

```
.SUBCKT PUMZ1 1 2 3 4 5 6
*QTR1 NPN 6=C 2=B 1=E
*QTR2 PNP 3=C 5=B 4=E
*
```

```
Q1 6 2 1 QTR1
Q2 3 5 4 QTR2
*
```

```
.MODEL QTR1 NPN(
```

```
+ IS=2.456E-14
+ NF=0.997
+ ISE=4.908E-15
+ NE=1.706
+ BF=265.4
+ IKF=0.1357
+ VAF=63.2
+ NR=1.004
+ ISC=6.272E-14
+ NC=1.243
+ BR=6.657
+ IKR=0.1144
+ VAR=25.9
+ RB=1
+ IRB=1E-06
+ RBM=1
+ RE=0.4683
+ RC=1.31
+ XTB=0
+ EG=1.11
+ XTI=3
+ CJE=1.384E-11
+ VJE=0.5561
+ MJE=0.3437
+ TF=5.275E-10
+ XTF=127
+ VTF=1.441
+ ITF=0.565
+ PTF=0
+ CJC=4.399E-12
+ VJC=0.2006
+ MJC=0.3344
+ XCJC=0.6193
+ TR=1E-32
+ CJS=0
+ VJS=0.75
+ MJS=0.333
+ FC=0.8361 )
*
```

```
.MODEL QTR2 PNP(
```

```
+ IS=2.514E-14
+ NF=0.9978
+ ISE=5.697E-15
+ NE=1.421
+ BF=315.5
+ IKF=0.08039
```

```
+ VAF=40.01
+ NR=1.001
+ ISC=2.533E-14
+ NC=1.25
+ BR=9.217
+ IKR=0.047
+ VAR=32.02
+ RB=1
+ IRB=1E-06
+ RBM=1
+ RE=0.6308
+ RC=0.956
+ XTB=0
+ EG=1.11
+ XTI=3
+ CJE=1.17E-11
+ VJE=0.746
+ MJE=0.4143
+ TF=6.328E-10
+ XTF=6.555
+ VTF=2.416
+ ITF=0.129
+ PTF=0
+ CJC=6.96E-12
+ VJC=0.778
+ MJC=0.6596
+ XCJC=0.6288
+ TR=1E-32
+ CJS=0
+ VJS=0.75
+ MJS=0.333
+ FC=0.79 )
.ENDS
*
```