OMMIC

Short Form Catalog 2014

MMIC products from 500MHz to 160GHz
Advanced GaAs, InP, 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
Innovating with III-V’s

GaAs-InP-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 30 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 Service and Epitaxial Wafers based on III-V (GaAs, GaN and InP) 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. All our actions are global and do take into the following areas of improvement.

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.
OMMIC

MMIC Products Selector Guide

Ultra Low Noise Amplifiers (0.5 - 6GHz)
Low Noise Amplifiers (5 - 160GHz)
Power Amplifiers (8 - 46GHz)
Wideband Amplifiers (DC - 54GHz)
Digital Attenuators and Phase shifters (5 - 35GHz)
Corechip and Control functions (5 - 35GHz)
Mixers (0.1 - 10GHz)
OMMIC Portfolio of MMICs, includes LNA from 5 to 160GHz for civil application such as Telecommunication, Passive imaging, Radars but also for space and military applications.

- LNA are manufactured using OMMC 135nm gate length PHEMT Technology (D01PH) or 70nm MHEMT (D007IH) Technology.
- The MMICs use gold bonding pads, backside metallization and are fully protected with Silicon Nitride passivation to obtain the highest level of reliability.
- D01PH technology has been evaluated for Space applications and is on the (EPPL), European Preferred Parts List of the (ESA) European Space Agency.

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**Performance Table for Ultra Low Noise Amplifiers**

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

<table>
<thead>
<tr>
<th>Part number</th>
<th>Operation Frequency (GHz)</th>
<th>Gain (dB)</th>
<th>Noise figure (dB)</th>
<th>OIP3 (dBm)</th>
<th>Bias (V)</th>
<th>Current (mA)</th>
<th>Package</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>CGY2105XHV</td>
<td>0.5 - 4</td>
<td>19</td>
<td>0.42</td>
<td>33</td>
<td>5</td>
<td>2 x 50</td>
<td>QFN 4x4</td>
<td>Production</td>
</tr>
<tr>
<td>CGY2106XHV</td>
<td>0.2 - 5</td>
<td>21</td>
<td>0.45</td>
<td>33</td>
<td>5</td>
<td>2 x 50</td>
<td>QFN 4x4</td>
<td>Production</td>
</tr>
<tr>
<td>CGY2107HV</td>
<td>0.5 - 6</td>
<td>21</td>
<td>0.6</td>
<td>34</td>
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<td>2 x 50</td>
<td>QFN 4x4</td>
<td>Production</td>
</tr>
<tr>
<td>CGY2108HV</td>
<td>0.5 - 6</td>
<td>22</td>
<td>0.6</td>
<td>36</td>
<td>5</td>
<td>2 x 50</td>
<td>QFN 4x4</td>
<td>Production</td>
</tr>
<tr>
<td>CGY2108GS</td>
<td>0.5 - 6</td>
<td>21</td>
<td>0.6</td>
<td>36</td>
<td>5</td>
<td>2 x 50</td>
<td>Flight Model</td>
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<tr>
<td>CGY2109HV</td>
<td>0.5 - 3</td>
<td>20</td>
<td>0.72</td>
<td>32</td>
<td>5</td>
<td>2 x 50</td>
<td>QFN 4x4</td>
<td>Production</td>
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</table>

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**Performance Table for Low Noise Amplifiers MMIC**

OMMIC LNA MMIC are suitable for nowadays satellite, radar, and passive imaging application thanks to very low noise performances.

<table>
<thead>
<tr>
<th>Part number</th>
<th>Operation Frequency (GHz)</th>
<th>Gain (dB)</th>
<th>Noise figure (dB)</th>
<th>OP1dB (dBm)</th>
<th>Bias (V)</th>
<th>Current (mA)</th>
<th>Package</th>
<th>Status</th>
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<tbody>
<tr>
<td>CGY2178UH/C1</td>
<td>5 - 6</td>
<td>30</td>
<td>1</td>
<td>15</td>
<td>3</td>
<td>40</td>
<td>Die</td>
<td>Production</td>
</tr>
<tr>
<td>CGY2180UH/C1</td>
<td>5 - 6</td>
<td>30</td>
<td>1,1</td>
<td>15</td>
<td>3</td>
<td>40</td>
<td>QFN</td>
<td>Sampling</td>
</tr>
<tr>
<td>CGY2120UH/C1</td>
<td>5 - 7</td>
<td>13,2</td>
<td>0,5</td>
<td>12</td>
<td>1</td>
<td>50</td>
<td>Die</td>
<td>Production</td>
</tr>
<tr>
<td>CGY2124UH/C1</td>
<td>8 - 12</td>
<td>32</td>
<td>1,1</td>
<td>10</td>
<td>5</td>
<td>55</td>
<td>Die</td>
<td>Production</td>
</tr>
<tr>
<td>CGY2142HC/C1</td>
<td>8 - 12</td>
<td>32</td>
<td>1,5</td>
<td>10</td>
<td>5</td>
<td>55</td>
<td>HTCC QFN</td>
<td>Sampling</td>
</tr>
<tr>
<td>CGY2125UH/C1</td>
<td>13 - 15</td>
<td>25</td>
<td>1,5</td>
<td>8</td>
<td>3,3</td>
<td>20</td>
<td>Die</td>
<td>Production</td>
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<tr>
<td>CGY2121UH/C1</td>
<td>18 - 26</td>
<td>17,5</td>
<td>1,2</td>
<td>5</td>
<td>0,8</td>
<td>60</td>
<td>Die</td>
<td>Production</td>
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<td>CGY2128UH/C1</td>
<td>24 - 34</td>
<td>24</td>
<td>1,3</td>
<td>11</td>
<td>3,5</td>
<td>47</td>
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<td>Production</td>
</tr>
<tr>
<td>CGY2122UH/C1</td>
<td>25 - 43</td>
<td>32</td>
<td>1,5</td>
<td>1,2</td>
<td>1,1</td>
<td>30</td>
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<td>CGY2123UH/C1</td>
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<td>22</td>
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<td>65</td>
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<td>Production</td>
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<tr>
<td>CGY2190UH/C1</td>
<td>70 - 110</td>
<td>23</td>
<td>3</td>
<td>1</td>
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<td>33</td>
<td>Die</td>
<td>Production</td>
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<tr>
<td>CGY2191UH/C2</td>
<td>100 - 160</td>
<td>20</td>
<td>4</td>
<td>3</td>
<td>1,4</td>
<td>42</td>
<td>Die</td>
<td>Sampling</td>
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</table>
OMMIC LNA Portfolio

Noise Figure (dB)

<table>
<thead>
<tr>
<th>Frequency (GHz)</th>
<th>CGY2105XHV/06XHV/07HV/09HV</th>
<th>CGY2124UH/C1</th>
<th>CGY2122XUH/C2</th>
</tr>
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<tbody>
<tr>
<td>500MHz – 6GHz</td>
<td>NF : 0.5dB</td>
<td>8 – 12GHz</td>
<td>NF : 1.4dB</td>
</tr>
<tr>
<td>20dB gain</td>
<td></td>
<td>Single supply</td>
<td></td>
</tr>
<tr>
<td>500MHz – 6GHz</td>
<td>NF : 0.5dB</td>
<td>8 – 12GHz</td>
<td>NF : 1.4dB</td>
</tr>
<tr>
<td>20dB gain</td>
<td></td>
<td>Single supply</td>
<td></td>
</tr>
<tr>
<td>25 – 43GHz</td>
<td>NF : 1.5dB</td>
<td>25 – 43GHz</td>
<td>NF : 1.5dB</td>
</tr>
<tr>
<td>32 dB Gain</td>
<td></td>
<td>32 dB Gain</td>
<td></td>
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</tbody>
</table>
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 OMMC 135nm gate length PHEMT Technology D01PH or 125nm MHEMT Technology D01MH.

### Performance Table for Power Amplifiers

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

<table>
<thead>
<tr>
<th>Part number</th>
<th>Operation Frequency (GHz)</th>
<th>Gain (dB)</th>
<th>Saturated Power (dBm)</th>
<th>Compression point P1dB (dBm)</th>
<th>Bias Voltage (V)</th>
<th>Bias Current (A)</th>
<th>Package</th>
<th>Status</th>
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</thead>
<tbody>
<tr>
<td>CGY2139MUH/C1</td>
<td>8 - 12</td>
<td>22</td>
<td>23</td>
<td>22</td>
<td>8</td>
<td>0.1</td>
<td>DIE</td>
<td>Production</td>
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<tr>
<td>CGY2139PUH/C1</td>
<td>8 - 12</td>
<td>19</td>
<td>27</td>
<td>26</td>
<td>7</td>
<td>0.18</td>
<td>DIE</td>
<td>Production</td>
</tr>
<tr>
<td>CGY2139ALUH/C1</td>
<td>8 - 12</td>
<td>23</td>
<td>40.5</td>
<td>39.6</td>
<td>8.5</td>
<td>3.9</td>
<td>DIE</td>
<td>Production</td>
</tr>
<tr>
<td>CGY2139AUH/C2</td>
<td>8 - 12</td>
<td>25</td>
<td>41</td>
<td>40.1</td>
<td>8.5</td>
<td>4.9</td>
<td>DIE</td>
<td>Production</td>
</tr>
<tr>
<td>CGY2134UH/C1</td>
<td>18 - 23</td>
<td>22</td>
<td>22</td>
<td>21</td>
<td>4.5</td>
<td>0.3</td>
<td>DIE</td>
<td>Production</td>
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<tr>
<td>CGY2135UH/C1</td>
<td>18 - 23</td>
<td>19</td>
<td>33.1</td>
<td>32.3</td>
<td>4.0</td>
<td>1.2</td>
<td>DIE</td>
<td>Production</td>
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<tr>
<td>CGY2138UH/C1</td>
<td>27.5 - 31</td>
<td>20</td>
<td>37</td>
<td>36</td>
<td>4.5</td>
<td>5.6</td>
<td>DIE</td>
<td>Production</td>
</tr>
<tr>
<td>CGY2130UH/C1</td>
<td>37 - 41</td>
<td>22</td>
<td>27</td>
<td>26</td>
<td>4.5</td>
<td>0.63</td>
<td>DIE</td>
<td>Production</td>
</tr>
<tr>
<td>CGY2132UH/C1</td>
<td>37 - 41</td>
<td>19</td>
<td>30</td>
<td>25.3</td>
<td>4.5</td>
<td>1.45</td>
<td>DIE</td>
<td>Production</td>
</tr>
<tr>
<td>CGY2131UH/C1</td>
<td>39 - 44</td>
<td>22</td>
<td>27</td>
<td>26.2</td>
<td>4.5</td>
<td>0.57</td>
<td>DIE</td>
<td>Production</td>
</tr>
<tr>
<td>CGY2133UH/C1</td>
<td>39 - 44</td>
<td>19</td>
<td>30</td>
<td>28</td>
<td>4.5</td>
<td>1.33</td>
<td>DIE</td>
<td>Production</td>
</tr>
<tr>
<td>CGY2136UH/C1</td>
<td>40 - 46</td>
<td>20</td>
<td>33.5</td>
<td>33</td>
<td>4.5</td>
<td>2.6</td>
<td>DIE</td>
<td>Production</td>
</tr>
</tbody>
</table>

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 OMMC 135nm gate length PHEMT Technology D01PH or 125nm MHEMT Technology D01MH.

### Performance Table for Wideband Amplifiers

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

<table>
<thead>
<tr>
<th>Part number</th>
<th>Operation Frequency (GHz)</th>
<th>Gain (dB)</th>
<th>NF (dB)</th>
<th>Compression point P1dB (dBm)</th>
<th>Bias Voltage (V)</th>
<th>Bias Current (mA)</th>
<th>Package</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>CGY2141UH/C1</td>
<td>DC - 46</td>
<td>16</td>
<td>2</td>
<td>21</td>
<td>5</td>
<td>195</td>
<td>DIE</td>
<td>Production</td>
</tr>
<tr>
<td>CGY2144UH/C2</td>
<td>DC - 54</td>
<td>13</td>
<td>2.5</td>
<td>15</td>
<td>5</td>
<td>100</td>
<td>DIE</td>
<td>Production</td>
</tr>
<tr>
<td>CGY2145UH/C1</td>
<td>0.5 - 45</td>
<td>12.7</td>
<td>1.8</td>
<td>18</td>
<td>5</td>
<td>85</td>
<td>DIE</td>
<td>Production</td>
</tr>
<tr>
<td>CGY2160UH/C1</td>
<td>1.5 - 47</td>
<td>14.5</td>
<td>2.5</td>
<td>17</td>
<td>5</td>
<td>103</td>
<td>DIE</td>
<td>Production</td>
</tr>
</tbody>
</table>
OMMIC Power Amplifiers and Wideband Amplifiers Portfolio

OMMIC Power Amplifiers

OMMIC Wideband Amplifiers
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**

**What is the issue without a SIPO integrated on the die?**

If not using a SIPO, you need to control each phase state and attenuation state through a parallel control.

This means many wires in parallel and very bad integration.

For example, for a 12 bit corechip (6 bit phase shifter + 6 bit attenuator) the user will need at least 24 bonding wires to control each state.

To solve serial interface issues, some suppliers provide external serial converter dies in CMOS, but this doesn’t solve integration issues due to the large amount of bonding between CMOS die and phase + attenuation die.

**What is the advantage of OMMIC ED02AH Process?**

Thanks to its ED02AH process, OMMIC can integrate in the same MMIC, enhanced and depletion transistors. Depletion transistors can be used for analog functions such as phase shifter and attenuators.

Enhanced transistors help to simplify and better integrate digital functions.

This enables OMMIC to integrate on the MMIC, the SIPO. Then the Corechip or Multifunction chip can be controlled in serial mode with only 3 wires (Data input, Clock, and Latch enable).

**OMMIC solution for highly integrated control functions?**

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

OMMIC solution for highly integrated control functions?
### OMMC Control Functions

<table>
<thead>
<tr>
<th>Function Type</th>
<th>Frequency (GHz)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>S</strong></td>
<td>0 - 4</td>
</tr>
<tr>
<td><strong>C</strong></td>
<td>4 - 6</td>
</tr>
<tr>
<td><strong>K</strong></td>
<td>6 - 10</td>
</tr>
<tr>
<td><strong>Ku</strong></td>
<td>10 - 18</td>
</tr>
<tr>
<td><strong>Ka</strong></td>
<td>18 - 38</td>
</tr>
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</table>

#### Control Functions Portfolio

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Function Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CGY2177SUH</td>
<td>6 bits / RMS phase err 6°</td>
</tr>
<tr>
<td>CGY2177XBUH</td>
<td>6 bits / RMS phase err 6°</td>
</tr>
<tr>
<td>2174UH</td>
<td>6 bits</td>
</tr>
<tr>
<td>CGY2176UH</td>
<td>6 bits / RMS Att 0,2dB</td>
</tr>
<tr>
<td>CGY2171XBUH</td>
<td>6 bits / RMS 0.25dB</td>
</tr>
<tr>
<td>CGY2169UH</td>
<td>6 bits / RMS 0.4dB</td>
</tr>
<tr>
<td>CGY2150SUH</td>
<td>3 bits / RMS 0.2dB</td>
</tr>
<tr>
<td>CGY215AUH</td>
<td>3 ports / 8 bits</td>
</tr>
<tr>
<td>CGY2170UH</td>
<td>4 ports / 7 bits</td>
</tr>
<tr>
<td>CGY2170XUH</td>
<td>4 ports / 6 bits</td>
</tr>
<tr>
<td>CGY239SUH</td>
<td>5 bits / 0,1 to 51,3ps</td>
</tr>
<tr>
<td>CGY2394SUH</td>
<td>1 bit / 30ms</td>
</tr>
</tbody>
</table>

#### Key Features

- **Control Functions**: Includes serial input parallel output interface, phase shifters, and attenuators.
- **Frequency Coverage**: From 0 to 38 GHz.
- **Performance Metrics**: RMS phase error, RMS attenuation, and port counts.

#### Innovating with III-V's

OMMIC offers a portfolio of control functions optimized for various bandwidths and applications, leveraging III-V materials for high performance and reliability.
Corechip and control function are manufactured using OMMIC 180nm gate length ED02AH E/D PHEMT Technology which is space qualified by ESA.

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
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<tbody>
<tr>
<td>CGY2175AUH/C1</td>
<td>4.5 - 6.5</td>
<td>6</td>
<td>3 ports</td>
<td>31.5 / 360</td>
<td>0.2 / 1.3</td>
<td>0 / +5</td>
<td>Die</td>
<td>Production</td>
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<tr>
<td>CGY2175BUH/C1</td>
<td>4.5 - 6.5</td>
<td>6</td>
<td>4 ports</td>
<td>31.5 / 360</td>
<td>0.3 / 1.8</td>
<td>0 / +5</td>
<td>Die</td>
<td>Production</td>
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<tr>
<td>CGY2170UH/C2</td>
<td>8.5 - 11.5</td>
<td>7</td>
<td>4 ports</td>
<td>31.5 / 360</td>
<td>0.25 / 5</td>
<td>0 / +5</td>
<td>Die</td>
<td>Production</td>
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<tr>
<td>CGY2170XUH/C2</td>
<td>8 - 12</td>
<td>6</td>
<td>4 ports</td>
<td>31.5 / 360</td>
<td>0.3 / 3</td>
<td>0 / +3</td>
<td>Die</td>
<td>Production</td>
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<tr>
<td>CGY2170XHC/C2</td>
<td>8 - 12</td>
<td>6</td>
<td>4 ports</td>
<td>31.5 / 360</td>
<td>0.3 / 3</td>
<td>0 / +3</td>
<td>HTCC QFN</td>
<td>Sampling</td>
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<tr>
<td>CGY2170YUH/C1</td>
<td>8 - 12</td>
<td>6</td>
<td>3 ports</td>
<td>31.5 / 360</td>
<td>0.4 / 3</td>
<td>0 / +3</td>
<td>Die</td>
<td>Production</td>
</tr>
<tr>
<td>CGY2350UH/C1</td>
<td>34 - 36</td>
<td>5</td>
<td>3 ports</td>
<td>31.5 / 360</td>
<td>2 / 8</td>
<td>0 / +3</td>
<td>Die</td>
<td>Development</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Part number</th>
<th>Operation Frequency (GHz)</th>
<th>Resolution [bits]</th>
<th>Topology</th>
<th>Gain/Noise (dB)</th>
<th>RMS Phase Error (dB)</th>
<th>Ctrl interface (V)</th>
<th>Package</th>
<th>Status</th>
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</thead>
<tbody>
<tr>
<td>CGY2179UH1</td>
<td>10.7 - 12.75</td>
<td>4</td>
<td>2 ports</td>
<td>12 / 1.9</td>
<td>7</td>
<td>0 / +5</td>
<td>Die</td>
<td>Production</td>
</tr>
<tr>
<td>CGY2179HV1</td>
<td>10.7 - 12.75</td>
<td>4</td>
<td>2 ports</td>
<td>12 / 2</td>
<td>7</td>
<td>0 / +5</td>
<td>QFN 4x5</td>
<td>Production</td>
</tr>
</tbody>
</table>

For system integrators who want to separate attenuation and phase shifting control OMMIC do offer stand alone functions of Digitally controlled attenuators, Digitally controlled Phase shifter or Digitally controlled True Time Delay.

<table>
<thead>
<tr>
<th>Part number</th>
<th>Operation Frequency (GHz)</th>
<th>Resolution [bits]</th>
<th>Insertion Loss (dB)</th>
<th>Phase Range (°)</th>
<th>RMS Phase Error (°)</th>
<th>Ctrl interface (V)</th>
<th>Package</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>CGY2177AUH/C1</td>
<td>4.8 - 5.8</td>
<td>6</td>
<td>5</td>
<td>360</td>
<td>2</td>
<td>0 / +5</td>
<td>Die</td>
<td>Production</td>
</tr>
<tr>
<td>CGY2173UH/C2</td>
<td>6 - 18</td>
<td>6</td>
<td>12</td>
<td>360</td>
<td>6</td>
<td>0 / -3</td>
<td>Die</td>
<td>Production</td>
</tr>
<tr>
<td>CGY2172XAUH/C1</td>
<td>8 - 12</td>
<td>6</td>
<td>8</td>
<td>360</td>
<td>2</td>
<td>0 / -3</td>
<td>Die</td>
<td>Production</td>
</tr>
<tr>
<td>CGY2172XBUH/C1</td>
<td>8 - 12</td>
<td>6</td>
<td>8</td>
<td>360</td>
<td>3</td>
<td>0 / +5</td>
<td>Die</td>
<td>Production</td>
</tr>
<tr>
<td>CGY2392SUH/C1</td>
<td>6 - 18</td>
<td>6</td>
<td>10.8</td>
<td>360</td>
<td>1.7</td>
<td>0 / +5</td>
<td>Die</td>
<td>Sampling</td>
</tr>
<tr>
<td>CGY2174UH/C1</td>
<td>13 - 16</td>
<td>6</td>
<td>8</td>
<td>360</td>
<td>6</td>
<td>0 / -3.3</td>
<td>Die</td>
<td>Production</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Part number</th>
<th>Operation Frequency (GHz)</th>
<th>Resolution [bits]</th>
<th>Insertion Loss (dB)</th>
<th>Attenu Range (dB)</th>
<th>RMS Attenu Error (dB)</th>
<th>Ctrl interface (V)</th>
<th>Package</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>CGY2176AUH/C1</td>
<td>1 - 8</td>
<td>6</td>
<td>5.6</td>
<td>31.5</td>
<td>0.2</td>
<td>0 / +5</td>
<td>Die</td>
<td>Production</td>
</tr>
<tr>
<td>CGY2171XAUH/C1</td>
<td>1 - 15</td>
<td>6</td>
<td>5</td>
<td>31.5</td>
<td>0.25</td>
<td>0 / -3</td>
<td>Die</td>
<td>Production</td>
</tr>
<tr>
<td>CGY2171XBUH/C1</td>
<td>1 - 15</td>
<td>6</td>
<td>5</td>
<td>31.5</td>
<td>0.25</td>
<td>0 / -3</td>
<td>Die</td>
<td>Production</td>
</tr>
<tr>
<td>CGY2390SUH/C1</td>
<td>6 - 18</td>
<td>6</td>
<td>4</td>
<td>35</td>
<td>0.2</td>
<td>0 / +5</td>
<td>Die</td>
<td>Sampling</td>
</tr>
<tr>
<td>CGY2199UH/C1</td>
<td>10 - 18</td>
<td>6</td>
<td>4</td>
<td>23.5</td>
<td>0.4</td>
<td>0 / -3.3</td>
<td>Die</td>
<td>Production</td>
</tr>
</tbody>
</table>

Innovating with III-V's
OMMIC

Foundry Services & III-V Processes

On site Epitaxy and Custom wafers processing
ED02AH 0.18um E/D GaAs pHEMT
D01PH 0.13um GaAs pHEMT
D01MH 0.13um GaAs mHEMT
D007IH 70nm GaAs mHEMT
D004IH 40nm GaAs mHEMT
DH15IB 0.15um InP/HBT
D01GH 100nm GaN/Si
OMMIC is a supplier of InP, GaN and GaAs based MMIC circuits and services to the Professional 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 HEMT 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 100nm. Another newly released process is D025PHS which is a 250nm pHemt D mode, enabling high power from C to X band (12W at 10GHz).

<table>
<thead>
<tr>
<th>Process Name</th>
<th>Type</th>
<th>Gate length (μm)</th>
<th>Status</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>ED02Ah</td>
<td>pHEMT</td>
<td>0.18</td>
<td>Full Production</td>
<td>60 GHz E/D mode</td>
</tr>
<tr>
<td>D01PH</td>
<td>pHEMT</td>
<td>0.13</td>
<td>Full Production</td>
<td>100 - 180 GHz power D mode</td>
</tr>
<tr>
<td>D01MH</td>
<td>mHEMT</td>
<td>0.1</td>
<td>Full Production</td>
<td>150 -250 GHz Power D mode</td>
</tr>
<tr>
<td>DH15B</td>
<td>HBT</td>
<td>1.5</td>
<td>Released</td>
<td>180 - 220 GHz InP HBT</td>
</tr>
<tr>
<td>D007H</td>
<td>mHEMT</td>
<td>0.07</td>
<td>Released</td>
<td>300 GHz low-noise, D-mode</td>
</tr>
<tr>
<td>E014H</td>
<td>mHEMT</td>
<td>0.1</td>
<td>Development</td>
<td>200 GHz E mode</td>
</tr>
<tr>
<td>D004H</td>
<td>mHEMT</td>
<td>0.04</td>
<td>Development</td>
<td>400-600 GHz low-noise, D mode</td>
</tr>
<tr>
<td>DH05B</td>
<td>HBT</td>
<td>0.5</td>
<td>Development</td>
<td>250-300GHz InP HBT</td>
</tr>
<tr>
<td>D025PHS</td>
<td>pHEMT</td>
<td>0.25</td>
<td>Released</td>
<td>60 GHz power D mode</td>
</tr>
<tr>
<td>D01GH</td>
<td>GaN/Si</td>
<td>0.1</td>
<td>Development</td>
<td>100 -200 GHz power D-mode</td>
</tr>
</tbody>
</table>

OMMIC’s InGaAs mHEMT process contains up to 80% indium in the InGaAs layer. Ommic uses this process to target low-noise and power devices fabricated on GaAs and InP substrates. The High Indium content in the InGaAs channel on a GaAs substrate yields performance equivalent to pHEMT on an InP substrate, with lower costs and easier fabrication.

OMMIC’s RF device catalog includes E/D-mode pHEMT, power pHEMT, general-purpose mHEMT, low noise MHEMT, E-Mode MHEMT and InP DHBT processes. Gate Lengths from 180nm to 70nm with F't's from 60 GHz to 300 GHz. The pHEMT and mHEMT devices are processed on GaAs substrate and the HBT devices on InP substrates.
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 40nm with D004IH process. With 100nm GaN/Si and D025PHS process OMMIC is targeting power applications from X to E band. The roadmap will lead us to develop sub 50nm GaN/Si in the future to target higher power at up to W band.
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**

0.18 μm 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)

**RF and DC Characteristics:**
- Two Threshold Voltages (Vt’s):
  - Enhancement Mode (225 mV)
  - Depletion Mode (-900 mV)
- Vbgd 8 V (typical)
- Ft’s of 63 GHz and 60 GHz (PCM)
- Full set of passives:
  - Epitaxied Resistors, NiCr Resistors, MIM capacitors (400 pf/mm² and 49 pf/mm²), Spirals, Air Bridges, Via holes, Microbumps, Fully passivated Chips with 150nm SiN passivation layer or optional 300nm for packaged devices.

This process is Space evaluated and EPPL listed by ESA.

**D01PH Process**

135 nm PHEMT D mode – Fully available in Production since 1999
Optimized for Ultra Low Noise and medium power application from 1GHz to 50GHz.

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

**RF and DC Characteristics:**
- Vbgd 12 V (typical)
- Vt of -0.9V
- Ft of 100 GHz
- Fmax of 180 GHz
- NFmin at 30GHz of 1dB
- P1dB/mm (40GHz)> 400mW/mm
- Full set of passives:
  - Epitaxied Resistors, NiCr Resistors, MIM capacitors, Spirals, Air Bridges, Via holes, Microbumps, Fully passivated Chips with 150nm SiN passivation layer or optional 300nm for packaged devices.
  - Thickness of 100um with possibility of 70um if special request
  - Thick metal option available for optimized noise performances.

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**

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

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

**RF and DC Characteristics**:
- $V_{bgd}$ 10 V (typical)
- $V_t$ of -0.9V
- $F_t$ of 150 GHz
- $F_{max}$ of 250 GHz
- $N_{Fmin}$ at 30GHz of 0.85dB
- Associated Gain at 30GHz of 11.5dB
- Full set of passives: Epitaxied Resistors, NiCr Resistors, MIM capacitors, Spirals, Air Bridges, Via holes, Microbumps, Fully passivated Chips with 150nm SiN.

Thickness of 100um
Thick metal option available for optimized noise performances.

This process is under space evaluation by ESA (to be completed by Q4 2014).

**D007IH Process**

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

Well suited for telecommunication, Satcom, Passive Imaging
Typical 2.8dB noise around 90GHz.

**RF and DC Characteristics**:
- Advanced 70 nm double - mushroom gate
- High In Channel (70 %)
- Outstanding $F_t$ : 300 GHz
- Very Low Noise : 0.5 dB Minimum Noise Figure at 30 GHz
- Associated Gain : 12.5dB at 30GHz
- $F_{max}$ of 450 GHz
- Full set of passives based on D01PH:
  Epitaxied Resistors, NiCr Resistors, MIM capacitors, Spirals, Air Bridges, Via holes, Microbumps, Fully passivated Chips with 150nm SiN passivation layer or optional 300nm for packaged devices.
  Thickness of 100um with possibility
  Thick metal option available for optimized noise performances.
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.

**DH15IB InP HBT**

*1.5 µm Emitter length D-mode* – Available as Pre-production, prototyping and shared wafer services

Optimized for VCO and mixers from C to V band.

Well suited for High data rate interfaces, TIA, Drivers, very low phase noise oscillators, mixers.

**RF and DC Characteristics:**
- Vce 6 V
- Ft of 180 GHz
- Fmax of 220 GHz

**D01GH GaN/Si Power Process**

*100 nm GaN/Si* – Available upon request for design and prototyping

Design Kit available. Shared wafer services available Q4 2014.

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

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

**RF and DC Characteristics:**
- Vbgd 30 V
- Ft of 95 GHz
- Fmax of 190 GHz
- Power: 3.2W/mm of gate at 30GHz
- PAE: 35%
- Mushroom Gate (100nm – 60nm)
- In situ passivated (for low lag effect <10%)
- Regrown ohmic contact (for high Gm)
- Full set of passives like D01PH

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

**D025PHS Power Process**

*250 nm PHEMT* – Prototyping

Optimized for power application from 5GHz to 20GHz

Well suited for telecommunication, Civil or Military Radar application or Satcom. Can be used for MMIC design or as stand alone power bars.

**Example of target:** 14W Psat in X band

**RF and DC Characteristics:**
- Vbgd of 16V
- Vt of -0.9V
- Ft: 37 GHz
- Fmax: 95GHz
- Power: 1.7W/mm of gate at 10GHz

*Xband radar (source US Navy)*
OMMIC
Design Center & Fab+

Custom designs team
Challenging designs from 5 to 160GHz
ADS SPICE and AWR design Kits
Multi Chip Projects shared wafers service
Simulation and Extractions for customers
System Models
OMMIC provides services to Customers requiring specific MMICs:

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

OMMIC has a long history of fully open Foundry Service. All OMMC 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”)

The OMMC design Manuals and design tools are extremely comprehensive and allow any type of design, from 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. OMMC 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 TransImpedance 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.

Thanks to proximity of Fabrication Line, Test Center, Reliability Center and Modeling Team on the same site, OMMC Design Center is able to obtain the best from all the OMMC 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 offered this service for a long time for his mature proprietary technologies.

**Technologies**:

The following list of OMMIC technologies can be used following the MCP projects:

- **D01PH**: Depletion mode PHEMT process with a gate length of 0.13 µm for both power and high frequency designs.
- **ED02AH**: Enhancement and Depletion mode PHEMT process with a gate length of 0.18 µm for analog and mixed analog/digital designs.
- **D01MH**: Depletion mode MHEMT process with a gate length of 0.13 µm for low noise, power and high frequency designs.
- **D007IH**: Depletion mode MHEMT process with a gate length of 0.07 µm for low noise and very high frequency designs.
- **DH15IB**: Double Heterojunction HBT process with an emitter of 1.5 µm for very high speed digital and high frequency RF designs.

**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 need to complain with minimum order value when it is applicable.

**Available die sizes**:

The following sizes are available for the MCP runs:

<table>
<thead>
<tr>
<th>X, Y dimension of the die</th>
<th>1.5mm</th>
<th>3mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>1mm</td>
<td>A=1.5 mm² N=25 dies</td>
<td>A=3 mm² N=20 dies</td>
</tr>
<tr>
<td>2mm</td>
<td>A=3 mm² N=20 dies</td>
<td>A=6 mm² N=15 dies</td>
</tr>
</tbody>
</table>

X, Y dimension of the die
A : Surface of the reticule  N : Number of dies delivered

Other Die size can be used, please contact OMMIC for special demands.
State of the art processes for space application
Space qualified processes
Wafer and Lot qualification capabilities
Reliability team dedicated to qualify flight models
Products in ESA preferred part list
More than 30,000 flight model delivered
More than 30,000 MMICs have been supplied for Flight Models. OMMIC has more than 100,000 yrs of accumulated Flight Life time around earth in several space mission and satellites equipments.

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 2 OMMIC processes ED02AH and D01PH, this 2 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 the OMMIC’s design team of OMMIC.

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.

<table>
<thead>
<tr>
<th>QUALIFICATION FLOW</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Packaged Chips</td>
<td>• Die-shear (MIL-STD-883G,method 2011.7)- 2 samples/ batch</td>
</tr>
<tr>
<td></td>
<td>• Bond-pull (MIL-STD-883G,method 2019.7)- 2 samples/ batch</td>
</tr>
<tr>
<td></td>
<td>• Pre-cap inspection (SCC 20400)</td>
</tr>
<tr>
<td></td>
<td>• Hermeticity test</td>
</tr>
<tr>
<td>Initial electrical measurements</td>
<td>• OMMIC specification</td>
</tr>
<tr>
<td></td>
<td>• 12 chips by wafer all kinds of considered MMIC</td>
</tr>
<tr>
<td></td>
<td>• 100% of MMIC</td>
</tr>
<tr>
<td>Burn-in test</td>
<td>• MIL STD 883 method 1015</td>
</tr>
<tr>
<td></td>
<td>• 160h @ 125°C (oven temperature)</td>
</tr>
<tr>
<td>Final electrical measurements &amp; External visual inspection</td>
<td>• OMMIC specification</td>
</tr>
<tr>
<td></td>
<td>• Hermeticity test0</td>
</tr>
<tr>
<td>Delivered</td>
<td>• Temperature cycling (MIL-STD-883G / 1010 cond. C)</td>
</tr>
<tr>
<td>LAT</td>
<td>• Constant Accélaration (MIL-STD-883G / 2001 cond. E, Y1 axis only)</td>
</tr>
<tr>
<td></td>
<td>• Electrical measurements (-20°C, room temperature, +80°C)</td>
</tr>
</tbody>
</table>

Aging biasing test bench

Burn-in Tests ovens
OMMIC
Production Line & and Back-end

More than 40 years in III-V industry
Class 10.000 production clean room
Certified ISO9001 ISO14001 and RoHs compliant
Standard and Space grade visual inspection
On wafer test capabilities for microwave & mmW products
Competitive lead times and maximum flexibility
OMMIC was founded on January 1, 2000 by Philips, based on a track record of 30 years of cutting-edge research and development in the fields of III/V epitaxy and integrated circuits technologies. Today, OMMC is an independent SME.

OMMIC consists of 5 main buildings of which about 1000 m² is of clean rooms of class 1000 and class 100 which are fully devoted to III-V IC development and fabrication.

Our society delivers MMICS products (standard and custom) : PHEMT 0.18 µm (ED02AH), PHEMT 0.13 µm (D01PH), MHEMT 0.13μm (D01MH) and now MHEMT 0.07μm (D007IH).

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 followed too 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 Sij, 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 micro and mm Wave 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 to allow us to implement prompt corrective or preventive response and to verify the final quality of each die before sending to our customers.

For this, we performed 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.
OMMIC
Sales support & Application

Global and dedicated customer support
System studies support
On field demonstration upon request
Mounting support
Packaging support
Custom modules design studies

Innovating with III-V's
Based in France, in the 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.

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.

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 meet us during events such as IMS or EuMW.

For all other countries including USA, Canada, UK, Germany and Spain OMMIC sales in direct.

Contact us at information@ommic.com
OMMIC
Short Form Catalog 2014

Address:
2 rue du Moulin
94453 Limeil Brevannes
France

Visit us
www.ommic.com

Contact us
information@ommic.com