

## JHM10 Series



- International Medical Approvals
- 4000 VAC Reinforced Insulation
- Meets IEC60601-1, 3<sup>rd</sup> Edition
- 2  $\mu$ A Patient Leakage Current
- DIP-24 Package
- EN55011 Level A With No External Components
- 3 Year Warranty

## Specification

## Input

Input Voltage Range	<ul style="list-style-type: none"> <li>• 5 V (4.5-9 VDC)</li> <li>• 12 V (9-18 VDC)</li> <li>• 24 V (18-36 VDC)</li> </ul>
Input Current	<ul style="list-style-type: none"> <li>• See table</li> </ul>
Inrush Current	<ul style="list-style-type: none"> <li>• 20 A max at 36 V</li> </ul>
Input Filter	<ul style="list-style-type: none"> <li>• Pi network</li> </ul>
Patient Leakage Current	<ul style="list-style-type: none"> <li>• 2 <math>\mu</math>A max</li> </ul>
Undervoltage Lockout	<ul style="list-style-type: none"> <li>• 5 V models, on at &gt;4.4 V, off &lt;4.2 V</li> <li>• 12 V models, on at &gt;8.8 V, off &lt;8.3 V</li> <li>• 24 V models, on at &gt;17.5 V, off &lt;17.0 V</li> </ul>
Input Surge	<ul style="list-style-type: none"> <li>• 5 V models 15 V for 3 s</li> <li>• 12 V models 25 V for 3 s</li> <li>• 24 V models 50 V for 3 s</li> </ul>

## Output

Output Voltage	<ul style="list-style-type: none"> <li>• See table</li> </ul>
Output Voltage Trim	<ul style="list-style-type: none"> <li>• <math>\pm</math>10%</li> </ul>
Minimum Load	<ul style="list-style-type: none"> <li>• No minimum load required</li> </ul>
Initial Set Accuracy	<ul style="list-style-type: none"> <li>• <math>\pm</math>1% max on V1, <math>\pm</math>2% max on V2</li> </ul>
Start Up Delay	<ul style="list-style-type: none"> <li>• 5 ms typical</li> </ul>
Start Up Rise Time	<ul style="list-style-type: none"> <li>• 2 ms typical</li> </ul>
Line Regulation	<ul style="list-style-type: none"> <li>• <math>\pm</math>0.3% max</li> </ul>
Load Regulation	<ul style="list-style-type: none"> <li>• <math>\pm</math>2% max 0% to 10% load, <math>\pm</math>1% max 10% to 100% load</li> </ul>
Cross Regulation	<ul style="list-style-type: none"> <li>• <math>\pm</math>4% max on dual with one output set to 50% load and the other varied from 10% to 100% load (D05 is 20% to 100%)</li> </ul>
Transient Response	<ul style="list-style-type: none"> <li>• 4% max deviation, recovery to within 1% in &lt;500 <math>\mu</math>s for a 50% load change at 0.25 A/<math>\mu</math>s rate</li> </ul>
Ripple & Noise	<ul style="list-style-type: none"> <li>• 1% pk-pk max at 20 MHz bandwidth</li> </ul>
Overload Protection	<ul style="list-style-type: none"> <li>• 120% - 200%, trip and restart</li> </ul>
Overvoltage Protection	<ul style="list-style-type: none"> <li>• 115% - 140%</li> </ul>
Temperature Coefficient	<ul style="list-style-type: none"> <li>• <math>\pm</math>0.03/<math>^{\circ}</math>C max</li> </ul>
Short Circuit Protection	<ul style="list-style-type: none"> <li>• Trip and Restart (hiccup mode), auto recovery</li> </ul>

## General

Efficiency	<ul style="list-style-type: none"> <li>• See tables</li> </ul>
Isolation	<ul style="list-style-type: none"> <li>• 4000 VAC for 1 min. double/reinforced with a working voltage of 250 VAC. Meets 2 x MOPP per 3rd edition of IEC60601-1 5000 VAC for 10 ms in accordance with IEC60664-1</li> </ul>
Input to Output Capacitance	<ul style="list-style-type: none"> <li>• 20 pF max</li> </ul>
Switching Frequency	<ul style="list-style-type: none"> <li>• 80 kHz to 1.2 MHz variable</li> </ul>
Power Density	<ul style="list-style-type: none"> <li>• 20.0 W/in<sup>3</sup></li> </ul>
MTBF	<ul style="list-style-type: none"> <li>• &gt;1 Mhrs typical to MIL-STD-217F at 25 <math>^{\circ}</math>C, GB</li> </ul>

## Environmental

Operating Temperature	<ul style="list-style-type: none"> <li>• -40 <math>^{\circ}</math>C to +80 <math>^{\circ}</math>C, see derating curve</li> </ul>
Case Temperature	<ul style="list-style-type: none"> <li>• +100 <math>^{\circ}</math>C max</li> </ul>
Storage Temperature	<ul style="list-style-type: none"> <li>• -40 <math>^{\circ}</math>C to +100 <math>^{\circ}</math>C</li> </ul>
Operating Humidity	<ul style="list-style-type: none"> <li>• 5-90%, non-condensing</li> </ul>
Cooling	<ul style="list-style-type: none"> <li>• Natural convection</li> </ul>

## EMC &amp; Safety

Emissions	<ul style="list-style-type: none"> <li>• EN55011 &amp; EN55022 level A conducted &amp; radiated with no external components</li> </ul>
Immunity	<ul style="list-style-type: none"> <li>• IEC60601-1-2, EN61204-3</li> </ul>
ESD Immunity	<ul style="list-style-type: none"> <li>• EN61000-4-2, level 2, Perf Criteria A</li> </ul>
Radiated Immunity	<ul style="list-style-type: none"> <li>• EN61000-4-3, 10 V/m Perf Criteria A</li> </ul>
EFT/Burst	<ul style="list-style-type: none"> <li>• EN61000-4-4, level 2 Perf Criteria A</li> </ul>
Surge	<ul style="list-style-type: none"> <li>• EN61000-4-5, level 1 Perf Criteria A</li> </ul>
Conducted Immunity	<ul style="list-style-type: none"> <li>• EN61000-4-6, 10 Vm, Perf Criteria A</li> </ul>
Magnetic Field	<ul style="list-style-type: none"> <li>• EN61000-4-8, 3 A/m Perf Criteria A</li> </ul>
Safety Approvals	<ul style="list-style-type: none"> <li>• UL60601-1 1<sup>st</sup> Edition, CSA-22.2 No.601.1-M90, 2005 IEC60601-1 3<sup>rd</sup> Edition</li> </ul>

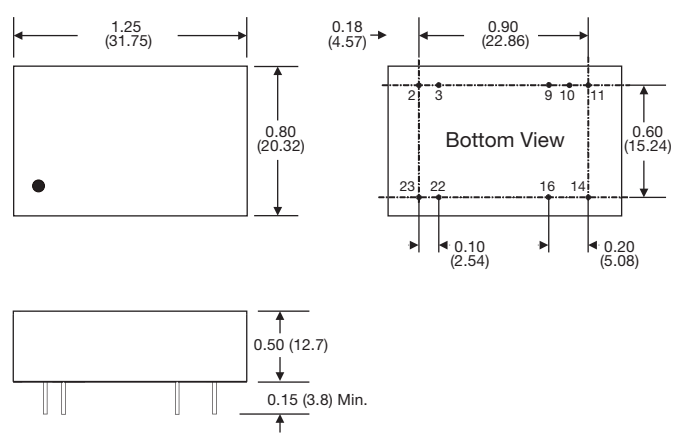
## Models and Ratings

Input Voltage	Output Voltage	Output Current	Input Current		Maximum Capacitive Load	Efficiency <sup>(3)</sup>	Model Number
			No Load <sup>(1)</sup>	Full Load <sup>(2)</sup>			
4.5-9 V	5.0 V	2000 mA	100 mA	2690 mA	2200 $\mu$ F	83.5%	JHM1005S05
	12.0 V	833 mA	115 mA	2640 mA	1000 $\mu$ F	85.0%	JHM1005S12
	15.0 V	666 mA	115 mA	2640 mA	680 $\mu$ F	85.0%	JHM1005S15
	$\pm$ 5.0 V	$\pm$ 1000 mA	130 mA	2760 mA	$\pm$ 1000 $\mu$ F	81.5%	JHM1005D05
	$\pm$ 12.0 V	$\pm$ 420 mA	115 mA	2695 mA	$\pm$ 470 $\mu$ F	84.0%	JHM1005D12
	$\pm$ 15.0 V	$\pm$ 333 mA	115 mA	2670 mA	$\pm$ 470 $\mu$ F	84.0%	JHM1005D15
9-18 V	5.0 V	2000 mA	50 mA	1310 mA	2200 $\mu$ F	86.0%	JHM1012S05
	12.0 V	833 mA	50 mA	1280 mA	1000 $\mu$ F	88.0%	JHM1012S12
	15.0 V	666 mA	50 mA	1265 mA	680 $\mu$ F	89.0%	JHM1012S15
	$\pm$ 5.0 V	$\pm$ 1000 mA	50 mA	1345 mA	$\pm$ 1000 $\mu$ F	84.0%	JHM1012D05
	$\pm$ 12.0 V	$\pm$ 420 mA	50 mA	1290 mA	$\pm$ 470 $\mu$ F	88.0%	JHM1012D12
	$\pm$ 15.0 V	$\pm$ 333 mA	50 mA	1280 mA	$\pm$ 470 $\mu$ F	88.0%	JHM1012D15
18-36 V	5.0 V	2000 mA	25 mA	645 mA	2200 $\mu$ F	87.0%	JHM1024S05
	12.0 V	833 mA	20 mA	630 mA	1000 $\mu$ F	89.0%	JHM1024S12
	15.0 V	666 mA	20 mA	630 mA	680 $\mu$ F	89.0%	JHM1024S15
	$\pm$ 5.0 V	$\pm$ 1000 mA	20 mA	660 mA	$\pm$ 1000 $\mu$ F	85.0%	JHM1024D05
	$\pm$ 12.0 V	$\pm$ 420 mA	25 mA	640 mA	$\pm$ 470 $\mu$ F	88.0%	JHM1024D12
	$\pm$ 15.0 V	$\pm$ 333 mA	25 mA	635 mA	$\pm$ 470 $\mu$ F	88.0%	JHM1024D15

### Notes

1. Input current measured at nominal input voltage.
2. Input current measured at lowest input voltage.
3. Typical values.

## Mechanical Details



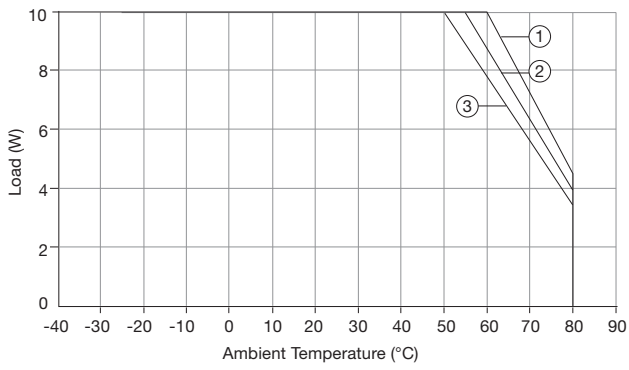
Pin	Pin Connections	
	Single	Dual
2	-Vin	-Vin
3	-Vin	-Vin
9	No Pin	Common
10	Trim	Trim
11	No Pin	-Vout
14	+Vout	+Vout
16	-Vout	Common
22	+Vin	+Vin
23	+Vin	+Vin

### Notes

1. All dimensions are in inches (mm)
2. Weight: 0.04 lbs (20 g) approx.
3. Pin diameter: 0.02  $\pm$ 0.002 (0.5  $\pm$ 0.05)
4. Pin pitch tolerance:  $\pm$ 0.01 ( $\pm$ 0.25)
5. Case tolerance:  $\pm$ 0.02 ( $\pm$ 0.5)

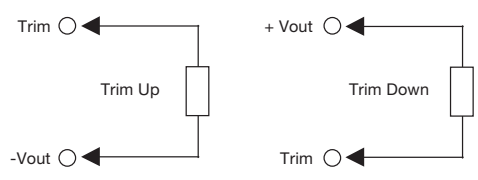
## Application Notes

### Derating Curve



- ① JHM1012/24 S05, S12, S15, D12, D15
- ② JHM1012/24 D05, JHM1005S05, S12, S15, D12, D15
- ③ JHM1005D05

### External Output Trim



For 5 V output:  
Trim +10%, R = 3.4 k typical  
Trim -10%, R = 1 k typical

For 12 V output:  
Trim +10%, R = 5.9 k typical  
Trim -10%, R = 11.3 k typical

For 15 V output:  
Trim +10%, R = 8.3 k typical  
Trim -10%, R = 10 k typical

For  $\pm$ 5 V output:  
Trim +10%, R = 12.0 k typical  
Trim -10%, R = 8.0 k typical

For  $\pm$ 12 V output:  
Trim +10%, R = 12.8 k typical  
Trim -10%, R = 9.5 k typical

For  $\pm$ 15 V output:  
Trim +10%, R = 18 k typical  
Trim -10%, R = 14.8 k typical