

## CP2725AC48TEZ-FB2 Compact Power Line High Efficiency Rectifier

Input: 100-120/220-240 Vac; Output: 2725W @ 52Vdc; 5 Vdc @ 4W

### RoHS Compliant



### Features

- Efficiency 95%
- Compact 1RU form factor providing 30 W/in<sup>3</sup>
- 2725W @ 52V from nominal 220 – 240Vac
- 1200W from nominal 100 – 120Vac (for  $V_o > 30Vdc$ )
- Output voltage programmable from 18V – 58Vdc
- PMBus compliant dual I<sup>2</sup>C 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<sup>†</sup> C22.2 No. 60950-1, and VDE<sup>‡</sup> 0805-1 Licensed to IEC60950-1
- CE mark meets 2006/95/EC directive<sup>§</sup>
- Internally controlled Variable-speed fan
- RoHS Directive 2011/65/EU and amended Directive (EU) 2015/863
- Special Foldback Curve

### Applications

- Wide band power amplifiers

### Description

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 I<sup>2</sup>C 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.

\* 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.



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### Electrical Specifications

Input					
Parameter	Min	Typ	Max	Units	Notes
Startup Input Voltage Low-line Operation High-line Operation			90 200		
Operating Voltage Range Low-line Configuration High-line Configuration	90 200	100, 110, 120 220 - 240	140 265	Vac	
Surges (no damage)	305				
Input Frequency	47		66	Hz	
Input Current			12 13.5	A	At 110 Vac At 240 Vac
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 265Vac, 60Hz
Power Factor	0.96	0.98			From 50% to 100% (2725W @ HL, 1200W @ LL). load
Efficiency <sup>1</sup>	20 – 90% of FL	93	95	%	With or'ing function, aux 5V output, dual/redundant I <sup>2</sup> C and RS485 communications and POE isolation >20% load Test condition: input; 240Vac, 60hz, output; 52Vdc
	>38V	85		%	
Holdup		20		ms	48Vdc, Measurement starts at zero crossing of the ac voltage, and voltage decayed to 40V. ← For loads below 1200W.
		30			
Ride thru	1/2	1		cycle	Tested at nominal 115V and 230V . Complies to CISPR24 standards
Power Fail Warning <sup>2</sup>	3	5		ms	Alarm issued via PFW signal going LO 5 ms prior to the main output decaying below 40Vdc.

Main Output					
Parameter	Min	Typ	Max	Units	Notes
Output Power	1200 2725			W	Above 30Vdc from nominal 90-120Vac upto 55°C. Above 52Vdc from nominal 200-265Vac upto 55°C
Default Set point		48		Vdc	Output floats with respect to frame ground.
Overall Regulation <sup>3</sup>	-1 -2		+1 +2	%	0 – 45C, minimum load 2.5A > 45C
Output Voltage Set Range	18		58	Vdc	Analog margining and RS485
	18		58	Vdc	Set by I <sup>2</sup> C
Output current	1 1		23 52.4	A	1200W @ 52V @ 90-120Vac. 2725W @ 52V @ 200-240Vac.

<sup>1</sup> At 52Vdc, 240Vrms and 25°C.

<sup>2</sup> Internal protection circuits may override the PFW signal and may trigger an immediate shutdown.

<sup>3</sup> Includes all variations due to specified load range, drift, and environmental conditions.

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Electrical Specifications (continued)

Main Output (continued)																
Parameter		Min	Typ	Max	Units	Notes										
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	mVrms mVp-p	Measured with 20MHz bandwidth under any condition of loading. Minimum load is 1A.										
External Bulk Load Capacitance		0		5,000	$\mu F$	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 (RS-485) <sup>4</sup> 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 $\Delta I$ $\Delta V$ Response Time			2.0 2	50	%FL Vdc ms	$\Delta I/\Delta t$ slew rate 1A/ $\mu s$ . Settling time to within regulation requirements. Minimum load of 2.5 amperes required.										
	Power Limit – high line	2725			W											
	Power limit – low line	1200			W											
The overload current limit threshold should be set $\cong 1A$ above the load envelope shown here																
Power curve																
	<b>Vo(V)</b>	18	26	30	32	36	40	44	48	49	50	51	52	54	56	58
	<b>Io(A)</b>	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
Permissible Load Boundary	<p>The graph plots output voltage (Vo) in Volts on the y-axis (15 to 60) against output current (Io) in Amperes on the x-axis (0 to 60). Two curves are shown: a red 'Low line power curve' and a blue 'High line power curve'. The high line curve is constant at 58V until approximately 48A, then drops to 52V at 52.4A. The low line curve is constant at 18V until approximately 23A, then rises to 30V at 40A, and finally to 52.4V at 52.4A. A dashed line indicates the permissible load boundary.</p>															
		<b>Vo(V)</b>	18	26	30	32	36	40	44	48	49	50	51	52	54	56
	<b>Io(A)</b>	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

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

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	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.

Electrical Specifications (continued)

Main Output (continued)						
Over-voltage	Delayed			60	Vdc	200msec delayed shutdown to be implemented. Instantaneous shutdown above this point.
	Immediate Latchoff			65	Vdc	
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 Below the maximum rating of the device being protected
Shutdown		20			°C	
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.						

Electrical Specifications (continued)					
Auxiliary Output					
Parameter	Min	Typ	Max	Units	Notes
Output Voltage Setpoint		5		Vdc	
Output Current	0.005		0.75	A	
Overall Regulation	-10		+5	%	Within ±5% when load is < 0.5A.
Ripple and Noise		50	100	mVpk-pk	20MHz bandwidth
Over-voltage Clamp			7	Vdc	
Over-current Limit	110		175	%FL	

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Environmental, EMC, Reliability Specifications					
Environmental					
Parameter	Min	Typ	Max	Units	Notes
Ambient Temperature Operating Derating	-40 <sup>5</sup>	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 <sup>6</sup>	Exceeds FCC and CISPR22 (EN55032) - Class A by a 6dB margin				
Conducted Emissions - ac	Exceeds FCC and CISPR22 (EN55032) 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 40Vdc 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 (10Vrms).				
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 Input - Output Output-Chassis	1500 3000 500			Vrms Vrms Vdc	Per EN60950. Consult factory for testing to this requirement Internal Lineage standard, GR_947
Service Life		10		Years	25°C ambient, full load excluding fans.

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

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

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