

# RECOM

## DC/DC Converter

## Features

- 2:1 or 4:1 wide input range
- 2kVDC/1 second isolation
- -40°C to +80°C operating temperature @ full load
- Industry standard pinout (SIP8)
- EN/UL62368 and UL60950 certified, CB report
- Low cost

## Regulated Converters

## RSOE(-Z)

1 Watt  
 SIP8  
 Single Output



## Description

The RSOE(-Z) is a low cost isolated, regulated and short-circuit protected DC/DC converter designed for industrial applications. A compact SIP8 case size, 2:1 input or 4:1 input, 2kVDC isolation and a wide operating temperature range of -40°C to +80°C without derating makes the RSOE(-Z) series ideal for industrial, transport and general-purpose on-board 5V power supplies. Industrial Class A EMC levels can be met with a simple Pi-filter and the converters come with a three year warranty.

## Selection Guide

Part Number	Input Voltage Range [VDC]	Input Current @ full load [mA]	Output Voltage [VDC]	Output Current [mA]	Efficiency typ. <sup>(1)</sup> [%]	max. Capacitive Load <sup>(2)</sup> [µF]
RSOE-0505S/H2	4.5 - 9	265	5	200	76	6800
RSOE-2405S/H2	18 - 36	52	5	200	80	6800
RSOE-1205SZ/H2	4.5 - 18	105	5	200	79	6800
RSOE-2405SZ/H2	9 - 36	53	5	200	79	6800

### 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



### Notes:

Note3: suffix "/H2" standard isolation voltage 2kVDC/1 second

Note4: without suffix 2:1 input voltage range

with suffix "Z" 4:1 input voltage range

### Ordering Examples:

RSOE-1205SZ/H2 12Vin 4:1 input voltage range 5Vout 2kVDC/1 second isolation  
 RSOE-0505S/H2 5Vin 2:1 input voltage range 5Vout 2kVDC/1 second isolation



UL62368-1 certified  
 C22.2 No. 62368-1-14 certified  
 UL60950 certified  
 C22.2 No. 60950-1-07 certified  
 IEC/EN62368-1 certified  
 EN55032/55024 compliant  
 CB Report

Specifications (measured @ Ta= 25°C, nominal Vin, full load unless otherwise specified)

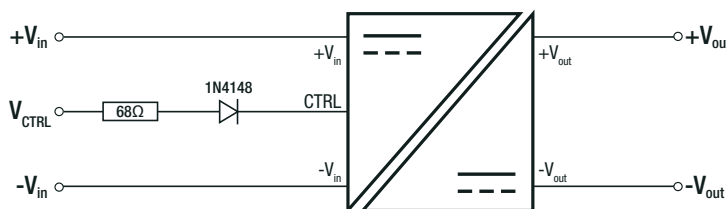
BASIC CHARACTERISTICS					
Parameter	Condition		Min.	Typ.	Max.
Internal Input Filter			capacitor		
Input Voltage Range	2:1 input	nom. Vin= 5VDC nom. Vin= 24VDC	4.5VDC 18VDC	5VDC 24VDC	9VDC 36VDC
	4:1 input (suffix "Z")	nom. Vin= 12VDC nom. Vin= 24VDC	4.5VDC 9VDC	12VDC 24VDC	18VDC 36VDC
Maximum Reverse Voltage					0VDC
Input Surge Voltage	100ms max.	nom. Vin= 5VDC nom. Vin= 12VDC nom. Vin= 24VDC		15VDC 25VDC 50VDC	
Quiescent Current	2:1 input	nom. Vin= 5VDC nom. Vin= 24VDC		40mA 3mA	
	4:1 input (suffix "Z")	nom. Vin= 12VDC nom. Vin= 24VDC		10mA 5mA	
Start-up time				500µs	3ms
Rise time				450µs	
Hold-up time				10µs	
Internal Operating Frequency	2:1 input		130kHz		
	4:1 input (suffix "Z")		250kHz		
Minimum Load <sup>(5)</sup>	2:1 input		0%		
	4:1 input (suffix "Z")		10%		
Output Ripple and Noise <sup>(6)</sup>	20MHz BW	2:1 input 4:1 input (suffix "Z")			75mVp-p 100mVp-p
ON/OFF CTRL	DC-DC ON DC-DC OFF		Open or 0VDC < V <sub>CTRL</sub> < 0.8VDC 2VDC < V <sub>CTRL</sub> < 6VDC		
Input Current of CTRL Pin	V <sub>CTRL</sub> = 5VDC V <sub>CTRL</sub> = 3.3VDC			15mA 10mA	
Standby Current				0.75mA	1.5mA

**Notes:**

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

Note6: Measurements are made with a 0.1µF MLCC across output (low ESR)

**ON/OFF CTRL Circuit**

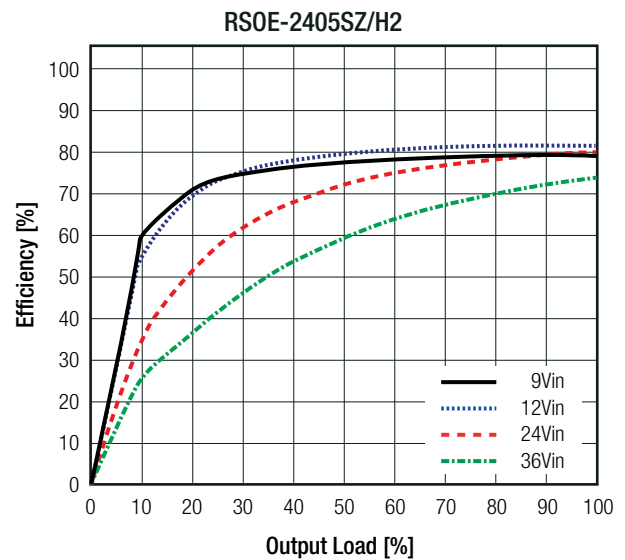
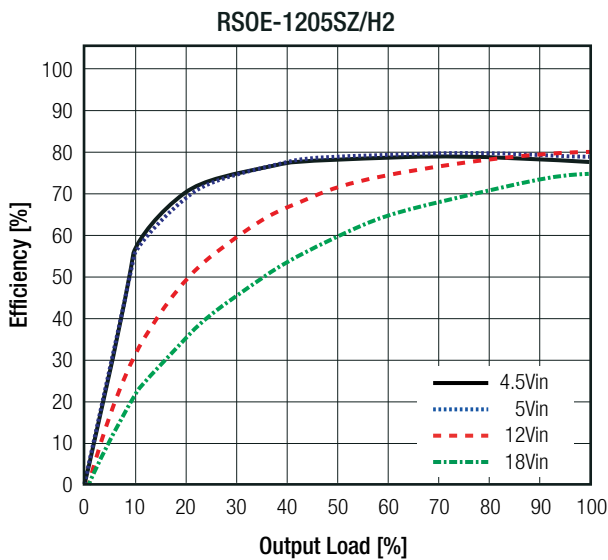
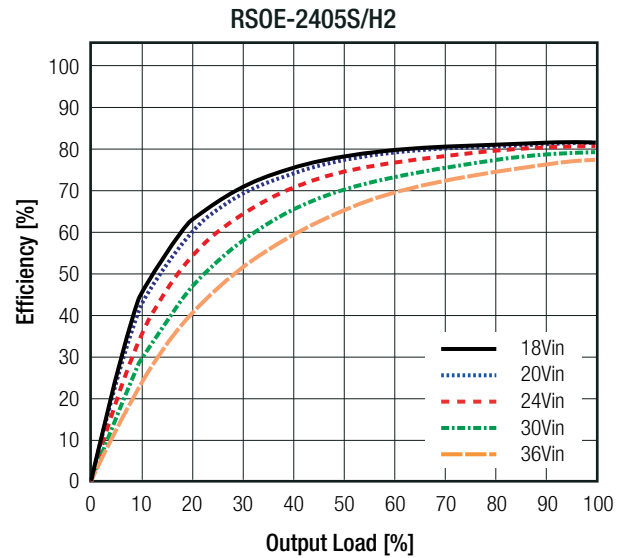
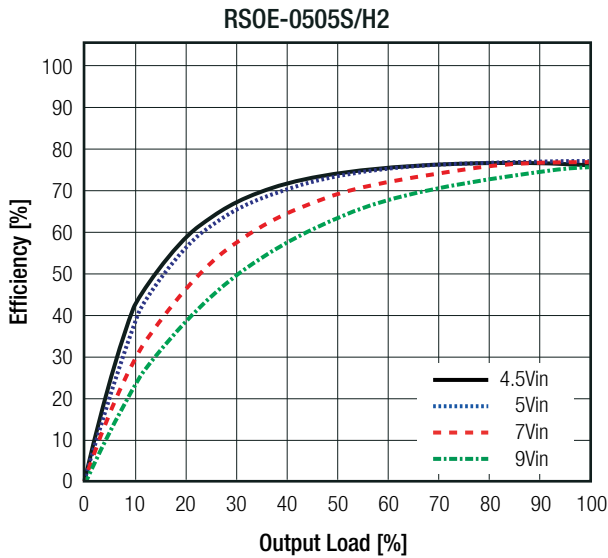


DC-DC ON: Open or 0VDC < V<sub>CTRL</sub> < 0.8VDC  
DC-DC OFF: 2VDC < V<sub>CTRL</sub> < 6VDC

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Specifications (measured @ Ta= 25°C, nominal Vin, full load unless otherwise specified)

Efficiency vs. Load



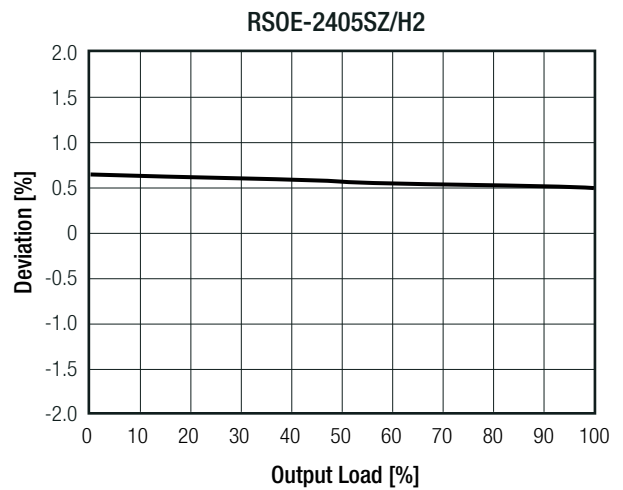
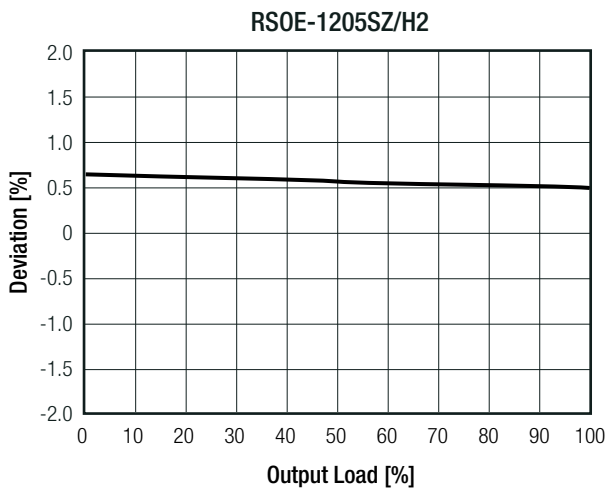
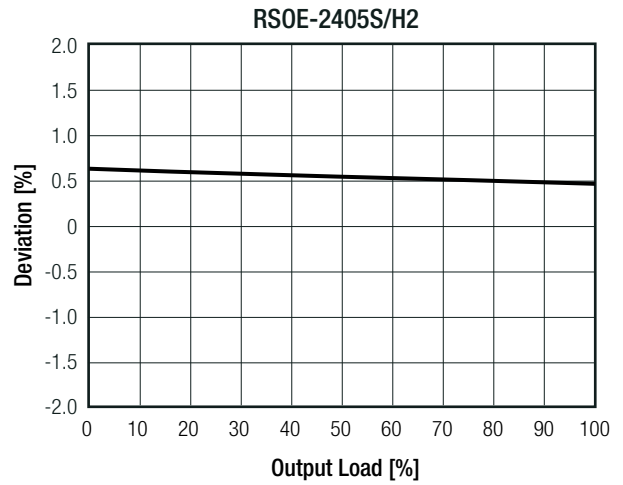
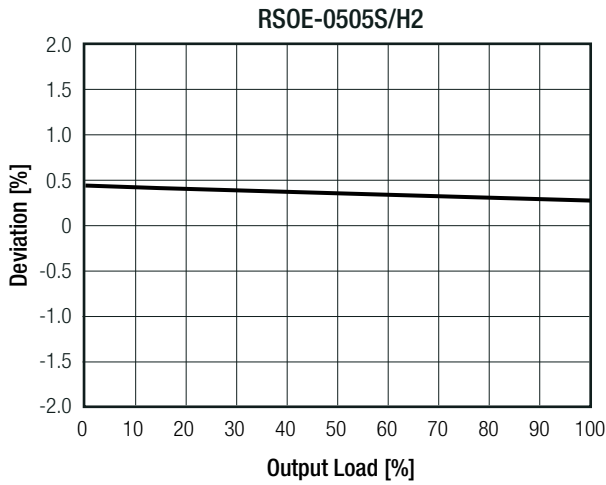
**REGULATIONS**

Parameter	Condition		Value
Output Accuracy			±2.0% max.
Line Regulation	low line to high line, full load	2:1 input	±0.2% max.
		4:1 input (suffix "Z")	±0.5% typ.
Load Regulation	0% to 100% load	2:1 input	0.5% max.
		4:1 input (suffix "Z")	0.5% typ.

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Specifications (measured @ Ta= 25°C, nominal Vin, full load unless otherwise specified)

Deviation vs. Load



**PROTECTIONS**

Parameter	Type		Value
Short Circuit Protection (SCP)	below 100mΩ		continuous, auto recovery
Isolation Voltage <sup>(7)</sup>	I/P to O/P	tested for 1 second	2kVDC
Isolation Resistance			1GΩ min.
Isolation Capacitance			100pF max.
Insulation Grade			functional

**Notes:**

Note7: For repeat Hi-Pot testing, reduce the time and/or the test voltage

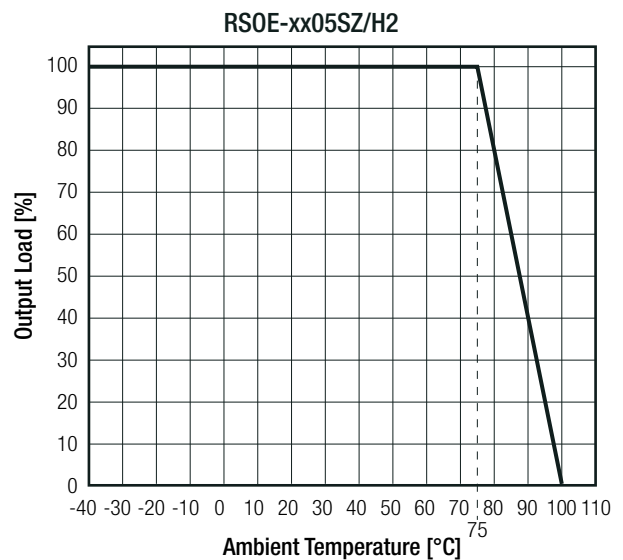
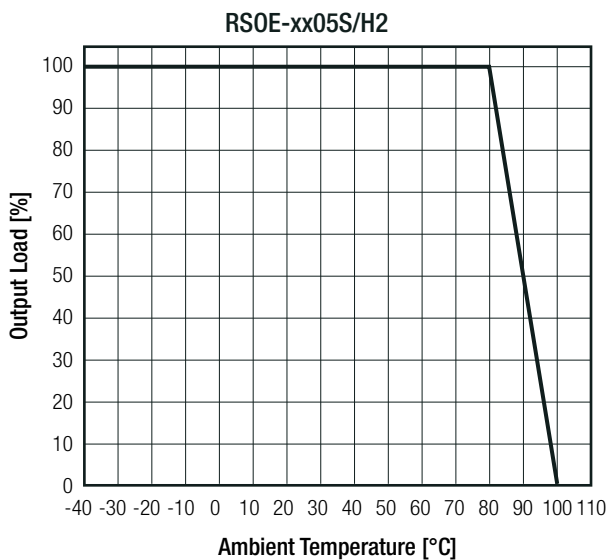
Note8: Refer to local safety regulations if input over-current protection is also required. Recommended fuse: slow blow type

**Specifications** (measured @ Ta= 25°C, nominal Vin, full load unless otherwise specified)

ENVIRONMENTAL				
Parameter	Condition			Value
Operating Temperature Range	without derating (refer to "Derating Graph")		2:1 input	-40°C to +80°C
			4:1 input (suffix "Z")	-40°C to +75°C
Maximum Case Temperature				+105°C
Temperature Coefficient				±0.05%/K
Operating Altitude				5000m
Operating Humidity	non-condensing			5% - 95% RH max.
Pollution Degree				PD2
Vibration				MIL-STD-202G
MTBF	according to MIL-HDBK-217F, G.B.	2:1 input	+25°C	3073 x 10 <sup>3</sup> hours
			+80°C	845 x 10 <sup>3</sup> hours
		4:1 input (suffix "Z")	+25°C	2800 x 10 <sup>3</sup> hours
			+75°C	950 x 10 <sup>3</sup> hours

**Derating Graph**

(@ Chamber and natural convection 0.1 m/s)



**SAFETY AND CERTIFICATIONS**

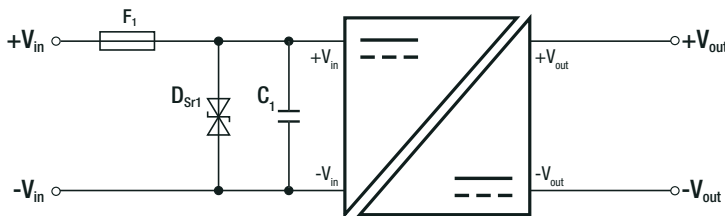
Certificate Type (Safety)	Report / File Number	Standard
Information Technology Equipment, General Requirements for Safety	E224736-A48	UL60950-1, 2nd Edition, 2014 CSA C22.2 No. 60950-1-07, 2nd Ed. 2014
Audio/Video, information and communication technology equipment - Safety requirements		UL62368-1, 2nd Edition, 2014 CSA C22.2 Nr. 62368-1-14, 2nd Ed. 2014
Audio/Video, information and communication technology equipment - Safety requirements (CB Scheme)	L0339m37-CB-1-B1	IEC/EN62368-1, 2nd Edition, 2014
RoHS2		RoHS 2011/65/EU + AM2015/863

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**Specifications** (measured @ Ta= 25°C, nominal Vin, full load unless otherwise specified)

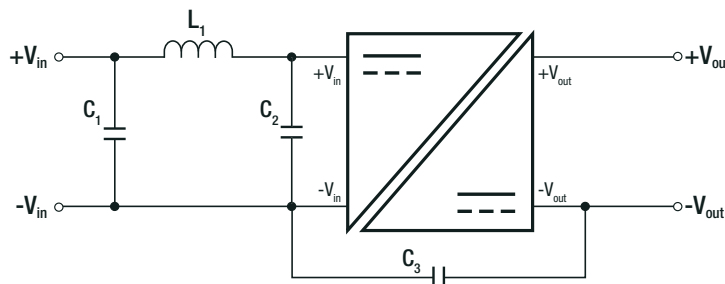
EMC Compliance	Conditions	Standard / Criterion
Electromagnetic compatibility of multimedia equipment - Emission requirements	with external filter (see filter suggestion below)	EN55032, Class A EN55032, Class B
Information technology equipment - Immunity characteristics - Limits and methods of measurement		EN55024, 2015
ESD Electrostatic discharge immunity test	±8kV Air; ±4kV Contact	IEC61000-4-2, Criteria A
Radiated, radio-frequency, electromagnetic field immunity test	3V/m	IEC61000-4-3, Criteria A
Fast Transient and Burst Immunity	DC Power Port: ±0.5kV	IEC61000-4-4, Criteria A
Surge Immunity	DC Power Port: ±0.5kV	IEC61000-4-5, Criteria A
Immunity to conducted disturbances, induced by radio-frequency fields	DC Power Port: 3V	IEC61000-4-6, Criteria A
Power Magnetic Field	50Hz, 1A/m	IEC61000-4-8, Criteria A

**Surge Protection Circuit according to IEC61000-4-5, Criteria A**



Model	D <sub>Sr1</sub>	C <sub>1</sub>
RSOE-0505S/H2	P4SMAJ11A	N/A
RSOE-2405S/H2	P4SMAJ18A	220µF/100V
RSOE-1205SZ/H2	P4SMAJ36A	470µF/100V
RSOE-2405SZ/H2	P4SMAJ36A	470µF/100V

**EMC Filtering Suggestions for EN55032**

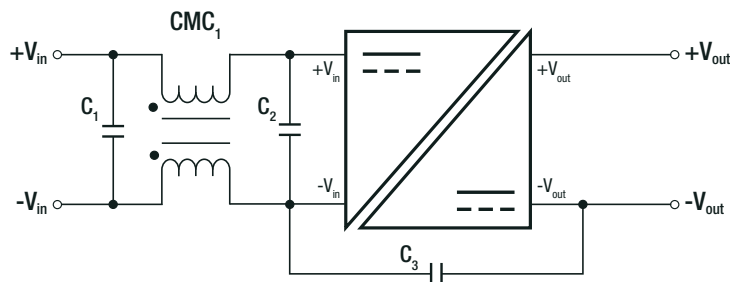


**Component List Class A**

Model	C1	C2	C3	L1
RSOE-0505S/H2	22µF/50V MLCC	22µF/50V MLCC	N/A	3µH choke
RSOE-2405S/H2				

**Component List Class A**

Model	C1	C2	C3	L1
RSOE-1205SZ/H2	22µF/50V MLCC	22µF/50V MLCC	150pF/3kV	3µH choke
RSOE-2405SZ/H2				



**Component List Class B**

Model	C1	C2	C3	CMC1
RSOE-0505S/H2	22µF/50V MLCC	22µF/50V MLCC	1000pF/3kV	0.45mH CMC
RSOE-2405S/H2				

**Component List Class B**

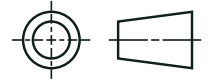
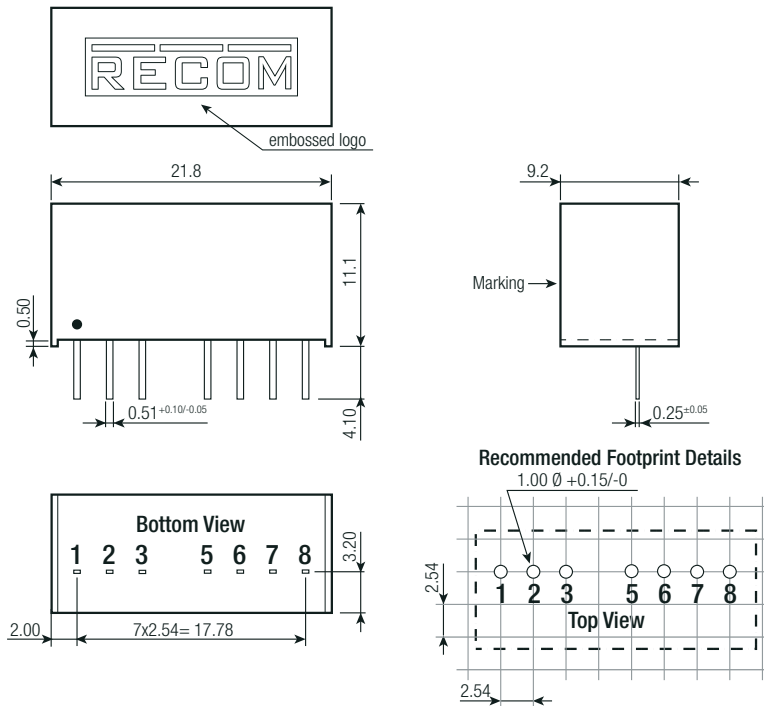
Model	C1	C2	C3	CMC1
RSOE-1205SZ/H2	22µF/50V MLCC	22µF/50V MLCC	1000pF/3kV	0.45mH CMC
RSOE-2405SZ/H2				

Specifications (measured @ Ta= 25°C, nominal Vin, full load unless otherwise specified)

**DIMENSION and PHYSICAL CHARACTERISTICS**

Parameter	Type	Value
Material	case potting PCB	non-conductive black plastic (UL94V-0) epoxy (UL94V-0) FR4 (UL94V-0)
Dimension (LxWxH)		21.8 x 9.2 x 11.1mm
Weight		4.7g typ.

**Dimension Drawing (mm)**



**Pinning Information**

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

NC= no connection  
Tolerance: xx.x= ±0.5mm  
xx.xx= ±0.25mm

**PACKAGING INFORMATION**

Packaging Dimension (LxWxH)	tube	520.0 x 11.2 x 18.2mm
Packaging Quantity		22pcs
Storage Temperature Range		-55°C to +125°C
Storage Humidity	non-condensing	5% - 95% RH max.

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