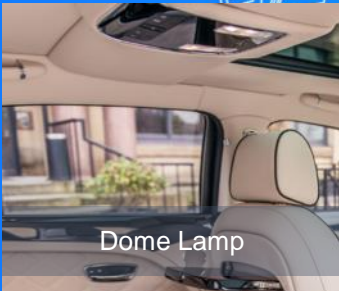
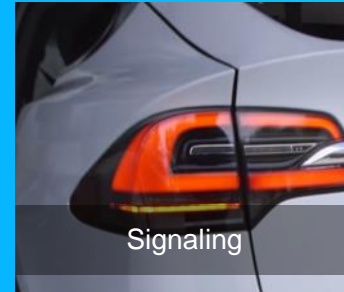
4.4V-7.55V with 50mV step

1.5% Output Accuracy Over Full Temperature Range

Programmable UV and OV Monitoring Thresholds

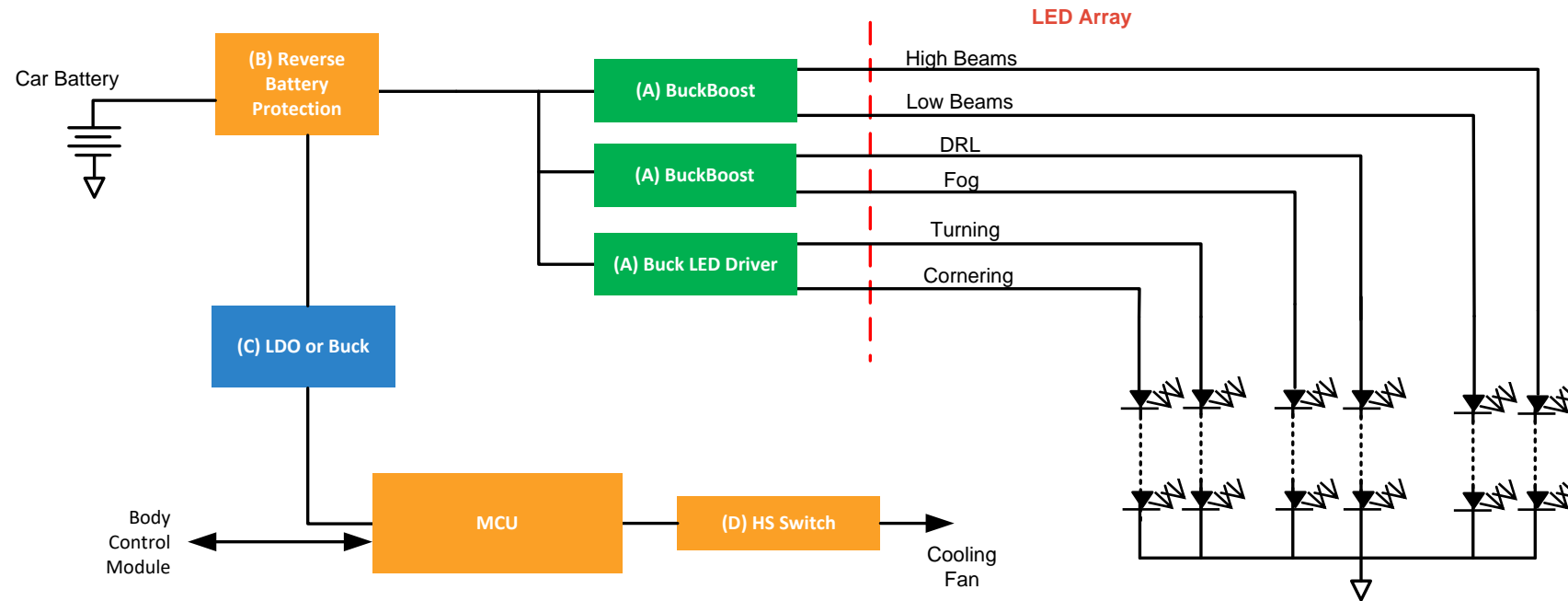


Lighting Applications



Application Block Diagrams

Headlamp with Buck / Buck-Boost



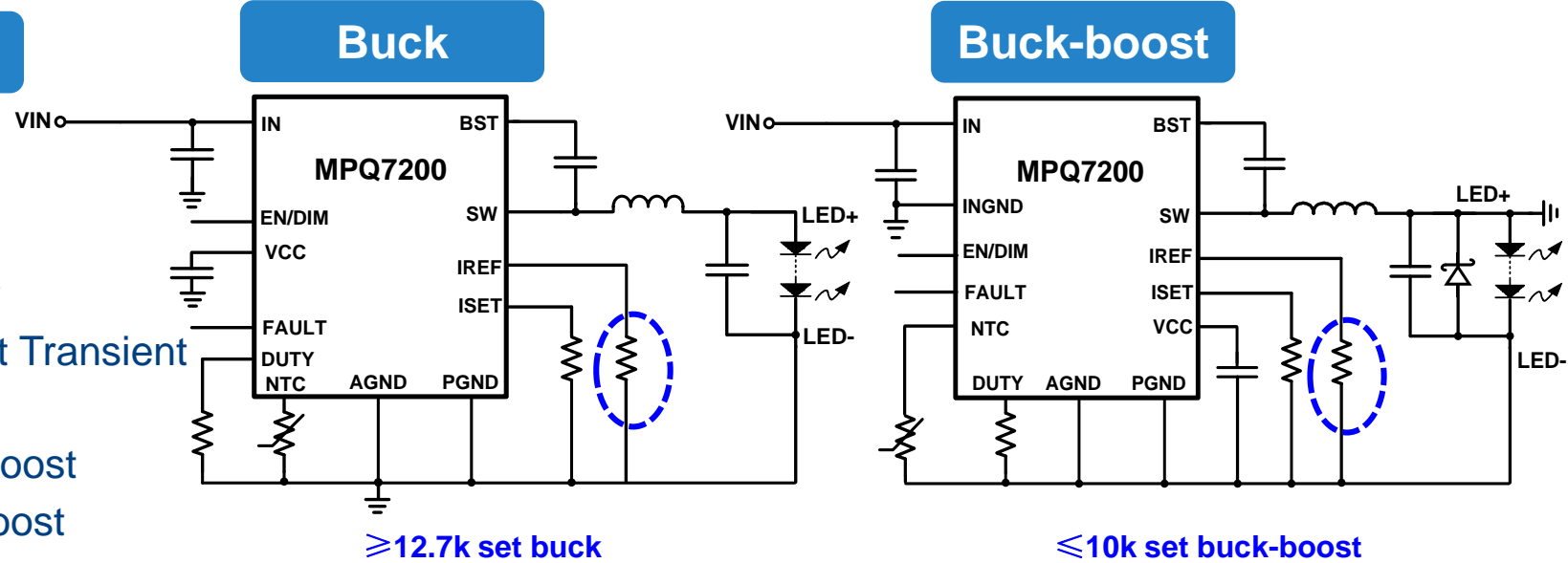
Block	Category	Key Reqs.	Parts (<u>Featured</u> , *Sampling, **Development)
A	Buck or Buck-Boost LED Driver	Load Dump, Low EMI, Fault Detection, Fast Transient	MPQ7200* , MPQ2484* , MPQ7210** , MPQ4425A/B/M , MPM6010 , MPQ2483 , MPQ24833 , MPQ2489
B	Reverse Battery Protection	Load Dump, Low Drop, Low Iq	MPQ5850**
C	LDO / Buck	Load Dump, Low EMI	MPQ2013 , MPQ2019 , MPQ4431 , MPQ4420 , MPQ4300*
D	High Side Switch	Fault Diagnostics	MPQ5069 , MPQ5060*

MPQ7200/MPQ7200A

42V, 3A Buck OR 1.2A Buck-boost Synchronous LED Driver

FEATURES

- Wide 5V-42V Operating Input Voltage
- Integrated 40mΩ/38mΩ HS/LS MOSFETs
- Integrated Current Sense
- Configurable Buck or Buck-Boost Topology
- Fixed Frequency Band-band Control – Fast Transient
- Two Fsw Options:
MPQ7200: 2.3MHz buck, 1.15MHz buck-boost
MPQ7200A: 410kHz in both buck&buck-boost
- Frequency Spread Spectrum
- Symmetric Input Layout
- 2-step Dimming & PWM Dimming Selection
- LED & Pins Open, Short Protection
- FAULT Indicator
- NTC Thermal Derating
- Input Power Derating in Buck-boost
- Load Dump Protection in Buck-boost
- Parallel 2 or more to provide higher power
- QFN-19 (3mmx4mm) for Compact Solution



TARGET APPLICATION

- Daytime Running Light & Position
- Fog Light

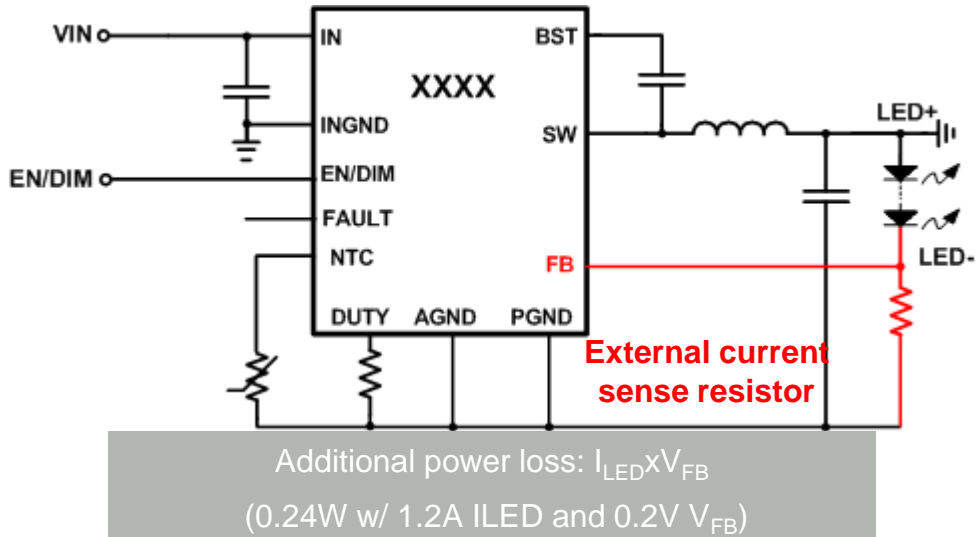
Perfect solution for
Car Lighting system



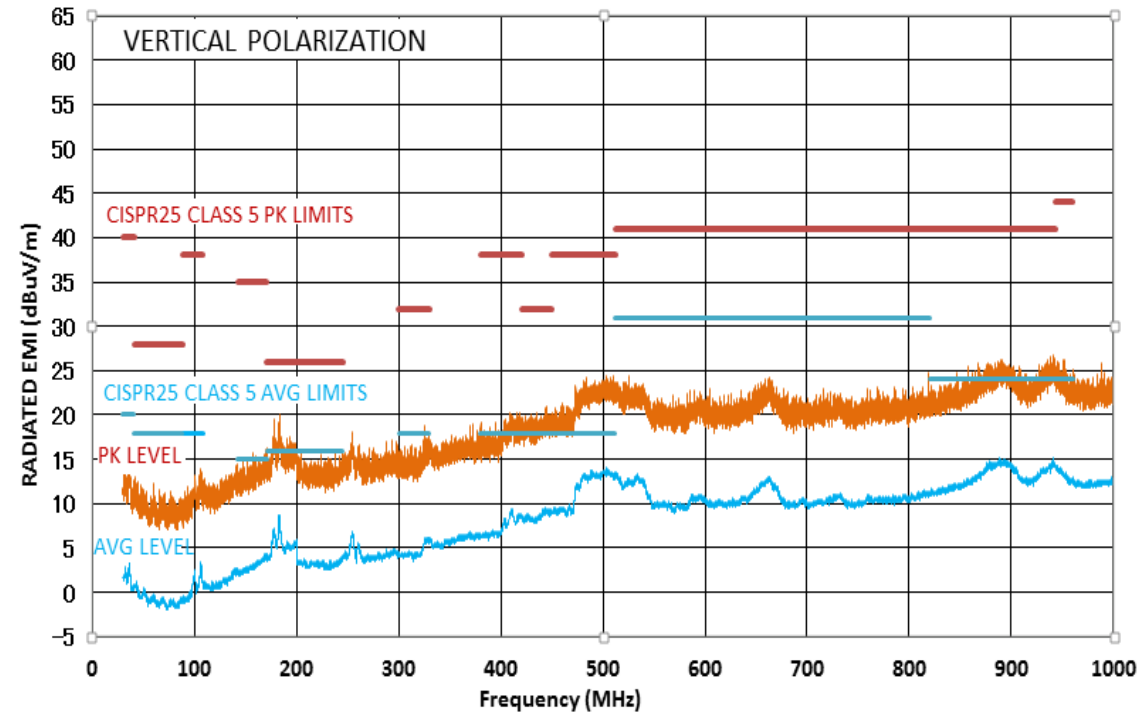
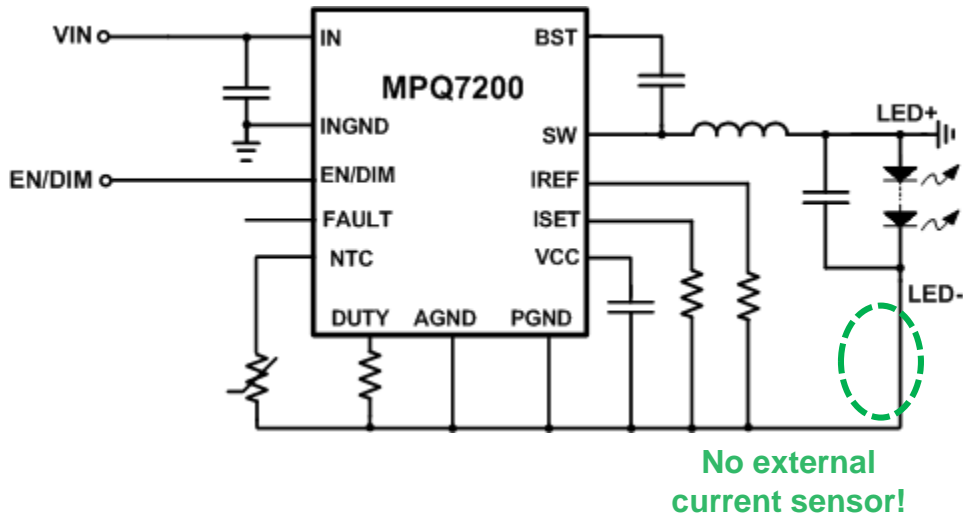
MPS

MPQ7200 performance

Traditional external current sense



MPQ7200 Integrated current sense

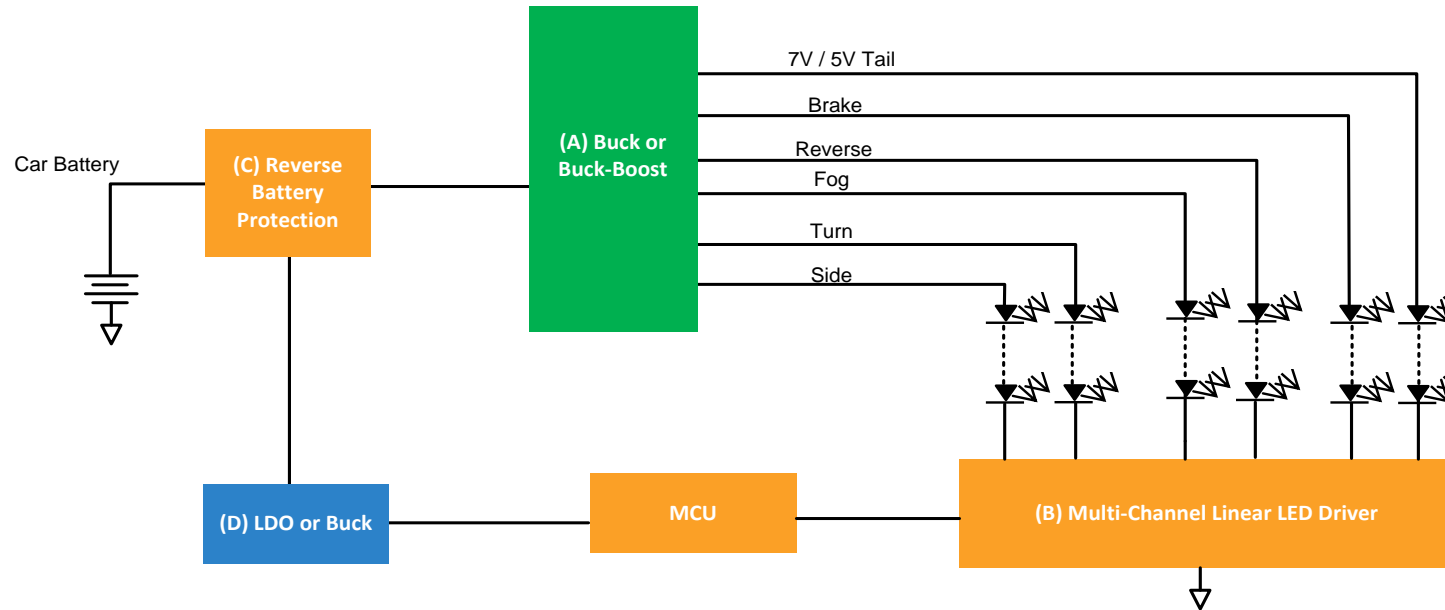


Benefits:

- Lower power loss & higher efficiency
- Better thermal
- Lower cost
- Space save



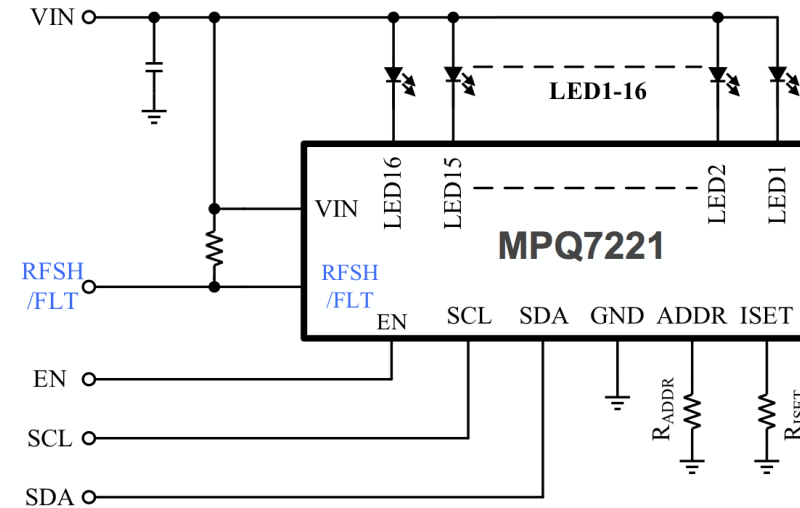
Rear Light with Dynamic Effects



Block	Category	Key Reqs.	Parts (Featured, *Sampling, **Development)
A	Buck or Buck-Boost	Load Dump, Low EMI, Fault Detection, Fast Transient	Buck: MPQ4420/4423 , MPQ4430 , MPQ4303 Buck-Boost: MPQ3910 , MPQ8875*
B	Multi-Channel Linear LED Driver	I2C, Dimming, Scalable	MPQ7221*
C	Reverse Battery Protection	Load Dump, Low Drop, Low Iq	MPQ5850**
D	LDO or Buck	Load Dump, Low EMI	MPQ2013 , MPQ2019 , MPQ4431 , MPQ4420/4423 , MPQ4300*

MPQ7221 16-Channel Linear LED Driver

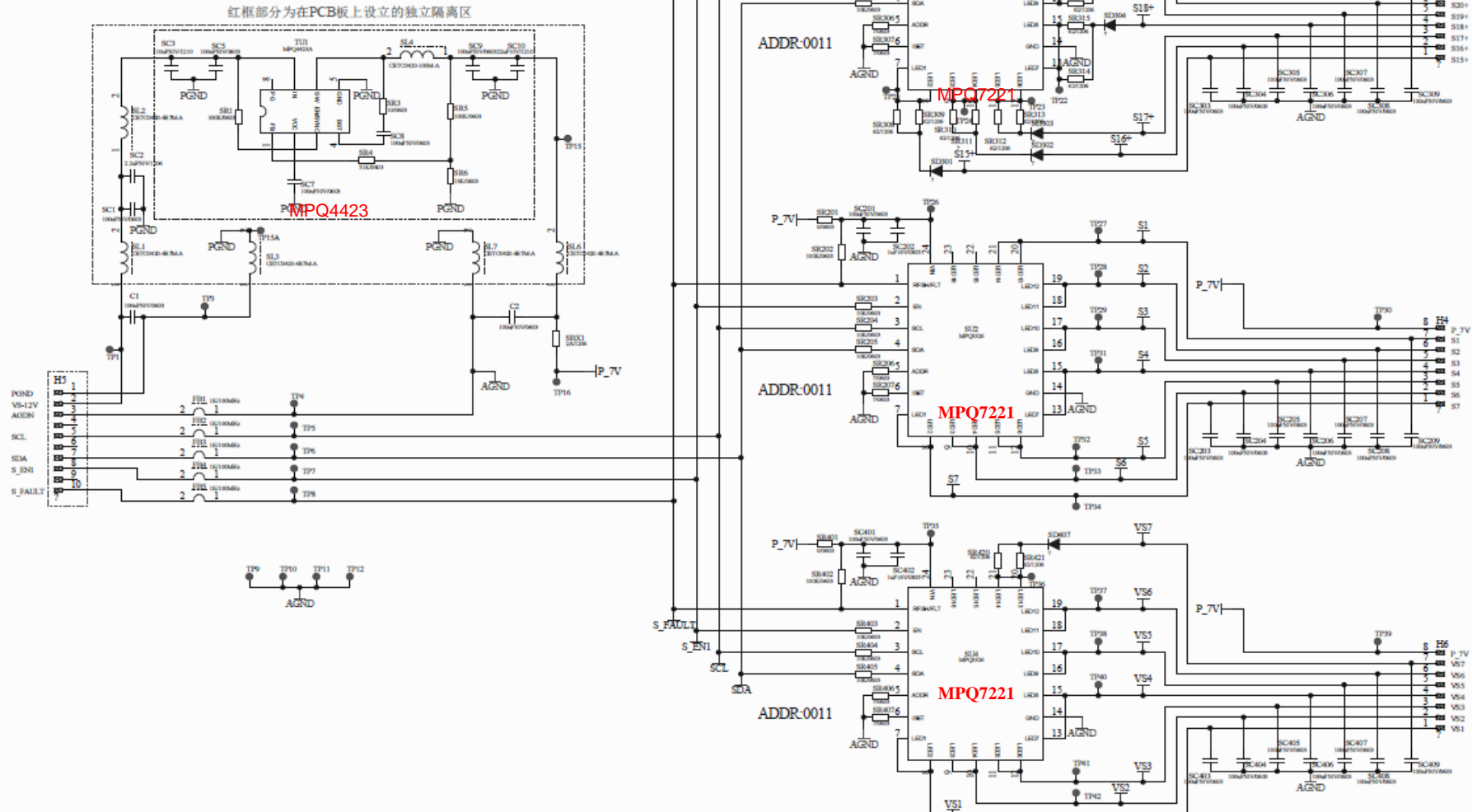
- Wide Input Voltage Range 4-18V
- 16 Channels, 80mA/ch max.
- LED Current Programmed by External Resistor
- 6-bit Analog / 12-bit PWM Dimming Per Channel
- PWM dimming frequency Selectable 220/250/280/330Hz
- Refresh Signal Output
- I2C Interface (Prog. Address)
- LED Current Slew Rate Programmable
- Fault indication
- LED Open/Short Protection
- Over Temperature Protection
- QFN24 (4mmx4mm)



Key Specs

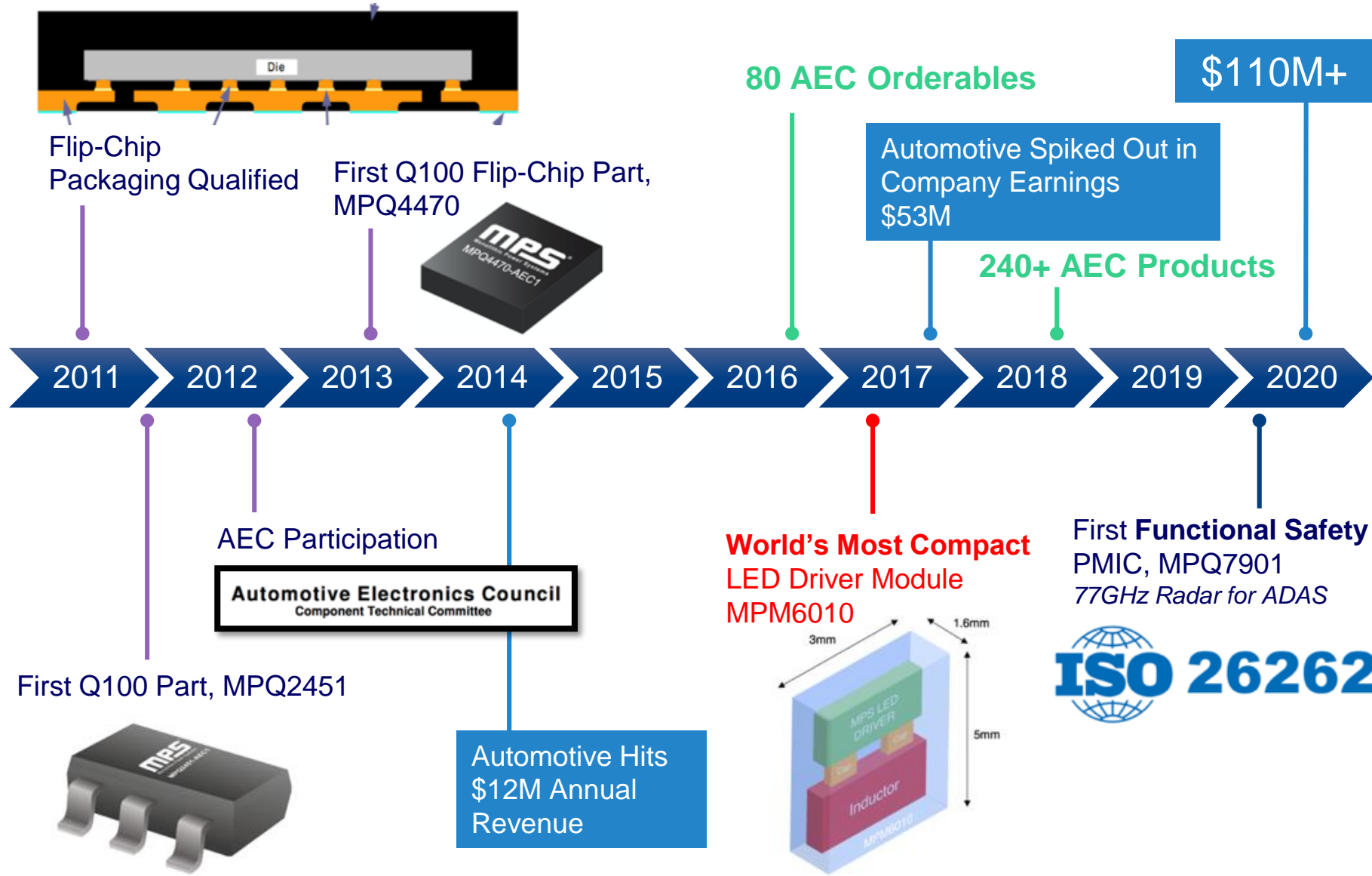
Input Voltage	4 – 18V
No. Channels	16
Current Per Channel	80mA
Package	QFN 24 (4mm x 4mm)

Rear Light Reference Design – MPQ7221+MPQ4423



MPS Power Technology

Our Automotive History



MPS Automotive Milestones in 2019



AEC-Q100 products shipped since 2016

400
Million

Company automotive revenue target

\$92M

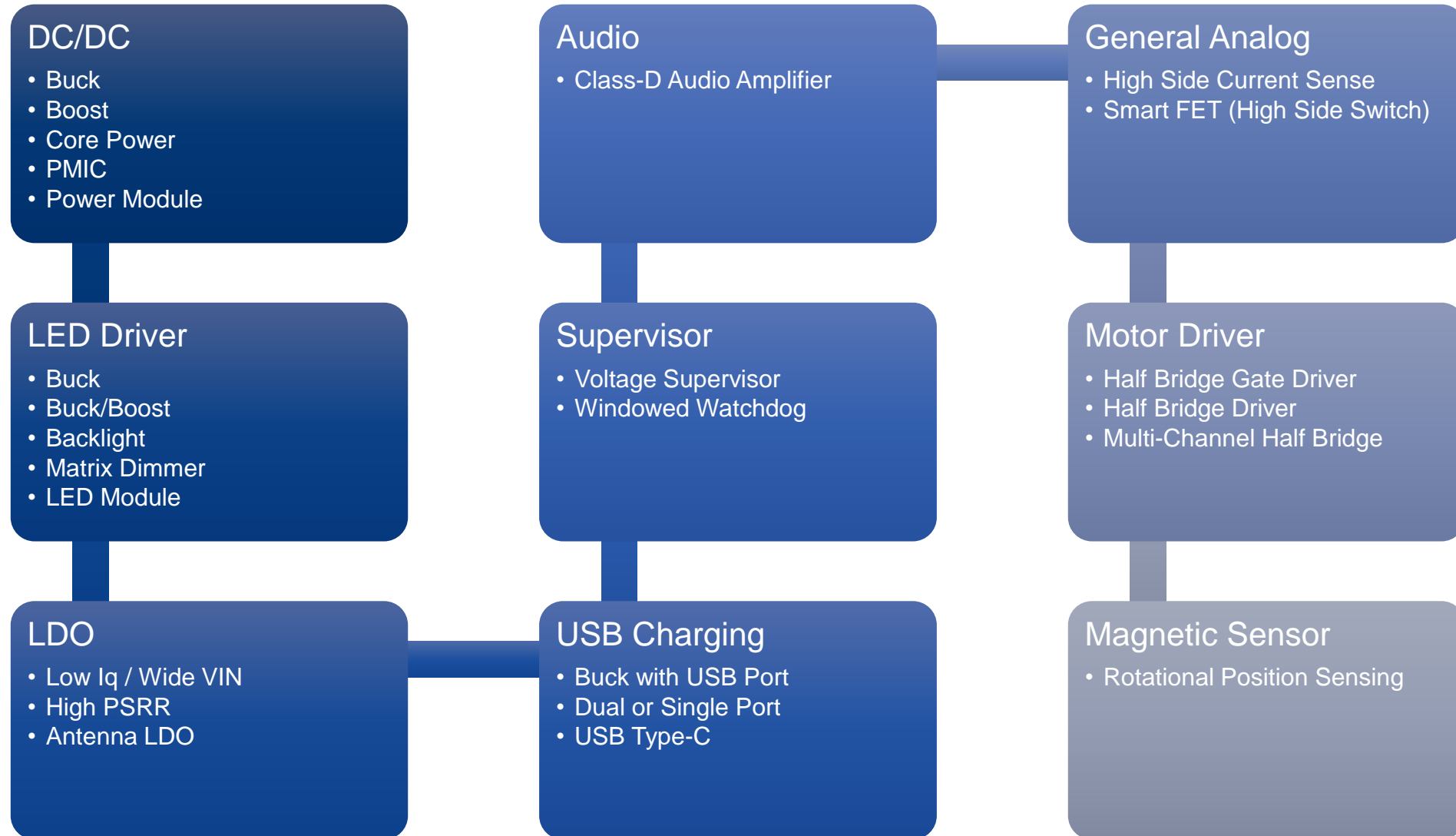
From beginning of our automotive journey to SOP at world's #1 automotive supplier, **Bosch**

10
Years

MPS Automotive Technology - Features & Benefits

	Higher Integration	Low-Ohmic FETs	Digital Config	Flip Chip Package	Symmetric Pinout, Spread Spectrum	Low Iq
Reduced BOM	●	●				
Smaller Board	●	●	●	●		
Easier Layout	●	●	●	●	●	
Cooler Thermals	●	●		●	●	
CISPR25 Compliance	●		●	●	●	
Improved Reliability	●		●			
Simpler Design	●		●	●		
Longer Battery Life						●

Automotive Product Families



40V Synchronous Bucks



Production

Sampling

Development

MPM3515 Series

4-40V / 1.5A

Compact Power Module

2.2MHz Fsw with fold-back
Integrated AEC-Q200 inductor
QFN17 (3x5) **Wettable Flank**

Versions:

3515 – 1.5A, 2.2MHz
3509 – 0.9A, 2.2MHz
3509B – 0.6A, 410kHz

MPQ4415A

4-40V / 1.5A

NEW

Integrated Input Capacitor

2.2MHz Fsw
Freq. foldback
Forced CCM
QFN16 (2.5x3) **Wettable Flank**

Versions:

MPQ4415M: integrated cap
MPQ4415A: non-cap version

MPQ4300 Series

3.5-50V / 0.5-3.5A

Spread Spectrum Family

Fixed output voltages
550kHz Fsw
Low Rdson (80/40mΩ)

Spread Spectrum

OCP, OVP
QFN16 (3x3)

Versions:

4300 – 500mA / 4301 – 1A
4302 – 2A / 4303 – 3A

MPQ9840 Series

3.3-40V / 1-3.5A

Low Iq, High Efficiency

10uA Iq standby
Low Rdson (90/40mΩ)
Fsw prog. 350kHz – 2.5MHz
90% eff. at 2.2MHz / 2A
SCP, OCP, OVP
QFN16 (3x4) **Wettable Flank**

Versions:

4431 – 1A / 4432 – 2.2A
4433 – 3A / 4430 – 3.5A

MPQ4420 Series

4-40V / 2A, 3A

Value Line Solution

410kHz default Fsw
TSOT23-8 (4420)
QFN8 (3x3) (4423) **Wettable Flank**

Versions:

4420H – 2A / 4420A – Forced CCM
4423H – 3A / 4423A – Forced CCM

MPQ4340

3.3-40V / 4A

Ultra Fast, Nano Iq

3.5uA Standby Mode
60/40mΩ HS/LS
25ns Min On Time
Soft Start and Power Good
Low Dropout Mode

Spread Spectrum

Symmetric VIN
2.2MHz supported
Selectable AAM or Forced CCM
QFN19 (3x4) **Wettable Flank**

Versions:

1A / 2A / 3A / 4A

MPQ4320

3.5-40V / 4A

Ultra Compact with Spread Spectrum

20uA Sleep Mode, 1.2uA Shutdown
50/35mΩ HS/LS

Spread Spectrum

Symmetric VIN
Soft Start and Power Good
Low Dropout Mode
2.2MHz supported
Selectable AAM or Forced CCM
QFN12 (2X3) **Wettable Flank**

Versions:

1A / 2A / 3A / 4A
MPQ4323M: Cap integrated 3A
MPQ4324M: Cap integrated 4A

MPQ4312 Series

3.3-50V / 2-7A

Low Iq Spread Spectrum Family

Spread Spectrum

10uA low Iq
Low Rdson FETs (40/17mΩ)
Fsw 520kHz
AAM or Forced CCM
Symmetric Vin layout

QFN20 (4x4) **Wettable Flank**

Versions:

4312 – 2A / 4313 – 3A / 4314 – 4A
4315 – 5A / 4316 – 6A / 4317 – 7A

MPQ4470 Series

4.5-40V / 5A, 3.5A

Low Rdson FETs (40/20mΩ)

Prog. Fsw 100kHz – 1MHz
SCP, OCP, UVP
QFN20 (3x4)

Versions:

4470 – 5A, OVP latch
4470A – 5A, non-OV latch
4473 – 3.5A, OVP latch

MPQ4436 (A/B)

3.3-50V / 6A

NEW

Multiphase w/ Current Sharing Spread Spectrum

18uA low Iq
Low Rdson FETs (48/20mΩ)
Fsw 420kHz or 2.2MHz
180° phase-shifted output clock
AAM or Forced CCM
Symmetric Vin layout
QFN20 (4x4) **Wettable Flank**

Versions:

4436 – 420kHz, no FSS
4436A – 420kHz, with FSS
4436B – 2.2MHz, no FSS
MPQ4360 – 2.2MHz, no FSS
MPQ4318 – 8A, FSS
MPQ4319H – 10A peak, FSS

MPQ2918

4-40V

Buck Controller

100kHz to 1MHz
Power good
Programmable CCM or AAM
Pulse-skipping mode
99.5% DC
TSSOP20
QFN20 (3x4) **Wettable Flank**

40V Sync Buck Families Key Features

Note: Various versions exist within each product family.
Some versions may not support all features indicated.

		MPQ4420	MPQ4470	MPQ4430	MPQ4300	MPQ4312	MPQ4436	MPQ4320	MPQ4340
Switching Frequency	Below 500kHz	✓	✓	✓	✓	✓	✓	✓	✓
	Above 2MHz, Batt to 5V			✓		✓	✓	✓	✓
	Above 2MHz, Batt to 3.3V							✓	✓
	Constant On Time		✓						
	Fixed Frequency	✓		✓	✓	✓	✓	✓	✓
Low Power	Low Power (10-20uA)			✓		✓	✓	✓	✓
	Ultra Low Power (< 5uA)								✓
Light-Load Efficiency	AAM	✓	✓	✓	✓	✓	✓	✓	✓
	Forced CCM	✓		✓	✓	✓	✓	✓	✓
EMC	Symmetric VIN					✓	✓	✓	✓
	Spread Spectrum				✓	✓	✓	✓	✓
Packaging	Wettable Flank	✓	✓	✓		✓	✓	✓	✓
Family Devices		MPQ4420/A/H MPQ4423/A/H MPQ4415/A/M MPM3515 MPM3509/B	MPQ4470/A MPQ4473	MPQ4430 MPQ4431 MPQ4432 MPQ4433	MPQ4300 MPQ4301 MPQ4302 MPQ4303	MPQ4312 MPQ4313 MPQ4314 MPQ4315 MPQ4316 MPQ4317	MPQ4436 MPQ4436A MPQ4436B	TBD	TBD



PMIC / Multi-Channel



Primary / 40V

MPQ7900

4-36V / 2 Buck, 1 LDO

1.5A HV Buck + 700mA LV
Buck + 300mA LDO

Target App: Rear Camera

Spread Spectrum

Switching freq, output voltage,
compensation etc all digitally
programmed

I2C, OTP

QFN16 (2.5x3.5)

Coax / 18V

MPQ7900LV

4-18V / 2 Buck, 1 LDO

1.5A MV Buck + 700mA LV
Buck + 300mA LDO

Target App: Rear Camera

Spread Spectrum

Switching freq, output voltage,
compensation etc all digitally
programmed

I2C, OTP

QFN16 (2.5x3.5)

5V

MPQ7920

2.7-5.5V / 4 Buck, 5 LDO

Quad Buck + Multi LDO PMIC

Buck outputs: 4.5A, 4A, 2.5A, 2A

Multiphase 4.5A + 4A and/or 2.5A + 2A

4 low noise LDOs

Flexible power sequencing

I2C, OTP

QFN26 (3.5x4.5) [Wettable Flank](#)

LED Drivers for Signaling & Illumination



20W+ Drivers *High Beam, Low Beam*

MPQ7200

42V / 3A

NEW

Sync Buck or Buck/Boost Driver

1.2A Buck/Boost or 3A Buck
Low Rdson FETs (40/38mΩ)
Integrated current sense with 5% accuracy
Hysteretic control mode with extremely fast transient response
2.2MHz switching freq.
[Frequency spread spectrum](#)
2-step dimming
NTC temp sensing
FAULT pin
QFN (3x4) [Wettable Flank](#)

MPQ2484

4.5-42V In / 80V Out

Multi-Topology LED Controller Supports Buck, Buck/Boost and Boost

Fast transient response for matrix LED
Low Iq (<100uA)
3A FET gate drive
[Frequency spread spectrum](#)
2-step dimming
NTC and FAULT pins
LED open/short
TSSOP24

10-12W Drivers *Fog, Daytime Running Lamps*

MPM6010

4-36V / 1.5A

Sync Buck LED Driver Module

Integrated 2.2uH inductor (AEC-Q200) + VCC & BST capacitors
2.2MHz with frequency fold-back
Low Rdson FETs (85/50mΩ)
PWM dimming from 100Hz to 2kHz
OCP with valley current detect
LED open/short
Forced CCM
QFN17 (3x5) [Wettable Flank](#)

MPQ4425M

4-36V / 1.5A

Sync Buck LED Driver

Integrated input capacitor (4425M only)
2.2MHz with frequency fold-back or 400kHz
Low Rdson FETs (85/50mΩ)
PWM dimming from 100Hz to 2kHz
OCP with valley current detect
LED open/short
Forced CCM
QFN13 (2.5x3) [Wettable Flank](#)
TSOT23 [4425B only](#)

Versions:

4425M – 2.2MHz, integrated input cap
4425A – 2.2MHz, non-cap
4425B – 400kHz, non-cap

MPQ24833B

4.5-55V / 2.5-3A

Non-Sync Buck / inverting Buck-Boost LED Driver

Low shutdown Iq (5uA)
410kHz switching freq.
PWM or analog dimming
PWM dimming from 450Hz to 2.2kHz
LED open/short/OTP
Cycle-by-cycle OCP
Output OVP, SCP
LED open string protection
SOIC8E

Versions:

24833B – 3A Current Limit, 150mΩ FET
2483A – 2.5A Current Limit, 280mΩ FET

Backlight, Instrumentation LED Drivers



Backlight

MPQ3386

25V / 20-30mA

6-String LED Driver for Backlight – Boost

3386: 30mA per string
625 or 1250kHz
LED open
QFN24 (4x4)

MPQ3387L

25V / 45mA

6-String LED Driver for Backlight – Boost

3387L: 45mA per string
625 or 1250kHz
LED open
QFN24 (4x4)

MPQ3369

3.5-36V / 100mA

6-String LED Driver for Backlight – Boost

15000:1 dim ratio
Up to 2.2MHz
3A current limit
Spread spectrum
LED open/short
LED current auto decrement at high temp
I2C
QFN24 (4x4), TSSOP28-EP

MPQ3367

3.5-36V / 150mA **NEW**

6-String LED Driver for Backlight – Boost

15000:1 dim ratio
Up to 2.2MHz
3A current limit
Spread spectrum
LED open/short
LED current auto decrement at high temp
I2C
QFN24 (4x4), TSSOP28-EP

Telltale

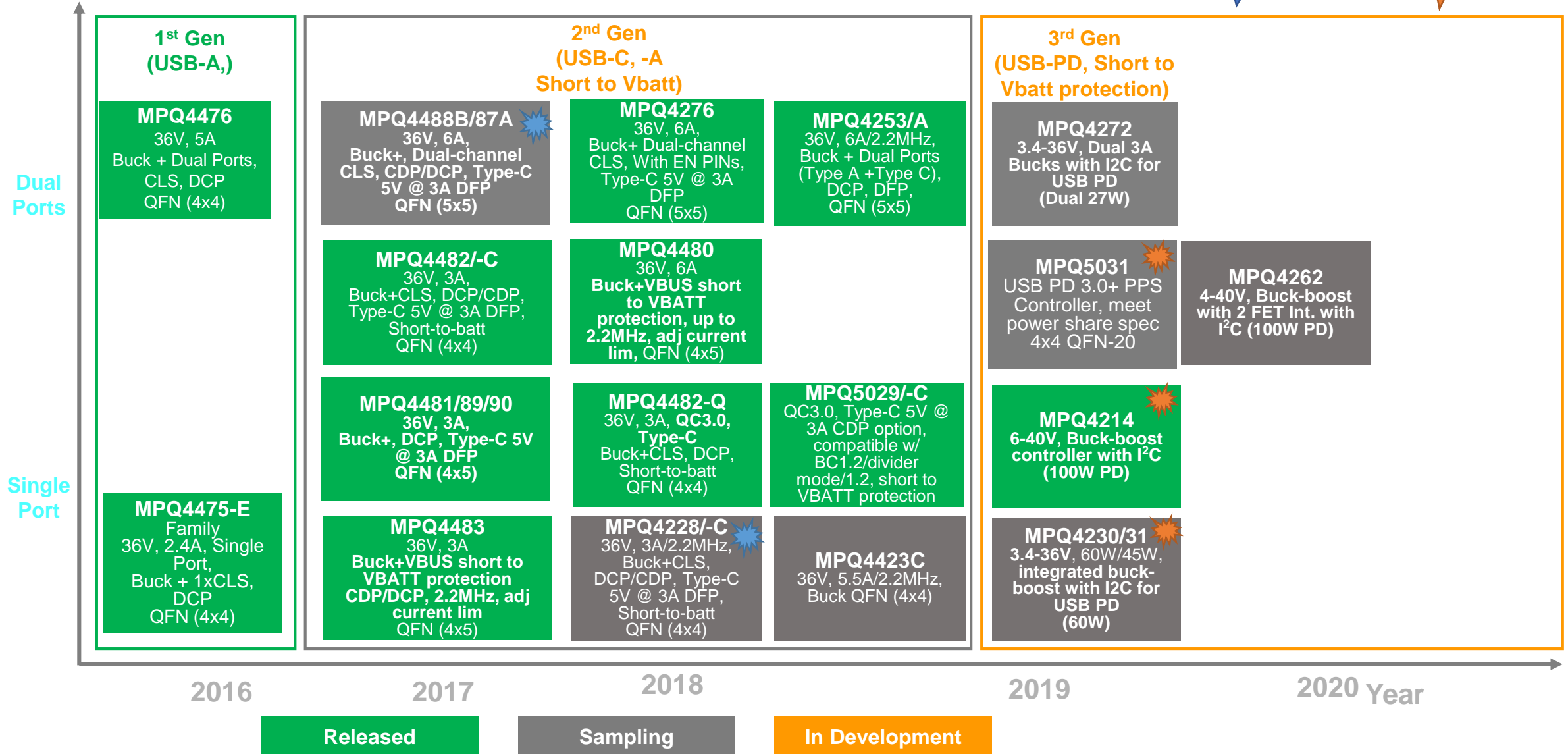
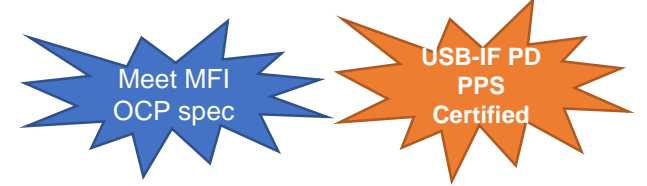
MPQ3326

2.7-18V / 25mA x16

16-Channel WLED Driver

6bit analog dimming and 12-bit PWM dimming each channel
LED current set by ext. resistor
Cascade up to 10 ICs
LED open/short
I2C
QFN24 (4x4), TSSOP28-EP

Automotive USB Charging Products Roadmap



Thank you