ISO 9001 CERTIFIED BY DSCC

MSK

M.S.KENNEDY CORP.

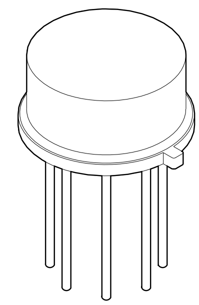
HIGH SPEED, BUFFER AMPLIFIER AMP 0002

4707 Dey Road Liverpool, N.Y. 13088 (315) 701-6751

MIL-PRF-38534 CERTIFIED

FEATURES:

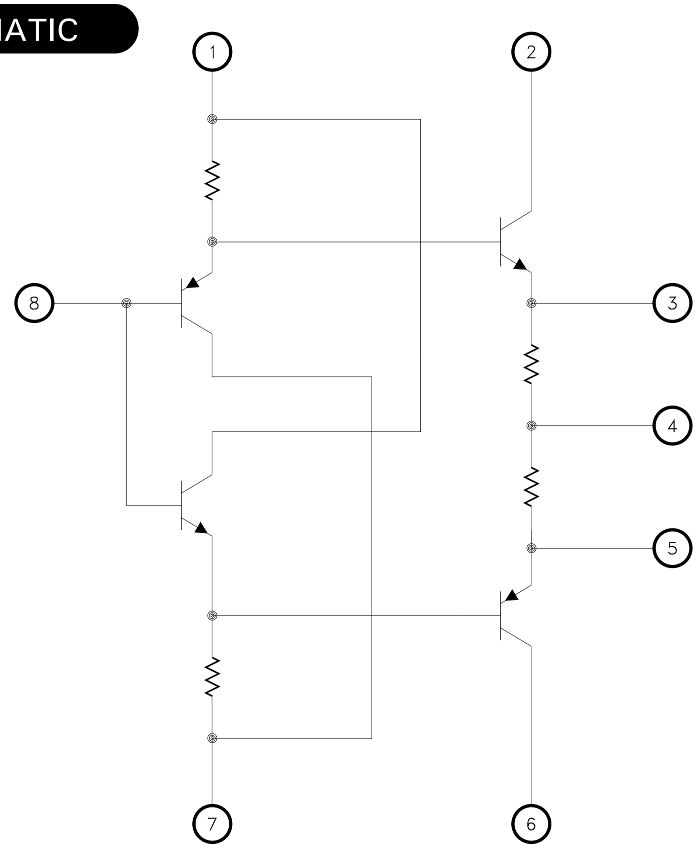
- Industry Wide LH0002 Replacement
- High Input Impedance-180KΩ Min
- Low Output Impedance-10Ω Max
- Low Harmonic Distortion
- DC to 30 MHz Bandwidth
- Slew Rate is Typically 400 V/μS
- Operating Range from ±5V to ±20V
- Available to DSCC SMD5962-7801301XC



DESCRIPTION:

The MSK 0002 is a general purpose current amplifier. It is the industry wide replacement for the LH0002. The device is ideal for use with an operational amplifier in a closed loop configuration to increase current output. The MSK 0002 is designed with a symmetrical output stage that provides low output impedances to both the positive and negative portions of output pulses. The MSK 0002 is packaged in a hermetic 8 lead low profile T0-5 header and is specified over the full military temperature range.

EQUIVALENT SCHEMATIC



TYPICAL APPLICATIONS

- High Speed D/A Conversion
- 30MHz Buffer
- Line Driver
- Precision Current Source

PIN-OUT INFORMATION

1	V1+	5	E4
2	V2+	6	V2-
3	E3	7	V1-
4	Output	8	Input

ABSOLUTE MAXIMUM RATINGS

$\pm V_{CC}$	Supply Voltage	±22V
V_{IN}	Input Voltage	±22V
P_d	Power Dissipation	600mW
T_C	Case Operating Temperature	
	(MSK 0002H)	-55°C to +125°C
	(MSK 0002)	-40°C to +85°C
T_{ST}	Storage Temperature Range	-65°C to +150°C
T_{LD}	Lead Temperature Range (10 Seconds)	+300°C
T_J	Junction Temperature	+175°C
θ_{jC}	Thermal Resistance	40°C/W

ELECTRICAL SPECIFICATIONS

Parameter	Test Conditions ①	Group A Subgroup	MSK 0002H ④ Min.	MSK 0002H ④ Typ.	MSK 0002H ④ Max.	MSK 0002 Min.	MSK 0002 Typ.	MSK 0002 Max.	Units
Quiescent Current	V_{IN}=0V R_S=10KΩ R_L=1.0KΩ	1	-	±6.3	±10	-	±6.3	±10	mA
Input Offset Current	R_S=10KΩ R_L=1.0KΩ	1	-	±2	±10	-	±2	±10	μA
		2,3	-	±2	±10	-	-	-	μA
Input Offset Voltage	R_S=300Ω R_L=1.0KΩ	1	-	±6	±30	-	±6	±30	mV
		2,3	-	±10	±30	-	-	-	mV
Input Impedance ③	V_{IN}=1.0V_{RMS} R_S=200KΩ R_L=1KΩ f=1.0KHz	4	180	-	-	180	-	-	KΩ
Output Impedance ③	V_{IN}=1.0V_{RMS} R_s=10KΩ R_L=50Ω f=1.0KHz	4	-	-	10	-	-	10	Ω
Output Voltage Swing	V_{IN}=±12Vp R_L=1.0KΩ f=1.0KHz	4	±10	±11	-	±10	±11	-	Vp
	V_{IN}=±10Vp R_L=100Ω $+V_{CC}$=±15V f=1.0KHz	4	±9.5	-	-	±9.5	-	-	Vp
Voltage Gain ②	V_{IN}=3.0V_{PP} f=1.0KHz R_S=10KΩ R_L=1.0KΩ	4	0.95	0.97	-	0.95	0.97	-	V/V
		5,6	0.95	-	-	-	-	-	V/V
Rise Time	V_{OUT}=2.5V_{PP} f=10KHz R_S=100Ω R_L=50Ω	4	-	8	12	-	8	12	nS

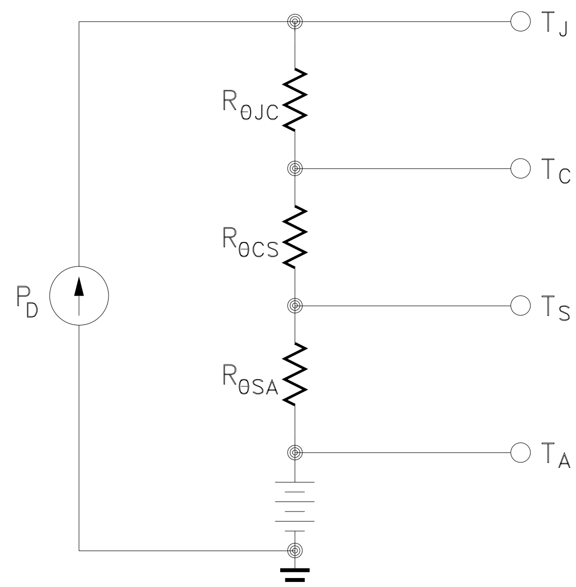
NOTES:

① Unless otherwise specified $\pm V_{CC}=\pm 12V_{DC}$
② Subgroups 5 & 6 shall be tested as part of device initial characterization and after design and process changes. Parameter shall be guaranteed to the limits specified for subgroups 5 & 6 for all lots not specifically tested.
③ Devices shall be capable of meeting the parameter, but need not be tested.
④ Subgroup 1,4 $T_A=T_C=+25°C$
Subgroup 2,5 $T_A=T_C=+125°C$
Subgroup 3,6 $T_A=T_C=-55°C$

HEAT SINKING

To determine if a heat sink is necessary for your application and if so, what type, refer to the thermal model and governing equation below.

Thermal Model:



Governing Equation:

$T_J = P_D \times (R_{\Theta JC} + R_{\Theta CS} + R_{\Theta SA}) + T_A$

Where

T_J = Junction Temperature
PD = Total Power Dissipation
$R_{\Theta JC}$ = Junction to Case Thermal Resistance
$R_{\Theta CS}$ = Heat Sink to Ambient Thermal Resistance
T_C = Case Temperature
T_A = Ambient Temperature
T_S = Sink Temperature

Example:

This example demonstrates a worst case analysis for the buffer output stage. This occurs when the output voltage is 1/2 the power supply voltage. Under this condition, maximum power transfer occurs and the output is under maximum stress.

Conditions:

VCC = ±12VDC
Vo = ±6Vp Sine Wave, Freq. = 1KHz
RL = 100Ω

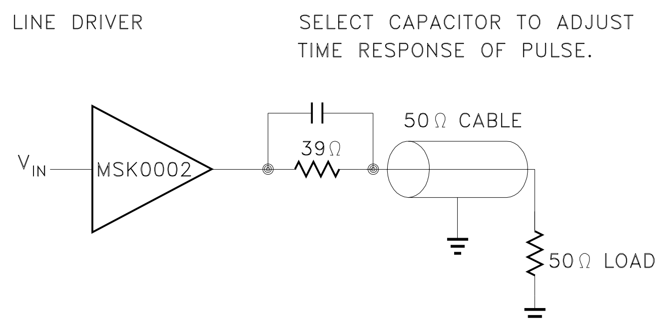
For a worst case analysis we will treat the ±6Vp sine wave as an 6 VDC output voltage.

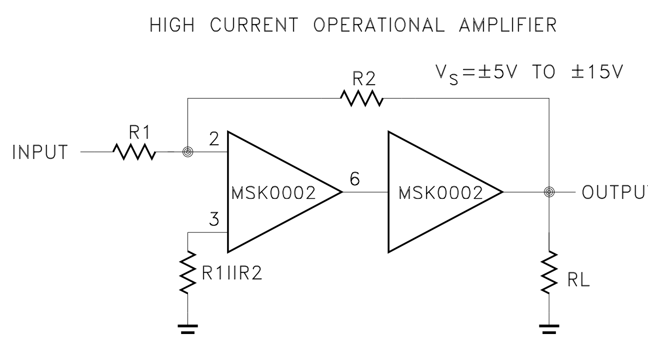
1.) Find Driver Power Dissipation
$PD = (Vcc - Vo)\ (Vo/R_L)$
$= (12V - 6V)\ (6V/100\Omega)$
$= 360mW$
2.) For conservative design, set $T_J = +125°C$ Max.
3.) For this example, worst case $T_A = +80°C$
4.) $R_{\Theta JC}$ = 40° C/W from MSK 0002H Data Sheet
5.) $R_{\Theta CS}$ = 0.15° C/W for most thermal greases
6.) Rearrange governing equation to solve for $R_{\Theta SA}$

$R_{\Theta SA} = ((T_J - T_A)/P_D) - (R_{\Theta JC}) - (R_{\Theta CS})$
$= ((125°C - 80°C) / 0.36W) - 40°C/W - 0.15°C/W$
$= 125 - 40.15$
$= 84.9°C/W$

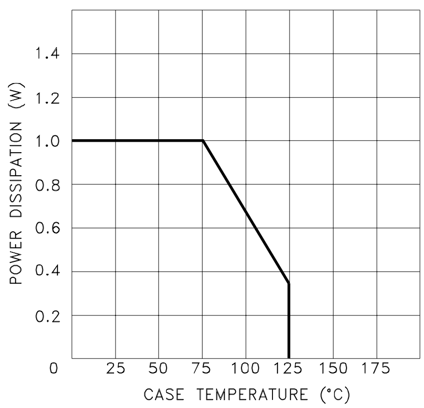
This heat sink in this example must have a thermal resistance of no more than 84.9°C/W to maintain a junction temperature of no more than +125°C.

Typical Applications:

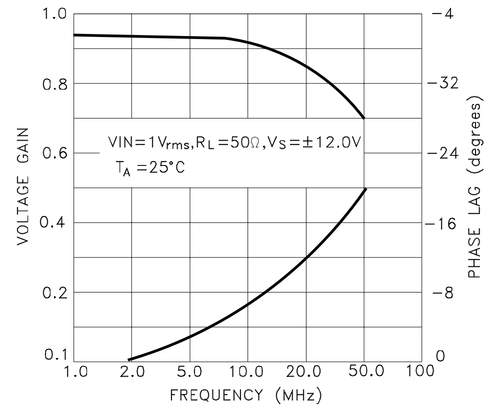




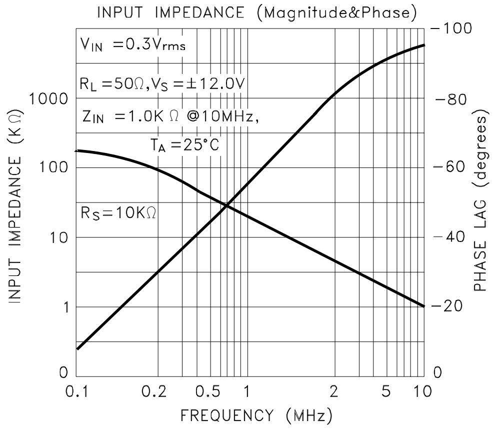
TYPICAL PERFORMANCE CURVES



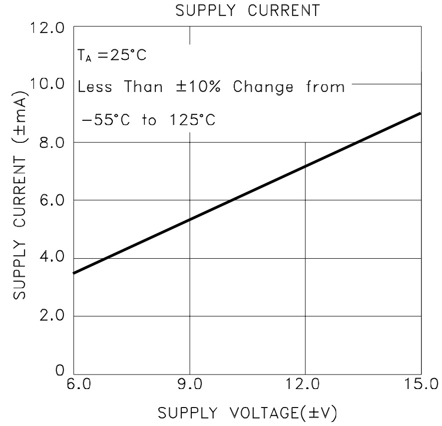
MAXIMUM POWER DISSIPATION



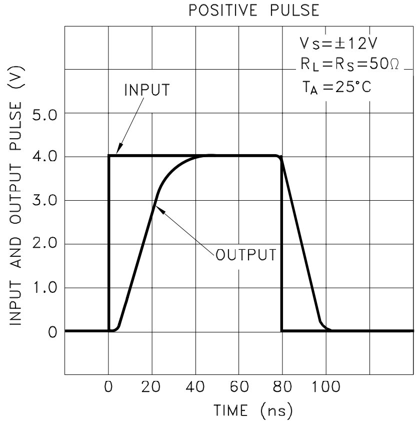
FREQUENCY RESPONSE



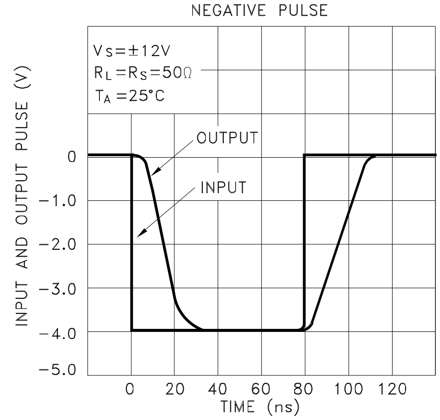
INPUT IMPEDANCE (Magnitude&Phase)



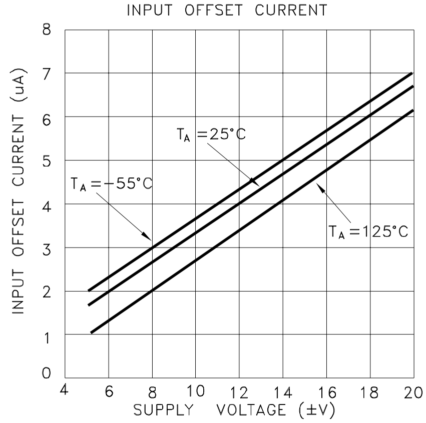
SUPPLY CURRENT



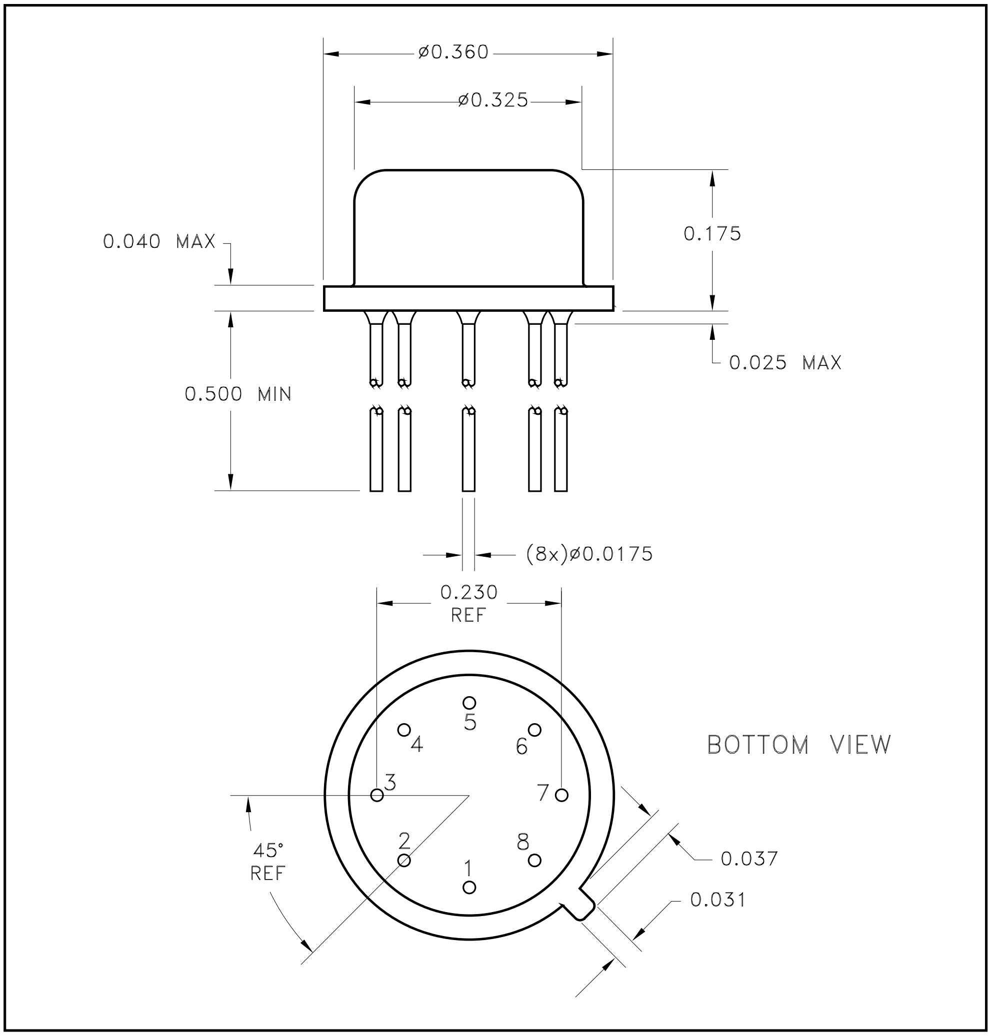
POSITIVE PULSE



NEGATIVE PULSE



INPUT OFFSET CURRENT



ALL DIMENSIONS ARE ±0.010 INCHES UNLESS OTHERWISE LABELED

ORDERING INFORMATION

Part Number	Screening Level
MSK0002	Industrial
MSK0002H	Military-Mil-PRF-38534
7801-301XC	DSCC-SMD

M.S. Kennedy Corp.
4707 Dey Road, Liverpool, New York 13088
Phone (315) 701-6751
FAX (315) 701-6752
www.mskennedy.com