

# WJ-PA10 / SMPA10

10 to 1000 MHz  
TO-8 CASCADABLE AMPLIFIER

- ◆ AVAILABLE IN SURFACE MOUNT
- ◆ HIGH OUTPUT POWER:  
+24.5 dBm (TYP.) @ +20 Vdc
- ◆ WIDE POWER SUPPLY RANGE:  
+12 TO +20 VOLTS
- ◆ WIDE BANDWIDTH: 10 TO 1000 MHz
- ◆ LOW VSWR: < 1.5:1 (TYP.)

## Specifications \*

| Characteristics                          | Typical    | Guaranteed  |                            |
|------------------------------------------|------------|-------------|----------------------------|
|                                          |            | 0° to 50°C  | -54° to +85°C <sup>2</sup> |
| Frequency (Min.)                         | 5-1100 MHz | 10-1000 MHz | 10-1000 MHz                |
| Small Signal Gain (Min.)                 | 10.0 dB    | 9.5 dB      | 9.0 dB <sup>2</sup>        |
| Gain Flatness (Max.)                     | < ±0.2 dB  | ±0.5 dB     | ±0.7 dB                    |
| Noise Figure (Max.)                      | 8.5 dB     | 9.5 dB      | 10.0 dB                    |
| Power Output                             |            |             |                            |
| at 1 dB Compression (Min.)               |            |             |                            |
| V <sub>CC</sub> = +15 Volts              | +22.5 dBm  | +20.0 dBm   | +20.0 dBm                  |
| V <sub>CC</sub> = +20 Volts <sup>2</sup> | +24.5 dBm  | +23.0 dBm   | +23.0 dBm                  |
| VSWR (Max.) Input/Output                 | < 1.5:1    | 2.0:1       | 2.0:1                      |
| DC Current (Max.)                        |            |             |                            |
| At +15 Volts                             | 95 mA      | 100 mA      | 105 mA                     |
| At +20 Volts <sup>2</sup>                | 130 mA     | 132 mA      | 134 mA                     |

\* Measured in a 50-ohm system with V<sub>CC</sub> = 15 Vdc Nominal.

### Notes:

1. WJ-CPA10 is a standard WJ-PA10 installed in a miniature SMA connector housing and guaranteed over 0°C to 50°C temperature range.
2. +71°C max. case temperature when V<sub>CC</sub> = 20 Vdc.

## Typical Intermodulation Performance at 25°C (Typ. +15 Vdc)

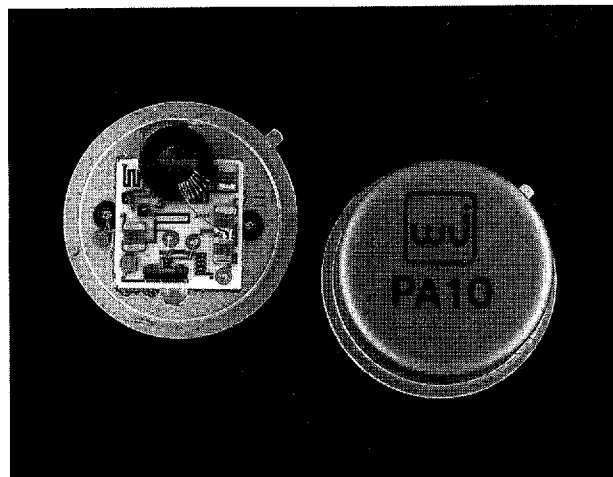
Second Order Harmonic Intercept Point.....> +50 dBm  
Second Order Two Tone Intercept Point.....+45 dBm  
Third Order Two Tone Intercept Point.....+36 dBm

## Absolute Maximum Ratings

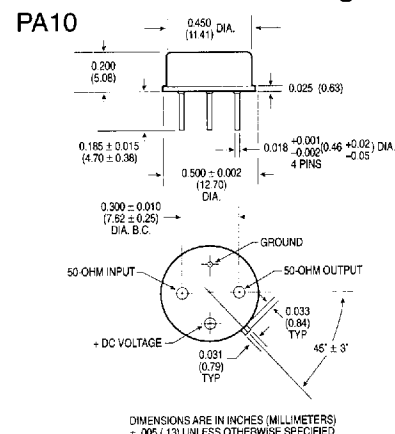
Storage Temperature .....-62°C to +125°C  
Maximum Case Temperature (At 15 Vdc) .....125°C  
Maximum DC Voltage.....+22 Volts  
Maximum Continuous RF Input Power .....+17 dBm  
Maximum Short Term RF Input Power (1 Minute Max.).....100 Milliwatts  
Maximum Peak Power .....0.5 Watt (3  $\mu$ sec Max.)  
"S" Series Burn-In Temperature (Case) (At 15 Vdc) .....125°C  
Proper heatsinking required to insure reliable performance.

Weight approximately 2.0 grams (0.07 oz.)

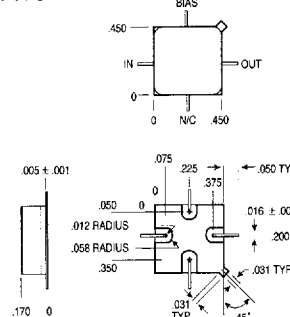
288



## Outline Drawings

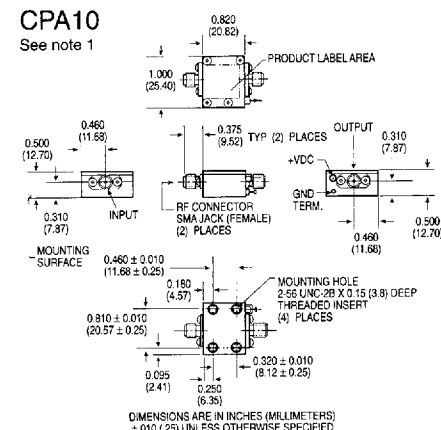


## SMPA10



## CPA10

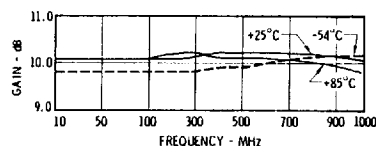
See note 1



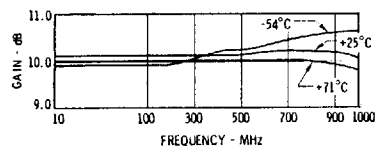
# Typical Performance at 25°C

## Gain

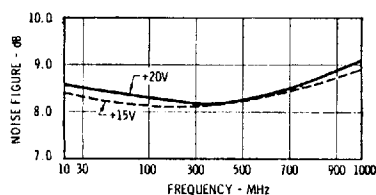
+15 V



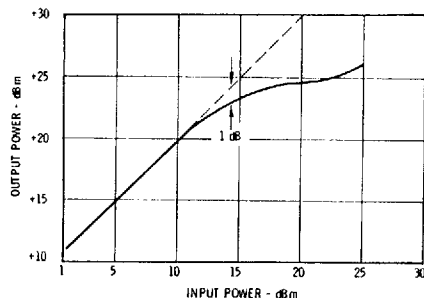
+20 V



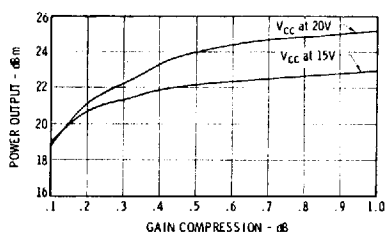
## Noise Figure



## Output Power vs. Input Power

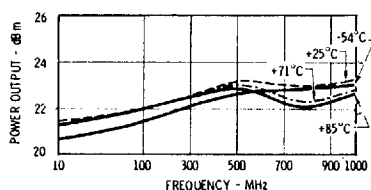


## Output Power vs. Gain Compression



## Power Output\*

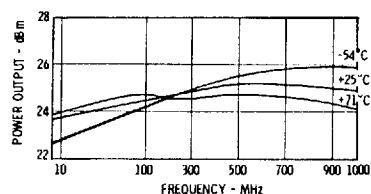
+15 V



\*at 1 dB Gain Compression

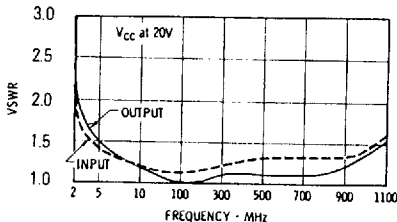
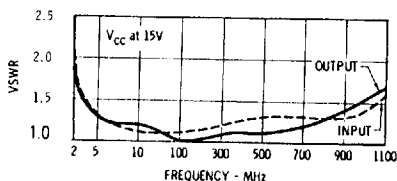
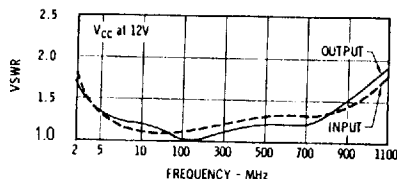
## Power Output\*

+20 V



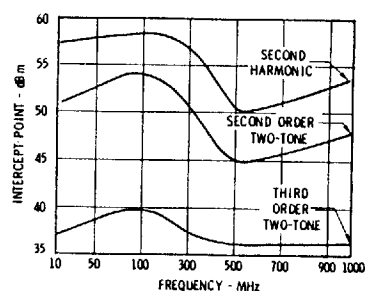
\*at 1 dB Gain Compression

## VSWR

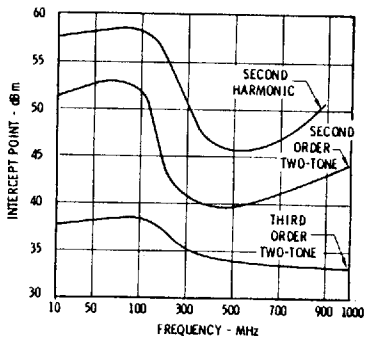


## Intercept Point

+20 V



+15 V



## Typical Automatic Test Data

Vcc = 20.0 V

| Frequency<br>MHz | VSWR<br>IN | VSWR<br>OUT | GAIN<br>DB |
|------------------|------------|-------------|------------|
| 2.0              | 1.6        | 1.9         | 10.4       |
| 5.0              | 1.2        | 1.3         | 10.7       |
| 10.0             | 1.1        | 1.1         | 10.7       |
| 50.0             | 1.1        | 1.0         | 10.8       |
| 100.0            | 1.1        | 1.0         | 10.8       |
| 200.0            | 1.1        | 1.0         | 10.7       |
| 300.0            | 1.2        | 1.1         | 10.6       |
| 400.0            | 1.3        | 1.1         | 10.7       |
| 500.0            | 1.3        | 1.1         | 10.5       |
| 600.0            | 1.4        | 1.1         | 10.5       |
| 700.0            | 1.4        | 1.2         | 10.5       |
| 800.0            | 1.4        | 1.2         | 10.4       |
| 900.0            | 1.5        | 1.2         | 10.2       |
| 1000.0           | 1.7        | 1.2         | 10.1       |
| 1100.0           | 1.8        | 1.2         | 9.7        |
| 1200.0           | 2.2        | 1.2         | 9.2        |

## Linear S-Parameters

| Frequency<br>MHz | S11  |      | S21   |      | S12  |     | S22  |      |
|------------------|------|------|-------|------|------|-----|------|------|
|                  | MAG  | ANG  | MAG   | ANG  | MAG  | ANG | MAG  | ANG  |
| 2.0              | .239 | -78  | 3.296 | -150 | .140 | 32  | .321 | 131  |
| 5.0              | .095 | -101 | 3.414 | -170 | .149 | 12  | .118 | 113  |
| 10.0             | .057 | -117 | 3.441 | -176 | .150 | 6   | .065 | 110  |
| 50.0             | .043 | -157 | 3.475 | 173  | .152 | -2  | .022 | 103  |
| 100.0            | .042 | -158 | 3.456 | 165  | .152 | -6  | .019 | 85   |
| 200.0            | .070 | -151 | 3.436 | 149  | .151 | -12 | .023 | 56   |
| 300.0            | .093 | -163 | 3.406 | 134  | .151 | -18 | .032 | 26   |
| 400.0            | .111 | -180 | 3.410 | 118  | .151 | -24 | .037 | -17  |
| 500.0            | .133 | 167  | 3.369 | 103  | .152 | -30 | .047 | -54  |
| 600.0            | .151 | 147  | 3.366 | 86   | .152 | -37 | .062 | -86  |
| 700.0            | .164 | 124  | 3.346 | 70   | .152 | -43 | .074 | -115 |
| 800.0            | .183 | 102  | 3.315 | 53   | .152 | -51 | .085 | -141 |
| 900.0            | .210 | 74   | 3.249 | 37   | .154 | -57 | .089 | -167 |
| 1000.0           | .249 | 44   | 3.181 | 19   | .152 | -65 | .091 | 166  |
| 1100.0           | .290 | 15   | 3.053 | 1    | .152 | -72 | .087 | 141  |
| 1200.0           | .368 | -13  | 2.885 | -17  | .155 | -79 | .072 | 112  |

## Typical Automatic Test Data

V<sub>CC</sub> = 15.0 V

| Frequency<br>MHz | VSWR<br>IN | VSWR<br>OUT | GAIN<br>DB |
|------------------|------------|-------------|------------|
| 2.0              | 1.6        | 1.8         | 10.3       |
| 5.0              | 1.2        | 1.2         | 10.5       |
| 10.0             | 1.1        | 1.1         | 10.6       |
| 50.0             | 1.1        | 1.0         | 10.7       |
| 100.0            | 1.1        | 1.0         | 10.7       |
| 200.0            | 1.1        | 1.0         | 10.6       |
| 300.0            | 1.2        | 1.0         | 10.6       |
| 400.0            | 1.2        | 1.0         | 10.6       |
| 500.0            | 1.3        | 1.1         | 10.6       |
| 600.0            | 1.3        | 1.1         | 10.6       |
| 700.0            | 1.3        | 1.2         | 10.6       |
| 800.0            | 1.4        | 1.2         | 10.6       |
| 900.0            | 1.5        | 1.2         | 10.5       |
| 1000.0           | 1.6        | 1.3         | 10.3       |
| 1100.0           | 1.8        | 1.3         | 10.0       |
| 1200.0           | 2.1        | 1.3         | 9.5        |

### Linear S-Parameters

| Frequency<br>MHz | S11  |      | S21   |      | S12  |     | S22  |      |
|------------------|------|------|-------|------|------|-----|------|------|
|                  | MAG  | ANG  | MAG   | ANG  | MAG  | ANG | MAG  | ANG  |
| 2.0              | .223 | -82  | 3.272 | -152 | .141 | 30  | .292 | 128  |
| 5.0              | .088 | -103 | 3.368 | -170 | .148 | 11  | .109 | 110  |
| 10.0             | .054 | -122 | 3.396 | -176 | .149 | 5   | .060 | 104  |
| 50.0             | .046 | -159 | 3.433 | 174  | .151 | -1  | .015 | 79   |
| 100.0            | .040 | -160 | 3.413 | 165  | .152 | -5  | .009 | 47   |
| 200.0            | .066 | -155 | 3.403 | 150  | .151 | -11 | .007 | 2    |
| 300.0            | .088 | -168 | 3.381 | 135  | .152 | -16 | .011 | -38  |
| 400.0            | .095 | -176 | 3.407 | 119  | .154 | -22 | .023 | -88  |
| 500.0            | .119 | 169  | 3.384 | 104  | .155 | -28 | .040 | -115 |
| 600.0            | .140 | 149  | 3.402 | 88   | .158 | -34 | .060 | -137 |
| 700.0            | .148 | 127  | 3.406 | 72   | .160 | -41 | .079 | -162 |
| 800.0            | .169 | 104  | 3.389 | 55   | .162 | -48 | .096 | 174  |
| 900.0            | .205 | 79   | 3.347 | 39   | .165 | -56 | .106 | 148  |
| 1000.0           | .238 | 49   | 3.282 | 21   | .166 | -63 | .119 | 120  |
| 1100.0           | .279 | 19   | 3.150 | 3    | .168 | -71 | .125 | 92   |
| 1200.0           | .360 | -10  | 2.988 | -16  | .170 | -80 | .125 | 59   |

V<sub>CC</sub> = 12.0 V

| Frequency<br>MHz | VSWR<br>IN | VSWR<br>OUT | GAIN<br>DB |
|------------------|------------|-------------|------------|
| 2.0              | 1.5        | 1.8         | 10.2       |
| 5.0              | 1.2        | 1.2         | 10.5       |
| 10.0             | 1.1        | 1.1         | 10.5       |
| 50.0             | 1.1        | 1.0         | 10.6       |
| 100.0            | 1.1        | 1.0         | 10.6       |
| 200.0            | 1.1        | 1.0         | 10.5       |
| 300.0            | 1.2        | 1.0         | 10.5       |
| 400.0            | 1.2        | 1.1         | 10.6       |
| 500.0            | 1.3        | 1.1         | 10.5       |
| 600.0            | 1.3        | 1.2         | 10.6       |
| 700.0            | 1.4        | 1.2         | 10.6       |
| 800.0            | 1.4        | 1.3         | 10.5       |
| 900.0            | 1.5        | 1.3         | 10.4       |
| 1000.0           | 1.6        | 1.4         | 10.2       |
| 1100.0           | 1.8        | 1.4         | 9.8        |
| 1200.0           | 2.1        | 1.4         | 9.4        |

### Linear S-Parameters

| Frequency<br>MHz | S11  |      | S21   |      | S12  |     | S22  |      |
|------------------|------|------|-------|------|------|-----|------|------|
|                  | MAG  | ANG  | MAG   | ANG  | MAG  | ANG | MAG  | ANG  |
| 2.0              | .212 | -83  | 3.254 | -153 | .141 | 29  | .275 | 126  |
| 5.0              | .089 | -106 | 3.336 | -170 | .146 | 11  | .102 | 106  |
| 10.0             | .058 | -123 | 3.356 | -176 | .150 | 5   | .056 | 96   |
| 50.0             | .043 | -159 | 3.399 | 174  | .151 | -1  | .015 | 47   |
| 100.0            | .045 | -164 | 3.375 | 165  | .151 | -5  | .012 | -10  |
| 200.0            | .064 | -155 | 3.365 | 149  | .151 | -10 | .015 | -68  |
| 300.0            | .088 | -166 | 3.347 | 135  | .153 | -15 | .021 | -96  |
| 400.0            | .106 | -178 | 3.380 | 119  | .155 | -21 | .040 | -120 |
| 500.0            | .128 | 167  | 3.354 | 104  | .159 | -26 | .060 | -139 |
| 600.0            | .141 | 149  | 3.371 | 88   | .161 | -33 | .082 | -158 |
| 700.0            | .157 | 127  | 3.376 | 72   | .165 | -39 | .105 | 180  |
| 800.0            | .177 | 104  | 3.356 | 55   | .168 | -47 | .126 | 157  |
| 900.0            | .211 | 76   | 3.309 | 38   | .173 | -54 | .142 | 132  |
| 1000.0           | .244 | 48   | 3.234 | 20   | .175 | -62 | .160 | 105  |
| 1100.0           | .295 | 18   | 3.089 | 2    | .178 | -71 | .171 | 78   |
| 1200.0           | .364 | -10  | 2.937 | -17  | .182 | -80 | .178 | 47   |

Thermal Data: V<sub>CC</sub> = 15 V<sub>dc</sub>

Thermal Resistance  $\theta_{jc}$  ..... 45°C/W  
 Transistor Power Dissipation P<sub>d</sub> ..... 0.928 W  
 Junction Temperature Rise Above Case T<sub>jc</sub> ... 42°C