30TB16FW_1.5 series

30W - Single Output - Wide Input - Isolated & Regulated
DC-DC Converter

DC-DC Converter 30 Watt

- Wide 2:1 input voltage range
- Short circuit protection (SCP)
- Isolation voltage: 1.5kVDC
- Input under-voltage lockout
- Over-current, over-voltage, over-temperature protection
- RoHS compliant (EU Directive 2011/65/EU)
- Operating temperature range: -40°C to +85°C
- Fixed switching frequency
- Remote on/off
- International standard pin-out
- Meets requirements for ETSI 300-132-2
- Adjustable output voltage
- Meets IEC60950-1

UL-60950-1 (E347551)

The 30B16FW_1.5 series are isolated 30W DC-DC converters with 2:1 input voltage. They feature efficiency up to 88%, 1500VDC isolation, operating temperature of -40°C to +85°C, input under-voltage protection, output over-voltage, output over-current, output short circuit protection and meets IEC60950-1.

They are widely applied in Distributed Power Architectures, Wireless Networks, access and optical Network Equipment, Enterprise Networks, latest generation IC's (DSP, FPGA, ASIC) and microprocessor powered applications

Common specifications

Short circuit protection:	Hiccup, self-recovery
Cooling:	Free air convection
Operation temperature range:	-40°C~+85°C
Storage temperature range:	-55°C~+125°C
Storage humidity range:	90% MAX
Thermal stability time:	30mins
FIT:	500; 10^9/MTBF
Vibration:	IEC60068-2-6: 10~500Hz sweep, 0.75mm excursion, 10g acceleration, 10minutes in each 3 perpendicular directions
Shock:	IEC 60068-2-27:200g acceleration, duration 3ms, 6 drops in each 3 perpendicular directions
Safety:	Compliant to IEC60950-1, UL60950-1, EN60950-1 and GB4943
Switching frequency:	250KHz MIN; 300KHz TYP; 350KHz MAX
Transportation:	ETS300019-1-2
MTBF (Telcordia SR332, 2011, 40°C):	2,000,000 hours
Weight:	14g

Protection specifications

Item	Test condition	Min	Typ	Max	Units
Input under voltage lockout	• Turn-on • Turn-off	32 30	34 32	36 34	V V
Short circuit protection	Hiccup mode Automatic recovery		4		Hour
Over current protection	Hiccup mode, automatic recovery		yes		
Over voltage protection	Under the converter's maximum allowable output power. Hiccup mode	3.7		4.6	V
Over temperature protection	Automatic recovery See OTP section	100	110	120	°C
Over Temperature Protection Hysteresis	Automatic recovery See OTP section		10	20	°C

Example:
30TB16FW_4803S1.5
30 = 30Watt; T = SMT; B16 = sixteenth-brick; F = Open Frame; W = wide input (2:1); 36-75Vin; 3.3Vout; S = single output; 1.5 = 1500VDC isolation

Output specifications

Item	Test condition	Min	Typ	Max	Units
Voltage set point 25°C, Io=Io (max)		3.267	3.3	3.333	V
Output current				10	A
Line regulation	Vin(min) to Vin(max) Io= Io(max), Vo=Vo(nom)			0.2	%Vo
Load regulation	Vin=Vin(nom) Io=0 to Io (max)			0.5	%Vo
Voltage precision	Vin(min) to Vin(max) Io=0 to Io(max)			1	%Vo
Output current limit inception		11		17	A
Remote sense	Vsense = Vout - Vload, sense connected at load			10	%Vo
External load capacitance	Full resistive load, low ESR	0		2200	µF
Temperature coefficient	Ambient temperature -40°C to 85°C			200	ppm/°C
Dynamic response*			200 ±5		µs %Vo
Ripple and noise	Measured with 1uF ceramic and 10uF Tantalum external capacitor		50		mVp-p
Turn-on delay time	Delay from instant at which Vin=Vin(min) until Vo=0% of Vo(nom)			10	ms
Turn-on rise time	Time for Vo to rise from 10% of Vo(nom) to 90% of Vo(nom)			10	ms
Turn-on transient: Output voltage overshoot	Time for Vo to rise from 10% of Vo(nom) to 90% of Vo(nom)			10	%Vo

* 25%-50%-25%,50%-75%-50%load step,di/dt=2.5A/µS. with 470uF aluminum electrolytic capacitor

Remote control specifications

Item	Test condition	Min	Typ	Max	Units
Logic low voltage		0		1.5	V
Logic high voltage		3.5		25	V

30TB16FW_1.5 series

30W - Single Output - Wide Input - Isolated & Regulated
DC-DC Converter

Input specifications

Item	Test condition	Min	Typ	Max	Units
Input voltage	• Continuous • Transient (100ms)			80 100	V V
Operating input voltage		36	48	75	V
Max. input current	100% load Vin= Vin (min) to Vin (max)			1.2	A
Input current	no load, full input		50		mA
Reflected ripple current*	peak-to-peak		30		mA
Inrush transient	Vin=48V		0.01		A^2S
Input fuse	Fast blow			3	A

* 5Hz to 20 MHz,12µH source inductance, 47µF aluminum electrolytic capacitor

Isolation specifications

Item	Test condition	Min	Typ	Max	Units
Isolation voltage*	Input/output		1500		VDC
Isolation resistance**	Test at 500VDC	10			MΩ
Isolation capacitance			2200		pF

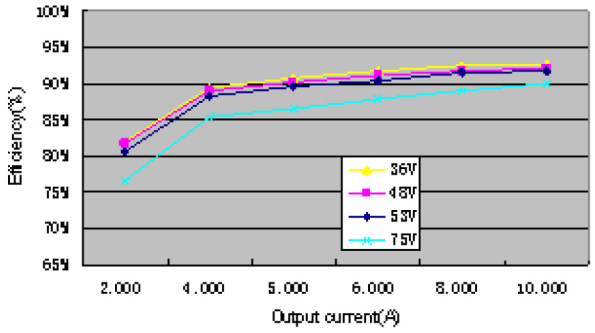
* Test duration 1 minute, leak current lower than 10mA
** The isolation resistance of input to output is no less than 10MΩ

Product Selection Guide

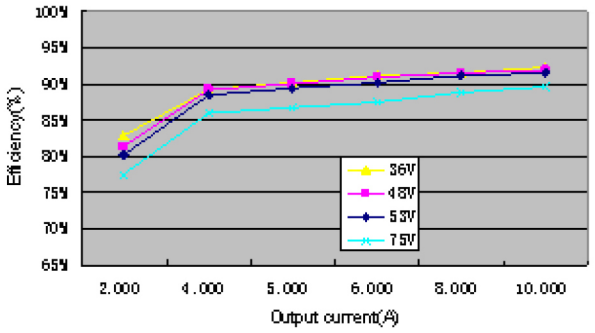
Part Number	Input Voltage [VDC] Nominal	Range	Max	Output Voltage [VDC]	Output Current [A, max]	Efficiency [%, Min./Typ.]	Capacitive load [µF, Max.]
30TB16FW_4803S1.5	5	36-75	80	3.3	10	90/91.5	10000

Typical characteristics

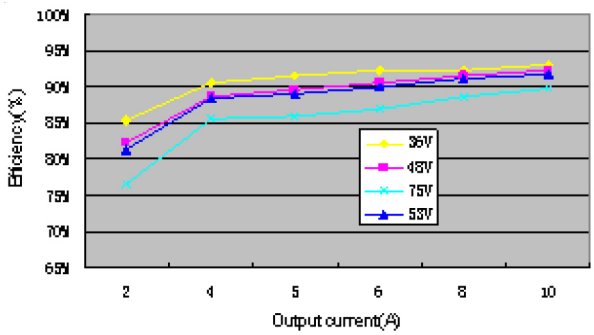
Efficiency
Converter Efficiency Vs. Output Current @25°C



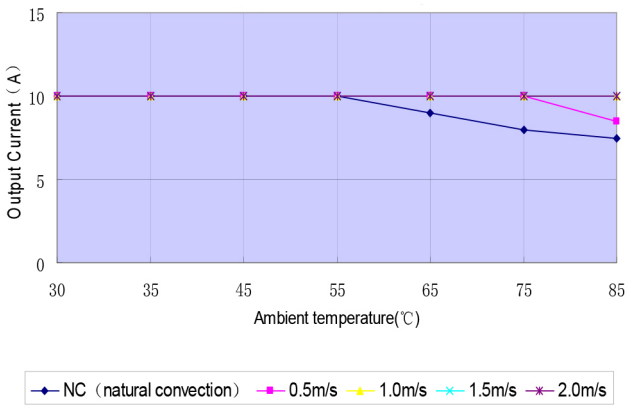
Efficiency
Converter Efficiency Vs. Output Current @high temp.



Efficiency
Converter Efficiency Vs. Output Current @low temp.

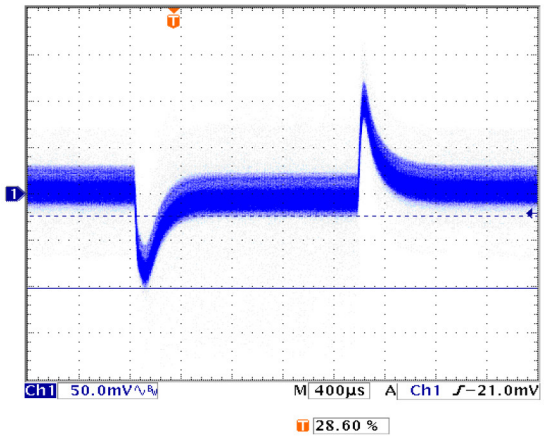


Derating
Available load current vs. ambient temperature and airflow for the module mounted horizontally

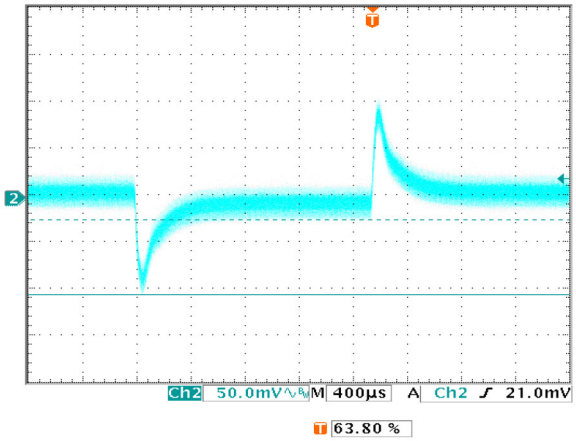


Typical characteristics

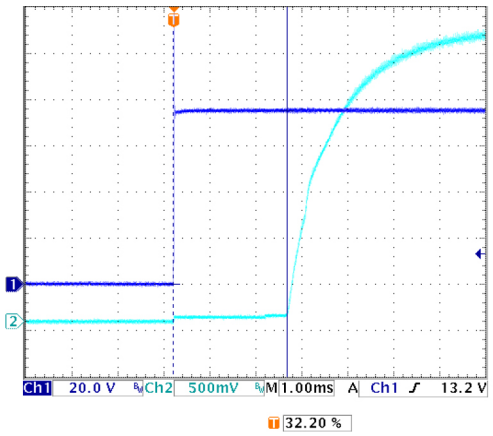
Dynamic response
Vin=48V/Vo=3.3V,25%~50%load,2.5A/μS
(add 470uF aluminum electrolytic capacitor)



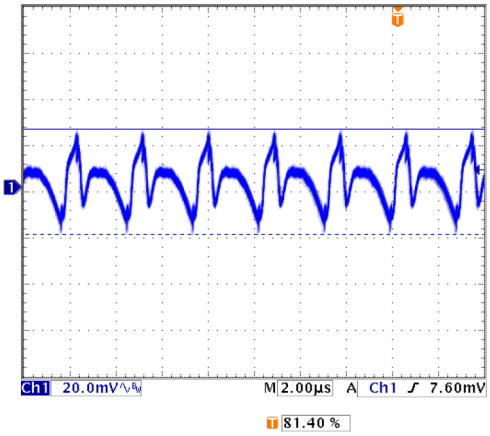
Dynamic response
Vin=48V/Vo=3.3V,50%~75%load,2.5A/μS
(add 470uF aluminum electrolytic capacitor)



Start-up
Vin=48V/Io=10A@25°C

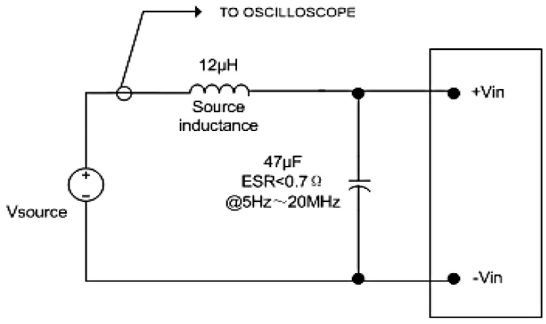


Output ripple & noise
Output voltage ripple (20MHz bandwidth, Vin=48V/Io=20A@25°C)



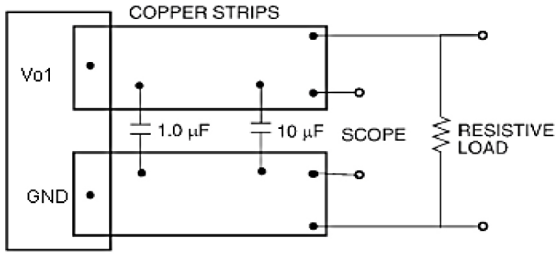
Test configurations

Input Reflected Ripple Current Test Setup



Measure input reflected ripple current with a simulated source inductance of 12μH. The measurement points for input reflected ripple current is showed above.

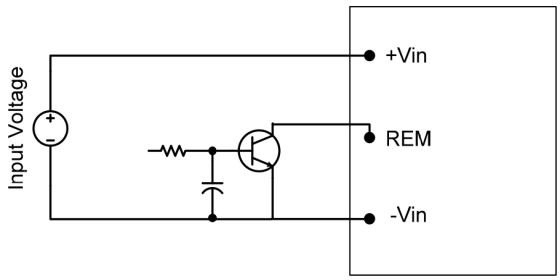
Peak to peak Output Ripple Test Setup



Scope measurements should be made using a BNC socket with a 1μF ceramic capacitor and a 10μF tantalum capacitor. Position the oscillograph probe between 51mm and 76mm(2in and 3in) from the module

Remote on/off

Remote On/Off application circuit



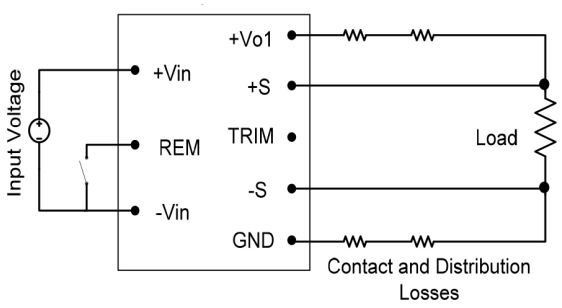
The REM pin is used to turn the power converter remote on or off via a system signal. This power module is negative logic, which turns the module on when the REM pin is at logic low and off when it is at logic high. We also provide positive logic remote On/Off which turns the module on during logic high and off during logic low.

To turn the power module on and off, the user must supply a switch to control the voltage between the REM pin and -Vin terminal (see Figure11). A logic low is V_{REM} = 0 V to 1.5 V. During logic high, the typical maximum V_{REM} voltage is 25V.

If not using the remote on/off feature, perform one of the following to turn the converter on:
For negative logic, short REM pin to -Vin.
For positive logic, leave REM pin open.

Remote sense

Circuit configuration for remote sense



Remote sense minimizes the effects of distribution losses by regulating the voltage at the remote sense connections.

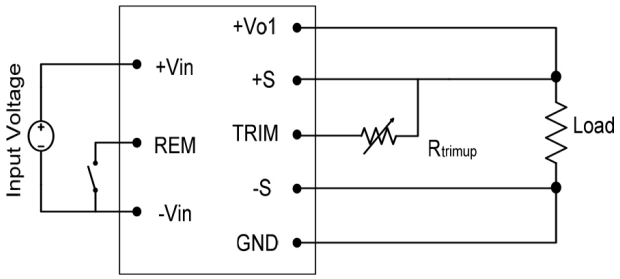
The voltage between the remote sense pins and the output terminals must not exceed the output voltage sense range (<10%Vo). The voltage between the Vo1 and GND terminals must not exceed the minimum output over-voltage protection value shown in the Feature Specifications table.

This limit includes any increase in voltage due to remote sense compensation and output voltage set-point adjustment (trim).

If not using the remote sense feature to regulate the output at the point of load, then connect +SENSE to Vo1 and -SENSE to GND.

Output voltage set point adjustment

Circuit configuration to increase output voltage



Output voltage trim allows the user to increase or decrease the output voltage set point of a module. This is accomplished by connecting an external resistor between the TRIM pin and either the +SENSE or -SENSE pins. The trim resistor should be positioned close to the module. If not using the trim feature, leave the TRIM pin open.

To increase the output voltage, refer to figure on the left. A trim resistor, Rtrimup, should be connected between the TRIM and +SENSE, with a value of:

$$R_{Trimup} = \left(\frac{Vout * 5.11 * (100 + \Delta)}{1.225 * \Delta} - \frac{511}{\Delta} - 10.22\right) K\Omega$$

Where,

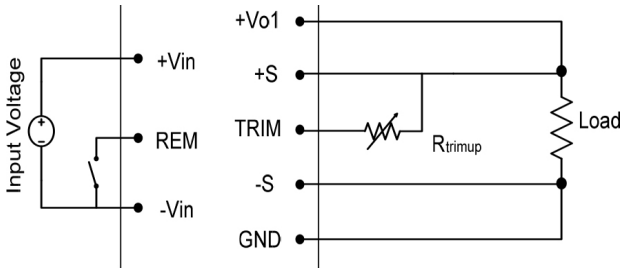
R_{trimup} = Required value of trim-up resistor [kΩ]

$$\Delta = \left| \frac{V_{trimup} - V_{nom}}{V_{nom}} \times 100 \right|$$

V_{nom} = Nominal value of output voltage [V]

Output voltage programming

Circuit configuration to decrease output voltage



Trimming beyond 110% of the rated output voltage is not an acceptable design practice, as this condition could cause unwanted triggering of the output overvoltage protection (OVP) circuit. When trimming up, care must be taken not to exceed the converter's maximum allowable output power.

To decrease the output voltage (see figure on the left), a trim resistor, R, should be connected between the TRIM and -S, with a value of:

$$R_{trimdown} = (\frac{511}{\Delta} - 10.22)K\Omega$$

Where,

$R_{trimdown}$ = Required value of trim-down resistor [kΩ]

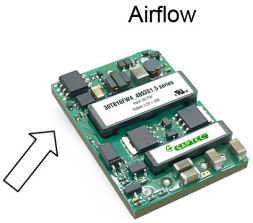
$$\Delta = \left| \frac{V_{trimdown} - V_{nom}}{V_{nom}} \times 100 \right|$$

V_{nom} = Nominal value of output voltage [V]

$V_{trimdown}$ = Desired (trimmed) output voltage [V]

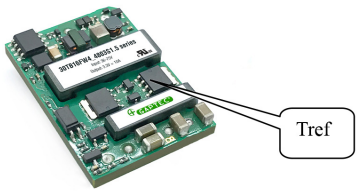
Heat transfer via convection

Recommended airflow direction

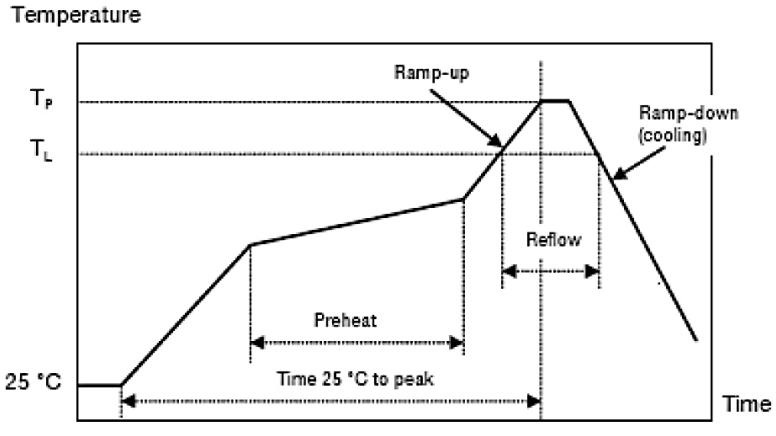


Over temperature protection

Tref Temperature Measurement Location



Recommended reflow profile

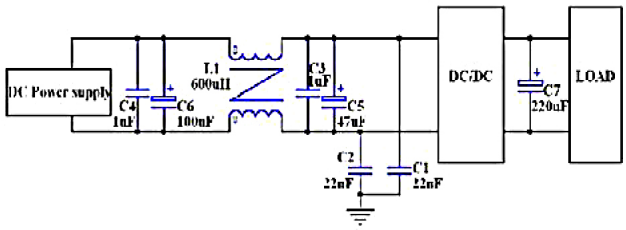


Reflow process specifications		Pb-free
Average ramp-up rate		3°C/s max
Solder melting temperature (lim)	T_L	+217°C
Time above T_L		30 s~90s
Minimum pin temperature	T_{pin}	+235°C
Peak product temperature	T_p	+245°C
Average ramp-down rate		6°C/s max
Time 25°C to peak		6 minutes max

Lead-free (Pb-free) solder processes
For Pb-free solder processes, a pin temperature (TPIN) in excess of the solder melting temperature (TL, +217°C to +221°C for Sn/Ag/Cu solder alloys) for more than 30 seconds, and a peak temperature of +235°C on all solder joints is recommended to ensure a reliable solder joint.

For Pb-free solder processes, the product is qualified for MSL 3 according to IPC/JEDEC standard J-STD-020C. During reflow, TP must not exceed +245°C at any time.

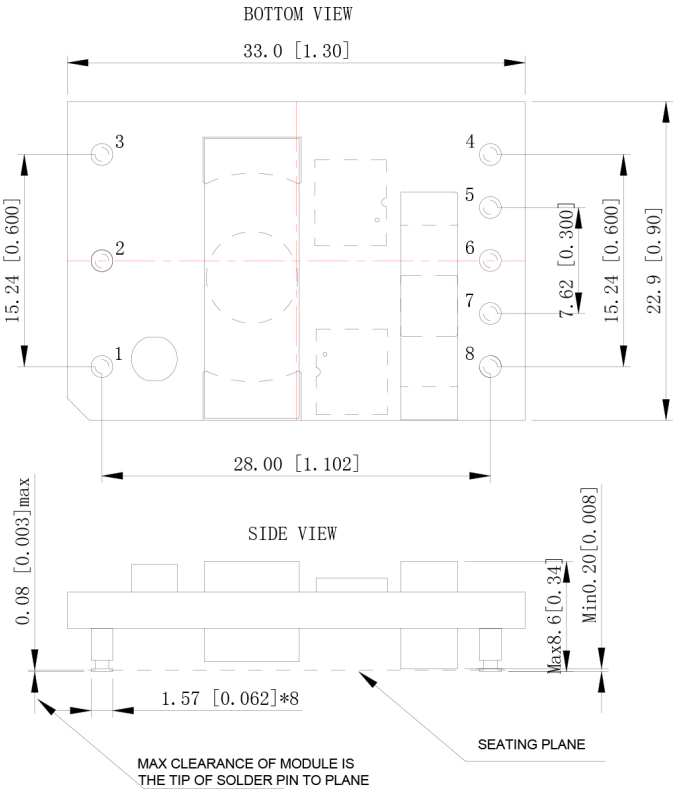
Recommended EMC application



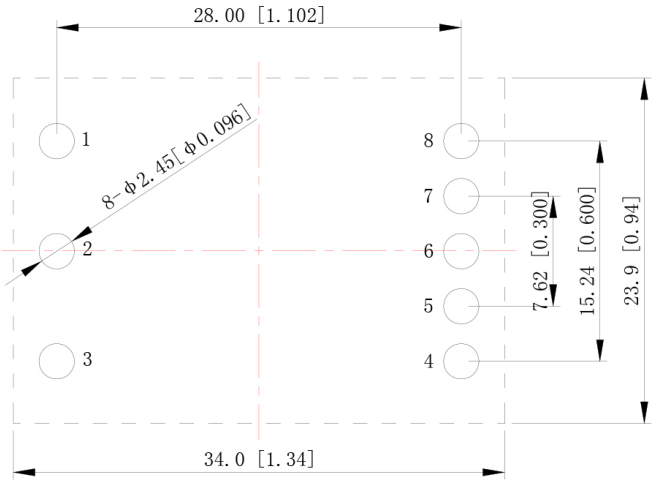
Suggested configuration to meet the conducted emission limits of EN55022 Class A.

Mechanical dimensions

Surface mounting



Recommended pad layout



Note:
Dimensions are in millimeters and (inches).

Tolerances:
x.x mm ± 0.5 mm (x.xx in. ± 0.02 in.) [unless otherwise indicated]
x.xx mm ± 0.25 mm (x.xxx in. ± 0.010 in)

Pin designations

Pin No.	Symbol	Function
1	+Vin	Positive input voltage
2	REM	Remote control
3	-Vin	Negative input voltage
4	GND	Negative output voltage
5	-SENSE	Negative output voltage remote compensate
6	TRIM	Adjustable output voltage
7	+SENSE	Positive output voltage remote compensate
8	Vo1	Positive output voltage