

THE TOYOTA PRIUS PLUG-IN HYBRID

Introduction

Prius Plug-in Hybrid combines all the principal attributes of the fourth generation Prius with a significantly extended all-electric EV driving range. It is built on the same Toyota New Global Architecture (TNGA) platform and showcases a number of new technologies that increase efficiency, performance and practicality, significantly enhancing the model's all-round appeal.

Toyota was first to bring the concept of the Plug-in Hybrid Electric Vehicle (PHEV) to the market with the original Prius Plug-in, launched in 2012. With its second generation model it has taken a further step towards its goal of reducing its whole-fleet CO₂ emissions by 90 per cent by 2050 (from their 2010 level) through the use of hybrid electric, plug-in hybrid electric, battery electric and fuel cell electric vehicle technologies.

The latest model was developed with the benefit of customer feedback on the first generation Prius Plug-in. More than simply an evolution of its hybrid sister model, it stands as a unique vehicle in its own right.

Its technological breakthroughs include a world first gas-injection heat pump air conditioning and two Toyota firsts: a battery warming system and a Dual Motor EV drive system.

Prius Plug-in achieves a major leap forward in efficiency, driving performance, innovation and styling, while supporting Toyota's progress towards its goal of creating the ultimate eco car. Notably its EV range has more than doubled, extending beyond 30 miles, and the car's maximum speed in EV mode has been increased from 53 to 84mph.

STATE-OF-THE-ART PHV TECHNOLOGY, DOUBLE THE EV DRIVING RANGE

- Battery development doubles the electric capacity, with EV driving range more than doubled to 34 miles
- Dual Motor Drive system provides better acceleration and 84mph maximum EV speed
- New battery warming system and gas-injection heat pump air conditioning further improve all-weather EV driving range
- Battery charging speed increased by 65 per cent – just two hours using a Type II Mode III Mennekes connector

Prius Plug-in Hybrid effectively offers customers two cars in one, with an even more sophisticated full hybrid powertrain and an all-electric EV driving capability that provides more than double the range of the previous model.

The increase in EV driving range from 15 to 34 miles has been achieved through technological improvements in three key areas: battery development, maximisation of EV driving performance; and an overall vehicle package that is significantly more efficient.

Battery development

The large-capacity lithium-ion battery, located under the rear load space, is key to Prius Plug-in's increased EV driving range. Its capacity has been doubled from 4.4 to 8.8kW/h, yet its volume has only increased by two thirds – from 87 to 145 litres. Weighing 120kg, it is only 50 per cent heavier than its predecessor.

Dual Motor Drive System

Prius Plug-in is equipped with Toyota's first hybrid powertrain to feature a Dual Motor Drive System, allowing EV power to be increased by around 83 per cent. A highly compact, one-way gear within the transaxle allows the hybrid system generator to act as a second electric motor. This boosts EV driving power, giving better acceleration, more engaging performance and a maximum EV speed of 84mph. It also means there is less frequent start-up of the engine.

Gas-injection heat pump air conditioning

A new gas-injection heat pump powers the air conditioning, a world-first technology that contributes to Prius Plug-in's greater efficiency. It can heat the cabin without starting the engine, even when outside temperatures are at -10°C, minimising the impact on fuel consumption and EV driving range.

The system is far more efficient than engine heating or high-power electric heaters. The pump can warm the car's interior using heat absorbed from the air outside the vehicle. The gas-injection system, mounted on the heat pump, ensures heating performance is not compromised when outside temperatures are low.

Battery warming system

During charging, a battery warming system will bring the cells up to an efficient working temperature, even when external temperatures drop as low as -20°C. This ensures battery

power and efficiency are maintained at a sufficient level to minimise the impact of cold weather on the EV driving range, with full power available from start-off.

Faster battery charging

The increase in maximum power from 2.0 to 3.3kW means the battery can be fully charged up to 65 per cent more quickly – in two hours when using the Type II Mode III Mennekes connector, or three hours 10 minutes using a standard household plug socket.

REWARDING DRIVING EXPERIENCE

- Toyota New Global Architecture platform provides greater rigidity, a lower centre of gravity and more precise handling
- PHEV-specific suspension settings secure high ride comfort with greater handling stability
- Enhanced EV driving experience with linear torque delivery and highly responsive acceleration
- Choice of Normal, Eco and Power driving modes, with HV, EV, EV City and Battery Charge Mode powertrain switching
- Focus on noise and vibration levels to achieve a cabin even quieter than a Prius

TNGA platform for responsive, engaging handling

Prius Plug-in's TNGA platform plays a defining role in generating a rewarding driving experience, giving the car a lower centre of gravity, a more engaging driving position and more precise and responsive handling, with less body roll.

These qualities are supported by a body that is 60 per cent more rigid than the previous model. This is thanks to a series of measures: extensive use of high-strength steels and structural adhesives; a stiffer connection between the cowl panel and front pillars; additional reinforcement to the centre pillars' lower structure and the panel connection; three-way reinforcement of the rear floor cross-member; and the use of continuous flanges to increase the strength of joints between various structural elements.

As a result, better handling can be gained directly from the quality of the chassis and body, without having to use firmer suspension settings, or compromising ride quality and comfort. This makes a significant contribution to improving driving dynamics, beyond that which might be expected from an eco car.

PHEV-specific suspension settings

The quality of Prius Plug-in's driving dynamics is also supported by specific settings for the front MacPherson strut and double wishbone rear suspension.

The front coil spring rates have been optimised for supple, high-quality ride comfort. The front shock absorbers have also been adjusted to provide greater damping force at low and very low speeds, and less at mid to high speeds, combining excellent ride quality with improved handling stability.

The front anti-roll bar has been made thicker than that in the fourth generation Prius, contributing to handling stability with a 13 per cent reduction in roll rate.

The new, trailing arm-type double wishbone rear suspension produces one third the level of shock when driving on uneven roads, compared to the previous Prius Plug-in. It has the same PHEV-specific features as the front suspension, again combining high-quality ride characteristics with handling stability.

Enhanced EV driving experience

The chassis's improved dynamic characteristics are matched by the more responsive character of the new plug-in hybrid system. The 83 per cent boost in EV power gained from the Dual Motor Drive System provides highly responsive acceleration when driving in all-electric EV mode.

Increased range aside, the Toyota engineers' main goal was a substantial improvement in the EV driving experience. This involved enhancing those characteristics that only EV drive can provide: the direct feeling of drive from motor to wheel, a broad spread of torque with linear axle response and the feeling of endless acceleration.

The full hybrid drive system's new transaxle is combined with a new, highly efficient Power Control Unit to achieve exceptional overall operating efficiency.

The full hybrid powertrain has a total power output of 120bhp/90kW and can achieve nought to 62mph acceleration in 11.1 seconds. Top speed is 101mph. Conversely official combined cycle fuel consumption (WLTP) is 188.32 – 235.4mpg with 28g/km CO₂ emissions.

Four powertrain modes, three driving modes

The driver can select four different powertrain modes to control how Prius Plug-in's seamless, electric continuously variable transmission delivers power: HV mode, EV mode, EV City and a new Battery Charge mode.

HV mode efficiently combines the power delivered by the engine and electric motors, allowing the car to operate as a full hybrid. The new Battery Charge mode, activated by pressing holding the HV/EV mode switch, uses the engine to generate electricity to charge the battery while driving in HV mode.

EV mode primarily uses electric power from the HV battery to drive the vehicle; the engine is only started when the throttle is wide open, or at high vehicle speeds. It incorporates a switchable EV City mode, which reduces maximum power output; the engine is only started when throttle kick-down is engaged, allowing the car to run on electric power alone, for as long as possible.

Three on-demand drive modes, Normal, Power and Eco, are available while Prius Plug-in is operating in HV, EV or EV City modes, to further improve efficiency, performance and fuel economy. These drive modes also incorporate comprehensive eco-driving support for drivers who want to develop more environmentally considerate techniques.

From start-up and at lower speeds with Normal drive mode selected, the car will automatically run in EV mode, using electric motor power alone to provide instant power and a very smooth, quiet ride with minimal noise and vibration. Thereafter, the full hybrid drive system automatically combines power from the engine and electric motor, or engages the electric motor alone, according to driving conditions.

Power mode gives a higher throttle response to accelerator pedal inputs, boosting power to improve acceleration and increase driving pleasure. Once in Power mode the car also engages a new DMD (Driver's Mind Logic) drive assist system to provide more responsive performance. DMD uses a Driver Monitoring Index (DMI) system which continuously monitors vehicle G-forces to understand driver behaviour and habits. Thus it will recognise a desire for sportier performance, adjusting engine braking and throttle response accordingly.

In Eco mode, the throttle response to aggressive use of the accelerator pedal is reduced and air conditioning control is adjusted to support better fuel economy. Depending on driving conditions, Eco mode can help drivers achieve a reduction in fuel consumption.

Even quieter than a Prius

A particular focus was placed on minimising noise and vibration, complementing the innate quietness of driving in EV mode. From the 2020 model year, Prius Plug-in complies with the legal requirement to be equipped with an Acoustic Vehicle Alert System (AVAS).

Strategic use of materials to suppress and absorb sound at the source noise has helped achieve exceptional cabin quietness, quieter even than the levels in the fourth generation Prius.

Measures specific to Prius Plug-in include bonnet side seals to reduce engine noise under acceleration and urethane wing separators that reduce the amount of noise reaching the cabin from the engine compartment. There is also acoustic glass in the front doors and inner silencers have been added to the rear wheel housings.

Cabin quietness and comfort have been further enhanced by the use of a urethane-based headlining, a larger floor silencer and high sound-absorbing materials in the front pillars, deck side and back door trim.

STRIKING, STAND-ALONE AERODYNAMIC STYLING

- Class-leading 0.25 drag coefficient
- Model-specific front and rear LED lights and two-tone 15-inch alloy wheels

Prius Plug-in's striking, highly aerodynamic design builds on the classic Prius profile with dedicated styling elements that evoke the car's advanced technologies.

The car is 165mm longer (at 4,645mm), 15mm wider (1,760mm) and 20mm lower (1,470mm) than the original model, and has longer front and rear overhangs (+25 and +80mm respectively) than the current, fourth generation Prius. The frontal design makes it immediately recognisable from the standard Prius, with a strong, three-dimensional acrylic treatment of the grille and thin, ultra-compact, four-LED headlamp units.

The strong forward projection of the grille is emphasised by highly aerodynamic sculpting of the sides of the bumper. The vertical arrangement of the daytime running lights and LED turn indicators at the extreme margins of the front wings reinforce the cars low, ground-hugging stance.

In profile the Prius Plug-in is distinguished by its longer rear overhang, lower cowl and rear spoiler heights and model-specific, two-tone 15-inch alloy wheels, designed to provide extra brake cooling.

At the rear the cross-sectional shape of the “double-bubble” rear screen is carried into the curve of the rear spoiler. LED rear light clusters are integrated in the extremities of the spoiler and are another feature unique to the plug-in version of Prius.

A comprehensive aerodynamic package is key to achieving a remarkably low, 0.25 drag coefficient, which contributes to the car’s low fuel consumption. Prius Plug-in builds on the aerodynamics of the standard Prius with a lower roof and rear spoiler height, an enlarged area of body undercovers, front and rear bumper corners shaped to rectify airflow, the double-bubble screen and aero-stabilising fins built into the rear combination lamps.

A shutter built into the lower front grille automatically opens and closes to optimise the flow of cooling air into the engine bay, reducing air resistance. When the engine is cold, the shutter is closed to suppress cooling airflow and reduce the time it takes for the engine to warm up, supporting lower fuel consumption.

INTERIOR DESIGN

- Clear, dual-zone, layered dashboard design with satin chrome trim
- Large, eight-inch infotainment screen and PHEV-specific dual 4.2-inch multi-information displays
- Three-seat rear cabin design introduced in 2019 model

Prius Plug-in shares the same dashboard design as the fourth generation Prius: a clear, structural arrangement that layers the driver’s information sources with due priority to the most important displays.

It is equipped with large, eight-inch infotainment screen with updated graphics and dual 4.2-inch TFT screens with PHEV-specific displays. The base of the shift panel in the centre console is finished with a satin chrome trim.

The front seat design is shared with Prius, too, designed to combat driver fatigue on long journeys. The rear of the cabin was changed for the 2019 model with three seats in place of the previous two.

The luggage deck was raised by 160mm to accommodate the larger hybrid battery, giving maximum loadspace volume of 360 litres.

ADVANCED TECHNOLOGY FOR GREATER EFFICIENCY

- Dual-zone S-flow air conditioning controls vents according to number of cabin occupants

- Adaptive Headlamp System provides optimum lighting in all driving conditions
- Lightweight CFRP (carbon fibre reinforced plastic) tailgate – a world first for a mass-production vehicle
- Enhanced Toyota Safety Sense package, incorporating Pre-Collision System with pedestrian and cyclist recognition and full-range Intelligent Adaptive Cruise Control

Prius Plug-in features advanced technologies that improve powertrain efficiency, promote environmental consideration and raise safety levels.

The car's driving modes include a Battery Charge Mode which uses the engine as a source of electricity generation to charge the battery when the vehicle is being driven in HV mode.

The new, dual-zone, gas-injection heat pump air conditioning system is equipped with S-flow control, which automatically adjusts cabin air vent operation in relation to which passenger seats are occupied, maintaining comfort while reducing power consumption.

The LED headlights feature Adaptive High-beam System (AHS) technology. This automatically shades areas of the light beam to prevent dazzling of drivers ahead and oncoming traffic, so maximising high-beam operation for the best possible illumination. The system adjusts the width of high-beam projection according to vehicle speed; from widest between nine and 25mph to narrowest at speeds above 50mph. AHS also incorporates a cornering lamp function to improve visibility through bends.

Prius Plug-in is the world's first mass-production car to be fitted with a CFRP (carbon fibre reinforced plastic) tailgate. This further reduces the vehicle's overall weight, thus contributing to its fuel efficiency.

Other technology features available for Prius Plug-in include a wireless phone charging tray, a large, colour head-up display and a Simple Intelligent Parking Assist system.

UK MODEL RANGE

Prius Plug-in is available in the UK in two specifications – Business Edition Plus and Excel.

Toyota Safety Sense is standard on both versions, including the Pre-Collision System with pedestrian (day/night) and cyclist (daylight) detection, Lane Trace Assist and Lane Departure Alert with steering control, Intelligent Adaptive Cruise Control, Adaptive High-beam System and Road Sign Assist. Additional safety features include a Blind Spot Monitor and Rear Cross Traffic Alert. The addition of data collection module (DCM) in 2020 equipped the car with eCall, enabling automatic alerts to be sent to the emergency services in the event of a serious impact.

Comfort and convenience items include dual-zone automatic air conditioning, rear passenger footwell heating and Smart Entry and Start.

The Business Edition Plus specification includes the Toyota Touch touchscreen multimedia and navigation system, heated, auto-dimming door mirrors with an automatic retracting function, rear-view camera, dusk-sensing LED headlights, colour head-up display, Bluetooth, six-speaker audio with DAB reception and heated front seats. In 2020, the specification was extended to include smartphone integration with the multimedia system via Apple CarPlay and Android Auto.

Excel models extend the specification with rain-sensing wipers, Simple Intelligent Park Assist and front and rear parking sensors, a 10-speaker JBL premium audio system, voice recognition control for the Toyota Touch 2 multimedia and navigation system and leather upholstery.

TIMELINE AND UK SALES

YEAR	MONTH	EVENT
1997	December	First generation Prius launched in Japan.
2000	October	Prius launched in the UK.
2004	January	Second generation Prius launched in the UK.
2009	January	The third generation Prius makes its debut at the Detroit motor show.
	August	Third-generation Prius UK sales launched.
	September	Prius Plug-in Hybrid concept car unveiled at Frankfurt motor show.
	December	Toyota announces a global trial leasing programme for Prius Plug-in.
2010	June	Toyota and EDF launch a trial of Prius Plug-in London to gather performance and user intelligence prior a production model being launched.
2011	March	Toyota reveals Prius Plug-in at the Geneva motor show and signals it will quickly advance into production.
	September	Production version of Prius+ appears at the Frankfurt motor show.
2012	July	Prius Plug-in UK sales begin .
2013	June	Global Prius sales pass three million units.
2014	July	A Prius Plug-in sets the first fuel economy record lap at the Nürburgring.
2015	July	Chargemaster Plc becomes Toyota's partner for providing home charging points for Prius Plug-in.

2016	March	An all-new Prius Plug-in is revealed at the New York motor show, constructed on a Toyota New Global Architecture-based platform.
	September	The new Prius Plug-in is presented for the first time in Europe at the Paris motor show .
2017	February	UK Prius Plug-in sales commence.
2019	July	Cabin configuration changes to provide three rear seats.
2020	November	Lane Trace Assist, smartphone integration and data collection module added to all versions.

Sales in UK markets in 2020: 829

Cumulative UK sales since launch (2012): 4,457

TECHNICAL SPECIFICATIONS

ENGINE	
Engine code	2ZR-FXE
Type	4-cylinder, in-line
Valve mechanism	DOHC 16-valve with VVT-i
Fuel system	Electronic fuel injection
Displacement (cc)	1,798
Compression ratio	13.04:1
Bore x stroke (mm)	80.5 x 88.3
Max. engine output (bhp/kW @ rpm)	97/72 @ 5,200
Max. engine torque (Nm @ rpm)	142 @3,600
Total hybrid system output (bhp/kW @ rpm)	120/90 @ 5,200
ELECTRIC MOTOR	
Type	Permanent magnet, synchronous
Max. output – motor generator 1 (kW)	22.5
Max. output – motor generator 2 (kW)	53
HYBRID SYSTEM	
Hybrid battery type	Lithium-ion
Battery capacity (kW/h)	8.8
Nominal voltage (V)	351.5
Max. charging power (kW)	3.3
Max. EV speed (mph)	84
Max. EV range (miles)	39

Total hybrid system output (bhp/kW @ rpm)	120/90 @ 5,200
Emissions level	Euro 6
TRANSMISSION	
Type	Electric continuously variable transmission (E-CVT)
Differential gear ratio	3.218
PERFORMANCE	
0 – 62mph acceleration (sec)	11.1
Max. speed (mph)	101
FUEL CONSUMPTION, EMISSIONS (WLTP) & INSURANCE	
Combined cycle (mpg)	188.32 – 235.40
Fuel tank capacity (l)	43
CO ₂ emissions – combined cycle (g/km)	28
Insurance group	20E
SUSPENSION	
Front	MacPherson strut
Rear	Double wishbone
STEERING	
Type	Electric power steering
Ratio	13.4:1
Turns lock-to-lock	2.84
Min. turning radius – tyre (m)	5.1

Min. turning circle – body (m)	5.2
BRAKES	
Front – diameter (mm)	Ventilated discs – 255
Rear – diameter (mm)	Solid discs – 259
Parking brake	Foot operated
WHEELS & TYRES	
Wheels	15-inch alloy
Tyres	195/65R15
EXTERIOR DIMENSIONS	
Overall length (mm)	4,645
Overall width (mm)	1,760
Overall height (mm)	1,470
Wheelbase (mm)	2,700
Front track (mm)	1,530
Rear track (mm)	1,540
Front overhang (mm)	975
Rear overhang (mm)	970
Ground clearance (mm)	123
Coefficient of drag (Cd)	0.25
INTERIOR DIMENSIONS	
Load capacity (litres, VDA)	360
Rear seats folded, loaded to tonneau cover	702
Rear seats folded, loaded to roof	1,204

Interior length (mm)	2,110
Interior width (mm)	1,490
Interior height (mm)	1,195
WEIGHTS	
Kerb weight (kg)	1,530 – 1,550
Gross vehicle weight (kg)	1,855

EQUIPMENT SPECIFICATIONS

SAFETY	BUSINESS EDITION PLUS	EXCEL
Toyota Safety Sense with: Pre-Collision System with pedestrian & cyclist detection Lane Trace Assist and Lane Departure Alert with steering control Road Sign Assist Adaptive High-beam System Intelligent Adaptive Cruise Control	✓	✓
Driver and passenger front airbags	✓	✓
Front side airbags	✓	✓
Driver's knee airbag	✓	✓
Curtain airbags	✓	✓
Passenger airbag cut-off switch	✓	✓
ABS with EBD and Brake Assist	✓	✓
Vehicle Stability Control (VSC)	✓	✓
Traction Control (TRC)	✓	✓
Blind Spot Monitor	✓	✓
Rear Cross Traffic Alert	✓	✓
Tyre Press Warning System	✓	✓
Hill-start Assist Control	✓	✓
Whiplash injury-lessening front seats	✓	✓
Front seatbelt pretensioners	✓	✓
Driver and front passenger seatbelt warning light and buzzer	✓	✓
Rear seatbelt indicator light	✓	✓
Isofix child seat restraint system	✓	✓
Child safety rear door locks	✓	✓
Emergency braking signal	✓	✓
eCall	✓	✓

INSTRUMENTS AND CONTROLS	BUSINESS EDITION PLUS	EXCEL
Dual 4.2-inch multi-information displays	✓	✓
Colour head-up display	✓	✓
Electric power steering	✓	✓
Foot operated parking brake	✓	✓
Automatic headlight levelling	✓	✓
Smart Entry & Start	✓	✓
Rear-view camera with static guidelines	✓	✓
Front and rear parking sensors	x	✓
Simple Intelligent Park Assist	x	✓
COMFORT & CONVENIENCE	BUSINESS EDITION PLUS	EXCEL
Power windows	✓	✓
One-touch up/down window operation	✓	✓
Passenger window lock	✓	✓
Electrically adjustable heated and folding door mirrors with auto retracting function	✓	✓
Tilt and telescopic-adjustable steering wheel	✓	✓
Rain sensing front wipers	✓	✓
Dusk-sensing headlamps	✓	✓
Auto-dimming rear-view mirror	✓	✓
12V power sockets (front and rear)	✓	✓
Illuminated entry and foot lamp system	✓	✓
Sunglasses holder	✓	✓
Retractable tonneau cover	✓	✓
Shopping bag hooks	✓	✓

AUDIO, NAVIGATION AND COMMUNICATIONS	BUSINESS EDITION PLUS	EXCEL
6-speaker audio system	✓	✘
10-speaker JBL premium audio system	✘	✓
Toyota Touch 2 with Go multimedia and navigation system with 8in touchscreen	✓	✓
DAB+ digital broadcast reception	✓	✓
Smartphone connection via Apple CarPlay/Android Auto	✓	✓
Voice recognition control	✘	✓
Auxiliary audio, phone and multimedia switches on steering wheel	✓	✓
Wireless mobile phone charger	✓	✓
USB port	✓	✓
Bluetooth	✓	✓
VENTILATION	BUSINESS EDITION PLUS	EXCEL
Dual-zone automatic air conditioning with S-flow	✓	✓
Rear passenger footwell heating	✓	✓
SECURITY	BUSINESS EDITION PLUS	EXCEL
Immobiliser with alarm system	✓	✓
Remote central door locking	✓	✓
SEATING, UPHOLSTERY & TRIM	BUSINESS EDITION PLUS	EXCEL
Cloth upholstery	✓	✘
Leather upholstery	Opt	✓
60:40 split folding rear seats	✓	✓
Height adjustable driver's seat	✓	✓
Power driver's seat lumbar adjustment	✓	✓
Power driver's seat height adjustment	✘	✓
Black interior with piano black centre console	Opt	Opt

White interior with white centre console	Opt	Opt
Leather steering wheel trim	✓	✓
Heated front seats	✓	✓
EXTERIOR & BODY	BUSINESS EDITION PLUS	EXCEL
LED headlamps	✓	✓
LED daytime running lights	✓	✓
LED rear lights and high-mounted stop light	✓	✓
Front fog lamps	✓	✓
Colour keyed door handles	✓	✓
Colour keyed door mirrors	✓	✓
Black centre and rear pillars	✓	✓
Black rear diffuser	✓	✓
15in alloy wheels	✓	✓
Metallic or pearlescent paint	Opt	Opt

ENDS

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