

# 0.5–12 GHz General Purpose Gallium Arsenide FET

## Technical Data

### ATF-10736

#### Features

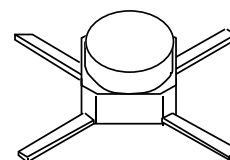
- **High Associated Gain:**  
13.0 dB Typical at 4 GHz
- **Low Bias:**  
 $V_{DS} = 2\text{ V}$ ,  $I_{DS} = 25\text{ mA}$
- **High Output Power:**  
20.0 dBm typical  $P_{1\text{ dB}}$  at 4 GHz
- **Low Noise Figure:**  
1.2 dB Typical at 4 GHz
- **Cost Effective Ceramic Microstrip Package**
- **Tape-and-Reel Packaging Option Available<sup>[1]</sup>**

#### Description

The ATF-10736 is a high performance gallium arsenide Schottky-barrier-gate field effect transistor housed in a cost effective microstrip package. Its noise figure makes this device appropriate for use in the gain stages of low noise amplifiers operating in the 0.5-12 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.

#### 36 micro-X Package



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

Symbol	Parameters and Test Conditions	Units	Min.	Typ.	Max.
$NF_O$	Optimum Noise Figure: $V_{DS} = 2\text{ V}$ , $I_{DS} = 25\text{ mA}$	$f = 2.0\text{ GHz}$		0.9	1.4
		$f = 4.0\text{ GHz}$		1.2	
		$f = 6.0\text{ GHz}$		1.4	
$G_A$	Gain @ $NF_O$ ; $V_{DS} = 2\text{ V}$ , $I_{DS} = 25\text{ mA}$	$f = 2.0\text{ GHz}$	12.0	16.5	
		$f = 4.0\text{ GHz}$		13.0	
		$f = 6.0\text{ GHz}$		10.5	
$P_{1\text{ dB}}$	Power Output @ 1 dB Gain Compression $V_{DS} = 4\text{ V}$ , $I_{DS} = 70\text{ mA}$	$f = 4.0\text{ GHz}$		20.0	
$G_{1\text{ dB}}$	1 dB Compressed Gain: $V_{DS} = 4\text{ V}$ , $I_{DS} = 70\text{ mA}$	$f = 4.0\text{ GHz}$		12.0	
$g_m$	Transconductance: $V_{DS} = 2\text{ V}$ , $V_{GS} = 0\text{ V}$	mmho	70	140	
$I_{DSS}$	Saturated Drain Current: $V_{DS} = 2\text{ V}$ , $V_{GS} = 0\text{ V}$	mA	70	130	180
$V_P$	Pinchoff Voltage: $V_{DS} = 2\text{ V}$ , $I_{DS} = 1\text{ mA}$	V	-4.0	-1.3	-0.5

#### Note:

1. Refer to PACKAGING section, "Tape-and-Reel Packaging for Surface Mount Semiconductors."

## ATF-10736 Absolute Maximum Ratings

Symbol	Parameter	Units	Absolute Maximum <sup>[1]</sup>
$V_{DS}$	Drain-Source Voltage	V	+5
$V_{GS}$	Gate-Source Voltage	V	-4
$V_{GD}$	Gate-Drain Voltage	V	-7
$I_{DS}$	Drain Current	mA	$I_{DSS}$
$P_T$	Total Power Dissipation <sup>[2,3]</sup>	mW	430
$T_{CH}$	Channel Temperature	°C	175
$T_{STG}$	Storage Temperature <sup>[4]</sup>	°C	-65 to +175

**Thermal Resistance:**  $\theta_{jc} = 350^{\circ}\text{C/W}$ ;  $T_{CH} = 150^{\circ}\text{C}$   
**Liquid Crystal Measurement:**  $1\mu\text{m Spot Size}^{[5]}$

### Notes:

1. Permanent damage may occur if any of these limits are exceeded.
2.  $T_{CASE}$  TEMPERATURE =  $25^{\circ}\text{C}$ .
3. Derate at  $2.9\text{ mW}/^{\circ}\text{C}$  for  $T_{CASE} > 25^{\circ}\text{C}$ .
4. Storage above  $+150^{\circ}\text{C}$  may tarnish the leads of this package difficult to solder into a circuit. After a device has been soldered into a circuit, it may be safely stored up to  $175^{\circ}\text{C}$ .
5. 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.

## Part Number Ordering Information

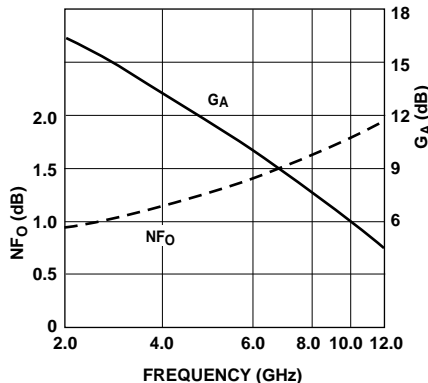
Part Number	Devices Per Reel	Reel Size
ATF-10736-TR1	1000	7"
ATF-10736-STR	10	STRIP

For more information, see "Tape and Reel Packaging for Semiconductor Devices."

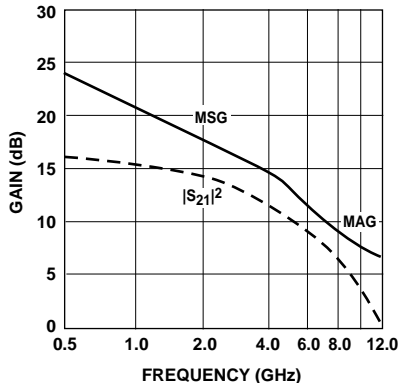
## ATF-10736 Noise Parameters: $V_{DS} = 2\text{ V}$ , $I_{DS} = 25\text{ mA}$

Freq. GHz	$NF_0$ dB	$\Gamma_{opt}$		$R_N/50$
		Mag	Ang	
1.0	0.8	0.88	41	0.52
2.0	0.9	0.75	85	0.27
4.0	1.2	0.48	159	0.08
6.0	1.4	0.46	-122	0.08
8.0	1.7	0.53	-71	0.43

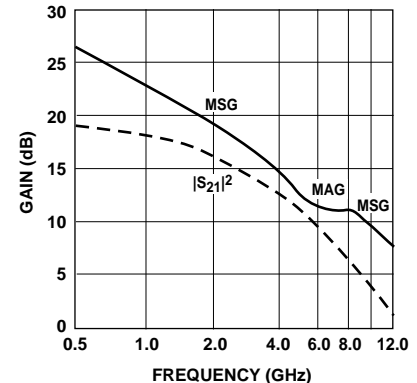
## ATF-10736 Typical Performance, $T_A = 25^{\circ}\text{C}$



**Figure 1. Optimum Noise Figure and Associated Gain vs. Frequency.**  
 $V_{DS} = 2\text{ V}$ ,  $I_{DS} = 25\text{ mA}$ ,  $T_A = 25^{\circ}\text{C}$ .



**Figure 2. Insertion Power Gain, Maximum Available Gain and Maximum Stable Gain vs. Frequency.**  
 $V_{DS} = 2\text{ V}$ ,  $I_{DS} = 25\text{ mA}$ .



**Figure 3. Insertion Power Gain, Maximum Available Gain and Maximum Stable Gain vs. Frequency.**  
 $V_{DS} = 4\text{ V}$ ,  $I_{DS} = 70\text{ mA}$ .

**Typical Scattering Parameters, Common Source,  $Z_O = 50\ \Omega$ ,  $T_A = 25^\circ\text{C}$ ,  $V_{DS} = 2\text{ V}$ ,  $I_{DS} = 25\text{ mA}$** 

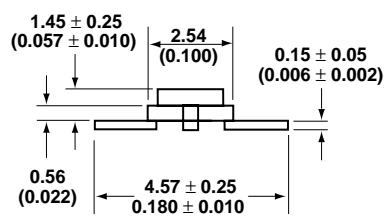
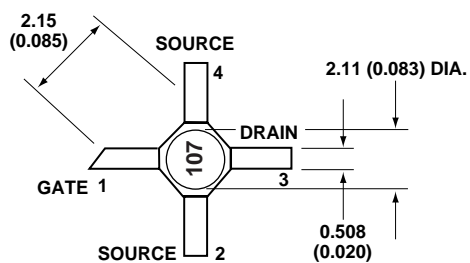
Freq. GHz	$S_{11}$		dB	$S_{21}$		dB	$S_{12}$		$S_{22}$	
	Mag.	Ang.		Mag.	Ang.		Mag.	Ang.	Mag.	Ang.
0.5	.96	-20	15.4	5.90	162	-32.4	.024	77	.50	-10
1.0	.92	-40	15.2	5.77	144	-26.7	.046	66	.48	-21
2.0	.77	-76	13.8	4.92	109	-21.3	.086	52	.39	-34
3.0	.59	-107	12.5	4.20	83	-20.0	.111	40	.33	-45
4.0	.49	-136	11.2	3.64	57	-17.3	.137	24	.26	-61
5.0	.43	-179	10.0	3.15	32	-15.5	.167	9	.14	-65
6.0	.49	138	8.6	2.74	8	-14.9	.179	-5	.05	22
7.0	.57	106	7.3	2.32	-13	-14.8	.183	-18	.19	60
8.0	.68	81	5.6	1.92	-32	-14.7	.185	-33	.33	57
9.0	.73	62	4.2	1.62	-50	-14.8	.183	-40	.42	46
10.0	.77	47	3.0	1.41	-66	-14.8	.182	-52	.46	38
11.0	.82	36	1.0	1.12	-81	-14.6	.186	-67	.50	27
12.0	.85	22	-0.2	0.98	-97	-14.5	.189	-75	.51	15

**Typical Scattering Parameters, Common Emitter,  $Z_O = 50\ \Omega$ ,  $T_A = 25^\circ\text{C}$ ,  $V_{DS} = 4\text{ V}$ ,  $I_{DS} = 70\text{ mA}$** 

Freq. GHz	$S_{11}$		dB	$S_{21}$		dB	$S_{12}$		$S_{22}$	
	Mag.	Ang.		Mag.	Ang.		Mag.	Ang.	Mag.	Ang.
0.5	.90	-32	19.0	8.95	147	-34.9	.018	77	.40	-7
1.0	.79	-53	18.0	7.96	128	-28.6	.037	70	.38	-17
2.0	.57	-96	15.5	5.99	90	-22.5	.075	56	.34	-38
3.0	.43	-129	13.3	4.60	64	-19.5	.106	43	.31	-50
4.0	.36	-163	11.6	3.78	39	-17.3	.136	31	.28	-51
5.0	.35	156	10.1	3.21	16	-15.6	.166	14	.22	-45
6.0	.47	110	8.8	2.76	-11	-14.5	.189	-5	.15	-4
7.0	.65	78	7.0	2.23	-36	-14.2	.196	-23	.28	35
8.0	.77	58	5.1	1.80	-56	-14.1	.198	-38	.42	37
9.0	.83	44	3.5	1.50	-72	-14.2	.195	-48	.51	33
10.0	.86	30	2.4	1.32	-88	-14.5	.188	-64	.55	26
11.0	.87	16	1.1	1.13	-106	-14.8	.182	-77	.60	18
12.0	.91	1	0.1	0.99	-123	-15.3	.171	-91	.65	7

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

### 36 micro-X Package Dimensions



**Notes:**

1. Dimensions are in millimeters (inches)
2. Tolerances: in .xxx = ± 0.005  
mm .xx = ± 0.13