

# M.I.T > CPU Clock Ratio & CPU Host Clock

Intel® Core i7 is a brand new architecture featuring the QPI bus which replaces the FSB bus. So, how does this affect overclocking? The Core i7 processor's frequency is  $Bclk * CPU$  multiplier. For ex. Intel's i7 965 XE, rated 3.2GHz frequency is  $133mhz ( Bclk ) * 24 (cpu ratio)$ .

With GIGABYTE's EX58 Series BIOS, users can adjust **CPU Clock Ratio** and **CPU Host Clock Frequency (Bclk)** in order to change the CPU's total frequency. The higher the number, the higher the CPU Clock and better performance by overclocking.

Under BIOS you can overclock the Host Frequency from 1MHz up to 1200MHz, and the CPU Clock Ratio from 1x up to 44x. Adjusting CPU Host Frequency (Bclk) will also change the QPI Bus, Uncore Frequency & Memory Frequency. Finding the best balance between "CPU Host Frequency, QPI Frequency, Uncore Freq & Memory Frequency will obtain the best overclocking results.



I7 XE 965 (3.2GHz)=  
 $133 * 24$

CPU FREQUENCY=  
CPU HOST  
FREQUENCY ( BCLK )  
\* CPU CLOCK RATIO

OVERCLOCK --- 28x 29x 30x

**CPU Clock Ratio** [ 24x ]  
**CPU Frequency** 3.20GHz ( 133x24 )

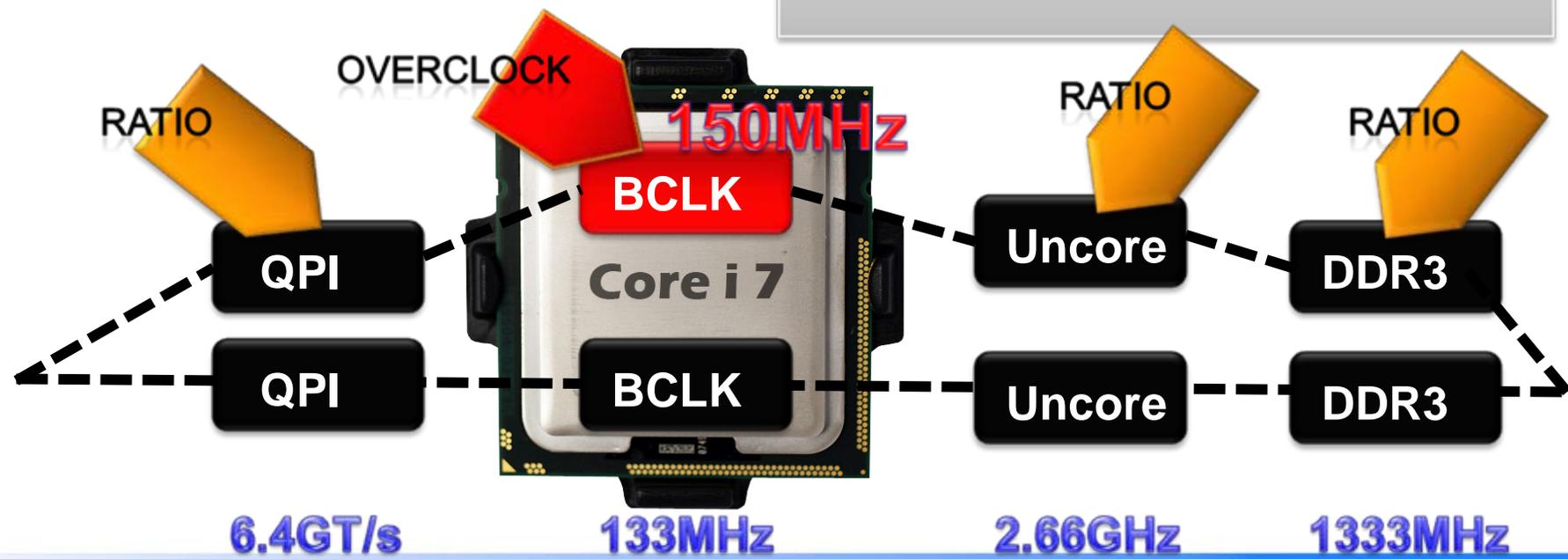
**CPU Host Clock Control** [ Enable ]  
**CPU Host Frequency ( MHz )** 133

OVERCLOCK ---200 201 202

# M.I.T > CPU Clock Ratio & CPU Host Clock

CPU Clock Ratio	[ 24x]
CPU Frequency	3.60GHz ( 150x24)
CPU Host Clock Control	[ Enable]
CPU Host Frequency ( MHz )	150

RAISING CPU HOST FREQUENCY WILL ALSO RAISE QPI / UNCORE / DDR3 FREQUENCY  
IF YOUR ADJUSTMENT OF BCLK CAUSES INSTABILITY, YOU CAN CHANGE TO A LOWER RATIO OF UNCORE / DDR3 / QPI CLOCK



## M.I.T > Advanced CPU Features

M.I.T > Advanced CPU features allows users to turn on features of the Intel Core i7 processor including Turbo Mode ( overclock), power savings and VT technology. GIGABYTE's BIOS also allows users to turn off cores.

CPU Clock Ratio	[ 24x ]
CPU Frequency	3.60GHz ( 150x24)
CPU Turbo Mode	[ Enabled ]
CPU Cores Enabled	[ ALL ]
CPU Multi-Threading	[ Enabled ]
CPU Enhanced Halt ( C1E )	[ Enabled ]
C3/C6/C7 State Support	[ Enabled ]
CPU EIST Function	[ Enabled ]
Virtualization Technology	[ Enabled ]

TURBO MODE, IF THIS FEATURE IS ENABLED, CPU CLOCK WILL BE HIGHER THAN MARKED FREQUENCY.

USERS CAN TURN ON ALL PROCESSOR CORES, OR SELECT TO TURN ON 1/2/3/4 CORES

IF THIS FEATURE IS DISABLED, PROCESSOR SMT WILL BE DISABLED

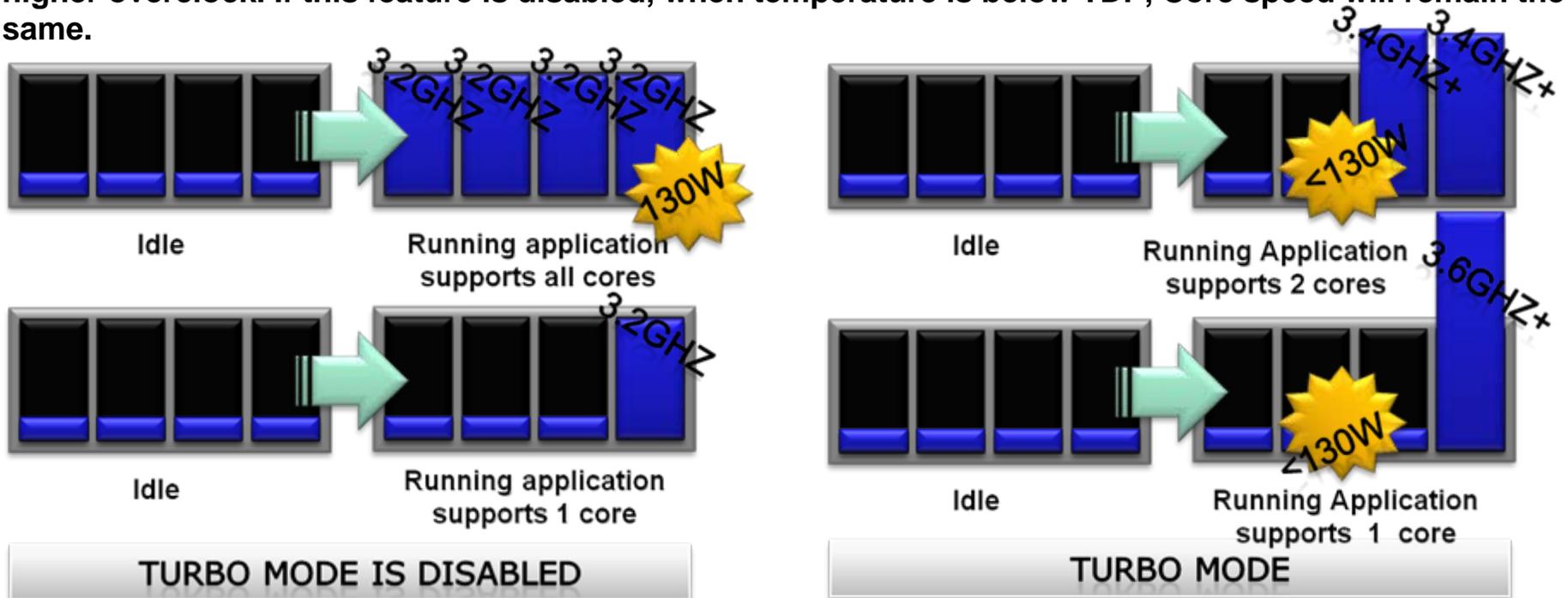
ENABLED THOSE FEATURES TO TURN ON INTEL'S POWER SAVING FUNCTIONS.

ENABLING THIS FEATURE TURNS ON INTEL'S VT FUNCTION.

# Turbo Mode

Bloomfield is Intel's new generation Core architecture with support for VRD 11.1 power savings and Intel's new Turbo Mode feature. If Turbo Mode is enabled in BIOS, when the processor is under loading, a thermal sensor will auto detect the temperature and TDP (Thermal Design Point) of the processor. If temperature is lower than marked TDP (XE 965 130W), then Turbo Mode will auto overclock the active cores based on TDP and processor usage.

If the application needs 2 cores, and temperature is below TDP, Turbo Mode will reallocate the power envelope from the 2 inactive cores and redistribute (overclock) to the active cores. If the application just needs 1 core, then the power envelope from the 3 inactive cores will be reallocated, resulting in an even higher overclock. If this feature is disabled, when temperature is below TDP, Core speed will remain the same.



# M.I.T > Uncore & QPI Features

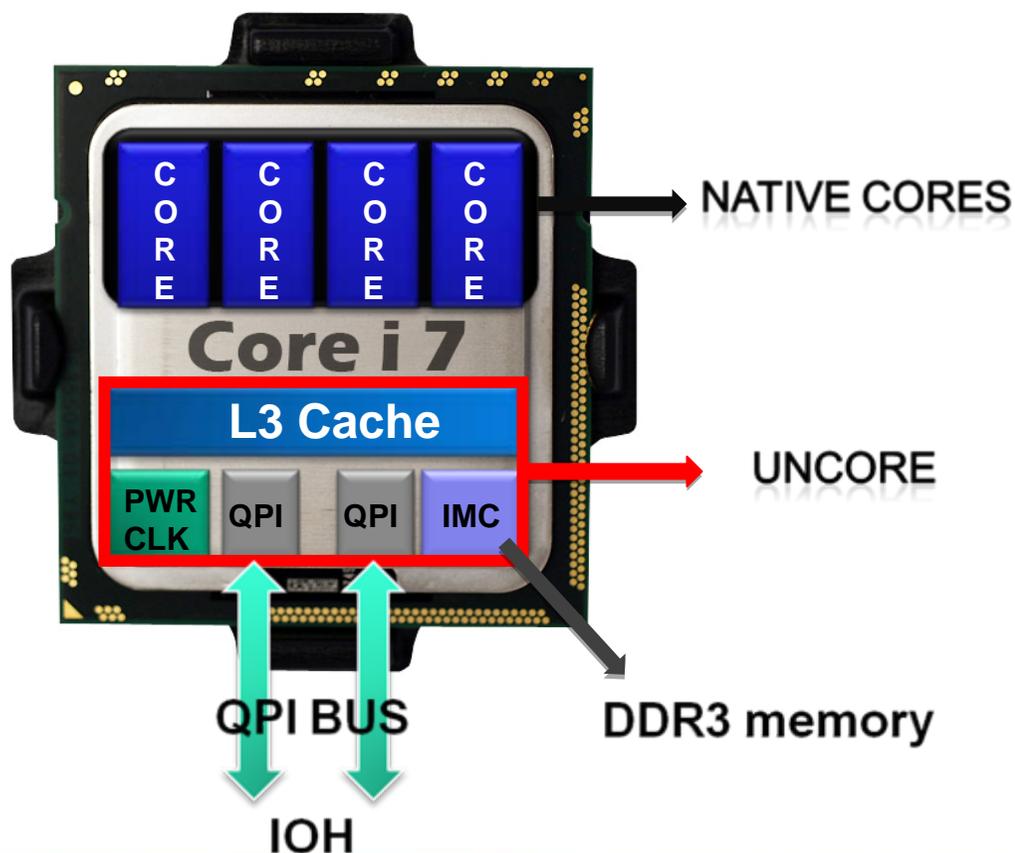
With this BIOS feature, users are able to change the Uncore frequency by manually changing the multiplier. Uncore relates to L3 cache, QPI and IMC. Higher Uncore frequencies will help to improve performance and also will raise Memory Clock and QPI BUS.

Uncore Frequency = BCLK X Uncore Multi, when BCLK is 133MHz and the Multi is x12, Uncore frequency will be 1600mhz. Users can change the multi from x12 to 30x manually.

Uncore Frequency [ Auto ]  
Uncore Frequency(Mhz) 2667

Uncore Frequency

Auto	.....	[ . ]
X12	.....	[ ]
X14	.....	[ ]
X16	.....	[ ]
X18	.....	[ ]
X20	.....	[ ]
X22	.....	[ ]
X24	.....	[ ]



# M.I.T > Uncore & QPI Features > QPI Link Speed

The QPI bus is based on Bclk and QPI multi. When overclocking Bclk, the QPI Bus will also increase. Increasing QPI PLL & VTT voltages will raise QPI frequency during overclocking.

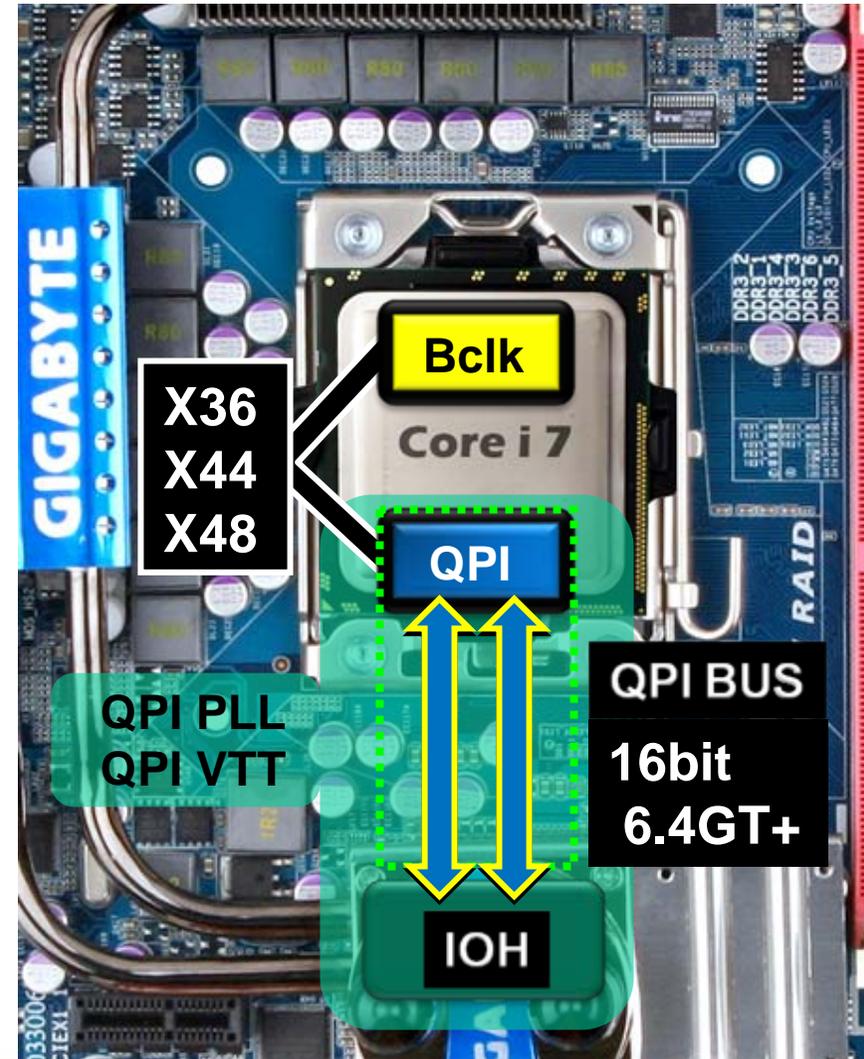
Default Bclk is 133mhz, if the QPI multi is x48, then QPI bus will be 6.3GT/s (133mhz\*48). Therefore, the transport data rate is 12.8GB/s (6.3GT/s \* 16bit/8). If users want to reach higher Bclk, dropping QPI multi to x36 or x44 will help.

QPI Link Speed [ Auto ]  
 QPI Link Speed (MT) 6400

QPI Link Speed

Auto	.....	[ . ]
X36	.....	[ ]
X44	.....	[ ]
X48	.....	[ ]
Slow Mode	...	[ ]

$$\text{QPI BUS} = \text{BCLK} \times \text{QPI LINK SPEED}$$



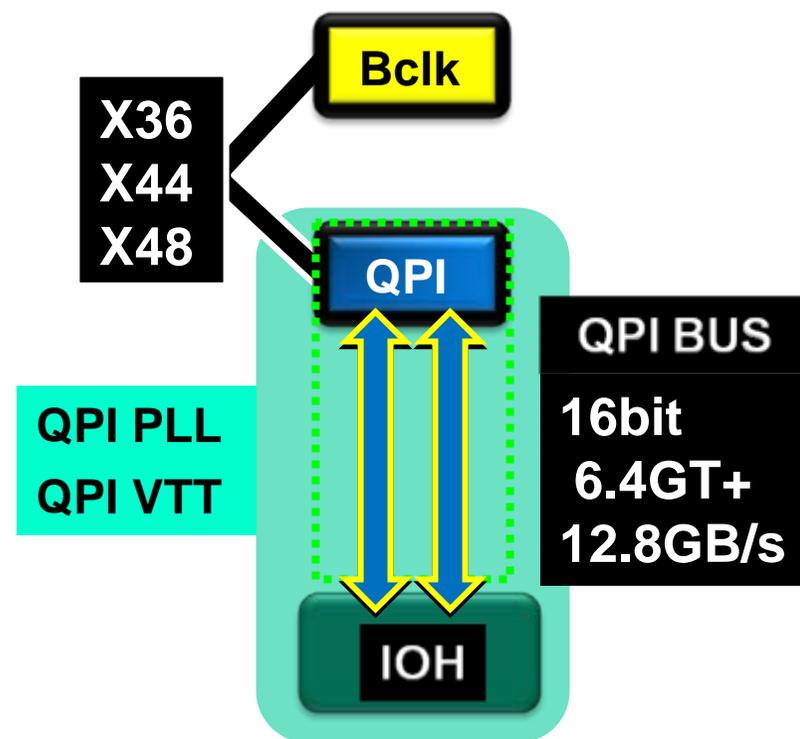
# M.I.T > Uncore & QPI Features > QPI Link Speed

## QPI Bus & BCLK

Change the CPU Host Clock Control in BIOS

BCLK	CPU Ratio	CPU Frequency	QPI Link Speed	QPI Bus
133	24	3.2Ghz	x36	4.8GT/s
150	24	3.6Ghz	x36	5.4GT/s
180	24	4.32Ghz	x36	6.4GT/s
200	20	4Ghz	x36	7.2GT/s
250	16	4Ghz	x36	9.0GT/s
133	24	3.2Ghz	x44	5.85GT/s
150	24	3.6Ghz	x44	6.6GT/s
180	24	4.32Ghz	x44	8.0GT/s
200	20	4Ghz	x44	8.8GT/s
250	16	4Ghz	x44	11.0GT/s
133	24	3.2Ghz	x48	6.4GT/s
150	24	3.6Ghz	x48	7.2GT/s
180	24	4.32Ghz	x48	8.6GT/s
200	20	4Ghz	x48	9.6GT/s
250	16	4Ghz	x48	12GT/s

$$\text{QPI BUS} = \text{BCLK} \times \text{QPI LINK SPEED}$$



# M.I.T > System Memory Multiplier (SPD)

Performance Enhance  
System Memory Multiplier (SPD)  
Memory Frequency (MHz)  
DRAM Timing Selectable (SPD)

[ Turbo ]  
[ 10.0 ]  
1333  
[ Manual ]

## System Memory Multiplier (SPD)

Memory Frequency (MHz)

[ 6.0 ]	[ 8.0 ]	[ 10.0 ]	[ 12.0 ]
800	1066	1333	1600
[ 14.0 ]	[ 16.0 ]	[ 18.0 ]	
1866	2133	2400	

DDR3 SPEED

RATIO

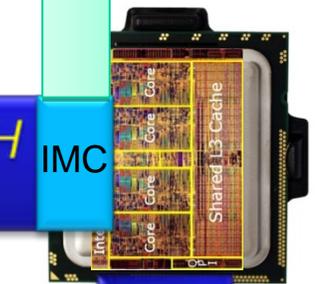
Users can change system Memory Multiplier in BIOS to adjust the best DDR3 frequency. Ratio is from 6 to 18. When overclocking Bclk, DDR3 frequency will also increase.



192 bit 3CH  
25.6GB/s



GIGABYTE EX58  
SYSTEM MEMORY  
MULTIPLIER  
(SOCKET 1366)



QPI 6.4GT/s  
12.8GB/s



X48 + QX9650  
SOCKET 775



FSB  
10.7GB/s



128 bit 2CH  
21.3GB/s



# Divider & Memory calculator

## GIGABYTE EX58 EXTREME Divider & Memory Ratio



select system memory multiplier (SPD) in BIOS will change memroy speed

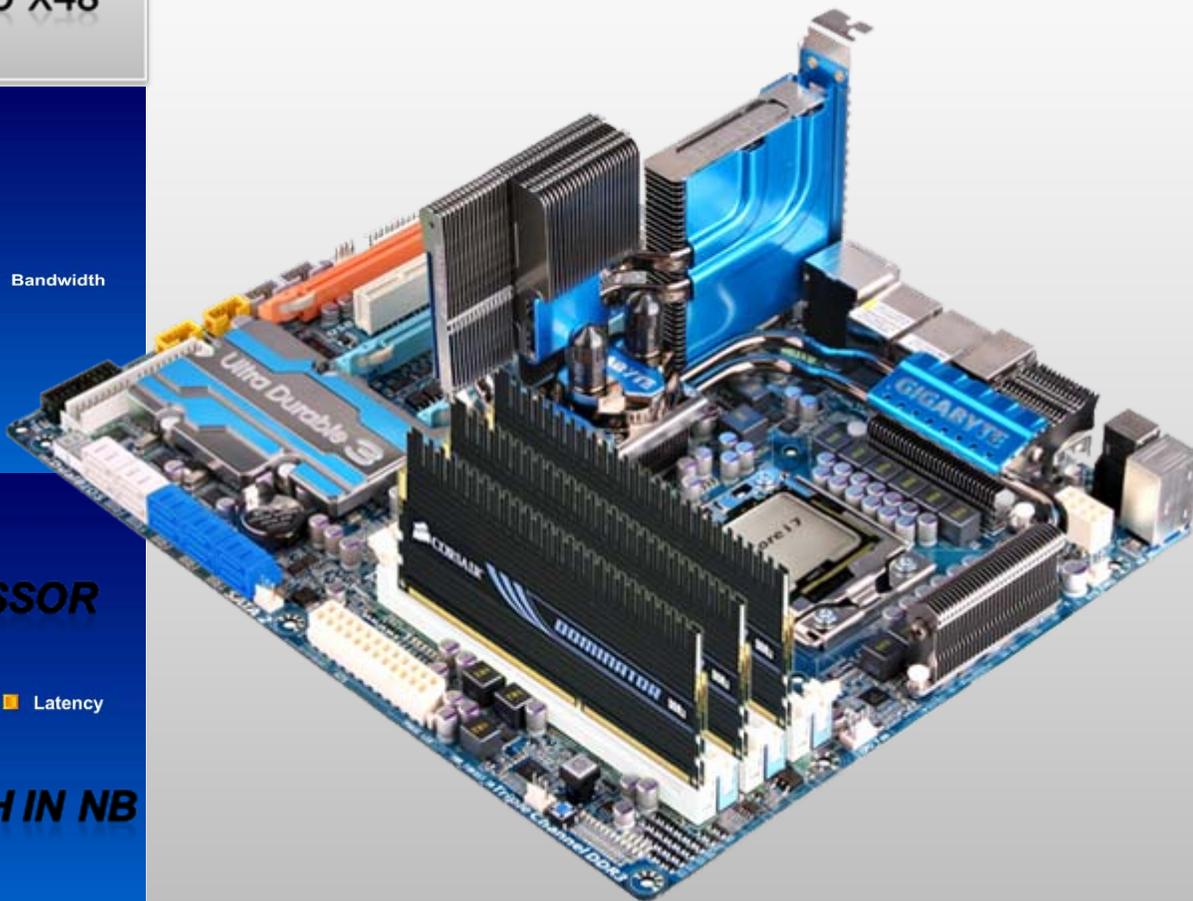
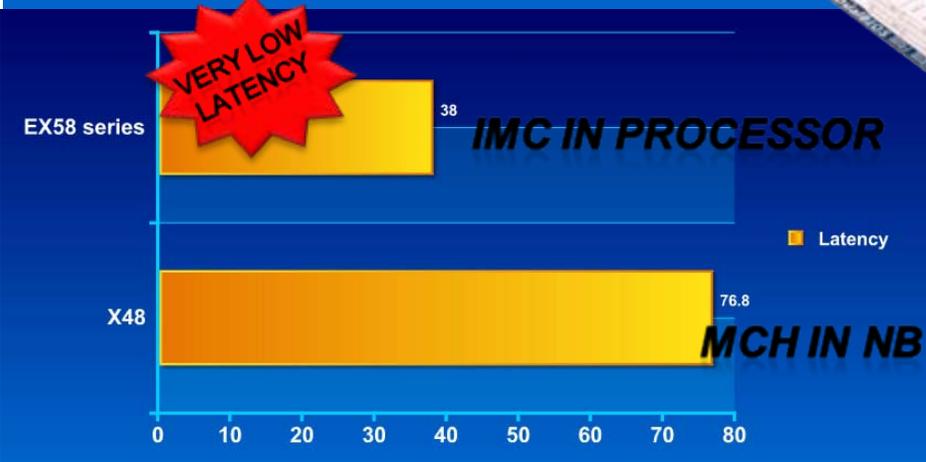
Divider	Bclk	Memory Freq	Effective Speed	Bandwidth(3CH) UP to	Divider	Bclk	Memory Freq	Effective Speed	Bandwidth(3CH) UP to
6	133	400	800	19.2GB/s	14	133	933	1866	44.8GB/s
6	150	450	900	21.6GB/s	14	150	1050	2100	50.4GB/s
6	180	540	1080	25.9GB/s	14	180	1260	2520	60.5GB/s
6	200	600	1200	28.8G/s	14	200	1400	2800	67.2GB/s
6	250	750	1500	36.0GB/s	14	250	1750	3500	84.0GB/s
8	133	533	1066	25.6GB/s	16	133	1066	2133	51.2GB/s
8	150	600	1200	28.8GB/s	16	150	1200	2400	57.6GB/s
8	180	720	1440	34.6GB/s	16	180	1440	2880	69.1GB/s
8	200	800	1600	38.4GB/s	16	200	1600	3200	76.8GB/s
8	250	1000	2000	48.0GB/s	16	250	2000	4000	96.0GB/s
10	133	666	1333	32.0GB/s	18	133	1200	2400	57.6GB/s
10	150	750	1500	36.0GB/s	18	150	1350	2700	64.8GB/s
10	180	900	1800	43.2GB/s	18	180	1620	3240	77.8GB/s
10	200	1000	2000	48.0GB/s	18	200	1800	3600	86.4GB/s
10	250	1250	2500	60.0GB/s	18	250	2250	4500	108GB/s
12	133	800	1600	38.4GB/s					
12	150	900	1800	43.2GB/s					
12	180	1080	2160	51.8GB/s					
12	200	1200	2400	57.6GB/s					
12	250	1500	3000	72GB/s					

# M.I.T > System Memory Multiplier (SPD)

**100%+**  
INCREASE LOWER  
LATENCY TO X48

**50%+**  
INCREASE  
BANDWIDTH TO X48

## EX58-EXTREME



# M.I.T > Advanced Voltage Control

ITEM	CURRENT VOLTAGE	VOLTAGE RANGE	STEP
CPU VCORE	1.07500V	[ 0.50000V-1.90000V STEP: 20MV ]	Increasing this voltage may help overclocking cpu frequency
QPI/VTT VOLTAGE	1.200V	[ 1.082V-2.000V STEP:20MV ]	Increasing this voltage,may help overclocking cpu bclk clock
CPU PLL	1.800V	[ 1.400V-2.500V STEP:20MV]	
MCH/ICH			
PCIE	1.500V	[1.000V-2.14V ,20MV]	Increasing this voltage may help overclocking pcie bus
QPI PLL	1.100V	[ 0.800V-1.600V,20MV]	Increase this voltage may help overclocking QPI clock
IOH CORE	1.100V	[ 1.000V-2.000V , 20MV]	
ICH I/O	1.500V	[1.050V-2.500V,20MV ]	Increase these voltages may help system's stability when overclocking
ICH CORE	1.100V	[0.920V-2.380V,20MV]	
DRAM			
DRAM VOLTAGE	1.500V	[1.300V-2.600V, 20MV]	Increasing these voltages may help overclocking DDR3 clock & lower timings.
DRAM TERMINATION	0.750V	[0.520V-1.225V,25MV]	
CH-A DATA VREF.	0.75V	[0.700V-0.970V,10MV]	
CH-B DATA VREF.	0.75V	[0.700V-0.970V,10MV]	
CH-C DATA VREF.	0.75V	[0.700V-0.970V,10MV]	
CH-A ADDRESS VREF	0.75V	[0.700V-0.970V,10MV]	
CH-B ADDRESS VREF	0.75V	[0.700V-0.970V,10MV]	
CH-C ADDRESS VREF	0.75V	[0.700V-0.970V,10MV]	