Applications

- Observation satellite payloads
- Scientific satellite payloads

Main features

- X-band transmission capability (8025-8400 MHz)
- Quick customization thanks to flexible design
- Wideband operation handling up to 155.5 Mbps information rate
- Higher data rate available with four transmitters (up to 622 Mbps)
- Automatic Earth station acquisition mode at equipment switch-ON
- Efficient EDAC circuits (Reed-Solomon 239/255, trellis coding) and frame interleaving capabilities
- Spectrally-optimized modulation schemes (TCM 5/6 or 2/3 8-PSK; QPSK option)
- High RF output power (6 W)
- Compatible with main bus interfaces (command & telemetry formats, 22 to 100 V range)
- Optimized heat flux density

Background since 1990

- Telecommunications key programs: Worldstar (L band modulator), Stentor (Ku band modulator).
- Observation programs: SPOT 5, Demeter, Essaim

Technical description

- Very compact design
- Large scale of integration of the digital circuits (FPGA’s and ASIC’s)
- Simple digital interfaces (parallel bus) and robust synchronization principle
- Parallel digital processing within the equipment
- Low and medium RF section based on MMIC chips
- In house power hybrids
- Automatic operational modes limiting the TM/TC interfaces
- Up to date overall power efficiency
- Control section and EPC based on surface mounted devices

Production

Typical schedule: 12 months
### Block Diagram

#### Interface / coding PCB
- **Input interface**
- **Scrambling / RS coding / interleaving / coder/mapper**
- **Transcoder**
- **I8PSK / QPSK modulator**
- **RF chain**

#### Data clock
- **Negatron**
- **DR**
- **XO**

#### FIFO status
- **DATA_IN[0:7]**
- **Byte clock**
- **SSPA_alim_TM**
- **Temp_TM**
- **VCO_TM**
- **Num_alim_TM**
- **Clk_S**
- **PLL**

#### Primary bus
- **TC_ON**
- **TC_OFF**
- **TC_data_N/R**

#### Typical performances

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Performance 8PSK</th>
<th>Performance QPSK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output power</td>
<td>Up to 6 W / 10 W option</td>
<td>Up to 22 W (^{(1)})</td>
</tr>
<tr>
<td>Useful data rate</td>
<td>Up to 155 Mbps (67 Mbauds)</td>
<td>Up to 140 Mbps (75 Mbauds)</td>
</tr>
<tr>
<td>Frequency</td>
<td>Between 8025 and 8400 MHz, +/−13 ppm</td>
<td>Between 8025 and 8400 MHz, +/−13 ppm</td>
</tr>
<tr>
<td>Stability</td>
<td>6.5 dB (TCM 2/3)</td>
<td>9 dB (^{(3)})</td>
</tr>
<tr>
<td>Eb/No @ BER = 10⁻⁹</td>
<td>8.2 dB (TCM 5/6)</td>
<td>&lt; 35 W (^{(2)})</td>
</tr>
<tr>
<td>DC power consumption</td>
<td>&lt; 35 W (^{(2)})</td>
<td>1.37 kg (^{(2)})</td>
</tr>
<tr>
<td>Mass</td>
<td>1.37 kg</td>
<td>255<em>91</em>103 mm³ (^{(3)})</td>
</tr>
<tr>
<td>Dimensions</td>
<td>255<em>91</em>103 mm³ (^{(3)})</td>
<td>1.37 kg</td>
</tr>
<tr>
<td>Thermal environment</td>
<td>-10/+50 °C (operating)</td>
<td>-10/+50 °C (operating)</td>
</tr>
<tr>
<td></td>
<td>-20/+60 °C (qualification)</td>
<td>20/+60 °C (qualification)</td>
</tr>
<tr>
<td>Reliability</td>
<td>600 fits @ 40 °C</td>
<td>600 fits @ 40 °C</td>
</tr>
</tbody>
</table>

\(^{(1)}\) for QPSK, external SSPA with up to 22 W output power can be proposed, depending on link budget.

\(^{(2)}\) 6 W RF output power.

\(^{(3)}\) with (255, 238) RS coding.

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