

	SECTION—MACRO MODELS
1	ADDA
2	ADDA
3	ADDA
4	ADDA
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95	ADDA
96	ADDA
97	ADDA
98	ADDA
99	ADDA
100	ADDA

SECTION 3—MACROMODELS

LM101A	1
LM107	2
LM108	3
LM108A	4
LM118	5
LM308	6
LM308A	7
LT1001	8
LT1007	9
LT1008	10
LT1012	11
LT1013/LT1014	12
LT1028	13
LT1037	14
LT1055	15
LT1056	16
LT1057	17
LT1078	18
LT1097	19
LT1101	20
LT1115	21
LT1178	22
LT118A	23
OP-05	24
OP-07	25
OP-27	26
OP-37	27
OP-97	28

LM101A Macromodel

```

*
* Linear Technology LM101A op amp model
* Written: 08-23-1989 15:55:44 Type: Bipolar npn input, external comp.
* Typical specs:
* Vos=7.0E-04, Ib=3.0E-08, Ios=1.5E-09, GBP=9.0E+05Hz, Phase mar.= 70 deg,
* SR(+)=5.0E-01V/us, SR(-)=4.8E-01V/us, Av= 104 dB, CMMR= 96 dB,
* Vsat(+)=1.00V, Vsat(-)=1.00V, Isc=+/-30.0mA, Iq= 1800uA
*
* Connections: + - V+V-0 CaCb
.subckt LM101A 3 2 7 4 6 1 8 ; Use C=30 pF in main circuit (Ca to Cb).
* input
rc1 7 80 5.895E+03
rc2 7 90 5.895E+03
q1 80 2 10 qm1
q2 90 3 11 qm2
c1 80 90 5.460E-12
re1 10 12 2.438E+03
re2 11 12 2.438E+03
iee 12 4 1.506E-05
re 12 0 1.328E+07
ce 12 0 1.579E-12
* intermediate
gcm 0 8 12 0 2.689E-09
ga 8 0 80 90 1.696E-04
r2 8 0 1.000E+05
* external comp cap used for c2 (see note above).
gb 1 0 8 0 1.401E+02
* output
ro1 1 6 3.333E+01
ro2 1 0 6.667E+01
rc 17 0 4.758E-05
gc 0 17 6 0 2.102E+04
d1 1 17 dm1
d2 17 1 dm1
d3 6 13 dm2
d4 14 6 dm2
vc 7 13 1.808E+00
ve 14 4 1.808E+00
ip 7 4 1.785E-03
dsub 4 7 dm2
* models
.model qm1 npn (is=8.000E-16 bf=2.439E+02)
.model qm2 npn (is=8.220E-16 bf=2.564E+02)
.model dm1 d (is=3.337E-15)
.model dm2 d (is=8.000E-16)
.ends LM101A
*
* - - - - * fini LM101A * - - - - * [oamm vnl 8/89]

```

LM107 Macromodel

```

*
* Linear Technology LM107 op amp model
* Written: 08-23-1989 15:53:34 Type: Bipolar npn input, internal comp.
* Typical specs:
* Vos=7.0E-04, Ib=3.0E-08, Ios=1.5E-09, GBP=9.0E+05Hz, Phase mar.= 70 deg,
* SR(+)=5.0E-01V/us, SR(-)=4.8E-01V/us, Av= 104 dB, CMMR= 96 dB,
* Vsat(+)=1.00V, Vsat(-)=1.00V, Isc=+/-30.0mA, Iq= 1800uA
*
* Connections: + - V+V-0
.subckt LM107 3 2 7 4 6
* input
rc1 7 80 5.895E+03
rc2 7 90 5.895E+03
q1 80 2 10 qm1
q2 90 3 11 qm2
c1 80 90 5.460E-12
re1 10 12 2.438E+03
re2 11 12 2.438E+03
iee 12 4 1.506E-05
re 12 0 1.328E+07
ce 12 0 1.579E-12
* intermediate
gcm 0 8 12 0 2.689E-09
ga 8 0 80 90 1.696E-04
r2 8 0 1.000E+05
c2 1 8 3.000E-11
gb 1 0 8 0 1.401E+02
* output
ro1 1 6 3.333E+01
ro2 1 0 6.667E+01
rc 17 0 4.758E-05
gc 0 17 6 0 2.102E+04
d1 1 17 dm1
d2 17 1 dm1
d3 6 13 dm2
d4 14 6 dm2
vc 7 13 1.808E+00
ve 14 4 1.808E+00
ip 7 4 1.785E-03
dsub 4 7 dm2
* models
.model qm1 npn (is=8.000E-16 bf=2.439E+02)
.model qm2 npn (is=8.220E-16 bf=2.564E+02)
.model dm1 d (is=3.337E-15)
.model dm2 d (is=8.000E-16)
.ends LM107
*
* - - - - * fini LM107 * - - - - * [oamm vnl 8/89]

```

LM108 Macromodel

```

*
* Linear Technology LM108 op amp model (with calls for LH2108)
* Written: 08-23-1989 15:42:36 Type: Bipolar npn input, external comp.
* Typical specs:
* Vos=7.0E-04, Ib=5.0E-10, Ios=5.0E-11, GBP=6.0E+05Hz, Phase mar.= 70 deg,
* SR(+)=2.0E-01V/us, SR(-)=1.9E-01V/us, Av= 110 dB, CMMR= 100 dB,
* Vsat(+)=1.00V, Vsat(-)=1.00V, Isc=+/- 6.0mA, Iq= 300uA
* (input differential mode clamp active)
*
* Connections: + - V+V-0 CaCb
.subckt LM108 3 2 7 4 6 1 8 ; Use C=30 pF in main circuit (Ca to Cb).
* input
rc1 7 80 8.842E+03
rc2 7 90 8.842E+03
q1 80 2 10 qm1
q2 90 3 11 qm2
ddm1 2 3 dm2
ddm2 3 2 dm2
c1 80 90 5.460E-12
re1 10 12 2.246E+02
re2 11 12 2.246E+02
iee 12 4 6.001E-06
re 12 0 3.333E+07
ce 12 0 1.579E-12
* intermediate
gcm 0 8 12 0 1.131E-09
ga 8 0 80 90 1.131E-04
r2 8 0 1.000E+05
* external comp cap used for c2 (see note above).
gb 1 0 8 0 3.146E+01
* output
ro1 1 6 1.111E+02
ro2 1 0 8.889E+02
rc 17 0 3.533E-04
gc 0 17 6 0 2.830E+03
d1 1 17 dm1
d2 17 1 dm1
d3 6 13 dm2
d4 14 6 dm2
vc 7 13 1.766E+00
ve 14 4 1.766E+00
ip 7 4 2.940E-04
dsub 4 7 dm2
* models
.model qm1 npn (is=8.000E-16 bf=5.714E+03)
.model qm2 npn (is=8.220E-16 bf=6.316E+03)
.model dml d (is=1.192E-10)
.model dm2 d (is=8.000E-16)
.ends LM108
*
.subckt LH2108 3 2 7 4 6 1 8
x_LH2108 3 2 7 4 6 1 8 LM108
.ends LH2108
*
* - - - - * fini LM108 family * - - - - * [oamm vnl 8/89]

```

LM108A Macromodel

```

*
* Linear Technology LM108A op amp model (with calls for LH2108A)
* Written: 08-23-1989 15:40:03 Type: Bipolar npn input, external comp.
* Typical specs:
* Vos=3.0E-04, Ib=5.0E-10, Ios=5.0E-11, GBP=6.0E+05Hz, Phase mar.= 70 deg,
* SR(+)=2.0E-01V/us, SR(-)=1.9E-01V/us, Av= 110 dB, CMMR= 110 dB,
* Vsat(+)=1.00V, Vsat(-)=1.00V, Isc=+/- 6.0mA, Iq=-300uA
* (input differential mode clamp active)
*
* Connections: + - V+V-0 CaCb
.subckt LM108A 3 2 7 4 6 1 8 ; Use C=30 pF in main circuit (Ca to Cb).
* input
rc1 7 80 8.842E+03
rc2 7 90 8.842E+03
q1 80 2 10 qm1
q2 90 3 11 qm2
ddm1 2 3 dm2
ddm2 3 2 dm2
c1 80 90 5.460E-12
re1 10 12 2.246E+02
re2 11 12 2.246E+02
iee 12 4 6.001E-06
re 12 0 3.333E+07
ce 12 0 1.579E-12
* intermediate
gcm 0 8 12 0 3.576E-10
ga 8 0 80 90 1.131E-04
r2 8 0 1.000E+05
* external comp cap used for c2 (see note above).
gb 1 0 8 0 3.146E+01
* output
ro1 1 6 1.111E+02
ro2 1 0 8.889E+02
rc 17 0 3.533E-04
gc 0 17 6 0 2.830E+03
d1 1 17 dm1
d2 17 1 dm1
d3 6 13 dm2
d4 14 6 dm2
vc 7 13 1.766E+00
ve 14 4 1.766E+00
ip 7 4 2.940E-04
dsub 4 7 dm2
* models
.model qm1 npn (is=8.000E-16 bf=5.714E+03)
.model qm2 npn (is=8.093E-16 bf=6.316E+03)
.model dm1 d (is=1.192E-10)
.model dm2 d (is=8.000E-16)
.ends LM108A
*
.subckt LH2108A 3 2 7 4 6 1 8
x_LH2108A 3 2 7 4 6 1 8 LM108A
.ends LH2108A
*
* - - - - * fini LM108A family * - - - - * [oamm vnl 8/89]
    
```

LM118 Macromodel

```

*
* Linear Technology LM118 op amp model
* Written: 11-21-1989 Type: Bipolar npn input, internal comp.
* Typical specs:
*   Ref. LM118 data sheet, LTC 1990 databook p2-313
* Comments:
*   Uses extended phase compensation; input differential mode clamp.
*
* Connections: + - V+V-0
.subckt LM118 3 2 7 4 6
* input
rc1 7 80 7.074E+02
rc2 7 90 7.074E+02
q1 80 2 10 qm1
q2 90 3 11 qm1
*
c1 80 91 300e-12
rxcl 91 90 1e3
cxc1 91 90 15e-12
c2 1 8 5.000E-12
*
rb1 2 102 1.0000E+00
rb2 3 103 1.0000E+00
dcm1 102 104 dm2
vz1 104 103 5.5
ddm2 103 105 dm2
vz2 105 102 5.5
re1 10 12 6.209E+02
re2 11 12 6.209E+02
iee 12 4 6.000E-04
re 12 0 3.332E+05
ce 12 0 2.632E-13
*
gcm 0 8 12 0 1.414E-08
ga 8 0 80 90 1.414E-03
r2 8 0 1.000E+05
gb 1 0 8 0 5.318E+01
ro2 1 0 7.4000E+01
*
rs 1 6 1
ec1 18 0 1 6 3.172e+01
gcl 0 8 20 0 1
rc1 20 0 1e3
d1 18 20 dm1
d2 20 18 dm1
d3a 131 70 dm3
d3b 13 131 dm3
gpl 0 8 70 7 1
vc 13 6 3.6473
rpla 7 70 1e4
rplb 7 131 1e5
d4a 60 141 dm3
d4b 141 14 dm3
gnl 0 8 60 4 1
ve 6 14 3.6473
rnla 60 4 1e4
rnlb 141 4 1e5
*
ip 7 4 4.400E-03
dsub 4 7 dm2
* models
.model qm1 npn (is=8.0000E-16
bf=2.4390E+03)
.model qm2 npn (is=8.6435E-16
bf=2.5641E+03)
*
.model dml d (is=1.000e-19)
.model dm2 d (is=8.000E-16)
.model dm3 d (is=1.000e-20)
.ends LM118
*
* - - - - * fini LM118 * - - - - *

```


LM308 Macromodel

```

*
* Linear Technology LM308 op amp model
* Written: 08-23-1989 15:46:51 Type: Bipolar npn input, external comp.
* Typical specs:
* Vos=2.0E-03, Ib=1.5E-09, Ios=2.0E-10, GBP=6.0E+05Hz, Phase mar.= 70 deg,
* SR(+)=2.0E-01V/us, SR(-)=1.9E-01V/us, Av= 110 dB, CMMR= 100 dB,
* Vsat(+)=1.00V, Vsat(-)=1.00V, Isc=+/- 6.0mA, Iq= 300uA
* (input differential mode clamp active)
*
* Connections: + - V+V-0 CaCb
.subckt LM308 3 2 7 4 6 1 8 ; Use C=30 pF in main circuit (Ca to Cb).
* input
rc1 7 80 8.842E+03
rc2 7 90 8.842E+03
q1 80 2 10 qm1
q2 90 3 11 qm2
ddm1 2 3 dm2
ddm2 3 2 dm2
c1 80 90 5.460E-12
re1 10 12 2.245E+02
re2 11 12 2.245E+02
iee 12 4 6.003E-06
re 12 0 3.332E+07
ce 12 0 1.579E-12
* intermediate
gcm 0 8 12 0 1.131E-09
ga 8 0 80 90 1.131E-04
r2 8 0 1.000E+05
* external comp cap used for c2 (see note above).
gb 1 0 8 0 3.146E+01
* output
ro1 1 6 1.111E+02
ro2 1 0 8.889E+02
rc 17 0 3.533E-04
gc 0 17 6 0 2.830E+03
d1 1 17 dm1
d2 17 1 dm1
d3 6 13 dm2
d4 14 6 dm2
vc 7 13 1.766E+00
ve 14 4 1.766E+00
ip 7 4 2.940E-04
dsub 4 7 dm2
* models
.model qm1 npn (is=8.000E-16 bf=1.875E+03)
.model qm2 npn (is=8.643E-16 bf=2.143E+03)
.model dm1 d (is=1.192E-10)
.model dm2 d (is=8.000E-16)
.ends LM308
*
* - - - - * fini LM308 * - - - - * [oamm vn1 8/89]

```


LM308A Macromodel

```

*
* Linear Technology LM308A op amp model
* Written: 08-23-1989 15:45:03 Type: Bipolar npn input, external comp.
* Typical specs:
* Vos=3.0E-04, Ib=1.5E-09, Ios=2.0E-10, GBP=6.0E+05Hz, Phase mar.= 70 deg,
* SR(+)=2.0E-01V/us, SR(-)=1.9E-01V/us, Av= 110 dB, CMMR= 110 dB,
* Vsat(+)=1.00V, Vsat(-)=1.00V, Isc=+/- 6.0mA, Iq= 300uA
* (input differential mode clamp active)
*
* Connections: + - V+V-0 CaCb
.subckt LM308A 3 2 7 4 6 1 8 ; Use C=30 pF in main circuit (Ca to Cb).
* input
rc1 7 80 8.842E+03
rc2 7 90 8.842E+03
q1 80 2 10 qm1
q2 90 3 11 qm2
ddm1 2 3 dm2
ddm2 3 2 dm2
c1 80 90 5.460E-12
re1 10 12 2.245E+02
re2 11 12 2.245E+02
iee 12 4 6.003E-06
re 12 0 3.332E+07
ce 12 0 1.579E-12
* intermediate
gcm 0 8 12 0 3.576E-10
ga 8 0 80 90 1.131E-04
r2 8 0 1.000E+05
* external comp cap used for c2 (see note above).
gb 1 0 8 0 3.146E+01
* output
ro1 1 6 1.111E+02
ro2 1 0 8.889E+02
rc 17 0 3.533E-04
gc 0 17 6 0 2.830E+03
d1 1 17 dm1
d2 17 1 dm1
d3 6 13 dm2
d4 14 6 dm2
vc 7 13 1.766E+00
ve 14 4 1.766E+00
ip 7 4 2.940E-04
dsub 4 7 dm2
* models
.model qm1 npn (is=8.000E-16 bf=1.875E+03)
.model qm2 npn (is=8.093E-16 bf=2.143E+03)
.model dml d (is=1.192E-10)
.model dm2 d (is=8.000E-16)
.ends LM308A
*
* - - - - - * fini LM308A * - - - - - * [oamm vn1 8/89]

```

LT1001 Macromodel

```

*
* Linear Technology LT1001 op amp model (with calls for LT1002)
* Written: 10-16-1989 15:04:20 Type: Bipolar npn input, internal comp.
* Typical specs:
* Vos=1.80E-05, Ib=7.00E-10, Ios=4.00E-10, GBP=8.0E+05Hz, Phase mar.=60.0deg,
* SR(+)=3.3E-01V/us, SR(-)=3.1E-01V/us, Av=118dB, CMMR=126dB,
* Vsat(+)=1.00V, Vsat(-)=1.00V, Isc=+/-25.0mA, Iq=1600uA
* (input differential mode clamp active)
*
* Connections: + - V+V-0
.subckt LT1001 3 2 7 4 6
* input
rc1 7 80 6.631E+03
rc2 7 90 6.631E+03
q1 80 102 10 qm1
q2 90 103 11 qm2
rb1 2 102 5.000E+02
rb2 3 103 5.000E+02
ddm1 102 104 dm2
ddm3 104 103 dm2
ddm2 103 105 dm2
ddm4 105 102 dm2
c1 80 90 8.660E-12
re1 10 12 1.409E+03
re2 11 12 1.409E+03
iee 12 4 9.901E-06
re 12 0 2.020E+07
ce 12 0 1.579E-12
* intermediate
gcm 0 8 12 0 7.558E-11
ga 8 0 80 90 1.508E-04
r2 8 0 1.000E+05
c2 1 8 3.000E-11
gb 1 0 8 0 1.538E+03
* output
ro1 1 6 2.575E+01
ro2 1 0 3.425E+01
rc 17 0 4.228E-06
gc 0 17 6 0 2.365E+05
d1 1 17 dm1
d2 17 1 dm1
d3 6 13 dm2
d4 14 6 dm2
vc 7 13 1.803E+00
ve 14 4 1.803E+00
ip 7 4 1.590E-03
dsub 4 7 dm2
* models
.model qm1 npn (is=8.000E-16 bf=5.500E+03)
.model qm2 npn (is=8.006E-16 bf=9.900E+03)
.model dml d (is=2.331E-08)
.model dm2 d (is=8.000E-16)
.ends LT1001
*
.subckt LT1002 3 2 7 4 6
x_LT1002 3 2 7 4 6 LT1001
.ends LT1002
*
* - - - - - * fini LT1001 family * - - - - - [oaram vn01 9/89]

```

LT1007 Macromodel

```

*
* Linear Technology LT1007 op amp model
* Written: 11-21-1989 Type: Bipolar npn input, internal comp.
* Typical specs:
*   Ref. LT1007 data sheet, LTC 1990 databook p2-57
* Comments:
*   Uses extended phase compensation; input differential mode clamp.
*
* Connections: + - V+V-0
.subckt LT1007 3 2 7 4 6
rc1 7 80 6.6315E+02
rc2 7 90 6.6315E+02
q1 80 2 10 qm1
q2 90 3 11 qm2
*
c1 80 91 200e-12
rxcl 91 90 50
cxcl 91 90 500e-12
c2 8 98 4.000e-12
rxcl 8 98 4.00k
cxcl 1 98 27.000e-12
*
cin 3 2 5e-12
ddm1 2 104 dm2
ddm3 104 3 dm2
ddm2 3 105 dm2
ddm4 105 2 dm2
re1 10 12 -2.6233E+01
re2 11 12 -2.6233E+01
iee 12 4 7.5030E-05
re 12 0 2.666E+06
ce 12 0 1.579E-12
gcm 0 8 12 0 7.558E-10
ga 8 0 80 90 1.5080E-03
r2 8 0 1.000E+05
gb 1 0 8 0 1.9176E+03
ro2 1 0 6.900E+01
*
rs 1 6 1
ecl 18 0 1 6 2.828e+01
gcl 0 8 20 0 1
rc1 20 0 1e3
d1 18 20 dm1
d2 20 18 dm1
*
d3a 131 70 dm3
d3b 13 131 dm3
gpl 0 8 70 7 1
vc 13 6 3.0909
rpla 7 70 1e4
rplb 7 131 1e5
d4a 60 141 dm3
d4b 141 14 dm3
gnl 0 8 60 4 1
ve 6 14 3.0909
rnla 60 4 1e4
rnlb 141 4 1e5
*
ip 7 4 2.625E-03
dsub 4 7 dm2
* models
.model qm1 npn (is=8.0000E-16
bf=1.7857E+03)
.model qm2 npn (is=8.0062E-16
bf=4.1667E+03)
.model dm1 d (is=1.000e-19)
.model dm2 d (is=8.000E-16)
.model dm3 d (is=1.000e-20)
.ends LT1007
*
* - - - - * fini LT1007 * - - - - *

```

LT1008 Macromodel

```

*
* Linear Technology LT1008 op amp model
* Written: 08-18-1989 17:38:46 Type: Bipolar npn input, external comp.
* Typical specs:
* Vos=3.0E-05, Ib=3.0E-11, Ios=3.0E-11, GBP=6.0E+05Hz, Phase mar.= 60 deg,
* SR(+)=2.0E-01V/us, SR(-)=1.9E-01V/us, Av= 126 dB, CMMR= 132 dB,
* Vsat(+)=1.00V, Vsat(-)=1.00V, Isc=+/- 8.0mA, Iq= 380uA
* (input differential mode clamp active)
*
* Connections: + - V+V-0 CaCb
.subckt LT1008 3 2 7 4 6 1 8 ; Use C=30 pF in main circuit (Ca to Cb).
* input
rc1 7 80 8.842E+03
rc2 7 90 8.842E+03
q1 80 2 10 qm1
q2 90 3 11 qm2
ddm1 2 3 dm2
ddm2 3 2 dm2
c1 80 90 8.660E-12
re1 10 12 2.246E+02
re2 11 12 2.246E+02
iee 12 4 6.000E-06
re 12 0 3.333E+07
ce 12 0 1.579E-12
* intermediate
gcm 0 8 12 0 2.841E-11
ga 8 0 80 90 1.131E-04
r2 8 0 1.000E+05
* external comp cap used for c2 (see note above).
gb 1 0 8 0 1.960E+02
* output
ro1 1 6 1.000E+02
ro2 1 0 9.000E+02
rc 17 0 6.802E-05
gc 0 17 6 0 1.470E+04
d1 1 17 dm1
d2 17 1 dm1
d3 6 13 dm2
d4 14 6 dm2
vc 7 13 1.774E+00
ve 14 4 1.774E+00
ip 7 4 3.740E-04
dsub 4 7 dm2
* models
.model qm1 npn (is=8.000E-16 bf=6.667E+04)
.model qm2 npn (is=8.009E-16 bf=2.000E+05)
.model dml d (is=4.276E-12)
.model dm2 d (is=8.000E-16)
.ends LT1008
*
* - - - - * fini LT1008 * - - - - * [oamm vn1 8/89]

```

LT1012 Macromodel

```

*
* Linear Technology LT1012 op amp model (with calls for LT1024)
* Written: 09-05-1989 16:53:38 Type: Bipolar npn input, internal comp.
* Typical specs:
* Vos=1.0E-05, Ib=3.0E-11, Ios=2.0E-11, GBP=6.0E+05Hz, Phase mar.= 70 deg,
* SR(+)=2.0E-01V/us, SR(-)=1.9E-01V/us, Av= 126 dB, CMMR= 132 dB,
* Vsat(+)=1.00V, Vsat(-)=1.00V, Isc=+/-12.5mA, Iq= 380uA
* (input differential mode clamp active)
*
* Connections: + - V+V-0
.subckt LT1012 3 2 7 4 6
* input
rc1 7 80 8.842E+03
rc2 7 90 8.842E+03
q1 80 2 10 qm1
q2 90 3 11 qm2
ddm1 2 3 dm2
ddm2 3 2 dm2
c1 80 90 5.460E-12
re1 10 12 2.246E+02
re2 11 12 2.246E+02
iee 12 4 6.000E-06
re 12 0 3.333E+07
ce 12 0 1.579E-12
* intermediate
gcm 0 8 12 0 2.841E-11
ga 8 0 80 90 1.131E-04
r2 8 0 1.000E+05
c2 1 8 3.000E-11
gb 1 0 8 0 1.960E+02
* output
ro1 1 6 1.000E+02
ro2 1 0 9.000E+02
rc 17 0 1.063E-04
gc 0 17 6 0 9.408E+03
d1 1 17 dm1
d2 17 1 dm1
d3 6 13 dm2
d4 14 6 dm2
vc 7 13 1.785E+00
ve 14 4 1.785E+00
ip 7 4 3.740E-04
dsub 4 7 dm2
* models
.model qm1 npn (is=8.000E-16 bf=7.500E+04)
.model qm2 npn (is=8.003E-16 bf=1.500E+05)
.model dm1 d (is=1.179E-19)
.model dm2 d (is=8.000E-16)
.ends LT1012
*
.subckt LT1024 3 2 7 4 6
x_LT1024 3 2 7 4 6 LT1012
.ends LT1024
*
* - - - - * fini LT1012 family * - - - - * [oamm vn01 9/89]

```

LT1013/LT1014 Macromodel

* This more complete macromodel has been adapted from the Parts
 * generated LT1013/LT1014 model. This version features closer
 * fidelity to the real part, with input common-mode clamping, and
 * compensated output clamping. It can be used for large signal
 * and/or single supply applications, where the inputs can
 * potentially be overdriven. Since it uses more active devices,
 * it may run more slowly than will a conventional macromodel.

* connections: non-inverting input

* | inverting input

* | | positive power supply

* | | | negative power supply

* | | | | output

* | | | | |

.subckt LT1013 1 2 3 4 5

*

c1 11 12 8.661E-12

c2 6 7 30.00E-12

dc 8 53 dx

de 54 8 dx

dlp 90 91 dx

dln 92 90 dx

dp 4 3 dx

egnd 99 0 poly(2) (3,0) (4,0) 0 .5

fb 7 99 poly(5) vb vc ve vlp vln 0 2.475E9 -2E9 2E9 2E9 -2E9

ga 6 0 11 12 113.1E-6

gcm 0 6 10 99 225.7E-12

iee 3 10 dc 12.03E-6

hlim 90 0 vlim 1K

q1 11 102 13 qx

q2 12 101 14 qx

rb1 2 102 400

rb2 1 101 400

dcm1 105 102 dx

dcm2 105 101 dx

vcmc 105 4 dc 0.4

r2 6 9 100.0E3

rc1 4 11 8.841E3

rc2 4 12 8.841E3

re1 13 10 4.519E3

re2 14 10 4.519E3

ree 10 99 16.63E6

ro1 8 5 80

ro2 7 99 25

ip 3 4 328E-6

vb 9 0 dc 0

vc 3 53 dc 1.610

ve 54 4 dc .61

vlim 7 8 dc 0

vlp 91 0 dc 25

vln 0 92 dc 25

.model dx D(Is=800.0E-18)

.model qx PNP(Is=800.0E-18 Bf=400)

.ends

* connections: non-inverting input

* | inverting input

* | | positive power supply

* | | | negative power supply

* | | | | output

* | | | | |

.subckt LT1014 1 2 3 4 5

*

x_LT1014 1 2 3 4 5 LT1013

.ends

* connections: non-inverting input

* | inverting input

* | | positive power supply

* | | | negative power supply

* | | | | output

* | | | | |

.subckt LT1006 1 2 3 4 5

*

x_LT1006 1 2 3 4 5 LT1013

.ends

LT1028 Macromodel

```

*
* Linear Technology LT1028 op amp model
* Written: 11-28-1989 Type: Bipolar npn input, internal comp.
* Typical specs:
*   Ref. LT1028 data sheet, LTC 1990 databook p2-161
* Comments:
*   Uses extended phase compensation; input differential mode clamp.
*
* Connections: + - V+V-0
.subckt LT1028 3 2 7 4 6
rc1 7 80 7.0736E+01
rc2 7 90 7.0736E+01
q1 80 2 10 qm1
q2 90 3 11 qm2
*
c1 80 91 750e-12
rxcl 91 90 50
cxc1 91 90 400e-12
c2 1 98 30.000E-12
rxc2 98 8 1k
cxc2 98 8 10.000E-12
*
cin 2 3 15e-12
rin 2 3 2e4
ddm1 2 104 dm2
ddm3 104 3 dm2
ddm2 3 105 dm2
ddm4 105 2 dm2
re1 10 12 -4.4157E+01
re2 11 12 -4.4157E+01
iee 12 4 4.5006E-04
re 12 0 4.4439E+05
ce 12 0 1.5789E-12
gcm 0 8 12 0 7.0854E-09
ga 8 0 80 90 1.4137E-02
r2 8 0 1.0000E+05
gb 1 0 8 0 2.6731E+02
ro2 1 0 7.9000E+01
*
rs 1 6 1
ecl 18 0 1 6 2.7910e+01
gcl 0 8 20 0 1
rcl 20 0 1e3
d1 18 20 dm1
d2 20 18 dm1
d3a 131 70 dm3
d3b 13 131 dm3
gpl 0 8 70 7 1
vc 13 6 3.6394
rpla 7 70 1e4
rplb 7 131 1e5
d4a 60 141 dm3
d4b 141 14 dm3
gnl 0 8 60 4 1
ve 6 14 3.6394
rnla 60 4 1e4
rnlb 141 4 1e5
*
ip 7 4 7.450E-03
dsub 4 7 dm2
* models
.model qm1 npn (is=8.0000E-16 bf=5.7692E+03)
.model qm2 npn (is=8.0062E-16 bf=1.0714E+04)
.model dml d (is=1.000e-19)
.model dm2 d (is=8.000E-16)
.model dm3 d (is=1.000e-20)
.ends LT1028
*
* - - - - - * fini LT1028 * - - - - - *
    
```


LT1037 Macromodel

```

*
* Linear Technology LT1037 op amp model
* Written: 11-21-1989 Type: Bipolar npn input, internal comp.
* Typical specs:
*   Ref. LT1037 data sheet, LTC 1990 databook p2-57
* Comments:
*   Uses extended phase compensation; input differential mode clamp.
*
* Connections: + - V+V-0
.subckt LT1037 3 2 7 4 6
rc1 7 80 6.6315E+02
rc2 7 90 6.6315E+02
q1 80 2 10 qm1
q2 90 3 11 qm2
*
c1 80 91 200e-12
rxc1 91 90 200
cxc1 91 90 200e-12
c2 8 98 1.000e-12
rxc2 8 98 10.00k
cxc2 1 98 5.000e-12
*
cin 3 2 5e-12
ddm1 2 104 dm2
ddm3 104 3 dm2
ddm2 3 105 dm2
ddm4 105 2 dm2
re1 10 12 -2.6233E+01
re2 11 12 -2.6233E+01
iee 12 4 7.5030E-05
re 12 0 2.666E+06
ce 12 0 1.579E-12
gcm 0 8 12 0 7.558E-10
ga 8 0 80 90 1.5080E-03
r2 8 0 1.000E+05
gb 1 0 8 0 1.9176E+03
ro2 1 0 6.900E+01
*
rs 1 6 1
ec1 18 0 1 6 2.828e+01
gc1 0 8 20 0 1
rc1 20 0 1e3
d1 18 20 dm1
d2 20 18 dm1
*
d3a 131 70 dm3
d3b 13 131 dm3
gpl 0 8 70 7 1
vc 13 6 3.0909
rpla 7 70 1e4
rplb 7 131 1e5
d4a 60 141 dm3
d4b 141 14 dm3
gn1 0 8 60 4 1
ve 6 14 3.0909
rn1a 60 4 1e4
rn1b 141 4 1e5
*
ip 7 4 2.625E-03
dsub 4 7 dm2
* models
.model qm1 npn (is=8.0000E-16 bf=1.7857E+03)
.model qm2 npn (is=8.0062E-16 bf=4.1667E+03)
.model dm1 d (is=1.000e-19)
.model dm2 d (is=8.000E-16)
.model dm3 d (is=1.000e-20)
.ends LT1037
*
* - - - - * fini LT1037 * - - - - *
    
```

LT1055 Macromodel

```

*
* Linear Technology LT1055 op amp model
* Written: 11-30-1989 Type: PFET input, internal comp.
* Typical specs:
*   Ref. LT1055 data sheet, LTC 1990 databook p2-219
* Comments:
*   Uses input common-mode clamp (comment out if not desired).
*
* Connections: + - V+V-0
.subckt LT1055 3 2 7 4 6
*
rd1 4 80 9.474E+02      d3a 131 70  dm3
rd2 4 90 9.474E+02      d3b 13  131 dm3
j1  80 102 10  jm1      gpl  0  8   70  7  1
j2  90 103 11  jm2      vc   13  6   2.9515
rg1  2  102 2.000E+00    rpla 7  70  1e4
rg2  3  103 2.000E+00    rplb 7  131 1e5
** cm clamp
dcm1 107 103 dm4        d4a  60 141 dm3
dcm2 105 107 dm4        d4b 141 14  dm3
vcmc 105 4  4.1e0       gnl  0  8   60  4  1
ecmp 106 4 103 4 1      ve   6  14  2.9515
rcmp 107 106 1e4        rnla 60  4  1e4
dcm3 109 102 dm4        rnlb 141 4  1e5
dcm4 105 109 dm4
ecmn 108 4 102 4 1
rcmn 109 108 1e4
**
c1  80 90 1.5e-11
rs1 10 12 1e0
rs2 11 12 1e0
iss  7 12 4.200E-04
rs   12 0 4.762E+05
cs   12 0 1.579E-12
*
gcm  0  8  12 0 1.329E-08
ga   8  0  80 90 1.056E-03
r2   8  0  1.000E+05
c2   1  8  3.6e-11
gb   1  0  8  0  5.097E+01
ro2  1  0  7.400E+01
*
rso  1  6  1.000E+00
ec1 18 0  1  6  1.712e+01
gc1  0  8  20 0  1
rc1 20 0  1e3
d1  18 20 dm1
d2  20 18 dm1
*
d3a 131 70  dm3
d3b 13  131 dm3
gpl  0  8   70  7  1
vc   13  6   2.9515
rpla 7  70  1e4
rplb 7  131 1e5
d4a  60 141 dm3
d4b 141 14  dm3
gnl  0  8   60  4  1
ve   6  14  2.9515
rnla 60  4  1e4
rnlb 141 4  1e5
*
ip  7  4  2.38e-3
dsub 4  7  dm2
* models
.model jml pjf (is=10e-12 beta=1.5e-3 vto=-1.0000e+00)
.model jm2 pjf (is=5e-12 beta=1.5e-3 vto=-9.9988e-01)
.model dm1 d   (is=1.000e-15)
.model dm2 d   (is=8.000E-16)
.model dm3 d   (is=1.000e-16)
.model dm4 d   (is=1.000e-09)
.ends LT1055
*
* - - - - - * fini LT1055 * - - - - - *

```

LT1056 Macromodel

```

*
* Linear Technology LT1056 op amp model
* Written: 11-30-1989 Type: PFET input, internal comp.
* Typical specs:
*   Ref. LT1056 data sheet, LTC 1990 databook p2-219
* Comments:
*   Uses input common-mode clamp (comment out if not desired).
*
* Connections: + - V+V-0
.subckt LT1056 3 2 7 4 6
*
rd1 4 80 9.474E+02
rd2 4 90 9.474E+02
j1 80 102 10 jm1
j2 90 103 11 jm2
rg1 2 102 2.000E+00
rg2 3 103 2.000E+00
** cm clamp
dcm1 107 103 dm4
dcm2 105 107 dm4
vcmc 105 4 4.1e0
ecmp 106 4 103 4 1
rcmp 107 106 1e4
dcm3 109 102 dm4
dcm4 105 109 dm4
ecmn 108 4 102 4 1
rcmn 109 108 1e4
**
c1 80 90 1.5e-11
rs1 10 12 1e0
rs2 11 12 1e0
iss 7 12 4.200E-04
rs 12 0 4.762E+05
cs 12 0 1.579E-12
*
gcm 0 8 12 0 1.329E-08
ga 8 0 80 90 1.056E-03
r2 8 0 1.000E+05
c2 1 8 3.000E-11
gb 1 0 8 0 5.097E+01
ro2 1 0 7.400E+01
*
rso 1 6 1.000E+00
ecl 18 0 1 6 1.712e+01
gcl 0 8 20 0 1
rcl 20 0 1e3
d1 18 20 dm1
d2 20 18 dm1
*
d3a 131 70 dm3
d3b 13 131 dm3
gpl 0 8 70 7 1
vc 13 6 2.9515
rpla 7 70 1e4
rplb 7 131 1e5
d4a 60 141 dm3
d4b 141 14 dm3
gnl 0 8 60 4 1
ve 6 14 2.9515
rnla 60 4 1e4
rn1b 141 4 1e5
*
ip 7 4 4.080E-03
dsub 4 7 dm2
* models
.model jm1 pjf (is=10e-12 beta=1.5e-3 vto=-1.0000e+00)
.model jm2 pjf (is=5e-12 beta=1.5e-3 vto=-9.9986e-01)
.model dm1 d (is=1.000e-15)
.model dm2 d (is=8.000E-16)
.model dm3 d (is=1.000e-16)
.model dm4 d (is=1.000e-09)
.ends LT1056
*
* - - - - - * fini LT1056 * - - - - - *

```

LT1057 Macromodel

```

*
* Linear Technology LT1057 op amp model
* Written: 11-30-1989 Type: PFET input, internal comp.
* Typical specs:
*   Ref. LT1057 data sheet, LTC 1990 databook p2-235
* Comments:
*   Uses input common-mode clamp (comment out if not desired).
*
* Connections: + - V+V-0
.subckt LT1057 3 2 7 4 6
*
rd1 4 80 9.474E+02
rd2 4 90 9.474E+02
j1 80 102 10 jm1
j2 90 103 11 jm2
rg1 2 102 2.000E+00
rg2 3 103 2.000E+00
** cm clamp
dcm1 107 103 dm4
dcm2 105 107 dm4
vcmc 105 4 4.1e0
ecmp 106 4 103 4 1
rcmp 107 106 1e4
dcm3 109 102 dm4
dcm4 105 109 dm4
ecmn 108 4 102 4 1
rcmn 109 108 1e4
**
c1 80 90 1.5e-11
rs1 10 12 1e0
rs2 11 12 1e0
iss 7 12 4.200E-04
rs 12 0 4.762E+05
cs 12 0 1.579E-12
*
gcm 0 8 12 0 1.329E-08
ga 8 0 80 90 1.056E-03
r2 8 0 1.000E+05
c2 1 8 3.3e-11
gb 1 0 8 0 5.097E+01
ro2 1 0 7.400E+01
*
rso 1 6 1.000E+00
ec1 18 0 1 6 2.569e+01
gcl 0 8 20 0 1
rcl 20 0 1e3
d1 18 20 dm1
d2 20 18 dm1
*
d3a 131 70 dm3
d3b 13 131 dm3
gpl 0 8 70 7 1
vc 13 6 3.1515
rpla 7 70 1e4
rplb 7 131 1e5
d4a 60 141 dm3
d4b 141 14 dm3
gn1 0 8 60 4 1
ve 6 14 3.1515
rn1a 60 4 1e4
rn1b 141 4 1e5
*
ip 7 4 1.28e-3
dsub 4 7 dm2
* models
.model jm1 pjf (is=10e-12 beta=1.5e-3 vto=-1.0000e+00)
.model jm2 pjf (is=5e-12 beta=1.5e-3 vto=-9.9978e-01)
.model dm1 d (is=1.000e-15)
.model dm2 d (is=8.000E-16)
.model dm3 d (is=1.000e-16)
.model dm4 d (is=1.000e-09)
.ends LT1057
*
.subckt LT1058 3 2 7 4 6
x_LT1058 3 2 7 4 6 LT1057
.ends LT1058
*
* - - - - * fini LT1057 family * - - - - *

```

LT1078 Macromodel

```

*
* Linear Technology LT1078 op amp model (with calls for LT1079, LT1077)
* Written: 10-17-1989 10:20:02 Type: Bipolar pnp input, internal comp.
* Typical specs:
* Vos=4.0E-05, Ib=6.0E-09, Ios=5.0E-11, GBP=2.0E+05Hz, Phase mar.= 60 deg,
* SR(-)=8.0E-02V/us, SR(+)=7.6E-02V/us, Av= 120 dB, CMMR= 108 dB,
* Vsat(+)=1.00V, Vsat(-)=0.00V, Isc=+/-15.0mA, Iq=45uA.
* (input common mode clamp active)
* (3 for 1!)
*
* Connections: + - V+V-0
.subckt LT1078 3 2 7 4 6
* input
rc1 4 80 2.653E+04
rc2 4 90 2.653E+04
q1 80 102 10 qm1
q2 90 103 11 qm2
rb1 2 102 6.000E+02
rb2 3 103 6.000E+02
dcm1 105 102 dm2
dcm2 105 103 dm2
vcmc 105 4 4.000E-01
c1 80 90 8.660E-12
re1 10 12 4.958E+03
re2 11 12 4.958E+03
iee 7 12 2.412E-06
re 12 0 8.292E+07
ce 12 0 1.579E-12
* intermediate
gcm 0 8 12 0 1.501E-10
ga 8 0 80 90 3.770E-05
r2 8 0 1.000E+05
c2 1 8 3.000E-11
gb 1 0 8 0 1.396E+02
* output
ro1 1 110 1.000E+02
ro2a 1 0 1.083E+03
ro2b 6 110 8.170E+02
ec 17 0 110 0 1
d1 1 17 dm1
d2 17 1 dm1
d3 110 13 dm2
d4 14 110 dm2
d5 6 110 dm2
d6 110 6 dm2
vc 7 13 1.790E+00
ve 14 4 7.901E-01
ip 7 4 4.259E-05
dsub 4 7 dm2
* models
.model qm1 pnp (is=8.000E-16 bf=1.992E+02)
.model qm2 pnp (is=8.012E-16 bf=2.008E+02)
.model dm1 d (is=2.119E-24)
.model dm2 d (is=8.000E-16)
.ends LT1078
*
.subckt LT1079 3 2 7 4 6
x_LT1079 3 2 7 4 6 LT1078
.ends LT1079
*
.subckt LT1077 3 2 7 4 6
x_LT1077 3 2 7 4 6 LT1078
.ends LT1077
*
* - - - - - * fini LT1078 family * - - - - - * [oamm vp01 10/89]

```

LT1097 Macromodel

```

*
* Linear Technology LT1097 op amp model
* Written: 12-05-1989 Type: Bipolar npn input, internal comp.
* Typical specs:
* Vos=1.0E-05, Ib=5.0e-11, Ios=2.0E-11, GBP=6.0E+05Hz, Phase mar.= 70 deg,
* SR(+)=2.0E-01V/us, SR(-)=1.9E-01V/us, Av= 126 dB, CMMR= 132 dB,
* Vsat(+)=1.00V, Vsat(-)=1.00V, Isc=+/-12.5mA, Iq= 380uA
* (input differential mode clamp active)
*
* Connections: + - V+V-O
.subckt LT1097 3 2 7 4 6
* input
rc1 7 80 8.842E+03
rc2 7 90 8.842E+03
q1 80 2 10 qm1
q2 90 3 11 qm2
ddm1 2 3 dm2
ddm2 3 2 dm2
c1 80 90 5.460E-12
re1 10 12 2.246E+02
re2 11 12 2.246E+02
iee 12 4 6.000E-06
re 12 0 3.333E+07
ce 12 0 1.579E-12
* intermediate
gcm 0 8 12 0 2.841E-11
ga 8 0 80 90 1.131E-04
r2 8 0 1.000E+05
c2 1 8 3.000E-11
gb 1 0 8 0 1.960E+02
* output
ro1 1 6 1.000E+02
ro2 1 0 9.000E+02
rc 17 0 1.063E-04
gc 0 17 6 0 9.408E+03
d1 1 17 dm1
d2 17 1 dm1
d3 6 13 dm2
d4 14 6 dm2
vc 7 13 1.785E+00
ve 14 4 1.785E+00
ip 7 4 3.740E-04
dsub 4 7 dm2
* models
.model qm1 npn (is=8.000E-16 bf=5.000e+04)
.model qm2 npn (is=8.003E-16 bf=7.500e+05)
.model dm1 d (is=1.179E-19)
.model dm2 d (is=8.000E-16)
.ends LT1097
*
* - - - - * fini LT1097 * - - - - *

```


LT1101 Macromodel

```

*
* Linear Technology LT1101 instrumentation amplifier model
* Written: 10-23-89 Type: Bipolar pnp input, single supply.
* Typical specs:
* Ref. LT1101 data sheet, LTC 1990 databook pl3-36
*
* Comments: Uses nested LT1078 model. Edit path of ".lib" below, or
*           use ".inc" function to call LT1078 model.
*
* Connections: Gnd G10a(-) V- V+ (+) G10b Out
.subckt LT1101 1 2 3 4 5 6 7 8
*
r90a 1 2 828e3
r9a 2 100 82.8e3
ra 100 101 9.2e3
rb 101 102 9.2e3
r9b 102 7 82.8e3
r90b 7 8 828e3
*
xa 3 100 5 4 101 LT1078
xb 6 102 5 4 8 LT1078
*
rina 3 0 7e9
rinb 6 0 7e9
*
.ends LT1101
* /- edit for LT1078 path
.lib LT1078
* - - - - - * fini LT1101 * - - - - - *

```


LT1115 Macromodel

```

*
* Linear Technology LT1115 op amp model
* Written: 11-28-1989 Type: Bipolar npn input, internal comp.
* Typical specs:
*   Ref. LT1115 data sheet, LTC Dec 1989
* Comments:
*   Uses extended phase compensation; input differential mode clamp.
*
* Connections: + - V+V-0
.subckt LT1115 3 2 7 4 6
rc1 7 80 7.0736E+01
rc2 7 90 7.0736E+01
q1 80 2 10 qm1
q2 90 3 11 qm2
*
c1 80 91 750e-12
rxcl 91 90 50
cxcl 91 90 400e-12
c2 1 98 30.000E-12
rxcl 98 8 1k
cxcl 98 8 10.000E-12
*
cin 2 3 15e-12
rin 2 3 2e4
ddm1 2 104 dm2
ddm3 104 3 dm2
ddm2 3 105 dm2
ddm4 105 2 dm2
re1 10 12 -4.4157E+01
re2 11 12 -4.4157E+01
iee 12 4 4.5006E-04
re 12 0 4.4439E+05
ce 12 0 1.5789E-12
gcm 0 8 12 0 7.0854E-09
ga 8 0 80 90 1.4137E-02
r2 8 0 1.0000E+05
gb 1 0 8 0 2.6731E+02
ro2 1 0 7.9000E+01
*
rs 1 6 1
ec1 18 0 1 6 2.7910e+01
gcl 0 8 20 0 1
rc1 20 0 1e3
d1 18 20 dm1
d2 20 18 dm1
*
d3a 131 70 dm3
d3b 13 131 dm3
gpl 0 8 70 7 1
vc 13 6 3.6394
rpla 7 70 1e4
rplb 7 131 1e5
d4a 60 141 dm3
d4b 141 14 dm3
gnl 0 8 60 4 1
ve 6 14 3.6394
rnla 60 4 1e4
rnlb 141 4 1e5
*
ip 7 4 7.450E-03
dsub 4 7 dm2
* models
.model qm1 npn (is=8.0000e-16 bf=3.4615e+03)
.model qm2 npn (is=8.0155e-16 bf=6.4286e+03)
.model dm1 d (is=1.000e-19)
.model dm2 d (is=8.000E-16)
.model dm3 d (is=1.000e-20)
.ends LT1115
*
* - - - - - * fini LT1115 * - - - - - *
    
```

LT1178 Macromodel

```

*
* Linear Technology LT1178 op amp model (with calls for LT1179)
* Written: 11-02-1989 13:20:10 Type: Bipolar pnp input, internal comp.
* Typical specs:
* Vos=4.0E-05, Ib=3.0E-09, Ios=5.0E-11, GBP=6.0E+04Hz, Phase mar.= 60 deg,
* SR(-)=2.5E-02V/us, SR(+)=2.4E-02V/us, Av= 117 dB, CMMR= 102 dB,
* Vsat(+)=1.00V, Vsat(-)=0.00V, Isc=+/- 5.0mA, Iq=14uA.
* (input common mode clamp active)
* (2 for 1)
*
* Connections: + - V+V-0
.subckt LT1178 3 2 7 4 6
* input
rc1 4 80 8.842E+04
rc2 4 90 8.842E+04
q1 80 102 10 qm1
q2 90 103 11 qm2
rb1 2 102 6.000E+02
rb2 3 103 6.000E+02
dcm1 105 102 dm2
dcm2 105 103 dm2
vcmc 105 4 4.000E-01
c1 80 90 8.660E-12
re1 10 12 1.933E+04
re2 11 12 1.933E+04
iee 7 12 7.560E-07
re 12 0 2.646E+08
ce 12 0 1.579E-12
* intermediate
gcm 0 8 12 0 8.984E-11
ga 8 0 80 90 1.131E-05
r2 8 0 1.000E+05
c2 1 8 3.000E-11
gb 1 0 8 0 1.647E+02
* output
ro1 1 110 2.000E+02
ro2a 1 0 2.166E+03
ro2b 6 110 1.634E+03
ec 17 0 110 0 1
d1 1 17 dm1
d2 17 1 dm1
d3 110 13 dm2
d4 14 110 dm2
d5 6 110 dm2
d6 110 6 dm2
vc 7 13 1.762E+00
ve 14 4 7.617E-01
ip 7 4 1.324E-05
dsub 4 7 dm2
* models
.model qm1 pnp (is=8.000E-16 bf=1.240E+02)
.model qm2 pnp (is=8.012E-16 bf=1.261E+02)
.model dm1 d (is=1.961E-16)
.model dm2 d (is=8.000E-16)
.ends LT1178
*
.subckt LT1179 3 2 7 4 6
x_LT1179 3 2 7 4 6 LT1178
.ends LT1179
*
* - - - - - * fini LT1178 family * - - - - - * [oamm vp01 10/89]
    
```

LT118A Macromodel

```

*
* Linear Technology LT118A op amp model
* Written: 11-21-1989 Type: Bipolar npn input, internal comp.
* Typical specs:
*   Ref. LT118A data sheet, LTC 1990 databook p2-313
* Comments:
*   Uses extended phase compensation; input differential mode clamp.
*
* Connections: + - V+V-0
.subckt LT118A 3 2 7 4 6
* input
rc1 7 80 7.074E+02
rc2 7 90 7.074E+02
q1 80 2 10 qm1
q2 90 3 11 qm1
*
c1 80 91 300e-12
rxcl 91 90 1e3
cxcl 91 90 15e-12
c2 1 8 5.000E-12
*
rb1 2 102 1.0000E+00
rb2 3 103 1.0000E+00
ddm1 102 104 dm2
vz1 104 103 5.5
ddm2 103 105 dm2
vz2 105 102 5.5
re1 10 12 6.209E+02
re2 11 12 6.209E+02
iee 12 4 6.000E-04
re 12 0 3.332E+05
ce 12 0 2.632E-13
*
gcm 0 8 12 0 1.414E-08
ga 8 0 80 90 1.414E-03
r2 8 0 1.000E+05
gb 1 0 8 0 5.318E+01
ro2 1 0 7.4000E+01
rs 1 6 1
ecl 18 0 1 6 3.172e+01
gcl 0 8 20 0 1
rc1 20 0 1e3
d1 18 20 dm1
d2 20 18 dm1
*
d3a 131 70 dm3
d3b 13 131 dm3
gpl 0 8 70 7 1
vc 13 6 3.6473
rpla 7 70 1e4
rplb 7 131 1e5
d4a 60 141 dm3
d4b 141 14 dm3
gnl 0 8 60 4 1
ve 6 14 3.6473
rnla 60 4 1e4
rn1b 141 4 1e5
*
ip 7 4 4.400E-03
dsub 4 7 dm2
* models
.model qm1 npn (is=8.0000E-16 bf=2.4390E+03)
.model qm2 npn (is=8.1562E-16 bf=2.5641E+03)
*
.model dm1 d (is=1.000e-19)
.model dm2 d (is=8.000E-16)
.model dm3 d (is=1.000e-20)
.ends LT118A
*
* - - - - - * fini LT118A * - - - - - *

```

OP-05 Macromodel

```

*
* Linear Technology OP05 op amp model
* Written: 08-23-1989 15:59:46 Type: Bipolar npn input, internal comp.
* Typical specs:
* Vos=2.0E-04, Ib=1.0E-09, Ios=1.0E-09, GBP=6.0E+05Hz, Phase mar.= 70 deg,
* SR(+)=3.0E-01V/us, SR(-)=2.9E-01V/us, Av= 114 dB, CMMR= 126 dB,
* Vsat(+)=2.00V, Vsat(-)=2.00V, Isc=+/-25.0mA, Iq= 3000uA
* (input differential mode clamp active)
*
* Connections: + - V+V-0
.subckt OP05 3 2 7 4 6
* input
rc1 7 80 8.842E+03
rc2 7 90 8.842E+03
q1 80 102 10 qm1
q2 90 103 11 qm2
rb1 2 102 5.000E+02
rb2 3 103 5.000E+02
ddm1 102 104 dm2
ddm3 104 103 dm2
ddm2 103 105 dm2
ddm4 105 102 dm2
c1 80 90 5.460E-12
re1 10 12 3.097E+03
re2 11 12 3.097E+03
iee 12 4 9.002E-06
re 12 0 2.222E+07
ce 12 0 1.579E-12
* intermediate
gcm 0 8 12 0 5.668E-11
ga 8 0 80 90 1.131E-04
r2 8 0 1.000E+05
c2 1 8 3.000E-11
gb 1 0 8 0 6.647E+02
* output
ro1 1 6 3.333E+01
ro2 1 0 6.667E+01
rc 17 0 1.393E-05
gc 0 17 6 0 7.179E+04
d1 1 17 dm1
d2 17 1 dm1
d3 6 13 dm2
d4 14 6 dm2
vc 7 13 2.803E+00
ve 14 4 2.803E+00
ip 7 4 2.991E-03
dsub 4 7 dm2
* models
.model qm1 npn (is=8.000E-16 bf=3.000E+03)
.model qm2 npn (is=8.062E-16 bf=9.000E+03)
.model dml d (is=5.991E-12)
.model dm2 d (is=8.000E-16)
.ends OP05
*
* - - - - - * fini OP05 * - - - - - * [oamm vn1 8/89]

```

OP-07 Macromodel

```

*
* Linear Technology OP07 op amp model
* Written: 08-24-1989 12:35:59 Type: Bipolar npn input, internal comp.
* Typical specs:
* Vos=3.0E-05, Ib=1.0E-09, Ios=4.0E-10, GBP=6.0E+05Hz, Phase mar.= 70 deg,
* SR(+)=2.5E-01V/us, SR(-)=2.4E-01V/us, Av= 114 dB, CMMR= 126 dB,
* Vsat(+)=2.00V, Vsat(-)=2.00V, Isc=+/-25.0mA, Iq=2500uA
* (input differential mode clamp active)
*
* Connections: + - V+V-0
.subckt OP07 3 2 7 4 6
* input
rc1 7 80 8.842E+03
rc2 7 90 8.842E+03
q1 80 102 10 qm1
q2 90 103 11 qm2
rb1 2 102 5.000E+02
rb2 3 103 5.000E+02
ddm1 102 104 dm2
ddm3 104 103 dm2
ddm2 103 105 dm2
ddm4 105 102 dm2
c1 80 90 5.460E-12
re1 10 12 1.948E+03
re2 11 12 1.948E+03
iee 12 4 7.502E-06
re 12 0 2.666E+07
ce 12 0 1.579E-12
* intermediate
gcm 0 8 12 0 5.668E-11
ga 8 0 80 90 1.131E-04
r2 8 0 1.000E+05
c2 1 8 3.000E-11
gb 1 0 8 0 1.294E+03
* output
ro1 1 6 2.575E+01
ro2 1 0 3.425E+01
rc 17 0 6.634E-06
gc 0 17 6 0 1.507E+05
d1 1 17 dm1
d2 17 1 dm1
d3 6 13 dm2
d4 14 6 dm2
vc 7 13 2.803E+00
ve 14 4 2.803E+00
ip 7 4 2.492E-03
dsub 4 7 dm2
* models
.model qm1 npn (is=8.000E-16 bf=3.125E+03)
.model qm2 npn (is=8.009E-16 bf=4.688E+03)
.model dm1 d (is=1.486E-08)
.model dm2 d (is=8.000E-16)
.ends OP07
*
* - - - - * fini OP07 * - - - - * [oamm vnl 8/89]

```

OP-27 Macromodel

```

*
* Linear Technology OP27 op amp model (with calls for OP227)
* Written: 11-21-1989 Type: Bipolar npn input, internal comp.
* Typical specs:
*   Ref. OP-27 data sheet, LTC 1990 databook p2-345
* Comments:
*   Uses extended phase compensation; input differential mode clamp.
*
* Connections: + - V+V-0
.subckt OP27 3 2 7 4 6
rc1 7 80 6.6315E+02
rc2 7 90 6.6315E+02
q1 80 2 10 qm1
q2 90 3 11 qm2
*
c1 80 91 200e-12
rxcl 91 90 50
cxc1 91 90 500e-12
c2 8 98 4.000e-12
rxcl 8 98 4.00k
cxc2 1 98 27.000e-12
*
cin 3 2 5e-12
ddm1 2 104 dm2
ddm3 104 3 dm2
ddm2 3 105 dm2
ddm4 105 2 dm2
re1 10 12 -2.6233E+01
re2 11 12 -2.6233E+01
iee 12 4 7.5030E-05
re 12 0 2.666E+06
ce 12 0 1.579E-12
gcm 0 8 12 0 7.558E-10
ga 8 0 80 90 1.5080E-03
r2 8 0 1.000E+05
gb 1 0 8 0 1.9176E+03
ro2 1 0 6.900E+01
*
rs 1 6 1
ec1 18 0 1 6 2.828e+01
gc1 0 8 20 0 1
rc1 20 0 1e3
dl 18 20 dm1
d2 20 18 dm1
*
*
d3a 131 70 dm3
d3b 13 131 dm3
gpl 0 8 70 7 1
vc 13 6 3.0909
rpla 7 70 1e4
rplb 7 131 1e5
d4a 60 141 dm3
d4b 141 14 dm3
gnl 0 8 60 4 1
ve 6 14 3.0909
rnla 60 4 1e4
rnlb 141 4 1e5
*
ip 7 4 2.625E-03
dsub 4 7 dm2
* models
.model qm1 npn (is=8.0000E-16 bf=2.0000E+03)
.model qm2 npn (is=8.0093E-16 bf=4.6667E+03)
.model dm1 d (is=1.000e-19)
.model dm2 d (is=8.000E-16)
.model dm3 d (is=1.000e-20)
.ends OP27
*
.subckt OP227 3 2 7 4 6
x_OP227 3 2 7 4 6 OP27
.ends OP227
*
* - - - - - * fini OP27 family * - - - - - *

```


OP-37 Macromodel

```

*
* Linear Technology OP37 op amp model (with calls for OP237)
* Written: 11-21-1989 Type: Bipolar npn input, internal comp.
* Typical specs:
*   Ref. OP-37 data sheet, LTC 1990 databook p2-345
* Comments:
*   Uses extended phase compensation; input differential mode clamp.
*
* Connections: + - V+V-0
.subckt OP37 3 2 7 4 6
rc1 7 80 6.6315E+02
rc2 7 90 6.6315E+02
q1 80 2 10 qm1
q2 90 3 11 qm2
*
c1 80 91 200e-12
rxcl 91 90 200
cxc1 91 90 200e-12
c2 8 98 1.000e-12
rxcl 8 98 10.00k
cxc2 1 98 5.000e-12
*
cin 3 2 5e-12
ddm1 2 104 dm2
ddm3 104 3 dm2
ddm2 3 105 dm2
ddm4 105 2 dm2
re1 10 12 -2.6233E+01
re2 11 12 -2.6233E+01
iee 12 4 7.5030E-05
re 12 0 2.666E+06
ce 12 0 1.579E-12
gcm 0 8 12 0 7.558E-10
ga 8 0 80 90 1.5080E-03
r2 8 0 1.000E+05
gb 1 0 8 0 1.9176E+03
ro2 1 0 6.900E+01
*
rs 1 6 1
ec1 18 0 1 6 2.828e+01
gc1 0 8 20 0 1
rc1 20 0 1e3
d1 18 20 dm1
d2 20 18 dm1
*
d3a 131 70 dm3
d3b 13 131 dm3
gp1 0 8 70 7 1
vc 13 6 3.0909
rpla 7 70 1e4
rplb 7 131 1e5
d4a 60 141 dm3
d4b 141 14 dm3
gn1 0 8 60 4 1
ve 6 14 3.0909
rnla 60 4 1e4
rn1b 141 4 1e5
*
ip 7 4 2.625E-03
dsub 4 7 dm2
* models
.model qm1 npn (is=8.0000E-16 bf=2.0000E+03)
.model qm2 npn (is=8.0093E-16 bf=4.6667E+03)
.model dm1 d (is=1.000e-19)
.model dm2 d (is=8.000E-16)
.model dm3 d (is=1.000e-20)
.ends OP37
*
.subckt OP237 3 2 7 4 6
x_OP237 3 2 7 4 6 OP37
.ends OP237
*
* - - - - - * fini OP37 family * - - - - - *
    
```


OP-97 Macromodel

```

*
* Linear Technology OP97 op amp model
* Written: 12-06-89 Type: Bipolar npn input, internal comp.
* Typical specs:
* Vos=3.0e-05, Ib=3.0E-11, Ios=2.0E-11, GBP=6.0E+05Hz, Phase mar.= 70 deg,
* SR(+)=2.0E-01V/us, SR(-)=1.9E-01V/us, Av= 126 dB, CMMR= 132 dB,
* Vsat(+)=1.00V, Vsat(-)=1.00V, Isc=+/-12.5mA, Iq= 380uA
* (input differential mode clamp active)
*
* Connections: + - V+V-0
.subckt OP97 3 2 7 4 6
* input
rc1 7 80 8.842E+03
rc2 7 90 8.842E+03
q1 80 2 10 qm1
q2 90 3 11 qm2
ddm1 2 3 dm2
ddm2 3 2 dm2
c1 80 90 5.460E-12
re1 10 12 2.246E+02
re2 11 12 2.246E+02
iee 12 4 6.000E-06
re 12 0 3.333E+07
ce 12 0 1.579E-12
* intermediate
gcm 0 8 12 0 2.841E-11
ga 8 0 80 90 1.131E-04
r2 8 0 1.000E+05
c2 1 8 3.000E-11
gb 1 0 8 0 1.960E+02
* output
ro1 1 6 1.000E+02
ro2 1 0 9.000E+02
rc 17 0 1.063E-04
gc 0 17 6 0 9.408E+03
d1 1 17 dm1
d2 17 1 dm1
d3 6 13 dm2
d4 14 6 dm2
vc 7 13 1.785E+00
ve 14 4 1.785E+00
ip 7 4 3.740E-04
dsub 4 7 dm2
* models
.model qm1 npn (is=8.000E-16 bf=7.500E+04)
.model qm2 npn (is=8.008e-16 bf=1.500E+05)
.model dm1 d (is=1.179E-19)
.model dm2 d (is=8.000E-16)
.ends OP97
*
* - - - - * fini OP97 * - - - - *

```