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

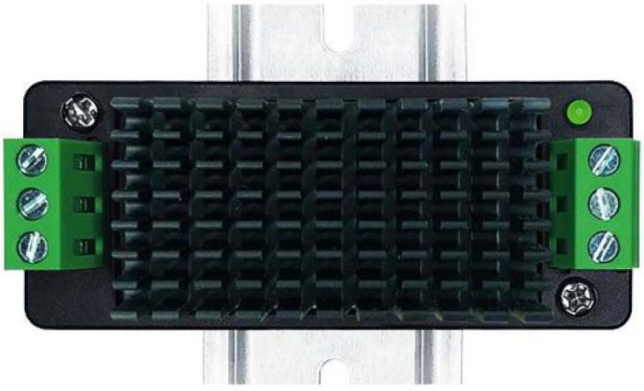


Figure 1.6. Terminal Block DIN-Rail with Heat Sink

FEATURES

- Wide Input Range: 18V ~ 36V
- Output Voltage: 5V
- Max. Output Current: 10A
- High Efficiency: 90% @V_{IN} = 18V & I_{OUT} = 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: −40°C ~ +85°C

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 −40°C to 85°C, 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 2×10^5 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.

No.	Name	Type	Description
1	SDN	Digital Input	Shutdown Control
2	VIN−	Power Input	Negative Input Voltage
3	VIN+	Power Input	Positive Input Voltage
4	VOUT+	Power Output	Positive Output Voltage
5	VOUT−	Power Output	Negative Output Voltage
6	Trim	Analog Input	Trimming Input

Table 2. Specifications

INPUT						
Parameter	**Symbol**	**Test Conditions**	**Min.**	**Typ.**	**Max.**	**Unit/Note**
Input Voltage	V_{IN}		18	24	36	V
Input Current	I_{IN}	Full Load		2315		mA
		No Load		50		mA
Surge Voltage (1sec. max.)					50	VDC

Under Voltage Lockout	UVLO			16		V
Shutdown	V_{SDNH}	ON	3.5		12	V
	V_{SDNL}	OFF	0		1.2	V
	I_{SDN}			150		mA
Start-up time	t_s			20		ms
Filter			Pi Filter			

OUTPUT

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit/Note
Output Voltage	V_{OUT}			5		V
Output Current	I_{OUT}				10	A
Output Voltage Accuracy					±2	%
Line Regulation	$\Delta V_{OUT}/\Delta V_{VPS}$				±1	%
Load Regulation	$\Delta V_{OUT}/\Delta I_{OUT}$	Load change from 10% to 100%			±2	%
Ripple & Noise					100	mV_{p-p}
Output Over Voltage Lockout	OVLO		$1.1V_{OUT}$		$2V_{OUT}$	
Output Over Current Protection			$1.1I_{OUT}$	$1.5I_{OUT}$	$2I_{OUT}$	
Capacitive Load					8000	μF
Efficiency	η			90		%
Output Voltage Drift	$\Delta V_{OUT}/\Delta t$		≤±8%/500us			

GENERAL CHARACTERISTIC

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit/Note
Isolation Voltage	V_{IS}			1500		VDC
Isolation Capacitance				2000		pF
Isolation Resistance			100			MΩ
Switching Frequency	f_{SW}			350		kHz
Operating Temperature Range	T_{opr}		−40		85	°C
Storage Temperature Range	T_{stg}		−55		125	°C
Maximum Case Temperature	T_{cs}	T_A = 25°C			105	°C
Storage Relative Humidity Range	RH		5		95	%
Mean Time Between Failure	MTBF	MIL-HDBK-217F@25°C		2×10^5		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 ±4KV	perf.Criteria B			
	Radiated Immunity	IEC/EN61000-4-3 10V/m	perf.Criteria A			
	EFT/Burst	IEC/EN61000-4-4 ±2KV(see Fig.2 for recommended circuit)	perf.Criteria B			
	Surge	IEC/EN61000-4-5 ±2KV	perf.Criteria B(see Fig.2 for recommended circuit)			
	Conducted Immunity	IEC/EN61000-4-6 3Vr.m.s	perf.Criteria A			

TYPICAL PERFORMANCE CHARACTERISTICS

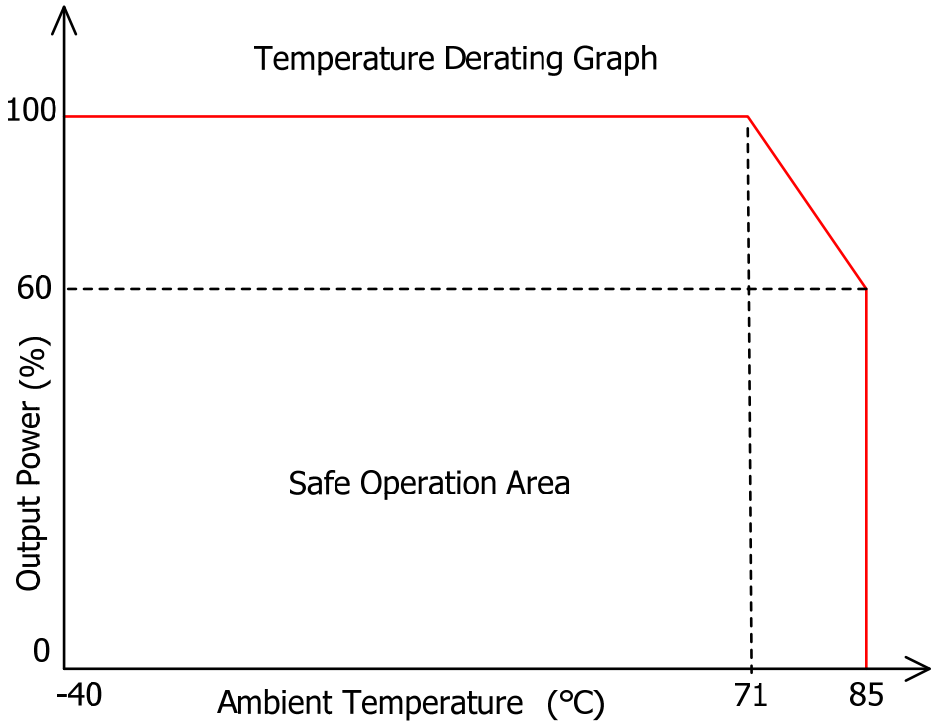


Figure 2. Derating Curve

TRIM APPLICATIONS CIRCUITS

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

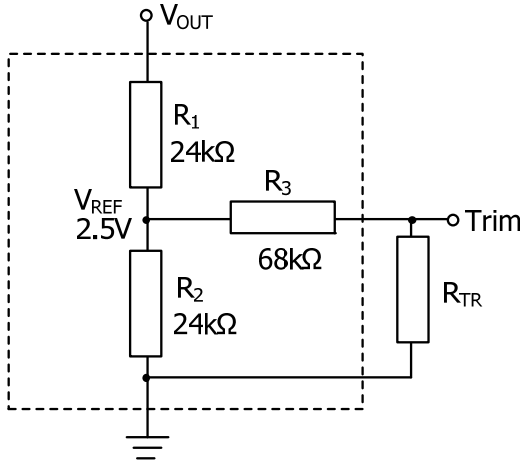


Figure 3. Trimming Up Output Voltage

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

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

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

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

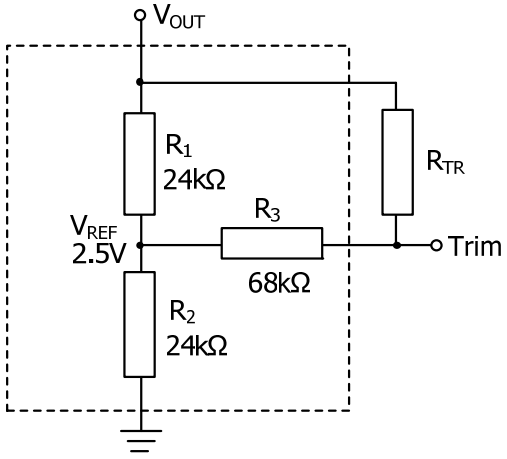


Figure 4. Trimming Down Output Voltage

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

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

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

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

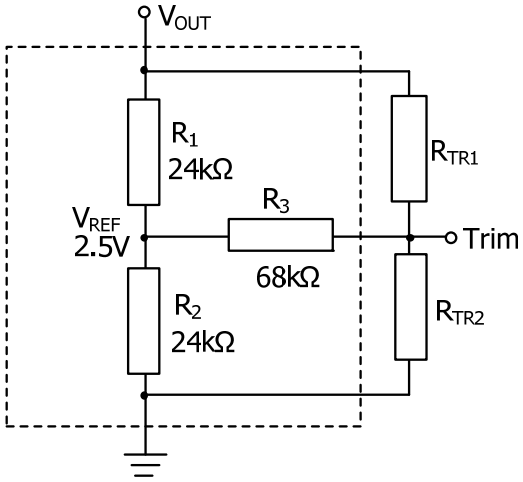


Figure 5. Trimming Up and Down Output Voltage

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

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

$$V_{OUT} =$$

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

TYPICAL APPLICATIONS

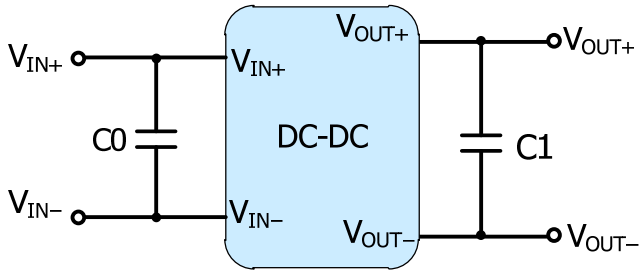


Figure 6. DC-DC Test Circuit

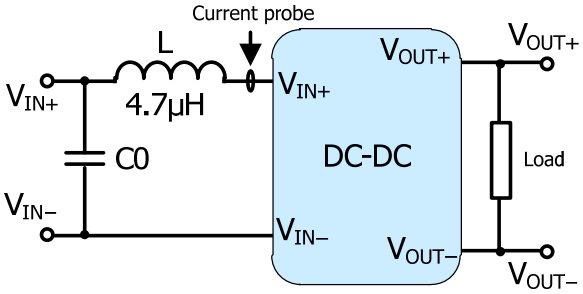


Figure 7. Input ripple Test Current Circuit

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.

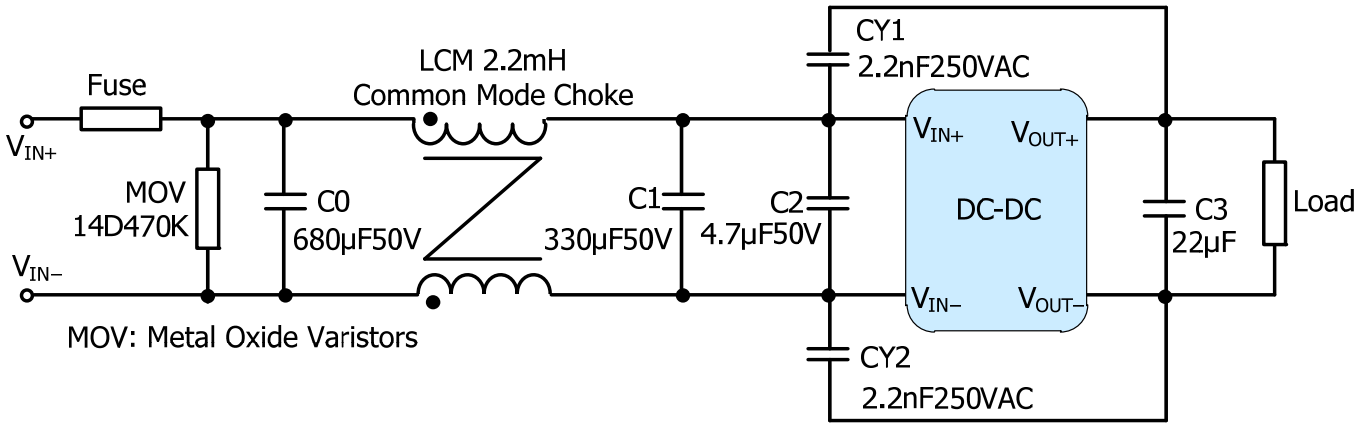
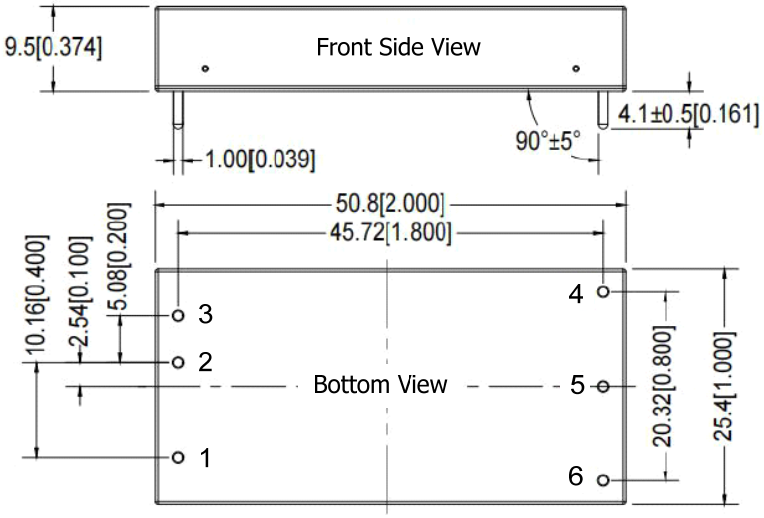
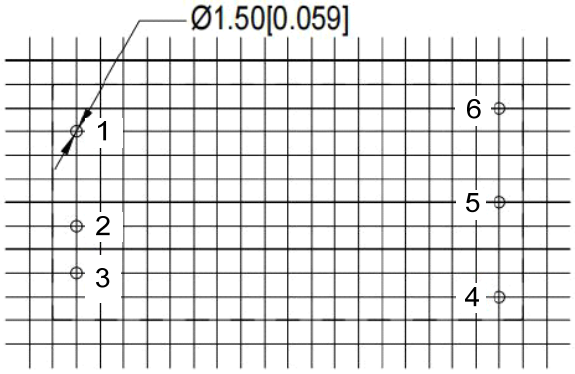


Figure 8. EMC Recommended Circuit

OUTLINE DIMENSIONS

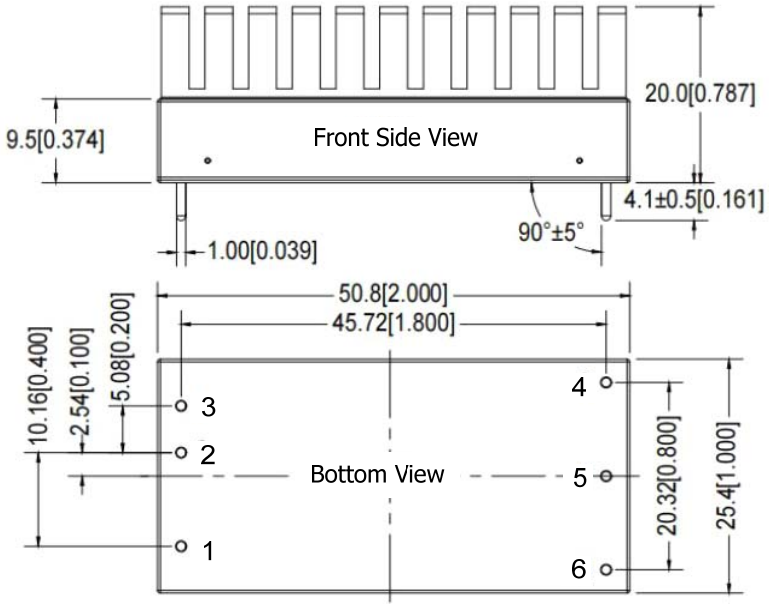
PCB Mount without Heat Sink(P)

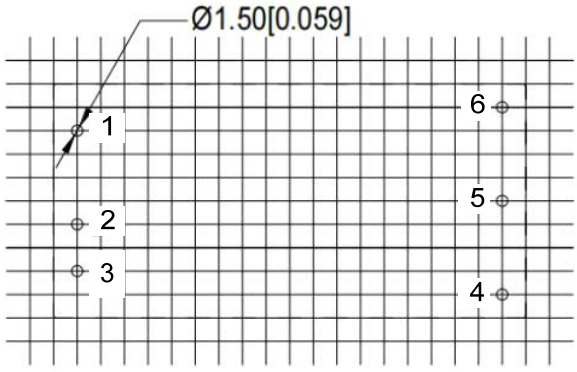




NOTE:
Unit: mm[inch]
Grid: 2.54mm×2.54mm
Diameter Tolerance of Terminal Block: ±0.10[±0.004]
Unmarked Tolerance: ±0.50[±0.020]

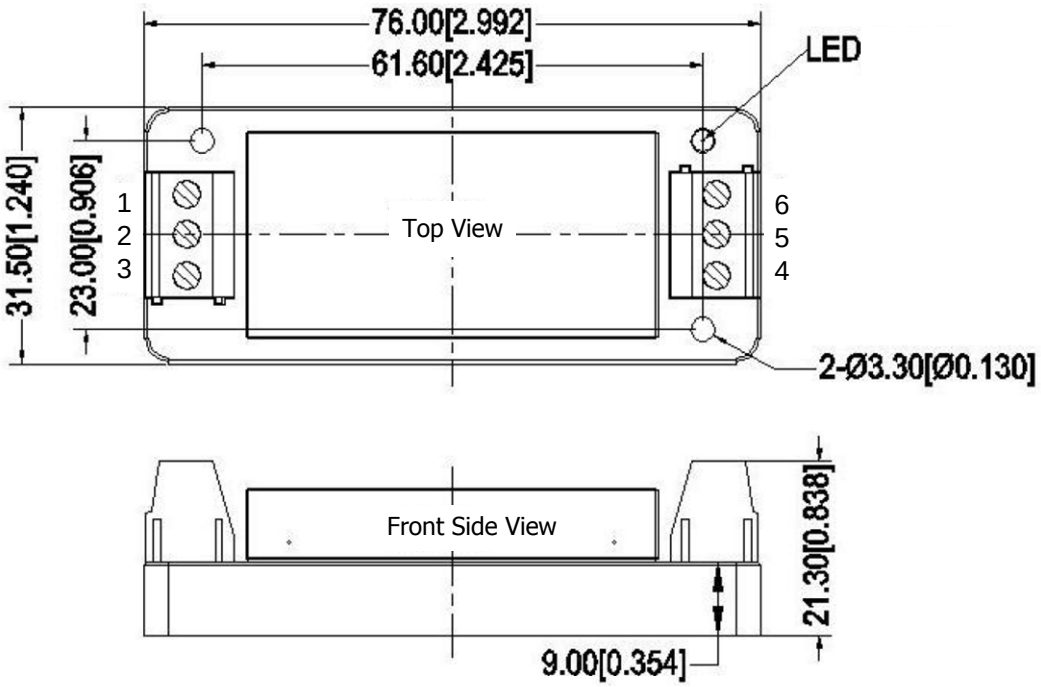
PCB Mount with Heat Sink (PH)



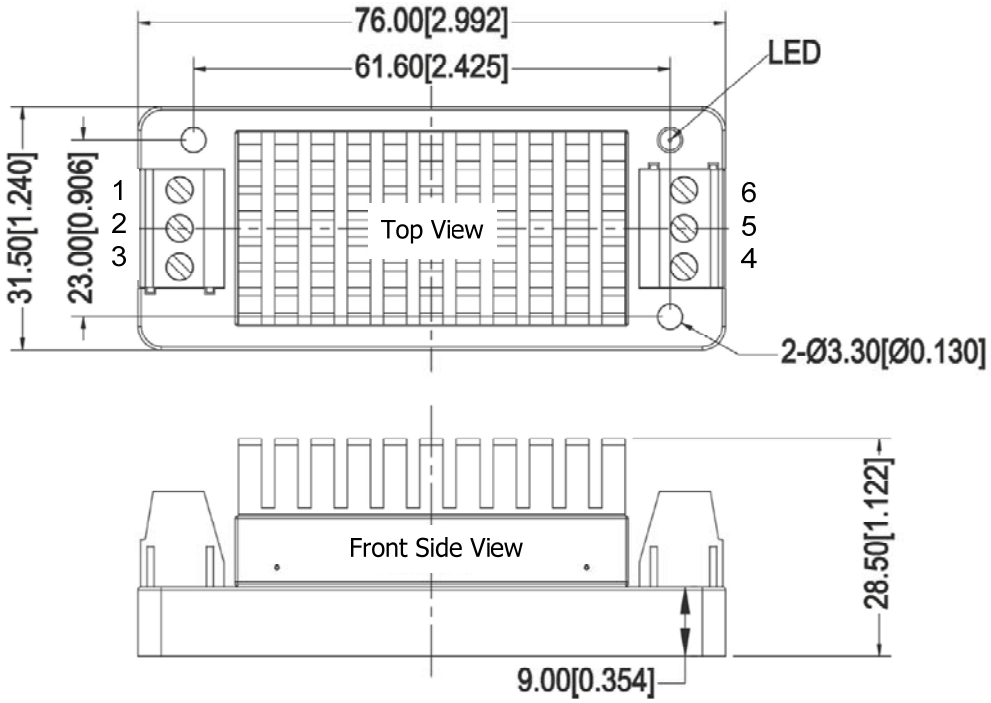


NOTE:
Unit: mm[inch]
Grid: 2.54mm×2.54mm
Diameter Tolerance of Terminal Block: ±0.10[±0.004]
Unmarked Tolerance: ±0.50[±0.020]

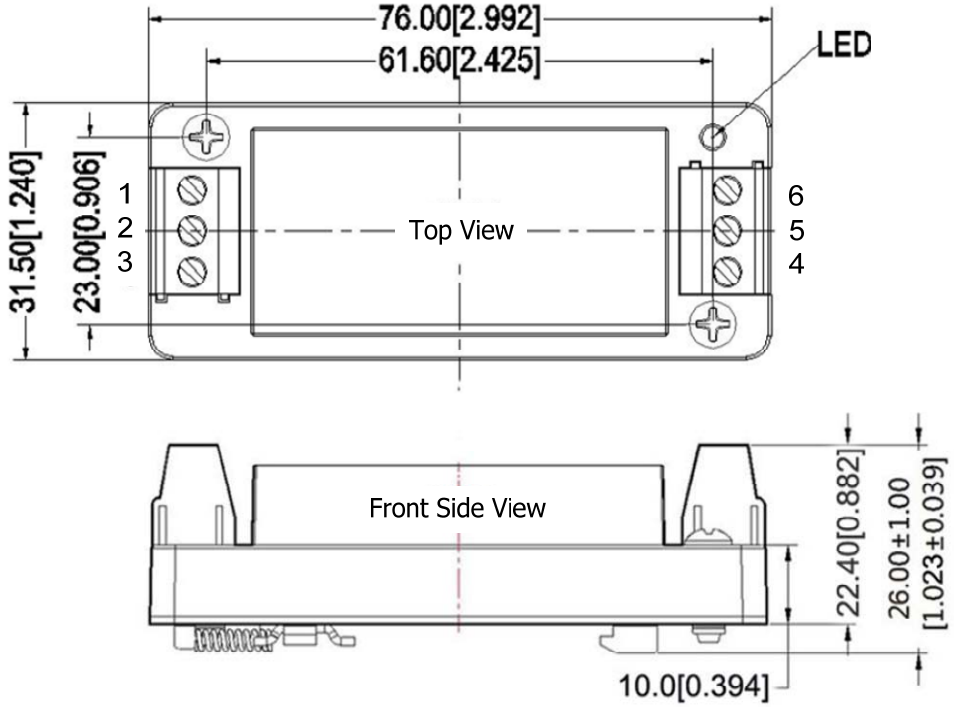
Terminal Block Mount without Heat Sink(T)



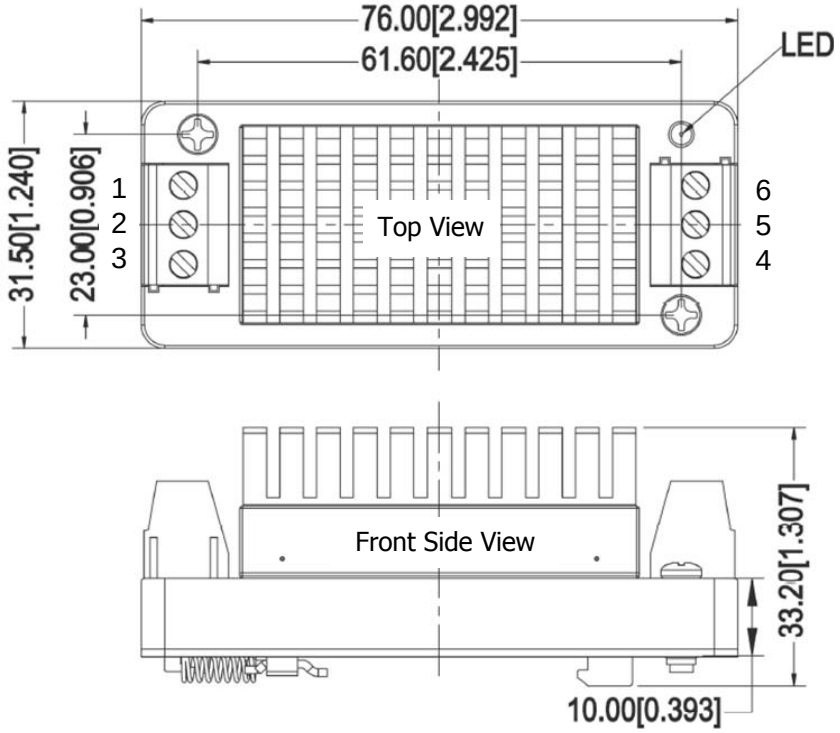
Terminal Block Mount with Heat Sink (TH)



Terminal Block DIN Rail without Heat Sink(TD)



Terminal Block DIN Rail with Heat Sink (TDH)



ORDING INFORMATION

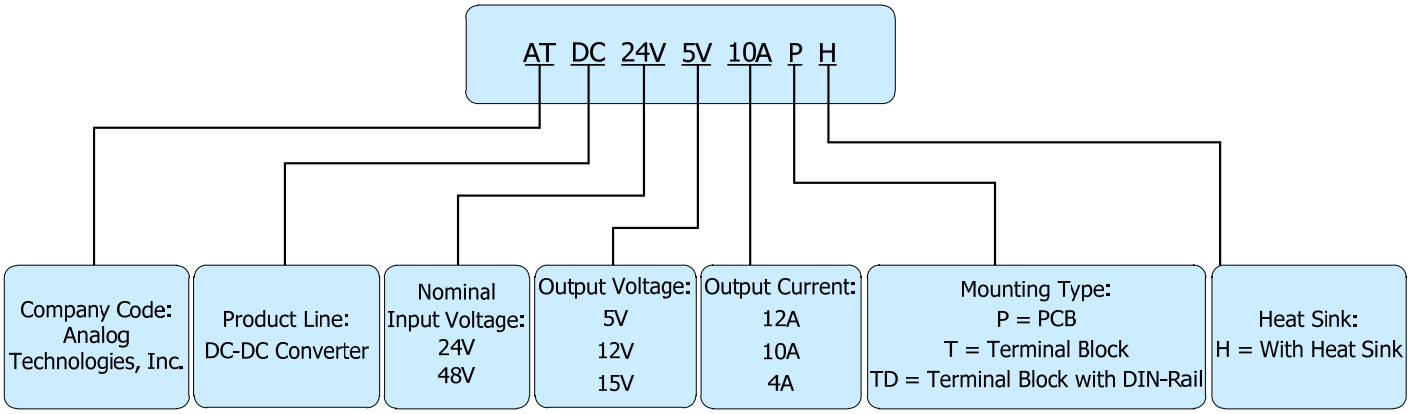


Figure 9. Naming Principle of ATDC24V5V10APH

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_{p-p}	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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