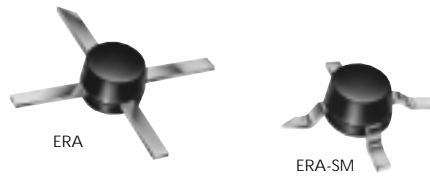


# MONOLITHIC AMPLIFIERS

50Ω

**BROADBAND** DC to 8 GHz



low power, up to +13.5 dBm output

all specifications at 25°C

| MODEL NO. | FREQ. GHz<br>f <sub>c</sub> - f <sub>u</sub> | GAIN, dB Typical    |      |      |      |      |      |     |              | MAXIMUM POWER (dBm) at 2 GHz* |                     |              | DYNAMIC RANGE at 2 GHz* |             | VSWR (:1) Typ.          |                                |        | ABSOLUTE MAX. RATING <sup>3</sup> |              | DC OPERATING POWER <sup>4</sup> at Pin 3 |     |                           | THERMAL RESISTANCE | CASE STYLE | CONNECTION | PRICE \$ |    |      |
|-----------|--|---------------------|------|------|------|------|------|-----|--------------|-------------------------------|---------------------|--------------|-------------------------|-------------|-------------------------|--------------------------------|--------|-----------------------------------|--------------|--|-----|---------------------------|--------------------|------------|------------|----------|----|------|
|           |  | over frequency, GHz |      |      |      |      |      |     |              | Output (1 dB Comp.) Typ.      | Input (no dmg) Min. | NF (dB) Typ. | IP3 (dBm) Typ.          | In DC-3 GHz | 3-f <sub>u</sub> ** GHz | Out DC-3-f <sub>u</sub> ** GHz | I (mA) | P (mW)                            | Current (mA) | Device Volt. Min                         | Max | θ <sub>jc</sub> Typ. °C/W | Note B             | QTY. (30)  |            |          |    |      |
|           |  | 0.1                 | 1    | 2    | 3    | 4    | 6    | 8   | Min. @ 2 GHz |                               |                     |              |                         |             |                         |                                |        |                                   |              |  |     |                           |                    |            |            |          |    |      |
| ERA-1     | DC-8   | 12.3                | 12.1 | 11.8 | 10.9 | 9.7  | 7.9  | 8.2 | 9            | 12.0                          | 10.0                | 15           | 4.3                     | 26          | 1.5                     | 1.8                            | 1.5    | 1.9                               | 75           | 330                                      | 40  | 3.4                       | 3.0                | 4.1        | 178        | VV105    | cb | 1.37 |
| ERA-2     | DC-6   | 16.2                | 15.8 | 15.2 | 14.4 | 13.1 | 11.2 | —   | 13           | 13.0                          | 11.0                | 15           | 4.0                     | 26          | 1.3                     | 1.4                            | 1.2    | 1.6                               | 75           | 330                                      | 40  | 3.4                       | 3.0                | 4.1        | 155        | VV105    | cb | 1.52 |
| ERA-3     | DC-3   | 22.1                | 21.0 | 18.7 | 16.8 | —    | —    | —   | 16           | 12.5                          | 9.0                 | 13           | 3.5                     | 25          | 1.5                     | —                              | 1.4    | —                                 | 75           | 330                                      | 35  | 3.2                       | 3.0                | 4.1        | 154        | VV105    | cb | 1.67 |
| ERA-1SM   | DC-8   | 12.3                | 12.1 | 11.8 | 10.9 | 9.7  | 7.9  | 8.2 | 9            | 12.0                          | 10.0                | 15           | 4.3                     | 26          | 1.5                     | 1.8                            | 1.5    | 1.9                               | 75           | 330                                      | 40  | 3.4                       | 3.0                | 4.1        | 183        | WW107    | cb | 1.42 |
| ERA-21SM  | DC-8   | 14.2                | 13.9 | 13.2 | 12.2 | 10.8 | 8.7  | 8.9 | 11.2         | 12.6                          | 10.6                | 15           | 4.7                     | 26          | 1.1                     | 1.4                            | 1.3    | 1.9                               | 75           | 330                                      | 40  | 3.5                       | 3.0                | 4.1        | 194        | WW107    | cb | 1.57 |
| ERA-2SM   | DC-6   | 16.2                | 15.8 | 15.2 | 14.4 | 13.1 | 11.2 | —   | 13           | 13.0                          | 11.0                | 15           | 4.0                     | 26          | 1.3                     | 1.4                            | 1.2    | 1.6                               | 75           | 330                                      | 40  | 3.4                       | 3.0                | 4.1        | 160        | WW107    | cb | 1.57 |
| ERA-33SM  | DC-3   | 19.3                | 18.7 | 17.4 | 15.9 | —    | —    | —   | 15           | 13.5                          | 11.5                | 13           | 3.9                     | 28.5        | 1.6                     | —                              | 1.25   | —                                 | 75           | 330                                      | 40  | 4.3                       | 3.8                | 4.8        | 140        | WW107    | cb | 1.72 |
| ERA-3SM   | DC-3   | 22.1                | 21.0 | 18.7 | 16.8 | —    | —    | —   | 16           | 12.5                          | 9.0                 | 13           | 3.5                     | 25          | 1.5                     | —                              | 1.4    | —                                 | 75           | 330                                      | 35  | 3.2                       | 3.0                | 4.1        | 159        | WW107    | cb | 1.72 |
| ERA-8SM   | DC-2   | 31.5                | 25.0 | 19.0 | 15.0 | 12.0 | —    | —   | 17           | 12.5                          | —                   | 13           | 3.1                     | 25          | 1.4                     | 1.8                            | 1.8    | 2.2                               | 65           | 250                                      | 36  | 3.7                       | 3.2                | 4.2        | 140        | WW107    | cb | 1.22 |

see suggested PCB layout PL-075 for ERA models

## features

- low thermal resistance
- miniature microwave amplifier
- frequency range, DC to 8 GHz, usable to 10 GHz
- up to 18.4 dBm typ. (16.5 dBm min) output power

## absolute maximum ratings

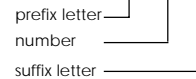
operating temperature: -45°C to 85°C  
storage temperature: -65°C to 150°C

## model identification

Model marking (see note below)

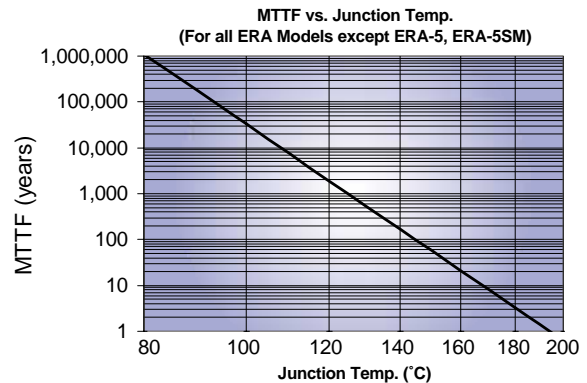
|                |    |
|----------------|----|
| ERA-1, ERA-1SM | 1  |
| ERA-2, ERA-2SM | 2  |
| ERA-21SM       | 21 |
| ERA-3, ERA-3SM | 3  |
| ERA-33SM       | 33 |
| ERA-4, -4SM    | 4  |
| ERA-4XSM       | 4X |
| ERA-5, ERA-5SM | 5  |
| ERA-50SM       | 50 |
| ERA-51SM       | 51 |
| ERA-5XSM       | 5X |
| ERA-6, ERA-6SM | 6  |
| ERA-8SM        | 8  |

Note: Prefix letter (optional) designates assembly location. Suffix letters (optional) are for wafer identification.

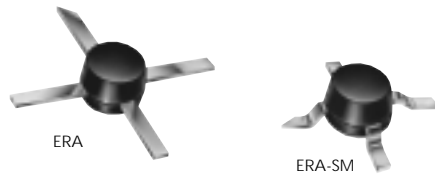


## NOTES:

- ◆ Aqueous washable
  - \* at 1 GHz for ERA-4,5,6, 4SM,4XSM, 5SM,5XSM, 50SM, 51SM, 6SM, 8SM.
  - \*\* f<sub>u</sub> is the upper frequency limit for each model as shown in the table; for ERA-8SM VSWR (In & Out) is specified at DC-1GHz & 1-4 GHz.
  - \*\*\* Gain and VSWR are specified at 1.5 GHz.
  - ⊛ Low frequency cutoff determined by external coupling capacitors.
  - A. Environmental specifications and re-flow soldering information available in General Information Section.
  - B. Units are non-hermetic unless otherwise noted. For details on case dimensions & finishes see "Case Styles & Outline Drawings".
  - C. Prices and Specifications subject to change without notice.
  - D. For Quality Control Procedures see Table of Contents, Section 0, "Mini-Circuits Guarantees Quality" article. For Environmental Specifications see Amplifier Selection Guide.
1. Model number designated by alphanumeric code marking.
  2. ERA-SM models available on tape and reel.
  3. Permanent damage may occur if any of these limits are exceeded. These ratings are not intended for continuous normal operation.
  4. Supply voltage must be connected to pin 3 through a bias resistor in order to prevent damage. See "Biasing MMIC Amplifiers" in minicircuits.com/application.html. Reliability predictions are applicable at specified current & normal operating conditions.



# Drop-In & Surface Mount



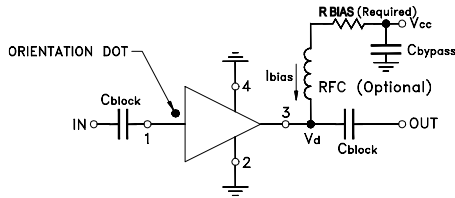
medium power, up to +18.4 dBm output

all specifications at 25°C

| MODEL NO.    | FREQ. GHz<br>$f_c - f_u$ | GAIN, dB Typical |      |      |      |      | Min. @ 2 GHz | MAXIMUM POWER (dBm) at 2 GHz* |                     |              | DYNAMIC RANGE at 2 GHz* |             | VSWR (:1) Typ.          |                                 |        |        | ABSOLUTE MAX. RATING <sup>3</sup> |                  | DC OPERATING POWER <sup>4</sup> at Pin 3 |     |     | THERMAL RESISTANCE<br>$\theta_{jc}$ Typ. °C/W | CASE STYLE<br>Note B | CONNECTION | PRICE \$<br>Qty. (30) |      |
|--------------|--------------------------|------------------|------|------|------|------|--------------|-------------------------------|---------------------|--------------|-------------------------|-------------|-------------------------|---------------------------------|--------|--------|-----------------------------------|------------------|--|-----|-----|---|----------------------|------------|-----------------------|------|
|              |                          | 0.1              | 1    | 2    | 3    | 4    |              | Output (1 dB Comp.) Typ. Min. | Input (no dmg) Typ. | NF (dB) Typ. | IP3 (dBm) Typ.          | In DC-3 GHz | 3-f <sub>u</sub> ** GHz | Out DC-33-f <sub>u</sub> ** GHz | I (mA) | P (mW) | Current (mA)                      | Device Volt. Min | Max                                      |     |     |   |                      |            |                       |      |
| ERA-6        | DC-4                     | 12.6             | 12.5 | 12.2 | 11.7 | 11.3 | 10.5         | 17.9                          | 16                  | 20           | 4.5                     | 36          | 1.3                     | 1.2                             | 1.6    | 1.8    | 120                               | 650              | 70                                       | 5.0 | 4.6 | 5.6   | 170                  | VV105      | cb                    | 3.85 |
| ERA-4        | DC-4                     | 14.3             | 14.0 | 13.4 | 12.7 | 11.8 | 11           | 17.3                          | 15                  | 20           | 4.2                     | 34          | 1.2                     | 1.2                             | 1.3    | 1.8    | 120                               | 650              | 65                                       | 4.5 | 4.2 | 5.5   | 163                  | VV105      | cb                    | 3.85 |
| ERA-5        | DC-4                     | 20.2             | 19.5 | 18.5 | 16.7 | 14.3 | 16           | 18.4                          | 16.5                | 13           | 4.3                     | 32.5        | 1.3                     | 1.3                             | 1.2    | 1.3    | 120                               | 650              | 65                                       | 4.9 | 4.2 | 5.5   | 278                  | VV105      | cb                    | 3.85 |
| ERA-6SM      | DC-4                     | 12.6             | 12.5 | 12.2 | 11.7 | 11.3 | 10.5         | 17.9                          | 16                  | 20           | 4.5                     | 36          | 1.3                     | 1.2                             | 1.6    | 1.8    | 120                               | 650              | 70                                       | 5.0 | 4.6 | 5.6   | 175                  | WW107      | cb                    | 3.90 |
| ERA-4SM      | DC-4                     | 14.3             | 14.0 | 13.4 | 12.7 | 11.8 | 11           | 17.3                          | 15                  | 20           | 4.2                     | 34          | 1.2                     | 1.2                             | 1.3    | 1.8    | 120                               | 650              | 65                                       | 4.5 | 4.2 | 5.5   | 168                  | WW107      | cb                    | 3.90 |
| NEW ERA-4XSM | DC-4                     | 14.7             | 14.2 | 13.5 | 12.0 | 11.8 | 12           | 17.0                          | 15.0                | 20           | 4.2                     | 35          | 1.2                     | 1.2                             | 1.2    | 1.4    | 100                               | 650              | 65                                       | 4.5 | 4.2 | 5.5   | 196                  | WW107      | cb                    | 1.69 |
| NEW ERA-5XSM | DC-4                     | 20.5             | 19.5 | 17.6 | 15.5 | 13.7 | 16           | 17.8                          | 16.5                | 13           | 3.5                     | 33          | 1.2                     | 1.3                             | 1.2    | 1.4    | 120                               | 650              | 65                                       | 4.9 | 4.2 | 5.5   | 133                  | WW107      | cb                    | 1.69 |
| ERA-51SM     | DC-4                     | 18.0             | 17.4 | 16.1 | 14.8 | 12.5 | 14           | 18.1                          | 16.5                | 13           | 4.1                     | 33          | 1.1                     | 1.2                             | 1.2    | 1.9    | 120                               | 650              | 65                                       | 4.5 | 4.2 | 5.5   | 154                  | WW107      | cb                    | 3.90 |
| ERA-5SM      | DC-4                     | 20.2             | 19.5 | 17.6 | 15.6 | 14.0 | 16           | 18.4                          | 16.5                | 13           | 4.3                     | 32.5        | 1.3                     | 1.3                             | 1.2    | 1.3    | 120                               | 650              | 65                                       | 4.9 | 4.2 | 5.5   | 283                  | WW107      | cb                    | 3.90 |
| ERA-50SM***  | DC-1.5                   | 20.7             | 19.4 | 18.3 | —    | —    | 16           | 17.2                          | 16.0                | 13           | 3.5                     | 32.5        | 1.3                     | —                               | 1.2    | —      | 120                               | 650              | 60                                       | 4.4 | 4.0 | 4.9   | 177                  | WW107      | cb                    | 2.95 |

see suggested PCB layout PL-075 for ERA models

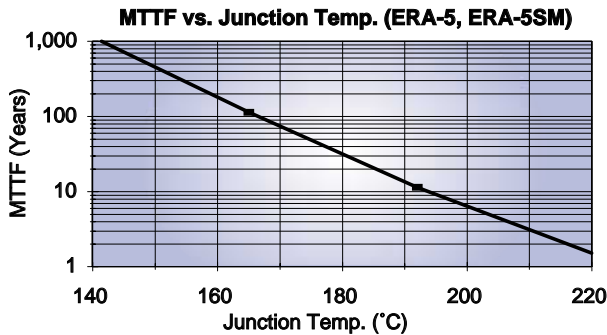
## typical biasing configuration



## RBIAS

"1%" Resistor Values (ohms) for Optimum Biasing of ERA Models

| Vcc | ERA-1   | ERA-2   | ERA-21SM | ERA-3   | ERA-33SM | ERA-4,   | ERA-5, | ERA-50SM,  | ERA-6,  | ERA-8SM |
|-----|---------|---------|----------|---------|----------|----------|--------|------------|---------|---------|
|     | ERA-1SM | ERA-2SM |          | ERA-3SM |          | 4SM,4XSM | 5SM    | -51SM,5XSM | ERA-6SM |         |
| 7   | 90.9    | 88.7    | 88.7     | 107     | 69.8     | 38.3     | 33.2   | 40.2       | 30.1    | 88.7    |
| 8   | 113     | 113     | 113      | 133     | 93.1     | 52.3     | 48.7   | 53.6       | 43.2    | 118     |
| 9   | 137     | 137     | 137      | 162     | 115      | 66.5     | 63.4   | 68.1       | 56.2    | 143     |
| 10  | 162     | 162     | 162      | 191     | 140      | 80.6     | 78.7   | 82.5       | 69.8    | 174     |
| 11  | 187     | 187     | 187      | 221     | 165      | 95.3     | 95.3   | 97.6       | 84.5    | 200     |
| 12  | 215     | 215     | 215      | 249     | 191      | 110      | 110    | 113        | 97.6    | 226     |
| 13  | 237     | 237     | 237      | 280     | 215      | 127      | 124    | 127        | 113     | 255     |
| 14  | 261     | 261     | 261      | 309     | 243      | 143      | 140    | 143        | 127     | 280     |
| 15  | 287     | 287     | 287      | 340     | 267      | 158      | 158    | 158        | 140     | 309     |
| 16  | 309     | 309     | 316      | 365     | 287      | 174      | 174    | 174        | 154     | 340     |
| 17  | 332     | 332     | 340      | 392     | 316      | 187      | 187    | 191        | 169     | 365     |
| 18  | 357     | 365     | 365      | 422     | 340      | 205      | 205    | 205        | 182     | 392     |
| 19  | 383     | 392     | 392      | 453     | 365      | 221      | 221    | 221        | 196     | 422     |
| 20  | 412     | 412     | 412      | 475     | 392      | 237      | 232    | 237        | 210     | 453     |



## NSN GUIDE

| MCL NO. | NSN              |
|---------|------------------|
| ERA-1SM | 5962-01-459-9075 |
| ERA-3SM | 5996-01-516-5438 |
| ERA-4SM | 5962-01-459-7410 |
| ERA-5SM | 5962-01-459-9314 |

## pin connections

| PORT       | cb     |
|------------|--------|
| RF IN      | 1      |
| RF OUT     | 3      |
| DC         | 3      |
| CASE GND   | 2,4    |
| NOT USED   | —      |
| DEMO BOARD | ERA-TB |

## designers kits available

| KIT NO.  | Model Type | No. of Units in Kit | Description              | Price \$ per kit |
|----------|------------|---------------------|--------------------------|------------------|
| K1-ERA   | ERA        | 30                  | 10 of each 1,2,3         | 49.95            |
| K2-ERA   | ERA        | 20                  | 10 of each 4,5           | 69.95            |
| K1-ERASM | ERA-SM     | 30                  | 10 of each 1SM, 2SM,3SM  | 49.95            |
| K2-ERASM | ERA-SM     | 20                  | 10 of each 4SM, 5SM      | 69.95            |
| K3-ERASM | ERA-SM     | 30                  | 10 of each 4SM, 5SM, 6SM | 99.95            |



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