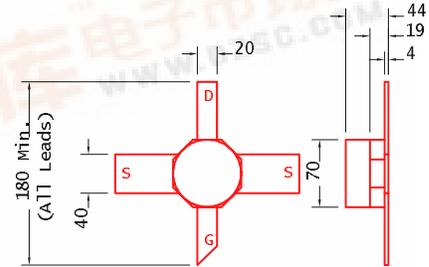




# EPB018A5/A7/A9-70

## DATA SHEET Super Low Noise High Gain Heterojunction FET

- NON-HERMETIC LOW COST CERAMIC 70 mil PACKAGE
- TYPICAL 0.50~0.90dB NOISE FIGURE AND 11.5~13.0dB ASSOCIATED GAIN AT 12GHz
- 0.3 X 180 MICRON RECESSED “ MUSHROOM” GATE
- Si<sub>3</sub>N<sub>4</sub> PASSIVATION
- ADVANCED EPITAXIAL HETEROJUNCTION PROFILE PROVIDES SUPER LOW NOISE, HIGH GAIN AND HIGH RELIABILITY



All Dimensions In mils.

### ELECTRICAL CHARACTERISTICS (T<sub>a</sub> = 25 °C)

| SYMBOLS          | PARAMETERS/TEST CONDITIONS  | MIN         | TYP          | MAX  | UNIT |
|------------------|---|-------------|--------------|------|------|
| NF               | Noise Figure, f=12GHz<br>V <sub>ds</sub> =2V, I <sub>ds</sub> =15mA           | EPB018A5-70 | 0.50         | 0.60 | dB   |
|                  |   | EPB018A7-70 | 0.65         | 0.80 |      |
|                  |   | EPB018A9-70 | 0.95         | 1.20 |      |
| Ga               | Associated Gain, f=12GHz<br>V <sub>ds</sub> =2V, I <sub>ds</sub> =15mA        | EPB018A5-70 | 11.5         | 13.0 | dB   |
|                  |   | EPB018A7-70 | 11.0         | 12.5 |      |
|                  |   | EPB018A9-70 | 10.5         | 11.5 |      |
| P <sub>1dB</sub> | Output Power at 1dB Compression<br>V <sub>ds</sub> =3V, I <sub>ds</sub> =25mA |             | 15.0<br>15.0 |      | dBm  |
| G <sub>1dB</sub> | Gain at 1dB Compression<br>V <sub>ds</sub> =3V, I <sub>ds</sub> =25mA         |             | 14.0         |      | dB   |
|                  |   |             | 11.5         |      |      |
| I <sub>ds</sub>  | Saturated Drain Current V <sub>ds</sub> =2V, V <sub>gs</sub> =0V              | 15          | 45           | 80   | mA   |
| G <sub>m</sub>   | Transconductance V <sub>ds</sub> =2V, V <sub>gs</sub> =0V                     | 50          | 90           |      | mS   |
| V <sub>p</sub>   | Pinch-off Voltage V <sub>ds</sub> =2V, I <sub>ds</sub> =1.0mA                 |             | -0.8         | -2.5 | V    |
| BV <sub>gd</sub> | Drain Breakdown Voltage I <sub>gd</sub> =10uA                                 | -3          | -6           |      | V    |
| BV <sub>gs</sub> | Source Breakdown Voltage I <sub>gs</sub> =10uA                                | -3          | -6           |      | V    |
| R <sub>th</sub>  | Thermal Resistance  |             | 480*         |      | °C/W |

\* Overall R<sub>th</sub> depends on case mounting.

### MAXIMUM RATINGS AT 25°C

| SYMBOLS          | PARAMETERS              | ABSOLUTE <sup>1</sup> | CONTINUOUS <sup>2</sup> |
|------------------|-------------------------|-----------------------|-------------------------|
| V <sub>ds</sub>  | Drain-Source Voltage    | 5V                    | 4V                      |
| V <sub>gs</sub>  | Gate-Source Voltage     | -3V                   | -2V                     |
| I <sub>ds</sub>  | Drain Current           | I <sub>ds</sub>       | 60mA                    |
| I <sub>gsf</sub> | Forward Gate Current    | 2mA                   | 0.3mA                   |
| P <sub>in</sub>  | Input Power             | 12dBm                 | @ 1dB Compression       |
| T <sub>ch</sub>  | Channel Temperature     | 175°C                 | 150°C                   |
| T <sub>stg</sub> | Storage Temperature     | -65/175°C             | -65/150°C               |
| P <sub>t</sub>   | Total Power Dissipation | 285mW                 | 240mW                   |

Note: 1. Exceeding any of the above ratings may result in permanent damage.

2. Exceeding any of the above ratings may reduce MTTF below design goals.



# EPB018A5/A7/A9-70

## DATA SHEET Super Low Noise High Gain Heterojunction FET

| EPB018A5-70<br>S-PARAMETERS<br>2V, 15mA |           |        |           |        |           |        |           |        | EPB018A7-70<br>S-PARAMETERS<br>2V, 15mA |           |        |           |        |           |        |           |        |
|---|-----------|--------|-----------|--------|-----------|--------|-----------|--------|---|-----------|--------|-----------|--------|-----------|--------|-----------|--------|
| FREQ<br>(GHz)                           | -- S11 -- |        | -- S21 -- |        | -- S12 -- |        | -- S22 -- |        | FREQ<br>(GHz)                           | -- S11 -- |        | -- S21 -- |        | -- S12 -- |        | -- S22 -- |        |
|   | MAG       | ANG    | MAG       | ANG    | MAG       | ANG    | MAG       | ANG    |   | MAG       | ANG    | MAG       | ANG    | MAG       | ANG    | MAG       | ANG    |
| 1.0                                     | 0.983     | -18.6  | 6.245     | 162.2  | 0.019     | 78.9   | 0.530     | -13.5  | 1.0                                     | 0.985     | -18.9  | 5.754     | 162.0  | 0.021     | 77.1   | 0.677     | -13.7  |
| 2.0                                     | 0.944     | -37.5  | 5.964     | 144.3  | 0.036     | 65.2   | 0.507     | -28.8  | 2.0                                     | 0.949     | -38.2  | 5.495     | 143.9  | 0.040     | 63.1   | 0.650     | -28.9  |
| 3.0                                     | 0.896     | -55.5  | 5.582     | 127.7  | 0.050     | 53.6   | 0.485     | -42.6  | 3.0                                     | 0.903     | -56.2  | 5.137     | 127.2  | 0.055     | 50.5   | 0.622     | -42.7  |
| 4.0                                     | 0.849     | -72.6  | 5.327     | 112.4  | 0.063     | 43.6   | 0.464     | -54.2  | 4.0                                     | 0.860     | -73.6  | 4.914     | 111.8  | 0.067     | 39.1   | 0.595     | -54.1  |
| 5.0                                     | 0.797     | -89.2  | 5.111     | 97.6   | 0.074     | 33.1   | 0.421     | -65.4  | 5.0                                     | 0.812     | -90.4  | 4.726     | 96.9   | 0.079     | 28.5   | 0.549     | -65.4  |
| 6.0                                     | 0.747     | -103.7 | 4.799     | 83.4   | 0.081     | 23.4   | 0.370     | -78.6  | 6.0                                     | 0.765     | -104.9 | 4.461     | 82.4   | 0.086     | 17.8   | 0.495     | -78.6  |
| 7.0                                     | 0.691     | -118.6 | 4.503     | 69.9   | 0.085     | 13.9   | 0.344     | -90.7  | 7.0                                     | 0.713     | -119.9 | 4.189     | 68.6   | 0.092     | 7.3    | 0.464     | -90.5  |
| 8.0                                     | 0.642     | -132.8 | 4.277     | 57.0   | 0.088     | 4.7    | 0.303     | -100.7 | 8.0                                     | 0.664     | -134.3 | 3.982     | 55.4   | 0.093     | -3.6   | 0.411     | -100.6 |
| 9.0                                     | 0.600     | -155.6 | 4.189     | 42.7   | 0.093     | -5.1   | 0.271     | -111.2 | 9.0                                     | 0.621     | -157.1 | 3.908     | 40.9   | 0.096     | -12.9  | 0.374     | -108.6 |
| 10.0                                    | 0.567     | -178.3 | 4.012     | 27.8   | 0.096     | -16.3  | 0.228     | -126.9 | 10.0                                    | 0.591     | -179.4 | 3.759     | 25.7   | 0.098     | -24.5  | 0.328     | -121.7 |
| 11.0                                    | 0.534     | 170.3  | 3.846     | 15.5   | 0.094     | -26.5  | 0.193     | -145.5 | 11.0                                    | 0.564     | 169.0  | 3.644     | 12.8   | 0.099     | -33.4  | 0.295     | -140.0 |
| 12.0                                    | 0.515     | 155.6  | 3.758     | 2.9    | 0.093     | -33.1  | 0.177     | -161.2 | 12.0                                    | 0.541     | 153.2  | 3.551     | -0.8   | 0.098     | -43.3  | 0.266     | -157.6 |
| 13.0                                    | 0.555     | 128.7  | 3.569     | -12.5  | 0.091     | -44.2  | 0.137     | 176.3  | 13.0                                    | 0.574     | 126.2  | 3.360     | -16.6  | 0.096     | -54.9  | 0.210     | -174.2 |
| 14.0                                    | 0.596     | 106.0  | 3.317     | -27.1  | 0.088     | -55.6  | 0.114     | 151.4  | 14.0                                    | 0.609     | 103.6  | 3.093     | -31.7  | 0.090     | -66.7  | 0.173     | 167.6  |
| 15.0                                    | 0.592     | 91.3   | 3.214     | -41.3  | 0.087     | -66.9  | 0.141     | 123.9  | 15.0                                    | 0.598     | 88.8   | 2.985     | -46.4  | 0.090     | -78.4  | 0.187     | 139.8  |
| 16.0                                    | 0.597     | 74.3   | 3.086     | -56.8  | 0.083     | -81.1  | 0.158     | 94.5   | 16.0                                    | 0.597     | 71.4   | 2.857     | -62.2  | 0.085     | -92.9  | 0.194     | 109.8  |
| 17.0                                    | 0.619     | 59.2   | 2.756     | -69.5  | 0.071     | -90.3  | 0.134     | 68.1   | 17.0                                    | 0.612     | 55.7   | 2.548     | -75.5  | 0.072     | -102.8 | 0.155     | 89.8   |
| 18.0                                    | 0.670     | 49.9   | 2.668     | -79.4  | 0.071     | -97.3  | 0.136     | 64.0   | 18.0                                    | 0.661     | 46.6   | 2.472     | -85.8  | 0.076     | -105.2 | 0.183     | 89.7   |
| 19.0                                    | 0.668     | 33.0   | 2.623     | -95.4  | 0.069     | -115.9 | 0.169     | 51.0   | 19.0                                    | 0.657     | 29.0   | 2.381     | -102.1 | 0.076     | -126.2 | 0.221     | 68.8   |
| 20.0                                    | 0.708     | 17.3   | 2.551     | -111.1 | 0.064     | -131.4 | 0.172     | 37.8   | 20.0                                    | 0.697     | 13.2   | 2.286     | -118.1 | 0.071     | -141.6 | 0.240     | 56.1   |
| 21.0                                    | 0.757     | 8.2    | 2.447     | -125.1 | 0.061     | -144.1 | 0.159     | 18.7   | 21.0                                    | 0.740     | 4.4    | 2.173     | -131.8 | 0.068     | -155.3 | 0.221     | 40.9   |
| 22.0                                    | 0.743     | -2.5   | 2.325     | -139.4 | 0.063     | -159.2 | 0.135     | 14.7   | 22.0                                    | 0.728     | -5.8   | 2.067     | -145.9 | 0.070     | -167.9 | 0.210     | 36.8   |
| 23.0                                    | 0.726     | -21.1  | 2.224     | -158.5 | 0.065     | 179.4  | 0.115     | -1.3   | 23.0                                    | 0.717     | -24.4  | 1.958     | -164.5 | 0.071     | 172.5  | 0.188     | 21.8   |
| 24.0                                    | 0.747     | -39.6  | 2.063     | -178.1 | 0.067     | 158.8  | 0.102     | -39.6  | 24.0                                    | 0.743     | -41.8  | 1.807     | 176.3  | 0.071     | 151.8  | 0.154     | -5.5   |
| 25.0                                    | 0.709     | -52.6  | 2.024     | 167.9  | 0.072     | 144.7  | 0.136     | -56.6  | 25.0                                    | 0.710     | -53.5  | 1.757     | 161.7  | 0.075     | 138.3  | 0.174     | -28.1  |
| 26.0                                    | 0.683     | -70.6  | 2.006     | 150.2  | 0.083     | 132.8  | 0.117     | -71.3  | 26.0                                    | 0.689     | -69.1  | 1.759     | 145.4  | 0.084     | 124.1  | 0.152     | -47.5  |

| EPB018A7-70<br>Noise Parameters<br>Vds=2V, Ids=15mA |           |       |               |       |
|---|-----------|-------|---------------|-------|
| Freq.<br>(GHz)                                      | Gamma Opt |       | Nfmin<br>(dB) | Rn/50 |
|   | (MAG)     | (ANG) |               |       |
| 2   | 0.76      | 25    | 0.37          | 0.26  |
| 4   | 0.65      | 56    | 0.43          | 0.22  |
| 6   | 0.51      | 84    | 0.48          | 0.16  |
| 8   | 0.41      | 118   | 0.55          | 0.11  |
| 10  | 0.26      | 159   | 0.61          | 0.08  |
| 12  | 0.26      | -144  | 0.68          | 0.08  |
| 14  | 0.32      | -82   | 0.89          | 0.18  |
| 16  | 0.40      | -46   | 1.10          | 0.29  |
| 18  | 0.40      | -26   | 1.30          | 0.45  |
| 20  | 0.51      | 8     | 1.45          | 0.55  |
| 22  | 0.41      | 27    | 1.69          | 0.61  |
| 24  | 0.48      | 75    | 1.83          | 0.59  |
| 26  | 0.52      | 108   | 2.05          | 0.40  |