

NEC

N-CHANNEL GaAs MES FET

NES1823P-30

30 W L-S BAND PUSH-PULL POWER GaAs MES FET

DESCRIPTION

The NES1823P-30 is a 30 W push-pull type GaAs MES FET designed for high power transmitter applications for PCS, DCS and IMT 2000 base station systems. It is capable of delivering 30 watts of output power (CW) with high linear gain, high efficiency and excellent distortion. Its primary band is 1.8 to 2.3 GHz, however with different matching, 60 MHz or less of instantaneous bandwidth can be achieved anywhere from 0.8 to 2.3 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 MES FET
- High output power : 30 W TYP.
- High linear gain : 13 dB TYP.
- High power added efficiency: 40 % TYP. @ $V_{DS} = 10\text{ V}$, $I_{Dset} = 4\text{ A}$, $f = 2.2\text{ GHz}$

ORDERING INFORMATION (PLAN)

Part Number	Package	Supplying Form
NES1823P-30	T-86	—

Remark To order evaluation samples, please contact your local NEC sales office.

(Part number for sample order: NES1823P-30)

ABSOLUTE MAXIMUM RATINGS ($T_A = +25^\circ\text{C}$)

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	27	A
Gate Current	I_G	180	mA
Total Power Dissipation	P_T	90 ^{Note}	W
Channel Temperature	T_{ch}	175	$^\circ\text{C}$
Storage Temperature	T_{stg}	-65 to +175	$^\circ\text{C}$

Note $T_c = 25^\circ\text{C}$

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. Before using this document, please confirm that this is the latest version.

Not all devices/types available in every country. Please check with local NEC representative for availability and additional information.

RECOMMENDED OPERATING LIMITS

Parameter	Symbol	Test Condition	MIN.	TYP.	MAX.	Unit
Drain to Source Voltage	V_{DS}		–	–	10.0	V
Gain Compression	Gcomp		–	–	3.0	dB
Channel Temperature	T_{ch}		–	–	+150	°C
Set Drain Current	I_{Dset}	$V_{DS} = 10\text{ V}$, RF OFF	–	–	5.0	A
Gate Resistance ^{Note}	R_g		–	–	30	Ω

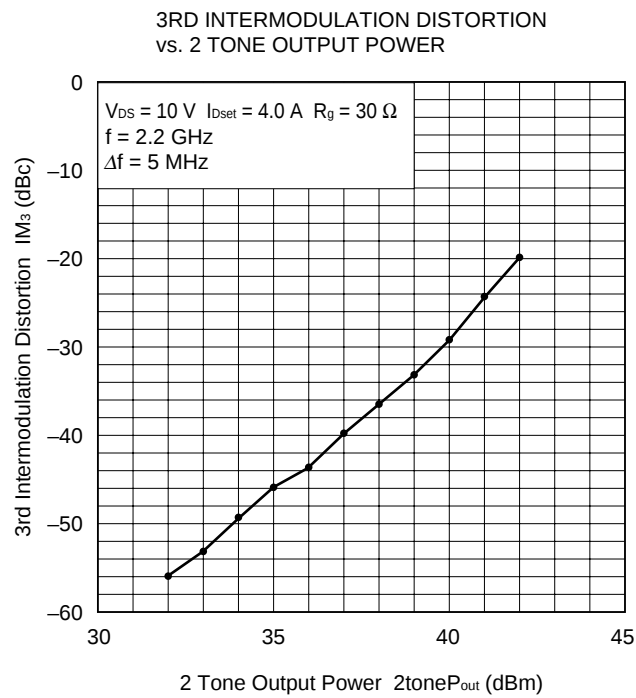
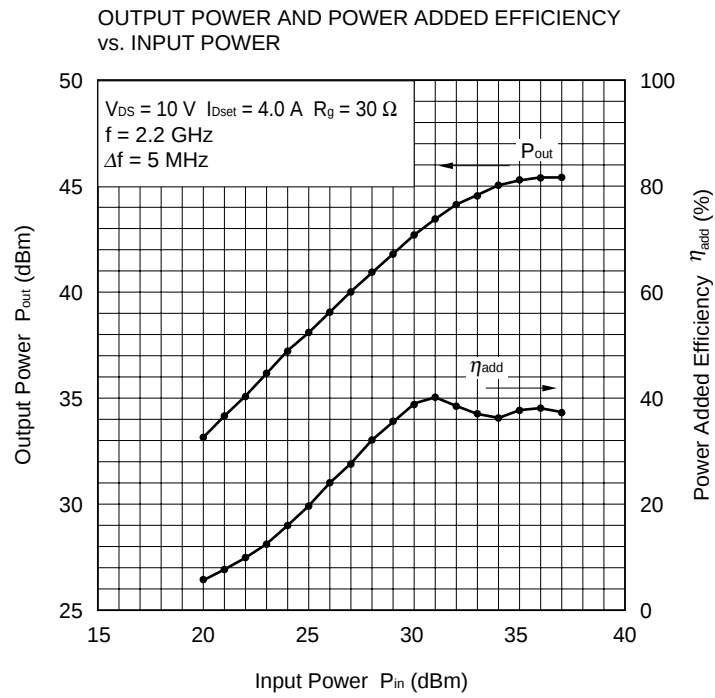
Note R_g is the series resistance between the gate supply and FET gate.

ELECTRICAL CHARACTERISTICS ($T_A = +25^\circ\text{C}$)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Saturated Drain Current	I_{DSS}	$V_{DS} = 2.5\text{ V}$, $V_{GS} = 0\text{ V}$	–	18.0	–	A
Pinch-off Voltage	V_p	$V_{DS} = 2.5\text{ V}$, $I_D = 80\text{ mA}$	–4.0	–2.6	–	V
Thermal Resistance	R_{th}	Channel to Case	–	1.3	1.7	°C/W
Output Power	P_{out}	$f = 2.2\text{ GHz}$, $V_{DS} = 10\text{ V}$ $P_{in} = +36\text{ dBm}$, $R_g = 30\ \Omega$ $I_{Dset} = 4.0\text{ A Total (RF OFF)}$ ^{Note 2}	44.0	45.0	–	dBm
Drain Current	I_D		–	7	9	A
Power Added Efficiency	η_{add}		–	40	–	%
Linear Gain ^{Note 1}	G_L		11	13	–	dB
3rd order Intermodulation Distortion	IM_3	$\Delta f = +5\text{ MHz}$, $P_{out} = 37\text{ dBm}$ (2-tone total)	–	–40	–	dBc

- Notes**
1. $P_{in} = +20\text{ dBm}$
 2. $I_{Dset} = 2.0\text{ A}$ each drain

TYPICAL CHARACTERISTICS ($T_A = +25^\circ\text{C}$)



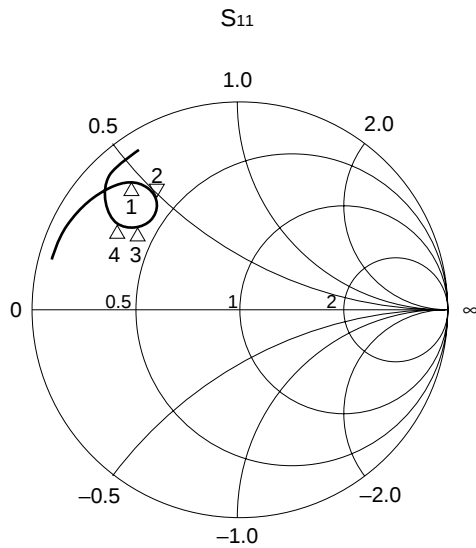
S-PARAMETERS

$V_{DS} = 10\text{ V}$, $I_{Dset} = 2\text{ A}$ (each drain)

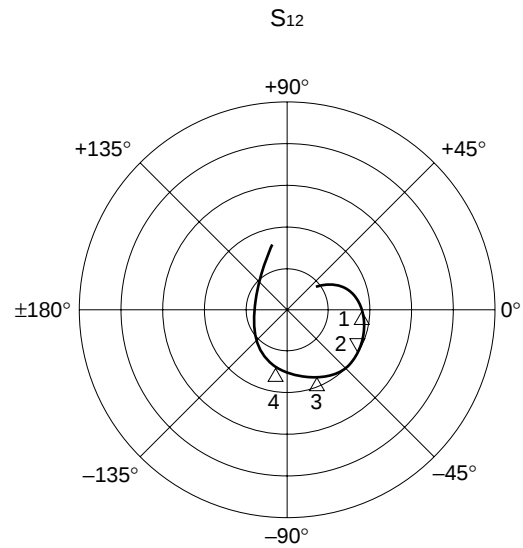
START 1 GHz, STOP 3 GHz, STEP 40 MHz

Marker

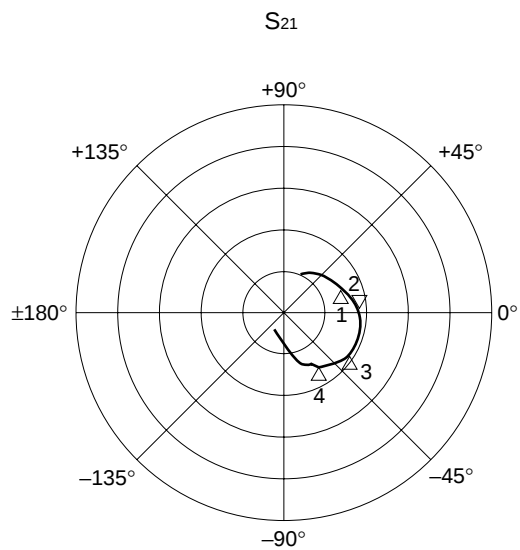
- 1: 1.8 GHz
- 2: 1.95 GHz
- 3: 2.1 GHz
- 4: 2.2 GHz



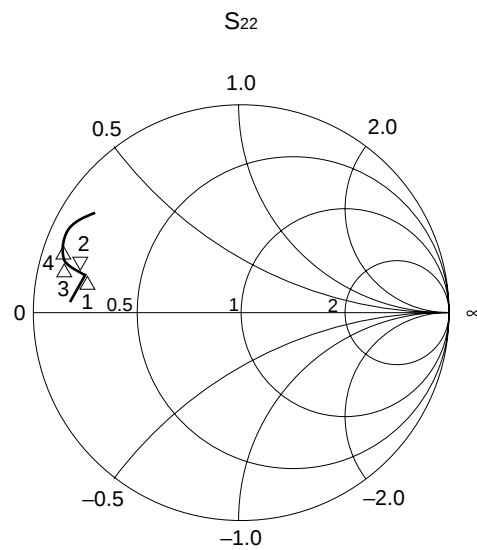
$R_{max.} = 1$



$R_{max.} = 0.05$



$R_{max.} = 5$



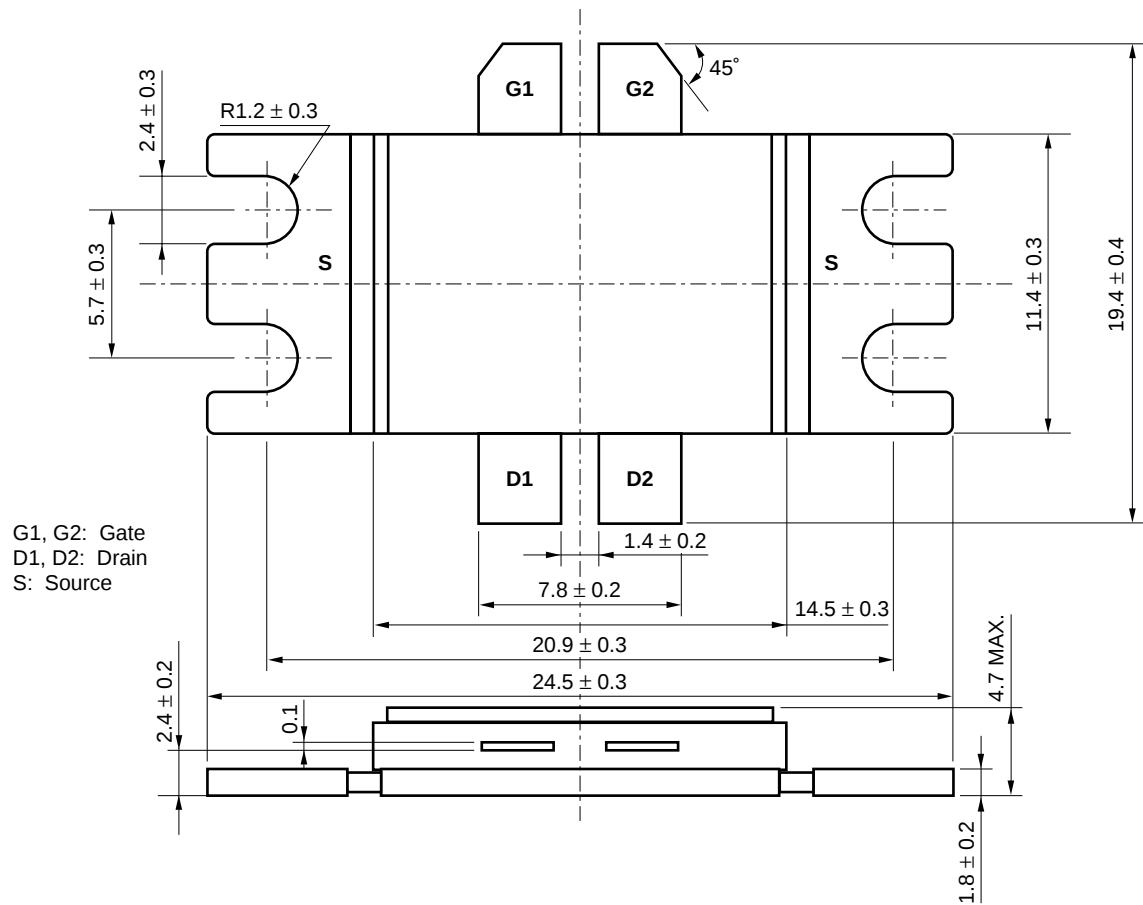
$R_{max.} = 1$

S-PARAMETERS

$V_{DS} = 10\text{ V}$, $I_{Dset} = 2\text{ A}$ (each drain)

FREQUENCY GHz	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
1.000	0.947	162.6	1.080	61.6	0.008	29.0	0.821	174.6
1.040	0.945	160.9	1.069	60.8	0.009	29.2	0.818	174.1
1.080	0.940	159.3	1.054	58.4	0.009	27.2	0.816	173.7
1.120	0.938	157.6	1.042	57.2	0.010	26.4	0.811	173.0
1.160	0.934	155.8	1.051	54.8	0.010	25.5	0.809	172.6
1.200	0.930	154.1	1.032	53.0	0.010	24.2	0.805	171.9
1.240	0.925	152.1	1.050	51.9	0.011	23.6	0.804	171.2
1.280	0.920	150.5	1.051	49.1	0.011	21.0	0.800	170.6
1.320	0.919	148.5	1.068	48.0	0.011	20.3	0.796	170.0
1.360	0.912	146.6	1.079	44.8	0.012	16.7	0.792	169.2
1.400	0.906	144.4	1.102	43.8	0.012	15.9	0.789	168.6
1.440	0.901	142.6	1.132	40.5	0.013	13.0	0.786	168.0
1.480	0.894	140.7	1.168	38.3	0.013	12.4	0.783	167.2
1.520	0.886	138.7	1.200	34.5	0.013	9.3	0.779	166.5
1.560	0.877	136.7	1.235	31.6	0.014	5.9	0.776	165.9
1.600	0.867	134.7	1.290	28.3	0.014	3.8	0.773	165.3
1.640	0.855	132.9	1.326	23.1	0.015	-0.3	0.769	164.9
1.680	0.840	131.0	1.364	20.0	0.015	-4.0	0.770	164.5
1.720	0.825	129.1	1.404	14.8	0.016	-9.0	0.771	164.2
1.760	0.809	127.4	1.472	11.4	0.016	-12.9	0.768	164.0
1.800	0.787	125.9	1.525	4.6	0.017	-19.6	0.771	163.9
1.840	0.758	124.5	1.583	1.0	0.018	-25.5	0.776	163.7
1.880	0.730	123.5	1.659	-6.7	0.018	-33.0	0.780	164.0
1.920	0.696	123.2	1.718	-11.5	0.018	-40.7	0.793	164.0
1.960	0.661	123.8	1.829	-20.3	0.019	-50.0	0.813	163.9
2.000	0.632	125.8	1.833	-29.9	0.019	-61.0	0.833	163.7
2.040	0.612	128.7	1.863	-38.4	0.018	-72.8	0.857	162.8
2.080	0.611	132.4	1.830	-49.8	0.017	-85.1	0.881	161.6
2.120	0.628	135.6	1.770	-57.4	0.015	-99.4	0.897	160.0
2.160	0.657	137.7	1.393	-70.7	0.014	-112.1	0.911	158.2
2.200	0.690	138.6	1.465	-76.7	0.012	-125.7	0.918	156.7
2.240	0.723	138.6	1.425	-86.2	0.010	-138.2	0.918	155.1
2.280	0.747	137.9	1.211	-92.2	0.009	-154.3	0.924	153.5
2.320	0.770	136.9	1.143	-98.0	0.008	-168.9	0.919	152.3
2.360	0.787	135.8	0.979	-103.7	0.007	176.2	0.916	151.5
2.400	0.799	134.6	0.911	-104.8	0.006	160.1	0.908	150.4
2.440	0.808	133.5	0.834	-111.1	0.006	150.4	0.906	149.7
2.480	0.815	132.4	0.737	-111.5	0.007	132.1	0.896	149.1
2.520	0.813	131.3	0.719	-116.5	0.007	126.2	0.895	148.5
2.560	0.817	130.0	0.610	-117.0	0.007	113.5	0.890	148.1
2.600	0.814	129.1	0.651	-119.9	0.007	109.1	0.885	147.8
2.640	0.811	128.1	0.552	-123.6	0.008	101.0	0.881	147.3
2.680	0.809	127.3	0.549	-124.4	0.008	96.3	0.875	147.1
2.720	0.803	126.3	0.488	-127.3	0.009	92.6	0.871	146.8
2.760	0.796	125.6	0.486	-127.7	0.009	87.1	0.867	146.4
2.800	0.789	124.6	0.454	-131.6	0.010	85.6	0.864	146.0
2.840	0.786	123.7	0.423	-133.1	0.011	81.3	0.857	145.9
2.880	0.779	123.0	0.411	-133.8	0.012	77.4	0.854	145.5
2.920	0.775	122.2	0.386	-135.3	0.013	76.4	0.848	145.1
2.960	0.771	121.4	0.396	-137.4	0.014	71.5	0.845	144.6
3.000	0.768	120.3	0.357	-140.5	0.015	71.2	0.838	144.3

PACKAGE DIMENSIONS (UNIT: mm)



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 $\pm 10 \mu\text{m}$. (roughness of surface is $\nabla\nabla\nabla$)

RECOMMENDED SOLDERING CONDITIONS

This product should be soldered under the following recommended conditions. For soldering methods and conditions other than those recommended below, contact your NEC sales representative.

Soldering Method	Soldering Conditions	Recommended Condition Symbol
Partial Heating	Pin temperature: 260°C Time: 5 seconds or less (per pin row)	—

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

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.

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- NEC devices are classified into the following three quality grades:
 "Standard", "Special", and "Specific". The Specific quality grade applies only to devices developed based on a customer designated "quality assurance program" for a specific application. The recommended applications of a device depend on its quality grade, as indicated below. Customers must check the quality grade of each device before using it in a particular application.

Standard: Computers, office equipment, communications equipment, test and measurement equipment, audio and visual equipment, home electronic appliances, machine tools, personal electronic equipment and industrial robots

Special: Transportation equipment (automobiles, trains, ships, etc.), traffic control systems, anti-disaster systems, anti-crime systems, safety equipment and medical equipment (not specifically designed for life support)

Specific: Aircraft, aerospace equipment, submersible repeaters, nuclear reactor control systems, life support systems or medical equipment for life support, etc.

The quality grade of NEC devices is "Standard" unless otherwise specified in NEC's Data Sheets or Data Books. If customers intend to use NEC devices for applications other than those specified for Standard quality grade, they should contact an NEC sales representative in advance.