

MC1496, MC1496B

Balanced Modulators/ Demodulators

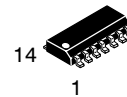
These devices were designed for use where the output voltage is a product of an input voltage (signal) and a switching function (carrier). Typical applications include suppressed carrier and amplitude modulation, synchronous detection, FM detection, phase detection, and chopper applications. See ON Semiconductor Application Note AN531 for additional design information.

Features

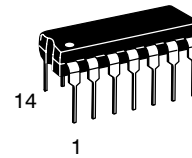
- Excellent Carrier Suppression -65 dB typ @ 0.5 MHz
 -50 dB typ @ 10 MHz
- Adjustable Gain and Signal Handling
- Balanced Inputs and Outputs
- High Common Mode Rejection -85 dB Typical
- This Device Contains 8 Active Transistors
- Pb-Free Package is Available*



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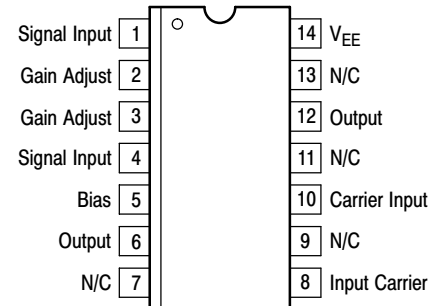


**SOIC-14
D SUFFIX
CASE 751A**



**PDIP-14
P SUFFIX
CASE 646**

PIN CONNECTIONS



ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 12 of this data sheet.

DEVICE MARKING INFORMATION

See general marking information in the device marking section on page 12 of this data sheet.

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Figure 1. Suppressed Carrier Output Waveform

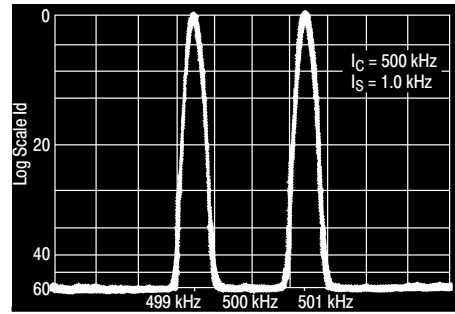


Figure 2. Suppressed Carrier Spectrum



Figure 3. Amplitude Modulation Output Waveform

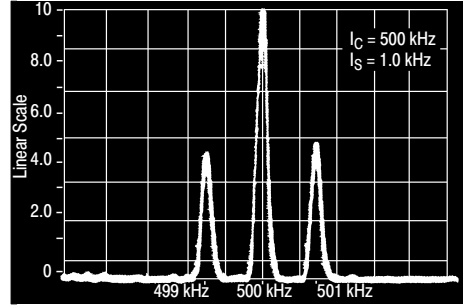


Figure 4. Amplitude-Modulation Spectrum

MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$, unless otherwise noted.)

Rating		Symbol	Value	Unit
Applied Voltage (V6-V8, V10-V1, V12-V8, V12-V10, V8-V4, V8-V1, V10-V4, V6-V10, V2-V5, V3-V5)		ΔV	30	Vdc
Differential Input Signal		V8 - V10 V4 - V1	+5.0 $\pm(5 + I_5 R_e)$	Vdc
Maximum Bias Current		I_5	10	mA
Thermal Resistance, Junction-to-Air Plastic Dual In-Line Package		$R_{\theta JA}$	100	$^\circ\text{C/W}$
Operating Ambient Temperature Range		T_A	0 to +70 -40 to +125	$^\circ\text{C}$
Storage Temperature Range		T_{stg}	-65 to +150	$^\circ\text{C}$
Electrostatic Discharge Sensitivity (ESD) Human Body Model (HBM) Machine Model (MM)		ESD	2000 400	V

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

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ELECTRICAL CHARACTERISTICS ($V_{CC} = 12$ Vdc, $V_{EE} = -8.0$ Vdc, $I_S = 1.0$ mAdc, $R_L = 3.9$ k Ω , $R_e = 1.0$ k Ω , $T_A = T_{low}$ to T_{high} , all input and output characteristics are single-ended, unless otherwise noted.) (Note 1)

Characteristic	Fig.	Note	Symbol	Min	Typ	Max	Unit
Carrier Feedthrough $V_C = 60$ mVrms sine wave and offset adjusted to zero $V_C = 300$ mVpp square wave: offset adjusted to zero offset not adjusted	5	1	V_{CFT}	- - - -	40 140 0.04 20	- - 0.4 200	μ Vrms mVrms
Carrier Suppression $f_S = 10$ kHz, 300 mVrms $f_C = 500$ kHz, 60 mVrms sine wave $f_C = 10$ MHz, 60 mVrms sine wave	5	2	V_{CS}	40 -	65 50	- -	dB k
Transadmittance Bandwidth (Magnitude) ($R_L = 50$ Ω) Carrier Input Port, $V_C = 60$ mVrms sine wave $f_S = 1.0$ kHz, 300 mVrms sine wave Signal Input Port, $V_S = 300$ mVrms sine wave $ V_C = 0.5$ Vdc	8	8	BW_{3dB}	- -	300 80	- -	MHz
Signal Gain ($V_S = 100$ mVrms, $f = 1.0$ kHz; $ V_C = 0.5$ Vdc)	10	3	A_{VS}	2.5	3.5	-	V/V
Single-Ended Input Impedance, Signal Port, $f = 5.0$ MHz Parallel Input Resistance Parallel Input Capacitance	6	-	r_{ip} C_{ip}	- -	200 2.0	- -	k Ω pF
Single-Ended Output Impedance, $f = 10$ MHz Parallel Output Resistance Parallel Output Capacitance	6	-	r_{op} C_{oo}	- -	40 5.0	- -	k Ω pF
Input Bias Current $I_{bS} = \frac{I_1 + I_4}{2}$; $I_{bC} = \frac{I_8 + I_{10}}{2}$	7	-	I_{bS} I_{bC}	- -	12 12	30 30	μ A
Input Offset Current $I_{ioS} = I_1 - I_4$; $I_{ioC} = I_8 - I_{10}$	7	-	$ I_{ioS} $ $ I_{ioC} $	- -	0.7 0.7	7.0 7.0	μ A
Average Temperature Coefficient of Input Offset Current ($T_A = -55^\circ\text{C}$ to $+125^\circ\text{C}$)	7	-	$ TC_{Iio} $	-	2.0	-	nA/ $^\circ\text{C}$
Output Offset Current (I6-I9)	7	-	$ I_{oo} $	-	14	80	μ A
Average Temperature Coefficient of Output Offset Current ($T_A = -55^\circ\text{C}$ to $+125^\circ\text{C}$)	7	-	$ TC_{Ioo} $	-	90	-	nA/ $^\circ\text{C}$
Common-Mode Input Swing, Signal Port, $f_S = 1.0$ kHz	9	4	CMV	-	5.0	-	Vpp
Common-Mode Gain, Signal Port, $f_S = 1.0$ kHz, $ V_C = 0.5$ Vdc	9	-	ACM	-	-85	-	dB
Common-Mode Quiescent Output Voltage (Pin 6 or Pin 9)	10	-	V_{out}	-	8.0	-	Vpp
Differential Output Voltage Swing Capability	10	-	V_{out}	-	8.0	-	Vpp
Power Supply Current I6 +I12 I14	7	6	I_{CC} I_{EE}	- -	2.0 3.0	4.0 5.0	mAdc
DC Power Dissipation	7	5	P_D	-	33	-	mW

1. $T_{low} = 0^\circ\text{C}$ for MC1496 $T_{high} = +70^\circ\text{C}$ for MC1496
 $= -40^\circ\text{C}$ for MC1496B $= +125^\circ\text{C}$ for MC1496B

MC1496, MC1496B

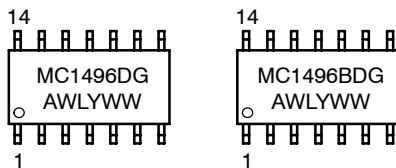
ORDERING INFORMATION

Device	Package	Shipping†
MC1496D	SOIC-14	55 Units/Rail
MC1496DG	SOIC-14 (Pb-Free)	
MC1496DR2	SOIC-14	2500 Tape & Reel
MC1496DR2G	SOIC-14 (Pb-Free)	
MC1496P	PDIP-14	25 Units/Rail
MC1496PG	PDIP-14 (Pb-Free)	
MC1496P1	PDIP-14	
MC1496P1G	PDIP-14 (Pb-Free)	
MC1496BD	SOIC-14	55 Units/Rail
MC1496BDG	SOIC-14 (Pb-Free)	
MC1496BDR2	SOIC-14	2500 Tape & Reel
MC1496BDR2G	SOIC-14 (Pb-Free)	
MC1496BP	PDIP-14	25 Units/Rail
MC1496BPG	PDIP-14 (Pb-Free)	

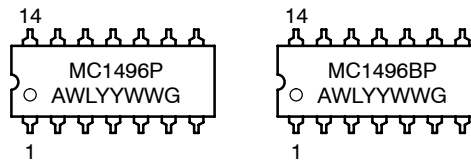
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

MARKING DIAGRAMS

**SOIC-14
D SUFFIX
CASE 751A**



**PDIP-14
P SUFFIX
CASE 646**

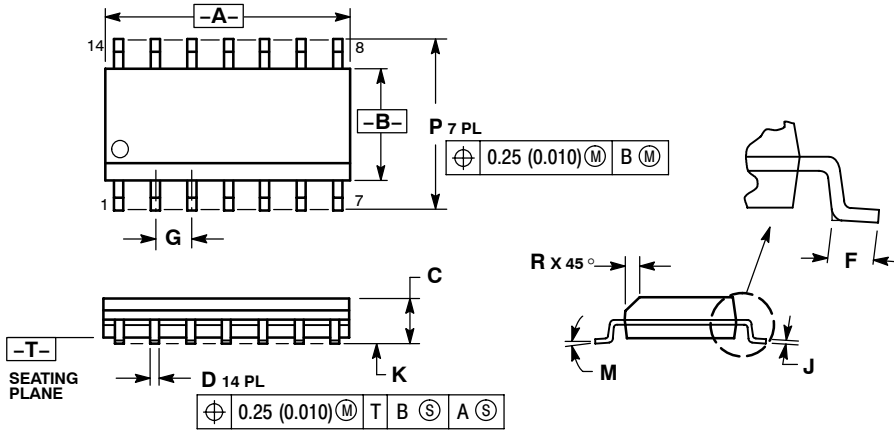


A = Assembly Location
 WL = Wafer Lot
 YY, Y = Year
 WW = Work Week
 G = Pb-Free Package

MC1496, MC1496B

PACKAGE DIMENSIONS

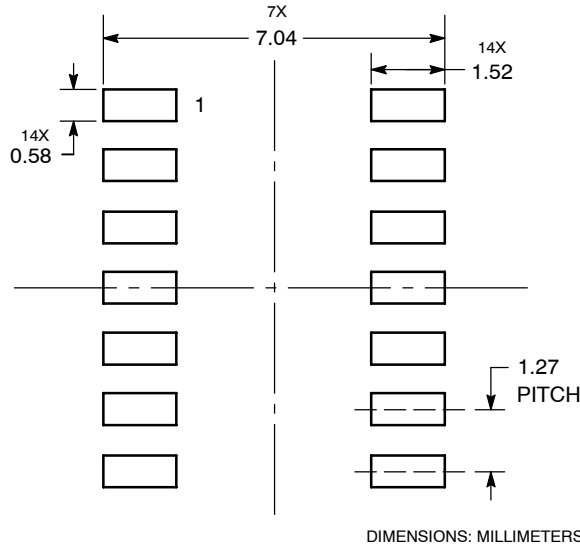
SOIC-14
CASE 751A-03
ISSUE H



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: MILLIMETER.
 3. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
 4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
 5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	8.55	8.75	0.337	0.344
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.054	0.068
D	0.35	0.49	0.014	0.019
F	0.40	1.25	0.016	0.049
G	1.27 BSC		0.050 BSC	
J	0.19	0.25	0.008	0.009
K	0.10	0.25	0.004	0.009
M	0°	7°	0°	7°
P	5.80	6.20	0.228	0.244
R	0.25	0.50	0.010	0.019

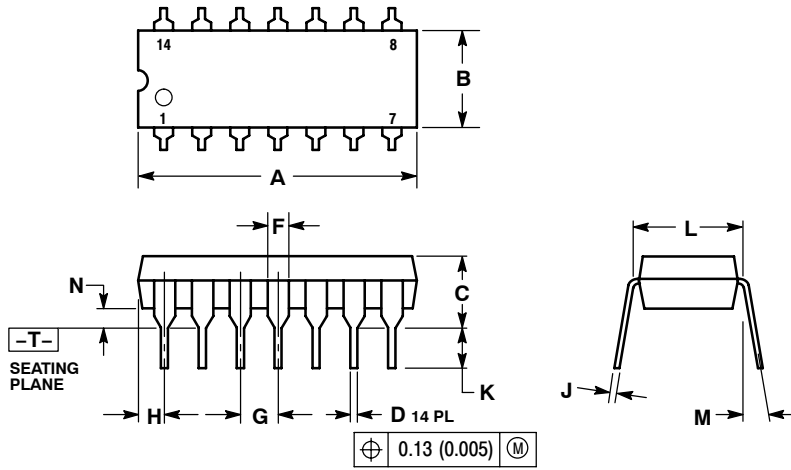
SOLDERING FOOTPRINT*



*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

MC1496, MC1496B

PDIP-14
CASE 646-06
ISSUE P



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
4. DIMENSION B DOES NOT INCLUDE MOLD FLASH.
5. ROUNDED CORNERS OPTIONAL.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.715	0.770	18.16	19.56
B	0.240	0.260	6.10	6.60
C	0.145	0.185	3.69	4.69
D	0.015	0.021	0.38	0.53
F	0.040	0.070	1.02	1.78
G	0.100 BSC		2.54 BSC	
H	0.052	0.095	1.32	2.41
J	0.008	0.015	0.20	0.38
K	0.115	0.135	2.92	3.43
L	0.290	0.310	7.37	7.87
M	---	10°	---	10°
N	0.015	0.039	0.38	1.01