

# Features

## Regulated Converters

- 6-Side Shielding
- External ON/OFF control
- 1.6kVDC Isolation
- UL/CSA/EN-60950-1 Certified
- Wide 4:1 Input Voltage Range
- Continuous Short Circuit Protection
- Efficiency up to 91%
- Fixed Switching Frequency

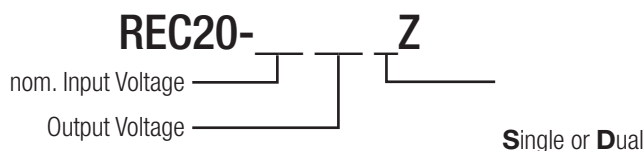
### Description

The REC20-xxxxS\_DZ -series offer single and dual regulated outputs in a 2"x1" package with 1.6kVDC isolation and are suitable for higher power industrial applications. Remote on/off control is standard. The higher current outputs have raised output voltages to compensate for track losses as standard. The converter is fully certified to UL/EN/IEC safety standards.

### Selection Guide

Part Number	Input Voltage Range [VDC]	Output Voltage [VDC]	Output Current [mA]	Efficiency typ. [%]	max. Capacitive Load [ $\mu$ F]
REC20-243.4SZ	9-36	3.4	5000	88	13000
REC20-245.1SZ	9-36	5.1	4000	90	9600
REC20-2412SZ	9-36	12	1667	89.5	1650
REC20-2415SZ	9-36	15	1333	90	1050
REC20-2405DZ	9-36	$\pm$ 5	$\pm$ 2000	87	$\pm$ 4800
REC20-2412DZ	9-36	$\pm$ 12	$\pm$ 834	89	$\pm$ 625
REC20-2415DZ	9-36	$\pm$ 15	$\pm$ 667	89	$\pm$ 525
REC20-483.4SZ	18-75	3.4	5000	88	13000
REC20-485.1SZ	18-75	5.1	4000	90	9600
REC20-4812SZ	18-75	12	1667	89.5	1650
REC20-4815SZ	18-75	15	1333	90.5	1050
REC20-4805DZ	18-75	$\pm$ 5	$\pm$ 2000	87	$\pm$ 4800
REC20-4812DZ	18-75	$\pm$ 12	$\pm$ 835	90	$\pm$ 625
REC20-4815DZ	18-75	$\pm$ 15	$\pm$ 667	91	$\pm$ 525

### Model Numbering



#### Ordering Examples:

REC20-4812SZ, Single Output, 18-75Vin (4:1) and 12Vout  
 REC20-2412DZ, Dual Output, 9-36Vin (4:1) and  $\pm$ 12Vout

# RECOM

## DC/DC Converter

### REC20-Z

20 Watt

2" x 1"

Single and Dual Output



IEC/EN60950-1 Certified  
 UL60950 Certified  
 CSA C22.2 NO. 60950 Certified  
 EN55022 Certified

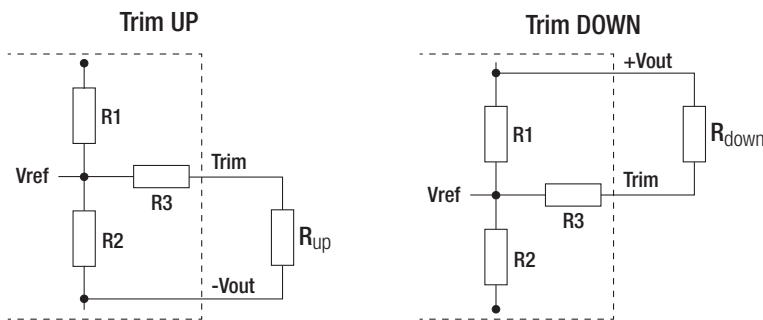
**Specifications** (measured @  $t_a = 25^\circ\text{C}$ , nominal input voltage, full load and after warm up unless otherwise specified)

BASIC CHARACTERISTICS					
Parameter	Condition		Min.	Typ.	Max.
Input Voltage Range	nom. Vin= 24V nom. Vin= 48V		9VDC 18VDC		36VDC 75VDC
Start/up Time				10ms	
Under Voltage Lockout (UVLO)	nom. Vin= 24V	DC-DC ON DC-DC OFF		9VDC 7.5VDC	
	nom. Vin= 48V	DC-DC ON DC-DC OFF		18VDC 16VDC	
Output Voltage Trimming	see calculation below				$\pm 10\%$
CTRL ON/OFF	DC-DC ON DC-DC OFF				Open or $2.5\text{V} < V_r < 12\text{V}$ Short or $0\text{V} < V_r < 1.2\text{V}$
Internal Operating Frequency				300kHz	
Minimum Load			0%		
Output Ripple and Noise <sup>(1)</sup>					100mVp-p

**Notes:**

Note1: Ripple and Noise is measured with a 20MHz bandwidth and a 0.1µF ceramic capacitor.

**Output Voltage Trimming**



Vout	3.4V	5.1V	12V	15V
R1	4.71 kΩ	2.3 kΩ	19.43 kΩ	25.6 kΩ
R2	2.7 kΩ	2.2 kΩ	5.1 kΩ	
R3	15 kΩ	9.1 kΩ	36 kΩ	
Vref	1.24 V		2.5 V	

**Trim Calculation**

$V_{out}$  = nom. output voltage

$\Delta V_{out}$  = output voltage trim

$R_{up}$  = trim up resistor

$R_{down}$  = trim down resistor

a = trim up factor

b = trim down factor

$$\Delta V_{out} = V_{out} - V_{out_{trimmed}}$$

$$R_{up} = \left[ \frac{a \cdot R_2}{R_2 - a} \right] - R_3 = \text{k}\Omega$$

$$R_{down} = \left[ \frac{b \cdot R_1}{R_1 - b} \right] - R_3 = \text{k}\Omega$$

$$a = \left[ \frac{V_{ref}}{(V_{out} + \Delta V_{out}) - V_{ref}} \right] \cdot R_1 = \text{k}\Omega$$

$$b = \left[ \frac{(V_{out} + \Delta V_{out}) - V_{ref}}{V_{ref}} \right] \cdot R_2 = \text{k}\Omega$$

**Trim Up:**

$V_{out} = 5.1\text{V}$ ,  $\Delta V_{out} = 0.51\text{V}$  (10%),  $V_{ref} = 2.5\text{V}$

$$a = \left[ \frac{2.5\text{V}}{(5.1\text{V} + 0.51\text{V}) - 2.5\text{V}} \right] \cdot 2.3\text{k}\Omega = \mathbf{1.843\text{k}\Omega}$$

$$R_{up} = \left[ \frac{1.843\text{k}\Omega \cdot 2.2\text{k}\Omega}{2.2\text{k}\Omega - 1.843\text{k}\Omega} \right] - 9.1\text{k}\Omega = \mathbf{2.255\text{k}\Omega}$$

**Trim down:**

$V_{out} = 5.1\text{V}$ ,  $\Delta V_{out} = -0.51\text{V}$  (-10%),  $V_{ref} = 2.5\text{V}$

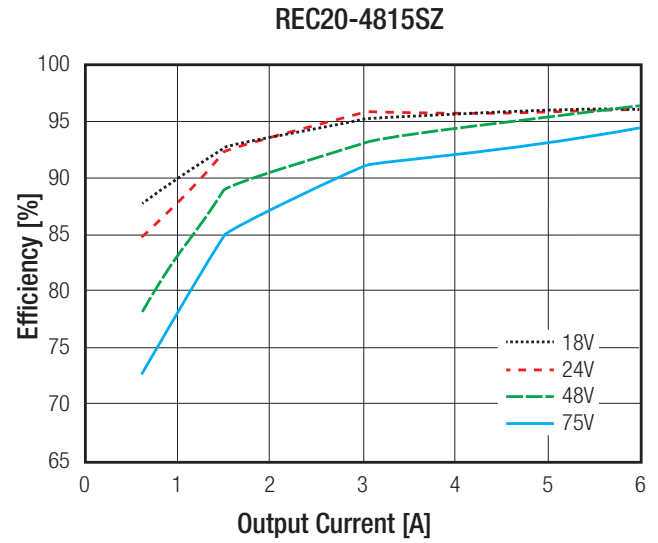
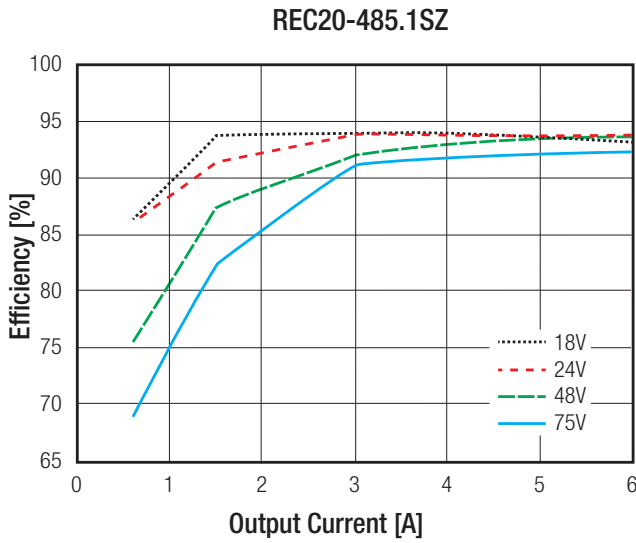
$$b = \left[ \frac{[5.1\text{V} + (-0.51\text{V})] - 2.5\text{V}}{2.5\text{V}} \right] \cdot 2.2\text{k}\Omega = \mathbf{1.839\text{k}\Omega}$$

$$R_{down} = \left[ \frac{1.839\text{k}\Omega \cdot 2.3\text{k}\Omega}{2.3\text{k}\Omega - 1.839\text{k}\Omega} \right] - 9.1\text{k}\Omega = \mathbf{0.080\text{k}\Omega}$$

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**Specifications** (measured @  $t_a = 25^\circ\text{C}$ , nominal input voltage, full load and after warm up unless otherwise specified)

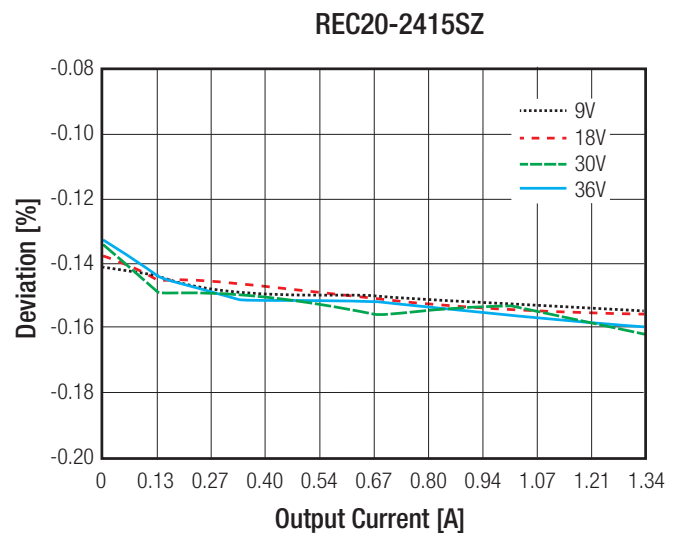
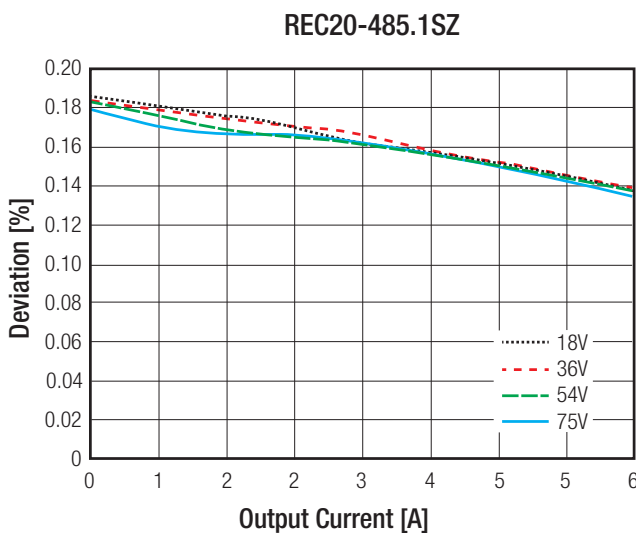
**Efficiency vs. Load**



**REGULATIONS**

Parameter	Condition	Type	Values
Output Accuracy			$\pm 1.0\%$ max.
Line Regulation	low line to high line, full load		$\pm 0.2\%$ max.
Load Regulation	0% to 100% load	single output	$\pm 0.5\%$ max.
		dual output	$\pm 1.0\%$ max.
Cross Regulation	25% to 100% load	dual output	$\pm 5.0\%$ max.
Transient Response Recovery Time	25% load step change		250 $\mu\text{s}$ typ.

**Deviation vs. Load**



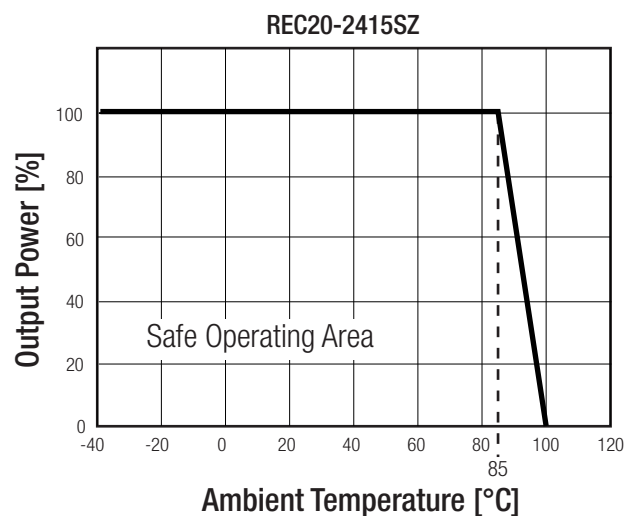
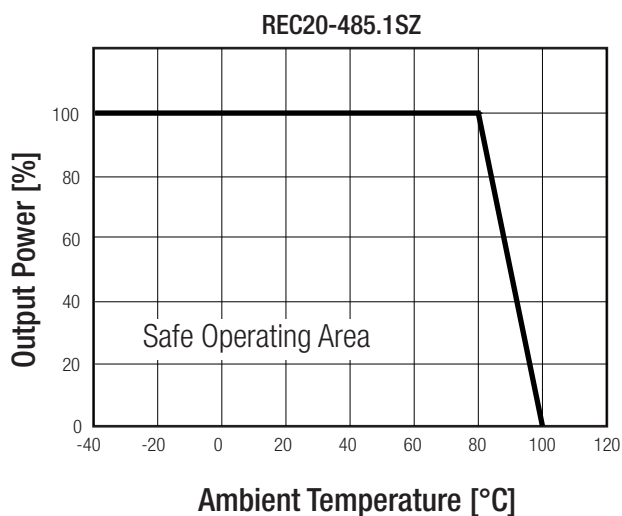
**Specifications** (measured @  $t_a = 25^\circ\text{C}$ , nominal input voltage, full load and after warm up unless otherwise specified)

PROTECTIONS			
Parameter	Condition		Value
Short Circuit Protection (SCP)	below $100\text{m}\Omega$		continuous, automatic recovery
Over Voltage Protection (OVP)	Zener Diode Clamp	$3.4V_{out}$	$4.5\text{VDC}$ typ.
		$5.1V_{out}$	$7\text{VDC}$ typ.
		$12V_{out}$	$16\text{VDC}$ typ.
		$15V_{out}$	$20\text{VDC}$ typ.
Over Load Protection (OLP)			$180\%$ typ.
Isolation Voltage	I/P to O/P	tested for 1 minute	$1.6\text{kVDC}$
Isolation Capacitance			$1200\text{pF}$ typ.
Isolation Resistance			$1\text{G}\Omega$ min.

ENVIRONMENTAL			
Parameter	Condition		Value
Operating Temperature Range	with derating (see graph)		$-40^\circ\text{C}$ to $+100^\circ\text{C}$
Maximum Case Temperature			$+105^\circ\text{C}$
Temperature Coefficient			$0.02\%/^\circ\text{C}$ typ.
Thermal Impedance	natural convection ( $0.1\text{m/s}$ )		$12^\circ\text{C/W}$
Operating Altitude			$5000\text{m}$
Operating Humidity	non-condensing		$5\% - 95\%$ RH max.
Vibration			MIL-STD-202G
MTBF	according to MIL-HDBK-217F G.B., $+25^\circ\text{C}$ , referring to REC20-485.1SZ		$1098 \times 10^3$ hours

**Derating Graph**

@ nominal input voltage, full load and natural convection ( $0.1\text{m/s}$ )



**Notes:**

Note2: For more details, please contact our technical support service at [techsupportAT@recom-power.com](mailto:techsupportAT@recom-power.com)

**Specifications** (measured @  $t_a = 25^\circ\text{C}$ , nominal input voltage, full load and after warm up unless otherwise specified)

### SAFETY AND CERTIFICATIONS

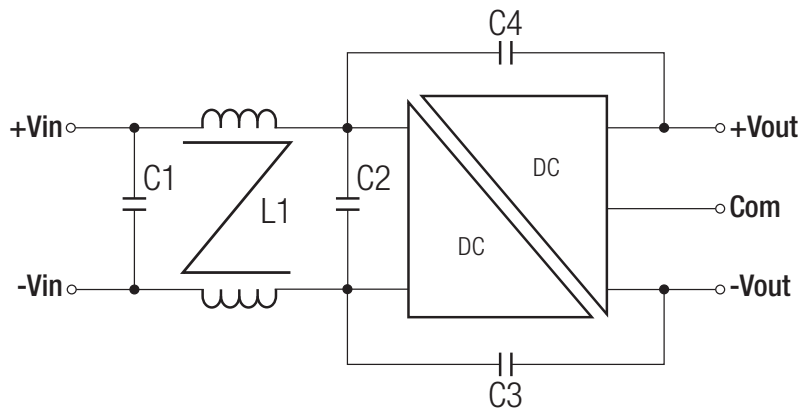
Certificate Type	Report / File Number	Standard
CB General Safety	E224736	IEC60950-1, 2nd Edition, 2013
UL General Safety		UL60950-1, 2nd Edition, 2014
EN General Safety		EN60950-1, 2nd Edition, 2013
CAN/CSA General Safety		C22.2 No. 60950-1-07, 2014

EMC Compliance	Condition	Standard / Criterion
EMI	without external filter	EN55022, Class A
	with external filter (see filter suggestions)	EN55022, Class B
ESD	Air: $\pm 8\text{kV}$ ; Contact: $\pm 4\text{kV}$	EN61000-4-2, Criteria B
Radiated Immunity	10V/m	EN61000-4-3, Criteria A
Fast Transient	$\pm 1\text{kV}$	EN61000-4-4, Criteria B
Surge <sup>(3)</sup>	$\pm 1\text{kV}$	EN61000-4-5, Criteria A
Conducted Immunity	10Vr.m.s	EN61000-4-6, Criteria A
Power Magnetic Field	50Hz 1A/m (r.m.s)	EN61000-4-8, Criteria A

**Notes:**

Note3: An external MOV is required if the module has to meet EN61000-4-5. The MOV suggest: NichTek SVI32-380

### EMC Filtering - Suggestions for Class B



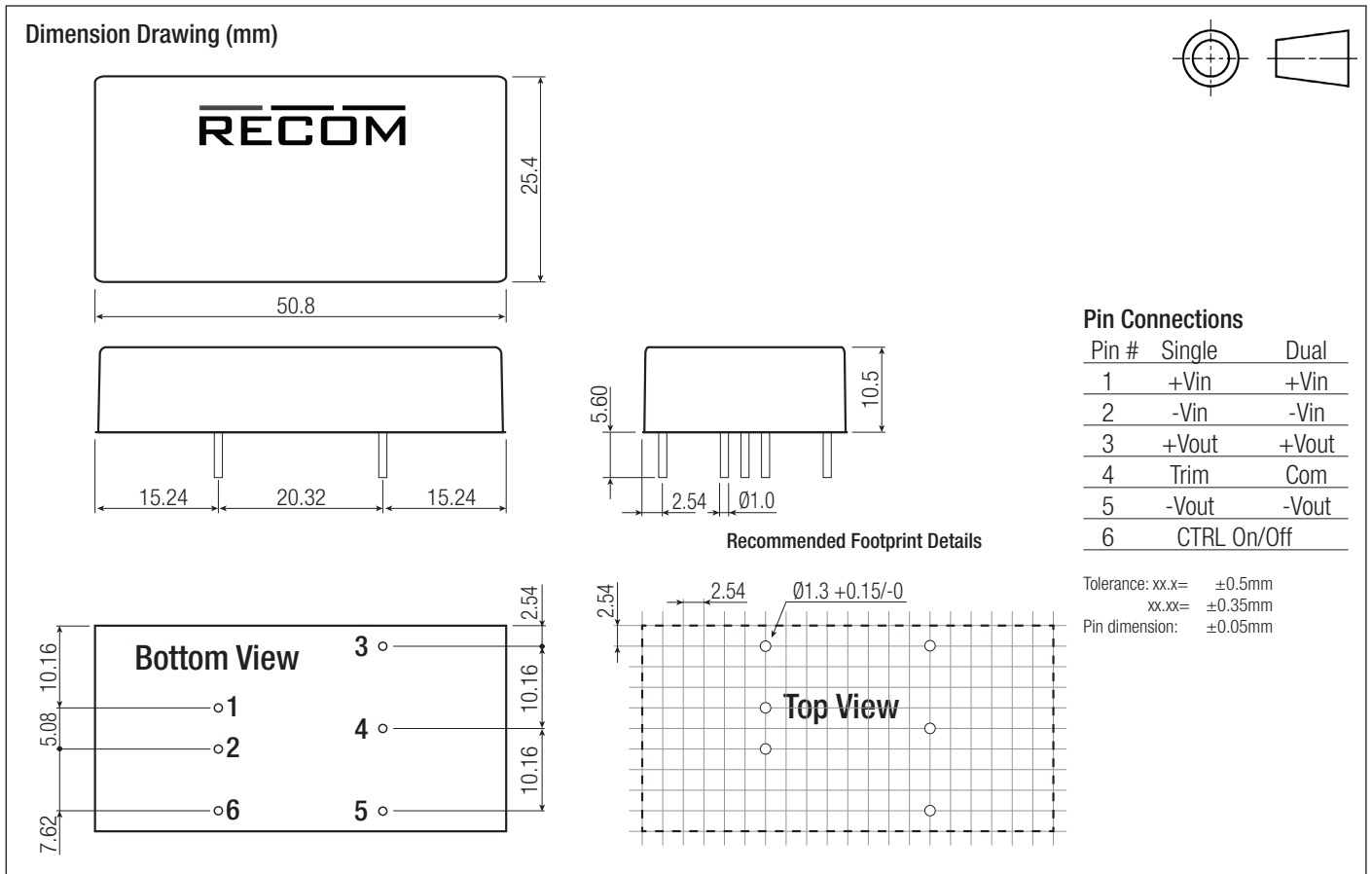
MODEL	C1	C2	L1	C3	C4
REC20-24xxS(D)Z	4.7 $\mu\text{F}$ /50V	4.7 $\mu\text{F}$ /50V	1.5mH CMC	1000pF/2kV	1000pF/2kV
REC20-48xxS(D)Z	2.2 $\mu\text{F}$ /100V	2.2 $\mu\text{F}$ /100V	2.0mH CMC	1000pF/2kV	1000pF/2kV

### DIMENSION and PHYSICAL CHARACTERISTICS

Parameter	Type	Value
Material	Case	nickel plated copper
	Base	non conductive black plastic
	PCB	FR4
	Potting	silicone (UL94 V-0)
Package Dimension (LxWxH)		50.8 x 25.4 x 10.2mm
Package Weight		27g typ.

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**Specifications** (measured @  $t_a = 25^\circ\text{C}$ , nominal input voltage, full load and after warm up unless otherwise specified)



<b>PACKAGING INFORMATION</b>		
Packaging Dimension (LxWxH)	Tube	520.0 x 54.5 x 21.0mm
Packaging Quantity		18pcs
Storage Temperature Range		-55°C to +125°C