Pizzicato input stage Prot_2a
component variation test

Note: No pot limiter resistors.
Use single-turn so setting can be determined

Aim for setting stage current
1.5mA to 2.0.mA

VPLUS

wiper=0.42
R=10k
VR3

R6 2.2K
C5 22µ
R12 910
REDLED D7
C7 22µ
D11 BAT85C
R23 33R

2N5401C Q3
R10 2.2k
D3 BAT85C
REDLED D8
R17 430
2N5401C Q5
1N4148C D5

1.2mA
Measure voltage across R8 for lower stage current

R7 680
R18 100

wiper=0.6
R=1k
VR1

2N5551C Q6

R19 4.7k
C9 2.0p
R24 680R

+V

-V

prot+

V1 25
V2 25

D1 BAT85C
JP1 0.1
2N5401C QD1
JP2 10G
R13 15

2N5401C Q8

C11 2p

R2 10k
2N5401C Q1
R4 120
C3 22p

Adjust LED current to scale supply voltage +/- 25V - +/- 40V
Adjust for 6 - 8mA quiescent in output stage

in
C1 22µF
R1 100
C2 1p
R3 10K
R27 3.3k
out FEEDBACK

GROUND

Q2 2N5551C
R5 120
C4 22p
R15 15
R14 150

D2 BAT85C
JP3 10G
QD2

wiper=0.25
R=10k
VR4

C10 2p
R26 680R

JP4 0.1
2N5551C

VR2 adjust lower stage current

VR2 R=1k wiper=0.64
Q7 2N5401C
Q10 2N5551C

R8 680
R21 100

Measure voltage across R8 for lower stage current

2N5551C Q4
R11 2.2k
1N4148C D6
2N5551C Q9

D4 BAT85C 910
C8 22µ
D9 REDLED
R22 430

;.step temp -5 45 10
.param tempnom 27

.param Freq=20K
.param numcyc=10
.param dlycyc=20
.param FFT=2**16
.param simtime=numcyc/Freq+dlytime
.param dlytime=dlycyc/Freq
.param timestep=(simtime-dlytime)/FFT
.four {Freq} V(out)
;.four {Freq} 6 V(Vin) V(out)

.options plotwinsize=0
.options numdgt=15

.ac oct 500 10 800Meg

;tran 0 {simtime} {dlytime} {timestep}

Vsop1Vsquare1
in
R800 1Meg
R801 1Meg
V4 AC 1

Adjust in combination with R9 for 1.2mA input stage current

R104 5.0k
R9 2.2k
C6 22µ
R16
D10 REDLED

.param Risetime=10n
.param SquareSymetry=0.5
.param Vsq=1
.param Square=1 Vstep=0.1 Fstep=Freq

R25 33R
D12 BAT85C
VMINUS

-V

Adjust tempco of input stage current

.include cordell-models.txt
.include Hegglun_VDMOS.txt
.include REDLED.txt

.MODEL BC546C NPN(Is=7.049f Xti=3 Eg=1.11 Vaf=24.76 Bf=543.1 Ise=78.17f Ne=1.679 Ikf=94.96m Nk=.5381 Xtb=1.5 Br=1 Isc=27.51f Nc=1.775 Ikr=3.321 Rc=.9706 Cjc=5.25p Mjc=.3147 Vjc=.5697 Fc=.5 Cje=11.5p Mje=.6715 Vje=.5 Tr=10n Tf=410.7p Itf=1.12 Xtf=26.19 Vtf=10)
.MODEL BC556C PNP(Is=1.02f Xti=3 Eg=1.11 Vaf=30.52 Bf=416.3 Ise=14.67f Ne=1.854 Ikf=.2088 Nk=.8219 Xtb=1.5 Br=9.102 Isc=4.1f Nc=3.982 Ikr=19.25m Rc=.9373 Cjc=9.81p Mjc=.332 Vjc=.4865 Fc=.5 Cje=30p Mje=.3333 Vje=.5 Tr=10n Tf=516.2p Itf=1.701 Xtf=35.24 Vtf=10)
.MODEL BZX793V9 D(RS=11.838 BV=3.6632 CJO=507.57P TT=50N M=.33 VJ=.75 IS=1.0E-10 N=1.27 IBV=5MA)