



Figure 1.1. PCB Mount without Heat Sink



Figure 1.2. PCB Mount with Heat Sink



Figure 1.3. Terminal Block Mount without Heat Sink



Figure 1.4. Terminal Block with Heat Sink



Figure 1.5. Terminal Block DIN-Rail without Heat Sink

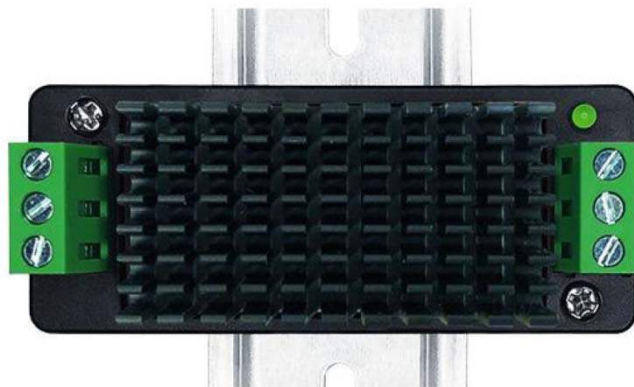


Figure 1.6. Terminal Block DIN-Rail with Heat Sink



FEATURES

- Wide Input Range: 18V ~ 36V
Output Voltage: 5V
Max. Output Current: 10A
High Efficiency: 90% @VIN = 18V & IOUT = 10A
Switching Frequency: 350kHz
Isolation Voltage: 1500VDC
Low Standby Power Consumption <= 0.3W
Output Start time <= 20ms
Fully Protected: OCP, SCP, OVLO & UVLO
Full Aluminum Housing for Complete Shielding
Operating Temperature Range: -40C ~ +85C

APPLICATIONS

This power module, ATDC24V5V10APH, is designed for achieving DC-DC conversion from an unregulated voltage, 18V to 36V, to a regulated 5V up to 10A output current as a power supply source. It is widely used in industrial applications where high voltage isolation is needed. As shown in Figure 1's, it comes with a variety of packaging for different mounting and power consumption.

DESCRIPTION AND SPECIFICATIONS

This power module can work under a wide operating temperature range of -40C to 85C, with built-in OCP(Over Current Protection), SCP(Short Current Protection), OVLO(Over Voltage Lock-out) and UVLO(Under Voltage Lock-out). The MTBF(Mean Time Between Failure) is 2x10^5 Hours, that's equivalent to 23 years continues usage. It has 3 different mounting packages: PCB, terminal block, and DIN-Rail, with or without heat sinks. The heat sink is needed for >6A output current applications, and can do without the heat sink if IOUT is <6A.

Table 1. Pin Names AND Functions.

Table with 4 columns: No., Name, Type, Description. Rows include SDN (Digital Input), VIN- (Power Input), VIN+ (Power Input), VOUT+ (Power Output), VOUT- (Power Output), and Trim (Analog Input).

Table 2. Specifications

Table with 7 columns: Parameter, Symbol, Test Conditions, Min., Typ., Max., Unit/Note. Rows include Input Voltage, Input Current (Full Load/No Load), and Surge Voltage (1sec. max.).



Under Voltage Lockout	UVLO			16		V
Shutdown	V <sub>SDNH</sub>	ON	3.5		12	V
	V <sub>SDNL</sub>	OFF	0		1.2	V
	I <sub>SDN</sub>			150		mA
Start-up time	t <sub>s</sub>			20		ms
Filter			Pi Filter			

**OUTPUT**

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit/Note
Output Voltage	V <sub>OUT</sub>			5		V
Output Current	I <sub>OUT</sub>				10	A
Output Voltage Accuracy					±2	%
Line Regulation	ΔV <sub>OUT</sub> /ΔV <sub>VPS</sub>				±1	%
Load Regulation	ΔV <sub>OUT</sub> /ΔI <sub>OUT</sub>	Load change from 10% to 100%			±2	%
Ripple & Noise					100	mV <sub>p-p</sub>
Output Over Voltage Lockout	OVLO		1.1V <sub>OUT</sub>		2V <sub>OUT</sub>	
Output Over Current Protection			1.1I <sub>OUT</sub>	1.5I <sub>OUT</sub>	2I <sub>OUT</sub>	
Capacitive Load					8000	μF
Efficiency	η			90		%
Output Voltage Drift	ΔV <sub>OUT</sub> /Δt		≤±8%/500us			

**GENERAL CHARACTERISTIC**

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit/Note
Isolation Voltage	V <sub>IS</sub>			1500		VDC
Isolation Capacitance				2000		pF
Isolation Resistance			100			MΩ
Switching Frequency	f <sub>SW</sub>			350		kHz
Operating Temperature Range	T <sub>opr</sub>		-40		85	°C
Storage Temperature Range	T <sub>stg</sub>		-55		125	°C
Maximum Case Temperature	T <sub>CS</sub>	T <sub>A</sub> = 25°C			105	°C
Storage Relative Humidity Range	RH		5		95	%
Mean Time Between Failure	MTBF	MIL-HDBK-217F@25°C		2×10 <sup>5</sup>		Hrs



Case Material			Aluminum	
Weight			28	g
			0.062	lbs
			0.988	Oz

**EMC CHARACTERISTIC**

EMI	Conducted Emissions	CISPR32/EN55032 CLASS B (see Fig.2 for recommended circuit)	
	Radiated Emissions	CISPR32/EN55032 CLASS B (see Fig.2 for recommended circuit)	
EMS	ESD	IEC/EN61000-4-2 Contact $\pm 4$ KV	perf.Criteria B
	Radiated Immunity	IEC/EN61000-4-3 10V/m	perf.Criteria A
	EFT/Burst	IEC/EN61000-4-4 $\pm 2$ KV(see Fig.2 for recommended circuit)	perf.Criteria B
	Surge	IEC/EN61000-4-5 $\pm 2$ KV	perf.Criteria B(see Fig.2 for recommended circuit)
	Conducted Immunity	IEC/EN61000-4-6 3Vr.m.s	perf.Criteria A

**TYPICAL PERFORMANCE CHARACTERISTICS**

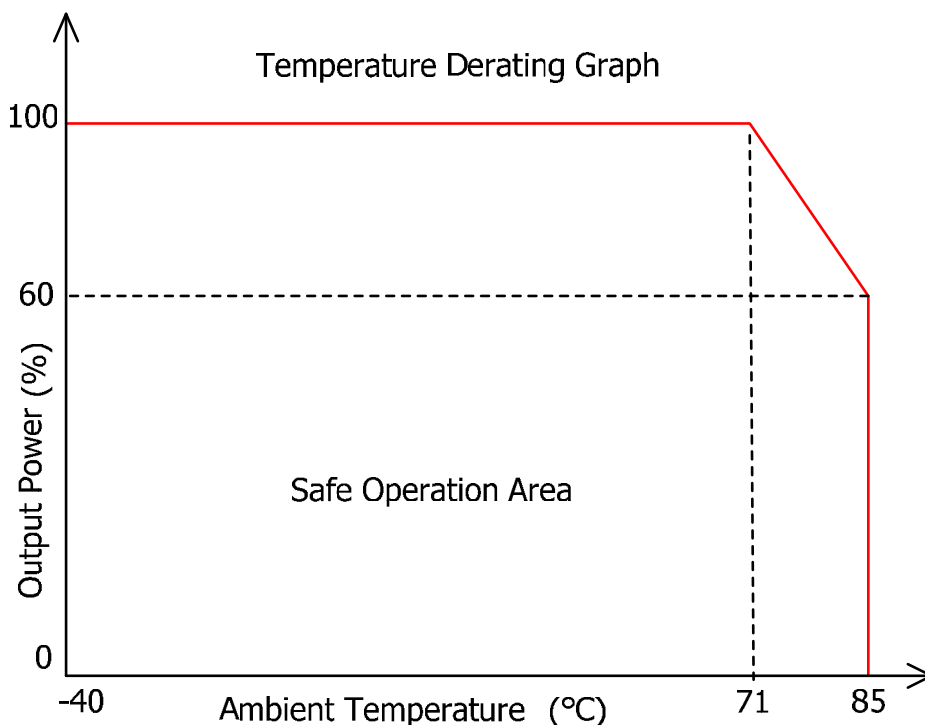


Figure 2. Derating Curve



## TRIM APPLICATIONS CIRCUITS

The output voltage can be trimmed in 3 ways: up, down and both.

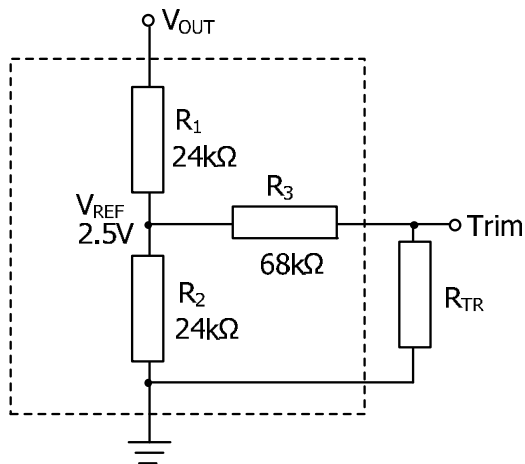


Figure 3. Trimming Up Output Voltage

$$V_{REF} = \frac{R_2 // (R_3 + R_{TR})}{R_1 + R_2 // (R_3 + R_{TR})} \times V_{OUT}$$

$$V_{OUT} = \left[ 1 + \frac{R_1}{R_2 // (R_3 + R_{TR})} \right] \times V_{REF}$$

$$V_{OUT} = 5 + \frac{60}{R_{TR} + 68}$$

$$R_{TR} = \frac{110}{V_{OUT} - 5} - 68$$

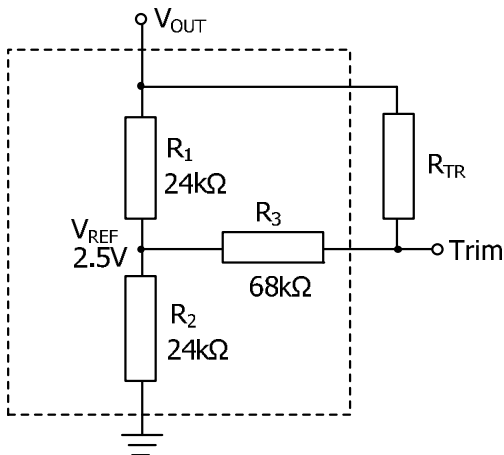


Figure 4. Trimming Down Output Voltage

$$V_{REF} = \frac{R_1 // (R_3 + R_{TR})}{R_2 + R_1 // (R_3 + R_{TR})} \times V_{OUT}$$

$$V_{OUT} = \left[ 1 + \frac{R_2}{R_1 // (R_3 + R_{TR})} \right] \times V_{REF}$$

$$V_{OUT} = 5 + \frac{60}{R_{TR} + 68}$$

$$R_{TR} = \frac{110}{V_{OUT} - 5} - 68$$

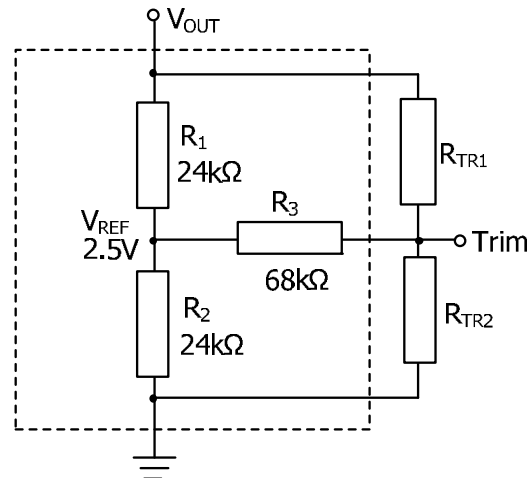


Figure 5. Trimming Up and Down Output Voltage

$$V_{REF} = \frac{R_2 // (R_3 + R_{TR1} // R_{TR2})}{R_1 + R_2 // (R_3 + R_{TR1} // R_{TR2})} \times V_{OUT}$$

$$+ \frac{R_{TR2} // (R_3 + R_1 // R_2)}{R_{TR1} + R_{TR2} // (R_3 + R_1 // R_2)} \times V_{OUT}$$

$$V_{OUT} =$$

$$\frac{14985R_{TR1}R_{TR2} + 2000R_{TR2}^2 + 25600R_{TR1}}{5492R_{TR1}R_{TR2} + 69R_{TR1}R_{TR2}^2 + 5460R_{TR2}^2 + 2176R_{TR1} + 2176R_{TR2}}$$



### TYPICAL APPLICATIONS

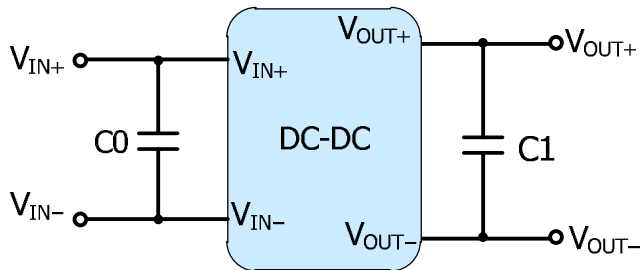


Figure 6. DC-DC Test Circuit

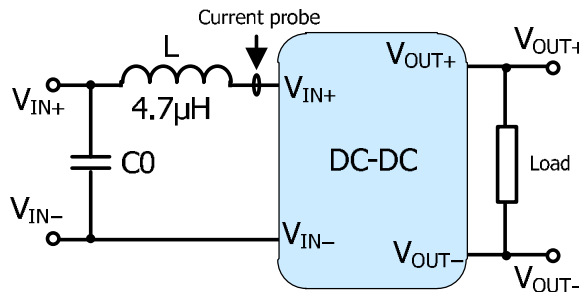


Figure 7. Input ripple Test Current Circuit

Recommended Values:

C0: 47µF ~ 100µF, C1: 10µF ~ 22µF

Select a low ESR capacitor and ensure that the voltage tolerance value is greater than the maximum input voltage.

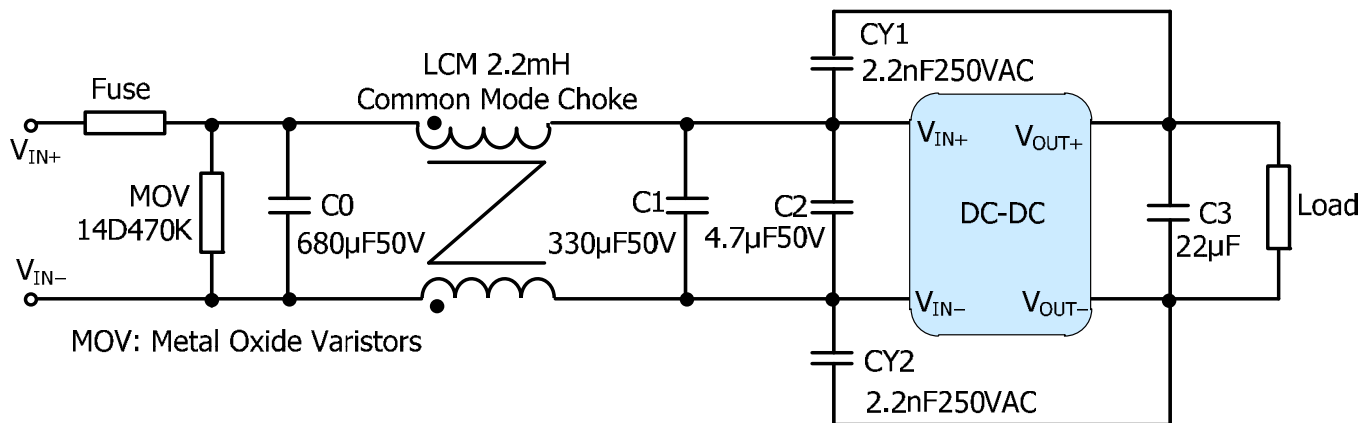
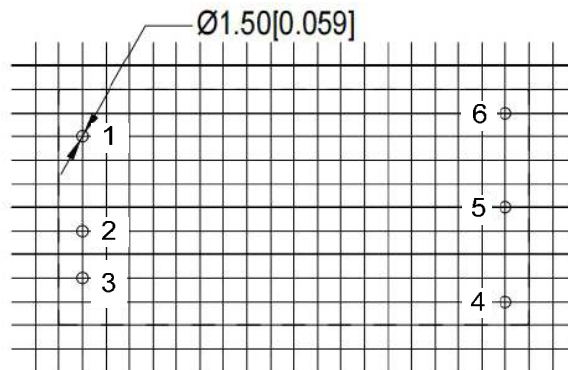
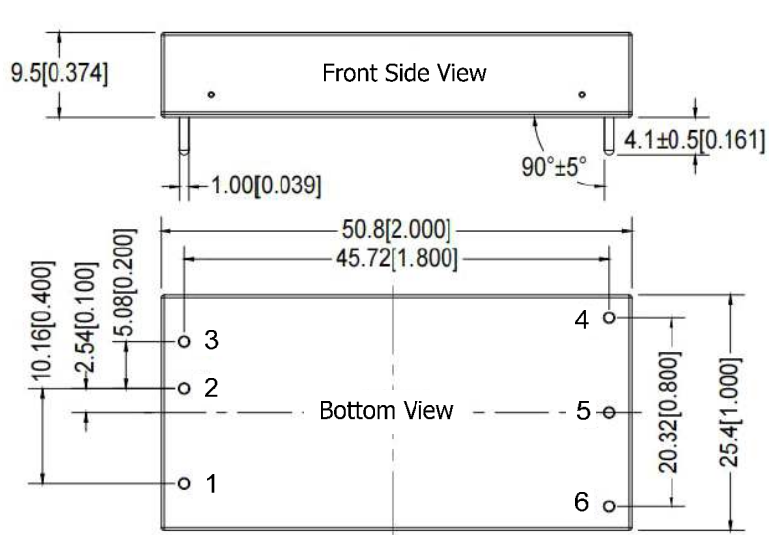


Figure 8. EMC Recommended Circuit



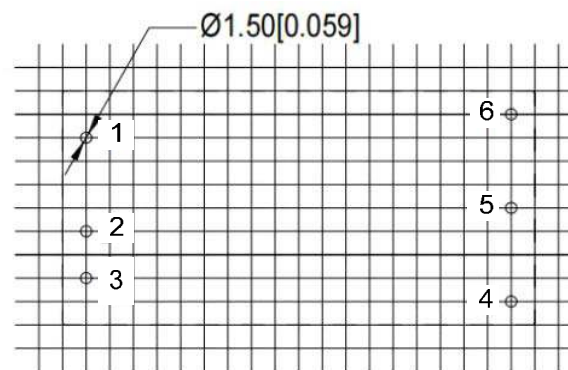
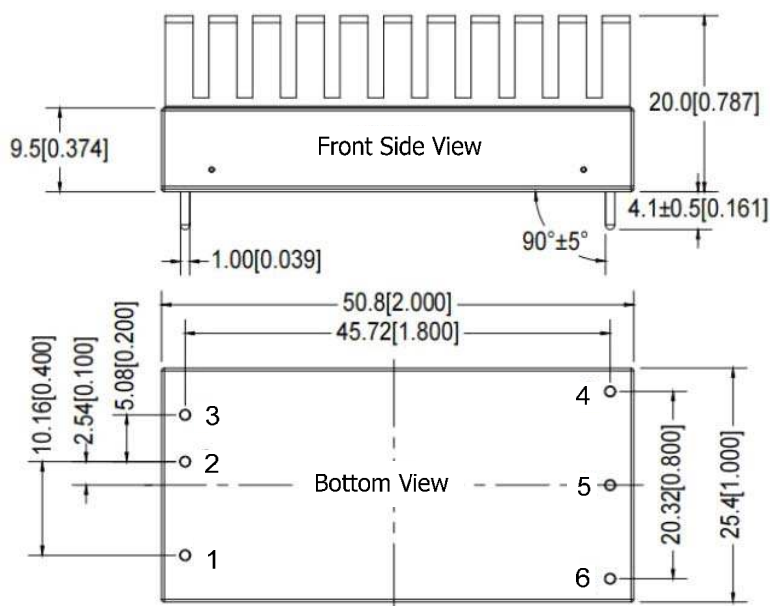
### OUTLINE DIMENSIONS

#### PCB Mount without Heat Sink(P)



NOTE:  
 Unit: mm[inch]  
 Grid: 2.54mm×2.54mm  
 Diameter Tolerance of Terminal Block: ±0.10[±0.004]  
 Unmarked Tolerance: ±0.50[±0.020]

#### PCB Mount with Heat Sink (PH)

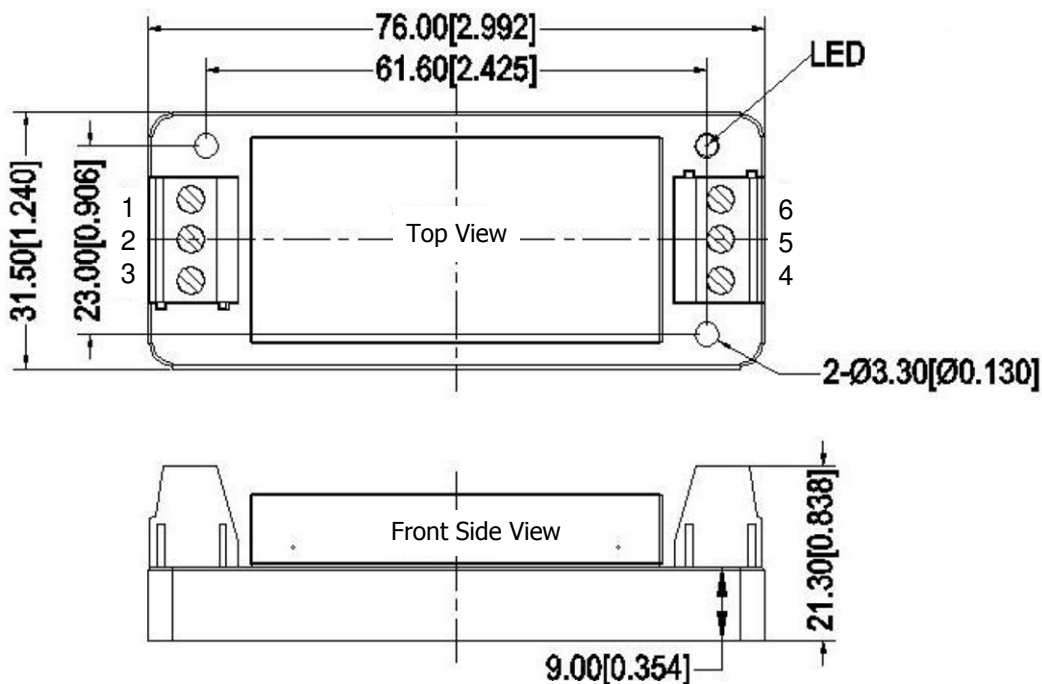


NOTE:  
 Unit: mm[inch]  
 Grid: 2.54mm×2.54mm  
 Diameter Tolerance of Terminal Block: ±0.10[±0.004]  
 Unmarked Tolerance: ±0.50[±0.020]

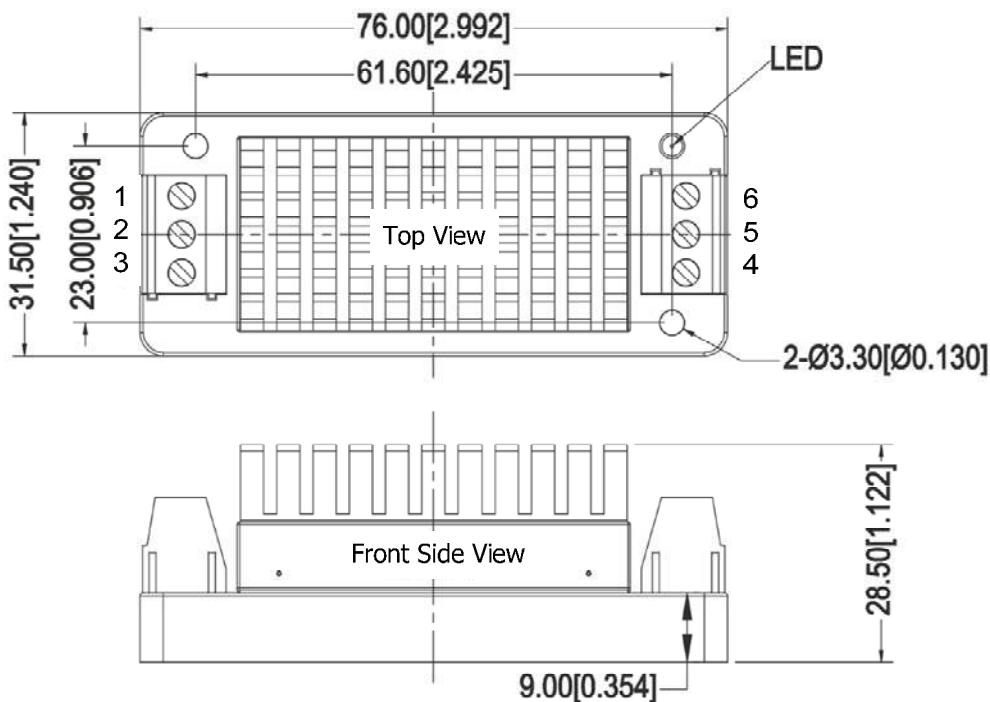




Terminal Block Mount without Heat Sink(T)



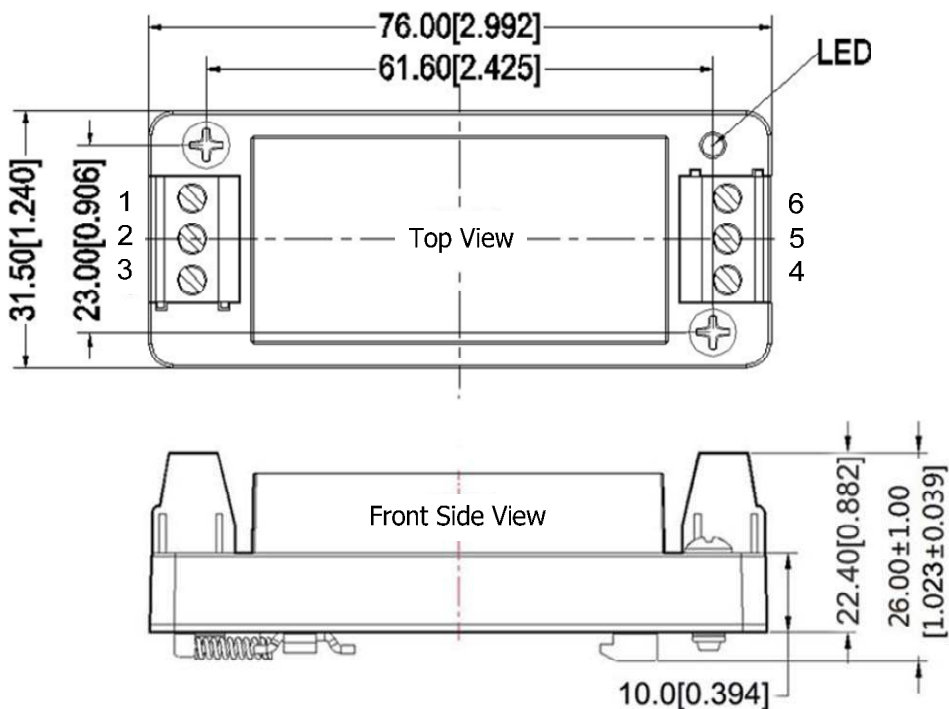
Terminal Block Mount with Heat Sink (TH)



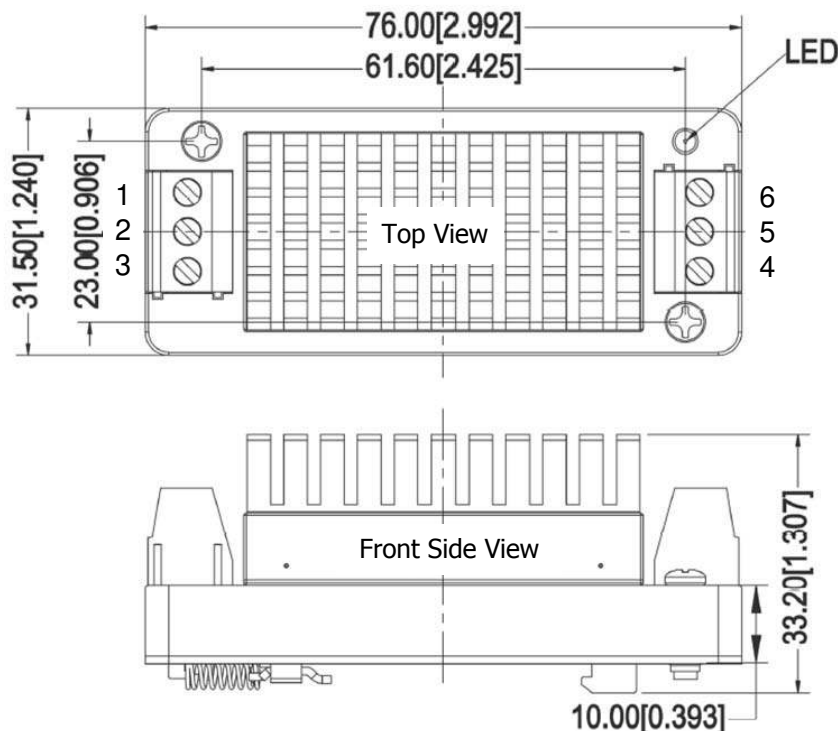




Terminal Block DIN Rail without Heat Sink(TD)



Terminal Block DIN Rail with Heat Sink (TDH)





**ORDERING INFORMATION**

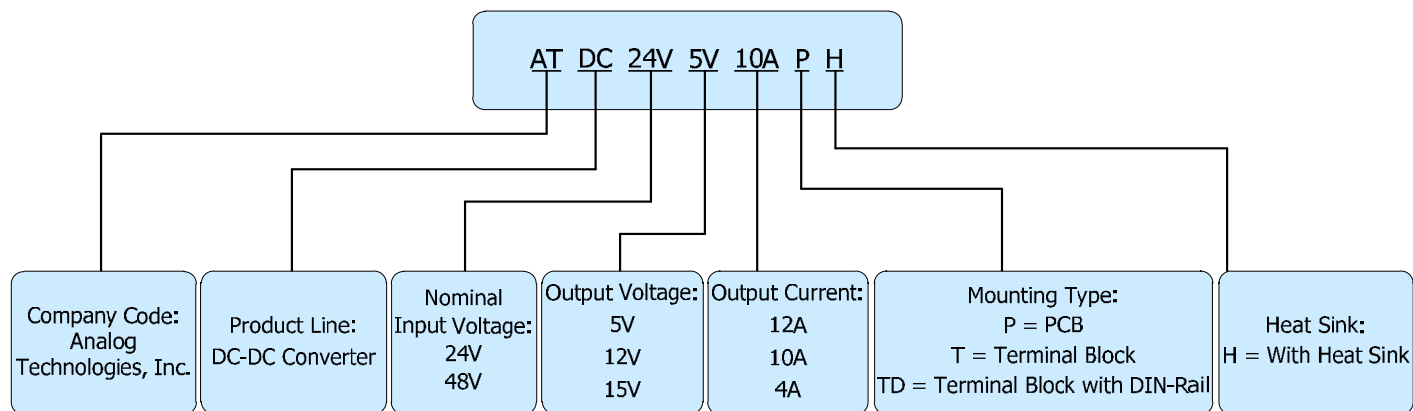


Figure 9. Naming Principle of ATDC24V5V10APH

**Table 4. ATDC24V5V10AXXX and Its Families.**

Product Model	Input Voltage		Output Voltage	Output Current	Input Current (mA)		MAX. Capacitive Load	Ripple & Noise 20MHz(Max)	Efficiency (%)	
	Typ.	Range	V	A	Full Load	No Load	μF	mV <sub>p-p</sub>	Min.	Typ.
ATDC24V3V312AXXX*	24	18~36	3.3	12	1885	50	10000	100	84	87
ATDC24V5V10AXXX*			5	10	2315	50	8000	100	87	90
ATDC24V12V4AXXX*			12	4.16	2350	2	2000	100	86	89
ATDC24V15V3R3AXXX*			15	3.33	2315	2	1000	100	87	90
ATDC24V24V2AXXX*			24	2.08	2315	2	500	100	87	90
ATDC48V3V310AXXX*	48	36~75	3.3	10	790	50	10000	100	84	87
ATDC48V5V10AXXX*			5	10	1158	50	8000	100	85	87
ATDC48V12V4AXXX*			12	4.16	1158	2	2000	100	87	89
ATDC48V15V3R3AXXX*			15	3.33	1158	2	1000	100	87	90
ATDC48V24V2AXXX*			24	2.08	1158	2	500	100	87	90

\*Note: See Figure 9.



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