Filtronic

# FPD2000AS

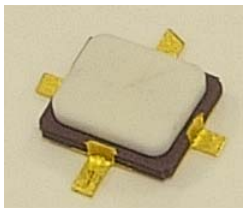
Datasheet v3.0

## 2W PACKAGED POWER PHEMT

### FEATURES:

- 33 dBm Output Power (P1dB) @1.8GHz
- 14 dB Power Gain (G1dB) @1.8GHz
- 46 dBm Output IP3
- 10V Operation
- 50% Power-Added Efficiency
- Evaluation Boards Available
- Usable Gain to 4GHz

### PACKAGE:



### GENERAL DESCRIPTION:

The FPD2000AS is a packaged depletion mode AlGaAs/InGaAs pseudomorphic High Electron Mobility Transistor (pHEMT), optimized for power applications in L-Band. The surface-mount package has been optimized for low parasitics.

### TYPICAL APPLICATIONS:

- Drivers or output stages in PCS/Cellular base station transmitter amplifiers
- Power applications in WLL/WLAN and WiMax (3.5GHz) amplifiers

### ELECTRICAL SPECIFICATIONS:

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|---|
| Power at 1dB Gain Compression | P1dB | VDS = 10V; IDS = 350 mA<br>ΓS and ΓL tuned for Optimum IP3 | 32 | 33 | | dBm |
| Power Gain at dB Gain Compression | G1dB | VDS = 10V; IDS = 350 mA<br>ΓS and ΓL tuned for Optimum IP3 | 12.5 | 14.0 | | |
| Maximum Stable Gain<br>S21/S12 | MSG | VDS = 10 V; IDS = 350 mA<br>PIN = 0dBm, 50Ω system | | 20 | | dB |
| Power-Added Efficiency<br>at 1dB Gain Compression | PAE | VDS = 10V; IDS = 350 mA<br>ΓS and ΓL tuned for Optimum IP3 | | 45 | | % |
| 3rd-Order Intermodulation Distortion | IM3 | VDS = 10V; IDS = 350 mA<br>ΓS and ΓL tuned for Optimum IP3<br>POUT = 22 dBm | | -47 | | dBc |
| Saturated Drain-Source Current | IDSS | VDS = 1.3 V; VGS = 0 V | | 1150 | | mA |
| Maximum Drain-Source Current | IMAX | VDS = 1.3 V; VGS ≅ +1 V | | 1800 | | mA |
| Transconductance | GM | VDS = 1.3 V; VGS = 0 V | | 1200 | | mS |
| Gate-Source Leakage Current | IGSO | VGS = -3 V | | 35 | 85 | μA |
| Pinch-Off Voltage | \|VP\| | VDS = 1.3 V; IDS = 4 mA | 0.7 | 0.9 | 1.4 | V |
| Gate-Source Breakdown Voltage | \|VBDGS\| | IGS = 4 mA | 6 | | | V |
| Gate-Drain Breakdown Voltage | \|VBDGD\| | IGD = 4 mA | 20 | | | V |
| Thermal Resistance (channel-to-case) | ΘCC | See Note on following page | | 20 | | °C/W |

Note: $T_{AMBIENT}$ = 22°; RF specification measured at f = 1850 MHz using CW signal (except as noted)



*Specifications subject to change without notice*
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## ABSOLUTE MAXIMUM RATING[1]:

| PARAMETER | SYMBOL | TEST CONDITIONS | ABSOLUTE MAXIMUM |
|---|---|---|---|
| Drain-Source Voltage | VDS | -3V < VGS < -0.5V [7] | 12V |
| Gate-Source Voltage | VGS | 0V < VDS < +8V | -3V |
| Drain-Source Current | IDS | For VDS < 2V | IDSS |
| Gate Current | IG | Forward / reverse current | +15/-2mA |
| RF Input Power [2] | PIN | Under any acceptable bias state | 29.5dBm |
| Channel Operating Temperature | TCH | Under any acceptable bias state | 175°C |
| Storage Temperature | TSTG | Non-Operating Storage | -40°C to 150°C |
| Total Power Dissipation [3] | PTOT | See De-Rating Note below | 7.6W |

Notes:
[1] $T_{Ambient}$ = 22°C unless otherwise noted; exceeding any one of these absolute maximum ratings may cause permanent damage to the device; Users should avoid exceeding 80% of 2 or more Limits simultaneously
[2] Max. RF Input Limit must be further limited if input VSWR > 2.5:1
[3] Total Power Dissipation defined as: $P_{TOT} \equiv (P_{DC} + P_{IN}) - P_{OUT}$,
where $P_{DC}$: DC Bias Power, $P_{IN}$: RF Input Power, $P_{OUT}$: RF Output Power
Total Power Dissipation to be de-rated as follows above 22°C:

$P_{TOT}$= 7.6 - (0.05W/°C) x $T_{PACK}$
where $T_{PACK}$= source tab lead temperature above 22°C
(Coefficient of de-rating formula is the Thermal Conductivity)

Example: For a 55°C carrier temperature: $P_{TOT}$ = 7.6W – (0.05 x (55 – 22)) = 5.95W
[5] For optimum heat sinking, metal-filled through (Source) via holes should be used directly below the central metallized ground pad on the bottom of the package
[6] Thermal Resistivity: The nominal value of 20°C/W is measured with the package mounted on a large heatsink with thermal compound to ensure adequate (unsoldered) contact. The package temperature is referred to the Source leads
[7] Operating at absolute maximum VD continuously is not recommended. If operation is considered then IDS must be reduced in order to keep the part within it's thermal power dissipation limits. Therefore VGS is restricted to <-0.5V.

## BIASING GUIDELINES:

- Active bias circuits provide good performance stabilization over variations of operating temperature, but require a larger number of components compared to self-bias or dual-biased. Such circuits should include provisions to ensure that Gate bias is applied before Drain bias, otherwise the pHEMT may be induced to self-oscillate.
- Dual-bias circuits are relatively simple to implement, but will require a regulated negative voltage supply for depletion-mode devices such as the FPD2000AS.
- The recommended 350mA bias point is nominally a Class AB mode. A small amount of RF gain expansion prior to the onset of compression is normal for this operating point.

## RECOMMENDED OPERATING BIAS CONDITIONS:

- Drain-Source Voltage: From 5V to 10V
- Quiescent Current: From 25% $I_{DSS}$ to 55% $I_{DSS}$



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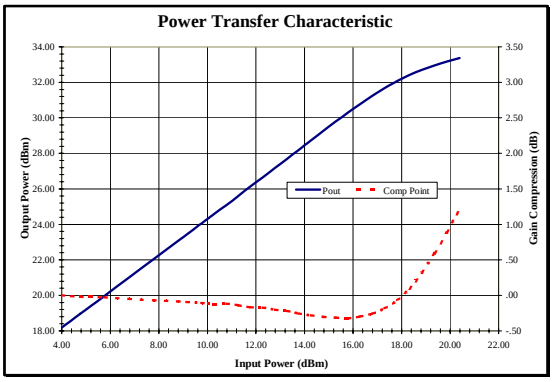
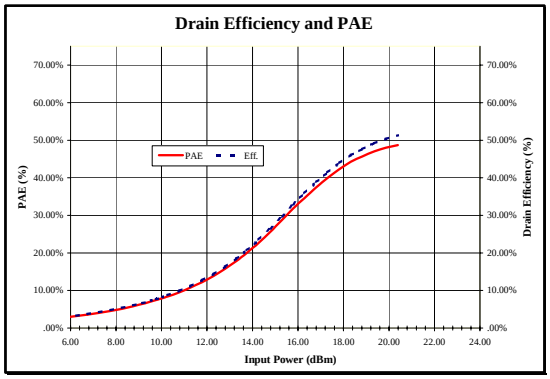
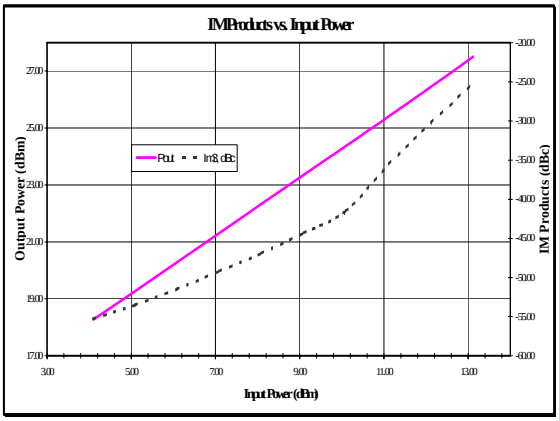
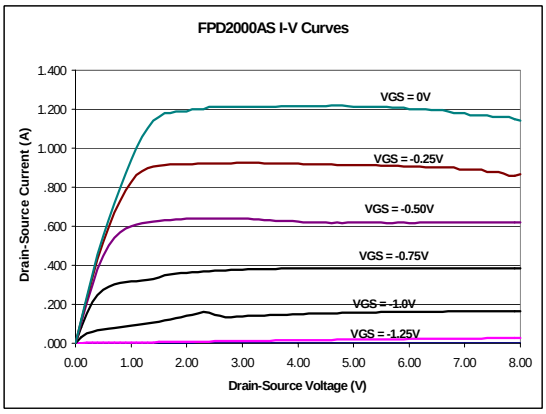
## TYPICAL MEASURED RF PERFORMANCE:

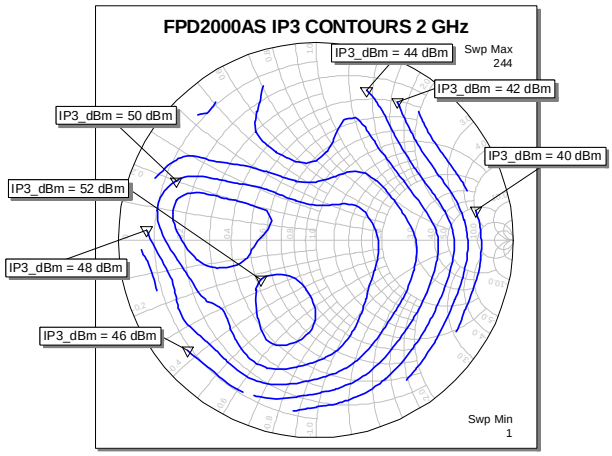
Note: Measurement Conditions $T_{AMBIENT}$ = 22°C unless otherwise stated (VDS=10V, IDS=350mA, f=1800MHz)



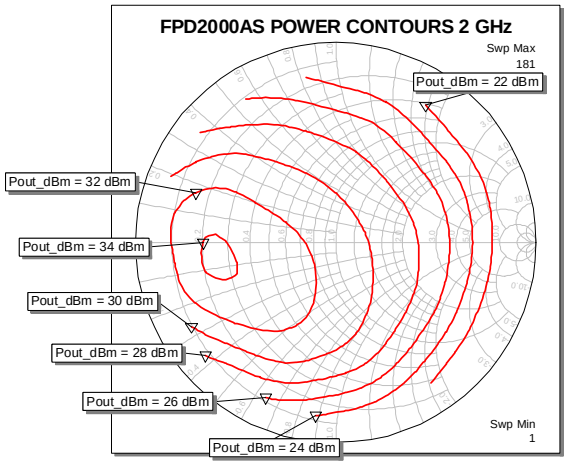




NOTE: IP3 contours generated with $P_{IN}$ = 11dB back-off from $P_{1dB}$. Local maxima for best linearity located at:
$\Gamma_L$ = 15 + j4.5 Ω and $\Gamma_L$ = 28 – j25 Ω
with $\Gamma_S$ = 9.5 - i4 Ω




NOTE: Power contours measured at constant input power, level set to meet nominal $P_{1dB}$ rating at optimum match point. Optimum match:
$\Gamma_S$ = 3 – j6 Ω and $\Gamma_L$ = 11 – j3 Ω



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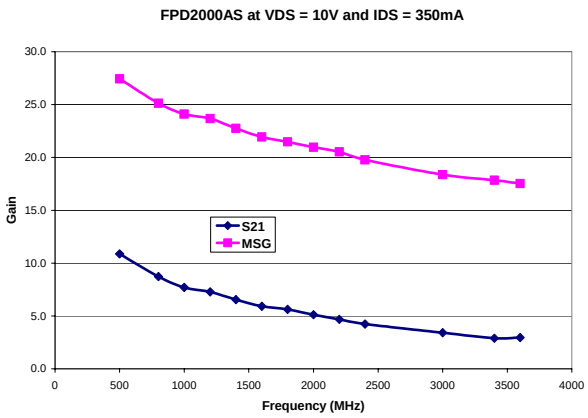
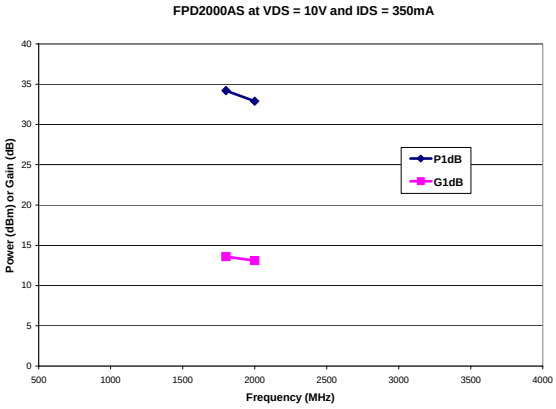
## TYPICAL MEASURED RF PERFORMANCE:

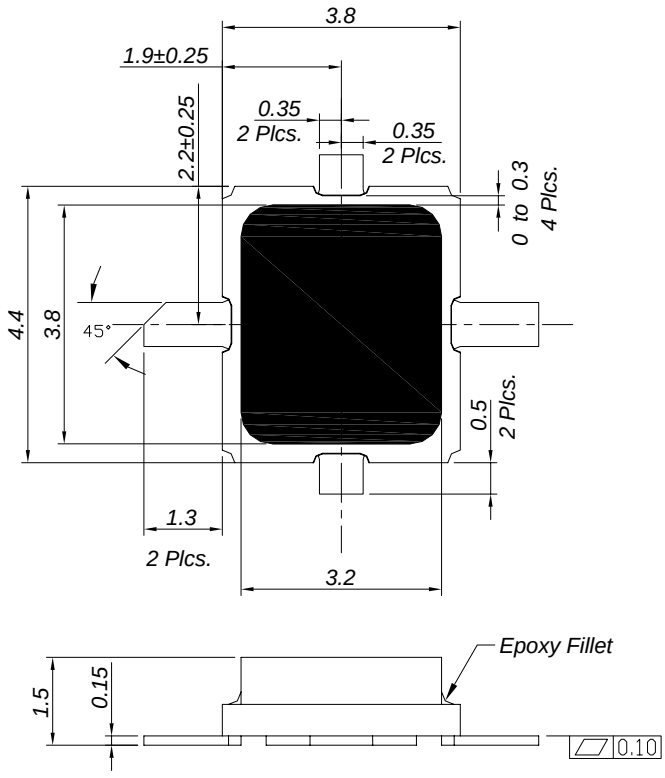
Note: Measurement Conditions $T_{AMBIENT}$ = 22°C unless otherwise stated (VDS=10V, IDS=200mA)

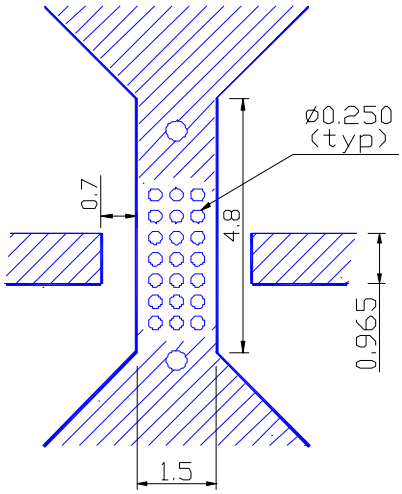



## AS PACKAGE OUTLINE AND RECOMMENDED PC BOARD LAYOUT:

(dimensions in millimeters – mm)







*All Dimnesions in mm*
*General Tolerance: .xx ± 0.05  .x ± 0.15*
*For best positional accuracy in auto pick and place*
*device should be referenced directly from the leads*



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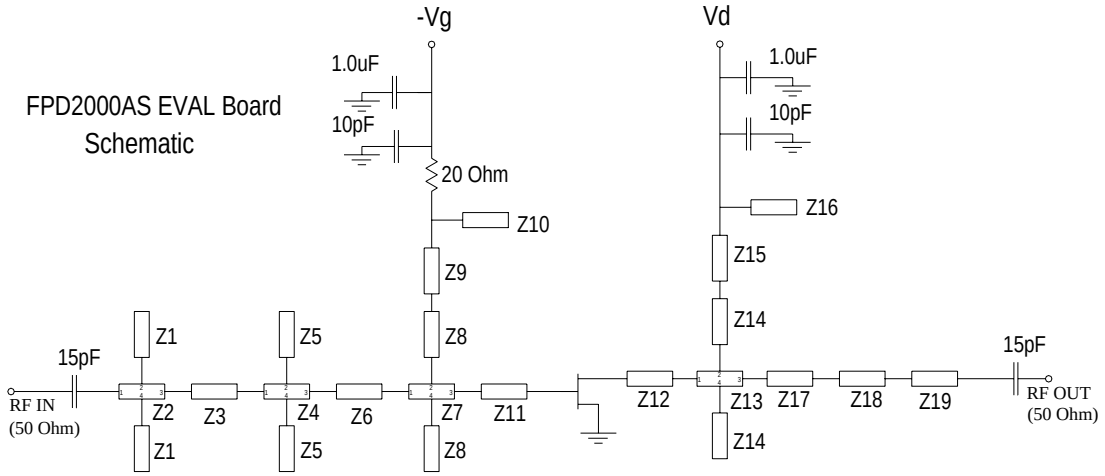
## REFERENCE DESIGN (3.4 – 3.5GHZ):

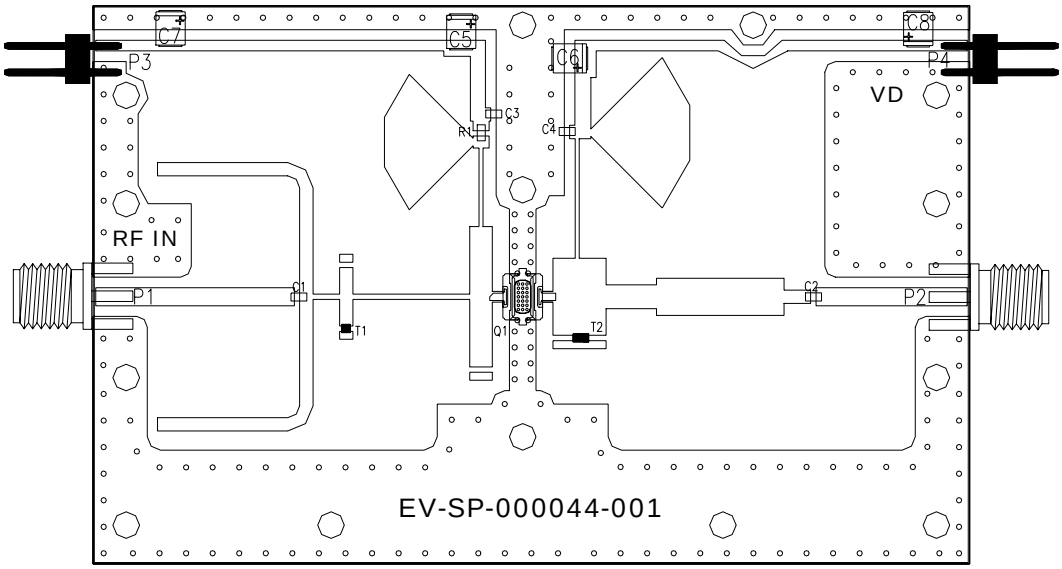
| PARAMETER | UNIT | PERFORMANCE |
|---|---|---|
| Frequency | GHz | 3.4 to 3.5 |
| Gain | dB | 10 |
| P1dB | dBm | 33 |
| IM3 @22dBm Pout SCL | dBc | -45dBc |
| S11 | dB | -6 |
| S22 | dB | -15 |
| Vd | V | 10 |
| Vg | V | -0.6 to -0.9 |
| Id | mA | 350 |

## SCHEMATIC:




| Desc. | Value |
|---|---|
| Z1 | 0.050" x 1.000" Microstrip |
| Z2 | W1=0.020" W2=0.050" W3=0.020" W4=0.050" Microstrip Cross |
| Z3 | 0.020" x 0.100" Microstrip |
| Z4 | W1=0.020" W2=0.050" W3=0.020" W4=0.050" Microstrip Cross |
| Z5 | 0.050" x 0.100" Microstrip |
| Z6 | 0.020" x 0.440" Microstrip |
| Z7 | W1=0.020" W2=0.085" W3=0.020" W4=0.085" Microstrip Cross |
| Z8 | 0.085" x 0.254" Microstrip |
| Z9 | 0.015" x 0.296" Microstrip |
| Z10 | 0.360" x 90° Microstrip Radial Stub |
| Z16 | 0.420" x 90° Microstrip Radial Stub |
| Z11, Z12 | 0.040" x 0.040" Microstrip |
| Z13 | W1=0.090" W2=0.200" W3=0.090" W4=0.200" Microstrip Cross |
| Z14 | 0.200" x 0.100" Microstrip |
| Z15 | 0.015" x 0.450" Microstrip |
| Z17 | 0.090" x 0.190" Microstrip |
| Z18 | 0.140" x 0.480" Microstrip |
| Z19 | 0.050" x 0.100" Microstrip |

## BOARD LAYOUT (3.4 – 3.5GHZ):




| Component | Description |
|---|---|
| R1 | Resistor 0.06 x 0.03 20Ω 1/4W |
| C1, C2 | Cap. 0.06 x 0.03 15pF |
| C3, C4 | Cap. 0.06 x 0.03 10pF |
| C5, C6, C7, C8 | Cap. SMD-B 1.0uF |
| P1, P2 | Edge Mount RF Connecter |
| P3, P4 | 2 Pin Header |
| T1, T2 | Copper Tab |
| Q1 | FPD2000AS |
| PCB | EV-SP-000016-001 (R4003, 30mil Thick) |
| Base Plate | TF-SP-000019-001 |

NOTE: AutoCAD™ drawing available on request



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## S-PARAMETERS:

Note: Biased @ 10V, 350mA

| FREQ-GHZ | S11MAG | S11ANG | S21MAG | S21ANG | S12MAG | S12ANG | S22MAG | S22ANG |
|---|---|---|---|---|---|---|---|---|
| 0.50 | 0.89 | -151.40 | 12.52 | 96.06 | 0.02 | 23.09 | 0.41 | -163.97 |
| 0.60 | 0.89 | -158.58 | 10.57 | 91.14 | 0.02 | 21.17 | 0.41 | -168.16 |
| 0.70 | 0.89 | -164.23 | 9.14 | 86.95 | 0.02 | 20.24 | 0.42 | -171.39 |
| 0.80 | 0.89 | -168.91 | 8.06 | 83.20 | 0.02 | 19.30 | 0.42 | -174.09 |
| 0.90 | 0.89 | -172.86 | 7.20 | 79.78 | 0.03 | 18.90 | 0.42 | -176.33 |
| 1.00 | 0.89 | -176.35 | 6.51 | 76.60 | 0.03 | 18.57 | 0.42 | -178.37 |
| 1.10 | 0.89 | -179.44 | 5.93 | 73.62 | 0.03 | 18.50 | 0.42 | 179.80 |
| 1.20 | 0.89 | 177.74 | 5.45 | 70.77 | 0.03 | 18.46 | 0.42 | 178.18 |
| 1.30 | 0.89 | 175.11 | 5.05 | 68.02 | 0.03 | 18.41 | 0.43 | 176.66 |
| 1.40 | 0.88 | 172.67 | 4.70 | 65.34 | 0.03 | 18.34 | 0.43 | 175.27 |
| 1.50 | 0.88 | 170.35 | 4.40 | 62.72 | 0.03 | 18.30 | 0.43 | 173.92 |
| 1.60 | 0.88 | 168.17 | 4.13 | 60.18 | 0.03 | 18.25 | 0.43 | 172.69 |
| 1.70 | 0.88 | 166.09 | 3.89 | 57.70 | 0.03 | 18.34 | 0.43 | 171.34 |
| 1.80 | 0.88 | 164.11 | 3.69 | 55.24 | 0.03 | 18.22 | 0.43 | 170.15 |
| 1.90 | 0.88 | 162.17 | 3.50 | 52.76 | 0.03 | 18.00 | 0.43 | 168.95 |
| 2.00 | 0.88 | 160.30 | 3.34 | 50.37 | 0.03 | 18.00 | 0.43 | 167.90 |
| 2.10 | 0.88 | 158.48 | 3.19 | 48.01 | 0.03 | 18.01 | 0.43 | 166.84 |
| 2.20 | 0.88 | 156.67 | 3.05 | 45.65 | 0.03 | 17.70 | 0.43 | 165.65 |
| 2.30 | 0.88 | 155.01 | 2.93 | 43.35 | 0.03 | 17.42 | 0.43 | 164.73 |
| 2.40 | 0.88 | 153.30 | 2.81 | 41.02 | 0.03 | 17.44 | 0.43 | 163.72 |
| 2.50 | 0.88 | 151.64 | 2.71 | 38.72 | 0.04 | 16.81 | 0.43 | 162.73 |
| 2.60 | 0.88 | 150.05 | 2.61 | 36.43 | 0.04 | 16.69 | 0.43 | 161.59 |
| 2.70 | 0.88 | 148.54 | 2.52 | 34.20 | 0.04 | 16.42 | 0.43 | 160.71 |
| 2.80 | 0.88 | 147.00 | 2.44 | 31.95 | 0.04 | 16.22 | 0.43 | 159.70 |
| 2.90 | 0.88 | 145.28 | 2.36 | 29.69 | 0.04 | 15.56 | 0.43 | 158.58 |
| 3.00 | 0.88 | 143.93 | 2.29 | 27.42 | 0.04 | 15.49 | 0.43 | 157.76 |
| 3.10 | 0.88 | 142.45 | 2.23 | 25.22 | 0.04 | 14.94 | 0.43 | 156.78 |
| 3.20 | 0.88 | 141.02 | 2.16 | 23.03 | 0.04 | 14.53 | 0.43 | 155.89 |
| 3.30 | 0.88 | 139.58 | 2.11 | 20.81 | 0.04 | 14.10 | 0.43 | 154.94 |
| 3.40 | 0.88 | 138.21 | 2.05 | 18.59 | 0.04 | 13.33 | 0.43 | 154.07 |
| 3.50 | 0.88 | 136.87 | 2.00 | 16.40 | 0.04 | 12.89 | 0.43 | 153.19 |
| 3.60 | 0.88 | 135.65 | 1.95 | 14.24 | 0.05 | 12.15 | 0.43 | 152.58 |
| 3.70 | 0.88 | 134.47 | 1.90 | 12.24 | 0.05 | 11.80 | 0.43 | 151.58 |
| 3.80 | 0.87 | 129.67 | 1.94 | 8.92 | 0.05 | 10.05 | 0.42 | 148.11 |
| 3.90 | 0.87 | 127.78 | 1.91 | 6.50 | 0.05 | 9.06 | 0.42 | 146.79 |
| 4.00 | 0.87 | 125.78 | 1.88 | 3.95 | 0.05 | 7.84 | 0.42 | 145.39 |
| 4.10 | 0.86 | 123.84 | 1.84 | 1.48 | 0.05 | 6.72 | 0.42 | 143.97 |
| 4.20 | 0.86 | 121.77 | 1.81 | -0.89 | 0.06 | 5.60 | 0.42 | 142.63 |
| 4.30 | 0.86 | 119.75 | 1.79 | -3.25 | 0.06 | 4.45 | 0.42 | 141.09 |
| 4.40 | 0.86 | 117.52 | 1.76 | -5.69 | 0.06 | 3.33 | 0.41 | 139.29 |
| 4.50 | 0.85 | 115.54 | 1.74 | -8.29 | 0.06 | 2.14 | 0.41 | 137.87 |
| 4.60 | 0.85 | 113.68 | 1.71 | -10.69 | 0.06 | 1.05 | 0.41 | 136.50 |
| 4.70 | 0.85 | 111.67 | 1.69 | -13.07 | 0.06 | -0.20 | 0.41 | 135.06 |
| 4.80 | 0.85 | 109.46 | 1.67 | -15.55 | 0.06 | -1.36 | 0.41 | 133.46 |
| 4.90 | 0.85 | 107.26 | 1.65 | -18.04 | 0.07 | -2.60 | 0.41 | 131.82 |
| 5.00 | 0.85 | 105.01 | 1.63 | -20.54 | 0.07 | -3.94 | 0.41 | 130.21 |



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## S-PARAMETERS (CONT.):

Note: Biased @ 10V, 350mA

| FREQ-GHZ | S11MAG | S11ANG | S21MAG | S21ANG | S12MAG | S12ANG | S22MAG | S22ANG |
|---|---|---|---|---|---|---|---|---|
| 5.10 | 0.85 | 102.67 | 1.61 | -23.07 | 0.07 | -5.34 | 0.41 | 128.50 |
| 5.20 | 0.85 | 100.31 | 1.59 | -25.68 | 0.07 | -6.87 | 0.41 | 126.81 |
| 5.30 | 0.84 | 97.99 | 1.58 | -28.24 | 0.07 | -8.40 | 0.41 | 125.07 |
| 5.40 | 0.84 | 95.60 | 1.56 | -30.82 | 0.07 | -9.89 | 0.41 | 123.35 |
| 5.50 | 0.84 | 93.23 | 1.54 | -33.39 | 0.08 | -11.46 | 0.41 | 121.57 |
| 5.60 | 0.84 | 90.81 | 1.52 | -36.00 | 0.08 | -12.98 | 0.40 | 119.83 |
| 5.70 | 0.84 | 88.26 | 1.50 | -38.59 | 0.08 | -14.50 | 0.41 | 117.91 |
| 5.80 | 0.84 | 85.69 | 1.49 | -41.22 | 0.08 | -16.11 | 0.41 | 116.04 |
| 5.90 | 0.84 | 83.17 | 1.47 | -43.83 | 0.08 | -17.66 | 0.41 | 114.18 |
| 6.00 | 0.83 | 80.66 | 1.45 | -46.44 | 0.08 | -19.28 | 0.41 | 112.34 |
| 6.10 | 0.83 | 78.11 | 1.44 | -49.07 | 0.09 | -21.12 | 0.41 | 110.62 |
| 6.20 | 0.83 | 75.46 | 1.42 | -51.79 | 0.09 | -23.29 | 0.41 | 108.63 |
| 6.30 | 0.83 | 72.84 | 1.40 | -54.48 | 0.09 | -25.03 | 0.41 | 106.57 |
| 6.40 | 0.83 | 70.23 | 1.39 | -57.14 | 0.09 | -26.82 | 0.41 | 104.45 |
| 6.50 | 0.83 | 67.48 | 1.37 | -59.81 | 0.09 | -28.64 | 0.41 | 102.37 |
| 6.60 | 0.83 | 64.77 | 1.35 | -62.42 | 0.09 | -30.28 | 0.41 | 100.18 |
| 6.70 | 0.82 | 62.13 | 1.33 | -64.76 | 0.09 | -31.41 | 0.41 | 98.06 |
| 6.80 | 0.82 | 59.92 | 1.32 | -66.68 | 0.10 | -30.95 | 0.40 | 97.13 |
| 6.90 | 0.83 | 57.56 | 1.32 | -69.52 | 0.10 | -32.92 | 0.41 | 96.12 |
| 7.00 | 0.83 | 54.88 | 1.31 | -72.55 | 0.10 | -35.78 | 0.42 | 94.11 |
| 7.10 | 0.83 | 52.08 | 1.29 | -75.44 | 0.11 | -38.26 | 0.42 | 91.84 |
| 7.20 | 0.83 | 49.37 | 1.28 | -78.19 | 0.11 | -40.46 | 0.42 | 89.62 |
| 7.30 | 0.83 | 46.66 | 1.26 | -80.88 | 0.11 | -42.52 | 0.43 | 87.37 |
| 7.40 | 0.83 | 44.02 | 1.24 | -83.44 | 0.11 | -44.17 | 0.43 | 85.28 |
| 7.50 | 0.83 | 41.53 | 1.23 | -86.01 | 0.11 | -45.73 | 0.43 | 83.74 |
| 7.60 | 0.83 | 38.88 | 1.22 | -88.90 | 0.11 | -48.21 | 0.43 | 81.63 |
| 7.70 | 0.83 | 36.18 | 1.20 | -91.67 | 0.12 | -50.47 | 0.44 | 79.39 |
| 7.80 | 0.83 | 33.64 | 1.19 | -94.33 | 0.12 | -52.59 | 0.44 | 77.14 |
| 7.90 | 0.84 | 31.05 | 1.17 | -97.01 | 0.12 | -54.72 | 0.44 | 74.97 |
| 8.00 | 0.84 | 28.44 | 1.16 | -99.67 | 0.12 | -56.85 | 0.44 | 72.73 |
| 8.10 | 0.84 | 25.95 | 1.15 | -102.28 | 0.12 | -58.91 | 0.45 | 70.54 |
| 8.20 | 0.84 | 23.49 | 1.13 | -104.88 | 0.12 | -60.91 | 0.45 | 68.43 |
| 8.30 | 0.84 | 21.07 | 1.12 | -107.55 | 0.12 | -62.95 | 0.45 | 66.26 |
| 8.40 | 0.84 | 18.55 | 1.11 | -110.22 | 0.13 | -65.03 | 0.45 | 64.01 |
| 8.50 | 0.84 | 16.14 | 1.09 | -112.79 | 0.13 | -66.97 | 0.46 | 61.79 |
| 8.60 | 0.84 | 13.74 | 1.08 | -115.39 | 0.13 | -68.91 | 0.46 | 59.50 |
| 8.70 | 0.84 | 11.39 | 1.07 | -117.96 | 0.13 | -70.86 | 0.46 | 57.23 |
| 8.80 | 0.84 | 8.95 | 1.06 | -120.52 | 0.13 | -72.85 | 0.46 | 55.01 |
| 8.90 | 0.85 | 6.61 | 1.04 | -123.07 | 0.13 | -74.90 | 0.46 | 52.71 |
| 9.00 | 0.85 | 4.26 | 1.03 | -125.62 | 0.13 | -76.87 | 0.46 | 50.40 |
| 9.10 | 0.85 | 1.89 | 1.02 | -128.14 | 0.14 | -78.87 | 0.46 | 48.10 |
| 9.20 | 0.85 | -0.35 | 1.01 | -130.70 | 0.14 | -80.90 | 0.47 | 45.92 |
| 9.30 | 0.85 | -2.77 | 1.00 | -133.36 | 0.14 | -83.07 | 0.47 | 43.66 |
| 9.40 | 0.85 | -5.00 | 0.99 | -135.96 | 0.14 | -85.21 | 0.47 | 41.26 |
| 9.50 | 0.85 | -7.40 | 0.98 | -138.56 | 0.14 | -87.34 | 0.47 | 38.92 |
| 9.60 | 0.85 | -9.69 | 0.97 | -141.19 | 0.14 | -89.56 | 0.47 | 36.40 |
| 9.70 | 0.85 | -12.14 | 0.97 | -143.84 | 0.15 | -91.85 | 0.47 | 33.98 |
| 9.80 | 0.85 | -14.66 | 0.96 | -146.52 | 0.15 | -94.12 | 0.47 | 31.53 |
| 9.90 | 0.85 | -17.20 | 0.95 | -149.12 | 0.15 | -96.23 | 0.48 | 29.14 |
| 10.00 | 0.85 | -19.62 | 0.94 | -151.71 | 0.15 | -98.00 | 0.48 | 26.66 |



*Specifications subject to change without notice*
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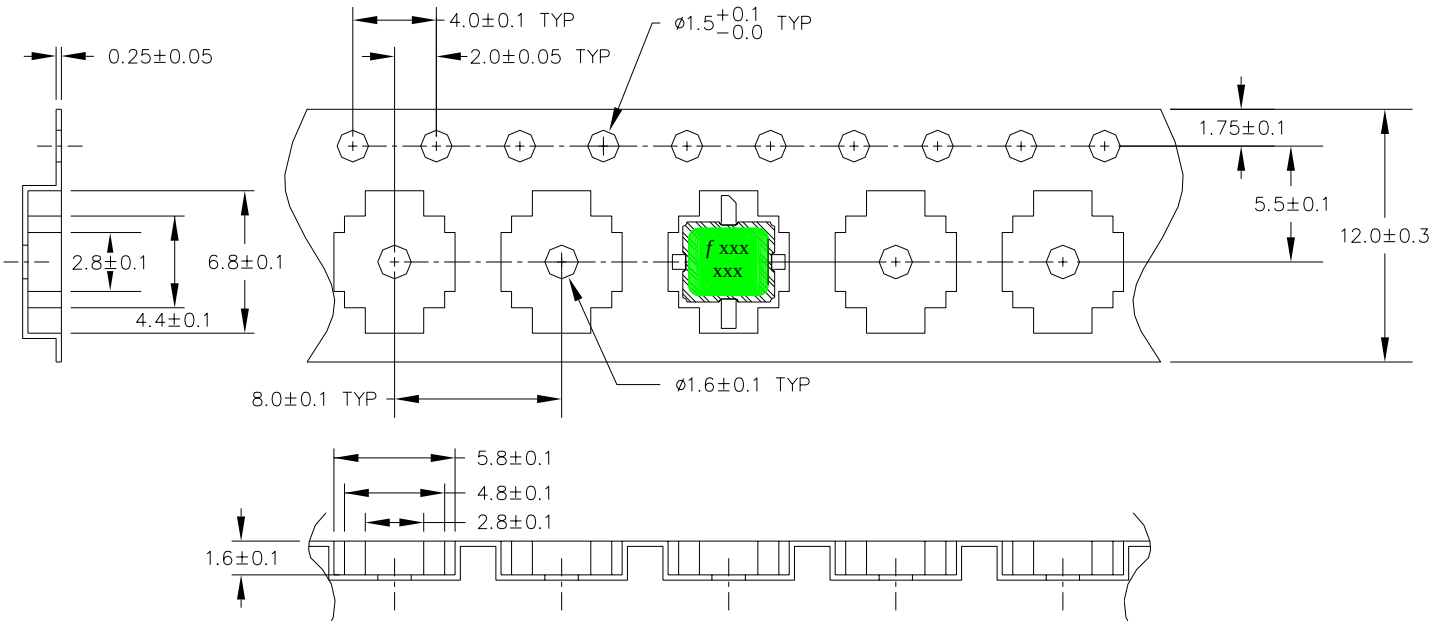
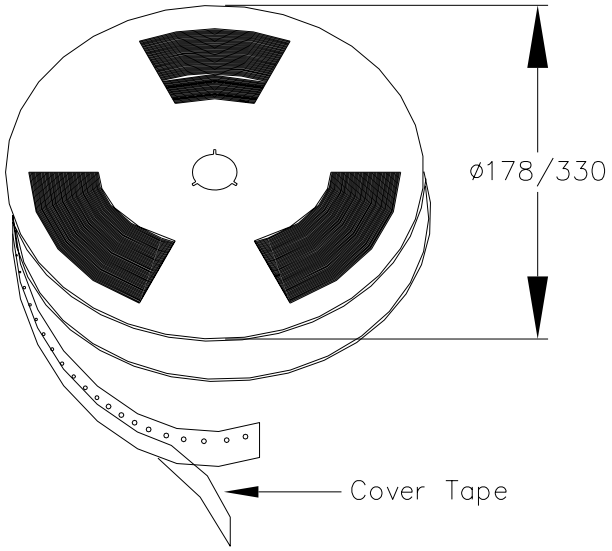
## TAPE AND REEL DIMENSIONS AND PART ORIENTATION




DIMENSIONS ARE IN MM




**PACKAGE MARKING CODE**

**Example:**

***f*1ZD**
**P2F**

***f* = Filtronic**
**1ZD = Lot / Date Code**
**P2F = Status, Part Code, Part Type**
**Parts per reel 178mm = 1000**
**330mm = 2500**



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## Preferred Assembly Instructions:

This package is compatible with both lead free and leaded solder reflow processes as defined within IPC/JEDEC J-STD-020C. The maximum package temperature should not exceed 260°C. Package leads are gold plated.

## Handling Precautions:


To avoid damage to the devices care should be exercised during handling.
Proper Electrostatic Discharge (ESD) precautions should be observed at all stages of storage, handling, assembly, and testing.

## ESD/MSL Rating:

These devices should be treated as Class 1A (250-500 V) using the human body model as defined in JEDEC Standard No. 22-A114. Further information on ESD control measures can be found in MIL-STD-1686 and MIL-HDBK-263.

The device has a MSL rating of Level 1. To determine this rating, preconditioning was performed to the device per, the Pb-free solder profile defined within IPC/JEDEC J-STD-020C, Moisture / Reflow sensitivity classification for non-hermatic solid state surface mount devices

## Application Notes & Design Data:

Application Notes and design data including S-parameters, noise parameters and device model are available on request.

## Disclaimers:

This product is not designed for use in any space based or life sustaining/supporting equipment.

## Ordering Information:

| Part Number | Description |
|---|---|
| FPD2000AS | Packaged pHEMT |
| FPD2000AS-EB | Packaged pHEMT evaluation board<br>EB-2000AS-AB (880MHz)<br>EB-2000AS-AA (1.85GHz)<br>EB-2000AS-AD (2.14GHz)<br>EB-2000AS-AE (2.4GHz)<br>EB-2000AS-AF (2.44GHz)<br>EB-2000AS-AG (2.5 to 2.7GHz)<br>EB-2000AS-AH (3.5GHz) |



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