Features

Unregulated Converter

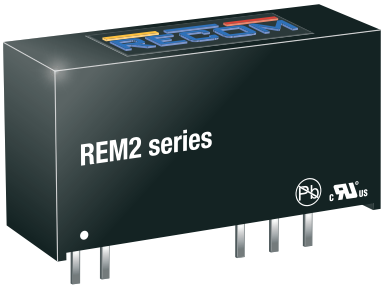
- Medical grade DC/DC converter
- 250VAC working, 2MOPP up to 5000m altitude
- 5.2kVDC/1 minute isolation
- Single or dual outputs
- -40°C up to +95°C operating temperature
- Medical certified (3rd Ed. safety, 4th Ed. EMC)

RECOM
DC/DC Converter

REM2

2 Watt SIP8 Single and Dual Output

5 YEAR Warranty



E314885

2MOPP
250VAC

CAN/CSA-C22.2 No. 60601-1:14 certified
ANSI/AAMI ES60601-1 certified
IEC/EN60601-1 pending
IEC/EN62368-1 pending
EN60601-1-2 compliant
EN55011 compliant
CB report

Description

The board-mount REM2 series complements the REM1 series by offering a 2W medical grade DC/DC converter in a compact SIP8 package. The REM2 features reinforced 5.2kVDC/1 minute isolation and 2MOPP/250VAC working voltage at 5000m. It offers single and dual outputs with up to 85% efficiency. The operating temperature range is -40°C up to +80°C without derating, and up to +95°C with 50% load. The converter is compliant to Class A/B EMC and 60601-1-2 (4th Ed.) medical EMC using a simple external LC filter. The REM2 is certified to CB, IEC/EN and ANSI/AAMI 60601 third edition medical safety standards (pending) and comes 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]
REM2-xx3.3S	3.3 / 5 / 12 / 15 / 24	3.3	606	77	1000
REM2-xx05S	3.3 / 5 / 12 / 15 / 24	5	400	79	1000
REM2-xx09S	3.3 / 5 / 12 / 15 / 24	9	222	84	470
REM2-xx12S	3.3 / 5 / 12 / 15 / 24	12	167	82	330
REM2-xx3.3D	5 / 15	±3.3	±303	79	680
REM2-xx05D	3.3 / 5 / 12 / 15 / 24	±5	±200	82	680
REM2-xx12D	3.3 / 5 / 12 / 15 / 24	±12	±84	85	150

Notes:

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

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

Model Numbering

Ordering Examples

REM2-0505S =	5Vin	5Vout	Single
REM2-2412D =	24Vin	12Vout	Dual

Specifications (measured @ Ta= 25°C, nom. Vin, full load unless otherwise stated)

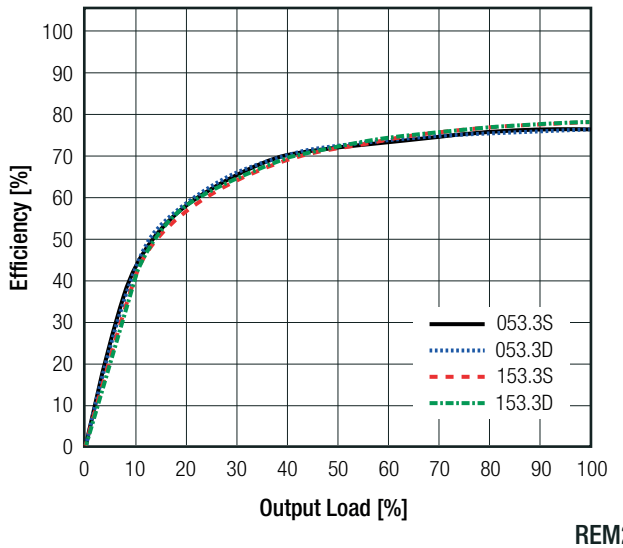
BASIC CHARACTERISTICS				
Parameter	**Condition**	**Min.**	**Typ.**	**Max.**
Internal Input Filter				capacitor
Input Voltage Range			±10%	
Input Current	nom. Vin = 3.3VDC		750mA	
	nom. Vin = 5VDC		520mA	
	nom. Vin = 12VDC		210mA	
	nom. Vin = 15VDC		175mA	
	nom. Vin = 24VDC		110mA	
Quiescent Current	nom. Vin = 3.3VDC		55mA	
	nom. Vin = 5VDC		46mA	
	nom. Vin = 12VDC		24mA	
	nom. Vin = 15VDC		18mA	
	nom. Vin = 24VDC		10mA	
Minimum Load		0%		
Internal Operating Frequency		20kHz		
Output Ripple and Noise [3]	20MHz BW			150mVp-p

Notes:

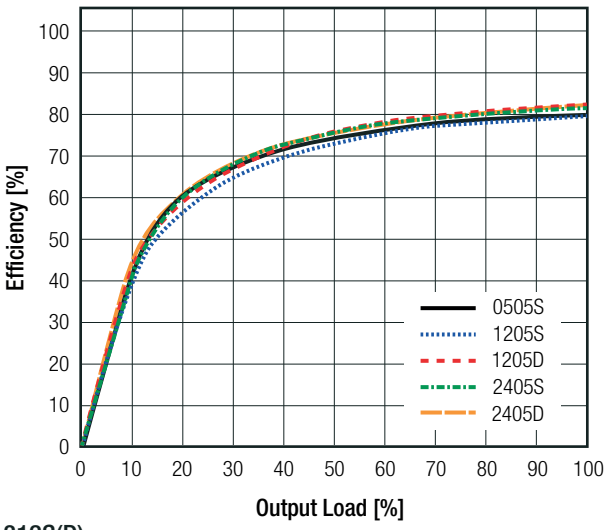
Note3: Measurements are made with a 0.1µF MLCC across output (low ESR)

Efficiency vs. Load

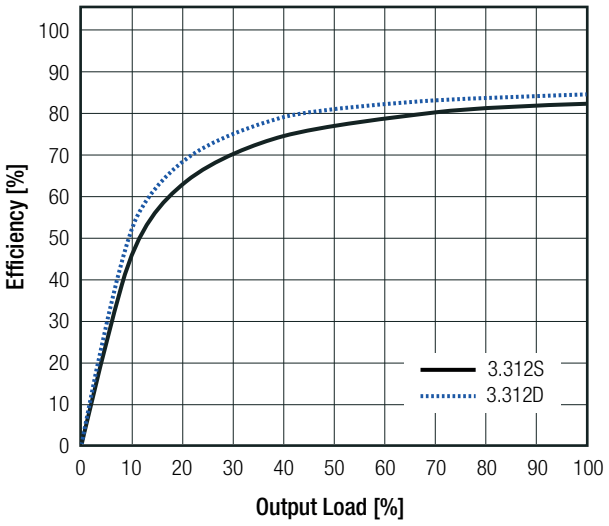
REM2-xx3.3S(D)



REM2-xx05S(D)



REM2-3.312S(D)



Specifications (measured @ Ta= 25°C, nom. Vin, full load unless otherwise stated)

REGULATIONS

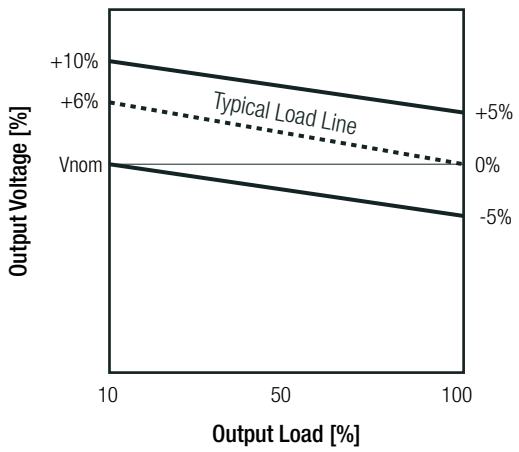
Parameter	Condition		Value
Output Accuracy			±5.0% max.
Line Regulation	low line to high line, full load		±1.2% typ. @ ±1.0% Vin
Load Regulation (4)	10% to 100% load	3.3, 5Vout 9, 12Vout	15.0% max. 10.0% max.
Cross Regulation (4)	10% to 100% load	dual output only	±5.0% typ.

Notes:

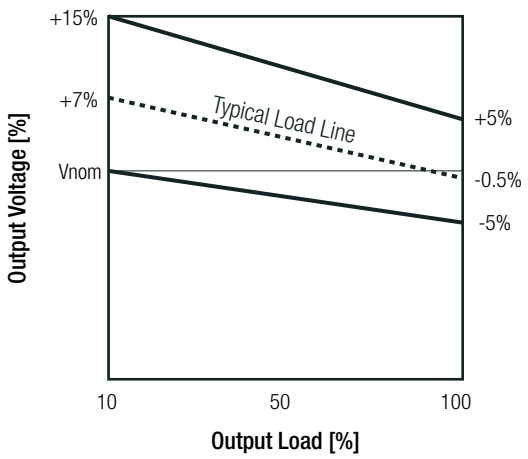
Note4: Operation below 10% load will not harm the converter, but specifications may not be met

Tolerance Envelope

REM2-3.312S

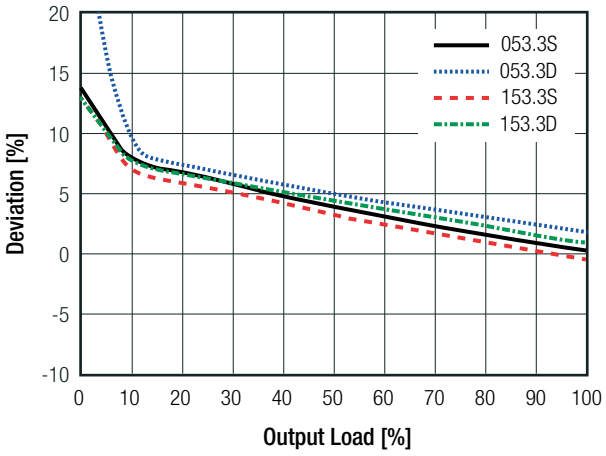


REM2-2405S

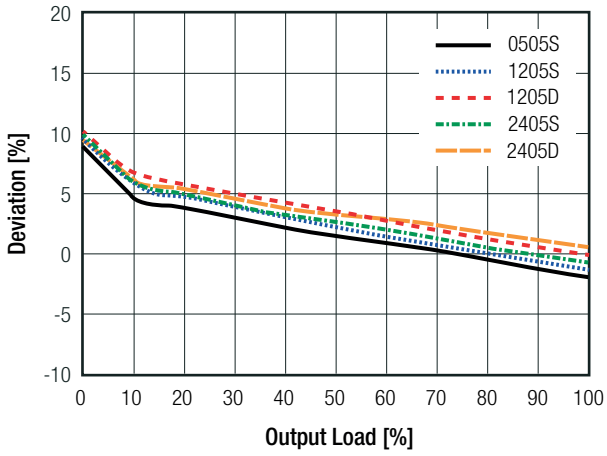


Deviation vs. Load

REM2-xx3.3S(D)



REM2-xx05S(D)



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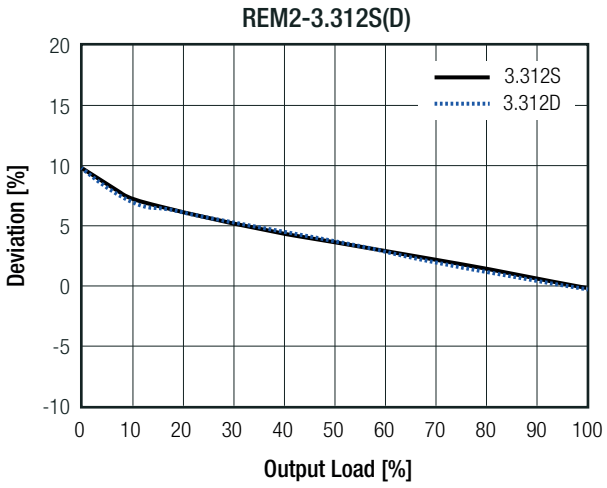
Specifications (measured @ Ta= 25°C, nom. Vin, full load unless otherwise stated)

Deviation vs. Load



PROTECTIONS

Parameter	Type		Value
Isolation Voltage (5)	I/P to O/P	tested for 1 minute	5.2kVDC
		rated for 1 minute	4kVAC
Isolation Resistance			10GΩ min.
Isolation Capacitance			25pF typ.
Insulation Grade			reinforced
Means of Protection	250VAC working voltage		2MOPP
Medical Device Classification			built-in power supply
Internal	clearance / creepage		>6.45mm
External	clearance / creepage		>6.45mm

Notes:

Note5: For repeat Hi-Pot testing, reduce the time and/or the test voltage

Note6: Refer to local safety regulations if input over-current protection is also required. Recommended fuse: slow blow type

ENVIRONMENTAL

Parameter	Condition		Value
Operating Temperature Range	full load @ natural convection 0.1m/s (see graph)		-40°C to +80°C
Maximum Case Temperature			+105°C
Temperature Coefficient			±0.02%/K
Thermal Impedance	0.1m/s, horizontal		40K/W
Operating Altitude			5000m
Operating Humidity	non-condensing		5% - 95% RH max.
Pollution Degree			PD2
Vibration			according to MIL-STD-202G standard
MTBF	according to MIL-HDBK-217F, G.B.	+25°C	12900 x 10^3 hours
		+80°C	5300 x 10^3 hours

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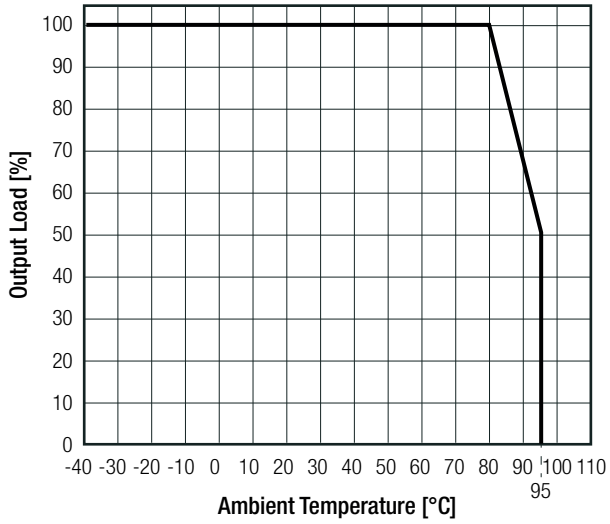
Specifications (measured @ Ta= 25°C, nom. Vin, full load unless otherwise stated)

Derating Graph

(@ Chamber and natural convection 0.1m/s)



SAFETY AND CERTIFICATIONS

Certificate Type (Safety)	Report / File Number	Standard
Medical Electric Equipment, General Requirements for Safety and Essential Performance	E314888	CAN/CSA-C22.2 No. 60601-1:14, 3rd Edition, 2014 ANSI/AAMI ES60601-1 + A2:2010/®2012
Medical Electric Equipment, General Requirements for Safety and Essential Performance (CB scheme)	pending	IEC60601-1:2005, 3rd Edition + AM1:2012
Medical Electric Equipment, General Requirements for Safety and Essential Performance	pending	EN60601-1:2006 + A1:2013
Audio/Video, Information and Communication Technology Equipment - Part1: Safety Requirements	pending	IEC62368-1:2014, 2nd Edition EN62368-1:2014 + AC:2015
RoHS2	TWNC00760450	RoHS-2011/65/EU + AM-2015/863

EMC Compliance	Condition	Standard / Criterion
Medical Electrical Equipment Part 1-2: Electromagnetic Disturbances – Requirements and Tests	WH-CE-E18083002	EN60601-1-2:2015
Industrial, Scientific and Medical Equipment - Radio Frequency Disturbance Characteristics - Limits and Methods of Measurement		EN55011:2016 + A1:2017, Class B
Information Technology Equipment - Radio Disturbance Characteristics - Limits and Methods of Measurement	with external filter	EN55032, Class B
ESD Electrostatic Discharge Immunity Test	Air ±2, 4, 8, 15kV Contact ±2, 4, 6, 8kV	IEC61000-4-2, Criteria A
Radiated, Radio-Frequency, Electromagnetic Field Immunity Test	10V/m (80-2700MHz) 9, 27, 28V/m (several frequencies)	IEC61000-4-3, Criteria A
Fast Transient and Burst Immunity	DC Power Port: ±0.5, 1, 2kV	IEC61000-4-4, Criteria A
Surge Immunity	DC Power Port: ±0.5, 1kV	IEC61000-4-5, Criteria B
Immunity to Conducted Disturbances, Induced by Radio-Frequency Fields	DC Power Port: 3, 6V	IEC61000-4-6, Criteria A
Power Magnetic Field Immunity	50Hz, 30A/m	IEC61000-4-8, Criteria A

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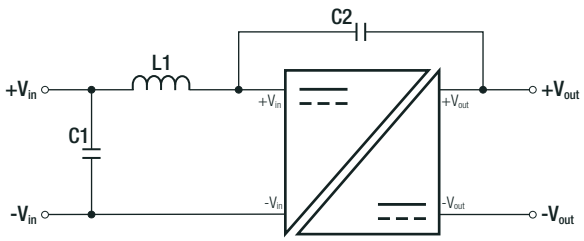
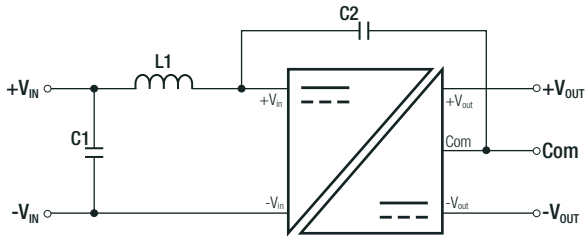
Specifications (measured @ Ta= 25°C, nom. Vin, full load unless otherwise stated)

EMC Filtering Suggestions according to EN55032

Single Output



Dual Output



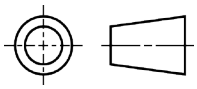
Component List Class B

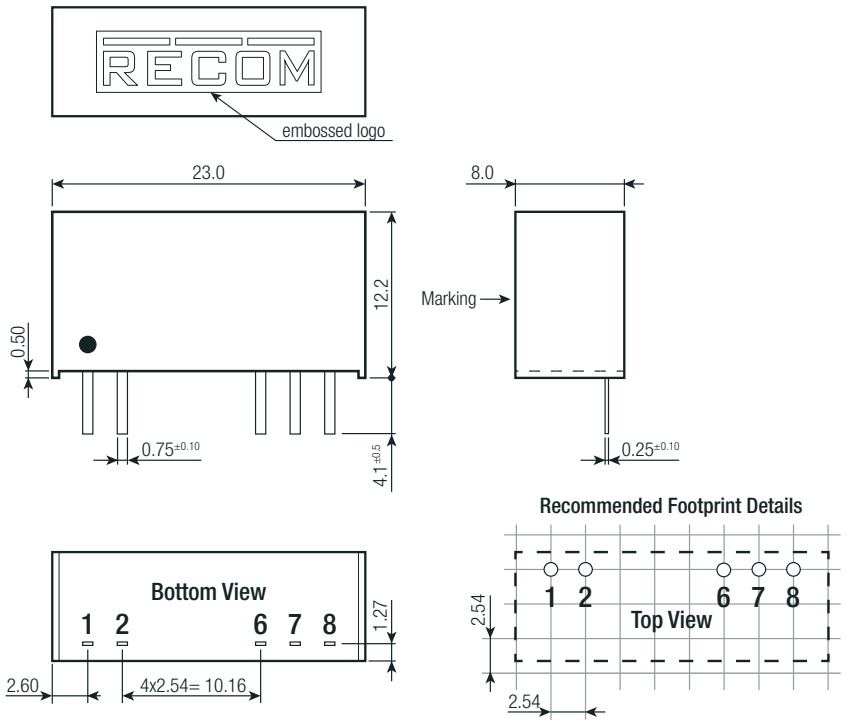
Input Voltage	C1	C2	L1
3.3VDC	4.7µF	470pF / 6kVDC	47µH
5VDC	10µF		22µH
12VDC	4.7µF		
15VDC	10µF		
24VDC			47µH

DIMENSION AND PHYSICAL CHARACTERISTICS

Parameter	Type	Value
Material	case potting PCB	black plastic, (UL94V-0) silicone, (UL94V-0) FR4, (UL94V-0)
Dimension (LxWxH)		23.0 x 8.0 x 12.2mm
Weight		4.4g typ.

Dimension Drawing (mm)





Pinning information

Pin #	Single	Dual
1	+Vin	+Vin
2	-Vin	-Vin
6	-Vout	-Vout
7	+Vout	Com
8	No Pin	+Vout

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

Specifications (measured @ Ta= 25°C, nom. Vin, full load unless otherwise stated)

PACKAGING INFORMATION		
Parameter	**Type**	**Value**
Packaging Dimension (LxWxH)	tube	520.0 x 22.1 x 10.2mm
Packaging Quantity	tube	20pcs
Storage Temperature Range		-55°C to +125°C
Storage Humidity	non-condensing	95% RH max.