



Electronics for the Future

New EcoGaN™ Power Stage ICs Contribute to Smaller Size and Lower Loss

Reduces component volume by 99% and power loss 55%,
when replacing silicon MOSFETs

August 31, 2023

ROHM Co., Ltd.

Marketing Communication Department

*"EcoGaN™" "Nano Pulse Control™" is a trademark or registered trademark of ROHM Co., Ltd.

*Please note that this document is current as of the date of publication

GaN (Gallium Nitride)

= A type of compound semiconductor material

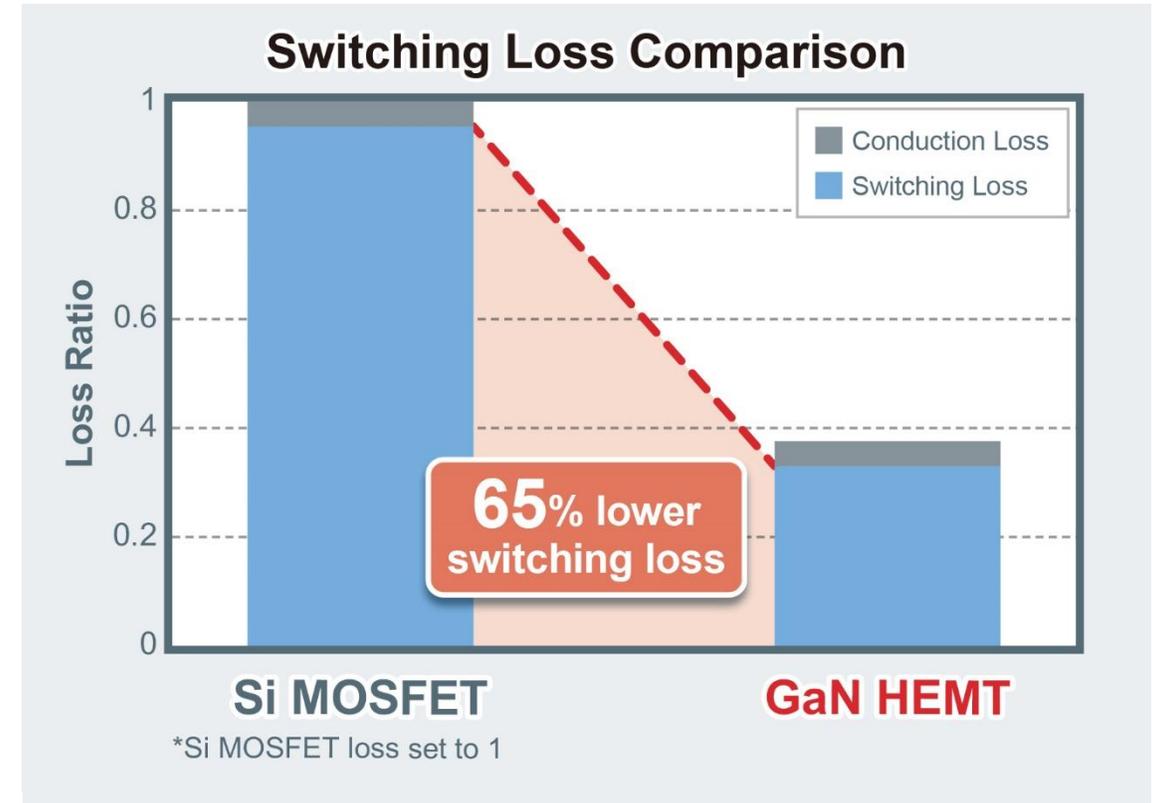
	Si	4H-SiC	GaN
Bandgap (eV)	1.12	3.2	3.4
Dielectric Constant	11.7	9.66	8.9
Breakdown Field (MV/cm)	0.3	3	3.3
Electron Saturation Velocity (10 ⁷ cm/s)	1	2	2.5
Bulk Electron Mobility (cm ² /Vs)	1350	720	900
Thermal Conductivity (W/cm·K)	1.5	4.5	2 to 3

- Wide bandgap
- High electron saturation velocity
- Large breakdown electric field

Like SiC, GaN has great potential to further reduce energy savings

HEMT (High Electron Mobility Transistor)

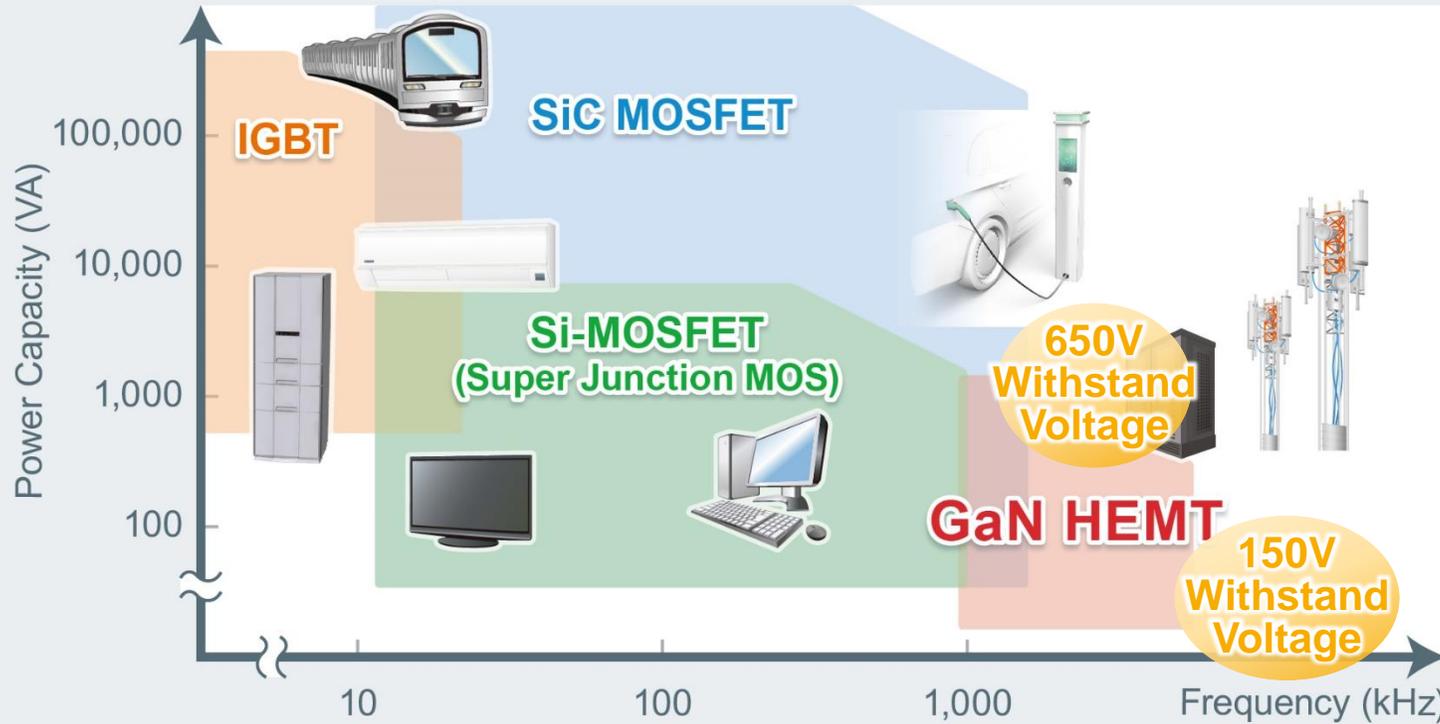
= A type of transistor element structure



GaN HEMTs significantly reduce switching losses vs Si MOSFETs

Power devices feature different power (VA) and operating frequency bands depending on the materials and device

Power Device Application Scope



SiC	<ul style="list-style-type: none"> • High power • High voltage (>600V) • High frequency (20 to 200kHz) • EV inverters, HV DC-DC, OBC • Primary power supplies for servers • Solar/wind power • Industrial power supplies • Railroad
GaN	<ul style="list-style-type: none"> • Middle power • Middle voltage (100 to 600V) • High frequency (More than 200kHz) • Server power supplies in data centers • Base station power supplies • Small AC adapter (consumer) • Automotive OBC, 48V DC-DC

ROHM begins development of 150V GaN devices to complement SiC

GaN HEMT enable ultra-high frequency operation in the medium voltage range

Challenges with Standalone GaN HEMTs

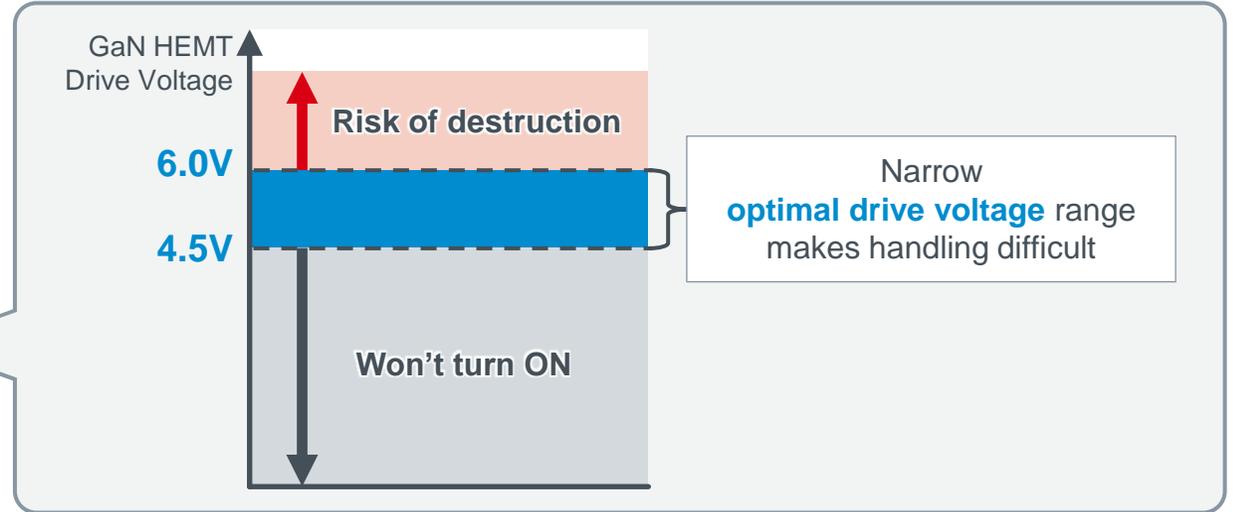
1 Low drive voltage V_{th} (generally around 1.5V to 1.8V)

Risk of self turn-ON

Self turn-ON: Device turns on due to malfunction

2 Low gate withstand voltage (6V typ.)

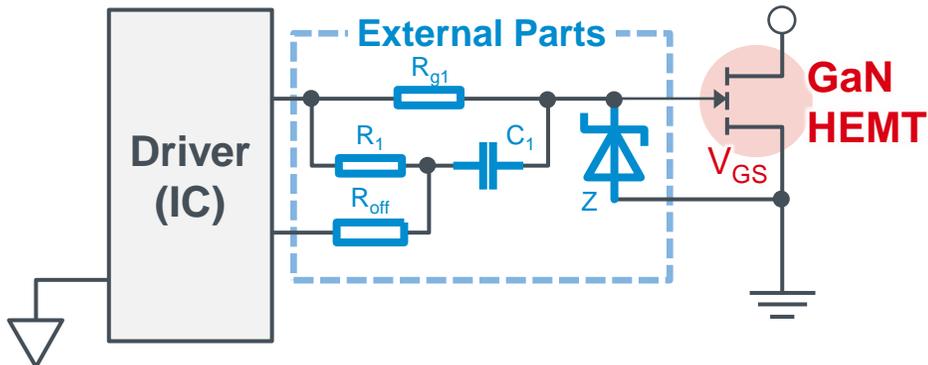
Risk of gate breakdown

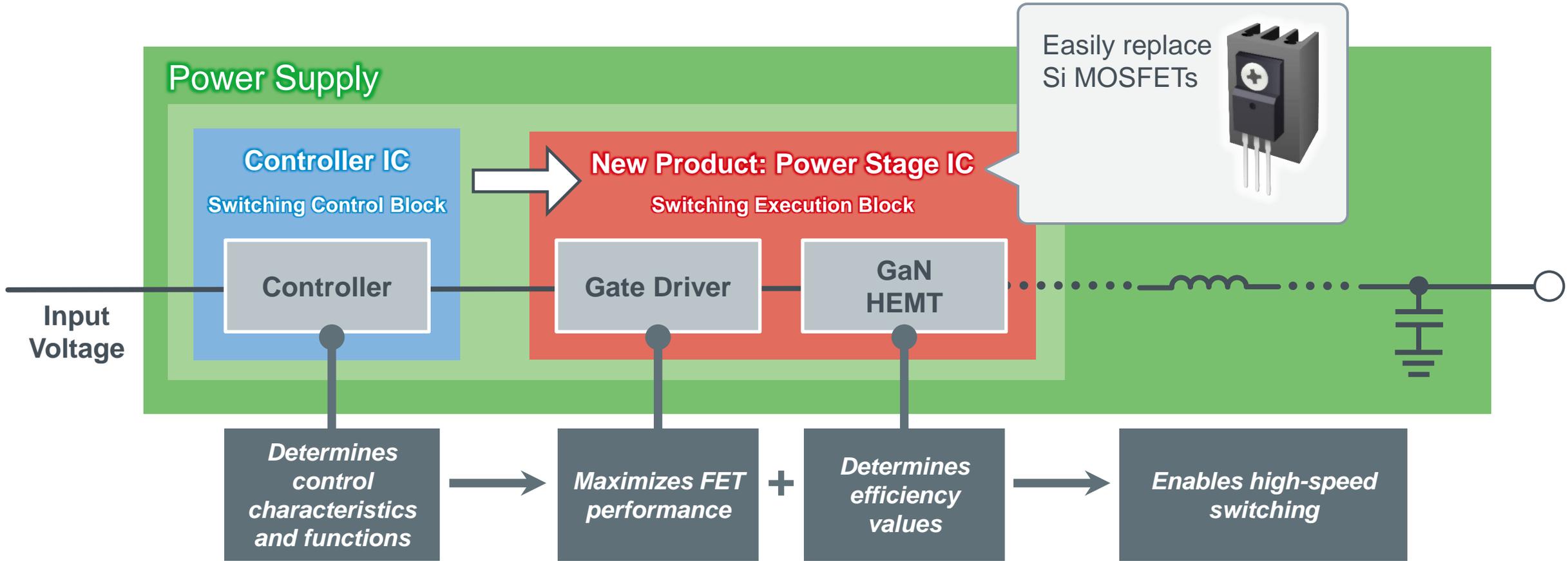


For these two issues, GaN HEMTs must be used in a set with gate drivers

However, additional concerns include

- Increased no. of external driver-related parts
- Parasitic effects must be considered

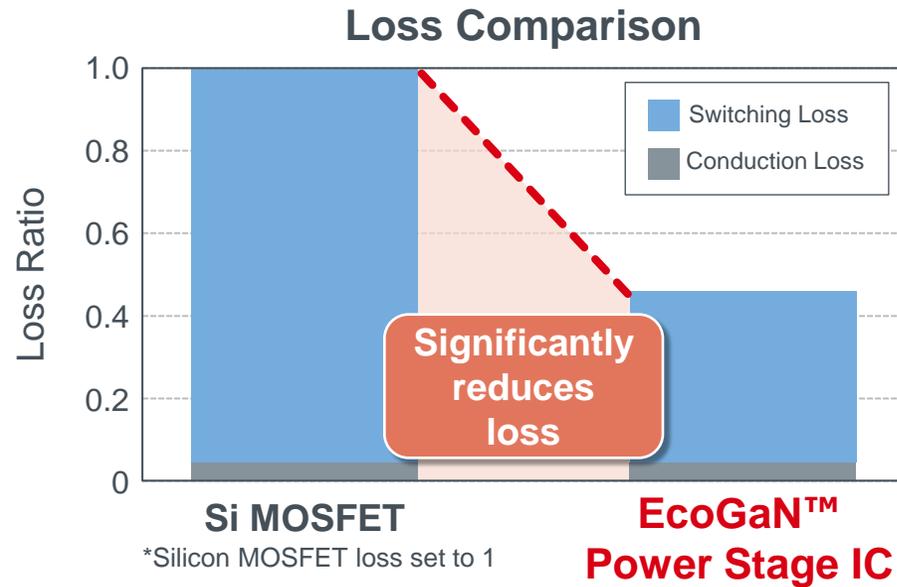




New products integrate a GaN HEMT and gate driver in single package - makes it easy to leverage GaN performance

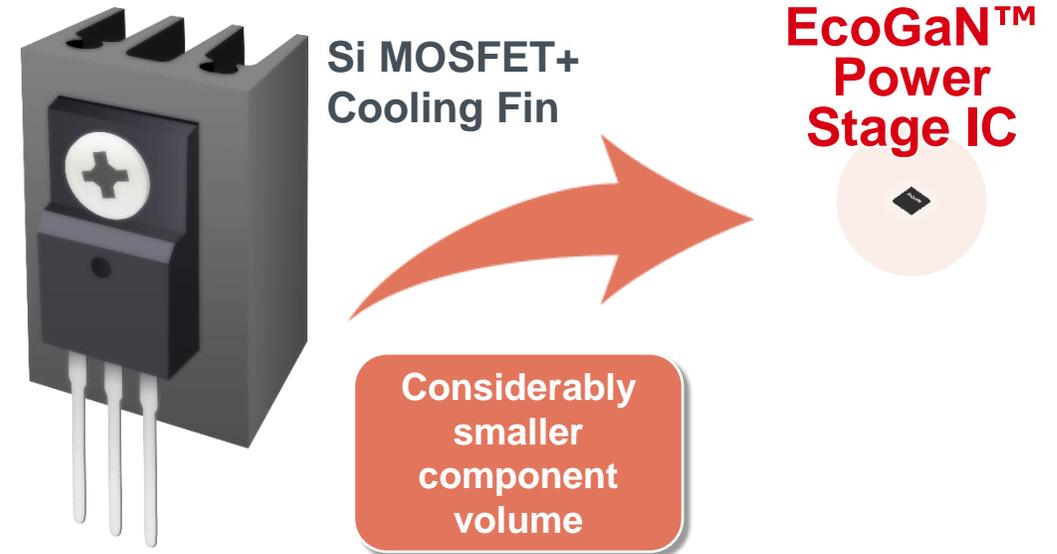
Adopting EcoGaN™ Power Stage IC provides the following

Low Loss with High Efficiency



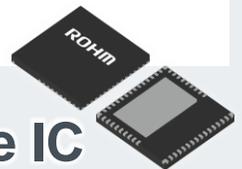
Faster switching dramatically reduces loss

Greater Miniaturization



Replacing Si MOSFETs achieves greater miniaturization

EcoGaN ROHM low ON-resistance high-speed switching EcoGaN™ Power Stage IC

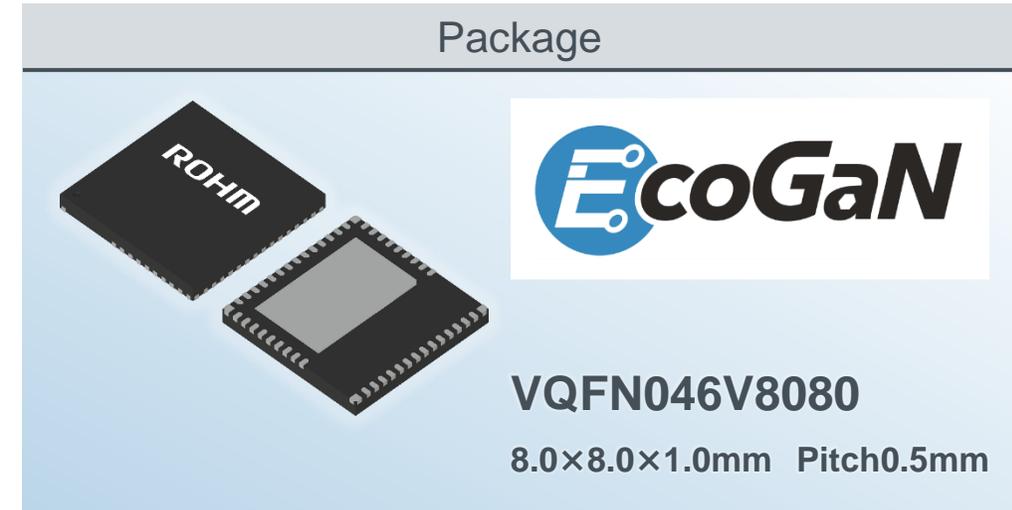


Overview of 650V EcoGaN™ (GaN HEMT) Power Stage ICs

EcoGaN™ is a trademark or registered trademark of ROHM Co., Ltd.



The [BM3G0xxMUV-LB](#) series of power stage ICs incorporates ROHM's 650V EcoGaN™ together with a dedicated gate driver that maximize performance along with additional functions and peripherals. The integrated design facilitates replacement of existing silicon power semiconductor circuits in primary power supplies



Power stage circuit ICs simplify mounting of GaN devices

Combines a 650V EcoGaN™, dedicated gate driver, additional functions, and peripheral components in a single package

Easily replace existing power semiconductor circuits

2.5V to 30V drive voltage range, 15μs (typ.) startup time, 11ns to 15ns propagation delay

Lower loss vs general products contributes to smaller sets

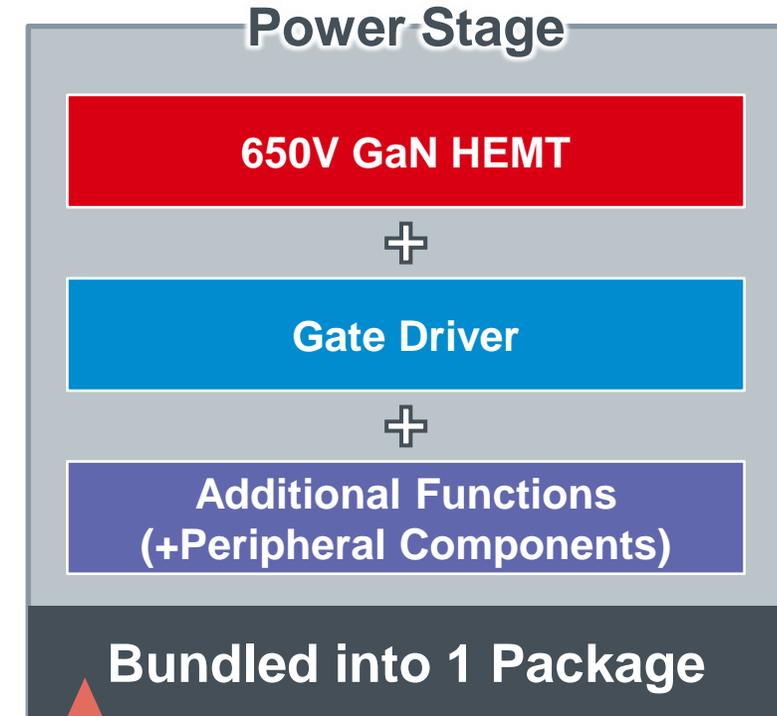
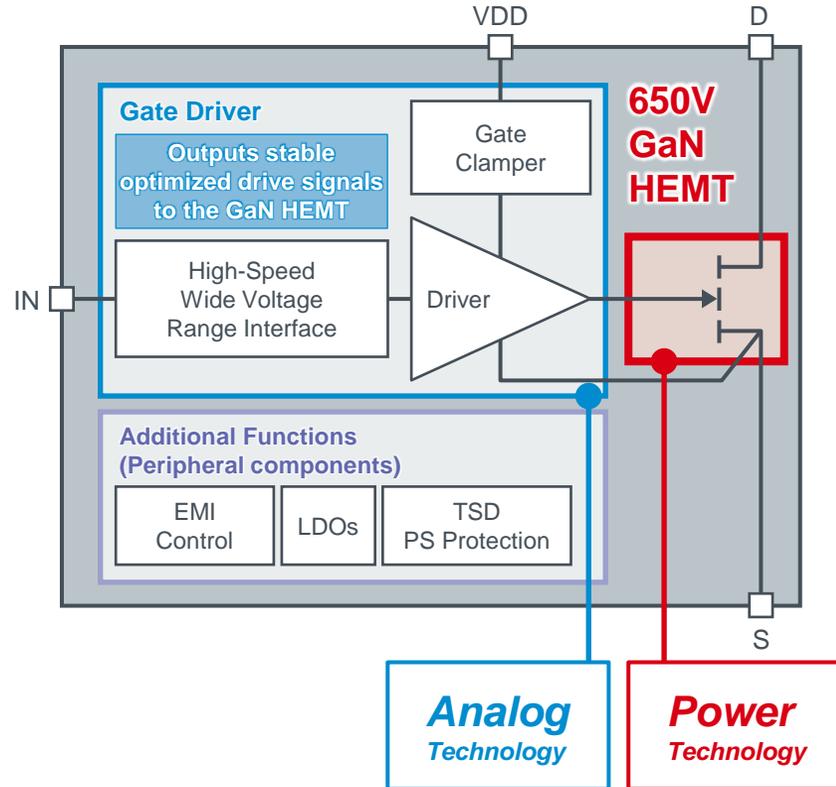
Delivers low switching loss with only one external part required

EcoGaN™ Power Stage IC Overview (For Primary Side PFC, AC-DC)

EcoGaN™ is a trademark or registered trademark of ROHM Co., Ltd.



BM3G0xxMUV-LB Series Block Diagram



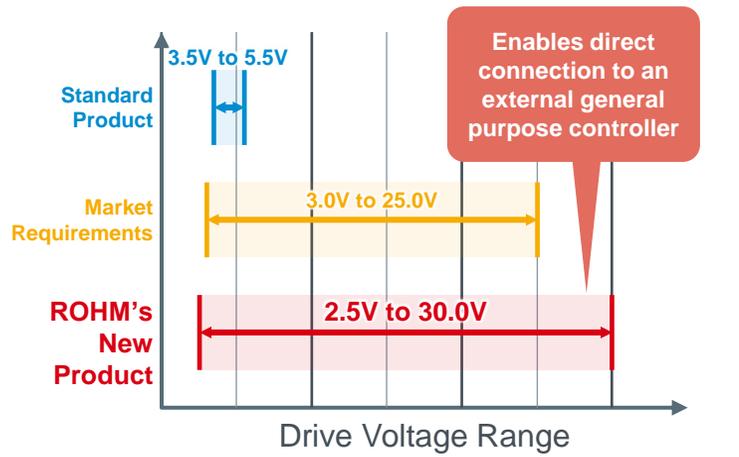
Maximizes GaN HEMT performance

Monolithic design eliminates the need for troublesome GaN HEMT drive adjustment

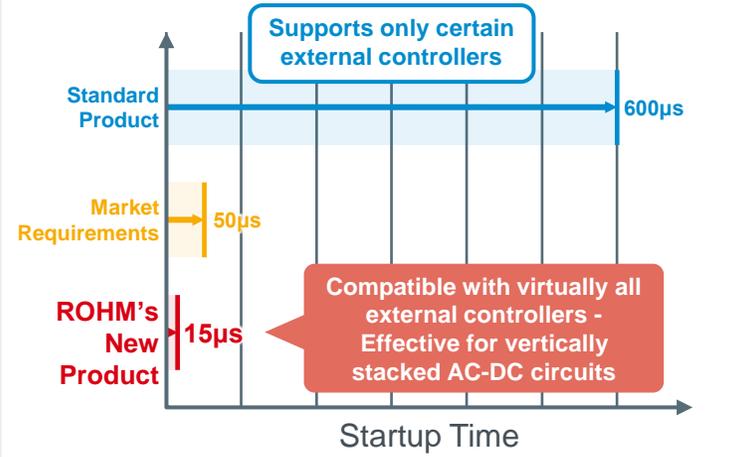
Facilitates GaN implementation

Compatible with All Primary Power Supply Circuits (primary PFC, AC-DC)

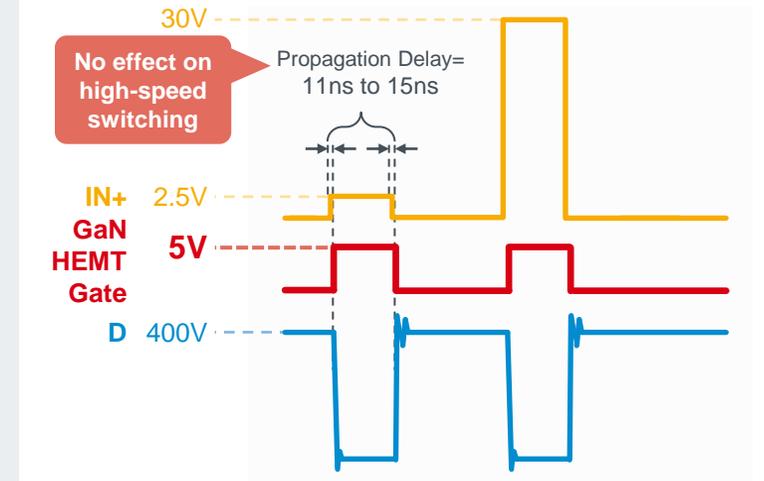
Broad range of drive voltages
(2.5V to 30.0V)



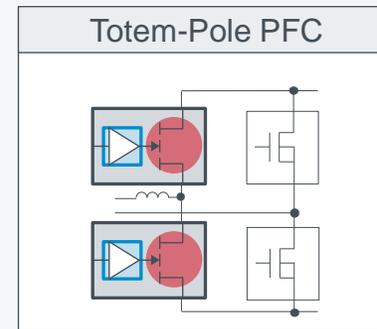
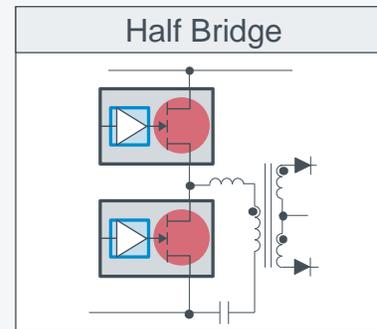
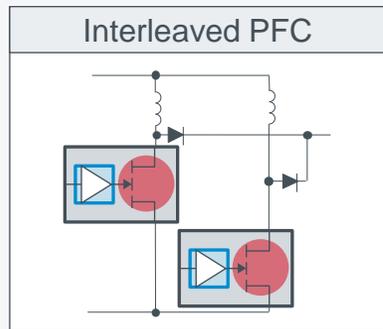
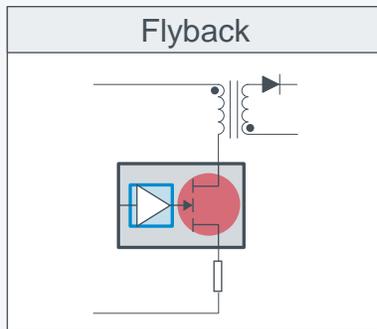
Fast startup time
(15μs typ.)



Short propagation delay
(11ns to 15ns typ.)



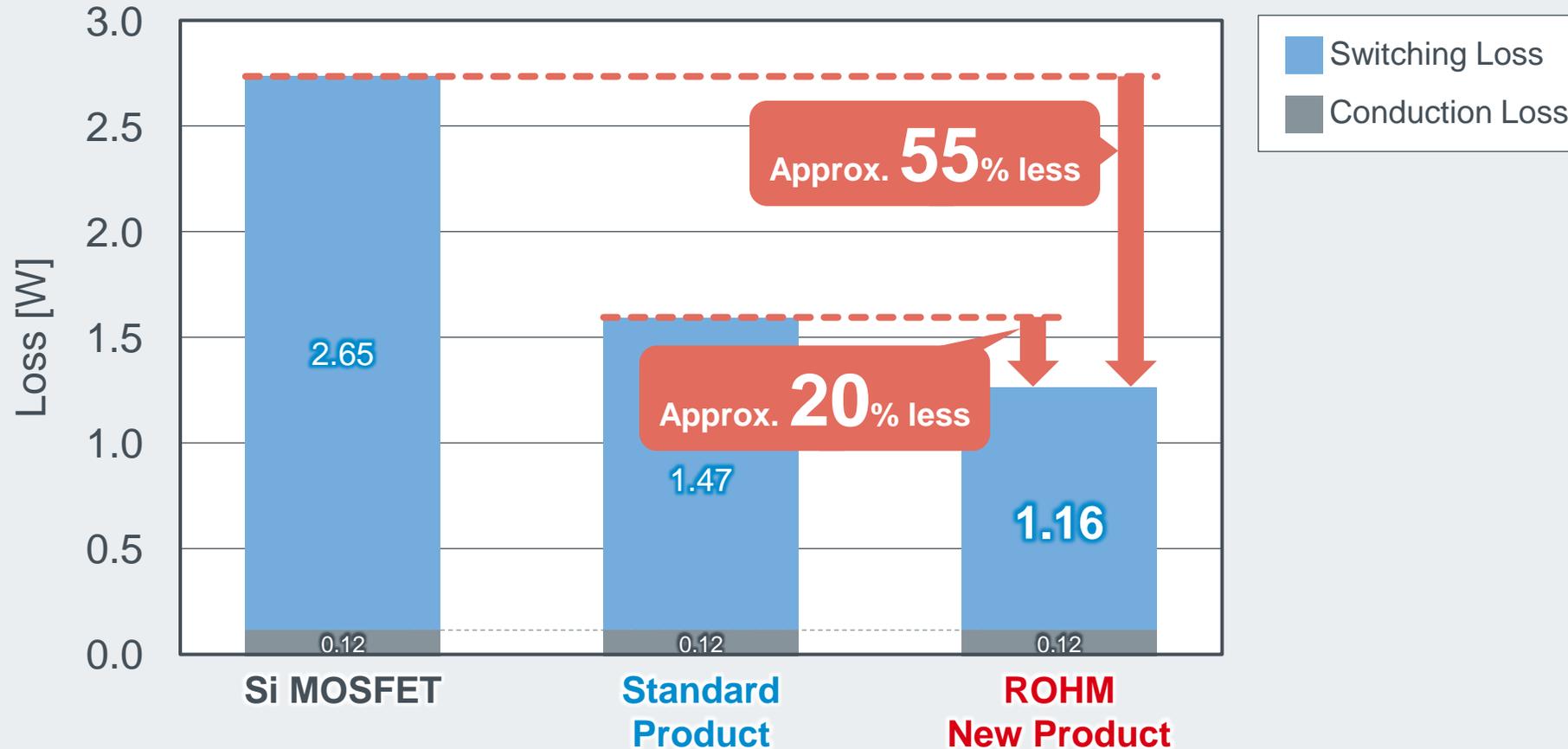
Topology Examples



Enables Lower Power Consumption

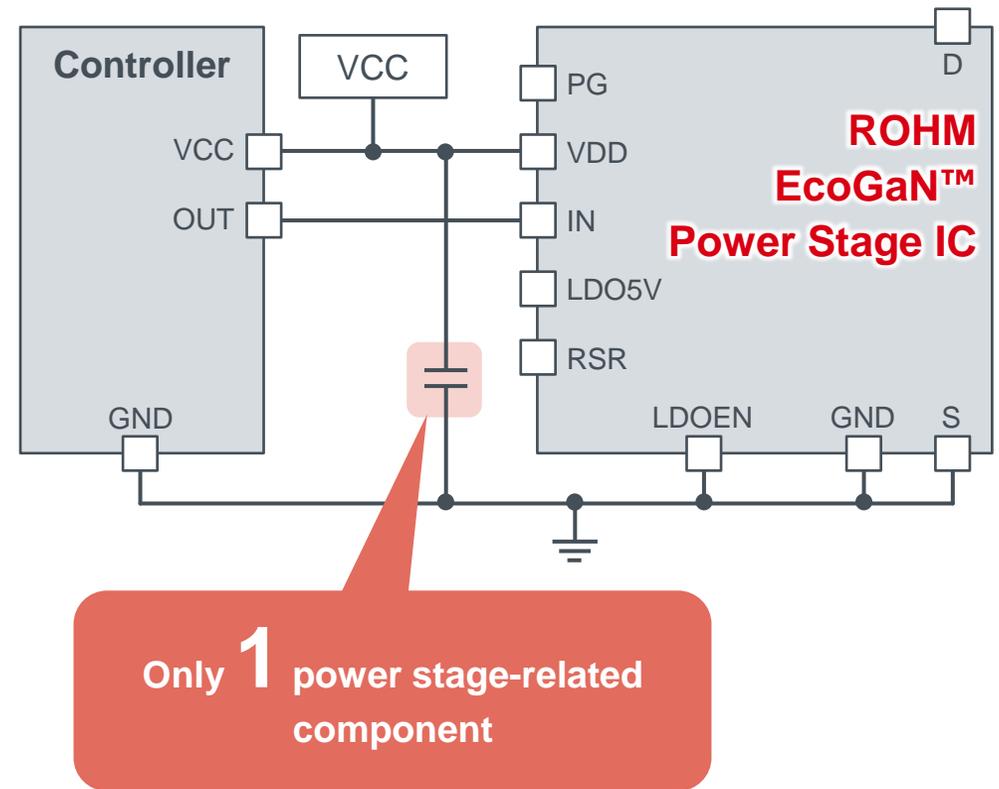
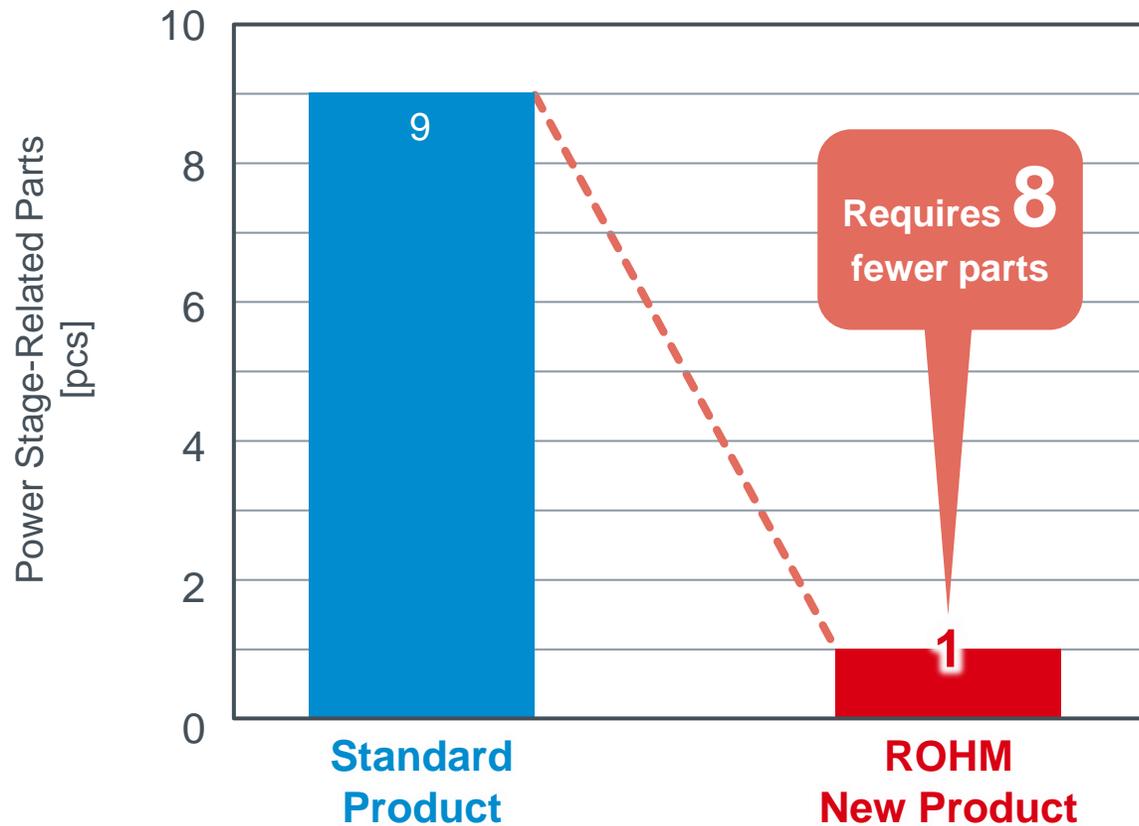
Low Switching Loss

(264VAC Input Voltage, 100W Output Power)



Reduces Application Size

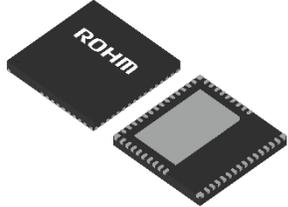
Requires just **1** external power-stage-related part

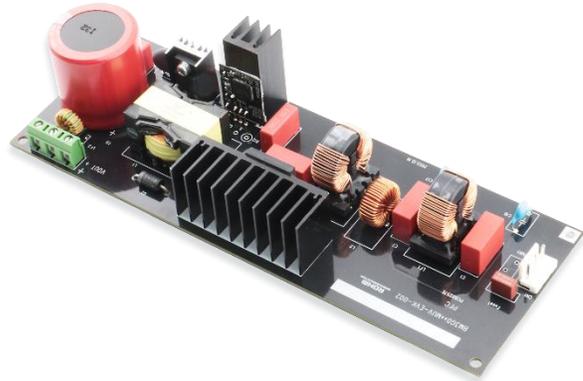


EcoGaN™ Power Stage IC Product / Evaluation Board Lineup



EcoGaN™ is a trademark or registered trademark of ROHM Co., Ltd.

Part No.	Drain Pin Voltage (Max.) [V]	Input Voltage Range [V]	Supply Pin Voltage [V]	Supply Pin Operating Current (Typ.) [μA]	Supply Pin Quiescent Current (Typ.) [μA]	ON-Resistance (Typ.) [mΩ]	Turn-ON Delay Time (Typ.) [ns]	Turn-OFF Delay Time (Typ.) [ns]	Operating Temp. Range [°C]	Package [mm]
New BM3G015MUV-LB	650	-0.6 to +30	6.25 to 30	450	150	150	11	15	-40 to +105	 VQFN046V8080 (8.0×8.0×1.0)
New BM3G007MUV-LB				650	180	70	12			



[BM3G007MUV-EVK-002](#)

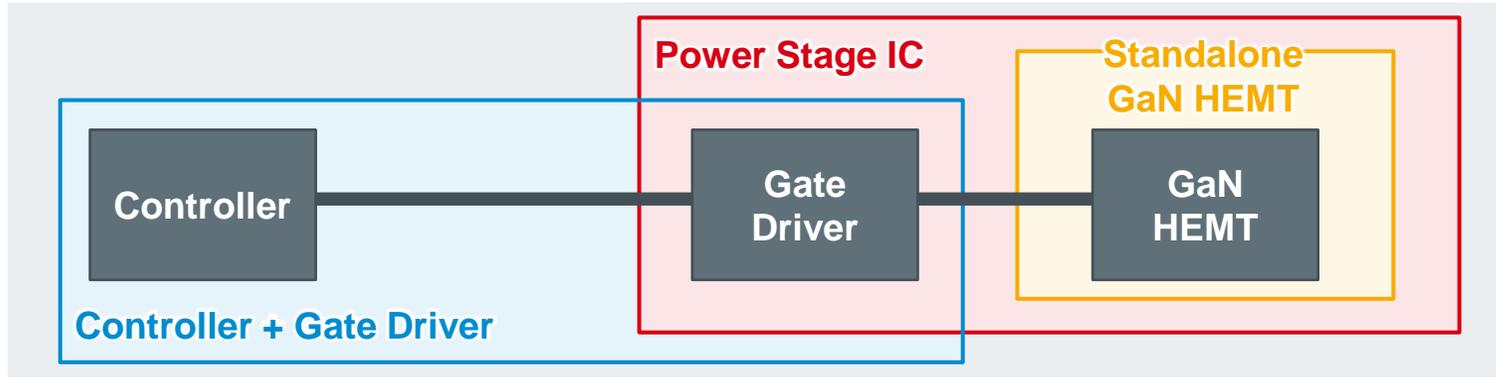


[BM3G007MUV-EVK-003](#)



[BM3G015MUV-EVK-003](#)

Evaluation boards are also offered for evaluation on the actual device



Eco-GaN™-Related Products Under Development

Low Voltage (<200V)

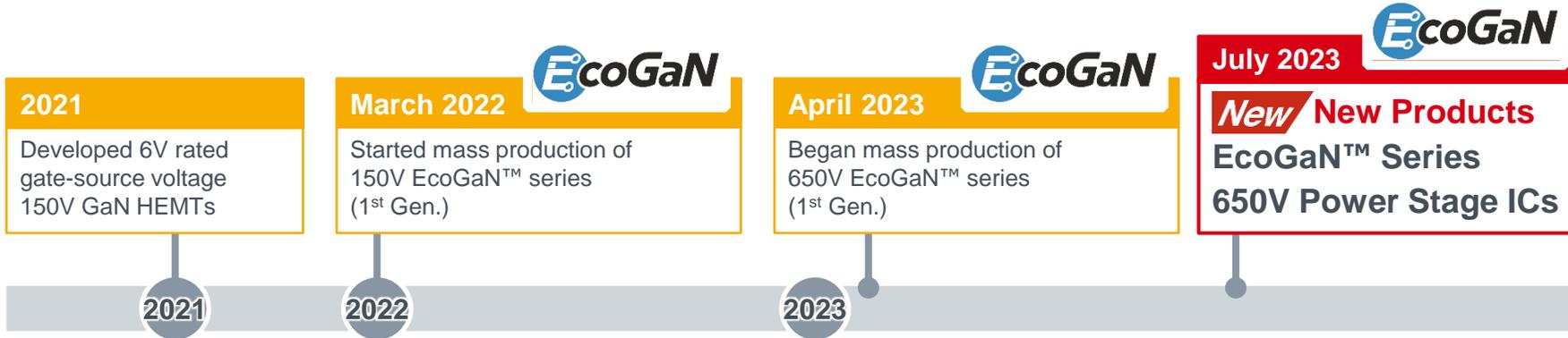
150V GaN HEMT (2nd/3rd Gen.)
Lower ON Resistance, Faster Switching

GaN Modules (1st/2nd Gen.)
Motor Drivers (Motor Controllers)

High Voltage (>600V)

650V GaN HEMTs (TOLL Package)
Lower ON Resistance, New Package

Power Stage ICs
Next-Generation Variants



March 2022
ROHM and Delta Electronics form a strategic partnership on developing power devices for power supply systems

March 2023
Established ultra-high-speed driver control IC technology for GaN devices

In addition to the performance of standalone GaN HEMTs, drive and technologies are also improved that enable the use of GaN devices in a variety of applications

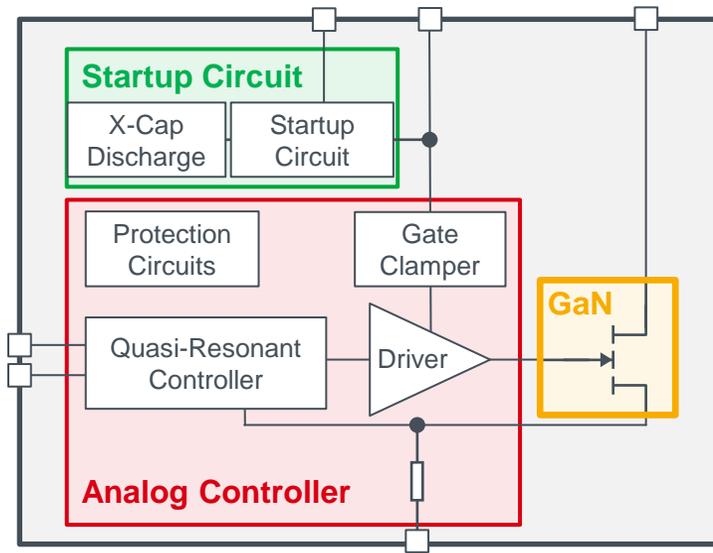
Next-Generation Power Stage ICs (Under Development)

EcoGaN™ is a trademark or registered trademark of ROHM Co., Ltd.

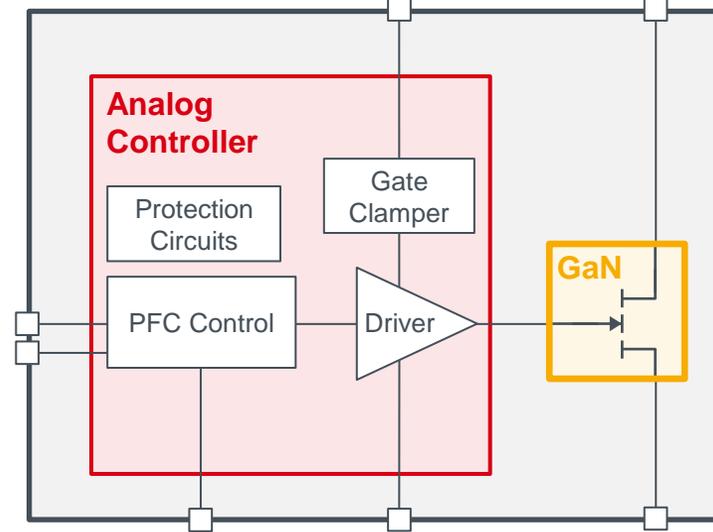


Expanded Lineup of EcoGaN™ Power Stage ICs with Built-In 650V GaN HEMT

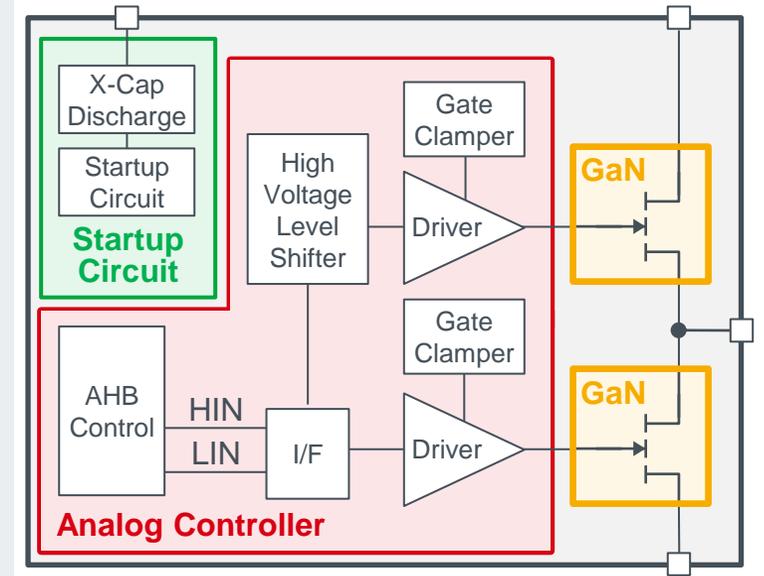
Quasi-Resonant AC-DC + GaN
(1Q 2024 mass production planned)



Power Factor Correction + GaN
(1Q 2024 mass production planned)



Half Bridge + GaN
(2Q 2024 mass production planned)



Incorporating peripheral components on a single chip allows GaN devices to be easily mounted in power supplies for a variety of applications



Electronics for the Future

- The content specified herein is for the purpose of introducing ROHM's products (hereinafter "Products").
- If you wish to use any such Product, please be sure to refer to the specifications, which can be obtained from ROHM upon request.
- Great care was taken in ensuring the accuracy of the information specified in this document. However, should you incur any damage arising from any inaccuracy or misprint of such information, ROHM shall bear no responsibility for such damage.
- The technical information specified herein is intended only to show the typical functions of and examples of application circuits for the Products. ROHM does not grant you, explicitly or implicitly, any license to use or exercise intellectual property or other rights held by ROHM and other parties.
- ROHM shall bear no responsibility whatsoever for any dispute arising from the use of such technical information. If you intend to export or ship overseas any Product or technology specified herein that may be controlled under the Foreign Exchange and the Foreign Trade Law, you will be required to obtain a license or permit under the Law.
- The content specified in this document is correct as of August 2023.