

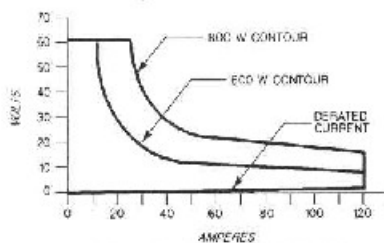
**Table 60504-1. Specifications**  
**(Specifications apply for 25°C ±5°C, except as noted)**

**DC Input Rating:**

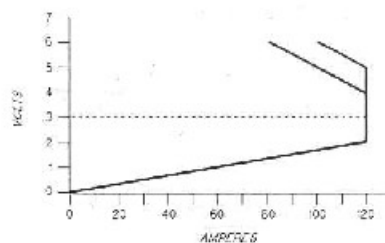
**Current:** 0 to 120 A

**Voltage:** 3 V to 60 V (minimum dc operation from 0 to 2 V for 0 to 120 A)

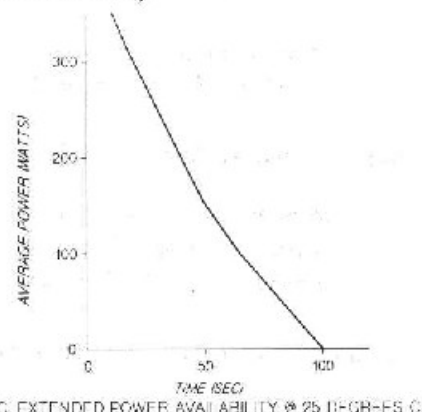
**Power:** 600 W at 40°C (derated to 450 W at 55°C)



A. OPERATING CHARACTERISTICS



B. DERATED CURRENT DETAIL



C. EXTENDED POWER AVAILABILITY @ 25 DEGREES C

**Constant Current Mode:**

**Ranges:** 0 to 12 A; and 0 to 120 A

**Accuracy:** (after 30 second wait): ±0.12% ±130 mA (both ranges)

**Resolution:** 3.2 mA (12 A range); 32 mA (120 A range)

**Regulation:** 10 mA (both ranges)

**Temperature Coefficient:** 120 ppm/°C ±8 mA/°C (both ranges)

**Constant Resistance Mode:**

**Ranges:** 0.017 to 0.5 Ω; 0.5 Ω to 500 Ω; and 5 Ω to 5 kΩ

**Accuracy:** ±0.8% ±5 mΩ with ≥12 A at input (0.5 Ω range);

±0.3% ±18 mS with ≥6 V at input (500 and 5 kΩ ranges)

**Resolution:** 0.14 mΩ (0.5 Ω range); 0.54 mS (500 Ω range); 0.054 mS (5 kΩ range)

**Regulation:** 20 mV with remote sensing (0.5 Ω range); 10 mA (500 and 5 kΩ ranges)

**Temperature Coefficient:** 800 ppm/°C ±0.2 mΩ/°C (0.5 Ω range);

300 ppm/°C ±1.2 mS/°C (500 and 5 kΩ ranges)

**Constant Voltage Mode:**

**Range:** 0 to 60 V

**Accuracy:** ±0.1% ±50 mV

**Resolution:** 16 mV

**Regulation:** 20 mV (remote sense); 100 mV (local sense)

**Temperature Coefficient:** 100 ppm/°C ±5mV/°C

**Transient Operation:**

**Continuous Mode**

**Frequency Range:** 0.25 Hz to 10 kHz

**Frequency Resolution:** 4%

**Frequency Accuracy:** 3%

**Table 60504-1. Specifications (continued)****Continuous Mode (continued)****Duty Cycle Range:** 3% to 97% (0.25 Hz to 1 kHz); 6% to 94% (1 kHz to 10 kHz)**Duty Cycle Resolution:** 4%**Duty Cycle Accuracy:** 6% of setting  $\pm 2\%$ **Pulsed Mode****Pulse Width:** 50  $\mu\text{s}$   $\pm 3\%$  minimum; 4 s  $\pm 3\%$  maximum**Transient Current Level** (0 to 12 A and 0 to 120 A ranges):**Resolution:** 52 mA (12 A range); 520 mA (120 A range)**Accuracy:**  $\pm 0.15\% \pm 160$  mA (12 A range);  $\pm 0.15\% \pm 700$  mA (120 A range)**Temperature Coefficient:** 150 ppm/ $^{\circ}\text{C}$   $\pm 10$  mA/ $^{\circ}\text{C}$ **Transient Resistance Level** (0.017 to 0.5  $\Omega$ , 0.5  $\Omega$  to 500  $\Omega$ , and 5  $\Omega$  to 5 k $\Omega$  ranges):**Resolution:** 2.2 m $\Omega$  (0.5  $\Omega$  range); 8.7 mS (500  $\Omega$  range); .87 mS (5 k $\Omega$  range)**Accuracy:**  $\pm 0.8\% + 7$  m $\Omega$  with  $\geq 12$  A at input (0.5  $\Omega$  range) $\pm 0.3\% + 26$  mS with  $\geq 6$  V at input (500  $\Omega$  range) $\pm 0.3\% + 18$  mS with  $\geq 6$  V at input (5 k $\Omega$  range)**Transient Voltage Level** (0 to 60 V):**Resolution:** 260 mV**Accuracy:**  $\pm 0.15\% \pm 300$  mV**Temperature Coefficient:** 150 ppm/ $^{\circ}\text{C}$   $\pm 5$  mV/ $^{\circ}\text{C}$ **Programmable Slew Rate** (For any given input transition, the time required will be either the total slew time or a minimum transition time, whichever is longer. The minimum transition time increases when operating with input currents under 2 A. The following are nominal values;  $\pm 25\%$  tolerance):**Current Slew Rate:\***

Rate #	120 A Range Step	12 A Range Step	Transition Time
1	2 A/ms	0.2 A/ms	8.0 ms
2	5 A/ms	0.5 A/ms	3.2 ms
3	10 A/ms	1 A/ms	1.6 ms
4	20 A/ms	2 A/ms	800 $\mu\text{s}$
5	50 A/ms	5 A/ms	320 $\mu\text{s}$
6	100 A/ms	10 A/ms	160 $\mu\text{s}$
7	0.2 A/ $\mu\text{s}$	20 A/ms	80 $\mu\text{s}$
8	0.5 A/ $\mu\text{s}$	50 A/ms	32 $\mu\text{s}$
9	1 A/ $\mu\text{s}$	100 A/ms	16 $\mu\text{s}$
10	2 A/ $\mu\text{s}$	0.2 A/ $\mu\text{s}$	12 $\mu\text{s}$
11	5 A/ $\mu\text{s}$	0.5 A/ $\mu\text{s}$	12 $\mu\text{s}$
12	10 A/ $\mu\text{s}$	1 A/ $\mu\text{s}$	12 $\mu\text{s}$

\*AC performance specified from 3 to 60 V.

**Table 60504-1. Specifications (continued)**

**Voltage Slew Rate:**

Rate #	Voltage Range Step	Transition Time*
1	1 V/ms	8.0 ms
2	2.5 V/ms	3.2 ms
3	5 V/ms	1.6 ms
4	10 V/ms	800 $\mu$ s
5	25 V/ms	320 $\mu$ s
6	50 V/ms	160 $\mu$ s
7	0.1 V/ $\mu$ s	85 $\mu$ s
8	0.25 V/ $\mu$ s	85 $\mu$ s
9	0.5 V/ $\mu$ s	85 $\mu$ s

\*Transition time based on low capacitance current source.

**Resistance Slew Rate (0.5  $\Omega$  range):** Uses the value programmed for voltage slew rate.

**Resistance Slew Rate (500 and 5 k $\Omega$  ranges):** Uses the value programmed for current slew rate.

**Current Readback:**

**Resolution:** 34 mA (via HP-IB); 100 mA (front panel)

**Accuracy (after 30 second wait):**  $\pm 0.05\% \pm 130$  mA

**Temperature Coefficient:** 50 ppm/ $^{\circ}$ C  $\pm 10$  mA/ $^{\circ}$ C

**Voltage Readback:**

**Resolution:** 17 mV (via HP-IB); 20 mV (front panel)

**Accuracy:**  $\pm 0.05\% \pm 45$  mV

**Temperature Coefficient:** 50 ppm/ $^{\circ}$ C  $\pm 2$  mV/ $^{\circ}$ C

**Maximum Readback Capability:** 65 to 70 V (typical)

**Power Readback:**

**Accuracy:**  $\pm 0.2\% \pm 8$  W

**External Analog Programming 0 to 10 V (dc or ac):**

**Bandwidth:** 10 kHz (3 db frequency)

**Accuracy:**  $\pm 4.5\% \pm 150$  mA (0 to 12 A range)

$\pm 4.5\% \pm 500$  mA (0 to 120 A range)

$\pm 0.8\% \pm 200$  mV (0 to 60 V range)

**Temperature Coefficient:** 100 ppm/ $^{\circ}$ C  $\pm 12$  mA/ $^{\circ}$ C (current ranges)

100 ppm/ $^{\circ}$ C  $\pm 1$  mV/ $^{\circ}$ C (voltage range)

**External Current Monitor (0 to 10 V):**

**Accuracy:**  $\pm 4\% \pm 170$  mA (referenced to analog common)

**Temperature Coefficient:** 50 ppm/ $^{\circ}$ C  $\pm 12$  mA/ $^{\circ}$ C

**Table 60504-1. Specifications (continued)**

**External Voltage Monitor (0 to 10 V):**

**Accuracy:**  $\pm 0.4\% \pm 60$  mV (referenced to analog common)

**Temperature Coefficient:** 100 ppm/ $^{\circ}$ C  $\pm 2$  mV/ $^{\circ}$ C

**Remote Sensing:** 5 Vdc maximum between sense and input binding posts

**Maximum Input Levels:**

**Current:** 122.4 A (programmable to lower limits)

**Voltage:** 75 V

**Minimum Operating Voltage:** 2 V (derated to 0 V at 0 A)

**Programmable Short Circuit:** 0.017  $\Omega$  (0.012  $\Omega$  typical)

**Programmable Open Circuit:** 20 k $\Omega$  (typical)

**Drift Stability (over an 8 hour interval):**

**Current:**  $\pm 0.03\% \pm 20$  mA

**Voltage:**  $\pm 0.01\% \pm 10$  mV

**PARD (20 Hz to 10 MHz noise):**

**Current:** 6 mA rms/60 mA p-p

**Voltage:** 8 mV rms

**DC Isolation Voltage:**  $\pm 240$  Vdc between + or - input binding post and chassis ground

**Digital Inputs:**

**Vlo:** 0.9 V maximum at Ilo = -1 mA

**Vhi:** 3.15 V minimum (pull-up resistor on input)

**Digital Outputs:**

**Vlo:** 0.72 V maximum at Ilo = 1 mA

**Vhi:** 4.4 V minimum at Ilo = -20  $\mu$ A

**Reverse Current Capacity:** 120 A when unit is on; 60 A when unit is off

**Weight:** 5.4 kg (12 lbs.)