ZF FailSafe® BIOS

BIOS License Included With Every ZFx86 Chip—Saves Time and Cost!

Every ZF Micro Solutions x86 FailSafe® System-on-a-Chip sold by ZF includes a fully paid run time license for the ZF FailSafe BIOS based on the Phoenix 4.x PC BIOS. Our FailSafe BIOS takes the industry leading standard Phoenix BIOS and extends it for the ultimate in embedded BIOS features.

There is no requirement for you to negotiate or secure any separate license agreement with Phoenix Technologies, Ltd. Our ZF agreement with Phoenix allows us to distribute the ZF FailSafe BIOS to our customers for use on every ZFx86 chip purchased. We pay the per-chip license fees so you don't have to.

The BIOS included with every ZF chip allows our customers, contract manufacturers, and distributors, to incorporate the ZF FailSafe BIOS within any products that use the ZFx86 System-on-a-Chip. You may resell the CPU itself or any subassembly or end-product that includes a ZFx86 CPU and pass on the fully paid Phoenix/ZF BIOS. No further licensing requirement with Phoenix or any third party is required as long as the BIOS used is that supplied by ZF.

A full-featured BIOS, the ZF FailSafe BIOS supports the entire array of system features present in the ZFx86 System-on-a-Chip. The BIOS itself is not a source code distribution, but rather an easily-used executable binary that runs on the ZFx86 within your product. ZF takes care of the cost overhead, paying Phoenix all royalty fees for every ZFx86 sold worldwide.

Lowest BOM Cost

Of prime importance in the design of any OEM product is the overall system cost in production. The ZFx86 architecture was created specifically to be cost-effective, allowing PC functionality and compatibility to be incorporated in high volume OEM products. ZFx86-Family is the only line of PC-on-a-chips that include a BIOS license (ZFx86 port of Phoenix Rev 4.0 Standard PC BIOS)[†].

Features

- License for ZFx86 port of Phoenix Rev 4.0 Standard PC BIOS included with every ZFx86.

- ZF FailSafe BIOS employs patented ZF FailSafe H/W and S/W features unique to embedded market for product robustness and longevity.

- BIOS supports industry standard software and hardware architectures.

- ZF FailSafe BIOS is a custom version of Phoenix BIOS, the world's most powerful and popular BIOS in existence on x86 processors. Large installed base ensures future compatibility with hardware and peripherals.

- BIOS supports CPU, support logic, super I/O devices, IRQ routing, boot block, setup, BIOS messages, POST tasks/codes, run-time services, interrupt vectors, BIOS data area, and extended BIOS data areas.

- BIOS updates posted free on ZF website.

BIOS Features

Built on top of the world standard Phoenix BIOS for 32-bit x86 desktop architecture (over 100 million deliveries annually– one billion units to date), the ZF FailSafe® BIOS supports features designed by ZF expressly for embedded applications. These patented ZF-unique features include:

◆ Default Configuration Settings selectable by OEM embedded product designers. This means that no battery backed CMOS is required to retain your customized settings, resulting in increased reliability at a lower BOM cost.

◆ ZEB BIOS Editor. This free development utility provides designers with a way to custom configure the ZF FailSafe BIOS without recompiling or difficult scripting. A simple user interface allows you to change default BIOS settings even after your design is finished. (Manufacturing engineers just love ZEB.)

◆ Control of eight ZFx86 user defined Chip Selects. This enables I/O and Flash Memory devices such as Disk-On-Chips to be connected without additional glue logic, again increasing reliability and reducing BOM cost.

◆ Enhanced error checking that not only increases field reliability, but helps pin-point, "bring up" design problems resulting in faster time to market.

◆ Headless (No Video/Keyboard) console support with Redirect terminal (includes POST code outputs).

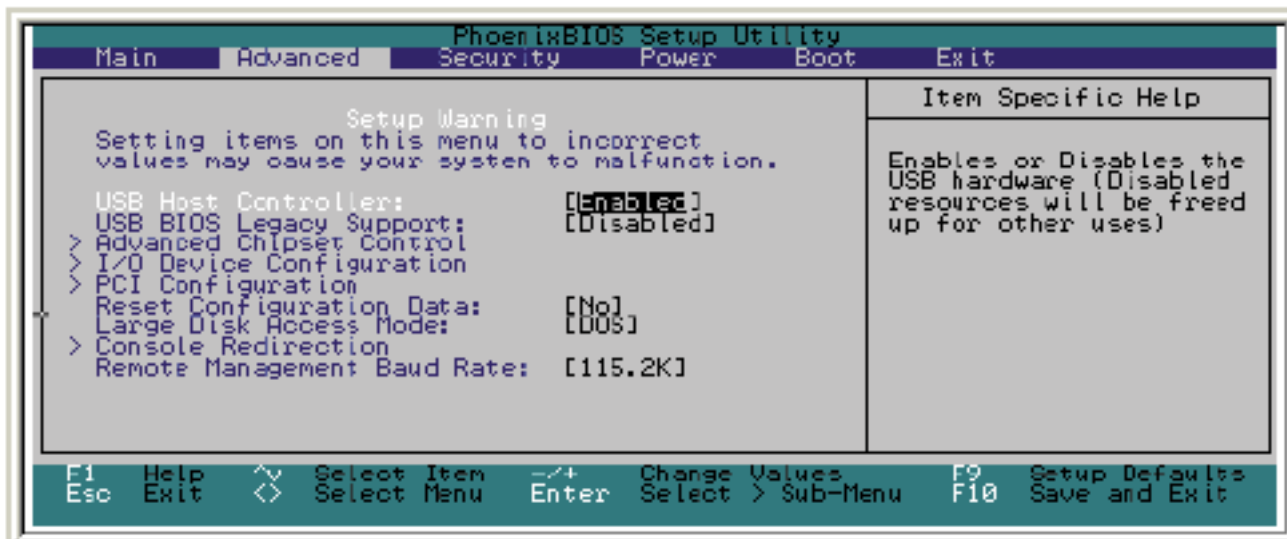◆ Advanced Power Management 1.2 Functions

Extended Features

In addition to the standard features documented in the PhoenixBIOS ™ User's Manual (available for download on our website *http://www.zfmicro.com/downloadtable.html)*, the ZFx86 FailSafe BIOS includes the following extended features important for embedded applications:

◆ ZFlash™ OS Loader Hook– enables operating systems such as Linux and VxWorks to boot from the same flash chip that contains the BIOS.

◆ ZFlash legacy ISA extension processor– allows user extension ROMs to be placed in the same flash device as BIOS.

◆ Configuration settings that manage ZFx86 ZF Logic Memory and I/O Chip Selects for Disk-On-Chip, flash-based extensions and custom I/O hardware.

◆ Universal Serial BUS Host Controller and Legacy Configuration Settings

◆ Infrared support

◆ Watchdog Timer Function

◆ Resident Flash Disk Function

Video Extension BIOS

The ZF FailSafe BIOS supports a load feature for custom PCI video BIOS binaries. Using our ZEB utility's main menu you may combine the ZFx86 BIOS with your own PCI video BIOS. The BIOS shadows the PCI video BIOS and treats it as if it were a standard PCI Extension ROM and initializes the matching embedded PCI Video chip.

BIOS Setup Screen


```
                    PhoenixBIOS Setup Utility
   Main      Advanced     Security      Power      Boot        Exit
                                                    Item Specific Help
                    Setup Warning
         Setting items on this menu to incorrect       Enables or Disables the
         values may cause your system to malfunction.  USB hardware (Disabled
                                                       resources will be freed
         USB Host Controller:        [Enabled]         up for other uses)
         USB BIOS Legacy Support:    [Disabled]
       > Advanced Chipset Control
       > I/O Device Configuration
       > PCI Configuration
         Reset Configuration Data:   [No]
         Large Disk Access Mode:     [DOS]
       > Console Redirection
         Remote Management Baud Rate: [115.2K]

   F1  Help   ^v  Select Item   -/+    Change Values   F9   Setup Defaults
   Esc Exit   <>  Select Menu   Enter  Select > Sub-Menu  F10  Save and Exit
```

ZF FailSafe® BIOS Reduces Time-To-Market, Empowers Developers

Making Internet Connected Equipment Crash proof with FailSafe Boot ROM

What happens when you send a software upgrade to an Internet connected system in the field and there is a hardware or software crash while the download is in process? The software is corrupted and the system cannot re-boot. If the download was being sent to hundreds or even thousands of systems at the same time the result can be catastrophic.

The Difference between Failsafe and Non-Failsafe Systems

When a watchdog timer scheme other than ZF's FailSafe system reaches a point where it cannot recover, a hard reset is performed. If their system software has been corrupted, the system will continuously try to re-boot without success. The system will not come up until it has been repaired. This usually requires sending out a field service technician or sending the equipment in for repair.

With ZF's FailSafe Boot ROM system in a product, if a failure occurs, the system will reach a hard reset, enable the FailSafe mechanism– and allow recovery of the software from any of a number of sources (backup chips, dial-out through a modem, etc.). Once the system software is reloaded the device can re-boot and resume operation.

Protecting your system with the embedded features of the ZFx86™ can be accomplished simply and reliably. The devices you will use include the dual watchdog timer, the FailSafe Boot ROM, the Z-Tag interface, the bootstrap register and a bit of code.   Use of these features results in a system that can diagnose most boot failures and recover from the conditions

Watchdog Timer Role

The watchdog timer checks against possible failures and bugs in the application program or operating system that make the system-on-a-chip (SOC) uncontrollable. Both watchdog timers generate events to notify the system of an error condition. These timers are individually initialized to a preset value. After initialization, WD1 begins a countdown that is reset to the initial value by software writing into the watchdog control register (tickle function) or external hardware driving logical "1" to an external control pin. If WD1 reaches zero, it indicates that the software has been unable to reset the timer in the allotted time and an event is generated to take corrective actions or to reset the device.

Once the first watchdog timer expires, the software can attempt to gain control of the system using an interrupt handler routine triggered by any of the events connected to the WD1 output line. If the software is successful, the program can resume as normal. The expired WD1 counter also enables the second watchdog counter (WD2). The second WDT is used to monitor the success of the software recovery mechanism. If the second timer expires it triggers a hardware system reset.

Bootstrap Register Role

A series of bits on the bootstrap register indicates to the system that a WD timer event has occurred thereby triggering a FailSafe Boot. This action makes it possible for the designer to implement multiple fault recovery mechanisms.

Failsafe Boot Role

The FailSafe Boot ROM is on-chip code that initializes the SOC device and uses the Z-Tag interface to load instructions and data it needs to recover the system. This code has multiple features that can allow any designer complete flexibility and control over the system.

Z-Tag Role

An EEPROM containing software required to execute the system recovery mechanism (including the contact number for code downloads) is connected to the SOC via the Z-Tag interface. The code in the EEPROM can be as simple as dial-up instructions for an internet appliance that would allow remote surfing of the device, or as complex as a full set of diagnostics and repair programs.

Watchdog Block Diagram

NMI
SCI
DMX
SMI
RESET

WD1
WD1 16-bit
WD2 8-bit
RESET

32KHz
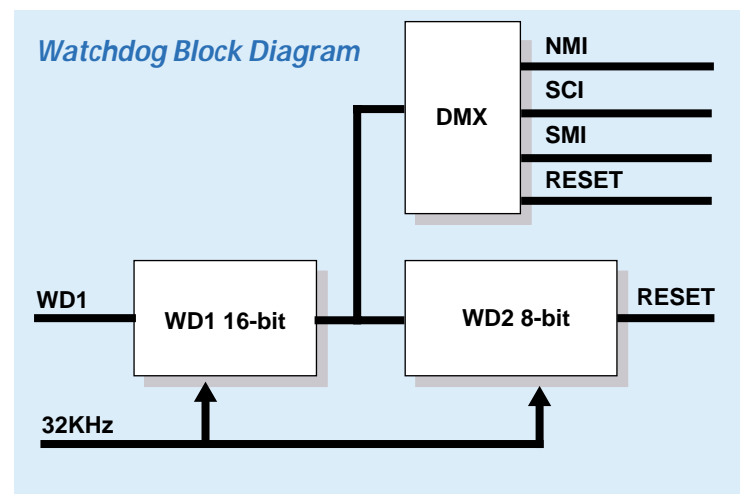
ZFx86 Ordering Information

◆ ZFx86BGA516-LCD– ZFx86-LCD PC-on-a-Chip (Phoenix BIOS run-time license included).

◆ ZFx86LCDIDS-K-01 – Integrated Development System for US. Includes board, case with power supply, hard disk, floppy and CD-ROM, cables, S/W, manuals, reference design and CAD files.

◆ ZFx86LCDIDS-KE-01 – Integrated Development System for export outside the US (same contents).

◆ ZFx86BGA388 – ZFx86 PC-on-a-Chip (Phoenix BIOS run-time license included). Standard temperature range: 0 to +70^C at speeds up to 128Mhz.

◆ ZFx86BGA388E100– ZFx86 PC-on-a-Chip (Phoenix BIOS run-time license included). Extended temperature range: -40^C to +85^C case temperature at speeds up to 100Mhz.

◆ ZFx86IDS-K-01 – Integrated Development System for US (same contents).

◆ ZFx86IDS-KE-01 – Integrated Development System for export outside the US.

◆ ZFx86BGA388-Lite– ZFx86-Lite PC-on-a-Chip (Phoenix BIOS run-time license included).

◆ ZFx86LTIDS-K-01 – Integrated Development System for US (same contents).

◆ ZFx86LTIDS-KE-01 – Integrated Development System for export outside the US (same contents).

◆ ZFx86BGA388 -TV– ZFx86-TV PC-on-a-Chip (Phoenix BIOS run-time license included).

◆ ZFx86TVIDS-K-01 – Integrated Development System for US (same contents).

◆ ZFx86TVIDS-KE-01 – Integrated Development System for export outside the US (same contents).

BIOS Resources On Our Website

ZFx86 BIOS Users Supplement–
http://www.zfmicro.com/library/MachZ_BIOS/ZFX86BIOS_users_supplement.PDF

ZFx86 BIOS Routing Interrupts–
http://www.zfmicro.com/library/MachZ_BIOS/9150-0015_routing_interrupt.pdf

Phoenix BIOS (4.x Rev 6) User Manual–
http://www.zfmicro.com/library/manuals/PhoenixBIOS4_rev6UserMan.pdf

Other BIOS-related files and ZFx86 Materials–
http://www.zfmicro.com/downloadtable.html

Notes:

The ZF FailSafe BIOS is unique to ZF and cannot be purchased from Phoenix Technologies Ltd. The ZF FailSafe system and ZF-Logic support are proprietary to ZF Micro Solutions Inc. and are not available in any other embedded BIOS.

[†] Customers of ZF Micro Solutions products are responsible for obtaining any development tools, OS fees, and/or additional licenses required to support their specific applications

[‡] Full ZF Micro Solutions Long Term Availability statement is available upon request.

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