DC – DC

Features

- 4:1 Wide Input Range
- Operating Temperature Range: -40~101°c
- Approved to cULus, UKCA, CE
- Approved to IEC/UL/EN62368-1
- Efficiency up to 89%
- EMC Class A & B Dependent on Input
- Single & Dual 20W Output Models
- Available with optional heatsink (HC)
- Six Sided Shielding

Ideal Power's 43RED20-xyzW 20W 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.

Models

Model Number	Input Range	Output Voltage	Output Current @Full Load mA	Input Current @No Load mA	Efficiency %	Maximum Capacitor Load µF
43RED20-24S3P3W	9~36	3.3	4500	6	85	7000
43RED20-24S05W	9~36	5	4000	6	88	5000
43RED20-24S12W	9~36	12	1670	6	89	850
43RED20-24S15W	9~36	15	1330	6	88	700
43RED20-24D12W	9~36	±12	±833	6	88	±500
43RED20-24D15W	9~36	±15	±667	6	89	±350
43RED20-48S3P3W	18~75	3.3	4500	4	85	7000
43RED20-48S05W	18~75	5	4000	4	88	5000
43RED20-48S12W	18~75	12	1670	4	89	850
43RED20-48S15W	18~75	15	1330	4	89	700
43RED20-48D12W	18~75	±12	±833	4	88	±500
43RED20-48D15W	18~75	±15	±667	4	89	±350
43RED20-110S3P3W	43~160	3.3	4500	3	85	7000
43RED20-110S05W	43~160	5	4000	3	87	5000
43RED20-110S12W	43~160	12	1670	3	88	850
43RED20-110S15W	43~160	15	1330	3	88	700
43RED20-110D12W	43~160	±12	±833	3	88	±500
43RED20-110D15W	43~160	±15	±667	3	89	±350

DC – DC

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)	43	110	160	
Start up voltage		24Vin(nom)			9	VDC
		48Vin(nom)			18	
		110Vin(nom)			43	
Shutdown voltage		24Vin(nom)	7.5	8	8.8	VDC
		48Vin(nom)	15.5	16	17.5	
		110Vin(nom)	38.5	40	42	
Start up time	Constant resistive load	Power up			30	ms
		Remote ON/OFF			30	
Input surge voltage	100 ms, max.	24Vin(nom)			50	VDC
		48Vin(nom)			100	
		110Vin(nom)			170	
Input filter		24Vin(nom), 48 Vin(nom) 110Vin(nom)		Common Chock Pi type		
Remote ON/OFF	Referred to –Vin pin	Positive logic (Option) DC-DC ON			Open or 3 ~ 15VDC	
		Positive logic (Option) DC-DC OFF			Short or 0 ~ 1.2VDC	
		Negative logic (Standard) DC-DC ON			Short or 0 ~ 1.2VDC	
		Negative logic (Standard) DC-DC OFF			Open or 3 ~ 15VDC	
		Input current of Ctrl pin			+1.0	mA
		Remote off input current	-0.5	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	Single Dual	-0.2		+0.2	%
	10% Load to 90% Load	Single	-1.0		+1.0	
		Dual	-0.1		+0.1	
			-0.8		+0.8	
Cross regulation	Asymmetrical load 25%/100% FL	Dual	-5.0		+5.0	%
Voltage adjustability	Single output		-10		+10	%
Ripple and noise	20MHz bandwidth	3.3Vout, 5Vout		75		mVp-p
	With a 1µF/50V X7R MLCC	12Vout, 15Vout		100		
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		5.6		7.0	
	12Vout		13.5		19.6	
	15Vout		16.8		20.5	
Over load protection	% of Iout rated			150		%
Short circuit protection			Continuous, automatics recovery			

General Specifications

Parameter	Conditions		Min	Typ	Max	Unit
Isolation voltage	1 minute	Input to Output	2250			VDC
Isolation resistance	500VDC		1			GΩ
Isolation capacitance					3000	pF
Switching frequency			297	330	363	kHz
Safety approvals	IEC/ EN/ UL62368-1			UL:E193009 CB:UL(Demko)		
Standard approvals	EN50155 EN45545-2					
Case material				Nickel-coated copper		
Base material						FR4 PCB
Potting material				Silicone (UL94 V-0)		
Weight				30g (1.06oz)		
MTBF	MIL-HDBK-217F, Full load			1.523×10^6 hrs		

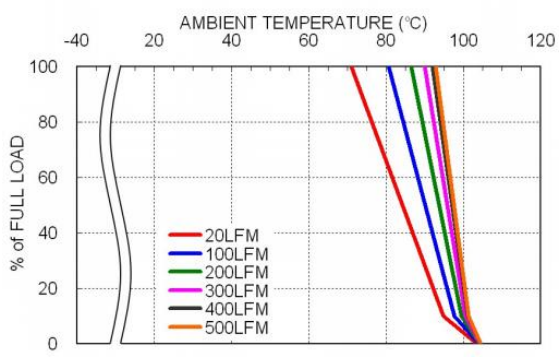
Environmental Specifications

Parameter	Conditions		Min	Typ	Max	Unit
Operating ambient temperature	Standard	With derating	-40		+101	℃
	M3 Version	With derating	-55		+101	
Maximum case temperature					105	℃
Storage temperature range			-55		+125	℃
Thermal impedance	Without heat-sink			12		℃/W
	With heat-sink			10		
Thermal shock						MIL-STD-810F
Shock						EN61373, MIL-STD-810F
Vibration						EN61373, MIL-STD-810F
Relative humidity						5% to 95% RH

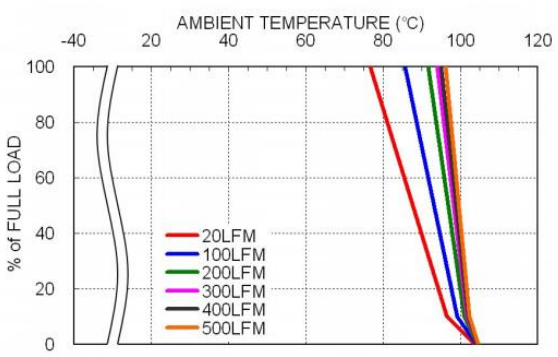
EMC Specifications

Parameter		Conditions		Level
EMI	EN55032,EN55011	24VDC, 48VDC	Without external components	Class B
	EN55032	110VDC	Without external components	Class A Class B
			With external components	
ESD	EN61000-4-2	Air ± 8kV and Contact ± 6kV		Perf. Criteria A
Radiated immunity	EN61000-4-3	20 V/m		Perf. Criteria A
Fast transient	EN61000-4-4	±2kV		Perf. Criteria A
	24VDC, 48VDC	With an external input filter capacitor (Nippon chemi-con KY series, 220µF/100V)		
	110VDC	With an external input filter capacitor (Rubycon BXF series, 100µF/250V)		
Surge	EN61000-4-5	EN55024 ±2kV and EN50155 ±2kV		Perf. Criteria A
	24VDC, 48VDC	With an external input filter capacitor (Nippon chemi-con KY series, 220µF/100V)		
	110VDC	With an external input filter capacitor (Rubycon BXF series, 100µF/250V)		
Conducted immunity	EN61000-4-6	10 Vr.m.s		Perf. Criteria A
Power frequency magnetic field	EN61000-4-8	100A/m continuous; 1000A/m 1 second		Perf. Criteria A

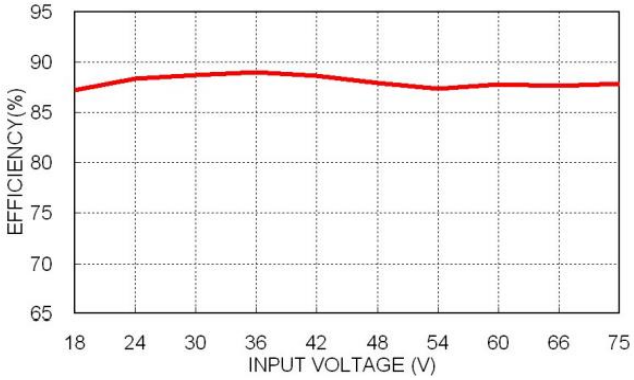
Characteristic Curve



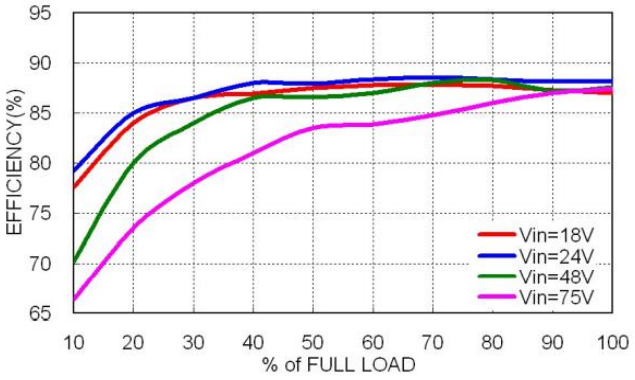
43RED20-48S05W Derating Curve



43RED20-48S05W Derating Curve With Heat-sink



43RED20-48S05W Efficiency vs. Input Voltage



43RED20-48S05W Efficiency vs. Output Load

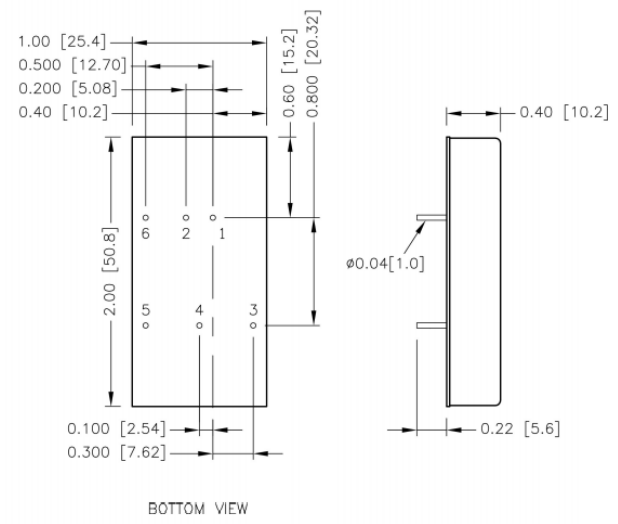
Fuse Consideration

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
43RED20-24S□□W,43RED20-24D□□W	4	Slow-Blow
43RED20-48S□□W,43RED20-48D□□W	2	Slow-Blow
43RED20-110S□□W,43RED20-110D□□W	1	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



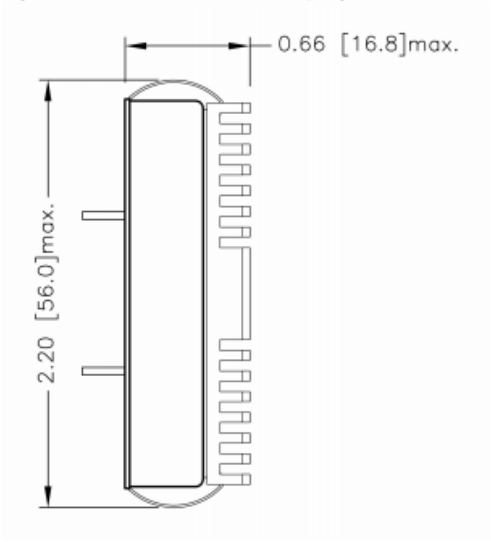
PIN CONNECTION

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

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

Heat-Sink Options

-HC (Heat-sink with clamps)

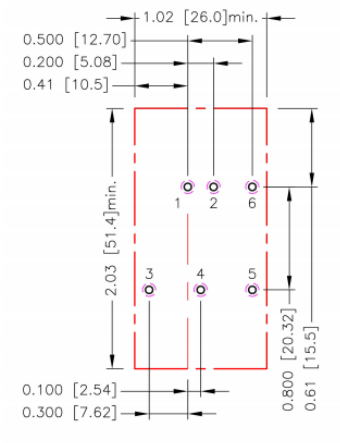


* All dimensions in inch [mm]

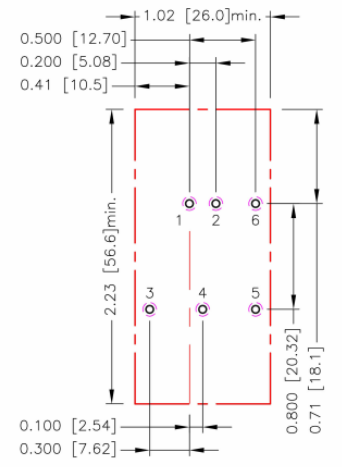
DC – DC

Recommended Pad Layout

Standard



-HC

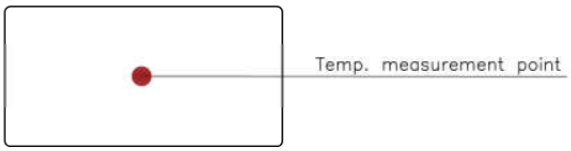


All dimensions in inch[mm]
Pad size(lead free recommended)
Through hole 1.2.3.4.5.6: Φ0.051[1.30]
Top view pad 1.2.3.4.5.6: Φ0.064[1.63]
Bottom view pad 1.2.3.4.5.6: Φ0.102[2.60

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

DC – DC

Output Voltage Adjustment

Output voltage set point adjustment allows the user to increase or decrease the output voltage set point 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, the output voltage set point increases. With an external resistor between the Trim and +Vout, the output voltage set point decreases. The external Trim resistor needs to be at least 1/16W of rated power.

■ **Trim Up Equation**

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

■ **Trim Down Equation**

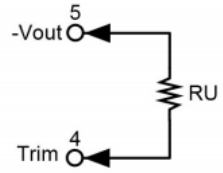
$$R_D = \left[\frac{(V_{o,down} - L) \times G}{(V_o - V_{o,down})} - H \right] \Omega$$

Module	G	H	K	L
43RED20-□□S3P3W	5110	2050	0.8	2.5
43RED20-□□S05W	5110	2050	2.5	2.5
43RED20-□□S12W	10000	5110	9.5	2.5
43RED20-□□S15W	10000	5110	12.5	2.5

EXTERNAL OUTPUT TRIMMING

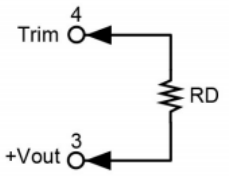
Output can be externally trimmed by using the method shown below.

Trim-up



□□S3P3W										
△V (%)	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										
△V (%)	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
□□S12W										
△V (%)	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										
△V (%)	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

Trim-down



□□S3P3W										
△V (%)	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 (kΩ)	116.719	54.779	34.133	23.810	17.616	13.486	10.537	8.325	6.604	5.228
□□S05W										
△V (%)	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 (kΩ)	248.340	120.590	78.007	56.715	43.940	35.423	29.340	24.778	21.229	18.390
□□S12W										
△V (%)	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 (kΩ)	776.557	380.723	248.779	182.807	143.223	116.834	97.985	83.848	72.853	64.057
□□S15W										
△V (%)	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 (kΩ)	818.223	401.557	262.668	193.223	151.557	123.779	103.938	89.057	77.483	68.223