

70 W L, S-BAND PUSH-PULL POWER GaAs MES FET

DESCRIPTION

The NES1823P-70 is a 70 W push-pull type GaAs MES FET designed for high power transmitter applications for PCS, DCS, PHS and IMT2000 base station systems. It is capable of delivering 70 W of output power (CW) with high linear gain, high efficiency and excellent distortion under the condition of 12 V operation. 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
- $V_{DS} = 12.0$ V operation
- High output power: $P_{out} = 70$ W TYP.
- High linear gain: $G_L = 11.0$ dB TYP.
- High power added efficiency: $\eta_{add} = 40\%$ TYP. @ $V_{DS} = 12.0$ V, $I_{Dset} = 5.0$ A (total), $f = 2.20$ GHz

ORDERING INFORMATION

Part Number	Package	Supplying Form
NES1823P-70	T-86	ESD protective envelope

Remark To order evaluation samples, consult your NEC sales representative.

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.

ABSOLUTE MAXIMUM RATINGS (Unless otherwise specified, 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}	19	V
Gate to Source Voltage	V _{GSO}	-7	V
Gate to Drain Voltage	V _{GDO}	-22	V
Drain Current	I _D	38	A
Gate Current	I _G	250	mA
Total Power Dissipation	P _{tot} ^{Note}	175	W
Channel Temperature	T _{ch}	175	°C
Storage Temperature	T _{stg}	-65 to +175	°C

Note T_C = +25°C

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Drain to Source Voltage	V _{DS}		-	-	12.0	V
Gain Compression	G _{comp}		-	-	3.0	dB
Channel Temperature	T _{ch}		-	-	+150	°C
Set Drain Current	I _{Dset}	V _{DS} = 12.0 V, RF OFF	-	5.0	6.0	A
Gate Resistance	R _g ^{Note}		-	-	20	Ω

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

ELECTRICAL CHARACTERISTICS (T_A = +25°C)

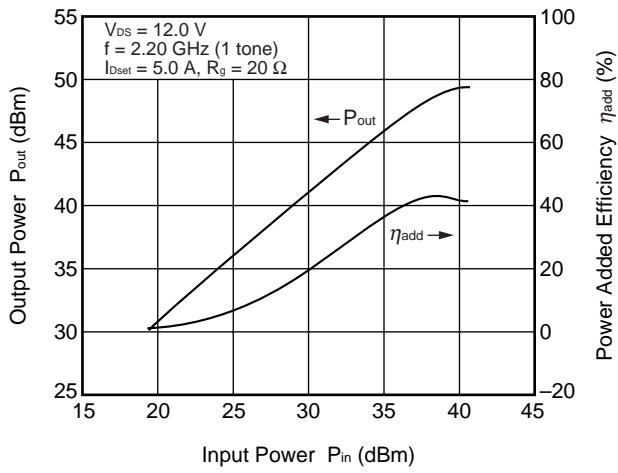
Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Saturated Drain Current	I _{DSS}	V _{DS} = 2.5 V, V _{GS} = 0 V	-	38.0	-	A
Pinch-off Voltage	V _p	V _{DS} = 2.5 V, I _D = 165 mA	-4.0	-2.6	-	V
Thermal Resistance	R _{th}	Channel to Case	-	0.65	0.85	°C/W
Output Power	P _{out}	f = 2.20 GHz, V _{DS} = 12.0 V,	47.5	48.5	-	dBm
Drain Current	I _D	P _{in} = 40.5 dBm, R _g = 20 Ω,	-	11.0	-	A
Power Added Efficiency	η _{add}	I _{Dset} = 5.0 A Total (RF OFF) ^{Note 1}	-	40	-	%
Linear Gain	G _L ^{Note 2}		10.0	11.0	-	dB
3rd Order Intermodulation Distortion	IM ₃	Δf = 5 MHz, P _{out} = 39 dBm (2 tones total)	-	-34	-	dBc

Notes 1. I_{Dset} = 2.5 A each drain

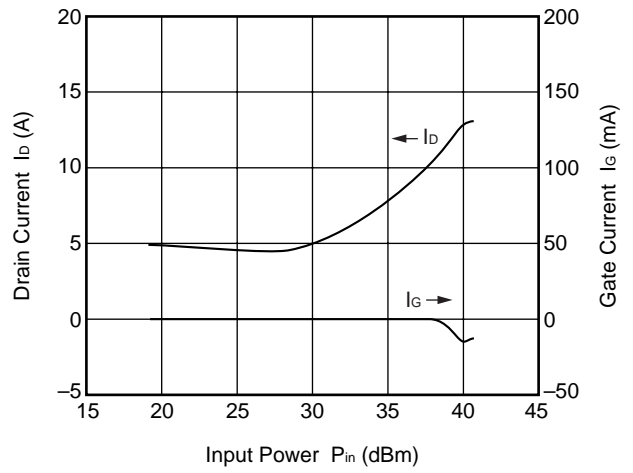
2. P_{in} = 23 dBm

TYPICAL CHARACTERISTICS (T_A = +25°C)

OUTPUT POWER, POWER ADDED EFFICIENCY vs. INPUT POWER [Power Matched]



DRAIN CURRENT, GATE CURRENT vs. INPUT POWER



Remark The graphs indicate nominal characteristics.

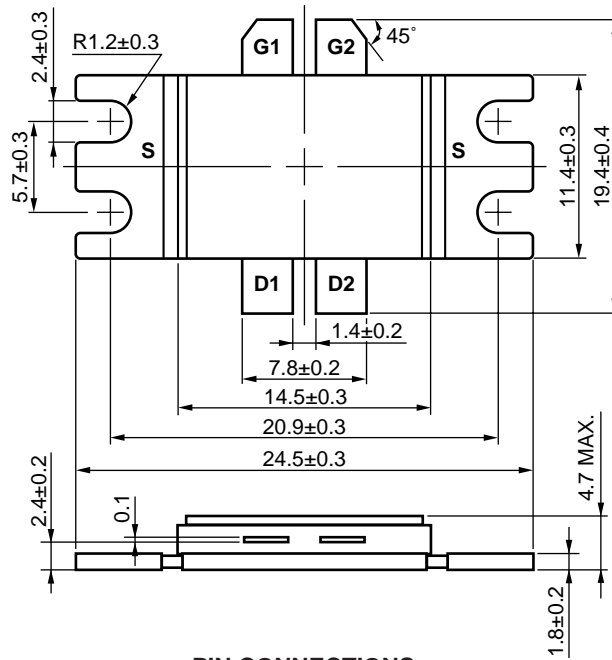
S-PARAMETERS

V_{DS} = 12.0 V, I_{Dset} = 2.5 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.)
1.200	0.950	167.0	0.800	45.4	0.007	24.7	0.877	171.0
1.250	0.947	165.7	0.814	42.4	0.007	23.6	0.876	170.4
1.300	0.940	164.4	0.827	39.2	0.008	22.2	0.871	169.8
1.350	0.936	163.4	0.837	36.9	0.008	20.9	0.869	169.4
1.400	0.928	162.0	0.860	33.3	0.008	18.3	0.865	168.7
1.450	0.916	160.5	0.885	29.7	0.009	14.9	0.862	168.1
1.500	0.905	159.0	0.918	25.6	0.009	12.6	0.857	167.5
1.550	0.896	157.9	0.949	22.7	0.010	10.3	0.854	167.3
1.600	0.878	156.2	0.992	17.9	0.010	5.7	0.849	166.9
1.650	0.855	154.1	1.047	12.5	0.011	0.8	0.847	166.5
1.700	0.827	152.2	1.122	6.6	0.011	-4.7	0.840	166.4
1.750	0.791	150.5	1.210	-0.7	0.012	-12.1	0.837	166.4
1.800	0.760	149.5	1.261	-5.8	0.013	-18.7	0.836	166.4
1.850	0.705	148.7	1.366	-15.1	0.013	-28.0	0.836	166.4
1.900	0.642	149.8	1.457	-26.3	0.014	-39.5	0.841	166.8
1.950	0.586	154.0	1.504	-39.7	0.013	-55.0	0.851	166.8
2.000	0.564	158.7	1.511	-48.6	0.013	-65.4	0.857	166.6
2.050	0.572	166.4	1.468	-63.3	0.012	-82.8	0.869	166.2
2.100	0.619	171.7	1.352	-76.8	0.010	-100.2	0.875	165.4
2.150	0.681	173.5	1.193	-89.0	0.008	-119.8	0.875	164.6
2.200	0.735	172.8	1.070	-98.8	0.006	-138.2	0.875	163.9
2.250	0.767	171.8	0.958	-105.7	0.006	-152.9	0.874	163.6
2.300	0.803	169.8	0.844	-112.4	0.005	-172.1	0.870	163.3
2.350	0.830	167.8	0.733	-117.4	0.004	162.8	0.864	163.0
2.400	0.852	165.9	0.664	-123.6	0.004	142.7	0.860	162.7
2.450	0.862	164.5	0.605	-126.9	0.004	129.2	0.858	162.9
2.500	0.877	162.8	0.551	-130.9	0.005	115.8	0.853	162.7
2.550	0.884	161.1	0.498	-133.7	0.005	98.9	0.849	162.5
2.600	0.892	159.4	0.452	-139.7	0.006	95.8	0.849	162.4
2.650	0.900	157.6	0.419	-140.9	0.007	86.6	0.848	162.6
2.700	0.906	156.6	0.392	-143.8	0.007	82.9	0.847	162.4
2.750	0.913	154.8	0.375	-146.7	0.008	77.6	0.847	162.6
2.800	0.921	153.2	0.337	-150.2	0.009	74.3	0.847	162.6
2.850	0.928	151.6	0.323	-152.5	0.010	67.8	0.847	162.7
2.900	0.934	150.3	0.312	-154.6	0.010	66.2	0.847	162.6
2.950	0.941	148.8	0.303	-158.7	0.011	63.6	0.847	162.3
3.000	0.951	147.0	0.276	-161.0	0.013	60.3	0.850	161.9

PACKAGE DIMENSIONS

T-86 (UNIT: mm)



PIN CONNECTIONS

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

RECOMMENDED MOUNTING CONDITIONS FOR CORRECT USE

- (1) Fix to a heat sink or mount surface completely with screws at the four holes of the flange.
- (2) The recommended torque strength of the screws is 30 N typical using M2.3 type screws.
- (3) The 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 and mounted 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 or below, Time: 5 seconds or less (per pin row)	-

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

[MEMO]

SAFETY INFORMATION ON THIS PRODUCT

<p>Caution</p>	<p>GaAs Products</p>	<p>The product contains gallium arsenide, GaAs. GaAs vapor and powder are hazardous to human health if inhaled or ingested.</p> <ul style="list-style-type: none"> • Do not destroy or burn the product. • Do not cut or cleave off any part of the product. • Do not crush or chemically dissolve the product. • Do not put the product in the mouth. <p>Follow related laws and ordinances for disposal. The product should be excluded from general industrial waste or household garbage.</p>
-----------------------	----------------------	---

- **The information in this document is current as of August, 2001. The information is subject to change without notice. For actual design-in, refer to the latest publications of NEC's data sheets or data books, etc., for the most up-to-date specifications of NEC semiconductor products. Not all products and/or types are available in every country. Please check with an NEC sales representative for availability and additional information.**
- No part of this document may be copied or reproduced in any form or by any means without prior written consent of NEC. NEC assumes no responsibility for any errors that may appear in this document.
- NEC does not assume any liability for infringement of patents, copyrights or other intellectual property rights of third parties by or arising from the use of NEC semiconductor products listed in this document or any other liability arising from the use of such products. No license, express, implied or otherwise, is granted under any patents, copyrights or other intellectual property rights of NEC or others.
- Descriptions of circuits, software and other related information in this document are provided for illustrative purposes in semiconductor product operation and application examples. The incorporation of these circuits, software and information in the design of customer's equipment shall be done under the full responsibility of customer. NEC assumes no responsibility for any losses incurred by customers or third parties arising from the use of these circuits, software and information.
- While NEC endeavours to enhance the quality, reliability and safety of NEC semiconductor products, customers agree and acknowledge that the possibility of defects thereof cannot be eliminated entirely. To minimize risks of damage to property or injury (including death) to persons arising from defects in NEC semiconductor products, customers must incorporate sufficient safety measures in their design, such as redundancy, fire-containment, and anti-failure features.
- NEC semiconductor products are classified into the following three quality grades:
 "Standard", "Special" and "Specific". The "Specific" quality grade applies only to semiconductor products developed based on a customer-designated "quality assurance program" for a specific application. The recommended applications of a semiconductor product depend on its quality grade, as indicated below. Customers must check the quality grade of each semiconductor product 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 and medical equipment for life support, etc.

The quality grade of NEC semiconductor products is "Standard" unless otherwise expressly specified in NEC's data sheets or data books, etc. If customers wish to use NEC semiconductor products in applications not intended by NEC, they must contact an NEC sales representative in advance to determine NEC's willingness to support a given application.

(Note)

(1) "NEC" as used in this statement means NEC Corporation and also includes its majority-owned subsidiaries.
 (2) "NEC semiconductor products" means any semiconductor product developed or manufactured by or for NEC (as defined above).

M8E 00.4