# Notes to reference schematics for S12(X) devices

1.

Decoupling of power supply is usually done with a combination of tantalum capacitors and ceramic capacitors. Tantalum capacitors act as a reservoir of charge to supply instantaneous charge requirements, so the charge need not come through the inductance of the power trace. Small ceramic capacitor with low inductance should be placed as close to pin as possible. The purpose of this capacitor is to reduce high frequency noise.

Typical value of tantalum capacitors is 10uF - 100uF; typical value of ceramic capacitors is 10nF - 100nF.

Power supply inputs like VDDX (power input of IO drivers), VDDR (power input of internal voltage regulator) and VDDA (power input of analog converter) must be connected to external supply voltage and decoupled by combination of tantalum and ceramic capacitors.

There are also several outputs of internal voltage regulators: signals VDD, VDDPLL and VDDF. These signals are connected to device pins to allow external decoupling capacitor(ceramic capacitor with X7R dielectric). Recommended capacitance is specified in reference manual. It is not allowed to connect external power supply voltage to these pins and it is not allowed to connect external load.

2.

MODE pins

Mode pins (MODA, MODB, MODC/BKGD) are latched at rising edge of reset signal. These pins select the mode of microcontroller: special single chip mode, normal single chip mode or expanded modes. Pin MODC/BKGD has internal pull up resistor (active all the time), pins MODA and MODB have internal pull down resistor (only when reset pin is low). This default configuration select normal single chip mode. Because of weak internal pull resistors (20k-50k) it is recommended to connect external ones to make the system immune against noise. If it is necessary to override internal pull resistor then use external pull resistor that is strong enough to ensure correct voltage level.

Notice that microcontrollers without external bus do not have MODA and MODB function on the pins.

MODA and MODB pins can be used as GPIO. In this case, ensure that these pins are pulled to desired level when reset is asserted.

3.

When external (canned) oscillator is used, the amplitude of its output square signal must be equal to VDDPLL voltage. That means 2.5V in case of devices based on 250nm technology and 1.8V in case of devices based on 180nm technology. The amplitude can be adjusted by resistor voltage divider.