

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.

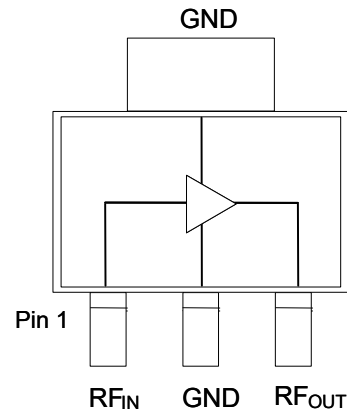
The XF1001-SC is suitable for applications up to 6 GHz where it has 10 dB of gain.

Ordering Information^{1,2}

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

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

Functional Block Diagram



Pin Configuration³

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

3. 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 1.9 GHz 5.8 GHz	dB	13.5 —	15.5 10.0	—
Noise Figure	1.9 GHz 5.8 GHz	dB	—	4.5 5.0	—
Input Return Loss	1.9 GHz 5.8 GHz	dB	—	12.5 22.5	—
Output Return Loss	1.9 GHz 5.8 GHz	dB	—	7.5 7.5	—
Output P1dB	1.9 GHz 5.8 GHz	dBm	29 —	30 30	—
Output IP3	Pout/Tone = 13 dBm, Spacing = 5 MHz 1.9 GHz 5.8 GHz	dBm	44.0 —	46.5 46.5	—
Quiescent Current	1.9 GHz 5.8 GHz	mA	—	300 300	330 —

Absolute Maximum Ratings^{4,5}

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°C
Operating Temperature	-40°C to +85°C
Storage Temperature	-55°C to +150°C
Thermal Resistance	30°C/W

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

Handling Procedures

Please observe the following precautions to avoid damage:

Static Sensitivity

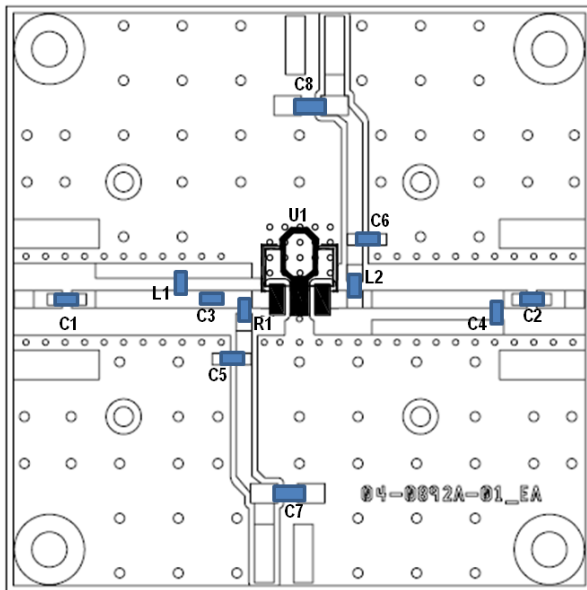
These electronic devices are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these Class 1A devices.

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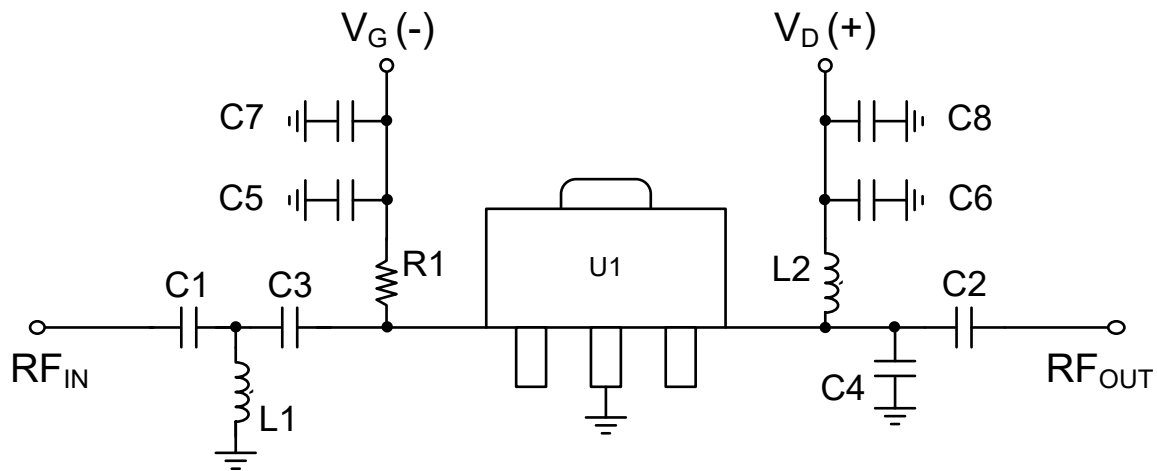
PCB Layout @ 1.9 GHz



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 μ F	0805
L1	1.6 nH	0603
L2	24 nH	0603
R1	2.49 K Ω	0603

Application Schematic @ 1.9 GHz



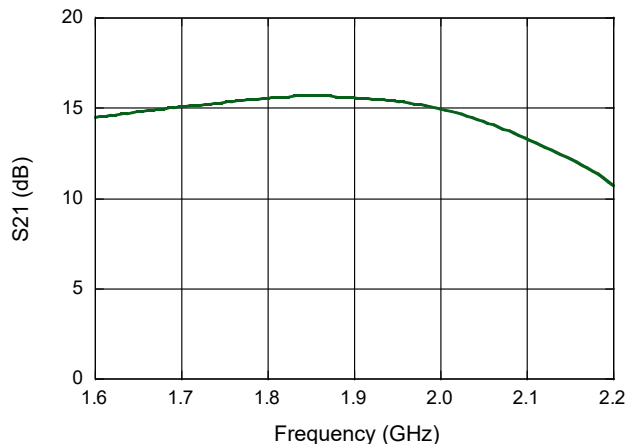
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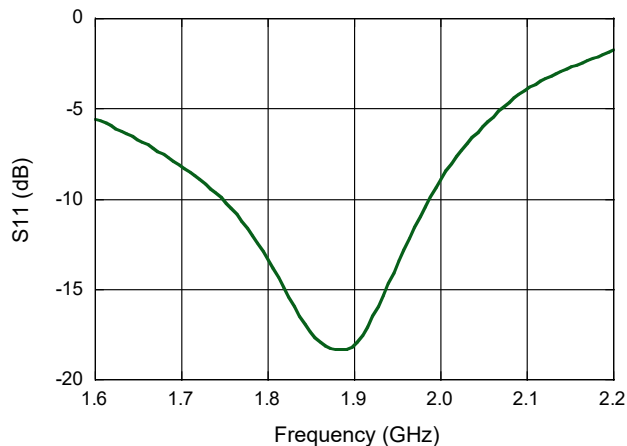
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Typical Performance Curves @ 1.9 GHz

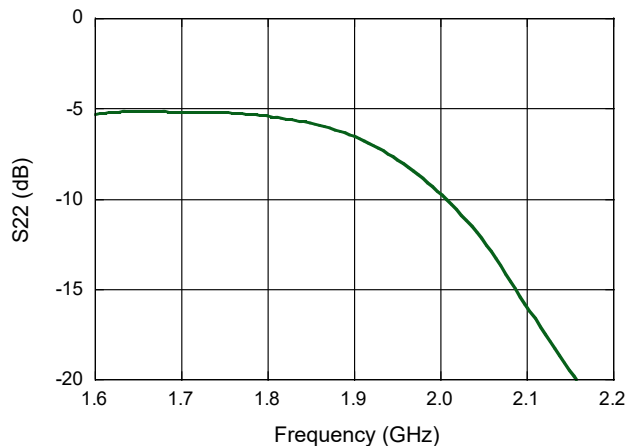
Gain



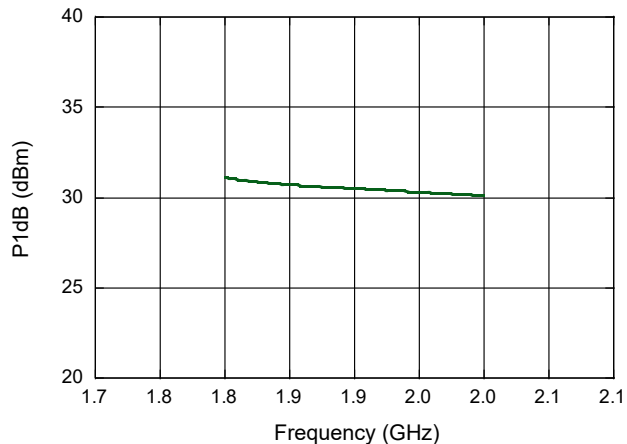
Input Return Loss



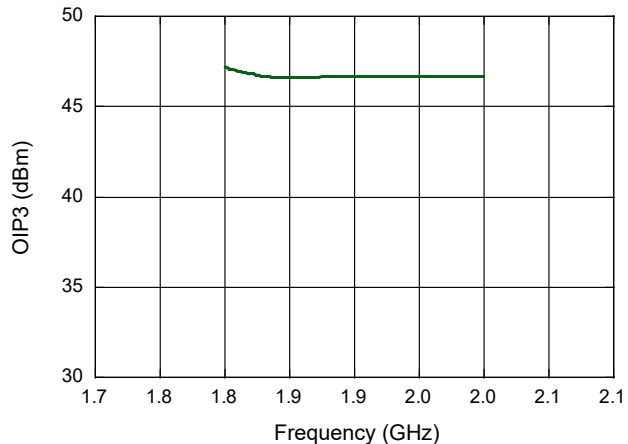
Output Return Loss



P1dB



OIP3

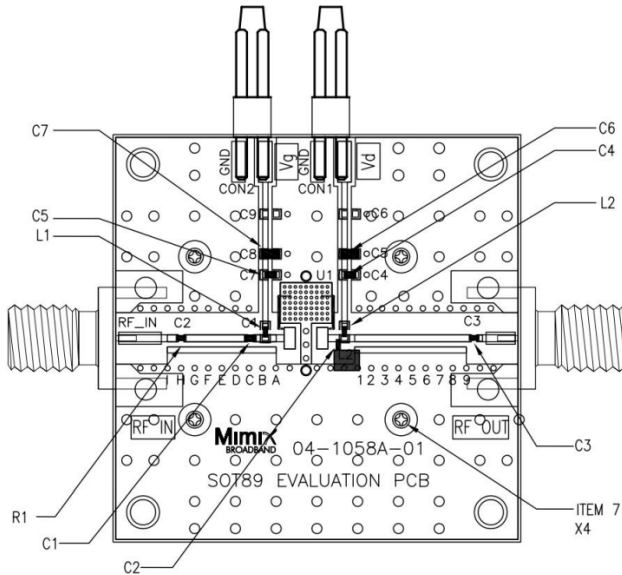


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PCB Layout @ 5.8 GHz

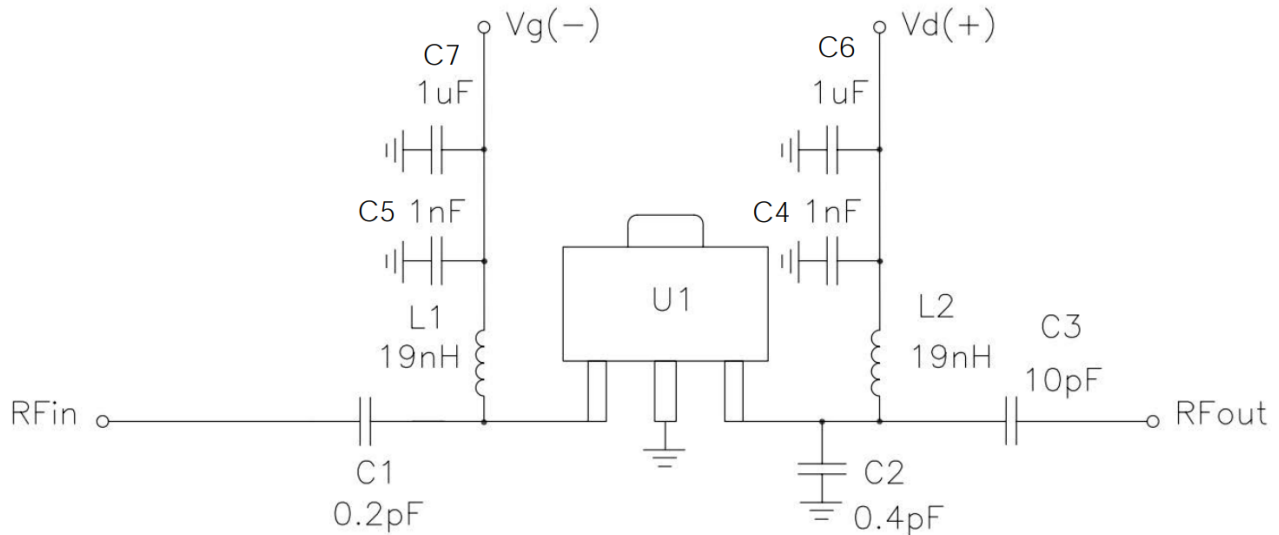


Parts List @ 5.8 GHz⁶

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 μ F	0603
L1, L2	19 nH	0402
R1	0 K Ω	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



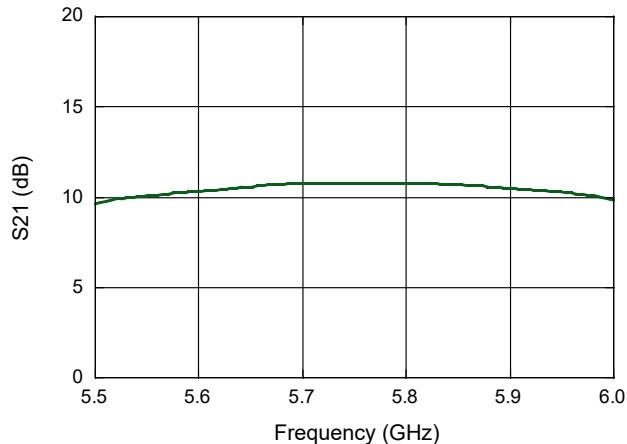
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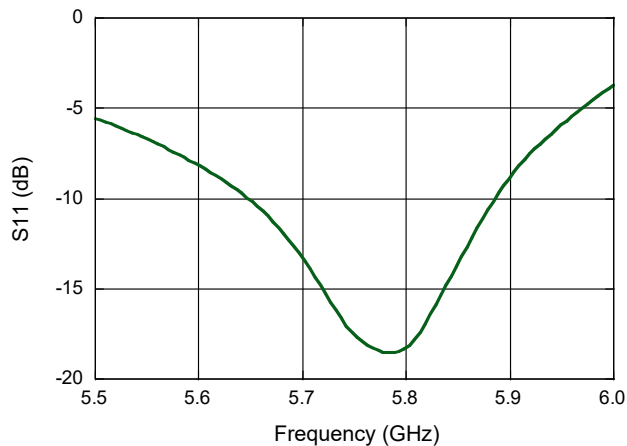
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Typical Performance Curves @ 5.8 GHz

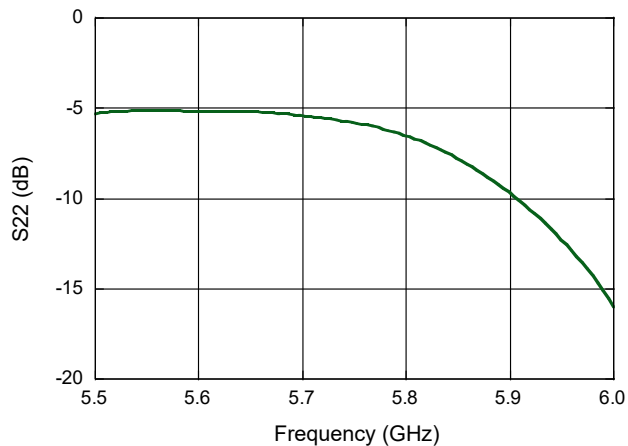
Gain



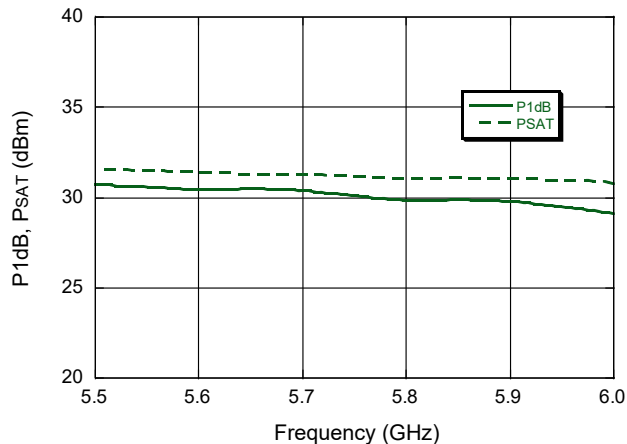
Input Return Loss



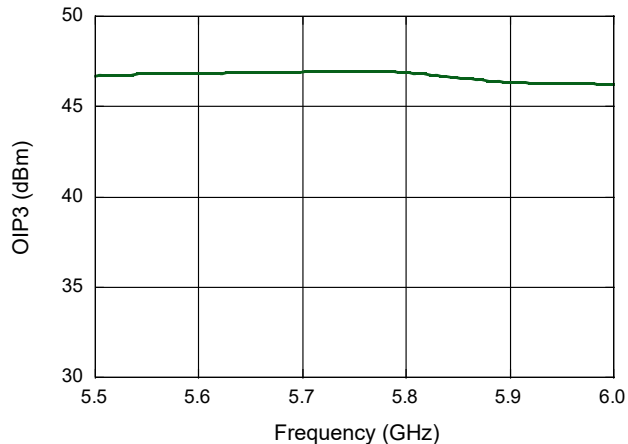
Output Return Loss



P1dB, P_{SAT}



OIP3



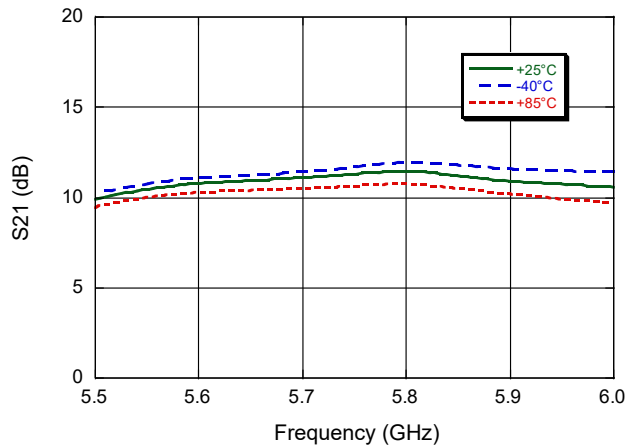
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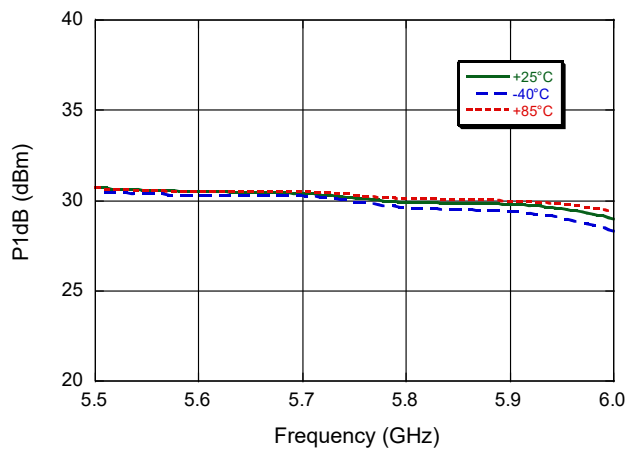
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Typical Performance Curves @ 5.8 GHz over Temperature

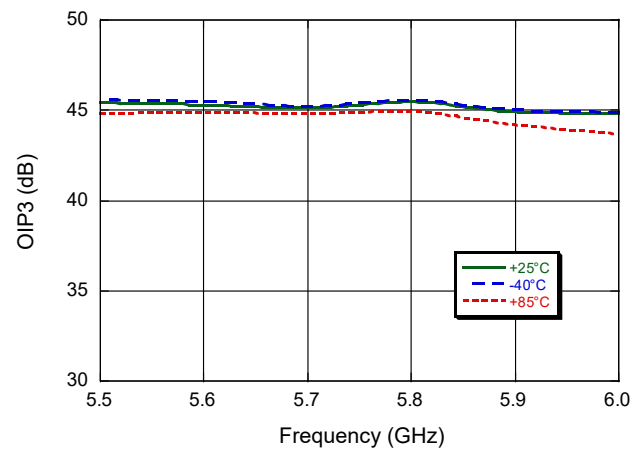
Gain



P1dB



OIP3

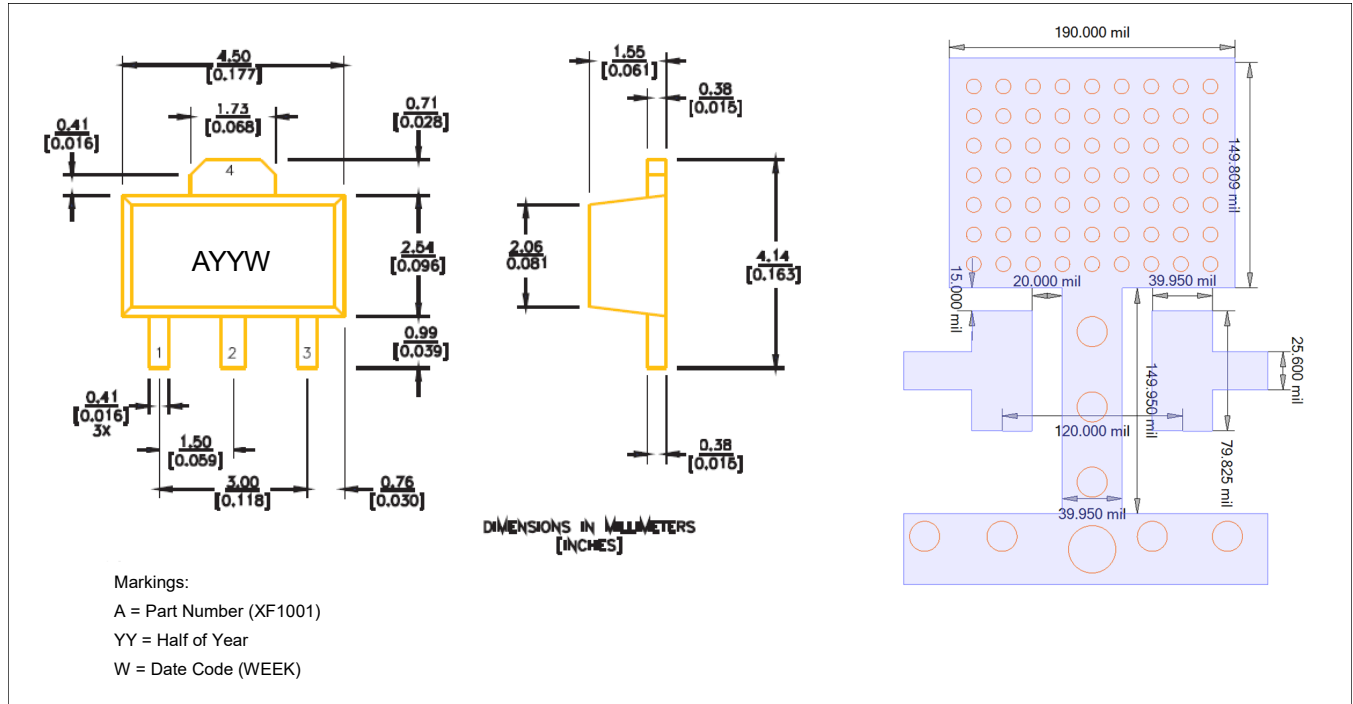


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Lead-Free SOT-89[†]



[†] 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