Technical Data Sheet

RAC20-K Series ◊ AC/DC Power Supply

20W ◊ Input: 100V-240(277)VAC

RECOM
AC/DC Converter

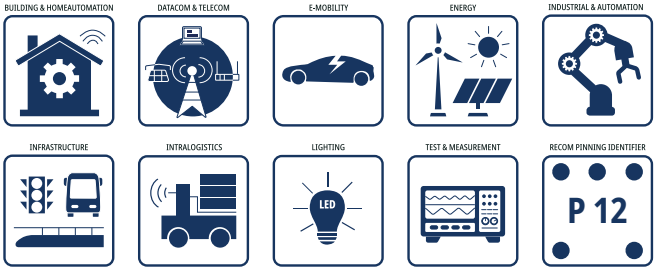
FEATURES

- Wide input range 85-264VAC / 85-305VAC
- Standby mode optimized PSU (ENER Lot 6)
- Operating Altitude up to 5000m
- Operating temperature range: -40°C to +85°C
- Class II installations (without FG)
- EMC compliant without external components
- No load power consumption 40mW typ.
- Wired connection variants
- 3 year warranty



THT= 2.0 x 1.0 x 0.9 inch
Wired= 2.0 x 1.0 x 0.9 inch

APPLICATIONS



SAFETY & EMC

CE
cULus E314885
IECEE CB SCHEME
ERP
HOUSEHOLD CERTIFIED EN-60335-1
RoHS² compliant 10 from 10
Reach compliant

DESCRIPTION

The RAC20-K series are highly efficient PCB-mount power conversion modules with ultra-low energy losses especially in light load conditions, making them a benchmark for always-on and standby mode operations, which are typically coming along with IoT and smart applications. The power supply units cover worldwide mains input range of 85VAC up to 305VAC and come with international safety certifications for industrial, AV and ITE as well as household standards. These AC/DC modules operate in a temperature range of -40°C to +85°C with up to 5000m operating altitude and offer fully protected single or dual outputs as well as EMC class B compliance without the need of any external components in floating connections. Wired connected "/NE" Versions are OVC III approved.

SELECTION GUIDE

Part Number	Input Voltage Range [VAC]		Output Voltage [VDC]	Output Current nom. [mA]	Efficiency (1) typ. [%]	Max. Capacitive Load (2) [µF]	Output Power continuous [W]
	Basic	Extended					
RAC20-05SK (3, 5)	85-264	85-305	5	4000	84	10000	20
RAC20-07SK (5)	85-264	-	7	2860	85	15000	20
RAC20-12SK (3, 4, 5)	85-264	85-305	12	1670	86	8000	20
RAC20-15SK (3, 5)	85-264	85-305	15	1333	86	1500	20
RAC20-24SK (3, 4, 5)	85-264	85-305	24	830	85	1000	20
RAC20-48SK (5)	85-264	-	48	410	85	330	20
RAC20-12DK (3)	85-264	85-305	±12	±833	84	±1200	20
RAC20-15DK (3)	85-264	85-305	±15	±670	84	±1000	20

Note1: Efficiency is tested at 230VAC input and constant resistive load at +25°C ambient
Note2: Max Cap Load is tested at nominal input and full resistive load

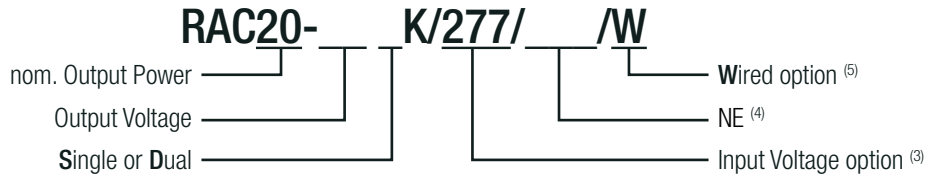
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RAC20-K Series ◊ AC/DC Power Supply

20W ◊ Input: 100V-240(277)VAC

RECOM AC/DC Converter

Model Numbering



Note3: Add suffix "/277" for extended input voltage range (85-305VAC)
without suffix= Basic input range 85-264VAC
For detail information refer to **„Nominal Input Voltage"**

Note4: use suffix "/NE/W" for wired items with OVC III rating and enhanced EMI filtering

Note5: Add suffix „/W" for wired version (single output only, combination of "/W" with "/277", only available as "/277/NE/W" for 12V and 24V output)
without suffix= standard THT version

ORDERING INFORMATION

Model	Output Voltage	Package Type Suffix			
		Basic (no suffix)	"/277"	"/W"	"/277/NE/W"
RAC20-05SK	5VDC	y	y	y	N/A
RAC20-07SK	7VDC	y	N/A	on request	N/A
RAC20-12SK	12VDC	y	y	use "/NE/W" for new designs	y
RAC20-15SK	15VDC	y	y	y	N/A
RAC20-24SK	24VDC	y	y	use "/NE/W" for new designs	y
RAC20-48SK	48VDC	y	N/A	y	N/A
RAC20-12DK	±12VDC	y	y	N/A	N/A
RAC20-15DK	±15VDC	y	y	N/A	N/A

y= standard portfolio; on request= MOQ may apply on project base; N/A= not available

BASIC CHARACTERISTICS (measured @ T_{AMB}= 25°C, nom. V_{IN}, full load and after warm-up unless otherwise stated)

Parameter	Condition		Min.	Typ.	Max.
Nominal Input Voltage	50/60Hz	basic version	100VAC		240VAC
		"/277" versions			277VAC
Operating Range (6)	standard version	47-63Hz	85VAC		264VAC
		DC	120VDC		370VDC
	/277 versions	47-63Hz	85VAC		305VAC
		DC	120VDC		430VDC
Input Current	115VAC				450mA
	230VAC				400mA
	277VAC				300mA
Inrush Current	cold start at +25°C	115VAC			20A
		230VAC			40A
		277VAC			50A
No Load Power Consumption	230VAC			40mW	100mW
Ecodesign Standby Mode Use (Available output power for stated input power)	P_{IN} = 0.5W				0.3W
	P_{IN} = 1.0W				0.7W
	P_{IN} = 2.0W				1.6W

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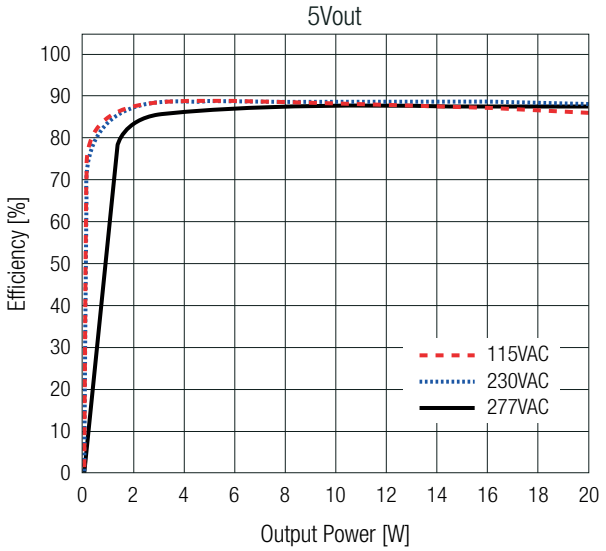
BASIC CHARACTERISTICS (measured @ T_{AMB}= 25°C, nom. V_{IN}, full load and after warm-up unless otherwise stated)

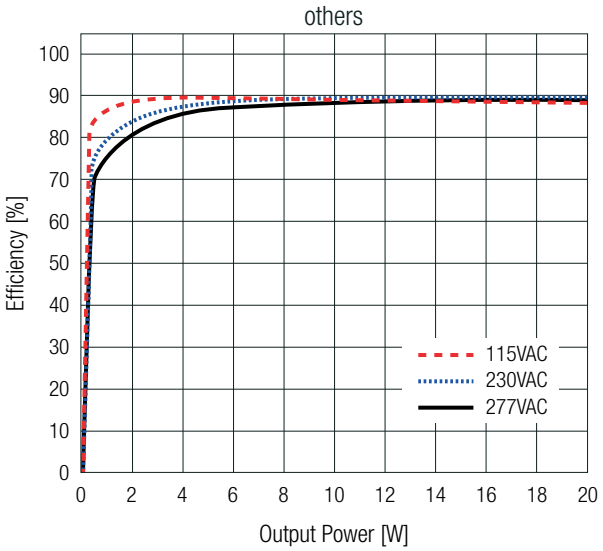
Parameter	Condition		Min.	Typ.	Max.
Input Frequency Range	AC Input		47Hz		63Hz
Minimum Load	single		0%		
	dual (required for regulation on both outputs)			10%	
Power Factor	115VAC		0.6		
	230VAC		0.5		
	277VAC		0.45		
Start-up Time				150ms	
Rise Time				40ms	
Hold-up Time	115VAC			12ms	
	230VAC			60ms	
	277VAC			90ms	
Internal Operating Frequency					150kHz
Output Ripple and Noise [7]	20MHz BW	5Vout		100mVp-p	
		others			1% of Vout

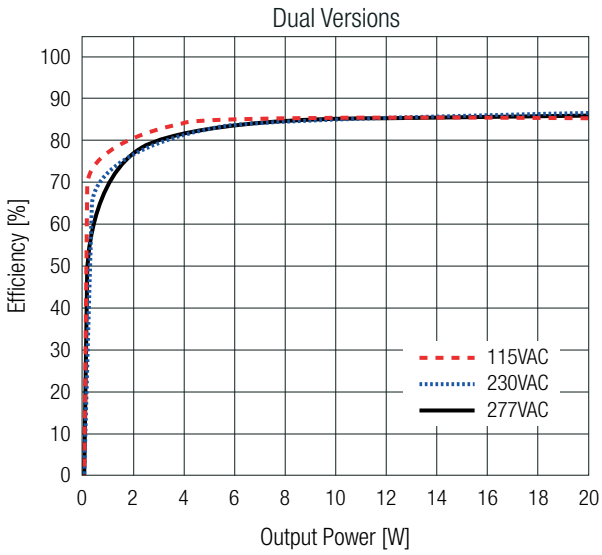
Note6: The products were submitted for safety files at AC-Input operation (90-305VAC).

Note7: Measurements are made with a 1.0µF MLCC across output (low ESR)
The test setup can have an impact on ripple noise values (placement of scope probe, capacitors, it's specifications, wires, PCB tracks, distances, etc.)

Efficiency vs Output Power







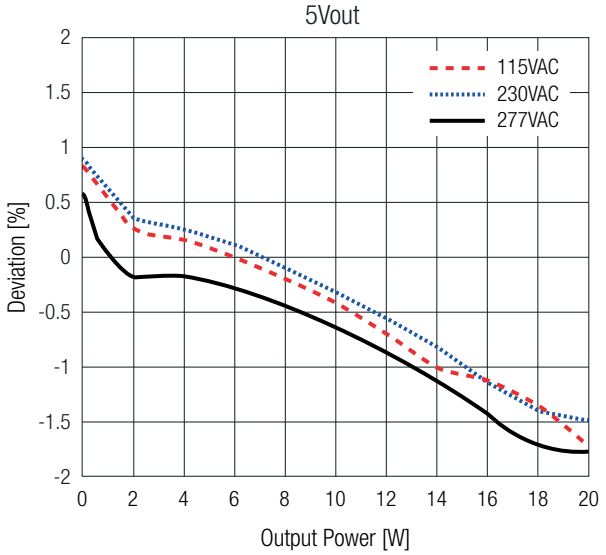
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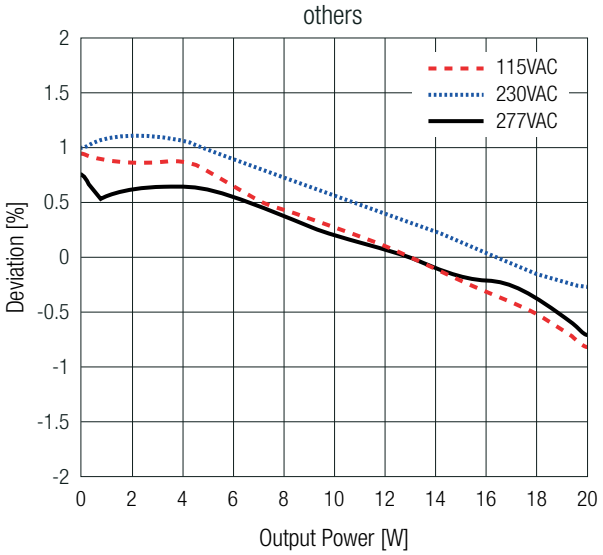
REGULATIONS (measured @ T_{AMB}= 25°C, nom. V_{IN}, full load and after warm-up unless otherwise stated)

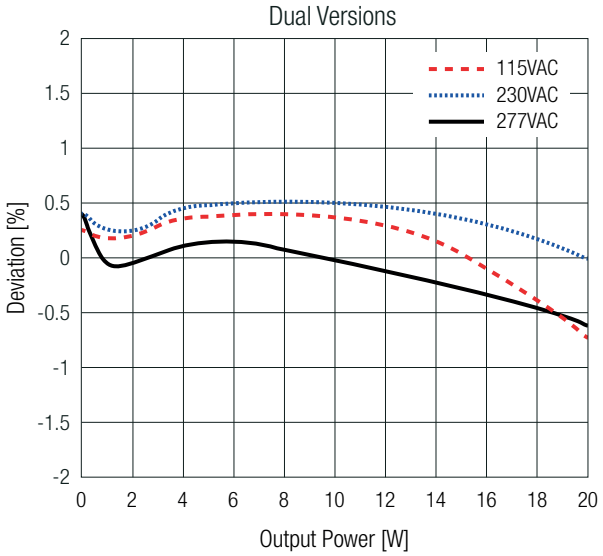
Parameter	Condition		Value
Output Accuracy			±2.0% typ.
Line Regulation	others	low line to high line, full load	±0.5% typ.
	"/277/NE/W"	low line to high line, full load	±1.0% typ.
Load Regulation [8]	10% to 100% load		2.0% typ.
Cross Regulation	dual output only		±10.0% typ.
Transient Response	25% load step change		4.0% max.
	recovery time		500µs typ.

Note8: Operation below 10% load will not harm the converter, but specifications may not be met

Deviation vs. Output Power







PROTECTIONS (measured @ T_{AMB}= 25°C, nom. V_{IN}, full load and after warm-up unless otherwise stated)

Parameter	Type		Value
Input Fuse [9]	internal	standard version	T3.15A, slow blow type
		"/NE/W"	T2A, slow blow type
		"/277" version	non, refer to **„Protection Circuit"**
Short Circuit Protection (SCP)	below 100mΩ		hiccup, auto recovery
Over Voltage Protection (OVP)	others		150%-195%, latch off mode
	"/NE/W"		120%-180%, latch off mode
Over Current Protection (OCP)	others		110%-130%, hiccup mode
	"/NE/W"		120%-150%, hiccup mode

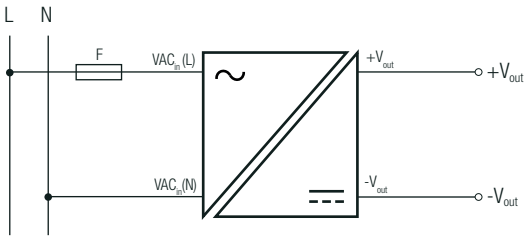
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PROTECTIONS (measured @ T_{AMB}= 25°C, nom. V_{IN}, full load and after warm-up unless otherwise stated)

Parameter	Type			Value
Over Voltage Category (10)	others			OVC II (5000m)
	"/NE/W"	according to 62368-1, 60335-1, 61558, 61347		OVC III (5000m)
Class of Equipment				Class II
Isolation Voltage (11)	I/P to O/P	tested for 1 minute	others	3kVAC
			"/NE/W"	4kVAC
Isolation Resistance	I/P to O/P , V_{iso} = 500VDC			1GΩ min.
Isolation Capacitance				100pF max.
Insulation Grade				reinforced

Note9: Refer to local safety regulations if input over-current protection is also required
Note10: For OVC III requirements please use "/NE/W" variants or refer to RAC20NE-K.pdf
Note11: For repeat Hi-Pot testing, reduce the time and/or the test voltage

Protection Circuit for RAC20-xxK/277 only:



ENVIRONMENTAL (measured @ T_{AMB}= 25°C, nom. V_{IN}, full load and after warm-up unless otherwise stated)

Parameter	Condition			Value
Operating Ambient Temperature Range	@ natural convection (0.1m/s) refer to **„Derating Graph"**	full load	others	-40°C to +55°C
			"/NE/W"	-40°C to +60°C
		with derating	all	-40°C to +85°C
Maximum Case Temperature				+95°C
Temperature Coefficient				±0.05%/K
Operating Altitude (12)	all models			5000m (OVC II)
	only "/NE/W" versions	according to 62368-1, 60335-1, 61558, 61347		5000m (OVC III)
Operating Humidity				20% - 90% RH max.
IP Rating				IP20
Pollution Degree				PD2
Vibration	10-500Hz, 2G 10min./1cycle, period 60min. along x,y,z axes			according to MIL-STD-202G
	3 axis, 40 g half sine, 11 ms shock			according to IEC 60068-2-27
	5-500Hz, 20m/s², 1 Oct/min, 15min			according to IEC 60068-2-65
	10-500Hz; RMS 23,4m/s² ; 15min			according to IEC 60068-2-64
MTBF	according to MIL-HDBK-217, G.B.		T_{AMB}= +25°C	>1196 x 10^3 hours
			T_{AMB}= +40°C	>955 x 10^3 hours
Design Lifetime	full load		T_{AMB}= +25°C	130 x 10^3 hours
			T_{AMB}= +55°C	16 x 10^3 hours

Note12: Recognized by safety agency for safe operation up to 5000m. High altitude operation may impact the performance and lifetime. Please contact RECOM tech support for advice

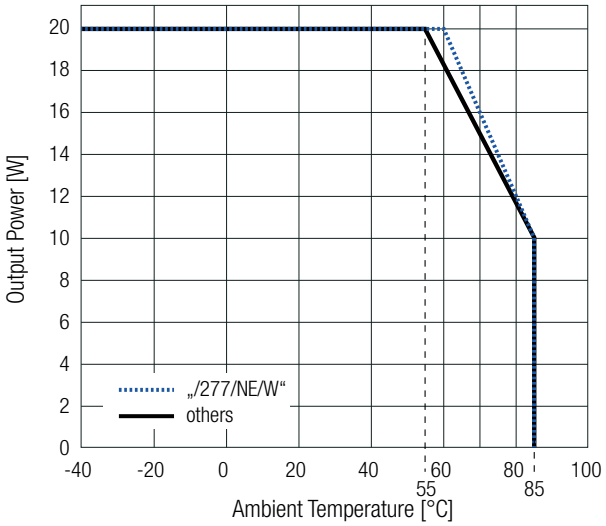
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ENVIRONMENTAL (measured @ T_{AMB}= 25°C, nom. V_{IN}, full load and after warm-up unless otherwise stated)

Derating Graph

(@ Chamber and natural convection 0.1m/s

Note13: Output power derating for Line-input of less than 90VAC (de-rate linearly from 100% at 90VAC to 90% at 85VAC)



SAFETY & CERTIFICATIONS (COVERING ALL VERSIONS EXCEPT “/NE/W”)

Certificate Type (Safety)	Report Number	Standard
Audio/Video, information and communication technology equipment - Safety requirements	E224736	UL62368-1, 2nd Edition, 2014 CAN/CSA C22.2 Nr. 62368-1-14, 2nd Ed. 2014
Audio/Video, information and communication technology equipment - Safety requirements (CB Scheme)	E491408-A6008-CB-1	IEC62368-1:2014 2nd Edition
Audio/Video, information and communication technology equipment - Safety requirements (LVD)		EN62368-1:2014 + A11:2017
Household and similar electrical appliances – Safety – Part 1: General requirements (CB Scheme)	4392216.50 4397422.50	IEC60335-1:2010 5th Edition + AM1:2013
Household and similar electrical appliances – Safety – Part 1: General requirements	LCS180508046AS	IEC60335-1:2010 + AMD2:2016 + COR1:2016 EN60335-1:2012 + A11:2014 + A13:2017
Safety of power transformers, power supplies, reactors and similar products for supply voltages up to 1100 V (CB Scheme)	50198090 001	IEC61558-1:2005 2nd Edition + A1:2009
Safety of power transformers, power supplies, reactors and similar products for supply voltages up to 1100 V		EN61558-1:2005 + A1:2009
Safety of power transformers, power supplies, reactors and similar products for supply voltages up to 1100 V Part 2: Particular requirements (CB Scheme)	50198090 001	IEC61558-2-16:2009 1st Edition + A1:2013
Safety of power transformers, power supplies, reactors and similar products for supply voltages up to 1100 V Part 2: Particular requirements		EN61558-2-16:2009 + A1:2013
Safety requirements for power electronic converter systems and equipment - Part 1: General (CB Scheme)	CN21R4QC001	IEC62477-1:2012 + A1:2016, 1st Edition
Safety requirements for power electronic converter systems and equipment - Part 1: General (LVD)		EN62477-1:2012 + A11:2014 + A1:2017
EAC	RU-AT.03.67361	TP TC 004/2011
RoHS2		RoHS-2011/65/EU + AM-2015/863

EMC Compliance	Condition	Standard / Criterion
Low voltage power supplies, d.c. output Part 3: Electromagnetic compatibility (EMC)		IEC/EN61204-3:2018, Class B
Electromagnetic compatibility of multimedia equipment - Emission requirements	without external filter	EN55032:2015, Class B
Electromagnetic compatibility of household appliances, electric tools and similar apparatus - Emission Requirements		EN55014-1:2006 + A2:2011
Information technology equipment - Immunity characters - Limits and methods of measurement		EN55024:2010 + A1:2015
Electromagnetic compatibility of household appliances, electric tools and similar apparatus - Immunity Requirements		EN55014-2:2015

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SAFETY & CERTIFICATIONS (COVERING ALL VERSIONS EXCEPT "/NE/W")

EMC Compliance	Condition	Standard / Criterion
ESD Electrostatic discharge immunity test	Air ±8kV, Contact ±4kV	EN61000-4-2:2009, Criteria B
Radiated, radio-frequency, electromagnetic field immunity test	80MHz - 6GHz: 10V/m 1.4GHz - 2GHz: 3V/m 2.0GHz - 2.7GHz: 1V/m	EN61000-4-3:2006 + A1:2008, Criteria A
Fast Transient and Burst Immunity	AC Port: ±2.0kV DC Port: ±2.0kV	EN61000-4-4:2012, Criteria B
Surge Immunity	AC Port: L-N ±1.0kV DC Port: ±0.5kV	EN61000-4-5:2014 + A1:2017, Criteria B
Immunity to conducted disturbances, induced by radio-frequency fields	AC Port: 10V DC Port: 10V	EN61000-4-6:2014, Criteria A
Power Magnetic Field Immunity	50Hz, 30A/m	EN61000-4-8:2010, Criteria A
Voltage Dips and Interruptions	Voltage Dips 20% Voltage Dips 30% Voltage Dips 60% Voltage Dips 100% Voltage Interruptions > 95%	EN61000-4-11:2004 + A1:2017, Criteria C EN61000-4-11:2004 + A1:2017, Criteria C EN61000-4-11:2004 + A1:2017, Criteria C EN61000-4-11:2004 + A1:2017, Criteria B EN61000-4-11:2004 + A1:2017, Criteria C
Limits of Voltage Fluctuations & Flicker		EN61000-3-3:2013
Limitations on the amount of electromagnetic interference allowed from digital and electronic devices		FCC 47 CFR Part 15 Subpart B, Class B
American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz		ANSI C63.4-2014, Class B

SAFETY & CERTIFICATIONS (COVERING "/NE/W" ONLY)

Certificate Type (Safety)	Report Number	Standard
Audio/Video, information and communication technology equipment - Part1: Safety requirements 3rd Edition	E491408-A6034-UL	UL62368-1:2019 3rd Edition
		CAN/CSA-C22.2 No. 62368-1-19 3rd Edition
Audio/Video, information and communication technology equipment - Part1: Safety requirements 3rd Edition	240408022	IEC62368-1:2018 3rd Edition
		EN IEC 62368-1:2020+A11:2020
Audio/Video, information and communication technology equipment - Part1: Safety requirements 3rd Edition	085-240223001-000	IEC62368-1:2018 3rd Edition
		EN IEC 62368-1:2020+A11:2020
Audio/Video, information and communication technology equipment - Part1: Safety requirements 3rd Edition	085-240223401-000	IEC62368-1:2018 3rd Edition
		EN IEC 62368-1:2020+A11:2020
Household and similar electrical appliances – Safety – Part 1: General requirements	64.110.24.02233.01	IEC60335-1:2010 + C1:2016 5th Edition
		EN60335-1:2012 + A15:2021
Measurement methods for electromagnetic fields of household appliances and similar apparatus with regard to human exposure	64.110.24.02233.01	EN62233:2008
Safety of power transformers, power supplies, reactors and similar products for supply voltages up to 1100 V 3rd Edition	085-240223101-000	IEC61558-1:2017 3rd Edition
		EN IEC 61558-1:2019
Safety of power transformers, power supplies, reactors and similar products for supply voltages up to 1100 V Part 2: Particular requirements		IEC61558-2-16:2009+A1:2013 1st Edition
		EN61558-2-16:2009+A1:2013
Lamp controlgear Part 1: General and safety requirements	085-240223201-000	IEC61347-1:2015+A1:2017 3rd Edition
		EN61347-1:2015+A1:2021
Lamp controlgear Part 2-13: Particular requirements for d.c. or a.c. supplied electronic controlgear for LED modules		IEC61347-2-13:2014+A1:2016 2nd Edition
		EN61347-2-13:2014+A1:2017

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SAFETY & CERTIFICATIONS (COVERING "/NE/W" ONLY)

EMC Compliance according to EN IEC61204-3	Condition	Standard / Criterion
Low voltage power supplies, d.c. output Part 3: Electromagnetic compatibility (EMC)		EN IEC 61204-3:2018
ESD Electrostatic discharge immunity test	Air: ±2, 4, 8kV Contact: ±4kV, ±6kV	IEC61000-4-2:2008, Criteria A EN61000-4-2:2009, Criteria A
Radiated, radio-frequency, electromagnetic field immunity test	10V/m (80-1000MHz), 3V/m (1400-2000MHz), 1V/m (2000-2700MHz)	IEC/EN61000-4-3:2006 + A2:2010 Criteria A
Fast Transient and Burst Immunity	L, N, L-N ±2kV for 24Vout	IEC/EN61000-4-4:2012, Criteria A
	L, N, L-N ±2kV for 12Vout	IEC/EN61000-4-4:2012, Criteria B
	L, N, L-N ±4kV for all versions	
Surge Immunity	L-N: 0.5, 1kV; for all versions	IEC/EN61000-4-5:2014 + A1:2017, Criteria A
	L-PE, N-PE: 1, 2kV; for all versions	IEC/EN61000-4-5:2014 + A1:2017, Criteria A
Immunity to conducted disturbances, induced by radio-frequency fields	10Vrms (0.15-80MHz)	IEC61000-4-6:2013, Criteria A EN61000-4-6:2014, Criteria A
Power Magnetic Field Immunity	30A/m	IEC61000-4-8:2009 / EN61000-4-8:2010
Voltage Dips and Interruptions	Dips: 100% (0.5P, 1.0P), 60%, 30%, 20%	IEC/EN61000-4-11:2004+A1:2017, Criteria A
	Interruption: 100%	IEC/EN61000-4-11:2004+A1:2017, Criteria B
Limits of Voltage Fluctuations & Flicker		EN61000-3-3:2013+A1:2019

EMC Compliance according to EN55032	Condition	Standard / Criterion
Electromagnetic compatibility of multimedia equipment – Emission Requirements	floating and earth referenced output	EN55032:2015+A11:2020

DIMENSION & PHYSICAL CHARACTERISTICS

Parameter	Type	Value
Materials	case/baseplate	black plastic, (UL94 V-0)
	potting	silicone, (UL94 V-0)
	PCB	FR4, (UL94 V-0)
Dimension (LxWxH)	all models	52.5 x 27.4 x 23.0mm 2.0 x 1.0 x 0.9 inch
Weight	THT versions	60.0g typ. 0.13 lbs
	wired and "/NE/W" versions	65.0g typ. 0.14 lbs

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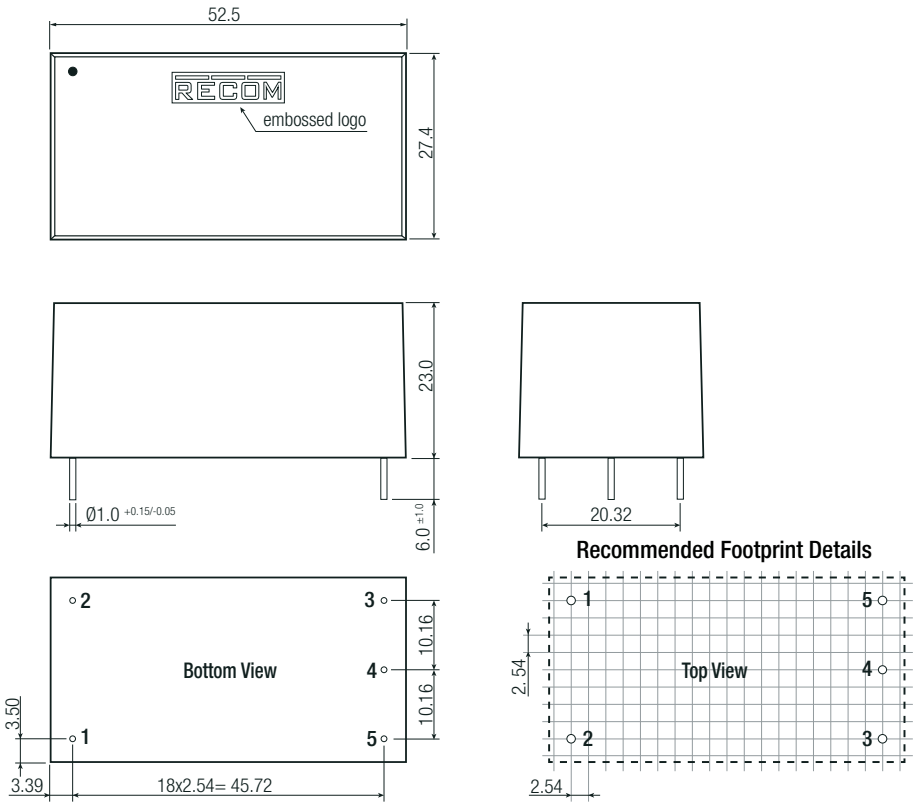
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20W ◊ Input: 100V-240(277)VAC

RECOM AC/DC Converter

DIMENSION & PHYSICAL CHARACTERISTICS

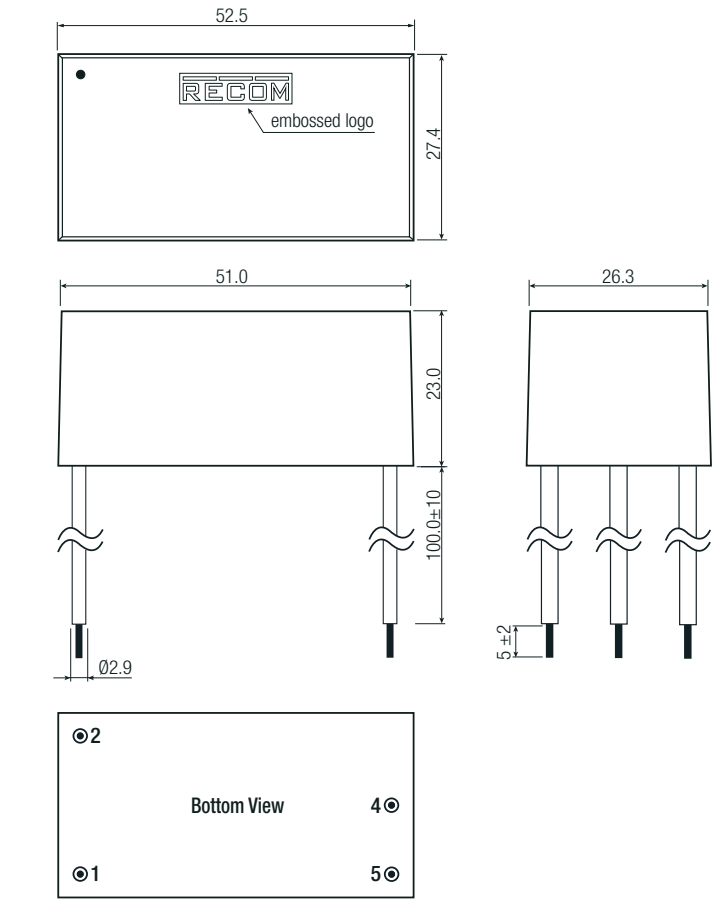
Dimension Drawing THT Version(mm)



Pinning information [P12]

Pin #	Single	Dual
1	VAC in (N)	VAC in (N)
2	VAC in (L)	VAC in (L)
3	no pin	-Vout
4	-Vout	Com
5	+Vout	+Vout

Dimension Drawing wired Versions (mm)



Wire information

#	Function	Wire color	Type	AWG
1	VAC in (N)	blue	UL-1015	18
2	VAC in (L)	brown	UL-1015	18
4	-Vout	black	UL-1015	18
5	+Vout	red	UL-1015	18

Tolerance: xx.x= ±0.5mm
xx.xx= ±0.25mm

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PACKAGING INFORMATION

Parameter	Type		Value
Packaging Dimension (LxWxH)	THT versions	tube	490.0 x 56.0 x 40.0mm
	Wired versions	tray	488.0 x 202.0 x 47.0mm
	"/NE/W" versions	tray	468.0 x 198.0 x 46.0mm
Packaging Quantity	THT versions		15pcs
	Wired versions		20pcs
	"/NE/W" versions		20pcs
Storage Temperature Range			-40°C to +85°C
Storage Humidity	non-condensing		20% to 90% RH max.

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