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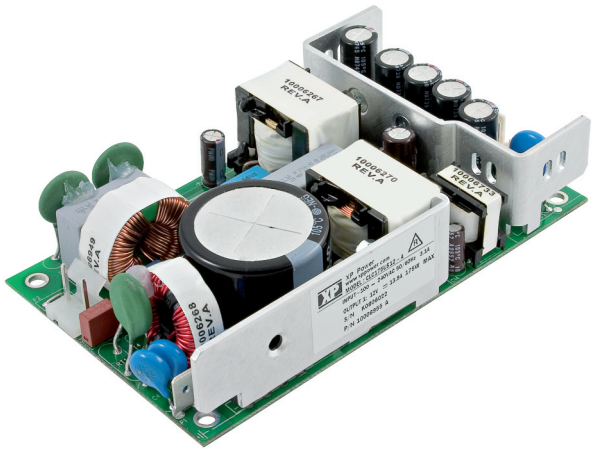
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CLC175 Series



- High Efficiency Resonant Topology
- High Power Density 9.0 W/in^3
- 12 V Fan Output as Standard
- Industry Standard 3.0” x 5.0” x 1.30” Format
- 5 V Standby Option
- Remote On/Off Option
- Power Good Signal Option
- Remote Sense as Standard

Designed for communications applications, the CLC175 has been developed to meet the needs of networking equipment, voice over IP systems, wireless LANs, servers, storage area networks and post-production broadcast equipment. Designers of these systems demand higher power from AC/DC units in industry-standard 1U formats as processing power and functionality grows with in tight space constraints.

The CLC175 delivers up to 175W across the full universal AC input range from an industry-standard 3 x 5 inch (76.2 x 127 mm) footprint. It is 1.30 inches (33.0 mm) high and achieves 9.0 Watts per cubic inch power density without compromising performance or functionality.

With efficiencies up to 90% at full load, the CLC175 requires only 10 CFM air-flow for full power operation at up to 50 °C ambient and will operate at up to 70°C ambient with 50% de-rating. The main output is 12, 24 or 48 VDC and each power supply also has a 12V / 500 mA fan output. The –A option includes an additional 5V / 500 mA standby output and a fully featured signal set with Power OK, low and high inhibit and remote sense.

Models and Ratings

Max Output Power[1]	V1 Output Voltage	V1 Max Output Current	Fan Output V2	Standby Supply V3 (optional)	Model Number[2]
175 W	12.0 VDC	13.9 A	12.0 V/0.5 A	5.0 V/0.5 A	CLC175US12
175 W	24.0 VDC	6.9 A	12.0 V/0.5 A	5.0 V/0.5 A	CLC175US24
175 W	28.0 VDC	6.25 A	12.0 V/0.5 A	5.0 V/0.5 A	CLC175US28[4]
175 W	48.0 VDC	3.5 A	12.0 V/0.5 A	5.0 V/0.5 A	CLC175US48

Notes:
1. 10 CFM airflow.
2. For V3 5 V standby, Power OK & Inhibit, add suffix '-A' to model number.
3. For cover with Top Fan assembly add '-TF' to model number, e.g. CLC175US12-TF or CLC175US12-ATF.
4. Not available for -A or -M.

Input Characteristics

Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Input Voltage - Operating	85	115/230	264	VAC	Derate output power < 90 VAC. See fig. 1. Power OK signal cannot be used <90 VAC.
Input Frequency	47	50/60	63	Hz	
Power Factor		>0.5			230 VAC, 100% load EN61000-3-2 class A compliant
Input Current - No Load		0.2/0.25		mA	115/230 VAC
Input Current - Full Load		3.0/1.5		A	115/230 VAC
Inrush Current			40	A	230 VAC cold start
Earth Leakage Current		200/400	475	µA	115/230 VAC/50 Hz (Typ.), 264 VAC/60 Hz (Max.)
Input Protection	T5.0A/250 V internal fuse				

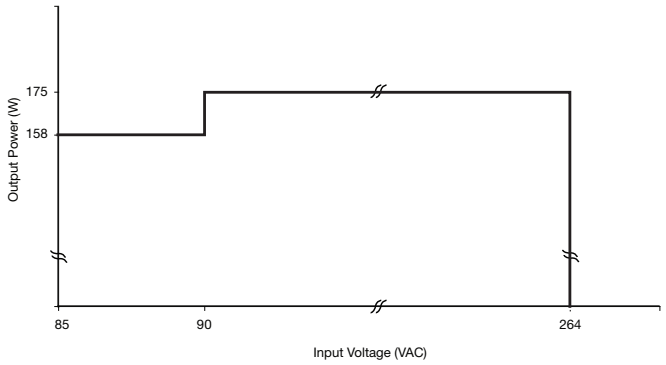
Output Characteristics

Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Output Voltage - V1	12		48	VDC	See Models and Ratings table
Initial Set Accuracy			±1 (V1) , ±5 (V2) & ±3 (V3)	%	50% load, 115/230 VAC
Output Voltage Adjustment	±5			%	V1 only via potentiometer. See mech. details (P13).
Minimum Load	0.1 A, V1			A	Required on V1 to maintain regulation of V2
Start Up Delay		1.5		s	230 VAC full load (see fig.2)[1]
Hold Up Time	16			ms	115 VAC full load (see fig.3 & 4)
Drift			±0.2	%	After 20 min warm up
Line Regulation			±0.5	%	90-264 VAC
Load Regulation			±1 (V1) , ±5 (V2 & V3)	%	0-100% load. V2 0.1-0.5 A load
Transient Response - V1			4	%	Recovery within 1% in less than 500 µs for a 50-75% and 75-50% load step
Over/Undershoot - V1		5		%	See fig.5
Ripple & Noise			1 (V1) & 2 (V2 & V3)	% pk-pk	20 MHz bandwidth (see fig.6 & 7)
Overvoltage Protection	115		140	%	Vnom DC. Output 1 only, recycle input to reset
Overload Protection	110		150	% I nom	Output 1 only, auto reset (see fig.8)
Short Circuit Protection					Continuous, trip & restart (hiccup mode)
Temperature Coefficient			0.05	%/°C	
Overtemperature Protection				°C	Not fitted

Notes:
1. Under certain environmental & line/load conditions i.e. 90 VAC, full load at 0 ºC longer start up times may be experienced, in the order of 3 seconds.

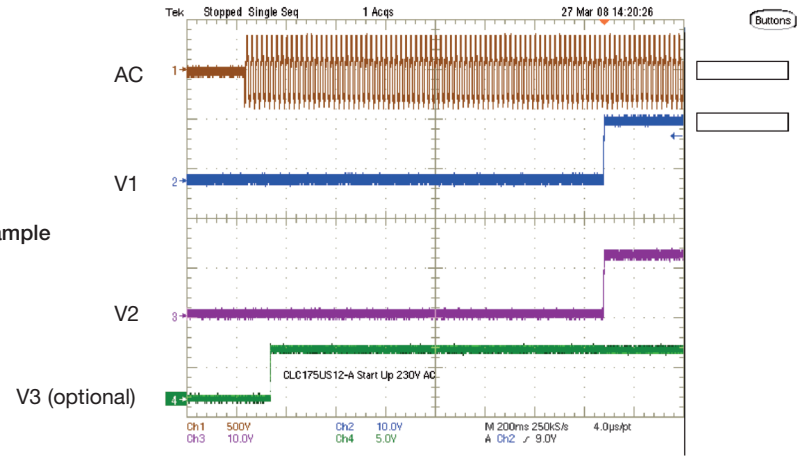
Input Voltage Derating

Figure. 1



Start Up Delay From AC Turn On

Figure 2
V1, V2 & V3 start up example from AC turn on



Hold Up Time From Loss of AC

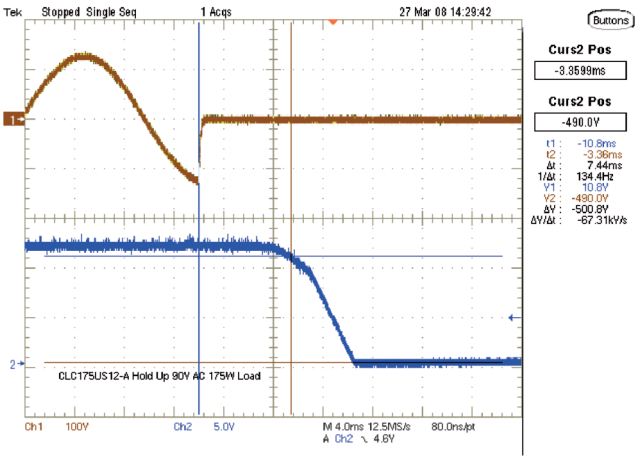


Figure 3
V1 hold up example at 175 W load with 90 VAC input

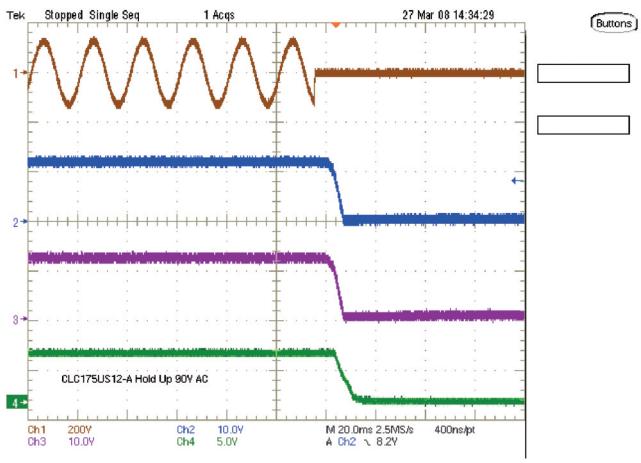


Figure 4
V1, V2 & V3 hold up example at 175 W load 90 VAC input

Output Overshoot

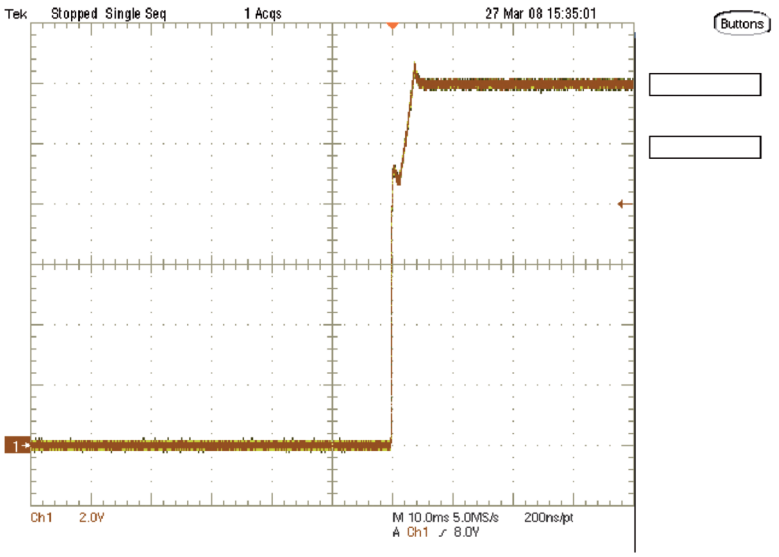


Figure 5
Typical Output Overshoot
(CLC175US12 shown)

Output Ripple & Noise

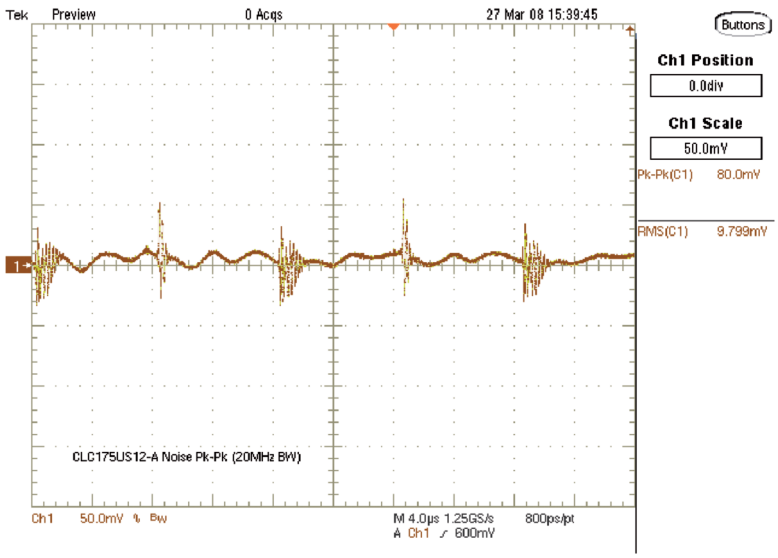


Figure 6
V1 CLC175US12 (full load)
80 mV pk-pk ripple. 20 MHz BW

Output Ripple & Noise cont.

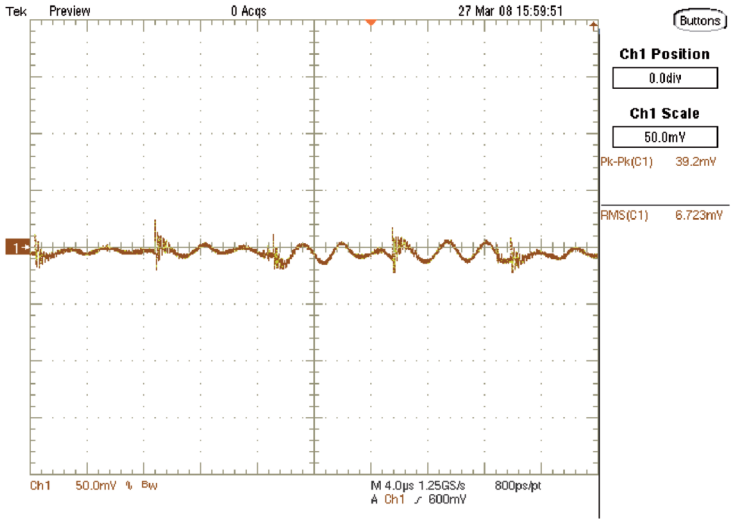


Figure 7
V1 CLC175US24 (full load)
39 mV pk-pk ripple. 20 MHz BW

Output Overload Characteristic

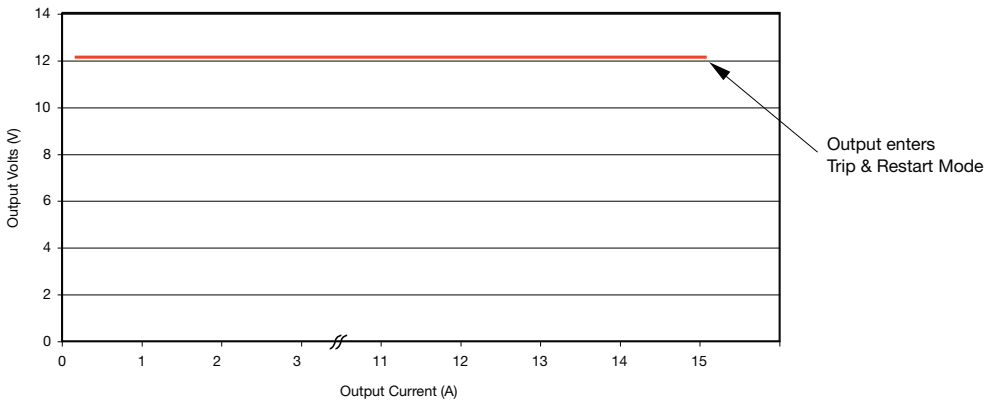


Figure 8
Typical V1 Overload
Characteristic
(CLC175US12 shown)

General Specifications

Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Efficiency		87		%	Full load (see fig.9 & 10)
Isolation: Input to Output	3000			VAC	
Input to Ground	1500			VAC	
Output to Ground	500			VAC	
Switching Frequency		70		kHz	
Power Density			9.0	W/in^3	
Mean Time Between Failure		390		kHrs	MIL-HDBK-217F, Notice 2 +25 °C GB
Weight			0.7 (320)	lb (g)	

Efficiency Versus Load

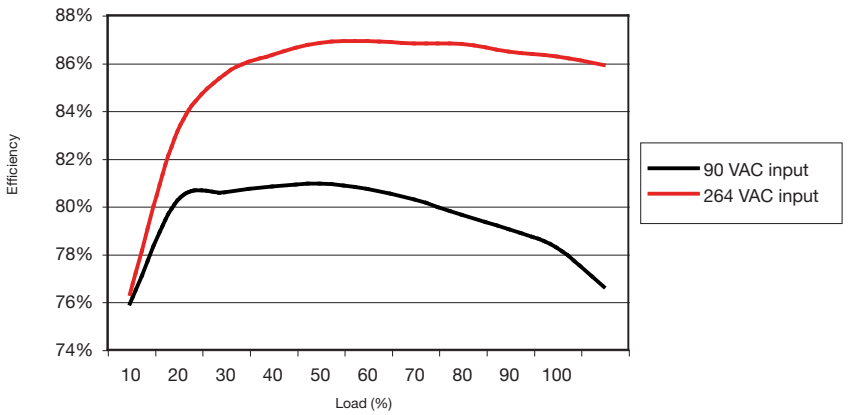


Figure 9
CLC175US12 at 90 & 230 VAC

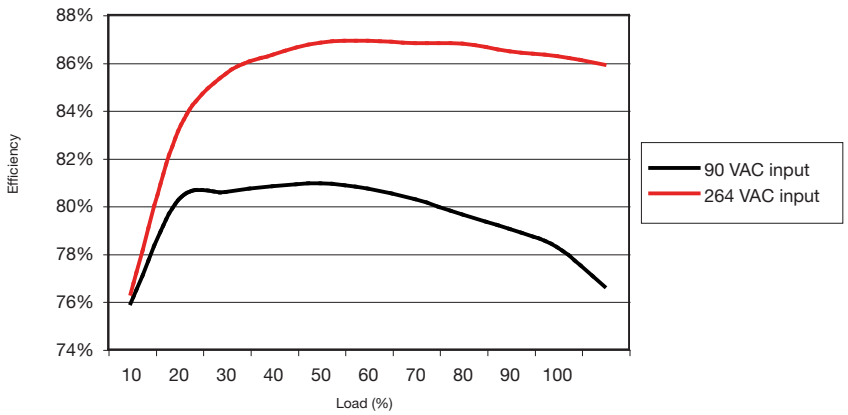


Figure 10
CLC175US24 at 90 & 230 VAC

Characteristic	Notes & Conditions
Signals (standard)	
Remote Sense	Compensates for 0.5 V total voltage drop
Signals (option -A)	
Power OK (combined AC OK & DC OK)	Open collector referenced to logic ground & output 0V, transistor normally off when AC is good (see fig.11 - 15) AC OK: Provides ≥ 3 ms warning of loss of output from AC failure
Remote On/Off (Inhibit/Enable)	Uncommited isolated optocoupler diode, powered diode inhibits the supply (see fig.16-21)
Standby Supply V3	5 V/0.5 A supply, always present when AC supplied, referenced to logic ground and output 0V

Signals

Power OK (Optional -A)

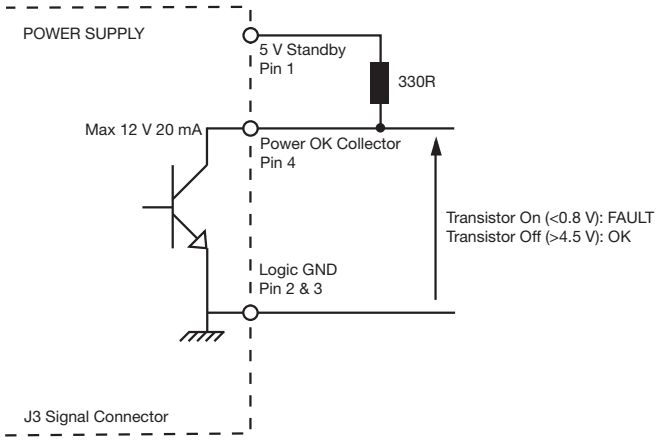


Figure 11

Power OK - Timing Diagram

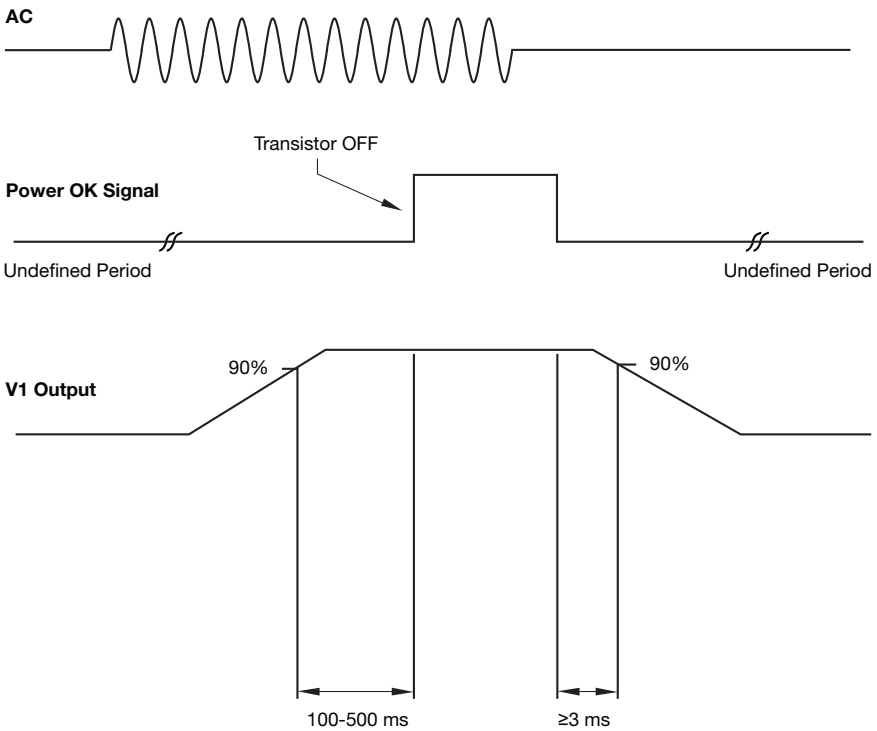


Figure 12

Signals (cont'd)

Power OK (Optional -A)

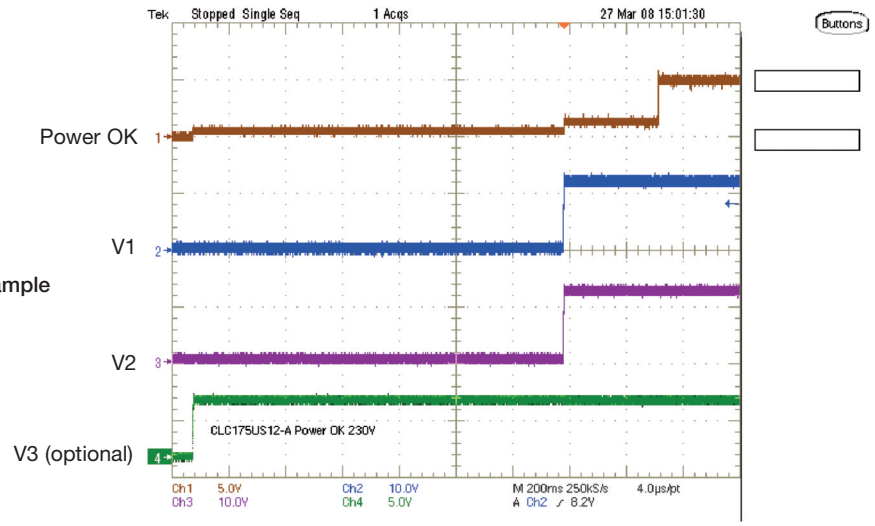


Figure 13
Power OK signal example at AC switch on

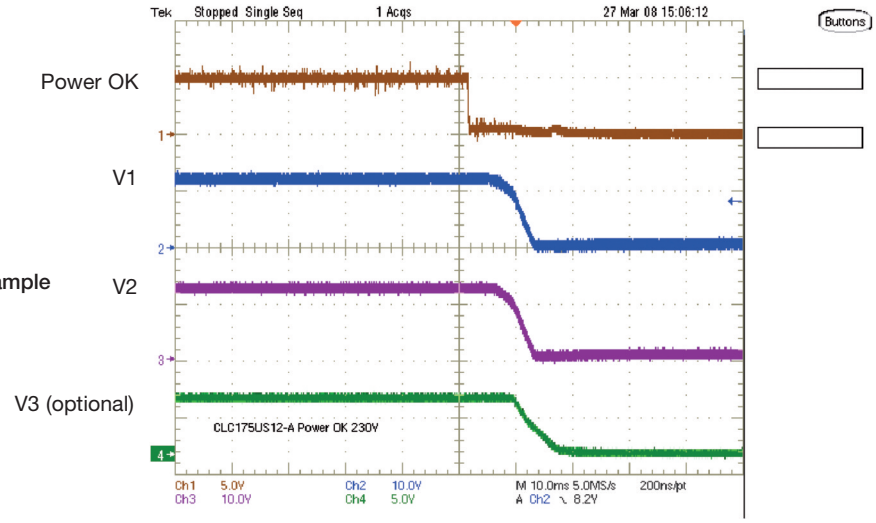


Figure 14
Power OK signal example at AC switch off

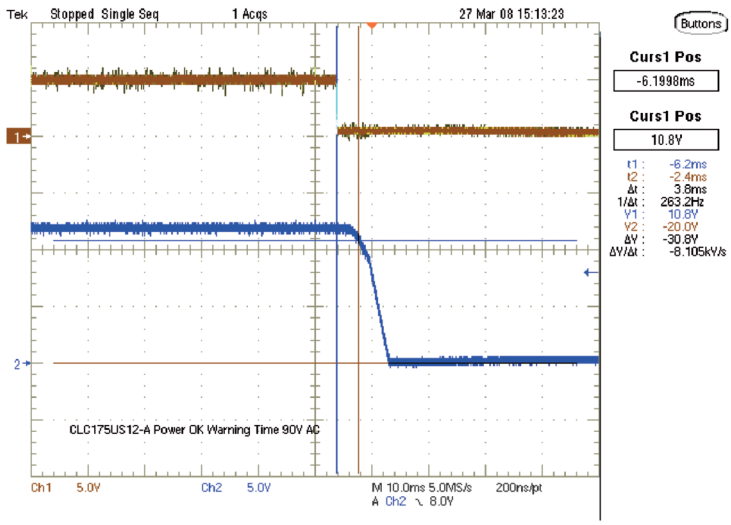


Figure 15
V1 warning time example at Power OK signal 90 VAC 175 W load

Signals (cont'd)

Remote On/Off (Inhibit/Enable) (Optional -A)

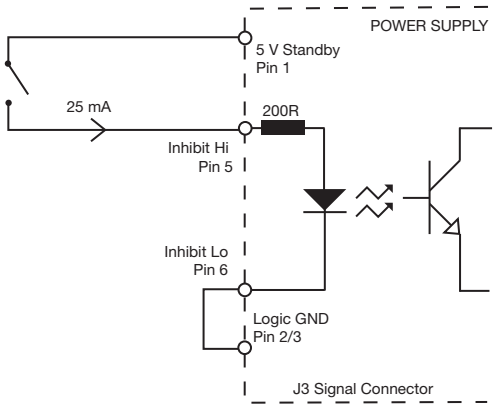


Figure 16
Inhibit (Hi)

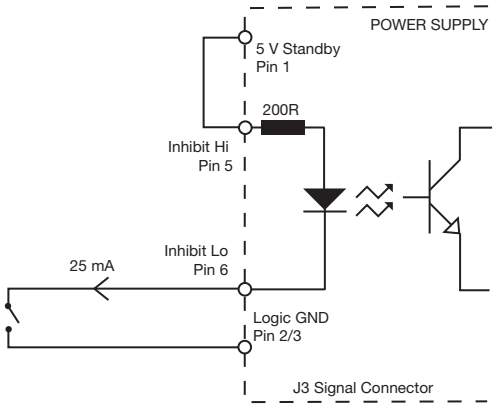


Figure 17
Inhibit (Lo)

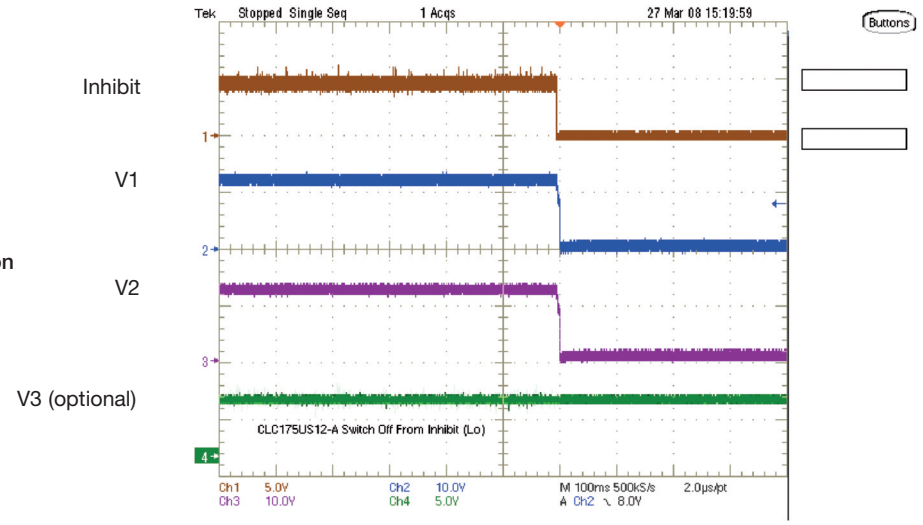


Figure 18
Example of outputs switching off when Inhibit (Lo) configuration used & switch closed

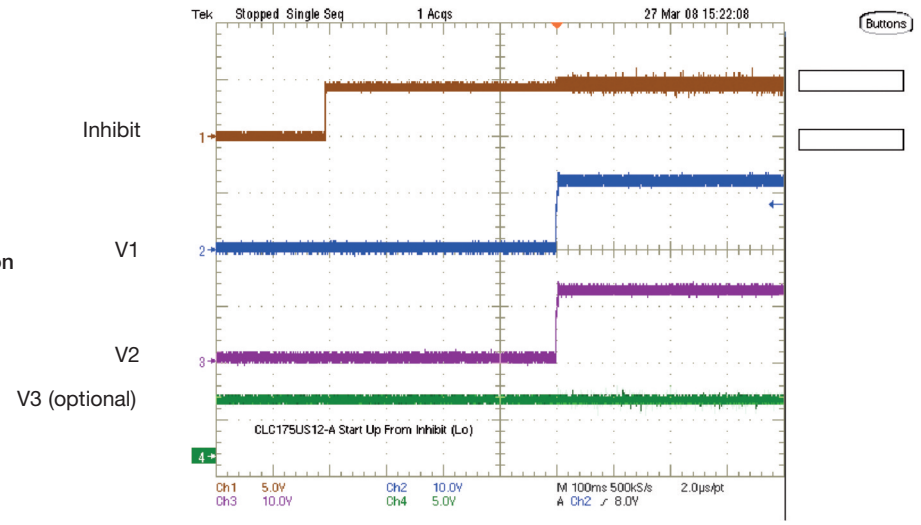


Figure 19
Example of outputs switching on when Inhibit (Lo) configuration used & switch open

Signals (cont'd)

Remote On/Off (Inhibit/Enable) (Optional -A)

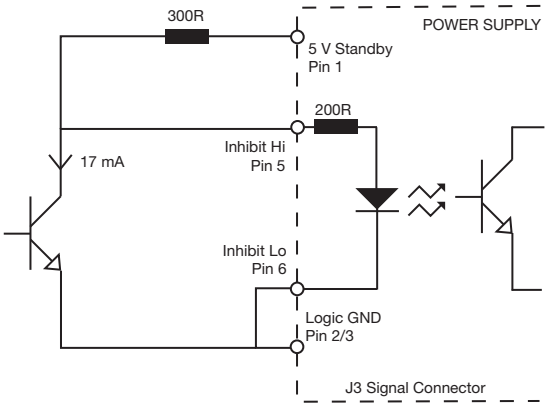


Figure 20
Enable (Hi)

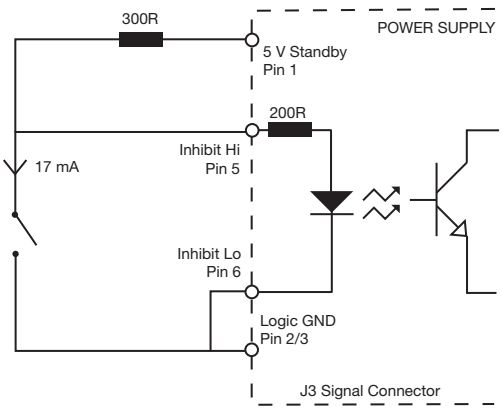


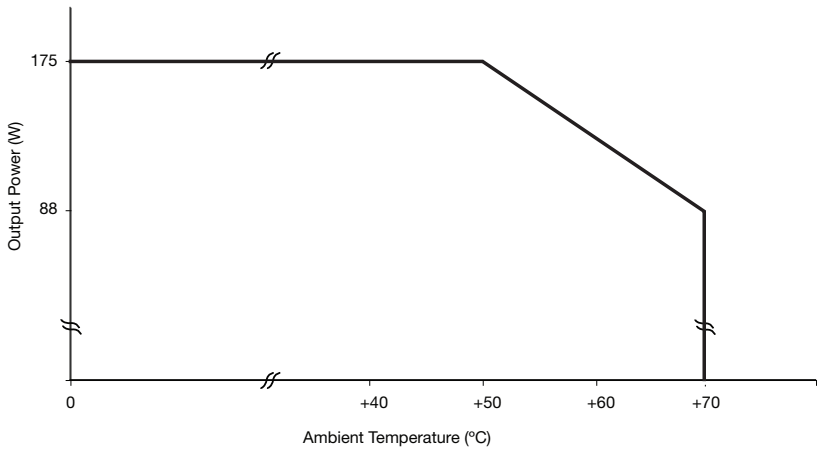
Figure 21
Enable (Lo)

Environmental

Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Operating Temperature	0		+70	ºC	Derate linearly from +50 ºC at 2.5%/ºC to 50% at 70 ºC (See fig.21 & Thermal Considerations).
Storage Temperature	-40		+85	ºC	
Cooling	10			CFM	See fig.21 & Thermal Considerations
Humidity	5		95	%RH	Non-condensing
Operating Altitude			3000	m	
Shock					3 x 30 g/11 ms shocks in both +ve & -ve directions along the 3 orthogonal axis, total 18 shocks.
Vibration					Three axis 5-500 Hz at 2 g x 10 sweeps

Derating Curve

Figure 21



Electromagnetic Compatibility - Immunity

Phenomenon	Standard	Test Level	Criteria	Notes & Conditions
Low Voltage PSU EMC	EN61204-3	High severity level	as below	
Harmonic Current	EN61000-3-2	Class A		
Radiated	EN61000-4-3	3	A	
EFT	EN61000-4-4	3	A	
Surges	EN61000-4-5	Installation class 3	A	
Conducted	EN61000-4-6	3	A	
Dips and Interruptions	EN61000-4-11	Dip: 30% 10 ms	A	
		Dip: 60% 100 ms	B	
		Dip: 100% 5000 ms	B	

Electromagnetic Compatibility - Emissions

Phenomenon	Standard	Test Level	Criteria	Notes & Conditions
Conducted	EN55022	Class B		See fig. 22
Radiated	EN55022	Class A		
Voltage Fluctuations	EN61000-3-3			

Typical EMC Plot

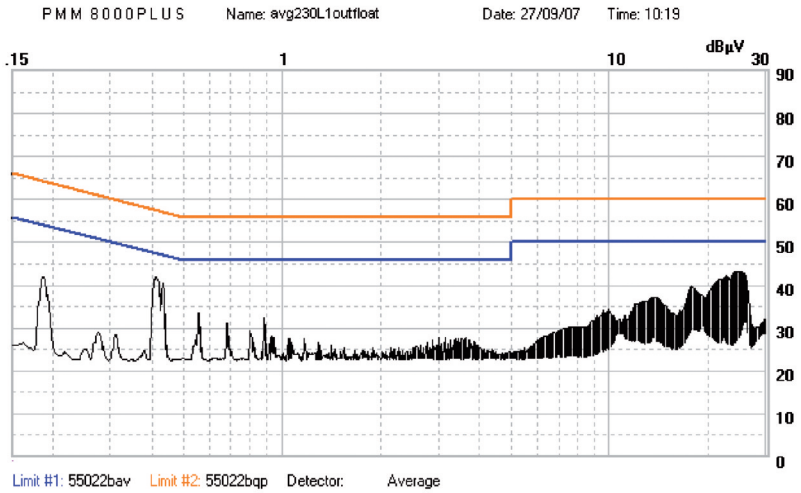
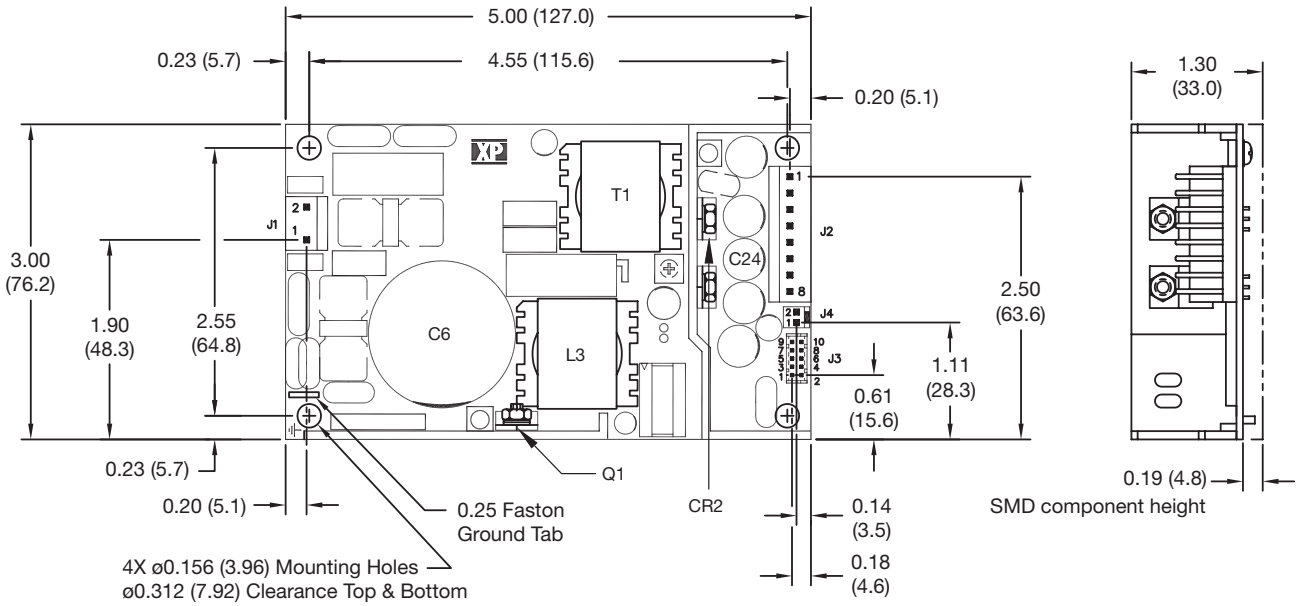


Figure 22
Typical conducted noise plot

Safety Agency Approvals

Safety Agency	Safety Standard	Category
CB Report	CSA CB155548-2013993 IEC60950-1:2005	Information Technology
CSA	CSA certificate #TBA CSA22.2 No. 60950-1-05	Information Technology
UL	UL File #E139109 UL60950-1 2nd Ed 2007	Information Technology
TUV	TUV Certificate #B08 04 57396 046 EN60950-1:2006	Information Technology
CE	LVD	

Mechanical Details



Input Connector J1	
Pin 1	Line
Pin 2	Neutral
0.25" Faston	Earth

J1 mates with Molex housing 09-50-1031 and Molex series 5194 crimp terminals.

Output Connector J2	
Pin	Single
1	+V1
2	+V1
3	+V1
4	+V1
5	RTN
6	RTN
7	RTN
8	RTN

J2 mates with Molex housing 09-50-1081 and Molex series 5194 crimp terminals.

Signal Connector J3	
Pin	Single
1	+V3 5V Standby*
2	Logic GND*
3	Logic GND*
4	Power OK*
5	Inhibit HI*
6	Inhibit LO*
7	+Sense
8	-Sense
9	+V1
10	-V1

*Optional

J3 mates with JST housing PHDR-10VS and JST series SPHD-001T-P0.5 crimp terminals.

Fan Connector J4	
Pin 1	+V2 Fan (12V)
Pin 2	Fan RTN

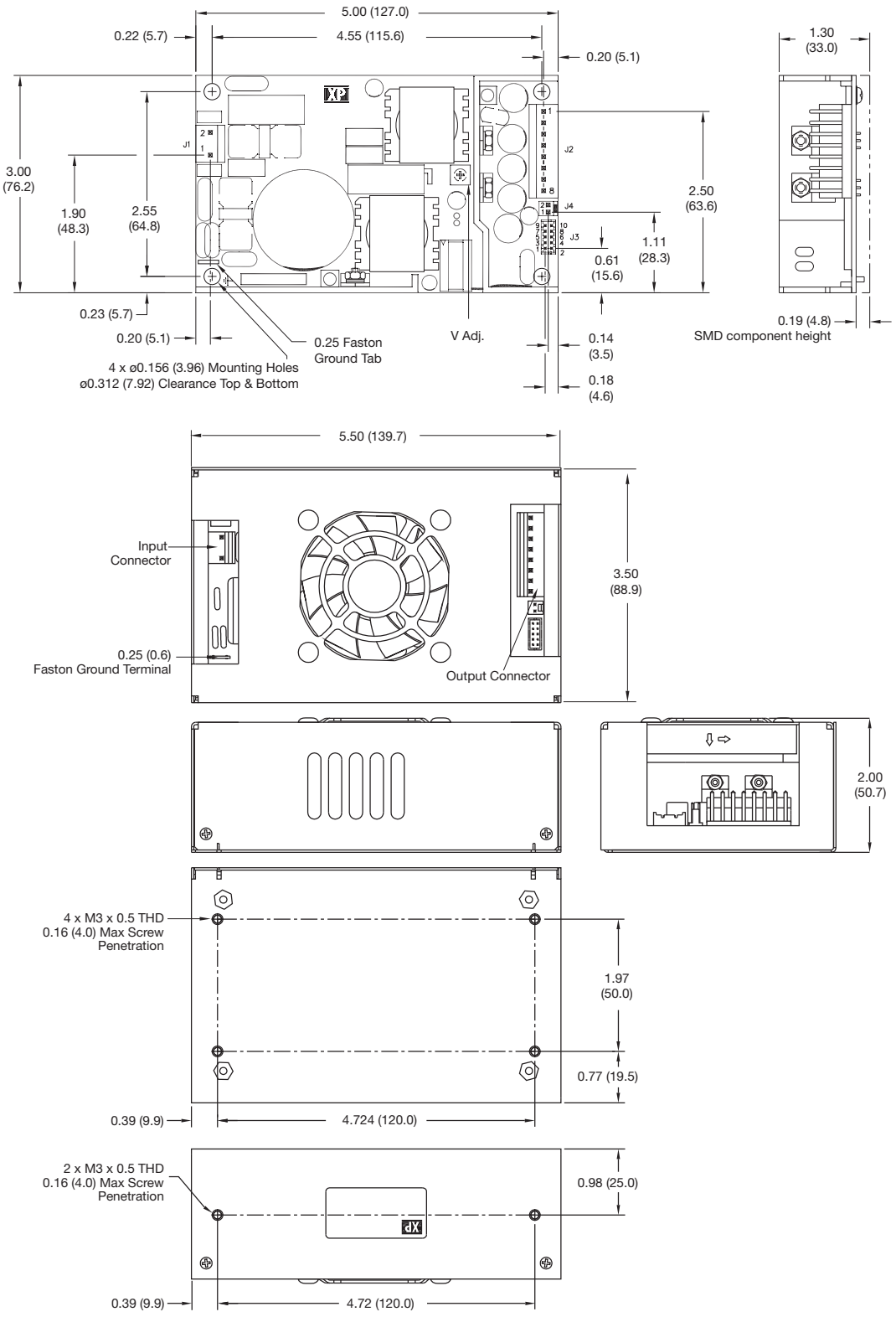
J4 mates with Molex housing 22-01-1024 and Molex series 5103 crimp terminals.

Notes

1. All dimensions in inches (mm). Tolerance .xx = ±0.02 (0.50); .xxx = ±0.01 (0.25)

Mechanical Details

Frame Cover



Input Connector J1	
Pin 1	Line
Pin 2	Neutral
0.25”Faston	Earth

J1 mates with Molex housing 09-50-1031 and Molex series 5194 crimp terminals.

Output Connector J2	
Pin	Single
1	+V1
2	+V1
3	+V1
4	+V1
5	RTN
6	RTN
7	RTN
8	RTN

J2 mates with Molex housing 09-50-1081 and Molex series 5194 crimp terminals.

Signal Connector J3	
Pin	Single
1	+5V Standby
2	Logic GND
3	Logic GND
4	Power OK
5	Inhibit HI
6	Inhibit LO
7	+Sense
8	-Sense
9	+Vout
10	-Vout

J3 mates with JST housing PHDR-10VS and JST SPHD-001T-P0.5 crimp terminals.

Fan Connector J4	
Pin 1	Fan +(12V)
Pin 2	Fan -

J4 mates with Molex housing 22-01-1024 and Molex series 5103 crimp terminals.

Notes

1. All dimensions in inches (mm). Tolerance .xx = ±0.02 (0.50); .xxx = ±0.01 (0.25)
2. Weight: 0.7 lbs (317g) approx.

Thermal Considerations

In order to ensure correct and reliable operation of the PSU in the most adverse conditions permitted in the end-use equipment, the temperature of the components listed in the table below must not be exceeded. See drawing on page 13 for component locations. Temperature should be monitored using K type thermocouples placed on the hottest part of the component.

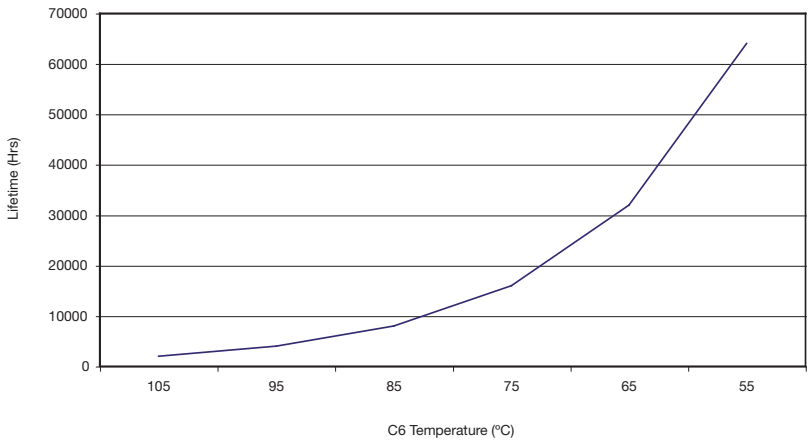
Temperature Measurements (Ambient ≤ 50 ºC)	
Component	**Max Temperature ºC**
T1	110 ºC
L3	120 ºC
Q1	110 ºC
CR2	110 ºC

Service Life

The estimated service life of the CLC175 is determined by the cooling arrangements and load conditions experienced in the end application. Due to the uncertain nature of the end application this estimated service life is based on the actual measured temperature of capacitors within the product when installed in the end application.

The graph below expresses the estimated lifetime for a given component temperature and assumes continuous operation at this temperature.

Estimated Service Life vs Component Temperature



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