

## Features

### Regulated Converters

- Constant Current Output LED Driver
- Wide Input Voltage Range
- PWM/Digital Dimming and Analogue Voltage Dimming
- Short Circuit and Overtemp. Protected
- IP67 rated for /W Version
- 96% Efficiency

### Description

The RCD series is a step-down constant current source designed for driving high power white LEDs. Standard output currents available are 300mA, 350mA, 500mA, 600mA, 700mA, 1A and 1.2A to make this driver compatible with a wide range of LEDs from many different manufacturers without the need for any external components. Despite its compact size, the RCD series is fully featured with very high efficiency, wide input voltage range, high ambient operating temperature and two means of LED dimming: PWM/digital control and analogue voltage dimming. Both dimming controls are independent and can be combined. The driver is also designed to be as reliable as the LEDs it is driving, even at the full operating temperature. A wired version is also available (/W Option) which has been tested to meet IP67.

### Selection Guide

Part Number	Input Range (VDC)	Output Current (mA)	Output Voltage (V)	Dimming Control	Mounting Style
RCD-24-0.30**	4.5-36V	0-300	2-34	Digital + Analogue	PCB or Wired
RCD-24-0.35**	4.5-36V	0-350	2-34	Digital + Analogue	PCB or Wired
RCD-24-0.50**	4.5-36V	0-500	2-34	Digital + Analogue	PCB or Wired
RCD-24-0.60**	4.5-36V	0-600	2-34	Digital + Analogue	PCB or Wired
RCD-24-0.70**	4.5-36V	0-700	2-34	Digital + Analogue	PCB or Wired
RCD-24-1.00**	4.5-36V	0-1000	2-34	Digital + Analogue	PCB or Wired
RCD-24-1.20**	4.5-36V	0-1200	2-34	Digital + Analogue	PCB or Wired

\*\* Add suffix /W for wired version without dimming control (four wires)

\*\* Add suffix /W/X1 for wired version with analogue dimming control (five wires)

\*\* Add suffix /W/X2 for wired version with PWM dimming control (five wires)

\*\* Add suffix /W/X3 for wired version with both analogue and PWM dimming controls (six wires)

### Specifications

( typical at 25°C, nominal input voltage, rated output current unless otherwise specified )

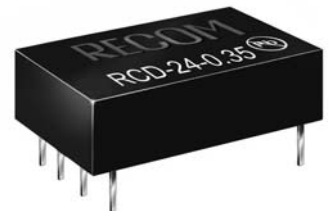
Input Voltage (absolute maximum)	36VDC max	
Recommended Input Voltage	5V min. / 24V typ. / 36VDC max	
Input Filter	Capacitor	
Output Voltage Range	Vin=36V	2V min. / 32V max
Output Current Range	Vin - Vout >1.3V	300mA-1200mA
Output Current Accuracy	300mA-1000mA	±2% typ
	1200mA	±3% typ
Internal Power Dissipation	Worst case load of 5 LEDs	800mW max
Output Current Stability	Vin=36V, Vout =1-9 LEDs	±1% max
Output Ripple and Noise (20MHz limited)	300mA-1000mA	120mVp-p max
Vin=36V, Vout =1-9 LEDs	1200mA	200mVp-p max
Temperature Coefficient	-40°C~+85°C ambient	±0.015%/°C max
Maximum Capacitive Load	100µF	
Operating Frequency	<1A	210kHz min/ 260kHz typ/ 300kHz max
	1A, 1.2A	350kHz min/ 450kHz typ/ 550kHz max
Efficiency at Full Load	96% max.	
Short Circuit Protection	Regulated at rated output current	
Operating Temperature Range (free air convection)	300mA/350mA	-40°C to +85°C
	500mA	-40°C to +80°C
	600mA	-40°C to +75°C
	700mA/1000mA	-40°C to +71°C
	1200mA	-40°C to +65°C
Storage Temperature Range	-55°C to +125°C	

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**INNOLINE**  
DC/DC-Converter

**RECOM**

## Constant Current Single Output

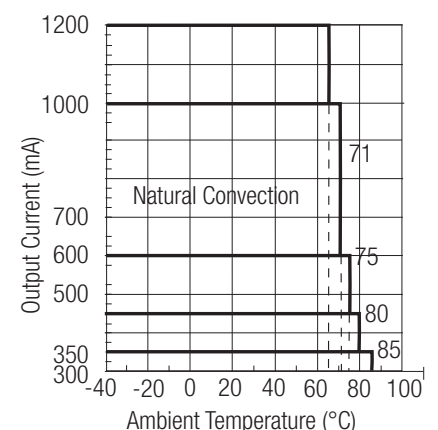


**EN-60950-1 Certified**  
**UL-60950-1 Pending**

# RCD-24

## Derating Graph

(Ambient Temperature)



### Specifications -Continued

Maximum Case Temperature		100°C
Overtemperature Shutdown (Auto-restart after cool down)	Internal IC Temperature Temperature Hysteresis	150°C typ. 20°C typ.
Thermal Impedance	Natural Convection	55°C/Watt
Case Material	Non Conductive Black Plastic	
Potting Material	Epoxy (UL94-V0)	
Dimensions	22.1 x 12.6 x 8.5mm	
Weight	4.5g	
Wave Soldering Profile	Max. 265°C/10 sec.	

### PWM Dimming and ON/OFF Control (Leave open if not used)

Remote ON/OFF	DC/DC ON	300mA-700mA	Open or 0V<Vr<0.6V
Threshold Voltages		1000mA-1200mA	Open or 0V<Vr<0.8V
	DC/DC OFF (Standby)	300mA-700mA	0.6<Vr<2.9V
		1000mA-1200mA	1.4<Vr<2.2V
	DC/DC OFF (Shutdown)	300mA-700mA	2.9V<Vr<6V
		1000mA-1200mA	2.2V<Vr<15V
Remote Pin Drive Current	Vr=5V		1mA max
Quiescent Input Current in Shutdown Mode	Vin=36V		200µA max
Maximum PWM Frequency (measured 10%~90% Dimming)	For Linear Operation Maximum Frequency	20 -200Hz 2000Hz	

### Analogue Dimming Control (leave open if not used)

Input Voltage Range		-0.3V - 15V
Control Voltage Range Limits (see Graph)	Full On Full Off	0.13V ± 50mV 4.5V ± 50mV
Analogue Pin Drive Current	Vc=5V	0.2mA max.

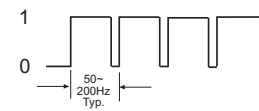
### Environmental

Relative Humidity	5% to 95% RH, non-condensing		
/W Versions			IP67
Conducted Emissions	(all series, see note)	EN55022	Class B
Radiated Emissions	(all series except 700mA)	EN55022	Class B
ESD	(all series)	EN61000-4-2	Class A
Radiated Immunity	(all series)	EN61000-4-3	Class A
Fast Transient	(all series)	EN61000-4-4	Class A
Conducted Immunity	(all series)	EN61000-4-6	Class A
MTBF (RCD-24-0.70, Nominal Vin, Full Load)	+25°C		605 x 10 <sup>3</sup> hours
using MIL-HDBK 217F	+71°C		516 x 10 <sup>3</sup> hours

Note: Requires an input filter to meet EN55022 ClassB conducted emissions.

### Digital Dimming

PWM Digital Control Signal



Output Current (LED appears dim)



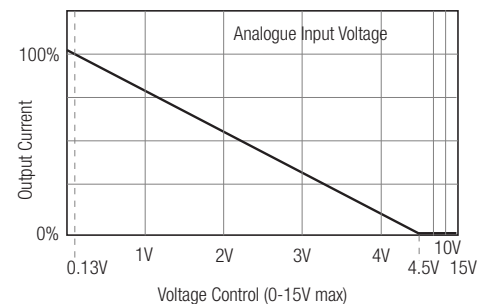
PWM Digital Control Signal



Output Current (LED appears bright)

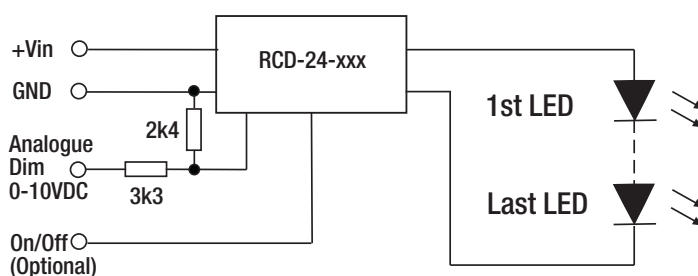


### Analogue Dimming



### Typical Application Circuit

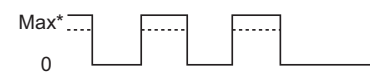
#### LED DRIVER with 0-10V Interface



PWM Digital Control Signal



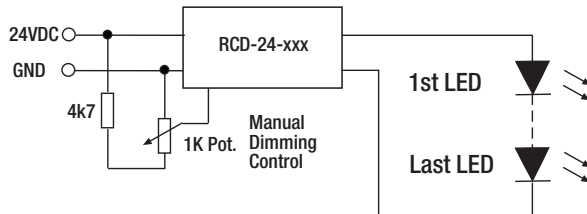
Output Current



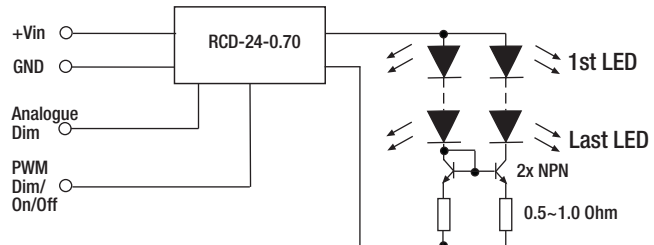
\* Max output current can also be set using Analogue input

## More Application Circuit Examples

LED DIMMER for up to 7 white LEDs



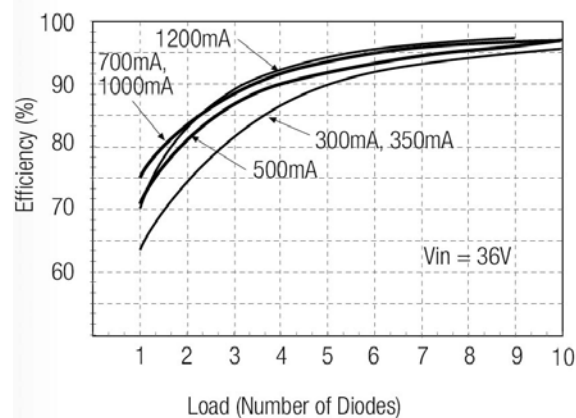
MULTIPLE LED DRIVER (up to 20 LEDs)



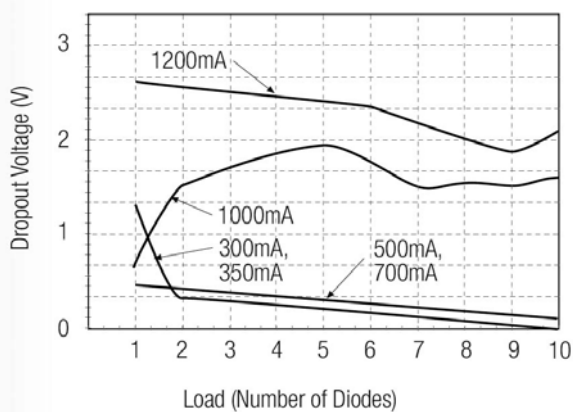
Driving Two Strings of 350mA LEDs with one 700mA Driver using a current mirror

## Typical Characteristics

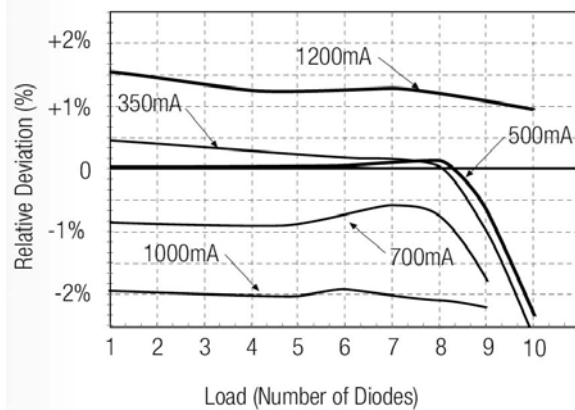
Efficiency/Load



Dropout Voltage/Load



Output Current Accuracy/Load



## Class B Filter Suggestion

### RCD-24-0.30 - RCD-24-0.70

No dimming or PWM dimming only:

$L1 = 47\mu\text{H}$

$C2 = C3 = 10\text{nF MLCC}$

Other caps not required

Analogue Dimming used:

$L1 = 120\mu\text{H}$

$C2 = C7 = 10\text{nF MLCC}$

Other caps not required

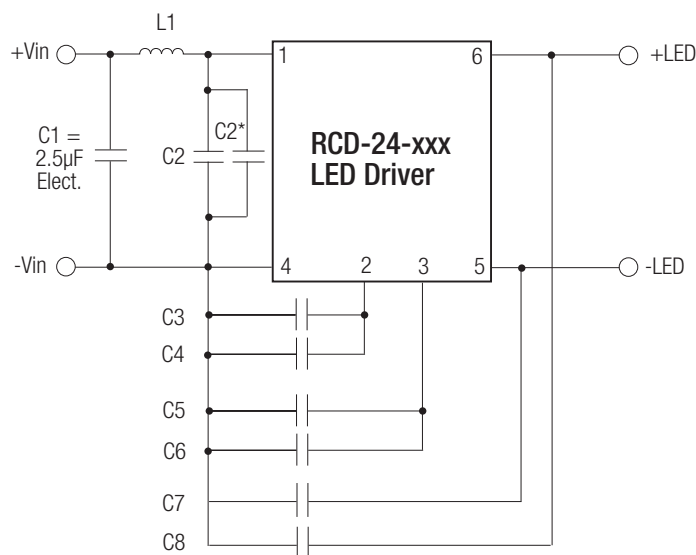
### RCD-24-1.00 - RCD-24-1.20

$L1 = 220\mu\text{H}$

$C2 = 10\text{nF MLCC}$

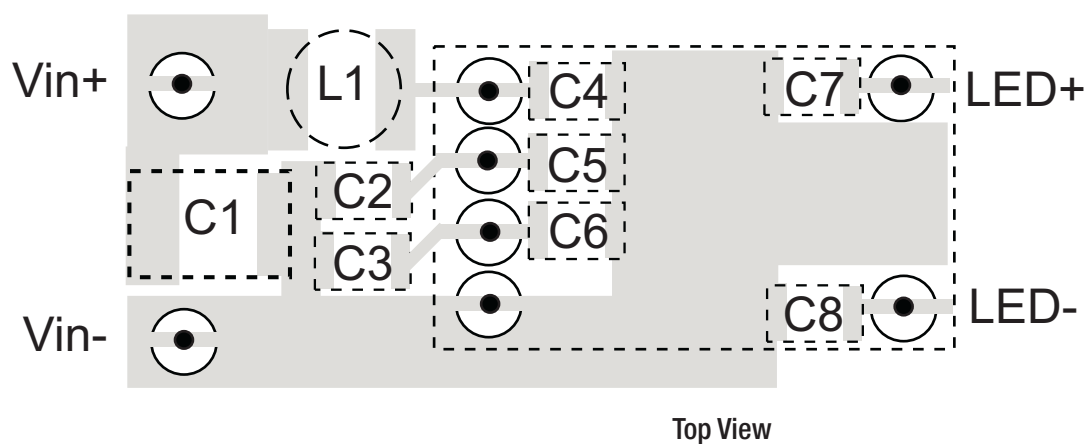
$C3 = C5 = 2.2\text{nF MLCC}$

$C4 = C6 = C7 = C8 = 100\text{nF MLCC}$

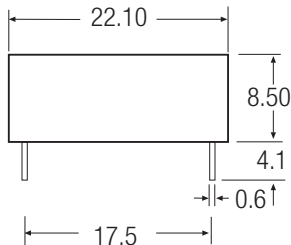


$C2^*$  = optional  $2\mu\text{F MLCC}$  required only if  $L1$  starts to resonate with the back ripple current. Effect depends on  $L1$  supplier and is not due to Recom.

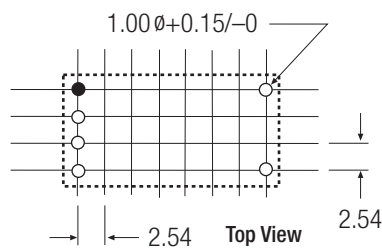
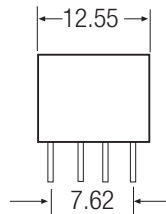
## Recommended PCB Layout



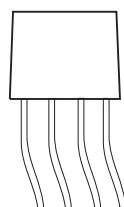
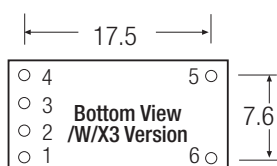
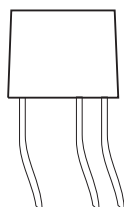
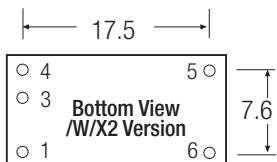
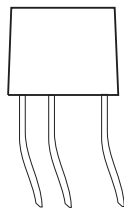
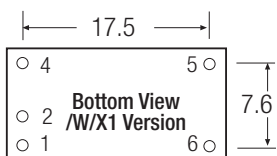
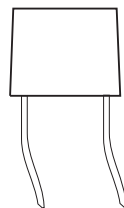
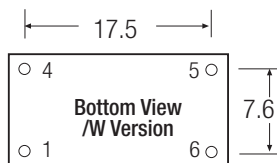
## Package Style and Pinning



Leave 1 mm space around case on PCB



### Recommended Footprint Details



Pin Connections RCD-24 Series		
Pin #	Out	Comments
1	+Vin	DC Supply
2	Analogue Dimming	Leave open if not used
3	PWM/ON/OFF	Leave open if not used
4	GND	Do not connect to -Vout
5	-Vout	LED Cathode Connection
6	+Vout	LED Anode Connection

XX.X ± 0.5 mm  
XX.XX ± 0.25 mm  
Pin Tolerance ± 0.1 mm

Wire Connections RCD-24/W Series		
Wire #	Function	Comments
1 (Red)	+Vin	DC Supply
4 (Black)	GND	Do not connect to -Vout
5 (Brown)	-Vout	LED Cathode Connection
6 (Yellow)	+Vout	LED Anode Connection

Wire length = 100mm + 10mm stripped & tinned = 110mm total  
Wire outside diameter = 1.6mm  
Wire core diameter = 0.75mm  
Wire is UL/CSA listed/ 22AWG / 300V Rated

Wire Connections RCD-24/W/X Series		
Wire #	Function	Comments
2 (Green)	Ana Dimming	/X1 or /X3
3 (Blue)	PWM Dimming	/X2 or /X3

Wire length = 100mm + 10mm stripped & tinned = 110mm total  
Wire outside diameter = 1.6mm  
Wire core diameter = 0.75mm  
Wire is UL/CSA listed/ 22AWG / 300V Rated