

ESCCON 2023

The European Space Components Conference

7 - 9 March 2023 | Toulouse | France



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Power GaN

The perspective of a European supplier
STMicroelectronics

Eric MOREAU

STMicroelectronics | Automotive & Discrete Group | PowerGaN Principal R&D Director & Toulouse Site Director



We are creators and makers of technology



One of the world's largest semiconductor companies



Over **50,000** employees
of which **9,000+** in R&D



\$16.1 billion revenues
in 2022



Over **80** sales & marketing
offices serving over **200,000**
customers across the globe



14 main manufacturing
sites

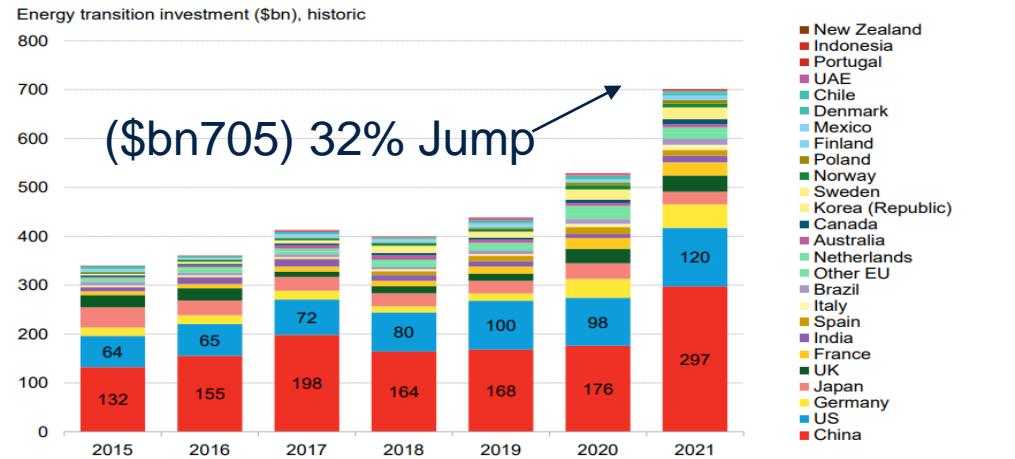


Signatory of the United Nations Global Compact (UNGC)
Member of the Responsible Business Alliance (RBA)

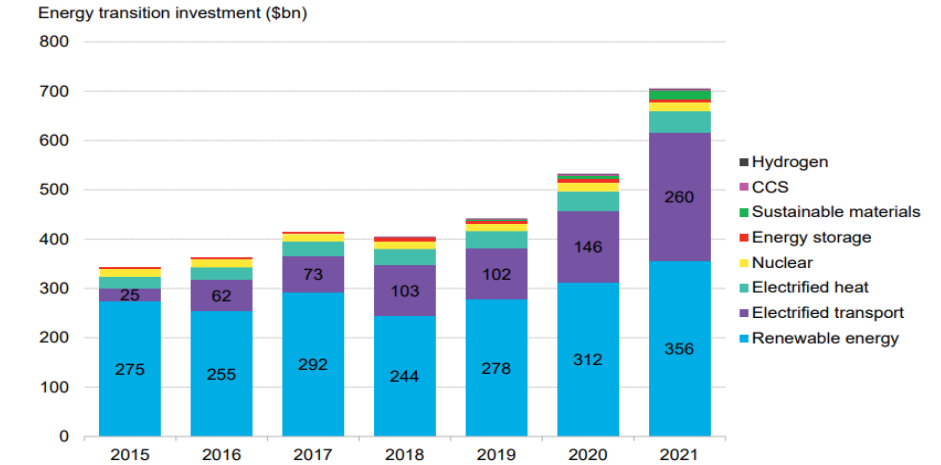
New generation of Power Semi-Conductors

Supporting Energy transition to a net zero-economy*

CEM members' annual energy transition investment



CEM members' annual energy transition investment



Fossil Energy



2020

Renewable Energy



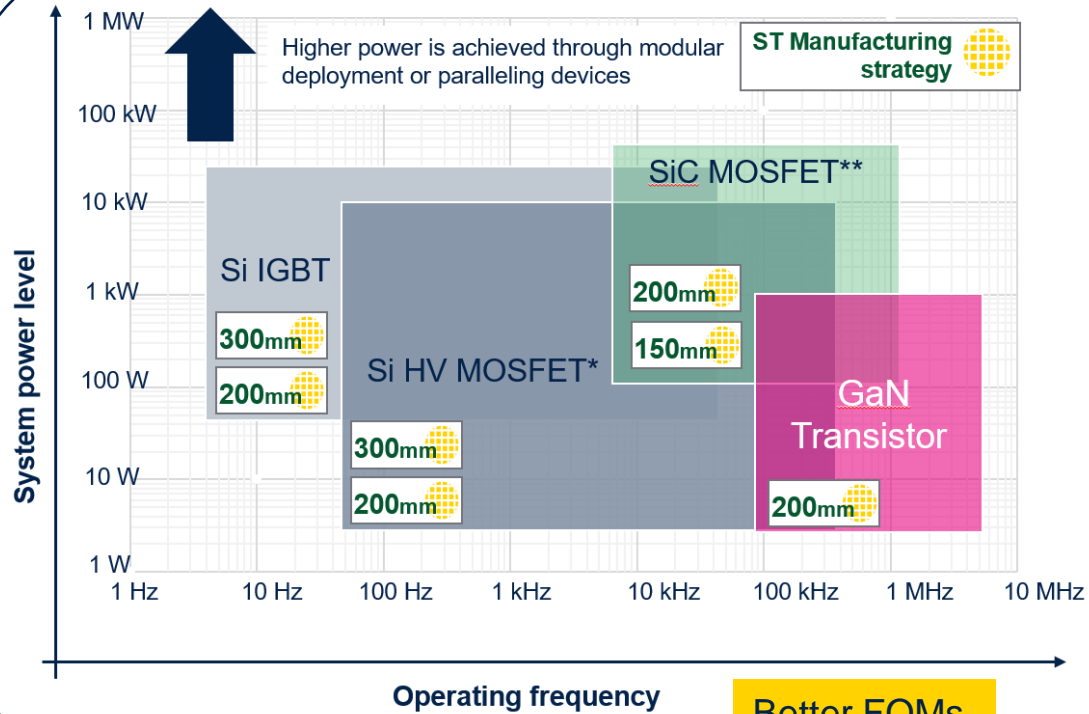
2050

Energy Handling

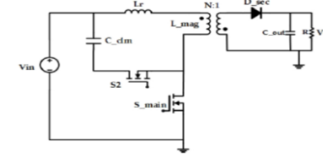
- Generation
- Conversion
- Distribution
- Storage

* balancing the amount of carbon emitted into the atmosphere with the carbon removed from it

GaN enables smaller and super efficient topologies

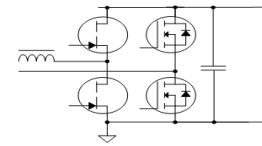


LLC and Active Clamp Flyback in Si and GaN



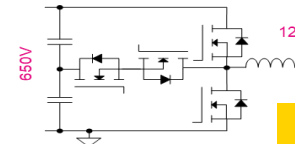
- **Higher frequencies** allowed, less C_{oss} , better time management in ZVS with **GaN**
- **Higher Power density**
- **Higher efficiency** with **same BOM**

Totem Pole PFC (SiC and GaN)



- CCM Totem Pole **can only be done** with **SiC** and **GaN**
- **Higher power density**
- **Higher efficiency** with **lower BOM**

3-Level / HB (SiC) like Vienna topologies



- 3-Level becomes **bidirectional** with **SiC** and **GaN**
- **Higher frequencies** allowed (48 kHz+ vs. Typ. < 20 kHz)
- **Higher efficiency** with **same or lower BOM**

Use of efficient architecture



Power supply



UPS



Solar Inverter



Industrial Motors



EV Charger



Traction



OBC, DC-DC

50-60%
lower losses

Increased Power Efficiency

3-5x
Frequency

20%
Reduced
Total Cost of
ownership (TCO)

70-80% reduced/smaller size
with an average weight
reduction of 50%



- Wide band Gap characteristics GaN 3.4 Volts vs 1.1 Volts for Si solutions)

- Depends on technology
- up to 350V for 650 V GaN transistor

- GaN material allow lower derating
- Still package dependent
- ST Power GaN specify max 150°C

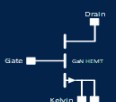
- ST European supply chain



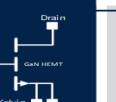

Work in progress to be planned with Partners to evaluate our ST Power GaN solutions

Product Plan

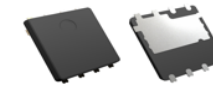
650V G-HEMT

Series	Sales Type	Target Electrical Specifications				Package	Eng Samples
		I_D [A]	R_{DS} typ [mΩ]	C_{oss} [pF]	Q_g [nC]		
 G-HEMT	SGT440R65AL	5	290	12.7	0.86	PowerFLAT 5x6	Q4 '22
	SGT190R65BL	TBD	150	TBD	TBD	PowerFLAT 5x6	Q4 '23
	SGT120R65AL	15	75	45	3	PowerFLAT 5x6	Q4 '22
	SGT65R65AL	30	42	80	6	PowerFLAT 5x6	Q4 '22
	SGT65R65AKT	30	42	80	6	LPAK 12x12 TSC	Q2 '23
	SGT40R65ALD	40	30	130	9.3	PowerFLAT 8x8 DSC	Q1 '23
	SGT40R65APT	40	30	TBD	TBD	PowerSO-20	Q2 '23
	SGT40R65AKT	40	30	130	9.3	LPAK 12x12 TSC	Q2 '23
	SGT20R65AKT	40	14	258	23	LPAK 12x12 TSC	Q2 '23

100 V G-HEMT

Series		I_D [A]	R_{DS} typ/max [mΩ]	C_{oss} [pF]	Q_g [nC]	Co(er) [pF]	Co(tr) [pF]	DirectGaN™	
 G-HEMT	SGT1D5R10ALD	90	1.2/1.5		25	TBD	TBD	TBD	TBD
	SGT2D2R10Ax	90	1.8/2.2	760	21	TBD	TBD	5x6 Form factor 	Q2 '23

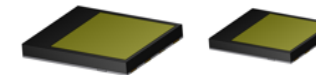
PowerFLAT 5x6 HV



PowerSO-20



DirectGaN 5x6 TSC



PowerFLAT 8x8 DSC



LPAK 12x12 TSC/BSC



Filière industrielle Européenne GaN-Si 200mm



Tours



Gallium Nitride

- Internal 200 mm line
- Volume production 2023

TOURS
Technology/Manufacturing



100-650V
Volume production 2023



Crolles



Gallium Nitride

- Former EXAGAN (GaNEpi)
- GaN Epi center tech. excellence
- 200mm GaN epitaxy (100V, 650 V, 900 V)

Smart GaN



Agrate



Agrate
Technology/Reliability/
Manufacturing



Toulouse



Gallium Nitride & Silicon Carbide

- Former EXAGAN (GaN)
- GaN Global Apps. Center of Excellence
- EMEA Tech. support (SiC & GaN)

TOULOUSE
Product/Application/System



GRENOBLE
Technology



Power GaN



Catania



Catania
Marketing/ Design/Technology/
Application/Reliability/
Packaging/
Manufacturing for RF



Our technology starts with You



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