Report- 11

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Show Deference Between Without Trojan and with Trojan Circuit

1. Job statistics summary

No	Without Trojan	With Trojan
01	tnom= 25.000	tnom= 25.000
02	temp= 25.000	temp= 25.000

2. HSPICE Threads Information

No	Without Trojan	With Trojan	
01	Command Line Threads Count:1	Command Line Threads Count :1	
02	Available CPU Count :8	Available CPU Count:8	
03	Actual Threads Count:1	Actual Threads Count :1	

3. Circuit Statistics

No	Without Trojan	With Trojan		
01	nodes = 33	nodes $=$ 45		
02	elements = 10	elements = 12		
03	mosfets = 6	mosfets = 8		
04	volt_srcs = 4	$volt_srcs = 4$		

4. Without Trojan:

***** Runtime Statistics (seconds) *****

analysis	time	# points	tot. iter	conv.iter
op point	0.00	1	18	
transient	0.01	201	522	148 rev = 20
readin	0.03			
errchk	0.01			
setup	0.00			
output	0.00			
neak	memory II	ced /	18 66 megs	hytes

peak memory used 48.66 megabytes total cpu time 0.05 seconds total elapsed time 0.29 seconds

With Trojan:

***** Runtime Statistics (seconds) ******

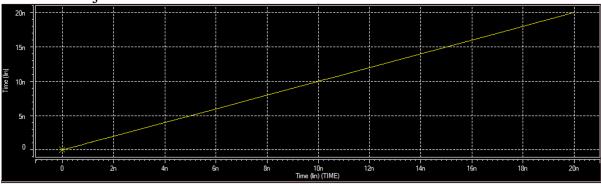
		`	,		
analysis	time	# points	tot. iter	conv.ite	er
op point	0.00	1	18		
transient	0.03	201	1229	237 rev=	67
readin	0.02				
errchk	0.01				
setup	0.00				
output	0.00				
1		1	10.70	1 4	

peak memory used 48.68 megabytes total cpu time 0.06 seconds total elapsed time 0.25 seconds

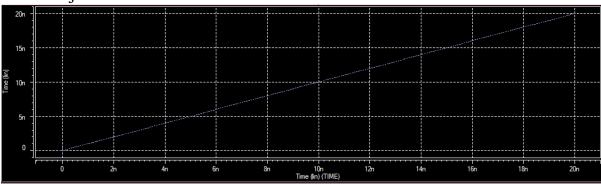
Graph Difference

1. Time

Without Trojan:



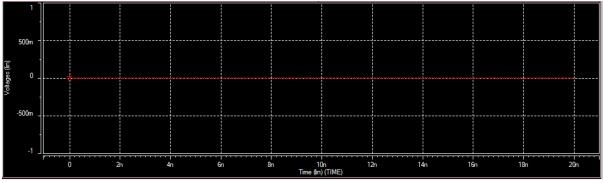
With Trojan:



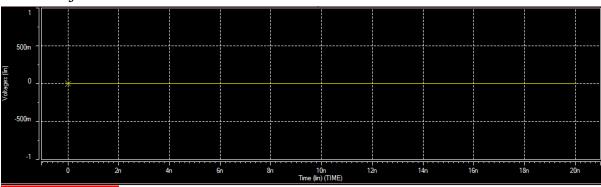
Remarks: Same

2. Voltage [v(0)]

Without Trojan:

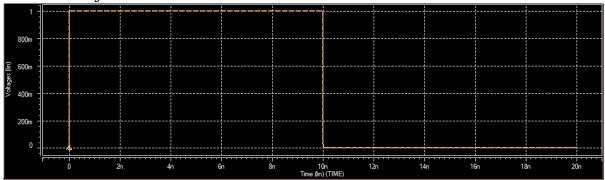


With Trojan:

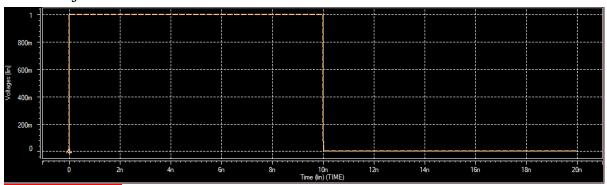


3. Voltage [v(bl)]

Without Trojan:



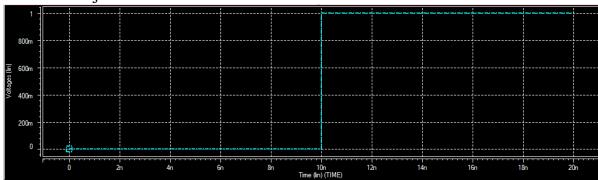
With Trojan:



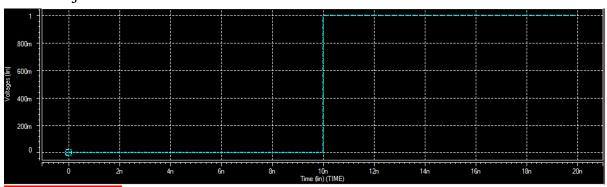
Remarks: Same

4. Voltage [v(blb)]

Without Trojan:

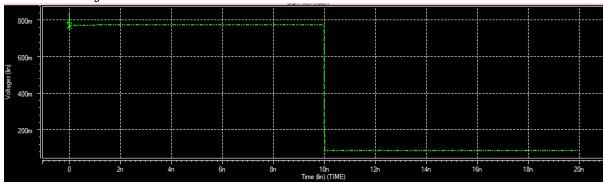


With Trojan:

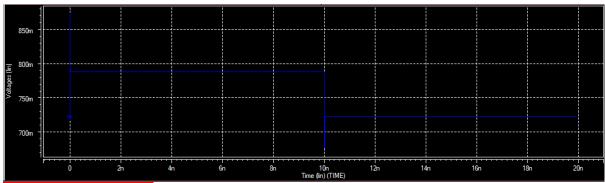


5. Voltage [v(q)]

Without Trojan:



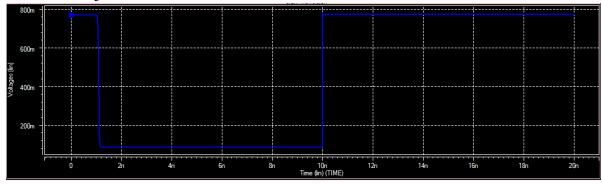
With Trojan:



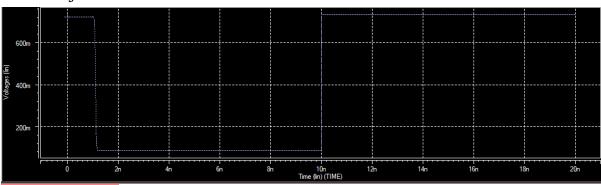
Remarks: Not Same

6. Voltage [v(qr)]

Without Trojan:

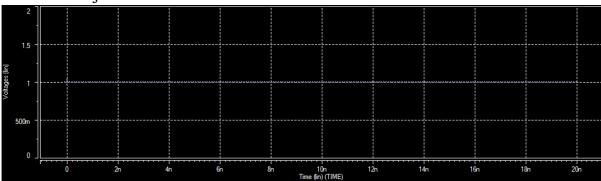


With Trojan:

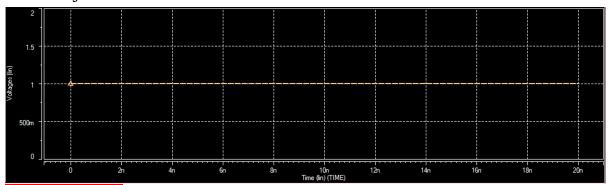


7. Voltage [v(vdd)]

Without Trojan:



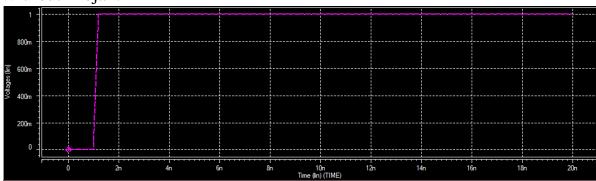
With Trojan:



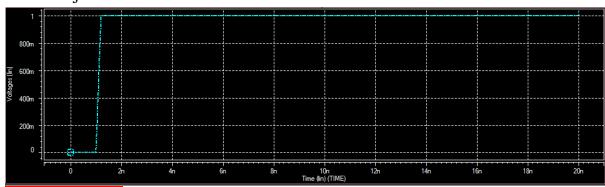
Remarks: Same

8. Voltage [v(wl)]

Without Trojan:

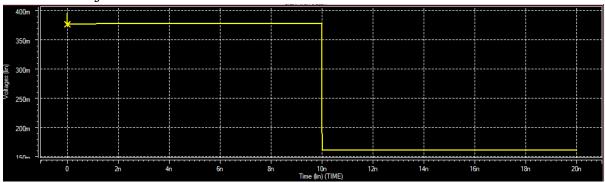


With Trojan:

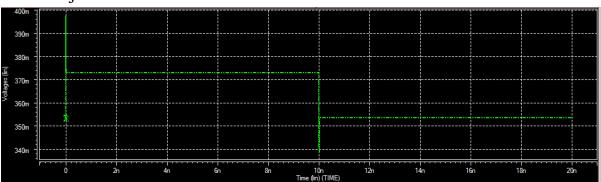


9. Voltage [v(x)]

Without Trojan:



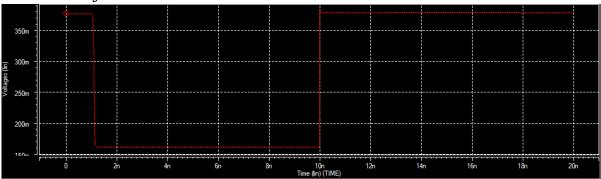
With Trojan:



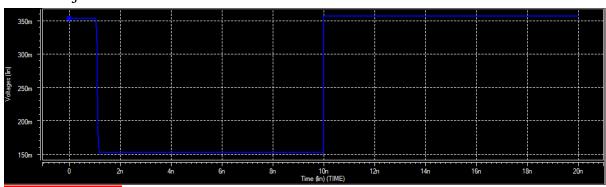
Remarks: Not Same

10.Voltage [v(y)]

Without Trojan:

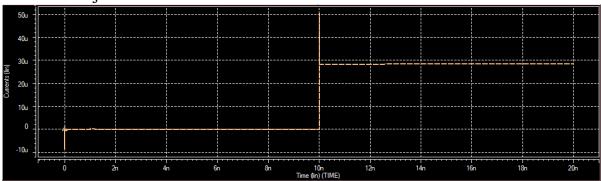


With Trojan:

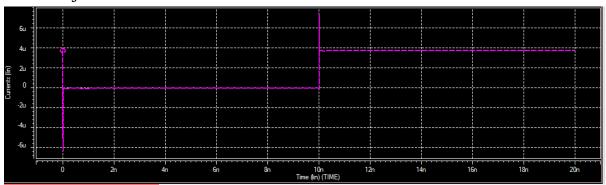


11. Current [i(vbl)]

Without Trojan:



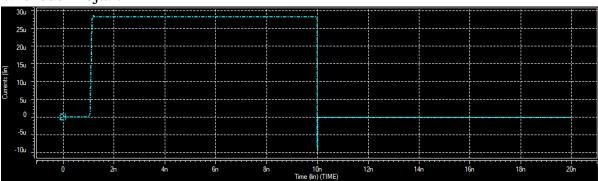
With Trojan:



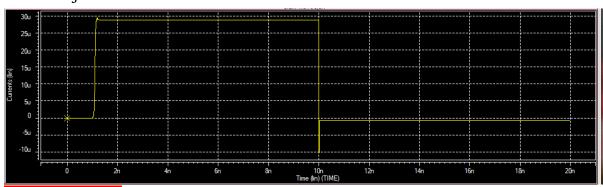
Remarks: Not Same.

12.Current [i(vblb)]

Without Trojan:

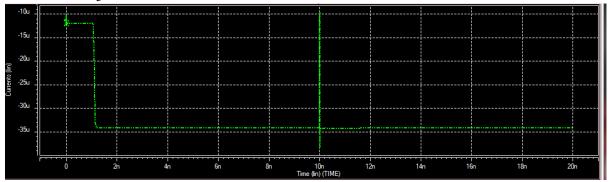


With Trojan:

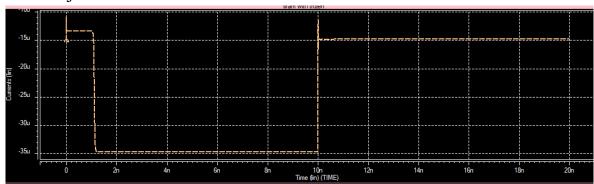


13.Current [i(vvdd)]

Without Trojan:



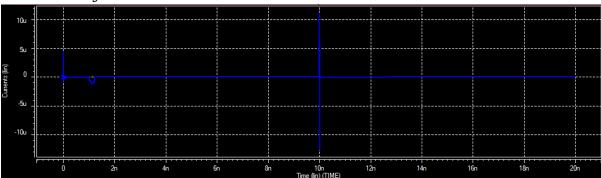
With Trojan:



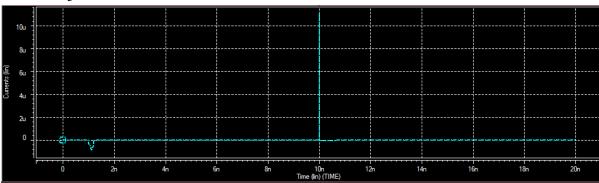
Remarks: Not Same

14.Current [i(vwl)]

Without Trojan:



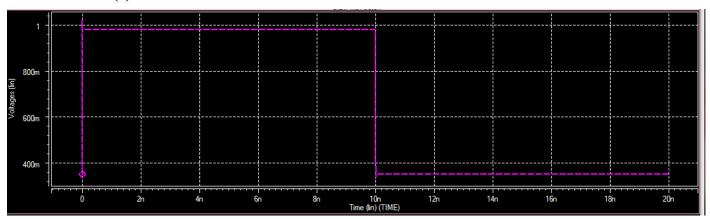
With Trojan:



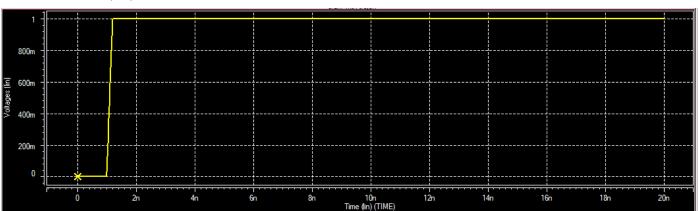
Remarks: Not Same

Some voltage which show only with Trojan SRAM

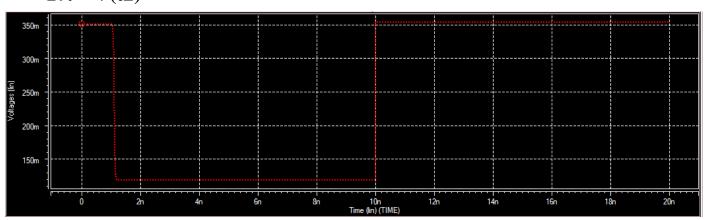
15. V(t)



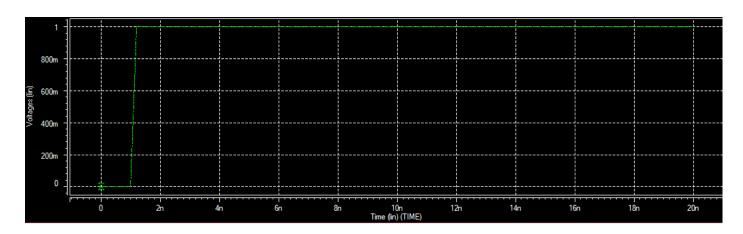
16. V(t1)



17. V(t2)



 $18. \qquad V(i5)$



Netlist Without Trojan

```
** SRAM without trojen
```

M1 Q X 0 0 nmos w=90n l=45n

M2 Q X vdd vdd pmos w=90n l=45n

M3 QR Y 0 0 nmos w=90n l=45n

M4 QR Y vdd vdd pmos w=90n l=45n

Mi5 Q wl bl bl nmos w=90n l=45n

M6 blb wl QR blb nmos w=90n l=45n

** Voltage source

Vbl bl 0 pulse(0 1 0n 0.01n 0.01n 10n 20n)

Vblb blb 0 pulse(0 1 10n 0.01n 0.01n 10n 20n)

Vvdd vdd 0 1

**Access Control

Vwl wl 0 pwl(0 0 1n 0 1.2n 1 5n 1)

.tran 0.1n 20n

.model nmos nmos level = 54

+version = 4.0 binunit = 1 paramchk= 1 mobmod = 0

+capmod = 2 igcmod = 1 igbmod = 1 geomod = 1

+diomod = 1 rdsmod = 0 rbodymod = 1 rgatemod = 1

+permod = 1 acnqsmod= 0 trnqsmod= 0

* parameters related to the technology node

+tnom = 27 epsrox = 3.9

+eta0 = 0.0049 nfactor = 2.1 wint = 5e-09

+cgso = 1.1e-10 cgdo = 1.1e-10 xl = -2e-08

* parameters customized by the user

```
+\text{toxe} = 1.75\text{e-}09 \quad \text{toxp} = 1.1\text{e-}09 \quad \text{toxm} = 1.75\text{e-}09 \quad \text{toxref} = 1.75\text{e-}09
+dtox = 6.5e-10 lint = 3.75e-09
+vth0 = 0.469  k1 = 0.528  u0 = 0.04372  vsat = 147390
+rdsw = 155 ndep = 3.28e+18 xj = 1.4e-08
* secondary parameters
     = 0
+11
               wl
                              lln = 1
                                             wln = 1
+lw
      =0
                       =0
                                lwn = 1
                ww
                                                 wwn
                                                      = 1
+lwl
      =0
                       =0
                wwl
                                 xpart = 0
+k2
      = 0.01
                 k3
                       =0
+k3b
      =0
                 w0
                       = 2.5e-006
                                   dvt0 = 1
                                                    dvt1 = 2
+dvt2 = -0.032
                   dvt0w = 0
                                    dvt1w = 0
                                                     dvt2w = 0
                  minv = 0.05
                                   voffl = 0
                                                   dvtp0 = 1.0e-009
+dsub = 0.1
                  lpe0 = 0
+dvtp1 = 0.1
                                  lpeb = 0
                    nsd = 2e + 020
+ngate = 2e+020
                                      phin = 0
+cdsc = 0.000
                  cdscb = 0
                                   cdscd = 0
                                                    cit = 0
                  etab = 0
+voff = -0.13
+vfb = -0.55
                                         = 1.2e-018
                       = 6e-010
                                   ub
                 ua
                     = 1.0
                                    = 1e-020
+uc
      =0
                a0
                                ags
+a1
      =0
                a2
                     = 1.0
                                b0
                                     =0
                                               b1
+keta = 0.04
                  dwg = 0
                                  dwb = 0
                                                   pclm = 0.04
                                      pdibleb = -0.005
+pdiblc1 = 0.001
                   pdiblc2 = 0.001
                                                         drout = 0.5
                   delta = 0.01
                                    pscbe1 = 8.14e + 008 \quad pscbe2 = 1e-007
+pvag = 1e-020
+fprout = 0.2
                  pdits = 0.08
                                   pditsd = 0.23
                                                    pdits1 = 2.3e + 006
     = 5
                rsw = 85
+rsh
                                rdw = 85
+rdswmin = 0
                   rdwmin = 0
                                     rswmin = 0
                                                      prwg = 0
+prwb = 6.8e-011
                          = 1
                                    alpha0 = 0.074
                                                      alpha1 = 0.005
                    wr
+beta0 = 30
                  agid1 = 0.0002
                                    bgidl = 2.1e+009 cgidl = 0.0002
+egidl = 0.8
+aigbacc = 0.012
                   bigbacc = 0.0028
                                       cigbacc = 0.002
+nigbacc = 1
                  aigbinv = 0.014
                                     bigbinv = 0.004
                                                        cigbinv = 0.004
+eigbinv = 1.1
                  nigbinv = 3
                                    aigc = 0.012
                                                     bigc = 0.0028
                                   bigsd = 0.0028
+cigc = 0.002
                  aigsd = 0.012
                                                       cigsd = 0.002
+nigc = 1
                poxedge = 1
                                  pigcd = 1
                                                   ntox = 1
+xrcrg1 = 12
                  xrcrg2 = 5
+cgbo = 2.56e-011 cgdl = 2.653e-10
```

```
+cgsl = 2.653e-10 ckappas = 0.03
                                       ckappad = 0.03
                                                          acde = 1
                  noff = 0.9
                                  voffcv = 0.02
+moin = 15
+kt1
      = -0.11
                  kt11 = 0
                                 kt2
                                       = 0.022
                                                  ute
                                                      = -1.5
       = 4.31e-009 ub1 = 7.61e-018 uc1 = -5.6e-011 prt
+ua1
                                                               = 0
      = 33000
+at
                   tnoimod = 0
+fnoimod = 1
+iss
     = 0.0001
                  jsws = 1e-011
                                    iswgs = 1e-010
                                                       njs
                                                             = 1
+ijthsfwd = 0.01
                   iithsrev=0.001
                                   bvs = 10
                                                      xibvs = 1
                  jswd = 1e-011
+isd
    = 0.0001
                                     jswgd = 1e-010
                                                        nid = 1
+ijthdfwd=0.01
                   ijthdrev = 0.001
                                      bvd = 10
                                                      xibvd = 1
                cis = 0.0005
                                  mis = 0.5
                                                  pbsws = 1
+pbs = 1
+cjsws = 5e-010
                   misws = 0.33
                                      pbswgs = 1
                                                        ciswgs = 3e-010
+mjswgs = 0.33
                    pbd = 1
                                    cid = 0.0005
                                                     mid = 0.5
+pbswd = 1
                  ciswd = 5e-010
                                     miswd = 0.33
                                                        pbswgd = 1
                                       tpb = 0.005
                                                         tci = 0.001
+cjswgd = 5e-010
                    mjswgd = 0.33
+tpbsw = 0.005
                   tcisw = 0.001
                                     tpbswg = 0.005
                                                        tciswg = 0.001
+xtis = 3
                xtid = 3
+dmcg = 0e-006
                    dmci = 0e-006
                                       dmdg = 0e-006
                                                           dmcgt = 0e-007
+dwi = 0.0e-008
                   xgw
                         = 0e-007
                                      xg1 = 0e-008
                 gbmin = 1e-010
+rshg = 0.4
                                     rbpb = 5
                                                     rbpd = 15
                                  rbsb = 15
+rbps = 15
                 rbdb = 15
                                                  ngcon = 1
.model pmos pmos level = 54
+version = 4.0 binunit = 1 paramchk= 1 mobmod = 0
               igcmod = 1 \quad igbmod = 1 \quad geomod = 1
+capmod = 2
+diomod = 1
               rdsmod = 0 rbodymod= 1 rgatemod= 1
               acngsmod= 0 trngsmod= 0
+permod = 1
* parameters related to the technology node
+tnom = 27 epsrox = 3.9
+eta0 = 0.0049 nfactor = 2.1 wint = 5e-09
+cgso = 1.1e-10 cgdo = 1.1e-10 xl = -2e-08
* parameters customized by the user
+\text{toxe} = 1.85\text{e-}09 \quad \text{toxp} = 1.1\text{e-}09 \quad \text{toxm} = 1.85\text{e-}09 \quad \text{toxref} = 1.85\text{e-}09
+dtox = 7.5e-10 lint = 3.75e-09
+vth0 = -0.418 k1 = 0.488 u0 = 0.00439 vsat = 70000
+rdsw = 155 ndep = 2.5e+18 xj = 1.4e-08
```

```
*secondary parameters
     = 0
                            lln = 1
+11
              wl
                   = 0
                                          wln = 1
+lw
      =0
               WW
                     =0
                              lwn = 1
                                             wwn = 1
     =0
                     =0
+lwl
               wwl
                              xpart = 0
+k2
      = -0.01
                     =0
                k3
     =0
                     = 2.5e-006
                                dvt0 = 1
                                               dvt1 = 2
+k3b
               w0
                 dvt0w = 0
+dvt2 = -0.032
                                 dvt1w = 0
                                                 dvt2w = 0
+dsub = 0.1
                minv = 0.05
                                voffl = 0
                                               dvtp0 = 1e-009
+dvtp1 = 0.05
                 lpe0 = 0
                               lpeb = 0
+ngate = 2e+020
                  nsd = 2e + 020
                                   phin = 0
+cdsc = 0.000
                 cdscb = 0
                                cdscd = 0
                                               cit
                                                   =0
+voff = -0.126
                 etab = 0
     = 0.55
                     = 2.0e-009
                                 ub = 0.5e-018
+vfb
                ua
                             ags = 1e-020
+uc
      =0
               a0
                    = 1.0
      =0
               a2
                    = 1
                             b0
                                  = -1e-020
                                             b1
+a1
                                                  =0
                 dwg = 0
                                dwb = 0
+keta = -0.047
                                               pclm = 0.12
                  pdiblc2 = 0.001
                                   pdiblcb = 3.4e-008 drout = 0.56
+pdiblc1 = 0.001
+pvag = 1e-020
                  delta = 0.01
                                 pscbe1 = 8.14e+008 pscbe2 = 9.58e-007
                pdits = 0.08
+fprout = 0.2
                                pditsd = 0.23
                                                pdits1 = 2.3e+006
+rsh = 5
               rsw = 85
                              rdw = 85
+rdswmin = 0
                 rdwmin = 0
                                  rswmin = 0
                                                  prwg = 3.22e-008
+prwb = 6.8e-011 wr = 1
                                 alpha0 = 0.074
                                                  alpha1 = 0.005
+beta0 = 30
                agid1 = 0.0002
                                 bgidl = 2.1e+009 cgidl = 0.0002
+egidl = 0.8
               bigbacc = 0.0028
+aigbacc = 0.012
                                    cigbacc = 0.002
                aigbinv = 0.014
+nigbacc = 1
                                  bigbinv = 0.004
                                                   cigbinv = 0.004
+eigbinv = 1.1
                 nigbinv = 3
                                 aigc = 0.69
                                                bigc = 0.0012
+cigc = 0.0008
                 aigsd = 0.0087
                                  bigsd = 0.0012
                                                   cigsd = 0.0008
               poxedge = 1
                                pigcd = 1
+nigc = 1
                                               ntox = 1
+xrcrg1 = 12
                xrcrg2 = 5
+cgbo = 2.56e-011 cgdl = 2.653e-10
+cgsl = 2.653e-10 ckappas = 0.03
                                   ckappad = 0.03
                                                     acde = 1
+moin = 15
                noff = 0.9
                               voffcv = 0.02
                kt11 = 0
                              kt2 = 0.022
                                                  = -1.5
+kt1
      = -0.11
                                              ute
```

= 4.31e-009 ub1 = 7.61e-018 uc1 = -5.6e-011 prt

+ua1

```
= 33000
+at
                  tnoimod = 0
+fnoimod = 1
      = 0.0001
                 jsws = 1e-011
                                  jswgs = 1e-010
                                                          = 1
+iss
                                                    njs
                  ijthsrev=0.001
+ijthsfwd = 0.01
                                   bvs
                                         = 10
                                                   xibvs = 1
+isd
      = 0.0001
                 jswd = 1e-011
                                   jswgd = 1e-010
                                                     njd
                                                         = 1
+ijthdfwd = 0.01
                  ijthdrev=0.001
                                    bvd = 10
                                                    xibvd = 1
     = 1
                cis
                    = 0.0005
                                mis
                                      = 0.5
                                               pbsws = 1
+pbs
+cisws = 5e-010
                  mjsws = 0.33
                                    pbswgs = 1
                                                     cjswgs = 3e-010
+mjswgs = 0.33
                   pbd = 1
                                  cid
                                       = 0.0005
                                                  mid = 0.5
+pbswd = 1
                 cjswd = 5e-010
                                   mjswd = 0.33
                                                     pbswgd = 1
                   mjswgd = 0.33
+cjswgd = 5e-010
                                     tpb
                                         = 0.005
                                                      tci = 0.001
+tpbsw = 0.005
                  tcisw = 0.001
                                   tpbswg = 0.005
                                                     tciswg = 0.001
+xtis = 3
               xtid = 3
+dmcg = 0e-006
                   dmci = 0e-006
                                     dmdg = 0e-006
                                                       dmcgt = 0e-007
+dwj
      = 0.0e-008
                  xgw
                         = 0e-007
                                    xgl
                                        = 0e-008
                                   rbpb = 5
                gbmin = 1e-010
                                                  rbpd = 15
+rshg = 0.4
                rbdb = 15
+rbps = 15
                                rbsb = 15
                                                ngcon = 1
.options POST=2
.options AUTOSTOP
.options INGOLD=2 DCON=1
.options GSHUNT=1e-12 RMIN=1e-15
.options ABSTOL=1e-5 ABSVDC=1e-4
.options RELTOL=1e-2 RELVDC=1e-2
.options NUMDGT=4 PIVOT=13
.options runlvl=6
```

Netlist with Trojan

** SRAM with trojen

.end

M1 Q X 0 0 nmos w=90n l=45n

M2 Q X vdd vdd pmos w=90n l=45n

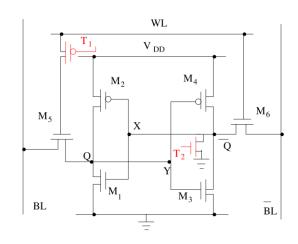
M3 QR Y 0 0 nmos w=90n l=45n

M4 QR Y vdd vdd pmos w=90n l=45n

Mi5 Q T bl bl nmos w=90n l=45n

M6 blb wl QR blb nmos w=90n l=45n

MT i5 T1 wl wl pmos w=90n l=45n



```
MTr QR T2 0 0 nmos w=90n l=45n
** Voltage source
Vbl bl 0 pulse(0 1 0n 0.01n 0.01n 10n 20n)
Vblb blb 0 pulse(0 1 10n 0.01n 0.01n 10n 20n)
Vvdd vdd 01
**Access Control
Vwl wl 0 pwl(0 0 1n 0 1.2n 1 5n 1)
.tran 0.1n 20n
.model nmos nmos level = 54
+version = 4.0 binunit = 1 paramchk= 1 mobmod = 0
+capmod = 2
                igcmod = 1 igbmod = 1
                                           geomod = 1
+diomod = 1
               rdsmod = 0 rbodymod= 1 rgatemod= 1
+permod = 1
               acnqsmod= 0 trnqsmod= 0
* parameters related to the technology node
+tnom = 27 epsrox = 3.9
+eta0 = 0.0049 nfactor = 2.1 wint = 5e-09
+cgso = 1.1e-10 cgdo = 1.1e-10 xl = -2e-08
* parameters customized by the user
+\text{toxe} = 1.75\text{e-}09 \quad \text{toxp} = 1.1\text{e-}09 \quad \text{toxm} = 1.75\text{e-}09 \quad \text{toxref} = 1.75\text{e-}09
+dtox = 6.5e-10 lint = 3.75e-09
+vth0 = 0.469  k1 = 0.528  u0 = 0.04372  vsat = 147390
+rdsw = 155 ndep = 3.28e+18 xj = 1.4e-08
* secondary parameters
+11
      = 0
               wl
                     =0
                               lln = 1
                                               wln
                                                     = 1
+lw
      =0
                 ww
                       =0
                                 lwn = 1
                                                  wwn = 1
+lwl
     =0
                       =0
                                 xpart = 0
                wwl
+k2
      = 0.01
                  k3
                       =0
      =0
                       = 2.5e-006
                                    dvt0 = 1
+k3b
                 w0
                                                     dvt1 = 2
+dvt2 = -0.032
                   dvt0w = 0
                                     dvt1w = 0
                                                      dvt2w = 0
+dsub = 0.1
                  minv = 0.05
                                    voffl = 0
                                                     dvtp0 = 1.0e-009
+dvtp1 = 0.1
                  lpe0 = 0
                                   lpeb = 0
+ngate = 2e+020
                    nsd = 2e + 020
                                       phin = 0
+cdsc = 0.000
                   cdscb = 0
                                    cdscd = 0
                                                     cit
                                                          =0
+voff = -0.13
                  etab = 0
```

= 6e-010

ua

ub

= 1.2e-018

+vfb = -0.55

```
=0
                     = 1.0
                                    = 1e-020
               a0
+uc
                               ags
                              b0
                                                   =0
+a1
      =0
               a2
                     = 1.0
                                    =0
                                             b1
+keta = 0.04
                 dwg = 0
                                 dwb = 0
                                                 pclm = 0.04
                   pdiblc2 = 0.001
                                     pdibleb = -0.005
+pdiblc1 = 0.001
                                                       drout = 0.5
                                   pscbe1 = 8.14e + 008 \quad pscbe2 = 1e-007
                   delta = 0.01
+pvag = 1e-020
+fprout = 0.2
                 pdits = 0.08
                                 pditsd = 0.23
                                                  pdits1 = 2.3e + 006
               rsw = 85
    = 5
                               rdw = 85
+rdswmin = 0
                  rdwmin = 0
                                   rswmin = 0
                                                     prwg = 0
                                  alpha0 = 0.074
+prwb = 6.8e-011
                   wr
                         = 1
                                                    alpha1 = 0.005
+beta0 = 30
                 agidl = 0.0002
                                  bgidl = 2.1e+009 cgidl = 0.0002
+egidl = 0.8
+aigbacc = 0.012
                   bigbacc = 0.0028
                                      cigbacc = 0.002
+nigbacc = 1
                 aigbinv = 0.014
                                   bigbinv = 0.004
                                                     cigbinv = 0.004
+eigbinv = 1.1
                  nigbinv = 3
                                  aigc = 0.012
                                                   bigc = 0.0028
+cigc = 0.002
                 aigsd = 0.012
                                  bigsd = 0.0028
                                                     cigsd = 0.002
+nigc = 1
                poxedge = 1
                                 pigcd = 1
                                                 ntox = 1
+xrcrg1 = 12
                 xrcrg2 = 5
+cgbo = 2.56e-011 cgdl = 2.653e-10
+cgsl = 2.653e-10 ckappas = 0.03
                                     ckappad = 0.03
                                                       acde = 1
                                 voffcv = 0.02
+moin = 15
                 noff = 0.9
      = -0.11
                                     = 0.022
+kt1
                 kt11 = 0
                                kt2
                                                ute
                                                    = -1.5
     = 4.31e-009 ub1 = 7.61e-018 uc1 = -5.6e-011 prt = 0
+ua1
     = 33000
+at
+fnoimod = 1
                  tnoimod = 0
+iss
      = 0.0001
                 jsws = 1e-011
                                  jswgs = 1e-010
                                                     njs
                                                          = 1
+ijthsfwd = 0.01
                  ijthsrev=0.001
                                   bvs = 10
                                                   xibvs = 1
     = 0.0001
                 jswd = 1e-011
                                   jswgd = 1e-010
                                                      nid = 1
+isd
+ijthdfwd = 0.01
                  ijthdrev=0.001
                                                    xibvd = 1
                                    bvd = 10
                                mis = 0.5
                                                pbsws = 1
+pbs
     = 1
                cis = 0.0005
+cisws = 5e-010
                   misws = 0.33
                                    pbswgs = 1
                                                     ciswgs = 3e-010
+mjswgs = 0.33
                                  cid = 0.0005
                   pbd = 1
                                                   mid = 0.5
                 cjswd = 5e-010
+pbswd = 1
                                    mjswd = 0.33
                                                     pbswgd = 1
                                      tpb = 0.005
                                                      tci = 0.001
+cjswgd = 5e-010
                   mjswgd = 0.33
+tpbsw = 0.005
                  tcisw = 0.001
                                    tpbswg = 0.005
                                                      tcjswg = 0.001
+xtis = 3
               xtid = 3
```

```
dmci = 0e-006
+dmcg = 0e-006
                                       dmdg = 0e-006
                                                           dmcgt = 0e-007
+dwi
       = 0.0e-008
                    xgw
                          = 0e-007
                                      xgl
                                           = 0e-008
+rshg = 0.4
                 gbmin = 1e-010
                                     rbpb = 5
                                                     rbpd = 15
                 rbdb = 15
                                  rbsb = 15
+rbps = 15
                                                   ngcon = 1
.model pmos pmos level = 54
+version = 4.0 binunit = 1 paramchk= 1 mobmod = 0
               igcmod = 1 \quad igbmod = 1 \quad geomod = 1
+capmod = 2
+diomod = 1
               rdsmod = 0 rbodymod = 1 rgatemod = 1
               acnqsmod= 0 trnqsmod= 0
+permod = 1
* parameters related to the technology node
+tnom = 27 epsrox = 3.9
+eta0 = 0.0049 nfactor = 2.1 wint = 5e-09
+cgso = 1.1e-10 cgdo = 1.1e-10 xl = -2e-08
* parameters customized by the user
+\text{toxe} = 1.85\text{e-}09 \quad \text{toxp} = 1.1\text{e-}09 \quad \text{toxm} = 1.85\text{e-}09 \quad \text{toxref} = 1.85\text{e-}09
+dtox = 7.5e-10 lint = 3.75e-09
+vth0 = -0.418 k1 = 0.488 u0 = 0.00439 vsat = 70000
+rdsw = 155 ndep = 2.5e+18 xj = 1.4e-08
*secondary parameters
+11
     = 0
               wl
                     =0
                              lln = 1
                                              wln
                                                  = 1
+lw
      =0
                       =0
                                 lwn = 1
                                                 wwn = 1
                \mathbf{w}\mathbf{w}
                                 xpart = 0
+lwl
     = 0
                wwl
                       =0
      = -0.01
+k2
                 k3
                       =0
+k3b
     =0
                 w0
                       = 2.5e-006
                                   dvt0 = 1
                                                    dvt1 = 2
                   dvt0w = 0
+dvt2 = -0.032
                                    dvt1w = 0
                                                     dvt2w = 0
                                                   dvtp0 = 1e-009
+dsub = 0.1
                  minv = 0.05
                                   voffl = 0
+dvtp1 = 0.05
                  lpe0 = 0
                                   lpeb = 0
+ngate = 2e+020
                    nsd = 2e + 020
                                       phin = 0
+cdsc = 0.000
                  cdscb = 0
                                   cdscd = 0
                                                         =0
                                                    cit
+voff = -0.126
                  etab = 0
+vfb = 0.55
                       = 2.0e-009
                                          = 0.5e-018
                 ua
                                    ub
                      = 1.0
+uc
      =0
                a0
                                ags = 1e-020
                a2
                      = 1
                               b0
+a1
      =0
                                     = -1e-020
                                                 b1
                                                       =0
+keta = -0.047
                  dwg = 0
                                   dwb = 0
                                                   pclm = 0.12
+pdiblc1 = 0.001
                   pdiblc2 = 0.001
                                      pdiblcb = 3.4e-008
                                                          drout = 0.56
```

```
+pvag = 1e-020
                  delta = 0.01
                                  pscbe1 = 8.14e + 008 \quad pscbe2 = 9.58e - 007
+fprout = 0.2
                pdits = 0.08
                                pditsd = 0.23
                                                pdits1 = 2.3e+006
+rsh = 5
               rsw = 85
                              rdw = 85
                 rdwmin = 0
                                  rswmin = 0
                                                   prwg = 3.22e-008
+rdswmin = 0
                                 alpha0 = 0.074
+prwb = 6.8e-011 wr
                      = 1
                                                  alpha1 = 0.005
+beta0 = 30
                agid1 = 0.0002
                                 bgidl = 2.1e+009
                                                   cgidl = 0.0002
+egidl = 0.8
+aigbacc = 0.012
                  bigbacc = 0.0028
                                    cigbacc = 0.002
+nigbacc = 1
                 aigbinv = 0.014
                                  bigbinv = 0.004
                                                    cigbinv = 0.004
+eigbinv = 1.1
                 nigbinv = 3
                                 aigc = 0.69
                                                 bigc = 0.0012
+cigc = 0.0008
                 aigsd = 0.0087
                                  bigsd = 0.0012
                                                    cigsd = 0.0008
               poxedge = 1
+nigc = 1
                                pigcd = 1
                                               ntox = 1
+xrcrg1 = 12
                 xrcrg2 = 5
+cgbo = 2.56e-011 cgdl = 2.653e-10
+cgs1 = 2.653e-10 ckappas = 0.03
                                    ckappad = 0.03
                                                     acde = 1
+moin = 15
                 noff = 0.9
                                voffcv = 0.02
      = -0.11
                kt11 = 0
                               kt2 = 0.022
+kt1
                                                  = -1.5
                                               ute
+ua1 = 4.31e-009 ub1 = 7.61e-018 uc1 = -5.6e-011 prt
                                                           =0
+at
     = 33000
+fnoimod = 1
                 tnoimod = 0
                jsws = 1e-011
                                 jswgs = 1e-010
    = 0.0001
+iss
                                                   nis = 1
                ijthsrev = 0.001
+ijthsfwd = 0.01
                                bvs = 10
                                                  xibvs = 1
+isd = 0.0001
                 jswd = 1e-011
                                jswgd = 1e-010
                                                    nid = 1
+ijthdfwd = 0.01
                  ijthdrev=0.001
                                                  xibvd = 1
                                   bvd = 10
+pbs
    = 1
               cis = 0.0005
                               mis = 0.5
                                              pbsws = 1
+cjsws = 5e-010
                  misws = 0.33
                                   pbswgs = 1
                                                   cjswgs = 3e-010
+mjswgs = 0.33
                  pbd = 1
                                 cid = 0.0005
                                                 mid = 0.5
+pbswd = 1
                 ciswd = 5e-010
                                  miswd = 0.33
                                                    pbswgd = 1
+cjswgd = 5e-010
                   mjswgd = 0.33
                                     tpb = 0.005
                                                     tci = 0.001
+tpbsw = 0.005
                  tcisw = 0.001
                                   tpbswg = 0.005
                                                    tcjswg = 0.001
+xtis = 3
               xtid = 3
                                  dmdg = 0e-006
+dmcg = 0e-006
                  dmci = 0e-006
                                                      dmcgt = 0e-007
+dwi = 0.0e-008
                  xgw = 0e-007
                                   xg1 = 0e-008
+rshg = 0.4
                gbmin = 1e-010
                                  rbpb = 5
                                                 rbpd = 15
+rbps = 15
                rbdb = 15 rbsb = 15
                                               ngcon = 1
```

- .options POST=2
- .options AUTOSTOP
- .options INGOLD=2 DCON=1
- .options GSHUNT=1e-12 RMIN=1e-15
- .options ABSTOL=1e-5 ABSVDC=1e-4
- .options RELTOL=1e-2 RELVDC=1e-2
- .options NUMDGT=4 PIVOT=13
- .options runlvl=6
- .end

THE END