500 Watt DC/DC Converter Series Data Sheet

Description:

The 500-Watt EVD series is a ruggedized DC-DC converter suitable for electric vehicles, marine, industrial and other similar applications that draw power from a bank of batteries or other high DC voltages. It is used to supply power to accessories, lights, instruments, etc.

- Fully Isolated
- High Reliability
- High Efficiency 93%
- Parallel Connection (up to 10 units)
- Over Voltage Protection
- Short Circuit Protection
- Over Temperature Protection
- Input Reverse Polarity Protection
- Enable/Remote On/Off
- Very Low Quiescent Current
- IP67 rated Enclosure
- RoHS Compliant
- Available with Molex connector or Flying Leads
- Compact design 144mm x 76mm x 45mm

Model Selection Table

Input		Output			Model Number (Factory Model)	Connection
Voltage Range (DC)	**Current** (Max.)	**Voltage** (Typ.)	**Current** (Max.)	**Parallel connect**		
30 – 65V	18.5A	13.5V	38A	Up to 10 Units max.	EVD-48-500-13F (PLD500-EVDG13-13W)	Flying Lead
					EVD-48-500-13 (PLD500-EVDG13-13)	Molex 42820 Series
50 – 126V	11.0A	13.5V	38A		EVD-80-500-13 (PLD500-EVDG11-13)	
		27.5V	18.5A		EVD-80-500-27 (PLD500-EVDG03-27)	
50 – 130V	11.0A	13.5V	38A		EVD-80-500-13F (PLD500-EVDG11-13W)	Flying Lead
		24V	20A		EVD-80-500-24F (PLD500-EVDG03-24W)	
		27.5V	18.5A		EVD-80-500-27F (PLD500-EVDG03-27W)	

Note: Please consult the factory for additional model versions.

General Specifications: *All Models*

General Conditions:
All specifications are stated at 25ºC ambient and typical input voltage unless otherwise specified.
Units are NOT designed to be hot-swappable, hot-swapping units while energized may cause damage.
Specification is subject to change without notice.

General Specification	**Min**	**Typ**	**Max**	**Units**
Low Voltage Efficiency	91.5	92.0		%
Nominal Voltage Efficiency	92.5	93.0		%
High Voltage Efficiency	92.5	93.0		%
Capacitive Load			5000	µF
Isolation Voltages (60 Seconds): Input to Output/Output to Case	1500/500			VAC
Insulation Resistance (@500VDC, <10mA)	10M			Ohms
Case/Baseplate Temperature Range	-40		+85	ºC
Storage Temperature	-40		+85	ºC
Over Temperature shut down		+90	+95	ºC
Humidity	0		90	%
MTBF Mil-HDBK-217F @ 25ºC Ground Benign	150			kHours
Cooling	Baseplate temperature cannot exceed the specified maximum, under all operating conditions in the application			
Case Size	190.0 x 76.0 x 45 mm (7.48 x 2.99 x 1.77 inches)			
Case Material	Metal			
Weight	1.25 kg			
Agency Approvals:	Designed to meet IEC, UL, and CSA safety requirements			
EMI/EMC	Emission: EN12895, EN55022 Immunity: EN12895		ESD: EN12895 ±4kV Contact / ±15kV Air	
Intrusion & Moisture Protection	IP67 (excluding connectors and cable terminations. Contact factory for IP67 rated connector).			
Vibration	8G in x, y, and z axis from 0 to 200 Hz for 1 minute			

Remote On/Off (referenced to –Vin)	Converter **On**:	Converter **Off**:
Enable pin (ON/OFF) connected to	+6VDC to +Vin Max	Floating, connected to-Vin

Input Specifications 48V (Molex/Fl. Lead)*:* *EVD-48-500-13 & 13F*

INPUT PARAMETERS	Conditions	Min	Typ	Max	Units
Input Voltage Range		30	48	65	VDC
Input Current EVD-48-500-13	@ 30VDC Input & Full Load			18.5	A
No Load Input Current:	Vin = 30V, Io = 0 Vin = 65V, Io = 0			300 180	mA
Shut Down Mode Input Current	Quiescent Current			30	µA
INPUT UVP/OVP					
Input UVLO, Turn Off	Io = 0A Io = Full Load	24	26	28	VDC
Input ULVO, Turn On		26	28	30	VDC
Input OVLO, Turn Off		67	69	71	VDC
Input OVLO, Turn On		65	67	69	VDC

Input Specifications 80V (Molex only): *EVD-80-500-13 & 27*

INPUT PARAMETERS	Conditions	Min	Typ	Max	Units
Input Voltage Range		50	72	126	VDC
Input Current	@ 50VDC Input & Full Load			11	A
No Load Input Current 13.5Vo (13)	Vin = 50V, Io = 0 Vin = 126V, Io = 0			150 100	mA
No Load Input Current 27.5Vo (27)	Vin = 50V, Io = 0 Vin = 130V, Io = 0			200 150	mA
Shut Down Mode Input Current	Quiescent Current			30	µA
INPUT UVP/OVP					
Input UVLO, Turn Off	Io = 0A Io = Full Load	44	46	48	VDC
Input ULVO, Turn On		46	48	50	VDC
Input OVLO, Turn Off		128	130	132	VDC
Input OVLO, Turn On		126	128	130	VDC

Input Specifications 80V (Flying Lead): *EVD-80-500-13F, 24F & 27F*

INPUT PARAMETERS	Conditions	Min	Typ	Max	Units
Input Voltage Range		50	72	130	VDC
Input Current	@ 50VDC Input and Full Load			11	A
No Load Input Current 13.5Vo (13F)	Vin = 50V, Io = 0 Vin = 130V, Io = 0			150 100	mA
No Load Input Current 24Vo & 27.5Vo (24F, 27F)	Vin = 50V, Io = 0 Vin = 130V, Io = 0			200 150	mA
Input Current in Shut Down Mode	Quiescent Current			30	µA
INPUT UVP/OVP					
Input UVLO, Turn Off	Io = 0A Io = Full Load	44	46	48	VDC
Input ULVO, Turn On		46	48	50	VDC
Input OVLO, Turn Off		132	134	136	VDC
Input OVLO, Turn On		130	132	134	VDC

13.5V Output Specifications: *EVD-48/80-500-13 & 13F*

OUTPUT PARAMETERS	Conditions	Min	Typ	Max	Units
Output Voltage (1)	Vin = 72V, Io = 0-38A	13.2	13.5	13.8	VDC
Output Current		0		38	A
Load Regulation	Vin = 72V, Io = 0-38A			7	%
Line Regulation	Vin = 50V-126V, Io = 38A			1	%
Ripple & Noise (2)	20MHz		100	140	mV (p-p)
Overshoot/Undershoot				5	%
Load Transient Response, 10A-19A step	R/S: 0.1A/µS, duration 10ms	12.4		14.8	V
Output Current Protection		43		51	A
Start Up Time	@ 25ºC, Full Load by Vin @ 25ºC, Full Load by Enable			500 500	mS
Rise Time	@ 25ºC, Full Load			500	mS
Output Voltage Protection			15.6	16	V

24V Output Specifications: *EVD-80-500-24F Model (24Vout)*

OUTPUT PARAMETERS	Conditions	Min	Typ	Max	Units
Output Voltage (1)	Vin = 72V, Io = 0-18.5A	23.5	24.0	24.5	VDC
Output Current		0		20	A
Load Regulation	Vin = 72V, Io = 0-18.5A			7	%
Line Regulation	Vin = 50V-126V, Io = 18.5A			1	%
Ripple & Noise (2)	20MHz		200	280	mV (p-p)
Overshoot/Undershoot				5	%
Load Transient Response, 5A-9A step	R/S: 0.1A/µS, duration 10ms	23.5		24.5	V
Output Current Protection		24		29	A
Start Up Time	@ 25ºC, Full Load by Vin @ 25ºC, Full Load by Enable			500 500	mS
Rise Time	@ 25ºC, Full Load			500	mS
Output Voltage Protection			30	31	V

27.5V Output Specifications: *EVD-80-500-27F Model (27Vout)*

OUTPUT PARAMETERS	Conditions	Min	Typ	Max	Units
Output Voltage (1)	Vin = 72V, Io = 0-18.5A	26.7	27.5	28.3	VDC
Output Current		0		18.5	A
Load Regulation	Vin = 72V, Io = 0-18.5A			7	%
Line Regulation	Vin = 50V-126V, Io = 18.5A			1	%
Ripple & Noise (2)	20MHz		200	280	mV (p-p)
Overshoot/Undershoot				5	%
Load Transient Response, 5A-9A step	R/S: 0.1A/µS, duration 10ms	27		28.1	V
Output Current Protection		23		27	A
Start Up Time	@ 25ºC, Full Load by Vin @ 25ºC, Full Load by Enable			500 500	mS
Rise Time	@ 25ºC, Full Load			500	mS
Output Voltage Protection			30	31	V

Notes: (1) Factory Set-point is Typical Voltage on table ±1.5%@ half load.

(2) Output terminated with 10µF aluminum capacitor and 0.1µF MLCC.

Application Notes:

Input Reverse Voltage Protection:

The reverse standoff voltage shall be no more than -75VDC for the EVD-48 series models.
The reverse standoff voltage shall be no more than -126VDC for the EVD-80 series models.

Remote On/Off:

The converter has an Enable control function. This Enable Pin is designed on the input side of the converter, the converter will turn on when the applied voltage is greater than 6V with reference to VIN- and turn off when the Enable PIN is connected to VIN- or left floating. A direct method to turn the converter on is connecting the Enable Pin to VIN+.

Output Over Voltage Protection:

The power converter includes an internal output over voltage protection (OVP) circuit, which monitors the voltage on the output terminals. If this voltage exceeds the OVP set point, the converter will shut down and then restart after a fixed delay time (hiccup mode).

Over Temperature Protection:

The over-temperature protection consists of circuitry that provides protection from thermal damage. If the temperature exceeds the preset temperature threshold, the converter will shut down, and protect components to not exceed their absolute maximum temperature ratings. The converter will restart after the baseplate temperature has fallen below 85ºC.

Output Over-Current Limit and Short Circuit Protection:

The converters include internal over-current protection (OCP) and short circuit protection (SCP) circuits. The response of the SCP circuit is much faster than that of the OCP circuit. A slow increase of the output current will let the converter enter OCP protection when the current exceeds the OCP set point, while a fast increase of the output current will let the converter enter SCP when the current exceeds the SCP set point.
Both OCP and SCP protection modes will auto-recover once the fault condition is removed.

-13/13F Models: The OCP is designed with constant current mode with a typical trigger point of 1.15*Io_nom. When the output current is greater than the trigger point, the output voltage will go to near zero and the output current will stay at typical 1.15*Io_nom after a short delay of 20ms.
The SCP is also designed with constant current mode with a typical trigger point of 1.15*Io_nom. When SCP events happen, for example, a sudden short circuit at the output, the module will first turn off and then enter constant current mode.

Both OCP and SCP protection modes will auto-recover once the fault condition is removed.

The module can **charge Aux. battery** attached on the output with a constant current of 1.15*Io_nom typical, from 9V to 13.8V. Care should be taken if the Aux. battery nominal sink current is less than 1.15*Io_nom. For this condition, an additional charging circuit should be added on the system side.

-24F/27F Model: The OCP is designed with constant current mode with a typical trigger point of 1.35*Io_nom. When the output current is greater than the trigger point, the output voltage will go to near zero and the output current will stay at typical 1.35*Io_nom after a short delay of 20ms.
The SCP is also designed with constant current mode with a typical trigger point of 1.35*Io_nom. When SCP events happen, for example a suddenly short circuit at the output, the module will turn off first and then enter constant current mode.

Both OCP and SCP protection modes will auto-recover once the fault condition is removed.

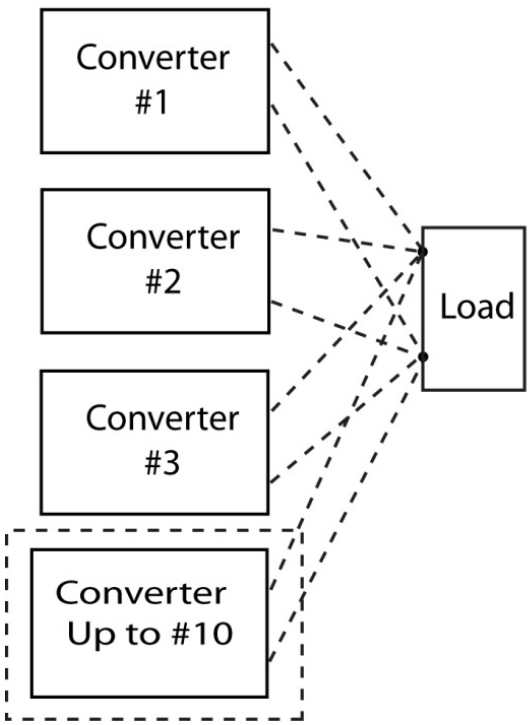
The module can **charge Aux. battery** attached on the output with a constant typical current of 1.35*Io_nom, from 20V to 28V. Care should be taken if the Aux. battery nominal sink current is less than 1.35*Io_nom. For this condition, an additional charging circuit should be added on the system side.

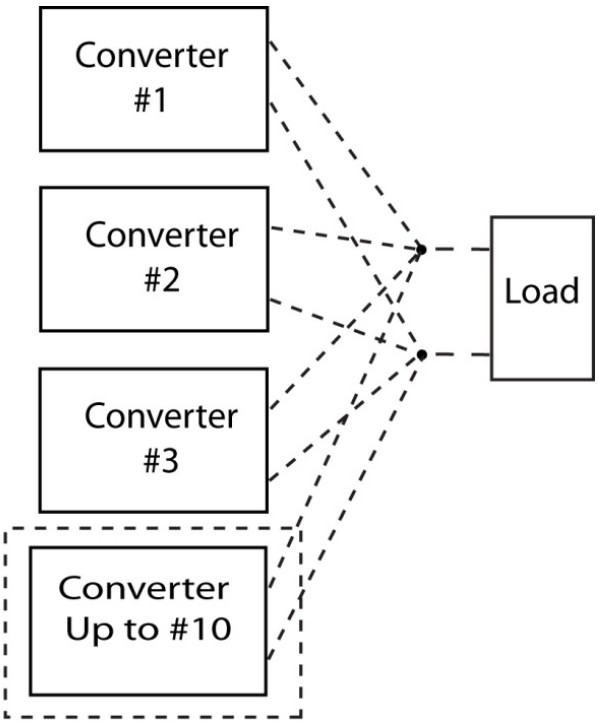
Output Over-Current Limit, Short Circuit Protection and when an Auxiliary Battery is connected:
Care should be taken if the DC-DC converter is used with an auxiliary battery connected to the output. If the battery's recommended safe charging or sink current is less than 1.15*Io_nom for the -13 or 1.35*Io_nom for the -27F DC-DC converter, damage to the battery may result. For this condition where controlled lower current is needed to charge a battery, we recommend customers to install additional charging circuitry on their end to into the application.

Thermal Condition:
The converter should be mounted to a chassis or a base plate with thermal grease, and the maximum base plate temperature is suggested to be controlled to within 85ºC.

Recommended Parallel Connections:

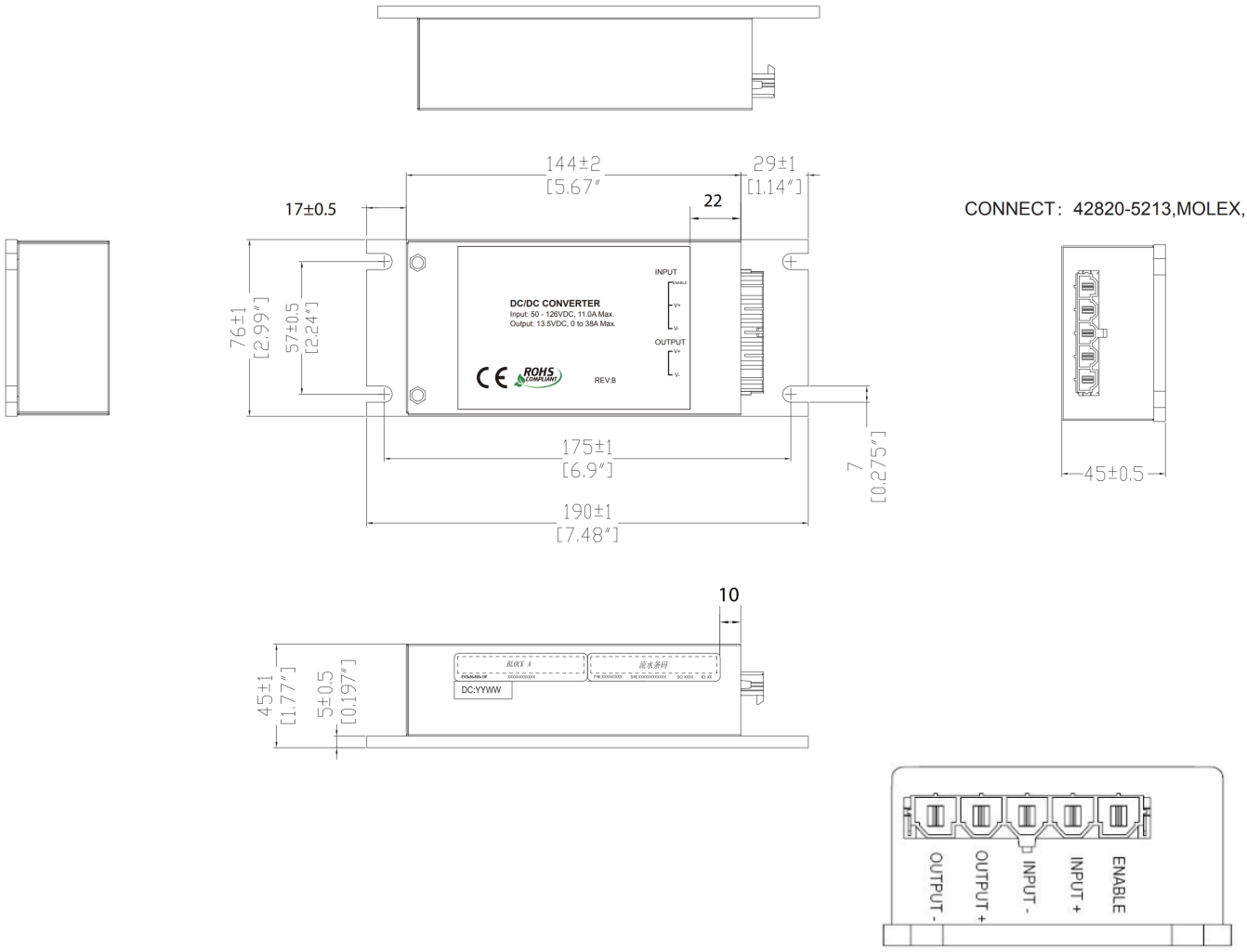
The module supports parallel operation. We suggested connecting the Modules in parallel as per the following configuration.
The impedance of the cables connecting the individual units should be within 5% of each other (same size, length, etc.)
During parallel operation, all units should be energized and de-energized together to prevent abnormal operation.
Ten modules in parallel can supply up to 5kW.





Mechanical Specifications for Connector Version

EVD-48-500-13, EVD-80-500-13 & EVD-80-500-27:



All dimensions are inches (mm)
Tolerance ±0.01 (0.254mm) unless otherwise noted.

Notes:

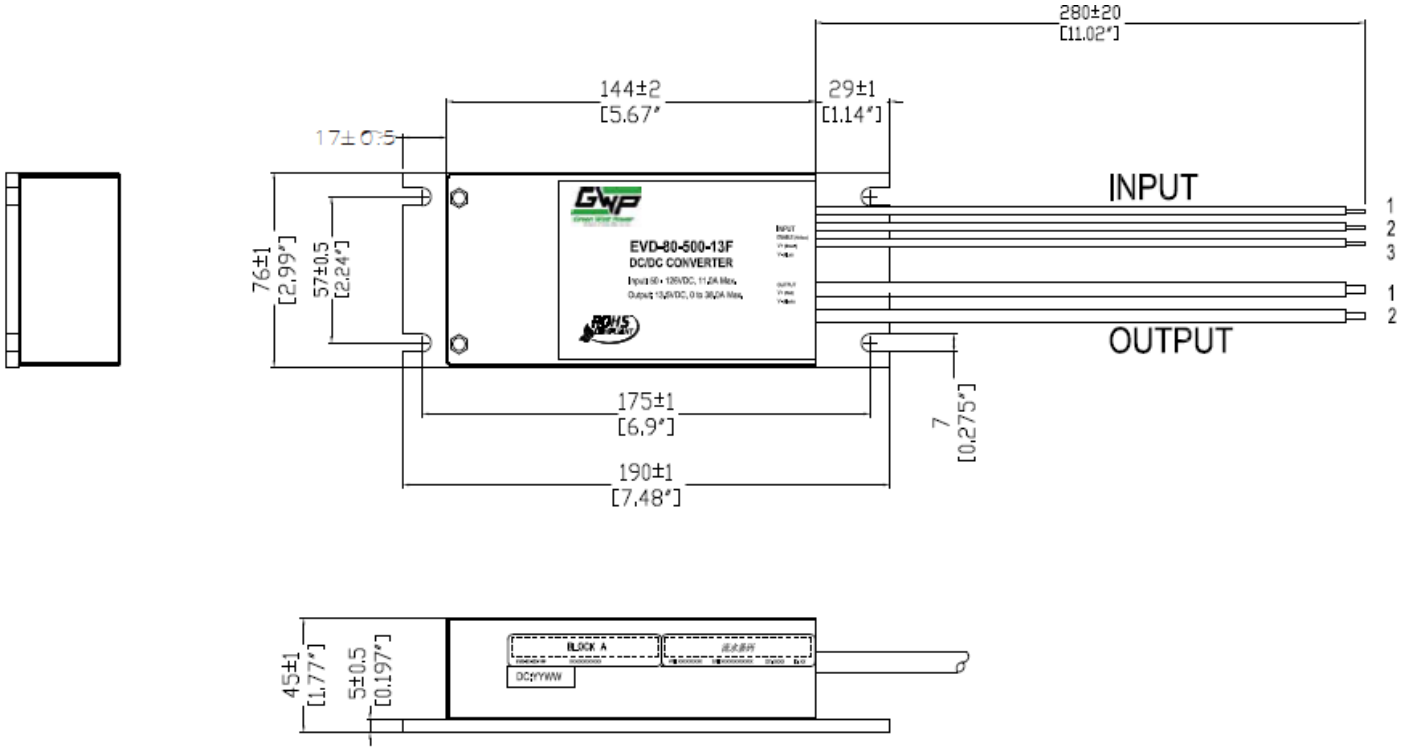
1. Connector: A Molex 42820 Series, model 42820-5213 is installed in the converter.
   Customer information on mating connector type: Molex 42816-0512 with terminal pins 42815-0042.

2. Enable: The converter output is enabled, when the enable signal is pulled HIGH to between 6VDC and +Vin max with reference to –Vin and disabled when pulled LOW.

   When the enable function is NOT being used, the enable pin should be hard-wired to +Vin to enable the output.

Mechanical Specifications for Flying Lead Version

EVD-48-500-13F, EVD-80-500-13F, EVD-80-500-24F and EVD-80-500-27F:



All dimensions are inches (mm)
Tolerance ±0.01 (0.254mm) unless otherwise noted.

Wire Size on Flying Lead Version:

INPUT FUNCTION	COLOR	EVD-48-500-13F	EVD-80-500-13F	EVD-80-500-24F & -27F
V+	Brown	14 AWG	16 AWG	16 AWG
V-	Blue	14 AWG	16 AWG	16 AWG
Enable	Yellow	18 AWG	18 AWG	18 AWG

OUTPUT FUNCTION	COLOR	EVD-48-500-13F	EVD-80-500-13F	EVD-80-500-24F & -27F
V+	Red	10 AWG	10 AWG	14 AWG
V-	Black	10 AWG	10 AWG	14 AWG

Note: Enable Function
The converter output is enabled, when the enable signal is pulled HIGH to between 6VDC and +Vin max with reference to –Vin and disabled when pulled LOW or left floating.
When the enable function is NOT being used, the enable pin should be hard-wired to +Vin to enable the output.