



# Intel® Atom™ Processor E6xx Series

Intelligent Systems Group  
Intel Corporation

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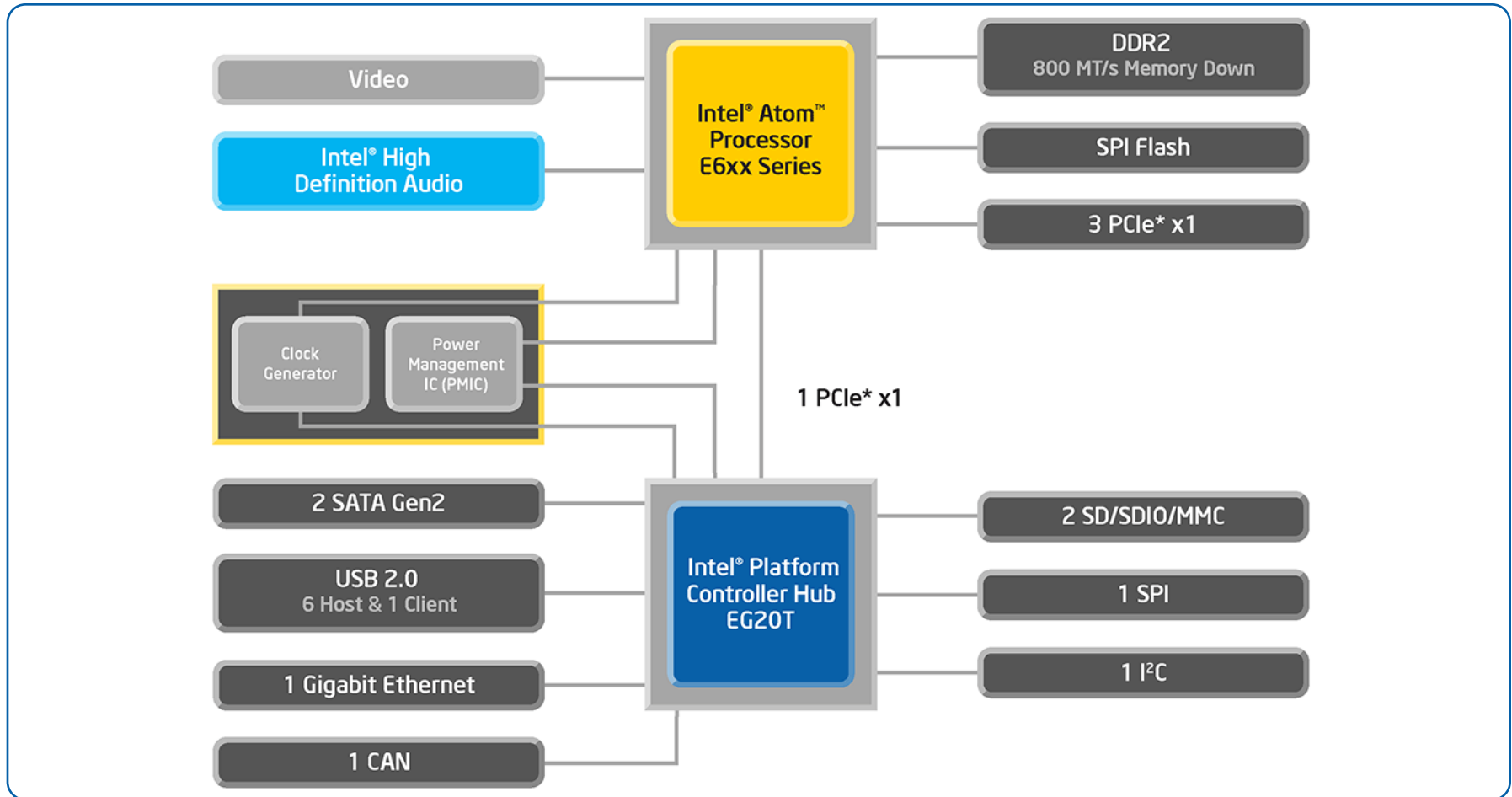
Intel® High Definition Audio (Intel® HD Audio) requires a system with an appropriate Intel chipset and a motherboard with an appropriate codec and the necessary drivers installed. System sound quality will vary depending on actual implementation, controller, codec, drivers and speakers. For more information about Intel HD audio, refer to <http://www.intel.com/>.

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Intel® Virtualization Technology requires a computer system with an enabled Intel® processor, BIOS, virtual machine monitor (VMM) and, for some uses, certain computer system software enabled for it. Functionality, performance or other benefits will vary depending on hardware and software configurations and may require a BIOS update. Software applications may not be compatible with all operating systems. Please check with your application vendor.

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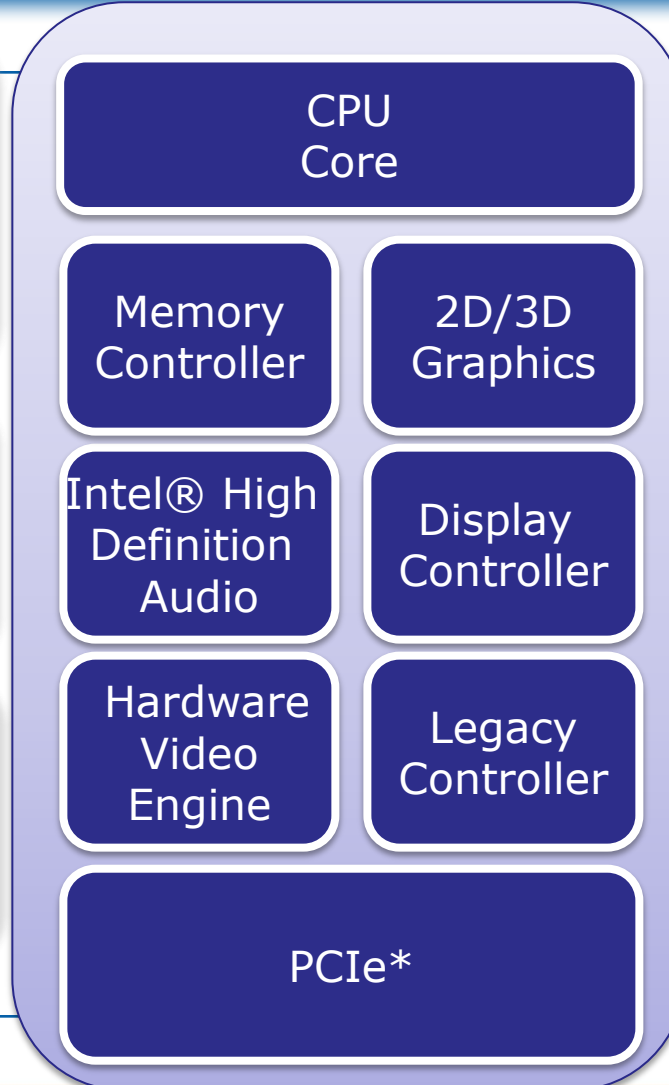
# Intel® Atom™ Processor E6xx Series Platform



- 0.6GHz to 1.6GHz
- 45 nm High K Process
- L1: 24K Data, 32K Instruction; L2: 512KB
- Enhanced Intel SpeedStep® Technology
- Intel® Hyper-Threading Technology and Intel® Virtualization Technology (Intel® VT) for IA-32, enabled

- DDR2 800 MT/s
- 8 devices, up to 2GB
- 32-bit, Single Channel
- Memory down only

- H/W accelerated video encode & decode
- Encode format: MPEG4, H.264
- Decode format: MPEG2, MPEG4, VC1, WMV9, H.264



- Up to 400MHz
- Supports OpenGL\* ES2.0, OpenVG\* 1.1

- 24-bit single channel LVDS and SDVO

- Four x1 lanes (4 ports)
- Interface to IOH or any other PCIe devices



# Intel® Atom™ Processor E6xx Series SKUs

Commercial Temperature	Industrial Temperature	Core Frequency (GHz)	Graphics Frequency (MHz)	Video Encode	Thermal Design Power (W)
Intel® Atom™ Processor E680	Intel® Atom™ Processor E680T	1.6	400	Yes	4.5*
Intel® Atom™ Processor E660	Intel® Atom™ Processor E660T	1.3	400	Yes	3.6
Intel® Atom™ Processor E640	Intel® Atom™ Processor E640T	1.0	320	Yes	3.6
Intel® Atom™ Processor E620	Intel® Atom™ Processor E620T	0.6	320	No	3.3*
*pre-silicon estimates					
Find and compare Intel product information at: <a href="http://ark.intel.com/">http://ark.intel.com/</a>					

# Intel® Atom™ Processor E6xx Series OS Support

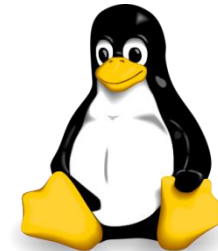
## Microsoft\*

- Windows\* XP SP3
- Windows\* CE 6.0 R3
- Windows\* Embedded Standard 2009
- Windows\* 7 and WES7\*



## Linux\*

- Fedora\* 11 /14
- MeeGo\* 1.2
- Wind River\* Linux\*
- Android 2.3



## Real Time OS

- QNX\* Neutrino\*
- WindRiver\* VxWorks\*

# Video and Graphics

# Microsoft\* OSs on Intel® Atom™ Processor Based Platform

		Windows* XP- XPE		Windows* 7 / WES7*		Windows* CE 6.0		WEC7*	
Platform	Graphics Engine	POR	Graphics Driver(s)	POR	Graphics Driver(s)	POR	Graphics Driver(s)	POR	Graphics Driver(s)
Intel® Atom™ Processor Z510	SGX 535	Yes	Intel® Embedded Graphics Drivers Intel® EMGD	Yes	Intel® EMGD 1.8	Yes	Intel Embedded Graphics Drivers (R2)	No	No
Intel® Atom™ Processor E6xx	SGX 535	Yes	Intel EMGD	Yes	Intel EMGD 1.8	Yes	Intel® EMGD 1.5.3 (R3)	Yes	Intel® EMGD 1.10
Intel® Atom™ Processor N4xx/N5xx	Intel® GMA 3150	Yes	Intel® Embedded Graphics Drivers 10.3.1	Yes	Intel® GMA Q2 2010	Yes	Intel® Embedded Graphics Drivers 10.3.1	Yes	Intel® Embedded Graphics Drivers 10.4.1
Intel® Atom™ Processor Z6xx	SGX 535	No	N/A	Yes	Intel® GMA600	No	N/A	No	N/A
Intel® Atom™ Processor N2000/D2000	SGX 545	Yes	Intel® EMGD 1.12	Yes	Intel GMA Dec 2011	No	N/A	Yes	Intel® EMGD 1.12



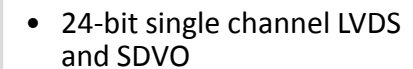
# Intel® Atom™ Processor Based Platform

		Fedora*		MeeGo*	
Platform	Graphics Engine	POR	Graphics Driver(s)	POR	Graphics Driver(s)
Intel® Atom™ Processor Z510	SGX 535	F11 F11/F14	Intel® EMGD 1.0, 1.5 Intel® EMGD 1.5.2	V1.0 V1.1	Intel EMGD 1.0, 1.5 Intel EMGD 1.5.2 IEGD 10.3.1 (Moblin 2.1)
Intel® Atom™ Processor E6xx	SGX 535	F11 F11/F14 F14	Intel EMGD 1.5 Intel® EMGD 1.5.2/1.6 Intel® EGMD 1.8/1.10	V1.0 V1.1 V1.2	Intel EMGD 1.5 Intel EMGD 1.5.2 Intel EMGD 1.6/1.8/1.10
Intel® Atom™ Processor E6xx	Intel® GMA 3150	F10	Intel® Embedded Graphics Drivers 10.3.1	V1.1	Intel® GMA
Intel® Atom™ Processor Z6xx	SGX 535	N/A	N/A	V1.1	OTC
Intel® Atom™ Processor N2000/D2000	SGX 545	N/A	N/A	Yes	OTC

Intel® EMGD: Intel® Embedded Media and Graphics Driver (Intel® EMGD)  
Intel® GMA: Intel® Graphics Media Accelerator (Intel® GMA)



\*Other names and brands may be claimed as the property of others



# Video and Graphic feature

## Intel® Atom™ Processor E6xx Series Provides:



- Ultra Low Power Integrated 3D Graphics Core
- Full HD HW Video Encode/Decode Engine, support in dedicated hardware H.264, MPEG1/2/4, VC1/WMV9 High Definition decode.

Offloads one of the most demanding tasks off of Intel® Atom™ processor core.

*Intel recommends developers to choose a media player that takes advantage of H/W accelerated video decode*

# Intel® Atom™ Processor Based Platform Graphics Features

Graphics Feature	Benefit
<b>Hardware-Based Video Acceleration</b> Supports full hardware acceleration of the following video compression standards: <ul style="list-style-type: none"> <li>• H.264 Baseline profile L3, Main profile L4.1, High profile L4.1</li> <li>• MPEG2 Main profile high level</li> <li>• MPEG4 Simple profile L3, Advanced simple profile L5</li> <li>• VC1 all profiles up to L3</li> <li>• WMV9 Simple profile Medium level</li> <li>• WMV9 Main profile High level</li> </ul>	Eliminates the need for SW codecs, thus offloading the CPU
<b>Support for 32 bit floating point operations</b>	High image quality
<b>UMA Memory architecture</b>	Reduced board space and cost
<b>Display Support</b> <ul style="list-style-type: none"> <li>• Dual Display Pipe with rotation support</li> <li>• LVDS + SDVO for display output</li> <li>• Supports Extended Desktop or Clone Mode</li> </ul>	Robust display controller offers flexibility



# LVDS

Differential interface used for local flat panels

Supports 18-bit or 24-bit color is supported

Max pixel clock of 80MHz

Panel timings must be supported by vBIOS

- Intel® Embedded Media and Graphics Driver (Intel® EMGD) tool exists to modify timings if not already supported by default vBIOS



# SDVO

Single SDVO channel

Use for any external display

- HDMI/DVI, Analog TV, VGA/CRT, LVDS

Up to 160 MHz pixel clock supported

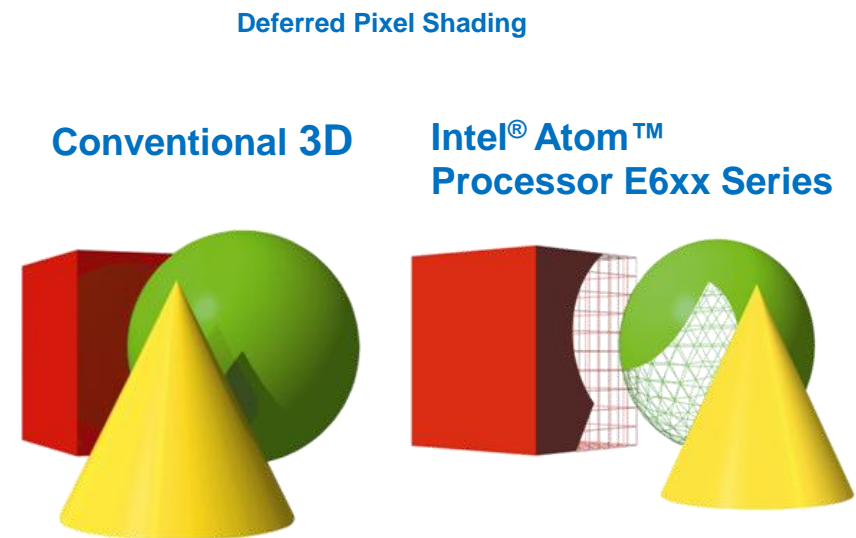
- Equates to 1280x1024 @ 85Hz
- Interface can physically go faster
- Includes 1920x1080p @60Hz (reduced blanking)

# Intel® Atom™ Processor E6XX Series Graphics Accelerator

## Deferred Pixel Shading

### Key Features

- Flexible Programmable Architecture
  - Shader based technology
  - 3D Graphics
  - 2D and advanced 2D Graphics
  - Video decode support
  - Image processing
- Deferred Pixel Shading
- High Performance
- Low Power
- Industry standard tool support
- Comprehensive OS/API support



# Tiling Benefits - Highest Image Quality

## Internal True Color Processing-32bit Floating points

The **Intel® Atom™ processor E6xx series** graphics core uses its on-chip tile buffer to process pixels at arbitrary pixel precisions up to 32 floating point even though the external frame buffer can be as low as 16-bit



Blending using 16bpp  
Distinct visible artefacts



Blending using 32bpp  
Internal True Color  
More accurate visual results



# References

Intel AppUp<sup>SM</sup> Developer Program <http://appdeveloper.intel.com/>

Intel® Atom™ Microarchitecture

<http://www.intel.com/technology/atom/microarchitecture.htm>

Intel® Atom™ Processor Web Site

<http://www.intel.com/products/processor/atom/index.htm>

Intel® Embedded Design Center <http://edc.intel.com/>

**Intel Press book: "Break Away with Intel® Atom™ Processors"**

[http://www.intel.com/intelpress/sum\\_ms2a.htm](http://www.intel.com/intelpress/sum_ms2a.htm)

Intel Product Information <http://ark.intel.com/>

Intel® 64 and IA-32 Architectures Software Developer's Manuals

<http://developer.intel.com/products/processor/manuals/>

Intel® Software Network <http://software.intel.com>

Intel Tools for Intel Atom Processors

<http://software.intel.com/en-us/articles/intel-tools-for-intel-atom-processors/>

N.A. Software\* Conversion tools

<http://www.nasoftware.co.uk/home/index.php/products/conversion-tools>

Klocwork Insight\* code productivity tools <http://www.klocwork.com/products/insight/>

Video Encoding Accelerator Solution for Intel® Atom™ Processor E6xx Series

<http://download.intel.com/design/intarch/PAPERS/324328.pdf>

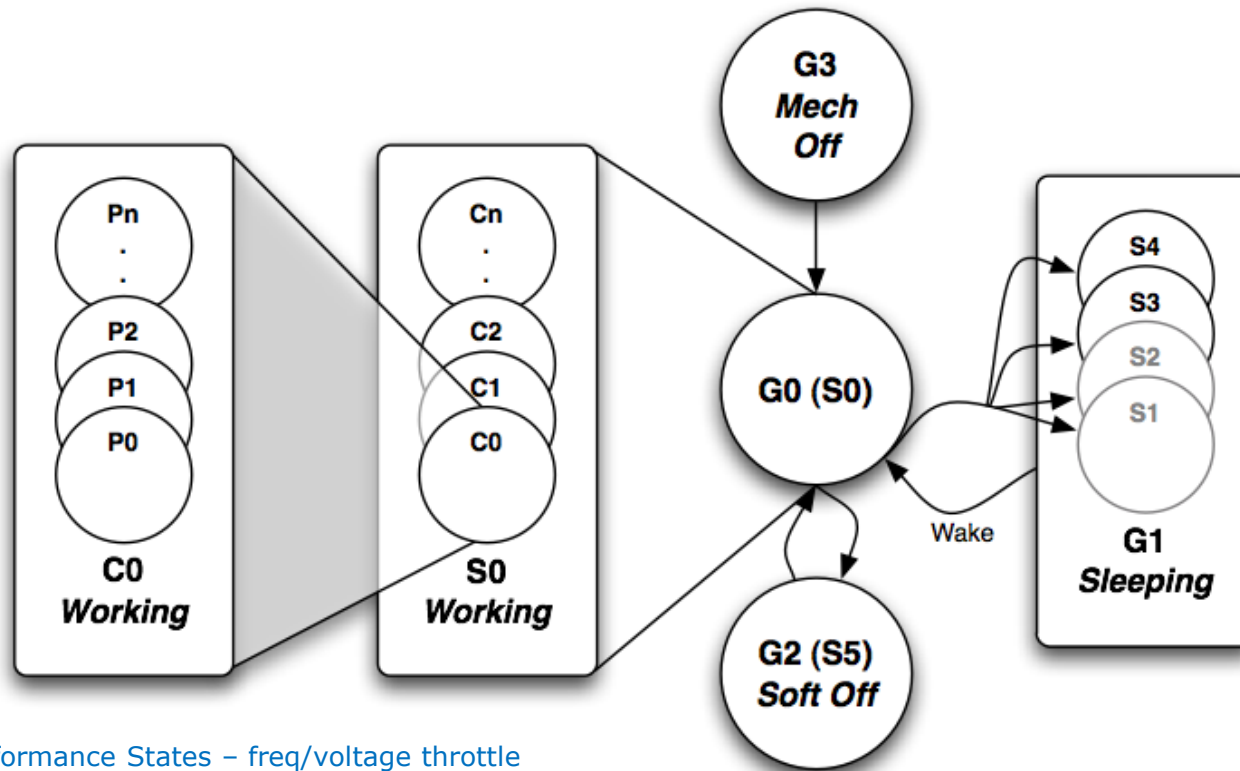
***Thank you!***

***Questions?***

# Backup

# Platform Power

# ACPI System Power States



**P-states** = Performance States – freq/voltage throttle

**C-states** = CPU power states –allows idle deep power saving

**S-states** = Sleep states – system power states

**G-states** = Global states – global power states

**T-states** = Thermal states – changes clock duty cycle

**D-states** = Device states – peripheral device power states

# System Sleep States – sub of G-states

**G0**  
Full-On

**S0**

**Full On:** Processor Operating. Individual devices may be shut down or be placed into lower power states to save power.

**G1**  
Sleeping

**S3**

**Suspend-to-Ram:** System context maintained in DRAM. Power shut off to non-critical circuits. Memory is retained and refreshes continue. All clocks are stopped except RTC clock.

**S4**

**Suspend-to-Disk:** System context maintained on disk. All power is then shut off except for that needed to resume.

**G2**  
Soft-Off

**S5**

**Soft Off:** System context not maintained. All power is shut off except for that needed to restart. A full boot is required when waking.

**G3**  
Mechanical-Off

Power is completely removed from the system except for the RTC. Hardware context is not retained. No "Wake" events are possible.

# ACPI Global Power States

Global System State	Sleep State	Software Runs?	Latency	Power consumption	OS restart required?	Exit state electronically/mechanically
G0 (working)	S0	Yes	0	High	No	Elec.
G1 (sleeping)	S1-S4	No	Increasing with sleep state	Lower	No	Elec.
G2 (soft off)	S5	No	Long	~0	Yes	Elec.
G3 (mech. off)	n/a	No	Long	RTC battery only	Yes	Mech. (big red on/off button!)

- Applies to entire system; visible to user
- Instant-on PCs would use G0 and G1 almost exclusively

# ACPI Big Picture

Global	Sleep	CPU	Processor State	System Clocks	Description
G0	S0	C0	Full On	On	Full On
G0	S0	C1	Auto-Halt		Auto Halt
G0	S0	C2	Stop Grant		Stop Grant
G0	S0	C3	Deep Sleep		Deep Sleep, CPU clock halted
G0	S0	C4	Deeper Sleep		CPU voltage lowered
G0	S0	C6	Deep Power Down		CPU cached flushed and disabled
G1	S3	power off	Off	Off, except SUSCLK and RTC clocks	Suspend to RAM
G1	S4			Off, except RTC clocks	Suspend to Disk
G2	S5				Soft Off
G3	NA			power off	Hard Off