

A green road sign with white text is mounted on a wooden post. The sign reads '宜普eGaN® FET 的进程'. The background is a desert landscape with a road leading towards a city skyline at sunset. The sky is blue with white clouds, and the sun is low on the horizon, creating a golden glow.

宜普eGaN® FET
的进程

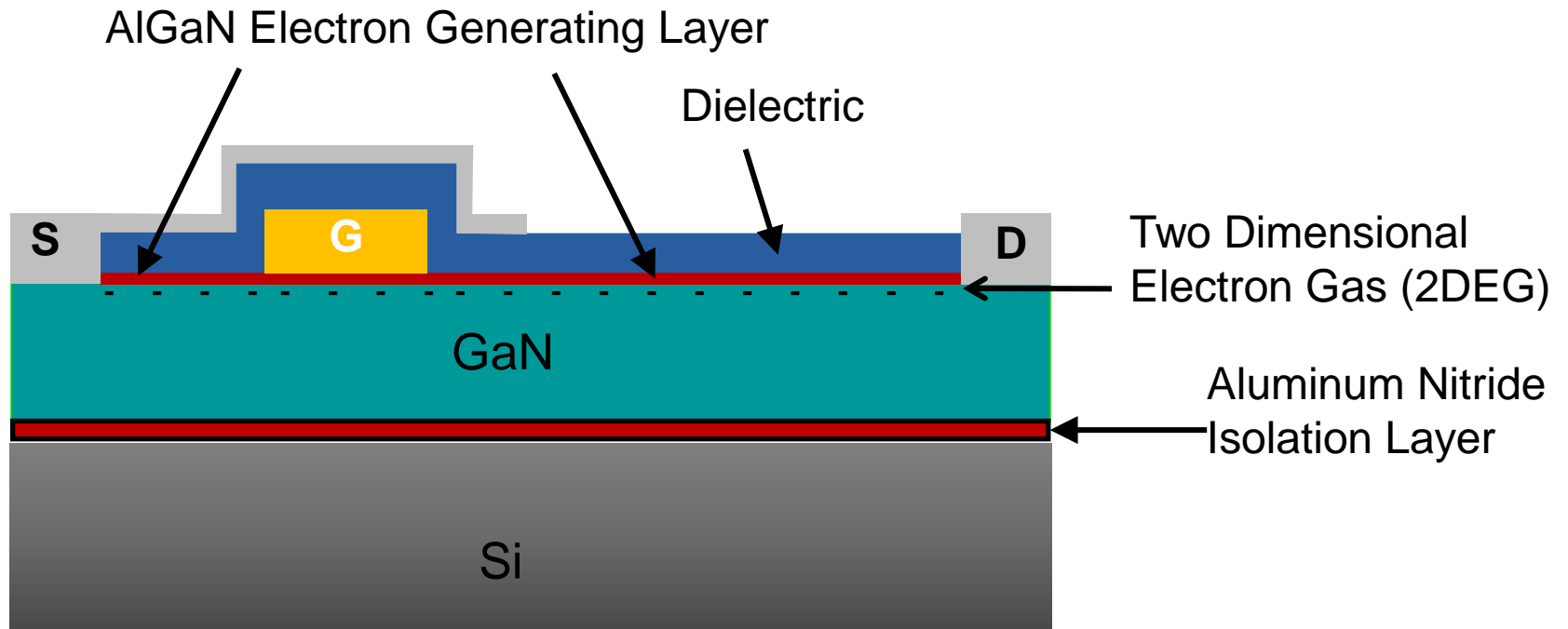
eGaN®FET 的科技发展
宜普电源转换公司

- 宜普的进程
- eGaN[®]FET 科技的进展
- eGaN[®]FET 生态环境发展
- 氮化镓器件具有什么优势
- 隔离式转换器效率
- 非隔离式转换器效率
- 产品发展计划

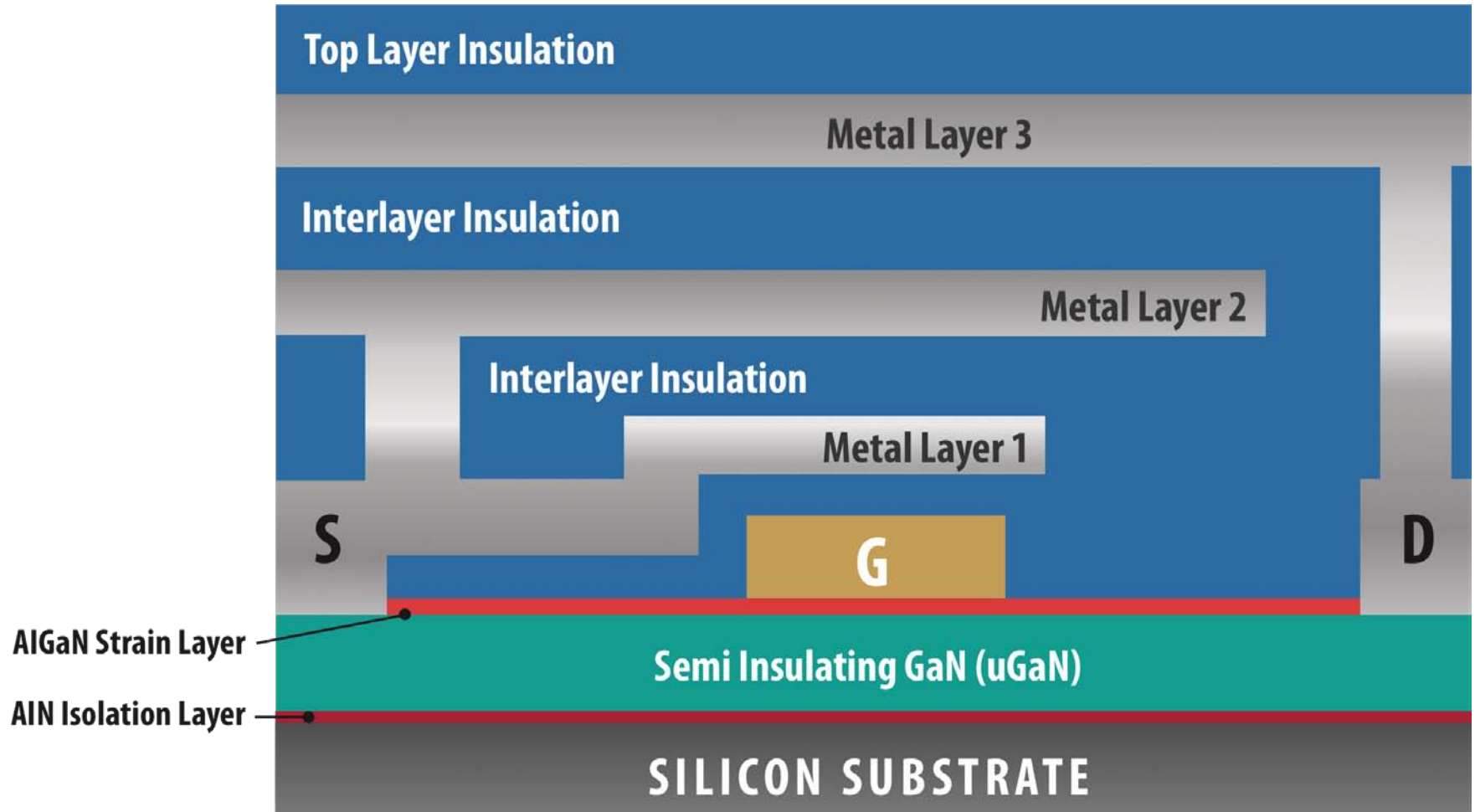
- 已可以应付庞大产能
- **eGaN FET** 全球付运给超过 **350** 个客户
- 多个大型**IC**公司正在发展优化了的驱动器，用来驱动 **eGaN FET** – 第一个是在**2011**年**6**月推出的德州仪器（国半）**LM5113**驱动器
- 在**2011**年第**3**季已经取得**ISO9001:2008** 质量认证
- 应用市场证明**eGaN FET** 可在多个应用领域提高效率,包括伺服器、通讯设备、太阳能微型逆变器、医疗设备及**RF** 系统等市场

eGaN[®]FET 科技的进展

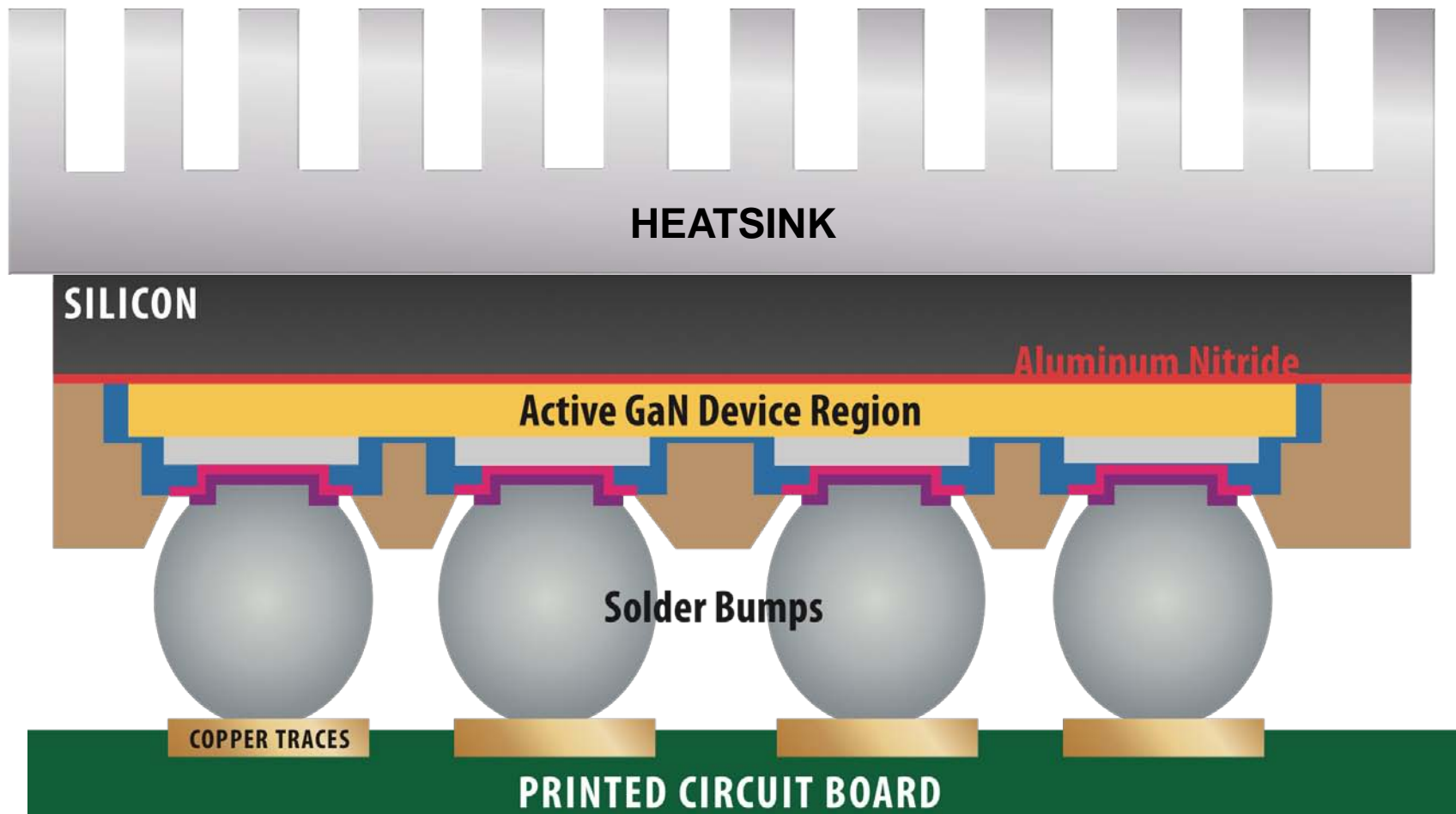
eGaN[®] FET结构



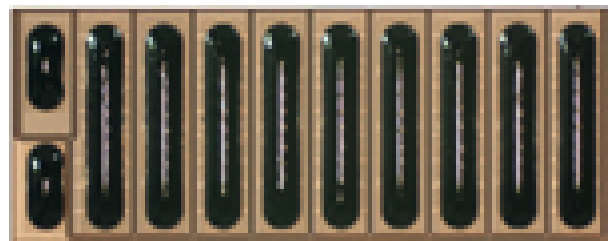
eGaN[®] FET 结构



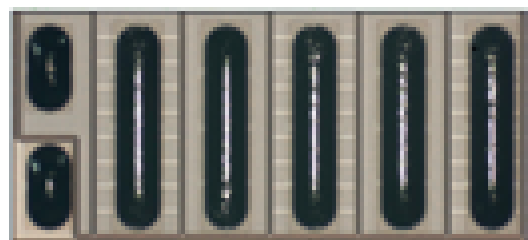
LGA 装配



EPC MOSFET Killer Products



LGA 4.1x1.6 x0.8



LGA 3.6x1.6 x0.8



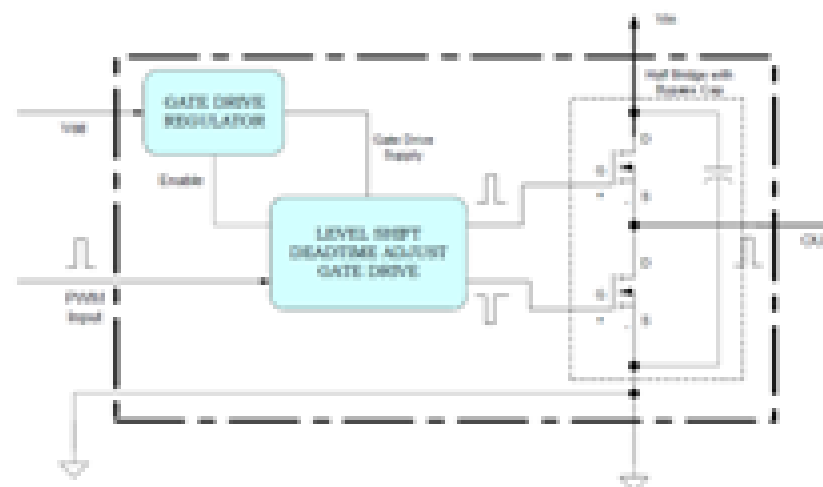
LGA 1.7x1.1x0.8



LGA 1.7x0.9x0.8



Development Board available



宜普产品数据表





















Part Number	Package (mm)	RoHS and Halogen Free	T _{J(MAX)} (°C)	V _{DS}	V _{GS} (max)	Max R _{DS(ON)} (mΩ) @5V _{GS}	Q _G typ (nC)	Q _{GS} typ (nC)	Q _{GD} typ (nC)	Q _{OSS} typ (nC)	V _{TH} typ	Q _{RR} (nC)	I _D (A)
EPC2015	LGA 4.1x1.6	Yes	150	40	6	4	10.5	3	2.2	18.5	1.4	0	33
EPC2014	LGA 1.7x1.1	Yes	150	40	6	16	2.5	0.67	0.48	4.8	1.4	0	10
EPC2001	LGA 4.1x1.6	Yes	125	100	6	7	8	2.3	2.2	35	1.4	0	25
EPC2007	LGA 1.7x1.1	Yes	125	100	6	30	2.1	0.5	0.6	10	1.4	0	6
EPC2010	LGA 3.6x1.6	Yes	125	200	6	25	5	1.3	1.7	40	1.4	0	12
EPC2012	LGA 1.7x0.9	Yes	125	200	6	100	1.5	0.33	0.57	11	1.4	0	3




40V - 200V 器件已经进行量产, 在2011年第四季可提供600V 器件的样品

演示板



EPC's half bridge development boards simplify the evaluation process of our eGaN FETs by including all the critical components and layout for optimal switching performance on a single board that can be easily connected into any existing converter.

Part Number	Description	V _{DS} (max)	I _d (max RMS)	Featured Product	Schematic	Gerber	Bill of Materials	
<u>EPC9001</u>	Half Bridge Plus Driver	40	15	EPC2015				Buy Now
<u>EPC9002</u>	Half Bridge Plus Driver	100	10	EPC2001				Buy Now
<u>EPC9003</u>	Half Bridge Plus Driver	200	5	EPC2010				Buy Now
<u>EPC9004</u>	Half Bridge Plus Driver	200	3	EPC2012				Buy Now
<u>EPC9005</u>	Half Bridge Plus Driver	40	7	EPC2014				Buy Now
<u>EPC9006</u>	Half Bridge Plus Driver	100	5	EPC2007				Buy Now

Part Number	Description	V _{in}	V _{out}	I _{out}	Featured Product	Schematic	Gerber	Bill of Materials	
<u>EPC9101</u>	19V to 1.2V Buck Converter	8V-19V	1.2V	18A	EPC2015/EPC2014				Buy Now
EPC9102	48V to 12V 1/8 th Brick	36V-60V	12V	15A	EPC2001/EPC2015				Coming Soon

eGaN[®]FET 生态环境发展

LM5113 – 专为驱动eGaN FET、 经过优化的半桥栅极驱动器

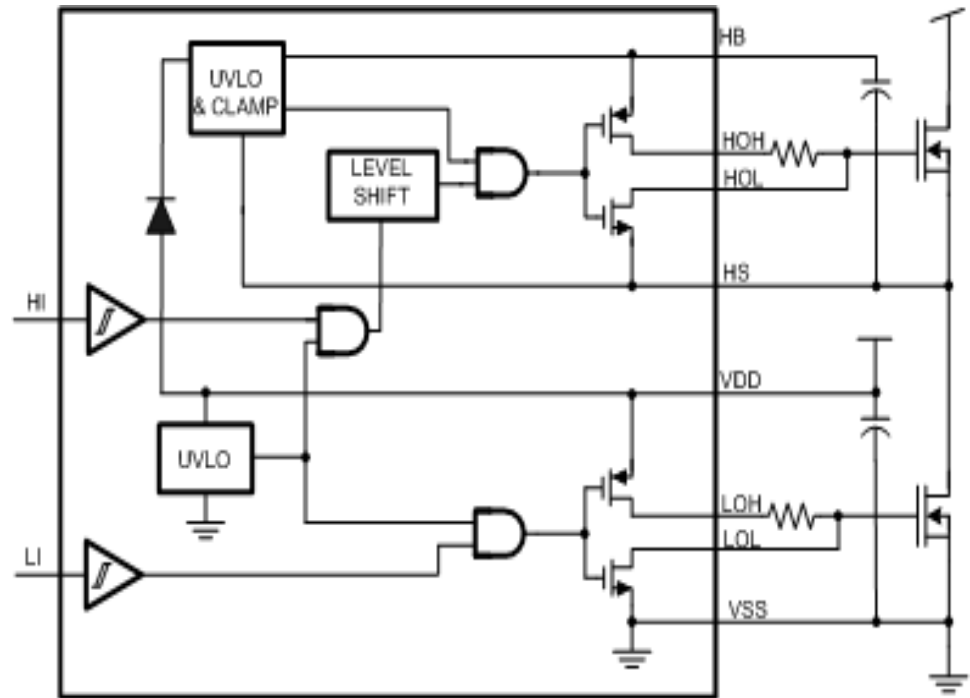


产品主要特征

- 0.5 Ohm Sink and 2 Ohm Source Capability
- Independent Source and Sink Outputs
- Bootstrap Voltage Clamp
- Vcc UVLO optimized for eGaN FETs (3.5V)
- 100V V_{HS} Rating
- >50V/ns dv/dt Immunity at V_{HS}
- Independent TTL Inputs
- Short Propagation Delays (25ns)
- 4ns Delay Matching Between Channels
- Low Power Consumption (2mA @ 0.5MHz)

现已供货

- Packages: **LLP-10 (4mm x 4mm),**
uSMD12 (2mm x 2mm)
- Production Release: **Oct 2011**



氮化镓器件具有什么优势？

使用eGaN FET可实现更小的系统尺寸

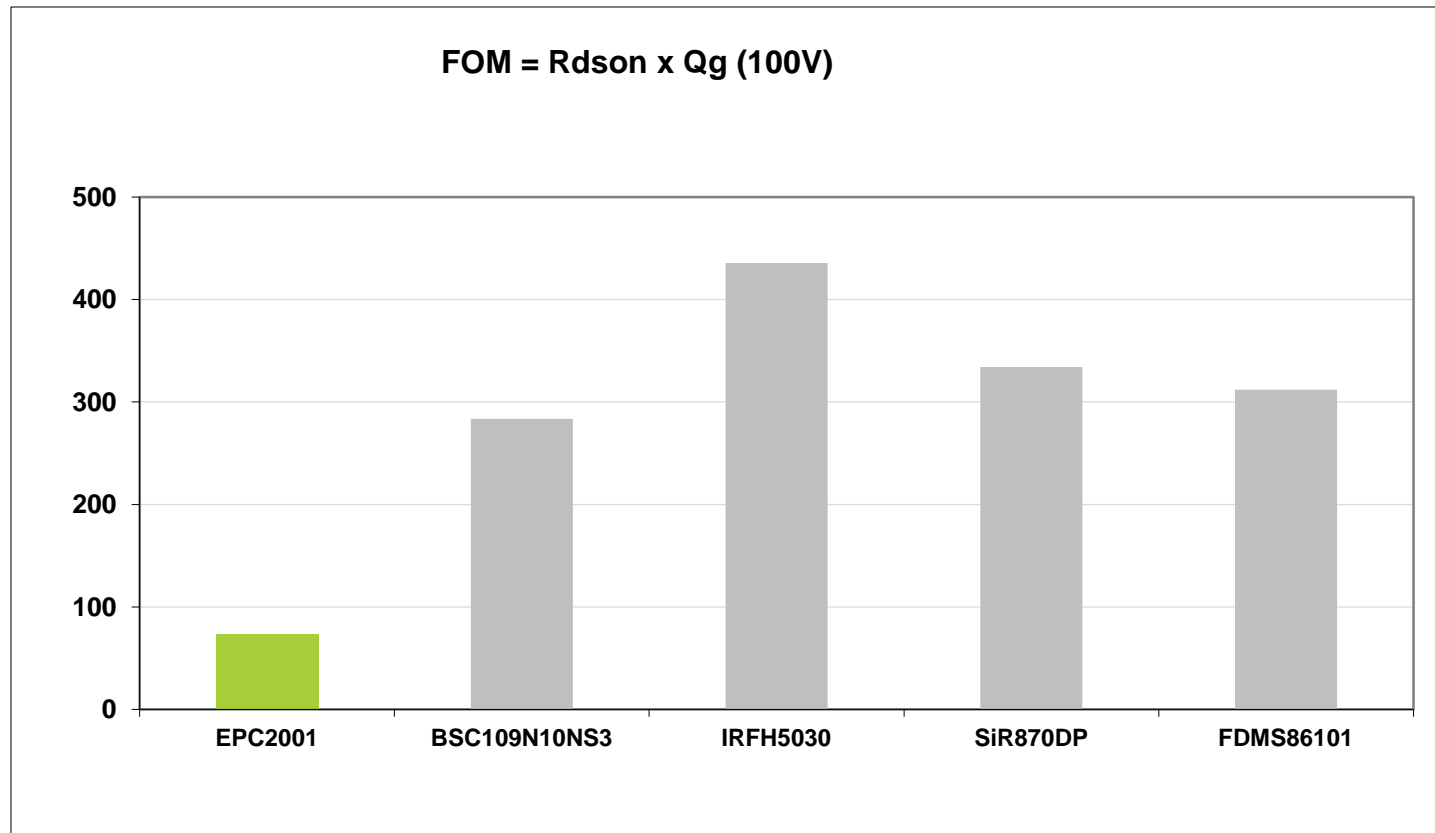
**200V 硅功率器件
(30 milli Ohms)**



**200V 氮化镓功率器件
(25 milli Ohms)**



eGaN FET 具更高开关速度



Source: Infineon, International Rectifier, Siliconix, and Fairchild data sheets

eGaN FET 的成本可以更低



	2010	2015
初始材料	相同	相同
Epi 外延生长	更高	相同
晶圆制造工艺	相同	更低
测试	相同	相同
组装	更低	更低
总成本	更高	更低

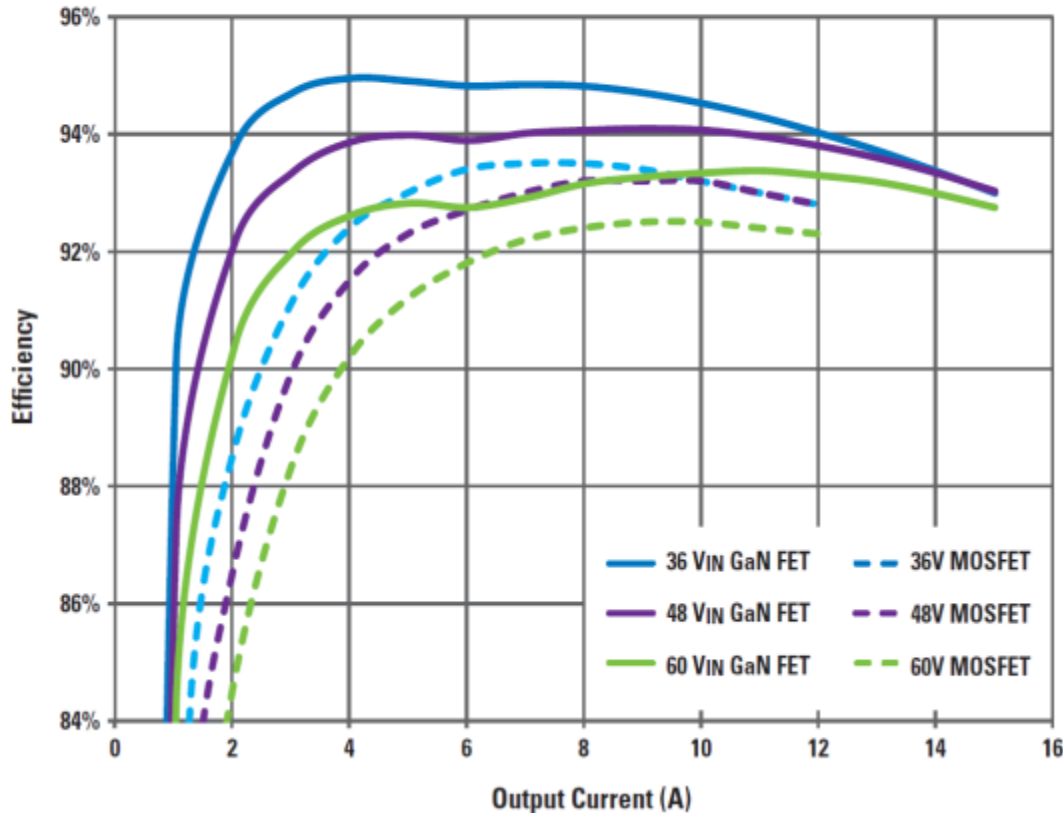
Source: EPC

隔离式DC-DC转换器效率

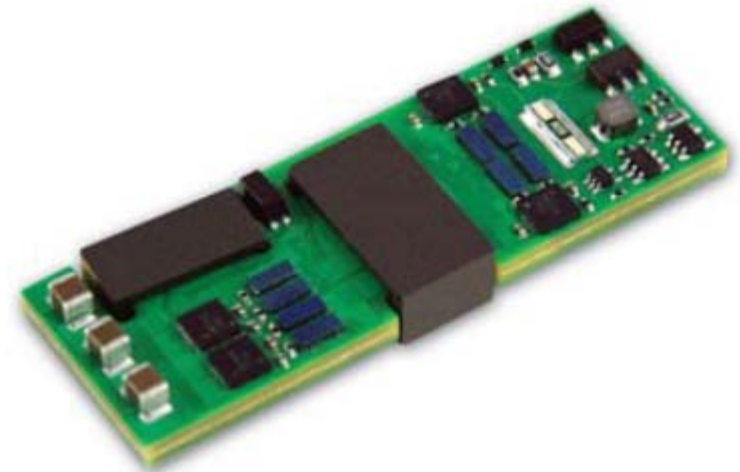
eGaN FET 与 MOSFET 的性能比较

GaN FET Efficiency vs Traditional MOSFET

Input 36 to 75V; Regulated output 12V; Switching frequency at 333 KHz
GaN FET, 250 KHz MOSFET



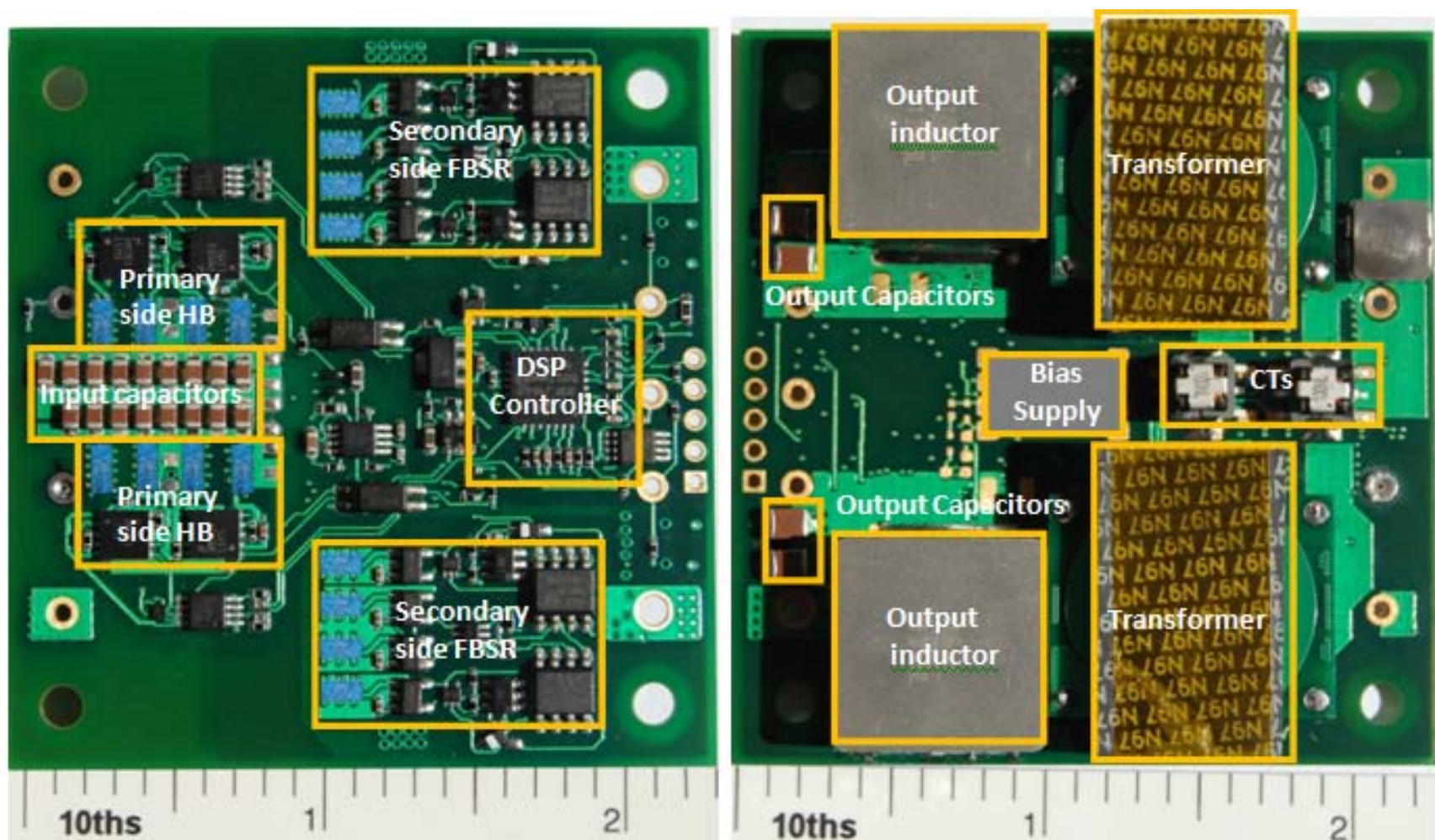
180W 1/8 Power Brick



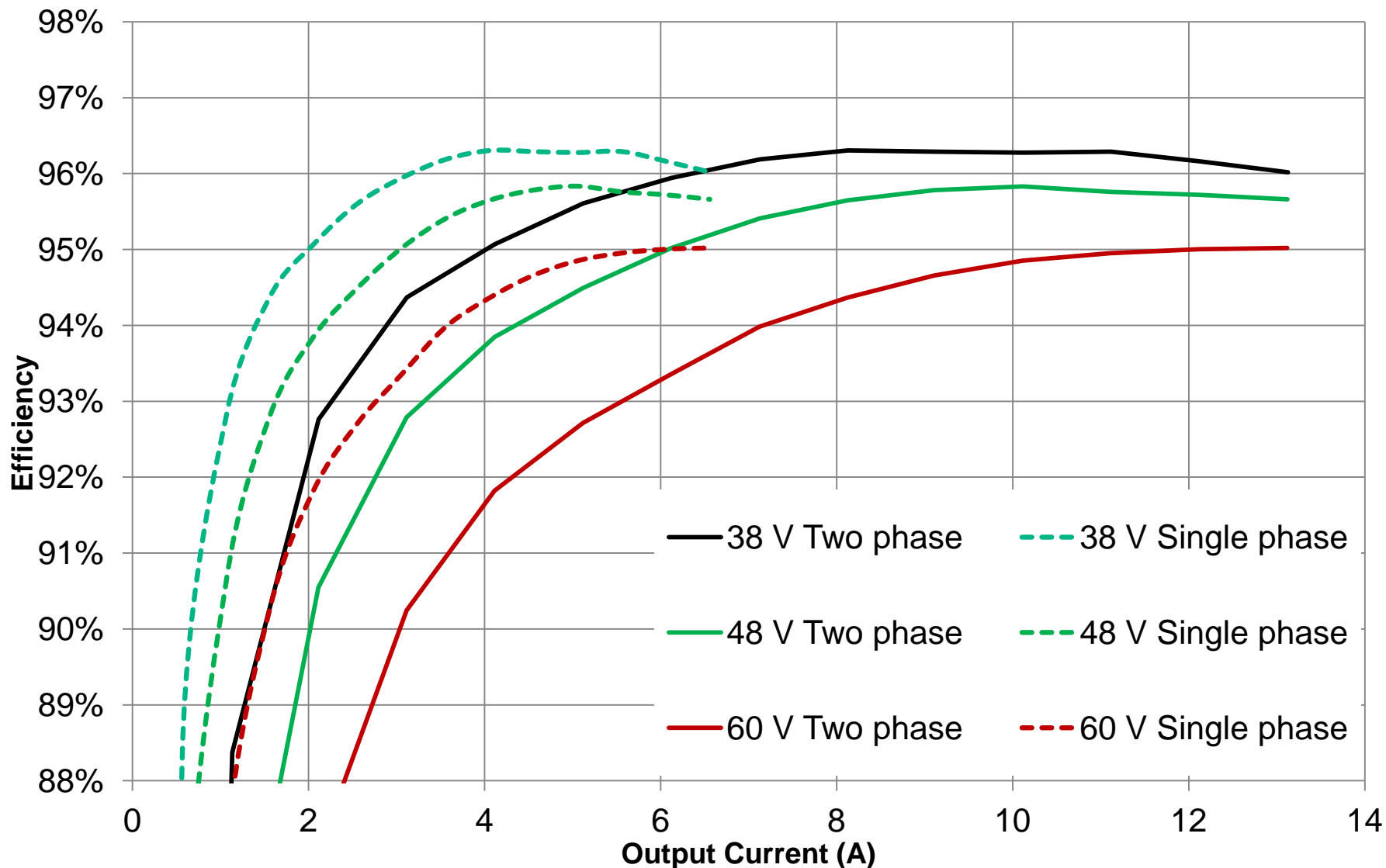
1/8 power brick featuring the EPC2001 eGaN FET and LM5113 GaN FET driver.

Isolated 1/8th Brick, Regulated 12 Vout

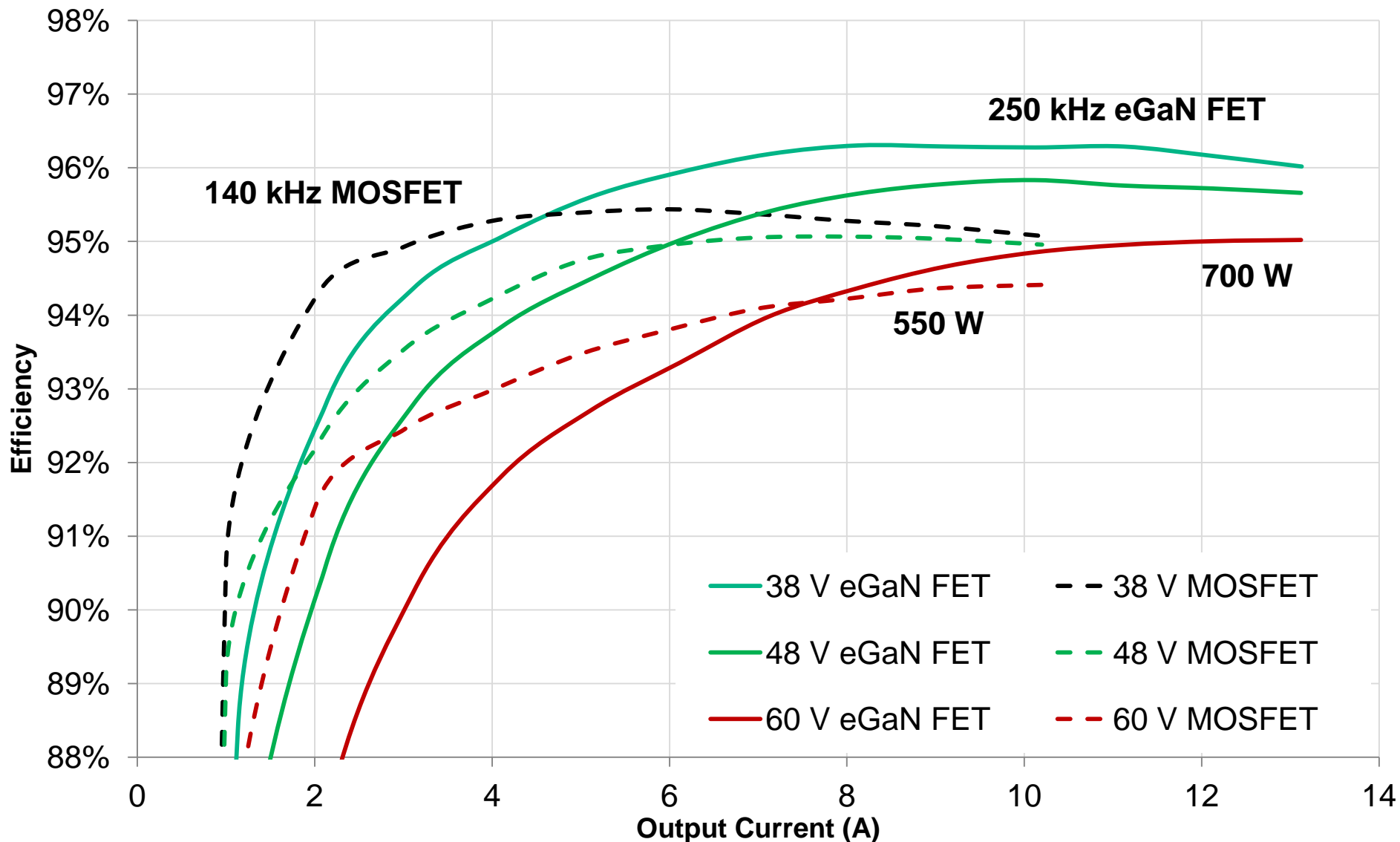
PSE 内的半砖 eGaN FET



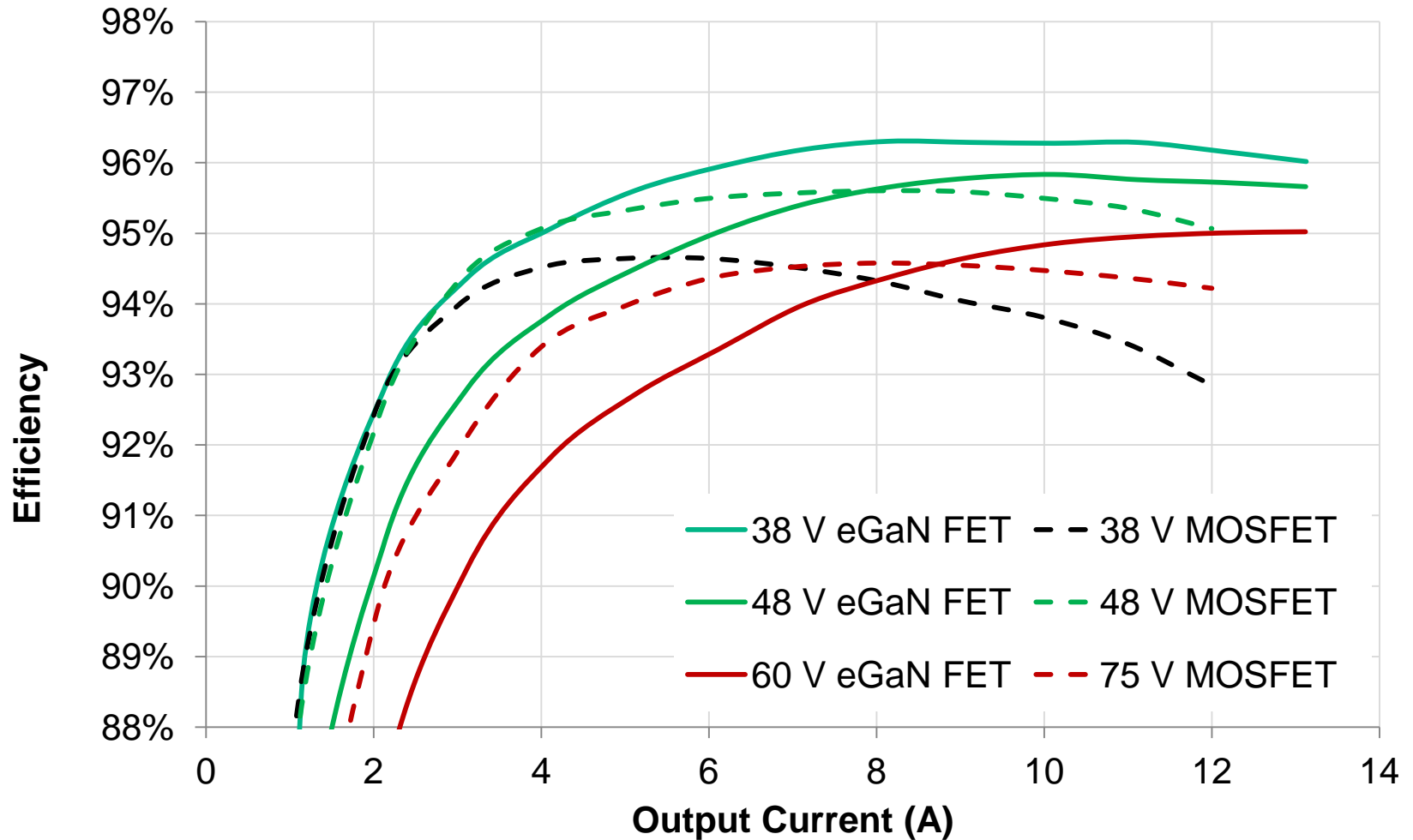
单相与两相的比较



效率的比较

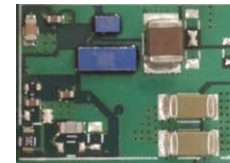
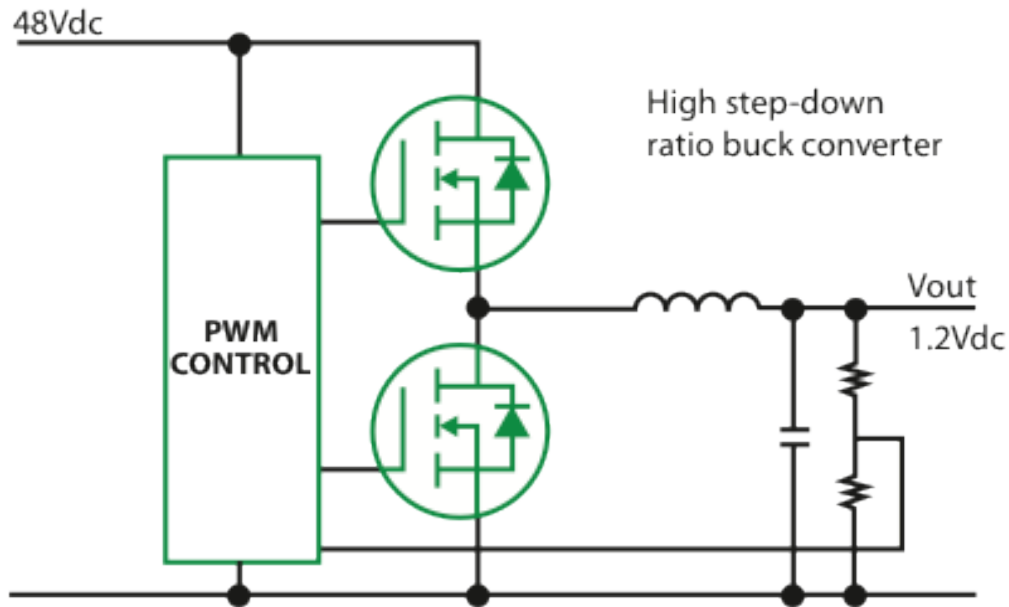


效率的比较



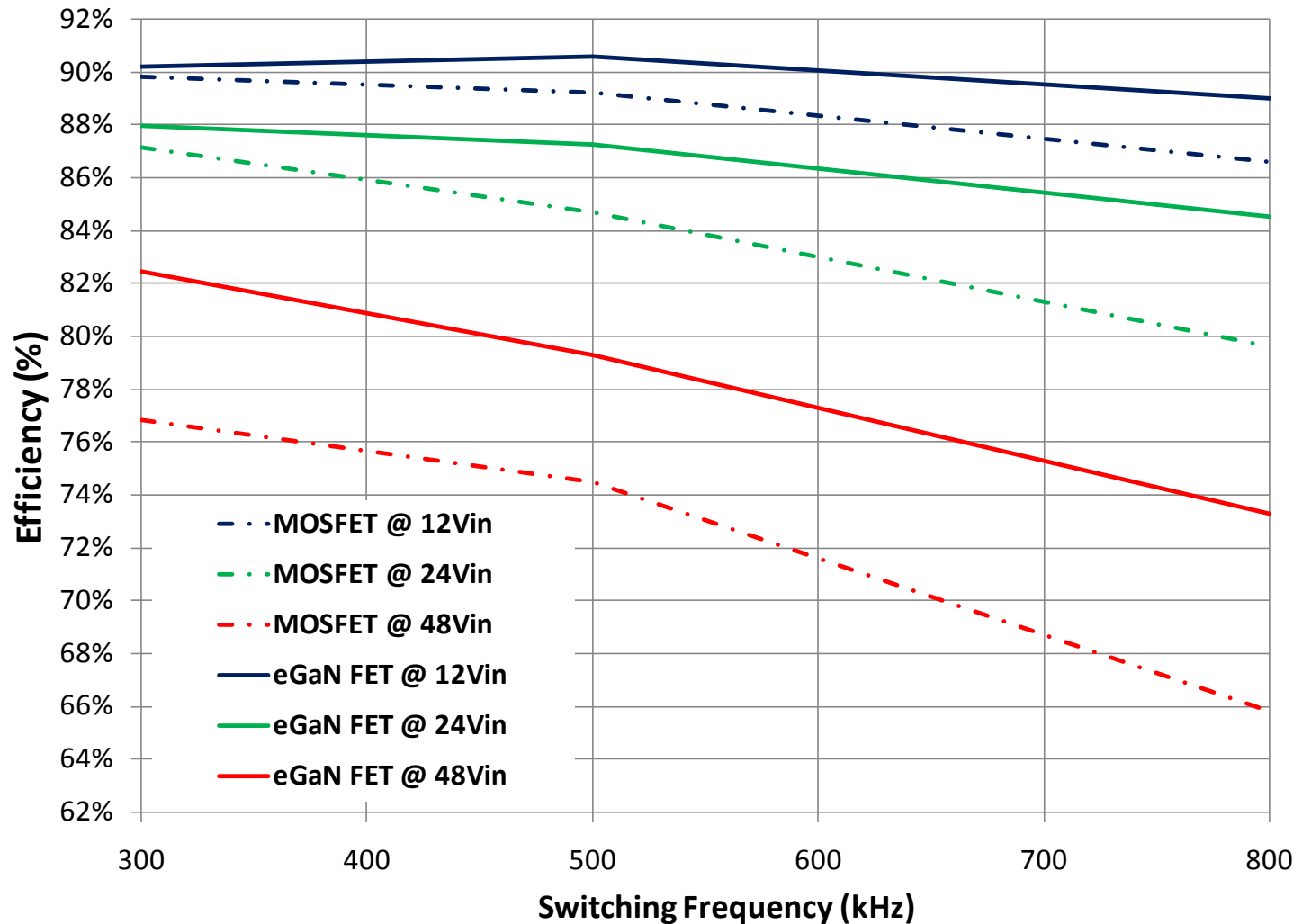
非隔离式DC-DC 转换器效率

降压转换器



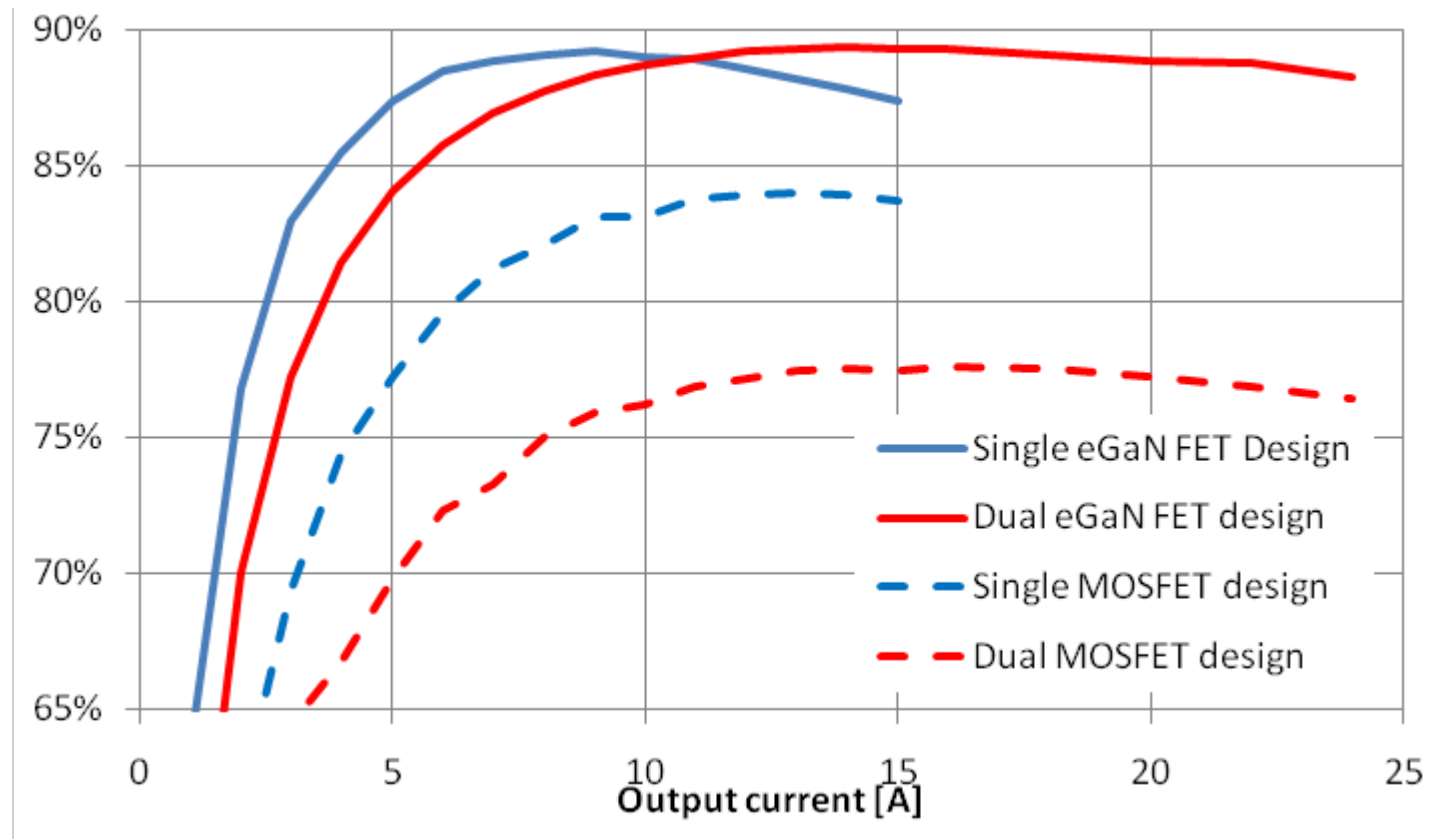
效率与频率

1.2 Vout / 5A



使用并联eGaN FET 降压转换器

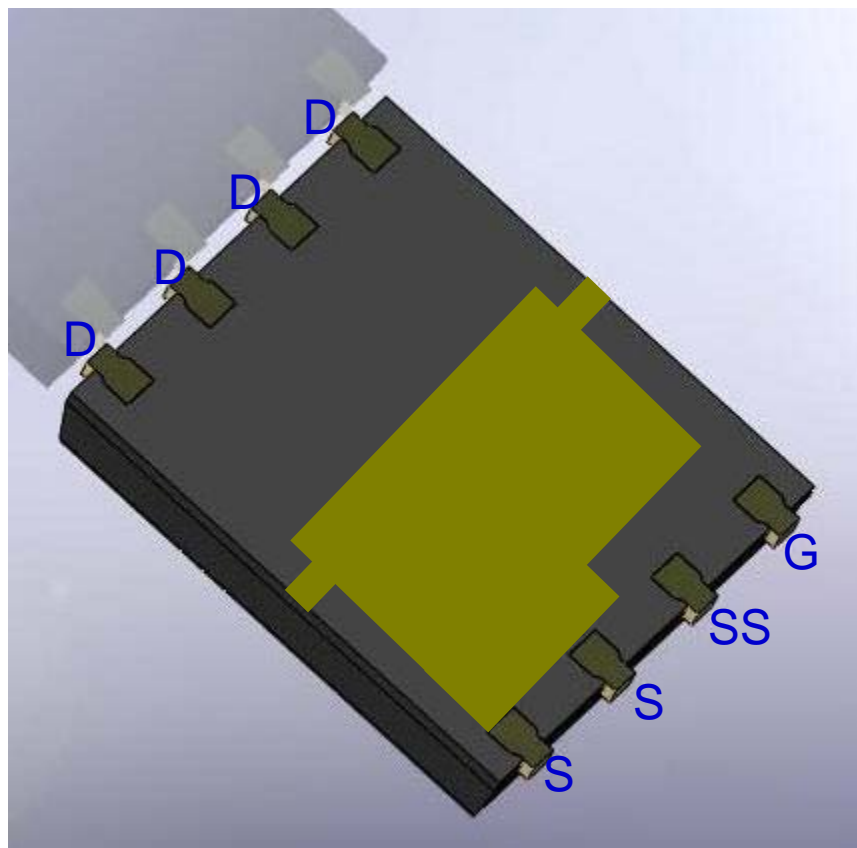
Efficiency at 1 MHz



$$12 V_{IN} - 1.2 V_{OUT}$$

宜普产品发展计划

5x6 mm PQFN 封装 (GaNPAK)



600V eGaN 器件封装 (GaNPAK)
在2011年供货

EPC3019 主要特征*:

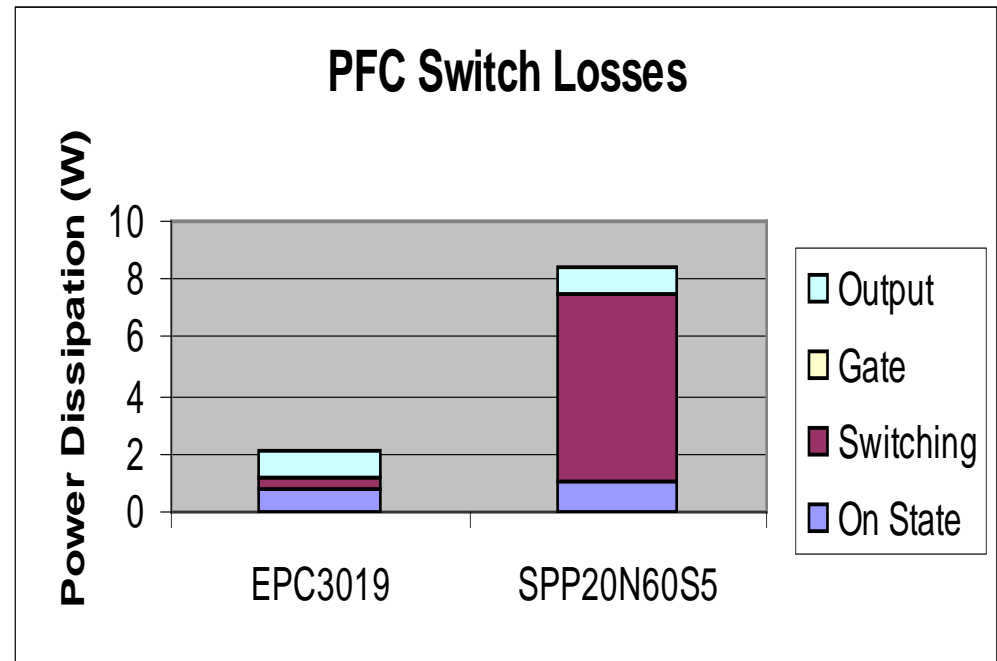
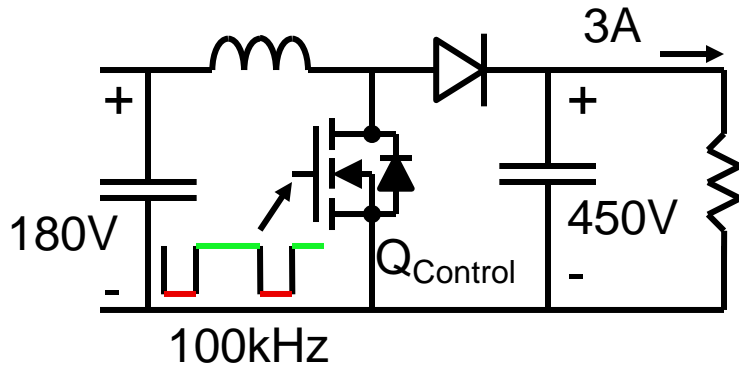
$V_{DS(MAX)}$	600V
$R_{DS(ON)(MAX)}$	100m Ω @25 $^{\circ}$ C
$I_{D(DC)MAX}$	5A
$Q_{GS}(typ)$	0.3 nC
$Q_{GD}(typ)$	4 nC
$V_{TH}(typ)$	1.4V

* 以上特征的极限是初步数据，如有更改，将不作令行通告。

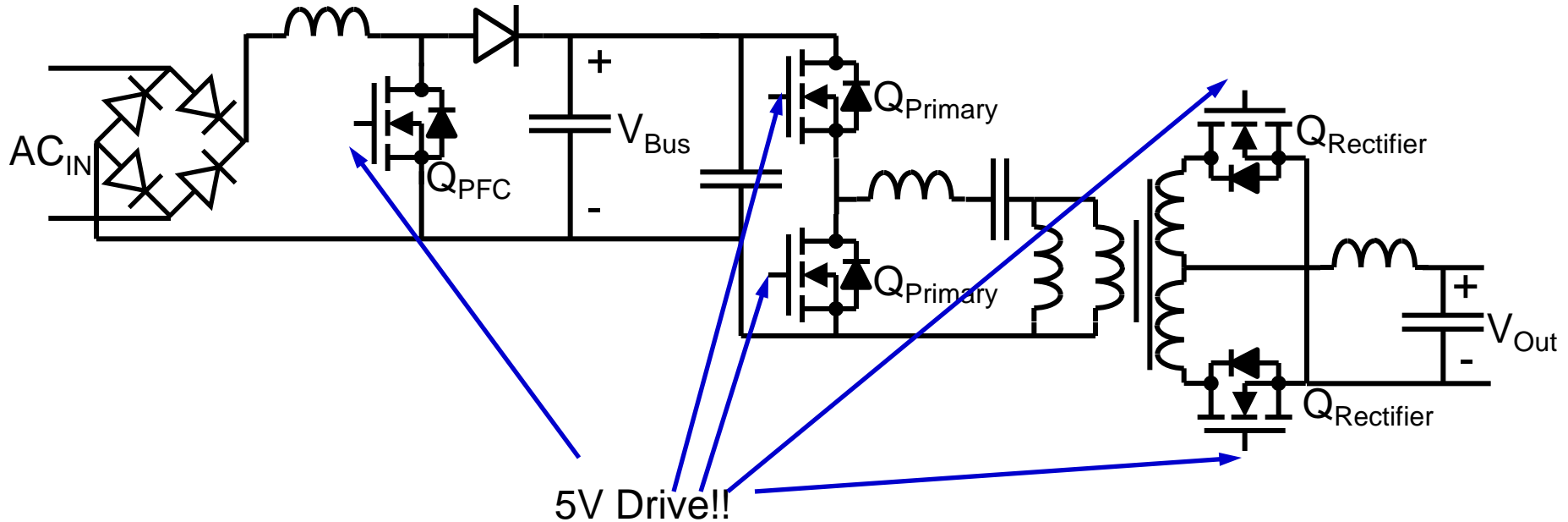
PFC 硬开关

GaN Transistor Selection

Part Number	Package	Mode Ch	Configuration	Vds	Vgs	Rdson (mΩ)		Q5 (nC)	Qgs (nC)	Qgd (nC)	Vgth (V)	Rg (Ω)	Qrr (nC)	Qoss (nC)	Id (A)	FOM (RxQ)	Info
				5V	100C	Q5	Qgs	Qgd	Qrr	Qoss							
EPC3019	SON 5x6	EN	Single	600	6	100	101.6	5.8	0.3	4	1.4	2	0	47	5	580	EPC
																	Dev 12/15/2010

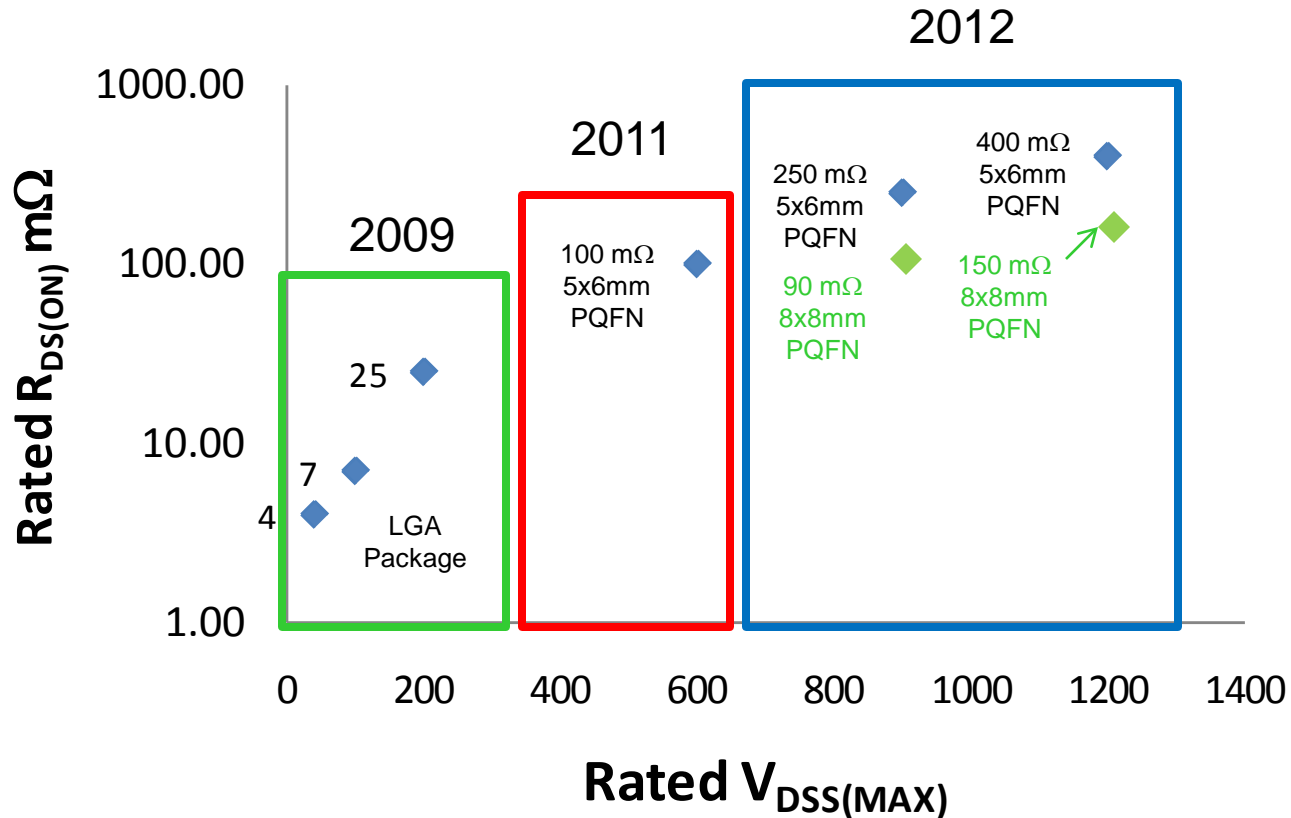


AC/DC – 半桥LLC



Socket	Part Number	Channel	Vds	Vgs	Rdson	Qg	Qgs	Qgd	Rg	Qrr	Qoss	Package
PFC	EPC3019	EN	600	6	100	7.1	0.53	4	2	0	47	SON 5x6
Primary	EPC3019	EN	600	6	100	7.1	0.53	4	2	0	47	SON 5x6
12V Out Rectifier	EPC1015	EN	40	6	3.2	11.6	3.8	2.2	0.6	0	18.5	LGA 4.1x1.6
48V Out Rectifier	EPC1010	EN	200	6	18	7.5	1.5	3.5	0.6	0	40	LGA 3.6x1.6

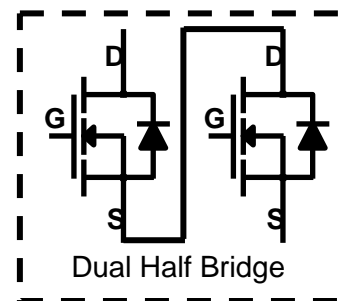
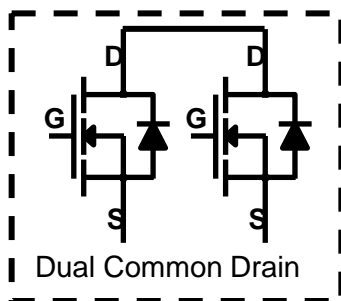
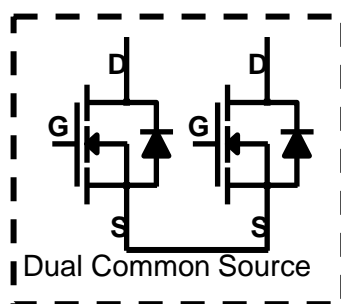
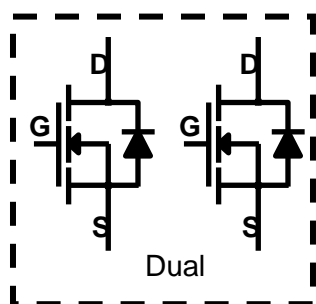
600V 器件以外



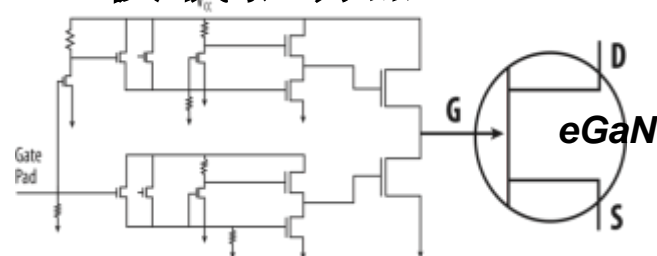
宜普会在2011年推出600V eGaN FET，并因应客户所需，我们有可能在2012年推出900V及1200V 器件

除了分立器件以外

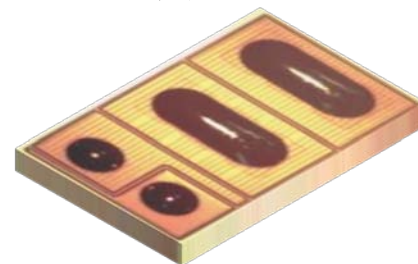
在同一 eGaN 晶片上还可以有多个器件



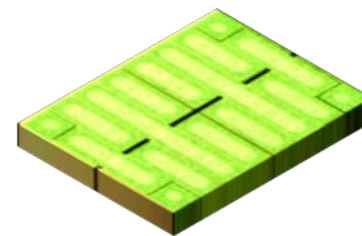
板载驱动器



带驱动器的分立 eGaN FET



带驱动器的全桥器件



- eGaN FET器件在推出市场后差不多两年时间，已经在高效应用中替代 MOSFET器件
- 市场上已经有数间大型集成电路公司正在发展可以驱动eGaN FET及经过优化的驱动器
- 600 V 产品会在不久的将来推出



硅器件的结束。。。。

就是从
氮化镓场效应晶体管
(eGaN FET) 开始!