

1–Solid State Power Amplifier

UHF Band 25W Solid-state Amplifier

1. Features

- High Output Power
- High Linearity
- High Efficiency
- High Reliability
- Operating Temperature: $-15^{\circ}\text{C} \sim +50^{\circ}\text{C}$
- Dimension: $320 \times 180 \times 35\text{mm}^3$
- Storage Temperature: $-40^{\circ}\text{C} \sim +70^{\circ}\text{C}$
- Flight Experience: Applied to one satellite.
Designed Lifetime: 3 years. On-orbit Operation Time: 2 years



2. Electrical Specification (Test Condition: $T_A = 25^{\circ}\text{C}$, $V_{CC} = +27\text{V}$)

Parameters	Symbol	Unit	Typical Value
Frequency Range	f_R	MHz	UHF Band
Linearity Gain	G_{lin}	dB	60
Gain Flatness	ΔG_p	dB	0.6
1dB Compression Point Output Power	P_{o-1}	W	28
Power Stability with Temperature Variation	ΔP_o	dB	± 1.0
Spurious Modulation	—	dB	60
Harmonic Suppression	—	dB	40
Power Dissipation	P	W	72.9

Internal Devices Operation: RF devices are all localized. Microwave devices are Si devices.
Installation: Vertical mount.

UHF Band 25W Solid-state Amplifier

1. Features

- High Efficiency
- Small Dimension
- High Linearity
- Superior Gain Flatness
- High Reliability
- Operating Temperature: $-10^{\circ}\text{C} \sim +55^{\circ}\text{C}$
- Weight: 1.8Kg
- Dimension: $265 \times 135 \times 40\text{mm}^3$
- Storage Temperature: $-40^{\circ}\text{C} \sim +70^{\circ}\text{C}$
- Flight Experience: Applied to one satellite.
(Designed Lifetime: 15 years) Designed Lifetime: 15 years. On-orbit Operation Time: 4 years



2. Electrical Specification (Test Condition: $T_A = 25^{\circ}\text{C}$, $V_{CC} = +100\text{V}$)

Parameters	Symbol	Unit	Typical Value
Parameter	Symbol	Typical Value	Unit
Frequency Range	f_R	MHz	UHF Band
Linearity Gain	G_{lin}	60	dB
Gain Flatness	ΔG_p	0.5	dB
1dB Compression Point Output Power	P_o	25	W
Third-order Intercept of 1dB Compression Point	—	≤ -16	dBc
Spurious Modulation	—	≤ -60	dBc
Power Dissipation	—	≤ 65	W

Internal Devices Operation: RF devices are all localized. Preceding stage of microwave devices: GaAs devices.
Last stage of microwave devices: Si devices. Installation: Horizontal installation with bottom contacted.

L Band 60W Solid-state Power Amplifier

1. Features

- High Output Power
- High Power Stability
- High Reliability
- Independently developed RF devices
- With Over-current and under-voltage protection circuit.
- Operating Temperature: $-15^{\circ}\text{C} \sim +50^{\circ}\text{C}$
- Weight: 2.2 Kg
- Dimension: $260 \times 161 \times 38.5\text{mm}^3$
- Storage Temperature: $-40^{\circ}\text{C} \sim +70^{\circ}\text{C}$
- Flight Experience: Applied to one satellite.
Designed Lifetime: 8 years. On-orbit Operation Time: 7 years



2. Electrical Specification (Test Condition: $T_A = 25^{\circ}\text{C}$, $V_{CC} = +28\text{V}$)

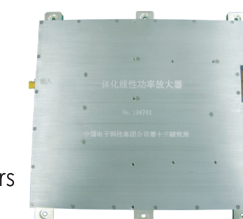
Parameters	Symbol	Unit	Typical Value
Frequency Range	f_R	MHz	Lband
Peak Output Power	P_o	W	60
Power Stability	ΔG_p	dB	$\pm 0.2\text{dB}$
Power	P	W	25.2
Dissipation Top Down	—	dB	0.3

Internal Devices Operation: RF devices are all localized. Microwave devices are GaAs devices. Installation: Horizontal installation with bottom contacted.

Integrated Dual-linear Power Amplifier

1. Features

- High Efficiency
- Small Dimension
- High Linearity
- Superior Gain Flatness
- High Reliability
- Operating Temperature: $-25^{\circ}\text{C} \sim +55^{\circ}\text{C}$
- Weight: 1.75Kg
- Dimension: $230 \times 200 \times 22\text{mm}^3$
- Storage Temperature: $-35^{\circ}\text{C} \sim +70^{\circ}\text{C}$
- Flight Experience: Applied to one satellite.
Designed Lifetime: 8 years. On-orbit Operation Time: 7 years



2. Electrical Specification (Test Condition: $T_A = 25^{\circ}\text{C}$, $V_{CC} = +28\text{V}$)

Parameters	Symbol	Unit	Typical Value
Frequency Range	f_R	MHz	Lband
Input Power	P_i	dBm	10
Output Power	P_o	W	60
In-band Gain Fluctuation	ΔG	dB	0.5
Third-order Intercept	—	dBc	-16
VSWR	VSWR	—	≤ 1.5
Second Harmonics	Rfn	dBc	≤ 25
Third Harmonics	Rfn	dBc	≤ -65
Clutter	Rfs	dBc	≤ -60

Internal Devices Operation: RF devices are all localized. Preceding stage of microwave devices: GaAs devices.
Last stage of microwave devices: Si devices. Installation: Horizontal installation with bottom contacted.

Integrated Dual Linear Power Amplifier

1. Features

- High Efficiency
- Tiered, heterogeneous
- High Linearity
- High Reliability
- Operating Temperature: $-25^{\circ}\text{C} \sim +55^{\circ}\text{C}$
- Weight: 1.7Kg
- Dimension: $160 \times 190 \times 40\text{mm}^3$
- Storage Temperature: $-35^{\circ}\text{C} \sim +70^{\circ}\text{C}$
- Flight Experience: Applied to one satellite.
- Designed Lifetime: 5 years. On-orbit Operation Time: 2 years



2. Electrical Specification (Test Condition: $T_A=25^{\circ}\text{C}$, $V_{CC}=+28\text{V}$)

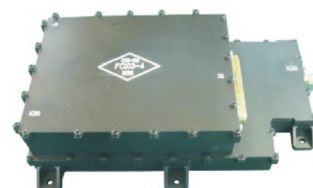
Parameters	Symbol	Typical Value	Unit
Frequency Range	f_r	S band	MHz
Input Power	P_i	0	dBm
Output Power	P_o	≥ 43	dBm
In-band Gain Fluctuation	ΔG	≤ 0.5	dB
Sidelobe Suppression	—	≥ 43	dB
VSWR	VSWR	≤ 1.3	—
Power Dissipation	P_{tot}	≤ 62	W
Second Harmonics	Rfn	≥ 40	dBc
Third Harmonics	Rfn	≥ 30	dBc
Carrier Drain Suppression	—	≥ 35	dBc
180MHz Out-Band Power Spectrum	—	-147	dBm/Hz

Internal Devices Operation: RF devices are all localized.
Microwave devices: GaAs devices.
Installation: Horizontal installation with bottom contacted.

S Band 1W/10W High Efficiency Solid-state Power Amplifier

1. Features

- High Efficiency
- Hierarchical Design
- Small Dimension
- High Reliability
- Operating Temperature: $-25^{\circ}\text{C} \sim +60^{\circ}\text{C}$
- Weight: 1.2Kg
- Dimension: $204 \times 111 \times 54\text{mm}^3$
- Storage Temperature: $-35^{\circ}\text{C} \sim +70^{\circ}\text{C}$
- Flight Experience: Applied to one satellite.
- Designed Lifetime: 10 years.



2. Electrical Specification (Test Condition: $T_A=25^{\circ}\text{C}$, $V_{CC}=+28\text{V}$)

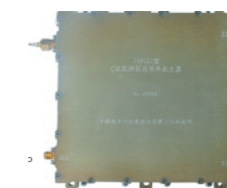
Parameters	Symbol	Typical Value	Unit
Frequency Range	f_r	S Band	MHz
Input Power	P_i	0	dBm
Output Power	P_o	≥ 10 ≥ 1	W
In-band Gain Fluctuation	ΔG	≤ 0.5	dB
Gain	—	≥ 38 ≥ 48	dB
VSWR	VSWR	≤ 1.3	dBc
Power Dissipation	P_{tot}	≤ 11 ≤ 32	W
Second Harmonics	Rfn	≥ 50	dBc
Noise	Nf	10/13	dB
Operating bandwidth	ΔB	60	MHz

Internal Devices Operation: RF devices are all localized.
Microwave devices: GaAs devices.
Installation: Horizontal installation with bottom contacted.

C Band 8W High Efficient Solid-state Power Amplifier

1. Features

- High Efficiency
- Hierarchical design, Small Dimension
- High precision of Gain control
- High Reliability
- Operating Temperature: $-25^{\circ}\text{C} \sim +60^{\circ}\text{C}$
- Weight: 1.6Kg
- Dimension: $204 \times 111 \times 54\text{mm}^3$
- Storage Temperature: $-35^{\circ}\text{C} \sim +70^{\circ}\text{C}$
- Flight Experience: Applied to one satellite.
- Designed Lifetime: 8 years.



2. Electrical Specification (Test Condition: $T_A=25^{\circ}\text{C}$, $V_{CC}=+28\text{V}$)

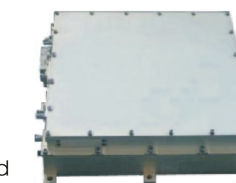
Parameters	Symbol	Typical Value	Unit
Frequency Range	f_r	Cband	MHz
Input Power	P_i	-22	dBm
Output Power	P_o	≥ 8	W
In-band Gain Fluctuation	ΔG	≤ 0.5	dB
Gain	G	≥ 60	dB
VSWR	VSWR	≤ 1.3	—
Power Dissipation	P_{tot}	30	W
Second Harmonics	Rfn	≥ 50	dBc
Noise	Nf	8	dB
Operating bandwidth	MHz	100	MHz

Internal Devices Operation: RF devices are all localized.
Microwave devices: GaAs devices.
Installation: Horizontal installation with bottom contacted.

C Band 20W High Efficient Solid-state Power Amplifier

1. Features

- High Efficiency
- Hierarchical
- High Precision of Gain Control
- High Reliability
- Operating Temperature: $-25^{\circ}\text{C} \sim +60^{\circ}\text{C}$
- Weight: 1.6Kg
- Dimension: $204 \times 111 \times 54\text{mm}^3$
- Storage Temperature: $-35^{\circ}\text{C} \sim +70^{\circ}\text{C}$
- Flight Experience: Applied to one satellite. Designed Lifetime: 12 years. On-orbit Operation Time: 2years
- The later development of frequency will cover C band



2. Electrical Specification (Test Condition: $T_A=25^{\circ}\text{C}$, $V_{CC}=+28\text{V}$)

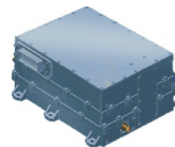
Parameters	Symbol	Typical Value	Unit
Frequency Range	f_r	C Band	MHz
Input Power	P_i	-40~+10	dBm
Output Power	P_o	≥ 20	W
In-band Gain Fluctuation	ΔG	≤ 0.5	dB
Gain	G	≥ 55	dB
VSWR	VSWR	≤ 1.3	—
Power Dissipation	P_{tot}	63~72	W
Second Harmonics	Rfn	≥ 50	dBc
Noise	Nf	23	dB
Operating bandwidth	ΔB	250	MHz
Third-order Intercept	-10dB IP_3	41	dB

Internal Devices Operation: RF devices are all localized.
Microwave devices: GaAs devices.
Installation: Horizontal installation with bottom contacted.

C Band 30W High Efficient Solid-state Power Amplifier

1. Features

- High Efficiency
- Imitation Imports Structural Layout
- High Precision of Gain Control , Wide Dynamic Range
- High Reliability
- Operating Temperature: $-25^{\circ}\text{C} \sim +60^{\circ}\text{C}$
- Weight: 1.6Kg
- Dimension: $135 \times 110 \times 76\text{mm}^3$
- Storage Temperature: $-35^{\circ}\text{C} \sim +70^{\circ}\text{C}$
- Flight Experience: Applied to one satellite. Designed Lifetime: 15 years . The frequency can cover C band



2. Electrical Specification (Test Condition: $T_A=25^{\circ}\text{C}$, $V_{cc}=+28\text{V}$)

Parameters	Symbol	Typical Value	Unit
Frequency Range	f_r	C Band	MHz
Input Power	P_i	$-10 \sim +10$	dBm
Output Power	P_o	≥ 30	W
In-band Gain Fluctuation	ΔG	≤ 0.5	dB
Gain	G	≥ 55	dB
VSWR	VSWR	≤ 1.3	—
Power Dissipation	P_{tot}	95	W
Second Harmonics	Rfn	≥ 50	dBc
Noise	Nf	25	dB
Operating bandwidth	ΔB	200	MHz
Third-order Intercept	IP3	36	dB

Internal Devices Operation: RF devices are all localized.
Microwave devices: GaAs devices.
Installation : Horizontal installation with bottom contacted.

X Frequency 10W Solid-state Power Amplifier

1. Features

- High Efficiency
- Imitation Imports Structural Layout
- High Precision of Gain Control , Wide Dynamic Range
- High Reliability
- Operating Temperature: $-25^{\circ}\text{C} \sim +60^{\circ}\text{C}$
- Weight: 1.5Kg
- Dimension : $285 \times 150 \times 75\text{mm}^3$
- Storage Temperature: $-35^{\circ}\text{C} \sim +70^{\circ}\text{C}$
- Flight Experience: Developed for one project. Designed Lifetime: 10years . The frequency can cover X band



2. Electrical Specification (Test Condition: $T_A=25^{\circ}\text{C}$, $V_{cc}=+28\text{V}$)

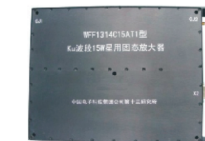
Parameters	Symbol	Typical Value	Unit
Frequency Range	f_r	X Band	MHz
Input Power	P_i	$-10 \sim +10$	dBm
Output Power	P_o	11	W
In-band Gain Fluctuation	ΔG	≤ 0.5	dB
Gain	G	45	dB
VSWR	VSWR	≤ 1.3	—
Power Dissipation	P_{tot}	50	W
Second Harmonics	Rfn	55	dBc
Operating bandwidth	ΔB	800	MHz

Internal Devices Operation: RF devices are all localized.
Microwave devices: GaAs devices.
Installation : Horizontal installation with bottom contacted.

Ku Band 15W Pluse Solid-state Power Amplifier

1. Features

- High Efficiency
- Vertical Installation
- High Precision of Gain Control ,
- Wide Dynamic Range
- High Reliability
- Operating Temperature: $-40^{\circ}\text{C} \sim +70^{\circ}\text{C}$
- Weight : 1.7Kg
- Dimension: $280 \times 190 \times 36\text{mm}^3$
- Storage Temperature: $-35^{\circ}\text{C} \sim +70^{\circ}\text{C}$
- Flight Experience: Applied to one satellite. Designed Lifetime: 10 years . The frequency will cover ku band



2. Electrical Specification (Test Condition : $T_A=25^{\circ}\text{C}$, $V_{cc}=+28\text{V}$)

Parameters	Symbol	Typical Value	Unit
Frequency Range	f_r	Ku Band	MHz
Input Power	P_i	-5	dBm
Output Power	P_o	15	W
In-band Gain Fluctuation	ΔG	≤ 0.3	dB
Gain	G	45	dB
VSWR	VSWR	≤ 1.5	—
Power Dissipation	P_{tot}	30	W
Second Harmonics	Rfn	50	dBc
Operating bandwidth	ΔB	400	MHz
Pluse Width	ΔT	26	us
Cycle	T	390	us

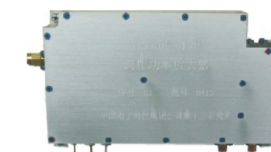
Internal Devices Operation: RF devices are all localized.
Microwave devices: GaAs devices.
Installation : Horizontal installation with bottom contacted.

2-Transmitting Components

S Band Phase Modulation Amplifier Module

1. Features

- Modulation: analog modulation
- Good Modulation Linearity and Stability
- With Temperature Changes
- Can be miniaturized design
- Operating Temperature: $-10^{\circ}\text{C} \sim +55^{\circ}\text{C}$
- Weight: 0.55Kg
- Dimension : $145 \times 80 \times 24\text{mm}^3$
- Storage Temperature: $-35^{\circ}\text{C} \sim +70^{\circ}\text{C}$
- Project Background: Developed for one project. USB answering machine.



2. Electrical Specification (Test Condition : $T_A=25^{\circ}\text{C}$, $V_{cc1}=+12\text{V}$, $V_{cc2}=-12\text{V}$)

Parameters	Symbol	Typical Value	Unit
Frequency Range	f_r	S Band	MHz
Input Power	P_i	-14	dBm
1dB Compression Point Output Power	$P-1$	29.7	dBm
High and Low Temperature Gain Fluctuations	ΔGT	≤ 1	dB
ModulationLinearity	—	1.5%	—
Harmonic Suppression	Rf	55	dBc
IF signal Carrier Wave Modulation	—	1.1	rad

Internal Devices Operation: RF devices are all localized.
Microwave devices: GaAs devices.
Installation : Horizontal installation with bottom contacted.

S-band Frequency Multiplier Phase Modulation Amplifier Module

1. 1. Features

- Modulation: BPSK
- High Carrier Suppression
- High second sideband suppression
- Low power consumption
- High Reliability
- Operating Temperature: $-10^{\circ}\text{C} \sim +50^{\circ}\text{C}$
- Weight: 0.64Kg
- Dimension: $174 \times 140 \times 22.5\text{mm}^3$
- Storage Temperature: $-35^{\circ}\text{C} \sim +70^{\circ}\text{C}$
- Project Background: Developed for TS project. Applied for answering machine.



2. Electrical Specification (Test Condition: $T_A=25^{\circ}\text{C}$, $V_{cc1}=+12\text{V}$, $+5\text{V}$, $V_{cc2}=-12\text{V}$)

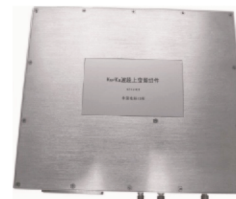
Parameters	Symbol	Typical Value	Unit
Frequency Range	f_r	S Band	MHz
1dB Compression Point Output Power	P-1	28	dBm
VSWR	VSWR	≤ 1.5	—
Power Dissipation	P_{tot}	3.5	W
Carrier Suppression	—	30	dBc
Second-order sideband suppression	—	37	dBc
LO phase noise	SSB	-98	dBc/Hz/10KHz

Internal Devices Operation: RF devices are all localized.
Microwave devices: GaAs devices.
Installation: Horizontal installation with bottom contacted.

Ku/KaBand Up Variable Frequency Components

1. 1. Features

- High reliability aerospace products
- Contained a Ka-band a 4×2 switch matrix
- Interior includes a Ku-band and a Ka upconverter
- Frequency covers 14~26GHz
- Chip Sealed Structure, Small Dimension
- Higher Switching Speed
- Wide Operating Temperature Range, High Reliability
- With BIT Detection Function
- Control Level Compatible TTL
- Operating Temperature: $-45^{\circ}\text{C} \sim +85^{\circ}\text{C}$



2. Typical Specifications ($V_{cc1}=+9\text{V}$, $V_{cc2}=+5\text{V}$, $V_{ee}=-5\text{V}$)

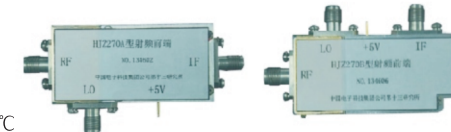
		Min	Max	Typ	Note
Up Variable Frequency Channel	Input Frequency	C Band			—
	Output Frequency	Ku, Ka Band			Ku, Ka band each channel
	Gain	14	—	26	—
	Harmonic suppression (dB)	50	—	—	—
	Intermodulation suppression (dBc)	50	—	—	—
Switch Matrix	Frequency	Ku, Ka Band			—
	Gain(dB)	10	—	13	—
	Isolation(dB)	35	—	50	—
	Output P1dB(dBm)	15	—	15.5	—

3-Receiving Component

C ~ X-Band Receiver Front-end Module

1. 1. Features

- versatile chipset design
- Small Dimension
- Low Noise
- High Reliability
- Operating Temperature: $-35^{\circ}\text{C} \sim +70^{\circ}\text{C}$
- Weight: 0.06Kg
- Dimension: $50 \times 24 \times 9\text{mm}^3$
- Storage Temperature: $-40^{\circ}\text{C} \sim +70^{\circ}\text{C}$
- Project Background: The project developed for TS for answering machine.



2. Electrical Specification (Test Condition: $T_A=25^{\circ}\text{C}$, $V_{cc1}=+12\text{V}$)

Parameters	Symbol	Typical Value	Unit
Frequency Range	f_r	C~X Band	MHz
IF frequency	f_I	125	MHz
Linear Gain	GL	42	dB
VSWR	VSWR	≤ 1.5	—
Noise	Nf	1.2	dB
Image Rejection	—	30	dBc
Not to damage the power	P_{max}	0	dBm

Internal Devices Operation: RF devices are all localized.
Microwave devices: GaAs devices.
Installation: Horizontal installation with bottom contacted.

L-band Low-Noise Receiver Module

1. Features

- High reliability aerospace products
- Low-Noise, High-Gain
- Integrated Local Oscillator Frequency Source
- AGC Dynamic Range of 60dB
- Built-in Low Dropout Voltage Regulator Circuit
- 803018mm³ Small Airtight Design, the leakage rate = 1×10^{-7}
- Seven kinds of selectable frequency, covering Compass, GPS, GLONASS, Galileo navigation system the reception frequency



2. Electrical Specification ($V_{cc}=+5.4\text{V}$, $T_a=25^{\circ}\text{C}$)

Parameters	Symbol	Value	Unit
Frequency	f	Lband	GHz
1dB Bandwidth	B_w	25 (Typ)	MHz
Noise	Nf	2.2	dB
Small-Signal Gain	G	94 (Typ)	dB
AGC Dynamic Range	ΔP	60	dB
Amplitude Stabilization Output Power	P_o	4 ± 0.2	dBm
Image Rejection	—	50	dB
Third-order Intermodulation	IM	32	dBc
Local Oscillator Phase Noise	—	≤ -65 @100Hz ≤ -75 @1kHz ≤ -85 @10kHz ≤ -95 @100kHz ≤ -120 @1MHz	dBc/Hz
Supply Current	I	290 (Typ)	mA

Millimeter-Wave Low-noise Amplifier

1. Features

- High Reliability Aerospace Products
- Operating Frequency: Ka-Band
- Low-Noise, High-Gain
- Built-in Secondary Power Supply
- Waveguide Input, Coaxial Output Port
- Part of the chip is local hermetically sealed (leak rate $\leq 1 \times 10^{-7}$)



2. Electrical Specification (Vcc=+6V, Ta=25°C)

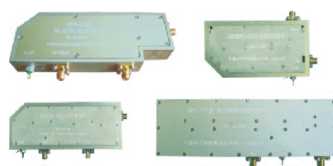
Parameters	Symbol	Typical Value	Unit
Frequency Range	f	Ka Band	GHz
Signal Broadband	B	± 1	GHz
Noise	Nf	≤ 2.5	dB
Power Gain	G	38 ± 2	dB
Input and Output VSWR	VSWR	≤ 1.3	—
Input 1dB Compression Point	Pi (1dB)	≥ -26	dBm
Inband Flatness	ΔG	0.6	dB
Group Delay Fluctuations	ΔT_{delay}	0.05	ns
Supply Current	I	130	mA
Sealability	R	$\leq 1 \times 10^{-7}, 1 \times 10^{-8}$ (Typ)	Pa. m ³ /s

4-Frequency Source Components

L/S Band Triode Frequency Multiplier Assembly

1. Features

- High Multiplier
- Small Size
- High Stability of Temperature
- Good Phase Noise
- Operating temperature: -20°C ~ +60°C
- Weight : 0.12Kg
- Dimension : 130×40×17mm³
- Storage Temperature : -40°C ~ +70°C
- Project Background: Developed for one project Applied for the LO answering machine



2. Electrical Specification (Test Condition: TA=25°C, Vcc1=+10V)

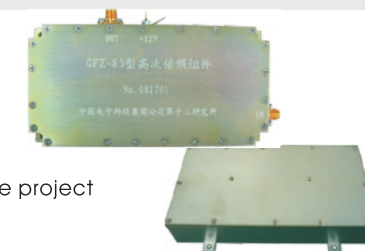
Parameters	Symbol	Typical Value	Unit
Frequency Range	f _r	L/S Band	MHz
Multiplying Gain	G	10	dB
Output Power	P _o	10	dBm
VSWR	VSWR	≤ 1.5	—
Power Dissipation	P _{tot}	1	W
@ 1KHz Phase Noise	SSB	-80	dBc/Hz
Harmonic Suppression	—	50	dBc
Temperature Stability	—	1	dB

Internal Devices Operation: Devices are all localized.
Microwave devices: Si devices.
Installation : Horizontal installation with bottom contacted.

Stepped Tube Multiplier Assembly

1. Features

- High Multiplier
- Small Size
- Low Power Consumption
- Good Phase Noise
- Operating temperature : -20°C ~ +60°C
- Weight : 0.2Kg
- Dimension : 120×50×20mm³
- Storage Temperature : -40°C ~ +70°C
- Project Background: Developed for one project Applied for the LO answering machine



2. Electrical Specification (Test Condition: TA=25°C, Vcc1=+10V)

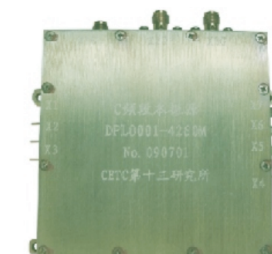
Parameters	Symbol	Typical Value	Unit
Frequency Range	f _r	L~XBand	MHz
Multiplying Gain	G	10	dB
Output Power	P _o	10	dBm
VSWR	VSWR	≤ 1.5	—
Power Dissipation	P _{tot}	0.5	W
@1KHzPhase Noise	SSB	-80	dBc/Hz
Harmonic Suppression	—	45	dBc

Internal Devices Operation: Devices are all localized.
Microwave devices: Si devices.
Installation : Horizontal installation with bottom contacted.

C Band LO source

1. Features

- High Multiplier
- Small Size
- Low Phase Noise
- Operating temperature : -15°C ~ +50°C
- Weight : 0.2Kg
- Dimension : 80×80×25mm³
- Storage Temperature : -40°C ~ +70°C
- Project Background: Developed for one project Applied for the LO answering machine
- Designed Lifetime: 12years.
On-orbit Operation Time: 2years



2. Electrical Specification (Test Condition: TA=25°C, Vcc1=+12V/5V)

Parameters	Symbol	Typical Value	Unit
Frequency Range	f _r	Cband	MHz
the number of multiplier	—	>100	次
Output Power	P _o	10	dBm
VSWR	VSWR	≤ 1.5	—
Power Dissipation	P _{tot}	150	mW
@10KHz Phase Noise	SSB	-90	dBc/Hz
Phase Leak	—	70	dBc
Harmonic Suppression	—	30	dB

Internal Devices Operation: Imported devices.
Installation : Horizontal installation with bottom contacted.

High Stability Clock Source

1. 1. Features

- High Stability Frequency
- High Accuracy Frequency
- Low Phase Noise
- Operating Temperature: $-25^{\circ}\text{C} \sim +50^{\circ}\text{C}$
- Weight : 0.3Kg
- Dimension : $80 \times 20 \times 25\text{mm}^3$
- Storage Temperature : $-40^{\circ}\text{C} \sim +70^{\circ}\text{C}$
- Project Background: Developed for one project. Applied for the LO signal.



2. Electrical Specification (Test Condition: $T_A=25^{\circ}\text{C}$, $V_{cc1}=+12\text{V}/5\text{V}$)

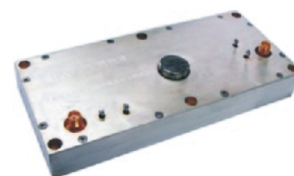
Parameters	Symbol	Typical Value	Unit
Frequency Range	f_r	P/L/SBand	MHz
the number of multiplier	—	100	次
Output Power	P_o	10	dBm
VSWR	VSWR	≤ 1.5	—
Power Dissipation	P_{tot}	3	W
@10KHz Phase Noise	SSB	-90	dBc/Hz
Phase leak	—	70	dBc
Harmonic Suppression	—	20	dBc
Frequency Accuracy	—	1×10^{-6}	—
Frequency Stability	—	1×10^{-7}	—

Internal Devices Operation: Imported devices.
Installation : Horizontal installation with bottom contacted.

Phasing PLL Frequency Source

1. 1. Features

- Phase Modulation Function
- High Accuracy Frequency
- Low phase Noise
- Operating Temperature : $-25^{\circ}\text{C} \sim +50^{\circ}\text{C}$
- Weight : 0.3Kg
- Dimension : $80 \times 20 \times 25\text{mm}^3$
- Storage temperature : $-40^{\circ}\text{C} \sim +70^{\circ}\text{C}$
- Project Background: Developed for one project. Applied for the LO signal



2. Electrical Specification (Test Condition: $T_A=25^{\circ}\text{C}$, $V_{cc1}=+12\text{V}$)

Parameters	Symbol	Typical Value	Unit
Frequency Range	f_r	U/H/F Band	MHz
Output Power	P_o	20	dBm
VSWR	VSWR	≤ 1.5	—
Power Dissipation	P_{tot}	1.5	W
@1KHz Phase Noise	SSB	-95	dBc/Hz
Modulation Rate	—	400	bPs
Harmonic Suppression	—	20	dB

Internal Devices Operation: Imported devices.
Installation : Horizontal installation with bottom contacted.

Phasing PLL Frequency Source

1. 1. Features

- Low Power Consumption
- Small Size
- High Reliability
- Operating Temperature : $-3^{\circ}\text{C} \sim +65^{\circ}\text{C}$
- Weight : 0.8Kg
- Dimension : $50 \times 41 \times 17\text{mm}^3$
- Storage temperature : $-40^{\circ}\text{C} \sim +70^{\circ}\text{C}$
- Project Background: Developed for one project. For the LO signal.



2. Electrical Specification (Test Condition: $T_A=25^{\circ}\text{C}$, $V_{cc1}=+12\text{V}$)

Parameters	Symbol	Typical Value	单位
Frequency Range	f_r	S~cBand	MHz
the number of multiplier	—	> 100	次
Output Power	P_o	10	dBm
VSWR	VSWR	≤ 1.5	—
Power Dissipation	P_{tot}	700	mW
@1KHz Phase Noise	SSB	-80	dBc/Hz
Harmonic Suppression	—	20	dB

Internal Devices Operation: Imported devices.
Installation : Horizontal installation with bottom contacted.

Multiplier Filter Assembly

1. 1. Features

- High Reliability Aerospace Products
- Interior contains comb spectroscopy and switch filter bank circuit
- The output signal has a high amplitude stability
- Low Phase Noise Deterioration
- Control Level Compatible With TTL Level
- $-55^{\circ}\text{C} \sim +85^{\circ}\text{C}$ Wide Operating Temperature Range



2. Typical Specifications ($V_{cc1}=+15\text{V}$, $V_{cc2}=+5\text{V}$, $V_{ee}=-5\text{V}$)

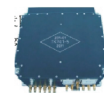
	Parameters	Min	Max	Typ	Note
RF	Input Frequency	100MHz			-155dBc/Hz@1kHz
	Input Power (dBm)	-1	-	+3	-
	Output Frequency	L-band 6 frequency point			100MHz Harmonic
	Output Power (dBm)	-6	-	-4	-
	Clutter Suppression (dBc)	-	-	-57	-
	Phase Noise Deterioration (dB)	-	3	2	@1kHz, Relative to the theoretical value
DC	+15V Supply Current (mA)	-	46	-	-
	+5V Supply Current (mA)	-	160	-	-
	-5V Supply Current (mA)	-	25	-	-

5-Transmitting and Receiving Assembly

Typical Radar Microwave Combination Products

1. Features

- functional Complexity, Multi-channel
- High Reliability
- Dimension : 250×240×90mm³
- Switching Fast Response
- Operating Temperature : -40℃~+65℃
- Storage Temperature : -40℃~+70℃
- Transceivers high isolation
- Weight : 6Kg
- Project Background:Developed for one project. Applied for early warning radar.



2. Electrical Specification(Test Condition: TA=25℃, Vcc1=+29V)

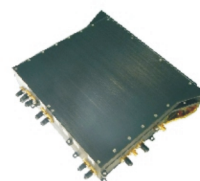
Parameters	Symbol	Typical Value	Unit
Frequency Range	f_R	C Band	MHz
IF Frequency	f_I	100	MHz
Receiver Gain	GL	73	dB
Receive Dynamic Range	—	72	dB
3dB Bandwidth of the IF Filter	IFBW	≥4	MHz
VSWR	VSWR	≤1.5	—
Noise	Nf	5	dB
Image Rejection	—	30	dBc
Without Damaging the Power	Pmax	30	dBm
On-off Ratio	—	140	dB
Transmitting Power	P	35	W

Internal Devices Operation: Devices are all localized.
Microwave devices: GaAs devices.
Installation : Horizontal installation with bottom contacted.

K-Band Inter-Satellite Link Transceiver RF

1. Features

- Functional complex, Set Transceivers frequency from one
- High Precision Delay, Precise Distance Measurement
- Transceivers High Isolation
- Dimension : 250×240×90mm³
- Storage Temperature : -40℃~+70℃
- Project Background: Developed for one project. For the transceiver.



2. Electrical Specification(Test Condition: TA=25℃, Vcc1=+29V)

Parameters	Symbol	Typical Value	Unit
Frequency Range	f_R	K Band	MHz
IF Frequency	f_I	150	MHz
Receiver Gain	GL	95	dB
Receive Dynamic Range	—	60	dB
3dB Bandwidth of the IF Filter	IFBW	≥25	MHz
VSWR	VSWR	≤1.5	—
Noise	Nf	3	dB
Image Rejection	—	40	dBc
1dB Compression Point Power	P-1	18	dBm
Received out-band power spectral density	—	-150	dBm/Hz
@1KHz Phase Noise	SSB	-85	dBc/Hz
Delay Accuracy	$\Delta \tau$	0.1	ns

Internal Devices Operation: Devices are all localized.
Microwave devices: GaAs devices.
Installation : Horizontal installation with bottom contacted.

KaFrequency band RF transceiver combination

1. Features

- Functional Complex, Set transceivers frequency source crystal in one
- UQPSK Modulation
- Modulation Spectrum of Small Amplitude and Phase Errors
- Multi-core Group Design, High localization
- High Reliability
- Operating Temperature: -35℃~+60℃
- Weight: 1.1Kg
- Dimension : 200×155×31mm³
- Storage Temperature: -40℃~+70℃
- Project Background: Developed for one project. For the answering machine.



2. Electrical Specification(Test Condition: TA=25℃, Vcc1=+28V)

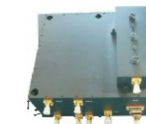
Parameters	Symbol	Typical Value	Unit
Frequency Range	f_R	Ka Band	MHz
IF Frequency	f_I	70	MHz
Receiver Gain	GL	95	dB
Receive Dynamic Range	—	60	dB
3dB Bandwidth of the IF Filter	IFBW	≥20	MHz
VSWR	VSWR	≤1.4	—
Noise	Nf	2.5	dB
Image Rejection	—	40	dBc
1dB compression point power	P-1	1.5	W
Phase Orthogonality	—	±2	°
@1KHz Phase Noise	SSB	-70	dBc/Hz
Amplitude Error	—	0.3	dB

Internal Devices Operation: Devices are all localized.
Microwave devices: GaAs devices.
Installation : Horizontal installation with bottom contacted.

S Frequency band RF transceiver combination

1. Features

- Functional Complex, Set transceivers frequency source crystal in one
- BPSK Modulation, Receiver Sensitivity, Low noiseFigure
- Transmit Phase of the work, Large Power Capacity
- Platform Products, High Reliability
- Operating Temperature: -35℃~+60℃
- Weight / Size: 3.2Kg / 190 × 160 × 90mm³
- Project Background: Developed for cargo ships, spacecraft, space stations, and other projects, applied for the relay terminals.
- Storage temperature: -40℃~+70℃



2. Electrical Specification(Test Condition: TA=25℃, Vcc1=+28V/110V)

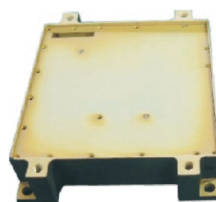
Parameters	Symbol	Typical Value	Unit
Frequency Range	f_R	S Band	MHz
IF Frequency	f_I	60~70	MHz
Receiver Gain	GL	110	dB
Receive Dynamic Range	—	60	dB
3dB Bandwidth of the IF Filter	IFBW	≥20	MHz
VSWR	VSWR	≤1.3	—
Noise	Nf	2.2	dB
Image Rejection	—	40	dBc
1dB Compression Point Power	P-1	17	W
Phase Error	—	±3	°
@1KHz Phase Noise	SSB	-80	dBc/Hz
Amplitude Error	—	0.3	dB

Internal Devices Operation: Devices are all localized.
Microwave devices: GaAs devices.
Installation : Horizontal installation with bottom contacted.

S-Band Miniaturization RF Transceiver Combination

1. Features

- Functional Complex, Set Transceivers frequency source crystal in one
- BPSK Modulation
- Receive High Sensitivity, Low Noise figure
- Transmitter Phase of the work, a large Power Capacity
- Small, Multi-core Group of Modular Design, High Reliability
- Operating Temperature : $-35^{\circ}\text{C} \sim +60^{\circ}\text{C}$
- Weight : 3.2Kg
- Dimension : $100 \times 100 \times 25\text{mm}^3$
- Storage Temperature : $-40^{\circ}\text{C} \sim +70^{\circ}\text{C}$
- Project Background: Developed for one project. For the relay terminal.



2. Electrical Specification (Test Condition: $T_A = 25^{\circ}\text{C}$, $V_{CC1} = +12\text{V}/+5\text{V}$)

Parameters	Symbol	Typical Value	Unit
Frequency Range	f_r	S Band	MHz
IF Frequency	f_I	60~70	MHz
Receiver Gain	GL	110	dB
Receive Dynamic Range	—	50	dB
3dB Bandwidth of the IF Filter	IFBW	≥ 20	MHz
VSWR	VSWR	≤ 1.3	—
Noise	Nf	2.5	dB
Image Rejection	—	35	dBc
1dB Compression Point Power	P-1	12	W
Phase Orthogonality	—	± 3	$^{\circ}$
@1KHz Phase Noise	SSB	-75	dBc/Hz
Amplitude Error	—	0.3	dB

Internal Devices Operation: Devices are all localized.
Microwave devices: GaAs devices.
Installation: Horizontal installation with bottom contacted.

Millimeter Wave Transceiver Microwave Combination

1. Features

- High Reliability Aerospace Products
- Three-channel millimeter wave downconversion receivers, 60MHz IF output, high latency time stability;
- Three-channel excitation signal generating circuit, using S-band high-performance direct UQPSK modulation module, the millimeter-wave frequency transmitter;
- Internal calibration emission source, calibration receivers, transceivers and calibration channel selection switch matrix, main and backup extension work;
- Containing low phase noise, high-clutter rejection frequency source, main and backup extension work;
- Anti total dose: 300kRad (Si);
- Operating temperature range $-40^{\circ}\text{C} \sim +65^{\circ}\text{C}$.



2. Main Specification

Parameters	Technical indicators
Frequency Range	$2x.xx \pm 0.5\text{GHz}$
Receive IF Output	$f_o \pm 12\text{MHz}$
Receiver Gain	$45 \sim 75\text{dB}$, 5dBStepping
Noise	5dB
Calibration Receive Gain	30dB
Delay Stability	$\leq 0.1\text{ns}$
Gain Flatness	1dB
Transmit baseband input	I / Q two-way, TTL level code rate 10.23MHz

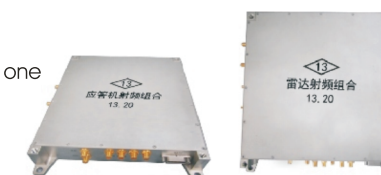
(continued)

Parameters	Technical Indicators
Transmitter Output Power	$7 \pm 1\text{dBm}$
Modulation	UQPSK
Transmitter Clutter Suppression	-75dBc
Transmitter Carrier Suppression	30dB
Frequency Source Phase Noise	-77dBc/Hz@100Hz
	-86dBc/Hz@1kHz
	-90dBc/Hz@10kHz
	-95dBc/Hz@100kHz
Frequency Source Spurious	-75dBc
Power Supply	+15V +6V -5V
Dimension	$315 \times 260 \times 90\text{mm}$

Radar RF Combination Answering Machine RF Combination

1. Features

- Used to spacecraft rendezvous and docking Microwave radar system
- Radio RF combination and transponder combination set transceiver channel, OCXO frequency source, QPSK modulator and power amplifier and other functions in one
- Receive channel has a secondary mixer and AGC functions
- Transmit channels using secondary mixer mode
- Using the thin, thick film technology, the use of multi-functional chip integration technology, it has achieved miniaturization, low power and lightweight design
- Anti-total dose: 100kRad (Si)



2. Main Specification

Parameters	Symbol	Typical Value	Unit	Note
Signal Frequency	f_{in}	f_o	MHz	Ku Band
Broadband	Bw3dB	≥ 25	MHz	—
Receive Dynamic Range	Lin	$-100 \sim -30$	dBm	—
Receive Output Power	Pout	0~5	dBm	—
Receive Third-order Intermodulation	IM3	≥ 40	dB	—
Receive Channel Isolation	IS0	≥ 60	dB	—
Receive Amplitude Consistency	ΔP_{out}	≤ 1	dB	—
Transmitter Output Power	Po	≥ 30	dBm	—
Emission Efficiency	η	$\leq 26\%$	—	—
Radar RF Power Portfolio	—	18	W	Stable Power
Answering Machine RF Combination Power Consumption	—	13	W	Stable Power
Radar RF Combination Size	—	$240 \times 210 \times 30$	mm	—
Should Radiofrequency Combined Size	—	$205 \times 180 \times 30$	mm	—
Radar RF Combined Weight	—	1.7	kg	—
Answering Machine RF Combined Weight	—	1.5	kg	—

6– Micro Mini Sized Module

DC/DC Module

1. Features

- High Surge Suppression
- Multi-channel Conversion
- Low Parasitism Output
- Operating Temperature : $-15^{\circ}\text{C} \sim +50^{\circ}\text{C}$
- Storage Temperature : $-40^{\circ}\text{C} \sim +70^{\circ}\text{C}$
- Weight : 0.8Kg
- Dimension : $120 \times 80 \times 30\text{mm}^3$
- Project Background : Applied for a variety of satellite platforms



2. Electrical Specification (Test Condition: $T_A = 25^{\circ}\text{C}$, $V_{CC1} = +5\text{V}$)

Parameters	Symbol	Typical Value	Unit
Busbar Amplitude	U	28/42/110	V
Efficiency	—	>83	%
Output Power	P _{tot}	30/60/80/120	W
Surge Suppression Amplitude	—	<1.5	—
Protection Function	—	Undervoltage, Overcurrent, Power Timing	—

Internal Devices Operation: Imported devices.
Installation : Horizontal installation with bottom contacted.