MA32

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FEATURES

- HIGH VOLTAGE OPERATION, 240V
- OUTPUT VOLTAGE UP TO 230V
- LOW QUIESCENT CURRENT
- AVAILABLE AS BARE DIE

APPLICATION

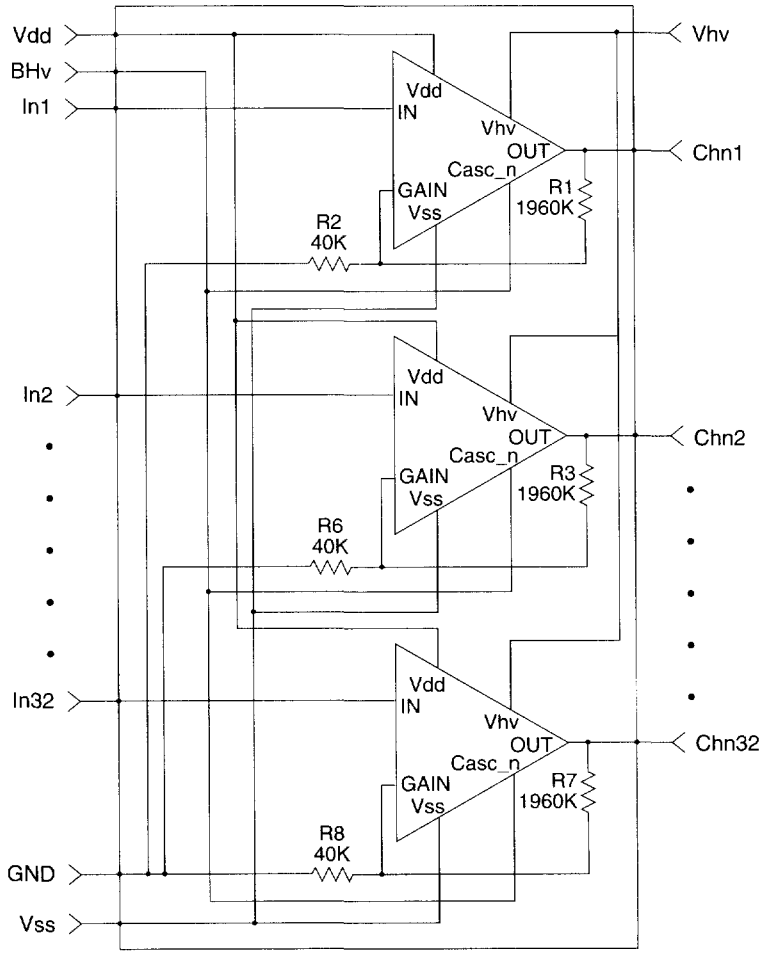
- HIGH VOLTAGE LINEAR DRIVERS FOR ELECTROSTATIC MEMS (micro electromechanical systems)

DESCRIPTION

The MA32 is a precision 32 channel high voltage driver for capacitive loads such as micro electromechanical systems (MEMS). The gain of each high voltage driver is internally set for 50 V/V. This allows selection of a 0 to 5V DAC for driving each channel linearly from 0 to approximately 230V. The internal gain setting resistors have a total series resistance ≥2MΩ to minimize static power dissipation when outputs are at high voltage.

The MA32 is packaged in a 240 pin quad-flat pack. (QFP01).

BLOCK DIAGRAM



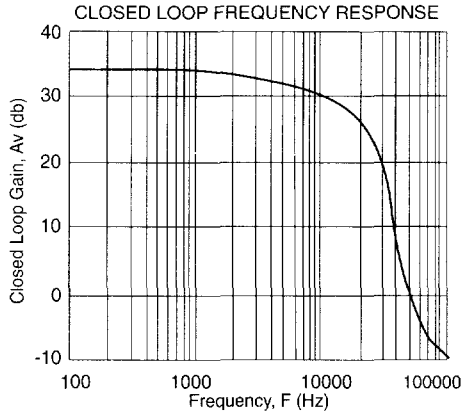
ABSOLUTE MAXIMUM RATINGS

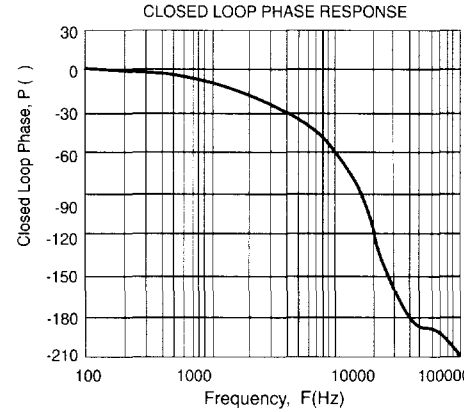
SUPPLY VOLTAGE, $+V_{hv}$	240V
SUPPLY VOLTAGE, V_{DD} to V_{SS}	7.5V
SUPPLY VOLTAGE, B_{SS}	– 0.5V
BIAS VOLTAGE, BVh	V_{DD} + 3V
OUTPUT CURRENT, source, sink	1mA
POWER DISSIPATION, continuous @ T_A = 25°C	4.8W
ESD SUSCEPTIBILITY[2]	1500V
TEMPERATURE, pin solder - 10s max	220°C
TEMPERATURE, junction	150°C
TEMPERATURE, storage	– 55° to + 125°C
OPERATING TEMPERATURE RANGE, case	– 25 to + 85° C

SPECIFICATIONS

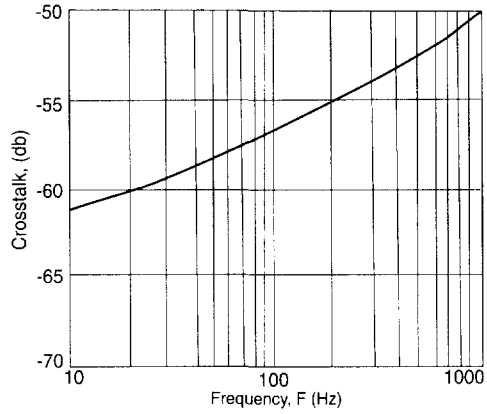
PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNITS
HIGH VOLTAGE AMP, each channel					
OFFSET VOLTAGE, initial[4]			285	500	mV
OFFSET VOLTAGE, between channels[4]			220	500	mV
OFFSET VOLTAGE, vs time			9		mV/√khz
COMMON MODE, voltage range		V_{SS} +0.5		V_{DD} –1.5	V
COMMON MODE REJECTION, DC			96		db
NOISE, broad band	10KHz BW, R_S = 1KΩ		4		µV RMS
OUTPUT VOLTAGE SWING	I_O=100µA	V_{hv} -10	V_{hv} -6.5		V
OUTPUT CURRENT, continuous		225	290		µA
SLEW RATE	C_L =100pF	0.35	0.70		V/µs
POWER BANDWIDTH	Vo =225Vp-p	0.9	1.25		Khz
GAIN		49.1	50	50.9	V/V
GAIN ERROR, between channels			0.73	1.5	%
LOAD CAPACITANCE			50	100	pF
CROSSTALK				71	mV/V
POWER SUPPLY[5]					
VOLTAGE, V_{hv} [6]	Ta ≤ 55°C	30	200	240	V
VOLTAGE, Total supply[1], V_{SS} to V_{DD}		5	6.5	7	V
CURRENT, quiescent V_{hv}			1.1	3.2	mA
CURRENT, quiescent V_{SS}, V_{DD}			1.2	6	mA
THERMAL					
RESISTANCE, junction to case			13.4		°C/W
RESISTANCE, junction to air			26		°C/W
TEMPERATURE RANGE, Junction	Meets full range specifications	0		150	°C
TEMPERATURE RANGE, Case	Meets full range specifications	0	55	70	°C

NOTES:
1. The specification given for V_{SS} and V_{DD} is the total voltage that may be applied between the V_{SS} and V_{DD} pins.
2. Human-body model, 100pF discharge through a 1.5K ohm resistor.
3. Unless otherwise noted all test conditions are the nominal specifications. Tc=25°C, internal gain =50.
4. Offset voltage is given as the maximum error on the output of each channel due to the input offset voltage of the channel amplifier times the internally set gain of 50.
5. The MA32 requires two power supplies for proper operation. To prevent damage to the MA32 or the load, the power supply turn on sequence must be followed. V_{DD} should be on and stabilized for 100µs prior to turn on of Vhv.
6. Please refer to thermal considerations section for applications where Ta is greater than 55°C.

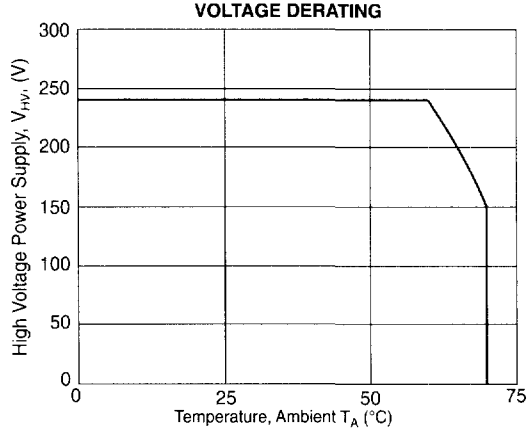




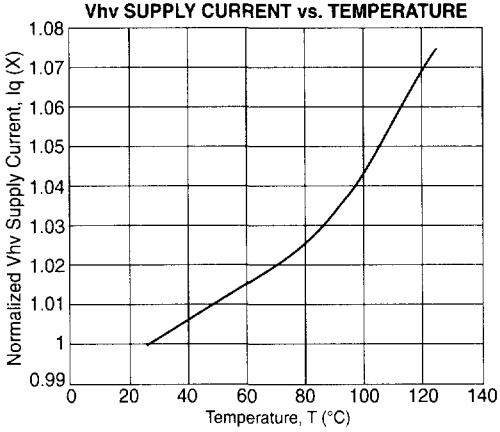
CROSSTALK



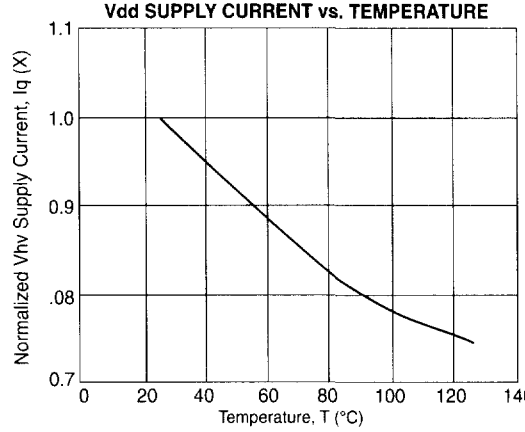
VOLTAGE DERATING



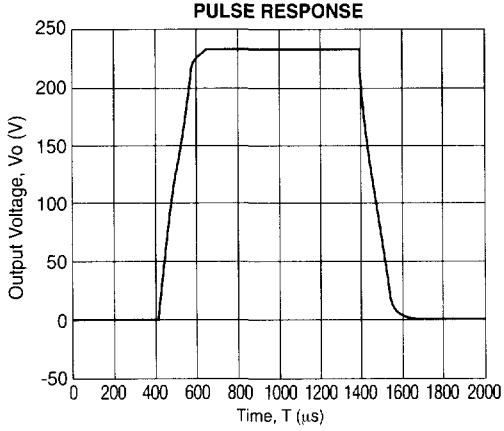
Vhv SUPPLY CURRENT vs. TEMPERATURE



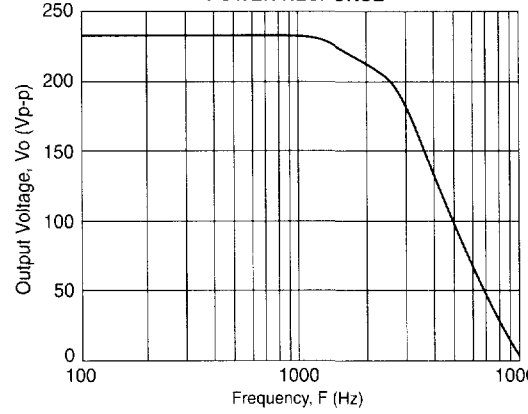
Vdd SUPPLY CURRENT vs. TEMPERATURE



PULSE RESPONSE



POWER RESPONSE



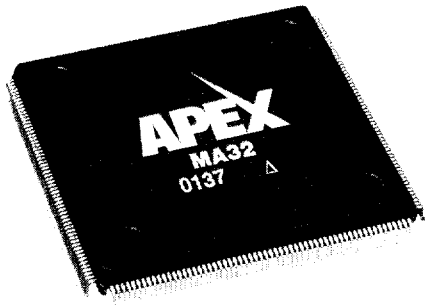
GENERAL

Please read Application Note 1 "General Operating Considerations" which covers stability, supplies, heat sinking, mounting, current limit, and specification interpretation. Visit www.apexmicrotech.com for design tools that help automate tasks such as calculations for stability, internal power dissipation, current limit; heat sink selection; Apex's complete Application Notes library; Technical Seminar Workbook; and Evaluation Kits.

Unused pins should NOT be tied to ground or any other potential. Unused pins must be floating. The unused pins between each output are required for high voltage isolation. Tying these pins to ground or power supply voltage defeats this purpose.

THERMAL CONSIDERATIONS

Under typical operating considerations the MA32 will not exceed maximum case or junction temperature limits. However, due to the power dissipation in the on board gain setting resistors the case temperature limit of 85°C can be exceeded at ambient temperatures greater than 55°C. Please refer to the voltage derating graph. This graph assumes all outputs are at maximum output levels resulting in maximum power dissipation. For this reason the graph is a very conservative estimate of the maximum supply voltage at Ta > 55°C. Please refer to application notes 1 and 11 for assistance in more detailed analysis for your particular application.



PIN OUT:

PIN NUMBERS	FUNCTION	NOTES
48,62,64,66,68,70,72,74,76,78, 80,82,84,86,88,90, 92,94,96,98,100,102,104,106,108,110,112,114,116, 118,120,129	Inputs 1-32 respectively	Inputs are not-inverting
10,240,238,236,234,232,230,228,226,224,222,220 218,216,214,212,210,208,206,204,202,200,198 196,194,192,190,188,186,184,182,171	Outputs 1-32 respectively	
18, 27, 154, 163	V_{HV}, High Voltage Supply	All pins should be connected. Proper power supply bypassing is required
29,152	GND, analog ground	
38,143	BH_V, Output Bias	Must be =Vdd. See absolute max ratings. This pin must be by-passed to ground with >10nF ceramic capacitor.
45,136	V_{DD} + Low voltage supply	All pins should be connected. Proper power supply bypassing is required.
39, 43, 46, 133, 138, 142	V_{SS}, – Low voltage supply	All pins should be connected. Proper power supply is required.
All Other	N/C	Pins are open internally. Do Not Ground