

APB13-070: Nitronex NPA1006 GaN HEMT Device tuned for 25 to 1000MHz Applications

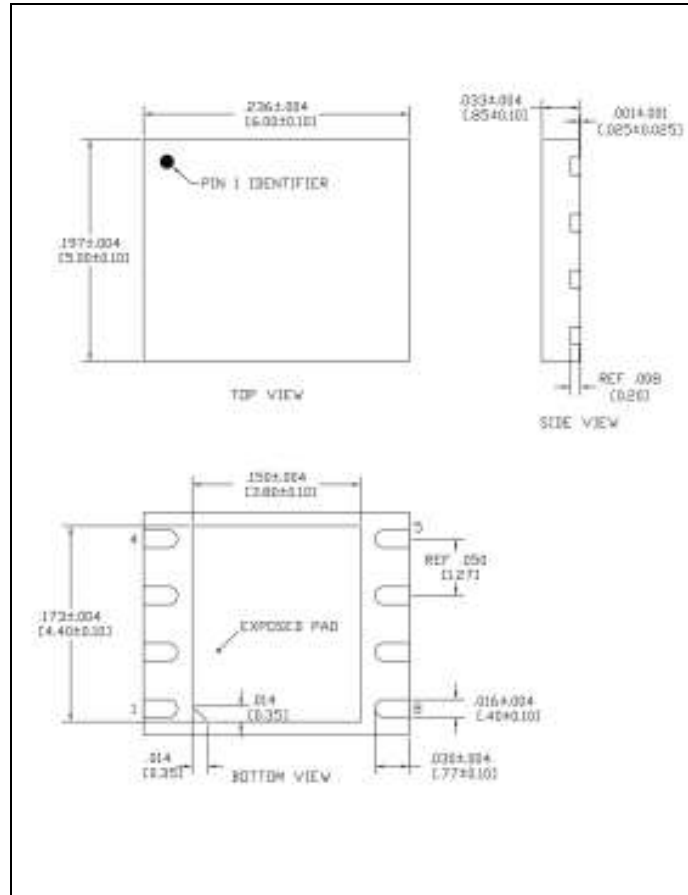
Application design APB13-070 with a Nitronex NPA1006 GaN HEMT device outputs approximately 11W of broadband RF power under CW operation across a 25-1000MHz frequency band. All measurements were collected at room temperature and 28V bias with $I_{DQ}=88\text{mA}$.

Caution: Do not operate the device with greater than 36 volts of drain-source potential and $I_{DQ} > 250\text{mA}$. Drain current can exceed 250mA under RF drive. Note, the gate bias is negative and is fully pinched off at approximately -2.0V .

Caution: Do not exceed 5 dB of gain compression with a single tone signal. Extreme overdrive will induce a strong reversal of the gate leakage current – from negative to positive. Note: Device saturation is reached when the polarity of the gate current turns positive, a small positive gate current of +3 mA will not harm the device but once the current turns positive it will grow exponentially with additional RF drive level. Maximum Pin should not exceed +33 dBm.

Biassing sequence: GaN HEMTs are depletion mode devices, therefore set the gate voltage to -2.0V , bring drain voltage up to 28VDC, adjust gate to obtain desired I_{DQ} , and then enable RF. Turn off device in the reverse sequence

Pin Layout of Device:



DFN6X5-8 Plastic Package Dimensions (all dimensions in inches [millimeters])

Pin	Function
1	Gate — DC Bias
2, 3	Gate — RF Input
6, 7	Drain — RF Output
Exposed Pad	Source — Ground
4, 5, 8	No Connect*

* All No Connect pins may be left floating or grounded

APB13-070 NPA1006 Application Board Schematic/BOM/Layout

25 - 1000 MHz Broadband Circuit

(CW, $V_{DS}=28V$, $I_{DD}=88mA$, $T_C=25^{\circ}C$, unless otherwise noted)

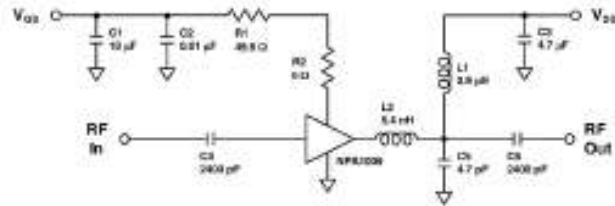


Figure 1. Electrical Schematic of 25 - 1000MHz Broadband Circuit for NPA1006
(For RF Tuning details see Component Placement Diagram Figure 2)

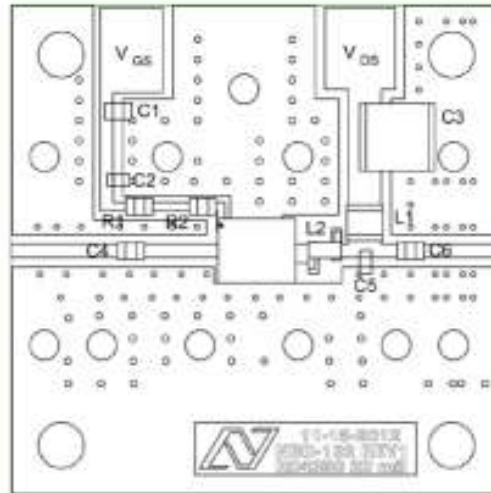
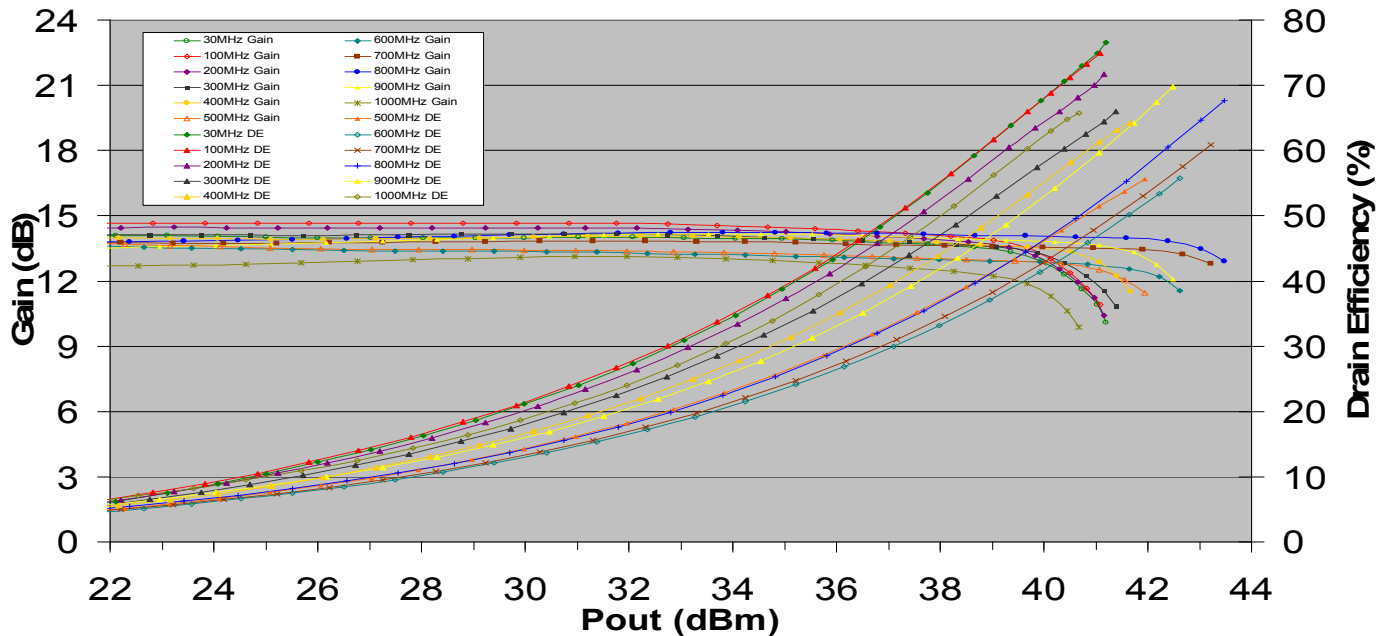


Figure 2: Component Placement of 25 - 1000MHz Broadband Circuit for NPA1006

Reference	Value	Manufacturer	Part Number
C1	10µF	TDK	C2012X5R1C106M085AC
C2	0.01µF	AVX	06031C103JAT2A
C3	4.7µF	TDK	C6750X7R2A475K230KA
C4, C6	2400pF	Dielectric Labs, Inc.	C08BL242X-5UN-X0
C5	4.7pF	Murata	GQM2195C2E4R7BB12
R1	49.9Ω	Panasonic	ERJ-6ENF49R9V
R2	0Ω	Panasonic	ERJ-6GEY0R00V
L1	0.9µH	Coilcraft	1008AF-901XJLC
L2	5.4nH	Coilcraft	0906-5 LB
PCB	RO4350, $\epsilon_r=3.5$, 0.020"	Rogers	Nitronex NBD-132r1

APB13-070 NPA1006 Test Data:
APB13-070 CW Retuned Performance at 30MHz-1GHz

(Vds: 28V, Idq: 88mA)



Freq(MHz)	p3db	DE-3dB	Gss	Pout (W)	θ_{j-c}	Pdiss	ΔT (°C)
30	40.9	74.2	14.16	12	4	4.7	19
50	41	75.2	14.58	13	4	4.6	18
100	40.8	73.3	14.63	12	4	4.8	19
150	40.8	71.3	14.59	12	4	5.3	21
200	40.9	69.5	14.42	12	4	5.8	23
250	41	65.4	14.36	13	4	7.1	28
300	41.3	65.4	14.09	13	4	7.7	31
350	41.6	68.7	14.13	14	4	7.1	29
400	41.7	65.7	13.91	15	4	8.3	33
450	41.8	59.9	14.15	15	4	10.7	43
500	41.9	56.5	13.81	15	4	12.6	50
550	42.2	55.2	14.41	17	4	14.1	56
600	42.4	55.4	13.66	17	4	14.7	59
650	43	59.4	14.47	20	4	14.4	57
700	43.4	62.7	14.98	22	4	13.7	55
750	43.6	66.3	15.2	23	4	12.3	49
800	43.6	69.2	14.98	23	4	10.9	44
850	43.2	71.4	14.59	21	4	9.1	36
900	42.6	72.8	13.18	18	4	7.7	31
950	41.8	71.6	12.91	15	4	6.8	27
1000	40.8	66.4	12.37	12	4	6.8	27

APB13-070 Small Signal Results

