

AC40W-12V-3.3V-PBF

(115Vac, 47-800Hz INPUT)

40W/12Vdc, 3.3Vdc DUAL OUTPUT

115Vac INPUT PFC POWER SUPPLY



Providing two isolated output voltages and up to 40W continuous output power, the **AC40W-12V-3.3V-PBF** is optimized for 115Vac/ 47-800Hz single phase RTCA/DO-160G airborne applications. It meets the most stringent airborne requirements including those for variable frequency 115Vac generator systems over the wide frequency range of 360-800Hz and RTCA/DO-160G category M emissions. The **AC40W-12V-3.3V-PBF** is capable of providing up to 42W output during momentary input AC interrupt conditions of up to 250mSec.

Weighing less than 12 ounces, the **AC40W-12V-3.3V-PBF** is constructed on a multi-layer PWB occupying ~28.1in². Component height is less than 1.05" and the supply contains 13 uniformly spaced #4 holes to facilitate mounting within upper unit. Five low-profile TO-220 power devices are mounted horizontally to two aluminum pedestals for heat transfer at upper unit level. Supply interconnection is accomplished using two right angle Molex 43045 series connectors. The **AC40W-12V-3.3V-PBF** is designed and manufactured to stand-up to the harsh operating environments encountered in today's aircraft installations.



FEATURES

	Efficiency: 78% typical at full rated output load
	Wide input range: 96 – 134Vac, 47-800Hz
	Inrush current limiting: < 3.7Apk cold start, < 7Apk warm start/ subsequent restarts
	Size: 5.62" x 5.00" x 1.0"; PCB thickness: 0.062"; Weight: less than 12 ounces
	Independent 3.3V auxiliary converter (PS2) OR'ED with ideal diode circuit with main 3.3V converter (PS1)
	Two isolated DC outputs: +12V (switched), +3.3V_OR'ED (unswitched)
	Independent over-current and over-voltage protection on each output
	Output DC valid status line (TTL)
	Over-temperature fault signal (TTL)
	MTBF: 636,900 Hours, RIAC 217Plus, Aic category, 55°C ambient temp, 65%DC, 2190 Cycles/ year



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STANDARD OUTPUTS

PARAMETER	OUTPUT VOLTAGE	
	+12V	+3.3V_OR'ED
Voltage Regulation	12.1V \pm 2%	3.3V +8, -3%
Output Current	2.64A	3A
Max Output Capacitance	680uF	1000uF
Maximum Load	32W	9.9W
Minimum Load	200mA	0A
Pk-pk Ripple + Noise (20MHz)	< 120mVpp	< 50mVpp
Overcurrent Set Point	3.75A (4.2A Max *)	4.1A (4.5A Max)
Notes	1, 2	1, 2, 3, 4, 5

Notes:

1. Constant-current limited
2. Any combination of 12V current (up to ~3.5A) and +3.3V_OR'ED current (up to 3A) adding up to ~42W of total output power can be drawn from the supply. * 12V output current limit is affected by +3.3V_OR'ED load current.
3. +3.3V_OR'ED output is present whenever input AC is valid. If main 3.3V (PS1) output loses regulation low (<3V) or main supply faults, auxiliary 3.3V (PS2) converter provides seamless output for +3.3V_OR'ED output utilizing ideal diode circuit.
4. Ideal diode controller current limit set point is 4.1A. 3.3V (PS1) current limit set point is 5A typical/ 6A max. 3.3V (PS2) current limit set point is 3.3A.
5. 3.3V (PS1) internal set-point is 3.45V (+/-3%) in order to assure 3.20V minimum output for +3.3V_OR'ED level at full 3A load as ideal diode controller may drop as much as 150mV at 3A load at 25C. +8% tolerance (3.56V) is listed as voltage may be 3.45V + 3% at no load with no drop in ideal diode controller circuit. 3.3V (PS2) level is fixed at 3.30Vdc +/-3%. Load regulation is +/-2%. Therefore when operating from 3.3V (PS2) at full 3A output, +3.3V_OR'ED level may be as low as 2.98V if running on low side of tolerance with additional 150mV drop in ideal diode controller.



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APPLICABLE SPECIFICATIONS

	RTCA/DO-160G, section 4, altitude/ temperature (operating) to 15,000 feet, category A1 equipment
	RTCA/DO-160G, section 6, humidity (operating) category A
	RTCA/DO-160G, section 7, shock (operating) category S, curve C
	RTCA/DO-160G, section 8, vibration (operating) category S, curve C
	RTCA/DO-160G, section 15, magnetic effect, category B
	RTCA/DO-160G, section 16, power input requirements for AC input, cat A(WF) equip, includes harmonic distortion
	RTCA/DO-160G, section 17, voltage spike, category B equipment
	RTCA/DO-160G, section 18, conducted susceptibility, category Z equipment
	RTCA/DO-160G, section 19, induced signal susceptibility, category Z equipment
	RTCA/DO-160G, section 20, conducted and radiated susceptibility, category T equipment
	RTCA/DO-160G, section 21, conducted and radiated emissions, category M equipment, with external power line EMI
	Operating temperature: -25°C to +70°C, no forced air required, requires two aluminum heat transfer pedestals are attached to external heatsink or upper unit level sheetmetal
	Storage temperature: -55°C to +100°C



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INTERCONNECTION

SUPPLY SIDE CONNECTORS AND PIN-OUTS

Connector	J1	J2
Pin #	Molex Right Angle 43045-0600	Molex Right Angle 43045-1200
1	n/c	n/c
2	Chassis Gnd	DCRTN
3	n/c	DCRTN
4	Line	DCRTN
5	n/c	+12Vout
6	Neutral	DCGOOD-L
7	--	+3.3V_OR'ED
8	--	OUTPUTEN-L
9	--	DCRTN
10	--	OVERTEMP-L
11	--	+12Vout
12	--	+3.3V_OR'ED



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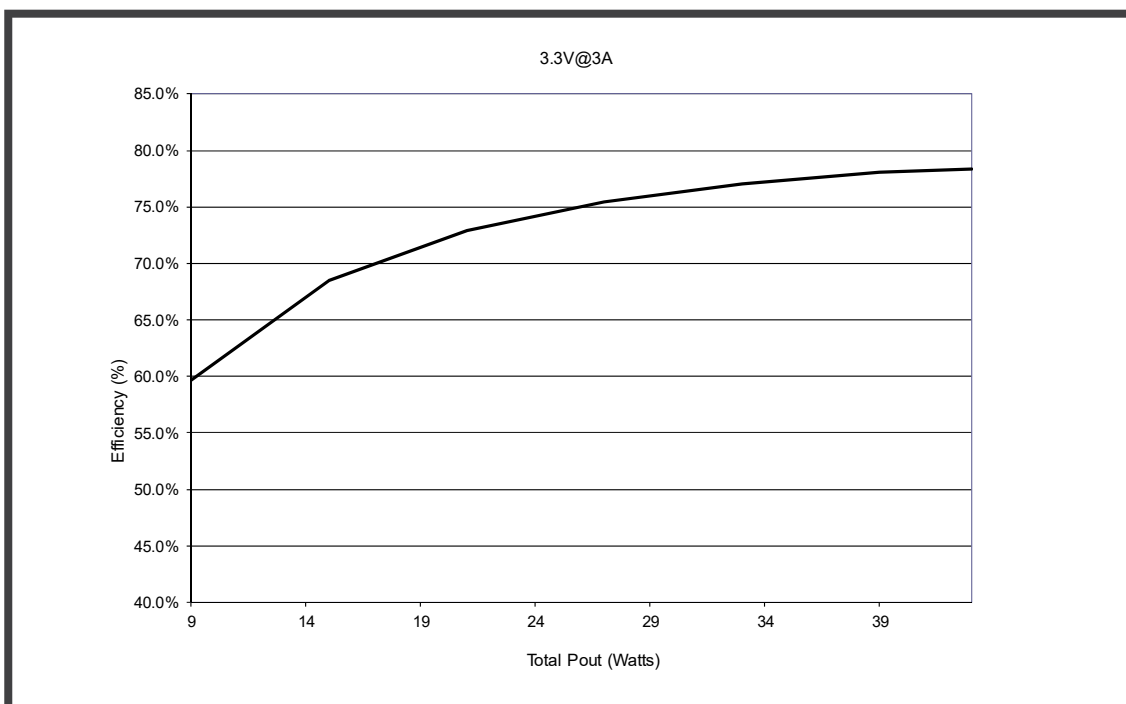
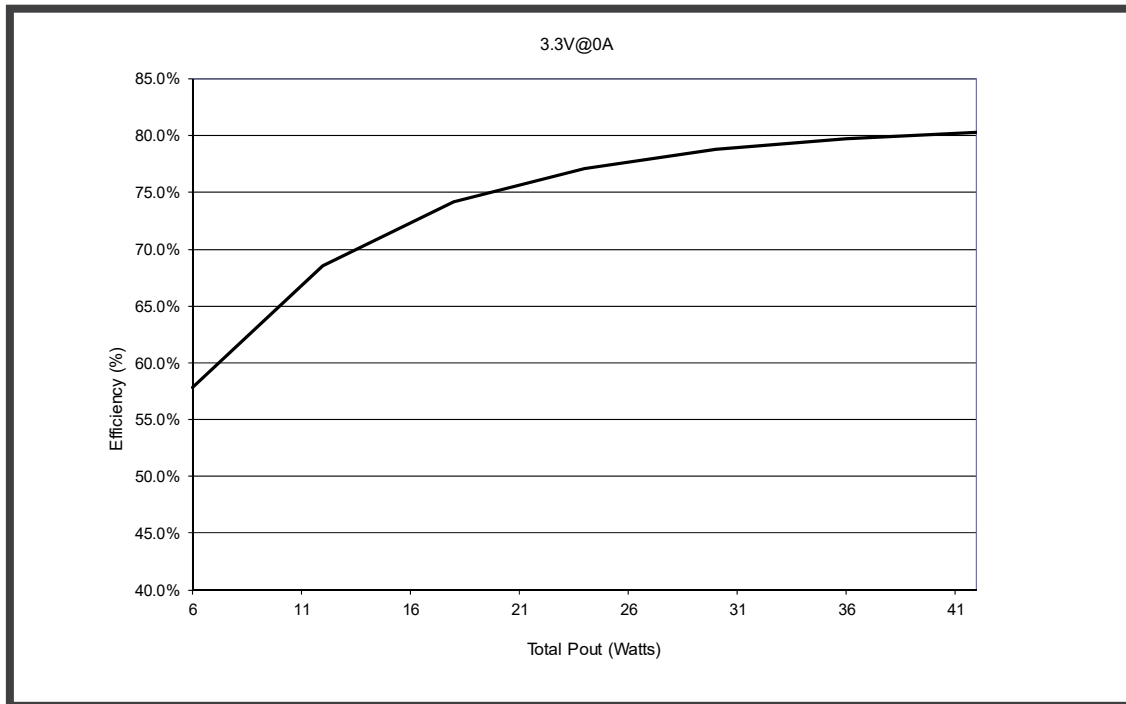
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EFFICIENCY CURVES

Efficiency using the following test conditions: $T_a = 23^\circ\text{C}$, active load applied to both outputs.

$V_{in} = 115\text{Vrms}/400\text{Hz}$. 3.3V (PS1 active) load set to 0A and 3A with remainder of load applied to 12V output.



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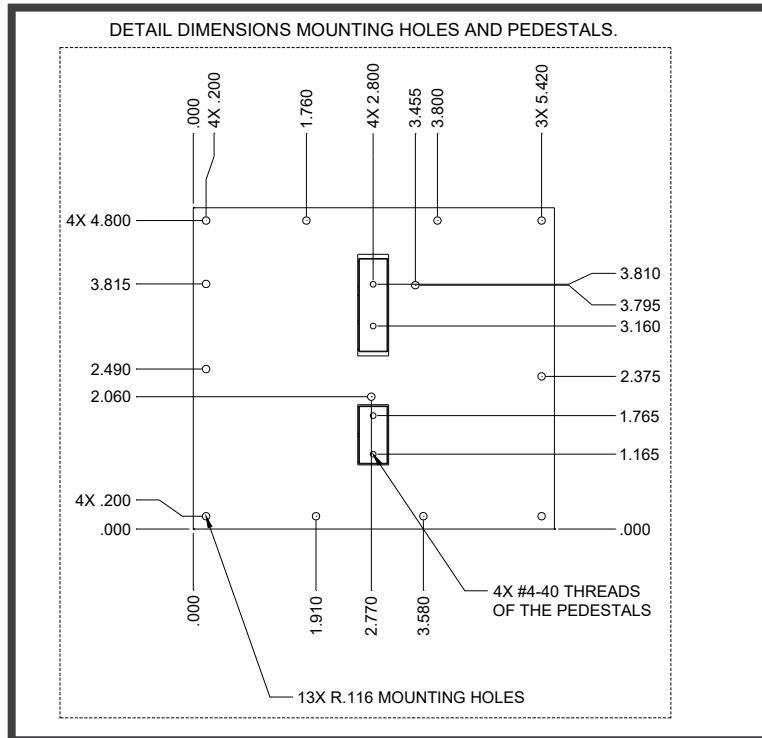
(115Vac, 47-800Hz INPUT)

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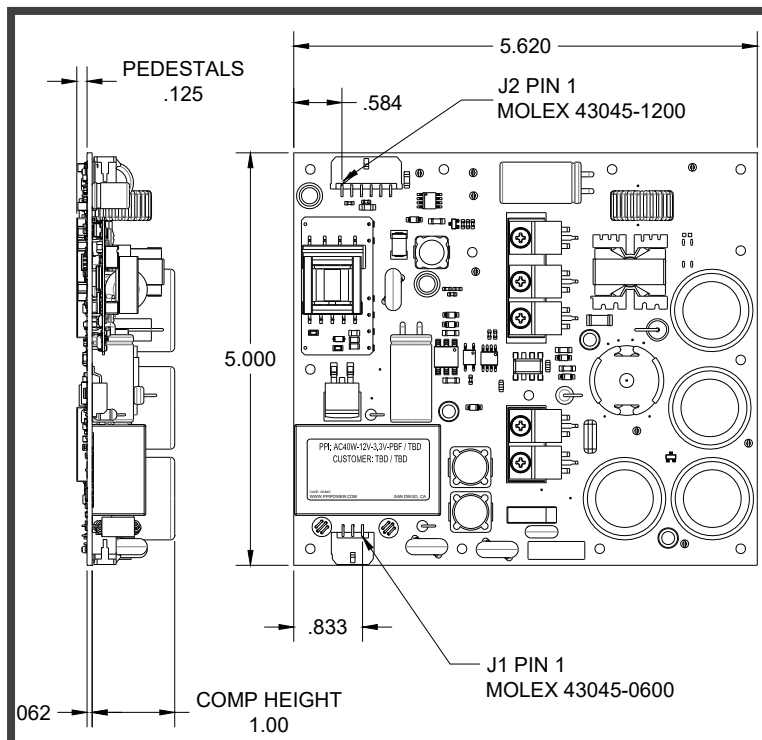
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MECHANICAL DIAGRAMS



MOUNTING HOLES AND PEDESTALS



TOP AND SIDE VIEWS

OUTLINE OR DETAILED SOLIDWORKS DRAWING FURNISHED UPON REQUEST



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ELECTRICAL SPECIFICATIONS

UNLESS OTHERWISE SPECIFIED THE FOLLOWING TEST CONDITIONS APPLY: Ta = 23°C. CONSTANT ACTIVE LOAD APPLIED TO OUTPUTS, Vin = 115Vrms/ 400Hz.

INPUT CHARACTERISTICS

PARAMETER	AC40W-12V-3.3V-PBF	REMARKS	NOTES
INPUT VOLTAGE RANGE	96 – 134Vrms	Complies with normal/ abnormal input voltages for AC operation per RTCA/DO-160G, Section 16, Category A	2
MUST START VOLTAGE	96Vrms minimum	Supply will start and remained enabled for input voltage in the range of 96Vrms < Vin < 134Vrms.	2
INPUT FREQUENCY RANGE	47 – 800Hz	Reduced distortion performance below 360Hz.	2
EFFICIENCY (FULL LOAD)	78% typical	Full rated output load (40W), see efficiency curve	2
INPUT CURRENT	450mArms at 115Vrms	Full rated output load (40W)	1
INRUSH CURRENT	< 3.7Apk/ < 7Apk	Cold Start/ Warm start	2
CREST FACTOR (CURRENT)	1.314 – 1.514	Ratio of peak / RMS	1
LINE FUSE, MAIN SUPPLY	1.5A, 125Vac	Line lead, slow-blow, not user-serviceable	1
LINE FUSE, 3.3V AUX SUPPLY (PS2)	1A, 125Vac	Line lead, slow-blow, not user-serviceable	1
INPUT TRANSIENT SUPPRESSION	TVS, 240Vac clamping, 42J, 3.5kA	Line to neutral after input line fuse, 150Vac allowable continuous applied input AC without activating TVS device	1
POWER FACTOR	0.98 min 0.92 min	Pout > 30W at 400Hz Pout > 30W at 800Hz	2
START-UP TIME	< 1Sec	Outputs within regulation	2
CONDUCTED EMISSIONS	RTCA/DO-160G, Section 21	Category M equipment	1, 5
QUIESCENT POWER	3.3W typical	Outputs Enabled, Pout = 0W	2
TOTAL HARMONIC DISTORTION (INPUT CURRENT)	< 5.5%	30W minimum output load	2
INDIVIDUAL HARMONICS AC CLEAN INPUT	EVEN: <1% If / n (n < 10) EVEN: <0.1%If (n ≥ 10) ODD: <30% If / n ODD TRIPLENS:<15% If /n	If = Fundamental current Vthd < 1.25%, n = order of harmonic (1 - 40) 30W minimum output load Harmonics < 10mA disregarded	1



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INPUT CHARACTERISTICS—CONTINUED

PARAMETER	AC40W-12V-3.3V-PBF	REMARKS	NOTES
INDIVIDUAL HARMONICS DISTORTED INPUT	EVEN: $<1\% I_f / n + 1.25V_n (n < 10)$ EVEN: $<0.1\% I_f + 1.25V_n (n \geq 10)$ ODD: $<30\% I_f / n + 1.25V_n$ ODD TRIPLENS: $<15\% I_f / n + 1.25V_n$	I_f = Fundamental current $V_{thd} > 10\%$ (clipped method) n = order of harmonic (1 - 40) 30W minimum output load Harmonics $< 10mA$ disregarded	1
STORAGE TEMPERATURE RANGE	-55°C TO +100°C	Non operational	1
OPERATING TEMPERATURE RANGE	-25°C TO +70°C	No external airflow required	1, 6
OUTPUTEN-L	Pull to $<2V_{dc}$ with respect to DCRTN in order to enable the +12V output	Internally pulled high to 3.3V_PS1 through 2.49k pull-up resistor. Pull to $<2V_{dc}$ with respect to DCRTN in order to enable +12V output. +3.3V_OR'ED output is unaffected by this signal	2

OUTPUT CHARACTERISTICS

PARAMETER	AC40W-12V-3.3V-PBF	REMARKS	NOTES
RATED OUTPUT POWER	42W	Continuous	2
OUTPUT VOLTAGE TOLERANCE	+12.1V \pm 2% +3.3V_OR'ED +8%, -3%	See "STANDARD OUTPUTS" table. When operating from 3.3V (PS1).	2
TEMPERATURE STABILITY COEFFICIENT	0.01% / °C	Maximum output voltage drift with temperature	1
OUTPUT RIPPLE + NOISE (pk-pk)	$<120mV_{pp}$: +12Voutput $<50mV_{pp}$: +3.3V_OR'ED output	20MHz Bandwidth	2
MINIMUM OUTPUT LOAD	200mA on 12V or 750mA on 3.3V	200mA minimum load is required for proper output regulation on the 12V output if output is enabled. 12V output will stay within +8, -5% regulation band if minimum load is not applied	2
LINE REGULATION	$<0.5\%$	Individual output deviation for $\pm 20\%$ step change in input voltage	1
LOAD REGULATION (TRANSIENT LOAD RECOVERY)	Outputs remain within regulation limits	50% to 100% step change in individual output load currents, starting and ending values reside anywhere between min load and full load	1
HOLD-UP TIME	250mSec min @ Pout = 42W	Uninterrupted ride through for momentary power interrupt	2



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OUTPUT CHARACTERISTICS—CONTINUED

PARAMETER	AC40W-12V-3.3V-PBF	REMARKS	NOTES
DIELCTRIC WITHSTAND INPUT TO OUTPUT	1500Vac	No arcing or damage for 60 second test Duration, 7mArms max leakage current	3, 6
DIELCTRIC WITHSTAND INPUT TO CHASSIS	1500Vac	No arcing or damage for 60 second test Duration, 7mArms max leakage current	3, 6
INSULATION RESISTANCE PRIMARY TO CHASSIS	> 100Mohms	Tested at 500Vdc	3, 6
INSULATION RESISTANCE PRIMARY TO SECONDARY	> 40Mohms	Tested at 50Vdc	3, 6
INSULATION RESISTANCE SECONDARY TO CHASSIS	> 40Mohms	Tested at 50Vdc	3, 6
OUTPUT OVERVOLTAGE PROTECTION (non-latching)	+12V output is limited to 110% of nominal set point	Pulse-by-pulse protection, 4mSec fault to activation delay, auto-restart	1
OUTPUT OVERVOLTAGE PROTECTION (latching)	+12V set point = 14.5V +3.3V_PS1 set point = 3.9V +3.3V_OR'ED set point = n/a	Supply will shutdown and remain disabled until input AC power is recycled if OVP set points are detected internally	1
+3.3V_OR'ED WHEN RUNNING FROM BACKUP 3.3V (PS2)	+3.3V_OR'ED > 2.98V at 3A load	3.3V_PS1 converter is disabled or faulted (<3V detected by IDC). See sheet 2, note 5.	2
OVERTEMP-L STATUS SIGNAL	Transitions to 0.5V max level upon detecting an internal operating temperature of +92°C +/- 4°C	Supply provides status signal OVERTEMP-L that asserts low when supply PWB temp is sensed at 92°C nominal, with ~13°C hysteresis. OVERTEMP-L signal is secondary side referenced w/ respect to DCRTN), capable of sinking 16mA. Signal has internal 24.9k pull-up to 3.3V_PS1	1
DC OUTPUT STATUS "DCGOOD-L"	Transitions high (2.86V min) upon detection of +12V output 6% below nominal set point	Secondary side referenced (w/ respect to DCRTN), 10mSec delay time, 1mA max source current; 16mA max sink current. Signal has internal 2.49k pull-up to 3.3V_PS1 and internal 21k pull down to DCRTN	2
PFC 200Vdc OUTPUT	200Vdc ± 3%	5W ≤ Pout < 40W.	2, 4

Notes:

1. Ensured by design, design verification tested, not 100% tested in production.
2. 100% tested for specification compliance in production.
3. Tested at AQL 5% for specification compliance in production.
4. 200Vdc PFC output voltage tolerance is +/-5% for Pout < 5W.
5. Requires small external power line filter for compliance. Contact PPI for details.
6. Requires that two aluminum heat transfer pedestals are attached to external heatsink, test plate or upper unit level sheetmetal.

