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Features

- 4:1 wide input voltage range
- Compact size 1“x1“ package
- Efficiency up to 90%
- Wide operating temperature from -40°C to +75°C without derating
- Continuous short circuit protection

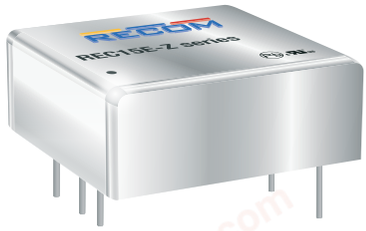
Regulated Converters

RECOM
DC/DC Converter

REC15E-Z

15 Watt 1“ x 1“ Single and Dual Output

YEAR 3 warranty



E224736

UL62368-1 certified
CAN/CSA-C22.2 No. 62368-1-14 certified
UL60950-1 certified
CAN/CSA-C22.2 No. 60950-1-0 certified
IEC/EN62368-1 certified
EN55032 compliant
EN55024 compliant
CB report

Description

The REC15E-Z series are 4:1 wide input voltage range 15W power DC/DC converters in a 1”x1” case. Despite their low cost, the converters are fully specified devices with output currents up to 4 Amps, no minimum load, 1.6kVDC isolation, high efficiency and low ripple/noise figures. The inputs are protected against transients of up to 100V and feature UVLO to allow the primary supply to start up safely. The single or dual outputs are continuously protected against short circuits and overload and can drive high capacitive loads. The REC15E-Z series will find many uses in cost sensitive applications where board space is at a premium.

Selection Guide

Part Number	nom. Input Voltage Range [VDC]	Output Voltage [VDC]	Output Current [mA]	Efficiency typ. (1) [%]	max. Capacitive Load (2) [µF]
REC15E-243.3SZ (3)	9 - 36	3.3	4000	85	12000
REC15E-2405SZ (3)	9 - 36	5	3000	88	6400
REC15E-2412SZ (3)	9 - 36	12	1250	88.5	1200
REC15E-2415SZ (3)	9 - 36	15	1000	89	900
REC15E-2424SZ (3)	9 - 36	24	625	89.5	240
REC15E-2412DZ (3)	9 - 36	±12	±625	87	±520
REC15E-2415DZ (3)	9 - 36	±15	±500	89	±330
REC15E-483.3SZ (3)	18 - 75	3.3	4000	85	12000
REC15E-4805SZ (3)	18 - 75	5	3000	88	6400
REC15E-4812SZ (3)	18 - 75	12	1250	89	1200
REC15E-4815SZ (3)	18 - 75	15	1000	89.5	900
REC15E-4824SZ (3)	18 - 75	24	625	90	240
REC15E-4812DZ (3)	18 - 75	±12	±625	89.5	±520
REC15E-4815DZ (3)	18 - 75	±15	±500	89.5	±330

Notes:

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

Model Numbering

REC15E-__ __ _ Z/X2

- nom. Input Voltage
- Output Voltage
- **S**ingle or **D**ual
- 4:1 Input
- Pinning (3)

Notes:

Note3: “/X2” is without ON/OFF CTRL and without Output Voltage Trimming
If the CTRL option is not chosen, pin3 (+ pin5 for single output) will be absent
Refer to ***„Dimension Drawing (mm)“***

Ordering Examples:

REC15E-2405SZ	9-36Vin, 5Vout, Single output, 4:1 input
REC15E-4812DZ	18-75Vin, ±12Vout, Dual output, 4:1 input
REC15E-2412SZ/X2	9-36Vin, 12Vout, Single output, 4:1 input, without ON/OFF CTRL and without Output Voltage Trimming

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DC/DC Converter

REC15E-Z Series

Specifications (measured @ Ta= 25°C, nom. Vin, full load and after warm-up unless otherwise stated)

BASIC CHARACTERISTICS

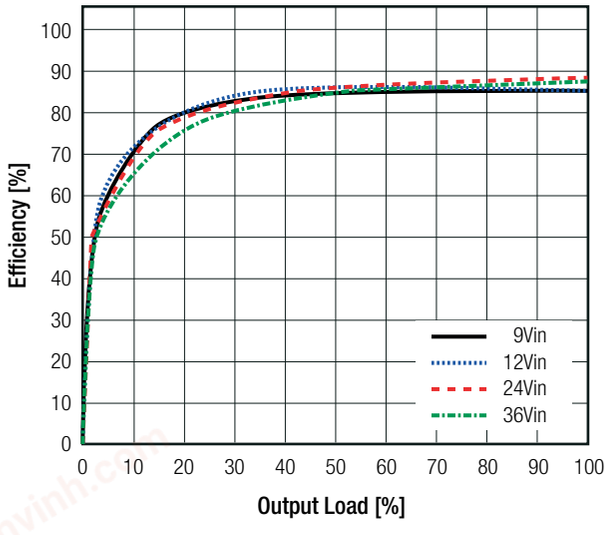
Parameter	Condition		Min.	Typ.	Max.
Internal Input Filter					Pi type
Input Voltage Range	nom. Vin= 24VDC nom. Vin= 48VDC		9VDC 18VDC	24VDC 48VDC	36VDC 75VDC
Input Surge Voltage	100ms max.	nom. Vin= 24VDC nom. Vin= 48VDC			50VDC 100VDC
Under Voltage Lockout (UVLO)	nom. Vin= 24VDC	DC-DC ON DC-DC OFF		7.5VDC	9VDC
	nom. Vin= 48VDC	DC-DC ON DC-DC OFF		16VDC	18VDC
Input Current	nom. Vin= 24VDC nom. Vin= 48VDC			700mA 350mA	
Quiescent Current	nom. Vin= 24VDC nom. Vin= 48VDC				7mA 5mA
Output Voltage Trimming	refer to ***„OUTPUT TRIM“***				±10%
Minimum Load			0%		
Start-up Time				20ms	25ms
ON/OFF CTRL	DC-DC ON DC-DC OFF				Open or 3.5V_{CTRL} - 15VDC Short or 0V_{CTRL} - 1.2VDC
Standby Current	DC-DC OFF			2mA	
Internal Operating Frequency				350kHz	
Output Ripple and Noise (4)	20MHz BW	nom. Vin= 24VDC nom. Vin= 48VDC			60mVp-p 100mVp-p

Notes:

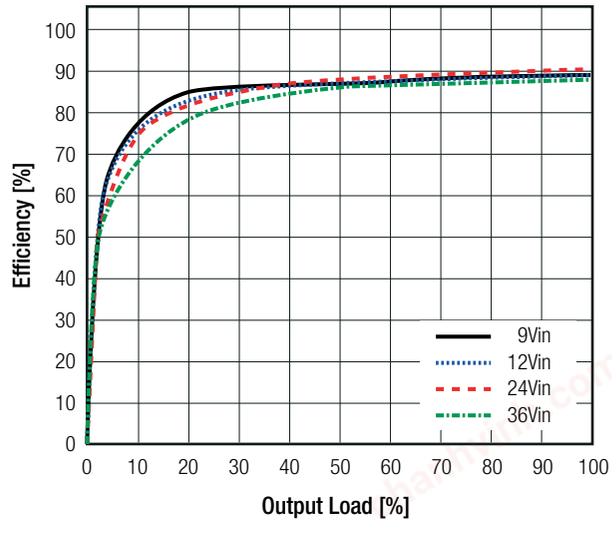
Note4: Measurements are made with a 1µF MLCC across output. (low ESR)

Efficiency vs. Load

REC15E-2405SZ



REC15E-2412SZ



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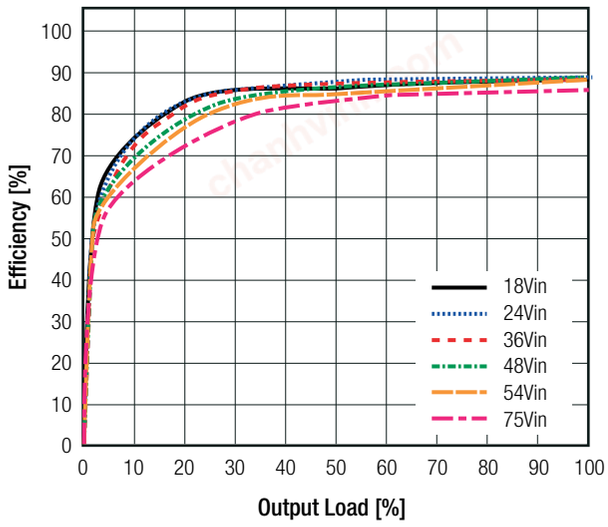
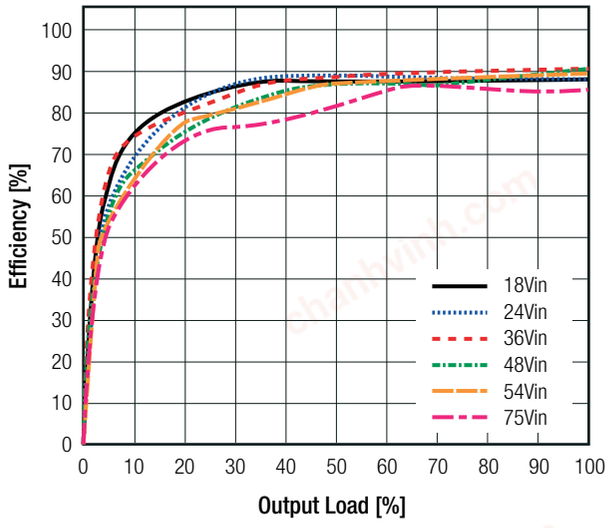
Specifications (measured @ Ta= 25°C, nom. Vin, full load and after warm-up unless otherwise stated)

Efficiency vs. Load

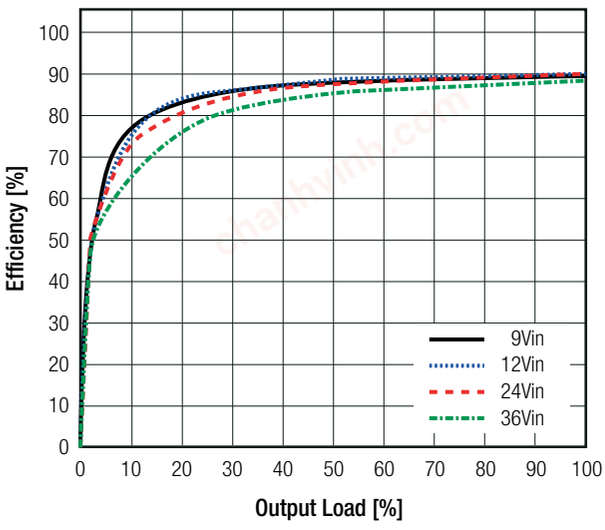
REC15E-4805SZ



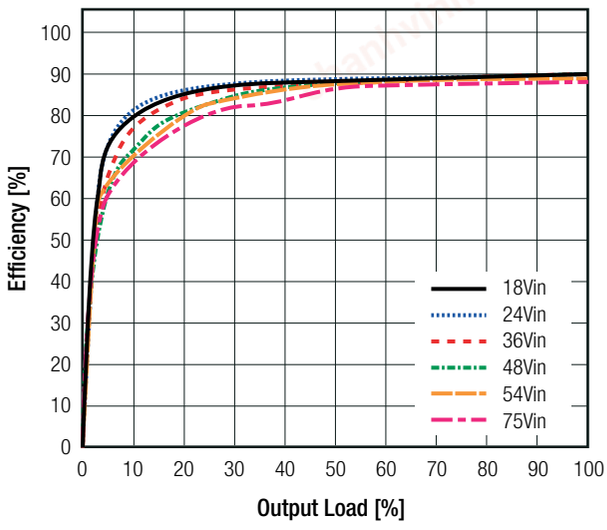
REC15E-4824SZ



REC15E-2415DZ



REC15E-4812DZ

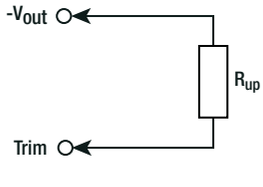


OUTPUT TRIM

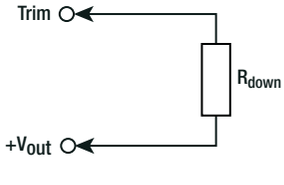
Output Voltage Trimming

It allows the user to increase or decrease the output voltage of the module. This is accomplished by connecting an external resistor between the Trim pin and either the +Vout or -Vout pins. With an external resistor between the -Vout and Trim pin, the output voltage increases. With an external resistor between the Trim and +Vout pin, the output voltage decreases. The values for trim resistors shown in trim tables below are according to standard E96 values; therefore, the specified voltage may slightly vary.

Trim up



Trim down



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DC/DC Converter

REC15E-Z Series

Specifications (measured @ Ta= 25°C, nom. Vin, full load and after warm-up unless otherwise stated)

$Vout_{nom}$ = nominal output voltage [VDC]
$Vout_{set}$ = trimmed output voltage [VDC]
V_{ref} = reference voltage [VDC]
R_{up} = trim up resistor [Ω]
R_{down} = trim down resistor [Ω]
R_1, R_2, R_3 = internal resistors [Ω]
k_u = trim up factor [ ]
k_d = trim down factor [ ]

$Vout_{nom}$	R_1	R_2	R_3	V_{ref}
3.3VDC	16k6Ω	10kΩ	52k3Ω	1.24VDC
5VDC	10kΩ		35k7Ω	2.5VDC
12VDC	38k1Ω		48k7Ω	
15VDC	50k1Ω		51kΩ	
24VDC	86k32Ω		73k2Ω	

Calculation:

$$k_u = \left[\frac{V_{ref}}{Vout_{set} - V_{ref}} \right] \times R_1 \qquad R_{up} = \left[\frac{k_u \times R_2}{R_2 - k_u} \right] - R_3$$

$$k_d = \left[\frac{Vout_{set} - V_{ref}}{V_{ref}} \right] \times R_2 \qquad R_{down} = \left[\frac{k_d \times R_1}{R_1 - k_d} \right] - R_3$$

Practical Example REC15-0505SZ trim up 10%

$$k_u = \left[\frac{2.5}{5.5 - 2.5} \right] \times 10k = \mathbf{8k33} \qquad R_{up} = \left[\frac{8k33 \times 10k}{10k - 8k33} \right] - 35K7 = \mathbf{14k2\Omega}$$

R_{up} according to E96 ≈ **14k3Ω**

Practical Example REC15-0505SZ trim down 10%

$$k_d = \left[\frac{4.5 - 2.5}{2.5} \right] \times 10k = \mathbf{8k} \qquad R_{down} = \left[\frac{8k \times 10k}{10k - 8k} \right] - 35k7 = \mathbf{4k3\Omega}$$

R_{down} according to E96 ≈ **4k32Ω**

REGULATIONS

Parameter	Condition		Value
Output Accuracy			±1.0% max.
Line Regulation	low line to high line, full load	Single Dual	±0.2% max. ±0.5% max.
Load Regulation (5)	10% to 100% load	Single Dual	0.5% max. 1.0% max.
Cross Regulation	dual output only		±5.0% max.

Notes:

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

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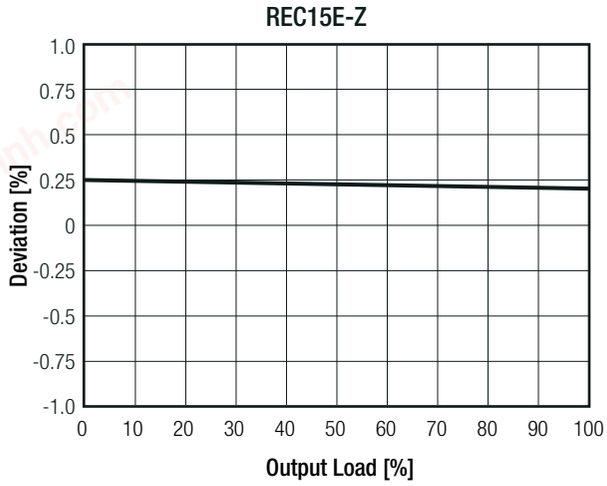
DC/DC Converter

REC15E-Z Series

Specifications (measured @ Ta= 25°C, nom. Vin, full load and after warm-up unless otherwise stated)

Deviation vs. Load



PROTECTIONS

Parameter	Type		Value
Short Circuit Protection (SCP)			continuous, automatic recovery
Over Current Protection (OCP)	nom. Vin= 24VDC nom. Vin= 48VDC		170%, hiccup mode 190%, hiccup mode
Isolation Capacitance			1200pF typ.
Isolation Voltage [6]	I/P to O/P	tested for 1 second tested for 1 minute	2kVDC 1.6kVDC
Isolation Resistance			1GΩ min.
Isolation Grade			functional

Notes:

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	Condition		Value
Operating Temperature Range [8]	full load @ free air convection refer to ***„Derating Graph“***		-40°C to +75°C -40°C to +105°C
Maximum Case Temperature			+110°C
Temperature Coefficient			± 0.02%/K
Thermal Impedance [8]	0.1m/s, horizontal		15.9K/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 +75°C	1400 x 10^3 hours 354 x 10^3 hours

Notes:

Note8: Test PCB:160x100mm105µm (Eurocard), double layer

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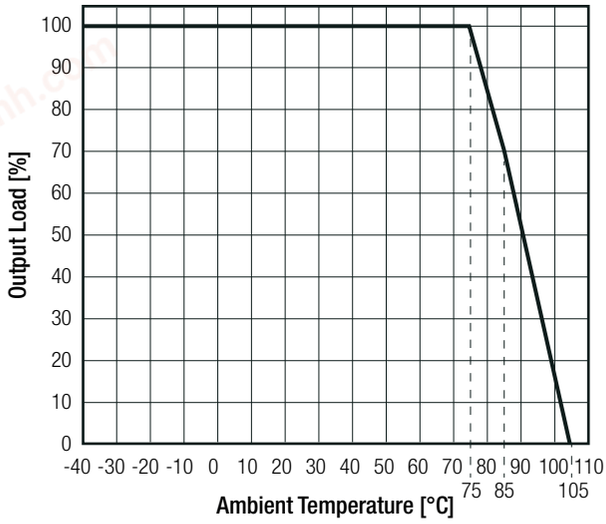
DC/DC Converter

REC15E-Z Series

Specifications (measured @ Ta= 25°C, nom. Vin, full load and after warm-up unless otherwise stated)

Derating Graph

(@ free air convection)



SAFETY AND CERTIFICATIONS		
Certificate Type (Safety)	**Report / File Number**	**Standard**
Audio/video, information and communication technology equipment - Safety requirements	E224736	UL62368-1, 2nd Edition, 2014 CAN/CSA -C22.2 No. 62368-1-14, 2nd Edition
Information Technology Equipment, General Requirements for Safety		UL60950-1, 2nd Edition, 2014 CAN/CSA C-22.2 No. 60950-1-07, 2nd Edition
Audio/video, information and communication technology equipment - Safety requirements (CB Scheme)	WD-ITAC-180737-A0	IEC62368-1:2014, 2nd Edition
Audio/video, information and communication technology equipment - Safety requirements		EN62368-1:2014 + A11:2017
RoHS2		RoHS 2011/65/EU + AM2015/863

EMC Compliance (pending)	Condition	Standard / Criterion
Electromagnetic compatibility of multimedia equipment - Emission requirements	without external filter refer to ***„EMC Filtering“***	EN55032:2015, Class B
ESD Electrostatic discharge immunity test	Contact: ±2, 4kV	IEC61000-4-2:2009, Criteria A
Radiated, radio-frequency, electromagnetic field immunity test (9)	3V/m	IEC61000-4-3:2006 + A2:2010, Criteria A
Fast Transient and Burst Immunity (9)	DC Power Port ±0.5, 1kV	IEC61000-4-4:2012, Criteria A
Surge Immunity (9)	DC Power Port ±0.5kV	IEC61000-4-5:2014 + A1:2017, Criteria A
Immunity to conducted disturbances, induced by radio-frequency fields (9)	DC Pwoer Port 3V DC Output Port 3V	IEC61000-4-6:2013 + C1:2015, Criteria A
Power Magnetic Field Immunity (9)	1A/m (50Hz)	IEC61000-4-8:2010, Criteria A

Notes:

Note9: Measurements are made with E-Cap 220uF/100V at input terminal

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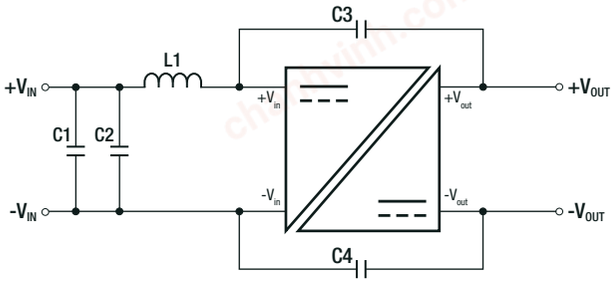
DC/DC Converter

REC15E-Z Series

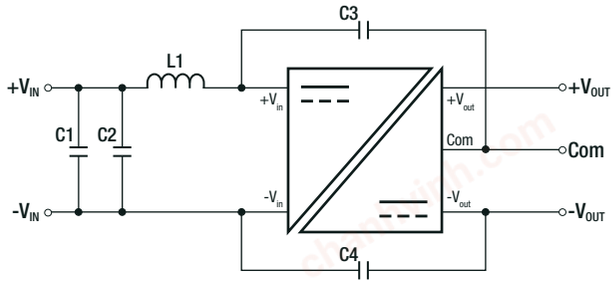
Specifications (measured @ Ta= 25°C, nom. Vin, full load and after warm-up unless otherwise stated)

EMC Filtering Suggestions according to EN55032 Class B

Single Output



Dual Output



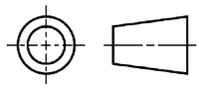
Component List Class B

MODEL	C1	C2	C3	C4	L1
REC15E-24xxS(D)Z	2.2µF/100V	2.2µF/100V	1500pF/2kV	1500pF/2kV	4.7µH
REC15E-48xxS(D)Z					

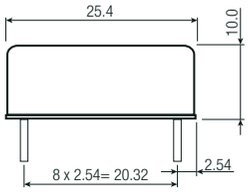
DIMENSION AND PHYSICAL CHARACTERISTICS

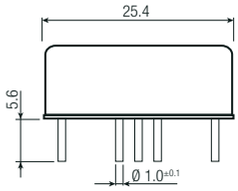
Parameter	Type	Value
Material	case potting PCB	nickel plated metal silicone, (UL94V-0 FR4, (UL94V-0
Dimension (LxWxH)		25.4 x 25.4 x 10.0mm
Weight		17g typ.

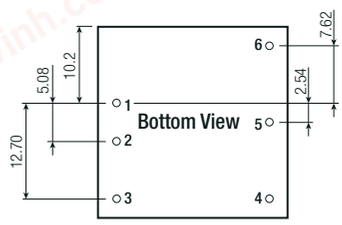
Dimension Drawing (mm)



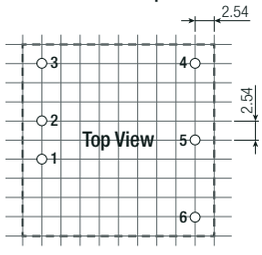








Recommended Footprint Details



Pinning information

Pin #	Single	Dual	Single/X2	Dual/X2
1	+Vin	+Vin	+Vin	+Vin
2	-Vin	-Vin	-Vin	-Vin
3	CTRL	CTRL	no pin	no pin
4	-Vout	-Vout	-Vout	-Vout
5	Trim	Com	no pin	Com
6	+Vout	+Vout	+Vout	+Vout

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

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Specifications (measured @ Ta= 25°C, nom. Vin, full load and after warm-up unless otherwise stated)

PACKAGING INFORMATION		
Parameter	**Type**	**Value**
Packaging Dimension (LxWxH)	tube	260.0 x 28.5 x 20.8mm
Packaging Quantity		8pcs
Storage Temperature Range		-55°C to +125°C
Storage Humidity		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.