

## Wideband - Fast-Slewing BUFFER AMPLIFIER

### FEATURES

- GAIN = .99V/V
- OUTPUT CURRENT,  $\pm 200\text{mA}$
- BANDWIDTH, 300MHz
- SLEW RATE, 2000V/ $\mu\text{sec}$
- ELECTRICALLY ISOLATED CASE
- EXTENDS OP AMP DRIVING CAPABILITY WHILE PRESERVING BANDWIDTH & SETTLING TIME

### DESCRIPTION

The 3553 is a unity-gain amplifier designed to be used either as a signal buffer, or as the power output stage for an operational amplifier. Because of its wideband response (300MHz, -3dB bandwidth) and fast slewing capability (2000V/ $\mu\text{sec}$ ) the 3553 is capable of following very fast signals. When used inside the feedback loop of an operational amplifier, these high speed characteristics are essential in order to preserve the performance and stability of the feedback amplifier circuit.

With its  $\pm 200\text{mA}$  of output current capability, the 3553 is capable of driving a signal of  $\pm 10\text{V}$  into a  $50\Omega$  load. This power capability, coupled with its extremely high speed and wide bandwidth, makes the 3553 ideally suited for line driving applications where fast pulses or wideband signals are involved.

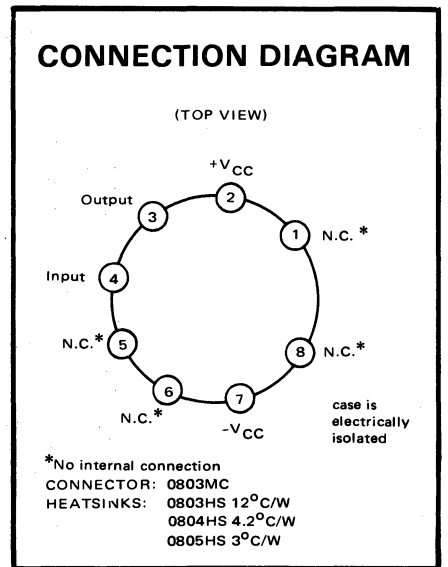
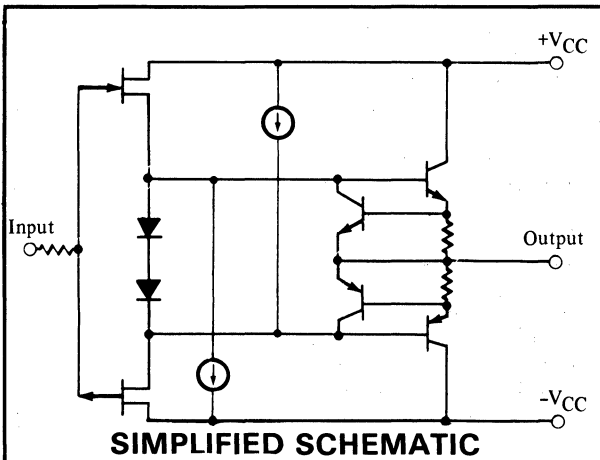
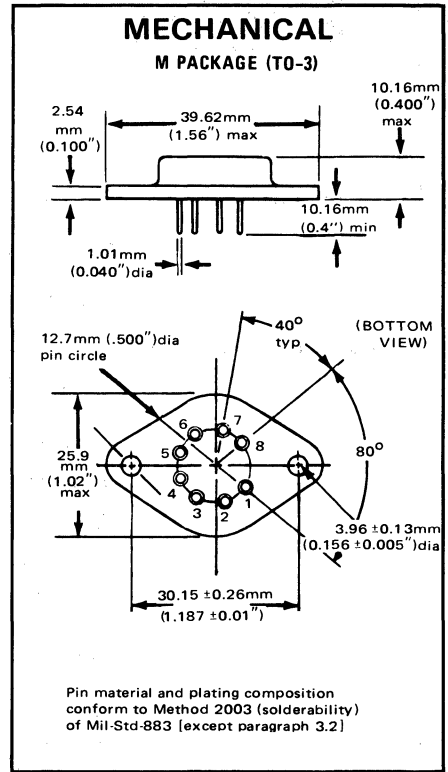
In addition to its fast/wideband characteristics and high output current, the 3553 has low input offset voltage and drift. This adds to its versatility, particularly in stand-alone buffer amplifier applications.

The 3553 is packaged in a reliable hermetically sealed TO-3 package for environmental ruggedness. The metal case is completely electrically isolated. This simplifies mounting and reduces cost since the need for insulating spacers and bushings is eliminated.

# SPECIFICATIONS

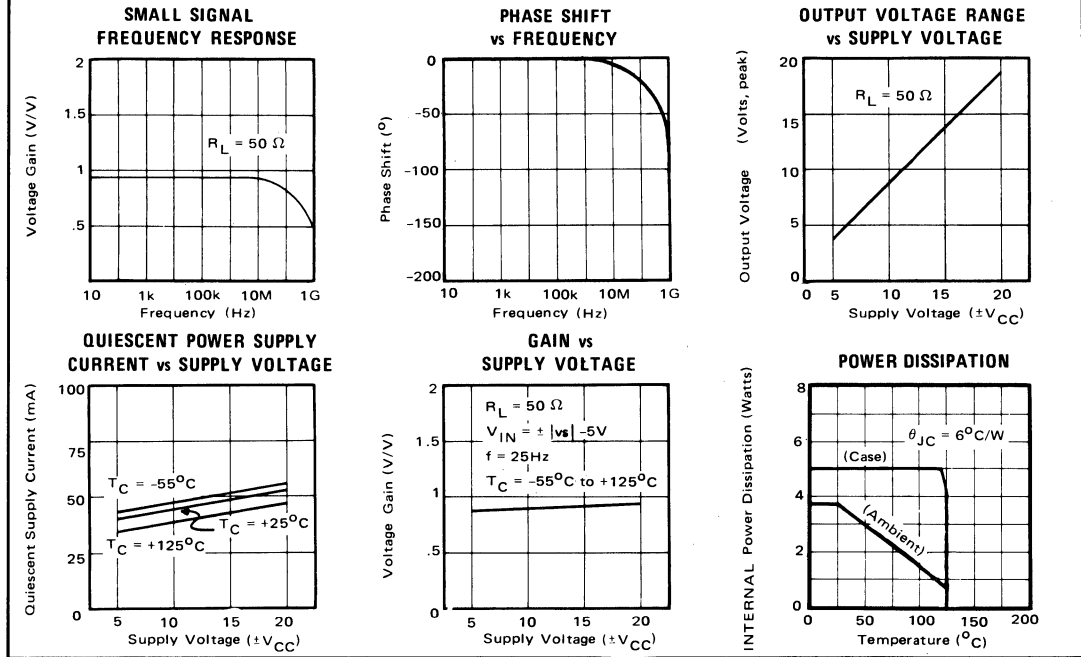
Specifications are typical at +25°C Case Temperature and ± 15 VDC power supply unless otherwise noted.

| <b>ELECTRICAL</b>  |   |
|--|---|
| <b>MODEL</b>   | <b>3553AM</b>   |
| <b>GAIN, DC</b><br>No Load<br>50 Ω Load, min   | 0.98 V/V<br>0.92 V/V  |
| <b>RATED OUTPUT</b><br>Voltage, min<br>Current, min<br>Output Resistance   | ±10 V<br>±200 mA<br>1 Ω   |
| <b>DYNAMIC RESPONSE</b><br>Slew Rate, min<br>Full Power Bandwidth, min<br>Small Signal -3dB Bandwidth<br>Settling Time to 1%<br>to .01%  | 2000 V/μsec<br>32 MHz<br>300 MHz<br>7.2 nsec<br>14.5 nsec               |
| <b>INPUT PARAMETERS</b><br>Input Voltage, linear range<br>Input Voltage, absolute, max<br>Input Impedance<br>Input Bias Current @ +25°C<br>(doubles/+10°C)   | ±10 V<br>±Supply Voltage<br>i011 Ω<br>-200 pA                           |
| <b>OUTPUT OFFSET VOLTAGE</b><br>Initial Offset @ +25°C, max<br>vs. Temperature (average) -25°C to +85°C  | ±50 mV<br>±300 μV/°C  |
| <b>POWER SUPPLY</b><br>Rated Voltage<br>Voltage Range, derated<br>Current, Quiescent, max<br>typ   | ±15 VDC<br>±5 VDC to ±20 VDC<br>±80 mA<br>±50 mA                        |
| <b>TEMPERATURE RANGE</b> (Case)<br>Specification<br>Operation (derate above +120°C Case)<br>Storage<br>θ <sub>JC</sub> Thermal Resistance, junction to case<br>θ <sub>JA</sub> Thermal Resistance, junction to ambient | -25°C to +85°C<br>-55°C to +125°C<br>-65°C to +150°C<br>6°C/W<br>33°C/W |



## TYPICAL PERFORMANCE CURVES

Typical at 25°C and rated supply voltage unless otherwise noted.



## APPLICATION INFORMATION

### BOOSTER AMPLIFIER

One of the primary applications for the 3553 is that of a current booster for an operational amplifier. The circuit of Figure 1 is typical of such applications. Note that the 3553 is used inside the feedback loop and becomes, effectively, the output stage of the composite amplifier. Because the 3553 has unity voltage gain, wideband response, fast slewing rate, and very little phase delay, the dynamic response of the operational amplifier is virtually unaffected by the addition of the booster.

The already low offset voltage of the 3553 is effectively reduced by a factor equal to the open loop gain of the operational amplifier and becomes a negligible factor in total offset error of the circuit.

Input impedance of the 3553 is extremely high, thus requiring almost no drive current from the operational amplifier. On the other hand, the presence of the 3553 in the circuit increases the output current capability to  $\pm 200$  mA, drastically lowers the output impedance of the loop, and permits the driving of low impedance loads such as a terminated 50 $\Omega$  coaxial line.

Capacitive loads, often a source of instability and oscillations in operational amplifier circuits, are buffered by the presence of the 3553. In driving heavily capacitive loads the slew rate of the 3553 will be seen to decrease. This is due simply to the large currents required by fast voltage slewing in a capacitive load,

$$I_c = C_{load} \frac{dV}{dt}$$

The internal current limit of the 3553 (approximately 600 mA) places a limit on the slewing rate under such conditions.

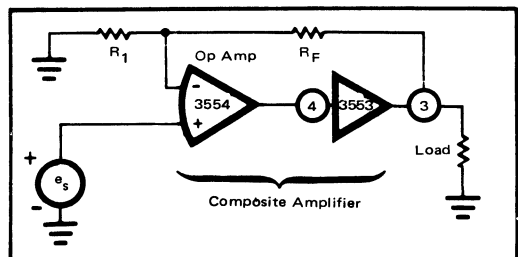


FIGURE 1. Model 3553 as a power booster.

## BUFFER AMPLIFIER

The 3553 may also be used, as shown in Figure 2, as a unity gain buffer amplifier. No operational amplifier is required in this mode of operation. Since the 3553 is then operated without feedback, its offset voltage and drift are translated to the output. While the gain is not precisely unity in this mode, the accuracy is adequate for many applications.

## INPUT/OUTPUT PROTECTION

The output stage of the 3553 is current limited at approximately 600 mA. This will provide a measure of output short circuit protection for the amplifier for a period of time as determined by the heatsinking used, the amplifier's thermal resistance, the ambient temperature, etc. The amplifier's output stage transistors should not be allowed to exceed 150°C (175°C absolute max).

The input stage is designed to allow the application of either supply voltage without damage to the amplifier.

## POWER DISSIPATION

The power dissipation capability of the 3553 varies with ambient temperature and with the type of heat sink used. A heat sink may be used to increase the dissipation capability or to achieve a given dissipation capability at higher temperature. The power derating curve is given in the typical performance curves on page I-123.

## WIRING RECOMMENDATIONS

No special wiring techniques are necessary with the 3553. However, it is recommended, as a good engineering practice, that the power supply lines be bypassed to common at a point near the amplifier. (A 1.0  $\mu$ F electrolytic in parallel with a 1000 pF ceramic is recommended.) If the 3553 is used with a wideband operational amplifier, all leads must be kept as short as possible to minimize stray capacitance and unwanted feedback paths.

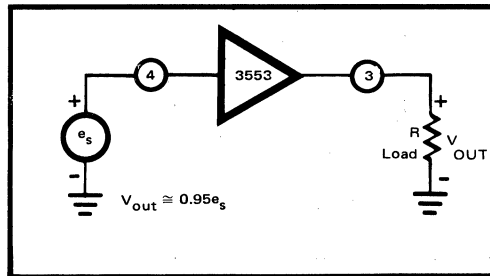


FIGURE 2. Model 3553 as a unity gain buffer.