FEATURES:
- Ultra Low Quiescent Current - ±15mA for High Voltage
- 150V Peak to Peak Output Voltage Swing
- Slew Rate - 4200V/µS Typical
- Gain Bandwidth Product - 550 MHz Typical
- Full Power Output Frequency - 9 MHz Typical
- Output Current - 250mA Peak
- Adjustable VHV Power Supply Minimizes Power Dissipation
- Compact Package Offers Superior Power Dissipation

DESCRIPTION:
The MSK 600(B) is a high voltage wideband amplifier designed to provide large voltage swings at high slew rates in wideband systems. The true inverting op-amp topology employed in the MSK 600 provides excellent D.C. specifications such as input offset voltage and input bias current. These attributes are important in amplifiers that will be used in high gain configurations since the input error voltages will be multiplied by the system gain. The MSK 600 achieves impressive slew rate specifications by employing a feed forward A.C. path through the amplifier, however, the device is internally configured in inverting mode to utilize this benefit. Internal compensation for gains of -5V/V or greater keeps the MSK 600 stable in this range. The MSK 600 is packaged in a space efficient, hermetically sealed, 12 pin power dual in line package that has a high thermal conductivity for efficient device cooling.
### ABSOLUTE MAXIMUM RATINGS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Test Conditions</th>
<th>Group A Subgroup</th>
<th>MSK 600B</th>
<th>MSK 600</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply Voltage</td>
<td>±VHV DC</td>
<td>1,2,3</td>
<td>-</td>
<td>1.0</td>
<td>2.0</td>
</tr>
<tr>
<td>Input Voltage Range</td>
<td>±Vin DC</td>
<td>1,2,3</td>
<td>-</td>
<td>12.0</td>
<td>17.0</td>
</tr>
<tr>
<td>Supply Voltage (Input Stage)</td>
<td>±Vcc DC</td>
<td>1,2,3</td>
<td>-</td>
<td>15.0</td>
<td>25.0</td>
</tr>
<tr>
<td>Thermal Resistance</td>
<td>θJC</td>
<td>±18VDC/W</td>
<td>-</td>
<td>30°C/W</td>
<td></td>
</tr>
</tbody>
</table>

**Group A**
1, 2, 3  5
2, 3  4

**Group B**
1

### ELECTRICAL SPECIFICATIONS

#### STATIC

- **Quiescent Current**
  - VIN = 0 @ +VCC
    - Subgroup 1, 2, 3: -10.0 to 1.5 mA
  - VIN = 0 @ -VCC
    - Subgroup 1, 2, 3: -15.0 to 20 mA
  - VIN = 0 @ +VHV
    - Subgroup 1, 2, 3: -15.0 to 28 mA
  - VIN = 0 @ -VHV
    - Subgroup 1, 2, 3: -15.0 to 28 mA

- **Input Offset Voltage**
  - VIN = 0
    - Subgroup 1, 2, 3: ±1.0 to 5.0 mV

- **Input Bias Current**
  - VIN = 0
    - Subgroup 1, 2, 3: 50 to 250 nA

- **Input Offset Voltage Drift**
  - VIN = 0
    - Subgroup 2, 5: ±10 to 50 μV/°C

- **Power Supply Range**
  - ±VCC
    - Subgroup 2, 5: ±12 to ±15 V
  - ±VHV
    - Subgroup 2, 5: ±50 to ±80 V

#### DYNAMIC CHARACTERISTICS

- **Output Voltage Swing**
  - f = 1KHz
    - Subgroup 4: ±70 to ±72 V

- **Peak Output Current**
  - f = 1KHz
    - Subgroup 4: ±200 to ±250 mA

- **Full Power Output**
  - V0 = ±70V
    - Subgroup 4: 2 to 9 MHz

- **Unity Gain Bandwidth**
  - V0 = ±10V
    - Subgroup 4: 80 to 100 MHz

- **Slew Rate**
  - V0 = ±70V
    - Subgroup 4: 3000 to 4200 V/μS

- **Voltage Gain**
  - f = 1KHz
    - Subgroup 4: 94 to 100 dB

- **Settling Time**
  - Av = -10V/V  V0 = ±60V
    - Subgroup 4: -100 to -200 nS
  - Av = -10V/V  V0 = ±60V
    - Subgroup 4: -500 to -500 nS

### NOTES:

1. Unless otherwise specified, ±VCC = ±15VDC, ±VHV = ±80VDC, CL = 8pF (probe capacitance) and Av = 10V/V.
2. This parameter is guaranteed by design but not tested. Typical parameters are representative of actual device performance but are for reference only.
3. Industrial grade devices shall be tested to subgroups 1 and 4 unless otherwise specified.
4. Military grade devices ("B" suffix) shall be 100% tested to subgroups 1, 2, 3 and 4.
5. Subgroup 1, 2, 3, 4: TA = TC = +25°C
   Subgroup 2, 3, 4: TA = TC = +125°C
   Subgroup 2, 3, 4: TA = TC = -55°C

- Supply Voltage
  - ±VHV = ±90V DC
  - ±VCC = ±18V DC
- Lead Temperature Range
  - ±VHV = ±72°C
  - ±VCC = ±25°C
- Storage Temperature Range
  - -65°C to +150°C
- Lead Temperature Range
  - -40°C to +85°C
- Storage Operating Temperature
  - -55°C to +125°C
- Junction Temperature
  - ±VHV = ±18°C

- Rev. A 8/00
FEED FORWARD TOPOLOGY

The MSK 600 employs a circuit topology known as "feed forward". This inverting configuration allows the user to realize the excellent D.C. input characteristics of a differential amplifier without losing system bandwidth. The incoming signal is split at the input into its A.C. and D.C. component. The D.C. component is allowed to run through the differential amplifier where any common mode noise is rejected. The A.C. component is "fed forward" to the output section through a very high speed linear amplifier where it is mixed back together with the D.C. component. The result is an amplifier with most of the benefits of a differential amplifier without the loss in system bandwidth.

INTERNAL COMPENSATION

Since the MSK 600 is a high voltage amplifier, it is commonly used in circuits employing large gains. Therefore, the internal compensation was chosen for gains of -5V/V or greater. In circuits running at gains of less than -5V/V, the user can further compensate the device by adding compensation networks at the input or feedback node. Pin 1 (comp) should be bypassed with a 0.1uF ceramic capacitor to +VHV for all applications.

HIGH VOLTAGE SUPPLIES

The positive and negative high voltage supplies on the MSK 600 can be adjusted to reduce power dissipation. The output of the MSK 600 will typically swing to within 8V of either high voltage power supply rail. Therefore, if the system in question only needs the output of the amplifier to swing ±40V peak, the power supply rails could be set to ±50V safely. For best performance, the minimum value of ±VHV should be ±50Vcc. Unbalanced power supply rails are also allowed as long as one or the other is not decreased to below 30V or above 90V. The high voltage and low voltage power supplies should be decoupled as shown in Figure 1.

TRANSITION TIMES

Transition time optimization of the MSK 600 follows the same basic rules as most any other amplifier. Best transition times will be realized with minimum load capacitance, minimum external feedback resistance and lowest circuit gain. Transition times will degrade if the output is driven too close to either supply rail. Feedback and input resistor values will affect transition time as well. See Figure 1 and Table 1 for recommended component values.

CURRENT LIMIT

Figure 2 is the recommended active short circuit protection scheme for the MSK 600. The following formula may be used for setting current limit:

\[ \text{Current Limit} = \frac{0.6V}{R_{sc}} \]

\( R_{\text{BASE}} \) must be selected based on the value of ±VHV as follows:

\[ R_{\text{BASE}} = \frac{((+VHV - (-VHV)) - 1.2V)}{4mA} \]

This formula guarantees that Q2 and Q4 will always have sufficient base current to be in operation. This circuit can be made tolerant of high frequency output current spikes with the addition of Csc. The corresponding time constant would be:

\[ T = (R_{sc})(C_{sc}) \]

A common value for Csc is approximately 1000pF. If current limit is unnecessary, short pin 7 to pin 8 and pin 11 to pin 12 as shown in Figure 1.

<table>
<thead>
<tr>
<th>VOLTAGE GAIN</th>
<th>-R\text{IN}</th>
<th>R_F</th>
<th>C_F</th>
</tr>
</thead>
<tbody>
<tr>
<td>-10V/V</td>
<td>1kΩ</td>
<td>10kΩ</td>
<td>0.5-5pF</td>
</tr>
<tr>
<td>-20V/V</td>
<td>249Ω</td>
<td>5kΩ</td>
<td>N/A</td>
</tr>
<tr>
<td>-50V/V</td>
<td>100Ω</td>
<td>5kΩ</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Table 1

Figure 1

Figure 2
### Ordering Information

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Screening Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSK600</td>
<td>Industrial</td>
</tr>
<tr>
<td>MSK600B</td>
<td>Military-Mil-PRF-38534</td>
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</tbody>
</table>

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