

# CRT100W12 SERIES

## 100 WATT 12:1 INPUT

## ISOLATED DC-DC CONVERTER

### Features

- Efficiency up to 92%
- Fixed Switching Frequency
- Regulated Outputs
- Remote On/Off
- Low No Load Power Consumption
- Fully Protected (OTP/OCV/OVP/UVLO)
- 3000Vac I/O Isolation
- Operating Ambient Temperature -40 to +90°C
- UL 62368-1 3rd (Reinforced Insulation) Approval
- Baseplate Cooled
- Low Inrush Current
- Input Reverse Polarity Protection
- Semi-Potting for High Moisture Environment
- Option Oring FET Model for Redundant Use
- Compliant to EN 55032/35, EN 50155, EN50121-3-2, EN 45545-2
- EN50155 Class S3/Class C2 Criteria A Without External Capacitor
- Output LED Indicator
- 5000m Operating Altitude



| MODEL NUMBER    | INPUT VOLTAGE | OUTPUT VOLTAGE | OUTPUT CURRENT |        | INPUT CURRENT |           | % EFF. |      | CAPACITOR LOAD MAX. |
|-----------------|---------------|----------------|----------------|--------|---------------|-----------|--------|------|---------------------|
|                 |               |                | MIN.           | MAX.   | NO LOAD       | FULL LOAD | (1)    | (2)  |                     |
| CRT100W12-72S12 | 14.4-160 VDC  | 12 VDC         | 0 mA           | 8.34 A | 10 mA         | 1600 mA   | 91     | 91   | 8330 uF             |
| CRT100W12-72S24 | 14.4-160 VDC  | 24 VDC         | 0 mA           | 4.17 A | 10 mA         | 1600 mA   | 90.5   | 90.5 | 4200 uF             |
| CRT100W12-72S48 | 14.4-160 VDC  | 48 VDC         | 0 mA           | 2.09 A | 10 mA         | 1600 mA   | 92     | 92   | 2100 µF             |

#### NOTE:

1. Nominal input voltage 72VDC.
2. Measured at 110V<sub>in</sub>.
3. To meet EN50155 and RIA12 refer to application note.
4. The converter operates in positive logic, turning on when the remote pin is high and off when it is low or open. In negative logic, it turns on when the remote pin is low or open and off when it is high. Refer to the **feature characteristics** section for details.

### PART NUMBER

| Series     | Nominal Input Voltage | Number of Outputs | Nominal Output Voltage                 | Mounting Type               | Remote On/Off Logic             | Oring                                               | Protective Coating                                             |
|------------|-----------------------|-------------------|----------------------------------------|-----------------------------|---------------------------------|-----------------------------------------------------|----------------------------------------------------------------|
| CRT100W12- | II                    | O                 | XX                                     | YY                          | L                               | Q                                                   | P                                                              |
| CRT100W12  | 72 : 72VDC            | S : Single        | 12 : 12VDC<br>24 : 24VDC<br>48 : 48VDC | EC : Enclosed Chassis Mount | None : Positive<br>N : Negative | None : No Oring Function<br>Q : With Oring Function | None : No Protective Coating<br>With<br>P : Protective Coating |

#### Part Number Example:

**CRT100W12-72S12ECN:** 100W, 12:1 14.4-160Vdc Input, Single 12Vdc Output, Enclosed Chassis Mount, Negative Logic

## 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    | -160 |      | 160  | V <sub>dc</sub> |
| Input Surge Voltage           | 100ms max.                       | All    |      |      | 200  | V <sub>dc</sub> |
| Operating Case Temperature    | At the center part of case plate | All    | -40  |      | 95   | °C              |
| Operating Ambient Temperature | See derating curve               | All    | -40  |      | 90   | °C              |
| Storage Temperature           |                                  | All    | -55  |      | 105  | °C              |

### INPUT CHARACTERISTICS

| PARAMETER                   | NOTES and CONDITIONS                                                 | Device                 | Min. | Typ. | Max. | Units           |
|-----------------------------|----------------------------------------------------------------------|------------------------|------|------|------|-----------------|
| Operating Input Voltage     |                                                                      | All                    | 14.4 | 72   | 160  | V <sub>dc</sub> |
| Input Under Voltage Lockout |                                                                      |                        |      |      |      |                 |
| Turn-On Voltage Threshold   | 50% Load                                                             | All                    |      | 13.5 | 14   | V <sub>dc</sub> |
| Turn-Off Voltage Threshold  | 50% Load                                                             | All                    | 11.8 | 12.3 |      | V <sub>dc</sub> |
| Lockout Hysteresis Voltage  | 50% Load                                                             | All                    |      | 1.2  |      | V <sub>dc</sub> |
| Maximum Input Current       | V <sub>in</sub> =14.4V, 75% Load ; V <sub>in</sub> =36.6V, Full load | All                    |      |      | 6.4  | A               |
| No-Load Input Current       | V <sub>in</sub> =72V, I <sub>o</sub> =0A                             | See Model Number Table |      |      |      | mA              |
| Inrush Current              | V <sub>in</sub> =110V , Full load                                    | All                    |      |      | 10   | A               |
| Hold up Time                | V <sub>in</sub> =24V, 85% Load (S2 level)                            | All                    | 10   | 15   |      | ms              |
|                             | V <sub>in</sub> =37.8V, Full load (S3 level)                         |                        | 20   | 25   |      |                 |
|                             | V <sub>in</sub> =110V, Full load (S3 level)                          |                        | 40   | 45   |      |                 |
| Fuse                        | Build-In                                                             | All                    |      | 10   |      | A               |

### OUTPUT CHARACTERISTICS

| PARAMETER                                                | NOTES and CONDITIONS                                                     | Device                                        | Min.                      | Typ. | Max.  | Units |
|----------------------------------------------------------|--------------------------------------------------------------------------|-----------------------------------------------|---------------------------|------|-------|-------|
| Voltage Set Point Accuracy                               | V <sub>in</sub> =72V, Full Load, T <sub>c</sub> =25°C                    | All                                           | -1.0                      |      | +1.0  | %     |
| Output Voltage Regulation                                |                                                                          |                                               |                           |      |       |       |
| Load Regulation                                          | Full Load to No Load                                                     | All                                           |                           |      | ±0.5  | %     |
| Line Regulation                                          | V <sub>in</sub> =High line to low line, full load                        | All                                           |                           |      | ±0.5  | %     |
| Temperature Coefficient                                  | T <sub>c</sub> =-40°C to 90°C                                            | All                                           |                           |      | ±0.02 | %/°C  |
| Output Voltage Ripple and Noise (5Hz to 20MHz bandwidth) |                                                                          |                                               |                           |      |       |       |
| Peak-to-Peak                                             | Full load, 10uF aluminum and 1uF ceramic capacitors                      | All                                           |                           |      | 100   | mV    |
| Output Current Range                                     | V <sub>in</sub> = 14.4 to 160V                                           | See Model Number Table & Power Derating Curve |                           |      |       | A     |
| Over Current Protection                                  | Hiccup, Auto recovery                                                    | All                                           | 105                       | 120  | 180   | %     |
| Short Circuit Protection                                 |                                                                          | All                                           | Continuous, Auto Recovery |      |       |       |
| External Load Capacitance                                | Full load (resistive)                                                    | See Model Number Table                        |                           |      |       | uF    |
| Output Voltage Adjustment Range                          | P <sub>o</sub> ≤ max. rated power, I <sub>o</sub> ≤ I <sub>o_max</sub> . | 12Vo                                          | -15                       |      | +25   | %     |
|                                                          |                                                                          | others                                        | -15                       |      | +20   |       |
| Over Voltage Protection                                  | Limited voltage, % of nominal V <sub>o</sub>                             | 48Vo                                          | 120                       | 125  | 130   | %     |
|                                                          |                                                                          | others                                        | 130                       | 135  | 140   |       |

### EFFICIENCY

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

# CRT100W12 Series

## DYNAMIC CHARACTERISTICS

| PARAMETER                               | NOTES and CONDITIONS                                                  | Device | Min. | Typ. | Max. | Units |
|-----------------------------------------|-----------------------------------------------------------------------|--------|------|------|------|-------|
| Output Voltage Current Transient        |                                                                       |        |      |      |      |       |
| Error Band                              | 75% to 100% of I <sub>o_max</sub> . step load change<br>di/dt=0.1A/us | All    |      |      | ±3   | %     |
| Recovery Time                           |                                                                       | All    |      | 250  | 500  | us    |
| Turn-On Delay and Rise Time             | Full load (Constant resistive load)                                   |        |      |      |      |       |
| Turn-On Delay Time, From On/Off Control | V <sub>on/off</sub> to 10%V <sub>o_set</sub> , Remote on              | All    |      | 25   |      | ms    |
| Turn-On Delay Time, From Input          | V <sub>in_min</sub> . to 10%V <sub>o_set</sub> , Power up             | All    |      | 25   |      | ms    |
| Output Voltage Rise Time                | 10%V <sub>o_set</sub> to 90%V <sub>o_set</sub>                        | 48Vo   |      | 30   |      | ms    |
|                                         |                                                                       | others |      | 22   |      |       |

## ISOLATION CHARACTERISTICS

| PARAMETER                                               | NOTES and CONDITIONS      | Device         | Min. | Typ.          | Max.         | Units                |
|---------------------------------------------------------|---------------------------|----------------|------|---------------|--------------|----------------------|
| Isolation Voltage<br>(100%factory Hi-Pot tested @2sec.) | 1 Minute; input to output | All            |      |               | 3000<br>4242 | $V_{ac}$<br>$V_{dc}$ |
|                                                         | 1 Minute; input to case   | All            |      |               | 2000<br>2828 | $V_{ac}$<br>$V_{dc}$ |
|                                                         | 1 Minute; output to case  | All            |      |               | 1500<br>2121 | $V_{ac}$<br>$V_{dc}$ |
| Isolation Resistance                                    | Input to output           | All            | 100  |               |              | MΩ                   |
| Isolation Capacitor                                     | Input to output           | All            |      | 4700          |              | pF                   |
|                                                         | Input to case             | 48Vo<br>others |      | 8800<br>16600 |              | pF                   |
|                                                         | Output to case            | 48Vo<br>others |      | 20000<br>9400 |              | pF                   |

## FEATURE CHARACTERISTICS

| PARAMETER                                                       | NOTES and CONDITIONS                                 | Device | Min. | Typ. | Max. | Units |
|-----------------------------------------------------------------|------------------------------------------------------|--------|------|------|------|-------|
| Switching Frequency                                             | Output ripple frequency                              | All    | 90   | 100  | 110  | KHz   |
| On/Off Control, Positive Remote On/Off Logic, Refer to -Vin Pin |                                                      |        |      |      |      |       |
| Logic High (Module On)                                          | $V_{on/off}$ at $I_{on/off}>0.3mA$                   | All    | 3.5  |      | 160  | V     |
| Logic Low (Module Off)                                          | $V_{on/off}$ at $I_{on/off}=0.0uA$ , Pin open=off    | All    | 0    |      | 1.2  | V     |
| On/Off Control, Negative Remote On/Off Logic, Refer to -Vin Pin |                                                      |        |      |      |      |       |
| Logic High (Module Off)                                         | $V_{on/off}$ at $I_{on/off}>0.3mA$                   | All    | 3.5  |      | 160  | 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)                   | $I_{on/off}$ at $V_{on/off}=0V$                      | All    | 0.3  |      | 2.4  | mA    |
| Off Converter Input Current                                     | Shutdown input idle current                          | All    |      | 3    | 10   | mA    |
| Over Temperature Shutdown                                       | Temperature at the center part of case, non-latching | All    |      | 100  |      | °C    |
| Over Temperature Recovery                                       |                                                      | All    |      | 90   |      | °C    |

## GENERAL SPECIFICATIONS

| PARAMETER        | NOTES and CONDITIONS                                                | Device | Min. | Typ. | Max. | Units   |
|------------------|---------------------------------------------------------------------|--------|------|------|------|---------|
| MTBF             | $I_o=100\%$ of $I_{o\_max}$ ;<br>MIL-HDBK - 217F_Notice 1, GB, 25°C | 12Vo   |      | 319  |      | K hours |
|                  |                                                                     | 24Vo   |      | 262  |      |         |
|                  |                                                                     | 48Vo   |      | 267  |      |         |
|                  | $I_o=100\%$ of $I_{o\_max}$ ;<br>Telcordia SR332, GB, 25°C          | 12Vo   |      | 2975 |      |         |
|                  |                                                                     | 24Vo   |      | 2746 |      |         |
|                  |                                                                     | 48Vo   |      | 3038 |      |         |
| Weight           |                                                                     | All    |      | 325  |      | grams   |
| Case Material    | Aluminum                                                            |        |      |      |      |         |
| Potting Material | UL 94V-0                                                            |        |      |      |      |         |

## GENERAL SPECIFICATIONS

|                 |                                                     |
|-----------------|-----------------------------------------------------|
| Shock/Vibration | EN 50155 (EN 61373) Compliant                       |
| Humidity        | 95% RH max. Non Condensing                          |
| Altitude        | 5000m Operating altitude, 12000m Transport altitude |
| Thermal Shock   | MIL-STD-810F                                        |
| Fire & Smoke    | EN 45545-2 Compliant                                |

## EMC SPECIFICATIONS (External components required, please refer to application note.)

|                                 |                                                                                                                                                                 |                  |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| EMI                             | EN 55032 & EN 50155 Compliant                                                                                                                                   | Class A          |
| ESD                             | EN 61000-4-2 Level 3: Air $\pm 8$ kV, Contact $\pm 6$ kV                                                                                                        | Perf. Criteria A |
| Radiated Immunity               | EN 61000-4-3 Level 3: 80~1000MHz, 20V/m                                                                                                                         | Perf. Criteria A |
| Fast Transient                  | EN 61000-4-4 Level 3: On power input port, $\pm 2$ kV (EN 50155)<br>Level 3: On power input port, $\pm 2$ kV (EN 55035)                                         | Perf. Criteria A |
| Surge                           | EN 61000-4-5 Level 4: Line to earth, $\pm 4$ kV, line to line, $\pm 2$ kV (EN 50155)<br>Level 3: Line to earth, $\pm 2$ kV, line to line, $\pm 1$ kV (EN 55035) | Perf. Criteria A |
| Conducted Immunity              | EN 61000-4-6 Level 3: 0.15~80MHz, 10V                                                                                                                           | Perf. Criteria A |
| Power Frequency Immunity        | EN 61000-4-8 Level 3: 50 Hz, 10A/m                                                                                                                              | Perf. Criteria A |
| Interruptions of Voltage Supply | EN 50155 Class S3: 20ms Interruptions                                                                                                                           | Perf. Criteria A |
| Supply Change Over              | EN 50155 Class C2: During a supply break of 30ms                                                                                                                | Perf. Criteria A |
| Application Note Link           | <a href="#">CRT100W12 Series App Notes</a>                                                                                                                      |                  |
| Packaging Information Link      | <a href="#">Packaging Information</a>                                                                                                                           |                  |

## Immunity to Environmental Conditions.

| Phenomenon                                                    | EN 50155; 2021 Reference Clause(s) | Reference Standard | Test Conditions                                                                                                                                                                                                                      | Result |
|---------------------------------------------------------------|------------------------------------|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| Low Temperature Start-up test                                 | 13.4.4                             | EN 60068-2-1       | Class OT6<br>Temperature: -40°C<br>Duration: 2 hrs                                                                                                                                                                                   | Pass   |
| Dry Heat Test                                                 | 13.4.5                             | EN 60068-2-2       | Class OT6 & Cycle A<br>Temperature: 85°C<br>Duration: 6 hrs                                                                                                                                                                          | Pass   |
| Low Temperature Storage Test                                  | 13.4.6                             | EN 60068-2-1       | Temperature: -40°C<br>Duration: 16 hrs                                                                                                                                                                                               | Pass   |
| Cyclic Damp Heat Test                                         | 13.4.7                             | EN 60068-2-30      | Temperature: 25°C - 55°C<br>Humidity: 90% RH<br>Duration: 48 hrs                                                                                                                                                                     | Pass   |
| Random Vibration Test                                         | 13.4.11                            | EN 61373           | Temperature: 25°C $\pm$ 10°C<br>Humidity: 50% $\pm$ 25% RH<br>Frequency range: 5 ~ 150 Hz<br>Vertical: 0.988 $m/s^2$<br>Transverse: 0.441 $m/s^2$<br>Longitudinal: 0.683 $m/s^2$<br>Duration: 10 min / axis                          | Pass   |
| Simulated Long Life Test at Increased Random Vibration Levels | 13.4.11                            | EN 61373           | Temperature: 25°C $\pm$ 10°C<br>Humidity: 50% $\pm$ 25% RH<br>Frequency range: 5 ~ 150 Hz<br>Vertical: 5.59 $m/s^2$<br>Transverse: 2.49 $m/s^2$<br>Longitudinal: 3.87 $m/s^2$<br>Duration: 5 hrs / axis                              | Pass   |
| Shock Test                                                    | 13.4.11                            | EN 61373           | Temperature: 25°C $\pm$ 10°C<br>Humidity: 50% $\pm$ 25% RH<br>Frequency range: 5 ~ 150 Hz<br>$\pm$ Vertical: 30 $m/s^2$<br>$\pm$ Transverse: 30 $m/s^2$<br>$\pm$ Longitudinal: 50 $m/s^2$<br>Duration: 30ms x18 (Each axis 3 shocks) | Pass   |



# CRT100W12 Series

## EN 45545-2 Fire & Smoke Test Conditions

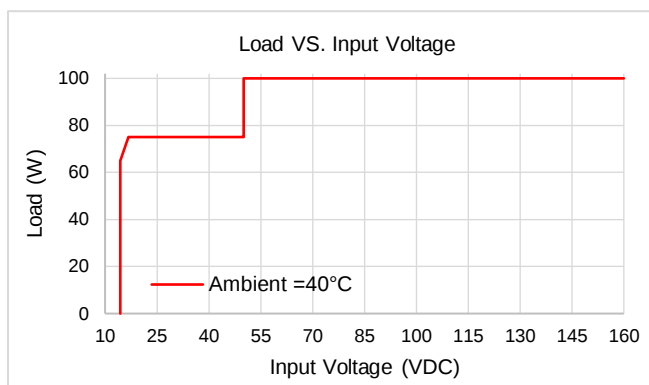
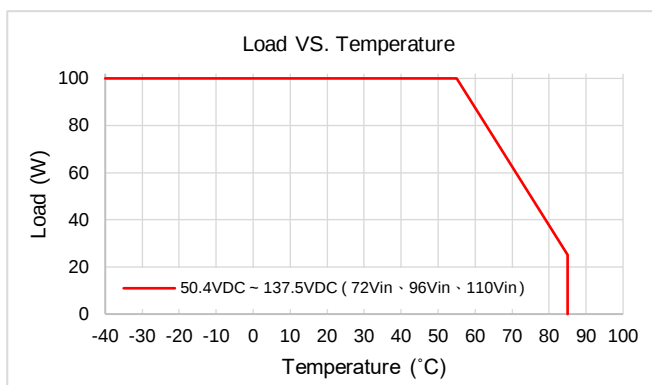
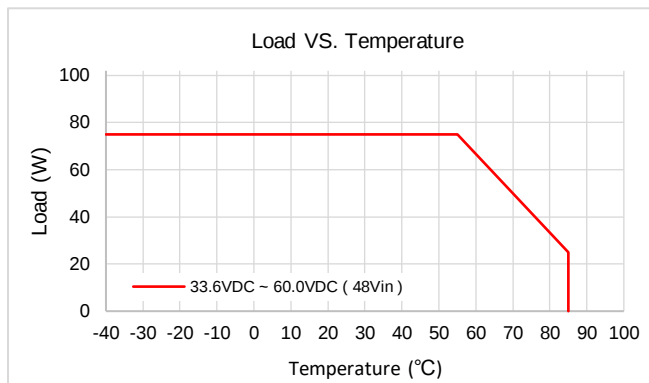
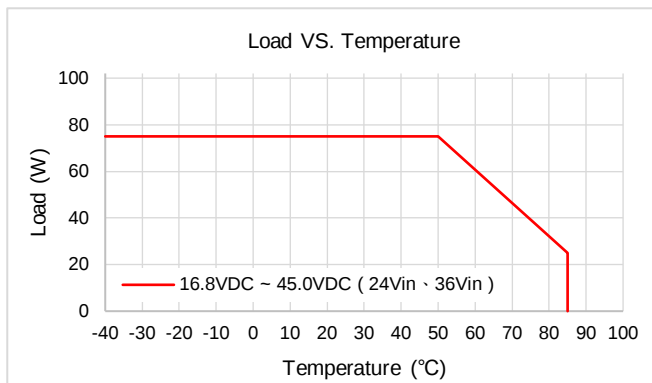
| Item |                     | Standard                                 | Hazard Level  |
|------|---------------------|------------------------------------------|---------------|
| R22  | Oxygen Index Test   | EN 45545-2: 2013<br>EN ISO 4589-2: 2006  | HL1, HL2, HL3 |
|      | Smoke Density Test  |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



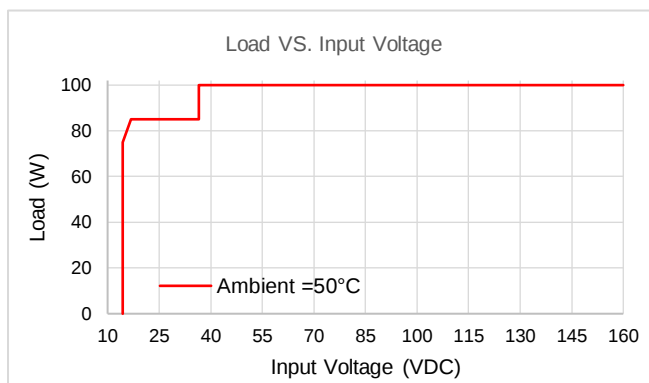
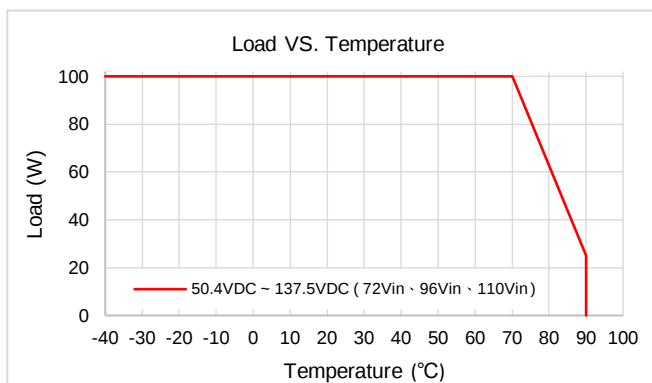
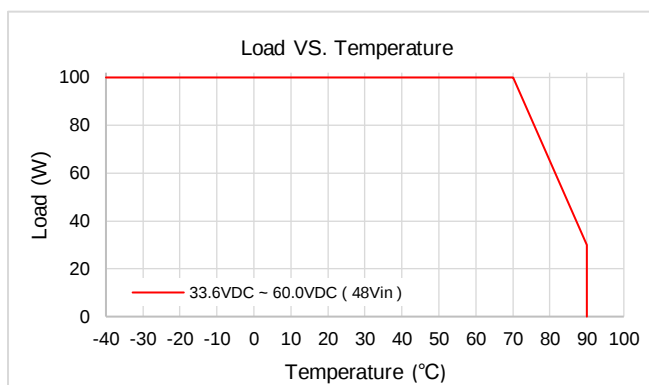
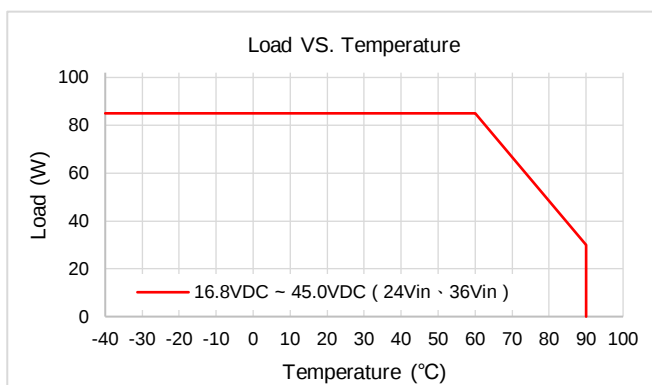
## CHARACTERISTIC CURVE

### Power Derating Curve

#### Nature Convection



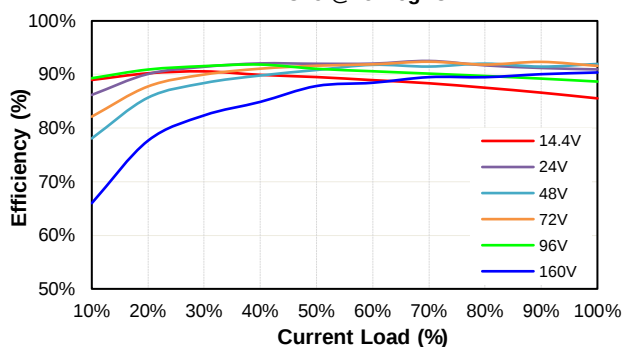
#### Conduction Convection with External Baseplate (36x36x0.2cm)



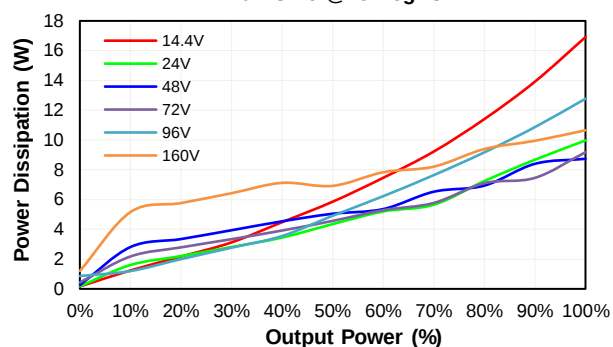
# CRT100W12 Series

## Performance Data

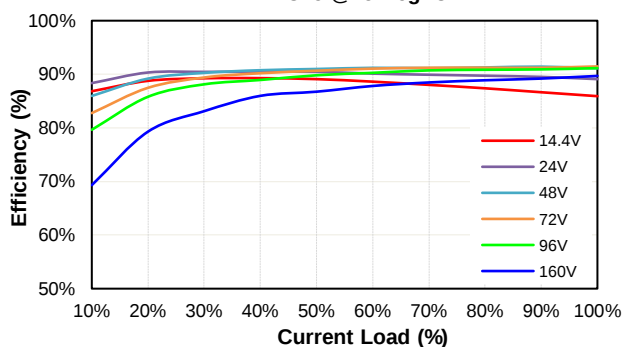
**CRT100W12-72S12**  
Eff Vs Io @25 Deg. C



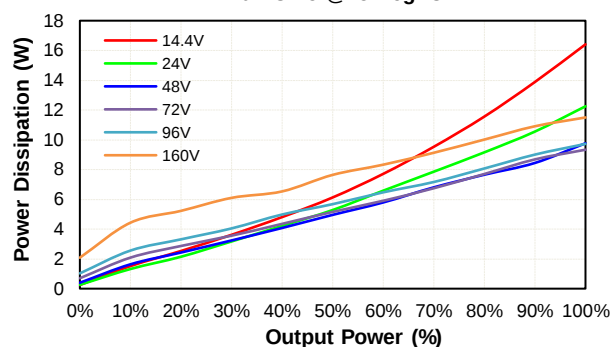
**CRT100W12-72S12**  
Pd Vs Po @25 Deg. C



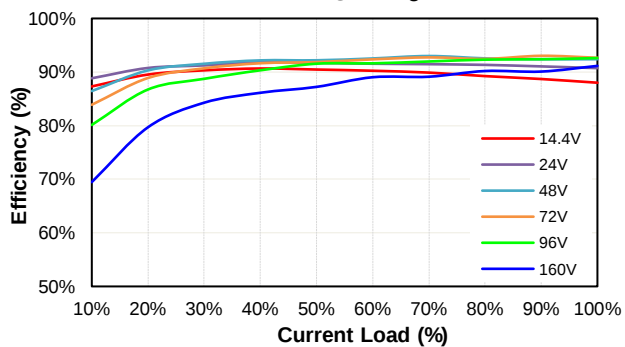
**CRT100W12-72S24**  
Eff Vs Io @25 Deg. C



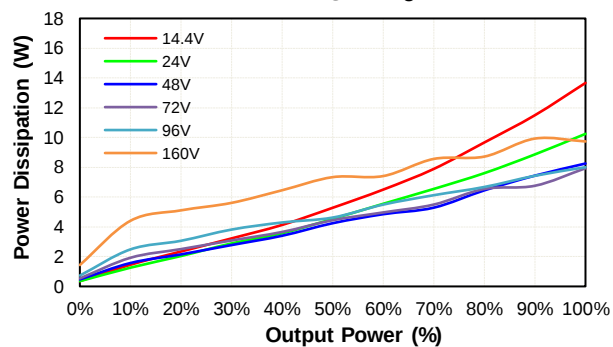
**CRT100W12-72S24**  
Pd Vs Po @25 Deg. C



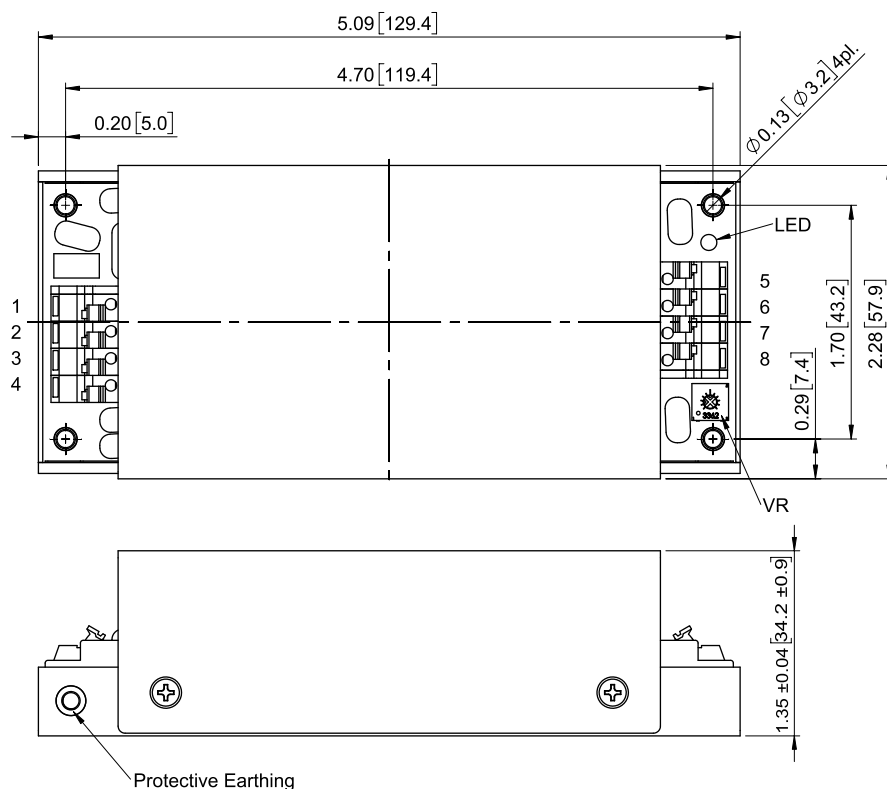
**CRT100W12-72S48**  
Eff Vs Io @25 Deg. C



**CRT100W12-72S48**  
Pd Vs Po @25 Deg. C



## MECHANICAL SPECIFICATION



All Dimensions in Inches[mm]  
Tolerance     Inches: x.xx=  $\pm 0.02$ , x.xxx=  $\pm 0.010$   
                  Millimeters: x.x=  $\pm 0.5$ , x.xx=  $\pm 0.25$

### Pin Connection

| Pin | Function        |
|-----|-----------------|
| 1   | +V Input        |
| 2   | -V Input        |
| 3   | Remote          |
| 4   | Function Ground |
| 5   | +V Output       |
| 6   | +V Output       |
| 7   | -V Output       |
| 8   | -V Output       |