**Cache Module Description Document**

1. **Introduction**

The cache (high-speed buffer memory) sits between the CPU and main memory, and is used to cache programs and data. The cache is made up of static memory chips (SRAM), which makes it very fast and helps improve overall system performance.

In the AP80 series chips, there is a 32KB-sized Cache and a 4KB-sized resident memory (TCM).

The cache replaces its contents based on program execution to improve cache hit rates. In contrast, TCM stores fixed content, which is copied from a fixed area of program space to TCM by hardware, and its contents do not change with program execution.

1. **Use of Cache/TCM**

* The Cache size in the AP80 series chips is 32KB, and the maximum supported code space is 8M Byte.
* The size of TCM is 4KB, corresponding to a program space of 0 to 4KB.

If the program is stored in Flash, when the TCM function is enabled, the hardware will automatically copy the content with addresses ranging from 0 to 4KB in Flash to TCM. Thus, when the CPU executes code with addresses ranging from 0 to 4KB, it can directly fetch the instructions from TCM for execution without having to fetch the instructions from Flash.

**2.1 Initialization of Cache/TCM**

The initialization of Cache/TCM uses the function int32\_t CacheInit(void). After calling CacheInit, the system enables the Cache cache function and also enables the TCM function. After the CacheInit function exits, the code in the 0-4KB address space of Flash has already been copied to TCM.

**2.2 How to Utilize the TCM Function in the Code**

The content cached in the Cache is determined by the hardware based on its algorithm. At different times during the program's execution, the content cached in the Cache changes, and this process is transparent to the user. Once CacheInit is called in the code, there is no need to worry about it anymore.

While TCM can only cache 0 to 4KB of Flash content, the content it stores is fixed. Then we can fix the parts of the code that need to run quickly in TCM to improve the running speed. Since the content in TCM is automatically copied by hardware, how do we put the required code into TCM? Just compile the part of the code that needs to be placed in TCM within 0 to 4KB. After calling CacheInit, the 0 to 4KB content of Flash will be copied to TCM.

Generally, the code that needs to be placed in TCM requires a quick response, such as certain interrupt service programs, screen flooding operations, etc.

It should be noted that in this initial 4KB, a portion is occupied by the interrupt vector table, and another portion is occupied by stubs in startup.c of the SDK, which together occupy approximately 256 bytes. The remaining part can be used by user code.