

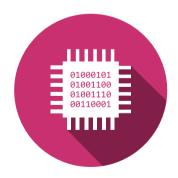


Conception numérique (DiD)

Mémoire morte ROM

Filière Systèmes industriels Filière Energie et techniques environmentales Filière Informatique et systèmes de communications

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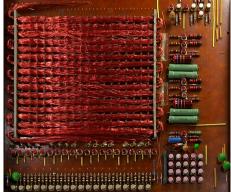
ROM – Read only memory



La mémoire morte (ROM) est une mémoire de données à laquelle on ne peut accéder qu'en lecture et qui n'est pas volatile. Cela signifie qu'elle conserve les données même lorsqu'elle n'est pas alimentée.

Elle est aujourd'hui généralement remplacée par la mémoire flash.

Le domaine d'application principal est la mémoire bios



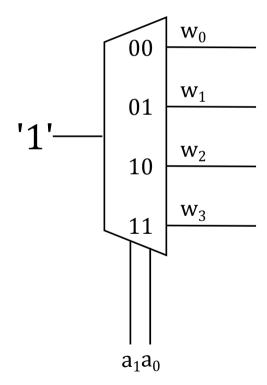
ROM – Read only memory

Structure avec MUX

a_1	a_0	w_0	w_1	w_2	w_3	
0	0	1	0	0	0	
0	1	0	1	0	0	
1	0	0	0	1	0	
1	1	0	0	0	1	

- *n*-Bit entrée de commande
- $2^n n$ -Bit sorties possibles





Exercice

Réalisation d'une fonction OR programmable

a_1	a_0	w_0	w_1	w_2	w_3	d_3	d_2	d_1	d_0
0	0	1	0	0	0	1	0	0	1
0	1	0	1	0	0	0	1	1	1
1	0	0	0	1	0	1	1	1	1
1	1	0	0	0	1	0	1	0	0

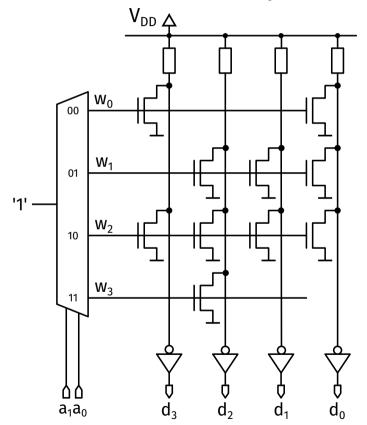




$$\begin{cases} d_3 = \overline{a_0} \\ d_2 = a_0 + a_2 \\ d_1 = a_0 \oplus a_1 \\ d_0 = \overline{a_0 * a_2} \end{cases}$$

ROM - Read only memory

Mux-OR Structure & capacité





$$C = n_w * n_d = 2^{n_a} * n_d$$

Exercice 1.1 (rom/logic-function-01)

Tailles de mémoire



a) Quelle est la capacité de la mémoire du slide précédent ?

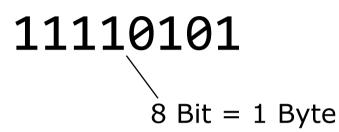
b) Quelle est la capacité d'une mémoire avec 10 lignes d'entrée et 8 lignes de sortie ?

c) Quelle est la capacité d'une mémoire avec 18 lignes d'entrée et 8 lignes de sortie ?

Système binaire - Remise à niveau



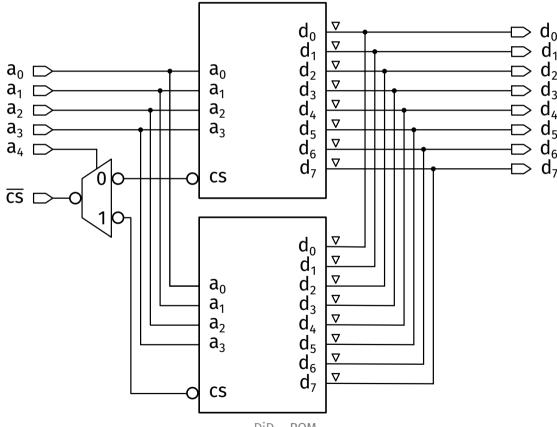
- 8 BIT forment un Byte (octet)
 - Purement historique
- Using IEC standard:
 - 1 KiB = 1'024 bytes (Note: big K)
 - 1 MiB = 1'024 KiB = 1'048'576 bytes
 - 1 GiB = 1'024 MiB = 1'048'576 KiB = 1'073'741'824 bytes
- Using SI standard:
 - 1 kB = 1'000 bytes (Note: small k)
 - 1 MB = 1'000 kB = 1,000,000 bytes
 - 1 GB = 1'000 MB = 1'000'000 KB = 1'000'000'000 bytes



Mémoire Interconnexion

Mise en serie

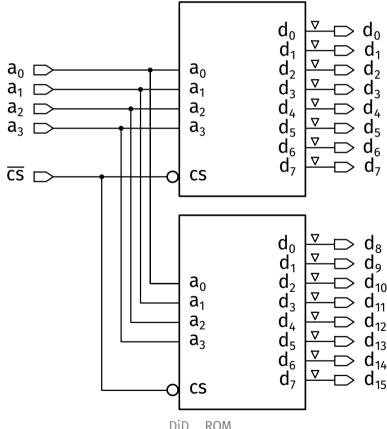




Mémoire Interconnexion

Mise en parallèle

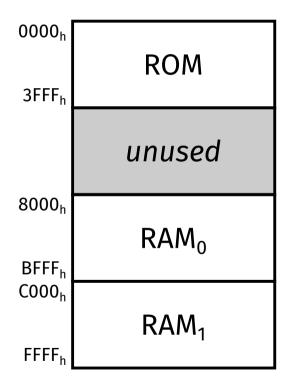




Plan d'occupation de la mémoire



 Plan d'occupation de la mémoire d'un μP à 16 lignes d'adresse



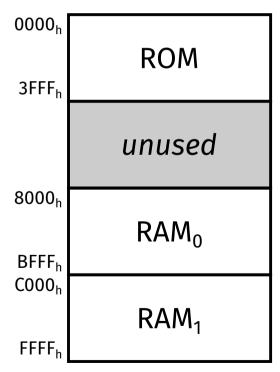
Exercice 2.1 (rom/rom-circuits-01)

Décodage ROM





Dessinez le décodage de la ROM de l'occupation de mémoire suivante.



Object file format

Intel HEX

- : Start delimiter
- Byte Count
- Address
- Record Type
 - 00 Data
 - 01 End of File
 - 02 Extended Segment Address
 - 03 Start Segment Address
 - 04 Extended Linear Address
 - 05 Start Linear Address
- Data
- Checksum
 - L'octet de somme de contrôle d'un enregistrement est le complément à deux de l'octet de poids faible (LSB) de la somme de toutes les valeurs d'octets décodées dans l'enregistrement avant la somme de contrôle.



:020000020000FC

:10000000000D1925313C47515B636A71767A7E7F1A

:100010007F7F7E7A76716A635B51473C3125190D8B

:1000200000F3E7DBCFC4B9AFA59D968F8A868281A6

:10003000808182868A8F969DA5AFB9C4CFDBE7F316

:00000001FF

Exercice 3.1.a (rom/crc-01)

CRC Checksum





Calculer la somme de contrôle CRC de l'entrée Intel Hex File

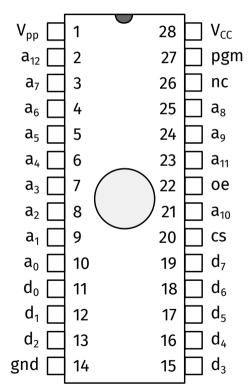
:0300300002337AXX

Mémoire

Types

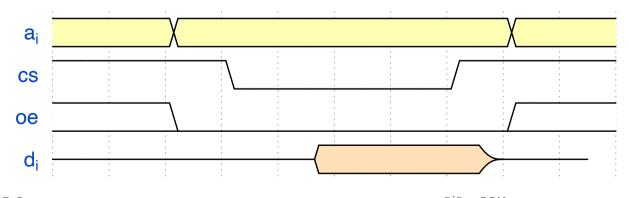
- PROM
- EPROM
- OTP-ROM
- EEPROM
- Flash

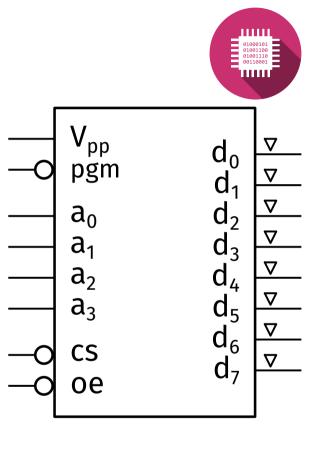




Accès à la mémoire Interface parallèle

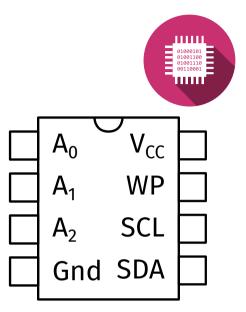
- Plus de signaux
- Bande passante plus élevée (sans changement de la fréquence d'horloge)





Accès à la mémoire Interface série (I2C)

- Moins de signaux
- Bande passante plus faible (sans changement de la fréquence d'horloge)





Exercice 4.1 (rom/rom-types-01)

ROM bande passante





Une ROM est proposée avec une interface sérielle (I2C) et parallèle. La mémoire comprend 8 bits d'adresse et 8 bits de données et est cadencée à 66MHz. Calculez la vitesse d'écriture maximale théorique. En outre, calculez de combien de % le plus rapide est le plus rapide.

WHY ARE THERE MIRRORS ABOVE BEDS

WHY DO I SAY WHY IS SEA SALT BETTER IN

WHY IS THERE NOT A POKEMON MMO WHY IS THERE LAUGHING IN TV SHOWS ARE THERE DOORS ON THE FREEWAY ARE THERE SO MANY SVCHOST-EXE RUNNING AREN'T ANY COUNTRIES IN ANTARCTICA WHY ARE THERE SCARY SOUNDS IN MINECRAFT WHY IS THERE KICKING IN MY STOMACH WHY ARE THERE TWO SLASHES AFTER HTTP WHY ARE THERE CELEBRITIES WHY DO SNAKES EXIST WHY DO OYSTERS HAVE PEARLS WHY ARE DUCKS CALLED DUCKS WHY DO THEY CALL IT THE CLAP WHY ARE KYLE AND CARTMAN FRIENDS WHY IS THERE AN ARROW ON AANG'S HEAD 🗷 WHY ARE TEXT MESSAGES BLUE WHY ARE THERE MUSTACHES ON CLOTHES WHY WUBA LUBBA DUB DUB MEANING IS THERE A WHALE AND A POT FALLING WHY ARE THERE SO MANY BIRDS IN SWISS WHY IS THERE SO LITTLE RAIN IN WALLIS WHY IS WALLIS WEATHER FORECAST ALWAYS WRONG

WHY HAVE DINOSAURS NO FUR WHY ARE SWISS AFRAID RWHY IS THERE A LINE THROUGH HI

WHY AREN'T ECONOMISTS RICH WHY DO AMERICANS CALL IT SOCCER & WHY ARE MY EARS RINGING WHY IS 42 THE ANSWER TO EVERYTHING WHY CAN'T NOBODY ELSE LIFT THORS HAMMER S **SWHY IS THERE ICE IN SPACE** WHY IS MARVIN ALWAYS SO SAD

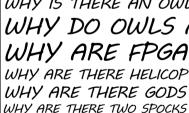
WHY IS SPACE BLACK WHY IS OUTER SPACE SO COLD WHY ARE THERE PYRAMIDS ON THE MOON WHY IS NASA SHUTTING DOWN A

THERE MALE AND FEMALE BIKES WHY ARE THERE BRIDESMAIDS WHY DO DYING PEOPLE REACH UP HOW FAST IS LIGHTSPEED WHY ARE OLD KLINGONS DIFFERENT E WHY ARE THERE TINY SPIDERS IN MY HOUSE ' DO SPIDERS COME INSIDE

WHY ARE THERE HUGE SPIDERS IN MY HOUSE $_{
m H}$ WHY ARE THERE LOTS OF SPIDERS IN MY HOUSE $\overline{oldsymbol{\lambda}}$ 为WHY ARE THERE SO MANY SPIDERS IN MY ROOM

SPYDER BITES ITCH

WHY ARE THERE **GHOSTS**



WHY IS THERE AN OWL IN MY BACKYARD WHY IS THERE AN OWL OUTSIDE MY WINDOW WHY IS THERE AN OWL ON THE DOLLAR BILL WHY DO OWLS ATTACK PEOPLE WHY ARE FPGA'S EVERYWHERE WHY ARE THERE HELICOPTERS CIRCLING MY HOUSE WHY ARE MY BOOBS ITCHY WHY ARE THERE GODS

'IS https://xkcd·com/1256/ THEY SAY T-MINUS WHY ARE THERE OBELISKS MWHY ARE WRESTLERS ALWAYS WET

TO WHY IS THERE A RED LINE THROUGH HTTPS ON TWITTER

WHY AREN'T MY ARMS GROWING WHY ARE THERE SO MANY CROWS IN ROCHESTER &

WHY IS TO BE OR NOT TO BE FUNNY

WHY DO CHILDREN GET CANCER 🗢

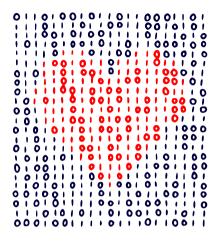
WHY IS POSEIDON ANGRY WITH ODYSSEUS

WHY DO Q TIPS FEEL GOOD

WHY AREN'T

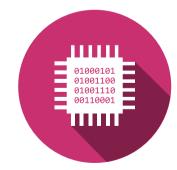
THERE GUNS IN

WHY ARE THERE SQUIRRELS









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