To our customers,

Old Company Name in Catalogs and Other Documents

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Renesas Electronics website: http://www.renesas.com

April 1st, 2010
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (http://www.renesas.com)

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RENESAS

N-CHANNEL GaAs MES FET

NES1821P-50

50 W L-BAND PUSH-PULL POWER GaAs MESFET

DESCRIPTION

The NES1821P-50 is a 50 W push-pull type GaAs MESFET designed for high power transmitter applications for PCS, DCS and PHS base station systems. It is capable of delivering 50 watts of output power (CW) with high linear gain, high efficiency and excellent distortion. Its primary band is 1.8 to 2.1 GHz, however with different matching, 60 MHz or less of instantaneous bandwidth can be achieved anywhere from 1.5 to 2.1 GHz. The device employs 0.9 μm Tungsten Silicide gates, via holes, plated heat sink, and silicon dioxide passivation for superior performance, thermal characteristics, and reliability.

Reliability and performance uniformity are assured by NEC's stringent quality and control procedures.

FEATURES

- Push-pull type N-channel GaAs MESFET
- High Output Power: 50 W typ.
- High Linear Gain: 10.5 dB typ.
- High Drain Efficiency: 52 % typ. @V_{DS} = 10 V, I_{Dset} = 2 A, f = 1.96 GHz

ORDERING INFORMATION (PLAN)

PART NUMBER	PACKAGE	SUPPLYING FORM
NES1821P-50	T-86	

Remarks To order evaluation samples, please contact your local NEC sales office.
(Part number for sample order: NES1821P-50)

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C)

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

Parameter	Symbol	Ratings	Unit
Drain to Source Voltage	V_{DS}	15	V
Gate to Source Voltage	V_{GSO}	–7	V
Gate to Drain Voltage	V_{GDO}	–18	V
Drain Current	I_D	30	A
Gate Current	I_G	200	mA
Total Power Dissipation	P_T	110*1	W
Channel Temperature	T_{ch}	175	°C
Storage Temperature	T_{stg}	–65 to +175	°C

***1.** T_C = 25°C

Caution Please handle this device at static-free workstation, because this is an electrostatic sensitive device.

The information in this document is subject to change without notice.

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Printed in Japan

RECOMMENDED OPERATING LIMITS

CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Drain to Source Voltage	V_{DS}			10.0	10.0	V
Gain Compression	Gcomp				3.0	dB
Channel Temperature	T_{ch}				+150	°C
Set Drain Current	I_{Dset}	V_{DS} = 10 V, RF OFF			4.0	A
Gate Resistance*1	R_g				10	Ω

***1** Rg is the series resistance between the gate supply and the FET gate.

ELECTRICAL CHARACTERISTICS (T_A = 25 °C)

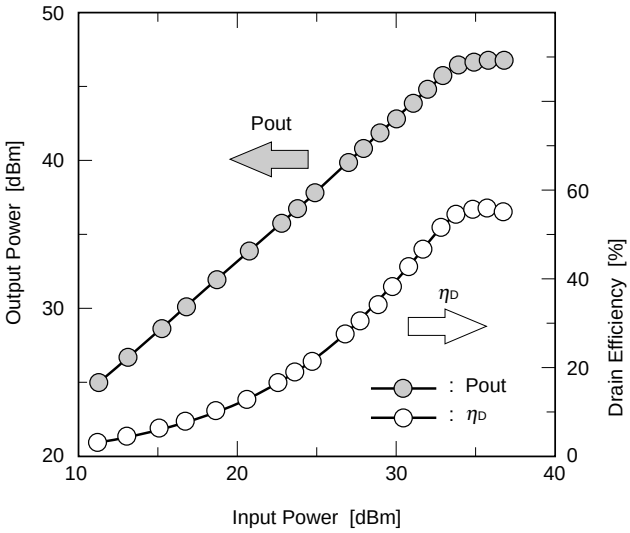
CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Saturated Drain Current	I_{DSS}	V_{DS} = 2.5 V, V_{GS} = 0 V		30.0		A
Pinch-off Voltage	V_p	V_{DS} = 2.5 V, I_D = 130 mA	–4.0	–2.6		V
Thermal Resistance	R_{th}	Channel to Case		1.0	1.5	°C/W
Output Power	P_{out}	f = 1.96 GHz, V_{DS} = 10 V Pin = +39.5 dBm, Rg = 10 Ω I_{Dset} = 2.0 A Total (RF OFF) ***2**	46.0	47.0		dBm
Drain Current	I_D			10	13	A
Drain Efficiency	η_D			52		%
Linear Gain*1	G_L		9.5	10.5		dB

***1** Pin = +30 dBm

***2** I_{Dset} = 1.0 A each drain

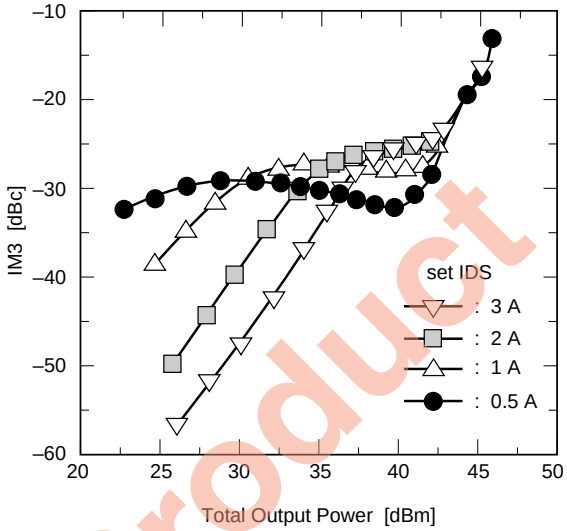
TYPICAL PERFORMANCE CURVES (T_A = 25 °C)

OUTPUT POWER AND DRAIN EFFICIENCY
vs INPUT POWER (1 tone)



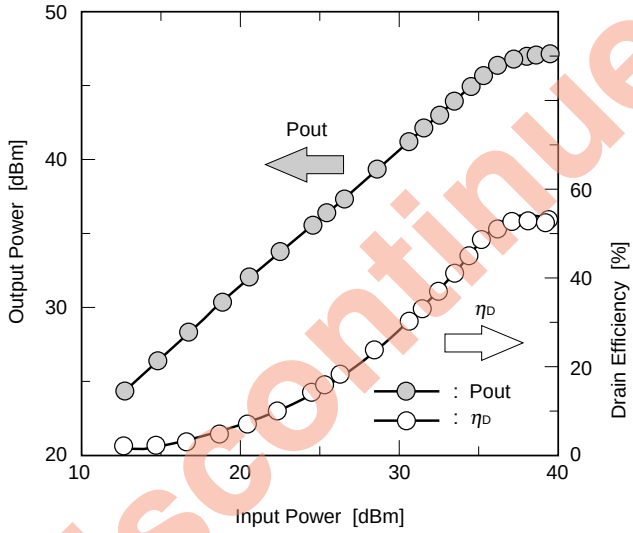
- Freq = 1.500 GHz (1tone)
- VDS = 10 V, IDSset = 1 A

INTERMODULATION DISTORTION vs
TOTAL OUTPUT POWER (2 tone signals)



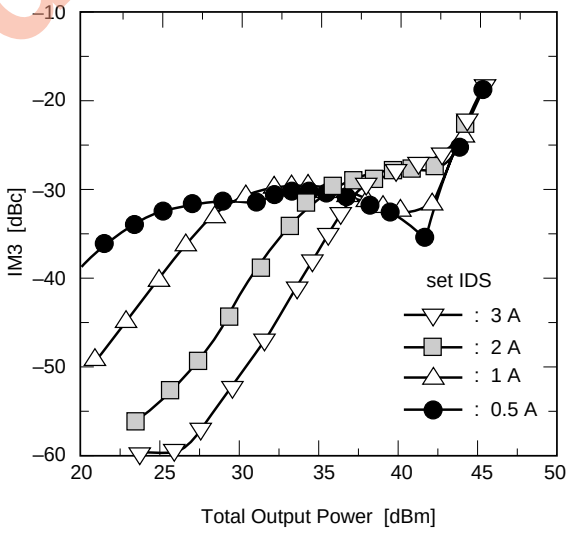
- Freq = 1.500, 1.501 GHz (2tones)
- VDS = 10 V, IDSset = 0.5, 1, 2, 3 A

OUTPUT POWER AND DRAIN EFFICIENCY
vs INPUT POWER (1 tone)



- Freq = 1.960 GHz (1tone)
- VDS = 10 V, IDSset = 1 A

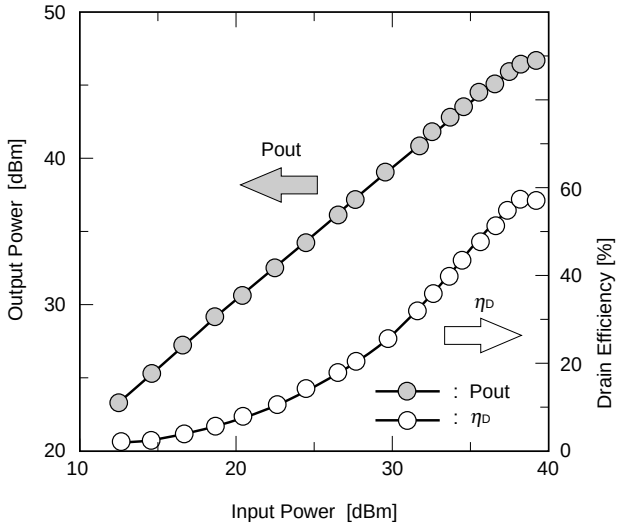
INTERMODULATION DISTORTION vs
TOTAL OUTPUT POWER (2 tone signals)



- Freq = 1.960, 1.961 GHz (2tones)
- VDS = 10 V, IDSset = 0.5, 1, 2, 3 A

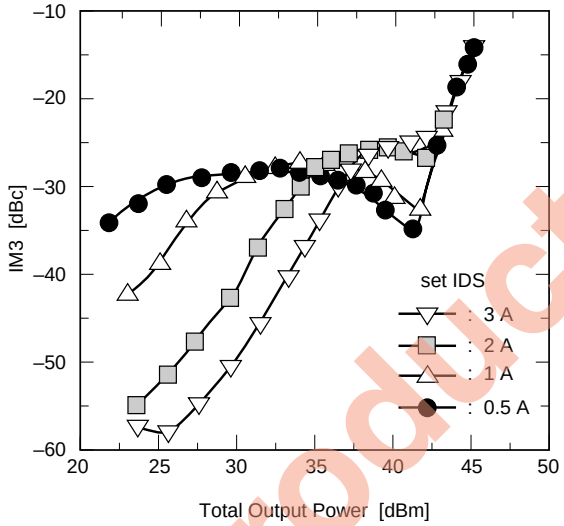
TYPICAL PERFORMANCE CURVES (T_A = 25 °C)

OUTPUT POWER AND DRAIN EFFICIENCY vs INPUT POWER (1 tone)



- Freq = 2.140 GHz (1tone)
- VDS = 10 V, IDSset = 1 A

INTERMODULATION DISTORTION vs TOTAL OUTPUT POWER (2 tone signals)



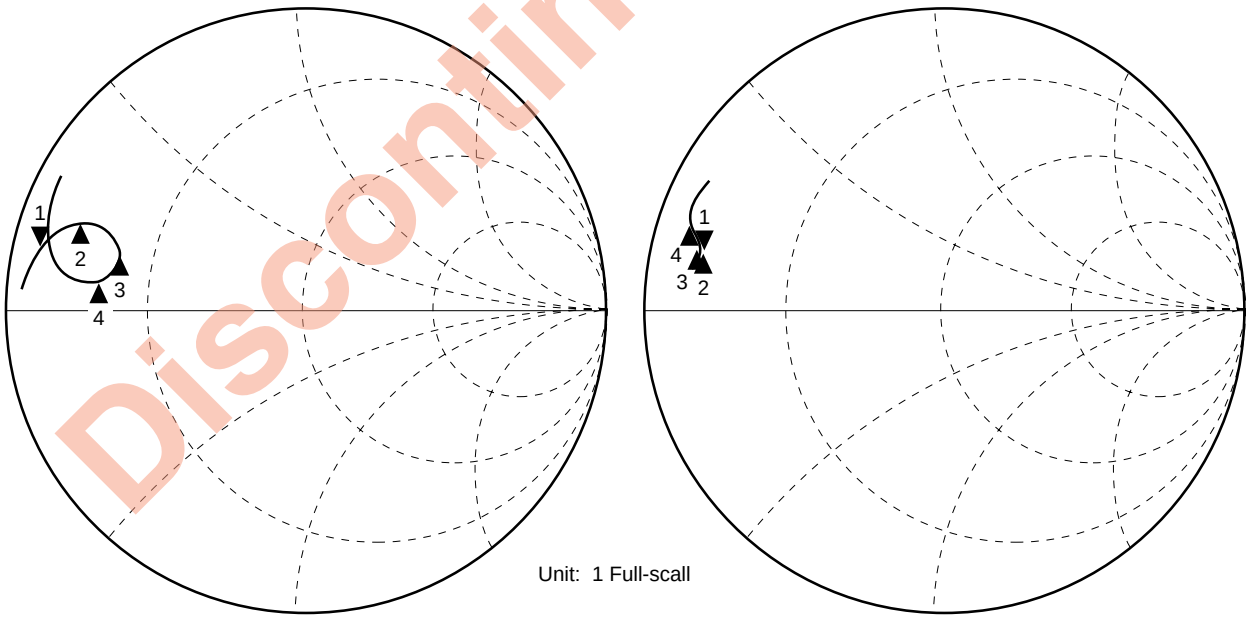
- Freq = 2.140, 2.141 GHz (2tones)
- VDS = 10 V, IDSset = 0.5, 1, 2, 3 A

S-Parameters on one drain side

VDS = 10 V, IDSset = 1 A

Marker
- 1: 1.50 GHz
- 2: 1.76 GHz
- 3: 1.96 GHz
- 4: 2.16 GHz

S11 S22



Unit: 1 Full-scall

Start 1 GHz Stop 3 GHz

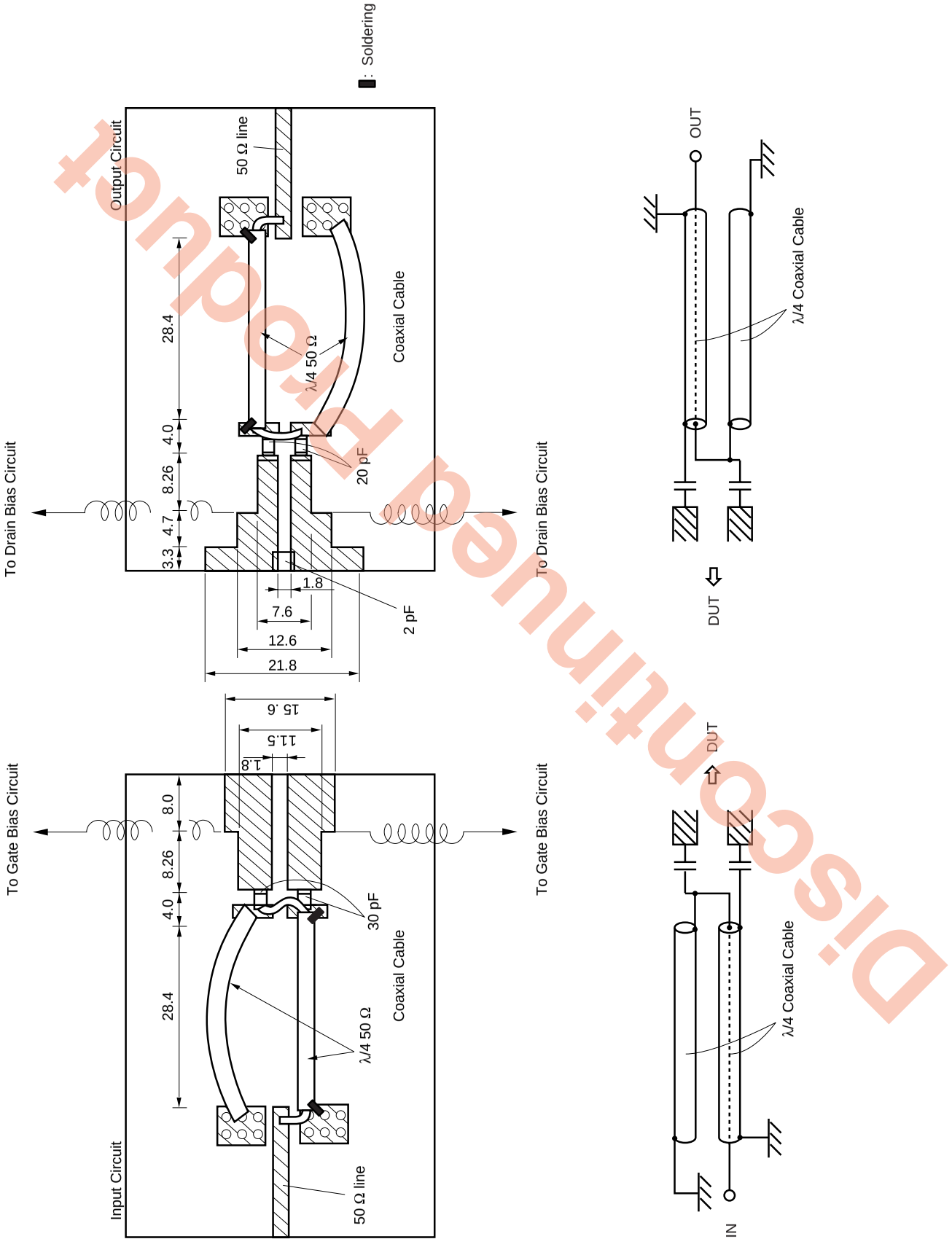
S-Parameters on one drain side

VDS = 10 V, IDS = 1 A

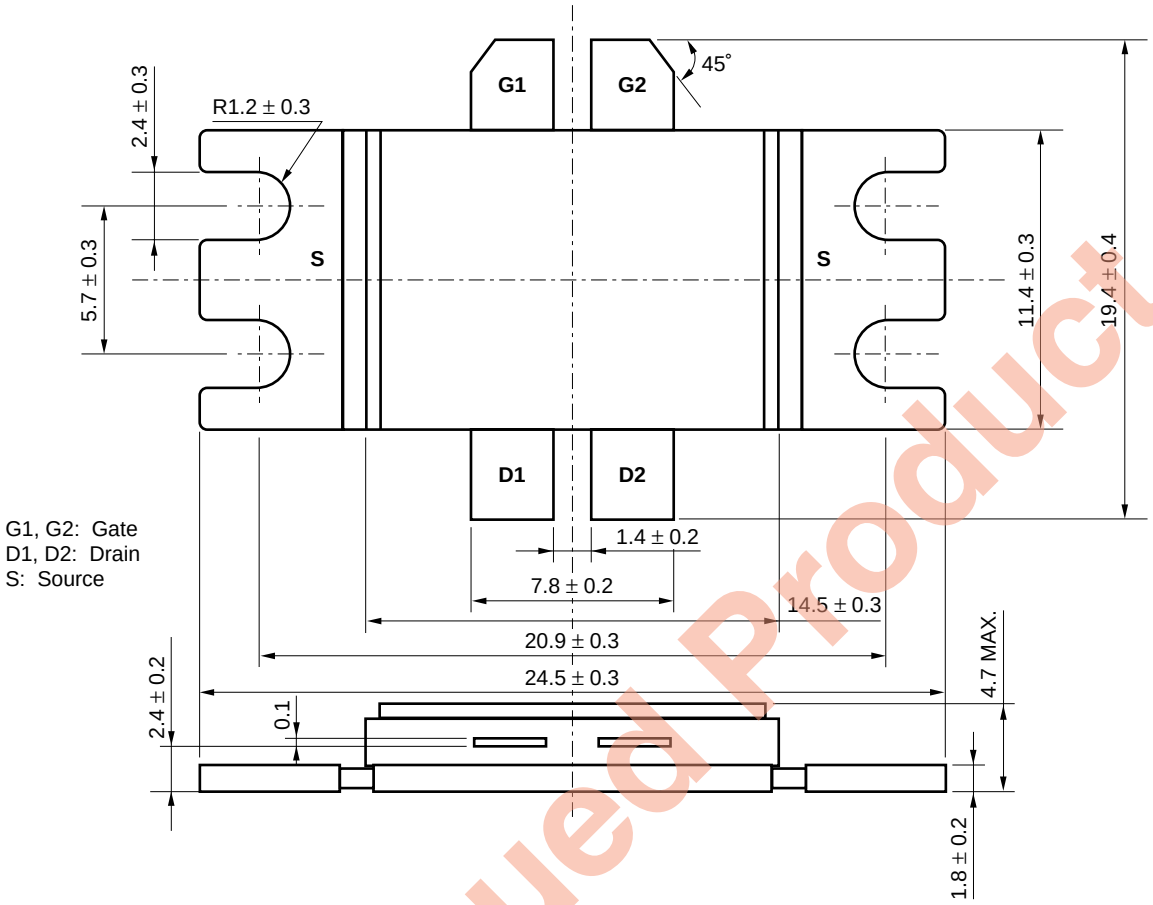
	S11		S21		S12		S22	
Freq. (MHz)	Mag.	Ang. (deg)	Mag.	Ang. (deg)	Mag.	Ang. (deg)	Mag.	Ang. (deg)
1600	0.837	137.7	0.941	45.1	0.023	35.5	0.839	162.3
1620	0.828	137.1	0.967	43.2	0.023	33.1	0.837	161.9
1640	0.816	135.6	0.993	41.5	0.024	29.6	0.837	161.5
1660	0.803	134.7	1.046	39.2	0.024	27.7	0.836	161.6
1680	0.792	133.7	1.090	34.9	0.024	26.4	0.835	161.3
1700	0.777	132.6	1.072	30.3	0.025	22.5	0.839	161.3
1720	0.758	132.1	1.061	29.3	0.024	17.5	0.836	161.3
1740	0.740	131.5	1.128	28.3	0.023	15.3	0.840	161.0
1760	0.720	130.6	1.196	22.9	0.023	12.9	0.838	160.8
1780	0.698	130.5	1.179	17.2	0.024	8.5	0.843	160.6
1800	0.675	129.9	1.144	16.3	0.023	1.4	0.850	160.1
1820	0.656	130.4	1.233	15.3	0.022	–2.5	0.853	160.1
1840	0.635	131.0	1.315	8.4	0.021	–6.0	0.858	160.1
1860	0.610	131.9	1.277	1.1	0.021	–9.8	0.858	160.0
1880	0.591	133.6	1.209	–1.9	0.020	–18.9	0.869	159.5
1900	0.576	135.6	1.240	–3.0	0.019	–26.2	0.880	159.7
1920	0.562	138.3	1.316	–8.3	0.017	–31.8	0.887	158.9
1940	0.557	141.2	1.308	–15.6	0.016	–38.6	0.896	158.5
1960	0.563	143.9	1.250	–21.1	0.015	–47.1	0.904	158.0
1980	0.571	146.3	1.206	–24.5	0.014	–55.9	0.915	157.2
2000	0.589	148.8	1.193	–27.8	0.012	–67.7	0.924	156.4
2020	0.610	150.4	1.195	–32.2	0.010	–79.4	0.929	155.6
2040	0.632	152.1	1.174	–38.8	0.009	–92.2	0.934	155.1
2060	0.661	152.6	1.096	–44.9	0.009	–108.5	0.941	154.1
2080	0.683	152.8	1.003	–46.9	0.008	–123.8	0.945	153.3
2100	0.712	152.7	1.001	–47.6	0.008	–143.8	0.943	152.6
2120	0.732	152.5	1.022	–53.6	0.008	–155.4	0.945	151.9
2140	0.754	152.0	0.937	–61.1	0.009	–168.9	0.948	151.2
2160	0.775	151.7	0.822	–63.0	0.010	–177.2	0.939	150.5
2180	0.791	151.1	0.797	–61.3	0.011	168.7	0.945	149.8
2200	0.807	150.3	0.837	–65.3	0.011	159.0	0.942	149.3
2220	0.822	149.4	0.785	–73.5	0.012	154.5	0.941	148.4
2240	0.833	148.7	0.679	–76.3	0.013	153.5	0.938	148.3
2260	0.847	147.9	0.638	–73.1	0.015	145.4	0.938	147.7
2280	0.854	147.3	0.660	–74.6	0.015	137.4	0.934	147.3
2300	0.862	146.3	0.637	–81.5	0.015	135.9	0.930	147.0
2320	0.869	145.9	0.566	–85.1	0.016	135.1	0.932	146.4
2340	0.877	144.9	0.520	–83.6	0.018	131.4	0.925	146.1
2360	0.882	144.6	0.519	–83.0	0.019	124.7	0.921	145.6
2380	0.890	143.8	0.514	–86.8	0.019	121.8	0.918	145.5
2400	0.892	143.5	0.477	–90.4	0.018	122.6	0.917	145.1
2420	0.895	142.8	0.437	–91.9	0.019	121.6	0.916	145.0
2440	0.902	142.1	0.410	–90.6	0.020	120.1	0.917	144.6
2460	0.901	141.5	0.411	–90.0	0.022	115.6	0.910	144.2
2480	0.902	140.9	0.410	–93.8	0.021	111.8	0.909	144.2

MATCHING CIRCUIT DRAWING [Unit: mm]

f = 1.96 GHz



PACKAGE DIMENSIONS (UNIT: mm)



G1, G2: Gate
D1, D2: Drain
S: Source

RECOMMENDED MOUNTING CONDITION for CORRECT USE

(1) Fix to a heatsink or mount surface completely with screw at the four holes of the flange.
(2) Recommended torque strength of the screw is 3 kgF typical using M2.3 type screw.
(3) Recommended flatness of the mount surface is less than ±10 μm. (roughness of surface is ▽▽▽)

RECOMMENDED SOLDERING CONDITION

This product should be soldered in the following recommended condition. Other soldering methods and conditions than the recommended conditions are to be consulted with our sales representatives.

Soldering method	Soldering conditions	Recommended condition symbol
Pin part heating	Pin area temperature: less than 260°C Hour: within 5 sec./pin.	

For details of recommended soldering conditions, please contact your local NEC sales office.

[MEMO]

[MEMO]

[MEMO]

Caution

The Great Care must be taken in dealing with the devices in this guide.
The reason is that the material of the devices is GaAs (Gallium Arsenide), which is designated as harmful substance according to the law concerned.
Keep the law concerned and so on, especially in case of removal.

M4 96.5