S-BAND PARTIALLY MATCHED POWER GaAs MESFET

NES2527B-30

FEATURES

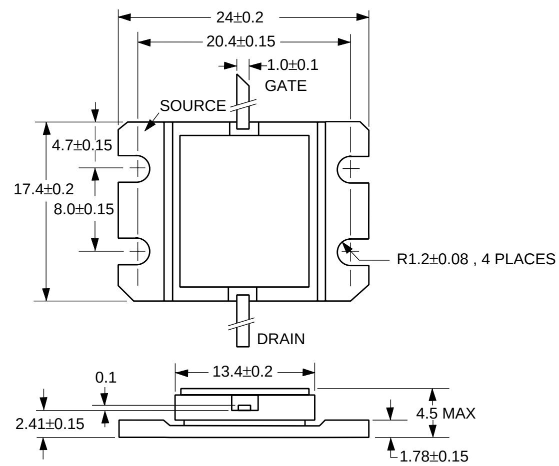
- **HIGH OUTPUT POWER:**
  30 W
- **LOW DISTORTION:**
  -45 dBc IM_3 at 33 dBm SCL
  (Verified by a Wafer Qual Test)
- **HIGH LINEAR GAIN:**
  13.0 dB
- **EFFICIENT LINEAR OPERATION:**
  6 A I_{DSQ}
- **WIDEBAND OPERATION:**
  RF measurements at both 2.5 & 2.7 GHz

DESCRIPTION

The NES2527B-30 is a 30 W GaAs MESFET with an internal matching network designed for High Power transmitter applications for MMDS systems. Its primary band is 2.5 to 2.7 GHz, but with different external matching, 200 MHz of instantaneous bandwidth can be achieved anywhere from 2.1 to 2.7 GHz. The internal matching network provides partial matching, and an external circuit completes the match to 50 Ω. The device contains two chips which employ 0.9 µm Tungsten Silicide gates, via holes, plated heat sink, and silicon dioxide passivation for superior performance, thermal characteristics, and reliability. This part is designed to be mass produced for low cost commercial applications.

OUTLINE DIMENSIONS (Units in mm)

PACKAGE OUTLINE T-79



ELECTRICAL PERFORMANCE (T_C = 40°C)

		PART NUMBER PACKAGE OUTLINE		NES2527B-30 T-79			
	SYMBOLS	CHARACTERISTICS	UNITS	MIN	TYP	MAX	TEST CONDITIONS
Functional Characteristics	P_{1dB}	Power Out at 1 dB Gain Compression	dBm	44.0	45.0		V_{DS} = 10 V
	G_L	Linear Gain	dB	11.5	13.0		f = 2.5 & 2.7 GHz
	η_{ADD}	Power-Added Efficiency at 1 dB Gain Compression	%		40		I_{DSQ} = 6.0 A
	I_{DSRF}	Drain Source Current at 1 dB Gain Compression	A		7.4		R_G = 10 Ω[2]
	IM_3	3rd Order Intermodulation Distortion[1]	dBc		-45	-40[1]	P_{OUT} = 33 dBm/Tone
Electrical DC Characteristics	I_{DSS}	Saturated Drain Current	A		15		V_{DS} = 2.5 V; V_{GS} = 0 V
	V_P	Pinch-off Voltage	V	-4.0	-2.6		V_{DS} = 2.5 V; I_{DS} = 84 mA
	g_m	Transconductance	mS		8		V_{DS} = 2.5 V; I_{DS} = 84 mA
	R_{TH}	Thermal Resistance, Channel to Case	K/W		1.3	1.5	T_C = 25°C, 10 V, 6.0 A

Notes:
1. IM_3 is measured with a two-tone test as part of Wafer Qualification Tests on a sample basis. Test criteria are set to ensure a maximum IM_3 of -40 dBc with a confidence factor of 90%.
2. Rg is the series resistance between the gate supply and the FET gate.

ABSOLUTE MAXIMUM RATINGS[1]

(T_C = 25°C unless otherwise noted)

SYMBOLS	PARAMETERS	UNITS	RATINGS
V_{DSO}	Drain to Source Voltage	V	15
V_{GDO}	Gate to Drain Voltage	V	-18
V_{GS}	Gate to Source Voltage	V	-7
I_{DS}	Drain Current	A	27
I_{GS}	Gate Current	mA	180
P_T	Total Power Dissipation	W	100
T_{CH}	Channel Temperature	°C	175
T_{STG}	Storage Temperature	°C	-65 to +175

Note:

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

RECOMMENDED OPERATING LIMITS

(Recommended operating conditions for reliable operation, i.e. > 10^6 hrs MTTF)

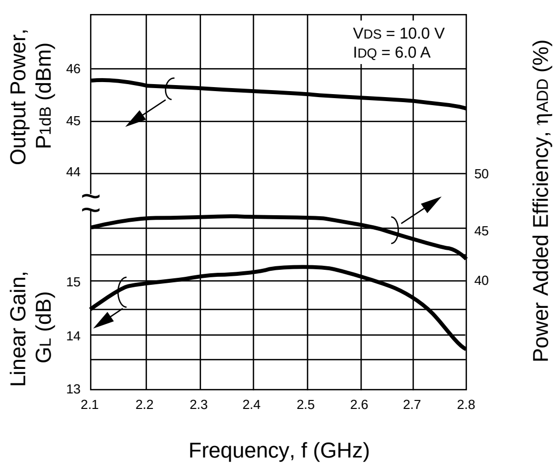
SYMBOLS	PARAMETERS	UNITS	MIN	TYP	MAX
V_{DS}	Drain to Source Voltage	V		10.0	10.0
T_{FLANGE}[1]	Flange Temperature	˚C			62
G_{COMP}	Gain Compression	dB			3.0
Rg[2]	Gate Resistance	Ω	5	10	15
I_{DSQ}	Drain Current (RF OFF)	A			6.0

Notes:

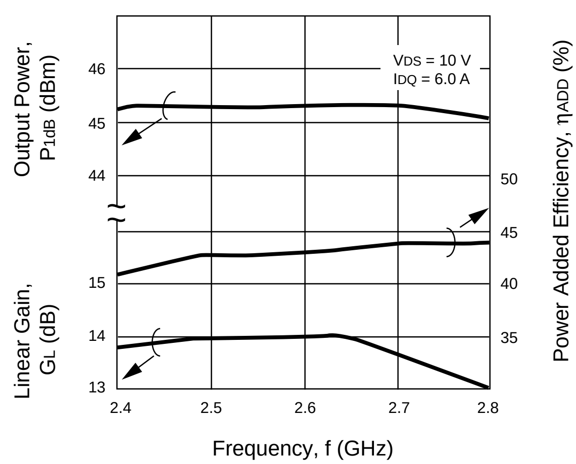
1. Calculation of maximum flange temperature is based on worst case conditions, that is, maximum R_{TH} at 62˚C flange (1.66) and maximum power dissipation with no RF output. Operation at higher flange temperature may result in a lower MTTF.
2. Rg is the series resistance between the gate supply and the FET gate.

TYPICAL PERFORMANCE CURVES (T_C = 40°C)

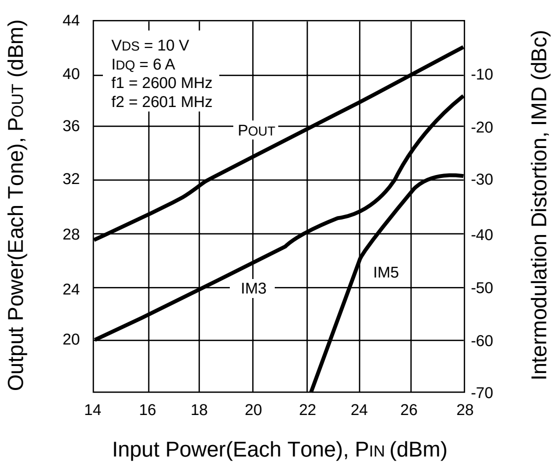
NARROW BAND OPTIMIZED PERFORMANCE (TUNED AT EACH FREQUENCY)



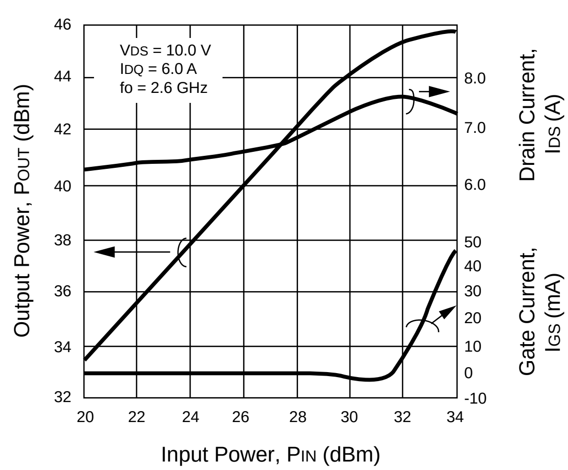
BROAD BAND PERFORMANCE (TESTED IN 2.5 - 2.7 GHz FIXTURE)



OUTPUT POWER AND INTERMODULATION DISTORTION vs. INPUT POWER



OUTPUT POWER & CURRENT vs. INPUT POWER



TYPICAL SCATTERING PARAMETERS[1]

Note:
1. This file and many other s-parameter files can be downloaded from www.cel.com.

NES2527B-30
V_{DS} = 10 V, I_{DS} = 6.0 A

FREQUENCY	S_{11}		S_{21}		S_{12}		S_{22}		K	MAG[1]
GHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG		(dB)
1.3	0.950	149.6	0.475	-4.9	0.003	-54.2	0.886	151.5	5.50	11.00
1.4	0.944	146.4	0.530	-13.8	0.004	-65.3	0.886	149.7	4.82	11.50
1.5	0.934	142.6	0.606	-23.7	0.005	-72.6	0.883	147.3	3.98	12.00
1.6	0.919	138.0	0.718	-34.3	0.006	-89.2	0.882	145.3	3.49	12.50
1.7	0.896	131.9	0.883	-46.6	0.008	-107.3	0.882	142.6	2.80	13.10
1.8	0.853	123.8	1.134	-61.0	0.011	-122.8	0.884	139.3	2.30	13.60
I.9	0.774	112.7	1.524	-78.5	0.017	-143.4	0.888	134.9	1.91	14.10
2.0	0.612	95.5	2.140	-101.8	0.025	-168.1	0.895	128.6	1.56	14.90
2.1	0.291	67.4	2.938	-133.6	0.039	158.3	0.857	118.4	1.36	15.20
2.2	0.180	-130.9	3.501	-173.0	0.050	118.5	0.740	108.2	1.23	15.60
2.3	0.549	-166.3	3.479	150.2	0.053	81.5	0.610	103.3	1.14	15.90
2.4	0.725	170.7	3.327	120.4	0.055	51.9	0.528	99.6	1.09	16.10
2.5	0.776	152.4	3.402	94.1	0.059	26.4	0.456	90.4	1.08	15.90
2.6	0.722	134.1	3.866	65.3	0.171	-2.0	0.339	67.8	1.09	15.50
2.7	0.450	113.4	4.671	24.5	0.089	-41.7	0.161	-21.7	1.17	14.70
2.8	0.305	-173.9	4.230	-31.7	0.083	-96.8	0.435	-145.7	1.35	13.50
2.9	0.677	175.8	2.613	-75.1	0.054	-138.7	0.569	169.3	1.74	11.90
3.0	0.812	161.1	1.630	-101.7	0.034	-164.0	0.546	147.1	2.55	9.90

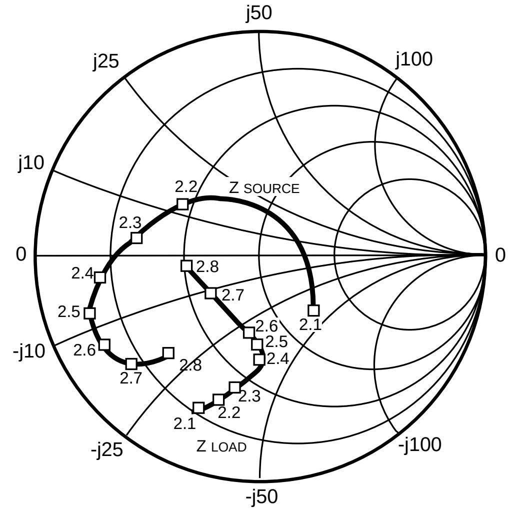
Note:
1. Gain Calculation:

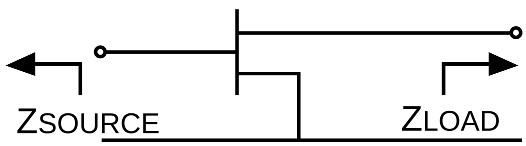
$$MAG = \frac{|S_{21}|}{|S_{12}|}\left(K - \sqrt{K^2 - 1}\right).$$ When $K \le 1$, MAG is undefined and MSG values are used. $MSG = \frac{|S_{21}|}{|S_{12}|}$, $K = \frac{1 + |\Delta|^2 - |S_{11}|^2 - |S_{22}|^2}{2\,|S_{12}\,S_{21}|}$, $\Delta = S_{11}\,S_{22} - S_{21}\,S_{12}$

MAG = Maximum Available Gain
MSG = Maximum Stable Gain

SOURCE & LOAD LARGE SIGNAL IMPEDANCES

f (GHz)	ZSOURCE (Ω)	ZLOAD (Ω)
2.1	55 - j18	14 - j24
2.2	22 + j13	17 - j26
2.3	13 + j4.0	21.5 - j26.5
2.4	8 - j3.0	31 - j27
2.5	7 - j8.0	32 - j23
2.6	9 - j11	34 - j15
2.7	13 - j14	29 - j10
2.8	16 - j20	23 - j1.4





ZSOURCE = Impedance of the input circuit as seen by the gate
ZLOAD = impedance of the output circuit as seen by the drain

BROADBAND TEST CIRCUIT, 2.5 - 2.7 GHz

(Artwork available from CEL engineering)