

THE TOYOTA C-HR

A fresh perspective on the crossover market

The C-HR (Coupe High-Rider) is designed to stand out both within the Toyota line-up and in the crossover market, representing Akio Toyoda's determination to allow greater stylistic freedom and promote creative engineering to deliver eye-catching designs and more driving pleasure.

It remains remarkably true to the general styling of the Toyota concept cars that attracted much public attention at the Paris motor show in 2014 and at the Frankfurt show the following year. Its coupe-like lines are testimony to its designers' resolve to create a stand-out style for Toyota and establish a new direction among mid-sized crossovers.

Toyota is targeting a clear and singular customer profile, people who are predominantly driven by emotional considerations, who want individuality and seek to be the first to try new experiences and products. Style and quality are essential qualities in any purchase they make and their car serves as an extension of their personality.

Inspired by what he learned from meeting this type of customer, C-HR Chief Engineer Hiroyuki Koba focused firmly on their requirements throughout the development process, setting high benchmarks for design and perceived quality.

The Toyota C-HR's unique character demonstrates the flexibility that the Toyota New Global Architecture (TNGA) gives to developers in the key areas of design, powertrain and dynamics, enabling them to deliver a new, fresh concept in what has become an increasingly commoditised crossover segment.

A NEW DESIGN DIRECTION FOR THE CROSSOVER SEGMENT

The Toyota C-HR's distinctive styling brings a new dynamism and sensual quality to the crossover market in its combination of a coupe-like upper body and the powerful underpinnings of an SUV.

The car measures 4,360mm long, 1,795mm wide and 1,565mm high, and has a 2,640mm wheelbase. The exterior remains remarkably faithful to the concept that was first shown in Paris in 2014, and which registered extremely well with target customers.

The model was developed under the concept "Sensual Speed Cross" and features a diamond-shape architectural theme. Prominent, projecting wheel arches at each corner emphasise the

vehicle's strength and rigidity and the modulated structure combines a powerful lower body and raised ground clearance with the slim, sleek cabin profile of a coupe.

Viewed from any angle, the combination of faceted, gemstone-like shapes with fluid surfaces and elegantly integrated detailing creates a delicate balance of precision and sensuality.

The front represents a further development of Toyota's contemporary design language, with a slender upper grille flowing from the Toyota emblem into the sleek extremities of the headlamp units, then wrapping fully around the front corners.

The sense of movement in the blacked-out rocker panel towards the front and rear wheels and a shoulder axis that runs the length of the vehicle generate a fast-looking quality in the bodywork.

The coupe-like elements include disguised rear door handles that are integrated into the rear pillars. The sweeping roofline projects powerfully into a rear spoiler with a skeletal frame, adding to the sense of speed in the design.

At the rear the strongly tapered cabin features a top-hinged tailgate that gives access to loadspace big enough to carry luggage for five people. This styling contrasts with the pronounced flaring of the wheel arches which gives C-HR a wide and powerful stance.

The prominent rear light clusters stand proud of the tapering bodywork – on some versions using LEDs and lightguides to create an expressive illumination signature.

INTERIOR DESIGN AND QUALITY

C-HR's interior follows a "Sensual Tech" design concept, combining high-tech functionality with a sensual, fashionable style. The cabin is airy and spacious, with a focused area around the driver.

The warm and welcoming feel is supported by a seamless, layered architecture for the instrument panel, which extends into the door trim and features stylish details and a piano black panel. It creates a contrast between sensual surfacing and crisp lines to project a fresh yet comfortable feel.

The area around the driver uses innovative details and inviting high-tech features that are intuitive to use. The switchgear and the eight-inch audio display touchscreen benefit from improved HMI designs, while the touchscreen to control the Toyota Touch 2 multimedia system is angled slightly towards the driver.

Together with the asymmetric centre console, this brings all controls within easy reach of the driver, while keeping relevant switchgear accessible for the front seat passenger.

Because the touchscreen stands proud of the dashboard, rather than being enclosed by it, the upper section of the dash is shallow in depth, helping secure a good field of vision for the driver.

The two-tiered front seat design combines a slender, sporty upper section with a more strongly bolstered and supportive lower part. The difference between the two is emphasised by the use of different tones, textures and patterns in the upholstery.

Toyota has targeted class-leading sensory quality, aware of the fact that C-HR customers will also consider premium brand models. To support this, it brought its European Sensory Quality team into the design process at the earliest stage for any vehicle yet.

Working closely with the designers, the SQ team focused on component quality and consistency of grain, texture, shape, colour and illumination in every element, even down to the radii of the stitching grooves in the seats.

To reinforce the link between the interior and exterior design, many switches have a similar shape, reflecting the diamond motif of the bodyshell. The same diamond theme can be seen in the door trim pattern, the JBL audio speaker grilles, the shape of the tweeter and even the needles on the analogue instrument dials.

The choice of finishes in the cabin is crucial to achieving a consistent, one-piece look. C-HR uses a leather-like finish for all background surfaces; a smooth Nappa grain for all surfaces that are touched; and a technical grain for functional elements such as the switchgear.

Decorative parts are finished in high-quality piano black and satin silver trim. The clear blue instrument and switchgear illumination has been tuned for a consistent hue, even on adjacent reflective surfaces of differing colours.

The interior can be specified with three colour schemes: Dark Grey, Black/Blue and Black/Brown.

EQUIPMENT FEATURES

To meet the demands of its target customers, Toyota has ensured C-HR offers a wide variety of equipment features. As part of its commitment to make advanced safety equipment widely available, Toyota Safety Sense is provided as standard on all versions.

The Toyota Safety Sense package includes a Pre-Collision System with pedestrian warning, Adaptive Cruise Control, Lane Departure Alert with steering control, Automatic High Beam and Road Sign Assist.

Excel grade models feature heated front seats, a smart entry system, rear privacy glass, part-leather upholstery, Simple Intelligent Park-Assist, Toyota Touch 2 with Go, 18-inch alloy wheels, Blind Spot Monitor and Rear Cross Traffic Alert. For customers who want a stronger, design-led specification, the Dynamic versions provide exclusive seat upholstery and alloy wheels, bi-tone paint finish with contrasting black roof and LEDs for all lights, including the headlights. Full details of the UK model range and equipment features are provided in a separate chapter of this press kit.

CONCERT HALL SOUND

C-HR can be equipped with a tailor-made JBL premium audio system, comprising an eight-channel, 576W stereo amplifier and nine speakers, including two newly-patented acoustic JBL wave guides – known as horn tweeters.

Elements in the cabin such as the windows and even the upholstery, as well as the rigidity of the body structure around each speaker, can have a significant impact on system sound quality, so JBL and Toyota engineers worked closely together from early in the design process.

In-depth customer analysis was also taken into account, which helped determine the orientation of the speaker layout and the use of a precisely integrated horn tweeter, mounted in the front pillar – a signature JBL feature – to deliver crisp, clear sound.

As well as the two 25mm horn tweeters and acoustic wave guides, the system also features two 80mm wide-dispersion units and two 17cm subwoofers in the front of the vehicle, and two 15cm full-range speakers and a 19cm subwoofer in a dedicated, 10-litre, ported enclosure in the boot.

Available in combination with C-HR's navigation option, the audio package also incorporates lossless audio encoding.

TOYOTA SAFETY SENSE

Toyota Safety Sense helps to reduce the risk of a collision and also makes life easier for the driver, reducing fatigue.

Pre-Collision Safety system

This system uses a front-mounted camera sensor and millimetre-wave radar sensor to detect vehicles and pedestrians on the road ahead, operating from 6mph (10km/h) up to the vehicle's maximum speed. If it calculates a risk of a collision, it automatically warns the driver with a buzzer and alert in the multi-information display. At the same time the Pre-Collision Brake Assist engages to provide extra braking force the moment the brake pedal is pressed. If the system determines that the possibility of a frontal collision with a vehicle or pedestrian is extremely high, the brakes are automatically applied to help avoid the collision or reduce its impact.

Adaptive Cruise Control

The Toyota C-HR's Adaptive Cruise Control with Full Speed Range Following Function makes use of the same millimetre-wave radar as the Pre-Collision Safety system to maintain a safe distance from the vehicle ahead, slowing the car to a standstill if necessary and accelerating smoothly back to the pre-selected cruising speed once the way ahead is clear.

Lane Departure Alert

Lane Departure Alert uses the camera on the windscreen to track the vehicle's course between lane markings painted on the road surface. If it judges that the vehicle is about to move out of its lane without the turn indicator being used, the system sounds a buzzer and lights up a warning on the multi-information display. If the vehicle is still moving outside the lane, it will apply light steering force (Excel and Dynamic grade models) to help the driver to bring the vehicle back on course.

Automatic High Beam

Automatic High Beam uses the same windscreen-mounted camera as the Lane Departure Alert. This recognises the lights of oncoming vehicles or traffic ahead, automatically switching the headlights to low beam to avoid dazzling other road users and returning them to high beam as soon as the road is clear, maximising night-time illumination and the driver's field of vision.

Road Sign Assist

Road Sign Assist uses the front camera to recognise principal highway/motorway warning and command signs. These are then repeated on the multi-information display, reducing the risk of the driver not being aware of speed limits, lane closures and other important information.

Advanced safety and driver assistance systems

The Toyota C-HR is available with additional systems that support safer driving by giving the driver better real-time information about the area immediately around the car, including a Blind Spot Monitor and Rear Cross Traffic Alert.

The Blind Spot Monitor uses radar sensors mounted on the rear corners of the vehicle to detect nearby vehicles in adjacent lanes as they move into the driver's blind spot. The driver is alerted to their presence by LED warning indicators in the door mirror on the appropriate side of the car. The LED indicators will remain illuminated as long as the vehicle remains in the blind spot. If the driver operates the turn indicators, intending to move into the path of the vehicle, the LEDs will flash rapidly to draw further attention to the hazard.

The same sensors are used to provide the Rear Cross Traffic Alert, monitoring approaching traffic from either side when the vehicle is reversed out of a parking space and warning the driver if any vehicles are detected.

Simple Intelligent Parking Assist system

The Toyota C-HR is available with Toyota's Simple Intelligent Parking Assist (S-IPA) system, which uses an array of sensors to identify viable parking spaces and surrounding objects. Improvements to the technology allow it to work in parking spaces up to 22 per cent smaller than previously.

The driver stops the car next to the parking space and pushes a single button to engage S-IPA, which guides the car to the correct position for reverse manoeuvring into the space, making use of sensors on the corners of the vehicle.

Multi-information display

The 4.2-inch multi-information display presents data and images in full colour and high resolution. The right-hand section shows speed, fuel level and other basic information, while the left offers a range of information which the driver can select using a switch on the steering wheel. The menu includes analysis of the driver's driving style, showing progressive fuel economy in periods of five minutes, last mile, last five miles and past month.

STATE-OF-THE-ART POWERTRAINS

The Toyota C-HR's engine range is designed to deliver exactly the kind of fluent, engaging driving behaviour its target customers are looking for. This is most powerfully witnessed in the – unique in its segment – hybrid electric model, the fundamental characteristics of which guarantee a smooth ride.

The full hybrid powertrain has a maximum power output of 120bhp/90kW and produces CO₂ emissions from as low as 86g/km. The combined cycle fuel consumption figures* are from 74.3mpg.

Toyota has made its system lighter and more efficient, and engineered it to give sharper performance. Detailed design changes to the 1.8-litre hybrid engine have resulted in 40 per cent thermal efficiency – a world-beating level for a petrol unit. The engine is built in Britain at Toyota Manufacturing UK's Deeside plant. Other hybrid components have been made lighter and smaller, and have been repositioned for improved packaging, helping give the car a low centre of gravity.

The new hybrid powertrain gives a responsive and fluid drive that particularly suits the crossover's dynamic design.

The Toyota C-HR is also available with the 1.2-litre turbo petrol engine featured in the Auris range. It develops 114bhp (85kW) and 185Nm of torque, with CO₂ emissions* from 135g/km (with manual transmission, 152g/km with manual transmission) and combined cycle fuel consumption* from 47.9mpg. It is available with a six-speed manual gearbox with front-wheel drive or CVT automatic with all-wheel drive.

* Fuel consumption and emissions figures are NEDC equivalents of WLTP data.

HYBRID ELECTRIC SYSTEM

Toyota has focused on making its new generation of hybrid electric models easier and more intuitive to drive. The hybrid system, as featured in the Toyota C-HR, has been set up to give natural, immediate and smooth response to any accelerator pedal input.

Fuel economy has been improved as well, with official combined cycle figures* for the model starting from 74.3mpg (17-inch wheels). The hybrid system has been rendered more compact, lighter in weight and lower in cost. It further benefits from significant advances in battery, electric motor and petrol engine technologies.

The new nickel-metal hydride hybrid battery has a higher energy density, allowing for its size to be reduced by 10 per cent while preserving the same level of power output. It also has a higher energy absorption capacity, taking in 28 per cent more energy in the same amount of time, which means that it charges faster than its predecessor. The electric motors are also smaller in size, but have a better power-to-weight ratio.

* Fuel consumption and emissions figures are NEDC equivalents of WLTP data.

Hybrid petrol engine improvements

The hybrid system's 1.8-litre VVT-i Atkinson cycle petrol engine has been completely re-engineered to deliver significantly better fuel economy, compared to the performance achieved by the system used in the previous, third generation Toyota Prius. The gas flow, combustion, cooling and knock control have all been improved and much more effective use is made of exhaust gas recirculation.

Toyota has developed a heat recovery system that uses spent exhaust gas to speed the warming up of engine coolant. This means fuel can be saved because the hybrid system is able to stop the engine earlier and more often when it isn't needed to power the vehicle. The engine is also helped to reach its optimum operating temperature more quickly thanks to a new dual-passage cooling system that can reduce the volume of coolant flowing into the engine, when required. This helps improve efficiency during cold weather.

Further work has been done to reduce energy losses, particularly through eliminating friction. Measures include the use of thin-section, resin-coated connecting rod bearings and a low-friction camshaft chain. Friction created by the piston skirts, rotating parts and oil pump has been reduced and a new electric water pump has helped cut the level of losses.

Conical "beehive"-type springs have been adopted to reduce the valvetrain load. And, to ensure comprehensive improvement, the entire engine underwent CAE analysis to achieve the best rigidity and to reduce noise and vibration.

The intake and exhaust systems came under particular scrutiny, resulting in an engine that enjoys better breathing, air filtration, packaging efficiency, reliability and quietness. The air filter has been made smaller and reduced in height, which helped the designers bring down the line of the bonnet. The new intake system has a resonator that creates less noise at noticeable frequencies and the intake duct is made of a porous material that suppresses resonance.

A fresh air inlet duct has been added to make sure ample air volume is obtained at motorway speeds, and a clever air/fluid separating structure has been added to prevent water and snow from mixing with the intake air. Should the fresh air duct fill with water or snow, a secondary inlet will operate as the air intake.

A thinner silencer secures optimum performance and noise reduction, while also improving the underbody aerodynamics and avoiding any intrusion on the amount of rear loadspace.

The engine block has V-shaped drilled paths that reduce losses in water jacket pressure. There is also a water jacket spacer which helps control cylinder wall temperatures in the combustion chamber, reducing friction and preventing engine knock, which in turn supports optimum ignition timing.

Engine cooling has been improved with a new cooling module structure and attachment, and a redesign that accommodates a lower hood line and helps reduce the car's centre of gravity.

While engine cooling helps improve anti-knock performance, it can lead to an increase in cooling heat loss. To help counter this, Toyota engineers developed a water jacket spacer to control temperature on the surface of the cylinder. This keeps engine oil warmer with lower viscosity and reduces the temperature fluctuation. This helps reduce friction and allows more engine torque to be generated. At the top end of the temperature scale it reduces temperatures in the combustion chamber.

The engine's maximum output of 97bhp/72kW (total hybrid system output 120bhp/90kW) is delivered at 5,200rpm, with peak torque of 142Nm at 3,600rpm.

World-best thermal efficiency

Thermal efficiency is a measurement of how well an engine converts the energy available in its fuel into usable energy to power the vehicle.

As a result of the large-volume exhaust gas recirculation system, improvements in combustion efficiency and innovative ways of managing heat and reducing friction, the Toyota C-HR's engine has a maximum 40 per cent thermal efficiency, the highest level in the world for a mass-produced petrol engine.

Improved exhaust gas recirculation

The exhaust gas recirculation system in the Toyota C-HR hybrid has a cooler which lowers the temperature of the gas being circulated, thereby reducing the temperature of the intake mixture and reducing the risk of engine knock. This allows ignition timing to be optimised, contributing to better thermal efficiency.

Multi-shaft transaxle – a hybrid first

Toyota's new generation hybrid electric system has a redesigned transaxle that offers more efficient performance and packaging and reduced weight. A gear train with the two electric motor-generators placed on multiple axes has been adopted to shorten the overall length by 47mm compared to the previous generation hybrid system.

The transaxle houses four components: two electric motor-generators (MG1 and MG2); a single planetary gear; and a reduction gear to the final drive. MG1 serves primarily as a generator, converting any surplus power from the petrol engine into electricity, which can be stored in the HV battery. It also serves as the engine's starter motor. MG2 is the electric drive motor, which also acts as a generator when the car is in regenerative braking mode. It drives the car from start-up, at low speed and in EV (electric vehicle) mode and is the sole propulsion method when the vehicle is in reverse.

Improved hybrid software

Updates to the hybrid system software enable C-HR to draw more on its electric drivetrain, allowing it to accelerate in a low engine rev range. It also has permitted a 60 per cent increase in the speed range of the electric motor (the range in which the electric motor can be used exclusively), compared to the third generation Prius. This means there is less dependency on the petrol engine at higher speeds, improving fuel economy.

Smaller, better electric motors

The two new motor-generators are smaller and lighter than before to suit the new multi-shaft transaxle design, with no negative impact on fuel economy.

Higher motor speed and new forced water-convection cooling in place of air cooling improve the efficiency of the electric-drive motor (MG2), which delivers 53kW of power and 163Nm of torque.

Fully redesigned power control unit

The power control unit (PCU) has been totally redesigned, resulting in a 33 per cent reduction in size, a six per cent weight saving and a 20 per cent reduction in electrical losses.

The PCU is the multi-purpose electrical heart of the vehicle, housing the inverter/voltage booster, a DC/DC converter for auxiliary power and the electronic control for the motor-generators.

In place of a belt-driven alternator C-HR uses a DC/DC converter to recharge the 12-volt auxiliary battery by using the HV battery energy.

Nickel-metal Hydride HV battery

The nickel-metal hydride (NiMH) battery is more compact and is located entirely beneath the rear seats, avoiding any intrusion in the load space. It has increased cooling efficiency and a wider regeneration range.

1.2-LITRE TURBOCHARGED PETROL ENGINE

The 1.2T engine benefits from a raft of advanced technologies that support both performance and efficiency, and makes good use of design features such as vertical vortex, high-tumble intake ports and an exhaust manifold that is integrated into the cylinder head.

This lightweight, highly compact unit features a number of advanced technologies, including direct injection, enhanced intelligent variable valve timing (Dual VVT-iW), a high tumble port cylinder head with an integrated exhaust manifold, a lightweight valvetrain, a variable control oil jet system and resin intake manifold and intake pipes. It is also able to switch from the Otto to the Atkinson cycle when running under low loads.

The turbo, the direct injection (which allows multiple injections) and the VVT-iW work together to provide high torque at low revs, good performance and low fuel consumption.

Maximum power output is 114bhp/85kW and an impressive 185Nm of torque is generated from 1,500 to 4,000rpm. Driving through a six-speed manual transmission, the engine gives the new Toyota C-HR 1.2T manual a nought to 62mph acceleration time of 10.9 seconds and a 118mph top speed. This is achieved in spite of a strong focus on fuel economy and CO₂ emissions – official combined cycle figures* indicate 47.9mpg and 135g/km.

* Fuel consumption and emissions figures are NEDC equivalents of WLTP data.

Advanced heat management

The key to achieving outstanding fuel consumption without compromising performance is to apply a higher compression. But generally, as compression increases, so does the risk of uncontrolled combustion, also known as knocking.

The 1.2T's high 10.0:1 compression ratio was made possible thanks to a series of technologies that improve control of the combustion process, allowing the risk of knocking to be avoided.

The intake ports have been designed to generate a more intense flow and a 'vertical vortex,' and the shape of the piston has been optimised to improve in-cylinder turbulence. As a result, fuel and intake air mix faster and form a more homogeneous mixture. This leads to a higher combustion speed, which helps prevent knocking.

Advanced heat-management is in itself a good way to improve fuel economy, but it can also reduce the risk of knocking. The engine was designed in such a way that the temperature of each individual part can be optimised. For example, the bottom of the pistons is cooled by oil jets and the cooling of the cylinder head is separate from that of the engine block. This allows the temperature in the combustion chamber to be reduced, while keeping the block itself hot enough to reduce friction.

Direct injection makes a contribution as well, as it helps to dissipate the heat in the combustion chamber. Also, the charge air passes through the intercooler, which uses an independent low temperature cooling circuit.

Low-end torque and quick response

A low-inertia turbocharger, the VVT-iW system and the D-4T direct injection work together to ensure strong torque delivery from low engine speeds. Together with the limited volume intake system, this ensures immediate response to the accelerator pedal.

The injection system was developed for the 1.2T engine. Compact in design, it is ideally suited to a small displacement engine. It allows multiple injections per cycle, and the optimised width and shorter length of the fuel spray ensure combustion quality, regardless of the engine regime and load.

From Otto to Atkinson

The VVT-iW variable valve-timing system operates on both the intake and the exhaust side, and maximising torque at all engine speeds. It also allows for the intake valve closing to be delayed, which means that the engine can operate in both the Otto and the Atkinson cycle. The latter is used in extremely low engine load conditions, when the intake valve remains open for a fraction of time after the compression stroke has set in, allowing part of the gas charge to be pushed back into the intake. As a result, the effective compression stroke is shortened. Pumping losses are reduced, since the pressure on the piston is lower, and the throttle valve can be opened wider.

Quick and smooth stop and start

A new start control was developed for the engine's stop and start system to ensure a quick and smooth engine restart. When the system shuts down the engine, it controls the stop position to leave the piston half way in the compression stroke. On restart, it applies stratified injection in the first compressed cylinder to counter vibrations. And by retarding the ignition, torque increase is kept in check, preventing the engine from revving excessively, hence ensuring a confident and smooth take-off.

Intelligent Manual Transmission

The Toyota C-HR 1.2T was the first Toyota model to adopt a new Intelligent Manual Transmission. Designed to work like a well-judged heel-and-toe action, it automatically increases engine revs when downshifting, ensuring a smooth gear shift.

The system also works when shifting up, reducing clutch shock to provide a more comfortable drive for both driver and passengers. A smooth start is also ensured and there is almost no risk of stalling – good news for any learner drivers in particular.

DYNAMIC PERFORMANCE

Chief Engineer Hiroyuki Koba, a keen driver, gave his full attention to the design and development of the Toyota C-HR chassis.

His input included driving thousands of miles on European roads from the outset of the project to understand not only the requirements of the road network, but also the way Europeans drive.

He said: “I have noticed, for example, that Europeans have a much more fluid driving style, based on a more acute observation of traffic. They avoid obstacles simply by adapting their trajectory and speed and will focus on carrying speed for efficient progress, while elsewhere in the world the preferred approach is very often to stop. This prompted us to work with our European team on driving precision in all aspects of the vehicle. We wanted performance on par with a good C-segment hatchback.”

The TNGA platform with its low centre of gravity has proved an ideal starting point from which to ensure that all the chassis features could be designed to respond immediately and naturally to the driver’s actions. Koba was engaged in each dynamic assessment and decision, ensuing that his vision of “response, linearity and consistency” is fully realised.

In particular, the steering has been designed to be perfectly linear, which, together with the optimum limitation of rolling motion, gives C-HR remarkable driving precision for a crossover. Limiting body movement, which affects tall cars in particular, also has a direct influence on comfort. Even on worn European roads, the car remains remarkably composed and accurate, contributing to a confident and enjoyable drive.

Response, linearity and consistency

Chief Engineer Koba remained true to his vision of “response, linearity and consistency” through the vehicle’s development phase. In this context, “response” describes how the car should react immediately to any driver input. “Linearity” means that vehicle response must build gradually and precisely in line with the degree of driver input. “Consistency” relates to how the car will react in the same, predictable fashion, no matter what the speed or circumstances. It’s Koba’s belief that by securing these three elements, the car can inspire true confidence and make every drive more enjoyable.

The rigid GA-C platform on which the Toyota C-HR is built provided an excellent starting point. To ensure precision, a MacPherson strut front suspension was designed specifically for the model. It includes a strut-bearing rotation axis, designed to support smooth and accurate

steering through a drastic reduction in friction. To ensure roll rigidity like that of a hatchback car, the large-diameter anti-roll bar is connected directly to the strut via a stabiliser link.

At the rear, a double wishbone system makes a big contribution to the crisp driving experience. Most of its hardware is shared with the latest generation Prius, the first model to be built on Toyota's new GA-C platform, but with modifications to meet Koba's requirements for controllability, stability and ride comfort. Using a sub-frame specific to the model allowed the suspension angles to be optimised – an element critical in giving this crossover hatchback-like handling, in spite of its increased height. Different from Prius, the C-HR uses a ball-joint to connect the No2 lower arm, giving a high level of twist rigidity and enabling compliance steer through the side forces acting on the rear wheels. The shock absorber is angled forward, reducing road load and improving luggage space.

All-wheel drive system

The Toyota C-HR 1.2T with CVT is available with a Dynamic Torque Control all-wheel drive system. Front and rear drive force distribution is precisely controlled by an electromagnetic coupling. According to driving conditions, this can vary the balance of drive between the front and rear axles between 100:0 and 50:50. The system includes Cornering Control, a specific logic that allows the driver to track the intended driving line by adjusting drive force according to the driving conditions. With Pre-Torque Control, the front/rear drive torque distribution is adjusted to 90:10, from the moment the driver turns the steering wheel. This ensures good response to changes in the steering angle when cornering. Thanks to the yaw-rate feedback control, understeer and oversteer are corrected by optimum control of the front and rear drive force, adjusted every six milliseconds.

TOYOTA NEW GLOBAL ARCHITECTURE

The Toyota C-HR reaps the benefits of being constructed on a new Toyota New Global Architecture-based platform (TNGA).

The Toyota C-HR followed the fourth generation Prius as the second production model to use the GA-C platform, strategically adapted to suit the particular requirements of a stylish and dynamically rewarding C-segment crossover.

It demonstrates how Toyota's development of TNGA has ensured its new platforms are not rigidly standardised, but have a built-in flexibility that allows them to be engineered with ease to suit multiple vehicle types, from hatchbacks to SUVs.

C-HR's use of a TNGA-based platform has proved central in supporting Chief Engineer Hiroyuki Koba's determination "not to compromise design or driving performance," contributing to the crossover's fun-to-drive quality, its individual styling and its fundamental safety performance.

Low centre of gravity

In terms of vehicle dynamics, the basic design of the GA-C platform allows for a low centre of gravity to be achieved – in the case of the Toyota C-HR, the lowest in its class, in fact. The benefit of this is realised in a more engaging drive and balanced handling, with much reduced body roll.

A low-set driving position is another direct benefit of TNGA, but with the C-HR the designers have raised the driver's hip point slightly compared to the new Prius, in line with the higher, commanding position at the wheel that crossover customers favour.

The adaptability of the GA-C platform is also witnessed in the car's shorter wheelbase compared to Prius (2,640 vs 2,700mm) and wider front and rear treads (+20mm front, +10mm rear). These changes reflect both the different packaging and handling requirements for the crossover.

Rationalised engine compartment

TNGA allows for the arrangement of the engine compartment to be rethought, with components relocated and set lower down in the space to support the vehicle's lower centre of gravity. In the C-HR it has enabled the engine to be angled slightly rearward, helping the designers secure a lower hood line as well as contributing to the lower centre of gravity.

Although the new Prius is exclusively powered by a full hybrid system, C-HR offers hybrid electric and petrol powertrains, the latter with the option of both front and all-wheel drive. The GA-C platform is able to accommodate each of these powertrains without compromising the vehicle's packaging, styling or chassis balance.

High-rigidity for rewarding dynamics and ride comfort

The GA-C platform combines with the highly rigid body to provide excellent responsiveness that is consistent with and linear to the driver's inputs. The essential quality of the dynamic handling removes the need for the suspension to be firmed up to achieve the desired level of performance, thus avoiding any compromise in ride comfort.

Design freedom with reduced vehicle height

As well as the lower hood line made possible by the repositioning of the engine within the engine bay, the GA-C platform also enables a lower overall vehicle height to be achieved. This has been of particular value to the C-HR design team in producing the striking, coupe-like upper body that helps set the Toyota apart from its compact crossover rivals. At the same time, the low roofline does not call for compromise in headroom for front or rear seat passengers, thanks to the lower seating positions made possible by the new platform.

Safety performance

Superior safety performance is inherent in TNGA, with priority given to achieving the highest standards of active and passive safety. Toyota's new platforms and vehicle designs target the exacting standards set by the world's leading independent crash test programmes, supported by the advanced performance of the functions and systems of Toyota Safety Sense, as featured on C-HR.

UK MODEL RANGE AND OWNERSHIP

The Toyota C-HR is available in three equipment grades: Icon, Excel and Dynamic.

The Icon specification includes dual-zone automatic air conditioning, 17-inch alloys, the Toyota Touch 2 touchscreen controlled multimedia system, front fog lamps, rain-sensing windscreen wipers and an auto-dimming rear-view mirror.

The Excel trim puts the emphasis on sophistication and refinement, with additional technology and comfort features. These include part-leather seat upholstery, heated front seats, smart (keyless) entry, parking sensors and Intelligent Park Assist, rear privacy glass, 18-inch alloys, a folding function for the door mirrors and a complement of driver assistance safety features including a Blind Spot Monitor, Rear Cross-Traffic Alert and Lane Change Assist. Upgraded Toyota Touch 2 also provides satellite navigation and access to on-line services.

The C-HR Dynamic models add extra appeal for customers who value high design quality and innovation. They come as standard with metallic paint with a contrast black roof, a grade-specific 18-inch alloy design, privacy glass, LED headlights and fog lights and a bespoke purple upholstery fabric.

All C-HR models benefit from Toyota Safety Sense, a package of active safety systems that can alert the driver to collision risks and intervene if necessary to avoid an impact, or mitigate the consequences if an accident is unavoidable. These elements include a Pre-Collision

System with autonomous emergency braking and pedestrian recognition, Lane Departure Warning, Traffic Sign Recognition and Automatic High Beam headlight operation.

Option packs

Owners of Icon grade models can extend the specification of their car with an optional Tech Pack, which adds the Blind Spot Monitor, Rear Cross Traffic Alert, Lane Change Assist and auto-folding door mirror function. For 1.2T versions, the pack also provides smart entry with push button start.

Also for Icon grade vehicles, a Leather Pack can be specified, introducing full black leather seat upholstery, and a Premium Pack, which provides both the leather and a JBL audio system.

All versions of C-HR can be equipped with a Sport Pack, adding side skirts and front and rear under-runs, or an SUV Pack, which adds side bars, a front guard and a rear under-run. The Protection Pack adds mud flaps, a rear bumper protection plate, front scuff plates and a boot liner.

A range of Integrated Entertainment Packs is available, offering different combinations of seatback docks, iPad holders and DVD players and monitors.

C-HR is covered by Toyota's five-year/100,000-mile new vehicle warranty. Standard servicing requirements are annually or every 10,000 miles, whichever falls earlier.

Timeline and UK sales

YEAR	MONTH	EVENT
2014	September	Toyota C-HR Concept makes its debut at the Paris motor show.
2015	September	Second C-HR Concept is presented at the Frankfurt motor show.
2016	September	The production-ready C-HR debuts at the Paris motor show.
	November	C-HR production begins at Toyota Motor Manufacturing Turkey.
	December	Official start of UK sales.

UK Sales in 2017: 14,677

Cumulative UK sales since launch (2016): 15,186

TOYOTA C-HR TECHNICAL SPECIFICATIONS

ENGINE		1.2T
Engine code		8NR-FTS
Type		4 cylinders, in-line
Valve mechanism		DOHC 16-valve with Dual VVT-iW
Fuel system		Direct injection
Turbocharger		Single scroll
Displacement (cc)		1,197
Bore x stroke (mm)		71.5 x 74.5
Compression ratio		10.0:1
Max. power (bhp/kW @ rpm)		114/85 @ 5,200 – 5,600
Max. torque (Nm @ rpm)		185 @ 1,500 – 4,000
ENGINE		1.8 HYBRID
Engine code		2ZR-FXE
Type		4 cylinders, in-line
Valve mechanism		DOHC 16-valve with VVT-i
Fuel system		Electronic fuel injection
Displacement (cc)		1,798
Bore x stroke (mm)		80.5 x 88.3
Compression ratio		13.0:1
Max. power (bhp/kW @ rpm)	Engine	97/72 @ 5,200
	Total hybrid system	120/90 @ 5,200

	(engine and motor)			
Max. torque (Nm @ rpm)		142 @ 3,600 – 4,000		
HYBRID SYSTEM				
Hybrid battery		Nickel-metal hydride (NiMH)		
Nominal voltage (V)		201.6		
Capacity (Ah)		6.5		
Motor generator		1NM		
Type		Permanent magnet synchronous		
Max. voltage (V)		600		
Max. output (kW)		53		
Max. torque (Nm)		163		
Total hybrid system (engine and motor) max. power (bhp/kW @ rpm)		120/90 @ 5,200		
TRANSMISSION		1.8 Hybrid	1.2T	
Type		CVT FWD	6MT FWD	CVT AWD
Gear ratios	1 st	-	3.727	2.480 to 0.396
	2 nd		2.045	
	3 rd		1.310	
	4 th		0.971	
	5 th		0.764	
	6 th		0.619	
	Reverse	-	3.333	2.604 to 1.680

Differential gear ratio		3.218	4.538	
PERFORMANCE		1.8 Hybrid CVT	1.2T 6MT	1.2T CVT AWD
Max. speed (mph)		105	118	111
Acceleration 0 -62mph (sec)		11.0	10.9	11.4
FUEL CONSUMPTION & EMISSIONS*		1.8 Hybrid CVT	1.2T 6MT	1.2T CVT AWD
Fuel consumption – combined (mpg)	17in wheel	74.3	47.9	-
	18in wheel	74.3	46.3	42.1
Fuel consumption – urban (mpg)	17in wheel	83.1	40.9	-
	18in wheel	83.1	38.7	35.3
Fuel consumption – extra-urban (mpg)	17in wheel	70.6	53.3	-
	18in wheel	70.6	53.3	47.9
CO ₂ emissions – combined (g/km)	17in wheel	86	135	-
	18in wheel	86	138	152
Insurance groups		14E	15E/16E	
CHASSIS				
Suspension				
Front suspension		MacPherson strut		
Rear suspension		Double wishbone		
Steering				

Type	Rack and pinion, electric power steering
Ratio	13.6:1
Turns lock-to-lock	2.76
Min. turning circle (tyre/body, m)	10.4/11.0
Brakes	
Front (diameter, mm)	Ventilated discs, 298.5
Rear (diameter, mm)	Solid discs, 281
Parking brake	Electric
DIMENSIONS	
Overall length (mm)	4,360
Overall width (mm)	1,795
Overall height (mm)	1,565
Wheelbase (mm)	2,640
Track – front (mm)	1,550 (17in wheel) 1,540 (18in wheel)
Track – rear (mm)	1,550 (16/17in wheel) 1,540 (18in wheel)
Front overhang (mm)	905
Rear overhang (mm)	815
Coefficient of drag (FWD/AWD, Cd)	0.32/0.33
Interior length (mm)	1,800
Interior width (mm)	1,795

Interior height (mm)	1.210		
Load capacity – VDA rears seats up (l)	377		
Load capacity – to tonneau cover (l)	920		
Load capacity – to roof (l)	1,160		
WEIGHTS	HYBRID	1.2T FWD	1.2T AWD
Kerb weight (min/max, kg)	1,380/1,420	1,320/1,390	1,460
Gross weight (kg)	1,860	1,845 (6MT) 1,865 (CVT)	1,930
Towing capacity – unbraked (kg)	725	720	720
Towing capacity – braked (kg)	725	1,300 (6MT) 1,100 (CVT)	1,100
WHEELS AND TYRES			
Wheels	17 or 18-inch alloy		
Tyres	215/60R17 96H or 225/50R18 95V		

* Fuel consumption and emissions figures are NEDC equivalents of WLTP data.

TOYOTA C-HR EQUIPMENT SPECIFICATIONS

SAFETY	ICON	EXCEL	DYNAMIC
Toyota Safety Sense: Pre-Collision System with Pedestrian Detection; Adaptive Cruise Control; Lane Departure Alert; Automatic High Beam; Road Sign Assist	✓	✓	✓
Driver and passenger front airbags	✓	✓	✓
Front side airbags	✓	✓	✓
Driver's knee airbag	✓	✓	✓
Front and rear curtain airbags	✓	✓	✓
ABS with EBD and Brake Assist	✓	✓	✓
Traction Control (TRC)	✓	✓	✓
Vehicle Stability Control (VSC)	✓	✓	✓
Hill-start Assist Control	✓	✓	✓
Front seatbelt pretensioners	✓	✓	✓
Three three-point rear seatbelts	✓	✓	✓
Driver and front passenger seatbelt warning light and buzzer	✓	✓	✓
Rear seatbelt indicator light	✓	✓	✓
Tyre Pressure Warning System	✓	✓	✓
Whiplash Injury Lessening front seats	✓	✓	✓
Anti-theft system (immobiliser and alarm)	✓	✓	✓
Passenger airbag cut-off switch	✓	✓	✓
ISOFIX child seat restraint system	✓	✓	✓
Child safety rear door locks	✓	✓	✓
Rear Cross Traffic Alert	Opt*	✓	✓
Blind Spot Monitor	Opt*	✓	✓

INSTRUMENTS AND CONTROLS	ICON	EXCEL	DYNAMIC
Dual 4.2in TFT multi-information display (hybrid models)	✓	✓	✓
EV, Eco and Power drive modes (hybrid models)	✓	✓	✓
Electric parking brake	✓	✓	✓
Manual headlamp levelling	✓	✓	✗
Automatic headlamp levelling	✗	✗	✓
COMFORT & CONVENIENCE	ICON	EXCEL	DYNAMIC
Front and rear power windows	✓	✓	✓
All windows with 'one-touch down' and anti-trap functions	✓	✓	✓
Electric power steering	✓	✓	✓
Tilt and telescopic-adjustable steering wheel	✓	✓	✓
Simple Intelligent Park Assist	✗	✓	✓
Front and rear parking sensors	✗	✓	✓
Smart Entry and push-button start (standard on all Hybrid models)	Opt*	✓	✓
Rain sensing front wipers	✓	✓	✓
Dusk-sensing headlamps	✓	✓	✓
12V power socket	✓	✓	✓
Auto-dimming rear view mirror	✓	✓	✓
AUDIO, NAVIGATION AND COMMUNICATIONS	ICON	EXCEL	DYNAMIC
Six-speaker audio	✓	✓	✓
JBL 10-speaker audio	✗	Opt	Opt
Toyota Touch 2: 8in touchscreen, six-speaker audio system with DAB tuner, Bluetooth, rear-view camera, Aux-in and USB port.	✓	✗	✗
Toyota Touch 2 with Go: 8in touchscreen, six-speaker audio system with DAB tuner, access to connected services, advanced Bluetooth, rear-view camera, Aux-in and USB port.	Opt	✓	✓

VENTILATION	ICON	EXCEL	DYNAMIC
Dual-zone automatic air conditioning	✓	✓	✓
SECURITY	ICON	EXCEL	DYNAMIC
Immobiliser with alarm system	✓	✓	✓
Remote central door locking	✓	✓	✓
SEATING, UPHOLSTERY & TRIM	ICON	EXCEL	DYNAMIC
Cloth upholstery	✓	x	x
Part-leather upholstery	x	✓	x
Dynamic (purple) cloth upholstery	x	x	✓
60:40 split folding rear seats	✓	✓	✓
Heated front seats	x	✓	✓
Power lumbar support on driver's seat	x	✓	✓
Adjustable front headrests	✓	✓	✓
Three adjustable rear integrated headrests	✓	✓	✓
Leather shift lever trim and knob	✓	✓	✓
Leather steering wheel cover	✓	✓	✓
EXTERIOR & BODY	ICON	EXCEL	DYNAMIC
17in alloy wheels	✓	x	x
18in alloy wheels	x	✓	✓
Front fog lamps	✓	✓	x
LED front fog lamps	x	x	✓
LED headlights	x	x	✓
LED rear lights	x	x	✓
LED daytime running lights	✓	✓	✓
Follow-me-home headlight function	✓	✓	✓
Electrically adjustable, heated door mirrors	✓	x	x
Electrically adjustable, heated and auto-retracting door mirrors	Opt*	✓	✓

Shark fin antenna	✓	✓	✓
Rear privacy glass	x	✓	✓
Tyre repair kit	✓	✓	✓
Metallic or pearlescent paint	Opt	Opt	✓
Bi-tone paint finish (contrast black roof)	x	x	✓
OPTION PACKS	ICON	EXCEL	DYNAMIC
Tech Pack (for 1.2T) – smart entry and start, Blind Spot Monitor, Rear Cross Traffic Alert, Lane Change Assist, auto-folding door mirrors	✓	x	x
Tech Pack (for Hybrid) – Blind Spot Monitor, Rear Cross Traffic Alert, Lane Change Assist, auto-folding door mirrors	✓	x	x
Leather Pack – full black leather seat upholstery	x	✓	✓
Premium Pack – full black leather seat upholstery and JBL premium audio system	x	✓	✓
Sport Pack – side skirt and front and rear under-runs	✓	✓	✓
SUV Pack – front guard, side bars and rear under-run	✓	✓	✓
Parking Pack – front and rear parking sensors	✓	x	x
Protection Pack – rear bumper protection plate, mud flaps, front scuff plates and boot liner	✓	✓	✓
Integrated Entertainment Packs – combinations of single/twin docks, iPad holders and DVD players	✓	✓	✓

ENDS

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