GoFast® for Thumb-2 and IAR EWARM

Features

- Fast
- Reentrant
- ROMable
- Conforms to IEEE 754
- “Link and Go” compiler support for IAR EWARM
- Includes complete source, test programs, project files, and startup code

Description

GoFast® for Thumb-2 (e.g. Cortex-M3) was carefully designed for high performance operation in embedded applications and ease of use including “link and go” compatibility with the IAR C compiler. GoFast provides ROMable, reentrant IEEE and ANSI compatible Thumb-2 floating point support. It boosts the performance of an application’s math calculations or eliminates the need for a hardware floating-point coprocessor, in order to reduce product manufacturing cost. It is delivered with full assembly source code.

Currently GoFast is offered for the ARM and Thumb-2 instruction sets, not Thumb.

Functionality

GoFast Thumb-2 offers the following reentrant floating point routines, for both single and double precision:

- **intrinsic basic operations + - * /**
- **intrinsic conversions**
- **sqrt**
- **sin, cos, tan**
- **asin, acos, atan, atan2**
- **sinh, cosh, atanh**
- **log, log10, exp, pow**
- **floor, ceil, fabs**
- **modf, fmod, frexp, ldexp**

Floating Point Technology

GoFast is based on “Architecture Independent Technology” (AIT) and proven floating point algorithms that were developed for over a decade. The algorithms have been thoroughly tested using automated methods.

Conformance and Testing

The accuracy of each GoFast Floating Point Library is within one (least significant) bit for arithmetic functions and two bits for transcendental functions, in most cases. The IEEE 754 Floating Point Format defines special representations for underflow, overflow, and invalid operation. The GoFast routines use these formats and adhere to the IEEE 754 error handling procedures in all applicable cases. Quality assurance and testing procedures have assured proper product operation. In addition, each delivery includes target specific test programs assuring confidence of product operation.

Timings

The following table gives the times for all floating point operations, for GoFast and the IAR floating point library. The times, in microseconds, were measured using the indicated processor and evaluation board. The basic operations (add, subtract, multiply, divide, conversions, and comparisons) in the IAR C library are hand-coded and faster than those in GoFast, so the IAR versions are used instead. (If you only need these basic operations, you don't need GoFast.) Thus, the routines linked are a mixture of both libraries, as indicated in **bold** below. GoFast provides the greatest benefit for the more complex operations, offering as much as a 10 times performance boost for some.

Microsecond Timings

Cortex-M3: LM3S8962, 50 MHz, Int SRAM

	Double-Precision		Single-Precision	
Function	**GoFast**	**IAR**	**GoFast**	**IAR**
add	2.6	**1.8**	1.8	**1.2**
subtract	2.7	**1.9**	1.9	**1.2**
multiply	2.6	**2.1**	1.6	**1.0**
divide	**7.3**	12.4	3.9	**1.6**
sqrt	**13.7**	53.4	**7.6**	11.3
exp	**12.8**	49.5	**4.2**	32.7
log	**19.9**	50.1	**9.1**	16.6
log10	**20.9**	56.8	**9.3**	20.0
sin	**10.5**	35.1	**4.1**	15.0
cos	**10.3**	34.7	**4.1**	14.8
tan	**17.7**	47.8	**6.9**	16.5
asin	**17.9**	123.6	**15.9**	29.6
acos	**18.2**	123.8	**17.8**	29.9
atan	**19.3**	59.3	**8.0**	15.2
atan2	**25.5**	69.5	**10.8**	17.2
pow	**32.5**	136.3	**13.6**	67.1
tanh	**18.3**	61.0	**9.0**	34.3
sinh	**17.8**	63.8	**7.1**	37.9
cosh	**17.5**	62.6	**6.9**	36.8
modf	3.8	**3.7**	**2.4**	2.4
fmod	**10.4**	104.6	**7.5**	71.6
fabs	**0.4**	1.3	**0.3**	0.9
floor	**1.1**	3.3	**0.7**	2.3
ceil	**1.2**	3.2	**0.8**	2.3
ldexp	**1.1**	2.2	**0.9**	1.9
frexp	**1.0**	1.1	**0.8**	0.9
cmp	1.4	**0.9**	**0.8**	0.8
fp to long	**0.8**	0.8	**0.5**	0.5
fp to ulong	0.9	**0.5**	0.5	**0.3**
long to fp	1.2	**0.6**	1.1	**0.6**
ulong to fp	1.0	**0.4**	0.8	**0.4**
sgl to dbl	0.8	**0.5**	–	–
dbl to sgl	1.1	**0.7**	–	–

Times were measured on Texas Instruments (Luminary Micro) LM3S8962-EK board with IAR v5.20.