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# Short Form Catalog 2017

MMIC products from 500 MHz to 400 GHz

Advanced GaAs & GaN processes

Epitaxy services

Foundry and FAB+ services

Design Center for state-of-the-art custom MMICs

Space Heritage and Space qualification services

# Innovating with III – V's

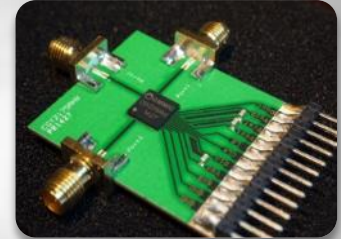
## GaAs – GaN Solution Leading Supplier

### OMMIC in few words

OMMIC, based near Paris in France, is a leading supplier of Epitaxy, Foundry Services and MMICs based around the most advanced III-V processes.

OMMIC is exploiting its more than 40 years background in III-V **Materials**, **Design** and **Processing** to provide innovative solutions enabling its customers to be leaders in a more and more demanding market place.

OMMIC is a supplier of MMIC circuits, Foundry Services and Epitaxial Wafers based on III-V (GaAs & GaN) materials. As a leader in advanced technologies, OMMIC provides its customers with cutting edge performance for Telecommunication, Space and Defense Applications.



### OMMIC: Flexible, customer oriented, with a strong Quality Policy



OMMIC operates in a highly competitive global market and must be competitive and responsive.

OMMIC has been **ISO 9001** certified since 1994 and **ISO 14001** since 2002.

This sustainable commitment is fully supported by its quality management system.

#### OMMIC is focused on :

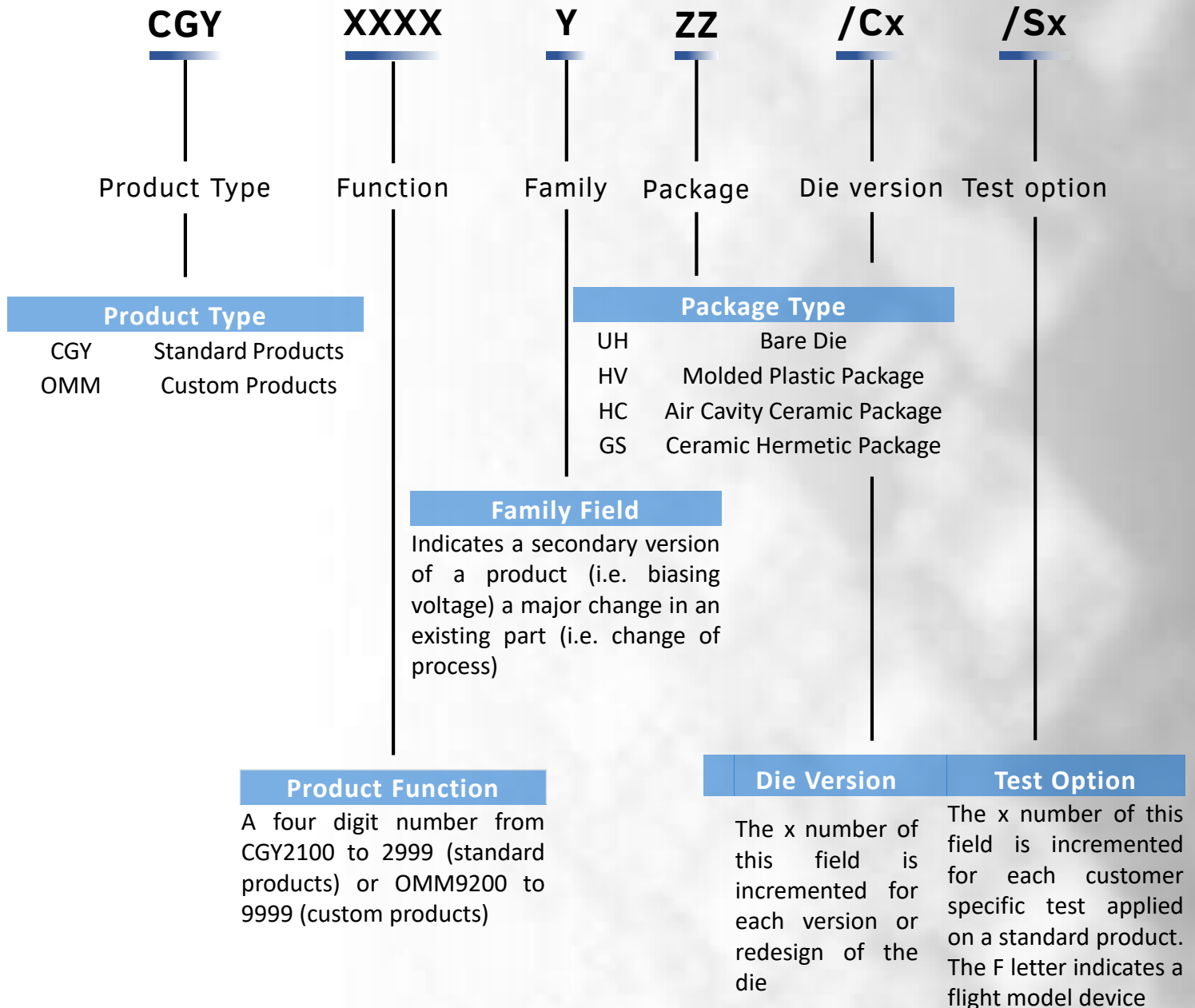
- Innovation and development through the establishment of partnerships with our customers, agents and suppliers.
- Compliance with the requirements of our customers and with the European regulation.
- Development of staff skills, responsible and motivating human policy.
- Minimize our impact on the environment through preventive action plans.



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Part designation at OMMIC are following defined rules; each field is related to the following items



## Part Number Example

Standard Product      Version A      Design Version 1

**CGY 2175 A HV /C1 /S1**

Part Number

Plastic QFN

Special Test for Customer 1



# MMIC Product Selector Guide

mmW GaN Roadmap  
(15 – 140 GHz)

Advanced Ka-band Solutions

Ultra Low Noise Amplifiers  
(0.5 – 6 GHz)

Low Noise Amplifiers  
(5 – 160 GHz)

Power Amplifiers  
(8 – 50 GHz)

Wideband Amplifiers  
(DC – 54 GHz)

Digital Attenuators & Phase-Shifters  
(5 – 35 GHz)

Corechips & control Functions  
(5 – 35 GHz)

Mixers & Miscellaneous  
(0.1 – 110 GHz)

Advanced W-band Solutions

OMMIC has developed a **state-of-the-art** Gallium Nitride (GaN) process (**D01GH**) available in production. Unlike most of our competitors, our GaN process is **very stable in time** and **do not suffer from memory effect**. OMMIC's goal is to bring GaN power density to always higher frequencies. This is why our current roadmap involves releasing short gate length processes.

## D01GH GaN on Si

100 nm – 105 GHz Ft

3.3 W/mm @ 30 GHz     Vdd = 12 V

Process on SiC available soon

Available

## D006GH GaN on Si or SiC

60 nm – 170 GHz Ft

2 W/mm @ 94 GHz

2017 – Q4

## D004GH GaN on SiC

40 nm – 210 GHz Ft

0.8 W/mm @ 140 GHz

2018

## Moving from 3- to 6-inch wafer

In late September 2017, **OMMIC** will be the **first European company** to produce **Gallium Nitride MMIC** on **6-inch wafers**.

The **D01GH** (aside) process will be available on 6-inch once the line is operational in production, quickly followed by the D006GH process.

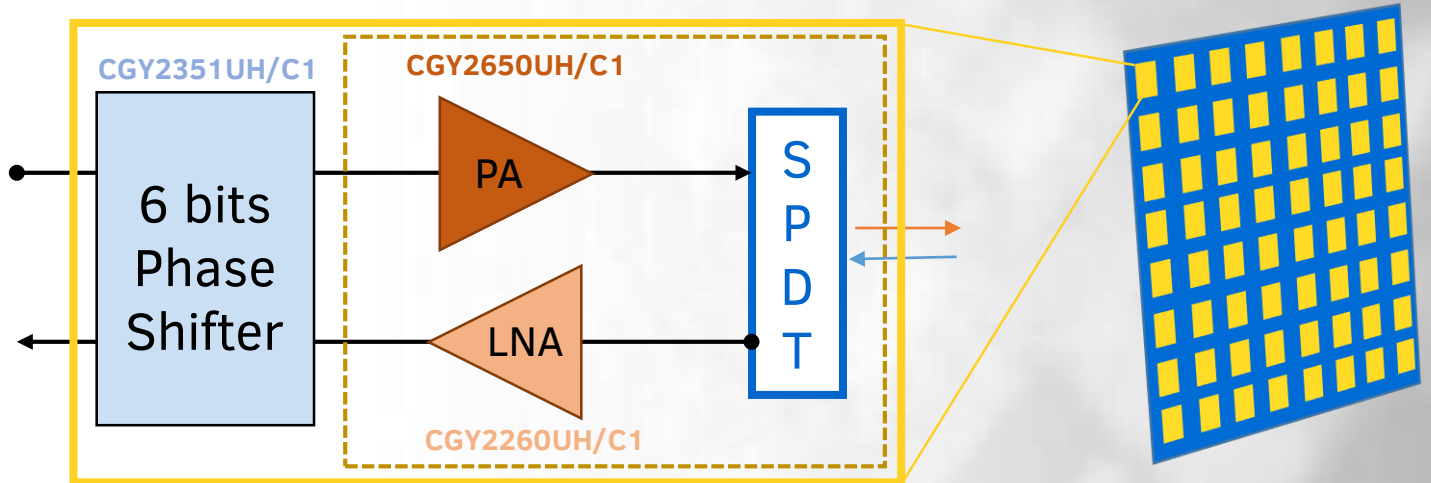


Both **GaN/SiC** and **GaN/Si** will be **available** on **6-inch wafers**.

Process	D01GH
Technology	GaN on Si
Status	Production
Space Grade	In 2020
Gate Length (μm)	0.1
Wafer Size (")	3
Thickness (μm)	100
Gate Write	E-beam
Ft (GHz)	105
Fmax (GHz)	160
Vbgd (V)	40
Vds max (V)	25
Idss (mA/mm)	700
Imax (mA/mm)	1100
NF (dB)	1.5 (40 GHz)
Power Density (mW/mm)	3300
gm (mS/mm)	650

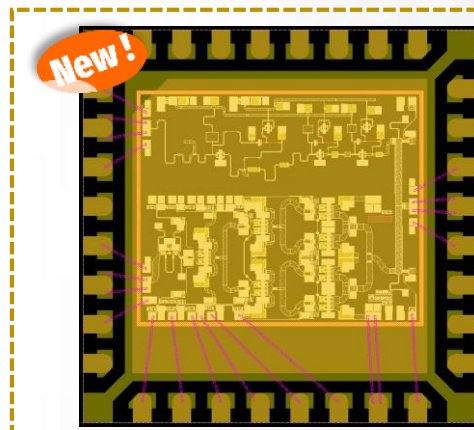


## Massive MIMO 28 GHz Solution for 5G



## Integrated solution : 30 GHz GaN T/R chip

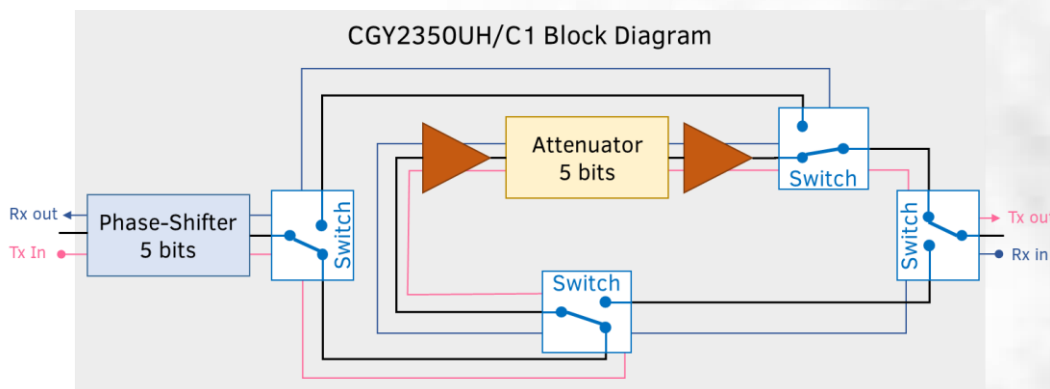
Samples available !



- 26 – 34 GHz
- 3 ports : LNA + PA + SPDT
- Switch losses : 1.5 dB
- RX and TX gain : 22 dB
- NF : 2.7 dB (switch losses' included)
- Pout 36 dBm (switch losses' included)
- Size 3650 x 3000
- compatible 5x5 QFN

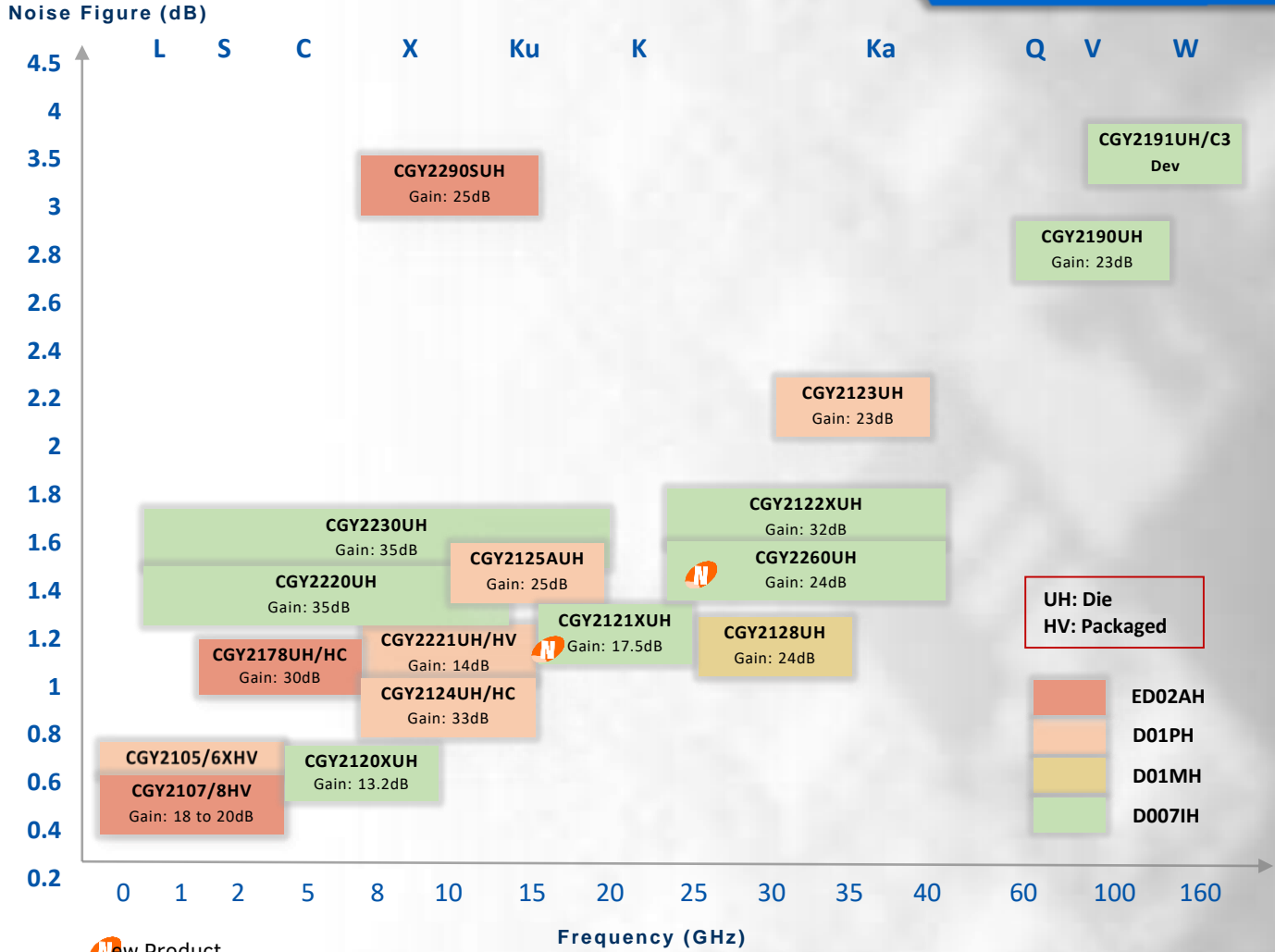
## 35 GHz control function solution

CGY2350UH/C1 Block Diagram

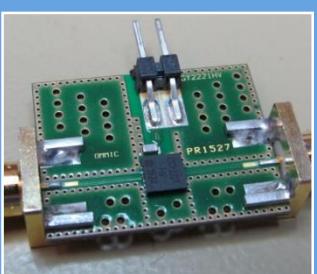


- 34 – 36 GHz
- RX and TX gain : > 3 dB
- 5-bit Phase-Shifter
- 5-bits Attenuator
- RMS  $\phi$  error : < 5 °
- RMS Amp error : < 0.6 dB
- OP1dB : > 10 dB

OMMIC LNA Portfolio

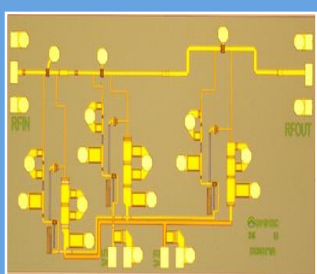


New Product



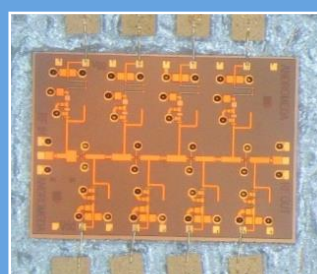
**CGY2221HV/C1**

Frequency : 7.5 – 13 GHz  
 NF : 1.6 dB  
 Gain : 17 dB  
 High Pin: 21dBm CW/31dBm 10%



**CGY2122XUH/C1**

Frequency : 25 – 43 GHz  
 NF : < 1.8 dB  
 Gain : 25 dB



**CGY2190UH/C2**

Frequency : 75 – 110 GHz  
 NF : 3 dB  
 Gain : 23 dB



OMMIC Portfolio of MMICs, includes LNA from 500MHz to 160GHz for civil application such as Telecommunication, Passive imaging, Radars but also for space and military applications.

LNA are manufactured using OMMIC 180 nm E/D PHEMT (**ED02AH**), 135 nm gate length PHEMT (**D01PH**), 125 nm MHEMT (**D01MH**) and 70 nm MHEMT (**D007IH**) Technologies.

The MMICs use gold bonding pads, backside metallization and are fully protected with Silicon Nitride passivation to obtain the highest level of reliability.


**D01PH** and **D01MH** technologies have been evaluated for Space applications and are on the European Preferred Parts List (**EPPL**), of the European Space Agency (**ESA**).

### Performance Table for Ultra Low Noise Amplifiers MMIC



OMMIC Ultra Low Noise Amplifier are dedicated to application such as Base Station Rx architectures thanks to a very low noise and high OIP3 from the L- to S-band. Standards targeted are GSM, CDMA2000, WCDMA, LTE and LTA-A.

Part number	Frequency (GHz)	Gain (dB)	NF (dB)	OP1dB (dBm)	Bias Voltage (V)	Bias Current (mA)	Package	Status
<b>CGY2105XHV</b>	0.5 – 4	19	0.42	35.00	5	2 x 50	QFN 4x4	Production
<b>CGY2106XHV</b>	0.1 – 3	19	0.45	35.00	5	2 x 50	QFN 4x4	Production
<b>CGY2108HV</b>	0.5 – 6	22	0.5	36	5	2 x 50	QFN 4x4	Production
<b>CGY2107UH</b>	0.5 – 6	24	0.6	34	5	2 x 50	QFN 4x4	Production
<b>CGY2108GS</b>	0.5 – 6	21	0.6	36	5	2 x 50	Flight Model	Production

### Performance Table for Low Noise Amplifiers MMIC

 New Product


OMMIC Low Noise Amplifier MMIC are suitable for nowadays satellites, radar, passive imaging and cryogenic application thanks to very low noise performances.

Part number	Frequency (GHz)	Gain (dB)	NF (dB)	OP1dB (dBm)	Bias Voltage (V)	Bias Current (mA)	Package	Status
<b>CGY2120XUH/C1</b>	5 – 7	13	0.5	12	1.0	50	Die	Production
<b>CGY2178HV/C1</b>	5 – 6	30	1.0	15	3.0	40	QFN	Production
<b>CGY2178UH/C1</b>	5 – 6	30	1.0	15	3.0	40	Die	Production
<b>CGY2124UH/C1</b>	8 – 12	33	1.1	11	5.0	55	Die	Production
<b>CGY2220UH/C1</b>	1 – 12	35	1.3	12	1.5	52	Die	Production
<b>CGY2221UH/C1</b>	7.5 – 13	17	1.6	17	5.0	82	Die	Production
<b>CGY2221HV/C1</b>	7.5 – 13	17	1.7	17	5.0	82	QFN	Sampling
<b>CGY2125UH/C1</b>	13 – 15	25	1.0	8	3.3	20	Die	Production
<b>CGY2230UH/C1</b>	1 – 18	35	1.5	12	1.5	50	Die	Production
<b>CGY2290SUH/C1</b>	6 – 18	9	3.3	13	5.0	30	Die	Production
 <b>CGY2121XUH/C2</b>	18 – 26	18	1.5	5	0.8	60	Die	Production
<b>CGY2128UH/C2</b>	24 – 34	24	1.3	11	3.5	47	Die	Production
<b>CGY2122XUH/C2</b>	25 – 43	32	1.5	1	1.1	30	Die	Production
 <b>CGY2260UH/C1</b>	25 – 43	24	1.5	8	1.5	50	Die	Sampling
<b>CGY2190UH/C2</b>	75 – 110	23	3.0	1	1.0	33	Die	Production



OMMIC Portfolio of MMICs, includes Power Amplifiers from 8 to 46GHz for civil application such as Telecommunication, Instrumentation, Radars but also for Satcom and military applications.

Power amplifiers are manufactured using OMMIC's GaAs 130 nm gate length PHEMT technology **D01PH**, our GaAs 250 nm gate length PHEMT technology **D025PHS** and our GaN/Si 100 nm gate length technology **D01GH**.

## Performance Table for Power Amplifiers

 New Product

OMMIC Power Amplifiers are dedicated to application such as Radar, telecommunication and instrumentation.

Part number	Frequency (GHz)	Gain (dB)	Saturated Power (dBm)	Compression Point P1dB (dBm)	Bias Voltage (V)	Bias Current (A)	Package	Status
CGY2139MUH/C1	8 – 12	22	22	21.0	8.0	0.10	Die	Production
CGY2139PUH/C1	7 – 12	26	26	25.0	7.0	0.18	Die	Production
CGY2134UH/C1	18 – 23	23	23	22.0	4.5	0.30	Die	Production
CGY2135UH/C1	18 – 23	25	22	32.3	4.0	1.20	Die	Production
CGY2130UH/C1	37 – 41	22	27	26.0	4.5	0.82	Die	Production
CGY2132UH/C1	37 – 41	20	30	28.5	4.5	1.45	Die	Production
CGY2131UH/C1	39 – 44	22	27	26.0	4.5	0.80	Die	Production
CGY2133UH/C1	39 – 44	20	30	28.0	4.5	1.33	Die	Production
CGY2136UH/C1	40 – 46	20	34	33.0	4.5	2.60	Die	Production
 CGY2620UH/C1	8 – 11	25	42	41.0	9.0	3.25	Die	Sampling
 CGY2650UH/C1	GaN 28 – 31.5	22	39	28.5	12.0	0.80	Die	Sampling

The MMICs use gold bonding pads and backside metallization and are fully protected with Silicon Nitride passivation to get the highest level of reliability. **D01PH** technology has been evaluated for Space applications and is on the European Preferred Parts List of the European Space Agency.

Wideband amplifiers are manufactured using OMMIC 130nm gate length PHEMT Technology **D01PH** or 130nm MHEMT Technology **D01MH**.

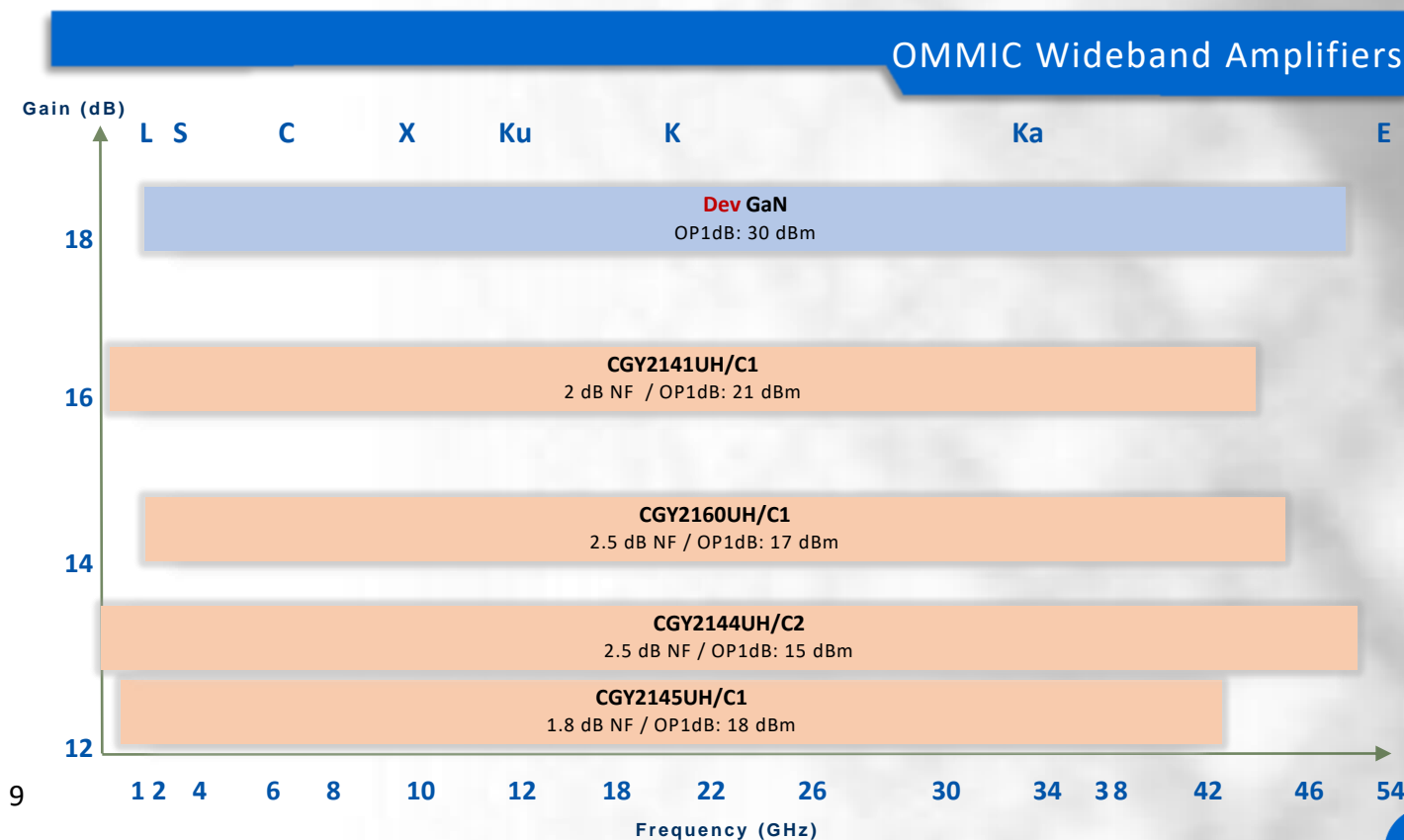
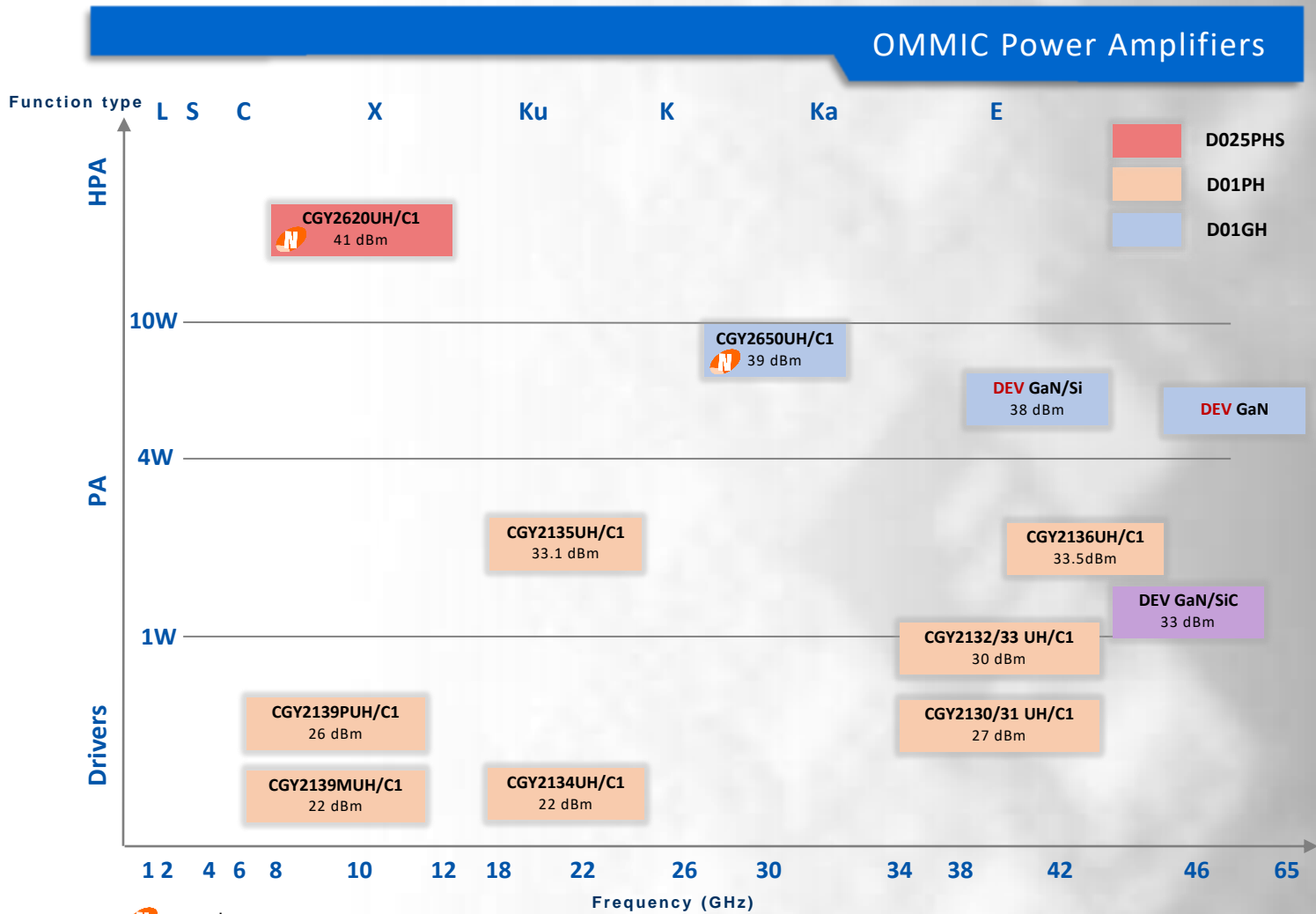
## Performance Table for Wideband Amplifiers

OMMIC Wideband Amplifiers are dedicated to application such as Instrumentation, Electronic warfare, 43 Gb/s OC-768 EAM Driver

Part number	Frequency (GHz)	Gain (dB)	Saturated Power (W)	Compression Point P1dB (dBm)	Bias Voltage (V)	Bias Current (A)	Package	Status
CGY2141UH/C1	DC – 46	16	2.0	21.0	5.00	195	Die	Production
CGY2144UH/C2	DC – 54	13	2,5	15.0	5.00	100	Die	Production
CGY2145UH/C1	0.5 – 45	13	1,8	18.0	5.00	85	Die	Production
CGY2160UH/C1	1.5 – 47	15	2,5	17.0	5.00	103	Die	Production

# OMMIC Power & Wideband Amplifiers Portfolio

Innovating with III-V's

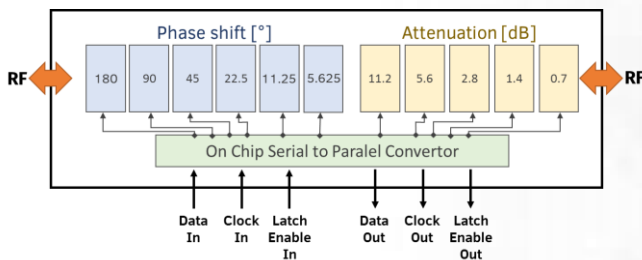




## Beam Forming for Massive MIMO 5G base station



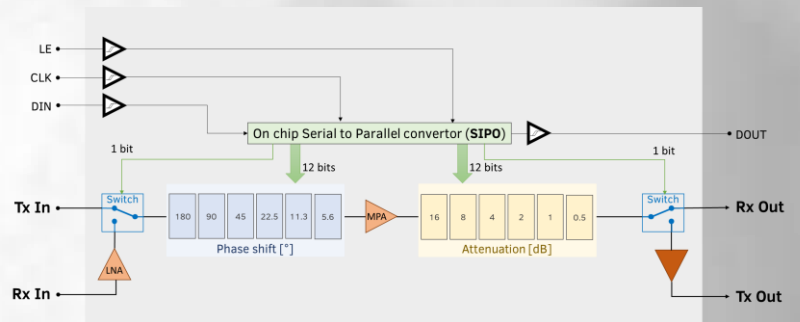
CGY2351UH/C1 – 2 ports, 11 bits  
Phase-Shifter and Attenuator



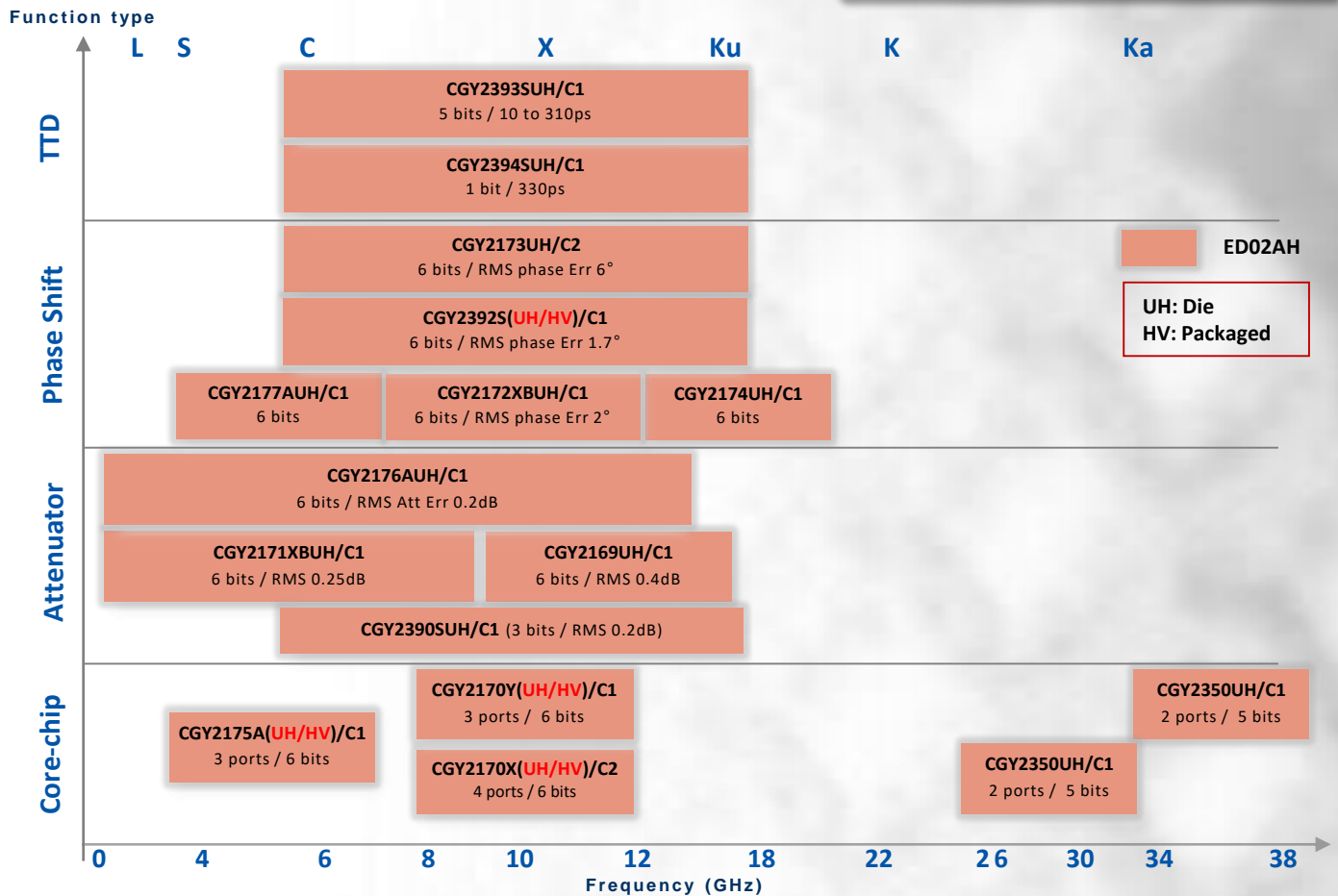
## Military Radar



CGY2170YHV/C1 – 4 ports, 26 bits  
Internal PA and LNA



## OMMIC Control Functions



## Performance Table for Digital Phase-Shifter Functions

Phase shifter, Attenuators, LNA and MPA integrated into a single chip controlled through Serial CMOS TTL compatible access

Part number	Frequency (GHz)	Resolution (bits)	Topology	Ctrl Range (dB/°)	RMS Atten/Phase Error (dB/°)	Ctrl Interface (V)	Package	Status
CGY2175AUH/C1	4.5 – 6.5	6	3 ports	31.5 / 360	0.20 / 1.3	0 / +5	Die	Production
CGY2175AHV/C1	4.5 – 6.5	6	3 ports	31.5 / 360	0.25 / 1.3	0 / +5	Die	Production
CGY2170YUH/C1	8 – 12	6	3 ports	31.5 / 360	0.40 / 3.0	0 / +3	Die	Production
CGY2170YHV/C1	8 – 12	6	3 ports	31.5 / 360	0.40 / 3.0	0 / +3	QFN	Production
CGY2170XUH/C2	8 – 12	6	4 ports	31.5 / 360	0.30 / 3.0	0 / +3	Die	Production
CGY2170XHV/C2	8 – 12	6	4 ports	31.5 / 360	0.35 / 3.0	0 / +3	QFN	Production
CGY2350UH/C1	34 – 36	5	3 ports	31.5 / 360	0.35 / 3.0	0 / +3	Die	Production
CGY2351UH/C1	26.5 – 30.5	6	2 ports	31.5 / 360	0.50 / 4.0	0 / +5	Die	Production

Phase shifter + LNA integrated in one die for internet over satellites Rx phased array antenna application

Part number	Frequency (GHz)	Resolution (bits)	Topology	Gain / Noise (dB)	RMS Phase Error (°)	Ctrl Interface (V)	Package	Status
CGY2179UH	10.7 – 12.5	4	2 ports	12 / 2	7.00	0 / +5	Die	Production
CGY2179HV	10.7 – 12.8	4	2 ports	12 / 2	7.00	0 / +5	QFN	Production

## Performance Table True-Time Delay Functions

Part number	Frequency (GHz)	Resolution (bits)	Min Delay (ps)	Full Delay (ps)	Insertion Loss (dB)	Ctrl Interface (V)	Package	Status
CGY2393SUH/C1	6 – 18	5	10.00	310	6.00	0 / +4	Die	Production
CGY2394SUH/C1	6 – 18	1	330.00	310	6.00	0 / +4	Die	Production

## Performance Table for Digital Phase-Shifter Functions

Part number	Frequency (GHz)	Resolution (bits)	Insertion Loss (dB)	Phase Range (°)	RMS Phase Error (°)	Ctrl Interface (V)	Package	Status
CGY2177AUH/C1	4.8 – 6.8	6	5.00	360	2.00	0 / +5	Die	Production
CGY2173UH/C2	6 – 18	6	13.00	360	4.00	0 / -3	Die	Production
CGY2172XAUH/C1	8 – 12	6	8.00	360	2.00	0 / -3	Die	Production
CGY2172XBUH/C1	8 – 12	6	8.00	360	2.00	0 / +5	Die	Production
CGY2392SUH/C1	6 – 18	6	10.80	360	1.70	0 / +5	Die	Production
CGY2392SHV/C1	6 – 18	6	10.80	360	1.90	0 / +5	QFN	Production
CGY2174UH/C1	13 – 16	6	8.00	360	6.00	0 / -3	Die	Production

## Performance Table for Digital Attenuators Functions

Part number	Frequency (GHz)	Resolution (bits)	Insertion Loss (dB)	Atten Range (dB)	RMS Atten Error (dB)	Ctrl Interface (V)	Package	Status
CGY2176UH/C1	4.8 – 6.8	6	5.60	32	0.20	0 / +5	Die	Production
CGY2171XBUH/C1	1 – 12	6	5.00	32	0.25	0 / +3	Die	Production
CGY2390SUH/C1	8 – 12	6	4.00	35	0.20	0 / +5	Die	Production
CGY2169UH/C1	8 – 12	6	4.00	24	0.40	0 / -3	Die	Production
CGY2191SUH/C1	6 – 18	6	4.00	32	0.20	0 / +5	Die	Production

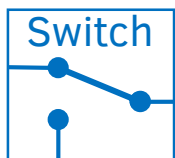
OMMIC Portfolio of MMICs, includes up and down, passive and active converters, SPDT switches and diodes.

## Performance Table for Mixers

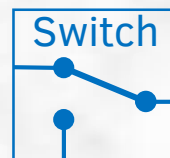
Mixers are manufactured using OMMIC's GaAs 180 nm E/D PHEMT (**ED02AH**) and 70 nm MHEMT (**DO07IH**) technologies. They generally feature high isolation and can be used for application such as radar, telecommunication, instrumentation and GPS system.

Part number	RF frequency (GHz)	LO frequency (GHz)	IF frequency (GHz)	PinLO (dBm)	Conversion Gain (dB)	ISO LO-RF (dB)	ISO LO-IF (dB)	IP1dB (dBm)	Type	Status
CGY2180UH/C1	0.7–3.7	0.7–4	DC–2	15	-7	35	35	12	Die	Production
CGY2181UH/C1	1–4.5	1–5	DC–2	15	-7	45	32	13	Die	Production
CGY2182UH/C1	3–10	3–10	DC–3	15	-7	60	45	12	Die	Production
CGY2184UH/C1	0.1–6	0.1–6	DC–3	0	18	40	40	3	Die	Production
CGY2183UH/C1	0.1–6	0.1–6	DC–3	-5	12	35	40	-5	Die	Production
CGY2460UH/C1	40.5–43.5	8.8–10	5.0–6	9	33			0	Die	Production
CGY2470UH/C1	92–96	86–90	5.1–6	7	-3	4	3	2	Die	Production
CGY2471UH/C1	92–96	86–90	5.2–6	7	-10		>10	5	Die	Production

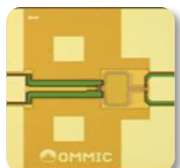
## Other products



**SPDT Switch : CGY2370UH/C1**  
**92 – 96 GHz**  
Isolation : 20 dB  
Switching speed : 10 ns



**SPDT Switch : CGY2890SUH/C1**  
**6 – 18 GHz**  
Isolation : > 50 dB  
Insertion Loss : 1.5 dB



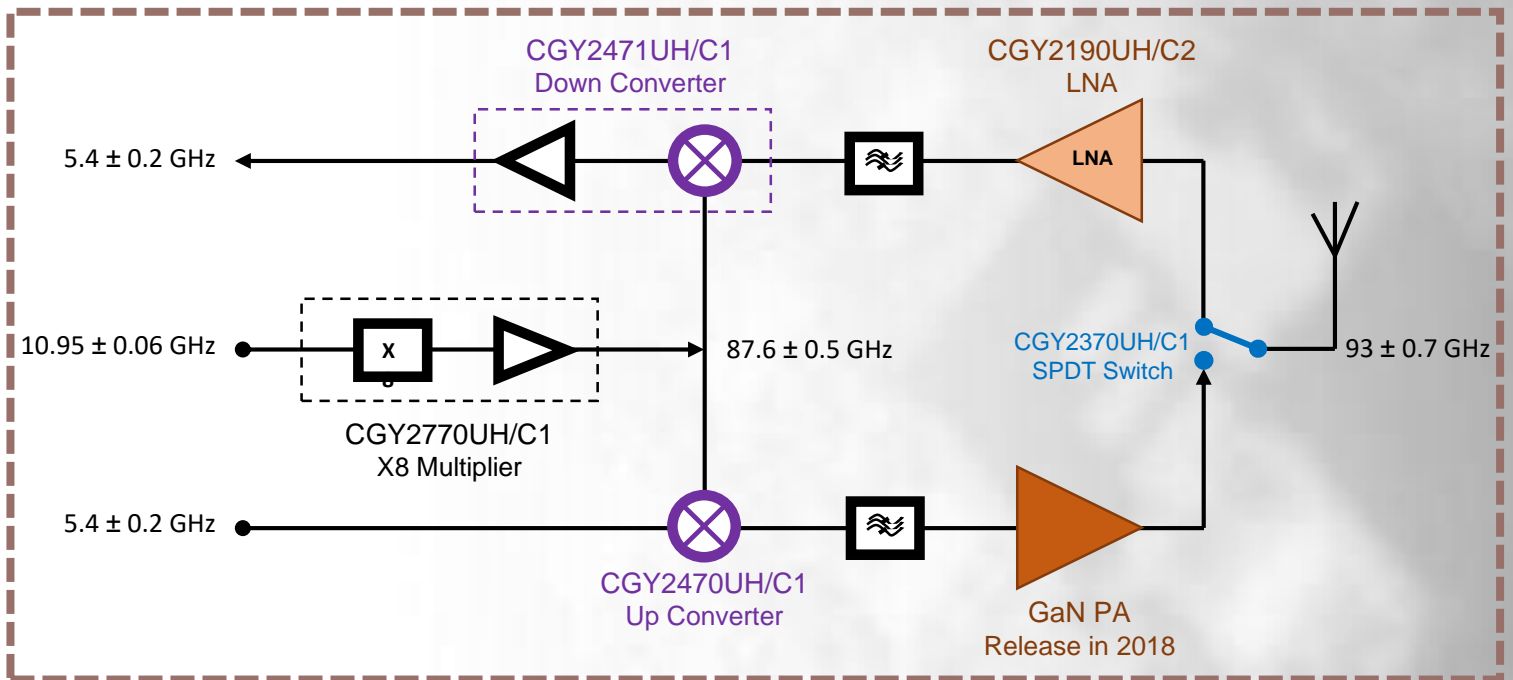
**Detector diode : CGY2870AUH/C1**  
**80 – 110 GHz**  
Zero bias  
Input power : < 0 dBm  
Input matching : -15 dB

**x8 Multiplier: CGY2770UH/C2**  
**11 – 11.5 to 88 – 92 GHz**  
Isolation : 20 dB  
Output power : 5 dBm

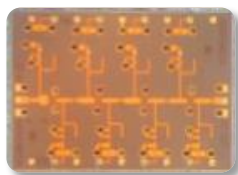


## 94 GHz chipset

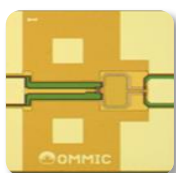
OMMIC has developed a 94 GHz chipset that can be used for satellite communication, active/passive imaging and different types of radars.



## W-Band 94 GHz Passive Imaging Solution



**CGY2190UH/C2**  
LNA  
75 – 110 GHz  
3 dB NF



**CGY2870UH/C1**  
Zero Bias  
Detector Diode  
80 – 110 GHz



OMMIC Portfolio of MMICs, includes Corechip and control functions.

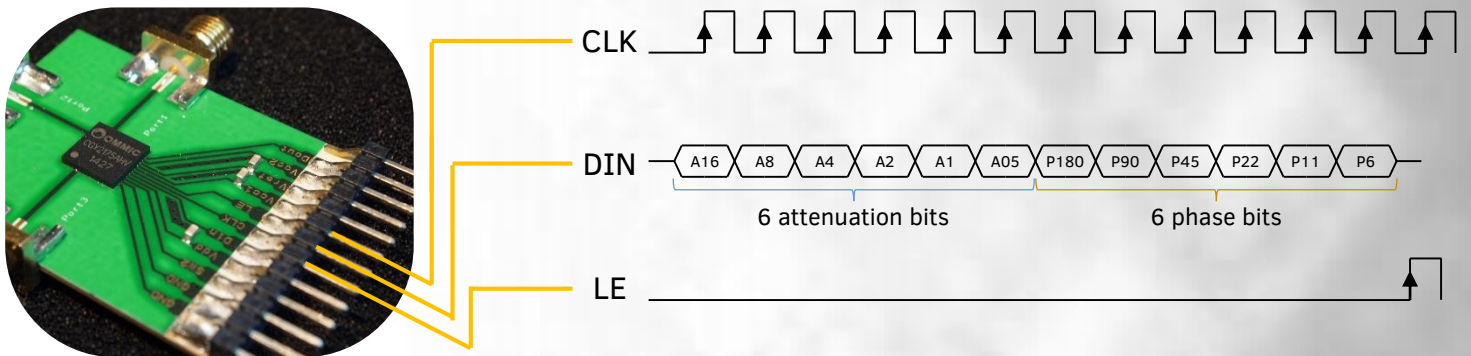
Corechips are based on the **integration in a single die of Digital Phase Shifters, Digital Attenuators, LNA, MPA and Switches** for phased array antenna applications. Phases and attenuation states are controlled through a single digital data serial input using OMMIC's E/D technology (ED02AH), enabling integration of **a Serial to Parallel interface on the die (SIPO)**.

## OMMIC SIPO stands for **Serial Input Parallel Output**.

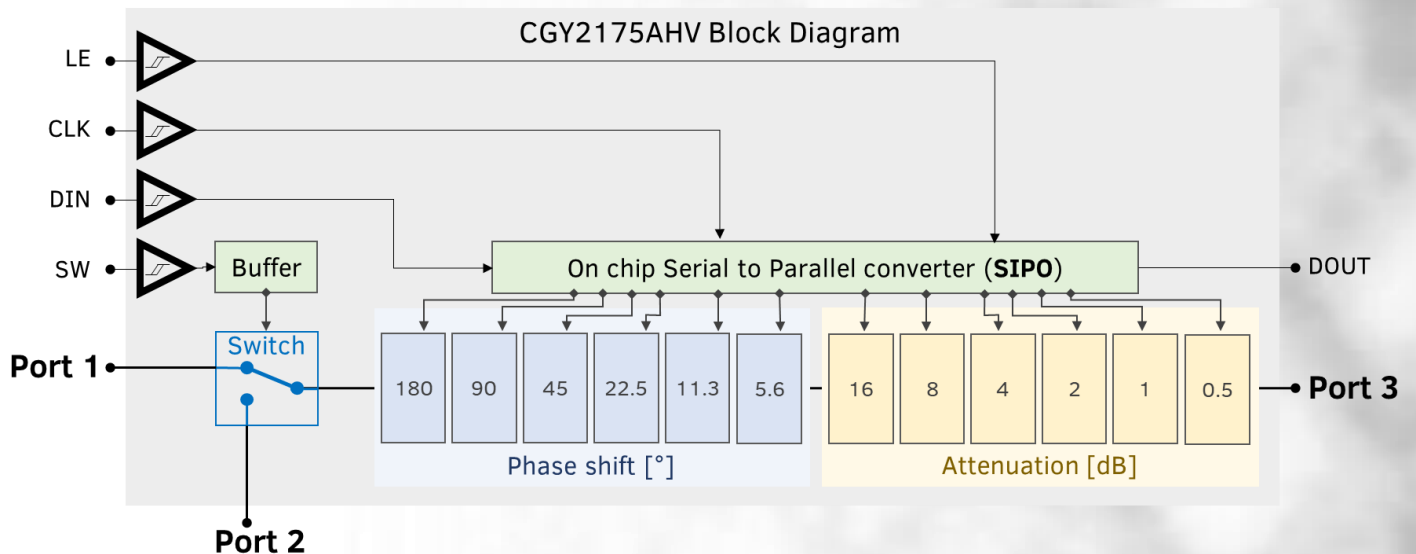
Thanks to its **E/D process** (ED02AH), OMMIC can integrate in the same MMIC, **enhanced and depletion** transistors. Depletion transistors can be used for analog function such as phase shifters and attenuators whilst enhanced transistor are used to design the SIPO.

With the SIPO, the number of bonding is greatly reduced and only three of them are needed to control a corechip.

### Example : CGY2175AHV (6-bit packaged C-band corechip)



Each phase and attenuation states are loaded in the shift register (at a clock (CLK) rate up to 250 MHz), then phase and attenuation configuration is changed after latch enable (LE) signal.





# Foundry Services & III – V Processes

## Epitaxy & Custom Wafers Processing

D025PHS 250 nm	GaAs pHEMT
ED02AH 180 nm	E/DGaAs pHEMT
D01PH 135 nm	GaAs pHEMT
D01MH 125 nm	GaAs pHEMT
D007IH 70 nm	GaAs pHEMT
DH15IB 1.5 $\mu$ m	InP HBT
D01GH 100 nm GaN /Si (or SiC)	pHEMT
D006GH 60 nm GaN /SiC (or Si)	pHEMT



## Epitaxy:

In addition to a product offering, OMMIC also supplies epi wafers to the merchant market in 3-, 4- and 6-inch formats using production MOVPE.

This activity includes pHEMT containing up to 25% indium in the GaInAs layer, as opposed to 40% that they use internally, as well as HBT structures.

Existing epi processes include :

- GaAs MESFET and HFET
- GaAs and InP based PHEMT
- GaAs/GaInP HBT
- InP/GaAsSb HBT

PHEMT materials are provided with inline capless wafer data.

HBT materials are provided with inline wide area HBT test data.



## Roadmap:

OMMIC has an aggressive roadmap to develop and introduce to the market advanced technologies based on III-V compounds.

This means moving to shorter gate lengths and optimizing the Channel Indium content for the PHEMT and MHEMT processes and smaller emitters and the use of antimonides for the InP DHBT.

The use of the MHEMT technology allows OMMIC to release processes that are truly optimized for high In content fully compatible with 6 inch wafers.

The short gate length technologies include 70 nm 70 % In MHEMTs, and soon 40 nm with D004IH process. With 100nm GaN/Si, 60nm GaN/SiC and D025PHS process OMMIC is targeting power applications from X to E band. The roadmap will lead us to develop sub-50nm GaN/SiC in the future to target higher power at up to W band.

OMMIC is a supplier of GaAs and GaN based MMIC circuits and services to the Professionals of the Telecom, Space and Defense markets and MOCVD based Epitaxial Wafers to the Merchant Market. Our on-site epitaxy serves High performance low cost PHEMT, MHEMT & HBT epitaxial wafer supply to large volume GaAs fab.

## Processes and Technology:

OMMIC has three principal pHEMT processes in full production and we have been introducing other processes including mHEMT and HBT. These services enable cut-off frequencies as high as 400 GHz via the mHEMT technology. The latest processes include GaN-on-Silicon 100 nm. Another newly released process is D025PHS which is a 250 nm pHEMT D mode, enabling high power from C to X band (12 W at 10 GHz).

With **ED02AH**, it is possible to have enhanced (E) and depletion (D) transistors on the same die. Having E- and D-type transistors allows to design control functions with a serial interface that simplifies the interaction with the device.

### Low Noise processes

Two mHEMT processes have been developed for low noise application : the **D01MH** and the **D007IH**.

With these processes, it is possible to design LNA from 5 to above 200 GHz. The D01MH is a space qualified process and is part of the ESA EPPL preferred parts.

OMMIC's brand new **D01GH** GaN process can also be used to develop robust X-band LNA.

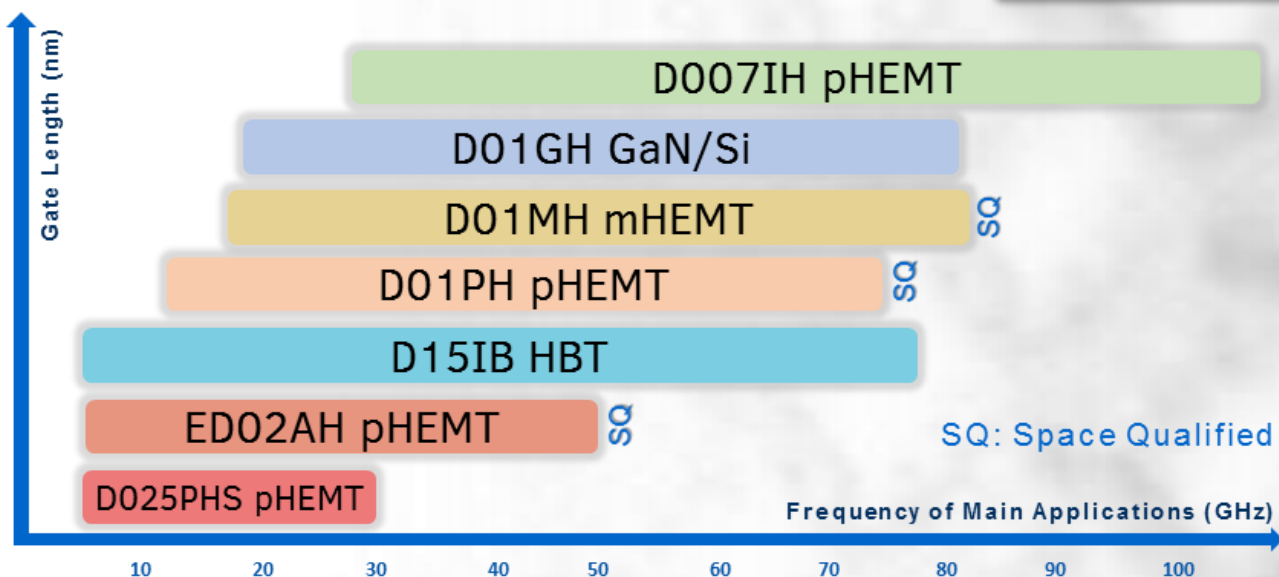
### Power processes

OMMIC has three major power process. **D01PH** is our legacy process and has been develop to design mid-PA. Since its release in 1999, OMMIC has develop two new processes :

- the **D025PHS** that is mainly for high power in the X-band
- the **D01GH**, a state-of-the-art GaN process that enables high power from X- to Q-band

Our current roadmap also includes the **D006GH**, a process designed to deliver power up to the W-band.

### All Processes



OMMIC's RF device and wafer fab process catalog includes E/D-mode pHEMT, power pHEMT, general-purpose mHEMT, low noise MHEMT, GaN/Si and InP DHBT processes.

## ED02AH Process

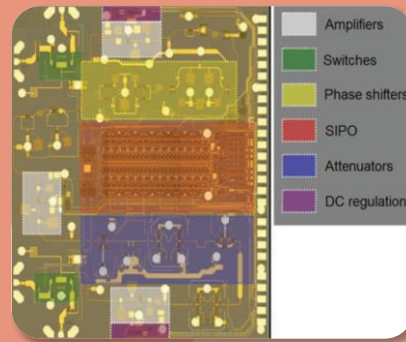
Process	ED02AH
Technology	GaAs p-Hemt
Status	Production
Space Grade	Space Qualified
Gate Length (μm)	0.18
Wafer Size (")	3
Thickness (μm)	100
Gate Write	E-beam
Ft (GHz)	60
Fmax (GHz)	110
Vb <sub>gd</sub> (V)	8
V <sub>ds</sub> max (V)	7
I <sub>dss</sub> (mA/mm)	250(on)/140(off)
I <sub>max</sub> (mA/mm)	400(on)/180(off)
MIM Capacitors (pF/mm <sup>2</sup> )	49 & 400
NF (dB)	0.8 (18 GHz)
Power Density (mW/mm)	330
gm (mS/mm)	450

**180 nm PHEMT** - Fully available in Production since 1995

Optimized for Low Noise and Mixed Signal thanks to Enhanced and Depletion transistors.

Well suited for Corechip in phased array antenna application ( integration of a serial interface on chip ) .

This process is Space evaluated and EPPL listed by ESA.



## D01PH Process

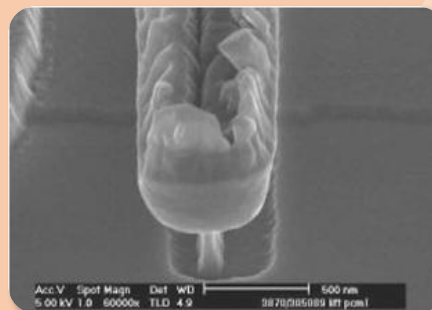
Process	D01PH
Technology	GaAs p-Hemt
Status	Production
Space Grade	Space Qualified
Gate Length (μm)	0.135
Wafer Size (")	3
Thickness (μm)	100    70
Gate Write	E-beam
Ft (GHz)	100
Fmax (GHz)	180
Vb <sub>gd</sub> (V)	12
V <sub>ds</sub> max (V)	10
I <sub>dss</sub> (mA/mm)	500
I <sub>max</sub> (mA/mm)	700
MIM Capacitors (pF/mm <sup>2</sup> )	49 & 400
NF (dB)	1.1 (30 GHz)
Power Density (mW/mm)	640
gm (mS/mm)	650

**135 nm PHEMT D mode** - Fully available in Production since 1999

Optimized for Ultra Low Noise and medium power application from 1 GHz to 50 GHz.

Well suited for NF <0.6 dB at 2 GHz, NF < 1.5 dB at 10 GHz.

This process is Space evaluated and EPPL listed by ESA.





OMMIC's RF device and wafer fab process catalog includes E/D-mode pHEMT, power pHEMT, general-purpose mHEMT, low noise MHEMT, GaN/Si and InP DHBT processes.

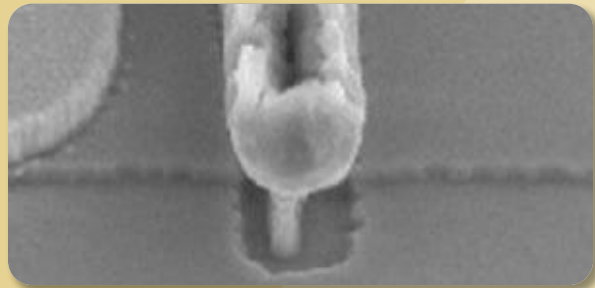
## D01MH Process

Process	D01MH
Technology	GaAs m-Hemt
Status	Production
Space Grade	Space Qualified
Gate Length ( $\mu\text{m}$ )	0.125
Wafer Size (")	3
Thickness ( $\mu\text{m}$ )	70    100
Gate Write	E-beam
Ft (GHz)	150
Fmax (GHz)	250
Vbgd (V)	8
Vds max (V)	6
Idss (mA/mm)	300
Imax (mA/mm)	500
MIM Capacitors (pF/mm <sup>2</sup> )	49 & 400
NF (dB)	0.8 (30 GHz)
Power Density (mW/mm)	300
gm (mS/mm)	700

**125 nm MHEMT** Fully available in Production since 2010  
Optimized for Ultra low noise application up to 90 GHz

Well suited very low noise application from Ku to E band such as Satcom application or Ka Band guidance systems.

This process is Space evaluated and EPPL by ESA.



## D007IH Process

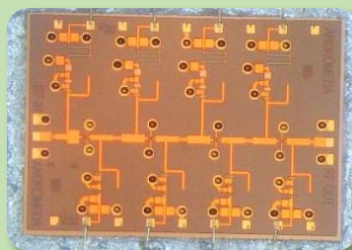
Process	D007IH
Technology	GaAs m-Hemt
Status	Production
Space Grade	Space Qualified
Gate Length ( $\mu\text{m}$ )	0.07
Wafer Size (")	3
Thickness ( $\mu\text{m}$ )	70    100
Gate Write	E-beam
Ft (GHz)	300
Fmax (GHz)	450
Vbgd (V)	4
Vds max (V)	3
Idss (mA/mm)	200
Imax (mA/mm)	400
MIM Capacitors (pF/mm <sup>2</sup> )	49 & 400
NF (dB)	0.5 (30 GHz)
Power Density (mW/mm)	NA
gm (mS/mm)	1600

**70 nm MHEMT** Fully available in Production since 2011  
Optimized for Ultra Low Noise from 20 GHz to 160 GHz.

Well suited for telecommunication, Satcom, Passive Imaging. Its advanced 70 nm double mushroom gate and high indium content provides very low noise :

- 0.5 dB NF at 30 GHz
- 2.8 dB NF at 90 GHz

Spatial evaluation by ESA is on-going and should be over in 2018.



CGY2190UH/C2 : W-band LNA



Passive imaging

OMMIC's RF device and wafer fab process catalog includes E/D-mode pHEMT, power pHEMT, general-purpose mHEMT, low noise MHEMT, GaN/Si and InP DHBT processes.

## D025PHS Process New!

Process	D025PHS
Technology	GaAs p-Hemt
Status	Production
Space Grade	–
Gate Length (µm)	0.25
Wafer Size (")	3
Thickness (µm)	70    100
Gate Write	E-beam
Ft (GHz)	34
Fmax (GHz)	95
Vbgd (V)	22
Vds max (V)	21
Idss (mA/mm)	
Imax (mA/mm)	500
MIM Capacitors (pF/mm <sup>2</sup> )	49 & 400
NF (dB)	–
Power Density (mW/mm)	900
gm (mS/mm)	

### 250 nm PHEMT - Prototyping

Optimized for power application from 5 GHz to 20 GHz

Well suited for telecommunication, Civil and Military Radar application or Satcom.



X-band radar (source US Navy)

## D01GH Process New!

Process	D01GH
Technology	GaN on Si
Status	Production
Space Grade	In 2020
Gate Length (µm)	0.1
Wafer Size (")	3
Thickness (µm)	100
Gate Write	E-beam
Ft (GHz)	105
Fmax (GHz)	160
Vbgd (V)	40
Vds max (V)	25
Idss (mA/mm)	700
Imax (mA/mm)	1100
MIM Capacitors (pF/mm <sup>2</sup> )	49 & 400
NF (dB)	1.5 (40 GHz)
Power Density (mW/mm)	3300
gm (mS/mm)	650

### 100 nm GaN/Si - Available in production since 2016

Optimized for power application from 20 GHz to 94 GHz but also for robust Low noise amplifier from 10 to 30GHz.

Well suited for power amplifier design for Ka-band Sat application, V-band and E-band point to point radio or Backhaul, future 5G products.

PAE: 45 %

In situ Passivated (for low lag effect <10%)

Regrown ohmic contact (for high Gm)

This process is based on 100% European raw material sourcing.



GaN Ka-band PA in a module  
Product CGY2650UH/C1



*Innovating with III - V's*

## Design Center & Fab +

Custom Design Services

Challenging Design from 5 to 200 GHz

ADS SPICE and AWR Design Kits

Multi Chip Projects Shared Wafer Service

Simulation & Extractions for Customers

System Modeling



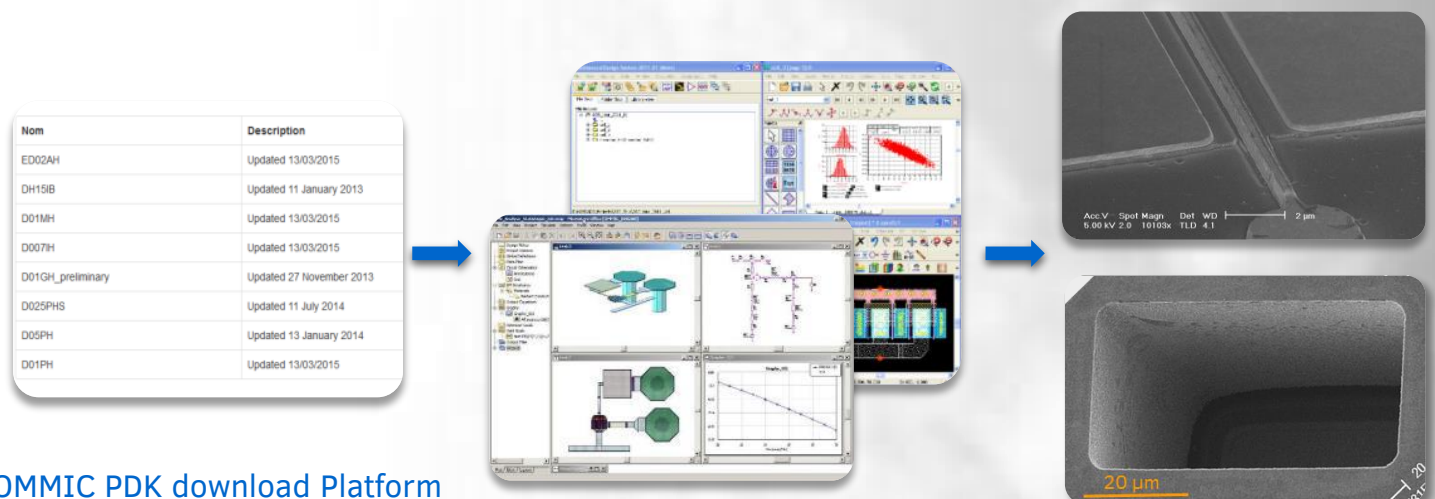
OMMIC provides services to Customers requiring specific MMICs:

- Open Foundry Service, allowing customers to design their own circuit, with help, training and support from OMMIC
- Custom Design Service: OMMIC designs circuits based on customer specifications

OMMIC has a long history of fully open Foundry Service. All OMMIC processes are available for Foundry Service.

This includes ED02AH PHEMT 60 GHz E/D process for Analog/Digital designs, D01PH PHEMT 100 GHz process for power up to millimeter wave, D01MH and D007IH 150 and 300 GHz MHEMT processes for mid power or extremely low noise designs up to 150 GHz or more, DH15IB 175 GHz D-HBT process for high bit rate functions or low phase noise devices.

Most of these processes have completed or are running a Space evaluation (ESA-EPPL). Foundry is available for full wafer runs or MCP (“pizza-masks”).



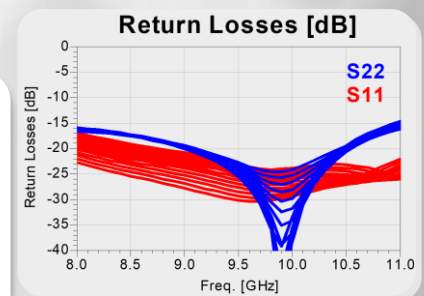
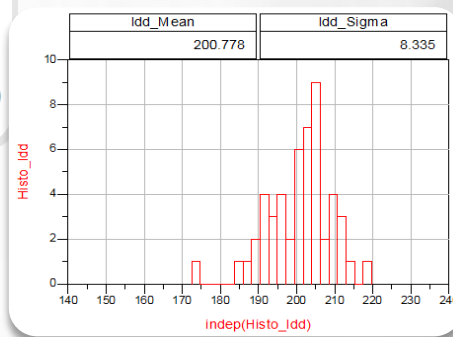
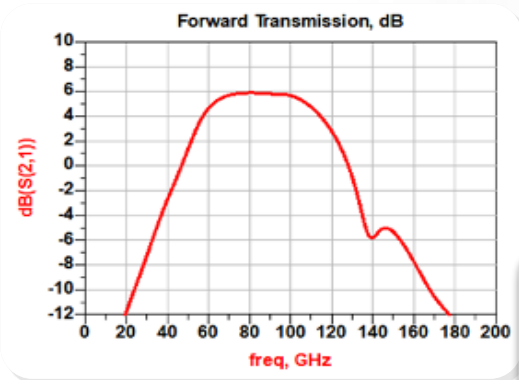
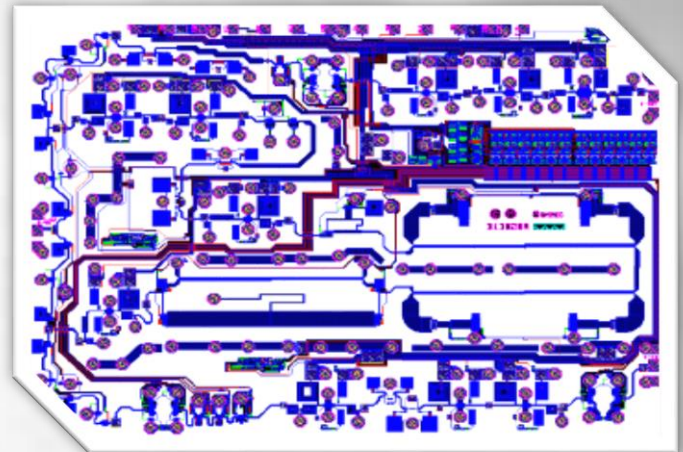
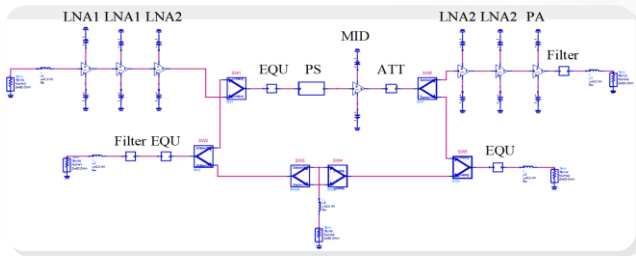
## OMMIC PDK download Platform

The OMMIC design Manuals and design tools are extremely comprehensive and allow any type of design. This includes mixed signal to low noise and high power, from DC to sub-millimeter wave.

OMMIC Design Kits include:

- Fully scalable models for all devices
- Linear, non linear and noise models for transistors (and diodes)
- Process statistical variations of all active and passive devices, allowing representative yield analysis
- Temperature effects for all passive and active devices
- Complete auto layout for all devices, including all types of interconnections
- E.M. information allowing advanced analysis
- Design Rules Checking

Design kits are regularly updated, in close collaboration with software suppliers. OMMIC provides hot line support, dedicated training, and powerful verification tools.



OMMIC design team is able to design MMICs from Customer specifications and Statement of Work.

- LNA
- Power Amplifiers
- Multifunction chips including digital parts
- Multipliers
- Down-convertors or Trans Impedance Amplifiers from DC to W band.

The design flow includes several reviews where close discussions with the customer ensure that the final MMIC will really enhance the final system.

This design flow is based on space standards such as ECSS-Q60-12A and have been approved for flight model designs.

The Fabrication Line, Test Center, Reliability Center and Modeling Team are on the same site. This proximity allows OMMIC Design Center to obtain the best performances from all the OMMIC processes, while maintaining yield and reliability.

A MultiChip Project (MCP) is a cost effective way to experience a new design topology or a new technology through a limited number of samples. OMMIC has been offering this service for a long time on his mature proprietary technologies.

## Technologies

The following processes can be used within the MCP program :

- **DH15IB**: Double Heterojunction HBT process, with a emitter of 1.5  $\mu\text{m}$  for very high speed digital and high frequency RF designs.
- **EDO2AH**: Enhancement and Depletion mode PHEMT process, with a gate length of 0.18  $\mu\text{m}$  for analog and mixed analog/digital designs;
- **DO1PH**: Depletion mode PHEMT process with a gate length of 0.13  $\mu\text{m}$  for both power and high frequency designs.
- **DO1MH**: Depletion mode MHEMT process, with a gate length of 0.13  $\mu\text{m}$  for low noise, power and high frequency designs.
- **DO07IH**: Depletion mode MHEMT process, with a gate length of 0.07  $\mu\text{m}$  for low noise and very high frequency designs.
- **DO1GH**: Depletion mode GaN/Si HEMT process, with a gate length of 0.10  $\mu\text{m}$  for power and low noise up to U-band.

## Conditions of use

- The size of the circuit must correspond to one of the fixed patterns for a MCP project.
- The Layout must be supplied according to a predefined time table available on the web site, by default 4 dates per year.
- MCP order should be placed at least 4 weeks before the announced MCP start date.
- The order needs to comply with minimum order value when it is applicable.

## Support

Users of OMMIC's normal MCP projects have full access to the MCP Customer Support Hotline during 1 year and get access to the technology design kit through OMMIC website.

Before manufacturing, all projects are checked by OMMIC using the OMMIC design rule checker. DRCs are performed at no extra cost.

## Starting Dates

Multichip runs are programmed at regular intervals. Please contact us or check our website to have the dates of the next run starts.

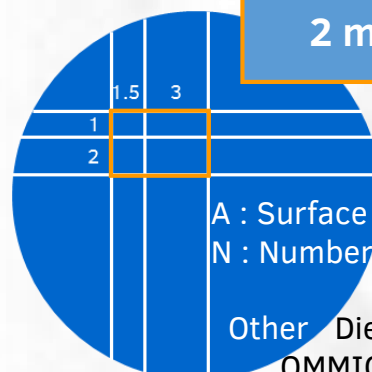
Please see: <http://www.ommic.com/site/mpw-4>

## University Partnership:

OMMIC is committed to give access to its technologies for Educational Purposes to Universities and Educational Establishments. Please contact us for more details.

## Available die sizes

Sizes	1.5 mm	3 mm
1 mm	A = 1.5 mm <sup>2</sup> N = 25 Dies	A = 3 mm <sup>2</sup> N = 20 Dies
2 mm	A = 3 mm <sup>2</sup> N = 20 Dies	A = 6 mm <sup>2</sup> N = 15 Dies



A : Surface of the reticule  
N : Number of dies delivered

Other Die size can be used, please contact OMMIC for special demands



# Space Heritage & Flight Models

## Services & Tools

Custom Design Services

Challenging Design from 5 to 200 GHz

ADS SPICE and AWR Design Kits

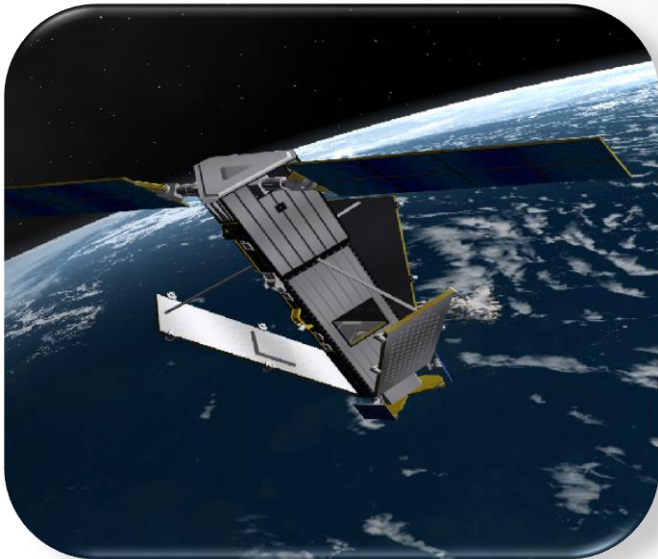
Multi Chip Projects Shared Wafer Service

Simulation & Extractions for Customers

System Modeling



More than 30 000 MMICs have been supplied for Flight Models. OMMIC has more than 100 000 years of accumulated Flight Life time around earth in several space mission and satellite equipment.



Components from OMMIC have been used in Flight Models for satellites from Europe, USA, India, Russia and other countries.

Functions include :

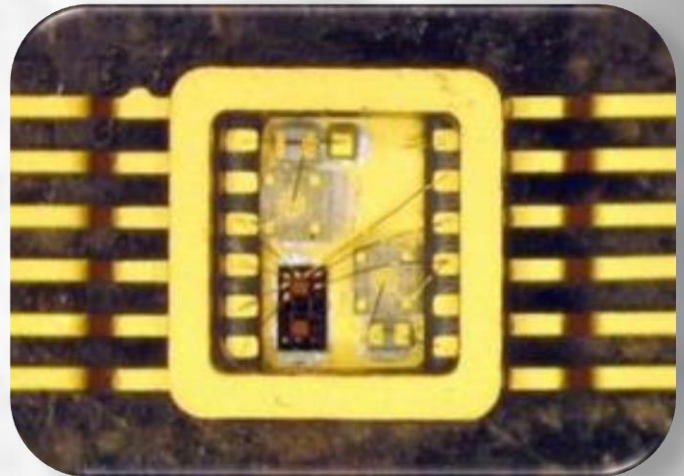
- Frequency Converters components as mixers and modulators
- Linear Components as Low Level Amplifiers, LNAs.
- Control Components as Phase Shifters, Attenuators.
- Power Components such as Medium Power Amplifiers.
- Non Linear Components such as Frequencies Multipliers.
- Negative Resistor for Oscillators.
- Multi-functions components composed by several functions.
- Numerical Components as Phase or Frequency Detector.

ESA has already evaluated 3 OMMIC processes ED02AH, D01PH and D01MH, these 3 processes being maintained on ESA EPPL list.

2 additional processes are considered to be inserted in the EPPL list after ESA monitored evaluation procedures.

OMMIC has already delivered many standard parts designed during the ECI (European Component Initiative) programs.

OMMIC can be a custom design center for space qualified components, many of them have already been designed by OMMIC's design team.



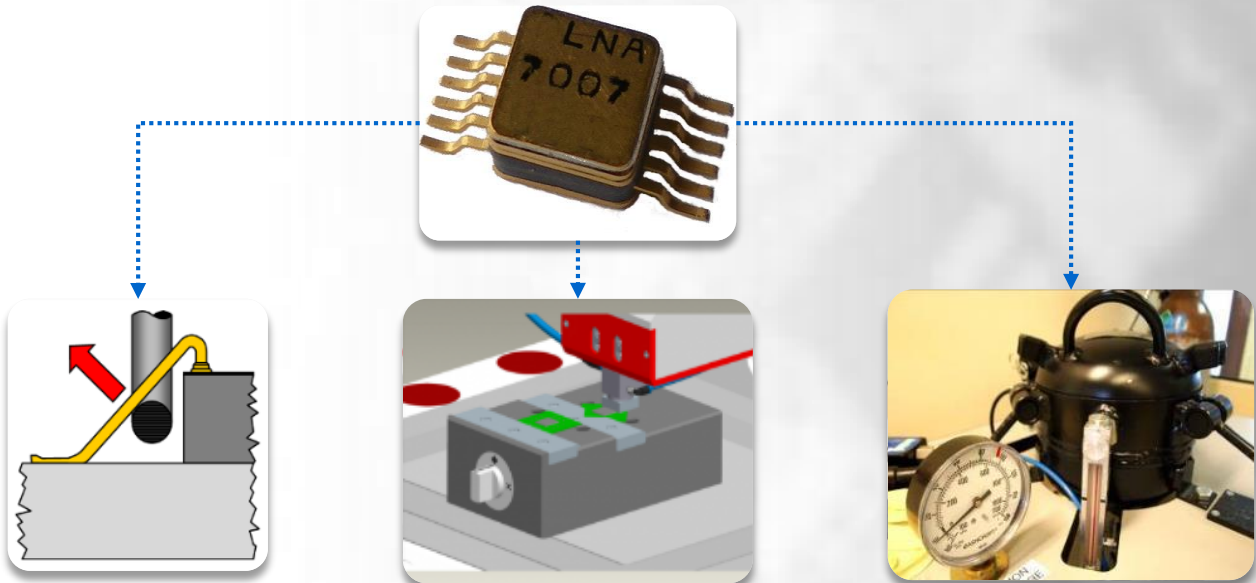
## They have already trusted OMMIC



OMMIC has a dedicated team for space qualification of flight models but also for reliability of all our components.

## Test performed for SPACE EVALUATION FLOW of Flight Model MMICs

All tests below are **Assembly test** for flight models and are performed at OMMIC in our reliability laboratory



**Bond-pull test**

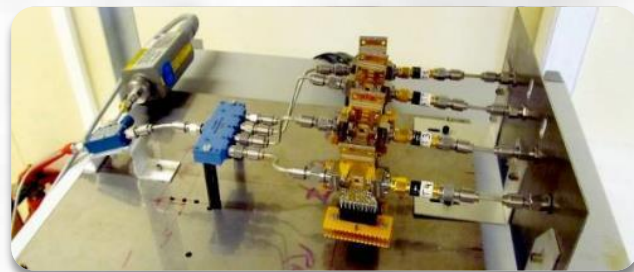
**Die-Shear test**

**Hermeticity test**

We also perform **Aging and life cycle tests** when requested like in MIL-STD-83 standard



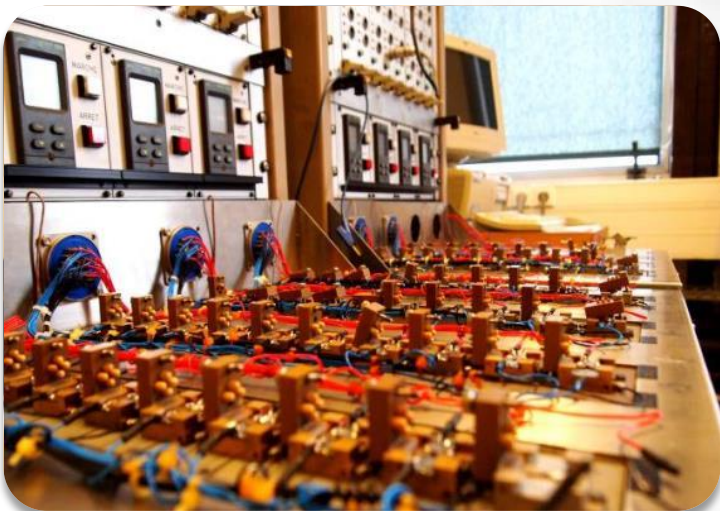
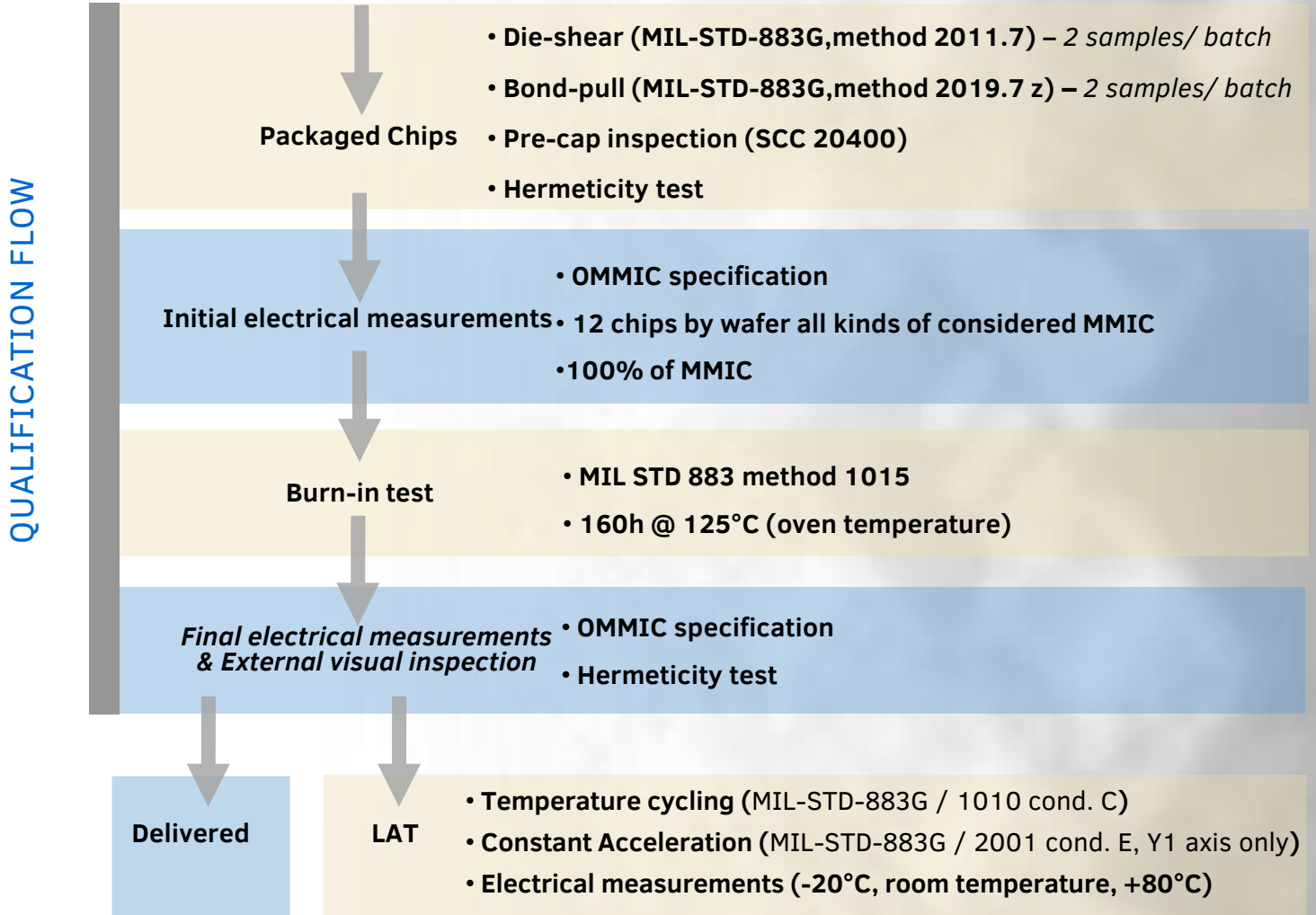
**High temperature DC life test**



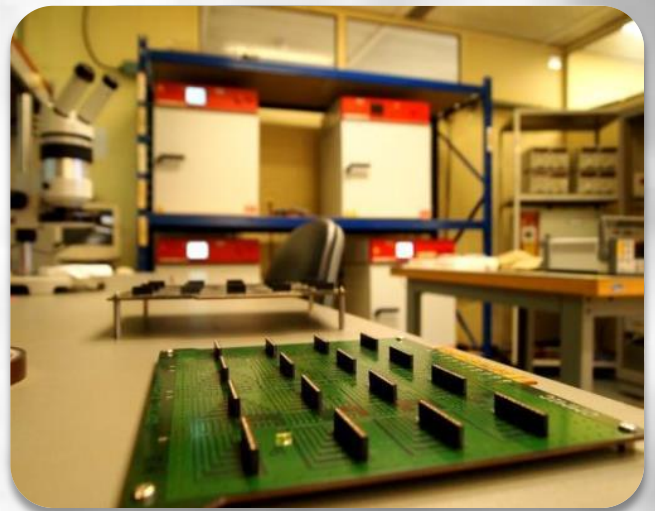
**Room temperature RF stress test**



OMMIC has a dedicated team for space qualification of flight models, but also for reliability of all our components.



**Aging biasing test bench**



**Burn-in Tests ovens**

## Production Line & back-end

More than 40 years in III – V industry

Produce on 3- and 6-inch wafers

Class 10,000 production clean room

Certified ISO9001 ISO14001  
&RoHs compliant

Standart & Space grade visual inspection

On wafer test capabilities for microwave  
& mm-wave products

Competitive lead time & maximum flexibility



OMMIC was founded on January 1, 2000 by Philips, based on a track record of 40 years of cutting-edge research and development in the fields of III-V epitaxy and integrated circuits technologies. Today, OMMIC is an independent SME.



OMMIC consists of 5 main buildings with 1 000 m<sup>2</sup> of clean rooms of class 1000 and class 100 which are fully devoted to III-V IC development and fabrication.

Our wafers are delivered with electrical properties guaranteed by the measurement of specific test modules added during the fabrication called PCM (Process Control Monitor).

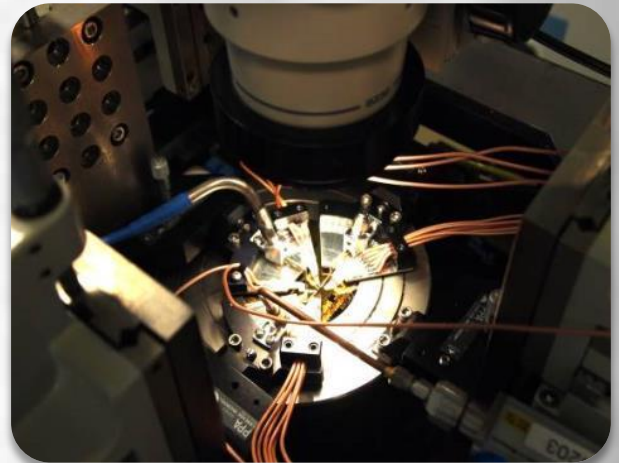
Our processes and our equipments are also followed with SPC (statistical process control).

Our on-wafer test center disposes of a wide variety of high performance tools and experienced people. It allows us to routinely measure the usual microwave characteristics like  $S_{ij}$ , spectrum anal., Scalar meas., Noise figure, DC pulsed meas...

All wafers are monitored by DC parametric and RF measurements during the Front End process.

Our experience in microwaves and mm-Waves tests and probe card's design, leads us to design complex tests procedures allowing testing the main performances and functionalities of our MMIC products in order to guarantee the delivery of known good dies.

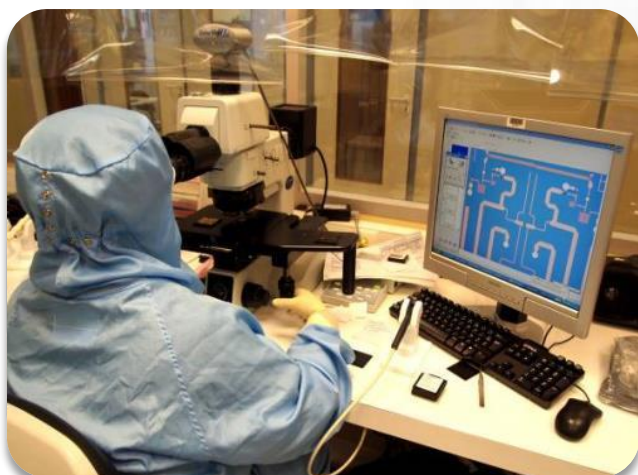
We open to our customers our RF-test capabilities and knowledge to design and conduct tests on their own prototypes, in order to help them to validate and improve their products.



The visual inspection process plays an essential role in our manufacturing steps to ensure anomaly detection. We can therefore implement prompt corrective or preventive responses and verify the final quality of each die before sending them to our customers.

In order to do so, we perform preliminary visual inspections at each critical step in the production line with sampling and a final visual inspection.

All our products are inspected according to international standards (MIL-STD-883) by a trained and qualified inspection staff. Moreover, for products with less stringent requirements, a commercial grade die inspection is available.



## Sales Support & Application

Global & dedicated customer support

System studies support

On field demonstration upon request

Monting support

Packaging support

Custom modules design studies



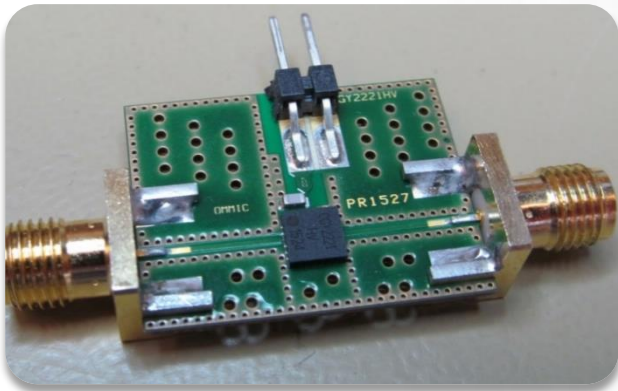
We are moving towards a world where integration and ease of use are central to the definition of complex electronic subsystems.

OMMIC invests every day to simplify the use of its products for its customers by developing packaged solutions while ensuring optimal performances.

Today, our solutions cover L-, S-, C- and X-band. Following our customers request, we are now focusing on packaging our Ka-band corechips solutions.

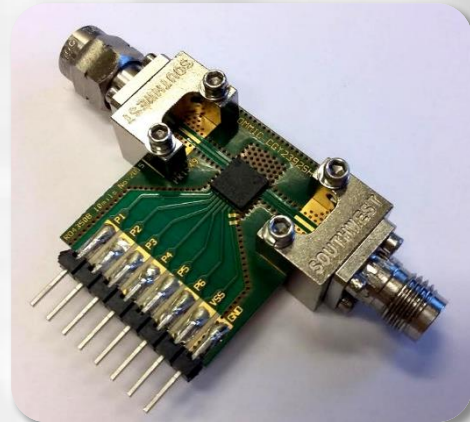
## Exemple of LNA packaged solution :

**CGY2221HV/C1**



**LNA 7.5 - 13 GHz NF: 1.6 dB  
Plastic QFN 4x4**

**CGY2392SHV/C1**



**Phase-Shifter 7.5 - 13 GHz  
RMS Phase Error 1.7 ° @ 12 GHz  
Plastic QFN 5x5**

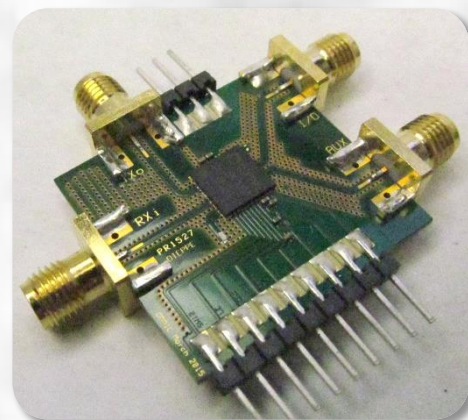
## Example of Corechip packaged solution :

**CGY2175AHV**



**6 bit C-band Corechip  
Plastic QFN 7x7**

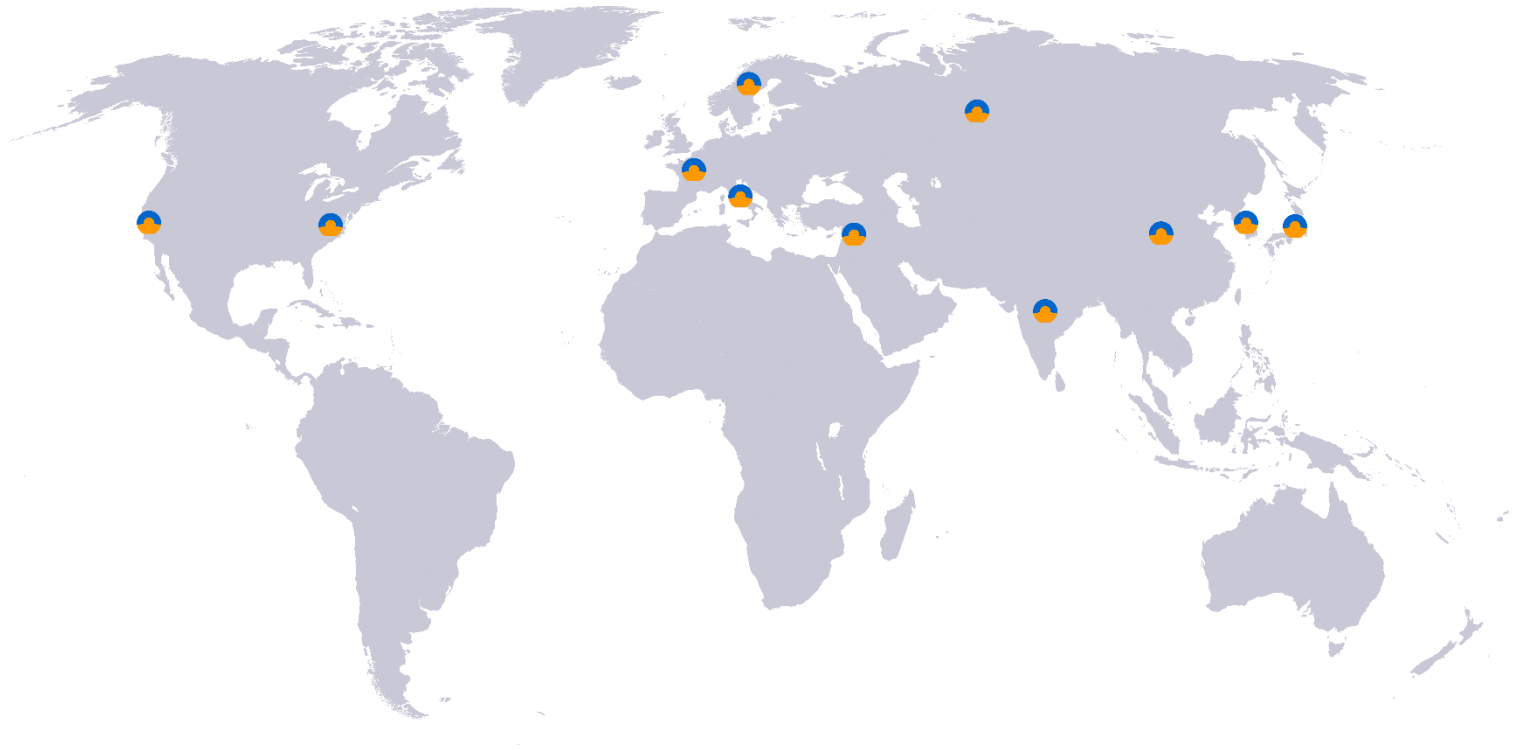
**Custom Ku-band Corechip**



**4 ports  
Plastic QFN 7x7**



Based in France , in Paris area, OMMIC occupies a central position in Europe but also in the world to deliver the right product in the right time to customers. Thanks to its powerful supply chain and reactive regional reps network, OMMIC can support any project in the entire world.



**CHINA**

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[sales@mrf.co.jp](mailto:sales@mrf.co.jp)

**ITALY**

Celte S.r.l  
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A sales and field application team at OMMIC is dedicated to customer sales and technical request to provide the best support in the shortest time.

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You can contact our support team whenever you need at [information@ommic.com](mailto:information@ommic.com)

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