Frequently Asked Questions About Temperature for Intel® Processors

What is Tjunction max temperature?

Tjunction max is the maximum thermal junction temperature that a processor will allow prior to using internal thermal control mechanisms to reduce power and limit temperature. Activation of the processor's thermal control system may cause performance loss as the processor typically reduces frequency and power to prevent overheating. The goal for a system builder or a do-it-yourself (DIY) end user is to design a platform configuration that keeps the processor under the Tjunction max threshold during heavy workloads to maximize performance of the system.

The benefit to a user is that many third-party utilities can monitor the digital thermal sensor (DTS) on the processor die to see how close the system is approaching the Tjunction max temperature without any destructive testing. We recommend that end users look up information on the product specification page (ark.intel.com) to aid them in system assembly. Original design manufacturers should consult the nondisclosure agreement (NDA) documentation available to them for full details.

What is Tcase max temperature?

Tcase max is measured by characterizing a socketed processor with an integrated heat spreader (IHS) for operation within an assembled system. This specification is set to ensure the processor does not exceed its operating temperature so long as the system is able to provide adequate cooling to maintain the top of the IHS at this temperature. This is primarily intended for system manufacturers in assessing their system design.

Could my processor get damaged from overheating?

It's unlikely that a processor would get damaged from overheating, due to the operational safeguards in place. Processors have two modes of thermal protection, throttling and automatic shutdown. When a core exceeds the set throttle temperature, it will reduce power to maintain a safe temperature level. The throttle temperature can vary by processor and BIOS settings. If the processor is unable to maintain a safe operating temperature through throttling actions, it will automatically shut down to prevent permanent damage.

Does Intel provide temperature ranges for each processor?

We do not provide temperature ranges for each processor, as it can vary. Processors have internal protections to prevent against excessive temperatures. Operating ranges below the protection points are highly dependent on system configuration and workload. You can find the thermal specifications for specific processors in Intel® Core™ Processor technical documentation.

How can I check the Tjunction max or Tcase max for my processor?

Follow these steps:

1. Visit our product specification information page.
2. Enter the Intel processor number in the search box. Refer to How to Identify My Intel® Processor.
3. Open the processor page, click Package Specifications.
4. Look for Tjunction or Tcase value.

Is it bad if my processor frequently approaches or reaches its maximum temperature?

Not necessarily. Many Intel® processors make use of Intel® Turbo Boost Technology, which allows them to operate at very high frequency for a short amount of time. When the processor is operating at or near its maximum frequency it's possible for the temperature to climb very rapidly and quickly reach its maximum temperature. In sustained workloads, it's possible the processor will operate at or near its maximum temperature limit. Being at maximum temperature while running a workload isn't necessarily cause for concern. Intel processors constantly monitor their temperature and can very rapidly adjust their frequency and power consumption to prevent overheating and damage.

How can I check if my system cooling solution is adequate?

Since normal operation can result in CPU temperatures being at their maximum value, it is difficult to tell purely from temperature alone if your system is having problems. If you purchased your system complete from a vendor, you should contact them for specific steps to take to troubleshoot your system

Where can I find more information if my computer is overheating?

Always contact the system manufacturer when you have an overheating issue.

Here are some resources that address overheating and prevention of overheating:

Warning signs of overheating

How to Identify My Intel® Processor

There are different options to get the name and the number of the Intel® Processors.

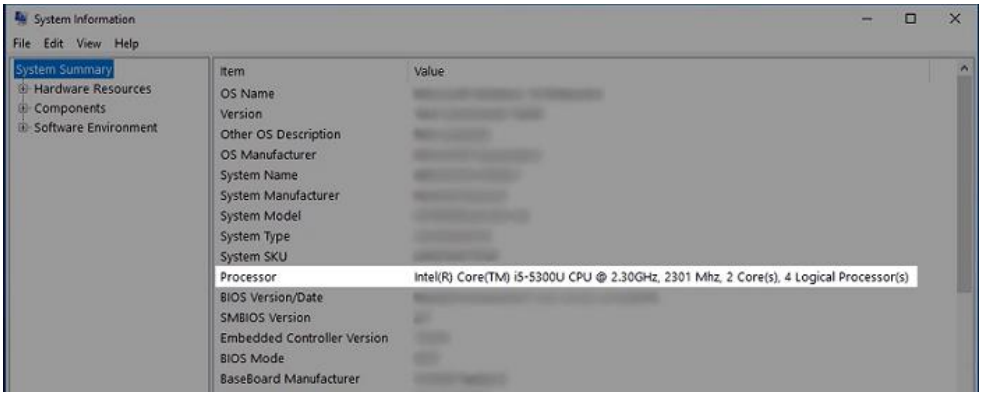
The methods below apply on all Intel® processors such as Intel® Core™, Intel® Xeon®, Intel® Pentium®, Intel® Celeron®, and Intel Atom® processors.

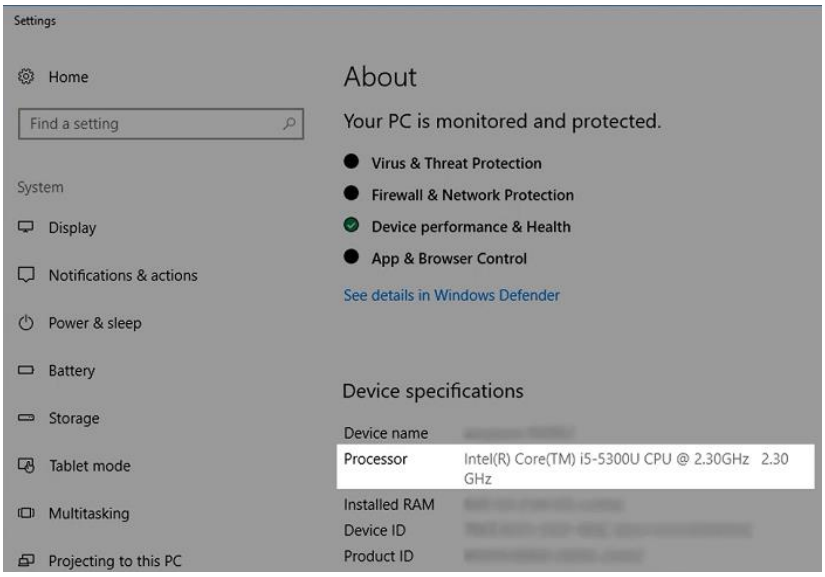
Option 1: Operating System

*Windows**

1. Press on the **Windows** key  on your keyboard and start typing *System*, choose **System Information** which will show **Processor** information with the name, number, and speed of the processor.
2. If the **Windows** key is not available on your keyboard, using your mouse, go to the Windows icon located on the bottom-left corner of your screen, right-click, and choose **System**. Look up the processor's name and number in the **Processor** information.

   The examples below show the case when choosing **System Information** and **System**.





*Linux**

Type the following command

```
lscpu | grep "Model name"
```

See examples:

```
pse@1804:~$ lscpu | grep  "Model name"
Model name:            Intel(R) Core(TM) i7-6700K CPU @ 4.00GHz
```

```
[root@pass1~]# lscpu | grep "Model name"
Model name:     Intel(R) Xeon(R) CPU E5-2699 v3 @ 2.30GHz
```

MAC OS

Type the following command in the terminal app

```
sysctl -a | grep machdep.cpu.brand_string
```

See an example:

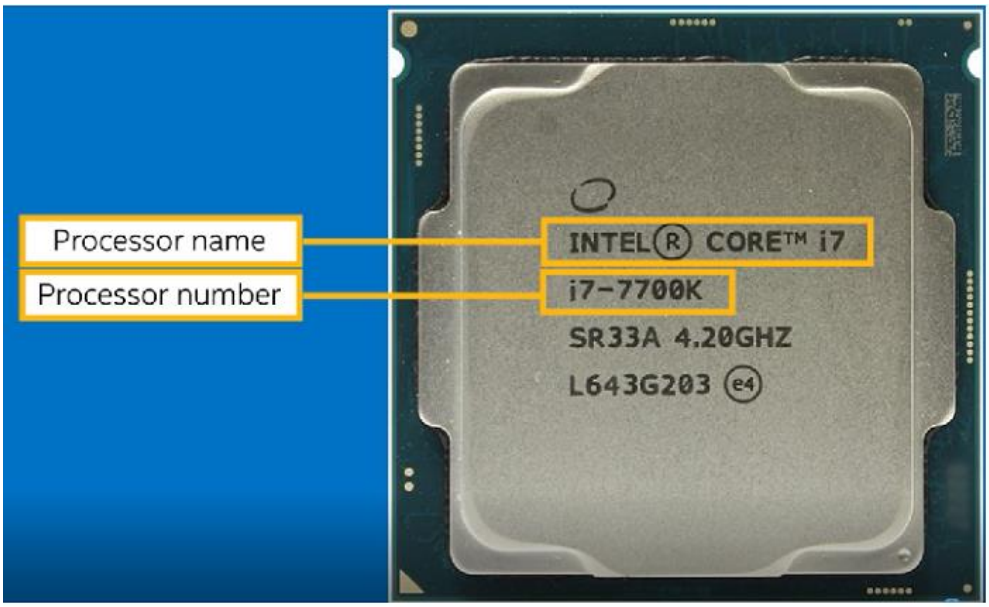
```
[redacted]:~$ sysctl -a | grep machdep.cpu.brand_string
machdep.cpu.brand_string: Intel(R) Core(TM) i5-4260U CPU @ 1.40GHz
```

Option 2: Packaging Box

If you bought an Intel® Boxed Processor, the information about the number of the processor along with other information like the batch number (FPO) and the serial number (ATPO) are listed on the packaging box.

Option 3: Markings on the Processors

The name and number of the Intel® Processor is listed on the top of the processor. See the example below.



Watch this video to see how to identify your Intel® Processor name and number.

Identify the Generation for your Intel® Core™ Processors

You can also identify the generation of the processor if your processor is Intel® Core™. The generation of the processor is the first number after i9, i7, i5, or i3.

Here are some examples:

- Intel® Core™ Processor i7-**10**710U Processor is **10th generation** because the number 10 is listed after i7.
- Intel® Core™ Processor i9-**9**900 Processor is **9th generation** because the number 9 is listed after i9.
- Intel® Core™ Processor i7-**9**850H Processor is **9th generation** because the number 9 is listed after i7.
- Intel® Core™ Processor i5-**8**600 Processor is **8th generation** because the number 8 is listed after i5.
- Intel® Core™ Processor i3-**7**350K Processor is **7th generation** because the number 7 is listed after i3.
- Intel® Core™ Processor i5-**6**400T Processor is **6th generation** because the number 6 is listed after i5.

Note If you need more information about any Intel® processor, use the Product Specification Page (ARK) and enter the processor number in the search box.