High-Power Outdoor C-, X- and Ku-Band Power Amplifiers

Overview
Comtech EF Data’s (CEFD) series of High-Power Outdoor (HPOD) C-, X-, and Ku-Band Solid-State Power Amplifiers (SSPAs) provide a cost-effective option to TWT amplifiers in satellite communications terminals. The HPOD delivers its rated power, guaranteed at the 1 dB compression point to the transmit waveguide flange.

Field Replaceable Power Supply
Recognizing that the MTBF limiting factor for almost all electronic equipment is the power supply, the HPOD provides for easy field replacement. Simply disconnect the AC mains, release the captive fasteners, and remove the supply from the SSPA module.

The Solid-State Advantage
Each HPOD is constructed with highly reliable GaAs FETs. High linearity SSPA technology enables achieving intermodulation specifications using lower power amplifiers. The HPOD SSPA also provides an MTBF that is 4 to 5 times greater than legacy TWT MTBFs.

Functional Description
An HPOD consists of an SSPA module with the Monitor/Control Processor (MCP), a field replaceable power supply, and a field replaceable fan assembly. The amplifier features a Comtech EF Data low-loss combining technique and MCP-based temperature versus gain compensation.

Redundant Systems
The HPOD amplifiers were designed from the start to provide cost-effective 1:1 or 1:2 systems. Redundant system control is built into the unit, eliminating an external controller with its associated cabling. This provides a cost benefit to our customers both at initial purchase and at installation.

Higher Power Through Phase Combining
Comtech EF Data’s phase-combined systems allow the outputs of two amplifiers to be summed together. A “normal” 1:1 system using 300 W amplifiers provides 300 W of output power (the offline unit’s capabilities are unusable). The same amplifiers in a 1+1 phase-combined system will provide 600 W of output power in normal operation, and a “soft failure” state of 300 W. If no degradation on failure can be accommodated, a third amplifier can be added to form a 1:2 phase-combined system.

Optional “Smart BUC” Functionality
Our unique approach to L-Band/RF frequency conversions eliminates DC and 10 MHz from the input coax. This greatly simplifies redundant and multi-carrier operation. It offers full 13.75 to 14.5 GHz Ku-Band coverage and supports industry standard FSK modem/BUC communications. The optional BUC can lock to an external or internal reference oscillator.

Feature Packed
The HPOD SSPAs come equipped with useful features that other manufacturers offer as options. Included in each unit’s base price are temperature compensation, sample ports, power monitor, field-replaceable power factor corrected supply, and full remote monitor and control capabilities.

www.comtechefdata.com
Specifications

Output

<table>
<thead>
<tr>
<th>Spec</th>
<th>C-Band</th>
<th>X-Band</th>
<th>Ku-Band</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>5.850 to 6.425 GHz, 5.850 to 6.725 GHz (Optional)</td>
<td>7.9 to 8.4 GHz</td>
<td>14.0 to 14.5 GHz, 13.75 to 14.5 GHz (Optional)</td>
</tr>
</tbody>
</table>

Available Power

<table>
<thead>
<tr>
<th>Outputs (Psat), W</th>
<th>200 (250)</th>
<th>250 (300)</th>
<th>200 (250)</th>
<th>400 (500)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Psat), W (See Note)</td>
<td>350 (400)</td>
<td>500 (600)</td>
<td>80 (100)</td>
<td>40 (60)</td>
</tr>
<tr>
<td>Phases Combined Systems (Psat), W (See Note)</td>
<td>700 (800)</td>
<td>800 (1000)</td>
<td>1000 (1200)</td>
<td>200 (250)</td>
</tr>
<tr>
<td>160 (200)</td>
<td>200 (250)</td>
<td>40 (60)</td>
<td>80 (100)</td>
<td>40 (60)</td>
</tr>
<tr>
<td>500 (600)</td>
<td>500 (600)</td>
<td>1000 (1200)</td>
<td>200 (250)</td>
<td>40 (60)</td>
</tr>
</tbody>
</table>

Mute: -60 dBc
Impedance: 50 Ω
VSWR: 1.25:1 maximum

Gain

Linear

<table>
<thead>
<tr>
<th>Spec</th>
<th>C-, X-, and Ku Band</th>
<th>70 dB min., 75 dB typical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adjust</td>
<td>20 dB in 0, 25 dB steps</td>
<td></td>
</tr>
</tbody>
</table>

Full Band: ± 1.0 dB
Per 40 MHz: ± 0.25 dB
-40 to +55°C: ± 1.0 dB

Linearity

Third Order Intermodulation Products

Linear (typ.): -30 dBc typical, -25 dBc max. @ 3 dB total back-off from rated P1dB (two tones, Δf = 1 MHz)

Parabolic: -30 dBc spectral regrowth @ 1.8 dB OPBO from rated P1dB

AM To PM Conversion

Linear: ± 0.01 ns/MHz
Parabolic: ± 0.003 ns/MHz
Ripple: ± 1.0 ns peak to peak

Spurious

Second Harmonic (C- and X-Band): -60 dB dBc max. @ 1 dB below rated output
Non-Harmonic Related: -65 dB dBc max.

Note: P1db over all temp/frequencies, Psat typ., Derate power by 1dB over 6.425 to 6.725 and 13.75 to 14.0 GHz and .2 dB for 500 W unit, @ + 55°C, standard band edge

Input

Impedance: 50 Ω
Noise Figure: 8 dB typical, 10 dB maximum @ maximum gain (15 dB for HPD Ku-Band)
VSWR: 1.25:1 maximum
Connector: Type N

Sample Ports

Output Sample: Type N, 50 Ω, -40 dBc nominal
Input Sample: Type N, 50 Ω, -20 dBc nominal

Remote Control

Com Port: RS-485 or RS-232, Ethernet optional

Alarms

Summary Fault: Form C

Environmental, Power and Physical

Operating Temp.: -40° to +55°C (-40° to 131°F)
Non-Operating Temp.: -50° to +75°C (-58° to 167°F)
Operating Humidity: 0 to 100% condensing
Ingress Protection: Designed for IP-66 (Dust tight, strong water jets)
Altitude: 10,000 feet above sea level (derated 2°C/ 1000 ft AMSL)
C- and X-Band: 180 to 264 VAC, 47 to 63 Hz
Ku-Band: 180 to 264 VAC, 47 to 63 Hz
Dimensions: 11.49" x 17.88" x 26.77" (29.18 x 45.41 x 67.99 cm)
Weight: 75 lbs (34 kg) nominal

Available Options

Optional BUC (Specifications may vary)