# ARTESYN PTH04040

3.3 / 5.0 Vin Single Output



Advanced Energy's Artesyn PTH04040 series non-isolated DC-DC converter complies with the Point-of-Load Alliance (POLA) standard. It offers some of the most advanced POL functions in the industry, including Auto-Track™ sequencing for controlled power-up/power-down of complex semiconductor devices such as DSPs, FPGAs and ASICs, and voltage margining. Standard features include pre-bias startup, programmable input undervoltage lockout, differential remote sense, remote On/Off and auto resetting short-circuit protection.

PTH04040 series converters have an input voltage range of 2.95 to 5.5 Vdc and an output voltage that can be trimmed from 0.8 to 2.5 Vdc to meet a wide variety of semiconductor power needs. Rated at 150 watts, the converters offer up to 93% efficiency and can deliver up to 60 amps. Available in through-hole horizontal mount and surface-mount versions, they have a small 1 x 2 inch (26.5 x 52 mm) footprint and an installed height of just 0.35 inch (9 mm).

DATA SHEET

**Total Power:**

150 Watts

**Input Voltage:**

2.95 - 5.5 Vdc

**# of Outputs:**

Single

RoHS 6/6 COMPLIANT

*Auto-track is a trademark of Texas Instruments.

## SPECIAL FEATURES

- 60 A output current(7)
- 3.3/5 V input voltage (2.95 - 5.5 Vdc)
- Wide-output voltage adjust (0.8 V - 2.5 V)
- Auto-track™ sequencing*
- Margin up/down controls
- Efficiencies up to 93%
- Output ON/OFF inhibit
- Differential remote sense
- Programmable input Under-Voltage Lockout (UVLO)
- Point-of-Load-Alliance (POLA) compatible
- RoHS compliant
- Two year warranty

## SAFETY

- UL/cUL CAN/CSA-C22.2 No. 60950
- File No. E174104
- TÜV Product Service (EN60950) Certificate No. B04 06 38572 044
- CB report and certificate to IEC60950, Certificate No. US/8292/UL

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## ELECTRICAL SPECIFICATIONS

| | | |
|---|---|---|
| **Input** | | |
| Input voltage range | (See Note 3, 5) | 2.95 - 5.5 V |
| Input standby current | | 60 mA typical |
| Remote ON/OFF | (See Note 5) | Negative logic |
| Undervoltage lockout<br>(Pin 8 open) | (See Note 6)<br>On threshold<br>Hysteresis | 6.6 - 7.5 Vdc typical<br>2.60 V<br>0.6 V |
| Track input voltage | Pin 18 (See Note 2) | -0.11 mA |
| **Output** | | |
| Voltage adjustability | 2.95 < Vi < 4.5 V<br>4.50 < Vi < 5.5 V | 0.8 - 1.65 Vdc<br>0.8 - 2.5 Vdc |
| Setpoint accuracy | (See Note 1) | ±2.0% Vo |
| Line regulation | | ±5 mV typical |
| Load regulation | | ±5 mV typical |
| Total regulation | (See Note 1) | ±3.0% Vo |
| Minimum load | | 0 A |
| Ripple and noise | 20 MHz bandwidth | 15 mV typical |
| Transient response | (See Note 4) | 100 µs recovery time<br>Overshoot/undershoot 200 mV |
| Margin adjustment | (See Note 8) | ±5.0% Vo |

All specifications are typical at nominal input, full load at 25 °C unless otherwise stated.
Cin = 1000 µF, Cout = 660 µF.

## GENERAL SPECIFICATIONS

| | | |
|---|---|---|
| Efficiency | (See Efficiency Table) | 93% max. |
| Insulation voltage | | Non-isolated |
| Switching frequency | | 825 MHz |
| Approvals and standards | | EN60950, UL/cUL60950 |
| Material flammability | | UL94V-0 |
| Dimensions | L x W x H | 51.94 x 26.54 x 9.07 mm<br>2.045 x 1.045 x 0.357 in |
| Weight | | 22.5 g (79 oz) |
| MTBF | Telcordia SR-332 | 2,100,000 hours |

## EMC CHARACTERISTICS

| | |
|---|---|
| Electrostatic discharge | EN61000-4-2, IEC801-2 |
| Conducted immunity | EN61000-4-6 |
| Radiated immunity | EN61000-4-3 |

## ENVIRONMENTAL SPECIFICATIONS

| | | |
|---|---|---|
| Thermal performance | Operating ambient temperature<br>Non-operating temperature | -40 °C to +85 °C<br>-40 °C to +125 °C |
| MSL ('Z' suffix only) | JEDEC J-STD-020C | Level 3 |
| Protection | | |
| Short-circuit | Auto reset | 90 A typical |
| Thermal | | Auto recovery |

## ORDERING INFORMATION

| Model Number[9] | Output Power (Max.) | Input Voltage | Output Voltage | Output Current (Min.) | Output Current (Max.) | Efficiency (Typical) | Regulation | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Line | Load |
| PTH04040W | 150 W | 2.95 - 5.5 V | 0.8 - 2.5 V | 0 A | 60 A | 93% | ±5 mV | ±5 mV |

## PART NUMBER SYSTEM WITH OPTIONS

| Product Family | Input Voltage | Output Current | Mechanical Package | Output Voltage Code | Pin Option | Mounting Options |
|---|---|---|---|---|---|---|
| PTH | 04 | 04 | 0 | W | A | S |
| Point-of-Load Alliance compatible | 04 = 2.95 - 5.5 Vdc | 04 = 60 A | Always 0 | W = Wide | | D = Horizontal through-hole (Matte Sn)<br><br>Z = Surface-mount (96.5/3.0/0.5 Sn/Ag/Cu pin solder material |

## OUTPUT VOLTAGE ADJUSTMENT

The ultra-wide output voltage trim range offers major advantages to users who select the PTH04040W. It is no longer necessary to purchase a variety of modules in order to cover different output voltages. The output voltage can be trimmed in a range of 0.8 Vdc to 2.5 Vdc. When the PTH04040W converter leaves the factory the output has been adjusted to the default voltage of 0.8 V.

| **Efficiency Table (Io = 45 A; Vin = 5 V)** | |
|---|---|
| Output Voltage | Efficiency |
| Vo = 1.2 V | 86% |
| Vo = 1.5 V | 88% |
| Vo = 1.8 V | 90% |
| Vo = 2.5 V | 93% |

Notes:
1. The set-point voltage tolerance is affected by the tolerance and stability of RSET. The stated limit is unconditionally met if RSET has a tolerance of 1% with 100 ppm/°C or better temperature stability.
2. This control pin has an internal pull-up to Vin nominal. If it is left open-circuit the module will operate when input power is applied. A small low-leakage (<100 nA) MOSFET is recommend for control. For further information, consult Application Note 192.
3. A 1000 µF input capacitor is required for proper operation. The capacitor must be rated for a minimum of 400 mA rms of ripple current.
4. This is with a 1 A/µs loadstep, 50 to 100% Iomax. Co = 660 µF.
5. The minimum input voltage is 2.95 V or 1.34 x Vo, whichever is greater.
6. These are default voltages. They may be adjusted using the 'UVLO Prog.' control input. Consult Application Note 192 for further details.
7. See Figures 1 and 2 for safe operating curves. All power pins must be used.
8. A small low-leakage (<100 nA) MOSFET is recommended to control this pin. The open-circuit voltage is less than 1 Vdc.
9. NOTICE: Some models do not support all options. Please contact your local Artesyn representative or use the on-line model number search tool at http://www.artesyn.com to find a suitable alternative.

## OUTPUT VOLTAGE ADJUSTMENT (CONTINUED)

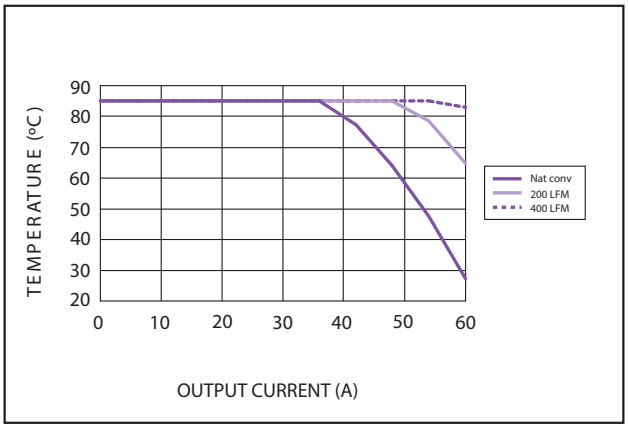



Figure 1 - Safe Operating Area
Vin = 3.3 V (See Note A)

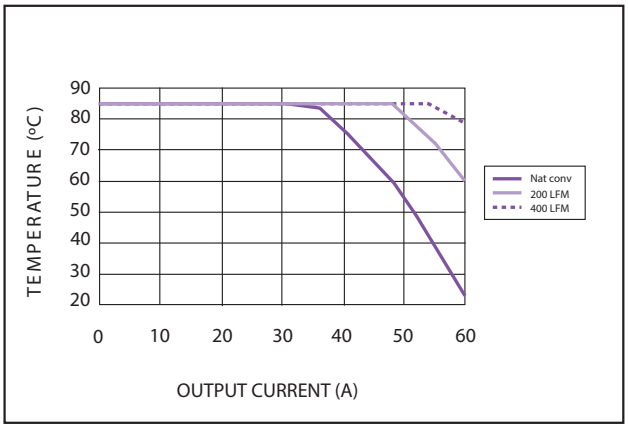



Figure 2 - Safe Operating Area
Vin = 5 V (See Note A)

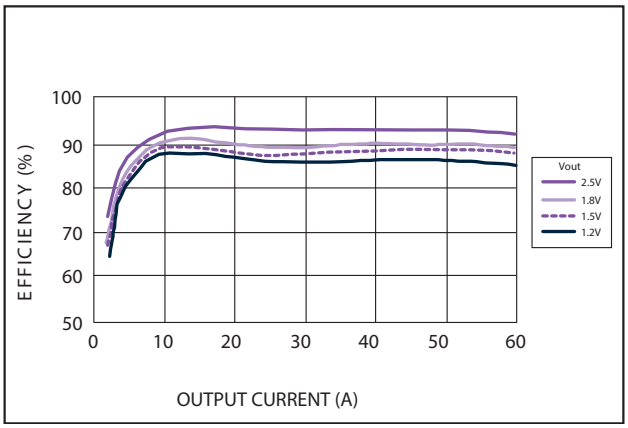



Figure 3 - Efficiency vs Load Current
Vin = 5 V (See Note B)

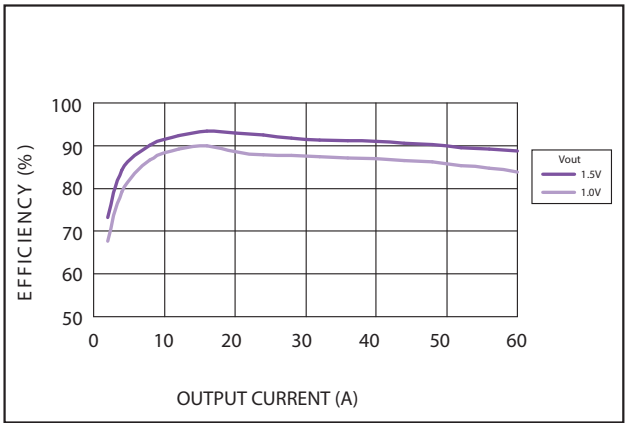



Figure 4 - Efficiency vs Load Current
Vin = 3.3 V (See Note B)

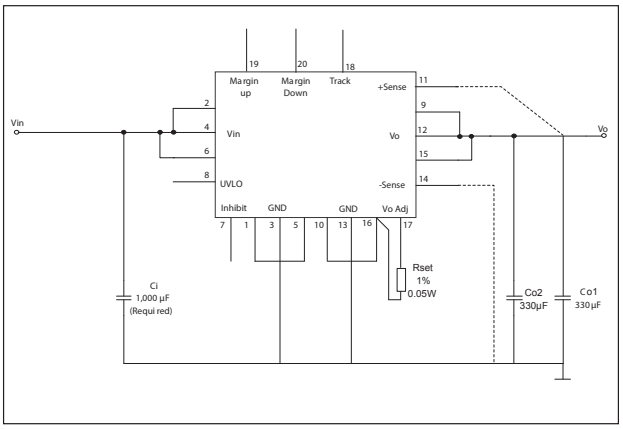
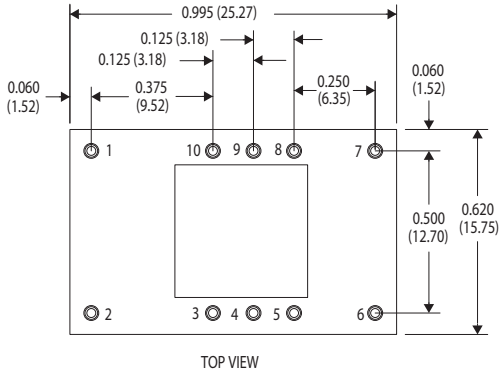


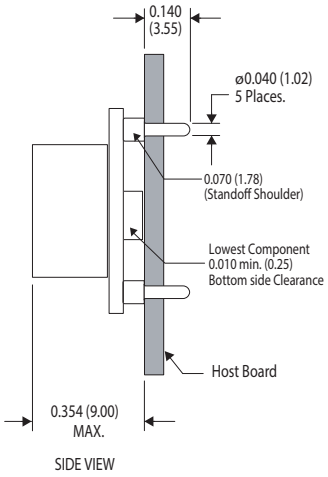

Figure 5 - Standard Application

Notes:
A. SOA curves represent the conditions at which internal components are within the Artesyn derating guidelines.
B. Characteristic data has been developed from actual products tested at 25 °C. This data is considered typical data for the converter.

## MECHANICAL DRAWINGS

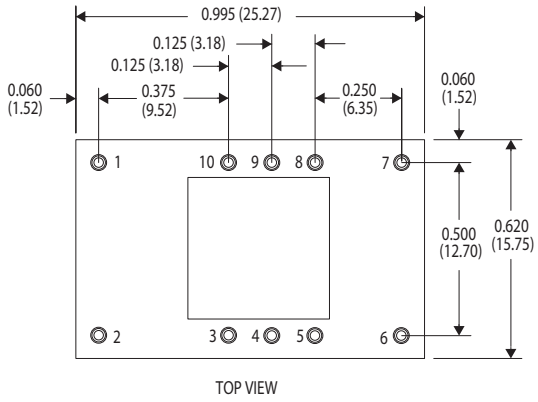
### Plated through-hole

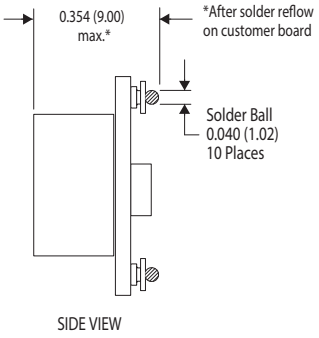



Dimensions in Inches (mm)
Tolerances (unless otherwise specified)
2 Places ±0.030 ( ±0.76)
3 Places ±0.010 ( ±0.25)

### Surface-mount




Dimensions in Inches (mm)
Tolerances (unless otherwise specified)
2 Places ±0.030 ( ±0.76)
3 Places ±0.010 ( ±0.25)

| Pin Assignments | |
|---|---|
| Pin | Function |
| 1 | Ground |
| 2 | Vin |
| 3 | Ground |
| 4 | Vin |
| 5 | Ground |
| 6 | Vin |
| 7 | Inhibit* |
| 8 | UVLO Programming |
| 9 | Vout |
| 10 | Ground |
| 11 | Vs+ |
| 12 | Vout |
| 13 | Ground |
| 14 | Vs- |
| 15 | Vout |
| 16 | Ground |
| 17 | Adjust |
| 18 | Track |
| 19 | Margin up* |
| 20 | Margin down* |
| *Denotes negative logic:<br>Open = Normal operation<br>Ground = Function active | |

## ABOUT ADVANCED ENERGY

Advanced Energy (AE) has devoted more than three decades to perfecting power for its global customers. AE designs and manufactures highly engineered, precision power conversion, measurement and control solutions for mission-critical applications and processes.

Our products enable customer innovation in complex applications for a wide range of industries including semiconductor equipment, industrial, manufacturing, telecommunications, data center computing, and medical. With deep applications know-how and responsive service and support across the globe, we build collaborative partnerships to meet rapid technological developments, propel growth for our customers, and innovate the future of power.

PRECISION | POWER | PERFORMANCE

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