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HITACHI SEMICONDUCTOR TECHNICAL UPDATE

Classification of Production	Microprocessor			No	TN-SH7-448A/E	Rev	1

THEME	Notice about FPU instructions issues	Classification of Information	1. Spec change 2. Supplement of Documents ③. Limitation of Use 4. Change of Mask 5. Change of Production Line				

PRODUCT NAME	SH7750 SH7750S SH7750R SH7751 SH7751R SH-4 core use product	Lot No. All lots	Reference Documents	SH7750 series hardware manual SH7751 series hardware manual	Effective Date Eternal

1. Summary

When a rounding mode of Round to Nearest is used , underflow flag is not set even if the result

is in the range to cause underflow defined in IEEE754.

1.1 Target user

The targe users are users who use Round to Nearest and request of completely agreement wiht

IEEE754.

1.2 Phenomenon

When a rounding mode of Round to Nearest is used, result of infinity precision x satisfies (1) or

(2)(single precision), or result of infinity precision x satisfies (3) or (4) (double precision), there

is a case that the result after rounding become a normalized number but underflow flag is set in

IEEE754.

This LSI does not set underflow flag in the above case , correct results are written to FRn.

Once more underflow flag is not set but inexact flag is set in this bug case. So FPU exceptions

occurs when enable field is set.

(1) H'007F FFFF < x < H'0080 0000

(2) H'807F FFFF > x > H'8080 0000

(3) H'000F FFFF FFFF FFFF < x < H'0010 0000 0000 0000

(4) H'800F FFFF FFFF FFFF > x > H'8010 0000 0000 0000

Examples of bug:

[1]Case of single precision

FPSCR.RM=00 (Round to Nearest), FPSCR.PR=0 (single precision),

FMUL instruction (H'00FF F000 * H'3F00 0800) is executed.

(1) IEEE754

Result : H'0080 0000

FPSCR : H'0004 300C

(2) This LSI

Result : H'0080 0000

FPSCR : H'0004 1004

[2]Case of double precision

FPSCR.RM=00 (Round to Nearest), FPSCR.PR=1 (double precision),

FDIV instruction (H'001F FFFF FFFF FFFF / H'4000 0000 0000 0000) is executed.

(1) IEEE754

Result : H'0010 0000 0000 0000

FPSCR : H'000C 300C

(2) This LSI

Result : H'0010 0000 0000 0000

FPSCR : H'000C 1004

1.3 Effect of bug

The main purpose of underflow is to indicate the result of arithmetic is a denormalized numk
or zero, but the result of arithmetic is a normalized number in this case. So this case-underflow
flag is not set-does not violate this main purpose of detecting an underflow. The effect of this debug
is limited to users who need all underflow case exactly.

2. Workaround

[1] Use FPSCR.RM=01(Round to Zero)

[2] When using FPSCR.RM=00(Round to Nearest), in order to detect the precise underflow condition,
   please set enable field of inexact, and analize the underflow condition in the exception handler.