NEC

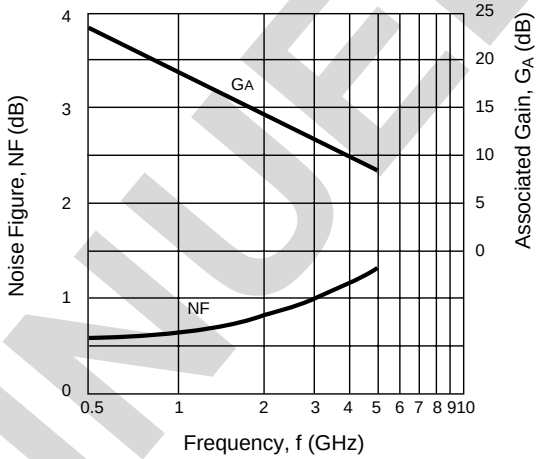
GaAs MESFET
L TO S BAND LOW NOISE AMPLIFIER

NE76118

FEATURES

- **LOW COST MINIATURE PLASTIC PACKAGE (SOT-343)**
- **LOW NOISE FIGURE:** 0.8 dB typical at 2 GHz
- **HIGH ASSOCIATED GAIN:** 13.5 dB typical at 2 GHz
- **L_G = 1.0 μm, W_G = 400 μm**
- **TAPE & REEL PACKAGING**

NOISE FIGURE & ASSOCIATED GAIN vs. FREQUENCY
V_{DS} = 3 V, I_D= 10 mA



DESCRIPTION

The NE76118 is a low cost gallium arsenide metal semiconductor field effect transistor housed in a miniature (SOT-343) plastic surface mount package. The device is fabricated using ion implantation for improved RF and DC performance, reliability, and uniformity. Its low noise figure, high gain, small size and weight make it an ideal low noise amplifier transistor in the 1-4 GHz frequency range. The NE76118 is suitable for GPS, PCS, WLAN, MMDS, TVRO, and other commercial applications.

NEC's stringent quality assurance and test procedures ensure the highest reliability and performance.

ELECTRICAL CHARACTERISTICS (T_A = 25°C)

PART NUMBER PACKAGE OUTLINE			NE76118 18		
SYMBOL	**PARAMETERS AND CONDITIONS**	**UNITS**	**MIN**	**TYP**	**MAX**
NF	Noise Figure at V_{DS} = 3 V, I_D = 10 mA				
	f = 2 GHz	dB		0.8	
	f = 4 GHz	dB		0.9	1.4
G_A	Associated Gain at V_{DS} = 3 V, I_D = 10 mA				
	f = 2 GHz	dB		13.5	
	f = 4 GHz	dB	9.5	10.5	
P_{1dB}	Output Power at 1 dB Gain Compression Point, f = 2 GHz				
	V_{DS} = 3 V, I_{DS} = 10 mA	dBm		12	
	V_{DS} = 3 V, I_{DS} = 30 mA	dBm		14	
G_{1dB}	Gain at P_{1dB}, f = 2 GHz				
	V_{DS} = 3 V, I_{DS} = 10 mA	dB		13	
	V_{DS} = 3 V, I_{DS} = 30 mA	dB		14	
I_{DSS}	Saturated Drain Current at V_{DS} = 3 V, V_{GS} = 0 V	mA	30		100
V_P	Pinch Off Voltage at V_{DS} = 3 V, I_D = 100 μA	V	-3.0		-0.5
g_m	Transconductance at V_{DS} = 3 V, I_D = 10 mA	mS	20	45	
I_{GSO}	Gate to Source Leakage Current at V_{GS} = -5 V	μA			10

Note:
1. Typical values of noise figures and associated gain are those obtained when 50% of the devices from a large number of lots were individually measured in a circuit with the input individually tuned to obtain the minimum value. Maximum values are criteria established on the production line as a "go-no-go" screening test with the fixture tuned for the "generic" type but not for each specimen.

ABSOLUTE MAXIMUM RATINGS[1] (T_A = 25°C)

SYMBOLS	PARAMETERS	UNITS	RATINGS
V_{DS}	Drain to Source Voltage	V	5
V_{GDO}	Gate to Drain Voltage	V	-5
V_{GSO}	Gate to Source Voltage	V	-6
I_{DS}	Drain Current	mA	I_{DSS}
T_{CH}	Channel Temperature	°C	150
T_{STG}	Storage Temperature	°C	-65 to +150
P_T	Total Power Dissipation	mW	130

Note:
1.Operation in excess of any one of these parameters may result in permanent damage.

TYPICAL NOISE PARAMETERS (T_A = 25°C)

V_{CE} = 3 V, I_C = 10 mA

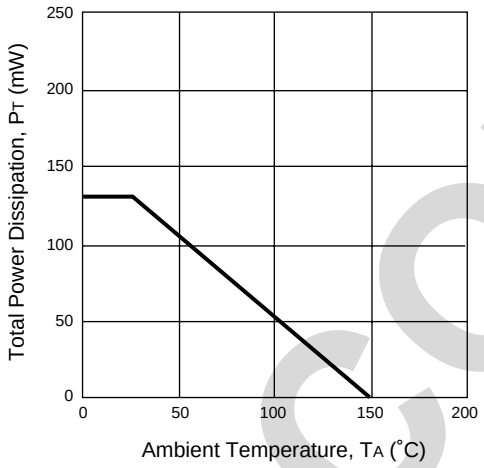
FREQ. (MHz)	NF_{OPT} (dB)	G_A (dB)	Γ_{OPT} MAG	Γ_{OPT} ANG	Rn/50
500	0.55	23.0	0.77	9	0.64
1000	0.65	18.0	0.78	26	0.50
1500	0.75	16.0	0.80	38	0.41
2000	0.85	14.2	0.79	42	0.35
2500	0.93	12.9	0.78	47	0.30
3000	1.00	11.7	0.76	55	0.26
3500	1.08	10.7	0.72	64	0.23
4000	1.15	10.0	0.64	76	0.20
4500	1.22	9.2	0.45	94	0.18
5000	1.30	8.5	0.28	109	0.16

RECOMMENDED OPERATING CONDITIONS

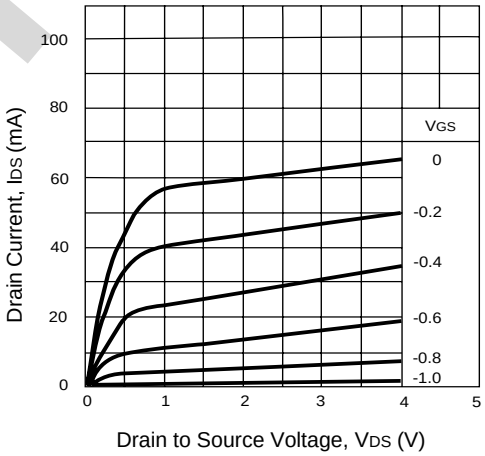
SYMBOLS	PARAMETERS	UNITS	MIN	TYP	MAX
V_{DS}	Drain to Source Voltage	V		3	4
I_D	Drain Current	mA		10	20
P_{IN}	Input Power	dBm			0

TYPICAL PERFORMANCE CURVES (T_A = 25°C)

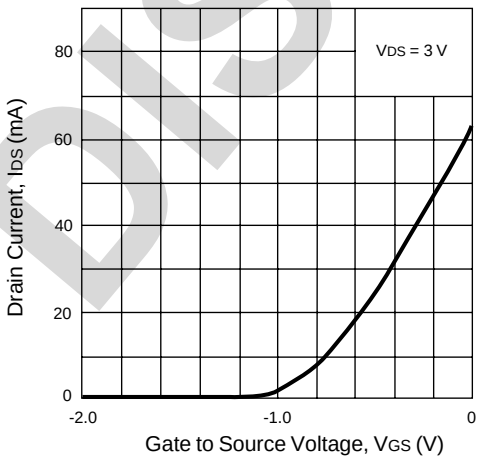
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



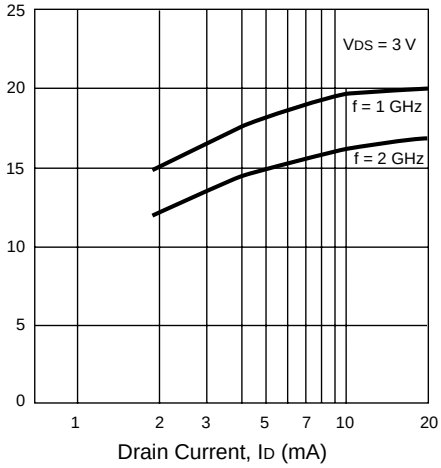
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



DRAIN CURRENT vs. GATE TO SOURCE VOLTAGE



FORWARD INSERTION GAIN vs. DRAIN CURRENT



TYPICAL SCATTERING PARAMETERS (T_A = 25°C)

V_{DS} = 2 V, I_{DS} = 10 mA

FREQUENCY	S_{11}		S_{21}		S_{12}		S_{22}		K	MAG[1]
(MHz)	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG		(dB)
100	1.001	-3.3	3.816	176.6	0.004	80.8	0.730	-1.2	0.07	29.4
200	0.998	-6.5	3.800	173.4	0.010	89.7	0.728	-2.2	0.02	25.9
300	0.944	-9.7	3.785	170.3	0.014	85.1	0.726	-3.4	0.10	24.3
400	0.988	-12.9	3.773	167.0	0.019	83.3	0.724	-4.5	0.15	23.0
500	0.980	-16.1	3.763	163.8	0.024	82.6	0.721	-5.6	0.17	21.9
600	0.972	-19.3	3.741	160.5	0.028	80.2	0.716	-6.8	0.22	21.2
700	0.961	-22.5	3.717	157.4	0.033	79.9	0.712	-7.9	0.24	20.5
800	0.951	-25.7	3.689	154.3	0.037	78.0	0.707	-9.0	0.28	19.9
900	0.937	-28.9	3.651	151.2	0.042	76.7	0.701	-10.2	0.31	19.4
1000	0.924	-32.0	3.615	148.1	0.046	74.7	0.694	-11.3	0.36	18.9
1500	0.846	-47.4	3.403	133.3	0.065	68.5	0.659	-16.7	0.51	17.2
2000	0.761	-61.7	3.138	119.7	0.081	63.8	0.621	-21.5	0.67	15.9
2500	0.678	-74.3	2.856	107.6	0.093	60.6	0.590	-24.8	0.82	14.9
3000	0.604	-85.0	2.605	97.0	0.103	59.5	0.570	-26.9	0.94	14.0
3500	0.536	-94.7	2.397	87.8	0.115	60.1	0.554	-27.5	1.04	12.1
4000	0.472	-103.8	2.227	79.4	0.128	61.0	0.536	-27.2	1.11	10.4
4500	0.414	-113.5	2.106	71.4	0.144	62.4	0.515	-26.4	1.14	9.4
5000	0.356	-123.7	2.011	63.1	0.165	63.8	0.492	-26.0	1.14	8.6

V_{DS} = 2 V, I_{DS} = 30 mA

FREQUENCY	S_{11}		S_{21}		S_{12}		S_{22}		K	MAG[1]
(MHz)	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG		(dB)
100	1.001	-3.7	5.136	176.2	0.004	84.5	0.650	-1.1	0.03	31.3
200	0.996	-7.4	5.109	172.4	0.009	90.1	0.650	-2.0	0.05	27.7
300	0.990	-10.9	5.074	168.8	0.013	87.6	0.647	-2.9	0.12	26.1
400	0.982	-14.5	5.045	165.2	0.016	85.2	0.645	-3.8	0.19	25.1
500	0.971	-18.1	5.008	161.6	0.021	84.7	0.641	-4.8	0.22	23.7
600	0.959	-21.7	4.957	157.9	0.024	81.8	0.637	-5.7	0.29	23.1
700	0.944	-25.2	4.903	154.3	0.028	81.0	0.633	-6.7	0.33	22.4
800	0.929	-28.6	4.838	151.0	0.032	79.8	0.628	-7.6	0.38	21.9
900	0.911	-32.1	4.762	147.5	0.036	79.7	0.623	-8.5	0.41	21.3
1000	0.893	-35.4	4.689	144.1	0.039	77.5	0.617	-9.4	0.47	20.8
1500	0.794	-51.5	4.276	128.5	0.056	73.1	0.587	-13.6	0.65	18.9
2000	0.693	-65.8	3.827	114.7	0.070	70.4	0.558	-17.4	0.81	17.4
2500	0.602	-77.8	3.398	102.7	0.083	68.2	0.538	-19.7	0.95	16.1
3000	0.525	-87.6	3.032	92.5	0.097	68.0	0.531	-21.2	1.04	13.8
3500	0.458	-95.9	2.738	83.8	0.111	68.1	0.526	-21.5	1.10	12.0
4000	0.399	-103.6	2.500	76.0	0.127	68.7	0.520	-21.1	1.13	10.8
4500	0.348	-111.9	2.329	68.6	0.147	68.9	0.508	-20.3	1.13	9.9
5000	0.299	-120.4	2.196	61.1	0.172	68.6	0.494	-19.6	1.10	9.1

V_{DS} = 3 V, I_{DS} = 10 mA

FREQUENCY	S_{11}		S_{21}		S_{12}		S_{22}		K	MAG[1]
(MHz)	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG		(dB)
100	1.001	-3.2	3.840	176.6	0.003	95.2	0.763	-1.3	-0.11	30.6
200	0.998	-6.5	3.825	173.4	0.009	90.4	0.763	-2.2	0.01	26.2
300	0.993	-9.6	3.808	170.3	0.012	85.4	0.761	-3.1	0.10	24.9
400	0.988	-12.8	3.795	167.1	0.017	84.7	0.759	-4.1	0.13	23.5
500	0.979	-15.9	3.786	163.9	0.022	83.3	0.756	-5.1	0.17	22.4
600	0.972	-19.2	3.764	160.6	0.025	80.9	0.752	-6.1	0.21	21.7
700	0.961	-22.3	3.741	157.5	0.029	79.7	0.748	-7.2	0.25	21.1
800	0.951	-25.5	3.712	154.5	0.033	77.8	0.743	-8.2	0.29	20.5
900	0.937	-28.6	3.675	151.3	0.037	77.5	0.738	-9.2	0.31	20.0
1000	0.924	-31.7	3.638	148.2	0.041	75.2	0.732	-10.3	0.36	19.5
1500	0.847	-46.9	3.427	133.5	0.057	69.3	0.698	-15.2	0.52	17.8
2000	0.762	-61.2	3.162	120.0	0.071	65.2	0.662	-19.6	0.68	16.5
2500	0.679	-73.6	2.877	107.9	0.080	62.3	0.632	-22.7	0.84	15.5
3000	0.605	-84.3	2.622	97.3	0.089	61.9	0.613	-24.5	0.98	14.7
3500	0.536	-93.8	2.410	88.3	0.099	63.5	0.597	-25.1	1.08	12.2
4000	0.471	-102.7	2.237	80.0	0.110	65.5	0.582	-24.6	1.15	10.7
4500	0.412	-111.9	2.115	72.1	0.126	68.1	0.566	-23.7	1.17	9.8
5000	0.355	-121.2	2.022	64.0	0.147	70.6	0.548	-23.1	1.15	9.1

TYPICAL SCATTERING PARAMETERS (T_A = 25 °C)

V_{DS} = 3 V, I_{DS} = 30 mA

FREQUENCY	S_{11}		S_{21}		S_{12}		S_{22}		K	MAG[1]
(MHz)	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG		(dB)
100	0.999	-3.6	5.174	176.2	0.002	102.3	0.695	-1.0	-0.11	33.9
200	0.996	-7.4	5.143	172.3	0.008	92.4	0.695	-1.9	0.03	28.3
300	0.990	-10.8	5.106	168.8	0.011	84.5	0.694	-2.7	0.16	26.6
400	0.981	-14.5	5.076	165.1	0.015	84.5	0.691	-3.7	0.19	25.4
500	0.970	-18.0	5.037	161.5	0.019	83.6	0.688	-4.6	0.24	24.2
600	0.959	-21.6	4.984	157.8	0.022	81.3	0.683	-5.5	0.29	23.6
700	0.944	-25.1	4.929	154.3	0.025	81.1	0.680	-6.4	0.33	22.9
800	0.928	-28.5	4.861	150.9	0.029	80.1	0.674	-7.3	0.37	22.3
900	0.910	-31.9	4.786	147.4	0.032	79.3	0.669	-8.2	0.42	21.7
1000	0.892	-35.3	4.709	144.0	0.035	77.9	0.663	-9.1	0.46	21.3
1500	0.793	-51.2	4.290	128.4	0.050	73.3	0.633	-13.0	0.66	19.3
2000	0.694	-65.3	3.836	114.6	0.063	70.7	0.604	-16.6	0.83	17.9
2500	0.603	-77.1	3.401	102.7	0.074	69.5	0.584	-18.9	0.97	16.6
3000	0.527	-86.7	3.032	92.5	0.085	69.9	0.574	-20.3	1.07	13.9
3500	0.461	-94.7	2.735	84.0	0.098	70.8	0.570	-20.6	1.12	12.3
4000	0.402	-102.0	2.497	76.3	0.113	72.2	0.564	-20.1	1.15	11.1
4500	0.352	-109.5	2.327	69.1	0.132	73.4	0.557	-19.2	1.13	10.2
5000	0.305	-117.2	2.199	61.8	0.156	74.1	0.545	-18.6	1.10	9.6

Note:

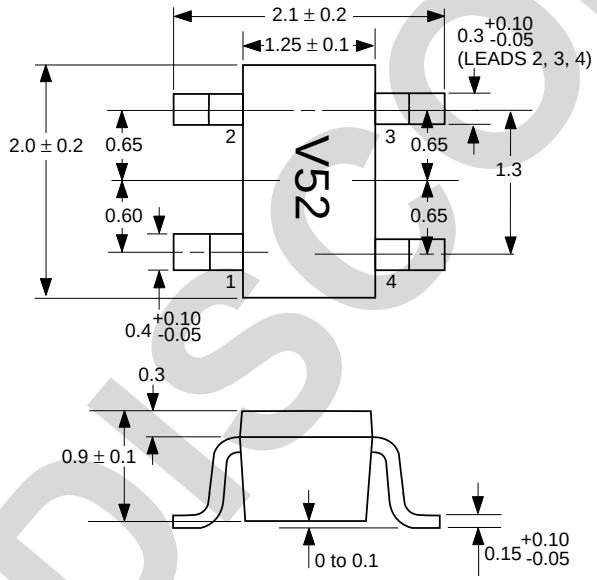
1. Gain Calculations:

MAG = $\frac{|S_{21}|}{|S_{12}|}\left(K \pm \sqrt{K^2 - 1}\right)$. When K ≤ 1, MAG is undefined and MSG values are used. MSG = $\frac{|S_{21}|}{|S_{12}|}$, K = $\frac{1 + |\Delta|^2 - |S_{11}|^2 - |S_{22}|^2}{2\,|S_{12}\,S_{21}|}$, $\Delta = S_{11}\,S_{22} - S_{21}\,S_{12}$

MAG = Maximum Available Gain
MSG = Maximum Stable Gain

OUTLINE DIMENSIONS (Units in mm)

PACKAGE OUTLINE 18



Pin Connections
1. Source
2. Gate
3. Source
4. Drain

ORDERING INFORMATION

PART NUMBER	QTY
NE76118-T1	3 K pcs per Reel[1]
NE76118-T2	3 K pcs per Reel[2]

Notes:
1. Embossed tape 8 mm wide. Pin 3 (source) and pin 4 (drain) face perforated side of the tape.
2. Embossed tape 8 mm wide. Pin 1 (source) and pin 2 (gate) face perforated side of the tape.