BJT Models

\* Library of bipolar transistor model parameters

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\*\*\*\* 2T312 Family

\*

.model q2T312a NPN(Is=4.943f Xti=3 Eg=1.11 Vaf=85 Bf=66.43 Ne=1.492

+ Ise=432.9f Ikf=.2951 Xtb=1.5 Br=.923 Nc=2 Isc=439f Ikr=.3 Rc=.65

+ Rb=14.3 Cjc=8.43p Mjc=.283 Vjc=.75 Fc=.5 Cje=18.57p Mje=.33

+ Vje=.75 Tr=137.5n Tf=1.221n Itf=50m Vtf=50 Xtf=2)

.model q2T312b NPN(Is=4.943f Xti=3 Eg=1.11 Vaf=85 Bf=74.91 Ne=1.87

+ Ise=6.197p Ikf=.6263 Xtb=1.5 Br=.923 Nc=2 Isc=439f Ikr=.3 Rc=.65

+ Rb=14.3 Cjc=8.06p Mjc=.3404 Vjc=.75 Fc=.5 Cje=18.57p Mje=.33

+ Vje=.75 Tr=164.6n Tf=790p Itf=50m Vtf=50 Xtf=2)

.model q2T312v NPN(Is=4.943f Xti=3 Eg=1.11 Vaf=85 Bf=119.7 Ne=1.579

+ Ise=295.1f Ikf=.5917 Xtb=1.5 Br=3.144 Nc=2 Isc=439f Ikr=.3 Rc=.65

+ Rb=14.3 Cjc=8.06p Mjc=.3404 Vjc=.75 Fc=.5 Cje=18.57p Mje=.33

+ Vje=.75 Tr=164.6n Tf=790p Itf=50m Vtf=50 Xtf=2)

\*

\*\*\*\* 2T313 Family

\*

.model q2T313a PNP(Is=3.306f Xti=3 Eg=1.11 Vaf=86.3 Bf=153.6 Ne=1.36

+ Ise=3.306f Ikf=2.47 Xtb=1.5 Var=40 Br=3.375 Nc=2 Isc=33.2f Ikr=.85

+ Rb=23.2 Rc=1.345 Cjc=18.71p Vjc=.69 Mjc=.31 Fc=.5 Cje=30.64p Vje=.69

+ Mje=.33 Tr=58.87n Tf=267.9p Itf=.785 Vtf=65 Xtf=2)

.model q2T313b PNP(Is=3.306f Xti=3 Eg=1.11 Vaf=86.3 Bf=153.6 Ne=1.36

+ Ise=3.306f Ikf=2.47 Xtb=1.5 Var=40 Br=3.375 Nc=2 Isc=33.2f Ikr=.85

+ Rb=23.2 Rc=1.345 Cjc=18.71p Vjc=.69 Mjc=.31 Fc=.5 Cje=30.64p Vje=.69

+ Mje=.33 Tr=58.87n Tf=267.9p Itf=.785 Vtf=65 Xtf=2)

\*

\*\*\*\* KT315 Family

\*

.model KT315a NPN(Is=21.11f Xti=3 Eg=1.11 Vaf=115 Bf=79.74 Ise=233.2f

+ Ne=1.417 Ikf=.2922 Nk=.6296 Xtb=1.5 Br=1.3 Isc=107.3f Nc=1.298

+ Ikr=2.561 Rb=12 Rc=1.032 Cjc=8.988p Mjc=.33 Vjc=.75 Fc=.5 Cje=18.5p

+ Mje=.33 Vje=.75 Tr=244.3n Tf=321.4p Itf=1 Xtf=2 Vtf=60)

.model KT315b NPN(Is=14.34f Xti=3 Eg=1.11 Vaf=125 Bf=210.6 Ise=157.3f

+ Ne=1.558 Ikf=.2999 Nk=.5082 Xtb=1.5 Br=1 Isc=15.86f Nc=1.022

+ Ikr=3.163 Rb=15 Rc=3.748 Cjc=8.988p Mjc=.33 Vjc=.75 Fc=.5 Cje=18.5p

+ Mje=.33 Vje=.75 Tr=301.4n Tf=321.4p Itf=1 Xtf=2 Vtf=60)

.model KT315v NPN(Is=21.11f Xti=3 Eg=1.11 Vaf=157 Bf=81.09 Ise=321.2f

+ Ne=1.458 Ikf=.2017 Nk=.4901 Xtb=1.5 Br=1 Isc=84.36f Nc=1.317

+ Ikr=1.671 Rb=12 Rc=1.426 Cjc=9.716p Mjc=.33 Vjc=.75 Fc=.5 Cje=18.5p

+ Mje=.33 Vje=.75 Tr=275.6n Tf=321.4p Itf=1 Xtf=2 Vtf=60)

.model KT315g NPN(Is=14.34f Xti=3 Eg=1.11 Vaf=125 Bf=210.6 Ise=157.3f

+ Ne=1.558 Ikf=.2999 Nk=.5082 Xtb=1.5 Br=1 Isc=15.86f Nc=1.022

+ Ikr=3.163 Rb=15 Rc=3.748 Cjc=8.988p Mjc=.33 Vjc=.75 Fc=.5 Cje=18.5p

+ Mje=.33 Vje=.75 Tr=301.4n Tf=321.4p Itf=1 Xtf=2 Vtf=60)

.model KT315d NPN(Is=21.11f Xti=3 Eg=1.11 Vaf=115 Bf=79.74 Ise=233.2f

+ Ne=1.417 Ikf=.2922 Nk=.6296 Xtb=1.5 Br=1.3 Isc=107.3f Nc=1.298

+ Ikr=2.561 Rb=12 Rc=1.032 Cjc=8.988p Mjc=.33 Vjc=.75 Fc=.5 Cje=18.5p

+ Mje=.33 Vje=.75 Tr=244.3n Tf=321.4p Itf=1 Xtf=2 Vtf=60)

\*

\*\*\*\* 2T316 Family

\*

.model q2T316b NPN(Is=3.49f Xti=3 Eg=1.11 Vaf=102 Bf=74.97 Ne=1.483

+ Ise=44.72f Ikf=.1322 Xtb=1.5 Var=55 Br=.2866 Nc=2 Isc=447f Ikr=.254

+ Rb=66.7 Rc=7.33 Cjc=3.934p Vjc=.65 Mjc=.33 Fc=.5 Cje=1.16p Vje=.69

+ Mje=.33 Tr=65.92n Tf=94.42p Itf=.15 Vtf=15 Xtf=2)

.model q2T316v NPN(Is=3.49f Xti=3 Eg=1.11 Vaf=102 Bf=74.97 Ne=1.483

+ Ise=44.72f Ikf=.1322 Xtb=1.5 Var=55 Br=.2866 Nc=2 Isc=447f Ikr=.254

+ Rb=66.7 Rc=7.33 Cjc=3.934p Vjc=.65 Mjc=.33 Fc=.5 Cje=1.16p Vje=.69

+ Mje=.33 Tr=65.92n Tf=94.42p Itf=.15 Vtf=15 Xtf=2)

.model q2T316g NPN(Is=2.753f Xti=3 Eg=1.11 Vaf=96 Bf=86.5 Ne=2.496

+ Ise=12.8p Ikf=97.23m Xtb=1.5 Var=55 Br=.6577 Nc=2 Isc=15.5p Ikr=.12

+ Rb=70.6 Rc=8.35 Cjc=4.089p Vjc=.65 Mjc=.33 Fc=.5 Cje=1.16p Vje=.69

+ Mje=.33 Tr=27.84n Tf=78.97p Itf=.151 Vtf=25 Xtf=2)

.model q2T316d NPN(Is=2.753f Xti=3 Eg=1.11 Vaf=96 Bf=136.5 Ne=2.496

+ Ise=12.8p Ikf=97.23m Xtb=1.5 Var=55 Br=.6577 Nc=2 Isc=15.5p Ikr=.12

+ Rb=70.6 Rc=8.35 Cjc=4.089p Vjc=.65 Mjc=.33 Fc=.5 Cje=1.16p Vje=.69

+ Mje=.33 Tr=27.84n Tf=78.97p Itf=.151 Vtf=25 Xtf=2)

\*

\*\*\*\* 2T325 Family

\*

.model q2T325a NPN(Is=19.86f Xti=3 Eg=1.11 Vaf=87 Bf=84.21 Ise=336.8f

+ Ne=1.424 Ikf=76.88m Nk=.5 Xtb=1.5 Br=1.78 Isc=.1p Nc=1.744 Ikr=.6068

+ Rb=25 Rc=.2997 Cjc=3.549p Mjc=.333 Vjc=.75 Fc=.5 Cje=3.42p Mje=.333

+ Vje=.75 Tr=16.38n Tf=138.3p Itf=.3 Xtf=1.7 Vtf=25)

.model q2T325b NPN(Is=19.86f Xti=3 Eg=1.11 Vaf=87 Bf=165.9 Ise=1.151p

+ Ne=1.612 Ikf=72.41m Nk=.5 Xtb=1.5 Br=1.78 Isc=.1p Nc=1.744 Ikr=.6068

+ Rb=27 Rc=.2997 Cjc=3.155p Mjc=.333 Vjc=.75 Fc=.5 Cje=3.42p Mje=.333

+ Vje=.75 Tr=11.53n Tf=138.3p Itf=.3 Xtf=1.7 Vtf=25)

.model q2T325v NPN(Is=9.164f Xti=3 Eg=1.11 Vaf=87 Bf=321.5 Ise=87.74f

+ Ne=1.473 Ikf=87.77m Nk=.5 Xtb=1.5 Br=1.78 Isc=.1p Nc=1.744 Ikr=.6068

+ Rb=31 Rc=.2997 Cjc=2.958p Mjc=.333 Vjc=.75 Fc=.5 Cje=3.42p Mje=.333

+ Vje=.75 Tr=8.891n Tf=112.2p Itf=.3 Xtf=2 Vtf=25)

\*

\*\*\*\* 2T326 Family

\*

.model q2T326a PNP(Is=496.3E-18 Xti=3 Eg=1.11 Vaf=110 Bf=79.59 Ne=1.376

+ Ise=8.406f Ikf=.106 Nk=.5 Xtb=1.5 Br=1 Isc=496.3E-18 Nc=1.636

+ Ikr=1u Rb=42 Rc=2.141 Cjc=3.7p Mjc=.33 Vjc=.75 Fc=.5 Cje=1.442p

+ Mje=.33 Vje=.75 Tr=3.696u Tf=443.3p Itf=1 Xtf=2 Vtf=20)

.model q2T326b PNP(Is=16.64f Xti=3 Eg=1.11 Vaf=115 Bf=99.06 Ne=2.527

+ Ise=54.12p Ikf=.6751 Xtb=1.5 Var=63 Br=1.75 Nc=2 Isc=12.5f Ikr=.52

+ Rb=52.4 Rc=1.85 Cjc=4.089p Vjc=.69 Mjc=.33 Fc=.5 Cje=3.375p Vje=.75

+ Mje=.35 Tr=40.04n Tf=160.2p Itf=.1 Vtf=10 Xtf=2)

\*

\*\*\*\* KT342 Family

\*

.model KT342a NPN(Is=5.997f Xti=3 Eg=1.11 Vaf=106.8 Bf=394.1 Ise=38.23f

+ Ne=1.421 Ikf=.1685 Nk=.4727 Xtb=1.5 Br=1 Isc=23.96f Nc=1.34

+ Ikr=2.077 Rb=19 Rc=.9855 Cjc=10.44p Mjc=.3906 Vjc=.75 Fc=.5

+ Cje=14.23p Mje=.33 Vje=.75 Tr=78.22n Tf=307.5p Itf=.52 Xtf=2 Vtf=50)

.model KT342b NPN(Is=5.997f Xti=3 Eg=1.11 Vaf=95.7 Bf=739.7 Ise=50.36f

+ Ne=1.496 Ikf=.1479 Nk=.5 Xtb=1.5 Br=1 Isc=23.96f Nc=1.34

+ Ikr=2.077 Rb=23 Rc=.9855 Cjc=10.44p Mjc=.3906 Vjc=.75 Fc=.5

+ Cje=14.23p Mje=.33 Vje=.75 Tr=78.22n Tf=307.5p Itf=.52 Xtf=2 Vtf=50)

.model KT342v NPN(Is=5.997f Xti=3 Eg=1.11 Vaf=86.61 Bf=956.7 Ise=46.78f

+ Ne=1.566 Ikf=.1922 Nk=.5 Xtb=1.5 Br=1 Isc=23.96f Nc=1.34

+ Ikr=2.077 Rb=25 Rc=.98 Cjc=10.44p Mjc=.3906 Vjc=.75 Fc=.5 Cje=14.23p

+ Mje=.33 Vje=.75 Tr=89.4u Tf=232.1p Itf=4.185 Xtf=3.3 Vtf=50)

\*

\*\*\*\* KT351 Family

\*

.model KT351a PNP(Is=4.943f Xti=3 Eg=1.11 Vaf=110 Bf=91.56 Ne=1.776

+ Ise=1.436p Ikf=.2116 Xtb=1.5 Var=25 Br=1.215 Nc=2 Isc=1.45p Ikr=.25

+ Rb=75 Rc=.44 Cjc=15.05p Vjc=.69 Mjc=.33 Fc=.5 Cje=24.48p Vje=.65

+ Mje=.33 Tr=223.6n Tf=217.4p Itf=.28 Vtf=35 Xtf=2)

.model KT351b PNP(Is=4.943f Xti=3 Eg=1.11 Vaf=110 Bf=185.3 Ne=1.776

+ Ise=1.436p Ikf=.2116 Xtb=1.5 Var=25 Br=1.215 Nc=2 Isc=1.45p Ikr=.25

+ Rb=75 Rc=.44 Cjc=15.05p Vjc=.69 Mjc=.33 Fc=.5 Cje=24.48p Vje=.65

+ Mje=.33 Tr=223.6n Tf=217.4p Itf=.28 Vtf=35 Xtf=2)

\*

\*\*\*\* KT355

\*

.model q2T355a NPN(Is=14.02f Xti=3 Eg=1.11 Vaf=82.35 Bf=172.2 Ne=2.211

+ Ise=9.573p Ikf=.2809 Xtb=1.5 Var=45 Br=.8636 Nc=2 Isc=1.12p Ikr=.253

+ Rb=41.6 Rc=3.55 Cjc=2.742p Vjc=.75 Mjc=.33 Fc=.5 Cje=2.635p Vje=.69

+ Mje=.33 Tr=76.29n Tf=65.28p Itf=.532 Vtf=15 Xtf=2)

\*

\*\*\*\* KT357 Family

\*

.model KT357a PNP(Is=67.34f Xti=3 Eg=1.11 Vaf=80 Bf=70.83 Ise=746.1f

+ Ne=1.452 Ikf=.1929 Nk=.5153 Xtb=1.5 Br=1 Isc=67.34f Nc=1.071

+ Ikr=2.269 Rc=3.665 Rb=50 Cjc=12.15p Mjc=.33 Vjc=.75 Fc=.5 Cje=18.5p

+ Mje=.33 Vje=.75 Tr=275.6n Tf=160.9p Itf=56.6m Xtf=.3203 Vtf=40)

.model KT357b PNP(Is=31.08f Xti=3 Eg=1.11 Vaf=75 Bf=203.3 Ise=325.3f

+ Ne=1.534 Ikf=.2072 Nk=.5155 Xtb=1.5 Br=1 Isc=34.36f Nc=1.022

+ Ikr=3.163 Rc=3.748 Rb=70 Cjc=10.93p Mjc=.33 Vjc=.75 Fc=.5 Cje=18.5p

+ Mje=.33 Vje=.75 Tr=275.6n Tf=91.32p Itf=.1303 Xtf=1.762 Vtf=40)

\*

\*\*\*\* 2T361 Family

\*

.model KT361a PNP(Is=67.34f Xti=3 Eg=1.11 Vaf=80 Bf=70.83 Ise=746.1f

+ Ne=1.452 Ikf=.1929 Nk=.5153 Xtb=1.5 Br=1 Isc=67.34f Nc=1.071

+ Ikr=2.269 Rc=3.665 Rb=50 Cjc=12.15p Mjc=.33 Vjc=.75 Fc=.5 Cje=18.5p

+ Mje=.33 Vje=.75 Tr=275.6n Tf=160.9p Itf=56.6m Xtf=.3203 Vtf=40)

.model KT361b PNP(Is=31.08f Xti=3 Eg=1.11 Vaf=75 Bf=203.3 Ise=325.3f

+ Ne=1.534 Ikf=.2072 Nk=.5155 Xtb=1.5 Br=1 Isc=34.36f Nc=1.022

+ Ikr=3.163 Rc=3.748 Rb=70 Cjc=10.93p Mjc=.33 Vjc=.75 Fc=.5 Cje=18.5p

+ Mje=.33 Vje=.75 Tr=275.6n Tf=91.32p Itf=.1303 Xtf=1.762 Vtf=40)

.model KT361v PNP(Is=67.34f Xti=3 Eg=1.11 Vaf=90.7 Bf=81.94 Ise=579.7f

+ Ne=1.51 Ikf=.2136 Nk=.5064 Xtb=1.5 Br=1 Isc=67.34f Nc=1.071

+ Ikr=2.269 Rc=3.665 Cjc=8.502p Mjc=.33 Vjc=.75 Fc=.5 Cje=18.5p

+ Mje=.33 Vje=.75 Tr=275.6n Tf=125.8p Itf=1.202 Xtf=5.752 Vtf=60)

.model KT361g PNP(Is=31.08f Xti=3 Eg=1.11 Vaf=75 Bf=203.3 Ise=325.3f

+ Ne=1.534 Ikf=.2072 Nk=.5155 Xtb=1.5 Br=1 Isc=34.36f Nc=1.022

+ Ikr=3.163 Rc=3.748 Rb=70 Cjc=10.93p Mjc=.33 Vjc=.75 Fc=.5 Cje=18.5p

+ Mje=.33 Vje=.75 Tr=275.6n Tf=91.32p Itf=.1303 Xtf=1.762 Vtf=40)

.model KT361d PNP(Is=67.34f Xti=3 Eg=1.11 Vaf=80 Bf=70.83 Ise=746.1f

+ Ne=1.452 Ikf=.1929 Nk=.5153 Xtb=1.5 Br=1 Isc=67.34f Nc=1.071

+ Ikr=2.269 Rc=3.665 Rb=50 Cjc=12.15p Mjc=.33 Vjc=.75 Fc=.5 Cje=18.5p

+ Mje=.33 Vje=.75 Tr=275.6n Tf=160.9p Itf=56.6m Xtf=.3203 Vtf=40)

\*

\*\*\*\* KT363 Family

\*

.model q2T363a PNP(Is=11.8f Xti=3 Eg=1.11 Vaf=95.7 Bf=100.6 Ne=1.971

+ Ise=1.834p Ikf=.195 Xtb=1.5 Var=65 Br=1.18 Nc=2 Isc=1p Ikr=.3 Rb=80

+ Rc=1.6 Cjc=2.958p Vjc=.69 Mjc=.33 Fc=.5 Cje=1.112p Vje=.71 Mje=.35

+ Tr=6.149n Tf=41.32p Itf=.12 Vtf=10 Xtf=2)

.model q2T363b PNP(Is=11.8f Xti=3 Eg=1.11 Vaf=95.7 Bf=156.2 Ne=1.971

+ Ise=1.834p Ikf=.195 Xtb=1.5 Var=65 Br=1.18 Nc=2 Isc=1p Ikr=.3 Rb=67.5

+ Rc=1.6 Cjc=2.958p Vjc=.69 Mjc=.33 Fc=.5 Cje=1.112p Vje=.71 Mje=.35

+ Tr=6.149n Tf=41.32p Itf=.12 Vtf=10 Xtf=2)

\*

\*\*\*\* KT368 Family

\*

.model q2T368a NPN(Is=8.675f Xti=3 Eg=1.11 Vaf=108 Bf=250.5 Ne=1.377

+ Ise=9.128f Ikf=.3608 Xtb=1.5 Var=56 Br=1.45 Nc=2 Isc=16.3f Ikr=.125

+ Rb=31.5 Rc=2.445 Cjc=2.35p Vjc=.75 Mjc=.33 Fc=.5 Cje=2.786p Vje=.69

+ Mje=.37 Tr=2.147n Tf=84.62p Itf=.15 Vtf=25 Xtf=2)

.model q2T368b NPN(Is=8.675f Xti=3 Eg=1.11 Vaf=108 Bf=325.3 Ne=1.377

+ Ise=9.128f Ikf=.3608 Xtb=1.5 Var=56 Br=1.45 Nc=2 Isc=16.3f Ikr=.125

+ Rb=31.5 Rc=2.445 Cjc=2.35p Vjc=.75 Mjc=.33 Fc=.5 Cje=2.786p Vje=.69

+ Mje=.37 Tr=2.147n Tf=84.62p Itf=.15 Vtf=25 Xtf=2)

\*

\*\*\*\* KT371

\*

.model q2T371a NPN(Is=1.378f Xti=3 Eg=1.11 Vaf=68.25 Bf=236 Ne=1.479

+ Ise=43.8f Ikf=.1777 Xtb=1.5 Var=45 Br=3.414 Nc=2 Isc=55f Ikr=35m

+ Rb=44.1 Rc=2.8 Cjc=1.932p Vjc=.75 Mjc=.33 Fc=.5 Cje=1.747p Vje=.69

+ Mje=.33 Tr=13.65n Tf=43.78p Itf=.35 Vtf=10 Xtf=2)

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\*\*\*\* KT3101

\*

.model KT3101a NPN(Is=25.63f Xti=3 Eg=1.11 Vaf=56 Bf=245.8 Ne=1.254

+ Ise=27.93f Ikf=54.66m Xtb=1.5 Var=20 Br=1.883 Nc=2 Isc=108.6f Ikr=57.63m

+ Rb=28 Rbm=8 Irb=.72m Rc=3.45 Cjc=1.166p Mjc=.2974 Vjc=.75 Fc=.5 Xcjc=0.5

+ Cje=1.354p Mje=.3137 Vje=.65 Tr=463.8p Tf=22.39p Itf=.367 Vtf=12 Xtf=2)

\*

\*\*\*\* KT3102 Family

\*

.model KT3102a NPN(Is=5.258f Xti=3 Eg=1.11 Vaf=86 Bf=185.1 Ne=7.428

+ Ise=28.21n Ikf=.4922 Xtb=1.5 Var=25 Br=2.713 Nc=2 Isc=21.2p Ikr=.25

+ Rb=52 Rc=1.65 Cjc=9.921p Vjc=.65 Mjc=.33 Fc=.5 Cje=11.3p Vje=.69

+ Mje=.33 Tr=57.71n Tf=611.5p Itf=.52 Vtf=80 Xtf=2)

.model KT3102b NPN(Is=3.628f Xti=3 Eg=1.11 Vaf=72 Bf=303.3 Ne=13.47

+ Ise=43.35n Ikf=96.35m Xtb=1.5 Var=30 Br=3.201 Nc=2 Isc=5.5p Ikr=.1

+ Rb=37 Rc=1.12 Cjc=11.02p Vjc=.65 Mjc=.33 Fc=.5 Cje=13.31p Vje=.69

+ Mje=.33 Tr=41.67n Tf=493.4p Itf=.12 Vtf=50 Xtf=2)

.model KT3102bm NPN(Is=891.4E-18 Xti=3 Eg=1.11 Vaf=64 Bf=311.9 Ne=4.136

+ Ise=594.5p Ikf=60.16m Xtb=1.5 Var=25 Br=5.622 Nc=2 Isc=1.225p Ikr=.25

+ Rb=59 Rc=1.23 Cjc=9.186p Vjc=.65 Mjc=.33 Fc=.5 Cje=9.139p Vje=.69

+ Mje=.33 Tr=28.24n Tf=786.5p Itf=.2 Vtf=30 Xtf=2)

.model KT3102v NPN(Is=3.628f Xti=3 Eg=1.11 Vaf=58.2 Bf=333.4 Ise=35.48f

+ Ne=1.602 Ikf=.1538 Nk=.5 Xtb=1.5 Br=1.546 Isc=18.26f Nc=1.585

+ Ikr=.6305 Rb=30 Rc=.1636 Cjc=11.02p Mjc=.33 Vjc=.65 Fc=.5 Cje=11.3p

+ Mje=.33 Vje=.69 Tr=41.67n Tf=493.4p Itf=.3 Xtf=2 Vtf=40)

.model KT3102g NPN(Is=2.99f Xti=3 Eg=1.11 Vaf=58.2 Bf=831 Ise=27.52f

+ Ne=1.623 Ikf=.1121 Nk=.5 Xtb=1.5 Br=1 Isc=211.5f Nc=1.76 Ikr=1.586

+ Rb=42 Rc=.4274 Cjc=8.873p Mjc=.33 Vjc=.75 Fc=.5 Cje=11.3p Mje=.33

+ Vje=.69 Tr=41.67n Tf=386.3p Itf=1 Xtf=2 Vtf=40)

.model KT3102d NPN(Is=3.628f Xti=3 Eg=1.11 Vaf=58.2 Bf=288.6 Ise=33.28f

+ Ne=1.634 Ikf=.1893 Nk=.5 Xtb=1.5 Br=1.546 Isc=18.26f Nc=1.585

+ Ikr=.6305 Rb=35 Rc=.1636 Cjc=11.02p Mjc=.33 Vjc=.65 Fc=.5 Cje=11.3p

+ Mje=.33 Vje=.69 Tr=41.67n Tf=493.4p Itf=.3 Xtf=2 Vtf=30)

.model KT3102e NPN(Is=2.99f Xti=3 Eg=1.11 Vaf=58.2 Bf=868.9 Ise=15.81f

+ Ne=1.65 Ikf=.179 Nk=.5 Xtb=1.5 Br=1 Isc=211.5f Nc=1.76 Ikr=1.586

+ Rb=53 Rc=.4274 Cjc=7.887p Mjc=.33 Vjc=.75 Fc=.5 Cje=11.3p Mje=.33

+ Vje=.69 Tr=41.67n Tf=386.3p Itf=1 Xtf=2 Vtf=30)

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\*\*\*\* KT3107 Family

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.model KT3107a PNP(Is=6.545f Xti=3 Eg=1.11 Vaf=86.5 Bf=105.5 Ne=8.56

+ Ise=7.735n Ikf=.1862 Xtb=1.5 Var=32 Br=1.62 Nc=2 Isc=3.35p Ikr=12m

+ Rb=39.1 Rc=.71 Cjc=12.83p Vjc=.65 Mjc=.33 Fc=.5 Cje=12.59p Vje=.69

+ Mje=.35 Tr=30.5n Tf=477.5p Itf=56m Vtf=35 Xtf=2)

.model KT3107b PNP(Is=2.111f Xti=3 Eg=1.11 Vaf=68.5 Bf=145.2 Ne=2.367

+ Ise=7.338p Ikf=.242 Xtb=1.5 Var=32 Br=7.573 Nc=2 Isc=1.55p Ikr=25m

+ Rb=25.5 Rc=.75 Cjc=11.86p Vjc=.69 Mjc=.33 Fc=.5 Cje=13.01p Vje=.69

+ Mje=.35 Tr=20.11n Tf=474p Itf=.15 Vtf=25 Xtf=1)

.model KT3107v PNP(Is=6.545f Xti=3 Eg=1.11 Vaf=86.5 Bf=105.5 Ne=8.56

+ Ise=7.735n Ikf=.1862 Xtb=1.5 Var=32 Br=1.62 Nc=2 Isc=3.35p Ikr=12m

+ Rb=39.1 Rc=.71 Cjc=12.83p Vjc=.65 Mjc=.33 Fc=.5 Cje=12.59p Vje=.69

+ Mje=.35 Tr=30.5n Tf=477.5p Itf=56m Vtf=35 Xtf=2)

.model KT3107g PNP(Is=6.531f Xti=3 Eg=1.11 Vaf=68.5 Bf=237.5 Ne=2.367

+ Ise=7.338p Ikf=.242 Xtb=1.5 Var=32 Br=7.573 Nc=2 Isc=1.55p Ikr=25m

+ Rb=25.5 Rc=.75 Cjc=11.86p Vjc=.69 Mjc=.33 Fc=.5 Cje=13.01p Vje=.69

+ Mje=.35 Tr=20.11n Tf=474p Itf=.15 Vtf=25 Xtf=1)

\*

\*\*\*\* 2T3108 Family

\*

.model q2T3108a PNP(Is=1.41f Xti=3 Eg=1.11 Vaf=87 Bf=112.7 Ne=3.346

+ Ise=114.2p Ikf=31.92m Xtb=1.5 Br=1.883 Nc=2 Isc=114f Ikr=31m Rc=4.25

+ Rb=52 Cjc=4.372p Mjc=.33 Vjc=.75 Fc=.5 Cje=3.714p Mje=.33 Vje=.75

+ Tr=67.31n Tf=344.1p Itf=56m Vtf=45 Xtf=1.5)

.model q2T3108b PNP(Is=863E-18 Xti=3 Eg=1.11 Vaf=85 Bf=112.4 Ne=12.53

+ Ise=37.65n Ikf=27.99m Xtb=1.5 Var=26 Br=2.984 Nc=2 Isc=1.25p Ikr=56m

+ Rb=52 Rc=4.24 Cjc=4.529p Vjc=.65 Mjc=.33 Fc=.5 Cje=3.763p Vje=.69

+ Mje=.33 Tr=43.55n Tf=292.3p Itf=58m Vtf=55 Xtf=2)

.model q2T3108v PNP(Is=1.41f Xti=3 Eg=1.11 Vaf=83 Bf=223.5 Ne=3.657

+ Ise=101p Ikf=35.11m Xtb=1.5 Br=1.655 Nc=2 Isc=114f Ikr=31m Rc=4.5

+ Rb=52 Cjc=4.372p Mjc=.33 Vjc=.75 Fc=.5 Cje=3.714p Mje=.33 Vje=.75

+ Tr=63.22n Tf=339.5p Itf=93m Vtf=40 Xtf=1.5)

\*

\*\*\* KT3117 Family

\*

.model KT3117a NPN(Is=61.27f Xti=3 Eg=1.11 Vaf=95.7 Bf=182 Ne=2.744

+ Ise=9.293n Ikf=2.622 Xtb=1.5 Var=65 Br=1.894 Nc=2 Isc=1.2n Ikr=2.65

+ Rb=30.7 Rc=.75 Cjc=28.58p Mjc=.4701 Vjc=.75 Fc=.5 Cje=68.82p Mje=.1985

+ Vje=.75 Tr=32.04n Tf=261.9p Itf=2.5 Vtf=40 Xtf=1.5)

.model q2T3117a NPN(Is=61.27f Xti=3 Eg=1.11 Vaf=95.7 Bf=182 Ne=2.744

+ Ise=9.293n Ikf=2.622 Xtb=1.5 Var=65 Br=1.894 Nc=2 Isc=1.2n Ikr=2.65

+ Rb=30.7 Rc=.75 Cjc=28.58p Mjc=.4701 Vjc=.75 Fc=.5 Cje=68.82p Mje=.1985

+ Vje=.75 Tr=32.04n Tf=261.9p Itf=2.5 Vtf=40 Xtf=1.5)

\*

\*\*\*\* KT502 Family

\*

.model KT502a PNP(Is=3.48f Xti=3 Eg=1.11 Vaf=60 Bf=121.1 Ise=27.32f

+ Ne=1.358 Ikf=74.95m Nk=.4803 Xtb=1.5 Br=1 Isc=13.91f Nc=1.34

+ Ikr=2.077 Rb=12 Rc=.9855 Cjc=23.66p Mjc=.33 Vjc=.75 Fc=.5

+ Cje=26.53p Mje=.33 Vje=.75 Tr=923.3n Tf=10.3n Itf=1 Xtf=2 Vtf=25)

.model KT502b PNP(Is=3.48f Xti=3 Eg=1.11 Vaf=60 Bf=209.4 Ise=54.03f

+ Ne=1.457 Ikf=27.44m Nk=.5 Xtb=1.5 Br=1.2 Isc=13.91f Nc=1.34

+ Ikr=2.077 Rb=15 Rc=1.133 Cjc=23.66p Mjc=.33 Vjc=.75 Fc=.5

+ Cje=26.53p Mje=.33 Vje=.75 Tr=712.7n Tf=7.62n Itf=1 Xtf=2 Vtf=25)

.model KT502v PNP(Is=7.541f Xti=3 Eg=1.11 Vaf=115 Bf=118.8 Ise=61.46f

+ Ne=1.382 Ikf=.1498 Nk=.593 Xtb=1.5 Br=2.3 Isc=13.91f Nc=1.34

+ Ikr=2.077 Rb=10 Rc=1.2 Cjc=23.66p Mjc=.33 Vjc=.75 Fc=.5 Cje=26.53p

+ Mje=.33 Vje=.75 Tr=363.5n Tf=10.3n Itf=1 Xtf=2 Vtf=25)

.model KT502g PNP(Is=3.48f Xti=3 Eg=1.11 Vaf=100 Bf=209.4 Ise=54.03f

+ Ne=1.457 Ikf=27.44m Nk=.5 Xtb=1.5 Br=1.2 Isc=13.91f Nc=1.34

+ Ikr=2.077 Rb=15 Rc=1.133 Cjc=23.66p Mjc=.33 Vjc=.75 Fc=.5

+ Cje=26.53p Mje=.33 Vje=.75 Tr=712.7n Tf=7.62n Itf=1 Xtf=2 Vtf=40)

.model KT502d PNP(Is=7.541f Xti=3 Eg=1.11 Vaf=115 Bf=118.7 Ise=73.88f

+ Ne=1.396 Ikf=.1211 Nk=.5237 Xtb=1.5 Br=2.3 Isc=13.91f Nc=1.34

+ Ikr=2.077 Rb=15 Rc=1.2 Cjc=23.66p Mjc=.33 Vjc=.75 Fc=.5 Cje=26.53p

+ Mje=.33 Vje=.75 Tr=484.6n Tf=12.96n Itf=1 Xtf=2 Vtf=50)

.model KT502e PNP(Is=3.48f Xti=3 Eg=1.11 Vaf=120 Bf=121.1 Ise=27.32f

+ Ne=1.358 Ikf=74.95m Nk=.4803 Xtb=1.5 Br=1 Isc=13.91f Nc=1.34

+ Ikr=2.077 Rb=12 Rc=.9855 Cjc=23.66p Mjc=.33 Vjc=.75 Fc=.5

+ Cje=26.53p Mje=.33 Vje=.75 Tr=923.3n Tf=10.3n Itf=1 Xtf=2 Vtf=80)

\*

\*\*\*\* KT503 Family

\*

.model KT503a NPN(Is=6.843f Xti=3 Eg=1.11 Vaf=60 Bf=104.8 Ise=70.91f

+ Ne=1.372 Ikf=.4526 Nk=.5243 Xtb=1.5 Br=1.1 Isc=26.4p Nc=2.088

+ Ikr=1.637 Rb=12 Rc=1.538 Cjc=23.66p Mjc=.33 Vjc=.75 Fc=.5

+ Cje=30.84p Mje=.33 Vje=.75 Tr=648.9n Tf=10.09n Itf=1 Xtf=2 Vtf=10)

.model KT503b NPN(Is=10.07f Xti=3 Eg=1.11 Vaf=60 Bf=166.4 Ise=100.2f

+ Ne=1.452 Ikf=.6117 Nk=.4667 Xtb=1.5 Br=1.7 Isc=47.49f Nc=1.715

+ Ikr=.7018 Rb=6 Rc=1.208 Cjc=23.66p Mjc=.33 Vjc=.75 Fc=.5

+ Cje=30.84p Mje=.33 Vje=.75 Tr=390.4n Tf=10.09n Itf=1 Xtf=2 Vtf=40)

.model KT503v NPN(Is=6.843f Xti=3 Eg=1.11 Vaf=114 Bf=130.7 Ise=56.77f

+ Ne=1.358 Ikf=.2659 Nk=.4211 Xtb=1.5 Br=1.2 Isc=26.4p Nc=2.088

+ Ikr=1.637 Rb=6 Rc=1.538 Cjc=23.66p Mjc=.33 Vjc=.75 Fc=.5

+ Cje=30.84p Mje=.33 Vje=.75 Tr=648.9n Tf=15.39n Itf=1 Xtf=2 Vtf=30)

.model KT503g NPN(Is=10.07f Xti=3 Eg=1.11 Vaf=145 Bf=166.4 Ise=100.2f

+ Ne=1.452 Ikf=.6117 Nk=.4667 Xtb=1.5 Br=1.7 Isc=47.49f Nc=1.715

+ Ikr=.7018 Rb=6 Rc=1.208 Cjc=23.66p Mjc=.33 Vjc=.75 Fc=.5

+ Cje=30.84p Mje=.33 Vje=.75 Tr=390.4n Tf=10.09n Itf=1 Xtf=2 Vtf=40)

.model KT503d NPN(Is=6.843f Xti=3 Eg=1.11 Vaf=129 Bf=106.6 Ise=66.48f

+ Ne=1.384 Ikf=.8419 Nk=.6328 Xtb=1.5 Br=1.2 Isc=26.4p Nc=2.088

+ Ikr=1.637 Rb=6 Rc=1.538 Cjc=23.66p Mjc=.33 Vjc=.75 Fc=.5

+ Cje=30.84p Mje=.33 Vje=.75 Tr=648.9n Tf=12.74n Itf=1 Xtf=2 Vtf=30)

.model KT503e NPN(Is=6.843f Xti=3 Eg=1.11 Vaf=145.2 Bf=104.8 Ise=70.91f

+ Ne=1.372 Ikf=.4526 Nk=.5243 Xtb=1.5 Br=1.1 Isc=26.4p Nc=2.088

+ Ikr=1.637 Rb=12 Rc=1.538 Cjc=23.66p Mjc=.33 Vjc=.75 Fc=.5

+ Cje=30.84p Mje=.33 Vje=.75 Tr=648.9n Tf=10.09n Itf=1 Xtf=2 Vtf=60)

\*

\*\*\*\* 2T504 - 505 Family

\*

.model q2T504a NPN(Is=26.98f Xti=3 Eg=1.11 Vaf=138 Bf=209.7 Ise=498.3f

+ Ne=1.412 Ikf=1.14 Nk=.5971 Xtb=1.5 Br=1.93 Isc=275.6f Nc=1.445

+ Ikr=81.42m Rb=6.7 Rc=.5483 Cjc=38.87p Mjc=.35 Vjc=.75 Fc=.5 Cje=592.8p

+ Mje=.33 Vje=.65 Tr=810.9n Tf=1.867n Itf=10.8 Xtf=2 Vtf=40)

\*

.model q2T505a PNP(Is=77.95f Xti=3 Eg=1.11 Vaf=98 Bf=242.4 Ise=890f

+ Ne=1.403 Ikf=2.079 Nk=.6286 Xtb=1.5 Br=1.93 Isc=53.03p Nc=1.441

+ Ikr=81.42m Rb=8.3 Rc=.6239 Cjc=59.15p Mjc=.33 Vjc=.75 Fc=.5

+ Cje=474.3p Mje=.33 Vje=.65 Tr=810.9n Tf=3.558n Itf=8 Xtf=2 Vtf=40)

\*

\*\*\*\* KT603 - KT605 Family

\*

.model q2T603a NPN(Is=91.85f Xti=3 Eg=1.11 Vaf=90 Bf=73.42 Ne=1.299

+ Ise=410f Ikf=1.033 Xtb=1.5 Br=.3123 Nc=2 Isc=1.265p Ikr=.41 Rc=1.17

+ Rb=12 Cjc=5.646p Mjc=.3443 Vjc=.75 Fc=.5 Cje=28.89p Mje=.283 Vje=.75

+ Tr=255.1n Tf=389.2p Itf=2.04 Vtf=60 Xtf=2)

.model q2T603b NPN(Is=91.85f Xti=3 Eg=1.11 Vaf=80 Bf=140.3 Ne=1.299

+ Ise=410f Ikf=1.033 Xtb=1.5 Br=1.113 Nc=2 Isc=1.265p Ikr=.41 Rc=1.17

+ Rb=12 Cjc=5.646p Mjc=.3443 Vjc=.75 Fc=.5 Cje=28.89p Mje=.283 Vje=.75

+ Tr=255.1n Tf=389.2p Itf=2.04 Vtf=60 Xtf=2)

\*

.model KT604a NPN(Is=19.56f Xti=3 Eg=1.11 Vaf=110 Bf=109.6 Ne=1.427

+ Ise=209f Ikf=1.478 Xtb=1.5 Br=.113 Nc=2 Isc=1.265p Ikr=.34 Rc=6.14

+ Rb=18 Cjc=11.42p Mjc=.3159 Vjc=.75 Fc=.5 Cje=31.04p Mje=.2732 Vje=.75

+ Tr=1.238u Tf=814.9p Itf=1.27 Vtf=80 Xtf=2)

\*

.model KT605a NPN(Is=19.56f Xti=3 Eg=1.11 Vaf=110 Bf=109.6 Ne=1.427

+ Ise=209f Ikf=1.478 Xtb=1.5 Br=.113 Nc=2 Isc=1.265p Ikr=.34 Rc=6.14

+ Rb=23 Cjc=11.42p Mjc=.3159 Vjc=.75 Fc=.5 Cje=31.04p Mje=.2732 Vje=.75

+ Tr=1.238u Tf=814.9p Itf=1.27 Vtf=80 Xtf=2)

\*

\*\*\*\* KT630 - 638 Family

\*

.model q2T630a NPN(Is=7.433f Xti=3 Eg=1.11 Vaf=112 Bf=217 Ise=28.05f

+ Ne=1.255 Ikf=.8802 Nk=.6361 Xtb=1.5 Br=1.922 Isc=77.34f Nc=1.547

+ Ikr=1.453 Rb=1.2 Rc=.3548 Cjc=21.86p Mjc=.33 Vjc=.75 Fc=.5

+ Cje=47.43p Mje=.33 Vje=.75 Tr=89.07n Tf=1.83n Itf=3 Xtf=.3 Vtf=60)

.model q2T630b NPN(Is=17.03f Xti=3 Eg=1.11 Vaf=123 Bf=472.7 Ne=1.368

+ Ise=163.3f Ikf=.4095 Xtb=1.5 Var=75 Br=4.804 Nc=2 Isc=1.35p Ikr=.21

+ Rb=1.4 Rc=.65 Cjc=21.24p Vjc=.69 Mjc=.33 Fc=.5 Cje=34.4p Vje=.69

+ Mje=.35 Tr=50.12n Tf=1.795n Itf=.65 Vtf=60 Xtf=1.1)

\*

.model q2T632a PNP(Is=14.34f Xti=3 Eg=1.11 Vaf=106 Bf=157.2 Ise=107f

+ Ne=1.424 Ikf=.1495 Nk=.4496 Xtb=1.5 Br=.85 Isc=8.399p Nc=2.28

+ Ikr=.1449 Rb=44.3 Rc=3.208 Cjc=9.073p Mjc=.33 Vjc=.7 Fc=.5 Mje=.33

+ Cje=25.11p Vje=.65 Tr=1.49u Tf=531.4p Itf=65.94m Xtf=.2 Vtf=40)

\*

.model q2T638a NPN(Is=49.43f Xti=3 Eg=1.11 Vaf=120 Bf=156.7 Ise=321.8f

+ Ne=1.45 Ikf=.2839 Nk=.5 Xtb=1.5 Br=.58 Isc=5.44p Nc=2.28 Ikr=.142

+ Rb=45.2 Rc=4.75 Cjc=12.1p Mjc=.33 Vjc=.75 Fc=.5 Cje=32.14p

+ Mje=.33 Vje=.75 Tr=1.725u Tf=501.7p Itf=24.56m Xtf=95.24m Vtf=40)

\*

\*\*\*\* 2T653 Family

\*

.model q2T653a NPN(Is=44.97f Xti=3 Eg=1.11 Vaf=113.3 Bf=130.5 Ise=466.8f

+ Ne=1.384 Ikf=1.511 Nk=.8169 Xtb=1.5 Br=1.93 Isc=640.4f Nc=1.441

+ Ikr=81.42m Rb=12 Rc=.6239 Cjc=17p Mjc=.33 Vjc=.75 Fc=.5 Cje=41.5p

+ Mje=.33 Vje=.75 Tr=393.8n Tf=805.3p Itf=1 Xtf=2 Vtf=60)

.model q2T653b NPN(Is=44.97f Xti=3 Eg=1.11 Vaf=79.03 Bf=179.9 Ise=228.5f

+ Ne=1.363 Ikf=.9461 Nk=.7366 Xtb=1.5 Br=1.93 Isc=640.4f Nc=1.441

+ Ikr=81.42m Rb=25 Rc=.6239 Cjc=17p Mjc=.33 Vjc=.75 Fc=.5 Cje=41.5p

+ Mje=.33 Vje=.75 Tr=451.8n Tf=715.8p Itf=3 Xtf=2 Vtf=50)

\*

\*\*\*\* KT809 Family

\*

.model q2T809a NPN(Is=130.1f Xti=3 Eg=1.11 Vaf=100 Bf=82.09 Ise=217.3p

+ Ne=1.719 Ikf=5.346 Nk=.4488 Xtb=1.5 Br=2.813 Isc=2.51p Nc=1.493

+ Ikr=1.238 Rc=.1166 Rb=1.5 Cjc=394.4p Mjc=.3333 Vjc=.75 Fc=.5

+ Cje=1.737n Mje=.33 Vje=.75 Tr=847.7n Tf=24.96n Itf=23.15 Xtf=5 Vtf=60)

.model KT809a NPN(Is=130.1f Xti=3 Eg=1.11 Vaf=100 Bf=82.09 Ise=217.3p

+ Ne=1.719 Ikf=5.346 Nk=.4488 Xtb=1.5 Br=2.813 Isc=2.51p Nc=1.493

+ Ikr=1.238 Rc=.1166 Rb=1.5 Cjc=394.4p Mjc=.3333 Vjc=.75 Fc=.5

+ Cje=1.737n Mje=.33 Vje=.75 Tr=847.7n Tf=24.96n Itf=23.15 Xtf=5 Vtf=60)

\*

\*\*\*\* KT812 Family

\*

.model KT812a NPN(Is=74.22f Xti=3 Eg=1.11 Vaf=153 Bf=123.5 Ne=1.754

+ Ise=172p Ikf=19.27 Xtb=1.5 Br=136.9m Nc=2 Isc=1.142p Ikr=8.53 Rc=.21

+ Rb=.5 Cjc=352.7p Mjc=.33 Vjc=.75 Fc=.5 Cje=800p Mje=.3395 Vje=.75

+ Xcjc=0.5 Tr=647.1n Tf=11.34n Itf=.45 Vtf=80 Xtf=2)

.model KT812b NPN(Is=43.44f Xti=3 Eg=1.11 Vaf=153 Bf=154.7 Ise=10.38p

+ Ne=1.51 Ikf=26.48 Nk=.8517 Xtb=1.5 Br=1 Isc=1.18p Nc=1.576 Ikr=.32

+ Rc=.2787 Rb=.2 Cjc=352.7p Mjc=.33 Vjc=.75 Fc=.5 Cje=800p Mje=.33

+ Vje=.75 Tr=647.1n Tf=11.34n Itf=1.5 Xtf=2 Vtf=80)

\*

\*\*\*\* KT814 Family

\*

.model KT814a PNP(Is=11.45f Xti=3 Eg=1.11 Vaf=62.37 Bf=176.8 Ise=88.24f

+ Ne=1.411 Ikf=.3656 Nk=.6491 Xtb=1.5 Br=1.238 Isc=269.4f Nc=1.51

+ Ikr=1.275 Rc=.1654 Rb=4 Cjc=88.73p Mjc=.3333 Vjc=.75 Fc=.5

+ Cje=71.14p Mje=.33 Vje=.75 Tr=2.046u Tf=26.36n Itf=3 Xtf=5 Vtf=10)

.model KT814b PNP(Is=11.45f Xti=3 Eg=1.11 Vaf=72.62 Bf=128.7 Ise=97.57f

+ Ne=1.421 Ikf=.2157 Nk=.4096 Xtb=1.5 Br=1.928 Isc=637.6f Nc=1.41

+ Ikr=.5927 Rc=.2979 Rb=4 Cjc=88.73p Mjc=.3333 Vjc=.75 Fc=.5

+ Cje=71.14p Mje=.3333 Vje=.75 Tr=2.046u Tf=26.36n Itf=3 Xtf=5 Vtf=10)

.model KT814v PNP(Is=11.45f Xti=3 Eg=1.11 Vaf=100 Bf=102.8 Ise=97.57f

+ Ne=1.421 Ikf=.2157 Nk=.4096 Xtb=1.5 Br=1.928 Isc=637.6f Nc=1.41

+ Ikr=.5927 Rc=.2979 Rb=4 Cjc=88.73p Mjc=.3333 Vjc=.75 Fc=.5

+ Cje=71.14p Mje=.3333 Vje=.75 Tr=2.046u Tf=26.36n Itf=3 Xtf=5 Vtf=10)

\*

\*\*\*\* KT815 Family

\*

.model KT815a NPN(Is=10.2f Xti=3 Eg=1.11 Vaf=70 Bf=191.7 Ise=349.5f

+ Ne=1.422 Ikf=.4139 Nk=.624 Xtb=1.5 Br=1.683 Isc=706.1f Nc=1.473

+ Ikr=.5592 Rc=.203 Rb=5 Cjc=88.73p Mjc=.3333 Vjc=.75 Fc=.5 Cje=71.14p

+ Mje=.3333 Vje=.75 Tr=2.046u Tf=24.32n Itf=1 Xtf=2 Vtf=10)

.model KT815b NPN(Is=10.2f Xti=3 Eg=1.11 Vaf=87 Bf=159.4 Ise=573.7f

+ Ne=1.453 Ikf=.3983 Nk=.5 Xtb=1.5 Br=1.576 Isc=231.6f Nc=1.44

+ Ikr=.3633 Rc=.2936 Rb=5 Cjc=88.73p Mjc=.3333 Vjc=.75 Fc=.5

+ Cje=71.14p Mje=.3333 Vje=.75 Tr=2.046u Tf=24.32n Itf=1 Xtf=2 Vtf=10)

.model KT815v NPN(Is=10.2f Xti=3 Eg=1.11 Vaf=87 Bf=115.3 Ise=573.7f

+ Ne=1.453 Ikf=.3983 Nk=.5 Xtb=1.5 Br=1.576 Isc=231.6f Nc=1.44

+ Ikr=.3633 Rc=.2936 Rb=5 Cjc=88.73p Mjc=.3333 Vjc=.75 Fc=.5

+ Cje=71.14p Mje=.3333 Vje=.75 Tr=2.046u Tf=24.32n Itf=1 Xtf=2 Vtf=10)

\*

\*\*\*\* KT816 Family

\*

.model KT816a PNP(Is=61.09f Xti=3 Eg=1.11 Vaf=63 Bf=210.7 Ise=1.298p

+ Ne=1.571 Ikf=.4055 Nk=.5019 Xtb=1.5 Br=1.216 Isc=1.831p Nc=1.514

+ Ikr=.7536 Rc=.1198 Cjc=129.88p Mjc=.3333 Vjc=.75 Fc=.5 Cje=110.3p

+ Mje=.3535 Vje=.75 Tr=391.3n Tf=23.31n Itf=1 Xtf=2 Vtf=10)

.model KT816b PNP(Is=61.09f Xti=3 Eg=1.11 Vaf=85 Bf=137.6 Ise=862.2f

+ Ne=1.481 Ikf=1.642 Nk=.5695 Xtb=1.5 Br=1.453 Isc=1.831p Nc=1.514

+ Ikr=.7536 Rc=.1198 Cjc=130.06p Mjc=.3333 Vjc=.75 Fc=.5 Cje=100.8p

+ Mje=.3333 Vje=.75 Tr=465.1n Tf=31.79n Itf=1 Xtf=2 Vtf=10)

.model KT816v PNP(Is=61.09f Xti=3 Eg=1.11 Vaf=85 Bf=100.3 Ise=862.2f

+ Ne=1.481 Ikf=1.642 Nk=.5695 Xtb=1.5 Br=1.453 Isc=1.831p Nc=1.514

+ Ikr=.7536 Rc=.1198 Cjc=130.06p Mjc=.3333 Vjc=.75 Fc=.5 Cje=100.8p

+ Mje=.3333 Vje=.75 Tr=465.1n Tf=31.79n Itf=1 Xtf=2 Vtf=10)

\*

\*\*\*\* KT817 Family

\*

.model kt817a NPN(Is=66.19f Xti=3 Eg=1.11 Vaf=100 Bf=287.1 Ise=330.5f

+ Ne=1.426 Ikf=.603 Nk=.5972 Xtb=1.5 Br=1.216 Isc=1.984p Nc=1.514

+ Ikr=.7536 Rc=.1198 Cjc=116.7p Mjc=.3155 Vjc=.75 Fc=.5 Cje=108.6p

+ Mje=.3333 Vje=.75 Tr=137.2n Tf=26.48n Itf=1 Xtf=2 Vtf=10)

.model kt817b NPN(Is=66.19f Xti=3 Eg=1.11 Vaf=105 Bf=132.5 Ise=564.1f

+ Ne=1.413 Ikf=.1501 Nk=.4187 Xtb=1.5 Br=1.663 Isc=1.043p Nc=1.476

+ Ikr=.9431 Rc=.1435 Cjc=98.3p Mjc=.3155 Vjc=.75 Fc=.5 Cje=108.6p

+ Mje=.3333 Vje=.75 Tr=137.2n Tf=26.48n Itf=1 Xtf=2 Vtf=10)

.model kt817v NPN(Is=66.19f Xti=3 Eg=1.11 Vaf=105 Bf=94.53 Ise=728.1f

+ Ne=1.432 Ikf=.4772 Nk=.4907 Xtb=1.5 Br=1.663 Isc=1.043p Nc=1.476

+ Ikr=.9431 Rc=.1435 Cjc=98.3p Mjc=.3155 Vjc=.75 Fc=.5 Cje=108.6p

+ Mje=.3333 Vje=.75 Tr=137.2n Tf=26.48n Itf=1 Xtf=2 Vtf=10)

\*

\*\*\*\* KT818 Family

\*

.model KT818a PNP(Is=150.1f Xti=3 Eg=1.11 Vaf=70 Bf=135.8 Ise=2.436p

+ Ne=1.37 Ikf=6.563 Nk=.6668 Xtb=1.5 Br=1.6 Isc=2.847p Nc=1.564 Ikr=.24

+ Rc=74m Rb=1 Cjc=1.183n Mjc=.3333 Vjc=.75 Fc=.5 Cje=1.635n Mje=.3333

+ Vje=.75 Tr=2.65u Tf=20.02n Itf=.3063 Xtf=.8299 Vtf=10)

.model KT818b PNP(Is=150.1f Xti=3 Eg=1.11 Vaf=80 Bf=179.1 Ise=1.171p

+ Ne=1.321 Ikf=5.846 Nk=.6543 Xtb=1.5 Br=1.6 Isc=2.847p Nc=1.564 Ikr=.24

+ Rc=74m Rb=1 Cjc=1.183n Mjc=.3333 Vjc=.75 Fc=.5 Cje=1.635n Mje=.3333

+ Vje=.75 Tr=2.203u Tf=20.02n Itf=.3063 Xtf=.8299 Vtf=10)

.model KT818v PNP(Is=150.1f Xti=3 Eg=1.11 Vaf=100 Bf=179.1 Ise=1.171p

+ Ne=1.321 Ikf=5.846 Nk=.6543 Xtb=1.5 Br=1.6 Isc=2.847p Nc=1.564 Ikr=.24

+ Rc=74m Rb=1 Cjc=1.183n Mjc=.3333 Vjc=.75 Fc=.5 Cje=1.635n Mje=.3333

+ Vje=.75 Tr=2.203u Tf=20.02n Itf=.3063 Xtf=.8299 Vtf=10)

\*

\*\*\*\* KT819 Family

\*

.model KT819a NPN(Is=114.5f Xti=3 Eg=1.11 Vaf=80 Bf=176.5 Ise=1.231p

+ Ne=1.371 Ikf=3.193 Nk=.5458 Xtb=1.5 Br=1 Isc=1.185p Nc=1.533 Ikr=.4086

+ Rc=36.34m Rb=2 Cjc=1.183n Mjc=.3333 Vjc=.75 Fc=.5 Cje=1.635n Mje=.3333

+ Vje=.75 Tr=2.955u Tf=14.69n Itf=1.387 Xtf=.4251 Vtf=10)

.model KT819b NPN(Is=114.5f Xti=3 Eg=1.11 Vaf=90 Bf=161 Ise=1.416p

+ Ne=1.341 Ikf=4.184 Nk=.649 Xtb=1.5 Br=3.8 Isc=1.266p Nc=1.51 Ikr=1.1

+ Rc=60m Rb=2 Cjc=1.183n Mjc=.3333 Vjc=.75 Fc=.5 Cje=1.635n Mje=.3333

+ Vje=.75 Tr=1.381u Tf=14.69n Itf=1.387 Xtf=.4251 Vtf=10)

.model KT819v NPN(Is=114.5f Xti=3 Eg=1.11 Vaf=100 Bf=161 Ise=1.416p

+ Ne=1.341 Ikf=4.184 Nk=.649 Xtb=1.5 Br=3.8 Isc=1.266p Nc=1.51 Ikr=1.1

+ Rc=60m Rb=2 Cjc=1.183n Mjc=.3333 Vjc=.75 Fc=.5 Cje=1.635n Mje=.3333

+ Vje=.75 Tr=1.381u Tf=14.69n Itf=1.387 Xtf=.4251 Vtf=10)

\*

\*\*\*\* KT830 Family

\*

.model q2T830a PNP(Is=40.74f Xti=3 Eg=1.11 Vaf=65 Bf=132.5 Ne=1.782

+ Ise=3.717p Ikf=.936 Xtb=1.5 Var=40 Br=.626 Nc=2 Isc=3.7p Ikr=.96

+ Rb=9 Rc=.25 Cjc=131.2p Mjc=.33 Vjc=.75 Fc=.5 Cje=114.7p Mje=.35

+ Vje=.65 Tr=3.056u Tf=17.31n Itf=.95 Vtf=25 Xtf=2)

.model q2T830b PNP(Is=40.74f Xti=3 Eg=1.11 Vaf=75 Bf=132.5 Ne=1.782

+ Ise=3.717p Ikf=.936 Xtb=1.5 Var=40 Br=.626 Nc=2 Isc=3.7p Ikr=.96

+ Rb=9 Rc=.25 Cjc=131.2p Mjc=.33 Vjc=.75 Fc=.5 Cje=114.7p Mje=.35

+ Vje=.65 Tr=3.056u Tf=17.31n Itf=.95 Vtf=25 Xtf=2)

.model q2T830v PNP(Is=40.74f Xti=3 Eg=1.11 Vaf=95 Bf=108.8 Ne=1.731

+ Ise=3.085p Ikf=1.873 Xtb=1.5 Var=50 Br=0.751 Nc=2 Isc=3.1p Ikr=1.8

+ Rb=12 Rc=.35 Cjc=131.2p Mjc=.33 Vjc=.75 Fc=.5 Cje=114.7p Mje=.35

+ Vje=.65 Tr=3.056u Tf=17.31n Itf=1.8 Vtf=50 Xtf=2)

\*

\*\*\*\* KT831 Family

\*

.model q2T831b NPN(Is=56.47f Xti=3 Eg=1.11 Vaf=83 Bf=236.8 Ne=2.918

+ Ise=8.105n Ikf=6.154 Xtb=1.5 Var=60 Br=.6713 Nc=2 Isc=2p Ikr=2.04

+ Rb=8.5 Rc=.27 Cjc=78.34p Mjc=.33 Vjc=.75 Fc=.5 Cje=241.4p Mje=.33

+ Vje=.65 Tr=2.353u Tf=5.055n Itf=4.09 Vtf=45 Xtf=2)

.model q2T831v NPN(Is=56.47f Xti=3 Eg=1.11 Vaf=80 Bf=255.7 Ne=2.918

+ Ise=8.105n Ikf=6.154 Xtb=1.5 Var=60 Br=.6713 Nc=2 Isc=2p Ikr=2.04

+ Rb=8.5 Rc=.27 Cjc=55.64p Mjc=.33 Vjc=.75 Fc=.5 Cje=181.5p Mje=.33

+ Vje=.65 Tr=1.223u Tf=5.055n Itf=4.09 Vtf=45 Xtf=2)

.model q2T831g NPN(Is=56.47f Xti=3 Eg=1.11 Vaf=83 Bf=118.4 Ne=2.918

+ Ise=16.21n Ikf=6.154 Xtb=1.5 Var=60 Br=.6713 Nc=2 Isc=2p Ikr=2.04

+ Rb=10.1 Rc=.27 Cjc=78.34p Mjc=.33 Vjc=.75 Fc=.5 Cje=241.4p Mje=.33

+ Vje=.65 Tr=2.353u Tf=5.055n Itf=4.09 Vtf=45 Xtf=2)

\*

\*\*\*\* 2T838 n-p-n

\*

.model q2T838a NPN(Is=74.22f Xti=3 Eg=1.11 Vaf=153 Bf=123.5 Ne=1.754

+ Ise=172p Ikf=19.27 Xtb=1.5 Br=136.9m Nc=2 Isc=1.142p Ikr=8.53 Rc=.21

+ Rb=3.4 Cjc=352.7p Mjc=.33 Vjc=.75 Fc=.5 Cje=800p Mje=.3395 Vje=.75

+ Xcjc=0.5 Tr=647.1n Tf=11.34n Itf=.45 Vtf=80 Xtf=2)

\*

\*\*\*\* 2T841 n-p-n

\*

.model q2T841a NPN(Is=114.2f Xti=3 Eg=1.11 Vaf=153 Bf=163.5 Ne=1.547

+ Ise=1.72p Ikf=7.27 Xtb=1.5 Br=1.36 Nc=2 Isc=1.142p Ikr=1.53 Rc=.21

+ Rb=1 Cjc=352.7p Mjc=.33 Vjc=.75 Fc=.5 Cje=800p Mje=.3395 Vje=.75

+ Xcjc=0.5 Tr=647.1n Tf=11.34n Itf=45 Vtf=80 Xtf=2)

\*

\*\*\*\* 2T842a p-n-p

\*

.model q2T842a PNP(Is=120.1f Xti=3 Eg=1.11 Vaf=100 Bf=174.1 Ne=1.498

+ Ise=1.681p Ikf=5.206 Nk=.5749 Xtb=1.5 Br=1.302 Isc=3.044p

+ Nc=1.426 Ikr=1.064 Rb=1 Rc=.2374 Cjc=557.4p Mjc=.3779 Vjc=.75 Fc=.5

+ Cje=3.051n Mje=.33 Vje=.75 Tr=825.9n Tf=5.126n Itf=25 Xtf=1.1 Vtf=40)

\*

\*\*\*\* KT908 Family

\*

.model q2T908a NPN(Is=114.5f Xti=3 Eg=1.11 Vaf=100 Bf=87.62 Ise=1.429p

+ Ne=1.286 Ikf=8.713 Nk=.4649 Xtb=1.5 Br=1.423 Isc=2.393p Nc=1.53

+ Ikr=.9543 Rc=56.36m Rb=1 Cjc=974.7p Mjc=.3085 Vjc=.75 Fc=.5

+ Cje=1.737n Mje=.33 Vje=.75 Tr=1.534u Tf=1.984n Itf=18.5 Xtf=3.4 Vtf=50)

.model q2T908b NPN(Is=114.5f Xti=3 Eg=1.11 Vaf=100 Bf=93.82 Ise=1.429p

+ Ne=1.286 Ikf=8.713 Nk=.4649 Xtb=1.5 Br=1.423 Isc=2.393p Nc=1.53

+ Ikr=.9543 Rc=56.36m Rb=1 Cjc=974.7p Mjc=.3085 Vjc=.75 Fc=.5

+ Cje=1.737n Mje=.33 Vje=.75 Tr=1.534u Tf=1.984n Itf=18.5 Xtf=3.4 Vtf=50)

.model KT908a NPN(Is=114.5f Xti=3 Eg=1.11 Vaf=100 Bf=87.62 Ise=1.429p

+ Ne=1.286 Ikf=8.713 Nk=.4649 Xtb=1.5 Br=1.423 Isc=2.393p Nc=1.53

+ Ikr=.9543 Rc=56.36m Rb=1 Cjc=974.7p Mjc=.3085 Vjc=.75 Fc=.5

+ Cje=1.737n Mje=.33 Vje=.75 Tr=1.534u Tf=1.984n Itf=18.5 Xtf=3.4 Vtf=50)

.model KT908b NPN(Is=114.5f Xti=3 Eg=1.11 Vaf=100 Bf=88.91 Ise=803.2f

+ Ne=1.272 Ikf=9.223 Nk=.4226 Xtb=1.5 Br=1.285 Isc=2.344p

+ Nc=1.542 Ikr=1.09 Rc=69.93m Cjc=974.7p Mjc=.3085 Vjc=.75 Fc=.5

+ Cje=1.737n Mje=.33 Vje=.75 Tr=1.534u Tf=1.984n Itf=18.5 Xtf=3.4 Vtf=50)

\*

\*\*\*\* KT921

\*

.model q2T921a NPN(Is=282f Xti=3 Eg=1.11 Vaf=47 Bf=69.37 Ne=1.688

+ Ise=164.3p Ikf=15.22 Xtb=1.5 Br=.3729 Nc=2 Isc=16.43p Ikr=15.22

+ Rc=.36 Rb=8 Cjc=103.1p Mjc=.245 Vjc=.75 Fc=.5 Cje=420.7p Mje=.4028

+ Vje=.75 Tr=838.6n Tf=628.1p Itf=15.33 Vtf=15 Xtf=1.5)

\*

\*\*\*\* KT922 Family

\*

.model q2T922a NPN(Is=134.9f Xti=3 Eg=1.11 Vaf=81.41 Bf=86.36 Ne=1.362

+ Ise=1.189p Ikf=1.122 Nk=.5086 Xtb=1.5 Br=1 Isc=6.713n Nc=1.805

+ Ikr=1.087 Rb=3 Rc=1.308 Cjc=26.72p Mjc=.33 Vjc=.75 Fc=.5

+ Cje=71.52p Mje=.33 Vje=.75 Tr=272.8n Tf=185.4p Itf=1 Xtf=1.3 Vtf=40)

.model q2T922b NPN(Is=292.3f Xti=3 Eg=1.11 Vaf=81.41 Bf=84.63 Ne=1.406

+ Ise=4.199p Ikf=2.359 Nk=.5229 Xtb=1.5 Br=1 Isc=17.13p Nc=1.803

+ Ikr=1.68 Rb=2 Rc=.9759 Cjc=48.58p Mjc=.33 Vjc=.75 Fc=.5 Cje=153.3p

+ Mje=.33 Vje=.75 Tr=141.3n Tf=211.6p Itf=8 Xtf=.45 Vtf=40)

.model q2T922v NPN(Is=430.3f Xti=3 Eg=1.11 Vaf=81.41 Bf=84.02 Ne=1.397

+ Ise=5.318p Ikf=3.706 Nk=.5578 Xtb=1.5 Br=1.734 Isc=7.445p Nc=1.577

+ Ikr=.166 Rb=3 Rc=.5487 Cjc=121.5p Mjc=.33 Vjc=.75 Fc=.5 Cje=408.7p

+ Mje=.33 Vje=.75 Tr=110.7n Tf=234.7p Itf=30 Xtf=.7 Vtf=40)

\*

\*\*\*\* KT928 Family

\*

.model q2T928a NPN(Is=16.09f Xti=3 Eg=1.11 Vaf=81.41 Bf=127.5 Ise=85.22f

+ Ne=1.284 Ikf=.2716 Nk=.4931 Xtb=1.5 Br=1 Isc=57.65p Nc=2.096

+ Ikr=1.637 Rb=11 Rc=1.538 Cjc=14.57p Mjc=.33 Vjc=.75 Fc=.5 Cje=78.2p

+ Mje=.33 Vje=.75 Tr=402n Tf=373.8p Itf=1 Xtf=2 Vtf=40)

.model q2T928b NPN(Is=16.09f Xti=3 Eg=1.11 Vaf=81.41 Bf=247.7 Ise=143.2f

+ Ne=1.385 Ikf=.3491 Nk=.5807 Xtb=1.5 Br=1.2 Isc=57.65p Nc=2.096

+ Ikr=1.637 Rb=12 Rc=1.654 Cjc=14.57p Mjc=.33 Vjc=.75 Fc=.5 Cje=78.2p

+ Mje=.33 Vje=.75 Tr=279.5n Tf=373.8p Itf=1 Xtf=2 Vtf=40)

\*

\*\*\*\* KT933 Family

\*

.model q2T933a PNP(Is=18.19f Xti=3 Eg=1.11 Vaf=78 Bf=122.8 Ise=86.44f

+ Ne=1.284 Ikf=.2819 Nk=.4822 Xtb=1.5 Br=1 Isc=57.65p Nc=2.096

+ Ikr=1.637 Rb=11 Rc=1.538 Cjc=39.2p Mjc=.4435 Vjc=.75 Fc=.5 Cje=23.31p

+ Mje=.201 Vje=.75 Tr=202.1n Tf=313.9p Itf=2.51 Xtf=1.52 Vtf=40)

\*

\*\*\*\* KT945 Family

\*

.model q2T945a NPN(Is=300.3f Xti=3 Eg=1.11 Vaf=95.7 Bf=193.9 Ise=2.284p

+ Ne=1.377 Ikf=21.59 Nk=.7771 Xtb=1.5 Br=1.216 Isc=8.999p Nc=1.514

+ Ikr=.7536 Rc=.1198 Cjc=525.9p Mjc=.3229 Vjc=.75 Fc=.5 Cje=3.794n

+ Mje=.33 Vje=.75 Tr=1.695u Tf=2.465n Itf=15 Xtf=2 Vtf=40)

.model q2T945b NPN(Is=350f Xti=3 Eg=1.11 Vaf=95.7 Bf=193.9 Ise=2.284p

+ Ne=1.377 Ikf=21.59 Nk=.7771 Xtb=1.5 Br=1.216 Isc=8.999p Nc=1.514

+ Ikr=.7536 Rc=.1198 Cjc=525.9p Mjc=.3229 Vjc=.75 Fc=.5 Cje=3.794n

+ Mje=.33 Vje=.75 Tr=1.695u Tf=2.465n Itf=15 Xtf=2 Vtf=40)

\*

\*

.model KT968a NPN(Is=89.93f Xti=3 Eg=1.11 Vaf=86 Bf=184.1 Ise=573.9f

+ Ne=1.436 Ikf=44.6m Nk=.4867 Xtb=1.5 Br=1 Isc=25.95p Nc=1.425 Ikr=2.599

+ Rb=27 Rc=.701 Cjc=13.31p Mjc=.5595 Vjc=.75 Fc=.5 Cje=34.2p Mje=.33

+ Vje=.75 Tr=1.045u Tf=1.325n Itf=3 Xtf=2 Vtf=20)

\*

\*

\*\*\*\* Darlington Transistors

\*

.Subckt q2T825a 1 2 3

\* Terminals: C B E \* Darlington PNP

Q1 1 2 4 q825a 0.1

Q2 1 4 3 q825a

R1 2 4 8K

R2 4 3 150

D1 1 3 d825a

.Model q825a PNP(Is=632.4f Xti=3 Eg=1.11 Vaf=100 Bf=112.1 Ise=962.8f

+ Ne=1.373 Ikf=2.187 Nk=.6196 Xtb=2.1 Br=66.4 Isc=974.4f Nc=1.207

+ Ikr=125.8 Rc=.2066 Cjc=508.9p Mjc=.4847 Vjc=.75 Fc=.5 Cje=379.8p

+ Mje=.4937 Vje=.75 Tr=89.17n Tf=17.41n Itf=5.921 Xtf=1.062 Vtf=10 Rb=.1)

.Model d825a D(Is=1.2p N=1 RS=.1 BV=100 IBV=.001 CJO=260p TT=500n)

.Ends

\*

.Subckt q2T827a 1 2 3

\* Terminals: C B E \* Darlington NPN

Q1 1 2 4 q827a 0.1

Q2 1 4 3 q827a

R1 2 4 8K

R2 4 3 150

D1 3 1 d827a

.Model q827a NPN(Is=1.129p Xti=3 Eg=1.11 Vaf=100 Bf=161 Ise=31.17p

+ Ne=1.557 Ikf=1.948 Nk=.648 Xtb=2 Br=1 Isc=23.5p Nc=1.489 Ikr=31.34m

+ Rc=.1682 Cjc=251.5p Mjc=.5045 Vjc=.75 Fc=.5 Cje=286.3p Mje=.4961

+ Vje=.75 Tr=810n Tf=23.64n Itf=10.92 Xtf=.3795 Vtf=10 Rb=.1)

.Model d827a D(Is=1.2p N=1 RS=.1 BV=100 IBV=.001 CJO=260p TT=500n)

.Ends

\*

\* ГТ311А

.model GT311A NPN(IS=14e-12 TF=10.7n TR=0 Cje=10p Cjc=7.5p

+ VJC=0.6 BF=71.4 BR=1.3 RB=100

\*

\* Library of Diode Model Parameters

\*

.Model KD102A D(Is=21.66p N=1.28 Rs=1.79 Cjo=3.27p Tt=6.12e-9

+ M=0.32 Vj=0.71 Fc=0.5 Bv=250 IBv=1e-11 Eg=1.11 Xti=3)

.model KD102B D(Is=910.8f Rs=6.325 N=1 Xti=3 Eg=1.11 Bv=300.2 Ibv=1.521m

+ Cjo=3.27p Vj=.71 M=.32 Fc=.5 Tt=6.12e-9)

.Model KD103A D(Is=67.08p N=1.21 Rs=1.43 Cjo=8.58p Tt=4.15e-9

+ M=0.31 Vj=0.72 Fc=0.5 Bv=75 IBv=1e-11 Eg=1.11 Xti=3)

.Model KD104A D(Is=5.812p N=1.15 Rs=8.1 Cjo=41.2p Tt=8.28e-9

+ M=0.33 Vj=0.71 Fc=0.5 Bv=300 IBv=1e-11 Eg=1.11 Xti=3)

.Model KD105B D(Is=84.26p N=1.11 Rs=0.12 Cjo=120p Tt=1.08e-8

+ M=0.33 Vj=0.71 Fc=0.5 Bv=400 IBv=1e-11 Eg=1.11 Xti=3)

.Model KD106A D(Is=114.3p N=1.23 Rs=6.3e-2 Cjo=130p Tt=3.85e-8

+ M=0.33 Vj=0.71 Fc=0.5 Bv=100 IBv=1e-10 Eg=1.11 Xti=3)

.Model KD202D D(Is=4.012n N=1.56 Rs=4.7e-2 Cjo=82p Tt=3.19e-7

+ M=0.38 Vj=0.75 Fc=0.5 Bv=200 IBv=1e-10 Eg=1.11 Xti=3)

.model KD202V D(Is=4.012n Rs=4.7e-2 N=1.56 Xti=3 Eg=1.11 Bv=100 Ibv=1e-10

+ Cjo=82p Vj=.75 M=.38 Fc=.5 Tt=3.12e-7)

.model KD202J D(Is=4.012n Rs=4.7e-2 N=1.56 Xti=3 Eg=1.11 Bv=300 Ibv=1e-10

+ Cjo=82p Vj=.75 M=.38 Fc=.5 Tt=3.12e-7)

.model KD202K D(Is=4.012n Rs=4.7e-2 N=1.56 Xti=3 Eg=1.11 Bv=400 Ibv=1e-10

+ Cjo=82p Vj=.75 M=.38 Fc=.5 Tt=3.12e-7)

.model KD202M D(Is=4.012n Rs=4.7e-2 N=1.56 Xti=3 Eg=1.11 Bv=500 Ibv=1e-10

+ Cjo=82p Vj=.75 M=.38 Fc=.5 Tt=3.12e-7)

.model KD202P D(Is=4.012n Rs=4.7e-2 N=1.56 Xti=3 Eg=1.11 Bv=600 Ibv=1e-10

+ Cjo=82p Vj=.75 M=.38 Fc=.5 Tt=3.12e-7)

.Model KD203A D(Is=2.98n N=1.52 Rs=9.3e-3 Cjo=21.2p Tt=9.09e-7

+ M=0.28 Vj=0.73 Fc=0.5 Bv=600 IBv=1e-10 Eg=1.11 Xti=3)

.model KD203B D(Is=303.3f Rs=30.57m N=1 Xti=3 Eg=1.11 Bv=799.9 Ibv=7.607u

+ Cjo=21.2p Vj=.73 M=.28 Fc=.5 Tt=9.09e-7)

.model KD203V D(Is=268.8f Rs=14.95m N=1 Xti=3 Eg=1.11 Bv=799.9 Ibv=7.607u

+ Cjo=21.2p Vj=.73 M=.28 Fc=.5 Tt=9.09e-7)

.model KD203G D(Is=303.3f Rs=30.57m N=1 Xti=3 Eg=1.11 Bv=999.9 Ibv=7.607u

+ Cjo=21.2p Vj=.73 M=.28 Fc=.5 Tt=9.09e-7)

.model KD203D D(Is=268.8f Rs=14.95m N=1 Xti=3 Eg=1.11 Bv=999.9 Ibv=7.607u

+ Cjo=21.2p Vj=.73 M=.28 Fc=.5 Tt=9.09e-7)

.Model KD204A D(Is=4.110n N=1.52 Rs=7.5e-2 Cjo=31.5p Tt=1.16e-7

+ M=0.35 Vj=0.68 Fc=0.5 Bv=400 IBv=1e-10 Eg=1.11 Xti=3)

.model KD204B D(Is=6.335f Rs=64.96m N=1 Xti=3 Eg=1.11 Bv=200.1 Ibv=161.7u

+ Cjo=35p Vj=.75 M=.3333 Fc=.5 Tt=1.16e-7)

.model KD204V D(Is=5.849f Rs=23.7m N=1 Xti=3 Eg=1.11 Bv=50.12 Ibv=517.3u

+ Cjo=35p Vj=.75 M=.3333 Fc=.5 Tt=1.16e-7)

.Model KD208A D(Is=181p N=1.31 Rs=0.12 Cjo=96.3p Tt=2.23e-7

+ M=0.38 Vj=0.68 Fc=0.5 Bv=100 IBv=1e-10 Eg=1.11 Xti=3)

.Model KD209A D(Is=62.2p N=1.23 Rs=0.17 Cjo=16.2 Tt=7.21e-7

+ M=0.35 Vj=0.68 Fc=0.5 Bv=600 IBv=1e-10 Eg=1.11 Xti=3)

.Model KD212A D(Is=1.26p N=1.1 Rs=0.11 Cjo=140.7p Tt=1.27e-8

+ M=0.26 Vj=0.73 Fc=0.5 Bv=200 IBv=1e-10 Eg=1.11 Xti=3)

.model KD212B D(Is=8.272p Rs=.107 N=1 Xti=3 Eg=1.11 Bv=100.2 Ibv=783.8u

+ Cjo=150p Vj=.75 M=.25 Fc=.5 Tt=360.7n)

.Model KD213A D(Is=57.90p N=1.12 Rs=17m Cjo=275.1p Tt=224n

+ M=0.321 Vj=0.72 Fc=0.5 Bv=200 IBv=1e-10 Eg=1.11 Xti=3)

.model KD213B D(Is=124.72p Rs=25.34m N=1 Xti=3 Eg=1.11 Bv=200.1 Ibv=258.6u

+ Cjo=249.6p Vj=.75 M=.33 Fc=.5 Tt=173.1n)

.model KD213V D(Is=20.83p Rs=19.59m N=1 Xti=3 Eg=1.11 Bv=100.1 Ibv=258.6u

+ Cjo=2.496n Vj=.75 M=.3333 Fc=.5 Tt=252.5n)

.model KD213G D(Is=64.72p Rs=25.34m N=1 Xti=3 Eg=1.11 Bv=200.1 Ibv=258.6u

+ Cjo=2.496n Vj=.75 M=.3333 Fc=.5 Tt=173.1n)

.Model KD219A D(Is=57.60n N=1.12 Rs=3m Cjo=63.1p Tt=1.23n

+ M=0.33 Vj=0.54 Fc=0.5 Bv=15 IBv=1e-11 Eg=1.11 Xti=3)

.Model KD220A D(Is=11.20n N=1.25 Rs=7.1e-2 Cjo=164.5p Tt=1.23e-9

+ M=0.33 Vj=0.65 Fc=0.5 Bv=400 IBv=1e-11 Eg=1.11 Xti=3)

.Model KD503A D(Is=7.920e-13 N=1.11 Rs=2.3 Cjo=1.45p Tt=2.19e-9

+ M=0.27 Vj=0.71 Fc=0.5 Bv=30 IBv=1e-11 Eg=1.11 Xti=3)

.Model KD509A D(Is=1.14p N=1.12 Rs=2.1 Cjo=2.15p Tt=3.25e-9

+ M=0.33 Vj=0.71 Fc=0.5 Bv=50 IBv=1e-11 Eg=1.11 Xti=3)

.model KD510A D(Is=528.2f Rs=1.302 N=1 Xti=3 Eg=1.11 Bv=70.23 Ibv=3.233m

+ Cjo=3p Vj=.75 M=.25 Fc=.5 Tt=1.443n)

.Model KD512A D(Is=2.120f N=1.0 Rs=9.2 Cjo=0.85p Tt=.961e-9

+ M=0.25 Vj=0.69 Fc=0.5 Bv=15 IBv=1e-11 Eg=1.11 Xti=3)

.Model KD513A D(Is=568.0f N=1.11 Rs=1.6 Cjo=1.81p Tt=.850e-9

+ M=0.31 Vj=0.69 Fc=0.5 Bv=50 IBv=1e-11 Eg=1.11 Xti=3)

.Model KD520A D(Is=618.0f N=1.12 Rs=6.3 Cjo=2.35p Tt=1.44e-9

+ M=0.33 Vj=0.68 Fc=0.5 Bv=15 IBv=1e-11 Eg=1.11 Xti=3)

.Model KD521A D(Is=115f N=1.0 Rs=3.21 Cjo=2.25p Tt=3.12e-9

+ M=0.26 Vj=0.68 Fc=0.5 Bv=75 IBv=1e-11 Eg=1.11 Xti=3)

.Model KD522A D(Is=227f N=1.1 Rs=1.17 Cjo=1.83p Tt=2.38e-9

+ M=0.25 Vj=0.68 Fc=0.5 Bv=50 IBv=1e-11 Eg=1.11 Xti=3)

.model KD522B D(Is=72.71f Rs=2.662 N=1 Xti=3 Eg=1.11 Bv=50.23 Ibv=862.1u

+ Cjo=2.6p Vj=.75 M=.15 Fc=.5 Tt=1.443n)

.model KD906A D(Is=718.1f Rs=2.763 N=1 Xti=3 Eg=1.11 Bv=140.3 Ibv=1.847m

+ Cjo=27.15p Vj=.75 M=.15 Fc=.5 Tt=179.8n)

\*

.Model D237A D(Is=31.69p N=1 Rs=91.07m Cjo=13p Tt=721.3n

+ M=0.25 Vj=0.75 Fc=0.5 Bv=200 IBv=1e-11 Eg=1.11 Xti=3)

.model D237B D(Is=31.69p Rs=91.07m N=1 Xti=3 Eg=1.11 Bv=400.1 Ibv=158.5u

+ Cjo=15p Vj=.75 M=.3333 Fc=.5 Tt=721.3n)

.model D237V D(Is=76.09p Rs=.4451 N=1 Xti=3 Eg=1.11 Bv=600.1 Ibv=158.5u

+ Cjo=15p Vj=.75 M=.3333 Fc=.5 Tt=721.3n)

.model D237E D(Is=28.72p Rs=51.27m N=1 Xti=3 Eg=1.11 Bv=200.1 Ibv=158.5u

+ Cjo=15p Vj=.75 M=.3333 Fc=.5 Tt=721.3n)

.model D237J D(Is=28.72p Rs=51.27m N=1 Xti=3 Eg=1.11 Bv=400.1 Ibv=158.5u

+ Cjo=15p Vj=.75 M=.3333 Fc=.5 Tt=721.3n)

\*

.Model K2DC523A D(Is=20.23f N=1.1 Rs=3.122 Cjo=1.564p Tt=271.3p

+ M=0.15 Vj=0.75 Fc=0.5 Bv=70 IBv=43.11m Eg=1.11 Xti=3)

.model K2DC523B D(Is=20.23f Rs=3.122 N=1 Xti=3 Eg=1.11 Bv=70.33 Ibv=43.11m

+ Cjo=1.564p Vj=.75 M=.15 Fc=.5 Tt=721.3p)

.Model K2DC627A D(Is=660.2f N=1.1 Rs=2.239 Cjo=3.5p Tt=14.6n

+ M=0.25 Vj=0.75 Fc=0.5 Bv=60 IBv=1e-11 Eg=1.11 Xti=3)

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\* Zener diodes

\*

.Model D814A D(Is=.3920p N=1.19 Rs=1.25 Cjo=41.15p Tt=49.11n

+ M=0.41 Vj=0.73 Fc=0.5 Bv=8 IBv=0.5u Eg=1.11 Xti=3)

.Model D814B D(Is=.3920p N=1.19 Rs=1.54 Cjo=38.39p Tt=58.13n

+ M=0.45 Vj=0.76 Fc=0.5 Bv=9 IBv=0.5u Eg=1.11 Xti=3)

.Model D814V D(Is=.5232p N=1.26 Rs=2.5 Cjo=37.56p Tt=58.34n

+ M=0.43 Vj=0.76 Fc=0.5 Bv=10 IBv=1u Eg=1.11 Xti=3)

.Model D814G D(Is=.1067p N=1.12 Rs=3.4 Cjo=28.08p Tt=68.87n

+ M=0.43 Vj=0.75 Fc=0.5 Bv=11 IBv=1u Eg=1.11 Xti=3)

.Model D814D D(Is=.5235p N=1.17 Rs=3.8 Cjo=29.15Ep Tt=59.96n

+ M=0.41 Vj=0.71 Fc=0.5 Bv=13 IBv=1u Eg=1.11 Xti=3)

.Model D815A D(Is=.1221e-11 N=1.67 Rs=0.24 Cjo=73.15p Tt=389.8n

+ M=0.37 Vj=0.78 Fc=0.5 Bv=5.6 IBv=5u Eg=1.11 Xti=3)

.Model D815B D(Is=.4173p N=1.22 Rs=0.27 Cjo=88.12p Tt=236.4En

+ M=0.36 Vj=0.78 Fc=0.5 Bv=6.8 IBv=5u Eg=1.11 Xti=3)

.Model D815V D(Is=.5225e-10 N=1.84 Rs=0.35 Cjo=76.32p Tt=245.24n

+ M=0.31 Vj=0.73 Fc=0.5 Bv=8.2 IBv=5u Eg=1.11 Xti=3)

.Model D815G D(Is=.9373e-10 N=1.55 Rs=0.6 Cjo=63.60p Tt=250.97n

+ M=0.38 Vj=0.71 Fc=0.5 Bv=10 IBv=5u Eg=1.11 Xti=3)

.Model D815D D(Is=.5227e-10 N=1.46 Rs=0.7 Cjo=73.31p Tt=217.3n

+ M=0.39 Vj=0.74 Fc=0.5 Bv=12 IBv=5u Eg=1.11 Xti=3)

.Model D815E D(Is=.4646e-10 N=1.39 Rs=0.9 Cjo=72.86p Tt=118.9n

+ M=0.39 Vj=0.78 Fc=0.5 Bv=15 IBv=5u Eg=1.11 Xti=3)

.Model D815J D(Is=.1996e-10 N=1.32 Rs=1.1 Cjo=82.14p Tt=222.9n

+ M=0.42 Vj=0.75 Fc=0.5 Bv=18 IBv=5u Eg=1.11 Xti=3)

.Model D816A D(Is=.4599e-11 N=1.25 Rs=2.4 Cjo=105.9p Tt=213.6n

+ M=0.41 Vj=0.71 Fc=0.5 Bv=22 IBv=10u Eg=1.11 Xti=3)

.Model D816B D(Is=.4279p N=1.14 Rs=2.8 Cjo=133.2p Tt=220.4

+ M=0.41 Vj=0.73 Fc=0.5 Bv=27 IBv=10u Eg=1.11 Xti=3)

.Model D816G D(Is=3.337p N=1.23 Rs=4.6 Cjo=103.5p Tt=203.5n

+ M=0.39 Vj=0.71 Fc=0.5 Bv=39 IBv=15u Eg=1.11 Xti=3)

.Model D816D D(Is=1.471p N=1.18 Rs=5.6 Cjo=82.24p Tt=207.4n

+ M=0.40 Vj=0.70 Fc=0.5 Bv=47 IBv=15u Eg=1.11 Xti=3)

.Model D817A D(Is=10.10p N=1.47 Rs=12 Cjo=57.00p Tt=500.0n

+ M=0.34 Vj=0.80 Fc=0.5 Bv=56 IBv=20u Eg=1.11 Xti=3)

.Model D817B D(Is=12.00p N=1.43 Rs=14 Cjo=68.00p Tt=500n

+ M=0.35 Vj=0.8 Fc=0.5 Bv=68 IBv=20u Eg=1.11 Xti=3)

.Model D817V D(Is=12.22p N=1.28 Rs=16 Cjo=54.48p Tt=414.1n

+ M=0.43 Vj=0.78 Fc=0.5 Bv=82 IBv=30u Eg=1.11 Xti=3)

.Model D817G D(Is=29.34p N=1.27 Rs=18 Cjo=82.0p Tt=500.0n

+ M=0.38 Vj=0.8 Fc=0.5 Bv=100 IBv=50u Eg=1.11 Xti=3)

.Model 2S191G D(Is=47.47e-15 N=1.27 Rs=9 Cjo=10.69p Tt=4.337n

+ M=0.39 Vj=0.79 Fc=0.5 Bv=9.1 IBv=1u Eg=1.11 Xti=3)

.Model 2S211G D(Is=418.2e-15 N=1.39 Rs=9 Cjo=10.17p Tt=7.934n

+ M=0.41 Vj=0.69 Fc=0.5 Bv=11 IBv=3u Eg=1.11 Xti=3)

.Model 2S522A D(Is=41.68e-15 N=1.06 Rs=2 Cjo=57.24p Tt=32.94n

+ M=0.39 Vj=0.72 Fc=0.5 Bv=22 IBv=5u Eg=1.11 Xti=3)

.Model 2S527A D(Is=25.00e-15 N=1.11 Rs=4 Cjo=47.42p Tt=256.6n

+ M=0.39 Vj=0.68 Fc=0.5 Bv=27 IBv=5u Eg=1.11 Xti=3)

.Model KS133A D(Is=89.00e-15 N=1.16 Rs=25 Cjo=72.00p Tt=57.00n

+ M=0.47 Vj=0.80 Fc=0.5 Bv=3.3 IBv=5u Eg=1.11 Xti=3)

.Model 2S133A D(Is=193.4e-15 N=1.85 Rs=22 Cjo=84.51p Tt=46.61n

+ M=0.38 Vj=0.73 Fc=0.5 Bv=3.3 IBv=5u Eg=1.11 Xti=3)

.Model KS139A D(Is=400.0e-15 N=1.35 Rs=30 Cjo=85.00p Tt=72.00n

+ M=0.45 Vj=0.80 Fc=0.5 Bv=3.9 IBv=5u Eg=1.11 Xti=3)

.Model KS147A D(Is=500.0e-15 N=1.35 Rs=22 Cjo=85.00p Tt=75.00n

+ M=0.45 Vj=0.80 Fc=0.5 Bv=4.7 IBv=5u Eg=1.11 Xti=3)

.Model 2S147A D(Is=1.236p N=1.87 Rs=20.2 Cjo=87.60p Tt=104.0n

+ M=0.3751 Vj=0.73 Fc=0.5 Bv=4.7 IBv=5u Eg=1.11 Xti=3)

.Model KS156A D(Is=3.600p N=1.52 Rs=13 Cjo=94.00p Tt=160.0n

+ M=0.41 Vj=0.80 Fc=0.5 Bv=5.6 IBv=5u Eg=1.11 Xti=3)

.Model KS168A D(Is=7.300p N=1.35 Rs=5.8 Cjo=62.00p Tt=250.0n

+ M=0.50 Vj=0.80 Fc=0.5 Bv=6.8 IBv=5u Eg=1.11 Xti=3)

.Model KS482A D(Is=47.47e-15 N=1.27 Rs=9 Cjo=10.69p Tt=4.337n

+ M=0.39 Vj=0.79 Fc=0.5 Bv=8.1 IBv=5u Eg=1.11 Xti=3)

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\*JFET

.model J2P307b NJF (Vto=-2.617 Beta=1.578m Lambda=1.890m Rs=15 Rd=15

+ Cgs=3.5p Cgd=3p Fc=0.5 Pb=1 Is=10f)

.model J2P307v NJF (Vto=-2.966 Beta=1.423m Lambda=7.299m Rs=18 Rd=18

+ Cgs=3.5p Cgd=3p Fc=0.5 Pb=1 Is=10f)

.model J2P307g NJF (Vto=-3.371 Beta=1.386m Lambda=3.532m Rs=16 Rd=16

+ Cgs=3.5p Cgd=3p Fc=0.5 Pb=1 Is=10f)

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