

# 3/6 Watts

## JHM Series



- International Medical Approvals
- 3000 VAC Reinforced Insulation
- 60 ° C Operation Without Derating
- 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>• 12 V (10-17 VDC)</li> <li>• 24 V (20-30 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>• 25 A max at 30 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>• 12 V model, on at &lt;9 V, off &gt;8.5 V</li> <li>• 24 V model on at &lt;18.8 V, off &gt;16 V</li> </ul>
Input Surge	<ul style="list-style-type: none"> <li>• 12 V models 25 V for 3 s</li> <li>• 24 V model 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</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,</li> <li>• <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 0% to 100% load</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 20 MHz bandwidth</li> </ul>
Overload Protection	<ul style="list-style-type: none"> <li>• 120% - 200%</li> </ul>
Overvoltage Protection	<ul style="list-style-type: none"> <li>• 120% - 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>• 5000 VAC for 10 ms (acc. to IEC60664-1), 3000 VAC reinforced isolation for 1 min.</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>• JHM03: 180 kHz to 1.2 MHz variable</li> <li>• JHM06: 200 kHz to 1.6 MHz variable</li> </ul>
Power Density	<ul style="list-style-type: none"> <li>• JHM03: 7.5 W/in<sup>3</sup>, JHM06: 17.0 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>• -20 <math>^{\circ}</math>C to +100 <math>^{\circ}</math>C, derate from 100% load at +60 <math>^{\circ}</math>C to no load at 100 <math>^{\circ}</math>C</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 & 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 3 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>• ANSI/AMMI ES60601-1 3rd Edition</li> <li>• CSA-22.2 No.60601-1:2008</li> <li>• IEC60601-1 3rd Edition</li> </ul>

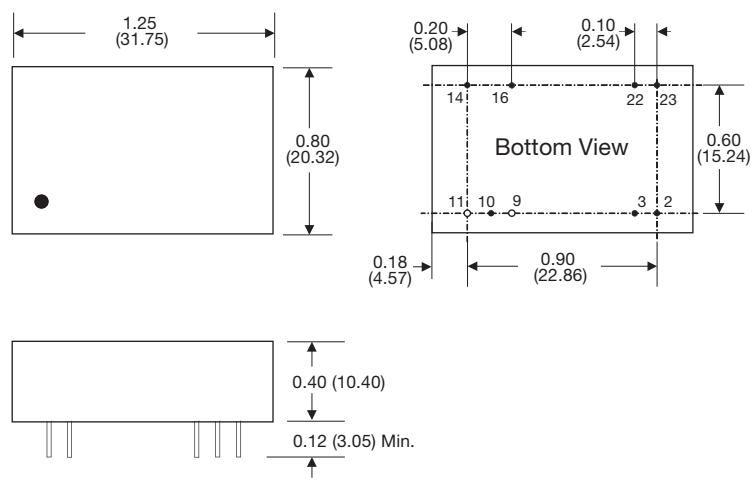
## Models and Ratings

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>			
10-17 V	5.0 V	600 mA	52 mA	380 mA	720 $\mu$ F	75%	JHM0312S05
	12.0 V	250 mA	64 mA	370 mA	300 $\mu$ F	77%	JHM0312S12
	15.0 V	200 mA	64 mA	370 mA	240 $\mu$ F	78%	JHM0312S15
	$\pm$ 12.0 V	$\pm$ 125 mA	66 mA	400 mA	$\pm$ 140 $\mu$ F	80%	JHM0312D12
	$\pm$ 15.0 V	$\pm$ 100 mA	85 mA	400 mA	$\pm$ 120 $\mu$ F	80%	JHM0312D15
20-30 V	5.0 V	600 mA	47 mA	210 mA	720 $\mu$ F	74%	JHM0324S05
	12.0 V	250 mA	42 mA	200 mA	300 $\mu$ F	77%	JHM0324S12
	15.0 V	200 mA	29 mA	190 mA	240 $\mu$ F	81%	JHM0324S15
	$\pm$ 12.0 V	$\pm$ 125 mA	40 mA	200 mA	$\pm$ 140 $\mu$ F	80%	JHM0324D12
	$\pm$ 15.0 V	$\pm$ 100 mA	50 mA	190 mA	$\pm$ 120 $\mu$ F	80%	JHM0324D15
10-17 V	5.0 V	1200 mA	72 mA	790 mA	1200 $\mu$ F	78%	JHM0612S05
	12.0 V	500 mA	86 mA	750 mA	500 $\mu$ F	80%	JHM0612S12
	15.0 V	400 mA	85 mA	740 mA	400 $\mu$ F	83%	JHM0612S15
	$\pm$ 12.0 V	$\pm$ 250 mA	60 mA	730 mA	$\pm$ 250 $\mu$ F	83%	JHM0612D12
	$\pm$ 15.0 V	$\pm$ 200 mA	80 mA	730 mA	$\pm$ 200 $\mu$ F	84%	JHM0612D15
20-30 V	5.0 V	1200 mA	44 mA	380 mA	1200 $\mu$ F	78%	JHM0624S05
	12.0 V	500 mA	39 mA	360 mA	500 $\mu$ F	83%	JHM0624S12
	15.0 V	400 mA	27 mA	350 mA	400 $\mu$ F	85%	JHM0624S15
	$\pm$ 12.0 V	$\pm$ 250 mA	37 mA	360 mA	$\pm$ 250 $\mu$ F	83%	JHM0624D12
	$\pm$ 15.0 V	$\pm$ 200 mA	39 mA	360 mA	$\pm$ 200 $\mu$ F	83%	JHM0624D15

### Notes

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

## Mechanical Details



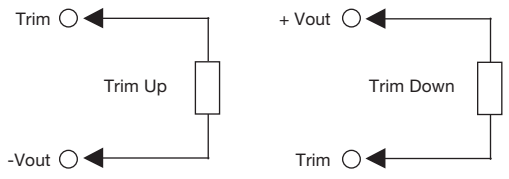
Pin Connections		
Pin	Single	Dual
2	-Vin	-Vin
3	-Vin	-Vin
9	No Pin	Common
10	Trim	Trim
11	No Pin	-Vout
14	+Vout	+Vout
16	-Vout	Common
22	+Vin	+Vin
23	+Vin	+Vin

### 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:  $\pm$ 0.014 ( $\pm$ 0.35)
5. Case tolerance:  $\pm$ 0.02 ( $\pm$ 0.5)

## Application Notes

### 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  $\pm$ 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