

35 Watt CD Single Series DC/DC Converters



Features

- Automotive Application
- 4 to 18 Volt Input Range
- 5 Volt, 35 Watt Output
- Isolated, Low I/O Capacitance
- Five Year Warranty

Selection Chart

Model	Input Range VDC		Output VDC	Output mA
	Min	Max		
12S5.7000CD	4	18	5	7000

Description

The CALEX 12S5.7000CD is a single output DC/DC converter with an input range of 4 to 18 VDC and a 5 VDC output. The output current is rated at 7 amps continuous over the input voltage range of 8 to 18 VDC, and derates linearly to 4 amps at 4 volts input (See figure 1).

The unit can withstand a Transient Input Voltage above 18V under limited conditions.

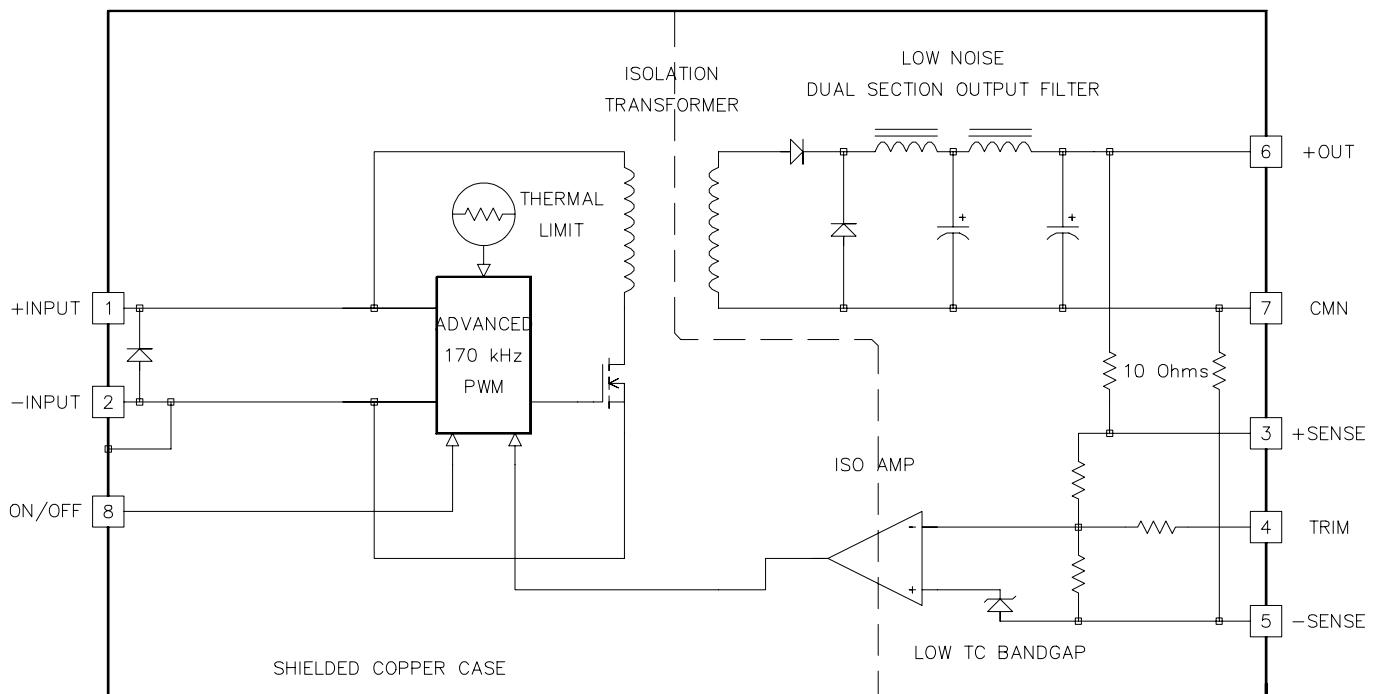
The full 7 amps of output is available on an intermittent use basis over the 4-8 volt input range. The ON time is limited to

30 seconds once every 10 minutes, which is a 5% duty cycle.

Also see the applications information section of this drawing. The 12S5.7000CD is functionally similar to the 24S5.7XT, having the same pinout and pin functions, but requires a low source impedance.

The unit is filled with a compound and will withstand a normal water wash after being soldered to a PC board.

12S5.7000CD Block Diagram



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Input Parameters (1)			
Model		12S5.7000CD	Units
Voltage Range	MIN	4	VDC
	TYP	12	
	MAX	18	
Transient Input Voltage (11) 500 ms max 5 minute max	MAX	40	VDC
		24	VDC
Reflected Ripple (7)	TYP	50	mA P-P
		10	mA RMS
Input Current 0% Load 100% Load	TYP	16	mADC
	TYP	4.0	ADC
Efficiency Vin = 12 VDC, 100% Load	TYP	73	%
Switching Frequency	TYP	170	kHz
Maximum Input 100ms, No Damage	MAX	20	VDC
Recommended Fuse		(2)	AMPS

NOTES

- All parameters measured at $T_c=25^\circ\text{C}$, $V_{in}=12\text{VDC}$, and maximum rated load unless otherwise noted. A 15 milliohm source impedance must be connected to the input pins for proper operation (See the applications section of this spec drawing). The 12S5.7000CD may be damaged without a low impedance source. The Sense pins are connected to their respective output pins. No connection to the Trim pin. Refer to CALEX Application Notes for definition of terms, measurement circuits, and other information.
- See CALEX Application Notes to determine the correct fuse. A fuse must be used for reverse voltage protection of the input.
- The case is connected to the -Input.
- The remote sense pins must be connected to their respective output pins for proper output voltage and regulation. The drop on the remote sense pins must be less than 0.2 Volts for both sense lines combined.
- Transient response is defined as the time required for the output voltage to settle from a 50% to 75% step change, of FL, to a 2% error band (rise time of step = 2 μSec).
- Dynamic response is defined as the peak voltage overshoot during a transient as defined in note 5 above.
- Noise is measured per CALEX Application Notes. Peak to Peak measurement bandwidth is 0 - 20 MHz. RMS measurement bandwidth is 0.01 - 1 MHz. Output noise is measured with a 10 μF tantalum capacitor and a 0.01 μF ceramic capacitor located 1 inch away from the converter. Input Reflected Ripple is measured with the external filter C1, C2, C3, and L1 connected to the input pins as shown in figure 2.
- The ON/OFF pin is Open Collector TTL, CMOS, and relay compatible. The input to this pin is referenced to the -Input (pin 2).
- The functional temperature range is intended to give an additional data point for use in evaluating this DC/DC converter. At the low functional temperature the converter will functional with no side effects, however sustained operation at the high functional temperature may reduce the expected operational life. The data sheet specifications are not guaranteed over the functional temperature range.
- The case thermal impedance with the installed heat sink is specified as the case temperature rise over ambient per package watt dissipated.
- The Transient Input Voltage can be applied after the unit is in the OFF mode by pulling the ON/OFF pin low. It is limited to an intermittent use basis with a 10% maximum duty cycle.
- Specifications subject to change without notice.
- Water Washability - Calex DC/DC converters are designed to withstand most solder/wash processes. Careful attention should be used when assessing the applicability in your specific manufacturing process. Converters are not hermetically sealed.

Output Parameters (1)			
Model		12S5.7000CD	Units
Output Voltage		5	VDC
Output Voltage Accuracy (4)	MIN	4.95	VDC
	TYP	5.00	
	MAX	5.05	
Rated Load Range	MIN	0	ADC
	MAX	7	
Load Regulation 25% - 100% Full Load	TYP	0.02	%
	MAX	0.1	
Line Regulation Vin = 8 to 18 VDC, Load=7A	TYP	0.04	%
	MAX	0.2	
Vin = 4 to 18 VDC, Load=4A	TYP	0.04	%
	MAX	0.4	
Vin = 4.5 to 8 VDC, Load=7A	TYP	0.2	%
	MAX	2.0	
Vin = 4 to 8 VDC, Load=7A	TYP	0.5	%
	MAX	5.0	
Transient Response (5)	TYP	700	μs
Dynamic Response (6)	TYP	320	mV peak
Noise Peak - Peak, 0-20MHz bw (7)	TYP	40	mV P-P
	TYP	10	
RMS, 0.01-1MHz bw	TYP	65	mV RMS
	MAX	200	
Temperature Coefficient	TYP	65	ppm/ $^\circ\text{C}$
Short Circuit Protection		Output to CMN and Thermal Protection	
Trim Range	TYP	10	%

APPLYING THE INPUT

The 12S5.7000CD requires a low impedance source to supply power to the input pins. The impedance must be less than 15 milliohms from DC to about 250 kHz. The unit may be damaged without the low impedance source. This can be achieved by an external input filter circuit (See figure 2). The components must be mounted near the 12S5.7000CD converter input pins, within 2 to 3 inches is satisfactory.

A typical application requires the following parts as a minimum: C1, C2, and C3.

Capacitors C1, C2, and C3 are rated to handle the total maximum input reflected ripple current. They can be reduced for lower output power applications. The following table shows the total input reflected ripple current at full load for several input voltages which defines the requirements for C1, C2, and C3.

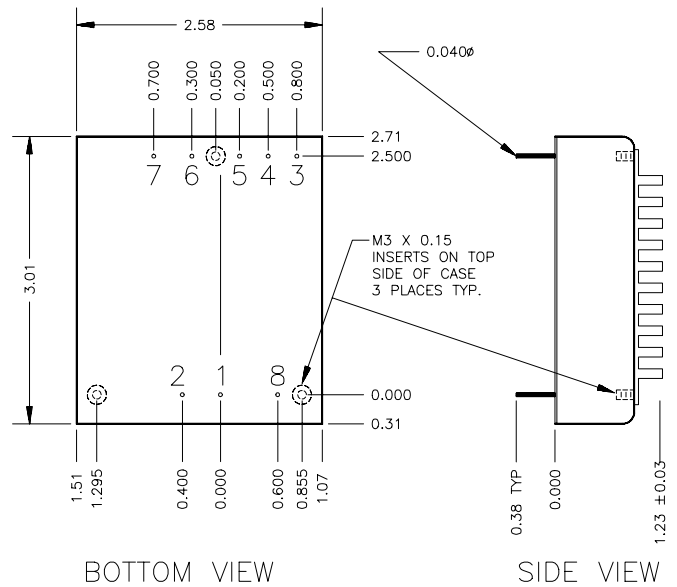
Vin (VDC)	8	12	18
I-RMS	8.1	7.2	6.2

Reverse input voltage protection is provided by an internal shunt diode across the input pins and an external fuse. The diode will blow the fuse when the input is reversed. The diode is rated for a 100 Amp 8 millisecond non-repetitive peak surge current.

The wires or PC board traces to the input pins should be sized to handle the high input currents, which will be about 6 amps at 8 volts input, and will increase to about 14 amps at 4 volts input.

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General Specifications (1)			
12S5.7000CD			Units
Isolation (3)			
Isolation Voltage Input to Output	MIN	700	VDC
Input to Output Capacitance	TYP	500	pF
On/Off Function (8)			
ON Logic Level or pin open	MIN	4	VDC
OFF Logic Level	MAX	1.5	VDC
Input Resistance	TYP	6	k ohms
Converter Input Current ON/OFF Pin Low	TYP	14	mA
Environmental			
Case Operating Range No Derating	MIN	-40	°C
	MAX	85	
Case Functional Range (9)	MIN	-55	°C
	MAX	90	
Storage Range	MIN	-55	°C
	MAX	100	
Thermal Impedence (10)	TYP	3.3	°C/Watt
Thermal Shutdown, Case Temperature	TYP	100	°C
General			
Unit Weight, w/heat sink	TYP	10	oz



PIN	FUNCTION
1	+INPUT
2	-INPUT
3	+SENSE
4	TRIM
5	-SENSE
6	+OUTPUT
7	CMN
8	ON/OFF

Mechanical tolerances unless otherwise noted:
 X.XX dimensions: ±0.020 inches
 X.XXX dimensions: ±0.005 inches

LOW NOISE INPUT CIRCUIT

Adding L1 and C4 to C1, C2, and C3 will reduce the input reflected ripple current. Increasing L1 will further lower the input reflected ripple current. Size L1 to handle the DC input current.

Adding the optional L2 and C5 filter will lower the input reflected ripple current even further. Size L2 to handle the DC input current.

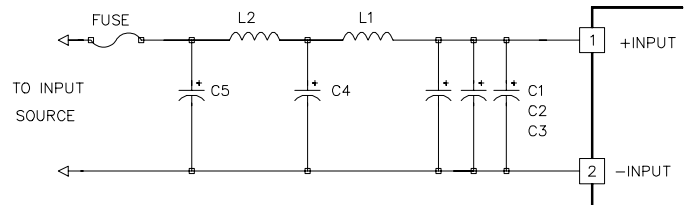


Figure 2. Input Filter and Fuse

C1, C2, C3: United Chemi-Con LXF25VB222M18X20LL
 2200 µF, 25V, ESR=0.038 ohms,
 Ripple Current 1.75A @ +105C, 3.0A @ +85C.

For higher input voltages use for
 C1, C2, C3: United Chemi-Con LXF50VB821M18X20LL
 820 µF, 50V, ESR=0.050 ohms,
 Ripple Current 1.52A @ +105C, 2.63A @ +85C.

C4, C5: United Chemi-Con LXF50VB180M5X11.5LL
 18 µF, 50V, 1.2 ohms,
 129mA @ +105C, 229mA @ +85C.

L1, L2: 20 µH. Rated at 12ADC.
 Coilcraft DMT2-20-12

Fuse: 15Amp standard blow.
 Bel Fuse 3AG15.
 Blows at 120 milliseconds with 5x current.

Notes:

- L2 and C5 are optional. Use to further reduce reflected ripple current.
- Equivalent parts can be used.

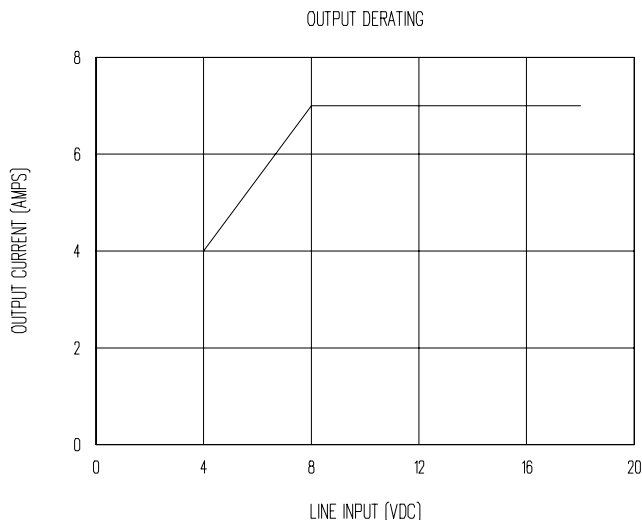


Figure 1. Output Derating