

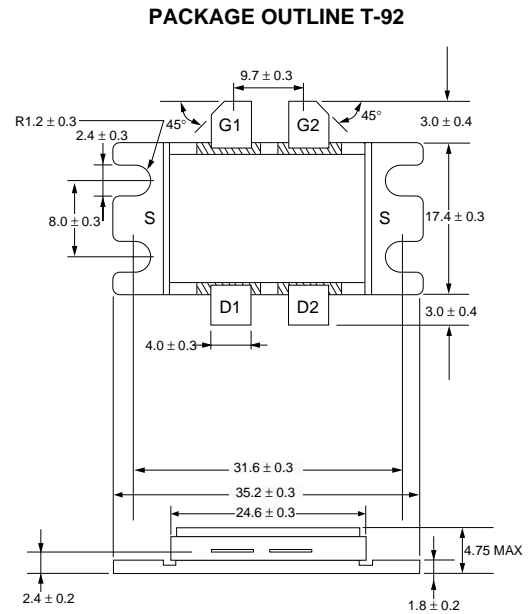
FEATURES

- **HIGH OUTPUT POWER:**
60 W
- **LOW DISTORTION:**
-45 dBc IM₃ at 36 dBm SCL
- **HIGH LINEAR GAIN:**
12 dB
- **EFFICIENT LINEAR OPERATION:**
6 A I_{DSQ} each side
- **WIDEBAND OPERATION:**
2.5 to 2.7 GHz instantaneous bandwidth

DESCRIPTION

The NES2427P-60 is a 60 W twin 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, greater than 200 MHz of instantaneous bandwidth can be achieved anywhere from 2.1 to 2.8 GHz. The internal matching network provides partial matching, and an external circuit completes the match to 50 Ω and combines the two sides of the device in balanced or in push-pull configuration. The device contains four 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)



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

ELECTRICAL CHARACTERISTICS (T_C = 25°C)

PART NUMBER				NES2427P-60			TEST CONDITIONS
PACKAGE OUTLINE				T-92			
	SYMBOLS	CHARACTERISTICS	UNITS	MIN	TYP	MAX	
Functional Characteristics	P _{1dB}	Power Out at 1 dB Gain Compression Point	dBm	47.0	48.0		V _{DS} = 10 V f = 2.5 & 2.7 GHz I _{DSQ} = 6.0 A (Each Side) R _G ² = 5 Ω (Each Side) P _{OUT} = 36 dBm/Tone
	GL	Linear Gain ¹	dB	10.0	12.0		
	η _{ADD}	Power-Added Efficiency at 1 dB Gain Compression	%		35		
	I _{DSRF}	Drain-Source Current at 1 dB Gain Compression	A		16.0		
	IM ₃	3rd Order Intermodulation Distortion ²	dBc		-45		
Electrical DC Characteristics	I _{DSS}	Saturated Drain Current, Each Side	A		18		V _{DS} = 2.5 V; V _{GS} = 0 V
	V _P	Pinch-off Voltage	V	-4.0	-2.1		V _{DS} = 2.5 V; I _{DS} = 84 mA (Each Side)
	R _{TH}	Channel-to-Flange, Total Thermal Resistance ³	K/W		0.65	0.76	T _{CASE} = 25°C, 10 V, 6.0 A (Each Side)

Notes:

1. Measured at P_{IN} = +32 dBm.
2. R_G is the series resistance between the gate supply and the FET gate.
3. To calculate R_{TH} versus T_F and T_{CH} (or P_{DISS}), see AN1032 "Microwave Power GaAs Device Thermal Resistance Basics" application note.

ABSOLUTE MAXIMUM RATINGS¹

(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 (Each Side)
I _{GS}	Gate Current	mA	±180 (Each Side)
P _T	Total Power Dissipation ²	W	200
T _{CH}	Channel Temperature	°C	175
T _{STG}	Storage Temperature	°C	-65 to +175

Notes:

1. Operation in excess of any one of these parameters may result in permanent damage.
2. T_c = 25°C

RECOMMENDED OPERATING LIMITS

(Recommended operating conditions for reliable operation, i.e. > 10⁶ hrs MTTF)

SYMBOLS	PARAMETERS	UNITS	MIN	TYP	MAX
V _{DS}	Drain to Source Voltage	V		10.0	10.0
T _{CH}	Channel Temperature	°C			150
G _{COMP}	Gain Compression	dB			3.0
R _g ¹	Gate Resistance	Ω	3	5	5 (Each Side)
I _{DSQ}	Drain Current (RF OFF)	A			6.0 (Each Side)

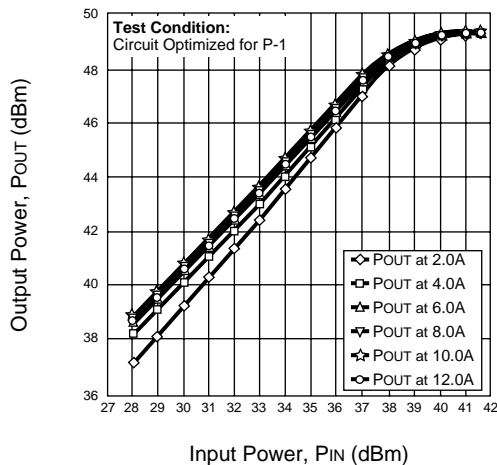
Note:

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

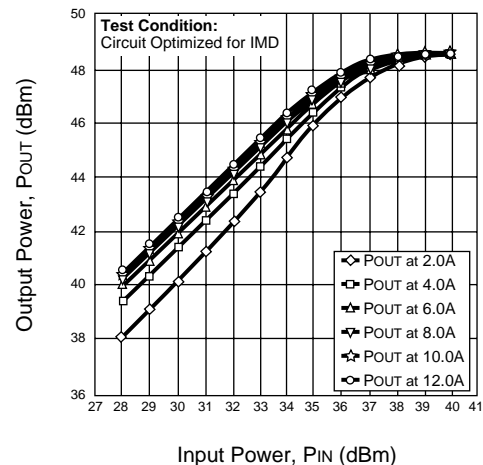
TYPICAL PERFORMANCE CURVES

IN A 2.5-2.7 GHz INSTANTANEOUS BANDWIDTH CIRCUIT (V_{DS} = 10.0 V and T_c = 25°C)

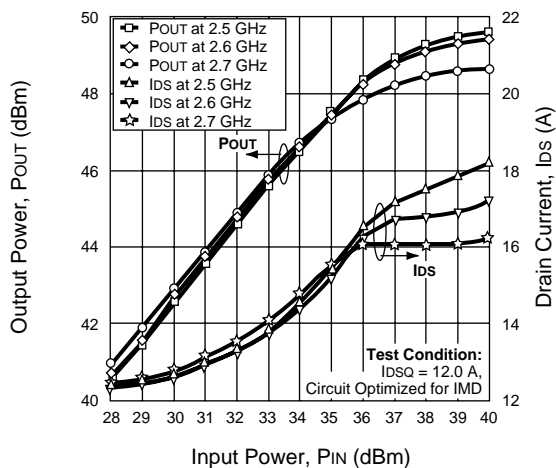
OUTPUT POWER vs. INPUT POWER AND I_{DSQ} AT 2.7 GHz



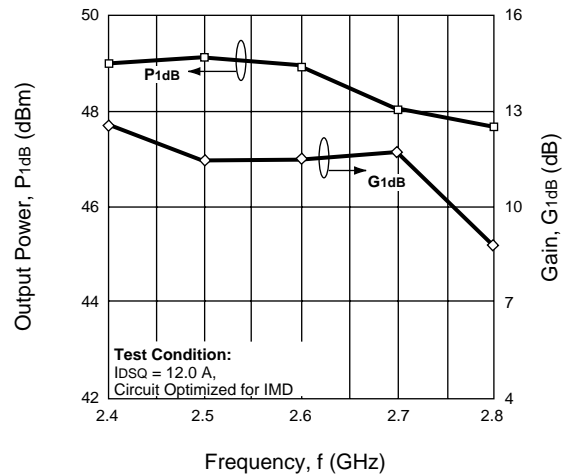
OUTPUT POWER vs. INPUT POWER AND I_{DSQ} AT 2.7 GHz



OUTPUT POWER AND I_{DS} vs. INPUT POWER AND FREQUENCY

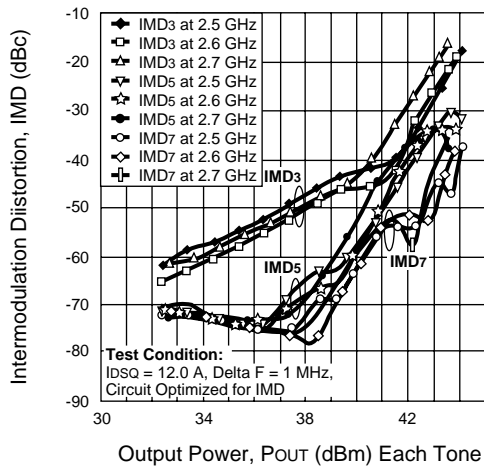


OUTPUT POWER AND GAIN AT 1dB COMPRESSION POINT vs. FREQUENCY

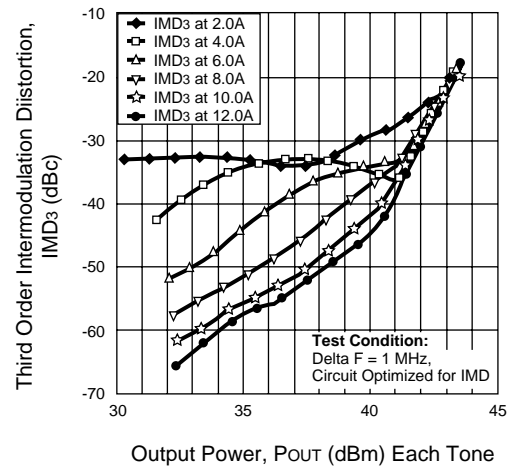


TYPICAL PERFORMANCE CURVES IN A 2.5-2.7 GHz INSTANTANEOUS BANDWIDTH CIRCUIT ($V_{DS} = 10.0\text{ V}$ and $T_{CASE} = 25^\circ\text{C}$)

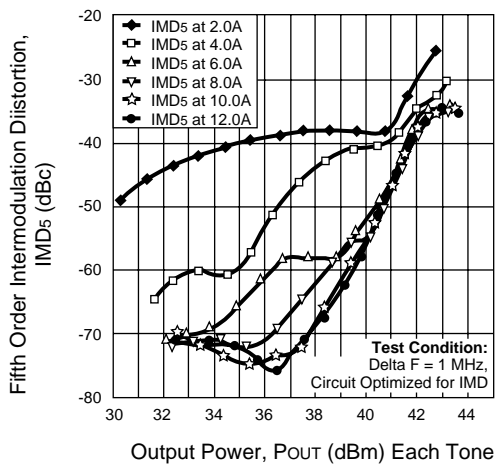
INTERMODULATION DISTORTION vs. OUTPUT POWER AND FREQUENCY



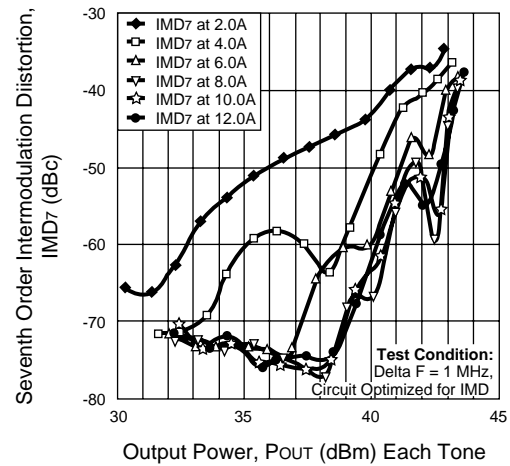
THIRD ORDER INTERMODULATION DISTORTION vs. I_{DSQ} AND OUTPUT POWER AT 2.7 GHz



FIFTH ORDER INTERMODULATION DISTORTION vs. I_{DSQ} AND OUTPUT POWER AT 2.7 GHz



SEVENTH ORDER INTERMODULATION DISTORTION vs. I_{DSQ} AND OUTPUT POWER AT 2.7 GHz



TYPICAL SCATTERING PARAMETERS, (FOR EACH SIDE)

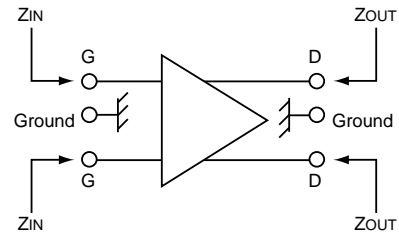
V_{DS} = 10 V, I_{DS} = 6.0 A, Z_O = 50 Ω, T_F = 25°C

FREQUENCY (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG	ANG(°)	MAG	ANG(°)	MAG	ANG(°)	MAG	ANG(°)
1.5	0.916	146.9	0.753	-19.8	0.005	-27.9	0.900	161.7
1.6	0.890	141.1	0.902	-30.9	0.006	-38.8	0.889	159.8
1.7	0.849	133.2	1.120	-44.2	0.008	-54.8	0.873	157.6
1.8	0.778	121.6	1.410	-59.0	0.010	-79.7	0.867	156.9
1.9	0.644	103.3	1.904	-78.7	0.013	-103.6	0.868	153.5
2.0	0.399	69.5	2.536	-105.8	0.017	-138.4	0.846	148.9
2.1	0.237	-32.3	3.116	-139.7	0.023	179.7	0.788	143.1
2.2	0.516	-110.0	3.191	-175.5	0.026	136.4	0.687	139.3
2.3	0.733	-141.2	2.949	154.9	0.027	99.2	0.586	139.5
2.4	0.833	-159.9	2.710	130.7	0.028	70.2	0.507	142.7
2.5	0.872	-173.6	2.622	109.1	0.031	45.7	0.438	147.6
2.6	0.870	174.6	2.673	87.7	0.035	21.8	0.380	158.7
2.7	0.798	162.9	2.783	63.5	0.041	-4.6	0.378	175.1
2.8	0.664	152.3	2.953	36.6	0.048	-32.7	0.469	-170.2
2.9	0.451	148.1	3.039	5.0	0.055	-65.2	0.645	-169.1
3.0	0.309	175.3	2.795	-29.2	0.055	-100.1	0.793	-178.9
3.1	0.426	-160.7	2.334	-60.2	0.049	-129.5	0.825	169.7
3.2	0.587	-161.7	1.890	-86.7	0.043	-154.2	0.808	160.9
3.3	0.692	-169.1	1.550	-109.8	0.038	-175.9	0.760	153.4
3.4	0.742	-178.6	1.319	-130.9	0.033	168.2	0.711	147.0
3.5	0.738	171.0	1.182	-153.3	0.031	154.8	0.661	138.4

HALF (EACH SIDE) DEVICE OPTIMAL INPUT AND OUTPUT IMPEDANCES

($V_{DS} = 10\text{ V}$ and $I_{DS} = 6.0\text{ A}$ half of the device)

$Z_{IN} = R_{IN} + jX_{IN}$ (Conjugate of source impedance).
 $Z_{OUT} = R_{OUT} + jX_{OUT}$ (Conjugate of load impedance).
 Z_{IN} is the optimal gate-to-ground input impedance of half of the device.
 Z_{OUT} is the optimal drain-to-ground output impedance of half of the device.
 The input circuit is optimized for the input return loss.



Frequency (GHz)	R _{IN} (Ohm)	X _{IN} (Ohm)	R _{OUT} (Ohm)	X _{OUT} (Ohm)
2.4	4.9	-9.1	17.2	16.4
2.5	4.0	-4.2	21.9	12.3
2.6	8.0	1.7	18.4	10.1
2.7	6.7	-2.4	16.8	11.1

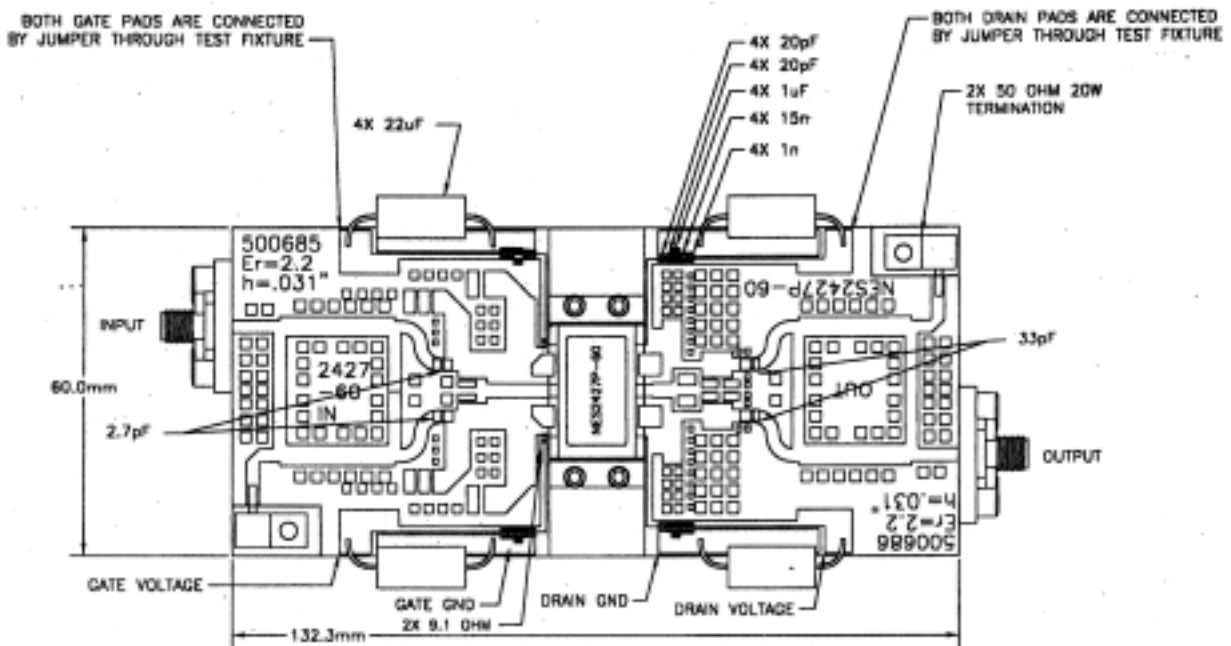
The output circuit is optimized for IMD₃ when the output power is 37 dBm each tone for half the device.

Frequency (GHz)	R _{IN} (Ohm)	X _{IN} (Ohm)	R _{OUT} (Ohm)	X _{OUT} (Ohm)
2.4	5.0	-8.7	21.6	9.5
2.5	3.9	-4.9	17.7	5.8
2.6	4.8	-1.7	15.9	3.1
2.7	5.4	3.0	13.5	3.6
2.8	5.9	2.7	11.3	4.0

The output circuit is optimized for the output power at 1dB gain compression.

NES2427P-60 BALANCED TEST FIXTURE (2.5 - 2.7 GHz) OPTIMIZED FOR IMD

(Artwork available from CEL engineering)



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