

Features

- Wide input range 85-305VAC
- 5000m operating altitude
- OVCIII up to 2000m altitude
- 4kVAC isolation rated/60sec.
- EMC compliant without external components
- No load power consumption <200mW

Regulated Converter



RAC20E-K/277

20 Watt
2" x 1"
Single Output



Description

RAC20E-K/277, the economy "E-K" series of compact 20 Watt AC/DC modules, is designed to meet general purpose requirements for a wide variety of equipment for the IoT, ITE and industrial markets. These encapsulated power supplies feature 4kVac isolation and over voltage category OVCIII, as well as 100-277VAC nominal input voltages. At OVC II usage, the operating altitude is rated for up to 5000m. For EMC compatibility in floating output configurations, EN55032 limits for class "B" are met without any external components. The outputs are protected against over current and short circuits and input protection by internal fuse is provided. All these features make the product one of the easiest integrated modular power solutions for lowest total cost of ownership in the industry.

Selection Guide

Part Number	Input Voltage Range [VAC]	nom. Output Voltage [VDC]	Output Current [mA]	Efficiency typ. (1) [%]
RAC20E-05SK/277	85-305	5	4000	80
RAC20E-12SK/277	85-305	12	1667	83
RAC20E-24SK/277	85-305	24	833	84

Notes:

Note1: Efficiency is tested at nominal input and full load at +25°C ambient

Model Numbering



UL/IEC/EN62368-1 certified
CAN/CSA G22.2 No. 62368-1 certified
IEC/EN62368-1 2nd Edition certified
IEC/EN62368-1 3rd Edition certified
IEC/EN61558-1/2-16 pending
EN55032 compliant
EN55035 compliant
CB Report

Specifications (measured @ Ta= 25°C, nom. Vin, full load and after warm-up unless otherwise stated)

BASIC CHARACTERISTICS					
Parameter	Condition		Min.	Typ.	Max.
Internal Input Filter					CM Choke
Nominal Input Voltage	50/60Hz		100VAC		277VAC
Operating Range (2, 3)	47-63Hz		85VAC	277VAC	305VAC
	DC		120VDC		430VDC
Input Current	115VAC				400mA
	230VAC				300mA
	277VAC				250mA
Inrush Current	cold start at 25°C	115VAC			20A
		230/277VAC			40A
No load Power Consumption					200mW
ErP Standby Mode Conformity (Maximum output power available for stated maximum input power)	0.5W				0.25W
	Input Power= 1.0W				0.6W
	2.0W				1.4W

Notes:

Note2: The products were submitted for safety files at AC-Input operation. (90-305VAC)

Note3: Refer to "Derating Graph"

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Zertifiziert nach ISO 9001:2008

Specifications (measured @ Ta= 25°C, nom. Vin, full load and after warm-up unless otherwise stated)

BASIC CHARACTERISTICS

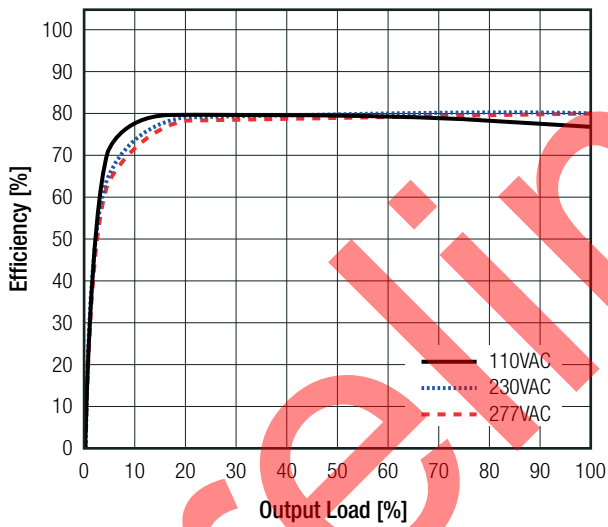
Parameter	Condition	Min.	Typ.	Max.
Input Frequency Range	AC Input	47Hz		63Hz
Minimum Load		0%		
Power Factor	115VAC 230VAC 277VAC		0.6 0.5 0.45	
Start-up Time				150ms
Rise Time				25ms
Hold-up Time	115VAC 230VAC 277VAC	25ms	10ms 40ms 60ms	
Internal Operating Frequency	100% load at nominal Vin		120kHz	
Output Ripple and Noise ⁽⁴⁾	20MHz BW	5Vout others		150mVp-p 1% of Vout

Notes:

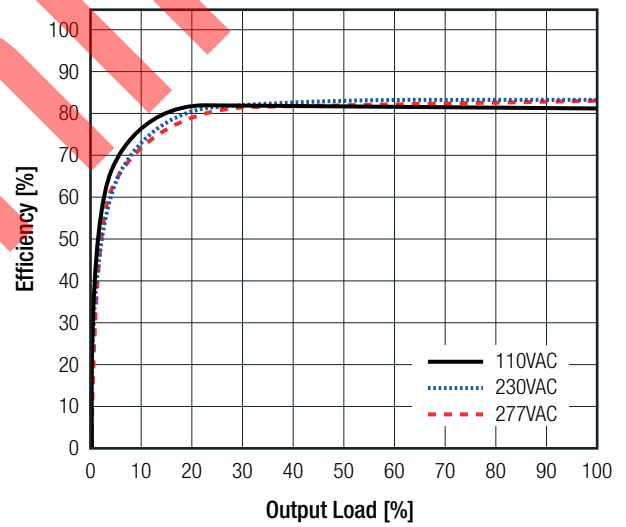
Note4: Measurements are made with a 0.1µF MLCC & 10µF E-cap in parallel across output. (low ESR)

Efficiency vs. Load

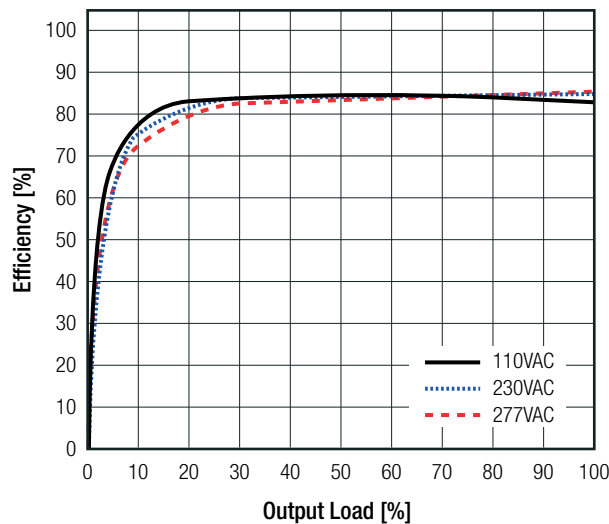
RAC20E-05SK/277



RAC20E-12SK/277



RAC20E-24SK/277



Specifications (measured @ Ta= 25°C, nom. Vin, full load and after warm-up unless otherwise stated)

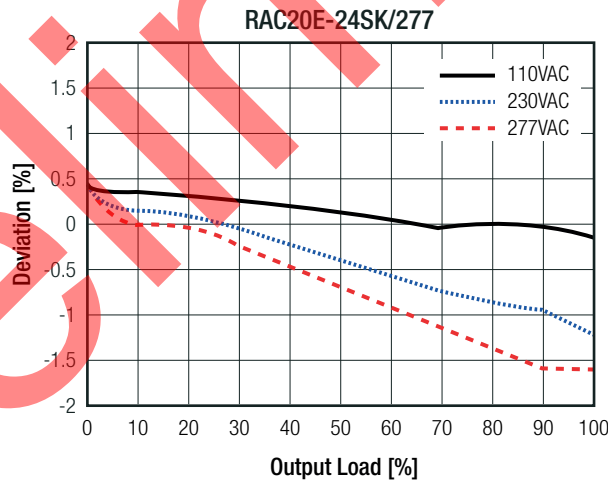
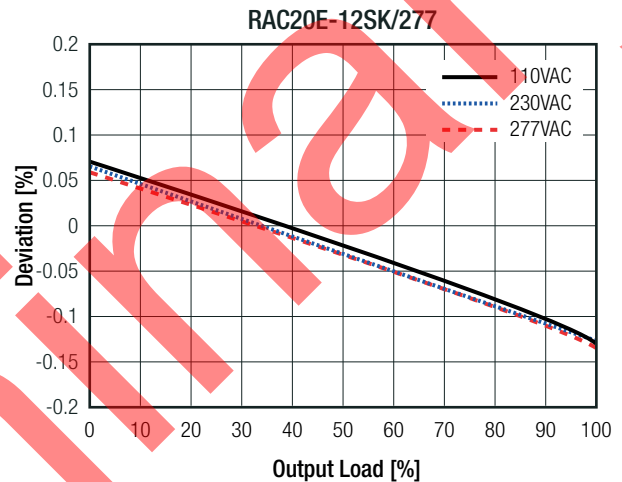
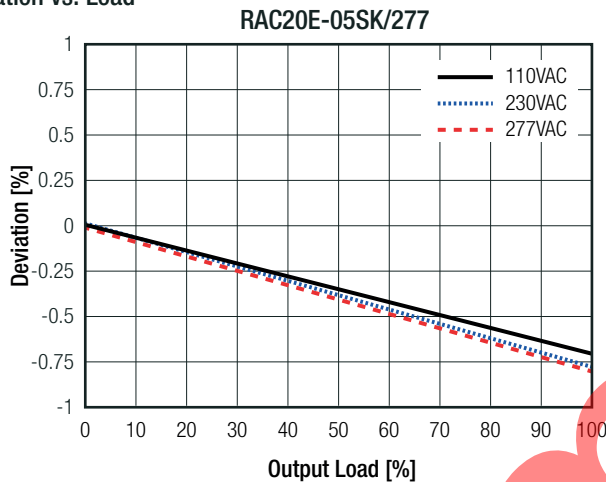
REGULATIONS

Parameter	Condition	Value
Output Accuracy		±2.0% typ.
Line Regulation	low line to high line, full load	±0.5% typ.
Load Regulation ⁽⁵⁾	10% to 100% load	1.0% typ.
Transient Response	25% load step change recovery time	3.0% max. 500µs max.

Notes:

Note5: Operation below 10% load will not harm the converter, but specifications may not be met

Deviation vs. Load



PROTECTIONS

Parameter	Type	Value
Input Fuse	internal	slow blow
Short Circuit Protection (SCP)		hiccup mode, automatic restart
Over Voltage Protection (OVP)		105% - 120%, clamping, automatic restart
Over Load Protection (OLP)		150% - 195%, hiccup mode
Over Voltage Category (OVC)	according to 62368-1 according to 61558-2-16	OVCII (5000m) OVCIII (2000m)
Isolation Voltage ⁽⁶⁾	I/P to O/P	1 minute 4kVAC

Notes:

Note6: For repeat Hi-Pot testing, reduce the time and/or the test voltage

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Specifications (measured @ Ta= 25°C, nom. Vin, full load and after warm-up unless otherwise stated)

PROTECTIONS

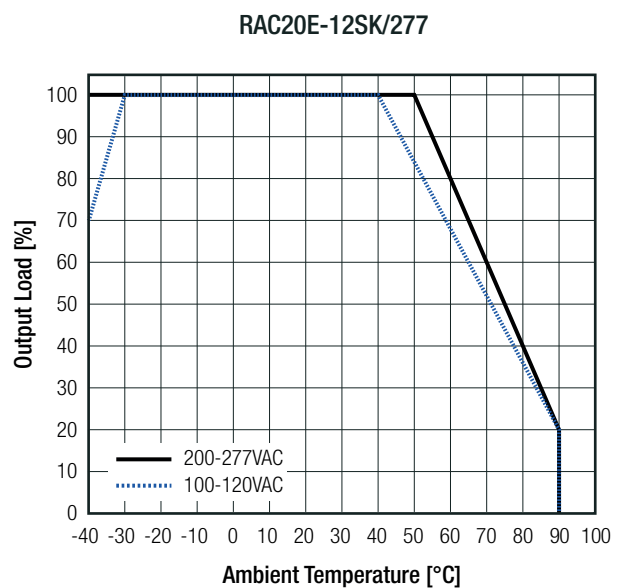
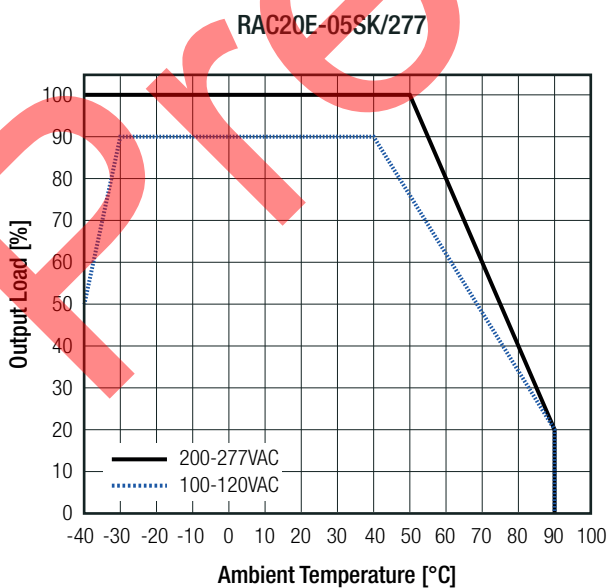
Parameter	Condition		Value
Isolation Resistance	I/P to O/P	V _{iso} = 500VDC	1GΩ min.
Isolation Capacitance		100kHz/0.1VDC	100pF max.
Leakage Current	@ 277VAC		0.25mA max.
Insulation Grade			reinforced

ENVIRONMENTAL

Parameter	Condition		Value
Operating Temperature Range	@ natural convection 0.1m/s	refer to "Derating Graph"	-40°C to +90°C
Maximum Case Temperature			+95°C
Temperature Coefficient			±0.02%/K
Operating Altitude			5000m (OVCI) 2000m (OVCIII)
Operating Humidity	non-condensing		20% - 90% RH max.
Pollution Degree			PD2
Vibration			10-500Hz, 2G 10min./1cycle, period 60min. each along x,y,z axes
MTBF	according to MIL-HDBK-217F, G.B.	+25°C +40°C	830 x 10 ³ hours 700 x 10 ³ hours
Design Lifetime	230VAC/60Hz and full load	T _{AMB} = +40°C	5Vout: 34 x 10 ³ hours 12Vout: 44 x 10 ³ hours 24Vout: 53 x 10 ³ hours
		T _{AMB} = +25°C	5Vout: 89 x 10 ³ hours 12Vout: 115 x 10 ³ hours 24Vout: 132 x 10 ³ hours

Derating Graph

(@ Chamber and natural convection 0.1m/s)

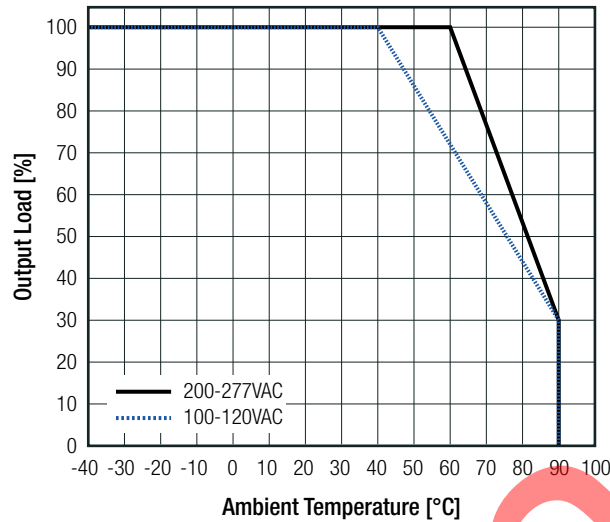


Specifications (measured @ Ta= 25°C, nom. Vin, full load and after warm-up unless otherwise stated)

Derating Graph ⁽⁷⁾

(@ Chamber and natural convection 0.1m/s)

RAC20E-24SK/277



SAFETY AND CERTIFICATIONS

Certificate Type (Safety)	Report / File Number	Standard
Audio/Video, information and communication technology equipment - Safety requirements	E491408-A6018-UL	UL62368-1 3rd Edition CAN/CSA-C22.2 No. 62368-1 3rd Edition
Audio/Video, information and communication technology equipment - Safety requirements (CB)	210615003	IEC62368-1:2014 2nd Edition
Audio/Video, information and communication technology equipment - Safety requirements (LVD)		EN62368-1:2014 + A11:2017
Audio/Video, information and communication technology equipment - Safety requirements	210615002	IEC62368-1:2018 3rd Edition
Audio/Video, information and communication technology equipment - Safety requirements		EN IEC 62368-1:2020 + A11:2020
Safety of power transformers, power supplies, reactors and similar products for supply voltages up to 1100 V (CB Scheme)	pending	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)	pending	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
RoHS2		RoHS-2011/65/EU + AM-2015/863

EMC Compliance

Condition	Standard / Criterion
ESD Electrostatic discharge immunity test	Air ±2kV, 4kV, 8kV Contact ±4kV IEC61000-4-2:2008, Criteria A EN61000-4-2:2009, Criteria A
Radiated, radio-frequency, electromagnetic field immunity test	10V/m (8MHz-1GHz) 3V/m (1.4GHz-2GHz) 1V/m (2GHz-2.7GHz) IEC61000-4-3:2006+A2:2010, Criteria A IEC61000-4-3:2006+A2:2010, Criteria A
Fast Transient and Burst Immunity	AC Port: ±2.0kV IEC/EN61000-4-4:2012, Criteria A
Surge Immunity	AC Port: ±1.0kV IEC/EN61000-4-5:2014, Criteria A
Immunity to conducted disturbances, induced by radio-frequency fields	AC Port: 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, Criteria A

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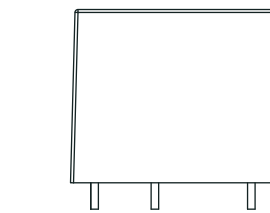
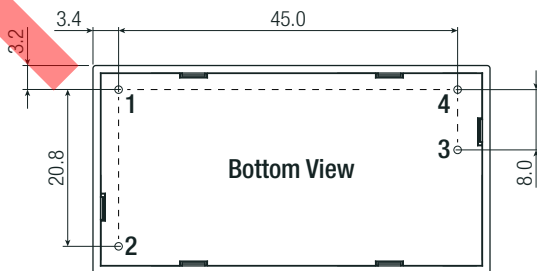
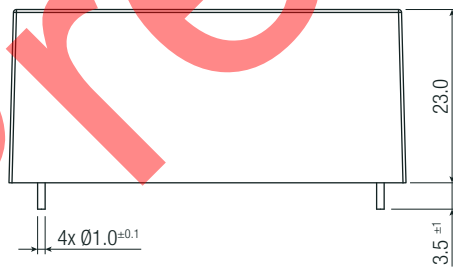
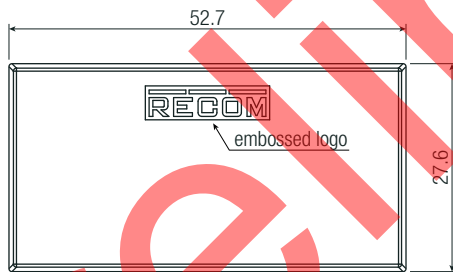
Specifications (measured @ Ta= 25°C, nom. Vin, full load and after warm-up unless otherwise stated)

EMC Compliance	Condition	Standard / Criterion
Voltage Dips and Interruptions	Voltage Dip 100% (0.5P)	IEC/EN61000-4-11:2004, Criteria A
	Voltage Dip 100% (1.0P)	IEC/EN61000-4-11:2004, Criteria A
	Voltage Dip 30%	IEC/EN61000-4-11:2004, Criteria A
	Voltage Dip 20%	IEC/EN61000-4-11:2004, Criteria A
	Voltage Interruption 100%	IEC/EN61000-4-11:2004, Criteria B
Limits of Harmonic Current Emissions		EN61000-3-2:2014
Limits of Voltage Fluctuations & Flicker		EN61000-3-3:2013
Low voltage power supplies, d.c. output Part 3: Electromagnetic compatibility (EMC)		EN IEC 61204-3:2018, Class B
Limitations on the amount of electromagnetic interference allowed from digital and electronic devices		FCC 47 CFR Part 15 Subpart B, Class B

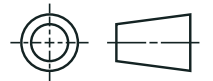
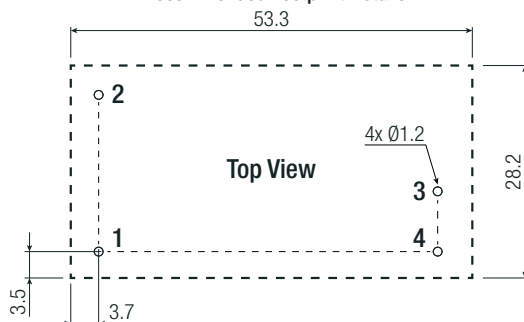
DIMENSION AND PHYSICAL CHARACTERISTICS

Parameter	Type	Value
Material	case/baseplate potting PCB	black plastic, (UL94 V-0) silicone, (UL94 V-0) FR4, (UL94 V-0)
Dimension (LxWxH)		52.7 x 27.6 x 23.0mm
Weight		60g typ.

Dimension Drawing (mm)



Recommended Footprint Details



Pinning Information

Pin #	Function
1	VAC in (N)
2	VAC in (L)
3	+Vout
4	-Vout

Tolerance: x.x= ±0.5mm
x.xx= ±0.25mm

Specifications (measured @ Ta= 25°C, nom. Vin, full load and after warm-up unless otherwise stated)

PACKAGING INFORMATION

Parameter	Type	Value
Packaging Dimension (LxWxH)	tube	490.0 x 56.0 x 40.0mm
Packaging Quantity		15pcs
Storage Temperature Range		-40°C to +85°C
Storage Humidity	non-condensing	20% to 90% RH max.

Preliminary



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