

APÉNDICES

A) Ficheros IBIS:

A.1. Modelo DR-1.

A.2. Modelo DR-2.

B) Ficheros de tecnología para MATLAB:

B.1. Modelo DR-1.

B.2. Modelo DR-2.

C) Ficheros HSPICE empleados:

C.1: Modelo de pendiente simple, curva de subida.

C.2: Modelo de pendiente simple, curva de bajada.

C.3: Modelo de fuente pwl, curva de subida (10 puntos).

C.4: Modelo de fuente pwl, curva de bajada(10 puntos).

C.5: Modelo de resistencias variables (10 puntos), curva de subida.

C.6: Modelo de resistencias variables (100 puntos), curva de subida.

D) Script en PERL.

A.1:Fichero IBIS para modelo DR-1.

```
#####
XXXXXXXXXX
IBIS Model of DR-1
YYYYYYYYYY
#####

[IBIS Ver]      2.1
[File name]    DR-1.ibs
[File Rev]     1.0
[Date]         Fri Oct 30 09:13:48 MET 1998

[Source]       XXXXXXXXX
[Notes]        All test data contained in this file are derived
                from HSPICE simulations.

[Disclaimer]    Data is for modeling purposes only and is not guaranteed.
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                vhdl.org:/pub/IBIS/models for the full disclaimer.

[Copyright]    XXXXXXXXXXXXXXXXXXXXXXXX

*****
Component      DR-1
*****

[Component]     DR-1
[Manufacturer]  YYYYYYYY

[Package]

      typ      min      max
R_pkg      0.00      0.00      0.00
L_pkg      0.00      0.00      0.00
C_pkg      0.00      0.00      0.00

[Pin]           signal_name      model_name
A1              CK_SYSTEM#        bc265a

*****
Model           bc265a
*****

[Model]         bc265a
[Model_type]    3-state
[Polarity]      Non-Inverting
[Enable]        Active-High
Vinl  =         0.40
Vinh  =         2.00
Vmeas =         1.25
Cref  =         0.00
Rref  =         1e+06
Vref  =         0.00

[Variable]      typ      min      max
C_comp          3.066e-12  2.738e-12  3.084e-12

[Variable]      typ      min      max
[Voltage range] 2.5      2.3      2.7

[Variable]      typ      min      max
[Temperature range] 25      100      0

[Pulldown]

Voltage          I(typ)          I(min)          I(max)
-1.500000000    -1.2845e-02    -1.0197e-02    -1.4288e-02
-1.400000000    -1.2582e-02    -9.9858e-03    -1.3991e-02
-1.300000000    -1.2308e-02    -9.7642e-03    -1.3683e-02
-1.200000000    -1.2020e-02    -9.5302e-03    -1.3359e-02
```

-1.10000000	-1.1713e-02	-9.2808e-03	-1.3018e-02
-1.00000000	-1.1382e-02	-9.0113e-03	-1.2654e-02
-0.90000000	-1.1020e-02	-8.7143e-03	-1.2258e-02
-0.80000000	-1.0609e-02	-8.3769e-03	-1.1816e-02
-0.70000000	-1.0122e-02	-7.9745e-03	-1.1301e-02
-0.60000000	-9.4897e-03	-7.4544e-03	-1.0652e-02
-0.50000000	-8.5396e-03	-6.6961e-03	-9.7072e-03
-0.40000000	-7.0535e-03	-5.5554e-03	-8.1501e-03
-0.30000000	-5.3092e-03	-4.1932e-03	-6.1542e-03
-0.20000000	-3.5409e-03	-2.7971e-03	-4.1050e-03
-0.10000000	-1.7709e-03	-1.3986e-03	-2.0532e-03
0.	1.8392e-09	2.3401e-08	1.9698e-09
0.10000000	1.7697e-03	1.3969e-03	2.0523e-03
0.20000000	3.5360e-03	2.7900e-03	4.1015e-03
0.30000000	5.2989e-03	4.1793e-03	6.1476e-03
0.40000000	7.0583e-03	5.5646e-03	8.1904e-03
0.50000000	8.8141e-03	6.9458e-03	1.0230e-02
0.60000000	1.0566e-02	8.3228e-03	1.2266e-02
0.70000000	1.2315e-02	9.6955e-03	1.4299e-02
0.80000000	1.4059e-02	1.1064e-02	1.6329e-02
0.90000000	1.5800e-02	1.2427e-02	1.8355e-02
1.00000000	1.7536e-02	1.3786e-02	2.0377e-02
1.10000000	1.9269e-02	1.5140e-02	2.2396e-02
1.20000000	2.0997e-02	1.6488e-02	2.4411e-02
1.30000000	2.2721e-02	1.7831e-02	2.6423e-02
1.40000000	2.4441e-02	1.9169e-02	2.8430e-02
1.50000000	2.6155e-02	2.0501e-02	3.0434e-02
1.60000000	2.7866e-02	2.1827e-02	3.2434e-02
1.70000000	2.9571e-02	2.3146e-02	3.4429e-02
1.80000000	3.1271e-02	2.4459e-02	3.6421e-02
1.90000000	3.2966e-02	2.5765e-02	3.8408e-02
2.00000000	3.4656e-02	2.7064e-02	4.0391e-02
2.10000000	3.6340e-02	2.8355e-02	4.2369e-02
2.20000000	3.8018e-02	2.9638e-02	4.4343e-02
2.30000000	3.9691e-02	3.0912e-02	4.6312e-02
2.40000000	4.1357e-02	3.2177e-02	4.8276e-02
2.50000000	4.3017e-02	3.3428e-02	5.0236e-02
2.60000000	4.4670e-02	3.4627e-02	5.2190e-02
2.70000000	4.6315e-02	3.5604e-02	5.4139e-02
2.80000000	4.7928e-02	3.6239e-02	5.6083e-02
2.90000000	4.9300e-02	3.6648e-02	5.8019e-02
3.00000000	5.0198e-02	3.6932e-02	5.9903e-02
3.10000000	5.0807e-02	3.7138e-02	6.1396e-02
3.20000000	5.1273e-02	3.7289e-02	6.2342e-02
3.30000000	5.1658e-02	3.7396e-02	6.3018e-02
3.40000000	5.1985e-02	3.7462e-02	6.3563e-02
3.50000000	5.2265e-02	3.7489e-02	6.4028e-02
3.60000000	5.2506e-02	3.7478e-02	6.4436e-02
3.70000000	5.2712e-02	3.7427e-02	6.4798e-02
3.80000000	5.2884e-02	3.7332e-02	6.5120e-02
3.90000000	5.3025e-02	3.7191e-02	6.5408e-02
4.00000000	5.3135e-02	3.6997e-02	6.5664e-02
[Pullup]			
Voltage	I(typ)	I(min)	I(max)
-1.50000000	1.2919e-02	1.0258e-02	1.4311e-02
-1.40000000	1.2546e-02	9.9490e-03	1.3904e-02
-1.30000000	1.2157e-02	9.6292e-03	1.3478e-02
-1.20000000	1.1749e-02	9.2970e-03	1.3032e-02
-1.10000000	1.1319e-02	8.9507e-03	1.2562e-02
-1.00000000	1.0866e-02	8.5879e-03	1.2065e-02
-0.90000000	1.0383e-02	8.2047e-03	1.1535e-02
-0.80000000	9.8652e-03	7.7946e-03	1.0966e-02
-0.70000000	9.2987e-03	7.3458e-03	1.0345e-02
-0.60000000	8.6588e-03	6.8350e-03	9.6518e-03
-0.50000000	7.8862e-03	6.2130e-03	8.8330e-03
-0.40000000	6.8320e-03	5.3775e-03	7.7497e-03
-0.30000000	5.3115e-03	4.2126e-03	6.1254e-03
-0.20000000	3.5581e-03	2.8373e-03	4.1159e-03
-0.10000000	1.7796e-03	1.4204e-03	2.0591e-03
0.	-2.7730e-10	-4.1880e-10	-3.0768e-10
0.10000000	-1.7787e-03	-1.4194e-03	-2.0586e-03
0.20000000	-3.5557e-03	-2.8367e-03	-4.1157e-03
0.30000000	-5.3308e-03	-4.2518e-03	-6.1712e-03
0.40000000	-7.1041e-03	-5.6647e-03	-8.2253e-03
0.50000000	-8.8754e-03	-7.0754e-03	-1.0278e-02
0.60000000	-1.0645e-02	-8.4837e-03	-1.2329e-02

0.70000000	-1.2412e-02	-9.8896e-03	-1.4378e-02
0.80000000	-1.4177e-02	-1.1293e-02	-1.6426e-02
0.90000000	-1.5941e-02	-1.2694e-02	-1.8472e-02
1.00000000	-1.7702e-02	-1.4092e-02	-2.0516e-02
1.10000000	-1.9460e-02	-1.5488e-02	-2.2558e-02
1.20000000	-2.1217e-02	-1.6880e-02	-2.4599e-02
1.30000000	-2.2971e-02	-1.8270e-02	-2.6638e-02
1.40000000	-2.4723e-02	-1.9657e-02	-2.8675e-02
1.50000000	-2.6472e-02	-2.1040e-02	-3.0710e-02
1.60000000	-2.8219e-02	-2.2421e-02	-3.2743e-02
1.70000000	-2.9963e-02	-2.3798e-02	-3.4774e-02
1.80000000	-3.1705e-02	-2.5172e-02	-3.6803e-02
1.90000000	-3.3444e-02	-2.6542e-02	-3.8830e-02
2.00000000	-3.5180e-02	-2.7908e-02	-4.0855e-02
2.10000000	-3.6913e-02	-2.9271e-02	-4.2878e-02
2.20000000	-3.8643e-02	-3.0629e-02	-4.4899e-02
2.30000000	-4.0370e-02	-3.1983e-02	-4.6917e-02
2.40000000	-4.2093e-02	-3.3330e-02	-4.8933e-02
2.50000000	-4.3814e-02	-3.4673e-02	-5.0946e-02
2.60000000	-4.5527e-02	-3.6008e-02	-5.2957e-02
2.70000000	-4.7236e-02	-3.7304e-02	-5.4966e-02
2.80000000	-4.8941e-02	-3.8374e-02	-5.6967e-02
2.90000000	-5.0619e-02	-3.9055e-02	-5.8965e-02
3.00000000	-5.2035e-02	-3.9493e-02	-6.0959e-02
3.10000000	-5.2912e-02	-3.9807e-02	-6.2897e-02
3.20000000	-5.3468e-02	-4.0051e-02	-6.4396e-02
3.30000000	-5.3875e-02	-4.0247e-02	-6.5279e-02
3.40000000	-5.4201e-02	-4.0408e-02	-6.5866e-02
3.50000000	-5.4476e-02	-4.0542e-02	-6.6316e-02
3.60000000	-5.4714e-02	-4.0653e-02	-6.6691e-02
3.70000000	-5.4925e-02	-4.0744e-02	-6.7017e-02
3.80000000	-5.5113e-02	-4.0815e-02	-6.7310e-02
3.90000000	-5.5282e-02	-4.0867e-02	-6.7577e-02
4.00000000	-5.5433e-02	-4.0902e-02	-6.7824e-02
[GND_clamp]			
Voltage	I(typ)	I(min)	I(max)
-1.50000000	-0.28276	-0.31079	-0.27595
-1.40000000	-0.23369	-0.26233	-0.22642
-1.30000000	-0.18526	-0.21446	-0.17764
-1.20000000	-0.13777	-0.16741	-0.12984
-1.10000000	-9.1928e-02	-0.12166	-8.3821e-02
-1.00000000	-4.9546e-02	-7.8218e-02	-4.1898e-02
-0.90000000	-1.6804e-02	-3.9587e-02	-1.2729e-02
-0.80000000	-4.5631e-03	-1.2665e-02	-4.8773e-03
-0.70000000	-2.2861e-03	-3.0689e-03	-3.0486e-03
-0.60000000	-1.1223e-03	-1.0153e-03	-1.6473e-03
-0.50000000	-3.0556e-04	-2.9958e-04	-5.4531e-04
-0.40000000	-2.4484e-05	-3.8438e-05	-5.4661e-05
-0.30000000	0.00000	-2.3393e-06	-1.3774e-06
-0.20000000	0.00000	0.00000	0.00000
-0.10000000	0.00000	0.00000	0.00000
0.	0.00000	0.00000	0.00000
0.10000000	0.00000	0.00000	0.00000
0.20000000	0.00000	0.00000	0.00000
0.30000000	0.00000	0.00000	0.00000
0.40000000	0.00000	0.00000	0.00000
0.50000000	0.00000	0.00000	0.00000
0.60000000	0.00000	0.00000	0.00000
0.70000000	0.00000	0.00000	0.00000
0.80000000	0.00000	0.00000	0.00000
0.90000000	0.00000	0.00000	0.00000
1.00000000	0.00000	0.00000	0.00000
1.10000000	0.00000	0.00000	0.00000
1.20000000	0.00000	0.00000	0.00000
1.30000000	0.00000	0.00000	0.00000
1.40000000	0.00000	0.00000	0.00000
1.50000000	0.00000	0.00000	0.00000
1.60000000	0.00000	0.00000	0.00000
1.70000000	0.00000	0.00000	0.00000
1.80000000	0.00000	0.00000	0.00000
1.90000000	0.00000	0.00000	0.00000
2.00000000	0.00000	0.00000	0.00000
2.10000000	0.00000	0.00000	0.00000
2.20000000	0.00000	0.00000	0.00000
2.30000000	0.00000	0.00000	0.00000
2.40000000	0.00000	0.00000	0.00000

2.50000000	0.00000	0.00000	0.00000
2.60000000	0.00000	0.00000	0.00000
2.70000000	0.00000	0.00000	0.00000
2.80000000	0.00000	0.00000	0.00000
2.90000000	0.00000	0.00000	0.00000
3.00000000	0.00000	0.00000	0.00000
3.10000000	0.00000	0.00000	0.00000
3.20000000	0.00000	0.00000	0.00000
3.30000000	0.00000	0.00000	0.00000
3.40000000	0.00000	0.00000	0.00000
3.50000000	0.00000	0.00000	0.00000
3.60000000	0.00000	0.00000	0.00000
3.70000000	0.00000	0.00000	0.00000
3.80000000	0.00000	0.00000	0.00000
3.90000000	0.00000	0.00000	0.00000
4.00000000	0.00000	0.00000	0.00000
[POWER_clamp]			
Voltage	I(typ)	I(min)	I(max)
-1.50000000	0.93754	1.03682	0.91014
-1.40000000	0.78689	0.89086	0.75493
-1.30000000	0.63524	0.74316	0.60154
-1.20000000	0.48131	0.59378	0.44563
-1.10000000	0.32564	0.44299	0.28786
-1.00000000	0.17194	0.29199	0.13397
-0.90000000	4.5225e-02	0.14811	2.4099e-02
-0.80000000	6.0024e-03	3.8800e-02	5.8380e-03
-0.70000000	3.1930e-03	5.1740e-03	4.0637e-03
-0.60000000	2.0199e-03	1.8166e-03	2.6962e-03
-0.50000000	1.0123e-03	9.0172e-04	1.4582e-03
-0.40000000	2.8688e-04	3.0924e-04	4.8411e-04
-0.30000000	2.7626e-05	5.1502e-05	5.0696e-05
-0.20000000	1.2703e-06	4.8699e-06	1.8883e-06
-0.10000000	0.00000	0.00000	0.00000
0.	0.00000	0.00000	0.00000
0.10000000	0.00000	0.00000	0.00000
0.20000000	0.00000	0.00000	0.00000
0.30000000	0.00000	0.00000	0.00000
0.40000000	0.00000	0.00000	0.00000
0.50000000	0.00000	0.00000	0.00000
0.60000000	0.00000	0.00000	0.00000
0.70000000	0.00000	0.00000	0.00000
0.80000000	0.00000	0.00000	0.00000
0.90000000	0.00000	0.00000	0.00000
1.00000000	0.00000	0.00000	0.00000
1.10000000	0.00000	0.00000	0.00000
1.20000000	0.00000	0.00000	0.00000
1.30000000	0.00000	0.00000	0.00000
1.40000000	0.00000	0.00000	0.00000
1.50000000	0.00000	0.00000	0.00000
1.60000000	0.00000	0.00000	0.00000
1.70000000	0.00000	0.00000	0.00000
1.80000000	0.00000	0.00000	0.00000
1.90000000	0.00000	0.00000	0.00000
2.00000000	0.00000	0.00000	0.00000
2.10000000	0.00000	0.00000	0.00000
2.20000000	0.00000	0.00000	0.00000
2.30000000	0.00000	0.00000	0.00000
2.40000000	0.00000	0.00000	0.00000
2.50000000	0.00000	0.00000	0.00000
2.60000000	0.00000	0.00000	0.00000
2.70000000	0.00000	0.00000	0.00000
2.80000000	0.00000	0.00000	0.00000
2.90000000	0.00000	0.00000	0.00000
3.00000000	0.00000	0.00000	0.00000
3.10000000	0.00000	0.00000	0.00000
3.20000000	0.00000	0.00000	0.00000
3.30000000	0.00000	0.00000	0.00000
3.40000000	0.00000	0.00000	0.00000
3.50000000	0.00000	0.00000	0.00000
3.60000000	0.00000	0.00000	0.00000
3.70000000	0.00000	0.00000	0.00000
3.80000000	0.00000	0.00000	0.00000
3.90000000	0.00000	0.00000	0.00000
4.00000000	0.00000	0.00000	0.00000

```

[Ramp]
|Variable      typ      min      max
dV/dt_r  0.7024/9.449e-10  0.5648/1.469e-09  0.8195/5.882e-10
dV/dt_f  0.6988/6.504e-10  0.5586/1.021e-09  0.8163/4.419e-10
R_load = 50
|
|
[Rising Waveform]
R_fixture = 50
V_fixture = 0.00
V_fixture_min = 0.00
V_fixture_max = 0.00
C_fixture = 0.00
|
|Time      V(typ)      V(min)      V(max)
0.         0.         0.         0.
1.0101010e-10  7.0272e-06  1.0051e-05  4.9755e-06
2.0202020e-10  1.7970e-05  2.7817e-05  4.6518e-06
3.0303030e-10  2.3444e-05  2.2038e-05  -5.5741e-05
4.0404040e-10  -5.2368e-04  -3.1547e-04  -1.2206e-03
5.0505051e-10  -2.2328e-03  -1.3640e-03  -3.1732e-03
6.0606061e-10  -4.9614e-03  -3.3448e-03  -8.7517e-03
7.0707071e-10  -1.2616e-02  -6.5397e-03  -2.7486e-02
8.0808081e-10  -1.9835e-02  -1.3274e-02  -1.3975e-02
9.0909091e-10  -1.3438e-02  -1.9006e-02  5.0844e-02
1.0101010e-09  1.1424e-03  -1.9755e-02  0.12283
1.1111111e-09  3.7489e-02  -1.5685e-02  0.25175
1.2121212e-09  9.3903e-02  -4.8507e-03  0.39239
1.3131313e-09  0.15337  7.8993e-03  0.53737
1.4141414e-09  0.22045  3.0035e-02  0.68279
1.5151515e-09  0.30244  5.9849e-02  0.82274
1.6161616e-09  0.38443  8.9663e-02  0.92995
1.7171717e-09  0.46642  0.11948  1.02346
1.8181818e-09  0.54790  0.14929  1.11697
1.9191919e-09  0.62748  0.18650  1.21047
2.0202020e-09  0.70298  0.22970  1.26754
2.1212121e-09  0.76809  0.27272  1.28537
2.2222222e-09  0.83320  0.31488  1.29658
2.3232323e-09  0.89831  0.35704  1.30419
2.4242424e-09  0.96341  0.39920  1.31180
2.5252525e-09  1.02466  0.44030  1.31941
2.6262626e-09  1.05280  0.47896  1.32610
2.7272727e-09  1.07118  0.51762  1.32918
2.8282828e-09  1.08272  0.55627  1.33226
2.9292929e-09  1.09088  0.59493  1.33534
3.0303030e-09  1.09903  0.63191  1.33842
3.1313131e-09  1.10718  0.66499  1.34126
3.2323232e-09  1.11533  0.69806  1.34315
3.3333333e-09  1.12048  0.73114  1.34504
3.4343434e-09  1.12368  0.76422  1.34694
3.5353535e-09  1.12687  0.79360  1.34883
3.6363636e-09  1.13007  0.81410  1.35052
3.7373737e-09  1.13326  0.82943  1.35142
3.8383838e-09  1.13600  0.83941  1.35233
3.9393939e-09  1.13844  0.84805  1.35323
4.0404040e-09  1.14088  0.85669  1.35413
4.1414141e-09  1.14333  0.86533  1.35500
4.2424242e-09  1.14577  0.87397  1.35575
4.3434343e-09  1.14743  0.87844  1.35650
4.4444444e-09  1.14859  0.88187  1.35725
4.5454545e-09  1.14974  0.88530  1.35799
4.6464646e-09  1.15090  0.88873  1.35866
4.7474747e-09  1.15205  0.89216  1.35903
4.8484848e-09  1.15318  0.89511  1.35939
4.9494949e-09  1.15430  0.89794  1.35975
5.0505051e-09  1.15542  0.90077  1.36011
5.1515152e-09  1.15654  0.90360  1.36048
5.2525253e-09  1.15766  0.90643  1.36084
5.3535354e-09  1.15844  0.90827  1.36121
5.4545455e-09  1.15899  0.90985  1.36157
5.5555556e-09  1.15954  0.91143  1.36194
5.6565657e-09  1.16009  0.91301  1.36226
5.7575758e-09  1.16064  0.91460  1.36243
5.8585859e-09  1.16122  0.91604  1.36259
5.9595960e-09  1.16182  0.91746  1.36276
6.0606061e-09  1.16242  0.91888  1.36293
6.1616162e-09  1.16302  0.92029  1.36310
6.2626263e-09  1.16363  0.92171  1.36330
6.3636364e-09  1.16405  0.92272  1.36349
6.4646465e-09  1.16435  0.92363  1.36369

```

6.5656566e-09	1.16465	0.92454	1.36389
6.6666667e-09	1.16495	0.92545	1.36406
6.7676768e-09	1.16525	0.92636	1.36415
6.8686869e-09	1.16558	0.92720	1.36423
6.9696970e-09	1.16593	0.92802	1.36431
7.0707071e-09	1.16628	0.92884	1.36439
7.1717172e-09	1.16663	0.92966	1.36448
7.2727273e-09	1.16698	0.93048	1.36459
7.3737374e-09	1.16723	0.93111	1.36470
7.4747475e-09	1.16741	0.93169	1.36481
7.5757576e-09	1.16759	0.93227	1.36493
7.6767677e-09	1.16776	0.93285	1.36502
7.7777778e-09	1.16794	0.93343	1.36507
7.8787879e-09	1.16814	0.93396	1.36511
7.9797980e-09	1.16835	0.93447	1.36515
8.0808081e-09	1.16857	0.93499	1.36519
8.1818182e-09	1.16878	0.93550	1.36523
8.2828283e-09	1.16899	0.93602	1.36530
8.3838384e-09	1.16914	0.93643	1.36537
8.4848485e-09	1.16925	0.93682	1.36543
8.5858586e-09	1.16937	0.93721	1.36550
8.6868687e-09	1.16948	0.93760	1.36556
8.7878788e-09	1.16959	0.93799	1.36558
8.8888889e-09	1.16972	0.93834	1.36560
8.9898990e-09	1.16985	0.93868	1.36562
9.0909091e-09	1.16998	0.93902	1.36564
9.1919192e-09	1.17011	0.93936	1.36566
9.2929293e-09	1.17025	0.93970	1.36571
9.3939394e-09	1.17034	0.93999	1.36575
9.4949495e-09	1.17041	0.94026	1.36579
9.5959596e-09	1.17048	0.94053	1.36583
9.6969697e-09	1.17055	0.94080	1.36586
9.7979798e-09	1.17062	0.94107	1.36586
9.8989899e-09	1.17072	0.94132	1.36586
1.0000000e-08	1.17084	0.94157	1.36587
[Falling Waveform]			
R_fixture	=	50	
V_fixture	=	2.5	
V_fixture_min	=	2.3	
V_fixture_max	=	2.7	
C_fixture	=	0.00	
Time	V(typ)	V(min)	V(max)
0.	2.50000	2.30000	2.70000
1.0101010e-10	2.49999	2.29999	2.69999
2.0202020e-10	2.49998	2.29997	2.70001
3.0303030e-10	2.50001	2.30002	2.70016
4.0404040e-10	2.50111	2.30078	2.70214
5.0505051e-10	2.50402	2.30266	2.70614
6.0606061e-10	2.50848	2.30577	2.71266
7.0707071e-10	2.51465	2.30928	2.72422
8.0808081e-10	2.52291	2.31312	2.73749
9.0909091e-10	2.52750	2.31709	2.72791
1.0101010e-09	2.52908	2.32201	2.71587
1.1111111e-09	2.52017	2.32496	2.64565
1.2121212e-09	2.51260	2.32542	2.48578
1.3131313e-09	2.49913	2.32374	2.26679
1.4141414e-09	2.45361	2.31749	2.04293
1.5151515e-09	2.36758	2.31276	1.86738
1.6161616e-09	2.26798	2.30865	1.71519
1.7171717e-09	2.13785	2.30413	1.64597
1.8181818e-09	2.00772	2.29496	1.57675
1.9191919e-09	1.87758	2.27064	1.50753
2.0202020e-09	1.79127	2.23399	1.43831
2.1212121e-09	1.70748	2.19067	1.38027
2.2222222e-09	1.62370	2.14559	1.37495
2.3232323e-09	1.53991	2.08069	1.37008
2.4242424e-09	1.45613	2.01579	1.36660
2.5252525e-09	1.42547	1.95089	1.36376
2.6262626e-09	1.40595	1.88599	1.36093
2.7272727e-09	1.39440	1.82231	1.35809
2.8282828e-09	1.38763	1.77240	1.35525
2.9292929e-09	1.38087	1.72249	1.35358
3.0303030e-09	1.37411	1.67257	1.35246
3.1313131e-09	1.36735	1.62266	1.35134
3.2323232e-09	1.36316	1.57469	1.35022
3.3333333e-09	1.36155	1.54871	1.34910
3.4343434e-09	1.35994	1.52272	1.34828

3.5353535e-09	1.35833	1.49674	1.34759
3.6363636e-09	1.35671	1.47075	1.34690
3.7373737e-09	1.35503	1.44607	1.34622
3.8383838e-09	1.35327	1.43612	1.34553
3.9393939e-09	1.35152	1.42863	1.34508
4.0404040e-09	1.34976	1.42320	1.34474
4.1414141e-09	1.34800	1.41890	1.34441
4.2424242e-09	1.34692	1.41460	1.34407
4.3434343e-09	1.34652	1.41030	1.34373
4.4444444e-09	1.34611	1.40600	1.34344
4.5454545e-09	1.34571	1.40305	1.34317
4.6464646e-09	1.34530	1.40107	1.34290
4.7474747e-09	1.34471	1.39909	1.34262
4.8484848e-09	1.34394	1.39711	1.34235
4.9494949e-09	1.34317	1.39512	1.34217
5.0505051e-09	1.34239	1.39342	1.34203
5.1515152e-09	1.34162	1.39190	1.34190
5.2525253e-09	1.34116	1.39039	1.34176
5.3535354e-09	1.34101	1.38888	1.34163
5.4545455e-09	1.34086	1.38737	1.34149
5.5555556e-09	1.34072	1.38622	1.34136
5.6565657e-09	1.34057	1.38534	1.34122
5.7575758e-09	1.34029	1.38447	1.34109
5.8585859e-09	1.33988	1.38359	1.34096
5.9595960e-09	1.33947	1.38271	1.34087
6.0606061e-09	1.33907	1.38191	1.34081
6.1616162e-09	1.33866	1.38118	1.34074
6.2626263e-09	1.33842	1.38044	1.34068
6.3636364e-09	1.33835	1.37970	1.34062
6.4646465e-09	1.33828	1.37897	1.34055
6.5656566e-09	1.33821	1.37838	1.34047
6.6666667e-09	1.33814	1.37789	1.34040
6.7676768e-09	1.33799	1.37741	1.34033
6.8686869e-09	1.33775	1.37693	1.34026
6.9696970e-09	1.33752	1.37644	1.34021
7.0707071e-09	1.33729	1.37600	1.34018
7.1717172e-09	1.33706	1.37558	1.34015
7.2727273e-09	1.33692	1.37516	1.34012
7.3737374e-09	1.33688	1.37474	1.34009
7.4747475e-09	1.33684	1.37432	1.34005
7.5757576e-09	1.33680	1.37397	1.34000
7.6767677e-09	1.33675	1.37368	1.33996
7.7777778e-09	1.33666	1.37338	1.33991
7.8787879e-09	1.33653	1.37308	1.33987
7.9797980e-09	1.33639	1.37278	1.33985
8.0808081e-09	1.33625	1.37250	1.33983
8.1818182e-09	1.33611	1.37225	1.33982
8.2828283e-09	1.33603	1.37199	1.33981
8.3838384e-09	1.33600	1.37173	1.33979
8.4848485e-09	1.33597	1.37147	1.33977
8.5858586e-09	1.33595	1.37125	1.33974
8.6868687e-09	1.33592	1.37105	1.33971
8.7878788e-09	1.33586	1.37085	1.33968
8.8888889e-09	1.33578	1.37066	1.33965
8.9898990e-09	1.33569	1.37046	1.33964
9.0909091e-09	1.33561	1.37028	1.33963
9.1919192e-09	1.33552	1.37011	1.33963
9.2929293e-09	1.33547	1.36994	1.33962
9.3939394e-09	1.33545	1.36977	1.33961
9.4949495e-09	1.33543	1.36960	1.33960
9.5959596e-09	1.33541	1.36945	1.33958
9.6969697e-09	1.33539	1.36932	1.33956
9.7979798e-09	1.33535	1.36918	1.33955
9.8989899e-09	1.33528	1.36905	1.33953
1.0000000e-08	1.33521	1.36891	1.33954

|

|

[End]

A.2: Fichero IBIS para modelo DR-2.

```
#####
|                                     XXXXXXXXX
|                                     IBIS Model of DR-2
|                                     yyyyyyyyyyyy
|#####
[IBIS Ver]      2.1
[File name]    DR-2.ibs
[File Rev]     1.0
[Date]         Fri Nov 6 13:21:16 MET 1998
|
[Source]       XXXXXXXXX
[Notes]        All test data contained in this file are derived
|              from HSPICE simulations.
|
[Disclaimer]    Data is for modeling purposes only and is not guaranteed.
|              IBIS Open Forum disclaims all warranties. See DISCLAIM.TXT in
|              vhdl.org:/pub/IBIS/models for the full disclaimer.
[Copyright]    (C) XXXXXXXXXXXXXXXX
|
|*****
|              Component      DR-2
|*****
[Component]    DR-2
[Manufacturer] YYYYYYYYYYYYYY
|
[Package]
|              typ            min            max
R_pkg          100m          100m          100m
L_pkg          4.1nH         3.1nH         7.2nH
C_pkg          0.20pF        0.150pF        0.600pF
|
[Pin]          signal_name    model_name
A1             CK_SYSTEM#     data_o
|
|*****
|              Model      DR-2
|*****
[Model]        DR-2
Model_type     3-state
Polarity       Non-Inverting
Enable         Active-Low
Vinl  =        0.80
Vinh  =        2.00
Vmeas =        1.25
Cref  =        30.0pF
Rref  =         0.5k
Vref  =         0.00
|
|Variable      typ            min            max
C_comp         1.279e-12      1.146e-12      1.414e-12
|
|Variable      typ            min            max
[Voltage range] 3.3           3.0           3.6
|
|Variable      typ            min            max
[Temperature range] 27         100           0
|
|
[Pulldown]
|
|Voltage      I(typ)          I(min)          I(max)
|
-3.300000000  -2.6706e-02      -1.6282e-02      -4.7516e-02
-3.200000000  -2.3795e-02      -1.4359e-02      -4.3137e-02
-3.100000000  -2.1129e-02      -1.2772e-02      -3.8905e-02
-3.000000000  -1.8764e-02      -1.1493e-02      -3.4841e-02
-2.900000000  -1.6760e-02      -1.0426e-02      -3.0973e-02
-2.800000000  -1.5110e-02      -9.4721e-03      -2.7334e-02
-2.700000000  -1.3703e-02      -8.5723e-03      -2.3974e-02
-2.600000000  -1.2408e-02      -7.7028e-03      -2.0974e-02
```

-2.50000000	-1.1158e-02	-6.8584e-03	-1.8427e-02
-2.40000000	-9.9335e-03	-6.0406e-03	-1.6331e-02
-2.30000000	-8.7375e-03	-5.2543e-03	-1.4524e-02
-2.20000000	-7.5796e-03	-4.5056e-03	-1.2834e-02
-2.10000000	-6.4735e-03	-3.8014e-03	-1.1195e-02
-2.00000000	-5.4362e-03	-3.1491e-03	-9.6046e-03
-1.90000000	-4.4871e-03	-2.5565e-03	-8.0841e-03
-1.80000000	-3.6493e-03	-2.0328e-03	-6.6660e-03
-1.70000000	-2.9530e-03	-1.5920e-03	-5.3944e-03
-1.60000000	-2.4505e-03	-1.2622e-03	-4.3322e-03
-1.50000000	-2.2334e-03	-1.0860e-03	-3.5940e-03
-1.40000000	-2.3455e-03	-1.0773e-03	-3.3757e-03
-1.30000000	-2.6904e-03	-1.1867e-03	-3.7217e-03
-1.20000000	-3.2395e-03	-1.3784e-03	-4.4777e-03
-1.10000000	-4.1363e-03	-1.6758e-03	-5.7903e-03
-1.00000000	-5.8246e-03	-2.1710e-03	-8.4477e-03
-0.90000000	-9.8796e-03	-3.1201e-03	-1.5782e-02
-0.80000000	-2.3766e-02	-5.3964e-03	-4.2698e-02
-0.70000000	-4.9430e-02	-1.2658e-02	-5.9791e-02
-0.60000000	-4.9547e-02	-2.7996e-02	-5.4876e-02
-0.50000000	-4.2500e-02	-3.1160e-02	-4.7743e-02
-0.40000000	-3.4395e-02	-2.5718e-02	-3.9130e-02
-0.30000000	-2.5996e-02	-1.9353e-02	-2.9687e-02
-0.20000000	-1.7450e-02	-1.2911e-02	-1.9977e-02
-0.10000000	-8.7799e-03	-6.4522e-03	-1.0077e-02
4.4408921e-16	-8.6352e-09	-6.0455e-09	-1.1089e-08
0.10000000	8.6741e-03	6.2981e-03	1.0022e-02
0.20000000	1.7033e-02	1.2308e-02	1.9758e-02
0.30000000	2.5069e-02	1.8027e-02	2.9198e-02
0.40000000	3.2775e-02	2.3452e-02	3.8334e-02
0.50000000	4.0143e-02	2.8578e-02	4.7157e-02
0.60000000	4.7168e-02	3.3403e-02	5.5659e-02
0.70000000	5.3842e-02	3.7925e-02	6.3831e-02
0.80000000	6.0159e-02	4.2140e-02	7.1665e-02
0.90000000	6.6112e-02	4.6048e-02	7.9153e-02
1.00000000	7.1697e-02	4.9645e-02	8.6287e-02
1.10000000	7.6907e-02	5.2929e-02	9.3058e-02
1.20000000	8.1737e-02	5.5900e-02	9.9460e-02
1.30000000	8.6182e-02	5.8555e-02	0.10548
1.40000000	9.0236e-02	6.0893e-02	0.11112
1.50000000	9.3892e-02	6.2910e-02	0.11637
1.60000000	9.7139e-02	6.4603e-02	0.12122
1.70000000	9.9958e-02	6.5963e-02	0.12565
1.80000000	0.10231	6.6990e-02	0.12965
1.90000000	0.10416	6.7713e-02	0.13320
2.00000000	0.10548	6.8209e-02	0.13623
2.10000000	0.10638	6.8557e-02	0.13867
2.20000000	0.10698	6.8817e-02	0.14048
2.30000000	0.10741	6.9020e-02	0.14174
2.40000000	0.10774	6.9188e-02	0.14259
2.50000000	0.10800	6.9332e-02	0.14320
2.60000000	0.10822	6.9458e-02	0.14365
2.70000000	0.10840	6.9572e-02	0.14401
2.80000000	0.10857	6.9677e-02	0.14431
2.90000000	0.10872	6.9775e-02	0.14456
3.00000000	0.10886	6.9867e-02	0.14478
3.10000000	0.10899	6.9954e-02	0.14498
3.20000000	0.10912	7.0039e-02	0.14517
3.30000000	0.10924	7.0124e-02	0.14534
3.40000000	0.10935	7.0234e-02	0.14550
3.50000000	0.10946	7.0300e-02	0.14566
3.60000000	0.10957	7.0605e-02	0.14581
3.70000000	0.10969	7.0981e-02	0.14596
3.80000000	0.10982	7.1669e-02	0.14610
3.90000000	0.11009	7.2622e-02	0.14625
4.00000000	0.11072	7.3662e-02	0.14641
4.10000000	0.11187	7.4694e-02	0.14664
4.20000000	0.11335	7.5691e-02	0.14721
4.30000000	0.11493	7.6640e-02	0.14854
4.40000000	0.11653	7.7540e-02	0.15041
4.50000000	0.11813	7.8408e-02	0.15247
4.60000000	0.11972	7.9285e-02	0.15462
4.70000000	0.12133	8.0205e-02	0.15683
4.80000000	0.12295	8.1179e-02	0.15909
4.90000000	0.12463	8.2206e-02	0.16143
5.00000000	0.12645	8.3274e-02	0.16389
5.10000000	0.12845	8.4362e-02	0.16650
5.20000000	0.13065	8.5420e-02	0.16936
5.30000000	0.13305	8.6272e-02	0.17252
5.40000000	0.13567	8.6117e-02	0.17602

5.50000000	0.13848	8.5479e-02	0.17988
5.60000000	0.14148	8.5708e-02	0.18412
5.70000000	0.14459	8.6661e-02	0.18874
5.80000000	0.14742	8.8185e-02	0.19375
5.90000000	0.14807	9.0114e-02	0.19914
6.00000000	0.14893	9.2366e-02	0.20488
6.10000000	0.15132	9.4915e-02	0.21091
6.20000000	0.15497	9.7749e-02	0.21682
6.30000000	0.15948	0.10086	0.22027
6.40000000	0.16460	0.10426	0.22157
6.50000000	0.17021	0.10793	0.22649
6.60000000	0.17626	0.11188	0.23347
[Pullup]			
Voltage	I(typ)	I(min)	I(max)
-3.30000000	7.8628e-02	6.1059e-02	0.10005
-3.20000000	7.6721e-02	5.9697e-02	9.8111e-02
-3.10000000	7.4897e-02	5.8337e-02	9.6491e-02
-3.00000000	7.3273e-02	5.6987e-02	9.5479e-02
-2.90000000	7.2155e-02	5.5660e-02	9.5970e-02
-2.80000000	7.2377e-02	5.4376e-02	0.10093
-2.70000000	7.6401e-02	5.3187e-02	0.10724
-2.60000000	8.4652e-02	5.2696e-02	0.10789
-2.50000000	8.9656e-02	5.5515e-02	0.10656
-2.40000000	9.5922e-02	6.5230e-02	0.10581
-2.30000000	0.10540	8.1725e-02	0.10886
-2.20000000	0.11387	9.0583e-02	0.11726
-2.10000000	0.11914	9.5312e-02	0.12607
-2.00000000	0.12070	9.6968e-02	0.13162
-1.90000000	0.11947	9.6447e-02	0.13272
-1.80000000	0.11632	9.4337e-02	0.13042
-1.70000000	0.11182	9.1001e-02	0.12599
-1.60000000	0.10633	8.6644e-02	0.12017
-1.50000000	0.10012	8.1478e-02	0.11347
-1.40000000	9.3516e-02	7.5900e-02	0.10628
-1.30000000	8.6781e-02	7.0215e-02	9.8831e-02
-1.20000000	7.9991e-02	6.4513e-02	9.1257e-02
-1.10000000	7.3166e-02	5.8817e-02	8.3604e-02
-1.00000000	6.6320e-02	5.3141e-02	7.5895e-02
-0.90000000	5.9478e-02	4.7517e-02	6.8147e-02
-0.80000000	5.2686e-02	4.1991e-02	6.0392e-02
-0.70000000	4.6003e-02	3.6583e-02	5.2684e-02
-0.60000000	3.9421e-02	3.1258e-02	4.5096e-02
-0.50000000	3.2857e-02	2.5964e-02	3.7622e-02
-0.40000000	2.6277e-02	2.0679e-02	3.0164e-02
-0.30000000	1.9688e-02	1.5414e-02	2.2667e-02
-0.20000000	1.3100e-02	1.0198e-02	1.5131e-02
-0.10000000	6.5301e-03	5.0528e-03	7.5693e-03
4.4408921e-16	2.7355e-08	2.4932e-08	3.1246e-08
0.10000000	-6.4086e-03	-4.9114e-03	-7.4781e-03
0.20000000	-1.2628e-02	-9.6476e-03	-1.4779e-02
0.30000000	-1.8655e-02	-1.4207e-02	-2.1900e-02
0.40000000	-2.4487e-02	-1.8586e-02	-2.8836e-02
0.50000000	-3.0121e-02	-2.2785e-02	-3.5586e-02
0.60000000	-3.5554e-02	-2.6801e-02	-4.2144e-02
0.70000000	-4.0782e-02	-3.0631e-02	-4.8507e-02
0.80000000	-4.5802e-02	-3.4275e-02	-5.4673e-02
0.90000000	-5.0613e-02	-3.7731e-02	-6.0637e-02
1.00000000	-5.5210e-02	-4.0996e-02	-6.6396e-02
1.10000000	-5.9591e-02	-4.4069e-02	-7.1947e-02
1.20000000	-6.3754e-02	-4.6948e-02	-7.7286e-02
1.30000000	-6.7694e-02	-4.9633e-02	-8.2409e-02
1.40000000	-7.1410e-02	-5.2120e-02	-8.7313e-02
1.50000000	-7.4899e-02	-5.4410e-02	-9.1994e-02
1.60000000	-7.8157e-02	-5.6500e-02	-9.6448e-02
1.70000000	-8.1181e-02	-5.8391e-02	-0.10067
1.80000000	-8.3964e-02	-6.0083e-02	-0.10466
1.90000000	-8.6496e-02	-6.1580e-02	-0.10840
2.00000000	-8.8762e-02	-6.2892e-02	-0.11189
2.10000000	-9.0746e-02	-6.4038e-02	-0.11508
2.20000000	-9.2457e-02	-6.5044e-02	-0.11795
2.30000000	-9.3931e-02	-6.5934e-02	-0.12046
2.40000000	-9.5208e-02	-6.6730e-02	-0.12261
2.50000000	-9.6327e-02	-6.7447e-02	-0.12446
2.60000000	-9.7318e-02	-6.8099e-02	-0.12606
2.70000000	-9.8206e-02	-6.8696e-02	-0.12746
2.80000000	-9.9009e-02	-6.9247e-02	-0.12869

2.90000000	-9.9741e-02	-6.9758e-02	-0.12980
3.00000000	-0.10041	-7.0235e-02	-0.13080
3.10000000	-0.10104	-7.0683e-02	-0.13170
3.20000000	-0.10162	-7.1106e-02	-0.13254
3.30000000	-0.10216	-7.1505e-02	-0.13331
3.40000000	-0.10268	-7.1886e-02	-0.13403
3.50000000	-0.10316	-7.2257e-02	-0.13471
3.60000000	-0.10363	-7.2740e-02	-0.13534
3.70000000	-0.10407	-7.4100e-02	-0.13594
3.80000000	-0.10449	-7.6851e-02	-0.13652
3.90000000	-0.10491	-8.0272e-02	-0.13706
4.00000000	-0.10540	-8.3978e-02	-0.13759
4.10000000	-0.10691	-8.7831e-02	-0.13810
4.20000000	-0.11021	-9.1771e-02	-0.13861
4.30000000	-0.11421	-9.5773e-02	-0.13913
4.40000000	-0.11844	-9.9837e-02	-0.14010
4.50000000	-0.12279	-0.10401	-0.14307
4.60000000	-0.12719	-0.10834	-0.14716
4.70000000	-0.13163	-0.11281	-0.15158
4.80000000	-0.13621	-0.11739	-0.15611
4.90000000	-0.14104	-0.12204	-0.16071
5.00000000	-0.14611	-0.12675	-0.16546
5.10000000	-0.15132	-0.13150	-0.17062
5.20000000	-0.15662	-0.13629	-0.17619
5.30000000	-0.16200	-0.14111	-0.18200
5.40000000	-0.16742	-0.14596	-0.18795
5.50000000	-0.17287	-0.15081	-0.19399
5.60000000	-0.17834	-0.15567	-0.20007
5.70000000	-0.18380	-0.16054	-0.20617
5.80000000	-0.18925	-0.16541	-0.21227
5.90000000	-0.19469	-0.17032	-0.21836
6.00000000	-0.20014	-0.17531	-0.22452
6.10000000	-0.20565	-0.18050	-0.23090
6.20000000	-0.21136	-0.18597	-0.23768
6.30000000	-0.21739	-0.19175	-0.24486
6.40000000	-0.22373	-0.19782	-0.25236
6.50000000	-0.23034	-0.20415	-0.26010
6.60000000	-0.23716	-0.21072	-0.26802
[GND_clamp]			
Voltage	I(typ)	I(min)	I(max)
-3.30000000	-23.34863	-24.06982	-23.09871
-3.20000000	-22.39009	-23.11384	-22.13871
-3.10000000	-21.43207	-22.15847	-21.17914
-3.00000000	-20.47463	-21.20375	-20.22006
-2.90000000	-19.51782	-20.24970	-19.26152
-2.80000000	-18.56169	-19.29635	-18.30357
-2.70000000	-17.60626	-18.34377	-17.34630
-2.60000000	-16.65159	-17.39204	-16.38978
-2.50000000	-15.69774	-16.44125	-15.43414
-2.40000000	-14.74482	-15.49150	-14.47949
-2.30000000	-13.79296	-14.54293	-13.52592
-2.20000000	-12.84231	-13.59569	-12.57352
-2.10000000	-11.89305	-12.64997	-11.62242
-2.00000000	-10.94541	-11.70599	-10.67287
-1.90000000	-9.99969	-10.76404	-9.72515
-1.80000000	-9.05624	-9.82447	-8.77964
-1.70000000	-8.11556	-8.88773	-7.83684
-1.60000000	-7.17830	-7.95443	-6.89745
-1.50000000	-6.24537	-7.02539	-5.96244
-1.40000000	-5.31806	-6.10172	-5.03325
-1.30000000	-4.39823	-5.18497	-4.11196
-1.20000000	-3.48903	-4.27756	-3.20194
-1.10000000	-2.59618	-3.38346	-2.30986
-1.00000000	-1.73149	-2.50974	-1.45064
-0.90000000	-0.92469	-1.67056	-0.66720
-0.80000000	-0.27571	-0.89967	-0.12683
-0.70000000	-2.5325e-02	-0.29408	-1.7949e-02
-0.60000000	-3.0067e-03	-3.6475e-02	-7.1925e-03
-0.50000000	-4.1628e-04	-2.3438e-03	-1.9332e-03
-0.40000000	-3.2889e-05	-1.2207e-04	-1.9285e-04
-0.30000000	-1.8258e-06	-6.6617e-06	-9.2605e-06
-0.20000000	0.00000	0.00000	0.00000
-0.10000000	0.00000	0.00000	0.00000
4.4408921e-16	0.00000	0.00000	0.00000
0.10000000	0.00000	0.00000	0.00000
0.20000000	0.00000	0.00000	0.00000

0.30000000	0.00000	0.00000	0.00000
0.40000000	0.00000	0.00000	0.00000
0.50000000	0.00000	0.00000	0.00000
0.60000000	0.00000	0.00000	0.00000
0.70000000	0.00000	0.00000	0.00000
0.80000000	0.00000	0.00000	0.00000
0.90000000	0.00000	0.00000	0.00000
1.00000000	0.00000	0.00000	0.00000
1.10000000	0.00000	0.00000	0.00000
1.20000000	0.00000	0.00000	0.00000
1.30000000	0.00000	0.00000	0.00000
1.40000000	0.00000	0.00000	0.00000
1.50000000	0.00000	0.00000	0.00000
1.60000000	0.00000	0.00000	0.00000
1.70000000	0.00000	0.00000	0.00000
1.80000000	0.00000	0.00000	0.00000
1.90000000	0.00000	0.00000	0.00000
2.00000000	0.00000	0.00000	0.00000
2.10000000	0.00000	0.00000	0.00000
2.20000000	0.00000	0.00000	0.00000
2.30000000	0.00000	0.00000	0.00000
2.40000000	0.00000	0.00000	0.00000
2.50000000	0.00000	0.00000	0.00000
2.60000000	0.00000	0.00000	0.00000
2.70000000	0.00000	0.00000	0.00000
2.80000000	0.00000	0.00000	0.00000
2.90000000	0.00000	0.00000	0.00000
3.00000000	0.00000	0.00000	0.00000
3.10000000	0.00000	0.00000	0.00000
3.20000000	0.00000	0.00000	0.00000
3.30000000	0.00000	0.00000	0.00000
3.40000000	0.00000	0.00000	0.00000
3.50000000	0.00000	0.00000	0.00000
3.60000000	0.00000	0.00000	0.00000
3.70000000	0.00000	0.00000	0.00000
3.80000000	0.00000	0.00000	0.00000
3.90000000	0.00000	0.00000	0.00000
4.00000000	0.00000	0.00000	0.00000
4.10000000	0.00000	0.00000	0.00000
4.20000000	0.00000	0.00000	0.00000
4.30000000	0.00000	0.00000	0.00000
4.40000000	0.00000	0.00000	0.00000
4.50000000	0.00000	0.00000	0.00000
4.60000000	0.00000	0.00000	0.00000
4.70000000	0.00000	0.00000	0.00000
4.80000000	0.00000	0.00000	0.00000
4.90000000	0.00000	0.00000	0.00000
5.00000000	0.00000	0.00000	0.00000
5.10000000	0.00000	0.00000	0.00000
5.20000000	0.00000	0.00000	0.00000
5.30000000	0.00000	0.00000	0.00000
5.40000000	0.00000	0.00000	0.00000
5.50000000	0.00000	0.00000	0.00000
5.60000000	0.00000	0.00000	0.00000
5.70000000	0.00000	0.00000	0.00000
5.80000000	0.00000	0.00000	0.00000
5.90000000	0.00000	0.00000	0.00000
6.00000000	0.00000	0.00000	0.00000
6.10000000	0.00000	0.00000	0.00000
6.20000000	0.00000	0.00000	0.00000
6.30000000	0.00000	0.00000	0.00000
6.40000000	0.00000	0.00000	0.00000
6.50000000	0.00000	0.00000	0.00000
6.60000000	0.00000	0.00000	0.00000
[POWER_clamp]			
Voltage	I(typ)	I(min)	I(max)
-3.30000000	2.0656e-06	2.0893e-06	2.2324e-06
-3.20000000	2.0312e-06	2.0505e-06	2.1930e-06
-3.10000000	1.9968e-06	2.0121e-06	2.1540e-06
-3.00000000	1.9625e-06	1.9740e-06	2.1155e-06
-2.90000000	1.9283e-06	1.9362e-06	2.0774e-06
-2.80000000	1.8942e-06	1.8987e-06	2.0398e-06
-2.70000000	1.8602e-06	1.8615e-06	2.0026e-06
-2.60000000	1.8263e-06	1.8246e-06	1.9657e-06
-2.50000000	1.7924e-06	1.7879e-06	1.9291e-06
-2.40000000	1.7586e-06	1.7515e-06	1.8929e-06

-2.30000000	1.7249e-06	1.7153e-06	1.8569e-06
-2.20000000	1.6912e-06	1.6792e-06	1.8212e-06
-2.10000000	1.6576e-06	1.6434e-06	1.7857e-06
-2.00000000	1.6240e-06	1.6078e-06	1.7504e-06
-1.90000000	1.5905e-06	1.5724e-06	1.7154e-06
-1.80000000	1.5570e-06	1.5371e-06	1.6806e-06
-1.70000000	1.5236e-06	1.5019e-06	1.6459e-06
-1.60000000	1.4902e-06	1.4669e-06	1.6113e-06
-1.50000000	1.4568e-06	1.4321e-06	1.5770e-06
-1.40000000	1.4235e-06	1.3973e-06	1.5428e-06
-1.30000000	1.3902e-06	1.3627e-06	1.5086e-06
-1.20000000	1.3570e-06	1.3282e-06	1.4746e-06
-1.10000000	1.3237e-06	1.2937e-06	1.4407e-06
-1.00000000	1.2905e-06	1.2594e-06	1.4069e-06
-0.90000000	1.2573e-06	1.2252e-06	1.3732e-06
-0.80000000	1.2242e-06	1.1910e-06	1.3396e-06
-0.70000000	1.1911e-06	1.1569e-06	1.3060e-06
-0.60000000	1.1580e-06	1.1229e-06	1.2725e-06
-0.50000000	1.1249e-06	1.0889e-06	1.2391e-06
-0.40000000	1.0918e-06	1.0550e-06	1.2057e-06
-0.30000000	1.0573e-06	1.0206e-06	1.1717e-06
-0.20000000	0.000000	0.000000	1.1214e-06
-0.10000000	0.000000	0.000000	0.000000
4.4408921e-16	0.000000	0.000000	0.000000
0.10000000	0.000000	0.000000	0.000000
0.20000000	0.000000	0.000000	0.000000
0.30000000	0.000000	0.000000	0.000000
0.40000000	0.000000	0.000000	0.000000
0.50000000	0.000000	0.000000	0.000000
0.60000000	0.000000	0.000000	0.000000
0.70000000	0.000000	0.000000	0.000000
0.80000000	0.000000	0.000000	0.000000
0.90000000	0.000000	0.000000	0.000000
1.00000000	0.000000	0.000000	0.000000
1.10000000	0.000000	0.000000	0.000000
1.20000000	0.000000	0.000000	0.000000
1.30000000	0.000000	0.000000	0.000000
1.40000000	0.000000	0.000000	0.000000
1.50000000	0.000000	0.000000	0.000000
1.60000000	0.000000	0.000000	0.000000
1.70000000	0.000000	0.000000	0.000000
1.80000000	0.000000	0.000000	0.000000
1.90000000	0.000000	0.000000	0.000000
2.00000000	0.000000	0.000000	0.000000
2.10000000	0.000000	0.000000	0.000000
2.20000000	0.000000	0.000000	0.000000
2.30000000	0.000000	0.000000	0.000000
2.40000000	0.000000	0.000000	0.000000
2.50000000	0.000000	0.000000	0.000000
2.60000000	0.000000	0.000000	0.000000
2.70000000	0.000000	0.000000	0.000000
2.80000000	0.000000	0.000000	0.000000
2.90000000	0.000000	0.000000	0.000000
3.00000000	0.000000	0.000000	0.000000
3.10000000	0.000000	0.000000	0.000000
3.20000000	0.000000	0.000000	0.000000
3.30000000	0.000000	0.000000	0.000000
3.40000000	0.000000	0.000000	0.000000
3.50000000	0.000000	0.000000	0.000000
3.60000000	0.000000	0.000000	0.000000
3.70000000	0.000000	0.000000	0.000000
3.80000000	0.000000	0.000000	0.000000
3.90000000	0.000000	0.000000	0.000000
4.00000000	0.000000	0.000000	0.000000
4.10000000	0.000000	0.000000	0.000000
4.20000000	0.000000	0.000000	0.000000
4.30000000	0.000000	0.000000	0.000000
4.40000000	0.000000	0.000000	0.000000
4.50000000	0.000000	0.000000	0.000000
4.60000000	0.000000	0.000000	0.000000
4.70000000	0.000000	0.000000	0.000000
4.80000000	0.000000	0.000000	0.000000
4.90000000	0.000000	0.000000	0.000000
5.00000000	0.000000	0.000000	0.000000
5.10000000	0.000000	0.000000	0.000000
5.20000000	0.000000	0.000000	0.000000
5.30000000	0.000000	0.000000	0.000000
5.40000000	0.000000	0.000000	0.000000
5.50000000	0.000000	0.000000	0.000000
5.60000000	0.000000	0.000000	0.000000

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5.70000000      0.00000      0.00000      0.00000
5.80000000      0.00000      0.00000      0.00000
5.90000000      0.00000      0.00000      0.00000
6.00000000      0.00000      0.00000      0.00000
6.10000000      0.00000      0.00000      0.00000
6.20000000      0.00000      0.00000      0.00000
6.30000000      0.00000      0.00000      0.00000
6.40000000      0.00000      0.00000      0.00000
6.50000000      0.00000      0.00000      0.00000
6.60000000      0.00000      0.00000      0.00000
|
|
[Ramp]
|Variable      typ      min      max
dV/dt_r  1.4573/7.093e-10      1.1951/1.041e-09      1.6680/4.358e-10
dV/dt_f  1.5677/6.852e-10      1.2858/1.020e-09      1.7727/4.283e-10
R_load   = 50
|
|
[Rising Waveform]
R_fixture      =      50
V_fixture      =      0.00
V_fixture_min  =      0.00
V_fixture_max  =      0.00
C_fixture      =      0.00
|
|Time      V(typ)      V(min)      V(max)
0.      0.      0.      0.
8.0808081e-11      0.      0.      0.
1.6161616e-10      5.9697e-07      6.8788e-07      5.7810e-07
2.4242424e-10      1.5122e-06      1.7057e-06      1.4345e-06
3.2323232e-10      2.4274e-06      2.7235e-06      2.2908e-06
4.0404040e-10      3.3426e-06      3.7414e-06      3.1472e-06
4.8484848e-10      5.1953e-06      5.7997e-06      4.8714e-06
5.6565657e-10      7.9853e-06      8.8984e-06      7.4635e-06
6.4646465e-10      1.0775e-05      1.1997e-05      1.0056e-05
7.2727273e-10      1.3565e-05      1.5096e-05      1.2648e-05
8.0808081e-10      1.6355e-05      1.8195e-05      1.5240e-05
8.8888889e-10      1.9642e-05      2.1846e-05      1.8280e-05
9.6969697e-10      2.3426e-05      2.6051e-05      2.1769e-05
1.0505051e-09      2.7210e-05      3.0255e-05      2.5258e-05
1.1313131e-09      3.0993e-05      3.4460e-05      2.8747e-05
1.2121212e-09      3.4777e-05      3.8664e-05      3.2236e-05
1.2929293e-09      3.8152e-05      4.2343e-05      3.7097e-05
1.3737374e-09      4.1117e-05      4.5496e-05      4.3329e-05
1.4545455e-09      4.4083e-05      4.8649e-05      4.9561e-05
1.5353535e-09      4.7048e-05      5.1802e-05      5.5793e-05
1.6161616e-09      5.0014e-05      5.4955e-05      6.2026e-05
1.6969697e-09      5.8847e-05      5.8793e-05      7.7750e-05
1.7777778e-09      7.3549e-05      6.3316e-05      1.0644e-04
1.8585859e-09      8.8250e-05      6.7838e-05      1.4556e-04
1.9393939e-09      1.0295e-04      7.2360e-05      1.9909e-04
2.0202020e-09      1.1765e-04      7.6883e-05      2.5263e-04
2.1010101e-09      1.4123e-04      8.3828e-05      3.0616e-04
2.1818182e-09      1.7450e-04      9.5426e-05      3.5970e-04
2.2626263e-09      2.1015e-04      1.1371e-04      4.1323e-04
2.3434343e-09      2.5494e-04      1.3621e-04      4.7725e-04
2.4242424e-09      2.9973e-04      1.5872e-04      5.4126e-04
2.5050505e-09      3.4453e-04      1.8122e-04      6.0527e-04
2.5858586e-09      3.8932e-04      2.0373e-04      6.6928e-04
2.6666667e-09      4.3411e-04      2.2623e-04      7.3329e-04
2.7474747e-09      4.7851e-04      2.5274e-04      8.3400e-04
2.8282828e-09      5.3561e-04      2.7000e-04      1.0525e-03
2.9090909e-09      1.0248e-03      3.2058e-04      1.7287e-03
2.9898990e-09      1.5429e-03      3.7339e-04      2.4352e-03
3.0707071e-09      3.6205e-03      1.0844e-03      -8.6831e-03
3.1515152e-09      -1.1026e-02      2.5974e-03      5.0440e-02
3.2323232e-09      3.1204e-02      2.2196e-03      0.16193
3.3131313e-09      0.11298      -9.2339e-03      0.29340
3.3939394e-09      0.19464      2.1231e-03      0.48839
3.4747475e-09      0.30136      4.6428e-02      0.79103
3.5555556e-09      0.50315      9.4192e-02      1.14617
3.6363636e-09      0.71714      0.15133      1.50882
3.7171717e-09      0.94894      0.22469      1.87146
3.7979798e-09      1.18074      0.35121      2.07310
3.8787879e-09      1.40968      0.48465      2.22422
3.9595960e-09      1.55008      0.62761      2.33489
4.0404040e-09      1.67780      0.76222      2.40567
4.1212121e-09      1.78433      0.87603      2.47645
4.2020202e-09      1.87528      0.97864      2.54722

```

4.2828283e-09	1.96624	1.08125	2.58936
4.3636364e-09	2.05719	1.18386	2.61317
4.4444444e-09	2.11512	1.26413	2.63403
4.5252525e-09	2.15797	1.34023	2.64776
4.6060606e-09	2.19132	1.40646	2.66149
4.6868687e-09	2.21355	1.46420	2.67522
4.7676768e-09	2.23577	1.52194	2.68895
4.8484848e-09	2.25800	1.57968	2.70178
4.9292929e-09	2.28023	1.63743	2.70832
5.0101010e-09	2.29906	1.68058	2.71485
5.0909091e-09	2.30921	1.70914	2.72139
5.1717172e-09	2.31937	1.73770	2.72792
5.2525253e-09	2.32952	1.76626	2.73410
5.3333333e-09	2.33968	1.79483	2.73782
5.4141414e-09	2.34876	1.81606	2.74154
5.4949495e-09	2.35511	1.82998	2.74526
5.5757576e-09	2.36146	1.84390	2.74897
5.6565657e-09	2.36782	1.85781	2.75249
5.7373737e-09	2.37417	1.87173	2.75460
5.8181818e-09	2.37974	1.88294	2.75672
5.8989899e-09	2.38331	1.89145	2.75883
5.9797980e-09	2.38688	1.89996	2.76095
6.0606061e-09	2.39045	1.90847	2.76298
6.1414141e-09	2.39402	1.91698	2.76440
6.2222222e-09	2.39734	1.92391	2.76582
6.3030303e-09	2.40003	1.92928	2.76724
6.3838384e-09	2.40273	1.93465	2.76867
6.4646465e-09	2.40542	1.94001	2.77001
6.5454545e-09	2.40812	1.94538	2.77085
6.6262626e-09	2.41048	1.94998	2.77169
6.7070707e-09	2.41201	1.95381	2.77253
6.7878788e-09	2.41354	1.95765	2.77337
6.8686869e-09	2.41507	1.96148	2.77419
6.9494949e-09	2.41660	1.96532	2.77482
7.0303030e-09	2.41807	1.96852	2.77545
7.1111111e-09	2.41938	1.97111	2.77608
7.1919192e-09	2.42069	1.97369	2.77671
7.2727273e-09	2.42201	1.97627	2.77730
7.3535354e-09	2.42332	1.97885	2.77766
7.4343434e-09	2.42446	1.98113	2.77802
7.5151515e-09	2.42517	1.98310	2.77838
7.5959596e-09	2.42588	1.98507	2.77874
7.6767677e-09	2.42659	1.98704	2.77909
7.7575758e-09	2.42730	1.98901	2.77941
7.8383838e-09	2.42805	1.99071	2.77973
7.9191919e-09	2.42889	1.99214	2.78004
8.0000000e-09	2.42973	1.99358	2.78036
[Falling Waveform]			
R_fixture	=	50	
V_fixture	=	3.3	
V_fixture_min	=	3.0	
V_fixture_max	=	3.6	
C_fixture	=	0.00	
Time	V(typ)	V(min)	V(max)
0.	3.30000	3.00000	3.60000
8.0808081e-11	3.30000	3.00000	3.60000
1.6161616e-10	3.30000	3.00000	3.60000
2.4242424e-10	3.30000	2.99999	3.60000
3.2323232e-10	3.29999	2.99999	3.59999
4.0404040e-10	3.29999	2.99999	3.59999
4.8484848e-10	3.29999	2.99999	3.59999
5.6565657e-10	3.29999	2.99998	3.59999
6.4646465e-10	3.29998	2.99998	3.59998
7.2727273e-10	3.29998	2.99997	3.59998
8.0808081e-10	3.29997	2.99997	3.59998
8.8888889e-10	3.29997	2.99996	3.59997
9.6969697e-10	3.29996	2.99995	3.59997
1.0505051e-09	3.29996	2.99995	3.59997
1.1313131e-09	3.29995	2.99994	3.59996
1.2121212e-09	3.29995	2.99994	3.59996
1.2929293e-09	3.29995	2.99993	3.59996
1.3737374e-09	3.29994	2.99993	3.59995
1.4545455e-09	3.29994	2.99993	3.59995
1.5353535e-09	3.29994	2.99992	3.59995
1.6161616e-09	3.29994	2.99992	3.59995
1.6969697e-09	3.29993	2.99992	3.59993
1.7777778e-09	3.29993	2.99992	3.59991

1.8585859e-09	3.29992	2.99992	3.59988
1.9393939e-09	3.29991	2.99991	3.59986
2.0202020e-09	3.29991	2.99991	3.59983
2.1010101e-09	3.29989	2.99991	3.59979
2.1818182e-09	3.29987	2.99990	3.59972
2.2626263e-09	3.29983	2.99989	3.59966
2.3434343e-09	3.29979	2.99988	3.59959
2.4242424e-09	3.29975	2.99986	3.59953
2.5050505e-09	3.29971	2.99984	3.59947
2.5858586e-09	3.29967	2.99983	3.59948
2.6666667e-09	3.29962	2.99981	3.59970
2.7474747e-09	3.29964	2.99981	3.60102
2.8282828e-09	3.30069	2.99990	3.60421
2.9090909e-09	3.30446	3.00171	3.60887
2.9898990e-09	3.30841	3.00364	3.61302
3.0707071e-09	3.31285	3.00758	3.60224
3.1515152e-09	3.31594	3.01152	3.50040
3.2323232e-09	3.25741	3.01354	3.40482
3.3131313e-09	3.19412	3.01178	3.28545
3.3939394e-09	3.12122	2.99095	3.02813
3.4747475e-09	3.01204	2.95410	2.73334
3.5555556e-09	2.85835	2.91274	2.37085
3.6363636e-09	2.63776	2.86212	2.00836
3.7171717e-09	2.41716	2.80200	1.64588
3.7979798e-09	2.19656	2.72030	1.39098
3.8787879e-09	1.97597	2.60265	1.20373
3.9595960e-09	1.76792	2.48501	1.06673
4.0404040e-09	1.58377	2.36736	0.99396
4.1212121e-09	1.43161	2.24971	0.92120
4.2020202e-09	1.31066	2.13340	0.84844
4.2828283e-09	1.18971	2.01931	0.80122
4.3636364e-09	1.06877	1.90523	0.78110
4.4444444e-09	0.99997	1.79114	0.76474
4.5252525e-09	0.96245	1.67706	0.75083
4.6060606e-09	0.92494	1.57855	0.73693
4.6868687e-09	0.88743	1.50602	0.72302
4.7676768e-09	0.84992	1.43348	0.71534
4.8484848e-09	0.82689	1.36094	0.70866
4.9292929e-09	0.81294	1.28841	0.70199
5.0101010e-09	0.80011	1.22819	0.69532
5.0909091e-09	0.79077	1.18850	0.68865
5.1717172e-09	0.78143	1.14880	0.68473
5.2525253e-09	0.77210	1.10911	0.68127
5.3333333e-09	0.76276	1.06942	0.67780
5.4141414e-09	0.75394	1.03944	0.67433
5.4949495e-09	0.74881	1.02565	0.67087
5.5757576e-09	0.74368	1.01186	0.66871
5.6565657e-09	0.73854	0.99807	0.66677
5.7373737e-09	0.73341	0.98428	0.66483
5.8181818e-09	0.72852	0.97187	0.66288
5.8989899e-09	0.72534	0.96177	0.66094
5.9797980e-09	0.72215	0.95168	0.65963
6.0606061e-09	0.71897	0.94158	0.65843
6.1414141e-09	0.71579	0.93149	0.65723
6.2222222e-09	0.71275	0.92340	0.65603
6.3030303e-09	0.71073	0.91866	0.65483
6.3838384e-09	0.70872	0.91392	0.65401
6.4646465e-09	0.70670	0.90918	0.65325
6.5454545e-09	0.70469	0.90444	0.65250
6.6262626e-09	0.70275	0.89982	0.65174
6.7070707e-09	0.70134	0.89540	0.65099
6.7878788e-09	0.69993	0.89098	0.65044
6.8686869e-09	0.69853	0.88657	0.64992
6.9494949e-09	0.69712	0.88215	0.64941
7.0303030e-09	0.69577	0.87860	0.64889
7.1111111e-09	0.69483	0.87649	0.64838
7.1919192e-09	0.69389	0.87438	0.64801
7.2727273e-09	0.69295	0.87228	0.64768
7.3535354e-09	0.69202	0.87017	0.64734
7.4343434e-09	0.69111	0.86799	0.64700
7.5151515e-09	0.69041	0.86571	0.64666
7.5959596e-09	0.68971	0.86342	0.64640
7.6767677e-09	0.68901	0.86113	0.64615
7.7575758e-09	0.68831	0.85884	0.64590
7.8383838e-09	0.68764	0.85709	0.64566
7.9191919e-09	0.68714	0.85624	0.64541
8.0000000e-09	0.68664	0.85540	0.64523

|

[End]

B.1: Ficheros de tecnología para modelo DR-1.

```
% Technology file for DR-1 model
% General parameters
Vol=0
Voh=2.5
Rlh=56.7768
Rhl=57.3268
Ro=50
C=3.066e-12
tfin=6e-9
errorlimit=0.01 %If we work with an error of 5 per cent
interv=50      % 50 points in each section

% Parameters for pls_r function:

dVr=0.7024
dtr=9.449e-10
% Parameters for pls_f function:

dVf=0.6988
dtf=6.504e-10
% Parameters for pwl_r function:

Tdesr=[0 1.431e-9 2.3759e-9 3.8069e-9]
Vdesr=[0 234.046e-3 937.083e-3 1.1707]

% Parameters for pwl_f function:
Tdesf=[0 1.6162e-9 2.22e-9 3.33e-9 4.7474e-9]
Vdesf=[2.5 2.268 1.6237 1.36155 1.34471]
```

B.2: Ficheros de tecnología para modelo DR-2.

% Technology file for VCX16244 (data_o) FAIRCHILD model

% General parameters

Vol=0

Voh=3.3

Rlh=17.9338

Rhl=13.1498

Ro=50

C=1.279e-12

tfin=8e-9

errorlimit=0.02

%If we work with an error of 2 per cent

interv=50

% 50 points in each section

% Parameters for pls_r function:

dVr=1.4573

dtr=7.093e-10

% Parameters for pls_f function:

dVf=1.5677

dtf=6.852e-10

% Parameters for pwl_r function:

Tdesr=1e-9[0 2.4242424e-1 2.7474747 3.2323232 3.555 3.7979 4.28283 4.60606 6.222]*

Vdesr=[0 1.5122e-6 4.7851e-4 3.1204e-2 0.50315 1.18074 1.96624 2.19132 2.39734]

%Tdesr=1e-9[0 2.4242424e-1 2.7474747 3.2323232 3.555 3.7979 4.28283 4.60606 6.222 8]*

%Vdesr=[0 1.5122e-6 4.7851e-4 3.1204e-2 0.50315 1.18074 1.96624 2.19132 2.39734 2.4288]

% Parameters for pwl_f function:

Tdesf=1e-9[0 2.7474747 3.23232 3.5555 3.63636 4.2020 4.28283 4.84848 5.41414 5.9797980]*

Vdesf=[3.3 3.299 3.25741 2.85835 2.63776 1.31066 1.18971 0.82689 0.75394 0.72215]

%Tdesf=1e-9[0 1.616162 3.0707071 3.23232 3.63636 4.2020 4.28283 4.84848 5.41414 5.9797980 8]*

%Vdesf=[3.3 3.29994 3.31285 3.25741 2.63776 1.31066 1.18971 0.82689 0.75394 0.72215 0.68717]

% Parameters for pulldown information

Vreference=[-3.3 -2.3 -1 0 0.3 0.8 1.2 1.5 1.8 2.5 3 3.3 4 5.2 6.6]

*lpd=[-2.6706e-2 -8.7375e-3 -5.8246e-3 -8.6352e-9 2.5069e-2 6.0159e-2 8.1737e-2 9.3892e-2
0.10231 0.108 0.10886 0.10924 0.11072 0.13065 0.17626]*

% Parameters for pullup information. The signs are changed with respect to the IBIS information.

*lpu=[7.8628e-2 0.10540 6.6320e-2 2.7355e-8 -1.8655e-2 -4.5802e-2 -6.3754e-2 -7.4899e-2 -
8.3964e-2 -9.6327e-2 -0.10041 -0.10216 -0.1054 -0.15662 -0.23716]*

% Parameters for the clamping information:

Vclamping=[-3.3 -2.8 -2.2 -1.6 -1.2 -0.9 -0.8 -0.5 -0.3 0 6.6];

lpc=zeros(size(Vclamping)) % If the clamping characteristics are not

lgc=zeros(size(Vclamping)) % considered.

C: Ficheros HSPICE empleados.**C.1: Modelo de pendiente simple, curva de subida:**

**Fichero general para el modelo lineal de un pin (subida). Por Mario Palma Serrano.*

```
Rlh 1 out 17.9338
Ccom out 0 1.279pF
Ro out 0 50
Vx 1 0 pulse( 0 3.3v 3.2954ns 1.1822ns 0.1ns 10ns 100ns)
.tran 0.01ns 8ns
.print v(out) v(1)
.options Post NoMod Probe
.end
```

C.2: Modelo de pendiente simple, curva de bajada:

**Fichero general para el modelo lineal de un pin (bajada). Por Mario Palma *Serrano*

```
Rhl 1 out 13.1498
Ccom out 0 1.279pF
Ro out 3 50
Vx 1 0 pulse( vh vl td tf tr pw per )
Voh 3 0 dc=3.3v
.tran 0.01ns 8ns
.print v(3) v(out) v(1)
.probe v(3) v(out) v(1)
.options Post NoMod Probe
.param vh=3.3 vl=0v td=3.3378ns tf=1.0706ns tr=0.1ns pw=10ns per=10ns
.end
```

C.3: Modelo de fuente pwl, curva de subida (10 puntos):

**Modelo lineal de un pin, fuente pwl. Por Mario Palma Serrano*

Rlh 1 2 17.9338

Ccom 2 0 1.279pF

Ro 2 0 50

Vx 1 0 pwl 0n 0v, 0.242424n 2.2683e-6v, 2.7474747n 6.5795125e-4v, 3.2323232n 4.29055e-2v, 3.555n 0.69183125v, 3.7979n 1.6235175v, 4.28283n 2.70358v, 4.60606n 3.013065v, 6.222n 3.3v, 8n 3.3v

.tran 0.01ns 8ns

.print v(2) v(1)

.options Post NoMod Probe

.end

C.4: Modelo de fuente pwl, curva de bajada (10 puntos):

**Modelo lineal de un pin, fuente pwl (bajada). Por Mario Palma Serrano*

Rhl 1 out 13.1498

Ccom out 0 1.279pF

Ro out 3 50

Voh 3 0 dc=3.3

Vx 1 0 pwl

<i>+ 0</i>	<i>3.300000000000000e+000,</i>
<i>+ 2.747474700000000e-009</i>	<i>3.288083125000000e+000,</i>
<i>+ 3.232320000000000e-009</i>	<i>3.206512968750000e+000,</i>
<i>+ 3.555500000000000e-009</i>	<i>2.679703125000000e+000,</i>
<i>+ 3.636360000000000e-009</i>	<i>2.472900000000000e+000,</i>
<i>+ 4.202000000000000e-009</i>	<i>7.372462500000000e-001,</i>
<i>+ 4.282830000000000e-009</i>	<i>5.948550000000000e-001,</i>
<i>+ 4.848480000000001e-009</i>	<i>1.550418750000000e-001,</i>
<i>+ 5.414140000000000e-009</i>	<i>9.424250000000000e-002,</i>
<i>+ 6.295454562500001e-009</i>	<i>0,</i>
<i>+ 8.000000000000000e-009</i>	<i>0</i>

.tran 0.01ns 8ns

.print v(3) v(out) v(1)

.probe v(3) v(out) v(1)

.options Post NoMod Probe

.end

C.5: Modelo de resistencias variables (10 puntos), curva de subida:

La característica de bajada es similar a este listado, por lo que no se añadirá debida a la gran longitud que ocupan.

** Driver no lineal con 10 puntos de salida deseados. Modelo DR-2*

Vcc pw 0 3.3

Ccomp out auxcomp 1.279e-12

Vccomp auxcomp 0 0

** Desireable output. Information taken from [Rising waveform].*

*Vout aux 0 pwl 0n 0v, 2.4242424e-10 1.5122e-6, 2.7474747n 4.7851e-4, 3.2323232n *3.1204e-2, 3.555n 0.50315, 3.7979n 1.18074, 4.28283n 1.96624, 4.60606n 2.19132, *6.222n 2.39734, 8n 2.4288

Ro out 0 50 ** Output load.*

lkpur 0 auxk pwl 0n -6.431302e-9, 2.4242424e-10 3.832351e-6, 2.7474747n 1.277916e-3, 3.2323232n 4.878539e-2, + 3.555n 0.383532, 3.7979n 0.624687, 4.28283n 0.834627, 4.60606n 0.9051382, 6.222n 0.984372, 8n 1

Vkpur auxk 0 0

Gpu 0 auxpu VCCS pwl(1) pw out

+ -3.3000000, -7.8628e-02
+ -2.3000000, -0.10540
+ -1.0000000, -6.6320e-02
+ 4.4408921e-16, -2.7355e-08
+ 0.3000000, 1.8655e-02
+ 0.8000000, 4.5802e-02
+ 1.2000000, 6.3754e-02
+ 1.5000000, 7.4899e-02
+ 1.8000000, 8.3964e-02
+ 2.5000000, 9.6327e-02
+ 3.0000000, 0.10041
+ 3.3000000, 0.10216
+ 4.0000000, 0.10540
+ 5.2000000, 0.15662
+ 6.6000000, 0.23716

Vpu auxpu 0 0

Ftpu pw out CCCS poly(2) Vkpur Vpu 0 0 0 0 1 **Multiplication of lkpur and Gpu.*

Fkpdr 0 auxd CCCS poly(1) Vkpur 1 -1 **kpd coefficients=1-kpu*

Vkpdr auxd 0 0

Gpd 0 auxpd VCCS pwl(1) out 0

+ -3.3000000, -2.6706e-02
+ -2.3000000, -8.7375e-03
+ -1.6000000, -2.4505e-03
+ -1.0000000, -5.8246e-03
+ -0.1000000, -8.7799e-03
+ 4.4408921e-16, -8.6352e-09

```
+ 0.30000000, 2.5069e-02
+ 0.80000000, 6.0159e-02
+ 1.20000000, 8.1737e-02
+ 1.80000000, 0.10231
+ 3.00000000, 0.10886
+ 3.30000000, 0.10924
+ 4.00000000, 0.11072
+ 5.20000000, 0.13065
+ 6.00000000, 0.14893
+ 6.60000000, 0.17626
```

```
Vpd auxpd 0 0
```

```
Ftpd out 0 CCCS poly(2) Vkpdr Vpd 0 0 0 0 1 *Multiplication of Ikpdr and Gpd
```

```
.tran 0.01n 8ns start=0
```

```
.print v(out) v(pw) i(Vkpur) i(Vkpdr) i(Vpu) i(Vpd)
```

```
*.probe v(out) v(pw) i(Vkpur) i(Vkpdr) i(Vpu) i(Vpd)
```

```
.options Post NoMod Probe
```

```
.end
```

C.6: Modelo de resistencias variables (100 puntos) curva de subida:

La característica de bajada es similar a este listado, por lo que no se añadirá debida a la gran longitud que ocupan.

* MODELO NO LINEAL PARA IBIS. FICHERO VCX16244 DE FAIRCHILD.

Vcc pw 0 3.3

Ccomp out auxcomp 1.279pF

Vccomp auxcomp 0 0

Ro out 0 50

Ikpwr 0 auxk pwl

```
+ 0. -8.452624088973827e-008,
+ 8.0808081e-11 7.962192022545706e-009,
+ 1.6161616e-10 6.810093624384617e-007,
+ 2.4242424e-10 1.637274138946410e-006,
+ 3.2323232e-10 2.593510824498990e-006,
+ 4.0404040e-10 3.694992400208360e-006,
+ 4.8484848e-10 5.775973410466336e-006,
+ 5.6565657e-10 8.691005801349400e-006,
+ 6.4646465e-10 1.160580469757642e-005,
+ 7.2727273e-10 1.452085761269301e-005,
+ 8.0808081e-10 1.751289667559229e-005,
+ 8.8888889e-10 2.102419286264235e-005,
+ 9.6969697e-10 2.497773890058106e-005,
+ 1.0505051e-09 2.893110749527802e-005,
+ 1.1313131e-09 3.288371566184391e-005,
+ 1.2121212e-09 3.677382609143998e-005,
+ 1.2929293e-09 4.023644385400266e-005,
+ 1.3737374e-09 4.333435996934737e-005,
+ 1.4545455e-09 4.643299694681962e-005,
+ 1.5353535e-09 4.953088323676715e-005,
+ 1.6161616e-09 5.353858191287075e-005,
+ 1.6969697e-09 6.367610560675573e-005,
+ 1.7777778e-09 7.903557818792196e-005,
+ 1.8585859e-09 9.439364932522576e-005,
+ 1.9393939e-09 1.097504655671896e-004,
+ 2.0202020e-09 1.264825724363406e-004,
+ 2.1010101e-09 1.526159111266403e-004,
+ 2.1818182e-09 1.877376266173755e-004,
+ 2.2626263e-09 2.263905266583276e-004,
+ 2.3434343e-09 2.731714378066798e-004,
+ 2.4242424e-09 3.199505706280734e-004,
+ 2.5050505e-09 3.667337127490666e-004,
+ 2.5858586e-09 4.135046252870299e-004,
+ 2.6666667e-09 4.602118098418705e-004,
+ 2.7474747e-09 5.085357292549652e-004,
+ 2.8282828e-09 6.350627421513444e-004,
+ 2.9090909e-09 1.150000669890170e-003,
+ 2.9898990e-09 1.931511966573555e-003,
+ 3.0707071e-09 1.509238085221107e-003,
+ 3.1515152e-09 -5.137797617519778e-003,
+ 3.2323232e-09 4.417517785166073e-002,
+ 3.3131313e-09 1.195931192343078e-001,
+ 3.3939394e-09 1.884041366165629e-001,
```

+ 3.4747475e-09 2.738995706438528e-001,
 + 3.5555556e-09 3.861860024112932e-001,
 + 3.6363636e-09 4.796146303684294e-001,
 + 3.7171717e-09 5.598352421058620e-001,
 + 3.7979798e-09 6.285995114199150e-001,
 + 3.8787879e-09 6.842634540930879e-001,
 + 3.9595960e-09 7.217832530016777e-001,
 + 4.0404040e-09 7.553542504497620e-001,
 + 4.1212121e-09 7.841375978661744e-001,
 + 4.2020202e-09 8.106141786123939e-001,
 + 4.2828283e-09 8.380059124610809e-001,
 + 4.3636364e-09 8.636220086762538e-001,
 + 4.4444444e-09 8.812234544795446e-001,
 + 4.5252525e-09 8.949627402158178e-001,
 + 4.6060606e-09 9.054765399705344e-001,
 + 4.6868687e-09 9.134241009983502e-001,
 + 4.7676768e-09 9.215497327541540e-001,
 + 4.8484848e-09 9.297649579003024e-001,
 + 4.9292929e-09 9.377391657625284e-001,
 + 5.0101010e-09 9.439967340013084e-001,
 + 5.0909091e-09 9.479642279999050e-001,
 + 5.1717172e-09 9.519664782317924e-001,
 + 5.2525253e-09 9.559882252460466e-001,
 + 5.3333333e-09 9.599284058389434e-001,
 + 5.4141414e-09 9.632937645917906e-001,
 + 5.4949495e-09 9.658455067734994e-001,
 + 5.5757576e-09 9.684068809072642e-001,
 + 5.6565657e-09 9.709790166859880e-001,
 + 5.7373737e-09 9.734794089579016e-001,
 + 5.8181818e-09 9.755488703566732e-001,
 + 5.8989899e-09 9.770060606654292e-001,
 + 5.9797980e-09 9.784660446638812e-001,
 + 6.0606061e-09 9.799288308341680e-001,
 + 6.1414141e-09 9.813694782505604e-001,
 + 6.2222222e-09 9.826720230412088e-001,
 + 6.3030303e-09 9.837815244060158e-001,
 + 6.3838384e-09 9.849301515506882e-001,
 + 6.4646465e-09 9.860782987688126e-001,
 + 6.5454545e-09 9.871974342805606e-001,
 + 6.6262626e-09 9.881236522085248e-001,
 + 6.7070707e-09 9.887787671470064e-001,
 + 6.7878788e-09 9.894344604648044e-001,
 + 6.8686869e-09 9.900907331182736e-001,
 + 6.9494949e-09 9.907415594664330e-001,
 + 7.0303030e-09 9.913571216022564e-001,
 + 7.1111111e-09 9.919204559234034e-001,
 + 7.1919192e-09 9.924852224537738e-001,
 + 7.2727273e-09 9.930527136211336e-001,
 + 7.3535354e-09 9.936002265476310e-001,
 + 7.4343434e-09 9.940486337571390e-001,
 + 7.5151515e-09 9.943550173252508e-001,
 + 7.5959596e-09 9.946615268661166e-001,
 + 7.6767677e-09 9.949681624574450e-001,
 + 7.7575758e-09 9.952789539473254e-001,
 + 7.8383838e-09 9.956122046157112e-001,
 + 7.9191919e-09 9.959754579881680e-001,
 + 8.0000000e-09 9.962542054390236e-001,
 Vkpur auxk 0 0

Fkpd 0 auxd CCCS poly(1) Vkpur 1 -1

*kpd coefficients=1-kpu

Vkpdr auxd 0 0

Gpd 0 auxpd VCCS pwl(1) out 0

```

+ -3.20000000, -2.3795e-02
+ -3.10000000, -2.1129e-02
+ -3.00000000, -1.8764e-02
+ -2.90000000, -1.6760e-02
+ -2.80000000, -1.5110e-02
+ -2.70000000, -1.3703e-02
+ -2.60000000, -1.2408e-02
+ -2.50000000, -1.1158e-02
+ -2.40000000, -9.9335e-03
+ -2.30000000, -8.7375e-03
+ -2.20000000, -7.5796e-03
+ -2.10000000, -6.4735e-03
+ -2.00000000, -5.4362e-03
+ -1.90000000, -4.4871e-03
+ -1.80000000, -3.6493e-03
+ -1.70000000, -2.9530e-03
+ -1.60000000, -2.4505e-03
+ -1.50000000, -2.2334e-03
+ -1.40000000, -2.3455e-03
+ -1.30000000, -2.6904e-03
+ -1.20000000, -3.2395e-03
+ -1.10000000, -4.1363e-03
+ -1.00000000, -5.8246e-03
+ -0.90000000, -9.8796e-03
+ -0.80000000, -2.3766e-02
+ -0.70000000, -4.9430e-02
+ -0.60000000, -4.9547e-02
+ -0.50000000, -4.2500e-02
+ -0.40000000, -3.4395e-02
+ -0.30000000, -2.5996e-02
+ -0.20000000, -1.7450e-02
+ -0.10000000, -8.7799e-03
+ 4.4408921e-16, -8.6352e-09
+ 0.10000000, 8.6741e-03
+ 0.20000000, 1.7033e-02
+ 0.30000000, 2.5069e-02
+ 0.40000000, 3.2775e-02
+ 0.50000000, 4.0143e-02
+ 0.60000000, 4.7168e-02
+ 0.70000000, 5.3842e-02
+ 0.80000000, 6.0159e-02
+ 0.90000000, 6.6112e-02
+ 1.00000000, 7.1697e-02
+ 1.10000000, 7.6907e-02
+ 1.20000000, 8.1737e-02
+ 1.30000000, 8.6182e-02
+ 1.40000000, 9.0236e-02
+ 1.50000000, 9.3892e-02
+ 1.60000000, 9.7139e-02
+ 1.70000000, 9.9958e-02
+ 1.80000000, 0.10231
+ 1.90000000, 0.10416
+ 2.00000000, 0.10548
+ 2.10000000, 0.10638
+ 2.20000000, 0.10698
+ 2.30000000, 0.10741
+ 2.40000000, 0.10774
+ 2.50000000, 0.10800
+ 2.60000000, 0.10822

```

```

+ 2.70000000, 0.10840
+ 2.80000000, 0.10857
+ 2.90000000, 0.10872
+ 3.00000000, 0.10886
+ 3.10000000, 0.10899
+ 3.20000000, 0.10912
+ 3.30000000, 0.10924
+ 3.40000000, 0.10935
+ 3.50000000, 0.10946
+ 3.60000000, 0.10957
+ 3.70000000, 0.10969
+ 3.80000000, 0.10982
+ 3.90000000, 0.11009
+ 4.00000000, 0.11072
+ 4.10000000, 0.11187
+ 4.20000000, 0.11335
+ 4.30000000, 0.11493
+ 4.40000000, 0.11653
+ 4.50000000, 0.11813
+ 4.60000000, 0.11972
+ 4.70000000, 0.12133
+ 4.80000000, 0.12295
+ 4.90000000, 0.12463
+ 5.00000000, 0.12645
+ 5.10000000, 0.12845
+ 5.20000000, 0.13065
+ 5.30000000, 0.13305
+ 5.40000000, 0.13567
+ 5.50000000, 0.13848
+ 5.60000000, 0.14148
+ 5.70000000, 0.14459
+ 5.80000000, 0.14742
+ 5.90000000, 0.14807
+ 6.00000000, 0.14893
+ 6.10000000, 0.15132
+ 6.20000000, 0.15497
+ 6.30000000, 0.15948
+ 6.40000000, 0.16460
+ 6.50000000, 0.17021
+ 6.60000000, 0.17626

```

Vpd auxpd 0 0

*Ftpd out 0 CCCS poly(2) Vkpdr Vpd 0 0 0 1 *Multiplication of Ikpdr and Gpd*

Gpu 0 auxpu VCCS pwl(1) pw out

```

+ -3.20000000, -0.076721
+ -3.10000000, -0.074897
+ -3.00000000, -0.073273
+ -2.90000000, -0.072155
+ -2.80000000, -0.072377
+ -2.70000000, -0.076401
+ -2.60000000, -0.084652
+ -2.50000000, -0.089656
+ -2.40000000, -0.095922
+ -2.30000000, -0.1054
+ -2.20000000, -0.11387
+ -2.10000000, -0.11914
+ -2.00000000, -0.1207
+ -1.90000000, -0.11947
+ -1.80000000, -0.11632
+ -1.70000000, -0.11182

```

+ -1.60000000, -0.10633
+ -1.50000000, -0.10012
+ -1.40000000, -0.093516
+ -1.30000000, -0.086781
+ -1.20000000, -0.079991
+ -1.10000000, -0.073166
+ -1.00000000, -0.06632
+ -0.90000000, -0.059478
+ -0.80000000, -0.052686
+ -0.70000000, -0.046003
+ -0.60000000, -0.039421
+ -0.50000000, -0.032857
+ -0.40000000, -0.026277
+ -0.30000000, -0.019688
+ -0.20000000, -0.0131
+ -0.10000000, -0.0065301
+ 4.4408921e-16, -2.7355e-08
+ 0.10000000, 0.0064086
+ 0.20000000, 0.012628
+ 0.30000000, 0.018655
+ 0.40000000, 0.024487
+ 0.50000000, 0.030121
+ 0.60000000, 0.035554
+ 0.70000000, 0.040782
+ 0.80000000, 0.045802
+ 0.90000000, 0.050613
+ 1.00000000, 0.05521
+ 1.10000000, 0.059591
+ 1.20000000, 0.063754
+ 1.30000000, 0.067694
+ 1.40000000, 0.07141
+ 1.50000000, 0.074899
+ 1.60000000, 0.078157
+ 1.70000000, 0.081181
+ 1.80000000, 0.083964
+ 1.90000000, 0.086496
+ 2.00000000, 0.088762
+ 2.10000000, 0.090746
+ 2.20000000, 0.092457
+ 2.30000000, 0.093931
+ 2.40000000, 0.095208
+ 2.50000000, 0.096327
+ 2.60000000, 0.097318
+ 2.70000000, 0.098206
+ 2.80000000, 0.099009
+ 2.90000000, 0.099741
+ 3.00000000, 0.10041
+ 3.10000000, 0.10104
+ 3.20000000, 0.10162
+ 3.30000000, 0.10216
+ 3.40000000, 0.10268
+ 3.50000000, 0.10316
+ 3.60000000, 0.10363
+ 3.70000000, 0.10407
+ 3.80000000, 0.10449
+ 3.90000000, 0.10491
+ 4.00000000, 0.1054
+ 4.10000000, 0.10691
+ 4.20000000, 0.11021
+ 4.30000000, 0.11421
+ 4.40000000, 0.11844

```

+ 4.50000000, 0.12279
+ 4.60000000, 0.12719
+ 4.70000000, 0.13163
+ 4.80000000, 0.13621
+ 4.90000000, 0.14104
+ 5.00000000, 0.14611
+ 5.10000000, 0.15132
+ 5.20000000, 0.15662
+ 5.30000000, 0.162
+ 5.40000000, 0.16742
+ 5.50000000, 0.17287
+ 5.60000000, 0.17834
+ 5.70000000, 0.1838
+ 5.80000000, 0.18925
+ 5.90000000, 0.19469
+ 6.00000000, 0.20014
+ 6.10000000, 0.20565
+ 6.20000000, 0.21136
+ 6.30000000, 0.21739
+ 6.40000000, 0.22373
+ 6.50000000, 0.23034
+ 6.60000000, 0.23716

```

```
Vpu auxpu 0 0
```

```
Ftpu pw out CCCS poly(2) Vkpur Vpu 0 0 0 0 1 *Multiplication of Ikpur and Gpu.
```

```
.tran 0.01ns 8ns start=0
```

```
.print v(out) v(pw) i(Vkpur) i(Vkpdr) i(Vpu) i(Vpd)
```

```
*.probe v(out) v(pw) i(Vkpur) i(Vkpdr) i(Vpu) i(Vpd)
```

```
.options Post NoMod Probe
```

```
.end
```

D: Script en PERL.

Listado en PERL del script utilizado para generar el fichero de entrada a HSPICE en el modelo de resistencias no lineales.

```

if ($#ARGV != 0)
{
    print "ERROR: No se ha llamado al programa correctamente\n";
    print "La forma correcta de ejecutar este script es:\n";
    print "  ibis2hspice.perl  NOMBRE_FICHERO_IBIS\n";
    exit;
}

# Chequea que exista ese fichero de entrada y que se pueda abrir.
open (ENTRADA, "$ARGV[0]") or die "ERROR: El fichero de datos de entrada no existe!\nNo se ha
podido ejecutar el programa\n";

# Pedimos el nombre del fichero de salida y chequeamos que no exista.
# En caso de que exista, preguntamos si queremos sobrescribir.
print "Nombre del fichero de salida: ";
$salida = <STDIN>;
chop ($salida);
$salida.= ".nd";

if (-e "$salida")
{
    print "WARNING: Ya hay un fichero con ese nombre en el directorio actual\n";
    print "Sobreescribir (s/n)";
    $yaexiste=<STDIN>;
    chop ($yaexiste);
    if (($yaexiste ne "s")&&($yaexiste ne "S"))
    {
        print "WARNING: No se ha ejecutado el programa\n";
        exit;
    }
}

open (SALIDA, ">$salida");

```

#Cogemos el fichero completo IBIS y lo metemos en la variable \$file.

while (defined (\$linea = <ENTRADA>))

```
{
    $file .= $linea;
}
```

Todo el fichero a \$_, para buscar patrones en él.

\$_ = \$file;

if (m/[Voltage range]/)

```
{
    ($Vrange,) = split (" ", $);
}
```

else

```
{
    $Vrange = "!!VRANGE NOT DEFINED!!";
}
```

if (m/C_comp/)

```
{
    ($Ccomp,) = split (" ", $);
}
```

else

```
{
    $Vrange = "!!CCOMP NOT DEFINED!!";
}
```

if (m/R_load =/)

```
{
    ($Rload,) = split (" ", $);
}
```

else

```
{
    $Rload = 50;
}
```

if (m/[Pulldown]/)

```
{
    $_ = $';
    m/[-\d]/;
    $_ = $& . $';
    m/[/];
    @pd = split ( "\n", $);
```

```

    }
    $_ = $file;

    if (m/[Pullup]/)
    {
        $_ = $';
        m/[-\d]/;
        $_ = $& . $';
        m/[/];
        @pu = split ( "\n", $');
    }

    #Empieza a generar el fichero de texto
    print SALIDA "** PONER COMENTARIO?\n";
    print SALIDA "Vcc pw 0 $Vrange\n" , "Ccomp out auxcomp $Ccomp \n", "Vccomp auxcomp 0 0\n";
    print SALIDA "Ro out 0 $Rload\n";
    print SALIDA "Ikpdr 0 auxk pwl TIEMPO-KPU(MATLAB)? \n";
    print SALIDA "Vkpdr auxk 0 0\n";

    #Bloque PULLDOWN
    print SALIDA "Fkpdr 0 auxd CCCS poly(1) Vkpdr 1 -1          *kpd coefficients=1-kpu\n", "Vkpdr
    auxd 0 0\n", "Gpd 0 auxpd VCCS pwl(1) out 0\n";

    for ( $indice=0; $indice <= $#pd; $indice ++)
    {
        ($var1, $var2, $var3) = split (" ", $pd[$indice]);
        print SALIDA "+ ", $var1, " ", $var2, "\n";
    }

    print SALIDA "Vpd auxpd 0 0\n", "Ftpd out 0 CCCS poly(2) Vkpdr Vpd 0 0 0 1 *Multiplication of
    Ikpdr and Gpd\n";

    #Fin de PULLDOWN

    #Bloque PULLUP
    print SALIDA "Gpu 0 auxpu VCCS pwl(1) pw out\n";

    for ( $indice=0; $indice <= $#pu; $indice ++)
    {
        ($var1, $var2, $var3) = split (" ", $pu[$indice]);
        print SALIDA "+ ", $var1, " ", (-1) * $var2, "\n";
    }

```

```
}
```

```
print SALIDA "Vpu auxpu 0 0\n", "Ftpu pw out CCCS poly(2) Vkpur Vpu 0 0 0 1 *Multiplication of  
Ikpur and Gpu.\n";  
#Fin de PULLUP
```

```
print SALIDA ".tran Tstep? Tfin? Tstart?\n";  
print SALIDA ".print v(out) v(pw) i(Vkpur) i(Vkpdr) i(Vpu) i(Vpd)\n";  
print SALIDA ".probe v(out) v(pw) i(Vkpur) i(Vkpdr) i(Vpu) i(Vpd)\n";  
print SALIDA ".options Post NoMod Accurate Probe\n";  
print SALIDA ".end\n";
```