



CRT60W12 SERIES 60 WATT 12:1 INPUT ISOLATED DC-DC CONVERTER

Features

- Efficiency up to 90.5%
- Fixed Switching Frequency
- Regulated Outputs
- Remote On/Off
- Low No Load Power Consumption
- Fully Protected (OTP/OCP/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
- Compliant to EN 55032/35, EN 50155, EN50121-3-2, EN 45545-2
- EN50155 Class S3/Class C1 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)	
CRT60W12-72S24	14.4-160 VDC	24 VDC	0 mA	2.5A	10 mA	1600 mA	90.5	90.5	3200 uF

NOTE:

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

PART NUMBER

Series	Nominal Input Voltage	Number of Outputs	Nominal Output Voltage	Mounting Type	Remote On/Off Logic
CRT60W12	II	O	XX	YY	L
CRT60W12	72 : 72VDC	S : Single	24 : 24VDC	EC : Enclosed Chassis Mount	None : Positive N : Negative

Part Number Example:

CRT60W12-72S24ECN: 60W, 12:1 14.4-160Vdc Input, Single 24Vdc 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 _{dc}
Input Surge Voltage	100ms max.	All			200	V _{dc}
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 _{dc}
Input Under Voltage Lockout						
Turn-On Voltage Threshold	50% Load	All		13.5	14	V _{dc}
Turn-Off Voltage Threshold	50% Load	All	11.8	12.3		V _{dc}
Lockout Hysteresis Voltage	50% Load	All		1.2		V _{dc}
Maximum Input Current	V _{in} =14.4V, 75% Load : V _{in} =36.6V, Full load	All			5.2	A
No-Load Input Current	V _{in} =72V, I _o =0A	See Model Number Table				mA
Inrush Current	V _{in} =110V, Full load	All			10	A
Hold up Time	V _{in} =24V, 85% Load (S2 level)	All	10			ms
	V _{in} =37.8V, Full load (S3 level)		20			
	V _{in} =110V, Full load (S3 level)		20			
Fuse	Build-in	All		8		A

OUTPUT CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
Voltage Set Point Accuracy	V _{in} =72V, Full load, T _c =25°C	All	-1.0		+1.0	%
Output Voltage Regulation						
Load Regulation	Full Load to No Load	All			±0.5	%
Line Regulation	V _{in} =High line to low line, full load	All			±0.5	%
Temperature Coefficient	T _c =-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 _{in} = 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 _o ≤ max. rated power, I _o ≤ I _{o_max}	All	-15		+20	%
Over Voltage Protection	Limited voltage, % of nominal V _o	All	130	135	140	%

EFFICIENCY

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
100% Load	V _{in} =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	All			±3	%
Recovery Time	$dI/dt=0.1A/us$	All		250	500	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		25		ms
Turn-On Delay Time, From Input	$V_{in_min.}$ to 10% V_{o_set} , Power up	All		25		ms
Output Voltage Rise Time	10% V_{o_set} to 90% V_{o_set}	All		22		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 4242	V_{ac} V_{dc}
	1 Minute; input to case	All			2000 2828	V_{ac} V_{dc}
	1 Minute; output to case	All			1500 2121	V_{ac} V_{dc}
Isolation Resistance	Input to output	All	100			MΩ
Isolation Capacitor	Input to output	All		4700		pF
	Input to case			16600		
	Output to case			9400		

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 $I_{o_max.}$; MIL-HDBK - 217F_Notice 1, GB, 25°C	All		262		K hours
	$I_o=100\%$ of $I_{o_max.}$; Telcordia SR332(issue 3) , GB, 25°C	All		2,746		K hours
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 $\pm 8\text{kV}$, Contact $\pm 6\text{kV}$	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, $\pm 2\text{kV}$ (EN 50155) Level 3: On power input port, $\pm 2\text{kV}$ (EN 55035)	Perf. Criteria A
Surge	EN 61000-4-5 Level 4: Line to earth, $\pm 4\text{kV}$, line to line, $\pm 2\text{kV}$ (EN 50155) Level 3: Line to earth, $\pm 2\text{kV}$, line to line, $\pm 1\text{kV}$ (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 C1: At 0.6*Vin duration 100 mS	Perf. Criteria A
Application Note Link	CRT60W12 Series App Notes	
Packaging Information Link	Packaging Information	

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 Temperature: -40°C Duration: 2 hrs	Pass
Dry Heat Test	13.4.5	EN 60068-2-2	Class OT6 & Cycle A Temperature: 85°C Duration: 6 hrs	Pass
Low Temperature Storage Test	13.4.6	EN 60068-2-1	Temperature: -40°C Duration: 16 hrs	Pass
Cyclic Damp Heat Test	13.4.7	EN 60068-2-30	Temperature: $25^{\circ}\text{C} - 55^{\circ}\text{C}$ Humidity: 90% RH Duration: 48 hrs	Pass
Random Vibration Test	13.4.11	EN 61373	Temperature: $25^{\circ}\text{C} \pm 10^{\circ}\text{C}$ Humidity: $50\% \pm 25\%$ RH Frequency range: 5 ~ 150 Hz Vertical: 0.988 m/s^2 Transverse: 0.441 m/s^2 Longitudinal: 0.683 m/s^2 Duration: 10 min / axis	Pass
Simulated Long Life Test at Increased Random Vibration Levels	13.4.11	EN 61373	Temperature: $25^{\circ}\text{C} \pm 10^{\circ}\text{C}$ Humidity: $50\% \pm 25\%$ RH Frequency range: 5 ~ 150 Hz Vertical: 5.59 m/s^2 Transverse: 2.49 m/s^2 Longitudinal: 3.87 m/s^2 Duration: 5 hrs / axis	Pass
Shock Test	13.4.11	EN 61373	Temperature: $25^{\circ}\text{C} \pm 10^{\circ}\text{C}$ Humidity: $50\% \pm 25\%$ RH Frequency range: 5 ~ 150 Hz $\pm$ Vertical: 30 m/s^2 $\pm$ Transverse: 30 m/s^2 $\pm$ Longitudinal: 50 m/s^2 Duration: 30ms x18 (Each axis 3 shocks)	Pass

EN 45545-2 Fire & Smoke Test Conditions

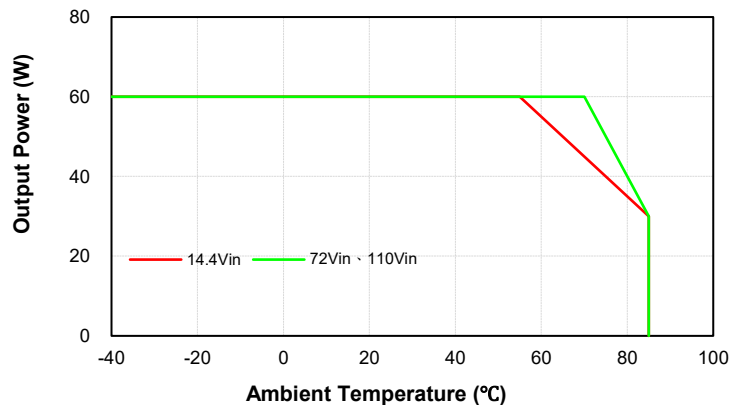
Item		Standard	Hazard Level
R22	Oxygen Index Test	EN 45545-2: 2013 EN ISO 4589-2: 2006	HL1, HL2, HL3
	Smoke Density Test	EN 45545-2: 2013 EN ISO 5659-2: 2013	HL1, HL2, HL3
	Smoke Toxicity Test	EN 45545-2: 2013 NF X70-100: 2006	HL1, HL2, HL3
R23	Oxygen Index Test	EN 45545-2: 2013 EN ISO 4589-2: 2006	HL1,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

CHARACTERISTIC CURVE

Power Derating Curve

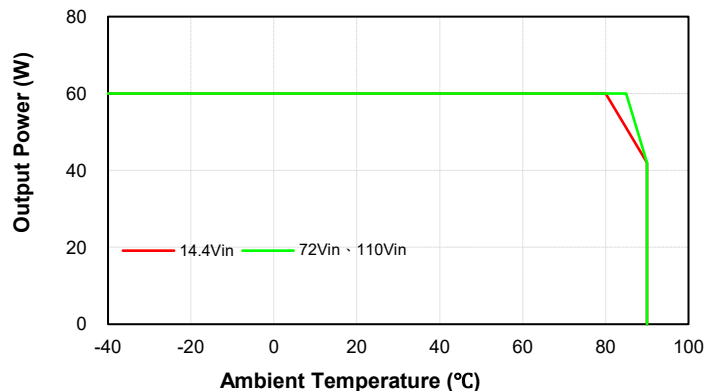
Nature Convection

Load VS. Temperature

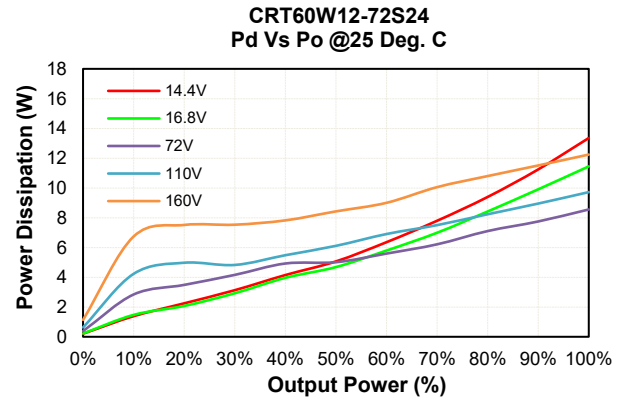
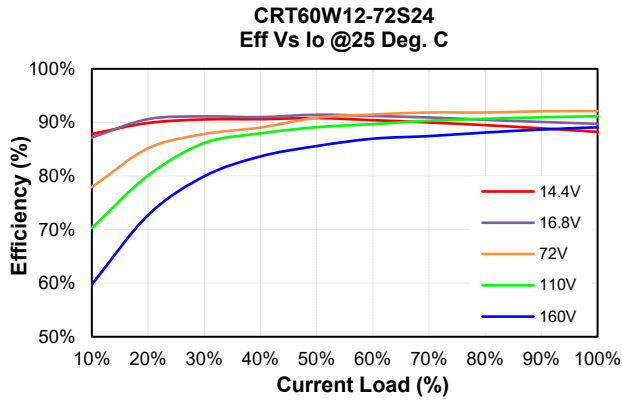


Conduction Convection with External Baseplate (36x36x0.2cm)

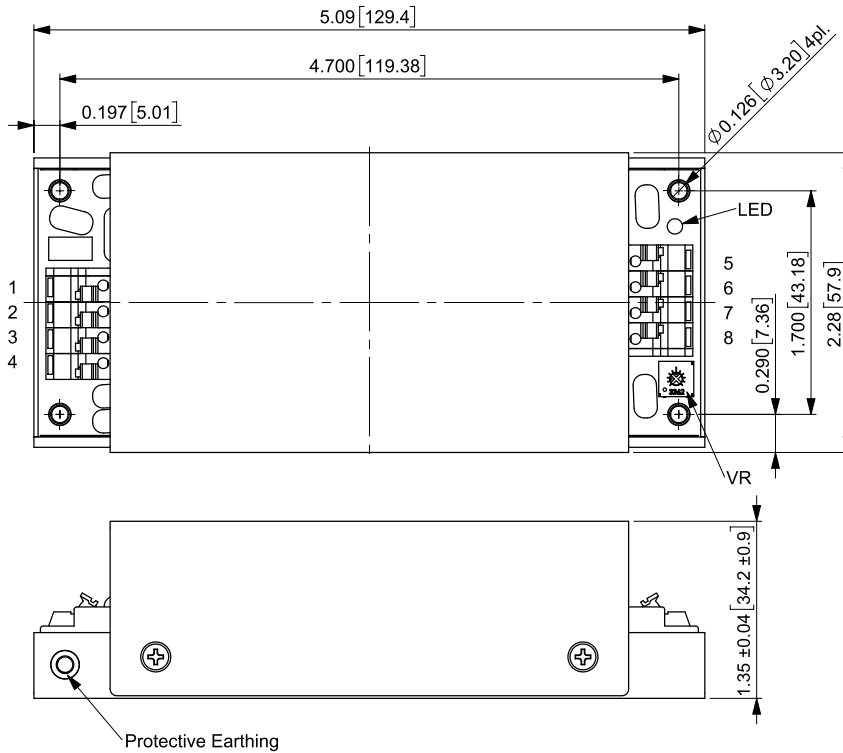
Load VS. Temperature



Performance Data



MECHANICAL SPECIFICATION



All Dimensions in Inches[mm]
Tolerance Inches: x.xx= ±0.03, x.xxx= ±0.020
Millimeters: x.x= ±0.7, x.xx= ±0.50

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