

# 浅谈5G基站电源

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March Y20

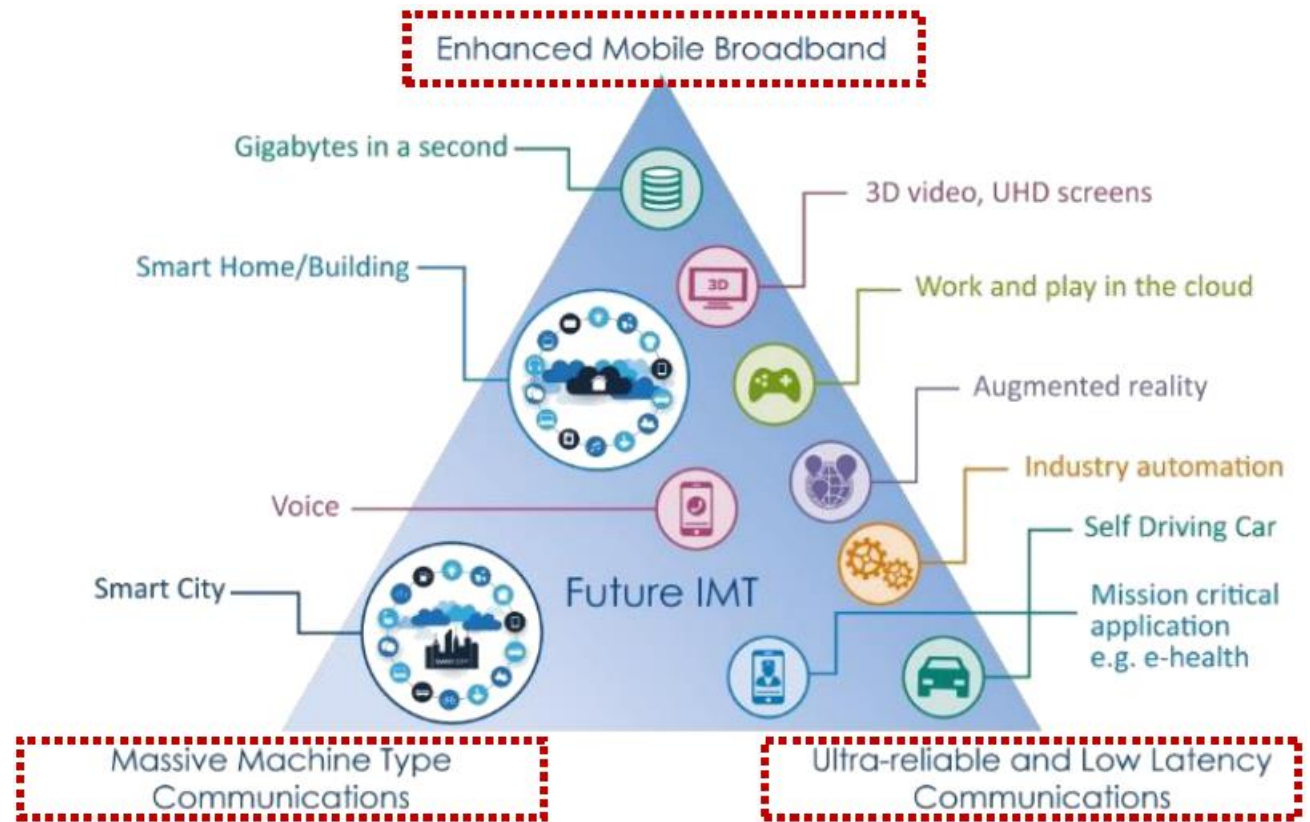


- 5G基站结构概述及5G基站规划
- 5G基站各结构电源需求及MPS解决方案
- MPS的电源模块

# 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/m <sup>2</sup>	100K/km <sup>2</sup>	10ms	350km/h	10Mbps	1Gbps
5G	10Mbps/m <sup>2</sup>	1M/km <sup>2</sup>	1ms	500km/h	100M~1Gbps	20Gbps

# 全球5G频率范围



## 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**

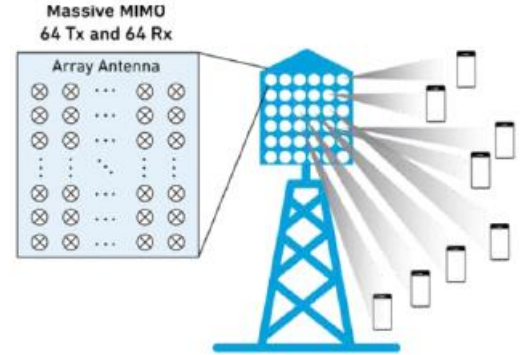
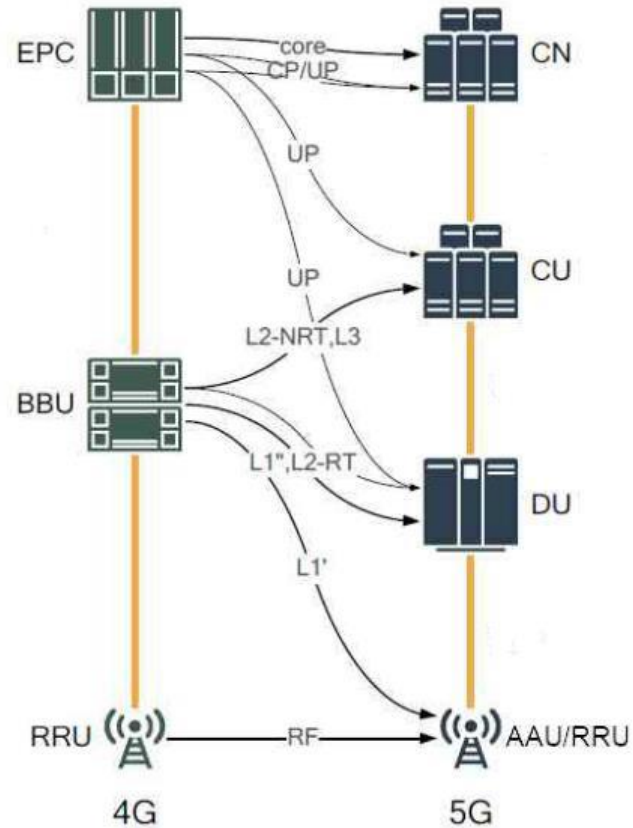
- Low real time operation of wireless protocol stack
- Part of Core network function

**DU**

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

**AAU**

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

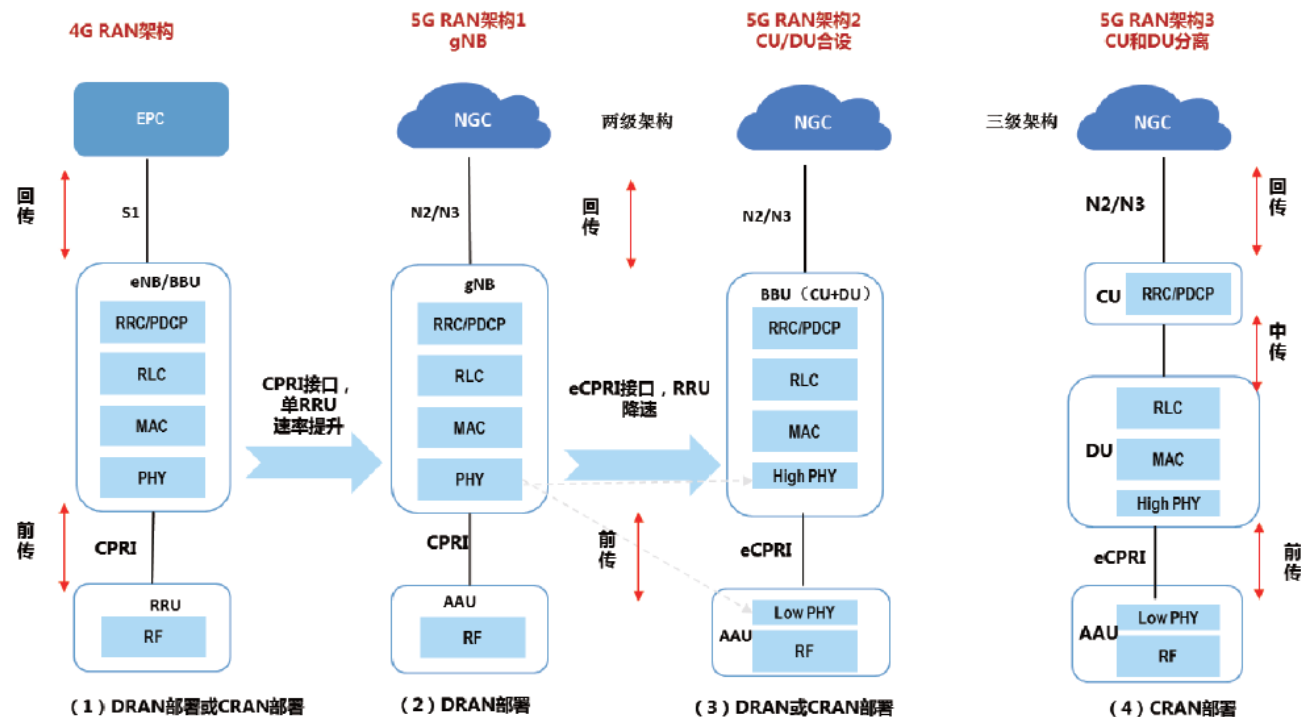


**BBU:** Building Base band Unit  
**RRU:** Radio Remote Unit  
**AAU:** Active Antenna Unit  
**CU:** Central Unit  
**DU:** Distributed Unit  
**CN:** Core Network

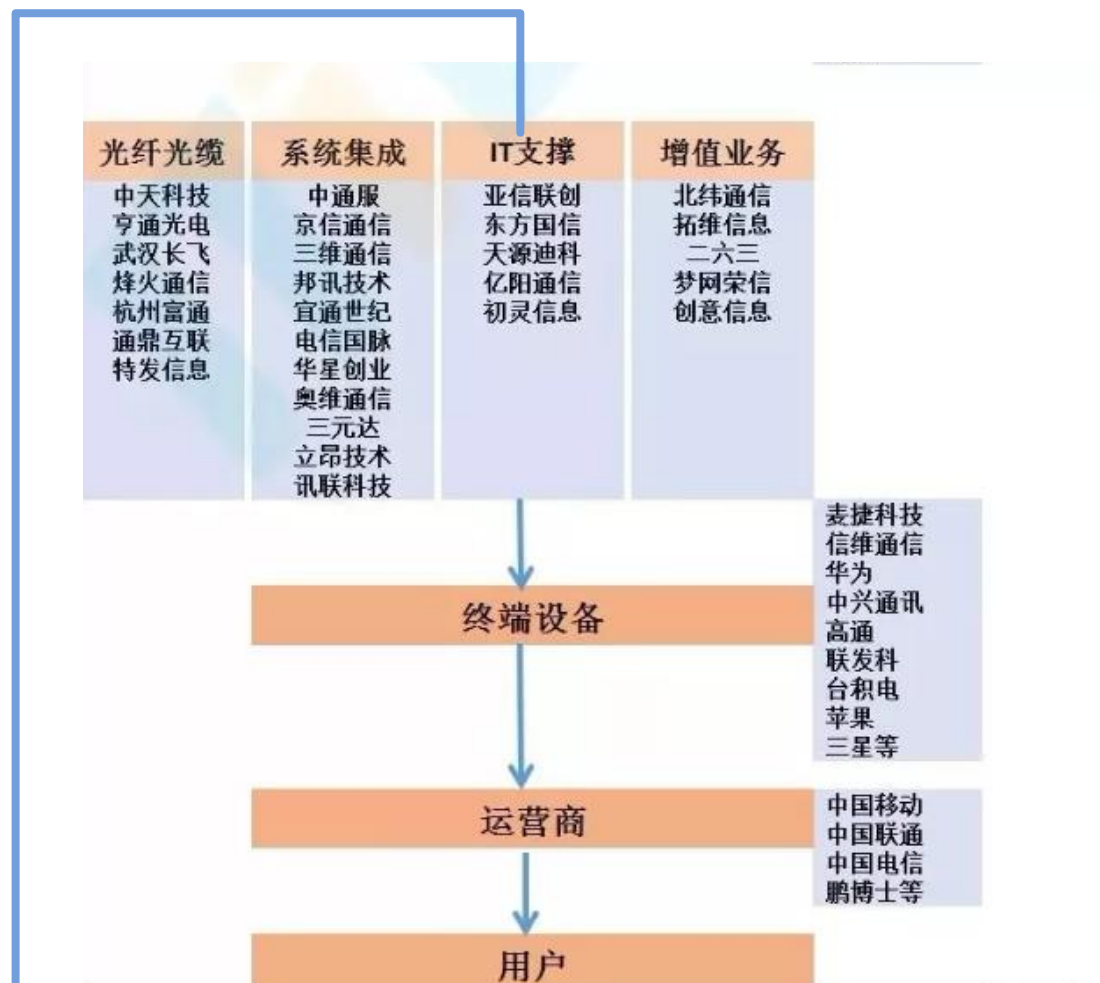
# 5G RAN分机架构

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





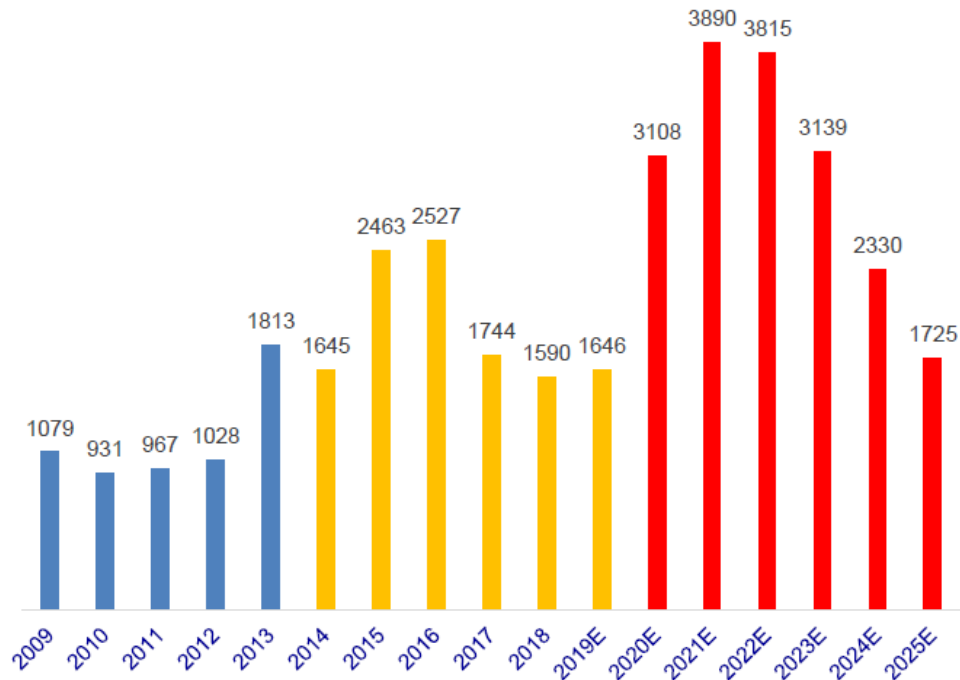
# 未来几年的5G规划

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)



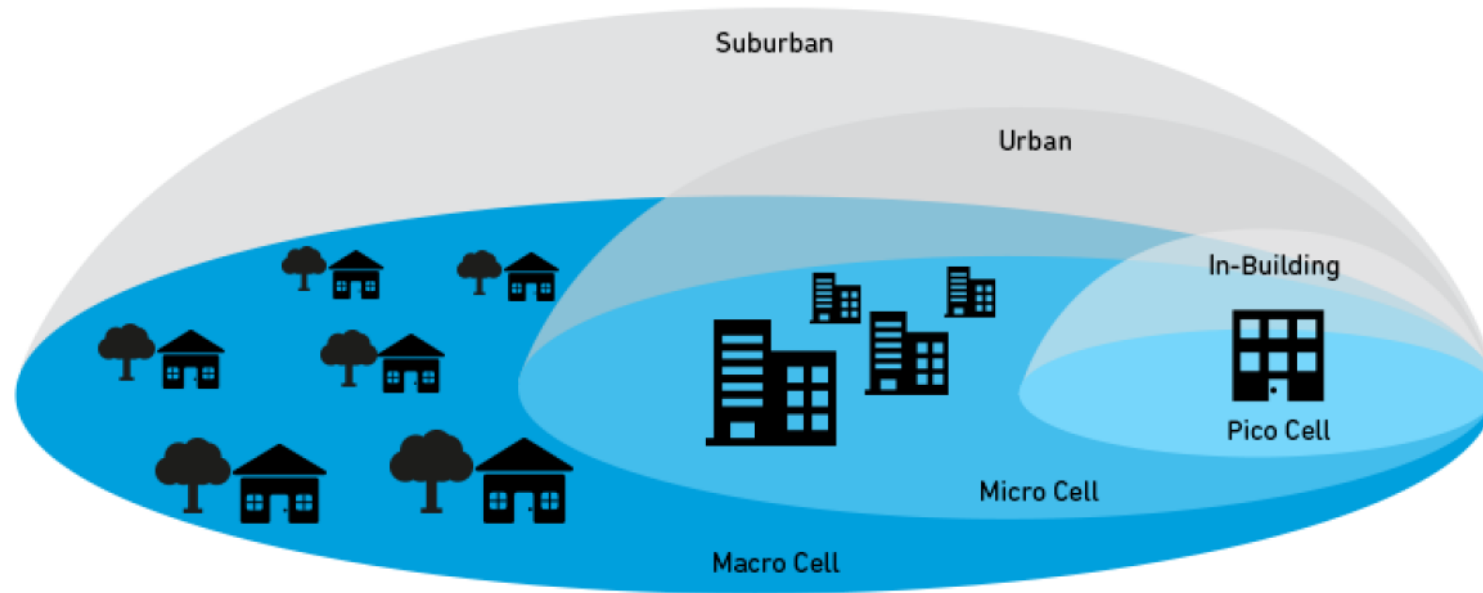
3G/4G/5G总投资规模 (亿元)

资料来源:公司公告, 申万宏源研究

# 5G基站的覆盖

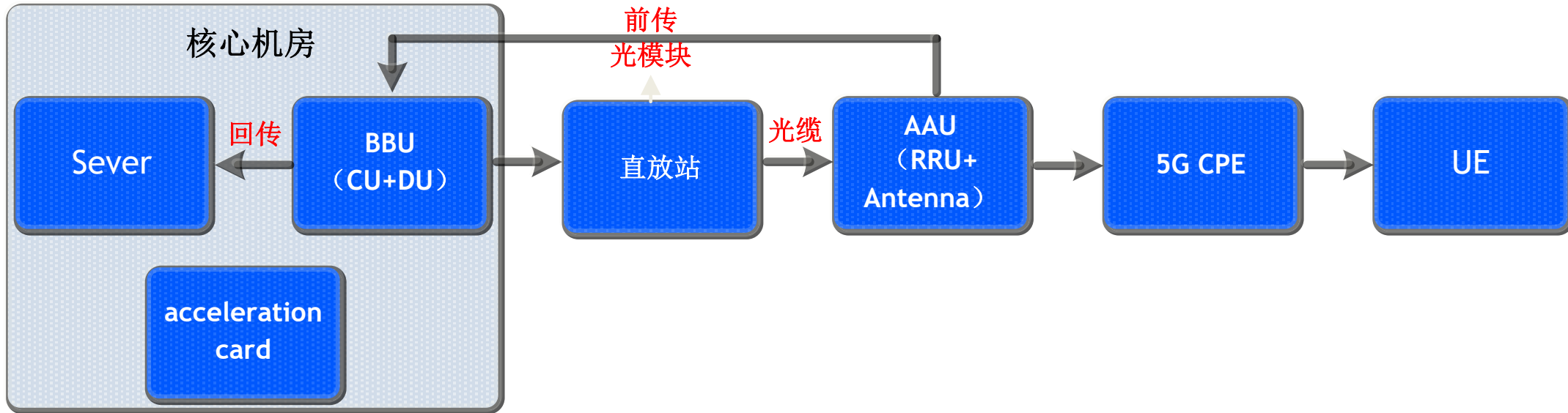
Cell Type	Output Power(W)	Cell Radius(km)	Users	Locations
Macro Cell	10 to >50	8~30	>2000	Outdoor
Micro Cell	1~10	0.2~2.0	100~2000	Indoor/Outdoor
Pico Cell	0.25~1	0.1~0.2	30~100	Indoor/Outdoor
Femtocell	0.001~0.25	0.010~0.1	1~30	Indoor

[www.qorvo.com](http://www.qorvo.com)

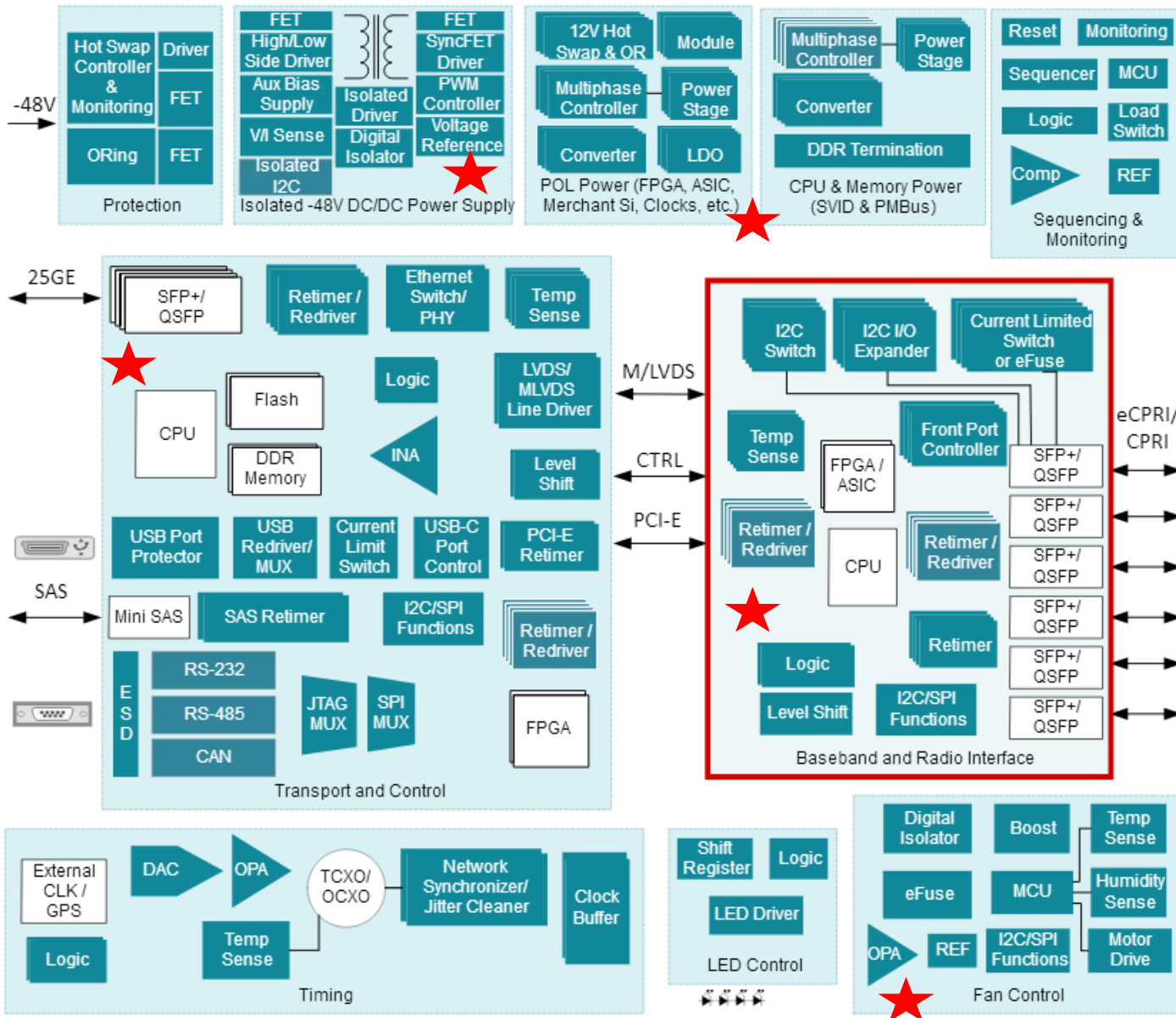


# 5G基站各结构电源需求

# 基站的承载网结构

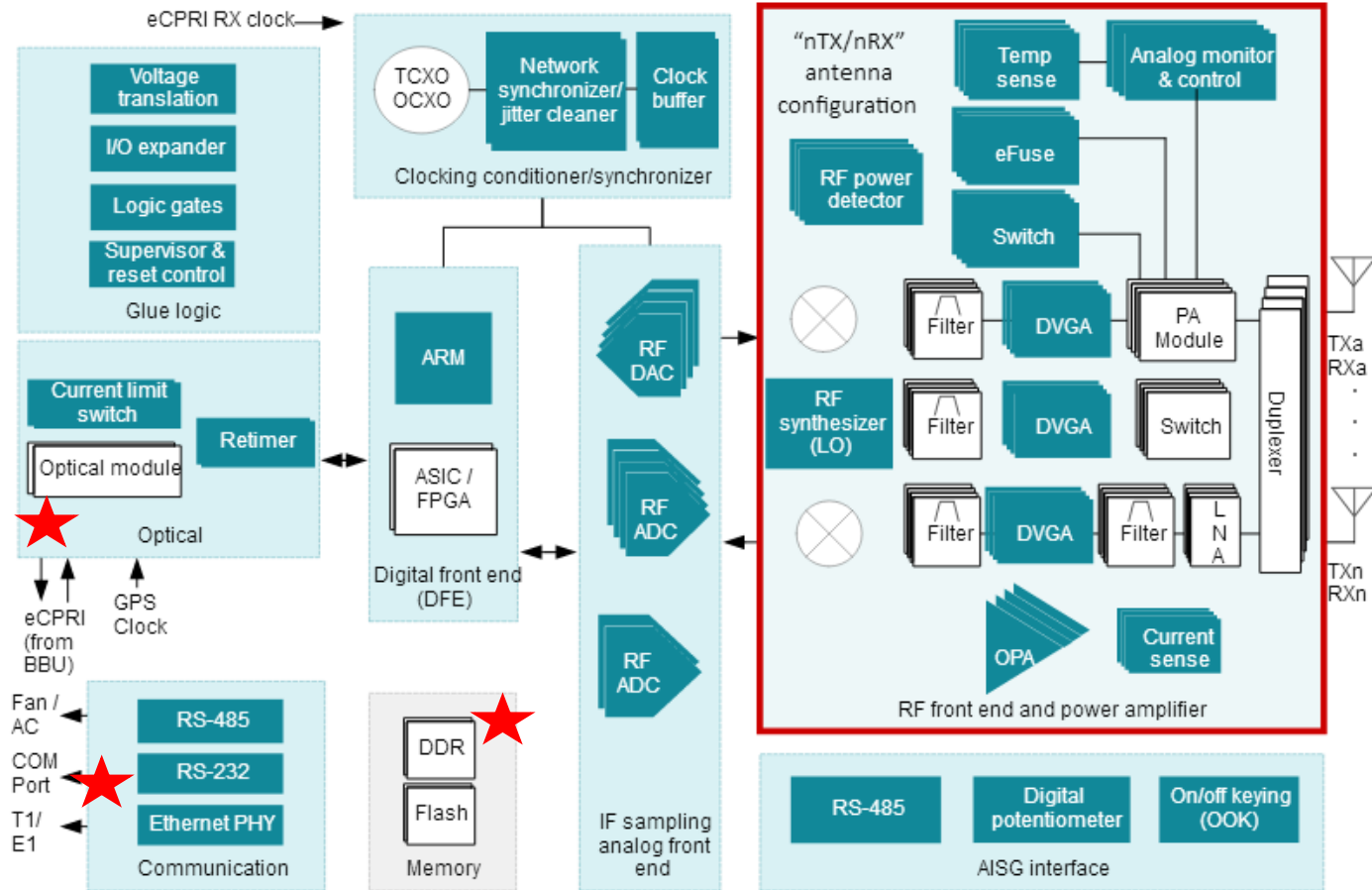
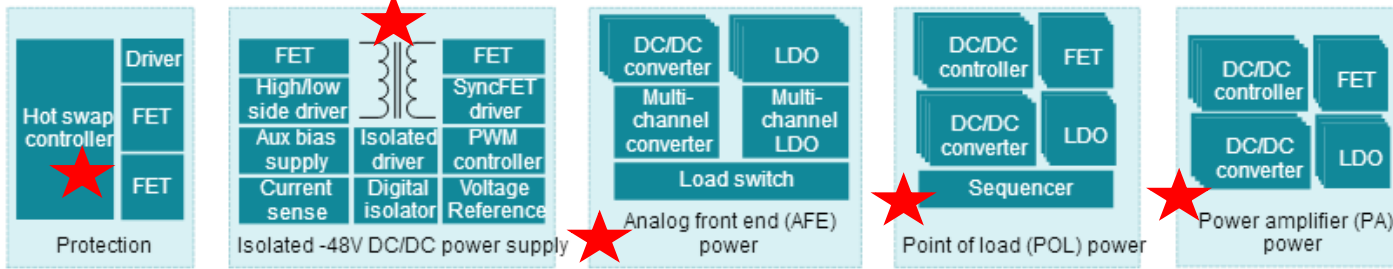


# System Diagram of BBU



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

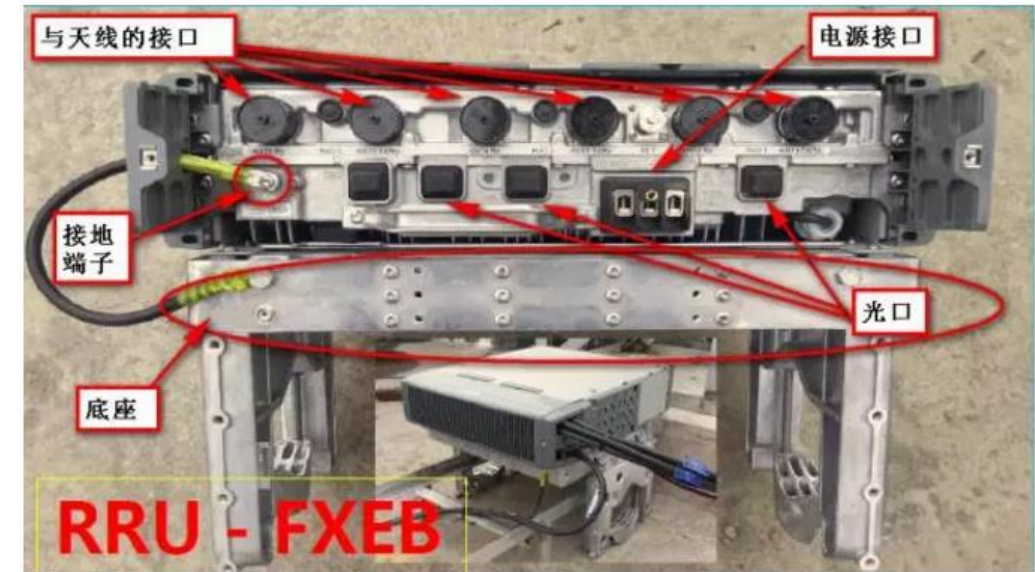
# System Diagram of RRU



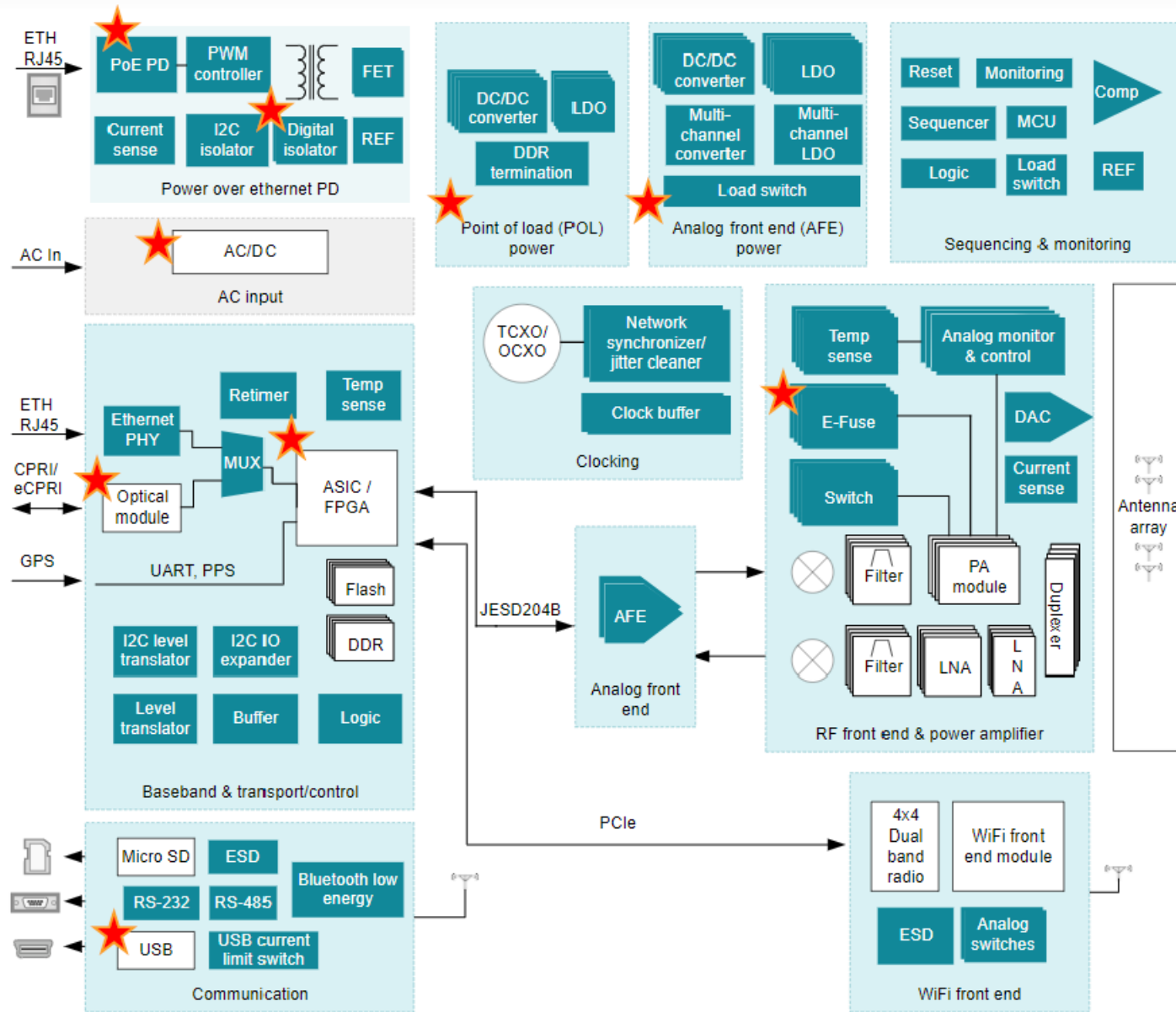
移动



电信

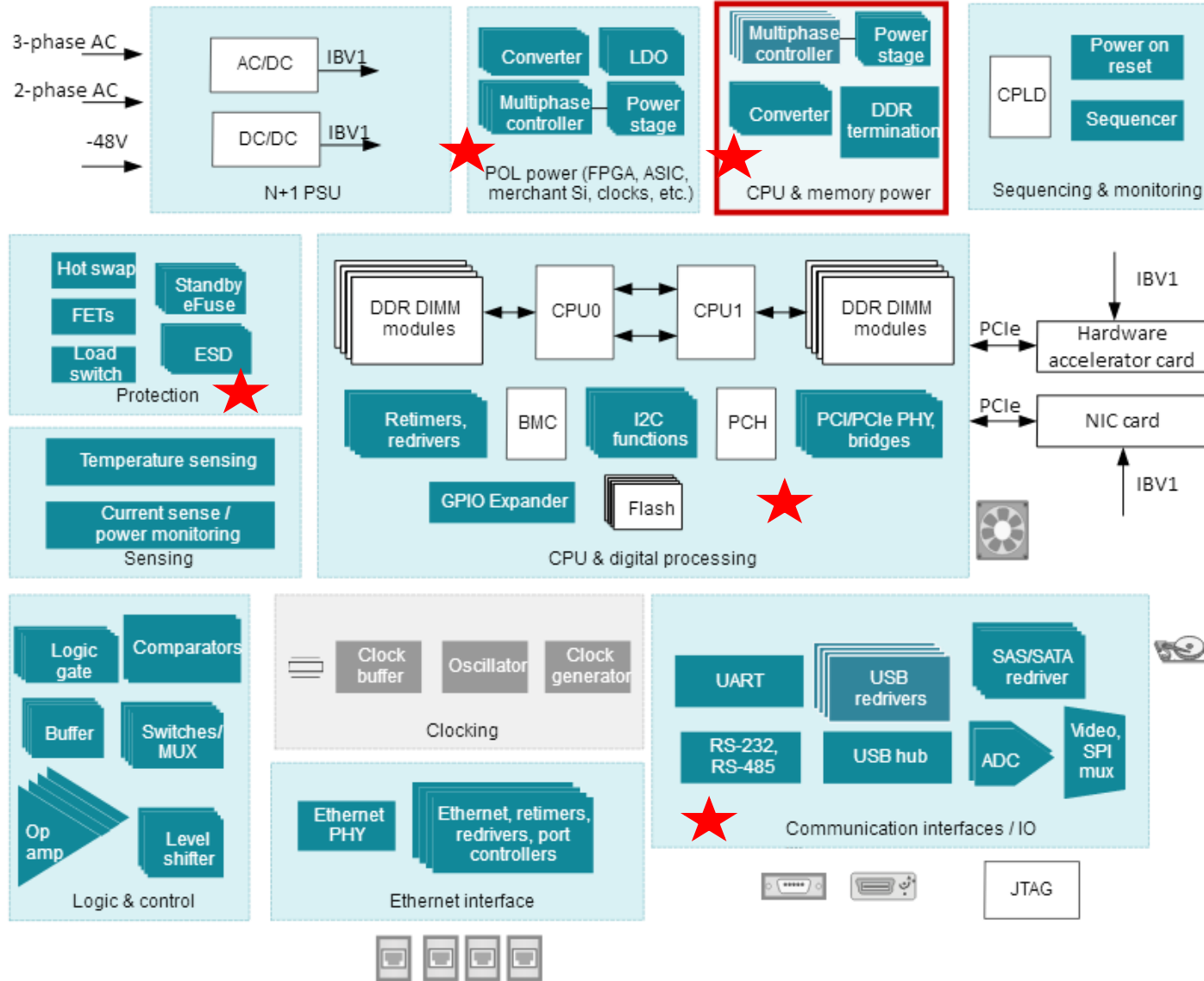


# System Diagram of Pico Cell



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

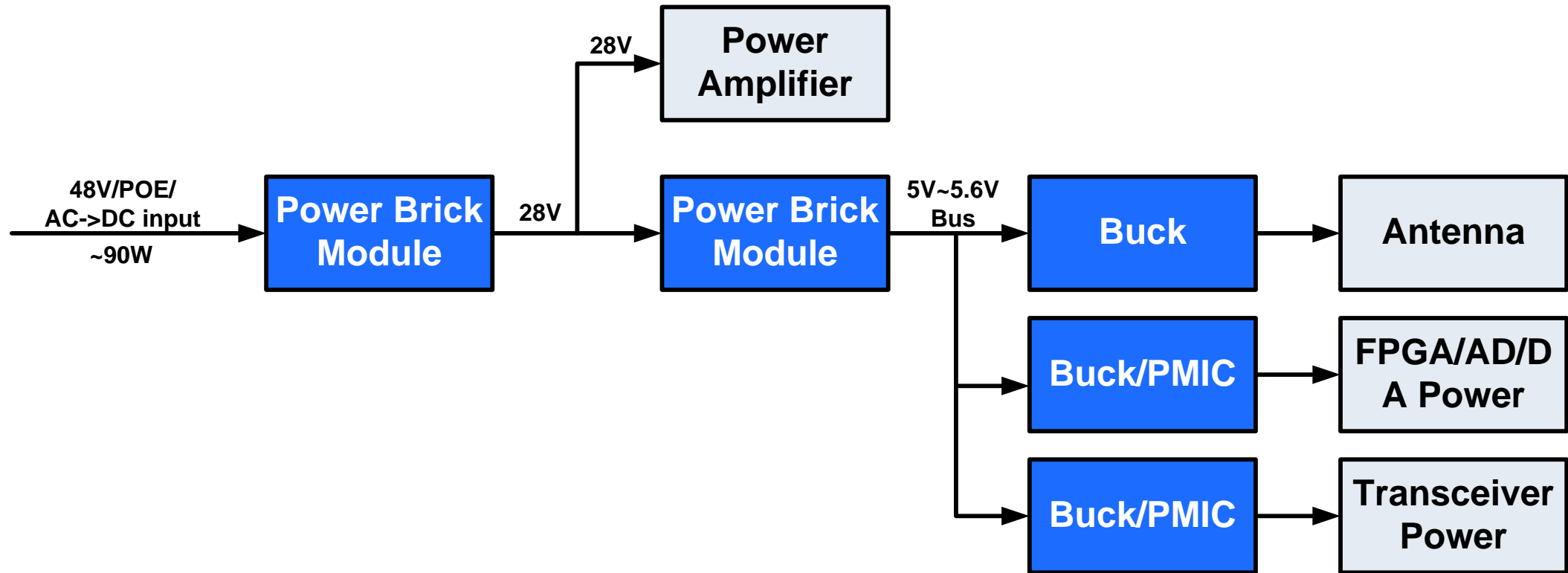
# System Diagram of 多路访问边缘计算 (MEC)



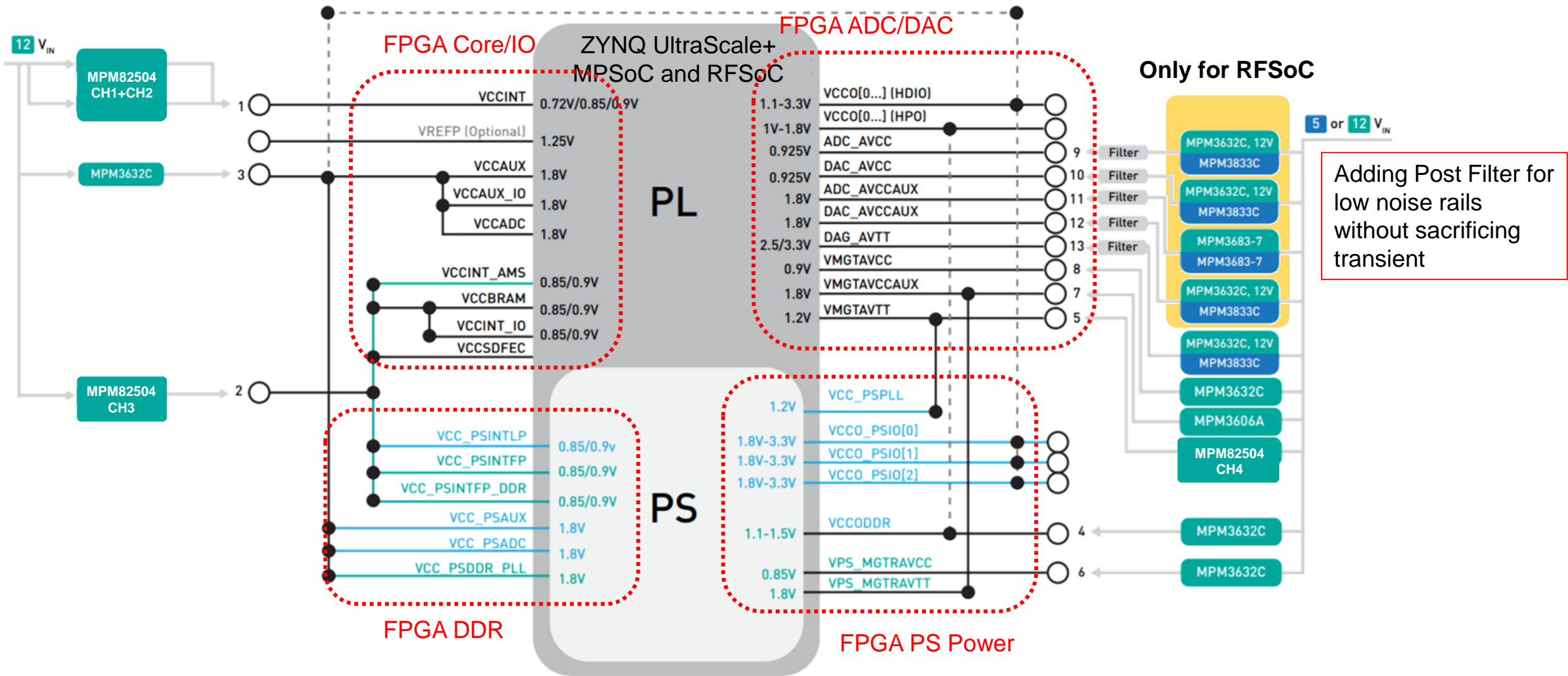
Socket	Opportunities
AC/DC input	Isolated gate driver MP188xx
CPU&Memory power/POL Power(FPGA/ASIC)	Multiphase Controller+Drmos/HC Buck or module/NB687B
FPGA/ASIC	Power module or high current buck
eFuse	MP50xx
Optical module	Buck/Boost/TEC control /EML Driver/E-fuse
Isolator	Interface Isolation MPQ27600



# Small Station Basic Power Architecture



# FPGA Power For Small Stations

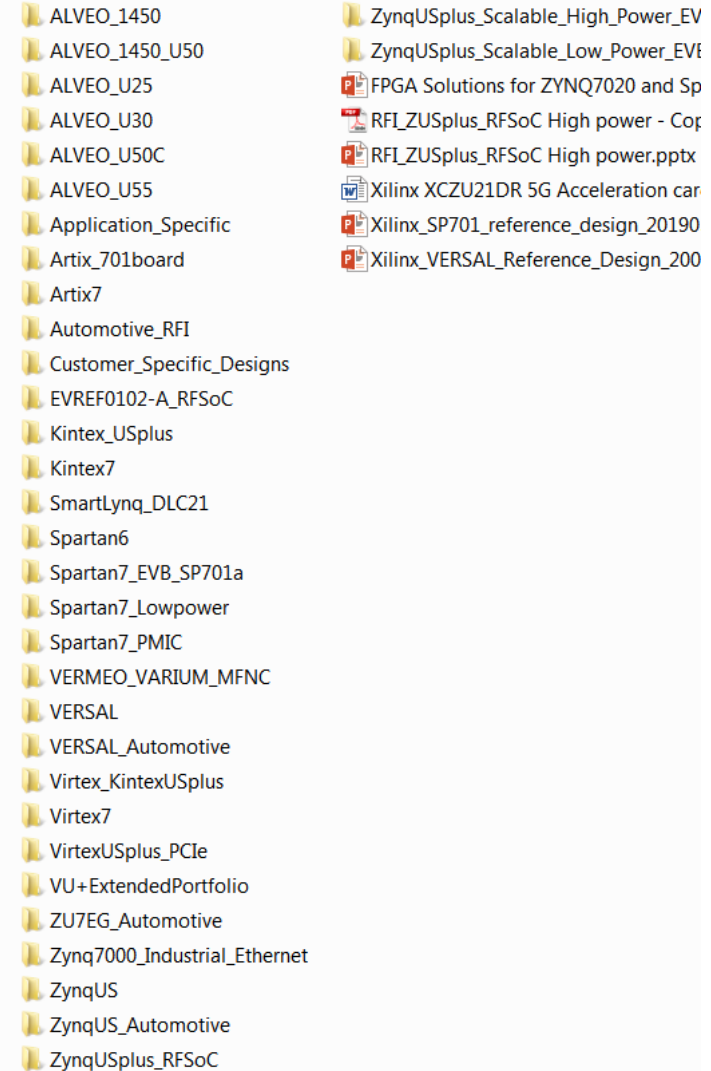


[https://www.monolithicpower.com/pub/media/mps\\_cms\\_document/m/p/mps-xilinx-artcile-q1-2019-\\_1.pdf](https://www.monolithicpower.com/pub/media/mps_cms_document/m/p/mps-xilinx-artcile-q1-2019-_1.pdf)

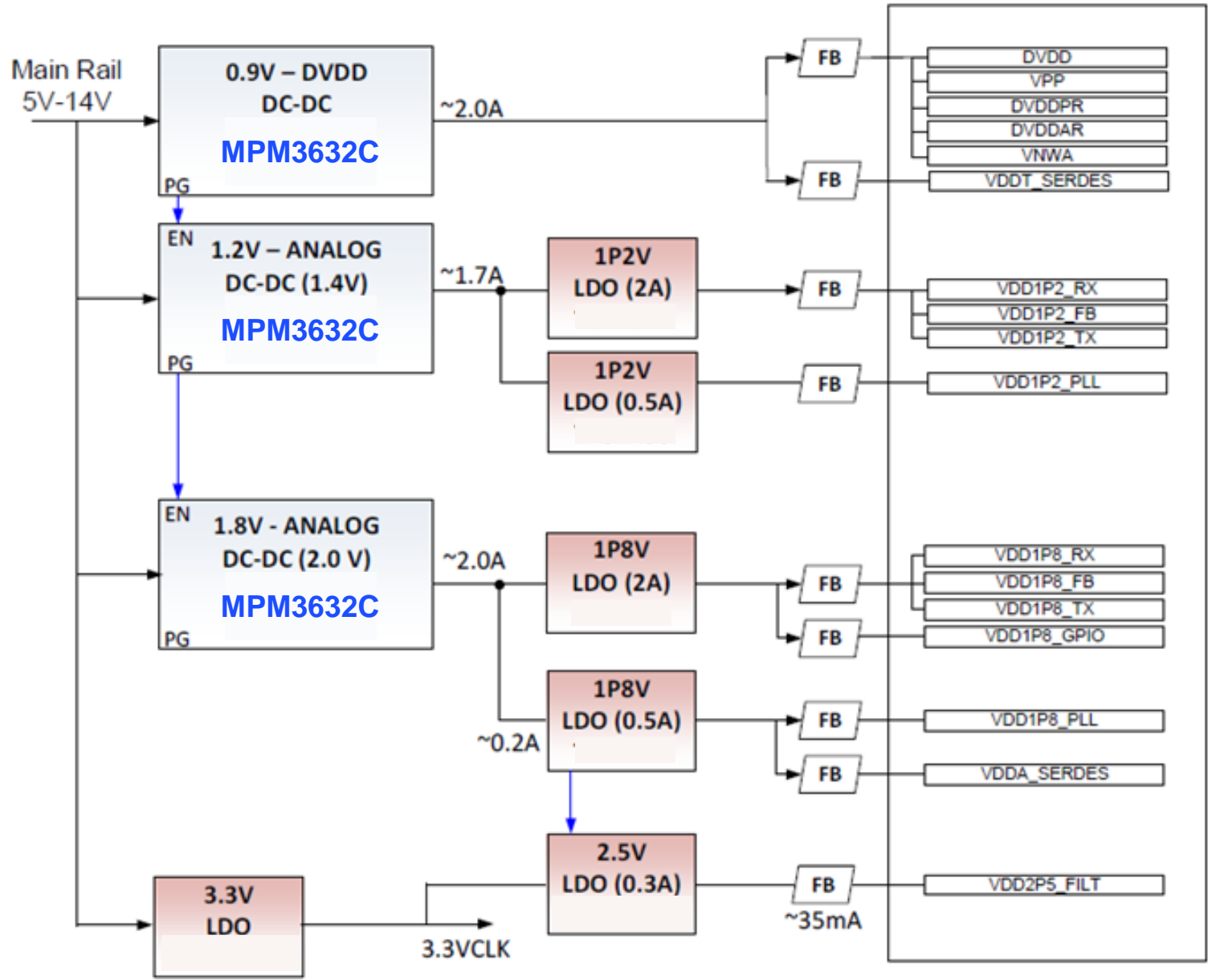


# FPGA/SoC Power Rails Requirement

- 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  $<\pm 3\%$
  - RFSoc Requires  $<1\text{mV}$  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

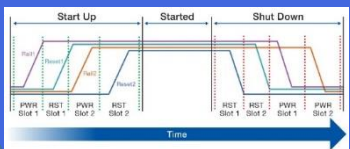
# MPS 电源模块

# 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



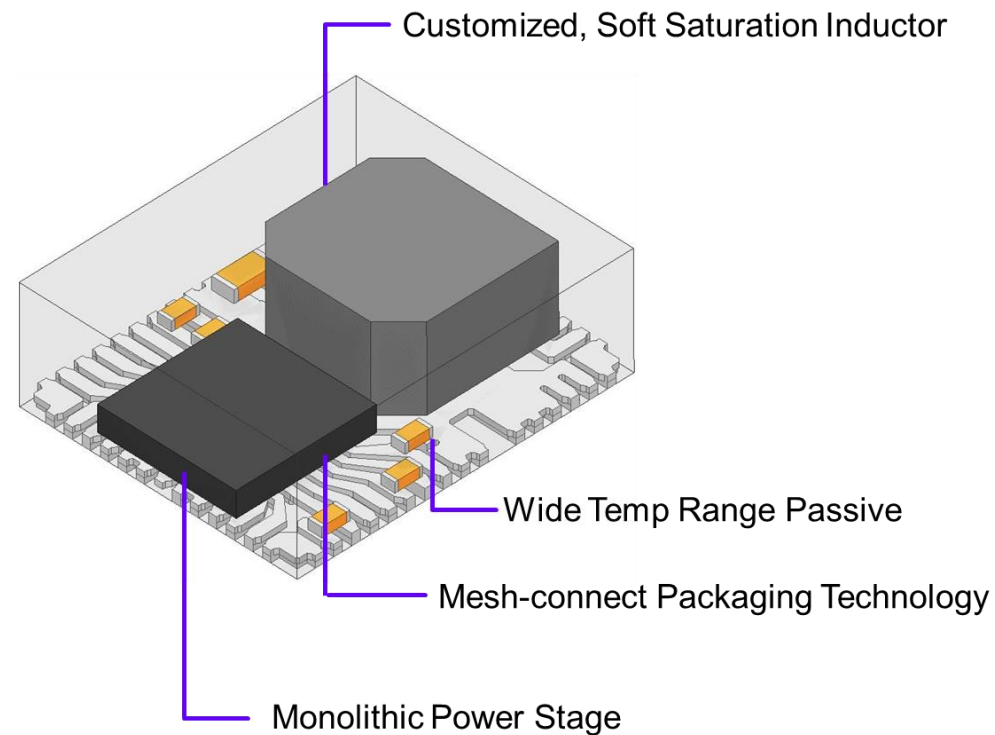
更紧凑的设计  
更高的功率密度



严格的EMI标准

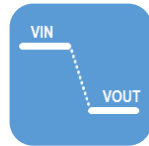


Radiated Emissions

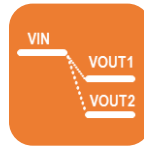




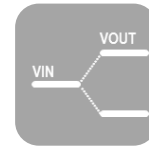
# Power Module Roadmap



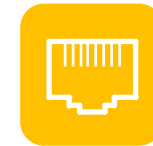
Single Buck



Multi-out Buck



Boost & Buck-Boost



POE



# MPS Power Module Family – Single Output Buck

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



# Multiple Output Buck

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



# MPS Power Module Family – Single Output Buck

$I_{OUT}$	$\leq 0.6A$	1-1.2A	2A	3A	4-5A	6-8A	10A	15A	20A	36A	100A
$V_{IN}$											
Wide VIN ( $\leq 75V$ )	<b>MPM3570E</b> 10x10x4mm 75V, Low EMI										
High Voltage ( $\leq 45V$ )	<b>MPM3506A</b> 3x5x1.6mm	<b>MPM3510A</b> <b>MPM3515</b> 3x5x1.6mm	<b>MPM3510A</b> <b>MPM3515</b> 3x5x1.6mm								
Medium Voltage ( $\leq 24V$ )		<b>NEW</b> <b>MPM3610/A</b> 3x3x2mm Low Iq, -33									
	<b>MPM3606/A</b> 3x5x1.6mm	<b>MPM3610/A</b> 3x5x1.6mm	<b>MPM3615/A</b> 3x5x1.6mm								
Low Input ( $\leq 6V$ )	<b>MPM3804</b> 2x2x0.9mm Fixed Vout	<b>MPM3811</b> 2x2x1.6mm	<b>MPM3815</b> 2.5x3.5x1.6mm CCM								
	<b>MPM3805</b> 3x2.5x0.9mm Fixed Vout	<b>MPM3810</b> 3x2.5x0.9mm	<b>MPM3815</b> 3x5x1.6mm								

**Efficiency vs. Load Current,  $V_{OUT}=3.3V$**

**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
- $\pm 1.5\%$  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

<b>MPM3695-25</b> 10x12x4mm I2C, Parallel, Telemetry	<b>NEW</b> <b>MPM3695-100</b> 15x30x5mm I2C, Parallel, Telemetry
<b>MPM3686</b> 12x15x4mm	

# MPS Power Module Family – Single Output Buck

$I_{OUT}$	$\leq 0.6A$	1-1.2A	2A	3A	4-5A	6-8A	10A	15A	20A	36A	100A
<b>Wide VIN (<math>\leq 75V</math>)</b>	<b>MPM3570E</b> 10x10x4mm 75V, Low EMI			<b>MPM3550</b> 10x12x4mm 55V, Parallel							
<b>High Voltage (<math>\leq 45V</math>)</b>	<b>MPM3506A</b> 3x5x1.6mm	<b>MPM3510A</b> <b>MPM3515</b> 3x5x1.6mm	<b>MPM3520E</b> 10x10x4mm Low EMI	<b>mEZD2596</b> 11x15x4mm Low EMI							
<b>Medium Voltage (<math>\leq 24V</math>)</b>		<b>NEW</b> <b>MPM3612</b> 3x3x2mm Low Iq, -33		<b>NEW</b> <b>MPM3632S</b> 3x3x2mm CCM	<b>MPM3650</b> 4x6x1.6mm						
	<b>MPM3606/A</b> 3x5x1.6mm	<b>MPM3610/A</b> 3x5x1.6mm	<b>MPM3620/A</b> 3x5x1.6mm	<b>MPM3650</b> 3x5x1.6mm <b>MPM3632C</b> CCM					<b>MPM3695-25</b> 10x12x4mm I2C, Parallel, Telemetry		<b>NEW</b> <b>MPM3695-100</b> 15x30x5mm I2C, Parallel, Telemetry
<b>Low Input (<math>\leq 6V</math>)</b>	<b>MPM3804</b> 2x2x0.9mm Fixed Vout	<b>MPM3811</b> 2x2x1.6mm	<b>MPM3822C</b> 2.5x3.5x1.6mm CCM	<b>MPM3833C</b> 2.5x3.5x1.6mm CCM							
	<b>MPM3805</b> 3x2.5x0.9mm Fixed Vout	<b>MPM3810</b> 3x2.5x0.9mm	<b>MPM3820</b> 3x5x1.6mm	<b>MPM3850</b> 3x5x1.6mm	<b>MPM3855</b> 3x5x1.6mm						

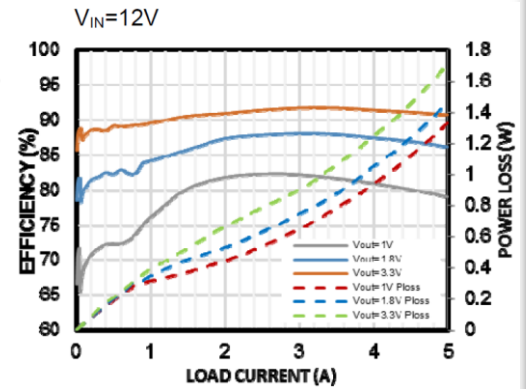
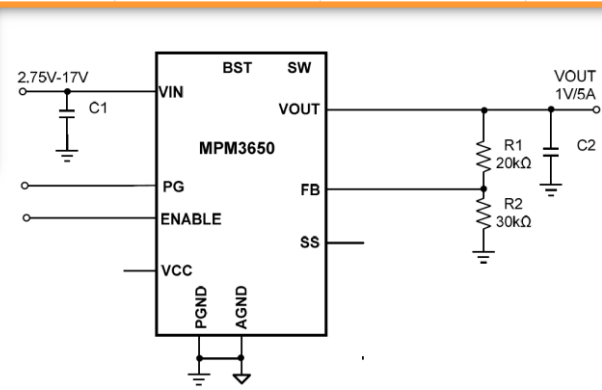
**Features and Benefits**

- 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
- $\pm 1.5\%$  Total Output Voltage Regulation
- Thin 3x3x1.45mm Package



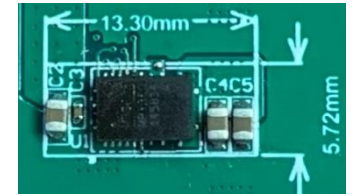
# MPS Power Module Family – Single Output Buck

$I_{OUT}$	$\leq 0.6A$	1-1.2A	2A	3A	4-5A
$V_{IN}$					
Wide VIN ( $\leq 75V$ )	<b>MPM3570E</b> 10x10x4mm 75V, Low EMI			<b>MPM3550</b> 10x12x4mm 55V, Parallel	
High Voltage ( $\leq 45V$ )	<b>MPM3506A</b> 3x5x1.6mm	<b>MPM3510A</b> <b>MPM3515</b> 3x5x1.6mm	<b>MPM3520E</b> 10x10x4mm Low EMI	<b>mEZD2596</b> 11x15x4mm Low EMI	<b>MPM3550E</b> 12x12x4mm Low EMI
Medium Voltage ( $\leq 24V$ )		<b>NEW</b> <b>MPM3612</b> 3x3x2mm Low Iq, -33		<b>NEW</b> <b>MPM3632S</b> 3x3x2mm CCM	<b>MPM3650</b> 4x6x1.6mm
	<b>MPM3606/A</b> 3x5x1.6mm	<b>MPM3610/A</b> 3x5x1.6mm	<b>MPM3620/A</b> 3x5x1.6mm	<b>MPM3650</b> 3x5x1.6mm <b>MPM3632C</b> CCM	
Low Input ( $\leq 6V$ )	<b>MPM3804</b> 2x2x0.9mm Fixed Vout	<b>MPM3811</b> 2x2x1.6mm	<b>MPM3822C</b> 2.5x3.5x1.6mm CCM	<b>MPM3833C</b> 2.5x3.5x1.6mm CCM	
	<b>MPM3805</b> 3x2.5x0.9mm Fixed Vout	<b>MPM3810</b> 3x2.5x0.9mm	<b>MPM3820</b> 3x5x1.6mm	<b>MPM3850</b> 3x5x1.6mm	<b>MPM380</b> 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
- $\pm 1.5\%$  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

$I_{OUT}$ / $V_{IN}$	$\leq 0.6A$	1-1.2A	2A	3A	4-5A	6-8A	10A	15A	20A	36A	100A
Wide VIN ( $\leq 75V$ )	<b>MPM3570E</b> 10x10x4mm 75V, Low EMI										
High Voltage ( $\leq 45V$ )	<b>MPM3506A</b> 3x5x1.6mm	<b>MPM3510A</b> <b>MPM3515</b> 3x5x1.6mm	<b>MPM3520E</b> 10x10x4mm Low EMI								
Medium Voltage ( $\leq 24V$ )		<b>NEW</b> <b>MPM3612</b> 3x3x2mm Low Iq, -33									
	<b>MPM3606/A</b> 3x5x1.6mm	<b>MPM3610/A</b> 3x5x1.6mm	<b>MPM3620/A</b> 3x5x1.6mm								
Low Input ( $\leq 6V$ )	<b>MPM3804</b> 2x2x0.9mm Fixed Vout	<b>MPM3811</b> 2x2x1.6mm	<b>MPM3822C</b> 2.5x3.5x1.6mm CCM								
	<b>MPM3805</b> 3x2.5x0.9mm Fixed Vout	<b>MPM3810</b> 3x2.5x0.9mm	<b>MPM3820</b> 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

**NEW** **MPM3690-50B**  
16x16x5mm  
I2C, Parallel, Telemetry

**NEW** **MPM3695-100**  
15x30x5mm  
I2C, Parallel, Telemetry

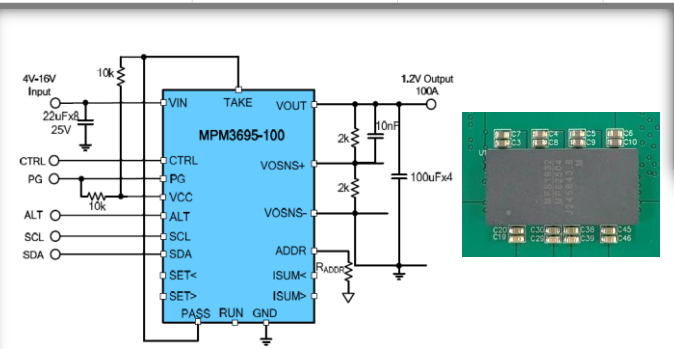
**MPM3686**  
2x15x4mm

# MPS Power Module Family – Single Output Buck

$I_{OUT}$ $V_{IN}$	$\leq 0.6A$	1-1.2A	2A	3A	4-5A	6-8A	10A	15A	20A	50A	100A
Wide VIN ( $\leq 75V$ )	<b>MPM3570E</b> 10x10x4mm 75V, Low EMI			<b>MPM3550</b> 10x12x4mm 55V, Parallel							
High Voltage ( $\leq 45V$ )	<b>MPM3506A</b> 3x5x1.6mm	<b>MPM3510A</b> <b>MPM3515</b> 3x5x1.6mm	<b>MPM3520E</b> 10x10x4mm Low EMI	<b>mEZD2596</b> 11x15x4mm Low EMI							
Medium Voltage ( $\leq 24V$ )		<b>NEW</b> <b>MPM3612</b> 3x3x2mm Low Iq, -33		<b>NEW</b> <b>MPM3632S</b> 3x3x2mm CCM	<h3>Features and Benefits</h3> <ul style="list-style-type: none"> <li>• 3V to 16V Input Range</li> <li>• 0.5V to 5.5V Output Voltage</li> <li>• Continuous 20A (Peak 25A)</li> <li>• Parallel up to 120A (up to 6Phase)</li> <li>• PMBus 1.3 Compliant</li> <li>• Ultra Fast Transient (COT)</li> <li>• 90% Peak Efficiency 12V-<math>\rightarrow</math>1V</li> <li>• 10mm*12mm*4mm QFN-59 Package</li> <li>• <a href="#">Videos</a></li> </ul>						
		<b>MPM3606/A</b> 3x5x1.6mm	<b>MPM3610/A</b> 3x5x1.6mm	<b>MPM3620/A</b> 3x5x1.6mm							
Low Input ( $\leq 6V$ )	<b>MPM3804</b> 2x2x0.9mm Fixed Vout	<b>MPM3811</b> 2x2x1.6mm	<b>MPM3822C</b> 2.5x3.5x1.6mm CCM	<b>MPM3833C</b> 2.5x3.5x1.6mm CCM							
	<b>MPM3805</b> 3x2.5x0.9mm Fixed Vout	<b>MPM3810</b> 3x2.5x0.9mm	<b>MPM3820</b> 3x5x1.6mm	<b>MPM3850</b> 3x5x1.6mm							

# MPS Power Module Family – Single Output Buck

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



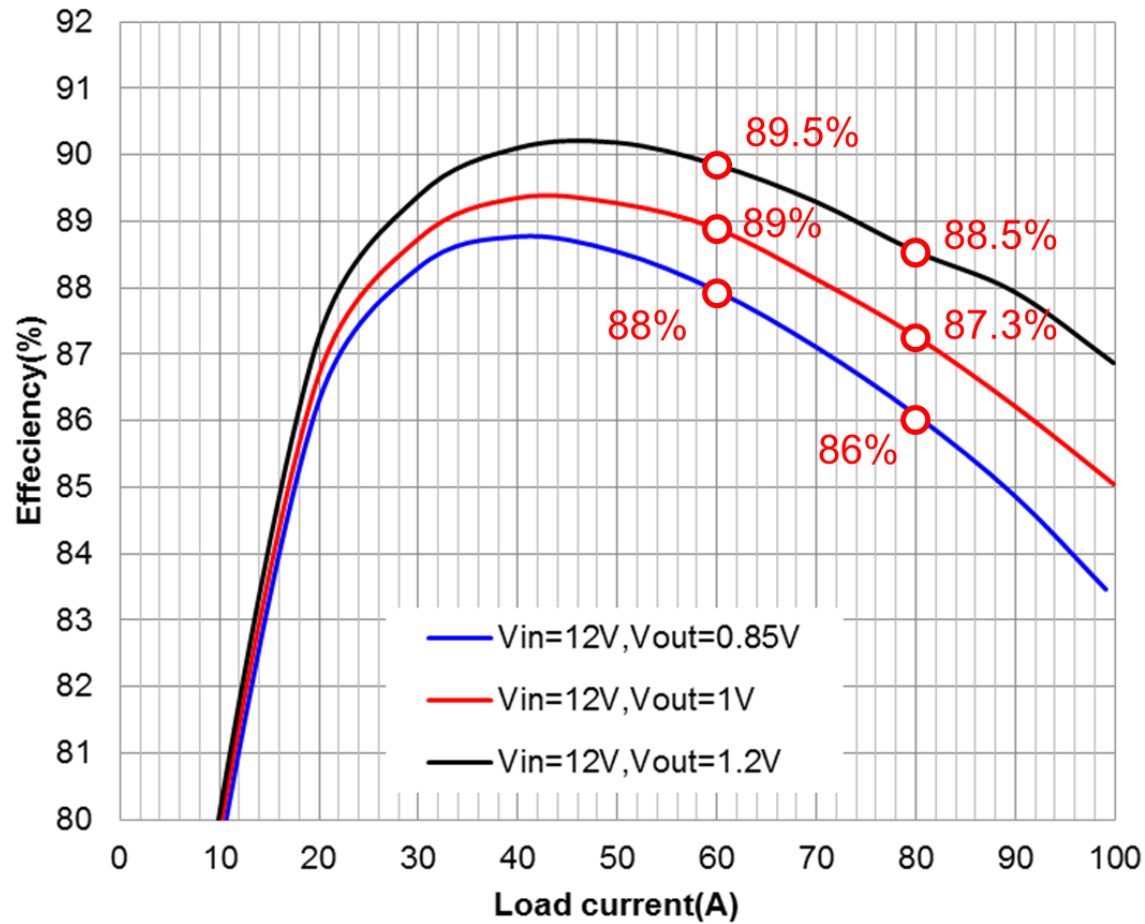
## Features and Benefits

- 3V to 16V Input Range
- 0.5V to 3.3V Output Voltage
- Continuous 100A (60A for 3.3V<sub>OUT</sub>)
- 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](#)

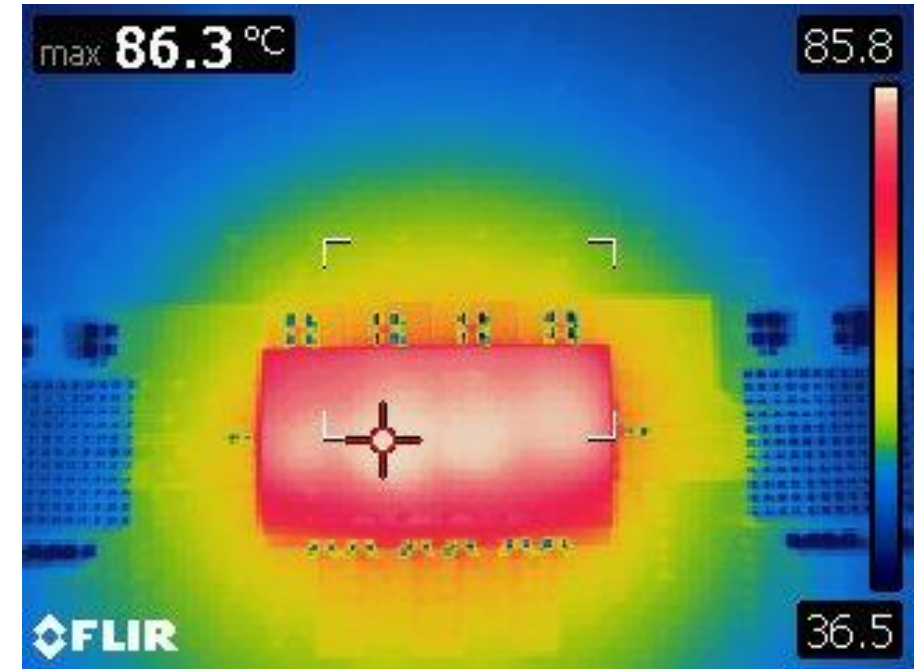




# MPM3695-100 Efficiency & Thermal



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

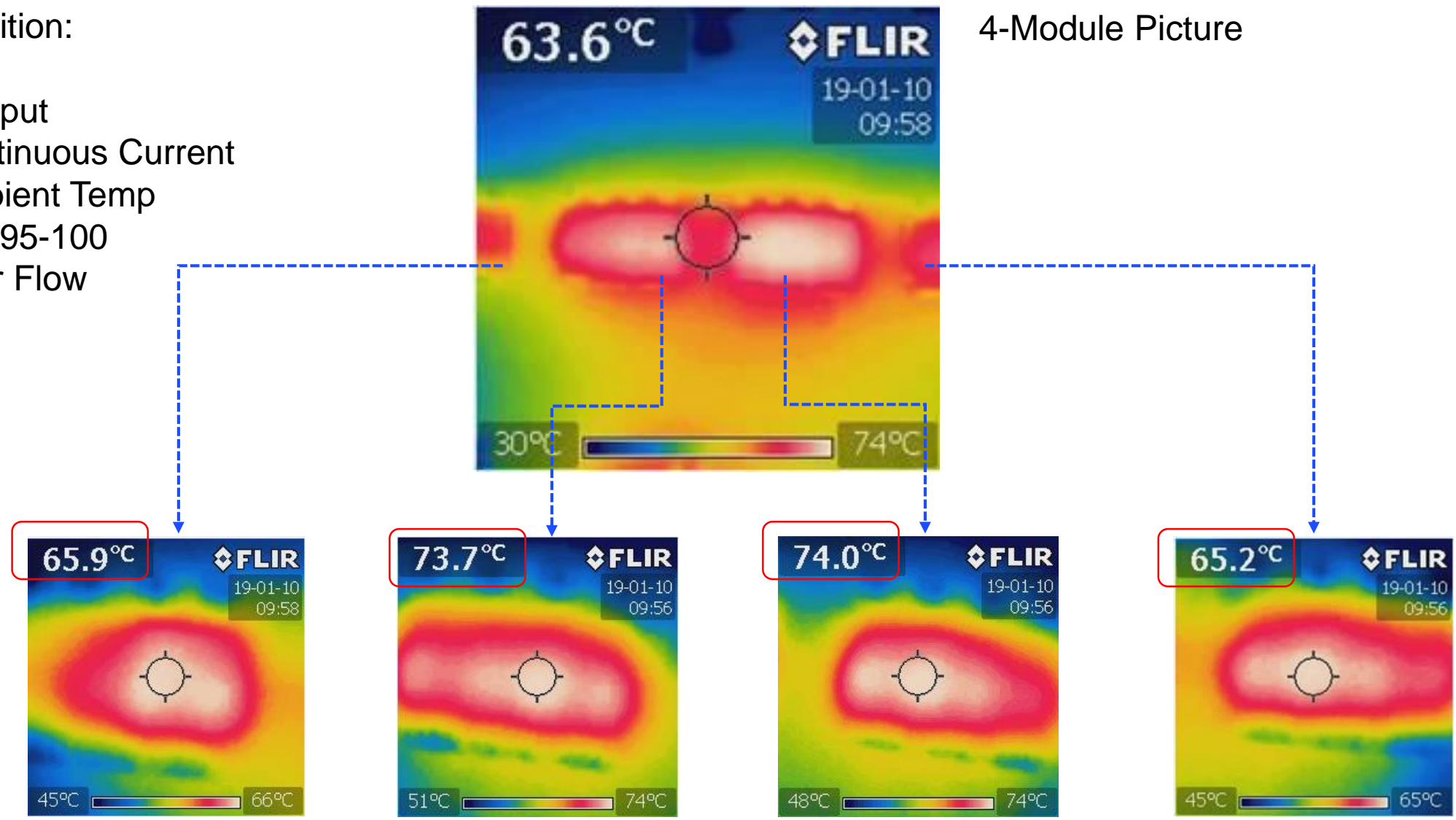


Single module operation

# Thermal Test

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

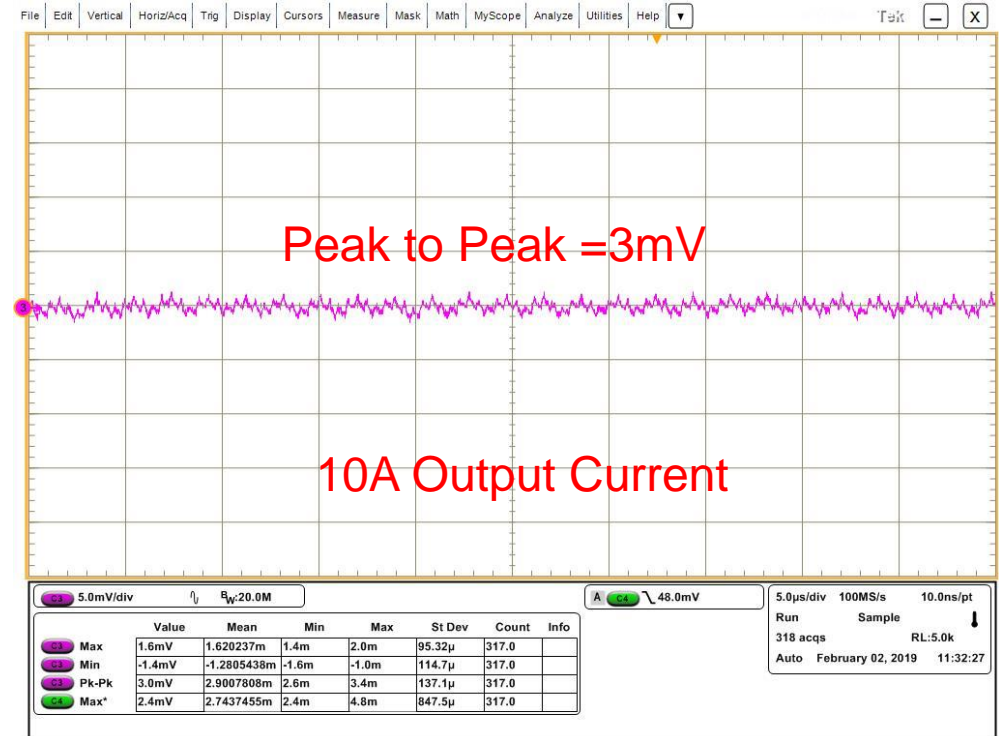
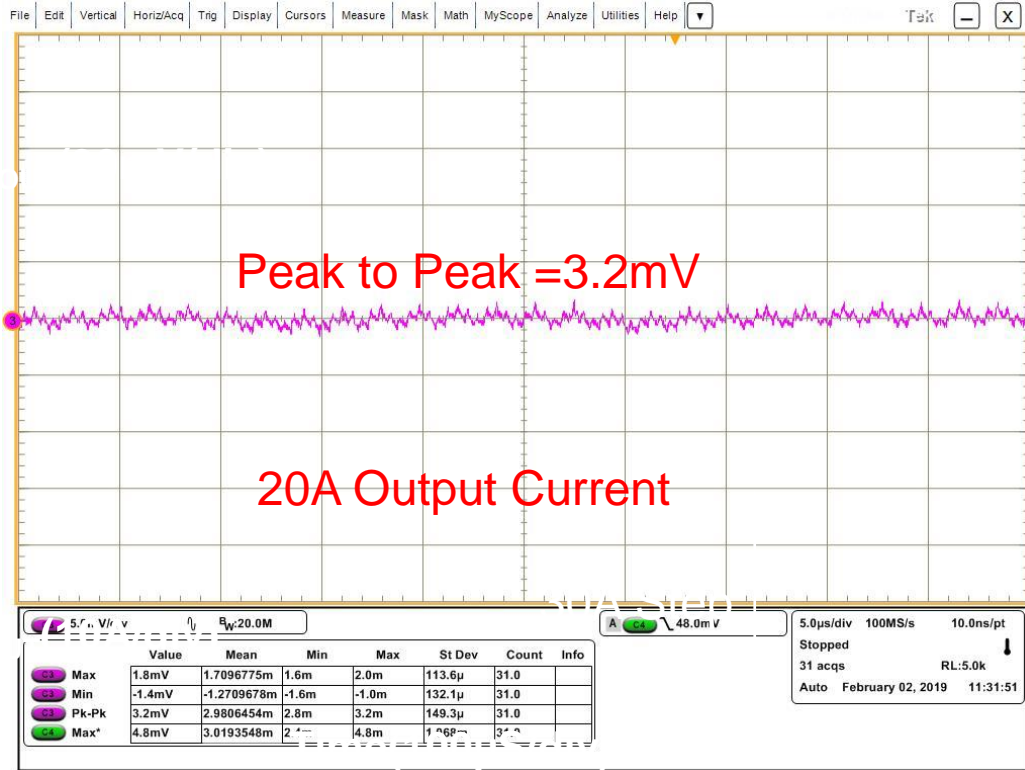
4-Module Picture



# Steady State Ripple – Single Phase

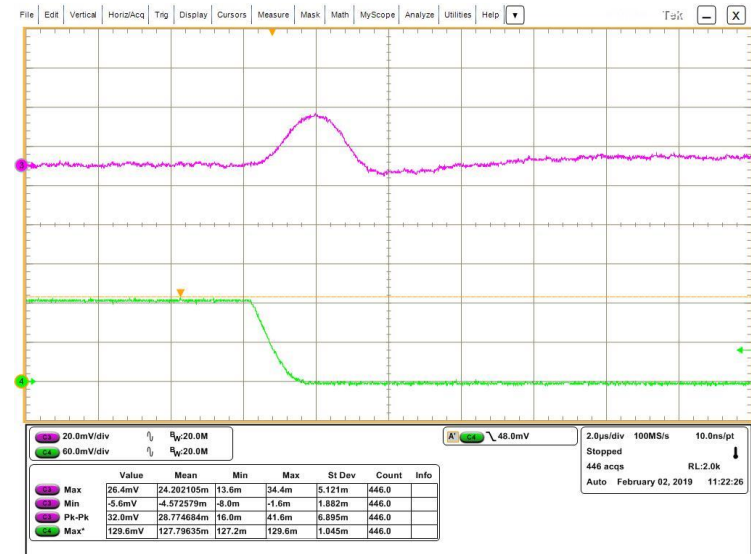
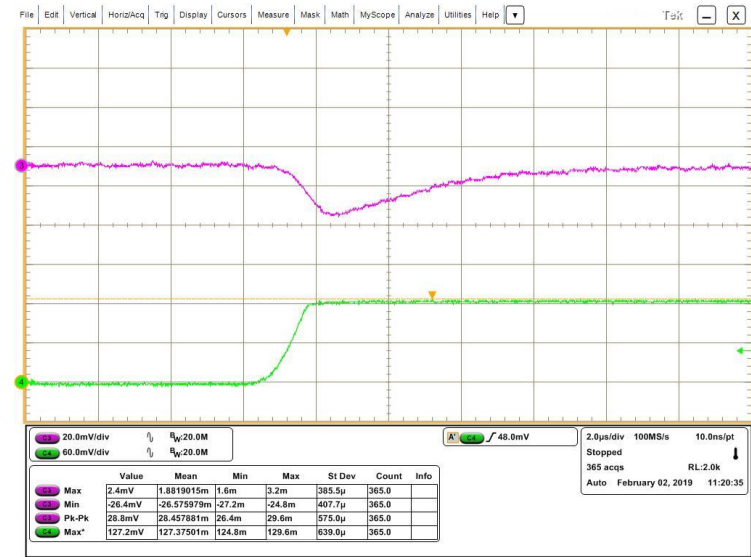
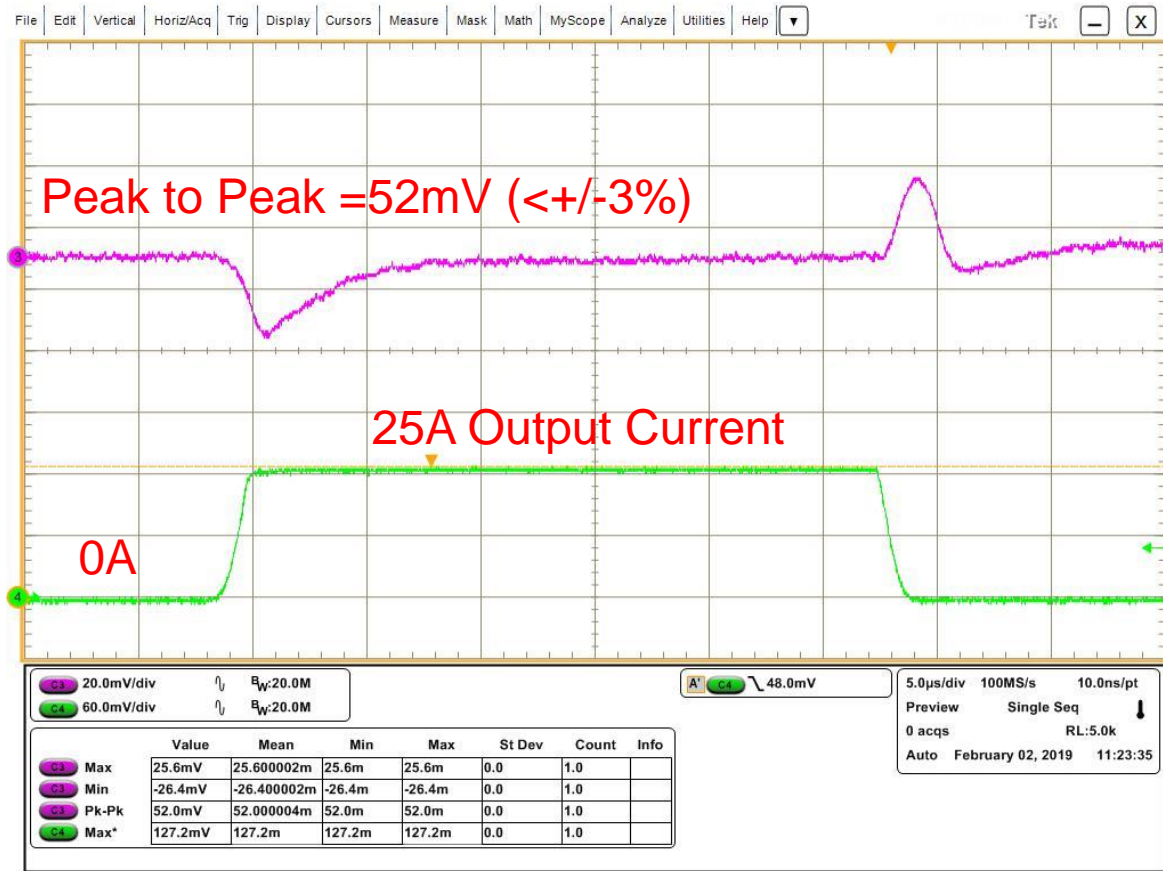
12V Input, 1V Output,  
COUT = 6x47 $\mu$ F + 1x220 $\mu$ F SP-CAP

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  
 CO<sub>UT</sub> = 6x47μF + 1x220μF SP-CAP



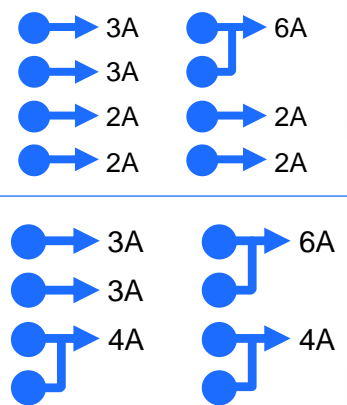
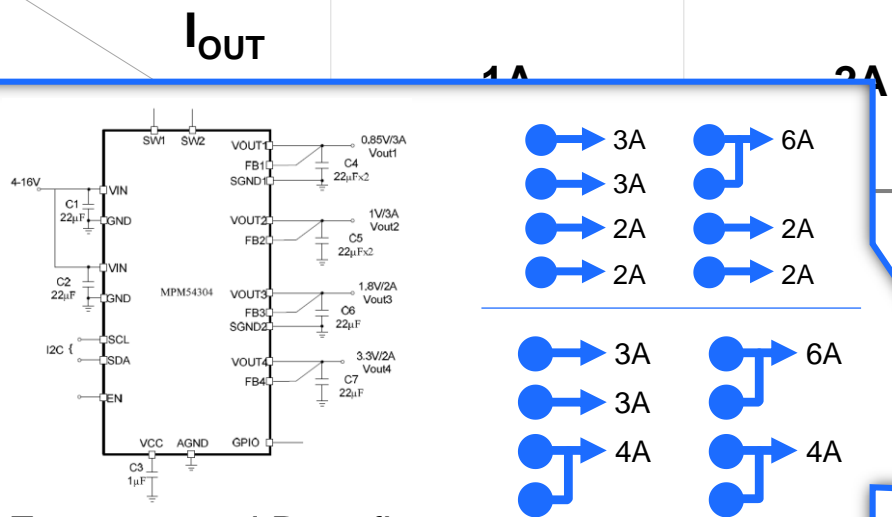
Achieves >70% output capacitance reduction compared to competing power modules

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



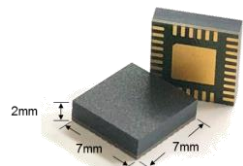
Parameter	Value
Number of power modules	2
Maximum output current	200A
Ceramic output capacitor	47uFx16 per module 6.3V 0805
SP-Cap output capacitor	220uFx8 total
Input voltage	12V
Output voltage	0.78V

# 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



3822  
6mm  
A

I <sub>OUT</sub>	1A	2A	3A	5A	12A	25A
			<p><b>MPM3596</b> 10x10x4.4mm 2x3A, I2C, Parallel, Telemetry</p>			
			<p><b>MPM54304</b> <span style="color:red">NEW</span> 7x7x5.4mm 2x3A+2x2A, I2C, Parallel</p>	<p><b>MPM54504</b> <span style="color:red">NEW</span> 9x15x5.4mm 4x5A, I2C, Parallel</p>	<p><b>MPM81204</b> <span style="color:red">NEW</span> 9.5x16x5.4mm 2x12A + 2x5A</p>	<p><b>MPM82504</b> <span style="color:red">NEW</span> 15x30x5.4mm 4x25A, I2C, Parallel, Telemetry</p>
				<p><b>MPM54502</b> <span style="color:red">NEW</span> 8x14x4.4mm 22V, 2x5A, I2C, Parallel, Telemetry</p>		<p><b>MPM3690-30A</b> <span style="color:red">NEW</span> 16x16x5.4mm 2x25A, I2C, Parallel, Telemetry</p>



# Multiple Output Buck

		$I_{OUT}$		5A	12A	25A
$V_{IN}$	High Voltage ( $\leq 45V$ )					
	Medium Voltage ( $\leq 16V$ )	<p><b>Features and Benefits</b></p> <ul style="list-style-type: none"> <li>Quad 5A Power Module</li> <li>3.3V to 16V Input Range</li> <li>0.5V to 5V Output Voltage</li> <li>Quad 5A Continuous                             <ul style="list-style-type: none"> <li>Peak 6A</li> </ul> </li> <li>9x15x5.18mm BGA Package</li> </ul>				
Low Input ( $\leq 6V$ )						
				<b>MPM54504</b> 9x15x5.2mm 4x5A	<b>MPM81204</b> 9.5x16x5.2mm 2x12A + 2x5A	<b>MPM82504</b> 15x30x5.2mm 4x25A, I2C, Parallel, Telemetry
				<b>MPM54502</b> 8x14x4.4mm 22V, 2x5A, I2C, Parallel, Telemetry		<b>MPM3690-50A</b> 16x16x5.2mm 2x25A, I2C, Parallel, Telemetry



# Multiple Output Buck

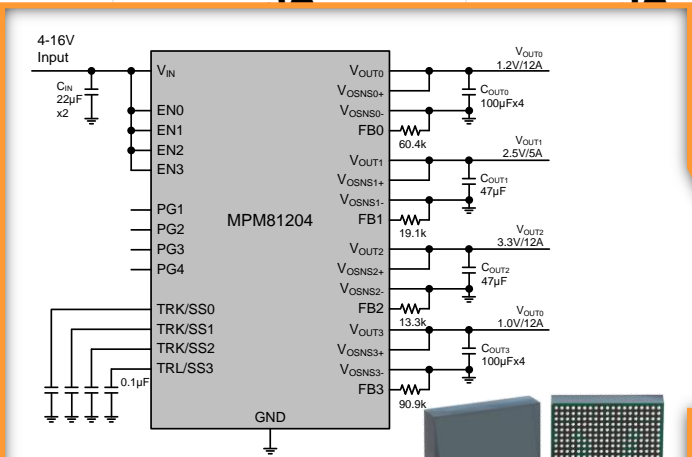
		1A		2A		5A		12A		25A	
$I_{OUT}$											
$V_{IN}$											
High Voltage ( $\leq 45V$ )	Four-Output										
	Dual-Output	<p><b>Features and Benefits</b></p> <ul style="list-style-type: none"> <li>• Dual 5A, Single 10A Power Module with I2C and Telemetry</li> <li>• 4V to 22V Input Range</li> <li>• 0.5V to 20V Output Voltage</li> <li>• PMBus 1.3</li> <li>• Built-in Power On/Off Sequence</li> <li>• 8x14x4.4mm LGA Package</li> </ul>									
Medium Voltage ( $\leq 16V$ )	Four-Output	NEW		NEW		NEW		NEW		NEW	
	Dual-Output	NEW		NEW		NEW		NEW		NEW	
Low Input ( $\leq 6V$ )	Four-Output	NEW		NEW		NEW		NEW		NEW	
	Dual-Output	NEW		NEW		NEW		NEW		NEW	





# Multiple Output Buck

$I_{OUT}$	1A	2A	3A	5A	12A	25A
$V_{IN}$						
High Voltage ( $\leq 45V$ )						
Medium Voltage ( $\leq 16V$ )	Four-Output				<div data-bbox="1811 629 2142 829"> <p><b>NEW</b></p> <p><b>MPM81204</b> 9.5x16x5.4mm 2x12A + 2x5A</p> </div>	<div data-bbox="2173 629 2504 829"> <p><b>NEW</b></p> <p><b>MPM82504</b> 15x30x5.4mm 4x25A, I2C, Parallel, Telemetry</p> </div>
	Dual-Output				<div data-bbox="1671 843 1791 1043"> <p><b>NEW</b></p> <p>502 nm I2C, metry</p> </div>	<div data-bbox="2173 843 2504 1043"> <p><b>NEW</b></p> <p><b>MPM3690-30A</b> 16x16x5.4mm 2x25A, I2C, Parallel, Telemetry</p> </div>
Low Input ( $\leq 6V$ )	<div data-bbox="410 1079 733 1272"> <p><b>MPM38111</b> 4x4x1.6mm 2x1A</p> </div>	<div data-bbox="764 1079 988 1272"> <p><b>MPM382</b> 4x4x1.6mm 2x2A</p> </div>				



## Features and Benefits

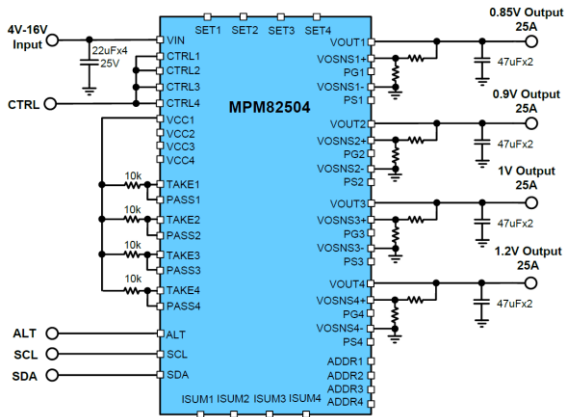
- Quad Output Power Module
- Dual 12A + Dual 5A
- 3V to 16V Input Range
- 0.6V to 3.3V Output Voltage for 12A
- 0.6V to 5V Output Voltage for 5A
- Pin Compatible with LTM4671
- $\pm 1.5\%$  Output Voltage Regulation
- 9.5x16x5.18mm BGA Package



# Multiple Output Buck

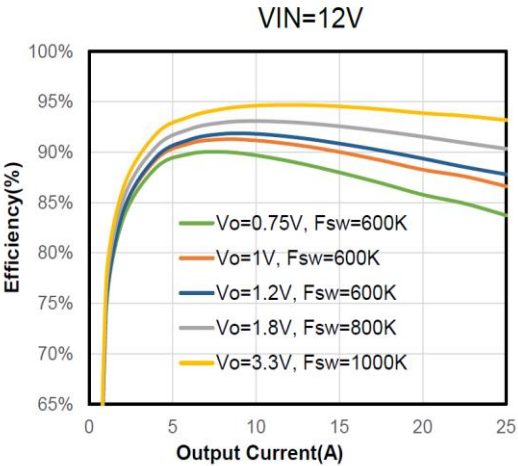
$I_{OUT}$  1A 2A 3A 5A 12A 25A

$V_{IN}$  High ( $\leq$ )

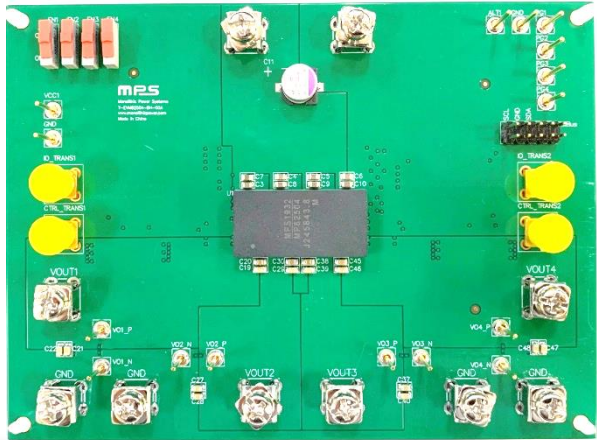


## Features and Benefits

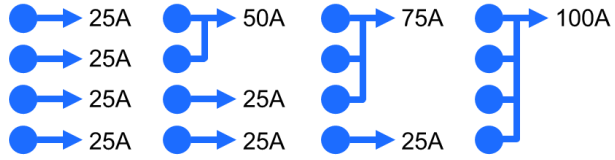
- Quad 25A Output Power Module with I2C and Parallelable
- 3V to 16V Input Range
- 0.5V to 1.8V Output for 25A
- 1.8V to 3.3V Output for 15A
- Parallel with MPM3695-100
- PMBus 1.3 Complaint
- Ultra Fast Transient
- Telemetry for  $V_{IN}$ ,  $V_{OUT}$ ,  $I_{OUT}$ , Temp
- 15x30x5.18mm BGA Package



Medium ( $\leq$ )



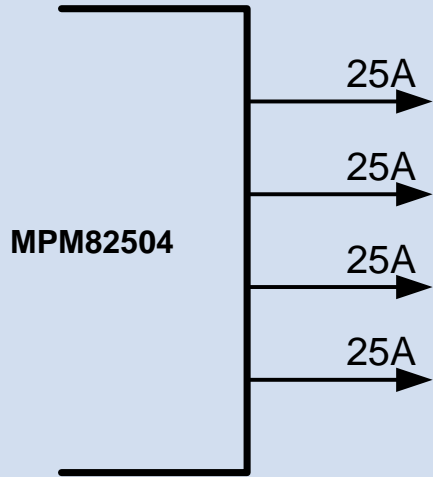
Low In



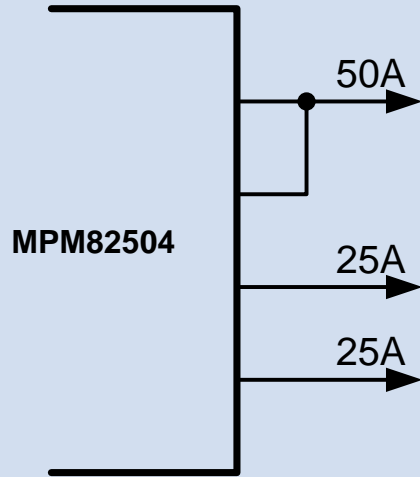
<p>16x5.4mm 2A + 2x5A</p>	<p><b>NEW</b> <b>MPM82504</b> 15x30x5.2mm 4x25A, I2C, Parallel, Telemetry</p>
<p>16x16x5.2mm 2x25A, I2C, Parallel, Telemetry</p>	<p><b>NEW</b> <b>MPM3690-50A</b> 16x16x5.2mm 2x25A, I2C, Parallel, Telemetry</p>

# MPM82504 Offers More Rail Combinations

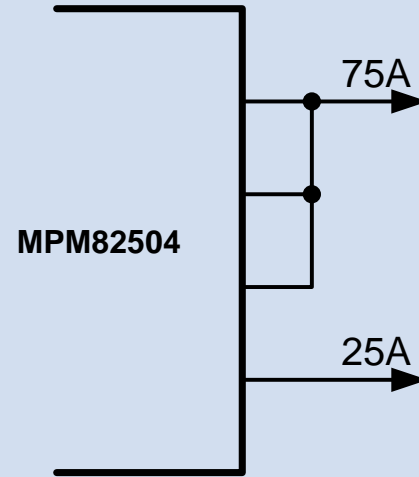
Quad output  
4 x 25A



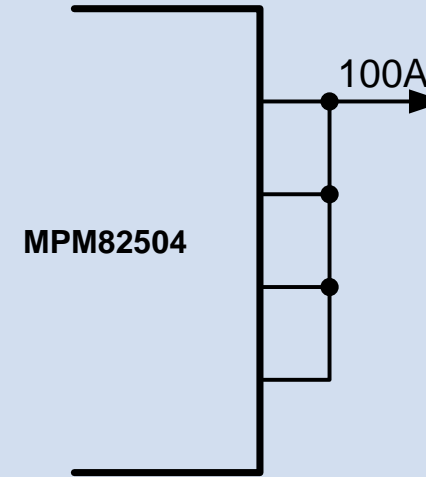
Triple Output  
50A+25A+25A



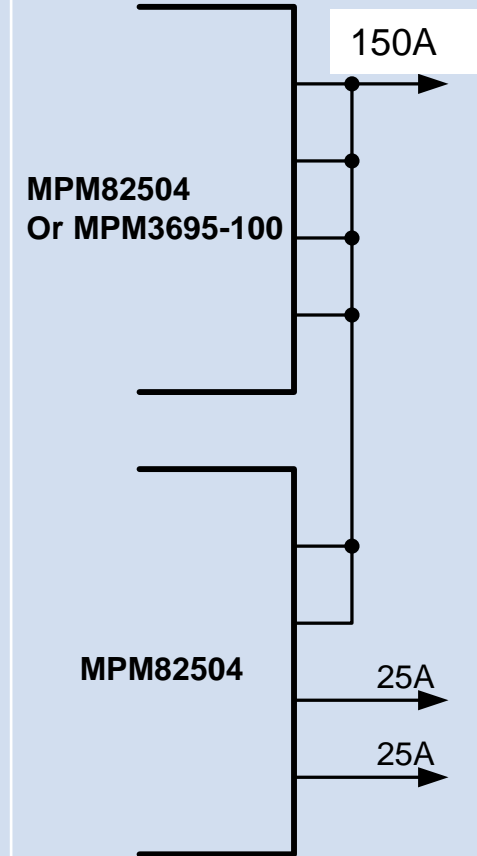
Dual Output  
75A+25A



Single Output  
100A



Multiple Module  
Paralleling



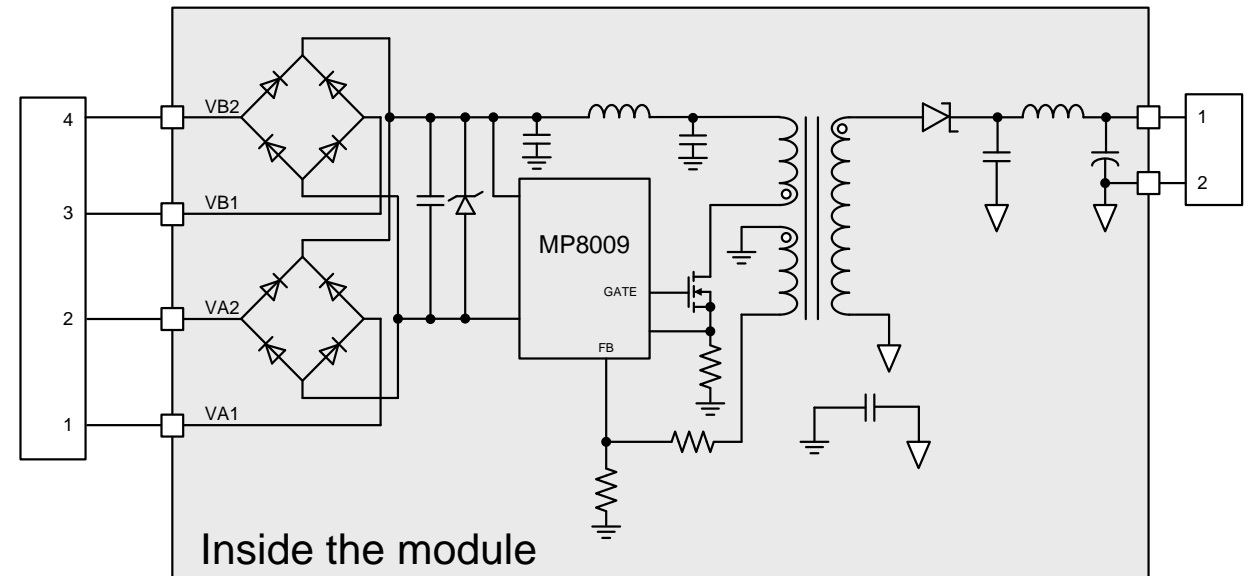
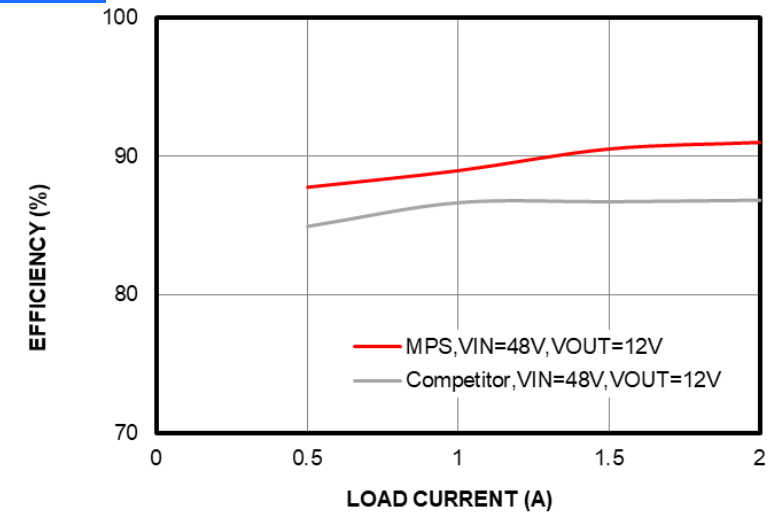
# mEVS84802A 802.3af/at 12V 25W PoE Module

## 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



MPS

**Thank You**