ERZIA
DATASHEET

High Power Amplifier
ERZ-HPA-0850-0980-55

ERZ-HPA-0850-0980-55

The ERZ-HPA-0850-0980-55 is a pulsed High Power Amplifier based on GaN technology focused for Radar applications in X band. It provides 300W in a compact size.

Main Features:

- Frequency Range: 8.5 to 9.8 GHz
- Typical values: Pout: 300 W, PAE 23%
- RF connectors (I/O): SMA (F) / WR-90
- DC & Control connectors: D-sub type
- Several mounting options
- Compact aluminum housing
- Hi-reliability and dedicated screening/ environmental tests available under request

Typical applications:

- Radar X-band

High Power Amplifier

ERZ-HPA-0850-0980-55

Electrical Specifications

Parameter	Value			Units
	Min	Typ	Max	
Frequency	8.5	-	9.8	GHz
Output Power (Psat)	54	55	56	dBm
Small Signal Gain	53	60	65	
Power Gain (@Psat)	48	55	62	dB
Pulse Width	0,01	-	250 @20% DC	us
			500 @10% DC	
Pulse Repetition Interval (PRI)	10 @DC 20%	-	-	us
	1.3 @DC 15%	-	-	
Duty Cycle (DC)	-	-	20 @PRI ≥10 us	%
	-	-	15 @PRI <10 us	
Output RF Pulse Rise Time	-	-	20	ns
Output RF Pulse Fall Time	-	-	20	ns
Amplifier ON/OFF Time	-	-	150/150	ns
Input/Output VSWR	-	-	2.0:1 / 2.0:1	-
DC Voltage	22	28	36	V
Avg. Power Consumption (@Psat)	150 @10% DC	-	200 @10% DC	W
	300 @20% DC		400 @20% DC	
PAE (@Psat)	20	23	27	%

Specifications at a case temperature of 25°C

Mechanical Specifications

Parameter	Value	Units
Dimensions	178x215x42.5 (LxWxH)	mm
RF Connectors	IN: SMA (F) / OUT: WR-90 (UBR100)	-
DC Connector	D-sub 5W5	-
Control Connector	D-sub 15	-

Output Power

Figure 2 shows saturated output power measurement as a function of frequency measured with a pulse width of 100us and a duty cycle of 10% at different temperatures (-40°C, 25°C and +55°C).

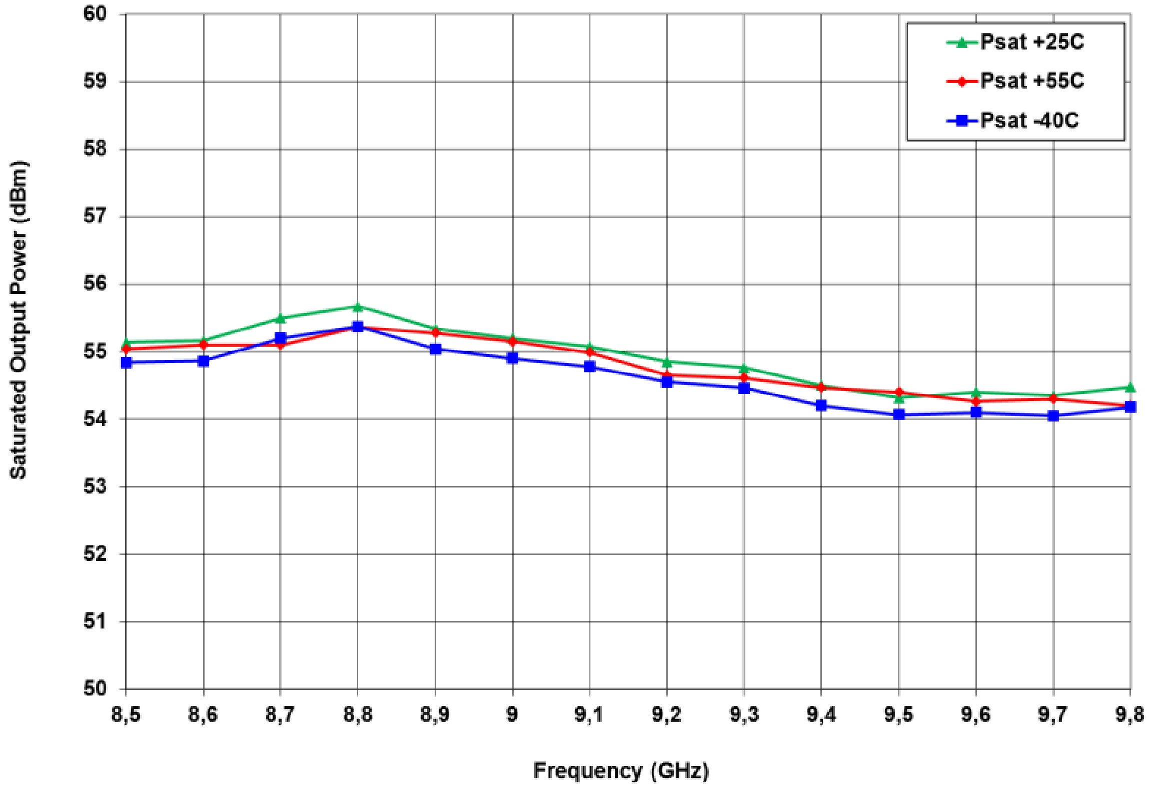


Figure 2: ERZ-HPA-0850-0980-55 Psat Vs Freq

Power Gain

Figure 2 shows power gain measurement as a function of frequency measured with a pulse width of 100us and a duty cycle of 10% at different temperatures (-40°C, 25°C and +55°C).

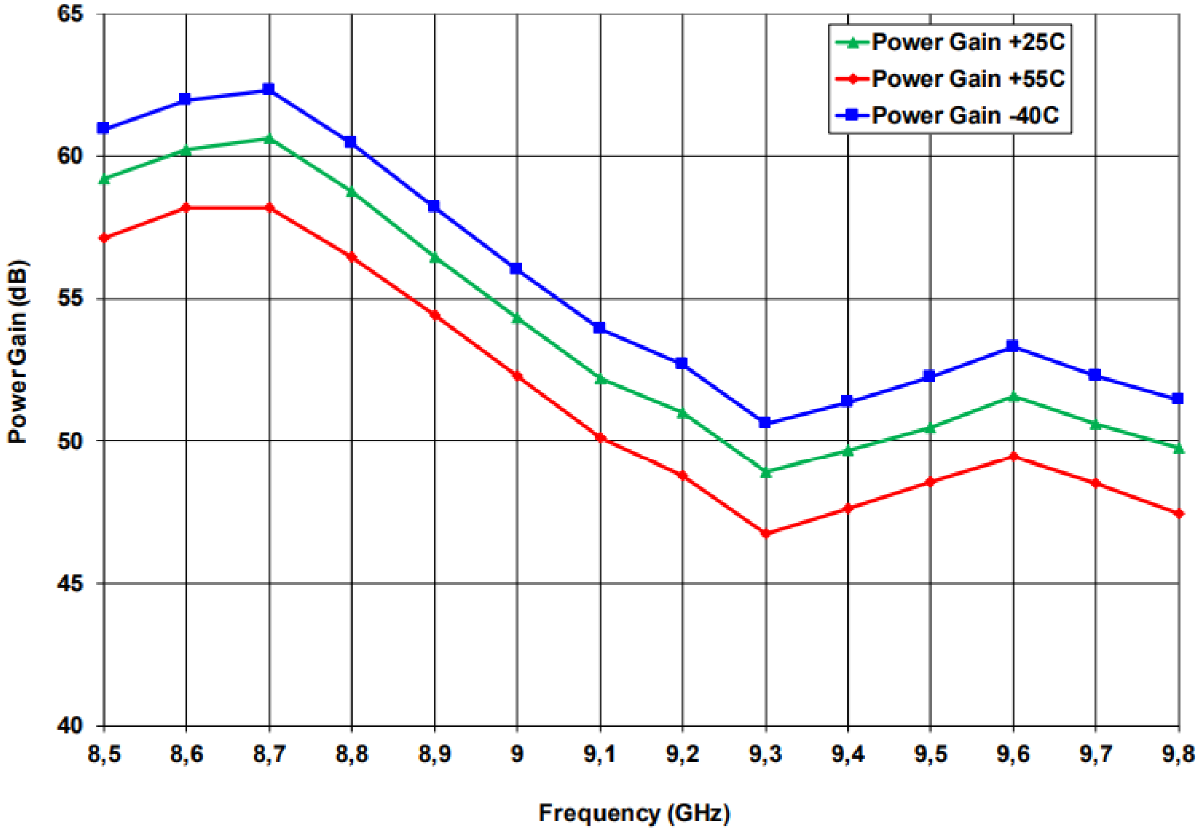


Figure 2: ERZ-HPA-0850-0980-55 Power Gain Vs Freq

Power Consumption

Figure 3 shows power consumption measurement as a function of frequency measured with a pulse width of 100us and a duty cycle of 10% at different temperatures (-40°C, 25°C and +55°C).

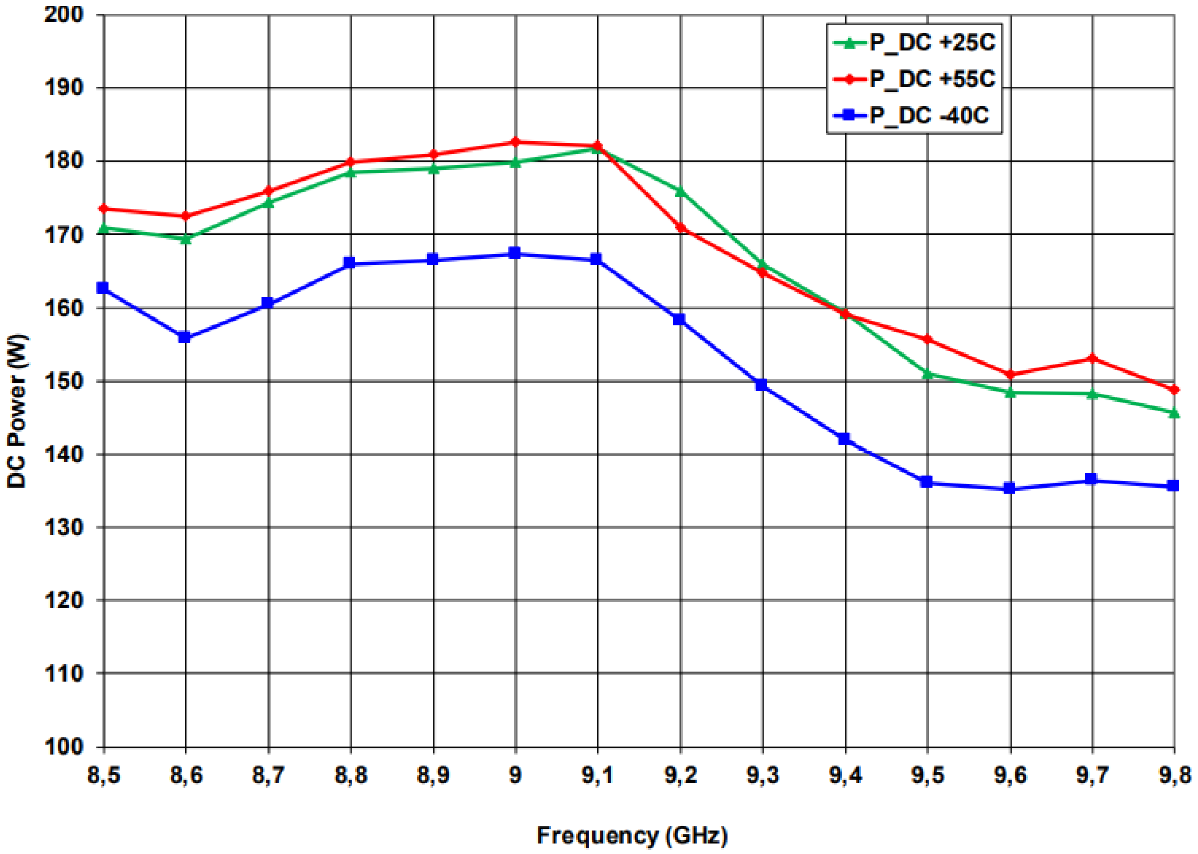


Figure 3: ERZ-HPA-0850-0980-55 Power Consumption Vs Freq

Output Power, Gain and Power Consumption Vs Input Power

Figure 4 shows output power, gain and power consumption measurement as a function of input power measured with a pulse width of 100us and a duty cycle of 10% at different at room temperature (25°C)

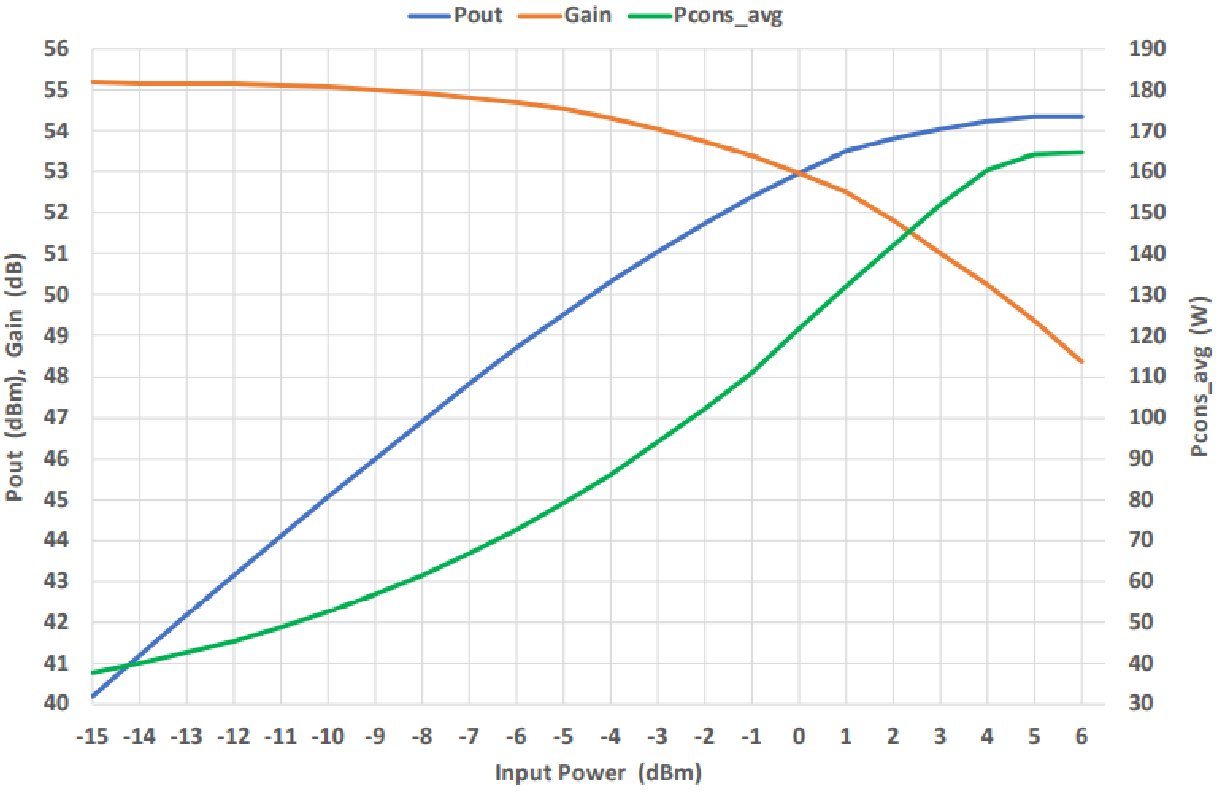


Figure 4: ERZ-HPA-0850-0980-55 Pout, Gain and Power consumption Vs Pin

Output Power Detected Vs Input Power

Figure 5 shows voltage measurement as a function of input power measured with a pulse width of 100us and a duty cycle of 10% at different at room temperature (25°C)

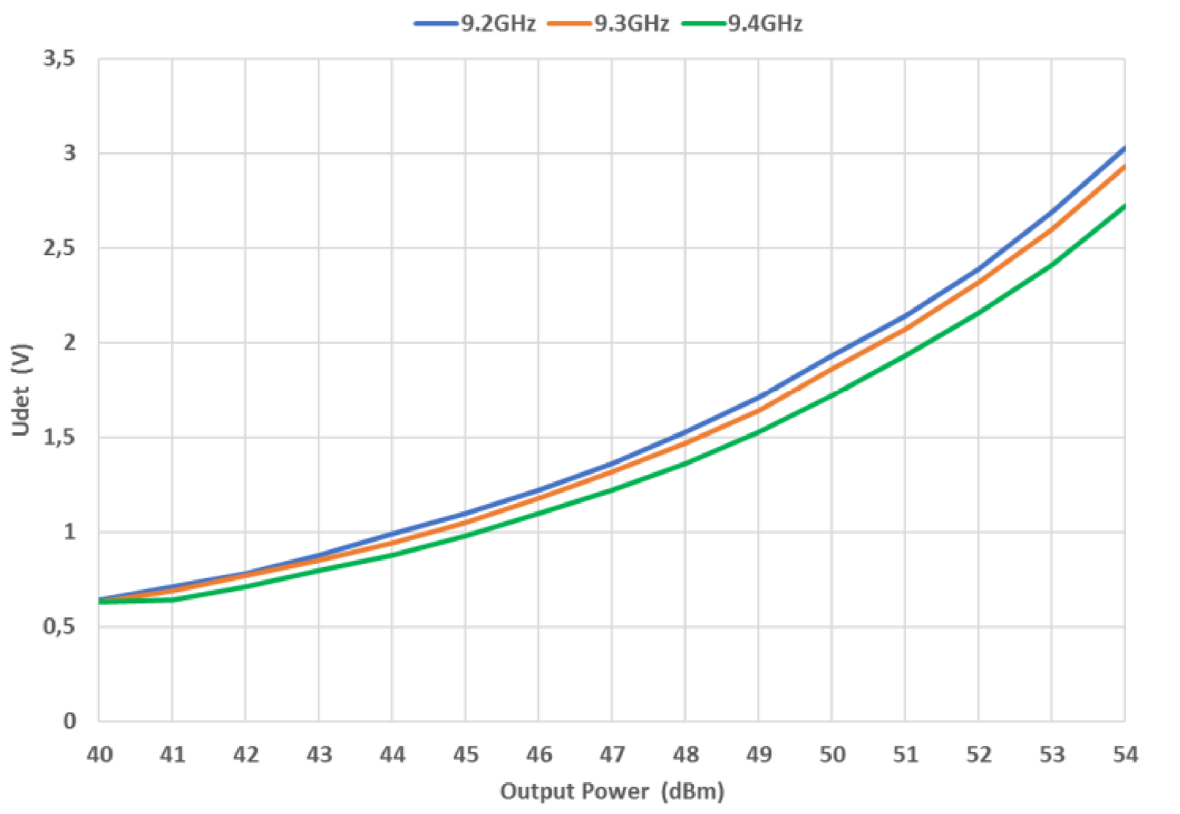


Figure 5: ERZ-HPA-0850-0980-55 Pout detected Vs Pin

Small Signal Gain

Figure 6 shows small signal gain measurement as a function of frequency measured with a pulse width of 100us and a duty cycle of 10% at different at room temperature (25°C)

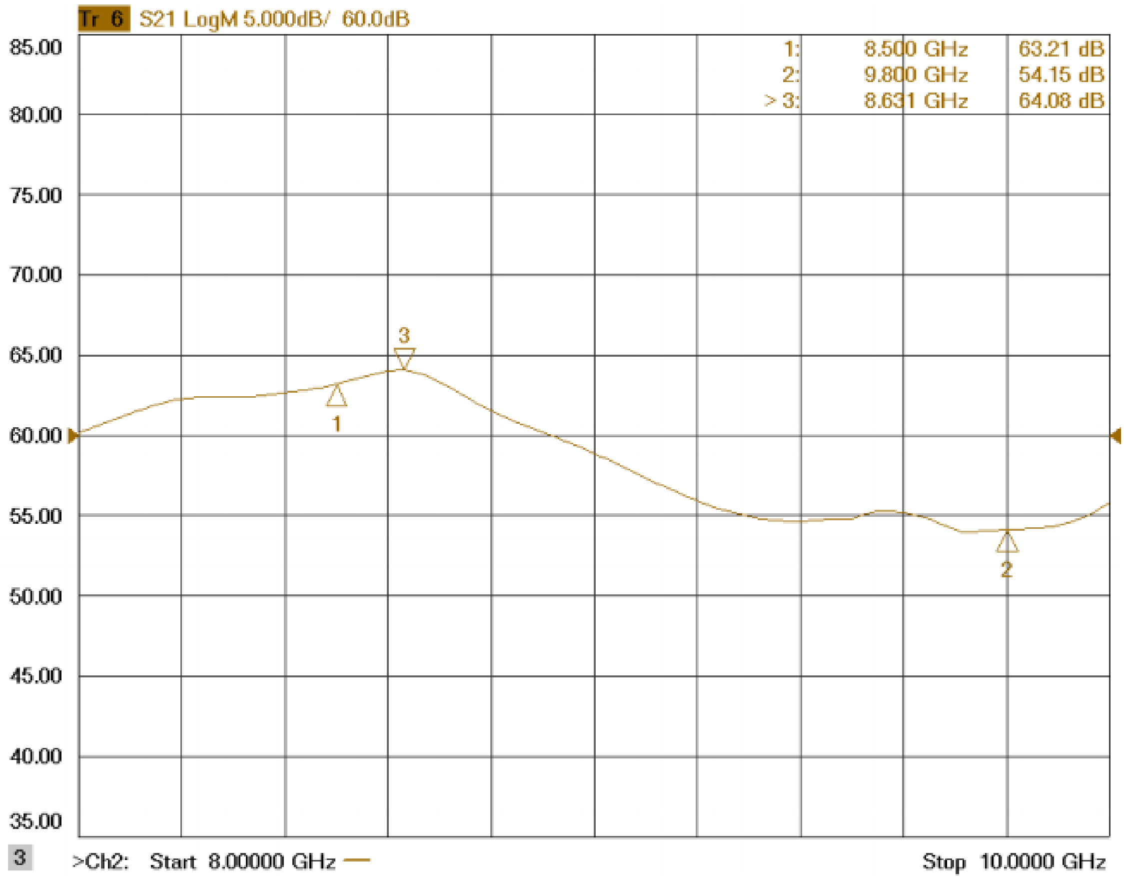


Figure 6: ERZ-HPA-0850-0980-55 Small signal gain Vs Frequency

Input and Output Matching

Figure 7 and 8 show input and output matching measurements as a function of frequency measured with a pulse width of 100us and a duty cycle of 10% at different at room temperature (25°C)

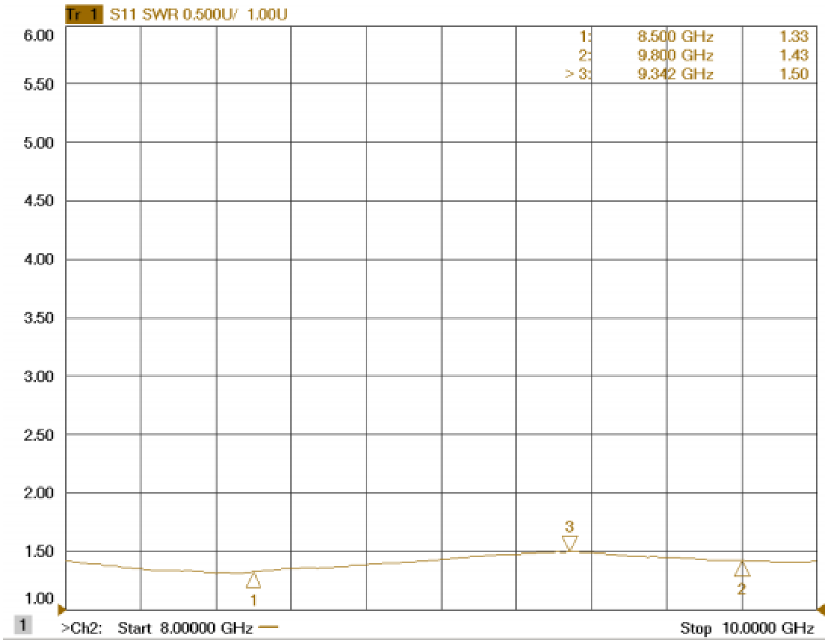


Figure 7: ERZ-HPA-0850-0980-55 Input Matching Vs Frequency

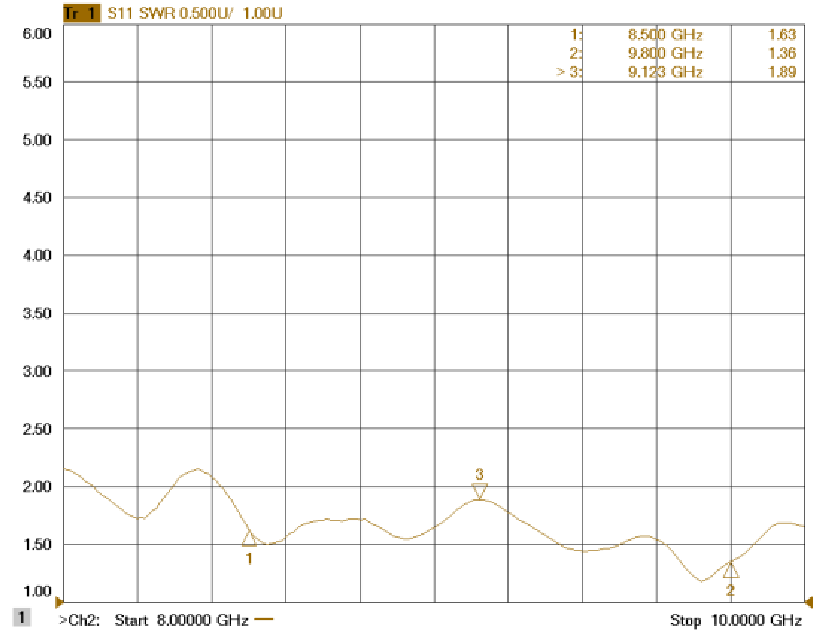


Figure 8: ERZ-HPA-0850-0980-55 Output Matching Vs Frequency

RF Output Pulses at Saturation Level

Figure 9, 10 and 11 show RF output pulse at different frequencies at room temperature (25°C)

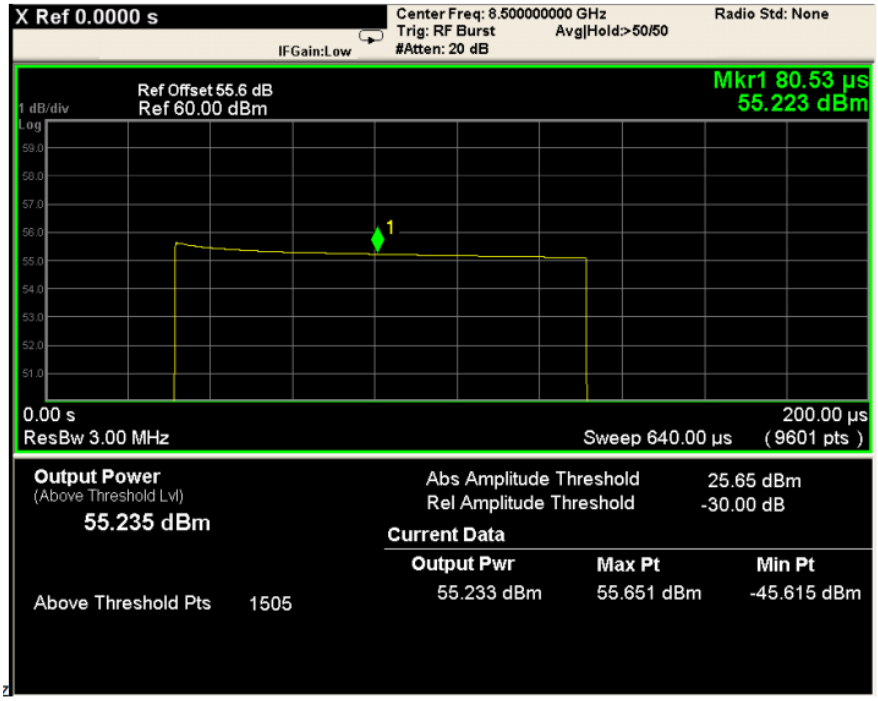


Figure 9: ERZ-HPA-0850-0980-55 RF Output Pulse at 8,5 GHz

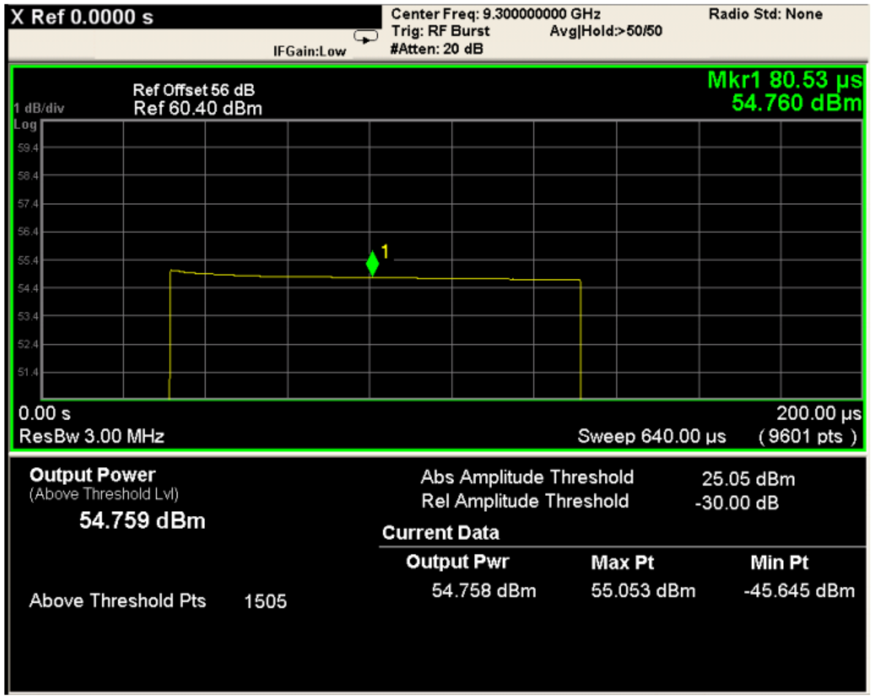


Figure 10: ERZ-HPA-0850-0980-55 RF Output Pulse at 9,3 GHz

RF Output Pulses at Saturation Level

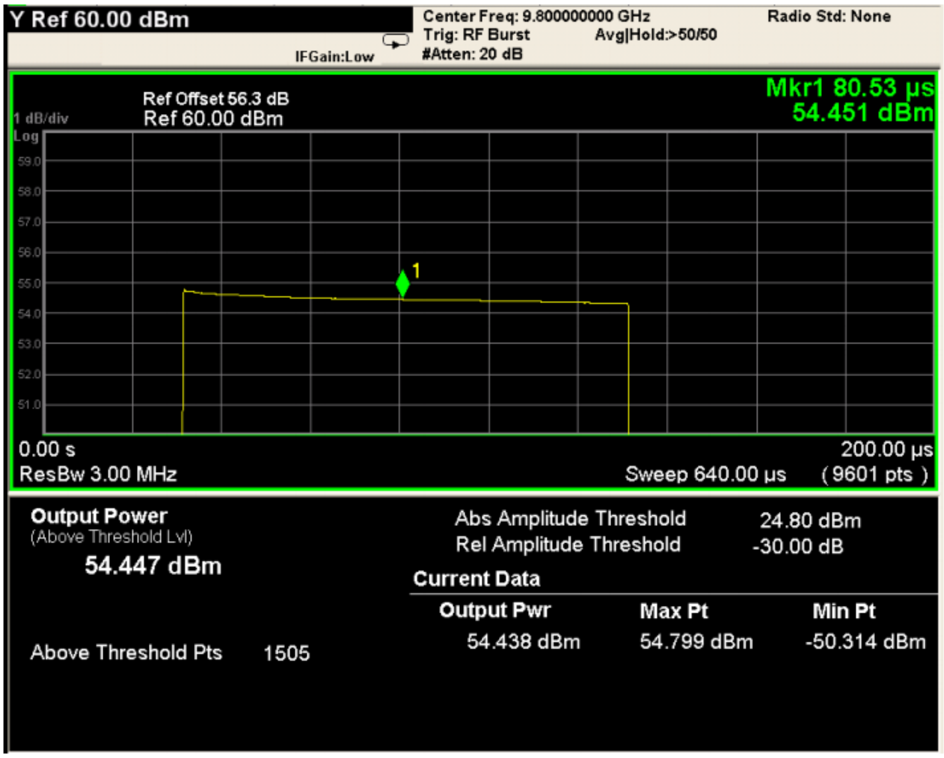


Figure 11: ERZ-HPA-0850-0980-55 RF Output Pulse at 9,8 GHz

Rise and Fall time

Figures 12 and13 show rise and fall time at room temperature (25°C)

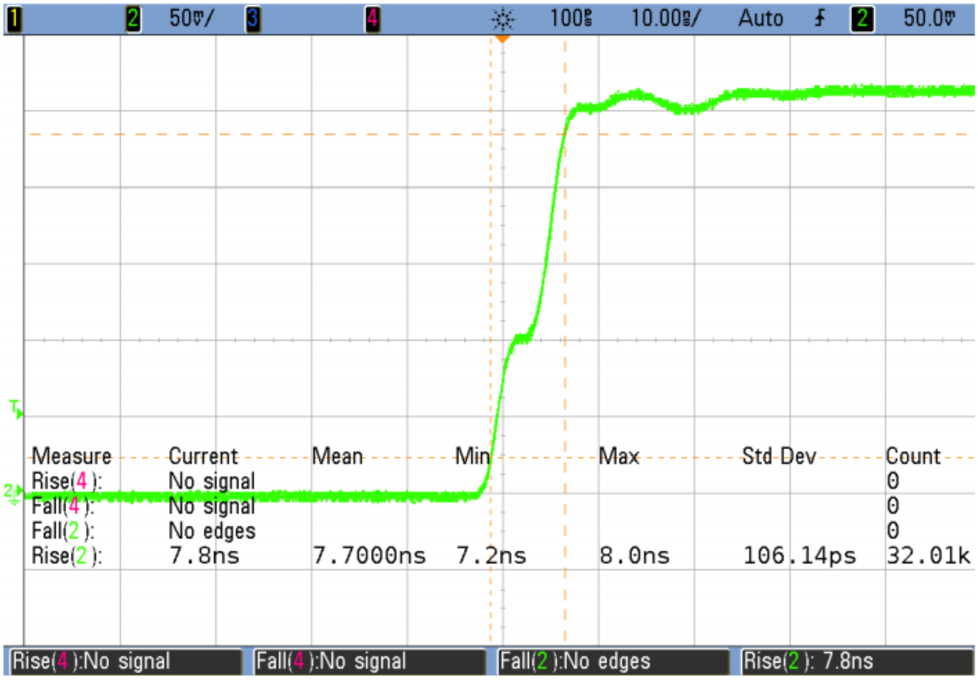


Figure 12: ERZ-HPA-0850-0980-55 Rise time

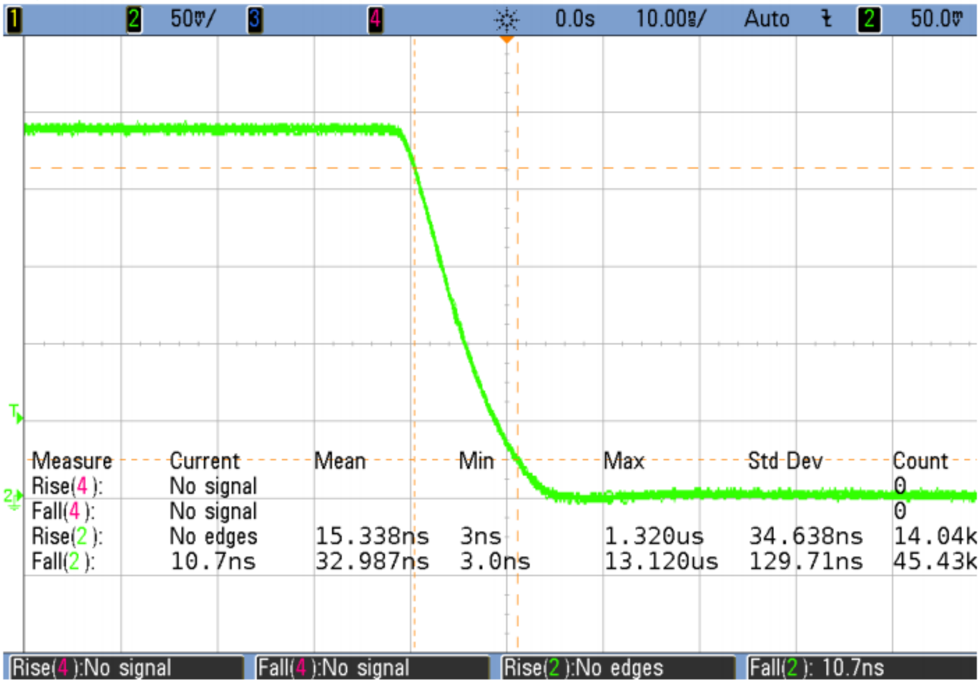


Figure 13: ERZ-HPA-0850-0980-55 Fall time

Outline Drawing

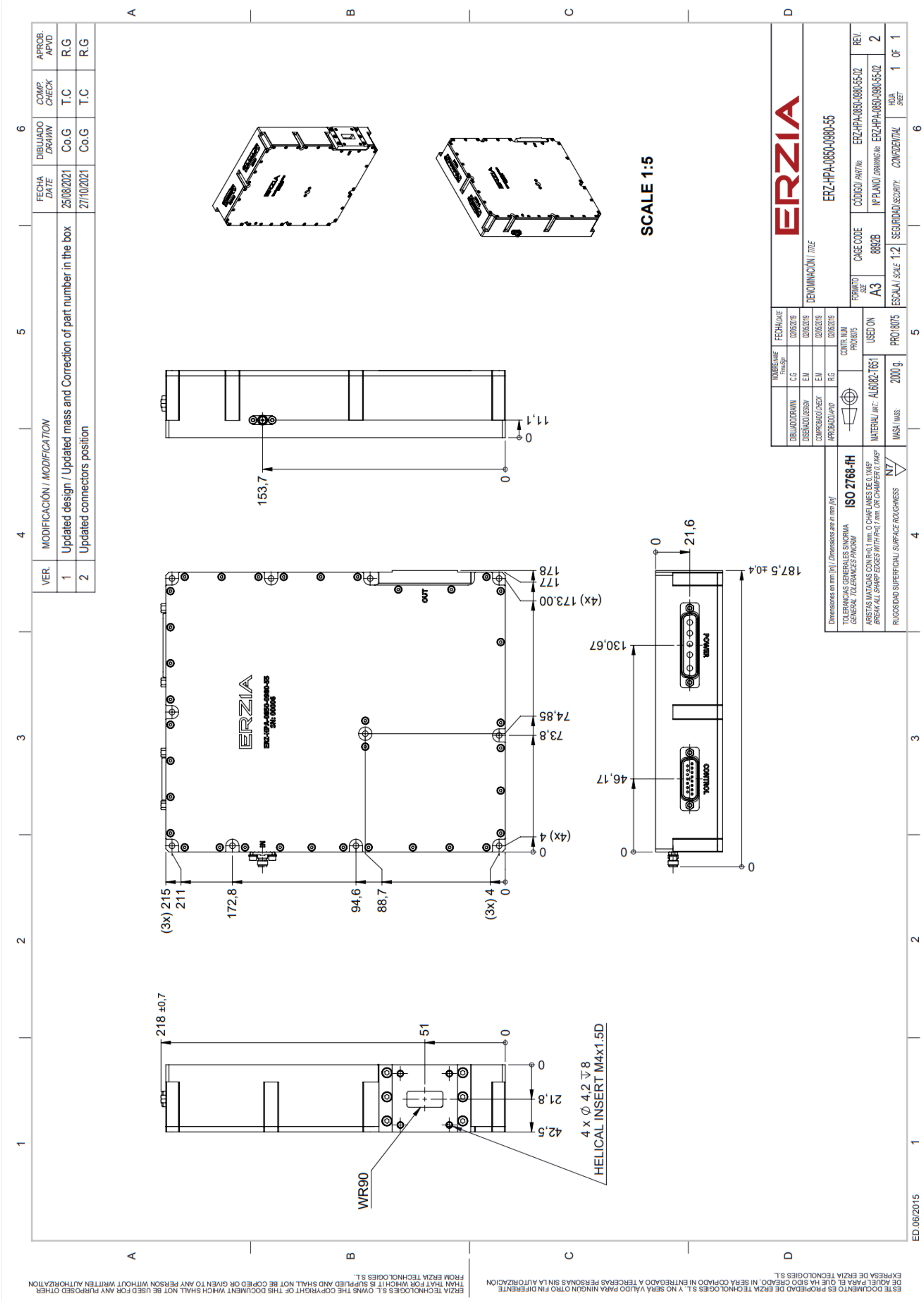


Figure 14: ERZ-HPA-0850-0980-55 Outline Drawing

Power Supply Interface

Power supply characteristics

- Input Voltage: 22 to 36 VDC

Table below shows D-Sub 5W5 connector pinout

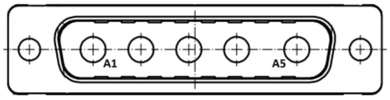


Figure 15: Power Connector. DSUB 5W5 Male Front View

PIN	LABEL	SIGNAL
A1	VCC	+28V Power Source
A2	VCC	+28V Power Source
A3	GND	Power Ground
A4	GND	Power Ground
A5	GND	Ground to Chasis

Control Interface

Control signals:

- Transmit gate signal
- Temperature sensor
- Reflected power detector
- Current consumption alarm
- Enable

- Transmit gate signal
- Temperature sensor
- Reflected power detector
- Current consumption alarm
- Enable

Table below shows D-Sub 15 connector pinout

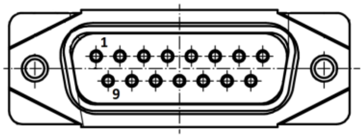


Figure 16: Control Connector. DSUB 15 Male Front View

PIN	LABEL	SIGNAL	Type
1	I_SEN	Current Sensor	Analog Output
2	P_DET	Output Power Detector	Analog Output
3	GND	Ground	Ground
4	T_ALM	Temperature Alarm	Digital Output
5	RP_ALM	Reflected Power Alarm	Digital Output
6	GND	Ground	Ground
7	RES	Reset	Digital Input
8	TGTX	Transmit Gate Signal	Digital Input
9	T_SEN	Temperature Sensor	Analog Output
10	RP_DET	Reflected Power Detector	Analog Output
11	GND	Ground	Ground
12	I_ALM	Current Consumption Alarm	Digital Output
13	GND	Ground	Ground
14	GND	Ground	Ground
15	EN	Enable	Digital Input

Control Interface

Control Signals description:

I_SEN (PIN 1): The input current is given by an analog voltage 0.01V per ampere. The sensor is designed for fast response to monitor signal transmission consumption.

RF_PWR (PIN 2): RF peak detector. The RF forward power is given by analog voltage.

TEMP_ALM (PIN 4): The temperature alarm remains high if temperature is lower than -40ºC or higher than +85ºC with 5ºC hysteresis. The HPA keeps switched off when this alarm is high and switch on when the internal temperature returns to normal operation temperature.

RF_R_PWR_ALM (PIN 5): The reflected power alarm is high when a reflected signal in the output occurs.

RESET (PIN 7): This pin is not connected internally in this unit.

MOD (PIN 8): Digital input modulation. Drive this pin with a control signal to synchronize RF signal and amplifier high power transmission. The transmit input signal shall comply 1μs ± 100ns before RF pulse start and 1μs after RF pulse ends. Transmit inhibited when disconnected. Maximum pulse width is 500 μS 10% duty cycle or 250 μS 20% duty cycle. Minimum width is 1 μS. This pin has an internal 10k pull down resistor.

TA_SEN (PIN 9): The HPA has an internal precision temperature sensor to monitor the internal temperature.
The transfer function is predominately linear with good accuracy near 25°C: Vo= −11.69 mV/°C × T +1.8663V, to best accuracy can be obtained by using the parabolic transfer function: Vo=(−3.88×10−6×T2) +(−1.15×10−2×T) + 1.8639. The operating temperature is -40ºC to +85ºC.

RF_R_PWR (PIN 10): RF peak detector. The RF reflected power is given by analog voltage.

I_ALM (PIN 12): The input current alarm remains high when input current is higher than a safe value.

Enable (PIN 15): Enable amplifier. Tie high to enable amplifier. Tie low or leave floating to switch off amplifier. This pin has an inter 10k pull down resistor

Digital Signals Characteristics				
Parameter	Min	Typ	Max	Unit
V_{IH}	+3,5	-	+5,5	V
V_{IL}	0	-	+1,5	V
V_{O}	0	-	+5	V

Absolute Maximum Ratings

Condition	Value
DC Voltage	+36 VDC
Maximum Input Power (CW)	+10 dBm
Operation temperature (at case)	-40 to 70 °C
Storage temperature	-55 to 125 °C

- Stress above these ratings may cause permanent damage to the device.
- It is final user responsibility to maintain the amplifier within the specified ranges.

Environmental Specifications (By Design)

Operating Temperature:	-40 to +70 °C	(MIL-STD-810F, method 520.2)
Storage Temperature:	-55 to 125 °C	(MIL-STD-810F, method 520.2)
Vibration:	8g rms	(MIL-STD-810F, method 514.5)
Shock:	20g,11ms,saw-tooth	(MIL-STD-810F, method 516.5)
Acceleration:	15g	(MIL-STD-810F, method 513.5)

RoHS & REACH Compliance

This part is compliant with EU 2011/65/UE RoHS (Restrictions on the Use of Certain Hazardous Substances in Electrical and Electronic Equipment) and REACH (Registration, Evaluation, Authorization and restriction of Chemical substances) directives.

Documentation and Test Reports

All modules are at least delivered with: Electrical Test Report, Certificate of Conformance, Certificate of Acceptance and Origin. Optionally, units can be environmentally tested (temperature, vibration…).

Option (HS): Heat Sink

A heat sink (HS) can be provided to allow the operation of Power Amplifiers. Please note that most power amplifiers need heat sink or appropriate heat dissipation strategy.

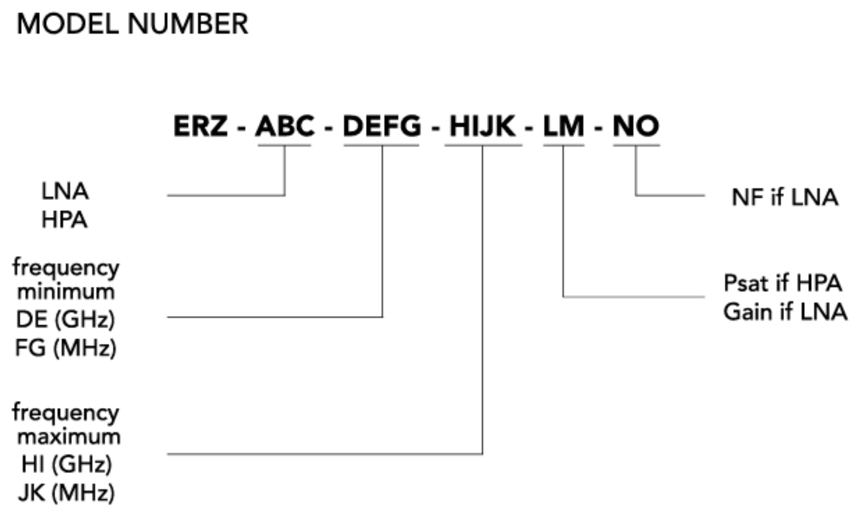
Space / Military Usage

Most of ERZIA´s products are based on rad-hard technologies and can be manufactured and integrated according to MIL / ECSS or specific hi-rel standard-screening for space, aeronautics, military or specific hi-reliability usage.

Customization and Extended Performances

ERZIA can fully design or adapt one of the existing RF amplifiers designs according to your specifications. Please contact us for additional information.

Model Number Codification



20190510_rev1.4

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