Institute for Technology Development

ADVANCED MICROELECTRONICS DIVISION

SCALABLE CMOS (SCMOS) DOUBLE METAL I / C STANDARD CELL LIBRARY	**dfrf311** D_FF_W/Q_Q_&_ASY_RST'	DATE: Mar 11,1989 VERSION: dlmV2.0

********** FLIP-FLOP TIMING INFO **********

2u SPECIAL FLIP FLOP TIMING

Data Setup time = 6.50 ns.

Data Hold time = 5.50 ns.

Maximum clock rise time

Clock pulse width = 3.50 ns.

Reset pulse width = 8.50 ns.

3u SPECIAL FLIP FLOP TIMING

Data Setup time = 13.50 ns.

Data Hold time = 9.50 ns.

Maximum clock rise time

Clock pulse width = 12.50 ns.

Reset pulse width = 6.50 ns.

********** SPICE DECK CONTINUED **********

```
M103x8 153 65 154 gnd NMOS W=12.0U L=2.0U
M107x8 154 57 58 gnd NMOS W=12.0U L=2.0U
M115x8 58 27 155 gnd NMOS W=12.0U L=2.0U
M119x8 155 Q 156 gnd NMOS W=12.0U L=2.0U
M126x8 156 65 gnd gnd NMOS W=12.0U L=2.0U
M144x4 gnd 58 Q gnd NMOS W=18.0U L=2.0U
M160x6 gnd Q Q_b gnd NMOS W=12.0U L=2.0U
```

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********** SPICE DECK **********

*** Generated from dfrf311.mag by magic's spice generator
*** technology: scmos
*** timestamp: 604112934
*** version: dlm V2.0
*** Capacitance Threshold = 5000000 units
*** Resistance Scale = 1000 units

M8x41 57 CLK2 vdd vdd PMOS W=29.0U L=2.0U
M16x41 vdd 57 27 vdd PMOS W=29.0U L=2.0U
M34x44 vdd DATA1 120 vdd PMOS W=26.0U L=2.0U
M38x44 120 57 52 vdd PMOS W=26.0U L=2.0U
M46x44 52 27 121 vdd PMOS W=22.0U L=2.0U
M54x44 121 24 vdd vdd PMOS W=22.0U L=2.0U
M62x44 vdd 65 121 vdd PMOS W=22.0U L=2.0U
M76x44 vdd 52 24 vdd PMOS W=22.0U L=2.0U
M96x45 vdd 24 123 vdd PMOS W=21.0U L=2.0U
M100x45 123 27 58 vdd PMOS W=21.0U L=2.0U
M114x45 vdd 57 124 vdd PMOS W=25.0U L=2.0U
M118x45 124 Q 58 vdd PMOS W=25.0U L=2.0U
M8x4 57 CLK2 gnd gnd NMOS W=24.0U L=2.0U
M16x4 gnd 57 27 gnd NMOS W=24.0U L=2.0U
M42x4 gnd DATA1 150 gnd NMOS W=19.0U L=2.0U
M46x4 150 27 52 gnd NMOS W=19.0U L=2.0U
M54x8 52 65 152 gnd NMOS W=15.0U L=2.0U
M58x8 152 24 151 gnd NMOS W=15.0U L=2.0U
M62x8 151 57 gnd gnd NMOS W=15.0U L=2.0U
M78x8 gnd 52 24 gnd NMOS W=15.0U L=2.0U
M126x39 58 65 vdd vdd PMOS W=31.0U L=2.0U
M144x39 vdd 58 Q vdd PMOS W=31.0U L=2.0U
M160x41 vdd Q Q_b vdd PMOS W=29.0U L=2.0U
M99x8 gnd 24 153 gnd NMOS W=12.0U L=2.0U

3-micron delay information.

Path	Timing	Nominal Case		Worst Case	
		No Load	1pF	No Load	1pF
CLK2---Q	Pd 0--1	11.81	14.20	18.62	21.94
	Pd 1--0	11.40	13.42	17.53	20.26
	Tr 0--1	5.29	9.44	7.05	12.36
	Tf 1--0	4.31	6.61	5.23	8.70
RST3---Q	Pd 0--1	N/A	N/A	N/A	N/A
	Pd 1--0	4.64	6.38	7.19	10.43
	Tr 0--1	N/A	N/A	N/A	N/A
	Tf 1--0	3.40	5.77	5.35	8.74
CLK2---Q_b	Pd 0--1	12.59	17.48	19.02	25.76
	Pd 1--0	12.97	18.30	20.22	28.23
	Tr 0--1	2.48	7.37	2.85	10.09
	Tf 1--0	2.16	6.42	2.70	9.57
RST3---Q_b	Pd 0--1	5.81	10.07	8.27	15.59
	Pd 1--0	N/A	N/A	N/A	N/A
	Tr 0--1	2.33	7.14	3.80	9.96
	Tf 1--0	N/A	N/A	N/A	N/A

2-micron delay information.

Path	Timing	Nominal Case		Worst Case	
		No Load	1pF	No Load	1pF
CLK2---Q	Pd 0--1	3.67	5.27	8.07	11.59
	Pd 1--0	3.64	5.35	8.01	11.77
	Tr 0--1	1.33	4.42	2.93	9.72
	Tf 1--0	1.23	3.09	2.71	6.80
RST3---Q	Pd 0--1	N/A	N/A	N/A	N/A
	Pd 1--0	1.46	2.69	3.21	5.92
	Tr 0--1	N/A	N/A	N/A	N/A
	Tf 1--0	1.39	3.03	3.06	6.67
CLK2---Q_b	Pd 0--1	3.95	7.76	8.69	17.07
	Pd 1--0	4.04	7.97	8.89	17.53
	Tr 0--1	0.69	4.35	1.52	9.57
	Tf 1--0	0.59	4.40	1.30	9.68
RST3---Q_b	Pd 0--1	1.78	5.05	3.92	11.11
	Pd 1--0	N/A	N/A	N/A	N/A
	Tr 0--1	1.01	4.26	2.22	9.37
	Tf 1--0	N/A	N/A	N/A	N/A

Cell Device Sizes

Transistor	Width (λ)	Length (λ)
64	12	2
62	24	2
63	24	2
51	19	2
50	19	2
55	15	2
54	15	2
53	15	2
52	15	2
56	12	2
61	12	2
59	12	2
60	12	2
58	18	2
57	12	2
65	12	2
34	29	2
33	29	2
32	29	2
20	26	2
21	26	2
25	22	2
23	22	2
22	22	2
27	21	2
26	21	2
31	25	2
29	25	2
30	31	2
28	31	2
24	22	2

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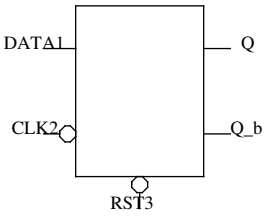
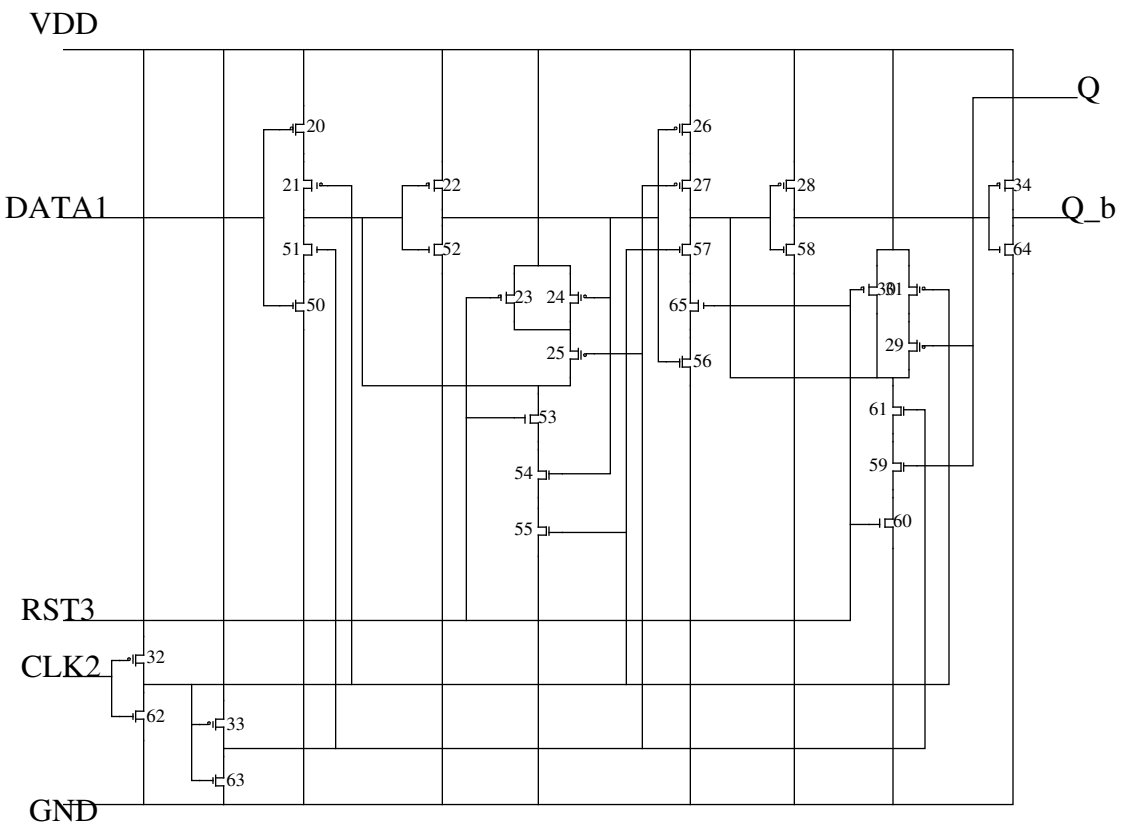


SYMBOL



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LOGIC EQUATIONS: Q = [(Qn-1 * C) + (Dn-1 * C)]*R'
Q=(.NOT.Q)'

Truth Table

C	D	R	Q	Q'
l2h	-	1	Qn-1	Qn-1'
h2l	-	1	D	D'
-	-	0	0	1
-	-	1	-	-

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TERMINAL LOCATION (In Lambda)

GRID	PIN_NAME	Y_LOC	CLASS
1	FeedThru	----	----
2	CLK2	24	1
3	FeedThru	----	----
4	DATA1	26	0
5	Blocked		----
6	Blocked		----
7	Blocked		----
8	FeedThru	----	----
9	FeedThru	----	----
10	Blocked		----
11	FeedThru	----	----
12	Blocked		----
13	Blocked		----
14	FeedThru	----	----
15	FeedThru	----	----
16	FeedThru	----	----
17	RST3	41	2
18	FeedThru	----	----
19	Q	34	0
20	FeedThru	----	----
21	Q_b	33	0