

Application Note

2-Wire Circuit Microphone Performance for 3-wire Specialty Transducer (ST) microphones

- Background:
 - Most ECM microphones are designed to work with a 2-wire circuit.
 - Almost all ST microphones are designed to work with a 3-wire circuit

This note is intended to assist customers who need to use a two-wire circuit with a KA microphone which is specified for 3-wire operation. This circumstance typically occurs for one of two reasons

- There is a legacy circuit designed for a 2-wire microphone
- There may only be room for 2 conductors

2-wire circuits affect

- Sensitivity
- Output impedance
- S/N Ratio
- Signal Headroom
- Current drain

Customers creating a specification based on their own 2-wire circuit may need assistance (correlation data, etc.) to avoid conflicts

3-wire hookup is specified and generally recommended because of the typical performance benefits:

Microphone Performance Advantage	Sensitivity	Current Drain	S/N	Output Impedance	Headroom
2-wire				X	
3-wire	X	X	X		X

Version 1.0

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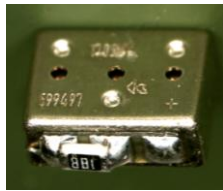
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Before adapting a 3-wire microphone for 2-wire operation, check the list below. Certain NR and WP models are specified for 2-wire operation:

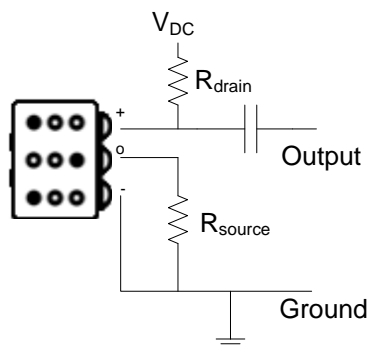
- NR
 - NR-23159-000
 - NR-23160-000
 - NR-25994-C97
 - NR-25994-D63
- WP
 - WP-23501-000
 - WP-25593-C97
 - WP-25993-D63

2-Wire Modifications

The simplest 2-wire modification is to install a 2.2k chip resistor (R_{source}) between the output and negative terminals on the microphone. The + and – terminals may then be used for the 2-wire hookup. When connected to the test circuit shown, the 2-wire sensitivity will be about 3dB lower in comparison to the specified 3-wire sensitivity. Suggested value for R_{drain} is also 2.2k Ω .



Example of installed chip resistor on NR terminal pads



Suggested 2-wire circuit

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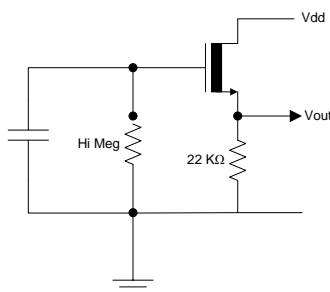
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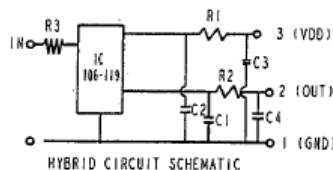
Example Data

- Three representative models were chosen to generate example data:
 - EK-23132-000
 - Typical of models using a discrete JFET circuit (BT, EA, EK and related models)
 - FG-23629-C36
 - Typical of models using a “coach class” RF enhanced circuit with NMOS IC
 - FG-23629-D62
 - A few FG model had the “coach class” components removed, but still use the NMOS IC
- Data includes (average of three measurements):
 - Sensitivity
 - Current Drain
 - DC Voltage at Microphone + Terminal
 - S/N
 - Output Impedance

EK Circuit

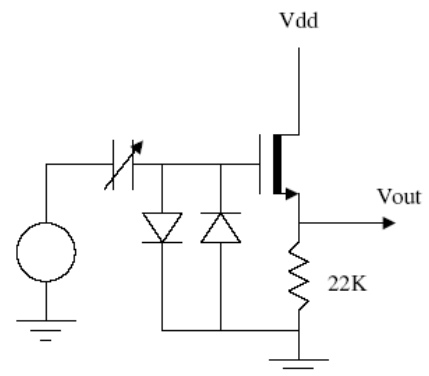


FG/EM “Coach Class” Circuit



COMPONENT	VALUE
R1	500 OHMS ± 50%
R2	500 OHMS ± 50%
R3	500 OHMS ± 50%
C1	27 pF ± 50%
C2	38 pF ± 50%
C3	13 pF ± 50%
C4	13 pF ± 50%

FG -D62 Circuit

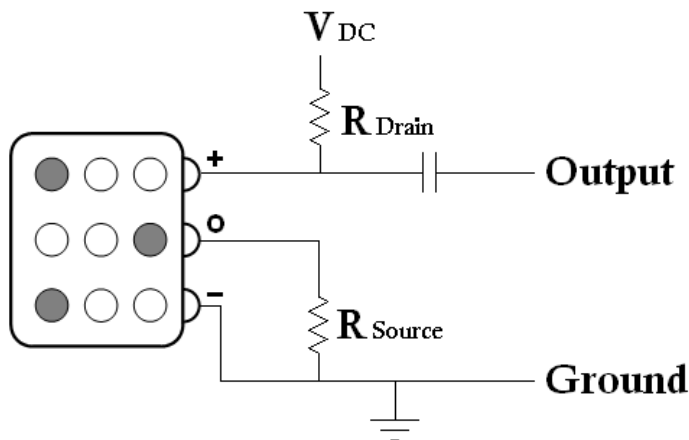


Application Note

2-Wire Circuit Parameters

- $V_{DC} = 3V$
- $R_{\text{drain}} = 1k, 2.2k, 9k$ ohms
- $R_{\text{source}} = 0, 1k, 2.2k$ ohms

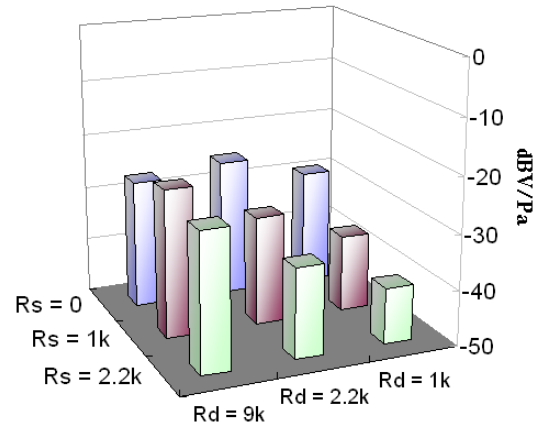
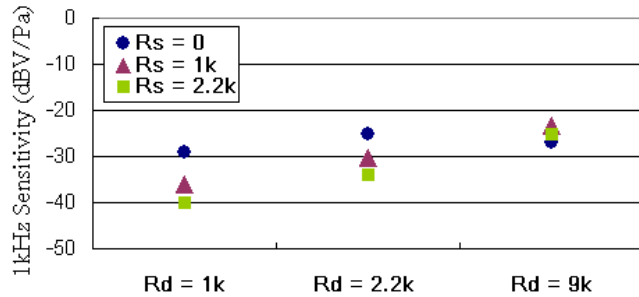
Circuit parameters are adjusted to show the effect on various performance parameters.



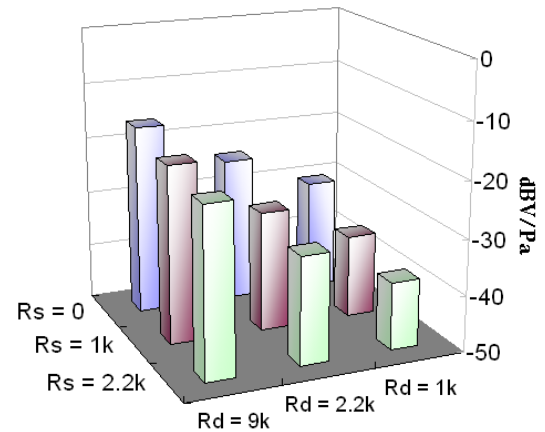
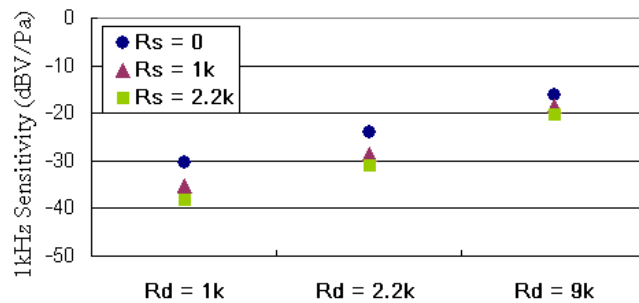
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1 kHz Sensitivity

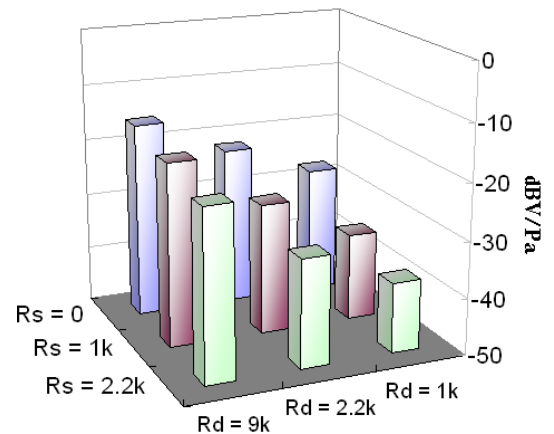
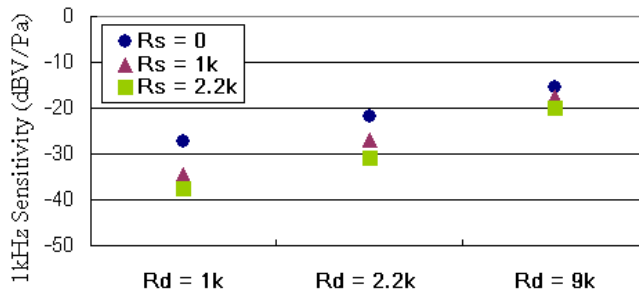
EK-23132-000



FG-23629-C36



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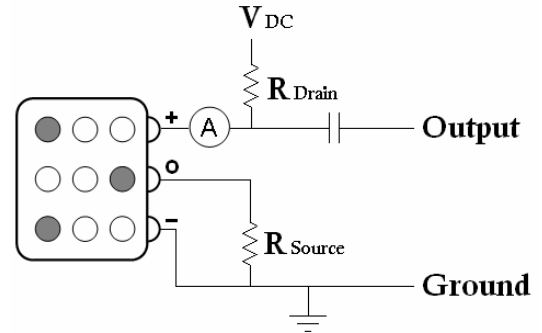
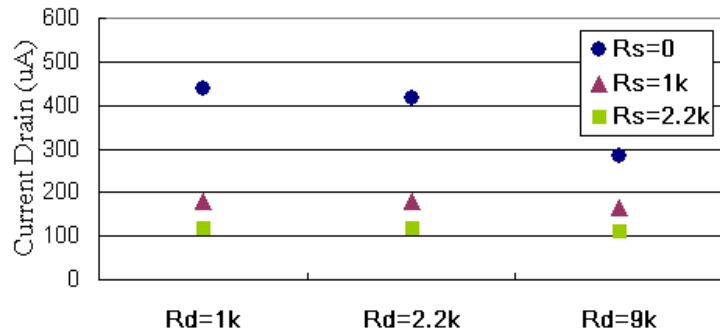
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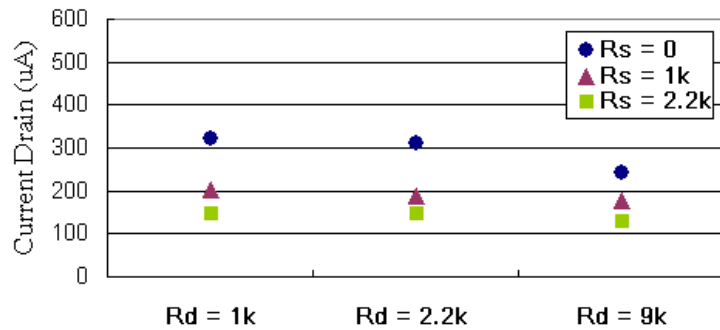
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Drain Current (μA)

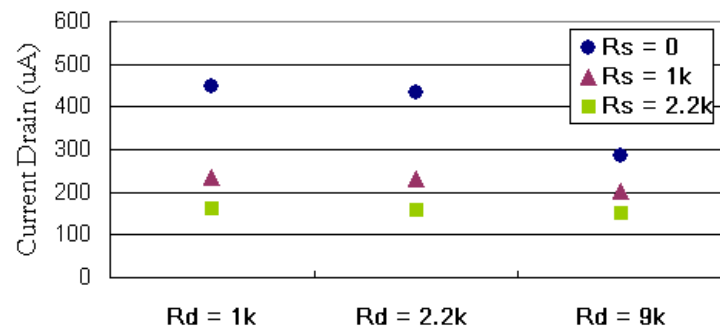
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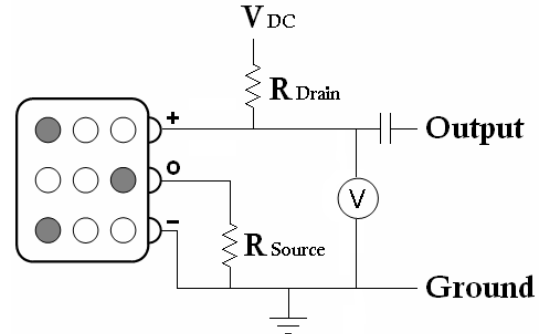
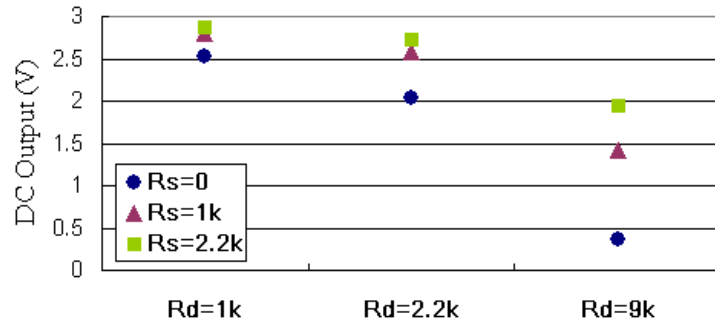
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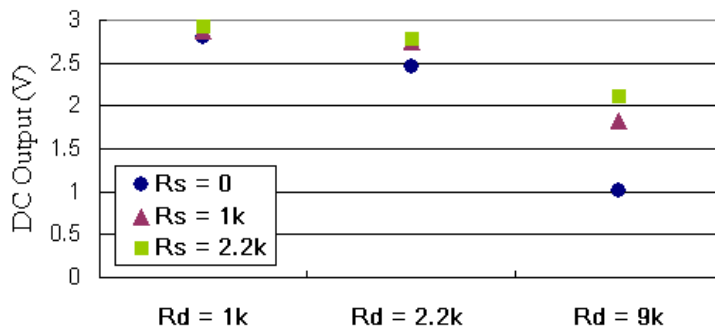
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DC Voltage at Microphone + Terminal

EK-23132-000

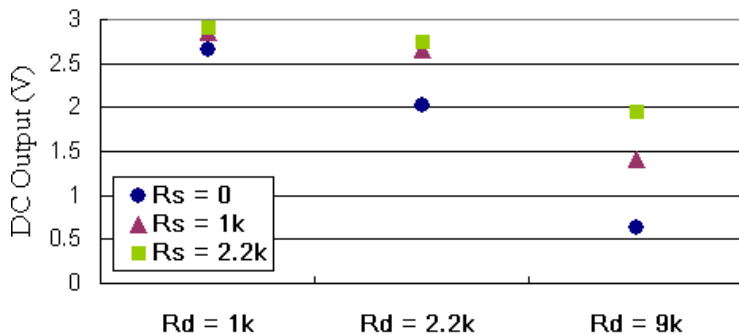


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Note: DC Voltage should be at least 1VDC at the microphone + terminal for proper function. If less than 1V appears, reduce R_{drain} and/or increase R_{source} until at least 1V appears.

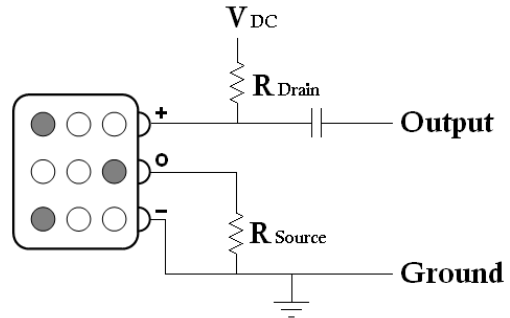
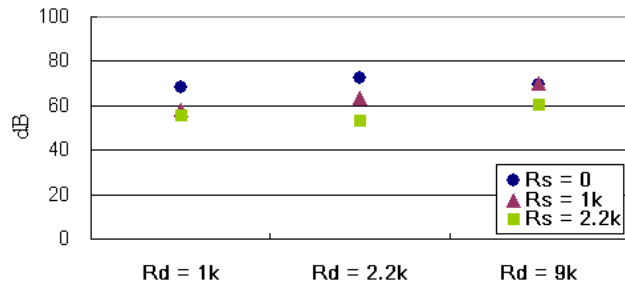
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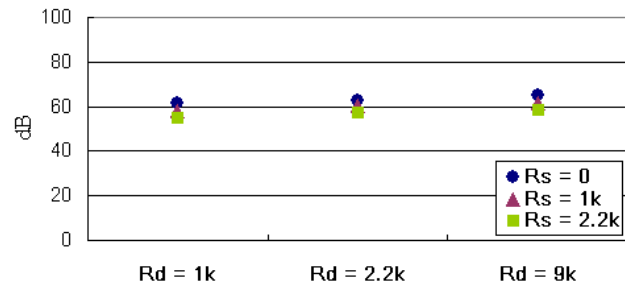
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Signal to Noise Ratio (dB assumes 1Pa input)

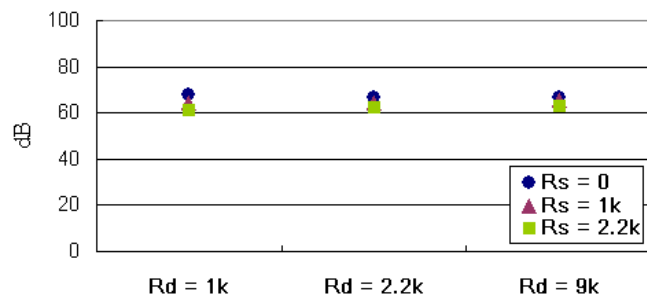
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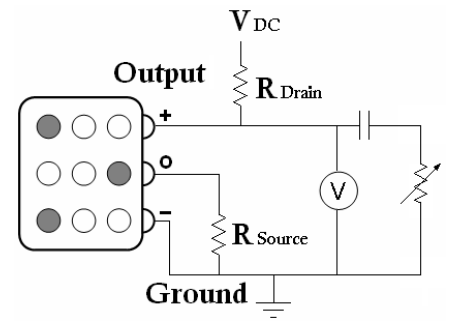
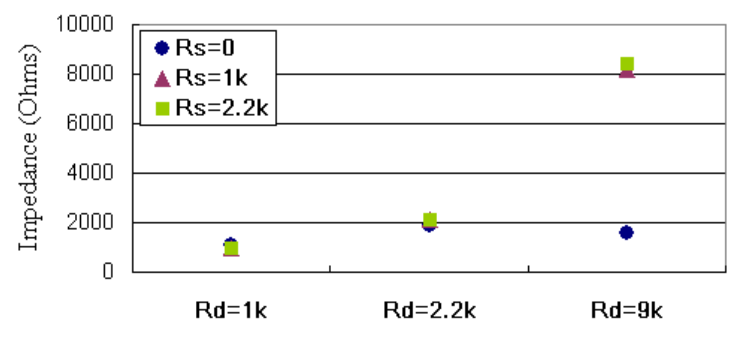


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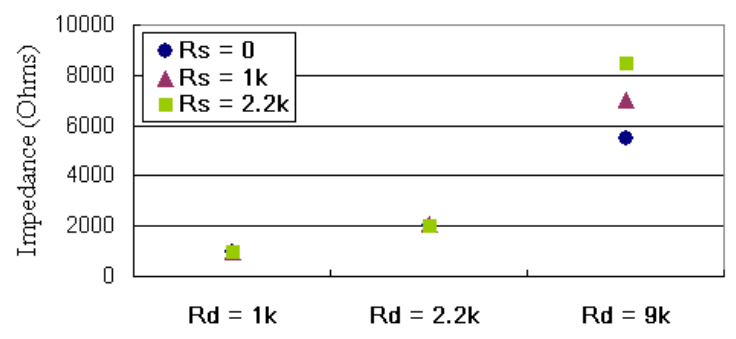
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Output Impedance (ohms)

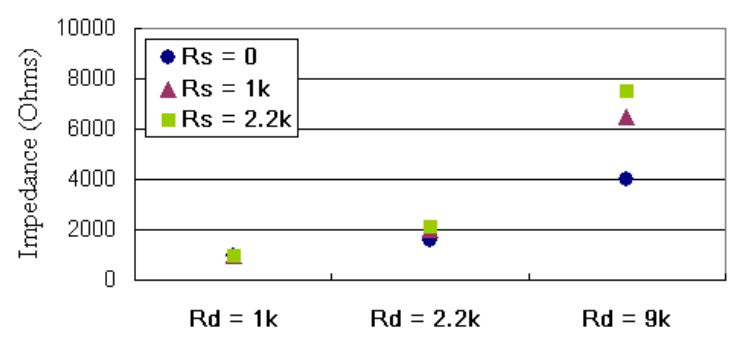
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