



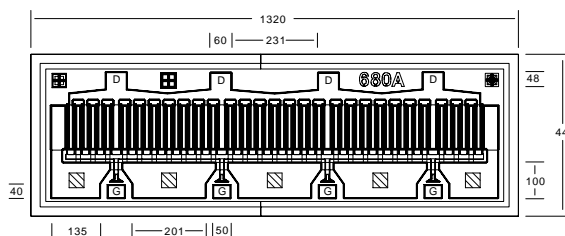
# EPA680A/EPA680AV

UPDATED 05/02/2006

## High Efficiency Heterojunction Power FET

### FEATURES

- +36.5dBm TYPICAL OUTPUT POWER
- 6.5dB TYPICAL POWER GAIN FOR EPA680A AND 8.0dB FOR EPA680AV AT 12GHz
- 0.4 X 6800 MICRON RECESSED "MUSHROOM" GATE
- Si<sub>3</sub>N<sub>4</sub> PASSIVATION AND PLATED HEAT SINK
- ADVANCED EPITAXIAL DOPING PROFILE PROVIDES HIGH POWER EFFICIENCY AND RELIABILITY
- Idss SORTED IN 160mA PER BIN RANGE



Chip Thickness: 45 ± 15 microns

☒ : Via Hole

No Via Hole For EPA680A

All Dimensions In Microns



Caution! ESD sensitive device.

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

| SYMBOLS          | PARAMETERS/TEST CONDITIONS  | EPA680A |      |      | EPA680AV |      |      | UNIT |
|------------------|---|---------|------|------|----------|------|------|------|
|                  |   | MIN     | TYP  | MAX  | MIN      | TYP  | MAX  |      |
| P <sub>1dB</sub> | Output Power at 1dB Compression f=12GHz<br>V <sub>ds</sub> =8V, I <sub>ds</sub> =50% I <sub>dss</sub>           | 35.5    | 36.5 |      | 35.5     | 36.5 |      | dBm  |
| G <sub>1dB</sub> | Gain at 1dB Compression f=12GHz<br>V <sub>ds</sub> =8V, I <sub>ds</sub> =50% I <sub>dss</sub>                   | 5.5     | 6.5  |      | 7        | 8    |      | dB   |
| PAE              | Power Added Efficiency at 1dB Compression<br>V <sub>ds</sub> =8V, I <sub>ds</sub> =50% I <sub>dss</sub> f=12GHz |         | 33   |      |          | 36   |      | %    |
| I <sub>dss</sub> | Saturated Drain Current V <sub>ds</sub> =3V, V <sub>gs</sub> =0V  | 1250    | 2050 | 2690 | 1250     | 2050 | 2690 | mA   |
| G <sub>m</sub>   | Transconductance V <sub>ds</sub> =3V, V <sub>gs</sub> =0V   | 1360    | 2150 |      | 1360     | 2150 |      | mS   |
| V <sub>p</sub>   | Pinch-off Voltage V <sub>ds</sub> =3V, I <sub>ds</sub> =20mA  |         | -1.0 | -2.5 |          | -1.0 | -2.5 | V    |
| BV <sub>gd</sub> | Drain Breakdown Voltage I <sub>gd</sub> =6.8mA  | -13     | -15  |      | -13      | -15  |      | V    |
| BV <sub>gs</sub> | Source Breakdown Voltage I <sub>gs</sub> =6.8mA   | -7      | -14  |      | -7       | -14  |      | V    |
| R <sub>th</sub>  | Thermal Resistance (Au-Sn Eutectic Attach)  |         | 6    |      |          | 5.5  |      | °C/W |

### MAXIMUM RATINGS AT 25°C

| SYMBOLS          | PARAMETERS              | EPA680A               |                         | EPA680AV              |                         |
|------------------|-------------------------|-----------------------|-------------------------|-----------------------|-------------------------|
|                  |                         | ABSOLUTE <sup>1</sup> | CONTINUOUS <sup>2</sup> | ABSOLUTE <sup>1</sup> | CONTINUOUS <sup>2</sup> |
| V <sub>ds</sub>  | Drain-Source Voltage    | 12V                   | 8V                      | 12V                   | 8V                      |
| V <sub>gs</sub>  | Gate-Source Voltage     | -5V                   | -3V                     | -5V                   | -3V                     |
| I <sub>gsf</sub> | Forward Gate Current    | 30.6 mA               | 10.2 mA                 | 30.6 mA               | 10.2 mA                 |
| I <sub>gsr</sub> | Reserve Gate Current    | -5.1 mA               | -1.7 mA                 | -5.1 mA               | -1.7 mA                 |
| P <sub>in</sub>  | Input Power             | 33.5 dBm              | @ 3dB Compression       | 33.5 dBm              | @ 3dB Compression       |
| T <sub>ch</sub>  | Channel Temperature     | 175°C                 | 175°C                   | 175°C                 | 175°C                   |
| T <sub>stg</sub> | Storage Temperature     | -65/175°C             | -65/175°C               | -65/175°C             | -65/175°C               |
| P <sub>t</sub>   | Total Power Dissipation | 23 W                  | 23 W                    | 25 W                  | 25 W                    |

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.

Specifications are subject to change without notice.

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Revised May 2006



# EPA680A/EPA680AV

UPDATED 05/02/2006

## High Efficiency Heterojunction Power FET

### S-PARAMETERS EPA680A 8V, 1/2 Idss

| Freq<br>(GHz) | S11   |        | S21   |       | S12   |      | S22   |        |
|---------------|-------|--------|-------|-------|-------|------|-------|--------|
|               | Mag   | Ang    | Mag   | Ang   | Mag   | Ang  | Mag   | Ang    |
| 1             | 0.943 | -164.0 | 7.210 | 90.7  | 0.009 | 21.7 | 0.681 | -174.6 |
| 2             | 0.944 | -173.1 | 3.626 | 78.2  | 0.011 | 23.5 | 0.697 | -174.5 |
| 3             | 0.945 | -176.8 | 2.393 | 68.8  | 0.011 | 26.1 | 0.711 | -173.2 |
| 4             | 0.942 | -179.5 | 1.770 | 60.1  | 0.013 | 36.0 | 0.727 | -172.8 |
| 5             | 0.941 | 178.9  | 1.441 | 52.6  | 0.014 | 41.6 | 0.745 | -172.3 |
| 6             | 0.940 | 176.6  | 1.133 | 44.8  | 0.015 | 45.8 | 0.765 | -172.6 |
| 7             | 0.944 | 174.7  | 0.921 | 38.3  | 0.016 | 48.4 | 0.798 | -172.8 |
| 8             | 0.944 | 173.0  | 0.761 | 32.0  | 0.015 | 47.5 | 0.817 | -173.6 |
| 9             | 0.942 | 171.1  | 0.638 | 25.9  | 0.016 | 53.6 | 0.840 | -174.0 |
| 10            | 0.945 | 169.2  | 0.550 | 20.4  | 0.017 | 54.5 | 0.857 | -175.2 |
| 11            | 0.947 | 167.6  | 0.477 | 15.2  | 0.018 | 52.5 | 0.870 | -175.8 |
| 12            | 0.946 | 166.5  | 0.422 | 10.5  | 0.020 | 52.9 | 0.885 | -177.2 |
| 13            | 0.946 | 165.3  | 0.376 | 5.9   | 0.021 | 46.6 | 0.887 | -178.3 |
| 14            | 0.948 | 165.0  | 0.339 | 1.6   | 0.023 | 53.1 | 0.904 | -179.8 |
| 15            | 0.939 | 164.4  | 0.309 | -2.1  | 0.024 | 47.6 | 0.900 | 179.5  |
| 16            | 0.945 | 164.5  | 0.285 | -5.0  | 0.022 | 45.8 | 0.914 | 178.6  |
| 17            | 0.938 | 164.5  | 0.262 | -9.1  | 0.024 | 45.2 | 0.920 | 177.4  |
| 18            | 0.931 | 164.8  | 0.240 | -11.9 | 0.028 | 41.0 | 0.915 | 175.8  |
| 19            | 0.937 | 164.8  | 0.223 | -14.8 | 0.028 | 40.1 | 0.926 | 175.8  |
| 20            | 0.931 | 165.3  | 0.211 | -16.4 | 0.033 | 41.9 | 0.936 | 175.3  |
| 21            | 0.919 | 163.0  | 0.195 | -20.6 | 0.036 | 39.0 | 0.948 | 175.1  |
| 22            | 0.924 | 161.1  | 0.185 | -23.2 | 0.038 | 40.6 | 0.935 | 176.8  |
| 23            | 0.907 | 159.4  | 0.180 | -26.0 | 0.043 | 35.9 | 0.949 | 175.1  |
| 24            | 0.908 | 156.4  | 0.173 | -29.9 | 0.049 | 31.5 | 0.937 | 175.2  |
| 25            | 0.898 | 155.1  | 0.169 | -33.5 | 0.056 | 29.0 | 0.944 | 173.6  |
| 26            | 0.888 | 152.3  | 0.168 | -37.4 | 0.066 | 24.1 | 0.939 | 172.1  |

Note: The data included 0.7 mils diameter Au bonding wires: 4 gate wires, 15 mils each; 4 drain wires, 15 mils each; 10 source wires, 7 mils each.

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# EPA680A/EPA680AV

UPDATED 05/02/2006

## High Efficiency Heterojunction Power FET

### S-PARAMETERS

EPA680AV 8V, 1/2 Idss

| Freq<br>(GHz) | S11   |        | S21   |       | S12   |      | S22   |        |
|---------------|-------|--------|-------|-------|-------|------|-------|--------|
|               | Mag   | Ang    | Mag   | Ang   | Mag   | Ang  | Mag   | Ang    |
| 1             | 0.962 | -166.0 | 7.084 | 90.5  | 0.011 | 16.4 | 0.651 | -175.5 |
| 2             | 0.965 | -174.4 | 3.544 | 79.4  | 0.012 | 17.2 | 0.660 | -175.8 |
| 3             | 0.968 | -177.9 | 2.340 | 70.9  | 0.011 | 25.3 | 0.665 | -175.1 |
| 4             | 0.971 | 180.0  | 1.727 | 62.9  | 0.013 | 32.7 | 0.683 | -174.6 |
| 5             | 0.970 | 179.9  | 1.334 | 56.3  | 0.012 | 38.2 | 0.712 | -176.1 |
| 6             | 0.974 | 178.3  | 1.089 | 49.5  | 0.013 | 43.4 | 0.733 | -176.6 |
| 7             | 0.974 | 177.2  | 0.918 | 43.0  | 0.013 | 53.8 | 0.748 | -177.4 |
| 8             | 0.976 | 175.6  | 0.785 | 37.5  | 0.015 | 55.3 | 0.768 | -177.2 |
| 9             | 0.981 | 174.6  | 0.684 | 31.2  | 0.014 | 55.3 | 0.784 | -178.6 |
| 10            | 0.978 | 173.2  | 0.598 | 25.1  | 0.013 | 58.5 | 0.808 | 178.6  |
| 11            | 0.975 | 171.9  | 0.523 | 20.9  | 0.018 | 62.1 | 0.835 | 178.2  |
| 12            | 0.984 | 170.5  | 0.463 | 15.4  | 0.016 | 62.8 | 0.853 | 176.4  |
| 13            | 0.984 | 170.9  | 0.407 | 10.7  | 0.017 | 59.7 | 0.848 | 174.3  |
| 14            | 0.980 | 169.1  | 0.349 | 6.4   | 0.019 | 62.2 | 0.860 | 173.8  |
| 15            | 0.991 | 169.7  | 0.320 | 3.4   | 0.017 | 58.8 | 0.869 | 172.0  |
| 16            | 0.973 | 168.6  | 0.281 | -1.3  | 0.017 | 53.4 | 0.884 | 170.0  |
| 17            | 0.993 | 168.0  | 0.256 | -5.1  | 0.017 | 59.0 | 0.888 | 168.5  |
| 18            | 0.981 | 167.8  | 0.226 | -8.3  | 0.017 | 50.7 | 0.906 | 167.7  |
| 19            | 0.986 | 166.4  | 0.210 | -11.8 | 0.018 | 51.7 | 0.911 | 166.2  |
| 20            | 0.989 | 165.4  | 0.196 | -14.6 | 0.020 | 45.1 | 0.910 | 165.5  |
| 21            | 0.981 | 159.4  | 0.192 | -18.9 | 0.022 | 42.2 | 0.920 | 165.7  |
| 22            | 0.986 | 159.1  | 0.172 | -22.8 | 0.021 | 45.3 | 0.931 | 164.4  |
| 23            | 0.987 | 158.3  | 0.160 | -25.4 | 0.022 | 50.5 | 0.932 | 162.3  |
| 24            | 0.988 | 158.7  | 0.142 | -28.2 | 0.024 | 51.6 | 0.936 | 159.1  |
| 25            | 0.980 | 158.9  | 0.126 | -28.7 | 0.022 | 50.1 | 0.911 | 158.1  |
| 26            | 0.961 | 159.2  | 0.114 | -30.3 | 0.027 | 50.9 | 0.933 | 157.5  |

Note: The data included 0.7 mils diameter Au bonding wires: 4 gate wires, 15 mils each; 4 drain wires, 15 mils each;

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