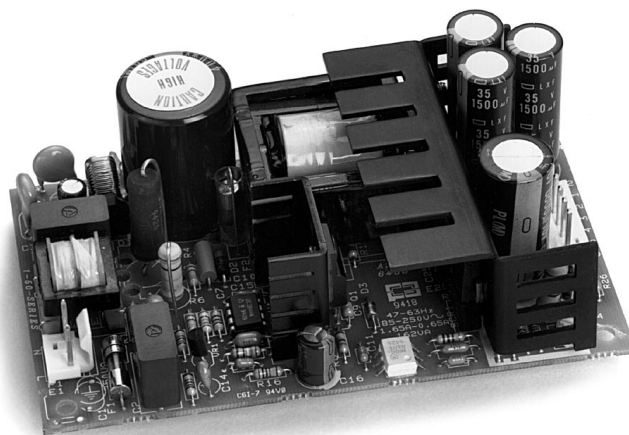


50-60W

OPEN-FRAME SWITCHING POWER SUPPLIES

- Single, Dual and Triple Output Models
- Models with Universal AC Input or DC Input
- CE Mark: UL/CSA/EN60950 Approvals
- Models to UL544/CSA C22.2-601/EN60-601 Medical Safety Standards
- EN55022/FCC Class B Input Line Filters
- 0% Minimum Load Requirement
- Over-Current/Short-Circuit Protection
- 2-Year Warranty
- Minimum 200,000-Hour MTBF



CHARACTERISTICS

Input Voltage	FLU and MDU models, universal input voltage range 85-265 VAC single phase or 100-370 VDC. DC-input models, see ratings table.
Input Line Frequency	47-440 Hz (ac input models).
Input Line Protection	FLU and MDU models, MOV transient protected, input line fuse on-board. (See Note 1.)
EMI Filter	Standard (FLU and MDU models). Performance surpasses conducted EMI requirements of EN55022/FCC Class B by 10 dB, typical.
Continuous Output Power	FLU1-50, MDU1-50, FLU2-50, FLU3-50, and DC50 series, 50W, max. FLU1-60 and DC60 series, 60W, max.
Leakage Current	MDU series, non-patient contact rating: 300 μ A, maximum.
Output Voltage Adjust	Primary output adjustable \pm 5%. Auxiliary outputs fixed.
Efficiency	62-76%, typical (nominal input voltage, nominal load conditions).
Hold-Up Time	16 ms (115 VAC input), 32 ms (230 VAC input), minimum, at full load.
Overload Protection	Power-limit circuit.
Short-Circuit Protection	Continuous.
Over-Voltage Protection	FLU and MDU series, primary output only (120% of rated output, typical).
Soft Start	Standard on all ac-input models.
Design Topology	Flyback converter with current-mode control.
Frequency of Operation	FLU1-50 and MDU1-50 series, 40 kHz, fixed. DC50 and DC60 series, 100 kHz, fixed. FLU1-60, FLU2-50, FLU3-50 series, 33 kHz, fixed.
Hi-Pot Isolation	FLU Series: 5300 VDC, input-to-output for one minute. MDU Series: 5700 VDC, input-to-output for one minute. DC50 and DC60 Series, 2500 VDC input-to-output for one minute. (See Note 2.)
Noise, Ripple and Spike	FLU and MDU models, 1% peak-to-peak, maximum. (See Notes 4, 5.)
Temperature Range	-20°C to +70°C.
Output Power De-Rating	De-rate output power and current linearly 2%/°C from +50°C to +70°C.
Temperature Coefficient	\pm 0.05%/°C over the entire operating temperature range.
Relative Humidity	0 to 95%, non-condensing.
Altitude	0 to 10,000 feet.
Cooling	Convection cooling is adequate. Moving air is recommended for operation in a confined area.
Storage Temperature	-40°C to +85°C.
Storage Humidity	0 to 95%, non-condensing.
Mean Time Between Failures	>200,000 hours. (Note 6.)

Model	Output Voltage Output (V)	Output Current			Voltage Tol.	Output Line Reg.	Output Load Reg.	Output Cross-Reg.
		Min. (A)	Nom. (A)	Max. (A)				
AC-DC 50W Singles 85-265 VAC Input								
FLU1-50-1AD	V1	5	0.00	10.0	1.0%	0.5%	0.5%	—
FLU1-50-2AD	V1	9	0.00	5.60	1.0%	0.5%	0.5%	—
FLU1-50-3AD	V1	12	0.00	4.20	1.0%	0.5%	0.5%	—
FLU1-50-4AD	V1	15	0.00	3.33	1.0%	0.5%	0.5%	—
FLU1-50-5AD	V1	24	0.00	2.10	1.0%	0.5%	0.5%	—
FLU1-50-6AD	V1	28	0.00	1.75	1.0%	0.5%	0.5%	—

AC-DC 50W Singles To UL544/EN60-601/CSA 22.2-601.1								
MDU1-50-1AD	V1	5	0.00	10.0	1.0%	0.5%	0.5%	—
MDU1-50-2AD	V1	9	0.00	5.60	1.0%	0.5%	0.5%	—
MDU1-50-3AD	V1	12	0.00	4.20	1.0%	0.5%	0.5%	—
MDU1-50-4AD	V1	15	0.00	3.33	1.0%	0.5%	0.5%	—
MDU1-50-5AD	V1	24	0.00	2.10	1.0%	0.5%	0.5%	—
MDU1-50-6AD	V1	28	0.00	1.75	1.0%	0.5%	0.5%	—

AC-DC 60W Singles 85-265 VAC Input								
FLU1-60-1AD	V1	5	0.00	12.0	1.0%	0.1%	0.2%	—
FLU1-60-2AD	V1	9	0.00	6.70	1.0%	0.1%	0.2%	—
FLU1-60-3AD	V1	12	0.00	5.00	1.0%	0.1%	0.2%	—
FLU1-60-4AD	V1	15	0.00	4.00	1.0%	0.1%	0.2%	—
FLU1-60-5AD	V1	24	0.00	2.50	1.0%	0.1%	0.2%	—
FLU1-60-6AD	V1	28	0.00	2.10	1.0%	0.1%	0.2%	—

AC-DC 50W Duals 85-265 VAC Input									
FLU2-50-1AD	V1	+5	0.00	5.00	6.00	1.0%	0.2%	1.0%	—
	V2	+12	0.00	2.10	3.00*	5.0%	1.0%	3.0%	5.0%
FLU2-50-2AD	V1	+5	0.00	5.00	6.00	1.0%	0.2%	1.0%	—
	V2	+24	0.00	1.10	1.50†	5.0%	1.0%	3.0%	5.0%

* Peak output current rating = 5.0A (<60 seconds, duty cycle <10%).

† Peak output current rating = 2.5A (<60 seconds, duty cycle <10%).

Optional L-bracket enclosures for the FLU1-50 series are available. For details, see dimension drawings for the Power General 40W series.

50-60W

OPEN-FRAME SWITCHING POWER SUPPLIES

Model	Output Voltage Output (V)	Output Current			Output Voltage (V)	Line Reg.	Load Reg.	Cross- Reg.
		Min. (A)	Nom. (A)	Max. (A)				
AC-DC 50W Triples								
85-265 VAC Input								
FLU3-50-1AD	V1 +5	0.00	5.00	6.00	1.0%	0.2%	1.0%	—
	V2 +12	0.00	1.60	3.00*	5.0%	1.0%	2.0%	5.0%
	V3 -12	0.00	0.50	0.50	5.0%	2.0%	3.0%	5.0%
FLU3-50-2AD	V1 +5	0.00	5.00	6.00	1.0%	0.2%	1.0%	—
	V2 +12	0.00	1.80	3.00*	5.0%	1.0%	3.0%	5.0%
	V3 -5	0.00	0.50	0.50	3.0%	0.5%	1.0%	1.0%
FLU3-50-3AD	V1 +5	0.00	5.00	6.00	1.0%	0.2%	1.0%	—
	V2 +15	0.00	1.15	2.00*	5.0%	1.0%	3.0%	5.0%
	V3 -15	0.00	0.50	0.50	3.0%	0.5%	1.0%	1.0%
FLU3-50-4AD	V1 5(I _{ISO})	0.00	8.00	9.00	1.0%	0.2%	0.5%	—
	V2 12(I _{ISO})	0.00	0.40	0.60	3.0%	0.5%	1.0%	1.0%
	V3 12(I _{ISO})	0.00	0.40	0.60	3.0%	0.5%	1.0%	1.0%
FLU3-50-5AD	V1 5(I _{ISO})	0.00	8.00	9.00	1.0%	0.2%	0.5%	—
	V2 15(I _{ISO})	0.00	0.35	0.60	3.0%	0.5%	1.0%	1.0%
	V3 15(I _{ISO})	0.00	0.35	0.60	3.0%	0.5%	1.0%	1.0%

* Peak output current rating = 5.0A (<60 seconds, duty cycle <10%).

Notes

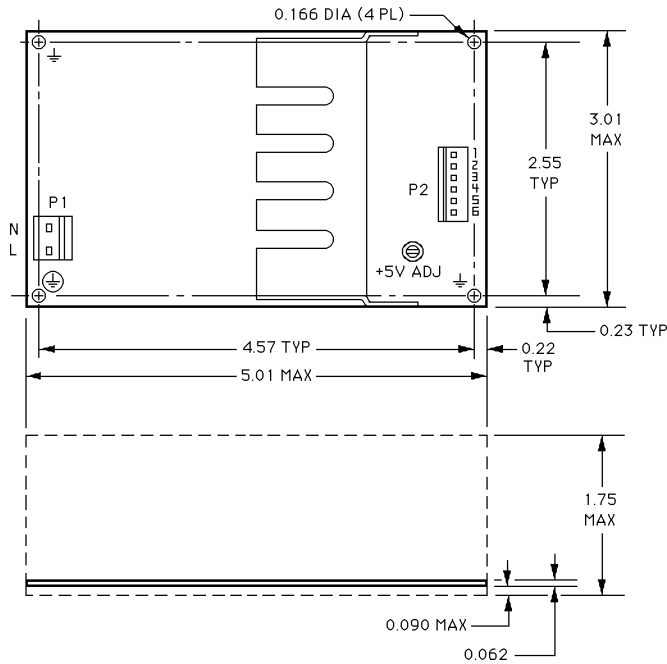
- For FLU and MDU models, replace the input line fuse with the same type and rating. Recommended: 2A/250V slow-blow fuse.
For the DC50 series, an external input line fuse is recommended: For 12V input models, use a 10A/125V fuse; for 24V input, use a 5A/125V fuse; for 48V input models, use a 3A/125V fuse.
For the DC60 series, an external input line fuse is recommended: For 12V input models, use a 10A/125V fuse; for 24V input, use a 6A/125V fuse; for 48V input models, use a 4A/125V fuse.
- Hi-pot isolation is 2200 VDC from the input of the supply to ground for 60 seconds.
- All measurements are made directly at the terminals of the power supply.
- Peak-to-peak and RMS metering equipment must have a 20 MHz frequency response with probes and cables that maintain a frequency response of 20 Hz to 20 MHz. Output ripple and spikes are measured directly at the output terminals of the power supply with a 0.1 μF ceramic capacitor. The instruments' probe ground band must make direct contact with the output return or common terminal of the supply to prevent erroneous noise measurements.
- For DC50-1 and DC50-2 models, 100 kHz noise and ripple at the 5V output is 20 mV_{pp}, typical; at auxiliary outputs, it is 5 mV_{pp}, typical. For DC50-3 and DC50-4 models, 100 kHz noise and ripple is 20 mV_{pp}, typical, for all outputs.
For DC60 models, 100 kHz noise and ripple is typically 20 mV_{pp}.
- MTBF is calculated using the parts stress method in MIL-HDBK 217F (ground benign, T_A = +25°C).
- Output voltage tolerance is measured under nominal load conditions.
- Line regulation is measured under nominal load conditions as the input voltage is varied from 85 to 265 VAC (ac-input models) or from minimum to maximum input voltage (dc input models).
- Load regulation is measured at 115 VAC or 230 VAC (ac input models) or at nominal input voltage (dc input models). For single output models, load regulation is measured while output current is varied from 0% to 100% of full load. With ac-input, multiple output models, the output under test is brought to 60% of nominal load; load current is then varied +40%/-30% of nominal while other outputs are held at nominal load conditions. With dc-input models, load regulation on an output is measured from nominal to maximum and minimum load while other outputs are held at nominal load conditions.
- Cross-regulation is tested by changing the load on the primary output from 50% to 100% of nominal load while measuring the voltage change on the auxiliary output under test.
- The FLU1-50, FLU2-50, FLU3-50 and FLU1-60 series are approved to UL1950 (File E140439), CSA22.2 No.234 (File LR52335) and EN60950/IEC950/DIN VDE 0805 (TÜV Licenses R9271543, R9171470, and R9271468).

Model	Input Voltage			Output Voltage (V)	Output Current			Output Voltage (V)	Line Reg.	Load Reg.
	Min. (V)	Nom. (V)	Max. (V)		Min. (A)	Nom. (A)	Max. (A)			
DC-DC 50W Triples[§]										
DC50-1A	10	12	18	V1 5(I _{ISO})	0.5	3.00	6.00	5.0%	0.2%	0.2%
				V2 12(I _{ISO})	0.1	1.00	1.00	4.0%	0.2%	0.2%
				V3 12(I _{ISO})	0.1	1.00	1.00	4.0%	0.2%	0.2%
DC50-2A	10	12	18	V1 12(I _{ISO})	0.5	3.00	6.00	5.0%	0.2%	0.2%
				V2 15(I _{ISO})	0.1	1.00	1.00	4.0%	0.2%	0.2%
				V3 15(I _{ISO})	0.1	1.00	1.00	4.0%	0.2%	0.2%
DC50-3A	10	12	18	V1 5(I _{ISO})	0.5	3.00	6.00	5.0%	0.2%	0.2%
				V2 12(I _{ISO})	0.2	2.00	3.00	4.0%	0.4%	6.0%
				V3 12(I _{ISO})	0.1	0.30	0.50	4.0%	0.4%	6.0%
DC50-4A	10	12	18	V1 5(I _{ISO})	0.5	3.00	6.00	5.0%	0.2%	0.2%
				V2 12(I _{ISO})	0.2	2.00	3.00	4.0%	0.2%	6.0%
				V3 5(I _{ISO})	0.2	0.50	1.00	4.0%	0.2%	6.0%
DC50-1B	18	24	36	V1 5(I _{ISO})	0.5	3.00	6.00	5.0%	0.2%	0.2%
				V2 12(I _{ISO})	0.1	1.00	1.00	4.0%	0.2%	0.2%
				V3 12(I _{ISO})	0.1	1.00	1.00	4.0%	0.2%	0.2%
DC50-2B	18	24	36	V1 5(I _{ISO})	0.5	3.00	6.00	5.0%	0.2%	0.2%
				V2 15(I _{ISO})	0.1	1.00	1.00	4.0%	0.2%	0.2%
				V3 15(I _{ISO})	0.1	1.00	1.00	4.0%	0.2%	0.2%
DC50-3B	18	24	36	V1 5(I _{ISO})	0.5	3.00	6.00	5.0%	0.2%	0.2%
				V2 12(I _{ISO})	0.2	2.00	3.00	4.0%	0.4%	6.0%
				V3 12(I _{ISO})	0.1	0.30	0.50	4.0%	0.4%	6.0%
DC50-4B	18	24	36	V1 5(I _{ISO})	0.5	3.00	6.00	5.0%	0.2%	0.2%
				V2 12(I _{ISO})	0.2	2.00	3.00	4.0%	0.2%	6.0%
				V3 5(I _{ISO})	0.2	0.50	1.00	4.0%	0.2%	6.0%
DC50-1C	36	48	72	V1 5(I _{ISO})	0.5	3.00	6.00	5.0%	0.2%	0.2%
				V2 12(I _{ISO})	0.1	1.00	1.00	4.0%	0.2%	0.2%
				V3 12(I _{ISO})	0.1	1.00	1.00	4.0%	0.2%	0.2%
DC50-2C	36	48	72	V1 5(I _{ISO})	0.5	3.00	6.00	5.0%	0.2%	0.2%
				V2 15(I _{ISO})	0.1	1.00	1.00	4.0%	0.2%	0.2%
				V3 15(I _{ISO})	0.1	1.00	1.00	4.0%	0.2%	0.2%
DC50-3C	36	48	72	V1 5(I _{ISO})	0.5	3.00	6.00	5.0%	0.2%	0.2%
				V2 12(I _{ISO})	0.2	2.00	3.00	4.0%	0.4%	6.0%
				V3 12(I _{ISO})	0.1	0.30	0.50	4.0%	0.4%	6.0%
DC50-4C	36	48	72	V1 5(I _{ISO})	0.5	3.00	6.00	5.0%	0.2%	0.2%
				V2 12(I _{ISO})	0.2	2.00	3.00	4.0%	0.2%	6.0%
				V3 5(I _{ISO})	0.2	0.50	1.00	4.0%	0.2%	6.0%
DC-DC 50-72W Singles[§]										
DC60-1A	10	12	18	V1 5	0.0	10	10	5.0%	0.2%	0.2%
DC60-2A	10	12	18	V1 12	0.0	5.0	5.0	5.0%	0.2%	0.2%
DC60-3A	10	12	18	V1 15	0.0	4.0	4.0	5.0%	0.2%	0.2%
DC60-4A	10	12	18	V1 24	0.0	2.5	2.5	5.0%	0.2%	0.2%
DC60-1B	18	24	36	V1 5	0.0	12	12	5.0%	0.2%	0.2%
DC60-2B	18	24	36	V1 12	0.0	5.0	6.0	5.0%	0.2%	0.2%
DC60-3B	18	24	36	V1 15	0.0	4.0	4.8	5.0%	0.2%	0.2%
DC60-4B	18	24	36	V1 24	0.0	2.5	3.0	5.0%	0.2%	0.2%
DC60-1C	36	48	72	V1 5	0.0	12	12	5.0%	0.2%	0.2%
DC60-2C	36	48	72	V1 12	0.0	5.0	6.0	5.0%	0.2%	0.2%
DC60-3C	36	48	72	V1 15	0.0	4.0	4.8	5.0%	0.2%	0.2%
DC60-4C	36	48	72	V1 24	0.0	2.5	3.0	5.0%	0.2%	0.2%

§ DC50 and DC60 models include under-voltage shutdown (10% below low line, remote shutdown (TTL HIGH disables the unit), and external frequency synchronization (2.8V positive pulse >9.1 μs at the synch pin).

50-60W

OPEN-FRAME SWITCHING POWER SUPPLIES



FLU1-50 AND MDU1-50 SERIES

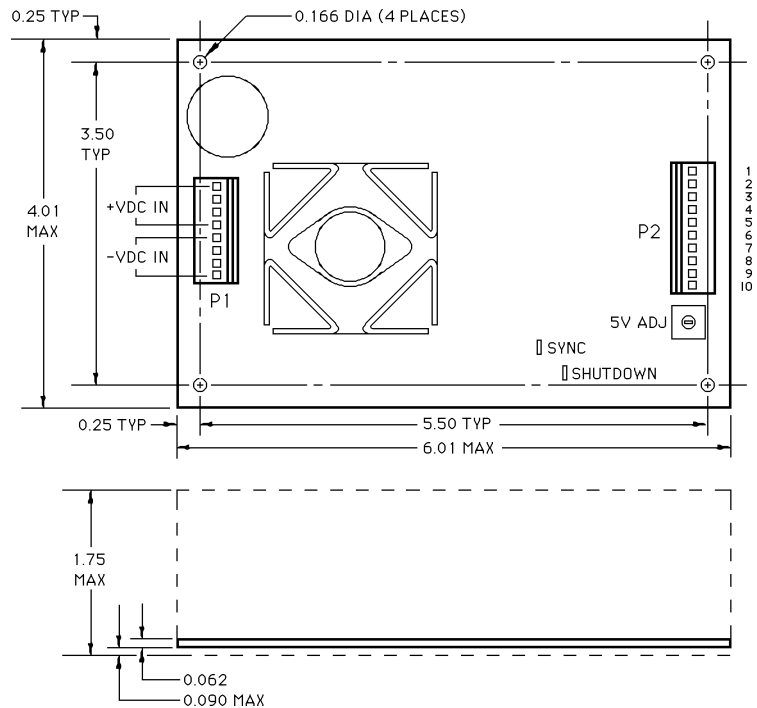
- A. Dimensions shown are in inches.
- B. Tolerances = 0.00 ±0.01 inch.
0.000 ±0.005 inch.
- C. P1 input connectors are Molex 26-60-4030. The mating connector combines Molex housing 43061-0003 and crimp terminal 08-70-1030.
- D. P2 output connectors are Molex 26-60-4060. The mating connector combines Molex housing 43061-0006 and crimp terminal 08-70-1030.

Pin-Out

Pin	FLU1-50	MDU1-50
1	V1	V1
2	V1	V1
3	V1	V1
4	Return	Return
5	Return	Return
6	Return	Return

DC50 SERIES

- A. Dimensions shown are in inches.
- B. Tolerances = 0.00 ±0.01 inch.
0.000 ±0.005 inch.
- C. P1 input connectors are Molex 26-60-4080. The mating connector combines Molex housing 09-50-8081 and crimp terminal 03-50-0106.
- D. P2 output connectors are Molex 26-60-4100. The mating connector combines Molex housing 09-50-8101 and crimp terminal 03-50-0106.
- E. Under-voltage shutdown on the DC50 series is activated at 10% below low line, typical. Over-voltage shutdown is typically activated at 10% above high line.
- F. A TTL HIGH signal at the external shutdown pin of the DC50 series disables the unit.
- G. External frequency synchronization of the DC50 series requires a 2.8V positive pulse (>9.1 μs) at the external synch pin.

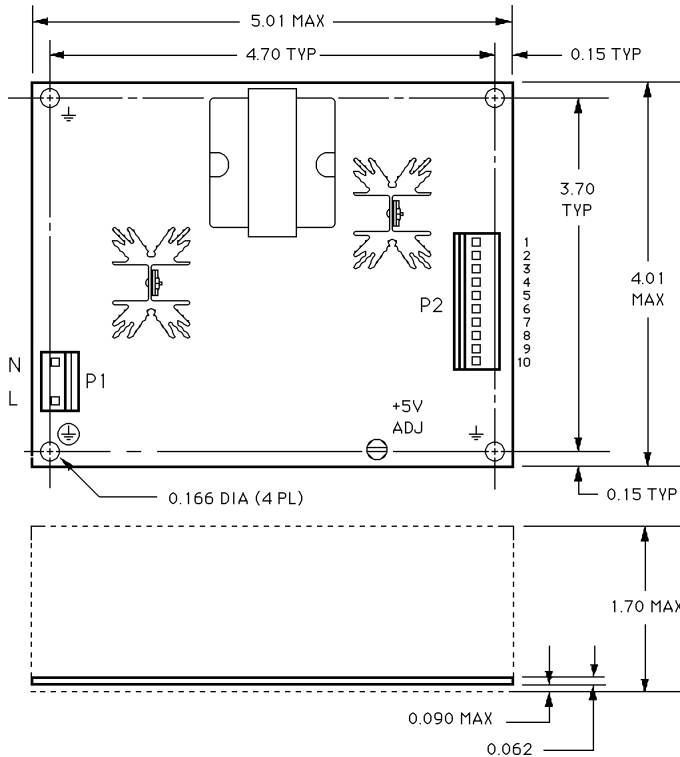


Pin-Out

Pin	DC50
1	V3
2	V3 Return
3	V2
4	V2
5	V2 Return
6	V2 Return
7	V1
8	V1
9	V1 Return
10	V1 Return

50-60W

OPEN-FRAME SWITCHING POWER SUPPLIES



FLU2-50/FLU3-50/FLU1-60 SERIES

- A. Dimensions shown are in inches.
- B. Tolerances = 0.00 ±0.01 inch.
0.000 ±0.005 inch.
- C. P1 input connectors are Molex 26-60-4030. The mating connector combines Molex housing 43061-0003 and crimp terminal 08-70-1030.
- D. P2 output connectors:
 FLU1-60 series—Molex 26-60-4080
 FLU2-50 series—Molex 26-60-4060
 FLU3-50 series, Models 1, 2, 3—Molex 26-60-4060
 FLU3-50 series, Models 4, 5—Molex 26-60-4100
 Mating connector housings:
 FLU1-60 series—Molex 43061-0008.
 FLU2-50 series—Molex 43061-0006.
 FLU3-50 series, models 1, 2, 3—Molex 43061-0006.
 FLU3-50 series, models 4, 5—Molex 43061-0010.
 Crimp terminals:
 All models—Molex 08-70-1030.

Pin-Out

Pin	FLU2-50	FLU3-50 Models 1-3	FLU3-50 Models 4-5	FLU1-60
1	V2	V2	+V2(ISO)	+Sense [§]
2	V1	V1	- V2(ISO)	V1
3	V1	V1	+V1(ISO)	V1
4	Common	Common	+V1(ISO)	V1
5	Common	Common	+V1(ISO)	Return
6	N/C	V3	- V1(ISO)	Return
7	N/A	N/A	- V1(ISO)	Return
8	N/A	N/A	- V1(ISO)	-Sense [§]
9	N/A	N/A	- V3(ISO)	N/A
10	N/A	N/A	+V3(ISO)	N/A

[§] If sense terminals are not used, tie together Pins 1 and 2 and tie together Pins 7 and 8.

DC60 SERIES

- A. Dimensions shown are in inches.
- B. Tolerances = 0.00 ±0.01 inch.
0.000 ±0.005 inch.
- C. Under-voltage shutdown on the DC60 series is activated at 10% below low line, typical. Over-voltage shutdown is typically activated at 10% above high line.
- D. A TTL HIGH signal at the external shutdown pin of the DC60 series disables the unit.
- E. External frequency synchronization of the DC60 series requires a 2.8V positive pulse (>9.1 μs) at the external synch pin.

Pin-Out

Terminal	DC60
1	+Sense [§]
2	V1
3	V1
4	Return
5	Return
6	-Sense [§]

[§] If Sense terminals are not used, tie together Terminals 1 and 2 and tie together Terminals 5 and 6.

