1 TO 9 VOLT INVERTER

RIFERIMENTI

Genere	DATE	Generalità	Note	Distribuzione
radio	Jan 16	Mini inverter	Lab note on file word yr 2000, rewritten 2016	Af web

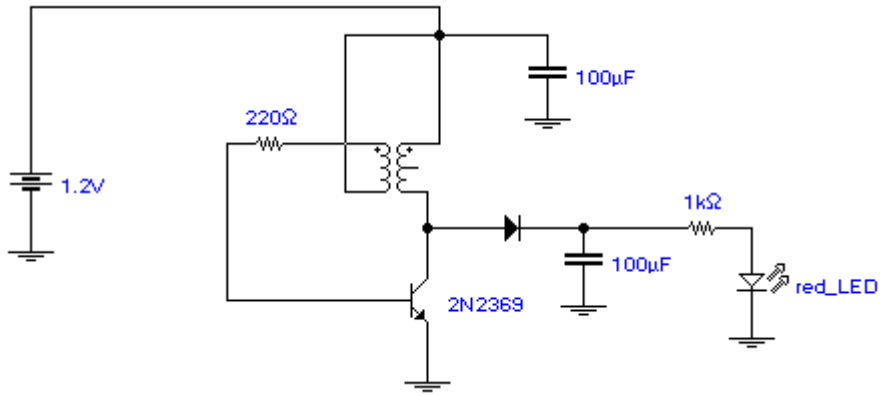
GENERALITA' - OVERVIEW

This is a lab note to remind some experiments about a booster starting from 1 .. 1.5 .. 2 Volt to 9 Volt.

It was a subject yet read on a British magazine, Epemag, of author mr Kaparnik.

At the time I needed to elevate voltage from the dynamo of my bycicle.

The following schematic shows the base circuit. I've tried with success also the more complex circuit with output regulation as suggested by Kaparnik.



The electric diagram shows a 2N2369 because the drawing program library was limited, really I've made tests with an SGS surplus bjt marked 1W8723.

It was a workhorse bjt in my lab, being object of any kind of torture. Original data sheet are a rare think, de-facto I have only second hand data. These data let me with some doubt because for example Vce is given only 20 Volt, but experience shows that employed as RF final amp they worked with 50 Volt peak or more.

This mini inverter shows at the oscilloscope a peak voltage as much as 45 Volt at collector.

Rectifier diode used here is a 1N5818 shottky.

MEASUREMENT

In this case with 1.2V input I measure over resistor 1 k Ohm about 6 Volt dc. Rising input voltage to 2,4 can obtain 9 Volt over R 1k, drawing about 50 milliamps.

The following table shows the performance.

Vbatt	V out	I tot	I out	n(%)
1.2	6	0.04	0.004	50
2.4	9	0.06	0.007	43.75

BJT is running at ambient temperature.

Waveshapes suggest that increasing power some problem may occur. Peak voltage on collector reach 45 Volts. Base voltage positive going beteen 0.7 – 1 Volt reach on negative side a -9 Volt and I think due to BVebo.

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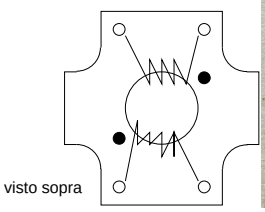
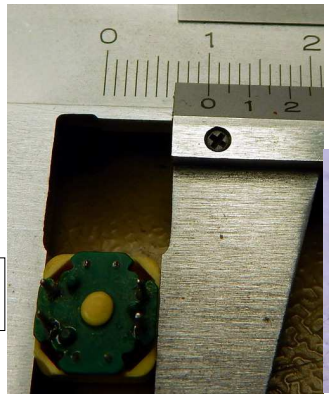
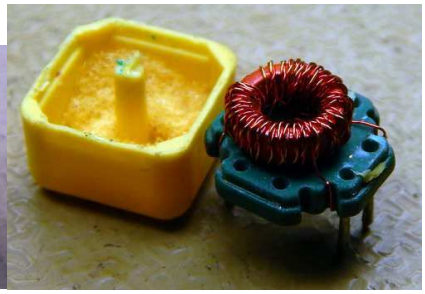
Frequency is near 100 kHz, 9 usec cycle.

TRANSFORMER

The transformer is a computer surplus inside a yellow plastic box. It's a ferrite toroid. Turns ratio is 1:1 and a single windings measure 535 micro Henries. It fits in 4 x 4 holes standard pcb.







Caliper reading in mm.

I've tried many other trafos to satisfy my curiosity, but original note went lost. Nowaday should possible to try with small toroid trafos recovered from a broken electronic lamp.

THE ORIGINAL MR KAPARNIK ARTICLE

A booster is simple electronic circuit, after reading mr Kaparnic.

Original BJT employed were ZTX650, not so rare as 1W8723 but….

Low Cost AA to PP3 Converter – Service (Call)

THERE are a variety of integrated devices available which perform single cell d.c. conversion. However, for some applications these may be limited in output voltage or be relatively expensive. The circuit diagrams shown in Fig.1 perform the same service for a very low cost and at a reasonable efficiency.

The simplest, Fig.1a is suited to applications which present a constant load. Transistor TR1, transformer T1, resistor R1 and preset potentiometer VR1 form a current-controlled switching oscillator. Each time TR1 turns off the collapsing magnetic field in T1 generates a high voltage positive pulse at TR1's collector. This, in series with the supply, is fed via diode D1 to capacitor C2. Under no-load it contains 30V. At constant load it remains stable and can be adjusted with preset VR1, but as loading increases it drops.

In applications exhibiting variable loading, regulation is necessary. The circuit shown in Fig.1b uses a pulse skipping technique i.e., occasionally inhibiting oscillation to maintain constant output. Transistors TR1 and TR2 form a simple Schmitt trigger comparator. Although both collector loads are identical a switching differential is maintained because TR2 is directly coupled to TR1; its base current contributes to the voltage across resistor R3.

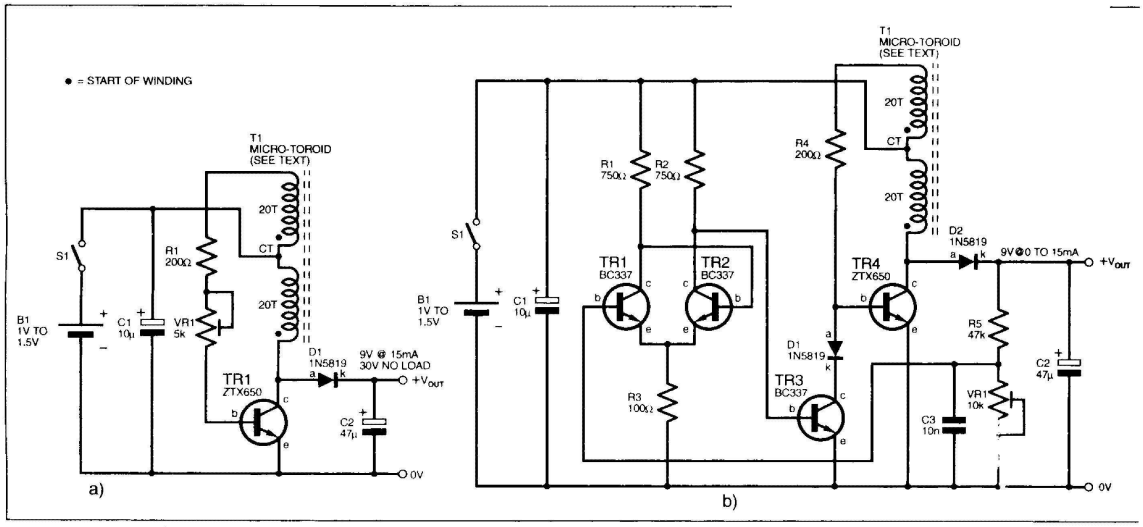
The Schmitt threshold consists of TR1 V_{BE} and the voltage across resistor R3. As the monitored voltage rises above this, TR1 turns on, TR2 turns off and TR3 turns on which disables transistor TR4. When it drops the reverse occurs. Hysteresis ensures clean switching and preset VR1 adjusts the output voltage. Diode D1 prevents negative pulses being routed via transistor TR3 and affecting the Schmitt trigger; it must be a Schottky diode otherwise TR3 will not switch TR4. The recommended ZTX650 transistor used for the oscillator is a high performance device with a very low $V_{CE(SAT)}$. This is necessary because there is little headroom at 1·0V.

As switching occurs at a very high frequency, T1 is extremely small. A microtoroid centre tapped transformer is constructed using an anti-parasitic bead 6mm by 4mm in diameter with a 2mm hole. Fold 90cm of 38s.w.g. enamelled copper wire in half, press the crease tightly together and then thread the folded wire repeatedly through the bead hole until 20 turns are wound. Trim protruding wires to 25mm.

The bead now contains two sets of 20 turns with two starts at one extremity and two ends at the other. Join an appropriate start and end together to form the tap (ct). If the circuit fails to oscillate, check the tap is correctly formed; otherwise, it is most likely a shorted turn.

Using a NiCad or NiMH battery with its virtually flat discharge characteristic will minimise supply drift.

Z. Kaparnik,
Swindon, Wilts.



ZTX 650

Fig.1. Low Cost AA to PP3 Converter. (a) Simple converter and (b) pulse skipping regulated version.

CASE PW Ic Pc CBO CEO HFE Ic VCE FT
E-Line D 2A 1W 45V 60V 100/300 0.5A 2V 175MHz ZTX750 AUDIO

Buon divertimento, Alessandro Frezzotti