### CA3090AQ



## Stereo Multiplex Decoder

For FM Stereo Multiplex Systems

#### FEATURES:

- Requires the use of only one low-inductance tuning coil
- Aulomalic stereo switching
- Directly drives a stereo indicator lamp up to 100 mA
- Includes driver for stereo-lamp indicator
  - Operates from a wide range of power supplies: 10 to 16 volts
- Requires only one adjustment for alignment
- Switching from monaural to stereo and stereo lo monaural produces no audible thumps

 $\mathsf{RCA}\text{-}\mathsf{CA3090AQ}^*,$  a monolithic silicon integrated circuit, is a stereo multiplex decoder intended for FM multiplex systems.

The CA309OAQ is the successor to the CA309OQ; it offers three major advantages over the CA309OQ as follows:

- 1. Can directly drive a stereo indicator lamp with a current drain of up to 100 mA.
- 2. Stereo Defeat/Enable control-voltage specifications.
- 3. Capable of operation with lower distortion.

This stereo multiplex decoder requires only one lowinductance tuning coil (requires only one adjustment for complete alignment), provides automatic stereo switching, energizes a stereo indicator lamp, and operates from a wide range of voltage supplies.

Figure 1 shows the block diagram for the CA309OAQ. The input signal from the detector is amplified by a low-distortion preamplifier and simultaneously applied to both the 19-kHz and 38-kHz synchronous detectors. A 76-kHz signal, generated by a local voltage-controlled oscillator (VCO), is counted down by two frequency dividers to a 38kHz signal and to two 19-kHz signals in phase quadrature. The 19-kHz pilot-tone supplied by the FM detector is compared to the locally generated 19-kHz signal in a synchronous detector. The resultant signal controls the voltage controlled oscillator (VCO) so that it produces an output signal to phase-lock the stereo decoder with the pilot tone. A second synchronous detector compares the locally generated **19-kHz** signal with the 19-kHz pilot tone. If the pilot tone exceeds an externally adjustable threshold voltage, a Schmitt trigger circuit is energized. The signal from the Schmitt trigger lights the stereo indicator, enables the 38-kHz synchronous detector, and automatically switches the CA3090AQ from monaural to stereo operation. The output signal from the 38-kHz detector and the composite signal from the preamplifier are applied to a

- Low distortion: under 0.5%
- Separate dc input permits stereo defeat or enable
- High signal output: directly drives audio amplifiers
- Excellent SCA (storecast) rejection: 55 dB typ.
- High audio channel separation: 40 dB typ.

matrixing circuit from which emerge the resultant left and right channel audio signals. These signals are applied to their respective left and right post amplifiers for amplification to a level sufficient to drive most audio amplifiers.

The CA3090AQ may be used without the stereo defeat/ enable function (see Fig. 6) if a control voltage for this function is not readily available. In this case, Terminal 4 should be grounded.

The CA309OAQ utilizes the 16-lead quad-in-line plastic package and operates over the ambient temperature range of  $-40^{\circ}$  c to  $+85^{\circ}$  c.

\*Formerly Developmental Type No. TA6262G.

**MAXIMUM RATINGS**, Absolute-Maximum Values at  $T_A = 25$ " C:

DC Supply Voltage	*	16 V
Current at Term. 12		100 mA
input Signal Voltage (Compo	site) ,	, 400 mV
Ambient Temperature Range:		
Operating		40 to +85° C
Storage		65 to +1 <b>50° C</b>
Lead Temperature (during so	oldering):	
At distance not less than 1/	/32" (0.79 mm)	
from case for 10 s max		+265° C

For stereo operation, a minimum input signal voltage (composite) of 40 mV is required.

# TV/CATV Circuits

ELECTRICAL CHARACTERISTICS										
	T	TEST CONDITIONS				ITS				
CHARACTERISTIC	TERMINAL MEASURED AND SYMBOL	Typ. Char. Curve Fig. No.	$T_A = 25^{\circ}C$ V+ = 12 V (unless specified otherwise)	Cir- cuit Fig. No.	Min.	Тур.	Max.	UNITS		
Static Cherecteristics										
Total Current (Terms. 9, 10. 11)	<sup> </sup> total		Lamp OFF	3	-	22	27	mA		
DC Voltage: Term. 1	v <sub>1</sub>			3	1.6	2.3	3.1	v		
Torme 0 and 10	*6 Ve e ve			3		2.1 E 4	3.0 7 A	v		
Term. 12 (Indicator Lamp OFF)	V12		V <sup>+</sup> = 16 V	3	3.7 12.7	- -	1.4	v		
Voltage Differential (Term. 2-Term. 1)	V <sub>2</sub> · V <sub>1</sub>			3	-	0	0.1	v		
Current et Term. 12 (In actual use external circuit resistance (e.g. lamp should limit Term. 12 to the maximum rated value of 100mA.)		4	<sup>4</sup> V <sub>IN</sub> (et f = 19 kHz)= 18 mV	1	75	100		mA		
Dynamic Cherecteristics	_									
Input Impedance	z <sub>in</sub>			7	1	50k	-	Ω		
Channel Separation (L + R Reference)*				7	25	40	-	dB		
Channel Balance (Monaural)				7	I	0.3	3	dB		
Monaural Gain			V <sub>IN</sub> = 180 mV		3	6	9	dB		
Stereo/Monaural Gain Ratio*				7	_	±0.3	±3	dB		
Indicator Lamp – Turn-ON Voltage		5	19-kHz pilot-tone @ Term.	7	1	4	1	mV		
Capture Range (Deviation from 76-kHzcenter frequency)		7.8	19-kHz pilot-tone voltage = 18 mV	7	±6.6	±10	-	%		
Distortion (75-μs de-emphasis): 2nd Harmonic			 _IN <sup>V∞</sup> 240 mV	7	-	0.2	-	%		
3rd. 4th, and 5th Harmonic				7	1	<0.1	_	%		
19-kHz Rejection	- I	1		17 I	-	35	-	dB		
38-kHz Rejection	h			7	-	25	_	dB		
SCA (storecast) Rejection				7	-	55	-	dB		
Stereo Defeat Voltage (V <sub>4</sub> )					-		<0.9	v		
Stereo Enable Voltage (V <sub>4</sub> )					>1.6		-	v		

NOTE: For improved pilot sensitivity end overload characteristic& replace the .039 μF capacitor between Terminals 7 and 8 with a Series L-C Network (L = 4.7 mH. C = 0.015 μF). Under these conditions, Indicelor Lamp Sensitivity: 'ON' = 3.3 mV, 'OFF' = 2.0 mV

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For stereo operation, test conditions require a composite stereo input signal (modulated at 1 kHz) including a 19-kHz (18 mV) pilot-tone signal.



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Fig. 3 - Test circuit for DC characteristics.

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Fig. 4 - Indicator lamp characteristics (IC vs. VCE).

COLLECTOR-TO-EMITTER VOLTAGE (VCE)---V

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9205-22551

)= 25°C

DC SUPPLY VOLTAGE (V+) = 11V INPUT SIGNAL VOLTAGE (VIN

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TEMPERATURE (TA

NUDICATOR LAMP AT

COLLECTOR CURRENT FOR INDICA TERM 12 LLC



9205-22552

0.039 μF \$470 kΩ

9205-22553









Fig. 7 - Test circuit for measurement of dynamic characteristics.

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### **TV/CATV** Circuits



Fig. 8 – Pilot-tone voltage level vs. VCO frequency with no pilot-tone applied.



Fig. 9 – Filter capacitance vs. VCO frequency with no pilot-tone applied



A- Foil side.



B-Component side.

Fig 10 - photographs of the CA3090A0 and outboardcomponents mounted on e 2 X 2%-inch printed-circuit board to constitute a complete stereo multiplex decoder.