Designated client product

This product will be discontinued its production in the near term.
And it is provided for customers currently in use only, with a time limit.
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New Japan Radio Co.,Ltd.

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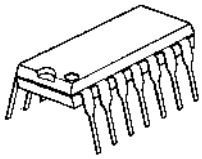
DOUBLE BALANCED MODULATION / DEMODULATOR

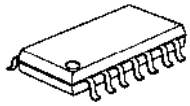
■ GENERAL DESCRIPTION

The **NJM1496** is a double balanced modulator-demodulator which produces an output voltage proportional to hte 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.

■ PACKAGE OUTLINE



NJM1496D



NJM1496M

NJM1496V

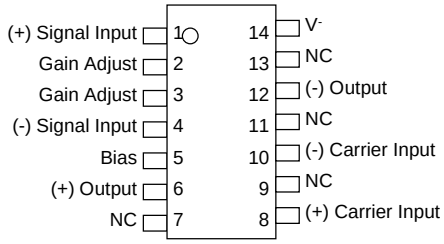
■ FEATURES

- 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

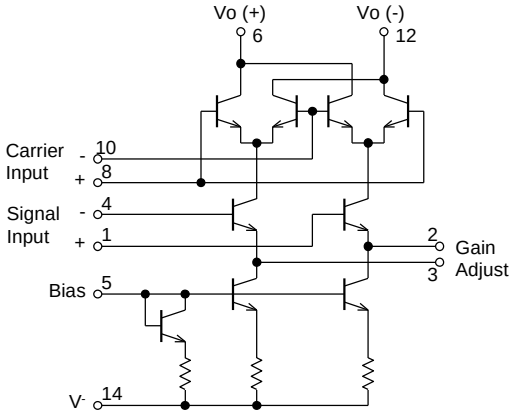
- Balanced Modulation
- Synchronous Detection
- FM Detection
- Phase Detection
- Sampling

■ PIN CONFIGURATION



NJM1496D
NJM1496M
NJM1496V

■ EQUIVALENT CIRCUIT



■ 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_5・Re) (Applied Pins 1-4)	V
Input Signal	5	V
Bias Current (I_5)	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_5=1.0mA, R_L=3.9kΩ, R_e=1.0kΩ, T_a=25°C)

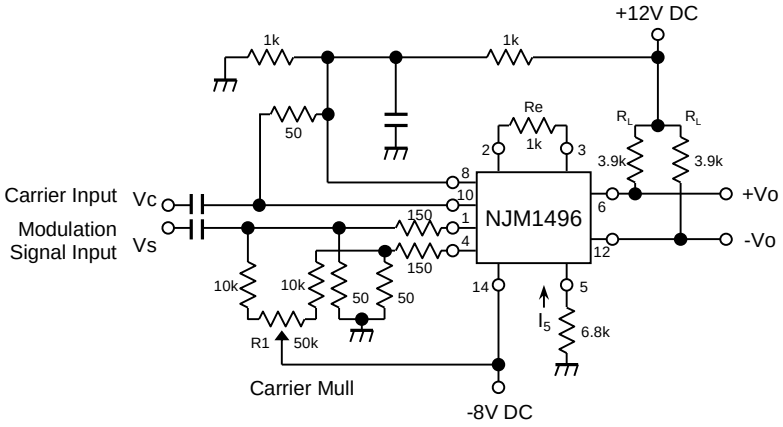
PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Single-Ended Input Impedance						
Parallel Input Resistance	R_{ip}	Signal Port, f =5.0MHz	-	200	-	kΩ
Parallel Input Capacitance	C_{ip}	Signal Port, f =5.0MHz	-	2.0	-	pF
Single-Ended Output Impedance						
Parallel Output Resistance	R_{op}	f =10MHz	-	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=3.9kΩ, R_e=1.0kΩ, T_a=25°C)

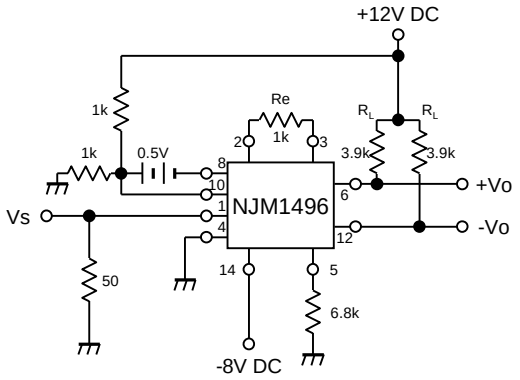
PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Carrier Feedthrough		V_C=60mVrms sine wave				
		offset adjusted				
	V_{CFT}	f_C=1.0kHz	-	40	-	μVrms
	V_{CFT}	f_C=10MHz	-	140	-	μVrms
		V_C=300mV_{P-P} square wave				
		f_C=1.0kHz				
	V_{CFT}	offset adjusted	-	0.04	0.4	mVrms
	V_{CFT}	offset not adjusted	-	20	200	mVrms
Carrier Suppression		f_S=10kHz, 300mVrms sine wave				
		offset adjusted				
	V_{CS}	f_C=500kHz, 60mVrms sine wave	40	65	-	dB
	V_{CS}	f_C=10MHz, 60mVrms sine wave	-	50	-	dB
Transadmittance Bandwidth						
(R_L=50Ω)		V_C=60mVrms sine wave				
Carrier Input Port	BW 3dB	f_S=1.0kHz, 300mVrms sine wave	-	300	-	MHz
Signal Input Port	BW 3dB	V_S=300mVrms sine wave		80		MHz
		$\lvert V_C \rvert$=0.5Vdc				
Voltage Gain, Signal Channel		V_S=100mVrms, f_S=1.0kHz				
	AV_S	$\lvert V_C \rvert$=0.5Vdc	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, $\lvert V_C \rvert$=0.5Vdc	-	-85	-	dB
Differential Output Swing Capability	DV_{out}		-	8.0	-	V_{P-P}

■ **TEST CIRCUIT**

● Carrier Feedthrough
● Carrier Suppression



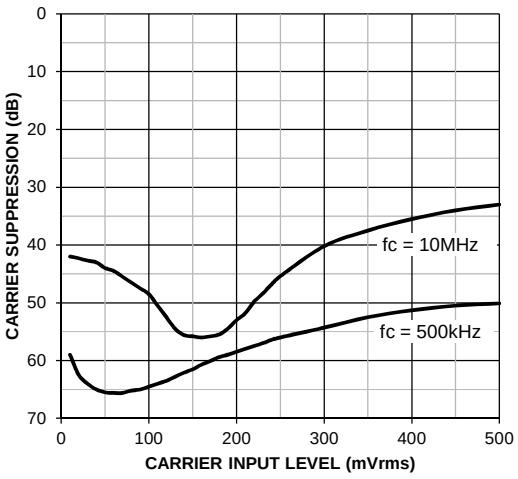
● Differential Output Swing Capability
● Signal Port Common Mode Rejection Ratio



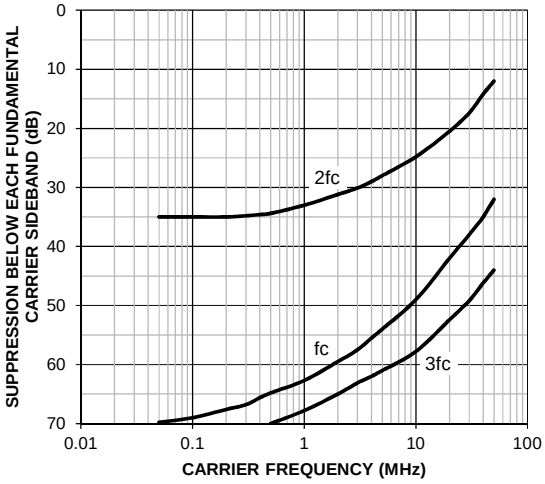
Connect a 100uF capacitor and a 3000pF capacitor in parallel to each other, if the capacitance is not specified.

■ TYPICAL CHARACTERISTICS

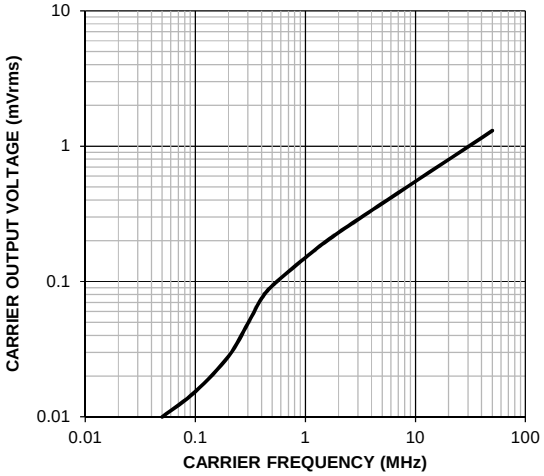
Carrier Suppression versus Carrier Input Level



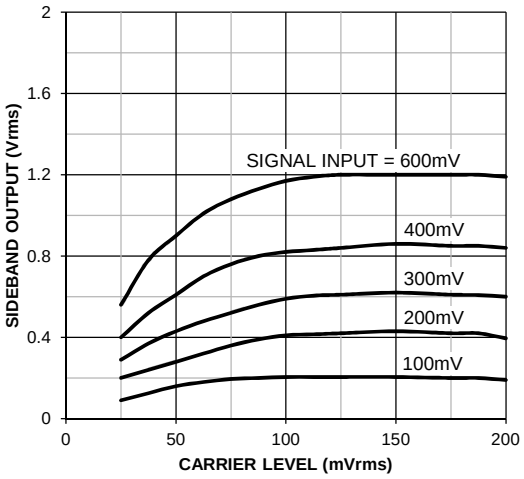
Carrier Feedthrough versus Frequency



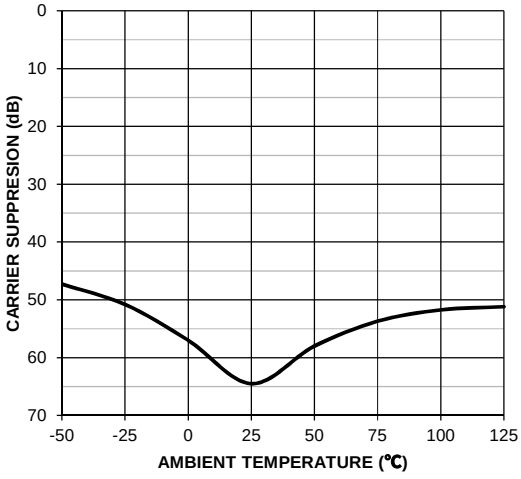
Carrier Feedthrough versus Frequency



Sideband Output versus Carrier Levels

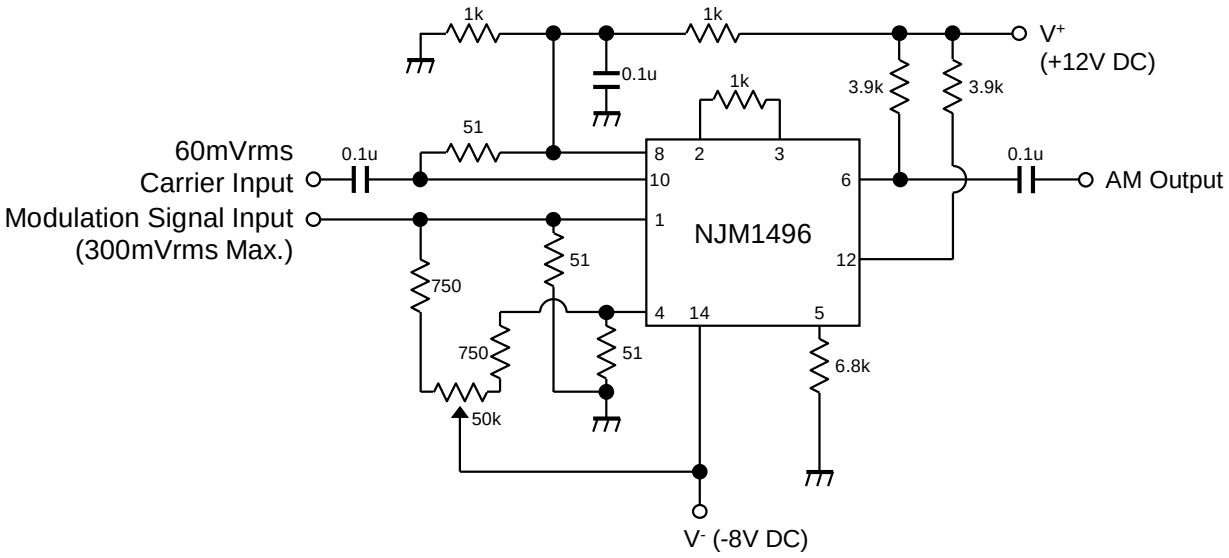


Carrier Suppression versus Temperature



■ TYPICAL APPLICATIONS

AM Modulator Circuit



Product Detector (+12V DC Single Supply)