FOREWORD

« OMMIC is a pioneer and a leader in the III/V domain, in particular in GaN and GaAs semiconductor technologies. With the release of its new 6-inch production line, OMMIC has positioned itself as French industrial leader in the development of the European telecommunications. Its current technologies provides solutions for the 5G base station market at 28 and 40 GHz, as much for the backhaul part of the network. Indeed, OMMIC’s GaN processes can be used at frequencies above 30 GHz with power output that has never been reached before in the industry. In addition, OMMIC is continuously investing in research and development to help its customers built new technologies. With this unique line in Europe, OMMIC affirm its ambition to strengthen its leadership in the market with ever-increasing production volumes. »
OMMIC AT A GLANCE

A LEADING SUPPLIER

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

Formerly Philips Semiconductor, OMMIC is exploiting more than 40 years background in III-V Materials, Design and Processing. Thanks to its innovative solutions, OMMIC enables its customers to be leaders in a more and more demanding market place.

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.

We have been working in collaboration with ESA for more than 20 years. ESA has already evaluated 3 OMMIC processes: EDO2AH, D01PH and D01MH. These 3 processes being maintained on ESA EPPL list. Two additional processes (including the D01CH GaN/Si) are being evaluated for insertion in the EPPL.

STEPS OF PRODUCTION

Step 1: EPITAXY
OMMIC has 4 Epitaxy reactors and develops its own epi structure.

Step 2: E-BEAM
OMMIC uses E-Beam lithography to define gates as small as 40 nm.

Step 3: PRODUCTION
OMMIC produces in France near Paris. The company has a 3-inch and 6-inch Fab line.

Step 4: TEST
OMMIC test 100% of the dies it produces. This includes RF and DC tests.

Step 5: DICING & PICKING
This step is done within OMMIC in the backend cleanroom.

Step 6: VISUAL INSPECTION
OMMIC visual inspect 100% of the dies with commercial and space grade screening.

Step 7: FINAL PRODUCT
Designed by OMMIC’s team.
INDUSTRIAL SECTORS

OMMIC is supplying MMIC, Fondry Services and Epitaxial Wafers based on III-V (GaN, GaAs and InP) materials. With its advanced technology, OMMIC has proven itself as a leader in its fields, providing its customers with cutting edge performance in the Telecommunication, Space and Defense markets.

33 %
OF OUR MARKET IS FOR THE HIGH-END SPACE MARKET

45 %
OF OUR MARKET IS FOR COMMERCIAL APPLICATION INCLUDING THE NEW CELLULAR TELECOM MARKET

22 %
OF OUR MARKET IS FOR THE HIGH-END DEFENSE MARKET

NEW PRODUCTION LINE

- PRODUCTION
- TEST
- INSPECTION
- THE WORLD’S FIRST 6-inch GaN/Si LINE IN PRODUCTION
- STRATEGY & ROADMAP
- THE LATEST NEWS

www.ommic.com
NEW PRODUCTION LINE

PRODUCTION

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, we are an independent SME.

OMMIC consists of 5 main buildings with 1000m² 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).

TEST

Once the wafers are fabricated, all dies are measured with DC and RF metrics verified. This includes the bias levels, but also S-parameters, Power measurements, noise measurements, etc. This ensures OMMC delivers only working dies with stunning performances.

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 know 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.

INSPECTION

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.

Two level of screening are available: Space grade for the highest reliability, and commercial grade for product with less stringent requirements.
STRATEGY & ROADMAP

Ommic strategy is articulated around GaN technology. With its wide bandgap and high electron mobility, GaN is a perfect candidate for emerging applications.

Our strategy includes:

**Full Replacement of GaAs Solutions**
OMMIC plans to fully replace its GaAs pHEMT solutions by its state-of-the-art GaN/Si technology, offering the best III-V RF solutions, complementary to Silicon RF solutions.

**High-End Space Market**
OMMIC continues to serve high-end high value-added space market, by taking advantage of its avant-garde Hi-Reliability process for consumer market.

**New Cellular Telecom Market**
OMMIC aims to enter cellular infrastructure market, especially 5G market with its cutting edge GaN/Si technology, suited for the 5G mmWave application.

**High-End Defense Market**
OMMIC continues to serve high-end high value-added military market, by taking advantage of its high-performance process for consumer market.

THE LATEST NEWS

**D01GH**
D01GH GaN/Si process is already available for OMMIC customer through open foundry service.

**D006GH**
D006GH GaN/Si 60 nm process PDK is already available for download.

**D004IH**
D004IH is being developed, the advancement can be followed by looking at the Ultrawave H2020 public project.

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**MMIC PRODUCT SELECTOR GUIDE**

- D01GH GaN/Si
- INNOVATIVE GaN PRODUCTS
- LOW NOISE AMPLIFIERS
- POWER & WIDEBAND AMPLIFIERS
- CONTROL FUNCTIONS
- MISCELLANEOUS
OMMIC's GaN has been engineered to reduce as much as possible traps in its process. The surface condition of GaN is being strictly monitored which is why, unlike most processes in production, OMMIC's D01GH has few-to-no measurable memory effect.

With D01GH, optimized digital predistortion technique can be used as much as complex modulation.

OmniMIC’s GaN has been designed so that maximum input power is higher than 35 dBm. This is handy because, in most settings, no limitor is needed in front of the LNA.

**MMIC PRODUCT SELECTOR GUIDE**

**D01GH GaN/Si**

**D01GH FEATURE:**
- Fmax : 160 GHz
- Gate length : 100 nm
- Ft : 110 GHz
- Vbgd : 40 V

**Main applications:**
- High frequency PA 15 GHz to 50 GHz
- Instrumentation wide band amplifier DC - 50 GHz
- Robust LNA (> 40 GHz) : up to 35 dBM Pin in CW

**INNOVATIVE GaN PRODUCTS PORTFOLIO**

GaN products are being actively developed for emerging applications: they are processed using D01GH GaN/Si technology which is 100% European source.

**LOW NOISE AMPLIFIER**

<table>
<thead>
<tr>
<th>PART NUMBER</th>
<th>FREQUENCY (GHz)</th>
<th>GAIN (dB)</th>
<th>NF (dB)</th>
<th>OP1dB (dBm)</th>
<th>VOLTAGE BIAS (V)</th>
<th>CURRENT BIAS (mA)</th>
<th>PACKAGE &amp; STATUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>CGY2222UH/C2</td>
<td>8 - 12</td>
<td>20</td>
<td>1.5</td>
<td>20</td>
<td>8</td>
<td>155</td>
<td>Die / Production</td>
</tr>
<tr>
<td>CGY2231UH</td>
<td>2 - 20</td>
<td>17</td>
<td>2.5</td>
<td>22</td>
<td>8</td>
<td>-</td>
<td>Die / Sampling</td>
</tr>
<tr>
<td>CGY2250UH/C1</td>
<td>26 - 34</td>
<td>20</td>
<td>1.6</td>
<td>27</td>
<td>8.5</td>
<td>90</td>
<td>Die / Production</td>
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**POWER AMPLIFIER**

<table>
<thead>
<tr>
<th>PART NUMBER</th>
<th>FREQUENCY (GHz)</th>
<th>GAIN (dB)</th>
<th>PSat (dBm)</th>
<th>PAE (%)</th>
<th>VOLTAGE BIAS (V)</th>
<th>CURRENT BIAS @ Psat (mA)</th>
<th>PACKAGE &amp; STATUS</th>
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<tbody>
<tr>
<td>CGY2540UH</td>
<td>0.5 - 20</td>
<td>22</td>
<td>35</td>
<td>12</td>
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<td>Die / Sampling</td>
</tr>
<tr>
<td>CGY2631UH</td>
<td>13 - 17</td>
<td>30</td>
<td>40</td>
<td>31</td>
<td>12</td>
<td>3</td>
<td>Die / Sampling</td>
</tr>
<tr>
<td>CGY2650UH/C1</td>
<td>30 - 33.5</td>
<td>22</td>
<td>39</td>
<td>31</td>
<td>12</td>
<td>4</td>
<td>Die / Production</td>
</tr>
<tr>
<td>CGY2651UH/C1</td>
<td>27 - 31</td>
<td>18</td>
<td>40</td>
<td>31</td>
<td>12</td>
<td>4</td>
<td>Die / Production</td>
</tr>
<tr>
<td>CGY2652UH</td>
<td>27 - 31</td>
<td>20</td>
<td>43</td>
<td>31</td>
<td>12</td>
<td>4</td>
<td>Die / Sampling</td>
</tr>
<tr>
<td>CGY2660UH</td>
<td>46 - 50</td>
<td>18</td>
<td>38</td>
<td>20</td>
<td>12</td>
<td>2.7</td>
<td>Die / Sampling</td>
</tr>
</tbody>
</table>
LOW NOISE AMPLIFIERS PORTFOLIO

PERFORMANCE FIGURE FOR LOW NOISE AMPLIFIERS MMIC

LNA are manufactured using GaAs technology (ED02AH, D01PH, D01MH) that have been space qualified by ESA, or innovating technology: GaAs mHEMT for lower noises & higher frequencies of GaN HEMT (D01GH) for robust LNA.

PERFORMANCE TABLE FOR LOW NOISE AMPLIFIERS MMIC

<table>
<thead>
<tr>
<th>PART NUMBER</th>
<th>FRQNCY (GHz)</th>
<th>GAIN (dB)</th>
<th>NF (dB)</th>
<th>OPUB (dBm)</th>
<th>VOLTAGE BIAS (V)</th>
<th>CURRENT BIAS (mA)</th>
<th>PACKAGE &amp; STATUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>CGY2120UH/C1</td>
<td>5 - 7</td>
<td>13</td>
<td>0.5</td>
<td>12</td>
<td>1.0</td>
<td>50</td>
<td>Die / Production</td>
</tr>
<tr>
<td>CGY2121UH/C1</td>
<td>18 - 26</td>
<td>18</td>
<td>1.5</td>
<td>5</td>
<td>0.8</td>
<td>60</td>
<td>Die / Production</td>
</tr>
<tr>
<td>CGY2122UH/C2</td>
<td>25 - 43</td>
<td>32</td>
<td>1.5</td>
<td>1</td>
<td>1.1</td>
<td>30</td>
<td>Die / Production</td>
</tr>
<tr>
<td>CGY2124UH/C1</td>
<td>8 - 12</td>
<td>33</td>
<td>1.1</td>
<td>11</td>
<td>11.0</td>
<td>55</td>
<td>Die / Production</td>
</tr>
<tr>
<td>CGY2125UH/C1</td>
<td>13 - 15</td>
<td>25</td>
<td>1.0</td>
<td>8</td>
<td>3.3</td>
<td>20</td>
<td>Die / Production</td>
</tr>
<tr>
<td>CGY2128UH/C2</td>
<td>24 - 34</td>
<td>24</td>
<td>1.3</td>
<td>11</td>
<td>3.5</td>
<td>47</td>
<td>Die / Production</td>
</tr>
<tr>
<td>CGY2178UH/C1</td>
<td>5 - 6</td>
<td>30</td>
<td>1.0</td>
<td>15</td>
<td>3.0</td>
<td>40</td>
<td>Die / Production</td>
</tr>
<tr>
<td>CGY2190UH/C2</td>
<td>75 - 110</td>
<td>23</td>
<td>3.0</td>
<td>1</td>
<td>1.0</td>
<td>33</td>
<td>Die / Production</td>
</tr>
<tr>
<td>CGY2220UH/C1</td>
<td>1 - 12</td>
<td>35</td>
<td>1.3</td>
<td>12</td>
<td>1.5</td>
<td>52</td>
<td>Die / Production</td>
</tr>
<tr>
<td>CGY2221H1/C1</td>
<td>7.5 - 13</td>
<td>17</td>
<td>1.7</td>
<td>17</td>
<td>5.0</td>
<td>82</td>
<td>QFN / Sampling</td>
</tr>
<tr>
<td>CGY2222UH/C2</td>
<td>7.5 - 13</td>
<td>17</td>
<td>1.6</td>
<td>17</td>
<td>5.0</td>
<td>82</td>
<td>Die / Production</td>
</tr>
<tr>
<td>CGY2222H2/C2</td>
<td>8 - 12</td>
<td>20</td>
<td>1.5</td>
<td>20</td>
<td>8.0</td>
<td>-</td>
<td>Die / Production</td>
</tr>
<tr>
<td>CGY2225UH/C1</td>
<td>1 - 18</td>
<td>35</td>
<td>1.5</td>
<td>12</td>
<td>1.5</td>
<td>50</td>
<td>Die / Production</td>
</tr>
<tr>
<td>CGY2223UH</td>
<td>2 - 20</td>
<td>17</td>
<td>2.5</td>
<td>22</td>
<td>8.0</td>
<td>-</td>
<td>Die / Sampling</td>
</tr>
<tr>
<td>CGY2232UH/C2</td>
<td>12 - 15</td>
<td>27</td>
<td>1.3</td>
<td>30</td>
<td>0.3</td>
<td>50</td>
<td>Die / Production</td>
</tr>
<tr>
<td>CGY2250UH/C1</td>
<td>5 - 7</td>
<td>13</td>
<td>0.5</td>
<td>12</td>
<td>1.0</td>
<td>50</td>
<td>Die / Production</td>
</tr>
<tr>
<td>CGY2250UH</td>
<td>2 - 20</td>
<td>17</td>
<td>2.5</td>
<td>22</td>
<td>8.0</td>
<td>-</td>
<td>Die / Sampling</td>
</tr>
<tr>
<td>CGY2260UH/C1</td>
<td>6 - 18</td>
<td>9</td>
<td>3.3</td>
<td>13</td>
<td>5.0</td>
<td>60</td>
<td>Die / Development</td>
</tr>
<tr>
<td>CGY2272UH</td>
<td>45 - 70</td>
<td>22</td>
<td>2.0</td>
<td>5</td>
<td>1.5</td>
<td>60</td>
<td>Die / Production</td>
</tr>
</tbody>
</table>

www.ommic.com
LNA written in blue are manufactured using GaN technology. They are therefore very robust and can handle more than 32 dBm input power in CW (> 40 dBm in pulse).

**POWER & WIDEBAND AMPLIFIERS PORTFOLIO**

OMMIC Portfolio of MMICS, includes Amplifiers from DC to 46 GHz for civil application such as Telecommunication, Instrumentation, Radars but also for Satcom and Military applications. PA were manufactured using GaAs technology (ED02AH, D01PH, D006GH), that have been space qualified by ESA. New amplifiers are designed in GaN HEMT (D01GH) for outstanding performances.

**PERFORMANCE TABLE FOR ULTRA LOW NOISE AMPLIFIERS MMIC**

<table>
<thead>
<tr>
<th>PART NUMBER</th>
<th>FREQUENCY (GHz)</th>
<th>GAIN (dB)</th>
<th>NF (dB)</th>
<th>OP1dB (dBm)</th>
<th>VOLTAGE BIAS (V)</th>
<th>CURRENT BIAS (mA)</th>
<th>PACKAGE &amp; STATUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>CGY2105XHV</td>
<td>0.5 - 4</td>
<td>19</td>
<td>0.42</td>
<td>21</td>
<td>5</td>
<td>2 x 50</td>
<td>QFN 4 x 4 / Production</td>
</tr>
<tr>
<td>CGY2106XHV</td>
<td>0.1 - 3</td>
<td>19</td>
<td>0.45</td>
<td>19</td>
<td>5</td>
<td>2 x 50</td>
<td>QFN 4 x 4 / Production</td>
</tr>
<tr>
<td>CGY2107UH</td>
<td>0.5 - 6</td>
<td>24</td>
<td>0.60</td>
<td>22</td>
<td>5</td>
<td>2 x 50</td>
<td>QFN 4 x 4 / Production</td>
</tr>
<tr>
<td>CGY2108CS</td>
<td>0.5 - 6</td>
<td>21</td>
<td>0.60</td>
<td>22</td>
<td>5</td>
<td>2 x 50</td>
<td>Flight Model / Production</td>
</tr>
</tbody>
</table>

OMMIC Power Amplifiers are dedicated to application such as radars, telecommunication and instrumentation. MMIC labeled in blue are using GaN technology.

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 130 nm gate length pHEMT Technology D01PH or 100 nm HEMT Technology D01GH.
OMMIC labeled in blue are using GaN technology. OMMIC Wideband Amplifiers are dedicated to application such as instrumentation, electronic warfare, 43 Gb/s OC-768 EAM Driver.

**CONTROL FUNCTIONS ADVANTAGES & PORTFOLIO**

OMMIC Portfolio 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 attenuations states are controlled through a Serial to Parallel interface on the die (SIPO) built with OMMIC’s E/D technology.

OMMIC SIPO stands for Serial Input Parallel Output. With the SIPO, the number of bonding is greatly reduced and only three of them are needed to control a corechip.

**Example:** CGY215AHV/C1 (6-bit package C-band corechip)

Each phase and attenuation states are loaded in the shift register (at a clock (CLK) rate up to 100 MHz), then phase and attenuation configuration are changed after latch enable (LE) signal.

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

**PERFORMANCE TABLE FOR WIDEBAND AMPLIFIERS MMIC**

<table>
<thead>
<tr>
<th>PART NUMBER</th>
<th>FRQNCY (GHz)</th>
<th>GAIN (dB)</th>
<th>Part (W)</th>
<th>COMPRESSION POINT P1dB (dBm)</th>
<th>VOLTAGE BIAS (V)</th>
<th>CURRENT BIAS (A)</th>
<th>PACKAGE &amp; STATUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>CGY2164UH/C1</td>
<td>DC - 46</td>
<td>16</td>
<td>0.20</td>
<td>21.0</td>
<td>5</td>
<td>195</td>
<td>Die/Production</td>
</tr>
<tr>
<td>CGY2164UH/C2</td>
<td>DC - 54</td>
<td>13</td>
<td>0.05</td>
<td>18.0</td>
<td>5</td>
<td>100</td>
<td>Die/Production</td>
</tr>
<tr>
<td>CGY2165UH/C1</td>
<td>0.5 - 45</td>
<td>13</td>
<td>0.10</td>
<td>18.0</td>
<td>5</td>
<td>85</td>
<td>Die/Production</td>
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<tr>
<td>CGY2165UH/C2</td>
<td>5.0 - 45</td>
<td>15</td>
<td>0.08</td>
<td>19.0</td>
<td>5</td>
<td>103</td>
<td>Die/Production</td>
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<tr>
<td>CGY22550UH/C</td>
<td>0.6 - 40</td>
<td>16</td>
<td>1.00</td>
<td>17.0</td>
<td>18</td>
<td>91</td>
<td>Die/Sampling</td>
</tr>
</tbody>
</table>

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

**PERFORMANCE TABLE FOR CORECHIP (PS + ATT)**

<table>
<thead>
<tr>
<th>PART NUMBER</th>
<th>FRQNCY (GHz)</th>
<th>CTRL BITS</th>
<th>TOPOLOGY</th>
<th>CTRL RANGE (dB)</th>
<th>RMS ATTEN./PHASE ERROR (dB)</th>
<th>CTRL INTERFACE (V)</th>
<th>PACKAGE &amp; STATUS</th>
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</thead>
<tbody>
<tr>
<td>CGY2170YH/C1</td>
<td>8 - 12</td>
<td>6</td>
<td>3 ports</td>
<td>31.5 / 360</td>
<td>0.40 / 3.0</td>
<td>0 / +3</td>
<td>QFN/Production</td>
</tr>
<tr>
<td>CGY2170YU/C1</td>
<td>8 - 12</td>
<td>6</td>
<td>3 ports</td>
<td>31.5 / 360</td>
<td>0.40 / 3.0</td>
<td>0 / +3</td>
<td>Die/Production</td>
</tr>
<tr>
<td>CGY2170XH/C2</td>
<td>8 - 12</td>
<td>6</td>
<td>4 ports</td>
<td>31.5 / 360</td>
<td>0.35 / 3.0</td>
<td>0 / +3</td>
<td>QFN/Production</td>
</tr>
<tr>
<td>CGY2170XU/C2</td>
<td>8 - 12</td>
<td>6</td>
<td>4 ports</td>
<td>31.5 / 360</td>
<td>0.30 / 3.0</td>
<td>0 / +3</td>
<td>Die/Production</td>
</tr>
<tr>
<td>CGY2175AH/C1</td>
<td>4.5 - 6.5</td>
<td>6</td>
<td>3 ports</td>
<td>31.5 / 360</td>
<td>0.25 / 1.5</td>
<td>0 / +5</td>
<td>Die/Production</td>
</tr>
<tr>
<td>CGY2175ALUH/C1</td>
<td>4.5 - 6.5</td>
<td>6</td>
<td>3 ports</td>
<td>31.5 / 360</td>
<td>0.20 / 1.0</td>
<td>0 / +5</td>
<td>Die/Production</td>
</tr>
<tr>
<td>CGY2175ALUH/C2</td>
<td>4.5 - 6.5</td>
<td>6</td>
<td>2 ports</td>
<td>31.5 / 360</td>
<td>0.40 / 3.0</td>
<td>-3 / -3</td>
<td>Die/Production</td>
</tr>
<tr>
<td>CGY2350UH/C1</td>
<td>12 - 15</td>
<td>6</td>
<td>2 ports</td>
<td>31.5 / 360</td>
<td>0.35 / 4.0</td>
<td>0 / +3</td>
<td>Die/Production</td>
</tr>
<tr>
<td>CGY2350UH/C2</td>
<td>12 - 15</td>
<td>6</td>
<td>2 ports</td>
<td>31.5 / 360</td>
<td>0.35 / 4.0</td>
<td>0 / +3</td>
<td>Die/Production</td>
</tr>
<tr>
<td>CGY2355UH/C1</td>
<td>26.5 - 30.5</td>
<td>6</td>
<td>2 ports</td>
<td>31.5 / 360</td>
<td>0.50 / 4.0</td>
<td>0 / +5</td>
<td>Die/Production</td>
</tr>
</tbody>
</table>

**PERFORMANCE TABLE FOR TRUE-TIME DELAY FUNCTIONS**

<table>
<thead>
<tr>
<th>PART NUMBER</th>
<th>FRQNCY (GHz)</th>
<th>CTRL BITS</th>
<th>TOPOLOGY</th>
<th>GAIN / NOISE (dB)</th>
<th>RMS PHASE ERROR (°)</th>
<th>CTRL INTERFACE (V)</th>
<th>PACKAGE &amp; STATUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>CGY2393SUH/C1</td>
<td>6 - 18</td>
<td>5</td>
<td>10</td>
<td>310</td>
<td>6</td>
<td>0 / +4</td>
<td>Die/Production</td>
</tr>
<tr>
<td>CGY2394SUH/C1</td>
<td>6 - 18</td>
<td>6</td>
<td>330</td>
<td>310</td>
<td>6</td>
<td>0 / +4</td>
<td>Die/Production</td>
</tr>
</tbody>
</table>

**PERFORMANCE TABLE FOR DIGITAL PHASE-SHIFTER FUNCTIONS**

<table>
<thead>
<tr>
<th>PART NUMBER</th>
<th>FRQNCY (GHz)</th>
<th>CTRL BITS</th>
<th>TOPOLOGY</th>
<th>INSERTION LOSS (dB)</th>
<th>PHASE RANGE (°)</th>
<th>RMS PHASE ERROR (°)</th>
<th>CTRL INTERFACE (V)</th>
<th>PACKAGE &amp; STATUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>CGY2172XUH/C1</td>
<td>8 - 12</td>
<td>6</td>
<td>8.00</td>
<td>360</td>
<td>2.00</td>
<td>0 / -3</td>
<td>Die/Production</td>
<td></td>
</tr>
<tr>
<td>CGY2172XH/C1</td>
<td>8 - 12</td>
<td>6</td>
<td>8.00</td>
<td>360</td>
<td>2.00</td>
<td>0 / -5</td>
<td>Die/Production</td>
<td></td>
</tr>
<tr>
<td>CGY2173UH/C2</td>
<td>6 - 18</td>
<td>6</td>
<td>13.00</td>
<td>360</td>
<td>4.00</td>
<td>0 / -3</td>
<td>Die/Production</td>
<td></td>
</tr>
<tr>
<td>CGY2174UH/C1</td>
<td>13 - 16</td>
<td>6</td>
<td>8.00</td>
<td>360</td>
<td>6.00</td>
<td>0 / -3</td>
<td>Die/Production</td>
<td></td>
</tr>
<tr>
<td>CGY2177AUH/C1</td>
<td>4.8 - 6.8</td>
<td>6</td>
<td>5.00</td>
<td>360</td>
<td>2.00</td>
<td>0 / +5</td>
<td>QFN/Production</td>
<td></td>
</tr>
<tr>
<td>CGY2192UH/C1</td>
<td>6 - 18</td>
<td>6</td>
<td>10.80</td>
<td>360</td>
<td>1.90</td>
<td>0 / +5</td>
<td>Die/Production</td>
<td></td>
</tr>
<tr>
<td>CGY2192UH/C2</td>
<td>6 - 18</td>
<td>6</td>
<td>10.80</td>
<td>360</td>
<td>1.70</td>
<td>0 / +5</td>
<td>Die/Production</td>
<td></td>
</tr>
</tbody>
</table>

**PERFORMANCE TABLE FOR DIGITAL ATTENUATORS FUNCTIONS**

<table>
<thead>
<tr>
<th>PART NUMBER</th>
<th>FRQNCY (GHz)</th>
<th>CTRL BITS</th>
<th>INSERTION LOSS (dB)</th>
<th>ATEN. RANGE (dB)</th>
<th>RMS ATTEN. ERROR (dB)</th>
<th>CTRL INTERFACE (V)</th>
<th>PACKAGE &amp; STATUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>CGY2169UH/C1</td>
<td>8 - 12</td>
<td>6</td>
<td>4.00</td>
<td>24</td>
<td>0.40</td>
<td>0 / -3</td>
<td>Die/Production</td>
</tr>
<tr>
<td>CGY2171UXH/C1</td>
<td>1 - 12</td>
<td>6</td>
<td>5.00</td>
<td>32</td>
<td>0.25</td>
<td>0 / +3</td>
<td>Die/Production</td>
</tr>
<tr>
<td>CGY2177UXUH/C1</td>
<td>4.8 - 6.8</td>
<td>6</td>
<td>5.00</td>
<td>32</td>
<td>0.20</td>
<td>0 / +5</td>
<td>Die/Production</td>
</tr>
<tr>
<td>CGY2199SUH/C1</td>
<td>6 - 18</td>
<td>6</td>
<td>4.00</td>
<td>32</td>
<td>0.20</td>
<td>0 / +5</td>
<td>Die/Production</td>
</tr>
<tr>
<td>CGY2390SUH/C1</td>
<td>8 - 12</td>
<td>6</td>
<td>4.00</td>
<td>35</td>
<td>0.20</td>
<td>0 / +5</td>
<td>Die/Production</td>
</tr>
</tbody>
</table>
Mixers are manufactured using OMMIC’s GaAs 180 nm E/D pHEMT (ED02AH) and 70 mm mHEMT (D0071H) technologies. They generally feature high isolation and can be used for application such as radar, telecommunication, instrumentation and GPS system.

### PERFORMANCE TABLE FOR MIXERS

<table>
<thead>
<tr>
<th>PART NUMBER</th>
<th>FREQUENCY (GHz)</th>
<th>LO FREQUENCY (GHz)</th>
<th>IF FREQUENCY (GHz)</th>
<th>PHASE LO (dBm)</th>
<th>CVRSN GAIN (dB)</th>
<th>ISO LO-RF (dB)</th>
<th>ISO LO-IF (dB)</th>
<th>IP1dB (dBm)</th>
<th>PACKAGE &amp; STATUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>CGY2180UH/C1</td>
<td>0.7 - 3.7</td>
<td>0.7 - 4</td>
<td>DC - 2</td>
<td>15</td>
<td>-7</td>
<td>35</td>
<td>35</td>
<td>12</td>
<td>Die/Production</td>
</tr>
<tr>
<td>CGY2181UH/C1</td>
<td>1 - 4.5</td>
<td>1 - 5</td>
<td>DC - 2</td>
<td>15</td>
<td>-7</td>
<td>45</td>
<td>32</td>
<td>13</td>
<td>Die/Production</td>
</tr>
<tr>
<td>CGY2182UH/C1</td>
<td>3 - 10</td>
<td>3 - 10</td>
<td>DC - 3</td>
<td>15</td>
<td>-7</td>
<td>60</td>
<td>45</td>
<td>12</td>
<td>Die/Production</td>
</tr>
<tr>
<td>CGY2183UH/C1</td>
<td>0.1 - 6</td>
<td>0.1 - 6</td>
<td>DC - 3</td>
<td>-5</td>
<td>12</td>
<td>35</td>
<td>40</td>
<td>-5</td>
<td>Die/Production</td>
</tr>
<tr>
<td>CGY2184UH/C1</td>
<td>0.1 - 6</td>
<td>0.1 - 6</td>
<td>DC - 3</td>
<td>0</td>
<td>18</td>
<td>40</td>
<td>40</td>
<td>3</td>
<td>Die/Production</td>
</tr>
<tr>
<td>CGY2166UH/C1</td>
<td>40.5 - 43.5</td>
<td>8.8 - 10</td>
<td>5.0 - 6</td>
<td>9</td>
<td>33</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>Die/Production</td>
</tr>
<tr>
<td>CGY2170UH/C1</td>
<td>92 - 96</td>
<td>86 - 90</td>
<td>51 - 6</td>
<td>7</td>
<td>-3</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>Die/Production</td>
</tr>
<tr>
<td>CGY2171UH/C1</td>
<td>92 - 96</td>
<td>86 - 90</td>
<td>5.2 - 6</td>
<td>7</td>
<td>-10</td>
<td>&gt; 10</td>
<td>5</td>
<td>Die/Production</td>
<td></td>
</tr>
</tbody>
</table>

### MISCELLANEOUS PORTFOLIO

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

### OTHER PRODUCTS

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

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

- **Gain Block Taverny**: CGY2731UH/C1
  - 12-15 GHz
  - Gain: 19 dB
  - NF: 4 dB
  - P3 dB: 10 dBm

- **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

### FOUNDRY SERVICES & III-V PROCESSES

- **EPITAXY PROCESSES**
- **III-V PROCESSES FOR FOUNDRY SERVICES**
- **GaN PROCESSES**
- **GaAs m-HEMT PROCESSES**
- **GaAs p-HEMT PROCESSES**
FOUNDRY SERVICES III-V PROCESSES

EPITAXY

OMMIC has a powerful R&D department developing its own processes starting from epitaxial structure. OMMIC has a number of MOCVD reactors and supply epi wafers in 3-inch, 4-inch and 6-inch. 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.

III-V PROCESSES FOR FOUNDRY SERVICES

You have not found any corresponding design in our standard product portfolio? OMMIC as a fully open foundry policy, providing the most innovative processes to the rest of the world; use it to design the device that is best suited for you!

PROCESSES & TECHNOLOGY

OMMIC is focused on III-V material for the performance it can offer. Our process portfolio includes GaAs pHEMT & mHEMT technology, InP HBT technology and GaN HEMT technology. These services enable cut-off frequencies as high as 400 GHz enabling new applications at always higher frequencies.

OMMIC processes are built for high reliability and space application. This is why all our processes in production are either spaced qualified by the European Space Agency, or in the process of being qualified.
The well-trusted reliability of GaAs pHEMT (D01PH) technology can be used for mid-power application in space. For other environment, take advantage of the high power density of our GaN processes (D01GH, D006GH). OMMIC's GaN technology features high output power (up to W-band), but also high linearity, low noise and no noticeable memory effect.

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

Need for robust LNA (Pin > 40 dBm)?
The large Breakdown voltage combined with the low noise of our GaN (D01GH, D006GH) technologies makes it perfect for such feature.

LOW NOISE APPLICATION
All of OMMIC processes are designed to minimize the noise figure of the transistors. Metamorphic technology (e.g D007IH, D004IH) is especially good for providing low noise at high frequencies.

POWER APPLICATION
The well-trusted reliability of GaAs pHEMT (D01PH) technology can be used for mid-power application in space. For other environment, take advantage of the high power density of our GaN processes (D01GH, D006GH). OMMIC’s GaN technology features high output power (up to W-band), but also high linearity, low noise and no noticeable memory effect.

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

D01GH Process
- GaN on Si
- Market Introduction in 2020
- 0.1 µm
- 3 inch / 6 inch
- 100 µm
- E-beam
- 110 GHz
- 160 GHz
- 36 V
- 12 V
- 1200 mA/mm
- 1700 mA/mm
- 400 pF/mm²
- 1.5 dB (40 GHz)
- 3300 mW/mm CW 5.9 Pulse
- 800 mS/mm

D006GH Process
- GaN on Si
- Market Introduction in 2020
- 0.06 µm
- 3 inch / 6 inch
- 100 µm
- E-beam
- 150 GHz
- 190 GHz
- 36 V
- 12 V
- 1200 mA/mm
- 1700 mA/mm
- 400 pF/mm²
- 1 dB (40 GHz)
- 3300 mW/mm CW 5.9 Pulse
- 900 mS/mm

GaN PROCESSES
OMMIC has released its first GaN process in 2015. All of the supply chain is located in Europe.
GaAs m-HEMT PROCESSES

OMMIC has released metamorphic processes with up to 70% of indium in the channel.

<table>
<thead>
<tr>
<th>Technology</th>
<th>Status</th>
<th>Space Grade</th>
<th>Gate Length</th>
<th>Wafer Size</th>
<th>Thinkness</th>
<th>Gate Write</th>
<th>Fmax</th>
<th>Vbgd</th>
<th>Vds q</th>
<th>Idss</th>
<th>MIM Capacitors</th>
<th>NF</th>
<th>Power Density</th>
</tr>
</thead>
<tbody>
<tr>
<td>GaAs m-Hemt</td>
<td>Production Space</td>
<td>Qualified</td>
<td>0.07 µm</td>
<td>3 inch</td>
<td>70 - 100 µm</td>
<td>E-beam</td>
<td>300 GHz</td>
<td>450 GHz</td>
<td>4 V</td>
<td>200 mA/mm</td>
<td>400 mA/mm</td>
<td>400 pF/mm²</td>
<td>0.5 dB (30 GHz)</td>
</tr>
</tbody>
</table>

LNA ✓ MIXER ✓

Well suited for application from 20 to 150 GHz.
Representative Device: CGY2260UH/C1

Operating range: 25 GHz to 43 GHz
Gain: 25 dB (+ 0.4 dB on bandwidth)
NF: 10 dB @36 GHz
OP1dB: 8 dBm
Power Consumption: Vd = 1.5 V
Id = 0.82 A

GaAs p-HEMT PROCESSES

GaAs p-HEMT have been manufactured since the late nineties, with a strong space heritage.

<table>
<thead>
<tr>
<th>Technology</th>
<th>Status</th>
<th>Space Grade</th>
<th>Gate Length</th>
<th>Wafer Size</th>
<th>Thinkness</th>
<th>Gate Write</th>
<th>Fmax</th>
<th>Vbgd</th>
<th>Vds q</th>
<th>Idss</th>
<th>MIM Capacitors</th>
<th>NF</th>
<th>Power Density</th>
</tr>
</thead>
<tbody>
<tr>
<td>GaAs p-Hemt</td>
<td>Production Space</td>
<td>Qualified</td>
<td>0.135 µm</td>
<td>3 inch</td>
<td>70 - 100 µm</td>
<td>E-beam</td>
<td>100 GHz</td>
<td>180 GHz</td>
<td>12 V</td>
<td>500 mA/mm</td>
<td>700 mA/mm</td>
<td>400 pF/mm²</td>
<td>1.1 dB (30 GHz)</td>
</tr>
</tbody>
</table>

LNA ✓ MIXER ✓ TWA ✓

Well suited for application from 5 to 45 GHz and Space application.
Representative Device: CGY2135UH/C1

Operating range: 18 GHz to 23 GHz
Gain: 25 dB
OP1dB: 31 dBm
Power Consumption: Vd = 4 V
Id = 1.2 A
<table>
<thead>
<tr>
<th>Technology</th>
<th>GaAs p-Hemt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status</td>
<td>Production</td>
</tr>
<tr>
<td>Space Grade</td>
<td>Space Qualified</td>
</tr>
<tr>
<td>Gate Length</td>
<td>0.18 µm</td>
</tr>
<tr>
<td>Wafer Size</td>
<td>3 inch / 6 inch</td>
</tr>
<tr>
<td>Thinness</td>
<td>100 µm</td>
</tr>
<tr>
<td>Gate Write</td>
<td>E-beam</td>
</tr>
<tr>
<td>Fmax</td>
<td>60 GHz</td>
</tr>
<tr>
<td>Vbgd</td>
<td>8 V</td>
</tr>
<tr>
<td>Vds q</td>
<td>7 V</td>
</tr>
<tr>
<td>Idss</td>
<td>250 (on) / 160 (off) mA/mm</td>
</tr>
<tr>
<td>Idss max</td>
<td>400 (on) / 180 (off) mA/mm</td>
</tr>
<tr>
<td>MIM Capacitors</td>
<td>49 &amp; 400 pF/mm²</td>
</tr>
<tr>
<td>NF</td>
<td>0.8 dB (18 GHz)</td>
</tr>
<tr>
<td>Power Density gm</td>
<td>350 mW/mm</td>
</tr>
<tr>
<td>gm</td>
<td>450 mS/mm</td>
</tr>
</tbody>
</table>

LNA ✓  CONTROL FUNCTION ✓
CORECHIPS ✓  MIXER ✓

Well suited for application from 1 to 40 GHz.
Representative Device: CGY2170UH/C1

Operating range : 8 GHz to 12 GHz
Gain : 5 dB
RMS_phase : 4°
RMS_atten : 0.5 dB

They are designing using OMMIC’s PDK:

**DESIGN CENTER & FAB + SERVICES**

- DESIGN KITS
- FOUNDRY SERVICE
- CUSTOM DESIGN
- MPW SCHEDULE
DESIGN CENTER & FAB + SERVICES

DESIGN KITS

Having trouble finding a product with exotic specification on the market? Check-out other options!

Foundry Service
OMMIC provides its Process Design Kit (PDK) under ADS (Keysight) or Microwave Office (AWR) for customers to design their own product.

Custom Design
OMMIC provides custom design MMIC services based on customer’s specifications, from DC to W-band.

Most of OMMIC’s processes have completed or are running a space evaluation (ESA-EPPL). 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 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
- Electro-thermal simulator
- Design Rules Checking

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

FOUNDRY SERVICE

All of OMMIC’s processes are available for full wafer foundry services. This service comes with on-wafer test (following customer specification) and visual inspection (MIL-STD-883). Before manufacturing, all projects are checked by OMMIC using the OMMIC design rule checker (DRC). DRCs are performed at no extra cost.

A MultiProject Wafer (MPW) 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 its proprietary technologies.

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 annonced MCP start date.
- The order needs to complaint with minimum order value when it is applicable.

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.

<table>
<thead>
<tr>
<th>SIZES</th>
<th>1.5 mm</th>
<th>3 mm</th>
</tr>
</thead>
</table>
| 1 mm  | A ≥ 1.5 mm²  
N = 25 Dies   |  
N = 20 Dies   |
| 2 mm  | A ≥ 3 mm²   
N = 20 Dies   |  
N = 15 Dies   |

A = Area of the reticule
N = Number of dies delivered

Other Die size can sometime be used, please contact OMMIC for special demands.
CUSTOM DESIGN

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.

MPW SCHEDULE

Important dates for available process for Multi Project Wafer (MPW).

- **SPACE QUALIFIED**
  - **ED02AH**
    - 03/09/2019
  - **D01PH**
    - 23/04/2019
    - 10/09/2019
  - **D01MH**
    - 16/04/2019
    - 03/09/2019

- **HIGH INDIUM CONTENT m-HEMT**
  - **D007IH**
    - 28/06/2019
    - 31/10/2019
  - **D004IH**
    - MPW dates not available yet

- **GaN**
  - **D01GH**
    - 30/04/2019
    - 13/08/2019
    - 29/11/2019
  - **D006GH**
    - 30/04/2019
    - 13/08/2019
    - 29/11/2019

For any other information or special request contact information@ommic.com. Visit our website www.ommic.com for up-to-date information.
ESA has already evaluated 3 OMMIC processes: EDO2AH, D01PH and D01MH. These 3 processes being maintained on the ESA EPPL list. Two additional processes are considered to be inserted in the EPPL list after ESA monitored evaluation procedures.

SPACE QUALIFICATION & RELIABILITY CENTER

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

TEST PERFORMED FOR SPACE EVALUATION

All tests below are assembly test for flight models and are performed at OMMIC or specialised external laboratories.

- **BURN-IN-TEST**
  - MIL STD 883 method 1015
- **TEMPERATURE CYCLING**
  - MIL STD 883G 1010 condition C
- **ELECTRICAL MEASUREMENTS**
  - -40°C, room temperature, +85°C
- **HERMETICITY TEST**
- **BOND-PULL**
  - MIL STD-883G method 2019.7z
- **PRE-CAP INSPECTION**
  - NORME ESA ESAC-Q-ST-60-12
- **MECHANICAL SHOCK**
  - MIL STD-883G 2001 condition E, Y1 axis only
- **DIE-SHEAR**
  - MIL STD 883G method 2017
- **CONSTANT ACCELERATION**
  - MIL STD-883G 2001 condition E, Y1 axis only
- **SCC 20400**

More than 50,000 MMICs have been supplied for Flight Models. OMMIC has more than 1,000,000 years of accumulated Flight Life time around earth in several space mission and satellite equipment.

Components from OMMIC have been used in Flight Models in 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 such as Medium Power Amplifiers
- Non Linear Components such as Frequencies Multipliers
- Negative Resistor for Oscillators
- Multi-functions components composed by several function
- Numerical Components as Phase or Frequency Detector

OMMIC has already delivered many standard parts designed during the ECI (European Component Initiative) programs. We can be a custom design center for space qualified components, many of them have already been designed by OMMIC’s design team.

**SPACE HERITAGE**

OMMIC has more than 1,000,000 years of accumulated Flight Life time.
They have already trusted OMMIC:

- MMIC PACKAGING
- SALES REPRESENTATIVE NETWORK
- THEY TRUSTING US
SALES SUPPORT FIELD

MMIC PACKAGING

We are moving towards a word 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.

Example of modeling with EM simulation:

Today, our solutions cover L-, to Ka-band. This includes GaN products for power application, robust LNA and T/R chip front ends.

SALES REPRESENTATIVE NETWORK

A sales and field application team at OMMIC is dedicated to customer sales and technical requests to provide the best support in the shortest time. Due to its world class status and human size, OMMIC is a very flexible company able to follow you in your most challenging projects. You can contact our support team whenever you need at: information@ommic.com or meets us at international RF event such as IMS or EuMW!
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.

Wherever you are, contact us!

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**THEY TRUST US**

More than 160 partners have already trusted OMMIC. Why not you?

& more...