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ISSUE 220 / AU REVOIR, GOPHER

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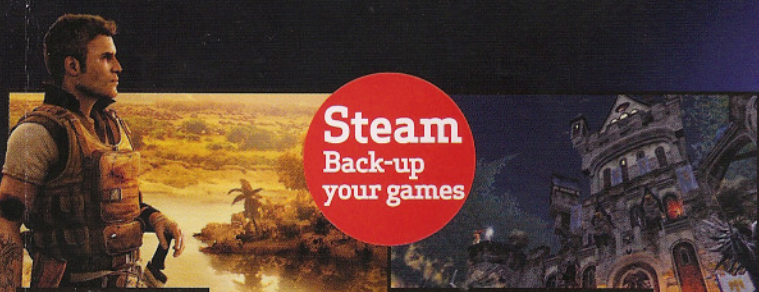
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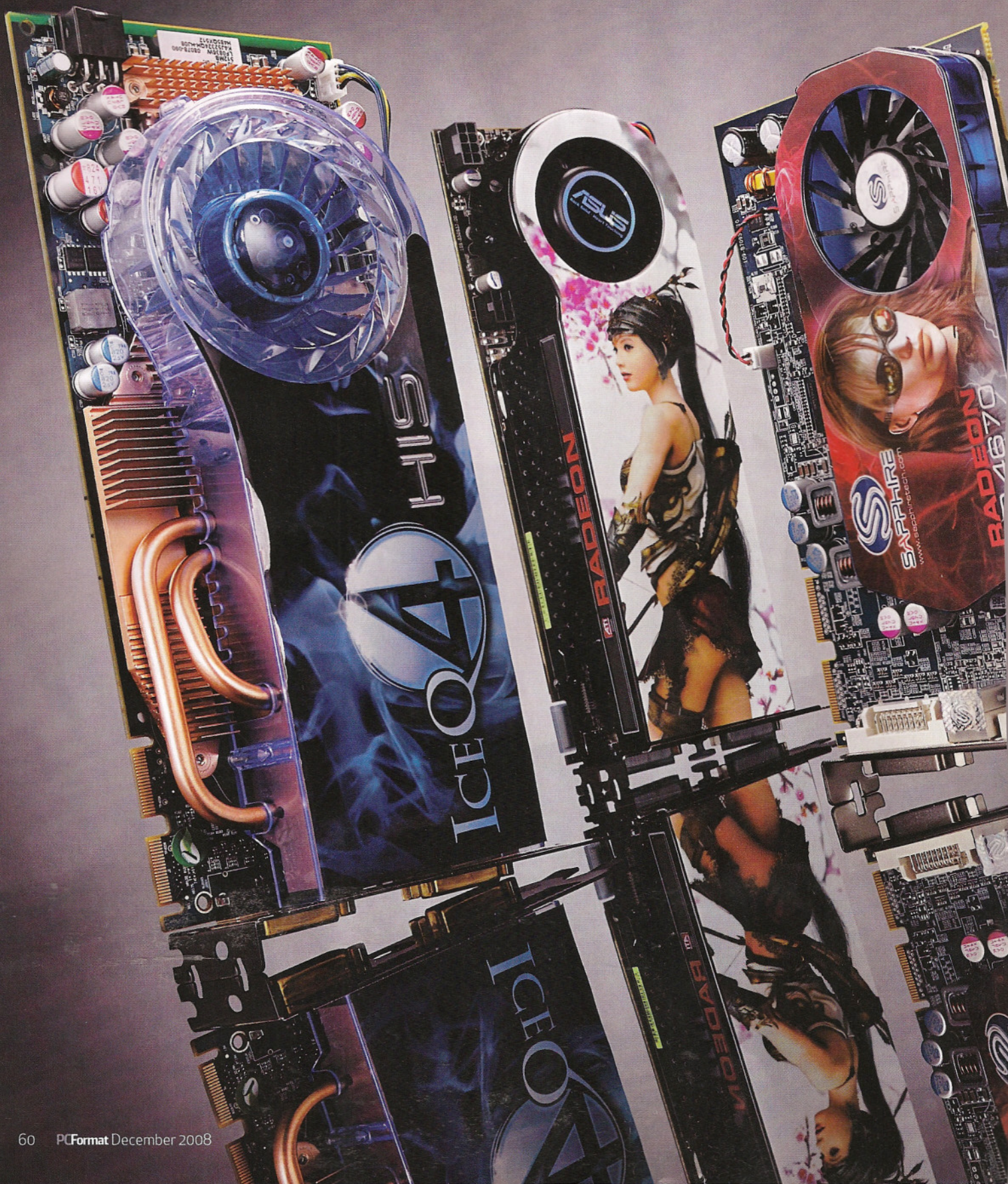
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# Wired Supertest





# BARGAINOUS GPU BOARDS

AMD dropped a bomb this summer with the Radeon HD 4800 series. As Jeremy Laird discovered, it's flattened graphics card prices across the board

**M**ore performance for less cash. That's standard operating procedure for PC gubbins. Year after year, the big chip companies crush transistors down to ever more nanoscopic proportions. Then, in turn, they can stuff more features and grunt into smaller and therefore cheaper chips. So, they sell more hardware. We get more muscle for our money. And everyone goes home happy.

This is particularly true of graphics cards right now. Things really took off with the arrival of AMD's Radeon HD 4800 series GPUs earlier this summer. Instead of attempting the usual and trying to produce the outright fastest GPU in the world, AMD decided to deliver the best bang for buck possible. The Radeon HD 4870 may not have been quite as quick as NVIDIA's beastly GeForce GTX 280. But it wasn't far off. More importantly, at around £200, it was miles cheaper.

So much cheaper, in fact, it was like dropping a bomb on the entire graphics market. Not only did the 4800 decimate everything in its immediate pricing vicinity. The ripples from the impact spread far and wide: just about every card on the market had to be repositioned at a lower price point. This may not have done much for NVIDIA's margins, but it does mean there has never been a better time to buy a graphics card. Of course, you've heard us say that before. Currently, though it's extra-special-ly-times-one-hundred true.

## Budget bustin'

The latest member of this budget busting trend is AMD's new Radeon HD 4600 series. Strictly speaking, it's a mid-range GPU that threads the gap between transistor-heavy flagship GPUs and all those largely irrelevant (if you care about 3D performance) entry-level chips. As it happens, the mid-range segment is struggling to maintain its relevancy with gaming enthusiasts right now. AMD's own 4800 series has sent the prices of what you may call upper-

medium graphics boards tumbling. You can now buy such a great graphics card for around £80 that anything less looks like a false economy.

What's more, in the GeForce 9600 GT, NVIDIA produced an exceptional mid-range chip. There's always been something preternaturally quick about the 9600 GT. It somehow manages to punch above its 64-shader weight. Not that 64 shaders is anything to sniff at, but the 9600 GT gets a lot closer to its bigger, 100-plus shader core Nvidia brothers than you may expect.

Part of the explanation is NVIDIA's welcome decision to give the 9600 GT a proper 256-bit memory bus. In the past, mid-range chipsets have taken it in the ghoulies, bandwidth wise, in the form of a narrow 128-bit bus. But with 256 bits of bus width, the 9600 GT has the memory pipes of a much more expensive chip.

Returning to the new Radeon HD 4600, it packs no fewer than 320 stream processing units. That's getting on for three times as many as its progenitor, the disappointing Radeon HD 3600.

"THIS SUMMER AMD'S RADEON HD 4800 SERIES DECIMATED EVERYTHING IN ITS IMMEDIATE PRICING VICINITY"



## How we tested

NVIDIA reckons GPUs will one day become unbeatable general-purpose number crunchers. For now, it's all about graphics, graphics, graphics. This month, our benchmarking has gone frag happy with a trio of popular shooters: *Call of Duty 4* provides a good metric of performance in current 3D

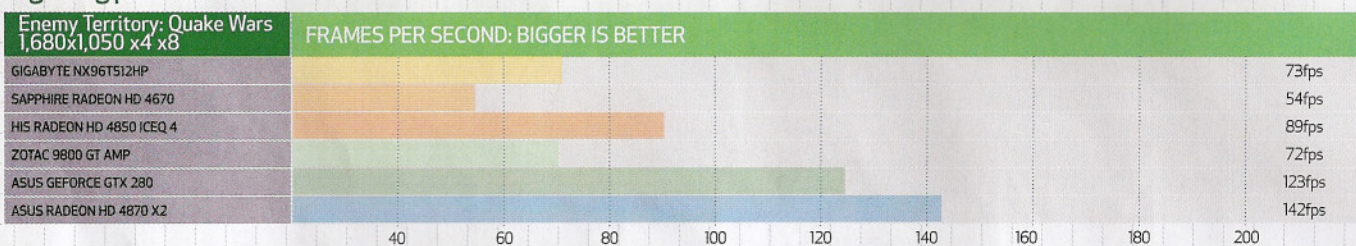
engines. *Crysis* is, of course, the GPU-killer par excellence. It's still the most graphically demanding game in town. And just for fun, we've thrown in *Enemy Territory: Quake Wars*. It's the ultimate manifestation of the Doom 3 engine and features OpenGL technology. Natch.

## Technical analysis

Making sense of an awful lot of numbers

PSU	Price	Web	Chipset	Core clockspeed	Memory (effective data rate)	Form factor (length, slot width)	Power connectors
GIGABYTE NX96T512HP	£83	<a href="http://uk.giga-byte.com">uk.giga-byte.com</a>	NVIDIA GeForce 9600 GT	720MHz (1,800MHz shaders)	512MB GDDR3 2GHz	Medium, dual-slot	Single six-pin PCI-E
SAPPHIRE RADEON HD 4670	£58	<a href="http://www.sapphiretech.com">www.sapphiretech.com</a>	AMD Radeon HD 4670	750MHz	512MB GDDR3 2GHz	Short, single-slot	None
HIS RADEON HD 4850 ICEQ 4	£131	<a href="http://www.hisdigital.com">www.hisdigital.com</a>	AMD Radeon HD 4850	685MHz	512MB GDDR3 2.2GHz	Long, dual-slot	Single six-pin PCI-E
ZOTAC 9800 GT AMP	£97	<a href="http://www.zotac.com">www.zotac.com</a>	NVIDIA GeForce 9800 GT	700MHz (1,700MHz shaders)	512MB GDDR3 2GHz	Long, single-slot	Single six-pin PCI-E
ASUS GEFORCE GTX 280	£335	<a href="http://uk.asus.com">uk.asus.com</a>	NVIDIA GeForce GTX 280	600MHz (1,300MHz shaders)	1GB GDDR3 2.2GHz	Extra long, dual-slot	Six-pin PCI-E, eight-pin PCI-E
ASUS RADEON HD 4870 X2	£388	<a href="http://uk.asus.com">uk.asus.com</a>	AMD Radeon HD 4870 X2	750MHz	2x 1GB GDDR5 3.6GHz	Extra long, dual-slot	Six-pin PCI-E, eight-pin PCI-E

### Low-end gaming performance



### Mid-range gaming performance



### High-end gaming performance



### DX10 gaming performance





More significantly, it matches the processor count of the now defunct Radeon HD 3800. That was AMD's fastest GPU as recently as May this year. The new 4600 also matches the 3800 series with a grand total of 16 texture units.

The fact that the Radeon HD 4600 can be had in range-topping 512MB GDDR3 4670 trim for a little over £50 is scarcely believable. Of course, something has to give when knocking up a cheapo chipset. Consequently, AMD has ripped out eight of the 3800's 16 render output units. It has also cut the memory bus in half. That latter point could be the chip's undoing. In an age where high quality filtering and anti-aliasing has become the norm. Will the 4600 really be able to take on the 256-bit GeForce 9600 GT with a mere 128-bit bus?

### Monstrous value

As impressive as the new Radeon 4600 series is as a value proposition, the sweet spot in terms of bang for buck for your money remains a little higher up the scale. If you can possibly stretch to them, you'll be richly rewarded by AMD's Radeon HD 4850 and NVIDIA's competing GeForce 9800 GT offerings. The former is an 800-stream-shader monster at an incredibly low price. With 40 texture units, it matches the more expensive Radeon HD 4870 chipset for features, so that it's really only clockspeeds on which you have to compromise. Overall, it's a fabulous GPU that makes mincemeat of any game you care to mention, with the inevitable exception of beautiful but brutal graphics fest that is *Crysis*.



Above For *Cry 2* will run respectably with either of the bargain cards on test. Now that's a game engine!

As for the 9800 GT, it's just the latest 55nm revision of the incredibly successful G92 GPU. Despite the GeForce 9 series moniker, therefore, there's little to choose between it and the older 8800 GT chipset. It has the same feature set, including 112 stream shaders, and even runs identical core and memory operating frequencies.

### The champs

All of which leaves the minor matter of the heavyweight champions of current graphics technology, AMD's Radeon HD 4870 X2 and the GeForce GTX 280 from

NVIDIA. Not only are these the fastest graphics boards on the planet, they also make for the most intriguing comparison. As a consequence of AMD's strategic decision to go all out for value rather than performance, it no longer has a single graphics chip that can compete with the 1.4 billion transistor leviathan that is the GTX 280.

So, AMD has no choice but to take the fight to NVIDIA with two chips on one board, running in dual-rendering CrossFire mode. In the past, dual-GPU boards have been patchy performers and that includes AMD's own Radeon

## HEAD TO HEAD: BODACIOUS BARGAINS

Model Gigabyte NX96T512HP Price £83 Web [uk.giga-byte.com](http://uk.giga-byte.com) Price check [www.techradar.com/469310](http://www.techradar.com/469310)

NVIDIA's GeForce 9600 GT looked like a winner at launch back in February. Then AMD waltzed up and slapped NVIDIA around with the Radeon HD 4800. Its effect

Gigabyte has kept the 9600 GT relevant in a tough competition



was to push some very powerful 3D hardware below the £100 barrier. That's made life a lot harder for the plucky little 'GT.

To counter this, Gigabyte has wheeled out this impressive factory overclocked revision. For starters, the core and shader clocks have been bumped from 650MHz and 1,650MHz respectively to 720MHz and 1,800MHz. Memory speeds are also up from 1.8GHz to 2GHz. All of which makes this probably the quickest 9600 GT we've seen and comfortably faster than Sapphire's Radeon HD 4670. Factor in the well-engineered passive cooling and it's just about worth the extra 25 smackers.

PCFormat Verdict 79

Model Sapphire Radeon HD 4670 Price £58 Web [www.sapphiretech.com](http://www.sapphiretech.com) Price check [www.techradar.com/469367](http://www.techradar.com/469367)

It's early days for the Radeon HD 4670 chipset, so it's no surprise to find that Sapphire's first take sticks closely to AMD's reference

Does the job if you really can't afford to spend more



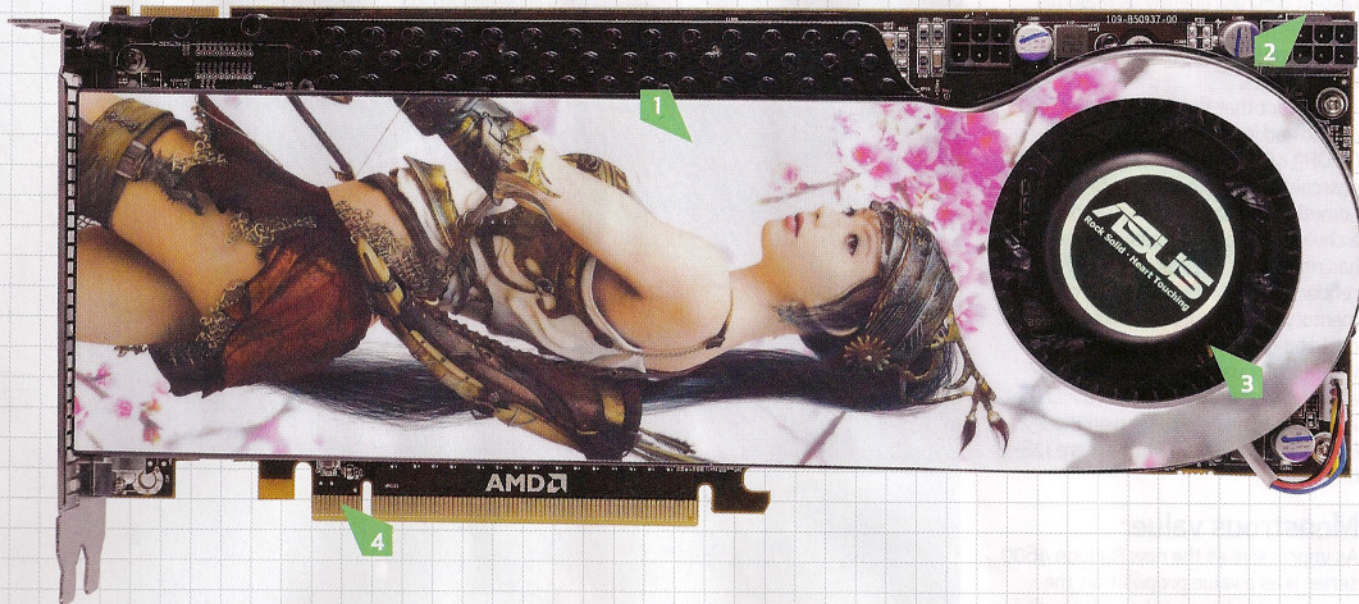
design. That's no bad thing given that it's an extremely compact single-slot card that does not require any supplementary power cables. It gets by just fine with the power from the PCI Express bus. A good choice for home theatre PCs, then.

It's still a fully featured board with a pair of dual-link DVI ports, support for HDMI content encryption and an adequate 512MB of GDDR3 memory. As for that 3D rendering shizzle, well, no less than 320 stream shaders deliver impressive performance for such an affordable board. The only problem is the 128-bit memory bus. It's a bit of a drag at high res and quality settings.

PCFormat Verdict 76



# Wired Supertest



## 1 Thanks for the memory

Asus's Radeon HD 4870 X2 packs 1GB of insanely fast GDDR5 memory for each of its GPUs. So, it keeps on trucking no matter how high the resolution or quality settings.

## 2 Pump up the power

The GeForce GTX 280 and Radeon HD X2 4870 boards require both a six-pin and an eight-pin supplementary power connector. You'll need a quality power supply to get the best from either.

## 3 Cool runnings

Several of the boards on test this month have unique cooling solutions. The most intriguing is Gigabyte's GeForce 9600 GT. Despite factory overlocked settings, it's a fanless and entirely silent design.

## 4 GP GP-who?

NVIDIA has been bigging up the GP-GPU (general purpose computing on the GPU) prowess of its graphics chips. So far, however, the number of desktop GP-GPU applications has been slim to none.

## HEAD TO HEAD: AFFORDABLE FLYERS

**Model** HIS Radeon HD 4850 IceQ 4  
**Price** £131 **Web** [www.hisdigital.com](http://www.hisdigital.com)  
**Price check** [www.techradar.com/469468](http://www.techradar.com/469468)

A big, fat overclocking-friendly cooler with 800 stream shaders and 40 texture units courtesy of AMD's awesome RV770 GPU -

As standard, the 4850 is good. Overclocked it's getting on for greatness



and all for £130. You get an awful lot of pixel pumping prowess for your cash.

The 4850 chipset is quite a goer in standard trim. But HIS has upped the ante with a core clockspeed of 685MHz (up from 625MHz stock) and an extra 200MHz of memory frequency for a headline rate of 2.2GHz.

Granted, it's not enough to make a truly dramatic difference, but it does help to maintain the 4850's advantage over Zotac's overclocked GeForce 9800 GT. If you own a 22-inch widescreen monitor, this card is a perfect match. It will drive any game maxed out at 1,680x1,050 (except *Crysis*) with buttery smoothness.

**PCFormat Verdict** 91

**Model** Zotac 9800 GT AMP  
**Price** £97 **Web** [www.zotac.com](http://www.zotac.com) **Price check** [www.techradar.com/469475](http://www.techradar.com/469475)

Is this a GeForce 8800 GT by another name? A die shrink of the G92 chip to 55nm aside that'll be an affirmative. All the key hardware features, including 112

Cranked up clockspeeds are not quite enough for Zotac's 9800 GT



stream shaders, 16 ROPs and a 256-bit memory bus are exactly the same. Frankly, NVIDIA has gotten itself muddled with its GeForce 8 and 9 series chipsets.

Nevertheless, an effort has been made to give this board a lift. Along with the snazzy orange PCB, Zotac has cranked up the clocks. The core frequencies take a big jump from 600MHz to 700MHz, while the shaders are up by 200MHz to 1,700MHz. That's enough to lift it to 9800 GTX levels of performance most of the time. Hurrah! However, it remains much slower than HIS's similarly overclocked Radeon HD 4850. Haroo. But it's still an attractive board at under £100.

**PCFormat Verdict** 82



- HD 3870 X2 board. Essentially, the problem comes down to the need for a well maintained set of driver profiles.

Just like CrossFire or SLI rendering solutions composed of multiple cards, the 4870 X2 will, in the long run, live or die on the quality of AMD's driver support. That's a worry given AMD's track record for CrossFire support. There are no such concerns with the GeForce GTX 280, of course. It's a classic single-chip bruiser that majors on brute force. In isolation it's an enormously impressive technical achievement, but it does look like a tiny bit of a knuckle dragger compared with the compact and nimble Radeon HD 4800 series.

### Pixels mean prizes

That's a quick précis of how the six pixel pounders we tested this month fit into the current graphics landscape. Time, therefore, to dole out the prizes. Of the budget board pairing, points for pluckiness go to Sapphire's take on the Radeon HD 4670. For a chip with a measly 128-bit memory bus, it's an awfully good performer. In raw price-performance terms, it's very hard to beat. But if we were spending our own money, we'd still stretch the extra £20 or so and plump for Gigabyte's intriguing GeForce 9600 GT.

For starters, the 9600 GT's 256-bit memory bus gives it a big advantage as you crank up the resolution and image quality settings. You also get some tasty factory overclocked settings and an impressive passive cooling solution. It's a great choice for a home theatre rig that dabbles in a spot of occasional fragging.



Above Did we already mention how beautiful the Far Cry 2 engine is?

It's a similar case of getting what you pay for with Zotac's GeForce 9800 GT and the HIS Radeon HD 4850 ICEQ4. Both cards come usefully overclocked from the factory, but the inherent superiority of the Radeon HD 4850 chipset and HIS's quiet but highly effective cooling solution is just enough to justify the £34 price premium.

The choice between the big high-end beasts is a much tougher call. For outright performance, the Radeon HD 4870 X2 gives its GeForce GTX 280 stablemate from Asus a thoroughly convincing spanking – it's simply quicker

across the board. We can't help having reservations about spending nearly £400 on a board though, so clearly at the mercy of timely driver updates. For that reason, and the GeForce's price advantage, we're calling that contest a dead heat.

But what about an overall champ? Predictably, perhaps, that accolade falls to HIS's Radeon HD 4850. The 4800 series GPU is simply a great chipset and a very welcome return to form from AMD. By cranking up the clocks and adding a quality cooler, HIS has only made it better. ■

## HEAD TO HEAD: CHAMPION CHIPS

Model Asus GeForce GTX 280 Price £335 Web [uk.asus.com](http://uk.asus.com) Price check [www.techradar.com/469490](http://www.techradar.com/469490)

There's a parallel universe where the GeForce GTX 280 is the world heavyweight champ of GPUs. For sure, that's what NVIDIA intended for this big, bad GPU. After all,

The fastest single GPU on the planet. But not by very much



you don't produce a 1.4 billion transistor GPU without planning on utter domination.

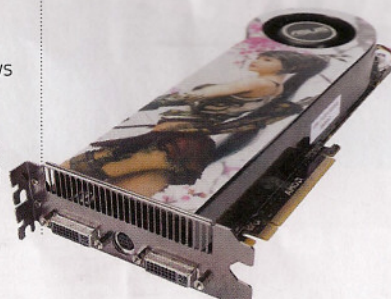
Back in this world, the GTX 280 gets the job done compared to any other single-GPU card. Thanks to a unique 512-bit memory bus and no fewer than 32 ROPs, it packs unprecedented overall pixel throughput. The problem is, AMD's leaner, meaner Radeon HD 4870 chipset costs nigh on half as much and yet comes dangerously close for overall performance. That allows AMD to offer the dual-chip X2 variant in the same pricing ballpark as the GTX 280. But in raw performance terms, the X2 is simply too hot to handle.

PCFormat Verdict 85

Model Asus Radeon HD 4870 X2 Price £388 Web [uk.asus.com](http://uk.asus.com) Price check [www.techradar.com/469509](http://www.techradar.com/469509)

If there's such a thing as dual-GPU done right, this is it. In terms of hardware specs, one of the areas that dual-chip cards have fallen short in the past is memory

Dual-GPU done right? That'll be the 4870 X2



availability and bandwidth. But not here. The X2 sports the same 3.6GHz (effective data rate) GDDR5 chips as its single-chip 4870 sibling. Just as important, each GPU has been given fully 1GB to play with. Yup, this is a 2GB monster of a card.

The result is truly massive performance scaling nearly all of the time. We may have had a few niggles in our original 4870 X2 review a few months ago. But this time round the X2 stood taller than the rest in every test. Nevertheless, we'll need to see ongoing evidence that AMD has the driver issue licked before we're completely confident that the X2 is a really safe buy.

PCFormat Verdict 85