White Paper

2nd generation Intel® Core™ processors help to boost system performance by delivering powerful processing and graphic performance for the gaming industry

Today's Casino Environment Overview

Technologies are changing the gaming and casino industries. Smart game players and the next generation casino customers have a higher expectation of the environment in which they choose to spend their leisure time. In today's casino environments, resort and casino management strives against their competitors to draw in higher numbers of casino and hotel patrons and the all important future generation of game players to increase their total revenues and ensure a prosperous future while ultimately providing a secure and enjoyable casino experiences where their guests want to spend more time and come back often. As a result, many of the next generation gaming stations such as slot machines, video lottery terminals, automated card or roulette games are integrated with high-definition 3D video and audio content and provide cutting edge player interactivity and convenience. These types of advanced gaming devices can be found all over the casino floor in today's modern casino. In order to present the stunning visual and audio effects, they intelligent systems require advanced software and hardware support working seamlessly together. A high-end slot machine is a perfect example when equipped with extra large screens with multi touch capabilities. Most gaming machines today are equipped with multiple displays with some displays designated for digital signage providing users and passers-by information such as show schedules, restaurant promotions, or hospitality specials. Other displays are designated for player tracking systems where players are asked to scan their player-card at the game before they play and the information scanned for each individual customer such as points earned and player preferences, is linked with the guest's account on file with the casino and kept in the player tracking database. Guests may not need to carry cash around as they can pay their total expenses when they checkout at the hotel. The slot machine might offer many options for the players such as ordering a beverage, booking a show ticket, or communicating with the hotel concierge for room services via real time video conferencing or through the interactive touch screen. Therefore the player does not have to leave a "lucky" slot machine nor be interrupted when playing and having a hot streak. Newer machines may even replace the traditional pull handle and button with virtual buttons projected on a small touch screen display.

Besides the gaming machines, the casino floors also provide many self-serve kiosk terminals serving casino guest 24/7 when needed such as ATM machines, ticket redemption kiosks, and digital signage display boards for restaurant or café or box office information. Devices like these which may involve customer's sensitive data will require advanced security settings to protect customers' privacy and personal information from being stolen and abused. In order to operate under 365 days non-stop environment, longevity, stable system performance, and smart power consumption management are all required to meet these demands.

Casino and Gaming Industry related applications at a glance

Casino floor:

Casino Floor Gaming Applications	Requirements
Cutting-edge slot machine	Large display with touch capability, multiple monitors with multi touch screen, high performance computing system to handle 3D videos and audio
3D Arcade game stations	Very high performance computing system, robust player interfaces and receipt tracking
Connected table games	High performance computing system, high speed network, security, touch screen
Self-serve cash-out Kiosk	Security, touch screen, rich I/O interface for supporting card reader, recipe printer and etc
Casino management systems and surveillance	High performance computing system, multi monitors, rich I/O interface, remote manageability, high level security

Retail stores and shopping center inside casinos:

Retail Stores and Restaurants Business	Requirements
Digital signage systems for restaurant, food court, box offices, bus and taxi	Multiple display, remote manageability, high performance
ATM and Banking Terminal	Security, security camera, remote manageability, rich I/O interfaces, touch screen
Self-serve Ticketing Kiosk	Security, remote manageability, rich I/O interfaces, touch screen
Lottery Terminals	Tamper-proof, security, low cost
Digital Vending Machines	Security, rich I/O interfaces, multiple display, touch screen

Casino resorts and hotels:

Resort and Hotel Business	Requirements
Hotel information billboard/digital signage systems	Multi monitors, remote management
Self-serve check-in/check-out Kiosk	Security, rich I/O interface, touch screen
Self-serve payment system in parking structure	Security, rich I/O interface, touch screen
Conference room and/or stage control systems: (lighting control, video/audio control, video phone, HVAC control, shade control etc)	High performance computing platform, rich I/O interfaces

To summarize the requirements for gaming applications the following is required: high performance, multi display, touch screen capability, security, remote management, rich user interfaces and long lifecycles. The next paragraphs will demonstrate the qualifications provided by Intel's Sandy Bridge platform in order to meet the qualifications for gaming devices.

Introduction of the Intel® Sandy Bridge platform and the features of its chipset and processors

The 2nd generation Intel® Core™ processors, code named Sandy Bridge, are based on the 32nm process technology featuring new levels of performance over the previous generation. When paired with the Intel® QM67 Express Chipset in a mobile platform or paired with the Intel® Q67 Express Chipset in a desktop platform, this two-chip platform computing system not only delivers stunning gaming experiences for the players in the casino floor but also reduce cost of property management by enabling the casino operator remotely manage the networked game stations through the built-in Intel® Active Management Technology and Intel® Trusted Execution Technology. By eliminating one chip from the motherboard design, the two-chip architecture helps reduce total power consumption and increases performance-per-watt as well as enables small form factor design for the space- and thermally constrained gaming machines.

The 2nd Generation Intel® Core™ i7 Processor coupled with Intel® QM67/Q67 Express Chipset for Gaming Device

The next generation gaming devices incorporate rich HD multimedia presentation with real time interactivities together delivering stunning and realistic visual experience to casino game players. The 2nd generation Intel® Core™ i7 processors offer built-in Intel® HD Graphics 3000 which doubles graphics performance compared with previous Intel® Core™ processor-based platforms. Its architecture improvements include 12 Execution Units (EUs), Dedicated Math box and Media Processing. For 3D performance, the Intel® HD Graphics 3000 supports core™ frequency up to 1350 MHz, DirectX 10.1, Open GL 3.0 and HDMI interface as well as supporting up to 2560 x 1600 maximum resolutions. BCM presented its MX67QM mini-itx motherboard during the 2011 gaming show by demonstrating its multi monitor features where the onboard graphics and PCI Express graphics cards were running simultaneously and support total four monitors. The system was equipped with Intel® QM67 Express Chipset, Intel® Core™ i7 processor, 4 GB memory and two additional graphic cards. Among the four monitors, two of them were playing HD videos, one was playing 2D game and the other one was playing 3D video. The system provides multiple video output interfaces including DVI, VGA, HDMI and LVDS enabling the connections to different types of monitors for our embedded customers. The platform also provide rich USB and COM interfaces to support USB touch screen, keyboard, mouse, card reader, web camera and many others.

The 2nd generation Intel® Core™ i7 processor supports Intel® Turbo Boost Technology which allows the processor to run faster than the marked frequency if the part is operating under power, temperature limits of the thermal design power (TDP). This results in increasing extra performance on demand for the gaming devices.

Figure Above: BI355-67QM Industrial Computer (MX67QM mini-ITX motherboard inside) with Intel® Core™ i7 processor supports four monitors playing different HD content.

BCM's Intel® Q67/QM67 Platform Features

The block diagrams on the next page have revealed the support of rich I/O interfaces for both platforms. In addition to those features, BCM's Intel® Q67/QM67 based motherboards also have the following features that help boost the gaming performance while providing a secure computing environment:

Intel® Active Management Technology (Intel® AMT):

The built-in Intel® AMT 7.0 provides the remote manageability allowing casino operators to manage several properties from one location. It also enables IT specialist to remotely discover, repair and protect the connected gaming assets through the network communication regardless the location and distance. By reducing onsite technician visits to the floors, it also helps reduce the cost for the casino owners while shortening the repair time for machines get back to operation mode and generate revenue.

Intel® Virtualization Technology (Intel® VT):

Typically gaming devices can run different software applications on a single computing machine. These applications include multiple networking games, random number generation, data analysis, player tracking and user interfaces. Intel® VT enables one machine to run multiple independent operating systems concurrently and isolates these applications to be stored and executed individually which can help reduce virtualization computing overhead and software complexity while increasing system security and high availability.

Support for High Definition Multimedia Interface (HDMI), DisplayPort* and DVI:

Majority high-end game software incorporates rich high-definition or 3D videos. To enrich the presentation of the game software, HDMI interface delivers uncompressed HD video and uncompressed multi-channel audio in a single cable, supporting all HD formats including 720p, 1080i and 1080p. This chipset also supports the DisplayPort* interface with up to 2560 x 1600 resolution.

Intel® Trusted Execution Technology (Intel® TXT) Security is one of the important factors for gaming devices. Intel® TXT is a hardware-based security that creates additional privileges and protect IT infrastructures against software-based attacks by validating the behavior of key components within a server or computing platform at startup.

Multi-monitor Support:

Both platforms are able to support more than two monitors by running onboard graphics and PCI Express graphic cards simultaneously when operating in Windows 7 environment.

List of Compatible Processors for the Intel® Q67 Express Chipset

Intel® Core™ i7-2600K Processor (8M Cache, up to 3.80 GHz)
Intel® Core™ i7-2600S Processor (8M Cache, up to 3.80 GHz)
Intel® Core™ i7-2600 Processor (8M Cache, up to 3.80 GHz)
Intel® Core™ i5-2500K Processor (6M Cache, up to 3.70 GHz)
Intel® Core™ i5-2500T Processor (6M Cache, up to 3.30 GHz)
Intel® Core™ i5-2500S Processor (6M Cache, up to 3.70 GHz)
Intel® Core™ i5-2500 Processor (6M Cache, up to 3.70 GHz)
Intel® Core™ i5-2405S Processor (6M Cache, up to 3.30 GHz)
Intel® Core™ i5-2390T Processor (3M Cache, up to 3.50 GHz)
Intel® Core™ i5-2400S Processor (6M Cache, up to 3.30 GHz)
Intel® Core™ i5-2400 Processor (6M Cache, up to 3.40 GHz)
Intel® Core™ i3-2130 Processor (3M Cache, 3.40 GHz)
Intel® Core™ i3-2105 Processor (3M Cache, 3.10 GHz)
Intel® Core™ i3-2125 Processor (3M Cache, 3.30 GHz)
Intel® Core™ i3-2100T Processor (3M Cache, 2.50 GHz)
Intel® Core™ i3-2120T Processor (3M Cache, 2.60 GHz)
Intel® Core™ i3-2100 Processor (3M Cache, 3.10 GHz)

Intel® Core™ i3-2120 Processor (3M Cache, 3.30 GHz)
Intel® Pentium® Processor G860 (3M Cache, 3.00 GHz)
Intel® Pentium® Processor G840 (3M Cache, 2.80 GHz)
Intel® Pentium® Processor G850 (3M Cache, 2.90 GHz)
Intel® Pentium® Processor G620T (3M Cache, 2.20 GHz)
Intel® Pentium® Processor G630T (3M Cache, 2.30 GHz)
Intel® Pentium® Processor G620 (3M Cache, 2.60 GHz)
Intel® Pentium® Processor G630 (3M Cache, 2.70 GHz)
Intel® Celeron® Processor G540 (2M Cache, 2.50 GHz)
Intel® Celeron® Processor G530T (2M Cache, 2.00 GHz)
Intel® Celeron® Processor G530 (2M Cache, 2.40 GHz)
Intel® Celeron® Processor G440 (1M Cache, 1.60 GHz)
Intel® Celeron® Processor G460 (1.5M Cache, 1.80 GHz)
Intel® Core™ i3-2115C Processor (3MB Cache, 2.00 GHz)
Intel® Celeron® Processor G540T (2M Cache, 2.10 GHz)
Intel® Pentium® Processor G640T (3M Cache, 2.40 GHz)
Intel® Pentium® Processor G860T (3M Cache, 2.60 GHz)
Intel® Celeron® Processor G550 (2M Cache, 2.60 GHz)
Intel® Core™ i3-2102 Processor (3M Cache, 3.10 GHz)
Intel® Pentium® Processor G622 (3M Cache, 2.60 GHz)
Intel® Pentium® Processor G632 (3M Cache, 2.70 GHz)
Intel® Pentium® Processor G640 (3M Cache, 2.80 GHz)
Intel® Pentium® Processor G870 (3M Cache, 3.10 GHz)
Intel® Core™ i5-2450P Processor (6M Cache, up to 3.50 GHz)
Intel® Core™ i5-2550K Processor (6M Cache, up to 3.80 GHz)

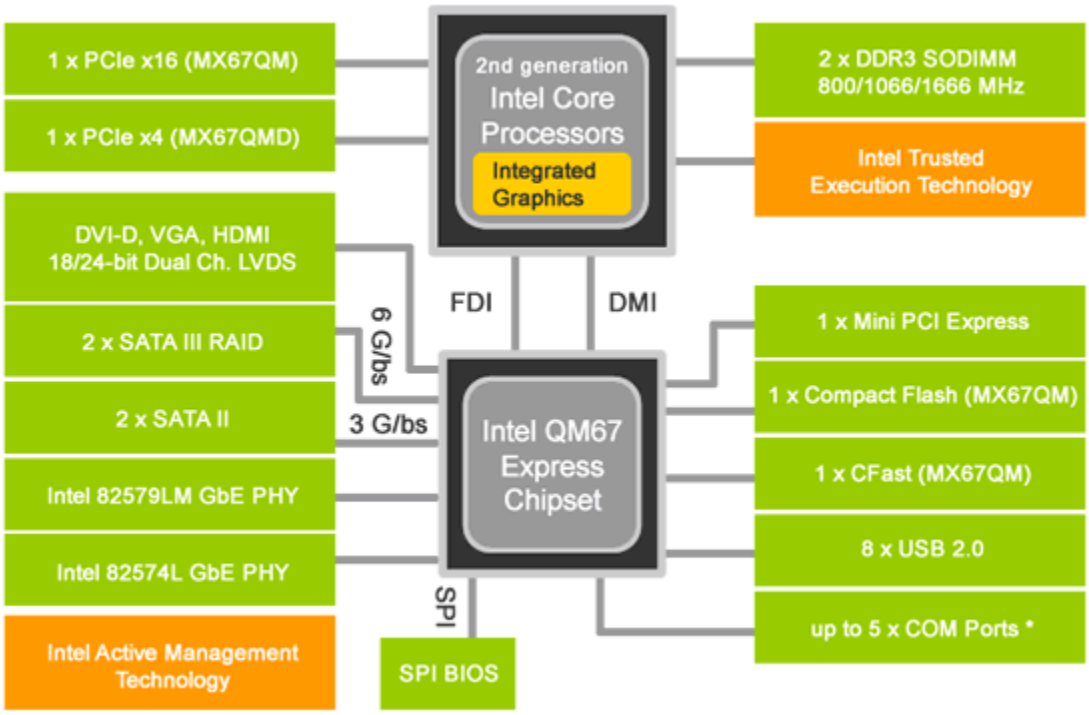
Note: The above list of processors information can be found from Intel® website at http://ark.intel.com/products/chipsets/52770

List of Compatible Processors for the Intel® QM67 Express Chipset

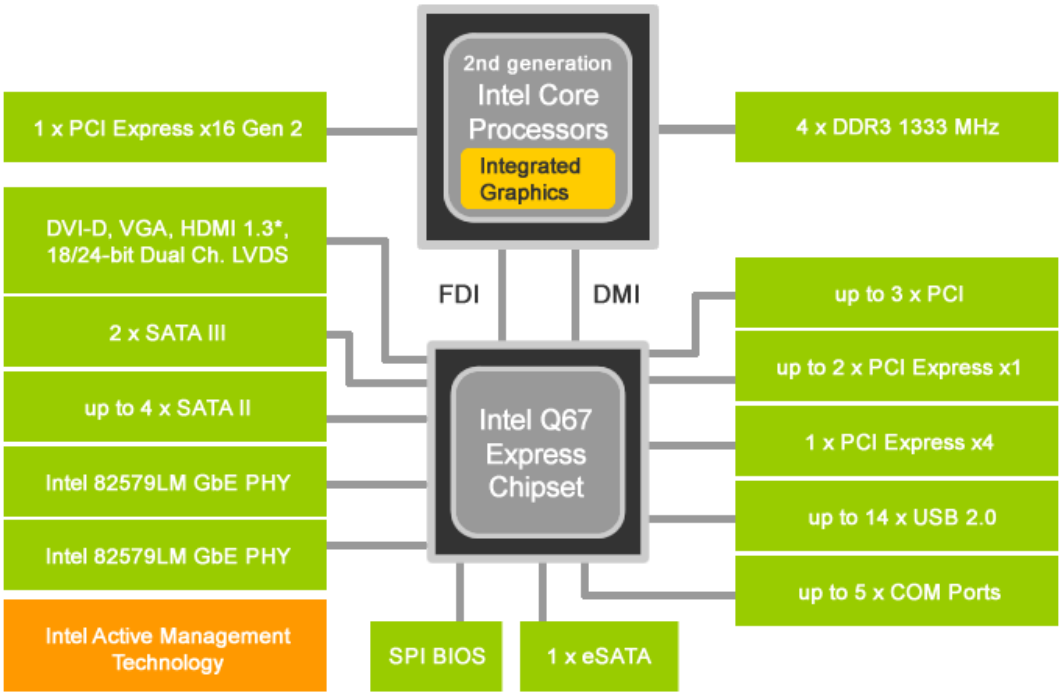
Intel® Core™ i7-2920XM Processor Extreme Edition (8M Cache, up to 3.50 GHz)
Intel® Core™ i7-2960XM Processor Extreme Edition (8M Cache, up to 3.70 GHz)
Intel® Core™ i7-2820QM Processor (8M Cache, up to 3.40 GHz)
Intel® Core™ i7-2860QM Processor (8M Cache, up to 3.60 GHz)
Intel® Core™ i7-2720QM Processor (6M Cache, up to 3.30 GHz)
Intel® Core™ i7-2760QM Processor (6M Cache, up to 3.50 GHz)
Intel® Core™ i7-2649M Processor (4M Cache, up to 3.20 GHz)
Intel® Core™ i7-2620M Processor (4M Cache, up to 3.40 GHz)
Intel® Core™ i7-2640M Processor (4M Cache, up to 3.50 GHz)
Intel® Core™ i7-2657M Processor (4M Cache, up to 2.70 GHz)
Intel® Core™ i7-2677M Processor (4M Cache, up to 2.90 GHz)
Intel® Core™ i7-2629M Processor (4M Cache, up to 3.00 GHz)
Intel® Core™ i7-2617M Processor (4M Cache, up to 2.60 GHz)
Intel® Core™ i7-2637M Processor (4M Cache, up to 2.80 GHz)
Intel® Core™ i5-2540M Processor (3M Cache, up to 3.30 GHz)
Intel® Core™ i5-2537M Processor (3M Cache, up to 2.30 GHz)
Intel® Core™ i5-2557M Processor (3M Cache, up to 2.70 GHz)
Intel® Core™ i3-2350M Processor (3M Cache, 2.30 GHz)
Intel® Core™ i5-2520M Processor (3M Cache, up to 3.20 GHz)
Intel® Celeron® Processor 847 (2M Cache, 1.10 GHz)
Intel® Celeron® Processor 857 (2M Cache, 1.20 GHz)
Intel® Celeron® Processor B840 (2M Cache, 1.90 GHz)
Intel® Celeron® Processor B810 (2M Cache, 1.60 GHz)
Intel® Celeron® Processor B800 (2M Cache, 1.50 GHz)
Intel® Core™ i3-2357M Processor (3M Cache, 1.30 GHz)
Intel® Core™ i5-2467M Processor (3M Cache, up to 2.30 GHz)
Intel® Celeron® Processor 847E (2M Cache, 1.10 GHz)
Intel® Core™ i3-2340UE Processor (3M Cache, 1.30 GHz)
Intel® Core™ i7-2610UE Processor (4M Cache, up to 2.40 GHz)
Intel® Core™ i7-2655LE Processor (4M Cache, up to 2.90 GHz)
Intel® Core™ i3-2310M Processor (3M Cache, 2.10 GHz)
Intel® Core™ i3-2330M Processor (3M Cache, 2.20 GHz)
Intel® Core™ i5-2410M Processor (3M Cache, up to 2.90 GHz)
Intel® Core™ i5-2430M Processor (3M Cache, up to 3.00 GHz)
Intel® Celeron® Processor B810E (2M Cache, 1.60 GHz)
Intel® Core™ i3-2330E Processor (3M Cache, 2.20 GHz)
Intel® Core™ i5-2510E Processor (3M Cache, up to 3.10 GHz)
Intel® Core™ i5-2515E Processor (3M Cache, up to 3.10 GHz)
Intel® Core™ i7-2630QM Processor (6M Cache, up to 2.90 GHz)
Intel® Core™ i7-2635QM Processor (6M Cache, up to 2.90 GHz)
Intel® Core™ i7-2670QM Processor (6M Cache, up to 3.10 GHz)
Intel® Core™ i7-2710QE Processor (6M Cache, up to 3.00 GHz)
Intel® Core™ i7-2715QE Processor (6M Cache, up to 3.00 GHz)

Note: The above list of processors information can be founded from Intel® website at http://ark.intel.com/products/chipsets/5277

Basic Block Diagram of the Intel® Q67 Desktop Platform



Basic Block Diagram of the Intel® Q67 Desktop Platform



Products provided by BCM which support the 2nd generation Intel® core™ i7 processors

Model Name	BC67Q	RX67Q	RX67QV	MX67QM	MX67QMD
Product Image					
Form Factor	ATX	mATX	mATX	Mini-ITX	Mini-ITX
Chipset	Intel® Q67	Intel® Q67	Intel® Q67	Intel® QM67	Intel® QM67
Supported Processors	2nd Gen Intel® Core™ i7/i5/i3 Desktop	2nd Gen Intel® Core™ i7/i5/i3 Desktop	2nd Gen Intel® Core™ i7/i5/i3 Desktop	2nd Gen Intel® Core™ i7/i5/i3 Mobile	2nd Gen Intel® Core™ i7/i5/i3 Mobile
Power Type	ATX	ATX	ATX	ATX	DC
Video Output	DVI-D, VGA	DVI-D, VGA, HDMI	DVI-D, VGA, HDMI, 18/24-bit Dual Channel LVDS	DVI-D, VGA, HDMI, 18/24-bit Dual Channel LVDS	DVI-D, VGA, HDMI, 18/24-bit Dual Channel LVDS
Ethernet Controller	Intel® 82579LM + 82574L	Intel® 82579LM + 82574L	Intel® 82579LM + 82574L	Intel® 82579LM + 82574L	Intel® 82579LM + 82574L
Number of LAN	2	2	2	2	2
Expansion	1 x PCIe x16 1 x PCIe x4 (x16 Physical slot) 2 x PCIe x1 3 x PCI	1 x PCIe x16 1 x PCIe x4 (x16 Physical lot) 2 x PCI	1 x PCIe x16 1 x PCIe x4 (x16 Physical lot) 2 x PCI	1 x PCIe x16 1 x Mini-PCIe 1 x Compact Flash Socket	1 x PCIe x4 1 x Mini-PCIe 1 x CFast Socket
USB	14 x USB 2.0	12 x USB 2.0	12 x USB 2.0	8 x USB 2.0	8 x USB 2.0
COM	1 x RS-232/422/485, 5 x RS-232	4 x RS-232	4 x RS-232	1 x RS-232/422/485, 4 x RS-232	4 x RS-232
SATA	2 x SATA III, 4 x SATA II	2 x SATA III, 3 x SATA II, 1 x eSATA	2 x SATA III, 3 x SATA II, 1 x eSATA	2 x SATA II, 2 x SATA III, RAID	2 x SATA II, 2 x SATA III, RAID

In additional to the standard motherboards above based on the Intel® Sandy Bridge platform, BCM also provides motherboard design services based on the same architecture for our ODM customers in retailing, Point of Sale, Self-serve Kiosk, banking, medical, industrial automation and surveillance industries.

The 2nd generation Intel® core™ i7/i5/i3 processors have revealed many improvements on processing power and graphics performance. When coupled with Intel® QM67 Chipset in a mobile platform or with Intel® Q67 Chipset in a desktop platform, the system delivers stunning visual experiences for gaming applications. Due to the price of LCD panels and touch screen interfaces have been dropping in recent years, many gaming machines utilize more than two monitors to maximize the game user experiences. Both platforms are able to support multi monitors by running onboard graphic and PCIe graphic card simultaneously. Both platform provides rich I/O interfaces and advanced Intel® Technologies such as Intel® Active Management Technology, Intel® Turbo Boost Technology, Intel® Virtualization Technology and Intel® Trusted Execution Technology for creating a secure and intelligent gaming platform.

Long-life Support with Intel® Intelligent System Alliance

It might take a year or two to complete the development of a gaming system. It is important to ensure the availability of the hardware components and BOM materials to extend its ROI. As an Associate member of the Intel® Intelligent System Alliance, BCM is not only able to obtain Intel's early access of new product information for ODM/OEM development but also ensures at least 7 years product longevity for our embedded customers. Please contact BCM for more information regarding building a gaming platform based on the 2nd generation Intel® Core™ processors with Intel® QM67/Q67 Express Chipset.

Safety and Environmental Regulations

BCM is committed to protect and enhance the global environment. To meet the expectations of our customers, employees, and the community in which our products are manufactured, marketed and used, all BCM motherboards are made with lead-free materials since July 1st, 2006. The MX67QM are no exceptions to this commitment and are regulated as RoHS Compliant motherboards.

In addition to the RoHS Compliant, the MX67QM motherboard has passed FCC and CE emission testing and is available in a full UL certified barebones system providing a ready-for-market building block for fast adoption and cost effective deployment by industry VARs for use in applications mentioned in this paper.

Embedded Lifecycle Support through Intel® Intelligent System Alliance

BCM is an Associate member of the Intel® Intelligent System Alliance, a community of embedded developers and solution providers. Through this membership, Intel® provides its members with long life product support for its processors, chipsets and technologies to ensure at least 7 year lifecycles.

Intel's long life product support enables industrial motherboard manufactures like BCM to design and manufacturing long life embedded boards using these high–quality, modular, standards-based building components. Thus the benefits are extended to our ODM/OEM customers by helping them to design more efficiently knowing they can count on the industrial motherboard they have selected, like the MX67QM, to be available for many years reducing frequent and costly redesigns and qualifications.

About the Intel® Intelligent System Alliance

The Intel® Intelligent System Alliance is one of the world's most recognized embedded technology platform providers. This community offers customers a trusted supply line of Intel® based products and technologies. The alliance members are committed to providing ideal solutions and total lifecycle support to help customers develop quick time-to-market and faster time-to-profit embedded products.

About BCM

BCM is a leading supplier of the long life industrial motherboards & systems serving our customers with turn-key stable computing platforms since 1990. We specialize in designing and manufacturing custom motherboards for industrial markets including gaming, retail, security and surveillance, industrial controls and automation, and medical equipment. In addition to customized ODM products, we also carry a broad line of off-the-shelf standard products in popular industrial motherboard form factors including Nano ITX, Mini ITX, mATX and ATX.

BCM is an Associate member of the Intel® Intelligent System Alliance. We specializes in supporting our custom motherboard design services through our strong engineering and project management teams located in Southern California complimenting our core™ development teams located in Taipei, Taiwan. Additionally, we are well staffed in North America to provide local warranty service, logistics, and technical support for prompt problem solving assistance. Our products have guaranteed extended lifecycles and are designed for 24/7/365 operation. For more information please visit BCM's website at www.bcmcom.com. Additional information about Intel® embedded products, please visit www.intel.com/embedded/index.htm