RSOK-Z Series ◊ Regulated SIP8

1W ◊ Isolated Single Output ◊ 4:1 Input

RECOM DC/DC Converter

FEATURES

- 4:1 wide input voltage range
- SIP8 package
- Continuous short circuit protection
- No minimum load required
- 3kVDC/1 second isolation
- Adjustable output (3.3V - 17VDC)
- 3 year warranty

Dimensions (LxWxH): 21.8 x 9.2 x 11.1mm (0.86 x 0.36 x 0.44inch)
4.7g (0.01lbs)

APPLICATIONS

SAFETY & EMC

RoHS2 compliant 10 from 10 · Reach compliant · IECEE CB SCHEME · c UL us E224736

DESCRIPTION

The RSOK-Z series is a cutting-edge DC/DC converter series with a wide 4:1 input voltage range of 9-36VDC. This converter features ON/OFF control for added convenience and precision. The RSOK-Z boasts high accuracy and tight line and load regulation, ensuring reliable performance even under challenging conditions. The device also includes continuous short circuit protection and undervoltage lockout (UVLO) for added safety and security. This product is certified to meet the rigorous safety requirements of IEC/EN/UL 62368-1, making it suitable for use in a variety of industrial applications. With a maximum output power of 1W and the ability to operate at 0% minimum load, the RSOK-Z is both versatile and efficient. Finally, the RSOK-Z offers functional grade isolation of 3kVDC/1sec and an operating range of -40°C to 95°C without derating, making it ideal for use in demanding industrial environments.

SELECTION GUIDE

Part Number	Input Voltage Range [VDC]	Output Voltage [VDC]	Output Current max. (1) [mA]	Efficiency typ. (2) [%]	max. Capacitive Load (3) [µF]
RSOK-2405SZ/H3	9-36	5	200	75	1500
RSOK-2412SZ/H3/ADJ	9-36	3.3-17	303	78	750

Note1: Make sure that the maximum rated output power will not be exceeded when trimming up
Note2: Efficiency is tested at minimum input and full load at +25°C ambient
Note3: Max Cap Load is tested at nominal input an full resistive load

MODEL NUMBERING

RSOK-__ __ S Z/H3/ADJ

- nom. Input Voltage
- nom. Output Voltage
- Adjust Pin
- 3kVDC Isolation
- Single

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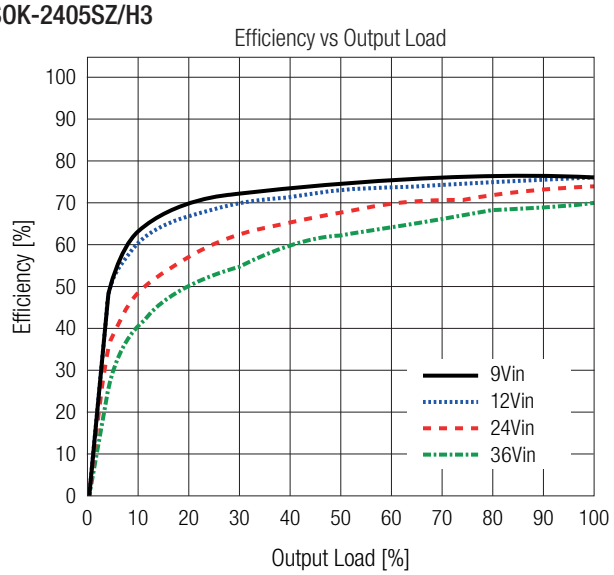
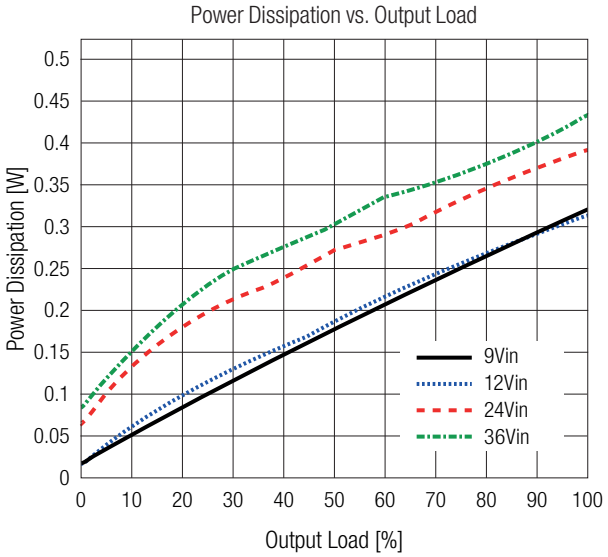
BASIC CHARACTERISTICS (measured @ T_{AMB}= 25°C, nom. V_{IN}, full load and after warm-up unless otherwise stated)

Parameter	Conditions		Min.	Typ.	Max.
Internal Input Filter					capacitors
Input Voltage Range	nom. V_{IN}= 24VDC		9VDC		36VDC
Under Voltage Lockout	DC-DC ON		8.1VDC		8.7VDC
	DC-DC OFF		6VDC		6.66VDC
Input Current				160mA	
Quiescent Current				3mA	10mA
Output Voltage Trimming	RSOK-2412SZ/H3/ADJ only; refer to **„Output Voltage Trimming“**		3.3VDC		17VDC
Minimum Load			0%		
ON/OFF CTRL	DC-DC ON		open or V_{CTRL} >1.5VDC		
	DC-DC OFF		short to -Vin or V_{CTRL}<1.5VDC		
Input Current of CTRL pin	DC-DC ON				1mA
Standby Current	DC-DC OFF			3mA	6mA
Internal Operating Frequency			100kHz		800kHz
Output Ripple and Noise [(4)]	RSOK-2405SZ/H3	20MHz BW; nom. V_{IN}= 24VDC		80mVp-p	120mVp-p
	RSOK-2412SZ/H3/ADJ	20MHz BW; nom. V_{IN}= 24VDC		150mVp-p	200mVp-p

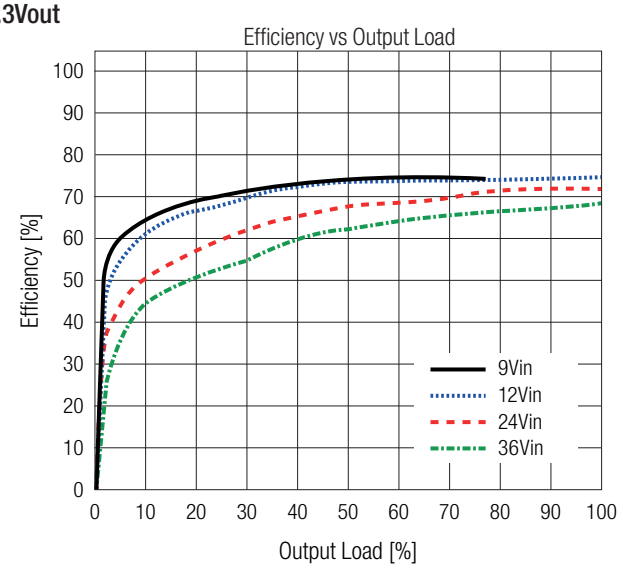
Note4: Measurements are made with a 0.1µF MLCC & 10µF E-cap in parallel across output. (low ESR)
The test setup can have an impact on ripple noise values (placement of scope probe, capacitors, it's specifications, wires, PCB tracks, distances, etc.)

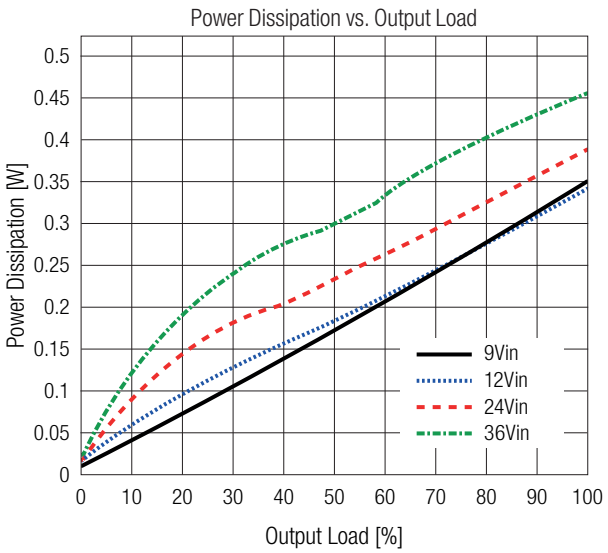
RSOK-2405SZ/H3





RSOK-2412SZ/H3/ADJ
3.3Vout





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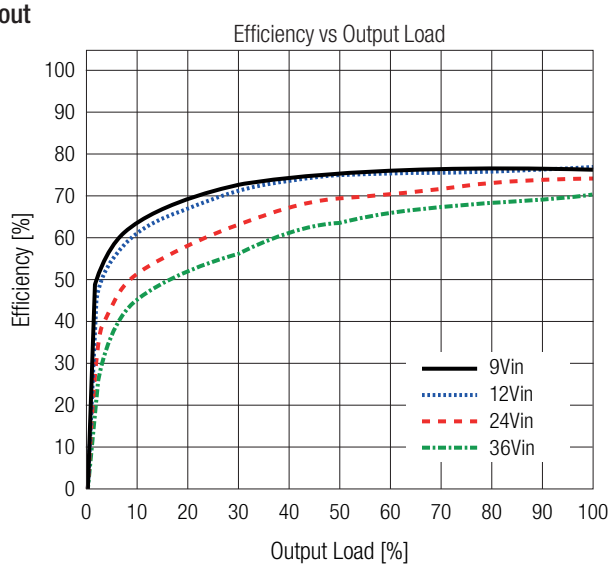
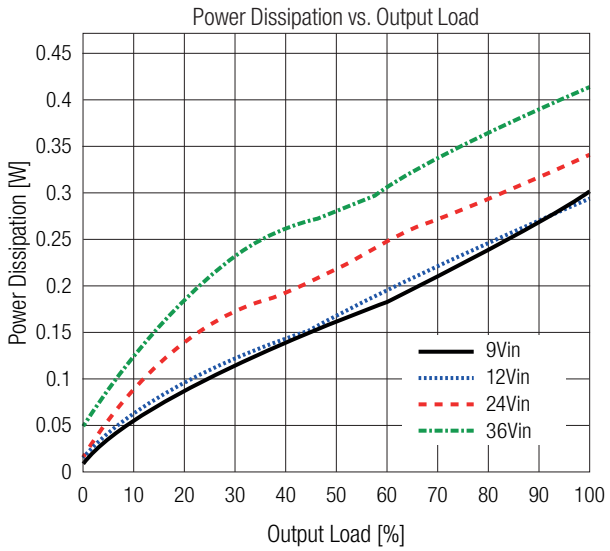
BASIC CHARACTERISTICS (measured @ T_{AMB}= 25°C, nom. V_{IN}, full load and after warm-up unless otherwise stated)

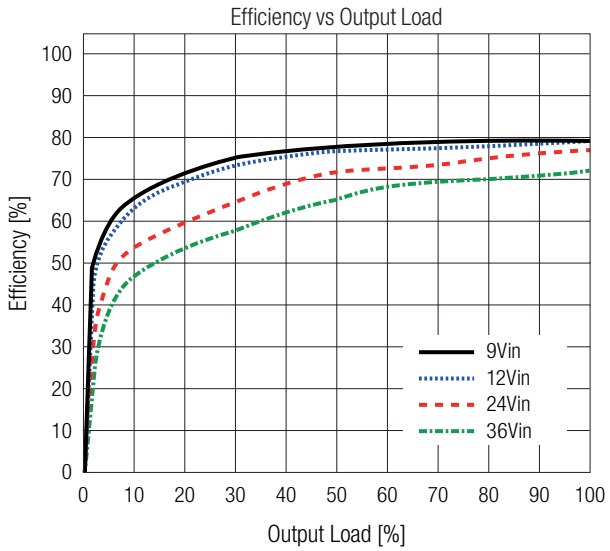
RSOK-2412SZ/H3/ADJ

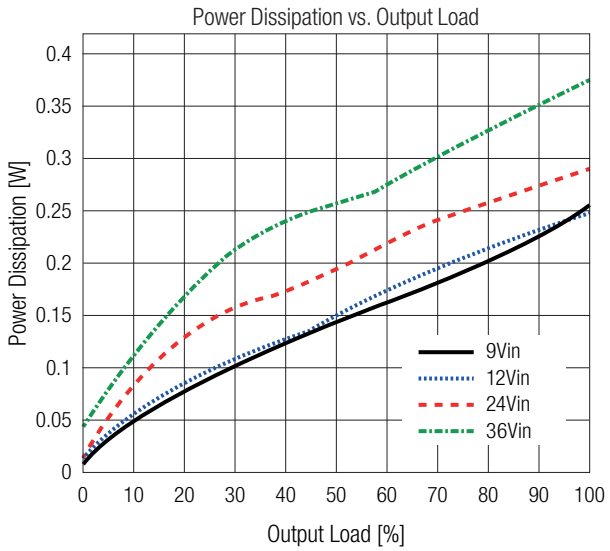
5Vout



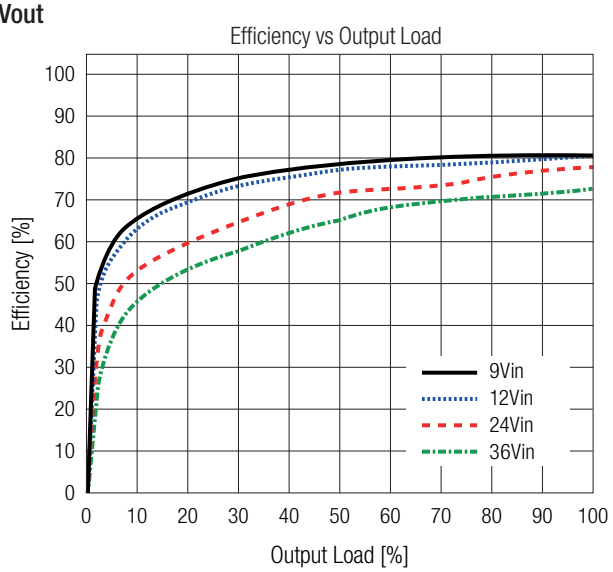


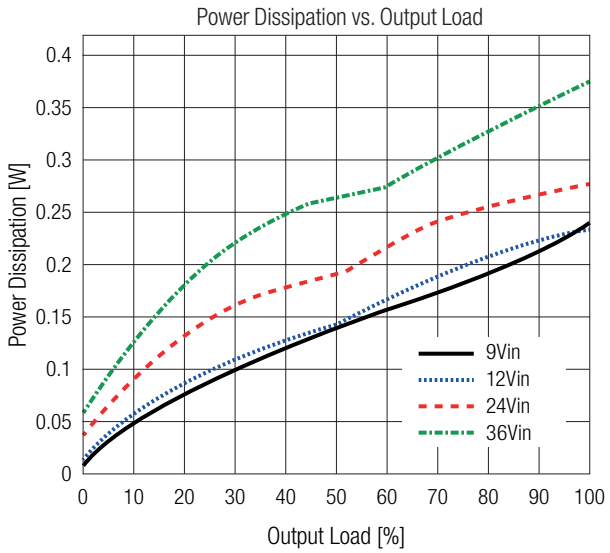
9Vout





12Vout





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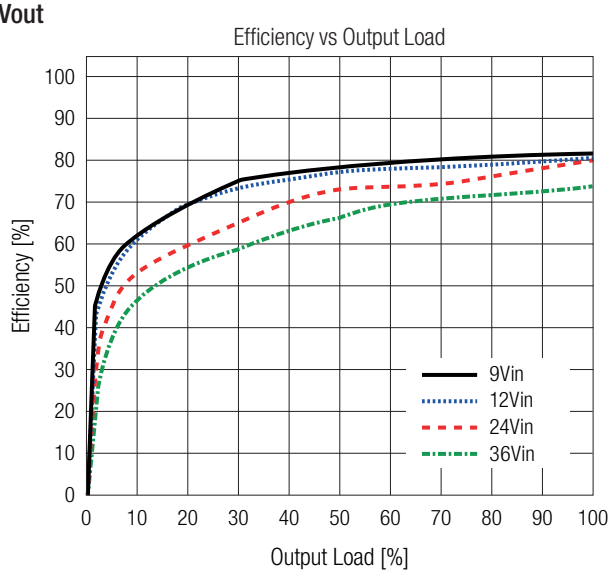
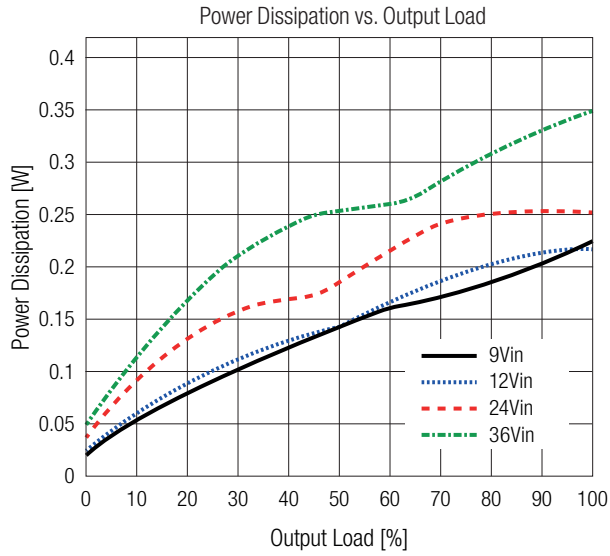
BASIC CHARACTERISTICS (measured @ T_{AMB}= 25°C, nom. V_{IN}, full load and after warm-up unless otherwise stated)

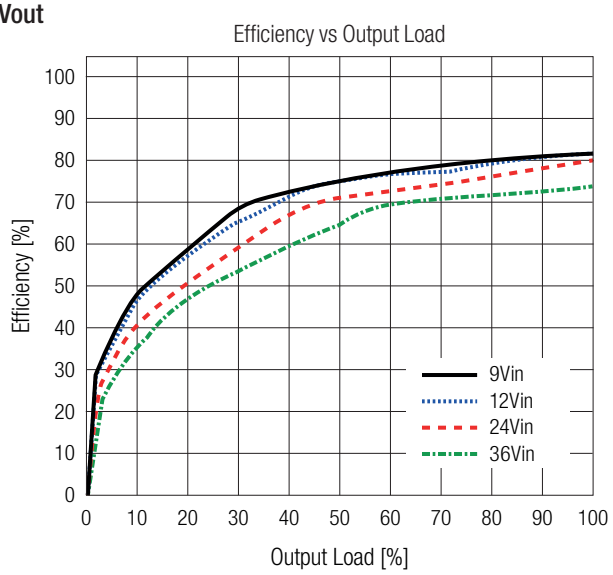
RSOK-2412SZ/H3/ADJ

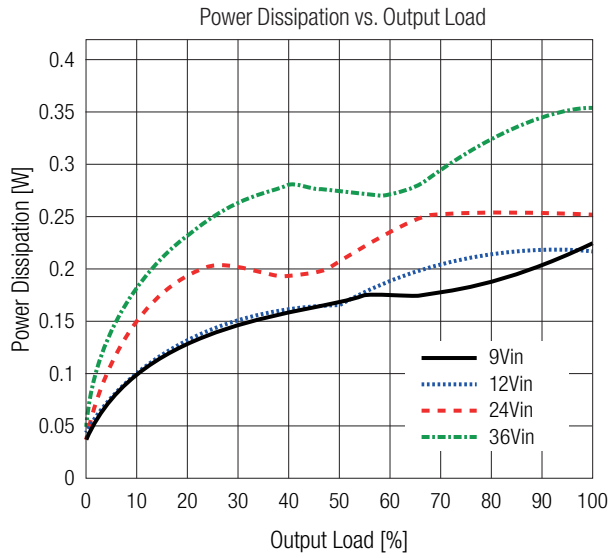
15Vout





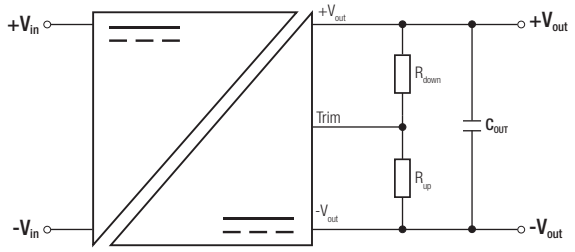
17Vout





OUTPUT VOLTAGE TRIMMING

The nominal output voltage of RSOK-2412SZ/H3/ADJ is 12V but can be trimmed between 3.3V and 17V by using an external trim resistor. The values for the trim resistor are according to standard E96 values; therefore, the specified voltage may slightly vary. Resistor values may be calculated with the following equation. Make sure that the maximum rated output power will not be exceeded when trimming up.



V_{ref}	= reference voltage	[0.596VDC]
$Vout_{set}$	= trimmed output voltage	[VDC]
R_{up}	= trim up resistor	[Ω]
R_{down}	= trim down resistor	[Ω]
R_1	= internal resistor	[200kΩ]
R_2	= internal resistor	[10k5Ω]

Calculation:

$$R_{UP} = \frac{V_{REF} \times R_1 \times R_2}{V_{OUT} \times R_2 - R_1 \times V_{REF} - R_2 \times V_{REF}} = \Omega$$

$$R_{DOWN} = \frac{R_1 \times R_2 \times (V_{OUT} - V_{REF})}{R_1 \times V_{REF} - R_2 \times (V_{OUT} - V_{REF})} = \Omega$$

Trim up

$Vout_{set}$ =	13	14	15	16	17	[VDC]
R_{up} (E96) ≈	113k	59k	39k2	29k4	23k7	[Ω]

Trim down

$Vout_{set}$ =	3.3	5	9	[VDC]
R_{down} (E96) ≈	63k4	127k	39k2	[Ω]
C_{out} =	22	10	-	[µF]

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OUTPUT VOLTAGE TRIMMING

Practical Example trim up to 17VDC:

$$R_{UP} = \frac{0.596V \times 200k\Omega \times 10.5k\Omega}{17V \times 10.5k\Omega - 200k\Omega \times 0.596V - 10.5k\Omega \times 0.596V} = 23.596\Omega$$

R_{up} according to E96 ≈ **23k7Ω**

Practical Example trim down to 3.3VDC:

$$R_{DOWN} = \frac{200k\Omega \times 10.5k\Omega \times (3.3V - 0.596V)}{200k\Omega \times 0.596V - 10.5k\Omega \times (3.3V - 0.596V)} = 62.532\Omega$$

R_{down} according to E96 ≈ **63k4Ω**

REGULATIONS

Parameter	Conditions	Value
Output Accuracy		±2.0% typ.
Line Regulation	low line to high line, full load	±0.5% max.
Load Regulation (5)	10%-100% load	1.0% max.

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

PROTECTIONS

Parameter	Type		Value
Short Circuit Protection (SCP)			continuous, auto recovery
Short Circuit Input Current	nom. V_{IN}= 24VDC		120mA max.
Isolation Voltage (6)	I/P to O/P	1 second	3kVDC
		rated for 1 minute	1.5kVAC/50Hz
Isolation Resistance	I/P to O/P, V_{ISO}= 500VDC		1GΩ min.
Isolation Capacitance	I/P to O/P, 100kHz/0.1V		50pF max.
Insulation Grade	according to 62368-1		functional

Note6: For repeat Hi-Pot testing, reduce the time and/or the test voltage
Note7: Refer to local safety regulations if input over-current protection is also required. Recommended fuse: slow blow type

ENVIRONMENTAL

Parameter	Conditions			Value
Operating Temperature Range	with derating, refer to **„Derating Graph“**			-40°C to +105°C
Maximum Case Temperature				+115°C max.
Temperature Coefficient				0.02%/K
Thermal Impedance	natural convection 0.1m/s			49.17K/W
Operating Altitude				5000m
Operating Humidity	non-condensing			95% RH max.
Pollution Degree				PD2
MTBF	according to MIL-HDBK-217F, G.B.	RSOK-2405SZ/H3; V_{IN}= 5VDC	T_{AMB}= +25°C	2725 x 10³ hours
			T_{AMB}= +80°C	867 x 10³ hours
		RSOK-2412SZ/H3/ADJ; V_{IN}= 24VDC	T_{AMB}= +25°C	2678 x 10³ hours
			T_{AMB}= +80°C	1106 x 10³ hours

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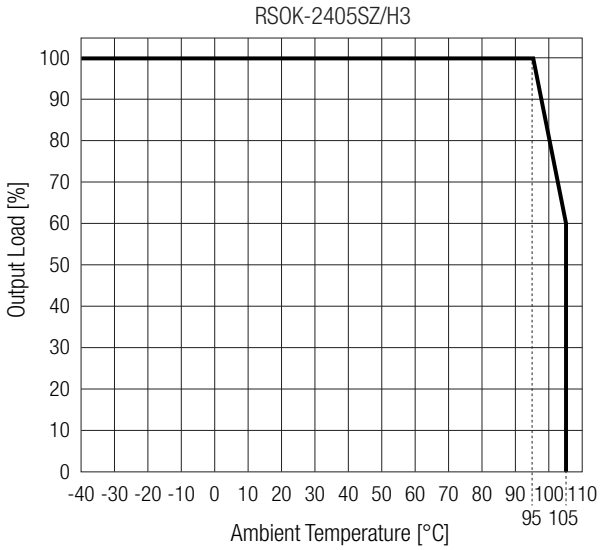
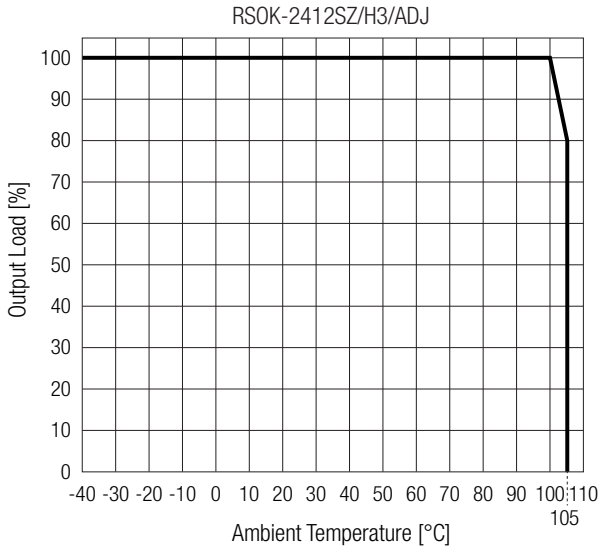
ENVIRONMENTAL

Derating Graph

(@ Chamber and natural convection 0.1m/s)





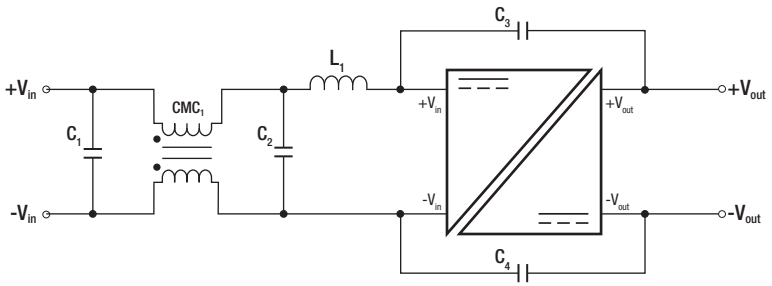
SAFETY & CERTIFICATIONS

Certificate Type (Safety)	Report Number	Standard
Audio/Video, information and communication technology equipment - Part1: Safety requirements 3rd Edition	E491408-A6025-UL	UL62368-1:2019, 3rd Edition
		CAN/CSA-C22.2 No. 62368-1-19 3rd Edition
Audio/Video, information and communication technology equipment - Part1: Safety requirements 3rd Edition (CB Scheme)	231227040	IEC62368-1:2018 3rd Edition
Audio/Video, information and communication technology equipment - Part1: Safety requirements 3rd Edition		EN IEC 62368-1:2020+A11:2020
RoHS2		RoHS 2011/65/EU + AM2015/863

EMC Compliance	Conditions	Standard / Criterion
Electromagnetic Compatibility of Multimedia Equipment - Emission Requirements	with external filter	EN55032, Class B

EMC Filtering Suggestion according to EN55032

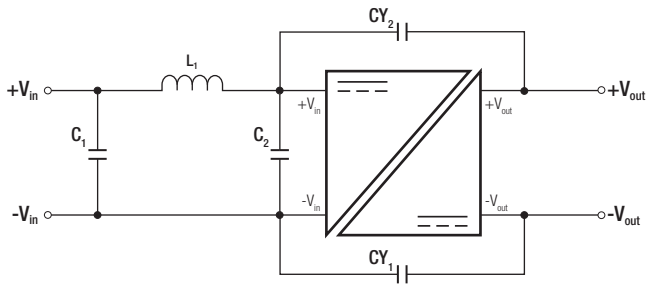
RSOK-2405SZ/H3



Component List Class B

C_1/C_2	CMC_1	L_1	C_3/C_4
10µF	11µH	22µH; RLS-226	2.2nF; 3kV

RSOK-2405SZ/H3/ADJ



Component List Class B

C_1/C_2	CY_1/CY_2	L_1
10µF	470pF	5.6µH, RLS-567

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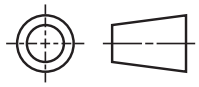
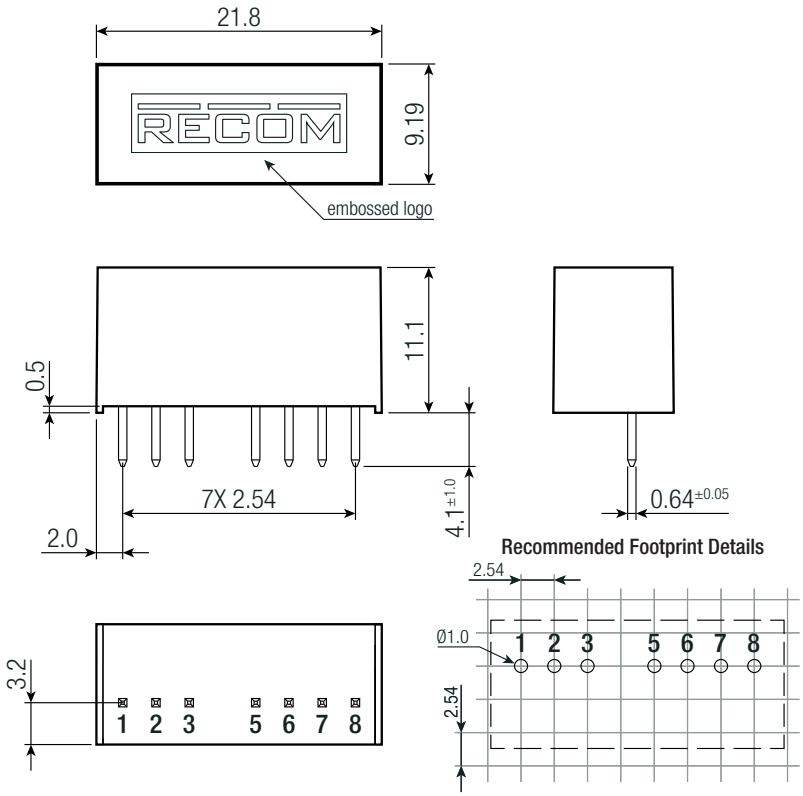
DIMENSION & PHYSICAL CHARACTERISTICS

Parameter	Type	Value
Material	case	black plastic, (UL94 V-0)
	potting	PU, (UL94 V-0)
	PCB	FR4, (UL94 V-0)
Dimension (LxWxH)		21.8 x 9.2 x 11.1mm 0.86 x 0.36 x 0.44 inch
Weight		4.7g typ. 0.01 lbs

Dimension Drawing (mm)





Pinning Information

Pin #	Single	/ADJ
1	-Vin	-Vin
2	+Vin	+Vin
3	CTRL	CTRL
5	NC	TRIM
6	+Vout	+Vout
7	-Vout	-Vout
8	NC	NC

NC= no connection

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

PACKAGING INFORMATION

Parameter	Type	Value
Packaging Dimension (LxWxH)	tube	520.0 x 11.5 x 19.0mm
Packaging Quantity		22pcs
Storage Temperature Range		-50°C to +125°C
Storage Humidity	non-condensing	95% RH max.

The product information and specifications may be subject to changes even without prior written notice.The product has been designed for various applications; its suitability lies in the responsibility of each customer. The products are not authorized for use in safety-critical applications without RECOM's explicit written consent. A safety-critical application is an application where a failure may reasonably be expected to endanger or cause loss of life, inflict bodily harm or damage property. The applicant 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.

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