■ 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.

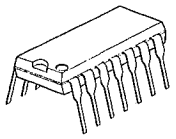
■ FEATURES

- 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

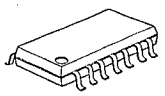
■ APPLICATION

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

■ PACKAGE OUTLINE



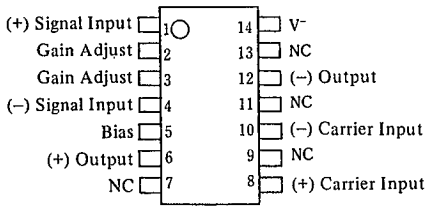
NJM1496D



NJM1496M

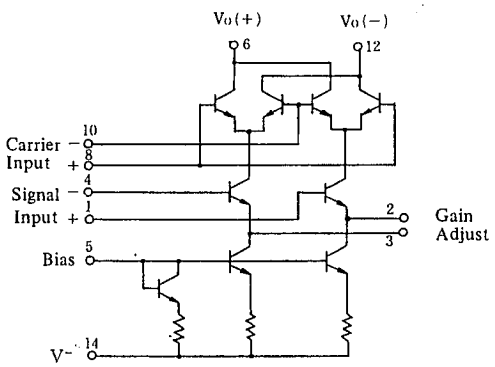
NJM1496V

■ PIN CONFIGURATION



NJM1496D
NJM1496M
NJM1496V

■ EQUIVALENT CIRCUIT



■ ABSOLUTE MAXIMUM RATINGS

(Ta=25℃)

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	−20～+75	℃
Storage Temperature Range	−40～+125	℃

■ ELECTRICAL CHARACTERISTICS

DC Characteristics (V^+=12V, V^-=−8V, I_5=1.0mA, R_L=3.9kΩ, Re=1.0kΩ, Ta=25℃)

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
$I_{bc}=I_8+I_{10}/2$	I_{bc}		—	12	30	μA
Input Offset Current						
$I_{ios}=I_1-I_4$	I_{ios}		—	0.7	7	μA
$I_{ioc}=I_8-I_{10}$	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

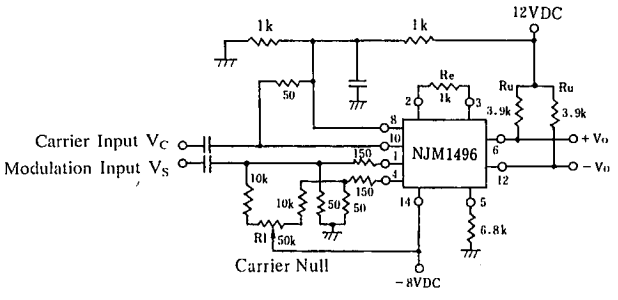
■ ELECTRICAL CHARACTERISTICS

AC Characteristics (V^+=12V, V^-=−8V, I_5=1.0mA, R_L=2.9kΩ, Re=1.0kΩ, Ta=25℃)

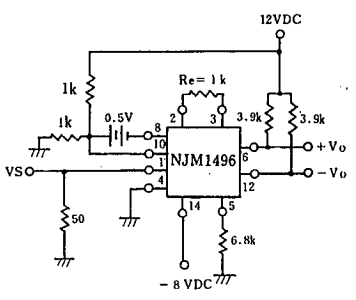
PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Carrier Feedthrough		Vc= 60mVrms sine wave				
		offset adjusted				
	V_{CFT}	fc=1.0kHz	—	40	—	μVrms
	V_{CFT}	fc=10MHz	—	140	—	μVrms
		Vc= 300mVp-p square wave				
		fc=1.0kHz				
	V_{CFT}	offset adjusted	—	0.04	0.4	mVrms
	V_{CFT}	offset not adjusted	—	20	200	mVrms
Carrier Suppression		fs = 10kHz, 300mVrms sine wave				
		offset adjusted				
	V_{CS}	fc = 500kHz, 60mVrms sine wave	40	65	—	dB
	V_{CS}	fc = 10MHz, 60mVrms sine wave	—	50	—	dB
Transadmittance Bandwidth						
(R_L = 50Ω)		Vc= 60mVrms sine wave				
Carrier Input Port	BW 3dB	fs = 1.0kHz, 300mVrms sine wave	—	300	—	MHz
Signal Input Port	BW 3dB	Vs = 300mVrms sine wave		80		MHz
		|Vc|=5Vdc				
Voltage Gain, Signal Channel		Vs = 100mVrms fs=1.0kHz				
	AV_S	|Vc|=0.5Vdc	2.5	3.5	—	V/V
Signal Port Common Mode Input Voltage						
Range	CM_V	fs = 1.0kHz	—	5.0	—	Vp-p
Signal Port Common Mode Rejection Ratio	ACM	fs = 1.0kHz, |Vc|=0.5Vdc	—	−85	—	dB
Differential Output Swing Capability	DV_{out}		—	8.0	—	Vp-p

■ TEST CIRCUIT

- Carrier feedthrough
- Carrier Suppression



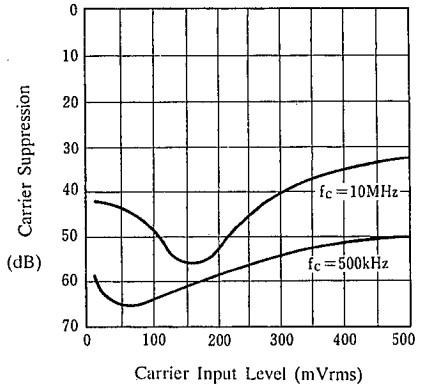
- Differential Output Swing Capability
- Signal Port Common Mode Rejection Ratio



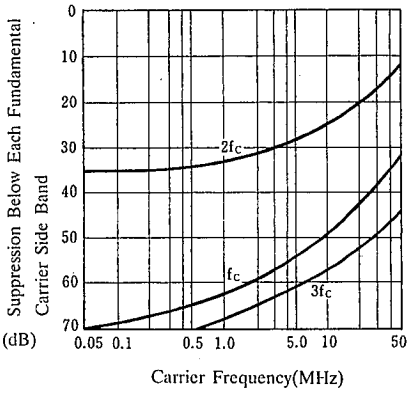
Connect a 100μF capacitor and a 3000pF capacitor in parallel to each other, if the capacitance is not specified.

■ TYPICAL CHARACTERISTICS

Carrier Suppression



Carrier Suppression



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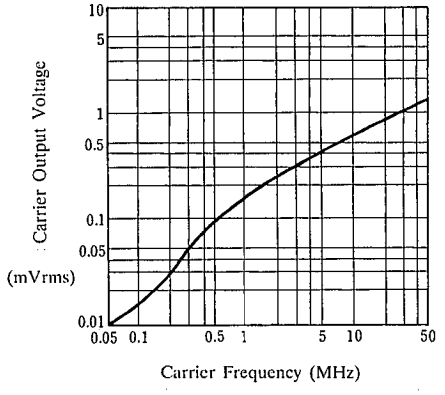
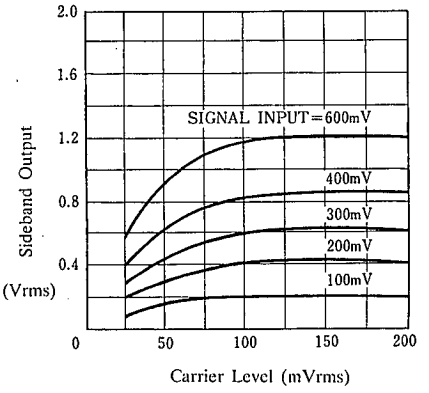
Carrier Feedthrough

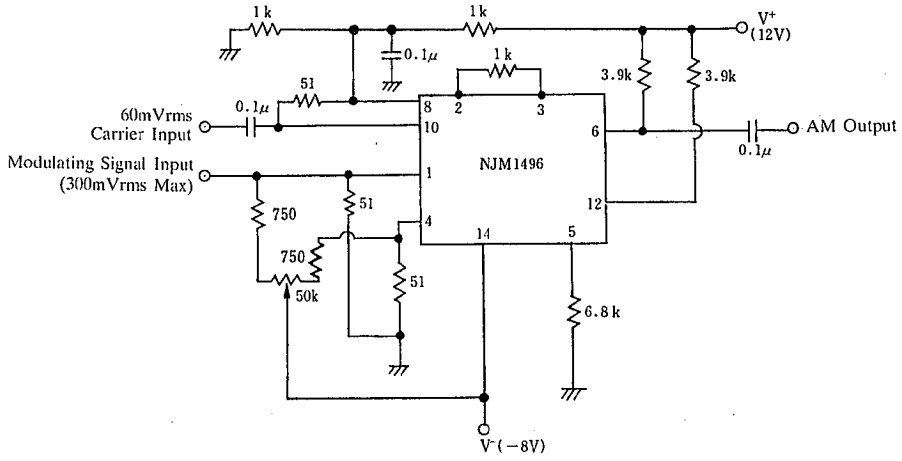


Sideband Output

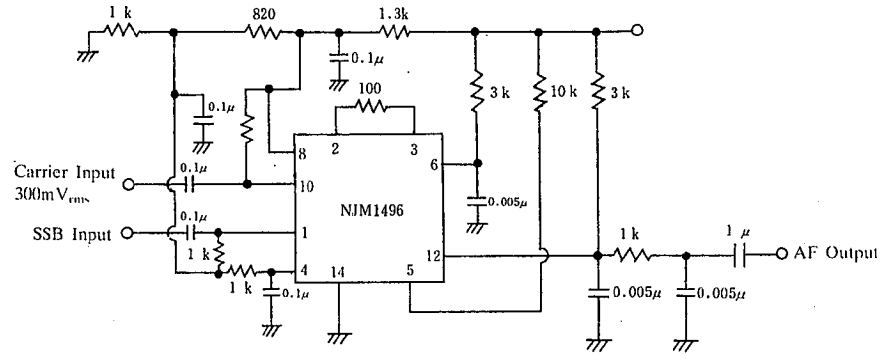


■ TYPICAL APPLICATIONS

AM Modulator Circuit



Product Detector (+12V DC Single Supply)



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