# Report- 13

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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 = 31	nodes $=$ 43
02	elements = 8	elements = 10
03	mosfets = 6	mosfets = 8
04	volt_srcs = 2	$volt\_srcs = 2$

#### 4. Without Trojan:

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

analysis	time	# points	tot. iter	conv.iter
op point	0.00	1	21	
transient	0.02	201	946	162  rev = 49
readin	0.01			
errchk	0.00			
setup	0.00			
output	0.00			
neak r	nemory ii	ised 4	18 68 meg	ahytes

peak memory used 48.68 megabytes total cpu time 0.03 seconds total elapsed time 0.20 seconds

#### With Trojan:

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

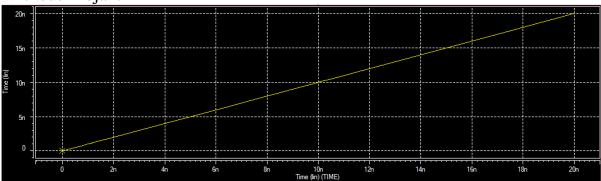
analysis	time	# points	tot. iter	conv.iter
op point	0.00	1	20	
transient	0.01	201	325	92  rev = 13
readin	0.01			
errchk	0.00			
setup	0.00			
output	0.00			
neak me	moru II	ced /	18 66 mea	abytes

peak memory used 48.66 megabytes total cpu time 0.02 seconds total elapsed time 0.17 seconds

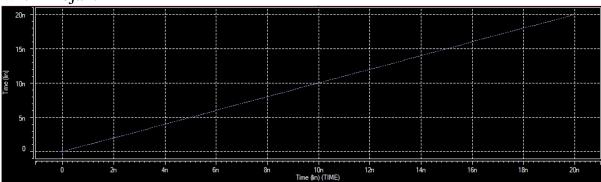
## **Graph Difference**

#### 1. Time

Without Trojan:



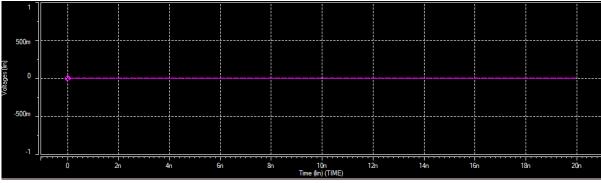
With Trojan:



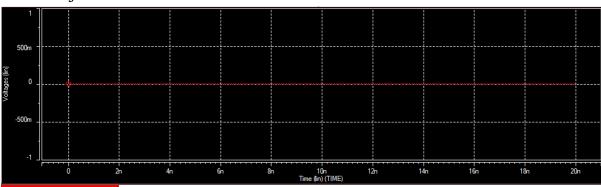
Remarks: Same

## 2. Voltage [v(0)]

Without Trojan:



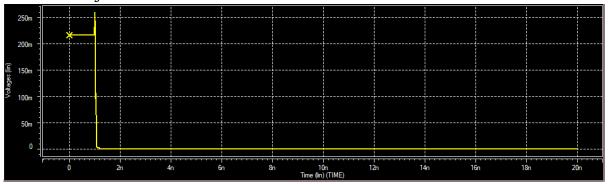
With Trojan:



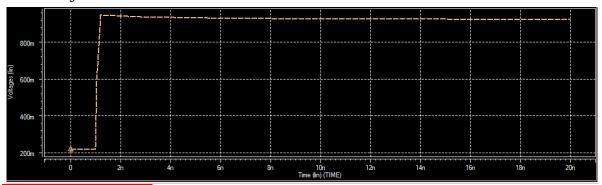
Remarks: Same

### 3. Voltage [v(bl)]

## Without Trojan:



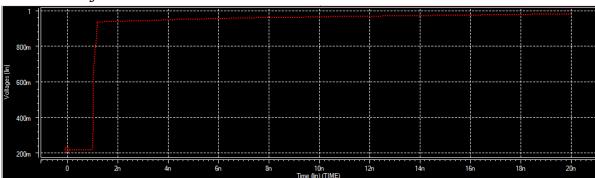
# With Trojan:



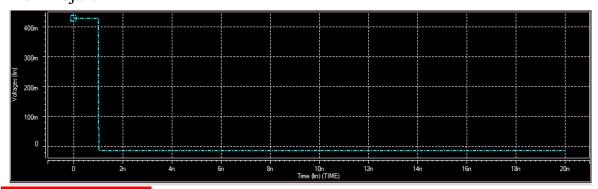
Remarks: Not Same

### 4. Voltage [v(blb)]

## Without Trojan:



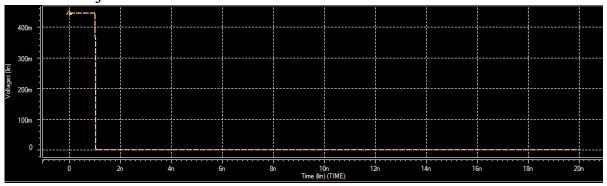
### With Trojan:



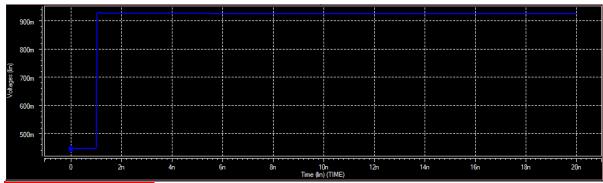
Remarks: Not Same

#### **5.** Voltage [v(q)]

## Without Trojan:



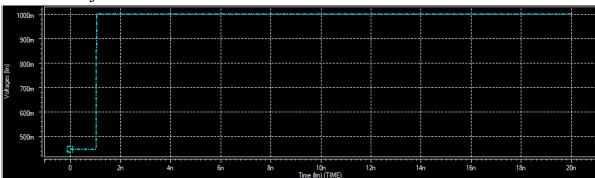
## With Trojan:



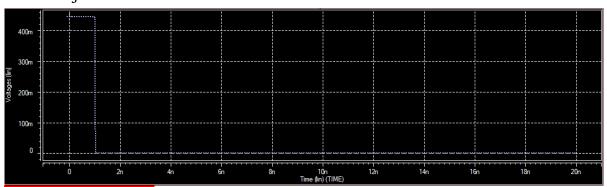
Remarks: Not Same

## 6. Voltage [v(qr)]

## Without Trojan:



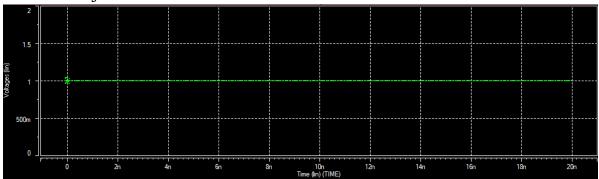
### With Trojan:



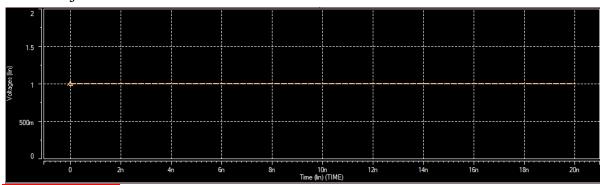
Remarks: Not Same

### 7. Voltage [v(vdd)]

Without Trojan:



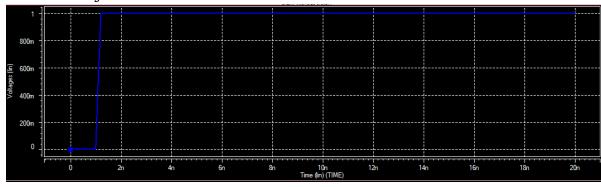
## With Trojan:



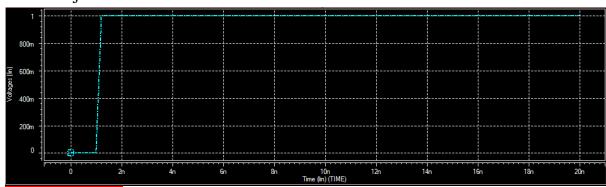
Remarks: Same

# 8. Voltage [v(wl)]

Without Trojan:



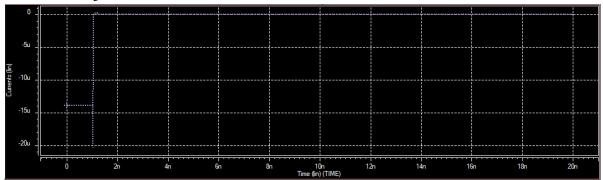
With Trojan:



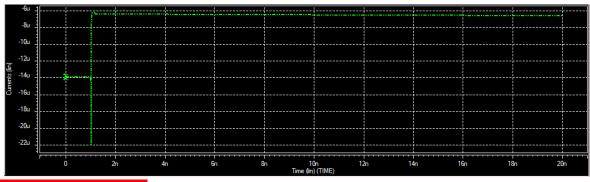
Remarks: Same

## 9. Current [i(vvdd)]

### Without Trojan:



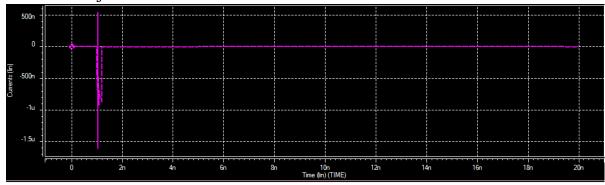
# With Trojan:



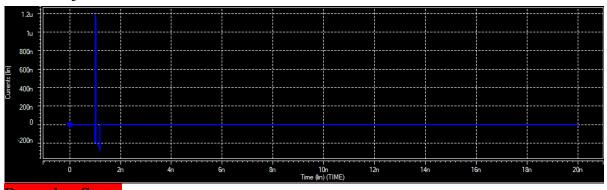
Remarks: Not Same

## 10.Current [i(vwl)]

#### Without Trojan:

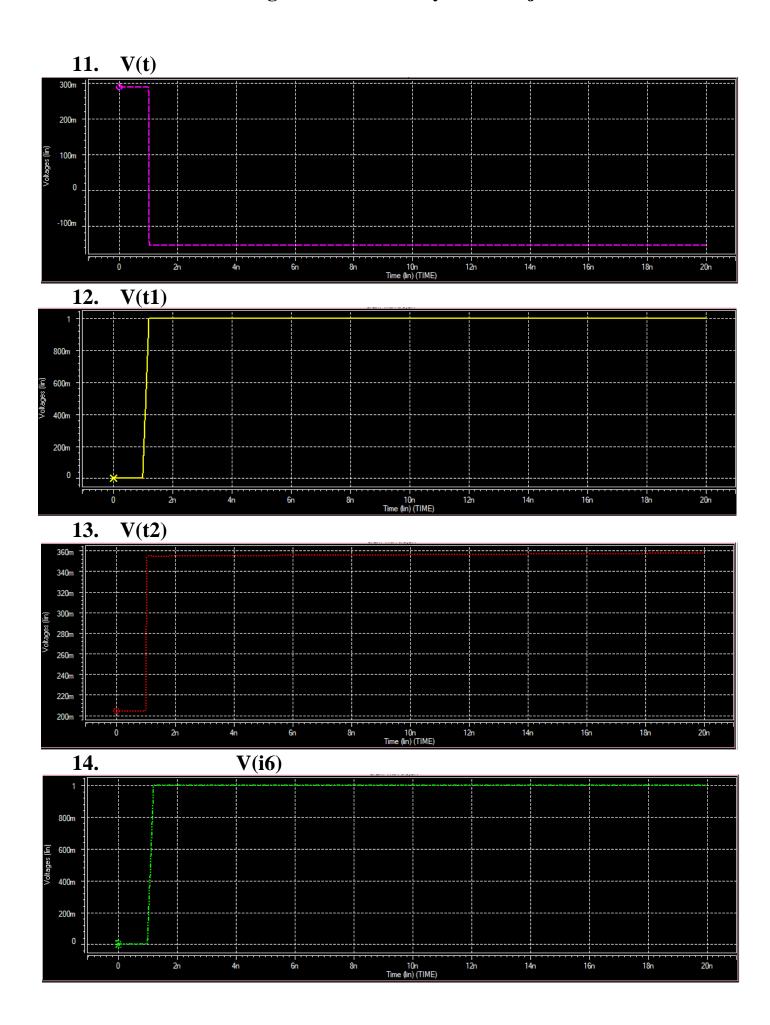


### With Trojan:



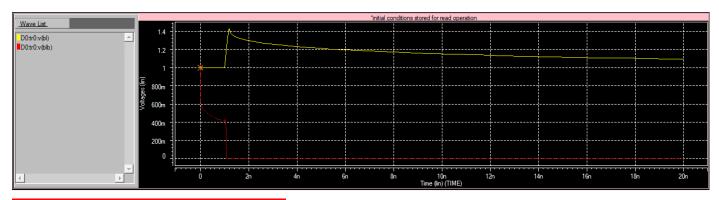
Remarks: Same

# Some voltage which show only with Trojan SRAM



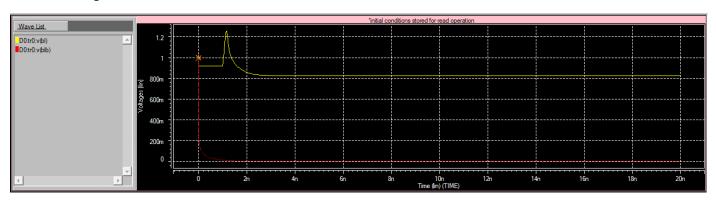
# **Read Operation**

# Without Trojan:



Remarks: Successfully read 1.

# With Trojan:



Remarks: Successfully read 1.

### **Netlist without Trojan**

```
M1 Q QR 0 0 nmos w=90n l=45n
M2 Q QR vdd vdd pmos w=90n l=45n
M3 QR Q 0 0 nmos w=90n l=45n
M4 QR Q vdd vdd pmos w=90n l=45n
M5 Q wl bl bl nmos w=90n l=45n
Mi6 blb wl QR blb nmos w=90n l=45n
** Voltage source
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
```

\*\* SRAM without trojen

```
* 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
                     = 0
                               lln = 1
                                              wln = 1
+lw
      =0
                       =0
                                 lwn = 1
                                                 wwn = 1
                ww
+lwl
      =0
                wwl
                       =0
                                 xpart = 0
      = 0.01
+k2
                 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
                  etab = 0
+voff = -0.13
+vfb = -0.55
                       = 6e-010
                                         = 1.2e-018
                  ua
                                   ub
+uc
      =0
                a0
                      = 1.0
                                ags
                                     = 1e-020
                                                b1
+a1
      =0
                a2
                      = 1.0
                                b0
                                      =0
                                                     =0
+keta = 0.04
                  dwg = 0
                                  dwb = 0
                                                   pclm = 0.04
                   pdiblc2 = 0.001
+pdiblc1 = 0.001
                                      pdibleb = -0.005
                                                          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
+rsh = 5
                rsw = 85
                                 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
                                    aigc = 0.012
+eigbinv = 1.1
                                                      bigc = 0.0028
                  nigbinv = 3
                  aigsd = 0.012
+cigc = 0.002
                                    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
+cgs1 = 2.653e-10 ckappas = 0.03
                                       ckappad = 0.03
                                                          acde = 1
+moin = 15
                  noff = 0.9
                                  voffcv = 0.02
      = -0.11
                                 kt2
                                       = 0.022
+kt1
                  kt11 = 0
                                                  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
                  isws = 1e-011
                                    jswgs = 1e-010
                                                             = 1
                                                       nis
+ijthsfwd = 0.01
                   ijthsrev=0.001
                                    bvs = 10
                                                      xibvs = 1
+isd = 0.0001
                  jswd = 1e-011
                                     jswgd = 1e-010
                                                        nid = 1
                   ijthdrev=0.001
                                                      xjbvd = 1
+ijthdfwd=0.01
                                      bvd = 10
                 cis = 0.0005
                                       = 0.5
                                                  pbsws = 1
+pbs = 1
                                  mis
+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
+cjswgd = 5e-010
                    mjswgd = 0.33
                                                         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
+dwi = 0.0e-008
                    xgw
                          = 0e-007
                                       xgl
                                           = 0e-008
                 gbmin = 1e-010
+rshg = 0.4
                                     rbpb = 5
                                                     rbpd = 15
+rbps = 15
                 rbdb = 15
                                  rbsb = 15
                                                   ngcon = 1
.model pmos pmos level = 54
+version = 4.0 binunit = 1 paramchk= 1 mobmod = 0
+capmod = 2
               igcmod = 1 \quad igbmod = 1 \quad geomod = 1
+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
+11
              wl
                   =0
                            lln = 1
                                           wln = 1
+lw
      =0
                     =0
                              lwn = 1
               WW
                                              wwn = 1
+lwl
      =0
               wwl
                     =0
                               xpart = 0
+k2
      = -0.01
                k3
                      =0
                     = 2.5e-006
                                 dvt0 = 1
                                                dvt1 = 2
+k3b
      =0
                w0
                                 dvt1w = 0
+dvt2 = -0.032
                 dvt0w = 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
+vfb
     = 0.55
                ua
                      = 2.0e-009
                                 ub
                                       = 0.5e-018
                              ags = 1e-020
      =0
                    = 1.0
+uc
               a0
      =0
               a2
                    = 1
                             b0
                                   = -1e-020
                                              b1
                                                    =0
+a1
                 dwg = 0
                                 dwb = 0
+keta = -0.047
                                                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 + 0.06
+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
                                     cigbacc = 0.002
+aigbacc = 0.012
+nigbacc = 1
                 aigbinv = 0.014
                                   bigbinv = 0.004
                                                    cigbinv = 0.004
                                 aigc = 0.69
+eigbinv = 1.1
                 nigbinv = 3
                                                 bigc = 0.0012
+cigc = 0.0008
                 aigsd = 0.0087
                                   bigsd = 0.0012
                                                     cigsd = 0.0008
+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
+moin = 15
                 noff = 0.9
                                voffcv = 0.02
+kt1
      = -0.11
                kt11 = 0
                               kt2 = 0.022
                                                    = -1.5
                                               ute
```

```
=4.31e-009 ub1
                       = 7.61e-018 uc1 = -5.6e-011 prt
+ua1
     = 33000
+at
+fnoimod = 1
                 tnoimod = 0
                                  jswgs = 1e-010
+iss
     = 0.0001
                 jsws = 1e-011
                                                    njs
                                                         = 1
+ijthsfwd = 0.01
                 ijthsrev=0.001
                                 bvs
                                        = 10
                                                  xibvs = 1
                                  jswgd = 1e-010
+isd
     = 0.0001
                 jswd = 1e-011
                                                     njd
                                                        = 1
+ijthdfwd=0.01
                  ijthdrev=0.001
                                   bvd
                                        = 10
                                                   xjbvd = 1
     = 1
               cis = 0.0005
                                    = 0.5
                                               pbsws = 1
+pbs
                                mis
+cjsws = 5e-010
                  mjsws = 0.33
                                   pbswgs = 1
                                                    cjswgs = 3e-010
+mjswgs = 0.33
                  pbd = 1
                                 cid
                                      = 0.0005
                                                  mid = 0.5
+pbswd = 1
                 ciswd = 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
                                                     tcjswg = 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
                                                  rbpd = 15
+rshg = 0.4
                gbmin = 1e-010
                                  rbpb = 5
                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
.end
```

### **Netlist with Trojan**

#### \*\* SRAM with trojen

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

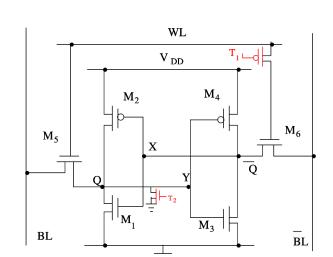
M2 Q QR vdd vdd pmos w=90n l=45n

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

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

M5 Q wl bl bl nmos w=90n l=45n

Mi6 blb T QR blb nmos w=90n l=45n



```
MT i6 T1 wl wl pmos w=90n l=45n
MTi Q T2 0 0 nmos w=90n l=45n
** Voltage source
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
                igcmod = 1 igbmod = 1 geomod = 1
+capmod = 2
+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
                      = 0
                wl
                                lln = 1
                                               wln
                                                    = 1
+lw
      =0
                 \mathbf{w}\mathbf{w}
                        =0
                                  lwn = 1
                                                  wwn
                                                        = 1
+lwl
      =0
                 wwl
                        =0
                                  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
+dsub = 0.1
                                     voffl = 0
                                                     dvtp0 = 1.0e-009
+dvtp1 = 0.1
                   lpe0 = 0
                                   lpeb = 0
                     nsd = 2e + 020
                                        phin = 0
+ngate = 2e+020
+cdsc = 0.000
                   cdscb = 0
                                     cdscd = 0
                                                      cit
                                                          =0
+voff = -0.13
                   etab
                        =0
+vfb
      = -0.55
                        = 6e-010
                                     ub
                                          = 1.2e-018
                  ua
```

```
=0
                     = 1.0
                                    = 1e-020
               a0
                              ags
+uc
      =0
               a2
                     = 1.0
                              b0
                                    =0
                                             b1
                                                   =0
+a1
+keta = 0.04
                 dwg = 0
                                dwb = 0
                                                pclm = 0.04
                  pdiblc2 = 0.001
                                    pdiblcb = -0.005
+pdiblc1 = 0.001
                                                       drout = 0.5
+pvag = 1e-020
                   delta = 0.01
                                   pscbe1 = 8.14e + 008 \quad pscbe2 = 1e-007
+fprout = 0.2
                 pdits = 0.08
                                 pditsd = 0.23
                                                  pdits1 = 2.3e + 006
+rsh = 5
               rsw
                     = 85
                               rdw = 85
                                   rswmin = 0
+rdswmin = 0
                  rdwmin = 0
                                                    prwg = 0
+prwb = 6.8e-011
                         = 1
                                  alpha0 = 0.074
                                                    alpha1 = 0.005
                   wr
                 agid1 = 0.0002
                                  bgidl = 2.1e+009 cgidl = 0.0002
+beta0 = 30
+egidl = 0.8
                   bigbacc = 0.0028
                                     cigbacc = 0.002
+aigbacc = 0.012
+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
+moin = 15
                 noff = 0.9
                                 voffcv = 0.02
                                     = 0.022
      = -0.11
+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
+jss = 0.0001
                 jsws = 1e-011
                                   jswgs = 1e-010
                                                          = 1
                                                     njs
+ijthsfwd = 0.01
                 ijthsrev=0.001
                                  bvs = 10
                                                   xibvs = 1
                 jswd = 1e-011
+jsd = 0.0001
                                   jswgd = 1e-010
                                                     nid = 1
+ijthdfwd=0.01
                  ijthdrev=0.001
                                    bvd = 10
                                                    xjbvd = 1
+pbs = 1
                cis = 0.0005
                                mjs = 0.5
                                                pbsws = 1
                   misws = 0.33
+cisws = 5e-010
                                    pbswgs = 1
                                                     ciswgs = 3e-010
+mjswgs = 0.33
                   pbd = 1
                                  cid = 0.0005
                                                   mid = 0.5
+pbswd = 1
                 cjswd = 5e-010
                                   mjswd = 0.33
                                                     pbswgd = 1
                                      tpb = 0.005
+cjswgd = 5e-010
                   mjswgd = 0.33
                                                      tci = 0.001
                                    tpbswg = 0.005
+tpbsw = 0.005
                  tcjsw = 0.001
                                                      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
                                    xgl = 0e-008
+rshg = 0.4
                gbmin = 1e-010
                                  rbpb = 5
                                                  rbpd = 15
                rbdb = 15
+rbps = 15
                                rbsb = 15
                                                ngcon = 1
.model pmos pmos 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
              acngsmod= 0 trngsmod= 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
+toxe = 1.85e-09 toxp = 1.1e-09 toxm = 1.85e-09 toxref = 1.85e-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
                     =0
+lw
      =0
                               lwn = 1
               ww
                                              wwn = 1
+lwl
     =0
               wwl
                      =0
                               xpart = 0
      = -0.01
+k2
                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 = 1e-009
+dsub = 0.1
                                lpeb = 0
+dvtp1 = 0.05
                 lpe0 = 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
+vfb
                                  ub
                                       = 0.5e-0.18
                ua
                                  = 1e-020
      =0
               a0
                    = 1.0
+uc
                              ags
+a1
      =0
               a2
                    = 1
                              b0
                                   = -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
                 pdits = 0.08
+fprout = 0.2
                                 pditsd = 0.23
                                                 pdits1 = 2.3e + 006
+rsh = 5
               rsw = 85
                               rdw = 85
                                                    prwg = 3.22e-008
+rdswmin = 0
                  rdwmin = 0
                                   rswmin = 0
+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
                                     cigbacc = 0.002
+aigbacc = 0.012
+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
                                                ntox = 1
+nigc = 1
                poxedge = 1
                                 pigcd = 1
+xrcrg1 = 12
                 xrcrg2 = 5
+cgbo = 2.56e-011 cgdl = 2.653e-10
+cgsl = 2.653e-10 \quad ckappas = 0.03 \quad ckappad = 0.03
                                                       acde = 1
+moin = 15
                 noff = 0.9
                                voffcv = 0.02
+kt1
      = -0.11
                 kt11 = 0
                               kt2 = 0.022
                                                ute = -1.5
+ua1 = 4.31e-009 ub1 = 7.61e-018 uc1 = -5.6e-011 prt = 0
     = 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
+jsd = 0.0001
                 jswd = 1e-011
                                   jswgd = 1e-010
                                                     nid = 1
+ijthdfwd = 0.01
                  ijthdrev=0.001
                                    bvd = 10
                                                   xibvd = 1
+pbs = 1
                cjs = 0.0005
                                mis = 0.5
                                                pbsws = 1
+cjsws = 5e-010
                  mjsws = 0.33
                                    pbswgs = 1
                                                    cjswgs = 3e-010
+miswgs = 0.33
                  pbd = 1
                                  cid = 0.0005
                                                  mid = 0.5
+pbswd = 1
                 cjswd = 5e-010
                                   mjswd = 0.33
                                                     pbswgd = 1
                                     tpb = 0.005
+cjswgd = 5e-010
                   mjswgd = 0.33
                                                      tci = 0.001
                                   tpbswg = 0.005
+tpbsw = 0.005
                  tcisw = 0.001
                                                     tcjswg = 0.001
+xtis = 3
               xtid = 3
+dmcg = 0e-006
                   dmci = 0e-006
                                     dmdg = 0e-006
                                                       dmcgt = 0e-007
```

= 0.0e-008 xgw = 0e-007= 0e-008+dwj xgl gbmin = 1e-010+rshg = 0.4rbpb = 5rbpd = 15+rbps = 15rbdb = 15rbsb = 15ngcon = 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