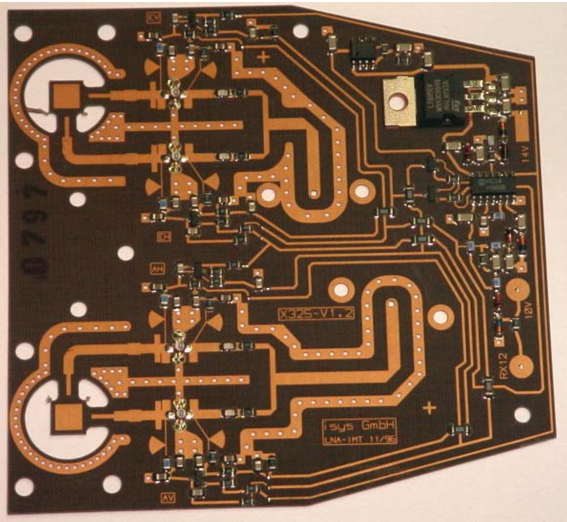
Piastra amplificatore 10/14 GHz low-noise cod. SU-02



La piastra qui a lato è un doppio amplificatore a 4 stadi su laminato in teflon , in origine era utilizzata come stadio front-end low noise per la ricezione TV Sat a 11 GHz . Era montata nell' antenna e precedeva il convertitore TV Sat (descritto prima coduce SU-01) .

Viene offerta sia per l'utilizzo come amplificatore e duplicatore (vedere desrizione più avanti) ma anche per il recupero da parte di radioamatori e hobbisti dei 4 GaAsFet di tipo Hemt ultra low noise NE 32584C Nec molto performanti. Questi Hemt sono tra i più utilizzati sia per applicazioni a 10 che a 24 GHz , sia come low noise che driver TX .

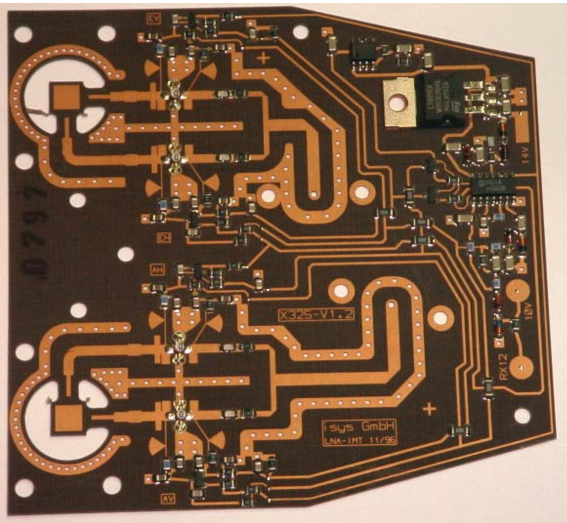
Questi hemt sono così performanti da essere usati perfino a 24 GHz potendo fornire > + 13dBm e 7 / 8 dBG , ovviamente a 10 GHz le prestazioni sono molto più elevate .

L' hobbista attento e smaliziato potrà subito intuire che sono presenti anche varie linee a 50Ω che , essendo su laminato in teflon , possono essere riutilizzate per molte applicazioni anche a microonde tra cui la possibilità di costruirsi un dc block , un amplificatore a MMIC , un rivelatore RF , un attenuatore ecc ecc queste piste sono usabili anche oltre 20 GHz .

Sulle pagine seguenti sono descritte molte modifiche ed applicazioni ; alcune riportate dai nostri stessi clienti , altre dalla rivista Inglese VHF Communications , vi è inoltre il data sheet dei 4 GaAsFet .

Progressivamente , quando i ns. clienti troveranno altre ed interessanti applicazioni e/o modifiche, saremo ben lieti di poterle pubblicare a seguito di quelle già disponibili .

Front-end 11 GHz from TV sat amplifier cod. SU-02



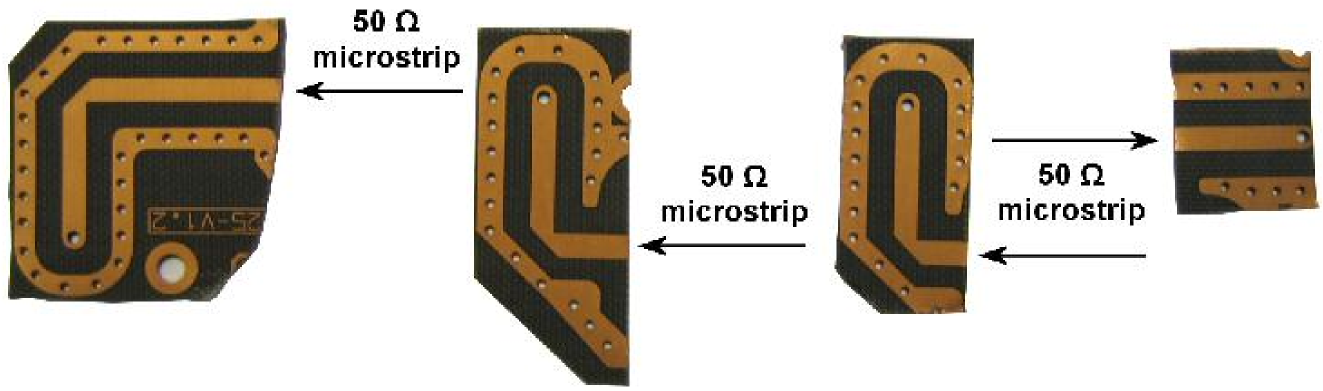
This p.c. board is a front-end used in ultra low noise amplifier as TV sat preamplifier .

We suggest to use it as 10 GHz amplifier and 12 to 24 GHz active doubler , the hamateur radio can save (retrieve) 4 pcs high performance GaAsFet Hemt type NE32584C Nec.

This Hemt is so good that you can use it also in 24 GHz band , performing > +13dBm and 7 / 8 dBG , of course at 10 GHz the performances are better .

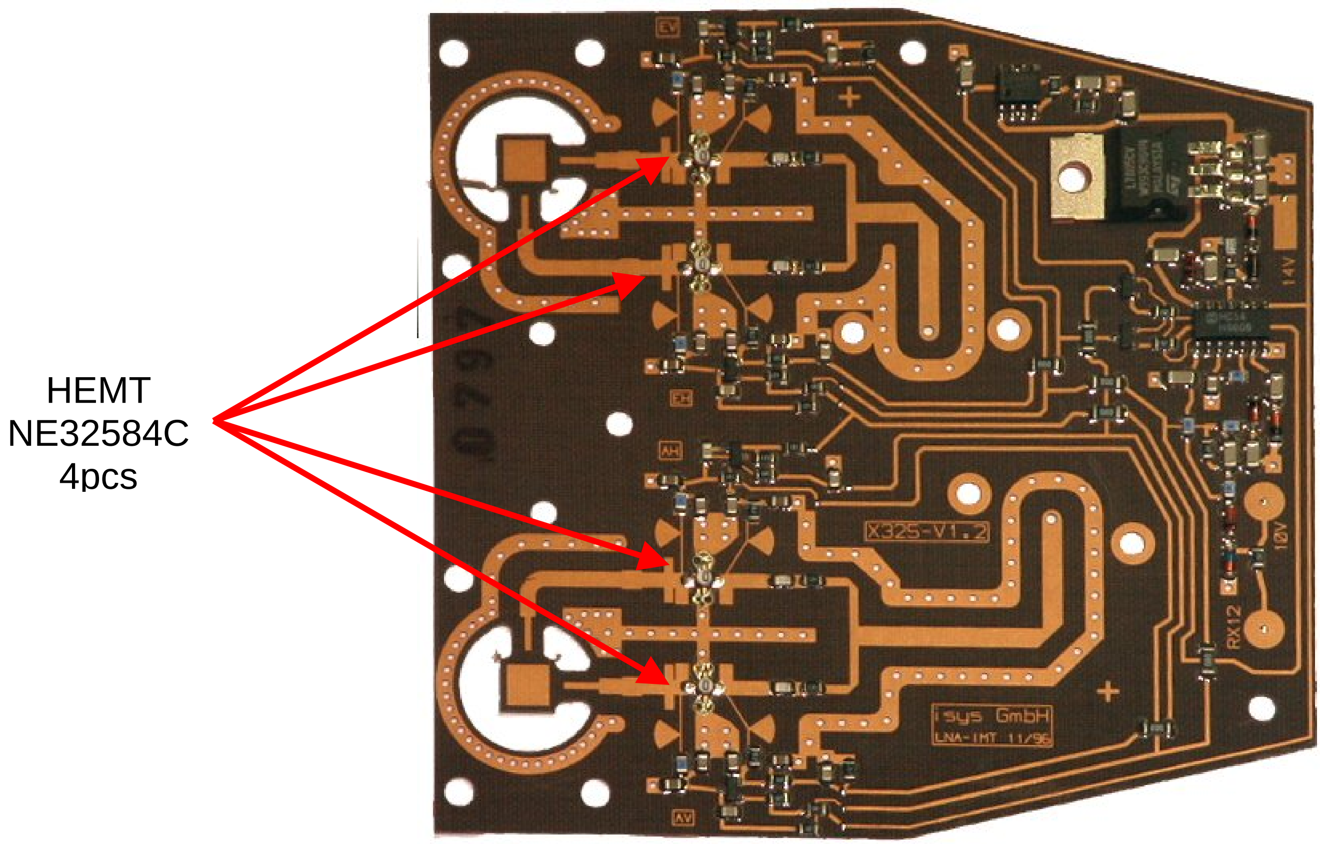
It is also possible to save some intersting 50Ω microstrips by cutting them from the main p.c. board . These little 50Ω strips are usable for many lab applications , for example for a dc block , a small attenuator , for a MMIC amplifier etc etc . These micro-strips are made of teflon substrate so they can be used over 20 GHz .

In the followig pages is avaialble an impressive documentation , in english and french language , because this p.c. board is used all over the world from many hamateur radio and published on the VHF Communications magazine too , it is also available the NE 32584C data sheet .



Risulta molto interessante recuperare le piste a 50 Ω ritagliandole dal circuito stampato. Essendo in teflon sono utilizzabili anche a microonde, almeno fino a 20 GHz.

It is very interesting to save some 50 Ω microstrips by cutting them from the p.c. board. They are made of teflon so you can use them in microwave frequencies to 20+ GHz.

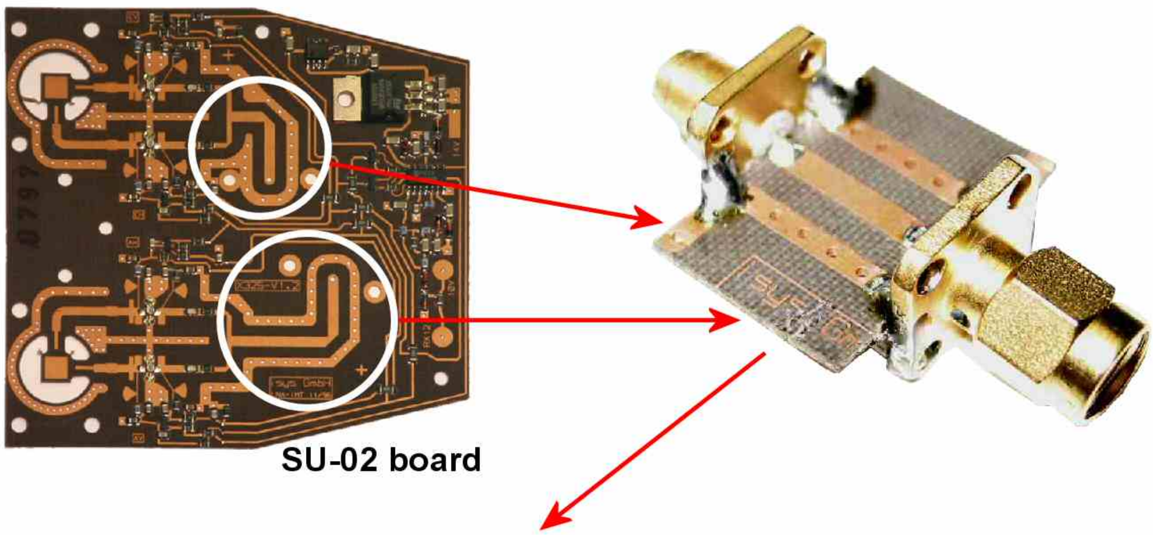


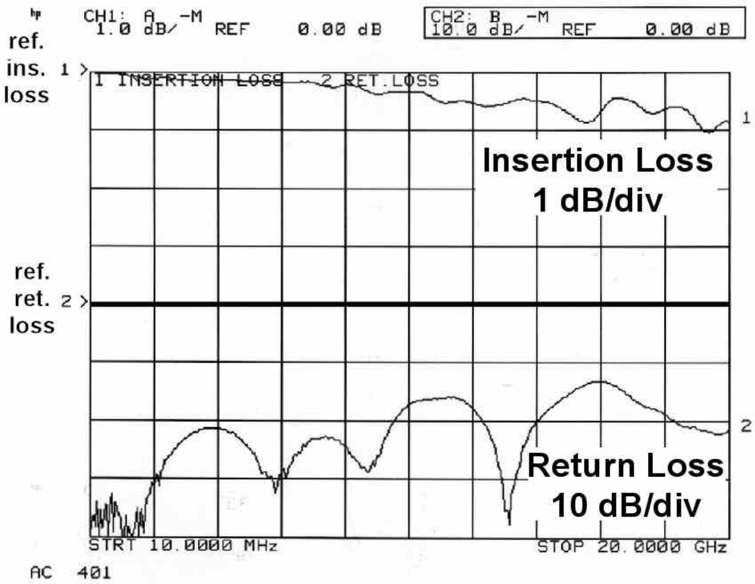
Di seguito molte pagine riguardanti , modifiche , articoli vari su riviste sia in italiano , inglese che francese più il data sheet completo del GaAsFet hemt NE32584C

Following many pages focusing on modifications and lab testing , both in english and french language and the NE 32584C data sheet

Piastrina a 50 Ω adatta fino alle microonde

Piece of 50 Ω p.c. board suitable for microwave





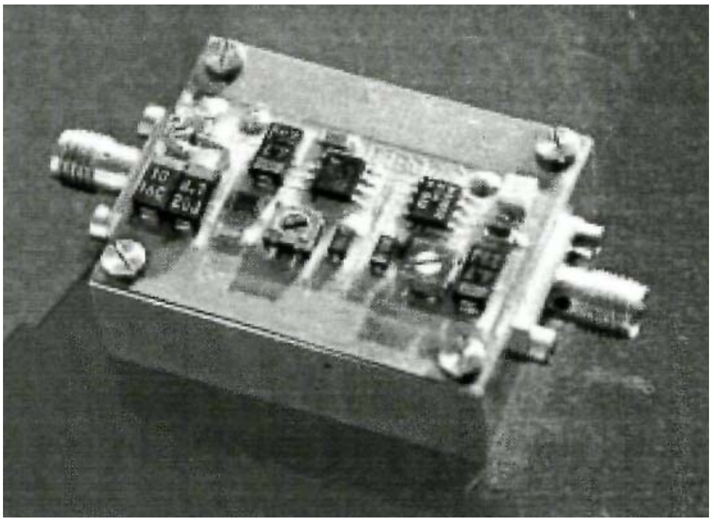
Test del circuito stampato ricavato dalla piastra SU-02 sia come perdita che Ross e montato con connettori SMA m+f

---

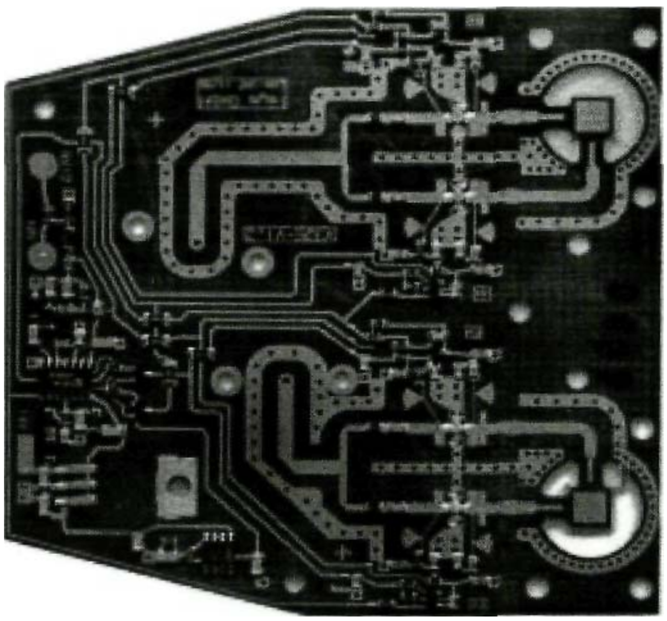
P.c. board saved from SU-02 with insertion loss and return loss tests, and connected with SMA m+f

Questo grafico rappresenta il test di una piccola piastra ricavata dal surplus SU-02 . La piastrina è stata ritagliata e poi connettorizzata con Sma femmina + maschio . Come si vede dal test su network analyzer è utilizzabile fino 20 GHz . Può essere usata ad esempio come dc block, jig di prova per componenti vari , strip a 50 Ω per MMIC , detector RF , bias T ecc. Ad esempio viene usata nel nostro laboratorio con successo come jig per la verifica della frequenza SRF (frequenza di autorisonanza) di induttanze e condensatori SMD abbinata al network analyzer .	The graph shows the test of a little 50 Ω strip saved from the surplus p.c. board SU-02 . This little p.c. board is mounted with a male and female SMA connectors . As shown in the network analyzer graph , it can be suitable up to 20 GHz as 50 Ω strip (with a lot of applications) , for MMIC test , as a dc block , as bias T , RF detector , as jig for RF components test, etc ... For istance we have used it in our lab with a network analyzer to test capacitors and coils SRF (self resonance frequency) .

Preamplificatori per la gamma dei 10 GHz



Partendo da una piastra TV Sat a basso costo



Preamplificatori 10GHz a basso costo

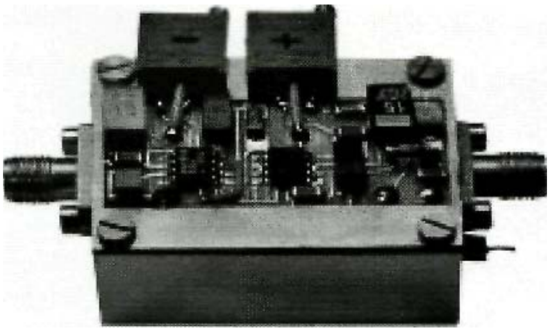
Il prezzo di mercato attuale di un prcamplificatore in gamma 10GHz, si aggira su 170-180 Euro. Costruirlo in casa partendo dal foglio di laminato, non è alla portata di lutti perché, questo richiede una preparazione complessa come: disegno con CAD grafico, stampa del master, corrosione delle piste in modo preciso, senza contare che i fogli di laminato in teflon sono forniti grezzi, quindi occorre sensibilizzarli con la solita bomboletta, cosa che (al sottoscritto) non sempre riesce a puntino.

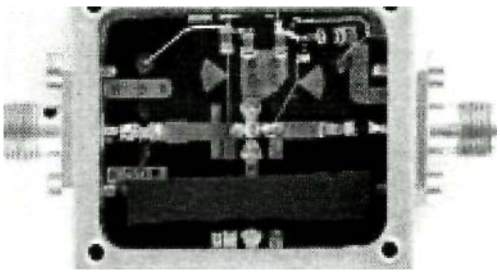
Oggi realizzare un preamplificatore di qualità... senza troppa fatica, con pochi soldi ed a colpo sicuro è possibile utilizzando i front-end televisivi.

Incitati da Franco Rota, la scorsa estate, I1TEX ed io, abbiamo costruito una serie dì preamplificatori a uno e due stadi per i 10GHz, un duplicatore di frequenza per oscillatori a 24GHz ed uno stadio dì ingresso per counter sempre a 10GHz.

La cifra di rumore ottenuta su tutti gli esemplari (circa una decina) si aggira attorno a 1 dB.
Attenzione, se questo valore non viene raggiunto, vuol dire che il GaAsFet ha subito qualche trauma durante la lavorazione.
Per fortuna i Ga-As Fet non mancano, basta sostituirlo con uno di quelli rimasti inutilizzati sulla basetta ritagliata, ed ecco che tutto deve funzionare correttamente.

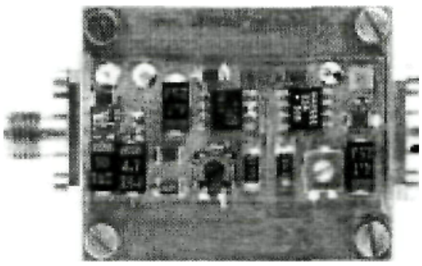
Da non mollo è comparso un articolo scritto da alcuni OM francesi che hanno seguito la stessa strada (vedere su VHF Communications, autunno 2004).
Essi dichiarano una cifra di rumore di circa 0,7dB.
Ritengo che la differenza sia prodotta dagli strumenti usati per la taratura, oppure gli amici d'oltre alpe hanno “spagliettato” con più cura di noi.





Montaggio

Per tutti gli oggetti menzionati, non servono molte parole dì spiegazione. Basta osservare attentamente le foto allegate per capire come procedere. Il connettore d'ingresso dovrà essere isolato dalla linea di gate interponendo un condensatore da 1pF dopo aver tagliato la pista con un cutter mollo affilato. Questo componente potrà essere recuperato dalla linea d'uscita di uno degli altri tre amplificatori non utilizzati.
Nel montaggio originale, le polarizzazioni sono ottenute in modo automatico. Questa soluzione è sicuramente



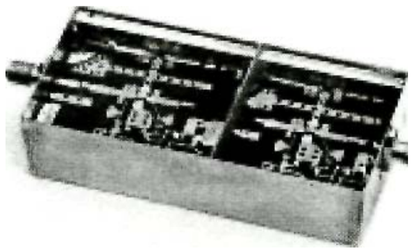
ottima per la produzione in serie, dove si cerca di ottenere una buona conformità delle caratteristiche senza disperdere energie con la taratura. Chi non possiede un misuratore di cifra di rumore e non ha amici attrezzati, potrà lasciare intatto il circuito originale.

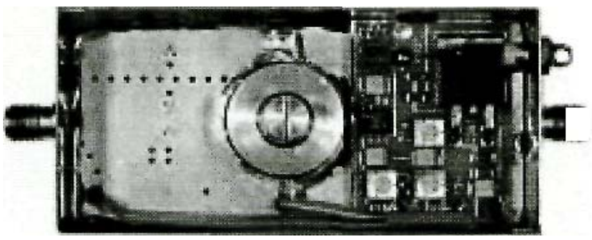
Ho disegnato una serie di stampati per gli alimentatori dei positivi e dei negativi, il laminato è vetronite presensibilizzata.
Il file è disponibile in formato CIRCAD oppure fotografico (gif, tiff, ecc.), il master può essere prodotto con una stampante laser di buona qualità su carta lucida (quella che usavano i disegnatori prima dell'era dei computer).

Gli alimentatori sono tre: uno piccolo che può essere montato all'interno della scatola fresala. Uno più grande, adatto per montaggio superficiale esterno e uno con doppia uscita, per alimentare gli amplificatori a più stadi.

ATTENZIONE, prima di collegare l'alimentatore all'apparato, sarà bene verificare che il negativo sia di circa -1V ed il positivo di circa 2.5V.
Le tarature d'affinamento saranno eseguite in seguito.
A montaggio ultimato gli apparati funzionano subito senza problemi, con una cifra di rumore di circa 1.4dB.
11 miglior rapporto segnale/rumore si ottiene regolando con la massima cura le tensioni d'alimentazione, mentre la "perfezione" si raggiunge solo spagliettando con molta pazienza. Il guadagno è di circa 11-12 dB.

L'amplificatore a due stadi si realizza con due amplificatori ricavati dalla stessa basetta, montati poi in serie fra loro.
Per migliorare le prestazioni, in particolare la selettività, basta inserire fra il primo ed il secondo stadio, un filtro che risuona sulla frequenza desiderata.
Sul prototipo è stato montato uno dei soliti risuonatori impiegati nei transverter tedeschi.
Un'altra soluzione potrebbe essere quella di utilizzare una coppetta in rame, di quelle impiegate in idraulica, con diametro interno di 16 mm profondità 8 mm.

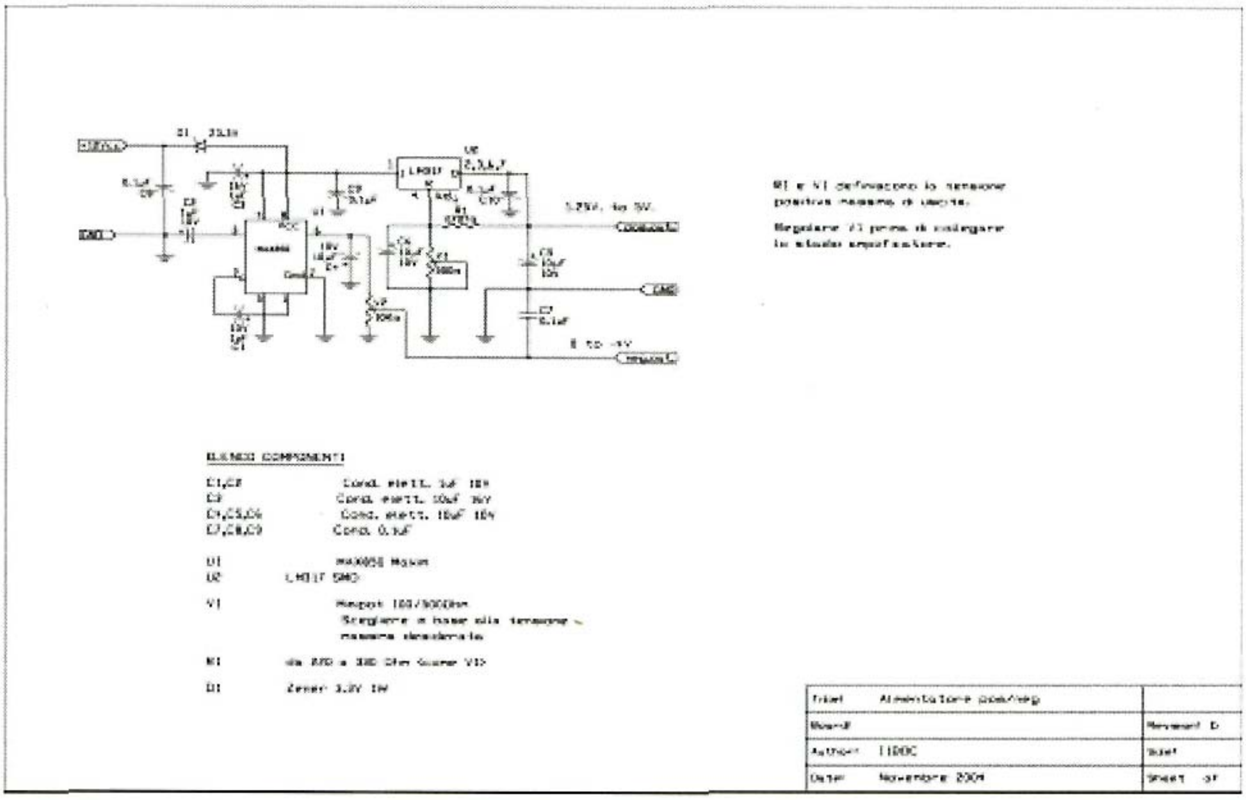




II front-end per counter in banda X non è molto diverso dai circuiti illustrati in precedenza. L'unica variante consiste nell'aver inserito sul connettore d'ingresso, due diodi pin rovesciati per proteggere lo stadio amplificatore. Non è necessario eseguire nessuna spagliettatura.

Il duplicatore da 12 a 24 GHz è più delicato e richiede l'inserzione di un triangolino a mela strada fra l'alimentazione ed il drain sulla linea ad alta impedenza di uscita.
Sarà inoltre necessario filtrare il segnale ottenuto, perché, sul connettore d'uscita, i segnali a 12 GHz e 24 GHz sono pressoché, uguali.
Prelevare il segnale attraverso una guida d'onda potrebbe risolvere questo problema.

Nella fotografia di uno degli amplificatori, si nota sul basso una lunga striscia di assorbitore. Questa non è la soluzione migliore. Per ottenere il minor rumore compatibilmente con una buona stabilità, sarà necessario inserire dei piccoli pezzi in posti trovali in modo sperimentale.



I master per costruire gli alimentatori sono disponibili su file in vari formati. Gli interessati possono richiederli all'autore.
Verranno inoltrati via Mail in breve tempo. Non sono stati inseriti in questo scritto, perché un file PDF non può rendere la risoluzione necessaria per produrre lo stampato. Buon lavoro a tutti Domenico I1BOC

Gerard Galve, F6CXO

Franco's Finest

Low priced 10GHz preamplifiers described by F6CXO

Franco Rota runs an RF component supply company in Italy called R F Elettronica. His main objective is to sell bulk components such as SMD parts to the electronics industry. He attends some radio rallies in Europe and often has interesting items for sale that can be used or adapted by radio amateurs for use on the amateur bands. This is the first article of a regular series that will describe one of Franco's products with details of its use by radio amateurs. If you require more details about the products you can contact VHF Communications or Franco – rf.elettronica@tiscalinet.it

1.0

Introduction

Franco sells the PCB described in this article for €3 (Fig 1). The board was initially purchased to salvage the 4 NE 32584's. After examination, I realised it was fairly rare to find satellite boards with preamplifiers which are so well aligned and so suitable for modifications.

Fig 2 shows a close up of the two preamplifier circuits. Preamplifier No. 1

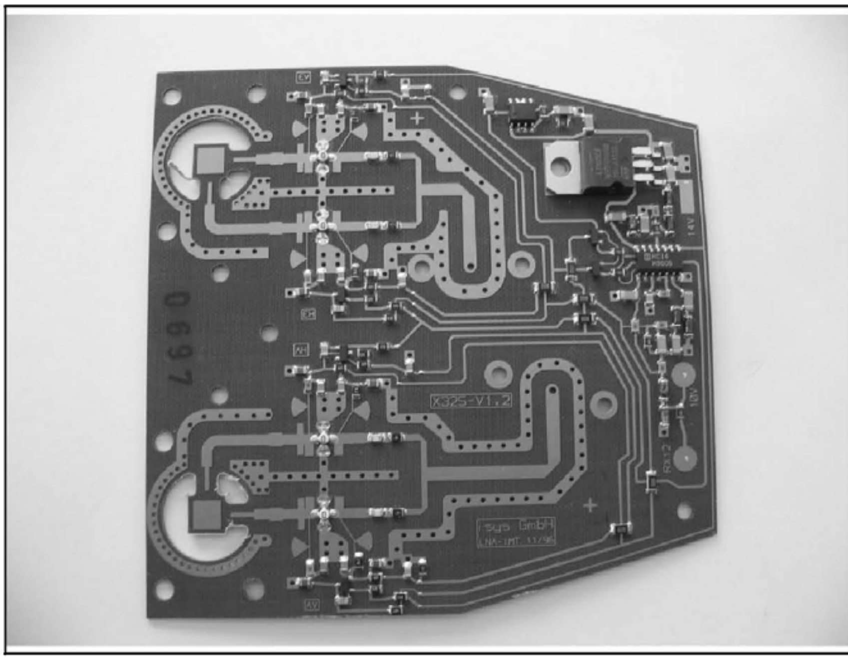


Fig 1: Picture of the amplifier PCB available from Franco Rota for €3.

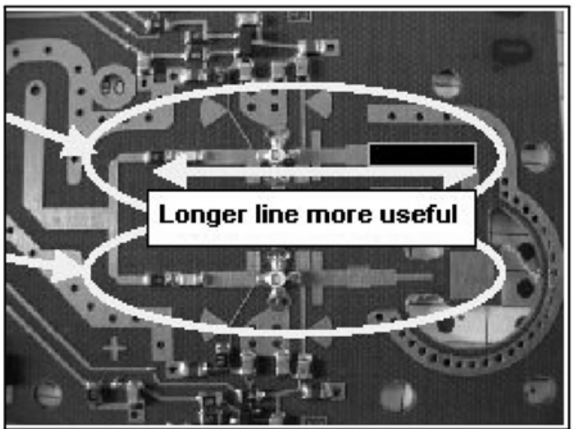


Fig 2: View of one pair of amplifiers. The top circuit is referred to as preamplifier No1 in the text, the bottom one is preamplifier No2.

can be adapted to a wider range of enclosures. The input track can be cut at any point throughout the black area.

Fig 3 shows that if you are careful, you can even salvage 2 preamplifier circuits on this board, use the output capacitor of one as the input for the other. You could just salvage transistors (that was the original idea). Fig 4 shows how the output capacitor of the right hand preamplifier is connected to the input of the left hand one. The negative feed potentiometer can be fitted on the existing printed circuit.

It is that easy, the hardest part is to find a housing that suits the length of the

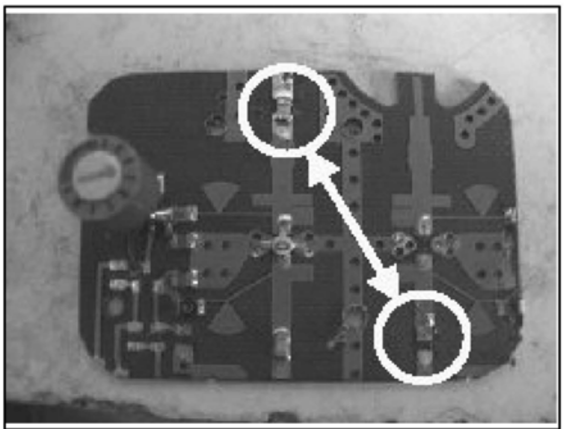


Fig 4: Connecting two amplifiers together.

printed circuit board. Just use your imagination and see what might be available at the back of some old drawer. Figs 5 and 6 show the authors example.

2.0 Performance

Let's see what this box of tricks can do.

- Noise Figure 0.7dB without the lid, 0.8dB with the lid.
- Gain 14dB from 10,368 to

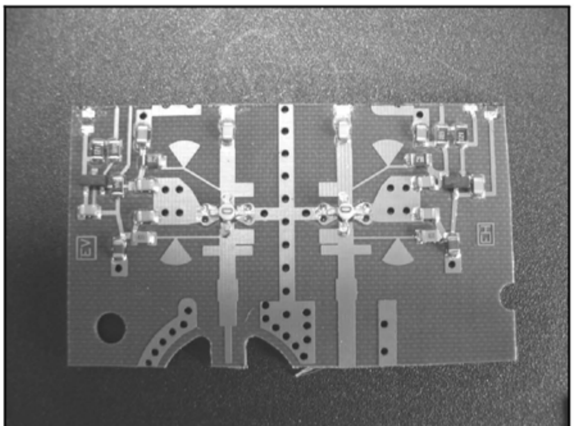


Fig 3 : How to use two amplifier circuits.

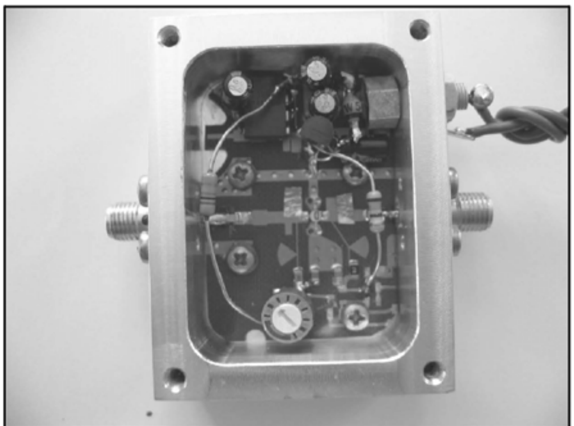


Fig 5: Example housing.

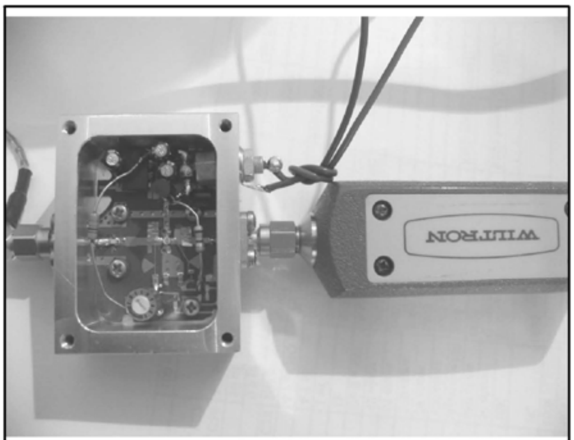


Fig 6: Example housing.

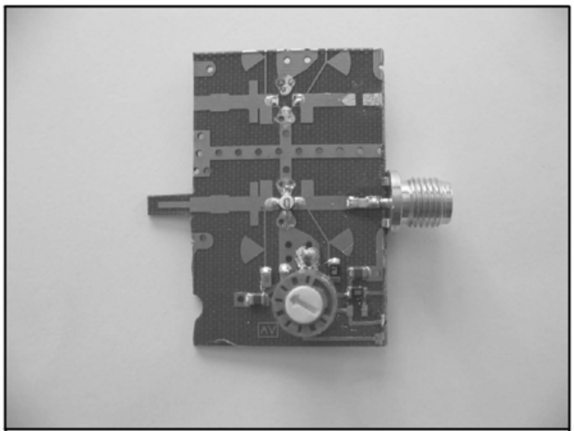


Fig 7: Using preamplifier No2 with direct waveguide input.

10,450MHz.

That's pretty fantastic for €1.5.

3.0
Alternative use

Circuit No. 2 is a little too short to position a capacitor at the input. It can be used very easily with the input line directly in the waveguide as used in the original design (Fig 7).

4.0
Circuit diagram

The original diagram is in the box shown in Fig 8. The power supply was made very simple with wiring "in the air". The ICL 7660 is upside down and the components are soldered directly onto the pins. The drain current should be set to 10mA.

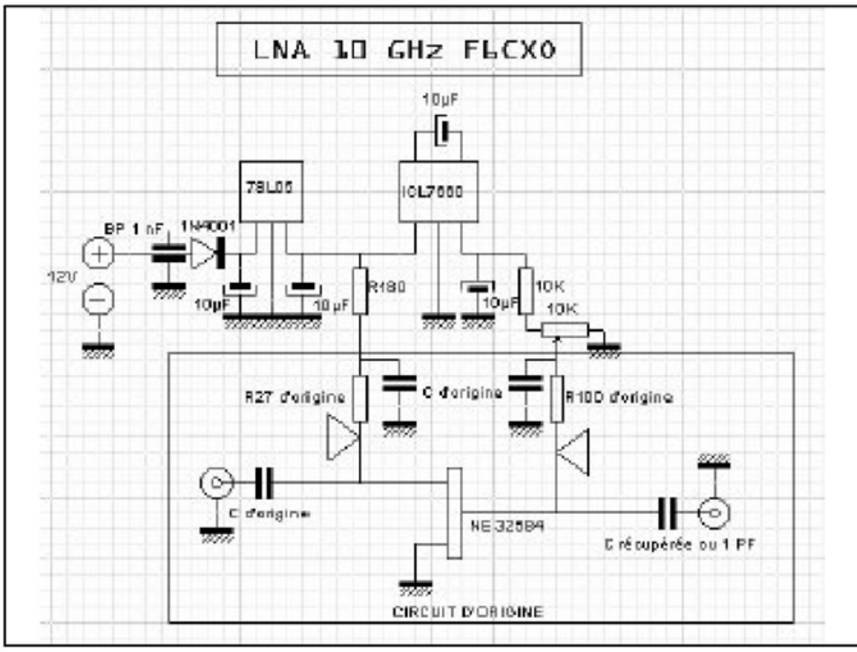


Fig 8: Circuit diagram of the preamplifier and the power supply used.

VHF COMMUNICATIONS 1/2005

Gerrard Galve, F6CXO

Franco's Finest

Inexpensive 12 to 24GHz doubler described by F6CXO

Franco Rota runs an RF component supply company in Italy called R F Elettronica. His main objective is to sell bulk components such as SMD parts to the electronics industry. He attends some radio rallies in Europe and often has interesting items for sale that can be used or adapted by radio amateurs for use on the amateur bands. This is the third article of a regular series that will describe one of Franco's products with details of its use by radio amateurs. If you require more details about the products you can contact VHF Communications or Franco – rf.elettronica@tiscalinet.it

1.0 Introduction

Franco sells the circuit board shown in Fig 1 for €3, it was featured in issue 3/2004 when it's use as a 10GHz preamplifier was described. The circuit board was initially purchased to salvage the 4 x NE32584's. It was then examined and it is quite rare to find satellite boards with pre-amplifiers so well aligned and so suitable for modifications. After some initial operations using them as inexpensive 10GHz pre-amplifiers, I had the idea of testing these circuits in a 12/24GHz doubler.

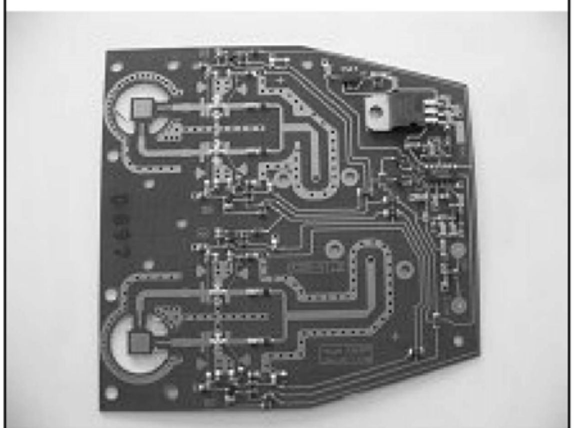


Fig 1: Picture of circuit board used.

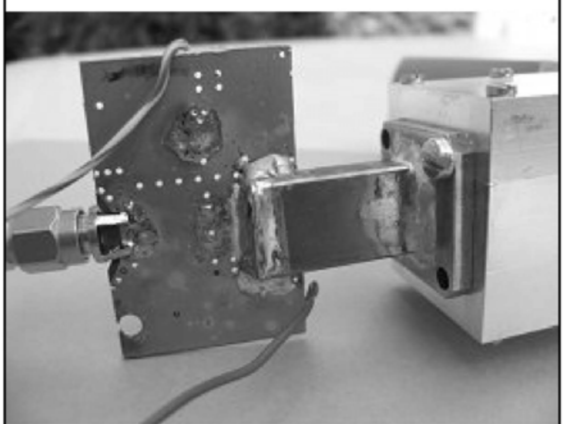


Fig 2: Picture of waveguide fitted to PCB.

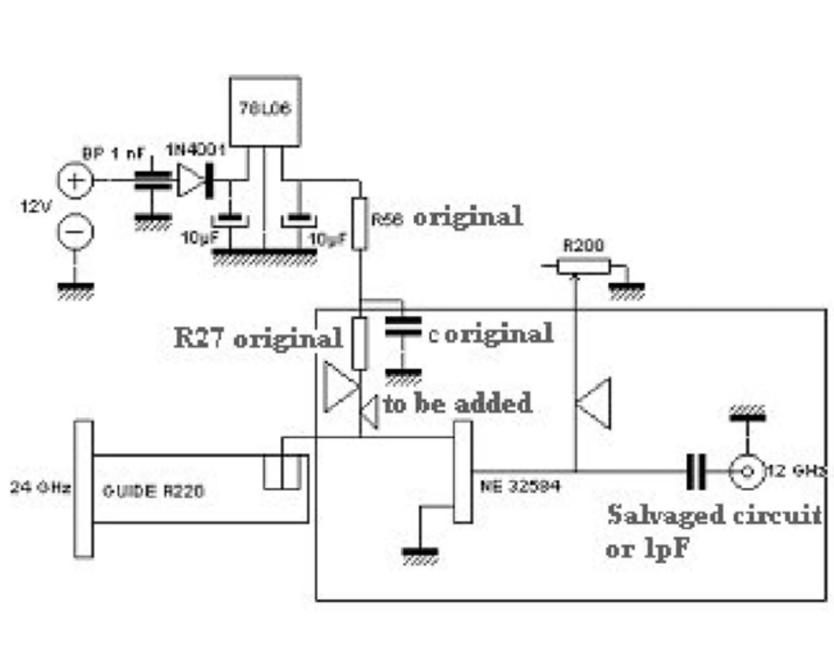


Fig 3: Circuit diagram of the modified circuit used.

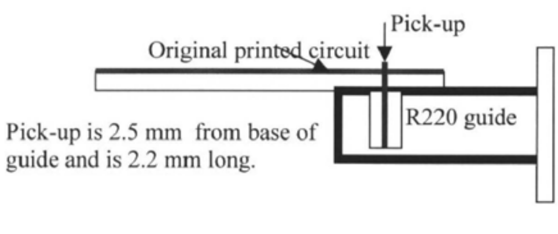


Fig 4: Diagram of main modification.

2.0

Modification

At the output, a short waveguide is used to recover the signal through a little piece of 1.7mm coax which has had its outer sheathing removed. Fig 2 show the waveguide fitted to the PCB, Fig 3 shows the modified section of the circuit used and Fig 4 is a diagram of the main

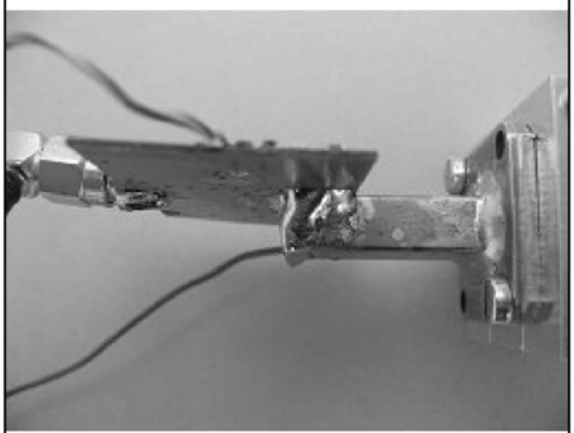


Fig 5: Side view of waveguide.

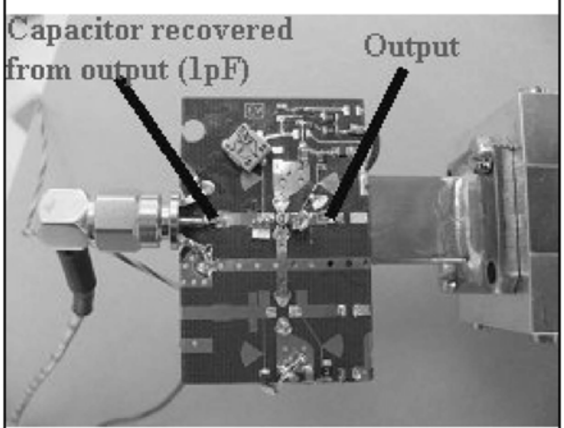


Fig 6. View of underside of PCB showing input and output.

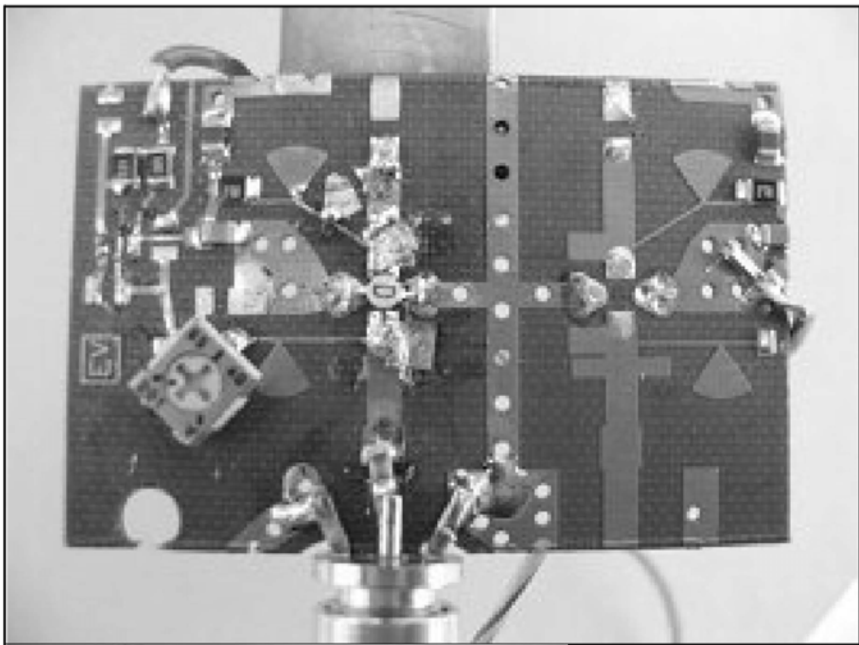


Fig 7: View of PCB showing optimisation foil flags.

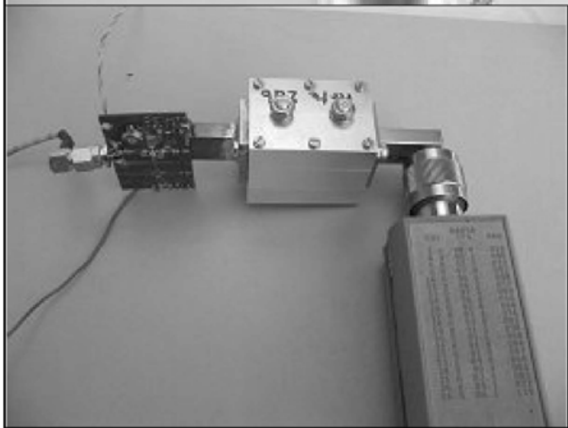


Fig 8: Test assembly using filter by OE9PMJ.

modification. Fig 6 shows the underside of the PCB and Fig 7 shows a close-up where you can see the foil flags used to optimise the circuit. To ensure that the output power measurements that I made were correct I used a filter designed by OE9PMJ to filter the output signal (Fig 8). The output measurements are show in Fig 9.

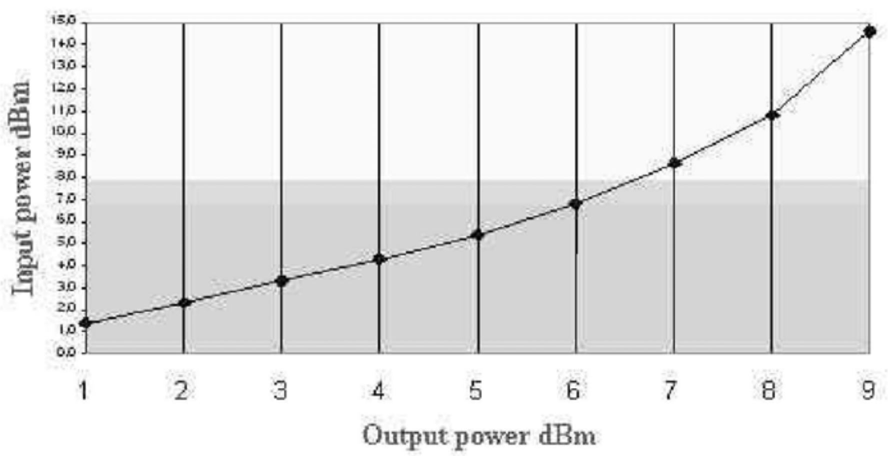
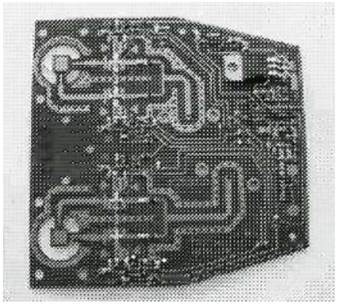


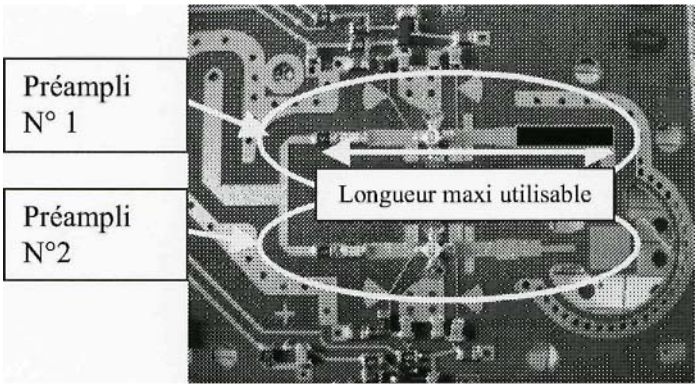
Fig 9: Graph showing test results of 12 to 24GHz doubler. Test conditions: V drain = 2.315v, I drain = 40mA.

DES PREAMPLIS 10 GHz PAS CHERS par F6CXO

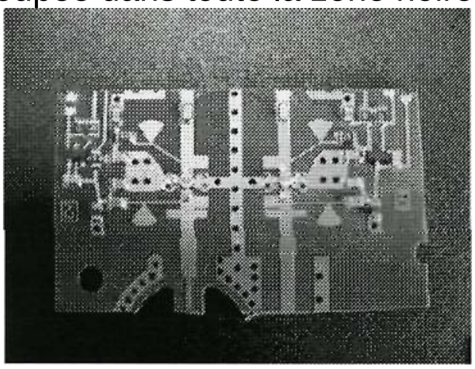
Vendu à CJ 2004 par I2FHW pour 3 €.



La platine a été achetée au départ pour récupération des 4 NE 32584.
Après examen, il est assez rare de trouver des platines satellites avec les préamplificateurs si bien alignés et si propìces à des modifications.

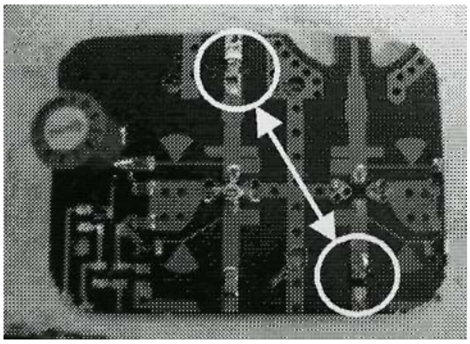


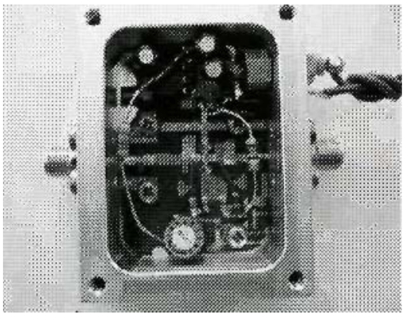
Le N° 1 permet de s'adapter à une variété plus grande de boîtier, la piste d'entrée peut être coupée dans toute la zone noire à n'importe quel endroit.



En étant soigneux, on pourrait même récupérer 2 circuits préamplificateurs sur cette platine, mais il faut bien récupérer des transistors (c'était le but initial) et surtout se servir de la capa de sortie de l'un comme capa d'entrée de l'autre.

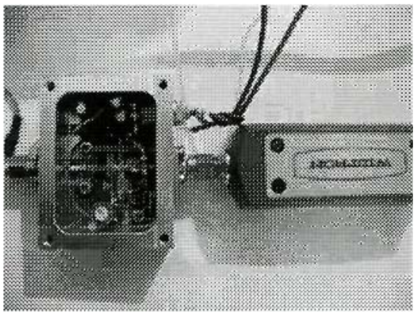
La capacité de sortie du préamplificateur de droite est soudée en entrée sur celui de gauche, le potentiomètre pour l'alimentation négative trouve sa place sur le CI existant.

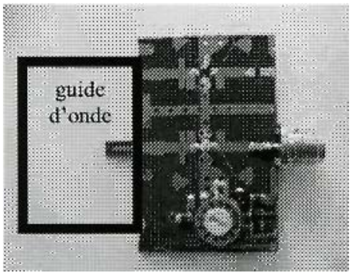




Et voilà , le plus dur est de trouver un boîtier qui s'adapte à la longueur du CI.
chacun laissera son imagination et ses fonds de tiroirs faire le reste.

Allons voir ce qu'il a dans le ventre ce truc là.
NF 0.7 dB sans le couvercle, 0.8 dB avec le couvercle.
Gain 14 dB de 10368 à 10450 MHz.
C'est assez fantastique pour 1.5 €

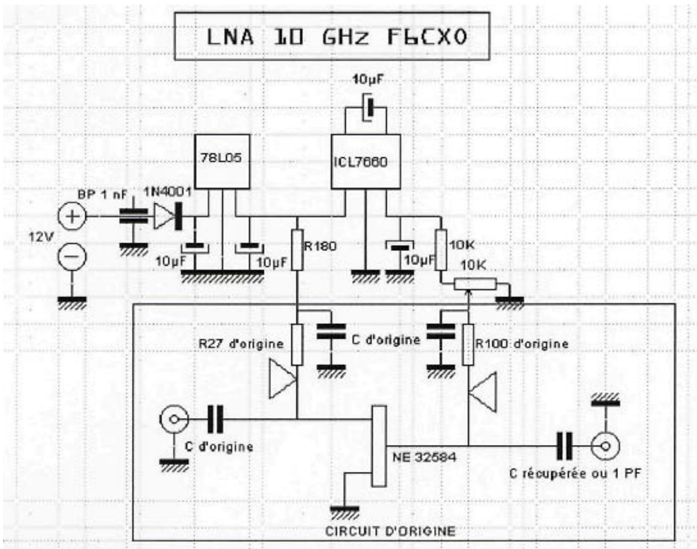




Le circuit N°2 est un peu trop court pour mettre une capa en entrée, il ira très bien pour installer avec la ligne d'entrée directement dans le guide comme prévu à l'origine.

YAPUKA trouver la mécanique.

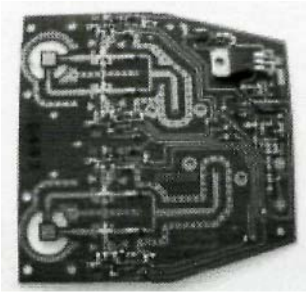
Le schéma électrique :
Encadré, le schéma d'origine.
L 'alimentation est simplifiée à l'extrême, câblée en l'air, l'ICL7660 est pattes en l'air, les composants soudés directement sur ses pattes.
Bonne réalisation à tous. 73 QRO Gérard
Régler I drain à 10 mA



Bonne réalisation à tous. 73 QRO Gérard.

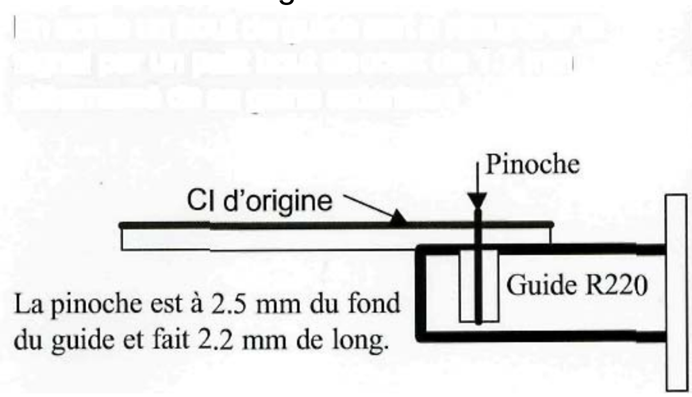
DOUBLEUR 12 => 24 GHz PAS CHERS par F6CXO

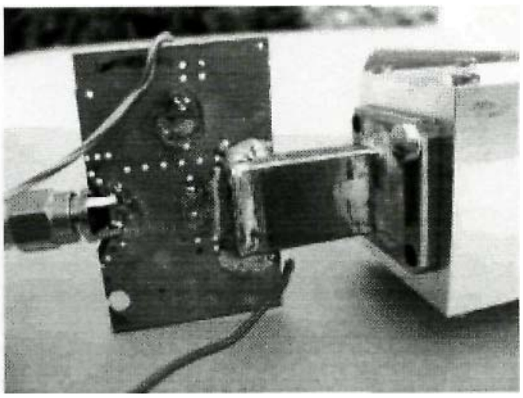
Vendu à CJ 2004 par I2FHW pour 3€

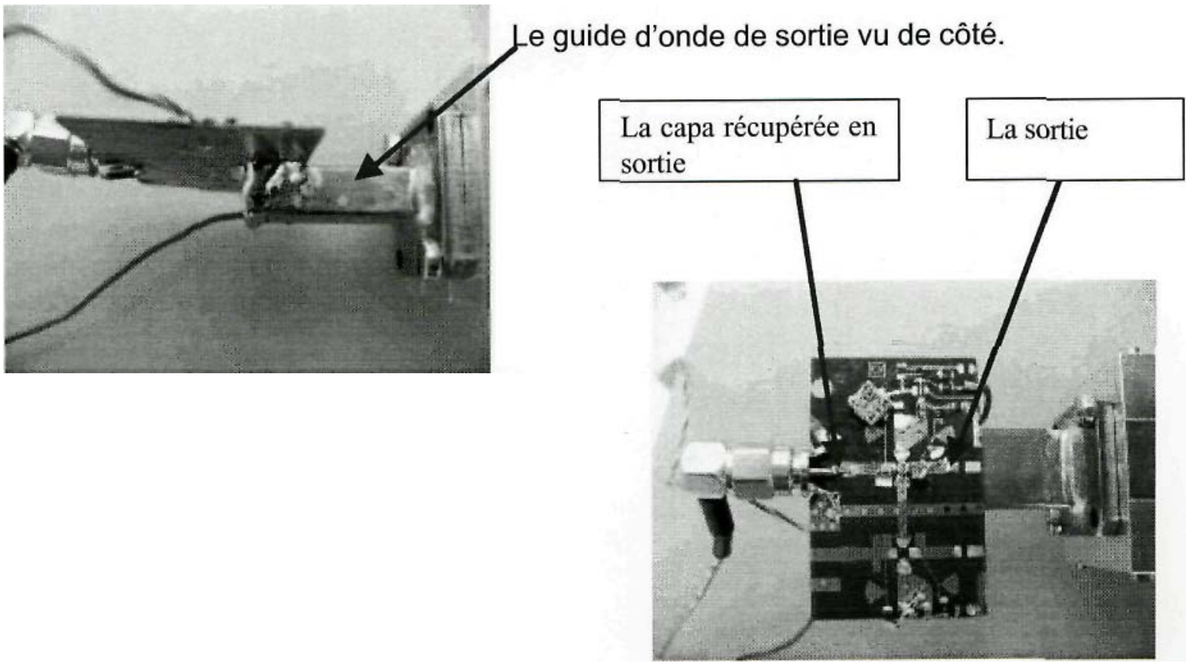


La platine a été achetée au départ pour récupération des 4 NE 32584.
Après examen, il est assez rare de trouver des platines sat avec les préamplificateurs si bien alignés et si propice a des modifications.
Après les premières manips sur les préamplis 10GHz pas cher, l'idée m'est venue de tester ces circuits en doubleur 12/24 GHz.

En sortie un bout de guide sert a récupérer le signal par un petit bout de coax de 1.7 mm débarrasse de sa gaine extérieure

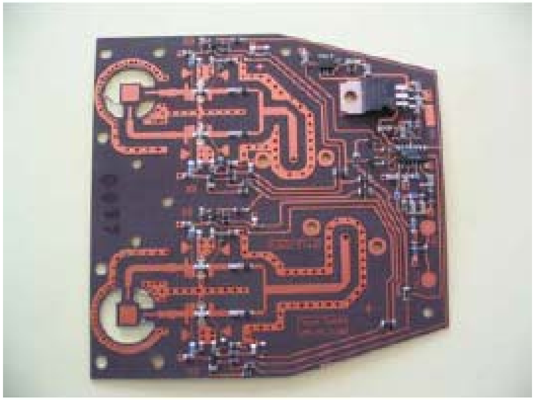






DES AMPLIS 10 GHz PAS CHERS par F6CXO

Vendu à CJ 2004 par I2FHW pour 3 €

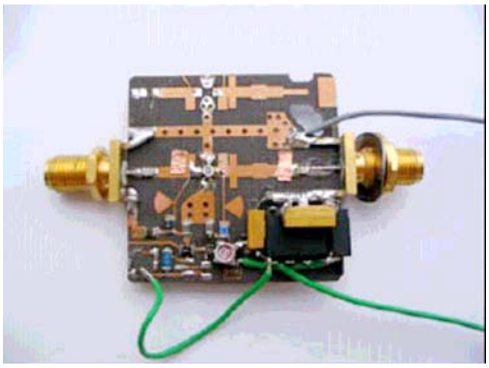


La platine a été achetée au départ pour récupération des 4 NE 32584.
Après examen, il est assez rare de trouver des platines sat avec les préamplificateurs si bien alignés et si propice a des modifications.

Après les préamplis, le doubleur 12/24 GHZ voici la suite du feuilleton : **Les amplis**

On a toujours besoin de booster à la sortie d'un OL, d'un transverter un peu poussif, etc etc.
L'idée a été d'essayer le NE3584 en puissance et ensuite de monter toute sorte de petit transistor de faible et moyenne puissance sur ce CI, la seule limite étant l'écart entre la ligne de gate et celle de drain.

Le NE32584 en puissance :



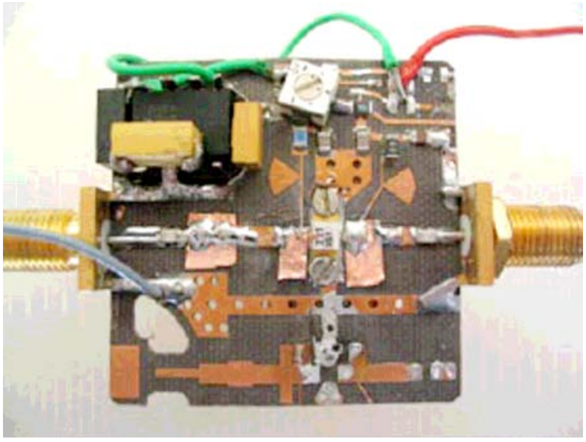
On pourrait pousser plus, mais c'était juste pour voir.
Vd = 3.1V , Id = 19 mA

0 dB entrée	➔+ 12 dBm sortie	= 12 dB de gain
+3 dB entrée	➔+ 13.1 dBm sortie	= 10.1 dB de gain
+6 dB entrée	➔+ 14 dBm sortie	= 8 dB de gain
+9 dB entrée	➔+ 14.6 dBm sortie	= 5.6 dB de gain
+10 dB entrée	➔+ 14.7 dBm sortie	= 4.7 dB de gain
+11 dB entrée	➔+ 14.8 dBm sortie	= 3.8 dB de gain

On compresse vite, mais on peut ainsi aider un étage OL un peu poussif, ou le transverter DBVAxx qui ne sort pas la puissance prévue.

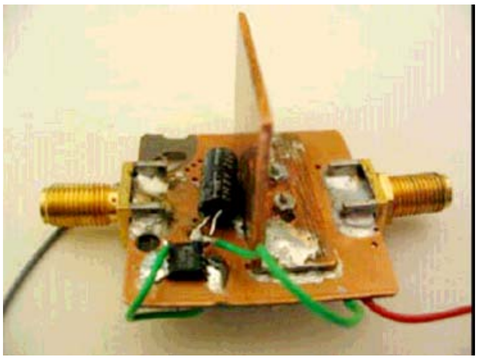
Et si on essayait un peu tout la dessus.

Après avoir débarrassé le CI des stubs existants, on découpe l'empreinte du transistor, et on soude sous le CI un bout de cuivre pour servir de support et de refroidisseur au transistor.

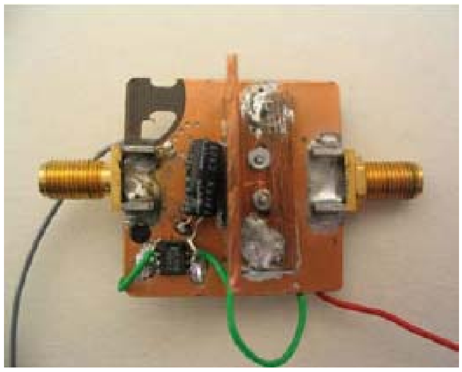


Montage d'un **FSX 51**

Transistor donné pour 19 dBm et 10 dB de gain sous 8 V.
Les résultats sont conformes aux spécifications, un peu de clinquant, de la patiente et les résultats sont là, 10 dB de gain et même 20 dBm en sortie, qui dit mieux.
L'alimentation de gate ne bouge pas par rapport au schéma initial, l'alim du drain est adaptée aux spécifications du transistor, dans ce cas VD 8V, R drain 9 Ohm.



Vue sur le bout de cuivre soudé directement sous le CI et servant de radiateur et de support pour fixer le transistor.
Serrer dans l'étau car ça chauffe quand même un peu.

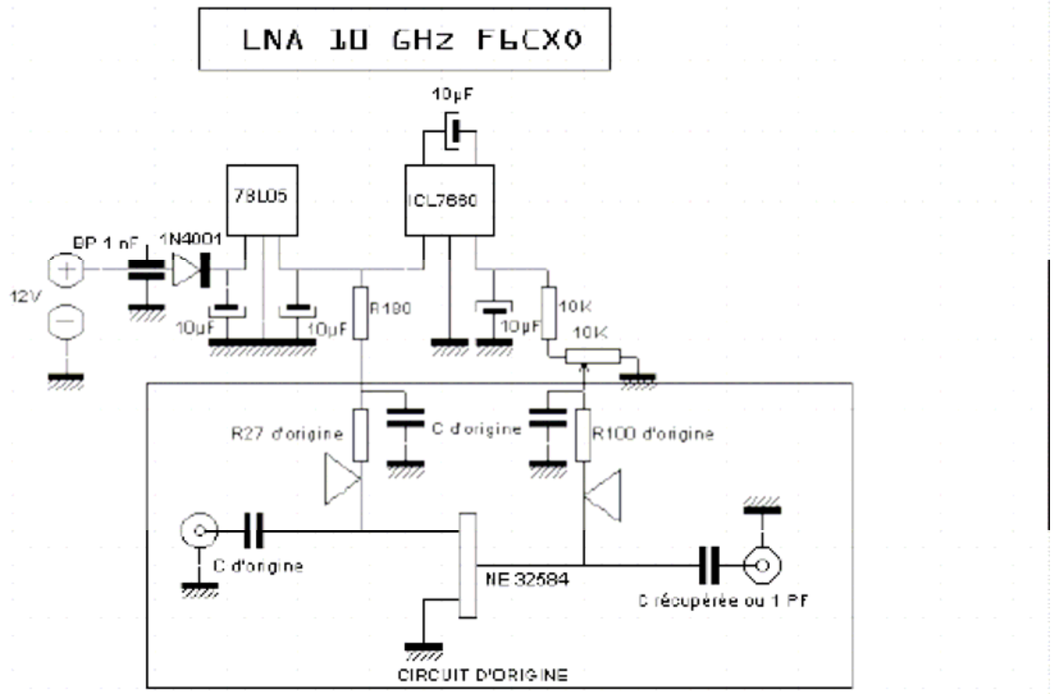


Les essais ont continués avec un **FLC 053**.

Transistor donné pour 27 dBm et 9 dB de gain, sans chercher à optimiser, j'ai au bout de 5 minutes obtenu 6 dB de gain ce qui prouve qu'en touillant un peu on doit obtenir des résultats aussi intéressants que le FSX51.

A mon avis, les seules limites sont mécaniques et encore, car un coup de cutter verticalement et on a un circuit entrée et un circuit sortie pouvant s'adapter à un peu tout.

<u>Le schéma électrique:</u>
Encadré, le schéma d'origine.
L 'alimentation est simplifiée à l'extrême, câblée en l'air, l'ICL7660 est pattes en l'air, les composants soudés directement sur ses pattes.
Supprimer R drain R27 et R180 et adapter selon le transistor disponible et la tension de drain nécessaire.



Bonne réalisation à tous. 73 QRO Gérard

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http://monsite.wanadoo.fr/F6CXO/

NEC

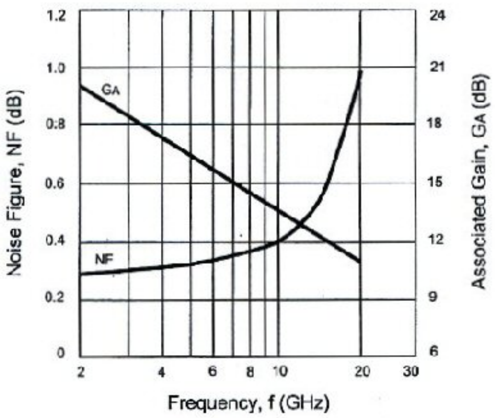
ULTRA LOW NOISE PSEUDOMORPHIC HJ FET

NE32584C

FEATURES

- **VERY LOW NOISE FIGURE:** 0.45 dB Typical at 12 GHz
- **HIGH ASSOCIATED GAIN:** 12.5 dB Typical at 12 GHz
- **$L_G \leq 0.20$ µm, $W_G = 200$ µm**
- **LOW COST METAL CERAMIC PACKAGE**
- **TAPE & REEL PACKAGING OPTION AVAILABLE**

NOISE FIGURE & ASSOCIATED GAIN vs. FREQUENCY
$V_{DS} = 2$ V, $I_{DS} = 10$ mA



DESCRIPTION

The NE32584C is a pseudomorphic Hetero-Junction FET that uses the junction between Si-doped AlGaAs and undoped InGaAs to create very high mobility electrons. The device features mushroom shaped TiAl gates for decreased gate resistance and improved power handling capabilities. The mushroom gate also results in lower noise figure and high associated gain. This device is housed in an epoxy-sealed, metal/ceramic package and is intended for high volume consumer and industrial applications.

NEC's stringent quality assurance and test procedures assure the highest reliability and performance.

ELECTRICAL CHARACTERISTICS ($T_A = 25°C$)

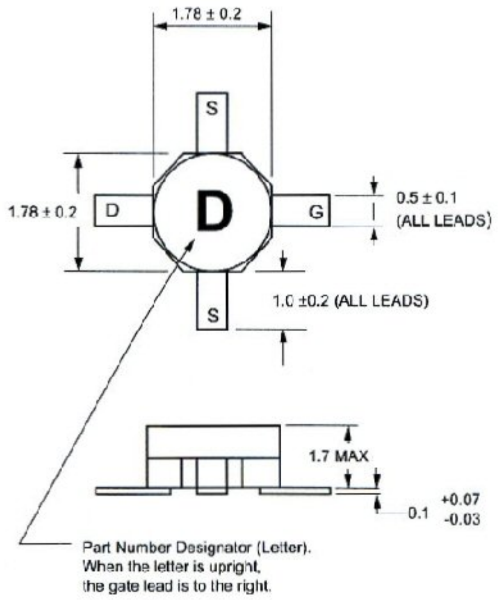
PART NUMBER PACKAGE OUTLINE			NE32584C 84C		
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX
NF[1]	Optimum Noise Figure, $V_{DS} = 2$ V, $I_{DS} = 10$ mA, f = 12 GHz	dB		0.45	0.55
GA[1]	Associated Gain, $V_{DS} = 2$ V, $I_{DS} = 10$ mA, f = 12 GHz	dB	11.0	12.5	
I_{DSS}	Saturated Drain Current, $V_{DS} = 2$ V, $V_{GS} = 0$ V	mA	20	60	90
V_P	Pinch-off Voltage, $V_{DS} = 2$ V, $I_{DS} = 100$ µA	V	-2.0	-0.7	-0.2
g_m	Transconductance, $V_{DS} = 2$ V, $I_D = 10$ mA	mS	45	60	
I_{GSO}	Gate to Source Leakage Current, $V_{GS} = -3$ V	µA		0.5	10.0
$R_{TH (CH-A)}$	Thermal Resistance (Channel to Ambient)	°C/W		750	
$R_{TH (CH-C)}$	Thermal Resistance (Channel to Case)	°C/W			350

Note:
1. Typical values of noise figures and associated gain are those obtained when 50% of the devices from a large number of lots were individually measured in a circuit with the input individually tuned to obtain the minimum value. Maximum values are criteria established on the production line as a "go-no-go" screening tuned for the "generic" type but not each specimen.

NE32584C

OUTLINE DIMENSIONS (Units in mm)

PACKAGE OUTLINE 84C



ORDERING INFORMATION

PART NUMBER	AVAILABILITY	LEAD LENGTH	PACKAGE OUTLINE
NE32584C-S	Bulk up to 1K	1.0 mm	84C
NE32584C-T1	1K/Reel	1.0 mm	84C

NE32584C

ABSOLUTE MAXIMUM RATINGS[1] (T_A = 25°C)

SYMBOLS	PARAMETERS	UNITS	RATINGS
V_{DS}	Drain to Source Voltage	V	4.0
V_{GS}	Gate to Source Voltage	V	-3.0
I_{DS}	Drain Current	mA	I_{DSS}
I_{GRF}	Gate Current	µA	100
T_{CH}	Channel Temperature	°C	150
T_{STG}	Storage Temperature	°C	-65 to +150
P_T	Total Power Dissipation	mW	165

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

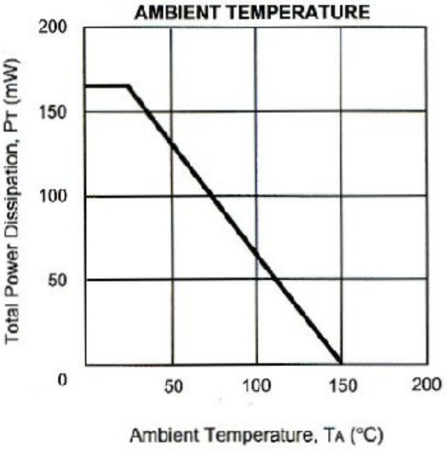
TYPICAL NOISE PARAMETERS (T_A = 25°C)

V_{DS} = 2 V, I_D = 10 mA

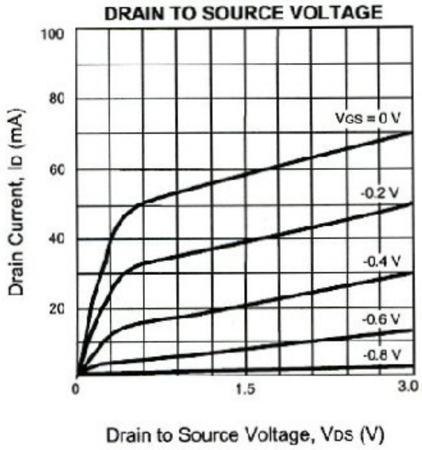
FREQ. (GHz)	NF_{OPT} (dB)	G_A (dB)	Γ_{OPT} MAG	Γ_{OPT} ANG	Rn/50
2	0.29	20.0	0.86	22	0.27
4	0.30	18.3	0.76	45	0.25
6	0.33	16.5	0.69	70	0.18
8	0.36	15.0	0.63	96	0.11
10	0.40	13.6	0.59	122	0.08
12	0.45	12.5	0.54	147	0.04
14	0.54	12.0	0.48	171	0.04
16	0.68	11.8	0.40	-165	0.05
18	0.85	11.5	0.31	-144	0.06

TYPICAL PERFORMANCE CURVES (T_A = 25°C)

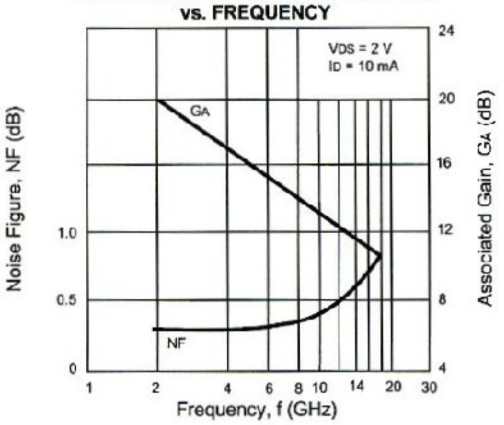
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



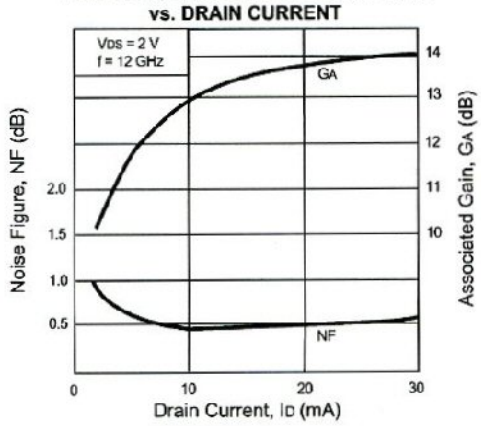
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



NOISE FIGURE AND ASSOCIATED GAIN vs. FREQUENCY

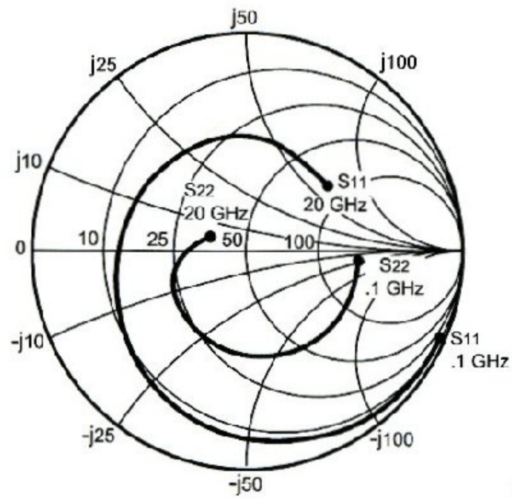


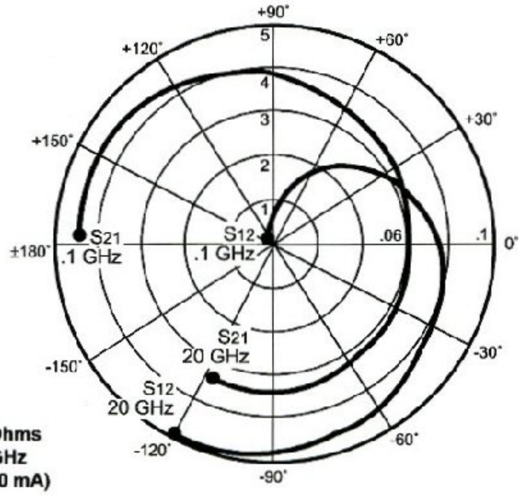
NOISE FIGURE AND ASSOCIATED GAIN vs. DRAIN CURRENT



NE32584C

TYPICAL COMMON SOURCE SCATTERING PARAMETERS (T_A = 25°C)





Coordinates in Ohms
Frequency in GHz
(V_{DS} = 2 V, I_{DS} = 10 mA)

NE32584C
V_{DS} = 2 V, I_{DS} = 10 mA

FREQUENCY	S_{11}		S_{21}		S_{12}		S_{22}		K	MAG
(GHz)	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG		(dB)
0.100	1.001	-1.75	5.202	178.07	0.001	83.90	0.587	-1.59	-0.075	37.162
0.200	1.001	-3.60	5.189	176.33	0.003	86.02	0.585	-3.13	-0.025	32.380
0.500	0.998	-8.95	5.178	170.78	0.008	83.30	0.585	-7.50	0.047	28.111
1.000	0.989	-17.72	5.128	161.98	0.015	76.85	0.581	-14.91	0.118	25.339
2.000	0.967	-34.63	5.013	145.12	0.030	64.62	0.576	-28.90	0.188	22.230
3.000	0.943	-50.81	4.865	128.82	0.043	53.33	0.567	-42.28	0.235	20.536
4.000	0.907	-66.71	4.703	112.71	0.054	42.06	0.554	-55.03	0.312	19.400
5.000	0.857	-81.86	4.493	97.04	0.062	31.40	0.531	-66.77	0.426	18.601
6.000	0.800	-96.39	4.297	82.71	0.069	21.97	0.503	-77.55	0.541	17.943
7.000	0.755	-110.25	4.143	69.20	0.075	13.52	0.483	-87.72	0.618	17.423
8.000	0.725	-124.55	4.068	55.99	0.081	5.09	0.470	-97.81	0.646	17.009
9.000	0.683	-138.37	3.994	42.58	0.084	-3.80	0.453	-106.93	0.724	16.771
10.000	0.663	-154.60	4.017	28.11	0.089	-12.63	0.431	-116.85	0.734	16.545
11.500	0.585	178.24	3.849	6.85	0.091	-26.79	0.359	-134.35	0.900	16.263
12.000	0.565	168.24	3.790	-0.46	0.090	-31.63	0.335	-140.87	0.960	16.244
13.000	0.551	148.32	3.720	-13.97	0.090	-41.14	0.300	-157.16	1.000	16.163
14.000	0.548	129.66	3.669	-28.93	0.089	-52.52	0.281	-173.11	1.029	15.113
15.000	0.560	112.17	3.652	-44.37	0.087	-64.18	0.276	171.08	1.025	15.253
16.000	0.565	94.50	3.557	-60.11	0.085	-76.05	0.274	154.07	1.052	14.824
17.000	0.565	76.97	3.448	-74.93	0.084	-89.05	0.259	135.78	1.101	14.196
18.000	0.575	60.33	3.357	-89.44	0.082	-103.35	0.263	116.62	1.120	14.012

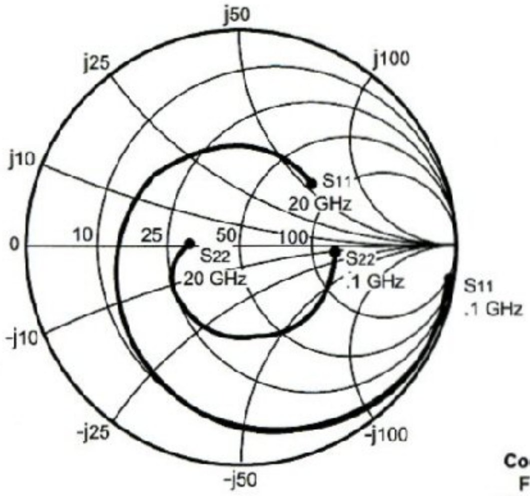
Note:
1. Gain Calculation:

$MAG = \frac{|S_{21}|}{|S_{12}|}\left(K \pm \sqrt{K^2 - 1}\right)$. When $K \leq 1$, 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

NE32584C

TYPICAL COMMON SOURCE SCATTERING PARAMETERS (T_A = 25°C)



Coordinates in Ohms
Frequency in GHz
(V_{DS} = 2 V, I_{DS} = 20 mA)

NE32584C
V_{DS} = 2 V, I_{DS} = 20 mA

FREQUENCY	S11		S21		S12		S22		K	MAG
(GHz)	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG		(dB)
0.100	1.001	-1.81	6.552	178.03	0.001	84.76	0.509	-1.76	-0.078	38.164
0.200	1.000	-3.77	6.531	176.09	0.003	86.79	0.507	-3.19	0.011	33.379
0.500	0.997	-9.43	6.511	170.33	0.007	83.69	0.506	-7.53	0.063	29.685
1.000	0.987	-18.65	6.432	161.14	0.014	77.38	0.502	-14.91	0.134	26.622
2.000	0.958	-36.35	6.243	143.49	0.027	65.71	0.496	-28.84	0.232	23.640
3.000	0.925	-53.13	5.999	126.61	0.038	55.04	0.487	-41.96	0.303	21.983
4.000	0.879	-69.42	5.734	110.09	0.048	44.64	0.474	-54.20	0.397	20.772
5.000	0.821	-84.79	5.417	94.24	0.056	34.90	0.454	-65.25	0.519	19.856
6.000	0.757	-99.35	5.121	79.85	0.062	26.33	0.430	-75.31	0.646	19.170
7.000	0.708	-113.22	4.892	66.26	0.068	18.60	0.413	-84.85	0.723	18.570
8.000	0.674	-127.54	4.754	53.02	0.074	10.86	0.401	-94.21	0.754	18.078
9.000	0.628	-141.15	4.617	39.77	0.078	2.80	0.389	-102.27	0.826	17.723
10.000	0.605	-157.21	4.599	25.65	0.083	-5.30	0.370	-111.19	0.836	17.436
11.000	0.549	-174.62	4.503	11.83	0.086	-14.51	0.330	-121.08	0.927	17.190
12.000	0.513	165.35	4.291	-2.24	0.087	-23.36	0.283	-133.16	1.017	16.128
13.000	0.504	145.18	4.193	-15.42	0.087	-32.46	0.248	-149.27	1.052	15.439
14.000	0.504	126.44	4.123	-29.96	0.088	-43.35	0.229	-165.01	1.061	15.202
15.000	0.517	109.11	4.106	-45.03	0.087	-54.72	0.225	179.28	1.050	15.376
16.000	0.527	91.65	4.001	-60.55	0.086	-66.36	0.224	161.59	1.058	15.203
17.000	0.530	74.05	3.888	-75.22	0.085	-79.11	0.208	142.58	1.098	14.697
18.000	0.543	57.36	3.785	-89.66	0.083	-93.10	0.212	121.91	1.114	14.536

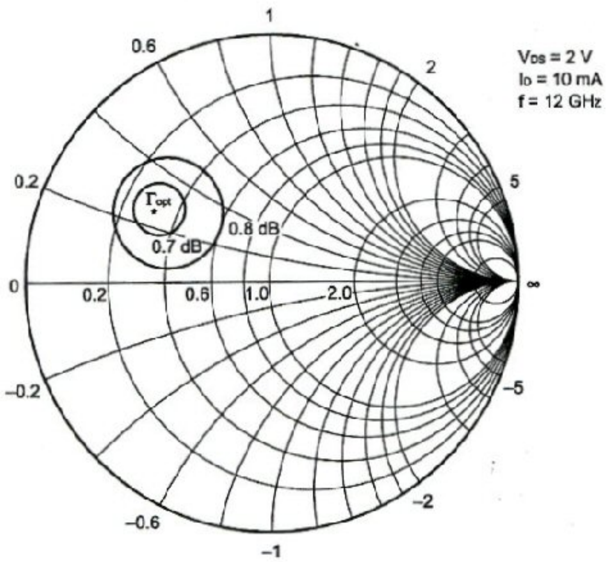
Note:
1. Gain Calculation:

$MAG = \frac{|S_{21}|}{|S_{12}|}\left(K \pm \sqrt{K^2 - 1}\right)$. When K ≤ 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

NOISE PARAMETER

<TYPICAL CONSTANT NOISE FIGURE CIRCLE>



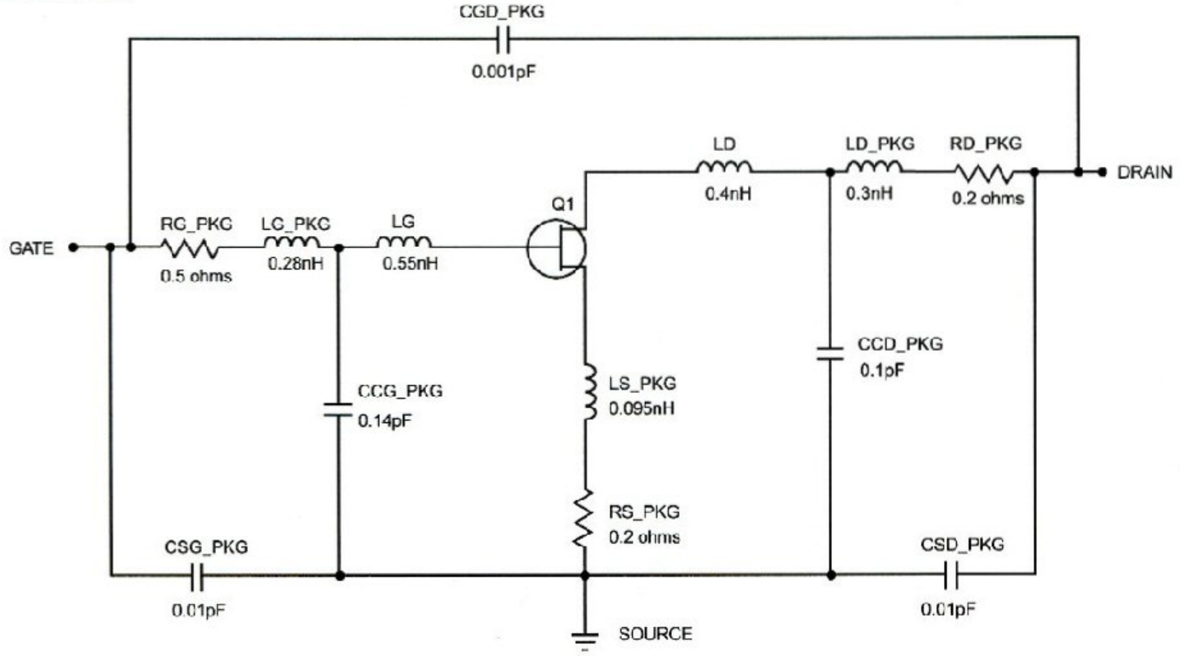
<NOISE PARAMETER>

V_{DS} = 2 V, I_D = 10 mA

Freq. (GHz)	$NF_{min.}$ (dB)	G_a (dB)	$\Gamma_{opt.}$ MAG.	$\Gamma_{opt.}$ ANG. (deg.)	$R_n/50$
2.0	0.29	20.0	0.86	22	0.27
4.0	0.30	18.3	0.76	45	0.25
6.0	0.33	16.5	0.69	70	0.18
8.0	0.36	15.0	0.63	96	0.11
10.0	0.40	13.6	0.59	122	0.08
12.0	0.45	12.5	0.54	147	0.04
14.0	0.54	12.0	0.48	171	0.04
16.0	0.68	11.8	0.40	−165	0.05
18.0	0.85	11.5	0.31	−144	0.06
24	~2	7-8			

NE32584C NONLINEAR MODEL

SCHEMATIC



FET NONLINEAR MODEL PARAMETERS (1)

Parameters	Q1	Parameters	Q1
VTO	-0.6723	RG	3
VTOSC	0	RD	2
ALPHA	4	RS	2
BETA	0.115	RGMET	0
GAMMA	0.08	KF	0
GAMMADC	0.07	AF	1
Q	2	TNOM	27
DELTA	0.5	XTI	3
VBI	0.715	EG	1.43
IS	3e-13	VTOTC	0
N	1.22	BETATCE	0
RIS	0	FFE	1
RID	0		
TAU	5e-12		
CDS	0.13e-12		
RDB	1000		
CBS	1e-9		
CGSO	0.3e-12		
CGDO	0.02e-12		
DELTA1	0.3		
DELTA2	0.1		
FC	0.5		
VBR	Infinity		

(1) Series IV Libra TOM Model

UNITS

Parameter	Units
time	seconds
capacitance	farads
inductance	henries
resistance	ohms
voltage	volts
current	amps

MODEL RANGE

Frequency: 0.1 to 18 GHz

Bias: V_{DS} = 1 V to 3 V, I_D = 5 mA to 30 mA

Date: 3/24/97