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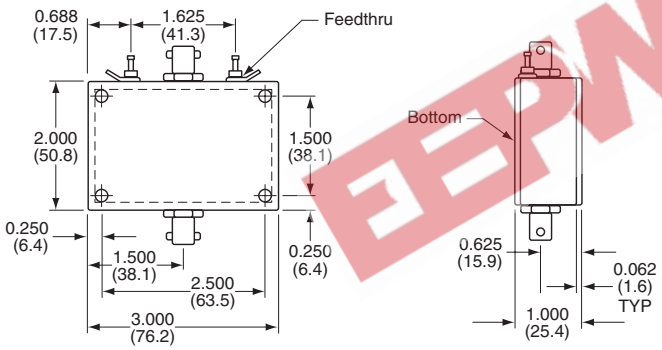
# KE Series
## Encased Amplifiers

### Features
- Wide bandwidth, fast settling, high slew rate
- Low distortion and overshoot
- Linear phase
- Easy to use encased form
- Direct replacement for E103, E104, E200, E220, and E231

### Applications
- For use on the bench or in a test station as a video amp, pulse amp, line driver, etc.
- "drop in" units for radar and communication systems




### General Description
The KE Series amplifiers are designed to take full advantage of Fairchild's high-performance DC-coupled operational amplifiers in an easy-to-use, encased form. This format makes the KE Series amplifiers an excellent choice for use on the bench, in a test station, or in other environments needing both high performance and ease of use.

The op amp-based KE Series amplifiers provide a wide selection of features as well as the ability to customize parameters such as voltage gain and output impedance to the application.

**KE231** .... designed for low-gain applications ($A_v$ = ±1 to ±5)
**KE220** .... high bandwidth (-3dB BW of 190MHz), lower output current (50mA)
**KE200** .... general purpose (-3dB BW of 95MHz)
**KE103** .... high output current (200mA)

The KE104 is an encased version of the KH104AI, a DC to 1.1GHz linear amplifier with a fixed gain of 14dB and 50Ω input and output impedances. These features, coupled with excellent distortion and VSWR characteristics, make the KE104 ideal for applications in wideband analog and high-speed digital communications, radar, and fiber optics transmitters and receivers.

**KE104** .... DC to 1.1GHz, fixed 14dB gain, low distortion.

### Ordering Information
**KE104**
Since gain and input and output impedances are fixed on the KE104, simply designate the connector type required by: KE104-BNC or KE104-SMA.

**KE103, KE200, KE220, and KE231**
Due to the flexibility possible with these amplifiers, the user must specify several parameters when ordering:

The full part number is KEnnn-p-con-$Z_i$-$Z_o$-$A_v$,
nnn: specify 103, 200, 220, or 231
p: specify N (non-inverting) or I (inverting)
con: specify BNC or SMA connectors or NDC for no case
$Z_i$: specify input impedance in ohms
$Z_o$: specify output impedance in ohms
$A_v$: specify voltage gain with output unterminated (ie: $Z_{load} = \infty$) (see example)

Select $Z_i$, $Z_o$, and $A_v$ within the following constraints:

| Parameter | KE103 | KE200 | KE220 | KE231 |
|---|---|---|---|---|
| $A_v$ | ±1/±40 | ±1/±50 | ±1/±50 | ±1/±5 |
| max $Z_{in}$ inverting | $\frac{1500}{A_v}$ | $\frac{2000}{A_v}$ | $\frac{1500}{A_v}$ | $\frac{250}{A_v}$ |
| non-inverting | 10k | 10k | 10k | 10k |
| min $Z_{out}$ | 0 | 0 | 0 | 0 |

**Example:**
KE200-N-BNC-75-50-20 means a KE200 with a non-inverting gain, BNC connectors, 75W input impedance, 50W output impedance, and a voltage gain of 20V/V (unterminated output). (When driving a realistic load, the actual gain is reduced by the factor $Z_{load}/(Z_{load} + Z_o)$ due to the resistive divider action of the output impedance, $Z_o$, and the load connected to the amplifier, $Z_{load}$. The unterminated voltage gain, $A_v$, should be selected with this in mind.)

## Typical Specifications (Note1)

| Model | -3dB BW (MHz) | Settling Time (ns, %) | Slew Rate (V/µs) | $V_{out}$, $I_{out}$ (V, mA) (Note 2) |
|---|---|---|---|---|
| **General Purpose** | | | | |
| KE200 | 95 | 18, 0.1 | 4000 | ±12, ±100 |
| **Wide bandwidth** | | | | |
| KE220 | 190 | 8, 0.1 | 7000 | ±12, ±50 |
| **High Output Current** | | | | |
| KE103 | 150 | 10, 0.4 | 6000 | ±11, ±200 |
| **Low Gain** | | | | |
| KE231 | 165 | 12, 0.1 | 3000 | ±11, ±100 |
| **Ultra-wide Bandwidth** | | | | |
| KE104 | 1100 | 1.2, 0.8 | 4500 | ±1.6, ±40 |

## Absolute Maximum Ratings

| Model | $V_{CC}$ (V) | Power Dissipation (W @ 25°C) | Derate Above 25°C mW/°C | Output Current (mA) | Input Voltage (V) | $T_o$ (°C) | $T_S$ (°C) |
|---|---|---|---|---|---|---|---|
| **General Purpose** | | | | | | | |
| KE200 | 5-17 | 1.8 | 10 | 100 | Note 3 | -25 to +85 | -65 to +150 |
| **Wide bandwidth** | | | | | | | |
| KE220 | 5-17 | 1.5 | 5 | 50 | Note 3 | -25 to +85 | -65 to +150 |
| **High Output Current** | | | | | | | |
| KE103 | 9-17 | 2.0 | 10 | 200 | Note 3/4 | -25 to +85 | -65 to +150 |
| **Low Gain** | | | | | | | |
| KE231 | 5-17 | 1.8 | 10 | 100 | Note 3 | -25 to +85 | -65 to +150 |
| **Ultra-wide Bandwidth** | | | | | | | |
| KE104 | 9-17 | 1.8 | N/A | 40 | ±0.5 | -25 to +85 | -65 to +150 |

### Notes

1. Nominal configuration

   $V_{cc}$: ±15V KE103, KE104, KE200, KE220, KE231 Load: 100Ω KE103, KE231; 200Ω KE200, KE220; 50Ω KE104 $A_v$: +20 KE103, KE200, KE220; +2 KE231

2. When the amplifier is configured with an output impedance ($Z_{out}$ > 0, the maximum output voltage swing (at the load) is reduced by the factor $Z_{load}/(Z_{load} + Z_{out})$. See the example on page 1.
3. These amplifiers must be kept out of saturation; in other words, the output voltage (determined by $V_{in}$ and $A_v$.) must be kept away from the supply voltage. $\left(|V_{in}| < \frac{|V_{CC}| - 2.5}{|A_v|}\right)$
4. In the non-inverting configuration, the input voltage to the KE103 must not exceed ±5V.

## Discussion

The performance specified above is that typically seen for a nominally-configured KE Series amplifier; performance for different configurations can be determined using the graphs. Other parameters not shown can be approximated by referring to the individual hybrid data sheets.

### Relative Bandwidth vs. Gain

At the nominal gain setting of +20 (+2 for the KE231),the amplifiers will typically provide 100% of the specified bandwidth; higher gains will reduce the bandwidth somewhat as shown in the graph.

### Relative Bandwidth vs. Load

Listed under the typical specifications table are the nominal loads at which the amplifiers will typically provide 100% of the specified bandwidth. Heavier loads decrease the bandwidth as the plot indicates. (The total load on the amplifier is the sum of the output impedance, $Z_o$, and the load connected external to the amplifier, $Z_{load}$).

### Relative Bandwidth vs. $V_{CC}$

All of the KE Series amplifiers are designed to operate on ±15V supplies. The user may elect, however, to use lower supplies but at some sacrifice in performance as shown in the plot.