

< Low Noise GaAs HEMT >

MGF4941CL

Micro-X type plastic package

DESCRIPTION

The MGF4941CL super-low noise InGaAs HEMT (High Electron Mobility Transistor) is designed for use in K band amplifiers.

The MGF4941CL is designed for automotive application and AEC-Q101 qualified.

FEATURES

Low noise figure @ f=25.2GHz
NFmin. = 2.4dB (Typ.)

High associated gain @ f=25.2GHz
Gs = 10.0dB (Typ.)

APPLICATION

K band low noise amplifiers

QUALITY GRADE

GG

MITSUBISHI Proprietary

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RECOMMENDED BIAS CONDITIONS

$V_{DS}=1.5V$, $V_{GS}=0V$

ORDERING INFORMATION

Tape & reel 4000pcs./reel

RoHS COMPLIANT

MGF4941CL is a RoHS compliant product. RoHS compliance is indicated by the letter "G" after the Lot Marking.

ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

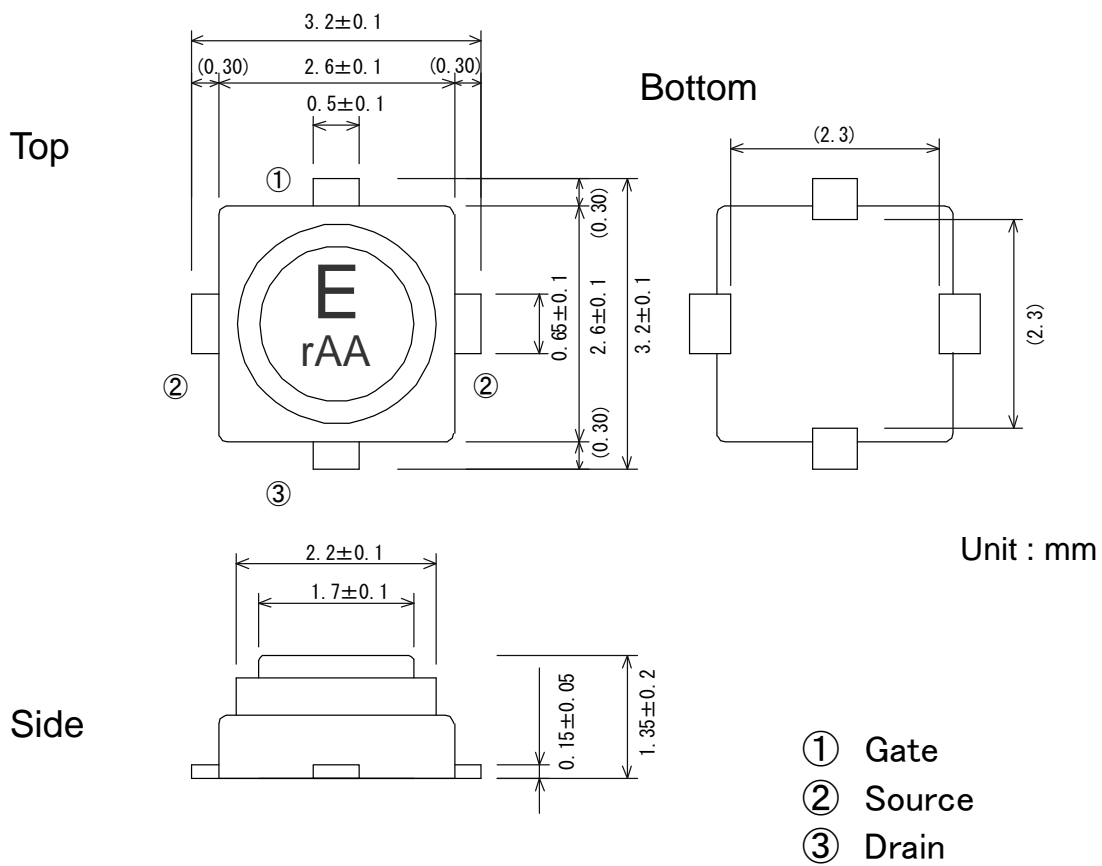
Symbol	Parameter	Ratings	Unit
VGDO	Gate to drain voltage	-3	V
VGSO	Gate to source voltage	-3	V
ID	Drain current	55	mA
PT	Total power dissipation	75	mW
Tch	Channel temperature	125	°C
Tstg	Storage temperature	-55 to +125	°C

ELECTRICAL CHARACTERISTICS (Ta=25°C)

Symbol	Parameter	Test conditions	Limits			Unit
			MIN.	TYP.	MAX	
$V_{(BR)GDO}$	Gate to drain breakdown voltage	$I_G=-10\mu A$	-3	--	--	V
I_{GSS}	Gate to source leakage current	$V_{GS}=-2V, V_{DS}=0V$	--	--	50	μA
I_{DSS}	Saturated drain current	$V_{GS}=0V, V_{DS}=1.5V$	15	--	60	mA
$V_{GS(off)}$	Gate to source cut-off voltage	$V_{DS}=1.5V, I_D=500\mu A$	-0.1	--	-1.5	V
Gs	Associated gain	$V_{DS}=1.5V,$ $V_{GS}=0V, f=25.2GHz$	7.5	10.0	--	dB
NFmin.	Minimum noise figure		--	2.4	3.8	dB

Note: Gs and NFmin. are tested with sampling inspection.

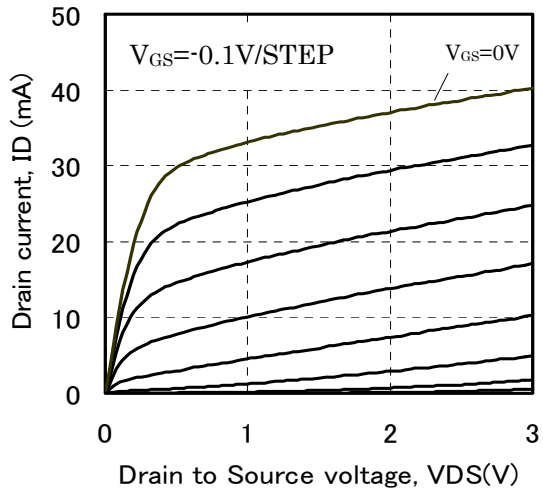
Fig.1



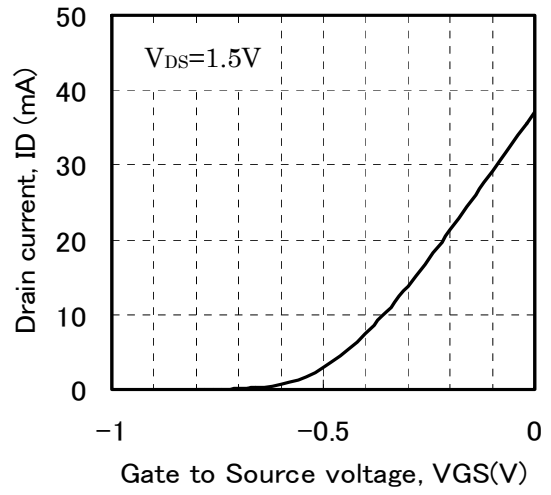
(GD-32)

TYPICAL CHARACTERISTICS (Ta=25°C)

I_D vs. V_{DS}



I_D vs. V_{GS}

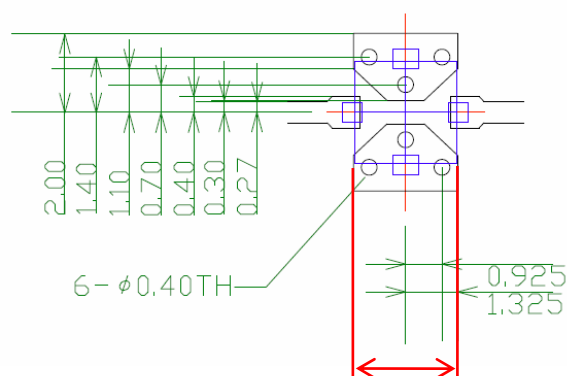


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S PARAMETERS (Ta=25°C, VDS=1.5V, VGS=0V)

Freq. (GHz)	S11		S21		S12		S22	
	(mag)	(ang)	(mag)	(ang)	(mag)	(ang)	(mag)	(ang)
1	0.991	-14.6	5.674	164.4	0.011	79.7	0.574	-11.4
2	0.971	-28.7	5.559	149.7	0.021	69.1	0.568	-22.4
3	0.944	-42.4	5.412	135.5	0.031	59.8	0.560	-33.1
4	0.908	-56.1	5.273	121.4	0.040	50.5	0.549	-43.5
5	0.868	-69.0	5.104	107.9	0.049	41.8	0.536	-53.3
6	0.825	-81.6	4.936	94.7	0.056	33.4	0.523	-62.5
7	0.780	-94.2	4.791	81.7	0.064	25.4	0.509	-71.4
8	0.729	-107.0	4.635	68.7	0.071	17.1	0.488	-80.3
9	0.671	-119.5	4.480	56.3	0.077	8.5	0.463	-88.2
10	0.616	-132.5	4.352	43.9	0.083	0.6	0.437	-96.1
11	0.561	-146.1	4.245	31.7	0.088	-7.1	0.409	-103.5
12	0.498	-161.3	4.116	19.4	0.091	-16.8	0.369	-110.2
13	0.455	-178.0	4.066	6.9	0.097	-23.0	0.343	-117.9
14	0.420	163.4	4.021	-5.7	0.099	-29.5	0.314	-125.1
15	0.396	141.2	3.932	-18.9	0.104	-37.1	0.267	-134.0
16	0.399	116.5	3.810	-33.0	0.110	-44.4	0.211	-147.1
17	0.420	92.5	3.680	-46.8	0.117	-53.3	0.152	-160.7
18	0.470	70.7	3.491	-60.8	0.122	-62.7	0.087	169.4
19	0.529	51.5	3.293	-74.4	0.125	-72.8	0.055	96.1
20	0.593	34.3	3.087	-87.9	0.127	-82.2	0.106	37.6
21	0.649	20.1	2.862	-100.8	0.128	-89.9	0.177	16.8
22	0.704	7.7	2.637	-113.5	0.126	-100.4	0.247	3.7
23	0.748	-3.6	2.411	-125.9	0.126	-108.5	0.312	-6.3
24	0.780	-13.2	2.188	-136.9	0.120	-117.3	0.364	-16.9
25	0.803	-21.1	2.037	-147.1	0.118	-124.0	0.402	-23.6
26	0.828	-28.6	1.885	-158.3	0.116	-129.7	0.442	-29.4

Freq. (GHz)	NFmin (dB)	Γ_{opt}		Rn (Ω)
		(mag)	(ang)	
6	0.47	0.81	53.2	15.0
7	0.57	0.74	66.4	13.5
8	0.66	0.67	80.7	11.5
9	0.76	0.59	96.3	9.0
10	0.86	0.52	113.0	7.0
11	0.95	0.46	130.8	5.5
12	1.05	0.40	149.6	4.5
13	1.14	0.35	169.5	4.0
14	1.24	0.31	-169.5	5.0
15	1.34	0.29	-147.6	6.5
16	1.43	0.29	-124.7	8.5
17	1.53	0.31	-100.9	12.0
18	1.63	0.35	-76.2	16.5
19	1.72	0.42	-50.6	22.5
20	1.82	0.52	-24.2	30.5
21	1.92	0.64	3.1	38.5



Calibration plane=2.6mm

- Recommended foot pattern;
 RO4350B/Rogers ($\epsilon_r=3.48$, $t=0.254\text{mm}$)

Note

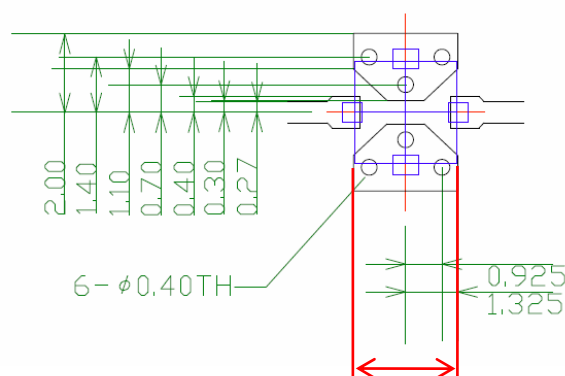
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S PARAMETERS (Ta=25°C, VDS=1.5V, IDS=10mA)

Freq. (GHz)	S11		S21		S12		S22	
	(mag)	(ang)	(mag)	(ang)	(mag)	(ang)	(mag)	(ang)
1	0.992	-14.2	4.930	164.8	0.013	78.3	0.638	-11.9
2	0.974	-28.1	4.850	150.3	0.026	67.8	0.630	-23.5
3	0.951	-41.5	4.737	136.4	0.038	57.9	0.621	-34.7
4	0.920	-55.0	4.638	122.5	0.049	47.8	0.607	-45.8
5	0.884	-67.8	4.517	109.1	0.059	38.3	0.592	-56.2
6	0.845	-80.4	4.395	96.0	0.068	29.3	0.575	-66.1
7	0.805	-93.0	4.292	83.0	0.077	20.6	0.556	-75.8
8	0.758	-106.0	4.184	70.0	0.085	11.3	0.531	-85.5
9	0.704	-118.7	4.075	57.4	0.092	2.1	0.501	-94.4
10	0.650	-132.1	3.984	44.9	0.098	-7.1	0.467	-103.2
11	0.596	-146.2	3.913	32.4	0.104	-15.6	0.432	-111.9
12	0.535	-161.9	3.820	19.7	0.107	-25.7	0.382	-120.2
13	0.492	-179.2	3.789	6.8	0.112	-33.3	0.346	-129.1
14	0.456	161.5	3.759	-6.3	0.114	-40.8	0.305	-137.9
15	0.432	138.9	3.678	-20.1	0.117	-49.5	0.248	-149.3
16	0.432	114.0	3.559	-34.6	0.122	-57.6	0.187	-165.8
17	0.453	90.0	3.423	-48.9	0.124	-66.6	0.126	173.3
18	0.499	68.1	3.229	-63.2	0.127	-75.6	0.082	124.9
19	0.551	49.1	3.027	-77.0	0.128	-85.7	0.099	64.8
20	0.612	32.0	2.823	-90.6	0.126	-94.5	0.157	30.2
21	0.663	17.9	2.603	-103.5	0.123	-103.3	0.224	13.1
22	0.708	5.8	2.390	-116.1	0.123	-111.0	0.287	0.8
23	0.749	-5.2	2.179	-128.5	0.120	-119.0	0.344	-9.2
24	0.777	-14.6	1.974	-139.5	0.111	-127.7	0.392	-19.3
25	0.797	-22.5	1.833	-149.7	0.110	-132.9	0.426	-25.5
26	0.821	-29.6	1.696	-160.8	0.105	-139.5	0.463	-31.5

Freq. (GHz)	NFmin (dB)	Γ_{opt}		Rn (Ω)
		(mag)	(ang)	
6	0.16	0.88	51.8	9.0
7	0.22	0.81	59.5	8.5
8	0.29	0.73	67.7	8.0
9	0.36	0.65	76.7	7.0
10	0.42	0.56	86.9	6.0
11	0.49	0.48	98.6	5.0
12	0.55	0.41	112.0	4.5
13	0.62	0.34	127.5	3.5
14	0.68	0.29	145.4	3.5
15	0.75	0.25	165.9	3.5
16	0.81	0.23	-170.6	4.0
17	0.88	0.23	-143.8	4.5
18	0.94	0.25	-113.4	6.0
19	1.01	0.31	-79.1	8.5
20	1.08	0.39	-40.6	13.0
21	1.14	0.51	2.3	18.0



- Recommended foot pattern;
 RO4350B/Rogers ($\epsilon_r=3.48$, $t=0.254\text{mm}$)

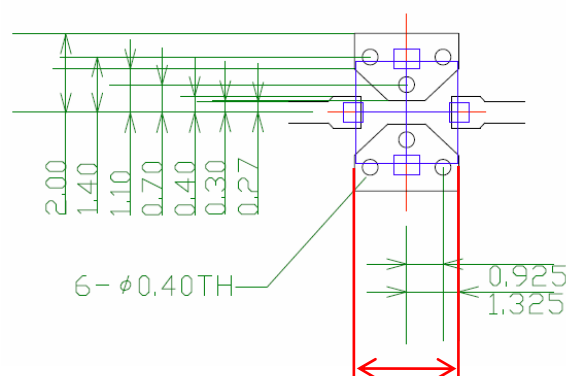
Note

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S PARAMETERS (Ta=25°C, VDS=2.0V, IDS=10mA)

Freq. (GHz)	S11		S21		S12		S22	
	(mag)	(ang)	(mag)	(ang)	(mag)	(ang)	(mag)	(ang)
1	0.992	-14.3	4.869	164.7	0.013	78.3	0.656	-11.8
2	0.974	-28.1	4.789	150.3	0.025	67.7	0.649	-23.3
3	0.951	-41.6	4.680	136.3	0.037	57.8	0.639	-34.5
4	0.920	-55.1	4.579	122.5	0.048	47.7	0.625	-45.4
5	0.884	-67.9	4.461	109.1	0.058	38.4	0.610	-55.7
6	0.846	-80.5	4.342	96.0	0.066	29.3	0.593	-65.6
7	0.805	-93.2	4.242	83.0	0.075	20.5	0.575	-75.2
8	0.757	-106.2	4.137	70.0	0.083	11.4	0.549	-84.8
9	0.703	-118.9	4.029	57.4	0.089	2.0	0.519	-93.6
10	0.649	-132.3	3.942	44.9	0.095	-6.8	0.486	-102.3
11	0.596	-146.4	3.872	32.4	0.100	-15.1	0.452	-110.8
12	0.534	-162.2	3.784	19.7	0.104	-25.1	0.403	-118.9
13	0.491	-179.5	3.753	6.8	0.107	-32.5	0.368	-127.8
14	0.454	161.1	3.727	-6.3	0.111	-40.1	0.329	-136.1
15	0.430	138.6	3.650	-20.0	0.112	-48.4	0.275	-146.9
16	0.431	113.8	3.538	-34.6	0.117	-56.1	0.215	-162.0
17	0.452	90.1	3.408	-48.8	0.119	-64.9	0.155	179.6
18	0.498	68.3	3.222	-63.1	0.122	-73.6	0.102	143.6
19	0.551	49.2	3.029	-77.1	0.124	-83.0	0.090	85.5
20	0.612	32.3	2.827	-90.8	0.124	-92.0	0.135	42.0
21	0.664	18.0	2.614	-103.8	0.119	-100.2	0.198	19.9
22	0.712	6.2	2.406	-116.6	0.121	-109.0	0.265	6.7
23	0.751	-4.8	2.192	-129.0	0.120	-116.5	0.321	-3.9
24	0.780	-14.5	1.986	-140.3	0.111	-125.3	0.374	-14.5
25	0.801	-22.1	1.843	-150.6	0.109	-130.6	0.410	-21.5
26	0.826	-29.4	1.703	-162.0	0.107	-136.8	0.453	-27.6

Freq. (GHz)	NFmin (dB)	Γ_{opt}		Rn (Ω)
		(mag)	(ang)	
6	0.16	0.89	52.3	9.5
7	0.22	0.82	59.7	9.0
8	0.29	0.74	67.5	8.0
9	0.35	0.65	76.1	7.0
10	0.42	0.57	85.9	6.0
11	0.48	0.49	97.1	5.0
12	0.55	0.41	110.2	4.5
13	0.61	0.34	125.3	4.0
14	0.68	0.29	142.8	3.5
15	0.74	0.25	163.1	3.5
16	0.81	0.23	-173.6	3.5
17	0.87	0.24	-146.8	4.0
18	0.94	0.27	-116.4	5.5
19	1.00	0.33	-81.9	8.0
20	1.07	0.42	-43.1	12.5
21	1.13	0.54	0.5	17.5



Calibration plane=2.6mm

- Recommended foot pattern;
 RO4350B/Rogers ($\epsilon_r=3.48$, $t=0.254$ mm)

Note

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(Reference)

Flow	Item	Comment
	Wafer Process	
	Wafer Test (DC)	100% Test
	Visual Inspection	
	Chip Separation	
	Die / Wire bonding	
	Internal Visual Inspection	
	Sealing	
	Separation	
	DC Test, Marking	100% Test, Ta=25deg.C
	RF Test (1)	S-parameter, 100% Test, Ta=25deg.C
	RF Test (2)	Noise figure, Sampling Test
	QAT	
	Taping, Shipping	

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