signetics BALANCED MODULATOR-DEMODULATOR | 5596

LINEAR INTEGRATED CIRCUITS

DESCRIPTION

The 5596 is a monolithic Double-Balanced Modulator/Demodulator designed for use where the output voltage is a product of an input voltage (signal) and a switched function (carrier). The S5596 will operate over the full military temperature range of -55°C to +125°C. The N5596 is intended for applications within the range of 0°C to +70°C.

FEATURES

- **EXCELLENT CARRIER SUPPRESSION**

  65dB typ @ 0.5 MHz

  50dB typ @ 10 MHz

- **ADJUSTABLE GAIN AND SIGNAL HANDLING**
- **BALANCED INPUTS AND OUTPUTS**
- **HIGH COMMON-MODE REJECTION — 85dB typ**

APPLICATIONS

SUPPRESSED CARRIER AND AMPLITUDE MODULATION
SYNCHRONOUS DETECTION
FM DETECTION
PHASE DETECTION
SAMPLING
SINGLE SIDEBAND
FREQUENCY DOUBLING

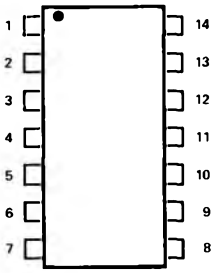
ABSOLUTE MAXIMUM RATINGS

Applied Voltage (Note 1)	30V
Differential Input Signal ($V_7 - V_8$)	±5.0V
Differential Input Signal ($V_4 - V_1$)	$\pm(5 + I_5 R_e)$V
Input Signal ($V_2 - V_1$, $V_3 - V_4$)	5.0V
Bias Current (I_5)	10mA
Power Dissipation (Pkg. Limitation)	
K-Package	680mW
Derate above 25°C	5.4mW/°C
A-Package (TO-116)	900mW
Derate above 25°C	7.2mW/°C
Operating Temperature Range	-55°C to +125°C
Storage Temperature Range	-65°C to +150°C

NOTES:
1. Voltage applied between pins 6-7, 8-1, 9-7, 9-8, 7-4, 7-1, 8-4, 6-8, 2-5, 3-5.
2. Pin number references pertain to K package pinout only.

PIN CONFIGURATIONS

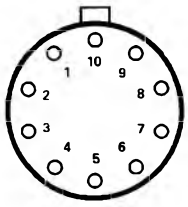
A PACKAGE
(Top View)



ORDER PART NOS.
S5596A/N5596A

1. Positive Signal Input
2. Gain Adjust
3. NC
4. Gain Adjust
5. Negative Signal Input
6. Bias
7. NC
8. Positive Output
9. Positive Carrier Input
10. Negative Carrier Input
11. NC
12. NC
13. Negative Output
14. V^-

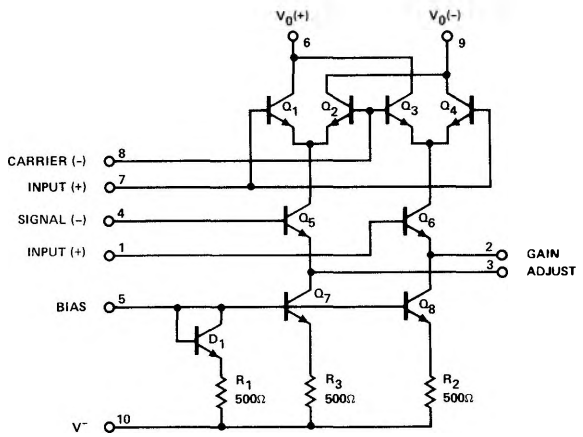
K PACKAGE



ORDER PART NOS.
S5596K/N5596K

1. Positive Signal Input
2. Gain Adjust
3. Gain Adjust
4. Negative Signal Input
5. Bias
6. Positive Output
7. Positive Carrier Input
8. Negative Carrier Input
9. Negative Output
10. V^-

SCHEMATIC DIAGRAM



ELECTRICAL CHARACTERISTICS*

(All input and output characteristics are single-ended unless otherwise noted.)

PARAMETER	S5596			N5596			UNITS
	MIN	TYP	MAX	MIN	TYP	MAX	
Carrier Feedthrough							μV(rms)
V_C = 60 mV(rms) sine wave and f_C = 1.0 kHz		40			40		
offset adjusted to zero f_C = 10 MHz		140			140		
V_C = 300 mVp-p square wave:							mV(rms)
offset adjusted to zero f_C = 1.0 kHz		0.04	0.2		0.04	0.4	
offset not adjusted f_C = 1.0 kHz		20	100		20	200	
Carrier Suppressions							dB
f_S = 10 kHz, 300 mV(rms)							
f_C = 500 kHz, 60 mV(rms) sine wave	50	65		40	65		
f_C = 10 MHz, 60 mV(rms) sine wave		50			50		
Transadmittance Bandwidth (Magnitude) (R_L = 50Ω)							MHz
Carrier Input Port, V_C = 60 mV(rms) sine wave		300			300		
f_S = 1.0 kHz, 300 mV(rms) sine wave							
Signal Input Port, V_S = 300 mV(rms) sine wave		80			80		
$\|V_C\|$ = 0.5V dc							
Signal Gain	2.5	3.5		2.5	3.5		V/V
V_S = 100 mV(rms), f = 1.0 kHz; $\|V_C\|$ = 0.5V dc							
Single-Ended Input Impedance, Signal Port, f = 5.0 MHz							
Parallel Input Resistance		200			200		kΩ
Parallel Input Capacitance		2.0			2.0		pF
Single-Ended Output Impedance, f = 10 MHz							
Parallel Output Resistance		40			40		kΩ
Parallel Output Capacitance		5.0			5.0		pF
Input Bias Current							μA
$I_{bS} = \frac{I_1 + I_4}{2}$; $I_{bC} = \frac{I_7 + I_8}{2}$		12	25		12	30	
		12	25		12	30	
Input Offset Current							μA
$I_{ioS} = I_1 - I_4$; $I_{ioC} = I_7 - I_8$		0.7	5.0		0.7	7.0	
		0.7	5.0		0.7	7.0	
Average Temperature Coefficient of Input Offset Current		2.0			2.0		nA/°C
(T_A = -55°C to +125°C)							
Output Offset Current		14	50		15	80	μA
($I_6 - I_9$)							
Average Temperature Coefficient of Output Offset Current		90			90		nA/°C
(T_A = -55°C to +125°C)							
Common-Mode Input Swing, Signal Port, f_S = 1.0 kHz		5.0			5.0		Vp-p
Common-Mode Gain, Signal Port, f_S = 1.0 kHz,		-85			-85		dB
$\|V_C\|$ = 0.5V dc							
Common-Mode Quiescent Output Voltage (Pin 6 or Pin 9)		8.0			8.0		Vdc
Differential Output Voltage Swing Capability		8.0			8.0		Vp-p
Power Supply Current							mAdc
$I_6 + I_9$		2.0	3.0		2.0	4.0	
I_{10}		3.0	4.0		3.0	5.0	
DC Power Dissipation		33			33		mW

(V^+ = +12V dc, V^- = -8.0V dc, I_5 = 1.0mA dc, R_L = 3.9kΩ, R_e = 1.0kΩ, T_A = +25°C unless otherwise noted)

*Pin number references pertain to K package pinout only.