

# CC20W15VFBV1

## 20W Flyback Converter

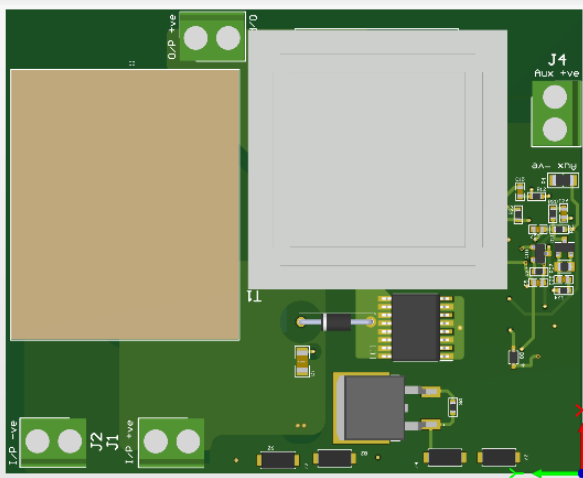
A highly versatile and easy-to-use evaluation board for a 20W flyback converter, designed to operate over an ultra-wide input voltage range from 60V to 2700V. It provides a regulated 15V output with up to 20W of continuous power. The board enables reliable performance evaluation across diverse high-voltage input conditions.

## BENEFITS

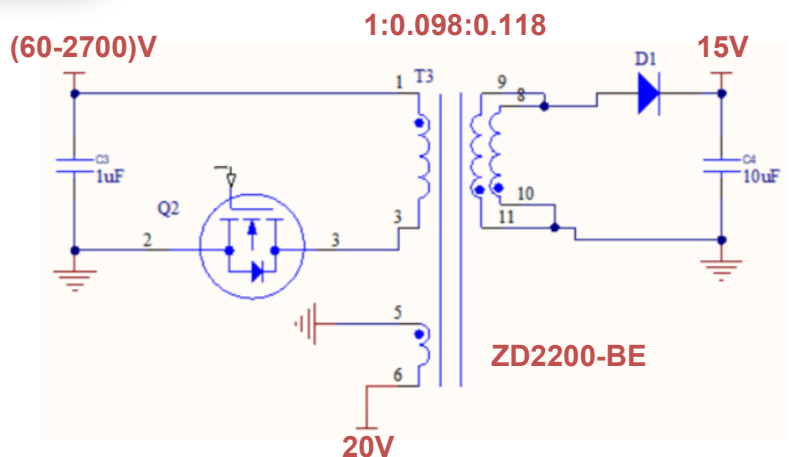
- ✓ Easy to use
- ✓ Versatile
- ✓ Fixed output
- ✓ Ultra-wide input range

## APPLICATIONS INCLUDE

Flyback converter is commonly used to provide isolated, low-power DC outputs from high and widely varying input voltages. Suitable for auxiliary power supplies, control circuitry, and high-voltage sensing applications.



Top view



Circuit diagram

Part Number	Package	Marking
CC20W15VFBV1	PCB	CoolCAD Electronics

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## Features and Board Functionality:

This evaluation board is designed to evaluate the performance of SiC devices in a flyback converter, focusing on efficiency across operating conditions. It supports a standard 16-SOIC (0.3" wide) 3.3 kV device and enables testing with input voltages up to 2.7 kV. Test boards for other package types can be provided upon user request. The evaluation board includes:

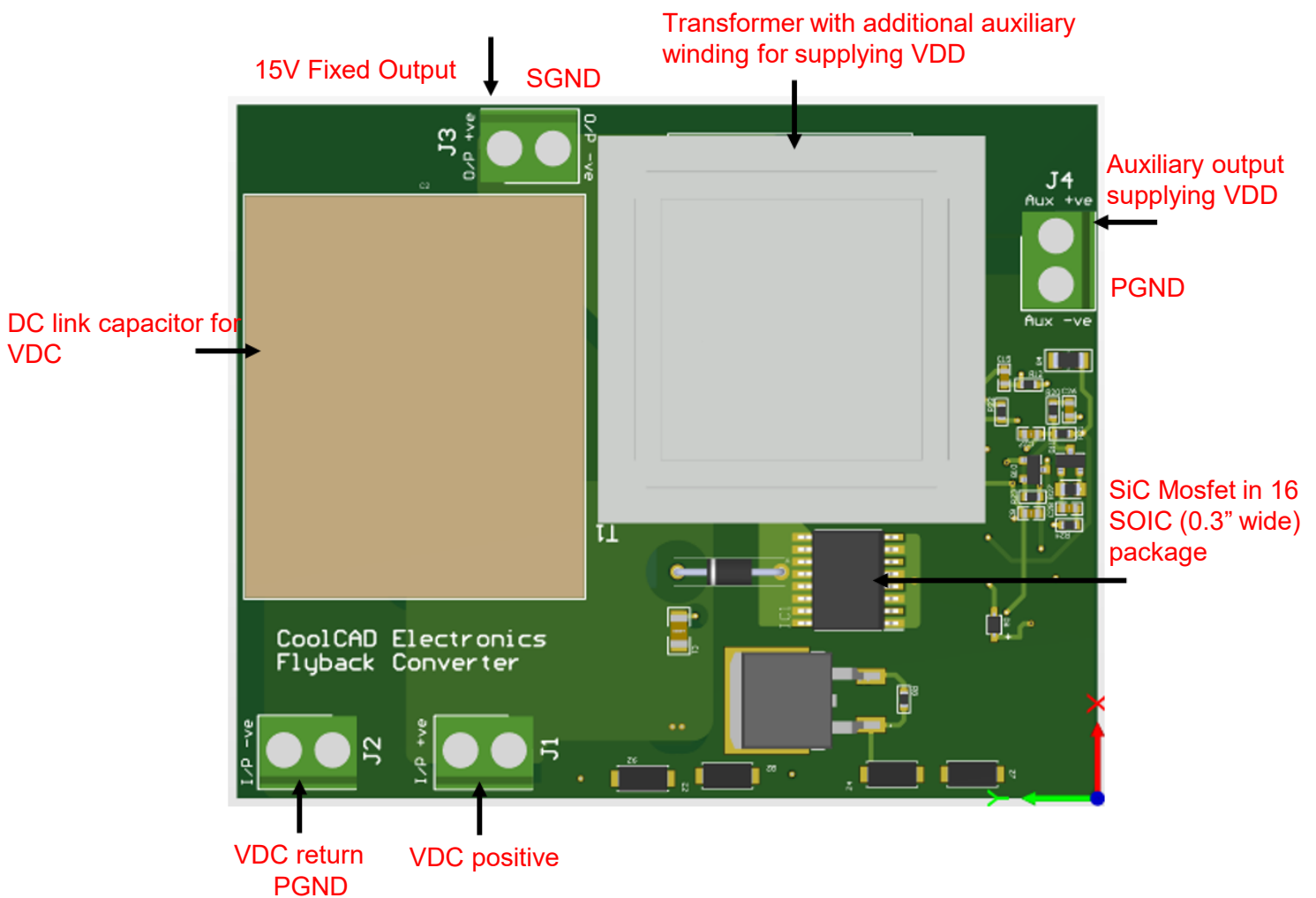
- Includes a 3.3 kV SiC device in a standard 16-SOIC (0.3" wide) package from CoolCAD Electronics.
- Integrated 550  $\mu$ H transformer for flyback operation.
- Flyback controller with startup circuitry to supply VDD until the auxiliary winding takes over.
- Auxiliary winding output for sustaining controller VDD.
- Swappable gate resistance for tuning switching performance.
- Fixed 18 V gate drive voltage.
- Primary-side control with voltage regulation and current-mode control.
- Screw terminals provided for VDC input, power ground, 15 V output, and output ground.

**Table 1** lists the physical dimensions of the board.

**Figure 1** shows a top side view of the board with key components and features

**Figure 2** shows a bottom side view of the board with key components and features

**Figure 3** shows a block diagram of the board circuitry



**Figure 1 : Flyback converter evaluation board: Top side view with major components highlighted**

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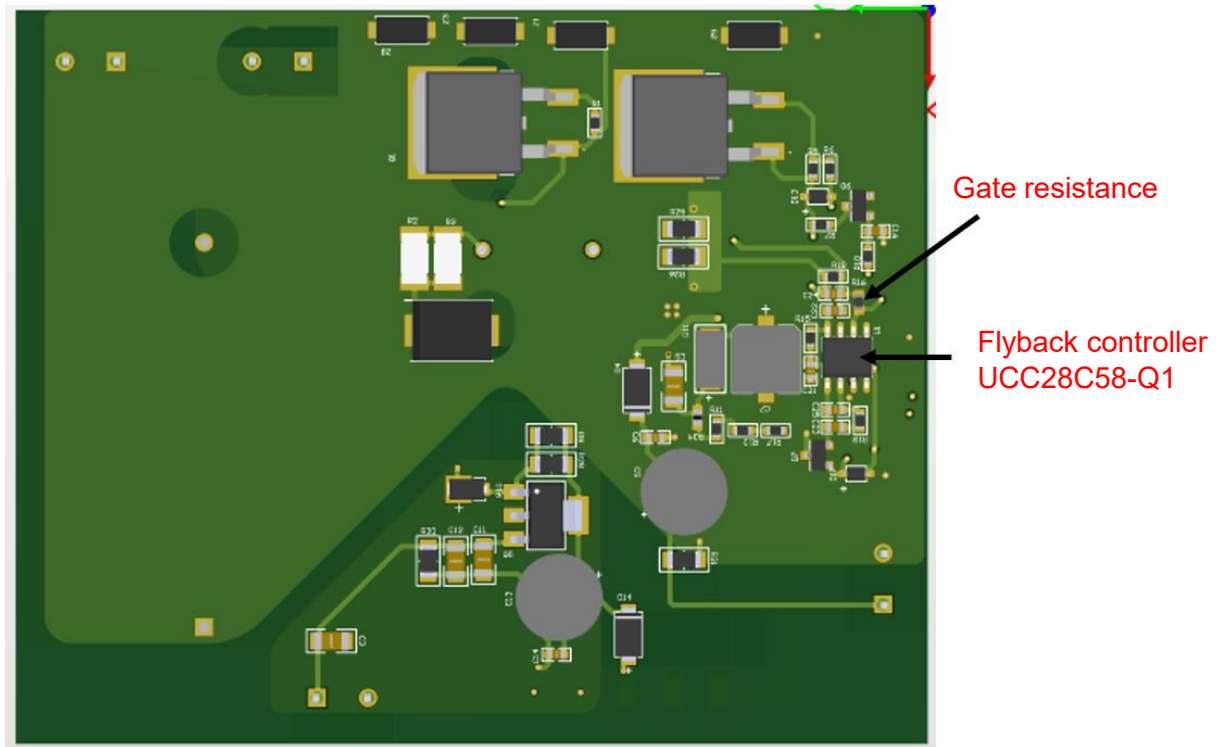


Figure 2 : Flyback converter evaluation board: Bottom side view with major components highlighted

Table 1: Flyback converter board dimensions

	Dimension	
Length	71.6mm	
Width	88.9mm	

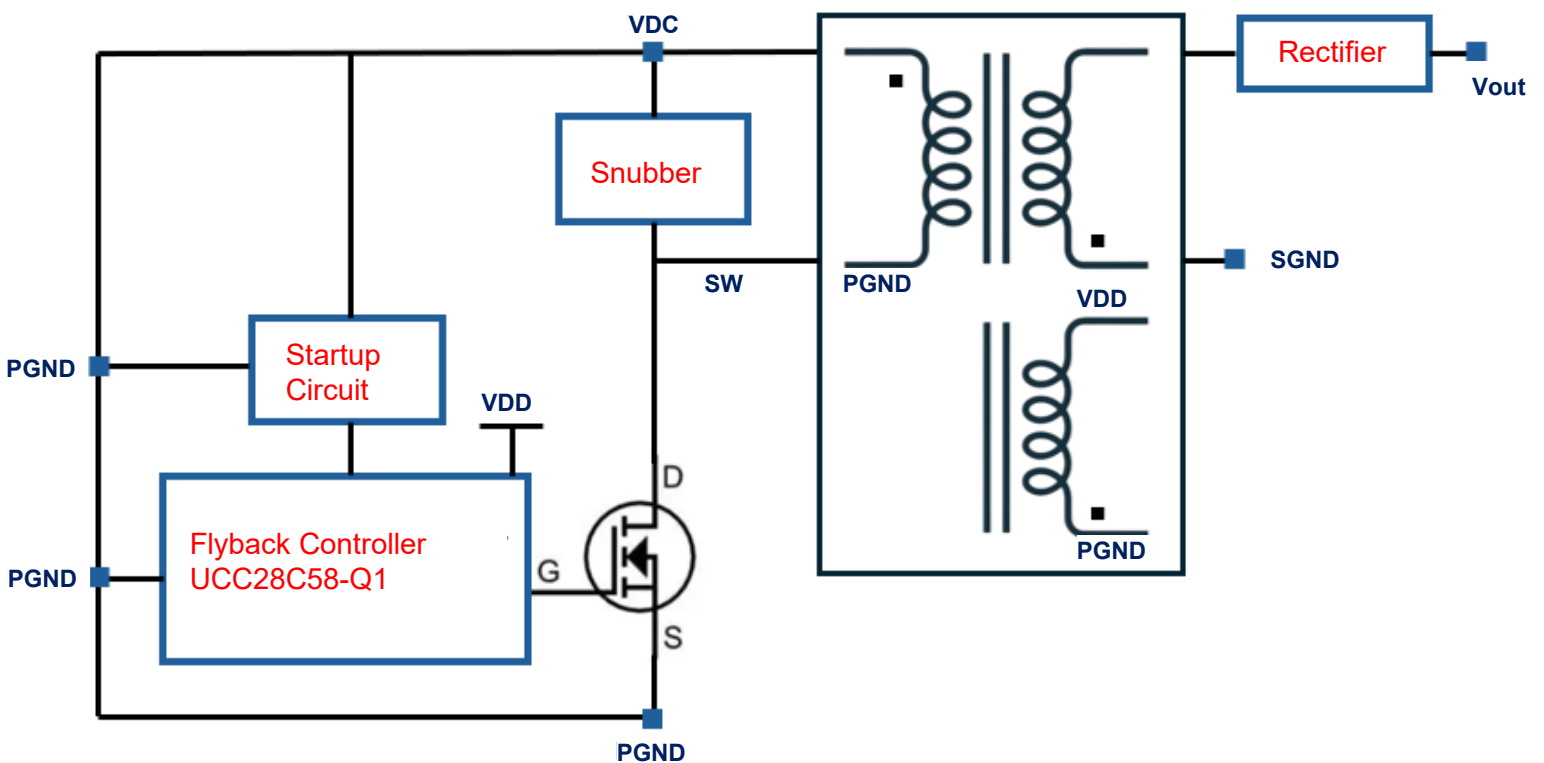


Figure 3: Flyback converter evaluation board block diagram

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**Table 2:** List of major board components and nets that are labeled in **Figures 1** and **2** with a detailed description of their functionality.

Component/Subcircuit	Description
15V Fixed Output	This is a fixed 15V output that can deliver a maximum power of 20W
SGND	Ground for 15V output
DC link capacitor for VDC	0.68μF/3kV Film capacitor for input voltage supply for the flyback converter (MKP1W036807J00KSSD)
VDC return-PGND	Return path for the input voltage supply which is same as PGND
VDC positive	Positive path for the input voltage supply
SiC Mosfet	Silicon carbide power MOSFET rated for 2.7kV operation in 16 SOIC (0.3" wide) package
Auxiliary output supplying VDD	20V auxiliary supply voltage used for supplying VDD on controller IC
Transformer	Transformer used in the converter for isolation with an additional auxiliary winding
Gate resistance	Swapable resistor for observing effect of gate resistance on switching behavior
Flyback controller	UCC28C58-Q1 Flyback controller IC for driving the gate voltage

**Table 3:** Recommended operating conditions and absolute maximum ratings

Parameter	Symbol	Min	Typ	Max	Unit	Note
High Voltage DC Input	VDC	60	-	2700	V	VDC-PGND
Output power	Pout	-	20	30	W	-
Output current	Iout	-	1.33	2	A	-
Ambient Temperature	T <sub>A</sub>	-40	27	105	°C	-

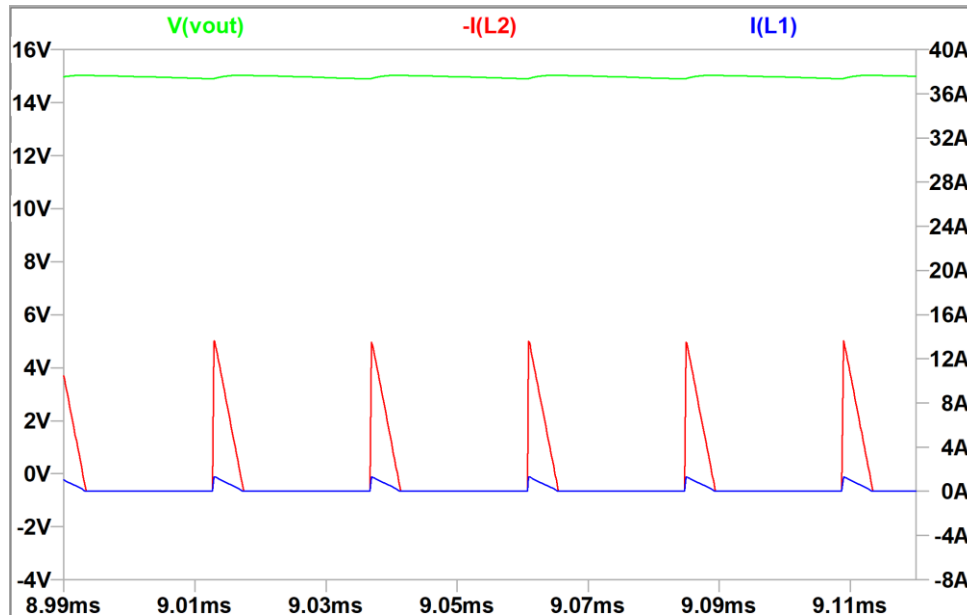
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**Quick Start Instruction:**

1. Connect a suitable load (e.g., a resistor capable of handling 20 W at 15 V) to the J3 terminal.
2. Apply an input voltage between 60 V and 2700 V across the supply terminals J1 (+) and J2 (-).
3. No external auxiliary supply is required for the controller VDD—the onboard startup circuit provides VDD until the transformer’s auxiliary winding takes over.
4. The auxiliary voltage can be monitored at J4, but do not connect any load to this terminal.
5. The flyback controller regulates the duty cycle, driving the SiC MOSFET gate at 18 V. The gate resistor (R16) is user-adjustable and can start at the default value.
6. The converter operates at a fixed switching frequency of 42.5 kHz.
7. All measurements and efficiency calculations can be performed using standard laboratory equipment.

**Example waveforms:**

**Figure 3** presents the oscilloscope waveforms of the flyback converter operating at a 60 V input and a regulated 15 V output, along with the corresponding input and output currents. The green waveform represents the regulated 15 V output voltage, the blue waveform shows the primary-side transformer current, and the red waveform corresponds to the secondary-side transformer current scaled according to the turns ratio.



**Figure 3 : Flyback converter operating in DCM at 60V input, 20W power showing Vout, transformer Ip and Is**

The same test procedure can be extended across the full input range up to 2.7 kV. As the input voltage varies, the controller automatically adjusts the duty cycle to maintain a constant output voltage, in accordance with the governing relationship shown below:

$$V_{out} = n \times \frac{D \times V_{in}}{1 - D}$$

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## Warnings

1. *The Flyback converter evaluation board should only be used by experts, knowing and understanding of its configuration.*
2. *The choices of external components and input voltage specifications require understanding of the circuit operation.*
3. *The user is responsible for the electrical safety and the proper handling and use of the evaluation board. It is your responsibility to use this board correctly and safely.*
4. *When using this board at high voltage, use it in an environment where sufficient safety measures have been taken.*
5. *CoolCAD Electronics is not responsible for accidents or injuries caused when using this board.*
6. *CoolCAD Electronics is not responsible for any consequences arising from the use of this board.*
7. *The evaluation board is provided as is without any warranties, except for in the case of shipping damage or existing manufacturing issue. The customer should alert CoolCAD Electronics within 30 days of purchase of this board for warranty.*
8. *If this board is modified or damaged by the customer, it cannot be replaced.*
9. *This datasheet is provided for reference only.*
10. *The data collected using this evaluation board may not be considered as a guarantee of components characteristics. Components must be tested thoroughly depending on intended application as adjustments may be necessary.*
11. *This board cannot be commercialized or sold by incorporating it into another product or equipment.*
12. *CoolCAD Electronics reserves the right to make any or all changes to the board's documentation, reference manuals, designs and specifications at any time without notice.*
13. *Diagrams and photos may differ from the actual board you have.*
14. *Please contact the distributor you purchased from for any inquiries.*

CAUTION: These devices and circuits are ESD sensitive. Use proper handling procedures.

**Disclaimer:** These specifications may not be considered as a guarantee of components characteristics. Components have to be tested depending on intended application as adjustments may be necessary. The use of CoolCAD Electronics components in life support appliances and systems are subject to written approval of CoolCAD Electronics.