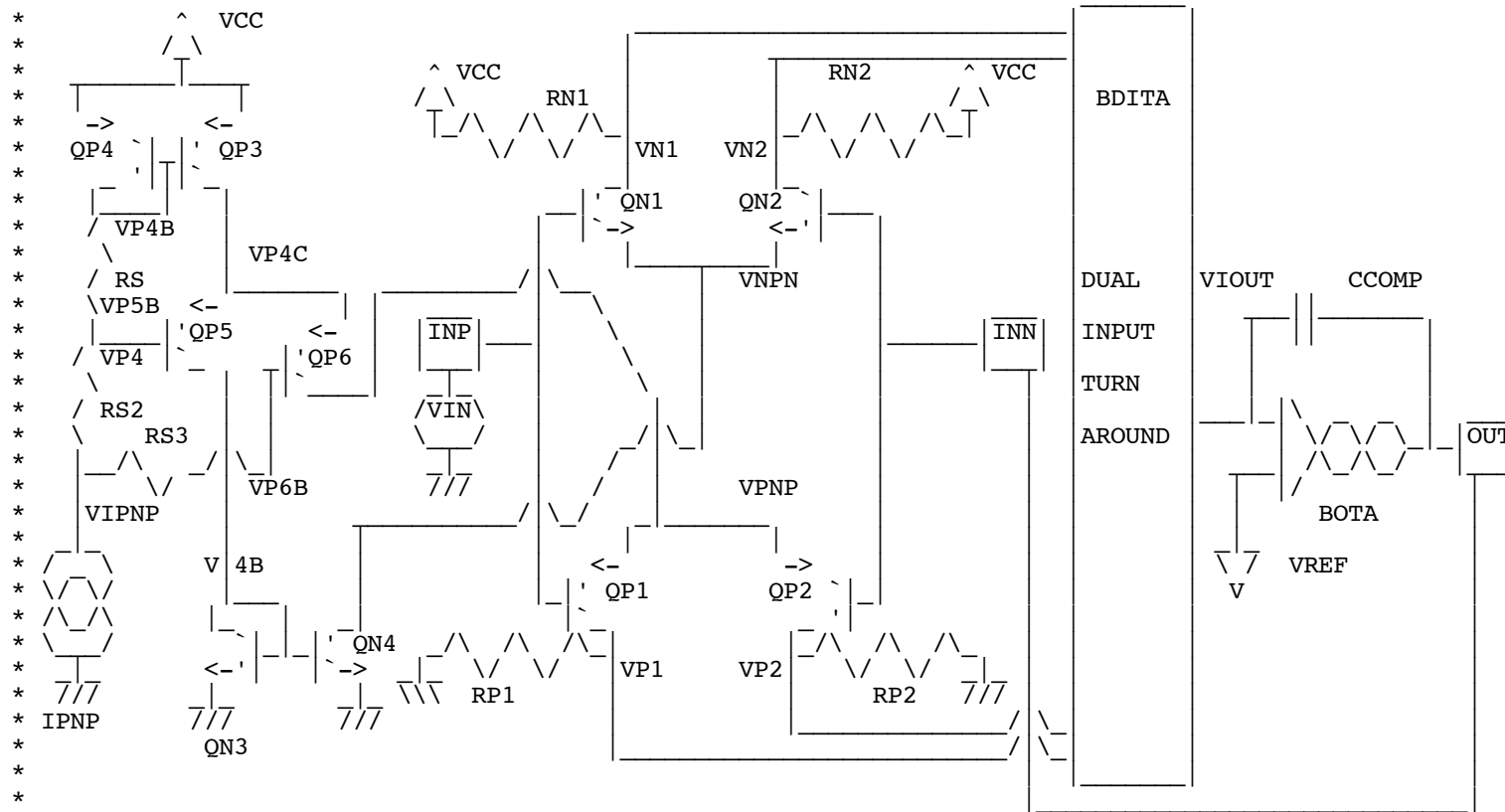


# RRI\_VPNP\_steering

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 \* www.idea2ic.com

US Patent # 5414388



.OPTIONS method=gear GMIN=1e-18

VIN	INP	0	SIN(6	6	1K )
QP1	VP1	INP	VPNP	PNPV	1.04
QP2	VP2	OUT	VPNP	PNPV	1
QP3	VP4C	VP	VCC	PNPV	1
QP4	VP	VP	VCC	PNPV	1
RP1	VP1	0	5K		
RP2	VP2	0	5K		
QN1	VN1	INP	VNPN	NPNV	1.02
QN2	VN2	OUT	VNPN	NPNV	1
QN3	VNPN	VN	0	NPNV	1
QN4	VN	VN	0	NPNV	1

```

RN1      VCC  VN1  5K
RN2      VCC  VN2  5K

VCC      VCC   0    12
VREF     VREF  0    6
IPNP     VIPNP 0    20u
RS       VP    VP5B 10k
RS2      VP5B  VIPNP 10k
RS3      VIPNP VP6B 150k
QP5      VN    VP5B  VP4C  PNPV  1
QP6      VPNP  VP6B  VP4C  PNPV  1

BDITA    VIOUT 0      I = ( V(VP2) - V(VP1) + V(VN2) - V(VN1) )/5000
BOTA     OUT   0      I = -1*( V(VIOUT) - V(VREF) )/5000
CCOMP    OUT   VIOUT 3p

.model   NPNV npn BF=150
.model   PNPV pnp BF=150
.model   PNPL pnp BF=5

.control
run
set      pensize = 2
dc       vin 0 12 100m
plot     v(out)-v(inp) title OffsetVoltageVsCommonMode
plot     v(vp1) v(vp2) v(vcc)-v(vn1) v(vcc)-v(vn2) title TailCurrentsVsCommonMode
*plot    v(vpnp)-v(vp5b) title PnpEmitterBase
.endc
.end

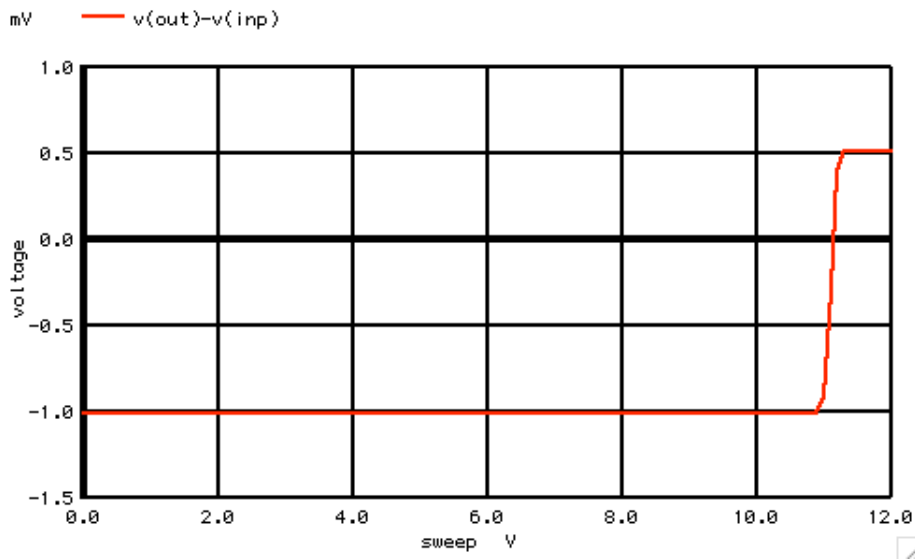
* =====END=====

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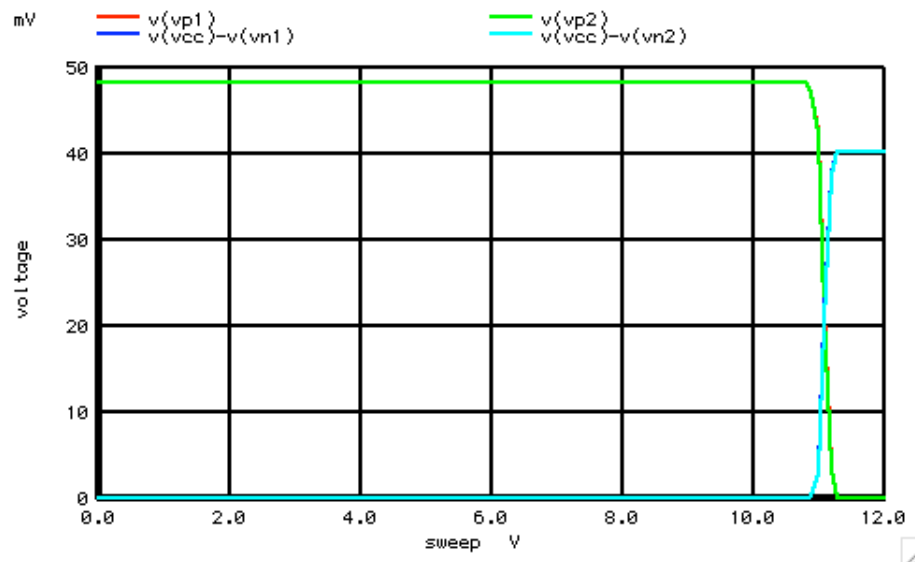
The steering can be done using vertical pnps in the circuit above which allows the transitions to happen smoothly enough for a full rail to rail voltage follower applications.

Graph 179 - dc217: OffsetVoltageVsCommonMode



**This version of the steering does have a little lower current gain for the npns.**

Graph 180 - dc217: TailCurrentsVsCommonMode



In the case of the LM6142, this gain difference was preferred. This meant the part was more stable at the top rail. Experience seems to suggest that this may have kept a lot of customers out of trouble.