

## Features

- 4:1 Wide Input Range
- Operating Temperature Range: -40°C~115°C
- Approved to UKCA, CE, CB, cURus, RoHS & REACH
- Safety Standards to IEC/UL/EN 62368-1, & EN 50155
- Efficiency up to 91%
- EMC Class A & B
- Single output 8.5~160V DC
- Available with optional Heatsink



Ideal Power's 43HAE200-xSyW 200W Half Brick DC/DC Converters Series are certified to UKCA, CE, CB, cURus, 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 DIP Type

43HAE200	-	48	S	05	W	-	P	Y	C	HS
Series Name		Input Voltage (VDC)	Output Quantity	Output Voltage (VDC)	Input Range		Ctrl and Pin Options	SYNC Options	CASE Pin Options	Assembly Options
		<b>24:</b> 8.5 ~ 36 9 ~ 36	<b>S:</b> Single	<b>3P3:</b> 3.3 <b>05:</b> 5	4:1		<input type="checkbox"/> : Negative logic 0.20" pin length <b>L:</b> Negative logic 0.145" pin length <b>P:</b> Positive logic 0.20" pin length <b>S:</b> Positive logic 0.145" pin length	<input type="checkbox"/> : No pin <b>Y:</b> SYNC	<input type="checkbox"/> : No pin <b>C:</b> CASE pin	<input type="checkbox"/> : None <b>Heat-sink type</b> <b>HS1:</b> 7G-0022A-F; H=0.45" <b>HS2:</b> 7G-0023A-F; H=0.24" <b>HS3:</b> 7G-0024A-F; H=0.45" <b>HS4:</b> 7GA0127P01-F; H=0.65" <b>HS5:</b> 7GA0128P01-F; H=1" <b>Through hole type</b> <b>TH:</b> No thread* *The module can't equip Heat-sink with TH option.
		<b>48:</b> 16.5 ~ 75		<b>12:</b> 12 <b>15:</b> 15 <b>24:</b> 24 <b>28:</b> 28 <b>48:</b> 48						
		<b>110:</b> 43 ~ 160								

### Part Number Structure Wall Mounted Type

43HAE200	-	48	S	05	W	-	P	TF1	R
Series Name		Input Voltage (VDC)	Output Quantity	Output Voltage (VDC)	Input Range		Ctrl and Pin Options	Assembly Options	Conformal Coating Options
		<b>24:</b> 8.5 ~ 36 9 ~ 36	<b>S:</b> Single	<b>3P3:</b> 3.3 <b>05:</b> 5	4:1		<input type="checkbox"/> : Negative logic 0.20" pin length <b>P:</b> Positive logic 0.20" pin length	<b>T:</b> Without EMC filter <b>TF1:</b> Integrated EMC filter and meets EN55032 Class A can be connected to PE	<input type="checkbox"/> : None <b>R:</b> Conformal coating
		<b>48:</b> 16.5 ~ 75		<b>12:</b> 12 <b>15:</b> 15 <b>24:</b> 24 <b>28:</b> 28 <b>48:</b> 48					
		<b>110:</b> 43 ~ 160							

No Y and C function for terminal block type, and terminal block type only for 0.20" pin length.

**Input Specifications**

Model Number	Input Range	Output Voltage	Output Current @Full Load mA	Input Current @No Load mA	Efficiency %	Maximum Capacitor Load µF
43HAE200-24S3P3W	9 ~ 36	3.3	50	25	87	151000
43HAE200-24S05W	9 ~ 36	5	36	30	90	72000
43HAE200-24S12W	8.5 ~ 36	12	15	30	89	12500
43HAE200-24S15W	8.5 ~ 36	15	12	30	90	8000
43HAE200-24S24W	8.5 ~ 36	24	7.5	35	90	3100
43HAE200-24S28W	8.5 ~ 36	28	6.5	40	90	2300
43HAE200-24S48W	8.5 ~ 36	48	3.7	45	89	770
43HAE200-48S3P3W	16.5 ~ 75	3.3	50	20	88	151000
43HAE200-48S05W	16.5 ~ 75	5	40	20	91	80000
43HAE200-48S12W	16.5 ~ 75	12	18	20	90	20000
43HAE200-48S15W	16.5 ~ 75	15	14	20	91	9300
43HAE200-48S24W	16.5 ~ 75	24	9	20	90	3700
43HAE200-48S28W	16.5 ~ 75	28	7.5	25	91	2600
43HAE200-48S48W	16.5 ~ 75	48	4.5	25	90	930
43HAE200-110S3P3W	43 ~ 160	3.3	57	10	87	172000
43HAE200-110S05W	43 ~ 160	5	44	10	89	88000
43HAE200-110S12W	43 ~ 160	12	20	10	89	16600
43HAE200-110S15W	43 ~ 160	15	16	10	90	10600
43HAE200-110S24W	43 ~ 160	24	10	10	89	4100
43HAE200-110S28W	43 ~ 160	28	8.5	15	90	3000
43HAE200-110S48W	43 ~ 160	48	5	15	89	1000

**Input Specifications**

Parameter	Conditions	Min	Typ	Max	Unit		
Operating input voltage range		24Vin(nom)	3.3 & 5Vout	9	24	36	VDC
			Others	8.5	24	36	
		48Vin(nom)		16.5	48	75	
		110Vin(nom)		43	110	160	
Start-up voltage		24Vin(nom)		--	--	9	VDC
		48Vin(nom)		--	--	18	
		110Vin(nom)		--	--	43	
Shutdown voltage		24Vin(nom)		7.3	7.7	8.1	VDC
		48Vin(nom)		15.5	16	16.3	
		110Vin(nom)		33	34.5	36	
Start-up time	Constant resistive load	Power up		--	75	--	ms
		Remote ON/OFF		--	75	--	
Input surge voltage	1 second, max.	24Vin(nom)		--	--	50	VDC
		48Vin(nom)		--	--	100	
		110Vin(nom)		--	--	185	
Input filter (1)		Pi type					
Remote ON/OFF	Referred to –Vin pin	Negative logic (standard)	DC-DC ON	Short or 0 ~ 1.2VDC			
			DC-DC OFF	Open or 3 ~ 12 VDC			
		Positive logic (standard)	DC-DC ON	Open or 3 ~ 12 VDC			
			DC-DC OFF	Short or 0 ~ 1.2VDC			
		Input current of Ctrl pin	-0.5		1	mA	
		Remote off input current			3	mA	
Sync pin signal			-0.3		5.6	V DC	

**Output Specifications**

Parameter	Conditions	Min	Typ	Max	Unit
Voltage accuracy		-1.0	--	+1.0	%
Line regulation	Low Line to High Line at Full Load	-0.1	--	+0.1	%
Load regulation	No Load to Full Load	-0.1	--	+0.1	%
Voltage adjustability	Maximum output deviation is inclusive of remote sense	-20	--	+10	%
Remote sense	% Of Vout(nom) If remote sense is not being used, Sense pins should be connected to corresponding polarity OUTPUT pins.		--	10	%
Ripple and noise	Measured by 20MHz bandwidth				
	With a 1µF/25V X7R MLCC and a 22µF/25V POS-CAP	3.3Vout, 5Vout	--	75	--
	With a 1µF/25V X7R MLCC and a 22µF/25V POS-CAP	12Vout, 15Vout	--	100	--
	With a 4.7µF/50V X7R MLCC	24Vout, 28Vout	--	200	--
	With a 2.2µF/100V X7R MLCC	48Vout	--	300	--
Temperature coefficient		-0.02		+0.02	%/°C
Transient response recovery time	25% load step change	--	200	250	µs
Over voltage protection	% of Vout(nom); Hiccup mode	115	--	130	
Overload protection	% of Iout rated; Hiccup mode	120	--	150	%
Short circuit protection		Continuous, automatic recovery			

**General Specifications**

Parameter	Conditions	Min	Typ	Max	Unit
Isolation voltage	1 minute 110Vin(nom) (Reinforced insulation)	Input to Output		3000	--
		Input (Output) to Case		1500	--
	1 minute Others	Input to Output		3000	--
		Input (Output) to Case		1600	--
Isolation resistance	500VDC	1	--	--	GΩ
Isolation capacitance		--	--	2500	pF
Switching frequency		225	250	275	kHz
Safety approvals	IEC/ EN/ UL62368-1	UL:E193009 CB:UL(Demko)			
Standard approvals	EN50155 EN45545-2				
Case material	24Vin(nom) and 48Vin(nom)	Metal			
	110Vin(nom)	Aluminum baseplate with plastic case			
Base material	24Vin(nom) and 48Vin(nom)	FR4 PCB			
Potting material		Silicone (UL94 V-0)			
Weight	Module stand alone	105g (3.70oz)			
	43HAE200-□□S□□W -T	235g (8.29oz)			
	43HAE200-□□S□□W -TF1	287g (10.12oz)			
MTBF	MIL-HDBK-217F, Full load	2.961 x 10 <sup>5</sup> hrs			

**Environmental Specifications**

Parameter	Conditions	Min	Typ	Max	Unit
Operating base-plate temperature	Baseplate	-40	--	+115	°C
Maximum case temperature		--	--	115	
Over temperature protection		--	120		
Storage temperature range	Terminal block type	-40	--	+105	
	Others	-55	--	+125	
Thermal impedance	Module without assembly option	--	6.1	--	°C/W
	Only mount on the iron baseplate	--	2.8	--	
	Heat-sink type with 0.24" Height	--	5.1	--	
	Heat-sink type with 0.45" Height	--	4.6	--	
	Heat-sink type with 0.65" Height	--	3.2	--	
	Heat-sink type with 1" Height	--	2.5	--	
Thermal shock					MIL-STD-810F
Shock					EN61373, MIL-STD-810F
Vibration					EN61373, MIL-STD-810F
Relative humidity					5% to 95% RH

**EMC Specifications**

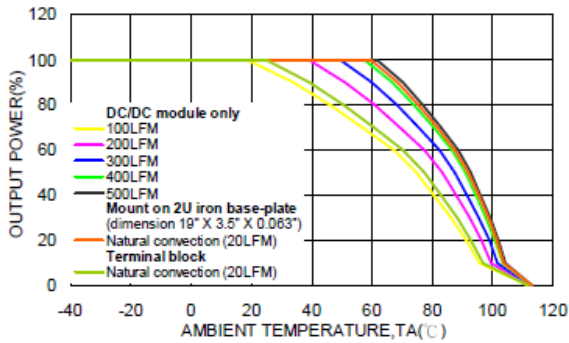
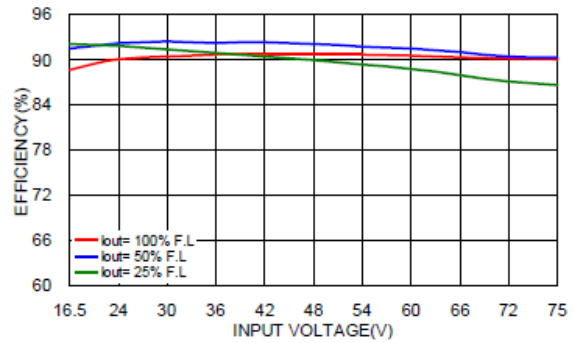
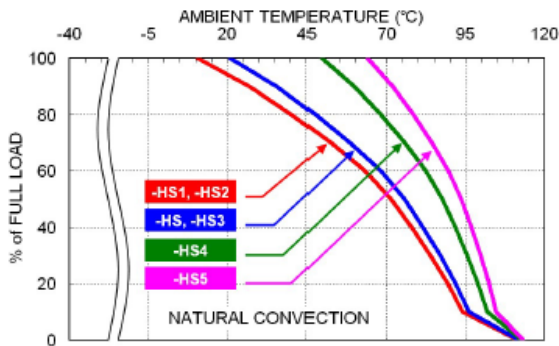
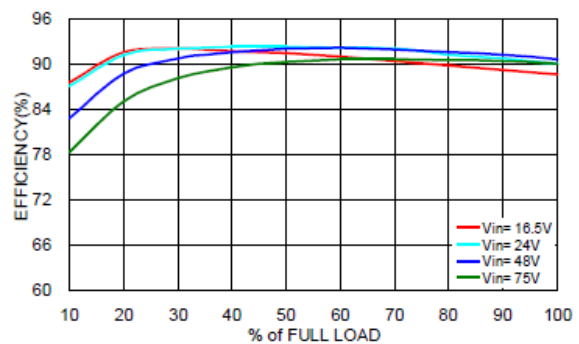
Parameter	Conditions	Level
EMI	EN55032, EN50121-3-2 43HAE200-□□S□□W-TF1	Class A
	Other models; with external components	Class A, Class B
	*Connecting four screw bolts to shield plane will help to reduce the EMI.	
EMS	EN55024 and EN50121-3-2	
ESD	EN61000-4-2 Air ± 8kV and Contact ± 6kV	Perf. Criteria A
Radiated immunity	EN61000-4-3 20 V/m	Perf. Criteria A
Fast transient	EN61000-4-4 ± 2kV	Perf. Criteria A
	43HAE200-24S□□W 43HAE200-48S□□W	With 2 pcs of aluminum electrolytic capacitor (Nippon Chemi-con KY series, 220µF/100V)
	43HAE200-110S□□W	With 2 pcs of aluminum electrolytic capacitor (Nippon Chemi-con KXJ series, 150µF/200V)
Surge	EN61000-4-5 ± 2kV	Perf. Criteria A
	43HAE200-24S□□W 43HAE200-48S□□W	With 2 pcs of aluminum electrolytic capacitor (Nippon Chemi-con KY series, 220µF/100V)
	43HAE200-110S□□W	With 2 pcs of aluminum electrolytic capacitor (Nippon Chemi-con KXJ series, 150µF/200V)
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

**Note:**

Input source impedance: The power module will operate as specifications without external components, if the source voltage has a very low impedance and reasonable input voltage regulation. Highly inductive source impedances can affect the stability of the power module. Since real-world voltage source has finite impedance, performance can be improved by adding external filter capacitor. The 43HAE200-24S□□W and 43HAE200-48S□□W recommended Nippon Chemi-con KY series, 100µF/100V. The 43HAE200-110S□□W recommended Ruby-con BXF series, 68µF/200V.

**CAUTION:**

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

**Characteristic Curve**

**43HAE200-48S05W Derating Curve**  
 (See Thermal Considerations)

**43HAE200-48S05W Efficiency vs. Output Load**

**43HAE200-48S05W Derating Curve with Heat-sink**  
 (See Thermal Considerations)

**43HAE200-48S05W Efficiency vs. Input Voltage**
**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.

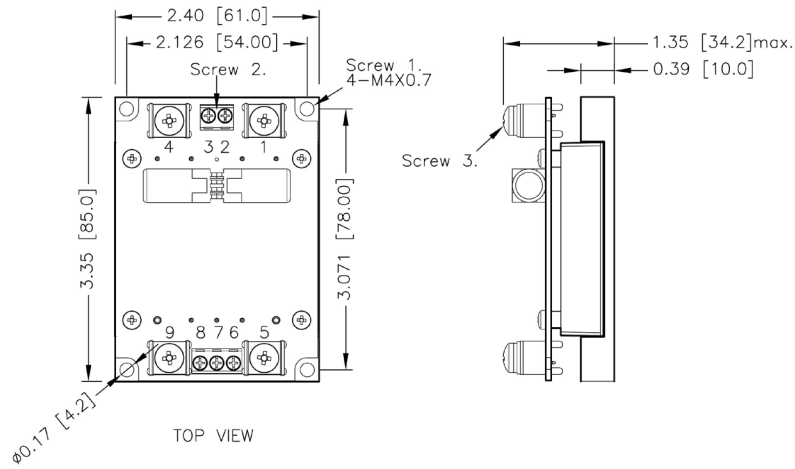
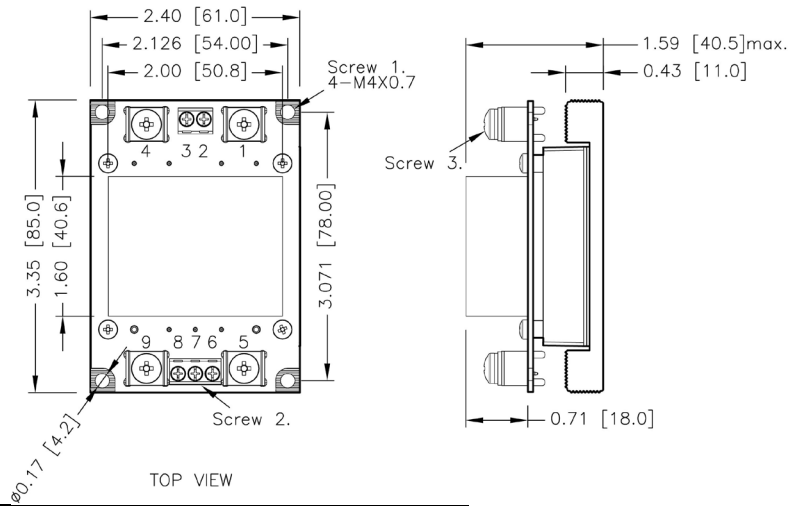
To maximum flexibility, internal fusing is not included; however, to achieve maximum safety and system protection, always use an input line fuse.

The input line fuse suggest as below :

Model	Fuse Rating (A)	Fuse Type
43HAE200-24S□□W	32	Fast-Acting
43HAE200-48S□□W	20	Fast-Acting
43HAE200-110S□□W	10	Fast-Acting

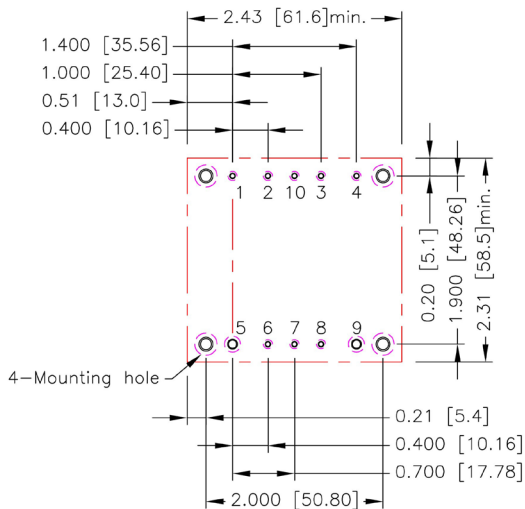
The table based on the information provided in this data sheet on inrush energy and maximum DC input current at low Vin.



**43HAE200-□□S□□W-T**

**43HAE200-□□S□□W-TF1**

**Terminal Connection**

Pin	Define
1	-Vin
2	NC
3	Ctrl
4	+Vin
5	-Vout
6	-Sense
7	Trim
8	+Sense
9	+Vout

1. All dimensions in inch [mm]
2. Tolerance :x.xx±0.02 [x.xx±0.5]  
x.xxx±0.01 [x.xx±0.25]
3. Screw 1 locked torque:  
MAX 11.2kgf-cm/ 1.10N-m
4. Screw 2 locked torque:  
MAX 5.2kgf-cm/ 0.51N-m
5. Screw 3 locked torque:  
MAX 16.8kgf-cm/ 1.65N-m

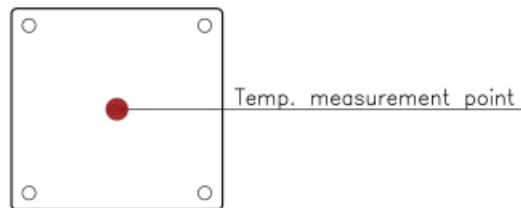
**Recommended Pad Layout**


All dimensions in inch[mm]  
 Pad size (lead free recommended)  
 Through hole 1,2,3,4,6,7,8,10:  $\Phi 0.051$ [1.30]  
 Through hole 5,9:  $\Phi 0.091$ [2.30]  
 Through hole of mounting:  $\Phi 0.126$ [3.20]  
 Top view pad 1,2,3,4,6,7,8,10:  $\Phi 0.064$ [1.63]  
 Top view pad 5,9:  $\Phi 0.113$ [2.88]  
 Top view pad of mounting:  $\Phi 0.157$ [4.00]  
 Bottom view pad 1,2,3,4,6,7,8,10:  $\Phi 0.102$ [2.60]  
 Bottom view pad 5,9:  $\Phi 0.181$ [4.60]  
 Bottom view pad of mounting:  $\Phi 0.252$ [6.40]

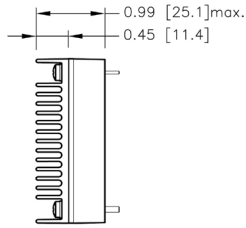
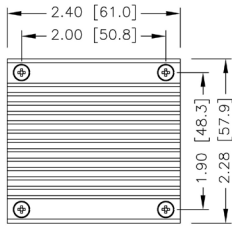
**Thermal Considerations**

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.

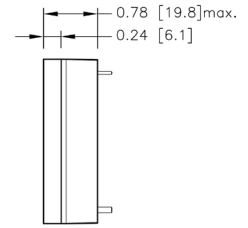
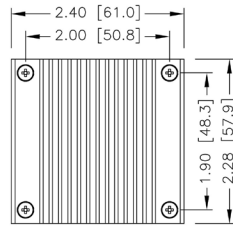
- Thermal test condition with vertical direction by natural convection (20LFM).
- The aluminum base-plate dimension is 19" X 3.5" X 0.063" (The height is EIA standard 2U).
- The heat-sink is optional and P/N: 7G-0021A-F, 7G-0022A-F, 7G-0023A-F, 7G-0024A-F, 7GA0127P01-F, 7GA0128P01-F.


**BASE PLATE**

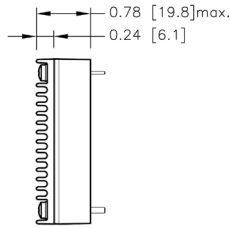
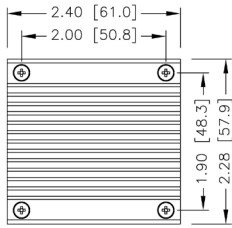


**Heat-Sink Options**
**43HAE200-□□S□□W –HS**  
 7G-0021A-F


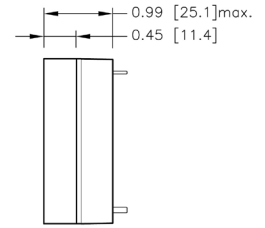
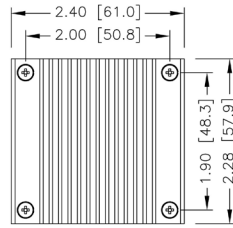
SIDE VIEW

**43HAE200-□□S□□W –HS1**  
 7G-0022A-F


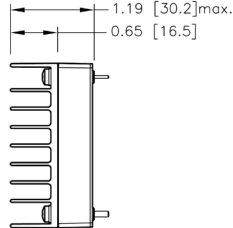
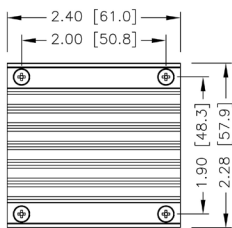
SIDE VIEW

**43HAE200-□□S□□W –HS2**  
 7G-0023A-F


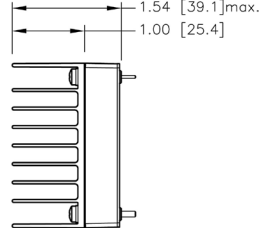
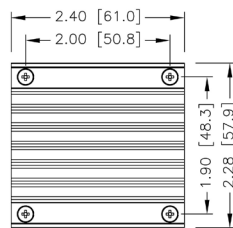
SIDE VIEW

**43HAE200-□□S□□W –HS3**  
 7G-0024A-F


SIDE VIEW

**43HAE200-□□S□□W –HS4**  
 7GA0127P01-F


SIDE VIEW

**43HAE200-□□S□□W –HS5**  
 7GA0128P01-F


SIDE VIEW

1. All dimensions in inch [mm]
2. Tolerance: x.xx±0.02 [x.x±0.5]  
 x.xxx±0.01 [x.xx±0.25]

### 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

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

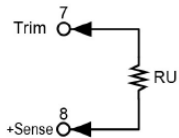
#### ■ Trim Down Equation

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

### Trim Up

#### EXTERNAL OUTPUT TRIMMING

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



#### □□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)	170.082	85.388	57.156	43.041	34.571	28.925	24.892	21.867	19.515	17.633

#### □□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)	310.245	156.163	104.803	79.122	63.714	53.442	46.105	40.602	36.322	32.898

#### □□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)	887.388	447.592	300.993	227.694	183.714	154.395	133.452	117.745	105.528	95.755

#### □□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)	1134.735	572.490	385.075	291.367	235.143	197.660	170.886	200.806	135.188	122.694

#### □□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)	1876.776	947.184	637.320	482.388	389.429	327.456	283.190	249.990	224.168	203.510

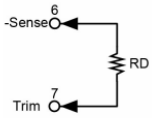
#### □□S28W

ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	28.28	28.56	28.84	29.12	29.40	29.68	29.96	30.24	30.52	30.80
RU (kΩ)	2206.571	1113.714	749.429	567.286	458.000	385.143	333.102	294.071	263.714	239.429

#### □□S48W

ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	48.48	48.96	49.44	49.92	50.40	50.88	51.36	51.84	52.32	52.80
RU (kΩ)	3855.551	1946.367	1309.973	991.776	800.857	673.578	582.665	514.480	461.447	419.020

Trim Down

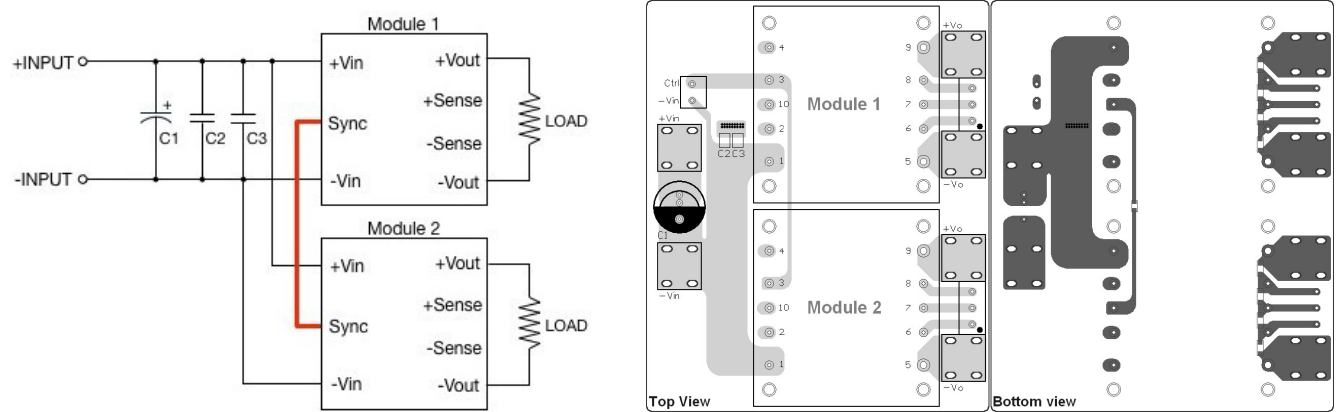


□□S□□W

$\Delta V$ (%)	1	2	3	4	5	6	7	8	9	10
RD (k $\Omega$ )	98.000	48.000	31.333	23.000	18.000	14.667	12.286	10.500	9.111	8.000
$\Delta V$ (%)	11	12	13	14	15	16	17	18	19	20
RD (k $\Omega$ )	7.091	6.333	5.692	5.143	4.667	4.250	3.882	3.556	3.263	3.000

Synchronous Pin

Multiple modules can be synchronized together simply by connecting the module SYNC pins together.



43HAE200-24S□□W-Y, 43HAE200-48S□□W -Y

Component	Value	Voltage	Reference
C1	220 $\mu$ F	100V	Nippon chemi-con KY-series
C2, C3	2.2 $\mu$ F	100V	1812 MLCC

43HAE200-110S□□W -Y

Component	Value	Voltage	Reference
C1	200 $\mu$ F	200V	Nippon chemi-con KXJ-series
C2, C3	1 $\mu$ F	250V	1812 MLCC