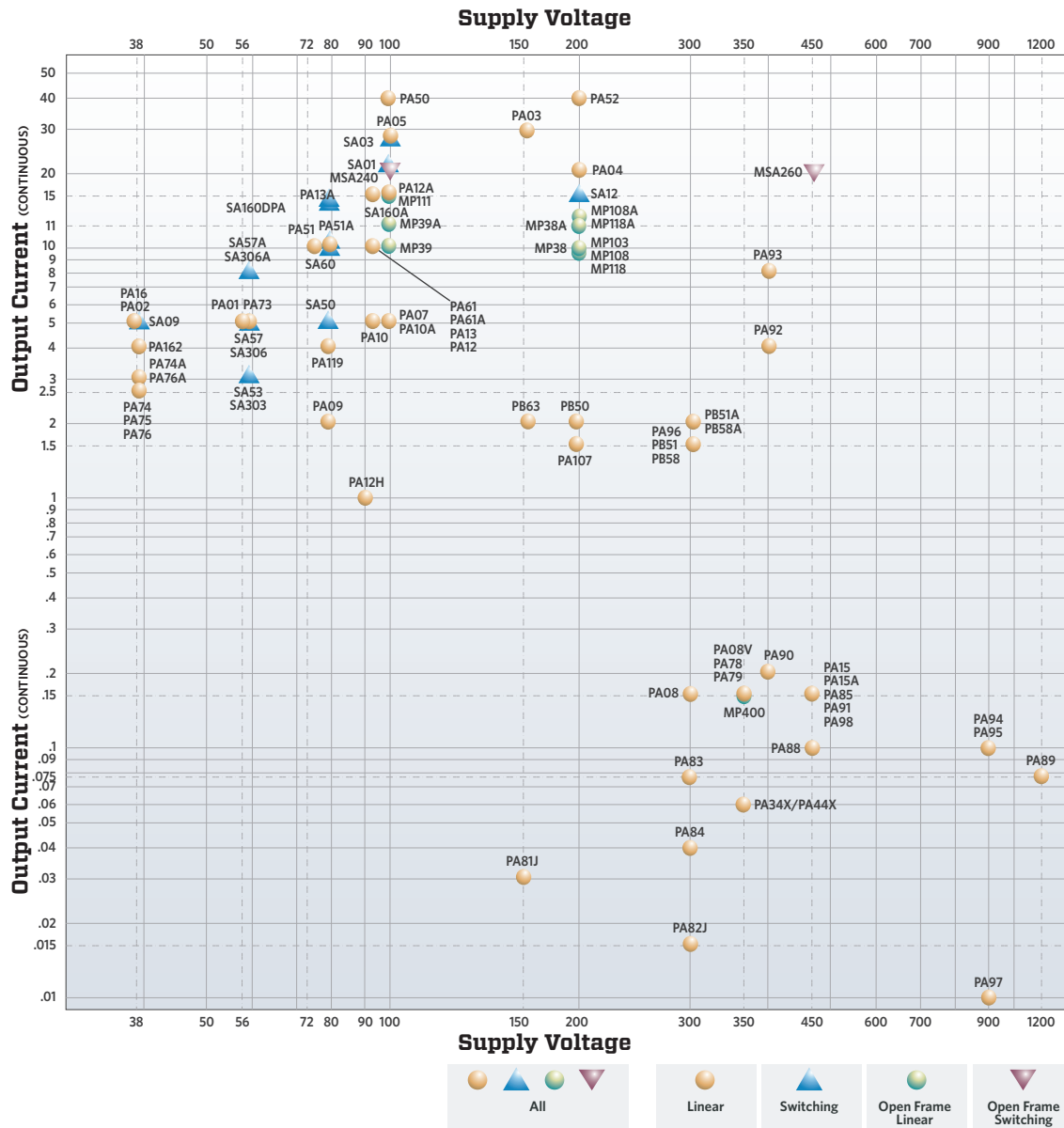


Product Summary Guide

APEXTM
MICROTECHNOLOGY
PRECISION • POWER • ANALOG

Precision Power Analog

It's an exciting future for precision power analog! Apex Microtechnology is an industry leader for high-performance power operational amplifiers, pulse width modulation (PWM) amplifiers, and precision voltage references (VRE). Product form factors include monolithic ICs, board-level "open frame" modules, and traditional hybrid designs that can deliver up to 40A of continuous output current and voltage supply operation ranging from 5V to 1200V. Target applications focus on the high power precision control of current, voltage and speed for the industrial, test and measurement, aerospace-defense, and medical markets.



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HIGH CURRENT OPERATIONAL AMPLIFIERS

Model	Output Current CONTINUOUS (A)	Supply Voltage MAX (V)	Slew Rate TYP (V/μs)	Standby Current MAX (mA)	Power Dissipation MAX (W)	Package
MP111FD	50 PEAK	100	130	157	170	34-pin Open Frame (FD)
PA50	40	100	50	36	400	12-pin MO-127 (CR)
PA52	40	200	50	36	400	12-pin MO-127 (CR)
PA03	30 PEAK	150	8	300	500	12-pin MO-127 (CU)
PA05	30	100	100	120	250	12-pin MO-127 (CR)
PA04	20 PEAK	200	50	90	200	12-pin MO-127 (CR)
PA12A	15 PEAK	100	4	50	125	8-pin TO-3 (CE)
PA13A	15	100	4	50	135	12-pin SIP (DP/EE)
MP103FC	15 PEAK (x2 channels)	200	167	26	35 per channel	42-pin Open Frame (FC)
MP38CLA	11	200	10	26	125	30-pin Open Frame (CL)
MP39CLA	11	100	10	26	125	30-pin Open Frame (CL)
MP108FDA	11	200	170	65	100	34-pin Open Frame (FD)
MP118FDA	11	200	65	25	100	34-pin Open Frame (FD)
MP108FD	10	200	170	65	100	34-pin Open Frame (FD)
MP118FD	10	200	65	25	100	34-pin Open Frame (FD)
MP38CL	10	200	10	26	125	30-pin Open Frame (CL)
MP39CL	10	100	10	26	125	30-pin Open Frame (CL)
PA12 (M)	10	100	4	50	125	8-pin TO-3 (CE)
PA13	10	100	4	50	135	12-pin SIP (DP/EE)
PA51 (M)	10	80	2.6	10	97	8-pin TO-3 (CE)
PA61 (M)	10	90	2.8	10	97	8-pin TO-3 (CE)
PA93	8	400	50	14	125	12-pin PowerSIP (DP)
PA01	5	60	2.6	50	67	8-pin TO-3 (CE)
PA02 (M)	5	38	20	40	48	8-pin TO-3 (CE)
PA07 (M)	5	100	5	30	67	8-pin TO-3 (CE)
PA10 (M)	5	100	3	30	67	8-pin TO-3 (CE)
PA107DP	5	200	3000	35	62.5	12-pin PowerSIP (DP)
PA16	5	38	20	40	62.5	12-pin PowerSIP (DP)
PA73 (M)	5	68	2.6	5	67	8-pin TO-3 (CE)
PA119CE	5	80	900	120	75	8-pin TO-3 (CE)
PA09 (M)	4.5	80	220	85	78	8-pin TO-3 (CE)
PA92	4	400	50	14	80	12-pin PowerSIP (DP)
PA74A	3 (x2 channels)	40	1.4	40	36/60	8-pin TO-3 (CE)
PA76A	3 (x2 channels)	40	1.4	40	36/60	8-pin TO-3 (CE)
PA74 (M)	2.5 (x2 channels)	40	1.4	40	36/60	8-pin TO-3 (CE)
PA76	2.5 (x2 channels)	40	1.4	40	36/60	8-pin TO-3 (CE)
PB50	2	200	100	12	35	8-pin TO-3 (CE)
PB51A	2	300	100	12	83	12-pin PowerSIP (DP)
PB58A	2	300	75	12 TYPICAL	83	8-pin TO-3 (CE)
PA96	1.5	300	250	35	70	8-pin TO-3 (CE)
PB51	1.5	300	100	12 TYPICAL	83	12-pin PowerSIP (DP)
PB58	1.5	300	100	12	83	8-pin TO-3 (CE)
PA75	1.5 (x2 channels)	40	1.5	10	28.6	7-pin TO-220 (CX) 7-pin DDPACK (CC)
PA162DK	1.5 (x4 channels)	40	1.4	20	45	20-pin PSOP (DK)
PA12H	1	100	4	50	125	8-pin TO-3 (CE)
PB63DP	2	200	1000	46	90	12-pin PowerSIP (DP)

(M) = Available in military grade, please refer to apexanalog.com for more information.

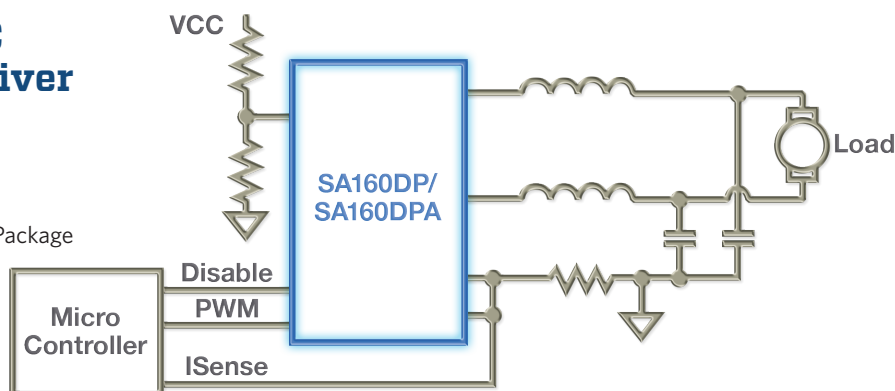
HIGH CURRENT PWM AMPLIFIERS

Model	Output Current CONTINUOUS (A)	Supply Voltage MAX (kHz)	Switching Frequency MAX (kHz)	Power Delivery MAX (W)	Internal Power Dissipation MAX (kHz)	Package
SA03	30	100	23	3000	300	12-pin MO-127(CR)
SA01	20	100	48.7	2000	185	10-pin PowerDIP (DE)
MSA260KC	30 PEAK	450	50	13500	300	58-pin Open Frame (KC)
MSA240KC	30 PEAK	100	50	3000	250	58-pin Open Frame (KC)
SA12	15	200	204	4000	250	12-pin MO-127(CR)
SA160DP	15 PEAK	80	45 TYPICAL	800	156	12-pin PowerSIP (DP)
SA160DPA	20 PEAK	80	45 TYPICAL	1200	156	12-pin PowerSIP (DP)
SA306AHU	8	60	100	480	100	44-pin HSOP (HU) 44-pin HSOP (HR)
SA57AHU	8	60	100	480	100	44-pin HSOP (HU)
SA09	7 PEAK	60	500 TYPICAL	300	80	18-pin DIP (EL)
SA50CE	5	80	50	400	72	8-pin TO-3 (CE)
SA303HU	3	60	100	180	100	44-pin HSOP (HU)
SA53HU	3	60	100	180	100	44-pin HSOP (HU)

Brush DC Motor Driver

SA160DP

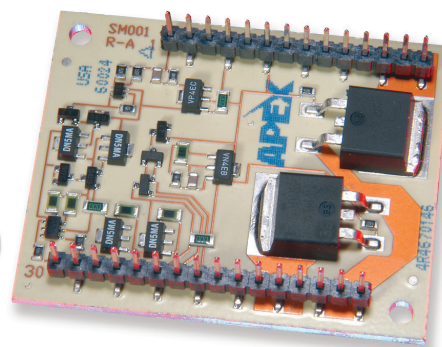
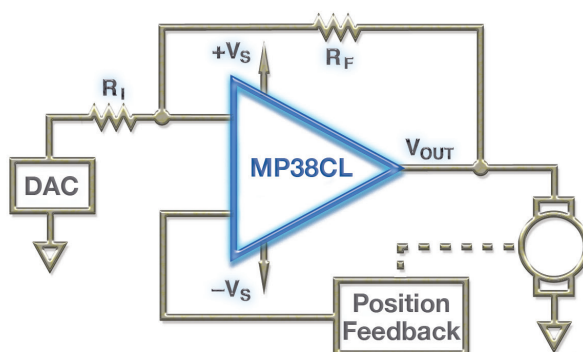
PWM Amplifier
15A PEAK, 80V
12-pin PowerSIP Package



Brush DC Motor Driver

MP38CL

Power Amplifier
10A, $\pm 100V$
Open Frame CL Package



HIGH SPEED OPERATIONAL AMPLIFIERS

Model	Slew Rate TYP (V/μs)	Supply Voltage MAX (kHz)	Output Current CONTINUOUS (A)	Standby Current MAX (mA)	Power Dissipation MAX (W)	Package
PA107DP	3000	200	5.0	35	62.5	12-pin PowerSIP (DP)
PA98	1000	450	0.20	25	30	12-pin PowerSIP (DP)
PA85	1000	450	0.20	25	30	8-pin TO-3 (CE)
PB63DP	1000	200	2.0	46	90	12-pin PowerSIP (DP)
PA119CE	900	80	5.0	120	75	8-pin TO-3 (CE)
PA94	700	900	0.10	24	30	8-pin PowerSIP (DQ)
PA79DK	350	350	0.15	2.5	14 per channel	20-pin PSOP (DK)
PA78DK	350	350	0.15	2.5	14	20-pin PSOP (DK)
MP400FC	350	50	0.15	2.5	14.2	42-pin Open Frame (FC)
PA91	300	450	0.20	14	30	12-pin PowerSIP (DP)
PA90	300	400	0.20	14	30	12-pin PowerSIP (DP)
PA96	250	300	1.5	35	70	8-pin TO-3 (CE)
PA09	220	80	4.5	85	78	8-pin TO-3 (CE)
PA84	200	300	0.04	7.5	17.5	8-pin TO-3 (CE)
MP108FDA	170	200	11.0	65	100	34-pin Open Frame (FD)
MP108FD	170	200	10.0	65	100	34-pin Open Frame (FD)
MP103FC	167	200	15 PEAK (x2 channels)	26	35 per channel	42-pin Open Frame (FC)
MP111FD	130	100	50 PEAK	157	170	34-pin Open Frame (FD)

HIGH VOLTAGE OPERATIONAL AMPLIFIERS

Model	Supply Voltage MAX (V)	Output Current CONTINUOUS (A)	Slew Rate TYP (V/μs)	Standby Current MAX (mA)	Power Dissipation MAX (W)	Package
PA89	1200	0.075	16	6	40	12-pin MO-127 (DC)
PA94	900	0.10	700	24	30	8-pin PowerSIP (DQ)
PA95	900	0.10	30	2.2	30	8-pin PowerSIP (DQ)
PA97	900	0.01	8	1	5	7-pin SIP (DR)
PA15	450	0.20	20	3	30	10-pin PowerSIP (FL/FU)
PA85 (M)	450	0.20	1000	25	30	8-pin TO-3 (CE)
PA88	450	0.10	30	2	15	8-pin TO-3 (CE)
PA91	450	0.20	300	14	30	12-pin PowerSIP (DP)
PA98	450	0.20	1000	25	30	12-pin PowerSIP (DP)
PA92	400	4	50	14	80	12-pin PowerSIP (DP)
PA90	400	0.20	300	14	30	12-pin PowerSIP (DP)
PA93	400	8	50	14	125	12-pin PowerSIP (DP)
PA340CC	350	0.06	32	2.5	14	7-pin DDPACK (CC)
PA341CE PA341DF PA341DW PA441DF PA441DW	350	0.06	32	2.5	12	8-pin TO-3 (CE) 24-pin PSOP (DF) 10-pin SIP (DW)
PA343DF/ PA443DF	350	0.06 (x2 channels)	30	2.5	12	24-pin PSOP (DF)
PA78DK	350	0.15	350	2.5	14	20-pin PSOP (DK)
PA79DK	350	0.15	350	2.5	26	20-pin PSOP (DK)
PA08 (M)	300	0.15	30	8.5	17.5	8-pin TO-3 (CE)
PA82J	300	0.015	20	8.5	11.5	8-pin TO-3 (CE)
PA83 (M)	300	0.75	30	8.5	17.5	8-pin TO-3 (CE)

(M) = Available in military grade, please refer to apexanalog.com for more information.

HIGH VOLTAGE OPERATIONAL AMPLIFIERS (cont.)

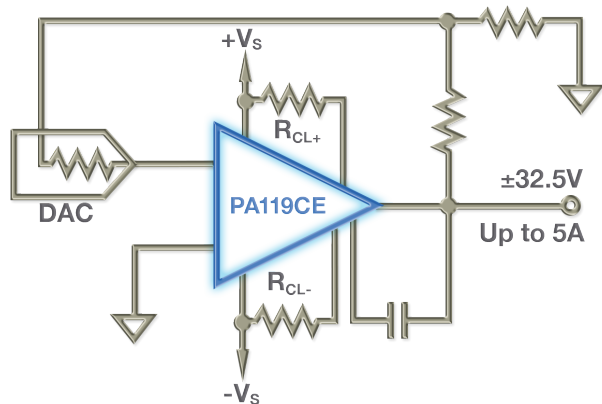
Model	Supply Voltage MAX (V)	Output Current CONTINUOUS (A)	Slew Rate TYP (V/ μ s)	Standby Current MAX (mA)	Power Dissipation MAX (W)	Package
PA84 (M)	300	0.40	200	7.5	17.5	8-pin TO-3 (CE)
PA96	300	1.5	250	35	70	8-pin TO-3 (CE)
PB51	300	1.5	100	18	83	12-pin PowerSIP (DP)
PB58	300	1.5	100	11	83	8-pin TO-3 (CE)
MP103FC	200	15 PEAK (x2 channels)	167	26	35 per channel	42-pin Open Frame (FC)
MP118FD	200	10	65	25	100	34-pin Open Frame (FD)
MP108FD	200	10	170	65	100	34-pin Open Frame (FD)
PA04	200	20 PEAK	50	90	200	12-pin MO-127 (CR)
PA107DP	200	5	3000	35	62.5	12-pin PowerSIP (DP)
PB50	200	2	100	12	35	8-pin TO-3 (CE)
MP38CLA	200	0.20	10	26	125	30-pin Open Frame (CL)
MP38CL	200	2.5	10	26	125	30-pin Open Frame (CL)
PA52	200	40	50	36	400	12-pin MO-127 (CR)
PB63DP	200	2	1000	46	90	12-pin PowerSIP (DP)
PA81J	150	30	20	8.5	11.5	8-pin TO-3 (CE)
PA03	150	30 PEAK	8	300	500	12-pin MO-127 (CU)
MP111FD	100	50 PEAK	130	157	170	34-pin Open Frame (FD)
PA05	100	30	100	120	250	12-pin MO-127 (CR)
PA07 (M)	100	5	5	30	67	8-pin TO-3 (CE)
MP39CLA	100	11	10	26	125	30-pin Open Frame (CL)
MP39CL	100	10	10	26	125	30-pin Open Frame (CL)

(M) = Available in military grade, please refer to apexanalog.com for more information.

Fast Power Driver with Current Output DAC

PA119CE

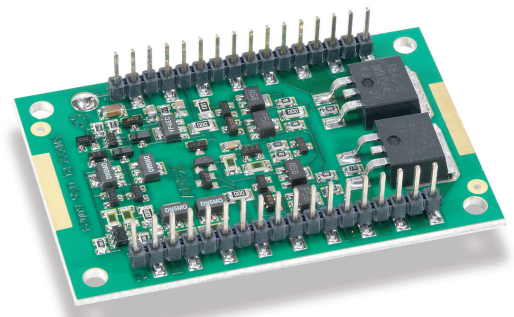
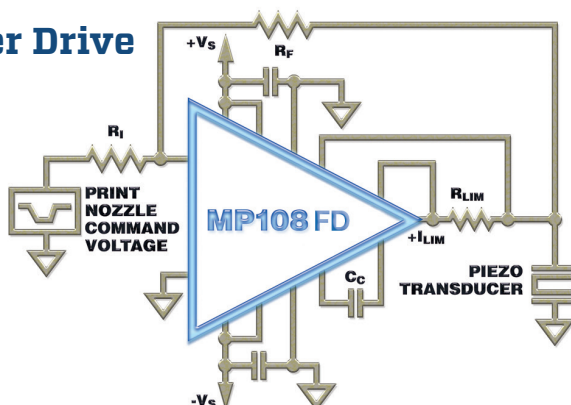
Power Amplifier
 $\pm 40V$, $900V/\mu s$
 8-Pin TO-3 Package



Piezo Transducer Drive

MP108FD

Power Amplifier
 $\pm 100V$, $170V/\mu s$
 Open Frame Package



HIGH VOLTAGE PWM AMPLIFIERS (cont.)

Model	Supply Voltage MAX (V)	Output Current CONTINUOUS (A)	Switching Frequency (kHz)	Power Delivery MAX (W)	Internal Power Dissipation MAX (W)	Package
MSA260KC	450	30 PEAK	50	13500	300	58-pin Open Frame (KC)
SA12	200	15	204	4000	250	12-pin MO-127 (CR)
MSA240KC	100	30 PEAK	50	3000	250	58-pin Open Frame (KC)
SA01	100	20	48.7	2000	185	10-pin PowerDIP (DE)
SA03	100	30	23	3000	300	12-pin MO-127 (CR)
SA50CE	80	5	50	400	72	8-pin TO-3 (CE)
SA160DP	80	15 PEAK	45 TYPICAL	800	156	12-pin PowerSIP (DP)
SA160DPA	80	20 PEAK	45 TYPICAL	1200	156	12-pin PowerSIP (DP)

PRECISION VOLTAGE REFERENCES

Model	Output (V)	Initial Error (+ mV)	TempCo (ppm/°C)	Noise (μ Vpp)	Package	Feature
VRE102	±10	1.0, 1.2, 1.5, 1.7	1.09, 1.11, 1.33, 1.45	6	DIP14 (HC)	High Temp Range
VRE104	4.5	0.8	1.48, 1.62, 1.70, 1.98	3	DIP14 (HC)	High Temp Range
VRE107M	±5	0.8, 0.9	1.33, 1.56	3	DIP14 (HC)	High Rel Military
VRE204M	4.5	0.8	1.48, 1.70	3	LCC20 (HD)	Small Pkg, High Rel Military
VRE205	5	0.8	1.33, 1.45, 1.56, 1.82	3	LCC20 (HD)	Small Pkg, High Rel Military
VRE210	10	0.5, 0.8, 1.0	1.09, 1.11, 1.33, 1.45	6	LCC20 (HD)	Small Pkg, High Temp Range
VRE302	2.5	0.4, 0.6	1.0, 2.2	1.5	DIP8 (KD), SMT8 (GD)	Low Cost
VRE304	4.5	0.9	0.6, 2.0	3	SMT8 (GD)	Low Cost
VRE305	5	0.5, 1.0	0.6, 1.0, 2.0	3	DIP8 (KD), SMT8 (GD)	Low Cost
VRE306	6	0.6	0.6, 2.0	4	SMT8 (GD)	Low Cost
VRE310	10	1.0	0.6, 1.0, 2.0	6	DIP8 (KD), SMT8 (GD)	Low Cost
VRE410	±10	1.6, 2.0, 2.2	1.0, 2.0, 2.2	6	SMT14 (GE)	Dual, Low Cost
VRE3025	2.5	0.25, 0.375, 0.5	0.6, 1.0, 2.0	1.5	DIP8 (KD), SMT8 (GF)	+10V Supply
VRE3050	5	0.5, 0.8, 1.0	0.6, 1.0, 2.0	3	SMT8 (GF)	+10V Supply
VRE3041	4.09	2.0	1.0	3	SMT8 (GF)	Low Drift

SINE WAVE REFERENCES

Model	Sine Wave Output (Vrms)	Initial Error (+ mV)	Temp Co (ppm/°C)	Distortion (%Thd)	Package
SWR200	7.071	0.5	20	.05	14-pin DIP (HC)



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