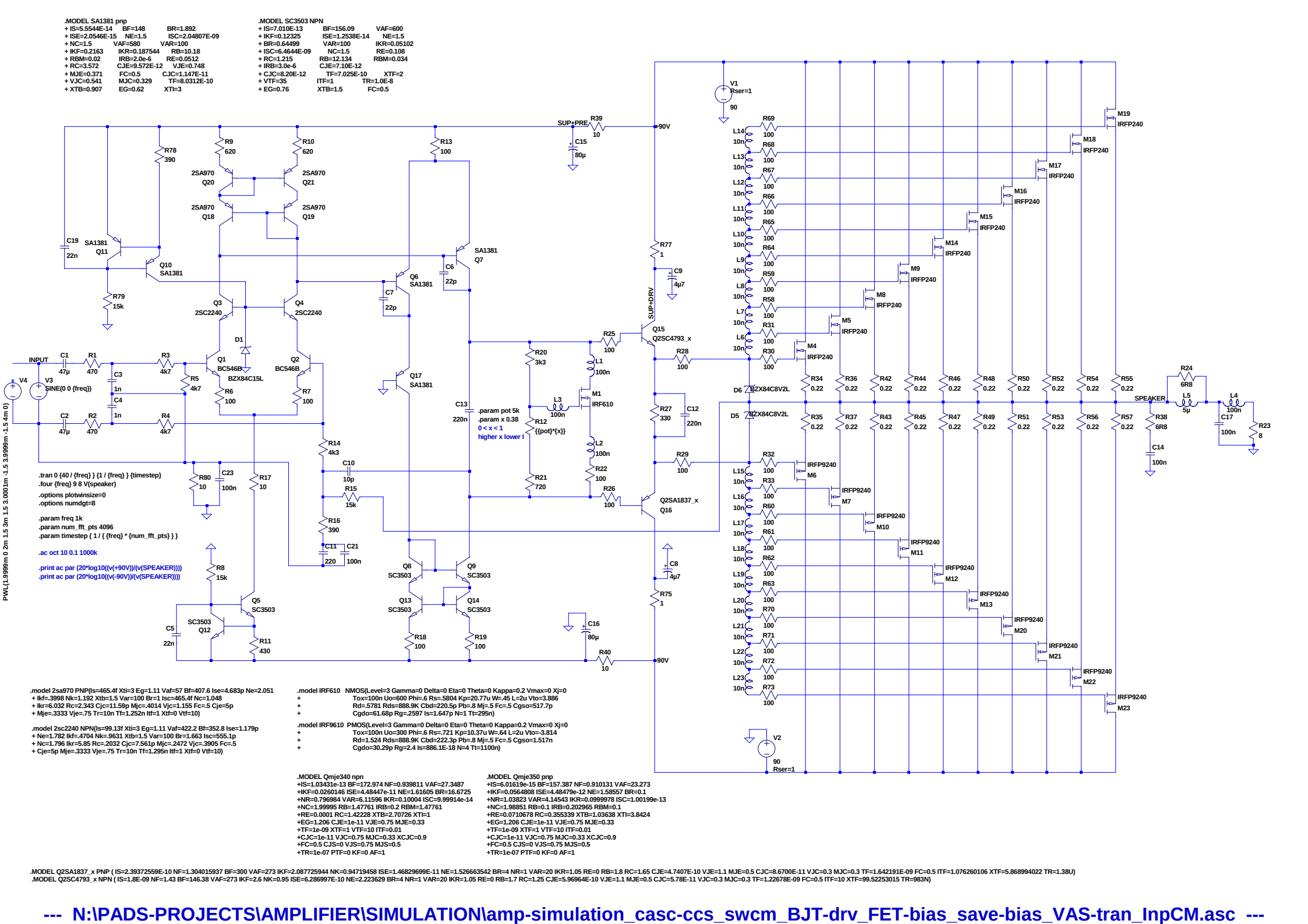
.MODEL SA1381 pnp
+ IS=5.5544E-14 BF=148 BR=1.892
+ ISE=2.0546E-15 NE=1.5 ISC=2.04807E-09
+ NC=1.5 VAF=580 VAR=100
+ IKF=0.2163 IKR=0.187544 RB=10.18
+ RBM=0.02 IRB=2.0e-6 RE=0.0512
+ RC=3.572 CJE=9.572E-12 VJE=0.748
+ MJE=0.371 FC=0.5 CJC=1.147E-11
+ VJC=0.541 MJC=0.329 TF=8.0312E-10
+ XTB=0.907 EG=0.62 XTI=3
.MODEL SC3503 NPN
+ IS=7.010E-13 BF=156.09 VAF=600
+ IKF=0.12325 ISE=1.2538E-14 NE=1.5
+ BR=0.64499 VAR=100 IKR=0.05102
+ ISC=6.4644E-09 NC=1.5 RE=0.108
+ RC=1.215 RB=12.134 RBM=0.034
+ IRB=3.0e-6 CJE=7.10E-12
+ CJC=8.20E-12 TF=7.025E-10 XTF=2
+ VTF=35 ITF=1 TR=1.0E-8
+ EG=0.76 XTB=1.5 FC=0.5
SUP+PRE
90V
SUP+DRV
INPUT
SPEAKER
V1
Rser=1
90
V2
Rser=1
V3
SINE(0 0 {freq})
V4
PWL(1.9999m 0 2m 1.5 3m 1.5 3.0001m -1.5 3.9999m -1.5 4m 0)
.tran 0 {40 / {freq} } {1 / {freq} } {timestep}
.four {freq} 9 8 V(speaker)
.options plotwinsize=0
.options numdgt=8
.param freq 1k
.param num_fft_pts 4096
.param timestep { 1 / { {freq} * {num_fft_pts} } }
.ac oct 10 0.1 1000k
.print ac par (20*log10((v(+90V))/(v(SPEAKER))))
.print ac par (20*log10((v(-90V))/(v(SPEAKER))))
.param pot 5k
.param x 0.38
0 < x < 1
higher x lower I
{{pot}*{x}}
Q1 BC546B
Q2 BC546B
BZX84C15L
D1
Q3 2SC2240
Q4 2SC2240
Q10 SA1381
Q11 SA1381
Q6 SA1381
Q7 SA1381
Q17 SA1381
2SA970 Q20
2SA970 Q21
2SA970 Q18
2SA970 Q19
Q15 Q2SC4793_x
Q16 Q2SA1837_x
M1 IRF610
IRFP240
IRFP9240
BZX84C8V2L
D6
D5
Q5 SC3503
Q12 SC3503
Q8 SC3503
Q9 SC3503
Q13 SC3503
Q14 SC3503
.model 2sa970 PNP(Is=465.4f Xti=3 Eg=1.11 Vaf=57 Bf=407.6 Ise=4.683p Ne=2.051
+ Ikf=.3998 Nk=1.192 Xtb=1.5 Var=100 Br=1 Isc=465.4f Nc=1.048
+ Ikr=6.032 Rc=2.343 Cjc=11.59p Mjc=.4014 Vjc=1.155 Fc=.5 Cje=5p
+ Mje=.3333 Vje=.75 Tr=10n Tf=1.252n Itf=1 Xtf=0 Vtf=10)
.model 2sc2240 NPN(Is=99.13f Xti=3 Eg=1.11 Vaf=422.2 Bf=352.8 Ise=1.179p
+ Ne=1.782 Ikf=.4704 Nk=.9631 Xtb=1.5 Var=100 Br=1.663 Isc=555.1p
+ Nc=1.796 Ikr=5.85 Rc=.2032 Cjc=7.561p Mjc=.2472 Vjc=.3905 Fc=.5
+ Cje=5p Mje=.3333 Vje=.75 Tr=10n Tf=1.295n Itf=1 Xtf=0 Vtf=10)
.model IRF610 NMOS(Level=3 Gamma=0 Delta=0 Eta=0 Theta=0 Kappa=0.2 Vmax=0 Xj=0
+ Tox=100n Uo=600 Phi=.6 Rs=.5804 Kp=20.77u W=.45 L=2u Vto=3.886
+ Rd=.5781 Rds=888.9K Cbd=220.5p Pb=.8 Mj=.5 Fc=.5 Cgso=517.7p
+ Cgdo=61.68p Rg=.2597 Is=1.647p N=1 Tt=295n)
.model IRF9610 PMOS(Level=3 Gamma=0 Delta=0 Eta=0 Theta=0 Kappa=0.2 Vmax=0 Xj=0
+ Tox=100n Uo=300 Phi=.6 Rs=.721 Kp=10.37u W=.64 L=2u Vto=-3.814
+ Rd=1.524 Rds=888.9K Cbd=222.3p Pb=.8 Mj=.5 Fc=.5 Cgso=1.517n
+ Cgdo=30.29p Rg=2.4 Is=886.1E-18 N=4 Tt=1100n)
.MODEL Qmje340 npn
+IS=1.03431e-13 BF=172.974 NF=0.939811 VAF=27.3487
+IKF=0.0260146 ISE=4.48447e-11 NE=1.61605 BR=16.6725
+NR=0.796984 VAR=6.11596 IKR=0.10004 ISC=9.99914e-14
+NC=1.99995 RB=1.47761 IRB=0.2 RBM=1.47761
+RE=0.0001 RC=1.42228 XTB=2.70726 XTI=1
+EG=1.206 CJE=1e-11 VJE=0.75 MJE=0.33
+TF=1e-09 XTF=1 VTF=10 ITF=0.01
+CJC=1e-11 VJC=0.75 MJC=0.33 XCJC=0.9
+FC=0.5 CJS=0 VJS=0.75 MJS=0.5
+TR=1e-07 PTF=0 KF=0 AF=1
.MODEL Qmje350 pnp
+IS=6.01619e-15 BF=157.387 NF=0.910131 VAF=23.273
+IKF=0.0564808 ISE=4.48479e-12 NE=1.58557 BR=0.1
+NR=1.03823 VAR=4.14543 IKR=0.0999978 ISC=1.00199e-13
+NC=1.98851 RB=0.1 IRB=0.202965 RBM=0.1
+RE=0.0710678 RC=0.355339 XTB=1.03638 XTI=3.8424
+EG=1.206 CJE=1e-11 VJE=0.75 MJE=0.33
+TF=1e-09 XTF=1 VTF=10 ITF=0.01
+CJC=1e-11 VJC=0.75 MJC=0.33 XCJC=0.9
+FC=0.5 CJS=0 VJS=0.75 MJS=0.5
+TR=1e-07 PTF=0 KF=0 AF=1
.MODEL Q2SA1837_x PNP (IS=2.39372559E-10 NF=1.304015937 BF=300 VAF=273 IKF=2.087725944 NK=0.94719458 ISE=1.46829699E-11 NE=1.526663542 BR=4 NR=1 VAR=20 IKR=1.05 RE=0 RB=1.8 RC=1.65 CJE=4.7407E-10 VJE=1.1 MJE=0.5 CJC=8.6700E-11 VJC=0.3 MJC=0.3 TF=1.642191E-09 FC=0.5 ITF=1.076260106 XTF=5.868994022 TR=1.38U)
.MODEL Q2SC4793_x NPN (IS=1.8E-09 NF=1.43 BF=146.38 VAF=273 IKF=2.6 NK=0.95 ISE=6.286997E-10 NE=2.223629 BR=4 NR=1 VAR=20 IKR=1.05 RE=0 RB=1.7 RC=1.25 CJE=5.96964E-10 VJE=1.1 MJE=0.5 CJC=5.78E-11 VJC=0.3 MJC=0.3 TF=1.22678E-09 FC=0.5 ITF=10 XTF=99.52253015 TR=983N)
--- N:\PADS-PROJECTS\AMPLIFIER\SIMULATION\amp-simulation_casc-ccs_swcm_BJT-drv_FET-bias_save-bias_VAS-tran_InpCM.asc ---