



# USB Accelerator datasheet

Version 1.4

## Features

- Google Edge TPU ML accelerator
  - 4 TOPS total peak performance (int8)
  - 2 TOPS per watt
- USB 3.0 (USB 3.1 Gen 1) Type-C socket
- Supports Linux, Mac, and Windows on host CPU

## Description

The Coral USB Accelerator adds an Edge TPU coprocessor to your system. It includes a USB-C socket you can connect to a host computer to perform accelerated ML inferencing.

The on-board Edge TPU is a small ASIC designed by Google that accelerates TensorFlow Lite models in a power efficient manner: it's capable of performing 4 trillion operations per second (4 TOPS), using 2 watts of power—that's 2 TOPS per watt. For example, one Edge TPU can execute state-of-the-art mobile vision models such as MobileNet v2 at almost 400 frames per second. This on-device ML processing reduces latency, increases data privacy, and removes the need for a constant internet connection.

## Ordering information

| Part number                    | Description  |
|--------------------------------|--|
| G950-01456-01<br>G950-06809-01 | Coral USB Accelerator (part number varies by region) |

See <https://coral.ai/products/accelerator>.



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## 1 System requirements

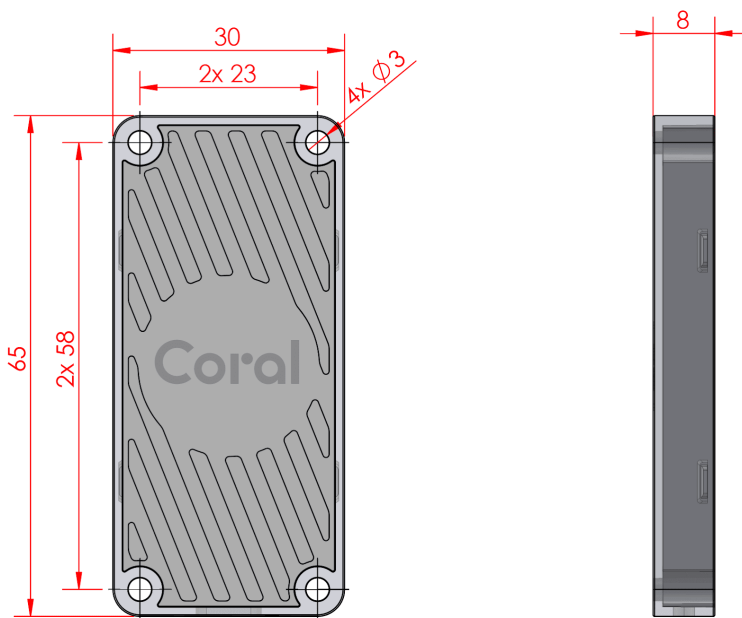
- A computer with one of the following operating systems:
  - Linux Debian 10, or a derivative thereof (such as Ubuntu 18.04), and a system architecture of either x86-64, Armv7 (32-bit), or Armv8 (64-bit) (Raspberry Pi is supported, but we have only tested Raspberry Pi 3 Model B+ and Raspberry Pi 4)
  - macOS 10.15, with either MacPorts or Homebrew installed
  - Windows 10
- One available USB port (for the best performance, use a USB 3.0 port)
- Python 3.5, 3.6, or 3.7

## 2 Component overview

**Table 1.** USB Accelerator components and features

| Feature        | Details  |
|----------------|--|
| ML accelerator |  |
| Edge TPU       | ASIC designed by Google that provides high performance ML inferencing for TensorFlow Lite models: <ul style="list-style-type: none"> <li>● 4 trillion operations per second (TOPS)</li> <li>● 2 TOPS per watt</li> </ul> |
| Connections    |  |
| USB            | <ul style="list-style-type: none"> <li>● USB 3.0 (USB 3.1 Gen 1) port and cable (SuperSpeed, 5 Gbps)</li> <li>● Included cable is USB Type-C to Type-A, and 300 mm (12 in) in length</li> </ul>                          |

## 3 Product dimensions



**Figure 1.** USB Accelerator dimensions and mounting hole details

USB cable length: 300 mm ± 20 mm.

## 4 Software and operation

The USB Accelerator does not require any software to be installed, but the host computer must have the Edge TPU runtime and API library. Instructions on how to install these are included in the guide for how to [get started with the USB Accelerator](#).

For information about how to create models and run inferences on the Edge TPU, read the documentation for [TensorFlow models on the Edge TPU](#).

### 4.1 Performance settings

When you first set up the USB Accelerator, you can select whether the device operates at the maximum clock frequency or the reduced clock frequency. The maximum frequency is twice the reduced setting, which increases the inferencing speed but also increases [power consumption](#).

**Caution:** If you set up the device to operate at the maximum clock frequency, the USB Accelerator can become very hot to the touch during operation. This might cause burn injuries. To avoid injury, either keep the device out of reach when operating it at maximum frequency, or use the reduced clock frequency.

To change the clock frequency at which the device operates, simply install the alternative runtime, as described in the instructions for how to [install the Edge TPU runtime](#).

### 4.2 LED behavior

The USB Accelerator includes an LED that indicates the current system state. The following table describes the behavior of the LED.

**Table 2.** USB Accelerator LED behavior and meaning

| System state         | LED behavior    |
|----------------------|-----------------|
| Edge TPU initialized | On (solid)      |
| Edge TPU running     | Pulse (breathe) |

## 5 Power specifications

The USB Accelerator is powered by 5 V from the USB interface through on-board power management chip (PMIC).

The device should be connected to a host computer with a USB cable that provides at least 500 mA at 5 V. Please note that when the device [runs at maximum speed](#), it can draw a peak current of 900 mA.

## 6 Recommended operating conditions

Depending on the computation workloads and operating frequency, the USB Accelerator may heat up during normal operation. Contact with the metal part of the device may lead to discomfort and/or skin burns if the device has been operating for an extended period. We recommend the following operating temperature ranges, depending on the operating frequency you have selected.

**Table 3.** USB Accelerator operating conditions

| Operating frequency | Maximum ambient temperature |
|---------------------|-----------------------------|
| Reduced             | 35 °C                       |
| Maximum             | 25 °C                       |

Google does not accept any responsibility for loss or damage if the device is handled unsafely or operated outside of the recommended ambient temperature range.

## 7 Environmental and electrical reliability tests

**Table 4.** Verified results for USB Accelerator environmental and electrical reliability tests

| Test                                | Conditions             | Verified   |
|-------------------------------------|------------------------|------------|
| Heat soak                           | Non-op: 60 °C / 90% RH | 72 hours   |
| Temp cycling                        | Non-op: -20 °C / 60 °C | 300 cycles |
| Short term survivability            | Non-op: 85 °C / 20% RH | 18 hours   |
| Long-term operational stress (LTOS) | Op: 40 °C / 90% RH     | 1000 hours |
| ESD - Air discharge                 | 15~35 °C, 30~60% RH    | 12 kV      |
| ESD - Contact discharge             | 15~35 °C, 30~60% RH    | 8 kV       |

## 8 Mechanical reliability tests

**Table 5.** Verified results for USB Accelerator mechanical reliability tests

| Test                             | Conditions   | Verified    |
|----------------------------------|--|-------------|
| 0.5 m controlled drop on wood    | 6 faces, 12 edges, 3/4" wood   | 18 drops    |
| 0.5 m tumble                     | Impact surface: steel plate > 3 mm thick                                     | 50 drops    |
| Repetitive drop                  | 75 mm drop on plywood, six faces   | 50 drops    |
| Vibration                        | 3 axes (X, Y and Z), 15 minutes per axis, 10-500 Hz.<br>Amplitude: 2.16 Grms | 45 minutes  |
| USB-C connector cycling          | Manual plug/unplug   | 1000 cycles |
| USB-C connector side load 2.5 kg | 2.5 kgf load, 15 mm from the plug, 2 orientations                            | 50 cycles   |
| Pressure & squeeze - 50 kg       | 50 kgf, 100 mm rubber pad  | 10 cycles   |
| Pressure & squeeze - 5 kg        | 5 kgf, 10 mm rubber pad  | 10 cycles   |
| USB cable 120° bend              | 60° CW + 60° CCW, 453 gf tension, 42 rpm                                     | 100 cycles  |

## 9 CAD files

**Table 6.** USB Accelerator 3D CAD file

| File                                       | Description                |
|--|----------------------------|
| <a href="#">Coral-USB-Accelerator.STEP</a> | 3D CAD file in STEP format |

## 10 Document revisions

**Table 7.** History of changes to this document

| Version              | Changes  |
|----------------------|--|
| 1.4 (August 2020)    | Removed list of certifications (instead <a href="#">see website</a> ).<br>Added ordering information with part number.<br>Updated document styles. |
| 1.3 (April 2020)     | Updated system architecture requirements (supports both ARMv7 and v8).   |
| 1.2 (January 2020)   | Updated system requirements for Mac and Windows support.   |
| 1.1 (October 2019)   | Clarified power requirements.  |
| 1.0 (September 2019) | Updated information about performance settings.  |
| Beta (March 2019)    | Initial release.   |