MIL-PRF-38534 CERTIFIED FACILITY

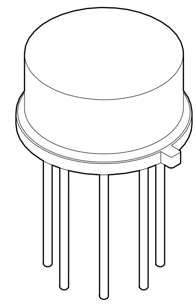
TTM Technologies

HIGH SPEED, BUFFER AMPLIFIER

0002

FEATURES:

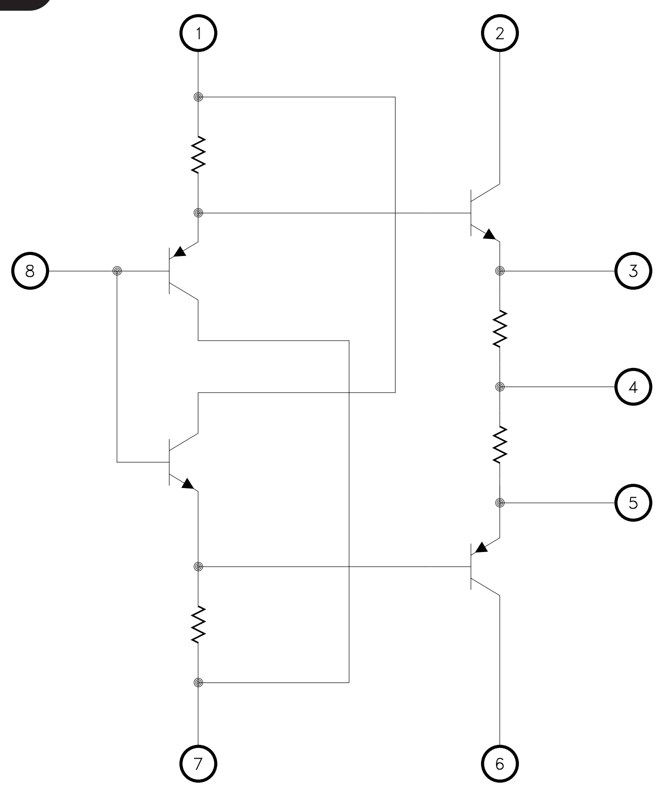
- -Industry Wide LH0002 Replacement
- High Input Impedance-180KΩ Min
- Low Output Impedance-10Ω Max
- Low Harmonic Distortion
- DC to 30 MHz Bandwidth
- Slew Rate is Typically 400 V/μS
- Operating Range from±5V to ±20V
- Available to DSCC SMD5962-7801301XC
- Equivalent Rad Hard Device MSK 0002RH



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

CASE = ISOLATED

ABSOLUTE MAXIMUM RATINGS ⑤

$\pm V_{CC}$	Supply Voltage	±22V
V_{IN}	Input Voltage	±22V
Pd	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
Θjc	Thermal Resistance @ TC = 125°C Output Devices	55°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	±12	μA
		2, 3	-	±5	±10	-	-	-	μA
Input Offset Voltage	R_S = 300Ω, R_L = 1.0KΩ	1	-	±6	±30	-	±6	±35	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	15	nS

NOTES:

① Unless otherwise specified $\pm V_{CC}$ = ±12V_{DC}.

② Subgroup 5 and 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 Industrial grade devices shall be tested to subgroups 1 and 4 unless otherwise requested.

⑤ Subgroup 1, 4 TA = +25°C
2, 5 TA = +125°C
3, 6 TA = -55°C

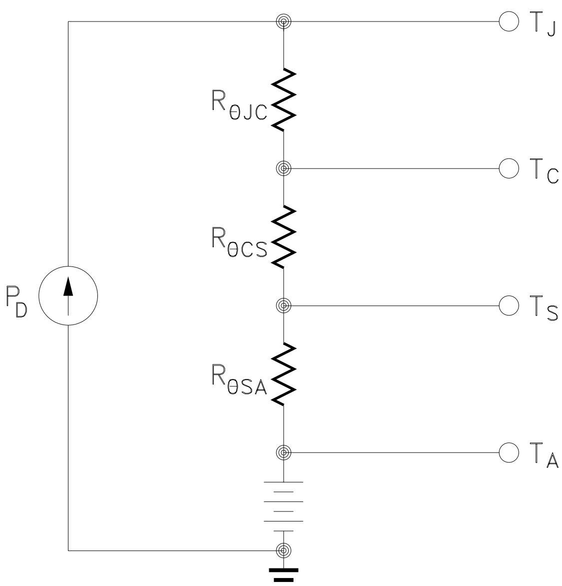
⑥ Continuous operation at or above absolute maximum ratings may adversly effect the device performance and/or life cycle.

APPLICATION NOTES

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
P_D = 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:

$V_{CC} = \pm 12V_{DC}$
Vo = ±6Vp Sine Wave, Freq. = 1KHz
$R_L = 100\Omega$

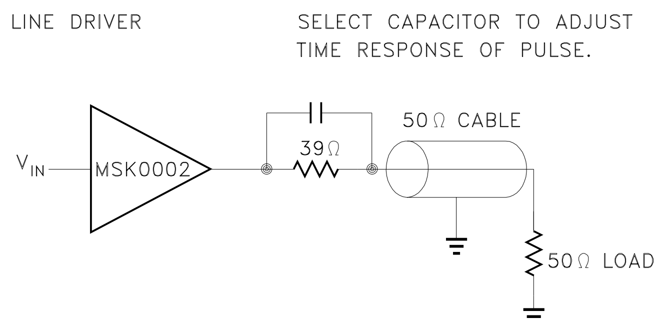
For a worst case analysis we will treat the ±6Vp sine wave as an 6 VDC output voltage.

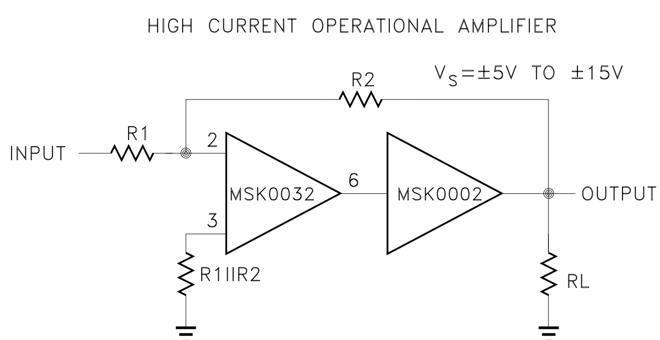
1.) Find Driver Power Dissipation
$P_D = (V_{CC} - V_O)(V_O/R_L)$
$= (12V-6V)(6V/100\Omega)$
$= 360mW$
2.) For conservative design, set T_J = +125°C Max.
3.) For this example, worst case T_A = +80°C
4.) $R_{\theta JC}$ = 55° C/W from MSK 0002H Data Sheet
5.) $R_{\theta CS}$ = 0.15° C/W for most thermal greases
6.) Rearrange governing equation to solve for $R_{\theta SA}$

$R_{\theta SA} = ((T_J - T_A)/P_D) - (R_{\theta JC}) - (R_{\theta CS})$
$= ((125°C - 80°C) / 0.36W) - 55°C/W - 0.15°C/W$
$= 125 - 55.15$
$= 69.9°C/W$

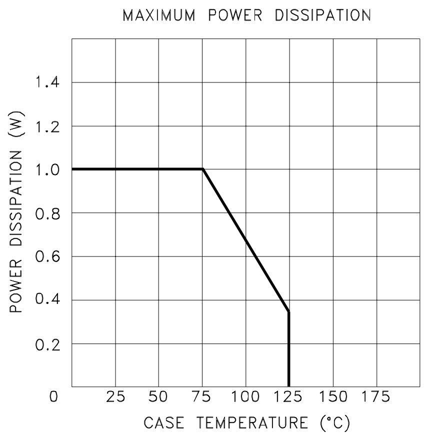
This heat sink in this example must have a thermal resistance of no more than 69.9°C/W to maintain a junction temperature of no more than +125°C.

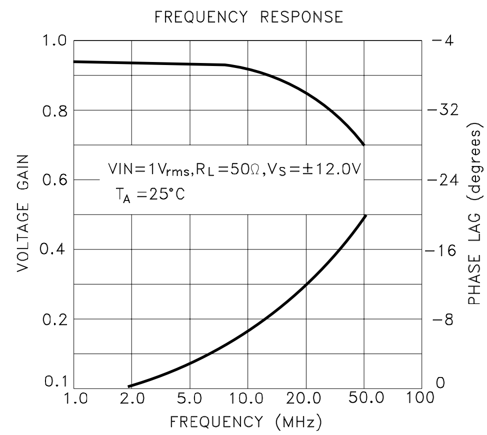
Typical Applications:

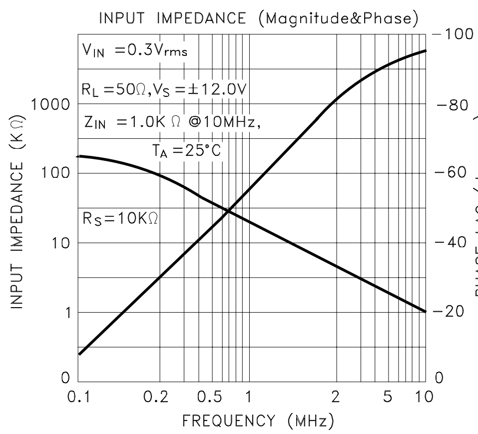


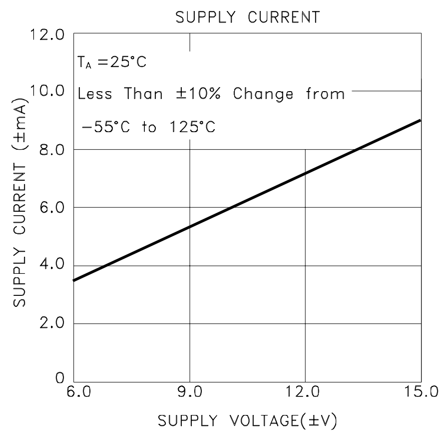


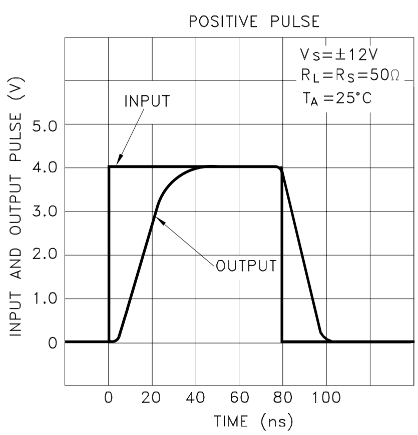
TYPICAL PERFORMANCE CURVES

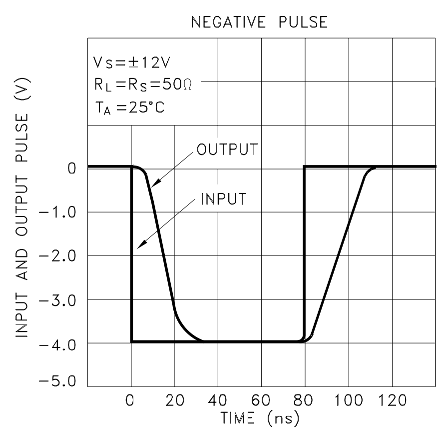


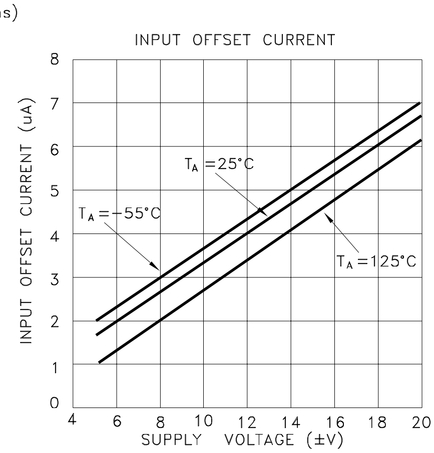




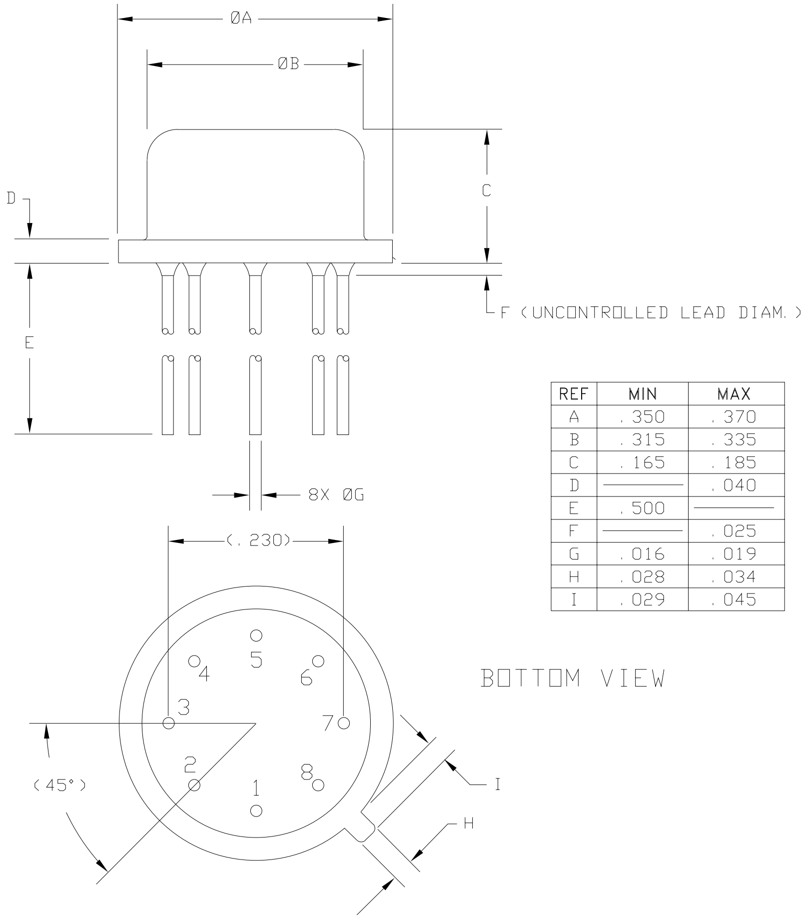








MECHANICAL SPECIFICATIONS



REF	MIN	MAX
A	.350	.370
B	.315	.335
C	.165	.185
D	——	.040
E	.500	——
F	——	.025
G	.016	.019
H	.028	.034
I	.029	.045

ALL DIMENSIONS ARE SPECIFIED IN INCHES

ORDERING INFORMATION

Part Number	Screening Level
MSK0002	Industrial
MSK0002H	MIL-PRF-38534 Class H
7801-301XC	DSCC-SMD

REVISION HISTORY

REV	STATUS	DATE	DESCRIPTION
D	Released	11/21	Remove MIL-PRF-38535

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