



**125W Ku-Band
 Compact Outdoor SSPA**

Description

The Teledyne Paradise Datacom Compact Outdoor Solid State Power Amplifier (SSPA) is built for extreme environmental conditions and high reliability operation. Along with the robust construction exists the highest power density in the industry. This allows solid state technology to be used in applications that have long been reserved for TWTAs.

At less than 40 lbs. (18 kg), and only slightly larger than a shoe box, this family of SSPAs is available in output power levels in the following range:

C-Band: 30W - 300W
X-Band: 25W - 250W
Ku-Band: 40W - 125W



Antenna-mount 1:1 system w/ mounting frame



SNG-mount 1:1 system w/ side-mount AC input

FEATURES

- Compact size and weight
- CE Compliance Tested
- Integrated forced-air cooling system
- Adjustable RF Gain, 55 dB to 75 dB
- Extreme Environmental Testing
- RF Output Sample Port
- Maintenance Free Operation
- Universal, Power Factor Corrected Power Supply
- Built-in 1:1 Redundancy Control
- Built-in Maintenance Switch Controller

OPTIONS

- Extended band operation
- Antenna Mounting Kit
- DC Operation (48VDC)
- Remote Control Panel
- L-Band Input
- Phase Combined Systems
- Low line voltage operation
- Fiber Optic Input
- Optional side-mount AC input for SNG installations

SPECIFICATIONS

- Compact Outdoor housing
 10.0 X 19.5 X 6.50 in
 254 X 495 X 165 mm
- White powder coat finish
- Operating temperature:
 -40 to +60 °C

Specifications, C-Band SSPAs

PARAMETER	NOTES	LIMITS	UNITS
Frequency Range	(See options for extended bands) Insat Band	5.850 to 6.425 6.725 to 7.025	GHz GHz
Output Power @: Saturation/ P_{1dB} (Typical/Guaranteed minimum)	HPAC2030ACXXXXX HPAC2040ACXXXXX HPAC2050ACXXXXX HPAC2075ACXXXXX HPAC2100ACXXXXX HPAC2140ACXXXXX HPAC2200ACXXXXX HPAC2250ACXXXXX HPAC2300ACXXXXX	P_{sat} / P_{1dB} 45.0 (32) / 44.8 (30) 46.0 (40) / 45.8 (38) 47.0 (50) / 46.8 (48) 48.8 (76) / 48.5 (70) 50.0 (100) / 49.5 (89) 51.5 (141) / 51.0 (126) 53.0 (200) / 52.3 (170) 54.0 (250) / 53.0 (200) 54.7 (300) / 54.0 (251)	dBm (W) dBm (W) dBm (W) dBm (W) dBm (W) dBm (W) dBm (W) dBm (W) dBm (W)
Power Requirements Line Frequency Line Power (Voltage) (typical @ 220 VAC)	power factor corrected HPAC2030ACXXXXX HPAC2040ACXXXXX HPAC2050ACXXXXX HPAC2075ACXXXXX HPAC2100ACXXXXX HPAC2140ACXXXXX HPAC2200ACXXXXX HPAC2250ACXXXXX HPAC2300ACXXXXX	47 to 63 350 (90-265) 350 (90-265) 425 (90-265) 500 (90-265) 750 (90-265) 875 (180-265) ¹ 1300 (180-265) ¹ 1500 (180-265) ¹ 1675 (180-265) ¹	Hz W (VAC) W (VAC) W (VAC) W (VAC) W (VAC) W (VAC) W (VAC) W (VAC) W (VAC)
Frequency Sub-Band Power De-rating 5.85 to 6.725 GHz 5.75 to 6.67 GHz	De-rate output power by 1.0 dB linearly from 6.425 to 6.725 GHz De-rate output power by 1.0 dB linearly from 6.425 to 6.67 GHz and by 0.5 dB from 5.85 to 5.75 GHz		

Note 1: Available with low line voltage option, 90 to 265 VAC.

Specifications, X-Band SSPAs

PARAMETER	NOTES	LIMITS	UNITS
Frequency Range	(see options for extended band)	7.900 to 8.400	GHz
Output Power @: Saturation/ P_{1dB} (Typical/Guaranteed minimum)	HPAX2025ACXXXXX HPAX2030ACXXXXX HPAX2060ACXXXXX HPAX2075ACXXXXX HPAX2100ACXXXXX HPAX2140ACXXXXX HPAX2200ACXXXXX HPAX2250ACXXXXX	P_{sat} / P_{1dB} 44.5 (28) / 44.0 (25) 45.9 (39) / 45.5 (35) 47.5 (60) / 47.3 (54) 48.8 (76) / 48.3 (68) 50.0 (100) / 49.5 (89) 51.4 (140) / 50.8 (120) 53.0 (200) / 51.8 (170) 54.0 (250) / 53.0 (200)	dBm (W) dBm (W) dBm (W) dBm (W) dBm (W) dBm (W) dBm (W) dBm (W)
Power Requirements Line Frequency Line Power (Voltage) (typical @ 220 VAC)	power factor corrected HPAX2025ACXXXXX HPAX2030ACXXXXX HPAX2060ACXXXXX HPAX2075ACXXXXX HPAX2100ACXXXXX HPAX2140ACXXXXX HPAX2200ACXXXXX HPAX2250ACXXXXX	47 to 63 378 (90-265) 461 (90-265) 500 (90-265) 700 (90-265) 850 (90-265) 1125 (180-265) ¹ 1425 (180-265) ¹ 2000 (180-265) ¹	Hz W (VAC) W (VAC) W (VAC) W (VAC) W (VAC) W (VAC) W (VAC) W (VAC)
Transmit Band Filter (Option)	Insertion Loss	-0.5	dB
Transmit Band Noise Power Density	Without optional filter With optional filter	-50 -120	dBm/4 KHz dBm/4 KHz
Frequency Sub-Band Power De-rating 7.70 to 8.40 GHz	De-rate output power by 1.0 dB linearly from 7.90 to 7.70 GHz		

Note 1: Available with low line voltage option, 90 to 265 VAC.

Specifications, Ku-Band SSPAs

PARAMETER	NOTES	LIMITS	UNITS
Frequency Range	(see options for extended band)	14.00 to 14.50	GHz
Output Power @: Saturation/ P_{1dB} (Typical/Guaranteed minimum)	HPAK2040ACXXXXX HPAK2050ACXXXXX HPAK2070ACXXXXX HPAK2100ACXXXXX HPAK2125ACXXXXX	P_{sat} / P_{1dB} 46.0 (40) / 45.0 (31) 47.0 (50) / 46.0 (40) 48.5 (70) / 47.5 (56) 50.0 (100) / 49.0 (80) 51.0 (125) / 50.0 (100)	dBm (W) dBm (W) dBm (W) dBm (W) dBm (W)
Power Requirements Line Frequency Line Power (Voltage) (typical @ 220 VAC)	power factor Line frequency HPAK2040ACXXXXX HPAK2050ACXXXXX HPAK2070ACXXXXX HPAK2100ACXXXXX HPAK2125ACXXXXX	.98 47 to 63 550 (90-265) 650 (90-265) 750 (90-265) 1200 (180-265) ¹ 1250 (180-265) ¹	Hz W (VAC) W (VAC) W (VAC) W (VAC) W (VAC)
Frequency Sub-Band Power De-rating 13.75 to 14.50 GHz	De-rate output power by 1.0 dB linearly from 14.00 to 13.75 GHz		

Note 1: Available with low line voltage option, 90 to 265 VAC.

Common Electrical Specifications

PARAMETER	NOTES	LIMITS	UNITS
Gain	range	55 - 75	dB
Gain Flatness	full band	± 1.0	dB
Gain Slope	full band (Extended C-Band)	± 1.5	dB
Gain Variation vs. Temperature	per 40 MHz	± 0.3	dB/40 MHz
Gain Stability	-40 °C to +55 °C	± 1.5	dB
Gain Adjustment	at constant temperature	± 0.25	dB/24 hours
	0.1 dB resolution	20	dB
Intermodulation Distortion	Two-Tone 3 dB back off from P _{1dB}	-25	dBc
AM/PM Conversion	@ rated P _{1dB}	3.5	°/dB
	@ P _{1dB} - 1 dB	1.5	°/dB
	@ P _{1dB} - 2 dB	1.0	°/dB
Spurious Harmonics (SSPA only)	(@ rated P _{1dB})	-65	dBc
	(@ rated P _{1dB} - 3 dB)	-50	dBc
Input/Output VSWR	Extended C-Band	1.30:1	
	Output VSWR: Ku-Band with bulkhead filter	1.50:1 1.40:1	
Noise Figure	at maximum gain	10	dB
Group Delay (per 40 MHz segment)	Linear	0.01	ns/MHz
	Parabolic	0.003	ns/MHz ²
	Ripple	1.0	ns p-p
Transmit Band Noise	TX Band	-75	dBW/4 KHz
Output Power Density	RX Band	-150	dBW/4 KHz
Residual AM Noise	0 - 10 KHz	-45	dBc
	10 KHz - 500 KHz	-20 (1.25 + log F)	dBc
	500 KHz - 1 MHz	-80	dBc
Phase Noise (SSPA only)	Offset frequency from carrier		
	10 Hz	-90	dBc/Hz
	100 Hz	-100	dBc/Hz
	1 KHz	-110	dBc/Hz
	10 KHz	-120	dBc/Hz
	100 KHz	-125	dBc/Hz
	1 MHz	-130	dBc/Hz
RF Power Detector	P _{sat} to (P _{sat} - 20 dBm)	20 ± 1.0	dBm

Environmental Specifications

PARAMETER	NOTES	LIMITS	UNITS
Operating Temperature	Ambient	-40 to +60	°C
Relative Humidity	Condensing	100	%
Cooling System	Integrated, Forced air	103	CFM
Ingress Protection Rating	With connectors properly sealed	IP54	
Audible Noise	Measured 1m from unit, at P _{sat}	74	dBA
Altitude	No temperature de-rating up to 10,000 ft. (3000 m) De-rate maximum temperature by 2°C per 1,000 ft (300 m) beyond 10,000 ft.		
Shock		50 g p-p, 11 msec pulses	
Vibration		3g rms 30 min. 5-2000 Hz	

L-Band Operation

Teledyne Paradise Datacom amplifiers are available with an integrated L-Band Block Up Converter. L-Band units utilize Teledyne Paradise Datacom's proprietary zBUC technology. The addition of a zBUC[®] converter to the SSPA typically increases the gain by 2-4 dB. The advantages of zBUC technology include:

- zBUC converter can detect and switch to an externally supplied reference.
- Optional internal high stability (10MHz) reference.
- zBUC converter can lock to an externally supplied reference of 10 or 50 MHz.
- zBUC converter can accept a wide range of external reference power (-10 to +5 dBm)
- zBUC converter can accept FSK monitor and control signal via the IFL for complete amplifier remote control.

Available Frequency Plans

Band	Frequency Band	IF Input	LO Frequency	RF Output	Gain Change
C	Standard C-Band	950 - 1525 MHz	4.900 GHz	5.850 - 6.425 GHz	0-4 dB
C	Extended C-Band	950 - 1825 MHz	4.900 GHz	5.850 - 6.725 GHz	0-4 dB
C	Palapa Band	950 - 1250 MHz	5.475 GHz	6.425 - 6.725 GHz	0-4 dB
C	Insat Band	950 - 1250 MHz	5.775 GHz	6.725 - 7.025 GHz	0-4 dB
C	Extended C-Band 2	950 - 1675 MHz	4.800 GHz	5.750 - 6.475 GHz	0-4 dB
C	Low C-Band	840 - 1000 MHz	4.250 GHz	5.090 - 5.250 GHz	0-4 dB
X	Standard X-Band	950 - 1450 MHz	6.950 GHz	7.900 - 8.400 GHz	0-2 dB
Ku	Standard Ku-Band	950 - 1450 MHz	13.050 GHz	14.00 - 14.50 GHz	0-2 dB
Ku	Extended Ku-Band	950 - 1700 MHz	12.800 GHz	13.75 - 14.50 GHz	0-2 dB

Electrical Specifications for Compact Outdoor SSPA with ZBUC converter

PARAMETER	NOTES	LIMITS				UNITS	
Gain	Nominal setting	75				dB	
Gain Flatness	full band (C-,X-,Ku-bands)	± 2.0				dB	
Gain Slope	per 40 MHz (C-,X-,Ku-bands)	± 0.5				dB/40 MHz	
Gain Adjusted Range		20				dB	
Gain Stability	Typical C-Band Adj. Range	60 - 80				dB	
	Typical Ku-Band Adj. Range	57 - 77				dB	
	-40 to +60 °C	± 1.5				dB	
Phase Noise	Offset frequency from carrier	<u>Absolute max.</u>	<u>C-band (typ.)</u>	<u>X-band (typ.)</u>	<u>Ku-band (typ.)</u>		
	10 Hz	-30	-60	-58	-56	dBc/Hz	
	100 Hz	-60	-74	-70	-67	dBc/Hz	
	1 KHz	-70	-84	-80	-78	dBc/Hz	
	10 KHz	-80	-100	-94	-91	dBc/Hz	
	100 KHz	-90	-105	-97	-94	dBc/Hz	
	1 MHz	-90	-125	-122	-120	dBc/Hz	
Spurious	In-Band Signal Related (C-/Ku-Band)					-50	dBc
	(Extended C-Band)					-40	dBc
	Close to Carrier Spurious (≤ 20 MHz)					-50	dBc
	Local Oscillator					-30	dBm
Noise Figure	At 75 dB gain setting	20				dB	
Input VSWR	L-Band	1.5 : 1					
Internal Reference Option	Reference Accuracy (initial)	± 1 • 10 ⁻⁸					
	Aging per day (after 30 days)	± 1 • 10 ⁻⁹					
	Aging per year (after 30 days)	± 6 • 10 ⁻⁸					
	Reference Stability over Temperature (-40 to +40 °C, ambient)	± 1 • 10 ⁻⁸					

Remote Control Panel - Ethernet Interface for the Compact Outdoor SSPA



The RCP2-1000 is a Remote Control Panel for the Compact Outdoor SSPA. It only requires 1RU of cabinet space and provides an identical local interface as exists on Teledyne Paradise Datacom Indoor Rack Mount amplifiers.

The controller communicates with the outdoor amplifier via a RS485 link. The controller then provides a wide range of interface capability including Ethernet communications. The following communication links are available at the Remote Control Panel:

- RS232 or Addressable RS485 Serial Data
- Discrete (Parallel) Interface - Form C contact outputs & Opto Isolated Inputs
- Ethernet Interface - A full complement of Ethernet Communications including UDP, SNMP, and an internal web browser.
- Local (Manual) interface via front panel LCD display

Fiber Optic Interface

Teledyne Paradise Datacom offers an Outdoor Fiber Optic Converter Module (OFM-1000) for the Compact Outdoor SSPA which interfaces with a rack mountable Fiber Optic to L Band Transceiver (RCPF-1000).

The 1RU Indoor Fiber Optic to L Band Transceiver complements the Compact Outdoor Amplifier for a complete Optical interface for the amplifier.

What distinguishes the Teledyne Paradise Datacom Fiber Optic solution is the ability to transmit and receive not only the L-Band IFL, but also a 10 MHz reference signal and an FSK signal that provides complete remote control of the amplifier. When equipped with a Paradise Datacom PD25 L-Band modem, a complete base-band to optical interface is realized.

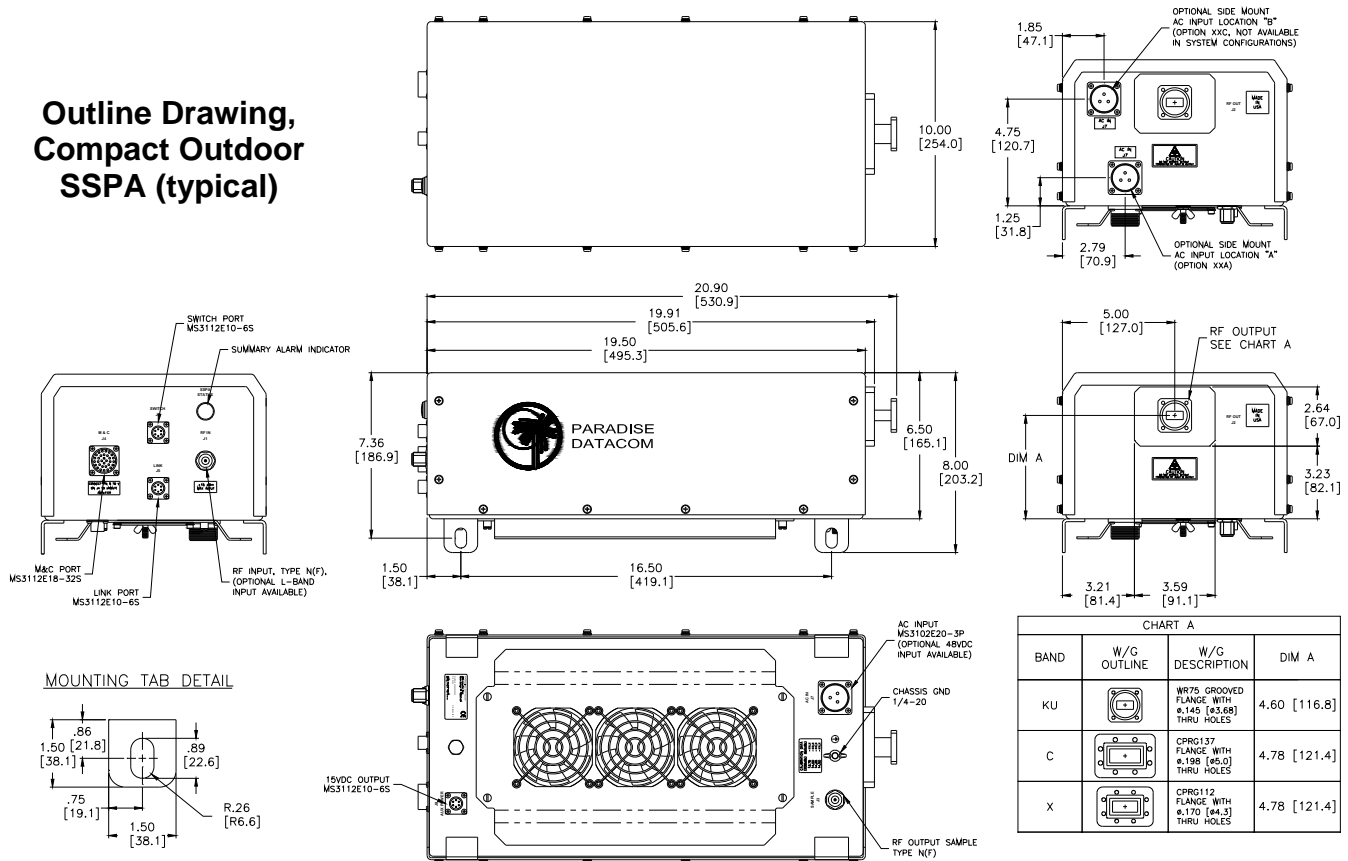
A system utilizing a Fiber Optic link can have an IFL length in excess of 1km. An optical link is also desirable in areas in which L-Band interference can degrade the system's performance.



Mechanical Specifications

PARAMETER	NOTES	LIMITS	UNITS/DETAILS
Size	Width X Length X Height	10.0 X 19.5 X 6.50 254 X 495 X 165	inches mm
Weight	Base unit (< 200W C-Band; < 100W Ku-Band) Base unit (≥ 200W C-Band; ≥ 100W Ku-Band) Base unit (< 200W X-Band) Base unit (≥ 200W X-Band) With Internal zBUC With 110 VAC Option With optional Tx Filter or Rx Reject Filter	36 (16.4) ± 3% 44 (20.0) ± 3% 46.7 (21.1) ± 3% 54.9 (25.0) ± 3% +1.7 (0.8) + 1.2 (0.6) + 1.0 (0.5) ea.	lbs. (kg) lbs. (kg) lbs. (kg) lbs. (kg) lbs. (kg) lbs. (kg) lbs. (kg)
Finish		Paint	White; powder coat
Connectors	RF Input RF Output - Ku-Band RF Output - C-Band RF Output - X-Band RF Output Sample Line Power Monitor and Control Link Port Redundancy Switch Auxiliary +15VDC LNB Power (500 mA)	Type N WR75 Waveguide WR137 Waveguide WR112 Waveguide Type N 3-pin MS-type 32-pin MS-type 6-pin MS type 6-pin MS-type 6-pin MS-type	Female Grooved flange (PBR-120) CPR137G flange (PDR-70) CPR112G flange (PDR-84) Female Plug Socket Socket Socket Socket

**Outline Drawing,
 Compact Outdoor
 SSPA (typical)**



Part Number Configuration Matrix

HPA **C 2 2 0 0 A C M X X X X**

Band	
C-Band	C
X-Band	X
Ku-Band	K

Generation	
Second	2

Power Level (Watts)	
C-Band	030, 040, 050, 075, 100, 140, 200, 250, or 300
X-Band	025, 030, 060, 075, 100, 170, 200, or 250
Ku-Band	040, 050, 070, 100, or 125

Frequency Sub Band	
C-Band	
A¹	5.850 to 6.425 GHz
B¹	5.850 to 6.725 GHz
C	5.750 to 6.670 GHz
E¹	6.425 to 6.725 GHz (Palapa)
F¹	6.725 to 7.025 GHz (Insat)
G¹	5.750 to 6.475 GHz
H¹	5.715 to 5.790 GHz
J¹	5.740 to 6.650 GHz
X-Band	
A¹	7.90 to 8.40 GHz
B	7.50 to 8.50 GHz
D	7.70 to 8.40 GHz
Ku-Band	
A¹	14.00 to 14.50 GHz
B¹	13.75 to 14.50 GHz

¹ Available with optional BUC

Package	
C	Standalone amplifier

Configuration Modifier 3	
X	None (Standard)
A	Side-Mount AC Input, Location 'A'
C¹	Side-Mount AC Input, Location 'B'
D	48 VDC Input
F	Side-mount 48V Input, Location 'A'
G	Side-mount 48V Input, Location 'B'

¹ Standalone units only

Configuration Modifier 2	
X	Standard
M	MS-Connector Covers
R¹	Receive Band Reject Filter
S¹	M + R (see above)

¹ X-Band units only

Configuration Modifier 1	
X	Standard
K¹	110 VAC Input Power

¹ Available on C- and X-Band units ≥ 140W and Ku-Band units ≥ 100W

System Configuration	
X	Standalone amplifier

Refer to the following specification sheets:

- 203581 for Redundant Systems
- 203582 for Phase Combined Systems

Block Up Converter	
M	Internal Reference BUC
P	External Reference BUC
X	No BUC

Example - A standalone 200W GaAs C-Band Compact Outdoor SSPA with an optional internal reference block up converter is part number: **HPAC2200ACMXXXX**.

Use and Disclosure of Data

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