DUAL HIGH POWER BRIDGE AMPLIFIER

121 SERIES

M.S.KENNEDY CORP.
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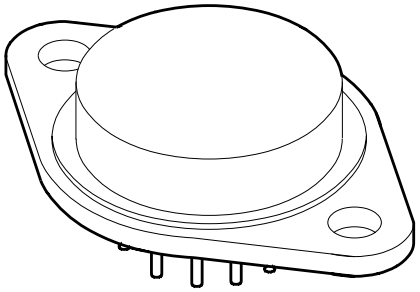
MIL-PRF-38534 QUALIFIED

FEATURES:

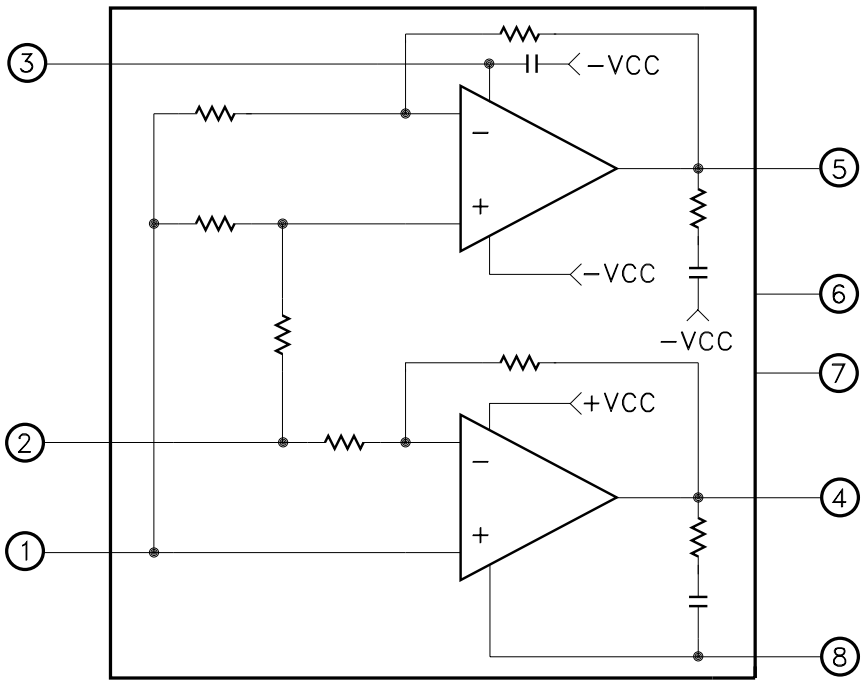
- Ultra Low Cost/Minimal External Components Required
- Complete Bridge/Dual Phase Output Configuration Up to 60 Watts
- Internal RC Output Snubber Networks For Ultra-Stable Operation
- Single or Dual Supply Operation 5V to 40V Total
- Internal Power Supply Decoupling Capacitor Provided
- Internal Output Current Limit 4A Typical
- Gain BW Product 600KHz Typical



DESCRIPTION:

The MSK 121(B) is a low cost monolithlic dual bridge amplifier capable of delivering 60 watts per package and is available in many preset gain configurations. Internal RC snubber networks ensure stable operation and an internal current limit of 4 amps improves product reliability under abnormal loading conditions. The MSK 121 Series can be powered from a split supply of ±2.5V to ±20V or single ended from 5V to 40V. A minimum of 3 amps of load current is available and the highly efficient driver section allows the output to swing to within 2.2 volts of the power supply rail when delivering 2.5 amps of load current. The MSK 121 Series is packaged in a hermetically sealed 8-pin TO-3 packae that can be attached directly to a heat sink for maximum thermal efficiency. Consult factory for alternate package configurations.

EQUIVALENT SCHEMATIC



TYPICAL APPLICATIONS

- Bridge Audio Amplifier
- Bi-Directional Motor Driver
- Dual Precision Power Regulator
- Dual Solenoid Controller

PIN-OUT INFORMATION

1	VREF	8	-VCC
2	INPUT	7	N/C
3	+VCC	6	N/C
4	OUTPUT 2	5	OUTPUT 1

ABSOLUTE MAXIMUM RATINGS

$\pm V_{CC}$	Total Supply Voltage 40V	T_{ST}	Test Storage Temperature Range -65°C to +150°C
I_{OUT}	Peak Output Current . . . . . SOA	T_{LD}	Lead Temperature Range . . . . . 300°C
V_{IND}	Differential Input Voltage . . . . . ±VCC		(Soldering 10 Seconds)
V_{INC}	Common Mode Range . . . . . ±VCC-0.5V	T_C	Case Operating Temperature
			MSK121 . . . . . -40°C to +85°C
			MSK121B . . . . . -55°C to +125°C
		T_J	Junction Temperature . . . . . +175°C

ELECTRICAL SPECIFICATIONS

Parameter	Test Conditions ①	Group A Subgroup	MSK 121B Min.	MSK 121B Typ.	MSK 121B Max.	MSK 121 Min.	MSK 121 Typ.	MSK 121 Max.	Units
STATIC									
Supply Voltge Range ②		-	±2.5	±15	±20	±2.5	±15	±20	V
Quiescent Current	Total - Both Amplifiers V_{IN} = 0V	1	-	35	60	-	35	90	mA
INPUT									
Output Offset Voltage	V_{IN}=0V	1	-	±0.5	±5	-	±1.5	±10	(mV)(Av)
Output Offset Voltage Drift ②	V_{IN}=0V	2,3	-	±10	±50	-	±15	±75	µV/°C
Input Bias Current ②		1	-	±30	±500	-	±30	±1500	nA
		2,3	-	±75	±1000	-	±75	-	nA
Input Capacitance ②		-	-	10	-	-	10	-	pF
Power Supply Rejection Ratio ②	V_{CC} = ±10V to ±15V	-	60	80	-	60	80	-	dB
OUTPUT									
Output Voltage Swing	R_L = 1KΩ; F = 10KHz	4	±14	±14.2	-	±14	±14.2	-	V
	R_L = 10Ω; F = 10KHz	4	±13	±13.7	-	±13	±13.7	-	V
Output Peak Current	F = 10KHz	4	±3	±4	-	±2.5	±3.5	-	A
Power Bandwidth ③	R_L = 10Ω; V_{OUT} = 10V_{PP}	-	-	40	-	-	40	-	kHz
TRANSFER CHARACTERISTICS									
Slew Rate ②	V_{OUT} = ±10V	4	0.5	1.5	-	0.5	1.5	-	V/µS
Voltage Gain	MSK121-1	4	±0.95	±1.0	±1.05	±0.9	±1.0	±1.1	V/V
	MSK121-2	4	±1.9	±2.0	±2.1	±1.8	±2.0	±2.2	V/V
	MSK121-5	4	±4.75	±5.0	±5.25	±4.8	±9.0	±5.4	V/V
	MSK121-10	4	±9.5	±10.0	±10.5	±9.3	±10.0	±10.7	V/V
THERMAL RESISTANCE									
θ_{JC} (Junction to Case)	One Amplifier, DC Output	-	-	5.0	-	-	5.0	-	°C/W
θ_{JC}	One Amplifier, AC Output F > 60Hz	-	-	3.7	-	-	3.7	-	°C/W
θ_{JC}	Both Amplifiers, DC Output	-	-	3.4	-	-	3.4	-	°C/W
θ_{JC}	Both Amplifiers, AC Output F > 60Hz	-	-	2.4	-	-	2.4	-	°C/W
θ_{JC} (Juction to Ambient)	No Heat Sink	-	-	30	-	-	30	-	°C/W

NOTES:

① ±VCC = ±15 V, VREF = 0V = GND, RL = 1KΩ unless otherwise specified.
② Parameter is guaranteed by design but not tested.
③ Typical specifications are representative of actual device performance at 25°C but are for reference only.
④ Military grade devices ('B' suffix) shall be 100% tested to subgroups 1,2,3 and 4.
⑤ Subgroup 5 and 6 testing available upon request.
⑥ Subgroup 1,4 $T_A = T_C = +25°C$
Subgroup 2,5 $T_A = T_C = +125°C$
Subgroup 3,6 $T_A = T_C = -55°C$

APPLICATION NOTES

POWER SUPPLY CONNECTIONS

The MSK 121 maximum supply voltage is specified as ±20V. However, single sided or unbalanced power supply operation is permisible as long as the total power supply voltage does not exceed 40V. Caution should be exercised when routing high current printed circuit paths. Generally, these paths should not be placed near low level, high impedance input circuitry to avoid oscillations.

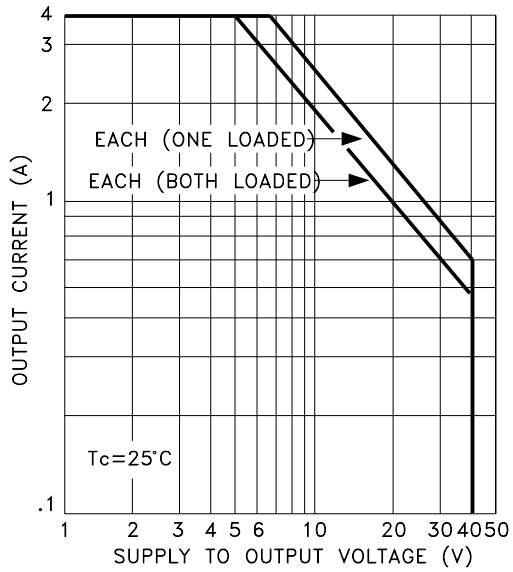
During initial evaluation, power supply current limiting is strongly advised to avoid damaging the device. The MSK 121 has an internal 0.1µF capacitor for high frequency decoupling. However, both the negative and positive power supplies must also be effectively decoupled with a low frequency bypass capacitor to avoid power supply induced oscillation. An effective decoupling scheme consists of 10µF of capacitance for every 1 Amp of output current from each power supply pin to ground. The capacitors will eliminate any peak output voltage clipping which may occur due to poor power supply load regulation. Power supply decoupling capacitors should be placed as close to the package power supply pins as possible (pins 3 and 8).

CURRENT LIMIT

The current limit circuitry is internal to the device. The typical value is shown in the parameter table. For protection against high energy flyback conditions (inductive loads), fast recovery reverse biased diodes should be connected from each output to the power supplies. (See Figure 1.)

SAFE OPERATING AREA

The safe operating area curve is a graphical representation of the power handling capability of the amplifier under various conditions. The wire bond current carrying capability, transistor junction temperature and secondary breakdown limitations are all incorporated into the safe operation area curves. All applications should be checked against the S.O.A. curves to ensure high M.T.B.F.



VREF PIN CONNECTIONS

The VREF pin is brought out to allow the user to bias the outputs at a predetermined DC level. When the input signal is AC coupled the output of each amplifier will be at the same DC level as the VREF pin. This feature is very usefull when using a single supply voltage. The user can simply connect a resistor voltage divider to VREF to bias the output at one half of the supply voltage by using 2 equal value resistors from +VCC to -VCC (GND).

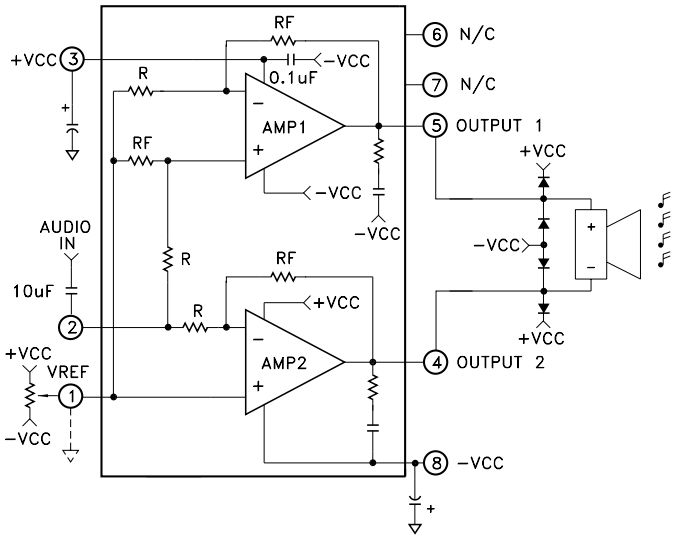
GAIN CONFIGURATIONS

The MSK 121 is available with preset gains of ±1, ±2, ±5 and ±10V/V. Refer to figure 1 for typical values of the internal components.

STABILITY CONSIDERATIONS

The MSK 121 has an internal RC snubber network on each output for excellent stability for most applications. Good layout practices should be used, however, when designing the printed circuit board.

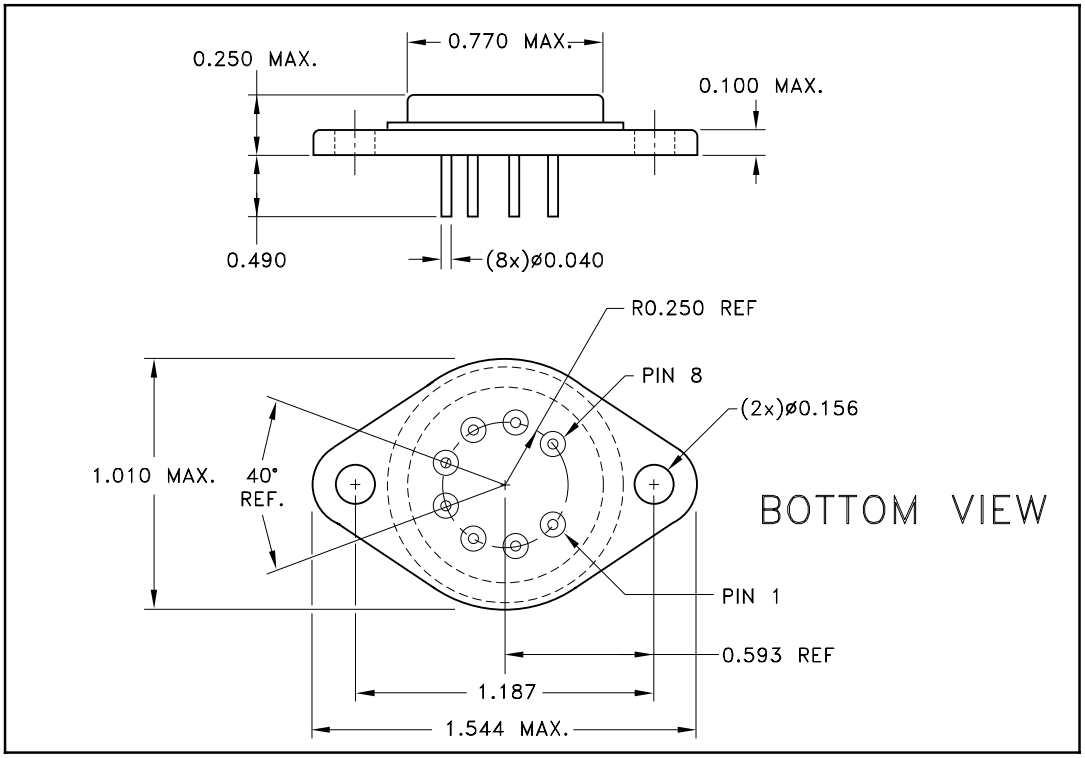
TYPICAL APPLICATION CIRCUIT



P/N	Av	Rf	R	ZIN(VREF = GND)
MSK121-1	±1	50KΩ	50KΩ	33.3KΩ
MSK121-2	±2	50KΩ	25KΩ	18.8KΩ
MSK121-5	±5	50KΩ	10KΩ	8.6KΩ
MSK121-10	±10	100KΩ	10KΩ	9.2KΩ

Figure 1

MECHANICAL SPECIFICATIONS



ALL DIMENSIONS ARE ±0.010 INCHES UNLESS OTHERWISE LABELED

ORDERING INFORMATION

Part Number	Screening Level	Voltage Gain*
MSK121-1	Industrial	±1
MSK121B-1	Military Mil-PRF-38534	±1
MSK121-2	Industrial	±2
MSK121B-2	Military Mil-PRF-38534	±2
MSK121-5	Industrial	±5
MSK121B-5	Military Mil-PRF-38534	±5
MSK121-10	Industrial	±10
MSK121B-10	Military Mil-PRF-38534	±10

* Please consult factory if alternate package or gain is required.

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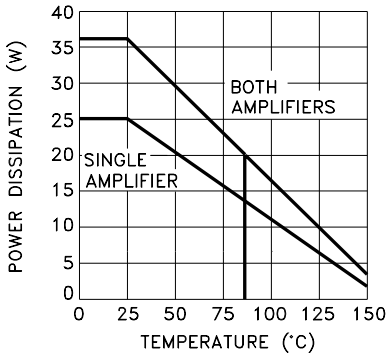
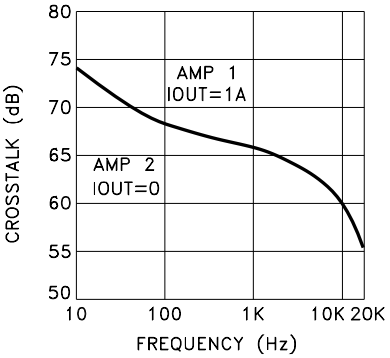
TYPICAL PERFORMANCE CURVES

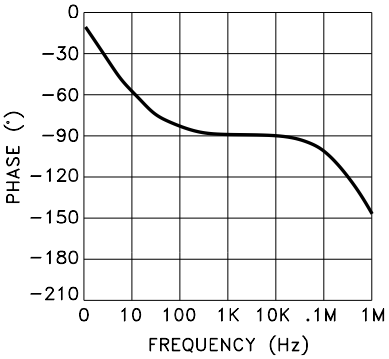
POWER DERATING



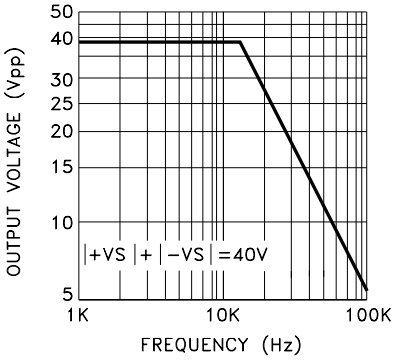
CROSSTALK vs FREQUENCY



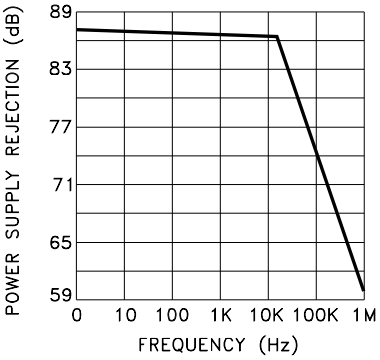
PHASE RESPONSE vs FREQENCY



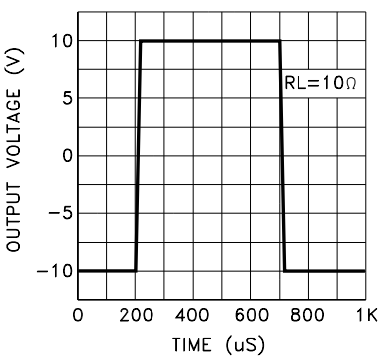
POWER RESPONSE vs FREQUENCY



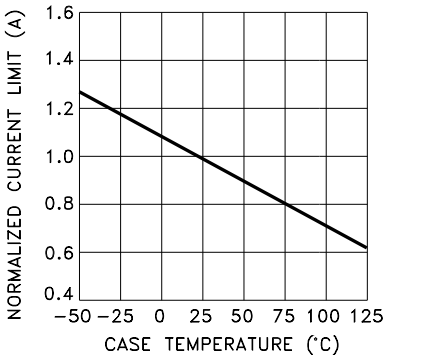
POWER SUPPLY REJECTION vs FREQUENCY



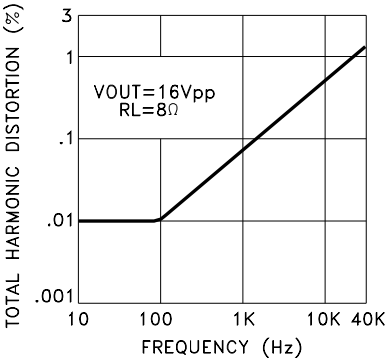
PULSE RESPONSE



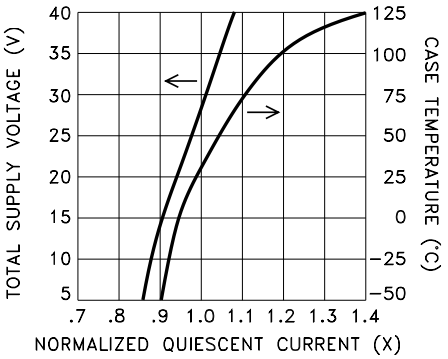
INTERNAL CURRENT LIMIT vs TEMPERATURE



HARMONIC DISTORTION vs FREQUENCY



QUIESCENT CURRENT vs SUPPLY VOLTAGE AND TEMPERATURE



OUTPUT VOLTAGE SWING vs OUTPUT CURRENT