

Features

Regulated Converters

- Wide 2:1 Input Voltage Range
- 1.6kVDC Isolation
- UL Certified
- Efficiency up to 91%
- Six-Sided Continuous Shield
- No Minimum Load

RECOM
DC/DC Converter

RP20-A

20 Watt

1" x 1"

Single & Dual Output



Description

The RP20-A series are ultraminiature 2:1 input voltage range power DC/DC converters in a case half the size of industry standard 20W converters. Despite their small size, the RP20-A converters are fully specified devices with output currents up to 4.5 Amps, up to 91% efficiency, no minimum load, 1600VDC isolation, a built-in Class A EMC filter and low ripple/noise figures. The outputs are also fully protected against short circuits, overcurrent and overvoltage. The no load input current is particularly low (only 4mA/6mA). The RP20-A series will find many uses in applications where board space and/or board height is at a premium or in battery-powered systems where standby current is important.

Selection Guide

Part Number	Input Voltage Range [VDC]	Output Voltage [VDC]	Output Current [mA]	Input ⁽¹⁾ Current [mA]	Efficiency ⁽¹⁾ typ. [%]	Max. Capacitive Load ⁽²⁾ [μF]
RP20-123.3SA ^(3,4)	9-18	3.3	4500	1390	89	7000
RP20-1205SA ^(3,4)	9-18	5	4000	1873	89	5000
RP20-1212SA ^(3,4)	9-18	12	1670	1876	89	850
RP20-1215SA ^(3,4)	9-18	15	1330	1868	89	700
RP20-243.3SA ^(3,4)	18-36	3.3	4500	688	90	7000
RP20-2405SA ^(3,4)	18-36	5	4000	916	91	5000
RP20-2412SA ^(3,4)	18-36	12	1670	928	90	850
RP20-2415SA ^(3,4)	18-36	15	1330	913	91	700
RP20-483.3SA ^(3,4)	36-75	3.3	4500	344	90	7000
RP20-4805SA ^(3,4)	36-75	5	4000	463	90	5000
RP20-4812SA ^(3,4)	36-75	12	1670	464	90	850
RP20-4815SA ^(3,4)	36-75	15	1330	462	90	700
RP20-1212DA ^(3,4)	9-18	±12	±833	1872	89	±500
RP20-1215DA ^(3,4)	9-18	±15	±667	1853	90	±350
RP20-2412DA ^(3,4)	18-36	±12	±833	926	90	±500
RP20-2415DA ^(3,4)	18-36	±15	±667	926	90	±350
RP20-4812DA ^(3,4)	36-75	±12	±833	468	89	±500
RP20-4815DA ^(3,4)	36-75	±15	±667	463	90	±350

Notes:

Note1: Values at nominal input voltage and full load

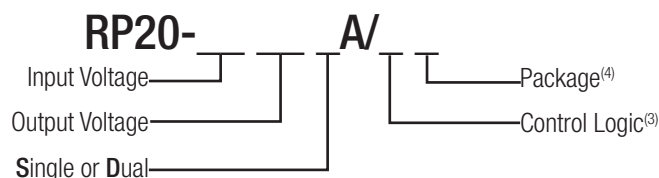
Note2: Test by minimum Vin and constant resistor load.



UL
E196683

UL60950-1 Certified

Model Numbering



Ordering Examples

RP20-2405SA/P = 24V Input, 5V Output, Positive Logic CTRL pin and Trim pin fitted

RP20-4812DA-HC = 48V Input, ±12V Output, Heat-sink fitted

Notes:

Note3: no suffix for standard part without Trim or CTRL

add suffix "P" for CTRL function with positive logic (1=ON, 0=OFF) and trim pin

add suffix "N" for CTRL function with negative logic (0=ON, 1=OFF) and trim pin

Note4: add suffix -HC for premounted Heat-sink and clips

Specifications measured at Ta = 25°C, nominal input voltage, full load otherwise noted

BASIC CHARACTERISTICS

Parameter	Condition	Min.	Typ.	Max.
Input Voltage Range	nom. Vin = 12V nom. Vin = 24V nom. Vin = 48V	9VDC 18VDC 36VDC	12VDC 24VDC 48VDC	18VDC 36VDC 75VDC
Under Voltage Lockout (UVLO)	Vin = 12V DC-DC ON DC-DC OFF		8VDC	9VDC
	Vin = 24V DC-DC ON DC-DC OFF		16VDC	18VDC
	Vin = 48V DC-DC ON DC-DC OFF		33VDC	36VDC
Input Filter	Pi-Type			
Input Reflected Ripple ⁽⁵⁾	nominal Vin and full load		30mAp-p	
Input Surge Voltage	Vin = 12V, 100ms max. Vin = 24V, 100ms max. Vin = 48V, 100ms max.			25VDC 50VDC 100VDC
Start-up time	Power up Remote ON/OFF			30ms 30ms
Operating Frequency Range	3.3Vout, 5Vout Others	248kHz 297kHz	275kHz 330kHz	303kHz 363kHz
Minimum Load		0%		
Ripple and Noise	measured by 20Mhz bandwidth with a 1μF M/C X7R and a 10μF T/C	Single	75mVp-p	
	measured by 20Mhz bandwidth with a 1μF M/C X7R and a 10μF T/C for each output	Dual	100mVp-p	
Remote ON/OFF ⁽⁶⁾	Positive Logic	DC-DC ON DC-DC OFF	Open or 3.0V < Vr < 15V Short or 0V < Vr < 1.2V	
	Negative Logic	DC-DC ON DC-DC OFF	Short or 0V < Vr < 1.2V Open or 3.0V < Vr < 15V	
Input current of Remote pin (CTRL)		DC-DC OFF	2mA	
		DC-DC ON	-0.5mA	1.0mA

Notes:

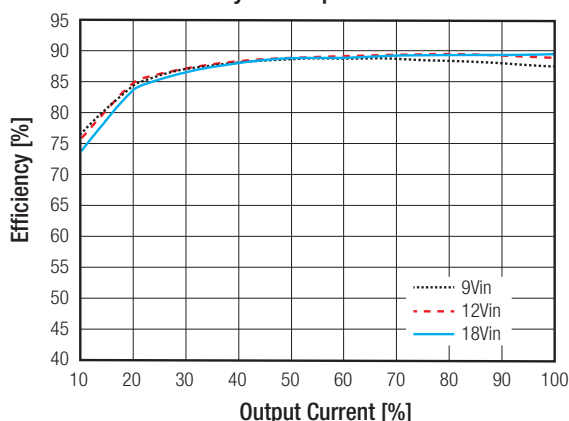
Note5: Simulated source impedance of 12μH. 12μH inductor in series with +Vin.

Note6: The ON/OFF control function can be positive or negative logic. The pin voltage is referenced to -Vin pin.

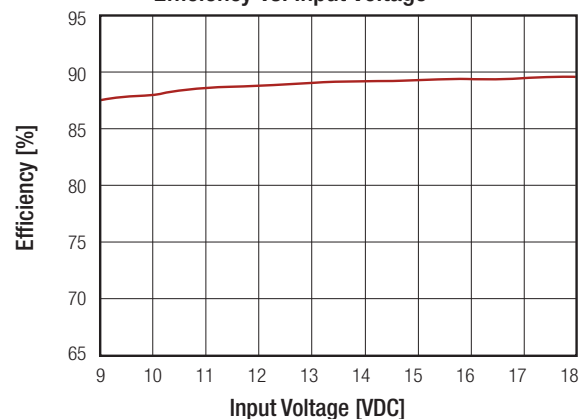
If no suffix is specified, the control pin will be omitted.

RP20-1205SA

Efficiency vs. Output Current



Efficiency vs. Input Voltage

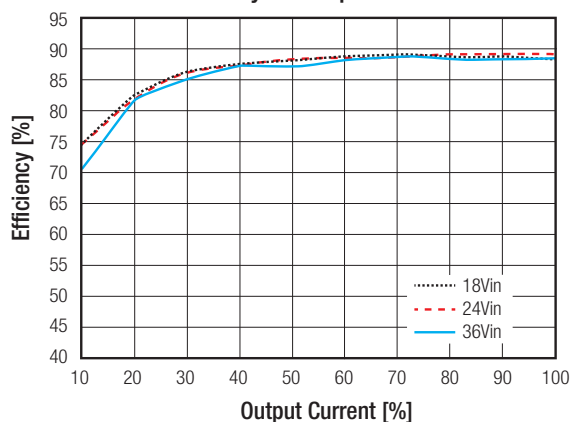


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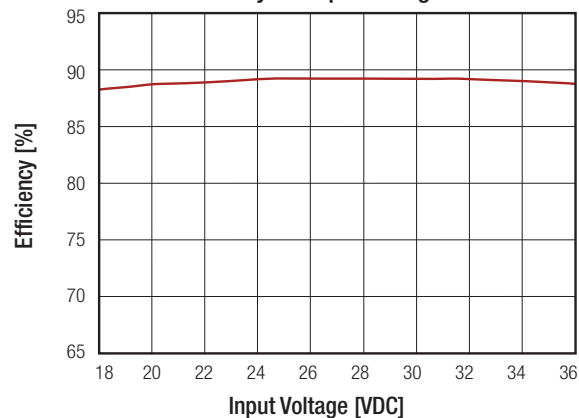
Specifications measured at $T_a = 25^\circ\text{C}$, nominal input voltage, full load otherwise noted

RP20-2405SA

Efficiency vs. Output Current

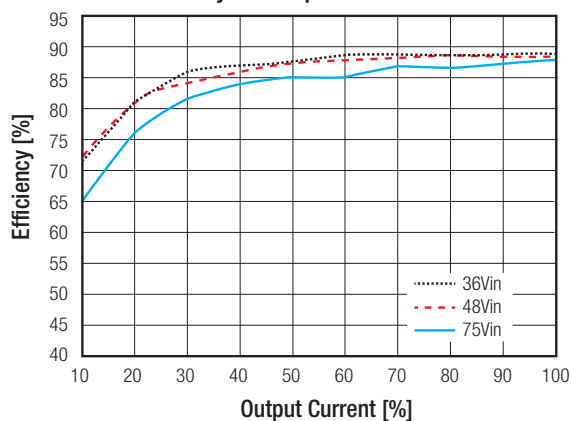


Efficiency vs. Input Voltage

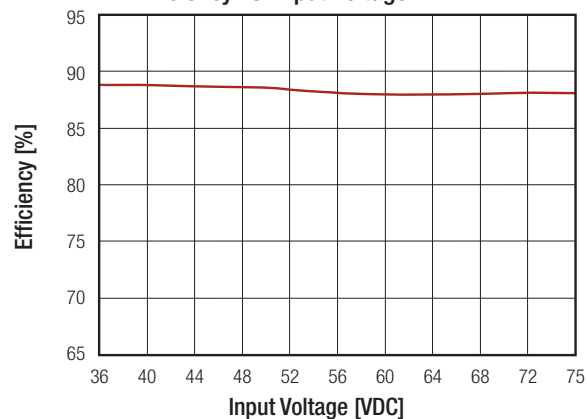


RP20-4805SA

Efficiency vs. Output Current



Efficiency vs. Input Voltage



REGULATIONS

Parameter	Condition		Value
Output Voltage Accuracy			$\pm 1\%$
Output Trimming	Single		$\pm 10\%$
Line Voltage Regulation	Single		$\pm 0.2\%$
	Dual		$\pm 0.5\%$
Load Voltage Regulation	0% to 100% load	Single	$\pm 0.2\%$
		Dual	$\pm 1.0\%$
	10% load to 90% load	Single	$\pm 0.1\%$
		Dual	$\pm 0.8\%$
Cross Regulation	asymmetrical 25% <> 100% load		$\pm 5\%$
Transient Response recovery time	25% load step change		250 μs

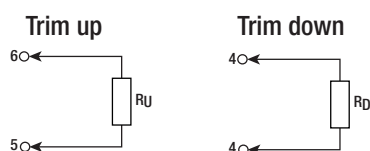
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Specifications measured at $T_a = 25^\circ\text{C}$, nominal input voltage, full load otherwise noted

External Output Trimming

Output Voltage Trimming

Some single/dual output Powerline converters offer the feature of trimming the output voltage over a certain range around the nominal value by using external trim resistors. No general equation can be given for calculating the trim resistors, but the following trimtables give typical values for choosing these trimming resistors. If voltages between the given trim points are required, extrapolate between the two nearest given values to work out the resistor required or use a variable resistor to set the output voltage. Output can be externally trimmed by using the method shown below.



RP20-xx3.3S

Trim up	1	2	3	4	5	6	7	8	9	10	%
V _{out} =	3.333	3.366	3.399	3.432	3.465	3.498	3.531	3.564	3.597	3.63	Volts
R _U =	57.93	26.16	15.58	10.28	7.11	4.99	3.48	2.34	1.46	0.75	kOhms
Trim down	1	2	3	4	5	6	7	8	9	10	%
V _{out} =	3.267	3.234	3.201	3.168	3.135	3.102	3.069	3.036	3.003	2.97	Volts
R _D =	69.47	31.23	18.49	12.12	8.29	5.74	3.92	2.56	1.50	0.65	kOhms

RP20-xx05S

Trim up	1	2	3	4	5	6	7	8	9	10	%
V _{out} =	5.05	5.10	5.15	5.20	5.25	5.30	5.35	5.4	5.45	5.50	Volts
R _U =	36.57	16.58	9.92	6.58	4.59	3.25	2.30	1.59	1.03	0.59	kOhms
Trim down	1	2	3	4	5	6	7	8	9	10	%
V _{out} =	4.95	4.90	4.85	4.80	4.75	4.70	4.65	4.60	4.55	4.50	Volts
R _D =	45.53	20.61	12.31	8.15	5.66	4.00	2.81	1.92	1.23	0.68	kOhms

RP20-xx12S

Trim up	1	2	3	4	5	6	7	8	9	10	%
V _{out} =	12.12	12.24	12.36	12.48	12.60	12.72	12.84	12.96	13.08	13.20	Volts
R _U =	367.91	165.95	98.64	64.98	44.78	31.32	21.70	14.49	8.88	4.39	kOhms
Trim down	1	2	3	4	5	6	7	8	9	10	%
V _{out} =	11.88	11.76	11.64	11.52	11.40	11.28	11.16	11.04	10.92	10.8	Volts
R _D =	460.99	207.95	123.60	81.42	56.12	39.25	27.20	18.16	11.13	5.51	kOhms

RP20-xx15S

Trim up	1	2	3	4	5	6	7	8	9	10	%
V _{out} =	15.15	15.3	15.45	15.60	15.75	15.90	16.05	16.20	16.35	16.50	Volts
R _U =	404.18	180.59	106.06	68.80	46.44	31.53	20.88	12.90	6.69	1.72	kOhms
Trim down	1	2	3	4	5	6	7	8	9	10	%
V _{out} =	14.85	14.70	14.55	14.40	14.25	14.10	13.95	13.80	13.65	13.50	Volts
R _D =	499.82	223.41	131.27	85.20	57.56	39.14	25.97	16.10	8.42	2.282	kOhms

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Specifications measured at $T_a = 25^\circ\text{C}$, nominal input voltage, full load otherwise noted

Dual Output Voltage Trim Tables

RP20-xx12D

Trim up	1	2	3	4	5	6	7	8	9	10	%
Vout =	24.24	24.48	24.72	24.96	25.20	25.44	25.68	25.92	26.16	26.40	Volts
$R_U =$	218.21	98.10	58.07	38.05	26.04	18.03	12.32	8.03	4.69	2.02	kOhms
Trim down	1	2	3	4	5	6	7	8	9	10	%
Vout =	23.76	23.52	23.28	23.04	22.80	22.56	22.32	22.08	21.84	21.6	Volts
$R_D =$	273.44	123.02	72.87	47.80	32.76	22.73	15.57	10.20	6.02	2.67	kOhms

RP20-xx15D

Trim up	1	2	3	4	5	6	7	8	9	10	%
Vout =	30.30	30.60	30.90	31.20	31.50	31.80	32.10	32.40	32.70	33.00	Volts
$R_U =$	268.29	120.64	71.43	46.82	32.06	22.21	15.10	9.91	5.81	2.53	kOhms
Trim down	1	2	3	4	5	6	7	8	9	10	%
Vout =	29.70	29.40	29.10	28.80	28.50	28.20	27.90	27.60	27.30	27.00	Volts
$R_D =$	337.71	152.02	90.13	59.18	40.61	28.23	19.39	12.76	7.60	3.47	kOhms

PROTECTIONS

Parameter	Condition		Value
Short Circuit Protection (SCP)			continuous, automatic recovery
Over Voltage Protection (OVP)	Zener Diode Clamp	3.3Vout 5Vout 12Vout 15Vout	3.7VDC - 5.4VDC 5.6VDC - 7.0VDC 13.5VDC - 19.6VDC 16.8VDC - 20.5VDC
Over Load Protection (OLP)	% Iout rated; Hiccup mode		150% typ.
Isolation Voltage	I/P to O/P I/P to O/P to case		1.6kVDC/1 minute 1.0kVDC/1 minute
Isolation Resistance	500 VDC		1G Ω min.
Isolation Capacitance			1500pF max.

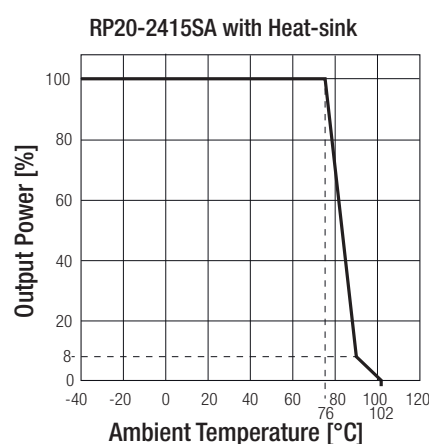
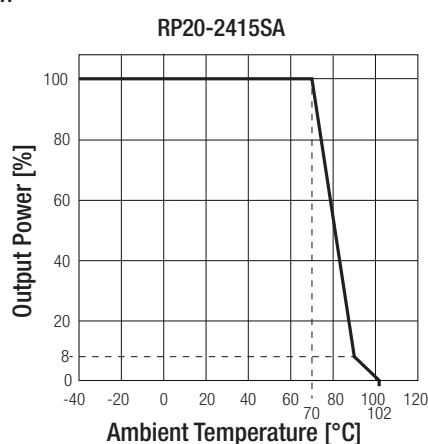
Notes:

Note7: This power module is not internally fused. An input line fuse must always be used.

Specifications measured at Ta = 25°C, nominal input voltage, full load otherwise noted

ENVIRONMENTAL		
Parameter	Condition	Value
Operating Temperature Range	without derating with derating	-40°C to +70°C -40°C to +102°C
Maximum Case Temperature		+105°C
Operating Humidity		5% - 95% RH
Temperature Coefficient		±0.02%/°C max.
Thermal Impedance	Natural convection (20LFM) Natural convection (20LFM) with Heat-sink	17,6°C/Watt 14,8°C/Watt
Thermal Shock		MIL-STD-810F
Vibration		MIL-STD-810F
MTBF	MIL-HDBK-217F Bellcore TR-NWT-000332 ⁽⁸⁾	1477 x 10 ³ hours 1766 x 10 ³ hours

Derating Graph⁽¹⁰⁾



Notes:

Note8: BELLCORE TR-NWT-000332. Case I: 50% Stress, Temperature at 40°C.

MIL-HDBK 217F Notice 2. Ta = 25°C, full load, (Ground, Benign, controlled environment).

Note9: Derating graphs are valid only for the shown part numbers. If you need detailed derating-information about a part-number not shown here please contact our technical support service at techsupportAT@recom-power.com

SAFETY AND CERTIFICATIONS		
Certificate Type (Safety)	Condition	Standard
UL General Safety	E196683	UL60950-1 1st Ed.: 2003 C22.2 No. 60950 1st. Ed.: 2003
EMC Compliance	Condition	Standard / Criterion
EMI Standard ⁽¹⁰⁾	with external filter	EN55022, Class A, Class B
ESD	Air ±8kV and Contact ±6kV	EN61000-4-2, Criteria A
Radiated Immunity	10 V/m	EN61000-4-3, Criteria A
Fast Transient ⁽¹¹⁾	±2kV	EN61000-4-4, Criteria A
Surge ⁽¹¹⁾	±2kV	EN61000-4-5, Criteria A
Conducted Immunity	10 Vr.m.s	EN61000-4-6, Criteria A

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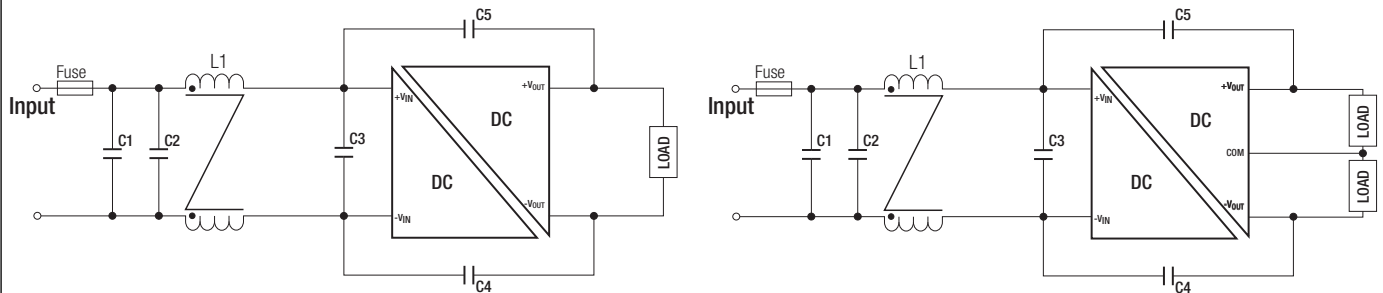
Specifications measured at $T_a = 25^\circ\text{C}$, nominal input voltage, full load otherwise noted

Notes:

Note10: The standard modules meet EMI Class A or Class B with external components, see filter suggestions below.

Note11: An external input filter capacitor is required if the module has to meet EN61000-4-4, EN61000-4-5. The filter capacitor Recom suggests: Nippon chemi-con KY series, 220 μF /100V.

EMI Filtering Class B



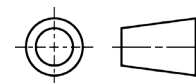
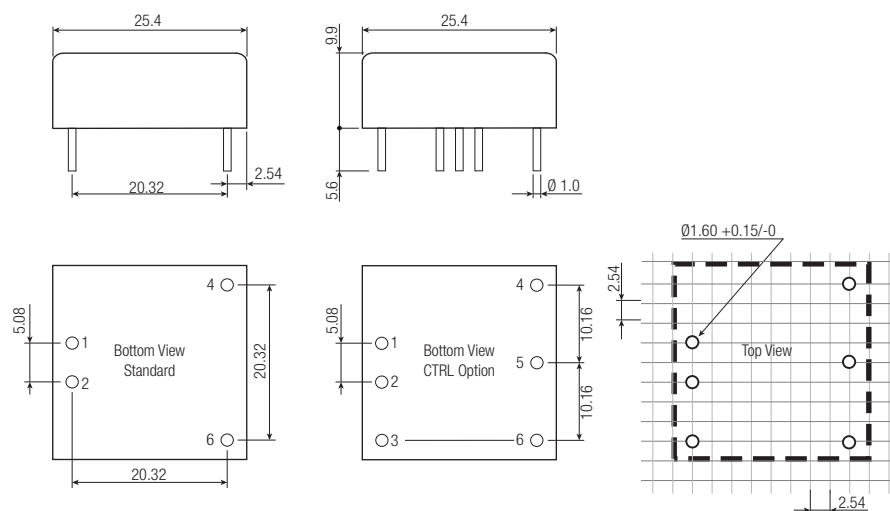
MODEL	C1	C2	C3	C4/C5	L1
RP20-12xxSA	4.7 μF /25V 1812 MLCC	N/A	N/A	470pF/2kV 1808 MLCC	CMC: 325 μH ref.: WE 744290321 ref.: CMC-06
RP20-24xxSA	4.7 μF /25V 1812 MLCC	N/A	N/A	470pF/2kV 1808 MLCC	CMC: 325 μH ref.: WE 744290321 ref.: CMC-06
RP20-48xxSA	2.2 μF /100V 1812 MLCC	2.2 μF /100V 1812 MLCC	2.2 μF /100V 1812 MLCC	470pF/2kV 1808 MLCC	CMC: 325 μH ref.: WE 744290321 ref.: CMC-06

DIMENSIONS and PHYSICAL CHARACTERISTICS		
Parameter	Type	Value
Material	Case	Nickel coated copper
	Base	FR4 PCB
	Potting	Silicone (UL94 V-0)
Packaging Dimension (LxWxH)	without Heat-sink	25.4 x 25.4 x 9.9mm
	with Heat-sink	31.4 x 25.4 x 16.5mm
Packaging Weight	without Heat-sink	15g
	with Heat-sink	21.44g

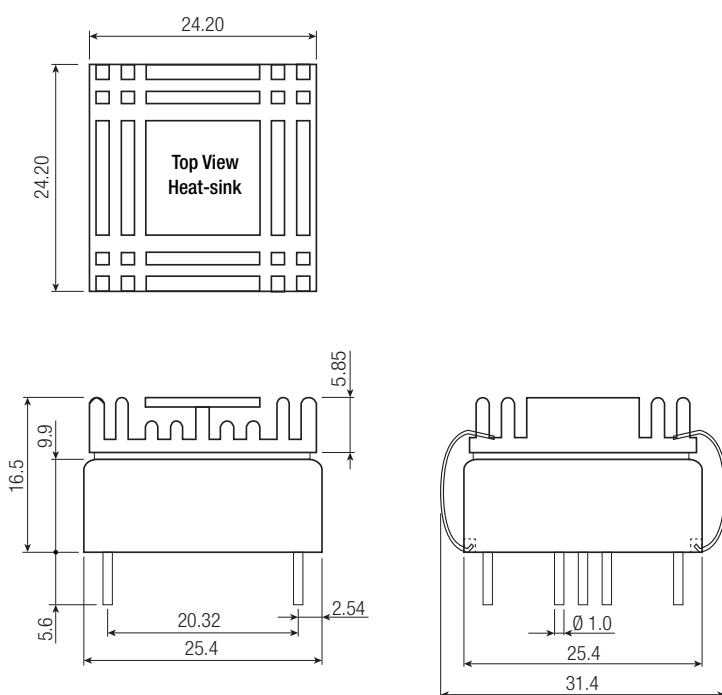
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Specifications measured at Ta = 25°C, nominal input voltage, full load otherwise noted

Dimension Drawing (mm)



Dimension Drawing (mm) with Heat-sink



Pin Connections

Pin #	Single	Dual
1	+Vin	+Vin
2	-Vin	-Vin
3	CTRL	CTRL
4	+Vout	+Vout
5	Trim	Com
6	-Vout	-Vout

Pin Pitch Tolerance ± 0.25 mm
Pin dimension tolerance ± 0.1 mm
XX.X ± 0.5 mm
XX.XX ± 0.25 mm

PACKAGING INFORMATION

Parameter	Type	Value
Packaging Quantity	without Heat-sink	8pcs.
	with Heat-sink	20pcs.
Storage Temperature Range		-55°C to +125°C
Storage Humidity		5% - 95% RH

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