Designing Single Board Computer for guaranteed availability
By Johni Chan

Overview

The traditional approach to Single Board Computer (SBC) design has been selecting processors, chip-sets, and features, and then conduct some rudimentary calculations on the total available real estate required fitting in all the features. Usually the feature set for all available SBCs in the market are quite similar. Although some SBCs may be slightly richer in feature sets or higher in performance based on processor and memory selection, but none can sustain the industry leadership for more than a year. Quality, Reliability, and Performance are a given and most customers demand that and the deciding factor is price

	PMC	Mem & Type	SCSI	ENET	Ride-Thru'
IBC 2801	32bit/33Mhz	1G DDR	Yes	Dual 10/100	No
IBC 2802	32bit/33Mhz	1G DDR	No	Quad ENET Dual GEthnt& Dual 10/100/1K	No
IBC 3801	64bit/66Mhz	1G DDR	Yes	Quad ENET Dual GEthnt& Dual 10/100/1K	Yes

Figure 1 illustrates the competitiveness of the Dual Tualatin low power SBC's among the I-Bus Continuon™ line of SBC

What happened to the all SBCs during power failures or most commonly during line voltage interruptions or power glitches?
The loss of power for even a few microseconds in a critical operation of a single board computer can be potentially disastrous and costly Often times, the loss of power requires the SBCs or the systems to reboot or restart. This reboot action often results in the loss of data and greatly reduces the efficiency of operation of the computing system. Many systems employ a large and external uninterruptible power supply to sustain power during line voltage interruptions. However, these external power sources are typically expensive, bulky, and in some instances fail to react quickly enough.

The I-Bus solutions

A comprehensive design of the overall single board computer through the use of a from-the-ground-up approach, including the high availability power requirements, is a fundamentally important aspect of creating a robust single board computer that can provide continue availability even during power interruptions. Introducing the I-Bus Continuon™ 3801 SBC with Power Rise-Through (PRT).

The IBC 3801 SBC

Using a low risk approach, the IBC 3801 SBC is based on the industry leading SBC design of the IBC 2801 from the I -Bus Continuon™ family blade server product which is fully cPSB PICMG 2.16 compatible to support Ethernet switched fabric backplane architectures. Figure 2 show the prototype of the IBC 3801 with rear I/O transition module. In addition to the compatibility of PICMG 2.1 full hot swap and PICMG 2.9 full IPMI system management, the IBC 3801 single board computer is the powerful, scalable, open architecture building block in a high-reliability and high-availability CompactPCI-based SBC from I-Bus. The IBC 3801 supports dual low voltage Intel Pentium III processors, operating at 933 MHz. Program and data storage needs are met with support for up to 4 Gbytes of DDR SDRAM as well as 256+ Mbytes of CompactFlash or 2 Gbyte IBM Microdrive, and a 40 Gbyte IDE hard drive on board, and/or on the IBC 2703 rear I/O transition module. Additional features include Ultra 160 SCSI with rear I/O, quad Ethernet (dual 10/100BaseTX and dual 1000BaseT),64bit/66 MHz PMC expansion and on-board AGP Video. Also supported is the full set of standard PC peripherals including Ultra ATA/100, 1.44 Mbyte floppy, USB, RS-232 serial ports and parallel port, mouse and keyboard. In addition to these rich features, the IBC 3801 features a patented DC power ride-through compensator on board, comprising a power storage device being coupled with the load, and the power storage device being configured to store power from the supply voltage without disrupting power supplied to the SBC and to supply power to the SBC when the supply voltage drops or being interrupted.

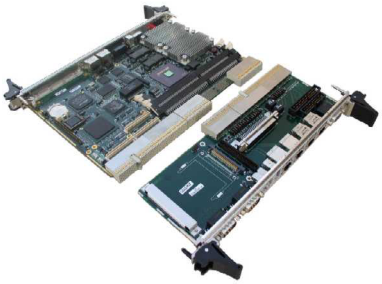

Figure 2. IBC 3801 and Rear Panel I/O

The systems today must reboot when a power interruption occurs. Some mission critical systems have attempted to go off the circuit board to receive ride-through power during a power interruption. Going off board requires an excess amount of time to activate and receive the alternate power. The excess recovery time often results in loss of data and / or processing which can be extremely costly. Typically, the current systems available in the market today still require a system reboot because the alternate power cannot supply power rapidly enough the IBC 3801 is capable of supplying current to the SBC during power outage, power sags thus avoiding the need for a separate external ride-through device to compensate for power glitches, in order to provide rapid response and to avoid reboots and restarts. Thus protecting customers mission critical data, processing resources and reduces the total cost of ownership to our customers.

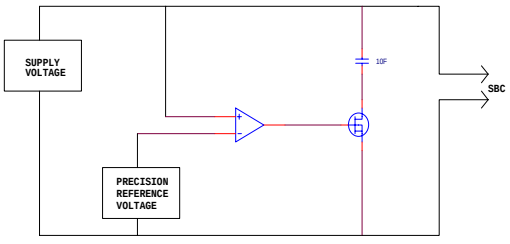

Figure 3. Simplified Ride-Thru' Block Diagram

How does the IBC 3801 PRT works?

Figure 3 shows the simplified Power Ride-Through Block Diagram. In the IBC 3801, a voltage comparator that compares a voltage provided by a power supply to a precision reference voltage controls the switching device. At initial power sequence, the ride-through circuitry will allow the power supply to ramp up to a predefined minimum operating voltage, Once the minimum operating voltage is reached, the comparator circuit drives the switching device to a conduction state. In the conduction state, the switching device forms a shunt regulator across the power supply. This has the effect of consuming excess capability of the power supply to charge up the energy storage device. After the energy storage device is charged, the source voltage continues to ramp up to a normal regulation level. The power supply at the normal regulation level drives the voltage comparator output to turn the switching device on to its maximum conduction state. Once the energy storage device is charged, the ride-through circuitry in the IBC 3801 will be armed and ready to supply the load current to the power supply during power glitches situation. Figure 4 depicts a simplified schematic diagram to illustrate the ride-through apparatus

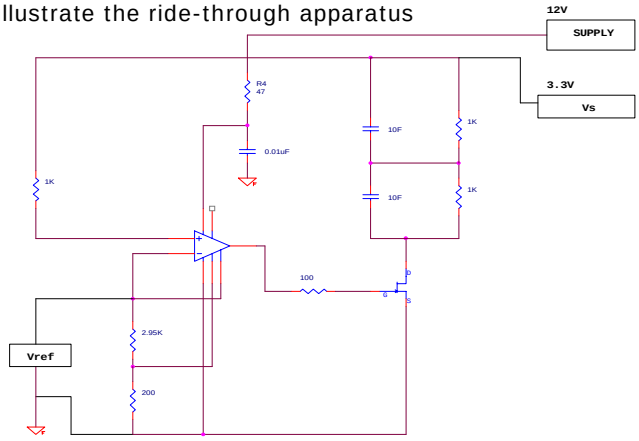

Figure 4. Simplified Schematic for the IBC 3801 Ride Thru'

Conclusion

As a result of intense market research and advanced modular design techniques, simulation and analysis the IBC 3801, a follow on of the IBC 2801 SBC of the I-Bus Continuon™ family products, provides an apparatus for on-board ride through power for a SBC during power interruptions by utilizing a power storage device configured to store power from a supply voltage without disrupting power supplied to the load. With additional rich features set in the IBC 2801, the IBC 3801 is the most advanced SBC ever design in the computing industry addressing all the critical needs of performance, availability, and lowest cost of ownership demand by the computing industry.

There are 11 patent applications filed with seven patents pending in this new I-Bus Continuon™ product family. The IBC 3801 is the key to Infini-Availability™ blade server platform.

Johni Chan *is President and CEO of I-Bus Corporation. Johni has more than 15 years of high-tech industry experience. He was previously President and CTO of AdStor Corporation, Vice President of Engineering at IBus/Phoenix, Director of Engineering at FORCE Computers Inc., and has held numerous senior management positions at IBM. Johni earned his B.S. from Ohio University and his M.S. and D.E. from Stanford University.*

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About I-Bus:

Founded in 1982, I-Bus is a leading provider of innovative high availability embedded computing solutions, a global supplier of open-standard architecture boards and systems for communications, industrial, enterprise, and military market. I-Bus is an OEM focused provider of HA computing platforms for use in mission critical applications and is committed to significant R&D in High Availability solutions.