

# UCC5710x: TI's First Protection Low-Side Protection Driver with DESAT



The UCC5710x devices are TI's first low-side gate driver family which uses DESAT protection. This single-channel family was designed primarily for both automotive and industrial topologies that require additional protection. The UCC57108 devices target IGBT while the UCC57102 devices target SiC FETs. Some of the benefits are discussed below.

## Protection

The UCC5710x devices have DESAT protection, which is a voltage-based detection of the collector of a FET. During a short-circuit event, the gate driver turns off the outputs of the driver, which protects the system. The integrated fault reporting maintains the fault signal to the MCU and keeps the outputs of the driver off until the fault is cleared. This extra level of protection compared to a comparable driver without protection allows for a safer system in noisy or harsh environments.

## Feature Options

The UCC5710x devices have 3 pinouts which add useful features depending on what the system requires:

- Bipolar ground: UCC5710xB devices have bipolar ground which provides negative clearance below ground; this prevents accidental turn-on from miller capacitor-induced noise.
- Split output: UCC5710xC variants have split outputs which utilizes separate pins for sourcing and sinking current. This allows for complete control and customizable gate resistance for turn-on and turn-off.
- Enable: UCC5710xW devices have an enable pin, which is an additional condition to make output high. In the event of a system fault, turning Enable low can quickly shut off the gate drive.

## Internal Voltage Reference

The UCC5710x devices have an integrated LDO which creates a 5V bias with a max of 20mA. This LDO can provide an additional bias supply without needing to redesign the power rail. The LDO typically is used to bias digital isolators, thermistors, modulators, and other components.

**Table 1. UCC5710x Overview Table**

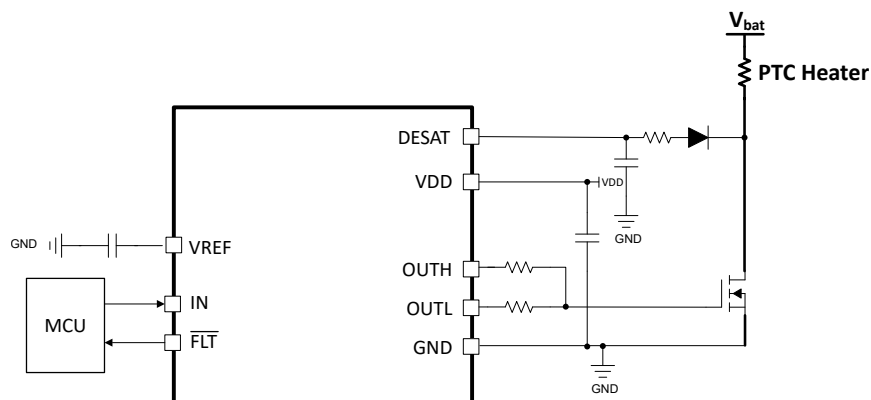
Product Features	Feature Impact	Key Applications
DESAT Protection	Integrated protection from short-circuits	xEV Automotive HVAC xEV Traction Inverter Servo Drives Power Tools A/C Inverter
Thermal shutdown	Shuts down driver when over temperature thresholds	
Fault Reporting	Reports faults to MCU	
30V Max VDD	Allows driver to survive transients and noise at inputs and VDD.	
-5V Negative Voltage Handling		
8V or 12V UVLO Options	IGBT and SicFET applications	
Bipolar Ground Option	Allows for negative clearance below 0V ground	
Split Output Option	Complete and separate control over drive source and sink strength	
Enable Option	Allows the power stage to be controlled independently of main control logic	

There are some technical features that can provide benefits to a design engineer.

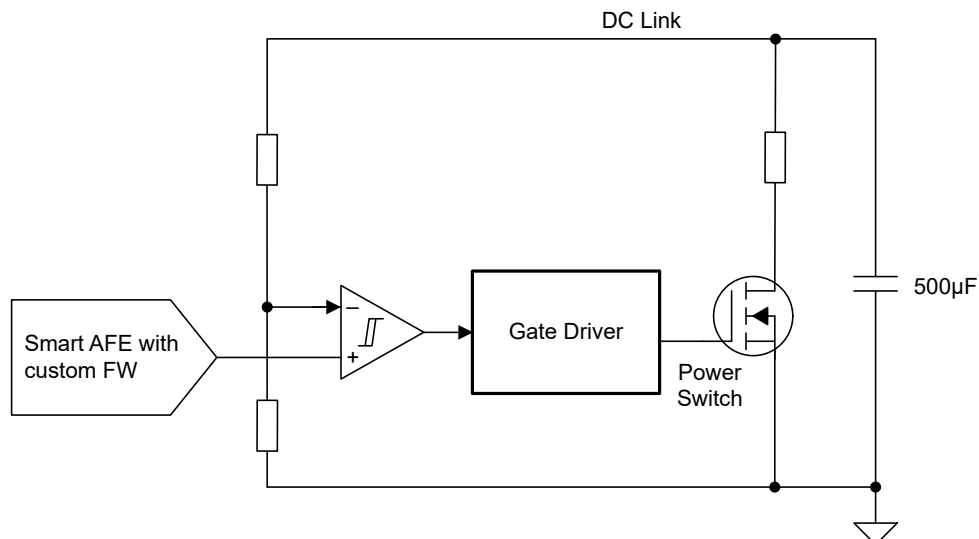
**Table 2. UCC5710x System Benefits**

System Requirement	Product Features	System Benefits
Robustness	DESAT Protection	Integrated DESAT in the gate drivers provides protection during short-circuit events.
	Thermal shutdown	Protects driver from overtemperature, protecting driver during harsh environments
	Fault Reporting	Reports faults to MCU for diagnostics.
	30V Max VDD	Driver can more easily handle transients and noise on VDD and inputs, providing robustness in system.
	-5V Negative Voltage Handling	
	Bipolar Ground	Protects systems that use SiC FETs by preventing accidental turn-on from miller capacitor-induced noise
Flexibility	8V or 12V UVLO Options	Optimizes driver UVLO for switch type.
Minimized Size and Cost	Integrated LDO	Adds convenient additional bias supply separate from the power rail
	DESAT Protection	Integrated DESAT prevents need of a larger discrete DESAT circuit.
	Split Output	Split output reduces cost by removing need for the output diode.

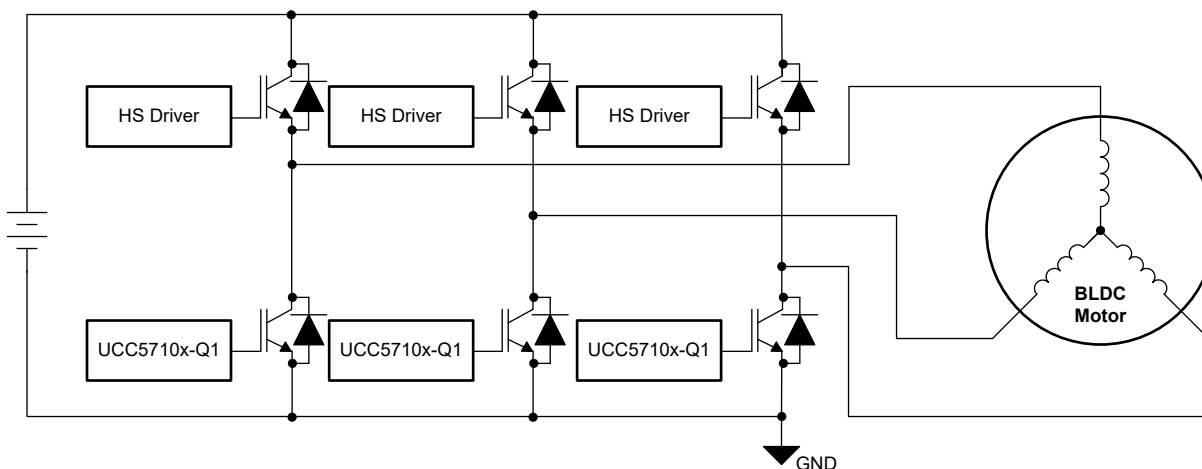
The UCC5710x family of devices have a wide variety of end equipments that have targeted sockets. Below are some topologies and end equipments where the UCC5710x family of devices can fit.



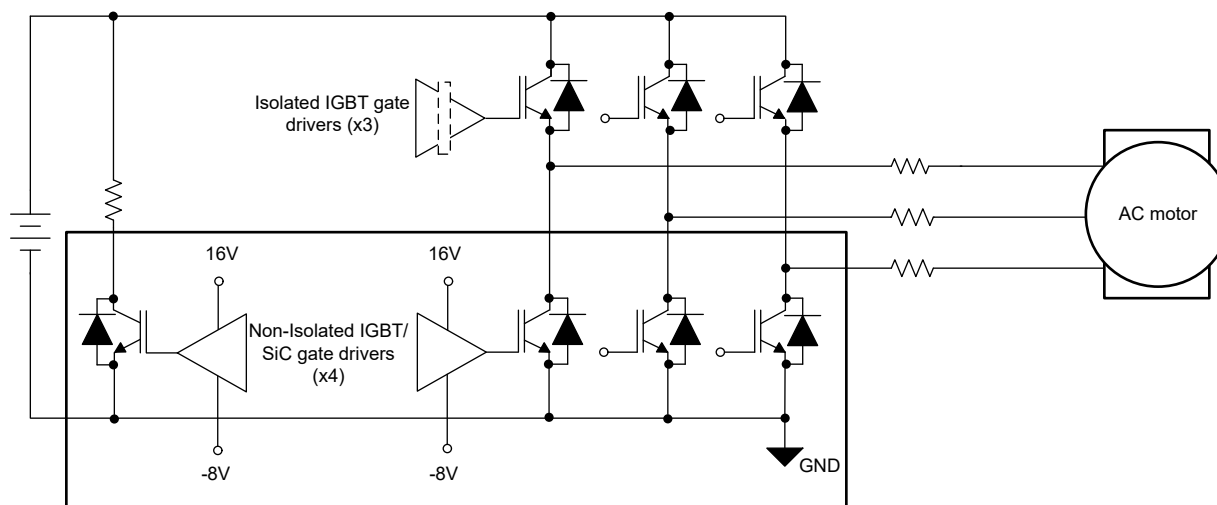
**Figure 1. UCC5710x-Q1 in Automotive PTC Heater**



**Figure 2. UCC5710x-Q1 in xEV Traction Inverter**



**Figure 3. UCC5710x-Q1 in Automotive HVAC Compressor**



**Figure 4. UCC5710x in Servo Drives**

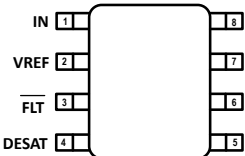
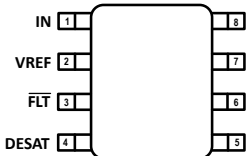
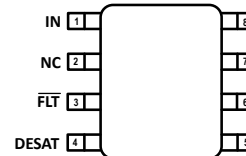
## Device Selection Guides

The UCC5710x devices have distinct features, electrical specifications, and pinouts. To aid in selection, the following tables help distinguish major differences between part numbers, variants, and provide insight comparing to legacy devices.

**Table 3. UCC5710x Generic Part Number Comparison Table**

Device	Channel Count	Drive Current	UVLO	Package Options
<a href="#">UCC57108 (-Q1)</a>	1	3A/3A	8V	D
<a href="#">UCC57102 (-Q1)</a>	1	3A/3A	12V	D
<a href="#">UCC57102Z (-Q1)</a>	1	3A/3A	12V	D

**Table 4. UCC5710x Pinouts by Variants**

	Pinouts		
Variant	UCC5710xB, UCC57102Z	UCC5710xC	UCC5710xW
UVLO	8V, 12V	8V, 12V	8V, 12V
Variant Feature	Bipolar ground	Split output	Enable
Pinout			

**Table 5. Legacy Devices Similar to UCC5710x**

Legacy Device	New Replacement GPN	Pin-to-Pin	Key Advantages
UCC27531	UCC5710xC	No	Added DESAT protection, fault reporting, and VREF while maintaining split output and 8V UVLO option.
UCC27511[A]	UCC5710xC	No	Added DESAT protection, fault reporting, and VREF while maintaining split output and increasing VDD to 30V.

## Additional Information:

### Additional References:

- [Applications and Benefits of UCC5710x-Q1](#)
- [Design Considerations for Automotive PTC Heater Modules](#)
- [Designing a Robust Traction Inverter Redundant Power Supply From 800V Battery](#)

**Table 6. UCC5710x Orderable Part Numbers**

Orderable Device	Package Type	Pins	Op Temp (°C)	Device Marking	Samples
UCC57108BDR	SOIC	8	-40 to 125	UC108B	<a href="#">Samples</a>
UCC57108BQDRQ1	SOIC	8	-40 to 125	U108BQ	<a href="#">Samples</a>
UCC57102BDR	SOIC	8	-40 to 125	UC102B	<a href="#">Samples</a>
UCC57102BQDRQ1	SOIC	8	-40 to 125	U102BQ	<a href="#">Samples</a>
UCC57108CDR	SOIC	8	-40 to 125	UC108C	<a href="#">Samples</a>
UCC57108CQDRQ1	SOIC	8	-40 to 125	U108CQ	<a href="#">Samples</a>
UCC57102CDR	SOIC	8	-40 to 125	UC102C	<a href="#">Samples</a>
UCC57102CQDRQ1	SOIC	8	-40 to 125	U102CQ	<a href="#">Samples</a>
UCC57108WDR	SOIC	8	-40 to 125	UC108W	<a href="#">Samples</a>
UCC57108WQDRQ1	SOIC	8	-40 to 125	U108WQ	<a href="#">Samples</a>
UCC57102WDR	SOIC	8	-40 to 125	UC102W	<a href="#">Samples</a>
UCC57102WQDRQ1	SOIC	8	-40 to 125	U102WQ	<a href="#">Samples</a>
UCC57102ZDR	SOIC	8	-40 to 125	UC102Z	<a href="#">Samples</a>
UCC57102ZQDRQ1	SOIC	8	-40 to 125	U102ZQ	<a href="#">Samples</a>

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