

# 1 W Heterojunction Field Effect Transistor (HFET) DC - 6 GHz



**XF1001-SC**  
Rev. V5

## Features

- Gain:
  - 15.5 dB @ 1.9 GHz
  - 10.0 dB @ 5.8 GHz
- Output IP3: 46.5 dBm
- P1dB: 30.0 dBm
- SOT-89 Surface Mount Technology Package
- RoHS\* Compliant

## Applications

- Aerospace and Defense
- Wireless Networking and Communication

## Description

The XF1001-SC is a high linearity Heterojunction Field Effect Transistor (HFET) housed in an industry standard SOT-89 package. Optimum performance is achieved when the device is biased at a drain voltage of 8 V and drain current of 300 mA. At this bias point, the device is capable of >30 dBm of P1dB and OIP3 of >46 dBm.

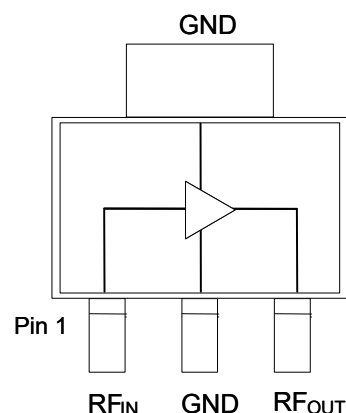
The XF1001-SC is suitable for applications up to 6 GHz where it has 10 dB of gain.

## Ordering Information<sup>1,2</sup>

| Part Number    | Package                  |
|----------------|--------------------------|
| XF1001-SC-0G00 | Bulk Packaging           |
| XF1001-SC-0G0T | 3000 piece reel          |
| XF1001-SC-EV1  | 5.8 GHz Evaluation Board |
| XF1001-SC-EV2  | 1.9 GHz Evaluation Board |

- Reference Application Note M513 for reel size information.
- All sample boards include 5 loose parts.

## Functional Block Diagram



## Pin Configuration<sup>3</sup>

| Pin # | Function         |
|-------|------------------|
| 1     | RF Input         |
| 2, 4  | Ground           |
| 3     | RF Output / Bias |

- The exposed pad centered on the package bottom must be connected to RF, DC and thermal ground.

\* Restrictions on Hazardous Substances, compliant to current RoHS EU directive.

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**Electrical Specifications:  $T_A = +25^\circ\text{C}$ ,  $V_{DD} = 8\text{ V}$ ,  $Z_0 = 50\ \Omega$**

| Parameter          | Conditions  | Units | Min.      | Typ.         | Max.     |
|--------------------|---|-------|-----------|--------------|----------|
| Gain               | Externally matched<br>1.9 GHz<br>5.8 GHz                  | dB    | 13.5<br>— | 15.5<br>10.0 | —        |
| Noise Figure       | 1.9 GHz<br>5.8 GHz  | dB    | —         | 4.5<br>5.0   | —        |
| Input Return Loss  | 1.9 GHz<br>5.8 GHz  | dB    | —         | 12.5<br>22.5 | —        |
| Output Return Loss | 1.9 GHz<br>5.8 GHz  | dB    | —         | 7.5<br>7.5   | —        |
| Output P1dB        | 1.9 GHz<br>5.8 GHz  | dBm   | 29<br>—   | 30<br>30     | —        |
| Output IP3         | Pout/Tone = 13 dBm, Spacing = 5 MHz<br>1.9 GHz<br>5.8 GHz | dBm   | 44.0<br>— | 46.5<br>46.5 | —        |
| Quiescent Current  | 1.9 GHz<br>5.8 GHz  | mA    | —         | 300<br>300   | 330<br>— |

### Absolute Maximum Ratings<sup>4,5</sup>

| Parameter              | Absolute Maximum                            |
|------------------------|---|
| Supply Voltage         | 9 V   |
| Gate Voltage ( $V_G$ ) | $-2.5\text{ V} < V_G < 0\text{ V}$          |
| Input Power            | 24 dBm                                      |
| Power Dissipation      | 4.5 W                                       |
| Current                | 450 mA                                      |
| Junction Temperature   | $+175^\circ\text{C}$                        |
| Operating Temperature  | $-40^\circ\text{C}$ to $+85^\circ\text{C}$  |
| Storage Temperature    | $-55^\circ\text{C}$ to $+150^\circ\text{C}$ |
| Thermal Resistance     | $30^\circ\text{C/W}$                        |

4. Exceeding any one or combination of these limits may cause permanent damage to this device.  
 5. MACOM does not recommend sustained operation near these survivability limits.

### Handling Procedures

Please observe the following precautions to avoid damage:

### Static Sensitivity

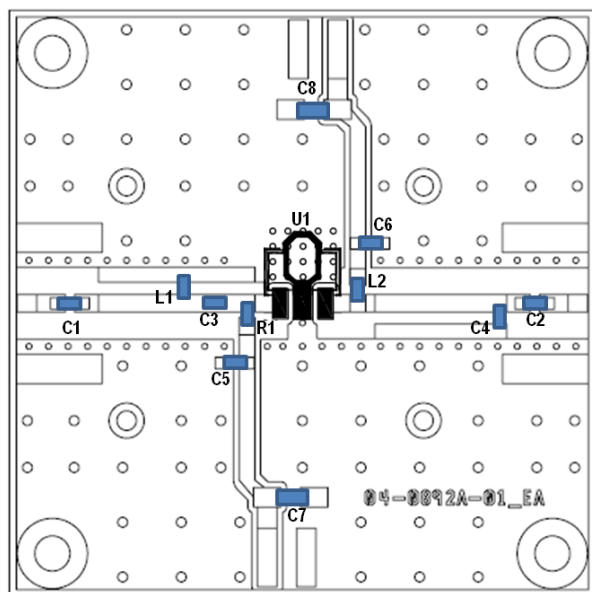
These electronic devices are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these Class 1A devices.

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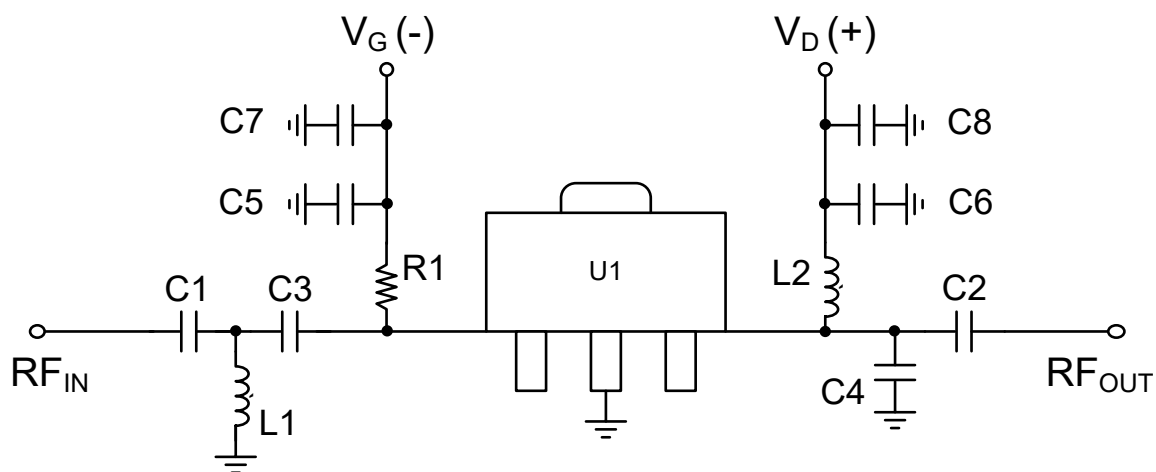
## PCB Layout @ 1.9 GHz



## Parts List @ 1.9 GHz

| Part   | Value           | Case Style |
|--------|-----------------|------------|
| C1, C2 | 100 pF          | 0603       |
| C3     | 2.2 pF          | 0603       |
| C4     | 1.2 pF          | 0603       |
| C5, C6 | 1000 pF         | 0603       |
| C7, C8 | 3.3 $\mu$ F     | 0805       |
| L1     | 1.6 nH          | 0603       |
| L2     | 24 nH           | 0603       |
| R1     | 2.49 K $\Omega$ | 0603       |

## Application Schematic @ 1.9 GHz



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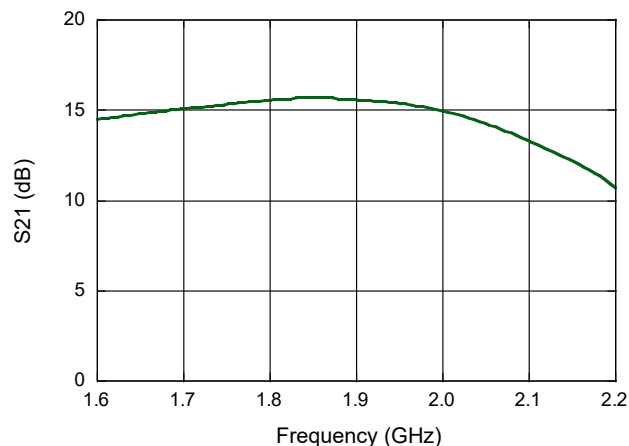
## DC - 6 GHz



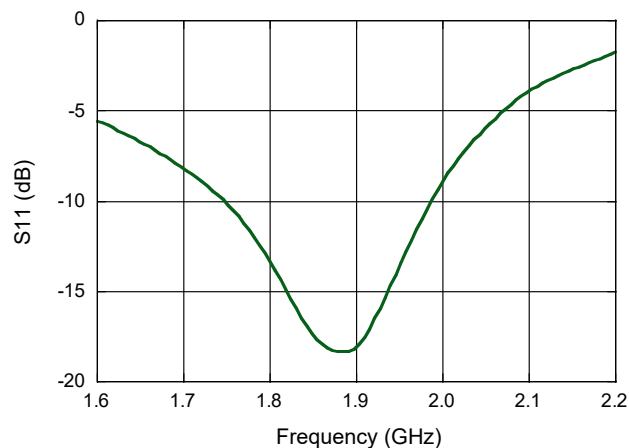
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### Typical Performance Curves @ 1.9 GHz

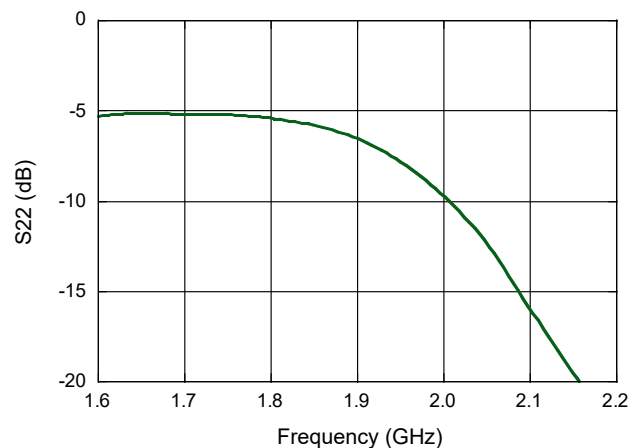
#### Gain



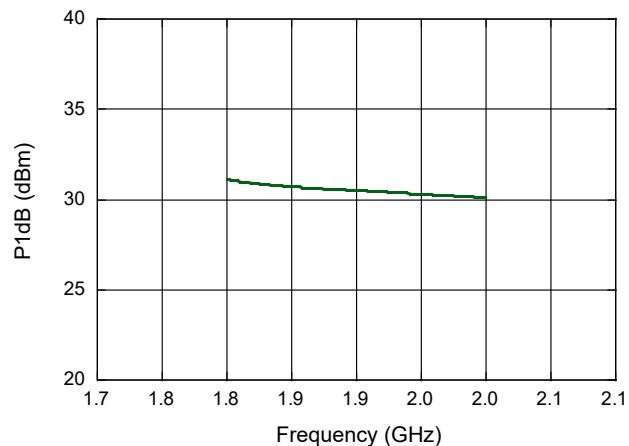
#### Input Return Loss



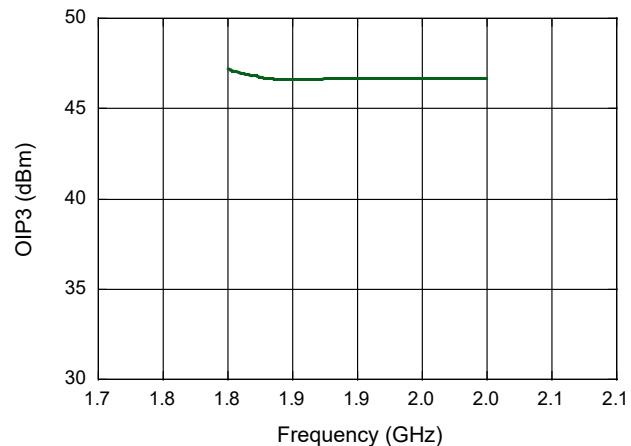
#### Output Return Loss



#### P1dB



#### OIP3

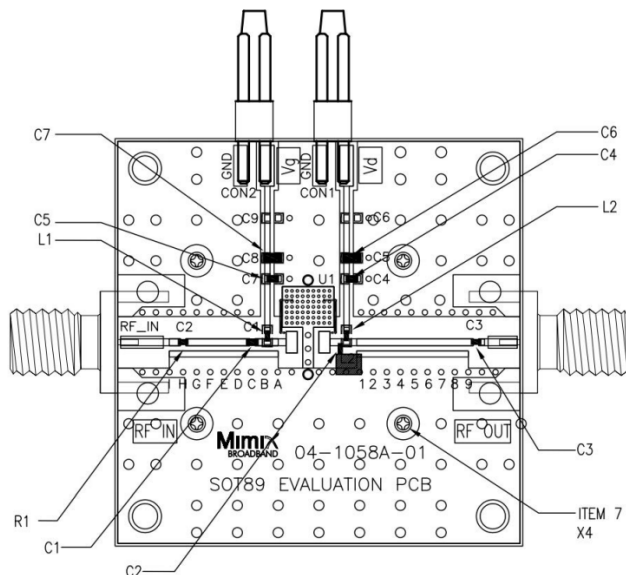


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## PCB Layout @ 5.8 GHz

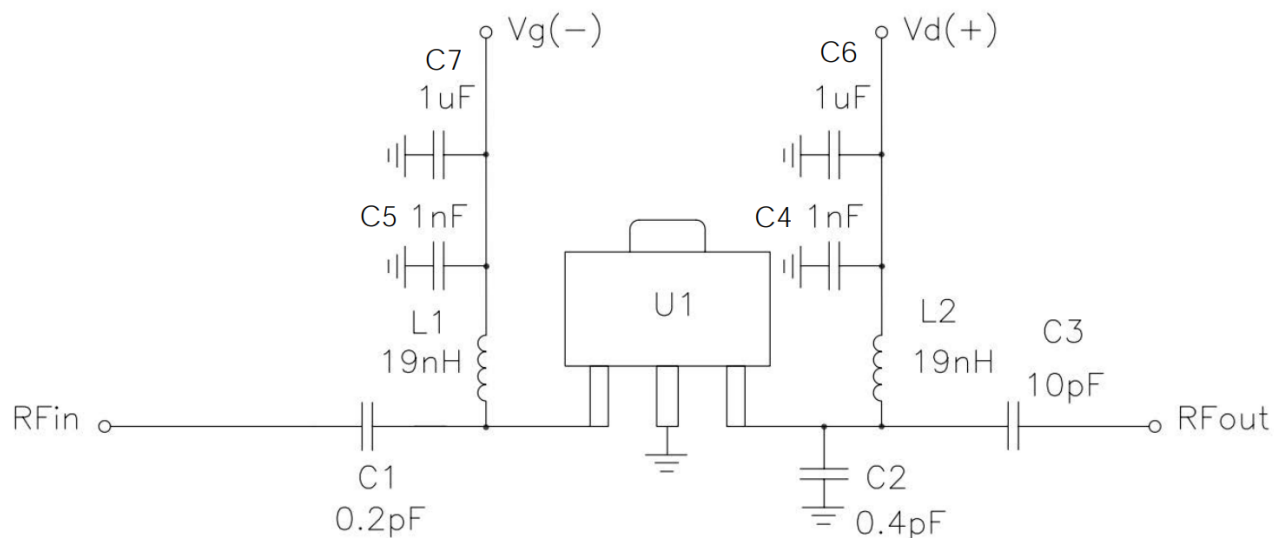


## Parts List @ 5.8 GHz<sup>6</sup>

| Part   | Value        | Case Style |
|--------|--------------|------------|
| C1     | 0.2 pF       | 0402       |
| C2     | 0.4 pF       | 0402       |
| C3     | 10 pF        | 0402       |
| C4, C5 | 1000 pF      | 0402       |
| C6, C7 | 1 $\mu$ F    | 0603       |
| L1, L2 | 19 nH        | 0402       |
| R1     | 0 K $\Omega$ | 0402       |

6. Parts List items correlate to the reference designators on the leaders in the PCB diagram, not the markings on the PCB.

## Application Schematic @ 5.8 GHz



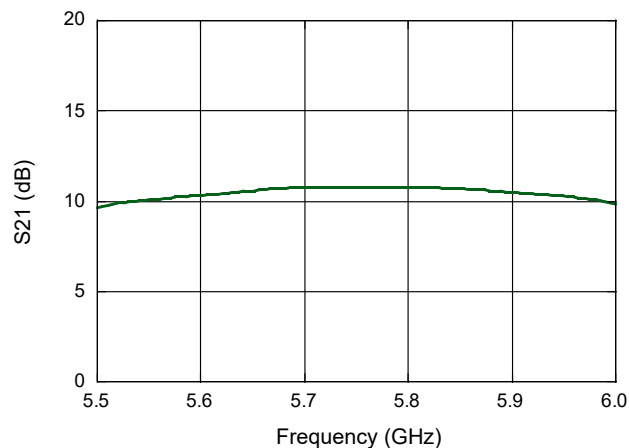
# 1 W Heterojunction Field Effect Transistor (HFET) DC - 6 GHz



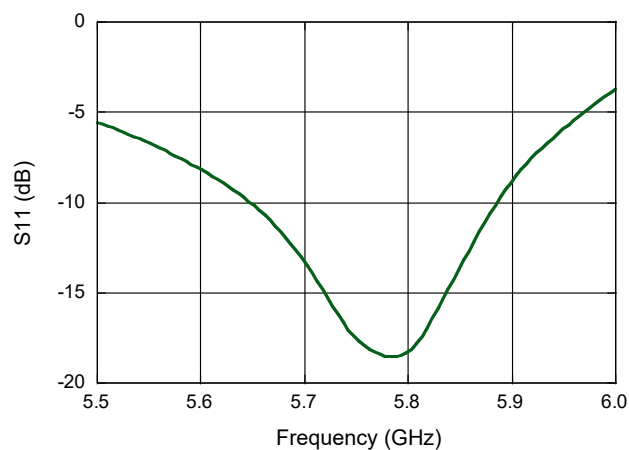
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## Typical Performance Curves @ 5.8 GHz

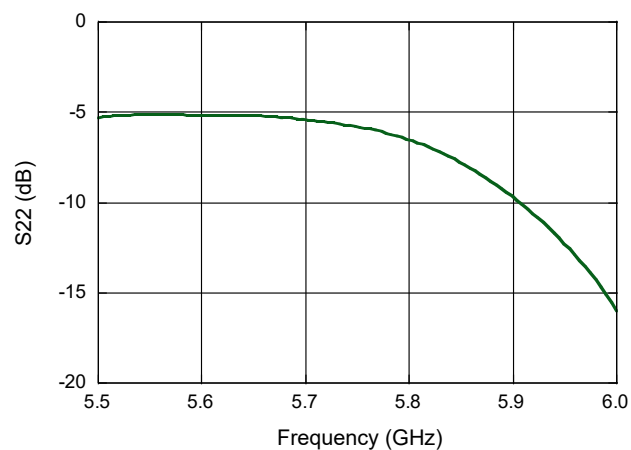
### Gain



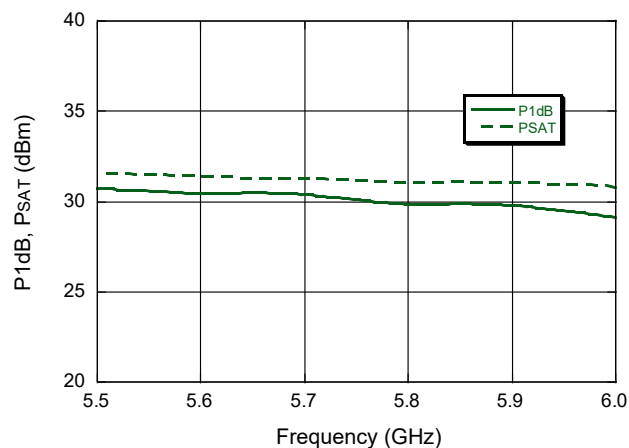
### Input Return Loss



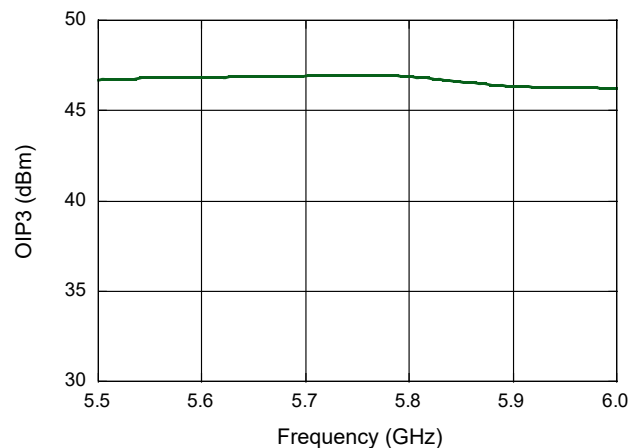
### Output Return Loss



### P1dB, P<sub>SAT</sub>



### OIP3



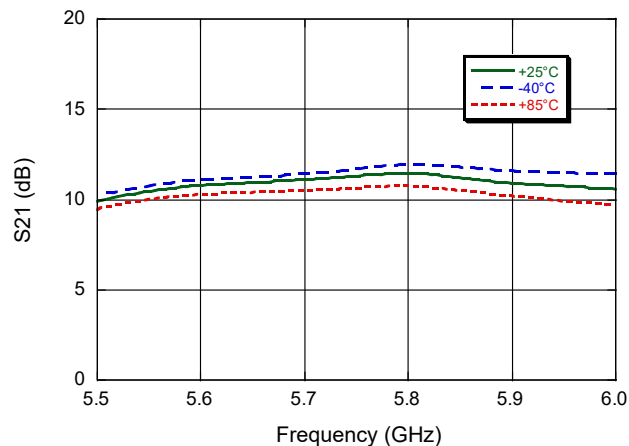
# 1 W Heterojunction Field Effect Transistor (HFET) DC - 6 GHz



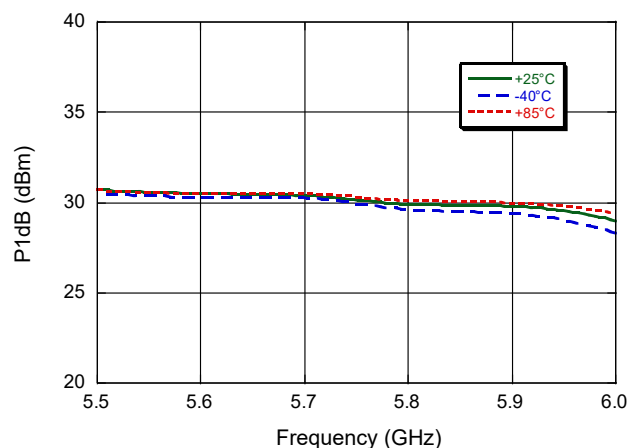
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## Typical Performance Curves @ 5.8 GHz over Temperature

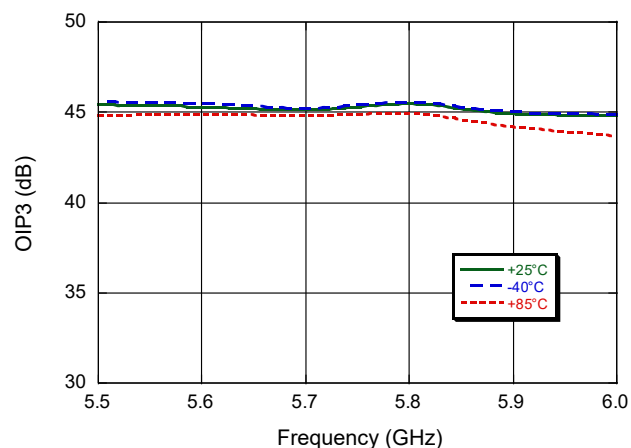
### Gain



### P1dB



### OIP3

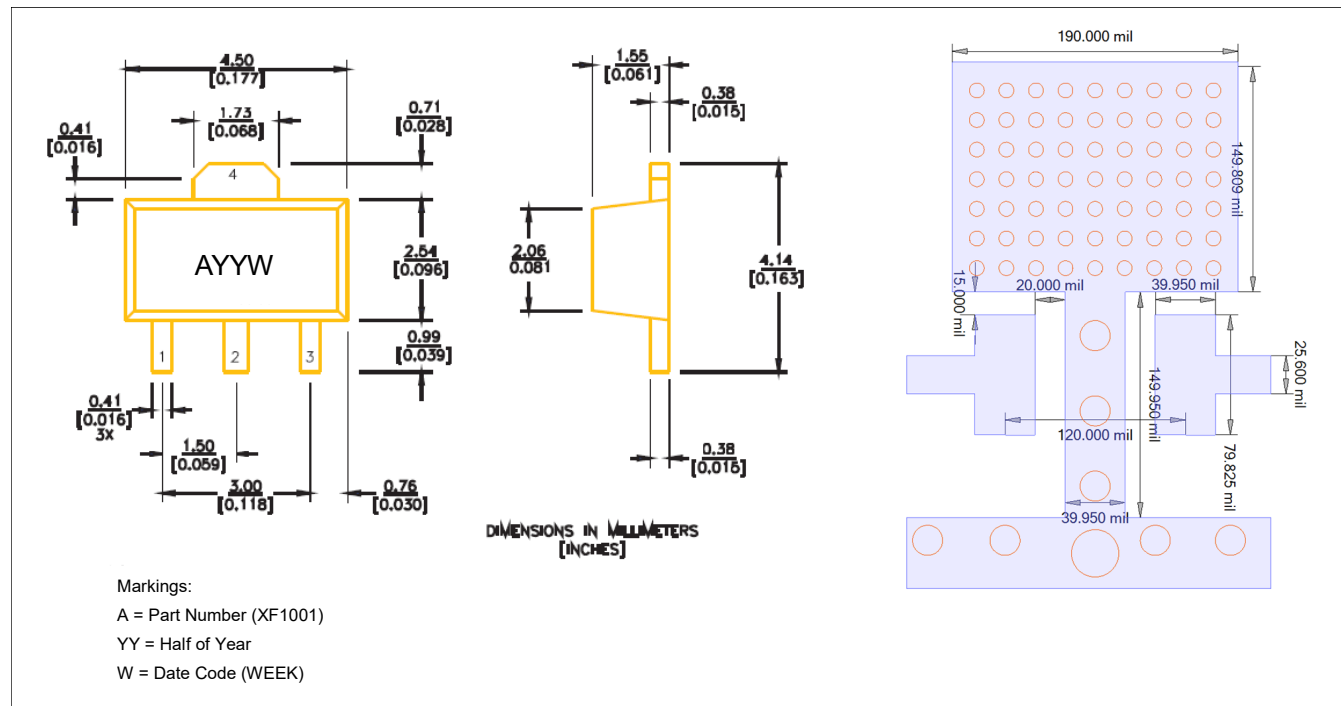


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## Lead-Free SOT-89<sup>†</sup>



<sup>†</sup> Reference Application Note M538 for lead-free solder reflow recommendations.  
Meets JEDEC moisture sensitivity level 1 requirements.  
Plating is 100% matte tin plating over copper



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