

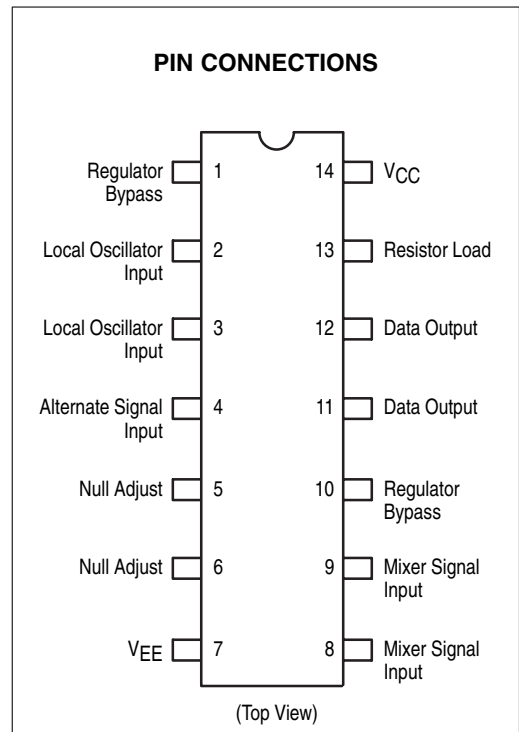
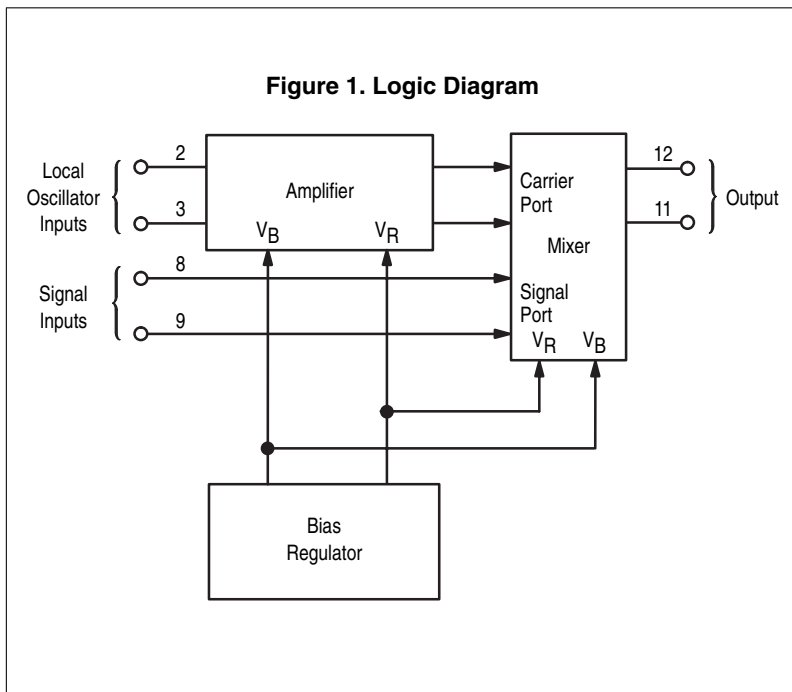
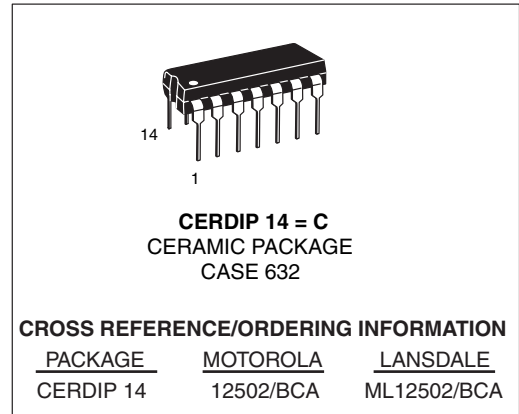
Legacy Device: Motorola 12502

The ML12502 is the military temperature version of the commercial ML12002 device. It is a double balanced analog mixer, including an input amplifier feeding the mixer carrier port and a temperature compensated bias regulator. The input circuits for both the amplifier and mixer are differential amplifier circuits. The on-chip regulator provides all of the required biasing.

This circuit is designed for use as a balanced mixer in high-frequency wide-band circuits. Other typical applications include suppressed carrier and amplitude modulation, synchronous AM detection, FM detection, phase detection, and frequency doubling, at frequencies up to UHF.

There are two package offerings:

- Dual Inline 14 Lead, Ceramic Package.
- Operating Temperature Range: $T_A = -55^\circ$ to $+125^\circ\text{C}$



ELECTRICAL CHARACTERISTICS

ABSOLUTE MAXIMUM RATINGS		Symbol	Min.	Max.	Units
Supply Voltage		VCC		+ 7.0	Vdc
Output Voltage		VOUT		+ 5.5	Vdc
Input Voltage		VIN		+ 5.5	Vdc
Operating Temperature Range		TA	- 55	+ 125	°C
Storage Temperature Range		Tstg	- 65	+ 175	°C

Test Temperature	Test Voltage Values (Volts)				
	V _{IH}	V _{IL}	V _{ILX}	V _{CC}	V _{EE}
TA = 25 °C	+ 2.9	+ 2.0	- 3.0	+ 5.0	- 5.0
TA = 125 °C	+ 2.9	+ 2.0		+ 5.0	
TA = -55 °C	+ 2.9	+ 2.0		+ 5.0	

Symbol	Parameter	Limits						Units	TEST VOLTAGE APPLIED TO PINS BELOW					
		+ 25 °C		+ 125 °C		- 55 °C			Pinouts referenced are for DIL package, check Pin Assignments Output Load = 50 Ω to Gnd					
Functional Parameters:		Subgroup 1		Subgroup 2		Subgroup 3			V _{IH}	V _{IL}	V _{CC}	V _{EE}	P.U.T.	
V _{Bias 1}	Bias Voltage	Min	2.32	Max	2.52	Min	2.34	Max	2.54					1
V _{Bias 4}	Bias Voltage		400		600		420		620					4
V _{Bias 5}	Bias Voltage		285		425		305		445					5
V _{Bias 6}	Bias Voltage		285		425		305		445					6
V _{Bias 10}	Bias Voltage		1.185		1.385		1.05		1.25					10
IO ₁	Power Supply Drain Current		0.7		1.3									11, 12
ΔIO ₁	Differential Current		- 50		50									11, 12
IO ₂	Power Supply Drain Current		2.1		3.9									11, 12
ΔIO ₂	Differential Current		- 100		100									11, 12
ICC	Power Supply Drain Current				16.0									14
I _{INH}	Input Current High				0.75									2, 3, 8, 9
I _{INL}	Input Current Low		- 0.7											2, 3, 8, 9
IO _{UT}	Output Current		4.2		7.8									11, 12, 14

ELECTRICAL CHARACTERISTICS

Test Temperature	Test Voltage Values (Volts)				
	V _{IH}	V _{IL}	V _{ILX}	V _{CC}	V _{EE}
T _A = 25 °C	+ 2.9	+ 2.0	-3.0	+ 5.0	-5.0
T _A = 125 °C	+ 2.9	+ 2.0		+ 5.0	
T _A = -55 °C	+ 2.9	+ 2.0		+ 5.0	

Symbol	Parameter	Limits						Units	TEST VOLTAGE APPLIED TO PINS BELOW
		+ 25 °C		+ 125 °C		- 55 °C			
	Functional Parameters:	Subgroup 9		Subgroup 10		Subgroup 11			Pinouts referenced are for DIL package, check Pin Assignments Output Load = 50 Ω to GND
		Min	Max	Min	Max	Min	Max		V _{ILX} V _{IN} V _{OUT} V _{CC} V _{EE} P.U.T.
AV1	AC Gain	5.0						V/V	9 2 11, 12 14 7 11, 12
AV2	AC Gain	0.28						V/V	3 8 11, 12 14 7 11, 12

NOTE: AC Gain is a function of the collector impedance.

Figure 2. Analog Mixer Circuit Schematic

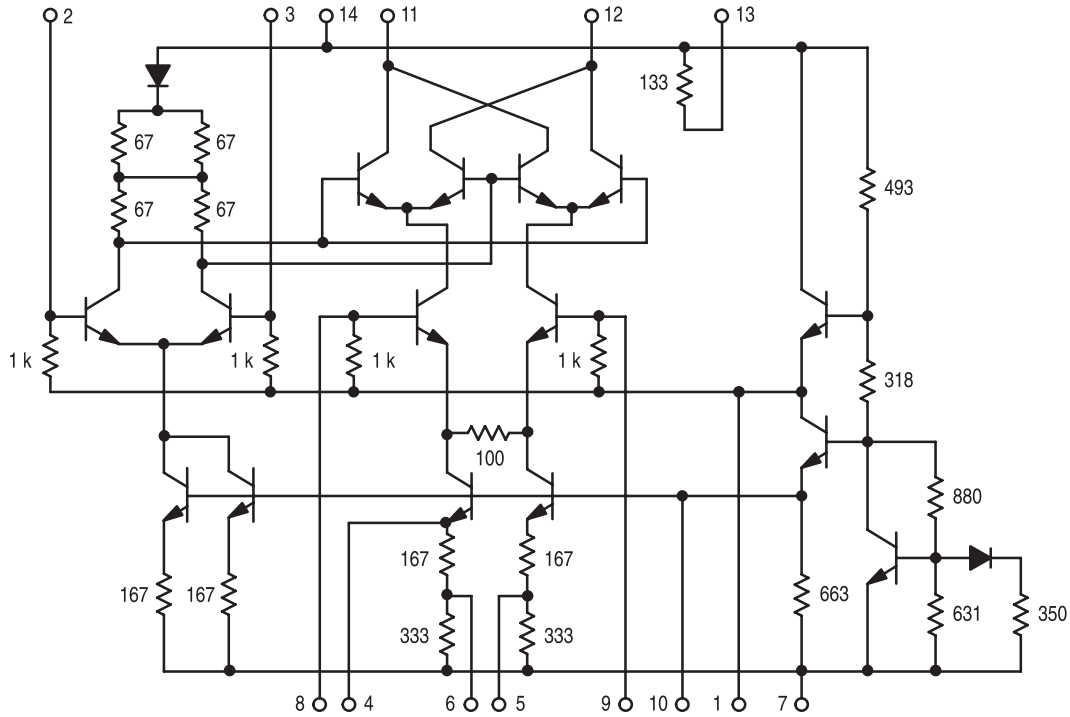
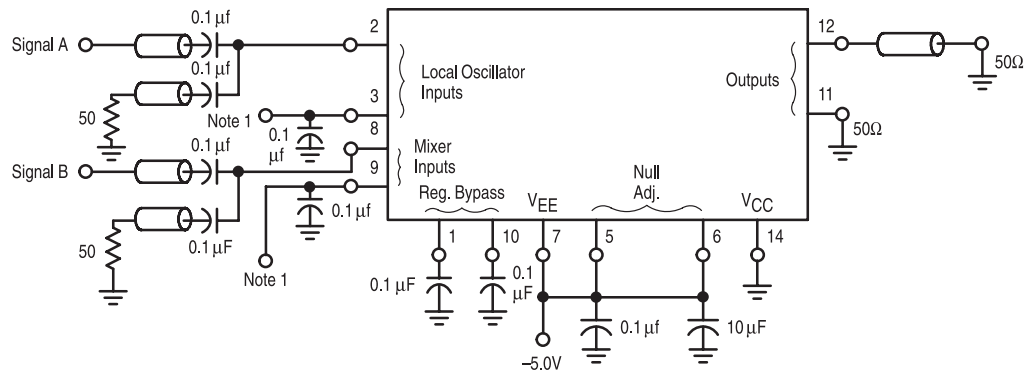


Figure 3. AC Gain Test

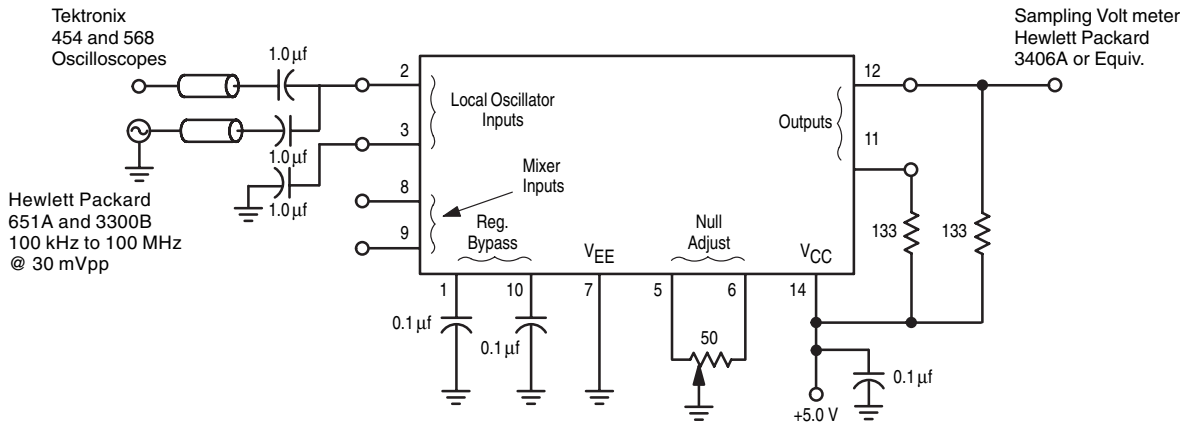
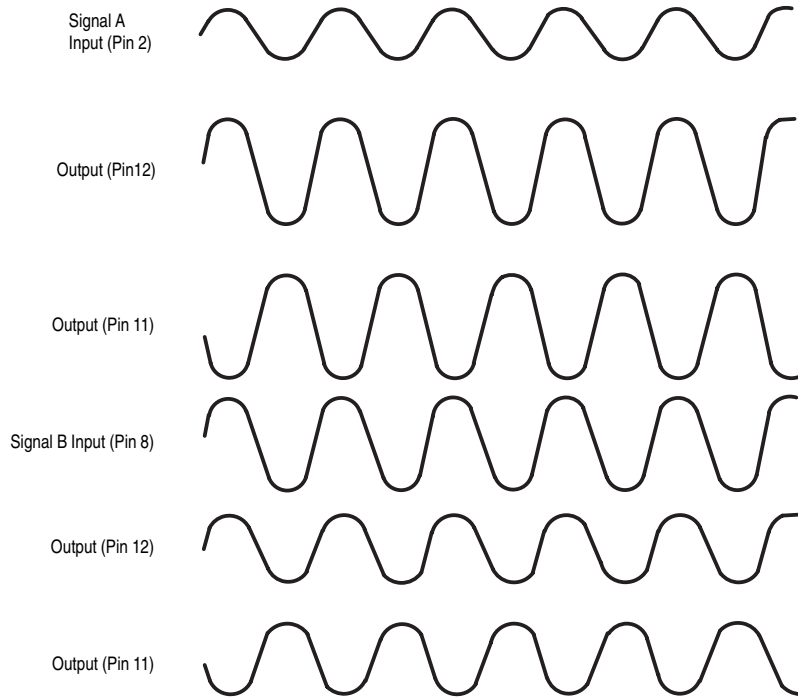


Note 1:
 $V_{IL} = -3.0\text{ V}$ on pin 3 when pin 8 is under test.
 $V_{IL} = -3.0\text{ V}$ on pin 9 when pin 2 is under test.

Signal A = 30 mVpp
 Signal B = 300 mVpp
 Freq. = 100 MHz

All input and output cables to the scope are equal lengths of 50-ohm coaxial cable. The unused output is connected to a 50-ohm resistor to ground.

Figure 4. Carrier Feedthrough Test Circuits



Notes:
 Test 1 – Adjust potentiometer for carrier null at $f_c = 100$ kHz.
 Test 2 – Connect pins 5 and 6 to Gnd.

All Input and output cables to the scope are equal lengths of 50-ohm coaxial cable.

Figure 5. Carrier Feedthrough versus Frequency (Test 1)

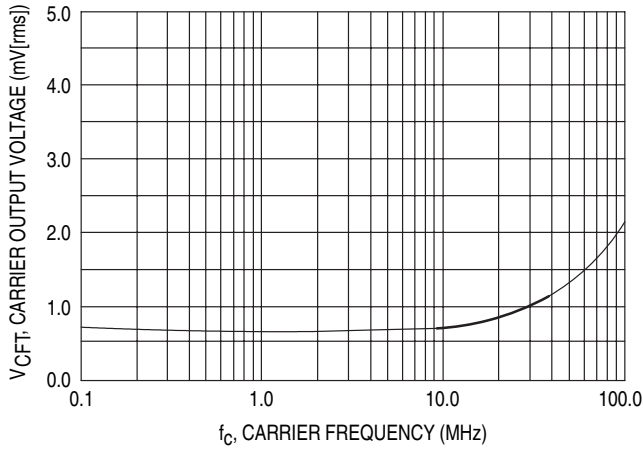


Figure 6. Carrier Feedthrough versus Frequency (Test 2)

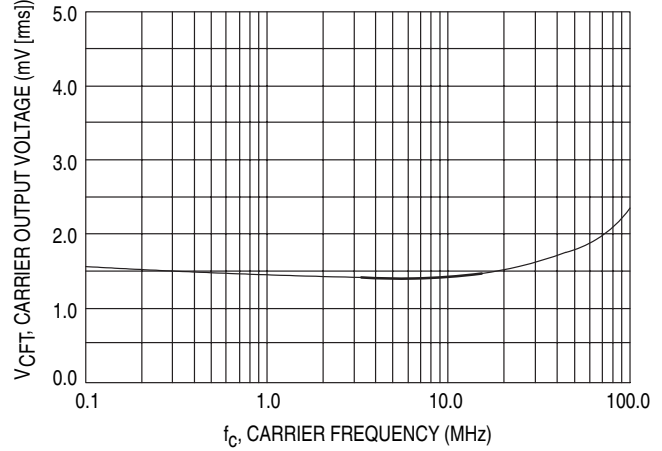
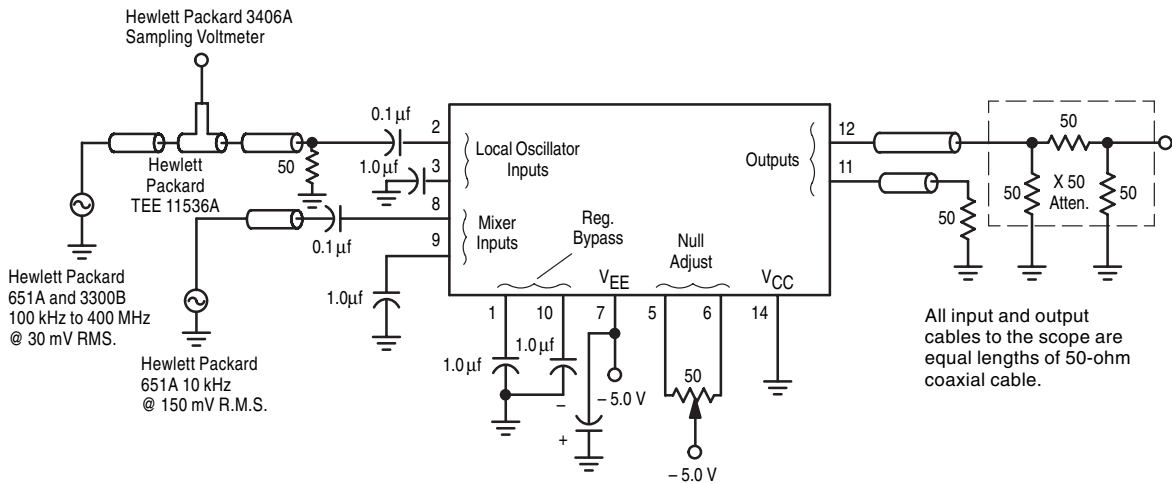


Figure 7. Carrier Suppression Test Circuit



- Notes:
 Test 1 – Adjust potentiometer for carrier null @ $f_c = 100$ kHz
 Test 2 – Connect pins 5 and 6 to -5.0 volts
 Test 3 – Adjust potentiometer for carrier null @ 25° C

Figure 8. Carrier Suppression versus Frequency (Test 1)

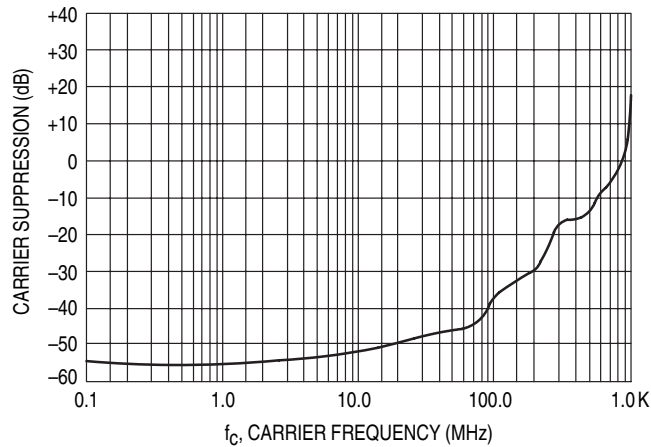


Figure 9. Carrier Suppression versus Frequency (Test 2)

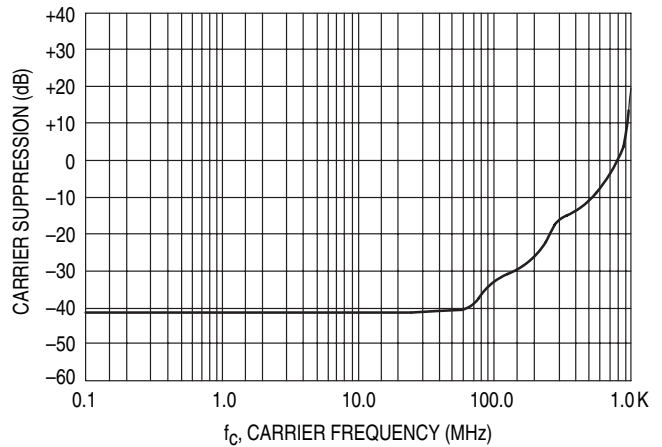


Figure 10. Carrier Suppression versus Temperature

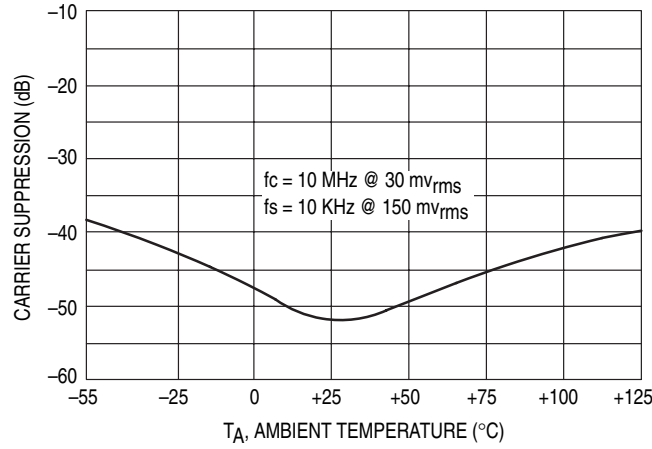


Figure 11. Output Offset Current (I_{OO}) versus Temperature

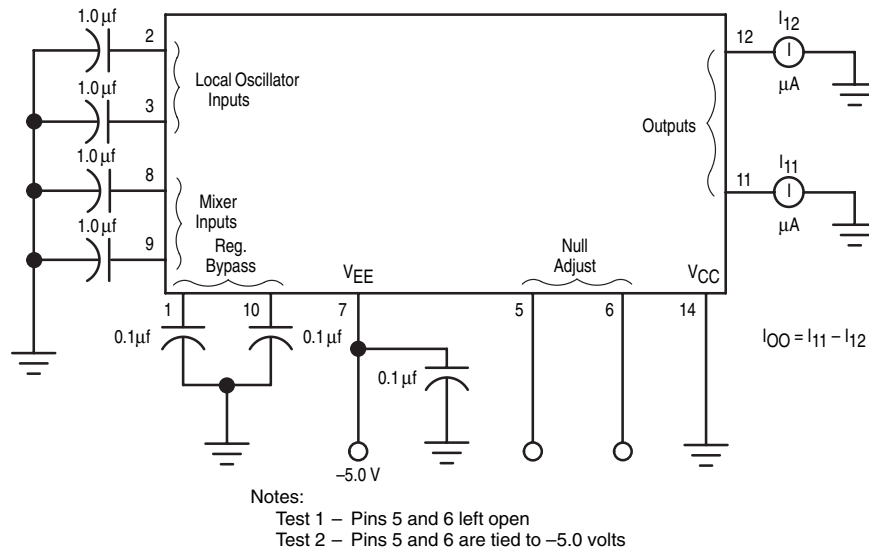


Figure 12. Output Offset Current versus Temperature

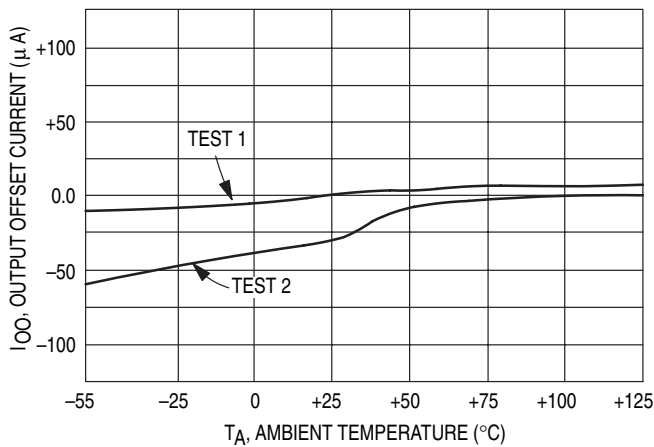
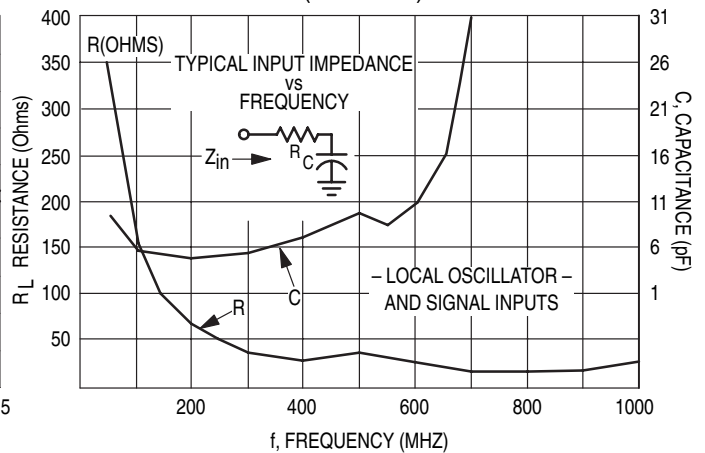
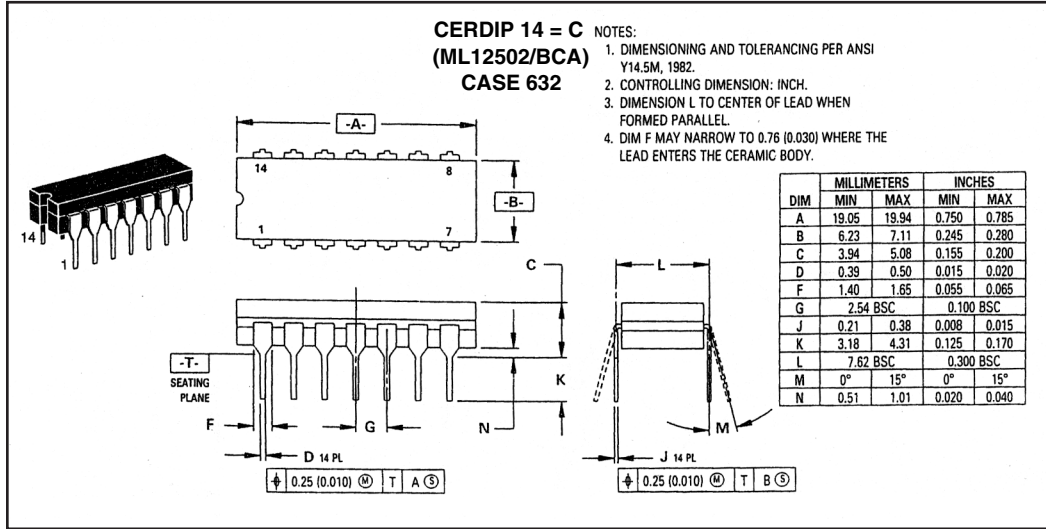


Figure 13. Typical Input Impedance versus Frequency (No Circuit)



OUTLINE DIMENSIONS



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