



To look at gain and phase margins: .include Cordell-Models.txt  
 i) comment the .tran line  
 ii) uncomment the .ac line  
 iv) re-run the simulation  
 iii) plot V(A)/V(B)  
 .tran 0 5m 1m 100n  
 options maxstep=10u  
 fourier 1K V(OUT)  
 ;ac oct 10 1 100Meg  
 .options plotwinsize=0 numdgt=15

\*ZETEX FZT491A Spice Model v1.0 Last Revised 8/8/05

```
.MODEL FZT491A NPN IS=3.05E-13 NF=1.0034 BF=650 IKF=0.8 VAF=165
+ISE=8.0191E-14 NE=1.4126 NR=1.001 BR=120 IKR=0.6 VAR=69
+ISC=1.6E-12 NC=1.38 RB=0.065 RE=0.109 RC=0.075
+CJC=17.2E-12 MJC=0.3429 VJC=0.4298 CJE=96E-12
+TF=0.71E-9 TR=2.5E-9
*
*$
*
```

\*ZETEX FZT558 Spice Model v3.0 Last Revised 20/09/2007

```
.MODEL FZT558 PNP IS=7.84E-14 NF=1 BF=210 IKF=1.5 VAF=1500
+NE=1.69 NR=1 BR=3.4 IKR=0.15 VAR=82 ISC=9.42E-12 NC=1.05 RB=0.5 RE=0.4 NC=1.25 RB=0.5 RE=0.224 RC=0.134 QUASIMOD=1 RCO=80 GAMMA=1
+RC=0.1 QUASIMOD=1 RCO=54 GAMMA=136 CJC=20.5E-12 MJC=0.38 VJC=0.69 CJE=9.5E-12 MJC=0.32 VJC=0.4 CJE=115E-12 MJE=0.37 VJE=0.8
+CJE=115E-12 MJE=0.43 VJE=0.85 TF=0.9E-9 TR=18E-5 TRC1=.015 TRB1=.015 TF=1.3E-9 TR=16E-6 TRC1=.004 TRB1=.004 TRE1=.004 XTB=1.4
+TRE1=.015 XTB=1.4
*
*$
*
```

\*ZETEX FZT591A Spice Model v1.0 Last Revised 8/8/05

```
.MODEL FZT591A PNP IS=3.0572E-13 NF=1.0103 BF=450 IKF=0.93
+VAF=20 ISE=1.5E-14 NE=1.52 NR=1.007 BR=160 IKR=0.08 VAR=33
+ISC=3.8738E-14 NC=1.0893 RB=0.112 RE=0.144 RC=0.156
+CJC=42E-12 MJC=0.4449 VJC=0.3131 CJE=91E-12
+TF=0.51E-9 TR=3.6E-9
*
*$
*
```

\*ZETEX FZT458 Spice Model v3.0 Last Revised 20/09/2007

```
.MODEL FZT458 NPN IS=5.32E-14 NF=1 BF=230 IKF=1.5 VAF=1500
+ISE=2.1E-14 NE=1.385 NR=1.05 BR=8 IKR=0.7 VAR=64 ISC=6.42E-12
+NE=1.385 NR=1.05 BR=8 IKR=0.7 VAR=64 ISC=6.42E-12
+TF=0.71E-9 TR=2.5E-9
*
*$
*
```

\*10N20 VDMOS + subthreshold (c) IanH & keantoken Jun 2019  
 .model 10N20 VDMOS (Rg=60 Vto=0.17 Kp=1.31 Lambda=3m  
 + Rs=0.245 Ksubthres=0.095 Mtriode=0.3 Rd=0.6  
 + Bex=-2 Vtocc=-1.6m ksubthres=0.095 Trs1=2.6m Trd1=3m  
 + Cgdmax=100p Cgdmin=5p a=0.25 Cgs=600p Cjo=1100p  
 + m=0.7 VJ=2.5 IS=4.0E-6 N=2.4 Vds=200 mfg=IHKT1906)

\*10P20 VDMOS with subthreshold (c) IanH & keantoken Jun 2019  
 .model 10P20 VDMOS (pchan Rg=60 Vto=-0.535 Kp=0.98 Lambda=5m  
 + Rs=0.37 Ksubthres=0.12 Mtriode=0.4 Rd=0.2  
 + Bex=-2 Vtocc=1.7m tsubthres1=3.1m Trs1=3.4m  
 + Cgdmax=100p Cgdmin=5p a=0.25 Cgs=600p Cjo=1100p  
 + m=0.7 VJ=2.5 IS=4.0E-6 N=2.4 Vds=200 mfg=IHKT1906)

\*\*\*\*  
 \*20N20 VDMOS with subthreshold (c) IanH & keantoken Jun 2019  
 .model 20N20 VDMOS (Rg=30 Vto=0.155 Kp=2.37 Lambda=3m  
 + Rs=0.12 Ksubthres=0.09 Mtriode=0.3 Rd=0.16  
 + Bex=-1.9 Vtocc=-1.6m tsubthres1=1m Trs1=2.5m  
 + Cgdmax=200p Cgdmin=10p a=0.25 Cgs=1.2n Cjo=2.2n  
 + m=0.7 VJ=2.5 IS=8.0E-6 N=2.4 Vds=200 mfg=IHKT1906)

\*20P20 VDMOS with subthreshold (c) IanH & keantoken Jun 2019  
 .model 20P20 VDMOS (pchan Rg=30 Vto=-0.61 Kp=1.82 Lambda=5m  
 + Rs=0.17 Ksubthres=0.105 Mtriode=0.35 Rd=0.05  
 + Bex=-2 Vtocc=2.2m tsubthres1=5m Trs1=2m  
 + Cgdmax=200p Cgdmin=10p a=0.25 Cgs=1200p Cjo=2200p  
 + m=0.7 VJ=2.5 IS=8.0E-6 N=2.4 Vds=200 mfg=IHKT1906)

.model LSK489A NJF(Beta=2.2m Betatce=-.5 Rd=11 Rs=30 Lambda=4.3m Vto=-1.13 Vtocc=-2.5m Is=3f Isr=0 N=1 Xti=0 Alpha=30u VK=120 Cgd=3.19p Mj=0.32 Pb=0.8 Fc=0.5 Cgs=2.92p Kf=0.0009f Af=1 Gdsnoi=2.15 Niev=3 Mfg=Linear\_Systems)

--- C:\Design\LTSpice\pwr\_amp89.asc ---