500 Watt DC/DC Converter EVD 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 Number	Input Voltage Range	Output Voltage (Typ.)	Input Amps (Max.)	Output Amps	Max in Parallel	Connection
EVD-48-500-13 *PLD500-EVDG13-13	30-65	13.5	18.5	38	10	Molex 42820 Series
EVD-48-500-13F *PLD500-EVDG13-13W	30-65	13.5	18.5	38	10	Flying Lead
EVD-80-500-13 *PLD500-EVDG11-13	50-126	13.5	11	38	10	Molex 42820 Series
EVD-80-500-13F *PLD500-EVDG11-13W	50-130	13.5	11	38	10	Flying Lead
EVD-80-500-27F *PLD500-EVDG03-27W	50-130	27.5	11	18.5	10	Flying Lead

*Factory model numbers

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General Specifications: *All Models*

Remote On/Off (referenced to –Vin)	Converter **On**:		Converter **Off**:	
Enable pin (ON/OFF) connected to	+6VDC to +Vin Max		Floating, connected to-Vin	
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)	10			Mohms
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 specified maximum, under all operating conditions in application			
Case Size	190.0 x 76.0 x 43.5 mm (7.48 x 2.99 x 1.71 inches)			
Case Material	Metal			
Weight	1.25 kg			
Agency Approvals:	Designed to meet IEC, UL, CSA safety requirements			
EMI/EMC	Emission: EN12895, EN55022 Immunity: EN12895		ESD: EN12895 ±4kV Contact / ±15kV Air	

48V Input Specifications: *EVD-48-500-13/13F/24F Models*

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
Input Current EVD-48-500-24	@ 30VDC Input & Full Load			12.0	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	Io = 0A Io = Full Load	26	28	30	VDC
Input OVLO, Turn Off	Io = 0A Io = Full Load	67	69	71	VDC
Input OVLO, Turn On	Io = 0A Io = Full Load	65	67	69	VDC

80V Input Specifications: *EVD-80-500-13 Model (126Vin Max)*

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	Vin = 50V, Io = 0 Vin = 126V, Io = 0			150 100	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	Io = 0A Io = Full Load	46	48	50	VDC
Input OVLO, Turn Off	Io = 0A Io = Full Load	128	130	132	VDC
Input OVLO, Turn On	Io = 0A Io = Full Load	126	128	130	VDC

80V Input Specifications: *EVD-80-500-13F/27F Models (130Vin Max)*

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 27.5Vo (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	Io = 0A Io = Full Load	46	48	50	VDC
Input OVLO, Turn Off	Io = 0A Io = Full Load	132	134	136	VDC
Input OVLO, Turn On	Io = 0A Io = Full Load	130	132	134	VDC

13.5V Output Specifications: *EVD-48-500-13 & 13F Models (48Vin)*

OUTPUT PARAMETERS	Conditions	Min	Typ	Max	Units
Output Voltage	Vin = 48V, Io = 0-38A	13.2	13.5	13.8	VDC
Output Current		0		38	A
Load Regulation	Vin = 48V, Io = 0-38A			7	%
Line Regulation	Vin = 30V-65V, Io = 38A			1	%
Ripple & Noise (3)	20MHz		100	140	mV (p-p)
Overshoot/Undershoot				5	%
Load Transient Response for Load step	10A-19A, R/S: 0.1A/µS, load duration 10ms	12.4		14.8	V
Output Current Protection		42		48	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

13.5V Output Specifications: *EVD-80-500-13 & 13F Models (80Vin)*

OUTPUT PARAMETERS	Conditions	Min	Typ	Max	Units
Output Voltage	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 (3)	20MHz		100	140	mV (p-p)
Overshoot/Undershoot				5	%
Load Transient Response or Load step	10A-19A, R/S: 0.1A/µS, load 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

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

OUTPUT PARAMETERS	Conditions	Min	Typ	Max	Units
Output Voltage	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 (3)	20MHz		200	280	mV (p-p)
Overshoot/Undershoot				5	%
Load Transient Response for Load step	5A-9A, R/S: 0.1A/µS, load 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

Specification Notes:

(1) All specifications are stated at 25ºC ambient and typical input line.

(2) Ingress protection to IP67, excluding connectors and cable terminations (contact factory for IP67 rated connector).

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

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

(5) Vibration to withstand 8G in x, y, and z axis from 0 to 200 Hz for 1 minute.

(6) Units are not designed to be hot-swapped. Hot swapping units while energized will cause damage.

(7) Specification is subject to change without notice.

Application Notes:

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 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 suddenly 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.

-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.

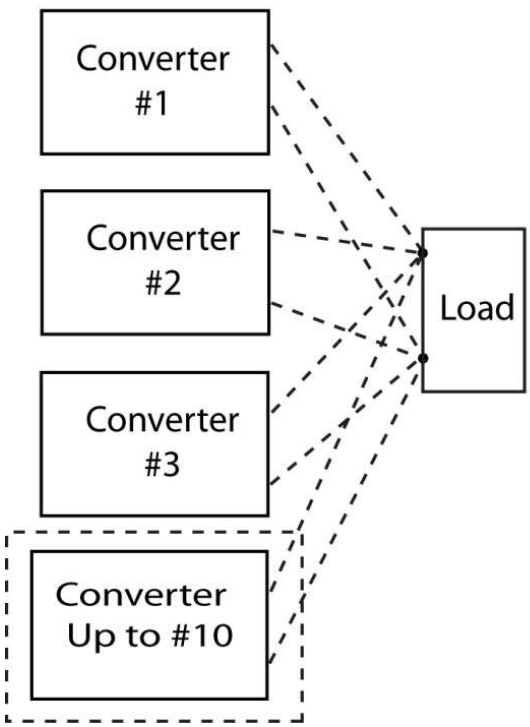
Input Reverse Voltage Protection:
The reverse standoff voltage shall be no more than -75VDC for the EVD-48 series models.
The reverse standoff voltage shall be no more than -126VDC for the EVD-80 series models.

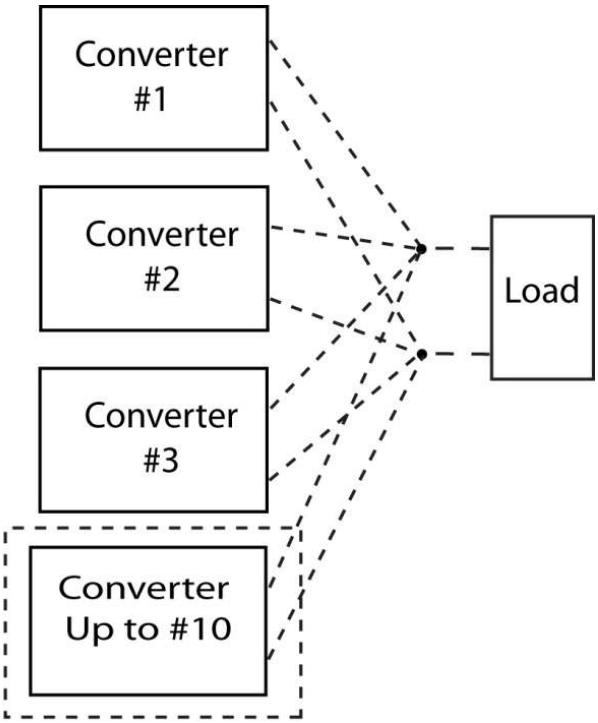
Remote On/Off:
The converter has Enable control function. This Enable Pin is designed on the input side of the converter, the converter will turn on when the applied voltage is greater than 6V with reference to VIN- and turn off when the Enable PIN is connected to VIN- or left floating. A direct method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

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:

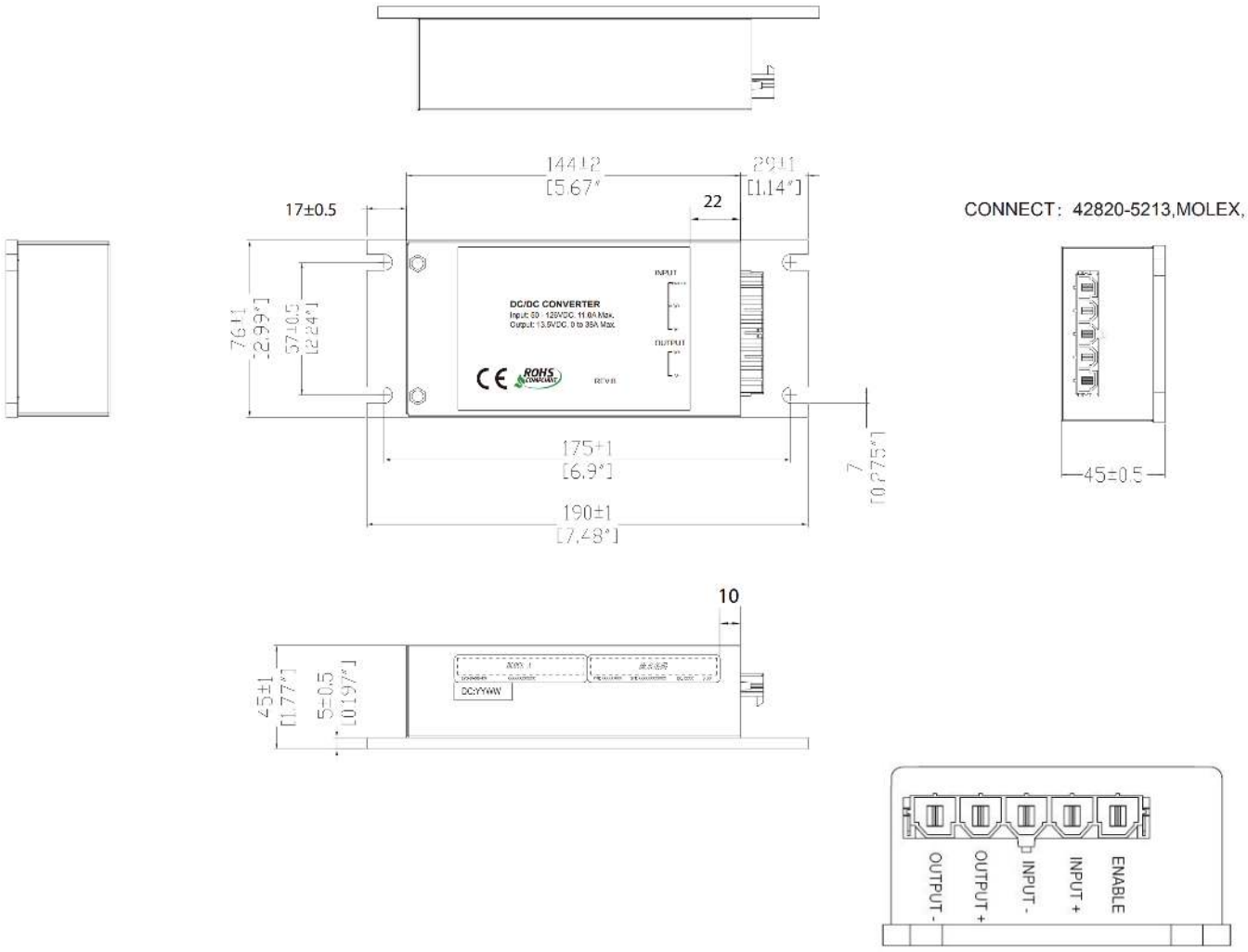
The module supports parallel operation. We suggested connecting the Modules in parallel as per the following configuration.
The impedance of the cables connecting the individual units should be within 5% of each other (same size, length, etc.)
During parallel operation, all units should be energized 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:



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

Notes:

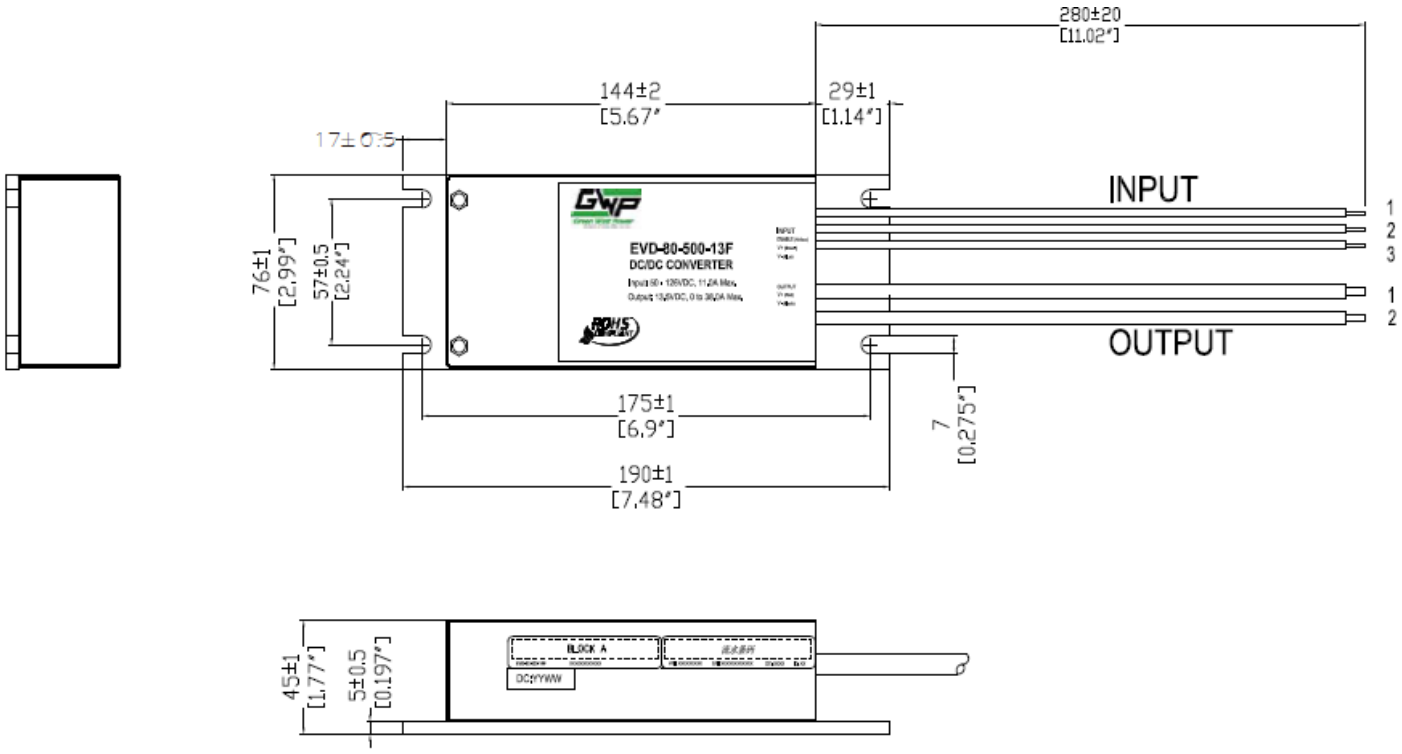
1. Connector: A Molex 42820 Series, model 42820-5213 is installed in the converter.
   Customer information on mating connector type: Molex 42816-0512 with terminal pins 42815-0114.

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 for enabling the output.

Mechanical Specifications for Flying Lead Version

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



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

INPUT FUNCTION	COLOR	-13F / -14F WIRE SIZE	-27F WIRE SIZE
V+	Brown	16 AWG	16 AWG
V-	Blue	16 AWG	16 AWG
Enable	Yellow	18 AWG	18 AWG

OUTPUT FUNCTION	COLOR	-13F / -14F WIRE SIZE	-27F WIRE SIZE
V+	Red	10 AWG	14 AWG
V-	Black	10 AWG	14 AWG

Note: 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 for enabling the output.