



What are VDDA and VSSA?

Asked 2 years, 1 month ago Modified 2 years, 1 month ago Viewed 8k times



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What do VDDA and VSSA mean? Are they for a separate analog power supply? What is an analog power supply in this context? How does it differ to a digital power supply? Which one is better to use and in which situation?



For reference I'm trying to incorporate the STM32F103C8 to my first digital schematic and I'm not sure what those pin-outs are. But regardless to my specific situation, I'd like to understand the concept in general, hence the generic questions.

microcontroller

power-supply

stm32

schematics

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edited Aug 27, 2020 at 15:04



pipe

12.9k ● 5 ● 37 ● 69

asked Aug 26, 2020 at 19:47



Diatrix

109 ● 1 ● 4

8 Have you actually tried to read the datasheet what those pins mean? There are block diagrams about it. – Justme Aug 26, 2020 at 19:49

1 ..in this context.. - which context? You haven't provided any. VDD/VSS are DC voltages that are usually connected to the drain/source of FET circuits (and usually simply the +/- supply terminals). A is likely standing for Analog. – Eugene Sh. Aug 26, 2020 at 19:50

1 my first digital schematic Here's me saying that all schematics are analog but some schematics may only contain digital ICs. All digital circuits need a power supply and a power supply is always voltage that's created by an analog circuit. Also study **schematics made by others** and learn from that. Without knowing "how it's done" you'll have an **extremely hard time** figuring out how to connect things. – Bimpelrekkie Aug 26, 2020 at 19:52

1 @EugeneSh. There is nothing "likely" about the "A". You are correct, it is analog supply, as about 10k Google hits can attest, not to mention the datasheet for STM itself – Maple Aug 26, 2020 at 19:53

@Bimpelrekkie by digital schematic I meant the first time I draw up a schematic using a computer program (KiCad in my case). I'm still learning, and I came up with this question. Thankfully Justme gave an excellent answer – Diatrix Aug 26, 2020 at 20:22

2 Answers

Sorted by:

Highest score (default)



VDDA and VSSA are the separate analog supply and analog ground pins for the MCU.

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These pins are directly powering only the analog components such as ADC inside the MCU.



It differs from the digital power supply so that the digital supply pins power all the digital



components in the MCU.



They are separated so the user can route the power pins separately and filter any digital noise so that the analog supply is clean and does not have much noise which could affect the ADC reading for example.

So it's not a better supply, the MCU needs all power supply and all ground pins to be connected. It just powers analog components from separate pins.

As the analog and digital parts must communicate between each other inside the chip, the analog and digital supplies must be within range given in datasheet for the part to work. In this case, the VDD and AVDD must be connected to same voltage supply, as they are not allowed to differ more than 50mV when running, and up to 300mV during power-up and power-down transitions.

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edited Aug 26, 2020 at 20:08

answered Aug 26, 2020 at 19:55



Justme

98.7k ● 2 ● 75 ● 200

- 2 Would be a perfect answer if you mentioned that since analog and digital parts of the chip do have internal connections, it is important for respective supply lines (especially ground!) to be within the ranges defined by the datasheet. – [Maple](#) Aug 26, 2020 at 20:03

Much better :). I'll remove my answer. Just leave these for reference here: pp 2.3.9 and 5.1.6. – [Maple](#) Aug 26, 2020 at 20:10



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V<single letter>: The voltage associated with a particular thing, i.e. V_e is the emitter voltage of a BJT, V_s is the source voltage, etc.

V<single letter> <different letter>: Usually more for theory, the voltage going *from* something *to* something, i.e. V_{be} is the voltage from base to emitter on a BJT.

V<two same letters>: The supply voltage typically associated with a terminal on a transistor. I.e., VEE is the emitter (almost always negative) supply in a BJT circuit, VDD is the drain (almost always positive) supply in a MOSFET circuit (even though a CMOS circuit will have sources connected to either VDD or VSS, because the transistors are a mix of NMOS and PMOS).

V<two same letters> <some other letter>: The supply voltage typically associated with a terminal on a transistor, only special somehow. In your case, VSSA means "lower voltage analog supply rail", and it's mated with VDDA, which is the *higher* voltage analog supply rail. So VSSD would be the digital VSS, VDDD would be the digital VDD (and I've never seen VDDD, but strange things are out there). It's certainly conceivable that you'll see VDD1, VDD2, etc., on a multi-supply board or chip.

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edited Aug 27, 2020 at 14:50


answered Aug 26, 2020 at 20:29



TimWescott

39.1k ● 1 ● 39 ● 92

- 2 The double letter suffix means plural, e.g. CC = collectors, EE = emitters, DD = drains, SS = sources. It originates from Latin legal shorthand for plural. – [tim](#) Aug 27, 2020 at 7:40

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- 1 "even though a CMOS circuit will have both drains and emitters connected to VDD" You sure about that? Drain of NMOS is connected to VDD and drain of PMOS is connected to VSS. Emitters (sources actually) are connected together. – [Durmus](#) Aug 27, 2020 at 7:46 
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- @Durmus: D'oh. Editing. Stand by. – [TimWescott](#) Aug 27, 2020 at 14:49
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- 1 Sorta D'oh. **Sources** are connected to the rails, drains to each other. And no emitters in sight, unless it's a strange mixed-technology chip. – [TimWescott](#) Aug 27, 2020 at 14:51
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