

**Driving integration: Compact power supplies
with the GaN system-in-package**

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**Bodo's
Wide Bandgap
Event 2025**

Making WBG Designs Happen

GaN

Agenda

1	EcoGaN introduction	4
2	System-in-Package	6
3	Products for USB power delivery	9
4	Prototype demonstrator	12
5	Conclusion	17

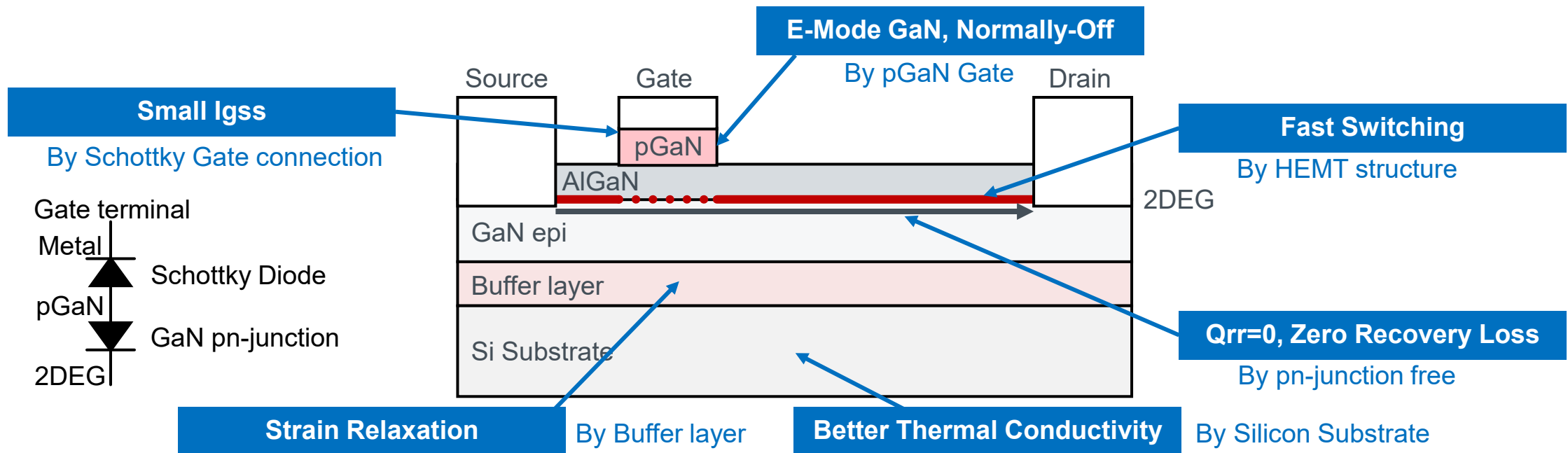
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EcoGaN™ chip technology



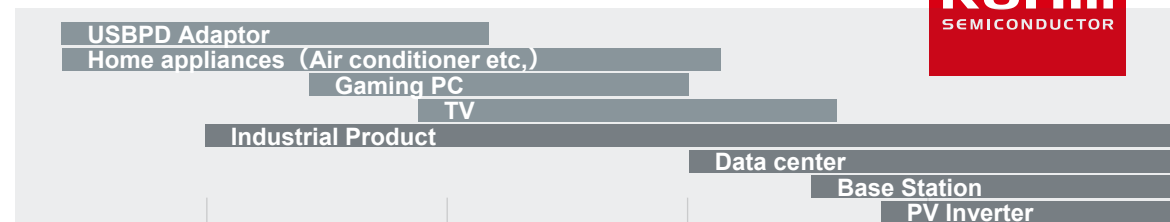
- Rohm EcoGaN™ is e-Mode GaN, Normally-off transistor, utilizing a p-GaN Gate.
- Lateral structure GaN device with a 2-dimensional electronic gas (2DEG), a high electron mobility transistor (HEMT)
- EcoGaN achieves the ideal $Q_{rr} = 0$, i.e., zero recovery loss



Agenda

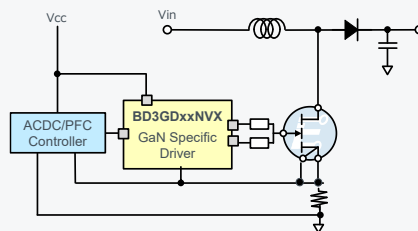
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EcoGaN lineup 650V



Discrete

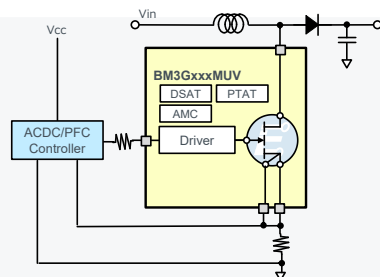
- High design flexibility



DrvGaN

SiP Power stage VCC not needed

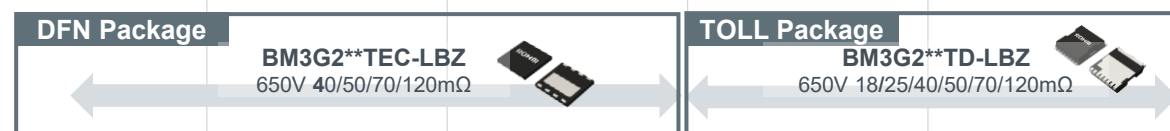
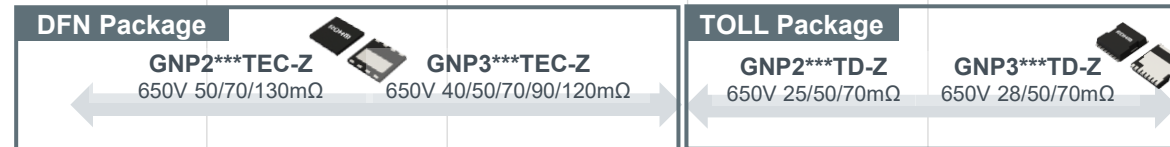
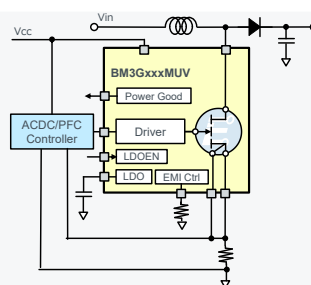
- Easy to replace from Si Only 4 functional pins G/D/S/KS
- Wide input Gate voltage range 8.5V to 20V
- No need Vcc supply pin
- Rich Protection TSD/PTAT/AMC/DSAT



Multi-Function

SiP Power stage Need VCC

- Easy to replace from Si
- Wide input Gate voltage range 4.5V to 30V
- Need Vcc supply
- Rich Function LDO/EMC control/etc.
- Low Propagation Delay
- Low Turn ON/OFF matching
- 5V μ -com direct drive

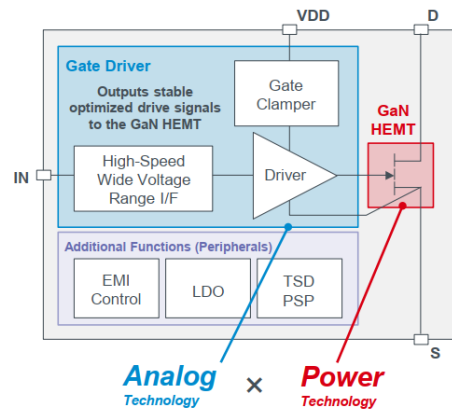


Rohm's System-in-Package (SiP) Line-up

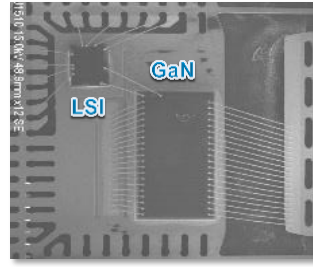
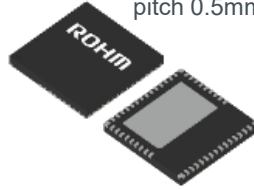
Power Stage IC (Driver + GaN)



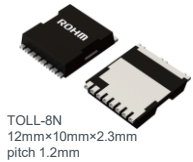
BM3G0xxMUV-LB series Block Diagram



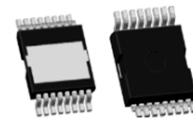
VQFN046V8080
8.0mm x 8.0mm x 1.0mm
pitch 0.5mm



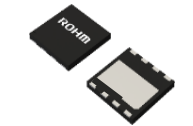
Product Name	R _{DS(on)}	Status
BM3G115MUV-LB	150 mΩ	Mass production
BM3G107MUV-LB	70 mΩ	
BM3G005MUV-LB	50 mΩ	



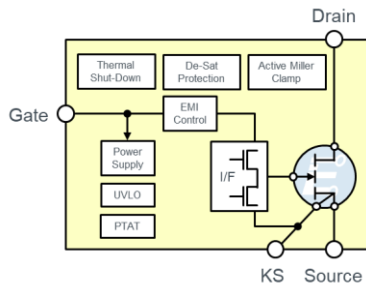
TOLL-8N
12mm x 10mm x 2.3mm
pitch 1.2mm



TOLT-16N
15mm x 9.9mm x 2.35mm
pitch 1.2mm



DFN8080CK
8.00mm x 8.00mm x 0.90mm
pitch 2.0mm

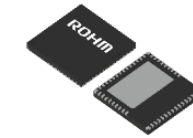


4-pin product
sample availability
2026-Q1

All-in-One (Controller + Driver + GaN)

- 1ch BCM PFC IC integrating GaN

- Max Frequency :120kHz
- Quiescent current :580uA
- Integrated Sense Register

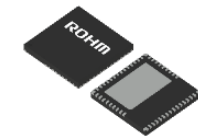


VQFN41V8080K
8.0mm x 8.0mm x 1.0mm
pitch 0.5mm

Product Name	R _{DS(on)}	Status
BM3GF01MUV-LBZ	150 mΩ	Samples available
BM3GF02MUV-LBZ	70 mΩ	

- QR Flyback IC integrating GaN

- Max Frequency :120kHz
- Burst mode current :500uA



VQFN41V8080K
8.0mm x 8.0mm x 1.0mm
pitch 0.5mm

Product Name	R _{DS(on)}	Output Power	Status
BM3GQ1A2MUV-LBZ	150 mΩ	100W	Samples available
BM3GQ1A3MUV-LBZ	150 mΩ	65W	

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Industrial Equipment, AC Adaptor, Household Appliances

GaNSiP for 65W USB charger



Block Diagram

VCC Wide Range input

7.4V to 55.0V

X-cap. Discharge

Up to 2.2uF

Gate Driver

For GaN HEMT

Rohm EcoGaN (E-mode)

DC 650V / Pulse 800V

Gen.1 150mΩ

Gen.2 120mΩ

Slew Rate Control

Turn OFF control

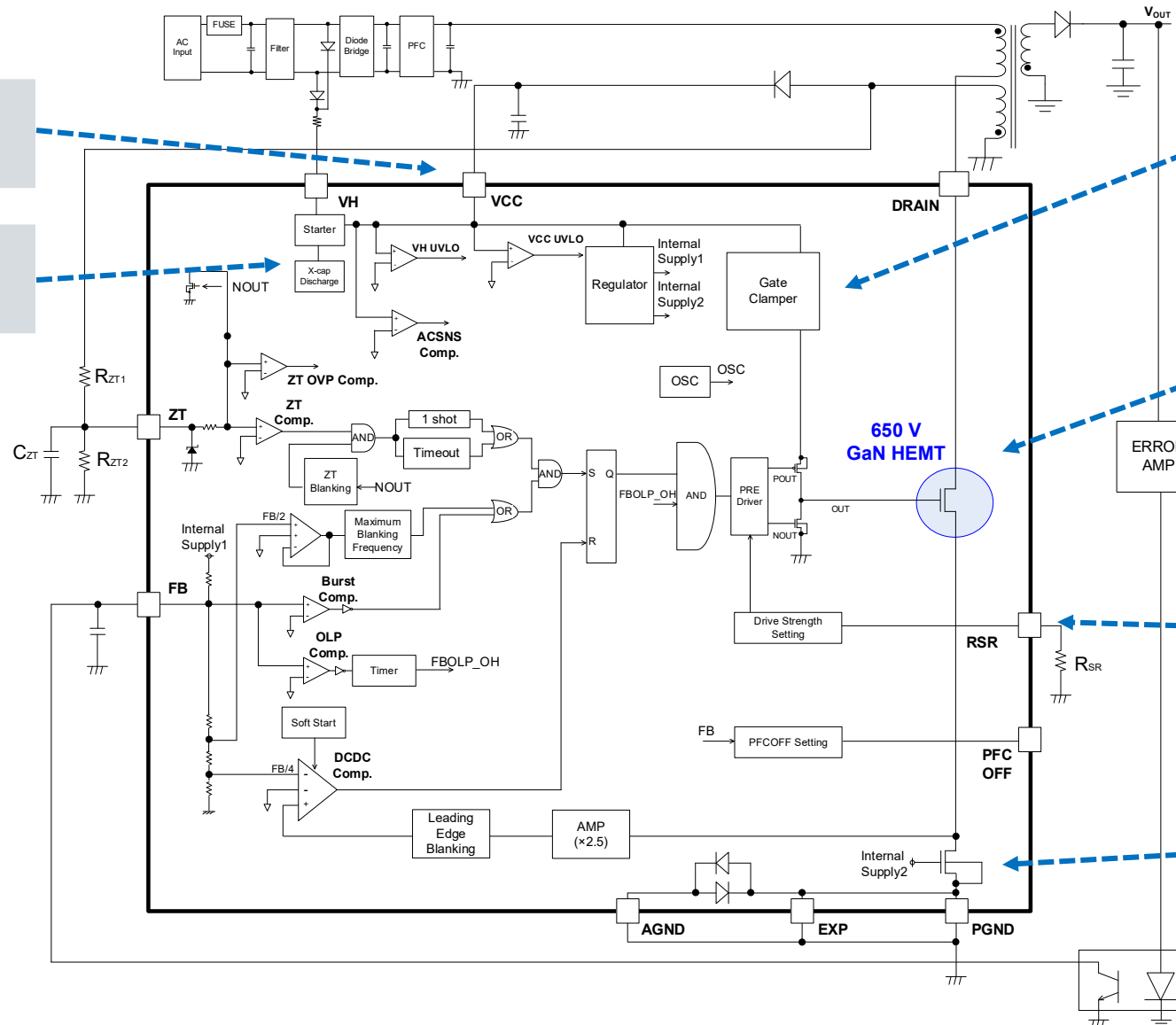
5.4V/ns to 43.0V/ns

Current Sensing

Integrated sense FET

$R_{th,j-a} = 26^{\circ}\text{C/W}$

Vin[Vac]	Pin[mW]
90	11.0
100	11.2
230	15.0
264	18.8



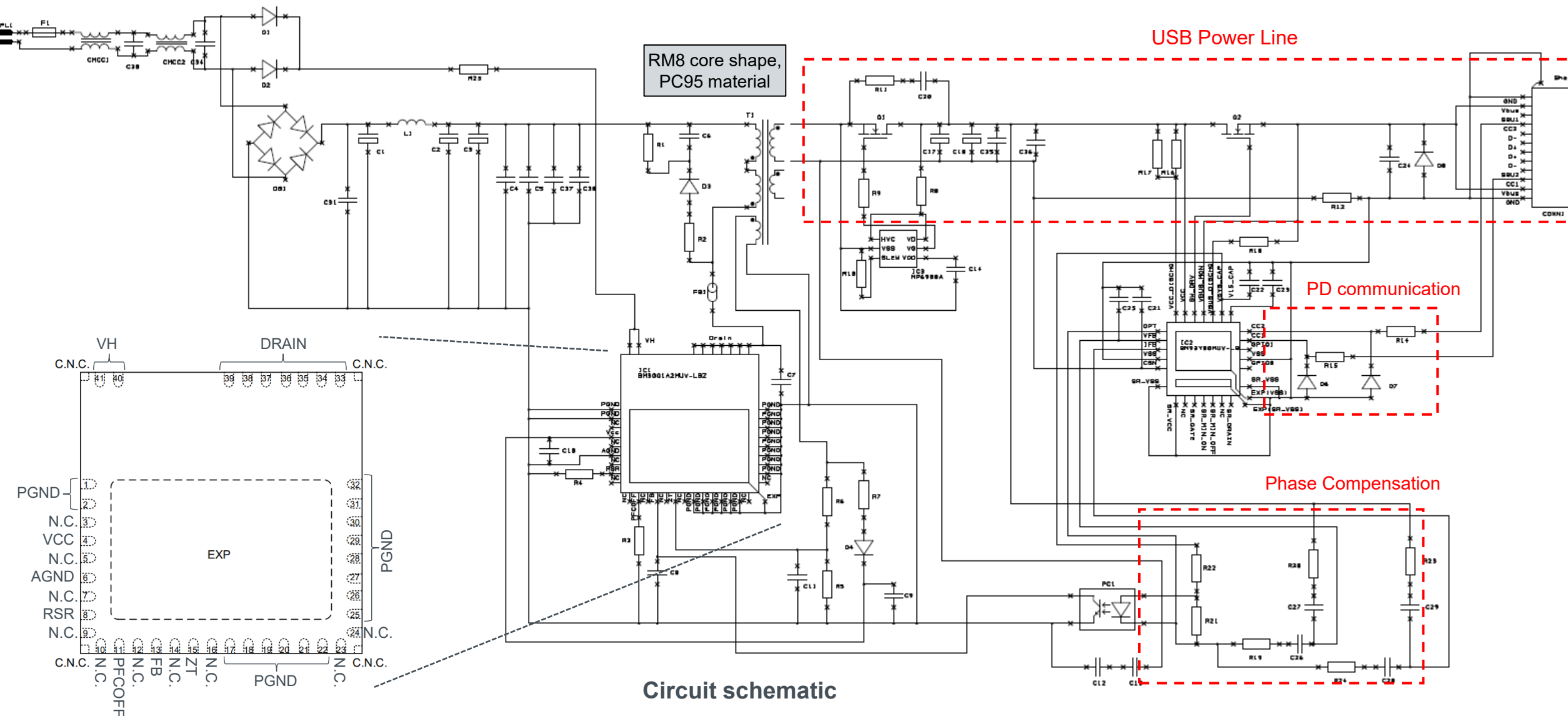
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Application: 65W USB Charger



Schematic details



Physical prototype

Conventional product:

$110 \times 50 \times 30 \text{ mm}^3$
 $\approx 150 \text{ cm}^3$

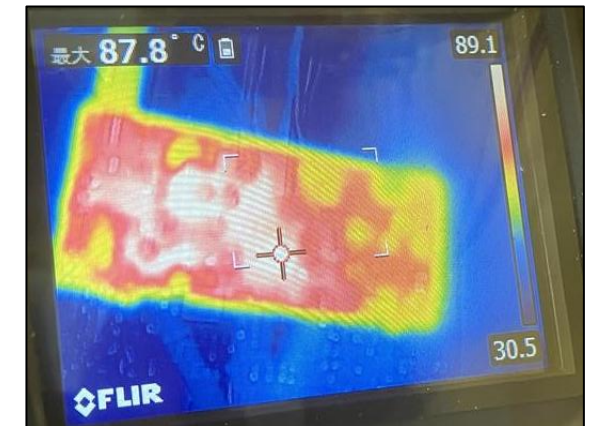
$\Rightarrow \rho \approx 0.4 \text{ W/cm}^3$



EcoGaN-powered, compact solution



Length	64	mm
Width	24	mm
Height	17	mm
Volume	27	cm ³
ρ	2.5	W/cm ³



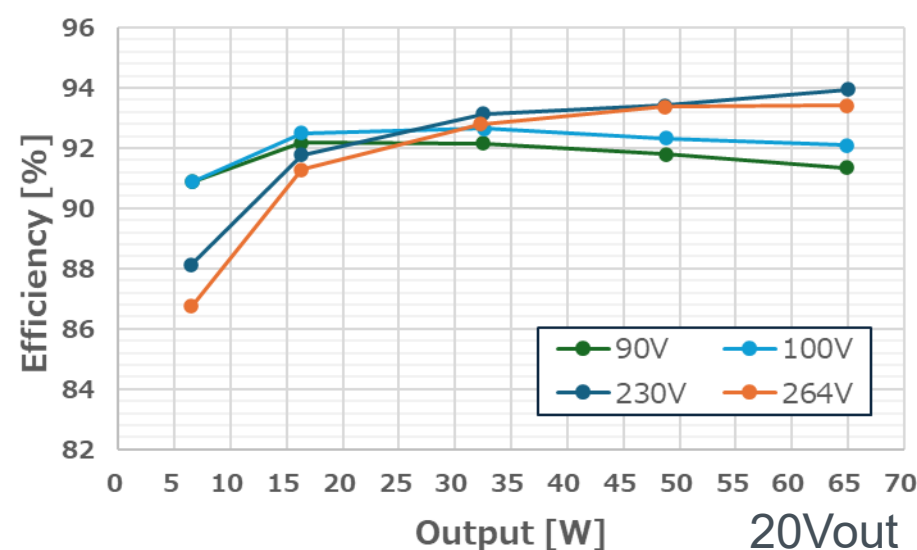
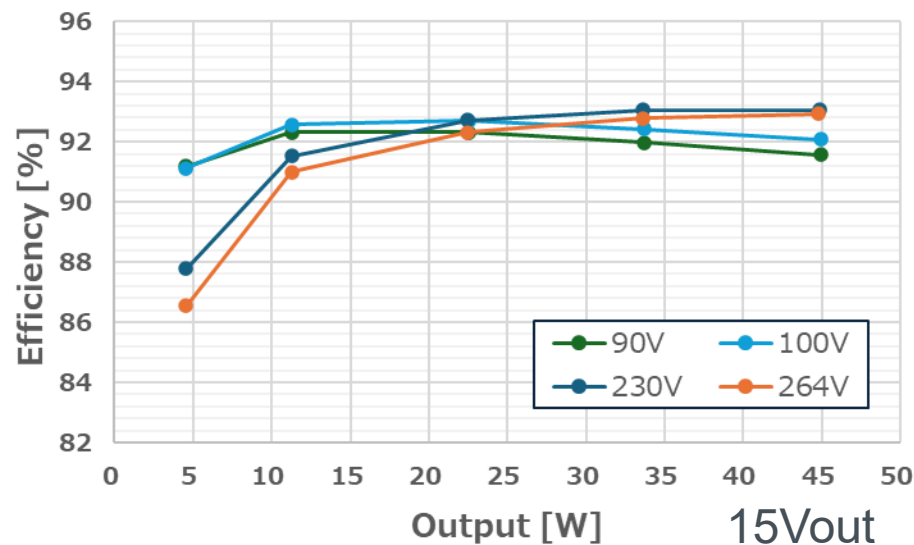
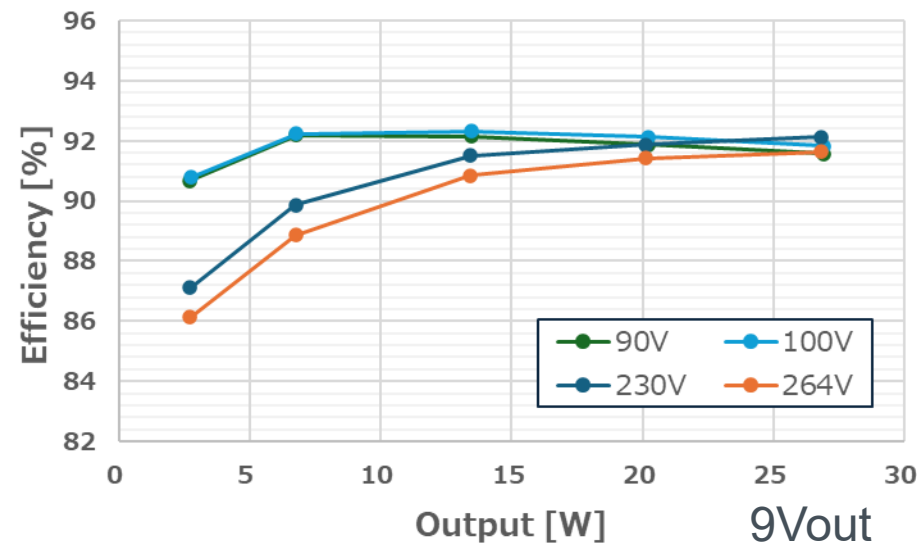
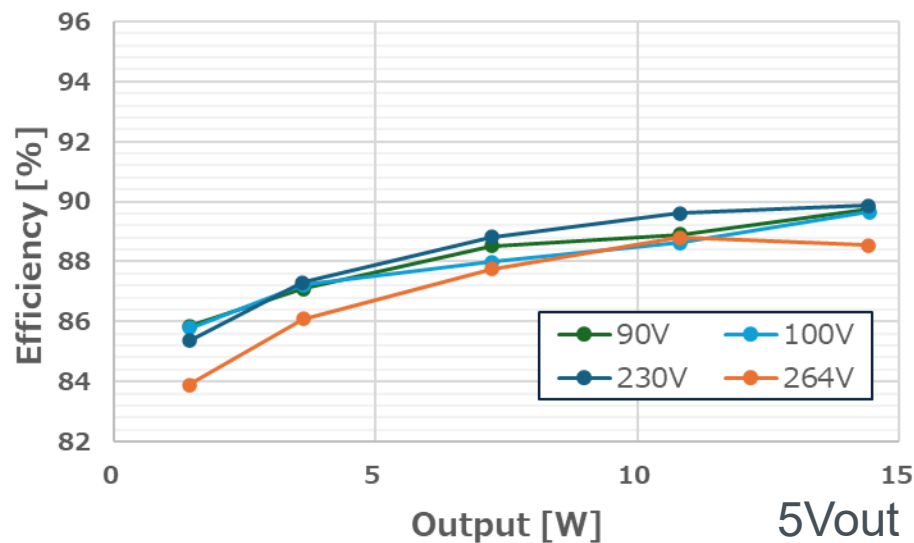
$\Rightarrow$ **~2x shorter**
~6x better power density



Efficiency results

featuring BM3GQ1A2MUV-LBZ (QFN 8x8 1Chip QR GaN)

$dv/dt_{off} \approx 40 \text{ V/ns}$



5. Application: 65W USB Charger



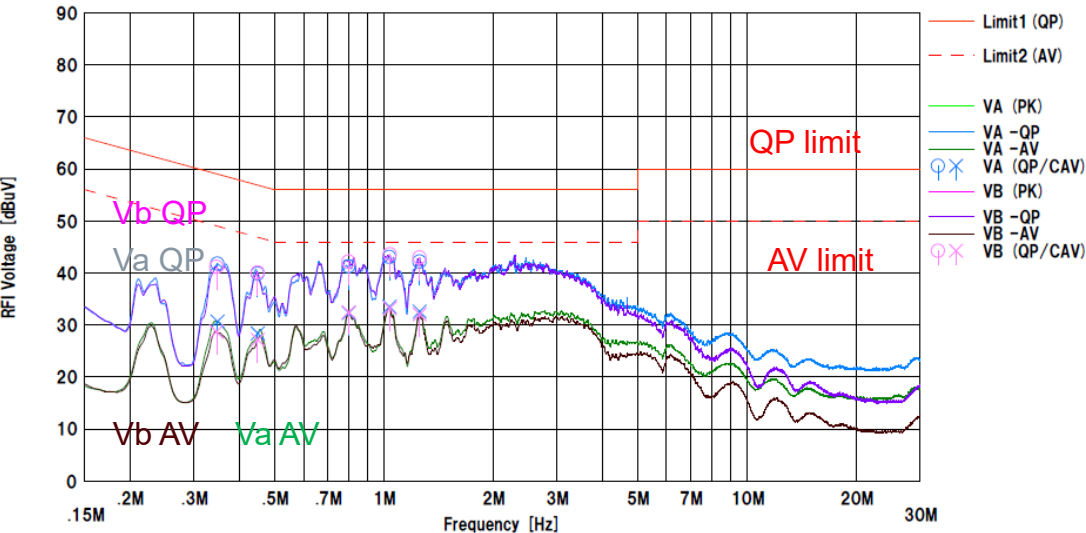
featuring BM3GQ1A2MUV-LBZ(QFN 8x8 1Chip QR GaN)

Conducted EMI measurement

Input:115Vac/230Vac Output:20V/3.25A(65W)

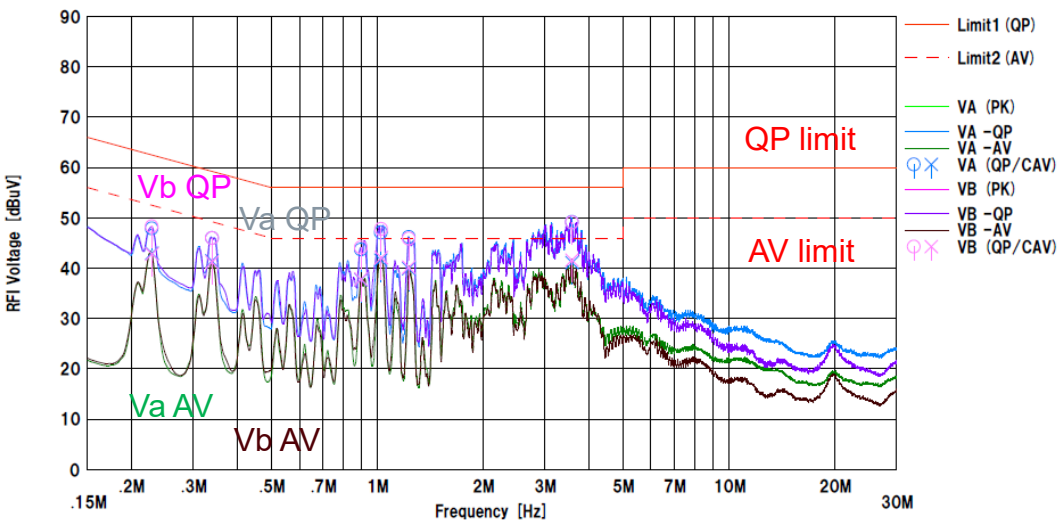
Accordance with CISPR32 standards

Condition: Xcap 0.68uF / Ycap 470pF Pri. GND to Sec. GND



No.	Freq. [MHz]	Reading		LISN [dB]	LOSS [dB]	PLIM [dB]	Results		Limit		Margin		Phase	Comment
		<QP>	<CAV>				<QP>	<CAV>	<QP>	<AV>	<QP>	<AV>		
		[dBuV]	[dBuV]				[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
1	0.34799	31.5	20.4	10.1	0.1	0.1	41.8	30.7	59.0	49.0	17.2	18.3	VA	
2	0.44924	29.6	18.1	10.1	0.1	0.1	39.9	28.4	56.9	46.9	17.0	18.5	VA	
3	0.80022	31.0	22.0	10.1	0.1	0.1	41.3	32.3	56.0	46.0	14.7	13.7	VA	
4	1.03646	32.7	23.1	10.2	0.1	0.1	43.1	33.5	56.0	46.0	12.9	12.5	VA	
5	1.25470	31.8	22.2	10.2	0.1	0.1	42.2	32.6	56.0	46.0	13.8	13.4	VA	
6	0.34574	30.9	18.4	10.1	0.1	0.1	41.2	28.7	59.1	49.1	17.9	20.4	VB	
7	0.44924	29.8	16.9	10.1	0.1	0.1	40.1	27.2	56.9	46.9	16.8	19.7	VB	
8	0.80022	31.9	22.2	10.1	0.1	0.1	42.2	32.5	56.0	46.0	13.8	13.5	VB	
9	1.03871	33.3	22.9	10.1	0.1	0.1	43.6	33.2	56.0	46.0	12.4	12.8	VB	
10	1.25470	32.6	21.7	10.2	0.1	0.1	43.0	32.1	56.0	46.0	13.0	13.9	VB	

115Vac



No.	Freq. [MHz]	Reading		LISN [dB]	LOSS [dB]	PLIM [dB]	Results		Limit		Margin		Phase	Comment
		<QP>	<CAV>				<QP>	<CAV>	<QP>	<AV>	<QP>	<AV>		
		[dBuV]	[dBuV]				[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
1	0.22875	37.6	32.7	10.1	0.1	0.1	47.9	43.0	62.5	52.5	14.6	9.5	VA	
2	0.33899	35.7	31.1	10.1	0.1	0.1	46.0	41.4	59.2	49.2	13.2	7.8	VA	
3	0.89922	33.4	27.4	10.1	0.1	0.1	43.7	37.7	56.0	46.0	12.3	8.3	VA	
4	1.02521	36.7	31.2	10.2	0.1	0.1	47.1	41.6	56.0	46.0	8.9	4.4	VA	
5	1.22995	35.8	29.5	10.2	0.1	0.1	46.2	39.9	56.0	46.0	9.8	6.1	VA	
6	3.58335	38.6	30.5	10.2	0.3	0.1	49.2	41.1	56.0	46.0	6.8	4.9	VA	
7	0.22875	38.0	32.5	10.1	0.1	0.1	48.3	42.8	62.5	52.5	14.2	9.7	VB	
8	0.33899	35.7	30.9	10.1	0.1	0.1	46.0	41.2	59.2	49.2	13.2	8.0	VB	
9	0.89922	33.8	27.5	10.1	0.1	0.1	44.1	37.8	56.0	46.0	11.9	8.2	VB	
10	1.02746	37.5	31.8	10.1	0.1	0.1	47.8	42.1	56.0	46.0	8.2	3.9	VB	
11	1.22995	35.6	29.9	10.1	0.1	0.1	45.9	40.2	56.0	46.0	10.1	5.8	VB	
12	3.58110	38.5	31.0	10.2	0.3	0.1	49.1	41.6	56.0	46.0	6.9	4.4	VB	

230Vac

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Conclusion



EcoGaN technology

- 650V, enhancement-mode, GaN-on-silicon
- DFN, TOLL, TOLT package for discrete and power stage products



System-in-package integration

- Gate driver integration to realize power stage ICs
- All-in-one, e.g., with quasi-resonant flyback control
- QFN packages with high thermal conductivity
- Rich protection functions



Application excellence

- Compact USB power, $2.5 \text{ W/cm}^3 \approx 40 \text{ W/in}^3$
- Efficiencies $\sim 90\%$, peak 94%
- Pass CISPR32 EMI tests without shielded case