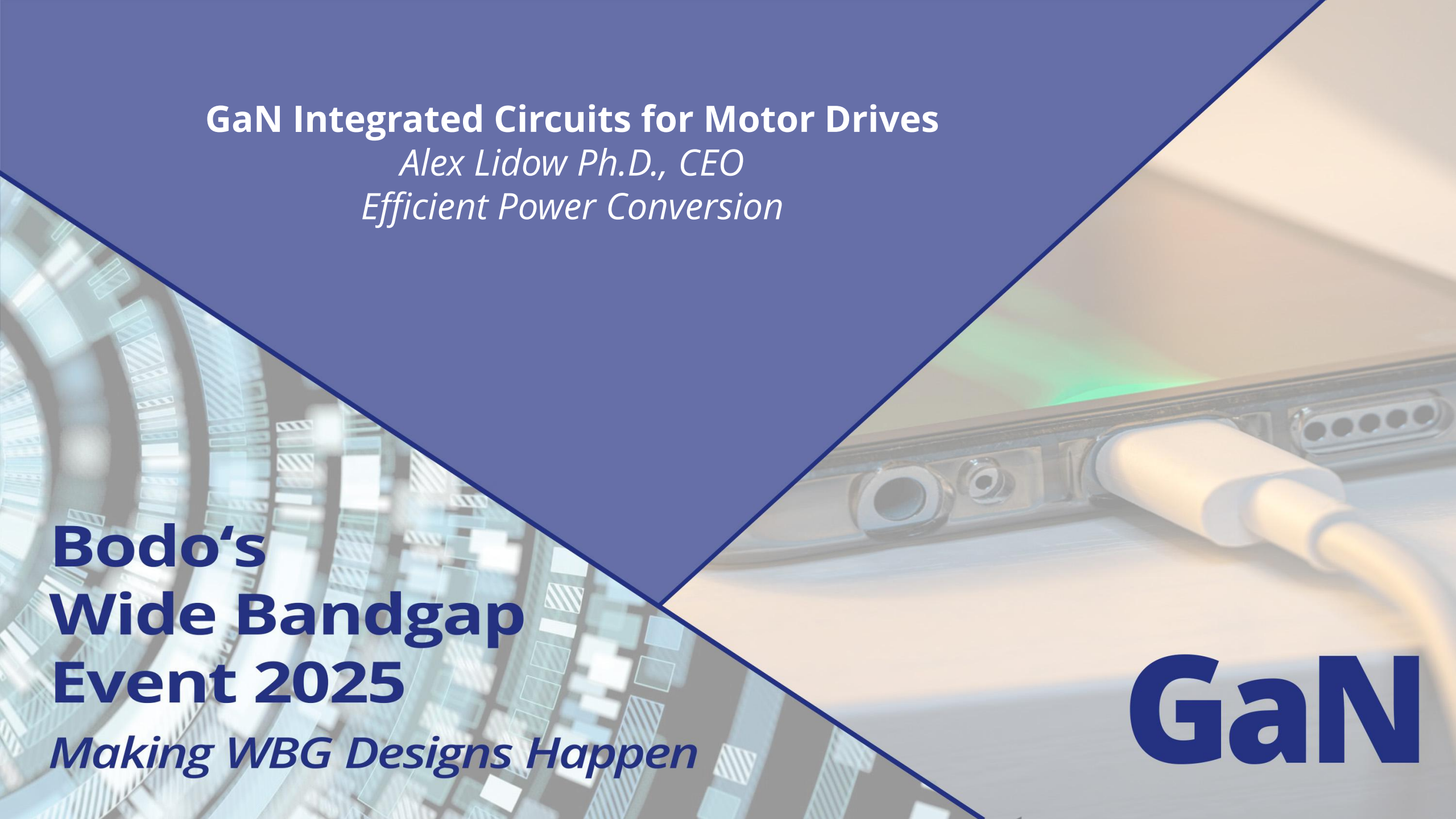
# GaN Integrated Circuits for Motor Drives

*Alex Lidow Ph.D., CEO*
*Efficient Power Conversion*



**Bodo's Wide Bandgap Event 2025**

*Making WBG Designs Happen*

**GaN**

# GaN Benefits in Joint Servo Drives

GaN devices switch fast with $Q_{RR} = 0$

**Higher switching frequency**

Electrolytic capacitor elimination and reduced motor losses

**Lower dead time**

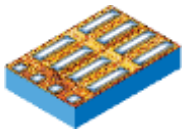
Higher torque per Ampere

High **joint efficiency** and **smooth and accurate operation**

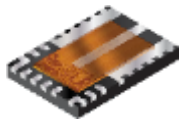
Highest miniaturization and lowest weight

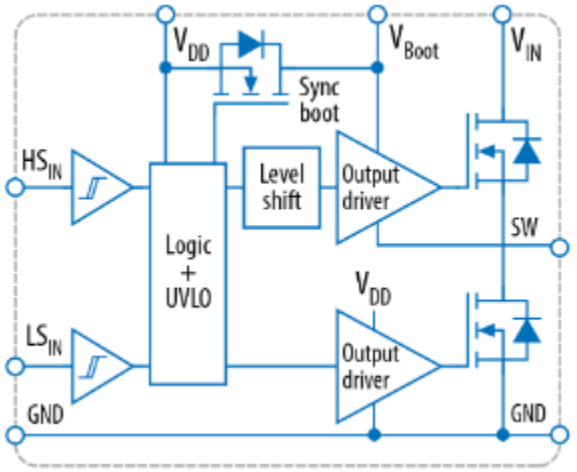
# Second Generation GaN Integrated Circuits

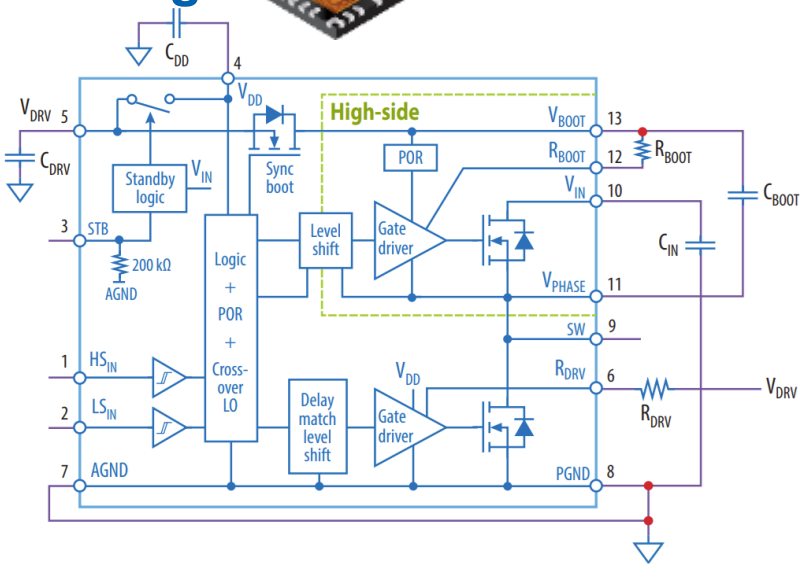
| | EPC2152 | EPC23102 | EPC23104 |
|---|---|---|---|
| $V_{DS}$ | 80 V | 100 V | 100 V |
| $R_{DS(on)}$ (typ) | 10 mΩ | 5.2 mΩ | 8.7 mΩ |
| $I_{DC}$ | 15 A | 35 A | 20 A |
| Package | CSP 3.9 x 2.6 mm | QFN 3.5 x 5 mm | |



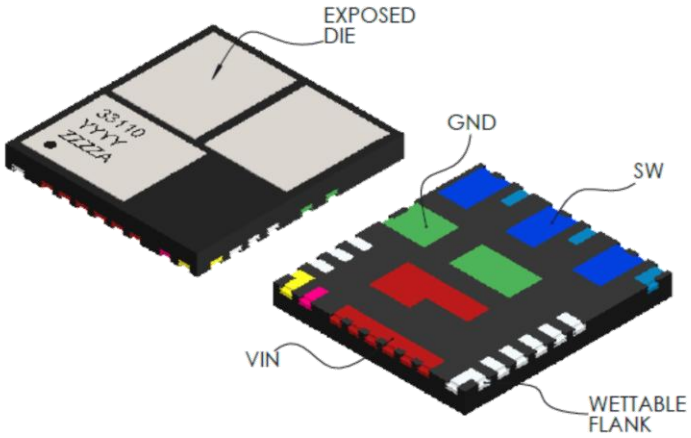
## 1-chip Power Stage



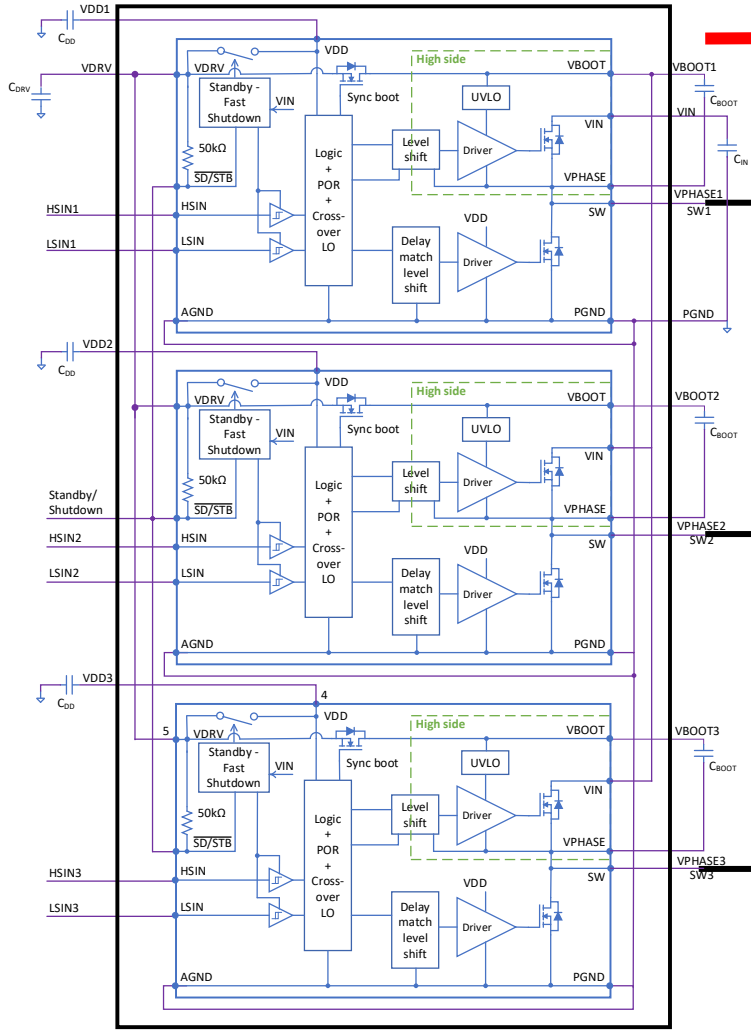


# EPC33110 – 3 Φ Robot Motor Module



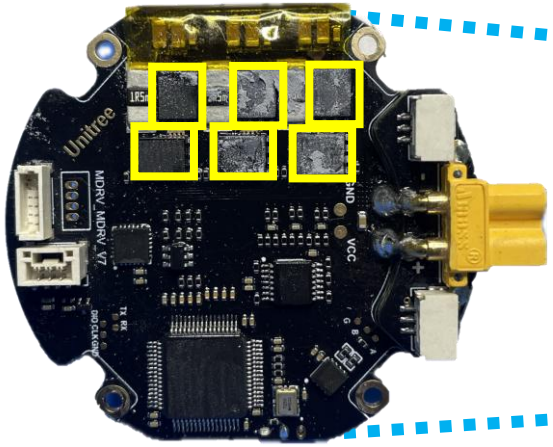

- **3-phase inverter in a small PQFN**
- 100 V, 8.7 mΩ, 10 $A_{RMS}$
- PQFN 6 x 6.5 mm, 600 µm clearance
- 5 V Voltage single supply input
- Top side cooling
- Exposed dies connected to GND
- 100 % ON capability, fast shutdown, standby function

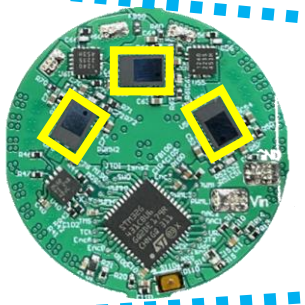


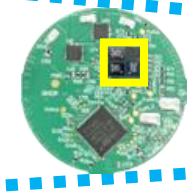

Alpha Samples available

# Size Matters

Smaller and Mightier





## MOS inverter

55 mm

6x (SuperSO8)
6x (6 x 5) $mm^2$

## EPC91118

32 mm

3x EPC23104
3x (3.5 x 5) $mm^2$

## EPC91122

23 mm

EPC33110
6.5 x 6 $mm^2$

# Third Generation GaN ICs - EPC23112

**Package**

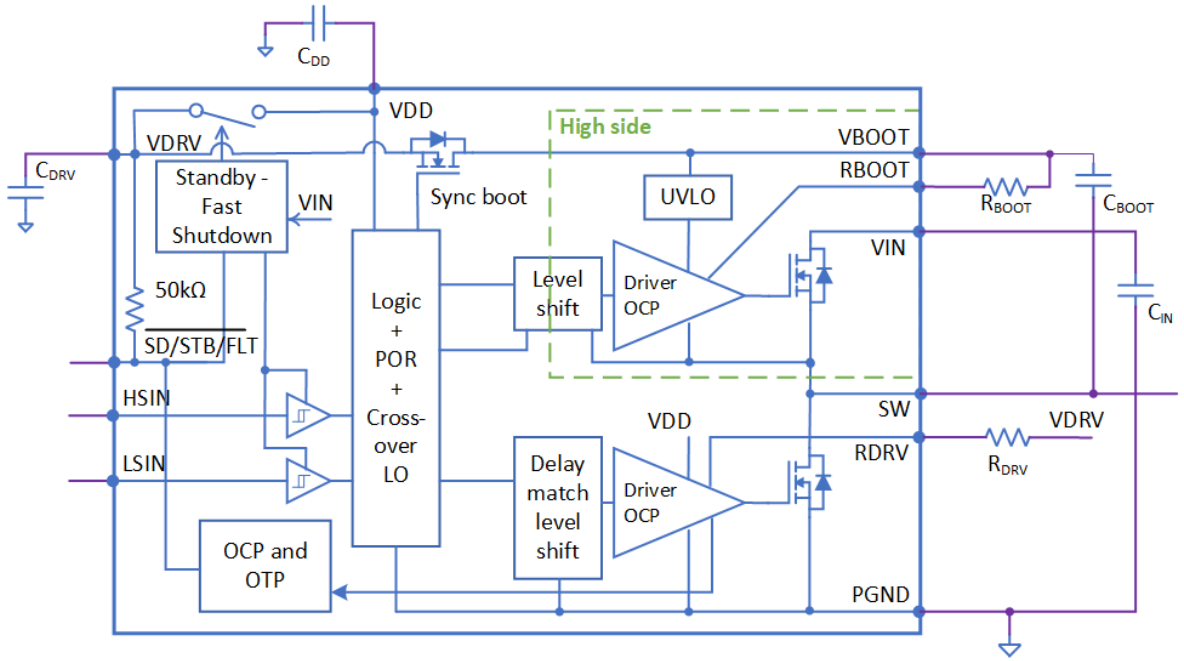
- Monolithic Powerstage
- 3.3 x 3.3 QFN, 600 µm clearance
- Exposed die on top
- Top surface weakly connected to GND


Alpha Samples
July 2026

**Technical Specs**

- 100 V
- 3.5 mΩ typ $R_{DSon}$
- 35 A
- 3.3 V and 5 V input logic
- Anti Shoot Through
- Low quiescent current
- OCP and OTP

**Block Diagram**



# Third Generation GaN ICs - EPC33111

**Package**

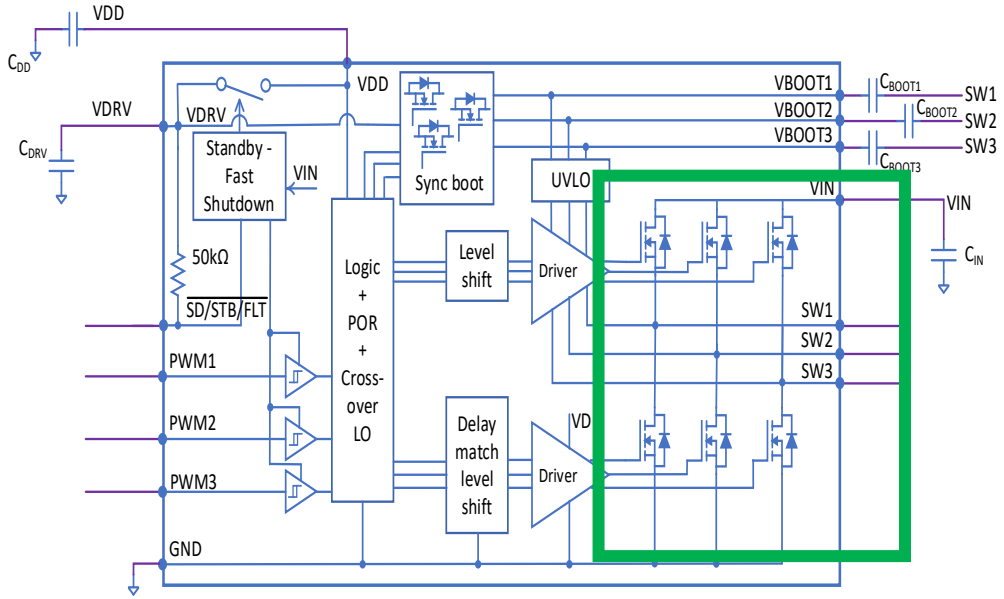
- 3 Phase Monolithic Powerstage
- 3x Gate driver + 6 Power FETs + bootstraps + level shifters
- 3.3 x 3.3 QFN, 550 µm clearance
- Exposed die on top
- Top surface weakly connected to GND


Alpha Samples
May 2026

**Technical Specs**

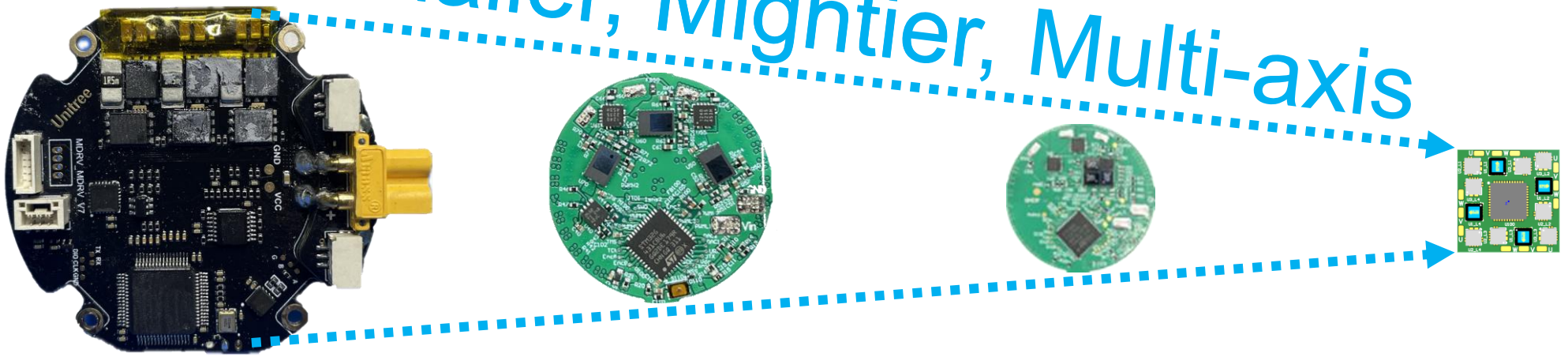
- 100 V
- 25 mΩ typ $R_{DSon}$
- 3.5 A
- Single PWM pin inputs
- Anti Shoot Through
- Fast Shutdown function

**Block Diagram**

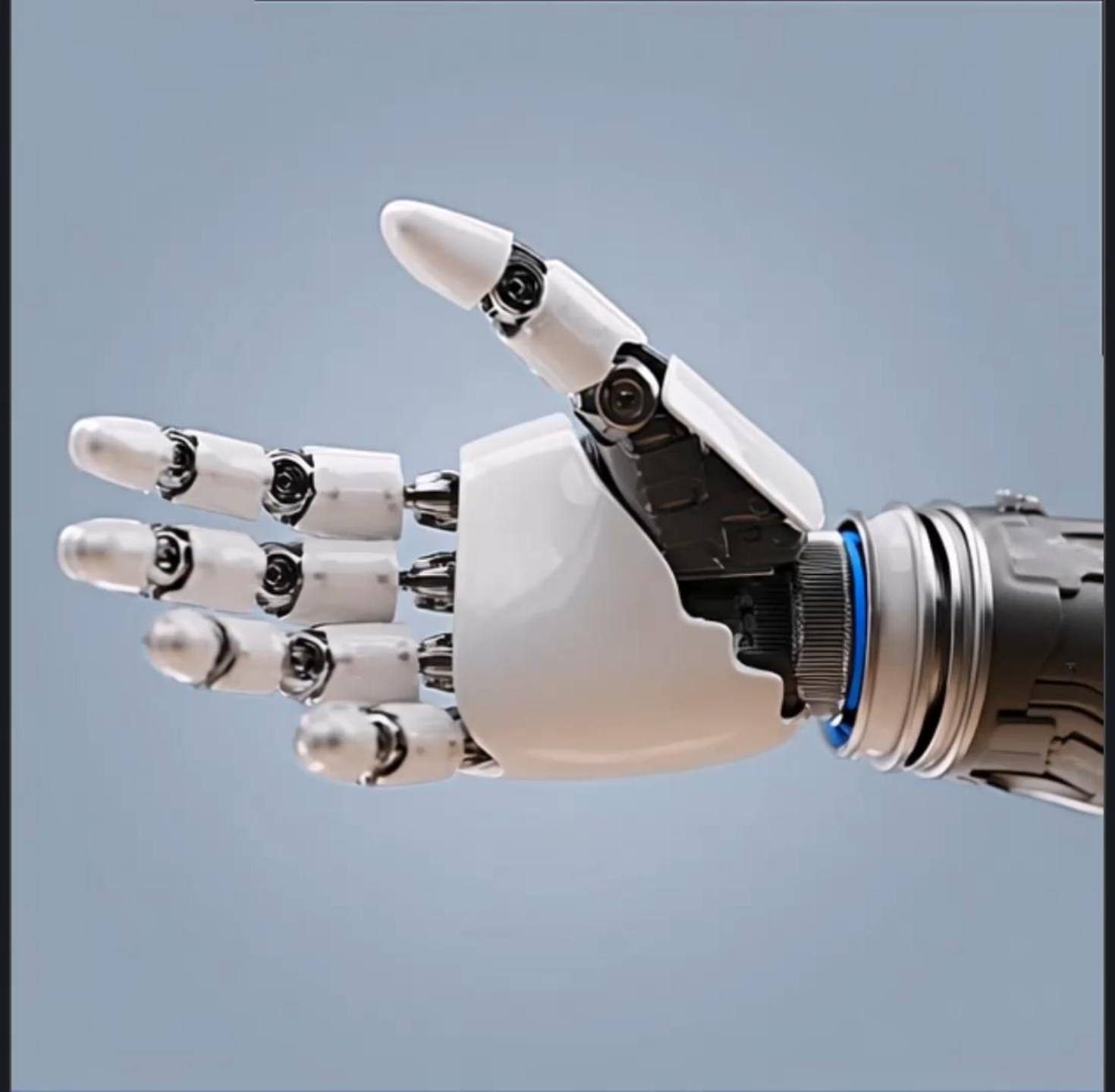


# Size Matters

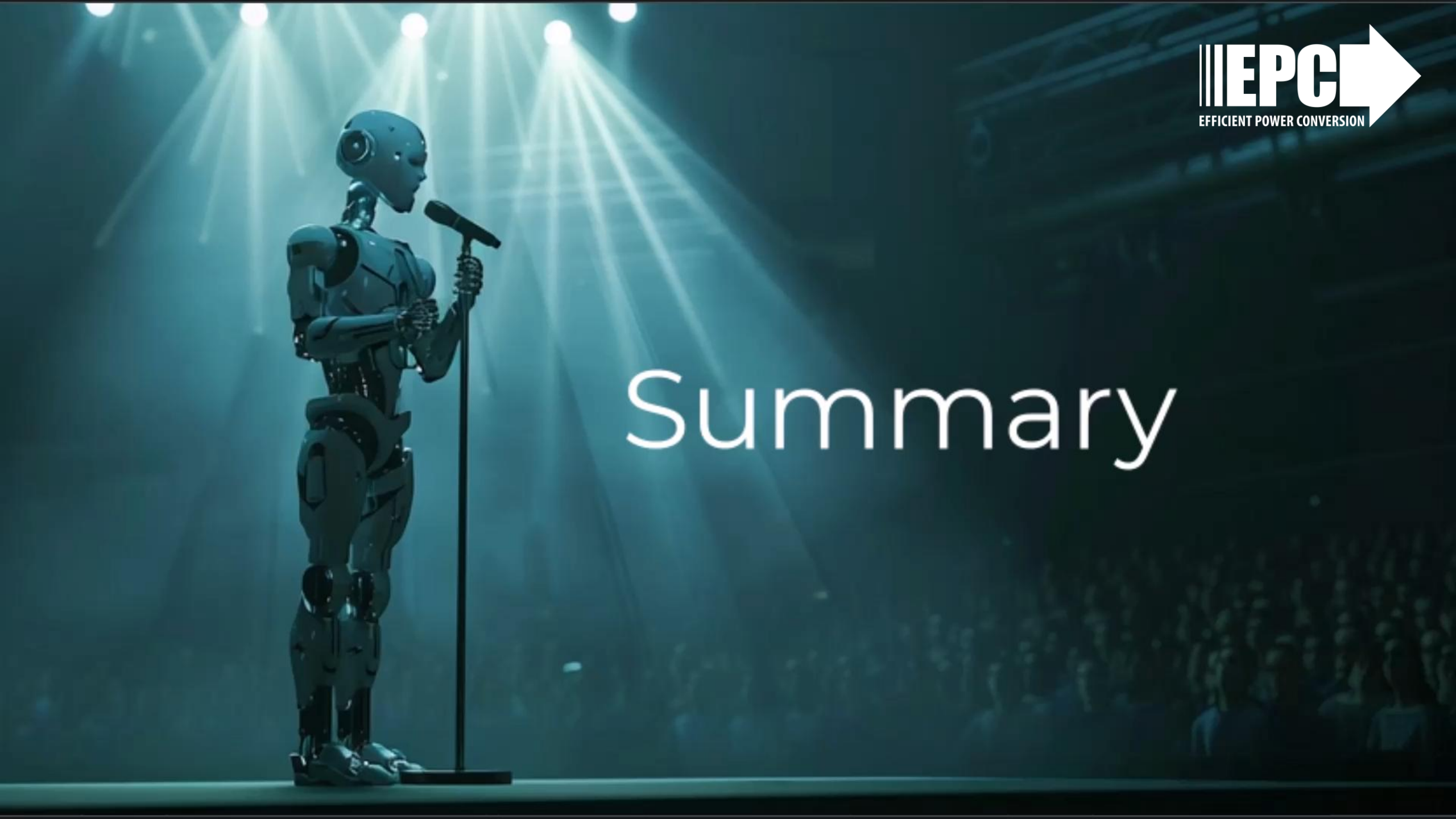
Smaller, Mightier, Multi-axis



| **MOS inverter** | **EPC91118** | **EPC91122** | **EPC911xx** |
|---|---|---|---|
| Single axis | Single axis | Single axis | **4x axis** |
| 55 mm | 32 mm | 23 mm | 20 x 20 $mm^2$ |
| 6x (SuperSO8)<br>6x (6 x 5) $mm^2$ | 3x EPC23104<br>3x (3.5 x 5) $mm^2$ | EPC33110<br>6.5 x 6 $mm^2$ | 4x EPC33112<br>4x (3.3 x 3.3) $mm^2$ |



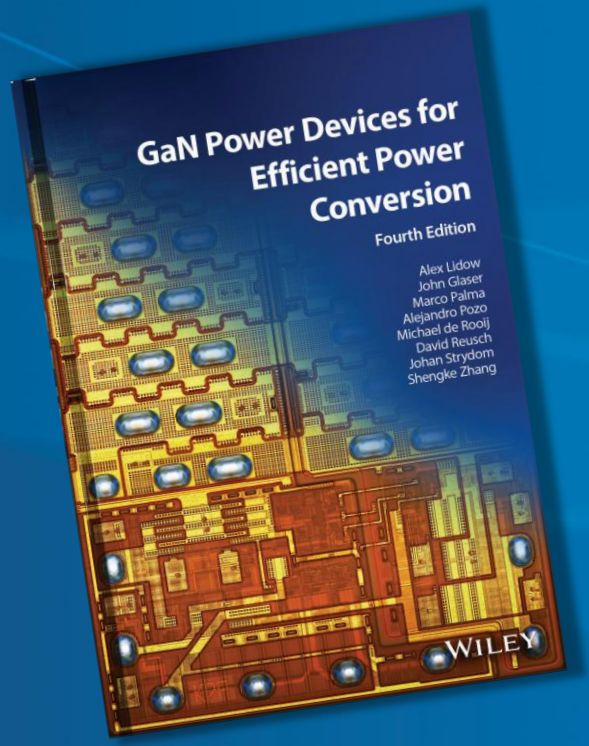
EPC
EFFICIENT POWER CONVERSION


EPC
EFFICIENT POWER CONVERSION
Summary

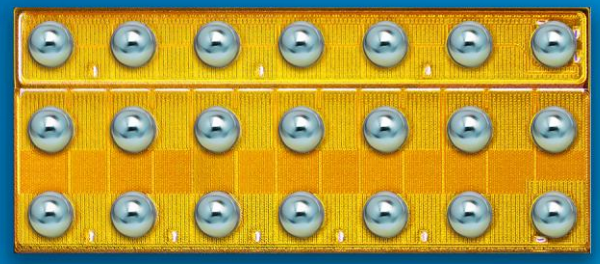
EFFICIENT POWER CONVERSION

# Click on images to learn more


How To GaN Video Series

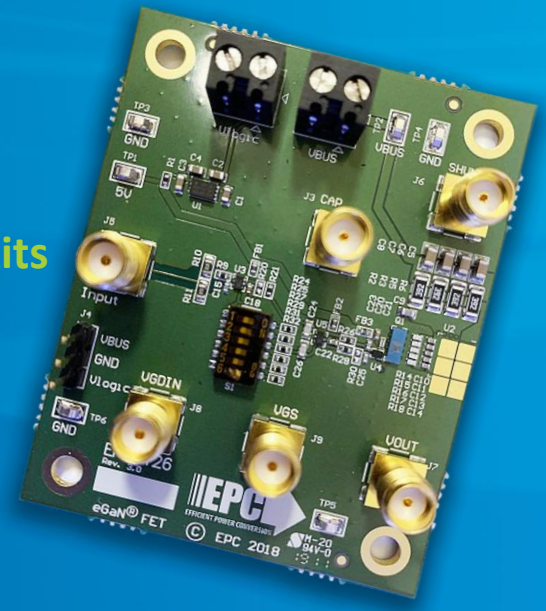



4th Edition Textbook



eGaN® FETs and ICs

Evaluation Kits

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