

# Features

- Universal Input 85-305VAC
- 3W PCB Mount Package
- <75mW No Load Power Consumption
- Ultra Low Profile, Compact Size
- -40°C to +85°C Operating Temperature
- Continuous SCP, OCP, OVP
- EN60335, IEC/EN/UL60950 & CE Certified

# Regulated Converters

## Description

The RAC03-GA series are low cost AC/DC power supplies, ideal for PCB mounted, compact, board level industrial applications. They feature universal AC input voltage range, regulated and short-circuit -proof isolated DC outputs, low standby power consumption and -40°C to +85°C operating temperature range. The RAC03-GA have a built-in Class A / FCC Part 15 EMC filter, are certified to IEC/EN/UL60950-1 and EN60335 and are pending to IEC/EN/UL62368 and EN61558 safety standards and come with a three year warranty.

## Selection Guide

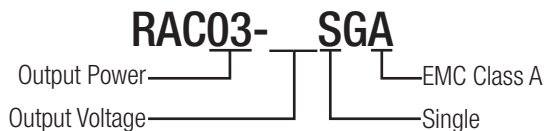
Part Number	Input Voltage Range [VAC]	Output Voltage [VDC]	Output Current [mA]	Efficiency typ. <sup>(1)</sup> [%]	Max. Capacitive Load <sup>(2)</sup> [µF]
RAC03-3.3SGA	85-305	3.3	910	70	2000
RAC03-05SGA	85-305	5	600	72	1500
RAC03-12SGA	85-305	12	250	78	500
RAC03-15SGA	85-305	15	200	78	200
RAC03-24SGA	85-305	24	130	80	150

### Notes:

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

Note2: Max. Cap. Load is tested at nominal input and full resistive load

## Model Numbering



### Ordering Example

RAC03-12SGA = 3W Output Power, 12V Output Voltage, Single Output, EMC Class A

## Specifications (measured @ ta=25°C, nom. Vin, full load unless otherwise noted)

BASIC CHARACTERISTICS					
Parameter	Condition		Min.	Typ.	Max.
Internal Input Filter			Pi-Type		
Input Voltage Range			85VAC 120VDC		305VAC 430VDC
Input Current	115VAC 230VAC			70mA 45mA	
Inrush Current	cold start at 25°C	115VAC 230VAC			10A 20A
No Load Power Consumption					75mW
Input Frequency Range	AC Input		45Hz		65Hz
Minimum Load			0%		
Power Factor	115VAC 230VAC			0.53 0.41	
Start-up Time	115VAC, 230VAC			30ms	1s
Hold-up Time	115VAC 230VAC			5ms 40ms	
Internal Operating Frequency	100% load at nominal Vin			65kHz	
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# RECOM

## AC/DC Converter

## RAC03-GA

# 3 Watt Single Output EMC Class A



UL60950-1 Certified  
IEC/EN60950-1 Certified  
UL62368-1 Pending  
IEC/EN62368-1 Pending  
EN61558-1 Pending  
EN61558-2-16 Pending



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Zertifiziert nach ISO 9001:2015

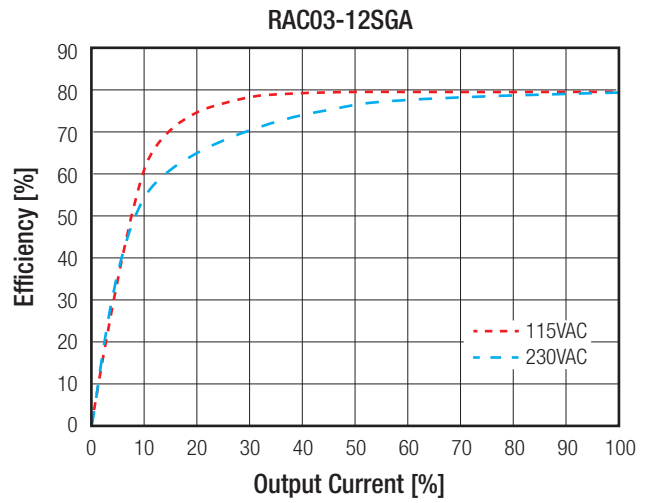
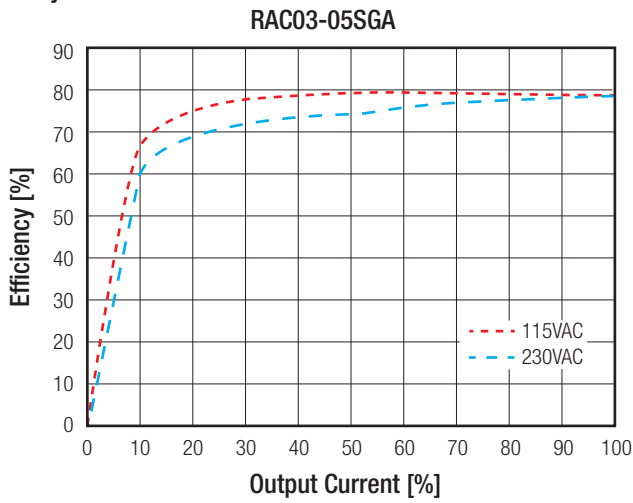
**Specifications** (measured @  $t_a=25^{\circ}\text{C}$ , nom.  $V_{in}$ , full load unless otherwise noted)

Output Ripple and Noise <sup>(3)</sup>	20MHz BW	0°C to 85°C	3.3, 5Vout 12Vout 15Vout 24Vout	100mVp-p 150mVp-p 200mVp-p 240mVp-p
		-30°C to 0°C	3.3, 5Vout 12Vout 15, 24Vout	200mVp-p 250mVp-p 300mVp-p

**Notes:**

Note3: Measurements are made with a 12" twisted pair-wire with a 0.1 $\mu\text{F}$  and 10 $\mu\text{F}$  parallel capacitor across output (low ESR).

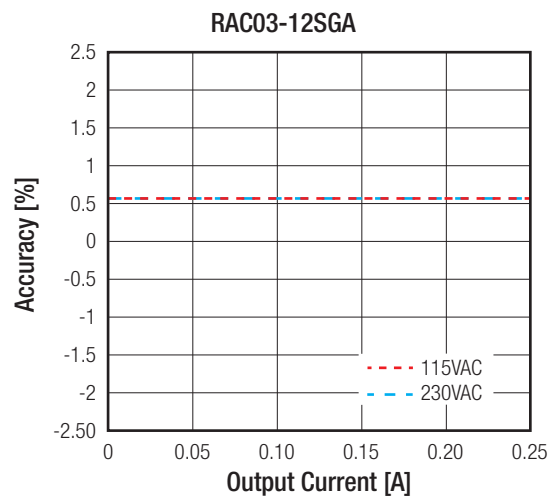
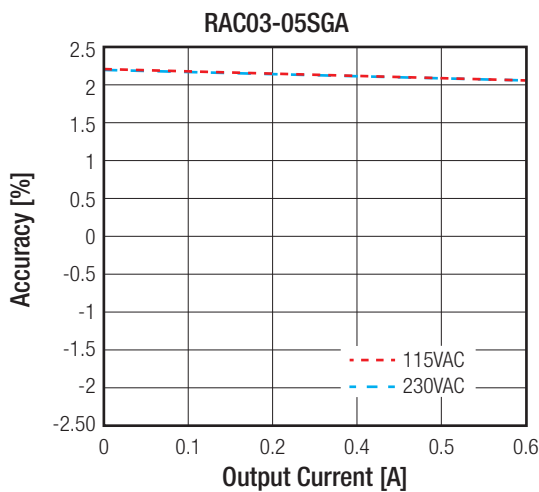
**Efficiency vs. Load**



**REGULATIONS**

Parameter	Condition	Value
Output Accuracy		$\pm 2.5\%$ max.
Line Regulation	low line to high line	$\pm 0.5\%$ max.
Load Regulation	10% to 100% load	$\pm 0.5\%$ max.

**Accuracy vs. Load**



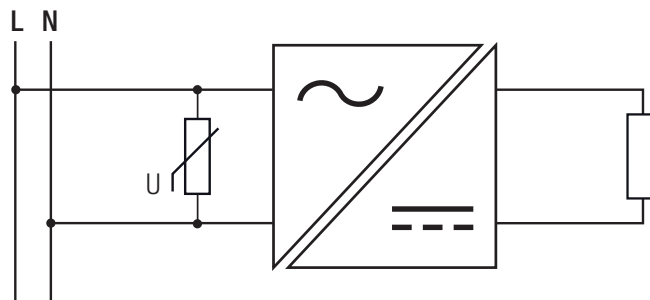
**Specifications** (measured @  $t_a=25^{\circ}\text{C}$ , nom.  $V_{in}$ , full load unless otherwise noted)

PROTECTIONS		
Parameter	Type	Value
Input Fuse	internal	T1A, 300V
Short Circuit Protection (SCP)	below 100m $\Omega$	long-term mode, auto recovery
Over Voltage Protection (OVP)	3.3Vout	3.8V - 4.9V, hiccup mode auto recovery
	5Vout	5.3V - 6.8V, hiccup mode auto recovery
	12Vout	12.6V - 16.2V, hiccup mode auto recovery
	15Vout	15.75V - 20.3V, hiccup mode auto recovery
	24Vout	25.2V - 32.4V, hiccup mode auto recovery
Over Current Protection (OCP)	3.3Vout	1.41A - 3A, hiccup mode auto recovery
	5Vout	0.91A - 2.2A, hiccup mode auto recovery
	12Vout	0.37A - 0.95A, hiccup mode auto recovery
	15Vout	0.29A - 0.72A, hiccup mode auto recovery
	24Vout	0.19A - 0.45A, hiccup mode auto recovery
Class of Equipment		Class II
Over Voltage Category (OVC)		OVC II
Isolation Voltage <sup>(4)</sup>	I/P to O/P	rated for 1 minute
Isolation Resistance		10M $\Omega$ min.
Insulation Grade		Reinforced
Leakage Current	277VAC, 50Hz	0.1mA max.

**Notes:**

Note4: For repeat Hi-Pot testing, reduce the time and/or the test voltage.

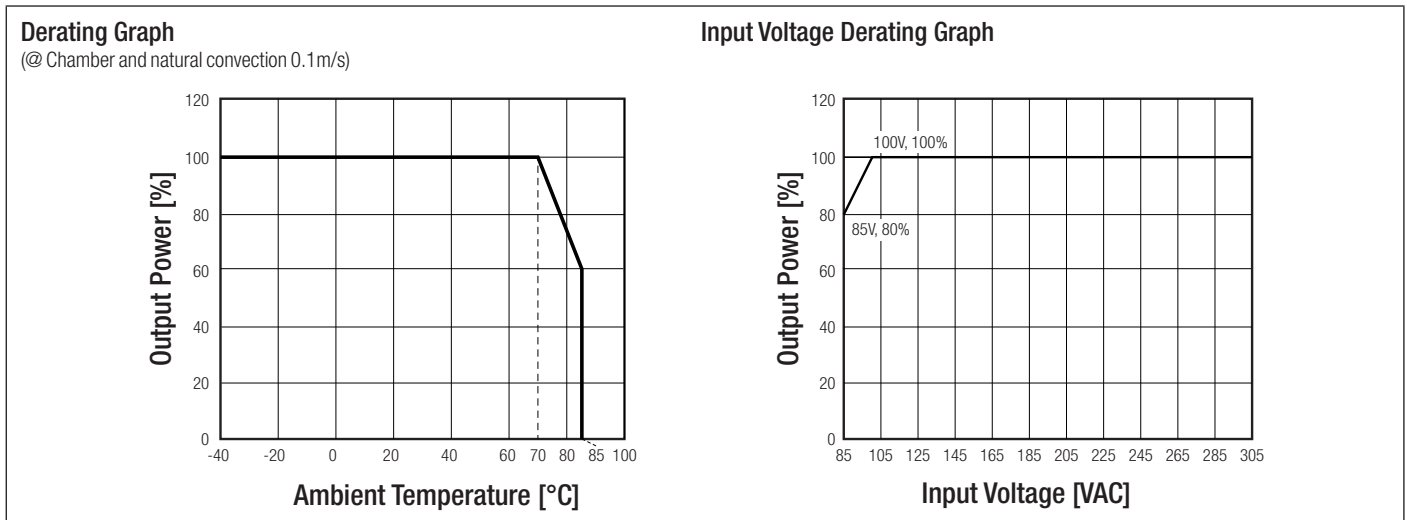
Note5: For operation at 230VAC, an external MOV is recommended. The Varistor should comply with IEC61051-2. eg. EPCOS S14 series.



ENVIRONMENTAL			
Parameter	Condition	Value	
Operating Temperature Range	without derating (@ natural convection 0.1m/s, see graph)	-40°C to +70°C	
Maximum Case Temperature		+100°C	
Temperature Coefficient		±0.03%/°C	
Operating Altitude		3000m	
Operating Humidity	non-condensing	5% - 95% RH	
Pollution Degree		PD2	
Shock		20G/11ms pulse, 3 times at each x, y, z axes	
Vibration		10-150Hz, 2G 10min./1cycle, period 60min. along x,y,z axes for 6 cycles	
MTBF	according to MIL-HDBK-217F, G.B.	+25°C	100 x 10 <sup>3</sup> hours
		+70°C	100 x 10 <sup>3</sup> hours

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**Specifications** (measured @  $t_a=25^{\circ}\text{C}$ , nom.  $V_{in}$ , full load unless otherwise noted)



**SAFETY AND CERTIFICATION**

Certificate Type (Safety)	Report / File Number	Standard
Information Technology Equipment, General Requirements for Safety (LVD)	SA17031845 001	IEC60950-1, 2nd Edition, 2005 + A1, 2009 + A2, 2013 EN60950-1, 2006 + A11, 2009 + A1, 2010 + A12, 2011 +A2, 2013
Information Technology Equipment, General Requirements for Safety	E196683-A3-UL	UL60950-1, 2nd Edition, 2014 CAN/CSA C22.2 No. 60950-1-07, 2nd Edition, 2014
Audio/video, information and communication technology equipment. Safety requirements	pending	UL62368-1 CAN/CSA C22.2 No 62368-1
Audio/video, information and communication technology equipment. Safety requirements	pending	IEC62368-1 EN62368-1
Household and similar electrical appliances - Safety. General requirements	SA1703184L 01001	EN60335, 2012 + A11, 2014
Measurement methods for electromagnetic fields of household appliances and similar apparatus with regard to human exposure	SA1703184L 01001	EN62233, 2008
Safety of power transformers, power supplies, reactors and similar products for supply voltages up to 1100 V Part 2: Particular requirements	pending	EN61558-1, 2005 + A1, 2009 EN61558-2-16, 2009 + A1, 2013
RoHs 2+		RoHS 2011/65/EU + AM2015/863

EMC Compliance	Condition	Standard / Criterion
Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement	EA1703184E 01001 with external components	EN55032, 2015, Class A
Limitations on the amount of electromagnetic interference allowed from digital and electronic devices	EA1703184E 01001	47 CFR FCC Part 15 Subpart B: 2016
ESD Electrostatic discharge immunity test	Air $\pm 8\text{kV}$ , Contact $\pm 4\text{kV}$	EN61000-4-2, 2009, Criteria A
Radiated, radio-frequency, electromagnetic field immunity test	3V/m	EN61000-4-3, 2006 + A1, 2008 + A2, 2010, Criteria A
Fast Transient and Burst Immunity	AC Power Port $\pm 1\text{kV}$	EN61000-4-4, 2012, Criteria A
Surge Immunity	AC Power Port L-N $\pm 1\text{kV}$	EN61000-4-5, 2014, Criteria B
Immunity to conducted disturbances, induced by radio-frequency fields	AC Power Port 3V	EN61000-4-6, 2014, Criteria A
Voltage Dips and Interruption	Voltage Dips >95% Voltage Dips 30% Voltage Interruptions >95%	EN61000-4-11, 2004, Criteria A EN61000-4-11, 2004, Criteria A EN61000-4-11, 2004, Criteria C

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**Specifications** (measured @  $t_a=25^\circ\text{C}$ , nom.  $V_{in}$ , full load unless otherwise noted)

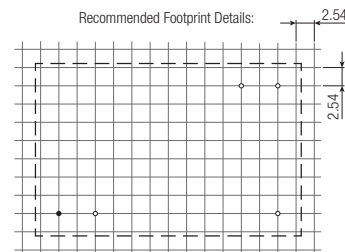
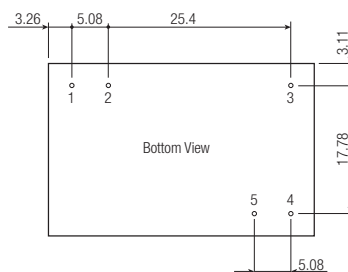
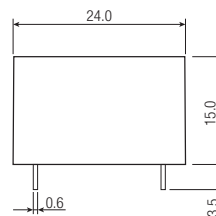
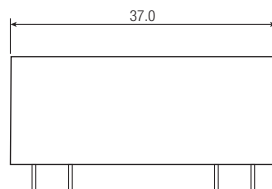
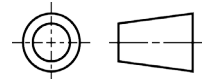
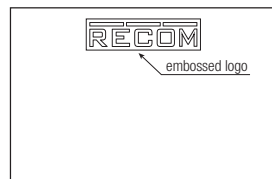
EMI Filtering according to EN60335-1 / EN55032 Class B Compliance

TBD

**DIMENSION and PHYSICAL CHARACTERISTICS**

Parameter	Type	Value
Material	Case PCB	black plastic, (UL94 V-0) FR4, (UL94 V-0)
Package Dimension (LxWxH)		37.0 x 24.0 x 15.0mm
Package Weight		20g typ.

**Dimension Drawing (mm)**



**Pin Connections**

Pin #	Single
1	VAC in (L)
2	VAC in (N)
3	NC
4	-Vout
5	+Vout

Tolerance: XX.X  $\pm$ 0.5mm  
Pin Width: XX.X  $\pm$ 0.05mm

**PACKAGING INFORMATION**

Parameter	Type	Value
Packaging Dimension (LxWxH)	tube	505.0 x 39.7 x 23.2mm
Packaging Quantity		20pcs
Storage Temperature Range		-40°C to +100°C
Storage Humidity	non-condensing	5% - 95% RH max.

The product information and specifications are subject to change without prior notice. RECOM products are not authorized for use in safety-critical applications (such as life support) without RECOM's explicit written consent. A safety-critical application is defined as an application where a failure of a RECOM product may reasonably be expected to endanger or cause loss of life, inflict bodily harm or damage property. The buyer shall indemnify and hold harmless RECOM, its affiliated companies and its representatives against any damage claims in connection with the unauthorized use of RECOM products in such safety-critical applications.

# Features

- Universal Input 85-305VAC
- 3W PCB Mount Package
- <75mW No Load Power Consumption
- Ultra Low Profile, Compact Size
- -40°C to +85°C Operating Temperature
- Continuous SCP, OCP, OVP
- IEC/EN/UL60950 & CE Certified, EN55032 Class B

# Regulated Converters



## RAC03-GB

**3 Watt  
Single  
Output  
EMC Class B**



### Description

The RAC03-GB series are low cost AC/DC power supplies, ideal for PCB mounted, compact, board level industrial applications. They feature universal AC input voltage range, regulated and short-circuit -proof isolated DC outputs, low standby power consumption and -40°C to +85°C operating temperature range. The RAC03-GB have a built-in Class B / FCC Part 15 EMC filter, are certified to IEC/EN/UL60950-1 and are pending to IEC/EN/UL62368 and EN61558 safety standards and come with a three year warranty.

### Selection Guide

Part Number	Input Voltage Range [VAC]	Output Voltage [VDC]	Output Current [mA]	Efficiency typ. <sup>(1)</sup> [%]	Max. Capacitive Load <sup>(2)</sup> [µF]
RAC03-05SGB	85-305	5	600	72	1500
RAC03-12SGB	85-305	12	250	78	500
RAC03-24SGB	85-305	24	130	80	150

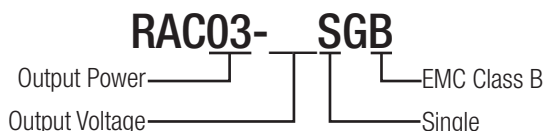
#### Notes:

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

Note2: Max. Cap. Load is tested at nominal input and full resistive load



### Model Numbering



#### Ordering Example

RAC03-12SGB = 3W Output Power, 12V Output Voltage, Single Output, EMC Class B



UL60950-1 Certified  
IEC/EN60950-1 Certified  
UL62368-1 Pending  
IEC/EN62368-1 Pending  
EN61558-1 Pending  
EN61558-2-16 Pending

### Specifications (measured @ ta=25°C, nom. Vin, full load unless otherwise noted)

BASIC CHARACTERISTICS				
Parameter	Condition	Min.	Typ.	Max.
Internal Input Filter				Pi-Type
Input Voltage Range		85VAC 120VDC		305VAC 430VDC
Input Current	115VAC 230VAC		70mA 45mA	
Inrush Current	cold start at 25°C 115VAC 230VAC			10A 20A
No Load Power Consumption				75mW
Input Frequency Range	AC Input	45Hz		65Hz
Minimum Load		0%		
Power Factor	115VAC 230VAC		0.53 0.41	
Start-up Time	115VAC, 230VAC		30ms	1s
Hold-up Time	115VAC 230VAC		5ms 40ms	
Internal Operating Frequency	100% load at nominal Vin		65kHz	

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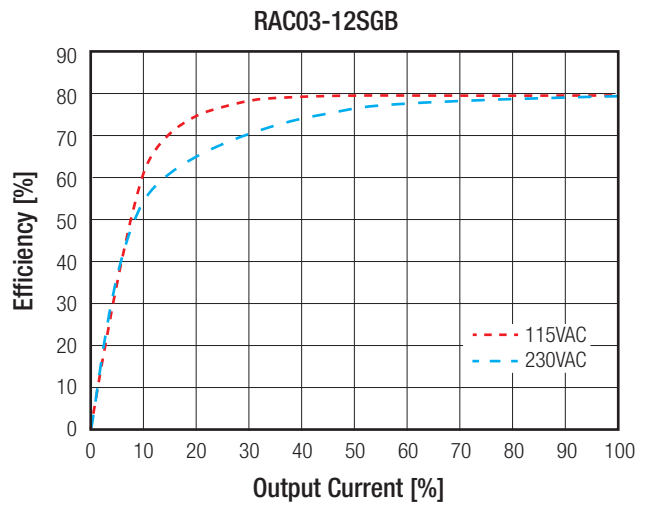
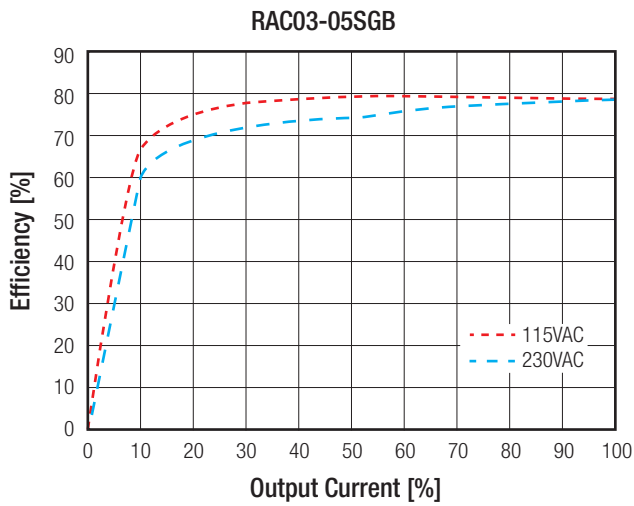
**Specifications** (measured @  $t_a=25^\circ\text{C}$ , nom.  $V_{in}$ , full load unless otherwise noted)

Output Ripple and Noise <sup>③</sup>	20MHz BW	0°C to 85°C	5Vout 12Vout 24Vout		100mVp-p 150mVp-p 240mVp-p
		-30°C to 0°C	5Vout 12Vout 24Vout		200mVp-p 250mVp-p 300mVp-p

**Notes:**

Note3: Measurements are made with a 12" twisted pair-wire with a 0.1µF and 10µF parallel capacitor across output (low ESR).

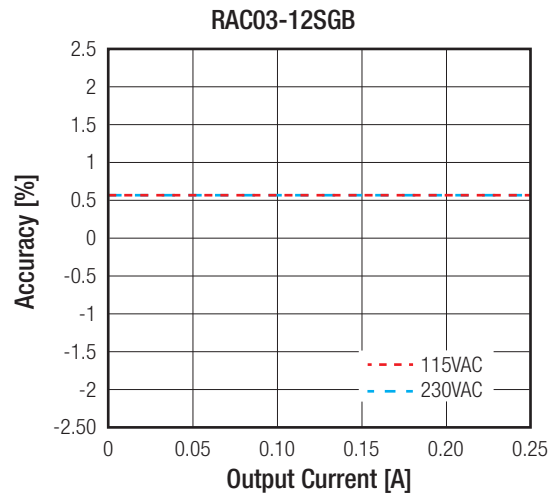
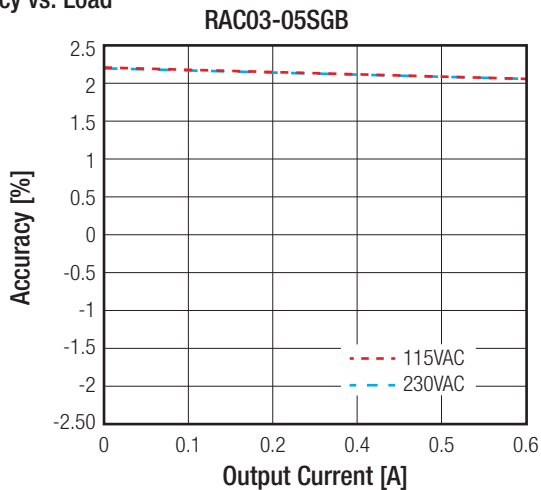
**Efficiency vs. Load**



**REGULATIONS**

Parameter	Condition	Value
Output Accuracy		±2.5% max.
Line Regulation	low line to high line	±0.5% max.
Load Regulation	10% to 100% load	±0.5% max.

**Accuracy vs. Load**



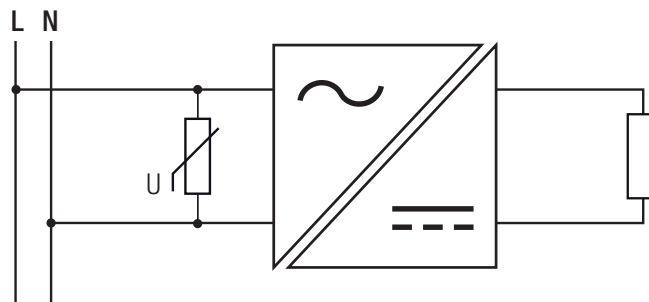
**Specifications** (measured @  $t_a=25^{\circ}\text{C}$ , nom.  $V_{in}$ , full load unless otherwise noted)

PROTECTIONS		
Parameter	Type	Value
Input Fuse	internal	T1A, 300V
Short Circuit Protection (SCP)	below 100m $\Omega$	long-term mode, auto recovery
Over Voltage Protection (OVP)	5Vout	5.3V - 6.8V, hiccup mode auto recovery
	12Vout	12.6V - 16.2V, hiccup mode auto recovery
	24Vout	25.2V - 32.4V, hiccup mode auto recovery
Over Current Protection (OCP)	5Vout	0.91A - 2.2A, hiccup mode auto recovery
	12Vout	0.37A - 0.95A, hiccup mode auto recovery
	24Vout	0.19A - 0.45A, hiccup mode auto recovery
Class of Equipment		Class II
Over Voltage Category (OVC)		OVC II
Isolation Voltage <sup>(4)</sup>	I/P to O/P	rated for 1 minute
Isolation Resistance		10M $\Omega$ min.
Isolation Capacitance		800pF min., 1200pF max.
Insulation Grade		Reinforced
Leakage Current	277VAC, 50Hz	0.1mA max.

**Notes:**

Note4: For repeat Hi-Pot testing, reduce the time and/or the test voltage.

Note5: For operation at 230VAC, an external MOV is recommended. The Varistor should comply with IEC61051-2. eg. EPCOS S14 series.

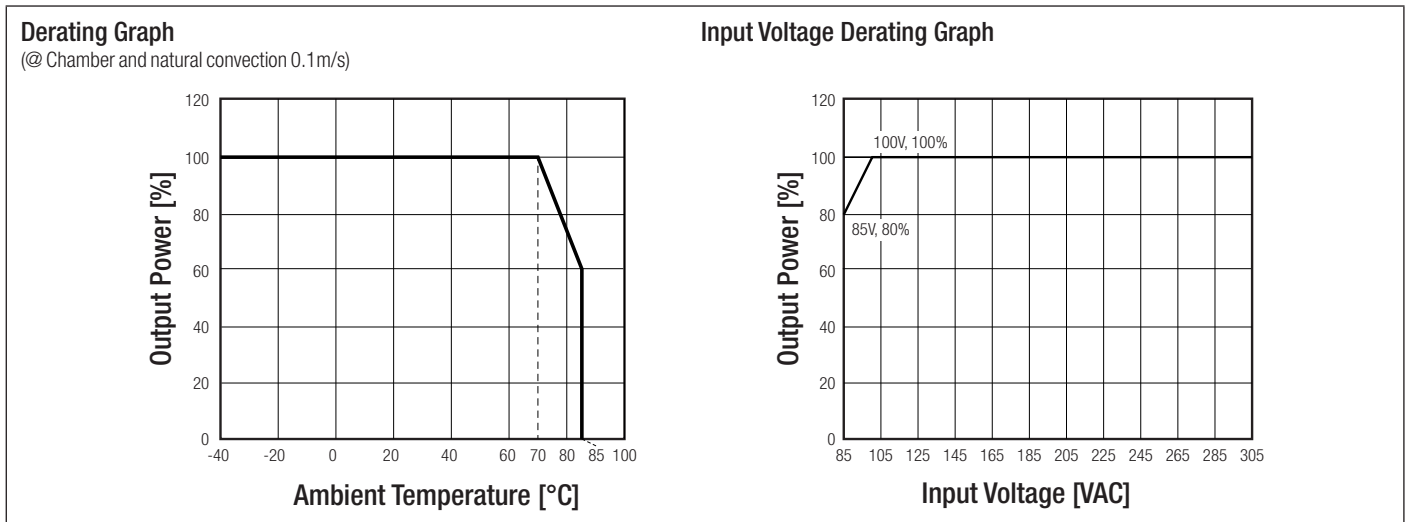


ENVIRONMENTAL			
Parameter	Condition	Value	
Operating Temperature Range	without derating (@ natural convection 0.1m/s, see graph)	-40°C to +70°C	
Maximum Case Temperature		+100°C	
Temperature Coefficient		±0.03%/°C	
Operating Altitude		3000m	
Operating Humidity	non-condensing	5% - 95% RH	
Pollution Degree		PD2	
Shock		20G/11ms pulse, 3 times at each x, y, z axes	
Vibration		10-150Hz, 2G 10min./1cycle, period 60min. along x,y,z axes for 6 cycles	
MTBF	according to MIL-HDBK-217F, G.B.	+25°C	100 x 10 <sup>3</sup> hours
		+70°C	100 x 10 <sup>3</sup> hours

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**Specifications** (measured @  $t_a=25^{\circ}\text{C}$ , nom.  $V_{in}$ , full load unless otherwise noted)



**SAFETY AND CERTIFICATION**

Certificate Type (Safety)	Report / File Number	Standard
Information Technology Equipment, General Requirements for Safety (LVD)	SA17031845 001	IEC60950-1, 2nd Edition, 2005 + A1, 2009 + A2, 2013 EN60950-1, 2006 + A11, 2009 + A1, 2010 + A12, 2011 +A2, 2013
Information Technology Equipment, General Requirements for Safety	E196683-A3-UL	UL60950-1, 2nd Edition, 2014 CAN/CSA C22.2 No. 60950-1-07, 2nd Edition, 2014
Audio/video, information and communication technology equipment. Safety requirements	pending	UL62368-1 CAN/CSA C22.2 No 62368-1
Audio/video, information and communication technology equipment. Safety requirements	pending	IEC62368-1 EN62368-1
Safety of power transformers, power supplies, reactors and similar products for supply voltages up to 1100 V Part 2: Particular requirements	pending	EN61558-1, 2005 + A1, 2009 EN61558-2-16, 2009 + A1, 2013
RoHs 2+		RoHS 2011/65/EU + AM2015/863

EMC Compliance	Condition	Standard / Criterion
Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement	EA1703184E 01001	EN55032, 2015, Class B
Limitations on the amount of electromagnetic interference allowed from digital and electronic devices	EA1703184E 01001	47 CFR FCC Part 15 Subpart B: 2016
ESD Electrostatic discharge immunity test	Air $\pm 8\text{kV}$ , Contact $\pm 4\text{kV}$	EN61000-4-2, 2009, Criteria A
Radiated, radio-frequency, electromagnetic field immunity test	3V/m	EN61000-4-3, 2006 + A1, 2008 + A2, 2010, Criteria A
Fast Transient and Burst Immunity	AC Power Port $\pm 1\text{kV}$	EN61000-4-4, 2012, Criteria A
Surge Immunity	AC Power Port L-N $\pm 1\text{kV}$	EN61000-4-5, 2014, Criteria B
Immunity to conducted disturbances, induced by radio-frequency fields	AC Power Port 3V	EN61000-4-6, 2014, Criteria A
Voltage Dips and Interruption	Voltage Dips >95% Voltage Dips 30% Voltage Interruptions >95%	EN61000-4-11, 2004, Criteria A EN61000-4-11, 2004, Criteria A EN61000-4-11, 2004, Criteria C

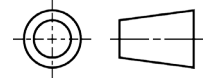
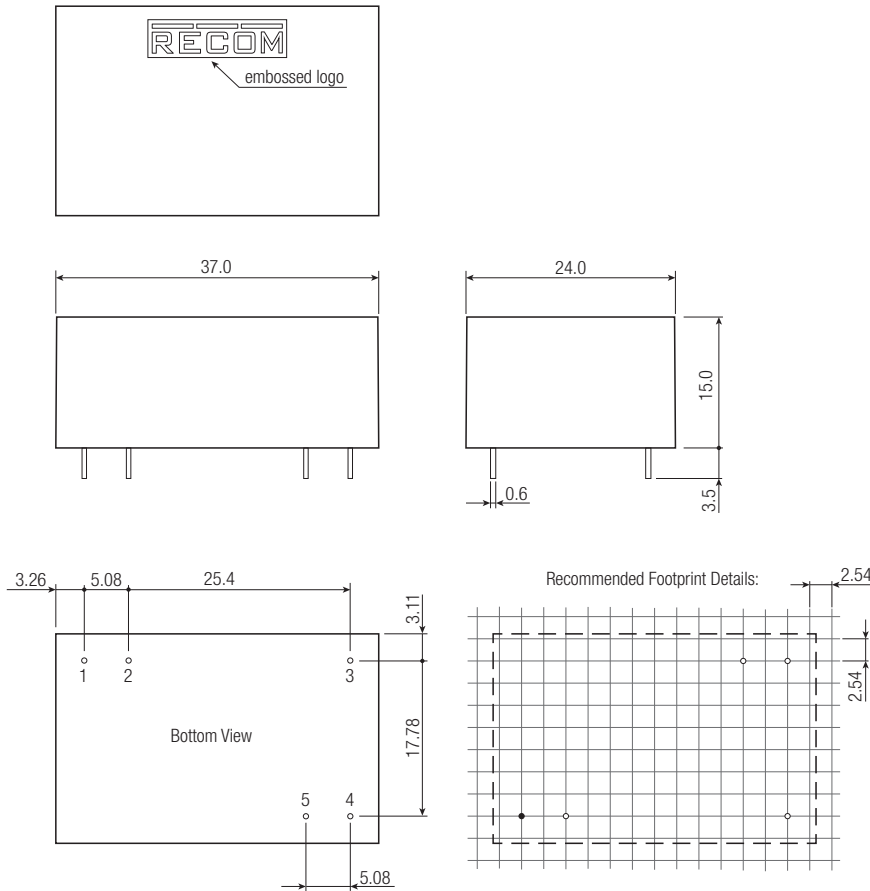
**DIMENSION and PHYSICAL CHARACTERISTICS**

Parameter	Type	Value
Material	Case PCB	black plastic, (UL94 V-0) FR4, (UL94 V-0)
Package Dimension (LxWxH)		37.0 x 24.0 x 15.0mm
Package Weight		20g typ.

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**Specifications** (measured @  $t_a=25^\circ\text{C}$ , nom.  $V_{in}$ , full load unless otherwise noted)

**Dimension Drawing (mm)**



**Pin Connections**

Pin #	Single
1	VAC in (L)
2	VAC in (N)
3	NC
4	-Vout
5	+Vout

Tolerance: XX.X  $\pm 0.5\text{mm}$   
Pin Width: XX.X  $\pm 0.05\text{mm}$

**PACKAGING INFORMATION**

Parameter	Type	Value
Packaging Dimension (LxWxH)	tube	505.0 x 39.7 x 23.2mm
Packaging Quantity		20pcs
Storage Temperature Range		-40°C to +100°C
Storage Humidity	non-condensing	5% - 95% RH max.

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# Features

- Universal Input 85-305VAC
- 4W PCB Mount Package
- <75mW No Load Power Consumption
- Ultra Low Profile, Compact Size
- -40°C to +85°C Operating Temperature
- Continuous SCP, OCP, OVP
- EN60335, EN60950, UL60950 & CE Pending

# Regulated Converters

## Description

The RAC04-GA series are low cost AC/DC power supplies, ideal for PCB mounted, compact, board level industrial applications. They feature universal AC input voltage range, regulated and short-circuit -proof isolated DC outputs, low standby power consumption and -40°C to +85°C operating temperature range. The RAC04-GA have a built-in Class A / FCC Part 15 EMC filter, are certified to IEC/EN/UL60950-1 and EN60335 and are pending to IEC/EN/UL62368 and EN61558 safety standards and come with a three year warranty.

## Selection Guide

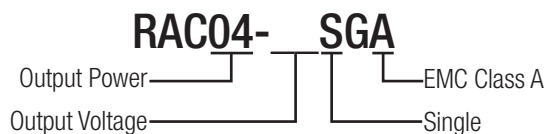
Part Number	Input Voltage Range [VAC]	Output Voltage [VDC]	Output Current [mA]	Efficiency typ. <sup>(1)</sup> [%]	Max. Capacitive Load <sup>(2)</sup> [μF]
RAC04-05SGA	85-305	5	800	72	1500
RAC04-12SGA	85-305	12	330	78	500
RAC04-24SGA	85-305	24	170	80	150

### Notes:

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

Note2: Max. Cap. Load is tested at nominal input and full resistive load

## Model Numbering



### Ordering Example

RAC04-12SGA = 4W Output Power, 12V Output Voltage, Single Output, EMC Class A

## Specifications (measured @ ta=25°C, nom. Vin, full load unless otherwise noted)

BASIC CHARACTERISTICS				
Parameter	Condition	Min.	Typ.	Max.
Internal Input Filter				Pi-Type
Input Voltage Range		85VAC 120VDC		305VAC 430VDC
Input Current	115VAC 230VAC		85mA 55mA	
Inrush Current	cold start at 25°C	115VAC 230VAC		10A 20A
No Load Power Consumption				75mW
Input Frequency Range	AC Input	45Hz		65Hz
Minimum Load		0%		
Power Factor	115VAC 230VAC		0.55 0.42	
Start-up Time	115VAC, 230VAC		30ms	1s
Hold-up Time	115VAC 230VAC		5ms 40ms	
Internal Operating Frequency	100% load at nominal Vin		65kHz	

continued on next page

**RECOM**  
AC/DC Converter

## RAC04-GA

4 Watt  
Single  
Output  
EMC Class A



UL60950-1 Certified  
IEC/EN60950-1 Certified  
UL62368-1 Pending  
IEC/EN62368-1 Pending  
EN61558-1 Pending  
EN61558-2-16 Pending

### Specifications (measured @ $t_a=25^\circ\text{C}$ , nom. $V_{in}$ , full load unless otherwise noted)

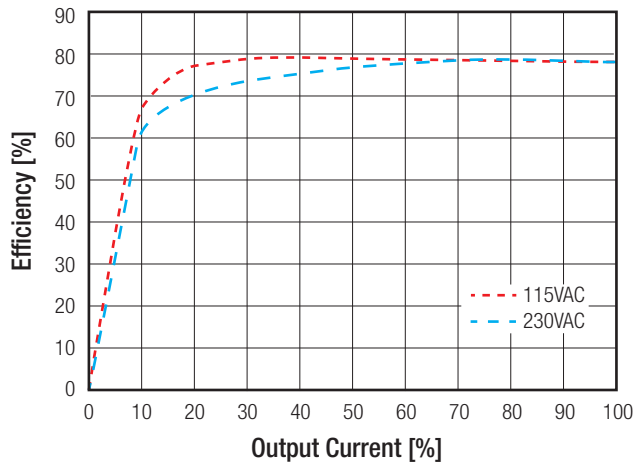
Output Ripple and Noise <sup>③</sup>	20MHz BW	0°C to 85°C	5 Vout 12Vout 24Vout		100mVp-p 150mVp-p 240mVp-p
		-30°C to 0°C	5Vout 12Vout 24Vout		200mVp-p 250mVp-p 300mVp-p

#### Notes:

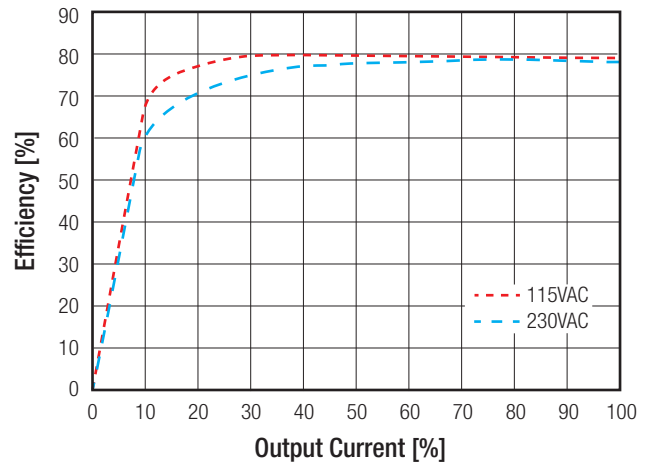
Note3: Measurements are made with a 12" twisted pair-wire with a 0.1 $\mu\text{F}$  and 10 $\mu\text{F}$  parallel capacitor across output (low ESR).

#### Efficiency vs. Load

RAC04-05SGA



RAC04-12SGA

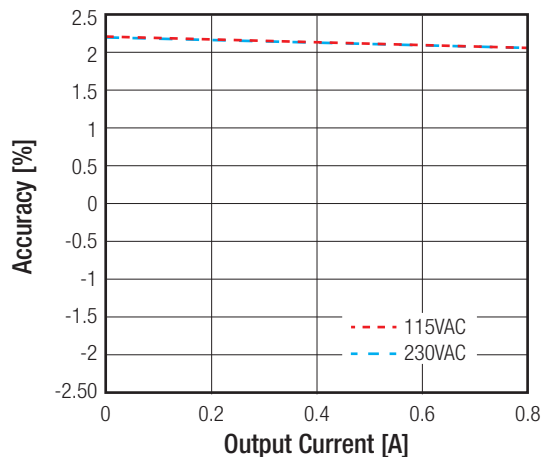


#### REGULATIONS

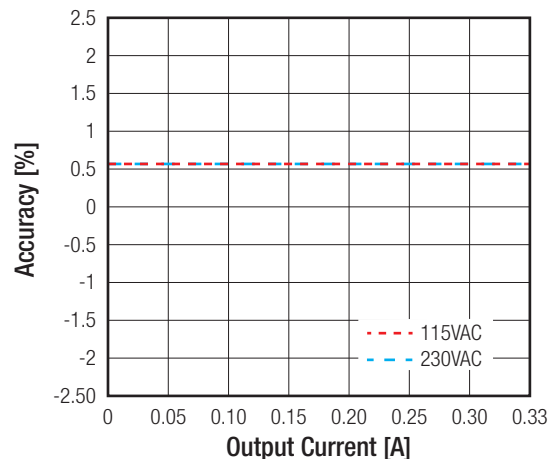
Parameter	Condition	Value
Output Accuracy		$\pm 2.5\%$ max.
Line Regulation	low line to high line	$\pm 0.5\%$ max.
Load Regulation	10% to 100% load	$\pm 0.5\%$ max.

#### Accuracy vs. Load

RAC04-05SGA



RAC04-12SGA



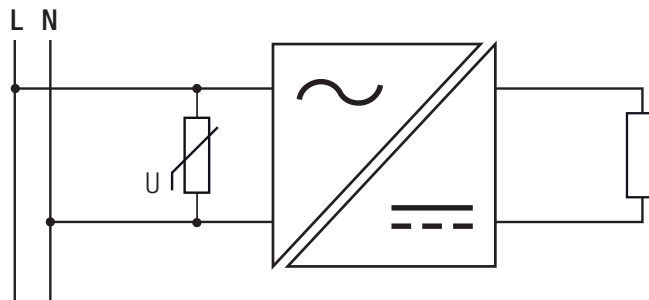
**Specifications** (measured @  $t_a=25^{\circ}\text{C}$ , nom.  $V_{in}$ , full load unless otherwise noted)

PROTECTIONS		
Parameter	Type	Value
Input Fuse	internal	T1A, 300V
Short Circuit Protection (SCP)	below 100m $\Omega$	long-term mode, auto recovery
Over Voltage Protection (OVP)	5Vout	5.3V - 6.8V, hiccup mode auto recovery
	12Vout	12.6V - 16.2V, hiccup mode auto recovery
	24Vout	25.2V - 32.4V, hiccup mode auto recovery
Over Current Protection (OCP)	5Vout	0.91A - 2.2A, hiccup mode auto recovery
	12Vout	0.37A - 0.95A, hiccup mode auto recovery
	24Vout	0.19A - 0.45A, hiccup mode auto recovery
Class of Equipment		Class II
Over Voltage Category (OVC)		OVC II
Isolation Voltage <sup>(4)</sup>	I/P to O/P	rated for 1 minute
Isolation Resistance		10M $\Omega$ min.
Insulation Grade		Reinforced
Leakage Current	277VAC, 50Hz	0.1mA max.

**Notes:**

Note4: For repeat Hi-Pot testing, reduce the time and/or the test voltage.

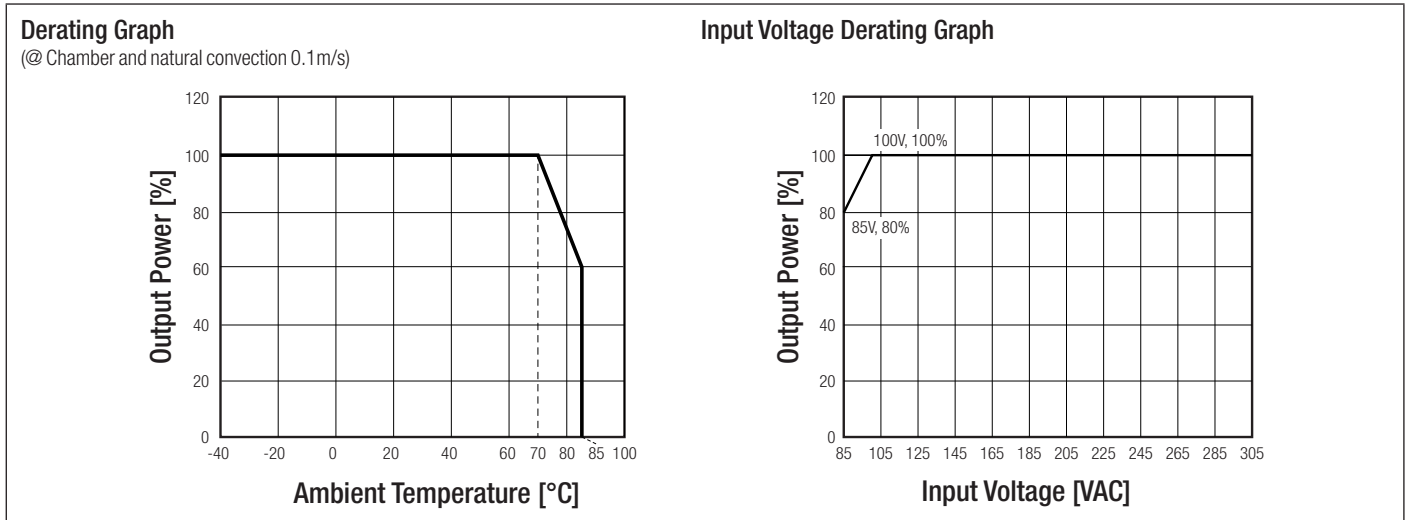
Note5: For operation at 230VAC, an external MOV is recommended. The Varistor should comply with IEC61051-2. eg. EPCOS S14 series.



ENVIRONMENTAL			
Parameter	Condition	Value	
Operating Temperature Range	without derating (@ natural convection 0.1m/s, see graph)	-40°C to +70°C	
Maximum Case Temperature		+100°C	
Temperature Coefficient		$\pm 0.03\%/^{\circ}\text{C}$	
Operating Altitude		3000m	
Operating Humidity	non-condensing	5% - 95% RH	
Pollution Degree		PD2	
Shock		20G/11ms pulse, 3 times at each x, y, z axes	
Vibration		10-150Hz, 2G 10min./1cycle, period 60min. along x,y,z axes for 6 cycles	
MTBF	according to MIL-HDBK-217F, G.B.	+25°C	100 x 10 <sup>3</sup> hours
		+70°C	100 x 10 <sup>3</sup> hours

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**Specifications** (measured @  $t_a=25^{\circ}\text{C}$ , nom.  $V_{in}$ , full load unless otherwise noted)



SAFETY AND CERTIFICATION		
Certificate Type (Safety)	Report / File Number	Standard
Information Technology Equipment, General Requirements for Safety (LVD)	SA17031845 001	IEC60950-1, 2nd Edition, 2005 + A1, 2009 + A2, 2013 EN60950-1, 2006 + A11, 2009 + A1, 2010 + A12, 2011 + A2, 2013
Information Technology Equipment, General Requirements for Safety	E196683-A3-UL	UL60950-1, 2nd Edition, 2014 CAN/CSA C22.2 No. 60950-1-07, 2nd Edition, 2014
Audio/video, information and communication technology equipment. Safety requirements	pending	UL62368-1 CAN/CSA C22.2 No 62368-1
Audio/video, information and communication technology equipment. Safety requirements	pending	IEC62368-1 EN62368-1
Household and similar electrical appliances - Safety. General requirements	SA1703184L 01001	EN60335, 2012 + A11, 2014
Measurement methods for electromagnetic fields of household appliances and similar apparatus with regard to human exposure	SA1703184L 01001	EN62233, 2008
Safety of power transformers, power supplies, reactors and similar products for supply voltages up to 1100 V Part 2: Particular requirements	pending	EN61558-1, 2005 + A1, 2009 EN61558-2-16, 2009 + A1, 2013
RoHs 2+		RoHS 2011/65/EU + AM2015/863
EMC Compliance	Condition	Standard / Criterion
Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement	EA1703184E 01001 with external components	EN55032, 2015, Class A
Limitations on the amount of electromagnetic interference allowed from digital and electronic devices	EA1703184E 01001	47 CFR FCC Part 15 Subpart B: 2016
ESD Electrostatic discharge immunity test	Air $\pm 8\text{kV}$ , Contact $\pm 4\text{kV}$	EN61000-4-2, 2009, Criteria A
Radiated, radio-frequency, electromagnetic field immunity test	3V/m	EN61000-4-3, 2006 + A1, 2008 + A2, 2010, Criteria A
Fast Transient and Burst Immunity	AC Power Port $\pm 1\text{kV}$	EN61000-4-4, 2012, Criteria A
Surge Immunity	AC Power Port L-N $\pm 1\text{kV}$	EN61000-4-5, 2014, Criteria B
Immunity to conducted disturbances, induced by radio-frequency fields	AC Power Port 3V	EN61000-4-6, 2014, Criteria A
Voltage Dips and Interruption	Voltage Dips >95% Voltage Dips 30% Voltage Interruptions >95%	EN61000-4-11, 2004, Criteria A EN61000-4-11, 2004, Criteria A EN61000-4-11, 2004, Criteria C

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**Specifications** (measured @  $t_a=25^\circ\text{C}$ , nom. Vin, full load unless otherwise noted)

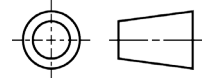
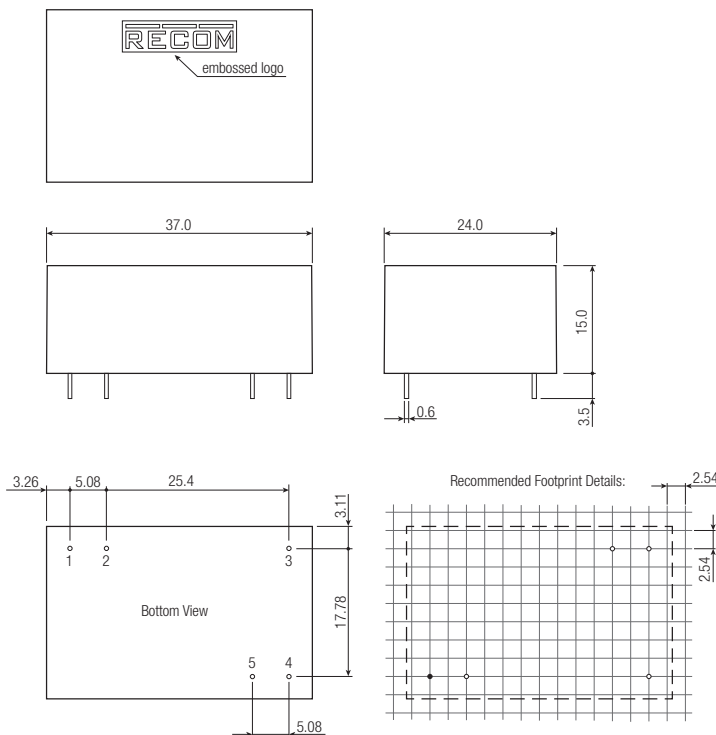
EMI Filtering according to EN60335-1 / EN55032 Class B Compliance

TBD

**DIMENSION and PHYSICAL CHARACTERISTICS**

Parameter	Type	Value
Material	Case PCB	black plastic, (UL94 V-0) FR4, (UL94 V-0)
Package Dimension (LxWxH)		37.0 x 24.0 x 15.0mm
Package Weight		20g typ.

**Dimension Drawing (mm)**



**Pin Connections**

Pin #	Single
1	VAC in (L)
2	VAC in (N)
3	NC
4	-Vout
5	+Vout

Tolerance: XX.X  $\pm$ 0.5mm  
Pin Width: XX.X  $\pm$ 0.05mm

**PACKAGING INFORMATION**

Parameter	Type	Value
Packaging Dimension (LxWxH)	tube	505.0 x 39.7 x 23.2mm
Packaging Quantity		20pcs
Storage Temperature Range		-40°C to +100°C
Storage Humidity	non-condensing	5% - 95% RH max.

The product information and specifications are subject to change without prior notice. RECOM products are not authorized for use in safety-critical applications (such as life support) without RECOM's explicit written consent. A safety-critical application is defined as an application where a failure of a RECOM product may reasonably be expected to endanger or cause loss of life, inflict bodily harm or damage property. The buyer shall indemnify and hold harmless RECOM, its affiliated companies and its representatives against any damage claims in connection with the unauthorized use of RECOM products in such safety-critical applications.

# Features

- Universal Input 85-305VAC
- 4W PCB Mount Package
- <75mW No Load Power Consumption
- Ultra Low Profile, Compact Size
- -40°C to +85°C Operating Temperature
- Continuous SCP, OCP, OVP
- IEC/EN/UL60950 & CE Certified, EN55032 Class B

# Regulated Converters

## Description

The RAC04-GB series are low cost AC/DC power supplies, ideal for PCB mounted, compact, board level industrial applications. They feature universal AC input voltage range, regulated and short-circuit -proof isolated DC outputs, low standby power consumption and -40°C to +85°C operating temperature range. The RAC04-GB have a built-in Class B / FCC Part 15 EMC filter, are certified to IEC/EN/UL60950-1 and are pending to IEC/EN/UL62368 and EN61558 safety standards and come with a three year warranty.

## Selection Guide

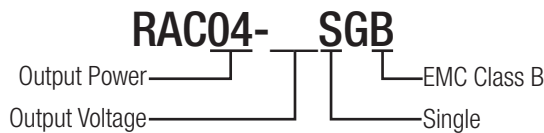
Part Number	Input Voltage Range [VAC]	Output Voltage [VDC]	Output Current [mA]	Efficiency typ. <sup>(1)</sup> [%]	Max. Capacitive Load <sup>(2)</sup> [µF]
RAC04-3.3SGB	85-305	3.3	1210	70	2000
RAC04-05SGB	85-305	5	800	72	1500
RAC04-12SGB	85-305	12	330	78	500
RAC04-15SGB	85-305	15	270	78	200
RAC04-24SGB	85-305	24	170	80	150

### Notes:

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

Note2: Max. Cap. Load is tested at nominal input and full resistive load

## Model Numbering



### Ordering Example

RAC04-12SGB = 4W Output Power, 12V Output Voltage, Single Output, EMC Class B

## Specifications (measured @ ta=25°C, nom. Vin, full load unless otherwise noted)

BASIC CHARACTERISTICS				
Parameter	Condition	Min.	Typ.	Max.
Internal Input Filter				Pi-Type
Input Voltage Range		85VAC 120VDC		305VAC 430VDC
Input Current	115VAC 230VAC		85mA 55mA	
Inrush Current	cold start at 25°C	115VAC 230VAC		10A 20A
No Load Power Consumption				75mW
Input Frequency Range	AC Input	45Hz		65Hz
Minimum Load		0%		
Power Factor	115VAC 230VAC		0.55 0.42	
Start-up Time	115VAC, 230VAC		30ms	1s
Hold-up Time	115VAC 230VAC		5ms 40ms	
Internal Operating Frequency	100% load at nominal Vin		65kHz	

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# RECOM

## AC/DC Converter

## RAC04-GB

# 4 Watt Single Output EMC Class B



UL60950-1 Certified  
IEC/EN60950-1 Certified  
UL62368-1 Pending  
IEC/EN62368-1 Pending  
EN61558-1 Pending  
EN61558-2-16 Pending



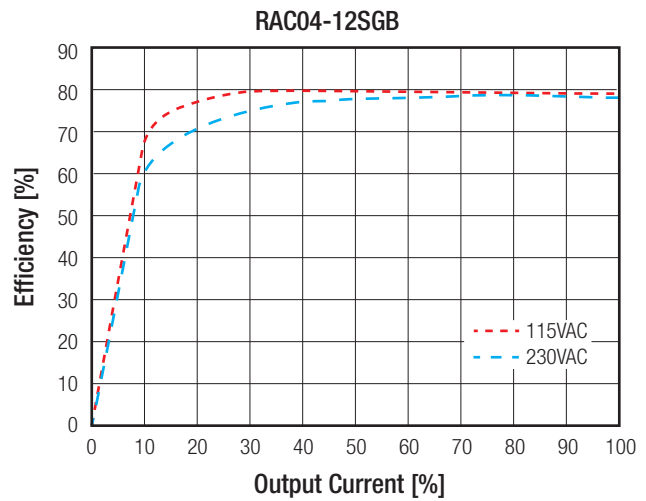
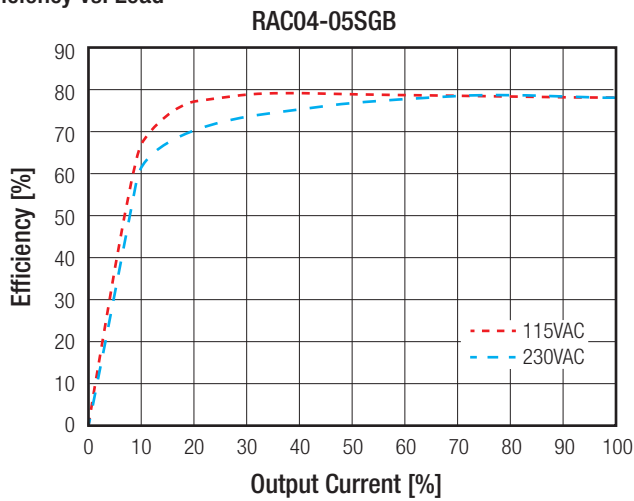
### Specifications (measured @ $t_a=25^\circ\text{C}$ , nom. $V_{in}$ , full load unless otherwise noted)

Output Ripple and Noise <sup>③</sup>	20MHz BW	0°C to 85°C	3.3, 5Vout 12Vout 15Vout 24Vout	100mVp-p 150mVp-p 200mVp-p 240mVp-p
		-30°C to 0°C	3.3, 5Vout 12Vout 15, 24Vout	200mVp-p 250mVp-p 300mVp-p

#### Notes:

Note3: Measurements are made with a 12" twisted pair-wire with a 0.1 $\mu\text{F}$  and 10 $\mu\text{F}$  parallel capacitor across output (low ESR).

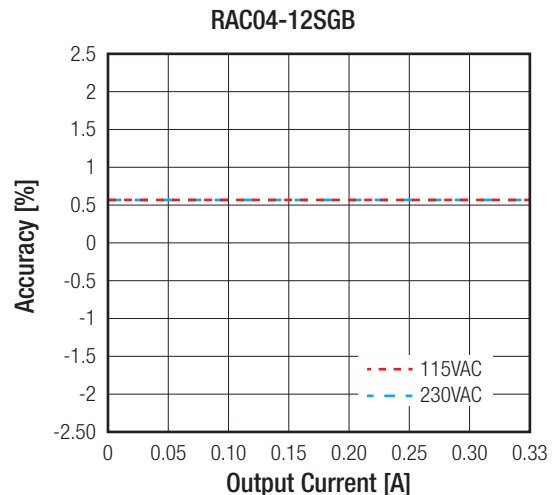
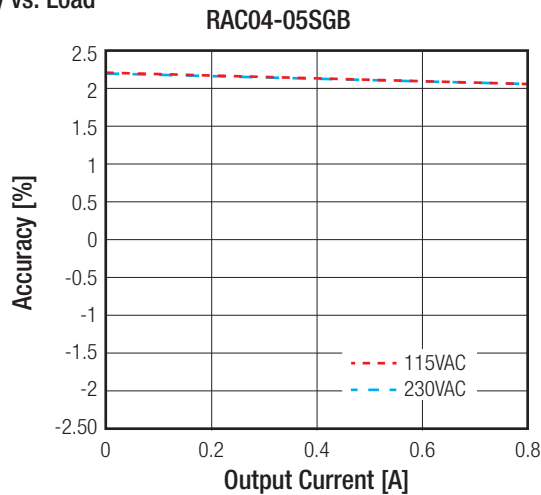
#### Efficiency vs. Load



#### REGULATIONS

Parameter	Condition	Value
Output Accuracy		$\pm 2.5\%$ max.
Line Regulation	low line to high line	$\pm 0.5\%$ max.
Load Regulation	10% to 100% load	$\pm 0.5\%$ max.

#### Accuracy vs. Load



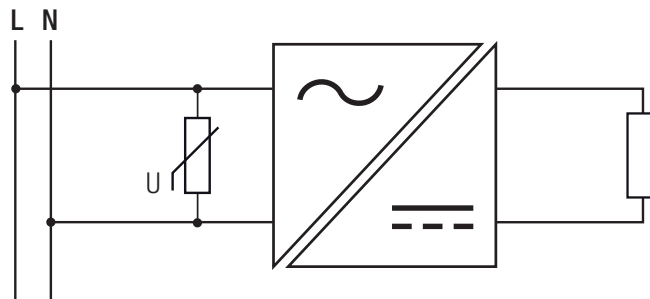
**Specifications** (measured @  $t_a=25^{\circ}\text{C}$ , nom.  $V_{in}$ , full load unless otherwise noted)

PROTECTIONS		
Parameter	Type	Value
Input Fuse	internal	T1A, 300V
Short Circuit Protection (SCP)	below 100m $\Omega$	long-term mode, auto recovery
Over Voltage Protection (OVP)	3.3Vout	3.8V - 4.9V, hiccup mode auto recovery
	5Vout	5.3V - 6.8V, hiccup mode auto recovery
	12Vout	12.6V - 16.2V, hiccup mode auto recovery
	15Vout	15.75V - 20.3V, hiccup mode auto recovery
	24Vout	25.2V - 32.4V, hiccup mode auto recovery
Over Current Protection (OCP)	3.3Vout	1.41A - 3A, hiccup mode auto recovery
	5Vout	0.91A - 2.2A, hiccup mode auto recovery
	12Vout	0.37A - 0.95A, hiccup mode auto recovery
	15Vout	0.29A - 0.72A, hiccup mode auto recovery
	24Vout	0.19A - 0.45A, hiccup mode auto recovery
Class of Equipment		Class II
Over Voltage Category (OVC)		OVC II
Isolation Voltage <sup>(4)</sup>	I/P to O/P	rated for 1 minute
Isolation Resistance		10M $\Omega$ min.
Isolation Capacitance		800pF min., 1200pF max.
Insulation Grade		Reinforced
Leakage Current	277VAC, 50Hz	0.1mA max.

**Notes:**

Note4: For repeat Hi-Pot testing, reduce the time and/or the test voltage.

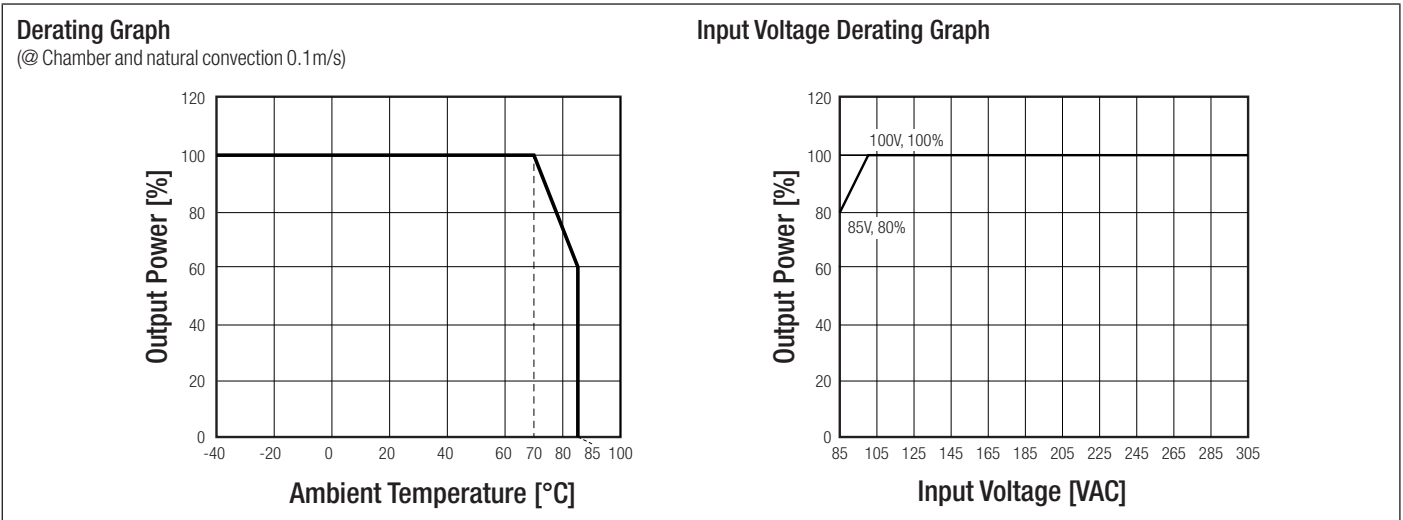
Note5: For operation at 230VAC, an external MOV is recommended. The Varistor should comply with IEC61051-2. eg. EPCOS S14 series.



ENVIRONMENTAL			
Parameter	Condition	Value	
Operating Temperature Range	without derating (@ natural convection 0.1m/s, see graph)	-40°C to +70°C	
Maximum Case Temperature		+100°C	
Temperature Coefficient		±0.03%/°C	
Operating Altitude		3000m	
Operating Humidity	non-condensing	5% - 95% RH	
Pollution Degree		PD2	
Shock		20G/11ms pulse, 3 times at each x, y, z axes	
Vibration		10-150Hz, 2G 10min./1cycle, period 60min. along x,y,z axes for 6 cycles	
MTBF	according to MIL-HDBK-217F, G.B.	+25°C	100 x 10 <sup>3</sup> hours
		+70°C	100 x 10 <sup>3</sup> hours

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**Specifications** (measured @  $t_a=25^{\circ}\text{C}$ , nom.  $V_{in}$ , full load unless otherwise noted)



**SAFETY AND CERTIFICATION**

Certificate Type (Safety)	Report / File Number	Standard
Information Technology Equipment, General Requirements for Safety (LVD)	SA17031845 001	IEC60950-1, 2nd Edition, 2005 + A1, 2009 + A2, 2013 EN60950-1, 2006 + A11, 2009 + A1, 2010 + A12, 2011 +A2, 2013
Information Technology Equipment, General Requirements for Safety	E196683-A3-UL	UL60950-1, 2nd Edition, 2014 CAN/CSA C22.2 No. 60950-1-07, 2nd Edition, 2014
Audio/video, information and communication technology equipment. Safety requirements	pending	UL62368-1 CAN/CSA C22.2 No 62368-1
Audio/video, information and communication technology equipment. Safety requirements	pending	IEC62368-1 EN62368-1
Safety of power transformers, power supplies, reactors and similar products for supply voltages up to 1100 V Part 2: Particular requirements	pending	EN61558-1, 2005 + A1, 2009 EN61558-2-16, 2009 + A1, 2013
RoHs 2+		RoHS 2011/65/EU + AM2015/863

EMC Compliance	Condition	Standard / Criterion
Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement	EA1703184E 01001	EN55032, 2015, Class B
Limitations on the amount of electromagnetic interference allowed from digital and electronic devices	EA1703184E 01001	47 CFR FCC Part 15 Subpart B: 2016
ESD Electrostatic discharge immunity test	Air $\pm 8\text{kV}$ , Contact $\pm 4\text{kV}$	EN61000-4-2, 2009, Criteria A
Radiated, radio-frequency, electromagnetic field immunity test	3V/m	EN61000-4-3, 2006 + A1, 2008 + A2, 2010, Criteria A
Fast Transient and Burst Immunity	AC Power Port $\pm 1\text{kV}$	EN61000-4-4, 2012, Criteria A
Surge Immunity	AC Power Port L-N $\pm 1\text{kV}$	EN61000-4-5, 2014, Criteria B
Immunity to conducted disturbances, induced by radio-frequency fields	AC Power Port 3V	EN61000-4-6, 2014, Criteria A
Voltage Dips and Interruption	Voltage Dips >95% Voltage Dips 30% Voltage Interruptions >95%	EN61000-4-11, 2004, Criteria A EN61000-4-11, 2004, Criteria A EN61000-4-11, 2004, Criteria C

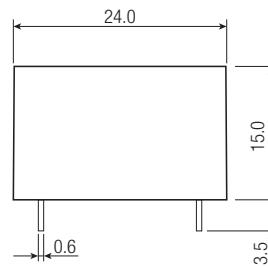
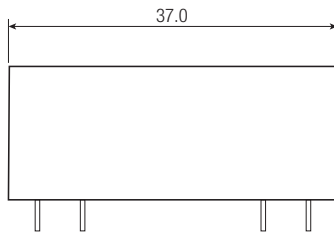
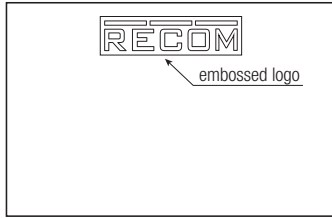
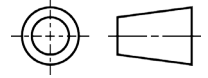
**DIMENSION and PHYSICAL CHARACTERISTICS**

Parameter	Type	Value
Material	Case PCB	black plastic, (UL94 V-0) FR4, (UL94 V-0)
Package Dimension (LxWxH)		37.0 x 24.0 x 15.0mm
Package Weight		20g typ.

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**Specifications** (measured @  $t_a=25^{\circ}\text{C}$ , nom.  $V_{in}$ , full load unless otherwise noted)

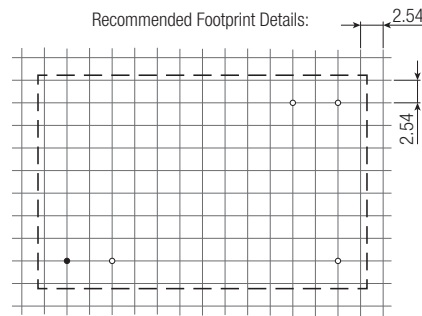
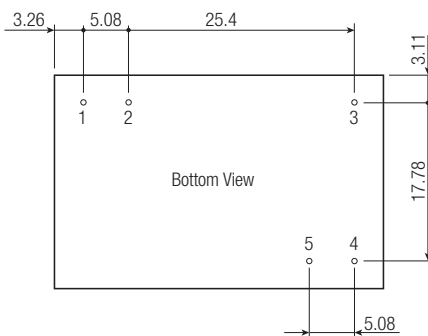
**Dimension Drawing (mm)**



**Pin Connections**

Pin #	Single
1	VAC in (L)
2	VAC in (N)
3	NC
4	-Vout
5	+Vout

Tolerance: xx.x=  $\pm 0.5\text{mm}$   
Pin width:  $\pm 0.05\text{mm}$



**PACKAGING INFORMATION**

Parameter	Type	Value
Packaging Dimension (LxWxH)	tube	505.0 x 39.7 x 23.2mm
Packaging Quantity		20pcs
Storage Temperature Range		-40°C to +100°C
Storage Humidity	non-condensing	5% - 95% RH max.

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