Technical Data Sheet

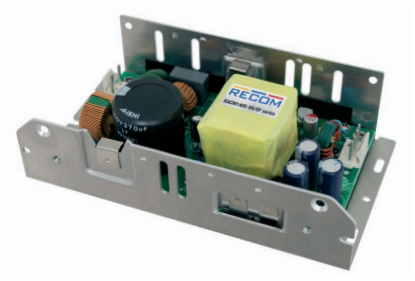
RACM140E-K Series ◊ AC/DC Power Supply

140W (210W/10s) ◊ Input: 100V-240VAC

RECOM
AC/DC Converter

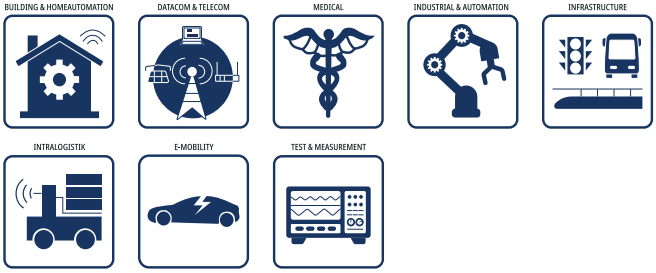
FEATURES

- Cost-efficient and reliable Design
- 210W boost power up to 10s
- Over voltage category OVC III; 2000m
- 5000m operating altitude
- Open Frame or enclosed; optional: Push-In connectors
- 2MOPP reinforced isolation, BF applicable
- 3 year warranty



Open frame: 147.0 x 81.5 x 38.0mm (5.7 x 3.2 x 1.5 inch)
Enclosed: 147.0 x 81.5 x 40.0mm (5.7 x 3.2 x 1.6 inch)

APPLICATIONS



SAFETY & EMC

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

DESCRIPTION

Cost efficiency and reliability characterize the RACM140E-K AC/DC power supplies, delivering a continuous output of 140 watts and a boost power of 210 watts for dynamic load surges lasting up to 10 seconds. Mounting options include industry-standard 3”x5” screw points or robust tabs, allowing direct installation from above onto base plates. Connection to be facilitated through a wiring harness and pin headers, or via optional tool-less ‘push-in’ terminals. Certified for household and industrial standards with overvoltage category OVC III respectively OVC II for operation up to 5000 meters altitude, the series additionally holds UL certifications with 2MOPP and complies with BF requirements for medical use. To simplify system integration, the modules offer ample margin to EN55032 ‘B’ limits and increased ‘Surge and Burst’ immunity. Covering a wide range of DC output requirements. output voltages can be adjusted by ±20% on average, using a trim potentiometer.

SELECTION GUIDE

Part Number	Operating Input Range [VAC]	Output Voltage nom. [VDC]	Output Adjustability [VDC]	rated Output Current (1) [A]	Efficiency (2) typ. [%]	rated Output Power (1) [W]
RACM140E-12SK (3)	80-264	12	12-18	11.6	86	140W
RACM140E-15SK (3)	80-264	15	12-18	9.3	87	140W
RACM140E-24SK (3)	80-264	24	22-28	5.8	88	140W
RACM140E-36SK (3)	80-264	36	30-36	3.8	90	136.8W
RACM140E-48SK (3)	80-264	48	48-54	2.9	90	140W

Note1: Refer to “**„PEAK LOAD Capability“.**
Note2: Efficiency is tested at nominal input and rated load at +25°C ambient.

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MODEL NUMBERING

RACM140E-__ SK/___

- nom. Output Power
- nom. Output Voltage
- **S**ingle
- Mechanical Options [3]

Note3: "/OF"= 5.7" x 3.2" open frame version, u-channel.
"/ENC"= 5.7" x 3.2" enclosed version (15Vout & 36Vout, on request).
"/PT/ENC"= 5.7" x 3.2" enclosed version with push in terminals (on request).

ORDERING INFORMATION

Model	nom. Output Voltage	Package Type		
		5.7" x 3.2" open frame "**/OF**"	5.7" x 3.2" enclosed "**/ENC**"	5.7" x 3.2" enclosed with push-in terminals "**/PT/ENC**"
RACM140E-12SK	12VDC	x	x	on request
RACM140E-15SK	15VDC	x	on request	on request
RACM140E-24SK	24VDC	x	x	on request
RACM140E-36SK	36VDC	x	on request	on request
RACM140E-48SK	48VDC	x	x	on request

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

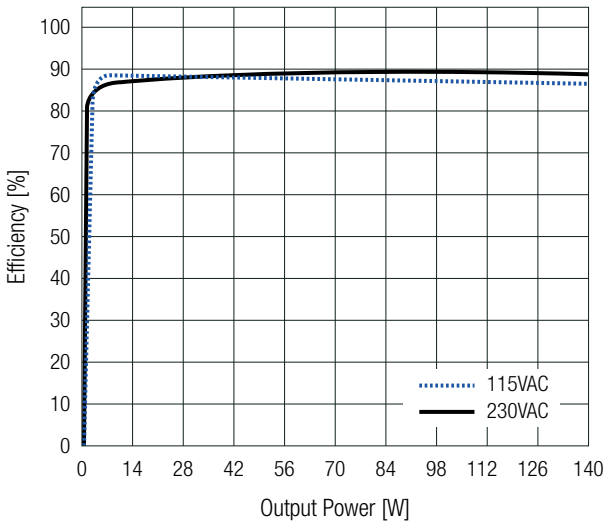
BASIC CHARACTERISTICS (measured @ T_{AMB}= 25°C, nom. V_{IN}, full load and after warm-up unless otherwise stated)

Parameter	Condition		Min.	Typ.	Max.
Nominal Input Voltage	50/60Hz		100VAC		240VAC
Operating Range [4]	47-63Hz		80VAC		264VAC
	DC		120VDC		370VDC
Input Current	115VAC				3A
	230VAC				2A
Inrush Current	cold start at 25°C	115VAC			30A
		230VAC			60A
No Load Power Consumption				100mW	
Ecodesign Standby Mode Use (Available output power for stated input power)	115/230VAC	P_{IN}= 0.3W		100mW	
		P_{IN}= 0.5W		300mW	
		P_{IN}= 1.0W		770mW	
Input Frequency Range	AC input		47Hz		63Hz
Output Voltage Adjustability [5]	on-board trim potentiometer	RACM140E-12SK	12VDC		18VDC
		RACM140E-15SK	12VDC		18VDC
		RACM140E-24SK	22VDC		28VDC
		RACM140E-36SK	30VDC		36VDC
		RACM140E-48SK	48VDC		54VDC
Minimum Load			0%		
Power Factor	115VAC			0.6	
	230VAC			0.5	
Start-up time	230VAC			200ms	300ms
Rise time	230VAC				20ms
Hold-up time	115VAC		10ms		
	230VAC		20ms		
Internal Operating Frequency					100kHz
Output Ripple and Noise [6]	20MHz BW	T_{AMB}= +25°C			1% of Vout

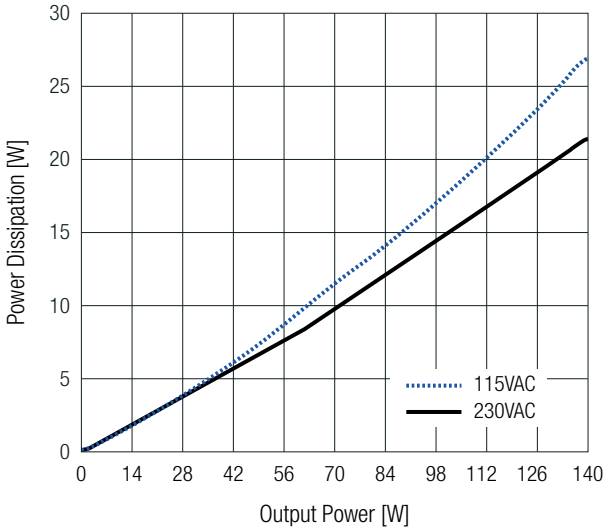
Note4: The products were submitted to all safety files at AC-operation.
Note5: Make sure that the maximum rated output power will not be exceeded when trimming up.
Note6: Measurements are made with a 0.1µF MLCC & 10µF E-cap in parallel across output (low ESR).
The test setup can have an impact on ripple noise values (placement of scope probe, capacitors, it's specifications, wires, PCB tracks, distances, etc.)

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

Efficiency vs Output Power



Power Dissipation vs. Output Power



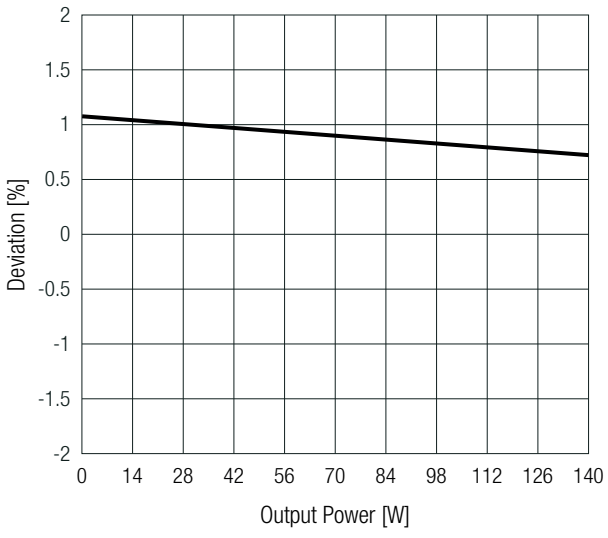
REGULATIONS (measured @ T_{AMB}= 25°C, nom. V_{IN}, full load and after warm-up unless otherwise stated)

Parameter	Condition	Value
Output Accuracy		±2.0% typ.
Line Regulation	low line to high line, full load	±0.5% typ.
Load Regulation [7]	10% to 100% load	2.0% typ.
Transient Response	25% load step change	4.0% max.
	recovery time	500µs typ.

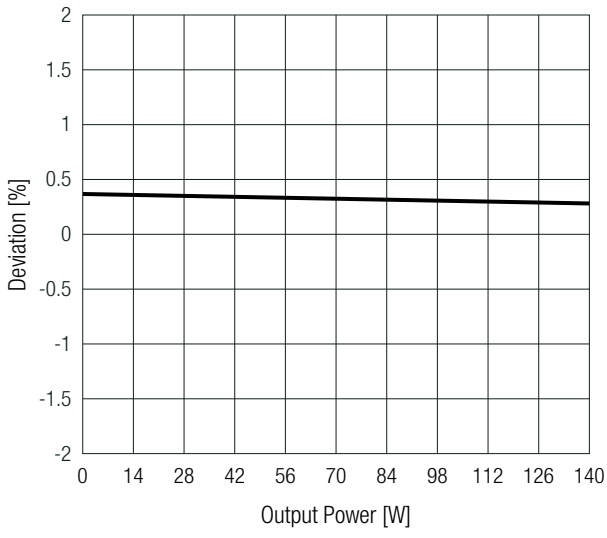
Note7: Operation below 10% load will not harm the converter, but specifications may not be met.

Deviation vs. Load

RACM140E-12SK, RACM140E-15SK



all others



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RECOM AC/DC Converter

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

Parameter	Type			Value
Internal Input Fuse [8]	dual-fusing (line & neutral)			2x T6.3A, slow blow type
Short Circuit Protection (SCP)	below 100mΩ			hiccup mode
Over Voltage Protection (OVP)	hiccup mode	RACM140E-12SK; RACM140E-15SK		30VDC max.
		RACM140E-24SK		40VDC max.
		RACM140E-36SK		48VDC max.
		RACM140E-48SK		65VDC max.
Over Voltage Category (OVC)	according to 61558			OVC III (2000m)
	according to 60601-1, 62368-1, 60335-1			OVC II (5000m)
Over Current Protection (OCP)				<200%, hiccup mode
DC ON LED				green light, output voltage present
Class of Equipment	with PE connection			Class I
Isolation Voltage [9]	I/P to O/P	1 minute	according to 61558	4.2kVAC
			according to 62368-1	4kVDC
Isolation Resistance	I/P to O/P, V_{ISO}=500VDC			1GΩ min.
Isolation Capacitance	I/P to O/P, 100kHz/0.1V			100pF max.
Insulation Grade	I/P to O/P			reinforced
Means of Protection	I/P to O/P			2MOPP
Medical Device Classification	built-in power supply			designed to support type BF applications
Touch Current	normal condition			<100µA
	single fault			<500µA
Earth Leakage Current (Input and Output to Earth (GND)	264VAC/63Hz	normal condition		<300µA

Note8: For system integration with DC operation, consider a suitable DC fuse in front of the input.

Note9: For repeat Hi-Pot testing, reduce the time and/or the test voltage.

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“**		-40°C to +90°C
Temperature Coefficient				±0.02%/K
Operating Altitude [10]	according to 62368-1, 60601-1, 60335-1			5000m (OVC II)
	according to 61558			2000m (OVC III)
Operating Humidity	non-condensing			90% RH max.
Pollution Degree				PD2
Vibration	according to MIL-STD-202G			10-500Hz, 2G 10min./1cycle, period, 60min. each along x,y,z axes
MTBF	according to MIL-HDBK-217, G.B.	T_{AMB}= +25°C		440 x 10^3 hours
		T_{AMB}= +40°C		400 x 10^3 hours
Design Lifetime	230VAC, full load	T_{AMB}= +45°C	RACM140E-12SK	30 x 10^3 hours
		T_{AMB}= +50°C	others	50 x 10^3 hours

Note10: 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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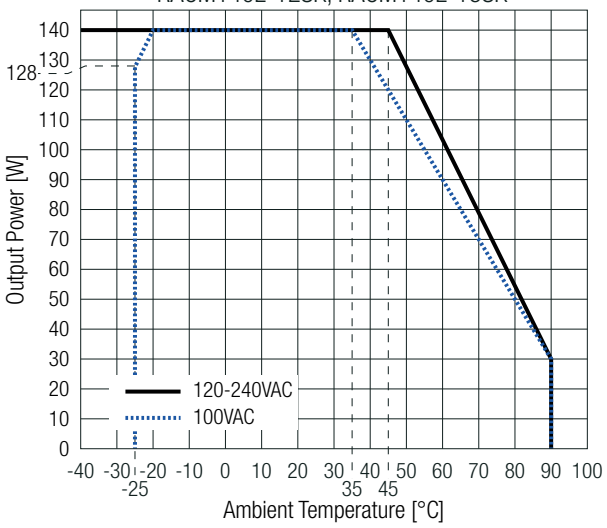
ENVIRONMENTAL (measured @ T_{AMB}= 25°C, nom. V_{IN}, full load and after warm-up unless otherwise stated)

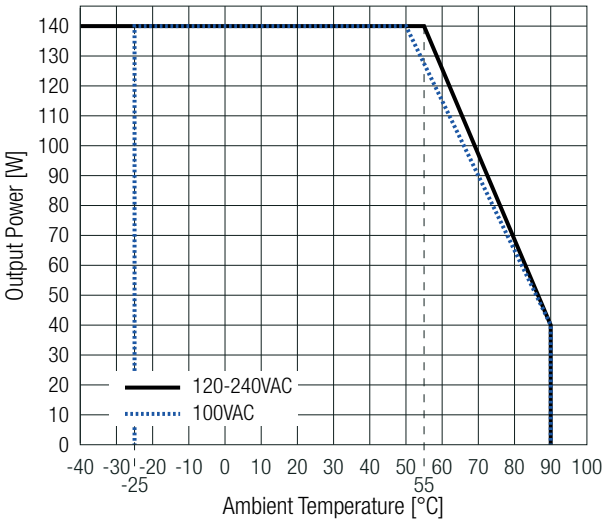
Derating Graph

(@ Chamber and natural convection 0.1m/s)

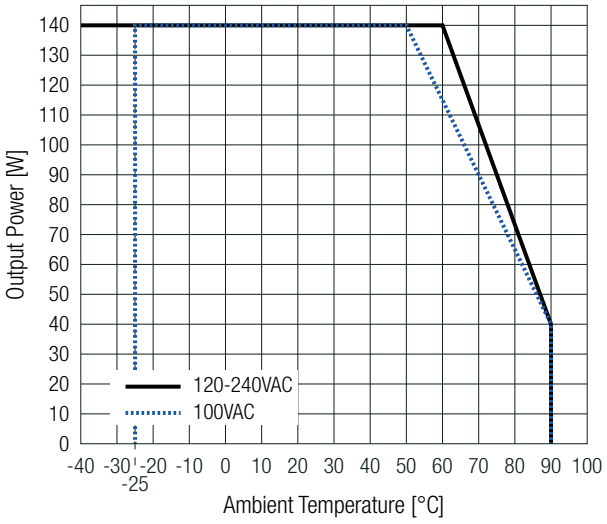
RACM140E-12SK, RACM140E-15SK



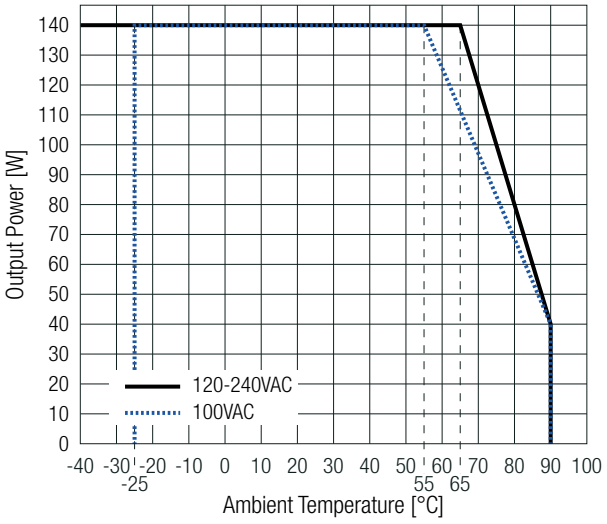
RACM140E-24SK



RACM140E-36SK



RACM140E-48SK



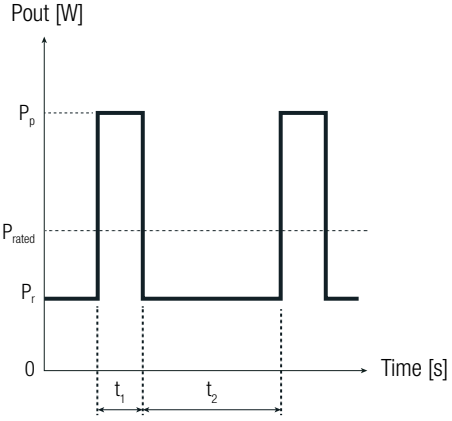
PEAK LOAD CAPABILITY

Peak Load calculation for recurrent dynamic loading (at natural convection 0.1m/s)

Parameters	Units	RACM140E-12SK RACM140E-15SK	RACM140E-24SK	RACM140E-36SK RACM140E-48SK
P_{rated}= rated output power	[W]	refer to „Derating Graph“		
P_P= peak output power	[W]	180W max.	210W max.	210W max.
P_r= recovery output power	[W]	use calculation below		
t_1= peak time set	[s]	10s max.		
t_2= recovery time	[s]	min. 5 x t_1		
k= heat dissipation factor	[ ]	1.1	1.0	0.9

Calculation:

$$P_r = \frac{P_{rated} \times (t_1 + t_2) - (P_P \times t_1)}{t_2 \times k}$$



Practical Example (RACM140E-48SK for still air convection):

Take the RACM140E-48SK at 240VAC input voltage and at T_{AMB}= 70°C, with still air convection.

P_P = 210W
P_{rated} = 120W
t_1 = 10s
t_2 = 5 x t_1
k = 1.0

$$P_r = \frac{120 \times (10 + 50) - (210 \times 10)}{50 \times 1} = \underline{102W}$$

SAFETY & CERTIFICATIONS

Certificate Type (Safety)	Report Number	Standard
Audio/Video, information and communication technology equipment - Part1: Safety requirements	085-230345101 -000	EN IEC 62368-1:2020+A11:2020
Audio/Video, information and communication technology equipment - Safety requirements (CB)		IEC62368-1:2018 3rd Edition
Medical electrical equipment Part 1: General requirements for basic safety and essential performance (CB)	230731004	IEC60601-1:2005+AM2:2020 Edition 3.2
Medical electrical equipment Part 1: General requirements for basic safety and essential performance		EN60601-1:2006+A2:2021
Medical electrical equipment Part 1: General requirements for basic safety and essential performance	E511305-D6003-UL	ANSI/AAMI ES60601-1:2005+A2:2010/(R)2012
		CAN/CSA-C22.2 No. 60601-1:14 3rd Edition
Household and similar electrical appliances – Safety – Part 1: General requirements	64.260.23.03453.01	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		EN62233:2008
Safety of power transformers, power supplies, reactors and similar products for supply voltages up to 1100 V 3rd Edition	085-230345201-100	IEC61558-1:2017 3rd Edition
Safety of power transformers, power supplies, reactors and similar products for supply voltages up to 1100 V 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
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 according to EN60601-1-2	Condition	Standard
Medical electrical equipment Part 1-2: General requirements for basic safety and essential performance (11)		EN60601-1-2:2015+A1:2021
ESD Electrostatic discharge immunity test	Contact ±4, 8kV	IEC61000-4-2:2009 EN61000-4-2:2008
Radiated, radio-frequency, electromagnetic field immunity test	10 V/m (80-2700MHz), 27V/m (385MHz), 28V/m (450MHz), 9V/m (710, 745, 780MHz), 28V/m (810, 870, 930MHz), 28V/m (1720, 1845, 1970MHz), 28V/m (2450MHz), 9V/m (5240, 5500, 5785MHz)	IEC/EN61000-4-3:2006 + A2:2010
Fast Transient and Burst Immunity (11)	L, N, PE, L-N, L-PE, N-PE, L-N-PE: ±2kV	IEC/EN61000-4-4:2012
Surge Immunity (11)	L-N: ±0.5, 1, 2kV L-PE, N-PE: ±4kV	IEC/EN61000-4-5:2014 + A1:2017
Immunity to conducted disturbances, induced by radio-frequency fields	3, 6Vrms (0.15-80MHz)	IEC61000-4-6:2013 EN61000-4-6:2014
Power Magnetic Field Immunity	30A/m	EN61000-4-8:2010
Voltage Dips and Interruptions	Dips: 100% (0.5P, 1.0P); 30% Interruption: 100%	EN61000-4-11:2004 + A1:2017
Limits of Harmonic Current Emissions	P_{OUT}= 112W	EN61000-3-2:2005+A1+A2:2009
Limits of Voltage Fluctuations & Flicker		EN61000-3-3:2013

SAFETY & CERTIFICATIONS

EMC Compliance according to EN61204-3	Condition	Standard / Criterion
Low voltage power supplies, d.c. output Part 3: Electromagnetic compatibility (EMC) (11)		EN IEC 61204-3:2018, Class B
ESD Electrostatic discharge immunity test	Contact: ±4kV	EN61000-4-2:2008, Criteria A IEC61000-4-2:2009, 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 (11)	L, N, PE, L-N, L-PE, N-PE, L-N-PE: ±2kV	IEC/EN61000-4-4:2012, Criteria A
Surge Immunity (11)	L-N: ±0.5, 1, 2kV L-PE, N-PE: ±4kV	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, Criteria A EN61000-4-8:2010, Crtieria A
Voltage Dip	100% (0.5P, 1.0P); 20%, 30%, 60%	EN61000-4-11:2004 + A1:2017, Criteria A
Voltage Interruptions	100%	EN61000-4-11:2004 + A1:2017, Criteria B
Limits of Harmonic Current Emissions	P_{OUT}= 112W	EN61000-3-2:2005+A1+A2:2009
Limits of Voltage Fluctuations & Flicker		EN61000-3-3:2013

EMC Compliance according to EN35032/55035	Condition	Standard / Criterion
Electromagnetic compatibility of multimedia equipment – Emission Requirements		EN55032:2015+A11:2020, CLass B
Electromagnetic compatibility of multimedia equipment – Immunity requirements		EN55035:2017+A11:2020
ESD Electrostatic discharge immunity test	Contact: ±4kV	EN61000-4-2:2008, Criteria A IEC61000-4-2:2009, 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 (11)	L, N, PE, L-N, L-PE, N-PE, L-N-PE: ±2kV	IEC/EN61000-4-4:2012, Criteria A
Surge Immunity (11)	L-N: ±2kV L-PE, N-PE: ±4kV	IEC/EN61000-4-5:2014 + A1:2017, Criteria A
Immunity to conducted disturbances, induced by radio-frequency fields	10Vrms (0.15-10MHz) 3-1Vrms (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, Crtieria A
Voltage Dip	100% (0.5P); 30%	EN61000-4-11:2004 + A1:2017, Criteria A
Voltage Interruptions	100%	EN61000-4-11:2004 + A1:2017, Criteria B
Limits of Harmonic Current Emissions	P_{OUT}= 112W	EN61000-3-2:2005+A1+A2:2009
Limits of Voltage Fluctuations & Flicker		EN61000-3-3:2013
Limitations on the amount of electromagnetic intererence allowed from digital and electronic devices		FCC 47 CFR Part 15 Subpart B, Class B

Note11: Valid under floating load conditions and with earth referenced output as well

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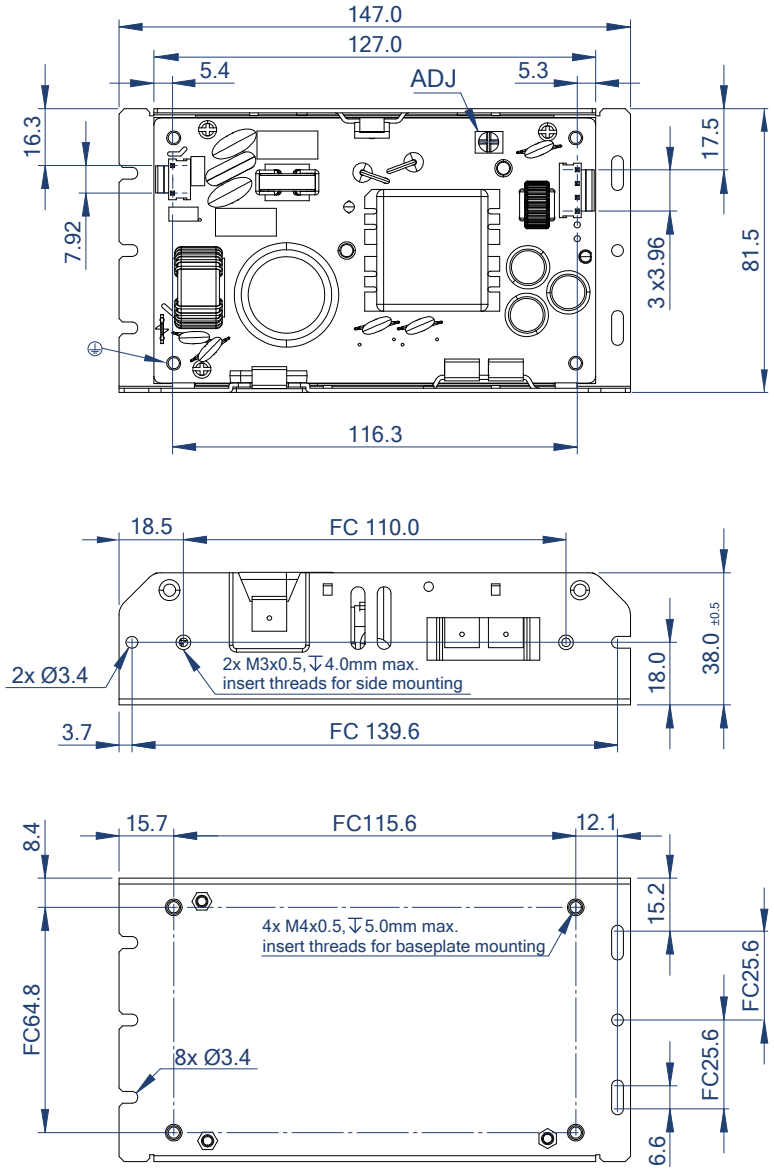
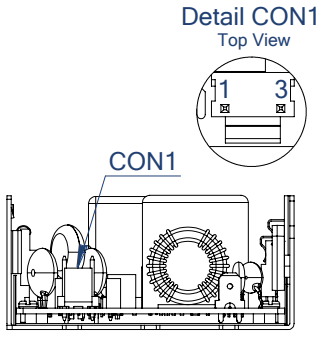
RECOM AC/DC Converter

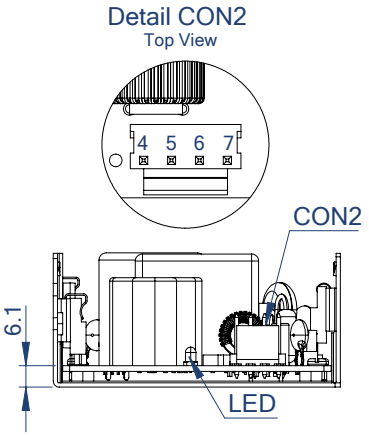
DIMENSION & PHYSICAL CHARACTERISTICS

Parameter	Type	Value
Materials	PCB	FR4, (UL94-V0)
	chassis	aluminum
Dimension (LxWxH)	"/OF"	147.0 x 81.5 x 38.0mm 5.7 x 3.2 x 1.5 inch
	"/ENC"	147.0 x 81.5 x 40.0mm 5.7 x 3.2 x 1.6 inch
Weight	"/OF"	311g typ. 0.68 lbs
	"/ENC"	348g typ. 0.76 lbs

Dimension Drawing "/OF" version (mm)







Note12: Every indicated fixation points can be used for PE connections

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

Connector Information

AC Input (CON1)

#	Function	Connector description
1	VAC in (N)	3 Pins (Pin2 removed)
3	VAC in (L)	with 3.96mm pitch

DC Output (CON2)

#	Function	Connector description
4, 5	+Vout	4 Pins
6,7	-Vout	with 3.96mm pitch

FC= Fixing centers

Compatible Connector

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

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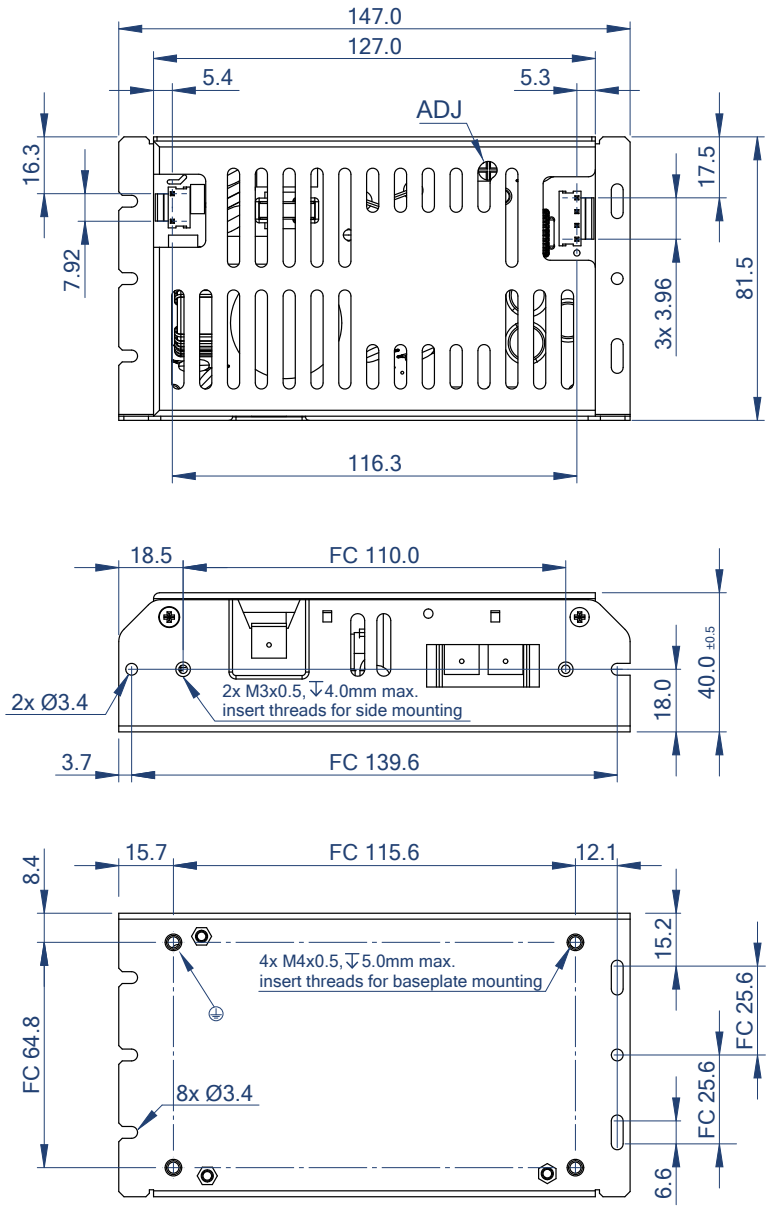
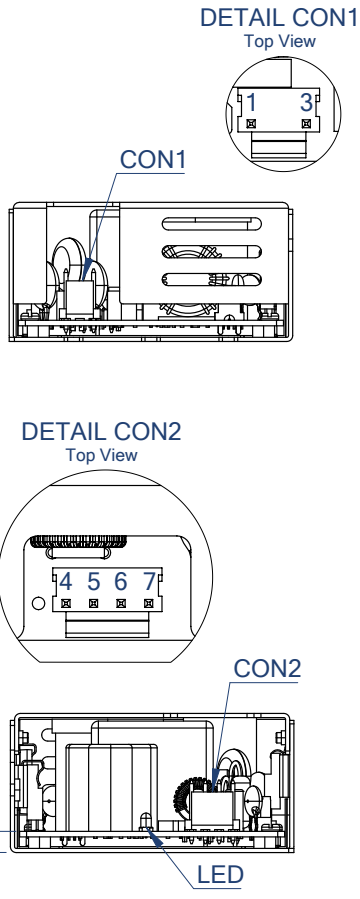
DIMENSION & PHYSICAL CHARACTERISTICS

Dimension Drawing "/ENC" version (mm)





Note12: Every indicated fixation points can be used for PE connections

Connector Information

AC Input (CON1)

#	Function	Connector
1	VAC in (N)	3 Pins (Pin2 removed)
3	VAC in (L)	with 3.96mm pitch

DC Output (CON2)

#	Function	Connector
4, 5	+Vout	4 Pins
6,7	-Vout	with 3.96mm pitch

FC= Fixing centers

Compatible Connector

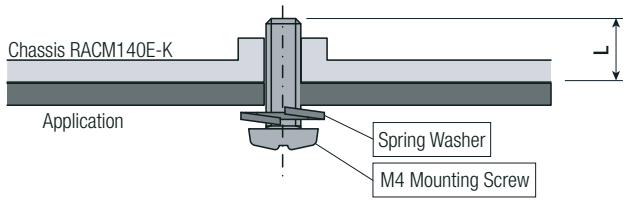
Housing	Crimp Terminal
Molex 41695 Series or equivalent	Molex 2478 Series or equivalent

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

INSTALLATION & APPLICATION

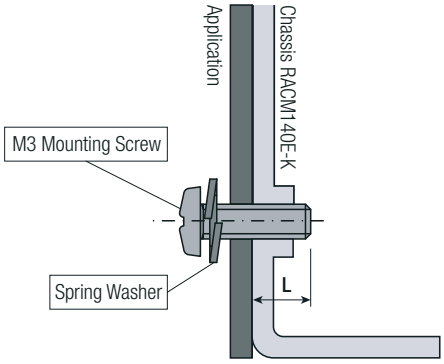
Mounting Equipment

Baseplate Mounting



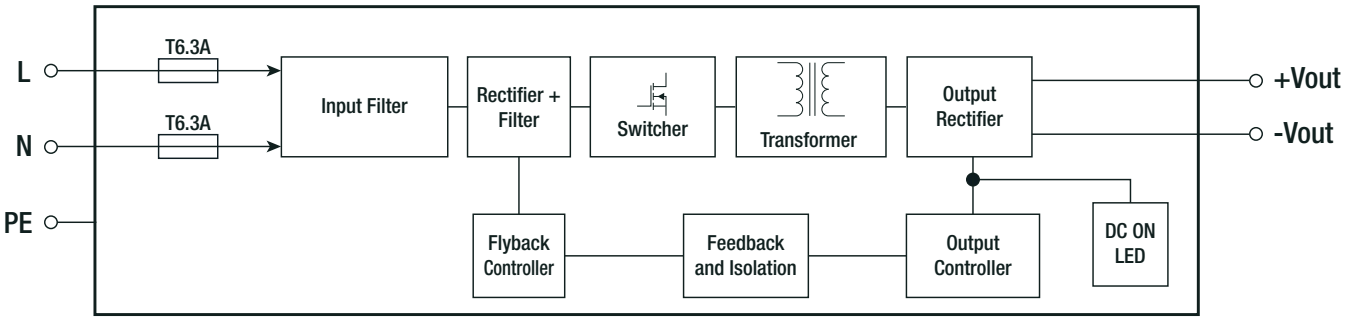
Recommended mounting tightening torque= 1.1Nm.
L= 3mm min. / 5mm max.

Side Mounting



Recommended mounting tightening torque= 0.7Nm.
L= 3mm min. / 4mm max.

BLOCK DIAGRAM



PACKAGING INFORMATION

Parameter	Type		Value
Packaging Dimension (LxWxH)	tray	open frame "/OF"	410.0 x 360.0 x 55.0mm
		enclosed "/ENC"	350.0 x 360.0 x 65.0mm
Packaging Quantity	open frame "/OF"		8pcs
	enclosed "/ENC"		6pcs
Storage Temperature Range			-40°C to +90°C
Storage Humidity	non-condensing		95% RH max.