DC – DC

Features

- 4:1 Wide Input Range
- Operating Temperature Range: -40~105°c
- Approved to cURus, CB, UKCA, CE, RoHS & REACH
- Safety Standards to IEC/UL/EN62368-1 & EN50155
- Efficiency up to 90.5%
- EMC Class A & B
- Single & Dual output 36~160V DC
- OCP, OTP, OVP SCP & UVP

Ideal Power's 43RHM20-xyzW 20W Series DIP DC/DC Converters are certified to cURus, CB, UKCA, CE, RoHS, REACH & EN 62368-1/IEC 62368-1/UL 62368-1 Standards and comply with the relevant Efficiency Regulations. These are primarily used in ITE, Audio & Video, Railway Industries and customised solutions are available upon request.

Part Number Structure

43RHM20 -	110	S	05	W	-	N
Series Name	Input Voltage (VDC)	Output Quantity	Output Voltage (VDC)	Input Range		Remote On/Off Options
	110: 36 ~ 160	**S:** Single	**05:** 05 **5P1:** 5.1 **12:**12 **15:**15 **24:** 24	4:1		□**:** Positive logic **T:** Negative logic
		D: Dual	**05:** 05 **12:** ±12 **15:** ±15			

Models

Model Number	Input Range V DC	Output Voltage V DC	Output Current @Full Load mA	Input Current @No Load mA	Efficiency %	Maximum Capacitor Load µF
43RHM20-110S05W	36 ~ 160	5	4000	10	90.5	5000
43RHM20-110S5P1W	36 ~ 160	5.1	4000	10	90.5	5000
43RHM20-110S12W	36 ~ 160	12	1670	10	88.5	850
43RHM20-110S15W	36 ~ 160	15	1330	10	89.5	700
43RHM20-110S24W	36 ~ 160	24	833	10	88.5	220
43RHM20-110D05W	36 ~ 160	±5	±2000	10	86	±2500
43RHM20-110D12W	36 ~ 160	±12	±833	10	88.5	±500
43RHM20-110D15W	36 ~ 160	±15	±667	10	89.5	±350

Input Specifications

Parameter	Conditions		Min	Typ	Max	Unit
Operating input voltage range		110Vin(nom)	36	110	160	V DC
Start-up voltage		110Vin(nom)			36	
Shutdown voltage		110Vin(nom)	32	34	35.8	
Start-up time	Constant resistive load	Power up		30	60	ms
		Remote ON/OFF		30	60	
Input surge voltage	1 second, max.	110Vin(nom)			200	V DC
Input filter				Pi type		
Remote ON/OFF	Referred to –Vin pin	Positive Logic DC-DC ON		Open or 3 ~ 12VDC		
		(Standard) DC-DC OFF		Short or 0 ~ 1.2VDC		
		Negative Logic DC-DC ON		Short or 0 ~ 1.2VDC		
		(Option) DC-DC OFF		Open or 3 ~ 12VDC		
		Input current of Ctrl pin	-0.5		0.5	mA
		Remote off input current		3		

Output Specifications

Parameter	Conditions		Min	Typ	Max	Unit
Voltage accuracy			-1.0		+1.0	%
Line regulation	Low Line to High Line at Full Load		-0.2		+0.2	
Load regulation	No Load to Full Load	Single	-0.5		+0.5	
		Dual	-1.0		+1.0	
Cross regulation	Asymmetrical load 25%/100% FL	Dual	-5.0		+5.0	
Voltage adjustability	Single	3.3Vout, 5Vout, 12Vout	-10		+10	
		15Vout, 24Vout	-10		+20	
Ripple and noise	Measured by 20MHz bandwidth With a 10µF/50V X7R MLCC	5Vout, 5.1Vout		75		mVp-p
		12Vout, 15Vout		100		
		24Vout		150		
Temperature coefficient			-0.02		+0.02	%/℃
Transient response recovery	25% load step change			250		µs
Over voltage protection	Single	5Vout, 5.1Vout		6.2		V DC
		12Vout		15		
		15Vout		20		
		24Vout		30		
Overload protection	% of Iout rated; Hiccup mode			150		%
Short circuit protection			Continuous, automatics recovery			

General Specifications

Parameter	Conditions		Min	Typ	Max	Unit
Isolation voltage	1 minute (Reinforced insulation)	Input to Output	3000			VDC
Isolation resistance	500VDC		1			GΩ
Isolation capacitance					1000	pF
Switching frequency			250	275	310	kHz
Safety approvals	IEC /UL/ EN62368-1					UL: E193009 CB: UL(Demko)
Standard approvals	EN50155 EN45545-2					
Case material						Non-conductive black plastic
Base material						Non-conductive black plastic
Potting material						Silicone (UL94 V-0)
Weight						24g (0.85oz)
MTBF	MIL-HDBK-217F, Full load					1.558 x 10^5 hrs

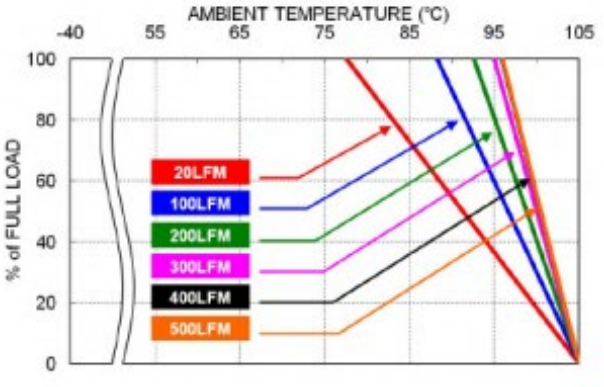
Environmental Specifications

Parameter	Conditions	Min	Typ	Max	Unit
Operating ambient temperature	With derating	-40		+105	℃
Maximum case temperature				105	℃
Over temperature protection			Internal temperature sensor		
Storage temperature range		-55		+125	℃
Thermal impedance			18.31		℃/W
Thermal shock					MIL-STD-810F
Shock					EN61373, MIL-STD-810F
Vibration					EN61373, MIL-STD-810F
Relative humidity					5% to 95% RH

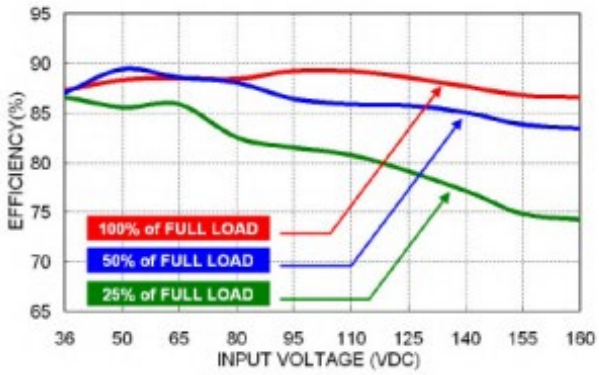
EMC Specifications

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 ± 8kV and Contact ± 6kV	Perf. Criteria A
Radiated immunity	EN61000-4-3	20V/m	Perf. Criteria A
Fast transient	EN61000-4-4 43RHM20-110□□□W	± 2kV With 2 pcs of aluminum electrolytic capacitor (Nippon chemi-con KXJ series, 220µF/200V) and a TVS (SMDJ170A, 170V, 3000Watt peak pulse power) in parallel.	Perf. Criteria A
Surge	EN61000-4-5 43RHM20-110□□□W	± 2kV With 2 pcs of aluminum electrolytic capacitor (Nippon chemi-con KXJ series, 220µF/200V in parallel) and a TVS(SMDJ170A, 170V, 3000Watt peak pulse power) in parallel.	Perf. Criteria A
Conducted immunity	EN61000-4-6	10Vr.m.s	Perf. Criteria A
Power frequency magnetic field	EN61000-4-8	100A/m continuous; 1000A/m 1 second	Perf. Criteria A

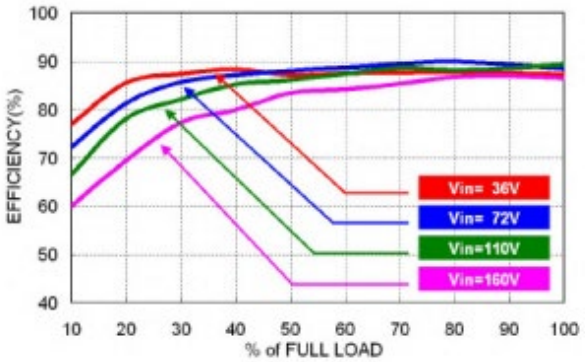
Characteristic Curve



43RHM20-110S05W Derating Curve



43RHM20-110S05W Efficiency vs. Input Voltage



43RHM20-110S05W Efficiency vs. Output Load

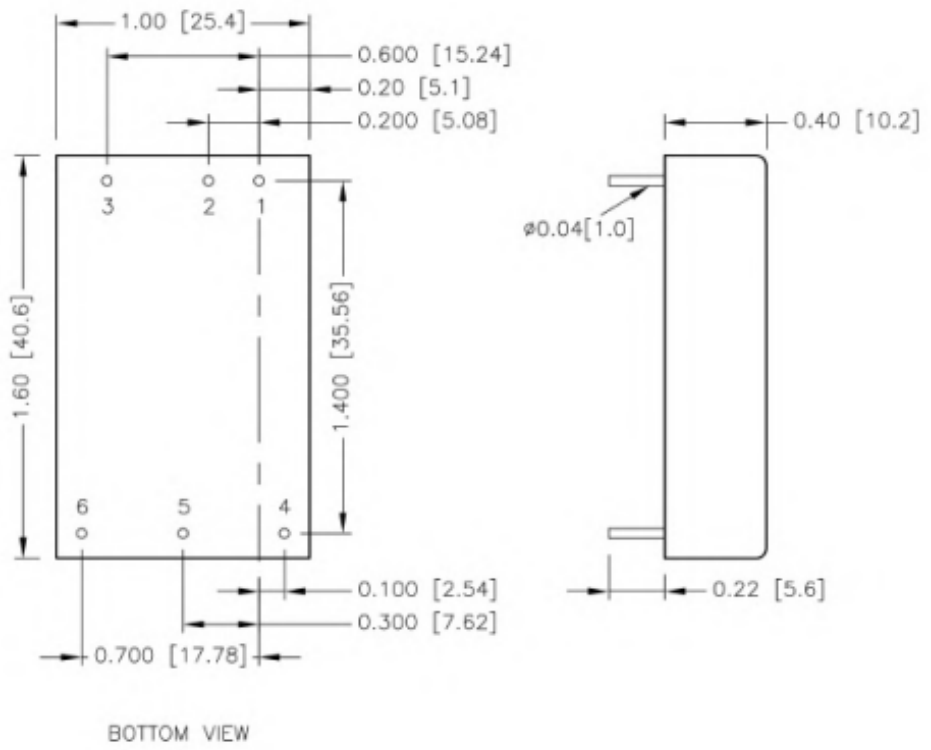
Fuse Consideration

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
43RHM20-110□□□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.

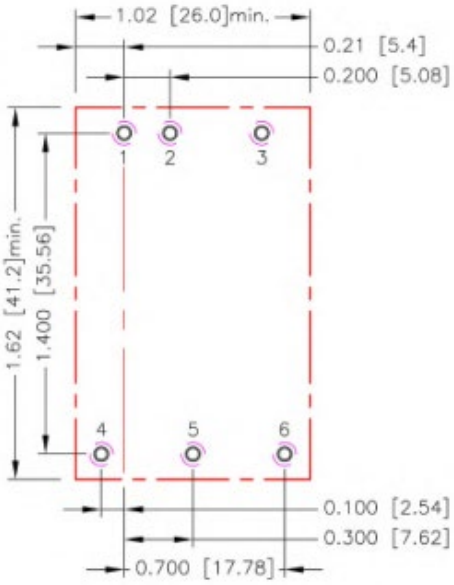
Mechanical Drawing



1. All dimensions in inch [mm]
2. Tolerance: x.xx±0.02 [x.x±0.5]
   x.xxx±0.010 [x.xx±0.25]
3. Pin dimension tolerance ±0.004[0.10]

PIN	Single	Dual
1	+ Vin	+ Vin
2	- Vin	- Vin
3	Ctrl	Ctrl
4	+ Vout	+ Vout
5	- Vout	Com
6	Trim	- Vout

Recommended Pad Layout

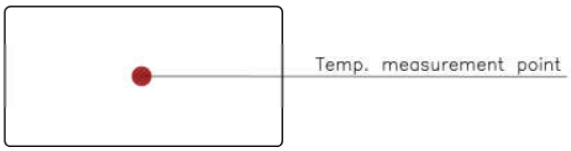


All dimensions in inch[mm]
Pad size(lead free recommended)
Through hole 1.2.3.4.5.6: Φ0.051[1.30]
Top view pad 1.2.3.4.5.6: Φ0.064[1.63]
Bottom view pad 1.2.3.4.5.6: Φ0.102[2.60]

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

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 -Output pin, the output voltage increases.
With an external resistor between the Trim and +Output pin, the output voltage decreases.
The external Trim resistor needs to be at least 1/10W of rated power.

■ Trim Up Equation

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

■ Trim Down Equation

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

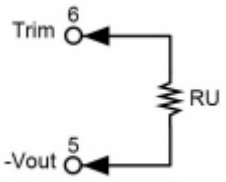
■ **Trim constants**

Module	G	H	K	L
43RHM20-110S3P3W	5110	2050	0.8	2.5
43RHM20-110S05W	5110	2050	2.5	2.5
43RHM20-110S12W	10000	5110	9.5	2.5
43RHM20-110S15W	10000	5110	12.5	2.5
43RHM20-110S24W	56000	13000	21.5	2.5

Trim-Up

EXTERNAL OUTPUT TRIMMING

Output can be externally trimmed by using the method shown below

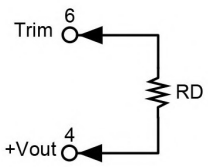


□□S05W											
ΔV	**(%)**	1	2	3	4	5	6	7	8	9	10
Vout	(V)	5.05	5.10	5.15	5.20	5.25	5.30	5.350	5.40	5.45	5.50
RU	(kΩ)	253.450	125.700	83.117	61.825	49.050	40.533	34.450	29.888	26.339	23.500
S5P1W											
ΔV	(%)	1	2	3	4	5	6	7	8	9	10
Vout	(V)	5.151	5.202	5.253	5.304	5.355	5.406	5.457	5.508	5.559	5.610
RU	(kΩ)	248.440	123.195	81.447	60.573	48.048	39.698	33.734	29.261	25.782	22.999
□□S12W											
ΔV	(%)	1	2	3	4	5	6	7	8	9	10
Vout	(V)	12.12	12.24	12.36	12.48	12.60	12.72	12.84	12.96	13.08	13.20
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	(%)	1	2	3	4	5	6	7	8	9	10
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

Trim-Up (continued)

□□**S24W**											
△V	(%)	1	2	3	4	5	6	7	8	9	10
Vout	(V)	24.24	24.48	24.72	24.96	25.20	25.44	25.68	25.92	26.16	26.40
RU	(kΩ)	570.333	278.667	181.444	132.833	103.667	84.222	70.333	59.917	51.815	45.333
△V	(%)	11	12	13	14	15	16	17	18	19	20
Vout	(V)	26.64	26.88	27.12	27.36	27.60	27.84	28.08	28.32	28.56	28.80
RU	(kΩ)	40.030	35.611	31.872	28.667	25.889	23.458	21.314	19.407	17.702	16.167

Trim-down



□□**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
RU	(kΩ)	248.340	120.590	78.007	56.715	43.940	35.423	29.340	24.778	21.229	18.390
□□**S5P1W**											
△V	(%)	1	2	3	4	5	6	7	8	9	10
Vout	(V)	5.049	4.998	4.947	4.869	4.845	4.794	4.743	4.692	4.641	4.590
RU	(kΩ)	253.350	123.095	79.677	57.968	44.942	36.258	30.056	25.404	21.786	18.891
□□**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
RU	(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
RU	(kΩ)	818.223	401.557	262.668	193.223	151.557	123.779	103.938	89.057	77.483	68.223
□□**S24W**											
△V	(%)	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
RU	(kΩ)	4947.667	2439.333	1603.222	1185.167	934.333	767.111	647.667	558.083	488.407	432.667