MOTOROLA

MCF5307
UART MODULE

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UART INTERFACE

OVERVIEW

- TWO INDEPENDENT, FULL DUPLEX ASYNCHRONOUS/SYNCHRONOUS RECEIVER/ TRANSMITTER CHANNELS

- INDEPENDENTLY PROGRAMMABLE BAUD RATE GENERATOR FOR EACH RECEIVER AND TRANSMITTER DERIVABLE FROM SYSTEM CLOCK OR EXTERNAL CLOCK ON **TIN** PIN

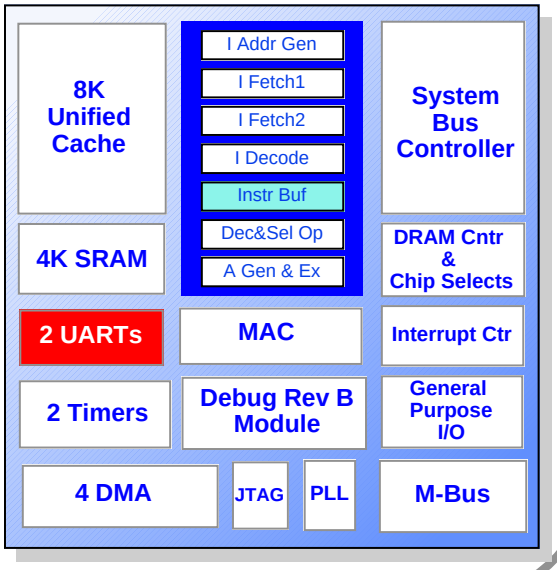
- PROGRAMMABLE DATA FORMAT, FIVE TO EIGHT DATA BITS PLUS PARITY OR ADDRESS MARK BIT

  PARITY OPTIONS:

  1- ODD PARITY
  2- EVEN PARITY
  3- FORCE PARITY
  4- NO PARITY

- PROGRAMMABLE CHANNEL MODES
  NORMAL (FULL DUPLEX)
  AUTOMATIC ECHO (HALF DUPLEX)
  LOCAL LOOPBACK
  REMOTE LOOPBACK

- UART CAN BE PROGRAMMED TO DIRECTLY INTERRUPT DMA FOR FAST TRANSFERS



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UART RECEIVER

FEATURES :

- AUTOMATIC WAKEUP FOR MULTIDROP APPLICATIONS
- FRAMING, PARITY AND OVERRUN ERROR DETECTIONS
- FALSE START BIT DETECTION
- LINE-BREAK DETECTION
- DETECTION OF A BREAK ORIGINATING IN THE MIDDLE OF A CHARACTER
- START/END BREAK INTERRUPT /STATUS
- FOUR STAGE FIFO RECEIVE BUFFER
- RECEIVER OPERATION MAY BE POLLED OR INTERRUPT DRIVEN

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UART TRANSMITTER

FEATURES:

- DOUBLE-BUFFERED OPERATION
- PARITY GENERATION: ODD, EVEN, NO PARITY OR FORCE PARITY
- STOP BIT GENERATION FROM .563 TO 2-BITS
- BREAK GENERATION
- AUTOMATIC NEGATION OF REQUEST-TO-SEND UPON COMPLETION OF MESSAGE TRANSMISSION
- PROGRAMMABLE CHARACTER LENGTH FROM 5 TO 8-BITS

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UART BLOCK DIAGRAM AND INTERFACE SIGNALS

RxD - SERIAL RECEIVE DATA PIN, DATA IS SAMPLED ON RISING EDGE OF CLOCK SOURCE.

TxD - SERIAL TRANSMIT DATA PIN, DATA IS SHIFTED OUT ON FALLING EDGE OF CLOCK SOURCE.

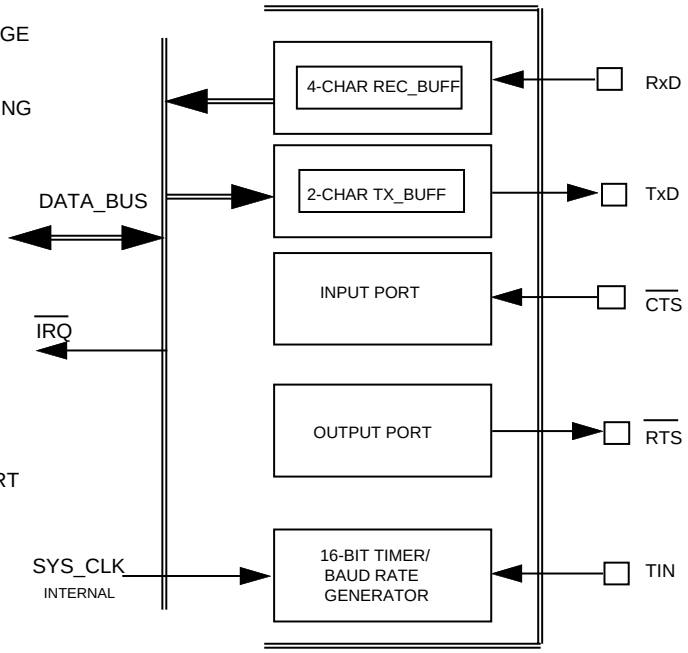
$\overline{\text{RTS}}$ - REQUEST-TO-SEND, THIS PIN MAY BE USED TO CONTROL SERIAL DATA FLOW WHEN CONNECTED TO CTS INPUT PIN OF THE TRANSMITTER.

$\overline{\text{CTS}}$ - CLEAR-TO-SEND, THIS SIGNAL GENERATES INTERRUPT REQUEST TO THE CPU UPON CHANGE OF STATE.

SYS_CLK - CLOCK INPUT TO BAUD RATE GENERATOR OR 16-BIT TIMER TO GENERATE STANDARD BAUD RATES.

$\overline{\text{IRQ}}$ - AN INTERNAL INTERRUPT REQUEST SIGNAL FROM THE DUART INTERFACE.

TIN - CAN BE USED AS THE CLOCK SOURCE



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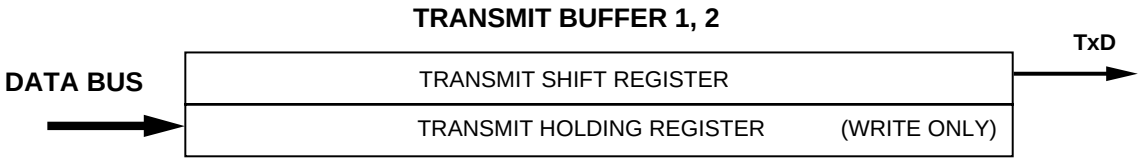
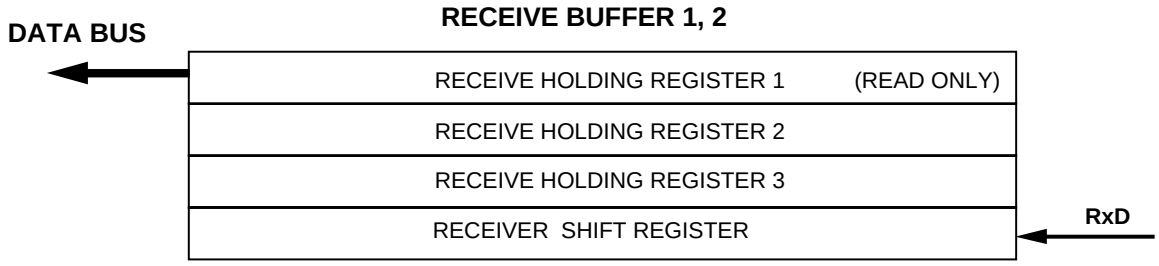
BUFFERED DUART (Rx/Tx Buff)



TxRDY - TRANSMITTER READY FOR A CHAR TO BE WRITTEN INTO HOLDING REGISTER.

TxEMP - TRANSMIT SHIFT REGISTER IS EMPTY.



RxRDY - RECEIVER READY 1 OR MORE CHAR IN FIFO.

FFULL - FIFO full at 3 bytes.

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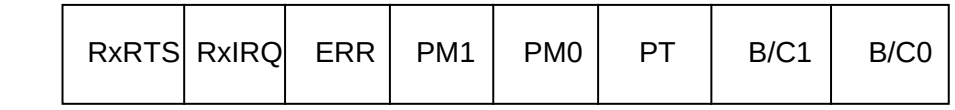
RECEIVER REGISTERS

UMR1 - UART MODE REGISTER 1



RST: 0 0 0 0 0 0 0 0

BITS/CHAR
00 - FIVE BITS
01 - SIX BITS
10 - SEVEN BITS
11 - EIGHT BITS

PARITY MODE AND TYPE
000 - EVEN PARITY
001 - ODD PARITY
010 - LOW PARITY
011 - HIGH PARITY
10x - NO PARITY
110 - MULTIDROP MODE / DATA CHAR
111 - MULTIDROP MODE / ADDRESS CHAR

ERROR MODE
1 - BLOCK MODE
0 - CHARACTER MODE

RECEIVER READY SELECT
1 - FFULL IS THE SOURCE THAT GENERATES IRQ
0 - RxRDY IS THE SOURCE THAT GENERATES IRQ

RXVR **RTS** CONTROL
1 - UPON RECEIPT OF A START BIT, $\overline{\textbf{RTS}}$ IS NEGATED IF THE CHANNEL'S FIFO IS FULL
0 - RECEIVER HAS NO EFFECT ON **RTS**

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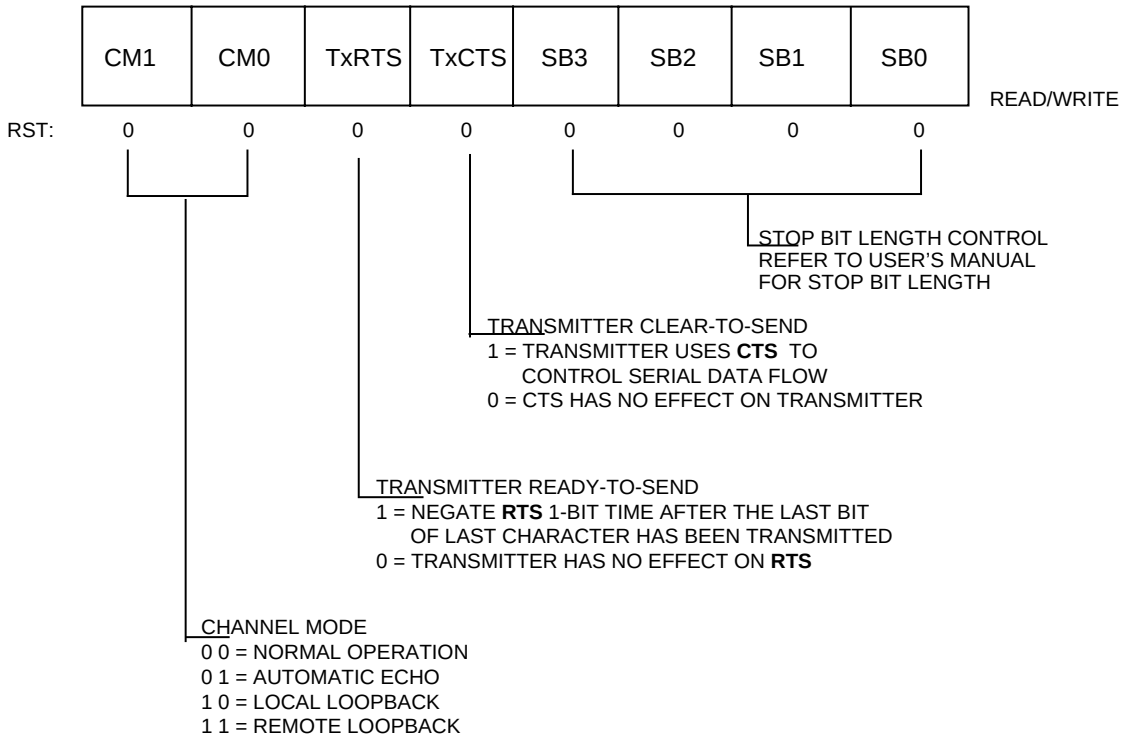
UART REGISTERS

UMR2 - UART MODE REGISTER 2



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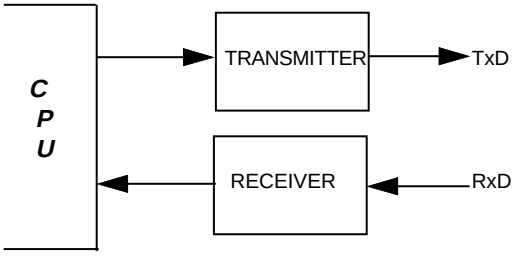
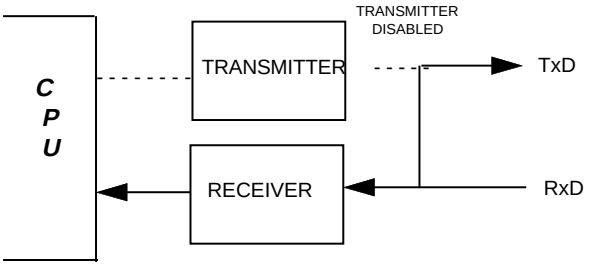
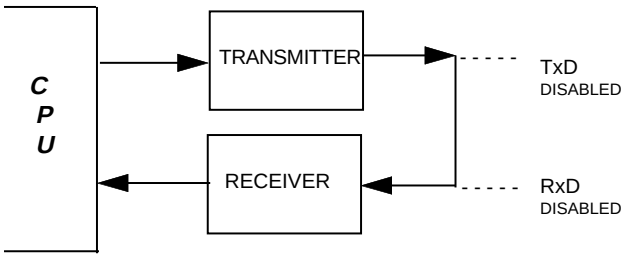
UART MODES



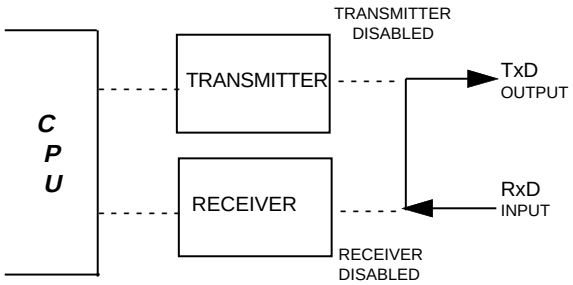
NORMAL OPERATION
UMR2(CM1:0) **= 00**



AUTOMATIC ECHO
UMR2(CM1:0) **= 01**



LOCAL LOOPBACK
UMR2(CM1:0) **= 10**



REMOTE LOOPBACK
UMR2(CM1:0) **= 11**

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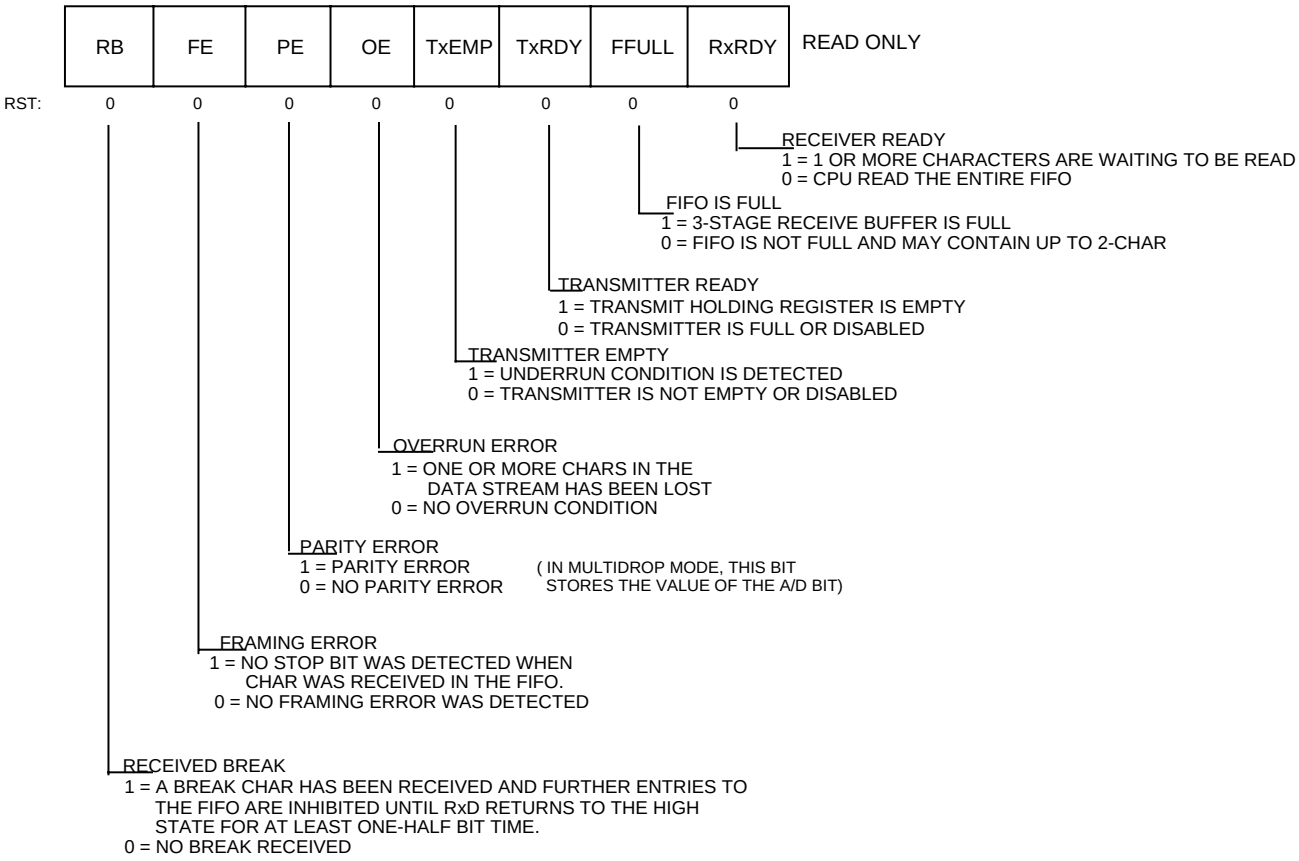
RECEIVER/TRANSMITTER STATUS

USR - STATUS REGISTER



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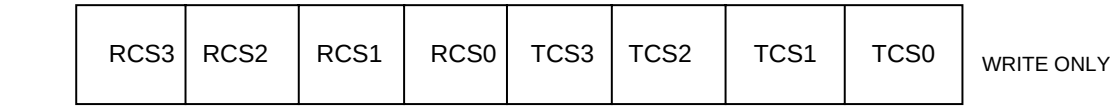
BAUD RATE SELECTION

UCSR - CLOCK SELECT REGISTER



1 1 0 1	TIMER
1 1 1 0	X16 CLK
1 1 1 1	X1 CLK

RECEIVER BAUD RATE SELECTION

1 1 0 1	TIMER
1 1 1 0	X16 CLK
1 1 1 1	X1 CLK

TRANSMITTER BAUD RATE SELECTION

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UART COMMANDS

UCR - COMMAND REGISTER

	-	MISC2	MISC1	MISC0	TC1	TC0	RC1	RC0	
									WRITE ONLY
RST:	0	0	0	0	0	0	0	0	

MISC2	MISC1	MISC0	COMMAND
0	0	0	NO COMMAND
0	0	1	RESET MODE REG PNTR
0	1	0	RESET RECEIVER
0	1	1	RESET TRANSMITTER
1	0	0	RESET ERROR STATUS
1	0	1	RESET BRK CHANGE IRQ
1	1	0	START BREAK
1	1	1	STOP BREAK

MISC COMMANDS

TC1	TC0	COMMAND
0	0	NO COMMAND
0	1	ENABLE TRANSMITTER
1	0	DISABLE TRANSMITTER
1	1	DO NOT USE

TRANSMITTER COMMANDS

RC1	RC0	COMMAND
0	0	NO COMMAND
0	1	ENABLE RECEIVER
1	0	DISABLE RECEIVER
1	1	DO NOT USE

RECEIVER COMMANDS

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UART REGISTERS

UIPCR - INPUT PORT CHANGE REGISTER

	0	0	0	COS	1	1	1	$\overline{CTS}$
RST:	0	0	0	0	0	1	1	$\overline{CTS}$

READ ONLY

COS - WHEN SET INDICATES A LOW-TO-HIGH OR HIGH-TO-LOW TRANSITION LONGER THAN 25-50usec HAS OCCURRED ON INPUT PIN. AN IRQ IS GENERATED TO THE CPU, IF ENABLED

CTS - INDICATES THE CURRENT PIN STATE INPUT

UIP - INPUT PORT REGISTER

	-	-	-	-	-	-	-	$\overline{CTS}$
RST:	1	1	1	1	1	1	1	$\overline{CTS}$

READ ONLY

CTS - INDICATES THE CURRENT PIN STATE INPUT

UACR - AUXILIARY CONTROL REGISTER

	BGR	CTMS2	CTMS1	CTMS0	-	-	-	IEC
RST:	0	0	0	0	0	0	0	0

WRITE ONLY

BGR=1, SET 2 OF BAUD RATES IS SELECTED
BGR=0, SET 1 OF BAUD RATES IS SELECTED

CTMS[2:0} SHOULD BE SET TO 110

IEC = 1, ENABLE IRQ TO CPU BY A CHANGE OF STATE ON CTS INPUT.
IEC = 0, NO IRQ IS GENERATED TO CPU BECAUSE OF A CHANGE ON CTS

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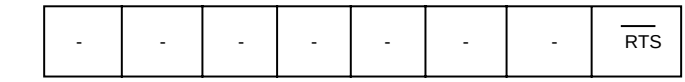
UART REGISTERS

UOP1 - OUTPUT PORT DATA REGISTER



WRITE ONLY

RST: - - - - - - - 0

BIT SET

Write a 1 to force RTS low

UOP0 - OUTPUT PORT DATA REGISTER

WRITE ONLY

RST: - - - - - - - -

BIT RESET

Write a 1 to force RTS high

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INTERRUPT ENABLE & STATUS

UISR - INTERRUPT STATUS REGISTER

	COS	-	-	-	-	DB	RxRDY	TxRDY	
RST:	0	0	0	0	0	0	0	0	READ ONLY

UIMR - INTERRUPT MASK REGISTER

	COS	-	-	-	-	DB	RxRDY	TxRDY	
RST:	0	0	0	0	0	0	0	0	WRITE ONLY

TRANSMITTER READY
1 = TRANSMIT HOLDING REGISTER IS EMPTY
0 = CPU LOADED TRANSMIT REG.

RECEIVER READY OR FIFO FULL. DUPLICATE OF UMR1 BIT6

CHANGE OF STATE
1 = INPUT PIN CHANGED STATE
0 = NO CHANGE OF STATE

DELTA BREAK
1 = RECEIVER DETECTED BREAK
0 = NO BREAK DETECTED

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UART INTERRUPT CONTROL

ICR 3 & 4- UART INTERRUPT CONTROL REGISTER 3 & 4

B7.....B0

AVEC	-	-	IL2	IL1	IL0	IP1	IP0

READ/WRITE

INTERRUPT PRIORITY
1 1 = HIGHEST
-
-
0 0 = LOWEST

INTERRUPT LEVEL
1 1 1 = IRQ SOURCE HAS HIGHEST PRIORITY
-
-
0 0 1 = IRQ SOURCE HAS LOWEST PRIORITY
0 0 0 = NO INTERRUPT IS REQUESTED

AUTOVECTOR
0 - IRQ SOURCE RETURNS VECTOR
1 - SIM GENERATES AVEC FOR IRQ SOURCE

UIVR - INTERRUPT VECTOR REGISTER

	IVR7	IVR6	IVR5	IVR4	IVR3	IVR2	IVR1	IVR0
RST:	0	0	0	0	1	1	1	1

READ/WRITE

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