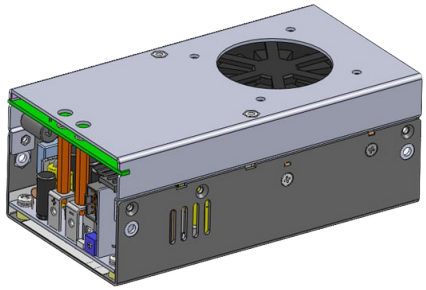
MC425D2412EF

400W Dual Output
Medical Power Supply



Industrial

Medical

FEATURES AND BENEFITS

Output power of 400W with airflow	Safety: Meets IEC/UL/EN60601-1, 3rd Ed. +Am1
3.4" (86mm) x 6.2" (157.4mm) x 2.68" (68mm)	24V and 12V high current outputs
Universal 90-264Vac Input Range	5V @ 2A Standby Output, 12V Fan Output
High level EMC Compliance	DC OK, Power Good, Inhibit Signals, Remote
>7 years Electrolytic Capacitor Life	2x MOPP Isolation
-10ºC to 70ºC Operating Temperature Range	

MODEL SELECTION

Model Number	Output Volts	Output Current Amps (A)	Efficiency (Combined Outputs)	Total Regulation	Max. Ripple & Noise[4] (mV pk-pk)	Overvoltage Threshold	MTBF (hrs) @ 110Vac
MC425D2412EF	24V	15.7A/22.4A[2,6]	88%	±3%	240	28.0 ± 2.5V	300,000
	5Vsb	2.0A		±5%	100	5.5V – 8V	
	12.12V8	8.0A		±3%	120	15V ± 1.0V	
	12V Fan5	1.0A		±10%	360	N/A	

Notes:
1. Total power with internal forced air cooling is 400W including 12V/1A for Fan output and 5V/2A standby and 12V @ 8A.
2. The 24V output current shall be derated as a function of 12V current where 24V load <15.7 – (12V Load / 1.86) amps. Ex. 24V max current = 11.4A when 12V is loaded to 8 amps.
3. Efficiency Values listed are measured at 115Vac input, full load and at an ambient temperature of 25°C.
4. Measured at 25°C ambient with noise probe directly at end of 6" twisted pair terminated with 0.1µF ceramic and 10µF low ESR capacitors. Values will be higher at ambient temperatures below 0°C.
5. Fan Output: If the load on this output is other than a fan, a short circuit condition on this output can only be remedied by removing both the cause of the short circuit and the load for a minimum of [20] seconds. This will allow the output to resume normal cooperation.
6. No Output adjustment for 12V output. The 12V output shares the common return with the 24V output.
7. MTBF values are in hours, per Telcordia 332, Issue 6, 25°C, full rated load (w/ airflow) at 110Vac input.
8. Tolerance ±3%; measured at 50% centering; total regulation includes line, load, and initial setting.
9. 12V main output rise time delayed by 15ms after 24V turn-on.

INPUT

AC Input	100VAC–240VAC ±10%, single phase, 47Hz–63Hz | 120-300Vdc (external fuse required for DC input)
Input Current	400W output: 115Vac: 5.2A, 230Vac: 2.5A
Inrush Current	264VAC, cold start: will not exceed 40Arms within ½ cycle. I2T is 25A2/Sec maximum
Input Fuses	F1, F2: (6.3A), 250Vac
Earth Leakage Current	<750µA @264Vac, 60Hz, NC | <1.5mA @264Vac, 60Hz, SFC
Patient Leakage Current (Output to Earth)	<100uA @264VAC, 60Hz input, NC | <500µA @264VAC, 60Hz input, SFC
Efficiency	88% combined

SAFETY

Safety Standards	EN/IEC/UL/CSA C22.2 No. 60601-1, 3rd Edition

OUTPUT

Output Power	400W max. continuous internal airflow
Ripple and Noise	See table on page 1
Load Regulation	See table on page 1
Line Regulation	See table on page 1
Total Regulation	See table on page 1
Minimum Load	Not required for main output or 5Vsb Fan Output: 0.5A min required on the main output in order for the 12V Fan output to be within regulation
Initial Set Point Tolerance	±1 %
Output Adjustability	24V Output: ±5% from nominal
Overshoot (Turn-on)	Main Outputs: <5%, 5Vsb Output: 8%
Phase/Gain Margin	PSU shall have >45 deg of phase margin under all load and input conditions, >12db of gain margin
Transient Response	50% load step. Δi/Δ<0,2A/µs. Max Volt Deviation = 5%. Recover to within 1% of nominal within 500µs
Turn-On Time	Main Output: <1 sec. max @ 115 Vac, rise time 30ms max. 5Vsb turn-on time is 500ms max., rise time 50ms max. Output Voltage rise is monotonic
Hold-Up Time	See Figure on page 5
Switching Frequency	75kHz typical

RELIABILITY

MTBF	>500K hours
Warranty	3 Years
REACH	REACH compliance required
ROHS	Product is ROHS compliant
Electrolytic Capacitor Lifetime	E-cap life = 7 tears, based on typical operation of 16 hours/day, 261 days/year at 40°C ambient temperature.

PROTECTION

Overvoltage Protection	24V & 5Vsb Outputs: Latching, see chart for trip ranges. 12V OVP latch off does not affect other outputs.
Short Circuit Protection	24V, 12V & 5Vsb Outputs: Cycling type, auto=recovery Fan Output: Recovery only after removal of short and load. See note 5 on page 1
Thermal Protection	Sensing transformer temperature, 135°C (55oC ambient temperature at full load). Auto-Recovery
Overload Protection	24V: 130 to 170% of rating, cycling type, auto-recovery - 12V: 110% to 170% of rating at 20-35°C

ISOLATION

Insulation Safety Rating (Type B)	Input-Ground: 1500VAC, 1 MOPP Input-Output: 4500VAC, 2 MOPP Output-Ground: Functional Insulation
Electric Strength Test Voltage (HIPOT)	Input-Ground: 1500VAC Input-Output: 4500VAC Output-Ground: 1500VAC

ENVIRONMENT

Operating Temperature Range	-10°C to +70°C - Starts up -40°C, 20 sec. to reach regulation. See Application Note for operating conditions during start-up. Derate output power of 50% between 50-70°C
Relative Humidity	5% to 95%, non-condensing
Altitude	Operating: up to 3000m (10,000ft) Non-operating: -500 to 40,000ft
Storage Temperature	-40 to 85°C
Shock	Operating/Non/Operating: Half-sine, 40gpk, 10ms, 3 axes, 6 shocks total
Vibration	Operating: 0.003g2/Hz, 1.5grms overall, 3 axis, 10 min/axis Non-Operating: 0/026g2/Hz, 5.0grms overall, 3 axis, 1 hr/axis
Cooling	
Audible Noise	<28dbA at 1m

SIGNALS/FEATURES

DC OK: (24V Output)	Goes HIGH when main DC output is above 90% of nominal voltage and goes LOW when the output is below 90% of rated main output DC voltage
12V Output	Shares common return with 24V.
Fan Output	12V @ 1A (air cooled) or 0.5A (convection), ±10% regulation for load change of 0.5A to full load on the main output
Standby Voltage	5V @ 2A, ±5% regulation over all changes in main output load current
24V Power Good / Power Fail	Signal is HIGH within 500ms after the main output is within regulation band upon AC turn on. Goes LOW with 4ms min. before the main DC output drops below 90% of nominal value when AC turns off
OVP & Overload / Short Circuit Protection	Turns off/on with 24V
Inhibit	Logic HIGH or open = ON Logic LOW or short to ground = OFF
Remote Sense	Compensates for up to 0.16V voltage drop on 24V. Max. deviation of 5% (main output) any 50% step above 5% load

MECHANICAL SPECIFICATIONS

Dimensions	3.4" (86mm) x 6.2" (157.4mm) x 2.68" (68mm) w/ fan cover
Input Connector	See table below
Output Connector	See table below
Unit Weight	

EMI/EMC COMPLIANCE

Conducted Emissions	EN55011/CISPR22: Class B, FCC Part 15.107, Class B, 6db margin typ.
Radiated Emissions	EN55022/CISPR22: Class A, FCC Part 15.109, Class A, 3db margin typ.
Line Harmonic Emissions	EN55024/IEC61000-3-2, Class A, C & D at full load (400W output).
Voltage Fluctuations & Flicker	EN55024/IEC61000-3-3, Section 5
Electrostatic Discharge Immunity	EN55024/IEC61000-4-2, Level 4: ±8kV contact, ±15kV air, Criteria A
Radiated RF EM Fields Susceptibility	EN55022/EN61000-4-3, Level 2, 10V/m, 80MHz- 2.7GHz, 80% AM at 1kHz, Criteria A
Electrical Fast Transients / Bursts	EN55024/IEC61000-4-4, Level 3, 2kV (PS Output), 1kV (signal outputs), Criteria A
Surges Line to Line (DM) and Line to Ground (CM)	EN55024/IEC61000-4-5, Level 3, 1kV DM, 2kV CM, Crit. A Level 4, 2kV DM, 4kV CM, Crit. C
Conducted Disturbances induced by RF Fields	EN55022/IEC61000-4-6, Level 3, 3V/m - 0.15 to 80MHz; and 6V/m in ISM and amateur radio bands, 80% AM at 1KHz
Rated Power Frequency Magnetic Fields Test	EN55024/IEC1000-4-8, Level 3: 10A/m, Criteria A
Voltage Dips2	EN55024/IEC/EN61000-4-11: --100% dip for 10 mS, Criteria A --100% dip for 5000mS, Criteria B -- 60% dip for 100mS, Criteria A -- 30% dip for 500mS, Criteria A

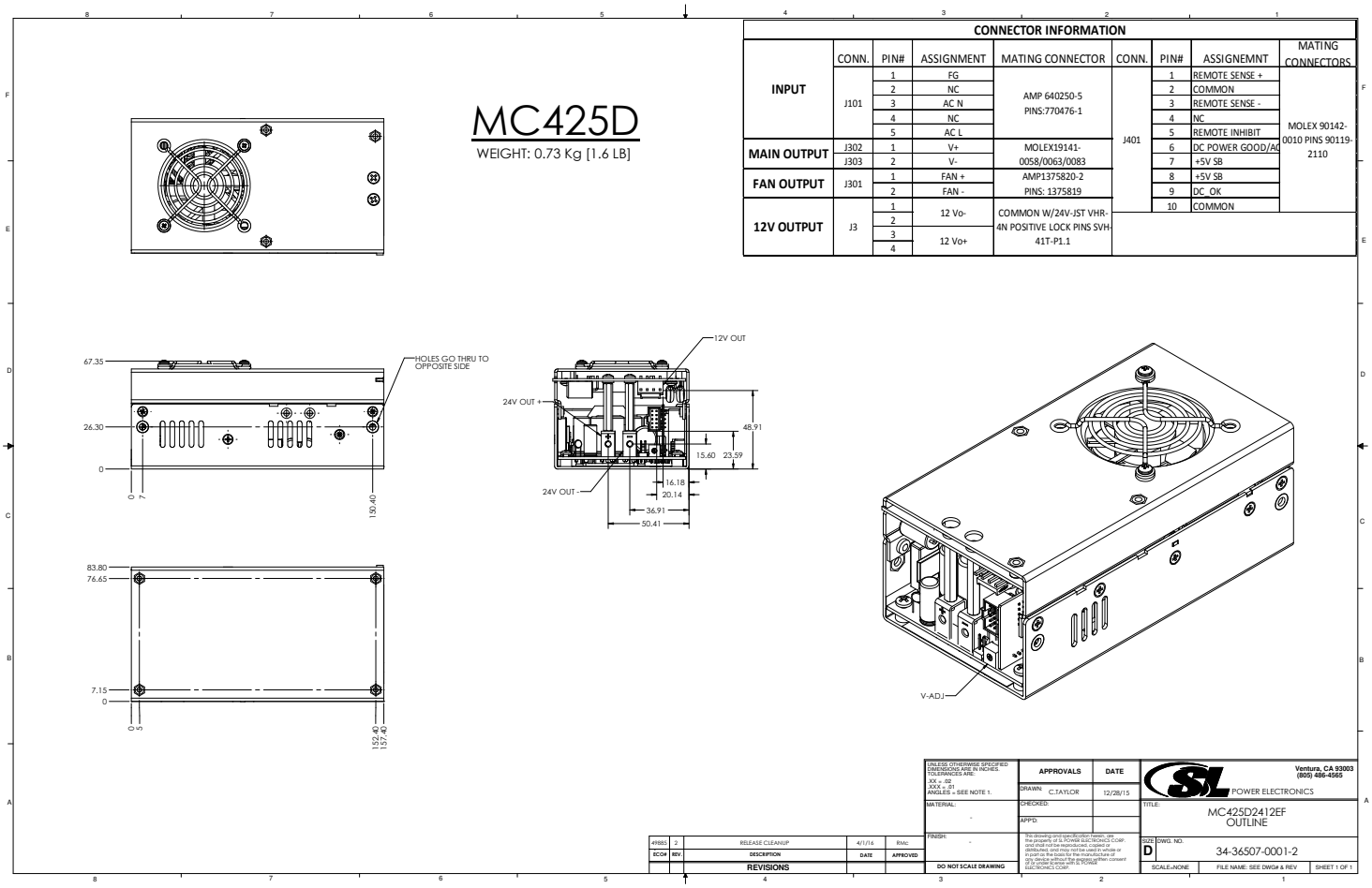
NOTES

1. Performance criteria are based on EN55024. According to the standards, performance criteria are defined as following:
A – Normal performance during and after the test B – Temporary degradation, self-recoverable
C – Temporary degradation, operator intervention required to recover the operation
D – Permanent damage
2. 100% dip for 20mS Crit. A @ 80% load; 30% dip for 500mS Criteria A @ 80% load.

MECHANICAL DRAWING AND CONNECTOR INFORMATION

Function	Conn.	Pin#	Assigment	Mating Connectors Ref.	Function	Conn.	Pin#	Assigment	Mating Connectors Ref
Input	J101	1	FG	amp 640250-5 pins:770476-1	signal	J401	1	Remote sense +	molex 90142-0010 pins 90119-2110
	J101	2	NC			J401	2	Common	
	J101	3	AC N			J401	3	Remote sense -	
	J101	4	NC			J401	4	NC	
	J101	5	AC L			J401	5	Remote Inhibit	
Main output	J302	1	V+	molex19141-0058/0063/0083		J401	6	DC Power Good/AC Fail	
	J303	2	V-			J401	7	+5V SB	
Fan output	J301	1	Fan+	amp 1375820-2 Pins 1375819		J401	8	+5V SB	
	J301	2	Fan-			J401	9	DC_OK	
12V Output	J3	1	12 Vo-	Common w/24V- Common w/24V- JST VHR-4N Positive Lock Pins SVH-41T-P1.1		J401	10	Common	
	J3	2	12 Vo-						
	J3	3	12 Vo+						
	J3	4	12 Vo+						

OUTLINE DRAWING



POWER FAIL WARNING AND HOLD-UP TIME (TYPICAL)

Output Power	Load Conditions			Power Fail Warning		Hold-up time	
	24V	12V	5VStd-By	24V	12V	24V	12V
380W	11.4A	8A	2A	4.8mS	20mS	10mS	26mS
154W	2 A	8A	2A	36mS	53mS	48mS	65mS
106W	2 A	4A	2A	54mS	80mS	72mS	97mS

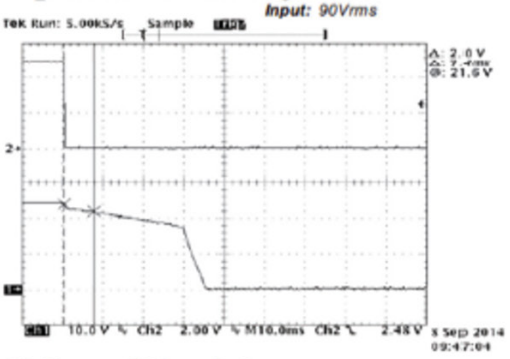
MC425D2412EF BENCHMARK UNIT #2 *with 12v output return connected to 24v input return*

Method of measurement: *Sense leads at load. Voltage measurement were taken at load.*

Power Good:

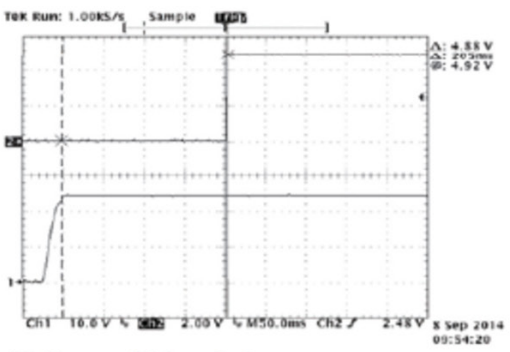
Pwr_Good Lo to Vmain ≤ 90% Timing

Input: *90Vrms*



CH1: 24v output_CH2: Power Good.

Pwr_Good Lo to Hi timing (after Vmain reg)



CH1: 24v output_CH2: Power Good.

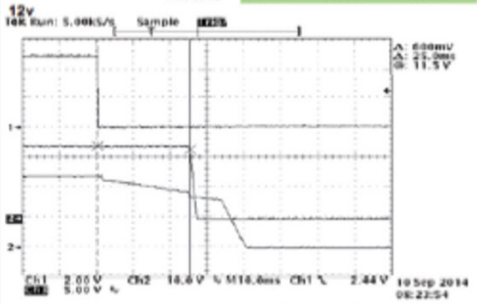
Load Condition:

24V/11.4A **12V/8A** **5VSB/2A**

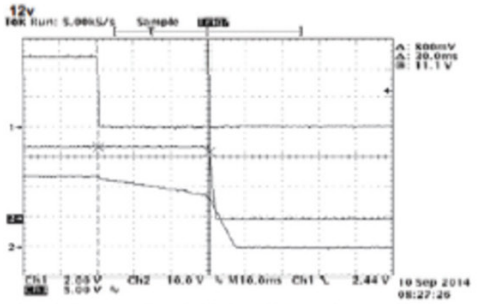
Total output power: 379.6 **watts**

Warning time

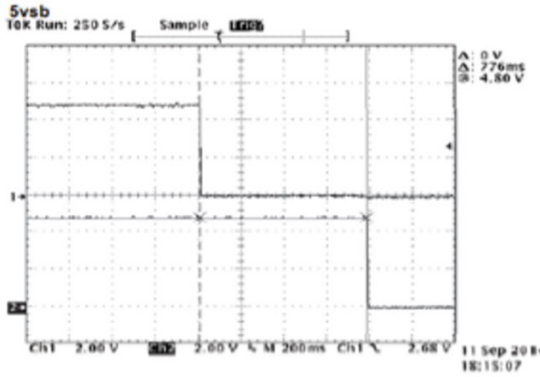
Vin	24v	12v	5vsb
90VAC	6.6ms	25ms	776ms
110VAC	7.4ms	30ms	776ms



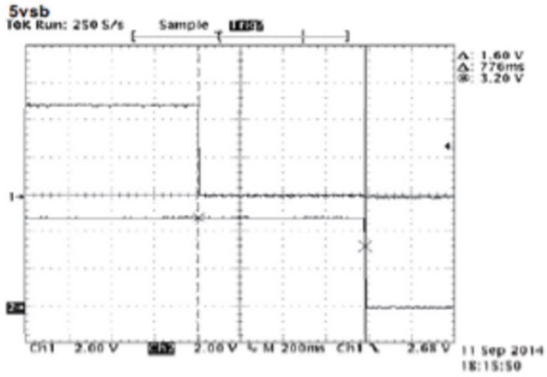
Power Fail warning time at 90VAC 380W load.
Ch1: Power Good/Fail Signal
Ch2: 24v output
Ch3: 12v output



Power Fail warning time at 110VAC 380W load.
Ch1: Power Good/Fail Signal
Ch2: 24v output
Ch3: 12v output



Power Fail warning time at 90VAC 380W load.
Ch1: Power Good/Fail Signal
Ch2: 5vsb output



Power Fail warning time at 110VAC 380W load.
Ch1: Power Good/Fail Signal
Ch2: 5vsb output

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