GIGABYTE™

Technology Guide Q1, 2009

Leading Innovation in Motherboard Technology

Contents

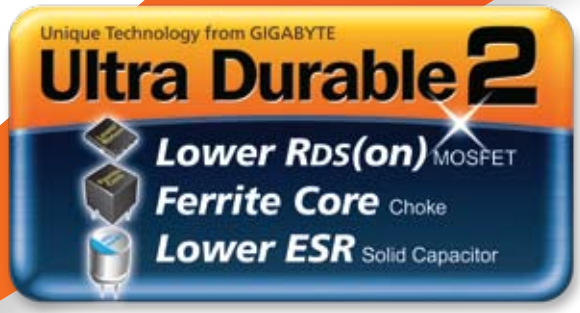
GIGABYTE Ultra Durable Series Evolution

Leading Industrial Quality Standards Year by Year

GIGABYTE had set a standard to the industry towards a better quality PC components ever since the adoption of ROHS manufacturing practices in 2005. In the following year, GIGABYTE announced the Ultra Durable motherboard series featuring all-solid capacitors with better power efficiency than old style electrolytic capacitors. In May 2007 GIGABYTE introduced the Ultra Durable 2 series of motherboards that boasted top quality environmentally friendly solid capacitors from Japan, Low RDS (On) MOSFETs that run cooler and Ferrite core chokes that help to reduce the amount of wasted electricity from the power phases that feed the CPU. In September 2008, GIGABYTE once again leads the motherboard industry for the highest quality, most innovative motherboard design with the launch of their latest Ultra Durable 3 technology. Ultra Durable 3 motherboards are the first consumer desktop motherboards to feature double the amount of copper for the Power and Ground layers of the PCB.

QUALITY MOTHERBOARDS

Year **2008**



Year **2007**

Year **2006**

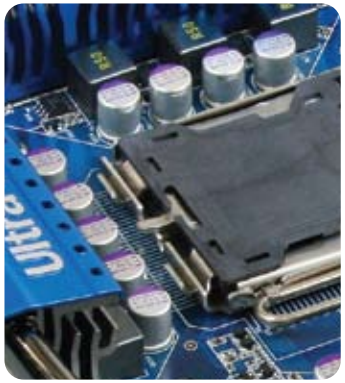
	Lower ESR Solid Capacitor	Ferrite Core Choke	Lower RDS(on) MOSFET	2 oz Copper Inner Layer
	✓	✓	✓	✓
	✓	✓	✓	
	✓			


Ultra Durable
All-Solid Capacitor Design
Built to Last
More Durable for Longer Lifetime
50,000 hrs.
Japanese
Solid Capacitor

More Durable for longer life time

Advantages of 50,000 Hours Japanese Solid Capacitors

GIGABYTE Ultra Durable 3 motherboards are equipped with solid capacitors developed by leading Japanese manufacturers. With an average lifespan of 50,000 hours, these solid capacitors provide the stability, reliability and longevity essential to meet the meet the power needs of high-end processors and other components running today's most demanding applications and games.

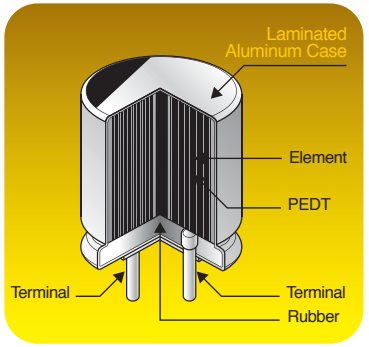


1 year = 24 hrs. x 365 days **= 8,760 hrs.**
5 years = 8,760 hrs. x 5 **= 43,800 hrs.**

* 50,000 hrs. of work time is calculated at 85°C temperature.

What is Solid Capacitor?

Solid capacitors and electrolytic capacitors both store electricity and discharge it when needed. The difference is that solid capacitors contain a solid organic polymer, while electrolytic capacitors use a liquid electrolyte.

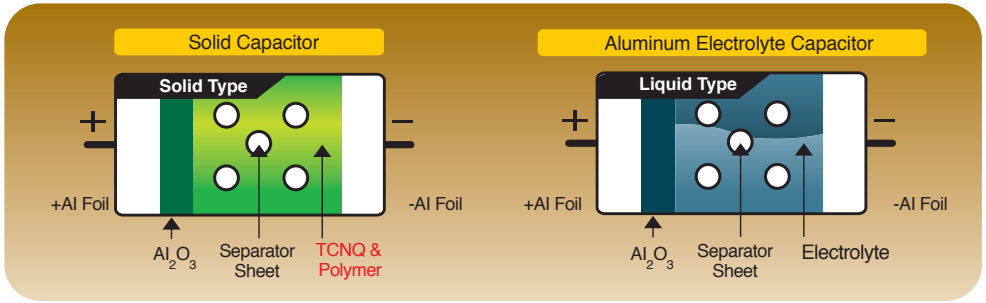


Solid capacitor

Separator sheet (electrolyte) impregnated with conductive polymer
Solid capacitors are composed of highly electro conductive polymer that dramatically improves stability and reliability

Aluminum electrolyte capacitor

Separator sheet (electrolyte) impregnated with electrolytic solution



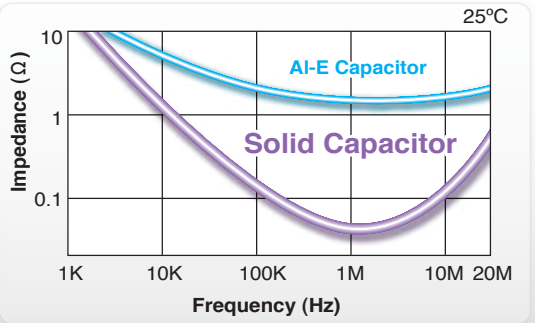
Why use Solid Capacitor?

Electro-conductive polymer used in solid capacitors helps to achieve the following excellent characteristics:

- Low ESR in High Frequency Area
- High Ripple Current
- Longer Life
- High Temperature Capability

Low ESR in High Frequency Area Cooler Motherboard

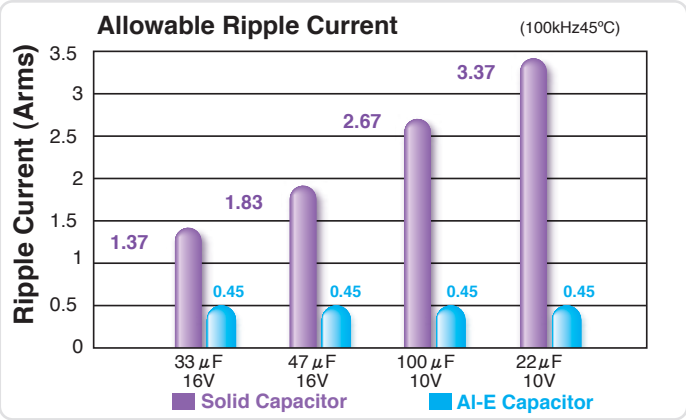
The Lower Equivalent Series Resistance (ESR) means Less power - solid capacitors are able to deliver substantially lower impedance at higher frequencies. Because there is less impedance, solid capacitors are more stable and generate less heat than electrolytic capacitors.



(From Sanyo)

Tolerating High Ripple Current for a More Stable Motherboard

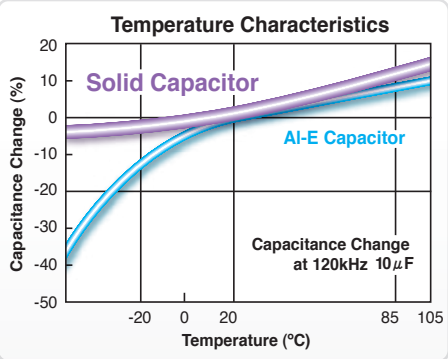
Higher Ripple Current absorbs higher power switching that plays a decisive role in motherboard power phase design. Solid capacitors have better capacity for power switching and thus contribute significantly to better motherboard stability compared to electrolytic capacitors.



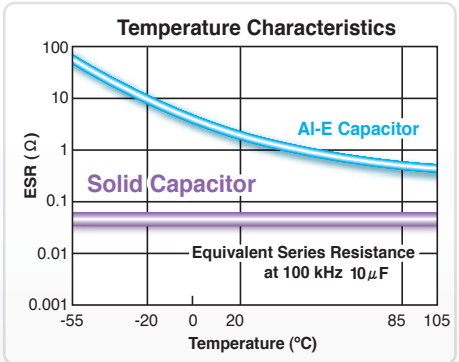
(From Sanyo)

High Temperature Capability - More Reliable Motherboard

Capacitance of solid capacitors stays stable in sharp changing temperatures - Solid capacitors deliver more stable capacitance and are less likely to be affected by temperature changes. As the chart shows, even at extreme temperatures, solid capacitors have relatively stable capacitance, especially when compared to electrolytic capacitors.



(From Sanyo)



(From Sanyo)

Longer Life - More Durable Motherboards

In terms of lifespan, solid capacitors last longer than electrolytic capacitors, especially at lower working temperatures. As the table below shows, at 65°C, the average lifespan for a solid capacitor is more than six times greater than electrolytic capacitors. In actual years, the solid capacitor will last approximately 23 years, while the electrolytic capacitor dies after only three years. Clearly, solid capacitors have a lifetime advantage over electrolytic capacitors.

Temp°C	Electrolytic Capacitors (Working Hours)	Solid Capacitors (Working Hours)	
95°C	4,000 hrs	6,324 hrs	1.5X longer
85°C	8,000 hrs	20,000 hrs	2.5X longer
75°C	16,000 hrs	63,245 hrs	4X longer
65°C	32,000 hrs	200,000 hrs	6.25X longer

No More Exploding Capacitors - More Stability for Over-Clocking

Swelling and leaking capacitors have bothered motherboard users for ages. This dramatically lowers a PC's performance, and may even damage the motherboard to the point where it can no longer operate.
As there is no liquid component to solid capacitors they don't leak or explode. In addition, their ability to tolerate extreme conditions and their overall robustness, make them much more suited to extreme operating environments.

Solid Capacitor and Electrolytic Capacitor Comparison

Characteristics	Solid Capacitors	Electrolytic Capacitors
Heat-Resistibility	☺	😐
Allowable Ripple Current	☺	😐
ESR in high Frequency	☺	☹
SMD Production	☺	☺
Safety	☺	😐
Environmental Protection	☺	😐

☺ Well 😐 Normal ☹ Bad

Summary of Solid Capacitor Features

Solid caps have a low ESR

A frequency characteristic of impendence shows an ideal curve
Ideal to use as de-coupling capacitor for removing such noise as ripple, spike, digital, static, audio, etc.

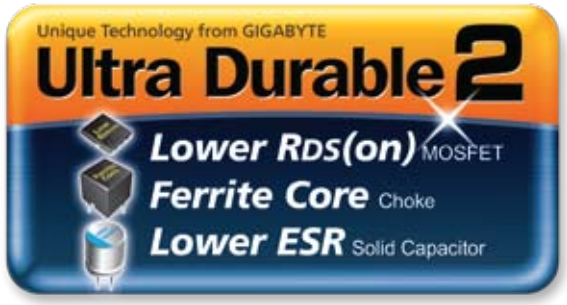
Able to handle large ripple current
Ideal for miniaturization, as a smoothing capacitor of switching power supply.

Able to discharge rapidly
Ideal for use as back-up capacitor in a circuit where large current is consumed at high-speed.

ESR of Solid is not that affected by temperature
The Solid cap can be used for low temperature specification equipment (0°C or less)

Solid caps enjoy a longer life
You can expect to use Solid caps for 20,000Hrs (3 years) at 85°C
Ideal for devices that should last for a long period.

Quality Components make Quality Motherboards



The usage of high quality components on a motherboard is the key factor for having a long lasting, stable and reliable product. This is especially the case for the power circuit design, which features the most critical components of a motherboard.

GIGABYTE has set the industry standard by using All-Solid Capacitors throughout a wide range of products in 2006. This year, GIGABYTE will set a new standard by using Ferrite Core Chokes and Lower RDS(on) MOSFETs for its latest upcoming products.

Ferrite core chokes have higher energy efficiency compared to the commonly used iron core chokes because they are able to store energy longer and prevent rapid energy loss at high frequency. Lower RDS(on) MOSFETs have a lower resistance, which reduces power consumption and heat generation.

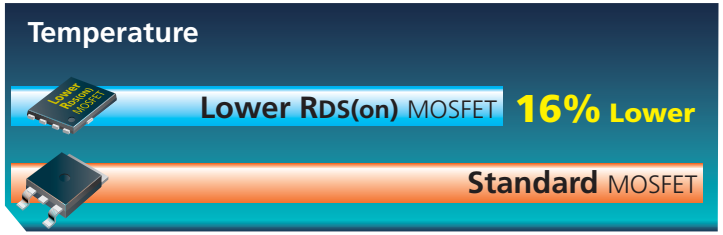
Better

New Design Ultra Durable 2	Old Design
Lower RDS(on) MOSFET	Standard MOSFET
Ferrite Core Choke	Iron Core Power Inductor
Lower ESR Solid Capacitor	Traditional Solid Capacitor

Lower RDS(on) MOSFET

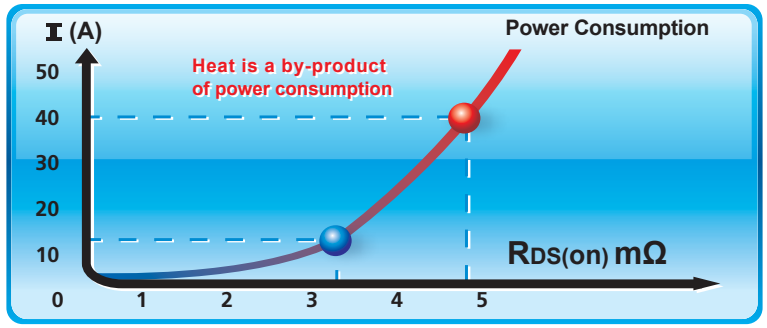
- **Optimized gate charge to minimize switching losses.**
- **Lower temperature, smaller size, better thermal characteristics.**

What is a MOSFET?
A MOSFET is a switch that allows or disallows electric current to pass through an electronic circuit.



In fact, when compared to standard MOSFETs, RDS(on) MOSFETs temperatures are 16% lower.

Lower Resistance = Lower Power Consumption = Lower Heat

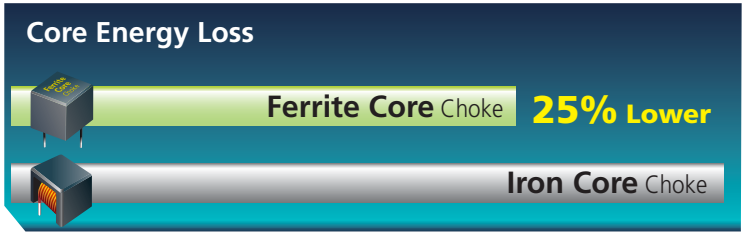


Power Equation: P = I² x R
(P: Power, I: Current, R: Resistance)

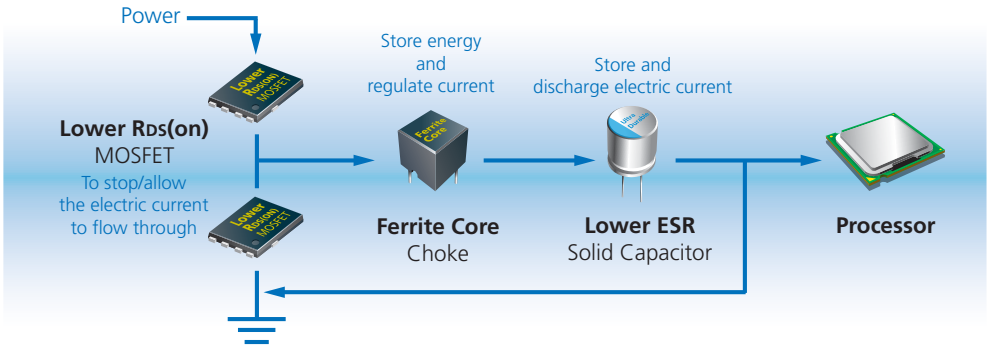
Ferrite Core Choke

- **Reduced core energy loss.** • **Lower EMI interference.**
- **Resists rust better than standard iron core chokes.**

What is a Choke?
A choke is an inductor that stores energy and regulates current.



How does the Ultra Durable 2 Power Design Work?

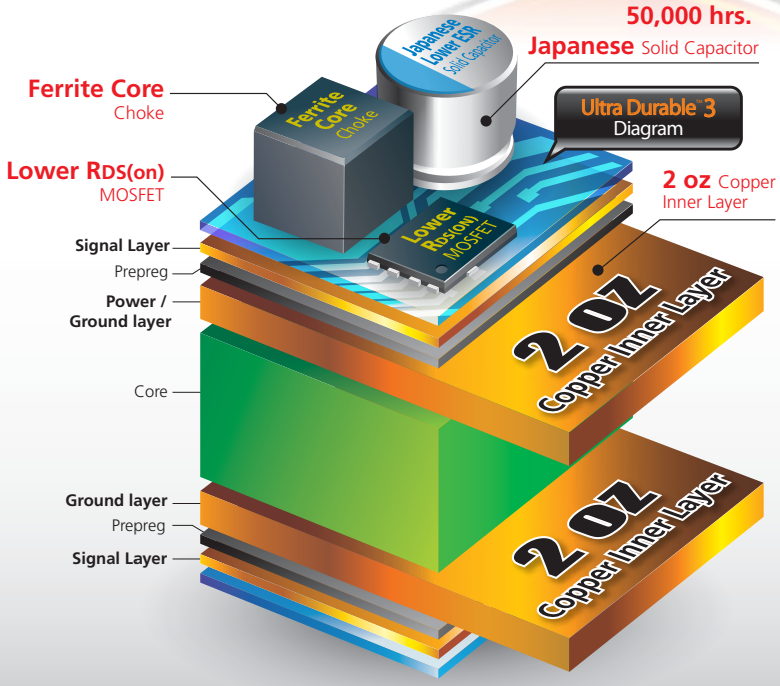


COPPER COOLED QUALITY

GIGABYTE Ultra Durable™ 3 Motherboards

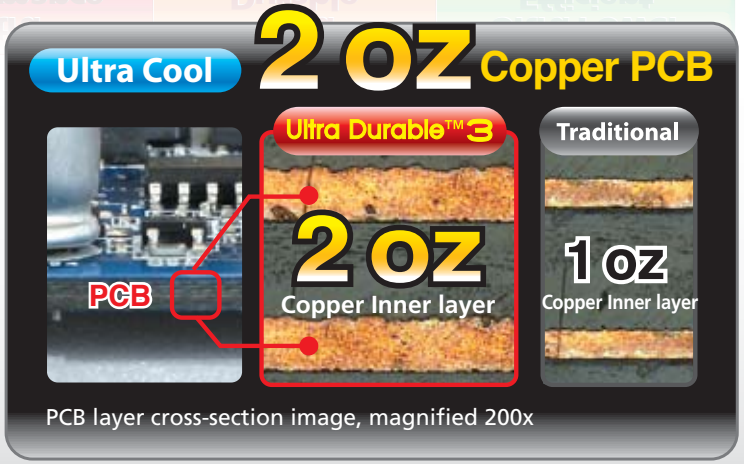
Copper Cooled Quality

GIGABYTE Ultra Durable™ 3 series motherboards



Ultra Cool	Ultra Performance	Ultra Durable	Ultra Power Efficient

As the signature specification for GIGABYTE Ultra Durable 3 motherboards featuring 50,000hrs operation time Japanese Solid Capacitor, Ferrite core chokes with higher energy efficiency compared to the commonly used iron core chokes and Lower RDS(on) MOSFETs that features a lower resistance, which reduces power consumption and heat generation. The GIGABYTE Ultra Durable 3 series motherboards promises to provide the stability, reliability and longevity essential to meet the power needs of high-end processors and other components running today's most demanding applications and games.

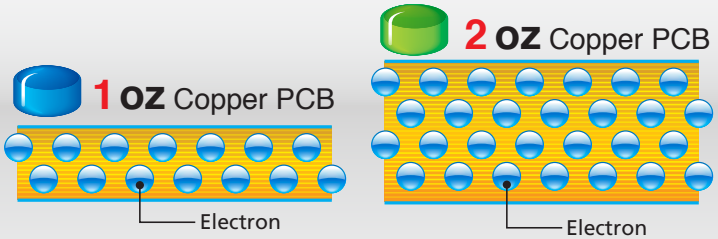


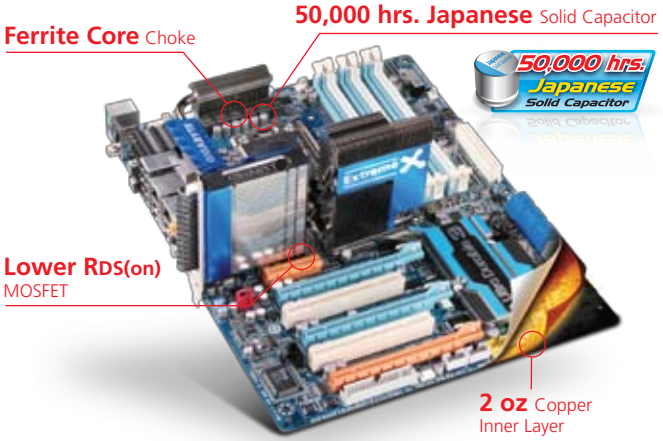
PCB layer cross-section image, magnified 200x

Reducing Impendance by 2X, allows greater electric current flow reduces heat generation

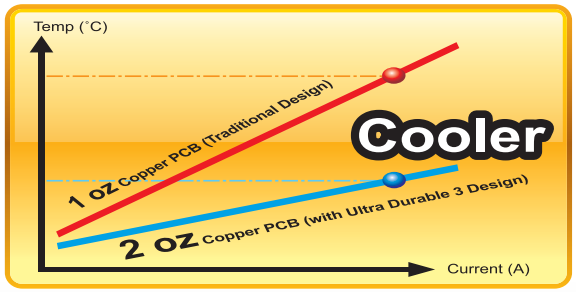
2X Lower Impedance

Doubling the amount of copper, lower the PCB impedance by 2X.



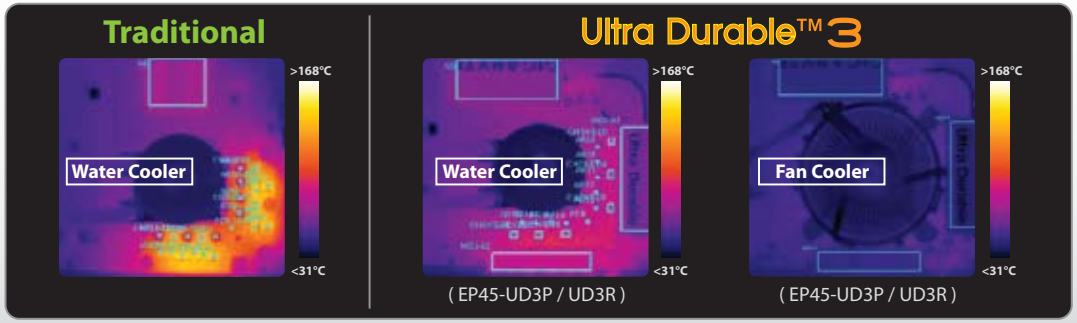


Doubling the amount of copper provides a more effective thermal cooling solution by delivering a more efficient spreading of heat from critical areas of the motherboard such as the CPU power zone throughout the entire PCB. In fact, GIGABYTE Ultra Durable 3 motherboards are able to deliver up to 50°C cooler working temperatures than traditional motherboards*.

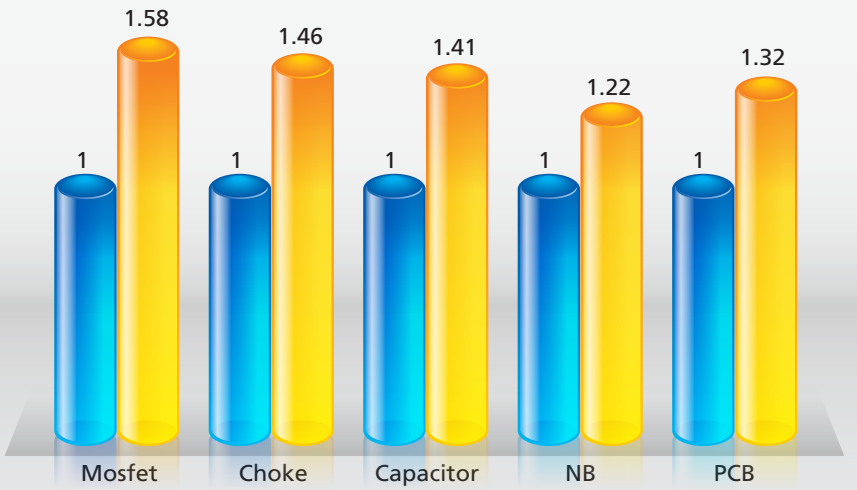


CPU VRM Temperature measurements under system setup with water-cooler block and CPU running at 100% loading

Infra Red CPU VRM Thermal Diagram



Motherboard Thermal Comparison



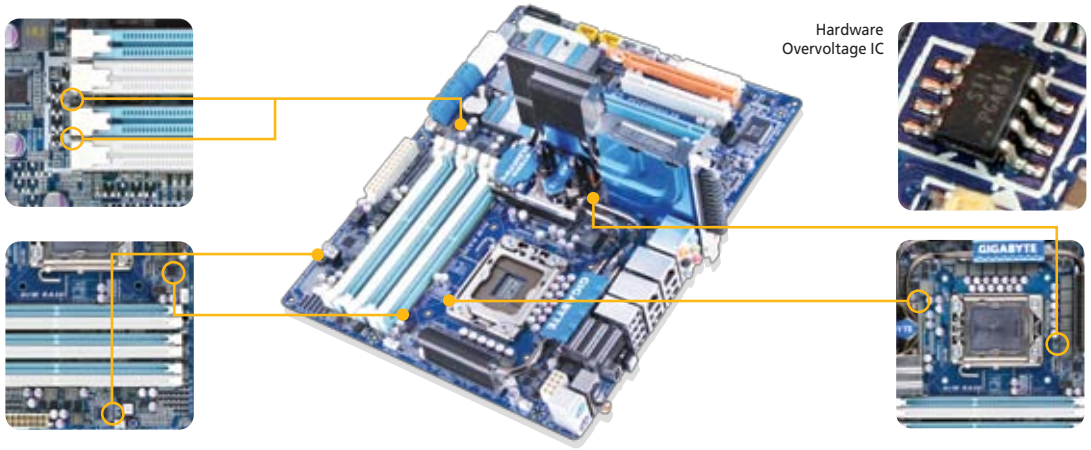
* CPU VRM Temperature measurements under CPU running at 100% loading.


Ultra Performance
QuickBoost
EasyTune6
PRECISION OV
DDR3 2200+
DDR2 1366+
2 GbE LAN

>>>

Precision OV

Hardware Precision Over Voltage Control IC



Precision OV is the hardware Over Voltage Control IC provide more voltage control options in CPU, NB and Memory. Design for overclockers and power users to offer maximum and finest tuning option to achieve higher speed and performance.

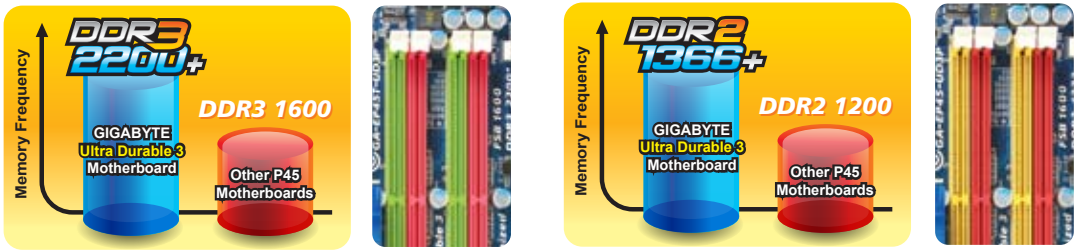
Benefits of Precision OV:

- Hardware Overvoltage Control IC
- Provides more voltage control options for CPU, NB & memory than before
- HW linear real time voltage control, no delay compared to previous GPIO controller
- Finer stepping of 20 mV min (0.002V)

DDR3 2200+ / DDR2 1366+

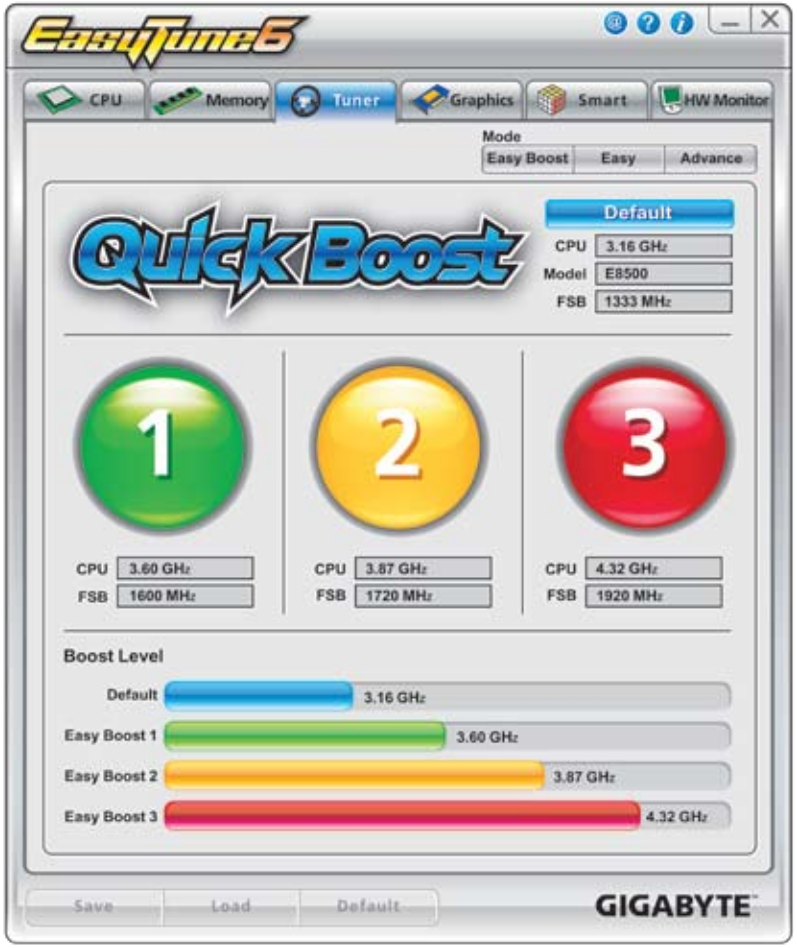
Higher Memory Performance

GIGABYTE Ultra Durable 3 series motherboards features 2 oz copper PCB design delivery native support for DDR memory up to **DDR2 1366+MHz/DDR3 2200+MHz** which allow users to reach higher memory frequency at lower voltage; achieving higher memory performance with lower power consumption to run even the most memory intensive applications such as high-definition video and 3D gamer with ease.



Quick Boost

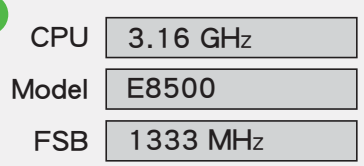
Quick and Effortless Overclocking with One Click



GIGABYTE Quick Boost provides 3 levels of CPU performance enhancement; a simple click on the desired level delivers quick and effortless overclocking for novice and experienced users alike. Designed with user-friendliness in mind, GIGABYTE Quick Boost allows CPU performance to optimize automatically according to different hardware combination with hardware profiles test approved by GIGABYTE engineers.

How To Use

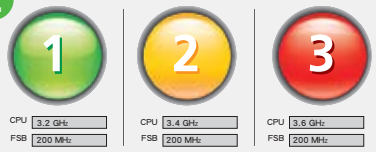
1



Displays processor's default readings

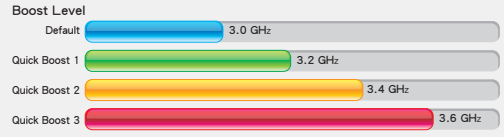
- CPU : Default frequency
- Model : Processor model number
- FSB : Default Front Side Bus frequency

2



Click on the button to select different levels of CPU performance boost

3



Displays CPU frequency to be adjust at different levels

4

Click on "Default" button to reset the Processor back to its default values

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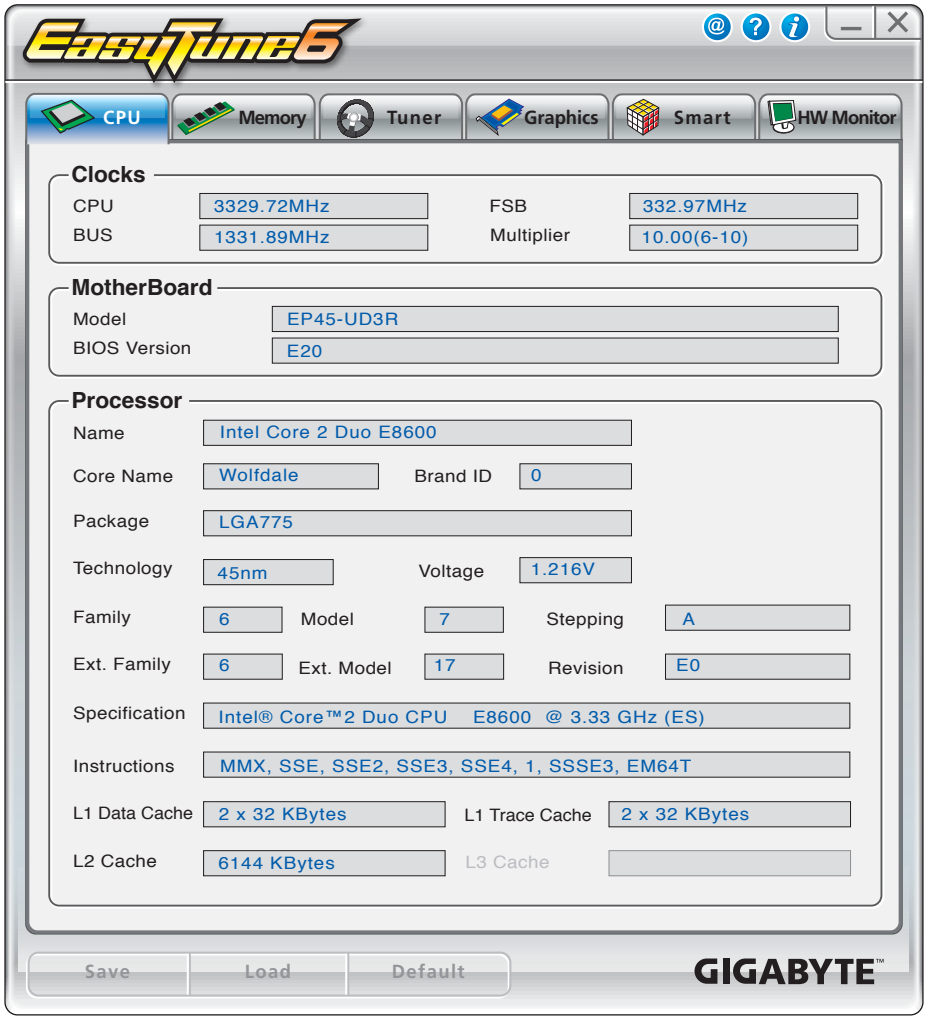
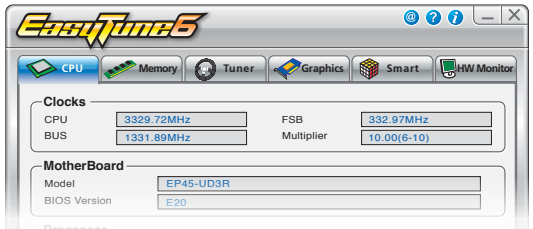


EasyTune™6

Quick and Effortless Fine Tune Your System

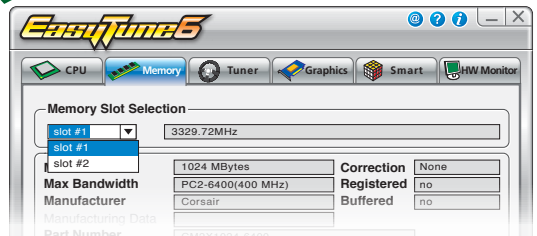
GIGABYTE has completely redesigned EasyTune6 from the ground up to make it easier than ever to manage and monitor your hardware resources as well as tweak your system settings in order to achieve maximum system performance. Whether you are an overclocking enthusiast, or a computer novice, EasyTune6 provides the tools you need to quickly and effortlessly fine tune your system.

CPU



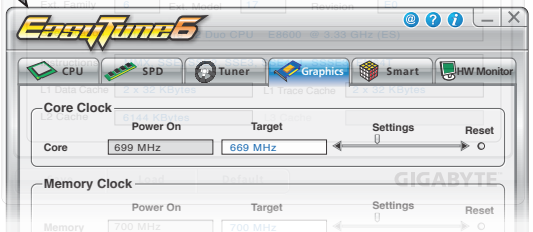
CPU Display CPU and motherboard information such as CPU name, spec, speed.

Memory



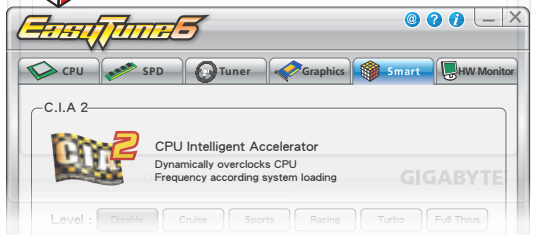
Memory System memory speed and module information.

Graphics



Graphics "Graphic" tab allows you to OC your graphic card by changing GPU core speed or graphic card memory speed.

Smart



Smart In "Smart" tab, you can use two GIGABYTE unique features to enhance system performance.

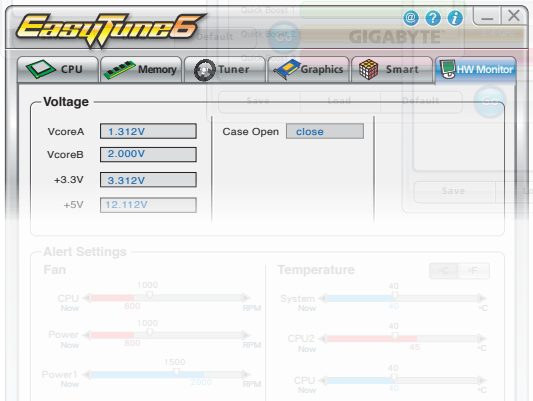
- **CIA2:** Provides 6 levels dynamic OC for your system.
- **Smart Fan:** User can adjust desire FAN speed according to CPU temp.

EasyTune6

Tuner

Tuner provides three way settings to satisfy different levels of user's needs and further enhanced their system.

- **Quick Boost:** Provide 3 levels of OC settings
- **Easy:** User can only allow to adjust FSB
- **Advanced:** There are more values available to adjust such as CPU frequency, ratio and RAM frequency…etc.



HW Monitor

"HW Monitor" tab represents your hardware status such as voltage, fan speed or system temperature.

2 Gigabit LAN

Super Ethernet Performance with Desktop PC's Highest 2 Gigabit Bandwidth !!!

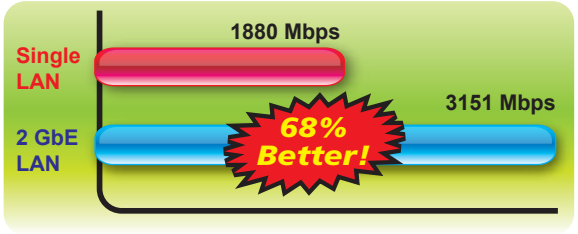
The 2GbE LAN with Teaming functionality enabled allows 2 single connections to act as 1 single connection for 2X bandwidth, improving overall throughput.

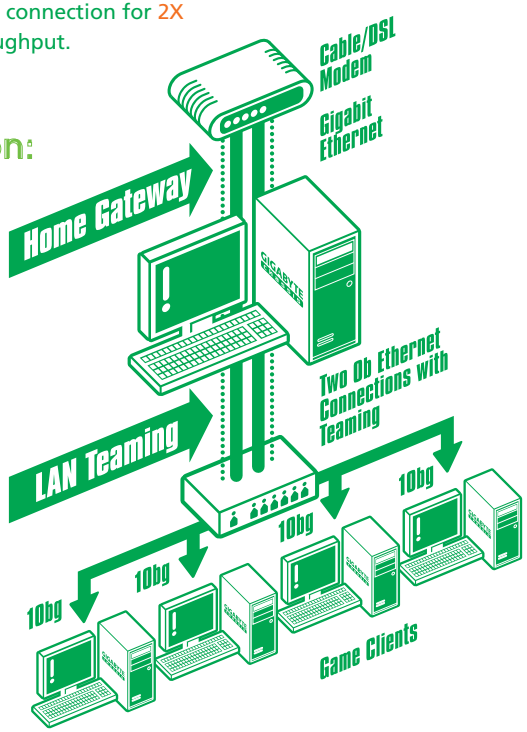
Benefits of 2GbE teaming function:

- Higher link availability – Fault Tolerance
- Increased link capacity – Higher Bandwidth
- Reduce cost for upgrading bandwidth

Through Teaming; 2 single Gbe Ethernet connections can be combined into one 2 Gbe link !!!!
Result in 2X (200%) Bandwidth boost !!!
Ideal for game / data server to provide faster data access !!!

Teaming Performance





"One Small Click for Man, One Giant Leap for Mankind"

Helping to save the world one motherboard at a time.

DYNAMIC ENERGY SAVER Advanced

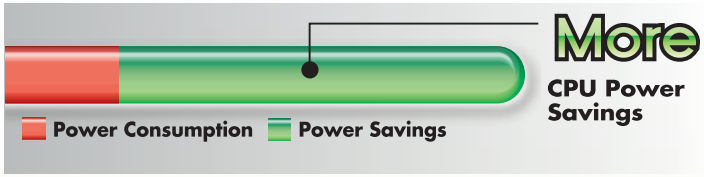
EASY ENERGY SAVER

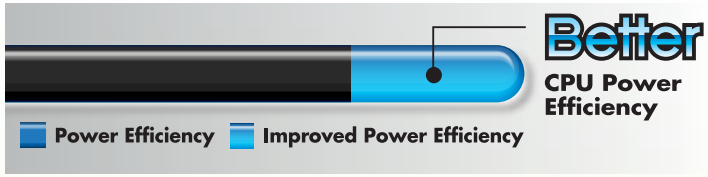
GIGABYTE Dynamic Energy Saver™ Advanced / Easy Energy Saver™

GIGABYTE Goes Green with Dynamic Energy Saver™ Advanced Technology

World's Only Energy Saving Technology with Hardware-based Dynamic 6-Gear Power Phase Switching

GIGABYTE Dynamic Energy Saver is a revolutionary technology that delivers unparalleled power savings with the simple click of a button. Featuring an advanced proprietary hardware and software design, GIGABYTE Dynamic Energy Saver is able to provide exceptional power savings and improved power efficiency without sacrificing computing performance.





Dynamic Energy Saver Advanced Features

- Improved algorithms in power savings and system performance
- Minimize CPU resources by allowing DES utility to be turned off
- Power Saving remains ON even if DES utility is turned off or removed from Windows task bar
- Allows Power Phase Switching even if users overclock or over-volt the system

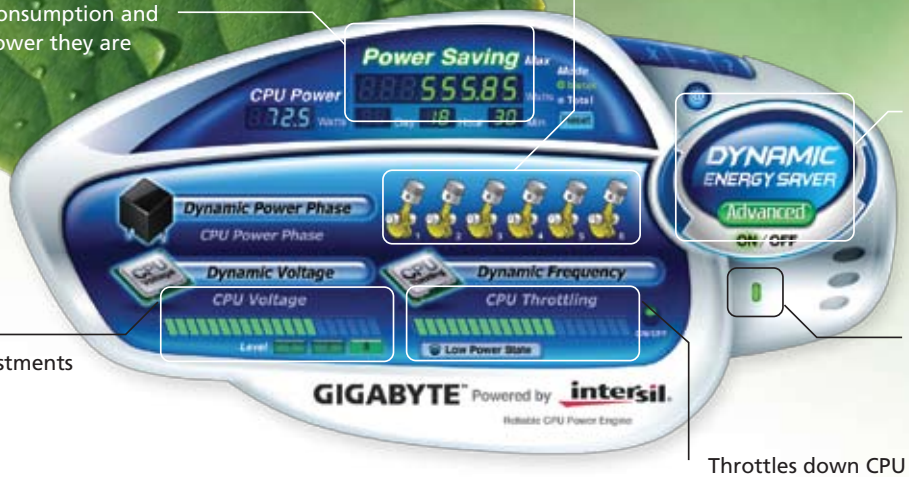
Powered by Intersil's Reliable Hardware CPU Power Engine

Intersil is the world leading provider for high performance power IC solutions, providing GIGABYTE motherboards with the industry's highest quality CPU power design.

One click energy saving with GIGABYTE Dynamic Energy Saver Advanced

Allows users to see real-time CPU power consumption and how much power they are saving

Allowing users to see the dynamic gear shifting in real-time



One Click to turn On or Off the GIGABYTE Dynamic Energy Saver Utility

3 levels of Voltage adjustments

Turn On or Off the Dynamic LED indicator on the motherboard

Throttles down CPU frequency for users wanting even greater energy savings

GIGABYTE Easy Energy Saver

GIGABYTE now makes it even easier for users to save energy with the new GIGABYTE Easy Energy Saver. One click of the Easy Energy Saver button and users are able to instantly take advantage of power savings, without a confusing setup or complicated calibration processes. Not only can users see real-time CPU power consumption in Watts, but once Easy Energy Saver is enabled, users can see how much power they are actually saving. Now, everyone can benefit from quick and easy energy savings, helping to not only save electricity costs, but also making it easy to do your part to help save the environment.

Stealth Mode Power Savings

Always-On Energy Saving Technology

Allows users to turn on or off the Dynamic Energy Saver Utility completely, while still experiencing the hardware-based energy saving benefits of DES.

Multi-gear Power Phase Switching During Overclocking

Automatically adjusts the energy savings settings to allow power users to play, while at the same time, take advantage of DES's efficient power phase switching.

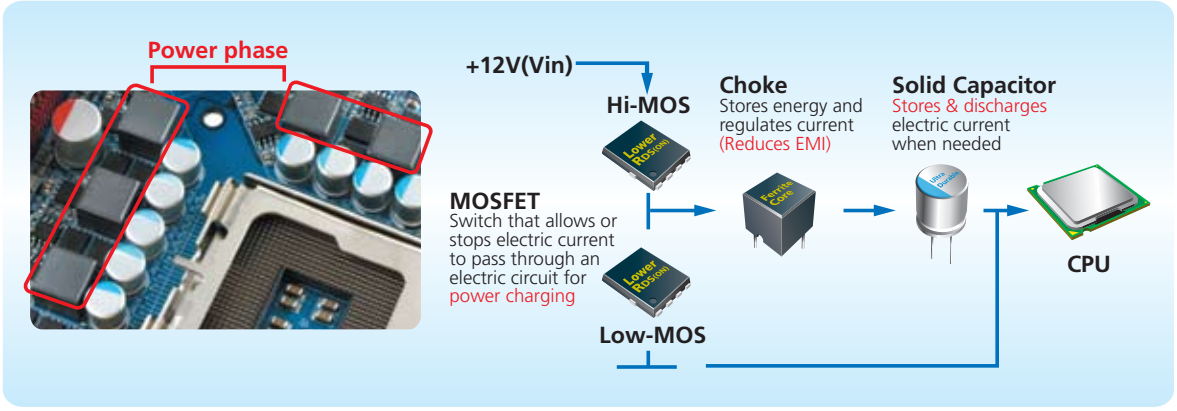
6-GEAR DYNAMIC POWER PHASE SWITCHING
World's Leading Energy Saving Technology

Delivering power only when it's needed

Dynamic 6-Gears Power Phase Switching Technology

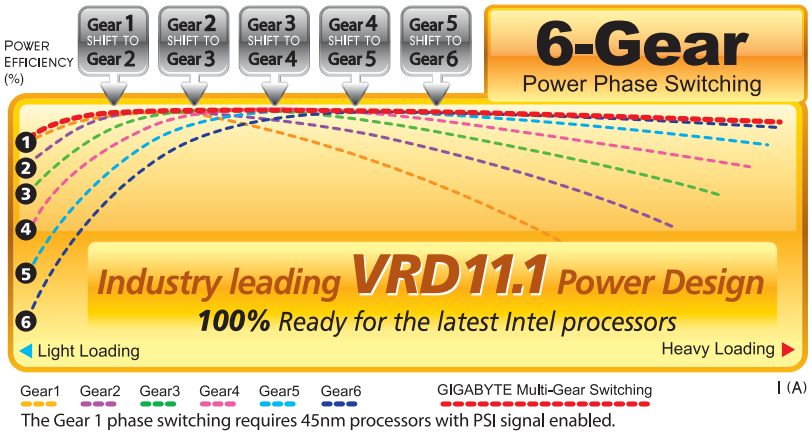
Featuring an advanced proprietary software and hardware design, GIGABYTE DES motherboards provide exceptional power savings and improved power efficiency through the use of GIGABYTE's unique multi-gear power phase design, allowing for the most efficient switching of power phases depending on CPU workload

What is a Power Phase ?
1 set Phase Power = 2 MOSFETs + 1 Choke + 1 Solid Capacitor



Only GIGABYTE's Multi-Gear Switching Provides Optimum Power Efficiency From Light To Heavy Loading

Dynamic Multi-Gear Power Design



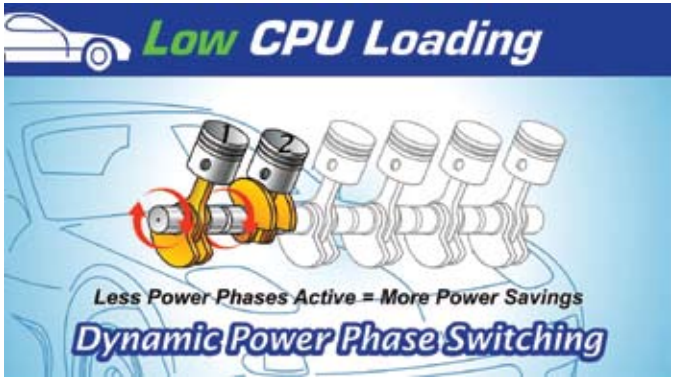
The Gear 1 phase switching requires 45nm processors with PSI signal enabled.

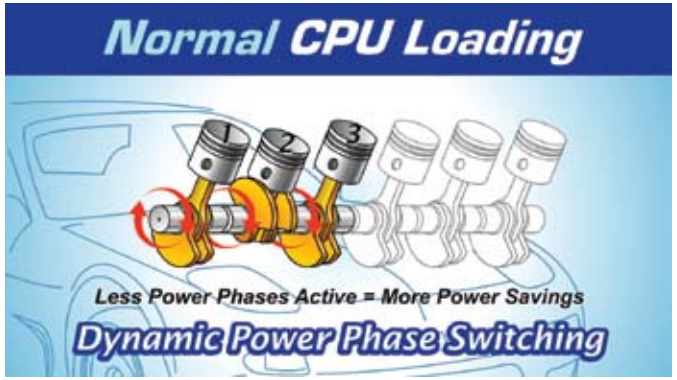
Dynamic LED Display

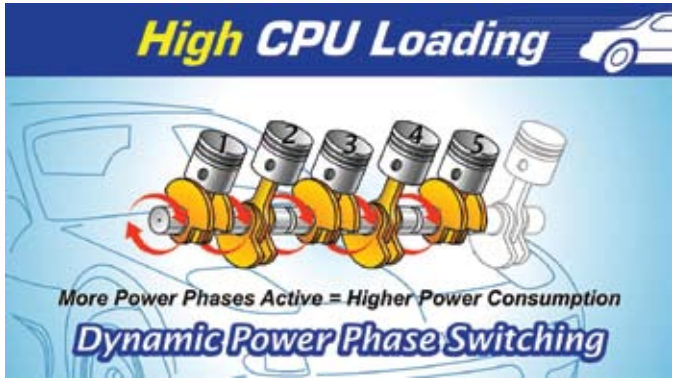
Dynamic LED during light loading | Dynamic LED during heavy loading

GIGABYTE's unique LED hardware design allows users to see the dynamic gear shifting in real-time

Dynamic 6-Gears Switching automatically adjusts the number of active power phases needed according to CPU loading







Tomorrow's Technology Today

GIGABYTE **VRD 11.1** Motherboards

100% Ready *for the Latest Intel CPUs*

New VRD 11.1 Power Specification for Intel New Processors

GIGABYTE's motherboards now offers support for the new VRD (Voltage Regulator Down) 11.1 processor power delivery specification from Intel. VRD 11.1 is a new energy saving power standard that communicates the CPU's power requirements to the motherboard, allowing DES Advanced motherboards to gear down to a single (1) power phase for unequalled power efficiency during deeper sleep state.


Gear down to 1 power phase
(During deep sleep mode)

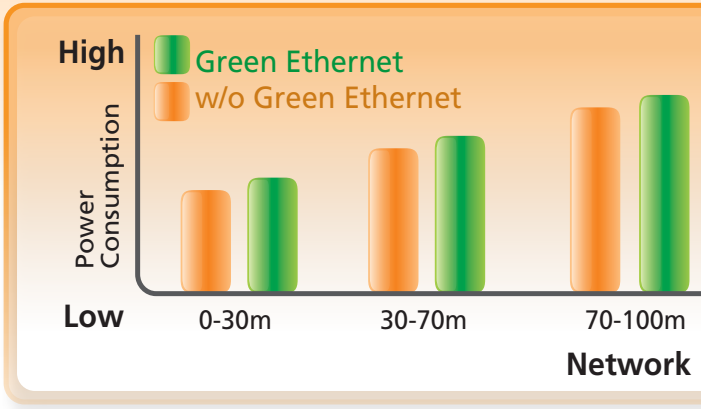
	New VRD 11.1 Design	Older VRD Design
Future CPU Support	Yes	No
Better power efficiency	Yes	No

What is a VRD ?

A Voltage Regulator Down (VRD) is an electrical regulator designed to automatically maintain a constant voltage level for the CPU.

Green Ethernet

Green Ethernet features lower power consumption than traditional Ethernet controllers by adjusting power amplitudes according to different network cable lengths. This allows lower energy lost while system Is either active or idle mode without sacrificing the quality of the network connections.



GREEN ETHERNET

Lower Power Consumption

100m Network Cable Length

Green Ethernet

High Power Consumption

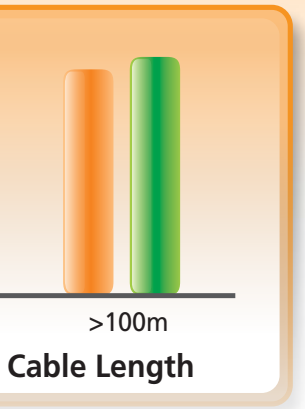
100m Network Cable Length

w/o Green Ethernet

GIGABYTE Cares

GIGABYTE is proud to be at the forefront of developing new technologies which help reduce the impact everyday computing has on the environment. As such, GIGABYTE has become a member of the Climate Savers Computing Initiative. Started by Google and Intel in 2007, the Climate Savers Computing Initiative is a nonprofit group of eco-conscious consumers, businesses and conservation organizations whose goal is to promote development, deployment and adoption of smart technologies that can both improve the efficiency of a computer's power delivery and reduce the energy consumed when the computer is in an inactive state.

climate savers smart computing℠



Corporate

- Energy-Saving and CO2 reduction activities
- Turning off lights during lunch breaks
- Running only one lift during off peak hours rather than all of the lifts
- Turn off PC after work and regular inspection for energy savings in the evening
- Saving water resources
- Converting to an online application and approval system to reduce paper usage
- Recycling of waste within office and factory buildings

Product

- Focus on Green design
- Restrict harmful materials
- The World's first RoHS motherboard
- Dynamic Energy Saver Motherboard
- GIGABYTE Motherboard to meet Energy Star 4.0 hardware requirement
- Green Mark certification of Taiwan

Social Responsibility

- First motherboard company to join leading Green Computing Initiatives
- Joining the environment protection plan
- Aim for Green products
- Pollution reduction and recycle for corporate mission

GIGABYTE Thermal Solutions

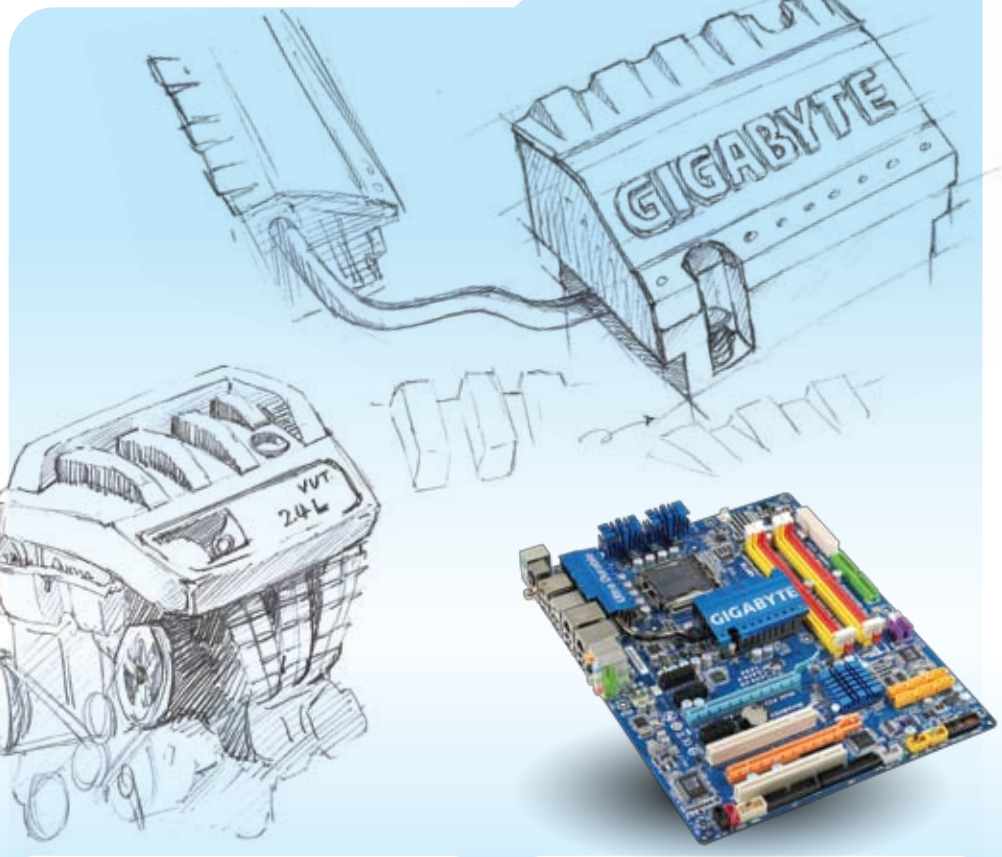
HYBRID Silent-Pipe 2 \ Silent-Pipe \ Heat Sink

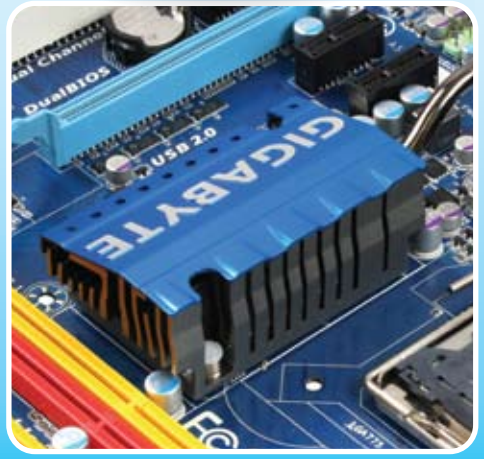
Design Concept

As the engine to automobile and the heart to human body, the CPU and the power phase as well as the thermal solution around are the energy source of the a motherboard. GIGABYTE brings this concept to the design of heat sink cover which is simulated the cylinder cover of an engine. The stylish uneven (lumpy) surface and fin optimizes thermal dissipation, and also create a fashion outlook on the motherboard.

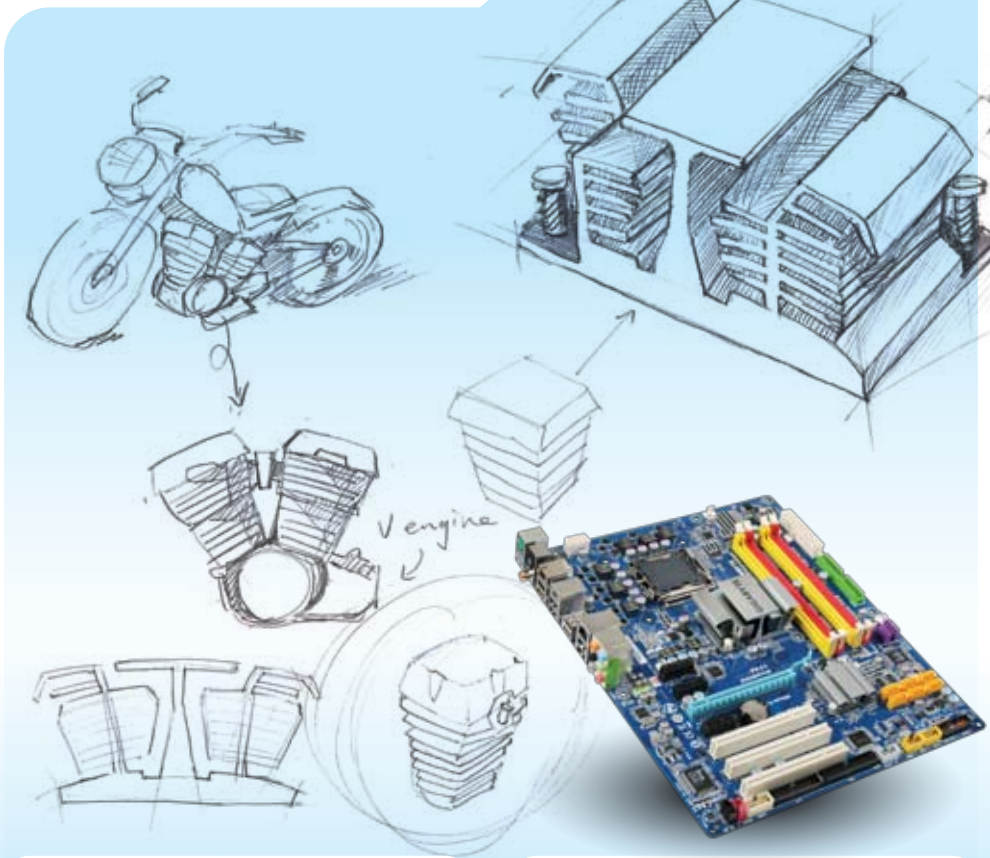
HYBRID Silent-Pipe 2 Prototype

Silent-Pipe Prototype





Heat Sink Prototype



HYBRID SILENT-PIPE 2

About Hybrid Silent Pipe 2

New thermal solution design of liquid cooling, screen cooling and external heat sink actually makes contact to provide unequalled heat conductivity

- Unique **Screen Cooling** thermal design effectively reduces the temperature around the CPU zone, and removes the heat between NB and SB area.
- **Liquid Cooling** system featuring special waterblock design with an enlarged dissipating surface area for enhanced heat dissipation and optimum flow-rate.
- **High-Precision die forming technology** utilized to increase the thermal conductivity of the material that makes up the heat sink.
- High performance **Copper Heat Pipe** with sintered process designed for ultra efficient thermal conductivity.
- **External Heat Sink** design utilizing a convection slot at the back of the chassis to increase thermal dissipation.

Extreme Cooling Solution

Unique Hybrid-Silent Pipe 2 combines Air cooling and Liquid Cooling to enable effective heat removal for near zero noise operation

Screen Cooling

Unique screen design effectively reduces the temperature around the CPU zone, and removes the heat between NB and SB area.

Copper Heat Pipe

With sintered process, the copper pipe is designed for ultra efficient thermal conductivity.

Ventilation Fin

External heat sink rapidly transfers the heat from components to outside the chassis.

Liquid Cooling

Featuring the special waterblock design and enlarged dissipating surface area, liquid cooling system enhance heat dissipation and optimum flow-rate.

Data Security Has Never Been This Easy

GIGABYTE Ultra TPM Motherboards

Setting a new standard for motherboard security

Plug & Play 2048 bit USB Key with Hardware based TPM security

Setting a New Standard for Motherboard Security

In today's computing environment, security threats such as viruses, worms, trojan attacks, malicious hacking and data/identity theft, etc. are not only happening more frequently, but the cost to victims of such attacks are also on the rise. While software solutions are able to protect data to a certain degree, a higher level of security measures is needed to ensure you do not become the next victim.

That is where a hardware based solution such as TPM (Trusted Platform Module) technology can help. Trusted Platform Modules are hardware based security microcontrollers that store keys, passwords and digital certificates and protects this data from external software attacks and physical theft.

Recognizing the need to protect users against today's computing security threats, GIGABYTE is the first motherboard manufacturer to equip their motherboards with an onboard TPM Module from Infineon with 2048 bit encryption key. But, they didn't stop there. GIGABYTE has paired their TPM module with a security software interface called GIGABYTE Ultra TPM, providing the Industry's highest level of data security through a hardware + software design.

In order to better understand GIGABYTE Ultra TPM and how it works, let's first get a crash course in how data security works.

Easy to Secure Your Data

With Infineon's TPM chip built-in, GIGABYTE provides TPM hardware-based encryption and decryption with digital signature keys to ensure a maximum level of data protection with 2048 bit

encryption. GIGABYTE Ultra TPM provides an added layer of security by allowing users to store their digital signature key on a USB thumb drive, so when they step away from their system, they can take the key with them, locking up their data and preventing unauthorized access while they are away. When making the portable user key, GIGABYTE Ultra TPM auto deletes the user key in the hard drive, ensuring the maximum level of data protection.

Nearly Impossible to Crack

Most data security solutions, whether they are software or hardware based, rely on a process of encryption and decryption to secure digital data. Encryption takes your data and transforms it, making it unreadable to anyone that doesn't have a "key" to read it. The key basically tells how that information was transformed, and acts as a password for the data. Once you have the key, you are able to undo the encryption, a process called decryption, making the data readable again.

Key size basically determines the level of security; 1 bit keys being the least secure, all the way up to the 2048 bit key found in GIGABYTE's Ultra TPM. How secure is 2048 bit security? The number of possible combinations from a 2048 bit number is 2^{2048}, which is 3.23 x 10^{616}. That is 3 followed by 616 zeros or

2^{2048}=3000000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000
0000000000000000000000000000000000000000000000000000000000000

That is how many possible different number combinations a 2048 bit key has. A computer capable of one million instructions per second would have to work for 1014 years to crack the key. Is it any wonder why this is considered military

The Benefits of GIGABYTE Ultra TPM

1. Security, manageability and flexibility that surpasses software-based encryption.
2. No password required. Users don't have to remember and keep entering their password. This also means there is no password for someone to crack.
   - Quick and effortless protection of data; plug in USB key to access data, or remove to safeguard.
   - Keeps data secure even when users are away from computer.
3. Optional backup of key stored in BIOS in case of misplaced key.
4. Very low CPU utilization. As all the encryption and decryption is done by the TPM, users are able to do other tasks simultaneously.

While no security system is 100% secure, GIGABYTE Ultra TPM provides the industry's highest level of military grade security, and at the same time, makes it easy enough for anyone to use. Whether protecting important data at the office or ensuring your kids don't accidentally delete things off the home computer, GIGABYTE Ultra TPM has you covered. Think of it as your own personal 24/7 security force.

Hardware + Software vs Software Based Security

GIGABYTE Ultra TPM Hardware + Software based **Encryption**	**TPM Hardware** Based **Security**	**Software** based **Encryption**
• Platform authentication with integrated security solution • Keys and secrets protected by dedicated hardware • Key can be deleted completely from system offering the highest level of security possible	• Platform authentication with integrated security solution • Keys and secrets protected by dedicated hardware	• Low Level of security
• High protection against logical attacks	• High protection against logical attacks	• Low protection against logical attacks
• Highest level of protection against physical attacks	• High protection against physical attacks	• No protection against physical attacks
• Low CPU utilization	• Low CPU utilization	• CPU Intensive

Ultra Safe - DualBIOS™

Automated Dual Protection Against BIOS Failure

DualBIOS™ Benefits :

1. Repair failure BIOS instantly
2. Fully automated without user intervention
3. Reduce service time

What if the BIOS Fails?

Have you ever been in the middle of a BIOS update and then had it fail for some reason? Or how about executing some applications only to find out that you've been infected by some new virus that completely blows away your BIOS?

Without the BIOS working the motherboard is basically not functional at all, can you imagine the time and efforts to get your motherboard fixed?

What might cause a BIOS Failure?

1. Power shut down during BIOS update process
2. Improper Overclocking settings
3. Virus attacks
4. Hardware Failure

again. When there is a BIOS firmware failure detected, the Backup BIOS will first recovers the Main BIOS file back to its factory default BIOS version, and everything is back to normal again. If BIOS failure is due to hardware damage, the Backup BIOS will takeover and function as the Main BIOS.

Automatically recovers Main BIOS data by Backup BIOS when Main BIOS has crashed or failed

How GIGABYTE DualBIOS™ Works?

GIGABYTE DualBIOS™ featuring two physical BIOS ROMS mounted on the motherboard. There is a second chip called Backup BIOS that stores the factory default BIOS version on it. The way it works is fully automated without any users intervention.

When you discover that you have a problem, all you need to do is shut the system down, and then boot up

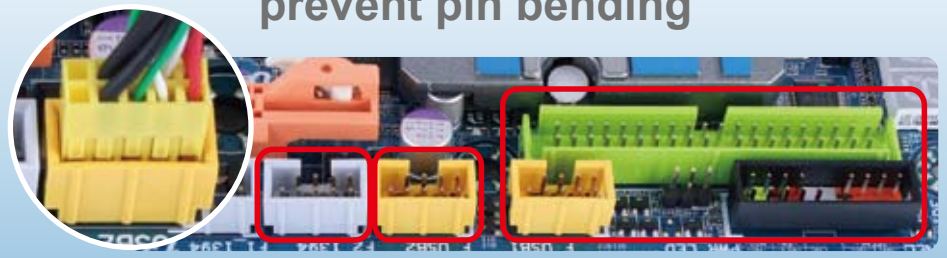
DualBIOS™ vs. Traditional single BIOS

Feature	GIGABYTE DualBIOS™	Single BIOS
2 physical BIOS ROMs onboard provide double protection against virus attack and firmware / physical damage	Yes	No
Auto recovery from backup BIOS when main BIOS firmware is damaged	Yes	No

Ultra Safe-Housing Pin Header

GIGABYTE user friendly feature "Housing Pin Header" , which can prevent internal I/O connector pins such as USB, IEEE 1394 or IDE devices cables insert at the wrong direction accidently. With the housing around the internal pin headers', it greatly reduces the bending pins due to improper handling or provide a more rigid connection between motherboard and the devices.

prevent pin bending



NEW, BETTER DESIGN

OLD DESIGN

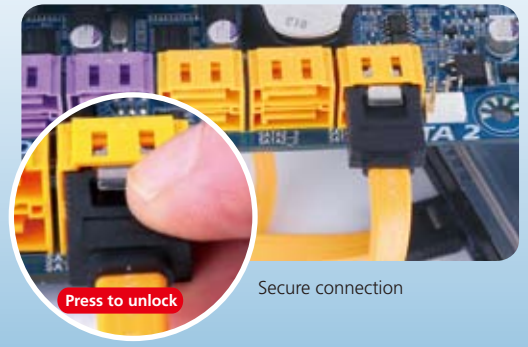
Ultra Safe-Lockable SATA Cable connector

GIGABYTE "Lockable SATA cable connector" compared to traditional SATA cable provides a better and firmer connection with the on-board SATA ports. With lockable SATA cable it greatly reduces the chances of SATA cable disconnection due to vibration or accidentally cable removal, in which prevents data corruption while harddrives or optical-drives are still functioning.

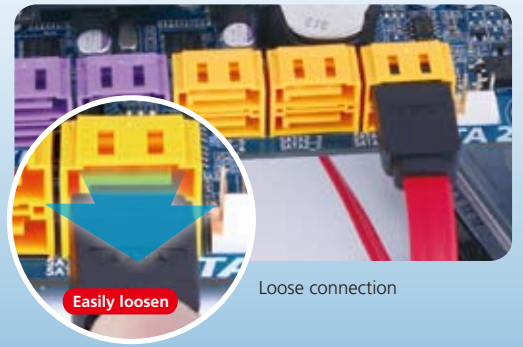
prevent SATA cable loosening

Lockable SATA connector

Traditional SATA connector



Secure connection



Loose connection

GIGABYTE Unique User Friendly Software Utilities

GIGABYTE provides many user friendly and power software utilities to allow end users to make their PC system much easy to install drivers, or upgrade new BIOS …etc.

@BIOS

The first Windows BIOS live update utility. This is a smart BIOS update software. It could help you to download the BIOS from internet and update it. Not like the other BIOS update software, it's a Windows utility. With the help of "@BIOS", BIOS updating is no more than a click.

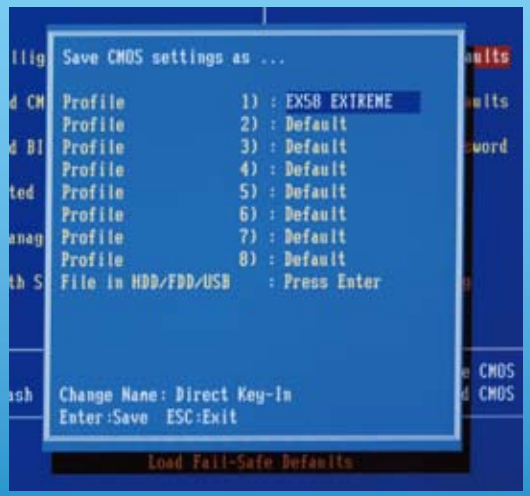
Q-Flash

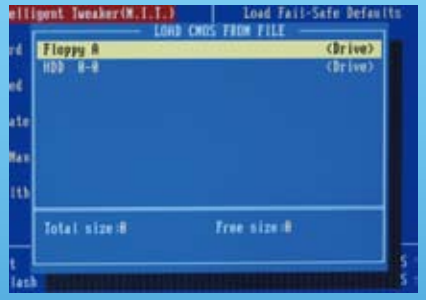
Q-Flash™ is a BIOS flash utility embedded in Flash ROM. With Q-Flash you can update the system BIOS without having to enter operating systems like MS-DOS or Windows first. (Not all motherboards support Q-Flash™, please use @BIOS™ or DOS flash utility to update BIOS if your motherboard does not have Q-Flash™.) With this utility, you can access Q-Flash by either pressing <End> key during the POST or pressing the <F8> key in BIOS setup menu, without the need for entering operating systems.

EZ-Share BIOS

SAVE/LOAD PROFILE FROM EXTRENAL HDD USB DRIVE/FLOPPY

GIGABYTE has made it easier than ever to save, share and load your BIOS settings. Want to overclock your system but don't know a lot about overclocking? Want to share your overclock settings with your friends? Then this setting is for you.



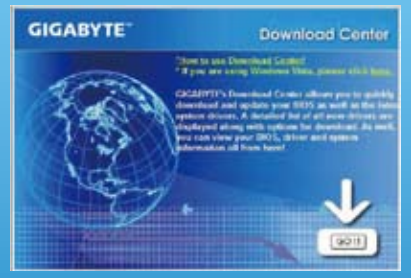


Express Install

GIGABYTE try to make your life easier when you install a new motherboard from us. With express install utility driver disk, you can install all the necessary hardware drivers with one CLICK. It' easy and effective way to install all drivers, if driver need to re-boot, Express install will continue to install rest of drivers without any additional click.

Download Center

Download center is an online utility which allows user have the access to GIGABYTE software server all over the world and search for the latest update even without the knowledge of your system. Updating the system's BIOS, drivers or new software patches had never been easier, It's simple and easy way to keep your PC up-to-date with single click. Check your system's latest update now at : http://www.gigabyte.com.tw/Support/Motherboard/DownloadCenter_List.aspx



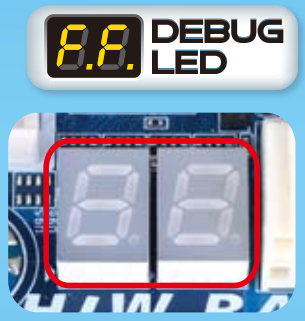
GIGABYTE Unique User Friendly Hardware design

Quick Switch

GIGABYTE quick switch is made for power users who often use and test their motherboard without PC case. GIGABYTE high-end models all comes with on-board Quick Switch which allows power users to turn on, reset, or clear CMOS more easier. All on-board Quick Switch is loaded with LED backlit, so you can see find it in the low light environment.

Debug LED

GIGABYTE adds debug LED on some premium models. Debug LED provides 2 digit display to show your current system condition. With debug LED display, advance users can easily to understand and diagnostic the system condition when their PC won't boot up properly. With debug LED, advance user no longer need to "GUESS" what is wrong or which component is bad when they face troublesome condition.



Diagnostic LED

Hardware Troubleshoot at a Glance

7 Onboard LEDs controlled by the system BIOS indicate if a malfunction is occurring, allowing users to directly see where the problem is occurring, so they can quickly take action.

CPU Memory PCI-E x16/x8 PCI-E x4/x1 PCI SATA IDE

e-SATA bracket kit

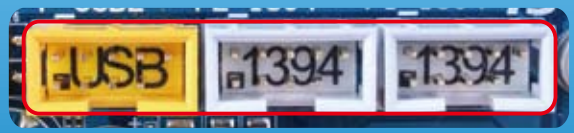
Only available from GIGABYTE, our unique e-SATA bracket kit provides user a easy way to use additional SATA hard disks from out side of their PC chassis. The bracket kit included 3 parts: e-SATA bracket which connect your on-board STAT port, a e-SATA to standard SATA cable to let you connect any SATA HD without e-SATA enclosure, and last, a power ATX to STA power cable to allow you to provide power source from your PC.

Connect SATA HDD, adapter not required

Extra enclosure and adapter required (Extra Cost)

On screen help connector

Many user been having trouble when tried to connect all cables inside of chassis. In many times, user may make mistake which miss insert the wrong cable into wrong connector. Such as use USB bracket and connect its cable into IEEE 1394 connector on board. This will cause failure of your hardware or even burn your device !! To avoid this kind of mistake, GIGABYTE print the clear text label on all I/O connector on the motherboard.

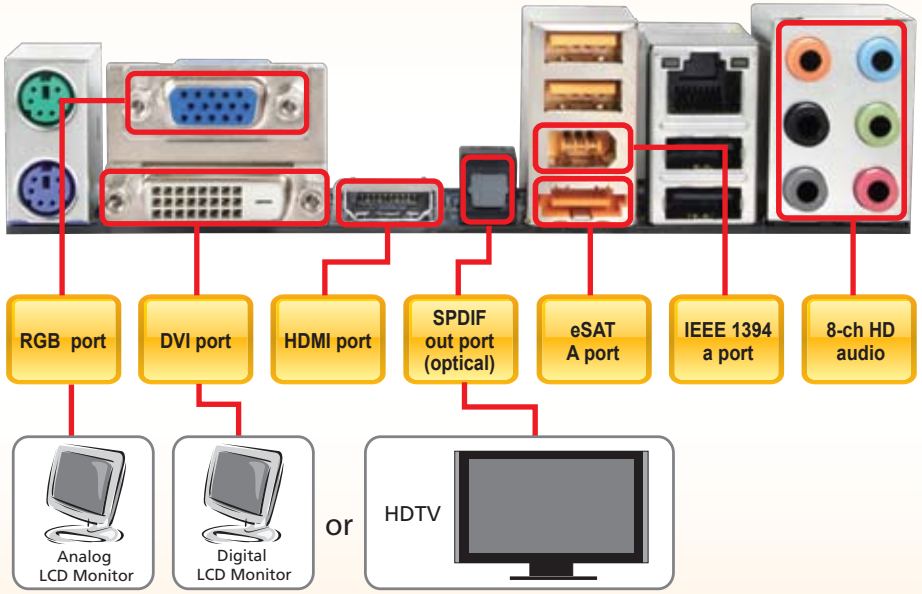


On screen help connector

GIGABYTE Unique User Friendly Hardware design- Back panel

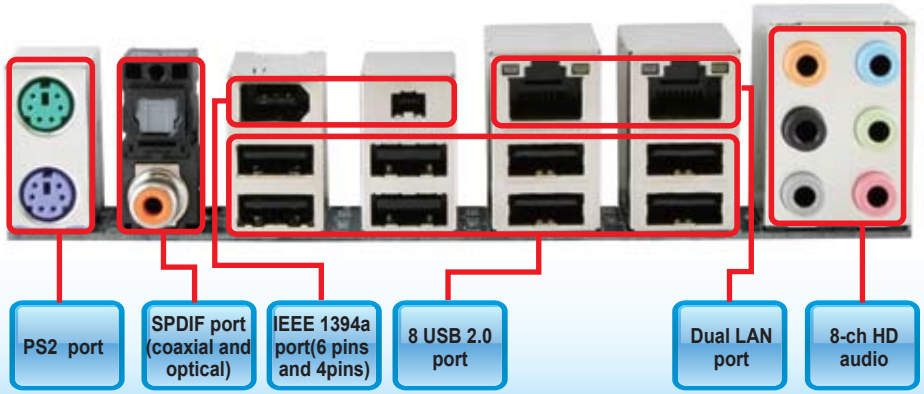
**For Back panel, GIGABYTE always want to give as many as I/O interface a user can get.
Because we understand a rich I/O back panel can help user to avoid many troublesome cable connecting and routing.
In here, we will demonstrate 2 different of back panel design,**

First one is a model with rich multi-media ability motherboard. For those model you will see GIGABYTE give you many different options on Video and audio output capacity. Such as for video out put, we offer you a HDMI, DVI, or traditional VGA outputs. For audio, we offer either high S/N 7.1 analogy output or digital SPDIF output



Another brilliant idea from GIGABYTE, with AUTO video switch, user can enjoy a REAL plug and play ability when using AMD chipset with HDMI output models.

Second model is for non graphic on-board products, so called discrete mother-board. Due to lack of graphic on board, so GIGABYTE will use all back panel I/O space to fill in maximum usage of it. As you see, in below sample, we add 8 USB 2.0 ports, also dual gigabit LAN, IEEE1394 and 7.1 audio output as well. All of them provides you a easy access and connect your external devices



HDMI HIGH DEFINITION MULTIMEDIA INTERFACE

DVI

eSATA

8 Channel AUDIO

HDCP Support GIGABYTE Graphics Accelerator

2 GbE LAN
2 Gigabit LAN

Unprecedented HD Audio experience

Delivers vivid surround sound for music, movies, and games, using two to eight speakers or any set of headphones Designed to automatically deliver the best possible listening experience. All user needs to do is select their output i.e. headphones, 2-channel speakers, 5.1-channel speakers etc.

DTS Connect

DTS Connect functional for the ultimate PC entertainment experience, delivering the finest cinematic surround sound effects.

Blu-ray / HD DVD Full Rate Audio support

Enables high quality Full Rate Lossless Audio for content protected media and support for both Blu-ray and HD DVD formats for an exhilarating home theater entertainment experience.

7.1 + 2 Channel High Definition output

Provides support for 7.1 sound playback, plus 2 channels of Independent stereo sound output (multiple streaming) through the front panel stereo outputs

Excellent Audio Performance

High-performance DAC (Digital-Analog Converter) with 106 dB Signal-to-Noise ratio playback quality, designed especially for Windows Vista Premium PCs

HDMI / DVI interface

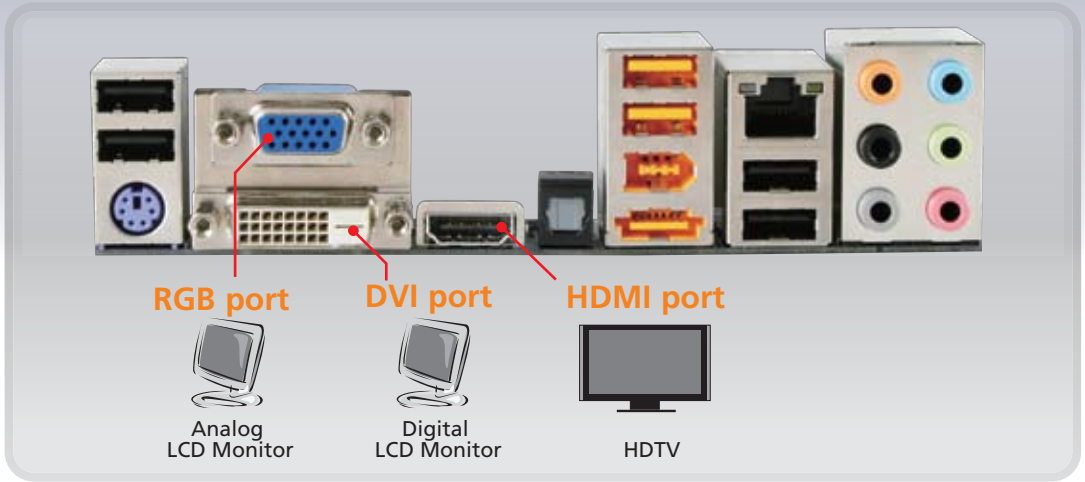
Next Generation Multimedia Interface

HDMI is the latest High-Definition Multimedia Interface able to provide up to 5Gb/s video transmitting bandwidth and 8-channel high quality audio all through a single cable. Able to transmit superior, uncompressed digital video and audio, HDMI ensures the crispest rendering of digital content up to 1080p without the quality losses associated with analog interfaces and their digital-to-analog conversion. In addition, HDMI is compatible with HDCP (High-bandwidth Digital Content Protection), allowing the playback of Blu-ray/HD DVD and other protected media content.

Integrated DVI Interface

DVI (Digital Visual Interface) is a new video interface standard designed for carrying uncompressed digital video data and to maximize the visual quality of digital display devices, such as flat LCD monitors, digital projectors, and so on. In addition, DVI interface is compatible with HDCP (High-bandwidth Digital Content Protection), allowing the playback of Blu-ray/HD DVD and other protected media contents.

GIGABYTE MB rear panel support HDMI / DVI interface



GIGABYTE™

It's time for a CHANGE

Ultra Durable™ 3 Family

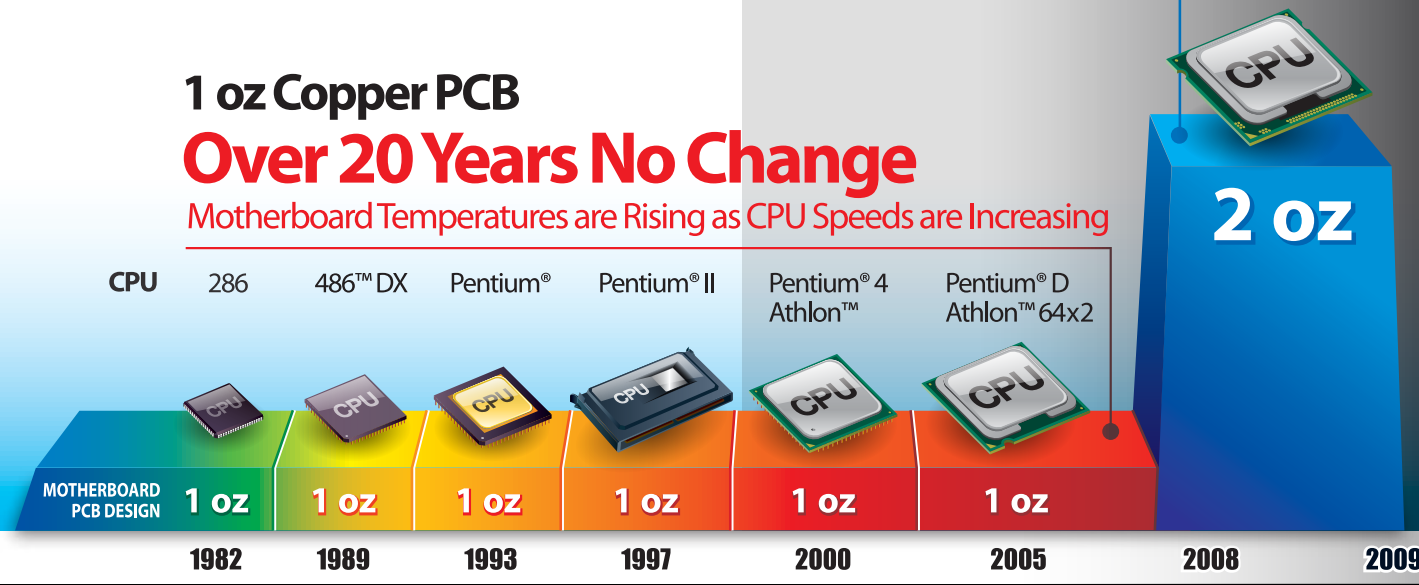
2 oz Copper PCB
Only from GIGABYTE
Continuing to Deliver the Lowest Motherboard Temperatures.

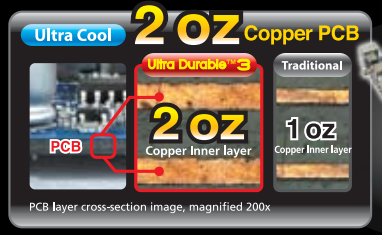
Core™ i7
Core™2 Duo
Phenom™ X4

The benefits of 2 oz Copper PCB design

- Lower Temperature
- 2X Lower Impedance
- Better Overclocking
- Lower EMI
- Better Power Efficiency
- Better ESD Protection

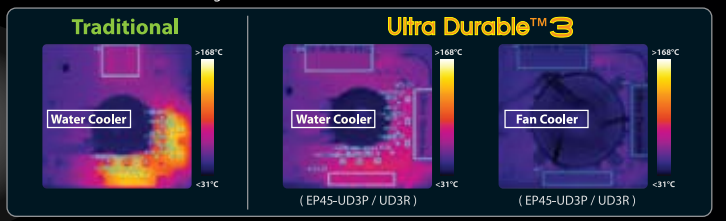
1 oz Copper PCB
Over 20 Years No Change
Motherboard Temperatures are Rising as CPU Speeds are Increasing





PCB (Printed Circuit Board) 2 oz copper PCB = Amount of copper weight in 1 square Foot (12 inch x 12 inch) area PCB is 2 oz.

Infra Red CPU VRM Thermal Diagram



* CPU VRM Temperature measurements under CPU running at 100% loading.

2 oz Copper Inner Layer

	Lower ESR Solid Capacitor	Ferrite Core Choke	Lower Rds(on) MOSFET	2 oz Copper Inner Layer
	✓	✓	✓	✓
	✓	✓	✓	
	✓			

Appendix GIGABYTE Motherboard Specifications

Intel Platform																	AMD Platform					
	X58 Chipset					P45 Chipset								P43 Chipset			790GX Chipset	790X Chipset	780G Chipset		770 Chipset	
Model	GA-EX58-EXTREME	GA-EX58-UD5	GA-EX58-UD4P	GA-EX58-UD4	GA-EX58-UD3R	GA-EP45T-UD3P	GA-EP45T-UD3R	GA-EP45T-UD3LR	GA-EP45-UD3P	GA-EP45-UD3R	GA-EP45-UD3	GA-EP45-UD3LR	GA-EP45-UD3L	GA-EP43-UD3L	GA-EP43-US3L	GA-P43-ES3G	GA-MA790GP-UD4H	GA-MA790X-UD4	GA-MA780GP-UD3H	GA-MA780G-UD3H	GA-MA770-UD3	GA-MA770-US3
Ultra Durable™ 3	★	★	★			★	★	★	★	★	★	★	★									
Ultra Durable™ 3 Classic				★	★									★	★		★	★	★	★	★	★
Dynamic Energy Saver™ Advanced	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★							
Easy Energy Saver™																★	★	★	★	★	★	★
Dynamic 6-Gear Power Phase Switching	★	★	★			★	★		★	★	★											
Dynamic 4-Gear Power Phase Switching				★	★			★				★	★	★	★							
VRD 11.1	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★						
Green Ethernet	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★
Precision OV	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★							
Quick Boost	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★							
EasyTune™ 6	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★
2 GbE LAN with Teaming	★	★				★			★													
Hybrid Silent-Pipe 2	★																					
Silent-Pipe design		★	★	★	★	★	★		★	★							★	★	★			
Ultra TPM			★			★			★													
DualBIOS™	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★
@BIOS	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★
EZ-Share BIOS	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★
Q-Flash	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★
Onboard Quick Switch	★	★	★																			
Debug LED	★	★																				
e-SATA	★	★	★	★		★	★	★	★	★												
Dolby Home Theater®	★	★	★			★	★		★	★	★						★		★	★		
Blu-ray Support	★	★	★			★	★		★	★	★						★	★	★	★		
DVI/HDMI																			★	★		
3 Way CrossFireX™	★	★	★																			
Hybrid CrossFireX™																	★		★	★		
CrossFireX™	★	★	★	★	★	★			★								★	★				
3 Way SLI™	★	★	★																			

Product features may vary by model and region.
Motherboard models may vary based on local distribution.
Please refer to GIGABYTE website for CPU support information.

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