FIG. 1

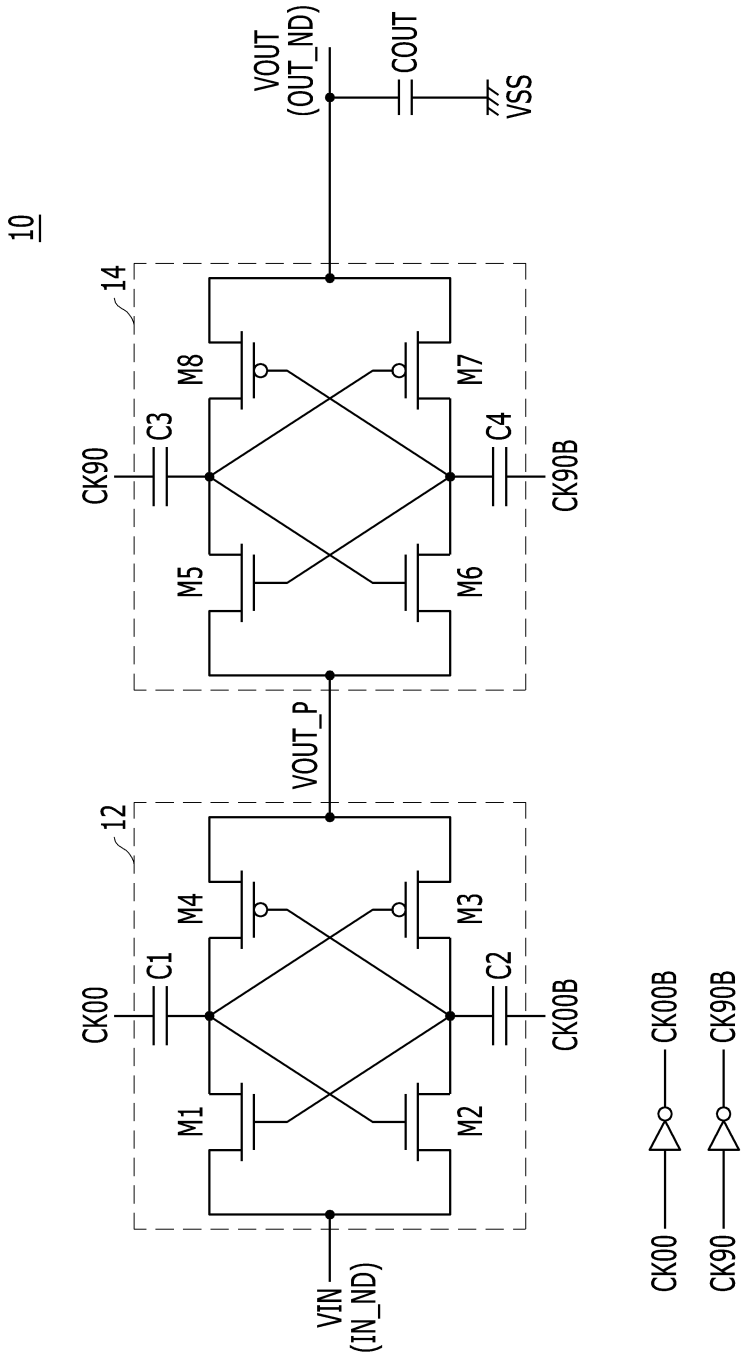

10
VOUT
(OUT_ND)
COUT
VSS
14
M8
M7
CK90
C3
C4
CK90B
M5
M6
VOUT_P
12
M4
M3
CK00
C1
C2
CK00B
M1
M2
VIN
(IN_ND)
CK00B
CK90B
CK00
CK90

FIG. 2

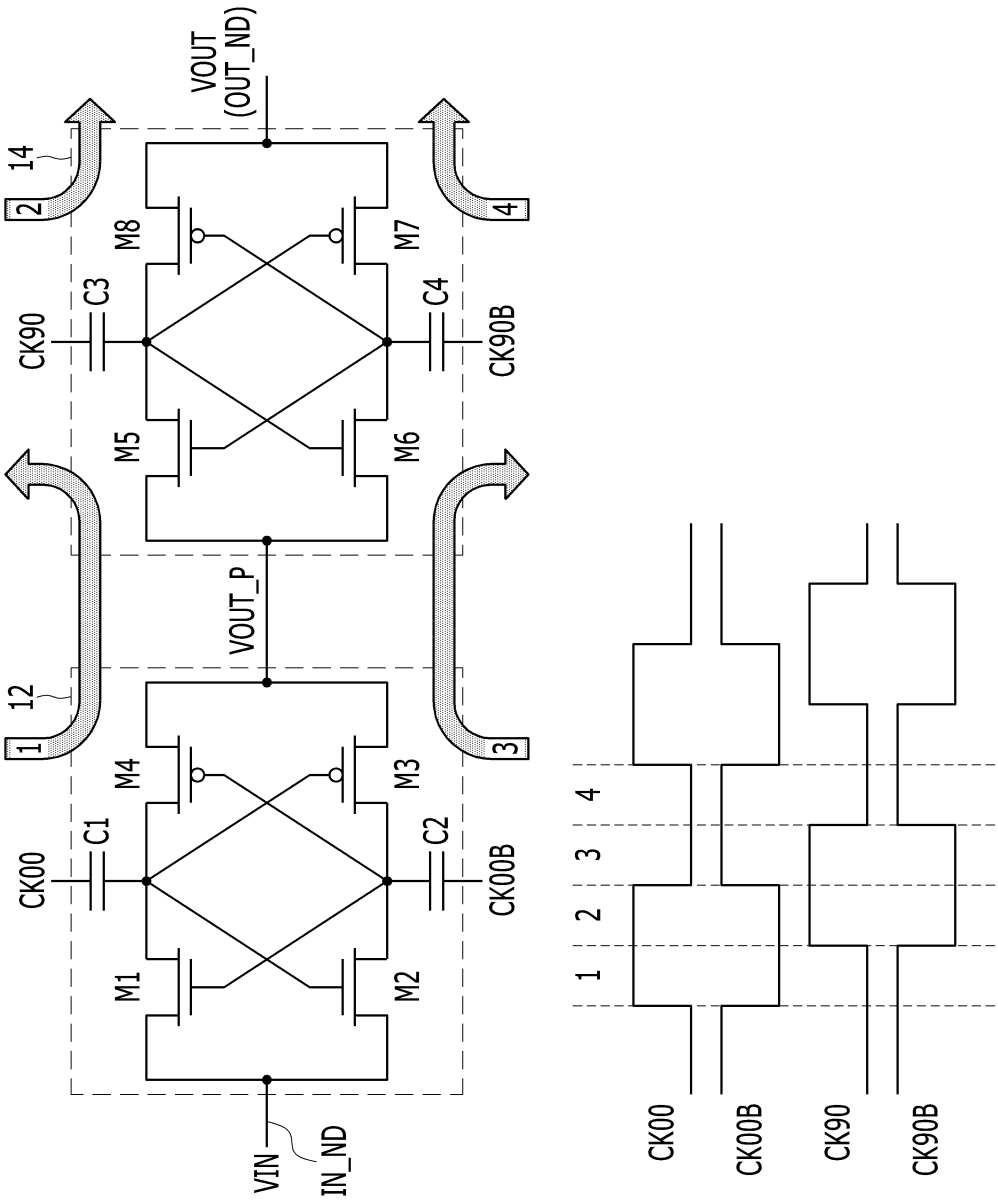

VOUT
(OUT_ND)
14
2
4
M8
M7
CK90
C3
C4
CK90B
M5
M6
VOUT_P
12
1
3
M4
M3
CK00
C1
C2
CK00B
M1
M2
VIN
IN_ND
1
2
3
4
CK00
CK00B
CK90
CK90B

FIG. 3

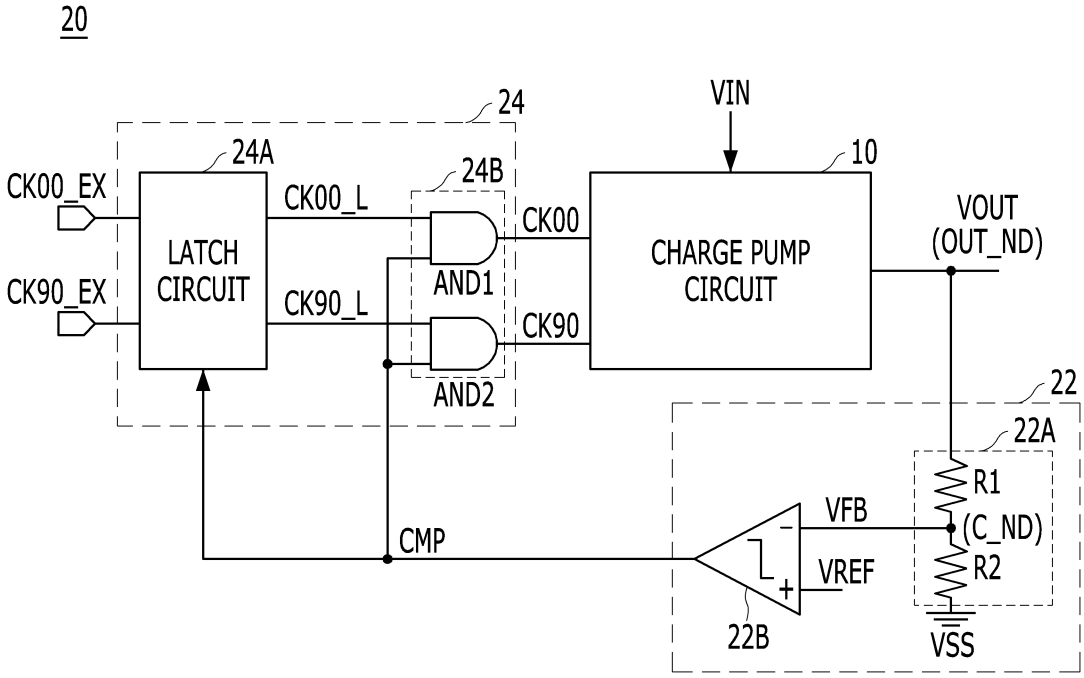

20
24
24A
24B
CK00_EX
CK90_EX
LATCH CIRCUIT
CK00_L
CK90_L
AND1
AND2
CK00
CK90
VIN
10
CHARGE PUMP CIRCUIT
VOUT (OUT_ND)
22
22A
R1
(C_ND)
R2
VSS
VFB
VREF
CMP
22B

FIG. 4A

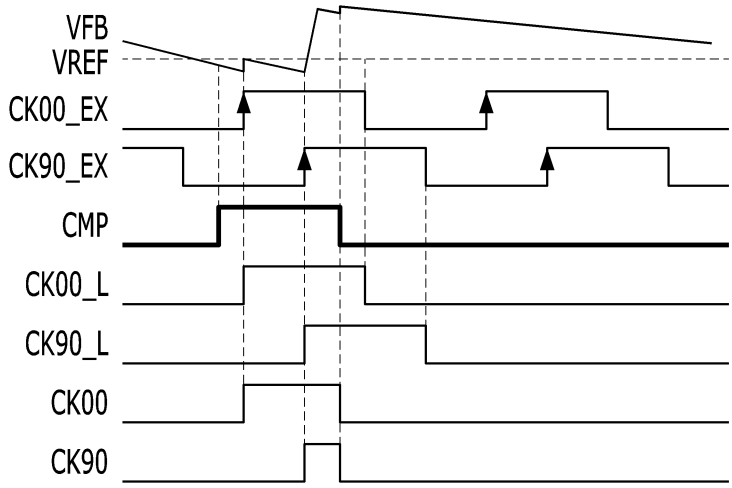

VFB
VREF
CK00_EX
CK90_EX
CMP
CK00_L
CK90_L
CK00
CK90

FIG. 4B

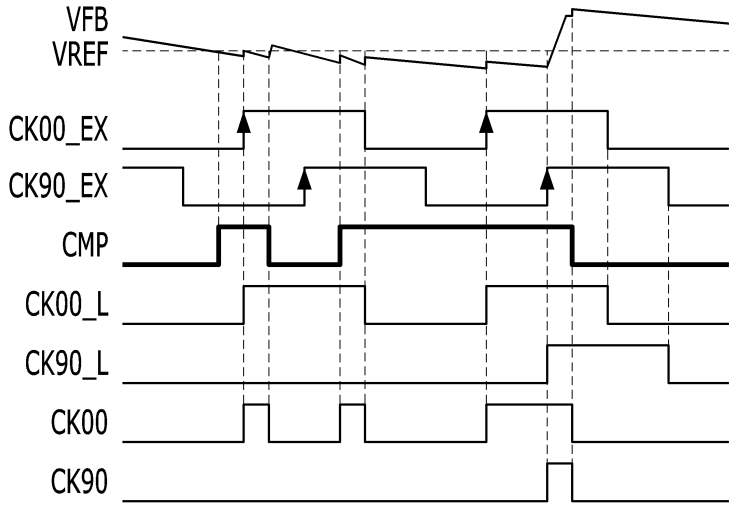

VFB
VREF
CK00_EX
CK90_EX
CMP
CK00_L
CK90_L
CK00
CK90

FIG. 5

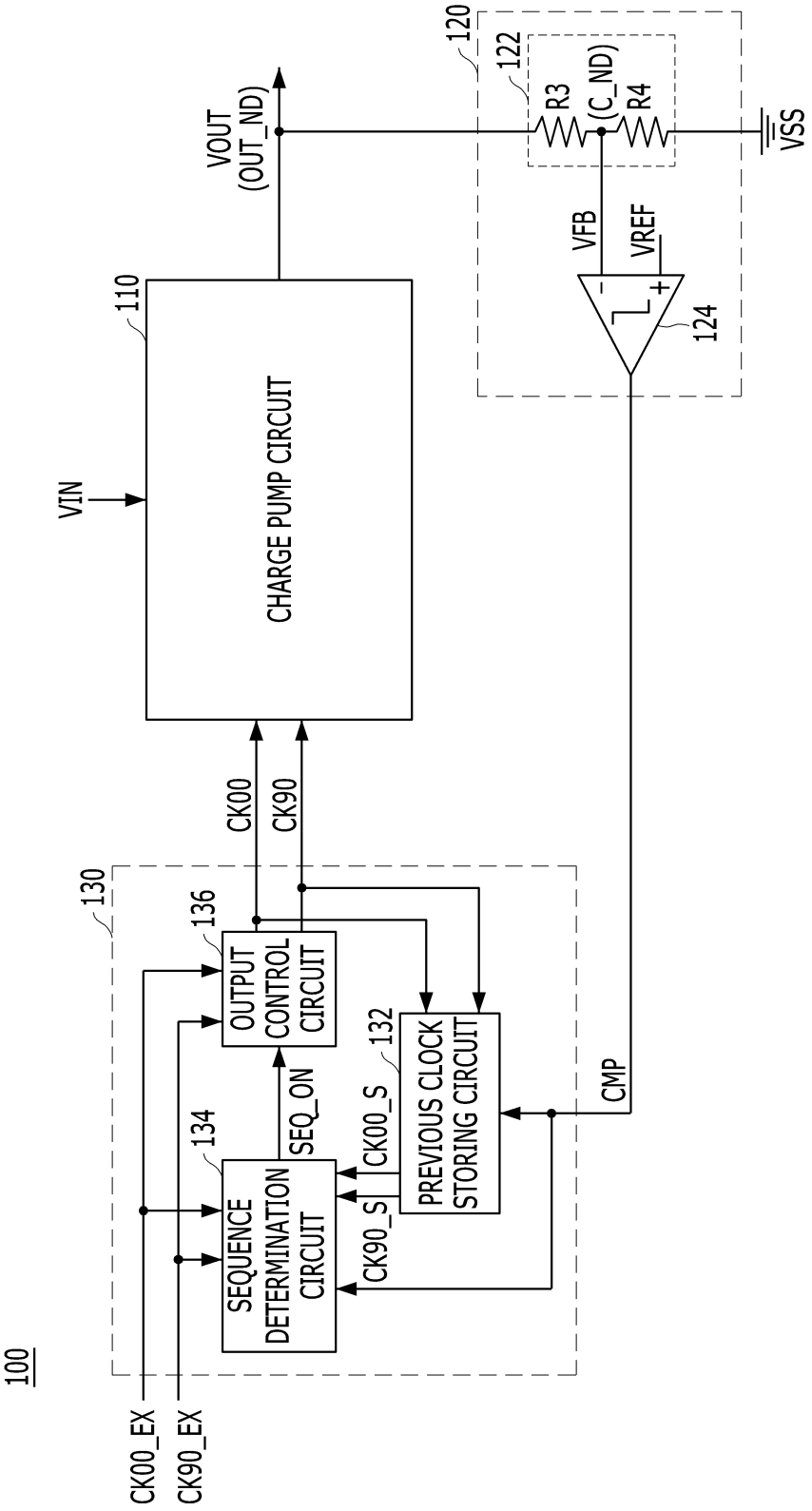

100
CK00_EX
CK90_EX
130
136
OUTPUT CONTROL CIRCUIT
134
SEQUENCE DETERMINATION CIRCUIT
SEQ_ON
132
CK00_S
CK90_S
PREVIOUS CLOCK STORING CIRCUIT
CMP
CK00
CK90
110
CHARGE PUMP CIRCUIT
VIN
VOUT (OUT_ND)
120
122
R3
(C_ND)
R4
VSS
VFB
VREF
124

FIG. 6

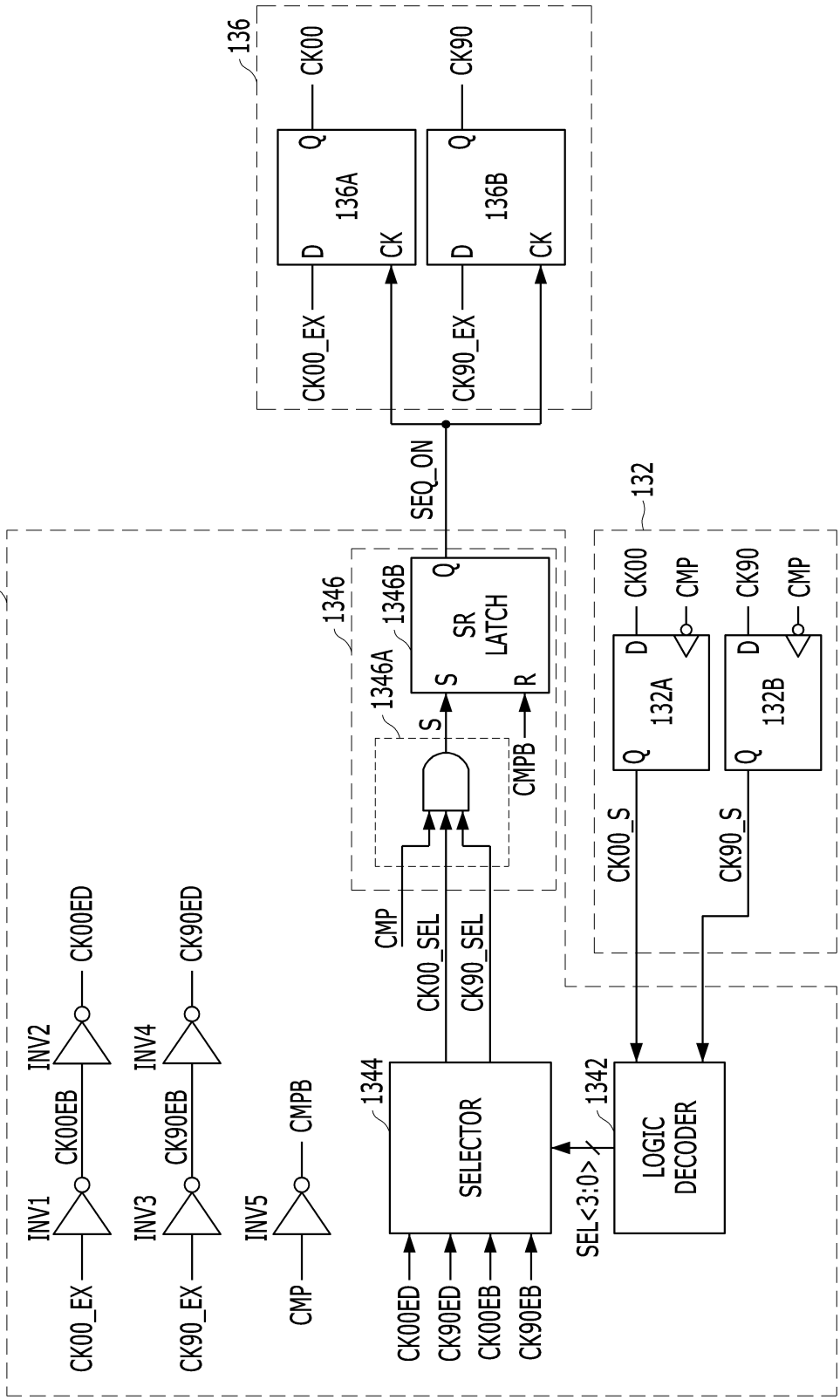

136
CK00
CK90
Q
136A
136B
D
CK
CK00_EX
CK90_EX
SEQ_ON
132
134
1346
1346B
1346A
SR
LATCH
S
R
CMPB
CMP
CK00_SEL
CK90_SEL
CK00
CK90
132A
132B
CK00_S
CK90_S
INV1
INV2
INV3
INV4
INV5
CK00EB
CK90EB
CK00ED
CK90ED
1344
SELECTOR
1342
LOGIC
DECODER
SEL<3:0>

FIG. 7

CK90_S	CK00_S	SEL<3:0>	CK90_SEL	CK00_SEL
0	0	0001	CK90B	CK00B
0	1	0010	CK90B	CK00D
1	0	0100	CK90D	CK00B
1	1	1000	CK90D	CK00D

FIG. 8

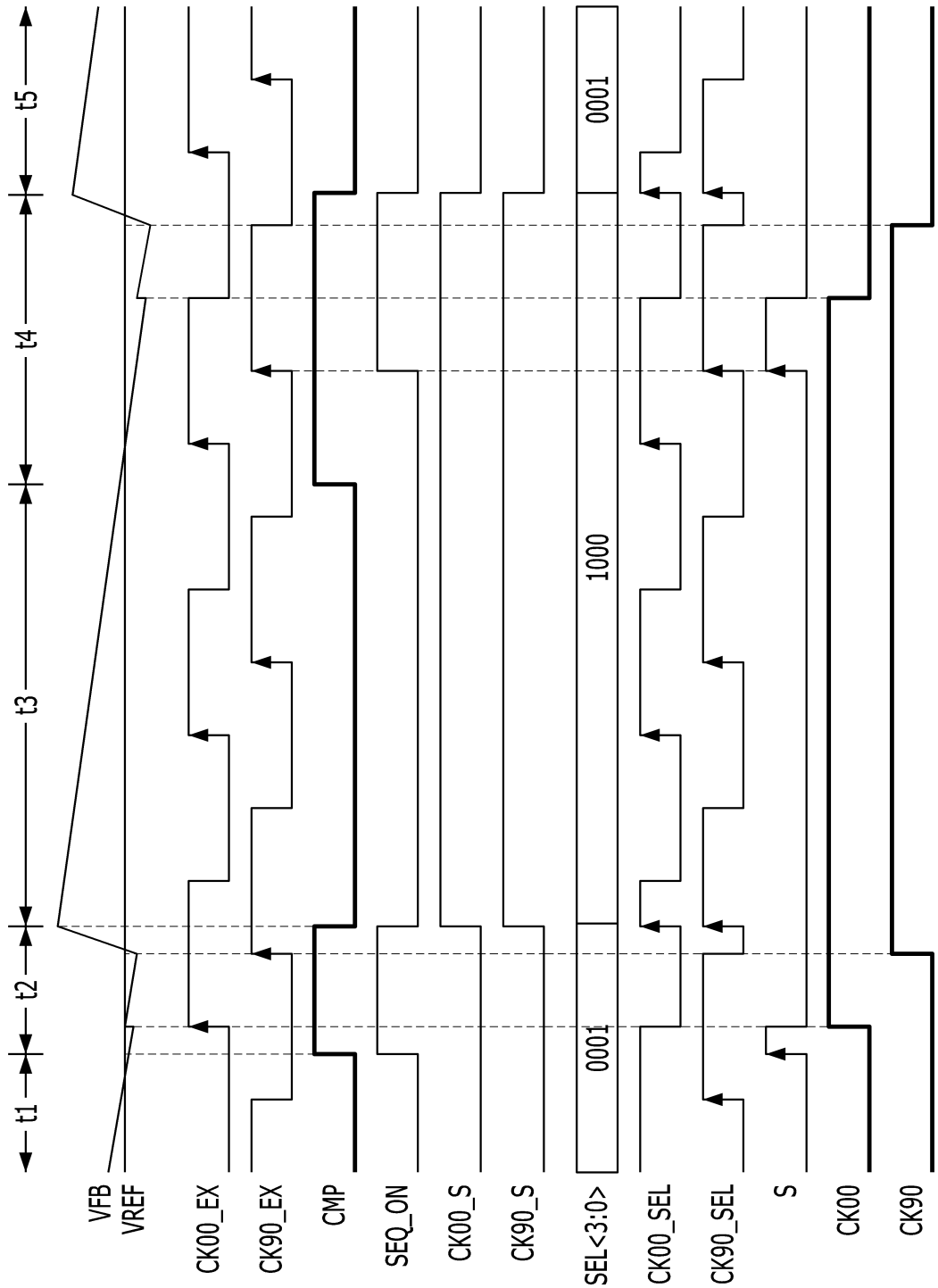

t1
t2
t3
t4
t5
VFB
VREF
CK00_EX
CK90_EX
CMP
SEQ_ON
CK00_S
CK90_S
SEL<3:0>
0001
1000
0001
CK00_SEL
CK90_SEL
S
CK00
CK90

FIG. 9A

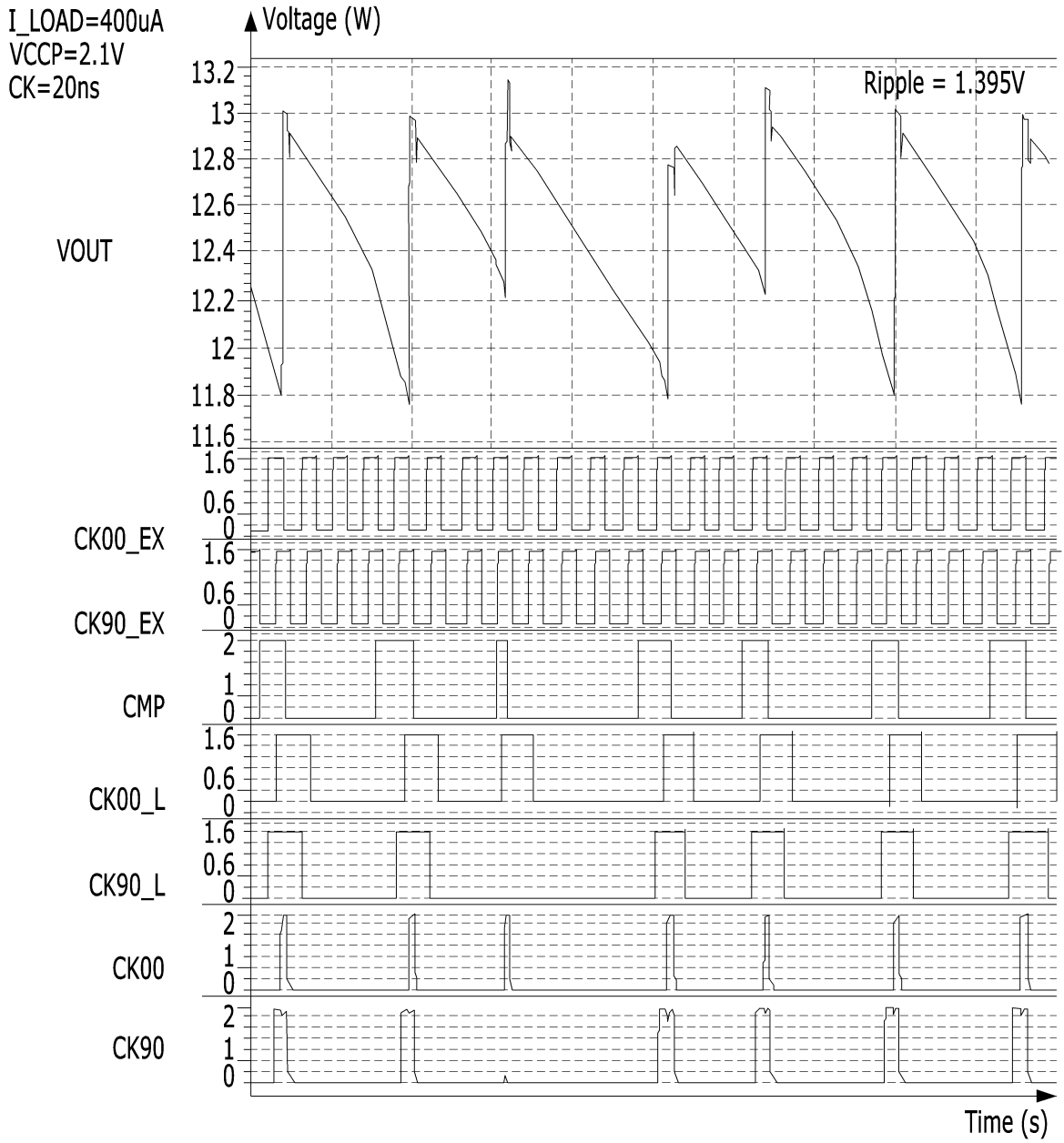

I_LOAD=400uA
VCCP=2.1V
CK=20ns
Voltage (W)
Ripple = 1.395V
VOUT
13.2
13
12.8
12.6
12.4
12.2
12
11.8
11.6
CK00_EX
CK90_EX
CMP
CK00_L
CK90_L
CK00
CK90
1.6
0.6
0
2
1
0
Time (s)

FIG. 9B

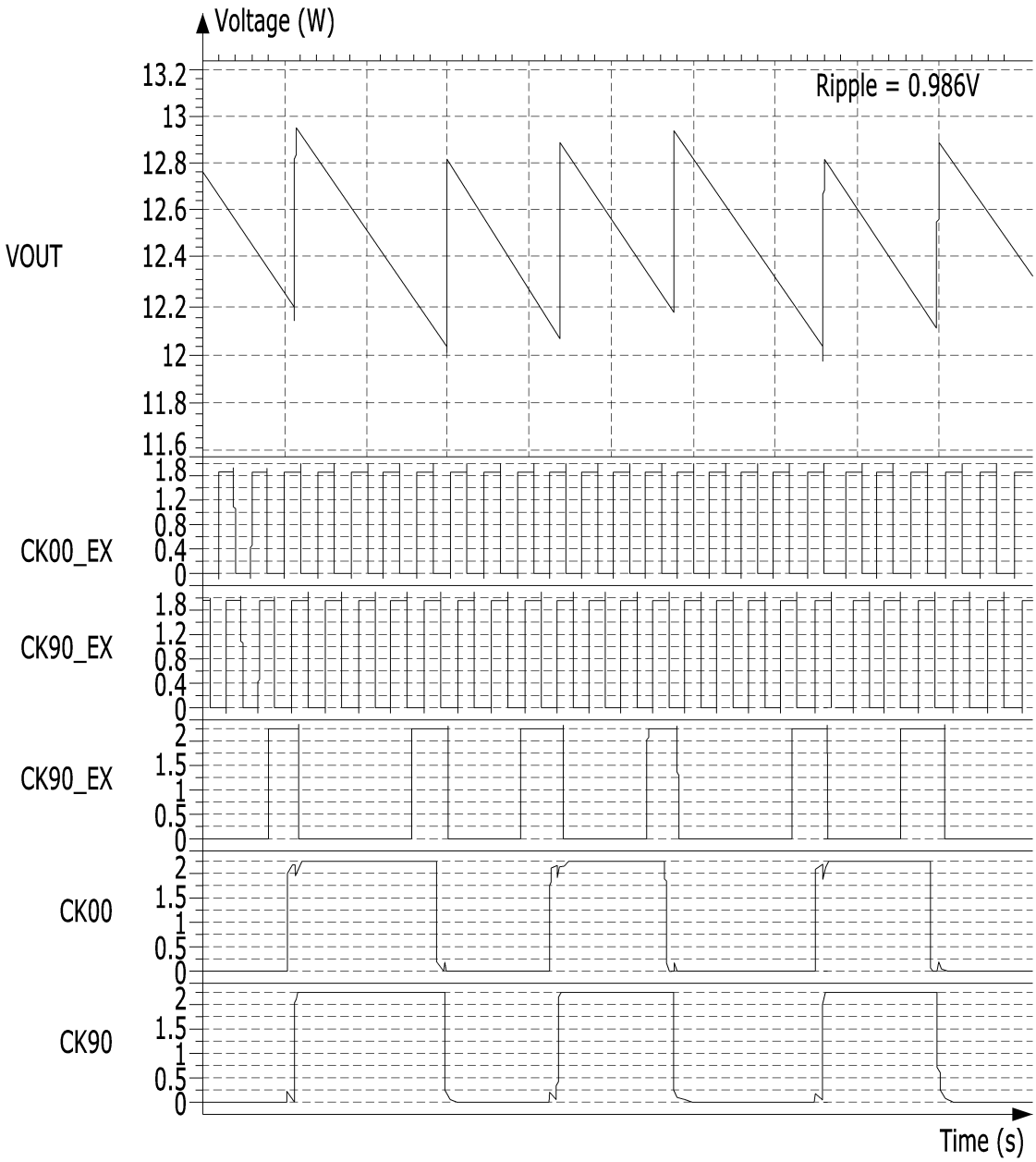

Voltage (W)
Ripple = 0.986V
VOUT
13.2
13
12.8
12.6
12.4
12.2
12
11.8
11.6
CK00_EX
CK90_EX
CK90_EX
CK00
CK90
1.8
1.2
0.8
0.4
0
2
1.5
1
0.5
Time (s)

FIG. 10

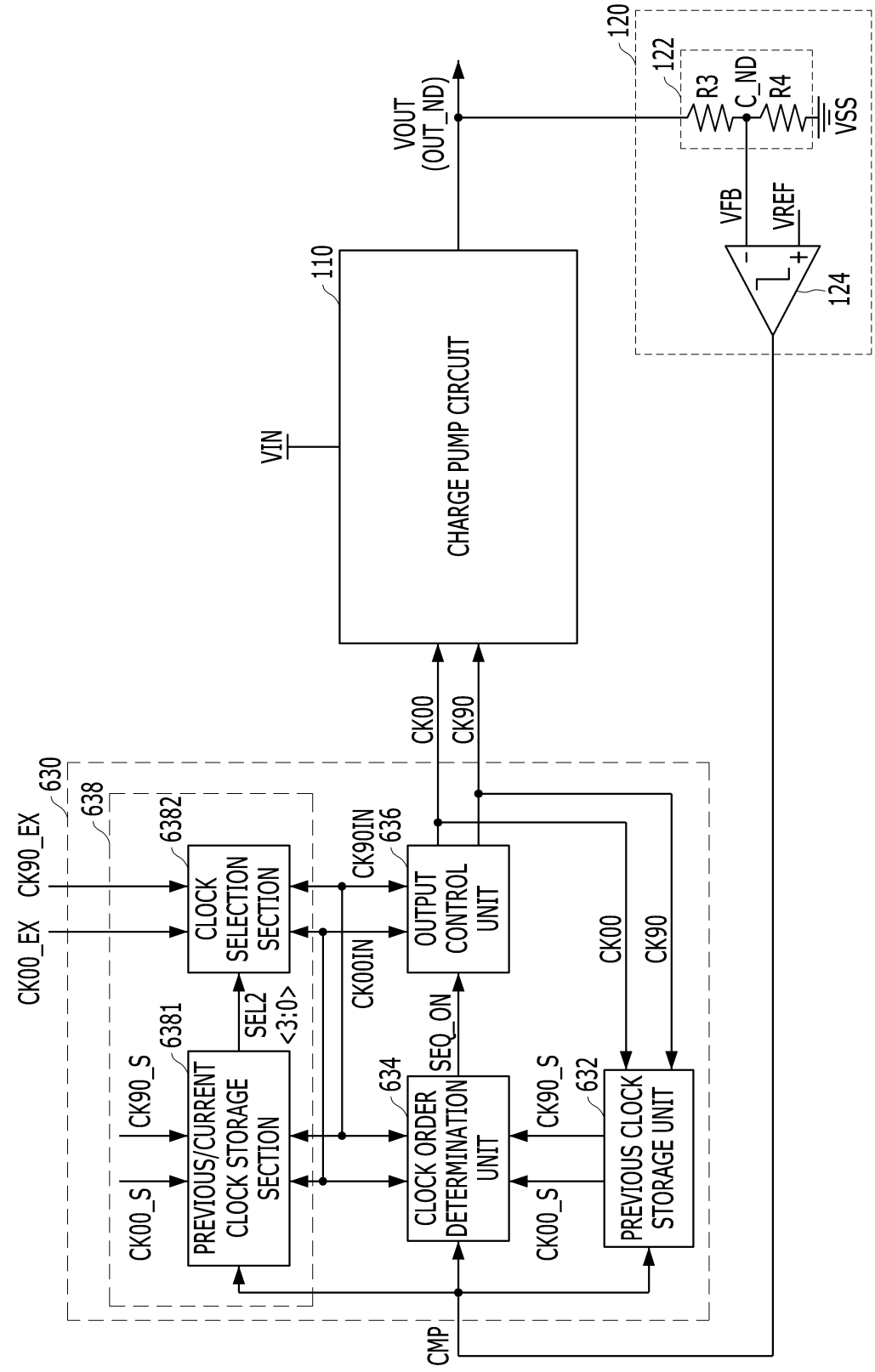

120
122
R3
C_ND
R4
VSS
VOUT
(OUT_ND)
VFB
VREF
124
110
CHARGE PUMP CIRCUIT
VIN
CK00
CK90
630
638
6382
CK90_EX
CK00_EX
CLOCK SELECTION SECTION
CK90IN
636
OUTPUT CONTROL UNIT
SEL2 <3:0>
CK00IN
SEQ_ON
6381
CK90_S
CK00_S
PREVIOUS/CURRENT CLOCK STORAGE SECTION
634
CLOCK ORDER DETERMINATION UNIT
632
PREVIOUS CLOCK STORAGE UNIT
CMP

FIG. 11

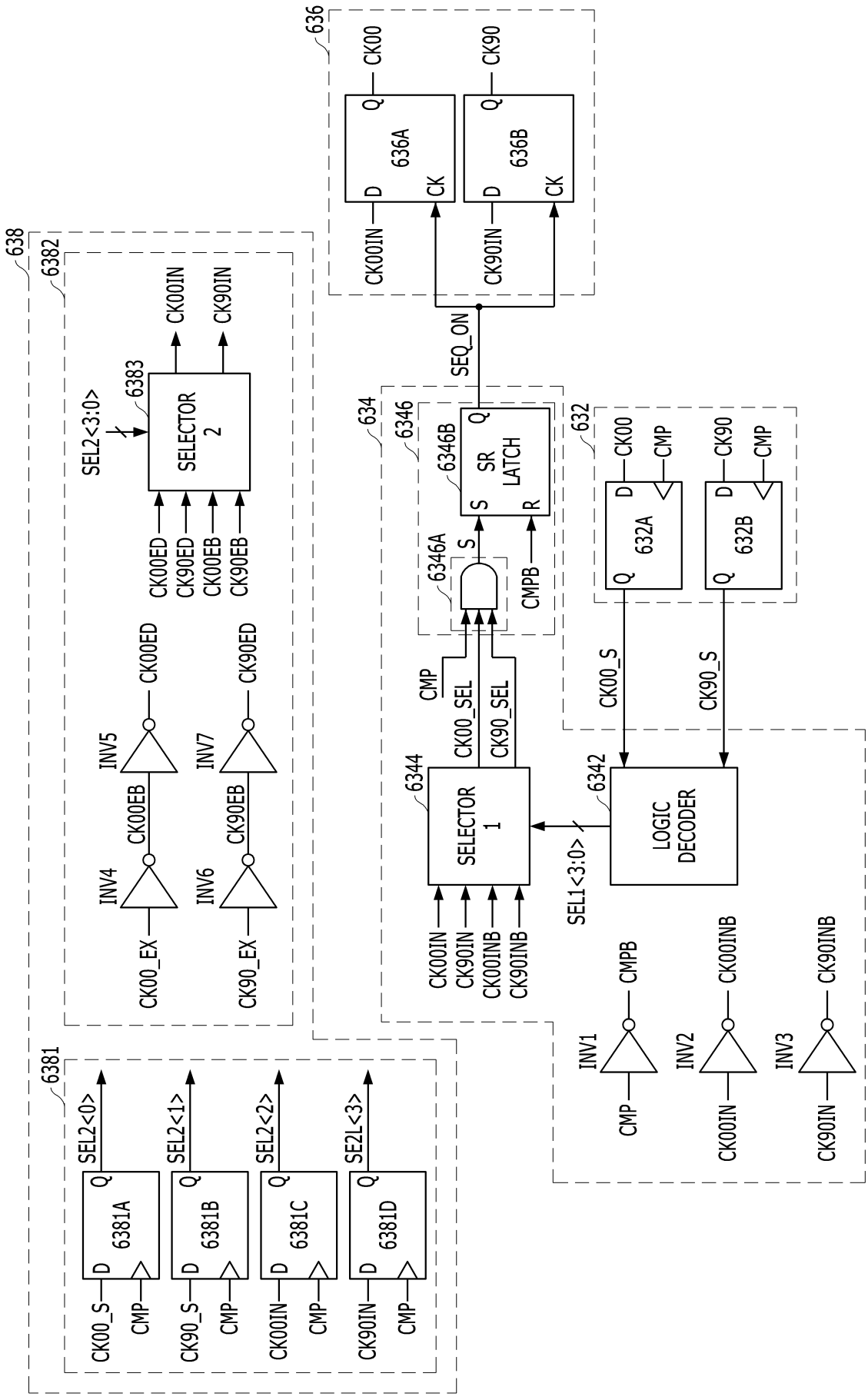

638
6382
6383
SELECTOR 2
SEL2<3:0>
CK00IN
CK90IN
CK00ED
CK90ED
CK00EB
CK90EB
INV5
INV7
INV4
INV6
CK00_EX
CK90_EX
6381
6381A
6381B
6381C
6381D
SEL2<0>
SEL2<1>
SEL2<2>
SE2L<3>
CK00_S
CK90_S
CMP
636
636A
636B
CK00
CK90
D
Q
CK
SEQ_ON
634
6346
6346A
6346B
SR LATCH
S
R
CMPB
632
632A
632B
6344
SELECTOR 1
6342
LOGIC DECODER
CK00_SEL
CK90_SEL
SEL1<3:0>
CK00INB
CK90INB
INV1
INV2
INV3

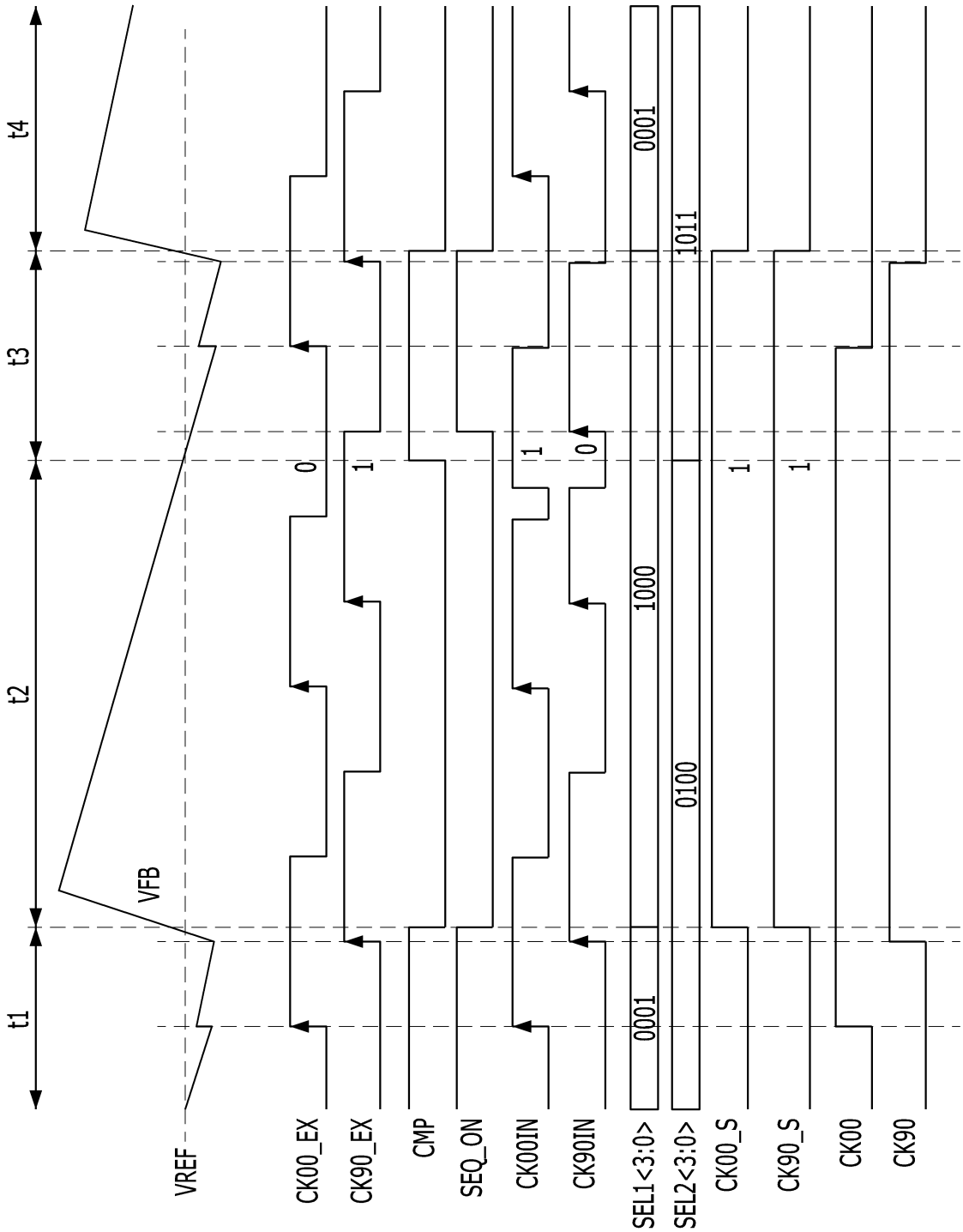
FIG. 12

OPERATION OF 634

OPERATION OF 638

CK90IN	CK00IN	CK90_S	CK00_S	SEL1<3:0>	SEL2<3:0>	CK90IN	CK00IN	CK90_SEL	CK00_SEL
1	0	0	0	0001	1000	CK90ED	CK00ED	CK90INB	CK00INB
0	1	0	0	0001	0100	CK90EB	CK00EB	CK90INB	CK00INB
0	0	0	0	0001	0000	CK90EB	CK00ED	CK90INB	CK00INB
1	1	0	0	0001	1100	CK90ED	CK00EB	CK90INB	CK00INB
1	0	0	1	0010	1001	CK90EB	CK00ED	CK90INB	CK00IN
0	1	0	1	0010	0101	CK90ED	CK00EB	CK90INB	CK00IN
0	0	0	1	0010	0001	CK90ED	CK00ED	CK90INB	CK00IN
1	1	0	1	0010	1101	CK90EB	CK00EB	CK90INB	CK00IN
1	0	1	0	0100	1010	CK90ED	CK00EB	CK90IN	CK00INB
0	1	1	0	0100	0110	CK90EB	CK00ED	CK90IN	CK00INB
0	0	1	0	0100	0010	CK90EB	CK00EB	CK90IN	CK00INB
1	1	1	0	0100	1110	CK90ED	CK00ED	CK90IN	CK00INB
1	0	1	1	1000	1011	CK90EB	CK00EB	CK90IN	CK00IN
0	1	1	1	1000	0111	CK90ED	CK00ED	CK90IN	CK00IN
0	0	1	1	1000	0011	CK90ED	CK00EB	CK90IN	CK00IN
1	1	1	1	1000	1111	CK90EB	CK00ED	CK90IN	CK00IN

FIG. 13


t1
t2
t3
t4
VREF
VFB
CK00_EX
CK90_EX
CMP
SEQ_ON
CK00IN
CK90IN
SEL1<3:0>
SEL2<3:0>
CK00_S
CK90_S
CK00
CK90
0
1
1
0
0001
1000
0100
1011
0001
1
1