AVANTEK

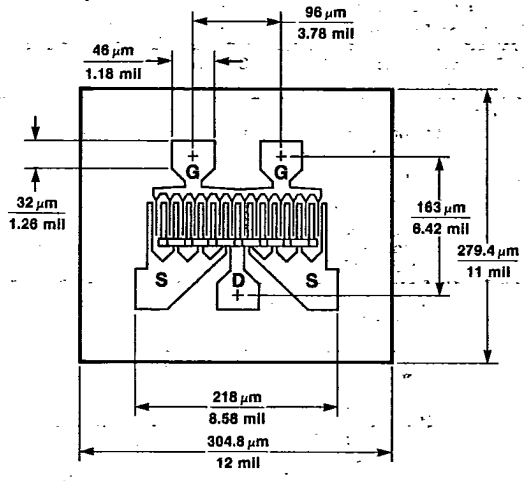
ATF-25100 (AT-8251)
0.5-10 GHz Low Noise Gallium Arsenide FET

T-31-25

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 $P_{1\,dB}$ at 4 GHz**

Avantek Chip Outline



Description

Avantek's ATF-25100 is a high performance gallium arsenide Schottky-barrier-gate field effect transistor chip. 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.

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.

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

Freq. GHz	NF_O dB	Gamma Opt Mag	Gamma Opt Ang	$R_N/50$
1.0	0.5	.91	11	1.03
2.0	0.6	.83	22	.79
4.0	0.8	.57	63	.67
6.0	1.0	.50	101	.23
8.0	1.2	.47	135	.34

Electrical Specifications, T_A = 25°C

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

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

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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	450 mW
Channel Temperature	T_{CH}	175°C
Storage Temperature	T_{STG}	–65°C to +175°C

Thermal Resistance: θ_{jc} = 200°C/W; T_{CH} = 150°C
Liquid Crystal Measurement; 1 µm Spot Size[4]

Notes:
1. Operation of this device above any one of these parameters may cause permanent damage.
2. Mounting Surface Temperature = 25°C.
3. Derate at 5 mW/°C for $T_{MOUNTING\ SURFACE}$ > 85°C.
4. 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.

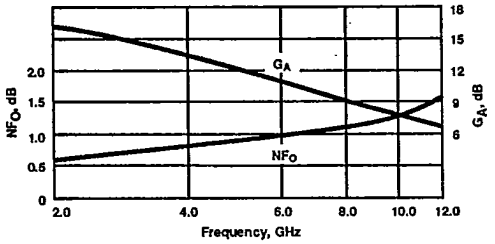
Part Number Ordering Information

Part Number	Devices Per Tray
ATF-25100-GP1	5
ATF-25100-GP3	50
ATF-25100-GP6	up to 300

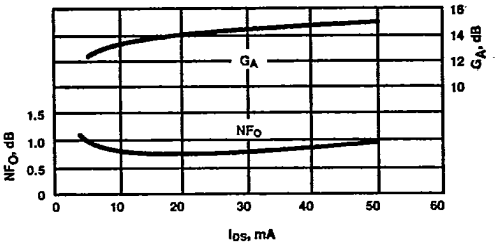
Typical Performance, T_A = 25°C

(unless otherwise noted)

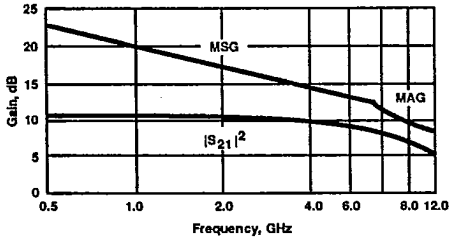
OPTIMUM NOISE FIGURE AND ASSOCIATED GAIN vs. FREQUENCY
V_{DS} = 3 V, I_{DS} = 20 mA



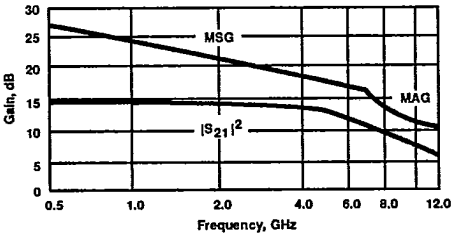
OPTIMUM NOISE FIGURE AND ASSOCIATED GAIN vs. I_{DS}
V_{DS} = 3 V, f = 4.0 GHz



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} = 50 mA



ATF-25100, 0.5-10 GHz
Low Noise Gallium Arsenide FET

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Typical Scattering Parameters: Common Source, Z_O = 50 Ω T_A = 25°C, V_{DS} = 3 V, I_{DS} = 20 mA

Freq. GHz	S_{11}		S_{21}			S_{12}			S_{22}	
	Mag	Ang	dB	Mag	Ang	dB	Mag	Ang	Mag	Ang
0.5	.98	–11	10.4	3.30	173	–34.9	.018	89	.53	–3
1.0	.98	–19	10.4	3.30	165	–29.9	.032	84	.52	–6
2.0	.96	–35	10.3	3.29	150	–24.3	.061	74	.47	–12
3.0	.94	–53	10.1	3.22	134	–21.0	.089	64	.41	–23
4.0	.87	–74	9.9	3.13	117	–19.0	.112	55	.32	–33
5.0	.79	–94	9.2	2.88	103	–18.1	.125	49	.24	–43
6.0	.74	–115	8.6	2.68	89	–17.0	.141	39	.13	–60
7.0	.70	–134	7.7	2.43	77	–16.7	.146	35	.03	–167
8.0	.66	–151	6.8	2.20	67	–16.3	.153	32	.07	155
9.0	.66	–163	6.4	2.09	57	–15.9	.160	25	.13	138
10.0	.67	–176	5.7	1.93	46	–15.8	.163	23	.17	135
11.0	.68	171	5.2	1.81	37	–15.5	.167	18	.23	132
12.0	.68	162	4.5	1.68	24	–15.4	.170	9	.24	130
									T_A = 25°C, V_{DS} = 5 V, I_{DS} = 50 mA	
0.5	.98	–14	14.6	5.40	173	–39.2	.011	88	.69	–1
1.0	.98	–25	14.5	5.32	163	–34.0	.020	82	.67	–5
2.0	.93	–47	14.3	5.16	144	–28.4	.038	71	.60	–12
3.0	.89	–70	13.7	4.82	127	–25.0	.056	65	.53	–17
4.0	.82	–94	13.0	4.48	110	–23.4	.068	52	.46	–20
5.0	.75	–117	11.8	3.88	97	–22.5	.075	50	.40	–24
6.0	.71	–137	10.9	3.51	83	–21.9	.080	46	.31	–29
7.0	.70	–159	9.7	3.07	71	–21.6	.083	42	.22	–35
8.0	.71	–169	8.7	2.73	63	–21.3	.086	41	.16	–42
9.0	.72	180	8.1	2.53	54	–20.9	.090	40	.12	–46
10.0	.73	172	7.3	2.31	44	–20.6	.093	39	.09	–55
11.0	.74	162	6.6	2.13	35	–20.2	.098	36	.05	–131
12.0	.73	150	6.4	2.08	21	–19.7	.104	34	.08	–170

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