

Express your talent with UMS !

Create your winning RF Products
thanks to UMS Foundry
Service Expertise



Broad portfolio
of proven and robust
GaN / GaAs processes



Excellent Electrical
model accuracy



Extensive back-end
capabilities



Industrial low-cost
packaging services



UMS has developed a family of robust and proven GaAs and GaN processes for the production of **state-of-the-art RF performance MMICs**. These processes are extensively used by foundry customers and UMS designers to deliver advanced MMIC solutions for Defense, Automotive, Space, Telecom and ISM markets.

UMS **Design Manuals** and **Design Kits**, developed in-house, will help you create your own circuits. During the design phase, the UMS Foundry team assists customers with a **close and interactive support**. **UMS electrical models** are renowned for **their accuracy**, which allows customers to succeed in reaching their RF performance targets **right from their first development runs**. All supplied wafers

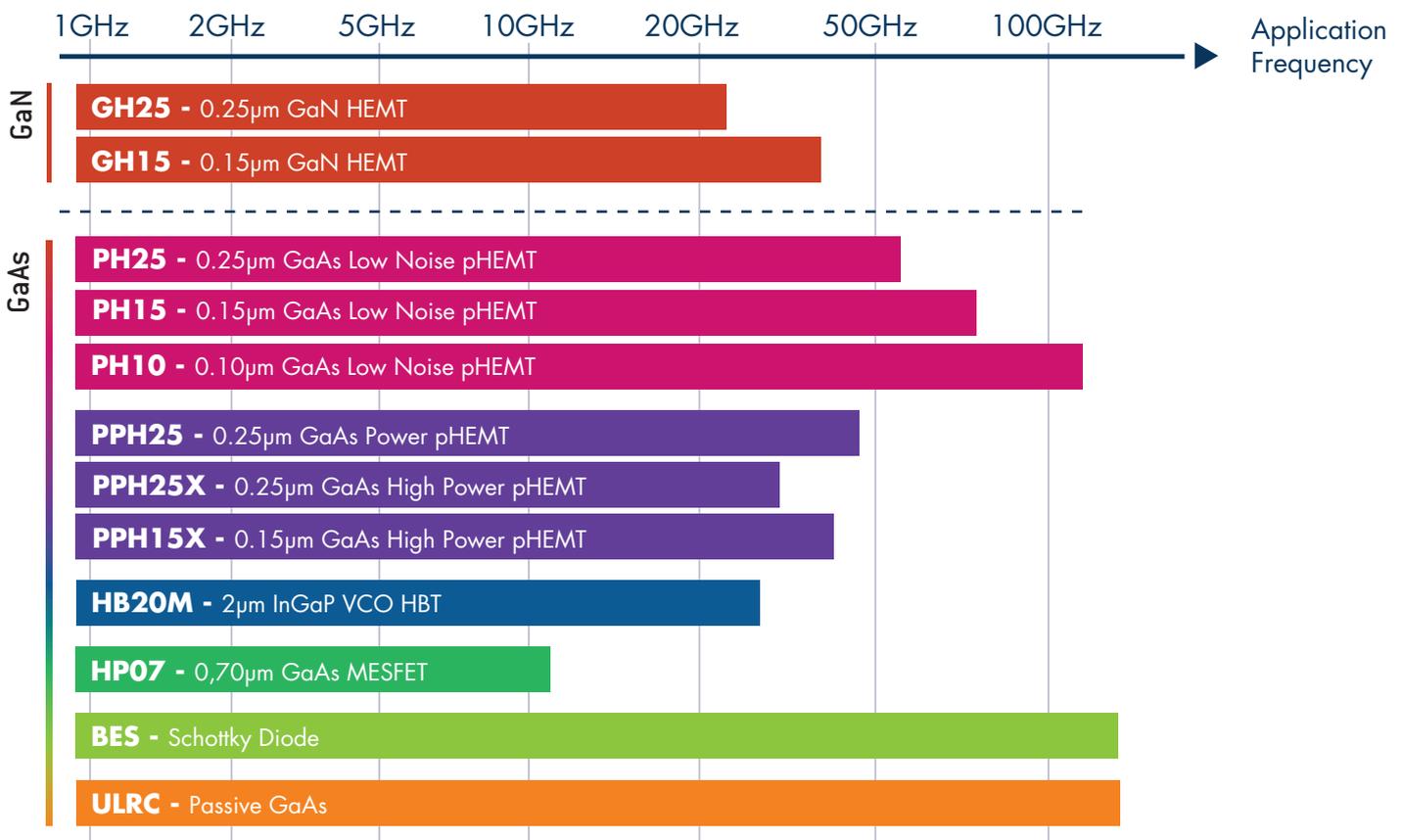
meet UMS **Process Control Monitor (PCM)** specifications and are visually inspected, which is a guarantee of UMS manufacturing quality.

Furthermore, UMS offers several optional services including **foundry training, on-wafer tests** (DC, RF, noise, power, mixer), **wafer dicing, die sorting, visual inspection, MMIC picking and packaging or delivery of Known Good Dies (KGD)**.

This wide range of services completes UMS foundry offer, enabling our customers to succeed with their development and production, **from small to very large volumes**.

GaN and GaAs processes for RF & mm-wave applications

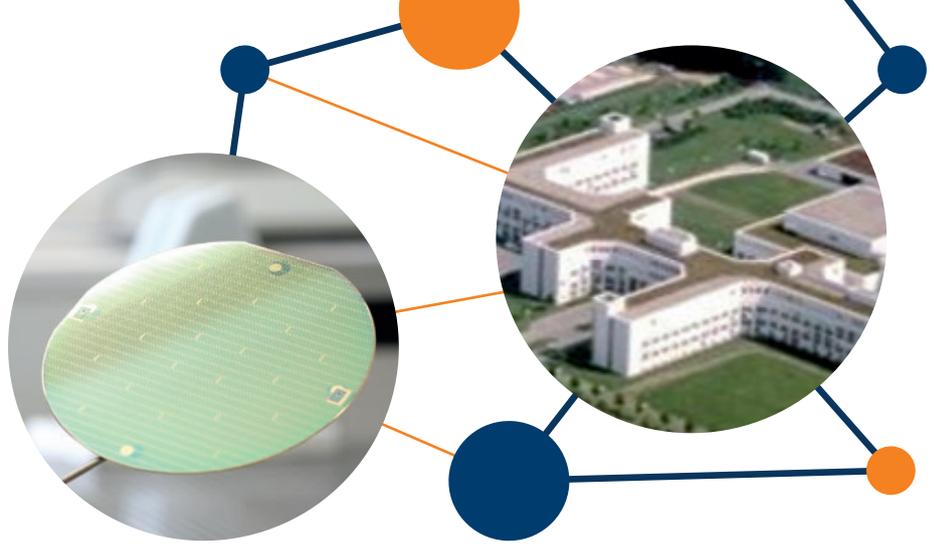
UMS offers a broad portfolio of high-performance and very reliable GaAs and GaN-on-SiC processes for MMIC design. UMS advanced pHEMT, HEMT, MESFET, HBT, Schottky and passive technologies, along with our dedicated engineering support, allow our foundry customers to design and manufacture their own state-of-the-art MMICs.



Open processes / Wafer fabrication

Our processes include:

- Air bridges
- MIM capacitors
- TaN and TiWSi resistors
- Via-holes
- Coating for packaging



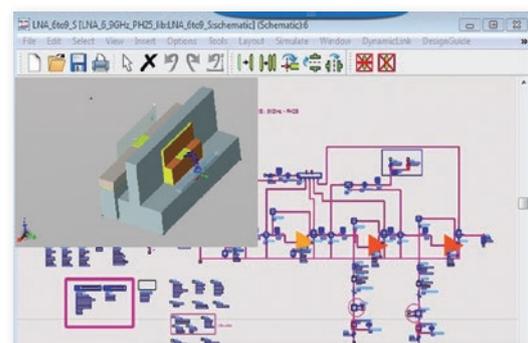
| Process | GH15 GaN | GH25 GaN | PH25 Low Noise | PH15 Low Noise | PH10 Low Noise | PPH25 Power | PPH25X High Power | PPH15X High Power | HB20M VCO | HP07 | BES |
|-------------------------------------|--------------------------|------------------------|---|---|--------------------------|------------------------|-----------------------------|-----------------------------|-----------------------|----------------------|------------------------------|
| Active device | HEMT | HEMT | pHEMT | pHEMT | pHEMT | pHEMT | pHEMT | pHEMT | HBT | MESFET | Schottky |
| Power Density | 4.2W/mm | 4.5W/mm | 250mW/mm | 300mW/mm | 250mW/mm | 700mW/mm | 900mW/mm | 800mW/mm | 2W/mm | 400mW/mm | - |
| Gate Length | 0.15µm | 0.25µm | 0.25µm | 0.15µm | 0.1µm | 0.25µm | 0.25µm | 0.15µm | 2µm Emitter width | 0.7µm | 1µm |
| Ids (gm max) Ids sat/Ic | 1200 mA/mm 1400 mA/mm | 880mA/mm 1000mA/mm | 200mA/mm 500mA/mm | 220mA/mm 550mA/mm | 280mA/mm | 200mA/mm 500mA/mm | 170mA/mm 250mA/mm | 350mA/mm 575mA/mm | 0.3mA/µm ² | 300mA/mm 450mA/mm | - |
| V _{BDS} / V _{BCE} | >70V | >100V | > 6V | > 4.5V | > 5V | > 12V | > 18V | > 12V | > 14V | > 14V | < -5V (Anode/ Cathode) |
| Cut off freq. | > 35 GHz | 30GHz | 90GHz | 110GHz | 130GHz | 50GHz | 45GHz | 70GHz | 30GHz | 15GHz | 3THz |
| V _{pinch} | -3.2V | -3.4V | - 0.8V | - 0.7V | -0.45V | - 0.9V | - 0.9V | - 0.95V | - | - 4.0V | - |
| Gm max / β | 390mS/mm | 290mS/mm | 560mS/mm | 640mS/mm | 750mS/mm | 450mS/mm | 360mS/mm | 480mS/mm | 60 | 110mS/mm | - |
| Wafer Thickness | 70µm | 100µm | 100µm | 100µm | 70µm | 100µm | 70µm | 70µm | 100µm | 100µm | 100µm |
| Noise / Gain | 1.5dB / 11dB @15GHz | 1.8dB / 11dB @15GHz | 0.6dB / 13dB @10GHz 2dB / 8dB @40GHz | 0.5dB / 14dB @10GHz 1.9dB / 6dB @60GHz | 2.3dB / 4.5dB @70GHz | 0.6dB / 12dB @10GHz | - | 1.8dB / 6dB @40GHz | - | - | - |

Process Design Kits

UMS modeling and CAD experts have built complete and highly accurate Process Design Kits (PDK). These PDKs include active (small and large signal) and passive scalable models that are directly linked to auto-layout and library options, compatible with your CAD tools.

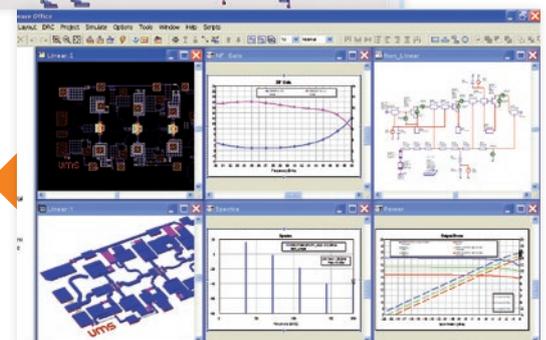
UMS PDKs include schematic capture, layout generation, layout verification (DRC) and 3D view generation for EM simulation. They are fully compatible with:

- **Pathwave ADS from Keysight (2017 to 2022 versions) for all processes.**
- **Microwave Office from Cadence for GaAs and GaN HEMT, HBT and Schottky diodes.**
- **Cadence Virtuoso (Layout and DRC).**
- **eDRC and Tape Out via our web portal.**



ADS 2020
(Keysight)

Microwave Office
(AWR)



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www.ums-rf.com

UMS Foundry services

UMS mainstream foundry service offer comes with the delivery of **Design Kits and Design Manuals**, the engineering support you need to get started, the construction of the reticle, the fabrication of the mask, and the manufacturing of GaN or GaAs wafers. UMS broad range of **Back-End services** can finally address various customer needs.

Back-end services:

- **Automated on-wafer testing solutions** for circuit characterization over 1 to 110GHz and MMIC sorting according to your product specifications: 100% functional on-wafer tests can thus be performed with various purposes such as DC tests, S-parameters measurement, noise measurement and CW-mode or pulsed-mode power measurement.
- **Laser wafer dicing:** This dicing technology allows high dicing yields.
- **Visual inspection:** with commercial or space screening grades.
- **Picking in accordance** with your sorting criteria: Individual die numbering allows chip identification. Known Good Dies may be delivered in Gel-Pak® or on UV-film.

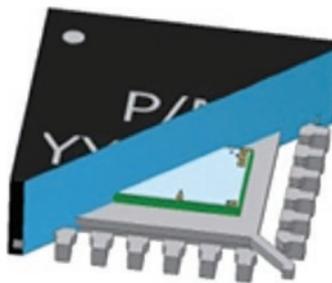


Standard & custom Probe cards

QFN packaging

As part of UMS foundry offer, we also propose low-cost **QFN packaging service:** Your circuits passivated with a protective BCB layer can thus be encapsulated in plastic molded packages. For this purpose, many UMS processes coming with the BCB option can be found on UMS website.

8 Standard QFN packages are offered, with dimensions ranging from 3x3mm² to 6x6mm². ADS models are available in the associated Design Kit for packaged MMIC designs.



Foundry course

UMS 2-day Foundry Courses bring information about the III-V technologies, processes, design methods, standards and spirit of UMS foundry service. This 2-day training is organized on a regular basis. It can also be arranged on request.

The foundry course is delivered by UMS experienced product line designers and engineers. The course agenda deals with the following various topics:

- **GaN/GaAs technologies and design rules**
- **LNA, PA, mixer, VCO design examples and design tricks**
- **CAD tools and electrical models through discussions and demo with external CAD support engineers**
- **Back-end services**
- **Thermal methodology and simulation**
- **Reliability**
- **Industrialization**
- **Packaging & Measurement capabilities for production**
- **Foundry flow and DRC**

In addition, UMS foundry users have the possibility to access additional e-training.



Foundry Service Modes

Full Wafer mode

- Full mask
- Technical support
- Full wafer / Known Good Dies
- Standard process time
- Full Back-End offering
- Space screening
- QFN packaging

Shared Mode (MPW)

- Shared mask
- Limited UMS support
- Low budget opportunity
- Fixed project launch date
- Fixed MMIC dimensions
- 16-20 chips per MMIC version
- No On-Wafer Test

■ Standard □ Optional

Multi Project Wafer (MPW)

Shared foundry runs or Multi-Project Wafers are a cost effective foundry approach well suited for institutes, labs, research centers and universities. This foundry offer allows different customer projects to be manufactured on a single wafer.

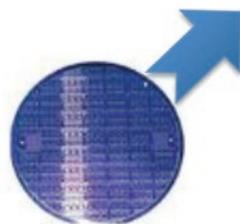
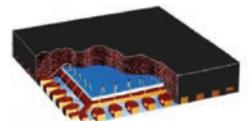
Participants have free access to Design Kits and receive 16-20 untested devices of each MMICs version on the MPW tile in Gel-Pak® box.

The possible MMIC length and width, including dicing streets and with a maximum 1:3 aspect ratio, are:

- 1 mm, 2mm, 3mm and 4mm for **GaN** processes (**GH25, GH15**)
- 1.4mm, 2mm, 2.4mm, 3.4mm, 4mm and 4.4mm for **high power GaAs** processes (**PPH25X, PPH15X**)
- 1 mm, 1.4mm, 2.4mm, 3.4mm and 4mm for **low-to-medium power GaAs** processes (**PH25, PH15, PH10, PPH25, HB20M, HP07, BES**)
- 1.4mm, 2mm, 2.4mm and 3.4mm for UMS **passive GaAs** process (**ULRC**)

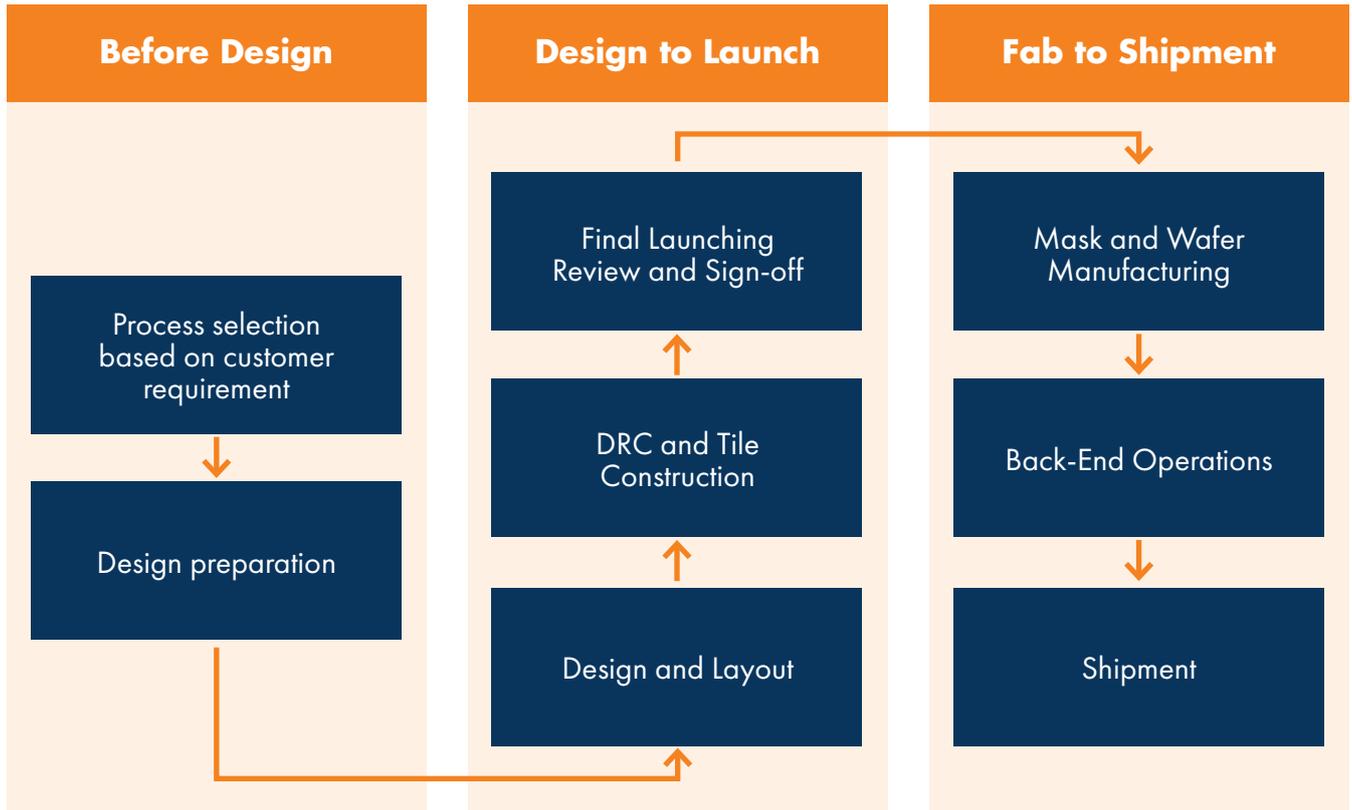
Prices per square millimeter vary according to the selected process. They can be found, along with additional details and MPW launch planning, at <https://www.ums-rf.com/foundry/>

| | 1 | 1,4 | 2,4 | 3,4 | 4 |
|-----|-----|-----|-----|------|------|
| 1 | 1 | 1,4 | 2,4 | | |
| 1,4 | 1,4 | 2 | 3,4 | 4,8 | 5,6 |
| 2,4 | 2,4 | 3,4 | 5,8 | 8,2 | 9,6 |
| 3,4 | | 4,8 | 8,2 | 11,6 | 13,6 |
| 4 | | 5,6 | 9,6 | 13,6 | 16 |



Example of mask tiles with available die size (mm).

High Level Foundry Service Flow



UMS is committed to offer full space evaluated processes. UMS is certified ISO 9001, ISO 14001 and ISO TS16949.

Contact UMS

For more information about UMS foundry services:
foundry@ums-rf.com

In addition to Foundry services, UMS also offers a complete catalogue RF and mmwave solutions.

For more information about UMS catalogue RF and mmwave solutions:
mktsales@ums-rf.com

Visit our website :
www.ums-rf.com

and

 www.linkedin.com/company/ums-umited-monolithic-semiconductors/
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