

## MUX-16/MUX-28

### FEATURES

- JFET Switches Rather Than CMOS
- Highly Resistant To Static Discharge Damage
- No SCR Latch-up Problems
- Low "ON" Resistance — 290Ω Typical
- Low Leakage Current
- Digital Inputs Compatible With TTL and CMOS
- Break-Before-Make Action
- 125° C Temperature-Tested Dice Available
- Overvoltage Protected
- Supply Loss Protection
- MUX-16 Pin Compatible With DG506, HI-506A, AD7506
- MUX-28 Pin Compatible With DG507, HI-507A, AD7507
- Available In Die Form

### ORDERING INFORMATION †

25°C RESISTANCE	PACKAGE			OPERATING TEMPERATURE RANGE
	CERDIP 28-PIN	LCC 28-CONTACT	PLASTIC 28-PIN	
290Ω	MUX16AT*	—	—	MIL
290Ω	MUX16ET	—	—	IND
400Ω	MUX16BT*	MUX16BTC/883	—	MIL
400Ω	MUX16FT	—	MUX16FP	XIND
400Ω	—	—	MUX16FPC	XIND
290Ω	MUX28AT*	—	—	MIL
290Ω	MUX28ET	—	—	IND
400Ω	MUX28BT*	MUX28BTC/883	—	MIL
400Ω	MUX28FT	—	MUX28FP	XIND
400Ω	—	—	MUX28FPC	XIND

\* For devices processed in total compliance to MIL-STD-883, add /883 after part number. Consult factory for 883 data sheet.

† Burn-in is available on commercial and industrial temperature range parts in CerDIP, plastic DIP, and TO-can packages.

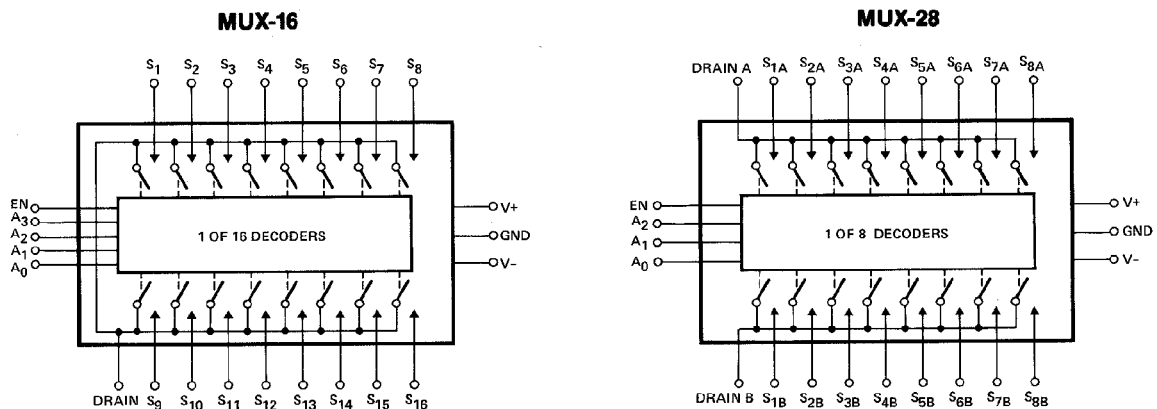
### GENERAL DESCRIPTION

The MUX-16 is a monolithic 16-channel analog multiplexer which connects a single output to 1 of the 16 analog inputs depending upon the state of a 4-bit binary address. Disconnection of the output is provided by a logical "0" at the ENABLE input, thereby providing a package selection function.

The MUX-28 is a monolithic 8-channel differential analog multiplexer configured in a double pole, 8-position (plus OFF) electronic switch array. A 3-bit binary input address connects a pair of independent analog inputs from each 8-channel input section to the corresponding pair of independent analog outputs. Disconnection of both inputs is provided by a logical "0" at the ENABLE input, thereby offering a package select function.

Fabricated with Precision Monolithics' high performance Bipolar-JFET technology, these devices offer low, constant "ON" resistance. Performance advantages include low leakage currents and fast settling time with low crosstalk to satisfy a wide variety of applications. These multiplexers do not suffer from latch-up or static discharge blow-out problems associated with similar CMOS parts. The digital inputs are designed to operate from both TTL and CMOS levels while always providing a definite break-before-make action without the need for external pull-up resistors. For single 8-channel and dual 4-channel models, refer to the MUX-08/MUX-24 data sheet.

### FUNCTIONAL DIAGRAMS



### REV. A

Information furnished by Analog Devices is believed to be accurate and reliable. However, no responsibility is assumed by Analog Devices for its use, nor for any infringements of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of Analog Devices.

One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106, U.S.A.  
 Tel: 617/329-4700 Fax: 617/326-8703 Twx: 710/394-6577  
 Telex: 924491 Cable: ANALOG NORWOODMASS

# MUX-16/MUX-28

## PIN CONNECTIONS & TRUTH TABLES

**MUX-16**  
28-PIN PLASTIC DIP (P-Suffix)  
28-PIN CERDIP (T-Suffix)

**MUX-28**

**MUX-16BTC/883**  
LCC (TC-Suffix)  
PLCC (PC-Suffix)

**MUX-16**

"ON"					"ON"						
A <sub>3</sub>	A <sub>2</sub>	A <sub>1</sub>	A <sub>0</sub>	EN	CHANNEL	A <sub>3</sub>	A <sub>2</sub>	A <sub>1</sub>	A <sub>0</sub>	EN	CHANNEL
X	X	X	X	L	NONE	H	L	L	L	H	9
L	L	L	L	H	1	H	L	L	H	H	10
L	L	L	H	H	2	H	L	H	L	H	11
L	L	H	L	H	3	H	L	H	H	H	12
L	L	H	H	H	4	H	H	L	L	H	13
L	H	L	L	H	5	H	H	L	H	H	14
L	H	L	H	H	6	H	H	H	L	H	15
L	H	H	L	H	7	H	H	H	H	H	16
L	H	H	H	H	8						

**MUX-28**

"ON"					
A <sub>2</sub>	A <sub>1</sub>	A <sub>0</sub>	EN	CHANNEL PAIR	
X	X	X	L	NONE	
L	L	L	H	1	
L	L	H	H	2	
L	H	L	H	3	
L	H	H	H	4	
H	L	L	H	5	
H	L	H	H	6	
H	H	L	H	7	
H	H	H	H	8	

### ABSOLUTE MAXIMUM RATINGS (Note 1)

Operating Temperature Range,	
MUX-16/28-AT, BT, BTC .....	-55°C to +125°C
MUX-16/28-ET .....	-25°C to +85°C
MUX-16/28-FP, FPC, FT .....	-40°C to +85°C
Junction Temperature (T <sub>J</sub> ) .....	-65°C to +150°C
Storage Temperature Range .....	-65°C to +150°C
Lead Temperature (Soldering, 60 sec) .....	300°C
Maximum Junction Temperature .....	150°C
V <sub>+</sub> Supply to V <sub>-</sub> Supply .....	36V
Logic Input Voltage .....	(V <sub>-</sub> or -4V) to V <sub>+</sub> Supply
Analog Input Voltage .....	V <sub>-</sub> Supply -20V to V <sub>+</sub> Supply +20V

### Maximum Current Through Any Pin ..... 25mA

PACKAGE TYPE	e <sub>JA</sub> (Note 2)	e <sub>JC</sub>	UNITS
28-Pin Hermetic DIP (T)	55	15	°C/W
28-Pin Plastic DIP (P)	56	30	°C/W
28-Contact LCC (TC)	86	35	°C/W
28-Contact PLCC (PC)	70	33	°C/W

#### NOTES:

- Ratings apply to both DICE and packaged parts, unless otherwise noted.
- e<sub>JA</sub> is specified for worst case mounting conditions, i.e., e<sub>JA</sub> is specified for device in socket for CerDIP, P-DIP, and LCC packages; e<sub>JA</sub> is specified for device soldered to printed circuit board for PLCC package.

### ELECTRICAL CHARACTERISTICS at V<sub>S</sub> = ±15V and T<sub>A</sub> = 25°C, unless otherwise noted.

PARAMETER	SYMBOL	CONDITIONS	MUX-16A/E MUX-28A/E			MUX-16B/F MUX-28B/F			UNITS	
			MIN	TYP	MAX	MIN	TYP	MAX		
"ON" Resistance	R <sub>ON</sub>	V <sub>S</sub> ≤ 10V, I <sub>S</sub> ≤ 200μA	—	290	380	—	400	580	Ω	
ΔR <sub>ON</sub> With Applied Voltage	ΔR <sub>ON</sub>	-10V ≤ V <sub>S</sub> ≤ 10V, I <sub>S</sub> = 200μA	—	1.5	5	—	1.5	5	%	
R <sub>ON</sub> Match Between Switches	R <sub>ON</sub> Match	V <sub>S</sub> = 0V, I <sub>S</sub> = 200μA	—	7	15	—	9	20	%	
Analog Voltage Range	V <sub>A</sub>	{Note 6}	+10	+11	—	+10	+11	—	V	
Source Current (Switch "OFF")	I <sub>S</sub> (OFF)	V <sub>S</sub> = 10V, V <sub>D</sub> = -10V (Note 1)	—	0.01	1	—	0.01	2	nA	
Drain Current (Switch "OFF")	I <sub>D</sub> (OFF)	V <sub>S</sub> = 10V, V <sub>D</sub> = -10V (Note 1)	MUX-16	—	0.2	1	—	0.2	2	nA
			MUX-28	—	0.1	1	—	0.1	2	nA
Leakage Current (Switch "ON")	I <sub>D</sub> (ON) +I <sub>S</sub> (ON)	V <sub>D</sub> = 10V (Note 1)	MUX-16	—	0.2	1	—	0.2	2	nA
			MUX-28	—	0.1	1	—	0.1	2	nA
Digital Input Current	I <sub>IN</sub>	V <sub>IN</sub> = 0.4V to 15V	—	1	10	—	1	10	μA	

# MUX-16/MUX-28

**ELECTRICAL CHARACTERISTICS** at  $V_S = \pm 15V$  and  $T_A = +25^\circ C$ , unless otherwise noted. *Continued*

PARAMETER	SYMBOL	CONDITIONS	MUX-16A/E MUX-28A/E			MUX-16B/F MUX-28B/F			UNITS	
			MIN	TYP	MAX	MIN	TYP	MAX		
Digital "0" Enable Current	$I_{INL(EN)}$	$V_{EN} = 0.4V$	-	4	10	-	4	10	$\mu A$	
Digital Input Capacitance	$C_{DIG}$		-	3	-	-	3	-	pF	
Switching Time ( $t_{TRAN}$ )	$t_{PHL}$	(Notes 2,5) Figure 1 (Test Circuits)	-	1.4	2.0	-	1.8	2.5	$\mu s$	
	$t_{PLH}$		-	1.2	1.8	-	1.6	2.2		
Output Settling Time	$t_s$	10V Step to 0.10%	-	2.6	-	-	2.7	-	$\mu s$	
		10V Step to 0.05%	-	3.2	-	-	3.4	-		
		10V Step to 0.02%	-	4.0	-	-	7.2	-		
Break-Before-Make Delay	$t_{OPEN}$	Figure 3	-	0.7	-	-	1	-	$\mu s$	
Enable Delay "ON"	$t_{ON(EN)}$	(Note 5) Figure 2 (Test Circuits)	-	1	2	-	1.2	2.5	$\mu s$	
Enable Delay "OFF"	$t_{OFF(EN)}$	(Note 5) Figure 2 (Test Circuits)	MUX-16	-	0.25	0.5	-	0.25	0.5	$\mu s$
			MUX-28	-	0.25	0.5	-	0.25	0.6	
"OFF" Isolation	$ISO_{OFF}$	(Note 4) Figure 4 (Test Circuits)	-	66	-	-	66	-	dB	
Crosstalk	CT	(Note 3) Figure 5 (Test Circuits)	-	75	-	-	75	-	dB	
Source Capacitance	$C_{S(OFF)}$	Switch "OFF," $V_S = 0V, V_D = 0V$	-	2.5	-	-	2.5	-	pF	
Drain Capacitance	$C_{D(OFF)}$	Switch "OFF," $V_S = 0V, V_D = 0V$	MUX-16	-	13	-	-	13	-	pF
			MUX-28	-	8	-	-	8	-	
Input to Output Capacitance	$C_{DS(OFF)}$	(Note 4)	-	0.15	-	-	0.15	-	pF	
Positive Supply Current (All Digital Inputs Logic "0" or "1")	$I_+$	$V_+ = 15V$	MUX-16	-	15	19	-	9	19	mA
			MUX-28	-	15	19	-	8	19	
		$V_+ = 5V$	MUX-16	-	12	-	-	8	-	
			MUX-28	-	12	-	-	7	-	
Negative Supply Current (All Digital Inputs Logic "0" or "1")	$I_-$	$V_- = -15V$	MUX-16	-	5	7	-	3.5	7	mA
			MUX-28	-	5	7	-	3	7	
		$V_- = -5V$	MUX-16	-	4	-	-	3	-	
			MUX-28	-	4	-	-	2.5	-	

**NOTES:**

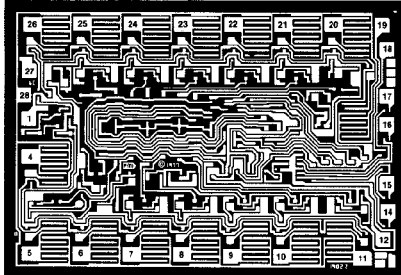
- Conditions applied to leakage tests insure worst case leakages.
- $R_L = 10M\Omega, C_L = 10pF$ .
- Crosstalk is measured by driving channel 8 (8B\*) with channel 7 (7B\*) ON.  
 $R_L = 1M\Omega, C_L = 10pF, V_S = 5V$  RMS,  $f = 500kHz$ .
- "OFF" isolation is measured by driving channel 8 (8B) with ALL channels OFF.  
 $R_L = 1k\Omega, C_L = 10pF, V_S = 5V$  RMS,  $f = 500kHz$ .  $C_{DS}$  is computed from the OFF isolation measurement.
- Sample tested.
- Guaranteed by leakage current and  $R_{ON}$  tests.

**ELECTRICAL CHARACTERISTICS** at  $V_S = \pm 15V, -55^\circ C \leq T_A \leq +125^\circ C$  for MUX-16AT/BT/BTC and MUX-28AT/BT/BTC;  $-25^\circ C \leq T_A \leq +85^\circ C$  for MUX-16ET and MUX-28ET;  $-40^\circ C \leq T_A \leq +85^\circ C$  for MUX-16 FT/FP/FPC and MUX-28FT/FP/FPC, unless otherwise noted.

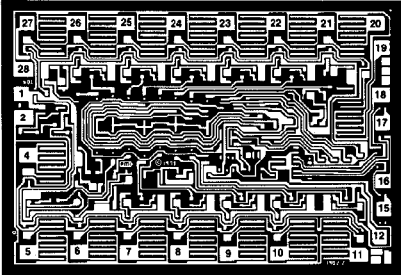
PARAMETER	SYMBOL	CONDITIONS	MUX-16A/E MUX-28A/E			MUX-16B/F MUX-28B/F			UNITS
			MIN	TYP	MAX	MIN	TYP	MAX	
"ON" Resistance	$R_{ON}$	$V_S \leq 10, I_S \leq 200\mu A$	-	-	500	-	-	800	$\Omega$
$\Delta R_{ON}$ With Applied Voltage	$\Delta R_{ON}$	$-10V \leq V_S \leq 10V, I_S = 200\mu A$	-	2	-	-	5.5	-	%
$R_{ON}$ Match Between Switches	$R_{ON}$ Match	$V_S = 0V, I_S = 200\mu A$	-	10	-	-	15	-	%
Analog Voltage Range	$V_A$	(Note 6)	+10 -10	+11 -15	-	+10 -10	+11 -15	-	V
Source Current (Switch "OFF")	$I_{S(OFF)}$	$V_S = 10V, V_D = -10V$ (Note 1)	-	-	25	-	-	50	nA
Drain Current (Switch "OFF")	$I_{D(OFF)}$	$V_S = 10V, V_D = -10V$ (Note 1)	-	-	75	-	-	250	nA
Leakage Current (Switch "ON")	$I_{D(ON)}$ $+I_{S(ON)}$	$V_D = 10V$ (Note 1)	-	-	75	-	-	250	nA
Digital "1" Input Voltage	$V_{INH}$	(Note 6)	2	-	-	2	-	-	V
Digital "0" Input Voltage	$V_{INL}$	(Note 6)	-	-	0.7	-	-	0.7	V
Digital Input Current	$I_{IN}$	$V_{IN} = 0.4V$ to 15V	-	-	20	-	-	20	$\mu A$
Digital "0" Enable Current	$I_{INL(EN)}$	$V_{EN} = 0.4V$	-	-	20	-	-	20	$\mu A$
Positive Supply Current	$I_+$	All Digital Inputs Logic "0" or "1"	-	-	24	-	-	24	mA
Negative Supply Current	$I_-$	All Digital Inputs Logic "0" or "1"	-	-	8.2	-	-	8.2	mA

# MUX-16/MUX-28

## DICE CHARACTERISTICS (125°C TESTED DICE AVAILABLE)



**MUX-16**



**MUX-28**

**DIE SIZE 0.110 × 0.076 inch, 8360 sq. mils  
(2.794 × 1.930 mm, 5392 sq. mm)**

**1. POSITIVE SUPPLY**  
**4. SOURCE 16 (S16)**  
**5. SOURCE 15 (S15)**  
**6. SOURCE 14 (S14)**  
**7. SOURCE 13 (S13)**  
**8. SOURCE 12 (S12)**  
**9. SOURCE 11 (S11)**  
**10. SOURCE 10 (S10)**  
**11. SOURCE 9 (S9)**  
**12. GROUND**  
**14. ADDRESS BIT 3 (A3)**  
**15. ADDRESS BIT 2 (A2)**  
**16. ADDRESS BIT 1 (A1)**

**17. ADDRESS BIT 0 (A0)**  
**18. ENABLE**  
**19. SOURCE 1 (S1)**  
**20. SOURCE 2 (S2)**  
**21. SOURCE 3 (S3)**  
**22. SOURCE 4 (S4)**  
**23. SOURCE 5 (S5)**  
**24. SOURCE 6 (S6)**  
**25. SOURCE 7 (S7)**  
**26. SOURCE 8 (S8)**  
**27. NEGATIVE SUPPLY (SUBSTRATE)**  
**28. DRAIN**

**1. POSITIVE SUPPLY**  
**2. DRAIN B**  
**4. SOURCE 8 (S8B)**  
**5. SOURCE 7 (S7B)**  
**6. SOURCE 6 (S6B)**  
**7. SOURCE 5 (S5B)**  
**8. SOURCE 4 (S4B)**  
**9. SOURCE 3 (S3B)**  
**10. SOURCE 2 (S2B)**  
**11. SOURCE 1 (S1B)**  
**12. GROUND**  
**15. ADDRESS BIT 2 (A2)**  
**16. ADDRESS BIT 1 (A1)**

**17. ADDRESS BIT 0 (A0)**  
**18. ENABLE**  
**19. SOURCE 1 (S1A)**  
**20. SOURCE 2 (S2A)**  
**21. SOURCE 3 (S3A)**  
**22. SOURCE 4 (S4A)**  
**23. SOURCE 5 (S5A)**  
**24. SOURCE 6 (S6A)**  
**25. SOURCE 7 (S7A)**  
**26. SOURCE 8 (S8A)**  
**27. NEGATIVE SUPPLY (SUBSTRATE)**  
**28. DRAIN A**

**WAFER TEST LIMITS** at  $V_+ = 15V$ ,  $V_- = -15V$ ,  $T_A = 25^\circ C$  for MUX-16/28 N and G,  $T_A = 125^\circ C$  for MUX-16/28 NT and GT, unless otherwise noted.

PARAMETER	SYMBOL	CONDITIONS	MUX-16/ MUX-28NT	MUX-16/ MUX-28N	MUX-16/ MUX-28GT	MUX-16/ MUX-28G	UNITS
			LIMIT	LIMIT	LIMIT	LIMIT	
"ON" Resistance	$R_{ON}$	$V_S = 0V$ , $I_S = 200\mu A$	540	380	800	580	$\Omega$ MAX
Digital "1" Input Voltage	$V_{INH}$		2	2	2	2	V MIN
Digital "0" Input Voltage	$V_{INL}$		0.8	0.8	0.8	0.8	V MAX
Digital "0" Input Current	$I_{INL}$	$V_{IN} = 0.4V$	20	10	20	10	$\mu A$ MAX
Digital "0" Enable Current	$I_{INL(EN)}$	$V_{EN} = 0.4V$	20	10	20	10	$\mu A$ MAX
Positive Supply Current (All Digital Inputs Logic "0")	$I_+$		24	19	24	19	mA MAX
Negative Supply Current (All Digital Inputs Logic "0")	$I_-$		8.2	7	8.2	7	mA MAX
Analog Input Range	$V_A$	(Note 2)	$\pm 10$	$\pm 10$	$\pm 10$	$\pm 10$	V MIN

**NOTE:**

Electrical tests are performed at wafer probe to the limits shown. Due to variations in assembly methods and normal yield loss, yield after packaging is not guaranteed for standard product dice. Consult factory to negotiate specifications based on dice lot qualification through sample lot assembly and testing.

**TYPICAL ELECTRICAL CHARACTERISTICS** at  $V_+ = 15V$ ,  $V_- = -15V$  and  $T_A = 25^\circ C$  for MUX-16/28 N and G,  $T_A = 125^\circ C$  for MUX-16/28 NT and GT, unless otherwise noted.

PARAMETER	SYMBOL	CONDITIONS	MUX-16/ MUX-28NT	MUX-16/ MUX-28N	MUX-16/ MUX-28GT	MUX-16/ MUX-28G	UNITS
			TYPICAL	TYPICAL	TYPICAL	TYPICAL	
Switching Time ( $t_{TRAN}$ )	$t_{PHL}$	(Note 1) Figure 1	2	1	2.6	1.5	$\mu S$
	$t_{PLH}$		1.8	0.9	2.4	1.4	
Output Settling Time	$t_S$	10V Step to 0.1% (Note 1)	2.5	1.5	2.9	1.9	$\mu S$
Break-Before-Make Delay	$t_{OPEN}$	(Note 1) Figure 3 (Test Circuits)	0.8	0.8	1	1	$\mu S$
Crosstalk	CT	(Note 1) Figure 5 (Test Circuits)	70	70	70	70	dB
$\Delta R_{ON}$ With Applied Voltage	$\Delta R_{ON}$	$-10V \leq V_S \leq 10V$ , $I_S = 200\mu A$	1.5	1.5	1.5	1.5	%
Leakage Current (Switch "ON")	$I_{D(ON)}$	$V_D = 10V$ (Note 1)	20	0.2	20	0.2	nA
Analog Input Range	$V_A$	(Note 2)	+11	+11	+11	+11	V
			-15	-15	-15	-15	

**NOTES:**

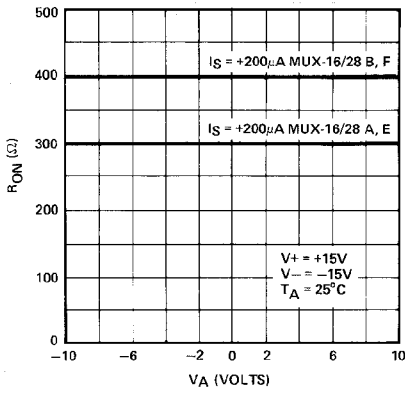
1. The data shown is extrapolated from measurements made on the packaged devices.

2. Guaranteed by  $R_{ON}$  and leakage current tests.

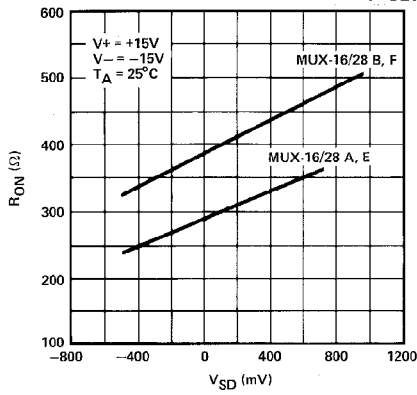
# MUX-16/MUX-28

TYPICAL PERFORMANCE CHARACTERISTICS (apply to all grades, unless otherwise noted.)

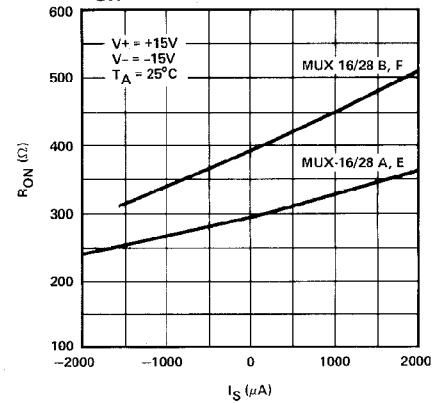
**"ON" RESISTANCE ( $R_{ON}$ ) vs ANALOG VOLTAGE ( $V_A$ )**



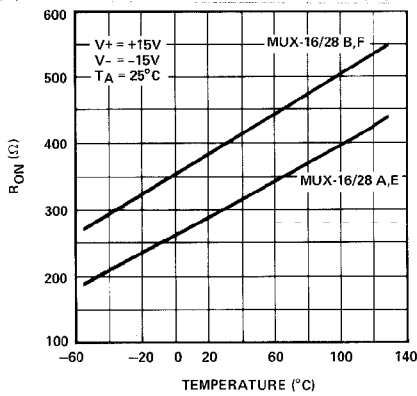
**$R_{ON}$  vs SWITCH VOLTAGE ( $V_{SD}$ )**



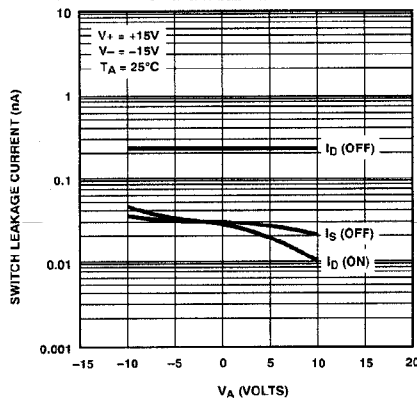
**$R_{ON}$  vs SWITCH CURRENT ( $I_S$ )**



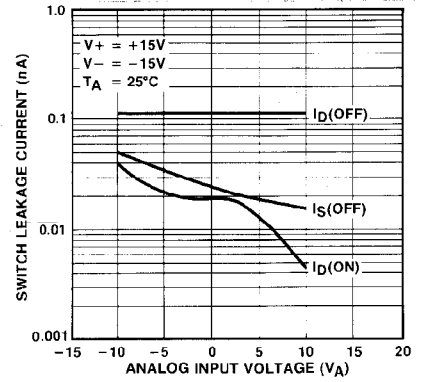
**$R_{ON}$  vs TEMPERATURE (T)**



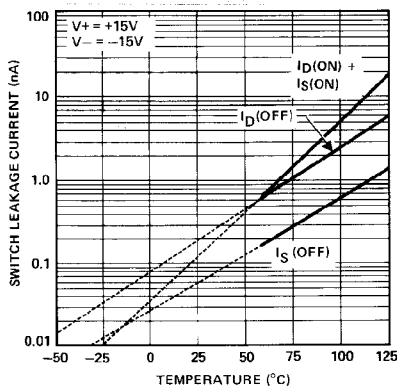
**MUX-16 SWITCH LEAKAGE CURRENTS vs ANALOG INPUT VOLTAGE ( $V_A$ )**



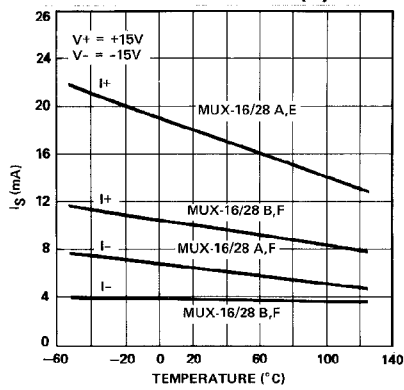
**MUX-28 SWITCH LEAKAGE CURRENTS vs ANALOG INPUT VOLTAGE ( $V_A$ )**



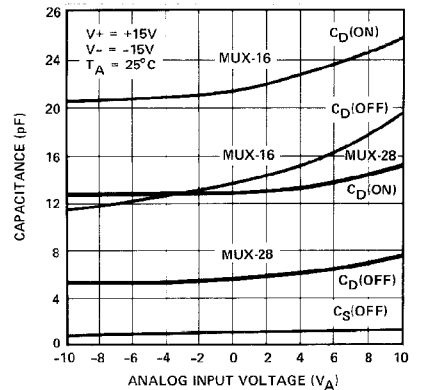
**SWITCH LEAKAGE CURRENTS vs TEMPERATURE**



**SUPPLY CURRENTS vs TEMPERATURE (T)**



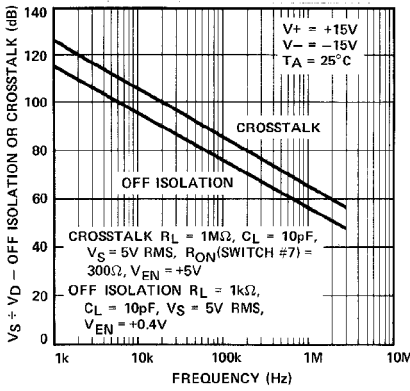
**SWITCH CAPACITANCES vs ANALOG INPUT VOLTAGE ( $V_A$ )**



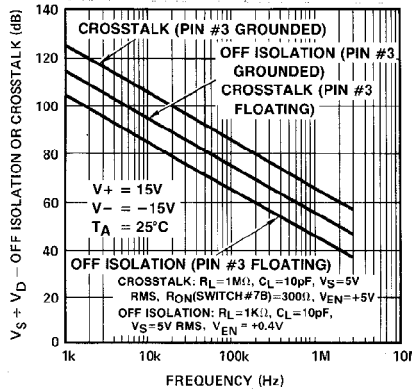
# MUX-16/MUX-28

TYPICAL PERFORMANCE CHARACTERISTICS (apply to all grades, unless otherwise noted.)

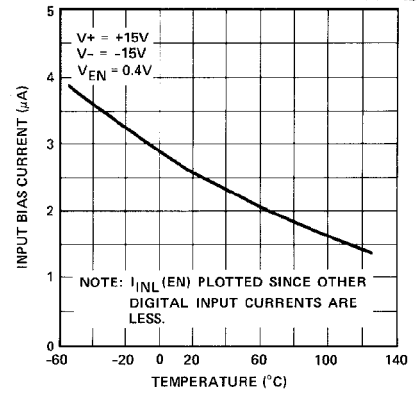
**MUX-16  
OFF PERFORMANCE OF  
CHANNEL 8**



**MUX-28  
OFF PERFORMANCE OF  
CHANNEL 8**

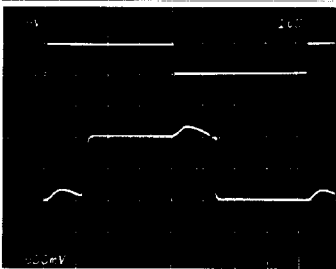


**DIGITAL INPUT BIAS CURRENTS vs TEMPERATURE (T)**



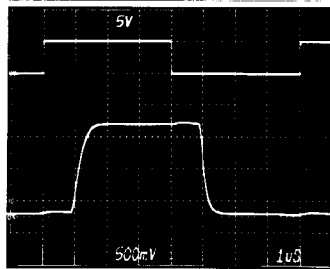
## MUX-16 DYNAMIC CHARACTERISTIC CURVES

**SMALL-SIGNAL SWITCHING**



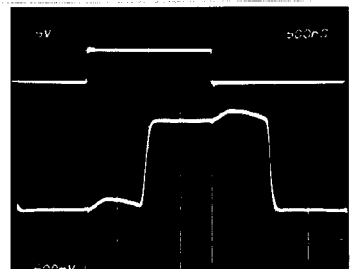
RL = 1MΩ, CL = 10pF, V1 = -500mV, V16 = +500mV

**SMALL-SIGNAL SWITCHING WITH FILTERING**



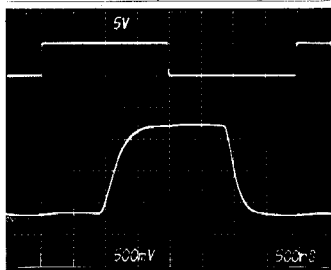
RL = 1MΩ, CL = 500pF, V1 = -500mV, V16 = +500mV

**SMALL-SIGNAL SWITCHING WITH 2μs SAMPLE TIME**



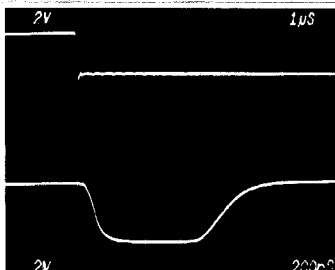
RL = 1MΩ, CL = 10pF, V1 = -700mV, V16 = +700mV

**SMALL-SIGNAL SWITCHING WITH FILTERING AND 2μs SAMPLE TIME**



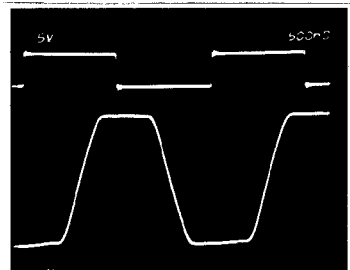
RL = 1MΩ, CL = 500pF, V1 = -700mV, V16 = +700mV

**BREAK-BEFORE-MAKE SWITCHING**



RL = 1kΩ, CL = 10pF, V1 = V16 = +10V

**LARGE-SIGNAL SWITCHING**

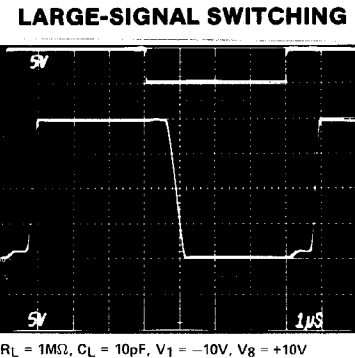
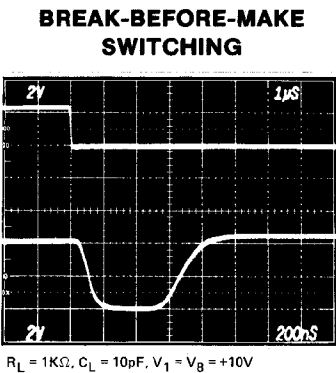
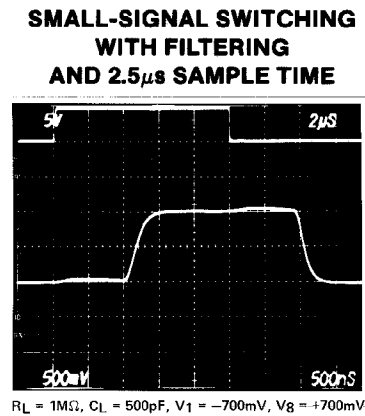
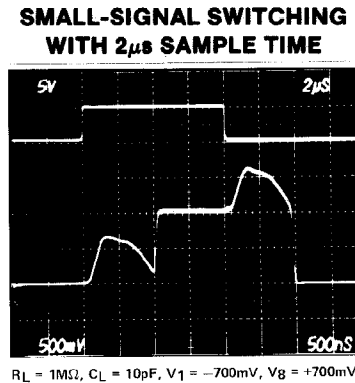
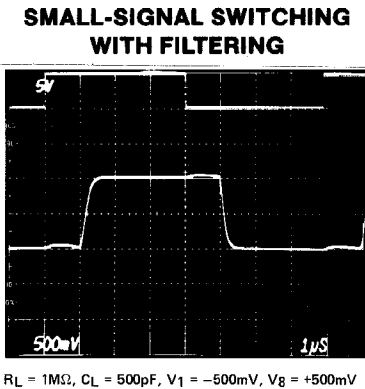
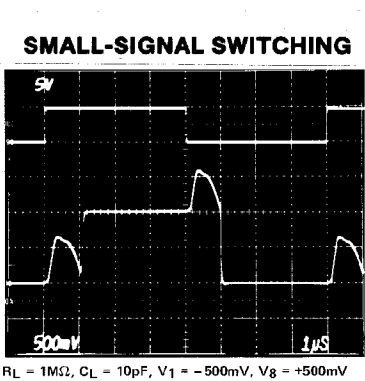


RL = 1MΩ, CL = 10pF, V1 = -10V, V16 = +10V

**NOTE:**

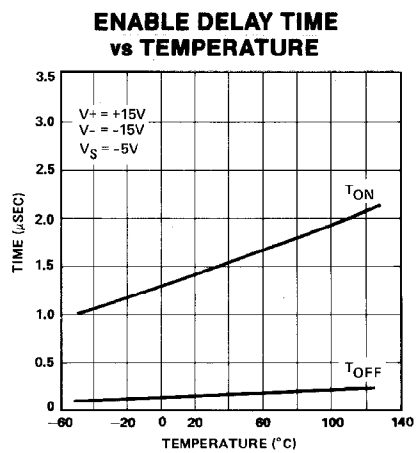
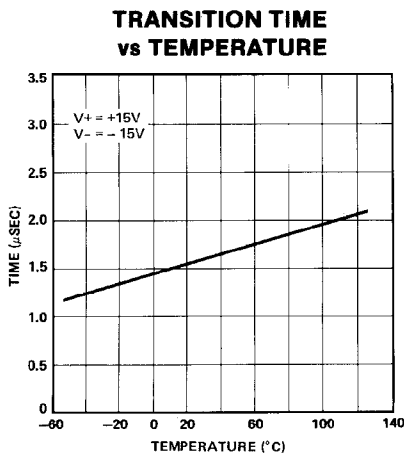
Top Waveforms: Digital Input 5V/Div  
Bottom Waveforms: Multiplexer Output (V<sub>D</sub>)

MUX-28 DYNAMIC CHARACTERISTIC CURVES



**NOTE:**  
 Top Waveforms: Digital Input 5V/Div  
 Bottom Waveforms: Multiplexer Output ( $V_D$ )

**TYPICAL PERFORMANCE CHARACTERISTICS** (apply to all grades, unless otherwise noted.)



# MUX-16/MUX-28

## A.C. TEST CIRCUITS

### TRANSITION TIME TEST CIRCUIT

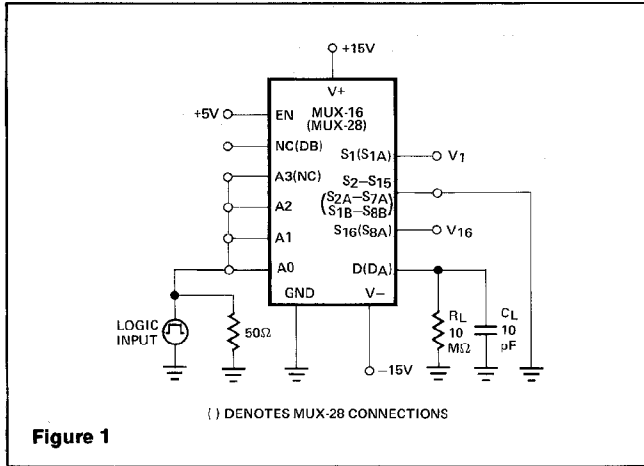


Figure 1

### ENABLE DELAY TIME TEST CIRCUIT

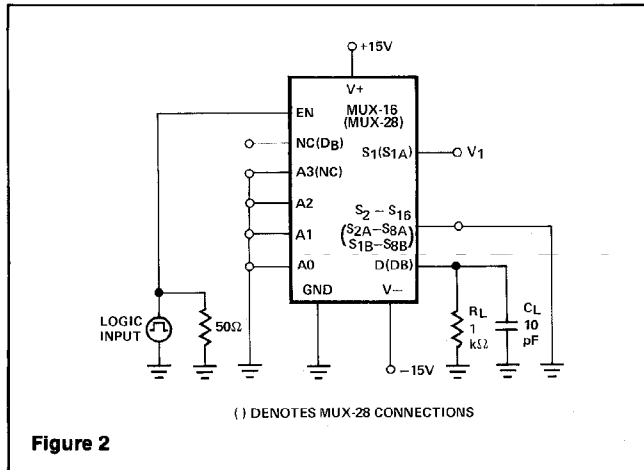


Figure 2

### BREAK-BEFORE-MAKE TEST CIRCUIT

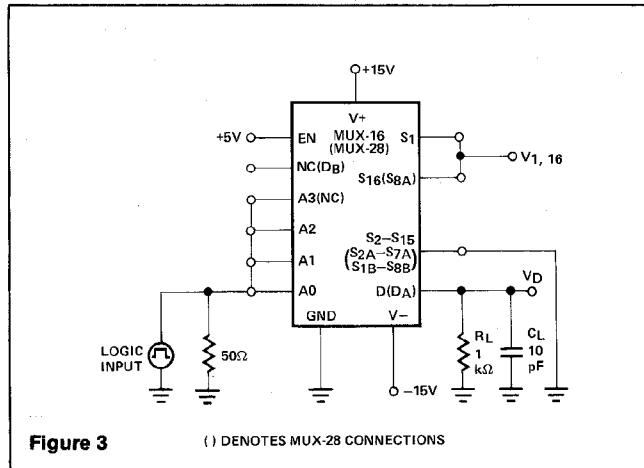
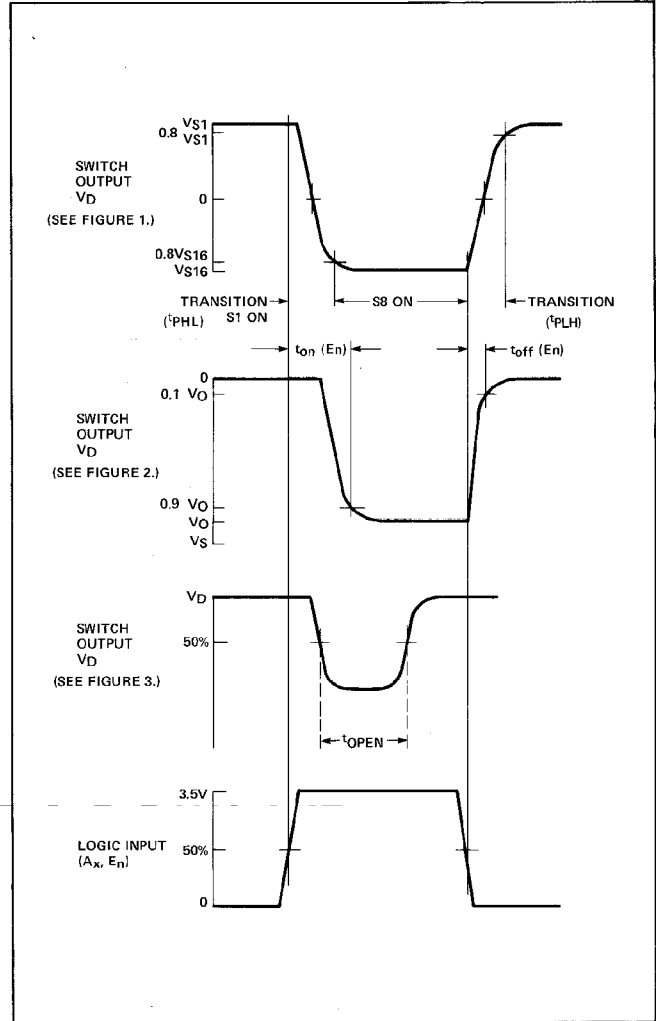


Figure 3

### SWITCHING TIME WAVEFORMS



### OFF ISOLATION TEST CIRCUIT

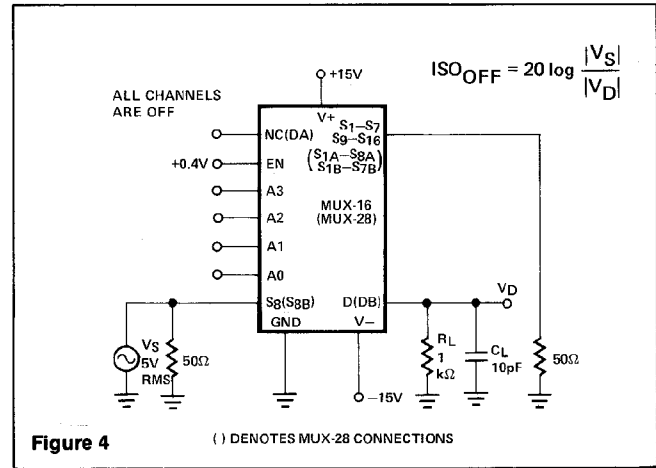


Figure 4



## CROSSTALK MEASUREMENT CIRCUIT

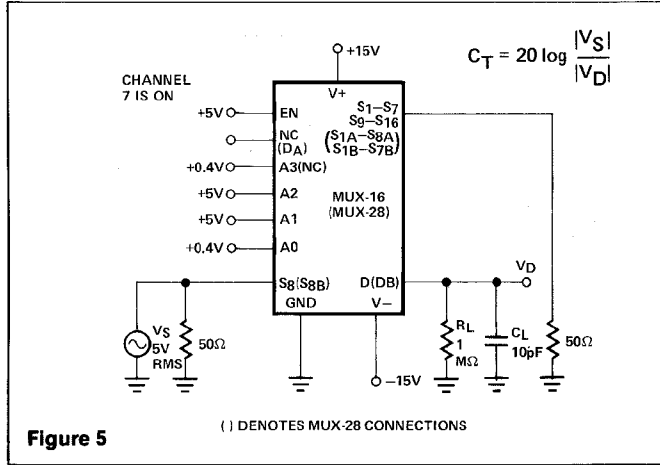
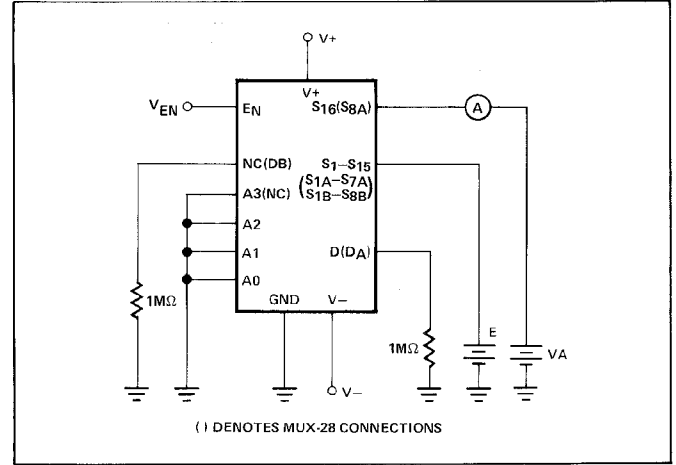


Figure 5

## OVERVOLTAGE MEASUREMENT TEST CIRCUIT



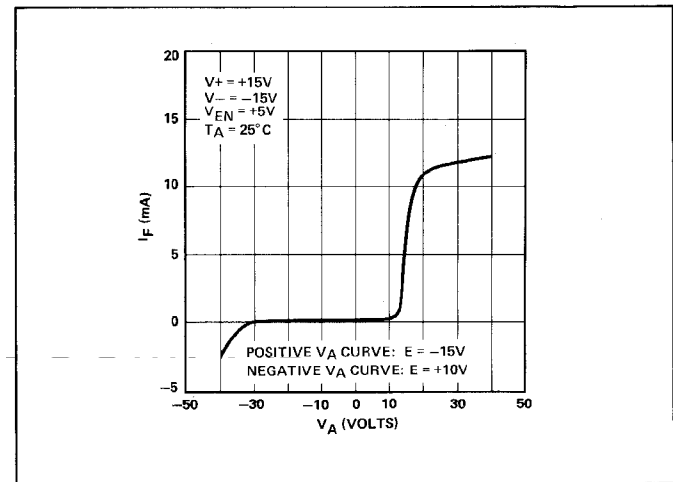
## APPLICATIONS INFORMATION

These analog multiplexers employ ion-implanted JFETs in a switch configuration designed to assure break-before-make (B.B.M.) action. The turn-off time is much faster than the turn-on time to guarantee B.B.M. over the full operating temperature and input voltage range. Fabricated with JFET processing rather than CMOS, special handling is not necessary to prevent damage to this multiplexer. Because the digital inputs only require a 2.0V logic "1" input level, power-consuming pullup resistors are not required for TTL compatibility to insure break-before-make switching as is most often the case with CMOS multiplexers. The digital inputs utilize PNP input transistors where input current is maximum at the logic "0" level and drops to that of a reverse-biased diode (about 10nA) as the input voltage is raised above  $\approx 1.4V$ .

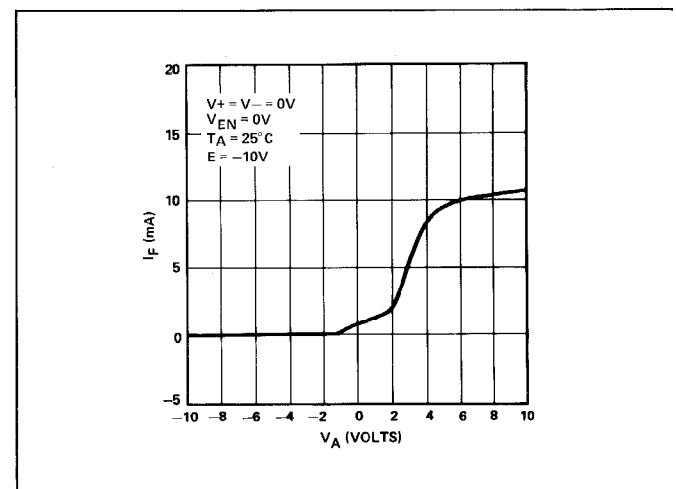
The "ON" resistance,  $R_{ON}$  of the analog switches is constant over the wide input voltage range of  $-15V$  to  $+11V$  with  $V_{SUPPLY} = \pm 15V$ . The overvoltage and supply-loss V-I characteristics shown indicate typical performance when the multiplexer is subjected to abnormal signals. For normal operation, however, positive input voltages should be restricted to 11V (or 4V less than the positive supply). This assures that the  $V_{GS}$  of an OFF FET switch remains greater than its  $V_p$ , preventing that channel from being falsely turned ON.

When operating with negative input voltages, the gate-to-channel diode will be turned on if the voltage drop across an ON switch exceeds  $-0.6V$ . While this condition will cause an error in the output, it will not damage the switch. In lab tests, the multiplexer output has been loaded with a  $0.01\mu F$  capacitor in the circuit of Figure 1. With  $V_1 = -10V$  and  $V_{16} = +10V$ , the logic input was driven at a 1kHz rate. The positive-going slew rate was  $0.3V/\mu Sec$  which is equivalent to a normal  $I_{DSS}$  of 3mA. The negative-going slew rate was  $0.7V/\mu sec$  which is equivalent to a "reverse"  $I_{DSS}$  of 7mA. Note that when switch one (1) is first turned ON it has a drop of  $-20V$  across its terminals. In spite of that fact, the current is limited to approximately twice its normal  $I_{DSS}$ .

## OVERVOLTAGE V-I CHARACTERISTIC

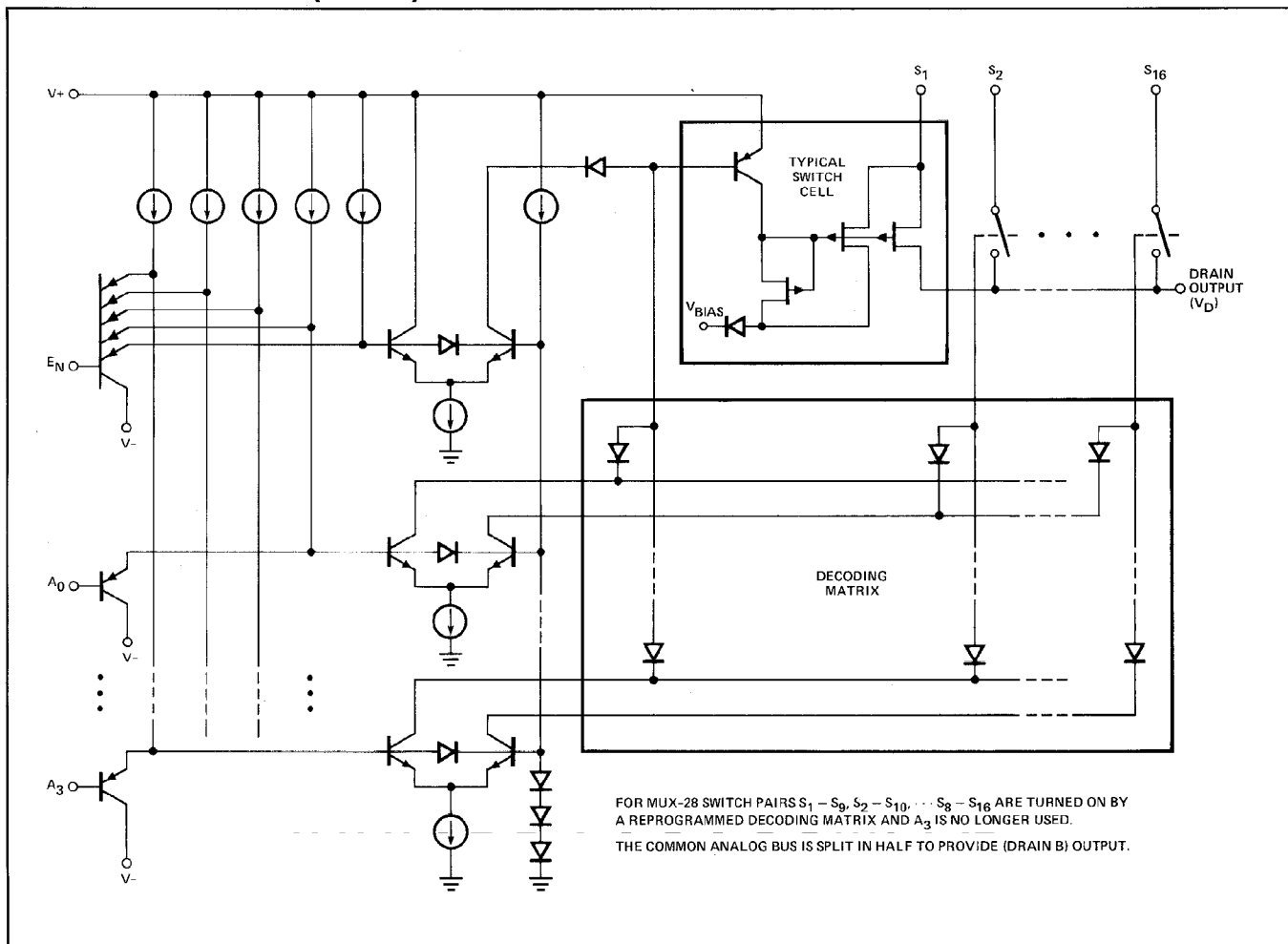


## SUPPLY-LOSS V-I CHARACTERISTIC



# MUX-16/MUX-28

## SIMPLIFIED SCHEMATIC (MUX-16)



-----

-----