MOTOROLA

MC13055

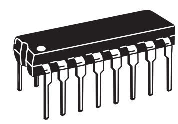
Wideband FSK Receiver

The MC13055 is intended fo RF data link systems using carrier frequencies up to 40 MHz and FSK (frequency shift keying) data rates up to 2.0 M Baud (1.0 MHz). This design is similar to the MC3356, except that it does not include the oscillator/mixer. The IF bandwidth has been increased and the detector output has been revised to a balanced configuration. The received signal strength metering circuit has been retained, as has the versatile data slicer/comparator.

- Input Sensitivity 20 µV @ 40 MHz
- Signal Strength Indicator Linear Over 3 Decades
- Available in Surface Mount Package
- Easy Application, Few Peripheral Components

WIDEBAND FSK RECEIVER

SEMICONDUCTOR TECHNICAL DATA



P SUFFIX
PLASTIC PACKAGE
CASE 648

D SUFFIX
PLASTIC PACKAGE
CASE 751B
(SO–16)

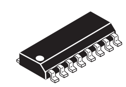
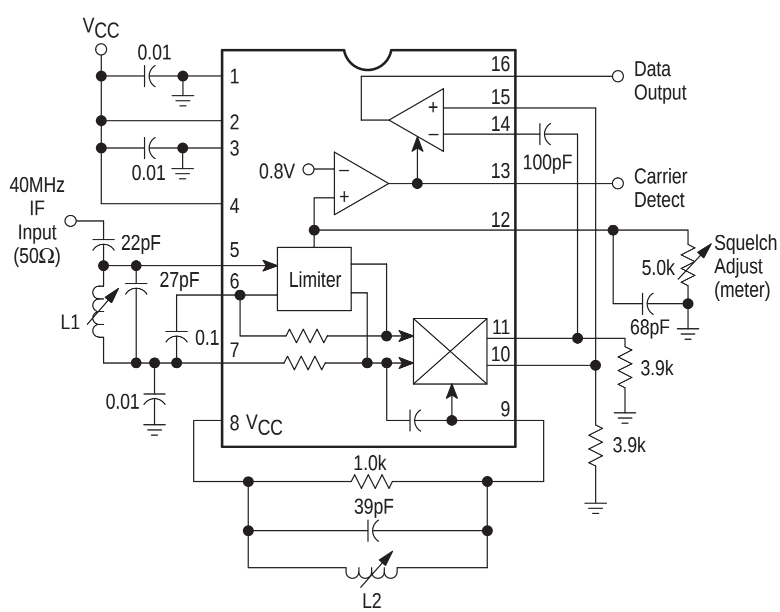
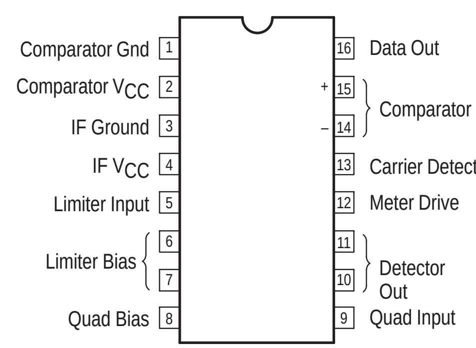


Figure 1. Block Diagram and Application Circuit



PIN CONNECTIONS



ORDERING INFORMATION

Device	Operating Temperature Range	Package
MC13055D	T_A = – 40 to +85°C	SO–16
MC13055P		Plastic DIP

NOT RECOMMENDED FOR NEW DESIGNS

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Power Supply Voltage	$V_{CC(max)}$	15	Vdc
Operating Supply Voltage Range	V2, V4	3.0 to 12	Vdc
Junction Temperature	T_J	150	°C
Operating Ambient Temperature Range	T_A	–40 to +85	°C
Storage Temperature Range	T_{stg}	–65 to +150	°C
Power Dissipation, Package Rating	P_D	1.25	W

ELECTRICAL CHARACTERISTICS (V_{CC} = 5.0 Vdc, f_o = 40 MHz, f_{mod} = 1.0 MHz, Δf = ±1.0 MHz, T_A = 25°C, test circuit of Figure 2.)

Characteristic	Conditions	Min	Typ	Max	Unit
Total Drain Current	12 + 14	–	20	25	mA
Data Comparator Pull–Down Current	I16	–	10	–	mA
Meter Drive Slope versus Input	I12	4.5	7.0	9.0	µA/dB
Carrier Detect Pull–Down Current	I13	–	1.3	–	mA
Carrier Detect Pull–Up Current	I13	–	500	–	µA
Carrier Detect Threshold Voltage	V12	690	800	1010	mV
DC Output Current	I10, I11	–	430	–	µA
Recovered Signal	V10 – V11	–	350	–	mVrms
Sensitivity for 20 dB S + N/N, BW = 5.0 MHz	VIN	–	20	–	µVrms
S + N/N at V_{in} = 50 µV	V10 – V11	–	30	–	dB
Input Impedance @ 40 MHz R_{in} C_{in}	Pin 5, Ground	– –	4.2 4.5	– –	kΩ pF
Quadrature Coil Loading R_{in} C_{in}	Pin 9 to 8	– –	7.6 5.2	– –	kΩ pF

Figure 2. Test Circuit

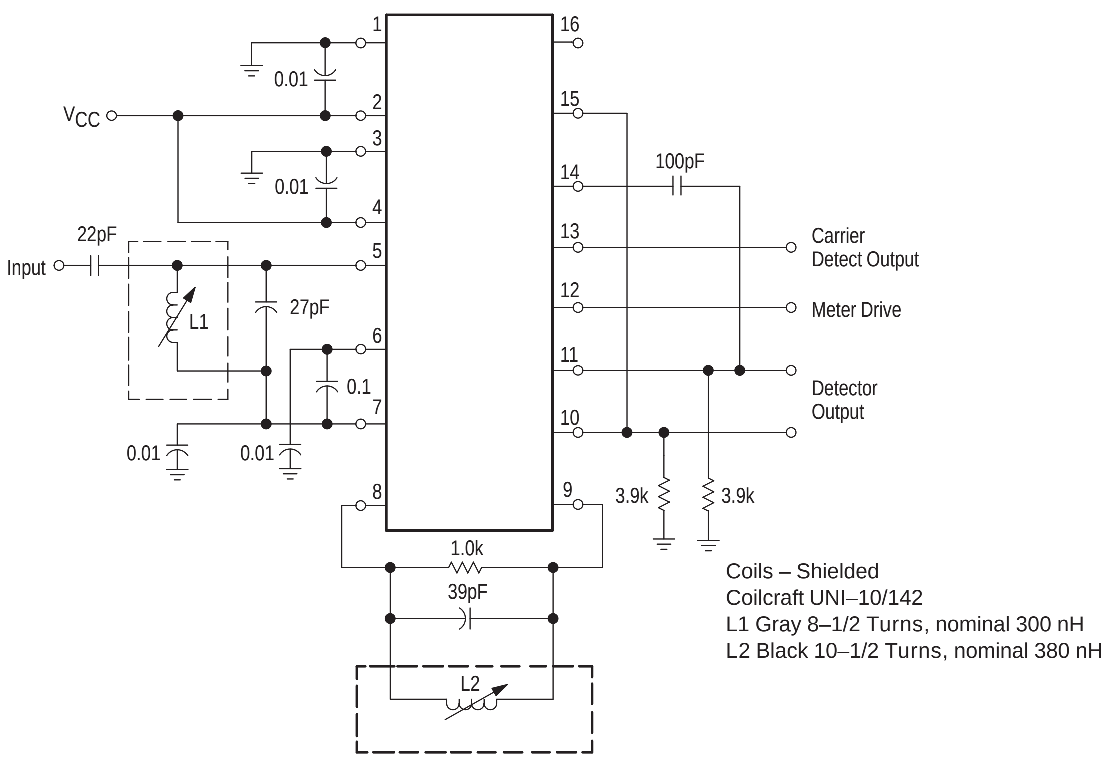


Figure 3. Overall Gain, Noise, AM Rejection

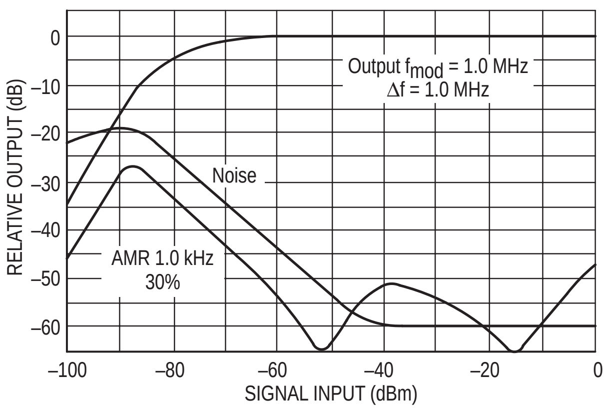


Figure 4. Meter Current versus Signal

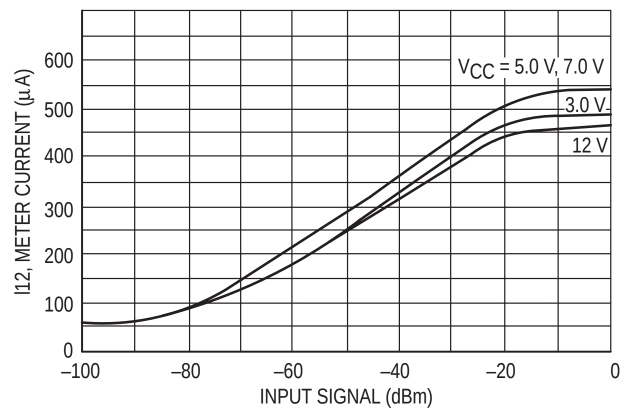


Figure 5. Untuned Input: Limiting Sensitivity versus Frequency

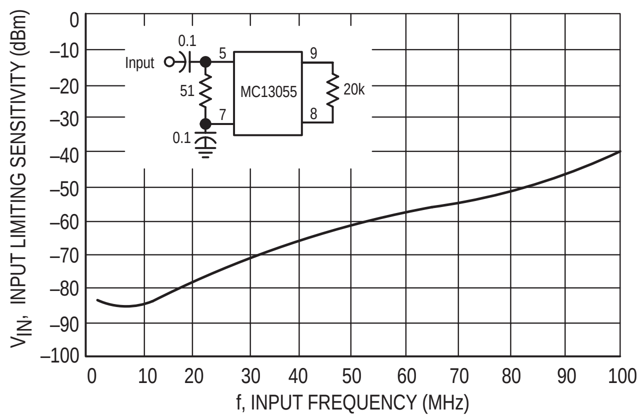


Figure 6. Untuned Input: Meter Current versus Frequency

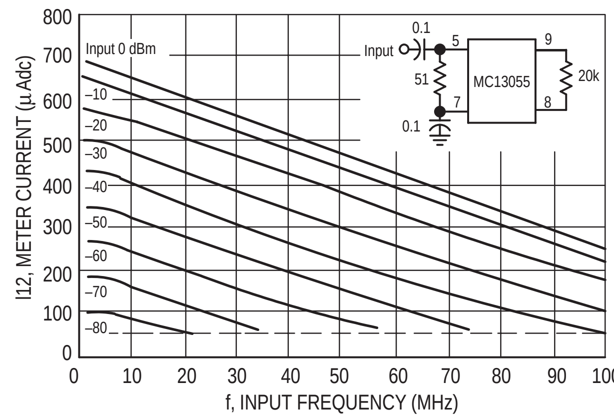


Figure 7. Limiting Sensitivity and Detuning versus Supply Voltage

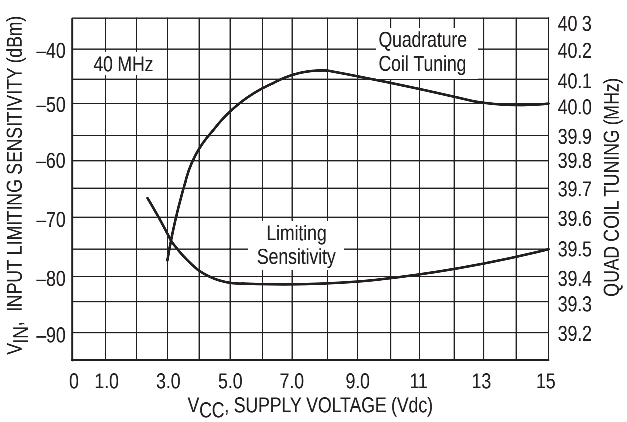


Figure 8. Detector Current and Power Supply Current versus Supply Voltage

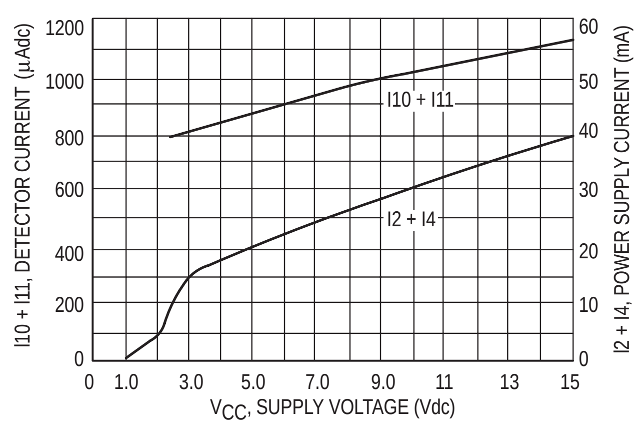


Figure 9. Recovered Audio versus Temperature

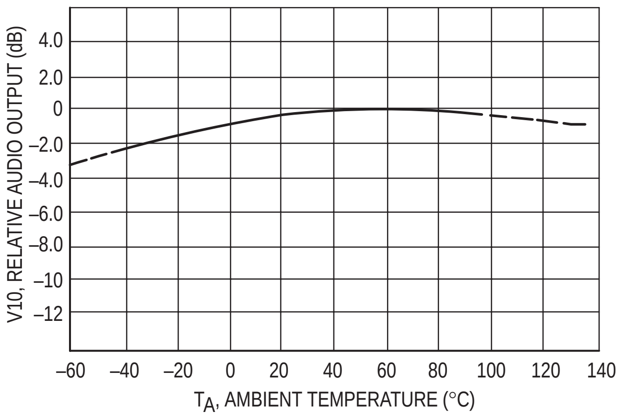


Figure 10. Carrier Detect Threshold versus Temperature

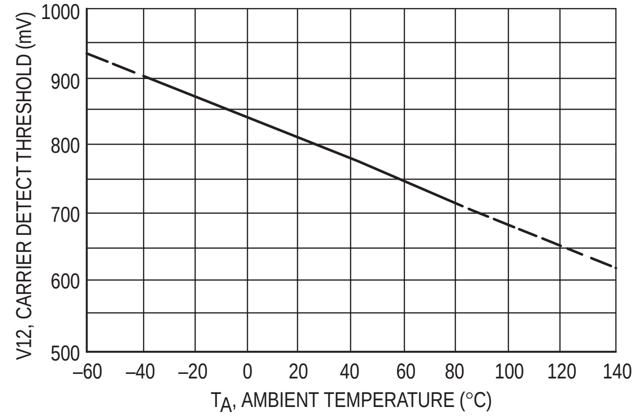


Figure 11. Meter Current versus Temperature

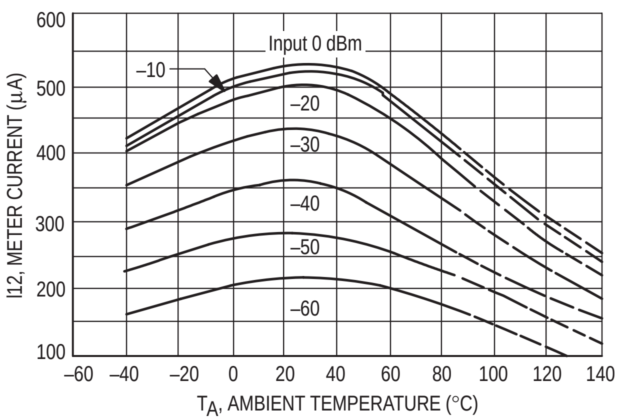


Figure 12. Input Limiting versus Temperature

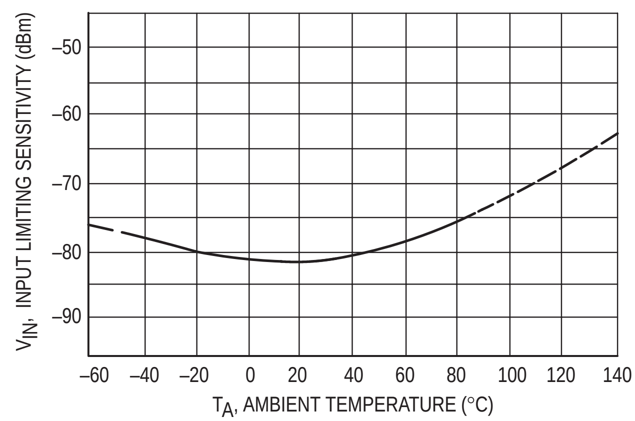
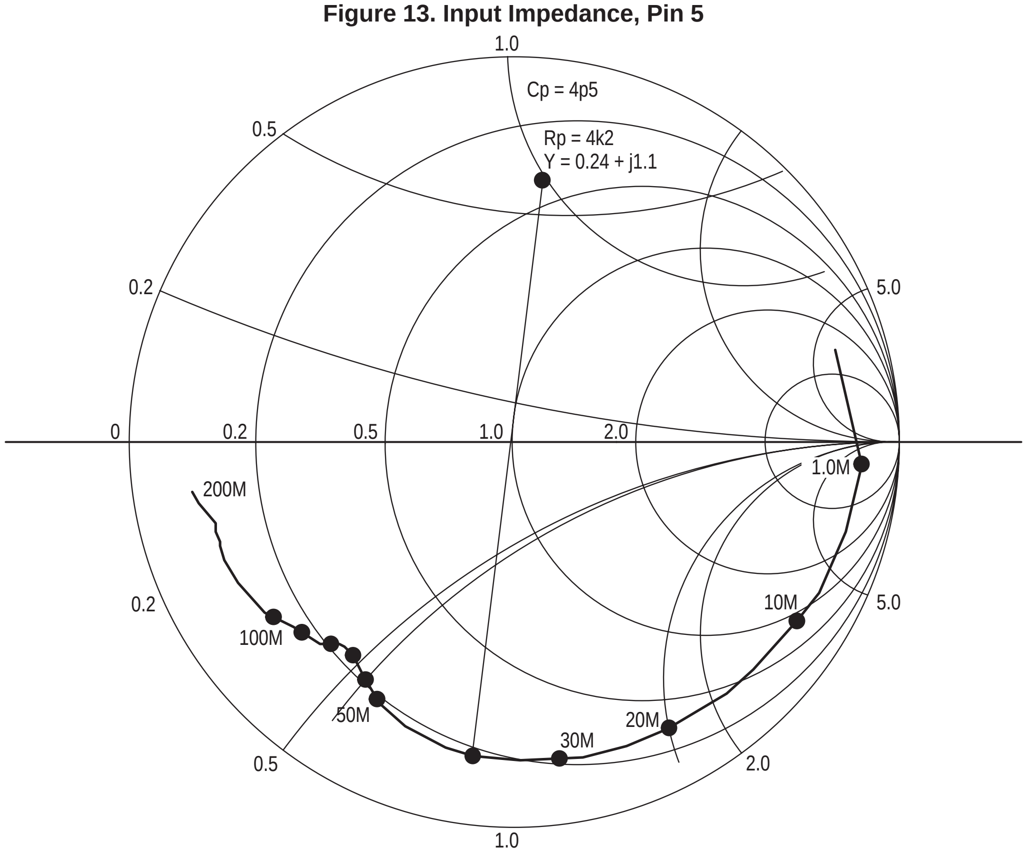
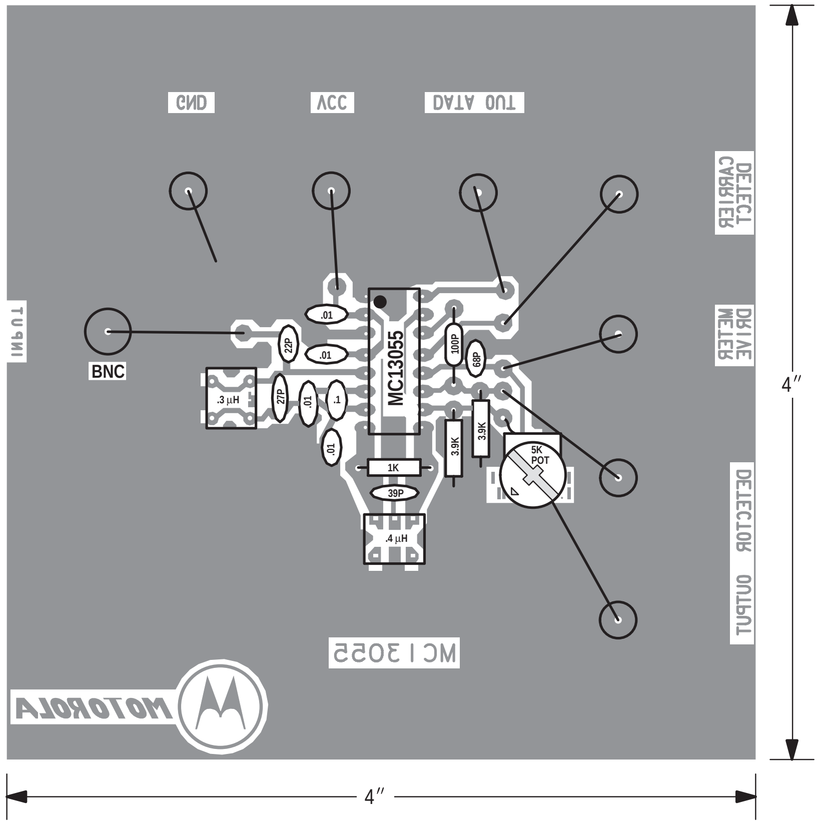


Figure 13. Input Impedance, Pin 5

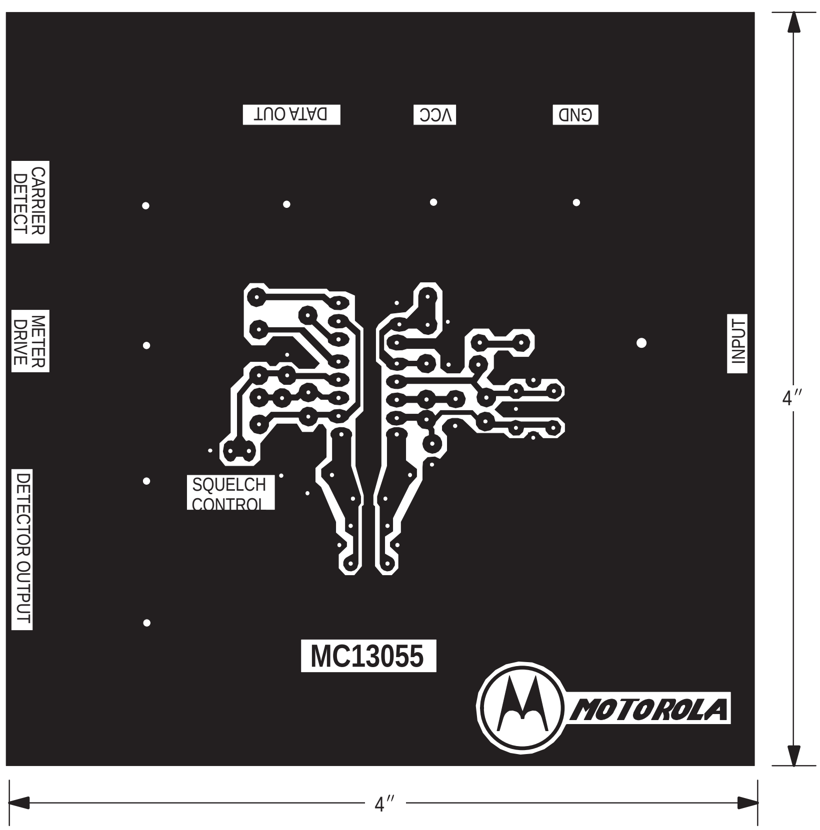


NOT RECOMMENDED FOR NEW DESIGNS

Figure 14. Test Fixture
(Component Layout)

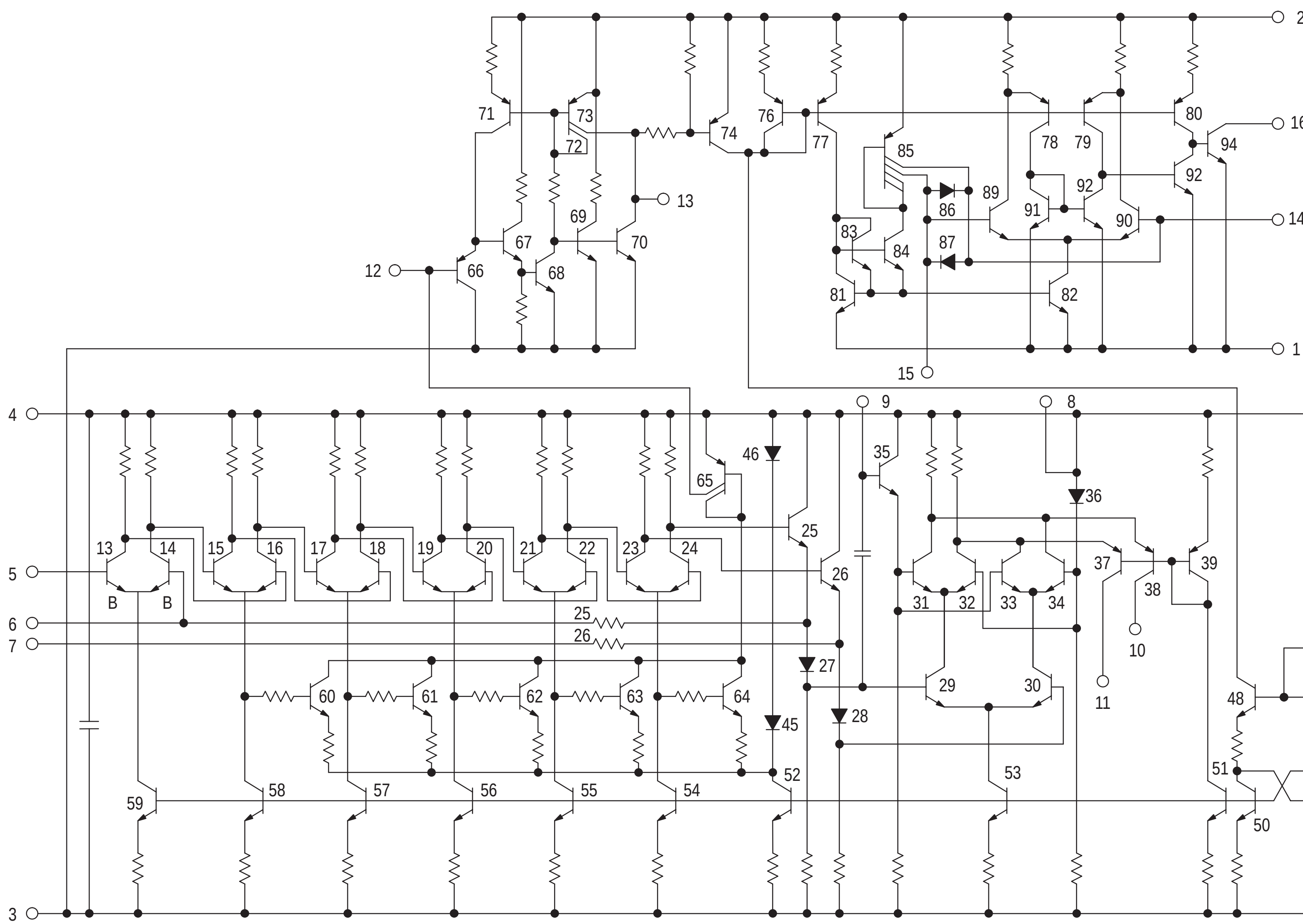


(Circuit Side View)



NOT RECOMMENDED FOR NEW DESIGNS

Figure 15. Internal Schematic



NOT RECOMMENDED FOR NEW DESIGNS

GENERAL DESCRIPTION

The MC13055 is an extended frequency range FM IF, quadrature detector, signal strength detector and data shaper. It is intended primarily for FSK data systems. The design is very similar to MC3356 except that the oscillator/mixer has been removed, and the frequency capability of the IF has been raised about 2:1. The detector output configuration has been changed to a balanced, open–collector type to permit symmetrical drive of the data shaper (comparator). Meter drive and squelch features have been retained.

The limiting IF is a high frequency type, capable of being operated up to 100 MHz. It is expected to be used at 40 MHz in most cases. The quadrature detector is internally coupled to the IF, and a 2.0 pF quadrature capacitor is internally provided. The 20 dB quieting sensitivity is approximately 20 µV, tuned input, and the IF can accept signals up to 220 mVrms without distortion or change of detector quiescent DC level.

The IF is unusual in that each of the last 5 stages of the 6 stage limiter contains a signal strength sensitive, current sinking device. These are parallel connected and buffered to produce a signal strength meter drive which is fairly linear for IF input signals of 20 µV to 20 mVrms (see Figure 4).

A simple squelch arrangement is provided whereby the meter current flowing through the meter load resistance flips a comparator at about 0.8 Vdc above ground. The signal strength at which this occurs can be adjusted by changing the meter load resistor. The comparator (+) input and output are available to permit control of hysteresis. Good positive action can be obtained for IF input signals of above 20 µVrms. A resistor (R) from Pin 13 to Pin 12 will provide V_{CC}/R of feedback current. This current can be correlated to an amount of signal strength hysteresis by using Figure 4.

The squelch is internally connected to the data shaper. Squelch causes the data shaper to produce a high (V_{CC}) output.

The data shaper is a complete “floating” comparator, with diodes across its inputs. The outputs of the quadrature detector can be fed directly to either or preferably both inputs of the comparator to produce a squared output swinging from V_{CC} to ground in inverted or noninverted form.

NOT RECOMMENDED FOR NEW DESIGNS