

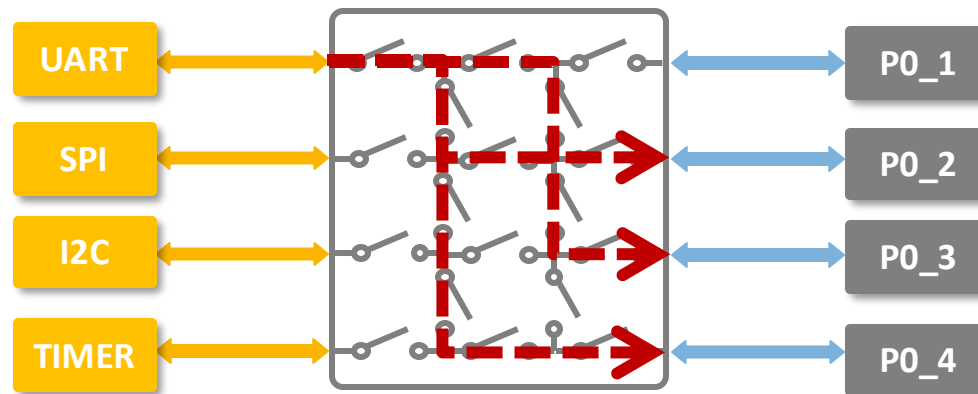
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SWITCH MATRIX OVERVIEW

Switch Matrix Overview

- The switch matrix connects internal signals (functions) to external pins
- **Movable functions**
 - **Most** functions can be **assigned** through the switch matrix to **any** external pin which is not a power or ground pin
- **Fixed-pin functions**
 - **A few** functions can only be assigned to one **particular** external pin and can be **enabled** or **disabled** through the switch matrix
- **Power supply functions**
 - **Power** supply voltage and **Ground** can only be assigned to one **particular** external pin and can **not** be enabled or disabled or replaced through the switch matrix



How to identify the functions

- The quick way to identify the movable/fixed-pin/power supply functions
 - All movable functions are listed in Table “Movable functions” in UM & DS
 - The fixed-pin and power supply functions are shown on the pin view of the package or in the table of pin description in DS

Note: GPIOs are **special** fixed-pin functions

Table 4. Movable functions switch matrix)

Function name	Type	Desc
Ux_TXD	O	Trans
Ux_RXD	I	Rece
Ux_RTS	O	Requ
Ux_CTS	I	Clear
Ux_SCLK	I/O	Seria

35	PIO1_7/CAPT_X8	} Fixed-pin functions
34	PIO0_6/ADC_1/ACMPVREF	
33	PIO0_07/ADC_0	
32	VREFP	} Power supply functions
31	VREFN	
30	VSS	
29	VDD	

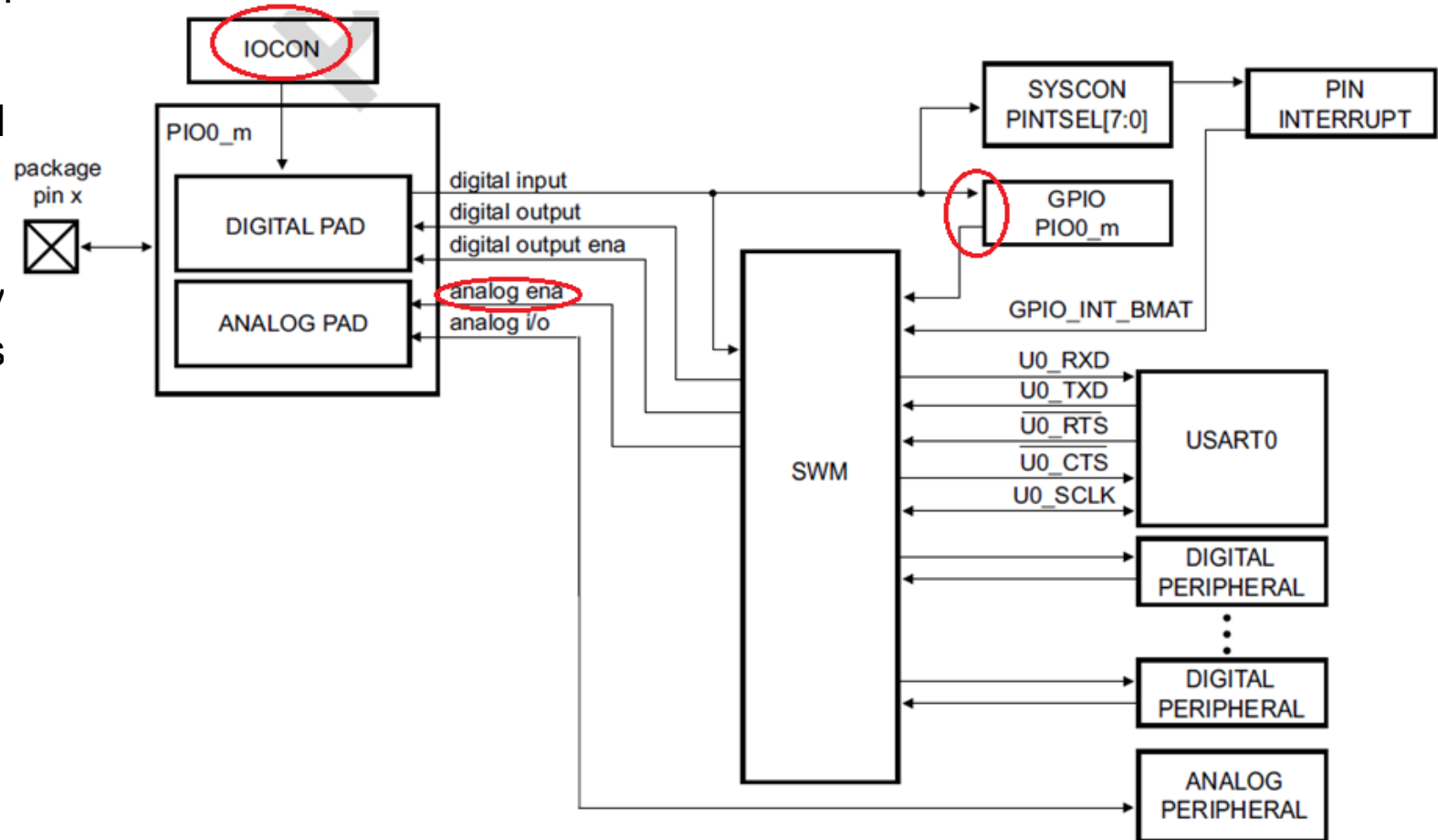
Table 3. Pin description

Symbol
PIO0_0/ACMP_I1/TDO
PIO0_1/ACMP_I2/CLKIN/TDI
SWDIO/PIO0_2/TMS

SWITCH MATRIX BLOCK

Switch Matrix block

- The electrical characteristics for I/O are configured by the **IOCON** block for each pin.
- If a fixed-pin **analog** function is selected its assigned pin cannot be used for any other function.
- If a fixed-pin function is deselected, any **movable** function can be assigned to its port and pin.
- If a fixed-pin function is deselected and no movable function is assigned to this pin, the pin is assigned its **GPIO** function.
- The level on a digital input is always reflected in the **GPIO** port register and in the pin interrupt/pattern match state.
- If any function is assigned to a pin, the **GPIO** output becomes disabled.



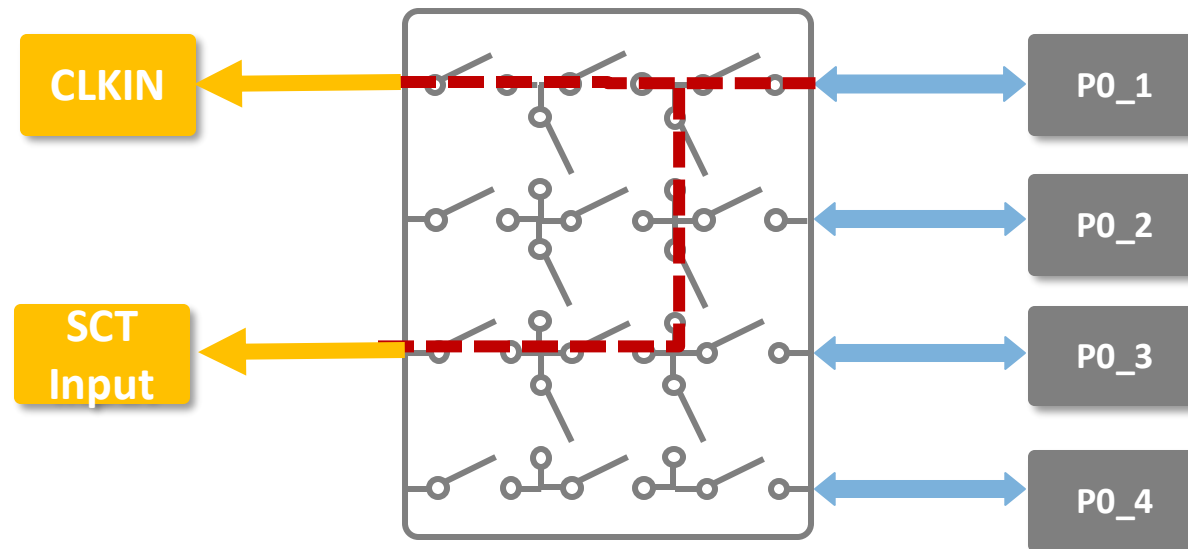
SWITCH MATRIX BASIC GUIDELINES

Guidelines to assign pins

- It is allowed to connect one input signal on a pin to multiple internal inputs by programming the same pin number in more than one PINASSIGN register.

Example:

You can enable the CLKIN input in the PINENABLE0 register on pin PIO0_1 and also assign one or more SCT inputs to pin PIO0_1 through the PINASSIGN registers to feed the CLKIN into the SCT.

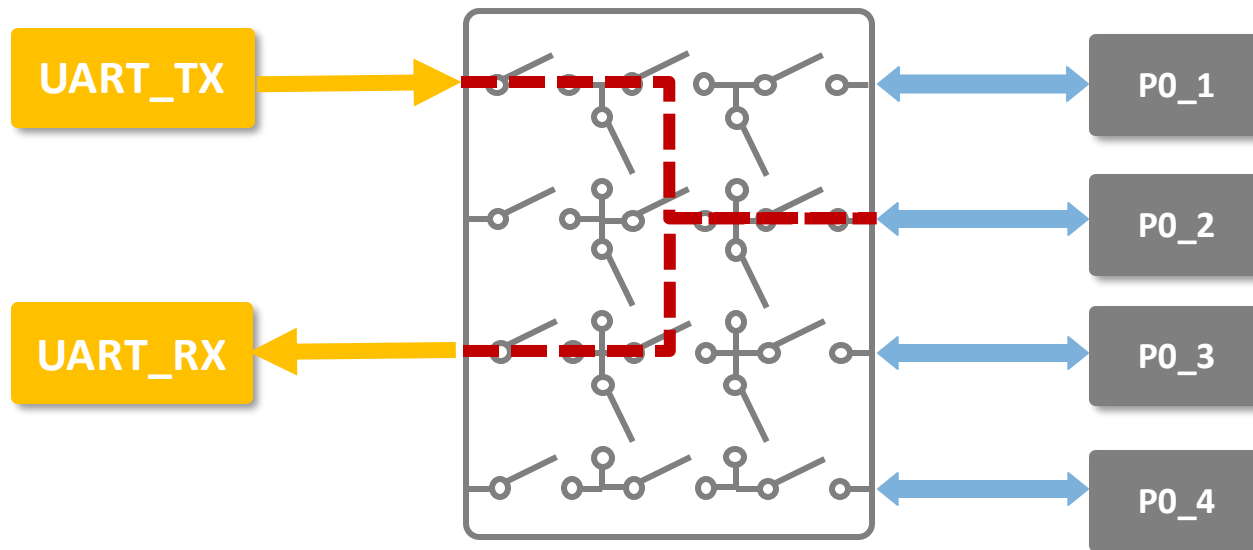


Guidelines to assign pins

- It is allowed to let one digital output function control one or more digital inputs by programming the same pin number in the PINASSIGN register bit fields for the output and inputs

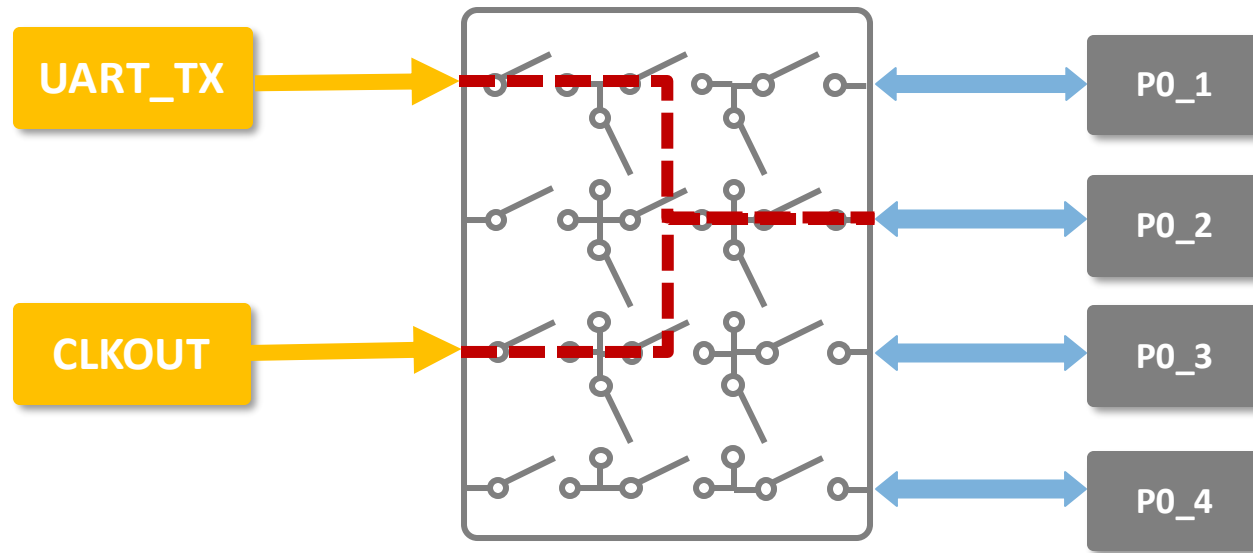
Example:

You can **loop back** the USART transmit output to the receive input by assigning the same pin number to Un_RXD and Un_TXD



Guidelines to assign pins

- It is **not** allowed to connect more than one output or bidirectional function to a pin



SWITCH MATRIX REGISTER

Switch Matrix Register

- The switch matrix consists of two blocks of pin-assignment registers **PINASSIGN (0-7)** and **PINENABLE(0)**
- Assign movable functions to **pin numbers** through the 8 bits of the **PINASSIGN** register associated with this function
- Each fixed-pin function is associated with one bit in the **PINENABLE** register which **selects or deselects** the function

Pin assign register 0 (**PINASSIGN0**)

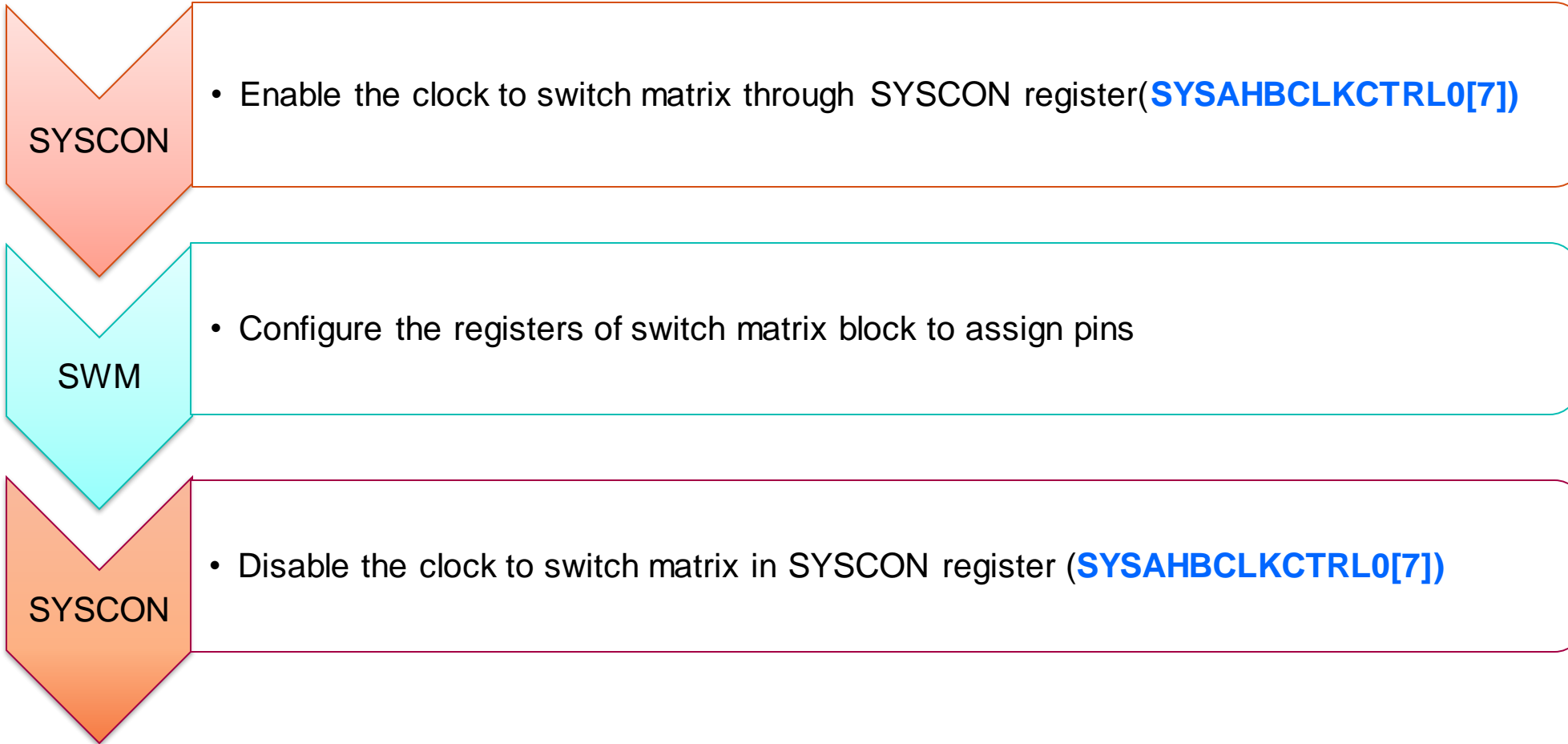
Bit	Symbol	Description	Reset value
7:0	U0_TXD_0	U0_TXD function assignment. The value is the pin number to be assigned to this function. The following pins are available: PIO0_0 (= 0) to PIO0_31 (= 0x1F) and from PIO1_0 (= 0x20) to PIO1_21(= 0x35).	0xFF

Pin enable register 0 (**PINENABLE0**)

Bit	Symbol	Value	Description	Reset value
0	ACMP_I1		ACMP_I1 function select.	1
		0	ACMP_I1 enabled on pin PIO0_00.	
		1	ACMP_I1 disabled.	

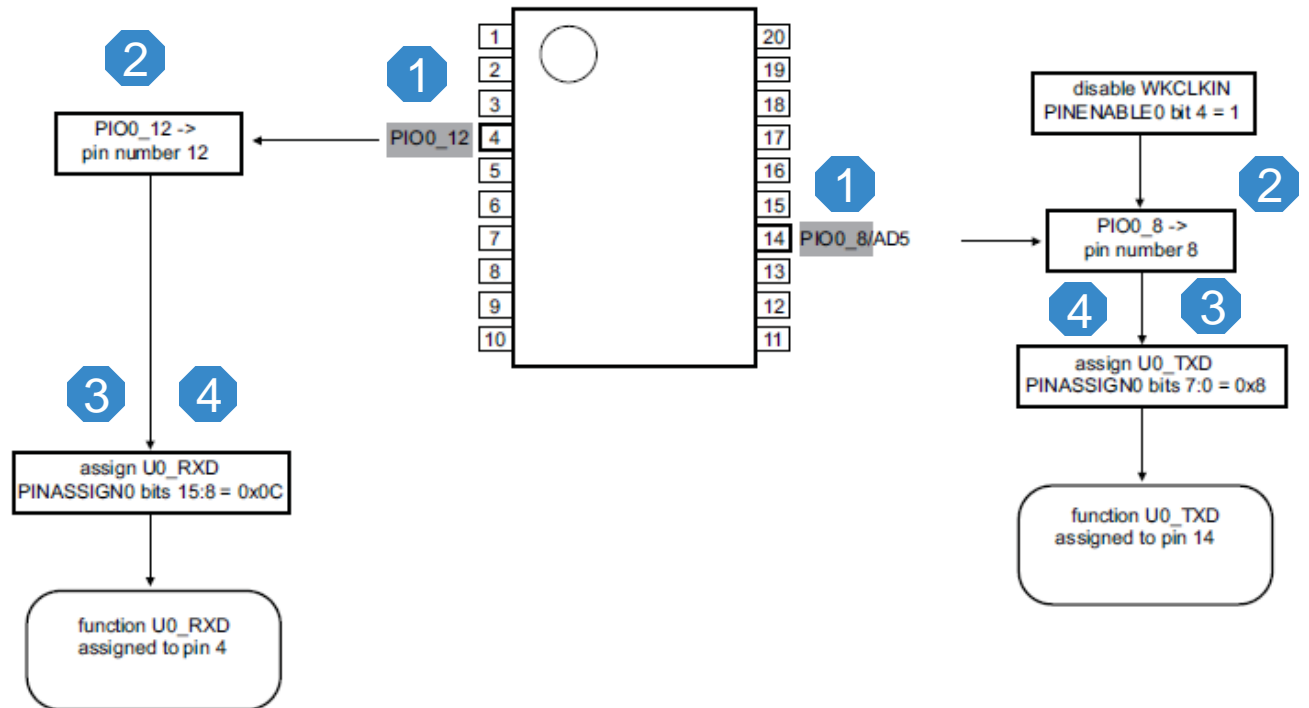
SWITCH MATRIX CONFIGURATION

Basic Configurations



Connect movable Function to Pin

1. Decide which package pin to connect the pin function to by package view
2. Find the default GPIO function PIO0_n or PIO1_n assigned to package pin x to decide the pin number by pin description table or package view
3. Locate the pin assign register for the function FUNC in the movable functions table or register description
4. Program the pin number n into the bits assigned to the pin function in the pin assign register



Enable Fixed-pin Function to Pin

- Fixed-pin function is the function that can **ONLY** be assigned to one pin
 - Analog inputs, all GPIO pins, and the debug SWD pins
- To assign a GPIO function to a pin, disable any special function available on this pin in the PINENABLE0/1 register and do NOT assign any movable function to it
- To assign other fixed-pin function to a pin, do
 - Locate the function in the pin description table in the data sheet which shows the package pin for this function
 - Enable the function in the PINENABLE0/1 register
 - All other possible functions on this pins are now disabled

Table 4. Pin description

Symbol	TSSOP20-1	TSSOP20-2	TSSOP16	HVQFN33		Reset state ^[1]	Type	Description
PIO0_0/ ACMP_I1/TDO	19	19	16	24	[2]	I; PU	IO	PIO0_0 — General-purpose port 0 input/output 0. In ISP mode, this is the U0_RXD pin (for single supply devices). In boundary scan mode: TDO (Test Data Out).
							A	ACMP_I1 — Analog comparator input 1.
PIO0_1(ADC_0)/ ACMP_I2/CLKIN/TDI	12	12	9	17	[2]	I; PU	IO	PIO0_1 — General-purpose port 0 input/output 1. In boundary scan mode: TDI (Test Data In).
							A	ACMP_I2 — Analog comparator input 2.
							I	CLKIN — External clock input.

Table 97. Pin enable register 0 (PINENABLE0, address 0x4000 C1C0) bit description

Bit	Symbol	Value	Description
10	ADC_0		ADC_0 function select.
		0	ADC_0 enabled on pin PIO0_1.
		1	ADC_0 disabled.

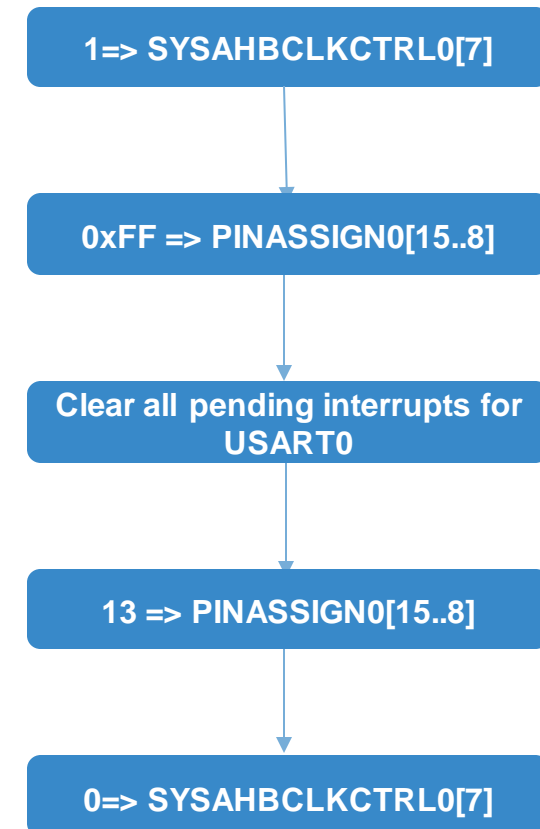
Changing the pin function assignment

- Pin function assignments can be changed “on-the-fly” from one peripheral to another

while the part is running

- To disconnect a peripheral from the pins and change the pin function assignment, follow these steps
 1. Enable the clock to the switch matrix
 2. Find the pin assignment register for the current pin function
 3. Set the corresponding bits in the PINASSIGN register to their default value 0xFF
 4. Clear all pending interrupts for the disconnected peripheral and ensure that the peripheral is in a defined state
 5. Program the pin number to the corresponding pin assignment register
 6. Disable the clock to the switch matrix.

U0_RXD: PIO0_12 => PIO0_13





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