Features

Unregulated Converters

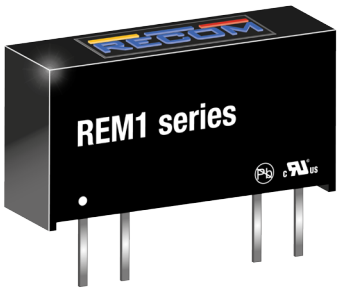
- Medical Grade DC/DC Converter
- 250VAC Working, 2MOPP
- 5.2kVDC Isolation for 250VAC working voltage
- -40°C up to +90°C Operating Temperature
- 3rd Ed. Safety and 4th. Ed. EMC (pending)

RECOM
DC/DC Converter

REM1

1 Watt SIP7 Single Output

5 YEAR warranty



2MOPP 250VAC

IEC/EN60601-1 (pending)
ANSI/AAMI ES60601-1 (pending)
IEC/EN62368-1 (pending)
UL62368-1 (pending)
IEC/EN60601-1-2
EN55011
CB Report

Description

The REM1 complements the existing board-mount REM3, REM6 and REM10 series by offering a 1W medical grade unregulated DC/DC converter in a more compact SIP7 package. The REM1 features reinforced 5.2kVAC/1 minute isolation and 2MOPP/250VAC working voltage. The REM1 is available with 3.3, 5, 12, 15 or 24V inputs and offers 3.3, 5 or 12V outputs with up to 85% efficiency. The operating temperature range is -40°C up to +90°C. The converter is Class B EMC and 60601-1-2 (4th Ed.) medical EMC certified using a simple external LC filter. The converters are fully certified to CB, IEC/EN and ANSI/AAMI 60601 third edition safety standards, RoHS2+ (10/10) and REACH and come with a 5 year warranty.

Selection Guide

Part Number	nom. Input Voltage [VDC]	Output Voltage [VDC]	Output Current [mA]	Efficiency typ. (1) [%]	Max. Capacitive Load (2) [µF]
REM1-3.33.3S	3.3	3.3	303	78	2200
REM1-3.305S	3.3	5	200	81	2200
REM1-3.312S	3.3	12	84	85	470
REM1-053.3S	5	3.3	303	79	2200
REM1-0505S	5	5	200	80	2200
REM1-0512S	5	12	84	84	470
REM1-123.3S	12	3.3	303	78	2200
REM1-1205S	12	5	200	81	2200
REM1-153.3S	15	3.3	303	77	2200
REM1-1505S	15	5	200	81	2200
REM1-243.3S	24	3.3	303	76	2200
REM1-2405S	24	5	200	80	2200

Notes:

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

Note2: Max Cap Load tested by nominal input and full resisitive load.

Specifications (measured @ ta= 25°C, nominal input voltage, full load and after warm-up)

BASIC CHARACTERISTICS				
Parameter	**Condition**	**Min.**	**Typ.**	**Max.**
Internal Input Filter				Capacitor
Input Voltage Range	nom. Vin= 3.3VDC	2.97VDC		3.63VDC
	nom. Vin= 5VDC	4.5VDC		5.5VDC
	nom. Vin= 12VDC	10.8VDC		13.2VDC
	nom. Vin= 15VDC	13.5VDC		16.5VDC
	nom. Vin= 24VDC	21.6VDC		26.4VDC
Maximum Reverse Voltage				0VDC
Quiescent Current	nom. Vin= 3.3VDC			40mA
	nom. Vin= 5VDC			25mA
	nom. Vin= 12VDC			12mA
	nom. Vin= 15VDc			10mA
	nom. Vin= 24VDC			7mA

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Specifications (measured @ ta= 25°C, nominal input voltage, full load and after warm-up)

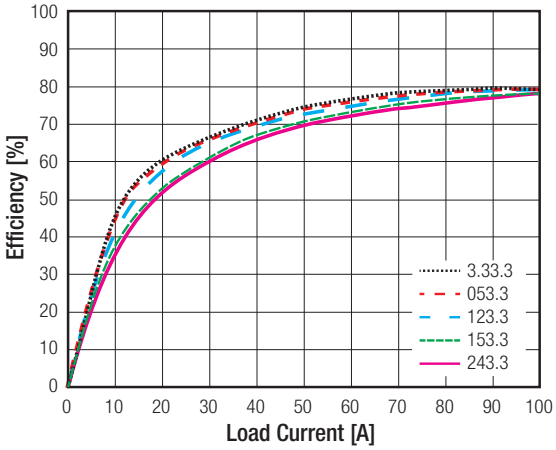
Parameter	Condition	Min.	Typ.	Max.
Internal Operating Frequency			40kHz	
Minimum Load			0%	
Output Ripple and Noise [3]	20MHz BW			75mVp-p

Notes:

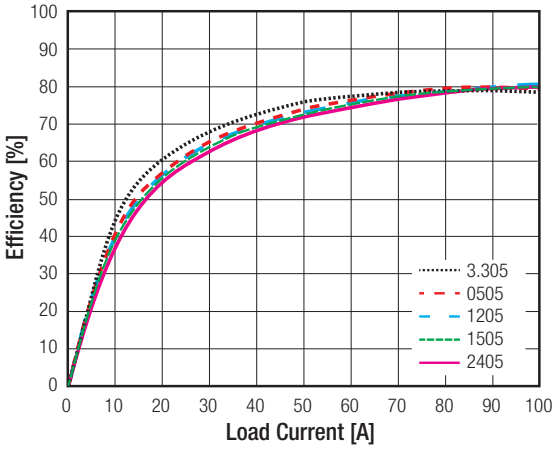
Note3: Measurements are made with a 0.1µF MLCC across output. (low ESR).

Efficiency vs. Load

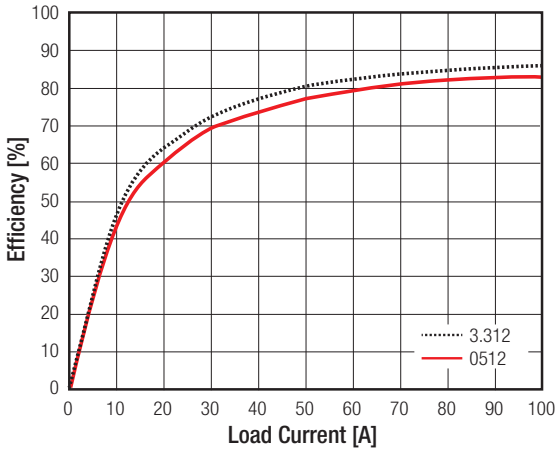
REM1-xx3.3S



REM1-xx05S

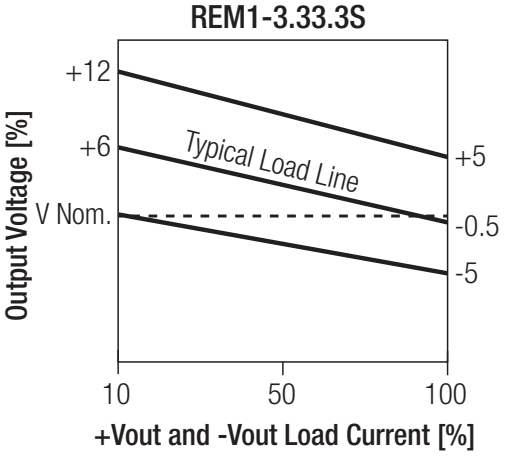


REM1-xx12S

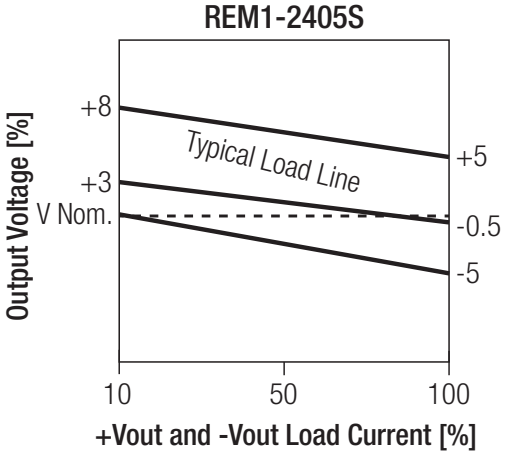


Tolerance Envelope

REM1-3.33.3S



REM1-2405S



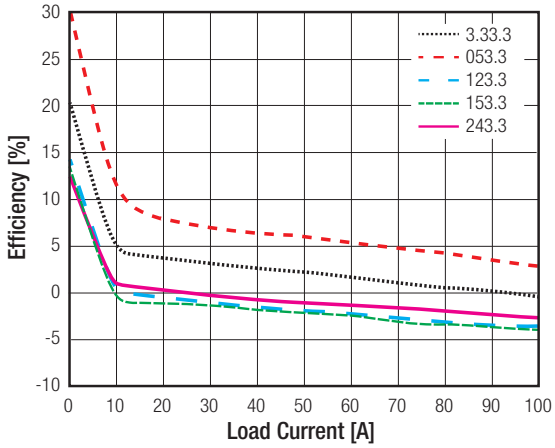
Specifications (measured @ ta= 25°C, nominal input voltage, full load and after warm-up)

REGULATIONS

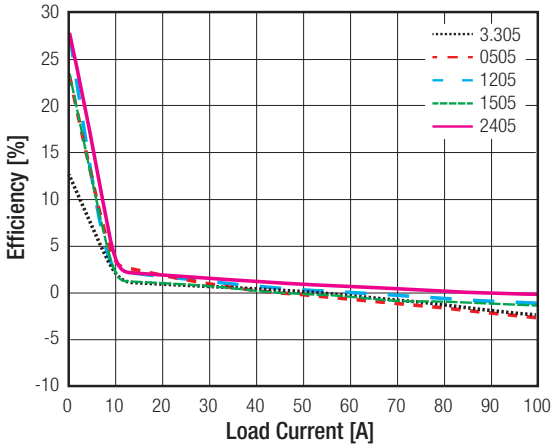
Parameter	Condition		Value
Output Accuracy			±5% max.
Line Regulation	low line to high line, full load		±1.2% typ. @ 1% of Vin
Load Regulation	10% to 100% load	3.3Vout and 5Vout 12Vout	±8% typ. / ±12% max. ±5% typ. / ±8% max.

Accuracy vs. Load

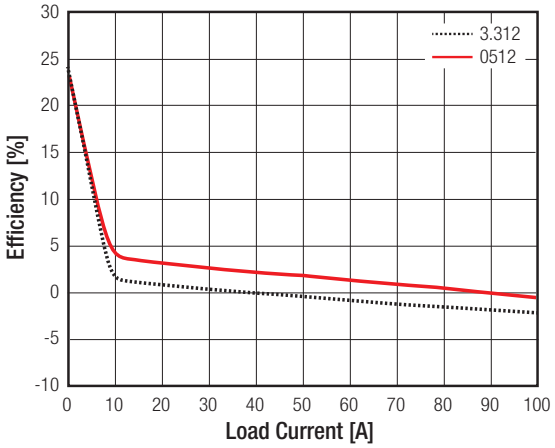
REM1-xx3.3S



REM1-xx05S



REM1-xx12S



PROTECTIONS

Parameter	Type		Value
Isolation Voltage (4)	I/P to O/P	tested for 1 minute	5.2kVDC 4.2kVAC
Isolation Resistance			10GΩ min.
Isolation Capacitance			25pF typ.
Insulation Grade			reinforced
Means of Protection	250VAC working voltage		2MOPP
Creepage and Clearance			≥8mm

Notes:

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

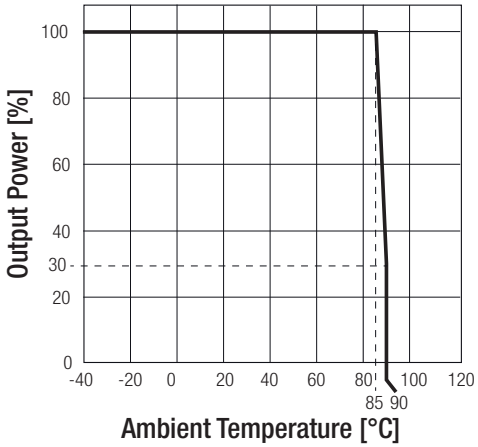
Note5: An input fuse is required if the mains supply is not over-current protected. Recommended fuse: T1A slow blow type

Specifications (measured @ ta= 25°C, nominal input voltage, full load and after warm-up)

ENVIRONMENTAL

Parameter	Condition	Value
Operating Temperature Range	without derating (see graph)	-40°C °C to +85°C
Maximum Case Temperature		105°C
Temperature Coefficient		0.02%/°C typ.
Operating Altitude	according to IEC/EN60601-1 accroding to IEC/EN62368-1	3000m 5000m
Operating Humidity	non-condensing	5% - 95% RH max.
Pollution Degree		PD2
MTBF	according to MIL-HDBK-217F, G.B. +25°C +85°C	18200 x 10^3 hours 7500 x 10^3 hours
Vibration		according to MIL-STD-202G standard

Derating Graph
(@ chamber and natural convection 0.1m/s)



SAFETY AND CERTIFICATIONS

Certificate Type (Safety)	Report / File Number	Standard
Audio/video, information and communication technology equipment. Safety requirements (CB Scheme)	pending	IEC/EN62368-1:2014
Audio/video, information and communication technology equipment. Safety requirements	pending	UL62368-1, 2nd Edition CAN/CSA-C22.2 No. 62368-1-14
Medical Electric Equipment, General Requirements for Saftey and Essential Performance	pending	IEC + UL + ANSI/AAMI ES60601-1, 3rd Edition CSA C22.2 No. 60601-1:14
Medical Electric Equipment, General Requirements for Safety and Essential Performance	pending	IEC60601-1:2005 +AM1:2012 EN60601-1:2006, 2013
RoHs2+		RoHS-2011/65/EU + AM-2015/863

EMC Compliance	Condition	Standard / Criterion
Medical electrical equipment - Part 1-2: General requirements for basic safety and essential performance - Collateral standard: Electromagnetic compatibility		IEC60601-1-2:2014 EN60601-1-2:2015
Industrial, scientific and medical equipment - Radio frequency disturbance characteristics - Limits and methods of measurement	with external filter	EN55011, Class B
ESD Electrostatic discharge immunity test	air: ±15kV; contact: ±8kV	IEC61000-4-2:2008 , Criteria A
Radiated, radio-frequency, electromagnetic field immunity test	3V/m	IEC61000-4-3:2010, Criteria A
Fast Transient and Burst Immunity	DC port: ±2kV	IEC61000-4-4:2012, Criteria A
Surge Immunity	DC port: ±1kV	IEC61000-4-5:2014, Criteria B
Immunity to conducted disturbances, induced by radio-frequency fields	DC port: 6V	IEC61000-4-6:2013, Criteria A
Power Magnetic Field Immunity	50Hz, 30A/m	IEC61000-4-8:2009, Criteria A

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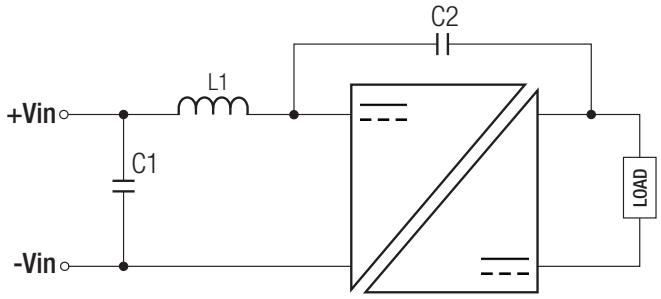
Specifications (measured @ ta= 25°C, nominal input voltage, full load and after warm-up)

EMC Filtering Suggestions according to EN55011



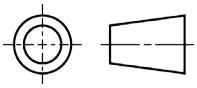
Component list Class B

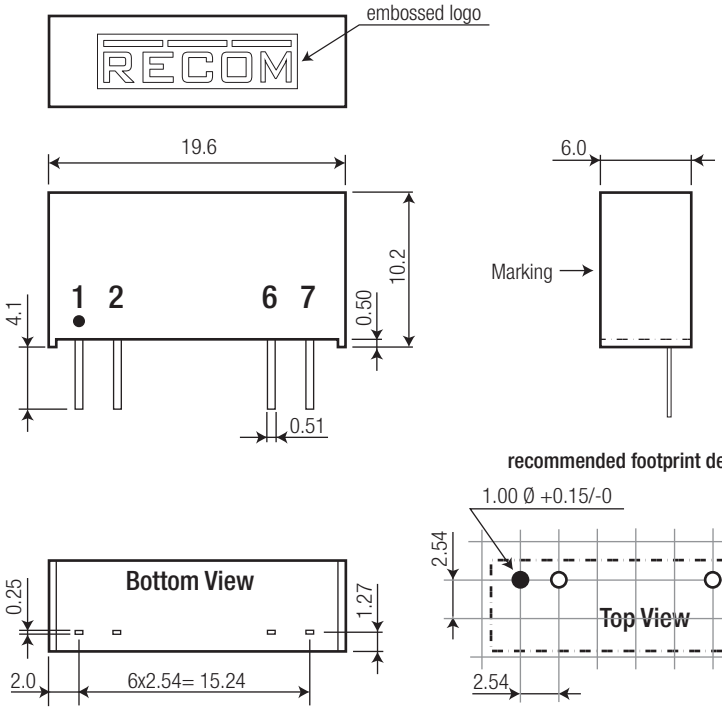
Input Voltage	C1	C2	L1
3.3VDC	4.7µF	470pF/6kVDC	22µH Choke
5VDC			
12VDC			
15VDC			
24VDC	2.2µF		47µH Choke

DIMENSION and PHYSICAL CHARACTERISTICS

Parameter	Type	Value
Material	Case	black plastic, (UL94 V-0)
	Potting	silicone (UL94 V-0)
	PCB	FR4 (UL94 V-0)
Package Dimension (LxWxH)		19.6 x 6.0 x 10.2mm
Package Weight		2.6g typ.

Dimension Drawing (mm)





Pin Connections

Pin #	Single
1	+Vin
2	-Vin
6	-Vout
7	+Vout

Tolerance: xx.x= ±0.5mm
xx.xx= ±0.25mm
Pin dimension: ±0.1mm

PACKAGING INFORMATION

Parameter	Type	Value
Packaging Dimension (LxWxH)	tube	520.0 x 16.0 x 9.3mm
Packaging Quantity		25pcs
Storage Temperature Range		-55°C to +125°C
Storage Humidtiy	non-condensing	TBD