5.5. Power Consumption

The following data shows the current consumption of various power supplies on 3 each of typical (`tt`), fast (`ff`) and slow (`ss`) corner RP2040 devices, with four different software use-cases.

NOTE

For power consumption of the Raspberry Pi Pico, please see the **Raspberry Pi Pico Datasheet**.

Firstly, 'Popcorn' (Media player demo) using the VGA, SD Card, and Audio board. This demo uses VGA video, I2S audio and 4-bit SD Card access, with a system clock frequency of 48MHz.

NOTE

For more details of the VGA board see the **Hardware design with RP2040** book.

Secondly, the BOOTSEL mode of RP2040. These measurements are made both with and without USB activity on the bus, using a Raspberry Pi 4 as a host.

The third use-case uses the `hello_dormant` binary which puts RP2040 into a low power state, `DORMANT` mode.

The final use-case uses the `hello_sleep` binary code which puts RP2040 into a low power state, `SLEEP` mode.

Table 627 has two columns per power supply, 'Typical Average Current' and 'Maximum Average Current'. The former is the current averaged over several seconds that you might expect a typical RP2040 to consume at room temperature and nominal voltage (e.g., DVDD=1.1V, IOVDD=3.3V, etc). The 'Maximum Average Current' is the maximum current consumption (again averaged over several seconds) you might expect to see on a worst-case RP2040 device, across the temperature extremes, and maximum voltage (e.g., DVDD=1.21V, etc).

NOTE

The 'Popcorn' consumption measurements are heavily dependant on the video being displayed at the time. The 'Typical' values are obtained over several seconds of video, with varied colour and intensity. The 'Maximum' values are measured during periods of white video, when the required current is at its highest.

Table 627. Power Consumption

Software Use-case	Typical Average DVDD Current	Max. Average DVDD current	Typical Average IOVDD Current	Max. Average IOVDD current	Typical Average USB_VDD Current	Max. Average USB_VDD current	Units
Popcorn	10.9	16.6	24.8	35.5	-	-	mA
BOOTSEL mode - Active	9.4	14.7	1.2	4.3	1.4	2.0	mA
BOOTSEL mode - Idle	9.0	14.3	1.2	4.3	0.2	0.6	mA
Dormant	0.18	4.2	-	-	-	-	mA
Sleep	0.39	4.5	-	-	-	-	mA

5.5.1. Power Consumption versus frequency

To give an indication of the relationship between the core frequency that RP2040 is operating at, and the current consumed by the DVDD supply, Figure 171 shows the measured results of a typical RP2040 device, continuously running FFT calculations on both cores, at various core clock frequencies. Figure 171 also shows the effects of case temperature, and DVDD voltage upon the current consumption.

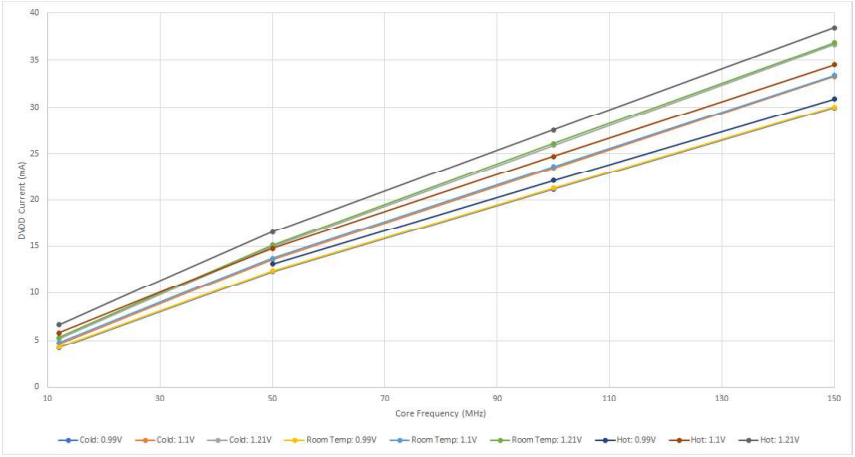

Figure 171. DVDD Current vs Core Frequency of a typical RP2040 device, whilst running FFT calculations