GoFast® for MIPS32 and GNU-Based Compilers

Features

- Fast
- Reentrant
- ROMable
- Conforms to IEEE 754
- "Link and Go" compiler support for MIPS SDE
- Includes complete source, test programs, project files, and startup code

Description

GoFast® for MIPS32 was carefully designed for high performance operation in embedded applications and ease of use including "link and go" compatibility with the MIPS SDE C compiler. GoFast provides ROMable, reentrant IEEE and ANSI compatible MIPS32 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.

GoFast for MIPS32 runs on all rev1 and rev2 cores. Contact us if you need support for MIPS64.

Functionality

GoFast MIPS32 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 GNU floating point library. The times, in microseconds, were measured using the indicated processor and evaluation board. GoFast provides the greatest benefit for the more complex operations, offering a 10x performance boost for many and even higher for some.

Microsecond Timings

PIC32 Starter Kit (PIC32MX360F512L), 80 MHz, RAM

Function	Double-Precision		Single-Precision	
	GoFast	GNU	GoFast	GNU
add	0.93	1.53	0.75	0.84
subtract	0.92	1.60	0.70	0.82
multiply	0.97	1.60	0.60	0.77
divide	2.38	7.84	1.12	1.77
sqrt	3.93	8.95	1.67	1.69
exp	4.15	42.22	1.30	–
log	6.05	48.08	2.13	–
log10	6.48	49.64	2.24	–
pow	10.40	135.30	3.66	–
sin	3.77	29.32	1.46	–
cos	3.71	30.05	1.45	–
tan	6.40	59.46	2.10	–
asin	5.33	77.31	4.02	–
acos	5.16	76.13	4.54	–
atan	6.74	48.59	2.35	–
atan2	8.76	67.37	3.16	–
sinh	5.92	70.57	2.06	–
cosh	5.81	54.03	1.96	–
tanh	6.04	70.10	2.53	–
modf	0.55	1.10	0.44	–
fmod	4.83	80.09	2.68	–
fabs	0.14	0.15	0.11	0.11
floor	0.35	6.51	0.23	–
ceil	0.46	5.91	0.24	–
ldexp	0.31	0.80	0.29	0.51
frexp	0.21	0.47	0.19	–
cmp	0.69	0.73	0.56	0.52
fp to long	0.20	0.32	0.18	0.22
fp to ulong	0.20	1.14	0.18	0.75
long to fp	0.24	0.29	0.21	0.67
ulong to fp	0.28	0.40	0.29	0.77
sgl to dbl	0.20	0.24	–	–
dbl to sgl	0.27	0.44	–	–