

# Features dimmable LED Driver

- Low cost buck LED driver
- 6-60V input
- Constant current output (350, 700 or 1050mA)
- Digital PWM and analog voltage dimming
- High efficiency up to 97%
- No internal E-Caps
- RoHS2 conform

## RCDE-48

# Constant Current Buck LED Driver



### Description

The RCDE-48 series is a step-down constant current source designed for driving high power LED applications from 12V, 24V or 48V nominal input voltages. 350, 700 or 1050mA output currents are available as standard. The input voltage range is from 6V up to 60VDC with UVLO. These high efficiency buck drivers have digital PWM and/or analog voltage dimming control which is capable of being controlled by 3.3V logic. The dimming input can also be used as an CTRL pin. Typical application is a 48V powered lighting solution for up to 15 high brightness LEDs in series.

### Selection Guide

Part Number	Input Voltage Range [VDC]	Output Voltage Range [VDC]	Output Current [mA]	Efficiency typ. <sup>(1)</sup> [%]	Dimming Control
RCDE-48-0.35	6-60	3-52	0-350	97	Analog and PWM
RCDE-48-0.70	6-60	3-52	0-700	97	Analog and PWM
RCDE-48-1.05	6-60	3-52	0-1050	97	Analog and PWM

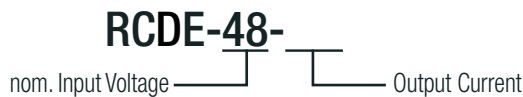
All LED Drivers may not be used without a load. They must be switched on the primary side only. Noncompliance may damage the LED or reduce its lifetime.



### Notes:

Note1: Efficiency is tested at nominal input and 15 LEDs (15 x  $V_f$  3VDC = 45VDC) at +25°C ambient

### Model Numbering



### Ordering Examples

RCDE-48-0.70    6-60 Vin    3-52Vout    0-700mA    Analog and PWM Dimming

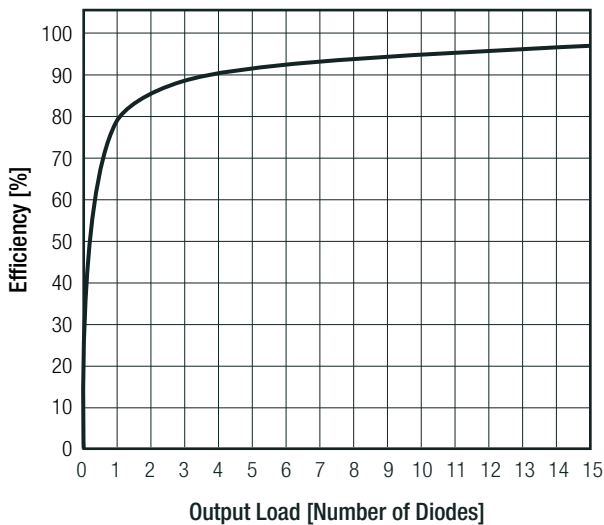
Specifications (measured @ Ta= 25°C, nom. Vin and 15 LEDs (15\*3V=45V) unless otherwise stated)

**BASIC CHARACTERISTICS**

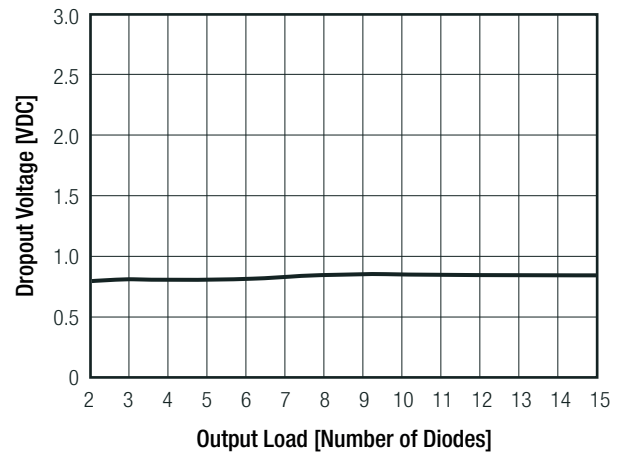
Parameter	Condition		Min.	Typ.	Max.
Internal Input Filter			capacitor		
Input Voltage Range	nom Vin= 48VDC		6VDC	48VDC	60VDC
Under Voltage Lockout (UVLO)	nom. Vin= 48VDC	DC-DC ON DC-DC OFF			5.6VDC 5.3VDC
Standby Current	nom. Vin= 48VDC	DC-DC OFF		5mA	
Internal Operating Frequency			210kHz		550kHz
Output Ripple Current	20MHz BW	RCDE-48-0.35 RCDE-48-0.70 RCDE-48-1.05		100mA <sub>p-p</sub> 200mA <sub>p-p</sub> 320mA <sub>p-p</sub>	
Output Ripple Noise	20MHz BW	RCDE-48-0.35 RCDE-48-0.70 RCDE-48-1.05		200mV <sub>p-p</sub> 300mV <sub>p-p</sub> 400mV <sub>p-p</sub>	
Reflected Back Ripple Current				50mA <sub>p-p</sub>	
Dropout Voltage	refer to "DROPOUT VOLTAGE" for detailed information	RCDE-48-0.35 RCDE-48-0.70 RCDE-48-1.05		1VDC 1.5VDC 2VDC	3VDC

**RCDE-48-0.35**

Efficiency vs. Load

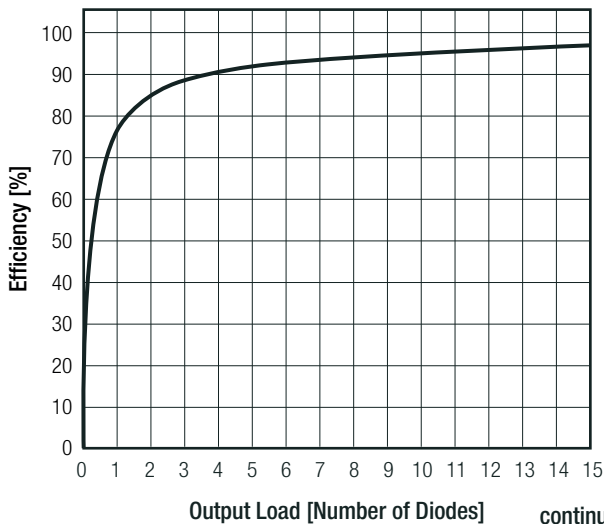


Dropout Voltage vs. Load

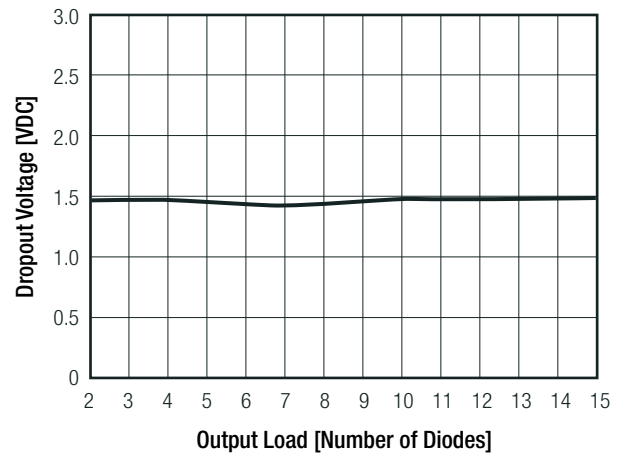


**RCDE-48-0.70**

Efficiency vs. Load



Dropout Voltage vs. Load

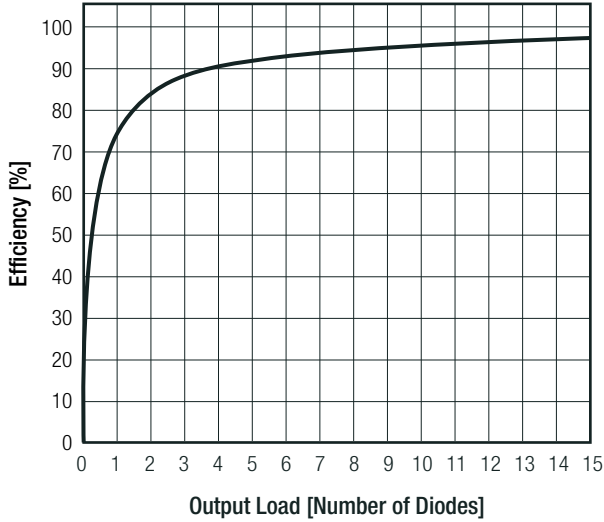


Output Load [Number of Diodes] continued on next page

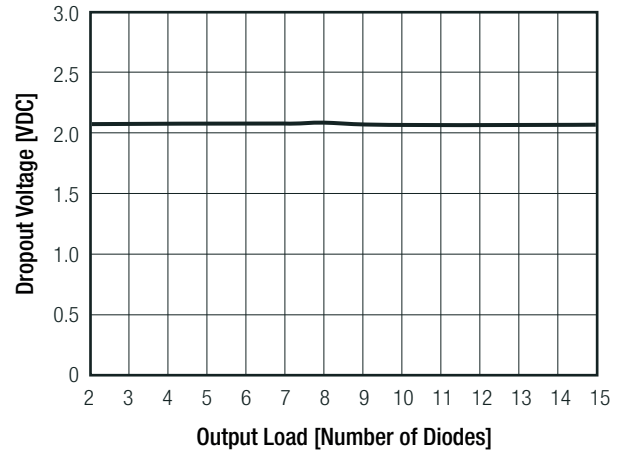
Specifications (measured @ Ta= 25°C, nom. Vin and 15 LEDs (15\*3V=45V) unless otherwise stated)

RCDE-48-1.05

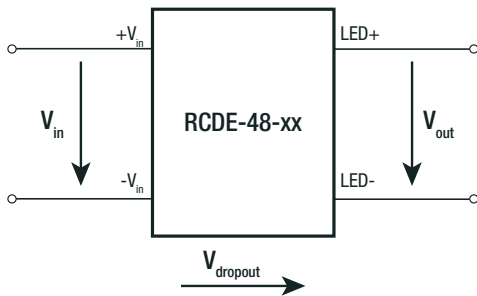
Efficiency vs. Load



Dropout Voltage vs. Load



**DROPOUT VOLTAGE**



Dropout voltage is the smallest difference between a regulators input and its output voltage, which is required to maintain regulation and enable the regulator to provide rated output voltage or current.

- $V_{in}$  = input voltage
- $V_{out}$  = output voltage
- $V_{dropout}$  = dropout voltage
- $n_{LED}$  = number of LEDs
- $V_{F max.}$  = forward voltage

**Example:**

- $V_{dropout} = 3VDC \text{ max.}$
- $n_{LED} = 11 \text{ LEDs}$
- $V_{F max.} = 3VDC$

$$V_{out max.} = V_{in} - V_{dropout}$$

$$V_{in min.} = 11 \times 3 + 3$$

$$V_{in min.} = n_{LED} \times V_{F max.} + V_{dropout}$$

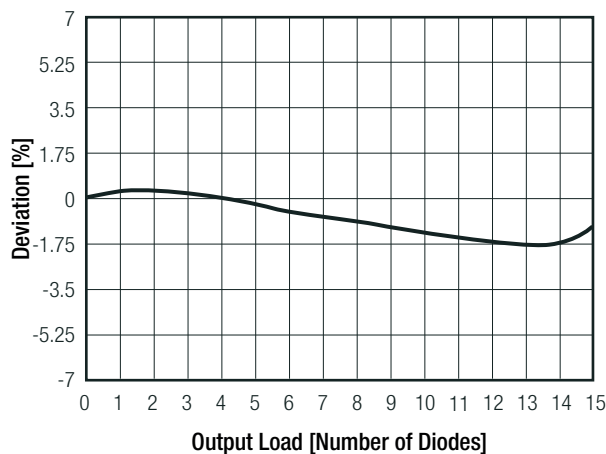
$$V_{in min.} = \underline{\underline{36VDC}}$$

**REGULATIONS**

Parameter	Condition	Value
Output Current Accuracy		±7.0% max.
Output Current Stability		±2.0% typ.

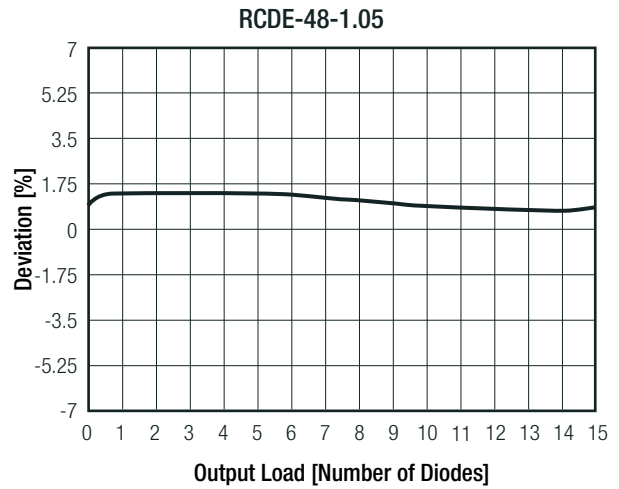
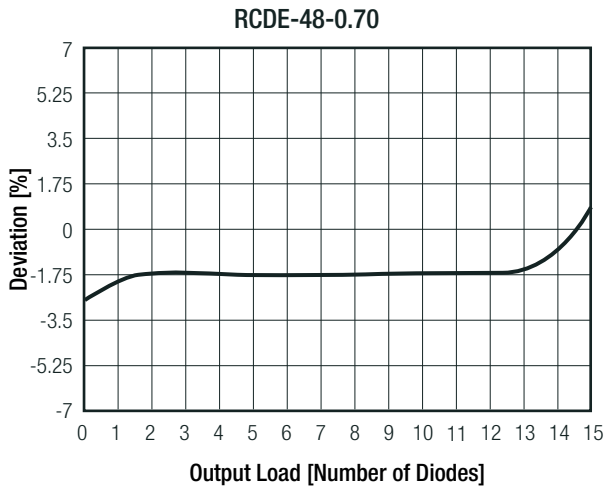
Deviation vs. Load

RCDE-48-0.35



**Specifications** (measured @ Ta= 25°C, nom. Vin and 15 LEDs (15\*3V=45V) unless otherwise stated)

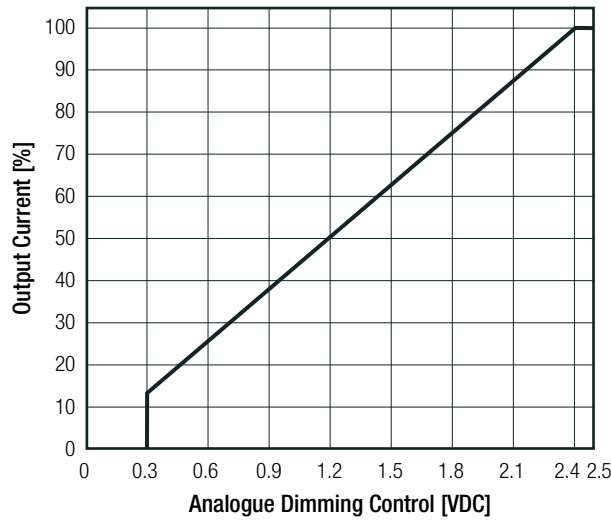
**Deviation vs. Load**



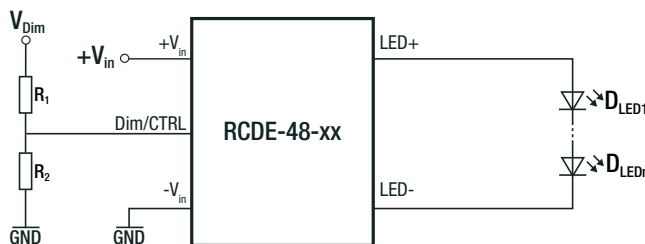
**ANALOG DIMMING CONTROL** (leave open if not used - do not tie to +Vin)

Parameter	Condition	Value
Input Voltage Limits	low line, DC-DC OFF high line, DC-DC ON	0VDC to 0.3VDC 3VDC to 12VDC
Control Voltage Range	20% to 100%	0.3VDC to 2.5VDC
Pin Drive Current	Analog	Vc= 5VDC 1mA max.

**Analog Dimming**



**Analog Dimming Application 1-10VDC**



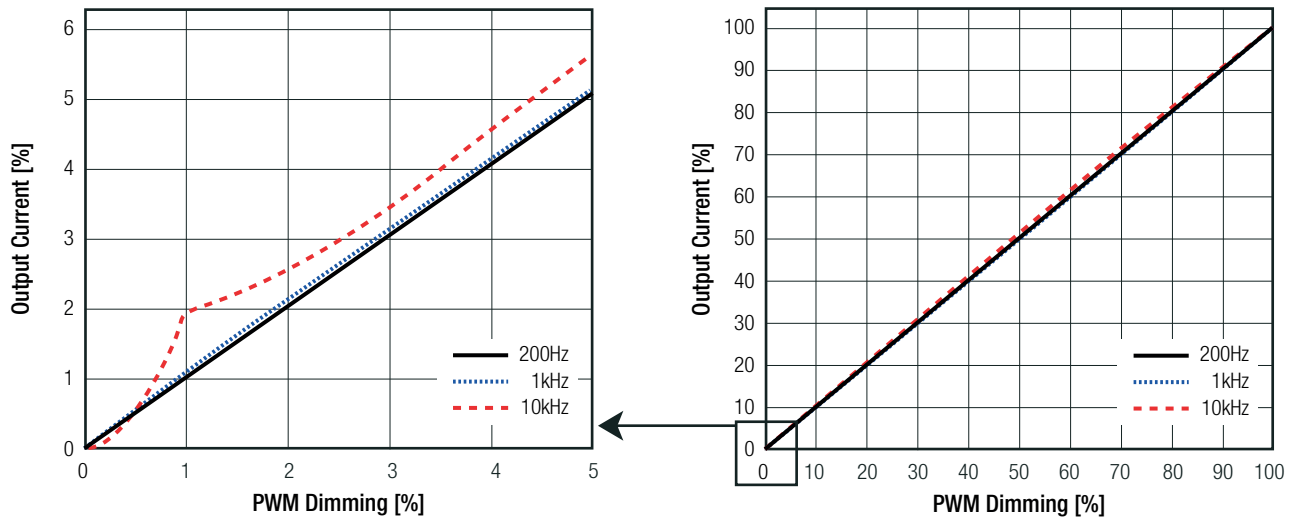
V <sub>Dim</sub>	R <sub>1</sub>	R <sub>2</sub>
1 - 10VDC	20kΩ	10kΩ

**Specifications** (measured @ Ta= 25°C, nom. Vin and 15 LEDs (15\*3V=45V) unless otherwise stated)

**PWM DIMMING AND ON/OFF CTRL** (leave open if not used - do not tie to +Vin)

Parameter	Condition		Value
Input Voltage Limits	low line, DC-DC OFF high line, DC-DC ON		0VDC to 0.3VDC 3VDC to 12VDC
Dimming Voltage Range	0% to 100%		0% - 100%, duty cycle
Pin Drive Current	ON/OFF CTRL	Vc= 5VDC	1mA max.
PWM Frequency	for linear operation frequency limit		200Hz - 1kHz 10kHz max.

**PWM Dimming**



**PROTECTIONS**

Parameter	Type	Value
Over Temperature Protection (OTP)	case temperature	115°C typ., ±10°C

**ENVIRONMENTAL**

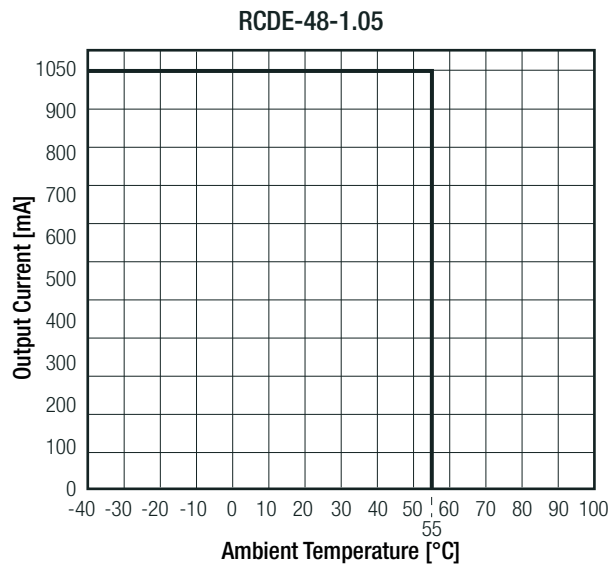
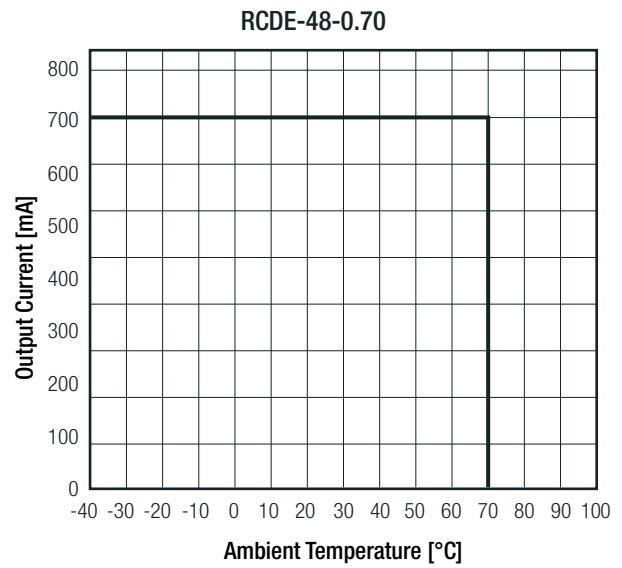
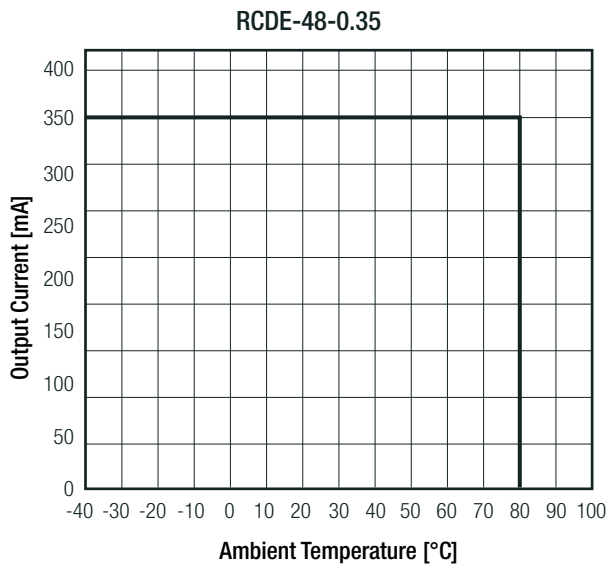
Parameter	Condition		Value
Operating Temperature Range	@ natural convection 0.1m/s		refer to "Derating Graph"
Maximum Case Temperature			105°C
Temperature Coefficient			0.06%/K typ.
Thermal Impedance			32K/W
Operating Altitude			5000m
Operating Humidity	non-condensing		95% RH
MTBF	according to MIL-HDBK-217F, G.B.	+25°C +40°C	1830 x 10 <sup>3</sup> hours 1730 x 10 <sup>3</sup> hours

continued on next page

Specifications (measured @ Ta= 25°C, nom. Vin and 15 LEDs (15\*3V=45V) unless otherwise stated)

**Derating Graph**

(@ Chamber and natural convection 0.1 m/s)



**SAFETY AND CERTIFICATIONS**

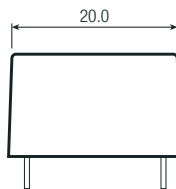
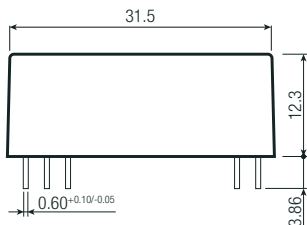
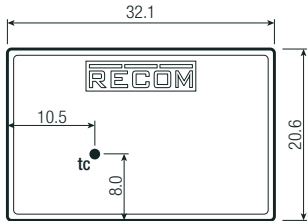
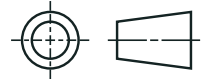
Certificate Type (Safety)	Report Number	Standard
RoHS2+		RoHS 2011/65/EU + AM2015/863
EMC Compliance	Condition	Standard / Criterion
Limits and Methods of Measurement of Radio Disturbance Characteristics of Electrical Lighting and Similar Equipment	with external filter	EN55015

Specifications (measured @ Ta= 25°C, nom. Vin and 15 LEDs (15\*3V=45V) unless otherwise stated)

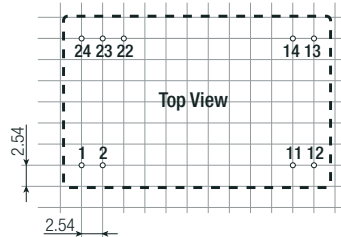
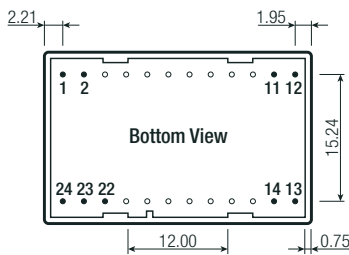
### DIMENSION AND PHYSICAL CHARACTERISTICS

Parameter	Type	Value
Material	case, baseplate potting PCB	non-conductive black plastic, (UL94 V-0) silicone, (UL94 V-0) FR4, (UL94 V-0)
Dimension (LxWxH)		32.1 x 20.6 x 12.3mm
Weight		16.0g typ.

#### Dimension Drawing (mm)



#### Recommended Footprint Details



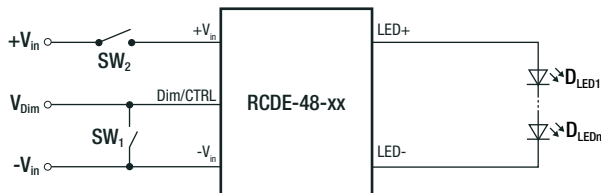
#### Pin Connections

#	Function	Description
1, 2	-Vin	-DC supply
11, 12	LED-	LED cathode connection
13, 14	LED+	LED anode connection
22	Dim/CTRL	leave open if not used
23, 24	+Vin	+DC supply

tc= case temperature measuring point  
Tolerance: xx.x= ±0.5mm  
xx.xx= ±0.25mm

### INSTALLATION AND APPLICATION

#### Connection



#### Notes:

Note2: Do not connect LED+ with +Vin and LED- with -Vin

### PACKAGING INFORMATION

Parameter	Type	Value
Packaging Dimension (LxWxH)	tube	512.9 x 22.2 x 20.9mm
Packaging Quantity		14pcs
Storage Temperature Range		-55°C to +125°C
Storage Humidity	non-condensing	95% RH max.

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