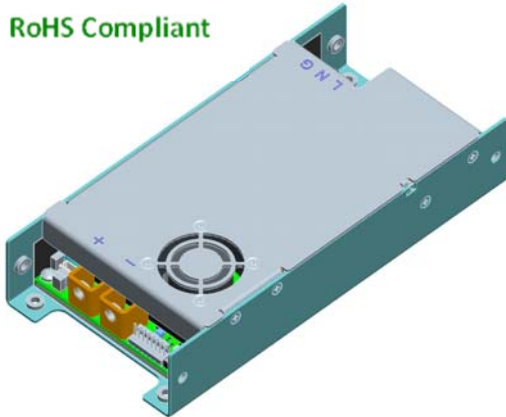


## CAR0424FP front-end

Input: 90Vac to 264Vac; Output: 24Vdc @ 400W; 5Vdc @ 1A Standby

RoHS Compliant



### Applications

- 24Vdc distributed power architectures
- Routers/ VoIP/Soft and other Telecom Switches
- Mid to high-end Servers, ATE Equipment

### Features

- Efficiency: exceeds 80plus “Gold” criteria
- Universal input with PFC
- No power de-rating at low range input
- ON/OFF control of the 24Vdc output
- Remote sense on the 24Vdc output
- No minimum load requirements
- 5Vdc @ 1A Standby
- Auto recoverable OC & OT protection
- Operating temperature: 0 - 70°C (de-rated above 50°C)
- Provisions for securing the power supply from either side or the bottom
- Forced air cooling
- EN60950-1 2006 +A12,2011
- UL60950-1, 2007
- IEC60950-1, 2005 +A1:2009 +A2:2013
- CE mark§
- CB certificate available
- Meets FCC part 15, EN55022 Class B standards
- Meets EN61000 immunity and transient standards
- Shock & vibration: Meets IPC 9592 Class II standards

### Description

The CAR0424FP Front-End provides highly efficient isolated power from worldwide input mains in a compact form factor. This power supply is ideal for applications where mid to light load efficiency is of key importance in order to reduce system power consumption during ‘typical’ operational conditions.

\* 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.

§ 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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CAR0424FP front-end

Input: 90Vac to 264Vac; Output: 24Vdc @ 400W; 5Vdc @ 5W Standby

Absolute Maximum Ratings

Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. These are absolute stress ratings only, functional operation of the device is not implied at these or any other conditions in excess of those given in the operations sections of the data sheet. Exposure to absolute maximum ratings for extended periods can adversely affect the device reliability.

Parameter	Symbol	Min	Max	Unit
Input Voltage: Continuous	$V_{IN}$	0	264	$V_{AC}$
Operating Ambient Temperature	$T_A$	0	70 <sup>1</sup>	°C
Storage Temperature	Tstg	-40	85	°C
I/O Isolation voltage to Frame (100% factory Hi-Pot tested)			2121	$V_{DC}$

Electrical Specifications

Unless otherwise indicated, specifications apply over all operating input voltage, load, and temperature conditions.

INPUT					
Parameter	Symbol	Min	Typ	Max	Unit
Operational Range	$V_{IN}$	90	115/230	264	$V_{AC}$
Frequency Range (ETSI 300-132-1 recommendation)	$F_{IN}$	47	50/60	63	Hz
Main Output Turn OFF	$V_{IN}$	70		80	$V_{AC}$
Main Output Turn ON		75		85	
Hysteresis between turn OFF and turn ON		5			
Maximum Input Current ( $V_O = V_{O, set}$ , $I_O = I_{O, max}$ )	$I_{IN}$			4.6	$A_{AC}$
				2.2	
Cold Start Inrush Current (Excluding x-caps, 25°C, <10ms, per ETSI 300-132)	$I_{IN}$			37	$A_{PEAK}$
Efficiency ( $T_{amb}=25^\circ C$ , $V_O = 24V$ )	$V_{IN}$ $\eta$		115V / 230V 88 / 91		%
100% load					
Holdup time ( $V_{OUT} \geq 23.52V_{DC}$ , $T_{AMB} 25^\circ C$ , $I_O = I_{O, max}$ )	$T$		20		ms
Leakage Current ( $V_{IN} = 250V_{AC}$ , $F_{IN} = 60Hz$ )	$I_{IN}$			3.5	$mA_{RMS}$
Isolation Input/Output		3000			$V_{AC}$
Input/Frame		2121			$V_{DC}$
Output/Frame		100			$V_{DC}$

24V <sub>dc</sub> MAIN OUTPUT					
Parameter	Symbol	Min	Typ	Max	Unit
Output Power	W	0	-	400 <sup>2</sup> 300	W
fan cooled convection cooled					
Factory Set default set point (full load, 115V <sub>AC</sub> , 25°C)	$V_O$	23.95	24.00	24.05	$V_{DC}$
Overall regulation (Line, load, temperature)		-2		+2	%
Ripple and noise <sup>3</sup>				120	mVP-P
Turn-ON overshoot				+3.5	%
Turn-ON delay				2	sec
ON/OFF delay time				40	ms
Turn-ON rise time (10 – 90% of $V_{OUT}$ )				500	ms

<sup>1</sup> See accompanying power derating table

<sup>2</sup> 450W for 1 minute, 10% duty cycle max

<sup>3</sup> Measured across a 10µf tantalum and a 0.1µf ceramic capacitors in parallel. 20MHz bandwidth

## CAR0424FP front-end

Input: 90Vac to 264Vac; Output: 24Vdc @ 400W; 5Vdc @ 5W Standby

24V <sub>dc</sub> MAIN OUTPUT (continued)					
Parameter	Symbol	Min	Typ	Max	Unit
Transient response 50% step [10%-60%, 50% - 100%] (di/dt - 1A/μs, recovery 500μs)	V <sub>o</sub>	-3.5		+3.5	%V <sub>O</sub>
Maximum voltage drop of remote sense				0.25	V <sub>DC</sub>
Oversvoltage protection, latched (recovery by cycling OFF/ON via hardware)		25.5		27.5	V <sub>DC</sub>
Output current	I <sub>o</sub>	0		16.7	A <sub>DC</sub>
Current limit			19		A <sub>DC</sub>

STANDBY OUTPUT					
Parameter	Symbol	Min	Typ	Max	Unit
Set point	V <sub>o</sub>		5.0		V <sub>DC</sub>
Overall regulation (load, temperature, aging)	V <sub>o</sub>	-5		+5	%
Ripple and noise				50	mV <sub>P-P</sub>
Output current	I <sub>o</sub>	0		1	A <sub>DC</sub>
Overload protection -		110		150	% of FL

## General Specifications

Parameter	Min	Typ	Max	Units	Notes
Calculated Reliability, 25°C Demonstrated Reliability		125,000 250,000		Hrs	Full load, ; MTBF per TR-NWT-000332 method I, case III,
Service Life		10		Yrs	Full load, excluding fans
Weight					

## Feature Specifications

Unless otherwise indicated, specifications apply over all operating input voltage, resistive load, and temperature conditions. See Control and Status for additional information. (I<sub>H</sub> < 20uA, I<sub>L</sub> < 4mA)

Parameter	Symbol	Min	Typ	Max	Unit
<b>ON/OFF</b> (pulled up internally to V <sub>stdby</sub> by a 10kΩ resistor)					
Logic High (24V <sub>DC</sub> OFF)	V <sub>IH</sub>	0.7V <sub>DD</sub>	—	V <sub>stdby</sub>	V <sub>DC</sub>
Logic Low (24V <sub>DC</sub> ON)	V <sub>IL</sub>	0	—	0.8	V <sub>DC</sub>
<b>Interlock</b> [short pin controlling presence of the 24V <sub>DC</sub> output] (pulled up internally to V <sub>stdby</sub> by a 10kΩ resistor)					
24V output ON	V <sub>I</sub>	0.7 V <sub>stdby</sub>	—	V <sub>stdby</sub>	V <sub>DC</sub>
24V output OFF	V <sub>I</sub>	0	—	0.4	V <sub>DC</sub>
<b>Power-OK</b> (pulled up internally to V <sub>stdby</sub> by a 10kΩ resistor)					
Logic High (Output voltage is present)	V <sub>OH</sub>	0.7 V <sub>stdby</sub>	—	V <sub>stdby</sub>	V <sub>DC</sub>
Logic Low (Output voltage is not present)	V <sub>OL</sub>	0	—	0.4	V <sub>DC</sub>
(Output transitions LO 4ms before 24V drops below regulation)					
<b>DC-OK</b> (pulled up internally to V <sub>stdby</sub> by a 10kΩ resistor)					
Logic High (24V <sub>DC</sub> Output is > 92% of nominal)	V <sub>OH</sub>	0.7 V <sub>stdby</sub>	—	V <sub>stdby</sub>	V <sub>DC</sub>
Logic Low (Input out of range)	V <sub>OL</sub>	0	—	0.4	V <sub>DC</sub>

## CAR0424FP front-end

Input: 90Vac to 264Vac; Output: 24Vdc @ 400W; 5Vdc @ 5W Standby

## Environmental Specifications

Parameter	Min	Typ	Max	Units	Notes
Ambient Temperature, fan cooled	0		50	°C	
Storage Temperature	-30		60	°C	
Operating Altitude	-152/500		3k/10k	m/ft	
Non-operating Altitude	-152/500		12k/40k	m / ft	
Power Derating with Temperature			2.5	%/°C	50°C to 70°C
Power Derating with Altitude			2.0	°C/301m °C/1k ft	Above 1524 m/5000 ft
Acoustic noise		45		dbA	A distance of 1m @ 30°C, linearly increases to < 50dbA @ 50°C.
Humidity	Operating Storage	30 10	95 95	%	Relative humidity, non-condensing
Shock and Vibration	Meet IPC 9592 Class II, Section 5 requirements				

## EMC Compliance

Parameter	Function	Standard	Level	Criteria	Test
AC input	Conducted emissions	EN55022, FCC part 15, CISP22	B		0.15 – 30MHz
	Radiated emissions <sup>4</sup>	EN55022, FCC part 15, CISP22	B <sup>5</sup>		30 – 10000MHz
	Conducted harmonics	EN61000-3-2		Compliant	
	Flicker	EN61000-3-3		Compliant	
AC input immunity	Voltage dips	EN61000-4-11		A	-30%, 10ms
				B	-60%, 100ms
				B	-100%, 5sec
	Voltage surge	EN61000-4-5		A	3.4kV, 1.2/50µs, common mode
				A	2.4kV, 1.2/50µs, differential mode
Fast transients	EN61000-4-4		B	5/50ns, 2kV (common mode)	
Enclosure immunity	Conducted RF fields	EN61000-4-6		A	130dBµV, 0.15-80MHz, 80% AM
	Radiated RF fields	EN61000-4-3		A	10V/m, 80-1000MHz, 80% AM
	ESD	EN61000-4-2		B	4kV contact, 8kV air

## Criteria Performance

- A No performance degradation
- B Temporary loss of function or degradation not requiring manual intervention
- C Temporary loss of function or degradation that may require manual intervention
- D Loss of function with possible permanent damage

<sup>4</sup> Radiated emissions compliance is contingent upon the final system configuration.

<sup>5</sup> Schaffner FN9222-15 external filter or equivalent may be used

CAR0424FP front-end

Input: 90Vac to 264Vac; Output: 24Vdc @ 400W; 5Vdc @ 5W Standby

Characteristic Curves

The following figures provide typical characteristics at 25°C.

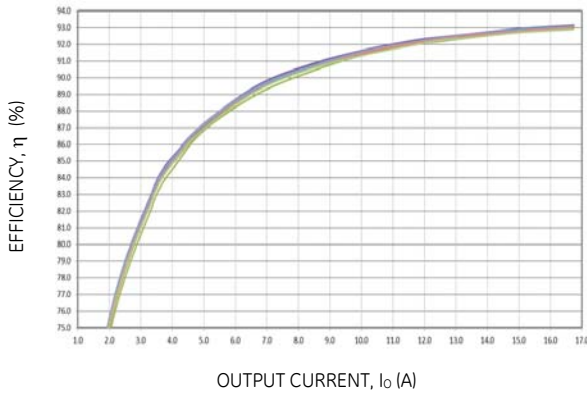


Figure 1. Efficiency V<sub>IN</sub>: 230V, Freq: 60Hz.

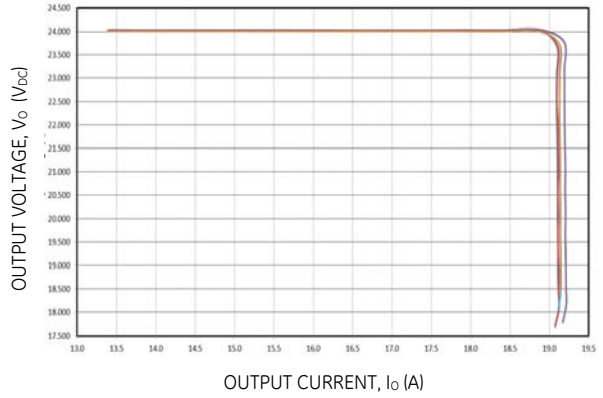


Figure 2. Output current limit profile

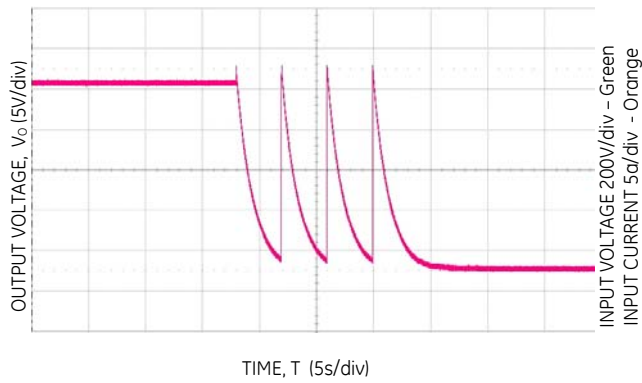


Figure 3. Overtolerance shutdown

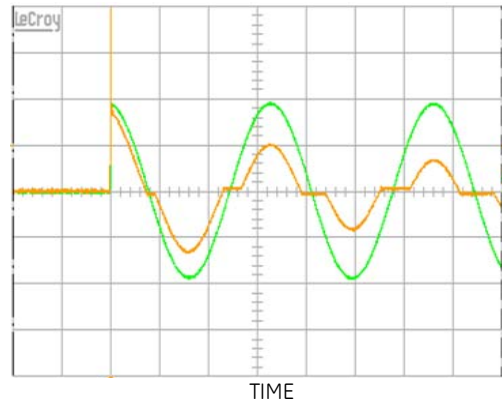


Figure 4. Inrush performance 5ms/div.

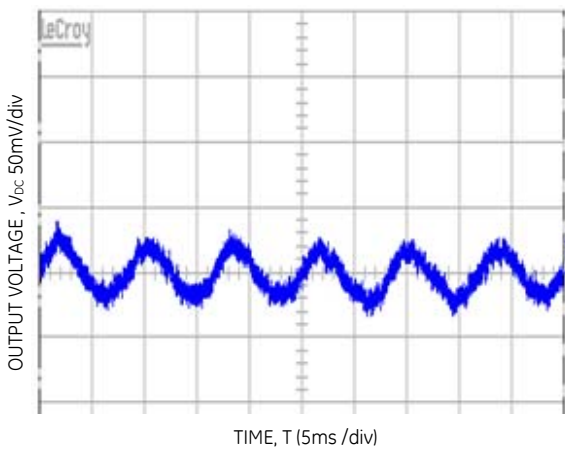


Figure 5. 24V<sub>DC</sub> output PARD, full load, V<sub>IN</sub> = 240V<sub>AC</sub>.

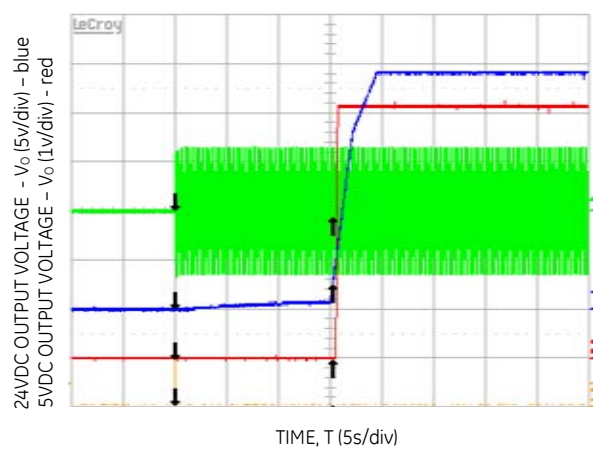


Figure 6. Start up V<sub>IN</sub> 90 V<sub>AC</sub>

CAR0424FP front-end

Input: 90Vac to 264Vac; Output: 24Vdc @ 400W; 5Vdc @ 5W Standby

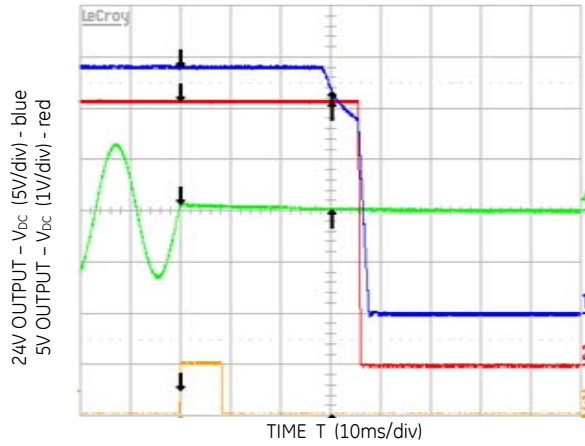


Figure 7. Holdup  $V_{IN} = 90V_{AC}$

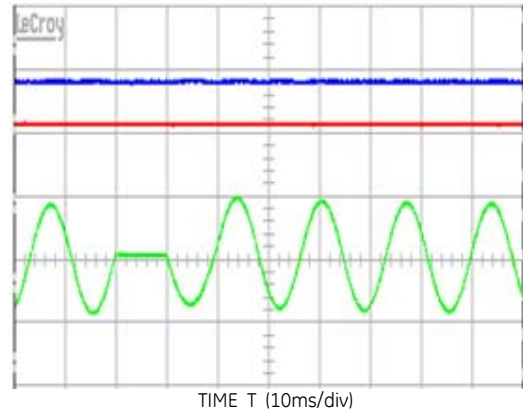


Figure 8. 1/2 cycle ride-through  $V_{IN} = 140V_{AC}$

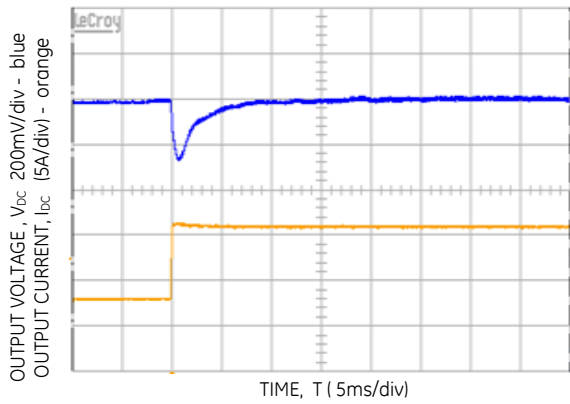


Figure 9. 24V Transient response 50% load step (50 - 100%)

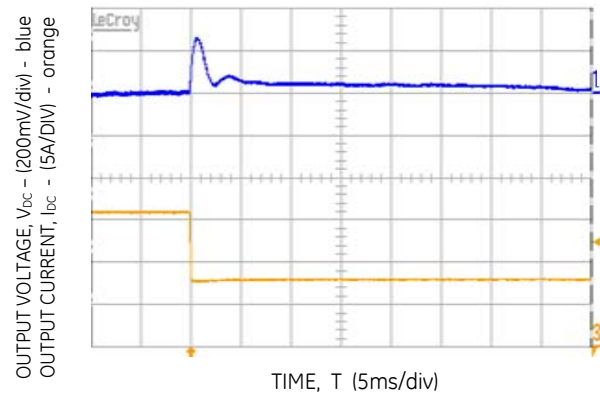


Figure 10. 24V Transient response 50% load step (100 - 50%)

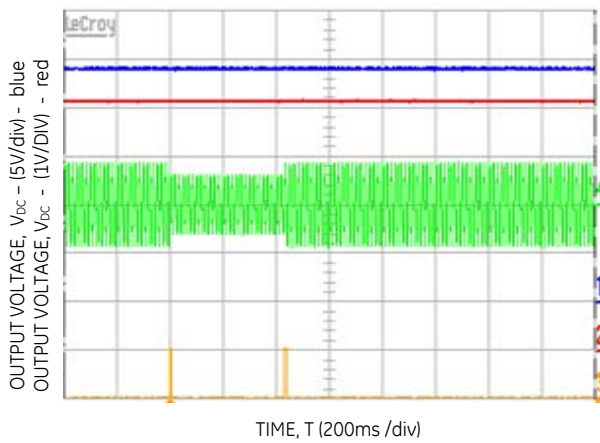


Figure 11. 30% dip ride-through  $V_{IN} = 115V_{AC}$

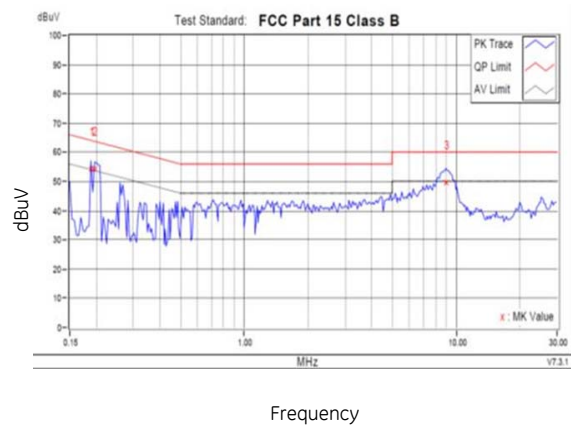
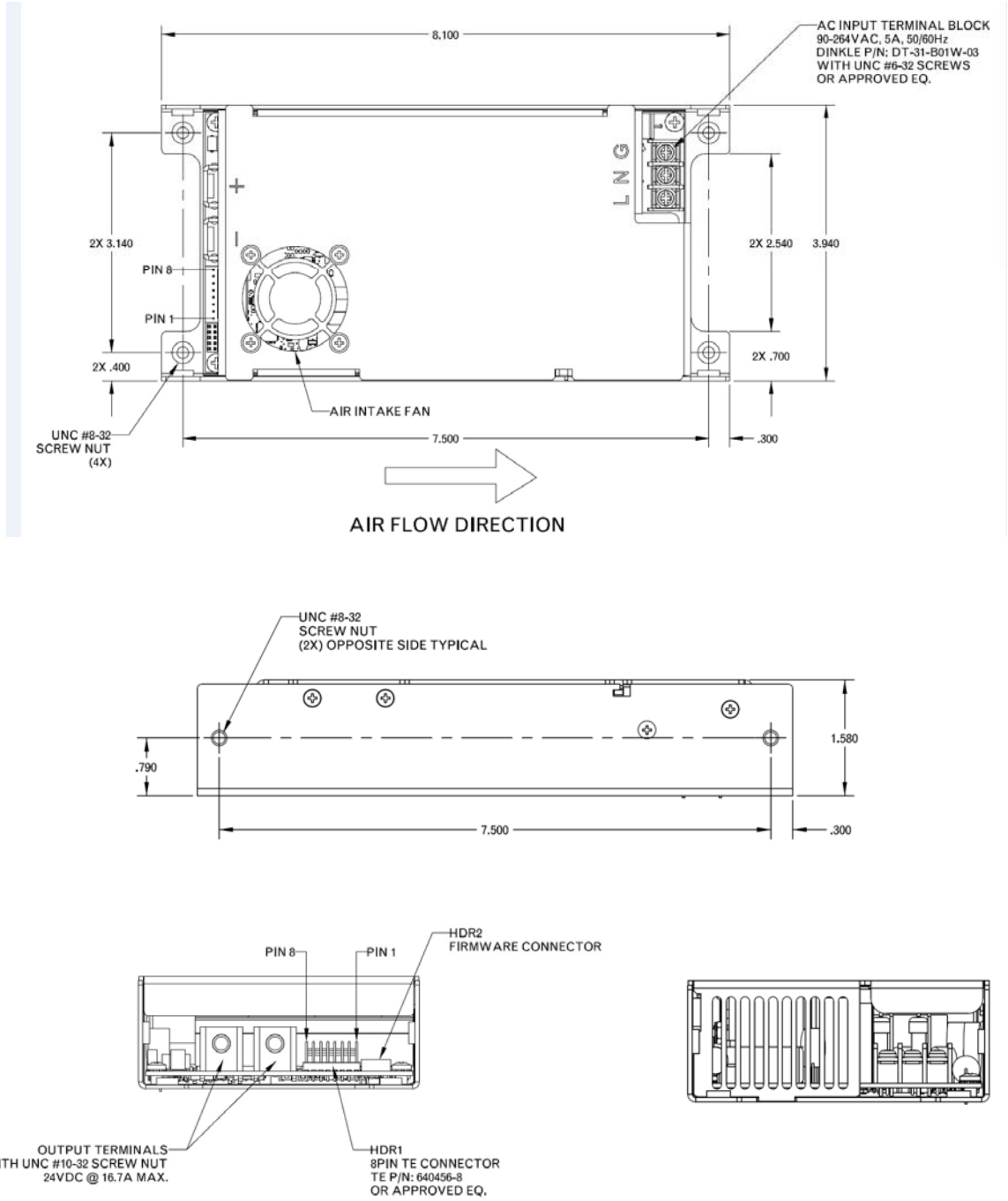


Figure 12. Conducted Emissions

CAR0424FP front-end

Input: 90Vac to 264Vac; Output: 24Vdc @ 400W; 5Vdc @ 5W Standby

Outline Drawing



CAR0424FP front-end

Input: 90Vac to 264Vac; Output: 24Vdc @ 400W; 5Vdc @ 5W Standby

Connector Pin Assignments

- Input Connector:** 3 position terminal block  
screw size #6-32
- Output Connector:** 2 separate bus bars  
screw size: #10-32
- Signal Connector** 8 pin connector TE: 640456-8  
Mating connector TE: MTA Series

Pin	Function
1	ON/OFF
2	Inhibit
3	Power-OK
4	DC-OK
5	Signal return
6	+5V <sub>oc</sub>
7	Remote Sense (-)
8	Remote Sense (+)



Ordering Information

Please contact your GE Sales Representative for pricing, availability and optional features.

PRODUCT	DESCRIPTION	PART NUMBER
CAR0424FPXXXZ01A	Input: 90Vac to 264Vac; Output: 24Vdc @ 400W; 5Vdc @ 1A Standby	CAR0424FPXXXZ01A

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