

# Model LC-1010

## Integrated Circuit



**FEI Microwave, Inc.**  
A SUBSIDIARY OF FREQUENCY ELECTRONICS, INC.

FEI Microwave's new integrated circuit, the LC-1010, is designed for use in a wide range of logarithmic amplifiers. It contains nine logging stages, biasing elements and an output amplifier capable of swings up to 6 volts.

(67.5 dB of RF range when used with detectors, due to the square law conversion characteristic). Each stage can have its bias current adjusted, thus allowing deviations from the square law in the detectors to be compensated.

Each stage can handle 15 dB of video signal, giving the chip the potential range of 135 dB

The adjustment ability can also be used to create transfer responses which are not logarithmic.

### Brief Specifications

Logging Range:	18 mV to 560 mV for 2 sections 18 mV to 100 mV for 1 section
Total Range:	135 dB at Video 67.5 dB at RF (with no extension) Estimated 75 dB with Linear Detector signal used for extension
Available Output Swing:	> 6 V (with a + 10 V supply)
Rise Time:	< 20 nS worst case at 6 V < 12 nS typical at 50 mV/dB
Power Supply:	< 10 mA at $\pm 8$ V, excluding load current Maximum voltage 20 V total with a minimum of 5 V on either rail; does not have to be symmetrical
Delay Time:	< 11 nS
Operating Temperature:	-54 to + 125°C
Package:	28 pin ceramic LCC

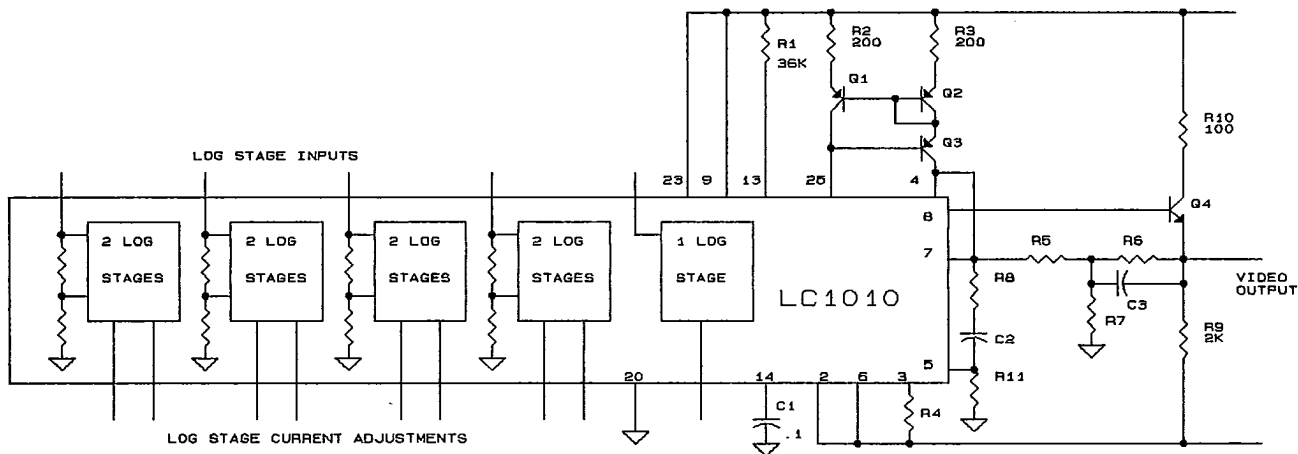
The block diagram found on the following page, shows the LC-1010 and its external components. The inputs are fed to the internal log stages which are of the standard parallel summed differential pair type. These give good linearity, coupled with high speed. Internal dividers are supplied for the two-stage sections.

The current output from the log stages is fed to a PNP current mirror, Q1, Q2, and Q3, which drives the output amplifier. Q4 is the actual output transistor and is external in order to reduce the power dissipation in the chip.

Other parts are used as described below:

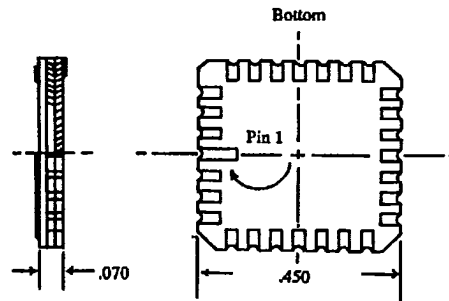
- |              |  |     |  |
|--------------|--|-----|--|
| R1           | Sets all of the log stages at a fixed slope    | C3  | Frequency compensation of the output amplifier |
| R2, R3       | Help keep the mirror balanced                  | C1  | Compensates the internal bias generator        |
| R4           | Sets the output DC offset                      | R10 | Short circuit protection                       |
| R5, R6, & R7 | Set the output slope                           |     |  |
| R8 & C2      | Frequency compensation of the output amplifier |     |  |

In addition, the slope of each individual stage can be adjusted with a resistor to the appropriate set point. A resistor to - V power will increase the slope while a resistor to ground will decrease it.



### Pin Number Allocations for the 28 Lead LCC

Pin Number	Description
1	Current Adjust for Log Stage 5
2	Negative Power Supply for Log Stages
3	Output Offset Adjust
4	Current to Cancel that from the PNP Mirror and balance the output
5	Output Amp Positive Input
6	Negative Power Supply for Output Stage
7	Output Amp Negative Input
8	Drive to External Output Transistor
9	Positive Power Supply
10	Output Short Circuit Protection
11	Log Stage 9 Input
12	Current Adjust for Log Stage 9
13	Current Adjust for All Log Stages Together
14	Decoupling for Bias Generator
15	Current Adjust for Log Stage 4
16	Current Adjust for Log Stage 3



Pin Number	Description
17	Current Adjust for Log Stage 1
18	Current Adjust for Log Stage 2
19	Log Stage 1 and 2 Input
20	Ground
21	Log Stage 3 and 4 Input
22	Log Stage 5 and 6 Input
23	Log Stage OP (normally + V Power Rail)
24	Log Stage 7 and 8 Input
25	Log Stage Output to Mirror
26	Current Adjust for Log Stage 7
27	Current Adjust for Log Stage 8
28	Current Adjust for Log Stage 6



**FEI Microwave, Inc.**  
A SUBSIDIARY OF FREQUENCY ELECTRONICS, INC.

825 Stewart Drive  
Sunnyvale, CA 94086-4514  
408 732 0880 FAX: 408 730 1611

Copyright 1989  
FEI Microwave, Inc.

Printed in U.S.A.  
Form No. 1489