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ED'S NOTE

FEBRUARY 2018

Musings of a tech editor

It may already be February, but when we were puting this issue together, we had only just scratched the surface of 2018. With the annual Consumer Electronics Show (CES) over, we've got a better idea of how the year ahead is looking for the tech industry.

I'd leave you to read the juicy bits in our cover feature. Instead, humor my thoughts around the conversations generated from CES announcements.

Robots, Automation and Artificial Intelligence were clearly the stars of the show. Seen as separate tech disciplines, robots are championed by companion and smart home helper bots, automation by self-driving cars and AI by just about everything with a chip in it.

Personally, I take a macro view. Robots are basically any device capable of helping humans perform a task autonomously, and the 'soul' of a robot is its software, or in other words, its AI. So, self-driving cars? AI-powered robot. Robot vacuum cleaner? AI-powered robot. Robot pet dog? AI-powered...you get me drift.

Even a smartphone is technically an AI-powered robot. Since our connected-online world does not require a physical form, any preconceived notion of a robot body doesn't apply. As such, smartphones can learn from our habits and be allowed some degree of task automation, from switching settings based on location, to sorting and auto-tagging your photos.

Progress is simply measured by the level of autonomy and the speed and complexity of AI.

So yes, we've come quite far in terms of what our gadgets can do, and we're positive in the direction they are heading towards, but when we really get down to the bottom on it, there was nothing truly innovative at CES.

Zachary Chan
Editor

ON THE COVER
PICTURE **2018 TECH TRENDS** DIGITAL ART **MAR KABAYAN** ART DIRECTION **ORLAND PUNZALAN**
All prices quoted in this magazine are in Singapore Dollars (SGD), unless otherwise specified.

5 reasons why the Huawei Mate 10 and Mate 10 Pro stand out

Huawei's newest flagship smartphones are performance powerhouses. Here's why.

1. AI IMPROVES EVERYTHING

The Mate 10 and Mate 10 Pro ship with Huawei's 10nm Kirin 970 chipset with a dedicated Neural Processing Unit for rapid AI (artificial intelligence) processing. The onboard AI cleverly makes everything better; it manages power so the phones stay powered up for longer, it can recognize scenes and optimize settings in the Camera app, and it can suggest smart tips based on how you're using the phones.

2. CAMERAS CO-ENGINEERED WITH THE LEGENDARY LEICA

The Mate 10 and Mate 10 Pro come with dual-camera systems that have been co-engineered with Leica, the legendary camera and lens company. Each phone features two Summilux-H lenses with a fast f/1.6 aperture, one 12MP RGB sensor (with OIS), and one 20MP monochrome sensor.

The Mate 10 and Mate 10 Pro use images taken with both cameras and combine them into a single, richly detailed photo. This works because a monochrome digital sensor can capture more fine detail than an RGB sensor, due to the lack of an RGB filter. You can even capture 20MP high-resolution black and white images with the monochrome sensor.

Instead of just a single ISP (image signal processor), the cameras feature dual ISPs for noise reduction and better low-light performance. A 4-in-1-hybrid autofocus system ensures you get the right subject sharply in focus.

3. MASSIVE BATTERY LIFE WITH QUICK CHARGING

We could all do with more battery life on our smartphones. The Mate 10 and Mate 10 Pro come with massive 4,000 mAh batteries, and both support Huawei Supercharge technology. The phones can get up to 30-35 percent charge in 15 minutes, 55-60 percent in 30 minutes, and 85-90 percent in about an hour.

4. GORGEOUS OLED DISPLAY WITH HDR TECHNOLOGY

The Mate 10 Pro has a beautiful 6-inch Full HD+ OLED display with vibrant colors and deep contrasts. The display is HDR10 certified, so you can enjoy videos that look stunningly true to life.

5. MODERN DESIGN WITH THE LATEST IN ANDROID

The Mate 10 and Mate 10 Pro feature modern designs, both in and out. The chassis is now elegant glass with an aluminum frame, and the phones come with Android 8.0 Oreo installed - the first for a non-Google branded device. An all-new EMUI 8.0 makes the Mate 10 and Mate 10 Pro more delightful and intuitive to use than ever before.

BONUS: Work and play on the big screen

If you've ever wished you could make your smartphone screen bigger, well, now you can. The Mate 10 and Mate 10 Pro processors are so powerful that you can connect either with a single cable to a larger screen, which lets you mirror or extend the display.

Now you can work on your smartphone just like you would with a PC, with a wireless mouse and keyboard. Even without peripherals, you can use the smartphone as a mobile touchpad to get things done. And it's not just for work, you can connect the Mate 10 and Mate 10 Pro to a larger screen for big screen gaming as well!

PICTURES **HUAWEI**

To find out more about the Huawei Mate 10 and Mate 10 Pro, go to **http://consumer.huawei.com/sg/**

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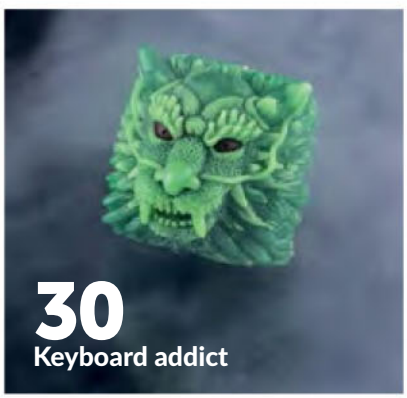

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PICTURE **DEEPCOOL**

STRAIGHT OUT OF SCIENCE FICTION

DeepCool's Quadstellar case looks more alien spacecraft than PC chassis. It features four discrete chambers that separate the main heat-generating components, so the power supply, GPU, storage drives, and motherboard are all housed separately. In addition, the fans and RGB lighting are controlled using the Quadstellar App, which is pretty nifty.

MORE INSIDE>

SECRETLAB TITAN NAPA
The new Titan chair, now in genuine napa leather.

CASIO GZE-1
A rugged camera for lovers of the distinctive G-Shock design.

DEVIALET PHANTOM OPERA DE PARIS
Why settle for a unique speaker, get the special edition of said speaker.

ALL THAT GLITTERS IS GOLD

Since Chinese New Year is just around the corner, Devialet and the Paris Opera have teamed up to come up with the limited edition Gold Phantom Opéra de Paris. These speakers feature the logo of the Paris Opera and also gold leaf gills finished by Ateliers Gohard using the laborious and age-old method of oil gilding. This is the same technique used to restore and gold of the famous Palais Garnier opera house. Only 38 units will be available in Singapore.

PICTURE **DEVIALET**

CRYSTAL CLEAR SOUNDS

The Clear are Focal's latest headphones and at they sit in between the entry-level Focal Elear and the flagship Focal Utopia. The Clear headphones are open-backed headphones and they feature an attractive metallic and silver design. More importantly, they are equipped with Focal's special M-profile aluminum/magnesium dome drivers, which are an improved version of the ones found on the Elear. Additionally, the Clear also comes fitted with a new type of perforated microfiber ear pads that help tame the bass.

PICTURE **FOCAL**

EVEN MORE LUXURY?

Secretlab's Titan NAPA comes clothed in napa leather, a soft and supple cut of calf leather that provides a butter-smooth feel. It produces a distinctive sheen under light, and is far more breathable than cheaper PU leather. And if you're worried about issues with peeling and flaking, well, that just doesn't happen with real leather.

PICTURE **SECRETLAB**

SURFACE CHALLENGER

The Samsung Notebook 9 Pen is the company's answer to the Microsoft Surface Pro. It boasts an integrated, battery-free S-Pen stylus that supports up to 4,096 levels of pressure sensitivity, so it's a great tool for doodling, sketching, and simple notetaking. The frame is constructed from a lightweight magnesium aluminum alloy that Samsung calls Metal12, and it weighs just 995g.

PICTURE **SAMSUNG**

COMPACT SIZE, DSLR SPEED

The latest version of the G1 X brings Dual Pixel AF and a massively up-sized APS-C sized sensor while still keeping its compact form factor. It's paired with a 24-72mm (35mm film equivalent) f/2.8– f/5.6 IS lens that gives you the equivalent of 3x optical zoom; perfect for portraits and landscapes. All in, expect better images and faster focusing than ever before.

PICTURE **CANON**

TINY BUT MIGHTY

It measures just 9.5cm wide, 3.8cm high, and 9.5cm deep and weighs only 290g, but Bose's SoundLink Micro has been engineered to blow your socks off no matter where your travels take you. Drop it in soapy water, chlorinated water,or the sea and this tiny powerhouse will keep playing without missing a beat, easily justifying its IPX7 rating.

PICTURE **BOSE**

LIKE A SAMURAI CLOAKED IN DARKNESS

The latest in Casio's premium MR-G series, the Total Black MR-G watch is inspired by kurozonae samurai weapons that have a distinctive uniform black color. The distinctive black finish resembles the fine gradations seen in black ink paintings, and the bezel is made of Cobarion, a Japan-developed alloy that is twice as hard as stainless steel and has a shine equal to platinum.

PICTURE **CASIO**

MILITARY-GRADE PROTECTION

Samsung's new Galaxy Tab Active 2 tablet can survive almost anything you throw at it thanks to its extremely durable thanks to its MIL-STD-810 certification which protects it against extreme pressure, temperatures, environments, vibration, and drops. It's also IP68 rated for protection against water as well as dust.

PICTURE **SAMSUNG**

PURE SPEED

This ultra-low latency Trident Z RGB kit combines high clocks with tight CL17-17-17-37 timings, the first to do so for a kit above 4,000MHz. The 32GB kit is rigorously hand-binned and uses Samsung B-die DDR4 IC components. Oh, and it glows as well.

PICTURE **G SKILL**

SMARTIFY YOUR DOOR

The Igloohome Smart Mortise is a designed-in-Singapore smart lock that cleverly works without WiFi. Instead, when you set it up for the first time, the Smart Mortise and the smartphone app generate a secret key, which the app can use to create access PINs from anywhere in the world.

PICTURE **IGLOOHOME**

SHOCK TREATMENT

With a design based on Casio's popular G-SHOCK series of watches, the GZE-1 is meant to take drops of up to four meters, dustproof to the IPX6 standard, waterproof to 50m, and perform at temperatures as low as -10C, so this is one tough camera. Its super wide-angle lens captures a 190.8°(still image) and 170.4°(movie) field of view, giving you a great new tool for extreme sports.

PICTURES **CASIO**

AFFORDABLE INFINITY DISPLAY

Samsung's first smartphone release of 2018 sees it's flagship bezel-less Infinity Display debut on its mid-range A series phones. The 2018 A8 has a Full HD+ 19:9 aspect ratio Super AMOLED display, and also features dual front-facing selfie cameras.

PICTURE **SAMSUNG**

1. COOL AND QUIET

Fractal Design's Define R6 is a study in Scandinavian minimalism. Its clean lines and elegant brushed metal front belie the acoustic foam layer that sits below, helping keep your system fan noise to a minimum. You can pop off the steel panel at the top to facilitate greater airflow, and there's plenty of space inside for multiple storage drives and the highest end components.
FRACTAL DESIGN DEFINE R6

2. FULL SPEED AHEAD

The Sapphire Radeon RX Vega 64 Nitro+ Limited Edition was designed to be taken to its limits. It features a 14-phase power design, dual BIOS, and aggressive factory overclocks, but it's the cooler that helps you really push the card. It utilizes a vapor chamber cooling solution instead of a direct contact copper plate, and pairs that with six nickel-plated heat pipes and three fans to keep things chilly.
SAPPHIRE RADEON RX VEGA 64 NITRO+ LIMITED EDITION

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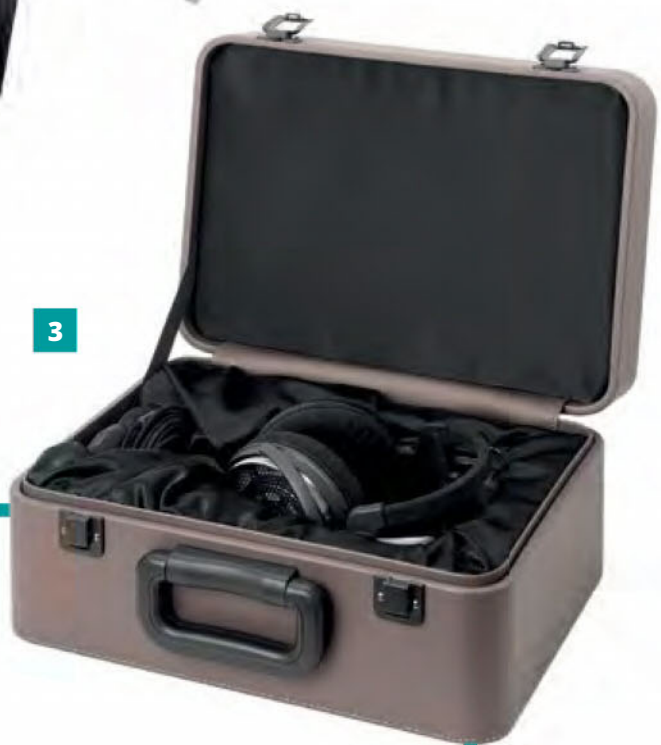

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3. FROM THE JAPANESE AUDIO GODS

The ATH-ADX5000 is Audio-Technica's newest flagship reference headphones. The ATH-ADX5000 is an open-back circumaural headphone and features 58mm drivers that are integrated into the baffle for reduced vibrations. Additionally, the drivers have special Tungsten-coated diaphragms for greater rigidity. To improve wearing comfort, the frame is made out of lightweight magnesium and the headband and earpads are lined with Alcantara. Each unit is also hand-assembled in Tokyo, Japan, and are individually numbered.
AUDIO-TECHNICA ATH-ADX5000

PICTURES **FRACTAL DESIGN, SAPPHIRE, AUDIO TECHNICA**

4. DIVING INTO THE NIGHT

The Seiko Prospex Black Series is inspired by the world of night diving, where functional features meet the elements. The watch case is protected by a hard black coating that reflects the darkness of the night sea, with a bright orange minute hand to illuminate the time. The watches are designed for water resistance to 200m and have screw-down crowns with black silicon rubber straps.

SEIKO PROSPEX BLACK SERIES

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5. A 120" DISPLAY IN YOUR POCKET

Measuring just 105 x 105 x 20mm and weighing only 240g, the new Canon Rayo S1 is capable of projecting a 120" long WVGA screen onto any blank surface, making it perfect for presentations on the go. It comes with 4GB of onboard memory so you can load presentations, videos and music on without the use of a computer. And it even functions as a powerbank and portable Bluetooth speaker too!

CANON RAYO S1

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6. CASH AND MORE

The Orbit wallet holds cash like you'd expect it to, but does so much more. It has RFID blocking to keep your cards safe, contains a 2500 mAh battery so you can use it to charge your phone on the go, can be used as a remote to take selfies with your phone. It also comes with a built-in Orbit tracker, so you'll always be able to find it; either by triggering the built-in alarm, or by locating it on a map in the app.

HBUTLER ORBIT WALLET

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7. THE ONE BATTERY TO POWER YOUR LIFE

This new portable battery is the only one you'll ever need. The Powerstation AC has been made to power laptops, tablets, smartphones, and other USB and AC devices, yes, even devices that require an AC outlet. The 22,000mAh can even fully charge a MacBook, and comes with USB-C PD 30W Fast Charge for rapid charging.

MOPHIE POWERSTATION AC

PICTURES **SEIKO, CANON, ORBIT, MOPHIE**

8. CHARGE STANDING UP OR LYING DOWN

Belkin's latest line of wireless chargers support the Qi standard, which means it works with phones like the Apple iPhone X and Samsung Note8. The Boost Up Wireless Charging Stand lets you charge your devices in either portrait or landscape mode, and supplies up to 10W for charging.

BELKIN BOOST UP WIRELESS CHARGING STAND

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10. DOUBLE THE HDR

Sony's new 4K Blu-ray player supports both HDR formats - HDR10 and Dolby Vision. If you also have a TV that plays both formats, this is the Blu-ray player to get to maximize your home theatre. The player is fully featured, with 4K video streaming apps, and support for a number of video and music formats, including MP4, DSD, FLAC, and so on.

SONY UBP-X700

9. ONE ROCKING SPEAKER

Designed to fit easily into any home, Creative's latest speakers take inspiration from the pebbles you find in Zen gardens. They sport 45 degree elevated custom-tuned far-field drivers with rear-facing passive radiators and promise to deliver an elevated personal listening experience with a greater degree of detail than you'd expect for something so tiny. And it runs on just a single USB cable!

CREATIVE PEBBLE

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11. STEADY AS SHE GOES

Go from underslung to upright filming positions with minimal shake thanks to the new DJI Ronin-S. DJI's first single-handed stabilizer for ILCs, the Ronin-S pairs its incredible 3-axis stabilization with a whole host of intelligent features so you can easily get shake-free footage while making camera adjustments with perfect precision.

DJI RONIN-S

PICTURES **BELKIN, CREATIVE, DJI, SONY**

12. A SOUND UPGRADE

Stop struggling to get quality sound out of your television and get the YAS-107 instead. It's a compact sound bar that comes with dual built-in subwoofers so even a single unit can offer you the full-range sound you need to get the most out of your movies and videos. With support for DTS Virtual:X technology, this single speaker will give you an immersive listening experience that truly puts you in the middle of the action.

YAMAHA YAS-107

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13. PIXELS, PIXELS EVERYWHERE!

Your standard two-dimentional photos are boring. Your friends are uploading 360-degree VR photos on your feed all the time, but here's your chance to still get the upper hand. Chinese company Pisofttech announced at CES 2018 a palm-sized VR camera that's not just capable of shooting panoramic videos up to 8K in resolution at 30fps, but powerful enough to stitch said video in-camera, in real-time. Wow.

PISOFTTECH PILOT ERA

14. LEVEL UP YOUR CAR

The Sony XAV-AV5000 levels up the intelligence of your car with the help of Apple CarPlay and Android Auto support. CarPlay integrates iPhones wih the car audio's display and controls, and Android Auto automatically brings useful information organized into simple cards. All this on a 6.95-inch bezel-less and capacitive touch screen that fits beautifully into your dash.

SONY XAV-AX5000

PICTURES **YAMAHA, SONY, PISOFTTECH**

How to become a better travel photographer

Simple ways to capture decisive moments, with a camera that travels with you.

Photo taken by FUJIFILM X-Photographer William Chua (@wiilliam_chua_photography)

1. Capture how you think and feel

Feelings of wonder and awe are among the best things about travel. But what excites you when you step off the plane isn't what'll always excite your audience. Ask yourself what it is about this scene that captures you. For example, maybe it's how the streets seem to hum with energy. Could you lower the shutter speed, so the blurring of motion conveys movement?

2. Go deeper

It's rare the perfect shot that you'll get the perfect shot within five minutes of reaching somewhere. Instead of rushing past multiple places, consider taking the time to go deep at one location. Get there early to see the sunrise there, leave there late to see the sunset. Speak to the people there and help them to relax in front of your camera. Go again tomorrow.

3. Review your photos daily

Reviewing your photos at the end of your day helps you take better photos the next day. See the common patterns that emerge, what captured your attention. Are you capturing it in a way that expresses how you think and feel about the subject? What is missing and is something you should pay more attention to?

A CAMERA BUILT TO JOURNEY WITH YOU

The Fujifilm X-Pro2 is the spiritual successor to the rangefinder. Like those iconic cameras, the X-Pro2 handles smoothly, with a compact body built for everyday carry. Its durable magnesium body is dust-proof, splash-proof, freeze-proof, and ready to travel.

Physical dials give you control over major settings at your fingertips, so you can adjust exposure quickly. Compose images in the viewfinder with an advanced autofocus system and expanded AF points. A new Focus Lever on the back of the camera moves like a joystick, for when you want to fine-tune focus.

A 24MP APS-C X-Trans III sensor delivers extraordinarily detailed images. Photographs come to life with Fujifilm's legendary colors, based on more than 80 years of film production and knowledge. The X-Pro2 features 15 film simulation modes, including the new ACROS film simulation. ACROS creates high-quality black and white images with elegant tones and rich textures for striking images.

Whether it's for everyday journeys or adventures throughout the globe, the Fujifilm X-Pro2 is ready to go with you.

PICTURES **FUJIFILM**

To find out more about the FUJIFILM X-Pro2, visit **FUJIFILM Studio at 3 Temasek Boulevard, Suntec City, #02-410, S038983.**

FUJIFILM
Value from Innovation

X-Pro2

THE PASSION FOR CLASSIC PERFECTION.

- 24.3 megapixels X-Trans CMOS III APS-C sensor
- Electronic Range Finder
- Advanced Optical Viewfinder System
- Fast & Accurate Autofocus with Manual Focus
- New ACROS Film Simulation
- Wifi Image Transfer feature

Fujifilm's X-Pro 2, the masterpiece of groundbreaking technology embodied in traditional chassis of ergonomic perfection. The all-new 24.3 megapixel image sensor X-Trans CMOS III and X-Processor Pro engine caters experience of high image quality and exceptional image processing capablities. Exquisite design, premium quality – the ultimate perfection to every shot.

X-TRANS CMOS III NEW
X-Processor Pro

Faster & exceptional processing capabilities

The all-new X-Trans CMOS III sensor features a newly developed sensor for outstanding image quality. Combined with the new X-Processor Pro engine, bringing higher speed and image processing capabilities for greater shooting quality.

AF Point Expansion

Phase detection AF area expanded to 7x7

Focusing points has been expanded from 49 to 77, including a faster and more precise AF detection, photographing moving subjects have improved dramatically.

Dual SD Card Slot Dual-Functional Dial

High Performance

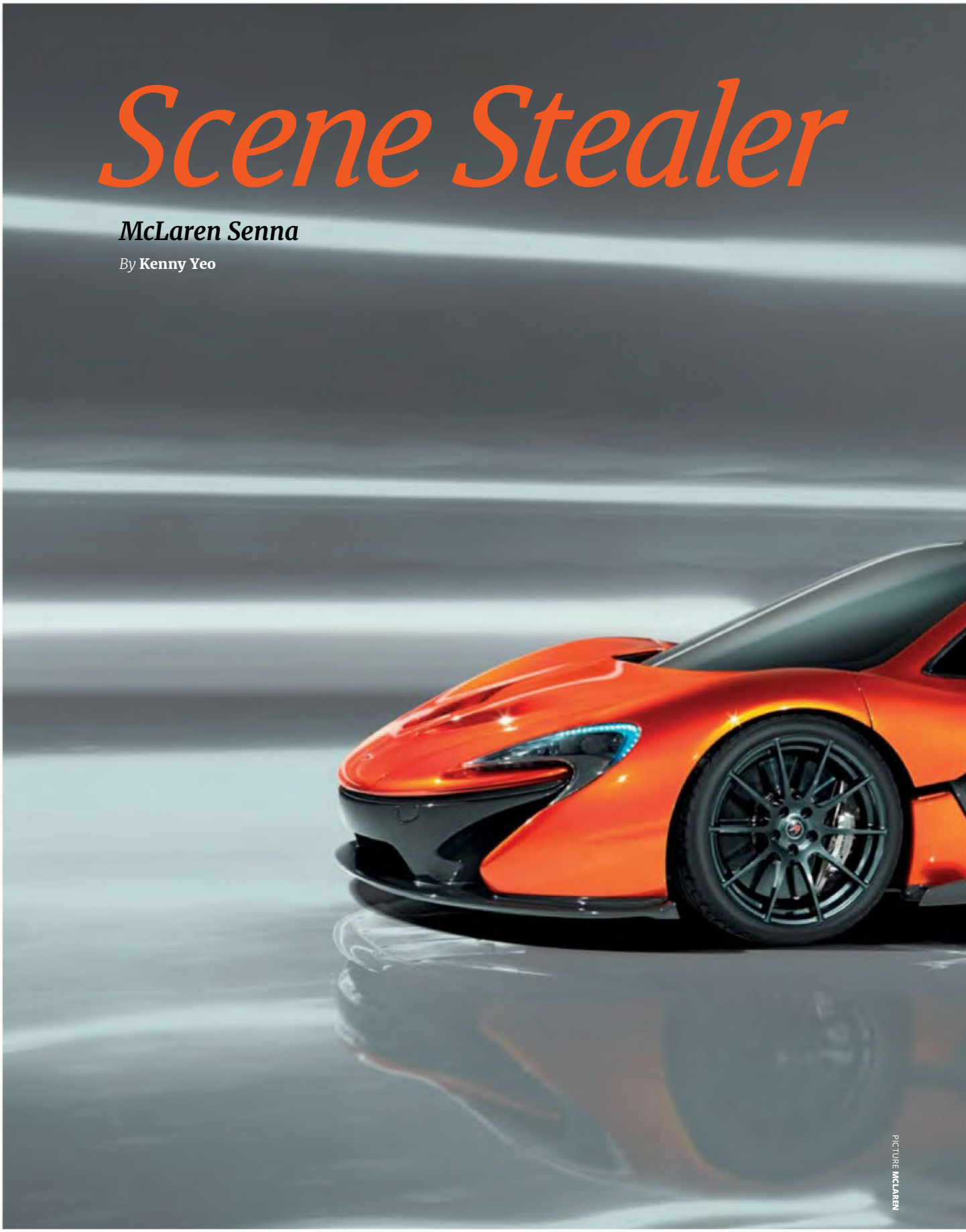
The first FUJIFILM mirrorless camera to offer dual SD card slots for high reliable data storage. The one dial for both ISO and shutter speed allows seamless control with ease.

www.fujifilm.com.sg | fujifilmCamerasSG | @fujifilmsg

Scene Stealer

McLaren Senna

By **Kenny Yeo**



PICTURE MCLAREN

When you name your car after arguably the greatest F1 driver of all time, you better be sure it is something special.

The McLaren Senna is a departure from the company's earlier cars. While cars like the P1 and 720S were built to be usable everyday supercars, the Senna was designed to be an out and out track monster.

To begin, it has no batteries. Instead, the Senna is powered solely by an internal combustion engine, specifically a twin-turbocharged 4.0-liter V8 that produces 789hp and 800nm of torque. This might not sound like much. After all, cars with over 1,000hp are not uncommon these days. However, the Senna makes up for it by weighing a mere 1,198kg. To give you some idea how light it is, consider this: the P1 is over 300kg heavier at 1,547kg.

Additionally, in contrast to the P1, which is all about sleek and svelte lines, the Senna is highly angular and is littered with creases and flaps. Oh, it also has an absolutely massive wing and the most outrageous rear diffuser we have seen on a car too. All of this is to generate downforce and to keep the car planted around corners at high speeds.

No word yet on performance, but we fully expect the Senna to hit 100km/h from a standstill in around 3 seconds and on to a top speed of around 320km/h. Perhaps most amazing of all is that despite its staggering US$1 million price tag, all 500 units of the Senna have found owners.

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KEYBOARDS ANONYMOUS

The story of how one writer went over the edge, fell down the rabbit hole of keyboards, and never returned.

MORE INSIDE>

A CHAT WITH CHET
Where Chet Pipkin, the founder and CEO of Belkin took some time to talk to us about automation, smart living and AI.

COMBATING AD FRAUD
Appier thinks AI can solve digital ad fraud and help clean up today's fake Internet.

PICTURE **KEYFORGE**

DOWN THE RABBIT HOLE WE GO.

This is why I have more keyboards than I can use at any one time

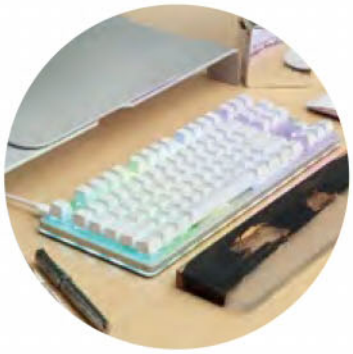
By **Koh Wanzi**

The keyboard is one-half of the way you interact with your PC. As someone who writes for a living, I spend hours upon hours pecking away at letters, trying to string a bunch of words together in a semi-coherent manner.

In other words, my keyboard is very important to me, and I'm pretty picky about how it feels. My first mechanical keyboard was a SteelSeries 6Gv2 with Cherry MX Black switches, and it was a huge step up from the mushy laptop and flimsy rubber-dome keyboards I had used before.

However, the thing with mechanical keyboards is that they aren't even anything new. The best keyboards were made in the 1980s – for instance, the iconic IBM Model F – but manufacturers had started to push more aggressively for cost savings by the 1990s, which led to a deluge of cheap, membrane keyboards on the mass market.

It's difficult to describe the appeal of tinkering with a new and hard to find switch type, but it has a lot to do with breaking up the monotony of your everyday computing experience.



Fast-forward to today, and mechanical keyboards are seeing a resurgence, most notably among gamers. The original Razer BlackWidow was one of the first mechanical keyboards marketed specifically at the gaming community, and the years since have seen countless competitors from other brands, including models with their own proprietary "gaming-oriented" switches.

But that's not why I can't get enough of mechanical keys. I'll admit that mechanical keyboards don't confer the same level of benefits as a good optical mouse in terms of gaming. They feel great to use, but don't markedly improve your ability to respond in game. Instead, their appeal lies in the sheer variety and depth of customizations they offer.

Other than your more commonplace Cherry MX Browns, Reds, and Blacks, there are a multitude of switch types to explore. There's a sense of serendipity from stumbling on a new switch type, such as that time I found MX Nature White switches on a Vortex Pok3r RGB keyboard.

These sit somewhere between Cherry MX Reds and Blacks, and have so far proved to be my favorite switch type after Topre switches. It's this potential for discovery and trying new things that makes this experience so fun.

Frankly, getting on Massdrop is risky business these days, because I'm likely to end up splurging some cash on a snazzy looking keyboard or keycap set, even though I never intended to. Lack of self-control aside, there truly is a lot to look forward to these days, as keyboard enthusiasts have taken to designing their own keyboards and switches and even reviving older designs.

One shining example is the Massdrop x Input Club K-Type mechanical keyboard, a unibody aluminum beauty with one of the most stunning lighting effects I've seen on a keyboard. More importantly, it uses brand new Halo switches, designed by Jacob Alexander over at Input Club.

The Halo True switch is modeled after the force curve of Topre switches, and they attempt to combine the velvety feel of the latter with the wide-ranging compatibility of Cherry MX-style stems.

Then there are the Hako switches, the result of a legal dispute between Massdrop and Input Club. These switches use Kaihua's new box switch design, which are supposedly more durable and stable.

But details aside, the point is there's a lot of iteration and innovation going on in the mechanical keyboard scene right now. Massdrop is also bringing back Hall Effect switches in the form of the Massdrop x XMIT keyboard, which uses magnets to trigger a key press.

It's difficult to describe the appeal of tinkering with a new and hard to find switch type, but it has a lot to do with breaking up the monotony of your everyday computing experience. Each switch truly feels distinct, and it's refreshing to be able to have something new to play with every so often.

Furthermore, with everything from delightfully retro designs to a more clean and modern look, it's seemingly impossible to settle.

You don't like the font on the stock keycaps or shiny ABS plastic? No problem, just swap them out. From custom sets on sites like Pimpmykeyboard.com to artisan keycaps from KeyForge, there are nearly limitless options as to what you can do. Let me just say that the latter is truly a work of art in its own right, and supply is so limited that the only way to get them is to know when the raffle opens so you can enter your name.

And let's get real here. One keyboard can't possibly accommodate all the drool-worthy keycaps out there. 1976? Pulse? Why not both?

PICTURES: **KEYFORGE, MASSDROP, HAKO, INPUT CLUB, OTAKU, 123RF**

ON CREATING POSITIVE SMART EXPERIENCES

Chet Pipkin, CEO, Belkin International

By **Zachary Chan** *Photography* **Angela Guo**

We used to have a very clear definition of tech, but with everything being smart today, it's suddenly gotten a lot bigger in scope...

Yes, it's gotten really blurry. You might want to spend some time thinking about this. Increasingly, software's eating the world. The way we buy books, perceive books, read them; from music to videos and even the way we move from point A to point B—are [all] software experiences that's delivered on hardware. You do still need hardware to get to the edge of the network; to the people, but these experiences that are getting unlocked through the combination of software and hardware platforms, are life experiences as opposed to just a router or a camera.

But many smart products don't seem to have a point. Sure, you can remotely activate a smart coffee maker, but you still have to physically set it up before and collect your coffee after. Why is this progress?

So I think you're thinking about this in exactly the right way, but there's a phenomena that will keep occurring in tech and consumer electronics. When new concepts come to the fore, things get way overhyped for their capabilities in the moment. Then we get fatigued of it, and by the time we're through that cycle, we're on to the next hype cycle. And that's about the time where the previous concept starts to really get traction and adoption in usability.

Won't this cycle hamper the adoption of products in the end? Especially as tech becomes more accessible to the common consumer that may not appreciate it in the first place.

I agree with you. So I think that's like concept number one from my perspective. Concept number two is, in tech, all too often there're too many companies and too many brands creating solutions in search of a problem. People get over concerned about the tech or the capabilities they have, and they say, "Oh, we've solved this problem with washing machines or coffee makers". But, they're approaching it in the wrong way. In many of these cases, the problem never existed in the first place. We do things exactly the opposite of that. So we go looking for the problem, or the consumer need, and then we try to find a way to solve it.

Creating a solution whether a problem existed just marketing right?

Well, here's what I think the third concept is. It's really simple to do engineering work and come up with complicated experiences for people; everyone does that. What's hard to do is the complicated work to make the user experiences simple.

How do you mean?

So for me, I come home standing right in front of the garage and I don't have my key. Or I'm home, but I'm on the wrong side of the house. I've got to walk all the way around to get back into the garage. Why can't I just do something from my phone? If I want to get in a delivery of groceries or something, I don't want them in my home, but I may want to open the garage remotely or able to get them a code that allows them to open a certain window.

Do I really have to reset the timer for this light to go on when dark? Why is the porch light on when it's light outside? Why is my irrigation watering my lawn when it's raining outside? I can do better than this.

It's these real needs that I truly want to solve for myself, experiences like that which led us to the Wemo platform.

You mentioned that "you could do better than this", in relation to knowing when to or not to water your plants. Everyone's seems to be turning to AI. How about you?

We're investing so so deeply [in AI]. An example just to illustrate how deeply engaged we are with it, we have a new joint venture called Phyn—a startup that we incubated from inside of Belkin around being able to monitor, measure and manage water in the home. We have a simple piece of hardware that goes anywhere your plumbing system, and it's got a water pressure sensor. If I'm taking a shower, washing dishes or washing my clothes; the changes in water pressure with each one of these cases creates a digital signature that's unique. And then we have algorithms

I'd want to know if somebody is trying to get into my network at home. That would be something that would be useful to me.

which reads the digital signature. Now we know when the kitchen sink goes on, when it goes off and how much water was used. This is a continually learning adaptive machine learning ecosystem.

This allows so many things to happen. For example, if I wanted to set policy, and I want this elderly couple to be able to get the water they need to bathe and cook, I can charge a nominal rate for that water usage. And then if there's some knucklehead that wants to use this precious water to overwater his grass, I could charge them ten times the rate. This really allows us to become a smart city.

You just touched a little on smart city policy making. There's also a lot of talk on smart city security in terms of cameras, AI facial recognition and the fear of turning into a surveillance state. Where do you stand between privacy and security?

So this is the way we [Belkin] think about things. We architect everything so that it is completely open source and can be easily interconnected to everything. But we curate as a business choice how much we open or don't open things. These are big ethical questions, and we'll offer our opinion on what policy might be, and then we'll follow the court of public opinion or government policy so that people can make their own choices. The key is to make everything really visible, make you really aware that these are the vulnerabilities you open up when you make this kind of choice.

Is it worth it to me to create this vulnerability, or this insight in my life for the benefit that I'm getting. If the benefit exceeds. Yeah, then I want to do it. But if the benefit isn't adequate, then I don't want to do it.

The other thing we're noticing today is that consumers are greatly underappreciating privacy and security, and they're not making it a factor in their purchase choices. Just like there was leaded paint and we didn't understand what the ramifications were, and it didn't matter to anybody until education hit a critical mass. There were antibiotics that we were putting in beef and chicken. Nobody cared, until the day they did.

Do you think this is one of the reasons why so many different systems exists? Are closed loop ecosystem more secure?

Yeah. So I think the tension here is again we architect all of our stuff to work really well with them other people's things. So for example. When Amazon came out with their natural voice platform, the Alexa platform and the Echo hardware. Amazon got the Wemo products working with the Alexa platform within a couple of weeks just kind of on their own because we've architected our platforms in that way.

I hand over some of my privacy, but I get benefits in turn - these are choices that societies, cultures, and people have to make.

Some people architect their platforms to be closed because they're afraid you want control and all that kind of stuff. That's a point of view. We just don't think that it's the one that is best for consumers.

But isn't it easier to buy a prepackaged smart home solution from a brand that sells all the hardware so you know it works, rather than hunt for compatible parts from a general solution like Wemo?

That's a really good question. Our principles and tenets are in privacy, interoperability and making things really simple for people. We set out to make Wemo the easiest to install, easiest to use, most approachable smart home enabler out there. And we think that we've done that pretty well.

Wemo works better with the Alexa platform than any other product out there; it works better with the Google platform than any product out there; works better with the Nest platform than any other, and soon, it will be compatible with Apple Home and HomeKit. When we do it, we try to be really thoughtful, so the first Home and HomeKit device is like a Wemo HomeKit bridge. All you go to do is take this adapter, plug it into any ethernet port in your router and all of your old Wemos will instantly be Home and HomeKit compatible.

Your thoughts on Singapore and the smart home scene?

This is one of my most favorite markets in the world. We've got these devices that are capable of such rich experiences, but they need a big connectivity pipe right? Singapore's done as good a job as anybody who's bringing these big pipes to the home, but then the problem is that Wi-Fi signals generally suck. The smart home will never work if we don't have a robust connection. Not close to the router, but when we're on our balcony; when we're outside on the patio at the edge of the network.

That is why we made Velop. And now Wi-Fi is no longer your choke point. We get to prove things out here in Singapore. When the world catches up to Singapore, we already have all these experiences that we can bring to the to the rest of the world. It's not our biggest market by any stretch, but I can argue that it's one of our most important. We just love it here. People are curious. They're smart. They're forward leaning.

CAN AI SAVE DIGITAL ADVERTISING?

In the beginning, there was the Internet. And then came the ads. Annoying little buggers them.

By **Zachary Chan**

At first, ads were benign in nature. Static buttons and banners that stayed where they were supposed to; a tolerated co-existence with an understanding to not intrude on our daily surfing.

But soon, the ads grew discontent with their lot. They wanted more of our eyeballs and the craving just kept on growing. They started to evolve. Simple animations would eventually give way to hostile pop-ups that overtook the entire screen or hold our browsers hostage.

This meant war.

To fight the tide of disruptive ads, humans built the first pop-up blockers. And for a mere moment, the Internet found peace...until Facebook and its ilk came to power.

The age of social networking brought about the destabilization of communication protocols, etiquette, and to an extreme extent, human judgement and intelligence. It was through this vulnerability, ads evolved yet again, only to become more malicious than ever.

The victims of fraudulent ads were no longer the elderly or the technically challenged. With social networks, came social engineering that pandered to our human naivety, ego and emotions. Even the supposed tech savvy netizens fell for the deviousness of fake news, fake polls, and fake quizzes. Many of us would willingly partake in fake giveaways, ignoring facts to the contrary because, "What harm is there in Liking a post?"

And then the other pin dropped. Years of harnessing human gullibility, the malicious ads attacked. Private data was stolen, leaked, and held hostage on a constant basis. We could no longer trust anything our friends shared, and every link was suspect.

No longer limited to an identifiable of shape or form within a browser window, pop-up blockers became as useful as a glass hammer. But of course, any kind of protection was better than nothing.

In 2017, Google, one of the largest digital advertising companies in the world, built an ad blocker right into their own Chrome web browser. Facebook finally took steps to regulate its content stream to try and stamp out fake news and ads, which had begun to have global political implications. In January 2018, it even drastically overhauled its News Feed to de-emphasize publishers and brand content.

Fake ads were now hurting real advertisers, but the problem had spiraled out of human control.

In mid-2017, Appier, a technology company specializing in providing AI solutions ran a study within its own network on the efficiency of AI in combating ad fraud. They predicted that ad fraud is costing the industry a 918% reduction in ROAS (Return On Ad Spend) and 157% drop in ad retention rate a day. Joe Su, Appier's Chief Technology Officer shared this, "Ad fraud has become a major threat to the online advertising industry and is projected to cost advertisers billions of dollars. Traditional rule-based methods of detecting and mitigating ad fraud has its limitations."

Appier's AI-based machine learning approach is capable of multi-dimensional data analysis and self-learning to create new rules to respond to evolving fraud. In their report, they were able to detect twice the suspicious ad activity compared to traditional methods.

While these efforts to combat online fraud stem from the corporate need to regain control of the digital space, any reduction in malicious activity online will be beneficial for all.

I will continue to keep my pop-up blockers active, but perhaps we can one day go back to co-existing with ads without living in a heightened level of suspicion that every link is out to get us.

PICTURES/SOURCE **APPIER MOBILE APP CAMPAIGNS, JULY TO AUGUST 2017**

A CRACKING DISCOVERY

Self-healing glass

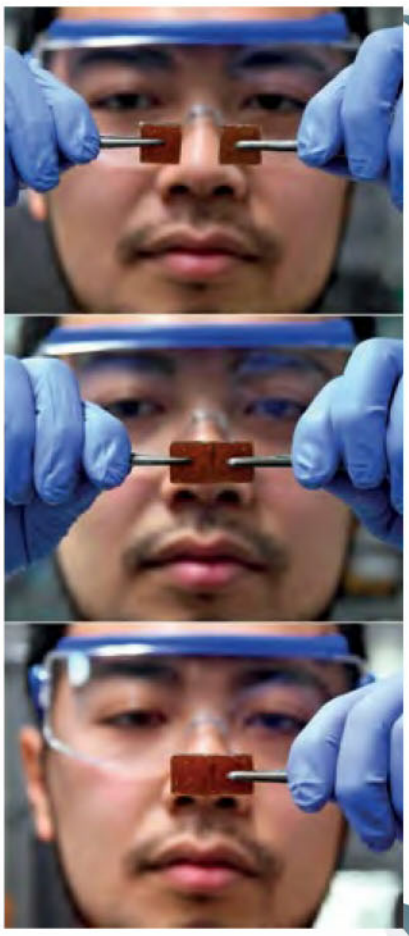
By **James Lu**

The days of shattered smartphone screens could soon be over. Japanese researchers at the University of Tokyo have accidentally developed a new type of glass that can heal itself from cracks and breaks.

The glass is made from a low weight polymer called "polyether-thioureas" that can heal cracks when simply pressed together by hand, without the need for high heat to melt the material.

Graduate school student Yu Yanagisawa was the first to discover the healing properties of the glass, when he was preparing the material as glue. Yanagisawa found that when he cut the polymer surface, the edges would adhere to each other, healing to form a strong sheet after being compressed for 30 seconds at room temperature. Further experimentation found that the healed material regained its original strength after a couple of hours.

Yanagisawa didn't believe the results at first and repeated his experiments multiple times to confirm the finding. He said, "I hope the repairable glass becomes a new environment-friendly material that avoids the need to be thrown away if broken."



PICTURES **123RF, UNIVERSITY OF TOKYO**

This is what real people are saying about the new Epson L-series ink tank printers

This is what real people are saying about the new Epson L-series ink tank printers

Five of our lucky readers tried out the new Epson L-series ink tank printers, from the L4150 to the L4160, L6160, L6170 and L6190. Now they reveal what it's like to use one.

If you're not familiar with Epson ink tank printers, they're printers that offer high page yields with low running costs. Whereas cartridge printers print up to a few hundred pages, ink tank printers can print up to several thousand pages.

Instead of ink cartridges that you replace, ink tank printers have large tanks that you refill with affordable ink bottles. The black ink bottle costs only S$14.90, while the cyan, magenta and yellow ink bottles cost S$9.90 each. Epson's new L-series printers offer an integrated ink tank design, a redesigned refilling process, and faster speeds.

But don't just take our word for it. Here's what our readers have to say about these printers (some of the testimonials have been edited for brevity).

PICTURE EPSON

1 REFILLING IS EASY AND SPILL-FREE

"The new refilling system promised (and delivered) no spills. You can turn the bottle upside down and the ink won't come out until you fit it into the correct nozzle. I tried fitting the yellow ink bottle into the magenta nozzle and it wouldn't fit. While refilling, you can leave the bottle attached and it'll stop when the ink tank is full, so the tank won't overflow. There was still ink left in the bottle, handy for last minute refills."
— *Adeel AJ, on the Epson L6190*

2 SAVE COSTS WITH CHEAPER PRINTS

"Our current printer prints around 1,500 pages per cartridge. The Epson L6170's specification is 7,500 pages for monochrome prints (which we are unable to verify yet). Based on the current cartridge and L6170 ink refill prices, the Epson's price per print is cheaper. Even if the L6170 only prints up to 4,000 pages, the price per print is still cheaper." — *Neaw Kang Hai, on the Epson L6170*

3 IMPRESSED WITH PRINT QUALITY

"I was impressed with the quality of the digital pictures that I printed. It's a low-cost way of getting your digital photos printed at home."
— *Melvin Lim, on the Epson L4150*

4 EASY TO SET UP AND USE

"The main feature I liked from the L4160 was the wireless connectivity with portable smart devices. Once the devices are set up, everything is good to go. No extra steps needed to print, unlike my previous printer.' — *James Quek, on the Epson L4160*

5 WOULD THEY RECOMMEND IT?

"The L6160 printer is designed for the office but is also well suited to home use, offering pro-level features that are easy to setup and use. It's arguably one of the best SOHO printers around."
— *Richard Neo, on the Epson L6160*

To find out more about the Epson L-series ink tank printers, go to **www.epson.com.sg/inktankprinter**

THE GOOD

THE BAD

AND THE WEIRD...

By **James Lu, Ng Cheong Seng, Marcus Wong, Alvin Soon**
Art Direction by **Orland Punzalan**

The Consumer Electronics Show offers a glimpse of the future in tech, and the sneak peek isn't always a good one. Here are the good, the bad, and the weirdest products from this year's show.

FROM CES 2018

PICTURES **DELL, KOHLER, AEE, DEBUSSY, SONY, 123RF**

THE GOOD

We can imagine spending real money on these.

Dell XPS 15 2-in-1

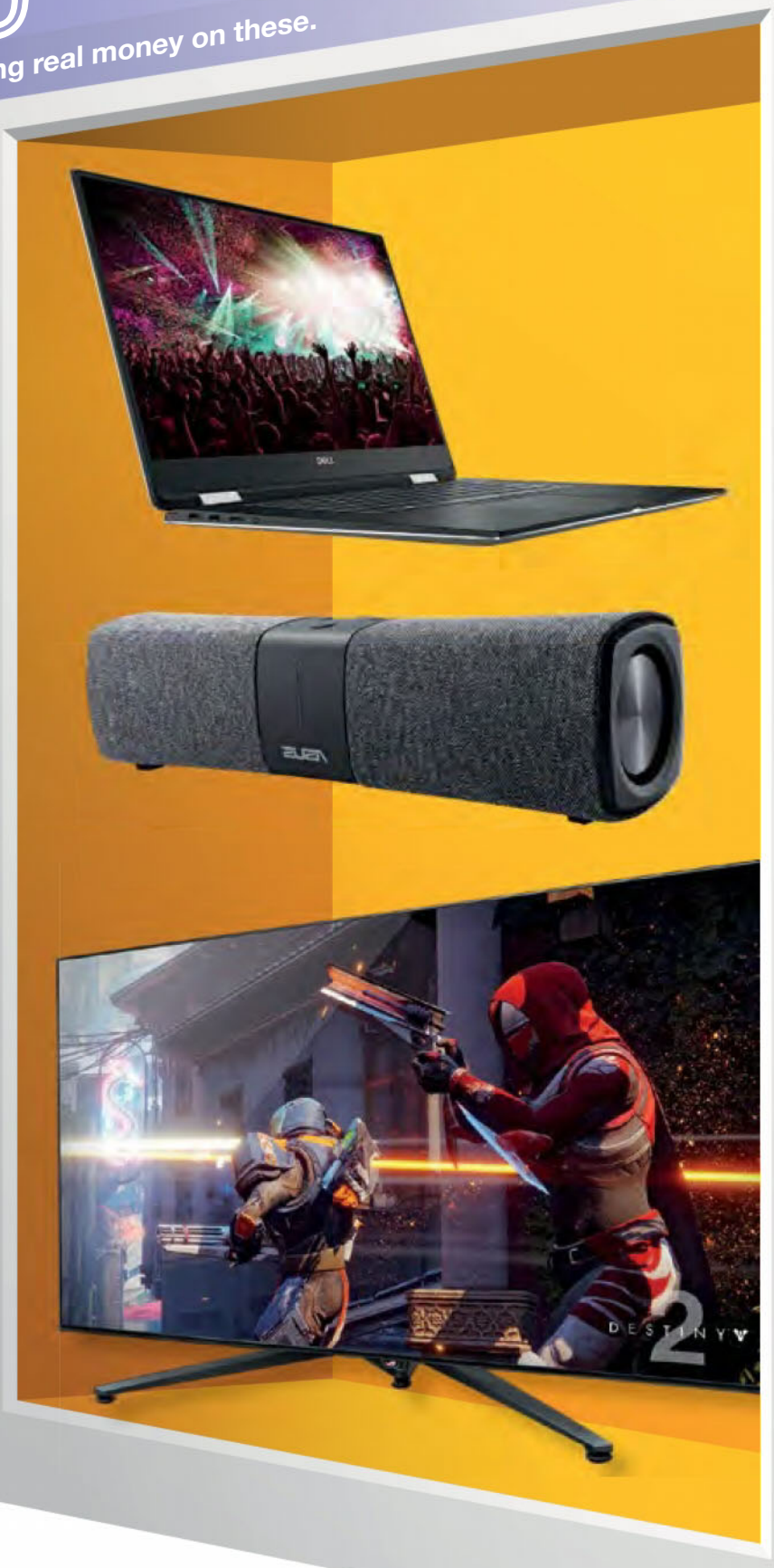
The Dell XPS 15 2-in-1 marks an unexpected collaboration between Intel and AMD. It's powered by an Intel Core-G processor, which fuses a quad-core Intel Core processor with an AMD Radeon RX Vega discrete GPU. The integration makes the Dell XPS 15 a powerhouse for graphics work, while keeping it slim and light.

ASUS Lyra Voice

The Asus Lyra Voice combines many things into one. It's an 802.11ac Wi-Fi mesh router, as well as a voice assistant with stereo speakers. The tri-band, AC2200-class device can connect with other Lyra hubs to form a mesh network. Plus, it ships with Amazon Alexa to answer your queries and control smart home devices.

Nvidia Big Format Gaming Displays

TVs usually don't make for great PC gaming displays, especially when you throw 4K and HDR at them. NVIDIA is going to change that now, with its Big Format Gaming Displays. Working in conjunction with its hardware partners, these BFGDs are high-end 65-inch, 4K HDR displays. There's support for 120Hz refresh rates, Nvidia G-Sync, Nvidia Shield, 1,000-nit peak luminance and DCI-P3 color gamut.



PICTURES **SAMSUNG, NVIDIA, DELL, ASUS**

SAMSUNG'S TV COMEBACK STORY BEGINS

MicroLED is the company's secret weapon to topple OLED. *By* **Ng Chong Seng**

Large, fancy TVs filled with acronyms and marketing terms are common sightings at CES. Samsung "The Wall" TV could be categorized as another example, but on this ginormous TV I see Samsung TV division's comeback. Or at the very least, a comeback in the making.

The Wall is a modular TV. Instead of one single panel, it's made up of many display modules, each of them 9.37 inches and bezel-less. Samsung made The Wall a 146-inch TV for CES 2018, but really, it could be any size.

The Wall is exciting to me because of its underlying microLED display technology. Its LEDs can turn on or off individually without a backlight, which potentially makes for infinite contrast and deep black levels.

If this sounds familiar to you, yes, these are exactly the strengths of OLED. microLED has every chance to combine the best of both LCD and OLED worlds. microLED provides brightness of up to 2,000 lumens, which currently isn't possible on OLED. And the use of an inorganic material (e.g., gallium nitride) improves lifespan.

It's obvious that microLED is the reason Samsung stuck with QLED TVs (quantum dot-enhanced LED-LCD TVs), instead of investing in OLED to compete with LG. Samsung leads in worldwide TV sales, but the sentiment that OLED rules in picture quality couldn't have sat well within the company.

To be clear, Samsung hasn't completed its comeback. The Wall was the only microLED TV announced. Its module-based construction suggests that Samsung hasn't figured out how to manufacture microLED panels for the consumer TV market yet.

Plus, features such as 4K resolution will affect how close each of the sub-pixels are to one another and throw up new technical challenges. It's why I think a 65-inch 4K HDR microLED TV is at least two years away.

Other than to impress, new displays at CES are usually big for a good reason. Smaller high-res panels are more difficult to make than bigger panels of the same resolution.

Still, credit where credit's due; Samsung has arguably brought forth the future of TV. Unlike many products announced at CES, The Wall is actually shipping this year. OLED is safe for the time being, but LG should start looking over its shoulders.

THE BAD

Why did they even make this stuff?

Modius Health

Modius Health claims it can help you lose weight by literally zapping your brain. The device delivers low-level electrical impulses to the hypothalamus, the part of the brain that regulates hunger. Modius claims that by wearing the Health for a few hours per week, it can convince your brain to decrease appetite. However, there's no real proof that the device actually works.

Seven Dreams Laundroid

Seven Dreams updated its Laundroid laundry-folding machine for CES 2018, but it still takes the machine five to ten minutes to fold one T-shirt. The Laundroid uses multiple robotic arms to pick up the clothes, scans them and transmits the images to a server. AI analyzes the clothing and determines how to fold the item. It will cost US$16,000.

Kohler Numi Smart Toilet

If you've ever dreamed of streaming music from your toilet, you now can with the Kohler Numi Smart Toilet. You can even talk to the toilet when you get bored, because it comes with Amazon Alexa. In case its automatic flush and deodorization features are too future-forward for you, you can also control the Toilet through its app or remote control.

PICTURES KODAK, KOHLER, MODIUS, SEVEN DREAMS

NOT EVERYTHING THAT GLITTERS IS GOLD

Where dubious tech solutions are peddled for problems you never knew you had. *By* **James Lu**

Every year, tech companies from around the world flock to CES to showcase their latest tech. But amongst actual innovation, some companies are content with trying to cash in on the latest fad.

There's no better example this year than Kodak, a once venerable name in photography that jumped into the unrelated field of bitcoin mining. At CES 2018, Kodak launched the KashMiner, a bitcoin mining rig that you can rent , not buy, from Kodak for two years, for US$3,400 up front. Plus 50 percent of any bitcoin you successfully mine.

The KashMiner brochure claims that customers can expect a payout of about US$375 per month for the next two years, if bitcoin averages $14,000 in that time.

But Kodak's math ignores a basic principle: each bitcoin mined makes the next one harder to mine. Mining bitcoin is currently becoming more difficult by 15 percent per month. That means the KashMiner's output will also drop by 15 percent each month.

So while Kodak's KashMiner may net you US$375 in its first month, as its output decreases, you won't be earning as much. To continue earning US$375 per month over two years, bitcoin will need to reach an average value of US$28,000 to offset the expected increase in difficulty.

Kodak isn't alone in its desperate cash grab. Many companies have changed their names to include either bitcoin or blockchain (the technology that underpins bitcoin), despite being in unrelated fields. The most egregious of these is the Long Island Ice Tea Corp, a beverage company that changed its name to Long Blockchain Corp, despite having nothing to do with cryptocurrency.

Unfortunately, these tactics work. A week after announcing the KashMiner, Kodak's shares went up 120 percent. And within a week of changing its name, Long Blockchain Corp saw a 458 percent jump in its stock price. Last year, 12 companies saw 309 to 42,500 percent gains, after changing their names to include bitcoin or blockchain.

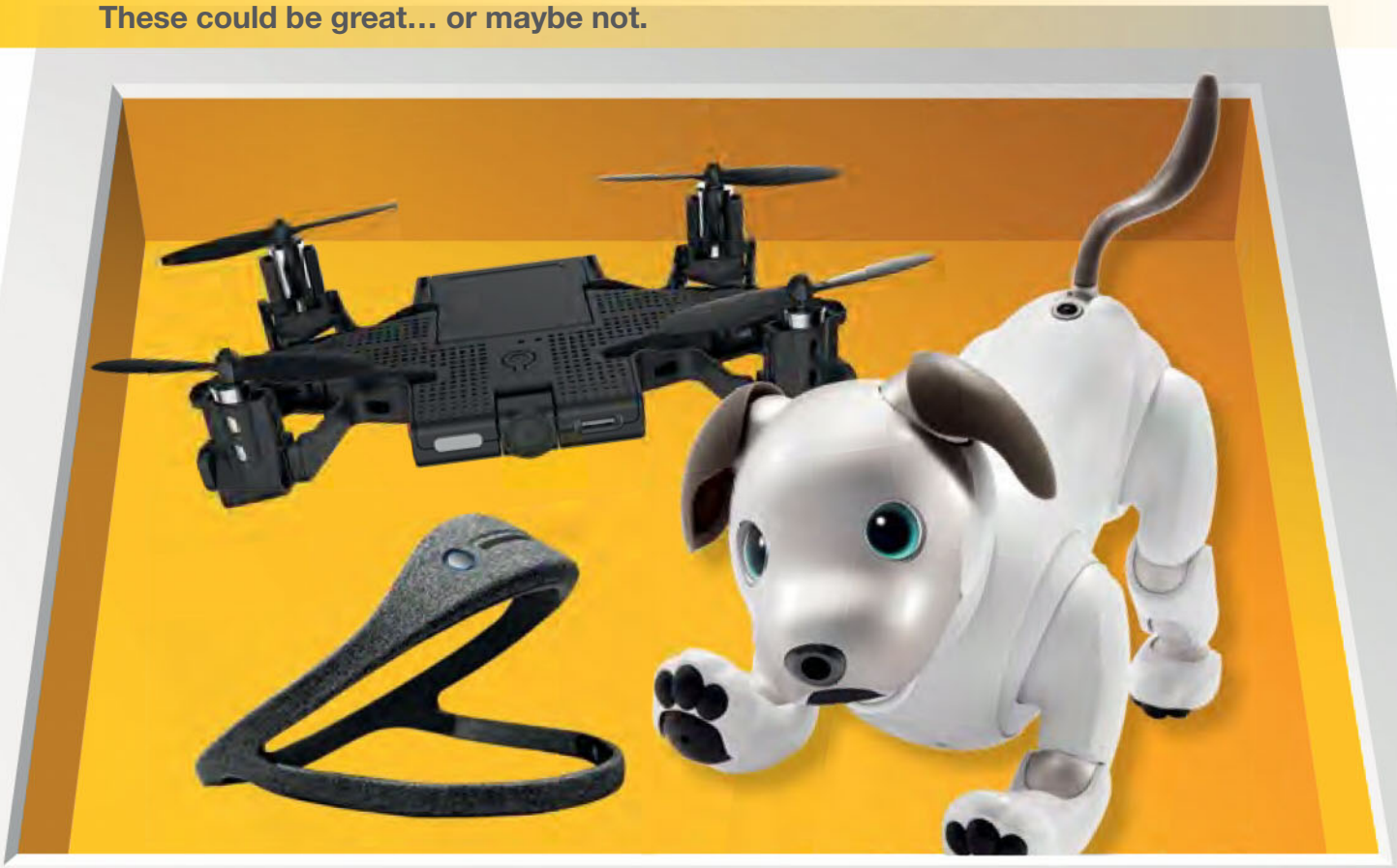
The lesson here? As long as people give money to companies that jump on the latest buzzword, there's nothing to stop them from coming back with new schemes. Right now it's 'bitcoin' and 'cryptocurrency,' but next year it could be something else. When these companies have nothing to do with whatever fad they're piggybacking on, they're just bamboozling investors.

So make sure you know what you're buying or investing in. Don't assume that because a company is throwing around words like 'bitcoin' or 'blockchain,' it actually knows what it's doing.

Kodak isn't alone in its desperate cash grab. Many companies have changed their names to include either bitcoin or blockchain, despite being in unrelated fields.

AND THE WEIRD

These could be great… or maybe not.



AEE Selfly Drone-Smartphone Case

A smartphone case that's also a drone — err, sure, why not? The AEE Selfly is a smartphone case with an embedded drone. Whenever you want to take a selfie that's too wide for your smartphone, just pop out the drone on the case. The AEE Selfly works with a smartphone app; it can grab 13MP stills and 1080p video.

Dreem

Dreem is a headset designed by Yves Béhar to help you sleep better. It plays white noise via bone conduction to help you sleep. Once you're asleep, the Dreem monitors your brain and plays sounds to improve deep sleep. White noise drowns sounds and bone conduction prevents it from disturbing your partner. But how comfortable is it to wear a headset to sleep?

Sony Aibo (2018)

Sony's new Aibo is either an adorable robot or a harbinger of the end. The refreshed robot dog has OLED eyes which give it nuanced expressions, the better to fool your human mind with. The AI inside develops a 'personality' over time, and can recognize members of the family. It's always online, the better to morph into a sentient overlord. But humanity has a chance — Aibo only has two hours of life on a single charge.

PAYING TOP DOLLAR FOR LESS ADVANCED TECH

What are you paying for when you're not actually paying for technology? *By* **Marcus Wong**

At huge tech shows like CES, there's inevitably going to be this group of products that you just can't place. It's not that they're bad products per se.

Take for example, the Debussy Nathaniel headphones from Funky Studio Group. These headphones are all-in-one luxury audio solutions, with 4G and Wi-Fi connectivity to stream music. There's 32GB of internal storage, and the headphones run an operating system so you won't need another device to play music.

There's even a color display on the right ear cup. When wearing the headphones, the screen becomes a gesture-based touchpad with playback controls. When you take the headphones off, you can browse music, create playlists, and go through settings. There's even a virtual assistant, so you can check your emails or get directions. It all sounds fantastic until you hear the price – the Nathaniel is going at US$4,990, for pre-orders.

For a new company that doesn't have a following, that's high enough to put off most people. After all, you can get a proven pair of high-end headphones at that price, like the Sonoma Model One headphone system. But charging high prices might be the point. More and more, we're seeing higher priced versions of products that don't do more than their regular counterparts. Instead, cosmetic changes are used to justify higher prices. Either that, or the inclusion of unnecessary features that do nothing for the core product.

Nikon's 100th Anniversary cameras, Vertu phones and KEF's LS 50 Wireless Nocturne speakers come to mind. Most major companies have had a limited edition model at some point that cost many times more than the original.

It's perplexing to think that in the world of consumer electronics, how advanced and effective a product is has less effect on its price than a branding gimmick.

Call it a sign of how commoditized technology has become. For those who seek exclusivity, it's not enough to own a flagship mobile phone or laptop any more. These days, what you need is an exclusive version of the high-end device that everyone else has. As you can see from the Debussy Nathaniel headphones, there are more of these than you might think.

PICTURES: **DEBUSSY, SONY, DREEM, AEE**

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HOW WE RATE:
Products are rated on a scale of **1** to **10**; **1** being so abysmal, it should be a crime to sell it, and **10** being almost perfect. Come now, nothing is perfect. An Editor's Choice may also be awarded based on unique merits.

PICTURE **MERCEDES BENZ**

MORE INSIDE>

MICROSOFT XBOX ONE X
The console you've been waiting for.

SECRETLAB OMEGA (2018)
Can gaming chairs get any better?

ASUS ROG GX501 ZEPHYRUS
Changing the perceptions of a gaming notebook.

- ACER SWITCH 5
- ASUS ZENBOOK FLIP S
- DELL XPS 13
- HP SPECTRE
- LENOVO YOGA 920
- LG GRAM 14
- MICROSOFT SURFACE PRO
- RAZER BLADE STEALTH

The Great Notebook

Advances in processor technology and materials have made ultraportable notebooks thinner, lighter, and faster. But out of all them, which is best? We take eight of them into our labs to find out.

Ultraportable Shootout

By **Kenny Yeo** *Photography by* **Darren Chang** *Art Direction by* **Orland Punzalan**

ACER SWITCH 5

The aptly named Switch is Acer's family of detachable notebooks of which the Switch 5 is its flagship. Based on first impressions, it is easy to dismiss it as a clone of Microsoft's Surface Pro, but that would be missing the point.

One standout feature of the Switch 5 is its LiquidLoop cooling system. In place of traditional heatsinks and fans, the Switch 5 instead uses a single fan-less liquid cooling circuit for cooling, allowing it to runs silently even under heavy loads.

The Switch 5 comes with a 12-inch IPS panel display with a 2,160 x 1,440 pixels resolution. The display is a little small and prone to reflection and glare, but it is crisp and sharp.

The Switch 5 is fairly compact, measuring just 9.6mm thick and weighing 900g. However, the bundled keyboard does add a fair bit of heft, increasing its thickness to 15.95mm and its weight to 1.27kg. It also has an integrated kickstand, which is handy and can tilt the Switch 5 at an angle of up to 165 degrees.

Inside, the Switch 5 is powered by a seventh generation Intel Core i7-7500U processor with 8GB of RAM and 512GB of SSD storage. Performance is decent and the notebook feels sufficiently snappy running productivity and web browser apps, but trailed most of its rivals in benchmark tests. Battery life is slightly disappointing at just three hours too.

One nifty feature about the Switch 5 is that its power button doubles up as a fingerprint scanner, allowing for quick logins. As for ports, the Switch 5 comes with one full-size USB 3.0 port and another USB-C port (something the Surface Pro lacks) that supports USB 3.1 Gen 1. There's also a microSD card reader.

+ Eerily quiet, integrated fingerprint sensor, lots of bundled accessories.

– Bundled keyboard is thick and heavy, ho-hum performance and battery life.

In another move to one-up the Surface Pro, the Switch 5 comes bundled with a keyboard and stylus. This makes the Switch 5 greater value than its Microsoft rival, which sells these accessories separately. The keyboard features backlights and attaches magnetically to the display. Key travel is quite decent and it is pleasant to type on. The trackpad, however, can be a little erratic at times. The stylus supports up to 1,024 levels of pressure is fairly accurate and responsive to use. It also attaches to the keyboard by the side using a loop.

The Active Pen comes as standard and the display is pressure sensitive to 1,024 levels.

The fingerprint sensor is cleverly hidden away on the side.

AT A GLANCE

PROCESSOR
Intel Core i7-7500U

MEMORY
8GB

STORAGE
512GB SSD

WEIGHT
1.27kg (with keyboard)

PRICE
$1,898

ASUS ZENBOOK FLIP S

AT A GLANCE

PROCESSOR
Intel Core i7-8550U

MEMORY
16GB

STORAGE
512GB SSD

WEIGHT
1.1kg

PRICE
$2,498

The ZenBook is ASUS' line of ultra-thin notebooks and for the past few years, they have been pushing the boundaries of what's possible in a thin and light notebook. And according to ASUS, the new ZenBook Flip S is the world's thinnest convertible notebook.

The important figures to note are these: 10.9mm thick and just 1.1kg heavy. The ZenBook Flip S doesn't just feel incredibly light, but well made too. The ZenBook Flip S comes in an all-metal body and has beveled edges. It is also available in two colors - Royal Blue and Smokey Grey. These colors are quite unique and attractive, setting them apart from the competition.

The ZenBook Flip S has a 13.3-inch Full HD IPS display. It looks a little dated compared to its higher resolution rivals, but colors are punchy and vivid. To keep the display light yet strong, ASUS employs the use of Corning Gorilla Glass to protect it.

Despite the ZenBook Flip S' slim dimensions, it is powered by Intel's newest eighth generation Core processor, specifically the quad-core Core i7-8550U. It also has 16GB of RAM and a 512GB SSD. Unfortunately, even though it is powered by Intel's latest, performance wasn't all that impressive. It was quick in short bursts, but suffered from a serious case of CPU throttling. This was most evident when running graphics benchmarks, where its numbers would gradually fall after consecutive runs. Battery life was also disappointing at just 163 minutes.

Port-wise, the ZenBook Flip S eschews full-size USB ports for two USB-C ports. Both support USB 3.1 Gen 1, which is a little disappointing because we had hoped to see Thunderbolt 3 support. The ZenBook Flip S does not come with an SD or microSD card reader. However, it does have an integrated fingerprint sensor on the sides, which allows quicker login using Windows Hello.

To ensure owners can use the ZenBook Flip S seamlessly with their existing peripherals, the ZenBook Flip S comes bundled with a USB-C adapter that offers a full-size USB 3.1 port, HDMI port, and a USB-C port for power. Speaking of power, the ZenBook Flip S supports fast charging and can achieve a 60% charge from zero in 49 minutes.

Pros: Incredibly thin and light, stylish design.

Severe CPU throttling and short battery life.

There's a fingerprint sensor hidden to the side of the ZenBook Flip S.

The bundled ASUS Pen supports up to 1,024 pressure levels.

DELL XPS 13

The XPS 13 from Dell has been one of the most popular ultraportable Windows notebooks, but it is starting to look a little aged in the face of newer designs from its rivals. In 2015, Dell gave the XPS 13 an extensive redesign and the 2017 model that we have here is still based on that.

The XPS 13 might have been slim and light two years ago, but it is now one of the heavier 13-inch ultraportable notebooks. It measures 15mm at its chunkiest point and weighs 1.29kg, which hardly makes it a behemoth but the inescapable remains: it is noticeably bulkier than its current rivals. That said, thanks to the thin bezels of its InfinityEdge display, the XPS 13's overall footprint still remains relatively small.

Class-leading performance, a good selection of ports, and outstanding battery life.

Chunkier and heavier than its rivals, looks a little dated.

The XPS 13 makes up for its bulk in other ways. To begin, it has one of the nicest displays. Its 13.3-inch IPS display supports a resolution of 3,200 x 1,800 pixels, one of the highest in its size. It is touch-enabled too. But more importantly, it looks fantastically crisp and vivid. The display's ultra-thin bezels accentuate the brilliance of the display further.

In terms of hardware, the XPS 13 is powered by Intel's latest eighth generation Core processor, specifically the quad-core Core i7-8550U. This is complemented by 16GB of RAM and a 512GB SSD. Perhaps it is because of its beefier chassis, the XPS 13 was able to put Intel's latest hardware to better use. There's no performance throttling here and the XPS 13 was the overall top performer in our benchmarking tests.

The XPS 13 offered good battery life too, recording a pretty impressive 247 minutes or just over 4 hours in our rather demanding battery life test. Part of this has to do with its relatively low power consumption; but also because at 60Wh, its battery is actually one of the largest in its class.

The other upside to being larger than its competitors is that the XPS 13 is able to accommodate more ports. In addition to two full-size USB 3.0 ports, the XPS 13 also has a single USB-C Thunderbolt 3 port and an SD card reader. SD card readers are fast becoming a rarity amongst modern ultraportables so it is nice to see that the XPS 13 still offers one.

The XPS 13 has a single USB Type-C Thunderbolt 3 port.

The XPS 13's InfinityEdge display has incredibly thin bezels.

AT A GLANCE

PROCESSOR
Intel Core i7-8550U

MEMORY
16GB

STORAGE
512GB SSD

WEIGHT
1.29kg

PRICE
$2,399

HP SPECTRE

AT A GLANCE

PROCESSOR
Intel Core i7-8550U

MEMORY
16GB

STORAGE
512GB SSD

WEIGHT
1.11kg

PRICE
$2,899

If there was an award for the most stylish notebook, the HP Spectre would have easily won it. It was clearly designed to standout. For a start, it is superbly slim and light, measuring just 10.4mm thick and weighing just 1.11kg. But most of all, it comes in an attractive shade of color that HP calls "dark ash with copper accents." We really love the copper accents.

The Spectre comes with a 13.3-inch IPS panel touchscreen display protected by Corning Gorilla Glass. The display offers a resolution of 1,920 x 1,080 pixels. Side by side comparisons against rivals with higher resolution displays, showed it was noticeably fuzzier. It doesn't help also that the colors of the Spectre's display look a little washed out.

+ Sleek and stylish, incredibly thin and light.

– Dismal battery life, pricey.

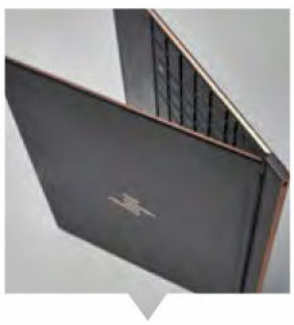
Under the proverbial hood, the Spectre is outfitted with Intel's latest eighth generation Core processor - the quad-core Core i7-8550U. Complementing the processor are 16GB of RAM and a 512GB SSD. Overall performance is above average.

What's not so good, however, is the Spectre's battery life lasting just 159 minutes or slightly more than two and a half hours. This was the shortest of all notebooks. Although its 43.7Wh battery is also one of the smallest in the shootout, it fell below average. If it is any consolation, the Spectre has a fast charge function, which enables users to charge it from zero to 50% in just 30 minutes.

In terms of ports, the Spectre offers just three USB-C ports. Two of which support Thunderbolt 3 and the final one supports USB 3.1 Gen 2. There's no SD or microSD card reader. To ensure that the Spectre can be used with existing peripherals out of the box, there's a bundled USB-C adapter that offers a full-size USB 3.0 port, an HDMI port, and a USB-C port for charging.

The Spectre also deserves special mention for its keyboard, which we felt was the most satisfying to use. It isn't mechanical but it has a good amount of travel and requires a higher than average amount of force to actuate. This makes it feel punchy, which is great for typing.

Additionally, it has an extra column of keys to include Delete, Home, Page Up, Page Down, and End keys. Touch typists will need a bit of time to get used to this layout, but once they do, they'll appreciate the extra column of keys.



The rose gold accents on the side give the Spectre a stylish look.

The Spectre comes with two USB Type-C Thunderbolt 3 ports.

LENOVO YOGA 920

The Lenovo Yoga 920's roots can be traced back to the Yoga 3 Pro from 2014. The watchband hinge, so synonymous now with the Yoga, was first introduced then. In terms of design, the two share many similarities, and as a result, the Yoga 920 can look a bit dated and not quite as fresh as some of its rivals.

In terms of dimensions, the Yoga 920 measures 13.95mm thick and weighs 1.37kg. It is fairly thin, but in terms of weight, it is actually heaviest notebook here. Fortunately, there's a good explanation for that and that's because the Yoga 920 happens to have the largest display and battery of all the notebooks in this shootout.

The Yoga 920 features a 13.9-inch touchscreen IPS display, and is the only notebook in this shootout with a 4K resolution (3,840 x 2,160 pixels). As a result, text and images look incredibly sharp and crisp. Colors are also bright and vivid.

The one thing that we dislike about the display is its huge bottom bezel, and it makes the Yoga 920 bigger than it ought to be. Because of this and its larger 13.9-inch display, the Yoga 920 has the largest footprint of all the notebooks too. If portability is one of your most important considerations, this is something you ought to take note.

Inside, the Yoga 920 is powered by Intel's newest eighth generation Core processor, specifically the quad-core Core i7-8550U. Running alongside this new CPU is 16GB of RAM and also a 1TB SSD. The Yoga 920 performed quite admirably in our benchmarking tests and was definitely one of the faster notebooks in this shootout. However, despite having the largest battery, it didn't last the longest in our battery test. Nevertheless, 222 minutes (or just under 4 hours), is still considered above average.

Excellent performance, good battery life, 4K display.

Bulkier and heavier than rivals, pricey.

As for ports, the Yoga 920 comes with a full-size USB 3.0 port and two USB-C ports supporting Thunderbolt 3. Unfortunately, there's no SD card reader, but there is a fingerprint scanner to the bottom right of the keyboard.

The Yoga 920 also comes with the Lenovo Active Pen 2, allowing users to draw, doodle, or take notes with their Yoga 920. The Lenovo Active Pen 2 is also the only one that rivals the Microsoft Surface Pen's 4,096 levels of pressure sensitivity. We found it to be quite responsive and pleasant to use.

The watchband hinge allows the display to fold almost completely flat against itself.

The Yoga 920 comes with two USB Type-C Thunderbolt 3 ports.

AT A GLANCE

PROCESSOR
Intel Core i7-8550U

MEMORY
16GB

STORAGE
1TB SSD

WEIGHT
1.37kg

PRICE
$3,299

LG GRAM 14

AT A GLANCE

PROCESSOR
Intel Core i7-7500U

MEMORY
16GB

STORAGE
8GB SSD

WEIGHT
970g

PRICE
$2,499

If weight and portability are your utmost considerations in a notebook, you want to pay attention to the LG gram 14. Unlike most of the other notebooks here with an aluminum chassis, the gram 14's chassis is made out of a blend of carbon fiber and magnesium alloy. The end result is that despite being one of the chunkiest notebooks - it measures 16mm thick - it is the lightest at just 980g. Yup, it weighs less than a kilogram.

That's even more impressive when you consider that it has a larger 14-inch IPS display. Unfortunately, the display only supports a Full HD resolution and colors tend to look a little washed out especially if you turn up the brightness levels.

Incredibly light, super long battery life, lots of ports.

Disappointing performance.

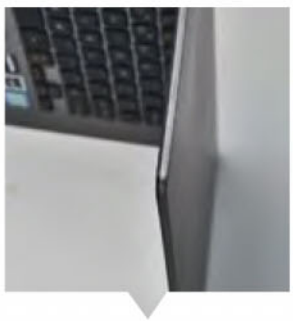
Inside, the gram 14 is powered by a seventh generation Core i7 processor - the Core i7-7500U. It also gets 8GB of RAM and a 512GB SSD. Interestingly, unlike the other notebooks here, its memory runs in single-channel mode. This, coupled with its older processor, means that performance isn't the gram 14's strong suit. In fact, we found that it had the poorest performance, especially where graphics are concerned. However, the gram 14 actually performs decently in actual usage and was speedy enough when running everyday applications like email apps and web browsers.

On the flip side, the gram 14 does boast an incredibly long battery life. It has a 60Wh battery, which is the second largest after the Lenovo Yoga 920, and lasted an amazing 572 minutes in our battery life test. That's over nine and a half hours; the longest in this shootout.

In the real world, if all you are doing is surfing the web and checking emails, we reckon you could easily get over 15 hours and up to 20 hours even. To give some perspective, the second-placed notebook in terms of battery life is the Dell XPS 13, which lasted 247 minutes, and that's not even half as long as the gram 14.

The gram 14 also offers a good selection of ports. It comes with two USB 3.0 ports, a single USB-C port supporting USB 3.1, an HDMI port, and a microSD carder. We would have preferred a Thunderbolt 3 port and a full-size SD card reader, but as it is, at least the gram 14 doesn't require an adapter to be usable with your existing accessories and peripherals.

The gram 14 is one of the few notebooks to come with a full-size HDMI port.



The Gram 14 is one of the notebooks to use magnesium alloy in its construction.

MICROSOFT SURFACE PRO

When it comes to detachable notebooks, the Surface Pro from Microsoft is widely acknowledged to be the gold standard. The Surface Pro 3 from 2014 showed the world that it was really possible to design a tablet that could function as well as a regular notebook and here we are now with the fifth generation of the Surface Pro.

The Surface Pro is wonderfully thin and light. On its own, without the keyboard attached, it measures just 8.5mm thick and weighs a mere 784g. Even with the keyboard, its thickness and weight only increase slightly to 14.15mm and 1.08kg. More importantly, it is less chunky and less heavy than the Acer Switch 5.

Good performance for short bursts, excellent portability.

Accessories are sold separately, serious throttling issues, pricey.

The Surface Pro comes with a 12.3-inch IPS display that supports a resolution of 2,736 x 1,824 pixels. Microsoft calls this display PixelSense. The bezels around the display are a little large but picture quality itself is top notch. The display is super sharp and the colors are vivid and gorgeous.

Inside, the Surface Pro is powered by a seventh generation Core i7 processor, but not the more common Core i7-8550U or Core i7-7500U. The Surface Pro gets the Core i7-7660U. This processor is a bit special because it gets the more powerful Intel Iris Plus Graphics 640 integrated GPU. Rounding up its specs, it also has 16GB of RAM and a 512GB SSD.

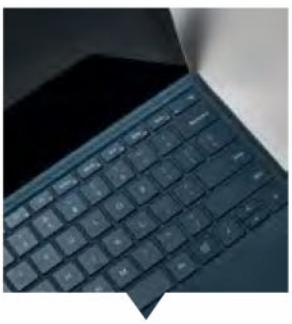
Thanks to the more powerful integrated GPU, the Surface Pro has the strongest graphics performance here. However, what the graphs don't show is that it is prone to serious throttling too. After subsequent benchmarking runs, we found the Surface Pro's performance will dip considerably.

The Surface Pro's battery life is decent as it recorded 246 minutes or just over 4 hours in our battery life test, making it on par with the Dell XPS 13.

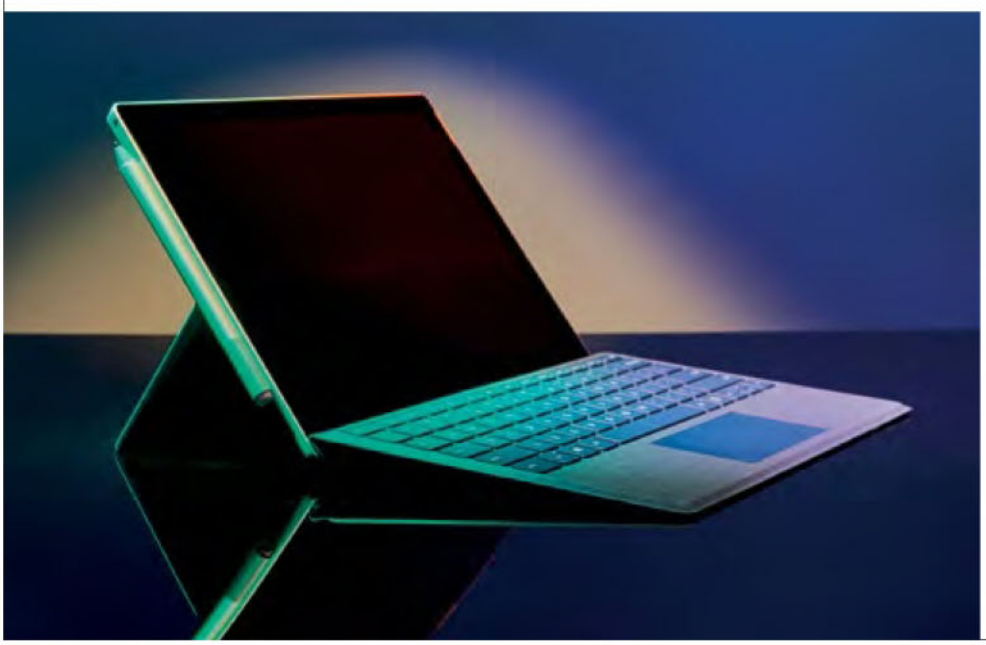
As for ports, the Surface Pro has a single full-size USB 3.0 port, a mini-DisplayPort, and a microSD card reader. Obviously, we would have preferred a USB-C port that supports USB 3.1 or Thunderbolt 3, but at least the mini-DisplayPort works better with higher resolution displays with high refresh rates.

One thing readers should take note is that accessories for the Surface Pro - such as the Surface Pen and Type Cover keyboard - are sold separately. This adds a considerable amount to the total cost of the system.

The Surface Pen is sold separately, but it is one of the most sensitive, supporting up to 4,096 levels of pressure.



The keyboard, which is wrapped in Alcantara, is also sold separately.



AT A GLANCE

PROCESSOR
Intel Core i7-7660U

MEMORY
16GB

STORAGE
512GB SSD

WEIGHT
1.1kg

PRICE
$3,188

RAZER BLADE STEALTH

AT A GLANCE

PROCESSOR
Intel Core i7-7500U

MEMORY
16GB

STORAGE
512GB SSD

WEIGHT
1.33kg

PRICE
$2,149

The Razer Blade Stealth is an interesting proposition. It is positioned as a gaming notebook, but not in the traditional sense. In place of earth-shattering hardware, the Blade Stealth has more modest specifications and relies on clever engineering to realize its potential as a gaming machine. As a result, Razer was able to make the Blade Stealth thin and light.

The headline figures are these: 13.1mm in thickness and just 1.33kg heavy. It might seem heavy when compared to its rivals in this shootout, but it is an absolute featherweight insofar as gaming notebooks are concerned.

The Blade Stealth comes with a 13.3-inch IGZO display that supports a resolution of 3,200 x 1,800 pixels. Even though it isn't 4K, it is easily one of the best displays in its class.

Underneath the proverbial hood, the Blade Stealth is powered by seventh generation Core processor - the Core i7-7500U. It also comes with 16GB of RAM and a 512GB SSD. Again, these specifications aren't typically what you would find on a gaming notebook, but like I said earlier, the Blade Stealth isn't a typical one.

You see, the Blade Stealth also comes with a USB-C Thunderbolt 3 port that can be connected to the Razer Core V2, an external graphics dock that can be outfitted with a PCIe graphics card allowing it to drastically improved the graphics performance of the Blade Stealth. If you wish, you can even outfit the Razer Core V2 with top-of-the-line graphics cards like the GeForce GTX 1080 Ti or Titan Xp.

This means the Blade Stealth can perform like a regular gaming notebook or desktop when docked at home. When you need to travel, just unplug it and it will function like any ultraportable notebook.

+ Stylish, customizable Chroma keyboard, great display.

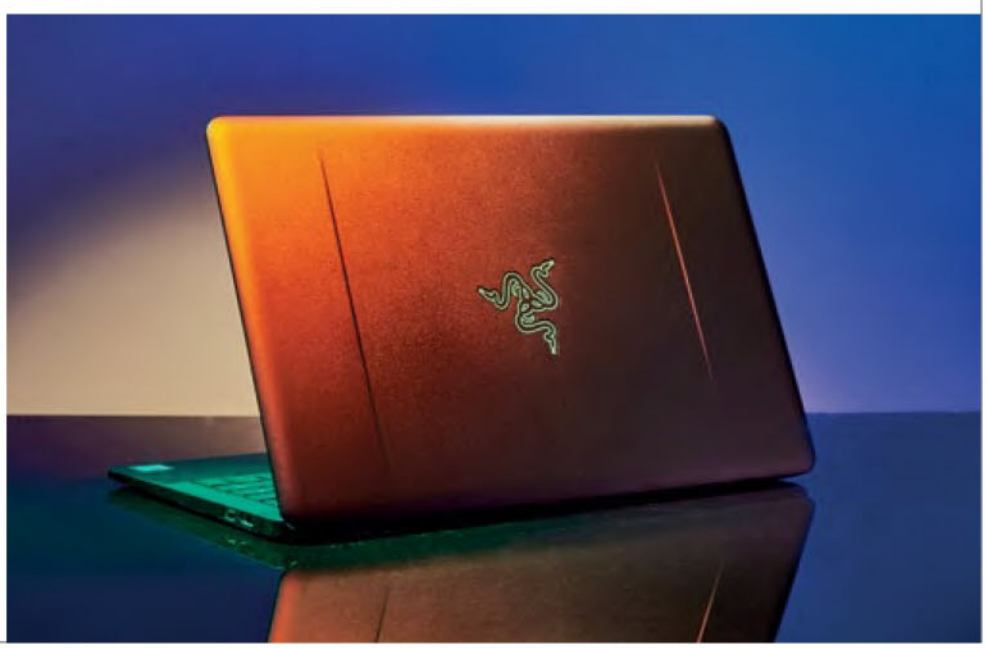
– Bulkier and heavier than rivals.

The Blade Stealth's overall performance is decent and comparable to other ultraportable notebooks with the same processor, and its battery life is pretty average at 192 minutes or just over three hours. And alongside its USB-C Thunderbolt 3 port, it also has two USB 3.0 ports and an HDMI 2.0a port.

The Blade Stealth also has other features that will appeal to gamers. For example, it has a highly customizable keyboard with Razer Chroma lighting and anti-ghosting capability. And on the connectivity front, it has Killer Wireless-AC, which helps reduce latency for online gaming.

The Blade Stealth's keyboard has Razer's highly customizable Chroma lighting effects.

The Blade Stealth has a single USB Type-C Thunderbolt 3 port.



SPECIFICATIONS

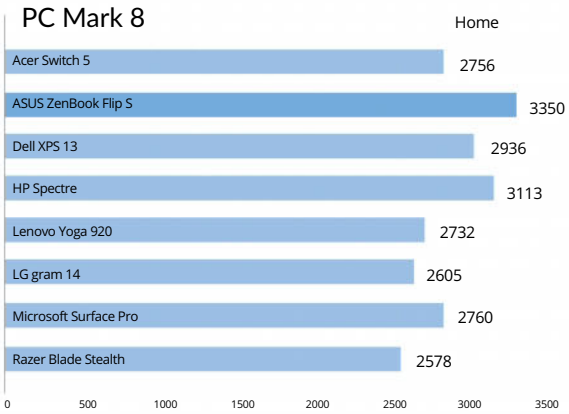
SPEC COMPARISON	DISPLAY	CPU	MEMORY	GRAPHICS	STORAGE	PORTS
ACER SWITCH 5	12-INCH IPS (2,160 X 1,440 PIXELS)	INTEL CORE I7-7500U	8GB DDR3 DUAL-CHANNEL	INTEL HD GRAPHICS 620	512GB SSD	1 X USB 3.0, 1 X USB-C 3.1 GEN 1
ASUS ZENBOOK FLIP S	13.3-INCH IPS (1,920 X 1,080 PIXELS)	INTEL CORE I7-8550U	16GB DDR3 DUAL-CHANNEL	INTEL HD GRAPHICS 620	512GB SSD	2 X USB-C 3.1 GEN 1
DELL XPS 13	13.3-INCH IPS (3,200 X 1,800 PIXELS)	INTE CORE I7-8550U	16GB DDR3 DUAL-CHANNEL	INTEL HD GRAPHICS 620	512GB SSD	2 X USB 3.0, 1 X USB-C THUNDERBOLT 3
HP SPECTRE	13.3-INCH IPS (1,920 X 1,080 PIXELS)	INTE CORE I7-8550U	16GB DDR3 DUAL-CHANNEL	INTEL HD GRAPHICS 620	512GB SSD	2 X USB-C THUNDERBOLT 3, 1 X USB-C GEN 1
LENOVO YOGA 920	13.9-INCH IPS (3,840 X 2,160 PIXELS)	INTE CORE I7-8550U	16GB 16GB DDR3 DUAL-CHANNEL	INTEL HD GRAPHICS 620	1TB SSD	1 X USB 3.0, 2 X USB-C THUNDERBOLT 3
LG GRAM 14	14-INCH IPS (1,920 X 1,080 PIXELS)	INTEL CORE I7-7500U	8GB DDR3 SINGLE-CHANNEL	INTEL HD GRAPHICS 620	512GB SSD	2 X USB 3.0, 1 X USB-C GEN 3.1, 1 X HDMI
MICROSOFT SURFACE PRO	12.3-INCH IPS (2,736 X 1,824 PIXELS)	INTEL CORE I7-7660U	16GB DDR3 DUAL-CHANNEL	INTEL IRIS PLUS GRAPHICS 640	512GB SSD	1 X USB 3.0, 1 X MINI-DISPLAYPORT
RAZER BLADE STEALTH	13.3-INCH IGZO IPS (3,200 X 1,800 PIXELS)	INTEL CORE I7-7500U	16GB DDR3 DUAL-CHANNEL	INTEL HD GRAPHICS 620	256GB SSD	2 X USB 3.0, 1 X USB-C THUNDERBOLT 3, 1 X HDMI 2.0A

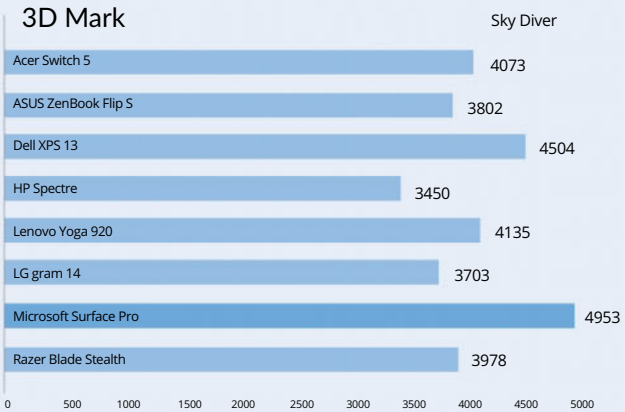
SD CARD READER	WIRELESS-AC	TOUCH SCREEN	CONVER-TIBLE	BATTERY SIZE	WEIGHT	DIMENSIONS (MM)	PRICE
YES (MICRO SDXC)	802.11AC/B/G/N/A	YES	YES (DETACH-ABLE)	37WH	1.27KG (WITH KEYBOARD)	292.9 X 201.8 X 15.95	$1,898
NO	802.11AC/B/G/N/A	YES	YES	39WH	1.1KG	313 X 218 X 10.9	$2,498
YES	802.11AC/B/G/N/A (KILLER NETWORK)	YES	NO	60WH	1.29KG	304 X 200 X 15	$2,699
NO	802.11AC/B/G/N/A	YES	NO	43.7WH	1.11KG	308.2 X 224.2 X 10.4	$2,899
NO	802.11AC/B/G/N/A	YES	YES	70WH	1.37KG	323 X 223.5 X 13.95	$3,299
YES (MICRO SDXC)	802.11AC/B/G/N/A	NO	NO	60WH	970G	323 X 213 X 16	$2,499
YES (MICRO SDXC)	802.11AC/B/G/N/A	YES	YES (DETACH-ABLE)	45WH	1.08KG (WITH KEYBOARD)	292.1 X 201.4 X 14.15	$3,188
NO	802.11AC/B/G/N/A (KILLER NETWORK)	YES	NO	53.6WH	1.33KG	321 X 206 X 13.1	$2,449

BENCHMARK PERFORMANCE

PCMARK 8

PCMark 8 tests a system's performance by putting it through different tasks that reflect the workloads of various kinds of users, for instance, the casual home user or the working creative professional. Unsurprisingly, the notebooks powered by the newer and faster eighth generation Core processors such as the ASUS ZenBook Flip S and HP Spectre recorded higher scores in this benchmark.



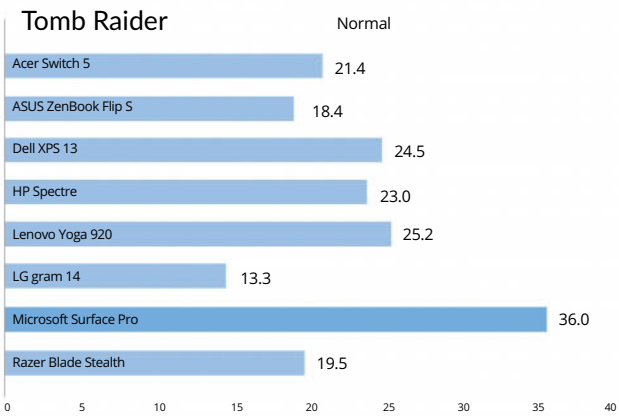


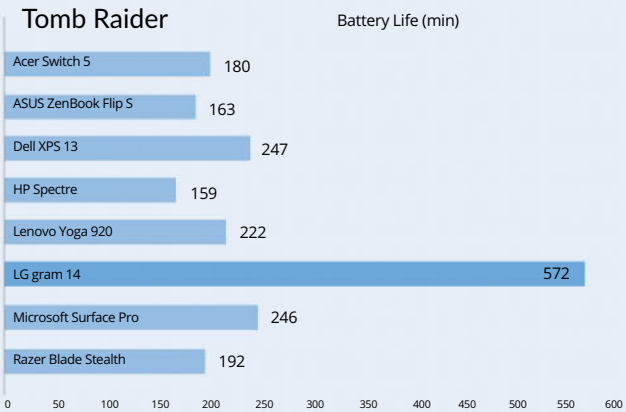
3DMARK

3DMark is a general graphics test benchmark that is useful for quickly gauging a system's graphics capabilities. As we had expected, the Microsoft Surface Pro was the top performer here thanks to its powerful Intel Iris Plus Graphics 640 integrated GPU. Trailing in second and third place were the Dell XPS 13 and Lenovo Yoga 920, who are powered by newer and more powerful eighth generation Core processors.

TOMB RAIDER

Tomb Raider might be an old title, but it is still a stiff test for notebooks that rely on integrated GPUs. The Microsoft Surface Pro was easily the top performer thanks to its powerful Intel Iris Plus Graphics 640 integrated GPU. However, severe CPU throttling soon kicked in and we saw the Surface Pro's performance drop after consecutive runs. The gram 14's performance was disappointing mostly because it has single-channel memory which greatly hampers the performance of its integrated GPU.





BATTERY LIFE

We put the notebooks through our grueling battery life test, which consists of productivity workloads such as photo and video editing, and even some light gaming. The gram 14 lasted 572 minutes and was the longest lasting notebook by a great margin. Far away in second and third place are the Dell XPS 13 and Microsoft Surface Pro with 247 and 246 minutes respectively. Incredibly, that's not even half of what the gram 14 managed!

AND THE BEST ULTRAPORTABLE IS...

LG GRAM 14

It was tightly contested, but in the end, the LG gram 14 emerged as our best ultraportable notebook. Admittedly, performance isn't its strongest suit, but we felt that it was snappy enough and more than up to the task when running everyday applications like web browsing, emails, and the occasional photo and video editing. More importantly, however, the gram 14 is unmatched in terms of portability. Not only is it easily the lightest notebook here, it also has the best battery life by some margin. It lasted over 9.5 hours, which is incredible when you consider that the second-placed notebook doesn't even last half as long.

King of the Hill

Intel's 8th-generation processors are multi-threading and gaming beasts, boasting more cores and threads across the entire line-up, but they're going to require a new Z370 motherboard. Here are your best bets.

By **Koh Wanzi** *Photography by* **Gong Yimin** *Art Direction by* **Orland Punzalan**

ASROCK Z370 TAICHI

ASUS ROG MAXIMUS X HERO

GIGABYTE Z370 AORUS GAMING 7

MSI Z370 GAMING PRO CARBON AC

The CLR_CMOS button is located on the rear I/O panel.

ASROCK Z370 TAICHI

ASRock's Z370 Taichi is a well-rounded board with great mass market appeal. It combines a rich selection of features with a very palatable price tag, so it quite effectively straddles the line between mainstream and enthusiast markets.

It comes with most of the features one expects, including three PCIe 3.0 x16 slots, eight SATA 6Gbps ports, and three M.2 sockets. That's more than enough expansion options for most users, and eight SATA ports is actually two more than most boards usually offer, thanks to an ASMedia ASM1061 controller.

In addition, it features onboard Wi-Fi, which is a nice inclusion given that the pricier ASUS and Gigabyte boards don't offer it. Most gamers will probably opt for a wired connection, but the added flexibility could come in useful. Speaking of wired, the board is also equipped with dual Intel Gigabit LAN ports that support teaming, so this is one of the most fully featured boards when it comes to networking and storage options.

However, given that the Z370 chipset has a total of 30 HSIO lanes that are divvied up among the PCIe, SATA, and USB 3.0 connectors, you won't be able to use all the aforementioned features at once. For example, populating all the M.2 sockets will disable five of the SATA ports.

The board ships with dual onboard BIOS as well, a much appreciated feature at this price point, although you'll have to fiddle with a pair of jumper pins to force the system to boot from the backup BIOS. This will prove useful when recovering from failed overclocks, and enthusiasts will appreciate the CLR_CMOS button on the rear I/O panel.

+ Plenty of storage expansion options.

− Mediocre overclocking performance.

Unfortunately, that's where the buck stops in catering to more serious users. The board is conspicuously missing any physical power or reset buttons, and you get just a single RGB LED header. And while other boards are clad from head to toe in LEDs, it's only the PCH heatsink that is sporting RGB LEDs on the Taichi.

The Z370 Taichi is for those who want all the essential features and then some. However, overclockers are better served by looking elsewhere.

A debug LED display helps with troubleshooting.

AT A GLANCE

VOLTAGE REGULATOR
12 phases

EXPANSION SLOTS
3x PCIe 3.0 x16, 2x PCIe 3.0 x1

STORAGE
8x SATA 6Gbps, 3x M.2

NETWORKING
Intel I219-V + Intel I211-AT
802.11ac Wi-Fi

PRICE
$379

ASUS ROG MAXIMUS X HERO

AT A GLANCE

VOLTAGE REGULATOR
10 phases

EXPANSION SLOTS
3x PCIe 3.0 x16, 3x PCIe 3.0 x1

STORAGE
6x SATA 6Gbps, 2x M.2

NETWORKING
Intel I219-V

PRICE
$519

The ASUS ROG Maximus X Hero sits in something of a sweet spot between the mainstream and enthusiast market. While it skews more toward the latter, it manages that without the exorbitant price tag that requires you to sell a limb. Yes, it is still the most expensive board here, but makes up for it with plenty of useful features and a thoughtful design.

Overclockers will appreciate the hardware controls, including Safe Boot, ReTry buttons, and a Slow Mode switch for those looking to push further with LN2 cooling. There's decent support for liquid cooling as well, with dedicated headers for both AIO and custom pumps.

All this is underpinned by solid overclocking performance and one of the most intuitive BIOS interfaces around. The settings for tweaking the DRAM frequency, voltages, and CPU ratio and BCLK are located on the same page, so you don't have to bounce around between menus.

The board uses a 10-phase power design, less than what the ASRock Taichi offers on paper. But as our overclocking results show, it's clearly the quality of the implementation that matters.

Then there are small quality-of-life features such as large-sized buttons for clearing CMOS and updating the BIOS on the rear I/O. The integrated I/O shield is also a great inclusion. Not only does it look impeccable, it really helps simplify the installation process.

The topmost M.2 socket features a large, dedicated heatsink that interfaces with the M.2 SSD beneath via a sizeable thermal pad. This particular socket is located between the CPU, GPU, and DIMM slots, so any measure to reduce temperatures and prevent throttling is welcome.

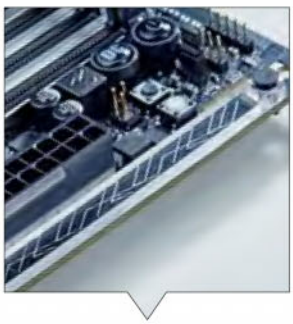
The board supports extensive customizations as well. In addition to LEDs built into the PCH and VRM heatsink, there are three RGB headers that support external LED strips. Two of these headers support Aura Sync-compatible strips from brands like Phanteks and BitFenix, so you can sync up the lighting effects across your entire system. The third header even supports strips with individual addressable LEDs, which offer an even greater degree of customization.

+ Plenty of enthusiast-oriented features.

− Pricey.

The integrated I/O shield simplifies the installation process considerably.

The board features a bunch of useful hardware buttons for overclockers.



You can swap out the overlay for your own 3D-printed design.

GIGABYTE Z370 AORUS GAMING 7

The Gigabyte Z370 Aorus Gaming 7 is the company's flagship Intel Z370 motherboard. That said, the laundry list of features reads more like that of a balanced all-rounder rather than that of an enthusiast-oriented model.

For instance, there are no auxiliary power connectors for the CPU or an LN2 mode switch for serious overclocking. You also won't find things like DIP switches to disable select PCIe or DIMM slots when you're troubleshooting or tweaking your system.

However, what the board does have is a solid selection of core features that will prove far more useful to a wider swath of users. This decision is reflected in the fairly reasonable $435 price tag, and you get everything you need, plus a little icing on the top.

This means decent storage expansion and connectivity options, in addition to customizable LEDs, a beefed-up onboard audio solution, and a total of eight fan headers, including a high amperage header that outputs up to 3A.

The topmost M.2 socket is also equipped with its own heat sink, which is particularly important given how close it is to heat-generating components like the CPU and GPU.

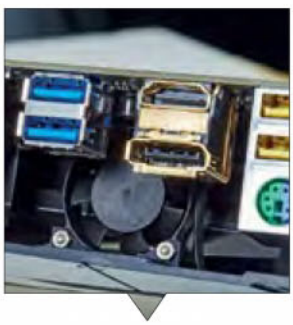
But while this board may lack certain features for more extreme overclockers, that doesn't mean it's a slouch either. It is equipped with an 8+2-phase power design for the CPU and iGPU, and uses Intersil's latest digital PWM and Smart Power Stages to supply up to 60A for each of the eight phases for the CPU Vcore.

Great overclocking performance.

No onboard Wi-Fi.

You also get all the essential buttons, including ones for power, reset, and clearing CMOS. However, it'd have been nice to see the CLR_CMOS button located at the rear I/O instead, as it'd make troubleshooting a lot easier once you've completed your build. In addition, you'll find a one-click OC button in the same area for a quick and hassle-free overclock.

Finally, the board also has a couple of nice features that tend to slip under the radar. This includes an ESS Sabre 9018 DAC for onboard audio and a second Ethernet port powered by the Killer E2500 Gigabit Ethernet controller.



There's a small 6,000RPM fan under the I/O cover for cooling the VRM components.

AT A GLANCE

VOLTAGE REGULATOR
10 phases

EXPANSION SLOTS
3x PCIe 3.0 x16, 3x PCIe 3.0 x1

STORAGE
6x SATA 6Gbps, 3x M.2

NETWORKING
Intel I219-V + Killer E2500

PRICE
$435

MSI Z370 GAMING PRO CARBON AC

AT A GLANCE

VOLTAGE REGULATOR
10 phases

EXPANSION SLOTS
3x PCIe 3.0 x16, 3x PCIe 3.0 x1

STORAGE
6x SATA 6Gbps, 2x M.2

NETWORKING
Intel I219-V
802.11ac Wi-Fi

PRICE
$349

MSI's Z370 Gaming Pro Carbon AC is the most affordable board of the lot at just $349. It's worth mentioning that MSI does have higher-end Z370 boards available, but we weren't able to secure one for this shootout.

That said, the Z370 Gaming Pro Carbon AC is more a mid-range board with a focus on aesthetics. There are literally lights everywhere, with LEDs built into the VRM and PCH heatsinks, under the board, and an LED light trail that traces the path of the audio circuitry.

What's more, the board features a total of four RGB headers, including two that support individually addressable LEDs. One of the latter was also designed specifically for Corsair LED strips, part of an MSI and Corsair collaboration.

There's also a dedicated fan header for use with Corsair's Hydro series coolers and their Corsair Link feature. While MSI's decision to focus on Corsair hardware can be questioned, as it shoehorns users into picking a single brand. However, at least it ensures the pairing will work, especially if you're already a Corsair fan.

Affordable and great-looking board.

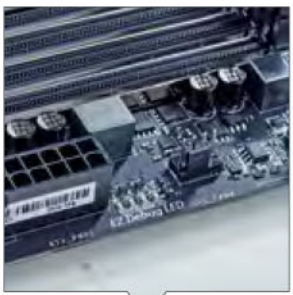
Not the best for overclocking.

Still, MSI has done a great job of cramming as much value as it can into what is a very attractive package. For instance, the onboard Wi-Fi is a nice touch, as some of the pricier boards don't have this. It's also equipped with plenty of USB ports on the back, including USB 3.1 (Gen 2) Type-C and Type-A ports, four USB 3.1 (Gen 1), and two USB 2.0 ports.

Storage expansion options are also on par with the competition, and you get metal-reinforced PCIe and DIMM slots and an M.2 heatsink as well.

Having said that, the Z370 Gaming Pro Carbon AC isn't the best board for enthusiasts. Like the ASRock board, there are no power or reset buttons, and it's also missing a debug LED display. There isn't a USB 3.1 (Gen 2) front panel connector either, so you're out of luck if your case supports this.

Furthermore, overclocking performance is decent, but it isn't quite as good as what ASUS and Gigabyte offer. Overall, this is a good board for the mass market and those who can't get enough of RGB LEDs, but not hardcore enthusiasts.



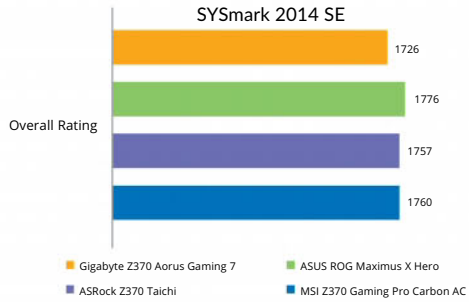
The EZ Debug LEDs stand in for a debug display in pinpointing hardware issues.

Two of the SATA ports are oriented to face upwards.

SPECIFICATIONS

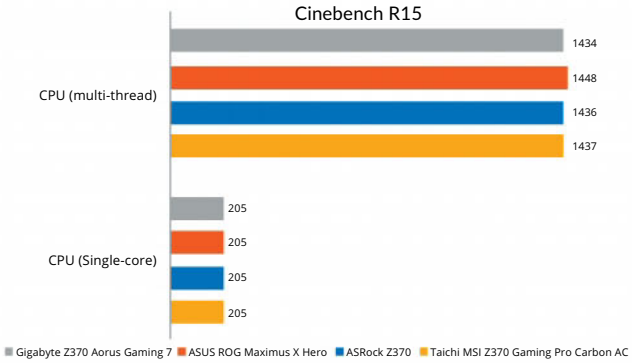
	ASRock Z370 Taichi	ASUS ROG Maximus X Hero	Gigabyte Z370 Aorus Gaming 7	MSI Z370 Carbon Pro Carbon
Voltage regulator	10+2-phase	8+2-phase	8+2-phase	8+2-phase
Memory	64GB DDR4-4333	64GB DDR4-4133	64GB DDR4-4133	64GB DDR4-4000
Expansion slots	3x PCIe 3.0 x16, 2x PCIe 3.0 x1	3x PCIe 3.0 x16, 3x PCIe 3.0 x1	3x PCIe 3.0 x16, 3x PCIe 3.0 x1	3x PCIe 3.0 x16, 3x PCIe 3.0 x1
USB ports (rear I/O)	• 1x USB 3.1 (Gen 2) Type-A • 1x USB 3.1 (Gen 2) Type-C • 4x USB 3.1 (Gen 1) Type-A	• 1x USB 3.1 (Gen 2) Type-A • 1x USB 3.1 (Gen 2) Type-C • 4x USB 3.1 (Gen 1) Type-A • 2x USB 2.0	• 1x USB 3.1 (Gen 2) Type-A • 1x USB 3.1 (Gen 2) • 5x USB 3.1 (Gen 1) Type-A	• 1x USB 3.1 (Gen 2) Type-A • 1x USB 3.1 (Gen 2) • 4x USB 3.1 (Gen 1) Type-A • 2x USB 2.0
Storage	8x SATA 6Gbps, 3x M.2	6x SATA 6Gbps, 2x M.2	6x SATA 6Gbps, 3x M.2	6x SATA 6Gbps, 2x M.2
Networking	Intel I219-V + Intel I211-AT 802.11ac Wi-Fi	Intel I219-V	Intel I219-V + Killer E2500	Intel I219-V
Audio	• Realtek ALC1220 • NE5532 Premium Headset Amplifier for front panel audio connector	• ROG SupremeFX 8-Channel High Definition Audio codec S1220 ESS ES9023P DAC	• Realtek ALC1220 ESS9018Q2C chip • Support for Sound BlasterX 720°	• Realtek ALC1220
Form factor	ATX	ATX	ATX	ATX
Price	$379	$519	$435	$349

BENCHMARK PERFORMANCE



SYSMARK 2014 SE

Unsurprisingly, there's little to distinguish the boards in SYSmark, and they performed very similarly given the otherwise identical configurations. The ASUS ROG Maximus X Hero was the top performer, but the difference between it and the Gigabyte board was just under 3 per cent, which is within a reasonable tolerance of deviation.

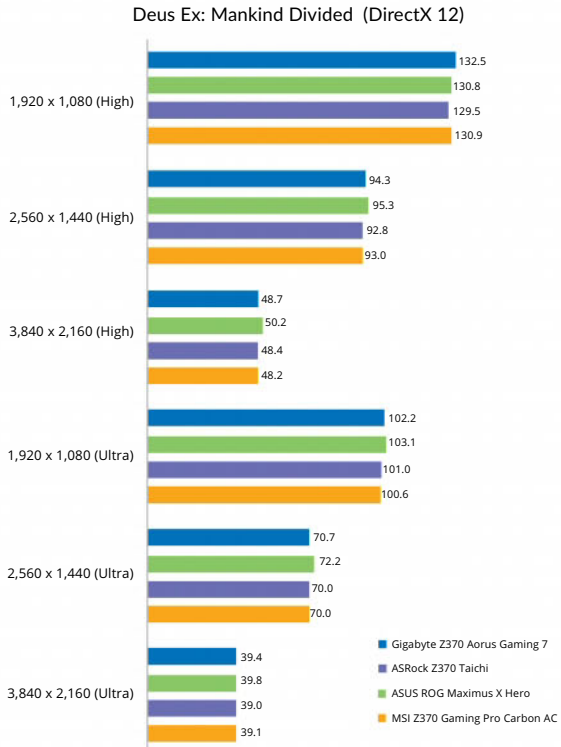


CINEBENCH R15 (MULTI-THREADED)

The multi-threaded test scenario uses all of the system's processing power – it can utilize up to 256 threads – to render a photorealistic 3D scene, making use of various algorithms to stress all available processor cores. The ASUS board topped the charts again, but it was a meager 0.97 per cent that separated it from the Gigabyte motherboard.

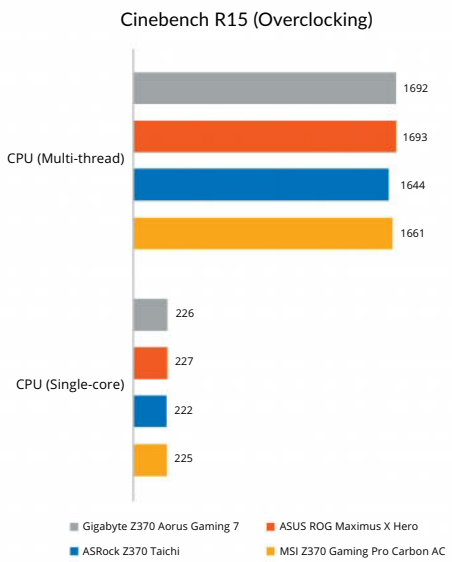
DEUS EX: MANKIND DIVIDED (1080P, ULTRA, DIRECTX 11)

Deus Ex: Mankind Divided is one of the most demanding games out there right now, where the GPU is a major limiting factor. Performance was once again really close, although the Gigabyte board took the lead this time, followed by the ASUS model.



OVERCLOCKING

The Gigabyte Z370 Aorus Gaming 7 enabled us to achieve the highest overclock here, and we were able to push the CPU to a maximum of 5.2GHz. However, this didn't necessarily result in the absolute best performance. The ASUS ROG Maximus X Hero squeaked ahead in Cinebench R15, despite managing a top speed of "only" 5.15GHz.



AND THE BEST INTEL Z370 MOTHERBOARD IS...

ASUS ROG MAXIMUS X HERO

And here we are again. ASUS motherboards command a premium, but they justify it with a winning combination of design elements, extensive features, solid performance and strong overclocking. From the get go, you've got useful hardware that caters for all level of users up to extreme LN2 overclocking. Even if you just want to add bling to your rig, nothing beasts the extensive customization options here, and support for custom 3D-printed nameplates and individually addressable LEDs leave plenty of room for personalization. Finally, it is thoughtful in its execution, with an integrated I/O shield and large buttons for updating the BIOS and clearing CMOS that make the board a pleasure to install and work with.

N S M
National Museum of Singapore

Eternal Landscape, a digital art installation by Yang Yongliang. Image courtesy of Yang Yongliang Studio.

digimuse

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National Museum of Singapore
Free admission

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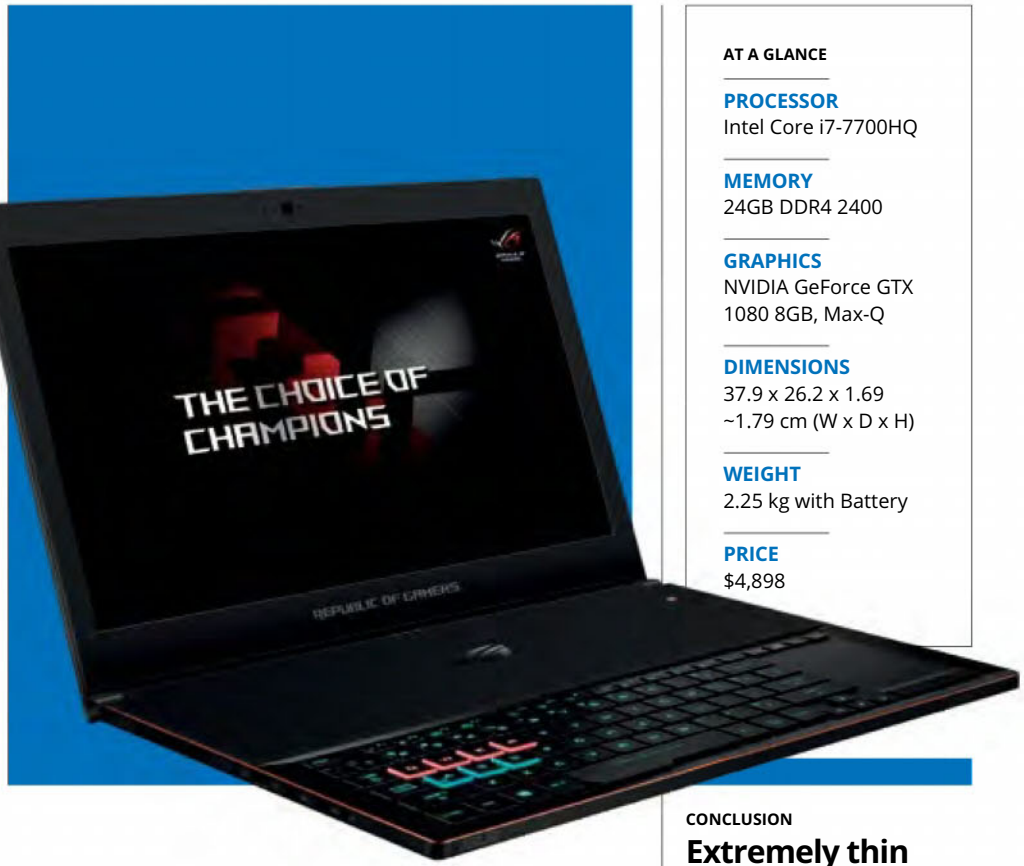
When East meets the West Wind

ASUS ROG GX501 Zephyrus

By **Aaron Yip**



AT A GLANCE

PROCESSOR
Intel Core i7-7700HQ

MEMORY
24GB DDR4 2400

GRAPHICS
NVIDIA GeForce GTX 1080 8GB, Max-Q

DIMENSIONS
37.9 x 26.2 x 1.69 ~1.79 cm (W x D x H)

WEIGHT
2.25 kg with Battery

PRICE
$4,898

CONCLUSION

Extremely thin and powerful, this Max-Q poster boy redefines design and style for dedicated gaming laptops.

What does it take to make an extreme gaming laptop that isn't built with the thickness of a Subway sandwich and quiet enough to run Overwatch next to a sleeping baby? Apparently, NVIDIA's unique Max-Q design approach.

At 16.9mm thick and 2.2kg, the ASUS ROG GX501 Zephyrus looks anorexic compared to its ROG siblings. And yet, our test model comes fully decked out with a 7th-gen Intel Core i7-7700HQ CPU (clocked at 2.8GHz), 24GB of memory, a 512GB SSD and an NVIDIA GeForce GTX 1080 8GB GPU. That's some serious firepower.

Its "Active Aerodynamic System" is a unique cooling design where a section of the bottom opens when you open the lid. ASUS claims a 32 percent increase in cooling performance. While hard to quantify, I can say that it measured just 10.6dBA on my sound level meter even at maximum load—that's about as noisy as a pin dropping.

When you open the laptop's lid, the bottom extends as well, to provide additional cooling ventilation to the Zypherus.

Unfortunately, this design comes back to haunt it for literally anything other than gaming. You see, the cooling design means that the hottest components—the CPU and GPU—are loaded at the back of the laptop, while the keyboard and trackpad are moved right to the bottom edge. This makes typing simply uncomfortable, even with the supplied wrist rest. The trackpad is also shoehorned to the right of the keyboard, rather than below. Sorry lefties.

Connectivity shouldn't be a problem though with four traditional USB 3.0 ports, a Thunderbolt 3 USB Type-C port, HDMI, and a headphone jack. You also get a USB-to-Ethernet and wireless Xbox controller dongles bundled.

Its 15.6-inch display supports all gaming niceties such as NVIDIA G-Sync and a 120Hz refresh rate, though maximum native resolution is pegged to 1,920 x 1,080. I had expected a more respectable 2,560 x 1,440 with such hardware. Still, the resolution cap ensured that the Zephyrus performed fantastically at everything I threw at it, averaging between 90 to 100fps and above for every game.

Unsurprisingly, battery life is a disappointment, scoring just 98 minutes in our PCMark 8 run. I held out hope that the Max-Q design would have helped, evidently, you'll have to keep it plugged in.

The Zephyrus is a high tech marvel compared to regular DTR laptops. It has all the performance, with none of the bulk, but there's no hiding the fact its design considerations mean it's not made for average mundane tasks outside of gaming.

TESTED & RATED

8.0/10

HWM SINGAPORE

PICTURES **ASUS**

The Hero and the Scar

ASUS ROG Strix GL503

By **Aaron Yip**

AT A GLANCE

DISPLAY
15.6-inch, 1,920 x 1,080-pixels, IPS, 144Hz (Scar) / 120Hz (Hero)

GRAPHICS
NVIDIA GeForce GTX 1070 8GB (Scar) / NVIDIA GeForce GTX 1060 6GB (Hero)

STORAGE
256GB (Scar) / 128GB (Hero) M.2 SSD, 1TB SeaGate FireCuda SSHD

DIMENSIONS
38.4 x 26.2 x 2.54cm

WEIGHT
2.5kg

PRICE
$3,498 (Scar)
$2,698 (Hero)

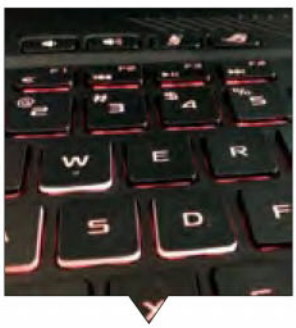
CONCLUSION

The ASUS ROG Strix GL503 Scar and Hero editions are well built and attractive, with almost all the right gaming traits.

The Hero and Scar editions of the ROG Strix GL503 laptop are really two of the same with some genre-specific designs targeted at MOBA and FPS gamers respectively.

The Hero (GL503VM) features highlighted QWER keys; common for games like DOTA 2. Crucially, it also features a 120Hz IPS display panel. The Scar (GL503VS) has highlighted WASD keys with a 0.25mm-deep concave absent from the Hero version. It also comes with a 144Hz refresh rate display. The Hero is adorned with ROG's signature Mayan patterns, and some gamers might prefer the fancier looking lid than the Scar's gunmetal gray.

Hardware-wise, both review units are powered by an Intel Core i7-7700HQ processor and 16GB of DDR4 RAM, but while the Hero comes with a 6GB NVIDIA GeForce GTX 1060, the Scar has a more powerful 8GB NVIDIA GeForce GTX 1070. The Scar also gets a larger 256GB PCIe SSD compared to the 128GB on the Hero. You won't have to worry about connectivity, as they both have heaps of ports including four USB 3.1 ports and a Thunderbolt 3 (Type-C) port.



The Scar's highlighted WASD keys are also concaved to help guide your fingers back into place quickly in the heat of a firefight.

Both sport the same unique thermal design, where venting grills above the keyboards allow more intake of cool air from the back. There are even intake cuts on the front edge, which seems to be a first for an ROG laptop. The fans never get excessively loud even at full load, although it's noticeable.

While I wouldn't say the GL503 keyboards are the best I've used, they do have appreciable tactile feedback and travel. You'll also get obligatory configurable RGB lighting via pre-installed ROG Aura Core sofware.

Despite ASUS trying to pigeonhole them as MOBA and FPS specialist laptops, both run most of today's games well, and performance is what you'd expect from such configurations. Except, you'll definitely feel the longer loading times from the choice of slow 5400rpm hybrid secondary drive.

Both notebooks also fared poorer in battery life tests than even its predecessor, the GL502, so keep them plugged in while gaming.

All in, the key decision maker will actually be whether you want the more powerful Scar ($3,498) with its GeForce GTX 1070 and 144Hz display, though the Hero is definitely more affordable at $2,698, and a better buy if you live by less demanding esports-type games like CS:GO and DOTA 2.

TESTED & RATED

8.0/10

HWM SINGAPORE

PICTURES **ASUS**

Steelseries finally puts a 3360 in a sub-100g MOUSE

Steelseries Rival 310

By **JAMES LU**

Despite the name, Steelseries' Rival 310 mouse actually feels a lot closer to the Rival 700 than the Rival 300. While the 700 was a great mouse, its 135g weight made it a little too heavy for most competitive FPS gamers. The 310 is much more manageable, coming in at a spritely 88g. The mouse has an ergonomic right-handed shape that feels very similar to the 700. It's quite different from the Rival 300, with a smaller overall size, and a fairly thin front end that flares out towards the rear. The hump on top is positioned towards the back of the mouse, while the front area gently slopes forward. There's a subtle curve on the left side for your thumb to rest in and the two side buttons are well-positioned and within easy reach. The shape makes the mouse best suited for palm and claw grips, and the large rear end helps keep the mouse secure in the base of your palm. The weight is evenly distributed with the center of mass sitting right in the middle of the mouse, despite its large rear end. It's a comfortable shape and fairly safe for most hand sizes with a length of 127mm and a grip width of about 62mm.

The mouse has a textured plastic finish that feels slightly gritty and does a great job at helping you maintain your grip. There's also rubberized grips on both sides for extra stability. The left and right mouse buttons feature a split-trigger design – which means both buttons are separate from the shell itself – with Omron switches underneath. There's a little bit of pre-travel with both buttons but it wasn't enough to cause any problems. The switches

The 310 uses a TrueMove3 (Pixart PMW 3360) sensor.

PICTURES **STEELSERIES**

The 310 has rubberized side grips.

themselves are crisp, and are light enough so that finger fatigue isn't an issue, while still being stiff enough to prevent misclicks. The scroll wheel has the same rubberized finish as the side grips and has an interesting notch pattern cut into it. It's a fairly basic scroll wheel and while it's fine for web browsing, it's a bit light and a little loose, so it's not ideal for bunny hopping. Behind the scroll wheel there's a dedicated DPI button. DPI can be set to anywhere between 100 to 12,000, but you'll need to install Steelseries' Engine software to do so. You'll also need to install Engine to customize the RGB lighting on the logo and scroll wheel. The cable on the 310 is made of a lightweight, soft rubber that I really like. It doesn't kink or drag on the table and it should work with most mouse bungees.

On the underside of the mouse, the 310 has an unusual three feet setup with one large foot in front, and two smaller ones at the rear. The feet are smooth and fast though,

CONCLUSION

A lightweight, no frills, ergonomic mouse with a great shape and an even better sensor.

and I didn't notice any difference compared to more traditional two and four feet setups.

The Rival 310 uses Steelseries' TrueMove3 optical sensor, which is Steelseries' custom version of the Pixart PMW3360. The sensor is located right in the middle of the base, which matches its weight distribution. Steelseries' implementation is on par with other popular 3360 mice, and tracks flawlessly at any DPI, with no acceleration, delay, jitter, smoothing, pixel skipping, or spin out issues. Lift off distance is fairly low, and is roughly equivalent to 1 CD (~1.2mm).

The Rival 310 doesn't have all of the advanced features of the Rival 700 but it does offer a comfortable ergonomic shape and a top-of-the-line sensor in a lightweight package, all of which make it one of the best FPS mice out there.

AT A GLANCE

BUTTONS
5

SENSOR
TrueMove3 (Pixart PMW 3360)

DPI
100-12,000

DIMENSIONS
127 x 62 x 42mm

WEIGHT
88g

PRICE
$119

TESTED & RATED

8.5/10

HWM SINGAPORE

Realizing 4K gaming

Microsoft Xbox One X

By **Aaron Yip (GameAxis)**

The Xbox One X is a substantial upgrade to the Xbox One released in 2013. It contains 6 TFLOPS of power from an AMD Radeon GPU, features 12GB of GDDR5 RAM and uses a 2.3GHz 8-core AMD Jaguar processor. That's nearly two teraflops more than the PS4 Pro, with a faster CPU and 3GB more of overall RAM.

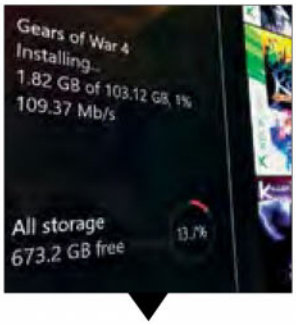
The real promise of the Xbox One X is true 4K and HDR gaming. The icing on the cake? The One X can run 4K at 60fps, previously possible only on high-end gaming PCs. Sony's console simply does not have the horsepower to render native 4K at 60fps.

Microsoft has promised more than 150 "enhanced" games for the One X, but that doesn't always mean they will support true 4K. Similar to how Sony let game developers decide how they could best make use of the additional power of the PS4 Pro, some of these game enhancements for the Xbox One X could simply be better frame rates instead of 4K resolution or HDR capability.

Even so, older enhanced Xbox One games look absolutely gorgeous with their new 4K trimmings – such as Fallout 4, and Dishonored 2. Gears of War 4 and Rise of the Tomb Raider even allow players to choose between a 60fps performance-focused mode or 4K with HDR mode.

Actual new titles like Forza Motorsport 7 offer the best of all three worlds with 4K, HDR and 60fps. Activision's Call of Duty: WWII, another "Enhanced for Xbox One X" title,

PICTURES **MICROSOFT**



Games enhanced for Xbox One X require a lot more space. Gears of War 4, for example, needs 100GB.

comes very close to how it looks on my PC (at 4K with dual GeForce GTX 1080s in SLI) thanks to texture improvements and 60fps.

I've also come to realize that while true 4K delivery was remarkable, of equal importance is the support for 60fps. Once you have tried a game in 60fps, it's hard to go back to 30fps, regardless of resolution. That said, I've played Destiny 2 on the Xbox One X and experienced noticeable frame rate improvements too, even though the game is locked at 30fps.

And yet, the current crop of launch titles do expose a glaring weakness of the console; there just aren't enough killer first-party 4K games for it.

Gears of War 4 and Forza Motorsport 7 are not exactly the marquee launch titles most of us want. You can even argue that they can be played on a Windows 10 computer anyway. What's Microsoft's first-party lineup like for 2018? Quite paltry to be honest. Crackdown 3 has been delayed, and the much hyped Scalebound and Fable Legends are canned. PlayerUnknown's Battlegrounds is only a timed exclusive and there is no new Halo.

The PS4 Pro may no longer be the most powerful console around, but it's still got highly anticipated games like the new God of War, Spider-Man, The Last of Us 2, and even Metal Gear maestro Kojima's weird Death Stranding coming for it.

Games sell consoles, and there isn't one game at the moment I can imagine that makes the Xbox One X a must have, not in the same way Legend of Zelda: Breath of the Wild was for the Nintendo Switch, or how Horizon: Zero Dawn spurred some PS4 owners to upgrade to the more powerful PS4 Pro.

The Xbox One X comes with 1TB of storage space, but I highly recommend using an external drive with it. Games enhanced for the Xbox One X are significantly larger than their standard Xbox One versions. After installing Call of Duty: WWII, Assassin's Creed: Origins, Gears of War 4, and Forza Motorsport 7, I was already left with less than 300GB.

Microsoft set out to build the most powerful gaming console and they've succeeded. At $699, the hardware package is undeniably attractive. Consider this. A decent 4K-capable gaming PC is going to set you back by $3,000, at least.

The Xbox One X is even an excellent media center. It supports native 4K Blu-ray playback with Dolby Atmos and HDR 10 (strangely, no Dolby Vision); something the PS4 Pro completely lacks. This makes the Xbox One X a remarkably value-for-money, high-end Blu-ray player.

The only problem that with the Xbox One X is games. It may be the current powerhouse for play third-party games, but Microsoft's first-party library has a long way to catch up to Sony. We can only hope for some surprises from Microsoft Game Studios when this year's E3 rolls around.

The limited edition Project Scorpio Xbox One X is really just an aesthetic variant of the standard console. Its hardware and even pricing are identical, so don't worry if you miss out on owning this.

AT A GLANCE

PROCESSOR
Custom AMD CPU @ 2.30 GHz, 8 cores

GRAPHICS
Custom AMD GPU @ 1.172 GHz, 40 CUs, Polaris features, 6.0 TFLOPS

MEMORY
12GB GDDR5, 8GB Flash

DIMENSIONS
11.81 x 9.44 x 2.36 inches

WEIGHT
3.81 kg

PRICE
$699 (1TB)

Read more at GAMEAXIS.com

CONCLUSION

The most powerful gaming console on Earth, but it desperately needs to deliver on games. And quickly.

TESTED & RATED
9.0/10
HWM SINGAPORE

A stylish bruiser

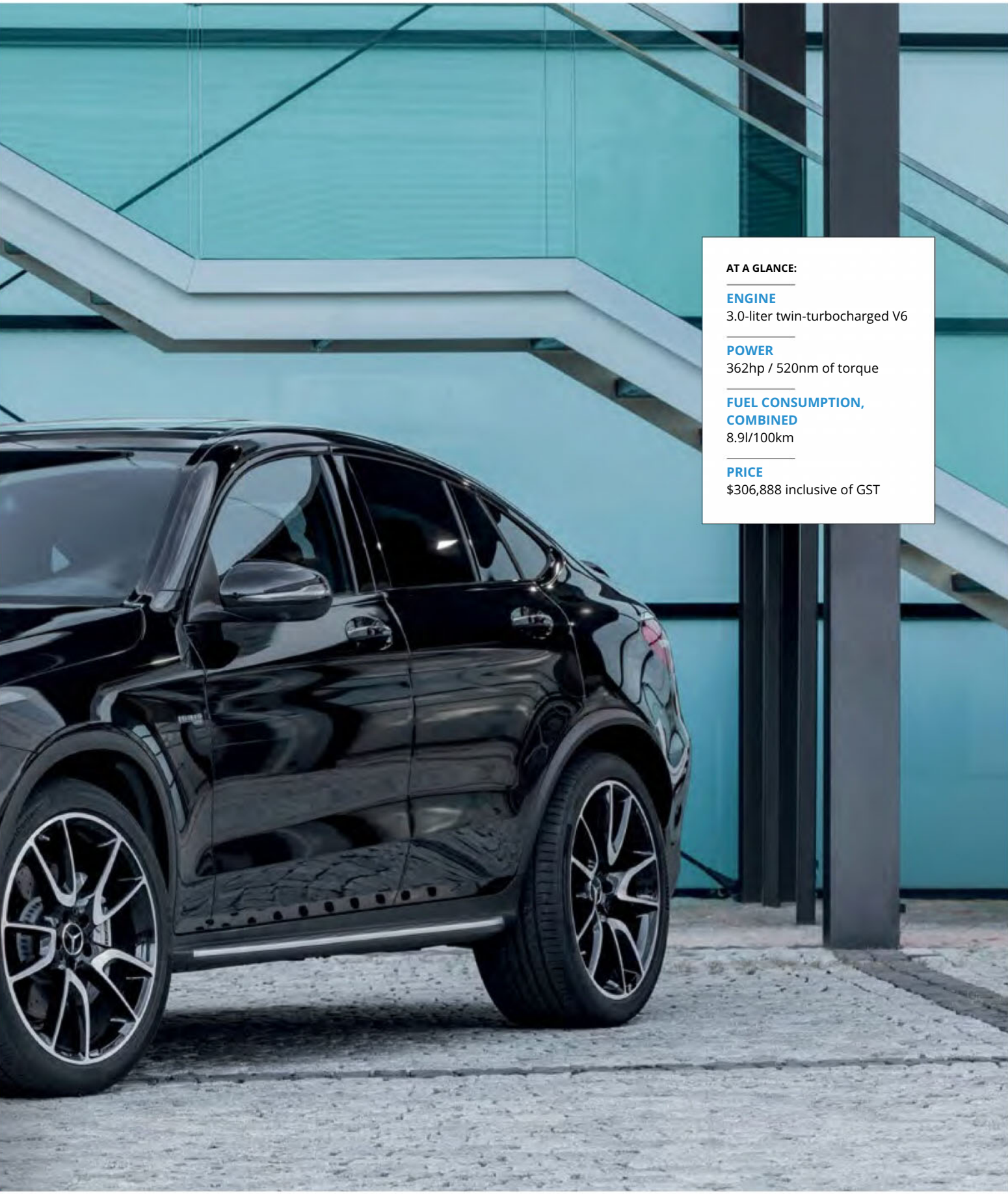
Mercedes-AMG GLC 43 4Matic Coupe

By **Kenny Yeo**

Mercedes-Benz today has a bewildering array of models. Apart from longtime staples like the E-Class and S-Class, we now have newer models like the CLS, GLA, GLC, and more. The GLC that I drove is Mercedes-Benz's compact SUV and was designed to go up against the likes of BMW's X3, Audi's Q5, and Porsche's Macan. Compact SUVs are immensely popular amongst car buyers today and every automaker wants a piece of the pie.

Specifically, the GLC model that I drove was the AMG GLC 43 Coupe. It used to be the top of the range model in the lineup, but it has since been supplanted by the recently announced AMG GLC 63 and AMG GLC 63 S. Nevertheless, it's still a sprightly little SUV but we'll talk more about performance later.

PICTURES **MERCEDES-BENZ**



AT A GLANCE:

ENGINE
3.0-liter twin-turbocharged V6

POWER
362hp / 520nm of torque

FUEL CONSUMPTION, COMBINED
8.9l/100km

PRICE
$306,888 inclusive of GST

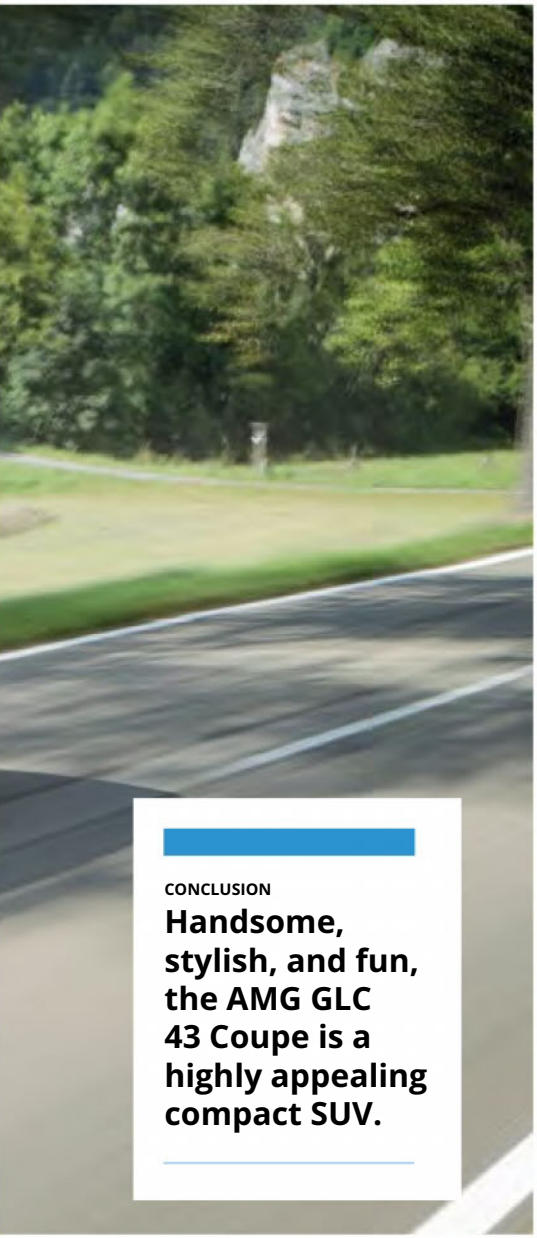
The GLC has always been a good-looking compact SUV, but I reckon the AMG GLC 43 Coupe looks even better, thanks to its more rakish silhouette and more aggressive styling. The diamond radiator grille, large air intakes, and stylish 19-inch AMG wheels are the standout elements that differentiate it from the lesser GLC variants.

There are more AMG bits in the cabin to remind you that you are driving something that's special. As you open the door, you will be greeted by brushed stainless steel door sills that are decorated with a large AMG logo that lights up and acts as courtesy lights in the dark. And as you settle into the cushy AMG seats, you come face to face with the AMG instrument cluster that features highly legible dials and a customizable 5.5-inch multifunction display that can be set to show your traveling speed, boost levels, fuel consumption, and more.

The slopping roofline means rear headroom is compromised.

The AMG GLC 43 Coupe is equipped with Mercedes-Benz's basic infotainment system, which has the usual radio, CD, and Bluetooth audio entertainment functions. The 7-inch display looks a little small because of its thick bezels, but it does the job well enough. There's no touchscreen capability here because Mercedes-Benz believes they are a safety hazard. For drivers who want

PICTURES **MERCEDES-BENZ**



CONCLUSION

Handsome, stylish, and fun, the AMG GLC 43 Coupe is a highly appealing compact SUV.

more, there's the advanced COMAND Online infotainment system that includes Internet connectivity and even a wireless hotspot. However, that's an expensive $13,200 option. If it is any consolation, the AMG GLC 43 Coupe does come with a Burmester surround sound system as standard. This is a 13-speaker setup coupled with a 9-channel DPS amplifier and it sounds pretty awesome.

Because of the GLC Coupe's sloping roofline, taller passengers might find headroom in the rear to be lacking. Likewise, the lower roofline and the car's liftback design also means that rear luggage space is somewhat compromised. Still, the rear luggage compartment is by no means small and will easily swallow a couple of luggage or a baby stroller or two with no problems. And if you need more boot space, the rear seats do fold flat to increase boot capacity from 550 to 1,600 liters.

The twin-turbocharged V6 makes a great noise.

The cabin is sporty, futuristic, and luxurious.

Though the "43" AMG models have often been referred to as the baby of Mercedes-Benz's AMG range, the AMG GLC 43 Coupe's performance is quite exhilarating. 367hp doesn't sound like much on paper, but thanks to the aggressive gearing of its 9-speed automatic and the generous serving of torque (520nm), the AMG GLC 43 Coupe is mighty quick off the line. Mind you, the AMG GLC 43 Coupe weighs over 2,400kg, but it will still hit 100km/h in under 5 seconds, up to an electronically limited top speed of 250km/h.

More appealing to tech geeks perhaps is the AMG Dynamic Select feature that lets drivers select and customize drive modes. The various modes have a big and noticeable effect on the way the AMG GLC 43 Coupe drives. In Sport+ mode, the transmission becomes super aggressive and wants to hold on to gears as long as possible before shifting up. Likewise, the suspension is also in its stiffest setting here, which reduces body roll during high-speed cornering maneuvers. The engine note also sharpens and the exhaust sounds raspier and even produces pops and crackles on overruns and downshifts. Despite the turbochargers, the AMG GLC 43 Coupe sounds really good when you are gunning it, which is a hallmark of any car that wears the AMG badge.

On the other hand, if you are tired and just want a relaxing cruise home, set it into Comfort mode and the AMG GLC 43 Coupe quietens down significantly, the transmission relaxes, and the suspension softens and becomes more pliant. At this point, you can turn up the Burmester audio system and the AMG GLC 43 Coupe transforms into a comfy cruiser. Finally, for the tinkerers out there, there's also an Individual mode that lets owners tweak all aspects of the car. For example, they can set the engine in Sport+ mode while leaving the suspension in comfort mode.

In the end, even though the AMG GLC 43 Coupe might not be particularly outstanding at any one thing - the Porsche Macan is more dynamic and fun to drive and the Audi SQ5 has a roomier interior - it more than makes up for it with its dashing good looks, luxurious cabin, ballistic powertrain, and exciting engine note.

TESTED & RATED

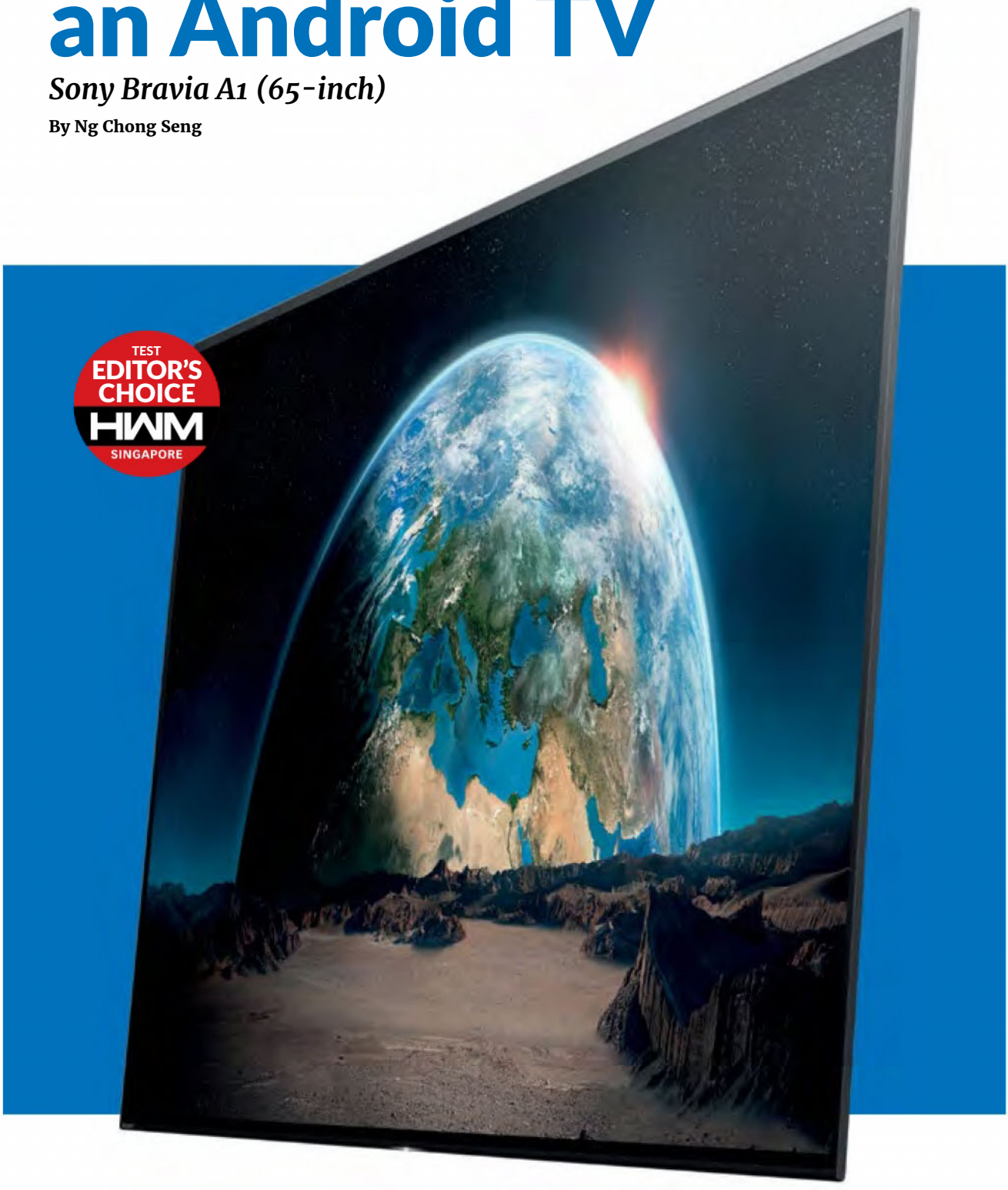
8.5/10

HWM SINGAPORE

OLED goodness on an Android TV

Sony Bravia A1 (65-inch)

By Ng Chong Seng



PICTURES **SONY**

CONCLUSION

Combines the strengths OLED technology, Android TV, and Sony's design into a single irresistible package.

The Bravia A1 series is Sony's first large-screen OLED TV. A 4K UHD TV that supports HDR10, Dolby Vision, and Hybrid Log-Gamma HDR formats, the A1 also touts a new X1 Extreme processor with tons of horsepower to handle all the real-time processing (e.g. object-based HDR remaster, color gradation smoothing, noise reduction, 4K upscaling) required to make the eight million self-illuminating pixels look good. Like all recent Bravia models, the A1 runs on the Android TV platform, so you can access the Google Play store to get apps, use Google Cast to get video from your phone to the big screen, and use voice search to find content.

The stand behind props up the TV and hides the cables for a clean look.

The other big story with the A1 is its Acoustic Surface sound technology. In short, Sony has decided against putting speakers along the sides of the TV. Instead, there are four actuators at the rear of the TV that vibrate to produce sound through the screen. The resulting experience was surprisingly good, as I did get the feeling that the actor's voice came from his mouth, and not some speaker at the bottom of the TV. All that said though, unlike LG's OLED offerings, the Sony A1 doesn't support Dolby Atmos.

To further realize this idea of the TV being a giant canvas, Sony has eliminated the traditional under-TV pedestal or feet. Much like a photo frame, the A1 is propped up with a flap-like stand on its back, which is well hidden from view when you're standing in front of the TV.

Out of the box, the Cinema Pro picture mode gave me the most accurate colors. My favorite test material, Planet Earth II and The Revenant, looked splendid on the A1, with super-deep black levels and super-high contrast in every scene. Coupled with a wide viewing angle with no magenta cast when the screen is hit by light, the A1 makes for a good living room and daytime TV, too.

With a peak brightness just over 700 nits, HDR material looked great on the A1. The only two things that made it into my notes are that Sony seems to tone-map differently than LG, which means detail in specular highlights on LG's high-end OLED TVs is a tad more revealing. But I was pixel-peeping when testing the TVs, and I doubt typical users would notice any difference. On the other hand, the A1's Smooth Gradation setting dealt large color blocks (e.g., blue skies) marginally better, offering fewer instances of banding and posterization. Finally, gaming performance was decent on the A1, though at 47ms (in 1080p), it's no match for LG's 22ms. With 4K, it came down to about 31ms.

Like the Panasonic EZ1000 OLED TV I've recently reviewed in a past issue, my chief gripe with the A1 is its price, which is okay if LG didn't have more affordable models (e.g., the C7 series) with similar image performance. But price isn't everything. If you're looking for the best 4K HDR Android TV, then the Sony Bravia A1 is without peer.

AT A GLANCE

TECHNOLOGY
OLED

RESOLUTION
3,840 x 2,160 pixels

HDR SUPPORT
HDR10, Dolby Vision, HLG

HDMI INPUTS
4

PRICE
$12,999

TESTED & RATED
9.0/10
HWM SINGAPORE

Compact MFP for high-quality prints

Canon Pixma TR8570

By Ng Chong Seng

AT A GLANCE

TECHNOLOGY
Inkjet

FUNCTIONS
Print, scan, copy, fax, wireless

ISO PRINT SPEED
Up to 15.0ipm (mono) / 10.0ipm (color)

AUTO DUPLEX PRINTING
Yes

PRICE
$289

At a height of 19cm, the Canon Pixma TR8570 all-in-one inkjet printer is shorter and more compact than most 4-in-1 printers, but Canon somehow managed to still pack an auto document feeder at the top and a 100-sheet paper cassette at the bottom.

With the exception of the power button, Canon eschewed physical controls on the TR8570. Instead, you get this large 4.3-inch color LCD display with large icons and touch targets. USB is the most straightforward way to connect it to a PC, but you've other connectivity options like wired and wireless LAN. The TR8570 is extremely mobile and cloud printing-friendly too, offering support for AirPrint for Apple devices, Mopria Print Service for Android, and Google Cloud Print.

Under the Pixma lineup, the TR8570 offers a few consumer-oriented features, including a built-in SD card slot, an ID card copying function (that prints both sides of the card on a single page), and a new Message in Print iOS app for embedding secret messages into a printed photo (recipients use the same app to view these embedded messages).

CONCLUSION

Prints well and works great with mobile devices. Get the upsized cartridges if you print a lot.

A 5-color inkjet printer (because it uses both dye and pigment black inks), the Pixma TR8570 has ISO rated print speeds of 15ipm (mono) and 10ipm (color). I found it closer to 11.4 and 8.4 pages per minute respectively. The printer also supports auto duplex printing, but the rate will drop further (4.7ppm for mono based on my tests) because additional time is needed for the ink to sufficiently dry before the printer can pull it back in to print on the other side. A borderless color 4R photo was typically printed in about 45 seconds.

The TR8570 supports direct printing from a memory card.

Print quality from the TR8570 is very good overall, as I consistently got sharp and full-bodied text. Colored graphics on plain paper look decent as well, with slight gradation imperfections. With Canon's own Photo Paper Plus Glossy II paper, my Photodisc test image was reproduced with good vibrancy and color accuracy, with skintones especially well-handled.

My chief gripe is that for office use the regular cartridges can't print a lot (200 pages in B/W, 250 pages in color), but Canon does offer 'XL' versions of these cartridges that bring the yield to 600 B/W pages and 800 color pages.

TESTED & RATED

8.0/10

HWM SINGAPORE

PICTURES **CANON**

You could be so much more

Fitbit Ionic

By **Alvin Soon**

AT A GLANCE

COMPATIBILITY
iOS, Android, Windows

WATER RESISTANCE
50 m

SCREEN SIZE
1.15" x 0.83"

BATTERY LIFE
Up to 4 days
Up to 10 hours (GPS)

PRICE
$458

CONCLUSION

Really more of a fitness tracker than a smartwatch.

The Ionic is Fitbit's second smartwatch, after last year's Blaze. Besides the usual fitness tracking bits, like built-in GPS, heart rate tracking, and automatic sleep tracking, the Ionic also runs Fitbit OS, which gives developers the ability to create apps for the smartwatch. The Ionic also gets Fitbit Pay in Singapore, for Mastercard and Visa credit and debit card customers with UOB and OCBC bank.

I really enjoy wearing the Ionic. It's thin and light on the wrist, and comfortable enough to wear to sleep. But while I wouldn't call it ugly, I can't say its angular lines make it an attractive smartwatch either.

It's easy to change the straps out on the Ionic — perhaps a bit too easy. You just press down on a button and the band snaps out, which is likely why the Sports band snapped off my wrist twice during a martial arts practice. That didn't happen when I did calisthenics and ran, but it does make me think the Ionic wouldn't work well for all sports.

I woke up on the fifth morning of wearing the Ionic with 14% of battery life left, after having logged two non-GPS workouts. So I guess Fitbit's claim of five-day battery life is more or less accurate, although your mileage will vary depending on how you use it.

After wearing the Ionic for a while, it becomes quite clear that it's really a fitness tracker that has a handful of smart features. That's because the smart features are pretty lackluster right now. The Ionic will let you see messages and calls, but you can't interact with them. You can get calendar notifications but you can't actually see your calendar. Switching watch faces is a laborious process that requires you to use the Fitbit app to download a face to the Ionic, and rebooting the watch to the new face.

I can't fully recommend the Ionic as a fitness tracker because its heart tracker wasn't giving me consistent results. I tested the Ionic against the Apple Watch Series 3, Garmin fenix 5, and the gym's treadmill heart rate monitor, and they all provided similar heart rates, while the Ionic would often lag behind, by as much as 10 to 20 beats at times.

The Fitbit Ionic feels like a box of unrealized potential. It's a shame too; because Fitbit has the best fitness-tracking app I've seen on iOS.

Switching faces is a laborious process that involves launching the app.

TESTED & RATED

6.5/10

HWM SINGAPORE

PICTURES **FITBIT**

An affordable iPhone X?

Oppo R11s

By **James Lu**

The Oppo R11s is an updated version of last year's R11 with a new bezel-less all screen design and an improved rear camera. The front now looks much cleaner thanks to the extra tall 18:9 display taking up most of the space and the fingerprint scanner relocated to the rear of the phone. The top and bottom bezels are relatively slim, and there are no distracting elements like a notch or logo to get in the way.

The metal unibody build is a hair thicker than before, measuring 7.1mm, but it feels just as thin - and as sharp - as before, as it tapers down to a knife-like edge. In fact, the phone is a little painful to grip due to how thin the edges are.

Like the R11, the volume keys can be found on the left, while the power button and the hybrid SIM slot are on the right. The bottom of the phone looks a bit crowded with the micro USB port, a secondary

CONCLUSION

The closest thing to an iPhone X-like experience for under $700.

PICTURES **OPPO**

microphone, the speaker, and headphone port all located down here. We're also disappointed to see that Oppo still hasn't switched USB Type-C.

The best feature on the R11 was its Full HD AMOLED display, and that's only gotten better with the R11s, which has a 6.01-inch 18:9 FHD+ 2,160 x 1,080 pixels (~401ppi) resolution AMOLED made by Samsung. The display is excellent, with strong contrast, deep blacks and rich colors. The only downside is that the maximum brightness is still a little dim, which can make it hard to see the screen

The fingerprint scanner has been relocated to the rear of the phone.

under bright sunlight. The Gorilla Glass 5 protecting the display is also highly reflective, which doesn't help.

The R11s runs on Android 7.1.1 Nougat with Oppo's ColorOS 3.2 on top. The OS is mostly the same as before, with a strong iOS look and feel to it. The biggest new feature in 3.2 is face recognition unlock, which is obviously Oppo's version of Apple's Face ID. It uses the front-facing camera and 120 recognition points (Face ID uses 30,000 points), and supposedly can't be fooled by a picture. However, it's really tricky to setup and seems to require perfect light conditions or it will fail and tell you to try again. Once you have managed to get it set up though, it actually works quite well and unlocks fairly fast. True to Oppo's word, I wasn't able to fool it with a picture of myself, which means it's at least somewhat more secure than Samsung and LG's face recognition software. Unfortunately, much like the setup process, it only really works in well-lit environments. In dim lighting, it takes a few attempts or doesn't work at all, and you can completely forget about using it in the dark.

The R11s runs on Qualcomm's mid-range Snapdragon 660 octa-core processor paired with 4GB RAM. Benchmark performance was a bit underwhelming, and the 660 is no match for Qualcomm's flagship 835 processor.

The R11s feature an improved dual rear camera setup, with the secondary telephoto camera now sporting a matching f/1.7 aperture lens as the primary lens. The primary lens is still 16-megapixels, while the secondary is 20-megapixels. Image quality is better than it was on the R11, with good color reproduction and contrast, and less softness towards the edge of the frame. However, the lack of OIS on either camera means low-light performance tends to be a bit hit or miss, and you often end up with blurry shots as a result.

The R11s has a slightly larger 3,200mAh battery than its predecessor, and boasts great battery life, lasting just under thirteen hours in our video looping benchmark test. As with all Oppo phones, the R11s supports Oppo's fast VOOC charging standard and come bundled with a 20W charging unit, which results in about 60 percent charge in 30 minutes, and about 90

At the bottom of the phone, there's a concave cutout to let sound from the speaker escape.

minutes for a full charge.

The R11s is a really nice update to the original R11, and the addition of a gorgeous extra tall AMOLED display adds a lot of value to this mid-range offering. The all screen design, face recognition unlock, and ColorOS' similarities to iOS, all make the R11s feel like a much more affordable version of the iPhone X, and honestly, that's not a bad thing.

However, $699 is a lot to ask for a phone with a mid-range processor, no NFC capabilities and an outdated micro-USB port, especially when Oppo's sister company, OnePlus, has 835 processors, NFC connectivity and USB Type-C ports in the OnePlus 5 and 5T for a similar price.

AT A GLANCE

OPERATING SYSTEM
Android 7.1.1 with Color OS 3.2

PROCESSOR
Qualcomm Snapdragon 660

DISPLAY
6.01-inch Full HD+ 2,160 x 1,080 pixels (~401ppi) AMOLED

CAMERA
Dual 16-megapixel f/1.7 + 20-megapixel f/1.7 telephoto

BATTERY
3,200mAh

DIMENSIONS
155.1 x 75.5 x 7.1 mm, 153g

PRICE
$699

TESTED & RATED
7.0/10
HWM SINGAPORE

The single-player success story

Wolfenstein II: The New Colossus

By **Salehuddin Husin (GameAxis)**

AT A GLANCE

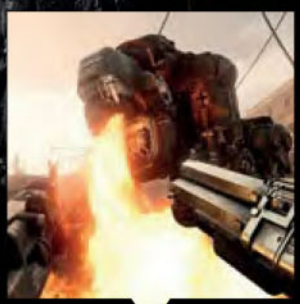
DEVELOPER
MachineGames

PUBLISHER
Bethesda Softworks

GENRE
First-person Shooter

PLATFORM
PC, PS4, Xbox One

PLAYERS
Single

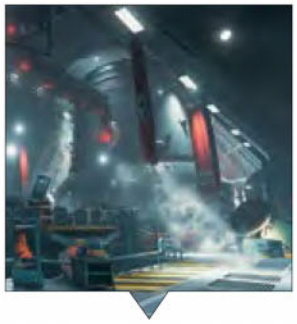


It's a shame that cooler enemies like the Panzerhund, a tank-like robotic dog, only appear in certain stages.

BJ Blaskowicz is the epitome of the Aryan Übermensch: blond, steel blue eyes, big as a house, and with the chiseled features of a Greek god. How ironic then that BJ is also the biggest threat the Third Reich has ever faced.

Wolfenstein II picks up immediately after 2014's Wolfenstein: The New Order, where BJ is left for dead after the final battle with Oberführer 'Deathshead'. He's rescued at the last second and whisked away to the Eva's Hammer for some desperate surgery.

When the game starts, BJ has already been down and out for five months, his muscles heavily atrophied.



Reviewed on a PS4 Pro, the game featured consistently fluid graphics at 60fps, and detailed modeling.

Despite losing the ability to walk, he amazingly has no issues holding a gun. So what does he do? Grab a wheelchair and go on a Nazi killing rampage.

Make no mistake – even on Normal difficulty, Wolfenstein II is hard. Enemies don't fool around and can have good aim, so you better be up to the task. While armor and health kits are abundant, BJ only has 50 health points for the first five or six hours of the game. Health doesn't regenerate fully, either, so dying is a very real possibility. That brings us to the game's first glaring flaw: no Quick Save feature.

Die (which you will) and you're forced to wait at least ten seconds to load. This is on a PS4 Pro with a hybrid hard drive too, so if you're on stock hardware chances are the wait's even longer. Also, accessing the menu to manually save quickly becomes an annoyance. This is especially irksome when you consider that stealth is practically a must to survive some levels.

Like The New Order, enemy captains can call in reinforcements. If somebody sounds the alarm by spotting you or hearing an unsilenced gun, you can expect to fight a sea of jackbooted soldiers. What that means is a trial-and-error approach to sneaking, where you must manually save every few minutes to reasonably progress.

Why not avoid the captains? Because you're awarded an Enigma card for each one you kill. These cards unlock optional missions later, so missing out on a couple potentially means shortchanged gameplay.

For a first-person shooter, Wolfenstein II has a surprising amount of depth. Your kills, and how you do so, levels up perks that grant passive modifiers such as carrying more ammunition or moving faster when crouched. If you don't mind the tedium, you can farm certain sections to raise specific perks.

Each weapon has three upgrades that you'll need to think long and hard about. Prefer a stealthy infiltration? Then you'll want suppressors for the pistol and machine pistol. Want to deal massive damage? That means modifying the shotgun to fire three shells at once. Wolfenstein II also lets you dual wield most primary weapons, so you're free to gun down Nazis with akimbo shotguns.

There's plenty of gameplay variety aside from that opening wheelchair stage, too. There's one where you're locked in a small arena, buying time for a resistance cell to escape. In another, you'll need to move fast as radiation continuously drains your health. If variety is the spice of life, then Wolfenstein II is a great tasting dish.

Each stage is bookended by cutscenes that further drive the story. Unlike most shooters, the plot is surprisingly good, full of believable and likeable characters. There's also plenty of great dialog – I especially enjoyed the prayers BJ says to Caroline, asking her to watch over him. The score, however, could use some work. I suppose it's fine as incidental music, but it never got my blood pumping even when it was supposed to.

Though most of Wolfenstein II is linear, it does open up once you unlock the Enigma Machine aboard Eva's Hammer. This is where you access assassination missions using the cards you acquired from dead captains, rewarding you with items not found within the regular campaign.

With buttery smooth 60 FPS, running and gunning has never felt more fluid. There were no noticeable framerate drops or visual tearing, and character models looked great. Melee kills are satisfyingly gruesome, and the various weaponry is incredibly fun. Still, nothing beats the satisfaction of a long-ranged, one-hit kill using the hatchet.

While BJ may never have the draw of Master Chief, Kratos, or even Nathan Drake, Bethesda has succeeded in creating an iconic hero of their own. Hopefully, he'll get to take his place among gaming's most recognizable heroes. Until then, he has more Nazis to kill.

CONCLUSION

Wolfenstein II is, in many ways, a step up from its predecessor with an interesting plot, likeable characters and great action.

TESTED & RATED

8.5/10

HWM SINGAPORE

Read more at GAMEAXIS.com

PICTURES **ZENIMAX MEDIA**

Just made of better stuff

Secretlab Omega (2018)

By **Koh Wanzi**

The new 2018 Omega feels like a more refined version of its predecessor, which was already a great chair to begin with.

For starters, the overall shape of the chair has been tweaked for a more modern look. The original Omega was decidedly curvaceous, with the backrest wings swooping in boldly as they moved down the chair. Now, the curves are far more subtle, and the backrest wings lower and wider, which is good news if you're a large person.

The build of the chair has also been improved. Secretlab says the cold-cure foam now sits more closely to the chair's metal frame. The chair is also now comprised of a single piece of foam, as opposed to a two-piece design previously. These updates are designed to offer better support and weight distribution.

All the features on the 2015 Omega also make their way over, and there's the familiar four-directional armrests and multi-tilt mechanism for finer-grained adjustments. The tilt mechanism works as it did before, and you can rock back in the chair and lock it in place by pushing down on the lever on the left.

Note that this isn't the same as pushing back the backrest, which lets you recline up to 165 degrees. The chair won't lay completely flat, but if you're in the habit of sleeping in it instead of your perfectly good bed, you can still probably do that anyway.

The chair is upholstered in PU leather though, which isn't the most breathable material, so you'd do best to have a fan that you can point your way.

CONCLUSION

A solid upgrade to Secretlab's line-up that is a good fit for both home and office.

AT A GLANCE

MAXIMUM LOAD
<110kg

RECOMMENDED HEIGHT
160 - 180cm

UPHOLSTERY MATERIAL
PU leather

PRICE
$469

The new armrests are wider and feature thicker and softer padding.

My favorite part of the chair is the memory foam lumbar pillow. I've saved the best for the last, and the new pillow really does make quite a tangible difference in terms of comfort. The memory foam is oh-so-plush, while still providing ample pushback and support—the way memory foam does. It fills the natural gap that exists between your lower back and the backrest perfectly, and goes a long way toward relieving strain and tension. The cover can also be removed and washed, which is super useful.

TESTED & RATED

9.0/10

HWM SINGAPORE

PICTURES **SECRETLAB**

ALL ABOUT THE SWITCHES

For years, the Cherry MX name was synonymous with the standard for top-of-the-line mechanical keyboards. The market now has more competition than ever and one mechanical keyboard is no longer like another...

TACTILE? CLICKY? LINEAR?

What you need to know about mechanical switches in 2018

By **Koh Wanzi**

Mechanical keyboards are an old invention made new. Their heyday in the 1980s was followed by a precipitous decline in the 1990s, but they've made a strong comeback since, riding largely on a wave of gamers demanding better tools with which to frag.

The most important thing on any keyboard is probably the switch type, which can make or break the entire product. Furthermore, you aren't simply limited to a choice of Cherry MX switches anymore, and manufacturers and keyboard enthusiasts have gone to town with their own designs.

Hopefully, this guide will help you better make sense of it all.

SPEED SWITCHES

Cherry MX Speed Silver
Creative PRES
Kailh Gold, Thick Gold, Silver, Copper
Logitech Romer-G
Razer Yellow
SteelSeries QS1

These switches are marketed mostly at gamers, and they feature shorter actuation distances – for instance 1.2mm versus 2mm – than other switch types. This means your key presses register earlier, thus allowing manufacturers to claim that they offer quicker response times and more actions per minute.

This makes sense in theory, but it's unlikely that anyone but the most competitive gamers will reap the supposed benefits. In other words, pick these switches because you like how they feel, not because they make you play better. The total travel distance on these switches tend to be shorter as well, so they'll feel shallower.

HYBRID-CAPACITIVE

Cooler Master NovaTouch
Topre

The list is short here, but these switches are in a class of their own. The NovaTouch is actually based off Topre's design, and the key difference is its support for a wide range of custom key caps thanks to its use of Cherry MX-style stems.

Both switches are technically not fully mechanical, and are thought of as a hybrid between a mechanical switch and a rubber dome. They feature a conical coiled spring underneath a rubber dome. Once a key is pressed, the spring compresses, and a capacitive circuit beneath senses a key press.

The smooth, velvety action of these switches and their soft landing are unparalleled, making these quite the fan favorites.

PICTURES **LOGITECH, HAKO, TOPRE, FLARETECH, GREETECH, 123RF**

CHERRY MX CLONES

Gateron (or Zealios)
Greetech
Kailh
Outemu
Razer

Cherry's patent expired in 2014, and we've since seen a flood of clones from manufacturers utilizing Cherry's designs. These are not necessarily inferior to the real thing, and some also offer their own unique force curves. For instance, Greetech Brown switches have an extremely steep tactile bump, including what has been described as a second, smaller bump in the middle of the curve's valley.

OPTICAL

Light Strike (LK)
Flaretech

There are just two main players making optical keyboard switches now. Both use light to actuate key presses, but they do so in different ways.

LK switches shoot a horizontal infrared light beam across the switch shaft. When the key is at rest, the switch stem blocks the light beam. But when you press down on a key, the stem goes down as well, so the light can pass across the shaft and register a key press.

Flaretech switches are slightly more complex. The IR LED and sensor are installed on the PCB itself, which means the design is inherently modular. The sensor uses infrared photothermal radiometry to detect when a physical object – that is, the switch – descends on it to knows when the key is pressed.

The biggest upside to this is the support for analog input; gradations of pressure can be used to control how fast your character moves in game, offering greater control over standard on/off input.

ENTHUSIAST-MADE

Halo True, Clear

Input Club has a monopoly on these switches, and you won't find them on any other keyboards at this time. The Halo True switch is modeled after the force curve on Topre switches, and feature a bottom-out force of 100g, great news for those who prefer not to bottom out.

On the other hand, the Hako switches (the result of a legal dispute between Input Club and Massdrop) use Kailh's box switches instead of a Cherry-style design. Box switches look similar to Cherry ones, but the key stem is boxed in by four walls, hence the name. They are supposedly structurally superior, boasting improved durability, less wobble, and self-cleaning capabilities.

READING YOUR SD CARD

By **Marcus Wong**

The high resolutions of today's imaging sensors means cameras need their storage to be larger, faster and more reliable than before. So, the SD card has had to evolve to keep up. Today's SD cards will give you more storage at higher speeds than before, so it's important to know which one to pick.

Here's a handy guide to show you exactly what all those symbols on the SD card mean.

Bus Speed

This is the speed at which the SD Card can communicate with your computer or digital camera, so the higher the bus speed, the faster the card will read and write overall. The reason why newer UHS-II and UHS-III cards boast a much higher speed is because they have a second row of pins on the back of the card. This gives them the ability to run in Full Duplex (one dedicated lane for host to card and the other for card to host), or Half Duplex, where both lanes run in the same direction for extra speed.

It's important to note that both card and reader have to support the same speeds, otherwise transfer speed will default to that of the slower party.

Capacity

As expected, this indicates how much the card can store. The large number indicates the actual capacity of the card, while the symbol by the side indicates what standard the card is built to. This indicates not only the highest storage capacity the card can take, but also the file format it ships with, as you can see from the table below.

	SD	SDHC	SDXC
	SD Standard	**SDHC Standard**	**SDXC Standard**
Capacity	up to 2GB	more than 2GB up to 32GB	more than 32GB up to 2TB
File System	FAT 12, 16	FAT 32	exFAT

Speed Class

Because there is so much discrepancy between memory access speed measurements between SD card manufacturers and brands, the SD association has also come up with a set of speed class symbols to help you more easily differentiate between them.

This is particularly important if you're doing a lot of video, as 4K video recording capabilities are becoming more common, and the transfer rates required for that are certainly much higher than what Full HD video requires.

A "C" with a number 10 in it indicates that the card has a speed class mark of 10, while one with a "U" and a number 3 within indicates UHS Speed Class 3. The latest speed class to be introduced is a "V" with a number beside. This is video specific, and was defined in answer to the growing number of cameras capable of producing 4K and higher video.

The tables on the next page show the different speed classes, and their respective recommended uses.

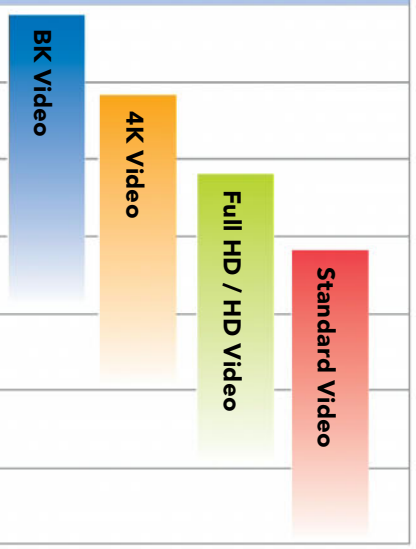
Maximum Read Speed

Often one of the larger numbers you'll see on the card, this refers to its read speed as defined by the manufacturer. Essentially, this indicates how fast data can be read from the card. Manufacturers don't often indicate the write speed as this is generally lower. Some manufacturers don't even use a numerical figure like 80MB/s, but rather indicate speed as a multiple of the read speed of CD-ROM. For eg, a card that's rated to 100X reads at 100 x 150 kb/s, which converts to 15MB/s.

Card types and their respective Bus speeds

Bus interface	Card type	Bus Mark	Bus Speed	Spec Version
DEFAULT SPEED	SD, SDHC AND SDXC	-	12.5MB/S	1.01
HIGH SPEED	SD, SDHC AND SDXC	-	25MB/S	1.10
UHS-I	SDHC AND SDXC	SDHC I SDXC I	50MB/S (SDR50, DDR50) 104MB/S (SDR104)	3.01
UHS-II	SDHC AND SDXC	SDHC II SDXC II	156MB/S FULL DUPLEX 312MB/S HALF DUPLEX	4.00
UHS-III	SDHC AND SDXC	SDHC III SDXC III	312MB/S FULL DUPLEX 624MB/S FULL DUPLEX	6.00

Speed classes and their respective minimum write speeds

Minimum Sequential Write Speed	SPEED CLASS			
	Speed Class	UHS Speed Class	Video Speed Class (NEW)	
Card Image				**Corresponding Video Format** The necessary speed varies by each recording / playback device condition, even in the same format.
90MB/sec			V90	
60MB/sec			V60	
30MB/sec		U3	V30	
10MB/sec	C10	U1	V10	
6MB/sec	C6		V6	
4MB/sec	C4			
2MB/sec	C2			

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