

# 0.5–10 GHz Low Noise Gallium Arsenide FET

## Technical Data

**ATF-25170**

### Features

- **Low Noise Figure:**  
0.8 dB Typical at 4 GHz
- **High Associated Gain:**  
14.0 dB Typical at 4 GHz
- **High Output Power:**  
21.0 dBm Typical  $P_{1\text{dB}}$  at 4 GHz
- **Hermetic Gold-Ceramic Microstrip Package**

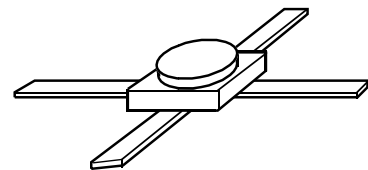
### Description

The ATF-25170 is a high performance gallium arsenide Schottky-barrier-gate field effect transistor

housed in a hermetic, high reliability package. Its noise figure makes this device appropriate for use in low noise amplifiers operating in the 0.5-10 GHz frequency range.

This GaAs FET device has a nominal 0.3 micron gate length using airbridge interconnects between drain fingers. Total gate periphery is 500 microns. Proven gold based metallization systems and nitride passivation assure a rugged, reliable device.

### 70 mil Package



### Electrical Specifications, $T_A = 25^\circ\text{C}$

Symbol	Parameters and Test Conditions	Units	Min.	Typ.	Max.	
$NF_O$	Optimum Noise Figure: $V_{DS} = 3\text{ V}$ , $I_{DS} = 20\text{ mA}$	$f = 4.0\text{ GHz}$	dB		0.8	1.0
		$f = 6.0\text{ GHz}$	dB		1.0	
		$f = 8.0\text{ GHz}$	dB		1.2	
$G_A$	Gain @ $NF_O$ : $V_{DS} = 3\text{ V}$ , $I_{DS} = 20\text{ mA}$	$f = 4.0\text{ GHz}$	dB	13.0	14.0	
		$f = 6.0\text{ GHz}$	dB		11.5	
		$f = 8.0\text{ GHz}$	dB		9.0	
$P_{1\text{dB}}$	Power Output @ 1 dB Gain Compression: $V_{DS} = 5\text{ V}$ , $I_{DS} = 50\text{ mA}$	$f = 4.0\text{ GHz}$	dBm		21.0	
$G_{1\text{dB}}$	1 dB Compressed Gain: $V_{DS} = 5\text{ V}$ , $I_{DS} = 50\text{ mA}$	$f = 4.0\text{ GHz}$	dB		15.0	
$g_m$	Transconductance: $V_{DS} = 3\text{ V}$ , $V_{GS} = 0\text{ V}$		mmho	50	80	
$I_{DSS}$	Saturated Drain Current: $V_{DS} = 3\text{ V}$ , $V_{GS} = 0\text{ V}$		mA	50	100	150
$V_P$	Pinch-off Voltage: $V_{DS} = 3\text{ V}$ , $I_{DS} = 1\text{ mA}$		V	-3.0	-2.0	-0.8

## ATF-25170 Absolute Maximum Ratings

Symbol	Parameter	Units	Absolute Maximum <sup>[1]</sup>
$V_{DS}$	Drain-Source Voltage	V	+7
$V_{GS}$	Gate-Source Voltage	V	-4
$V_{GD}$	Gate-Drain Voltage	V	-8
$I_{DS}$	Drain Current	mA	$I_{DSS}$
$P_T$	Power Dissipation <sup>[2,3]</sup>	mW	450
$T_{CH}$	Channel Temperature	°C	175
$T_{STG}$	Storage Temperature	°C	-65 to +175

**Thermal Resistance:**  $\theta_{jc} = 300^\circ\text{C/W}$ ;  $T_{CH} = 150^\circ\text{C}$   
**Liquid Crystal Measurement:** 1  $\mu\text{m}$  Spot Size<sup>[4]</sup>

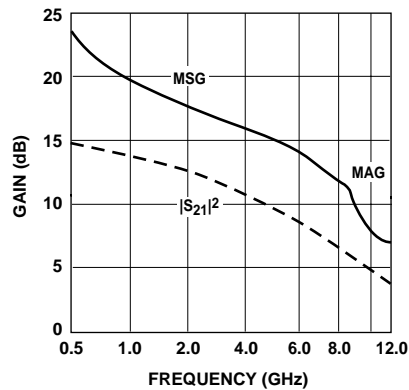
### Notes:

1. Permanent damage may occur if any of these limits are exceeded.
2.  $T_{\text{MOUNTING SURFACE}} = 25^\circ\text{C}$ .
3. Derate at 3.3 mW/°C for  $T_{\text{MOUNTING SURFACE}} > 40^\circ\text{C}$ .
4. The small spot size of this technique results in a higher, though more accurate determination of  $\theta_{jc}$  than do alternate methods. See MEASUREMENTS section for more information.

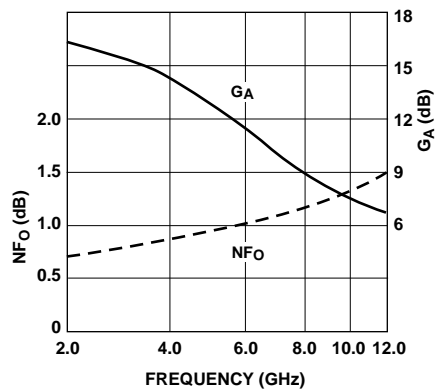
## ATF-25170 Noise Parameters: $V_{DS} = 3\text{ V}$ , $I_{DS} = 20\text{ mA}$

Freq. GHz	$NF_O$ dB	$\Gamma_{opt}$		$R_N/50$
		Mag	Ang	
1.0	0.6	.89	24	.78
2.0	0.7	.77	50	.53
4.0	0.8	.63	105	.33
6.0	1.0	.66	147	.06
8.0	1.2	.62	-159	.11

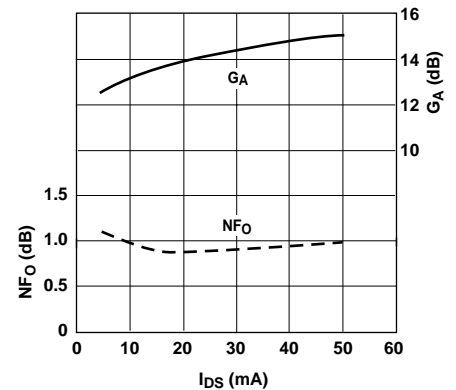
## ATF-25170 Typical Performance, $T_A = 25^\circ\text{C}$



**Figure 1. Insertion Power Gain, Maximum Available Gain and Maximum Stable Gain vs. Frequency.**  
 $V_{DS} = 3\text{ V}$ ,  $I_{DS} = 20\text{ mA}$ .



**Figure 2. Optimum Noise Figure and Associated Gain vs. Frequency.**  
 $V_{DS} = 3\text{ V}$ ,  $I_{DS} = 20\text{ mA}$ .



**Figure 3. Optimum Noise Figure and Associated Gain vs.  $I_{DS}$ .**  
 $V_{DS} = 3\text{ V}$ ,  $f = 4.0\text{ GHz}$ .

**Typical Scattering Parameters, Common Emitter,  $Z_0 = 50 \Omega$ ,  $T_A = 25^\circ\text{C}$ ,  $V_{DS} = 3\text{V}$ ,  $I_{DS} = 20\text{mA}$**

Freq. GHz	$S_{11}$		dB	$S_{21}$		dB	$S_{12}$		$S_{22}$	
	Mag.	Ang.		Mag.	Ang.		Mag.	Ang.	Mag.	Ang.
0.5	.98	-23	13.6	4.80	160	-32.8	.023	76	.50	-23
1.0	.96	-38	13.0	4.46	147	-23.6	.037	67	.48	-30
2.0	.88	-66	11.5	3.75	121	-23.6	.066	50	.44	-45
3.0	.80	-86	10.2	3.23	102	-21.8	.081	41	.41	-55
4.0	.77	-106	9.3	2.93	82	-19.7	.103	28	.38	-65
5.0	.71	-127	8.5	2.66	62	-18.6	.118	17	.35	-78
6.0	.65	-149	7.9	2.47	42	-17.7	.130	6	.30	-93
7.0	.60	-173	7.3	2.33	24	-16.5	.149	-4	.26	-111
8.0	.56	161	6.8	2.20	5	-15.8	.162	-16	.22	-134
9.0	.56	136	6.2	2.05	-14	-15.1	.175	-26	.21	-166
10.0	.55	118	5.4	1.87	-31	-15.0	.178	-35	.21	173
11.0	.53	108	4.9	1.76	-46	-14.9	.180	-42	.22	164
12.0	.53	95	4.7	1.71	-62	-14.8	.183	-52	.23	159

A model for this device is available in the DEVICE MODELS section.

**70 mil Package Dimensions**

