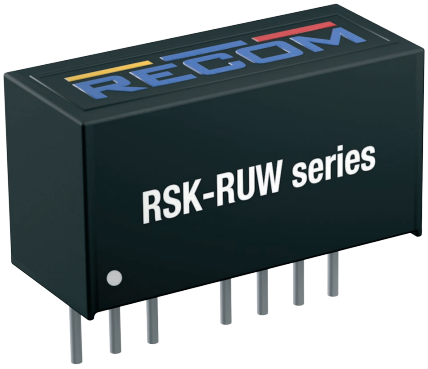
RSK-RUW Series ◊ Regulated SIP8

2W ◊ Isolated Single Output ◊ 8:1 Input

RECOM
DC/DC Converter

FEATURES

- 8:1 wide input voltage range
- SIP8 package
- Continuous short circuit protection
- No minimum load required
- 3kVDC/1 second isolation
- 78% typical efficiency
- 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 RSK-RUW series is a state-of-the-art isolated DC/DC converter that boasts an ultra-wide 8:1 input voltage range of 4.5-36VDC. The RSK-RUW also includes ON/OFF control for added convenience and precision. The device delivers high accuracy and tight line and load regulation, ensuring stable performance even in challenging conditions. The RSK-RUW also includes continuous short circuit protection and undervoltage lockout (UVLO) for added safety and security. This product is certified according to IEC/EN/UL 62368-1, making it suitable for use in a variety of industrial applications. With a maximum output power of 2W and the ability to operate at 0% minimum load, the RSK-RUW is very versitile. The device also offers high efficiency, with a typical value of 78%. Finally, the RSK-RUW offers functional grade isolation of 3kVDC/1sec and an industrial operating temperature range of -40°C to 105°C with derating, making it ideal for use in demanding industrial environments.

SELECTION GUIDE

Part Number	Input Voltage Range [VDC]	Output Voltage [VDC]	Output Current max. [mA]	Efficiency typ. (1) [%]	max. Capacitive Load (2) [µF]
RSK-2405SRUW/H3	4.5-36	5	400	75	2000
RSK-2412SRUW/H3/ADJ	4.5-36	3.3-17	167	78	2500

Note1: Efficiency is tested at minimum input and full load at +25°C ambient
Note2: Max Cap Load is tested at nominal input an full resistive load

MODEL NUMBERING

RSK-__ __ S RUW/H3/ADJ

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

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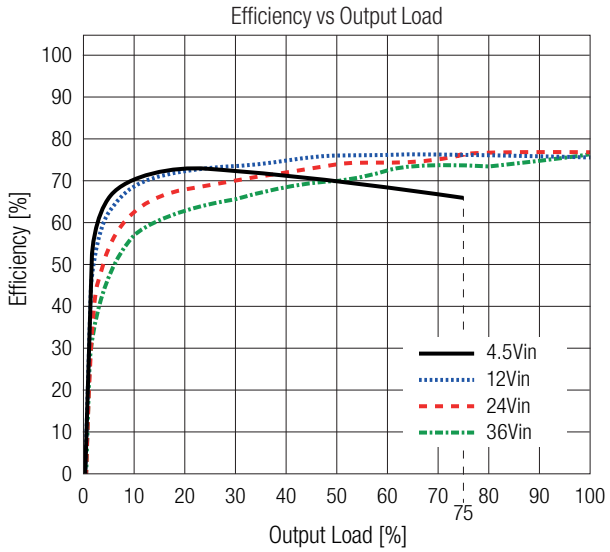
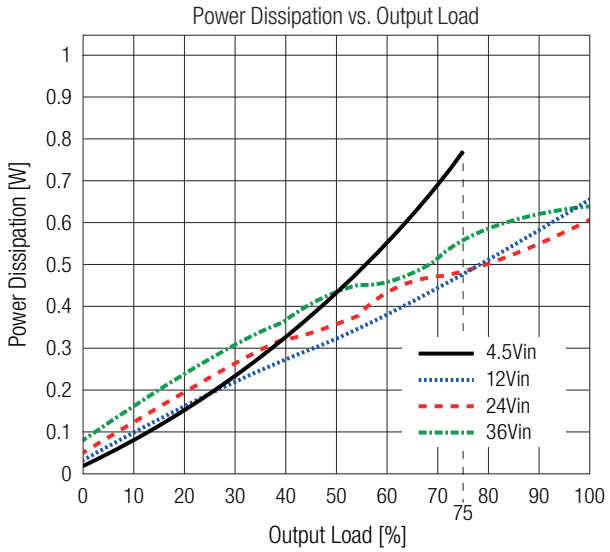
BASIC CHARACTERISTICS (measured @ T_{AMB}= 25°C, nom. V_{IN}, full load and after warm-up unless otherwise stated)

Parameter	Conditions			Min.	Typ.	Max.
Internal Input Filter						capacitors
Input Voltage Range	nom. V_{IN}= 24VDC			4.5VDC		36VDC
Under Voltage Lockout	DC-DC ON			4VDC		4.3VDC
	DC-DC OFF			3.3VDC		3.6VDC
Quiescent Current						20mA
Output Voltage Trimming	RSK-2412SRUW/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		400kHz
Output Ripple and Noise (3)	20MHz BW	RSK-2405SRUW/H3	nom. V_{IN}= 5VDC			50mVp-p
			nom. V_{IN}= 24VDC			100mVp-p
		RSK-2412SRUW/H3/ADJ	nom. V_{IN}= 24VDC		150mVp-p	

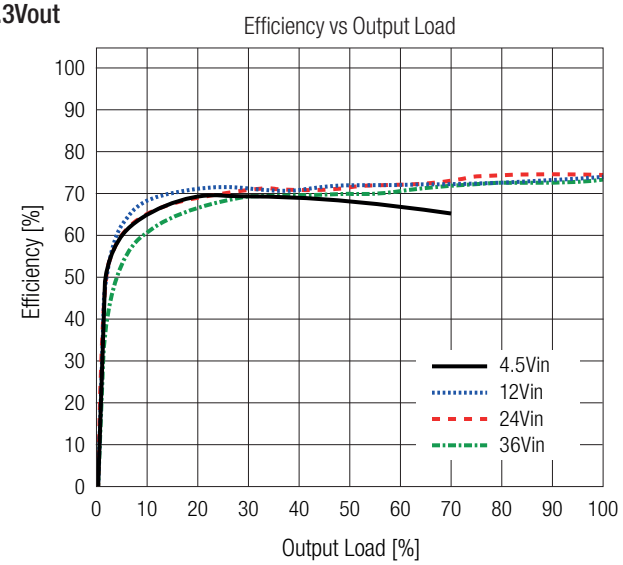
Note3: Measurements are made with a 0.1µF MLCC & 10µF E-cap in parallel across output. (low ESR)
The test setup can have an impact on ripple noise values (placement of scope probe, capacitors, it's specifications, wires, PCB tracks, distances, etc.)

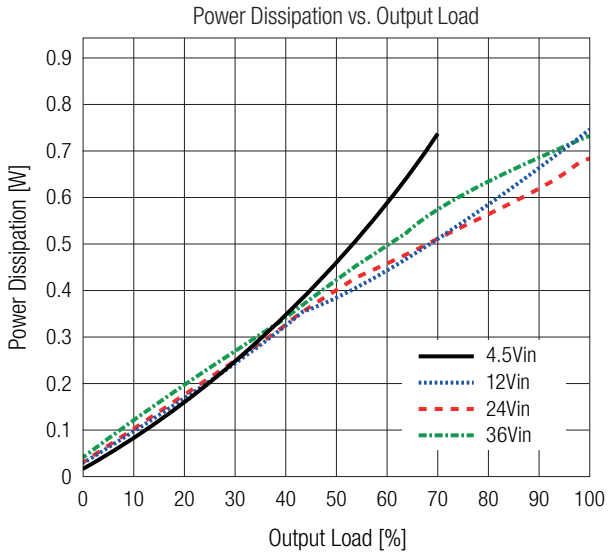
RSK-2405SRUW/H3





RSK-2412SRUW/HR/ADJ
3.3Vout





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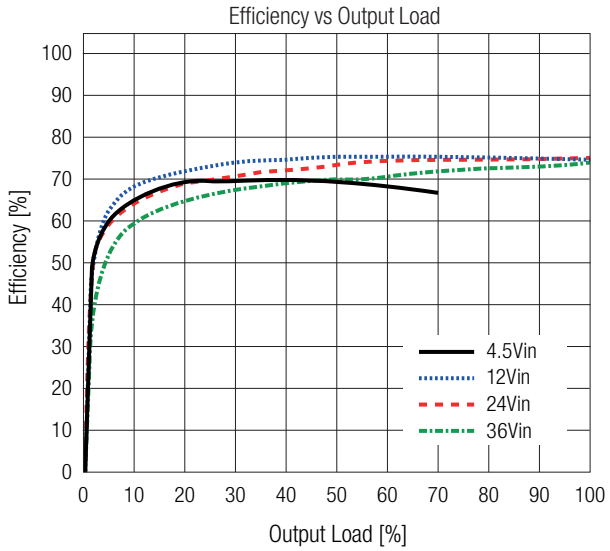
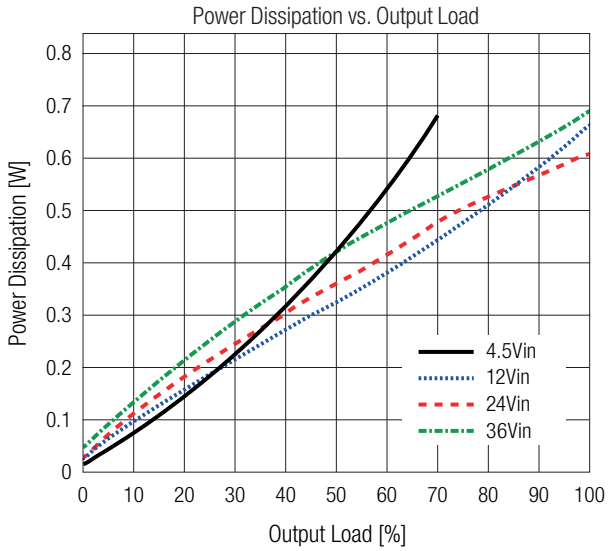
BASIC CHARACTERISTICS (measured @ T_{AMB}= 25°C, nom. V_{IN}, full load and after warm-up unless otherwise stated)

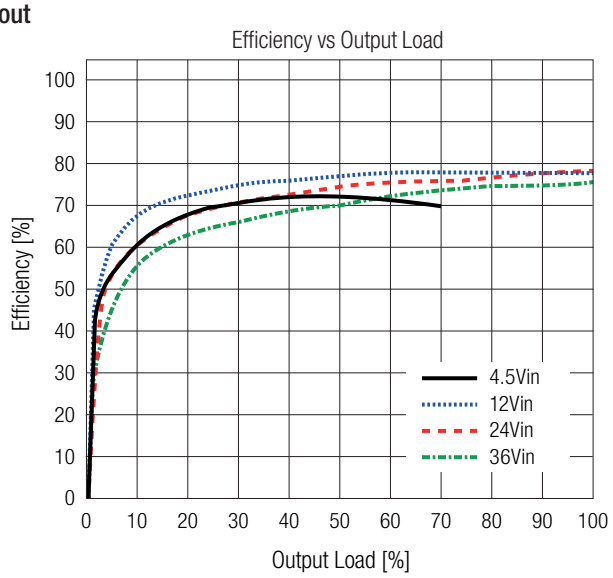
RSK-2412SRUW/HR/ADJ

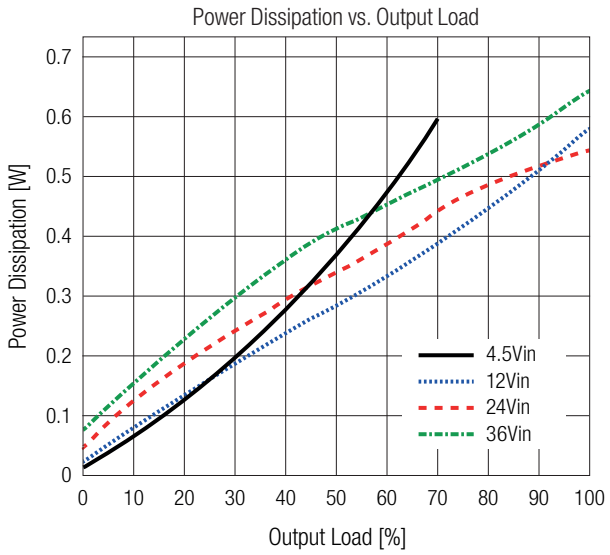
5Vout



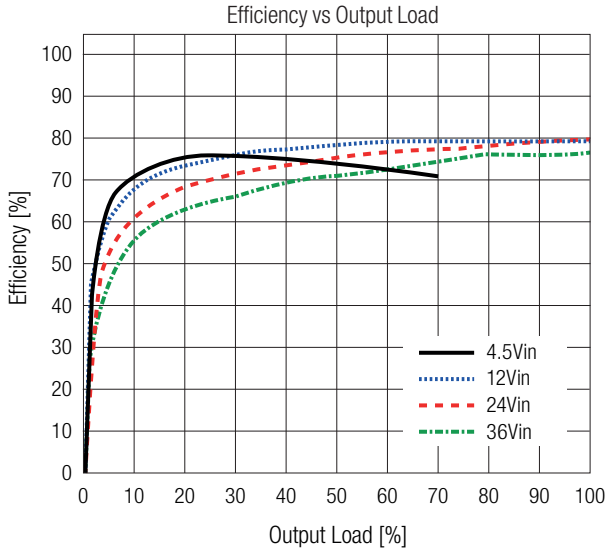


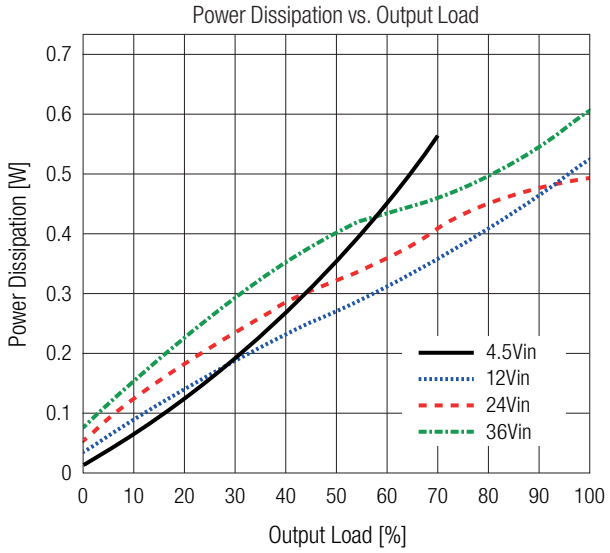
9Vout





12Vout





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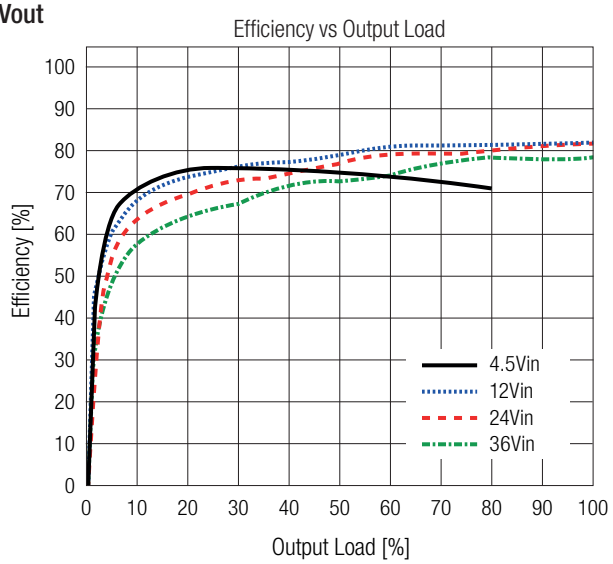
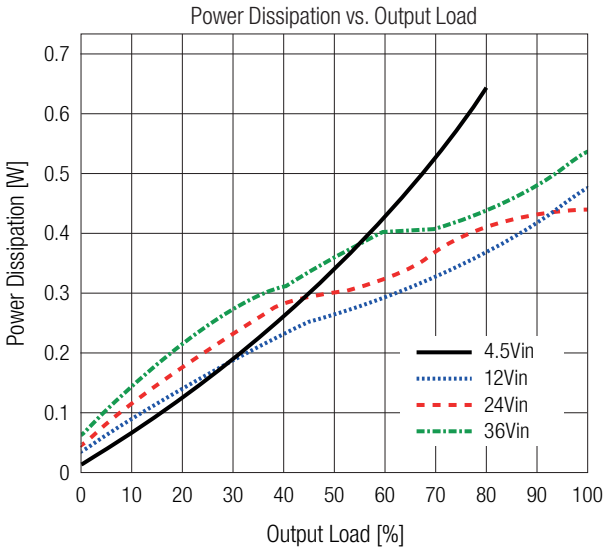
BASIC CHARACTERISTICS (measured @ T_{AMB}= 25°C, nom. V_{IN}, full load and after warm-up unless otherwise stated)

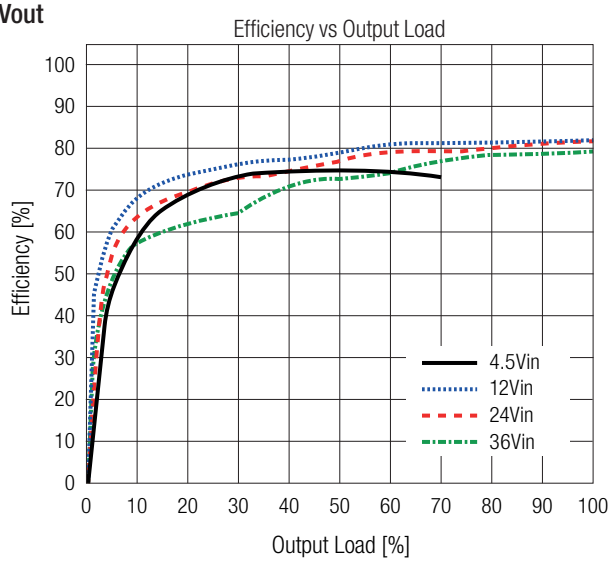
RSK-2412SRUW/HR/ADJ

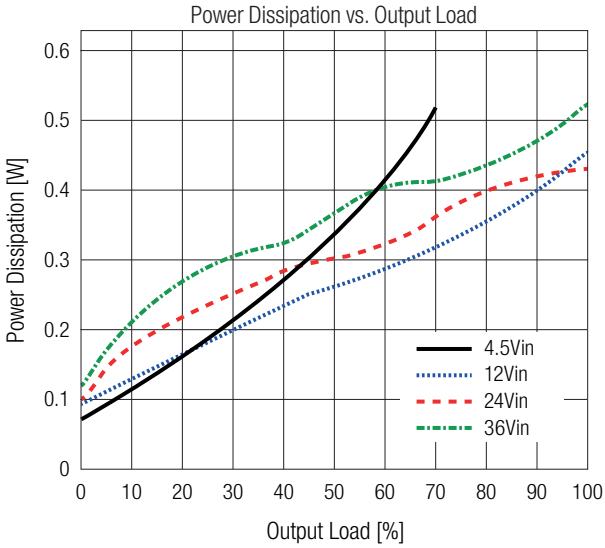
15Vout





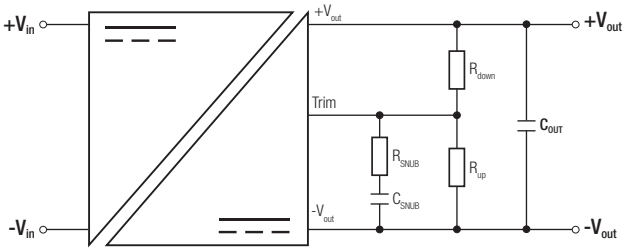
17Vout





OUTPUT VOLTAGE TRIMMING

The nominal output voltage of RSK-2412SRUW/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.



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	576k	[Ω]
C_{OUT}=	44	10	-	[µF]
R_{SNUB}=	820	-	-	[Ω]
C_{SNUB}	220	-	-	[pF]

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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			±3.0% typ.
Line Regulation	low line to high line, full load	nom. V_{IN}= 5VDC	±1.0% max.
		nom. V_{IN}= 24VDC	±0.5% max.
Load Regulation (4)	10%-100% load		2.0% max.
	0%-100% load		2.0% typ.

Note4: 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}= 5VDC		500mA max.
	nom. V_{IN}= 24VDC		120mA max.
Over Temperature Protection (OTP)	auto restart after cool down		150°C max.
Isolation Voltage (5)	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		15pF max.
Insulation Grade	according to 62368-1		functional

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	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				36.0K/W
Operating Altitude					5000m
Operating Humidity	non-condensing				95% RH max.
Pollution Degree					PD2
MTBF	according to MIL-HDBK-217F, G.B.	RSK-2405SRUW/H3	nom. V_{IN}= 5VDC	T_{AMB}= +25°C	3463 x 10³ hours
				T_{AMB}= +80°C	749 x 10³ hours
			nom. V_{IN}= 24VDC	T_{AMB}= +25°C	3404 x 10³ hours
				T_{AMB}= +80°C	1034 x 10³ hours
		RSK-2412SRUW/H3/ADJ; V_{IN}= 24VDC		T_{AMB}= +25°C	2413 x 10³ hours
				T_{AMB}= +80°C	764 x 10³ hours

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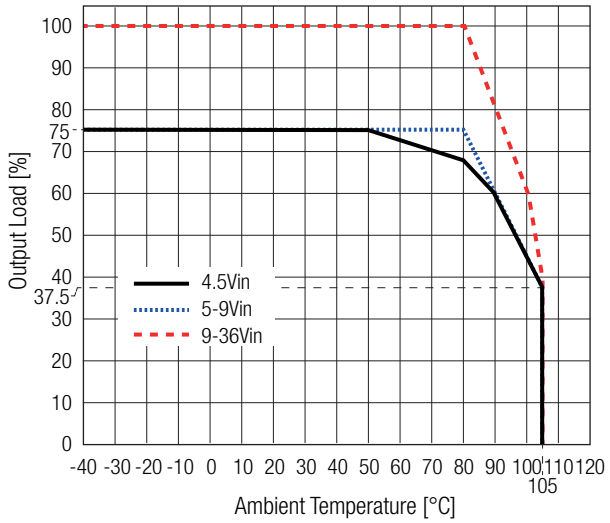
ENVIRONMENTAL

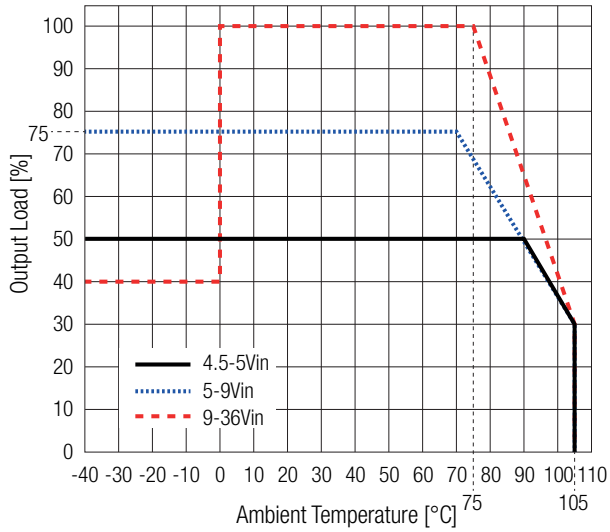
Derating Graph

(@ Chamber and natural convection 0.1m/s)

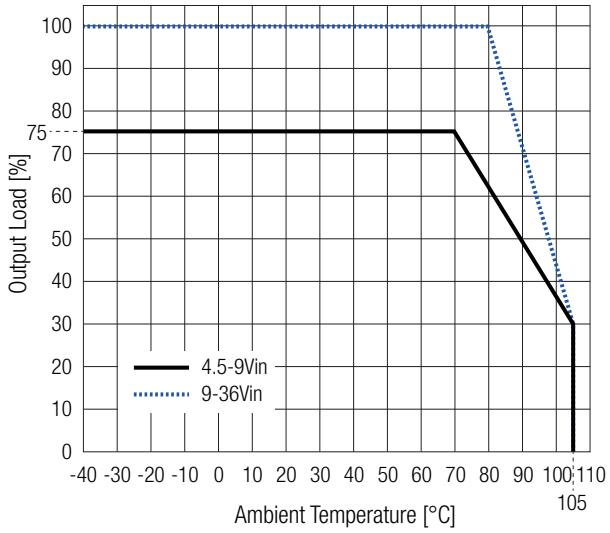
RSK-2405SRUW/H3



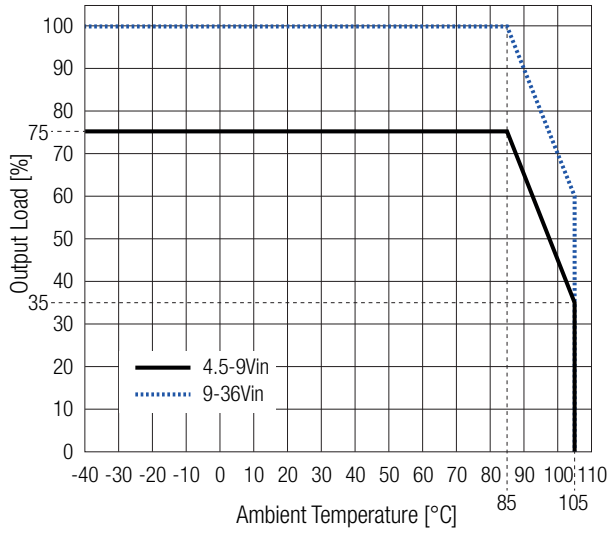
RSK-2412SRUW/H3/ADJ
V_{OUT}= 3.3-5VDC



RSK-2412SRUW/H3/ADJ
V_{OUT}= 5-12VDC



RSK-2412SRUW/H3/ADJ
V_{OUT}= 12-17VDC



SAFETY & CERTIFICATIONS

Certificate Type (Safety)	Report Number	Standard
Audio/Video, information and communication technology equipment - Part1: Safety requirements 3rd Edition	E491408-A6024-UL	UL62368-1:2019, 3nd 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)	231227038	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

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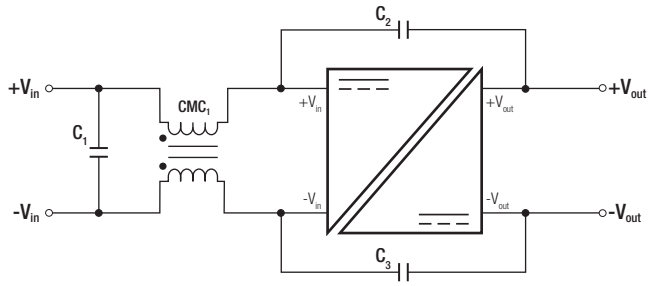
SAFETY & CERTIFICATIONS

EMC Compliance	Conditions	Standard / Criterion
Electromagnetic Compatibility of Multimedia Equipment - Emission Requirements	with external filter (7)	EN55032, Class B

EMC Filtering Suggestion according to EN55032

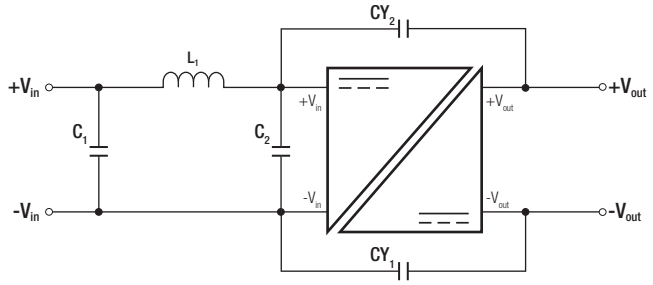
RSK-2405SRUW/H3



Component List Class B

C_1	CMC_1	C_2/C_3
10µF	11µH	2.2nF; 3kV

RSK-2412SRUW/H3/ADJ



Component List Class B

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

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

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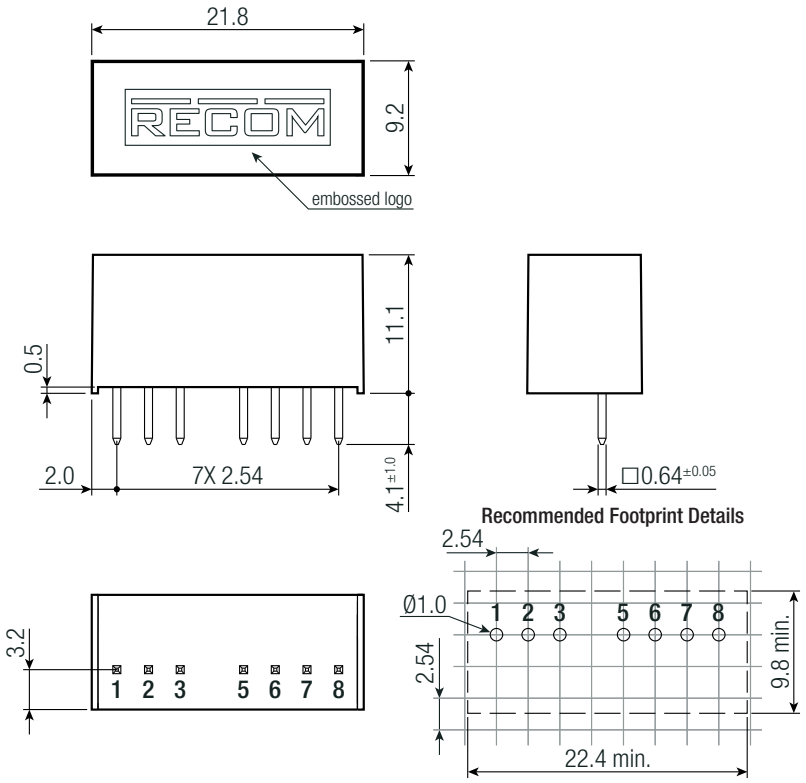
DIMENSION & PHYSICAL CHARACTERISTICS

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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