



## 20DAWE\_1.6R series

20W - Single/Dual Output DC-DC Converter - Wide Input - Isolated

### DC-DC Converter

20 Watt

- ⊕ 2:1 input voltage range
- ⊕ Operating ambient temp. range: -40°C to +85°C
- ⊕ 1600VDC isolation voltage
- ⊕ Up to 90% efficiency
- ⊕ Short circuit protection (SCP)
- ⊕ Over current protection
- ⊕ Over voltage protection
- ⊕ MTBF: 1,000,000 hours

Introducing our new 20DAWE\_1.6R series, a robust and efficient DC-DC converter solution designed for reliable operation in demanding industrial environments. Featuring a 2:1 input voltage range, the series offers design flexibility across a wide range of applications. The converters are specified for an operating ambient temperature range from -40 °C to +85 °C and provide a 1600 VDC isolation voltage, ensuring safe and stable performance. With efficiencies of up to 90 %, the 20DAWE\_1.5 series helps minimize power losses and supports compact, thermally optimized designs. Integrated short circuit, over current, and over voltage protection enhance system reliability, while a high MTBF of 1,000,000 hours underlines the series' suitability for long-term and mission-critical applications.



Common specifications	
Short circuit protection	Input voltage range, continuous, self recovery
Switching frequency	300 kHz (PWM)
Operation temperature	-40°C ~+85°C (with derating)
Storage temperature	-55°C ~+125°C
Soldering Profile	Wave-soldering, 260°C (±5°C); time: 5 - 10s Manual-welding, 360°C (±10°C); time: 3 - 5s
Storage humidity	5-95% RH (non-condensing)
MTBF	> 1,000,000 hours (MIL-HDBK-217F@25°C))
Ctrl	Turn on module, ctrl pin open or pulled high (TTL2.7-12VDC) Turn off module, ctrl pin pulled low to GND (0-1.2VDC)
Input filter	PI Filter
Hot plug	Unavailable
Vibration	IEC/EN 61373 -Category 1,Grade B
Case material	Aluminum alloy
Mechanical dimensions	50.80 × 25.40 × 11.80mm
Weight	25.0g (typ.)
Cooling method	Free air convection

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

Output specifications						
Item	Test condition	Min	Typ	Max	Units	
Output voltage accuracy (0% - 100% load)	Vo1		±1.0	±3.0	%	
	Vo2		±2.0	±5.0		
Linear regulation (Vin = min. to max. @ full load)	Vo1		±0.2	±0.5	%	
	Vo2		±0.5	±1.0		
Load regulation (5% - 100% load)	Vo1		±0.5	±1.0	%	
	Vo2		±0.5	±1.5		
Load regulation	(0% - 100% load)		±1.0	±5.0		
Cross regulation	Dual out. with Positive out. at 50% load and negative out. from 10% - 100% load			±5.0	%	
Ripple & noise*	20MHz bandwidth, 5% - 100% load, parallel cable method		50	100	mVp-p	
Transient recovery time	25% load step change, nominal input voltage		300	500	µs	
Transient response deviation	25% load step change, nominal input voltage		±5.0	±8.0	%	
Temp. drift coefficient	Full load			±0.03	%/°C	
Trim	Input voltage range		90		110	
Over-voltage protection	Input voltage range		110		160	
Over-current protection	Input voltage range		110	140		

Note: \*Under 0% - 5% load conditions, ripple & noise does not exceed 5%Vo.

Isolation specifications						
Item	Test condition	Min	Typ	Max	Units	
Isolation Voltage	Input-output, test time 1 minute, leakage current less than 1mA	1600			VDC	
Isolation Resistance	Input-output, resistance at 500VDC	1000			MΩ	
Isolation Capacitance	Input-output, 100kHz/0.1V		2000		pF	

#### Example:

**20DAWE\_2405S1.6R**  
 20 = 20Watt; D = DIP; A = Series; W = Wide input; E = Cost effective;  
 24 = 24Vin; 05 = 5Vout; S = Single Output; 1.6 = 1600VDC isolation;  
 R = Revised

- The input voltage should not exceed the specified range value, otherwise it may cause permanent and irreparable damage;
- It is recommended to use at a load of over 5%. If the load is below 5%, the ripple index of the product may exceed the specifications, but it does not affect the reliability of the product;
- Suggested dual output module load imbalance:  $\leq \pm 5\%$ . If it exceeds  $\pm 5\%$ , it cannot be guaranteed that the product performance meets all performance indicators in this datasheet;
- The maximum capacitive load is tested within the input voltage range and under full load conditions;
- Unless otherwise specified, all indicators in this datasheet are measured at Ta = 25°C, humidity <75% RH, nominal input voltage, and output rated load;
- All indicator testing methods in this datasheet are based on our company's standards;
- For specific requirements please contact our technical team directly;
- Product specifications are subject to change without prior notice.

Input specifications						
Item	Test condition	Min	Typ	Max	Units	
Input current (full load/ no load)	<b>12VDC Nominal input</b>					
	• 15V Output (Dual)		1916/17	1960/25		
	• 24V Output (Dual)		1894/20	1938/30		
	<b>24VDC Nominal input</b>					
	• 3.3V Output (Single)		799/40	818/45		
	• 5/6/9V Output (Single)		947/40	969/80		
	• Others Output (Single)		936/6	958/10		
	• 3.3V Output (Dual)		818/40	838/45		
	• 5/6V Output (Dual)		969/40	993/80		
	• Others Output (Dual)		947/6	969/10		
	• 3.3V Output (Single)		400/20	409/25		
	• 5/6V Output (Single)		485/20	497/60		
• Others Output (Single)		474/5	485/9			
• 3.3V Output (Dual)		409/20	419/25			
• 5/6V Output (Dual)		485/20	496/60			
• Others Output (Dual)		474/5	485/9			
Reflected ripple current	Nominal input series		30		mA	
Surge voltage (1 sec. max.)	12VDC Nominal input	-0.7		25	VDC	
	24VDC Nominal input	-0.7		50		
	48VDC Nominal input	-0.7		100		
Starting voltage	12VDC Nominal input			9	VDC	
	24VDC Nominal input			18		
	48VDC Nominal input			36		
Undervoltage protection	12/24VDC Nominal input	5.5	6.5		VDC	
	48VDC Nominal input	12	15.5			
Start time	Nominal input and constant resistance load		10		ms	

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EMC specifications			
EMC	EMI	CE	CISPR32/EN55032 CLASS A (without extra components)/CLASS B (see fig. 3-② for recommended circuit)
EMC	EMI	RE	CISPR32/EN55032 CLASS A (without extra components)/CLASS B (see fig. 3-② for recommended circuit)
EMC	EMS	ESD	IEC/EN61000-4-2 Contact±4kV Perf. criteria B
EMC	EMS	RS	IEC/EN61000-4-3 10V/m Perf. criteria A
EMC	EMS	EFT	IEC/EN61000-4-4 ±2kV (see fig. 3-③ for recommended circuit) Perf. criteria B
EMC	EMS	Surge	IEC/EN61000-4-5 line to line ±2kV (see fig. 3-③ for recommended circuit) Perf. criteria B
EMC	EMS	CS	IEC/EN61000-4-6 3Vr.m.s Perf. criteria A

## Product Selection Guide

Approval	Part number	Input Voltage Nominal Range** (VDC)	Input Voltage*** Max. (VDC)	Output Voltage (VDC)	Output Current (mA) max.	Full Load Efficiency**** % (typ.)	Capacitive Load max. (µF)
	20DAWE_2403S1.6R	24 (18-36)	40	3.3	5000	86	10000
	20DAWE_2405S1.6R	24 (18-36)	40	5	4000	88	10000
	20DAWE_2406S1.6R	24 (18-36)	40	6	3333	88	8200
	20DAWE_2409S1.6R	24 (18-36)	40	9	2222	88	4700
	20DAWE_2412S1.6R	24 (18-36)	40	12	1667	89	1600
	20DAWE_2415S1.6R	24 (18-36)	40	15	1333	90	1000
	20DAWE_2418S1.6R	24 (18-36)	40	18	1111	90	820
	20DAWE_2424S1.6R	24 (18-36)	40	24	833	90	500
	20DAWE_4803S1.6R	48 (36-75)	80	3.3	5000	86	10000
	20DAWE_4805S1.6R	48 (36-75)	80	5	4000	86	10000
	20DAWE_4806S1.6R	48 (36-75)	80	6	3333	87	8200
	20DAWE_4809S1.6R	48 (36-75)	80	9	2222	88	4700
	20DAWE_4812S1.6R	48 (36-75)	80	12	1667	89	1600
	20DAWE_4815S1.6R	48 (36-75)	80	15	1333	89	1000
	20DAWE_4818S1.6R	48 (36-75)	80	18	1111	88	820
	20DAWE_4824S1.6R	48 (36-75)	80	24	833	88	500

Approval	Part number	Input Voltage Nominal Range** (VDC)	Input Voltage*** Max. (VDC)	Output Voltage (VDC)	Output Current (mA) max.	Full Load Efficiency**** % (typ.)	Capacitive Load***** max. (µF)
	20DAWE_1215D1.6R	12 (9-18)	20	±15	±667	87	625
	20DAWE_1224D1.6R	12 (9-18)	20	±24	±417	88	220
	20DAWE_2403D1.6R	24 (18-36)	40	±3.3	±2500	84	4800
	20DAWE_2405D1.6R	24 (18-36)	40	±5	±2000	86	4800
	20DAWE_2406D1.6R	24 (18-36)	40	±6	±1667	87	3300
	20DAWE_2409D1.6R	24 (18-36)	40	±9	±1111	88	2200
	20DAWE_2412D1.6R	24 (18-36)	40	±12	±833	88	800
	20DAWE_2415D1.6R	24 (18-36)	40	±15	±667	89	625
	20DAWE_2418D1.6R	24 (18-36)	40	±18	±556	89	470
	20DAWE_2424D1.6R	24 (18-36)	40	±24	±417	89	330
	20DAWE_4803D1.6R	48 (36-75)	80	±3.3	±2500	84	4800
	20DAWE_4805D1.6R	48 (36-75)	80	±5	±2000	86	4800
	20DAWE_4806D1.6R	48 (36-75)	80	±6	±1667	87	3300
	20DAWE_4809D1.6R	48 (36-75)	80	±9	±1111	88	2200
	20DAWE_4812D1.6R	48 (36-75)	80	±12	±833	88	800
	20DAWE_4815D1.6R	48 (36-75)	80	±15	±667	89	625
	20DAWE_4818D1.6R	48 (36-75)	80	±18	±556	89	470
	20DAWE_4824D1.6R	48 (36-75)	80	±24	±417	89	330

Note:  
Please note: Add suffix /CM for chassis mount option; add suffix /DR for DIN rail option; add suffix /HS for heat sink option i.e. 20DAWE\_4824D1.6R/DR  
\*\* The /CM and /DR start-up and minimum input voltages are increased by 1VDC due to the input reverse polarity protection circuit;  
\*\*\* Absolute maximum stress rating without damage (not recommended);  
\*\*\*\* Efficiency is measured at nominal input voltage and rated output load; efficiencies for „CW“ and „CR“ Model's is decreased by 2% due to the input reverse polarity protection circuit.  
\*\*\*\*\* The specified maximum capacitive load value for positive and negative output is identical.

Typical characteristics

Temperature derating graph  
(Single/Dual others)

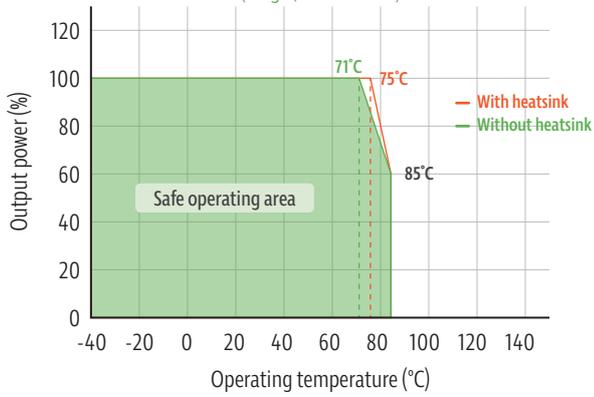


Figure 1

Temperature derating graph

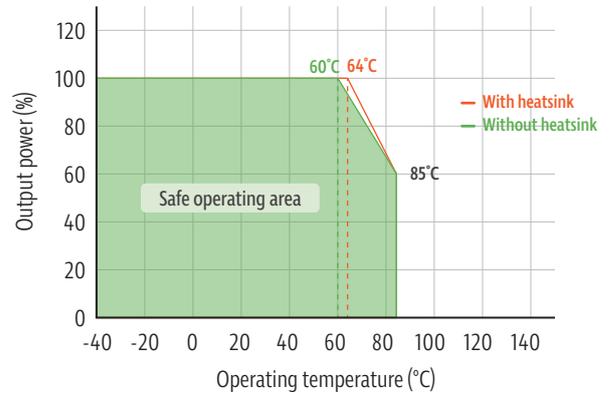
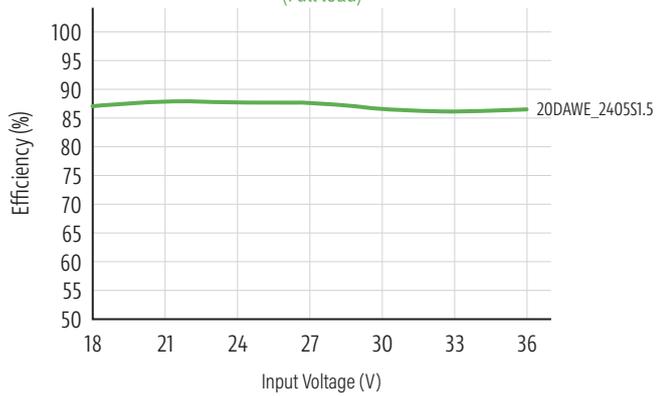
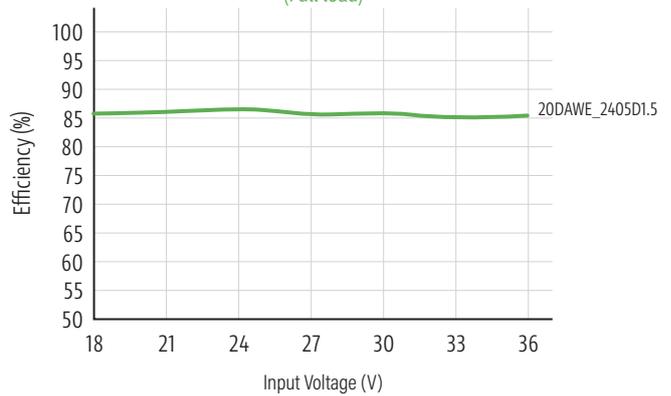


Figure 1

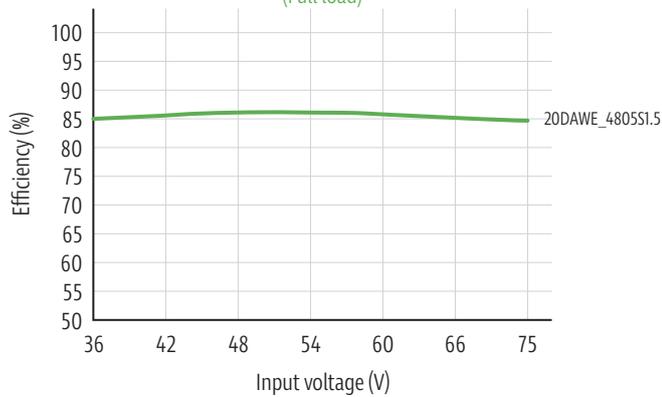
Efficiency vs input voltage  
(Full load)



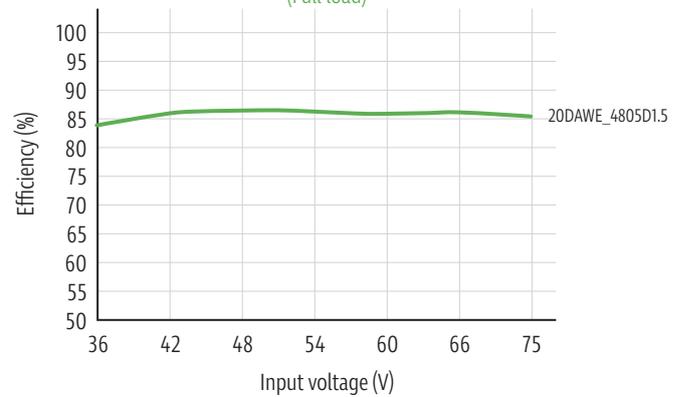
Efficiency vs input voltage  
(Full load)



Efficiency vs input voltage  
(Full load)

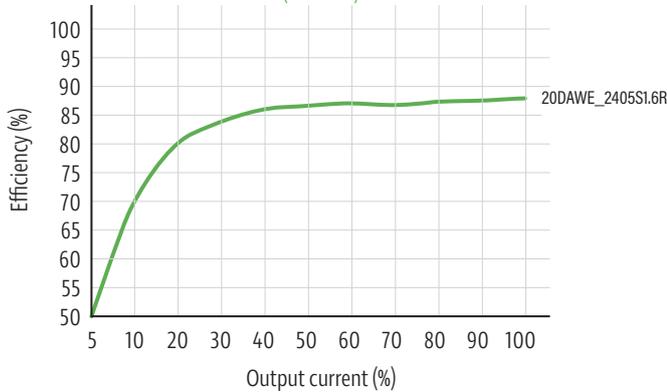


Efficiency vs input voltage  
(Full load)

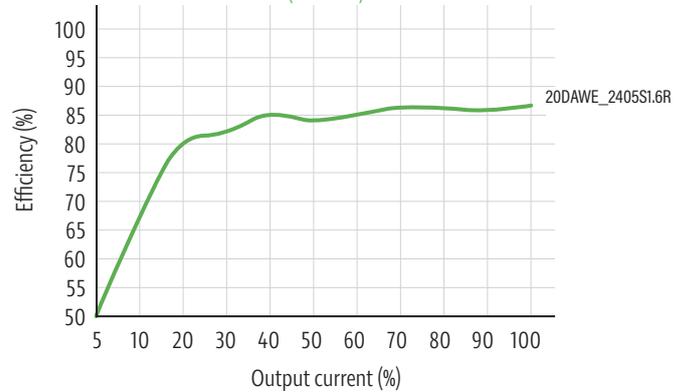


## Typical characteristics

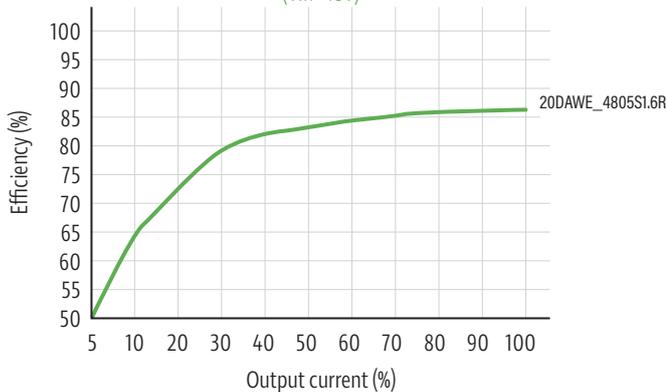
**Efficiency vs output load**  
(Vin=24V)



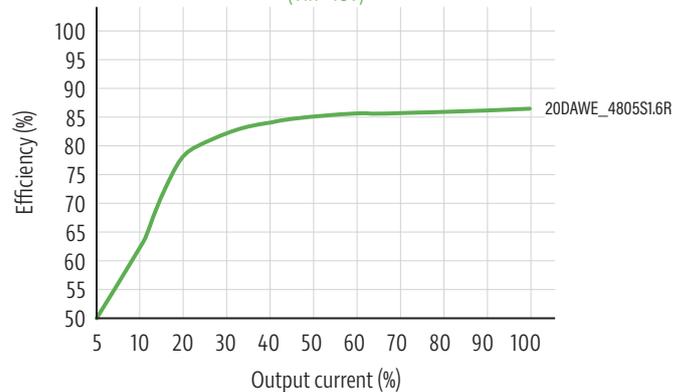
**Efficiency vs output load**  
(Vin=24V)



**Efficiency vs output load**  
(Vin=48V)



**Efficiency vs output load**  
(Vin=48V)



## Typical circuit design and application

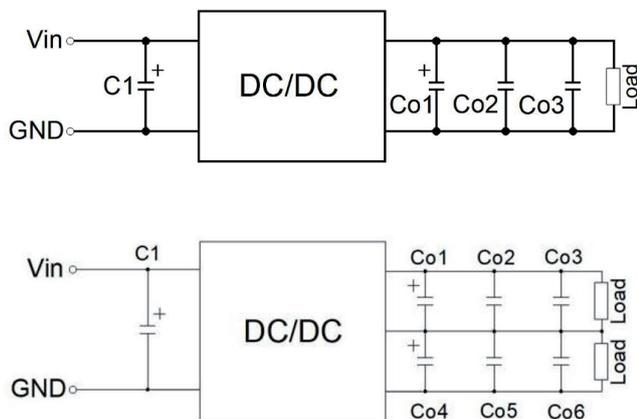


Figure 2

Recommended Capacitive Load Value Table

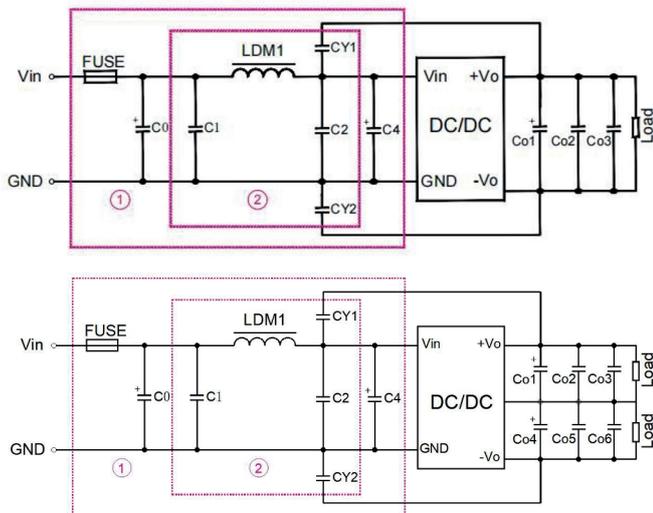
Vout (VDC)	C1	Co1/Co4	Co2/Co5	Co3/Co6
3.3/5/6	100µF/100V	100µF/16V	10µF/50V	0.1µF/16V
9/12/15	100µF/100V	100µF/25V	10µF/50V	0.1µF/25V
18/24	100µF/100V	47µF/50V	10µF/50V	0.1µF/50V

All the 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 C1 and Co1/Co2/Co3 /Co4/Co5/Co6/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.

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### EMI recommended component parameters

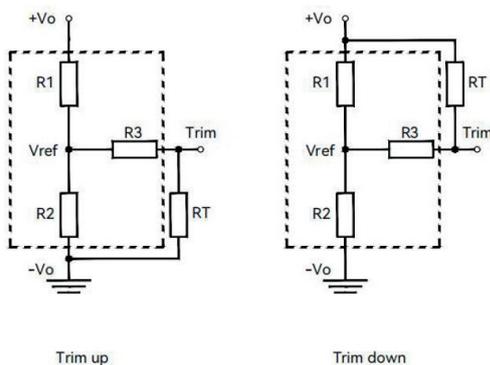


EMI recommended component parameters

Model	Vin: 12V/24V	Vin: 48V
FUSE	Select according to the actual input current of the customer	
C0/C4	330uF/50V	330uF/100V
C1/C2	4.7uF/50V	4.7uF/100V
LDM1	10uH/4A	10uH/2A
Co1/Co2/Co3/Co4/Co5/Co6	Refer figure 2 capacitive load value table	
CY1/CY2	1nF/2kVDC	

Notes: For EMC tests we use Part ① in fig. 3 for immunity and part ② for emissions test. Selecting based on needs.

### Trim recommended circuit



Pin Definition Table

Vout(V)	R1 (KΩ)	R2 (KΩ)	R3 (KΩ)	Vref (V)
3.3	10	6.064	13.622	1.24
5	2.4	2.344	13.622	2.5
6	10	6.982	13.622	2.5
9	12	4.602	17.346	2.5
12	8.2	2.153	17.346	2.5
15	12	2.388	21.016	2.5
18	24	3.868	33.275	2.5
24	10	1.158	10.714	2.5

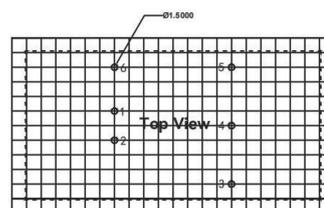
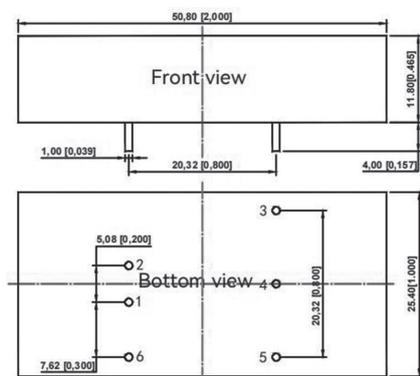
$$\text{Up : } R_t = \frac{nR_2}{R_2 - n} - R_3$$

$$n = \frac{V_{ref}}{V_o - V_{ref}} * R_1$$

$$\text{Down : } R_t = \frac{nR_1}{R_1 - n} - R_3$$

$$n = \frac{V_o - V_{ref}}{V_{ref}} * R_2$$

### Mechanical dimensions



The grid distance is 2.54mm x2.54mm

Note:  
Unit: mm [inch]  
Pin section tolerances: ±0.10 [±0.004]  
General tolerances: ±0.5 0[±0.020]

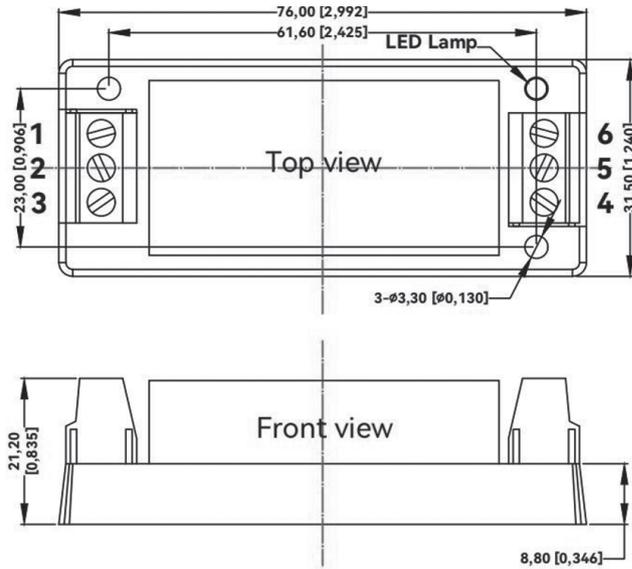
Pin definition table

Pin	Single	Dual
1	GND	GND
2	Vin	Vin
3	+Vo	+Vo
4	Trim	COM
5	-Vo	-Vo
6	Ctrl	Ctrl

## 20DAWE\_1.6R series

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### Chassis mounting dimensions



Pin definition table		
Pin	Single	Dual
1	Ctrl	Ctrl
2	GND	GND
3	Vin	Vin
4	+Vo	+Vo
5	Trim	COM
6	-Vo	-Vo

Note:

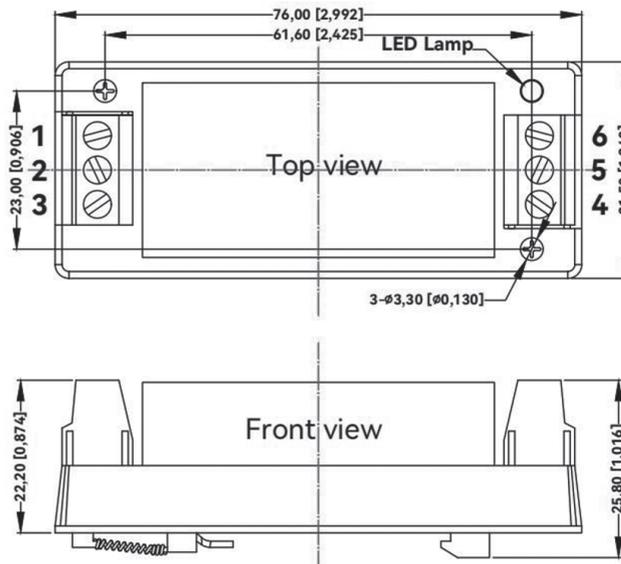
Unit: mm [inch]

Wire range: 24-12 AWG

General tolerances: ±1.00 [±0.039]

Tightening torque: Max 0.4 N·m

### DIN rail mounting dimensions



Pin definition table		
Pin	Single	Dual
1	Ctrl	Ctrl
2	GND	GND
3	Vin	Vin
4	+Vo	+Vo
5	Trim	COM
6	-Vo	-Vo

Note:

Unit: mm [inch]

Wire range: 24-12 AWG

General tolerances: ±1.00 [±0.039]

Tightening torque: Max 0.4 N·m