

Features

- 4:1 Wide Input Range
- Operating Temperature Range: -40~105°C
- Approved to cURus, UKCA, CE
- Approved to IEC/UL/EN62368-1
- Efficiency up to 90%
- EMC Class A & B Dependent on Input
- Single & Dual 10W Output Models
- Six-Sided Shielding



Ideal Power's 43RCD10-xyzW 10W Series PCB Mount DIP DC/DC Converters are certified to cURus, UKCA, CE, RoHS, REACH & IEC/UL/EN 62368-1, EN 50155 Standards and comply with Efficiency Regulations. These are primarily used in ITE, Video & Audio, Railway Industries and customised solutions are available upon request.

Part Number Structure

43RCD10-	48	S	05	W -	M3	A	H
Series Name	Input Voltage (VDC)	Output Quantity	Output Voltage (VDC)	Input Range	Operating Temp. Options	Remote On/Off & Trim Options	Isolation Options
	24: 9~36 48: 18 ~ 75 110: 36 ~ 160	S: Single D: Dual	3P3: 3.3 05: 5 12: 12 15: 15 24: 24 05: ±5 12: ±12 15: ±15 24: ±24	4:1	□: Standard -40°C~+105 °C With Derating M3: M3 Version -55°C~+105 °C With Derating	□: Negative logic A: Positive logic B: Without Ctrl pin C: Negative logic without Trim pin D: Without Ctrl & Trim pin E: Positive logic without Trim pin	□: Standard H: AC Isolation

Models

Model Number	Input Range	Output Voltage	Output Current @Full Load mA	Input Current @No Load mA	Efficiency %	Maximum Capacitor Load µF
43RCD10-24S3P3W	9~36	3.3	3000	10	87	3500
43RCD10-24S05W	9~36	5	2000	10	89	2500
43RCD10-24S12W	9~36	12	830	10	89	430
43RCD10-24S15W	9~36	15	670	10	90	350
43RCD10-24S24W	9~36	24	420	10	90	125
43RCD10-24D05W	9~36	±5	±1000	10	86	±1440
43RCD10-24D12W	9~36	±12	±416	10	89	±250
43RCD10-24D15W	9~36	±15	±333	10	89	±180
43RCD10-24D24W	9~36	±24	±210	10	90	±56
43RCD10-48S3P3W	18~75	3.3	3000	8	87	3500
43RCD10-48S05W	18~75	5	2000	8	89	2500
43RCD10-48S12W	18~75	12	830	8	89	430
43RCD10-48S15W	18~75	15	670	8	90	350
43RCD10-48S24W	18~75	24	420	8	90	125
43RCD10-48D05W	18~75	±5	±1000	8	86	±1440
43RCD10-48D12W	18~75	±12	±416	8	89	±250
43RCD10-48D15W	18~75	±15	±333	8	89	±180
43RCD10-48D24W	18~75	±24	±210	8	90	±56
43RCD10-110S3P3W	36~160	3.3	3000	6	87	3500
43RCD10-110S05W	36~160	5	2000	6	88	2500
43RCD10-110S12W	36~160	12	830	6	89	430
43RCD10-110S15W	36~160	15	670	6	89	350
43RCD10-110S24W	36~160	24	420	6	89	125
43RCD10-110D05W	36~160	±5	±1000	6	85	±1440
43RCD10-110D12W	36~160	±12	±416	6	89	±250
43RCD10-110D15W	36~160	±15	±333	6	89	±180
43RCD10-110D24W	36~160	±24	±210	6	89	±56

Input Specifications

Parameter	Conditions	Min	Typ	Max	Unit	
Operating input voltage range	24Vin(nom)	9	24	36	VDC	
	48Vin(nom)	18	48	75		
	110Vin(nom)	36	110	160		
Start-up voltage	24Vin(nom)	--	--	9	VDC	
	48Vin(nom)	--	--	18		
	110Vin(nom)	--	--	36		
Shutdown voltage	24Vin(nom)	7.5	8	8.8	VDC	
	48Vin(nom)	15.5	16	17.5		
	110Vin(nom)	32	34	35.5		
Start-up time	Constant resistive load	Power up	--	30	50	ms
		Remote ON/OFF	--	30	50	
Input surge voltage	1 second max	24Vin(nom)	--	--	50	VDC
		48Vin(nom)	--	--	100	
		110Vin(nom)	--	--	200	
Input filter	Pi type					
Remote ON/OFF	Referred to -Vin pin	Positive logic (Option)	DC-DC ON	DC-	Open or 0 ~ 0.5VDC	
		Negative logic (Standard)	DC OFF	DC	3 ~ 12VDC	
		Input current of Ctrl pin	-0.5	--	+1.0	mA
		Remote off input current	--	2.5	--	mA

Output Specifications

Parameter	Conditions	Min	Typ	Max	Unit	
Voltage accuracy		-1.0	--	+1.0		
Line regulation	Low Line to High Line at Full Load	Single	-0.2	--	+0.2	
		Dual	-0.5	--	+0.5	
Load regulation	No Load to Full Load 10% Load to 90% Load	Single	--	--	+0.2	%
		Dual	-0.2	--	+1.0	
		Single	-10.	--	+0.1	
Cross regulation	Asymmetrical load 25%/100% FL	Dual	-5.0	--	+5.0	
Voltage adjustability	Single output	3.3Vout, 12Vout	-10	--	+10	
		Others	-10	--	+20	
Ripple and noise	Measured by 20MHz bandwidth					mVp-p
	With a 10µF/25V X7R MLCC	Single				
		3.3Vout, 5Vout 12Vout, 15Vout	--	75	--	
	With a 2.2µF/50V X7R MLCC	24Vout	--	100	--	
		Dual				
	5Vout 12Vout, 15Vout 24Vout	--	75	--		
With a 10µF/25V X7R MLCC for each output With a 2.2µF/50V X7R MLCC for each output	--	75	--			
Temperature coefficient		-0.02		+0.02	%/°C	
Transient response recovery time	25% load step change		250		µs	
Over voltage protection	3.3Vout	3.7	--	5.4	VDC	
	5Vout	6.3	--	7.4		
	12Vout	13.5	--	19.6		
	15Vout	18.3	--	22.0		
	24Vout	29.1	--	32.5		
Overload protection	% of lout rated		170	%		
Short circuit protection					Continuous, automatic recovery	

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General Specifications

Parameter	Conditions		Min	Typ	Max	Unit	
Isolation voltage	1 minute	Input to Output	3000	--	--	VDC	
		Input (Output) to Case	2250	--	--		
	1 minute	AC Isolation	Input to Output	2000	--	--	VAC
			Input (Output) to Case	1500	--	--	
Isolation resistance	500VDC		1	--	--	GΩ	
Isolation capacitance			--	--	1500	pF	
Switching frequency	24 VDC input, 48VDC input	3.3Vout, 5Vout	260	290	320	kHz	
		Others	325	360	395		
	110VDC input	All	220	245	270	kHz	
Safety approvals	IEC/ EN/ UL62368-1				UL:E193009 CB:UL(Demko)		
Standard approvals	EN50155 EN45545-2						
Case material						Copper	
Base material						FR4 PCB	
Potting material						Epoxy (UL94 V-0)	
Weight						16.5g (0.58oz)	
MTBF	MIL-HDBK-217F, Full load				2.334 x 10 ⁶ hrs		

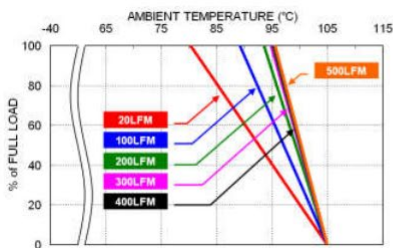
Environmental Specifications

Parameter	Conditions		Min	Typ	Max	Unit
Operating case temperature	Standard type	With derating	-40	--	+105	°C
		M3 version	-55	--	+105	
	43RCD10-000S3P3W	Meet the railway OT4 temperature requirement as power derating to 7W output power				
	43 RCD10-000S05W					
	43 RCD10-000D05W					
The others	Meet the railway OT4 temperature					
Maximum case temperature			--	--	105	°C
Storage temperature range			-55	--	+125	°C
Thermal impedance			--	16.8	--	°C/W
Thermal shock						MIL-STD-810F
Shock						EN61373, MIL-STD-810F
Vibration						EN61373, MIL-STD-810F
Relative humidity						5% to 95% RH

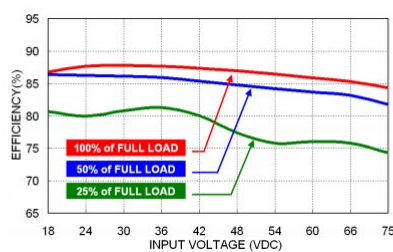
EMC Specifications

Parameter	Conditions		Level
EMI	EN55032, EN50121-3-2	Without external components	Class A
		With external components	Class B
EMS	EN55024, EN50121-3-2		
ESD	EN61000-4-2	Air $\pm 8\text{kV}$ and Contact $\pm 6\text{kV}$	Perf. Criteria A
Radiated immunity	EN61000-4-3	20V/m	Perf. Criteria A
Fast transient	EN61000-4-4	$\pm 2\text{kV}$	
	43RCD10-24000W	With an aluminum electrolytic capacitor (Nippon chemi-con KY series, $470\mu\text{F}/50\text{V}$) and a TVS (SMDJ58A, 58V, 3000Watt peak pulse power) in parallel.	
	43RCD10-48000W	With an aluminum electrolytic capacitor (Nippon chemi-con KY series, $330\mu\text{F}/100\text{V}$) and a TVS (SMBJ120A, 120V, 600Watt peak pulse power) in parallel.	Perf. Criteria A
Surge	43RCD10-110000W	With an aluminum electrolytic capacitor (Nippon chemi-con KXJ series, $330\mu\text{F}/200\text{V}$) and a TVS (SMBJ300A, 300V, 600Watt peak pulse power) in parallel.	
	EN61000-4-5	$\pm 2\text{kV}$	
	43RCD10-24000W	With an aluminum electrolytic capacitor (Nippon chemi-con KY series, $470\mu\text{F}/50\text{V}$) and a TVS (SMDJ58A, 58V, 3000Watt peak pulse power) in parallel.	
Conducted immunity	43RCD10-48000W	With an aluminum electrolytic capacitor (Nippon chemi-con KY series, $330\mu\text{F}/100\text{V}$) and a TVS (SMBJ120A, 120V, 600Watt peak pulse power) in parallel.	Perf. Criteria A
	43RCD10-110000W	With an aluminum electrolytic capacitor (Nippon chemi-con KXJ series, $330\mu\text{F}/200\text{V}$) and a TVS (SMBJ300A, 300V, 600Watt peak pulse power) in parallel.	
Power frequency magnetic field	EN61000-4-8	10Vr.m.s	Perf. Criteria A
		100A/m continuous; 1000A/m 1 second	Perf. Criteria A

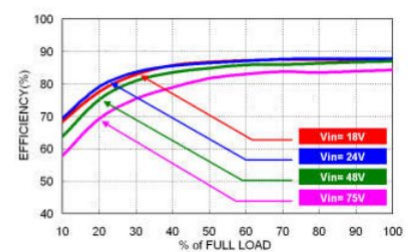
CAUTION: This power module is not internally fused. An input line fuse must always be used.

Characteristic Curve


43RCD10-48S3P3W Derating Curve



43RCD10-48S3P3W Efficiency vs. Input Voltage



43RCD10-48S3P3W Efficiency vs. Output Load

Fuse Consideration

This power module is not internally fused. An input line fuse must always be used.

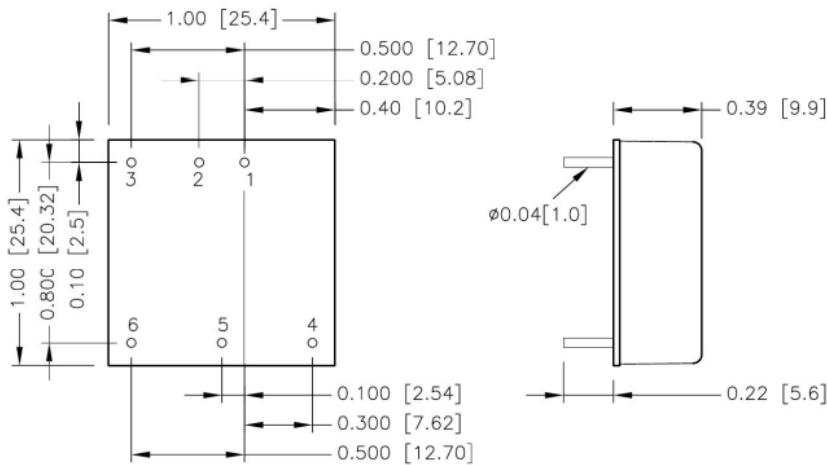
This encapsulated power module can be used in a wide variety of applications, ranging from simple stand-alone operation to an integrated part of sophisticated power architecture.

To maximum flexibility, internal fusing is not included; however, to achieve maximum safety and system protection, always use an input line fuse. The input line fuse suggest as below:

Model	Fuse Rating (A)	Fuse Type
43RCD10-24S□□W, 43RCD10-24D□□W	2	Slow-Blow
43RCD10-48S□□W, 43RCD10-48D□□W	1.25	Slow-Blow
43RCD10-110S□□W, 43RCD10-110D□□W	.063	Slow-Blow

The table based on the information provided in this data sheet on inrush energy and maximum DC input current at low Vin.

Mechanical Drawing

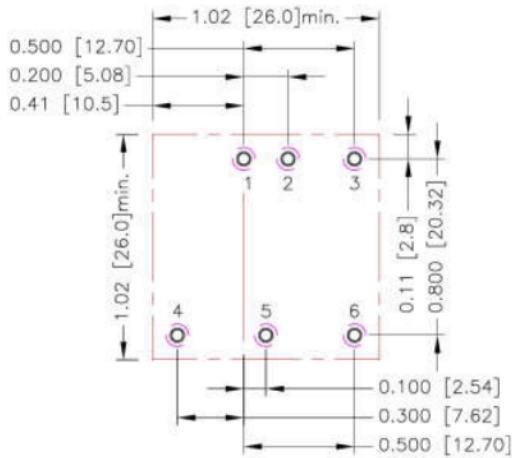


BOTTOM VIEW

PIN CONNECTION

PIN	SINGLE	DUAL
1	+Vin	+Vin
2	-Vin	-Vin
3	Ctrl	Ctrl
4	+Vout	+Vout
5	Trim	Common
6	-Vout	-Vout

- All dimensions in inch [mm]
- Tolerance :x.xx±0.02 [x.x±0.5]
x.xxx±0.01 [x.xx±0.25]
- Pin dimension tolerance ±0.004[0.10]

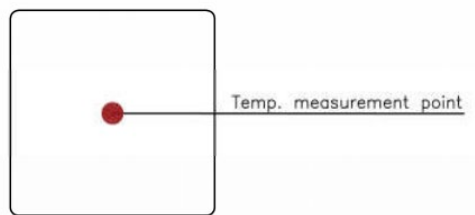
Recommended Pad Layout


All dimensions in inch[mm]
 Pad size(lead free recommended)
 Through hole 1.2.3.4.5.6: $\Phi 0.051$ [1.30]
 Top view pad 1.2.3.4.5.6: $\Phi 0.064$ [1.63]
 Bottom view pad 1.2.3.4.5.6: $\Phi 0.102$ [2.60]

Thermal Considerations

The power module operates in a variety of thermal environments. However, sufficient cooling should be provided to help ensure reliable operation of the unit. Heat is removed by conduction, convection, and radiation to the surrounding Environment. Proper cooling can be verified by measuring the point as the figure below. The temperature at this location should not exceed "Maximum case temperature". When Operating, adequate cooling must be provided to maintain the test point temperature at or below "Maximum case temperature". You can limit this Temperature to a lower value for extremely high reliability.

- Thermal test condition with vertical direction by natural convection (20LFM).



TOP VIEW

Output Voltage Adjustment

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 Trim and -Vout pin, the output voltage increases.

With an external resistor between the Trim and +Vout pin, the output voltage decreases. The external Trim resistor needs to be at least 1/8W of rated power.

■ Trim Up Equation

$$R_U = \left[\frac{G \times L}{(V_{o,up} - L - K)} - H \right] \Omega$$

■ Trim Down Equation

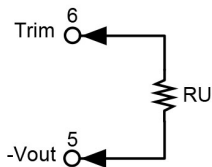
$$R_D = \left[\frac{(V_{o,down} - L) \times G}{(V_o - V_{o,down})} - H \right] \Omega$$

Module	G	H	K	L
43RCD10-00S3P3W	5110	2050	0.8	2.5
43RCD10-00S05W	5110	2050	2.5	2.5
43RCD10-00S12W	10000	5110	9.5	2.5
43RCD10-00S15W	10000	5110	12.5	2.5
43RCD10-00S24W	56000	13000	21.5	2.5

EXTERNAL OUTPUT TRIMMING

Output can be externally trimmed by using the method shown below.

Trim-up



□□S3P3W

ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	3.333	3.366	3.399	3.432	3.465	3.498	3.531	3.564	3.597	3.630
RU (kΩ)	385.071	191.511	126.990	94.730	75.374	62.470	53.253	46.340	40.963	36.662

□□S05W

ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	5.050	5.100	5.150	5.200	5.250	5.300	5.350	5.400	5.450	5.500
RU (kΩ)	253.450	125.700	83.117	61.825	49.050	40.533	34.450	29.888	26.339	23.500

ΔV (%)	11	12	13	14	15	16	17	18	19	20
Vout (V)	5.550	5.600	5.650	5.700	5.750	5.800	5.850	5.900	5.950	6.000
RU (kΩ)	21.177	19.242	17.604	16.200	14.983	13.919	12.979	12.144	11.397	10.725

□□S12W

ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	12.120	12.240	12.360	12.480	12.600	12.720	12.840	12.960	13.080	13.200
RU (kΩ)	203.223	99.057	64.334	46.973	36.557	29.612	24.652	20.932	18.038	15.723

□□S15W

ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	15.150	15.300	15.450	15.600	15.750	15.900	16.050	16.200	16.350	16.500
RU (kΩ)	161.557	78.223	50.446	36.557	28.223	22.668	18.700	15.723	13.409	11.557

ΔV (%)	11	12	13	14	15	16	17	18	19	20
Vout (V)	16.650	16.800	16.950	17.100	17.250	17.400	17.550	17.700	17.850	18.000
RU (kΩ)	10.042	8.779	7.711	6.795	6.001	5.307	4.694	4.149	3.662	3.223

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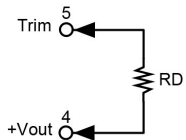
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Trim-up (Continued)
□□S24W

ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	24.240	24.480	24.720	24.960	25.200	25.440	25.680	25.920	26.160	26.400
RU (k Ω)	570.333	278.667	181.444	132.833	103.667	84.222	70.333	59.917	51.815	45.333

ΔV (%)	11	12	13	14	15	16	17	18	19	20
Vout (V)	26.640	26.880	27.120	27.360	27.600	27.840	28.080	28.320	28.560	28.800
RU (k Ω)	40.030	35.611	31.872	28.667	25.889	23.458	21.314	19.407	17.702	16.167

Trim-down

□□S3P3W

ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	3.267	3.234	3.201	3.168	3.135	3.102	3.069	3.036	3.003	2.970
RD (k Ω)	116.719	54.779	34.133	23.810	17.616	13.486	10.537	8.325	6.604	5.228

□□S05W

ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	4.950	4.900	4.850	4.800	4.750	4.700	4.650	4.600	4.550	4.500
RD (k Ω)	248.340	120.590	78.007	56.715	43.940	35.423	29.340	24.778	21.229	18.390

□□S12W

ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	11.880	11.760	11.640	11.520	11.400	11.280	11.160	11.040	10.920	10.800
RD (k Ω)	776.557	380.723	248.779	182.807	143.223	116.834	97.985	83.848	72.853	64.057

□□S15W

ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	14.850	14.700	14.550	14.400	14.250	14.100	13.950	13.800	13.650	13.500
RD (k Ω)	818.223	401.557	262.668	193.223	151.557	123.779	103.938	89.057	77.483	68.223

□□S24W

ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	23.760	23.520	23.280	23.040	22.800	22.560	22.320	22.080	21.840	21.600
RD (k Ω)	4947.667	2439.333	1603.222	1185.167	934.333	767.111	647.667	558.083	488.407	432.667