

# SL1496C SL1596C

## DOUBLE-BALANCED MODULATOR/DEMODULATOR

The SL1596C and SL1496C are versatile monolithic integrated circuit double balanced modulators/demodulators, designed for use where the output voltage is the product of the signal input voltage and the switching carrier voltage. The SL1596C has an operating temperature range of  $-55^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$ , whilst that of the SL1496C is  $0^{\circ}\text{C}$  to  $+70^{\circ}\text{C}$ .

### FEATURES

- Carrier Suppression 65dB Typ.  
@ 500 kHz  
50dB Typ.  
@ 10 MHz
- Common Mode Rejection 85dB Typ.
- Gain and Signal Handling Both Adjustable
- Balanced Inputs and Outputs

### APPLICATIONS

- DSB, DSBSC, AM Modulation
- Synchronous Detection
- FM Detection
- Phase Detection
- Telephone FDM Systems

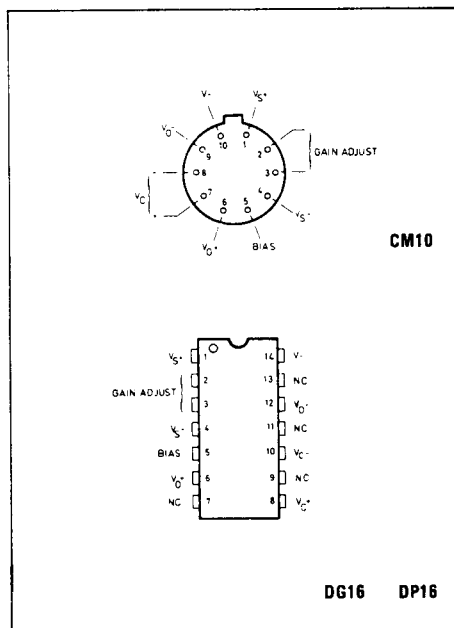
### ORDERING CODES

SL1496C — CM, SL1496C — DG, SL1496C — DP  
 SL1596C — CM, SL1596C — DG

### ABSOLUTE MAXIMUM RATINGS

(Pin number reference to CM package)

Applied voltage*	30V
Differential input signal ( $V_7-V_8$ )	$\pm 5\text{V}$
Differential input signal ( $V_4-V_1$ )	$\pm (5+15R_E)\text{V}$
Bias current ( $I_5$ )	10mA
Operating temperature range	
SL1496C	$0^{\circ}\text{C}$ to $+70^{\circ}\text{C}$
SL1596C	$-55^{\circ}\text{C}$ to $+125^{\circ}\text{C}$



### CM Package

Storage temperature range	$-55^{\circ}\text{C}$ to $+175^{\circ}\text{C}$
Junction temperature	$+175^{\circ}\text{C}$
Package dissipation ( $25^{\circ}\text{C}$ )	680mW

### DG Package

Storage temperature range	$-55^{\circ}\text{C}$ to $+175^{\circ}\text{C}$
Junction temperature	$+175^{\circ}\text{C}$
Package dissipation ( $25^{\circ}\text{C}$ )	600mW

### DP Package

Storage temperature range	$-55^{\circ}\text{C}$ to $+125^{\circ}\text{C}$
Junction temperature	$+125^{\circ}\text{C}$
Package dissipation ( $25^{\circ}\text{C}$ )	500mW

## ELECTRICAL CHARACTERISTICS

Test Conditions (unless otherwise stated):—

 $V^+ = +12V$  DC,  $V^- = -8V$  DC,  $I_S = 1.0$  mA DC,  $R_L = 3.9$  k $\Omega$ ,  $R_{\theta} = 1.0$  k $\Omega$ ,  $T_A = +25^{\circ}\text{C}$ 

All input and output characteristics single-ended, unless otherwise stated.

Characteristic*	SL1596			SL1496			Units
	Min	Typ	Max	Min	Typ	Max	
Carrier Feedthrough							$\mu\text{V(rms)}$
$V_C = 60$ mV(rms) sine wave and offset adjusted to zero	—	40	—	—	40	—	$\text{mV(rms)}$
$f_C = 1.0$ kHz	—	140	—	—	140	—	
$V_C = 300$ mVp-p square wave offset adjusted to zero	—	0.04	0.2	—	0.04	0.4	dB
offset not adjusted	—	20	100	—	20	200	
Carrier Suppression							
$f_S = 10$ kHz, 300 mV(rms)	50	65	—	40	65	—	V/V
$f_C = 500$ kHz, 60 mV(rms) sine wave	—	50	—	—	50	—	
$f_C = 10$ MHz, 60 mV(rms) sine wave	2.5	3.5	—	2.5	3.5	—	
Signal Gain							
$V_S = 100$ mV(rms), $f = 1.0$ kHz, $ V_C  = 0.5$ V DC	—	200	—	—	200	—	k $\Omega$
Single-Ended Input Impedance, Signal Port, $f = 5.0$ MHz	—	2.0	—	—	2.0	—	pF
Parallel Input Resistance	—	40	—	—	40	—	k $\Omega$
Parallel Input Capacitance	—	5.0	—	—	5.0	—	pF
Single-Ended Output Impedance, $f = 10$ MHz	—	12	25	—	12	30	$\mu\text{A}$
Parallel Output Resistance	—	0.7	5.0	—	0.7	7.0	$\mu\text{A}$
Parallel Output Capacitance	—	2.0	—	—	2.0	—	nA/ $^{\circ}\text{C}$
Input Bias Current							
$\frac{I_1 + I_4}{2}$ , $\frac{I_7 + I_8}{2}$	—	14	50	—	14	80	$\mu\text{A}$
Input Offset Current							
$(I_1 - I_4)$ , $(I_7 - I_8)$	—	90	—	—	90	—	nA/ $^{\circ}\text{C}$
Average Temperature Coefficient of Input Offset Current ( $T_A = -55^{\circ}\text{C}$ to $+125^{\circ}\text{C}$ )	—	5.0	—	—	5.0	—	Vp-p
Output Offset Current	—	85	—	—	85	—	dB
$(I_6 - I_9)$	—	8.0	—	—	8.0	—	V DC
Average Temperature Coefficient of Output Offset Current ( $T_A = -55^{\circ}\text{C}$ to $+125^{\circ}\text{C}$ )	—	8.0	—	—	8.0	—	Vp-p
Common-Mode Input Swing, Signal Port, $f_S = 1.0$ kHz	—	2.0	3.0	—	2.0	4.0	mA DC
Common-Mode Gain, Signal Port, $f_S = 1.0$ kHz, $ V_C  = 0.5$ V DC	—	3.0	4.0	—	3.0	5.0	mW
Common-Mode Quiescent Output Voltage (Pin 6 or Pin 9)	—	33	—	—	33	—	
Differential Output Voltage Swing Capability							
Power Supply Current							
$I_6 + I_9$	—	2.0	3.0	—	2.0	4.0	
$I_{10}$	—	3.0	4.0	—	3.0	5.0	
DC Power Dissipation	—	33	—	—	33	—	

\*Pin numbers are given for TO-5 package.

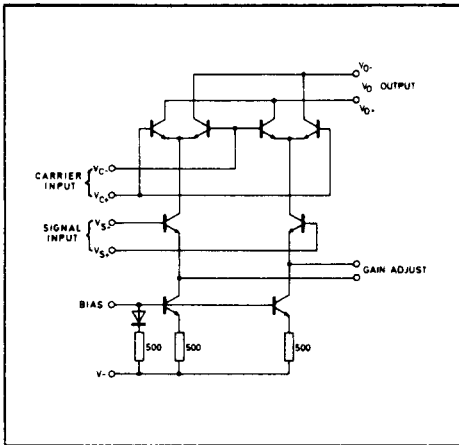


Fig. 2 Circuit diagram

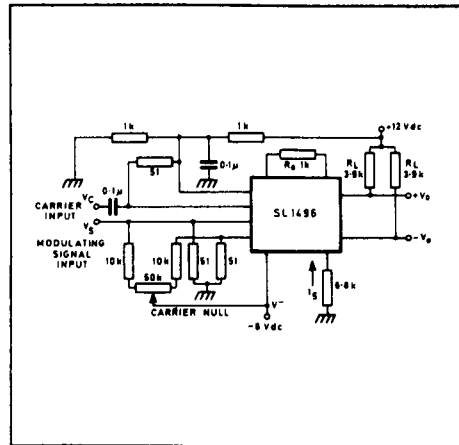


Fig. 3 Typical modulator circuit