R

DS

V

DD

C

L

Charge

capacitive

R

DS

V

DD

C

L

Charge

capacitive

*Basculement*

|  |  |  |  |
| --- | --- | --- | --- |
| *Vdd* | *ΔVi* | *Bas* | *Haut* |
| 5V | 1.5V | [0V à 1.5V] | [3.5V à 5V] |
| 10V | 3V | [0V à 3V] | [7V à 10V] |
| 15V | 4.5V | [0V à 4.5V] | [11.5V à 15V] |

|  |  |
| --- | --- |
| *Vdd* | *Marge de bruit* |
| 5V | 1.5V |
| 10V | 3V |
| 15V | 4.5V |

*Vtl*

*Vth*

*Vc*

*Vs*



74LS14

*Ve*

*V1*

*V2*

1k



*V1*

*Ve*

*V2*

*12V*

TTL

CO

autre

famille

*5V*

*pull-up*

*12V*

TTL

CO



*1*

*2*

*3*

*4*

*40*

*5*

*20*

*30*

*10*

*VOH*

*IOH(mA)*

*1*

*2*

*3*

*4*

*100*

*5*

*50*

*75*

*25*

*VOL*

*IOL(mA)*

*1*

*2*

*3*

*4*

*3.8*

*1*

*2*

*3*

*4*

*Vo*

*Vi*

C

E

B

C

E

B

Commande

*t*

*t*

*t*

*Vd*

*Id*

*Vcom*

*E*

*-E*

*t*

*on*

*t*

*rr*

*IF*

*-IF*

*0.7*

*-E*

D

Q

D

Q

D

Q

D

Q

H

H

H

H

MXR

MXR

MXR

MXR

QC

QB

QA

QD

C

B

A

D

PL

ES

H

ES

*Ao*

PL

*A1*

*A2*

*A3*

*A4*

*A5*

*A6*

*A7*

*Qo*

*Q1*

*Q2*

*Q3*

*Q4*

*Q5*

*Q6*

*Q7*

H

A

B

C

D

a

b

c

d

e

f

g

LT

BI/RBO

RBI

N

7446

/

47

/

48

A

7

B

1

C

2

D

6

LT

3

BI

4

LE

5

QA

13

QB

12

QC

11

QD

10

QE

9

QF

15

QG

14

4511

470

**1**

**0**

**1**

**0**

**1**

**1**

**0**

6 à 15V

|  |  |  |
| --- | --- | --- |
| A1 | Ao | S |
| 0 | 0 | Eo |
| 0 | 1 | E1 |
| 1 | 0 | E2 |
| 1 | 1 | E3 |

*A1*

*S1*

*A2*

*S2*

*A3*

*S3*

*A0*

*S0*

*B1*

*B2*

*B3*

*B0*

*Cin*

*Cout*

*additionneur*

*1*

*A*

*B*

*A-B*

*A1*

*S1*

*A2*

*S2*

*A3*

*S3*

*A0*

*S0*

*B1*

*B2*

*B3*

*B0*

*Cin*

*Cout*

*additionneur*

*Mode*

*A*

*B*

*A+B*

*ou*

*A-B*

*A1*

*S1*

*A2*

*S2*

*A3*

*S3*

*A0*

*S0*

*B1*

*B2*

*B3*

*B0*

*Cin*

*Cout*

*additionneur*

*Mode*

*A*

*B*

*A+B*

*ou*

*A-B*

*CB*

*A1*

*S1*

*A2*

*S2*

*A3*

*S3*

*A0*

*S0*

*B1*

*B2*

*B3*

*B0*

*Cin*

*Cout*

*additionneur*

*Mode*

*A*

*B*

*A+B*

*ou*

*A-B*

*CB*

Eo

S

E1

E2

E3

E4

E5

E6

E7

E8

E9

E10

E11

E12

E13

E14

E15

Ao

A1

A2

A3

?

?

?

?

?

?

?

?

?

?

?

?

?

?

?

?

?

MXR

S=F

A

B

C

D

S=F(A,B,C,D)

A

B

C

D

B

A

PB

Tr

M

Tv

Binaire

vers

Gray

A

B

C

D

Go

G1

G2

G3

Go

G1

G2

G3

A

B

C

D

|  |  |  |
| --- | --- | --- |
| C17 | C20 | S |
| 0 | 0 | 1 |
| 0 | 1 | x |
| 1 | 0 | 0 |
| 1 | 1 | 1 |

00

01

11

10

1

1

1

1

1

1

1

F=AD̅+BCD̅+B̅CD+A̅BC̅D

BA

DC

00

01

11

10

00

01

11

10

1

1

1

1

1

F=A̅CD̅+AB̅C̅+A̅D

BA

DC

00

01

11

10

1

1

1

1

00

01

11

10

1

1

1

1

1

BA

DC

00

01

11

10

1

1

1

G1=BC̅+B̅C=BC

1 0 0 0

0 0 0 0

0 0 0 1

0 0 1 0



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1

1

1

Binaire

Code de Gray

A

B

C

D

DCBA

0

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

Decimal

1

0

2

3

14

15

13

12

11

12

3

4

8

15

0

7

101 111

+ 11 +101

1000 1100

*1 1000000*

10101

+11100

110001

1 0 1 0 0 1 0 1

- 1 1 1 0 1 1 1 0

01 1 1 1 1 1 0 0

1 1 0 1 1 0 1 1 1

*1 1 100*

0111

+ 1001

1 0000

|  |  |  |
| --- | --- | --- |
| opération | résultat | emprunt |
| *X Y Bin* | *S* | *Bout* |
| 0 - 0 - 0 | 0 | 0 |
| 0 - 0 - 1 | 1 | 1 |
| 0 - 1 - 0 | 1 | 1 |
| 0 - 1 - 1 | 0 | 1 |
| 1 - 0 - 0 | 1 | 0 |
| 1 - 0 - 1 | 0 | 0 |
| 1 - 1 - 0 | 0 | 0 |
| 1 - 1 - 1 | 1 | 1 |

175

87

43

21

10

5

2

1

0

1

1

1

1

0

1

0

1

1 0 1 0 1 1 1 1

2

2

2

2

2

2

2

2

947

473

1

1 1 1 0 1 1 0 0 1 1

2

236

1

2

0

2

118

0

2

59

1

2

29

1

2

14

0

2

7

1

2

3

1

2

1

1

2

0



+

-

+

-

+

-

Vs

Vs

a

b

b

a

b

Ve

Vs

F=50Hz, R=100Ω , C=2200µF

Av

Ve

Vs

RL

Vi=AvVe

Zs= 8K

Ze

Ve

Vs

Vg=10mV

Zg=100 Ω

RL

Générateur

Amplificateur

Charge

Vi = AvVe

Zs

Ze

Ve

Vg

Zg

RL

Générateur

Amplificateur

Charge

Vs

Vcc=12V

Rc=8k

E

B

C

E

B

C

Vs

RB

RL

1K

VS1

RB1

RB2

270k

36k

300k

RE

1k

β =200

β =200

10mV

100Ω

RE

560Ω

0

1

2

4

3

5

6

7

8

9

10

to

τ

2/3ΔV

ΔV

t2

t1

Ve

Vs

0

1

2

4

3

5

6

7

8

9

10

to

τ

⅔ ΔV

ΔV

t2

t1

-5

-4

-2

-3

-1

τ

Continuité mathématique

⅔ ΔV

⅓ΔV

τ

⅓ ΔV

⅔ ΔV

E1

E2

1 ms

0

2

4

6

8

10

-4

-2

-6

-8

-10

-12

-14

τ

1 ms

Ve

Vs

E1

E2

E3

E5

E4

to

t1

t2

0

2

4

6

8

10

to

t1

E

τ=60µs

100 µs

Vs

Veq

0

2

6

12

10

8

14

-2

-4

to

t1

τ=75µs

100 µs

E1

E2

E3

3.75

Ve

Vs

continuité mathématique

+

-

Ve

Vs

R2

R1

i

i

=0

source

Charge

Av2

f02

Av1

f01

+

-

1K

ve

10K

+

-

1K

100K

vs

gain 11 (20.8 dB) f0 = 326KHz

gain 101 (40.1 dB) f0 = 34.1kKHz

gain 1111 (60.9 dB) f0 = 34.1kKHz

+

-

v

s

C

v

e

R

Rf

+

-

v

s

100n

v

e

3k

100k

1 ms

-10

Ve

10

Vs

8

-8

6

4

2

0

-2

-4

-6

+

-

Vs

Ve

100k

100nF

100nF

3k

3k

1 ms

-10

Ve

10

Vs

8

-8

6

4

2

0

-2

-4

-6

R

10k

1mA

Volts

-10.00

R

10k

Volts

10.00

1mA

Vs1

Vs2

Vc1

Vc2

VOH

VTH

VTL

VOL

0

V +

V -

Vs

T

Tdch

Tch

fo

R2

10k

R1

10k

C1

50nF

R

1.59k

C2

50nF

R

1.59k

Ve

Vs

R2

10k

R1

10k

C

50nF

R

1.59k

C

50nF

R

1.59k

Ve

Vs

R1

10k

R2

10k

R

1.59k

R

1.59k

C

50nF

C

50nF

Ve

Vs

R2

R1

C

R

C

R

Ve

Vs

R2

10k

R1

15k

C

10nF

R

1.59k

C

10nF

R

1.59k

Ve

Vs

-20

-40

-60

-80

10

0

-100

10

100

1k

2k

10k

100k

1M

Gain

10

100

1k

2k

10k

100k

1M

0

-20

-40

-60

-80

-100

-120

-140

-160

-180

-90

10

100

1k

2k

10k

100k

1M

0

-10

-20

-30

-40

-50

-60

-70

-80

-90

-100

-110

-120

-130

-140

-150

-160

-170

-180

Phase

-40

-60

-70

-80

-90

-20

0

10

-30

-50

-10

10

100

1k

2k

10k

100k

1M

10

100

1k

2k

10k

100k

1M

0

-20

-40

-60

-80

-100

-120

-140

-160

-180

-90

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ho | 1 |  |  |  |  |  |
| Q | 0,7 | 0,8 | 1 | 2 | 5 | 10 |
| H(fo) | 0,7 | 0,8 | 1 | 2 | 5 | 10 |
| H(fo)(dB) | -3,10 | -1,94 | 0 | 6,02 | 13,98 | 20 |
| H(2fo) | 0,48 | 0,51 | 0,55 | 0,63 | 0,66 | 0,67 |
| H(2fo)(dB) | -6,33 | -5,81 | -5,12 | -3,98 | -3,60 | -3,54 |

fo

2fo

10fo

20

10

15

5

0

-5

-10

-15

-20

-25

10

5

2

1

0.7

Q

-260

-240

-220

-200

-180

-160

-140

-120

-100

-90

-270

-80

-60

-40

-20

0

20

40

60

80

90

-90

fo

10fo

10

5

2

1

0.7

Q

ho>0

ho<0

fo

f2

f1

H(fo)

H(fo)

√2

Bande passante

H

fo

f2

f1

HdB(fo)

HdB(fo)-3dB

Bande passante

HdB=20log(H)

fo

f2

f1

H(fo)

H(fo)

√2

Bande passante

H

R2

8k

R1

10k

C1

50nF

R3

318

C2

50nF

R4

318

Ve

R6

8k

R5

10k

C3

50nF

R7

3.18k

C4

50nF

R8

3.18k

Vs

-20

-30

20

-10

0

100

1k

10k

100k

10

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| *Poids base 10* | | | | | | |
| *…* | *105* | *104* | *103* | *102* | *101* | *100* |
| *…* | *100000* | *10000* | *1000* | *100* | *10* | *1* |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| *Poids base 2* | | | | | | |
| *…* | *25* | *24* | *23* | *22* | *21* | *20* |
| *…* | *32* | *16* | *8* | *4* | *2* | *1* |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| *Poids base 16* | | | | | | |
| *…* | *165* | *164* | *163* | *162* | *161* | *160* |
| *…* | *1048576* | *65536* | *4096* | *256* | *16* | *1* |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *Poids base 10* | | | | | | | | | | |
| *…* | *105* | *104* | *103* | *102* | *101* | *100* | *.* | *10-1* | *10-2* | *10-3* |
| *…* | *100000* | *10000* | *1000* | *100* | *10* | *1* | *.* | *0.1* | *0.01* | *0.001* |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *Poids base 2* | | | | | | | | | | |
| *…* | *25* | *24* | *23* | *22* | *21* | *20* | *.* | *2-1* | *2-2* | *2-3* |
| *…* | *32* | *16* | *8* | *4* | *2* | *1* | *.* | *0.5* | *0.25* | *0.125* |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *Poids base 16* | | | | | | | | | | |
| *…* | *165* | *164* | *163* | *162* | *161* | *160* | *.* | *16-1* | *16-2* | *16-3* |
| *…* | *1048576* | *65536* | *4096* | *256* | *16* | *1* | *.* | *0.0625* | *0.0039* | *0.000244* |