



50DAW_1.5R series

50W - Single Output - Wide Input - Isolated & Regulated DC-DC Converter

24Vin

- ⊕ Wide 2:1 input voltage range
- ⊕ High efficiency up to 91%
- ⊕ Input under-voltage protection, output short circuit, over-current, over-voltage protection
- ⊕ Operating ambient temp. range: -40°C to +105°C
- ⊕ No-load power consumption as low as 0.048W

- ⊕ 1.5kVDC I/O isolation
- ⊕ Six-sided metal shielding package
- ⊕ Input reverse polarity protection available with chassis or DIN-Rail mounting version
- ⊕ Industry standard pin-out
- ⊕ Meets IEC62368, UL62368 standards
- ⊕ EN62368 approved



DC-DC Converter

50 Watt

The 50DAW_1.5R series of isolated 50W DC-DC converter products with a wide 2:1 input voltage range. They feature efficiencies up to 91%, input to output isolation is tested with 1500VDC and the converter safety operate ambient temperature of -40°C to +105°C, input under-voltage protection, output over-voltage, over-current, short-circuit protection. They are ideally and widely used in applications such as industrial control, electric power, instruments and communications.

Common specifications

Item	Test condition	Min	Typ	Max	Units
Short circuit protection	Continuous, self-recovery				
Operating Temperature	See Fig. 1	-40	+105	°C	
Storage Temperature		-55	+125	°C	
Storage humidity	Non-condensing	5	95	%RH	
Pin Soldering Resistance Temperature	Soldering spot is 1.5mm for 10 seconds		+300	°C	
Vibration	10-150Hz, 5G, 0.75mm. along X, Y and Z				
Switching Frequency *	PWM mode	300	KHz		
MTBF	MIL-HDBK-217F@25°C	> 1000,000 h			
Hot plug:	Unavailable				
Case material:	Aluminum alloy				
Dimension (Without heat sink)	<ul style="list-style-type: none"> • Horizontal package • Chassis mounting • Din-Rail mounting 	50.80 × 25.40 × 11.80 mm 76.00 × 31.50 × 21.20 mm 76.00 × 31.50 × 25.80 mm			
Dimension (With heat sink)	<ul style="list-style-type: none"> • Horizontal package • Chassis mounting • Din-Rail mounting 	51.40 × 26.20 × 16.50 mm 76.00 × 31.50 × 25.30 mm 76.00 × 31.50 × 29.90 mm			
Weight (Without heat sink)	<ul style="list-style-type: none"> • Horizontal package • Chassis mounting • Din-Rail mounting 	39g TYP. 62g TYP. 82g TYP.			
Weight (With heat sink)	<ul style="list-style-type: none"> • Horizontal package • Chassis mounting • Din-Rail mounting 	47g TYP. 70g TYP. 90g TYP.			
Cooling:	Free air convection				

Note: *Switching frequency is measured at full load. The module reduces the switching frequency for light load (below 50%) efficiency improvement.

Example:

50DAW_2415S1.5R

50 = 50Watt; D = DIP; A = series; W = wide input (2:1); 24 = 18-36Vin; 15 = 15Vout; S = single output; 1.5 = 1500VDC isolation; R = Revised

Note:

1. It is recommended to use at more than 10% load. If the load is lower than 10%, the ripple of the product may exceed the specifications, but the reliability of the product is not affected.
2. The maximum capacitive load offered were tested at nominal input voltage and full load;
3. Unless otherwise specified, parameters in this datasheet were measured under the conditions of Ta = 25°C, humidity<75%RH with nominal input voltage and rated output load;
4. All index testing methods in this datasheet are based on company corporate standards;
5. We can provide product customization service, please contact our technicians directly for specific information;
6. Products are related to laws and regulations: see „Features“ and „EMC“;
7. Our products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified units.

Input specifications

Item	Test condition	Min	Typ	Max	Units
Input Current (full load / no-load, Nominal input voltage)	<ul style="list-style-type: none"> • 3.3VDC output • 5VDC output • 12VDC output • 15VDC output • 24VDC output 	1511/2 2289/3 2289/5 2289/11 2289/4	1545/- 2341/- 2341/- 2341/- 2341/-	mA	mA
Input surge voltage (1 sec. max.)		-0.7		50	VDC
Start-up voltage				18	VDC
Input under voltage protection		11	13		VDC
Start-up time	Nominal input voltage & constant resistance load	10	120	ms	
Input filter	PI filter				
Ctrl*	<ul style="list-style-type: none"> • Models ON • Models OFF • Input current when off 			6	mA
				12	

Note: *The Ctrl pin voltage is referenced to input GND.

Output specifications

Item	Test condition	Min	Typ	Max	Units
Voltage accuracy	5%-100% load	±1	±3	%	
Line regulation	Input voltage variation from low to high at full load	±0.2	±0.5	%	
Load regulation	5%-100% load	±0.5	±1	%	
Transient recovery time	25% load step change, nominal input voltage	250	500	μs	
Transient response deviation	25% load step change, input voltage range <ul style="list-style-type: none"> • 3.3/5VDC output • others 	±3	±8	%	
Temperature Coefficient	Full load			±0.03	%/°C
Ripple & Noise*	20MHz bandwidth, 5%-100% load <ul style="list-style-type: none"> • 3.3/5VDC output • 12/15VDC output • 24VDC output 	120 180 240	200 250 300	mVp-p	mVp-p
Trim		90	110		VDC
Over voltage protection	Input voltage range	110	140	160	%Vo
Over current protection	Input voltage range	110	140	200	%Io

Note: *The "parallel cable" method is used for Ripple and Noise test, please refer to DC-DC Converter Application Notes for specific information.

50DAW_1.5R series

50W - Single Output - Wide Input - Isolated & Regulated DC-DC Converter

Isolation specifications						EMC specifications		
Item	Test condition	Min	Typ	Max	Units	Emissions	CE	CISPR32/EN55032 CLASS B (see Fig.3 for recommended circuit)
Isolation voltage	<ul style="list-style-type: none"> • Input-output Electric Strength Test for 1 minute with a leakage current of 1mA max. • Input/output-Housing Electric Strength Test for 1 minute with a leakage current of 1mA max. 	1500			VDC	Emissions	RE	CISPR32/EN55032 CLASS B (see Fig.3 for recommended circuit)
		1000				Immunity	ESD	IEC/EN61000-4-2 Contact ±4KV
Isolation resistance	Input-output resistance at 500VDC	100			MΩ	Immunity	RS	IEC/EN61000-4-3 10V/m
Isolation capacitance	Input-output capacitance at 100KHz/0.1V		2200		pF	Immunity	EFT	IEC/EN61000-4-4 100KHz ±2KV (see Fig.3 for recommended circuit)
						Immunity	Surge	IEC/EN61000-4-5 line to line ±2KV (see Fig.3 for recommended circuit)
						Immunity	CS	IIEC/EN61000-4-6 10 Vr.m.s

Product Selection Guide

Part Number	Nominal	Input Voltage [VDC] Range	Max ⁽¹⁾	Output Voltage [VDC]	Output Current [mA, Max]	Efficiency [%], Min./Typ.]	Capacitive load [μF, Max]
50DAW_2403S1.5R	24	18-36	40	3.3	10000/500	89/91	27000
50DAW_2405S1.5R	24	18-36	40	5	10000/500	89/91	18900
50DAW_2412S1.5R	24	18-36	40	12	4167/208	89/91	3700
50DAW_2415S1.5R	24	18-36	40	15	3333/167	89/91	2000
50DAW_2424S1.5R	24	18-36	40	24	2083/104	89/91	1000

Notes:

- ① Recommended to choose modules with a heat sink for enhanced heat dissipation and applications with extreme temperature requirements;
- ② The minimum input voltage and starting voltage of chassis mounting and DIN-Rail mounting Model are 1VDC higher than those of DIP package due to input reverse polarity protection function;
- ③ Exceeding the maximum input voltage may cause permanent damage;
- ④ Efficiency is measured at nominal input voltage and rated output load; efficiencies for chassis mounting and DIN-Rail mounting Model's is decreased by 2% due to the input reverse polarity protection circuit.

Typical characteristics

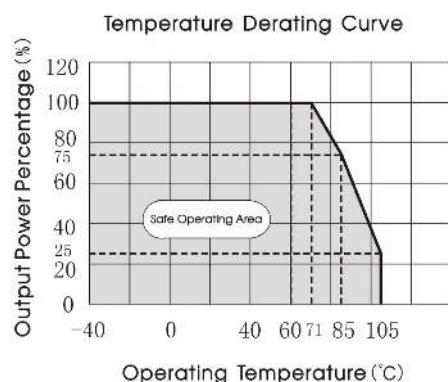
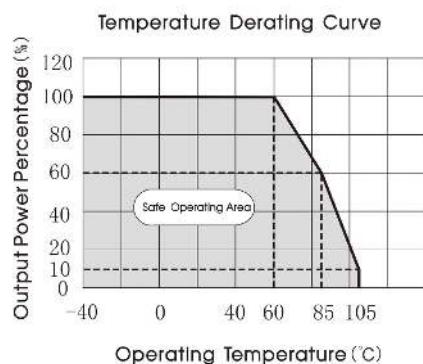


Fig. 1

Typical application

All DC-DC converters of this series are tested before delivery using the recommended circuit shown in Fig. 2. Input and/or output ripple can be further reduced by appropriately increasing the input & output capacitor values Cin and Cout and/or by selecting capacitors with a low ESR (equivalent series resistance). Also make sure that the capacitance is not exceeding the specified max. capacitive load value of the product



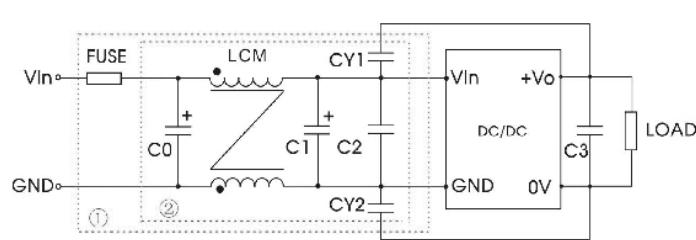
Fig. 2

Vout (VDC)	Cin (μF)	Cout (μF)
3.3	100μF/50V	470μF/10V
12/15	100μF/50V	100μF/25V
24	100μF/50V	47μF/50V

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EMC compliance circuit

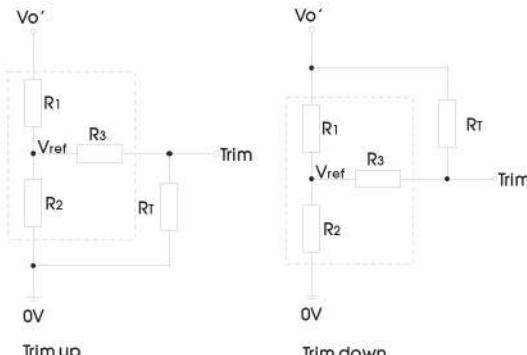


Notes: We use Part ① in Fig. 3 for Immunity tests and Part ② for Emissions test.
Selecting based on needs.

Parameter description:

Model	Vin:24V
FUSE	T/4A/250VAC
C0	680μF/50V
LCM	2.2mH
C1	330μF/50V
C2	4.7μF/50V
CY1, CY2	Y1 Safety capacitor 2.2nF/250VAC
C3	Refer to the Cout in Fig.2

Trim Function for Output Voltage Adjustment (open if unused)



TRIM resistor connection (dashed line shows internal resistor network)

Calculating Trim resistor values: es:

$$\text{up: } RT = \frac{\alpha R_2}{R_2 - \alpha} - R_3 \quad \alpha = \frac{V_{ref}}{V_o' - V_{ref}} \cdot R_1$$

$$\text{down: } RT = \frac{\alpha R_1}{R_1 - \alpha} - R_3 \quad \alpha = \frac{V_o' - V_{ref}}{V_{ref}} \cdot R_2$$

RT is Trim resistance
α is a self-defined parameter, with no real meaning.

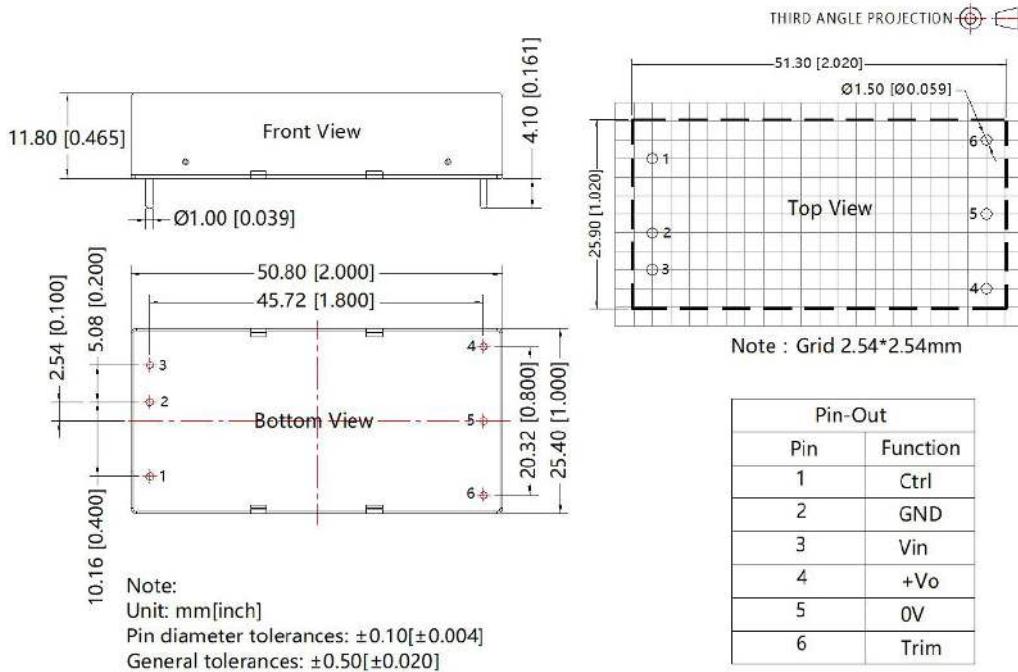
Vout(V)	Vout adjustable value(v)	RT(KΩ)	R1(KΩ)	R2(KΩ)	R3(KΩ)	Vref(V)
3.3	Up: 3.63	15.0	4.83	2.87	4.7	1.24
3.3	Down: 2.97	18.7	4.83	2.87	4.7	1.24
5	Up: 5.5	13.3	2.87	2.87	4.7	2.5
5	Down: 4.5	5.4	2.87	2.87	4.7	2.5
12	Up: 13.2	7.6	10.90	2.87	15	2.5
12	Down: 10.8	60.7	10.90	2.87	15	2.5
15	Up: 16.5	8.9	14.35	2.87	15	2.5
15	Down: 13.5	90.2	14.35	2.87	15	2.5
24	Up: 26.4	21.6	48.77	2.87	5.1	2.5
24	Down: 21.6	185.9	48.77	2.87	5.1	2.5

The products do not support parallel connection of their output

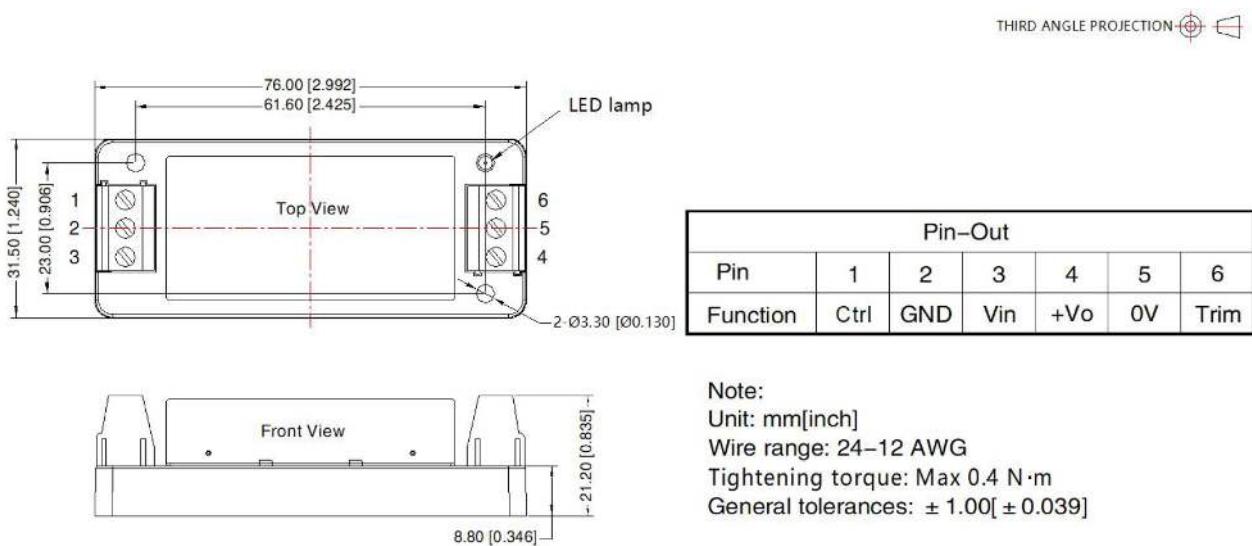
50DAW_1.5R series

50W - Single Output - Wide Input - Isolated & Regulated
DC-DC Converter

Horizontal Package - Dimensions and Recommended Layout



Chassis Mounting - Dimensions and Recommended Layout

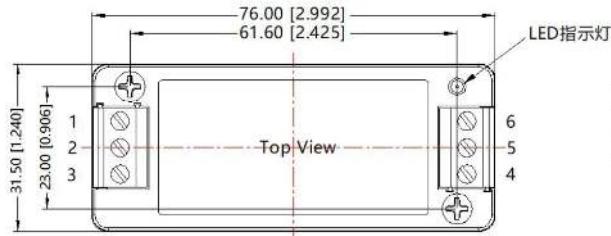


50DAW_1.5R series

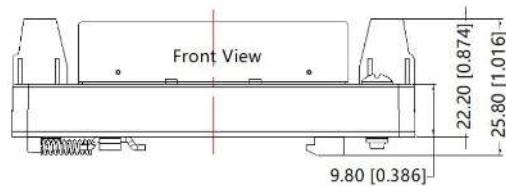
50W - Single Output - Wide Input - Isolated & Regulated
DC-DC Converter

Din-Rail mounting - Dimensions and Recommended Layout

THIRD ANGLE PROJECTION



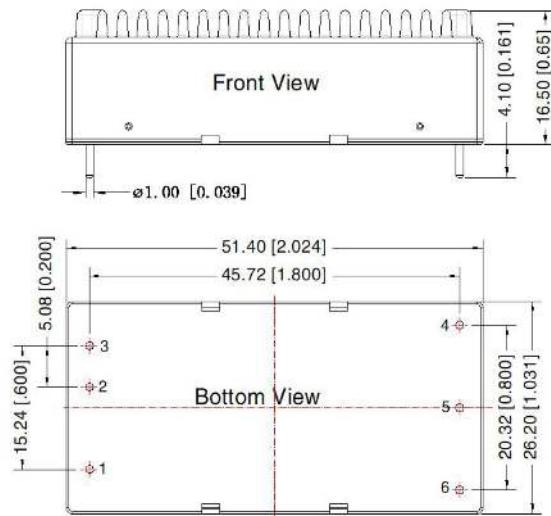
Pin-Out						
Pin	1	2	3	4	5	6
Function	Ctrl	GND	Vin	+Vo	0V	Trim



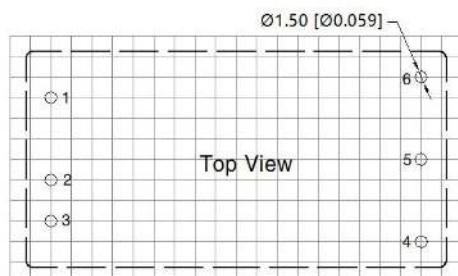
Note:
Unit: mm[inch]
Mounting rail: TS35
Wire range: 24-12 AWG
Tightening torque: Max 0.4 N·m
General tolerances: $\pm 1.00[\pm 0.039]$

Horizontal Package- Dimensions and Recommended Layout (With Heat Sink)

THIRD ANGLE PROJECTION



Note:
Unit: mm[inch]
Pin diameter tolerances: $\pm 0.10[\pm 0.004]$
General tolerances: $\pm 0.50[+0.020]$



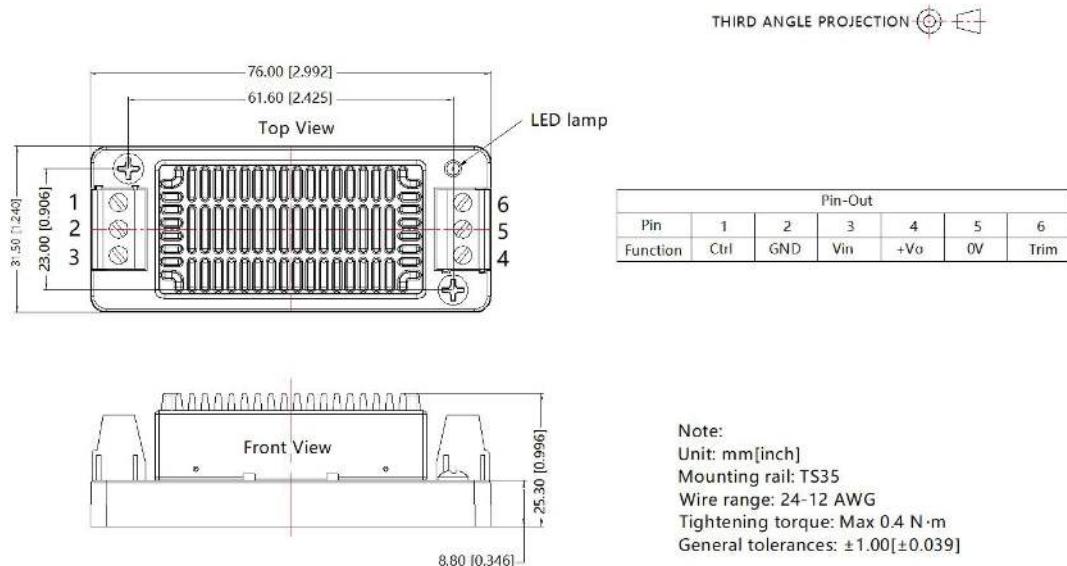
Note: Grid: 2.54*2.54mm

Pin	Function
1	Ctrl
2	GND
3	Vin
4	+Vo
5	0V
6	Trim

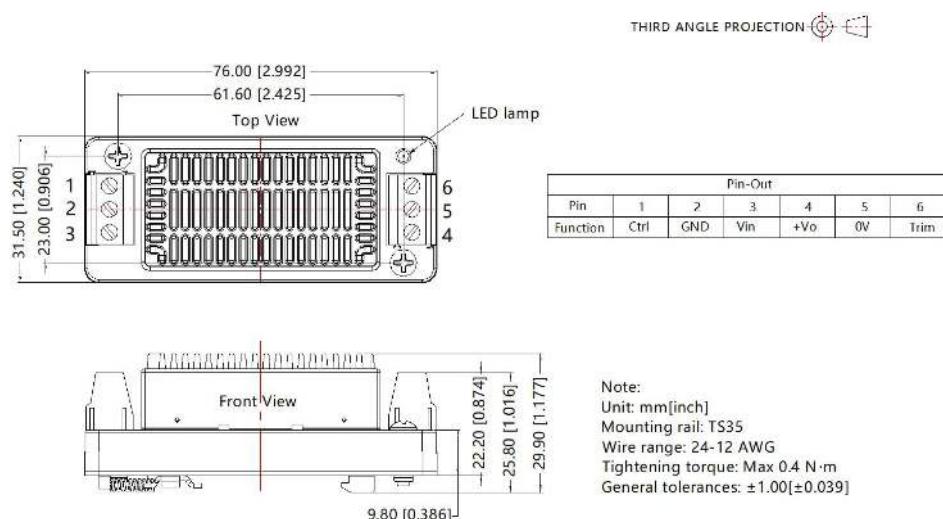
50DAW_1.5R series

50W - Single Output - Wide Input - Isolated & Regulated
DC-DC Converter

Chassis Mounting - Dimensions and Recommended Layout (With Heat Sink)



Din-Rail mounting - Dimensions and Recommended Layout (With Heat Sink)





50DAW_1.5R series

50W - Single Output - Wide Input - Isolated & Regulated DC-DC Converter

48Vin

- ⊕ Wide 2:1 input voltage range
- ⊕ High efficiency up to 92%
- ⊕ 1.5kVDC I/O isolation
- ⊕ Input under-voltage protection, output short circuit, over-current, over-voltage protection
- ⊕ Operating ambient temp. range: -40°C to +105°C



- ⊕ No-load power consumption as low as 0.048W
- ⊕ Six-sided metal shielding package
- ⊕ Input reverse polarity protection available with chassis or DIN-Rail mounting version
- ⊕ Industry standard pin-out
- ⊕ Meets IEC62368, UL62368, EN62368 standards

DC-DC Converter

50 Watt

The 50DAW_1.5R series of isolated 50W DC-DC converter products with a wide 2:1 input voltage range. They feature efficiencies up to 92%, input to output isolation is tested with 1500VDC and the converter safety operate ambient temperature of -40° to +105°C, input under-voltage protection, output short-circuit, over-current, over-voltage protection. They are ideally and widely used in applications such as industrial control, electric power, instruments and communications.

Common specifications

Item	Test condition	Min	Typ	Max	Units
Short circuit protection	Hiccup, continuous, self-recovery				
Operating Temperature	See Fig. 1	-40		+105	°C
Storage Temperature		-40		+125	°C
Storage humidity		5	95		%RH
Soldering Resistance Temperature	Soldering spot is 1.5mm for 10 seconds			+300	°C
Vibration	10-150Hz, 5G, 0.75mm. along X, Y and Z				
Switching Frequency *	PWM mode	300		KHz	
MTBF	MIL-HDBK-217F@25°C	> 1000,000 h			
Hot plug:	Unavailable				
Case material:	Aluminum alloy				
Dimension (Without heat sink)	<ul style="list-style-type: none"> • Horizontal package • Chassis mounting • Din-Rail mounting 	50.80 × 25.40 × 11.80 mm 76.00 × 31.50 × 21.20 mm 76.00 × 31.50 × 25.80 mm			
Dimension (With heat sink)	<ul style="list-style-type: none"> • Horizontal package • Chassis mounting • Din-Rail mounting 	51.40 × 26.20 × 16.50 mm 76.00 × 31.50 × 25.30 mm 76.00 × 31.50 × 29.90 mm			
Weight (Without heat sink)	<ul style="list-style-type: none"> • Horizontal package • Chassis mounting • Din-Rail mounting 	42g TYP. 65g TYP. 85g TYP.			
Weight (With heat sink)	<ul style="list-style-type: none"> • Horizontal package • Chassis mounting • Din-Rail mounting 	50g TYP. 73g TYP. 93g TYP.			
Cooling:	Free air convection				

Note: *Switching frequency is measured at full load. The module reduces the switching frequency for light load (below 50%) efficiency improvement.

Example:

50DAW_2415S1.5R
50 = 50Watt; D = DIP; A = series; W = wide input (2:1); 24 = 18-36Vin;
15 = 15Vout; S = single output; 1.5 = 1500VDC isolation; R = Revised

Note:

1. It is recommended to use at more than 10% load. If the load is lower than 10%, the ripple of the product may exceed the specifications, but the reliability of the product is not affected.
2. The maximum capacitive load offered were tested at nominal input voltage and full load;
3. Unless otherwise specified, parameters in this datasheet were measured under the conditions of Ta = 25°C, humidity<75%RH with nominal input voltage and rated output load;
4. All index testing methods in this datasheet are based on company corporate standards;
5. We can provide product customization service, please contact our technicians directly for specific information;
6. Products are related to laws and regulations: see „Features“ and „EMC“;
7. Our products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified units.

Input specifications

Item	Test condition	Min	Typ	Max	Units
Input Current (full load /no-load, Nominal input voltage)	<ul style="list-style-type: none"> • 3.3VDC output • 5VDC output • 12VDC output • 15VDC output • 24VDC output 	756/1 1145/2 1133/4 1133/4 1133/3	773/- 1171/- 1158/- 1158/- 1158/-	mA	mA
Input surge voltage (1 sec. max.)		-0.7		80	VDC
Start-up voltage				36	VDC
Input under voltage protection	26		30		VDC
Start-up time	Nominal input voltage & constant resistance load		10	120	ms
Input filter	PI				
Ctrl*	<ul style="list-style-type: none"> • Models ON • Models OFF • Input current when off 			2	12 mA
					(TTL 3.0-12VDC) Ctrl pin pulled low to GND (0-1.2VDC)

Note: *The Ctrl pin voltage is referenced to input GND.

Output specifications

Item	Test condition	Min	Typ	Max	Units
Voltage accuracy	5%-100% load	±1	±3	%	
Line regulation	Input voltage variation from low to high at full load	±0.2	±0.5	%	
Load regulation	5%-100% load	±0.5	±1	%	
Transient recovery time	25% load step change, nominal input voltage	250	500	μs	
Transient response deviation	25% load step change, input voltage range <ul style="list-style-type: none"> • 3.3/5VDC output • others 	±3 ±3	±8 ±5	%	
Temperature Coefficient	Full load			±0.03	%/°C
Ripple & Noise*	20MHz bandwidth, 5%-100% load <ul style="list-style-type: none"> • 3.3/5VDC output • 12/15VDC output • 24VDC output 	170 200 180	200 250 350	mVp-p	mVp-p
Trim		90	110		VDC
Over voltage protection	Input voltage range	110	140	160	%Vo
Over current protection	Input voltage range	110	140	200	%Io

Note: *The "parallel cable" method is used for Ripple and Noise test, please refer to DC-DC Converter Application Notes for specific information.

50DAW_1.5R series

50W - Single Output - Wide Input - Isolated & Regulated DC-DC Converter

Isolation specifications						EMC specifications		
Item	Test condition	Min	Typ	Max	Units	Emissions	CE	CISPR32/EN55032 CLASS B (see Fig.3 for recommended circuit)
Isolation voltage	• Input-output Electric Strength Test for 1 minute with a leakage current of 1mA max.	1500			VDC	Emissions	RE	CISPR32/EN55032 CLASS B (see Fig.3 for recommended circuit)
	• Input/output-Housing Electric Strength Test for 1 minute with a leakage current of 1mA max.	1000				Immunity	ESD	IEC/EN61000-4-2 Contact ±6KV perf. Criteria B
Isolation resistance	Test at 500VDC	100			MΩ	Immunity	RS	IEC/EN61000-4-3 10V/m perf. Criteria A
Isolation capacitance	100KHz/0.1V		2200		pF	Immunity	EFT	IEC/EN61000-4-4 100KHz ±2KV (see Fig.3 for recommended circuit) perf. Criteria B
						Immunity	Surge	IEC/EN61000-4-5 line to line ±2KV (see Fig.3 for recommended circuit) perf. Criteria B
						Immunity	CS	IIEC/EN61000-4-6 10 Vr.m.s perf. Criteria A

Selection Guide						
Part Number	Input Voltage [VDC]			Output Voltage [VDC]	Output Current [mA, Max]	Efficiency [%], Min./Typ.]
	Nominal	Range	Max ⁽¹⁾			Capacitive load [μF, Max]
50DAW_4803S1.5R	48	36-75	80	3.3	10000	89/91
50DAW_4805S1.5R	48	36-75	80	5	10000	89/91
50DAW_4812S1.5R	48	36-75	80	12	4167	90/92
50DAW_4815S1.5R	48	36-75	80	15	3333	90/92
50DAW_4824S1.5R	48	36-75	80	24	2083	90/92

Notes:

- ① Recommended to choose modules with a heat sink for enhanced heat dissipation and applications with extreme temperature requirements;
- ② The minimum input voltage and starting voltage of chassis mounting and DIN-Rail mounting Model are 1VDC higher than those of DIP package due to input reverse polarity protection function;
- ③ Exceeding the maximum input voltage may cause permanent damage;
- ④ Efficiency is measured at nominal input voltage and rated output load; efficiencies for chassis mounting and DIN-Rail mounting Model's is decreased by 2% due to the input reverse polarity protection circuit.

Typical characteristics

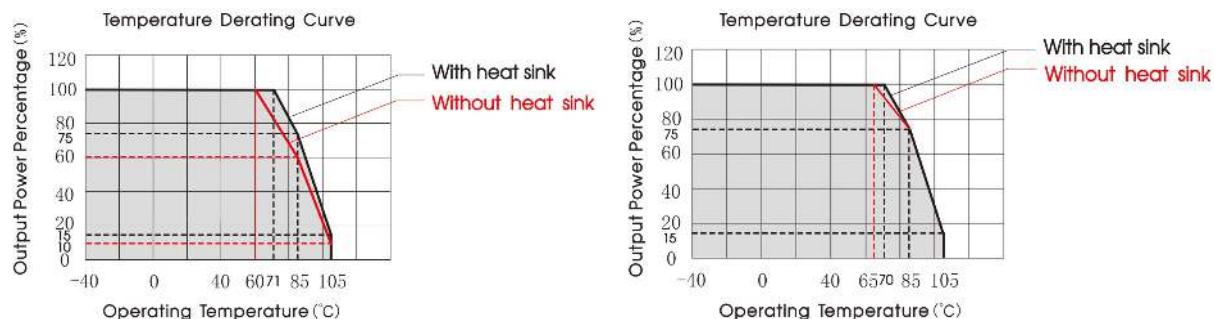


Fig. 1

Typical application

All DC-DC converters of this series are tested before delivery using the recommended circuit shown in Fig. 2. Input and/or output ripple can be further reduced by appropriately increasing the input & output capacitor values C_{in} and C_{out} and/or by selecting capacitors with a low ESR (equivalent series resistance). Also make sure that the capacitance is not exceeding the specified max. capacitive load value of the product

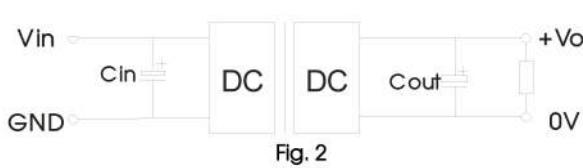


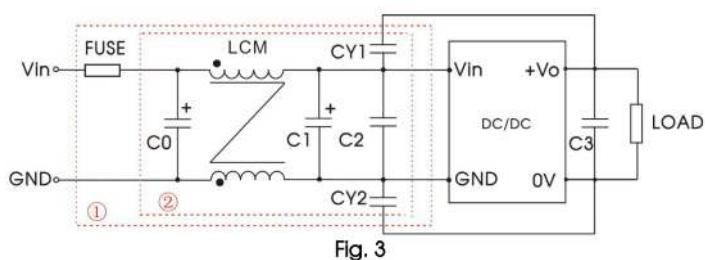
Fig. 2

Vout (VDC)	Cin (μF)	Cout (μF)
3.3	200μF/10V	470μF/10V
5	100μF/50V	470μF/10V
12/15	100μF/50V	100μF/25V
24	100μF/50V	47μF/50V

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EMC compliance circuit

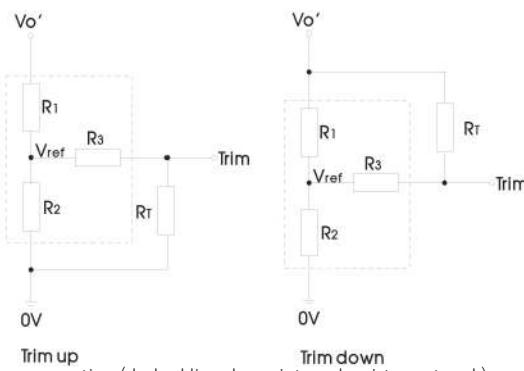


Notes: We use Part ① in Fig. 3 for Immunity tests and Part ② for Emissions test.
Selecting based on needs.

Parameter description:

Model	Vin:48V
FUSE	T/2A/250VAC
C0	330μF/100V
LCM	2.2mH, recommended to use MORNSUN P/N: FL2D-30-222
C1	330μF/100V
C2	2.2uF/100V
CY1, CY2	Y1 Safety capacitor 3.3nF/250VAC
C3	Refer to the Cout in Fig.2

Trim Function for Output Voltage Adjustment (open if unused)



TRIM resistor connection (dashed line shows internal resistor network)

Calculating Trim resistor values:

$$\text{up: } R_T = \frac{\alpha R_2}{R_2 - \alpha} - R_3 \quad \alpha = \frac{V_{ref}}{V_{o'} - V_{ref}} \cdot R_1$$

$$\text{down: } R_T = \frac{\alpha R_1}{R_1 - \alpha} - R_3 \quad \alpha = \frac{V_{o'} - V_{ref}}{V_{ref}} \cdot R_2$$

RT is Trim resistance
α is a self-defined parameter, with no real meaning.

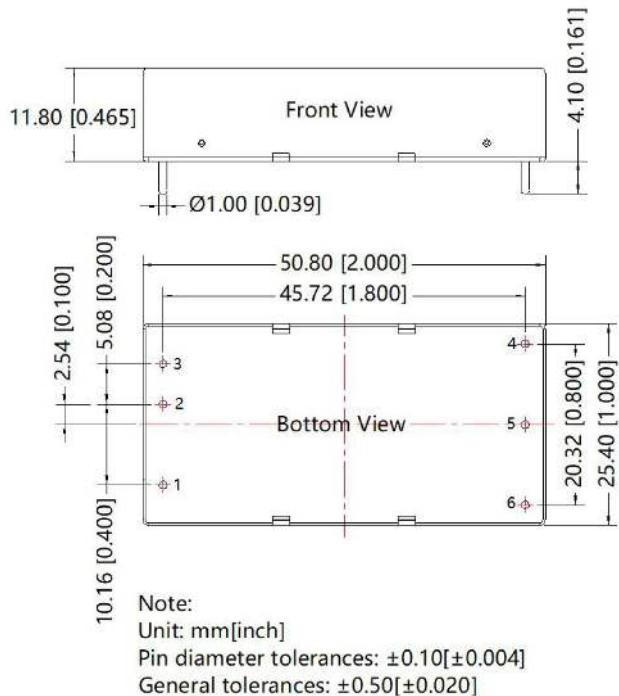
Vout(V)	Vout adjustable value(v)	RT(KΩ)	R1(KΩ)	R2(KΩ)	R3(KΩ)	Vref(V)
3.3	Up: 3.63	10	4.83	2.87	10	1.24
3.3	Down: 2.97	13.5	4.83	2.87	10	1.24
5	Up: 5.5	4.3	2.87	2.87	10	2.5
5	Down: 4.5	1.5	2.87	2.87	10	2.5
12	Up: 13.2	7.6	10.90	2.87	15	2.5
12	Down: 10.8	60.7	10.90	2.87	15	2.5
15	Up: 16.5	8.9	14.35	2.87	15	2.5
15	Down: 13.5	90.2	14.35	2.87	15	2.5
24	Up: 26.4	21.6	48.77	2.87	5.1	2.5
24	Down: 21.6	185.9	48.77	2.87	5.1	2.5

The products do not support parallel connection of their output

50DAW_1.5R series

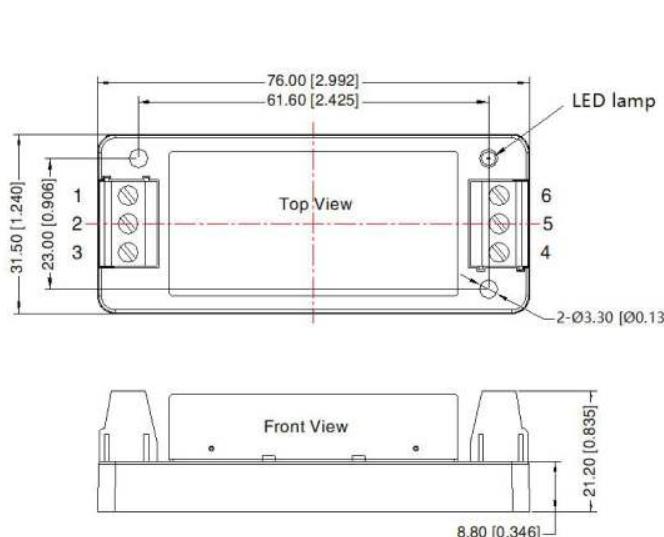
50W - Single Output - Wide Input - Isolated & Regulated
DC-DC Converter

Horizontal Package - Dimensions and Recommended Layout



Pin-Out	
Pin	Function
1	Ctrl
2	GND
3	Vin
4	+Vo
5	0V
6	Trim

Chassis Mounting - Dimensions and Recommended Layout



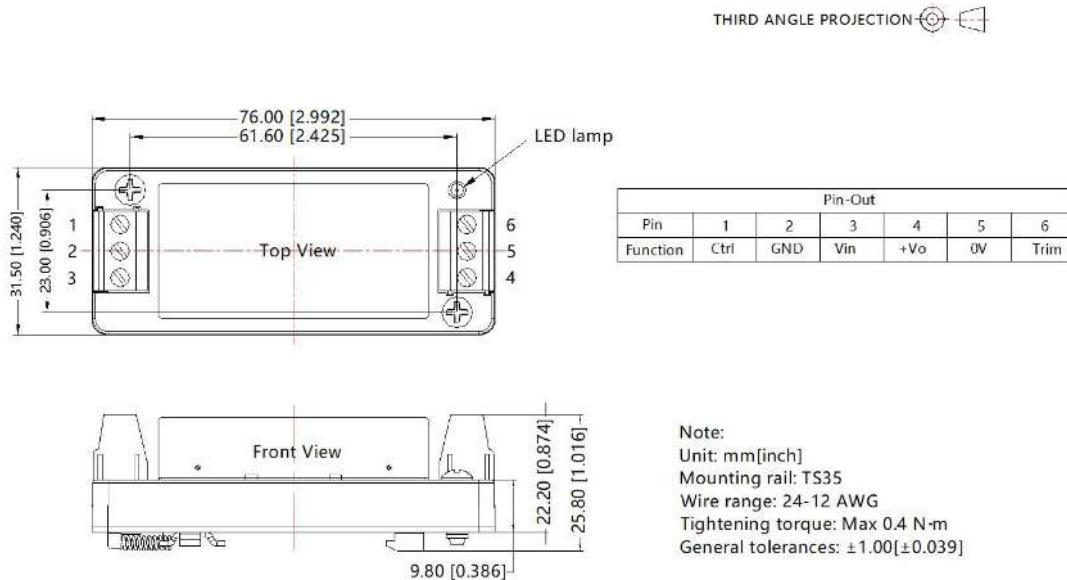
Pin-Out						
Pin	1	2	3	4	5	6
Function	Ctrl	GND	Vin	+Vo	0V	Trim

Note:
Unit: mm[inch]
Wire range: 24-12 AWG
Tightening torque: Max 0.4 N·m
General tolerances: ± 1.00[± 0.039]

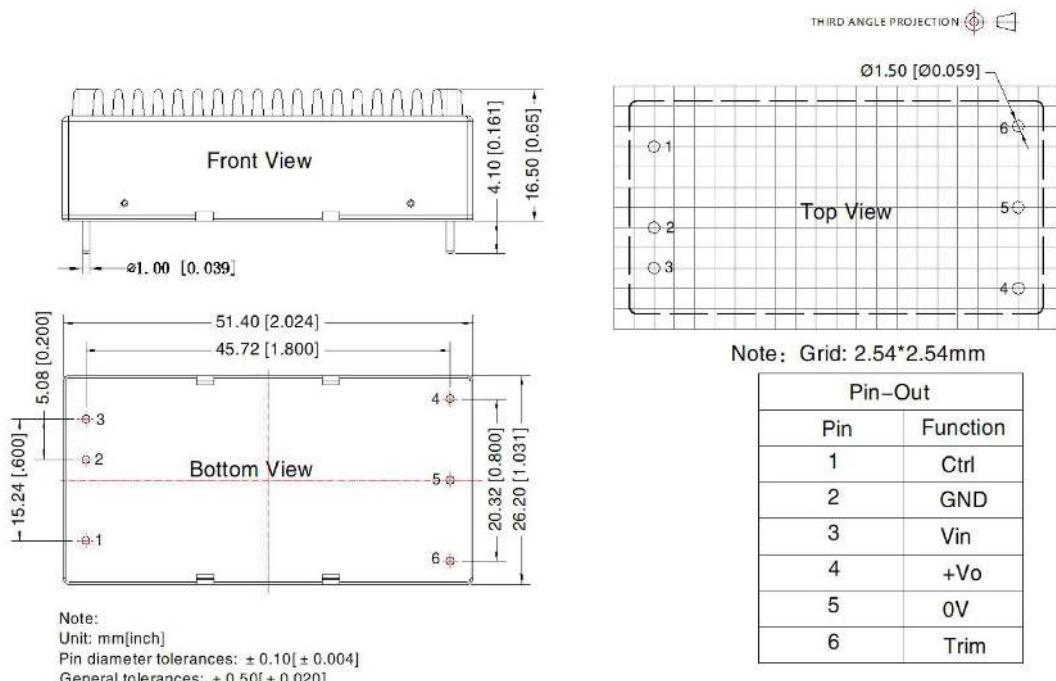
50DAW_1.5R series

50W - Single Output - Wide Input - Isolated & Regulated
DC-DC Converter

Din-Rail mounting - Dimensions and Recommended Layout



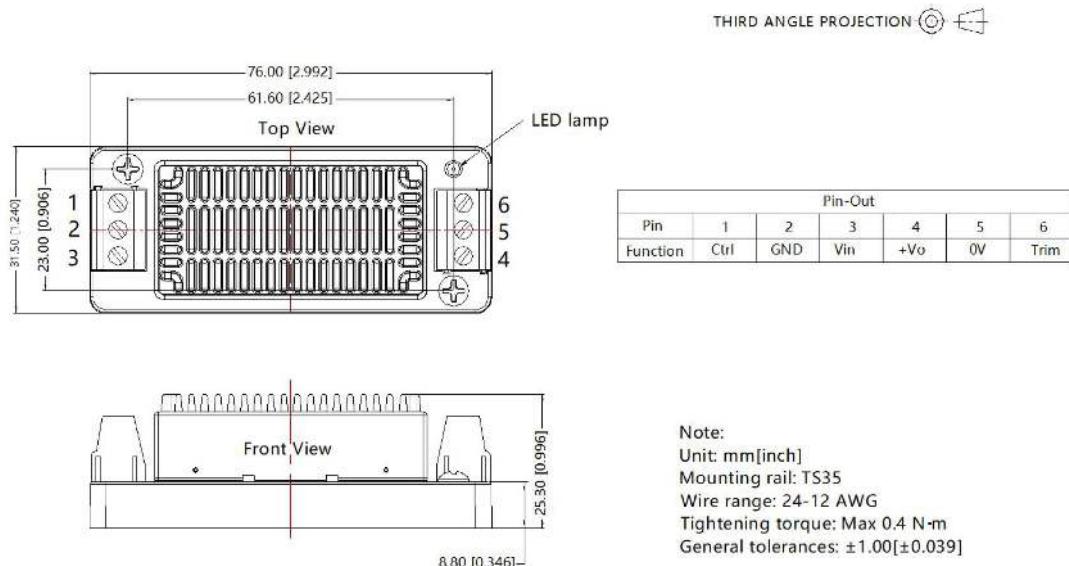
Horizontal Package- Dimensions and Recommended Layout (With Heat Sink)



50DAW_1.5R series

50W - Single Output - Wide Input - Isolated & Regulated
DC-DC Converter

Chassis Mounting - Dimensions and Recommended Layout (With Heat Sink)



Din-Rail mounting - Dimensions and Recommended Layout (With Heat Sink)

