# EC7BW18 SERIES
## 20 WATT 18:1 INPUT ISOLATED DC-DC CONVERTER

## Features

- Efficiency up to 90%
- Fixed Switching Frequency
- Regulated Outputs
- Remote On/Off
- Low No Load Power Consumption
- Fully protected (OTP/OCP/OVP/UVLO)
- 3000Vac I/O Isolation
- Operating Case Temperature -40 to +105℃
- 2”x1”x0.4” Size Meet Industrial Standard
- CB Test Certificate IEC62368-1
- EN55032/EN55035/EN50155 Compliant with External Circuits
- UL62368-1 2nd (Reinforced Insulation) Approval
- Shock & Vibration EN50155 (EN61373) Compliant
- Fire & Smoke EN45545-2 Compliant
- 5000m Operating Altitude




E176177

| MODEL NUMBER | INPUT VOLTAGE | OUTPUT VOLTAGE | OUTPUT CURRENT | | INPUT CURRENT | | % EFF. | | CAPACITOR LOAD MAX. |
|---|---|---|---|---|---|---|---|---|---|
| | | | MIN. | MAX. | NO LOAD | FULL LOAD | (1) | (2) | |
| EC7BW18-72S05 | 8.5-160 VDC | 5 VDC | 0 mA | 4000 mA | 5 mA | 323 mA | 86 | 85 | 6800uF |
| EC7BW18-72S12 | 8.5-160 VDC | 12 VDC | 0 mA | 1670 mA | 8 mA | 312 mA | 89 | 88 | 3300uF |
| EC7BW18-72S15 | 8.5-160 VDC | 15 VDC | 0 mA | 1330 mA | 8 mA | 312 mA | 89 | 88 | 2200uF |
| EC7BW18-72D12 | 8.5-160 VDC | ±12 VDC | 0 mA | ±833 mA | 8 mA | 312 mA | 89 | 88 | 820μF |
| EC7BW18-72D15 | 8.5-160 VDC | ±15 VDC | 0 mA | ±667 mA | 8 mA | 312 mA | 89 | 88 | 680μF |
| EC7BW18-72D24 | 8.5-160 VDC | ±24 VDC | 0 mA | ±417 mA | 8 mA | 309 mA | 90 | 89 | 330μF |

NOTE:

1. Nominal Input Voltage 72 VDC
2. Measured at 110Vin
3. To meet EN50155 and RIA12 refer to application note.

## PART NUMBER

| Series | Nominal Input Voltage | Number of Outputs | Nominal Output Voltage | Remote On/Off Logic |
|---|---|---|---|---|
| EC7BW18- | II | O | XX | L |
| EC7BW18 | 72： 72 VDC | S： Single<br>D： Dual | 05： 5.0VDC<br>12： 12VDC<br>15： 15VDC<br>24： 24VDC | None： Positive<br>N： Negative |

Part Number Example:

**EC7BW18-72S12N:** 2”x1”, 20W, 18:1 8.5-160Vdc Input, Single 12Vdc Output, Negative Logic



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# TECHNICAL SPECIFICATIONS

(All specifications are typical at nominal input, full load at 25℃ unless otherwise noted.)

## ABSOLUTE MAXIMUM RATINGS

| PARAMETER | NOTES and CONDITIONS | Device | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| Input Voltage | Continuous | All | -0.3 | | 160 | $V_{dc}$ |
| Input Surge Voltage | 100ms max. | All | | | 200 | $V_{dc}$ |
| Operating Case Temperature | At the center part of case plate | All | -40 | | 105 | ℃ |
| Storage Temperature | | All | -55 | | 125 | ℃ |

## INPUT CHARACTERISTICS

| PARAMETER | NOTES and CONDITIONS | Device | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| Operating Input Voltage | | All | 8.5 | 72 | 160 | $V_{dc}$ |
| Input Under Voltage Lockout | | | | | | |
| Turn-On Voltage Threshold | 70% Load | All | 8.5 | 9 | 9.5 | $V_{dc}$ |
| Turn-Off Voltage Threshold | 70% Load | All | 7 | 7.5 | 8 | $V_{dc}$ |
| Lockout Hysteresis Voltage | 70% Load | All | | 1.5 | | $V_{dc}$ |
| Maximum Input Current | $V_{in}$=12V, Full load<br>$V_{in}$=8.5V, 70% Load | All | | | 2.2 | A |
| No-Load Input Current | $V_{in}$=72V, $I_o$=0A | See Model Number Table | | | | mA |
| Input Filter | Pi filter. | All | | | | |
| Inrush Current ($I^2t$) | As per ETS300 132-2. | All | | | 0.1 | $A^2s$ |
| Input Reflected Ripple Current | P-P thru 12uH inductor, 5Hz to 20MHz. | All | | 30 | | mA |

## OUTPUT CHARACTERISTICS

| PARAMETER | NOTES and CONDITIONS | Device | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| Voltage Set Point Accuracy | $V_{in}$=72V, Full load, $T_c$=25℃ | All | -1.0 | | +1.0 | % |
| Output Voltage Balance | $V_{in}$=72V, Full load, $T_c$=25℃ | Dual | -1.0 | | +1.0 | % |
| Output Voltage Regulation | | | | | | |
| Load Regulation | Full load to no load | Single<br>Dual | | | ±0.2<br>±1.0 | % |
| Line Regulation | $V_{in}$=High line to low line, full load | All | | | ±0.2 | % |
| Cross Regulation | Load cross variation 25%/100% | Dual | | | ±5.0 | % |
| Temperature Coefficient | $T_c$=-40℃ to 105℃ | All | | | ±0.02 | %/℃ |
| Output Voltage Ripple and Noise (5Hz to 20MHz bandwidth) | | | | | | |
| Peak-to-Peak | Full load, 1.0uF ceramic capacitors. | 5Vo<br>Others | | | 75<br>100 | mV |
| RMS. | | All | | | 40 | mV |
| Output Current Range | $V_{in}$= 8.5 to 12V<br>$V_{in}$= 12 to 160V | See Power Derating Curve<br>See Model Number Table | | | | A |
| Over Current Protection | Hiccup Mode. Auto recovery | All | 110 | 150 | 180 | % |
| Short Circuit Protection | | All | Continuous, Auto Recovery. | | | |
| External Load Capacitance | Full load (resistive) | See Model Number Table | | | | uF |
| Output Voltage Trim Range | Po≦max rated power, $I_o$ ≦ $I_{o_max}$ | Single | -20 | | +15 | % |
| Over Voltage Protection | Zener Clamp | 5Vo<br>12Vo<br>15Vo<br>±12Vo<br>±15Vo<br>±24Vo | | 6.2<br>15<br>18<br>±15<br>±18<br>±30 | | $V_{dc}$ |



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## EFFICIENCY

| PARAMETER | NOTES and CONDITIONS | Device | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| 100% Load | Vin=72V, 110V | See Model Number Table | | | | % |

## DYNAMIC CHARACTERISTICS

| PARAMETER | NOTES and CONDITIONS | Device | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| Output Voltage Current Transient | | | | | | |
| Error Band | 75% to 100% of $I_{o_max}$ step load change $d_i/d_t$=0.1A/us (within 1% Vout nominal) | All | | | ±5 | % |
| Recovery Time | | All | | | 250 | us |
| Turn-On Delay and Rise Time | Full load (Constant resistive load) | | | | | |
| Turn-On Delay Time, From On/Off Control | $V_{on/off}$ to 10%$V_{o_set}$, Remote on | All | | 5 | | ms |
| Turn-On Delay Time, From Input | $V_{in_min}$ to 10%$V_{o_set}$, Power up | All | | 5 | | ms |
| Output Voltage Rise Time | 10%$V_{o_set}$ to 90%$V_{o_set}$ | 5Vo | | 10 | | ms |
| | | Others | | 5 | | ms |

## ISOLATION CHARACTERISTICS

| PARAMETER | NOTES and CONDITIONS | Device | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| Isolation Voltage (100% factory Hi-Pot tested @2sec.) | 1 minute; Input to output, | All | | | 3000 | $V_{ac}$ |
| | | | | | 4200 | $V_{dc}$ |
| Isolation Resistance | Input to output | All | 1000 | | | MΩ |
| Isolation Capacitance | Input to output (10KHz, 0.25V) | All | | 20 | | pF |

## FEATURE CHARACTERISTICS

| PARAMETER | NOTES and CONDITIONS | Device | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| Switching Frequency | Output ripple frequency | All | 180 | 200 | 220 | KHz |
| On/Off Control, Positive Remote On/Off logic, Refer to –Vin pin. | | | | | | |
| Logic Low (Module Off) | $V_{on/off}$ at $I_{on/off}$=1.0mA | All | 0 | | 1.2 | V |
| Logic High (Module On) | $V_{on/off}$ at $I_{on/off}$=0.0uA, Pin open=On | All | 4.0 or Open Circuit | | 160 | V |
| On/Off Control, Negative Remote On/Off logic, Refer to –Vin pin | | | | | | |
| Logic High (Module Off) | $V_{on/off}$ at $I_{on/off}$=0.0uA, Pin open=Off | All | 4.0 or Open Circuit | | 160 | V |
| Logic Low (Module On) | $V_{on/off}$ at $I_{on/off}$=1.0mA | All | 0 | | 1.2 | V |
| On/Off Current (for both remote on/off logic) | $I_{on/off}$ at $V_{on/off}$=0V | All | | 0.4 | 1 | mA |
| Leakage Current (for both remote on/off logic) | Logic High, $V_{on/off}$=15V | All | | | 30 | uA |
| Off Converter Input Current | Shutdown input idle current | All | | 3 | 5 | mA |
| Over Temperature Shutdown | Temperature at the center part of case, non-latching | All | | 110 | | ℃ |
| Over Temperature Recovery | | All | | 92 | | ℃ |

## GENERAL SPECIFICATIONS

| PARAMETER | NOTES and CONDITIONS | Device | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| MTBF | $I_o$=100% of $I_{o_max}$; MIL-HDBK - 217F_Notice 1, GB, 25℃ | 5Vo | | 1242 | | K hours |
| | | 12Vo | | 1397 | | |
| | | 15Vo | | 1631 | | |
| | | ±12Vo | | 1341 | | |
| | | ±15Vo | | 1571 | | |
| | | ±24Vo | | 1622 | | |
| Weight | | All | | 28.5 | | grams |
| Case Material | Plastic, DAP, UL 94V-0 | | | | | |
| Base plate Material | FR4 | | | | | |



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## GENERAL SPECIFICATIONS

| | | | |
|---|---|---|---|
| Potting Material | UL 94V-0 | | |
| Pin Material | Base: Copper<br>Plating: Nickel with Matte Tin | | |
| Shock/Vibration | MIL-STD-810F/EN61373 Compliant | | |
| Humidity | 95% RH max. Non Condensing | | |
| Altitude | 5000m Operating Altitude, 12000m Transport Altitude | | |
| Thermal Shock | MIL-STD-810F | | |
| Fire & Smoke | EN45545-2 Compliant | | |
| EMI | EN55032 & EN50155 Compliant (with external filter) | | Class A |
| ESD | EN61000-4-2 | Level 3: Air ±8kV, Contact ±6kV | Perf. Criteria A |
| Radiated immunity | EN61000-4-3 | Level 3: 80~1000MHz, 20V/m | Perf. Criteria A |
| Fast Transient | EN61000-4-4 | Level 3: On power input port, ±2kV, external input capacitor required (EN50155)<br>Level 4: On power input port, ±4kV, external input capacitor required (EN55035) | Perf. Criteria A |
| Surge | EN61000-4-5 | Level 4: Line to earth, ±4kV, Line to line, ±2kV (EN50155)<br>Level 4: Line to earth, ±4kV, Line to line, ±2kV (EN55035) | Perf. Criteria A |
| Conducted immunity | EN61000-4-6 | Level 3: 0.15~80MHz, 10V | Perf. Criteria A |
| Interruptions of Voltage Supply | EN50155 | Class S3: 20ms interruptions | Perf. Criteria A |
| Supply Change Over | EN50155 | Class C2: During a supply break of 30ms | Perf. Criteria A |
| Application Note Link | | | EC7BW18-72 Series App Notes |
| Packaging Information Link | | | Packaging Information |

## Immunity to Environmental Conditions

| Phenomenon | EN50155; 2017 Reference Clause(s) | Reference Standard | Test Conditions | Result |
|---|---|---|---|---|
| Low Temperature Start-up test | 13.4.4 | EN 60068-2-1 | Class OT4<br>Temperature: -40℃<br>Duration: 2 hrs | Pass |
| Dry Heat Test | 13.4.5 | EN 60068-2-2 | Class OT4 & Cycle B<br>Temperature: 70℃<br>Duration: 6 hrs<br>Extended temperature: 85℃<br>Extended Duration: 10min | Pass |
| Low Temperature Storage Test | 13.4.6 | EN 60068-2-1 | Temperature: -40℃<br>Duration: 16 hrs | Pass |
| Cyclic Damp Heat Test | 13.4.7 | EN 60068-2-30 | Temperature: 25℃ - 55℃<br>Humidity: 90% RH<br>Duration: 48 hrs | Pass |
| Random Vibration Test | 13.4.11 | EN 61373 | Temperature: 25℃ +/- 10℃<br>Humidity: 50% +/-25% RH<br>Frequency range: 5 ~ 150 Hz<br>Vertical: 1.01 $m/s^2$<br>Transverse: 0.450 $m/s^2$<br>Longitudinal: 0.700 $m/s^2$<br>Duration: 10 min / axis | Pass |
| Simulated Long Life Test at Increased Random Vibration Levels | 13.4.11 | EN 61373 | Temperature: 25℃ +/-10℃<br>Humidity: 50% +/-25% RH<br>Frequency range: 5 ~ 150 Hz<br>Vertical: 5.72 $m/s^2$<br>Transverse: 2.55 $m/s^2$<br>Longitudinal: 3.96 $m/s^2$<br>Duration: 5 hrs / axis | Pass |
| Shock Test | 13.4.11 | EN 61373 | Temperature: 25℃ +/-10℃<br>Humidity: 50% +/-25% RH<br>Frequency range: 5 ~ 150 Hz<br>+/-Vertical: 30 $m/s^2$<br>+/-Transverse: 30 $m/s^2$<br>+/-Longitudinal: 50 $m/s^2$<br>Duration: 30ms x18 (Each axis 3 shocks) | Pass |



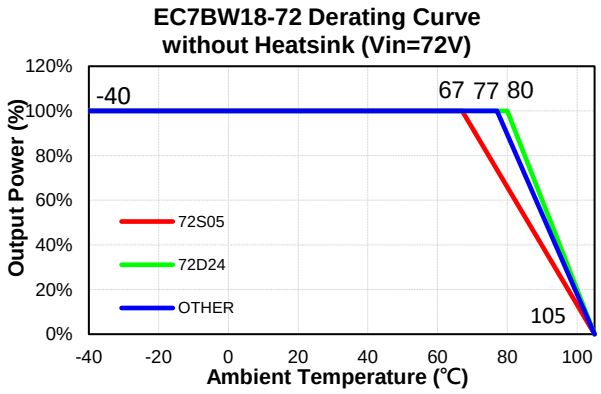
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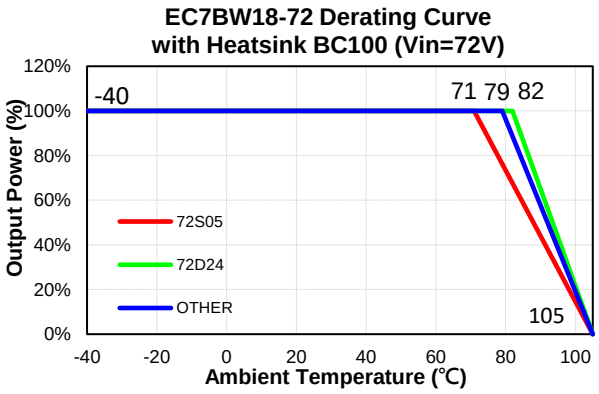
## EN45545-2 Fire & Smoke Test Conditions

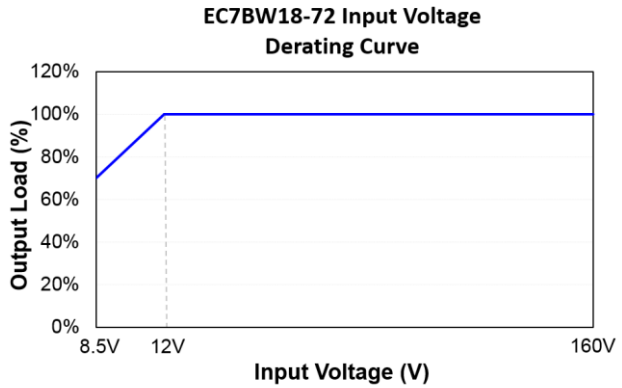
| Item | | Standard | Hazard Level |
|---|---|---|---|
| R22 | Oxygen Index Test | EN 45545-2: 2013<br>EN ISO 4589-2: 2006 | HL1, HL2, HL3 |
| | Smoke Density Test | EN 45545-2: 2013<br>EN ISO 5659-2: 2013 | HL1, HL2, HL3 |
| | Smoke Toxicity Test | EN 45545-2: 2013<br>NF X70-100: 2006 | HL1, HL2, HL3 |
| R23 | Oxygen Index Test | EN 45545-2: 2013<br>EN ISO 4589-2: 2006 | HL1, HL2, HL3 |
| | Smoke Density Test | EN 45545-2: 2013<br>EN ISO 5659-2: 2013 | HL1, HL2, HL3 |
| | Smoke Toxicity Test | EN 45545-2: 2013<br>NF X70-100: 2006 | HL1, HL2, HL3 |
| R24 | Oxygen Index Test | EN45545-2: 2013<br>EN ISO 4589-2 | HL1, HL2, HL3 |
| R25 | Glow - Wire Test | EN 45545-2:2013<br>EN 60695-2-11:2001 | HL1, HL2, HL3 |
| R26 | Vertical Flame Test | EN 45545-2: 2013<br>EN 60695-11-10: 2013 | HL1, HL2, HL3 |

## CHARACTERISTIC CURVE

### Power Derating Curve



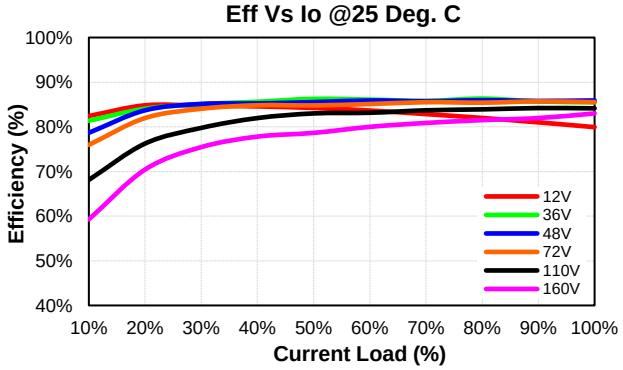





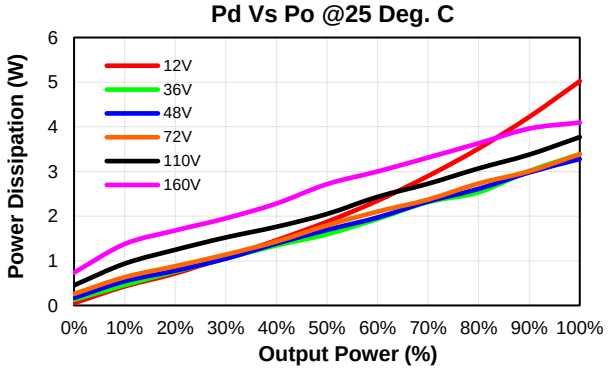

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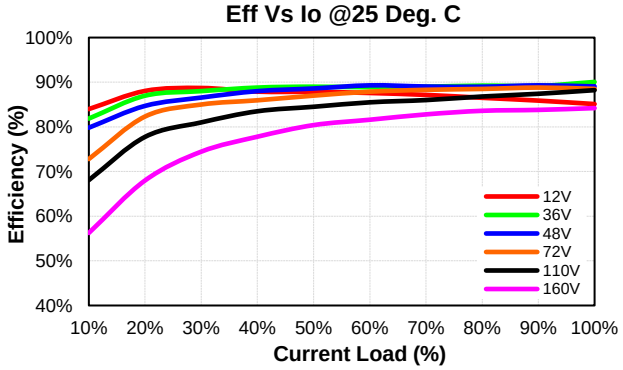
EC7BW18-72S05
Eff Vs Io @25 Deg. C



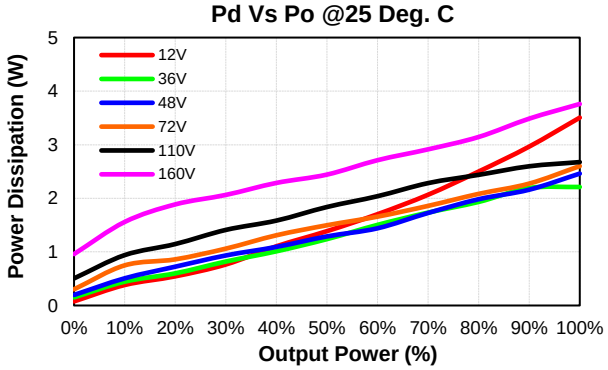

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Pd Vs Po @25 Deg. C



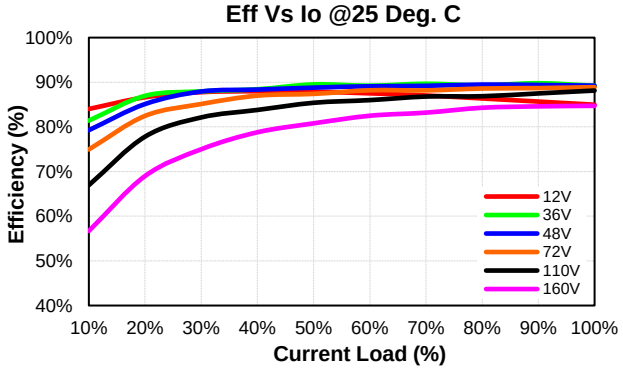

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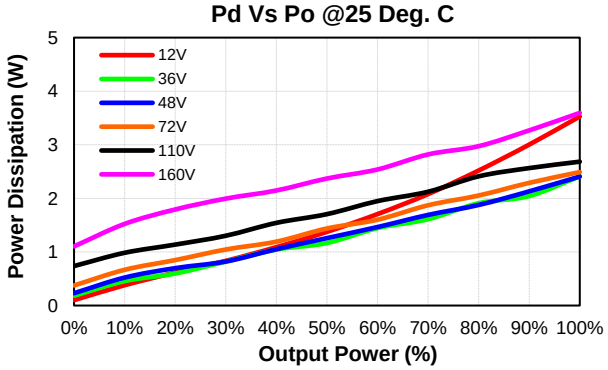

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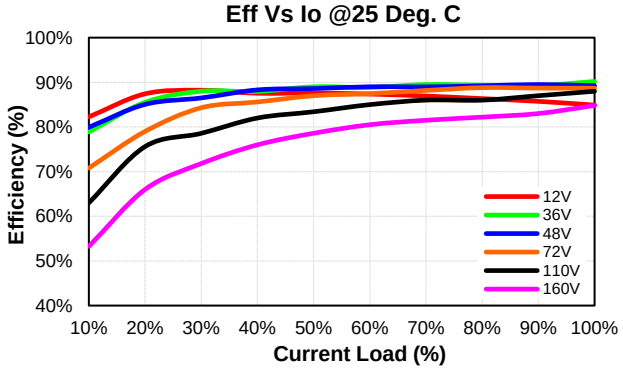

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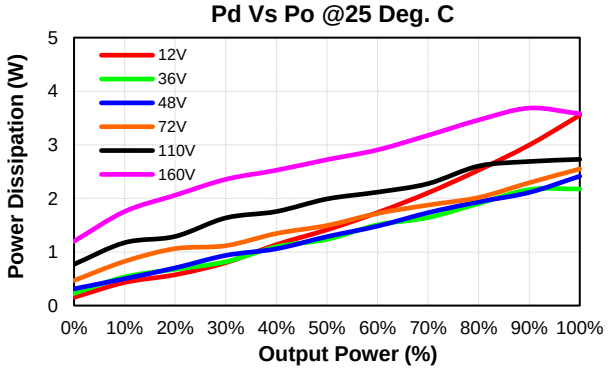

EC7BW18-72S15
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EC7BW18-72D12
Eff Vs Io @25 Deg. C



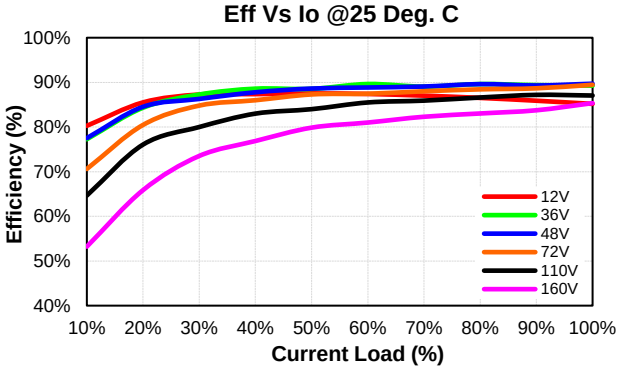

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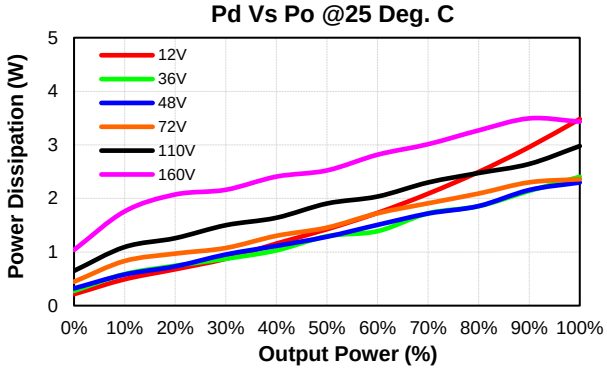



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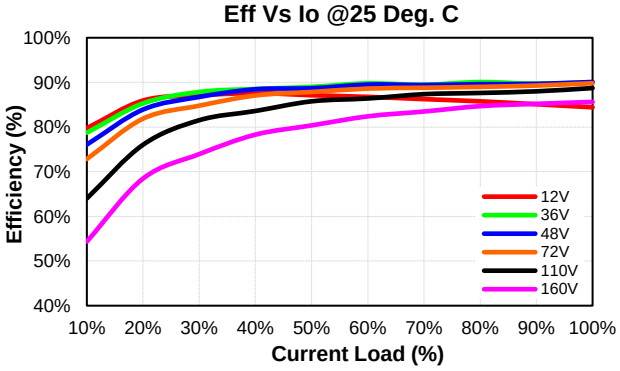
**EC7BW18-72D15**
**Eff Vs Io @25 Deg. C**



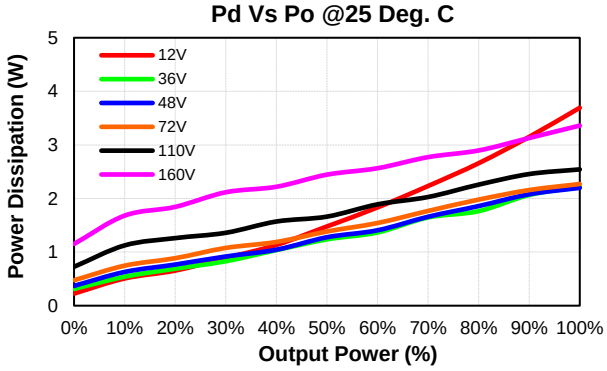

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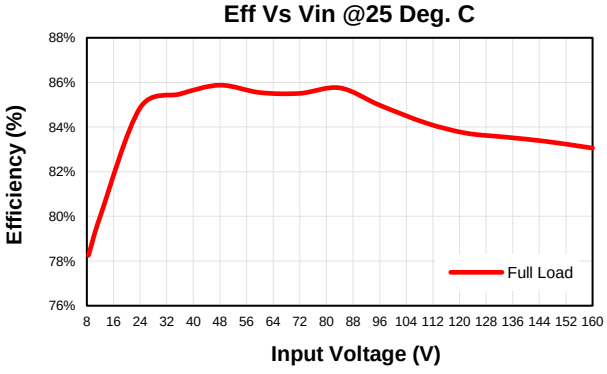

**EC7BW18-72D24**
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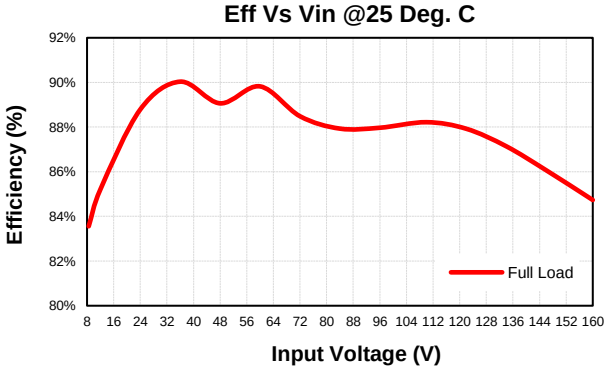

**EC7BW18-72D24**
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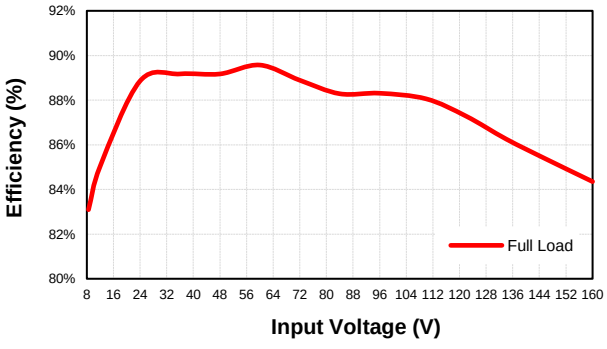

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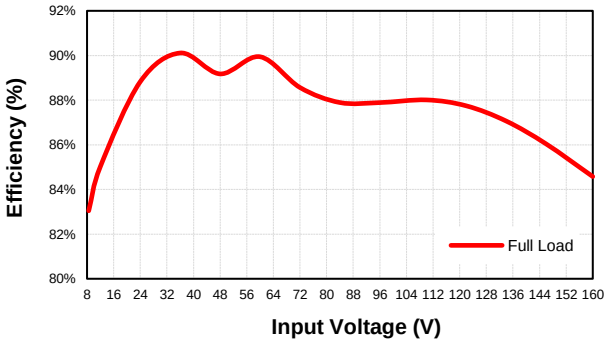

**EC7BW18-72S12**
**Eff Vs Vin @25 Deg. C**




**EC7BW18-72S15**
**Eff Vs Vin @25 Deg. C**

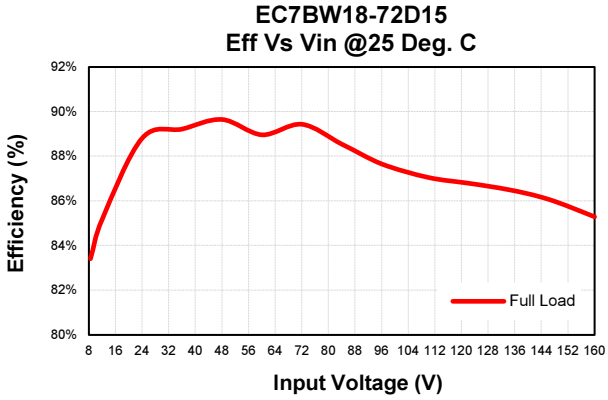


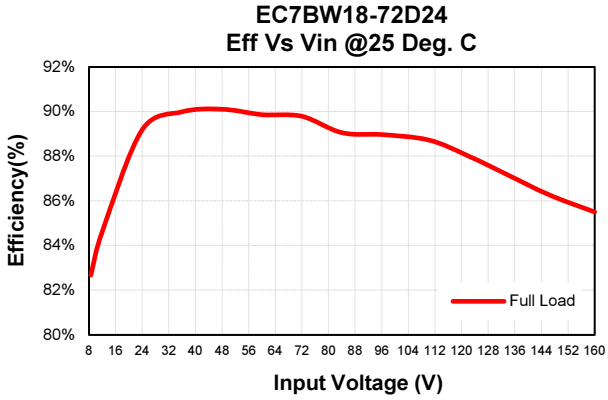

**EC7BW18-72D12**
**Eff Vs Vin @25 Deg. C**





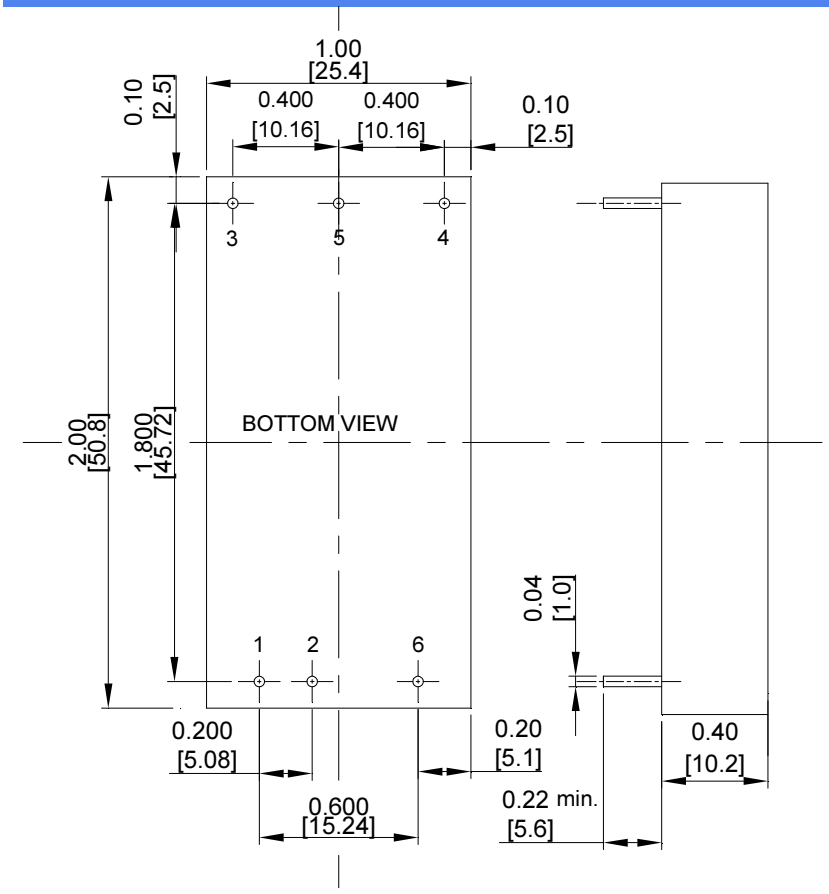

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**Note: 8.5Vin Efficiency at 70% Full Load**

## MECHANICAL SPECIFICATION




| PIN CONNECTION | | |
|---|---|---|
| Pin | Single | Dual |
| 1 | +V Input | +V Input |
| 2 | -V Input | -V Input |
| 3 | +V Output | +V Output |
| 4 | Trim | -V Output |
| 5 | -V Output | Common |
| 6 | Remote On/Off | |

NOTE: Pin Size is 0.04±0.004 Inch (1.0±0.1 mm)DIA
All Dimensions In Inches (mm)
Tolerances Inches: X.XX= ±0.02 , X.XXX= ±0.010
Millimeters: X.X= ±0.5, X.XX= ±0.25

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