



FP101

High Dynamic Range FET

The Communications Edge™

Advanced Product Information

Product Features

- 50-3000 MHz Bandwidth
- +37 dBm Output IP3
- 2.0 dB Noise Figure
- 13.5 dB Gain
- +26 dBm P1dB
- MTBF >100 Years
- SOT-89 SMT Package



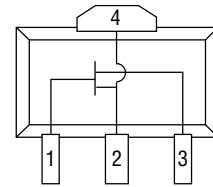
Actual Size

Product Description

The FP101 is a high dynamic range FET packaged in a low cost surface mount package. The combination of low noise figure and high IP3 at the same bias point makes it ideal for receiver and transmitter applications. The FP101 achieves +37 dBm OIP3 at a mounting temperature of 80°C with an associated MTBF of >100 years³.

All devices are 100% RF and DC tested. The product is targeted for applications where high linearity is required.

Functional Diagram



| Function | Pin No. |
|----------|---------|
| Gate | 1 |
| Source | 2 |
| Drain | 3 |
| Source | 4 |

Specifications

| DC Electrical Parameter | Units | Minimum | Typical | Maximum | Condition |
|-------------------------------|-------|---------|---------|---------|--------------|
| Saturated Drain Current, Idss | mA | 220 | 340 | 380 | Vgs = 0 V |
| Transconductance, Gm | mS | | 120 | | |
| Pinch Off Voltage, Vp | V | -5.0 | -3.7 | | Ids = 1.2 mA |

| RF Parameter | Units | Minimum | Typical | Maximum | Condition |
|------------------------------------|-------|---------|---------|---------|-----------|
| Small Signal Gain, Gss | dB | 11 | 13.5 | | |
| Maximum Stable Gain, Gmsg | dB | | 20.5 | | |
| Third Order Output Intercept, OIP3 | dBm | 34 | 37 | | |
| 1 dB Compression Point, P1dB | dBm | 23 | 26 | | |
| Noise Figure, NF | dB | | 2.0 | | |

Test conditions unless otherwise noted:

1. RF and DC parameters measured under the following conditions unless otherwise noted. T = 22°C with Vds = 8 volts, Ids = 100 mA. Test frequency = 800 MHz, 50 ohm system.
2. OIP3 Measured with two tones at an output power of 2 dBm/tone separated by 10 MHz. The suppression on the largest IM3 product is used to calculate the OIP3 using a 2:1 rule.
3. MTBF calculated with channel temperature at 155°C.

Recommended Maximum Ratings

| Parameter | Rating |
|-----------------------------|---------------|
| Gate to Source Voltage | -6.0 V |
| Drain to Source Voltage | 9.0 V |
| Operating Case Temperature | -40 to +80°C |
| Storage Temperature | -55 to +125°C |
| RF Input Power (continuous) | +12 dBm |
| Gate Current | 6 mA |
| Maximum DC Power | 0.9 W |

Operation of this device above any of these parameters may cause permanent damage.

Ordering Information

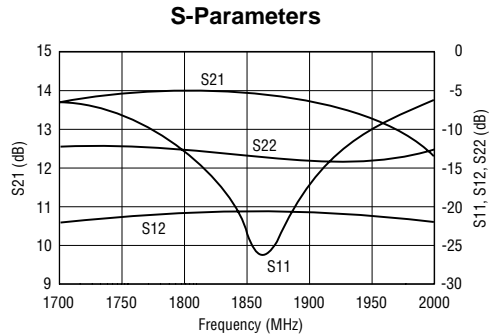
| Part No. | Description |
|----------|--|
| FP101 | High Dynamic Range FET (Available in tape and reel) |

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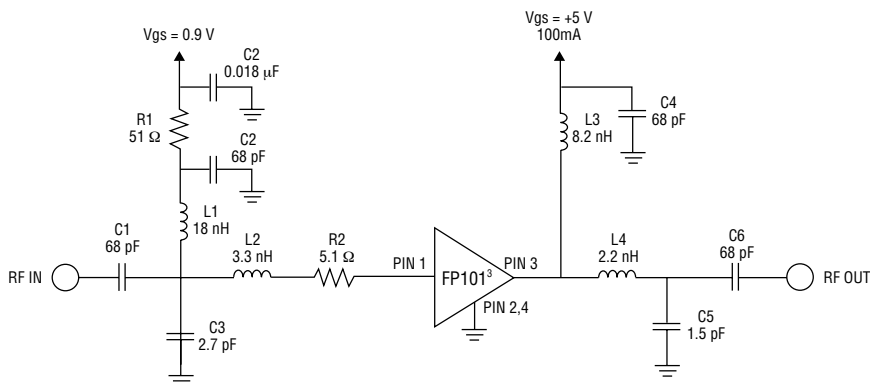
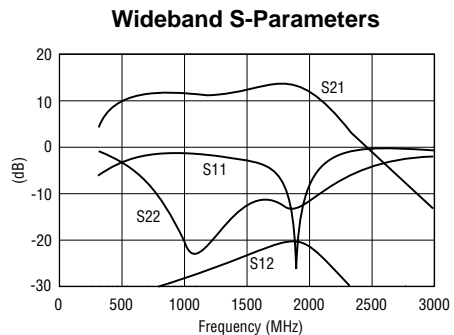
Application Circuit: 1800-1900 MHz

| Frequency | 1850 MHz |
|--------------------------|--------------|
| S21 - Gain | 13.9 dB |
| S11 - Input Return Loss | 23.6 dB |
| S22 - Output Return Loss | -13.5 dB |
| S12 - Isolation | -20.9 dB |
| Output IP3 ¹ | 36.2 dBm |
| Output P1dB ⁴ | 23.3 dBm |
| Noise Figure | 3.6 dB |
| Drain Bias | 5 V @ 100 mA |

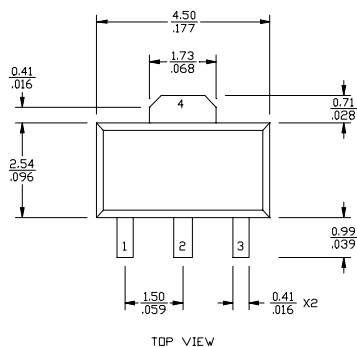


Notes

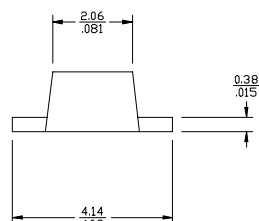
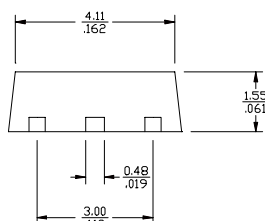
- OIP3 is measured with 2 tones at an output power of 10 dBm/tone with 10 MHz spacing at 1850 MHz. The suppression on the largest IM3 product is used to calculate OIP3 using a 2:1 slope rule. Test parameters were taken at 25°C.
- All components are 0603 size. Toko LL1608-FH chip inductors and AVX ±0.1 pF tolerance capacitors (C3 and C5) were used in the design. Other capacitor components are standard types. The overall circuit size should be minimized as much as possible.
- The FET should be mounted as shown in the FP101 datasheet.
- The drain voltage can be increased up +8 V for increased output power performance (higher P1dB). The gate voltage can be adjusted so that the drain bias can be anywhere between 50 - 150 mA, depending on the required performance using this device.
- More details are shown in WJ Application Note "FP101 PCS Application Circuit"



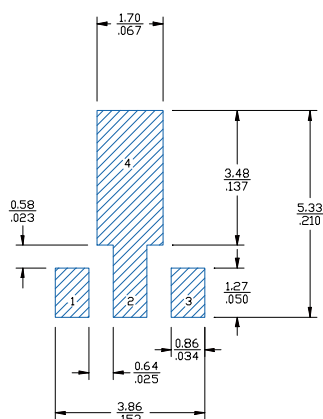
Outline Drawing



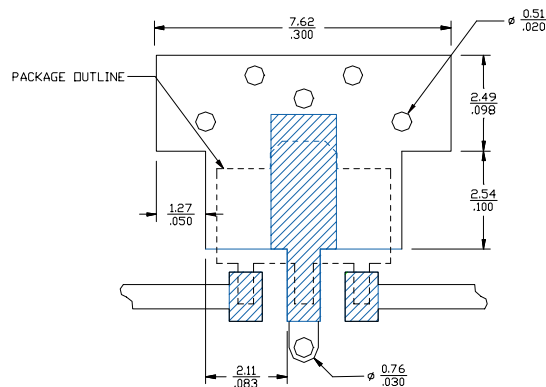
mm
inch



Land Pattern



Mounting Configuration



| FUNCTION | PIN NO. |
|---------------|---------|
| INPUT | 1 |
| GROUND | 2 |
| OUTPUT (BIAS) | 3 |
| GROUND | 4 |

- Notes:
1. Ground vias are critical for thermal and RF grounding considerations.
 2. A minimum of 6 ground vias are required for 14 mil and 29 mil FR4 board.
 3. If your PCB design rules allow, ground vias should be placed under the land pattern for better RF and thermal performance. Otherwise ground vias should be placed as close to land pattern as possible.
 4. Trace width depends on PC board.

This document contains information on a new product.
Specifications and information are subject to change without notice.



Caution! ESD sensitive device.

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Typical Test Data

S-Parameters ($V_{ds} = +5\text{ V}$, $I_{ds} = 100\text{ mA}$, $T = 22^\circ\text{C}$, unmatched device in a 50 ohm system)

| Freq (MHz) | S11 (dB) | S11 (Ang) | S21 (dB) | S21 (Ang) | S12 (dB) | S12 (Ang) | S22 (dB) | S22 (Ang) |
|------------|----------|-----------|----------|-----------|----------|-----------|----------|-----------|
| 200 | -0.05 | -11.65 | 13.09 | 170.35 | -40.11 | 83.52 | -20.18 | -20.22 |
| 400 | -0.03 | -23.12 | 13.00 | 161.72 | -33.94 | 77.88 | -18.83 | -41.57 |
| 600 | -0.18 | -36.31 | 12.87 | 151.32 | -30.39 | 68.68 | -19.57 | -59.31 |
| 800 | -0.32 | -47.17 | 12.65 | 142.63 | -28.11 | 61.81 | -18.20 | -76.47 |
| 1000 | -0.50 | -58.15 | 12.38 | 133.74 | -26.38 | 55.76 | -17.00 | -91.39 |
| 1200 | -0.67 | -69.49 | 12.09 | 125.22 | -25.12 | 48.54 | -16.25 | -103.87 |
| 1400 | -0.88 | -79.35 | 11.76 | 117.41 | -24.03 | 42.65 | -15.13 | -112.58 |
| 1600 | -0.99 | -89.35 | 11.43 | 109.46 | -23.28 | 36.62 | -14.26 | -121.97 |
| 1800 | -1.21 | -98.68 | 11.04 | 101.95 | -22.60 | 30.96 | -13.77 | -129.80 |
| 2000 | -1.33 | -107.48 | 10.68 | 94.92 | -21.97 | 25.56 | -13.13 | -136.00 |
| 2200 | -1.53 | -116.22 | 10.30 | 87.87 | -21.48 | 20.05 | -12.63 | -142.70 |
| 2400 | -1.67 | -124.67 | 9.94 | 81.13 | -21.06 | 14.86 | -12.13 | -148.50 |
| 2600 | -1.74 | -129.96 | 9.70 | 76.55 | -20.80 | 11.41 | -11.84 | -152.37 |
| 2800 | -1.87 | -137.82 | 9.34 | 70.28 | -20.44 | 6.62 | -11.55 | -157.82 |
| 3000 | -1.97 | -146.08 | 9.01 | 64.05 | -20.22 | 0.76 | -11.24 | -162.58 |

S-Parameters ($V_{ds} = +8\text{ V}$, $I_{ds} = 100\text{ mA}$, $T = 22^\circ\text{C}$, unmatched device in a 50 ohm system)

| Freq (MHz) | S11 (dB) | S11 (Ang) | S21 (dB) | S21 (Ang) | S12 (dB) | S12 (Ang) | S22 (dB) | S22 (Ang) |
|------------|----------|-----------|----------|-----------|----------|-----------|----------|-----------|
| 200 | -0.11 | -11.45 | 12.37 | 170.42 | -39.98 | 79.95 | -14.10 | -12.80 |
| 400 | -0.09 | -22.71 | 12.28 | 161.78 | -33.90 | 76.01 | -13.71 | -26.74 |
| 600 | -0.24 | -35.70 | 12.17 | 151.43 | -30.61 | 67.68 | -14.51 | -36.99 |
| 800 | -0.38 | -46.35 | 11.97 | 142.64 | -28.17 | 61.30 | -14.24 | -50.43 |
| 1000 | -0.53 | -57.07 | 11.72 | 133.73 | -26.47 | 54.53 | -14.01 | -63.83 |
| 1200 | -0.70 | -68.34 | 11.44 | 125.17 | -25.18 | 47.72 | -13.94 | -74.67 |
| 1400 | -0.90 | -77.99 | 11.13 | 117.20 | -24.20 | 41.43 | -13.43 | -85.29 |
| 1600 | -1.02 | -88.00 | 10.81 | 109.14 | -23.36 | 35.88 | -13.06 | -95.56 |
| 1800 | -1.24 | -97.21 | 10.43 | 101.55 | -22.67 | 30.53 | -12.84 | -104.03 |
| 2000 | -1.35 | -105.96 | 10.08 | 94.34 | -22.13 | 25.25 | -12.44 | -111.54 |
| 2200 | -1.54 | -114.67 | 9.70 | 87.18 | -21.60 | 20.06 | -12.16 | -119.40 |
| 2400 | -1.69 | -123.07 | 9.35 | 80.34 | -21.19 | 14.79 | -11.82 | -126.07 |
| 2600 | -1.76 | -128.30 | 9.11 | 75.57 | -20.96 | 11.26 | -11.63 | -130.63 |
| 2800 | -1.89 | -136.04 | 8.76 | 69.16 | -20.59 | 6.53 | -11.40 | -136.59 |
| 3000 | -2.00 | -144.31 | 8.43 | 62.87 | -20.35 | 1.69 | -11.16 | -141.99 |