Loading 23-bit Extended Symbol Addresses into the Accumulator on the TMS320C54x DSP

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Abstract

On Texas Instruments (TI™) TMS320C54x devices that support extended addressing, the READA and WRITA instructions support 23-bit addresses. This document discusses how 23-bit symbolic addresses can be loaded into the accumulator to avoid the necessity to hard-code the address.

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Design Problem

On TMS320C54x devices that support extended addressing, the READA and WRITA instructions support 23-bit addresses. How can 23-bit symbolic addresses be loaded into the accumulator to avoid the necessity to hard-code the address?

Solution

Normally, the following assembly code can be used to load a symbolic address into the accumulator to be later used by a READA or WRITA instruction:

```
LD      #symbol_name, A     ; load 16-bit symbolic address
            ⋮
READA        dma
```

On C54x devices that support extended addressing, the READA and WRITA instructions can utilize the full 23-bit address. However, the LD instruction shown above limits the constant *symbol_name* to 16-bits. To load a full 23-bit symbolic address into the accumulator, the following code may be used:

```
                        ;load 23-bit symbolic address
LDX        #symbol_name, 16, A     ;load upper 7-bits of address
OR         #symbol_name, A         ;load lower 16-bits of address
            ⋮
READA        dma
```

The LDX instruction is a pseudo-instruction used by the compiler for managing 23-bit symbolic addresses. LDX is assembled as a normal LD instruction, but the assembler assigns the upper 7 bits of the symbolic address to the long constant in the instruction instead of the lower 16 bits as usual. When the code runs, the extended portion of the address is loaded into the accumulator and the left-shifted 16 bits to be in the high half of the accumulator. The OR instruction assigns the lower 16 bits of the symbolic address as the constant and places it to the low half of the accumulator. The result is the full 23-bit address is now contained in the accumulator and can be used to provide addresses for the READA or WRITA instructions.

To use this solution, the assembler version being used must support extended addressing (version 1.20 or greater) and the code should be assembled using the –mf option.

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