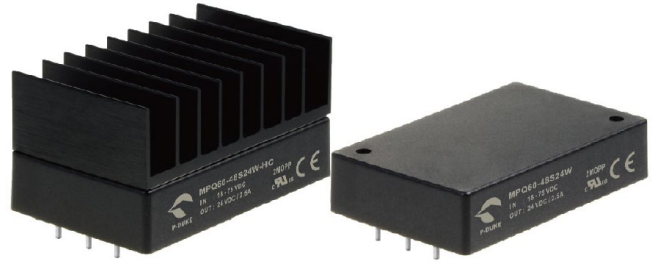


## Features

- 4:1 Wide Input Range
- Operating Temperature Range: -40~105°C
- Approved to cURus, UKCA, CE, RoHS & REACH
- Safety Standards to IEC/UL/EN62368-1 & EC/EN/ ANSI/ AAMI ES 60601-1
- Efficiency up to 92.5%
- EMC Class A & B
- Single output 9~75V DC
- Available with optional Heat-Sink



Ideal Power's 43MPQ60-xyxW 60W Series Pin Connection DC/DC Converters are certified to cURus, UKCA, CE, FCC, CB, RoHS, REACH & EC/ EN/ ANSI/ AAMI ES 60601-1 & IEC/ EN/ UL 62368-1 Standards and comply with the relevant Efficiency Regulations. These are primarily used in ITE, Video & Audio, Medical Industries and customised solutions are available upon request.

### Part Number Structure

MPQ60	-	48	S	05	W	-	N	HS
Series Name		Input Voltage (VDC)	Output Quantity	Output Voltage (VDC)	Input Range		Remote On/Off Options	Assembly Options
		24: 9 ~ 36 48: 18 ~ 75	S: Single  D: Dual	05:5 12:12 15:15 24:24  12:±12 15:±15	W : 41		□: Positive logic N: Negative logic	□: None HS: 7GA0131P01-F; H=0.65"

**Models**

Model Number	Input Range V DC	Output Voltage V DC	Output current @ Full Load A	Input Current @ No Load A	Efficiency %	Maximum Capacitor Load μF
43MPQ60-24S05W	9 ~ 36	5	12	15	89.5	17000
43MPQ60-24S5P1W	9 ~ 36	5.1	12	15	89.5	17000
43MPQ60-24S12W	9 ~ 36	12	5	15	91.5	3000
43MPQ60-24S15W	9 ~ 36	15	4	15	90	1900
43MPQ60-24S24W	9 ~ 36	24	2.5	15	90	730
43MPQ60-24D12W	9 ~ 36	±12	±2.5	15	90	±1500
43MPQ60-24D15W	9 ~ 36	±15	±2	15	90	±940
43MPQ60-48S05W	18 ~ 75	5	12	10	89.5	17000
43MPQ60-48S5P1W	18 ~ 75	5.1	12	10	89.5	17000
43MPQ60-48S12W	18 ~ 75	12	5	10	92	3000
43MPQ60-48S15W	18 ~ 75	15	4	10	92.5	1900
43MPQ60-48S24W	18 ~ 75	24	2.5	10	90	730
43MPQ60-48D12W	18 ~ 75	±12	±2.5	15	90	±1500
43MPQ60-48D15W	18 ~ 75	±15	±2	15	90	±940

**Input Specifications**

Parameter	Conditions	Min	Typ	Max	Unit	
Operating input voltage range	24Vin(nom)	9	24	36	V DC	
	48Vin(nom)	18	48	75		
Start-up voltage	24Vin(nom)	--	--	9	V DC	
	48Vin(nom)	--	--	18		
Shutdown voltage	24Vin(nom)	7.8	8	8.6	V DC	
	48Vin(nom)	15.8	15	17.4		
Start-up time	Constant resistive load	Power up	--	30	60	ms
		Remote ON/OFF	--	30	60	
Input surge voltage	24Vin(nom)	--	--	50	V DC	
	48Vin(nom)	--	--	100		
Input filter		Pi Type				
Remote ON/OFF (Option)	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
Remote off input current			3		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	-0.2	--	+0.2		
		Dual	-1.0	--	+1.0	%	
Cross regulation	Asymmetrical load 25%/100% FL	Dual	-5.0	--	+5.0		
Voltage adjustability	Single output	5Vout, 5.1Vout, 12Vout	-10	--	+10		
		15Vout, 24Vout	-10	--	+20		
Maximum output deviation is inclusive of remote sense							
Remote sense	% of Vout(nom) If remote sense is not being used, Sense pins			--	10		
Measured by 20MHz bandwidth							
Ripple and noise		Single					
		With a 10µF/25V X7R MLCC	5Vout, 5.1Vout	--	75	--	
		With a 10µF/25V X7R MLCC	12Vout, 15Vout	--	100	--	mVp-p
		With a 4.7µF/50V X7R MLCC	24Vout	--	150	--	
		Dual					
		With a 10µF/25V 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	% of Vout(nom); Hiccup mode	Single					
		5Vout, 5.1Vout, 12Vout, 15Vout, 24Vout	--	120	--		
		Dual	--	130	--	%	
		±12Vout, ±15Vout	--	120	--		
Overload protection	% of Iout rated; Hiccup mode		--	150	195		
Short circuit protection			Continuous, automatic recovery				
MTBF	MIL-HDBK-217F, Full load		1.064 x 10 <sup>6</sup> hrs				

**General Specifications**

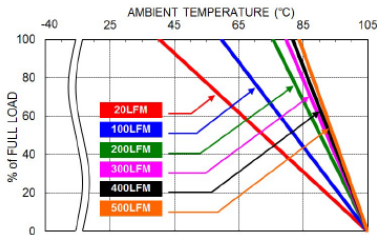
Parameter	Conditions		Min	Typ	Max	Unit
Isolation voltage	1 minute		5000	--	--	V AC
	Reinforced insulation for 250 VAC working voltage					
Isolation resistance	500V DC		10	--	--	GΩ
Isolation capacitance			--	40	--	pF
Leakage current	240V AC, 60Hz		--	4	4.5	µA
Switching frequency			225	250	275	kHz
Clearance/Creepage			8	--	--	mm
Safety approvals	EC/ EN/ ANSI/AAMI ES 60601-1		UL:E360199			
	IEC/ EN/ UL 62368-1		UL:E193009			
			CB:UL(Demko)			
Case material			Non-conductive black plastic			
Base material			Non-conductive black plastic			
Potting material			Silicone (UL94 V-0)			
Weight			51g (1.80oz)			

**Environmental Specifications**

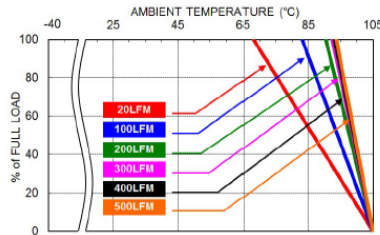
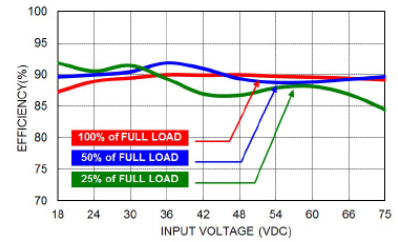
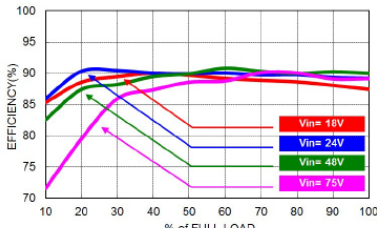
Parameter	Conditions		Min	Typ	Max	Unit
Operating ambient temperature	With derating		-40	--	+105	°C
Maximum case temperature			--	--	105	°C
Over temperature protection			--	115	--	°C
Storage temperature range			-55	--	+125	°C
Thermal impedance	Natural convection	Without Heat-sink	--	9.7	--	°C/W
		With Heat-sink	--	5.5	--	
Operating altitude			--	--	5000	m
Thermal Shock						MIL-STD-810F
Shock						MIL-STD-810F
Vibration						MIL-STD-810F
Relative humidity						5% to 95% RH

**EMC Specifications**

Parameter	Conditions		Level
EMI	EN55011, EN55032, EN60601-1-2	With external components	Class A, Class B
EMS	EN55024 and EN60601-1-2		
ESD	EN61000-4-2	Air ± 15kV and Contact ± 8kV	Perf. Criteria A
Radiated immunity	EN61000-4-3	10 V/m	Perf. Criteria A
Fast transient	EN61000-4-4	± 2kV	Perf. Criteria A
	43MPQ60-24□□□W	With 2 pcs of aluminum electrolytic capacitor (Nippon chemi-con KY series, 220µF/100V) and a TVS (SMDJ58A, 58V, 3000-Watt peak pulse power) in parallel.	
	43MPQ60-48□□□W	With 2 pcs of aluminum electrolytic capacitor (Nippon chemi-con KY series, 220µF/100V) and a TVS (SMDJ120A,120V, 3000-Watt peak pulse power) in parallel.	
Surge	EN61000-4-5	± 1kV	Perf. Criteria A
	43MPQ60-24□□□W	With 2 pcs of aluminum electrolytic capacitor (Nippon chemi-con KY series, 220µF/100V) and a TVS (SMDJ58A, 58V, 3000-Watt peak pulse power) in parallel.	
	43MPQ60-48□□□W	With 2 pcs of aluminum electrolytic capacitor (Nippon chemi-con KY series, 220µF/100V) and a TVS (SMDJ120A,120V, 3000-Watt peak pulse power) in parallel.	
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**


43MPQ60-48S24W Derating Curve


 43MPQ60-48S24W Derating Curve  
 With Heat-sink

 43MPQ60-48S24W Efficiency vs. Input  
 Voltage

 43MPQ60-48S24W Efficiency vs.  
 Output Load

**Fuse Considerations**

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.

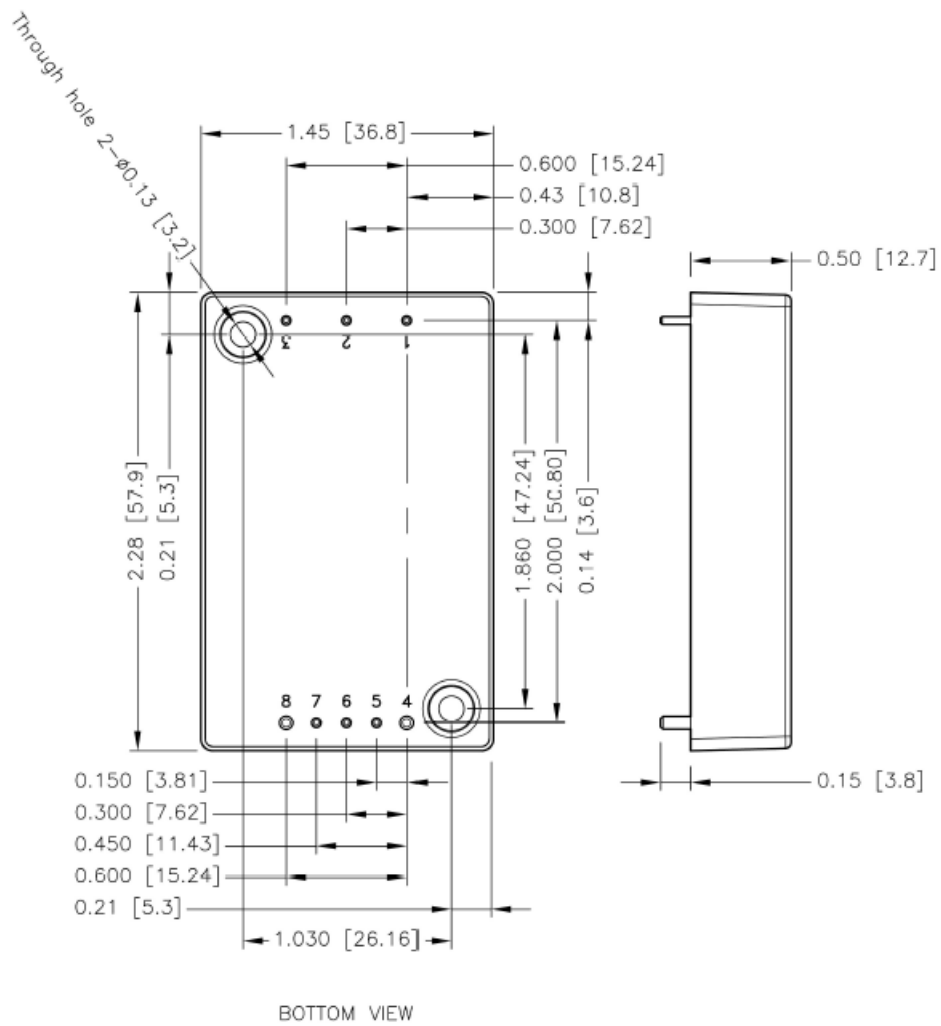
To maximum flexibility, internal fusing is not included; however, to achieve maximum safety and system protection, always use an input line fuse.

The input line fuse suggest as below :

Model	Fuse Rating (A)	Fuse Type
43MPQ60-24□□□W	10	Fast-Acting
43MPQ60-48□□□W	6.3	Slow-Blow

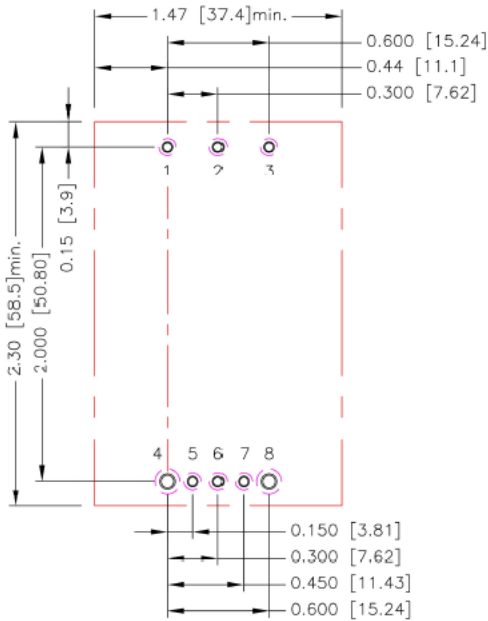
The table based on the information provided in this data sheet on inrush energy and maximum DC input current at low Vin.

Mechanical Drawing



Pin Connection

Pin	Single	Dual
1	- Vin	- Vin
2	Ctrl	Ctrl
3	+ Vin	+ Vin
4	- Vout	- Vout
5	- Sense	- Sense
6	Trim	Common
7	+ Sense	+ Sense
8	+ Vout	+ Vout

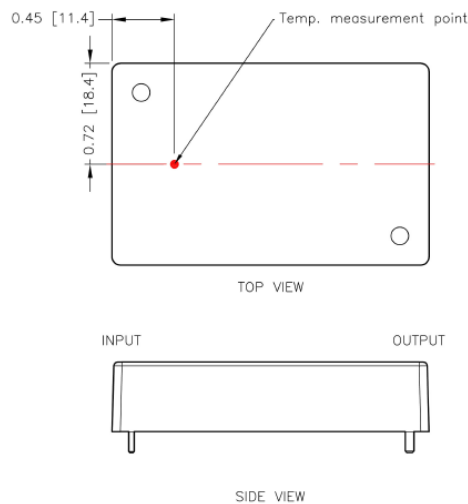
**Recommended Pad Layout**


All dimensions in inch[mm]  
 Pad size(lead free recommended)  
 Through hole 1.2.3.5.6.7:  $\varnothing 0.051[1.30]$   
 Through hole 4.8:  $\varnothing 0.075[1.90]$   
 Top view pad 1.2.3.5.6.7:  $\varnothing 0.064[1.63]$   
 Top view pad 4.8:  $\varnothing 0.094[2.38]$   
 Bottom view pad 1.2.3.5.6.7:  $\varnothing 0.102[2.60]$   
 Bottom view pad 4.8:  $\varnothing 0.150[3.80]$

**Thermal Considerations**

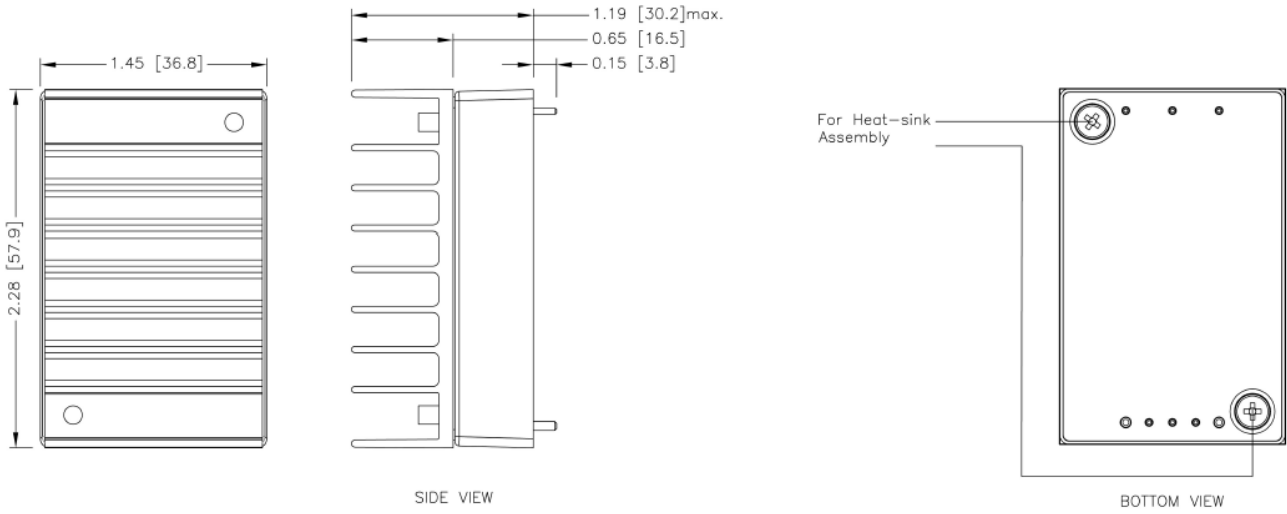
The power module operates in a variety of thermal environments. However, sufficient cooling should be provided to help ensure reliable operation of the unit. Heat is removed by conduction, convection, and radiation to the surrounding Environment. Proper cooling can be verified by measuring the point 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).



**Heat-Sink Type Options**

43MPQ60-□□□W-**HS**  
7GA0131P01-F



1. All dimensions in inch [mm]
2. Tolerance :x.xx±0.02 [x.x±0.5]



## Output Voltage Adjustment

Output voltage is adjustable for 10% trim up or -20% trim down of nominal output voltage by connecting an external resistor between the Trim pin and either the +Sense or -Sense pins. With an external resistor between the Trim and -Sense pin, the output voltage set point decreases. With an external resistor between the Trim and +Sense pin, the output voltage set point increases. Maximum output deviation is +10% inclusive of remote sense. The external TRIM resistor needs to be at least 1/8W of rated power.

### ■ Trim Up Equation

$$R_U = \left( \frac{V_{OUT}(100 + \Delta\%) - 100 + 2\Delta\%}{1.225\Delta\%} - \frac{100 + 2\Delta\%}{\Delta\%} \right) k\Omega$$

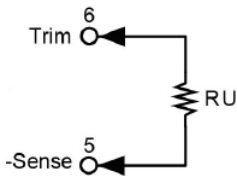
### ■ Trim Down Equation

$$R_D = \left( \frac{100}{\Delta\%} - 2 \right) k\Omega$$

## Trim Up

### EXTERNAL OUTPUT TRIMMING

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



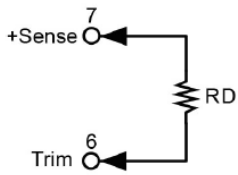
□□S05W										
ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	5.05	5.10	5.15	5.20	5.25	5.30	5.35	5.40	5.45	5.50
RU (kΩ)	35.360	16.244	9.752	6.483	4.514	3.198	2.257	1.550	1.000	0.559
□□S5P1W										
ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	5.151	5.202	5.253	5.304	5.355	5.406	5.457	5.508	5.559	5.610
RU (kΩ)	36.753	16.700	10.001	6.649	4.637	3.295	2.337	1.618	1.059	0.611
□□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)	392.864	172.175	101.446	66.591	45.837	32.068	22.264	14.929	9.234	4.685
□□S15W										
ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	15.15	15.30	15.45	15.60	15.75	15.90	16.05	16.20	16.35	16.50
RU (kΩ)	413.163	198.115	125.754	89.445	67.618	53.050	42.636	34.820	28.739	23.872
□□S24W										
ΔV (%)	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)	947.146	472.772	303.499	216.605	163.724	128.153	102.589	83.329	68.298	56.240
□□S48W										
ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	26.64	26.88	27.12	27.36	27.60	27.84	28.08	28.32	28.56	28.80
RU (kΩ)	46.353	38.099	31.104	25.101	19.892	15.330	11.302	7.718	4.509	1.619

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**Trim Down**


□□S05W										
ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	4.95	4.90	4.85	4.80	4.75	4.70	4.65	4.60	4.55	4.50
RU (kΩ)	46.686	20.817	12.360	8.162	5.653	3.984	2.794	1.903	1.210	0.656
□□S5P1W										
ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	5.049	4.998	4.947	4.8960	4.845	4.794	4.743	4.692	4.641	4.590
RU (kΩ)	47.801	21.688	13.003	8.663	6.061	4.326	3.088	2.159	1.436	0.859
□□S12W										
ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	11.88	11.76	11.64	11.52	11.40	11.28	11.16	11.04	10.92	10.80
RU (kΩ)	435.294	201.116	120.429	79.573	54.894	38.371	26.535	17.639	10.709	5.157
□□S15W										
ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	14.85	14.70	14.55	14.40	14.25	14.10	13.95	13.80	13.65	13.50
RU (kΩ)	302.154	132.978	78.547	51.685	35.680	25.055	17.489	11.826	7.429	3.916
□□S24W										
ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	23.76	23.52	23.28	23.04	22.80	22.56	22.32	22.08	21.84	21.60
RU (kΩ)	736.063	326.672	192.473	125.790	85.913	59.383	40.459	26.282	15.263	6.454

DC - DC