# EC7BW18 ECRT/EDRT SERIES 20 WATT 16:1 INPUT ISOLATED DC-DC CONVERTERS

## Features

- Efficiency Up to 88%
- Fixed Switching Frequency
- Regulated Outputs
- Negative Logic Remote On/Off
- Low No Load Power Consumption
- Fully protected (OTP/OCP/OVP/UVLO)
- 3000Vac I/O Isolation
- Operating Case Temperature -40 to +100℃
- UL62368-1 2nd (Reinforced Insulation) Approval for DC Modules
- Compliant with EN50155/ EN50121-3-2/ EN45545-2
- Safety Meets IEC/EN/UL 62368-1
- Chassis Mount, Baseplate Cooled
- Low Inrush Current
- Input Reverse Polarity Protection
- EN50155 Class S3/ Class C2 Criteria A Without External Capacitor
- Output LED Indicator
- 4.45"x2.33"x0.68" Size



CE Railway System

| MODEL NUMBER | INPUT VOLTAGE | OUTPUT VOLTAGE | OUTPUT CURRENT | | INPUT CURRENT | | % EFF. | CAPACITOR LOAD MAX. |
|---|---|---|---|---|---|---|---|---|
| | | | MIN. | MAX. | NO LOAD | FULL LOAD | | |
| EC7BW18-72S05-ZZZZW | 10-160 VDC | 5 VDC | 0 mA | 4000 mA | 8 mA | 330 mA | 84 | 6800uF |
| EC7BW18-72S12-ZZZZW | 10-160 VDC | 12 VDC | 0 mA | 1670 mA | 10 mA | 320 mA | 87 | 3300uF |
| EC7BW18-72S15-ZZZZW | 10-160 VDC | 15 VDC | 0 mA | 1330 mA | 10 mA | 316 mA | 88 | 2200μF |
| EC7BW18-72D12-ZZZZW | 10-160 VDC | ±12 VDC | 0 mA | ±833 mA | 10 mA | 320 mA | 87 | 820μF |
| EC7BW18-72D15-ZZZZW | 10-160 VDC | ±15 VDC | 0 mA | ±667 mA | 10 mA | 316 mA | 88 | 680μF |
| EC7BW18-72D24-ZZZZW | 10-160 VDC | ±24 VDC | 0 mA | ±417 mA | 10 mA | 316 mA | 88 | 330μF |

NOTE:

1. Nominal Input Voltage 72 VDC.
2. VR1 is Used for Output Voltage Adjustment (Single Output Only).
3. Refer to Application Note for Thermal Resistance and Derating Information.
4. TVS is Included for Input Surge Voltage Protection.
5. Fuse & Shunt Diode is Include Inside for Input Reverse Polarity Protection.
6. CN1 & CN2 connection: DINKLE 0137-1103 Series or Equivalent, Suitable Electric Wire: 26~16AWG (IEC 0.2~1.5mm$^2$).
7. EC7BW18-72XYY-ZZZZW has De-rating by Input Voltage is Required See Power Derating Curve.
8. EDRT & EDRTP with Din Mount, the Clip is Suitable for TS-35 Din Rail.

## PART NUMBER

| Series | Nominal Input Voltage | Number of Outputs | Nominal Output Voltage | Chassis Mount Type | Coating |
|---|---|---|---|---|---|
| EC7BW18- | II | O | XX | -ZZZZ | W |
| EC7BW18 | 72: 72 VDC | S: Single<br>D: Dual | 05: 5VDC<br>12: 12VDC<br>15: 15VDC<br>24: 24VDC | ECRT: Enclosed Chassis Mount + Railway Turnkey<br>EDRT: Enclosed Chassis Mount + Din Rail + Railway Turnkey | None: Without Protective Coating<br>P: ***Coming Soon*** |

Part Number Example:

**EC7BW18-72S12-EDRTP:** Enclosed Chassis Mount + Din Rail, 20W, 18:1 10-160Vdc Input, Single 12Vdc Output, With Protective Coating

## TECHNICAL SPECIFICATIONS

(All specifications are typical at nominal input, full load at 25°C 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 | | 100 | °C |
| Storage Temperature | | All | -40 | | 105 | °C |

### INPUT CHARACTERISTICS

| PARAMETER | NOTES and CONDITIONS | Device | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| Operating Input Voltage | | All | 10 | 72 | 160 | $V_{dc}$ |
| Input Under Voltage Lockout | | | | | | |
| Turn-On Voltage Threshold | 70% Load | All | 8.5 | 9.2 | 9.9 | $V_{dc}$ |
| Turn-Off Voltage Threshold | 70% Load | All | 8.1 | 8.7 | 9.1 | $V_{dc}$ |
| Lockout Hysteresis Voltage | 70% Load | All | | 0.5 | | $V_{dc}$ |
| Maximum Input Current | $V_{in}$=14V, Full Load | All | | 2.0 | | A |
| Maximum Input Inrush Current | $V_{in}$=160V, Full Load | All | | | 15 | A |
| No-Load Input Current | $V_{in}$=72V, Io=0A | See Model Number Table | | | | mA |

### OUTPUT CHARACTERISTICS

| PARAMETER | NOTES and CONDITIONS | Device | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| Voltage Set Point Accuracy | $V_{in}$=72V, Full Load, Tc=25°C | All | -1.2 | | +1.0 | % |
| Output Voltage Regulation | | | | | | |
| Load Regulation | Full Load to No Load | Single | | | ±1.5 | % |
| | | Dual | | | ±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 | Tc=-40°C to 100°C | All | | | ±0.02 | %/°C |
| Output Voltage Ripple and Noise (5Hz to 20MHz bandwidth) | | | | | | |
| Peak-to-Peak | Full load, 1uF ceramic capacitors | All | | | 100 | mV |
| RMS. | | All | | | 40 | mV |
| Output Current Range | $V_{in}$= 10 to 160V | See Model Number Table & Power Derating Curve | | | | mA |
| 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, $I_o \leqq I_{o_max}$ | 72S05 | -20 | | +15 | % |
| | | 72S12 | See Power Derating Curve | | | |
| | | 72S15 | | | | |
| Over Voltage Protection | Zener Clamp | 5Vo | 6.2 | | | Vdc |
| | | 12Vo | 15 | | | |
| | | 15Vo | 18 | | | |
| | | ±12Vo | ±15 | | | |
| | | ±15Vo | ±18 | | | |
| | | ±24Vo | ±30 | | | |

### EFFICIENCY

| PARAMETER | NOTES and CONDITIONS | Device | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| 100% Load | Vin=72V | 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 | | 30 | | ms |
| Turn-On Delay Time, From Input | $V_{in_min}$ to 10%$V_{o_set}$, Power Up | All | | 30 | | 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 | $V_{ac}$ |
| | 1 minute; Input to Case | All | | | 2000 | $V_{ac}$ |
| | 1 minute; Output to Case | All | | | 500 | $V_{ac}$ |
| Isolation Resistance | Input to Output | All | 1000 | | | MΩ |
| Isolation Capacitance | Input to Output | All | | 2400 | | pF |
| | Input to Case | All | | 2400 | | |
| | Output to Case | All | | 1900 | | |

## FEATURE CHARACTERISTICS

| PARAMETER | NOTES and CONDITIONS | Device | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| Switching Frequency | Pulse wide modulation (PWM), Fixed | All | 180 | 200 | 220 | KHz |
| On/Off Control, Remote On/Off logic, Refer to –Vin pin | | | | | | |
| Logic High (Module Off) | $V_{on/off}$ at $I_{on/off}$>0.3mA | All | 3.5 | | 12 | V |
| Logic Low (Module On) | $V_{on/off}$ at $I_{on/off}$=0.0uA, Pin open=On | All | 0 | | 1.2 | V |
| On/Off Current (for both remote on/off logic) | Ion/off at Von/off=3.5-12V | All | 0.3 | | 2.4 | mA |
| Off Converter Input Current | Shutdown input idle current | All | | 3 | 5 | mA |
| Over Temperature Shutdown | Temperature at the Center Part of Case Plate, Non-Latching | All | | 106 | | °C |
| Over Temperature Recovery | | All | | 92 | | °C |

## 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°C | 72S05 | | 462 | | K hours |
| | | 72S12 | | 481 | | |
| | | 72S15 | | 527 | | |
| | | 72D12 | | 518 | | |
| | | 72D15 | | 549 | | |
| | | 72D24 | | 523 | | |
| Weight | | -ECRT | | 129 | | grams |
| | | -EDRT | | 144 | | |
| | | -ECRTP | | 135 | | |
| | | -EDRTP | | 150 | | |
| Case plate Material | Aluminum | | | | | |
| Potting Material | UL 94V-0 (DC Module) | | | | | |
| Shock/Vibration | EN50155 (EN61373) Compliant | | | | | |
| Humidity | 95% RH max. Non Condensing | | | | | |
| Altitude | 5000m Operating Altitude, 12000m Transport Altitude | | | | | |
| Thermal Shock | MIL-STD-810F | | | | | |

## GENERAL SPECIFICATIONS

| | | | |
|---|---|---|---|
| Fire & Smoke | EN45545-2 Compliant | | |
| EMI | EN50155 Compliant | | 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 | Perf. Criteria A |
| Surge | EN61000-4-5 | Level 4: Line to earth, ±4kV, Line to line, ±2kV | 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 30 ms, | Perf. Criteria A |
| Application Note Link | | | EC7BW18-72S EC(D)RT Series App Notes |
| Packaging Information Link | | | Packaging Information |

## Immunity to Environmental Conditions.

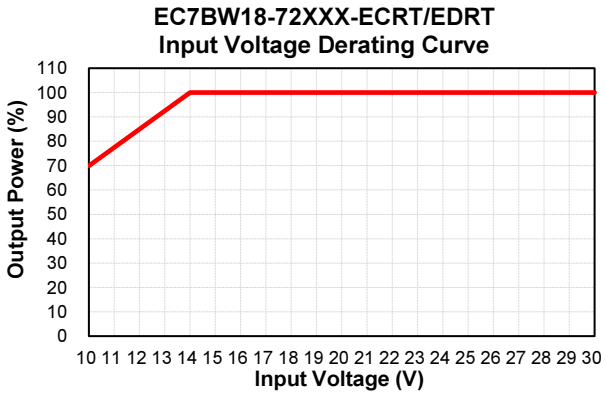
| Phenomenon | EN50155; 2017 Reference Clause(s) | Reference Standard | Test Conditions | Result |
|---|---|---|---|---|
| Low Temperature Start-up test | 13.4.4 | EN 60068-2-1 | Class OT4<br>Temperature: -40℃<br>Duration: 2 hrs | Pass |
| Dry Heat Test | 13.4.5 | EN 60068-2-2 | Class OT4 & ST2<br>Temperature: 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 |

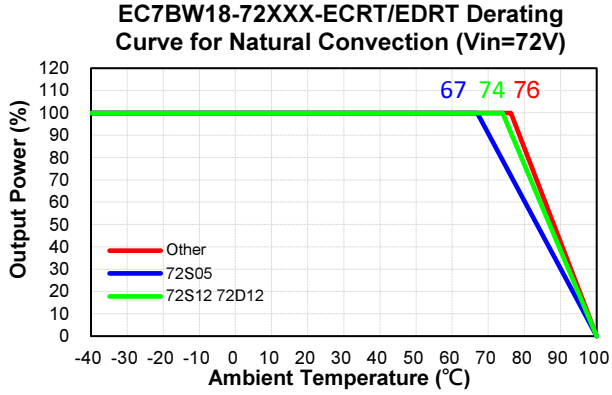
## EN45545-2 Fire & Smoke Test Conditions.

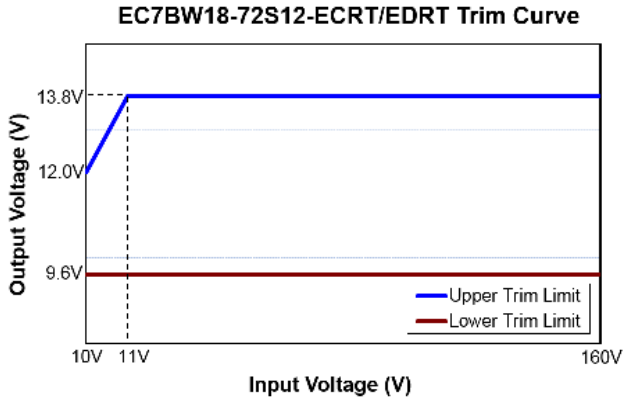
| Item | | Standard | Hazard Level |
|---|---|---|---|
| R22 | Oxygen Index Test | EN 45545-2: 2013<br>EN ISO 4589-2: 2006 | HL1, HL2, HL3 |
| | Smoke Density Test | EN 45545-2: 2013<br>EN ISO 5659-2: 2013 | HL1, HL2, HL3 |
| | Smoke Toxicity Test | EN 45545-2: 2013<br>NF X70-100: 2006 | HL1, HL2, HL3 |
| 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 |

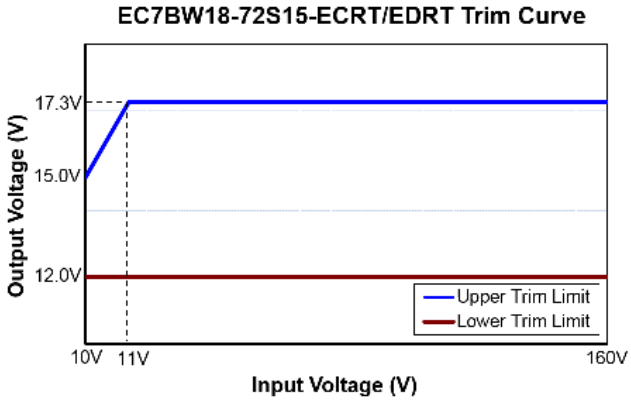
## CHARACTERISTIC CURVE

### Power Derating Curve



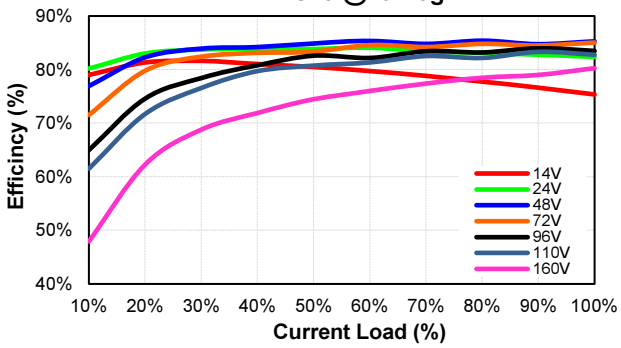



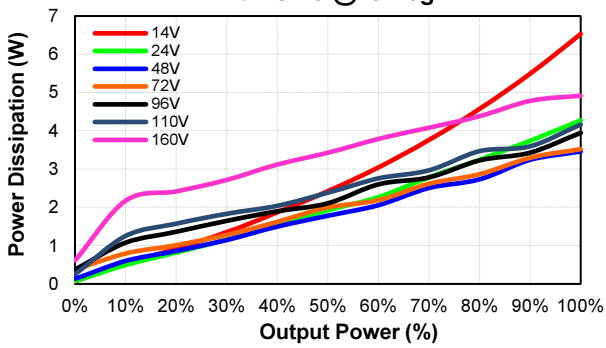



## Performance Data

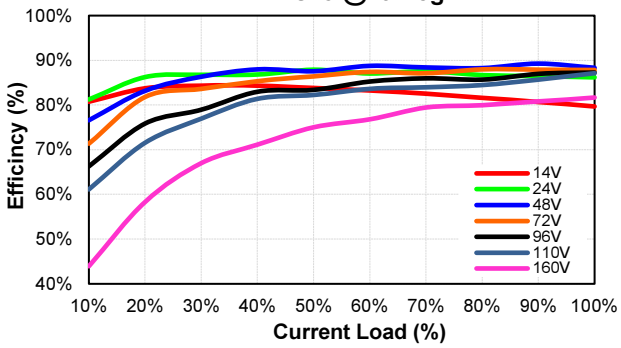
EC7BW18-72S05-ECRT
Eff Vs Io @25 Deg. C



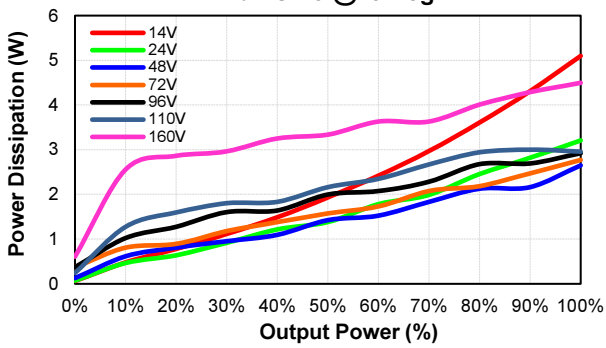

EC7BW18-72S05-ECRT
Pd Vs Po @25 Deg. C



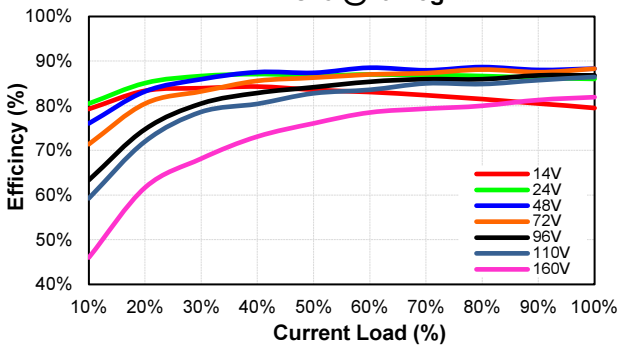

EC7BW18-72S12-ECRT
Eff Vs Io @25 Deg. C



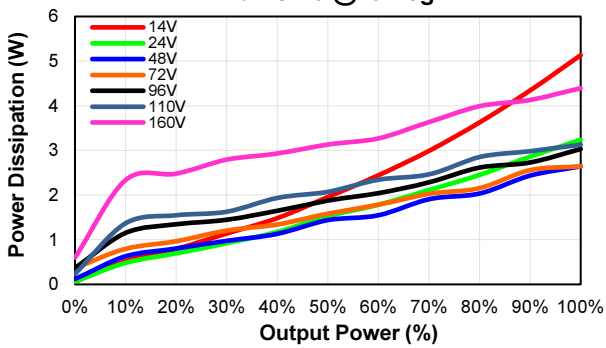

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Pd Vs Po @25 Deg. C



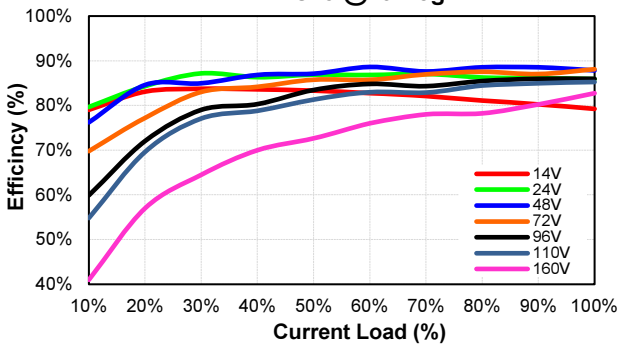

EC7BW18-72S15-ECRT
Eff Vs Io @25 Deg. C



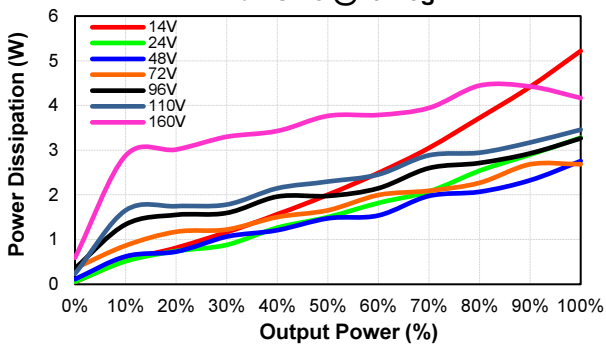

EC7BW18-72S15-ECRT
Pd Vs Po @25 Deg. C

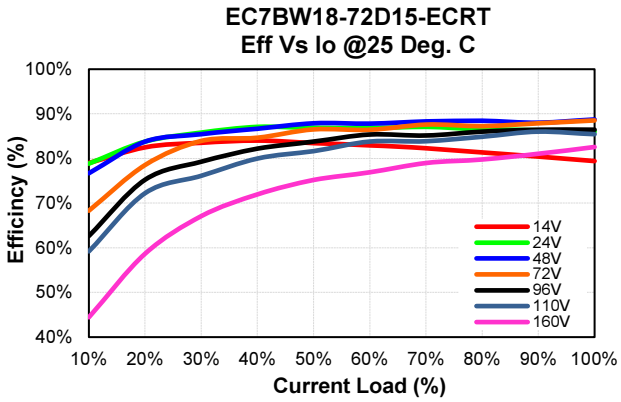


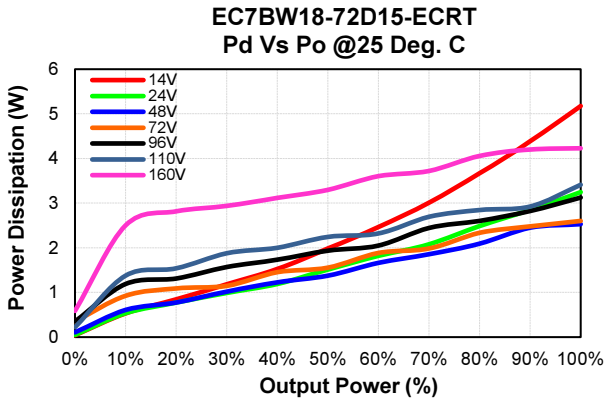

EC7BW18-72D12-ECRT
Eff Vs Io @25 Deg. C

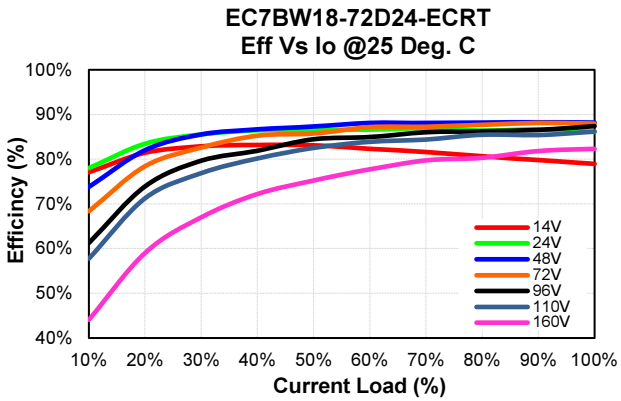


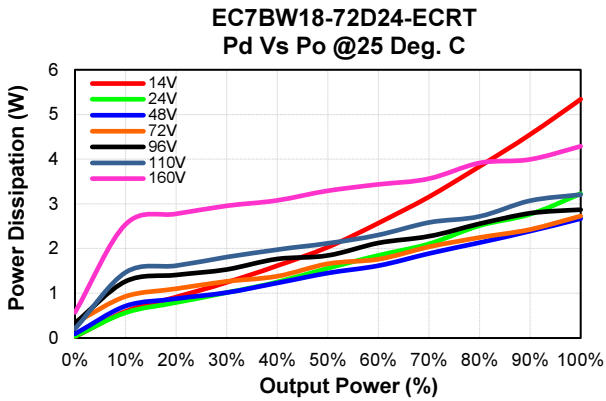

EC7BW18-72D12-ECRT
Pd Vs Po @25 Deg. C





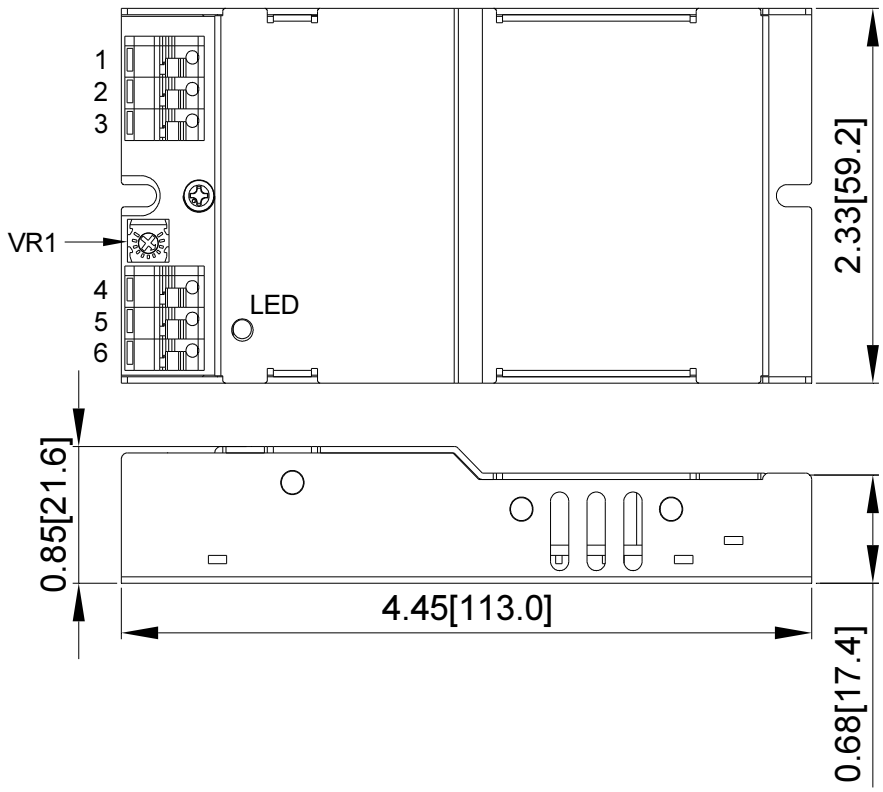



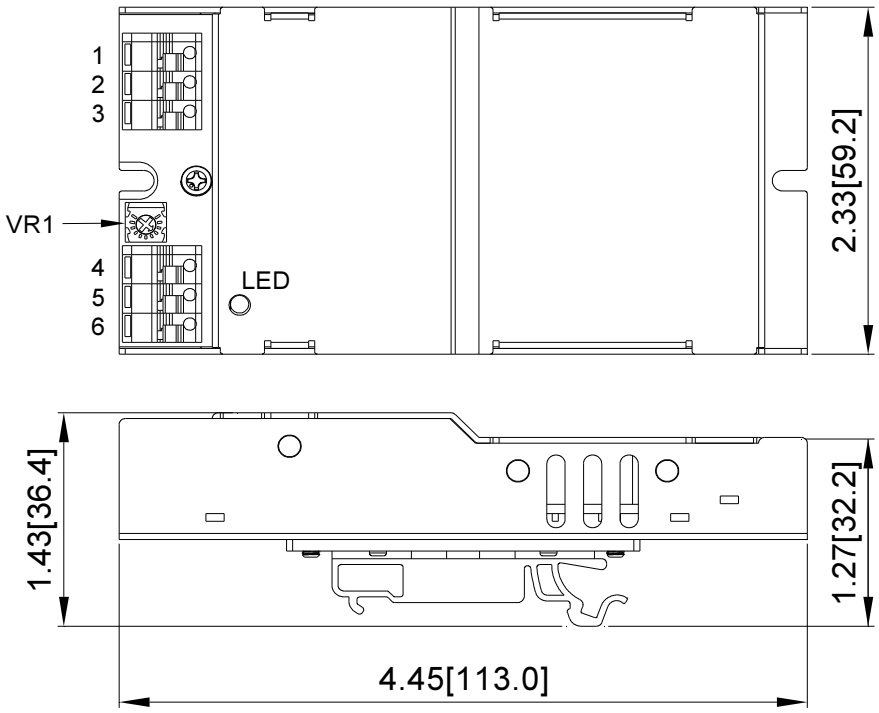




## MECHANICAL SPECIFICATION

EC7BW18-72XXX-ECRT



EC7BW18-72XXX-EDRT




| PIN CONNECTION | | |
|---|---|---|
| Pin | Dual | Single |
| 1 | +V Input | +V Input |
| 2 | -V Input | -V Input |
| 3 | Remote | Remote |
| 4 | -V Output | NA |
| 5 | Common | -V Output |
| 6 | +V Output | +V Output |

All Dimensions in Inches[mm]
Tolerance Inches: X.XX=±0.02 , X.XXX= ±0.010
Millimeters: X.X= ±0.5 , X.XX=±0.25

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