浅谈5G基站电源

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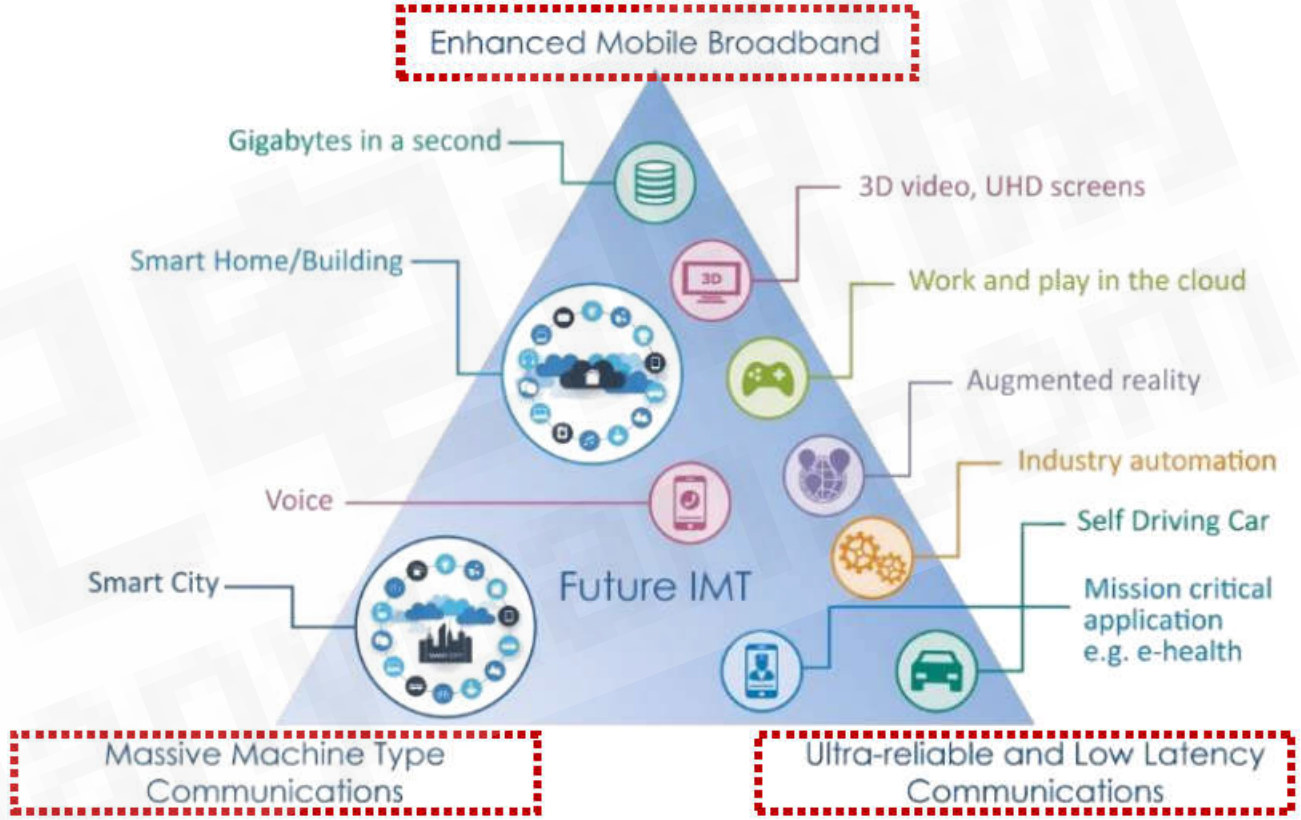
概览

- 5G基站结构概述及5G基站规划
- 5G基站各结构电源需求及MPS解决方案
- MPS的电源模块

5G基站结构概述及5G基站规划

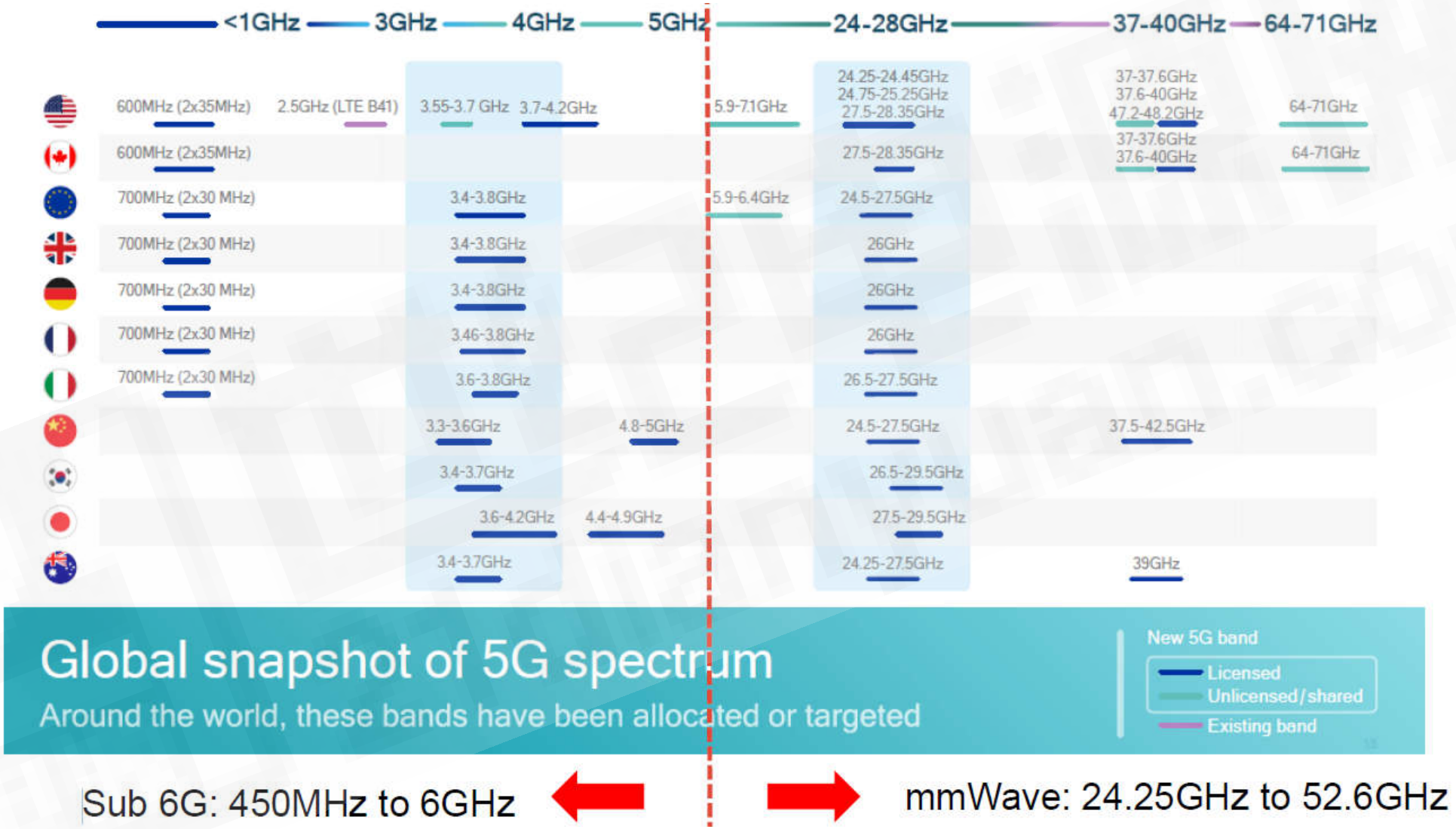
5G三类典型业务场景

5G三大特点	应用场景
eMMB--增强型移动宽带	超高清视频、虚拟现实（VR）/增强现实（AR)
mMTC--大规模机器类通信	智慧城市，智能家居等物联网应用
uRLLC--超可靠低时延通信	工业控制，无人机控制，智能驾驶控制



Network	Traffic Density	Connection Density	Latency	Mobility	Experienced Rate	Peak Rate
4G	0.1Mbps/m2	100K/km2	10ms	350km/h	10Mbps	1Gbps
5G	10Mbps/m2	1M/km2	1ms	500km/h	100M~1Gbps	20Gbps

全球5G频率范围


<1GHz
3GHz
4GHz
5GHz
24-28GHz
37-40GHz
64-71GHz
600MHz (2x35MHz)
2.5GHz (LTE B41)
3.55-3.7 GHz
3.7-4.2GHz
5.9-7.1GHz
24.25-24.45GHz
24.75-25.25GHz
27.5-28.35GHz
37-37.6GHz
37.6-40GHz
47.2-48.2GHz
64-71GHz
600MHz (2x35MHz)
27.5-28.35GHz
37-37.6GHz
37.6-40GHz
64-71GHz
700MHz (2x30 MHz)
3.4-3.8GHz
5.9-6.4GHz
24.5-27.5GHz
700MHz (2x30 MHz)
3.4-3.8GHz
26GHz
700MHz (2x30 MHz)
3.4-3.8GHz
26GHz
700MHz (2x30 MHz)
3.46-3.8GHz
26GHz
700MHz (2x30 MHz)
3.6-3.8GHz
26.5-27.5GHz
3.3-3.6GHz
4.8-5GHz
24.5-27.5GHz
37.5-42.5GHz
3.4-3.7GHz
26.5-29.5GHz
3.6-4.2GHz
4.4-4.9GHz
27.5-29.5GHz
3.4-3.7GHz
24.25-27.5GHz
39GHz
Global snapshot of 5G spectrum
Around the world, these bands have been allocated or targeted
New 5G band
Licensed
Unlicensed/shared
Existing band
Sub 6G: 450MHz to 6GHz
mmWave: 24.25GHz to 52.6GHz

5G 网络架构

- **Radio Access Network**
  - 4G: two stage (BBU, RRU)
  - 5G: three stages (CU, DU, AAU)
- **Antenna: Massive MIMO, integrated with RF module**

5G Base Band Station Fuction Module

CU

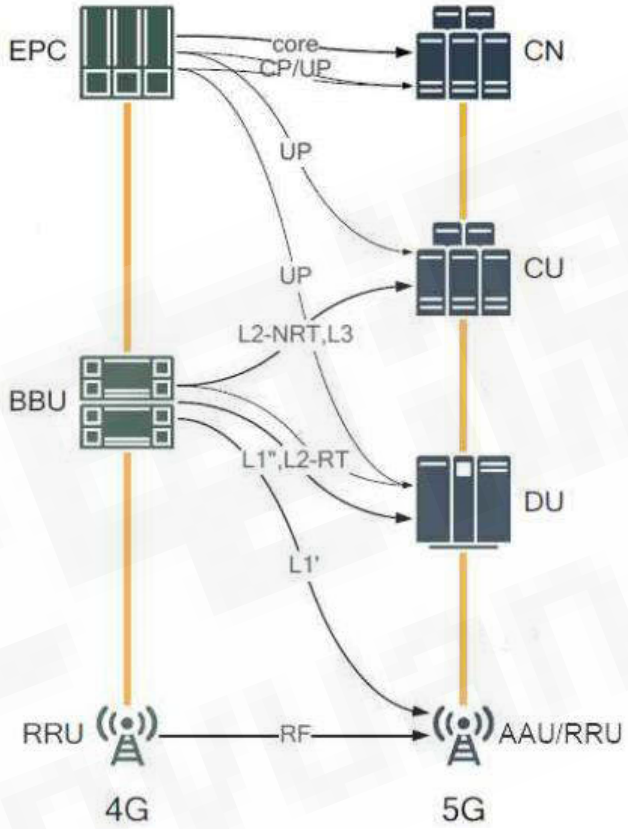
- Lowe real time operation of wireless protocol stack
- Part of Core network function

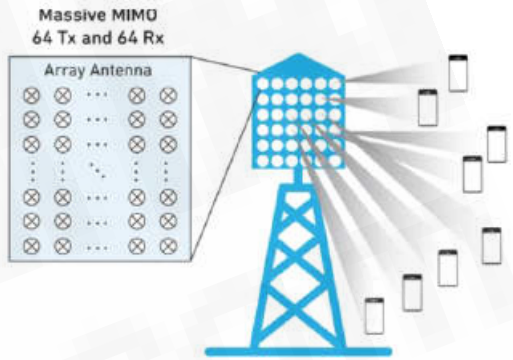
DU

- Physcial layer function and high real time operation of protocol stack
- Meet uRLLC demand

AAU

- Active Antenna, former RRU, and Physical layer of BBU



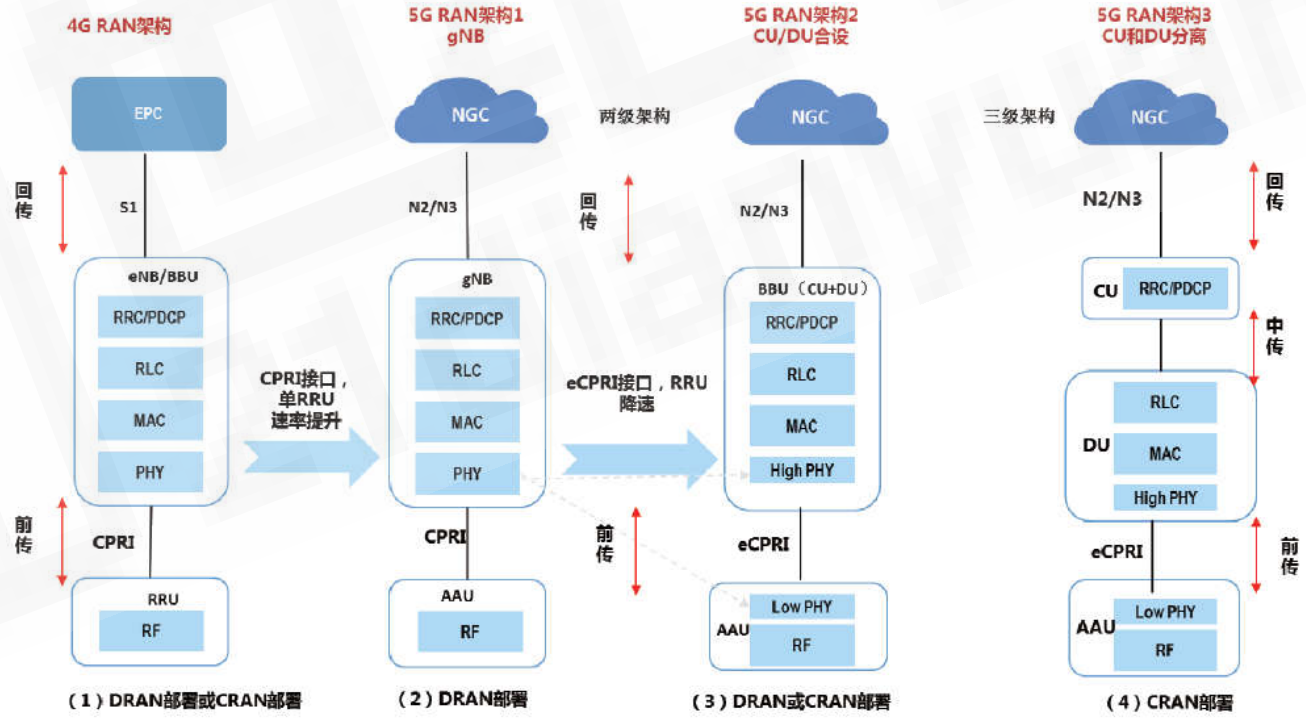


BBU: Building Base band Unit
RRU: Radio Remote Unit
AAU: Active Antenna Unit
CU: Central Unit
DU: Distributed Unit
CN: Core Network

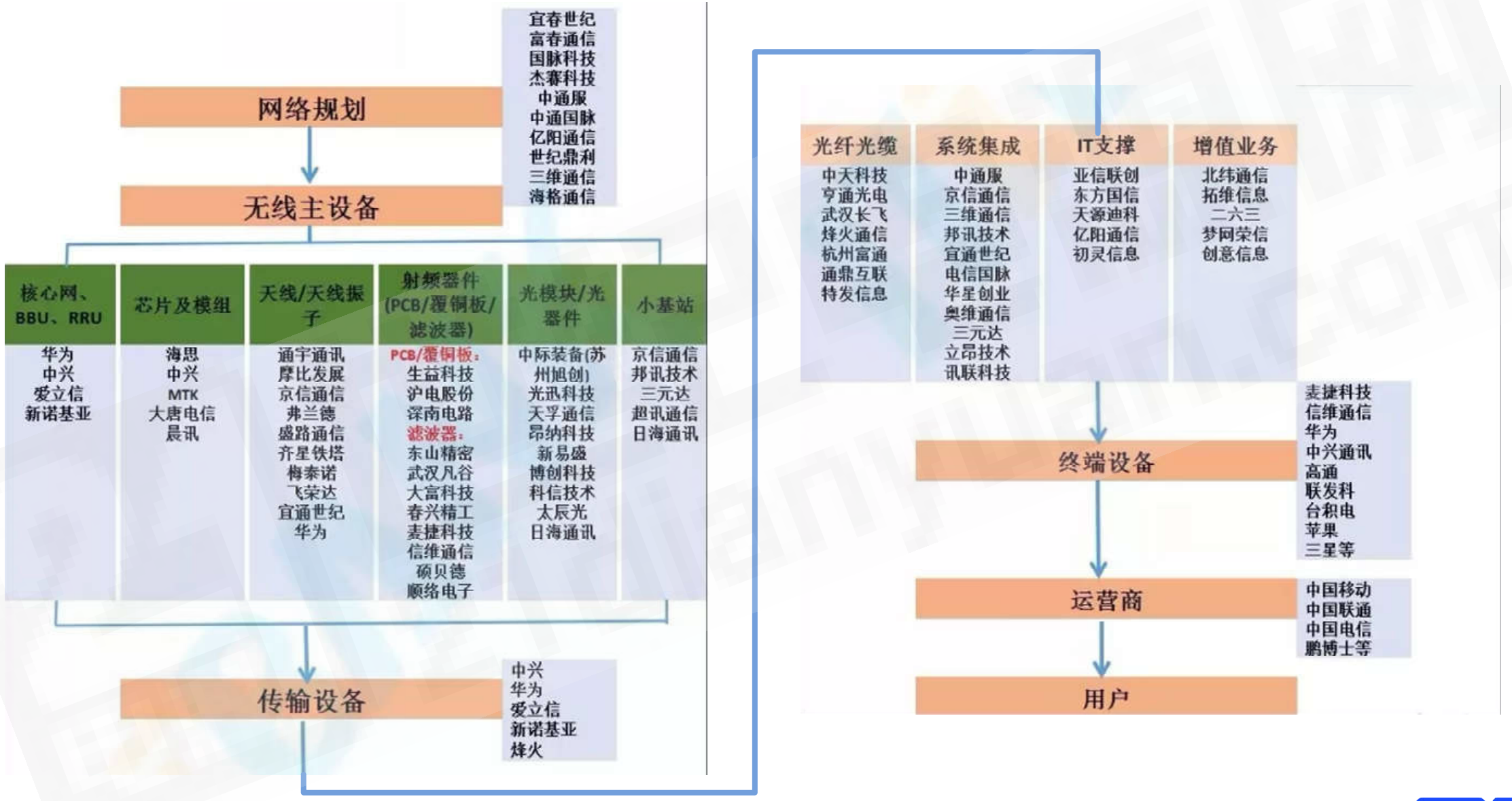
5G RAN分机架构

网络分层	无线接入侧		城域网汇聚层	城域网核心层/骨干网
	5G前传	5G中回传	5G回传+DCI	5G回传+DCI
传输距离	<10~20km	<40km	<40~80km	<<40~80km/几百km
组网拓扑	星形为主，环网为辅	环网为主，少量为链形或星型链路	环网或双上联链路	环网或双上联链路
客户接口	eCPRI： 25G CPRI: Nx10G~25G或 1*100G	5G初期：10GE/25GE 规模商用：N*25GE/50GE	5G初期：10GE/25GE 规模商用：N*25GE/50GE/100GE	5G初期：25GE/50GE/100GE 规模商用：N*100GE/400GE
线路接口	10G/25G/100Gb/s灰光或 N*25G/50Gb/sWDM彩光	10G/25G/100Gb/s灰光或 N*25G/50Gb/sWDM彩光	100G/200Gb/s灰光或N*100Gb/sWDM 彩光	200G/400Gb/s灰光或 N*100G/200G/400Gb/sWDM彩光

DRAN-分布式无线接入网
CRAN-基站式无线接入网
CPRI-通用公共无线电接口



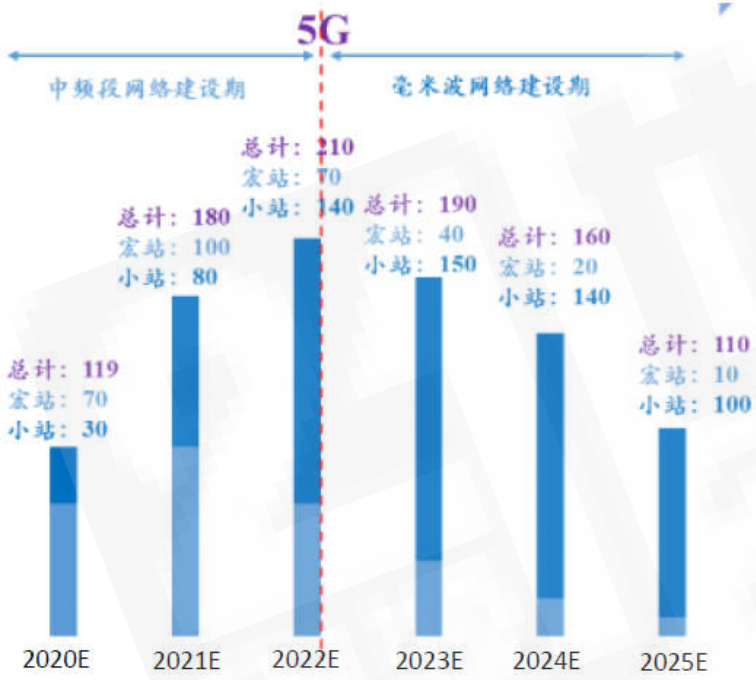
5G通讯产业链


网络规划
宜春世纪
富春通信
国脉科技
杰赛科技
中通服
中通国脉
亿阳通信
世纪鼎利
三维通信
海格通信
无线主设备
核心网、BBU、RRU
华为
中兴
爱立信
新诺基亚
芯片及模组
海思
中兴
MTK
大唐电信
晨讯
天线/天线振子
通宇通讯
摩比发展
京信通信
弗兰德
盛路通信
齐星铁塔
梅泰诺
飞荣达
宜通世纪
华为
射频器件(PCB/覆铜板/滤波器)
PCB/覆铜板：
生益科技
沪电股份
深南电路
滤波器：
东山精密
武汉凡谷
大富科技
春兴精工
麦捷科技
信维通信
硕贝德
顺络电子
光模块/光器件
中际装备(苏州旭创)
光迅科技
天孚通信
昂纳科技
新易盛
博创科技
科信技术
太辰光
日海通讯
小基站
京信通信
邦讯技术
三元达
超讯通信
日海通讯
传输设备
中兴
华为
爱立信
新诺基亚
烽火
光纤光缆
中天科技
亨通光电
武汉长飞
烽火通信
杭州富通
通鼎互联
特发信息
系统集成
中通服
京信通信
三维通信
邦讯技术
宜通世纪
电信国脉
华星创业
奥维通信
三元达
立昂技术
讯联科技
IT支撑
亚信联创
东方国信
天源迪科
亿阳通信
初灵信息
增值业务
北纬通信
拓维信息
二六三
梦网荣信
创意信息
终端设备
麦捷科技
信维通信
华为
中兴通讯
高通
联发科
台积电
苹果
三星等
运营商
中国移动
中国联通
中国电信
鹏博士等
用户

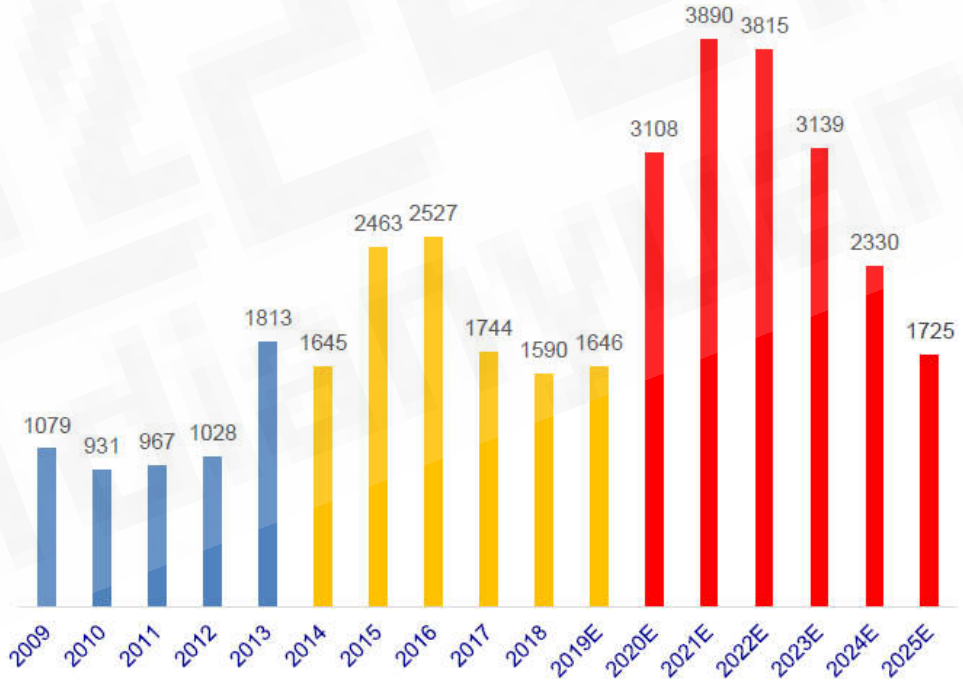
未来几年的5G规划

5G的无线接入5G将实现中低高频段的全频谱接入，中低频段将提供连续性覆盖，毫米波高频段将作为热点区域或容量提升的覆盖。

- 中低频段的宏站可实现与4G宏站相当的覆盖范围，预计最终4G基站380万（预计宏站265万+小站115万），5G宏站数量为4G宏站1.2倍，达到320万个。
- 毫米波高频段的小站数量保守估计将是宏站的2倍多，我们预计5G小站将达到640万个。



5G宏站与小站预估数量（万站）



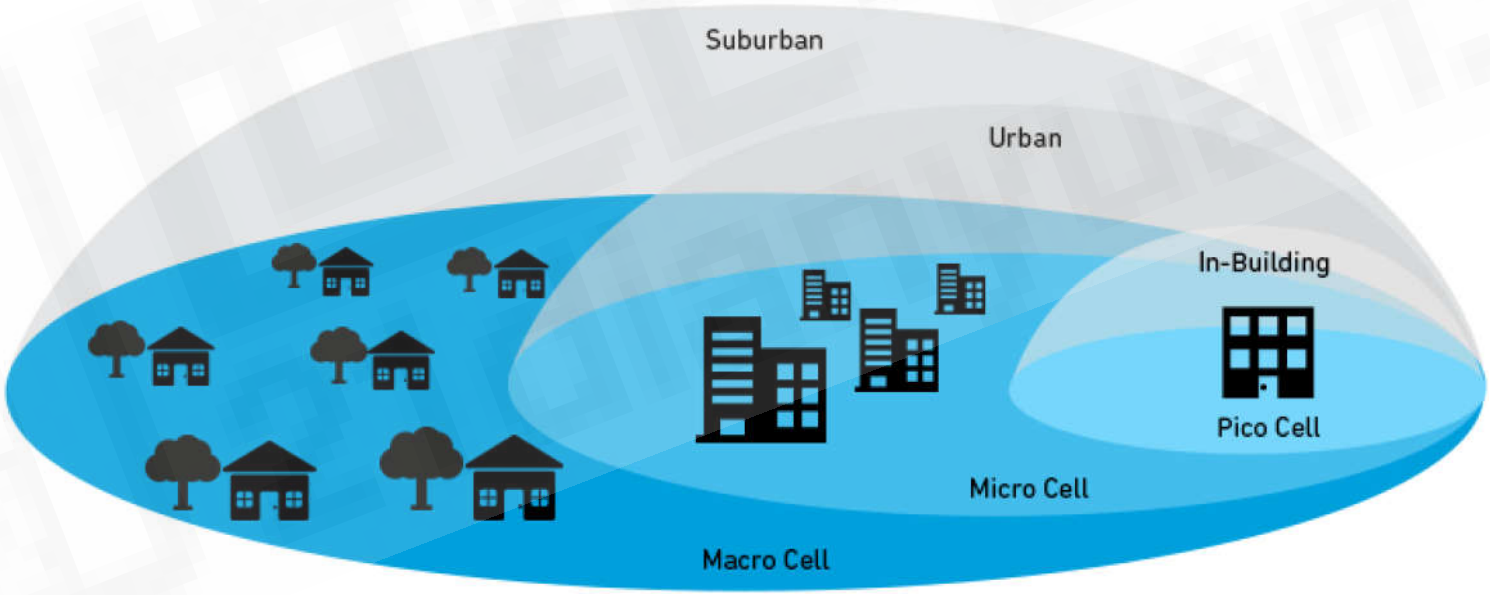
3G/4G/5G总投资规模（亿元）

资料来源:公司公告，申万宏源研究

5G基站的覆盖

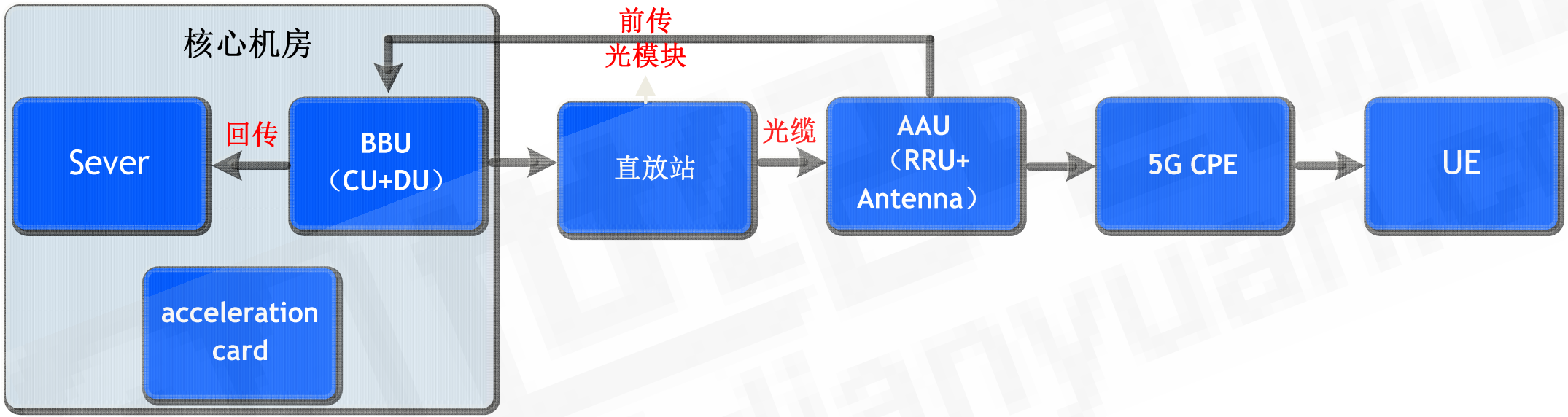
Cell Type	Output Power(W)	Cell Radius(km)	Users	Locations
Macro Cell	10 to >50	8~30	>2000	Outdoor
Micro Cell	1~10	0.2~2.0	100~2000	Indoor/Outdoor
Pico Cell	0.25~1	0.1~0.2	30~100	Indoor/Outdoor
Femtocell	0.001~0.25	0.010~0.1	1~30	Indoor

www.qorvo.com

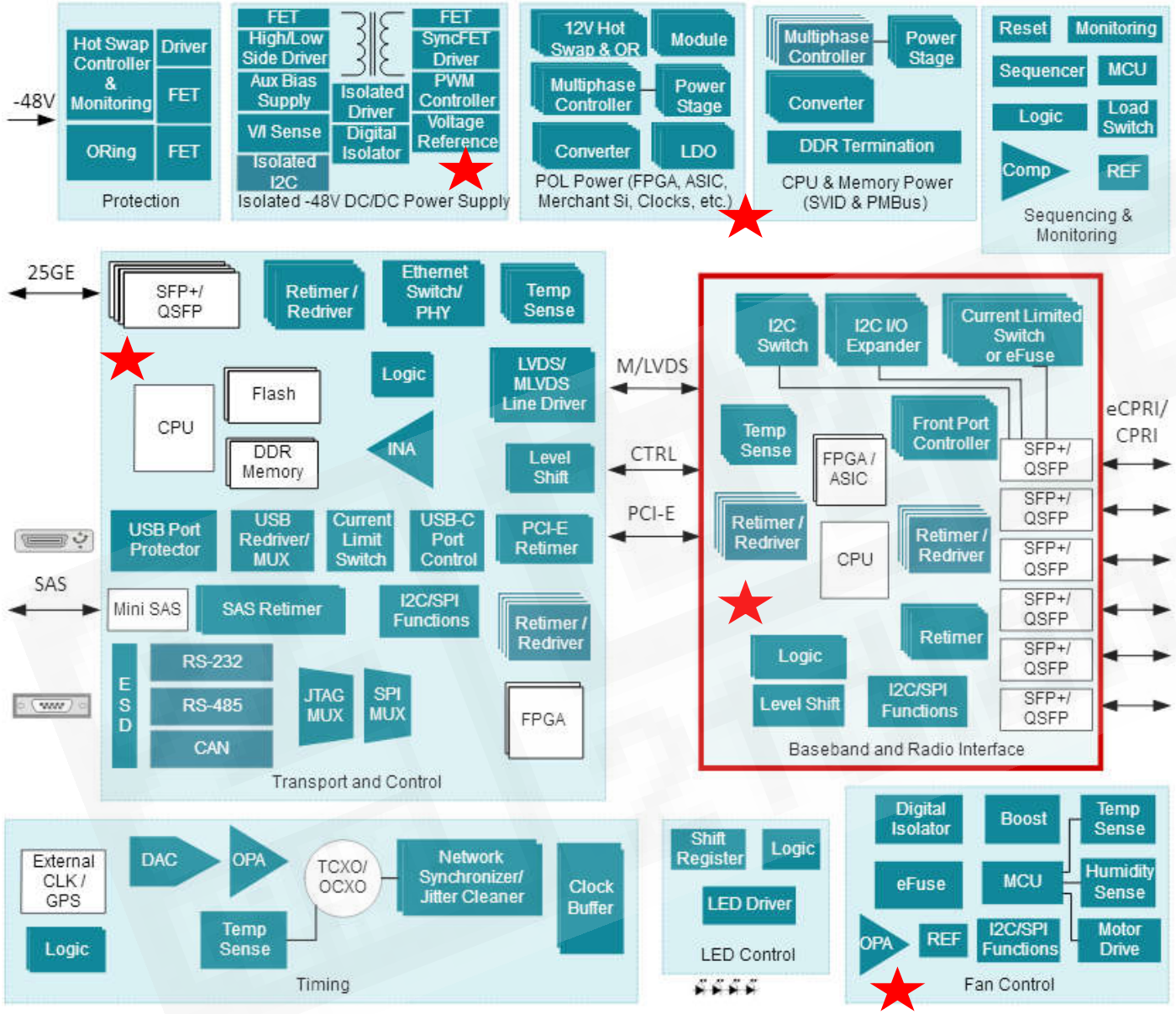


5G基站各结构电源需求

基站的承载网结构

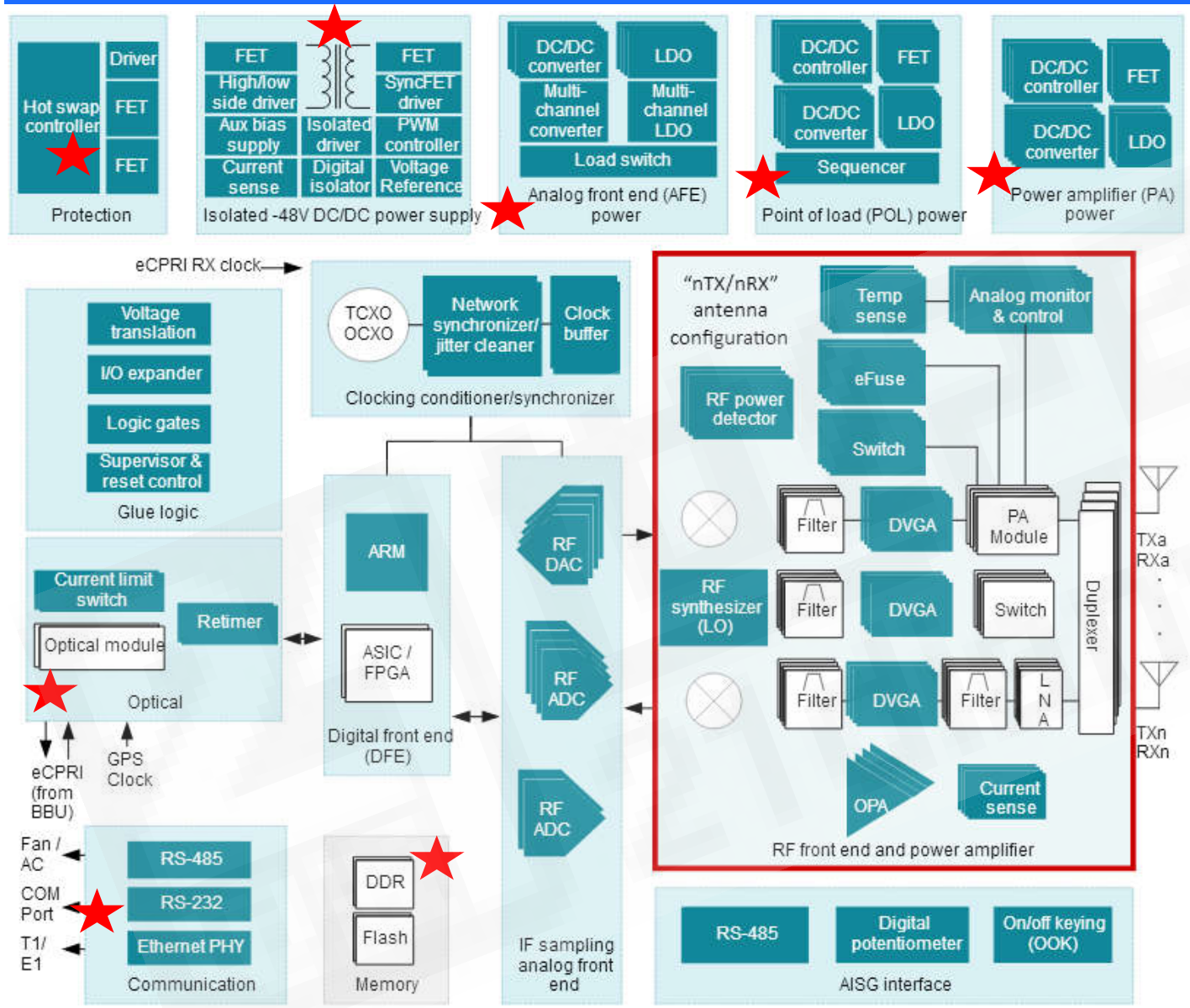

核心机房
Sever
回传
BBU
（CU+DU）
acceleration
card
前传
光模块
直放站
光缆
AAU
（RRU+
Antenna）
5G CPE
UE

System Diagram of BBU

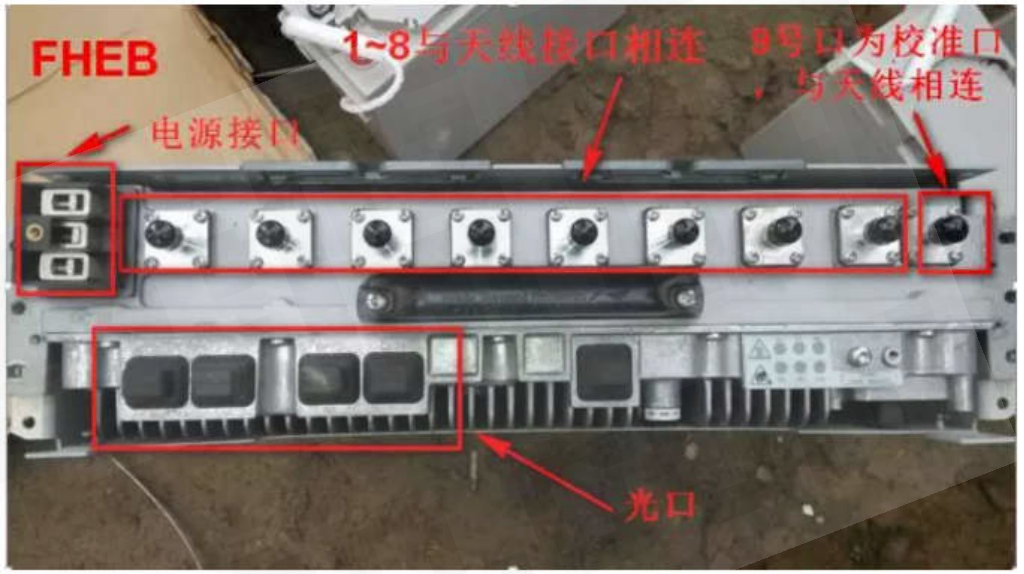


Socket	Opportunities
Isolated -48V DCDC power Supply	MP6005 or isolated module
FPGA/ASIC	high current Power module
CPU&Memory power/POL Power	Multiphase Controller+Drmos/HC buck/NB687B
Optical module	Buck/Boost/TEC control /EML Driver/E-fuse
Isolator	Interface Isolation MPQ27600
LED Control	LED Driver
Fan Control	Boost, Motor Driver, eFuse Switch

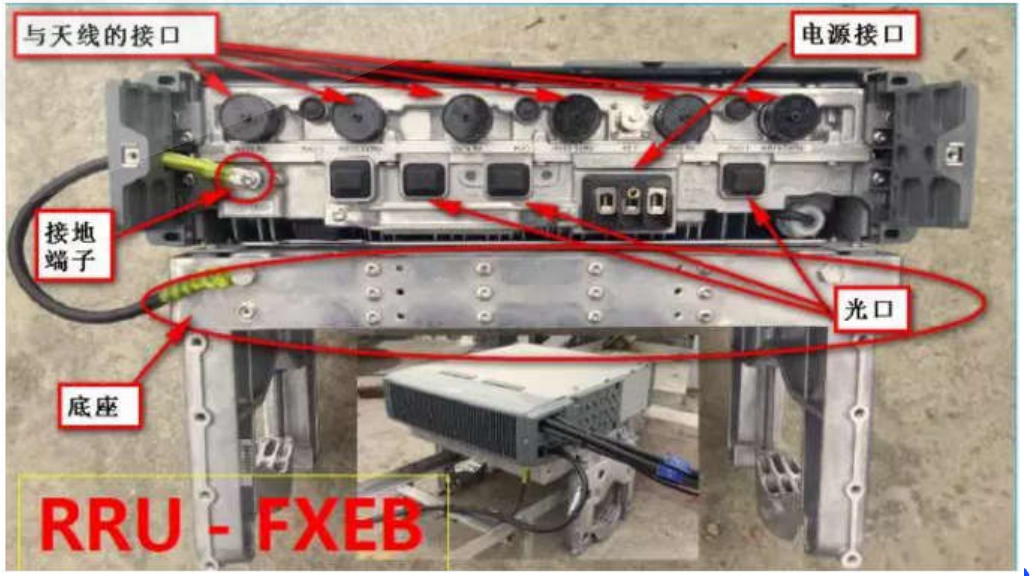
System Diagram of RRU



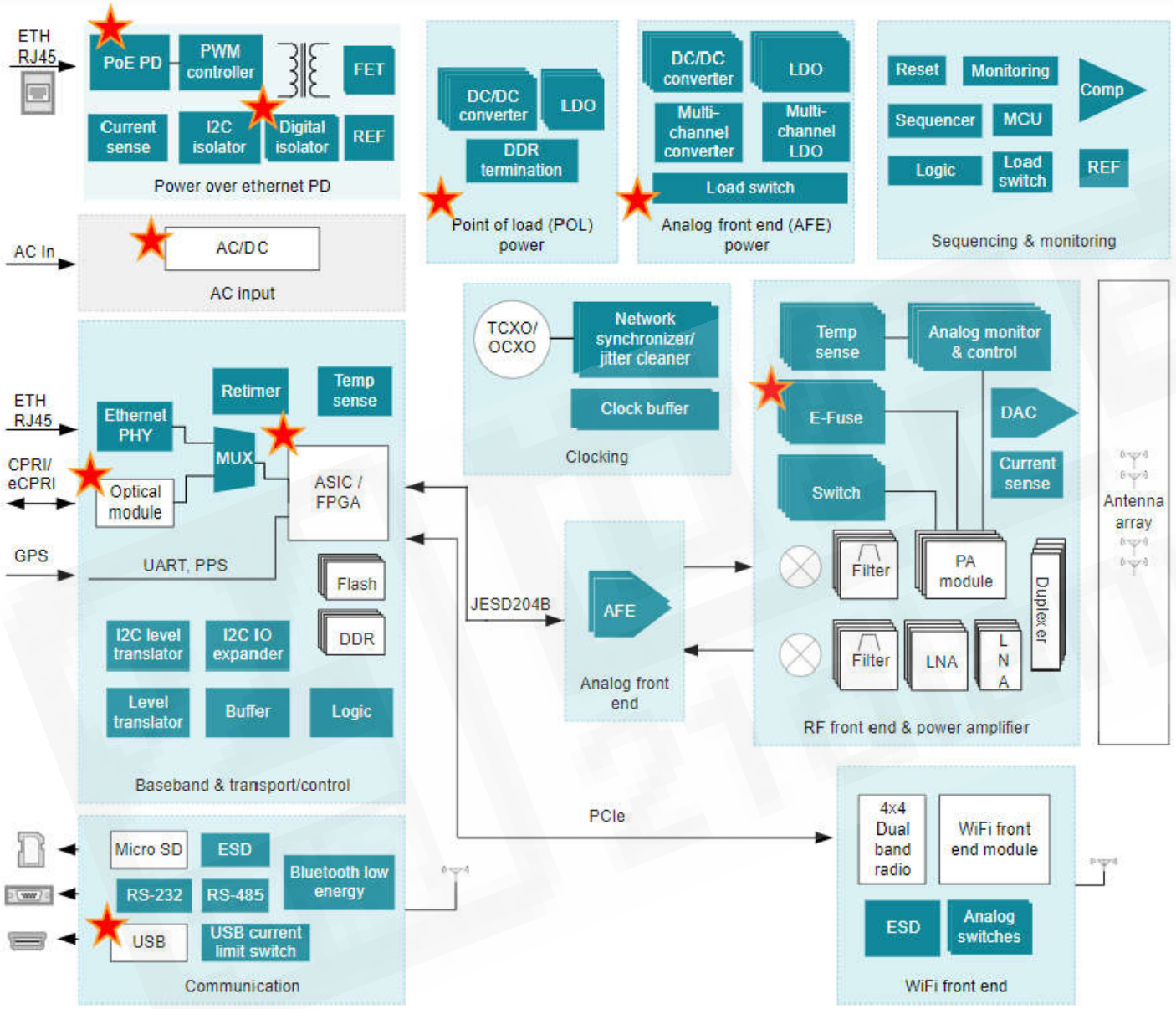
移动



电信

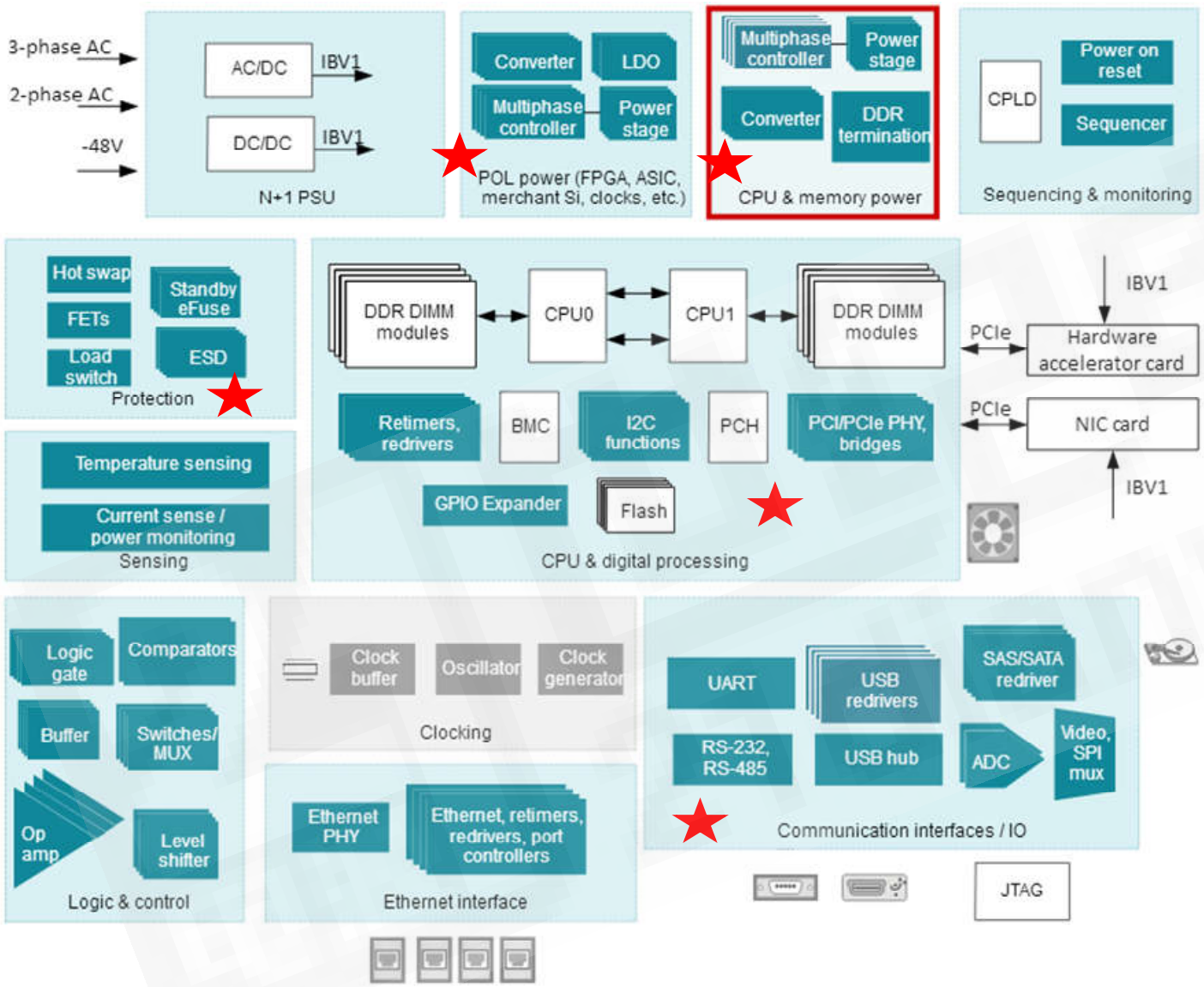


System Diagram of Pico Cell



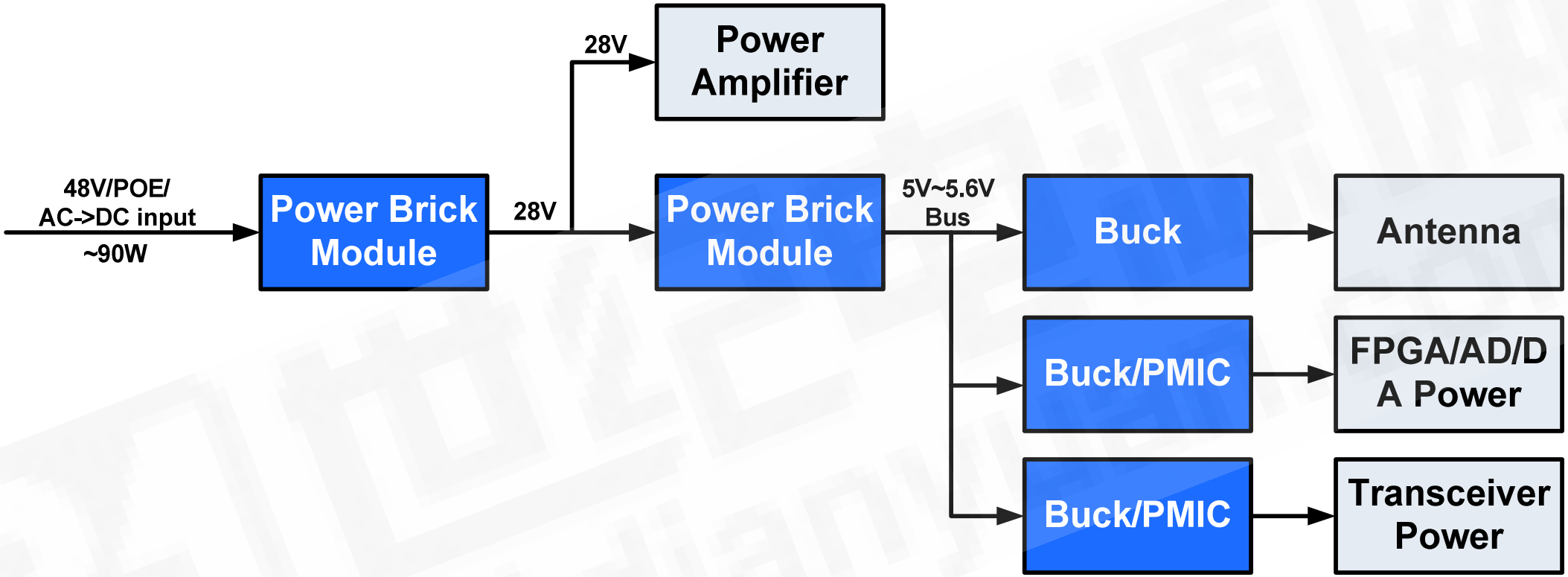
Socket	OPPs
AC/DC input	Flyback/PFC+LLC
POE	802.3at/bt POE MP8009/8030
Isolator	Interface isolation MP276xx
ASIC/Processor	Power module: MPM3695-xx/MPM82504
Optical Module	Buck/Boost/TEC control /EML Driver/E-fuse
USB port	Port controller & CLS MP5030, MP5016
E-fuse	Current limiting and monitor MP50xx
POL power	LDO:0.3A~2A, high PSRR Buck converter: Sync Modules: 1~6A, up to 18Vin
AFE Power	LDO, buck converter, buck modules, boost, load switch

System Diagram of 多路访问边缘计算 (MEC)

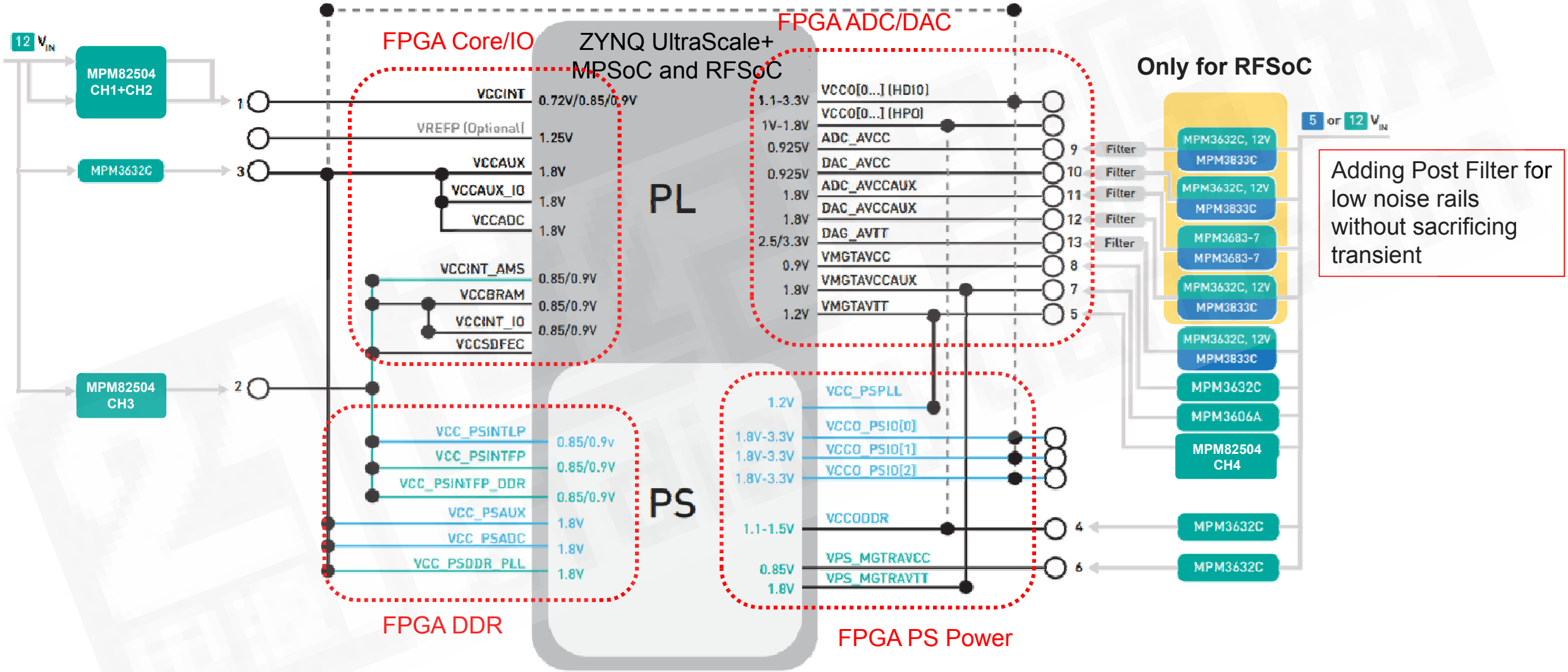


Socket	Opportunities
AC/DC input	Isolated gate driver MP188xx
CPU&Memory power/POL Power(FPGA/ASIC)	Multiphase Controller+Drmos/HC Buck or module/NB687B
FPGA/ASIC	Power module or high current buck
eFuse	MP50xx
Optical module	Buck/Boost/TEC control /EML Driver/E-fuse
Isolator	Interface Isolation MPQ27600

Small Station Basic Power Architecture



FPGA Power For Small Stations

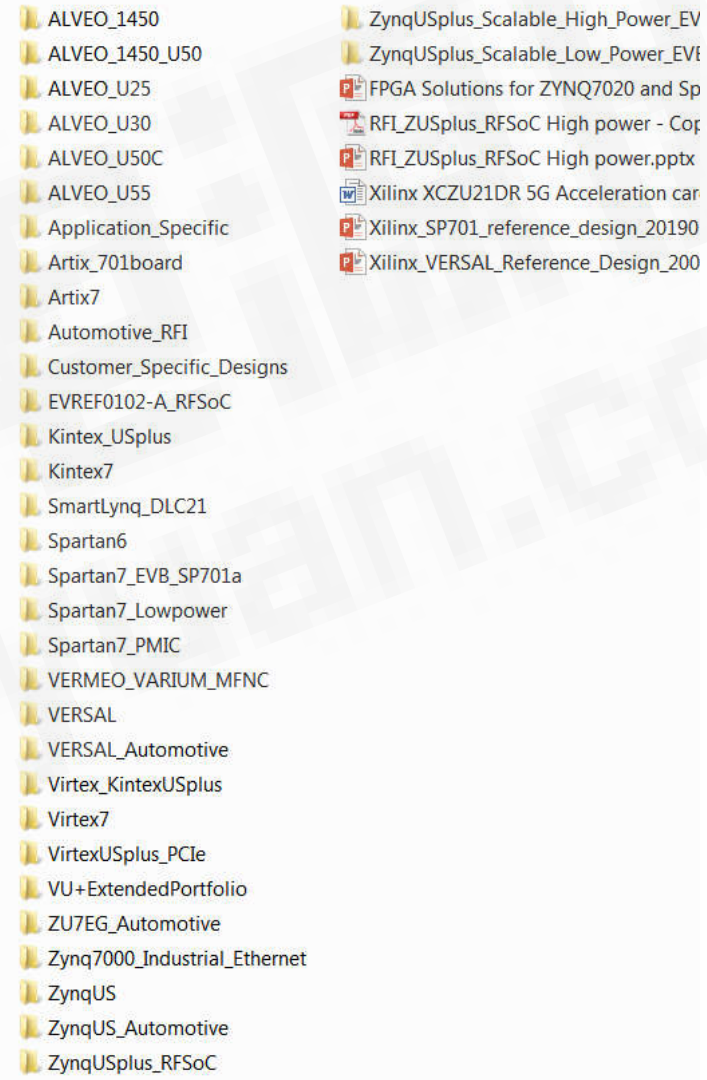


Adding Post Filter for low noise rails without sacrificing transient

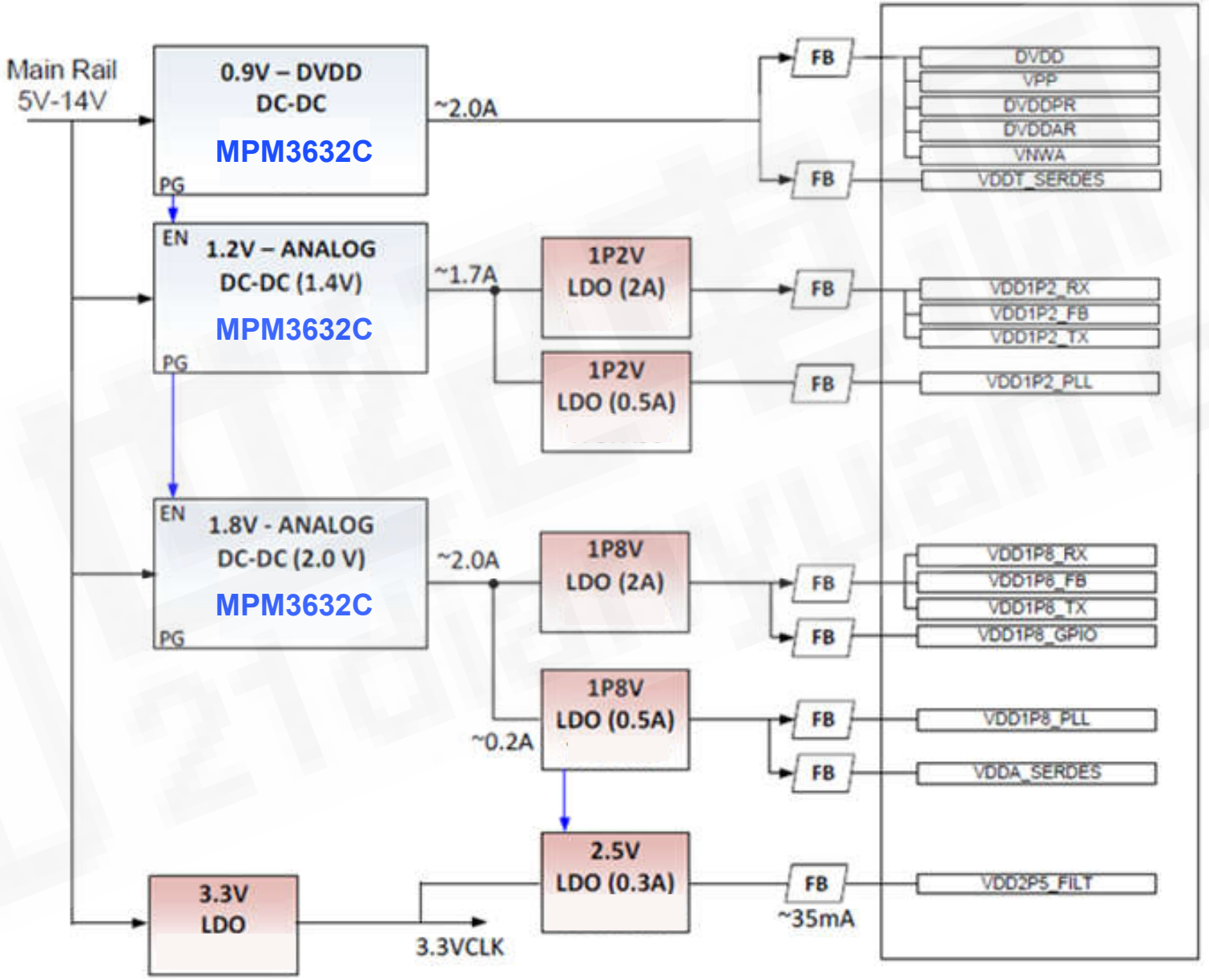
https://www.monolithicpower.com/pub/media/mps_cms_document/m/p/mps-xilinx-artcile-q1-2019-_1.pdf

FPGA/SoC Power Rails Requirement

- Multiple Power Rails (4 to 14+)
  - Core power: 0.72V/0.85V/0.9V, 3A to 180A
  - IO Power: 5-30W
  - Aux Power: 1W to 7W
  - Multi-Gigabit transceiver, HB memory, User Defined…
  - ARM core power rails
- Tight Voltage Regulation
  - DC accuracy + Ripple + Transient <±3%
  - RFSoc Requires <1mV ripple
- Power Up and Down Sequencing Needed
- High Efficiency
- Small Solution Size



Transceiver Power For Small Stations



For multiple Transceiver structure, MPM81204 can be a good fit

Power tree for 5G Small Base Station—BBU and RRU

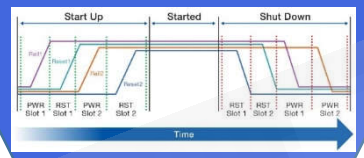
Category	Platform or Spec	MPS P/N
Power Supply	**48Vin->28V(PA)/12V/5.5V** Brick module or 60~100W POE module	**MP8020/MP8030/BT POE module** **MP6005/MP9928**
Application Processor	**NXP**:LX2080A **Intel**: Arria 10 **Xilinx**: XCZU15EG; Zynq US+ ZU9CG	**MPM3695-100—100A** **MPM82504—4*25A** **MPM3690-30B—36A** **MPM3695-25—20A continue, 25A peak;**
Baseband modem (+PMU power supply)—(For BBU, and realized by Processor(FPGA))	**Qualcomm**: FSM100X **Huawei**: Balong5000; **Intel:** XMM8160; **SAMSUNG:** Exynos 5100; **紫光展锐:** Makalu Ivy510-12nm; **MTK:** Helio M70-7nm;	**MPS Power Module**
RF receiver and transmitter—(For RRU)	**ADI**: ADRV9009/9025;	**MPM54504/MPM54304**
CLK Synchronizer	**AD9528**-3.3V power supply	**MP20051 or 2A/3A DCDC**
Ethernet Transceiver	**Broadcom**: **Marvell**: 88X3310/88E1518 **Realtek**:	**High current module power for core or 2A/3A Power module**
Antenna		**MPS Motor Driver**
Fan Control—(For BBU)		**MP6616/6650/6630H**
Isolator—(for Outdoor base station)	RJ45 isolation	**MPQ27600/MP27631**

MPS 电源模块

5G时代电源的新挑战

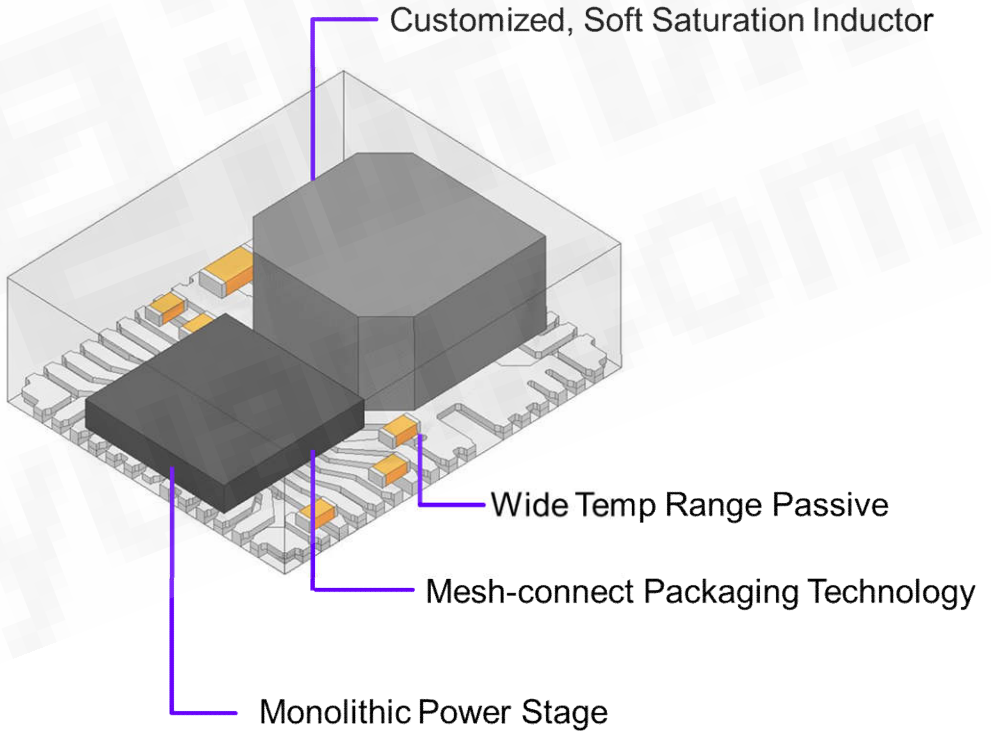
越来越短的开发周期

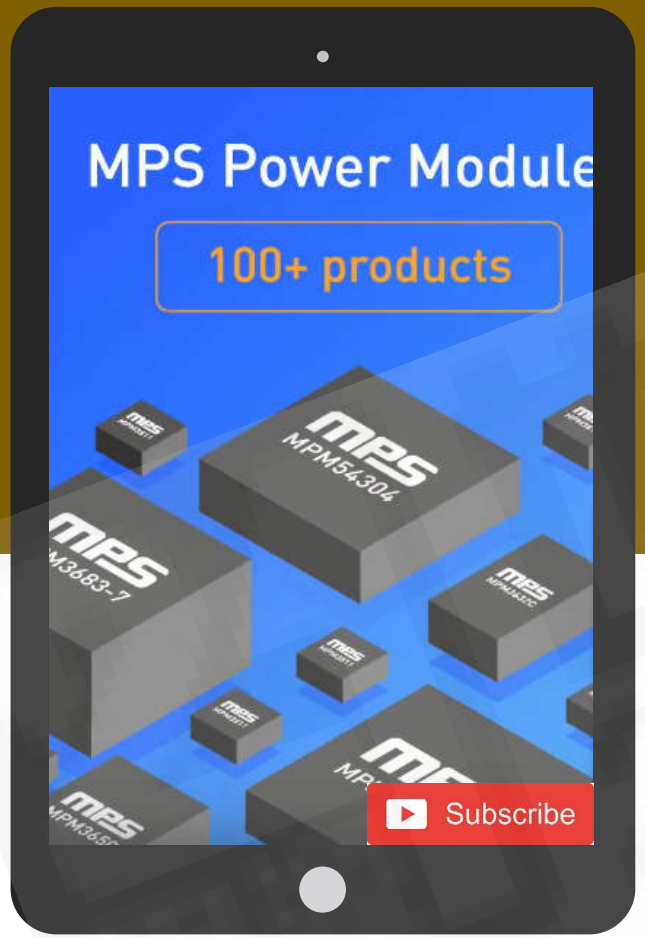
复杂的多路电源轨系统



更紧凑的设计
更高的功率密度

严格的EMI标准

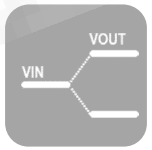




Power Module Roadmap

Single Buck

Multi-out Buck



Boost & Buck-Boost

POE

MPS Power Module Family – Single Output Buck

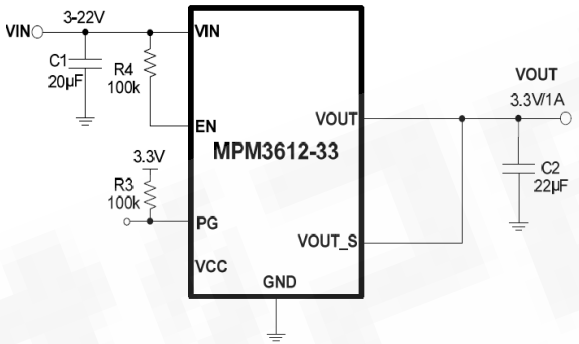
V_{IN} \ I_{OUT}	≤0.6A	1-1.2A	2A	3A	4-5A	6-8A	10A	15A	20A	50A	100A
Wide VIN (≤75V)	**MPM3570E** 10x10x4mm 75V, Low EMI			**MPM3530** 10x12x4mm 55V, Parallel							
High Voltage (≤45V)	**MPM3506A** 3x5x1.6mm	**MPM3510A** **MPM3515** 3x5x1.6mm	**MPM3520E** 10x10x4mm Low EMI	**MPM3593** 6x8x1.6mm I2C, Low EMI	**MPM3550E** 12x12x4mm Low EMI	**MPM3596** 10x10x4mm I2C,Low EMI, Parallel, Telemetry					
Medium Voltage (≤24V)		NEW **MPM3612** 3x3x2mm Low Iq, -33		NEW **MPM3632S** 3x3x2mm CCM	NEW **MPM3650** 4x6x1.6mm	**MPM3683-7** 7x4x4mm	**MPM3695-10** 8x8x2mm I2C, Parallel, Telemetry		**MPM3695-25** 10x12x4mm I2C, Parallel, Telemetry		NEW **MPM3695-100** 15x30x5mm I2C, Parallel, Telemetry
	MPM3606/A 3x5x1.6mm	**MPM3610/A** 3x5x1.6mm	**MPM3620/A** 3x5x1.6mm	**MPM3630** 3x5x1.6mm **MPM3632C** CCM		**MPM3680** 12x12x4mm	NEW **MPM54502** 8x14x4.4mm I2C, Telemetry	**MPM3684** 12x15x4mm	**MPM3686** 12x15x4mm		
Low Input (≤6V)	**MPM3804** 2x2x0.9mm Fixed Vout	**MPM3811** 2x2x1.6mm	**MPM3822C** 2.5x3.5x1.6mm CCM	**MPM3833C** 2.5x3.5x1.6mm CCM		NEW **MPM3860** 4x6x1.6mm CCM					
	MPM3805 3x2.5x0.9mm Fixed Vout	**MPM3810** 3x2.5x0.9mm	**MPM3820** 3x5x1.6mm	**MPM3830** 3x5x1.6mm	**MPM3840** 3x5x1.6mm						

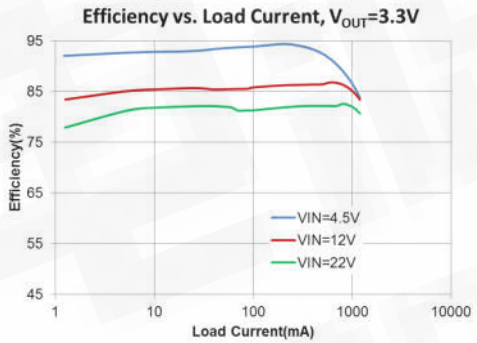
Multiple Output Buck

V_{IN} \ I_{OUT}	1A	2A	3A	5A	12A	25A
High Voltage (≤45V)			**MPM3596** 10x10x4.4mm 2x3A, I2C, Parallel, Telemetry			
Medium Voltage (≤16V)	Four-Output		NEW **MPM54304** 7x7x5.2mm 2x3A+2x2A, I2C, Parallel	NEW **MPM54504** 9x15x5.2mm 4x5A	NEW **MPM81204** 9.5x16x5.2mm 2x12A + 2x5A	NEW **MPM82504** 15x30x5.2mm 4x25A, I2C, Parallel, Telemetry
	Dual-Output			NEW **MPM54502** 8x14x4.4mm 22V, 2x5A, I2C, Parallel, Telemetry		NEW **MPM3690-50A** 16x16x5.2mm 2x25A, I2C, Parallel, Telemetry
Low Input (≤6V)	**MPM38111** 4x4x1.6mm 2x1A	**MPM3822** 4x4x1.6mm 2x2A				

MPS Power Module Family – Single Output Buck

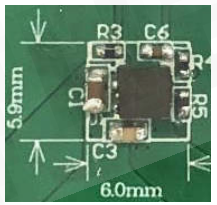
V_{IN} \ I_{OUT}	≤0.6A	1-1.2A	2A	3A	4-5A	6-8A	10A	15A	20A	36A	100A
Wide VIN (≤75V)	**MPM3570E** 10x10x4mm 75V, Low EMI										
High Voltage (≤45V)	**MPM3506A** 3x5x1.6mm	**MPM3510A** **MPM3515** 3x5x1.6mm	MP								
Medium Voltage (≤24V)		NEW MPM361 3x3x2mm Low Iq, -33							PM3695-25 10x12x4mm I2C, Parallel, Telemetry		NEW MPM3695-100 15x30x5mm I2C, Parallel, Telemetry
	MPM3606/A 3x5x1.6mm	**MPM3610/A** 3x5x1.6mm	MPM36 3x5x1.6						MPM3686 12x15x4mm		
Low Input (≤6V)	**MPM3804** 2x2x0.9mm Fixed Vout	**MPM3811** 2x2x1.6mm	MPM38 2.5x3.5x1 CCM								
	MPM3805 3x2.5x0.9mm Fixed Vout	**MPM3810** 3x2.5x0.9mm	MPM3 3x5x1.6								





Features and Benefits

- Wide Input Range: 3V to 22V
- 0.6V to 12V Output Voltage
  - Fixed 3.3V output option
- Ultra Low IQ: 5µA
- 1A Continuous Current
- ±1.5% Total Output Voltage Regulation
- Small 3x3x2mm Package
- COT Control, Ultra Fast Transient
- Max 98% duty cycle

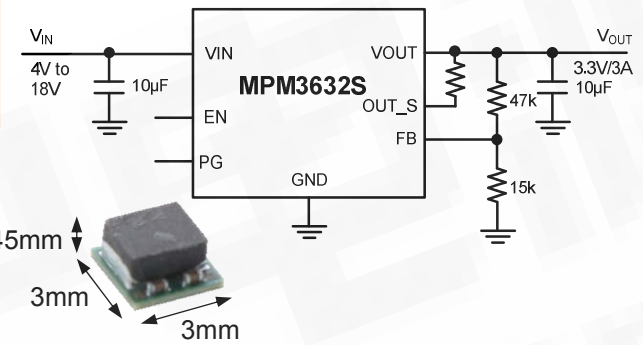


Applications

- Server PSU
- MCU and DSP Power
- Space limited Applications

MPS Power Module Family – Single Output Buck

V_{IN} \ I_{OUT}	≤0.6A	1-1.2A	2A	3A	4-5A	6-8A	10A	15A	20A	36A	100A
Wide VIN (≤75V)	**MPM3570E** 10x10x4mm 75V, Low EMI			**MPM3550** 10x12x4mm 55V, Parallel							
High Voltage (≤45V)	**MPM3506A** 3x5x1.6mm	**MPM3510A MPM3515** 3x5x1.6mm	**MPM3520E** 10x10x4mm Low EMI	**mEZD2596** 11x15x4mm Low EMI	MPM						
Medium Voltage (≤24V)		NEW **MPM3612** 3x3x2mm Low Iq, -33		NEW **MPM3632S** 3x3x2mm CCM	MPM365 4x6x1.6mm				**MPM3695-25** 10x12x4mm I2C, Parallel, Telemetry		NEW **MPM3695-100** 15x30x5mm I2C, Parallel, Telemetry
	MPM3606/A 3x5x1.6mm	**MPM3610/A** 3x5x1.6mm	**MPM3620/A** 3x5x1.6mm	**MPM3650** 3x5x1.6mm **MPM3632C** CCM					**MPM3686** 12x15x4mm		
Low Input (≤6V)	**MPM3804** 2x2x0.9mm Fixed Vout	**MPM3811** 2x2x1.6mm	**MPM3822C** 2.5x3.5x1.6mm CCM	**MPM3833C** 2.5x3.5x1.6mm CCM							
	MPM3805 3x2.5x0.9mm Fixed Vout	**MPM3810** 3x2.5x0.9mm	**MPM3820** 3x5x1.6mm	**MPM3850** 3x5x1.6mm	MPM38 3x5x1.6mm						

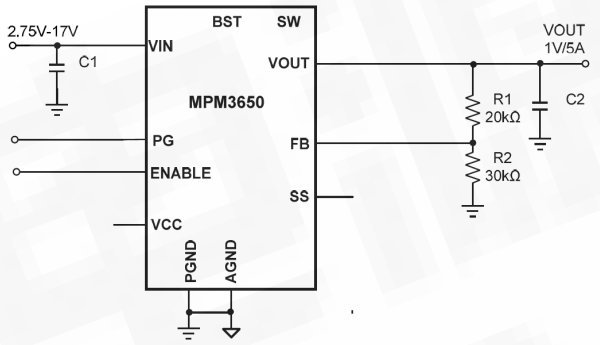


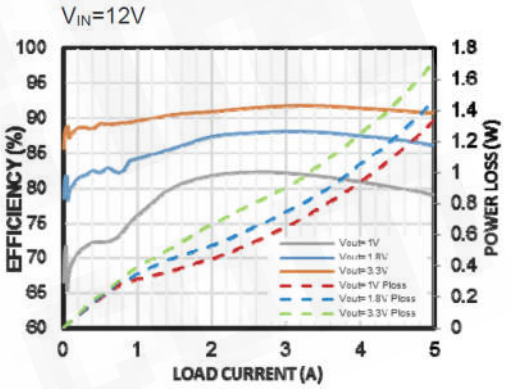
Features and Benefits

- Thin 3x3x1.45mm Package
- ECP (Embedded Chip Package)
- Input Range: 4V to 18V
- 0.6V to 5.5V Output Voltage
- 3A Continuous Current
- 2.2MHz Switching Frequency
- Forced CCM, Ultra Fast Transient
- ±1.5% Total Output Voltage Regulation
- Thin 3x3x1.45mm Package

MPS Power Module Family – Single Output Buck

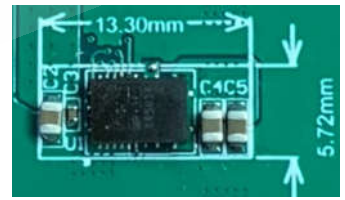
V_{IN} \ I_{OUT}	≤0.6A	1-1.2A	2A	3A	4-5A
Wide VIN (≤75V)	MPM3570E 10x10x4mm 75V, Low EMI			MPM3550 10x12x4mm 55V, Parallel	
High Voltage (≤45V)	MPM3506A 3x5x1.6mm	MPM3510A MPM3515 3x5x1.6mm	MPM3520E 10x10x4mm Low EMI	mEZD2596 11x15x4mm Low EMI	MPM3550E 12x12x4mm Low EMI
Medium Voltage (≤24V)		NEW MPM3612 3x3x2mm Low Iq, -33		NEW MPM3632S 3x3x2mm CCM	MPM3650 4x6x1.6mm
	MPM3606/A 3x5x1.6mm	MPM3610/A 3x5x1.6mm	MPM3620/A 3x5x1.6mm	MPM3650 3x5x1.6mm MPM3632C CCM	
Low Input (≤6V)	MPM3804 2x2x0.9mm Fixed Vout	MPM3811 2x2x1.6mm	MPM3822C 2.5x3.5x1.6mm CCM	MPM3833C 2.5x3.5x1.6mm CCM	
	MPM3805 3x2.5x0.9mm Fixed Vout	MPM3810 3x2.5x0.9mm	MPM3820 3x5x1.6mm	MPM3850 3x5x1.6mm	MPM380 3x5x1.6mm





Features and Benefits

- Wide Input Range: 2.75V to 17V
- 0.6V to 1.8V Output Voltage 6A
- 3.3V to 5.5V Output Voltage 5A
- Forced CCM for Low Voltage Ripple
- Fixed 1.2MHz Switching Frequency
- ±1.5% Total Output Voltage Regulation
- Small 4x6x1.6mm Package
- COT Control, Ultra Fast Transient



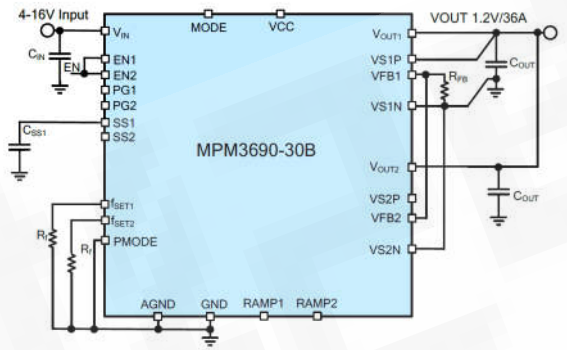
Applications

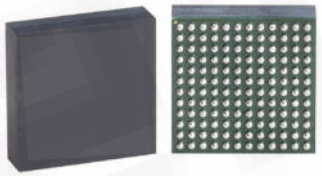
- FPGA/ASIC Power
- Acceleration Card
- Test Equipment

MPS Power Module Family – Single Output Buck

V_{IN} \ I_{OUT}	≤0.6A	1-1.2A	2A	3A	4-5A	6-8A	10A	15A	20A	36A	100A
Wide VIN (≤75V)	MPM3570E 10x10x4mm 75V, Low EMI										
High Voltage (≤45V)	MPM3506A 3x5x1.6mm	MPM3510A MPM3515 3x5x1.6mm	MPM3520E 10x10x4mm Low EMI								
Medium Voltage (≤24V)		NEW MPM3612 3x3x2mm Low Iq, -33							0x12x4mm C, Parallel, Telemetry	NEW M3690-50B 16x16x5mm I2C, Parallel, Telemetry	NEW MPM3695-100 15x30x5mm I2C, Parallel, Telemetry
	MPM3606/A 3x5x1.6mm	MPM3610/A 3x5x1.6mm	MPM3620/A 3x5x1.6mm						PM3686 2x15x4mm		
Low Input (≤6V)	MPM3804 2x2x0.9mm Fixed Vout	MPM3811 2x2x1.6mm	MPM3822C 2.5x3.5x1.6mm CCM								
	MPM3805 3x2.5x0.9mm Fixed Vout	MPM3810 3x2.5x0.9mm	MPM3820 3x5x1.6mm								

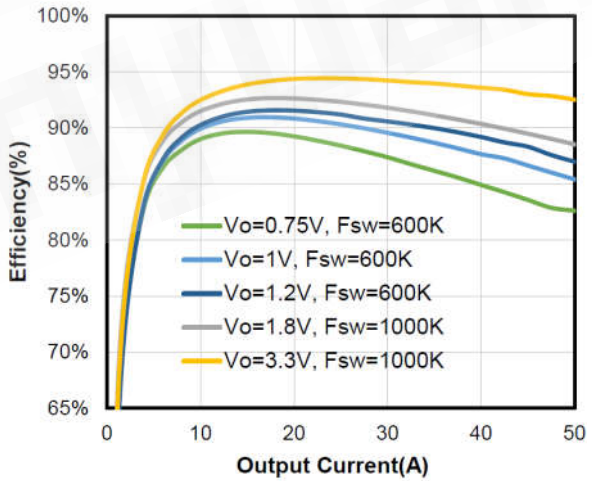
Interleaved Operation at 1.2V, 36A





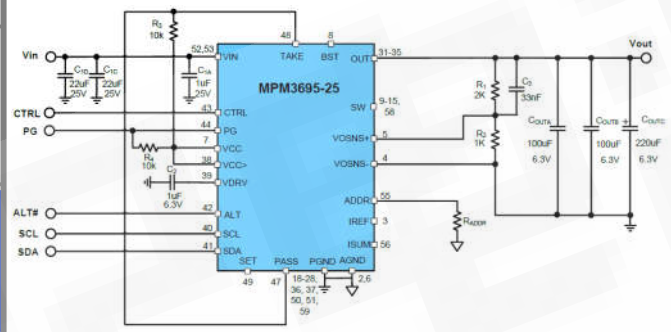
Features and Benefits

- 3V to 16V Input Range
- 0.6V to 3.3V Output Voltage
- Dual 18A or Single 36A
- Ultra Fast Transient
- Ext SS, FREQ pins
- 91% Peak Efficiency 12V->1V
- 16x16x5.18mm BGA Package



MPS Power Module Family – Single Output Buck

V_{IN} \ I_{OUT}	≤0.6A	1-1.2A	2A	3A	4-5A	6-8A	10A	15A	20A	50A	100A
Wide VIN (≤75V)	**MPM3570E** 10x10x4mm 75V, Low EMI			**MPM3550** 10x12x4mm 55V, Parallel							
High Voltage (≤45V)	**MPM3506A** 3x5x1.6mm	**MPM3510A MPM3515** 3x5x1.6mm	**MPM3520E** 10x10x4mm Low EMI	**mEZD2596** 11x15x4mm Low EMI							
Medium Voltage (≤24V)		NEW **MPM3612** 3x3x2mm Low Iq, -33		NEW **MPM3632S** 3x3x2mm CCM					**MPM3695-25** 10x12x4mm I2C, Parallel, Telemetry		NEW **MPM3695-100** 15x30x5mm I2C, Parallel, Telemetry
	MPM3606/A 3x5x1.6mm	**MPM3610/A** 3x5x1.6mm	**MPM3620/A** 3x5x1.6mm	**MPM3650** 3x5x1.6mm **MPM3632C** CCM				**M3684** 5x4mm	**MPM3686** 12x15x4mm		
Low Input (≤6V)	**MPM3804** 2x2x0.9mm Fixed Vout	**MPM3811** 2x2x1.6mm	**MPM3822C** 2.5x3.5x1.6mm CCM	**MPM3833C** 2.5x3.5x1.6mm CCM							
	MPM3805 3x2.5x0.9mm Fixed Vout	**MPM3810** 3x2.5x0.9mm	**MPM3820** 3x5x1.6mm	**MPM3850** 3x5x1.6mm							

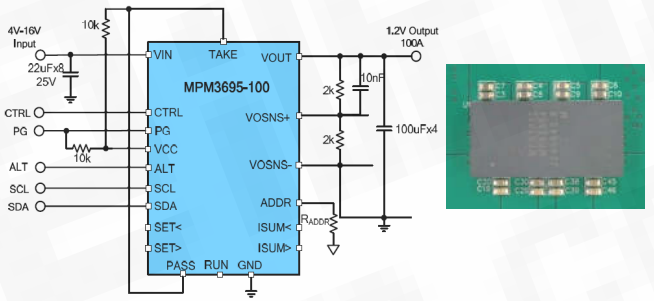


Features and Benefits

- 3V to 16V Input Range
- 0.5V to 5.5V Output Voltage
- Continuous 20A (Peak 25A)
- Parallel up to 120A(up to 6Phase)
- PMBus 1.3 Compliant
- Ultra Fast Transient (COT)
- 90% Peak Efficiency 12V->1V
- 10mm*12mm*4mm QFN-59 Package
- Videos

MPS Power Module Family – Single Output Buck

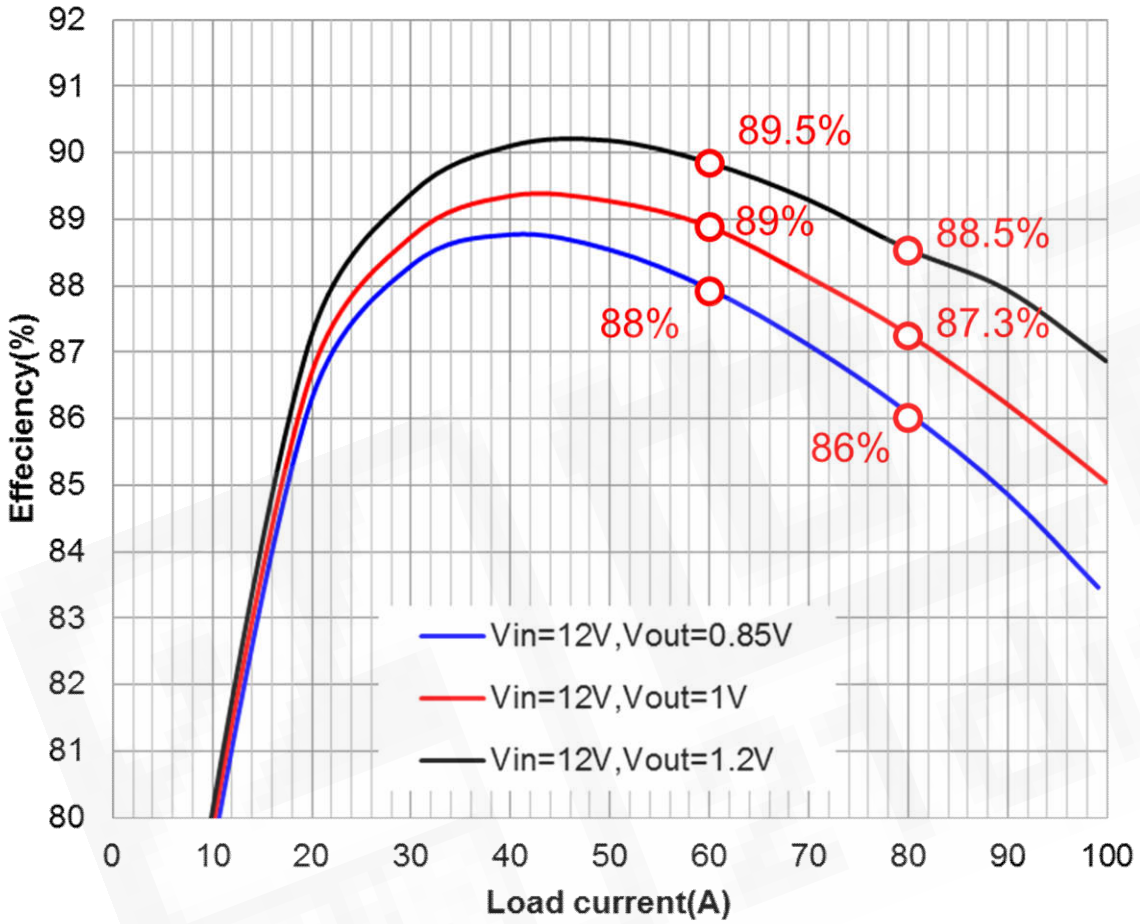
V_{IN} \ I_{OUT}	≤0.6A	1-1.2A	2A	3A	4-5A	6-8A	10A	15A	20A	50A	100A
Wide VIN (≤75V)	**MPM3570E** 10x10x4mm 75V, Low EMI			**MPM3550** 10x12x4mm 55V, Parallel							
High Voltage (≤45V)	**MPM3506A** 3x5x1.6mm	**MPM3510A MPM3515** 3x5x1.6mm	**MPM3520E** 10x10x4mm Low EMI	**mEZD2596** 11x15x4mm Low EMI	**MPM3550E** 12x12x4mm Low EMI	**MPM3596** 10x10x4mm I2C,Low EMI, Parallel, Telemetry					
Medium Voltage (≤24V)		NEW **MPM3612** 3x3x2mm Low Iq, -33		NEW **MPM3632S** 3x3x2mm CCM	NEW **MPM3650** 4x6x1.6mm	**MPM3683-7** 7x4x4mm					NEW **MPM3695-100** 15x30x5mm I2C, Parallel, Telemetry
	MPM3606/A 3x5x1.6mm	**MPM3610/A** 3x5x1.6mm	**MPM3620/A** 3x5x1.6mm	**MPM3650** 3x5x1.6mm **MPM3632C** CCM		**MPM3680** 12x12x4mm					
Low Input (≤6V)	**MPM3804** 2x2x0.9mm Fixed Vout	**MPM3811** 2x2x1.6mm	**MPM3822C** 2.5x3.5x1.6mm CCM	**MPM3833C** 2.5x3.5x1.6mm CCM		NEW **MPM3860** 4x6x1.6mm CCM					
	MPM3805 3x2.5x0.9mm Fixed Vout	**MPM3810** 3x2.5x0.9mm	**MPM3820** 3x5x1.6mm	**MPM3850** 3x5x1.6mm	**MPM380** 3x5x1.6mm						



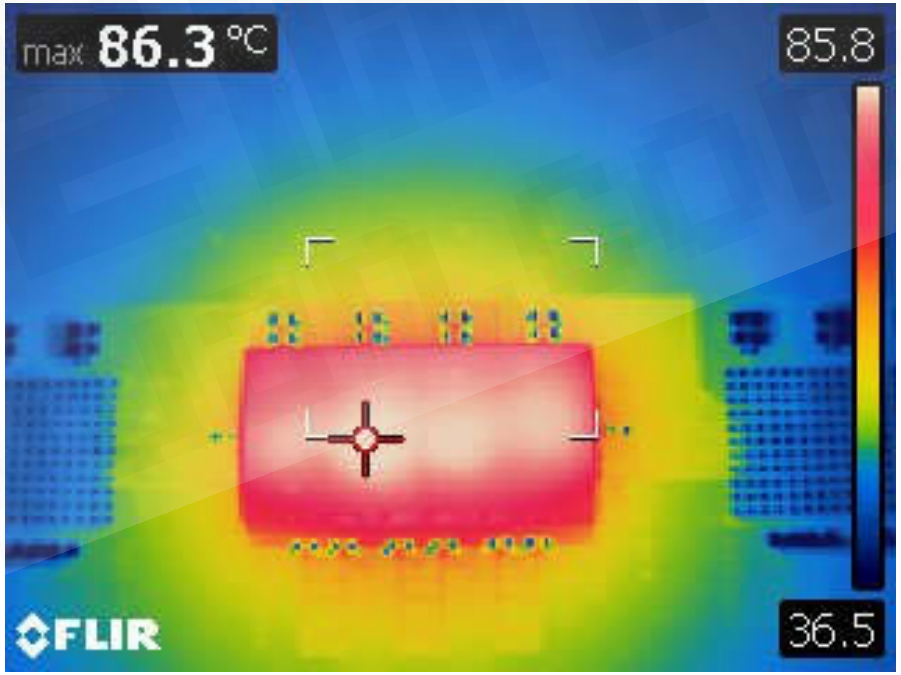
Features and Benefits

- 3V to 16V Input Range
- 0.5V to 3.3V Output Voltage
- Continuous 100A (60A for 3.3V_{OUT})
- Parallel up to 800A
- PMBus 1.3 Compliant
- 4-Phase Power stage in one module
- Ultra Fast Transient
- 90% Peak Efficiency 12V->1V
- 15x30x5.18mm BGA Package
- Videos

MPM3695-100 Efficiency & Thermal



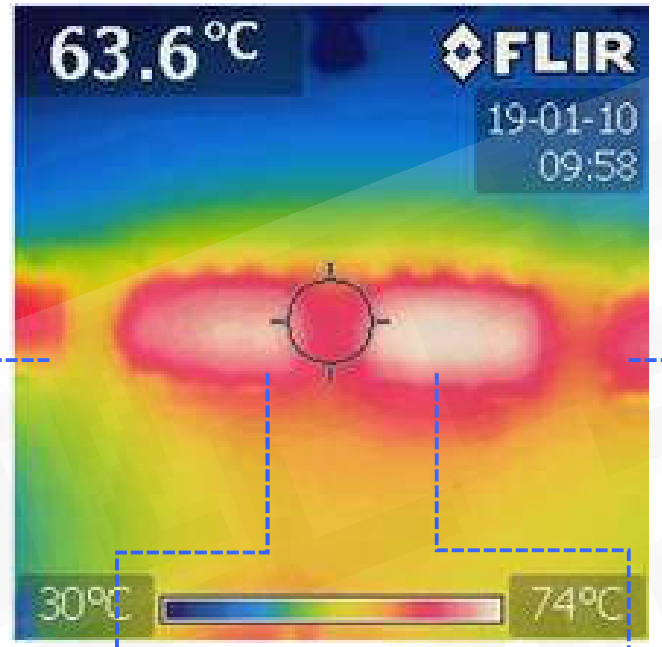
12V Input, 1.0V Output, 80A,
No Forced Airflow, 25°C Ambient



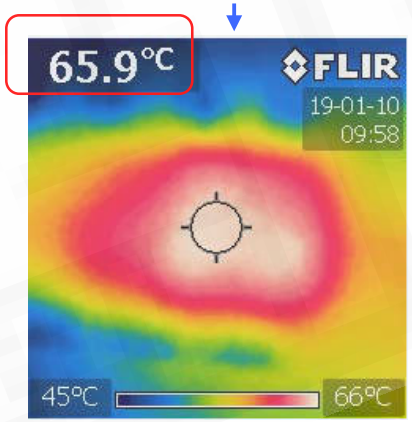
Single module operation

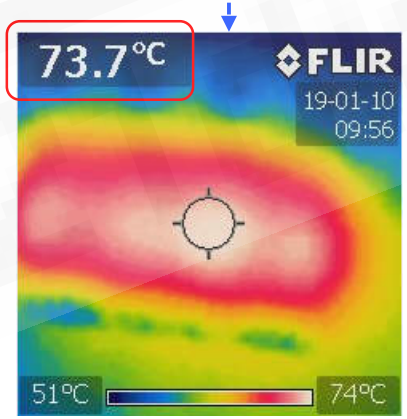
Thermal Test

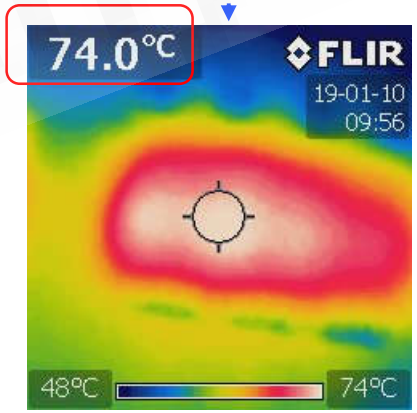
Test Condition:
12V Input
0.85V Output
320A Continuous Current
18°C Ambient Temp
4xMPM3695-100
0.5m/S Air Flow

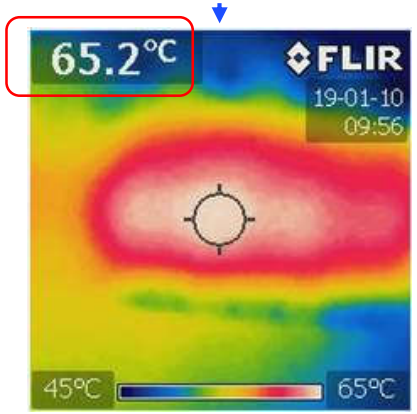


4-Module Picture





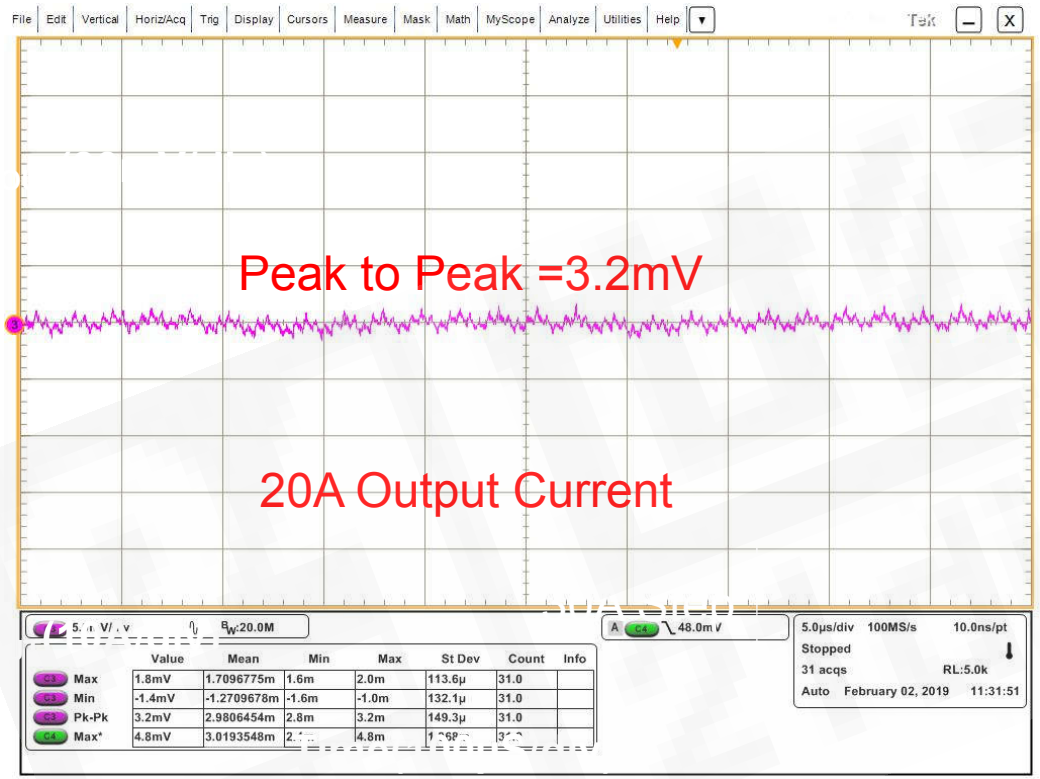


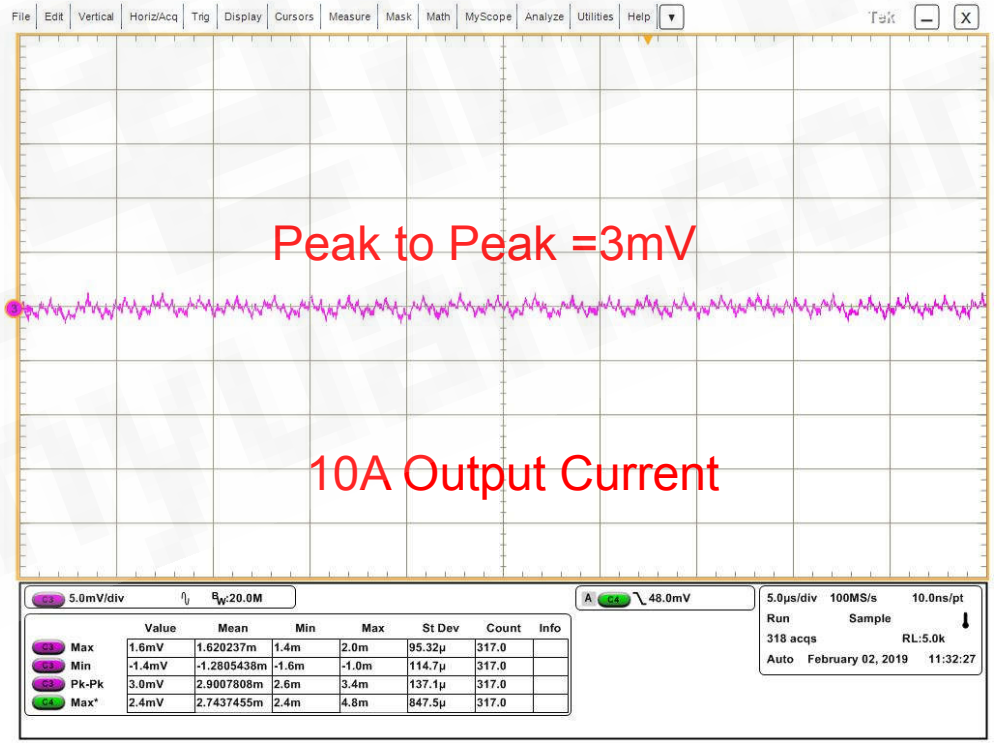


Steady State Ripple – Single Phase

12V Input, 1V Output,
COUT = 6x47µF + 1x220µF SP-CAP

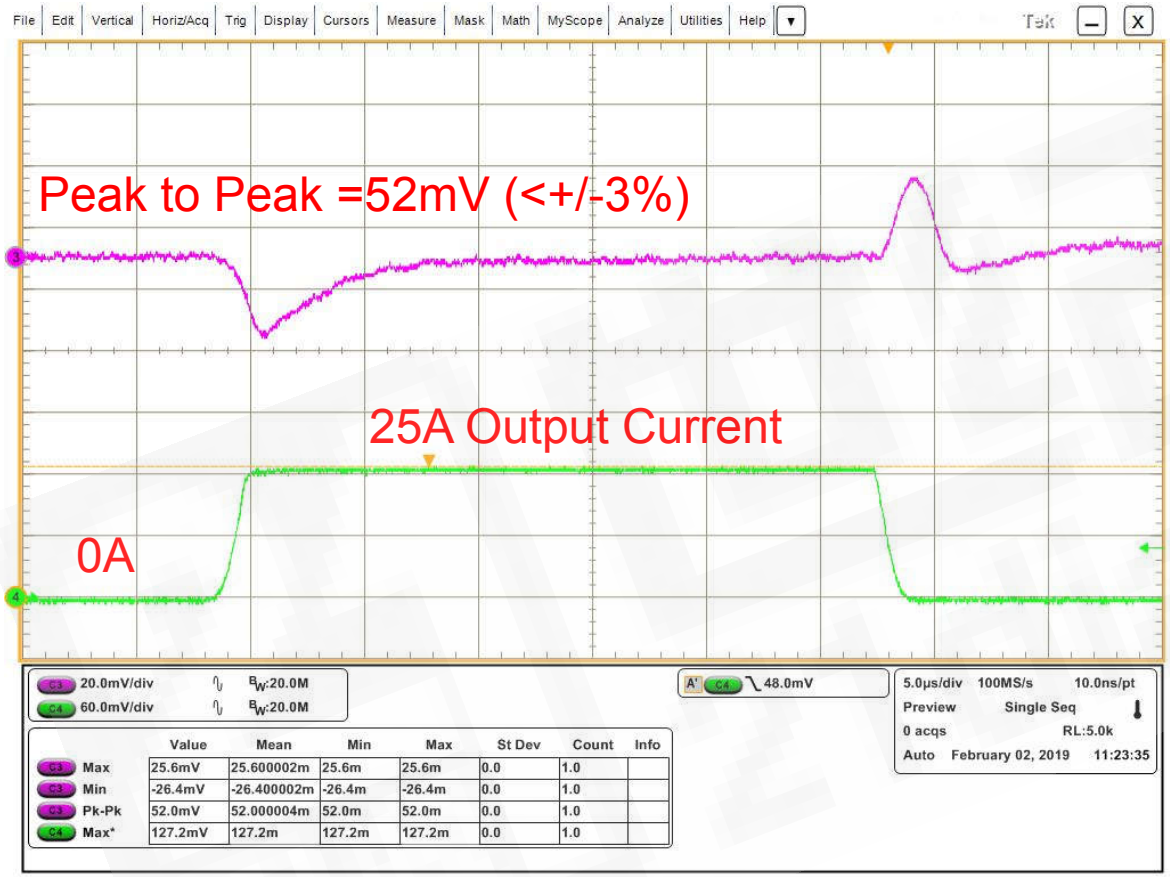
Achieves >70% output capacitance reduction compared to competing power modules

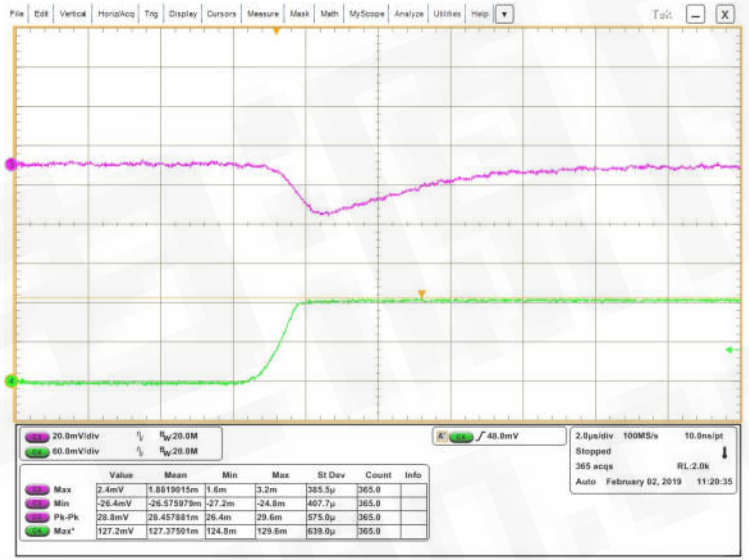


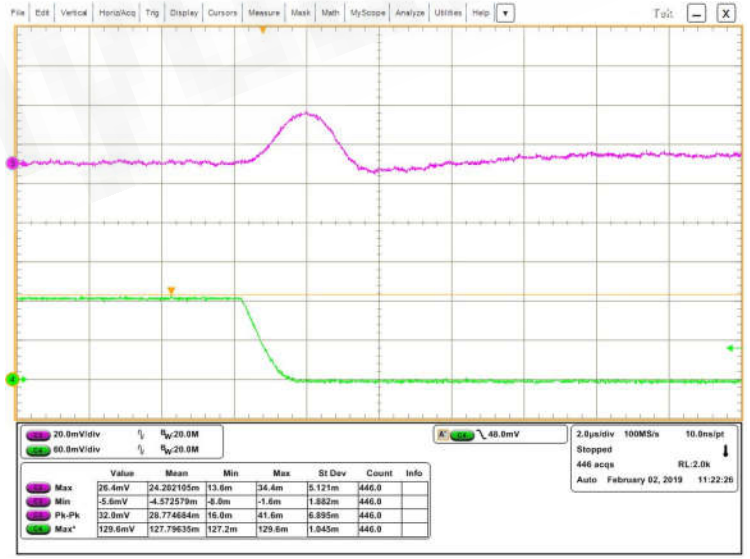


Load Transient Performance – Single Phase

12V Input, 1V Output, 0A-25A Step (25%), 10A/us
COUT = 6x47µF + 1x220µF SP-CAP

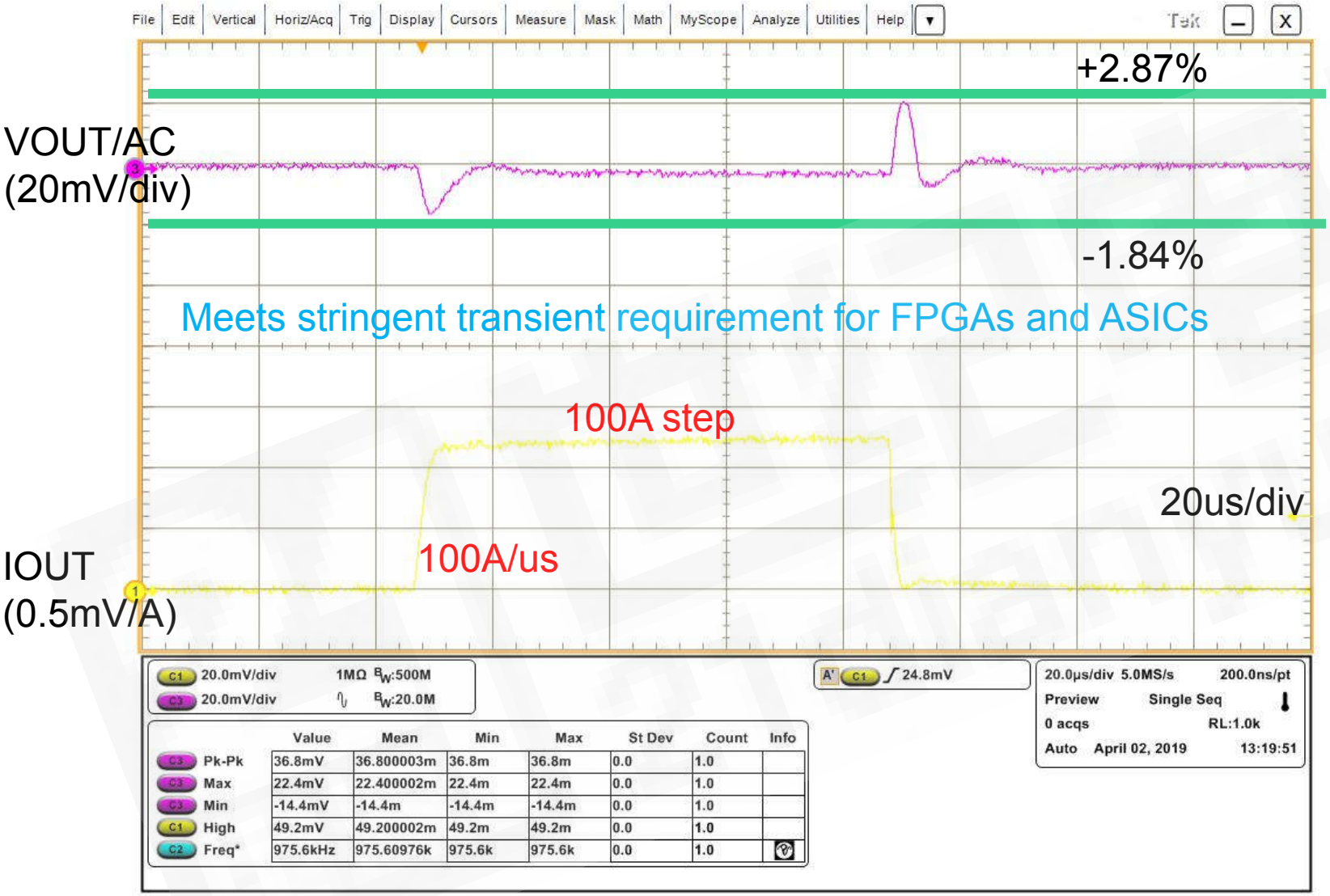






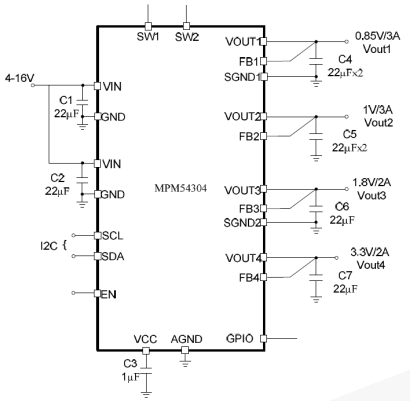
Achieves >70% output capacitance reduction compared to competing power modules

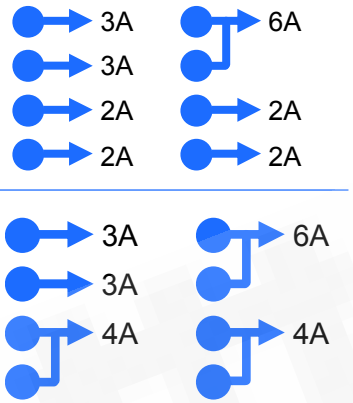
100A Transient in 1 Micro Second – 2xMPM3695-100



Parameter	Value
Number of power modules	2
Maximum output current	200A
Ceramic output capacitor	47uFx16 per module 6.3V 0805
SP-Cap output capacitor	220uFx8 total
Input voltage	12V
Output voltage	0.78V

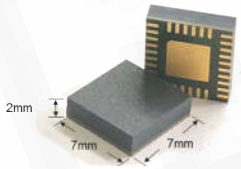
Multiple Output Buck





Features and Benefits

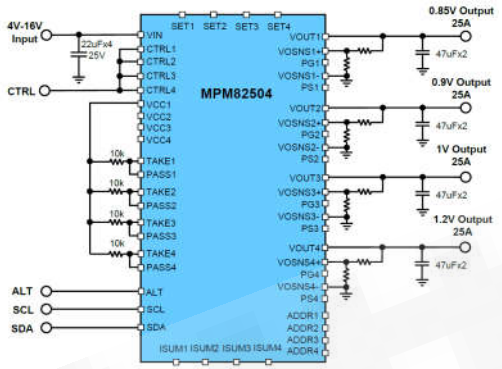
- Ease of Use; Small Size; Sequence
- Quad Output Power Module with I2C
- Only 5 External Components needed
- 4V to 16V Input Range
- 0.55V to 7V Output Voltage
- Dual 3A + Dual 2A
  - 6A + 4A Configurable
- Built-in Power On/Off Sequence
- 7x7x2mm LGA Package

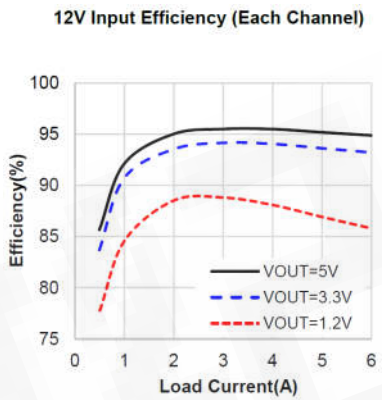


I_{OUT}	1A	2A	3A	5A	12A	25A
			MPM3596 10x10x4.4mm 2x3A, I2C, Parallel, Telemetry			
			NEW MPM54304 7x7x5.4mm 2x3A+2x2A, I2C, Parallel	NEW MPM54504 9x15x5.4mm 4x5A, I2C, Parallel	NEW MPM81204 9.5x16x5.4mm 2x12A + 2x5A	NEW MPM82504 15x30x5.4mm 4x25A, I2C, Parallel, Telemetry
				NEW MPM54502 8x14x4.4mm 22V, 2x5A, I2C, Parallel, Telemetry		NEW MPM3690-30A 16x16x5.4mm 2x25A, I2C, Parallel, Telemetry
			3822 6mm A			

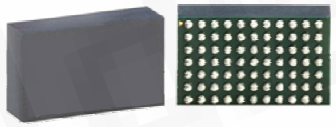
Multiple Output Buck

V_{IN} \ I_{OUT}	5A	12A	25A
High Voltage (≤45V)			
Medium Voltag (≤16V)	MPM54504 9x15x5.2mm 4x5A NEW MPM54502 8x14x4.4mm 22V, 2x5A, I2C, Parallel, Telemetry NEW	MPM81204 9.5x16x5.2mm 2x12A + 2x5A NEW	MPM82504 15x30x5.2mm 4x25A, I2C, Parallel, Telemetry NEW MPM3690-50A 16x16x5.2mm 2x25A, I2C, Parallel, Telemetry NEW
Low Input (≤6V			





5A
5A
5A
5A

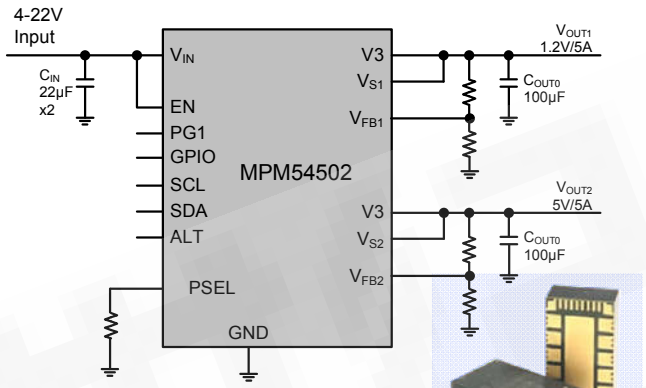


Features and Benefits

- Quad 5A Power Module
- 3.3V to 16V Input Range
- 0.5V to 5V Output Voltage
- Quad 5A Continuous
  - Peak 6A
- 9x15x5.18mm BGA Package

Multiple Output Buck

V_{IN} \ I_{OUT}	1A	2A	3A	5A	12A	25A
High Voltage (≤45V)						
Medium Voltage (≤16V)	Four-Outp			NEW **MPM54504** 9x15x5.2mm 4x5A	NEW **MPM81204** 9.5x16x5.2mm 2x12A + 2x5A	NEW **MPM82504** 15x30x5.2mm 4x25A, I2C, Parallel, Telemetry
	Dual-Outp			NEW **MPM54502** 8x14x4.4mm 22V, 2x5A, I2C, Parallel, Telemetry		NEW **MPM3690-50A** 16x16x5.2mm 2x25A, I2C, Parallel, Telemetry
Low Input (≤6V)	**MPM381** 4x4x1.6m 2x1A					

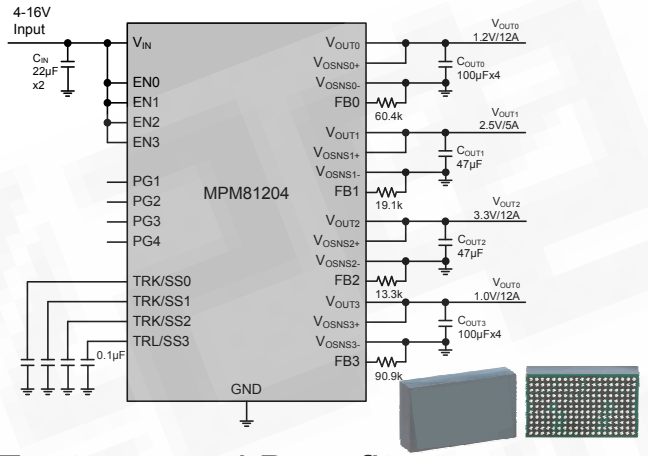


Features and Benefits

- Dual 5A, Single 10A Power Module with I2C and Telemetry
- 4V to 22V Input Range
- 0.5V to 20V Output Voltage
- PMBus 1.3
- Built-in Power On/Off Sequence
- 8x14x4.4mm LGA Package

Multiple Output Buck

V_{IN} \ I_{OUT}	1A	2A	3A	5A	12A	25A
High Voltage (≤45V)						
Medium Voltage (≤16V) — Four-Output					NEW **MPM81204** 9.5x16x5.4mm 2x12A + 2x5A	NEW **MPM82504** 15x30x5.4mm 4x25A, I2C, Parallel, Telemetry
Medium Voltage (≤16V) — Dual-Output				NEW **…502** …mm …I2C, …metry		NEW **MPM3690-30A** 16x16x5.4mm 2x25A, I2C, Parallel, Telemetry
Low Input (≤6V)	**MPM38111** 4x4x1.6mm 2x1A	**MPM382…** 4x4x1.6mm 2x2A				

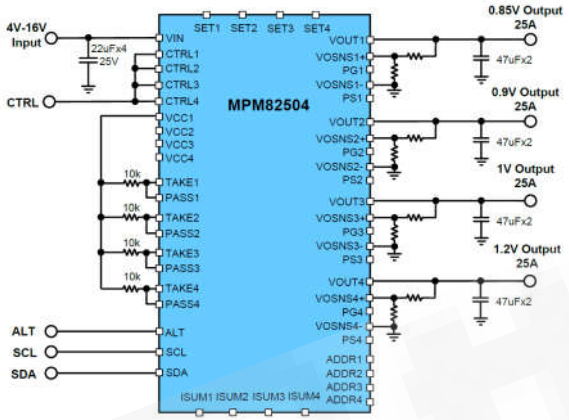


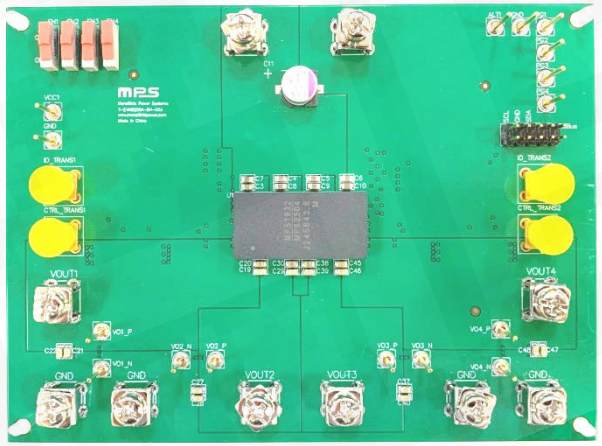
Features and Benefits

- Quad Output Power Module
- Dual 12A + Dual 5A
- 3V to 16V Input Range
- 0.6V to 3.3V Output Voltage for 12A
- 0.6V to 5V Output Voltage for 5A
- Pin Compatible with LTM4671
- ±1.5% Output Voltage Regulation
- 9.5x16x5.18mm BGA Package

Multiple Output Buck

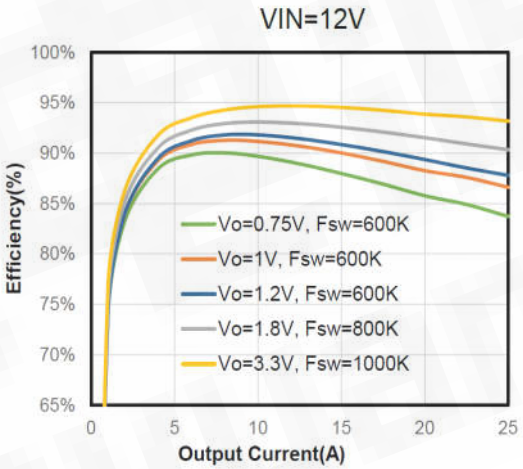
V_{IN} \ I_{OUT}	1A	2A	3A	5A	12A	25A
High (≤						
Mediu (≤						
Low In						

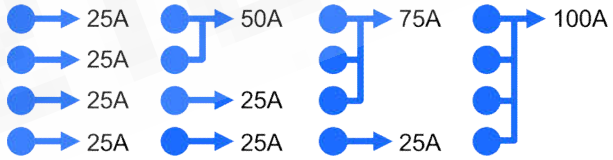




Features and Benefits

- Quad 25A Output Power Module with I2C and Parallelable
- 3V to 16V Input Range
- 0.5V to 1.8V Output for 25A
- 1.8V to 3.3V Output for 15A
- Parallel with MPM3695-100
- PMBus 1.3 Complaint
- Ultra Fast Transient
- Telemetry for V_{IN}, V_{OUT}, I_{OUT}, Temp
- 15x30x5.18mm BGA Package





16x5.4mm
2A + 2x5A

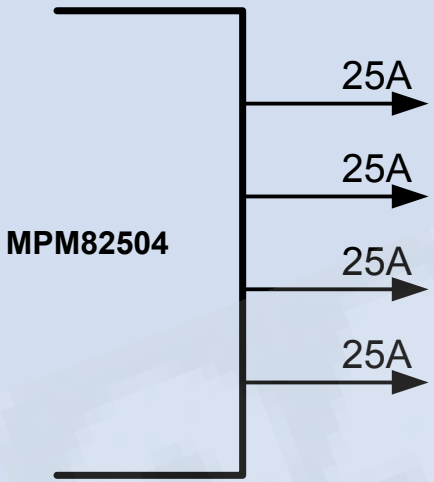
NEW
MPM82504
15x30x5.2mm
4x25A, I2C, Parallel, Telemetry

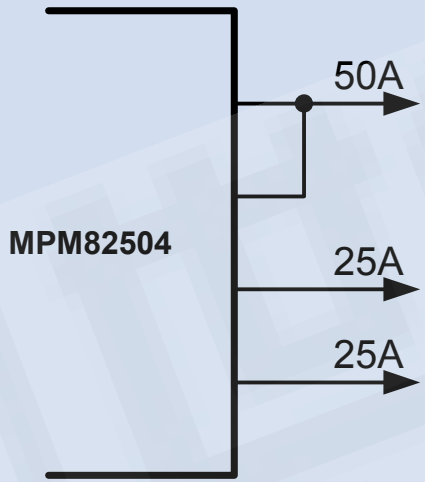
NEW
MPM3690-50A
16x16x5.2mm
2x25A, I2C, Parallel, Telemetry

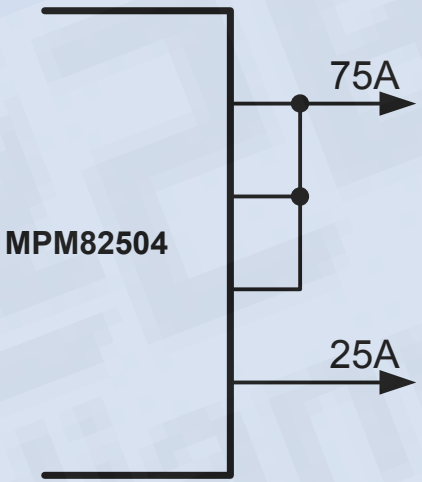
Mass Production | Sampling | New Products in Development

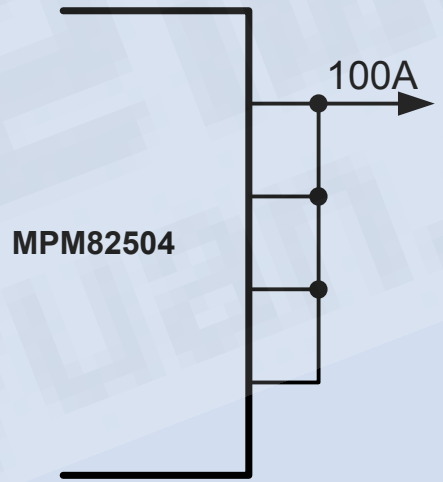
MPM82504 Offers More Rail Combinations

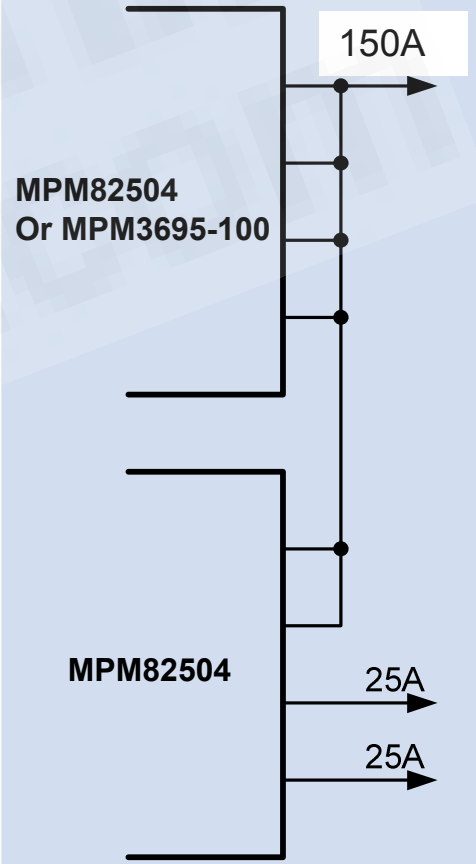
Quad output 4 x 25A	Triple Output 50A+25A+25A	Dual Output 75A+25A	Single Output 100A	Multiple Module Paralleling









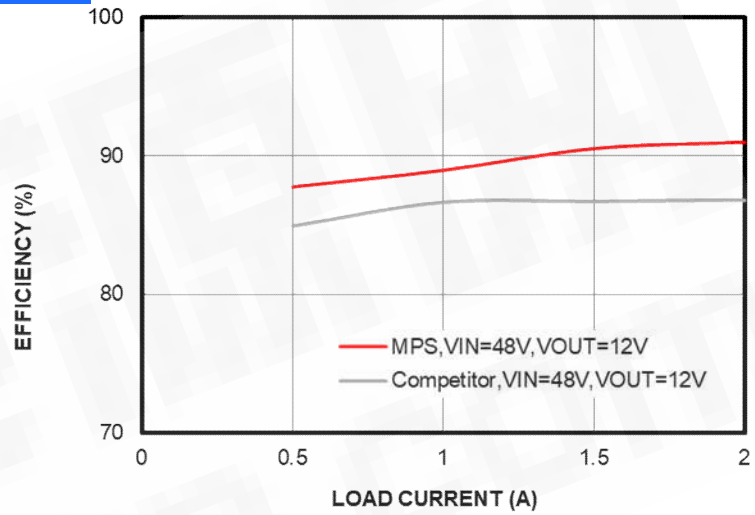


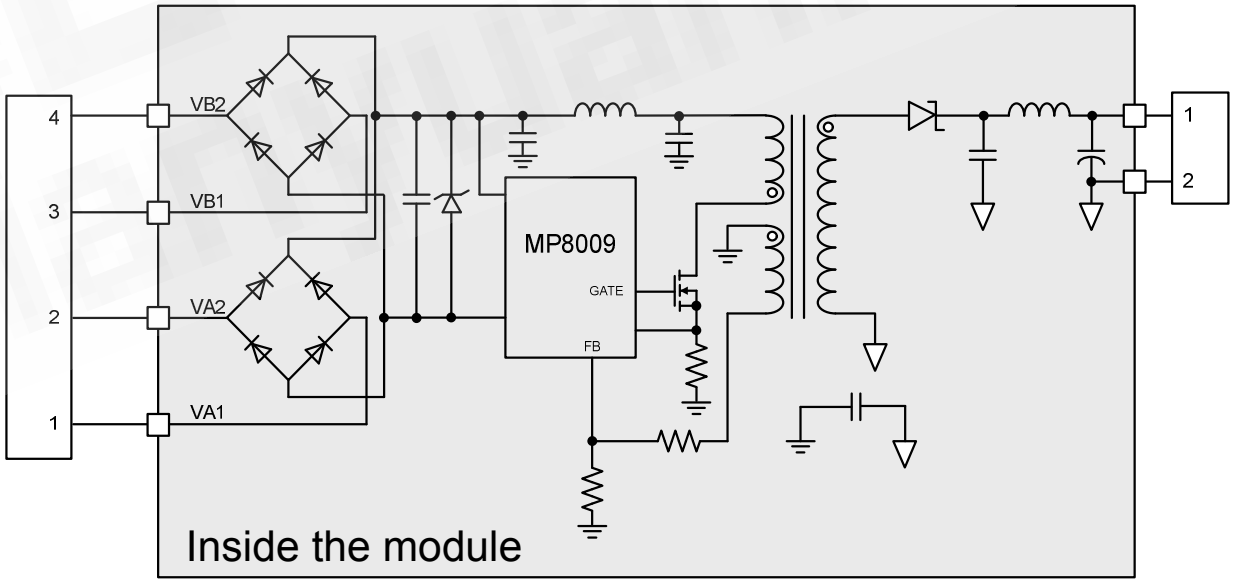
mEZS84802A 802.3af/at 12V 25W PoE Module

FEATURES

- Compatible with 802.3af/at Specifications
- V_{IN} Range: 42V to 53V
- Up to 25W Output Power with 12V Output
- SIP Package 56mm(L)x22mm(H)
- High Efficiency: 5% higher than competitor
  - 91% @ 24W, 89% @ 12W
- Minimum external components needed
- 1500V Isolation
- Hiccup Protection for OLP, SCP, OVP and thermal shut down
- Meet EN55022 Class B EMI standard
- Featured by MP8009
  - Fully-Integrated 802.3at/at Compliant PoE PD Interface with Flyback/Forward Controller
- Pin Compatible with PD-1002
- Sampling now, MP in July

Samples available now





Thank You