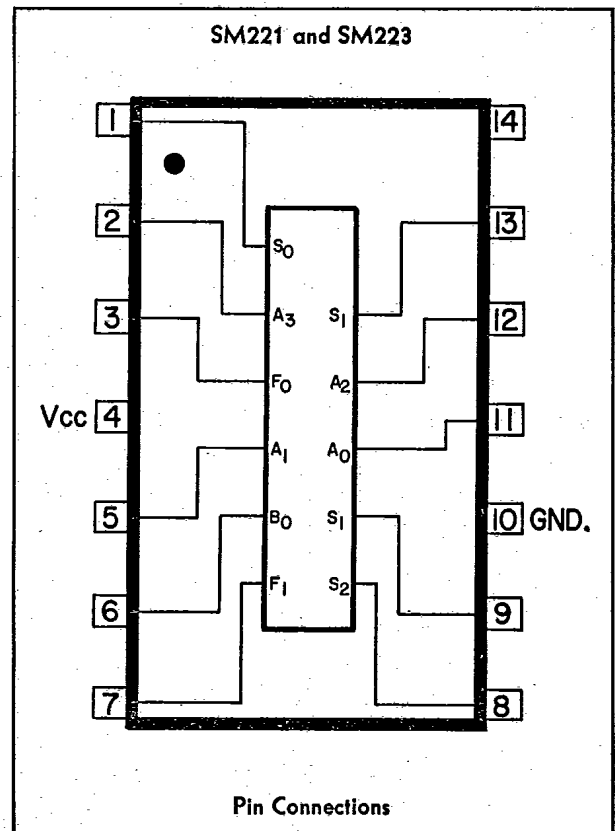
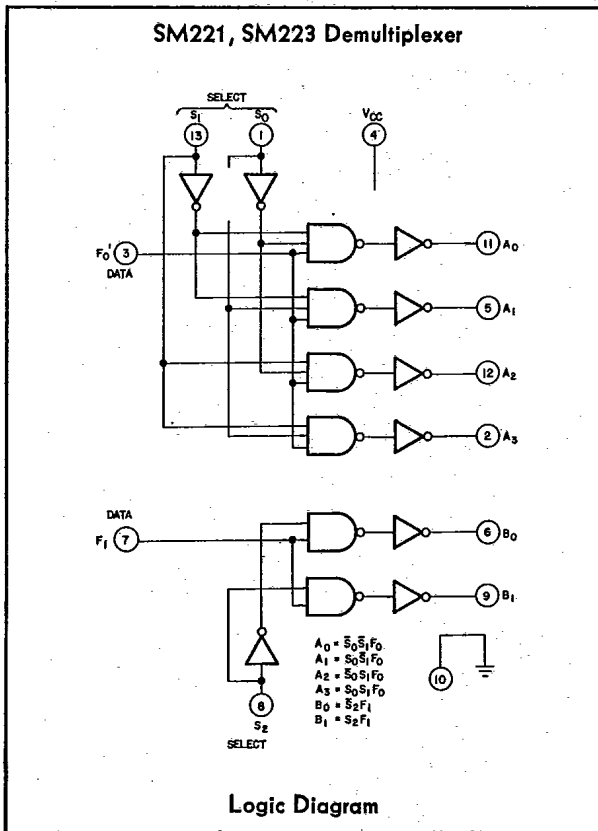


**Demultiplexer  
SM221 and SM223**

**Monolithic Digital Functional Arrays For Military Temp. Range -55°C to +125°C • Industrial 0°C to +75°C**



The SM221 and SM223 Demultiplexers, described in this data sheet, are part of Sylvania's line of Monolithic Digital Functional Arrays.

These devices are high speed, silicon, integrated circuit arrays designed to perform the opposite function of their companion circuits, the SM211 and SM213. That is, the SM211 and SM213 function as multiplexers or encoders, while the SM221 and SM223 function as demultiplexers or decoders.

The SM221 and SM223 arrays are offered in 14-lead flat pack (TO-85) or Sylvania's ceramic 14-lead dual-in-line plug-in package.

**FUNCTIONAL DESCRIPTION**

The Demultiplexer Arrays consist of two decoding sections. In one section, the data input may be steered to any one of four identical outputs under control of two selection variables. In the other section, another data input may be routed to either of two identical outputs depending on the state of one selection line. The output inverter/drivers provide the "true" states of the input data allowing direct entry into subsequent systems without extra gate inversion. An obvious application for this type of device is as a demultiplexer operating on a serial data line and converting to parallel data. The original parallel data would have been multiplexed into serial form by a Sylvania SM211 or SM213 array. Thus, the SM210 and SM220 series devices make an ideal pair in systems where it is desired to multiplex many data lines, transmit on one or two lines, and convert back to the original data form at the receiving end for processing.

*SM-00221-1X*

## SPECIAL FEATURES

1. Each package decodes one data line into four outputs and another data line into two outputs.
2. High speed: Typically less than 12 nanoseconds delay from data input to any output.
3. Complete compatibility with all SUHL\* I and II devices and other Sylvania arrays.
4. High fanout: 7 SUHL I loads.
5. High capacitance drive.
6. High noise immunity:  $\pm 400$  milliwatts over the temperature range.
7. Wide logic swing: Typical logic "0" = 0.25 volts, logic "1" = 3.25 volts.
8. Low output impedance in "0" and "1" state reduces noise pickup.
9. Buffered outputs.
10. Single 5-volt power supply.
11. Each input is protected by a clamp diode.

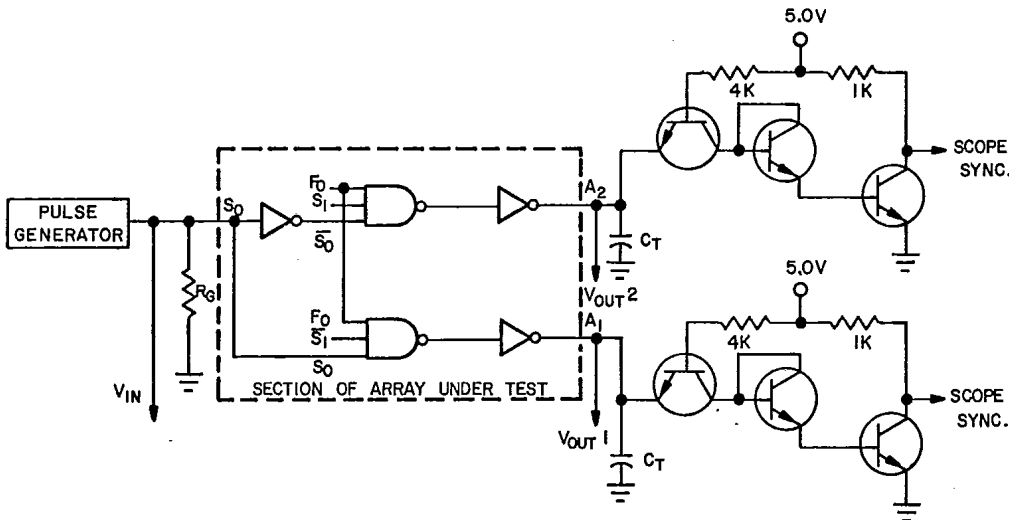
\*Sylvania Universal High-Level Logic

## RATINGS

VOLTAGE	Min.	Typ.	Max.	TEMPERATURE	Min.	Typ.	Max.
Supply Voltage (10-millisecond pulse, 50% duty cycle)			7 Vdc	Operating Temperature: SM221 (Military) SM223 (Industrial) Storage Temperature	-55°C		+125°C
Supply Voltage (Operating): SM221 (Military)	4.5V	5.0V	5.5 Vdc		0°C		+75°C
SM223 (Industrial)	4.75V	5.0V	5.25 Vdc		-65°C		+200°C
Input Voltage			5.5 Vdc				
Output Voltage			5.5 Vdc				

## TYPICAL SWITCHING CHARACTERISTICS

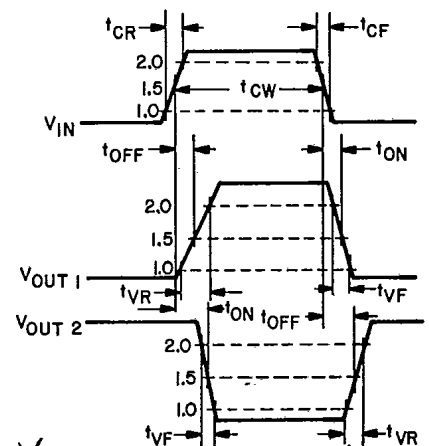
Parameters @ $V_{CC} = 5.0$ Volts, $T_A = +25^\circ\text{C}$ , $C_T = 15$ pF, $FO = 1$					
Signal Path	$t_{ON}$	$t_{OFF}$	$t_{VR}$	$t_{VF}$	Units
Any input to any output	20	20	4	2.5	nsec Max.



Illustrating a two-gate path from a control input to one output and a three-gate path from the same control input to another output. When  $\bar{S}_1 F_0 = 1$ , output  $A_1$  follows the input and appears after two gate delays. When  $\bar{S}_1 F_0 = 1$ , output  $A_2$  is the inverse of the input and appears after three gate delays.

### Notes:

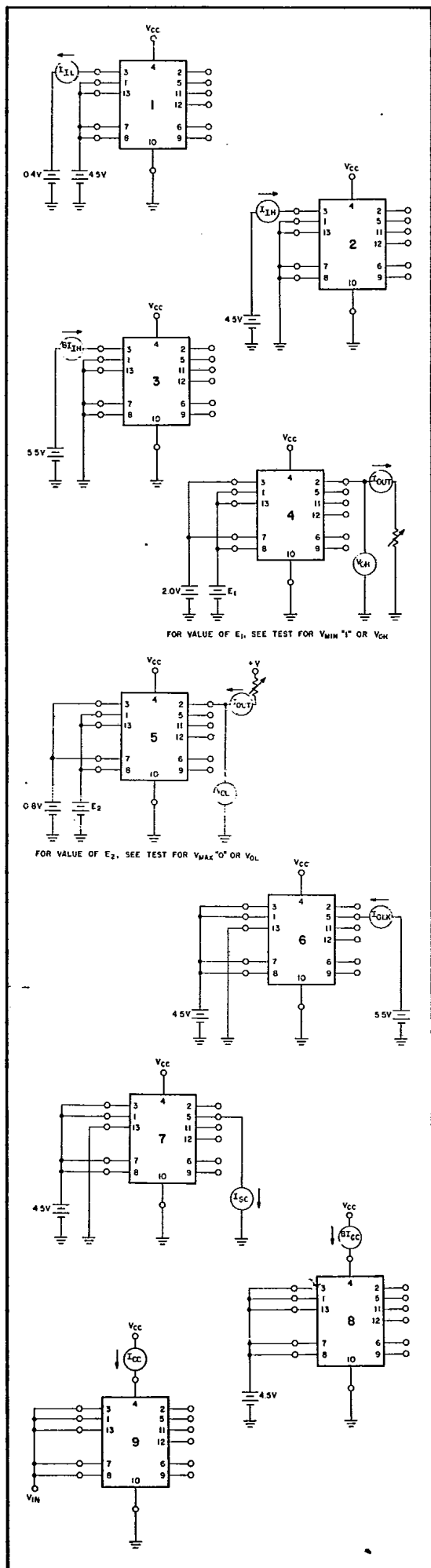
1. PRR = 2 MHz
2.  $t_{CW} = 200$  nsec
3.  $V_{CA} = 3.0$  Volts
4.  $t_{CR}, t_{CF} \leq 10$  nsec
5.  $R_G =$  Output Impedance of Pulse Generator, Typ.  $50 \Omega$
6. Transistors 2N2784 or Equivalent.
7.  $C_T =$  Total Output Capacitance Including Probe, Wiring and Load



SM-00221-2X

# TEST FIGURES

# ELECTRICAL CHARACTERISTICS

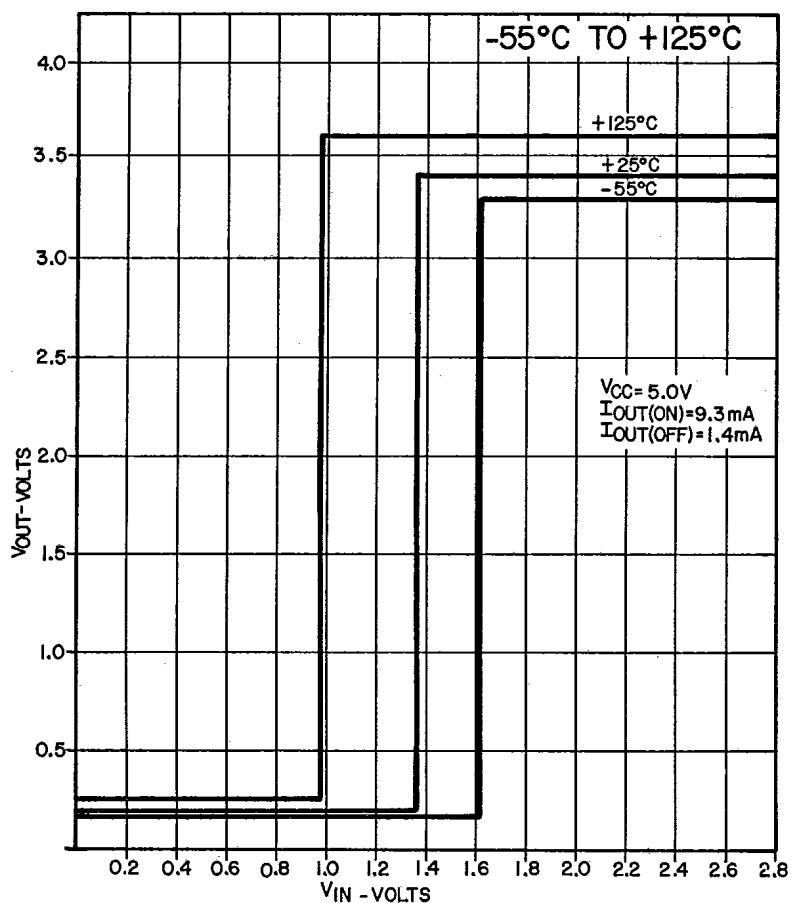


Parameters	Symbol	SM221 @ -55°C to +125°C Units	SM223 @ 0°C to +75°C Units	Test Fig. No.
<b>INPUT</b> Input Load Current, $S_0$ and $S_1$ $S_2$ $F_0$ $F_1$ @ $V_{IN} =$ Other Inputs $V_{CC}$	$I_{IL}$ $I_{iL}$ $I_{iL}$ $I_{iL}$ $I_{iL}$	4.0 mA Max. 2.66 mA Max. 5.33 mA Max. 2.66 mA Max. 0.4 Volts 4.5 Volts 5.5 Volts	4.5 mA Max. 3.0 mA Max. 6.0 mA Max. 3.0 mA Max. 0.4 Volts 4.5 Volts 5.25 Volts	1
Input Leakage Current, $S_0$ and $S_1$ $S_2$ $F_0$ $F_1$ @ $V_{IN} =$ Other Inputs $V_{CC}$	$I_{iH}$ $I_{iH}$ $I_{iH}$ $I_{iH}$	0.3 mA Max. 0.2 mA Max. 0.4 mA Max. 0.2 mA Max. 4.5 Volts 0 Volts 5.5 Volts	0.3 mA Max. 0.2 mA Max. 0.4 mA Max. 0.2 mA Max. 4.5 Volts 0 Volts 5.25 Volts	2
Input Breakdown Current, $S_0$ and $S_1$ $S_2$ $F_0$ $F_1$ @ $V_{IN} =$ Other Inputs $V_{CC}$	$B_{iH}$ $B_{iH}$ $B_{iH}$ $B_{iH}$	3 mA Max. 2 mA Max. 4 mA Max. 2 mA Max. 5.5 Volts 0 Volts 5.5 Volts	3 mA Max. 2 mA Max. 4 mA Max. 2 mA Max. 5.5 Volts 0 Volts 5.25 Volts	3
Logic "1" Threshold Voltage Minimum input voltage which will function as a logic "1" Other Inputs $V_{CC}$	$V_{MIN}$ "1"	2.0 Volts 4.5 Volts 4.5 Volts	2.0 Volts 4.5 Volts 4.75 Volts	4
Logic "0" Threshold Voltage Maximum input voltage which will function as a logic "0" Other Inputs $V_{CC}$	$V_{MAX}$ "0"	0.8 Volts 4.5 Volts 4.5 Volts	0.8 Volts 4.5 Volts 5.25 Volts	5
<b>OUTPUT</b> Output Leakage Current @ $V_{OUT} =$ Inputs $F_0$ and $F_1$ Inputs $S_0, S_1, S_2$ adjusted to set output under test to logic "1" $V_{CC}$	$I_{OLK}$	0.25 mA Max. 5.5 Volts 4.5 Volts 5.5 Volts	0.25 mA Max. 5.5 Volts 4.5 Volts 5.25 Volts	6
Output Short Circuit Current @ $V_{OUT} =$ Inputs $F_0$ and $F_1$ Inputs $S_0, S_1, S_2$ adjusted to set output under test to logic "1" $V_{CC}$	$I_{SC}$	25 mA Min. 100 mA Max. 0 Volts 4.5 Volts 5.0 Volts	25 mA Min. 100 mA Max. 0 Volts 4.5 Volts 5.0 Volts	7
Logic "0" Level @ $I_{OUT} =$ Inputs $F_0$ and $F_1$ Other Inputs $V_{CC}$	$V_{OL}$	0.4 Volts Max. 9.3 mA 0.8 Volts 2.0 Volts 4.5 Volts	0.4 Volts Max. 11.6 mA 0.8 Volts 2.0 Volts 4.75 Volts	5
Logic "1" Level @ $I_{OUT} =$ Inputs $F_0$ and $F_1$ Inputs $S_0, S_1, S_2$ adjusted to appropriate threshold condition which will set output under test to logic "1" $V_{CC}$	$V_{OH}$	2.4 Volts Min. 1.4 mA 2.0 Volts 4.5 Volts	2.4 Volts Min. 1.4 mA 2.0 Volts 4.75 Volts	4
<b>POWER REQUIREMENTS</b> Breakdown Current Inputs $V_{CC}$ (10 millisecond pulse, 50% duty cycle) 25°C only	$B_{lcc}$	92 mA Max. 4.5 Volts 7.0 Volts	108 mA Max. 4.5 Volts 7.0 Volts	8
Current Drain, "ON" State Inputs $V_{CC}$	$I_{CC}$ "0"	66 mA Max. 0 Volts 5.0 Volts	75 mA Max. 0 Volts 5.0 Volts	9
Current Drain, "OFF" State* Inputs $V_{CC}$	$I_{CC}$ "1"	58 mA Max. 4.5 Volts 5.0 Volts	67 mA Max. 4.5 Volts 5.0 Volts	9

\*There is no true "OFF" State (all outputs at logic "1"). Only one output in each section may be at logic "1" at one time.

SM 2221 9.

# SM221 AND SM223 TYPICAL TRANSFER CHARACTERISTICS



## ORDERING INFORMATION

SM221 and SM223 arrays are currently offered for operation over the Military temperature range of  $-55^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$  and Industrial/Commercial temperature range of  $0^{\circ}\text{C}$  to  $+75^{\circ}\text{C}$ . A two-digit suffix is used to denote choice of package. Thus, orders should be placed as follows:

14-lead hermetic flat pack. . . . . SM221-02 or SM223-02

14-lead hermetic plug-in package. . . . . SM221-03 or SM223-03

The nearest Sylvania sales office or distributor will be happy to accept your order or provide further information.