



ATF-21100 (AT-8111)
0.5-6 GHz Low Noise
Gallium Arsenide FET

Features

- Low Noise Figure: 0.9 dB typical at 4 GHz
- High Associated Gain: 13.0 dB typical at 4 GHz
- High Output Power: 23.0 dBm typical $P_{1\text{ dB}}$ at 4 GHz

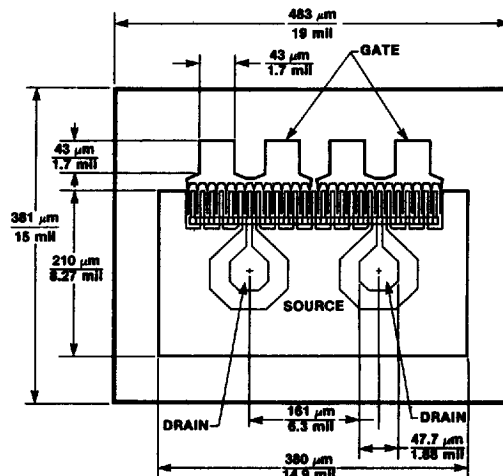
Description

The ATF-21100 is a high performance gallium arsenide Schottky-barrier-gate field effect transistor chip. This device is designed for use in low noise or medium power amplifier applications in the 0.5-6 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 750 microns. Proven gold based metallization systems and nitride passivation assure a rugged, reliable device.

The recommended mounting procedure is to die attach at a stage temperature of 300 C using a gold-tin preform under forming gas. Assembly can be performed with either wedge or ball bonding using 0.7 mil gold wire. See also "Chip Use" in the APPLICATIONS section.

Chip Outline



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

Freq. GHz	NF ₀ dB	Gamma Mag	Opt Ang	R _n /50
0.5	0.4	.93	10	.92
1.0	0.5	.86	20	.83
2.0	0.6	.72	42	.64
4.0	0.9	.61	104	.28
6.0	1.2	.55	160	.07

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

Symbol	Parameters and Test Conditions ¹	Units	Min.	Typ.	Max.
NF ₀	Optimum Noise Figure: $V_{DS} = 3\text{ V}$, $I_{DS} = 20\text{ mA}$				
GA	Gain @ NF ₀ : $V_{DS} = 3\text{ V}$, $I_{DS} = 20\text{ mA}$	$f = 2.0\text{ GHz}$		0.6	1.1
		$f = 4.0\text{ GHz}$		0.9	
		$f = 6.0\text{ GHz}$		1.2	
P _{1 dB}	Output Power @ 1 dB Gain Compression: $V_{DS} = 5\text{ V}$, $I_{DS} = 80\text{ mA}$	$f = 2.0\text{ GHz}$		16.0	
		$f = 4.0\text{ GHz}$		13.0	
		$f = 6.0\text{ GHz}$		10.0	
G _{1 dB}	1 dB Compressed Gain: $V_{DS} = 5\text{ V}$, $I_{DS} = 80\text{ mA}$	$f = 4.0\text{ GHz}$		13.0	
g _m	Transconductance: $V_{DS} = 3\text{ V}$, $V_{GS} = 0\text{ V}$	mmho	70	120	
I _{DSS}	Saturated Drain Current: $V_{DS} = 3\text{ V}$, $V_{GS} = 0\text{ V}$	mA	80	120	200
V _P	Pinchoff Voltage: $V_{DS} = 3\text{ V}$, $I_{DS} = 1\text{ mA}$	V	-3.0	-1.5	-0.8

Note: 1. RF performance is determined by assembling and testing 10 samples per wafer.

Absolute Maximum Ratings

Parameter	Symbol	Absolute Maximum ¹
Drain-Source Voltage	V _{DS}	+7 V
Gate-Source Voltage	V _{GS}	-4 V
Drain Current	I _{DS}	I _{DSS}
Power Dissipation ^{2,3}	P _T	600 mW
Channel Temperature	T _{CH}	175°C
Storage Temperature	T _{STG}	-65°C to +175°C

Thermal Resistance: $\theta_{JC} = 150^\circ \text{C/W}$; T_{CH} = 150°C
Liquid Crystal Measurement; 1 μm Spot Size⁴

Notes:

- Operation of this device above any one of these parameters may cause permanent damage.
- Mounting Surface Temperature = 25°C.
- Derate at 6.7 mW/°C for T_{MOUNTING SURFACE} > 85°C.
- The small spot size of this technique results in a higher, though more accurate determination of θ_{JC} than do alternate methods. See MEASUREMENTS section for more information.

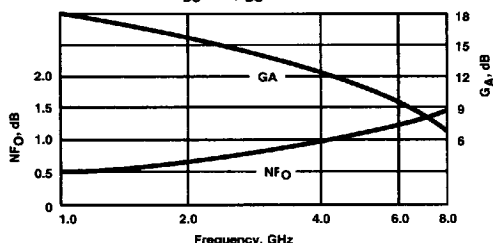
Part Number Ordering Information

Part Number	Devices Per Tray
ATF-21100-GP1	5
ATF-21100-GP3	50
ATF-21100-GP6	up to 300

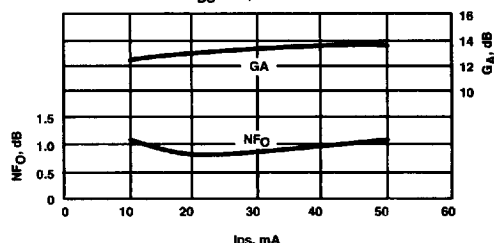
Typical Performance, T_A = 25°C

(unless otherwise noted)

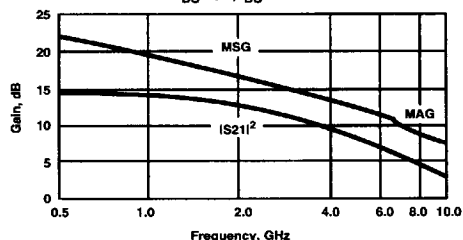
OPTIMUM NOISE FIGURE AND
ASSOCIATED GAIN vs. FREQUENCY
V_{DS} = 3 V, I_{DS} = 20 mA



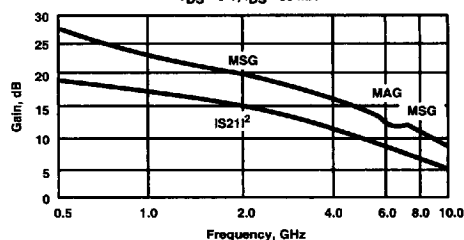
OPTIMUM NOISE FIGURE AND
ASSOCIATED GAIN vs. I_{DS}
V_{DS} = 3 V, f = 4.0 GHz



INSERTION POWER GAIN, MAXIMUM AVAILABLE GAIN
AND MAXIMUM STABLE GAIN vs. FREQUENCY
V_{DS} = 3 V, I_{DS} = 20 mA



INSERTION POWER GAIN, MAXIMUM AVAILABLE GAIN
AND MAXIMUM STABLE GAIN vs. FREQUENCY
V_{DS} = 5 V, I_{DS} = 80 mA



ATF-21100, 0.5-6 GHz

Low Noise Gallium Arsenide FET

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

Freq. GHz	S_{11}		S_{21}			S_{12}			S_{22}	
	Mag	Ang	dB	Mag	Ang	dB	Mag	Ang	Mag	Ang
0.5	.97	-20	14.0	5.00	166	-30.8	.029	77	.52	-11
1.0	.95	-34	13.7	4.82	152	-24.7	.058	73	.48	-28
2.0	.83	-69	12.6	4.26	130	-20.2	.098	56	.43	-52
3.0	.70	-101	11.1	3.59	105	-18.2	.123	45	.39	-74
4.0	.63	-129	9.5	2.97	88	-17.3	.136	39	.36	-92
5.0	.60	-152	7.9	2.47	74	-17.1	.139	36	.33	-107
6.0	.60	-169	6.4	2.10	62	-17.0	.141	34	.32	-122
7.0	.63	177	5.1	1.81	53	-17.0	.142	33	.33	-134
8.0	.66	167	4.1	1.60	44	-16.8	.145	32	.33	-145
9.0	.68	160	3.1	1.44	36	-16.4	.152	31	.34	-154
10.0	.70	155	2.1	1.32	28	-15.7	.164	27	.33	-166

 $T_A = 25^\circ\text{C}$, $V_{DS} = 5 \text{ V}$, $I_{DS} = 80 \text{ mA}$

Freq. GHz	S_{11}		S_{21}			S_{12}			S_{22}	
	Mag	Ang	dB	Mag	Ang	dB	Mag	Ang	Mag	Ang
0.5	.96	-25	18.2	8.10	161	-34.4	.019	80	.50	-9
1.0	.90	-50	17.4	7.41	144	-29.1	.035	71	.46	-17
2.0	.76	-89	15.1	5.72	117	-25.0	.056	62	.37	-26
3.0	.68	-116	13.0	4.48	99	-23.1	.070	60	.31	-32
4.0	.65	-137	11.3	3.66	85	-21.6	.083	61	.26	-38
5.0	.63	-156	9.7	3.06	72	-20.3	.097	61	.23	-49
6.0	.62	-172	8.3	2.61	61	-18.9	.113	62	.20	-65
7.0	.64	175	7.2	2.29	51	-17.8	.129	61	.19	-86
8.0	.66	163	6.2	2.04	41	-16.7	.146	60	.20	-103
9.0	.68	151	5.2	1.82	32	-15.7	.165	57	.22	-119
10.0	.71	139	4.2	1.63	23	-14.7	.184	54	.26	-135

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