

CP2725AC48TEZ – FB2 Compact Power Line High Efficiency Rectifier

Input: 100 – 120/220 – 240V_{AC}; Output: 2725W @ 52V_{DC}; 5 V_{DC} @ 4W

RoHS Compliant



The CP2725AC48TEZ-FB2 Rectifier has an extremely wide programmable output voltage capability and fold-back current limiting features. High-density front-to-back airflow is designed for minimal space utilization and is highly expandable for future growth. This custom rectifier incorporates both RS485 and dual-redundant I²C communications busses that allow it to be used in a broad range of applications. Feature set flexibility makes this rectifier an excellent choice for a set of applications requiring operation over a wide output voltage range.

Applications

- Wide band power amplifiers

Features

- Efficiency 95%
- Compact 1RU form factor providing 30 W/in³
- 2725W @ 52V from nominal 220 – 240V_{AC}
- 1200W from nominal 100 – 120V_{AC} (for V_o > 30V_{DC})
- Output voltage programmable from 18V – 58V_{DC}
- PMBus compliant dual I²C and RS485 serial busses
- Power factor correction (meets EN/IEC 61000-3-2 and EN 60555-2 requirements)
- Output overvoltage and overload protection
- AC Input overvoltage and undervoltage protection
- Over – temperature warning and protection
- Redundant, parallel operation with active load sharing
- Redundant +5V Aux power
- Remote ON/OFF
- Hot insertion/removal (hot plug)
- Four front panel LED indicators
- UL* Recognized to UL60950-1, CAN/ CSA† C22.2 No. 60950-1, and VDE‡ 0805-1 Licensed to IEC60950-1
- CE mark meets 2006/95/EC directive§
- Internally controlled Variable – speed fan
- RoHS Directive 2011/65/EU and amended Directive (EU) 2015/863
- Special Foldback Curve

* UL is a registered trademark of Underwriters Laboratories, Inc.

† CSA is a registered trademark of Canadian Standards Association.

‡ VDE is a trademark of Verband Deutscher Elektrotechniker e.V.

§ This product is intended for integration into end – user equipment. All the required procedures for CE marking of end – user equipment should be followed. (The CE mark is placed on selected products.)

** ISO is a registered trademark of the International Organization of Standards.

Technical Specifications

Electrical Specifications

Input

Parameter	Min	Typ	Max	Units	Notes
Startup Input Voltage			90		
Low – line Operation			200		
High – line Operation				V_{AC}	
Operating Voltage Range					
Low – line Configuration	90	100, 110, 120	140		
High – line Configuration	200	220 – 240	265		
Surges (no damage)	305				
Input Frequency	47		66	Hz	
Input Current			12 13.5	A	At 110 V_{AC} At 240 V_{AC}
Inrush Transient		25	30	Apk	Measured at 25°C for all line conditions; does not include X – Capacitors charging.
Input Leakage Current		2.5	3.5	mA	Measured at 265 V_{AC} , 60Hz
Power Factor	0.96	0.98			From 50% to 100% (2725W @ HL, 1200W @ LL) load
Efficiency ¹	20 – 90% of FL	93	95	%	With or'ing function, aux 5V output, dual/redundant I ² C and RS485 communications and POE isolation
	>38V	85		%	>20% load Test condition: input; 240 V_{AC} , 60hz, output; 52 V_{DC}
Holdup		20 30		ms	48 V_{DC} ; Measurement starts at zero crossing of the ac voltage, and voltage decayed to 40V. For loads below 1200W.
Ride thru	1/2	1		cycle	Tested at nominal 115V and 230V. Complies to CISPR24 standards
Power Fail Warning ²	3	5		ms	Alarm issued via PFW signal going LO 5 ms prior to the main output decaying below 40 V_{DC} .

Main Output

Parameter	Min	Typ	Max	Units	Notes
Output Power	1200 2725			W	Above 30 V_{DC} from nominal 90 – 120 V_{AC} upto 55°C. Above 52 V_{DC} from nominal 200 – 265 V_{AC} upto 55°C
Default Set point		48		V_{DC}	Output floats with respect to frame ground.
Overall Regulation ³	-1 -2		+1 +2	%	0 – 45°C, minimum load 2.5A > 45°C
Output Voltage Set Range	18		58	V_{DC}	Analog margining and RS485
	18		58	V_{DC}	Set by I ² C
Output current	1 1		23 52.4	A	1200W @ 52V @ 90-120 V_{AC} . 2725W @ 52V @ 200-240 V_{AC} .
Current Share $V_o > 42V$ $V_o < 42V$	-5 -10		5 10	%FL	Compared to the average output current delivered by a set of Rectifiers. Loads > 50% FL
Output Ripple RMS (5Hz to 20MHz) Peak-to-Peak (5Hz to 20MHz)		60	100 500	mV _{rms} mV _{p-p}	Measured with 20MHz bandwidth under any condition of loading. Minimum load is 1A
External Bulk Load Capacitance	0		5000	μF	External capacitance can be increased but the rectifier will not meet its turn – ON rise time requirement.
Turn – on Delay Rise Time – Standard (PMBus) – Telecom (RS485) ⁴ Overshoot		5 100 5		s ms s %	Monotonic Turn_On from 30% to 100% of Vnom above -5°C operation. Monotonic Turn_On from 60% to 100% of Vnom below -5°C operation.
Load Step Response ΔI ΔV Response Time		2.0 2	50	%FL V_{DC} ms	DI/Dt slew rate 1A/μs. Settling time to within regulation requirements. Minimum load of 2.5 amperes required.

¹At 52 V_{DC} , 240 V_{rms} and 25°C.

²Internal protection circuits may override the PFW signal and may trigger an immediate shutdown.

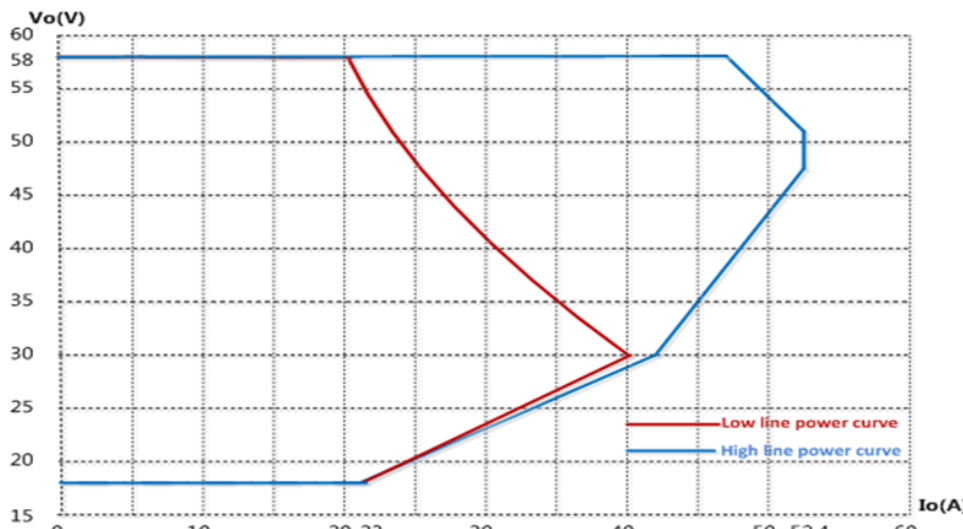
³Includes all variations due to specified load range, drift, and environmental conditions.

⁴Below -5°C, the rise time is approximately 5 minutes to protect the bulk capacitors.

Technical Specifications (continued)

Electrical Specifications (continued)

Main Output (continued)

Parameter		Min	Typ	Max	Units	Notes										
Permissible Load Boundary	Power limit – high line	2725			W											
	Power limit – low line	1200			W											
	The overload current limit threshold should be set @ 1A above the load envelope shown here															
	Power curve															
	Vo(V)	18	26	30	32	36	40	44	48	49	50	51	52	54	56	58
	Io(A)	20.7	35.1	42.3	43.4	45.8	48.2	50.6	52.4	52.4	52.4	52.4	52.4	50.5	48.7	47.0
																
	Vo(V)	18	26	30	32	36	40	44	48	49	50	51	52	54	56	58
	Io(A)	20.7	35.1	40.0	37.5	33.3	30.0	27.3	25.0	24.5	24.0	23.5	23.1	22.2	21.4	20.7
	Contract terms are for supporting all loads inside the load map. The customer will develop a control interface which maintains the operating voltage and current so as to not exceed the load map.															
System Power Up	Units should be able to be plugged in one at a time and guarantee system start up. Units should stay in current limit for approximately 20 seconds to guarantee restart.															
Over – voltage Delayed Immediate Latchoff			60	V _{DC}	200msec delayed shutdown to be implemented.											
			65	V _{DC}	Instantaneous shutdown above this point.											
Three restart attempts may be implemented within a one minute window prior to a latched shutdown																
Over – temperature Warning		5		°C	Implemented prior to commencement of an OT shutdown											
Shutdown		20		°C	Below the maximum rating of the device being protected											
Auto – recoverable	Temperature hysteresis of approximately 10°C provided between shutdown and restart.															
Overcurrent events that exceed the envelope by 5% will hiccup continuously at a frequency of approximately once every 20 seconds. For voltage set – points below 42V, a tracking Under Voltage shutdown occurs at 2 volts below set-point. UV must exhibit for more than 1 second before shutdown. UV shutdown will exhibit the same 20 second hiccup behavior.																

Auxiliary Output

Parameter	Min	Typ	Max	Units	Notes
Output Voltage Setpoint		5		V _{DC}	
Output Current	0.005		0.75	A	
Overall Regulation	-10		+5	%	Within ±5% when load is < 0.5A.
Ripple and Noise		50	100	mV _{pk-pk}	20MHz bandwidth
Over – voltage Clamp			7	V _{DC}	
Over – current Limit	110		175	%FL	

Technical Specifications (continued)

Environmental, EMC, Reliability Specifications

Environmental

Parameter	Min	Typ	Max	Units	Notes
Ambient Temperature Operating Derating	-40 ⁵	1	55 2	°C °C	Air inlet from sea level to 5,000 feet. Per 1,000 feet above 5,000 feet.
Storage Temperature	-40		85	°C	
Humidity	5		95	%	Relative humidity, non – condensing
Altitude	-60 -200		4000 13000	m ft	For operation above 2500m (5000 ft.), maximum operating temperature is derated by 2°C per 305m (1000 ft.).
Shock and Vibration					IPC9592 sections 5.2.8 – 5.2.13
Earthquake Rating	4			Zone	Per Telcordia GR-63-CORE, all floors, when installed in CP Shelf.
Acoustic Noise		55		dBA	Noise is proportional to fan speed, load and ambient temperature.
Harmonic Emissions	Per EN/IEC61000-3-2				
Radiated Emissions ⁶	Exceeds FCC and CISPR22 (EN55022) – Class A by a 6dB margin				
Conducted Emissions – ac	Exceeds FCC and CISPR22 (EN55022) Class A Telcordia GR-1089-CORE - Class A by a 6dB margin				
ESD	Error free per EN/IEC 61000-4-2 Level 3 (6 kV contact discharge, 8 kV air discharge).				
Radiated Immunity	Error free per EN/IEC 61000-4-3 Level 3 (10 V/m).				
Electrical Fast Transient Burst	Error free per EN/IEC 61000-4-4 Level 3 (2 kV, 5 kHz repetition rate)				
Lightning Surge, Error Free Damage Free	EN/IEC61000-4-5 Level 4 (4 kV common mode, 2 kV differential mode). ANSI C62.41 Level A3 (6 kV common and differential mode)				
Line sags and interruptions	IPC9592A issued May 2010; 1 cycle interruption or 25% sag (115V, 230V – nominal for UUT) for 2 seconds the output shall stay above 40V _{DC} at full load. [Note: An input sag below 80V may cause an immediate shutdown].				
Conducted Immunity	Error free per EN/IEC 61000-4-6 Level 3 (10V _{rms}).				
Reliability (calculated)		450,000		Hours	At ambient of 25°C at full load per Telcordia SR-332, issue 2, Reliability Prediction for Electronic Equipment, Method I Case III.
Isolation					
Input – Chassis/Signals	1500			V _{rms}	Per EN60950.
Input – Output	3000			V _{rms}	Consult factory for testing to this requirement
Output – Chassis	500			V _{DC}	Internal Lineage standard, GR_947
Output – Chassis/Signals	2250			V _{DC}	POE compliant Rectifier, Per IEEE802.3.
Service Life		10		Years	25°C ambient, full load excluding fans.

⁵Designed to start and work at an ambient as low as -40°C, but may not meet operational limits until above -5°C

⁶Radiated emissions compliance was met using a Lineage Power shelf. This shelf includes output common and differential mode capacitors that assist in meeting compliance.

Technical Specifications (continued)

Control and Status

The Rectifier provides three means for monitor/control: analog, PMBus™, or the OmniOn Galaxy – based RS485 protocol.

Details of analog control and the PMBus™ based protocol are provided in this data sheet. OmniOn will provide separate application notes on the Galaxy RS485 based protocol for users to interface to the rectifier. Contact your local OmniOn representative for details.

Signal Reference

Unless otherwise noted, all signals are referenced to Logic_GRD. See the Signal Definitions Table at the end of this document for further description of all the signals.

Logic_GRD is isolated from the main output of the power supply for PMBus communications. Communications and the 5V standby output are not connected to main power return (Vout(-)) and can be tied to the system digital ground point selected by the user. (Note that RS485 communications is referenced to Vout(-), main power return of the power supply).

Logic_GRD is capacitively coupled to Frame_GRD inside the power supply. The maximum voltage differential between Logic_GRD and Frame_GRD should be less than 100V_{DC}.

Control Signals

Enable: Controls the main 48V_{DC} output when either analog control or PMBus protocols are selected, as configured by the Protocol pin. This pin must be pulled low to turn **ON** the rectifier. The rectifier will turn **OFF** if either the **Enable** or the **ON/OFF** pin is released. This signal is referenced to Logic_GRD. In RS485 mode this pin is ignored.

ON/OFF: This is a shorter pin utilized for hot – plug applications to ensure that the rectifier turns **OFF** before the power pins are disengaged. It also ensures that the rectifier turns **ON** only after the power pins have been engaged. Must be connected to V_OUT (-) for the rectifier to be ON.

Margining: The 48V_{DC} output can be adjusted between 18 – 58V_{DC} by a control voltage on the Margin pin. This control voltage can be generated either from an external voltage source, or by forming a voltage divider between 3.3V and Logic_GRD, as shown in Fig. 1. The power supply includes the high side pull-up 10kΩ resistor to 3.3V_{DC}. Connecting a resistor between the margin pin and Logic_GRD will complete the divider.

An open circuit, or a voltage level > 3.0V_{DC}, on this pin sets the main output to the factory default setting of 48V_{DC}.

Hardware margining is only effective until software commanded output voltage changes are not executed. Software commanded output voltage settings permanently override the hardware margin setting until power to the internal controller is interrupted, for example if input power or bias power is recycled.

The controller always restarts into its default configuration, programmed to set the output as instructed by the margin pin. Subsequent software commanded settings permanently override the margin pin. Adding a resistor between margin and Vout(-) is an ideal way of changing the factory set point of the rectifier to whatever voltage level is desired by the user.

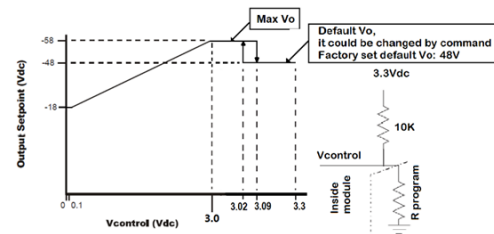


Figure 1. Diagram showing how output can be margined using Vcontrol adjustment.

Module Present Signal: This signal has dual functionality. It can be used to alert the system when a rectifier is inserted. A 500Ω resistor is present in series between this signal and Logic_GRD. An external pull – up should not raise the voltage on the pin above 0.25V_{DC}. When the voltage on this pin exceeds 1V_{DC}, the write_protect feature of the EEPROM is enabled.