Features

Regulated Converter

- 1.6“x3“, optional 2“x3“, low profile
- 40W power from -40°C up to +60°C ambient
- Operating temp. up to +85°C with derating.
- 4 kVac/1min reinforced isolation
- 2MOPP medical certified, B and BF compliant
- 5000m (medical/ITE) operating altitude
- Class B EMC filter built-in

RECOM

AC/DC Converter

RACM40-K/OF

40 Watt Open Frame 1.6“x3“ & 2“x3“ Single Output

Description

The ultra-compact versatile, industrial + household + medical grade AC/DC converter series RACM40-K delivers 40 watts of output power from -40°C to +60°C with natural air convection only, and up to +85°C with derating or forced air cooling. With a clear focus on extended thermal performance for systems where space is limited, these 1.6“ x 3“ compact modules are designed to gain highest overall efficiency levels over the full output load range from universal AC inputs. The RACM40-K has ANSI/AAMI/IEC 60601-1 medical safety and EN 60601-1-2 medical EMC certifications and offers 4kVac/1 min isolation, 2MOPP, and is designed to meet B and BF requirements. It is additionally certified (CB Report) IEC/EN 62368-1; IEC61010 and IEC61558-1/-2-16 for industrial applications and IEC/EN 60335-1 for household appliances. The robust built-in class B EMC filter has sufficient margin to allow either Class II or Class I PELV with grounded output installations. A range of mechanical fixing options makes the RACM40-K suitable for many different mounting conditions: the standard chassis-mount part mates with Molex connectors, and the /PCB option permits direct installation in printed circuit boards. Additionally, a 2“ x 3“ footprint for backward-compatibility retrofit for legacy designs is available on request.

Selection Guide

Part Number	Input Voltage Range [VAC]	Output Voltage [VDC]	Output Current [mA]	Efficiency typ. (1) [%]	Output Power [W]
RACM40-05SK/OF (2, 3)	80-264	5	6000	87	30
RACM40-12SK/OF (2, 3)	80-264	12	3334	90	40
RACM40-15SK/OF (2, 3)	80-264	15	2667	90	40
RACM40-18SK/OF (2, 3)	80-264	18	2222	90	40
RACM40-24SK/OF (2, 3)	80-264	24	1667	90	40
RACM40-36SK/OF (2, 3)	80-264	36	1111	90	40
RACM40-48SK/OF (2, 3)	80-264	48	833	90	40

Notes:

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

Model Numbering

RACM40- __ SK /OF/ __ -

- nom. Output Power
- Output Voltage
- Single
- Case style (2)
- Connection options (2)
- Packaging options (3)

Notes:

Note2: “/OF” = standard 1.6”x3” open frame version with standard header connectors
“/OF/PCB-T”= 1.6”x3” open frame with PCB mounting pins
“OF/2x3” = 2”x3” open frame version with standard header connector (12 and 24Vout versions available; 5, 15, 18, 36 and 48Vout versions with MOQ ≥1000pcs)

Note3: without suffix, standard single pack (1pcs/cardboard box)
add suffix “-CTN” for project packaging (4 layers of tray within a carton, for “/OF” only + MOQ ≥1024pcs)
for detail information, refer to ***“PACKAGING INFORMATION”***
For other case/connection/footprint options, please contact RECOM technical support

Ordering Examples:

RACM40-05SK/OF	5Vout	1.6” x 3”	open frame	standard header connector	1pcs/cardboard box
RACM40-24SK/OF/PCB-T	24Vout	1.6” x 3”	open frame	PCB mounting pins	16pcs/tray packaging
RACM40-12SK/OF/2x3	12Vout	2” x 3”	open frame	standard header connector	1pcs/cardboard box
RACM40-12SK/OF-CTN	12Vout	2” x 4”	open frame	standard header connector	64pcs/carton (MOQ= 1024pcs)

2MOPP
250VAC

IEC/EN62368-1 (pending)
ANSI/AAMI ES60601-1 certified
CSA/CAN-C22.2 No. 60601-1:14 certified
IEC/EN60601-1 certified
IEC/EN60335-1 (pending)
IEC/EN61010-1 (pending)
EN62233 (pending)
IEC/EN61558-1 (pending)
IEC/EN61558-2-16 (pending)
EN55032/35 compliant
IEC/EN60601-1-2 compliant
CB Report (pending)

RACM40-K/OF Series

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

BASIC CHARACTERISTICS

Parameter	Condition		Min.	Typ.	Max.
Nom. Input Voltage	60Hz 50Hz		100VAC		 240VAC
Input Voltage Range [3]	47-63Hz DC		80VAC 120VDC		264VAC 370VDC
Input Current	115VAC 230VAC				1000mA 500mA
Inrush Current	cold start	115VAC 230VAC			15A 30A
ErP Standby Mode Conformity: (Maximum output power available for stated maximum input power)	115VAC	RACM40 input power max. 0.5W	0.3W		
		RACM40 input power max. 1.0W	0.7W		
	230VAC	RACM40 input power max. 0.5W	0.27W		
		RACM40 input power max. 1.0W	0.65W		
No load Power Consumption	230VAC			100mW	
Input Frequency Range	AC Input		47Hz		63Hz
Minimum Load			0%		
Power Factor	115VAC 230VAC		0.6 0.5		
Start-up Time				160ms	
Rise Time				70ms	
Hold-up Time	115VAC 230VAC		16ms 60ms		
Internal Operating Frequency	100% load at nominal Vin			100kHz	
Output Ripple and Noise [4]	20MHz BW	5Vout others			80mVp-p 1% of Vout

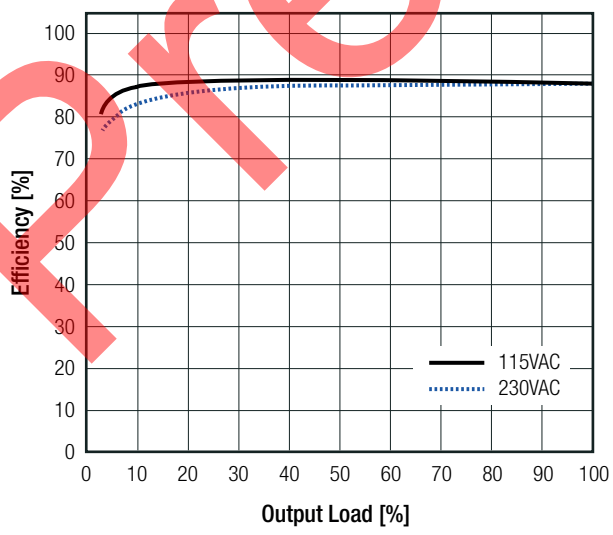
Notes:

Note3: The products were submitted for safety files at AC-Input operation

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

Efficiency vs. Load

RACM40-05SK/OF



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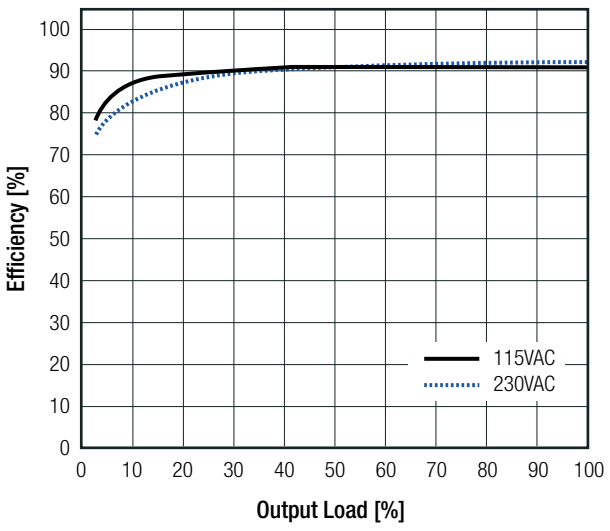

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Specifications (measured @ Ta= 25°C, nom. Vin, full load and after warm-up unless otherwise stated)

REGULATIONS

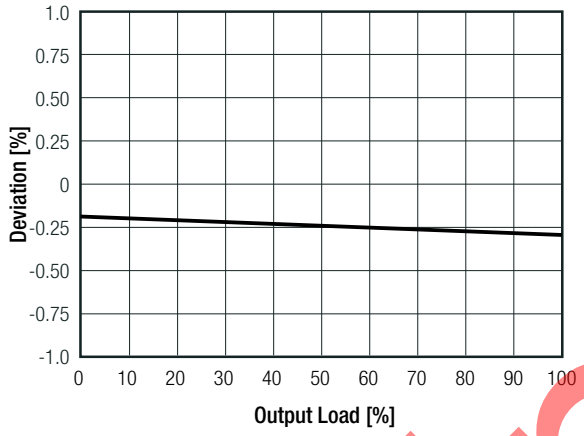
Parameter	Condition		Value
Output Accuracy	100% load		±1.0% max.
Line Regulation	low line to high line	5Vout	±0.1% typ.
		others	±0.05% typ.
Load Regulation (5)	10% to 100% load	5, 12, 15, 18Vout	0.7% typ.
		24, 36, 48Vout	0.5% typ.
Transient Response	25% load step change		3.0% max.
	recovery time		500µs max.

Notes:

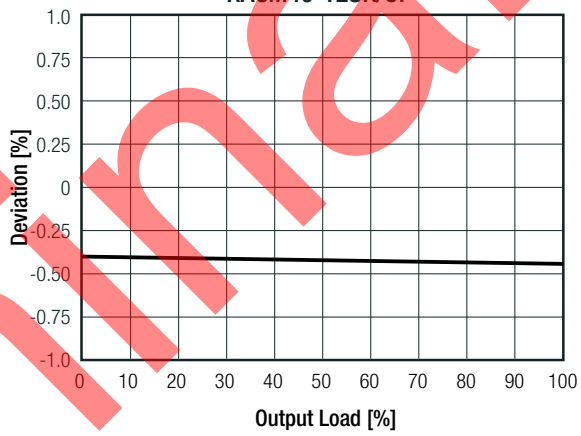
Note5: Operation below 10% load will not harm the converter, but specifications may not be met

Deviation vs. Load

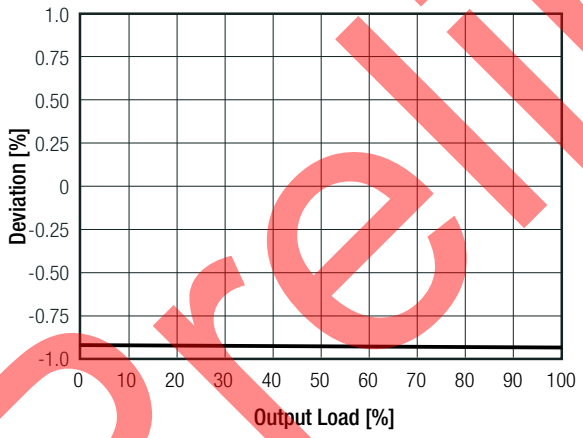
RACM40-05SK/OF



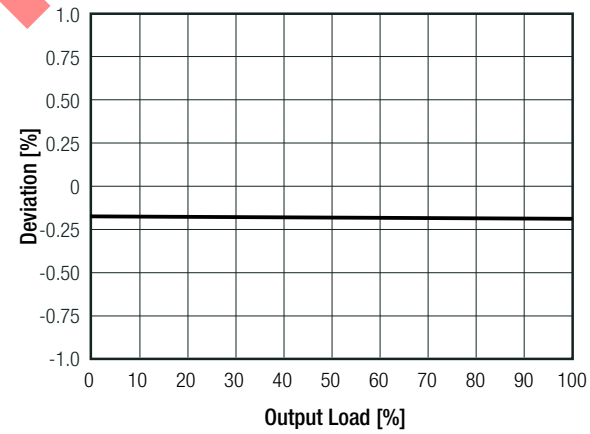
RACM40-12SK/OF



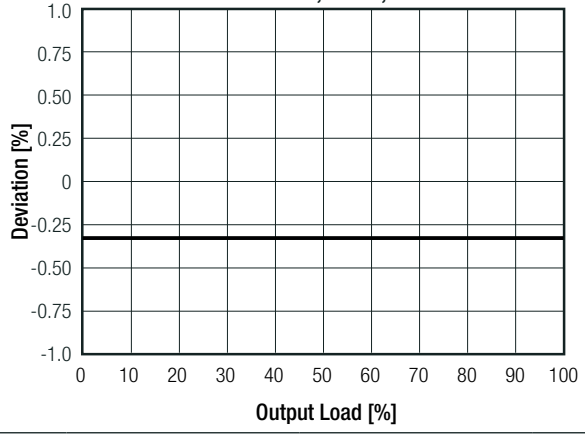
RACM40-15SK/OF



RACM40-18SK/OF



RACM40-24SK, 36SK, 48SK/OF



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

PROTECTIONS

Parameter	Type/Condition		Value
Input Fuse	internal		T3.15A, slow blow type
Short Circuit Protection (SCP)	below 100mΩ		hiccup mode, auto recovery
Over Voltage Protection (OVP)			105% - 120%, hiccup mode
Output Reverse Voltage Protection	overrun rate of nominal output		107% - 145%, hiccup mode
Over Current Protection (OCP)			130% - 180%, hiccup mode
Thermal Shutdown	TC point IC 101		+130°C
Over Voltage Category (OVC)			OVCII
Class of Equipment			Class II
Isolation Voltage (safety certified) (6)	I/P to O/P	1 minute	4kVAC
Isolation Resistance	I/P to O/P, Isolation Voltage 500VDC		1GΩ min.
Isolation Capacitance	I/P to O/P, 100KHz/0.1V		100pF max.
Insulation Grade			reinforced
Means of Protection	277VAC working voltage		2MOPP

Notes:

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

ENVIRONMENTAL

Parameter	Condition		Value
Operating Temperature Range	@ natural convection 0.1m/s	refer to ***"Derating Graph"***	-40°C to +85°C
Temperature Coefficient			±0.02%/K
Operating Altitude (7)	according to 62368-1/61010 and 60601-1		5000m
Operating Humidity	non-condensing		95% RH max.
Pollution Degree			PD2
Vibration	according to MIL-STD-202G		10-500Hz, 2G 10min./1cycle, period 60min. along x,y,z axes
MTBF	according to MIL-HDBK-217F, G.B.	+25°C +40°C	>1006 x 10^3 hours >790 x 10^3 hours
Design Lifetime	nom. Vin= 230VAC, +40°C		>98 x 10^3 hours

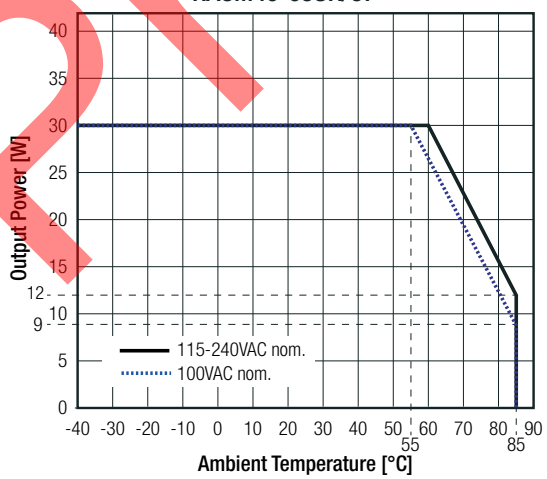
Notes:

Note7: 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

Derating Graph (9)

(@ Chamber and natural convection 0.1m/s)

RACM40-05SK/OF



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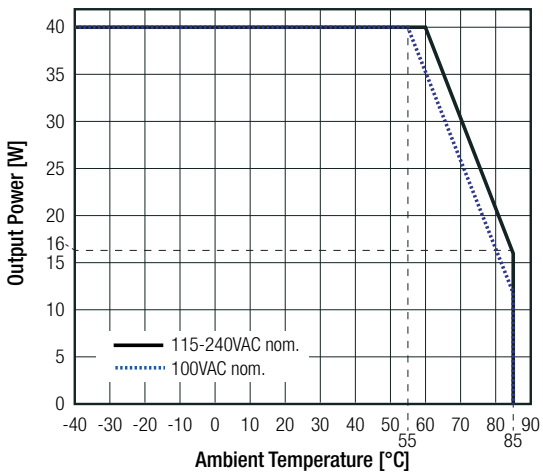

Notes:

Note9: Output power derating for Line-input of less than 90VAC (derate linearly from 100% at 90VAC to 80% at 80VAC)

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

SAFETY AND CERTIFICATIONS		
Certificate Type (Safety)	**Report / File Number**	**Standard**
Medical electrical equipment Part 1: General requirements for basic safety and essential performance	E511305-D1001-1/A0/C0-UL	ANSI/AAMI ES60601-1:2005 + A2:2010/2012 CAN/CSA-C22.2 No. 60601-1:14, 3rd Edition
Medical electrical equipment Part 1: General requirements for basic safety and essential performance		IEC60601-1:2005, 3rd Edition + AM1:2012 EN60601-1:2006 + A1:2013
Audio/Video, information and communication technology equipment - Safety requirements (CB Scheme)	pending	IEC62368-1:2014 2nd Edition
Audio/Video, information and communication technology equipment - Safety requirements (LVD)	pending	EN62368-1:2014 + A11:2017
Household and similar electrical appliances – Safety – Part 1: General requirements	pending	IEC60335-1:2010 5th Edition + C1:2016
Household and similar electrical appliances – Safety – Part 1: General requirements (LVD)	pending	EN60335-1:2012 + A14:2019
Electrical Equipment For Measurement, Control, and Laboratory Use; Part 1: General Requirements (CB Scheme)	pending	IEC61010-1:2010+A1:2016, 3rd Edition
Electrical Equipment For Measurement, Control, and Laboratory Use; Part 1: General Requirements	pending	EN61010-1:2010+A1:2019
Measurement methods for electromagnetic fields of household appliances and similar apparatus with regard to human exposure	pending	EN62233:2008
Safety of power transformers, power supplies, reactors & similar products for supply voltages up to 1100V (CB Scheme)	pending	IEC61558-1:2005 2nd Edition + A1:2009
Safety of power transformers, power supplies, reactors & similar products for supply voltages up to 1100V	pending	EN61558-1:2005 + A1:2009
Safety of power transformers, power supplies, reactors & 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 & similar products for supply voltages up to 1100 V Part 2: Particular requirements	pending	EN61558-2-16:2009 + A1:2013
RoHS2		RoHS 2011/65/EU + AM2015/863

EMC Compliance (Medical)	**Condition**	**Standard / Criterion**
Medical electrical equipment - Part 1-2: General requirements for basic safety and essential performance - Collateral standard: Electromagnetic compatibility - Requirements and tests 4th Ed.	4789293779	EN60601-1-2:2015
ESD Electrostatic discharge immunity test	Air ±2, 4, 8, 15kV; Contact ±8kV	IEC61000-4-2:2008 , Criteria A EN61000-4-2:2009, Criteria A
Radiated, radio-frequency, electromagnetic field immunity test	9V/m (710, 745, 780, 5240, 5500, 5785MHz) 10V/m (80-2700MHz) 27V/m (385MHz) 28V/m (450, 810, 870, 930, 1720, 1845, 1970, 2450MHz)	IEC/EN61000-4-3:2006 + A2:2010, Criteria A
Fast Transient and Burst Immunity	AC Por:t L, N, L-N ±2kV	IEC/EN61000-4-4:2012, Criteria A
Surge Immunity	AC Port L-N: ±0.5, 1, 2kV L-PE, N-PE: ±0.5, 1, 2, 4kV	IEC/EN61000-4-5:2014, Criteria B
Immunity to conducted disturbances, induced by radio-frequency fields	AC Port: 3Vrms (0.15-80MHz) 6Vrms (IMS Band)	IEC61000-4-6:2013, Criteria A EN61000-4-6:2014, Criteria A
Power Magnetic Field Immunity	30A/m	IEC61000-4-8:2009, Criteria A EN61000-4-8:2010, Criteria A
Voltage Dips and Interruptions	Voltage Dips 30% Voltage Dips 100% (0.5P) Voltage Dips 100% (1.0P) Voltage Interruptions 100%	IEC/EN61004-11:2004, Criteria A IEC/EN61004-11:2004, Criteria A IEC/EN61004-11:2004, Criteria A IEC/EN61004-11:2004, Criteria B

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

EMC Compliance (Industrial)	Condition	Standard / Criterion
Electromagnetic compatibility of multimedia equipment – Emission Requirements	LCS200616044BE	EN55032:2015
Electromagnetic compatibility of multimedia equipment – Immunity requirements		EN55035:2017
ESD Electrostatic discharge immunity test	Air ±2, 4, 8kV; Contact ±2, 8kV	IEC61000-4-2:2008 , Criteria A EN61000-4-2:2009, Criteria A
Radiated, radio-frequency, electromagnetic field immunity test	3V/m (4800-1000MHz, 1800, 2600, 3500, 5000MHz)	IEC/EN61000-4-3:2006 + A2:2010, Criteria A
Fast Transient and Burst Immunity	AC Port: L, N, L-N ±1kV	IEC/EN61000-4-4:2012, Criteria B
Surge Immunity	AC Port: L-N: ±1kV	IEC/EN61000-4-5:2014, Criteria B
Immunity to conducted disturbances, induced by radio-frequency fields	AC Port: 3Vrms (0.15-80MHz) 3Vrms (10-30MHz) 1Vrms (30-80MHz)	IEC61000-4-6:2013, Criteria A EN61000-4-6:2014, Criteria A
Power Magnetic Field Immunity	1A/m	IEC61000-4-8:2009, Criteria A EN61000-4-8:2010, Criteria A
Voltage Dips and Interruptions	Voltage Dips 30% Voltage Dips 100% Voltage Interruptions 100%	IEC/EN61004-11:2004, Criteria C IEC/EN61004-11:2004, Criteria B IEC/EN61004-11:2004, Criteria C

EMC Compliance (Low voltage power supply)	Condition	Standard / Criterion
Low voltage power supplies, d.c. output Part 3: Electromagnetic compatibility (EMC)	LCS200616049BE	IEC/EN61204-3:2018
ESD Electrostatic discharge immunity test	Air ±2, 4, 8kV; Contact ±2, 8kV	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	AC Port: L, N, L-N ±2kV	IEC/EN61000-4-4:2012, Criteria B
Surge Immunity	AC Port: L-N: ±1kV	IEC/EN61000-4-5:2014, Criteria B
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, Criteria A EN61000-4-8:2010, Criteria A
Voltage Dips and Interruptions	Voltage Dips 20, 30,60% Voltage Dips 100% (0.5P) Voltage Dips 100% (1.0P) Voltage Interruptions 100%	IEC/EN61004-11:2004, Criteria C IEC/EN61004-11:2004, Criteria B IEC/EN61004-11:2004, Criteria B IEC/EN61004-11:2004, 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
Limitations on the amount of electromagnetic interference allowed from digital and electronic devices, industrial, scientific, and medical equipment		FCC 47 CFR Part 18

DIMENSION AND PHYSICAL CHARACTERISTICS		
Parameter	**Type**	**Value**
Material	PCB	FR4, (UL94 V-0)
Dimension (LxWxH)	"/OF" type "/PCB" type "/OF/2x3" type	78.3 x 40.6 x 25.5mm 78.3 x 40.6 x 29.1mm 78.3 x 53.0 x 25.5mm
Weight	"/OF" and "/PCB" type "/OF/2x3" type	74g typ. 80g typ.

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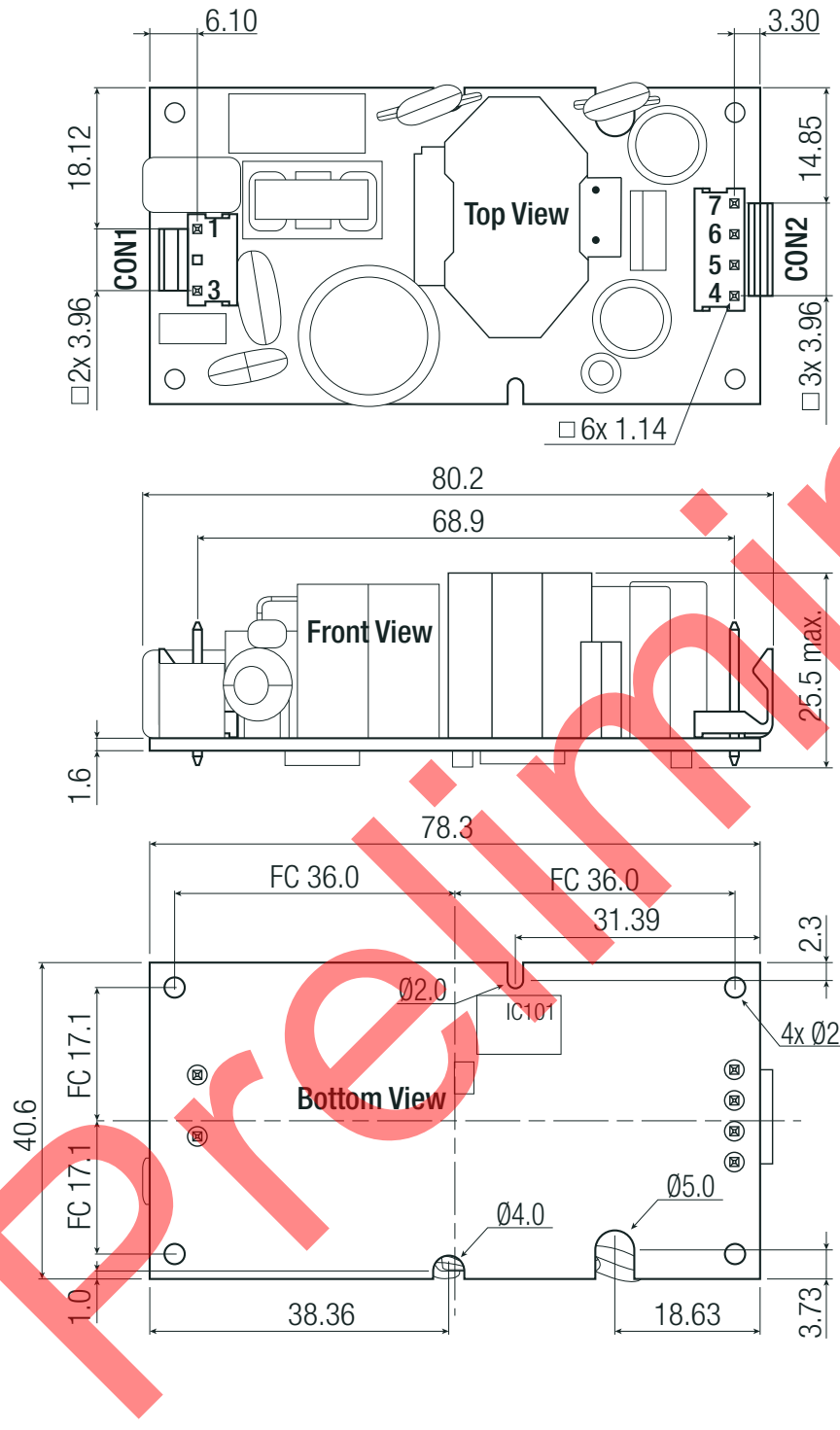
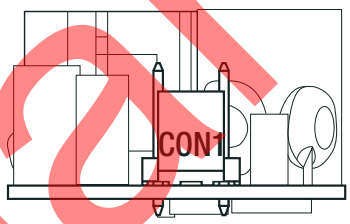
Specifications (measured @ Ta= 25°C, nom. Vin, full load and after warm-up unless otherwise stated)

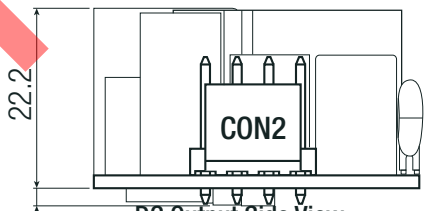
Dimension Drawing "/OF" (mm)



General tolerances according to ISO 2768-m (table for reference only)	
Dimension range	Tolerances
0.5 - 6 mm	±0.1 mm
6 - 30 mm	±0.2 mm
30 - 120 mm	±0.3 mm
120 - 400 mm	±0.5 mm

AC Input Side View





DC Output Side View

Connector Information

#	Function	Terminal
	AC Input (CON1)	
1	VAC in (N)	3 Pins (Pin2 removed)
3	VAC in (L)	with 3.96mm pitch
	DC Output (CON2)	
4,5	-VDC out	4 Pins
6,7	+VDC out	with 3.96mm pitch

FC= fixing centers

Compatible Connector
Housing
Molex 41695 Series or equivalent
Crimp Terminal
Molex 2478 Series or equivalent

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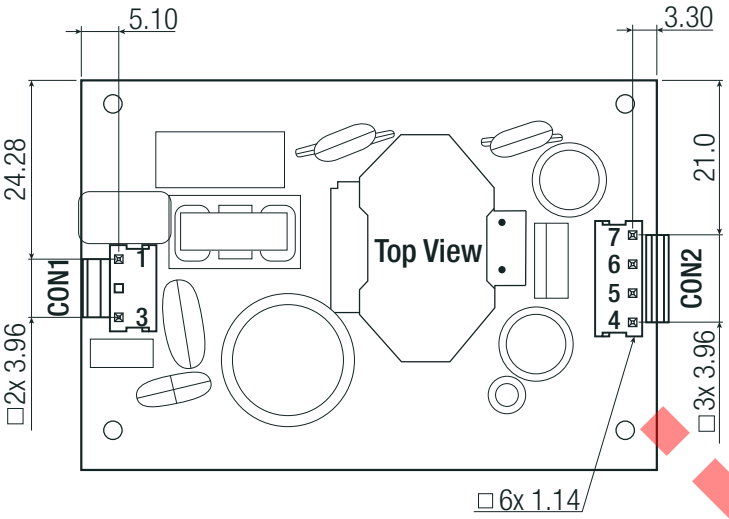
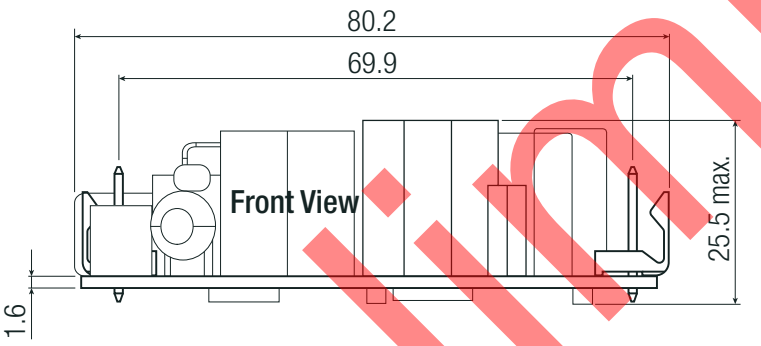
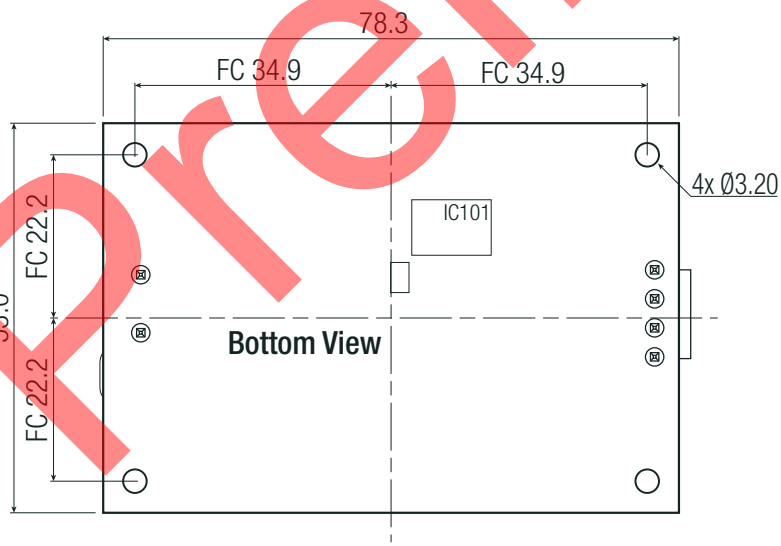
Specifications (measured @ Ta= 25°C, nom. Vin, full load and after warm-up unless otherwise stated)

Dimension Drawing "/OF/2x3" (mm)

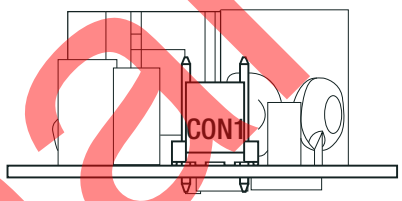




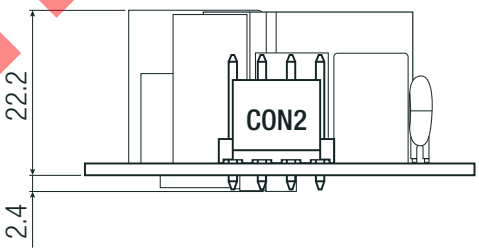


General tolerances according to ISO 2768-m (table for reference only)	
Dimension range	Tolerances
0.5 - 6 mm	±0.1 mm
6 - 30 mm	±0.2 mm
30 - 120 mm	±0.3 mm
120 - 400 mm	±0.5 mm

AC Input Side View



DC Output Side View



Connector Information

#	Function	Terminal
	AC Input (CON1)	
1	VAC in (N)	3 Pins (Pin2 removed)
3	VAC in (L)	with 3.96mm pitch
	DC Output (CON2)	
4,5	-VDC out	4 Pins
6,7	+VDC out	with 3.96mm pitch

FC= fixing centers

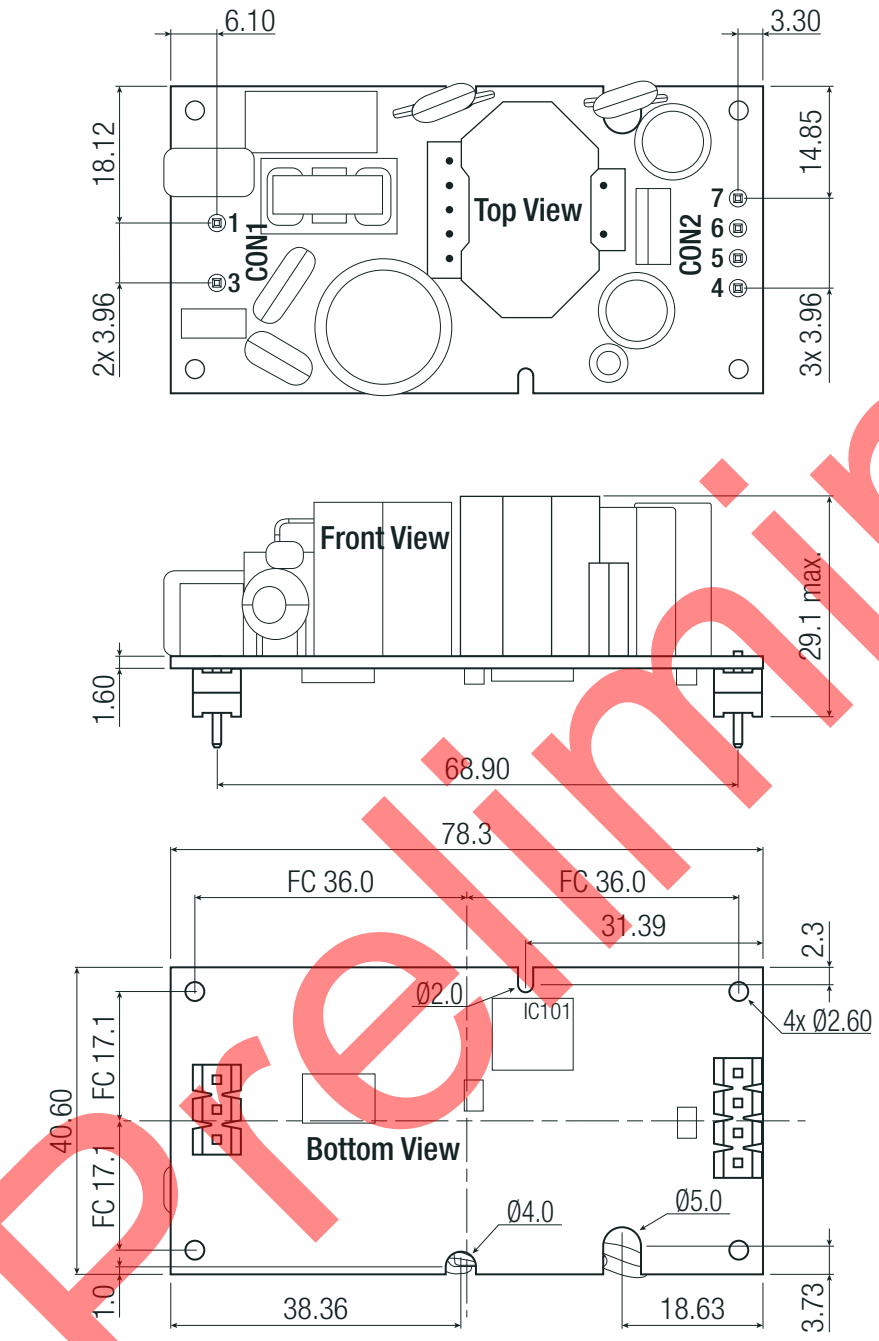
Compatible Connector
Housing
Molex 41695 Series or equivalent
Crimp Terminal
Molex 2478 Series or equivalent

continued on next page

RACM40-K/OF Series

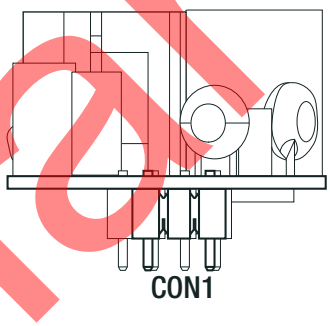
Specifications (measured @ Ta= 25°C, nom. Vin, full load and after warm-up unless otherwise stated)

Dimension Drawing "/OF/PCB" (mm)

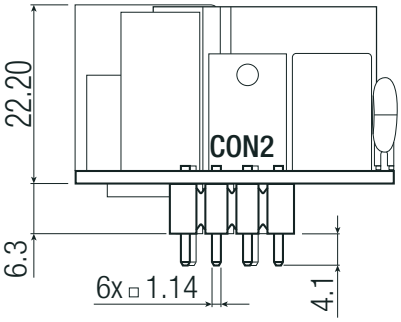


General tolerances according to ISO 2768-m (table for reference only)	
Dimension range	Tolerances
0.5 - 6 mm	±0.1 mm
6 - 30 mm	±0.2 mm
30 - 120 mm	±0.3 mm
120 - 400 mm	±0.5 mm

AC Input Side View



DC Output Side View



Pin-header Information

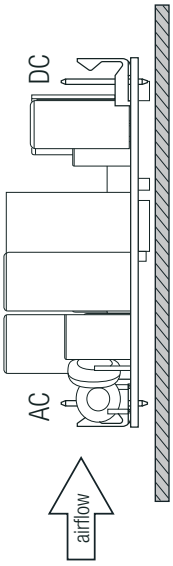
#	Function	Terminal
	AC Input (CON1)	
1	VAC in (N)	3 Pins (Pin2 removed)
3	VAC in (L)	with 3.96mm pitch
	DC Output (CON2)	
4,5	-VDC out	4 Pins
6,7	+VDC out	with 3.96mm pitch

FC= fixing centers

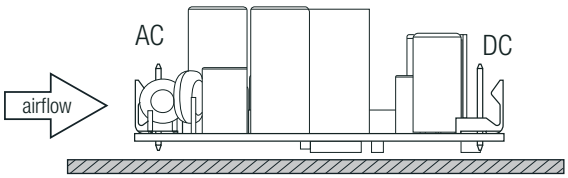
Specifications (measured @ Ta= 25°C, nom. Vin, full load and after warm-up unless otherwise stated)

Mounting

vertical

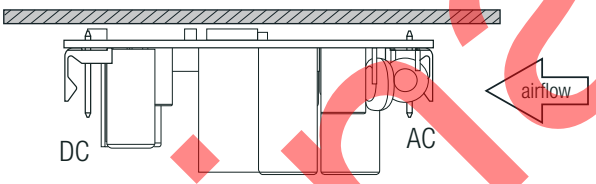


horizontal (standard)

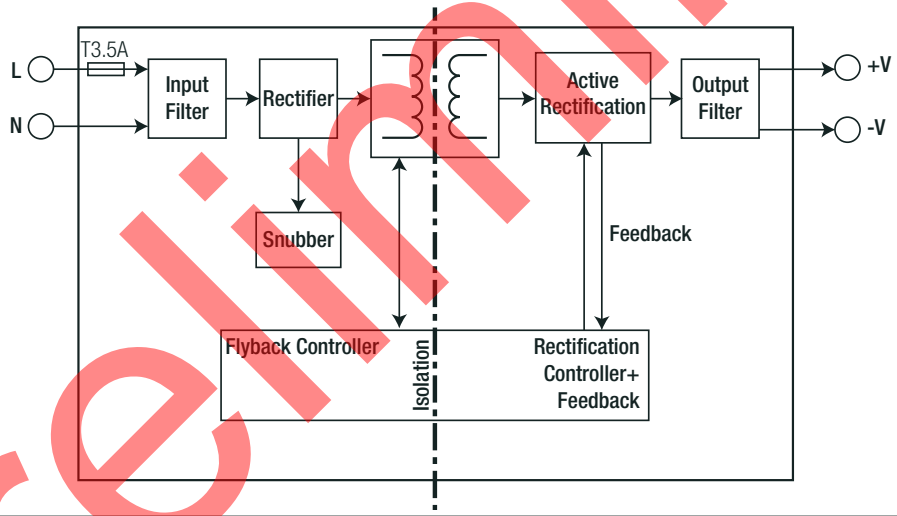


If module is mounted vertical or upside-down with natural convection cooling, the power must be derated ≥ 10%.

upside-down



Blockdiagram



PACKAGING INFORMATION

Parameter	Type		Value
Packaging Dimension (LxWxH)	"/OF" and "/OF/2x3" type	cardboard box (single pack)	65.0 x 55.0 x 95.0mm
	"/OF/PCB-T" type	single tray (carton)	365.0 x 210.0 x 56.0mm
	"/OF-CTN" type	tray in carton (project pack)	375.0 x 220.0 x 225.0mm
Package Unit	"/OF" type and "/OF/2x3" type		1pcs
	"/OF/PCB-T" type		16pcs
	"/OF-CTN" type, MOQ= 1024pcs		64pcs
Storage Temperature Range			-40°C to +90°C
Storage Humidity	non-condensing		95% max.