CanTakeAudioGain

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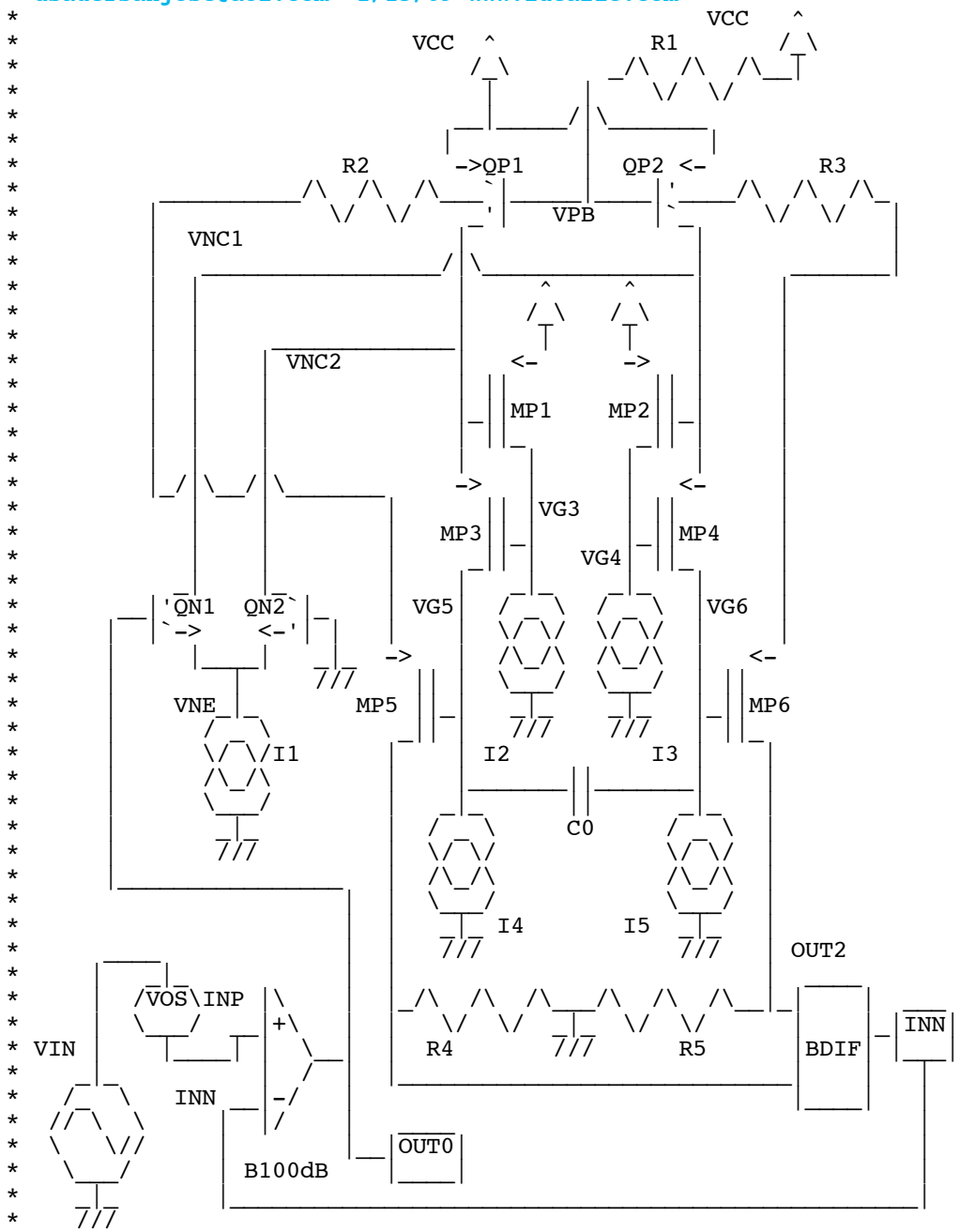

```
.OPTIONS    GMIN = 1e-18
VCC         VCC   0    DC    5
I4          VG5   0    20u
I5          VG6   0    20u
MP5         OUT1  VG5  VS5   VCC  pchannel   w=10u l=1u
MP6         OUT2  VG6  VS6   VCC  pchannel   w=10u l=1u
QP1         VNC2  VPB  VCC        PNPL
QP2         VNC1  VPB  VCC        PNPL
R1          VCC   VPB  10K
R2          VPB   VS5  30K
R3          VPB   VS6  30K
MP1         VG3   VNC2 VCC   VCC  pchannel   w=10u l=1u
MP2         VG4   VNC1 VCC   VCC  pchannel   w=10u l=1u
MP3         VG5   VG3  VNC2  VCC  pchannel   w=10u l=1u
MP4         VG6   VG4  VNC1  VCC  pchannel   w=10u l=1u
I2          VG3   0    20u
I3          VG4   0    20u
R4          OUT1  0    10
R5          OUT2  0    10
C0          VG5   VG6  10p
BDIF        INN   0    V  =  V(OUT2) -V(OUT1)

QN1         VNC1  OUT0 VNE       NPNV
QN2         VNC2  0    VNE       NPNV
I1          VNE   0    .5n

VIN         VIN   0    SIN( 0 .1u 10k) AC .1u
VOS         VIN   INP  DC    1f
B100dB      OUT0   0    V  = (V(INP) -V(INN))*100000


.MODEL  PNPL    PNP( BF=50 VAF=20 )
.MODEL  NPNV    NPN( BF=50 VAF=20 )
.model  nchannel nmos (level=3)
.model  pchannel pmos (level=3)


.control
set pensize = 2
tran        1u   1m    0  1u
plot        v(inp)
plot        v(out0)
ac          dec      30       1M      100k
plot        db(inp)  db(out0) db(out0/inp) db(inn/out0)


.endc

.end
```

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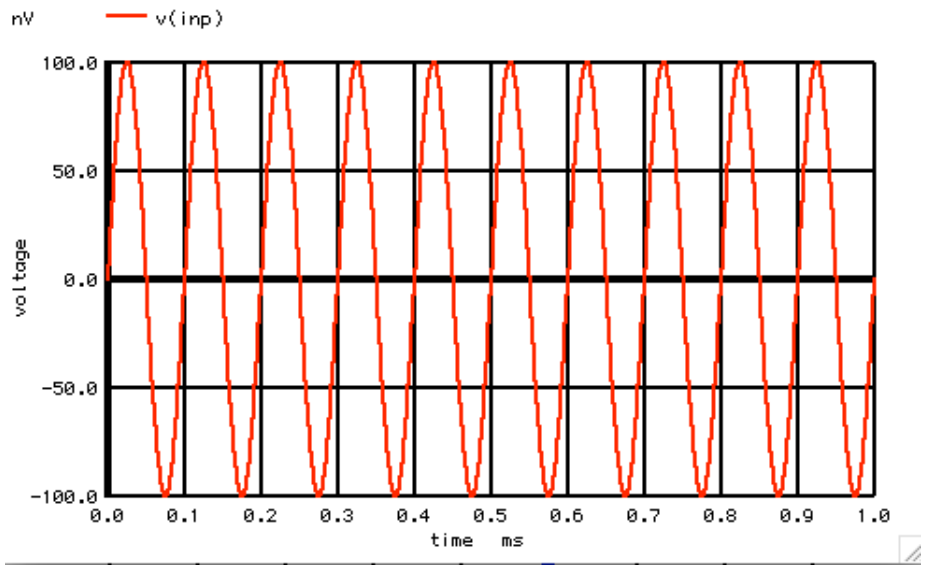
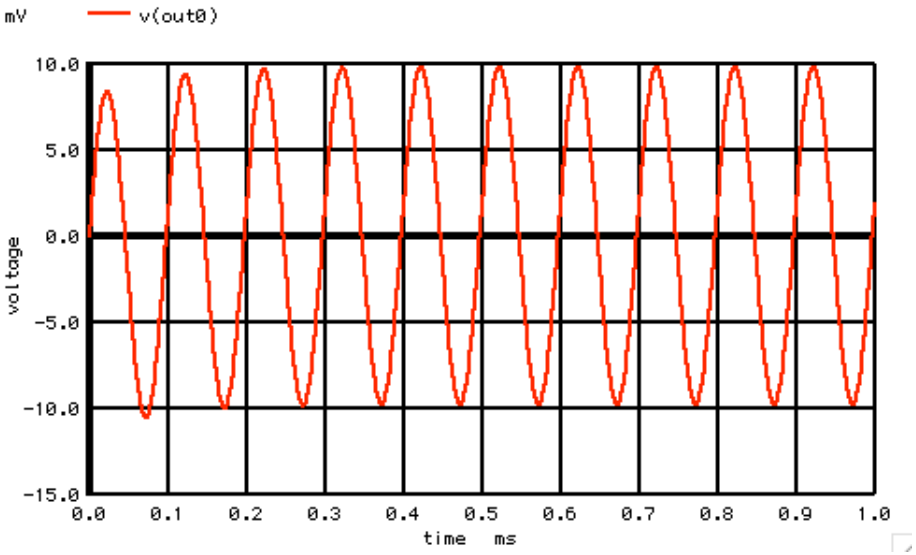
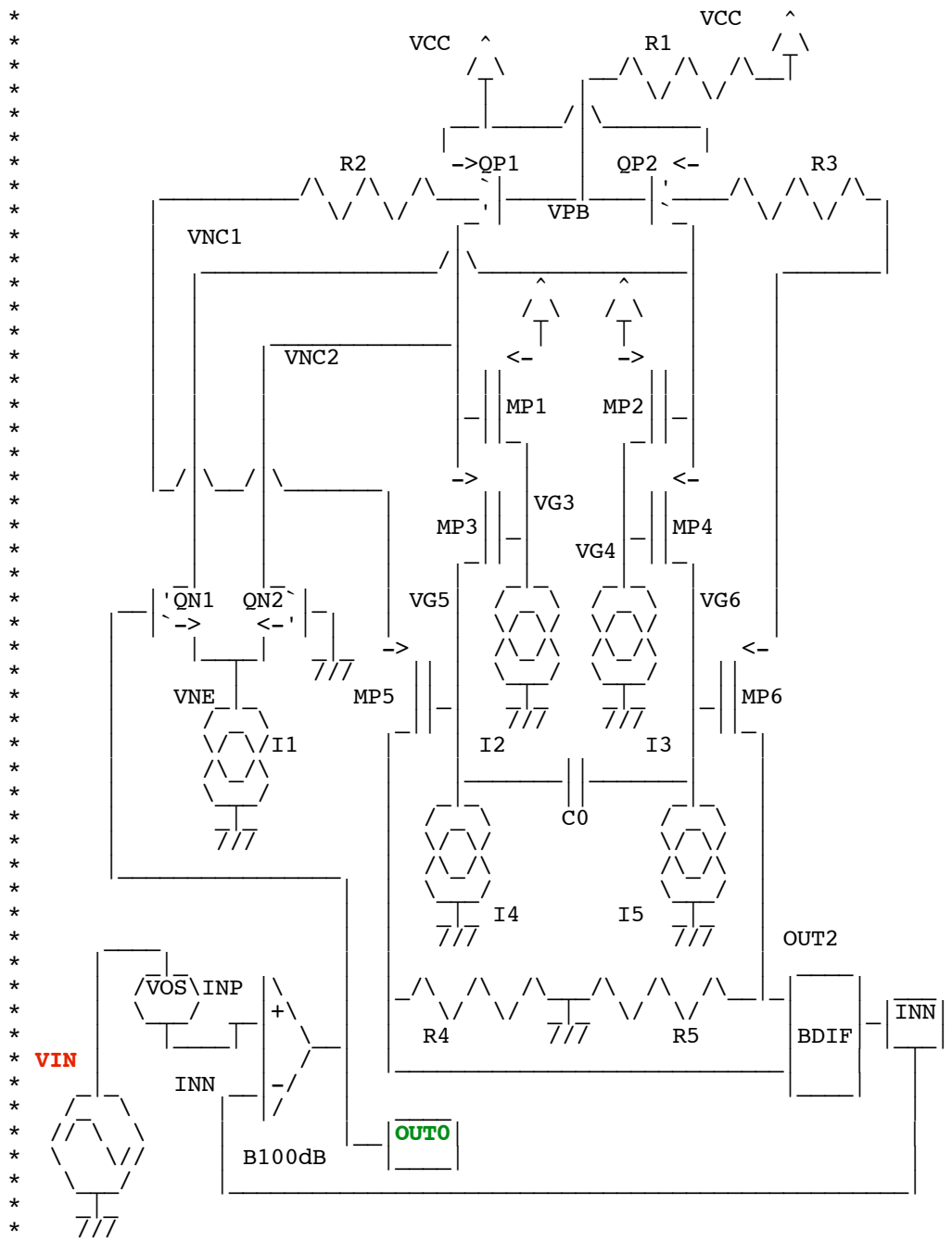
http://www.fileformat.info/convert/doc/pdf2txt.htm

The integrator block gets connected to the 100dB gain block and now the required gain can be done on chip.

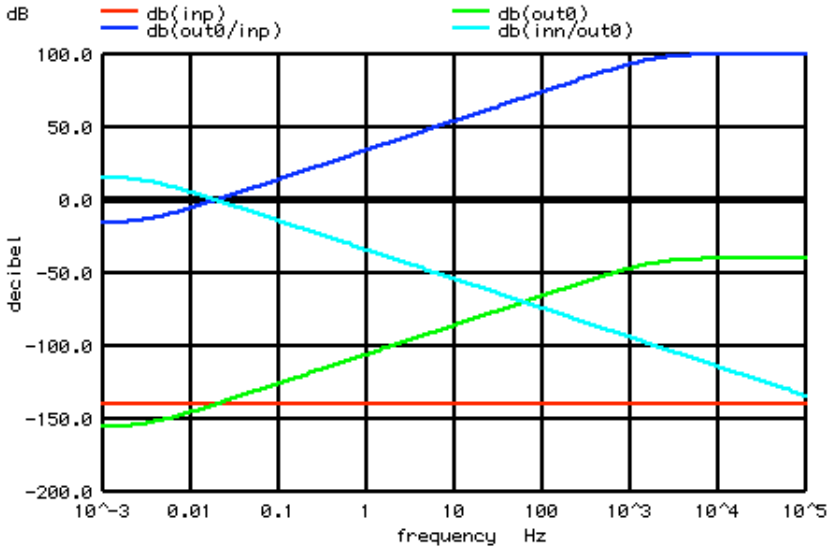




Testing the ability to reject offset appears to be pushing the convergence limits in some versions of spice. But the AC plots show the integrator block functioning as desired.


VCC
VCC
R1
R2
->QP1
QP2 <-
R3
VPB
VNC1
VNC2
MP1
MP2
VG3
MP3
MP4
VG4
VG5
VG6
'QN1
QN2`
MP5
MP6
VNE
I1
I2
I3
C0
I4
I5
OUT2
/VOS\INP
INN
BDIF
INN
VIN
OUT0
B100dB

Input signal levels and gain is shown below.



There were three integration blocks in the LMC2001. One was used to gain up the chopper signal as shown above. Another one was used to integrate the output of the chopper signal. A third was used to actually gain up the shot noise of an input stage which was then applied to spread spectrum the clock. As before, this was done in a way which did not introduce clock gliches on the supply.

For some reason National Semiconductor applied for three patents on the concept of actually using real random noise to spread spectrum the chopper. Perhaps the wording on the claims need some rework.