

# MODEL 234P04 HIGH POWER AMPLIFIER

Specifications typical at 25°C with forced air at 400 fpm, HV = +160 V. Current mode load = 250  $\mu$ H + 33 m $\Omega$ . Capacitor each side to ground 0.47  $\mu$ F.

Model	Current Mode								Voltage Mode (-V)		
	Output ( $\pm$ A Peak) Pulse Duration / Off time (ms)								Output (kVA) Sine Burst Duration/ Off time (ms)	Load	
234P04	(DC)	500/500	100/100	10/20	170/1000	25/1000	4/100	EHC	(DC)	500/500	( $\Omega$ )
	300	375	440	500	500	625	625	650	23	32	0.45 0.32

**PEAK CURRENT SHUTDOWN** 675 A

## EXTRA HIGH CURRENT MODE

Burst Waveform Equal positive and negative pulses  
 Peak Current  $\pm$ 650A  
 Max on time each polarity 40ms  
 Max Duty Factor 0.18

## INPUT LIMITER

Adjustable  
 Current Mode  $\pm$ 30 to  $\pm$ 650 A  
 Voltage Mode  $\pm$ 15 to  $\pm$ 160 V

## SATURATION RESISTANCE

0.012  $\Omega$

## GAIN

Adjustable with programmable span  
 Current Mode 30 to 70 A/V  
 Voltage Mode 25.0 V/V, 28 dB

## OUTPUT OFFSET

$\pm$ 100 mA, adjustable to zero  
 Current Mode Span 1.4 A  
 Voltage Mode Span 0.9 V

## INPUT CHARACTERISTICS

Main Input 1 Differential  
 Impedance 50 k $\Omega$  each input to ground, 25 k $\Omega$  differential  
 Max Input Voltage  $\pm$ 18 V either input or differential  
 Common Mode Rejection 70 dB min, from DC to 360 Hz  
 Input 2 Same as Input 1  
 Gain Programmable

## DC OUTPUT RESISTANCE

Current Mode 500  $\Omega$   
 Voltage Mode 0.0012  $\Omega$

## LOAD

Current Mode 250  $\mu$ H + 33 m $\Omega$ , 0.47  $\mu$ F each side to ground  
 Voltage Mode 0.45  $\Omega$   
 Adaptable Range 2  $\mu$ H to 2.5 H, 0.012  $\Omega$  to Open

## CURRENT MODE RESPONSE

Small Signal Bandwidth -3 dB @ 4 kHz

**CURRENT SETTLING TIME**

Time Reference	End of input ramp
Input Ramp Slope	$\pm 300 \text{ A}/600 \mu\text{sec}$
Ramp 0 to $\pm 300 \text{ A}$	150 $\mu\text{sec}$ to within 3.0 A, 1% 500 $\mu\text{sec}$ to within 1.2 A, 0.4% 350 $\mu\text{sec}$ to within 0.6 A, 0.1%
Ramp $\pm 300 \text{ A}$ to 0 A	100 $\mu\text{sec}$ to within 3.0 A, 1% 150 $\mu\text{sec}$ to within 1.2 A, 0.4% 500 $\mu\text{sec}$ to within 0.6 A, 0.1%

**VOLTAGE MODE RESPONSE**

Power Bandwidth	Flat to DC DC to 4 kHz, -1 dB
Load Resistance	0.45 $\Omega$
Small Signal	-1 dB @ 10 kHz -3 dB @ 20 kHz
Open Load	+0.5, -3 dB from DC to 40 kHz

**TOTAL HARMONIC DISTORTION**

Current Mode	200 Hz, 225 A <sub>RMS</sub> , 0.2% max
Voltage Mode	200 Hz, 18 kVA, 0.3% max
Load	250 $\mu\text{H}$ + 33 m $\Omega$

**DC DRIFT**

Current Mode Offset	After 1 hour 5 mA/ $^{\circ}\text{C}$
Scale Factor	150 ppm/ $^{\circ}\text{C}$
Voltage Mode Offset	0.5 mV/ $^{\circ}\text{C}$
Scale Factor	50 ppm/ $^{\circ}\text{C}$

**SWITCHING FREQUENCY**

Synchronization	50 kHz Input or output
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**NOISE OUTPUT/RIPPLE**

Current Mode	.01 Hz to 40 kHz <200 $\mu\text{mA}$ <sub>RMS</sub> >40Hz <(F/40)*200 $\mu\text{A}$ <sub>RMS</sub>
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**CURRENT MONITOR**

Source Resistance	Front panel BNC and rear panel D connector $\pm 1 \text{ V}/60 \text{ A} \pm 1\%$ 0.1 $\Omega$
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**VOLTAGE MONITOR**

Source Resistance	Front panel BNC and rear panel D connector $\pm 1 \text{ V}/20 \text{ V} \pm 1\%$ 940 $\Omega$
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**PROGRAMMING HEADER**

Accessibility	Sets gain and response for specific load Rear panel D connector
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## REMOTE SHUTDOWN

Switch closure enables output  
Selectable ENABLE or INHIBIT  
Grounded or optoisolated input  
Front panel **Inhibit** switch must be off

## SWITCHES

**Inhibit** , with LED, front panel  
**Reset**, front and rear panels

## LOAD PROTECTION

Voltage or Current      Adjustable input limiter  
Soft Start  
Shutdown      Current vs time  
All four bridge arms open  
Diode Clamps      To +HV and ground

## AMPLIFIER PROTECTION

Overload      Input limiter  
Current vs Time      Shutdown  
Each Heat Sink Temp      Shutdown 90 °C  
Overvoltage Shutdown      170 V  
Undervoltage Shutdown      35 V  
Fan Undervoltage Shutdown      22 V

## 5 V CMOS STATUS OUTPUTS

+5 V      Fault Is Low  
CHANNEL ON      +5 V Regulated, HV is on  
NORMAL      Master and slaves enabled and operating  
FAULT      Amplifier operates if enabled  
DC      Inverted normal  
HOT      One or more DC voltages out of range  
OVER-CURRENT      Coil or heat sink over-temperature  
MODULE 1      Too much current for too long  
MODULE 2      Module 1 fault  
MODULE 3      Module 2 fault  
MODULE 4      Module 3 fault  
Maximum Current Output      Module 4 fault  
10 mA each output

## FRONT PANEL LEDS

Same as CMOS outputs listed above.

## REAR PANEL LED

NORMAL

## POWER REQUIREMENTS

Fan Supply Required      +28 V @ 2 A  
High Voltage Supply      +50 V to +160 V  
Current      See Note 1  
Quiescent Current      1.3 A  
Internal Capacitance      72,000 µF

## THERMAL REQUIREMENTS

Power Dissipation at 225 A RMS	1600 W
Peak Dissipation at 318 A	3200 W
Panel Inlet Air Temperature	-20 °C to +35 °C
Storage	-30 °C to +85 °C

## MECHANICAL

Size	10.5" high x 19" wide x 23.4" deep; can be rack mounted 26.7 cm high x 48.3 cm wide x 59.4 cm deep
Weight	85 lb, 39.0 kg

## NOTES

1. Current required to supply load I<sup>2</sup>R losses plus amplifier losses.