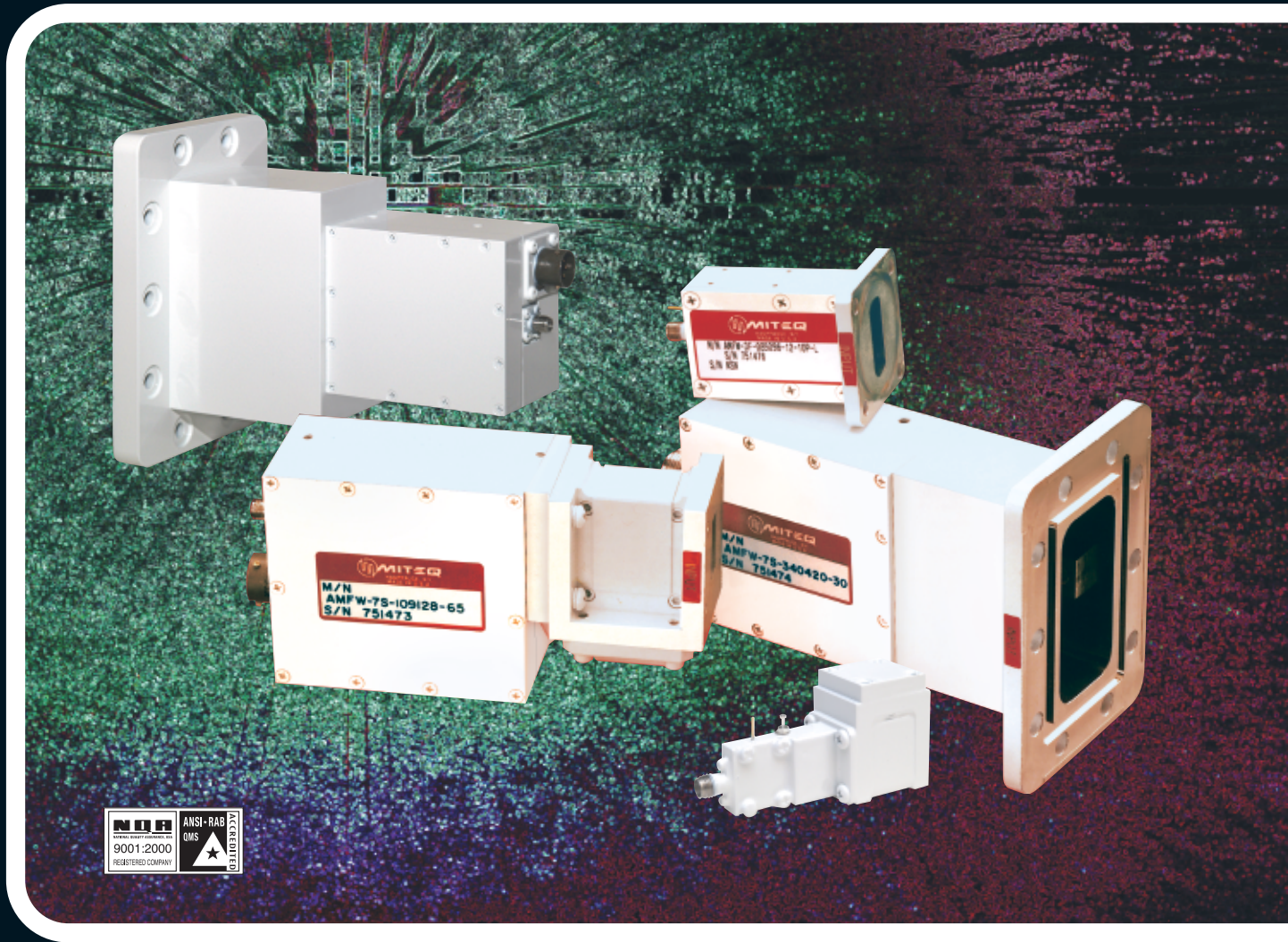


# AMF SATCOM AMPLIFIERS ULTRA LOW NOISE LNAs



- S-BAND
- C-BAND
- X-BAND
- Ku-BAND
- Ka-BAND



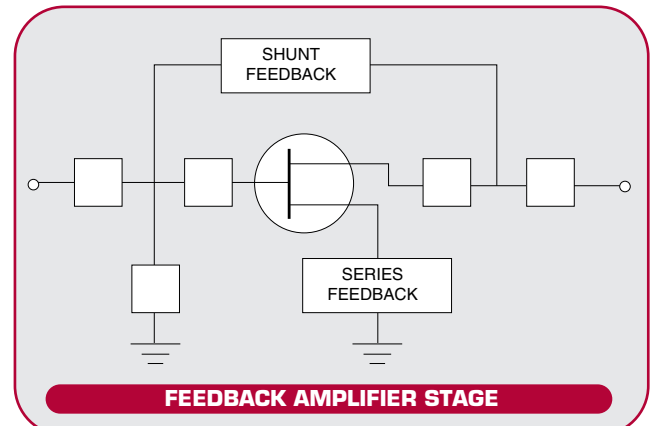
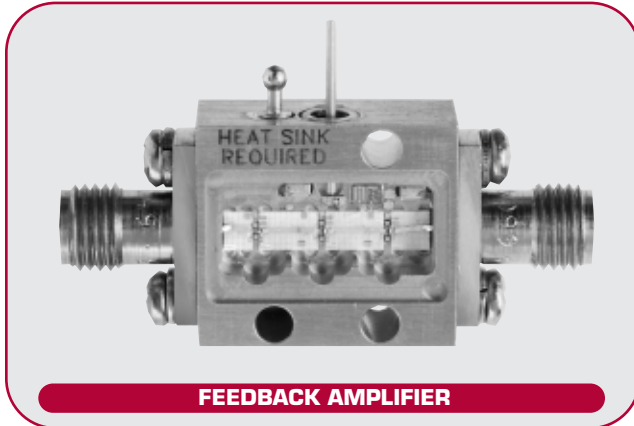
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## CIRCUIT DESCRIPTIONS

MITEQ's AMF Series SATCOM amplifiers capitalize on technology developed at MITEQ during the past 35 years. This technology had been mainly in support of the radiometry community providing state-of-the-art low noise amplifier designs. Based upon a hybrid Microwave-Integrated-Circuit (MIC) approach, MITEQ utilizes chip-and-wire-construction to minimize losses to the input stage, as well as supporting the subtle adjustments needed to achieve the optimum match for VSWR and noise figure.

MITEQ's SATCOM amplifiers are offered with and without the use of input isolators. In both cases, feedback is the technique used in the input stage to facilitate impedance matching for an optimum balance of power (VSWR) and noise figure.



## FEEDBACK DESIGNS

Feedback based designs use a single transistor in each stage. The impedance of the FET is matched to the input or output source and load impedance by means of coupling a portion of the output signal back into the input with frequency dependent elements. Two basic types of feedback are applied, series or parallel. Series feedback is also known as "lossless" feedback because there is no additional lossy circuits added to the input of the FET. Although difficult to optimize, a lossless feedback design provides the lowest noise figures available today.

In implementing this design, the engineer must pay particular attention when impedance matching the input stages. The interaction of power and noise match of the transistor must be optimized over the specified band. This optimization of a feedback amplifier design involves a tradeoff exercise between input VSWR and noise figure performance. The matching techniques utilized are best accomplished in "chip and wire" construction where subtle tuning can be realized. It is an area that requires extensive experience and a detailed knowledge of the transistor and impedance matching circuits to achieve the best performance.

MITEQ is not the only company using feedback approach to achieve low noise figures; however, many of our competitors must utilize input and interstage isolators to allow them to provide good VSWR performance in the presence of the best noise match. Although isolators are sometimes used for special applications, MITEQ has proven an ability to achieve both a good power match and an optimum noise match without isolators. This gives us a great advantage over our competition by providing the lowest noise figures available.

## NOISE TEMPERATURE, NOISE FIGURE AND NOISE FACTOR

The basic formula are:

$$\text{Noise Factor (F)} = \text{SNR}_i / \text{SNR}_o = (\text{Signal}_{\text{input}} / \text{Noise}_{\text{input}}) / (\text{Signal}_{\text{output}} / \text{Noise}_{\text{output}})$$

$$\text{Noise Figure (NF)} = 10 \times \log (\text{Noise Factor}) \text{ [in dB]}$$

$$\text{Noise Temperature (T)} = 290 \times 10^{(\text{Noise Figure}/10)-1} \text{ [in K]}$$

Note: Log must be to base 10. When using calculators and spreadsheets make sure that base 10 is selected. As a test,  $10 \times \log(2)$  should give an answer of +3 dB.

## CASCADED NOISE FIGURE

The basic formula is:

$$\text{Noise Figure}_{\text{total}} = \text{NF}_1 + (\text{NF}_2 - 1) / G_1 + (\text{NF}_3 - 1) / G_1 G_2 + \dots$$

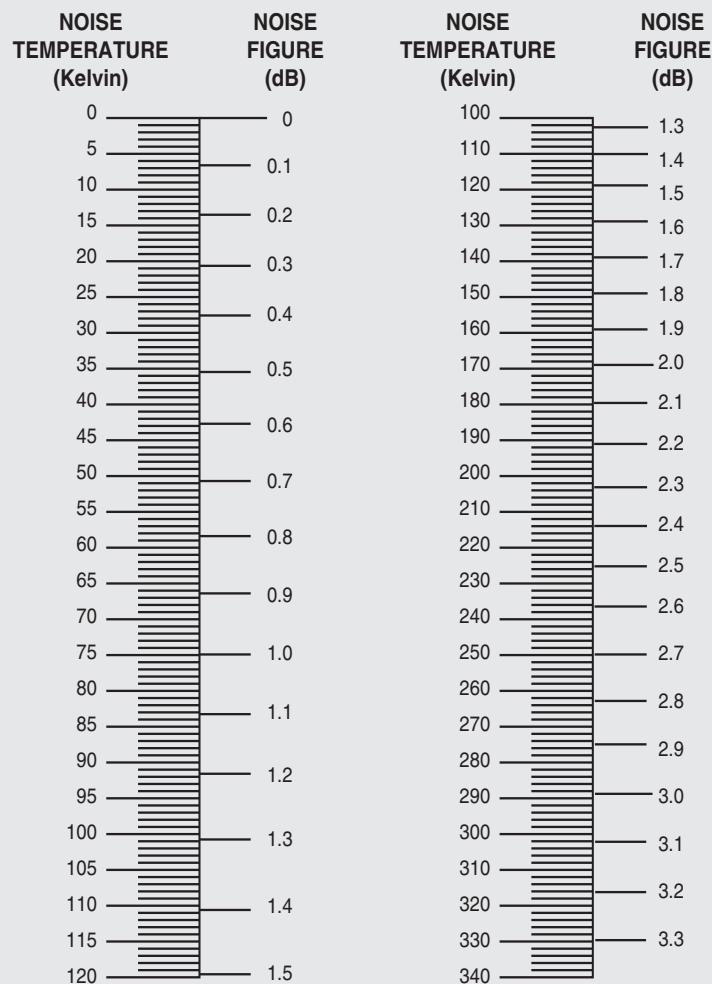
where

- $G_1$  and  $\text{NF}_1$  are the gain and noise figure of the first amplifier in the cascade.
- $G_2$  and  $\text{NF}_2$  are the gain and noise figure of the second amplifier in the cascade.
- $\text{NF}_3$  is the noise figure of the third amplifier in the cascade.

It should be noted that the noise figure contributions of any components after the first amplifier stage will be negligible if that first-stage amplifier has sufficiently high gain.

If a passive device (one with loss) is included in the cascade, the insertion loss of the device would be inserted into the formula as value less than 1 (minus value in dB). Also, the noise figure of the device would be equal to the inverse of the gain (positive value in dB).

## NOISE TEMPERATURE VERSUS NOISE FIGURE



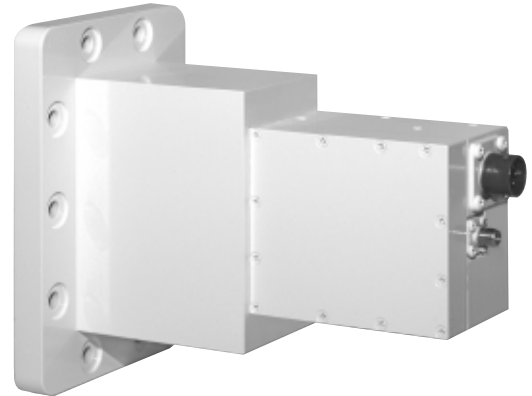
## AMFW ULTRA LOW NOISE S-BAND WAVEGUIDE LNAs

### FEATURES

- Noise temperatures as low as 30 K
- Internal regulation and reverse voltage protection
- CPR340F input waveguide and SMA female output
- Fully weatherproof
- Compliant vs. MIL-STD-810E Salt Fog testing
- Two-year product warranty

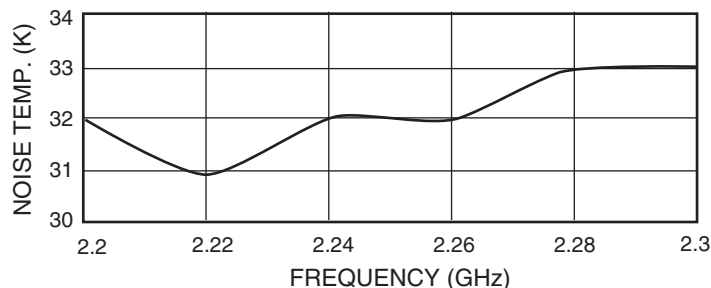
### OPTIONS

- Fault alarm circuitry
  - Form-C, contact closure
  - Fully integrated
- DC bias applied through the RF output
- 110/220 VAC internal power supplies
  - Fully integrated
  - CE certified
- DC bias of -24 VDC
- Higher output powers
  - P1 dB of +15 dBm, min.; OIP3 of +25 dBm, min.
  - P1 dB of +20 dBm, min.; OIP3 of +30 dBm, min.
  - P1 dB of +23 dBm, min.; OIP3 of +33 dBm, min.
- Improved gain variation vs. temperature
  - 3 dB, P-P, max.
- N-type female RF output connector
- CPR430F input waveguide
  - Requires a change in outline drawing
  - Please consult factory for details
- Input limiter protection up to 2 watts CW
  - Please consult factory for details
- Customer specified gain windows
  - Please consult factory for details



MITEQ's AMFW catalog line of SATCOM waveguide amplifiers utilizes PHEMTs offering the lowest noise figures available in the various frequency bands associated with S-band satellite communication. Achieving noise temperatures as low as 30 K, these amplifiers have been designed using state-of-the-art technology and can be used in either fixed or transportable applications. The high-reliability design of these S-band amplifiers allows MITEQ to offer a standard two-year warranty on units that consistently experience the harsh environments involved with satellite base-station operation.

**TYPICAL NOISE TEMPERATURE DATA  
MODEL AMFW-5F-022023-05-10P**





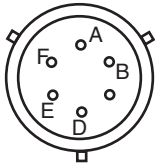
## AMFW ULTRA LOW NOISE S-BAND WAVEGUIDE LNAs

### ELECTRICAL SPECIFICATIONS

PARAMETERS	NOTES	MINIMUM	NOMINAL/TYPICAL	MAXIMUM
Standard frequency options		2.1 GHz 2.2 GHz 2.2 GHz		2.4 GHz 2.3 GHz 2.4 GHz
Standard gain options		70 dB 60 dB 50 dB 40 dB	72 dB 64 dB 54 dB 44 dB	
Gain flatness	Full band per 40 MHz		0.7 dB, P-P 0.3 dB, P-P	1 dB, P-P 0.4 dB, P-P
Gain variation vs. temperature (-40 to +60°C)	Standard Option -TC		4.25 dB, P-P 2.5 dB, P-P	5 dB, P-P 3 dB, P-P
Gain stability, constant temperature	Short (10 minutes) Medium (24 hours) Long (1 week)			±0.10 dB ±0.20 dB ±0.50 dB
Noise temperature options	At +23°C case temp.		28 K 33 K 38 K 43 K 46 K	30 K 35 K 40 K 45 K 50 K
Input VSWR			1.2:1	1.25:1
Output VSWR			1.35:1	1.5:1
Output power at 1 dB compression	Standard Option -P1 Option -P2 Option -23P	+10 dBm +15 dBm +20 dBm +23 dBm	+13 dBm +18 dBm +23 dBm +25 dBm	
Output third order intercept point	Standard Option -P1 Option -P2 Option -23P	+20 dBm +25 dBm +30 dBm +33 dBm	+23 dBm +28 dBm +32 dBm +34 dBm	
Group delay, per 40 MHz	Linear Parabolic Ripple			0.01 ns/MHz 0.001 ns/MHz <sup>2</sup> 0.3 ns, P-P
AM/PM conversion	-5 dBm output			0.05 dB/°
Max. input without damage				+10 dBm CW
DC voltage requirements		+14.5 VDC	+15 VDC	+28 VDC
DC current	Standard Options -P1 or -P2		175 mA 275 mA	250 mA 425 mA
Temperature range Operating Storage		-40°C -50°C		+60°C +80°C
MTBF	Ground benign		250,000 hours	

# AMFW ULTRA LOW NOISE S-BAND WAVEGUIDE LNAs

## CONNECTOR INFORMATION



### STANDARD LNA

Pin A	+12 VDC to +28 VDC
Pin B	Ground
Pin C	Ground
Pin D	Not Used
Pin E	Not Used
Pin F	Not Used

### LNA WITH POWER SUPPLY

Pin A	110 VAC/220 VAC
Pin B	Ground
Pin C	110 VAC/220 VAC
Pin D	Not Used
Pin E	Not Used
Pin F	Not Used

### LNA WITH FAULT ALARM

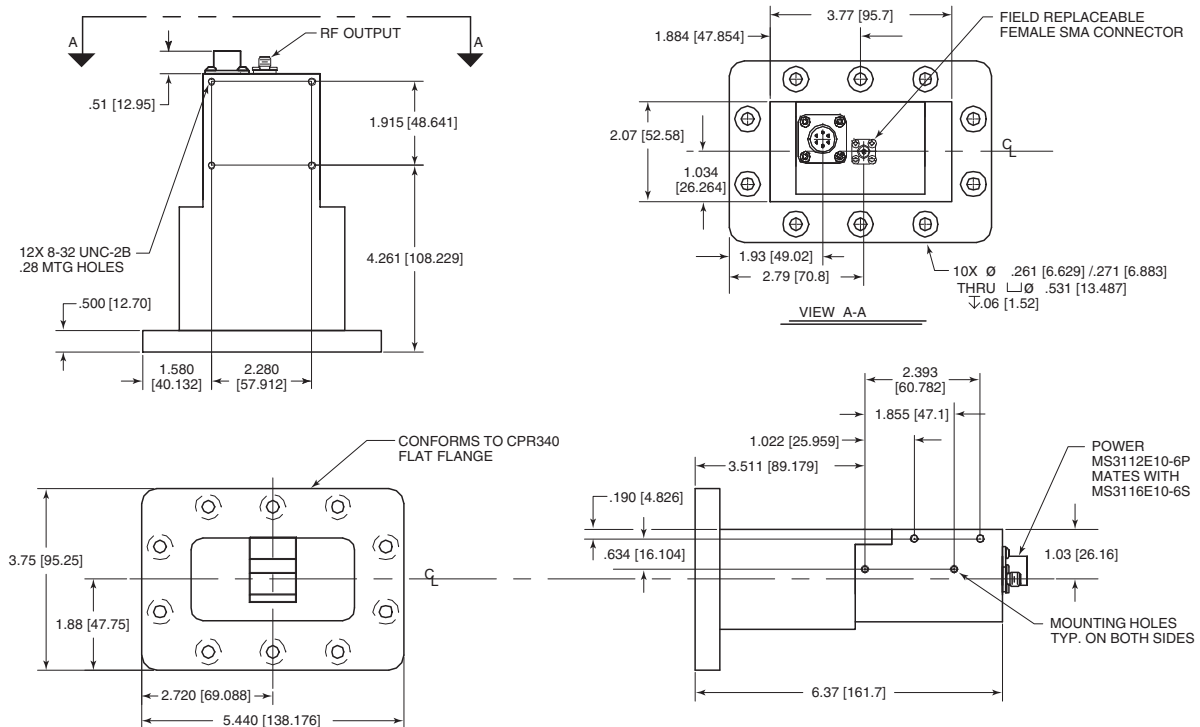
Pin A	+12 VDC to +28 VDC
Pin B	Ground
Pin C	Ground
Pin D	Alarm, Normally Open
Pin E	Alarm, Common Connection
Pin F	Alarm, Normally Closed

### LNA WITH ALARM AND SUPPLY

Pin A	110 VAC/220 VAC
Pin B	Ground
Pin C	110 VAC/220 VAC
Pin D	Alarm, Normally Open
Pin E	Alarm, Common Connection
Pin F	Alarm, Normally Closed

Part Number : MS3112E10-6P (Mating MS3116E10-6S provided with each LNA.)

## OUTLINE DRAWING



Note: Dimensions shown in brackets [ ] are in millimeters.

# AMFW ULTRA LOW NOISE S-BAND WAVEGUIDE LNAs

## AVAILABLE OPTIONS

Fault alarm .....Add suffix -F\*  
 DC bias through the RF output.....Add suffix -C  
 Solder bias pin.....Add suffix -B  
 110 VAC/220 VAC operation.....Add suffix -O\*  
 DC power supply at -24 VDC .....Add suffix -NEG\*  
 Output P1 dB of +15 dBm .....Add suffix -P1  
 Output P1 dB of +20 dBm .....Add suffix -P2  
 Output P1 dB of +23 dBm .....Add suffix -23P  
 3 dB, P-P, gain change vs. temperature .....Add suffix -TC  
 N-type female output connector .....Add suffix -N  
 CPR430F input waveguide.....Add suffix -430F  
 \* Specifications compliant temperature range limited to -15° to +60°C.  
 Note: Outline drawing changes to MITEQ 148029.

## OTHER AVAILABLE OPTIONS (Call factory for details)

Customer specified frequency ranges  
 Customer specified gain windows  
 Phase matching  
 Amplitude matching  
 Front-end protection (input limiter)

## ORDERING INFORMATION

**AMFW-xx-xxxxxx-xx**

### Minimum Gain Designation (dB)

5S = 40  
 6S = 50  
 7S = 60  
 8S = 70

### Frequency Designation (GHz)

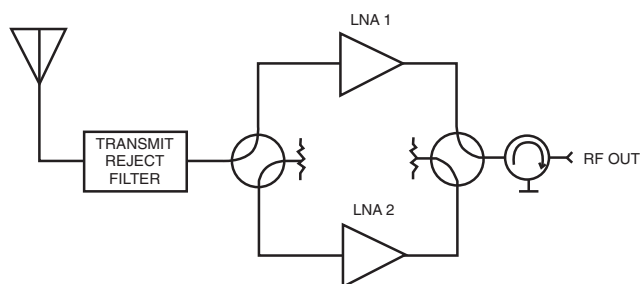
021024 = 2.1 – 2.4  
 022023 = 2.2 – 2.3  
 022024 = 2.2 – 2.4

### Maximum Noise Temperature (K)

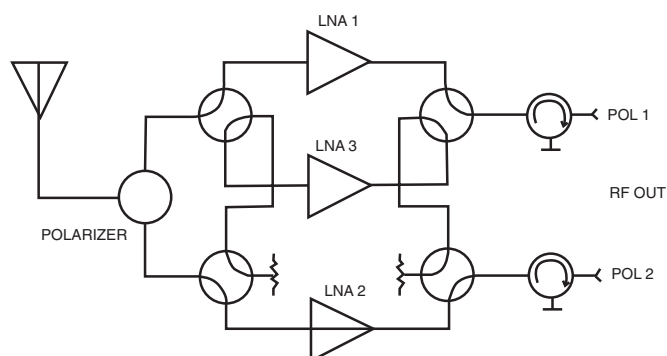
30 = 30  
 35 = 35  
 40 = 40  
 45 = 45  
 50 = 50

## TYPICAL APPLICATIONS

### 1:1 Redundant Systems



### 1:2 Redundant Systems





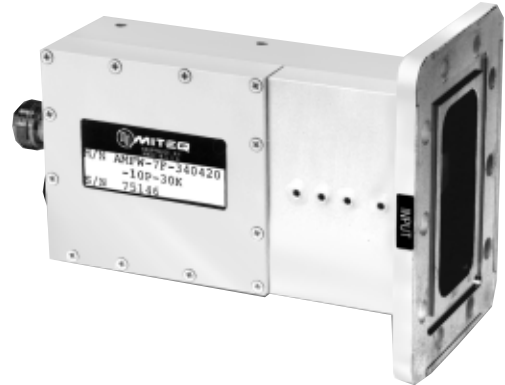
## AMFW ULTRA LOW NOISE C-BAND WAVEGUIDE LNAs

### FEATURES

- Noise temperatures as low as 28 K
- Internal regulation and reverse voltage protection
- CPR229G grooved input and N-type female output
- Fully weatherproof
- Compliant vs. MIL-STD-810E Salt Fog testing
- Two-year product warranty

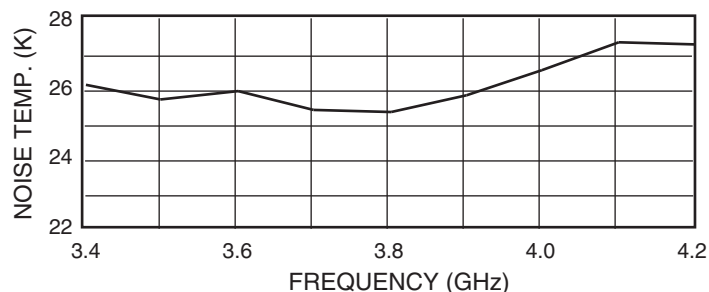
### OPTIONS

- Fault alarm circuitry
  - Form-C, contact closure
  - Fully integrated
- DC bias applied through the RF output
- 110/220 VAC internal power supplies
  - Fully integrated
  - CE certified
- DC bias of -24 VDC
- Higher output powers
  - P1 dB of +15 dBm, min.; OIP3 of +25 dBm, min.
  - P1 dB of +20 dBm, min.; OIP3 of +30 dBm, min.
  - P1 dB of +23 dBm, min.; OIP3 of +33 dBm, min.
- Improved gain variation vs. temperature
  - 3 dB, P-P, max.
- SMA female RF output connector
- Integrated transmit/reject filter
  - Upper band edge at 4.2 GHz
  - Rejection of 20 dB, min., at 5.2 GHz
- Input limiter protection up to 25 watts CW
  - Please consult factory for details
- Customer specified gain windows
  - Please consult factory for details



MITEQ's AMFW catalog line of SATCOM waveguide amplifiers utilizes PHEMTs offering the lowest noise figures available in the various frequency bands associated with C-band satellite communication. Achieving noise temperatures as low as 28 K, these amplifiers have been designed using state-of-the-art technology and can be used in either fixed or transportable applications. The high-reliability design of these C-band amplifiers allows MITEQ to offer a standard two-year warranty on units that consistently experience the harsh environments involved with satellite base-station operation.

**TYPICAL NOISE TEMPERATURE DATA  
MODEL AMFW-7S-340420-28**



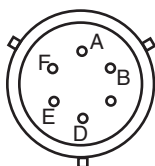
## AMFW ULTRA LOW NOISE C-BAND WAVEGUIDE LNAs

### ELECTRICAL SPECIFICATIONS

PARAMETERS	NOTES	MINIMUM	NOMINAL/TYPICAL	MAXIMUM
Standard frequency options		3.4 GHz 3.4 GHz 3.6 GHz 4.0 GHz 4.4 GHz		4.2 GHz 4.8 GHz 4.2 GHz 4.8 GHz 4.8 GHz
Standard gain options		70 dB 60 dB 50 dB 40 dB	72 dB 64 dB 54 dB 44 dB	
Gain flatness	Full band per 40 MHz		0.7 dB, P-P 0.3 dB, P-P	1 dB, P-P 0.4 dB, P-P
Gain variation vs. temperature (-40 to +60°C)	Standard Option -TC		4.25 dB, P-P 2.5 dB, P-P	5 dB, P-P 3 dB, P-P
Gain stability, constant temperature	Short (10 minutes) Medium (24 hours) Long (1 week)			±0.10 dB ±0.20 dB ±0.50 dB
Noise temperature options	At +23°C case temp.		26 K 28 K 33 K 38 K 43 K	28 K 30 K 35 K 40 K 45 K
Input VSWR			1.2:1	1.25:1
Output VSWR			1.35:1	1.5:1
Output power at 1 dB compression	Standard Option -P1 Option -P2 Option -23P	+10 dBm +15 dBm +20 dBm +23 dBm	+13 dBm +18 dBm +23 dBm +25 dBm	
Output third order intercept point	Standard Option -P1 Option -P2 Option -23P	+20 dBm +25 dBm +30 dBm +33 dBm	+23 dBm +28 dBm +32 dBm +34 dBm	
Group delay, per 40 MHz	Linear Parabolic Ripple			0.01 ns/MHz 0.001 ns/MHz <sup>2</sup> 0.3 ns, P-P
AM/PM conversion	-5 dBm output			0.05 dB/°
Max. input without damage				+10 dBm CW
DC voltage requirements		+12 VDC	+15 VDC	+28 VDC
DC current	Standard Options -P1 or -P2		175 mA 275 mA	250 mA 425 mA
Temperature range Operating Storage		-40°C -50°C		+60°C +80°C
MTBF	Ground benign		250,000 hours	

# AMFW ULTRA LOW NOISE C-BAND WAVEGUIDE LNAs

## CONNECTOR INFORMATION



### STANDARD LNA

Pin A	+12 VDC to +28 VDC
Pin B	Ground
Pin C	Ground
Pin D	Not Used
Pin E	Not Used
Pin F	Not Used

### LNA WITH POWER SUPPLY

Pin A	110 VAC/220 VAC
Pin B	Ground
Pin C	110 VAC/220 VAC
Pin D	Not Used
Pin E	Not Used
Pin F	Not Used

### LNA WITH FAULT ALARM

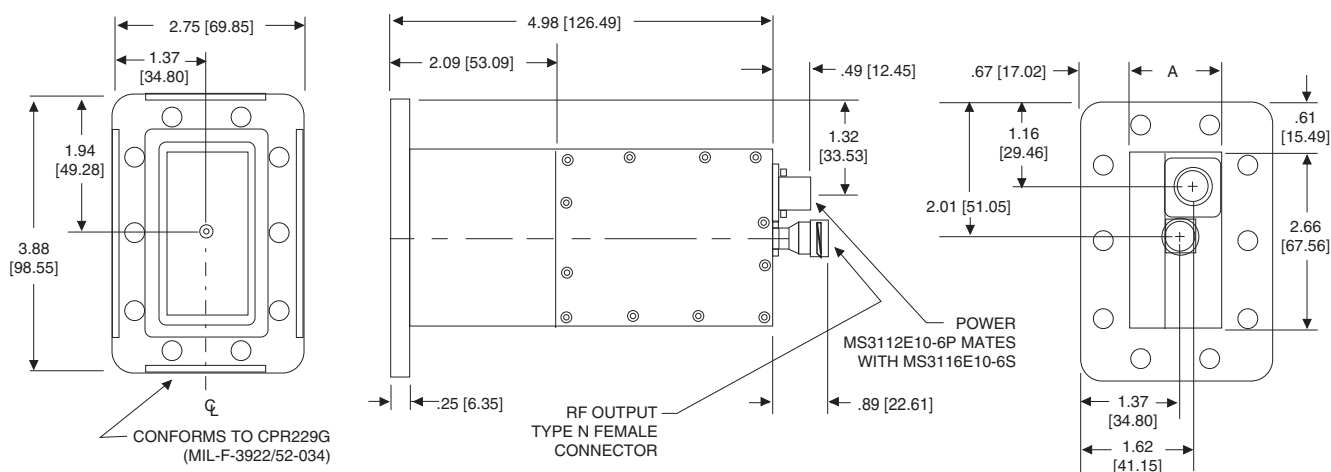
Pin A	+12 VDC to +28 VDC
Pin B	Ground
Pin C	Ground
Pin D	Alarm, Normally Open
Pin E	Alarm, Common Connection
Pin F	Alarm, Normally Closed

### LNA WITH ALARM AND SUPPLY

Pin A	110 VAC/220 VAC
Pin B	Ground
Pin C	110 VAC/220 VAC
Pin D	Alarm, Normally Open
Pin E	Alarm, Common Connection
Pin F	Alarm, Normally Closed

Part Number : MS3112E10-6P (Mating MS3116E10-6S provided with each LNA.)

## OUTLINE DRAWING



DASH NUMBER TABLE		
DASH NO.	DIM. A	DESCRIPTION
-1	1.15 [29.21]	STANDARD OR MONITOR ALARM BOARD OPTION
-2	2.26 [57.40]	OPTIONAL MONITOR AND/OR OPTIONAL POWER SUPPLY

Note: Dimensions shown in brackets [ ] are in millimeters.

# AMFW ULTRA LOW NOISE C-BAND WAVEGUIDE LNAs

## AVAILABLE OPTIONS

Fault alarm .....Add suffix -F\*  
 DC bias through the RF output.....Add suffix -C  
 Solder bias pin.....Add suffix -B  
 110 VAC / 220 VAC operation.....Add suffix -O\*  
 DC power supply at -24 VDC .....Add suffix -NEG\*  
 Output P1 dB of +15 dBm .....Add suffix -P1  
 Output P1 dB of +20 dBm .....Add suffix -P2  
 Output P1 dB of +23 dBm .....Add suffix -23P  
 3 dB, P-P, gain change vs. temperature .....Add suffix -TC  
 SMA female output connector .....Add suffix -SMA  
 Internal transmit/reject filter .....Add suffix -TRF  
 \* Specifications compliant temperature range limited to -15° to +60°C.

Note: Rejection of 20 dB, min., above 5.2 GHz.

## OTHER AVAILABLE OPTIONS (Call factory for details)

Customer specified frequency ranges  
 Customer specified gain windows  
 Phase matching  
 Amplitude matching  
 Front-end protection (input limiter)

## ORDERING INFORMATION

**AMFW-xx-xxxxxx-xx**

### Minimum Gain Designation (dB)

5S = 40  
 6S = 50  
 7S = 60  
 8S = 70

### Frequency Designation (GHz)

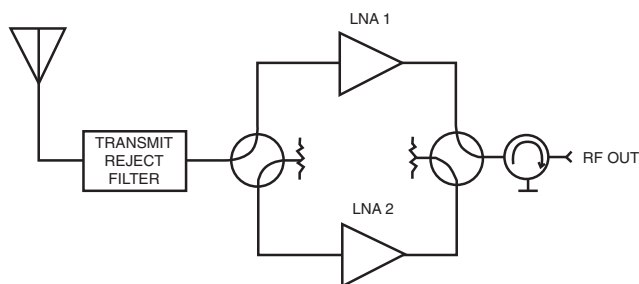
340420 = 3.4 – 4.2  
 340480 = 3.4 – 4.8  
 360420 = 3.6 – 4.2  
 400480 = 4.0 – 4.8  
 440480 = 4.4 – 4.8

### Maximum Noise Temperature (K)

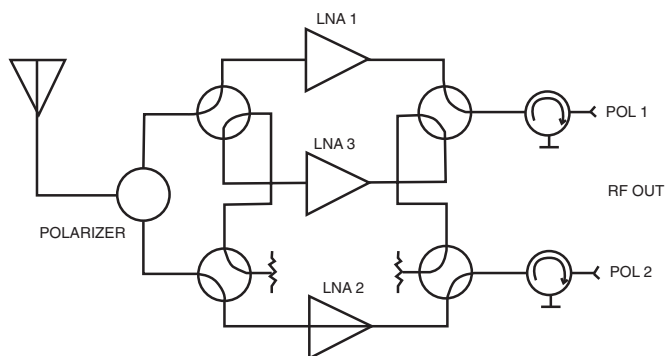
28 = 28  
 30 = 30  
 35 = 35  
 40 = 40  
 45 = 45

## TYPICAL APPLICATIONS

### 1:1 Redundant Systems



### 1:2 Redundant Systems



## **AMFW C-Band Amplifier Noise Temperature vs. Ambient Temperature**

Noise temperature vs. ambient temperature for an AMFW C-band amplifier can be found from the equation:

$$(NT_2 / NT_1) = (T_2 / T_1)^{1.5}$$

where:

$NT_2$  = Noise Temperature at Case Temperature 2

$NT_1$  = Noise Temperature at Case Temperature 1

$T_2$  = Case Temperature 2 in °K

$T_1$  = Case Temperature 1 in °K

(The conversion is °K = °C + 273)

For the condition where the initial case temperature is at +23°C ( $T_1 = 296^\circ\text{K}$ ), the ratio  $NT_2/NT_1$  can be summarized by the following table:

<b>AMBIENT TEMPERATURE, <math>T_2</math> (in °C)</b>	<b>RATIO <math>NT_2 / NT_1</math></b>
0	0.89
+23	1.00
+40	1.09
+50	1.14
+60	1.19

### **EXAMPLE**

- An AMFW C-band amplifier is specified to have a noise temperature of 30°K when the case temperature is at +23°C.
- What is the noise temperature when the case temperature is at +50°C?  
From the table,  $NT_2/NT_1$  at +50°C is 1.14.  
 $NT_2 = 1.14 \times 30^\circ\text{K} = 34.2^\circ\text{K}$  at +50°C case temperature

## AMFW ULTRA LOW NOISE X-BAND WAVEGUIDE LNAs

### FEATURES

- Noise temperatures as low as 45 K
- Internal regulation and reverse voltage protection
- CPR112G grooved input and SMA-female output
- Fully weatherproof
- Compliant vs. MIL-STD-810E Salt Fog testing
- Two-year product warranty

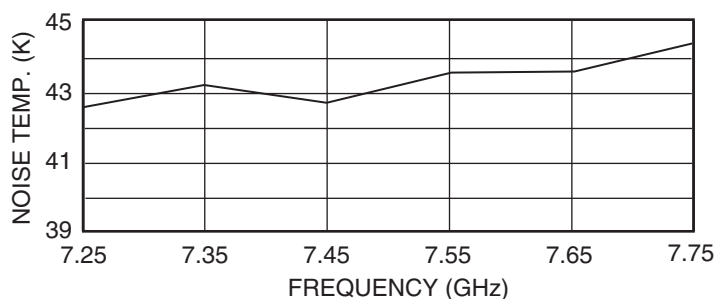
### OPTIONS

- Fault alarm circuitry
  - Form-C, contact closure
  - Fully integrated
- DC bias applied through the RF output
- 110/220 VAC internal power supplies
- Fully integrated
- CE certified
- DC bias of -24 VDC
- Higher output powers
  - P1 dB of +15 dBm, min.; OIP3 of +25 dBm, min.
  - P1 dB of +20 dBm, min.; OIP3 of +30 dBm, min.
  - P1 dB of +23 dBm, min.; OIP3 of +33 dBm, min.
- Improved gain variation vs. temperature
  - 3 dB, P-P, max.
- N-type female RF output connector
- Integrated transmit/reject filter
  - Requires a change in outline drawing
  - Rejection of 40 dB, min., from 4 to 6.9 GHz
  - Rejection of 30 dB, min., at 7 and 7.9 GHz
  - Rejection of 40 dB, min., from 8 to 12 GHz
- Input limiter protection up to 25 watts CW
  - Please consult factory for details
- Customer specified gain windows



MITEQ's AMFW catalog line of SATCOM waveguide amplifiers utilizes PHEMTs offering the lowest noise figures available in the various frequency bands associated with X-band satellite communication. Achieving noise temperatures as low as 45 K, these amplifiers have been designed using state-of-the-art technology and can be used in either fixed or transportable applications. The high-reliability design of these X-band amplifiers allows MITEQ to offer a standard two-year warranty on units that consistently experience the harsh environments involved with satellite base-station operation.

**TYPICAL NOISE TEMPERATURE DATA  
MODEL AMFW-7S-725775-45**





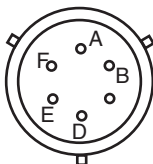
## AMFW ULTRA LOW NOISE X-BAND WAVEGUIDE LNAs

### ELECTRICAL SPECIFICATIONS

PARAMETERS	NOTES	MINIMUM	NOMINAL/TYPICAL	MAXIMUM
Standard frequency options		7.10 GHz 7.10 GHz 7.25 GHz 7.25 GHz 8.00 GHz		7.75 GHz 8.40 GHz 7.75 GHz 8.40 GHz 8.40 GHz
Standard gain options		70 dB 60 dB 50 dB 40 dB	72 dB 64 dB 54 dB 44 dB	
Gain flatness	Full band per 40 MHz		1.4 dB, P-P 0.3 dB, P-P	2 dB, P-P 0.4 dB, P-P
Gain variation vs. temperature (-40 to +60°C)	Standard Option -TC		4.4 dB, P-P 2.65 dB, P-P	5 dB, P-P 3 dB, P-P
Gain stability, constant temperature	Short (10 minutes) Medium (24 hours) Long (1 week)			±0.10 dB ±0.20 dB ±0.50 dB
Noise temperature options at +23°C case temperature	7.25 – 7.75 GHz All frequency ranges		44 K 48 K 52 K 57 K 62 K	45 K 50 K 55 K 60 K 65 K
Input VSWR	7.25 – 7.75 GHz All frequencies		1.22:1 1.36:1	1.25:1 1.5:1
Output VSWR			1.4:1	1.5:1
Output power at 1 dB compression	Standard Option -P1 Option -P2 Option -23P	+10 dBm +15 dBm +20 dBm +23 dBm	+13 dBm +18 dBm +23 dBm +25 dBm	
Output third order intercept point	Standard Option -P1 Option -P2 Option -23P	+20 dBm +25 dBm +30 dBm +33 dBm	+23 dBm +28 dBm +32 dBm +34 dBm	
Group delay, per 40 MHz	Linear Parabolic Ripple			0.01 ns/MHz 0.001 ns/MHz <sup>2</sup> 0.3 ns, P-P
AM/PM conversion	-5 dBm output			0.05 dB/°
Max. input without damage				+10 dBm CW
DC voltage requirements		+12 VDC	+15 VDC	+28 VDC
DC current	Standard Options -P1 or -P2		195 mA 345 mA	275 mA 475 mA
Temperature range Operating Storage		-40°C -50°C		+60°C +80°C
MTBF	Ground benign		250,000 hours	

# AMFW ULTRA LOW NOISE X-BAND WAVEGUIDE LNAs

## CONNECTOR INFORMATION



### STANDARD LNA

Pin A	+12 VDC to +28 VDC
Pin B	Ground
Pin C	Ground
Pin D	Not Used
Pin E	Not Used
Pin F	Not Used

### LNA WITH POWER SUPPLY

Pin A	110 VAC/220 VAC
Pin B	Ground
Pin C	110 VAC/220 VAC
Pin D	Not Used
Pin E	Not Used
Pin F	Not Used

### LNA WITH FAULT ALARM

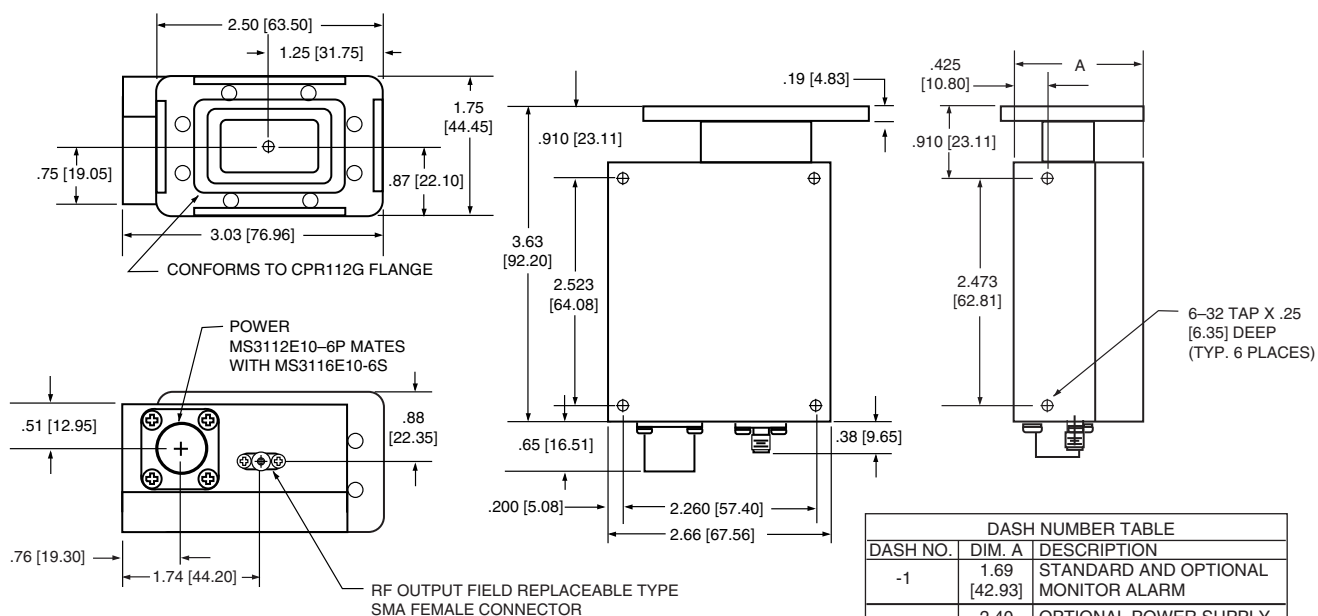
Pin A	+12 VDC to +28 VDC
Pin B	Ground
Pin C	Ground
Pin D	Alarm, Normally Open
Pin E	Alarm, Common Connection
Pin F	Alarm, Normally Closed

### LNA WITH ALARM AND SUPPLY

Pin A	110 VAC/220 VAC
Pin B	Ground
Pin C	110 VAC/220 VAC
Pin D	Alarm, Normally Open
Pin E	Alarm, Common Connection
Pin F	Alarm, Normally Closed

Part Number : MS3112E10-6P (Mating MS3116E10-6S provided with each LNA.)

## OUTLINE DRAWING



Note: Dimensions shown in brackets [ ] are in millimeters.

## AMFW ULTRA LOW NOISE X-BAND WAVEGUIDE LNAs

## AVAILABLE OPTIONS

Fault alarm .....	Add suffix -F*
DC bias through the RF output.....	Add suffix -C
Solder bias pin.....	Add suffix -B
110 VAC/220 VAC operation.....	Add suffix -O*
DC power supply at -24 VDC .....	Add suffix -NEG*
Output P1 dB of +15 dBm .....	Add suffix -P1
Output P1 dB of +20 dBm .....	Add suffix -P2
Output P1 dB of +23 dBm .....	Add suffix -23P
3 dB, P-P, gain change vs. temperature .....	Add suffix -TC
N-type female output connector .....	Add suffix -N
Internal transmit/reject filter .....	Add suffix -TRF

\* Specifications compliant temperature range limited to -15° to

Note: Rejection of 30 dB, min., at 7 and 7.9 GHz.  
Outline drawing changes to MITEQ 135805.

**OTHER AVAILABLE OPTIONS** (Call factory for details)

- Customer specified frequency ranges
- Customer specified gain windows
- Phase matching
- Amplitude matching
- Front-end protection (input limiter)

## ORDERING INFORMATION

**AMFW-xx-xxxxxx-xx**

### Minimum Gain Designation (dB)

$$\begin{aligned} 5S &= 40 \\ 6S &= 50 \\ 7S &= 60 \\ 8S &= 70 \end{aligned}$$

### Frequency Designation (GHz)

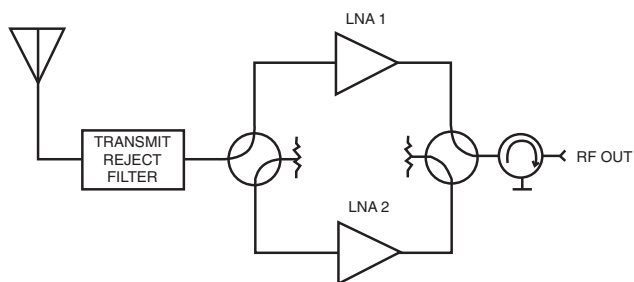
$$\begin{aligned} 710775 &= 7.10 - 7.75 \\ 710840 &= 7.10 - 8.40 \\ 725775 &= 7.25 - 7.75 \\ 725840 &= 7.25 - 8.40 \\ 800840 &= 8.00 - 8.40 \end{aligned}$$

### Maximum Noise Temperature (K)

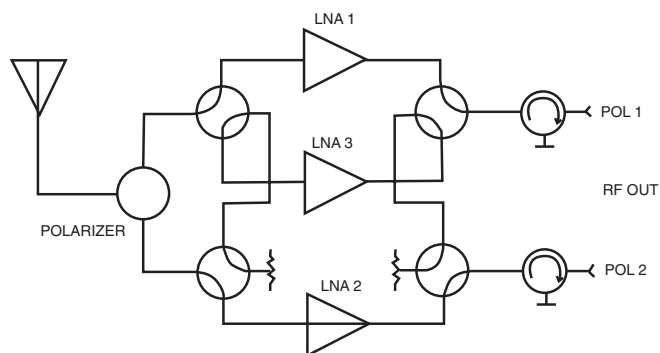
45 = 45 (7.25 to 7.75 GHz only)  
50 = 50  
55 = 55  
60 = 60  
65 = 65

## TYPICAL APPLICATIONS

## 1:1 Redundant Systems



## 1:2 Redundant Systems



### **AMFW X-Band Amplifier Noise Temperature vs. Ambient Temperature**

Noise temperature vs. ambient temperature for an AMFW X-band amplifier can be found from the equation:

$$(NT_2 / NT_1) = (T_2 / T_1)^{1.6}$$

where:

$NT_2$  = Noise Temperature at Case Temperature 2

$NT_1$  = Noise Temperature at Case Temperature 1

$T_2$  = Case Temperature 2 in °K

$T_1$  = Case Temperature 1 in °K

(The conversion is °K = °C + 273)

For the condition where the initial case temperature is at +23°C ( $T_1 = 296^\circ\text{K}$ ), the ratio  $NT_2/NT_1$  can be summarized by the following table:

<b>AMBIENT TEMPERATURE, <math>T_2</math> (in °C)</b>	<b>RATIO <math>NT_2 / NT_1</math></b>
0	0.88
+23	1.00
+40	1.09
+50	1.15
+60	1.21

#### **EXAMPLE**

- An AMFW X-band amplifier is specified to have a noise temperature of 45°K when the case temperature is at +23°C.
- What is the noise temperature when the case temperature is at +50°C?  
From the table,  $NT_2/NT_1$  at +50°C is 1.15.  
 $NT_2 = 1.15 \times 45^\circ\text{K} = 51.75^\circ\text{K}$  at +50°C case temperature

## AMFW ULTRA LOW NOISE Ku-BAND WAVEGUIDE LNAs

### FEATURES

- Noise temperatures as low as 60 K
- Internal regulation and reverse voltage protection
- WR75 input and SMA-female output
- Fully weatherproof
- Compliant vs. MIL-STD-810E Salt Fog testing
- Two-year product warranty

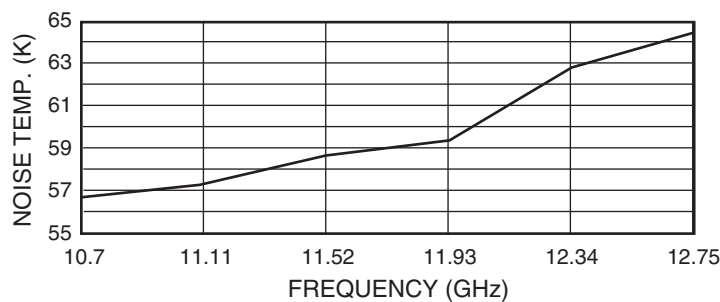
### OPTIONS

- Fault alarm circuitry
  - Form-C, contact closure
  - Fully integrated
- DC bias applied through the RF output
- 110/220 VAC internal power supplies
  - Fully integrated
  - CE certified
- DC bias of -24 VDC
- Higher output powers
  - P1 dB of +15 dBm, min.; OIP3 of +25 dBm, min.
  - P1 dB of +20 dBm, min.; OIP3 of +30 dBm, min.
  - P1 dB of +23 dBm, min.; OIP3 of +33 dBm, min.
- Improved gain variation vs. temperature
  - 3 dB, P-P, max.
- N-type female RF output connector
- Integrated transmit/reject filter
  - Upper band edge at 12.75 GHz
  - Rejection of 20 dB, min., at 13.5 GHz
- Input limiter protection up to 25 watts CW
  - Please consult factory for details
- Customer specified gain windows
  - Please consult factory for details



MITEQ's AMFW catalog line of SATCOM waveguide amplifiers utilizes PHEMTs offering the lowest noise figures available in the various frequency bands associated with Ku-band satellite communication. Achieving noise temperatures as low as 60 K, these amplifiers have been designed using state-of-the-art technology and can be used in either fixed or transportable applications. The high-reliability design of these Ku-band amplifiers allows MITEQ to offer a standard two-year warranty on units that consistently experience the harsh environments involved with satellite base-station operation.

**TYPICAL NOISE TEMPERATURE DATA  
MODEL AMFW-7S-10128-65**



## AMFW ULTRA LOW NOISE Ku-BAND WAVEGUIDE LNAs

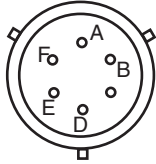
### ELECTRICAL SPECIFICATIONS

PARAMETERS	NOTES	MINIMUM	NOMINAL/TYPICAL	MAXIMUM
Standard frequency options		10.70 GHz 10.95 GHz 10.95 GHz 11.40 GHz 11.70 GHz 12.20 GHz		12.75 GHz 11.70 GHz 12.75 GHz 12.20 GHz 12.75 GHz 12.75 GHz
Standard gain options		70 dB 60 dB 50 dB 40 dB	72 dB 64 dB 54 dB 44 dB	
Gain flatness	Full band per 40 MHz		1.45 dB, P-P 0.3 dB, P-P	2 dB, P-P 0.4 dB, P-P
Gain variation vs. temperature (-40 to +60°C)	Standard Option -TC		4.35 dB, P-P 2.45 dB, P-P	5 dB, P-P 3 dB, P-P
Gain stability, constant temperature	Short (10 minutes) Medium (24 hours) Long (1 week)			±0.10 dB ±0.20 dB ±0.50 dB
Noise temperature options at +23°C case temperature	Up to 12.2 GHz  All frequencies		58 K 63 K 67 K 72 K 76 K	60 K 65 K 70 K 75 K 80 K
Input VSWR			1.23:1	1.25:1
Output VSWR			1.42:1	1.5:1
Output power at 1 dB compression	Standard Option -P1 Option -P2 Option -23P	+10 dBm +15 dBm +20 dBm +23 dBm	+13 dBm +18 dBm +23 dBm +25 dBm	
Output third order intercept point	Standard Option -P1 Option -P2 Option -23P	+20 dBm +25 dBm +30 dBm +33 dBm	+23 dBm +28 dBm +32 dBm +34 dBm	
Group delay, per 40 MHz	Linear Parabolic Ripple			0.01 ns/MHz 0.001 ns/MHz <sup>2</sup> 0.3 ns, P-P
AM/PM conversion	-5 dBm output			0.05 dB/°
Max. input without damage				+10 dBm CW
DC voltage requirements		+12 VDC	+15 VDC	+28 VDC
DC current	Standard Options -P1 or -P2		205 mA 360 mA	275 mA 475 mA
Temperature range Operating Storage		-40°C -50°C		+60°C +80°C
MTBF	Ground benign		250,000 hours	



# AMFW ULTRA LOW NOISE Ku-BAND WAVEGUIDE LNAs

## CONNECTOR INFORMATION



### STANDARD LNA

Pin A	+12 VDC to +28 VDC
Pin B	Ground
Pin C	Ground
Pin D	Not Used
Pin E	Not Used
Pin F	Not Used

### LNA WITH POWER SUPPLY

Pin A	110 VAC/220 VAC
Pin B	Ground
Pin C	110 VAC/220 VAC
Pin D	Not Used
Pin E	Not Used
Pin F	Not Used

### LNA WITH FAULT ALARM

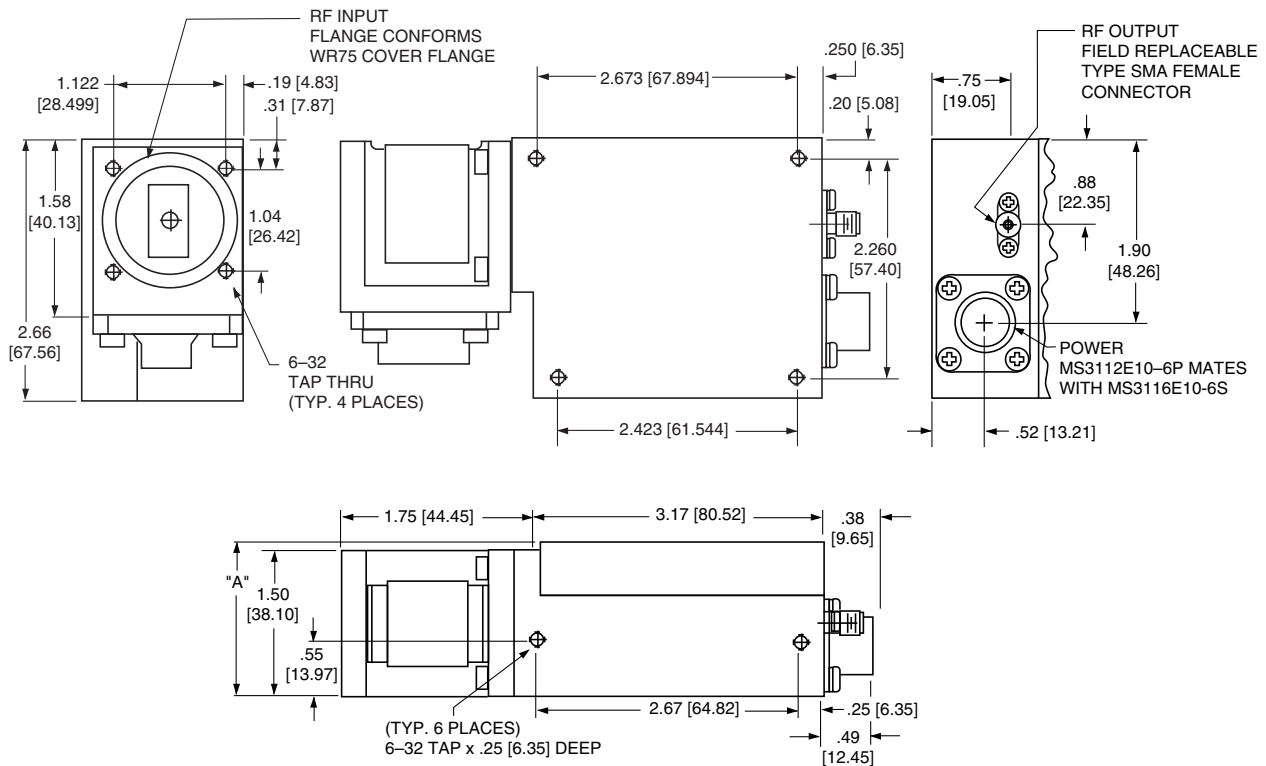
Pin A	+12 VDC to +28 VDC
Pin B	Ground
Pin C	Ground
Pin D	Alarm, Normally Open
Pin E	Alarm, Common Connection
Pin F	Alarm, Normally Closed

### LNA WITH ALARM AND SUPPLY

Pin A	110 VAC/220 VAC
Pin B	Ground
Pin C	110 VAC/220 VAC
Pin D	Alarm, Normally Open
Pin E	Alarm, Common Connection
Pin F	Alarm, Normally Closed

Part Number : MS3112E10-6P (Mating MS3116E10-6S provided with each LNA.)

## OUTLINE DRAWING



Note: Dimensions shown in brackets [ ] are in millimeters.

DASH NUMBER TABLE		
DASH NO.	DIM. A	DESCRIPTION
-1	1.68 [42.67]	STANDARD OR OPTIONAL MONITOR ALARM
-2	2.38 [60.45]	OPTIONAL POWER SUPPLY AND/OR OPTIONAL MONITOR ALARM

# AMFW ULTRA LOW NOISE Ku-BAND WAVEGUIDE LNAs

## AVAILABLE OPTIONS

Fault alarm .....Add suffix -F\*  
 DC bias through the RF output.....Add suffix -C  
 Solder bias pin.....Add Suffix -B  
 110 VAC/220 VAC operation.....Add suffix -O\*  
 DC power supply at -24 VDC .....Add suffix -NEG\*  
 Output P1 dB of +15 dBm .....Add suffix -P1  
 Output P1 dB of +20 dBm .....Add suffix -P2  
 Output P1 dB of +23 dBm .....Add suffix -23P  
 3 dB, P-P, gain change vs. temperature .....Add suffix -TC  
 N-type female output connector .....Add suffix -N  
 Internal transmit/reject filter .....Add suffix -TRF  
 \* Specifications compliant temperature range limited to -15° to +60°C.

Note: Rejection of 20 dB, min., at 13.5 GHz.

## OTHER AVAILABLE OPTIONS (Call factory for details.)

Customer specified frequency ranges  
 Customer specified gain windows  
 Phase matching  
 Amplitude matching  
 Front-end protection (input limiter)

## ORDERING INFORMATION

**AMFW-xx-xxxxxx-xx**

### Nominal Gain Designation (dB)

5S = 40 dB  
 6S = 50 dB  
 7S = 60 dB  
 8S = 70 dB

### Frequency Designation (GHz)

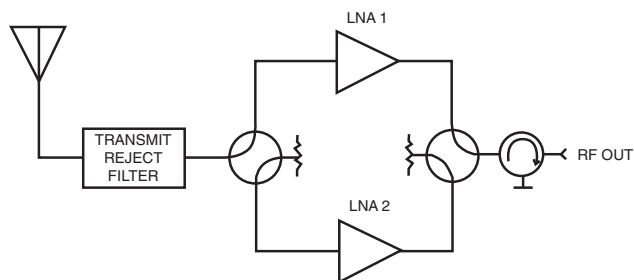
107128 = 10.70 – 12.75  
 109117 = 10.95 – 11.70  
 109128 = 10.95 – 12.75  
 114128 = 11.40 – 12.75  
 117128 = 11.70 – 12.75

### Maximum Noise Temperature (K)

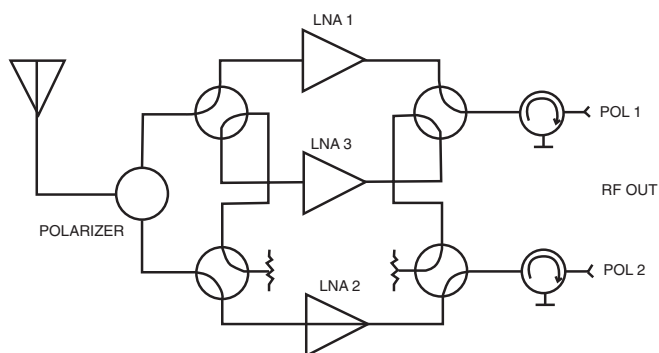
60 = 60 (only available in units operating up to 12.2 GHz)  
 65 = 65  
 70 = 70  
 75 = 75  
 80 = 80

## TYPICAL APPLICATIONS

### 1:1 Redundant Systems



### 1:2 Redundant Systems



## **AMFW Ku-Band Amplifier Noise Temperature vs. Ambient Temperature**

Noise temperature vs. ambient temperature for an AMFW Ku-band amplifier can be found from the equation:

$$(NT_2 / NT_1) = (T_2 / T_1)^{1.8}$$

where:

$NT_2$  = Noise Temperature at Case Temperature 2

$NT_1$  = Noise Temperature at Case Temperature 1

$T_2$  = Case Temperature 2 in °K

$T_1$  = Case Temperature 1 in °K

(The conversion is °K = °C + 273)

For the condition where the initial case temperature is at +23°C ( $T_1 = 296^\circ\text{K}$ ), the ratio  $NT_2/NT_1$  can be summarized by the following table:

<b>AMBIENT TEMPERATURE, <math>T_2</math> (in °C)</b>	<b>RATIO <math>NT_2 / NT_1</math></b>
0	0.86
+23	1.00
+40	1.11
+50	1.17
+60	1.24

### **EXAMPLE**

- An AMFW Ku-band amplifier is specified to have a noise temperature of 65°K when the case temperature is at +23°C.
- What is the noise temperature when the case temperature is at +50°C?  
From the table,  $NT_2/NT_1$  at +50°C is 1.17.  
 $NT_2 = 1.17 \times 65^\circ\text{K} = 76.05^\circ\text{K}$  at +50°C case temperature

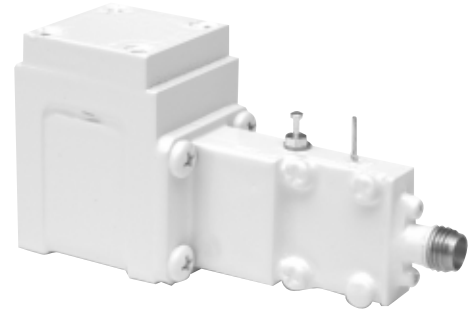
## AMFW ULTRA LOW NOISE Ka-BAND WAVEGUIDE LNAs

### FEATURES

- Noise temperatures as low as 100 K
- Internal regulation and reverse voltage protection
- WR42 input and SMA-female output
- Fully weatherproof
- Two-year product warranty

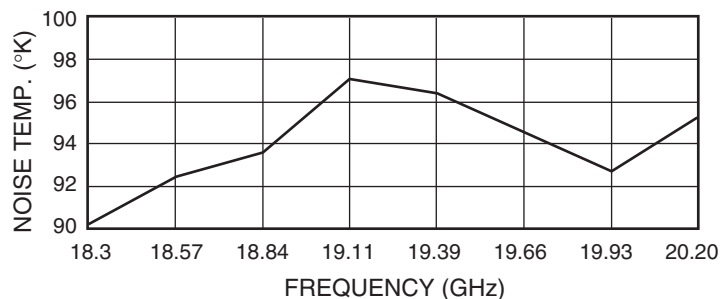
### OPTIONS

- Fault alarm circuitry
  - Form-C, contact closure
  - Fully integrated
- DC bias applied through the RF output
- 110/220 VAC internal power supplies
  - Fully integrated
  - CE certified
- DC bias of -24 VDC
- Higher output powers
  - P1 dB of +15 dBm, min.; OIP3 of +25 dBm, min.
  - P1 dB of +20 dBm, min.; OIP3 of +30 dBm, min.
  - P1 dB of +23 dBm, min.; OIP3 of +33 dBm, min.
- Improved gain variation vs. temperature
  - 3 dB, P-P, max.
- 2.4 mm female RF output connector
- Input limiter protection up to 4.5 watts CW
  - Please consult factory for details
- Customer specified frequency bands
  - Please consult factory for details
- Customer specified gain windows
  - Please consult factory for details



MITEQ's AMFW catalog line of SATCOM waveguide amplifiers utilizes PHEMTs offering the lowest noise figures available in the various frequency bands associated with Ka-band satellite communication. Achieving noise temperatures as low as 100 K, these amplifiers have been designed using state-of-the-art technology and can be used in either fixed or transportable applications. The high-reliability design of these Ka-band amplifiers allows MITEQ to offer a standard two-year warranty on units that consistently experience the harsh environments involved with satellite base-station operation.

**TYPICAL NOISE TEMPERATURE DATA  
MODEL AMFW-6F-183202-110K-13P**



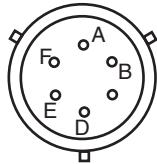
## AMFW ULTRA LOW NOISE Ka-BAND WAVEGUIDE LNAs

### ELECTRICAL SPECIFICATIONS

PARAMETERS	NOTES	MINIMUM	NOMINAL/TYPICAL	MAXIMUM
Standard frequency options		17.0 GHz 17.7 GHz 17.7 GHz 17.7 GHz 18.1 GHz 19.7 GHz 20.2 GHz		22.0 GHz 20.2 GHz 21.2 GHz 22.0 GHz 21.2 GHz 20.2 GHz 21.2 GHz
Standard gain options		60 dB 50 dB 40 dB 30 dB	62 dB 54 dB 44 dB 35 dB	
Gain flatness	Full band per 40 MHz		2.15 dB, P-P 0.3 dB, P-P	3 dB, P-P 0.4 dB, P-P
Gain variation vs. temperature (-40 to +60°C)	Standard Option -TC		4.45 dB, P-P 2.65 dB, P-P	5 dB, P-P 3 dB, P-P
Gain stability, constant temperature	Short (10 minutes) Medium (24 hours) Long (1 week)			±0.10 dB ±0.20 dB ±0.50 dB
Noise temperature options at +23°C case temperature	Up to 20.2 GHz Up to 21.3 GHz All frequencies		98 K 107 K 116 K 123 K 131 K	100 K 110 K 120 K 130 K 140 K
Input VSWR	With input isolator		1.22:1	1.25:1
Output VSWR	With output isolator		1.28:1	1.3:1
Output power at 1 dB compression	Standard Option -15P Option -20P Option -23P	+10 dBm +15 dBm +20 dBm +23 dBm	+13 dBm +18 dBm +23 dBm +25 dBm	
Output third order intercept point	Standard Option -15P Option -20P Option -23P	+20 dBm +25 dBm +30 dBm +33 dBm	+23 dBm +28 dBm +32 dBm +34 dBm	
Group delay, per 40 MHz	Linear Parabolic Ripple			0.01 ns/MHz 0.001 ns/MHz <sup>2</sup> 0.3 ns, P-P
AM/PM conversion	-10 dBm output			0.05 dB/°
Max. input without damage				+10 dBm CW
DC voltage requirements		+12 VDC	+15 VDC	+28 VDC
DC current	Standard Options -P1 or -P2		225 mA 375 mA	275 mA 475 mA
Temperature range Operating Storage		-40°C -50°C		+60°C +80°C
MTBF	Ground benign		200,000 hours	

# AMFW ULTRA LOW NOISE Ka-BAND WAVEGUIDE LNAs

## CONNECTOR INFORMATION



### STANDARD LNA

Pin A	+12 VDC to +28 VDC
Pin B	Ground
Pin C	Ground
Pin D	Not Used
Pin E	Not Used
Pin F	Not Used

### LNA WITH POWER SUPPLY

Pin A	110 VAC/220 VAC
Pin B	Ground
Pin C	110 VAC/220 VAC
Pin D	Not Used
Pin E	Not Used
Pin F	Not Used

### LNA WITH FAULT ALARM

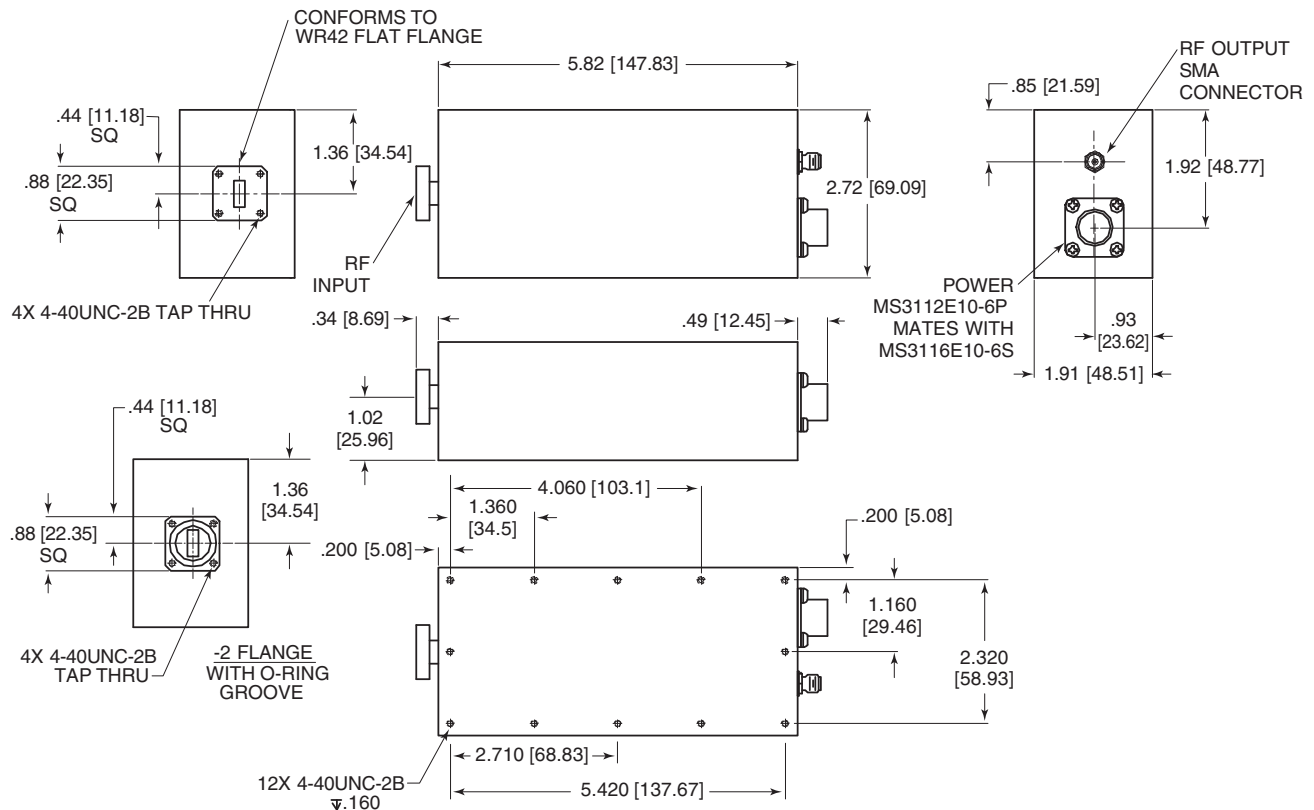
Pin A	+12 VDC to +28 VDC
Pin B	Ground
Pin C	Ground
Pin D	Alarm, Normally Open
Pin E	Alarm, Common Connection
Pin F	Alarm, Normally Closed

### LNA WITH ALARM AND SUPPLY

Pin A	110 VAC/220 VAC
Pin B	Ground
Pin C	110 VAC/220 VAC
Pin D	Alarm, Normally Open
Pin E	Alarm, Common Connection
Pin F	Alarm, Normally Closed

Part Number : MS3112E10-6P (Mating MS3116E10-6S provided with each LNA.)

## OUTLINE DRAWING



Note: Dimensions shown in brackets [ ] are in millimeters.



# AMFW ULTRA LOW NOISE Ka-BAND WAVEGUIDE LNAs

## AVAILABLE OPTIONS

Fault alarm .....Add suffix -F\*  
 DC bias through the RF output.....Add suffix -C  
 110 VAC/220 VAC operation.....Add suffix -O\*  
 DC power supply at -24 VDC .....Add suffix -NEG\*  
 Output P1 dB of +15 dBm .....Add suffix -15P  
 Output P1 dB of +20 dBm .....Add suffix -20P  
 Output P1 dB of +23 dBm .....Add suffix -23P  
 3 dB, P-P, gain change vs. temperature .....Add suffix -TC  
 2.4 mm female output connector.....Add suffix -24M  
 \* Specifications compliant temperature range limited to -15° to +60°C.

## OTHER AVAILABLE OPTIONS (Call factory for details.)

Customer specified frequency ranges  
 Customer specified gain windows  
 Phase matching  
 Amplitude matching  
 Front-end protection (input limiter)

## ORDERING INFORMATION

**AMFW-xx-xxxxxx-xxx**

### Minimum Gain Designation (dB)

4F = 30 dB  
 5F = 40 dB  
 6F = 50 dB  
 7F = 60 dB

### Frequency Designation (GHz)

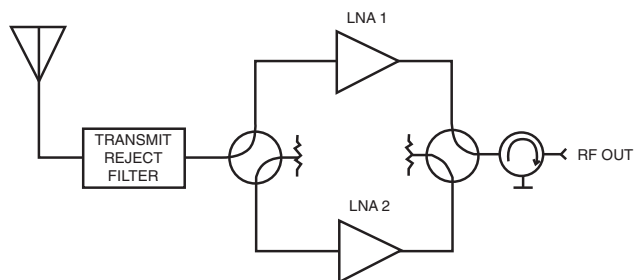
170220 = 17.0 – 22.0  
 177202 = 17.7 – 20.2  
 177212 = 17.7 – 21.2  
 177220 = 17.7 – 22.0  
 181212 = 18.1 – 21.2  
 197202 = 19.7 – 21.2  
 202212 = 20.2 – 21.2

### Maximum Noise Temperature (K)

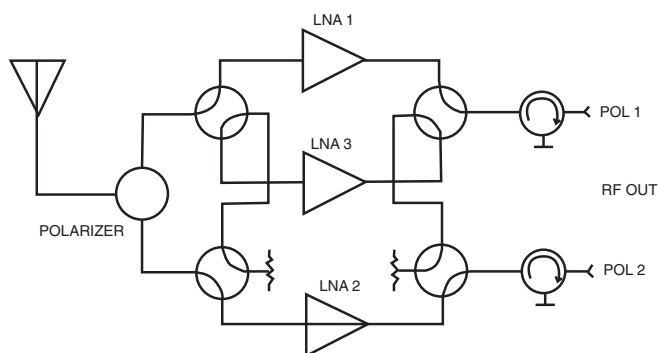
100 = 100 (only available in units operating up to 20.2 GHz)  
 110 = 110 (only available in units operating up to 21.3 GHz)  
 120 = 120  
 130 = 130  
 140 = 140

## TYPICAL APPLICATIONS

### 1:1 Redundant Systems



### 1:2 Redundant Systems



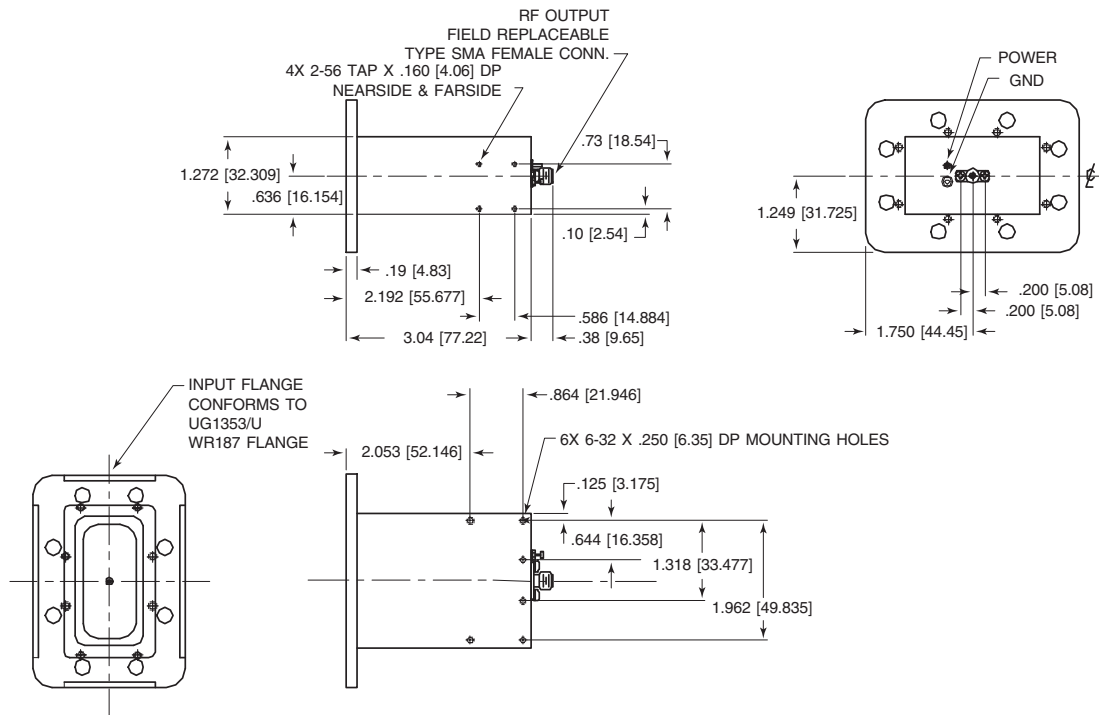
## ADDITIONAL WAVEGUIDE AMPLIFIERS

MODEL NUMBER	OPERATING FREQ. RANGE (GHz)	GAIN (dB, Min.)	GAIN FLATNESS (±dB, Max.)	NOISE TEMP (K, Max.)	OUTPUT 1 dB COMP (+dBm, Min.)	VSWR IN/OUT (Max.)	NOMINAL DC CURRENT (mA @+15V)	OUTLINE NO.
AMFW-7S-340500-35-10P	3.4 – 5	60	1	35	10	2:1	225	125063
AMFW-7S-360480-42-15P	3.6 – 4.8	60	0.5	42	15	1.5:1	225	125063
AMFW-3F-540590-50-10P	5.4 – 5.9	30	0.5	50	10	1.5:1	125	126487
AMFW-4S-560780-60-11P	5.6 – 7.8	30	2	60	11	2:1	150	139170
AMFW-7S-710840-50-10P	7.1 – 8.4	60	1	50	10	1.5:1	200	138968
AMFW-6S-770850-50-10P	7.7 – 8.5	50	1	50	10	1.5:1	150	138968
AMFW-5S-800840-45-UG138	8 – 8.4	45	0.5	45	10	1.5:1	150	127534
AMFW-5S-800850-55-13P	8 – 8.5	40	0.75	55	13	1.3:1/1.5:1	150	138968
AMFW-6S-800900-50-20P	8 – 9	55	0.75	50	20	1.5:1	400	138968
AMFW-4F-080120-90-10P	8 – 12	40	1.5	90	10	2:1	150	126133
AMFW-4F-850950-95-10P	8.5 – 9.5	30	0.75	95	10	1.5:1	150	126133
AMFW-6S-102128-75-13P	10.2 – 12.8	50	1.5	75	13	1.4:1/1.8:1	200	138966
AMFW-6S-107133-70-10P	10.7 – 13.3	50	1	70	10	1.3:1/1.5:1	200	138966
AMFW-6S-109145-120-13P	10.9 – 14.5	50	1.5	120	13	1.3:1/1.5:1	200	138966
AMFW-6F-120180-170-10P	12 – 18	45	2	170	10	2:1	200	127539
AMFW-5F-124160-250-18P	12.4 – 16	28	2	250	18	2:1	350	127539
AMFW-6S-126152-90-10P	12.6 – 15.2	50	1	90	10	1.5:1/2:1	200	127539
AMFW-7S-137145-85-10P	13.7 – 14.5	60	0.75	85	10	1.8:1	225	138966
AMFW-7S-145155-110-10P	14.5 – 15.5	60	0.5	110	10	2:1	225	138966
AMFW-6F-175220-180-10P	17.5 – 22	50	1.5	180	10	1.5:1/2:1	250	131596
AMFW-8S-177212-125-13P	17.7 – 21.2	60	1	125	13	1.5:1/2:1	275	141050
AMFW-4F-180220-140-10P	18 – 22	30	1.5	140	10	2:1	150	131596
AMFW-6F-180265-200-10P	18 – 26.5	40	2	200	10	2.3:1/2:1	200	128869
AMFW-6F-181213-125-20P	18.1 – 21.3	46	1	125	20	1.3:1	325	131596
AMFW-6F-183188-110-10P	18.3 – 18.8	30	0.5	110	10	1.5:1/2:1	150	131596
AMFW-6F-183202-115-10P	18.3 – 20.2	50	1	115	10	1.3/2:1	200	131596

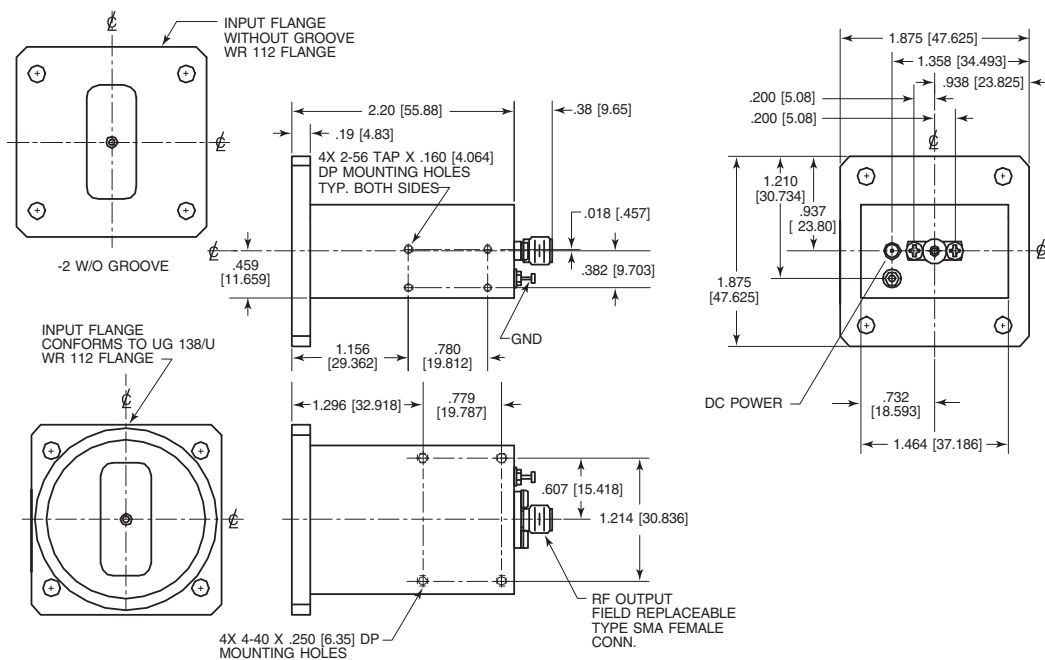


# 

126487



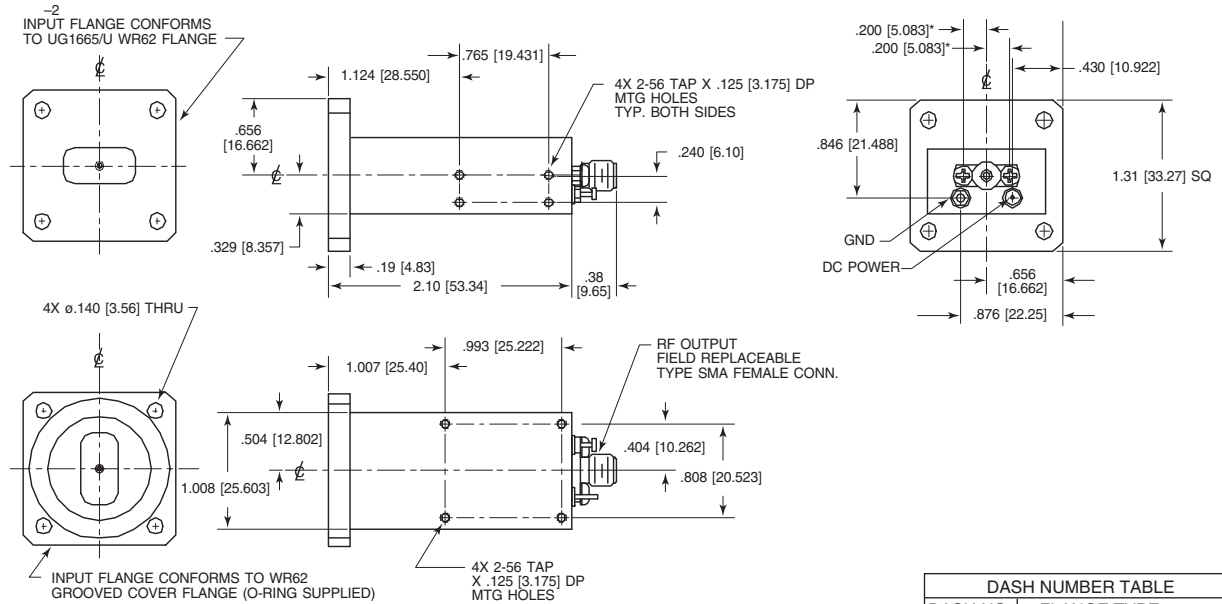
127534



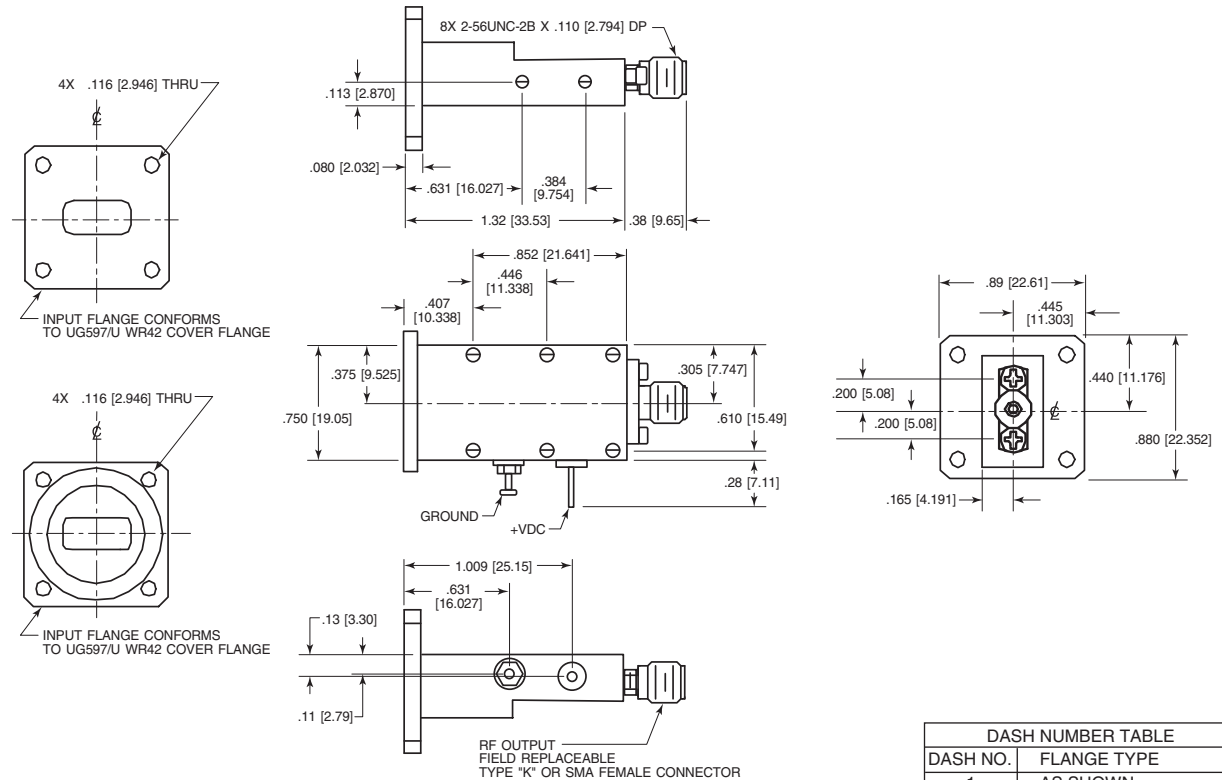
NOTE: DIMENSIONS SHOWN IN BRACKETS [ ] ARE IN MILLIMETERS.

# OUTLINE DRAWINGS

**127539**



**128869**



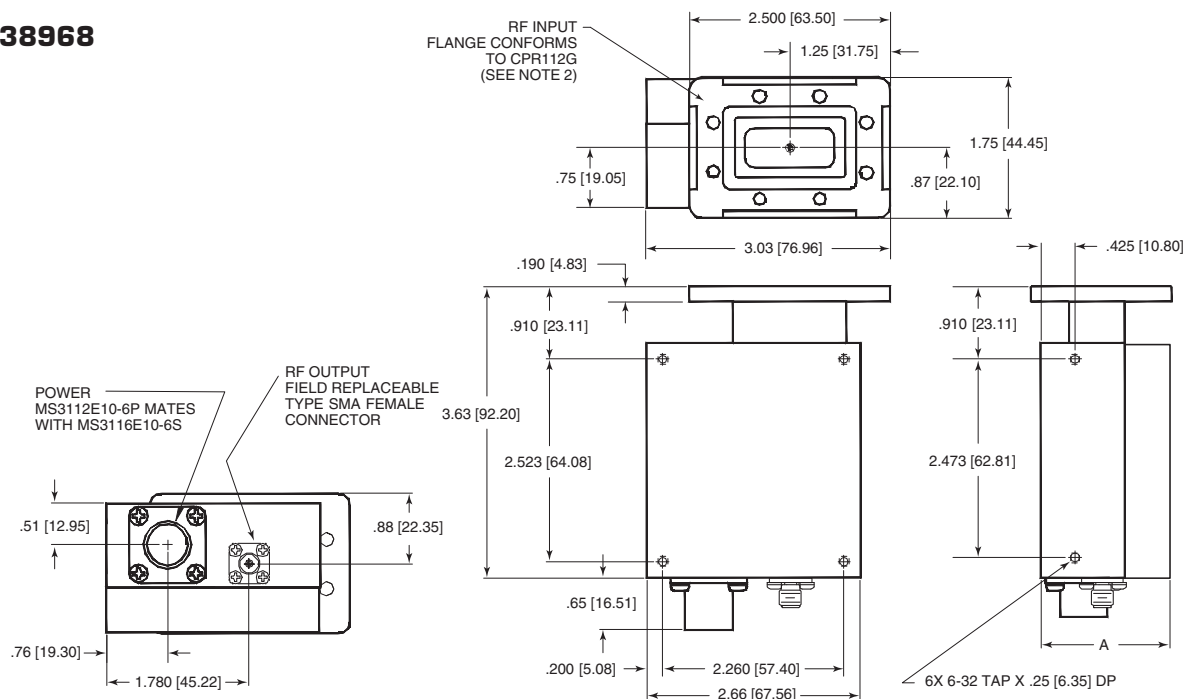
NOTE: DIMENSIONS SHOWN IN BRACKETS [ ] ARE IN MILLIMETERS.





# OUTLINE DRAWINGS

138968

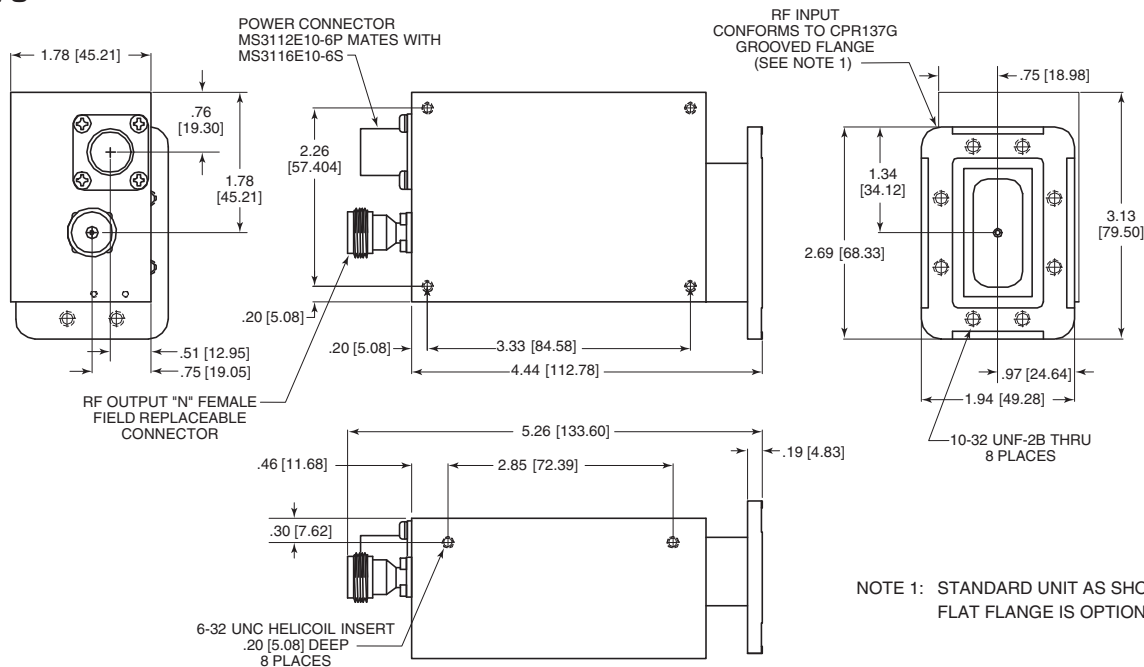


DASH NUMBER TABLE			
DASH NO.	DIM. A	OPTION P/N SUFFIX	DESCRIPTION
-1	1.59 [40.39]	NONE	STANDARD LNA
		-F	LNA WITH OPTIONAL FAULT ALARM
-2	2.30 [58.42]	-O	LNA WITH OPTIONAL 100-240 VAC POWER SUPPLY
		-O, -F	LNA WITH OPTIONAL FAULT ALARM AND 100-240 VAC POWER SUPPLY

## NOTES:

1. STANDARD UNIT AS SHOWN, FLAT FLANGE IS OPTIONAL.
2. SMA FIELD REPLACEABLE CONNECTOR OPTION AVAILABLE.

139170



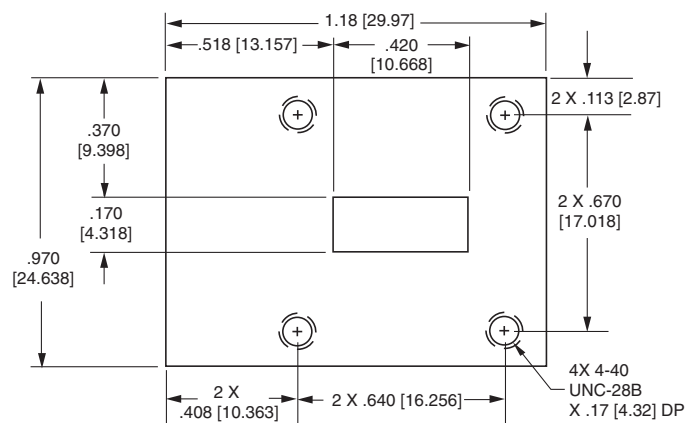
NOTE 1: STANDARD UNIT AS SHOWN, FLAT FLANGE IS OPTIONAL.

NOTE: DIMENSIONS SHOWN IN BRACKETS [ ] ARE IN MILLIMETERS.

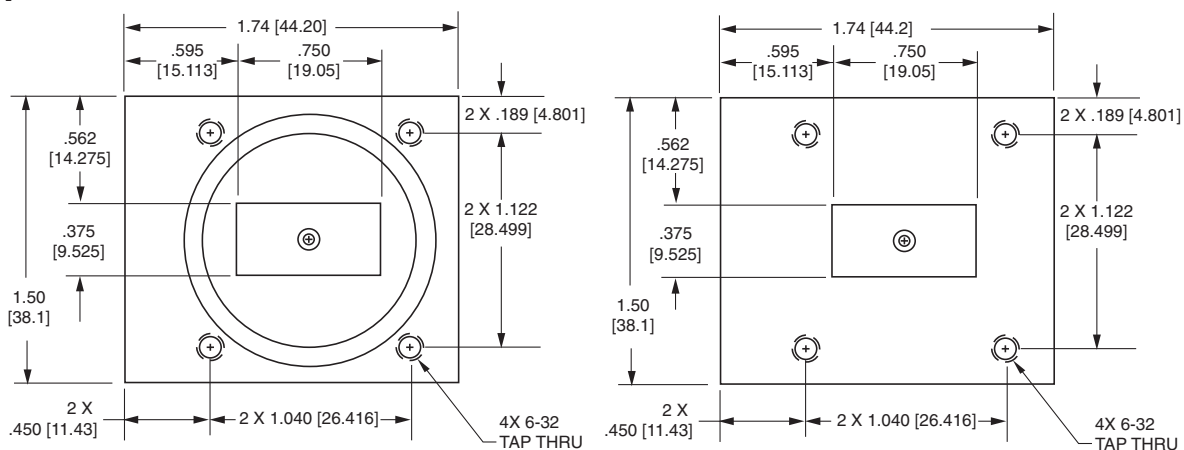
**141050**



**161500**

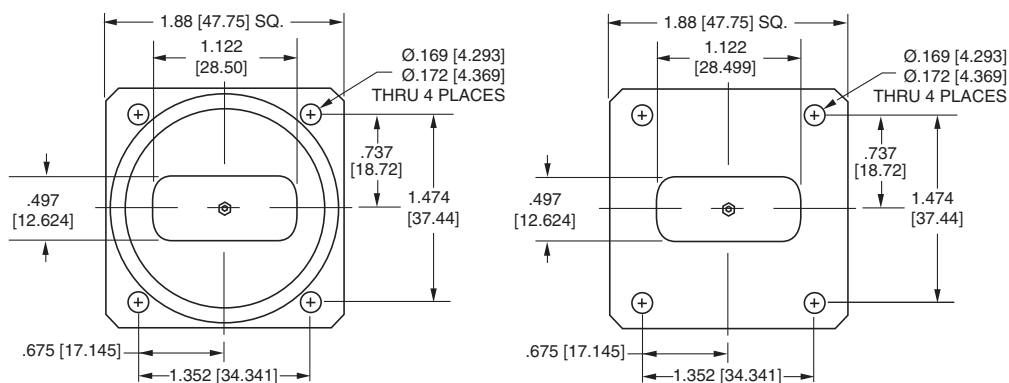


**161501**



DASH NUMBER TABLE		
DASH NO.	PART NO.	TYPE
-1	138966	GROOVED
-2	138966	NONE

## 161502

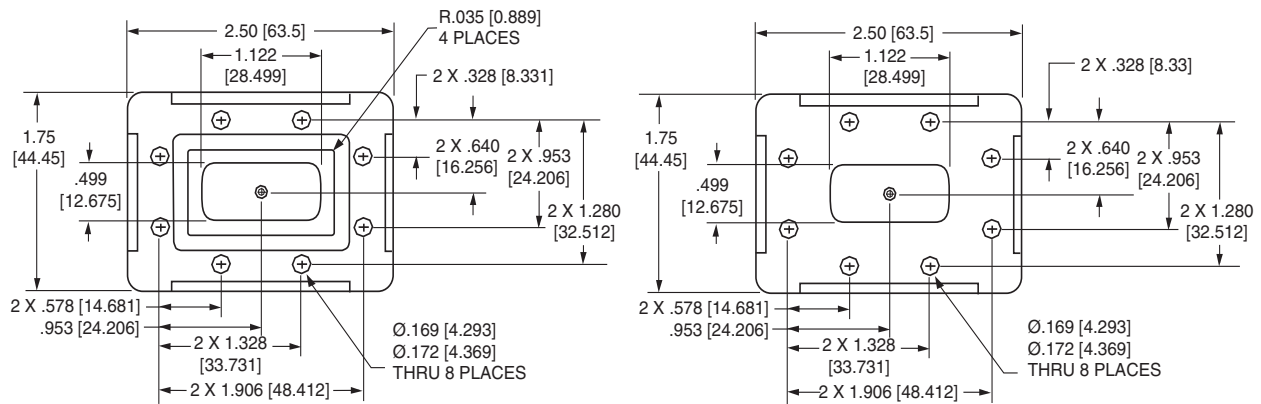


DASH NUMBER TABLE		
DASH NO.	PART NO.	TYPE
-1	127534	GROOVED
-2	127534	NONE

NOTE: DIMENSIONS SHOWN IN BRACKETS [ ] ARE IN MILLIMETERS.

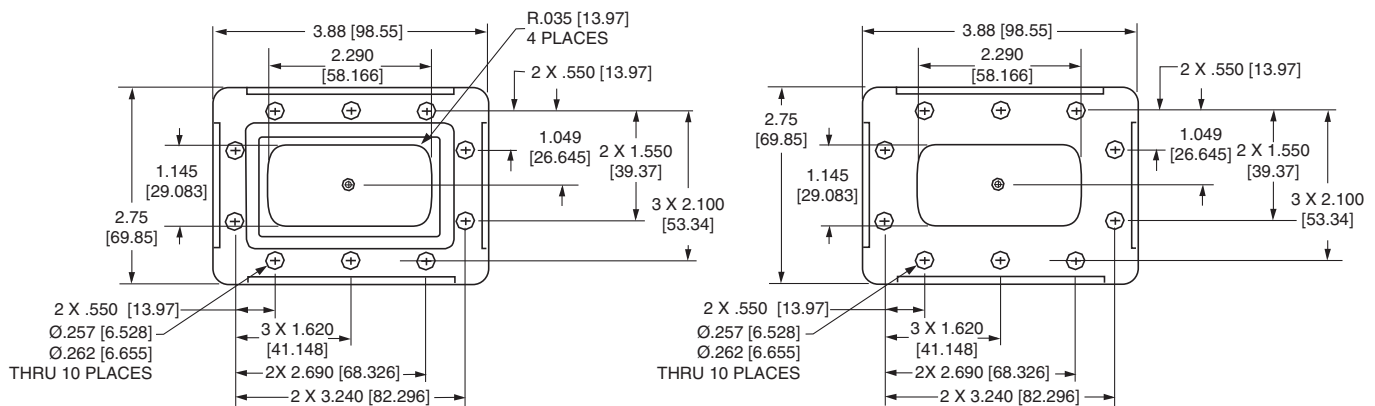
# FLANGE OUTLINE DRAWINGS

## 161503



DASH NUMBER TABLE		
DASH NO.	PART NO.	TYPE
-1	138968	GROOVED
-2	138968	NONE

## 161504



DASH NUMBER TABLE		
DASH NO.	PART NO.	TYPE
-1	125063	GROOVED
-2	125063	NONE

NOTE: DIMENSIONS SHOWN IN BRACKETS [ ] ARE IN MILLIMETERS.

## AMPLIFIER INSTALLATION INSTRUCTIONS

The SATCOM low-noise amplifiers produced by MITEQ's AMF Amplifier Department have been assembled, aligned, tested and inspected to ensure compliant performance. As with any piece of electronic equipment, proper installation is essential to guarantee optimal performance and reliability.

When installing an AMFW amplifier, the following precautions must be taken into consideration. Deviation from any of these precautions may void the applicable MITEQ warranty.

### ELECTROSTATIC PRECAUTIONS

MITEQ's AMFW low-noise amplifiers contain parts that are extremely sensitive to damage by electrostatic discharge (ESD). For this reason, standard ESD precautionary procedures must be used when handling these assemblies. Grounding wrist bands and anti-static bags are considered standard equipment in protecting against ESD damage.

### OTHER HANDLING CONSIDERATIONS

The plating/priming/painting process used to produce the AMFW amplifiers was verified by an independent test lab through a 96-hour, aggravated Salt Fog test. However, any nicks and/or scratches that may appear in a units finish will jeopardize its ability to withstand harsh environments. For this reason, extreme care must be taken when handling these units so that the external finish is not damaged in any way.

### THERMAL CONSTRAINTS

While most of the AMFW amplifiers produced are specified to operate from -40 to +60°C, the specific operating range for each LNA is defined on the Final Test Data Sheet supplied with each unit. Operating these devices outside these temperature ranges could cause permanent damage to the internal electrical circuitry.

### MOUNTING REQUIREMENTS

The mounting hardware to be used when installing SATCOM low-noise amplifiers produced by MITEQ's AMF Amplifier Department is defined in the following table. Care should be taken not to exceed the torque defined.

AMPLIFIER BAND	OUTLINE	CHASSIS MOUNTING HOLES	CHASSIS MOUNTING HARDWARE TORQUE	WAVEGUIDE FLANGE MOUNTING HOLES
C	125063	8 - 32	19 ± 1 in-lbs.	Conforms to CPR229G
X	138968	6 - 32	12 ± 1 in-lbs.	Conforms to CPR112G
Ku	138966	6 - 32	12 ± 1 in-lbs.	Conforms to WR75

As stated in the "Other Handling Considerations" section, throughout the installation process extreme care must be taken when handling these amplifiers so that the external finish is not damaged in any way.

Before fastening the waveguide flange with the proper hardware, acceptable weatherproofing techniques (for example, a flange gasket) must be used between the flange face and the contact surface.

After the required hardware has been properly torqued and the installation complete, all exposed hardware and the areas of the amplifier where hardware has come in contact should be coated with a commercial form of weatherproofing material, (an example of such a material would be canned urethane paint). This will help protect the hardware and any areas of the amplifier's chassis that might have been marred during the installation process.

Finally, so as to protect the enclosed contacts from the environment, the chassis-mounted connector and its supplied mate must be properly engaged.

## ISO 9001:2000 CERTIFIED

MITEQ attained its original ISO 9001 registration in June 1993, when fewer than 1500 companies were registered. ISO 9001 has since become a recognized standard for quality in over 90 countries. Nationally, it is accepted by an ever-increasing number of government agencies in place of longstanding military specifications covering quality and inspection criteria. Among those are MIL-Q-9858 and MIL-I-45208.

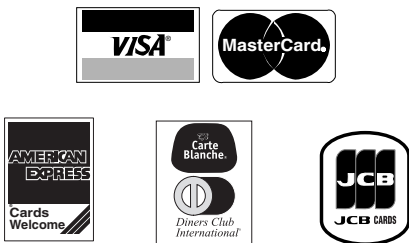


MITEQ's quality system is certified to ISO 9001 by **National Quality Assurance USA (NQA)**, an accredited registrar of the **American National Standards Institute - Registration Accreditation Board (ANSI-RAB)**. NQA performs a quality audit at MITEQ every six months to assure continued compliance to the standard. Additionally, MITEQ's internal auditing system, coupled with regular management reviews, assures that the quality system is effective, updated and constantly improved.

## ORDERING INFORMATION

### PRICING AND TERMS

A quotation on any item in the catalog is available by contacting the factory. All quotations, unless otherwise noted, are valid for 60 days from the date of issue, F.O.B. (FCA) Hauppauge, NY 11788. Pricing does not include customer or government source inspection unless otherwise noted. On international orders, an irrevocable letter of credit may be required. MITEQ accepts these credit cards:



### QUANTITY DISCOUNTS

A quantity discount is generally available on most catalog items. Due to the wide variety of devices in the catalog, it is not possible to provide a standard discount schedule. When quantities are involved, please contact the factory and the appropriate information will be provided.

### SHIPPING INFORMATION

Unless instructed otherwise by the customer, we will ship UPS in the U.S. F.O.B. (FCA) Hauppauge. Air freight will be used as the primary international means of shipment. Please indicate at time of purchase what method of shipment you require.

### DRAWINGS AND SPECIFICATIONS

Material presented in this catalog is current at the time of printing. Mechanical and electrical requirements are subject to change. If either of these parameters is critical, please contact the factory to verify that the information is current.

### APPLICATION ENGINEERING

We maintain a large support staff of engineers who are experts in specific areas of microwave technology. Each has an engineering background that combines both a formal engineering education with training and experience in product design. As further technical support, we make available the services of our engineering and scientific staff, who may be consulted on more advanced circuit designs or application problems.

### RETURNED MATERIAL

For all items requiring service, regardless of warranty status, MITEQ's Customer Service department should be contacted for a Return Material Authorization (RMA) number. This can be done by either visiting our website ([www.miteq.com](http://www.miteq.com)) and requesting an RMA number online or by calling (631) 439-9300. When requesting an RMA number either over the internet or by phone, you will need to provide the model number, serial number and as much information as possible about the nature of your difficulty. All returns must arrive freight, postage, duties and handling prepaid.

### SOURCE INSPECTION

Government / customer source inspection is available on any item upon receipt of the complete written confirmation of purchase order items, including the prime government contract number. Source inspection with respect to some products increases the unit price and extends delivery because of duplicate standard final inspection and testing. It is recommended wherever possible that a Certificate of Compliance be substituted for source inspection to minimize price and delivery delays.

### REPAIR COSTS

Warranty repairs will be made at no cost to the customer. Units out of warranty, or those which have been mishandled, will require approval by the customer for the charges involved before the repairs can be accomplished. We will provide an estimate for the cost of the repair, which can be applied to the repair, if approval is granted. For those items that are deemed beyond repair, or where the customer may decide not to repair the unit, a handling charge will be applicable.

## WARRANTY

1. MITEQ, Inc. warrants to the purchaser that each of its products, when shipped will be free from defects in material and workmanship and will perform in full accordance with applicable specifications. The limit of liability under this warranty is at MITEQ, Inc.'s option to repair or replace any product or part thereof which shall within: (a) three years of delivery for indoor equipment, (b) two years of delivery for outdoor equipment and (c) one year of delivery for integrated assemblies or equipment having RF output powers equal to or greater than +24 dBm, be returned by the purchaser to MITEQ, Inc., at 100 Davids Drive, Hauppauge, New York, 11788, and shall, as determined by examination by MITEQ, Inc., prove defective in material and/or workmanship. Warranty returns must first be authorized in writing by MITEQ, Inc. Disassembly of any MITEQ, Inc. product by anyone other than an authorized representative of MITEQ, Inc. voids this warranty in its entirety. MITEQ, Inc. reserves the right to make changes in any of its products without incurring any obligation to make the same changes on previously delivered products.
2. Components and subsystems having been repaired by MITEQ, Inc. shall be warranted for that repair for ninety (90) days. For products that are still within the original warranty period as described above, the original warranty (if longer) will take precedence. For all SATCOM products, that portion of the system that is repaired, will be warranted for one year.
3. As a condition to the warranties provided for herein, the Buyer will prepay the shipping charges for all products returned to MITEQ, Inc. for repair and MITEQ, Inc. will pay the return shipping with the exception of rack mountable hardware returned from outside the United States in which case the buyer will pay the shipping charges.
4. The buyer will pay the cost of inspecting and testing any goods returned under the warranty or otherwise which are found to meet the applicable specifications or which are not defective or not covered by the warranty.
5. Products sold by MITEQ, Inc. shall not be considered defective or non-conforming to the Buyers' order if they (a) satisfactorily fulfill the performance requirements that were (i) provided by the Buyer to MITEQ, Inc. or (ii) as published in the Sellers' product specification literature, or (b) or in accordance with any written or verbal agreement between the Buyer and MITEQ, Inc., or (c) are in accordance with samples approved by the Buyer. This warranty shall not apply to any products or parts thereof which have been subject to accident, negligence, alteration, abuse or misuse. MITEQ, Inc. makes no warranty whatsoever in respect to accessories or parts not supplied by it.
6. Limitations of Warranty, Damages and Liability

EXCEPT AS EXPRESSLY SET FORTH HEREIN, THERE ARE NO WARRANTIES, CONDITIONS, GUARANTEES OR REPRESENTATIONS AS TO MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR OTHER WARRANTIES, CONDITIONS, GUARANTEES OR REPRESENTATIONS, WHETHER EXPRESSED OR IMPLIED, IN LAW OR IN FACT, ORAL OR IN WRITING.

MITEQ, INC.'S AGGREGATE LIABILITY IN DAMAGES OR OTHERWISE SHALL NOT EXCEED THE PAYMENT, IF ANY, RECEIVED BY MITEQ, INC. FOR THE UNIT OF PRODUCT OR SERVICE FURNISHED OR TO BE FURNISHED, AS THE CASE MAY BE, WHICH IS THE SUBJECT OF CLAIM OR DISPUTE. IN NO EVENT SHALL MITEQ, INC. BE LIABLE FOR INCIDENTAL, CONSEQUENTIAL, OR SPECIAL DAMAGES, HOWSOEVER CAUSED.

7. All matters regarding this warranty shall be interpreted in accordance with the laws of the State of New York and any controversy that cannot be settled directly shall be settled by arbitration in New York, New York in accordance with the rules then prevailing of the American Arbitration Association, and judgement upon the award rendered may be entered in any court having jurisdiction thereof.

**FEDERAL SUPPLY CODE**

**Our Federal Supply Code is: 33592**





Davids Drive • Hauppauge, NY



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