

# Product Overview

## UCC25661(-Q1) Selection Guide



### Introduction

The [UCC25661\(-Q1\)](#) is a family of inductor-inductor-capacitor (LLC) controllers designed to support wide input and output voltage applications while extending the operating resonant frequency maximum to 750kHz to increase power density. LLC controllers in half-bridge configuration are typically used for 120W to 800W applications. UCC25661(Q1) can be used in a full-bridge configuration to extend the maximum output power level. To find more information about the LLC topology, see also the [LLC Topology Overview](#) introduction video on ti.com. The new UCC25661(Q1) has many improvements over the UCC25660 including more orderable parts with greater variety of features like overcurrent and overload protections decoupling. In addition, UCC25661(Q1) has the options to minimize ripple in burst mode and minimize audible noise with soft in/out of burst mode. In addition UCC25661(Q1) has faster load transient response, widened burst mode hysteresis, and improved noise immunity relative to UCC25660. To enable the wide input and output operating range, the UCC25661(-Q1) introduces a new form of control, input power proportional control (IPPC). This new method minimizes the impact of the operating frequency on regulation thresholds which improves performance over the full load range in applications ranging from adapters, TV, battery chargers, lighting, and electric vehicles. See the references design section of each product page for more technical details.

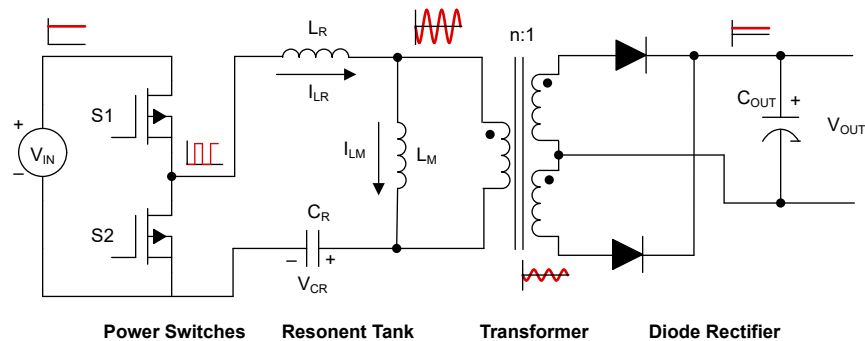


Figure 1. LLC Converter Example Block Diagram

### Feature Differentiation

- **Extend Gain Range (EGR)** – Supports nominal light load when the PFC is disabled and avoids over-load protection faults
- **Over-current protection (OCP)/Over-load protection (OLP) decoupling** – Allows more flexibility on setting OCP threshold independent of OLP threshold
- **Burst mode retention** – Forces the controller to stay in burst mode during soft on/off burst mode operation.
- **PFC On/Off** – The controller can directly disable the [PFC controller](#) when entering burst mode to minimize standby power
- **Soft on/off burst mode** – Ramps in and out of burst mode to help minimize the potential for audible noise
- **Over-voltage protection (OVP) latch** – In the event of an output over-voltage, the controller stays latched off until power is reset
- **X-Capacitor (Xcap) Discharge**– quickly discharges the capacitance across the high-voltage line and neutral terminals to comply with IEC60950, IEC60065, and IEC6238
- **High-Voltage (HV) Startup** – Minimizes losses by removing high voltage leakage path during normal operation.

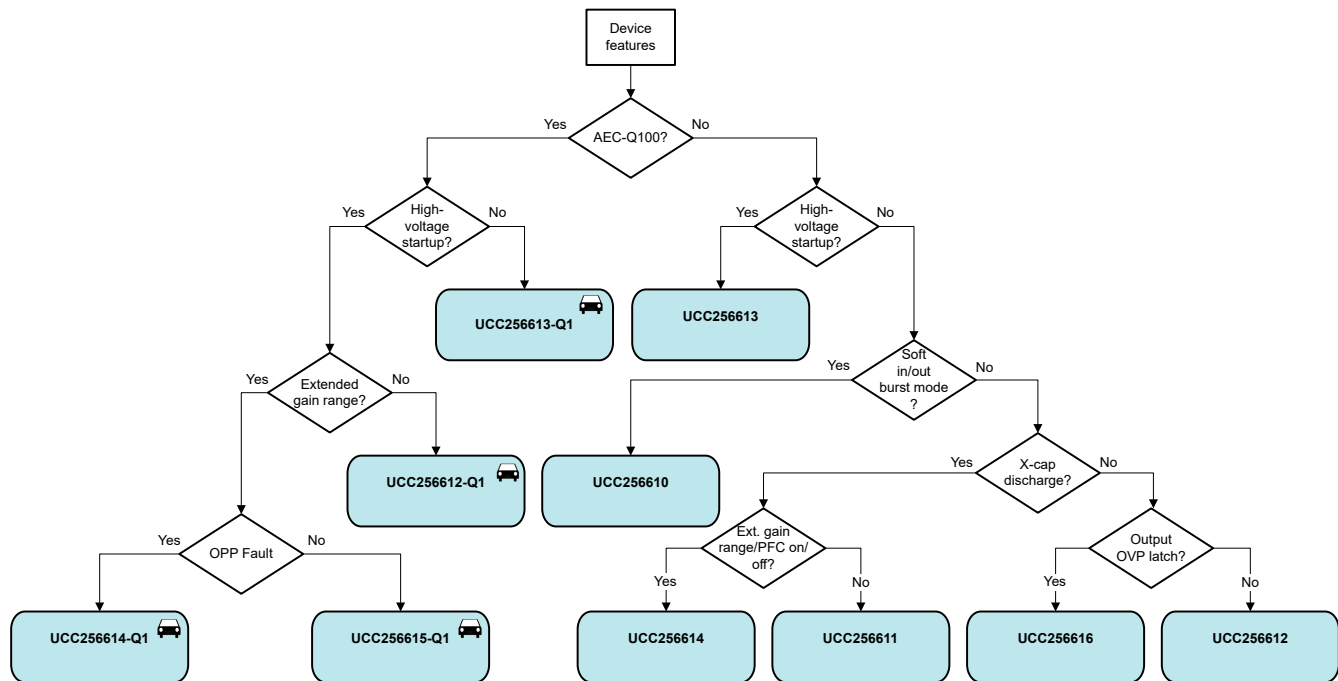
So, each orderable part number (OPN) is optimized for specific applications based on unique combination of features. UCC256611 and UCC256614(-Q1) are typically used in AC input systems. Power supplies with DC input and an existing auxiliary supply typically use UCC256613 or UCC256613-Q1. The UCC256614 and UCC256614-Q1 are popular in wide input applications because these devices can leverage Extended Gain Range. Another typical use case for UCC256613 large screen OLED TVs where a 2nd LLC stage is needed to power the backlight. In general, the UCC256610 is used in general AC/DC adapters. Next, the UCC256611 is used in AIO, PC, and gaming adapters. The UCC256612 variant is optimized for lighting, appliances, and battery chargers. The UCC256613 is typically used in broad industrial AC/DC supplies and the UCC256614 is popular in TV applications because these applications prefer using high-voltage startup but do not require X-capacitor discharge. The following section explains the features and why some designers prefer each version.

The flyback topology is a popular choice for the auxiliary supply, and typically [UCG2882x](#), [UCC2891x](#), [UCC28881](#), and [UCC287xx\(-Q1\)](#) can be used. Diodes on the secondary side of a flyback and/or LLC power stage can be replaced with a FET and [UCC24612](#) synchronous rectification controller for higher efficiency.

UCC25661-Q1 enables higher power density and reliable automotive DC/DC converters across vehicle types and charging infrastructure. Learn more about how LLC topology is addressing trends and challenges in the following [technical article](#). In summary, UCC25661-Q1 offers protection features to enable better reliability from capacitive region avoidance, pre-biased startup, plus adaptive soft-start. Finally, UCC25661(-Q1) offers mixed burst mode to improve light load efficiency and minimize risk of audible noise. However, the UCC256614-Q1 does not have XCD, since this feature is not required for DC/DC converters inside a vehicle. The below table below summarizes the key differences between the UCC25661(-Q1) family. The selection guide helps identify which version is most appropriate for an application based on the required features.

**Table 1. UCC25661(-Q1) Device Comparison Table**

UCC25661	0	1	2	3	4	6	2-Q1	3-Q1	4-Q1	5-Q1
Typical applications	Adapter	AIO, PC, Gaming Adapter	Lighting, Battery Charger	Generic, OLED TV	LED TV	AIO PC, Monitor	DC/DC Converter	Automotive Charger	HV-LV supply, uDCDC	uDCDC
Application needs	EGR and soft in/out	OVP Latch and XCD	DC input	Existing auxiliary supply	High power density, low standby	HVSU and OVP Latch	DC input	Existing auxiliary supply	High power density, low standby	Interact with host digital controller
High Voltage Startup	✓	✓	✓		✓	✓	✓		✓	✓
X-Capacitor Discharge	✓	✓			✓					
Extended Gain Range	✓				✓				✓	✓
OVP Latch		✓				✓				
Burst mode retention	✓	✓	✓	✓	✓		✓	✓	✓	
Soft in/out burst-mode	✓									
OCP/OLP decoupling										
PFC ON and OFF					✓				✓	
OPP Fault	✓	✓	✓	✓	✓	✓	✓	✓	✓	



**Figure 2. Selection Guide**

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