

DOUBLE BALANCED MODULATION / 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.

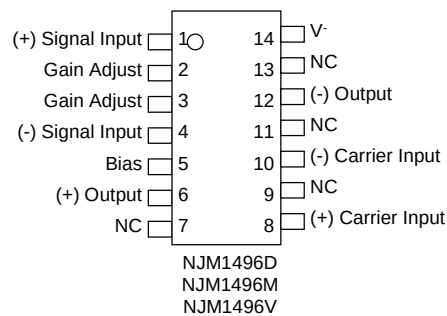
■ FEATURES

- Excellent carrier suppression
65dB typical at 0.5MHz
50dB 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

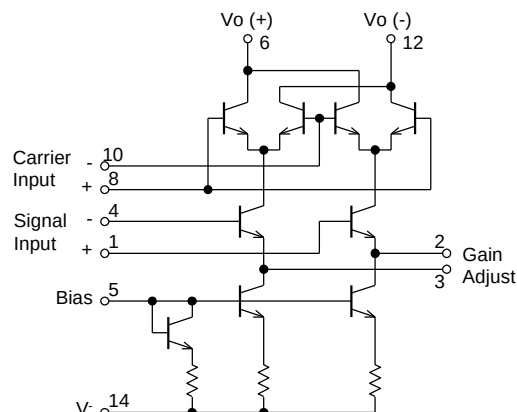
■ APPLICATION

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

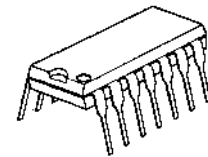
■ PIN CONFIGURATION



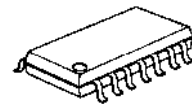
■ EQUIVALENT CIRCUIT



■ PACKAGE OUTLINE



NJM1496D



NJM1496M



NJM1496V

■ ABSOLUTE MAXIMUM RATINGS

(T_a=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	±(5+I _s •R _e) (Applied Pins 1-4)	V
Input Signal	5	V
Bias Current (I _s)	10	mA
Power Dissipation	(DIP14) 570	mW
	(DMP14) 300	mW
	(SSOP14) 300	mW
Operating Temperature Range	-40 to +85	°C
Storage Temperature Range	-40 to +125	°C

■ ELECTRICAL CHARACTERISTICS

DC characteristics (V⁺=12V, V⁻=-8V, I_s=1.0mA, R_L=3.9kΩ, R_e=1.0kΩ, T_a=25°C)

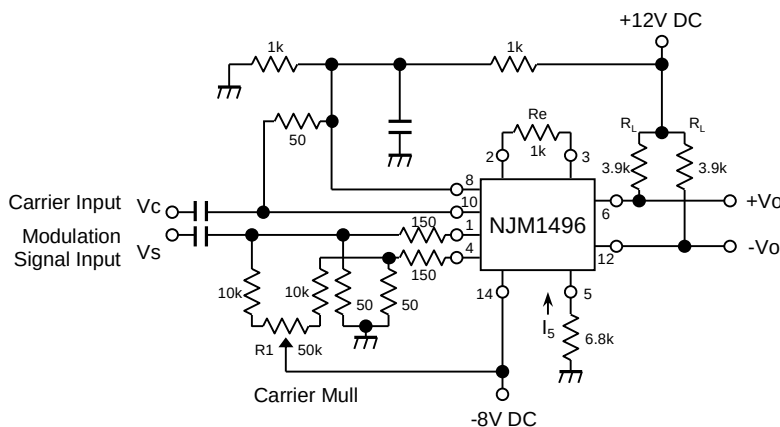
PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Single-Ended Input Impedance						
Parallel Input Resistance	R _{ip}	Signal Port, f=5.0MHz	-	200	-	kΩ
Parallel Input Capacitance	C _{ip}	Signal Port, f=5.0MHz	-	2.0	-	pF
Single-Ended Output Impedance						
Parallel Output Resistance	R _{op}	f=10MHz	-	40	-	kΩ
Parallel Output Capacitance	C _{op}	f=10MHz	-	5.0	-	pF
Input Bias Current						
I _{bs} =I ₁ +I ₄ / 2	I _{bs}		-	12	30	μA
I _{bs} =I ₈ +I ₁₀ / 2	I _{bc}		-	12	30	μA
Input Offset Current						
I _{ios} =I ₁ - I ₄	I _{ios}		-	0.7	7	μA
I _{ios} =I ₈ - I ₁₀	I _{ioc}		-	0.7	7	μA
Average Temperature Coefficient of Input Offset Current	ΔI _{io}		-	2.0	-	nA / °C
Output Offset Current						
(I ₆ - I ₁₂)	I _{oc}		-	15	80	μA
Average Temperature Coefficient of Output Offset Current	ΔI _{oc}		-	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 ($V^+=12V$, $V^-=-8V$, $I_5=1.0mA$, $R_L=3.9k\Omega$, $R_e=1.0k\Omega$, $T_a=25^\circ C$)

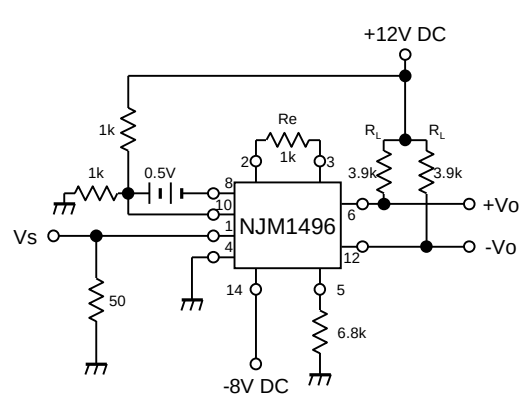
PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Carrier Feedthrough		$V_C=60mV_{rms}$ sine wave offset adjusted				
	V_{CFT}	$f_C=1.0kHz$	-	40	-	μV_{rms}
	V_{CFT}	$f_C=10MHz$	-	140	-	μV_{rms}
		$V_C=300mV_{P-P}$ square wave $f_C=1.0kHz$				
	V_{CFT}	offset adjusted	-	0.04	0.4	mV_{rms}
	V_{CFT}	offset not adjusted	-	20	200	mV_{rms}
Carrier Suppression		$f_S=10kHz$, $300mV_{rms}$ sine wave offset adjusted				
	V_{CS}	$f_C=500kHz$, $60mV_{rms}$ sine wave	40	65	-	dB
	V_{CS}	$f_C=10MHz$, $60mV_{rms}$ 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 =0.5V_{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



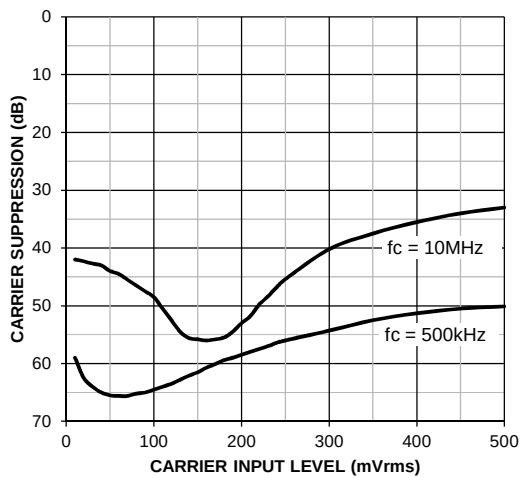
- Differential Output Swing Capability
- Signal Port Common Mode Rejection Ratio



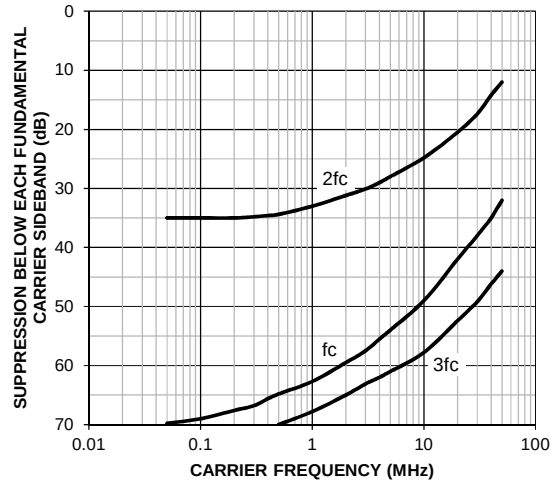
Connect a 100uF capacitor and a 3000pF capacitor in parallel to each other, if the capacitance is not specified.

■ TYPICAL CHARACTERISTICS

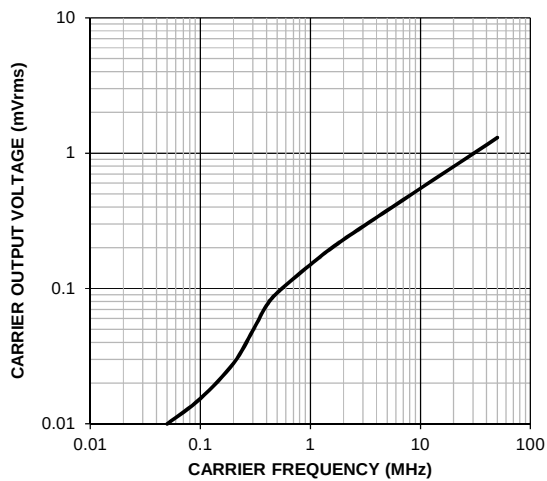
Carrier Suppression versus Carrier Input Level



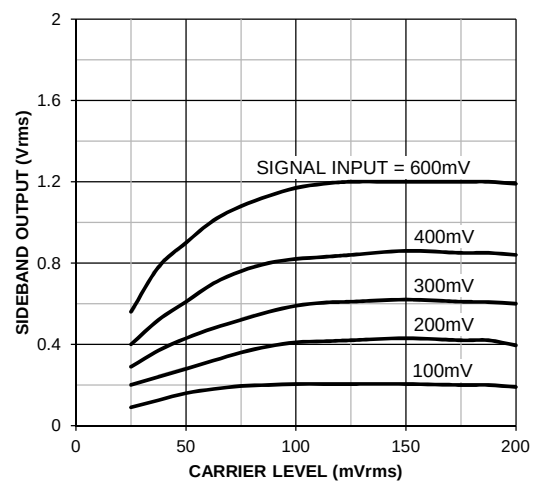
Carrier Feedthrough versus Frequency



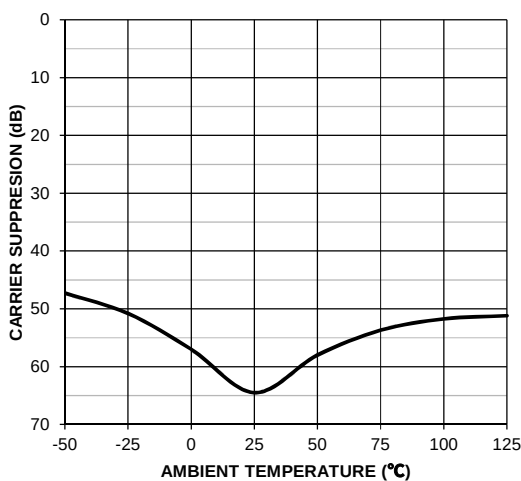
Carrier Feedthrough versus Frequency



Sideband Output versus Carrier Levels

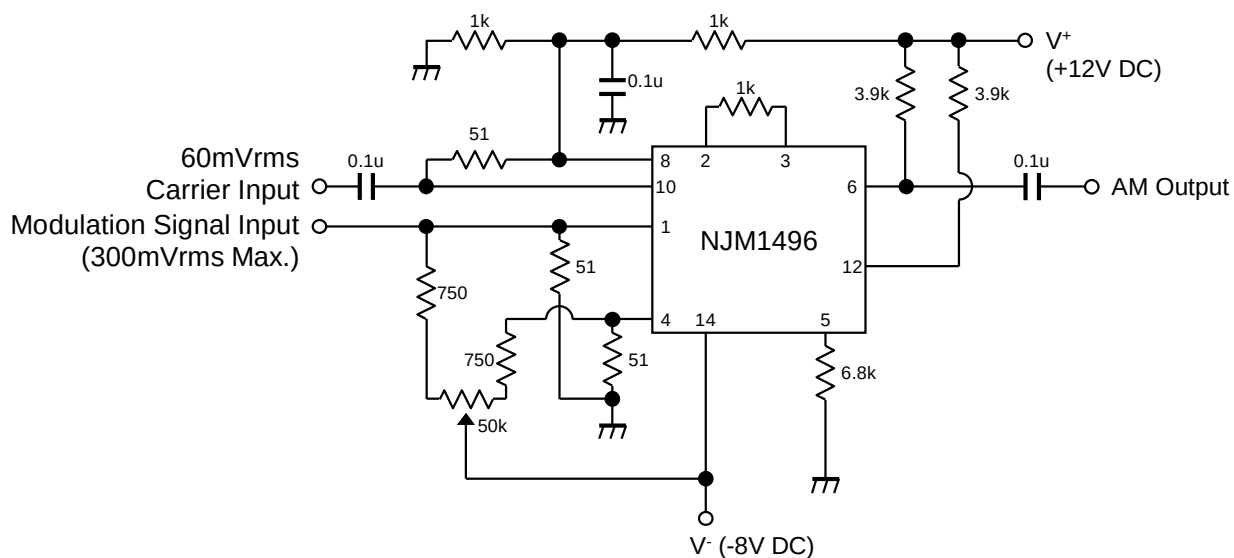


Carrier Suppression versus Temperature

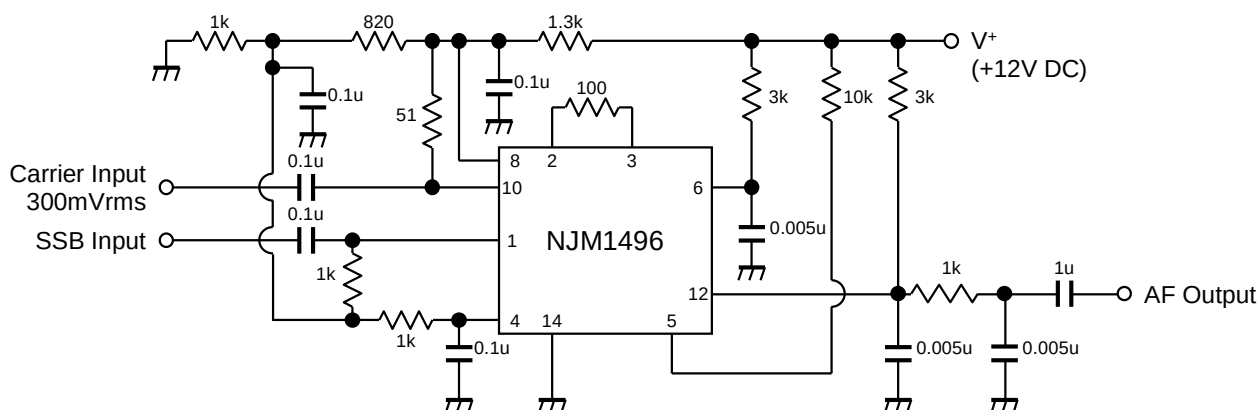


■ TYPICAL APPLICATIONS

AM Modulator Circuit



Product Detector (+12V DC Single Supply)



[CAUTION]

The specifications on this databook are only given for information, without any guarantee as regards either mistakes or omissions. The application circuits in this databook are described only to show representative usages of the product and not intended for the guarantee or permission of any right including the industrial rights.

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

[NJR:](#)

[NJM1496M-T1](#) [NJM#1496D](#) [NJM1496M-T2](#) [NJM#1496M](#)