

DOUBLE BALANCED MODULATOR/DEMODULATOR

■ GENERAL DESCRIPTION

The NJM1496 is a double balanced modulator-demodulator which produces an output voltage proportional to the product of an input (signal) voltage and a switching (carrier) signal. Typical applications include suppressed carrier modulation, amplitude modulation, synchronous detection, FM or PM detection, broadband frequency doubling and chopping.

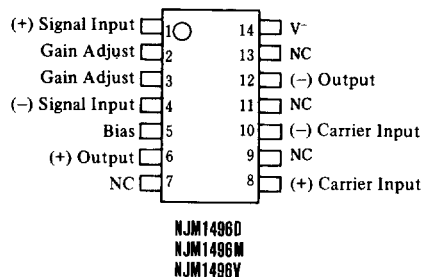
■ FEATURES

- Excellent carrier suppression
65dB typical at 0.5MHz
50 dB typical at 10MHz
- Adjustable gain and signal handling
- Fully balanced inputs and outputs
- High Common Mode Rejection 85dB Typ.
- Package Outline DIP14, DMP14, SSOP14
- Bipolar Technology

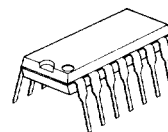
■ APPLICATION

- Balanced Modulation
- Synchronous Detection
- FM Detection
- Phase Detection
- Sampling

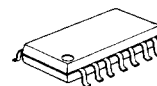
■ PIN CONFIGURATION



■ PACKAGE OUTLINE



NJM1496D

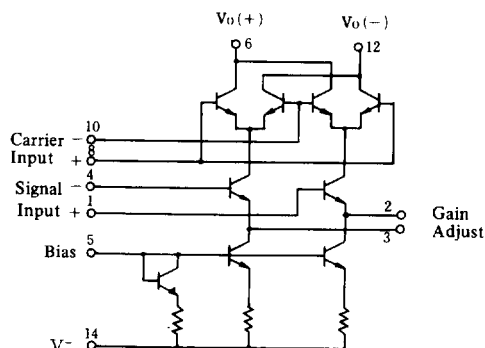


NJM1496M



NJM1496V

■ EQUIVALENT CIRCUIT





■ ABSOLUTE MAXIMUM RATINGS

(Ta=25°C)

PARAMETER	RATINGS	UNIT
Applied Voltage	30(Applied Pins 6-8, 12-8, 6-10, 12-10, 10-1, 8-1, 10-4, 8-4, 2-5, 3-5)	V
Carrier Input Voltage	± 5 (Applied Pins 8-10)	V
Signal Input Voltage	$\pm (5 + I_{Re})$ (Applied Pins 1-4)	V
Input Signal	5	V
Bias Current (Is)	10	mA
Power Dissipation	(DIP14) 570	mW
	(DMP14) 300	mW
	(SSOP14) 300	mW
Operating Temperature Range	-20 ~ +75	°C
Storage Temperature Range	-40 ~ +125	°C

■ ELECTRICAL CHARACTERISTICS

DC Characteristics (V⁺=12V, V⁻=-8V, I_S=1.0mA, R_L=3.9k Ω , R_e=1.0k Ω , Ta=25°C)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Single-Ended Input Impedance						
Parallel Input Resistance	R _{ip}	Signal Port, f=5.0MHz	—	200	—	k Ω
Parallel Input Capacitance	C _{ip}	Signal Port, f=5.0MHz	—	2.0	—	pF
Single-Ended Output Impedance						
Parallel Output Resistance	R _{op}	f=10MHz	—	40	—	k Ω
Parallel Output Capacitance	C _{op}	f=10MHz	—	5.0	—	pF
Input Bias Current						
I _{bs} = I ₁ + I ₄ /2	I _{bs}		—	12	30	μ A
I _{bc} = I ₈ + I ₁₀ /2	I _{bc}		—	12	30	μ A
Input Offset Current						
I _{ios} = I ₁ - I ₄	I _{ios}		—	0.7	7	μ A
I _{ioc} = I ₈ - I ₁₀	I _{ioc}		—	0.7	7	μ A
Average Temperature Coefficient of Input Offset Current	ΔI_{io}		—	2.0	—	nA/°C
Output Offset Current (I ₆ - I ₁₂)	I _{oc}		—	15	80	μ A
Average Temperature Coefficient of Output Offset Current	ΔI_{ioc}		—	90	—	nA/°C
Output Voltage	V _o		—	8.0	—	V
Operating Current						
(I ₆ + I ₁₂)	I _{D+}		—	2.0	4.0	mA
I ₁₄	I _{D-}		—	3.0	5.0	mA
DC Power Dissipation	P _D		—	33	—	mW



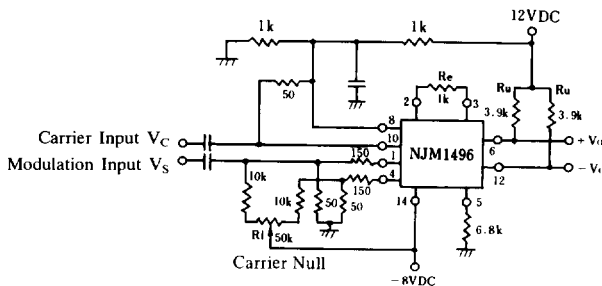
ELECTRICAL CHARACTERISTICS

AC Characteristics ($V^+=12V$, $V^-=-8V$, $I_S=1.0mA$, $R_L=2.9k\Omega$, $R_e=1.0k\Omega$, $T_a=25^\circ C$)

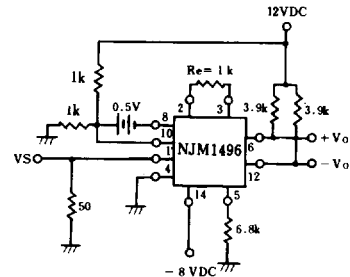
PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Carrier Feedthrough	V_{CFT}	$V_c = 60mV_{rms}$ sine wave offset adjusted				
		$f_c = 1.0kHz$	—	40	—	μV_{rms}
		$f_c = 10MHz$	—	140	—	μV_{rms}
	V_{CFT}	$V_c = 300mV_{p-p}$ square wave offset adjusted				
		$f_c = 1.0kHz$	—	0.04	0.4	mV_{rms}
		offset not adjusted	—	20	200	mV_{rms}
Carrier Suppression	V_{CS}	$f_s = 10kHz$, $300mV_{rms}$ sine wave offset adjusted				
		$f_c = 500kHz$, $60mV_{rms}$ sine wave	40	65	—	dB
		$f_c = 10MHz$, $60mV_{rms}$ sine wave	—	50	—	dB
Transadmittance Bandwidth ($R_L = 50\Omega$)		$V_c = 60mV_{rms}$ sine wave				
Carrier Input Port	BW 3dB	$f_s = 1.0kHz$, $300mV_{rms}$ sine wave	—	300	—	MHz
Signal Input Port	BW 3dB	$V_s = 300mV_{rms}$ sine wave $ V_c \approx f \cdot 5V_{dc}$		80		MHz
Voltage Gain, Signal Channel	AV_s	$V_s = 100mV_{rms}$ $f_s = 1.0kHz$ $ V_c = 0.5V_{dc}$	2.5	3.5	—	V/V
Signal Port Common Mode Input Voltage Range	CM_V	$f_s = 1.0kHz$	—	5.0	—	V _{p-p}
Signal Port Common Mode Rejection Ratio	ACM	$f_s = 1.0kHz$, $ V_c = 0.5V_{dc}$	—	-85	—	dB
Differential Output Swing Capability	DV_{out}		—	8.0	—	V _{p-p}

TEST CIRCUIT

- Carrier feedthrough
- Carrier Suppression



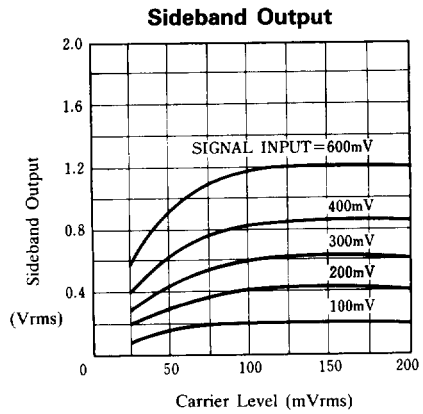
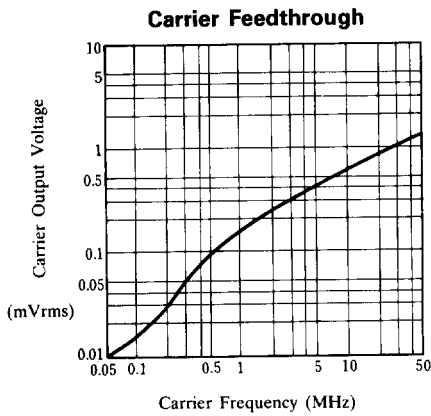
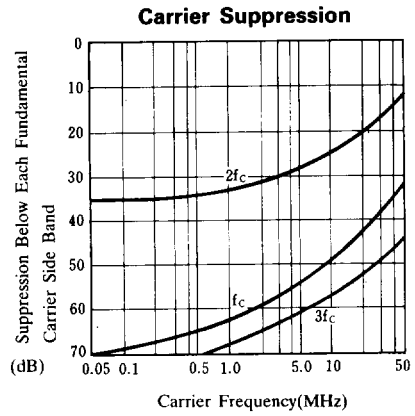
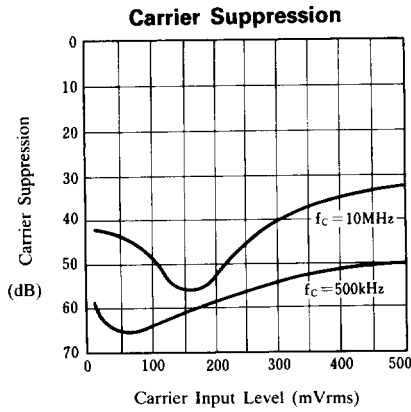
- Differential Output Swing Capability
- Signal Port Common Mode Rejection Ratio



Connect a $100\mu F$ capacitor and a $3000pF$ capacitor in parallel to each other, if the capacitance is not specified.



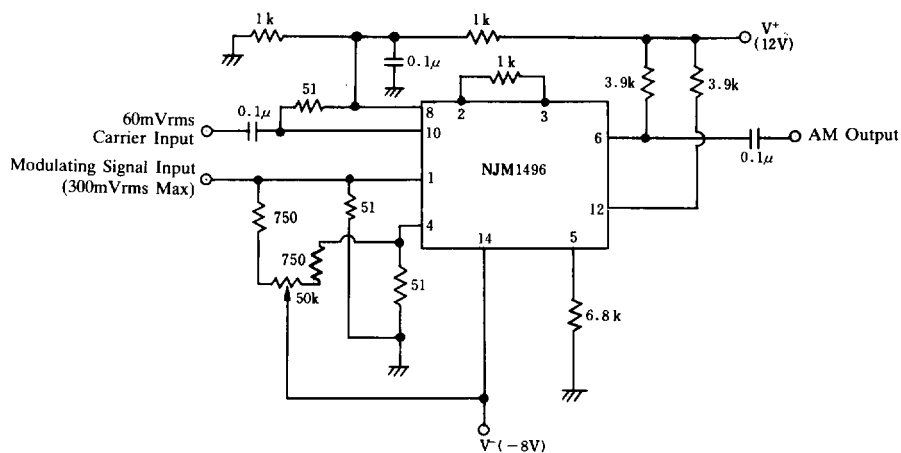
■ TYPICAL CHARACTERISTICS





■ TYPICAL APPLICATIONS

AM Modulator Circuit



Product Detector (+12V DC Single Supply)

