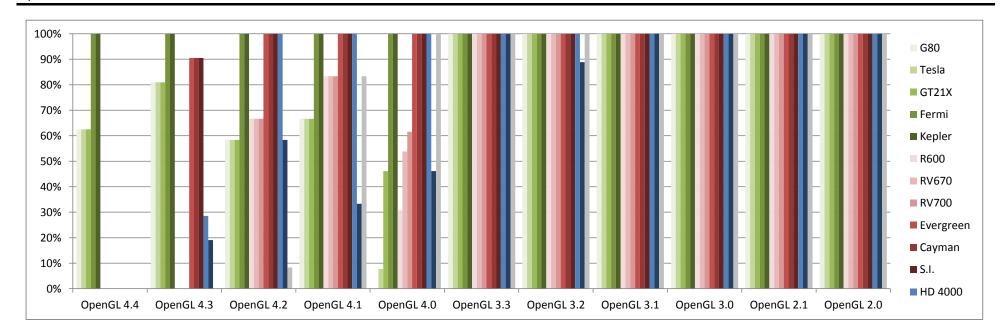
## **OpenGL hardware matrix**

Extensions exposed by OpenGL implementations

September 2013, G-Truc Creation

Vendor	NVIDIA								AMD			Intel	Mesa	Apple	
Drivers version		;	326.98 b	eta					13.4			10.18.10.3277	git-9.2	10.9.pre	
Release date		:	28/08/2	013				24	/04/2013			30/08/2013	30/03/2013	14/03/2013	
Platforms	G80	Tesla	GT21X	Fermi	Kepler	R600	RV670	RV700	Evergreen	Cayman	S.I.	HD 4000	Mesa	MacOS X	
OpenGL 4.4	63%	63%	63%	100%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
OpenGL 4.3	81%	81%	81%	100%	100%	0%	0%	0%	90%	90%	90%	29%	19%	0%	
OpenGL 4.2	58%	58%	58%	100%	100%	67%	67%	67%	100%	100%	100%	100%	58%	8%	
OpenGL 4.1	67%	67%	67%	100%	100%	83%	83%	83%	100%	100%	100%	100%	33%	83%	
OpenGL 4.0	0%	8%	46%	100%	100%	31%	54%	62%	100%	100%	100%	100%	46%	100%	
OpenGL 3.3	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
OpenGL 3.2	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	89%	100%	
OpenGL 3.1	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
OpenGL 3.0	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
OpenGL 2.1	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
OpenGL 2.0	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	



## Nomenclature:

## Supported

Not supported

Support added from previous report

OpenGL Extensions	G80	Tesla	GT21X	Fermi	Kepler	R600	RV670	RV700	Evergreen	Cayman	S.I.	HD 4000	Mesa	MacOS X
KHR texture compression astc ldr	Χ	Χ	Χ	Х	Χ	Χ	Х	Χ	Χ	Χ	Χ	Х	Х	Х
ARB robustness	V	V	V	V	V	Χ	Χ	Χ	Χ	Χ	Χ	X	X	X
ARB sparse texture	Χ	Χ	Χ	V	V	X	Χ	Χ	Χ	Χ	Χ	X	X	X
ARB shading language include	V	V	V	V	V	Χ	Χ	Χ	Χ	Χ	Χ	X	Χ	V
ARB shader stencil export	Χ	Χ	Χ	Χ	Χ	Χ	Χ	Χ	V	V	V	X	X	X
ARB shader group vote	X	Χ	Χ	V	V	X	Χ	Χ	Χ	Χ	Χ	X	X	X
ARB shader draw parameters	X	Χ	Χ	V	V	X	Χ	Χ	Χ	Χ	Χ	X	Χ	X
ARB seamless cubemap per texture	Χ	Χ	Χ	Χ	V	X	Χ	Χ	Χ	Χ	Χ	X	Χ	X
ARB robustness isolation	V	V	V	V	V	Χ	Χ	Χ	Χ	Χ	Χ	X	Χ	X
ARB robust buffer access behavior	V	V	V	V	V	Χ	Χ	Χ	Χ	Χ	Χ	X	X	X
ARB debug output	V	V	V	V	V	V	V	V	V	V	V	X	V	X
ARB indirect parameters	Χ	Χ	Χ	V	V	X	Χ	Χ	Χ	Χ	Χ	X	Χ	X
ARB compute variable group size	Χ	Χ	Χ	V	V	Χ	Χ	Χ	Χ	Χ	Χ	X	X	X
ARB compatibility	V	V	V	V	V	V	V	V	V	V	V	V	X	X
ARB cl event	Χ	Χ	Χ	Χ	Χ	Χ	Χ	Χ	Χ	Χ	Χ	X	Χ	X
ARB bindless texture	X	Χ	Χ	Χ	V	X	Χ	Χ	Χ	Χ	Χ	X	X	X
EXT texture sRGB decode	Χ	Χ	Χ	V	V	Χ	Χ	Χ	V	V	V	V	X	V
EXT texture mirror clamp	V	V	V	V	V	V	V	V	V	V	V	X	Χ	V
EXT framebuffer multisample blit scaled	Χ	Χ	Χ	V	V	X	Χ	Χ	Χ	Χ	Χ	X	Χ	V
EXT direct state access	V	V	V	V	V	V	V	V	V	V	V	X	Χ	X
EXT depth bounds test	V	V	V	V	V	Χ	Χ	Χ	Χ	Χ	V	X	Χ	V
NV vertex buffer unified memory	V	V	V	V	V	Χ	Χ	Χ	Χ	Χ	Χ	X	Χ	X
NV texture multisample	V	V	V	V	V	Χ	Χ	Χ	Χ	Χ	Χ	X	Χ	X
NV texture barrier	V	V	V	V	V	V	V	V	V	V	V	X	Χ	V
NV shader buffer store	Χ	Χ	Χ	V	V	Χ	Χ	Χ	Χ	Χ	Χ	X	X	X
NV shader buffer load	V	V	V	V	V	X	X	Χ	X	Χ	Χ	X	Χ	X
NV shader atomic float	X	Χ	Χ	V	V	Χ	Χ	Χ	Χ	X	Χ	X	X	X

NV multisample coverage	V	V	V	V	V	Χ	Χ	Χ	Χ	Χ	Χ	Χ	X	X	
NV explicit multisample	V	V	V	V	V	V	V	V	V	V	V	Χ	Х	Х	
NV copy image	V	V	V	V	V	V	V	V	٧	V	V	Χ	Χ	Х	
NV bindless texture	Χ	Χ	Χ	Х	V	Х	Х	X	Χ	Χ	Χ	Χ	Х	Х	
NV bindless multi draw indirect	Χ	Χ	Χ	V	V	Х	X	X	Χ	Χ	Χ	Χ	Χ	Х	
NV blend equation advanced	Χ	Χ	Χ	V	V	Х	Х	Х	Χ	Χ	Χ	Χ	Χ	Х	
INTEL map texture	Χ	Χ	Χ	X	Χ	Χ	Χ	X	Χ	Χ	Χ	V	X	X	
ATI texture mirror once	V	V	V	V	V	V	V	V	V	V	V	Х	Х	V	
AMD vertex shader viewport index	Χ	Χ	Χ	Χ	Χ	Χ	X	X	V	V	V	Χ	Χ	X	
AMD vertex shader layer	Χ	Χ	Χ	Х	Х	Х	Х	Х	V	V	V	Х	Χ	Х	
AMD transform feedback3 lines triangles	X	Χ	Χ	X	Χ	Χ	X	X	X	V	V	Χ	Χ	Х	
AMD stencil operation extended	Χ	Χ	Χ	Χ	Χ	Χ	X	Х	Χ	Х	V	Χ	Χ	Х	
AMD sparse texture	X	Χ	Χ	X	Χ	Χ	X	X	Χ	Χ	V	Χ	Χ	Х	
AMD shader trinary minmax	Χ	Χ	Χ	Χ	Χ	Χ	X	X	Χ	Χ	V	Χ	Χ	Х	
AMD seamless cubemap per texture	Χ	Χ	Χ	Χ	V	Χ	Χ	V	V	V	V	Χ	Χ	X	
AMD sample positions	Χ	Χ	Χ	Χ	Χ	V	V	V	V	V	V	Χ	Χ	Х	
AMD query buffer object	Χ	Χ	Χ	Χ	Χ	X	Χ	X	V	V	٧	Χ	Χ	X	
AMD pinned memory	Χ	Χ	Χ	Χ	Χ	V	V	V	V	V	V	Χ	Χ	X	
AMD blend minmax factor	X	Χ	Χ	X	Χ	X	X	X	Χ	V	V	Χ	Χ	Х	
Support	37%	37%	37%	61%	70%	22%	22%	24%	359	% 39%	48%	,	7%	2%	15%
OpenGL 4.4	G80	Tesla	GT21X	Fermi	Kepler	R600	RV670	RV700	Evergreen	Cayman	S.I.	HD 4000	Mesa	MacOS 2	Χ
ARB buffer storage	Χ	Χ	Χ	V	V	Х	X	X	Χ	Х	Χ	Χ	Х	Х	
ARB clear texture	X	Χ	Χ	V	V	X	Χ	X	X	Χ	Χ	Χ	Χ	X	
ARB enhanced layouts	٧	V	V	V	V	X	X	X	Χ	Χ	Χ	Χ	Χ	Х	
ARB multi bind	٧	V	V	V	V	X	X	X	Χ	Χ	Χ	Χ	Χ	Х	
ARB query buffer object	Χ	Χ	Χ	V	V	X	Χ	X	Χ	Χ	Χ	Χ	Χ	Х	
ARB texture mirror clamp to edge	٧	V	V	V	V	X	X	Χ	Χ	Х	Χ	Χ	Χ	X	
ARB texture stencil8	V	V	V	V	V	Χ	X	Χ	Χ	Χ	Χ	Χ	Χ	Х	
ARB vertex type 10f 11f 11f rev	٧	V	V	V	V	Χ	X	Χ	Χ	Χ	Χ	Χ	Χ	Χ	
Support	81%	81%	81%	100%	100%	0%	0%	0%	909	% 90%	90%	,	29%	19%	0%
·															

G80 Tesla GT21X Fermi Kepler R600 RV670 RV700 Evergreen Cayman S.I.

HD 4000

Mesa

MacOS X

OpenGL 4.3

GL ARB vertex attrib binding	V	V	V	V	V	Χ	Χ	Χ	Χ	X	Х	Χ	Х	Χ	
GL ARB texture view	V	V	V	V	V	Χ	Х	Χ	Χ	X	Х	Х	Х	Х	
GL ARB texture storage multisample	V	V	V	V	V	Χ	Χ	X	V	V	V	X	X	X	
GL ARB texture query levels	V	V	V	V	V	Χ	Χ	X	V	V	V	X	X	X	
GL ARB texture buffer range	V	V	V	V	V	Χ	Χ	X	V	V	V	X	V	X	
GL ARB stencil texturing	V	V	V	V	V	Χ	Χ	X	V	V	V	X	X	X	
GL ARB shader storage buffer object	X	Χ	Χ	V	V	Χ	Χ	X	V	V	V	V	X	X	
GL ARB shader image size	X	Χ	Χ	V	V	Χ	Χ	X	V	V	V	X	X	X	
GL ARB program interface query	V	V	V	V	V	Χ	Χ	X	V	V	V	V	X	X	
GL ARB multi draw indirect	X	Χ	Χ	V	V	Χ	Χ	X	V	V	V	V	X	X	
GL ARB invalidate subdata	V	V	V	V	V	Χ	Χ	X	V	V	V	X	V	X	
GL ARB internalformat query2	V	V	V	V	V	Χ	Χ	X	V	V	V	X	X	X	
GL ARB framebuffer no attachments	V	V	V	V	V	Χ	Χ	X	V	V	V	X	X	X	
GL ARB fragment layer viewport	V	V	V	V	V	Х	Χ	X	V	V	V	X	X	X	
GL ARB explicit uniform location	V	V	V	V	V	Χ	Χ	X	V	V	V	X	X	X	
GL ARB ES3 compatibility	V	V	V	V	V	Х	Χ	X	V	V	V	X	V	X	
GL KHR debug	V	V	V	V	V	Χ	Χ	X	V	V	V	V	V	X	
GL ARB copy image	V	V	V	V	V	Χ	Χ	X	V	V	V	X	X	X	
GL ARB compute shader	X	Χ	Χ	V	V	Χ	Χ	X	V	V	V	V	X	X	
GL ARB clear buffer object	V	V	V	V	V	Х	Χ	X	V	V	V	X	X	X	
GL ARB arrays of arrays	V	V	V	V	V	Χ	Χ	Χ	V	V	V	V	X	Χ	
Support	81%	81%	81	% 100%	100%	0%	0%	0%		90%	90% 90	%	29%	19%	0%

OpenGL 4.2	G80	Tesla	GT21X	Fermi	Kepler	R600	RV670	RV700	Evergreen	Cayman	S.I.	HD 4000	Mesa	MacOS X
GL ARB transform feedback instanced	Χ	Χ	Χ	V	V	٧	V	V	V	V	٧	V	V	X
GL ARB texture compression bptc	X	X	Χ	V	V	Χ	X	Χ	V	V	V	V	X	X
GL ARB texture storage	V	V	V	V	V	٧	V	V	V	V	V	V	V	X
GL ARB shading language packing	V	V	V	V	V	V	V	V	V	V	V	V	V	X
GL ARB shading language 420pack	V	V	V	V	V	٧	V	V	V	V	V	V	Х	X
GL ARB shader image load store	X	Χ	X	V	V	Χ	X	Χ	V	V	V	V	X	X
GL ARB shader atomic counters	X	Χ	Χ	V	V	Χ	Χ	Χ	V	V	V	V	Х	X
GL ARB map buffer alignment	V	V	V	V	V	V	V	V	V	V	V	V	V	X
GL ARB internalformat query	V	V	V	V	V	V	V	V	V	V	V	V	V	V

GL ARB conservative depth	V	V	V	V	V	V	V	V	V	V	V	V	V	Χ
GL ARB compressed texture pixel storage	V	V	V	V	V	V	V	V	V	V	V	V	Х	X
GL ARB base instance	Χ	Χ	Х	V	V	Χ	Χ	Χ	V	V	V	V	V	X
Support	58%	58%	58%	100%	100%	67%	67%	67%		100%	100% 100%	4 100%	58%	8%
OpenGL 4.1	G80	Tesla	GT21X	Fermi	Kepler	R600	RV670	RV700	Evergr	een Cayr	nan S.I.	HD 4000	Mesa	MacOS X
GL ARB viewport array	V	V	V	V	V	٧	V	V	V	V	V	V	Х	V
GL ARB vertex attrib 64bit	Χ	Χ	Х	V	V	Χ	X	Χ	V	V	V	V	Х	V
GL ARB shader precision	Χ	Χ	Χ	V	V	V	V	V	V	V	V	V	Х	V
GL ARB separate shader objects	V	V	V	V	V	V	V	V	V	V	V	V	X	V
GL ARB get program binary	V	V	V	V	V	V	V	V	V	V	V	V	V	X
GL ARB ES2 compatibility	V	V	V	V	V	V	V	V	V	V	V	V	V	V
Support	67%	67%	67%	100%	100%	83%	83%	83%		100%	100% 100%	<b>100</b> %	33%	83%
OpenGL 4.0	G80	Tesla	GT21X	Fermi	Kepler	R600	RV670	RV700	Evergr	een Cayr	man S.I.	HD 4000	Mesa	MacOS X
GL ARB transform feedback3	Χ	Χ	Χ	V	V	V	V	V	V	V	V	V	V	V
GL ARB transform feedback2	Χ	V	V	V	V	V	V	V	V	V	V	V	V	V
GL ARB texture query lod	Χ	Χ	V	V	V	Χ	Χ	V	V	V	V	V	V	V
GL ARB texture gather	Χ	Χ	V	V	V		•	V	V	V	V	V	X	V
GL ARB texture cube map array	Χ	Χ	V	V	V	Χ	V	V	V	V	V	V	V	V
GL ARB texture buffer object rgb32	Χ	Χ	X	V	V	V	V	V	V	V	V	V	V	V
GL ARB tessellation shader	Χ	Χ	X	V	V	X	X	Χ	V	V	V	V	Х	V
GL ARB shader subroutine	Χ	Χ	Χ	V	V		• •	X	V	V	V	V	X	V
GL ARB sample shading	Χ	Χ	V	V	V	Χ	V	V	V	V	V	V	X	V
GL ARB gpu shader5	Χ	Χ	X	V	V	Χ	X	X	V	V	V	V	X	V
GL ARB gpu shader fp64	X	Χ	X	V	V	X	X	X	V	V	V	V	Х	V
GL ARB draw indirect	Χ	Χ	X		V	X	X	X	V	V	V	V	Х	V
GL ARB draw buffers blend	Χ	Χ	V	V	V	V	V	V	V	V	V	V	V	V
Support	0%	8%	46%	100%	100%	31%	54%	62%		100%	100% 100%	100%	46%	100%
OpenGL 3.3	G80	Tesla	GT21X	Fermi	Kepler	R600	RV670	RV700	Evergr	een Cayr	nan S.I.	HD 4000	Mesa	MacOS X
GL ARB vertex type 2 10 10 10 rev	V	V	V		V	V	V	V	V	V	V	V	V	V
GL ARB timer query	V	V	V	V	V	V	V	V	V	V	V	V	V	V

GL ARB texture swizzle	V	V	V	V	V	V	V	V	V	V	V	V	V	V	
GL ARB texture rgb10 a2ui	V	V	V	V	V	V	V	V	V	V	V	V	V	V	
GL ARB shader bit encoding	V	V	V	V	V	V	V	V	V	V	V	V	V	V	
GL ARB sampler objects	V	V	V	V	V	V	V	V	V	V	V	V	V	V	
GL ARB occlusion query2	V	V	V	V	V	V	V	V	V	V	V	V	V	V	
GL ARB instanced arrays	V	V	V	V	V	V	V	V	V	V	V	V	V	V	
GL ARB explicit attrib location	V	V	V	V	V	V	V	V	V	V	V	V	V	V	
GL ARB blend func extended	V	V	V	V	V	V	V	V	V	V	V	V	V	V	
Support	1009	6 100%	% 100%	100%	100%	100%	100%	100%	5 10	0% 1009	6 100 <sup>9</sup>	6 10	00%	100%	100%
• •															
OpenGL 3.2	G80	Tesla	GT21X	Fermi	Kepler	R600	RV670	RV700	Evergree	n Cayman	S.I.	HD 4000	Mesa	MacO	S X
GL ARB vertex array bgra	V	V	V	V	V	٧	V	V	V	V	V	V	V	V	
GL ARB texture multisample	V	V	V	V	V	٧	V	V	V	V	V	V	V	V	
GL ARB sync	V	V	V	V	V	٧	V	V	V	V	V	V	V	V	
GL ARB seamless cube map	V	V	V	V	V	V	V	V	V	V	V	V	V	V	
GL ARB provoking vertex	V	V	V	V	V	٧	V	V	V	V	V	V	V	V	
GL ARB geometry shader4	V	V	V	V	V	V	V	V	V	V	V	V	X	V	
GL ARB fragment coord conventions	V	V	V	V	V	V	V	V	V	V	V	V	V	V	
GL ARB depth clamp	V	V	V	V	V	V	V	V	V	V	V	V	V	V	
GL ARB draw elements base vertex	V	V	V	V	V	V	V	V	V	V	V	V	V	V	
Support	100%	6 100%	% 100%	100%	100%	100%	100%	100%	5 10	0% 100%	6 100°	6 10	00%	89%	100%
OpenGL 3.1	G80	Tesla	GT21X	Fermi	Kepler	R600	RV670	RV700	Evergree	n Cayman	S.I.	HD 4000	Mesa	MacO	S X
GL ARB uniform buffer object	V	V	V	V	V	V	V	V	V	V	V	V	V	V	
GL EXT texture snorm	V	V	V	V	V	V	V	V	V	V	V	V	V	V	
GL ARB texture rectangle	V	V	V	V	V	V	V	V	V	V	V	V	V	V	
GL ARB texture buffer object	V	V	V	V	V	V	V	V	V	V	V	V	V	V	
GL NV primitive restart	V	V	V	V	V	V	V	V	V	V	V	V	V	V	
GL ARB draw instanced	V	V	V	V	V	V	V	V	V	V	V	V	V	V	
GL ARB copy buffer	V	V	V	V	V	V	V	V	V	V	V	V	V	V	
Support	100%	6 100%	% 100%	100%	100%	100%	100%	100%	10	0% 100%	% 100 <sub>9</sub>	<b>6</b> 10	00%	100%	100%
OpenGL 3.0	G80	Tesla	GT21X	Fermi	Kepler	R600	RV670	RV700	Evergree	n Cayman	S.I.	HD 4000	Mesa	MacO	SX

GL ARB vertex array object	V	V	V	V	٧	V	V	V	V	V	V	V	V	V	
GL EXT transform feedback	V	V	V	V	V	٧	V	V	V	V	V	V	V	V	
GL ARB texture rg	V	V	V	V	V	V	V	V	V	V	V	V	V	V	
GL EXT texture shared exponent	V	V	V	V	V	V	V	V	V	V	V	V	V	V	
GL EXT texture integer	V	V	V	V	V	V	V	V	٧	V	V	V	V	V	
GL ARB texture float	V	V	V	V	V	V	V	V	V	V	V	V	V	V	
GL ARB texture compression rgtc	V	V	V	V	V	V	V	V	V	V	V	V	V	V	
GL EXT texture array	V	V	V	V	V	V	V	V	V	V	V	V	V	V	
GL EXT packed float	V	V	V	V	V	V	V	V	V	V	V	V	V	V	
GL EXT packed depth stencil	V	V	V	V	V	V	V	V	V	V	V	V	V	V	
GL ARB map buffer range	V	V	V	V	V	V	V	V	V	V	V	V	V	V	
GL ARB half float vertex	V	V	V	V	V	V	V	V	V	V	V	V	V	V	
GL ARB half float pixel	V	V	V	V	V	V	V	V	V	V	V	V	V	V	
GL EXT gpu shader4	V	V	V	V	V	V	V	V	V	V	V	V	V	V	
GL ARB framebuffer sRGB	V	V	V	V	V	V	V	V	V	V	V	V	V	V	
GL ARB framebuffer object	V	V	V	V	V	V	V	V	V	V	V	V	V	V	
GL ARB depth buffer float	V	V	V	V	V	V	V	V	V	V	V	V	V	V	
GL NV conditional render	V	V	V	V	V	V	V	V	V	V	V	V	V	V	
GL ARB color buffer float	V	V	V	V	V	V	V	V	V	V	V	V	V	V	
Support	100%	6 100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	1	100%	100%	100%
OpenGL 2.1	G80	Tesla	GT21X	Fermi	Kepler	R600	RV670	RV700	Evergreen	Cayman	S.I.	HD 4000	Mesa	MacOS	X
GL EXT texture sRGB	V	V	V	V	V	V	V	V	V	V	V	V	V	V	
GL ARB pixel buffer object	V	V	V	V	V	V	V	V	V	V	V	V	V	V	
Support	100%	6 100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	1	100%	100%	100%
OpenGL 2.0	G80	Tesla	GT21X	Fermi	Kepler	R600	RV670	RV700	Evergreen	Cayman	S.I.	HD 4000	Mesa	MacOS	X
GL ARB vertex shader	V	V	V	V	V	V	V	V	V	V	V	V	V	V	
GL ARB texture non power of two	V	V	V	V	V	V	V	V	V	V	V	V	V	V	
GL EXT stencil two side	V	V	V	V	V	V	V	V	V	V	V	V	V	V	

V

GL ARB shader objects

GL ARB point sprite

GL ARB fragment shader	V	V	V	V	V	V	V	V V	V		V	V	V	V	
GL ARB draw buffers	V	V	V	V	V	٧	V	V V	V		V	V	V	V	
GL EXT blend equation separate	V	V	V	V	V	V	V	V V	V		V	V	V	V	
Support	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%		100%	100%	100%