DATASHEET

Turntide DC/DC Converter (500W)

The latest isolated DC/DC converter from Turntide boasts 500W output power in the same package size as existing 300W converters; this is achieved by utilising a high efficiency topology which boasts >91% efficiency at a typical operating load of 75%.The 500W DCDC converter is designed to operate in the standard industrial temperature range of -40˚C to +85˚C and has many protection features such as input UVLO, input OVLO, input reverse polarity, inrush current, output short circuit and over temperature. Parallel connection of multiple units without using a diode on the output is another feature of converter. The mechanical construction is based on is based on the previous 300W rugged DCDC converter.

Features

+ 500W Output power
+ Rugged design
+ High reliability
+ Small footprint
+ Wide input range
+ Output voltage options 12 – 14V
+ High Efficiency >91% at 75% load
+ Wide temperature range -40˚C to +85˚C
+ Parallel connection of multiple units
+ Output Enable pin
+ Input UVLO/OVLO
+ Input Reverse Polarity protection
+ Output Short Circuit protection
+ Over Temperature protection
+ Limited Inrush Current
+ 1500VDC isolation
+ IP66 rating
+ UL
+ CE Marked
+ EMC compliant - EN12895, EN55022

Electrical Characteristics

All electrical specifications are based on 25˚C ambient temperature, typical input voltage, rated load and connected to a 1.4 ˚C/W heatsink, unless otherwise stated.

Specification is subject to change without notice.

Input characteristics	Min	Typ	Max	Units	Notes
Input voltage range	30	48	70	Vdc	
Input UVLO, turn-on	24.7	25.5	26.2	Vdc	
Input UVLO, turn-off	24.4	25.1	25.9	Vdc	
Input OVLO, turn-on	76.2	78.5	80.9	Vdc	
Input OVLO, turn-off	77.3	79.6	82	Vdc	
Max input current		19		Adc	$V_{IN\ MIN}$, $I_{OUT\ MAX}$
Zero load input current		75	100	mAdc	$I_{OUT\ MIN}$
Max off state input current		100		µAdc	$V_{IN\ MAX}$, Enable floating
Max inrush current < 10µs		10		Apk	$V_{IN\ MAX}$
Max inrush current			1.5	Apk	$V_{IN\ MAX}$
Reflected input ripple			0.5	Apk-pk	$I_{OUT\ MAX}$
Reverse polarity input voltage			90	Vdc	
Enable input ON threshold	30		70	Vdc	Enable is referenced to VIN -ve

Output characteristics	Min	Typ	Max	Units	Notes
Output current range	0		35.7	Adc	
Output voltage set point	13.86	14	14.14	Vdc	Factory set (Note 1) @ 50% load
Output voltage regulation	13.3	14	14.7	Vdc	From V_{OUT} set point, 0% to 100% load
Output ripple and noise			250	mV	20MHz BW, 100% load
Output voltage transient regulation		+/-8		%	From V_{OUT} set point, V_{IN} typ, 10-20A dynamic, 0.1A/µs
Output overshoot			3	%	
Current share accuracy		5	10	%	15%-100% load
Efficiency		93		%	50% load
		91		%	75% load
		90		%	100% load

Note 1: Please contact Turntide if a different set point between 12V-14V is required.

General Characteristics	Min	Typ	Max	Units	Notes
Isolation voltage			1500	Vdc	Input to output
			1500	Vdc	Input to baseplate
			1500	Vdc	Output to baseplate
Switching frequency		100		kHz	
Weight		900		g	

Environmental	Min	Typ	Max	Units	Notes
Storage temperature	-40		+85	˚C	
Operating temperature	-40		+85	˚C	
Humidity (condensing)	0		90	%RH	
Ingress Protection	IP66				Excluding connector
Vibration	6G rms, 0-1000Hz, 3 planes				
Shock	50G, 3 planes				
EMC Emissions	EN12895				
EMC Immunity	EN12895				
ESD	EN12895				± 4kV contact, ± 15kV air

Electrical Curves

Fig 1: Efficiency vs Output load

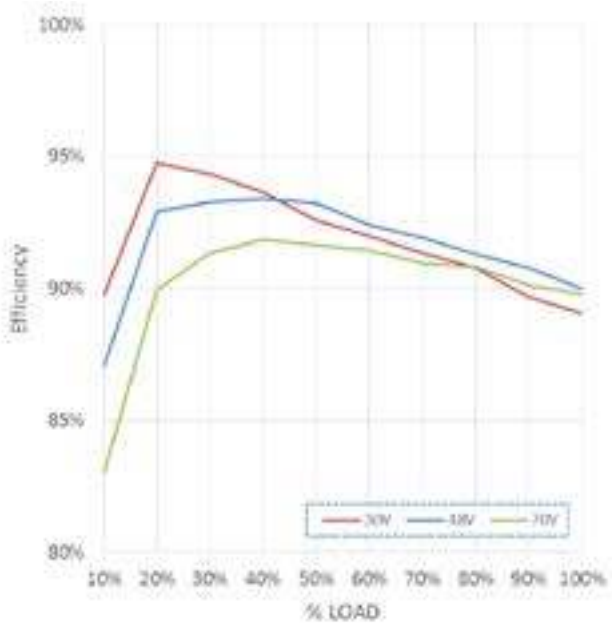


Fig 2: Vout vs Output load

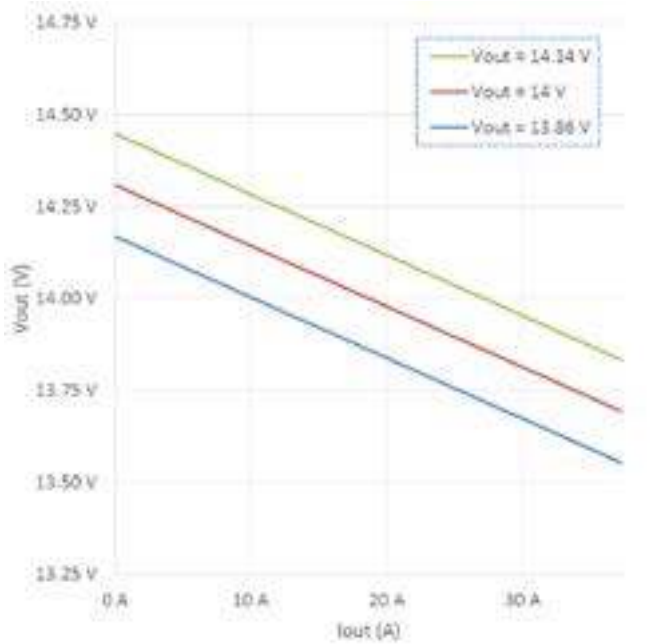


Fig 3: Start-up waveform

V_{IN} = 48V, $I_{OUT\ Max}$

CH1: V_{IN}, 10V/div 100ms/div

CH2: V_{OUT}, 2V/div 100ms/div

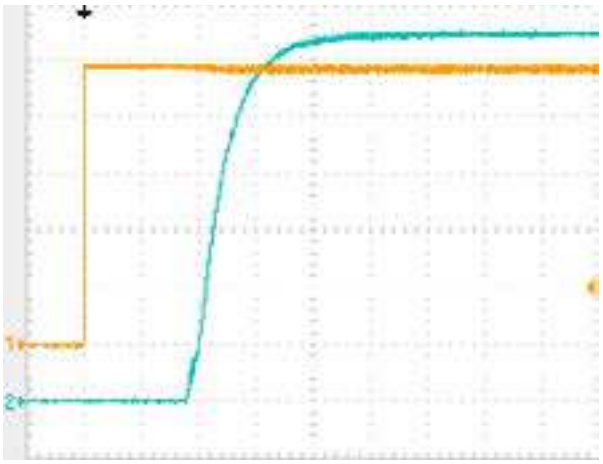


Fig 4: Inrush current

V_{IN} = 48V, $I_{OUT\ Max}$

CH1: I_{IN}, 100mA/div 10ms/div

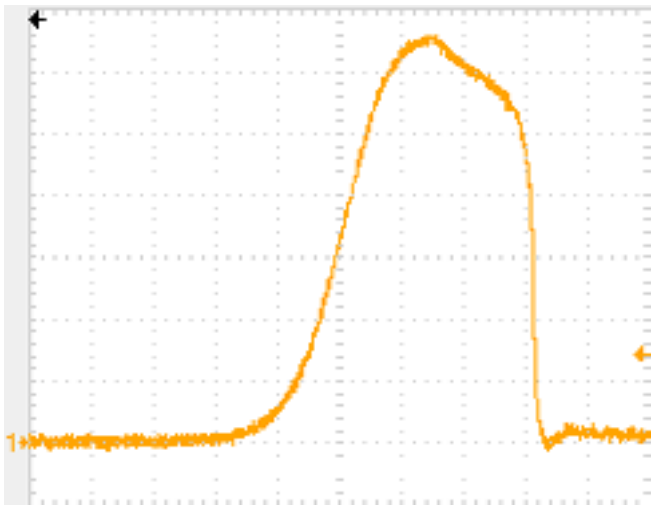


Fig 5: OVP and UVP Protection

V_{IN} = 0V-90V, I_{OUT} = 10A

CH1: V_{IN}, 20V/div 1s/div

CH2: V_{OUT}, 5V/div 1s/div

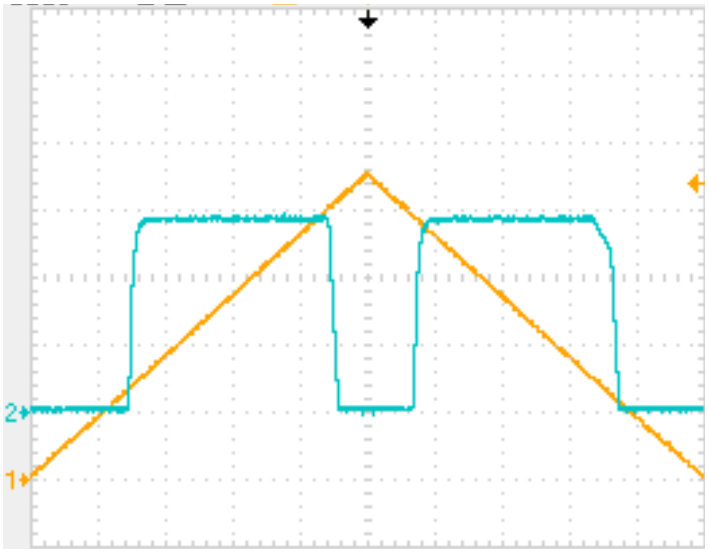


Fig 6: Control Loop Dynamic response

V_{IN} = 48V, I_{OUT} = 10-20A 0.1A/μs

CH1: I_{OUT}, 5A/div 250μs/div

CH2: V_{OUT}, 50mV/div 250μs/div

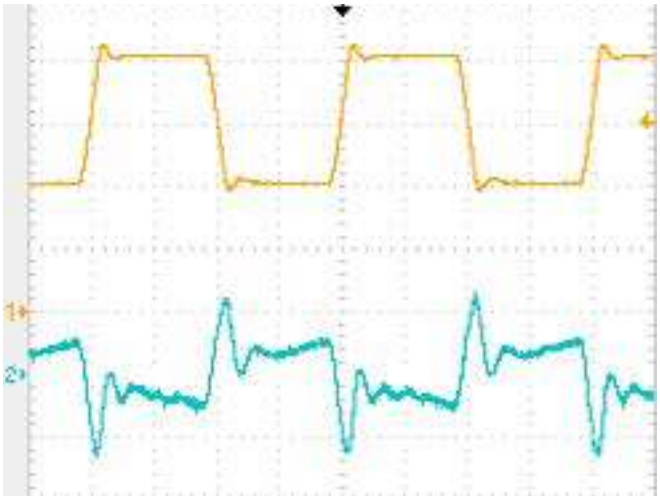


Fig 7: Output ripple and noise

V_{IN} = 48V, $I_{OUT\ MAX}$, 20MHz BW

CH1: V_{OUT}, 50mV/div 5μs/div

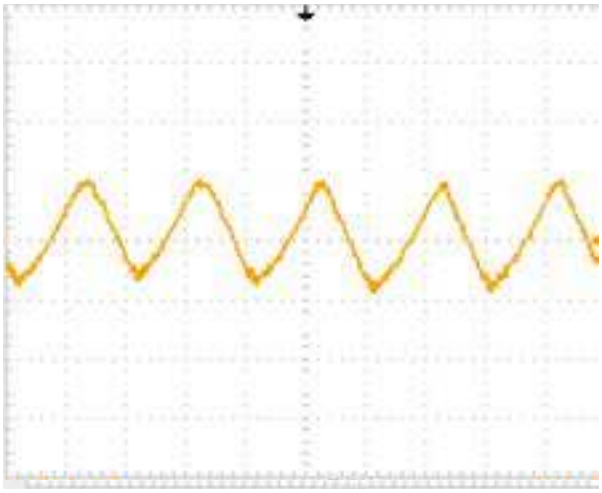
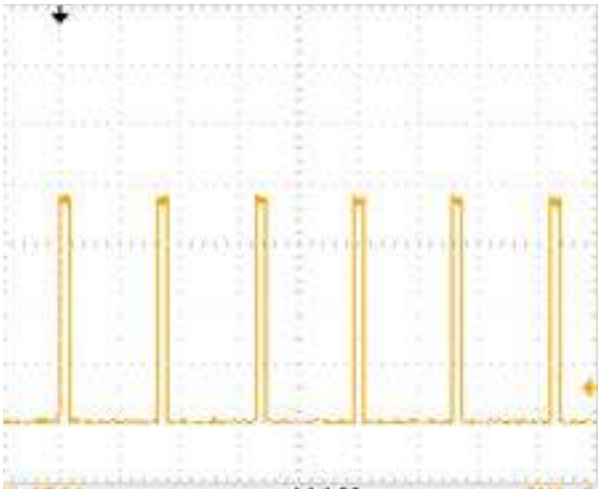


Fig 8: Output short circuit current

V_{IN} = 48V

CH1: I_{OUT}, 25A/div 1s/div



Application Information

Enable input

The DCDC converter output is enabled when the enable input is pulled higher than $V_{IN\ MIN}$. The enable circuitry should be referenced to the negative input terminal. Negative voltages down to -100Vdc can be applied to the enable input without any damage. If the enable function is not required then the enable input should be hard wired to V_{IN} +ve externally.

Output voltage set point

The output voltage set point is factory set to 14V. Please contact Turntide if a different set point between 12V-14V is required.

Parallel connection of multiple units

The DCDC converter includes an active droop circuit for paralleling of multiple units; therefore external sharing diodes are not required. When this function is required, care should be taken to wire the outputs of the units together using matched cable lengths.

Input under / over voltage lock out (UVLO / OVLO)

The DCDC converter incorporates protection circuitry to disable the output when the input voltage is outside its specified operating range; hysteresis is included to ensure clean start-up and shutdown.

Reverse input protection

In the event that the input is wired incorrectly the DCDC converter will self-protect.

Output short circuit protection

In the event that the output is shorted, the DCDC converter will protect itself from excessive stress. The converter will continue to try and power-up, however, if the short is still applied the output will shut down. Once the fault is removed the converter will power-up.

Thermal considerations

To protect the DCDC converter from excessive temperatures the baseplate should be connected to a suitable heatsink using the 4 fixing holes; thermal grease is recommended. If the converter is subjected to excessive temperatures, an over temperature protection circuit will operate. This protection circuit operates in two stages; stage 1 will reduce the output voltage to 50% of its initial set point, if the temperature keeps rising then stage 2 will shut down the output. The output will recover when the over temperature condition is removed.

Fusing

Input and output fusing is not provided. A suitable fuse should be installed in the end application.

Regulatory

UL583 YCFT2.AU3720

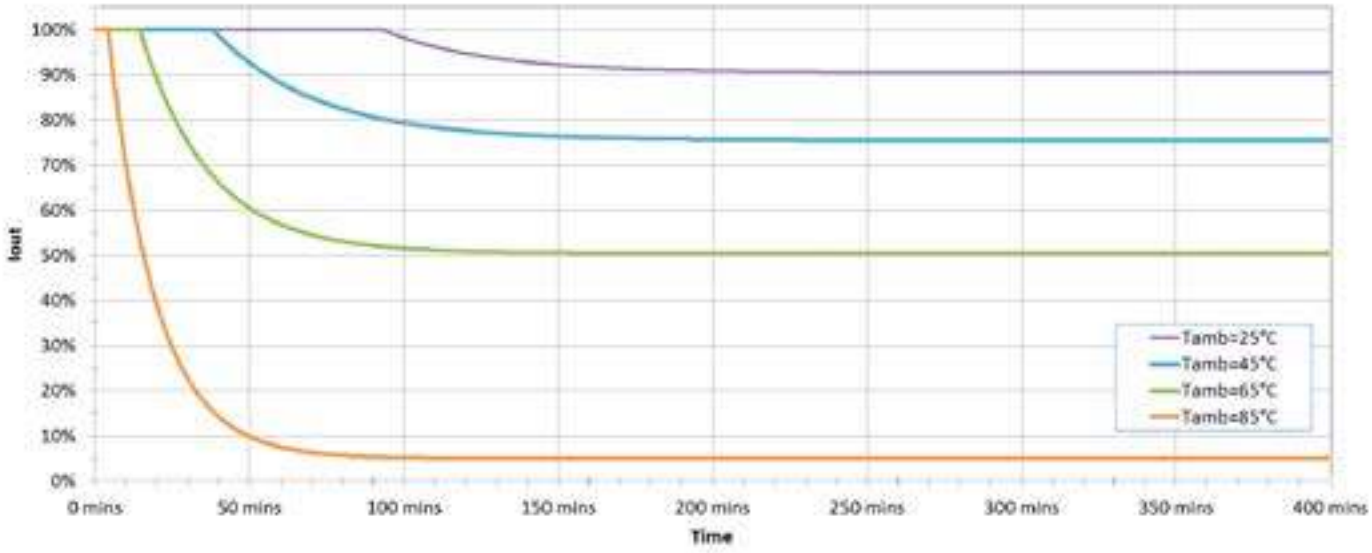
The CE mark applies only to the provisions of the low voltage directive. It is the responsibility of the installer to take any precautions necessary to ensure that the assembled equipment is EMC compliant.

Thermal de-rating

The DCDC converter should be tested in the end application to ensure suitable thermal performance. The following graphs should be used as a guide.

Fig 9: Thermal de-rating guideline

$R_{th\_hs\text{-}a} = 1.4°C/W$



Mechanical Drawing