ANALOG DEVICES

16-Channel/Dual 8-Channel JFET Analog Multiplexers (Overvoltage Protected)

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

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.

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.
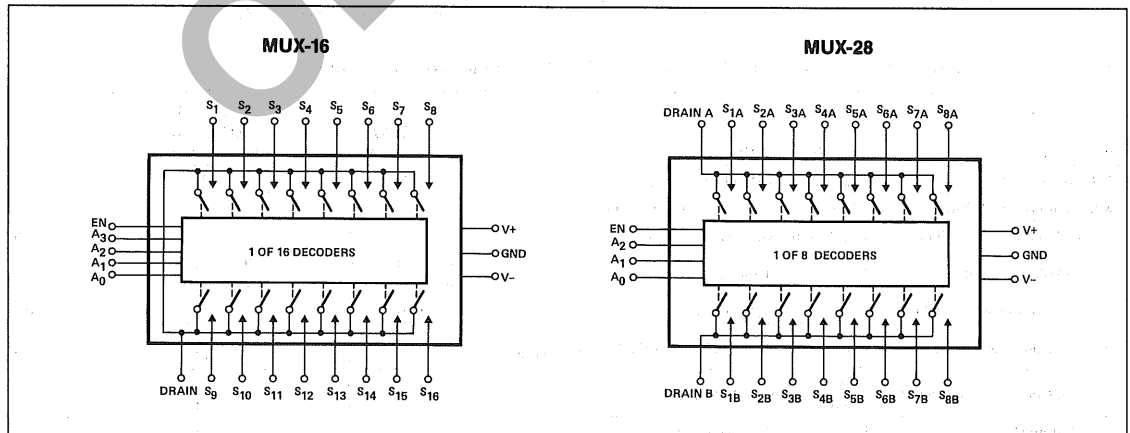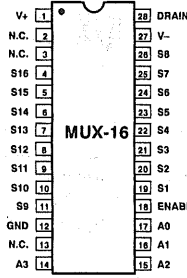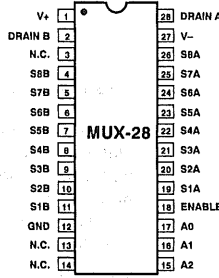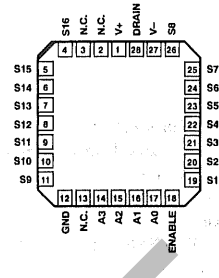
FUNCTIONAL DIAGRAMS

MUX-16/MUX-28

PIN CONNECTIONS & TRUTH TABLES

MUX-16

A₃ A₂ A₁ A₀ EN	"ON" CHANNEL	A₃ A₂ A₁ A₀ EN	"ON" 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

A₂ A₁ A₀ EN	"ON" 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_J) ... −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+ Supply to V− Supply ... 36V
Logic Input Voltage ... (V− or −4V) to V+ Supply
Analog Input Voltage ... V− Supply −20V to V+ Supply +20V

Maximum Current Through Any Pin ... 25mA

PACKAGE TYPE	Θ_JA (Note 2)	Θ_JC	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:
1. Ratings apply to both DICE and packaged parts, unless otherwise noted.
2. Θ_JA is specified for worst case mounting conditions, i.e., Θ_JA is specified for device in socket for CerDIP, P-DIP, and LCC packages; Θ_JA is specified for device soldered to printed circuit board for PLCC package.

ELECTRICAL CHARACTERISTICS at V_S = ±15V and T_A = 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_ON	V_S ≤ 10V, I_S ≤ 200μA	—	290	380	—	400	580	Ω
ΔR_ON With Applied Voltage	ΔR_ON	−10V ≤ V_S ≤ 10V, I_S = 200μA	—	1.5	5	—	1.5	5	%
R_ON Match Between Switches	R_ON Match	V_S = 0V, I_S = 200μA	—	7	15	—	9	20	%
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)	—	0.01	1	—	0.01	2	nA
Drain Current (Switch "OFF")	I_D (OFF)	V_S = 10V, V_D = −10V (Note 1) MUX-16 / MUX-28	— / —	0.2 / 0.1	1 / 1	— / —	0.2 / 0.1	2 / 2	nA
Leakage Current (Switch "ON")	I_D (ON) +I_S (ON)	V_D = 10V (Note 1) MUX-16 / MUX-28	— / —	0.2 / 0.1	1 / 1	— / —	0.2 / 0.1	2 / 2	nA
Digital Input Current	I_IN	V_IN = 0.4V to 15V	—	1	10	—	1	10	μA

REV. A

ELECTRICAL CHARACTERISTICS at $V_S = \pm 15V$ and $T_A = +25°C$, 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	µA
Digital Input Capacitance	C_{DIG}		–	3	–	–	3	–	pF
Switching Time (t_{TRAN})	t_{PHL} t_{PLH}	(Notes 2,5) Figure 1 (Test Circuits)	– –	1.4 1.2	2.0 1.8	– –	1.8 1.6	2.5 2.2	µs
Output Settling Time	t_s	10V Step to 0.10% 10V Step to 0.05% 10V Step to 0.02%	– – –	2.6 3.2 4.0	– – –	– – –	2.7 3.4 7.2	– – –	µs
Break-Before-Make Delay	t_{OPEN}	Figure 3	–	0.7	–	–	1	–	µs
Enable Delay "ON"	$t_{ON (EN)}$	(Note 5) Figure 2 (Test Circuits)	–	1	2	–	1.2	2.5	µs
Enable Delay "OFF"	$t_{OFF (EN)}$	(Note 5) Figure 2 (Test Circuits) MUX-16 / MUX-28	– –	0.25 0.25	0.5 0.5	– –	0.25 0.25	0.5 0.6	µs
"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 / MUX-28	– –	13 8	– –	– –	13 8	– –	pF
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 / MUX-28, V+ = 5V MUX-16 / MUX-28	– – – –	15 15 12 12	19 19 – –	– – – –	9 8 8 7	19 19 – –	mA
Negative Supply Current (All Digital Inputs Logic "0" or "1")	I–	V– = –15V MUX-16 / MUX-28, V– = –5V MUX-16 / MUX-28	– – – –	5 5 4 4	7 7 – –	– – – –	3.5 3 3 3	7 7 – –	mA

NOTES:
1. Conditions applied to leakage tests insure worst case leakages.
2. $R_L = 10M\Omega$, $C_L = 10pF$.
3. 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.
4. "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.
5. Sample tested.
6. Guaranteed by leakage current and R_{ON} tests.

ELECTRICAL CHARACTERISTICS at $V_S = \pm 15V$, $-55°C \le T_A \le +125°C$ for MUX-16AT/BT/BTC and MUX-28AT/BT/BTC; $-25°C \le T_A \le +85°C$ for MUX-16ET and MUX-28ET; $-40°C \le T_A \le +85°C$ 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}	$V_S \le 10$, $I_S \le 200\mu A$	–	–	500	–	–	800	Ω
ΔR_{ON} With Applied Voltage	ΔR_{ON}	$-10V \le V_S \le 10V$, $I_S = 200\mu A$	–	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	µA
Digital "0" Enable Current	I_{INL} (EN)	$V_{EN} = 0.4V$	–	–	20	–	–	20	µA
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
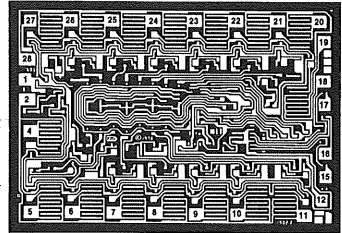
DICE CHARACTERISTICS (125°C TESTED DICE AVAILABLE)
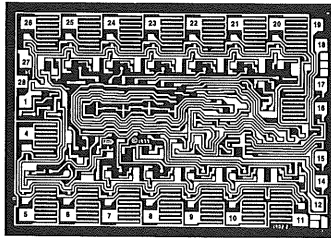
MUX-16   **MUX-28**

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

MUX-16	MUX-28
1. POSITIVE SUPPLY	1. POSITIVE SUPPLY
4. SOURCE 16 (S16)	2. DRAIN B
5. SOURCE 15 (S15)	4. SOURCE 8 (S8B)
6. SOURCE 14 (S14)	5. SOURCE 7 (S7B)
7. SOURCE 13 (S13)	6. SOURCE 6 (S6B)
8. SOURCE 12 (S12)	7. SOURCE 5 (S5B)
9. SOURCE 11 (S11)	8. SOURCE 4 (S4B)
10. SOURCE 10 (S10)	9. SOURCE 3 (S3B)
11. SOURCE 9 (S9)	10. SOURCE 2 (S2B)
12. GROUND	11. SOURCE 1 (S1B)
14. ADDRESS BIT 3 (A3)	12. GROUND
15. ADDRESS BIT 2 (A2)	15. ADDRESS BIT 2 (A2)
16. ADDRESS BIT 1 (A1)	16. ADDRESS BIT 1 (A1)
17. ADDRESS BIT 0 (A0)	17. ADDRESS BIT 0 (A0)
18. ENABLE	18. ENABLE
19. SOURCE 1 (S1)	19. SOURCE 1 (S1A)
20. SOURCE 2 (S2)	20. SOURCE 2 (S2A)
21. SOURCE 3 (S3)	21. SOURCE 3 (S3A)
22. SOURCE 4 (S4)	22. SOURCE 4 (S4A)
23. SOURCE 5 (S5)	23. SOURCE 5 (S5A)
24. SOURCE 6 (S6)	24. SOURCE 6 (S6A)
25. SOURCE 7 (S7)	25. SOURCE 7 (S7A)
26. SOURCE 8 (S8)	26. SOURCE 8 (S8A)
27. NEGATIVE SUPPLY (SUBSTRATE)	27. NEGATIVE SUPPLY (SUBSTRATE)
28. DRAIN	28. DRAIN A

WAFER TEST LIMITS at V+ = 15V, V− = −15V, T_A = 25°C for MUX-16/28 N and G, T_A = 125°C for MUX-16/28 NT and GT, unless otherwise noted.

PARAMETER	SYMBOL	CONDITIONS	MUX-16/ MUX-28NT LIMIT	MUX-16/ MUX-28N LIMIT	MUX-16/ MUX-28GT LIMIT	MUX-16/ MUX-28G LIMIT	UNITS
"ON" Resistance	R_{ON}	V_S = 0V, I_S = 200μA	540	380	800	580	Ω 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	μA MAX
Digital "0" Enable Current	$I_{INL(EN)}$	V_{EN} = 0.4V	20	10	20	10	μA 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)	±10	±10	±10	±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°C for MUX-16/28 N and G, T_A = 125°C for MUX-16/28 NT and GT, unless otherwise noted.
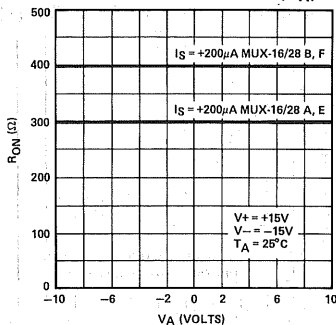
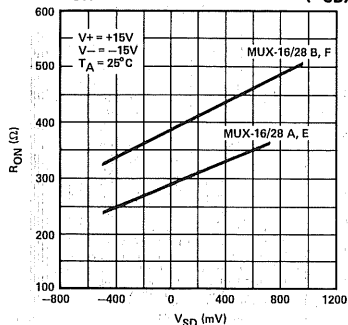| PARAMETER	SYMBOL	CONDITIONS	MUX-16/ MUX-28NT TYPICAL	MUX-16/ MUX-28N TYPICAL	MUX-16/ MUX-28GT TYPICAL	MUX-16/ MUX-28G TYPICAL	UNITS
Switching Time (t_{TRAN})	t_{PHL} t_{PLH}	(Note 1) Figure 1	2 1.8	1 0.9	2.6 2.4	1.5 1.4	μs
Output Settling Time	t_S	10V Step to 0.1% (Note 1)	2.5	1.5	2.9	1.9	μs
Break-Before-Make Delay	t_{OPEN}	(Note 1) Figure 3 (Test Circuits)	0.8	0.8	1	1	μs
Crosstalk	CT	(Note 1) Figure 5 (Test Circuits)	70	70	70	70	dB
ΔR$_{ON}$ With Applied Voltage	ΔR_{ON}	−10V ≤ V_S ≤ 10V, I_S = 200μA	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 −15	+11 −15	+11 −15	+11 −15	V

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

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

REV. A

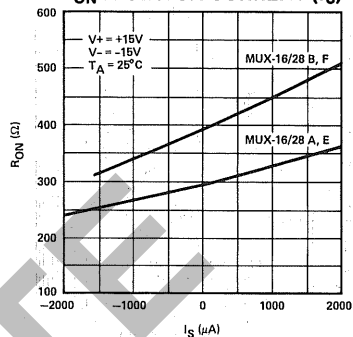**TYPICAL PERFORMANCE CHARACTERISTICS** (apply to all grades, unless otherwise noted.)
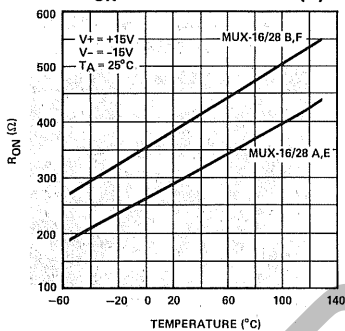
"ON" RESISTANCE (R_{ON}) vs ANALOG VOLTAGE (V_A)

$I_S = +200\mu A$ MUX-16/28 B, F

$I_S = +200\mu A$ MUX-16/28 A, E

V+ = +15V
V− = −15V
$T_A = 25°C$

R_{ON} (Ω)

V_A (VOLTS)

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

V+ = +15V
V− = −15V
$T_A = 25°C$

MUX-16/28 B, F

MUX-16/28 A, E

R_{ON} (Ω)

V_{SD} (mV)

R_{ON} vs SWITCH CURRENT (I_S)

V+ = +15V
V− = −15V
$T_A = 25°C$

MUX-16/28 B, F

MUX-16/28 A, E

R_{ON} (Ω)

I_S (μA)

R_{ON} vs TEMPERATURE (T)

V+ = +15V
V− = −15V
$T_A = 25°C$

MUX-16/28 B,F

MUX-16/28 A,E

R_{ON} (Ω)

TEMPERATURE (°C)

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

V+ = +15V
V− = −15V
$T_A = 25°C$

I_D (OFF)

I_S (OFF)

I_D (ON)

SWITCH LEAKAGE CURRENT (nA)

V_A (VOLTS)

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

V+ = +15V
V− = −15V
$T_A = 25°C$

I_D(OFF)

I_S(OFF)

I_D(ON)
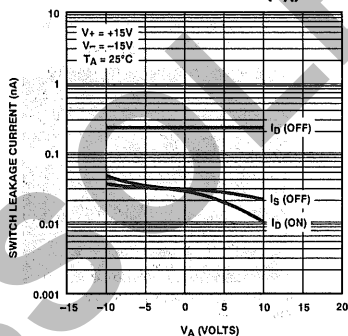
SWITCH LEAKAGE CURRENT (nA)

ANALOG INPUT VOLTAGE (V_A)

SWITCH LEAKAGE CURRENTS vs TEMPERATURE

V+ = +15V
V− = −15V

I_D(ON) + I_S(ON)

I_D(OFF)

I_S (OFF)
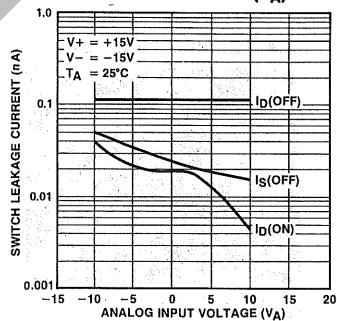
SWITCH LEAKAGE CURRENT (nA)
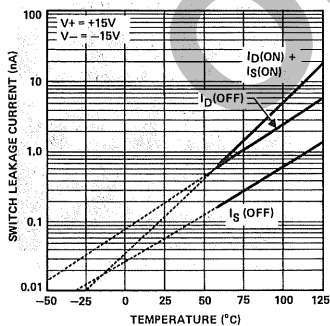
TEMPERATURE (°C)

SUPPLY CURRENTS vs TEMPERATURE (T)

V+ = +15V
V− = −15V

I+ MUX-16/28 A,E

I+ MUX-16/28 B,F

I− MUX-16/28 A,F

I− MUX-16/28 B,F

I_S (mA)

TEMPERATURE (°C)
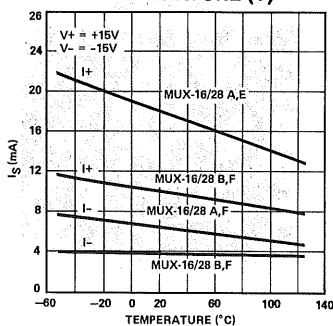
SWITCH CAPACITANCES vs ANALOG INPUT VOLTAGE (V_A)
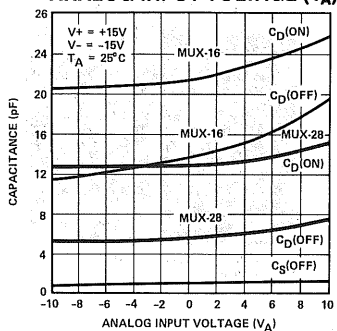
V+ = +15V
V− = −15V
$T_A = 25°C$

C_D(ON) MUX-16

C_D(OFF)

MUX-16

MUX-28

C_D(ON)

MUX-28

C_D(OFF)

C_S(OFF)

CAPACITANCE (pF)

ANALOG INPUT VOLTAGE (V_A)

5

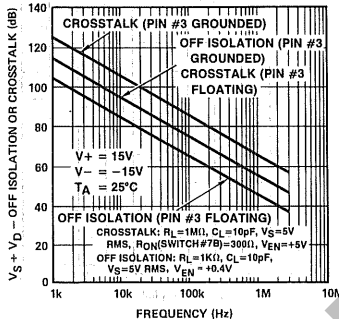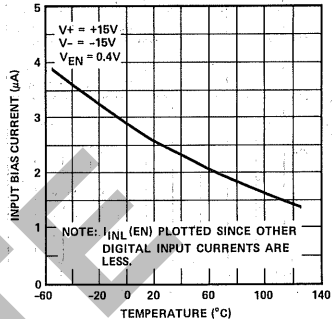## TYPICAL PERFORMANCE CHARACTERISTICS (apply to all grades, unless otherwise noted.)

MUX-16 OFF PERFORMANCE OF CHANNEL 8

CROSSTALK

OFF ISOLATION

V+ = +15V
V− = −15V
T_A = 25°C

CROSSTALK R_L = 1MΩ, C_L = 10pF, V_S = 5V RMS, R_{ON}(SWITCH #7) = 300Ω, V_{EN} = +5V
OFF ISOLATION R_L = 1kΩ, C_L = 10pF, V_S = 5V RMS, V_{EN} = +0.4V

MUX-28 OFF PERFORMANCE OF CHANNEL 8

CROSSTALK (PIN #3 GROUNDED)
OFF ISOLATION (PIN #3 GROUNDED)
CROSSTALK (PIN #3 FLOATING)

V+ = 15V
V− = −15V
T_A = 25°C

OFF ISOLATION (PIN #3 FLOATING)
CROSSTALK: R_L=1MΩ, C_L=10pF, V_S=5V RMS, R_{ON}(SWITCH#7B)=300Ω, V_{EN}=+5V
OFF ISOLATION: R_L=1kΩ, C_L=10pF, V_S=5V RMS, V_{EN} = 0.4V
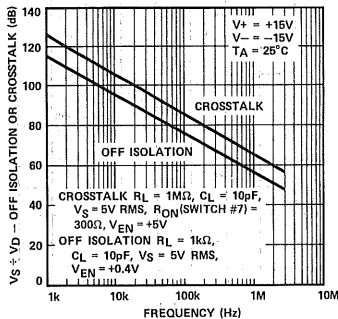
DIGITAL INPUT BIAS CURRENTS vs TEMPERATURE (T)

V+ = +15V
V− = −15V
V_{EN} = 0.4V

NOTE: I_{INL} (EN) PLOTTED SINCE OTHER DIGITAL INPUT CURRENTS ARE LESS.

MUX-16 DYNAMIC CHARACTERISTIC CURVES

SMALL-SIGNAL SWITCHING

R_L = 1MΩ, C_L = 10pF, V_1 = −500mV, V_{16} = +500mV

SMALL-SIGNAL SWITCHING WITH FILTERING

R_L = 1MΩ, C_L = 500pF, V_1 = −500mV, V_{16} = +500mV

SMALL-SIGNAL SWITCHING WITH 2μs SAMPLE TIME

R_L = 1MΩ, C_L = 10pF, V_1 = −700mV, V_{16} = +700mV

SMALL-SIGNAL SWITCHING WITH FILTERING AND 2μs SAMPLE TIME

R_L = 1MΩ, C_L = 500pF, V_1 = −700mV, V_{16} = +700mV

BREAK-BEFORE-MAKE SWITCHING
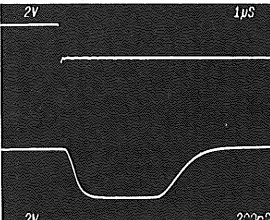
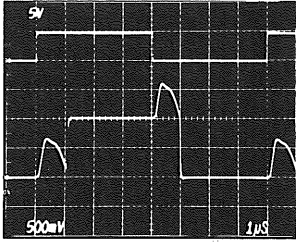R_L = 1kΩ, C_L = 10pF, V_1 = V_{16} = +10V

LARGE-SIGNAL SWITCHING
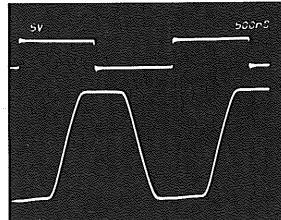
R_L = 1MΩ, C_L = 10pF, V_1 = −10V, V_{16} = +10V

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

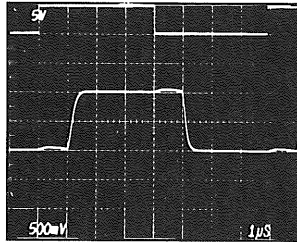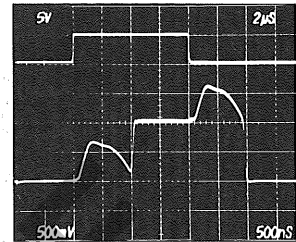## MUX-28 DYNAMIC CHARACTERISTIC CURVES

SMALL-SIGNAL SWITCHING

$R_L = 1M\Omega$, $C_L = 10pF$, $V_1 = -500mV$, $V_8 = +500mV$
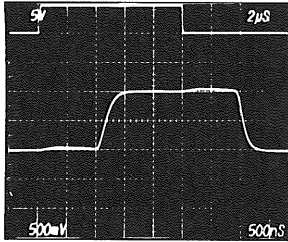
SMALL-SIGNAL SWITCHING WITH FILTERING

$R_L = 1M\Omega$, $C_L = 500pF$, $V_1 = -500mV$, $V_8 = +500mV$

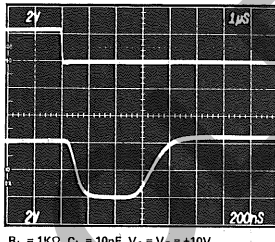### SMALL-SIGNAL SWITCHING WITH 2μs SAMPLE TIME

$R_L = 1M\Omega$, $C_L = 10pF$, $V_1 = -700mV$, $V_8 = +700mV$

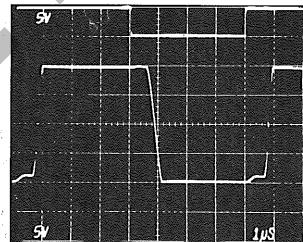### SMALL-SIGNAL SWITCHING WITH FILTERING AND 2.5μs SAMPLE TIME

$R_L = 1M\Omega$, $C_L = 500pF$, $V_1 = -700mV$, $V_8 = +700mV$

BREAK-BEFORE-MAKE SWITCHING

$R_L = 1K\Omega$, $C_L = 10pF$, $V_1 = V_8 = +10V$
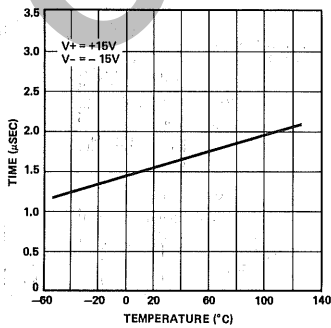
LARGE-SIGNAL SWITCHING

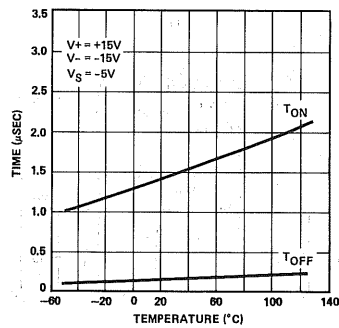$R_L = 1M\Omega$, $C_L = 10pF$, $V_1 = -10V$, $V_8 = +10V$

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

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

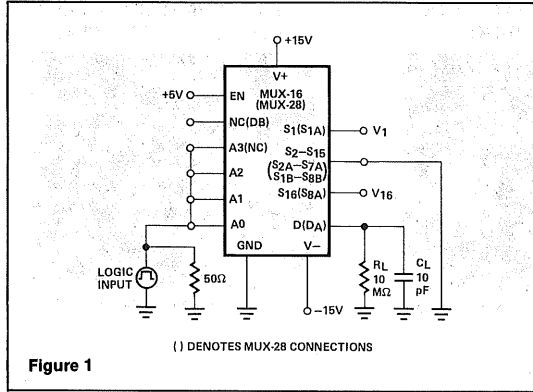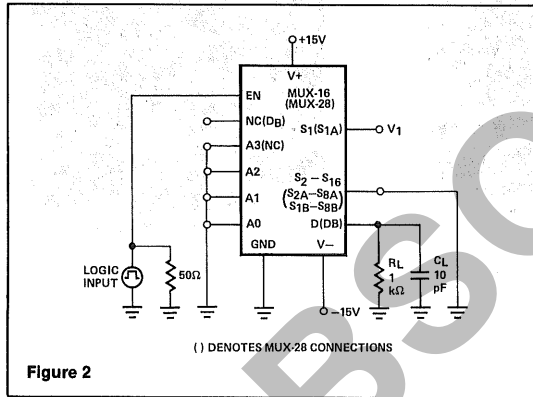### TRANSITION TIME vs TEMPERATURE

ENABLE DELAY TIME vs TEMPERATURE
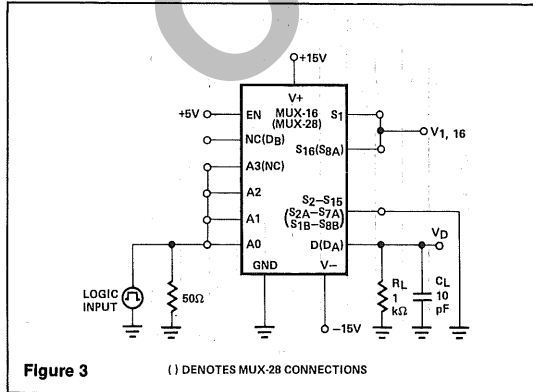
MUX-16/MUX-28

A.C. TEST CIRCUITS

TRANSITION TIME TEST CIRCUIT

Figure 1

( ) DENOTES MUX-28 CONNECTIONS

ENABLE DELAY TIME TEST CIRCUIT

Figure 2

( ) DENOTES MUX-28 CONNECTIONS

BREAK-BEFORE-MAKE TEST CIRCUIT

Figure 3   ( ) DENOTES MUX-28 CONNECTIONS

SWITCHING TIME WAVEFORMS
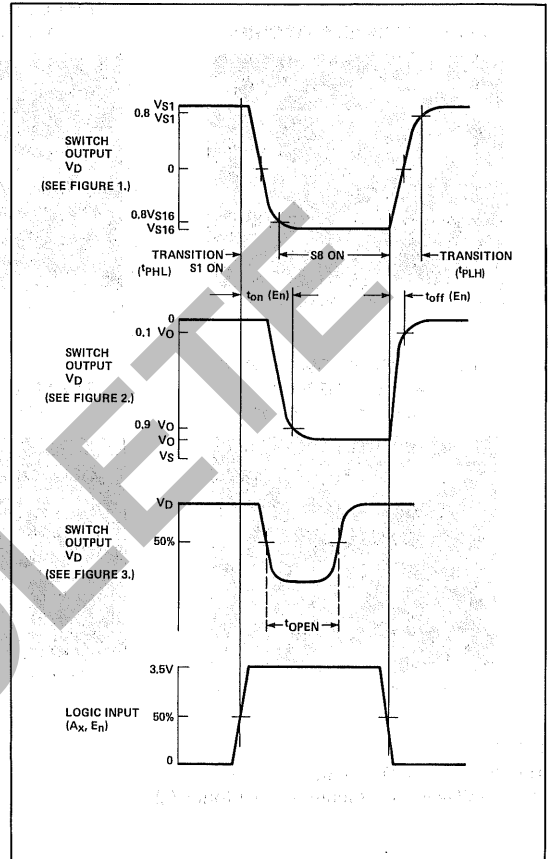
OFF ISOLATION TEST CIRCUIT

$$ISO_{OFF} = 20 \log \frac{|V_S|}{|V_D|}$$

Figure 4   ( ) DENOTES MUX-28 CONNECTIONS
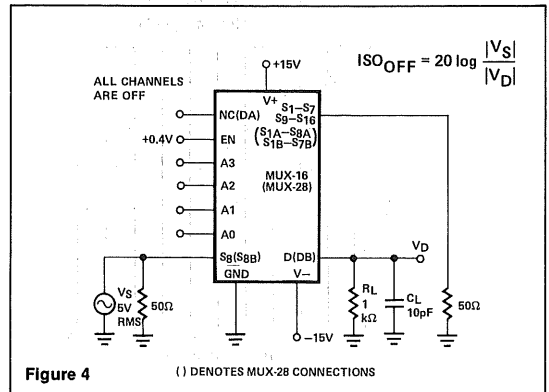
CROSSTALK MEASUREMENT CIRCUIT

$$C_T = 20 \log \frac{|V_S|}{|V_D|}$$

Figure 5

( ) DENOTES MUX-28 CONNECTIONS
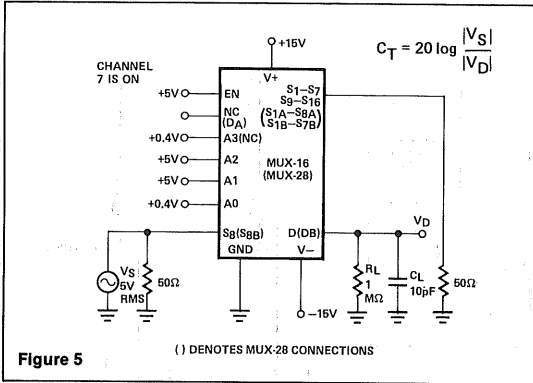
OVERVOLTAGE MEASUREMENT TEST CIRCUIT

( ) DENOTES MUX-28 CONNECTIONS
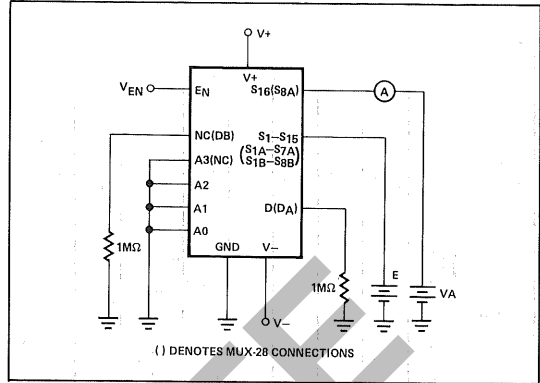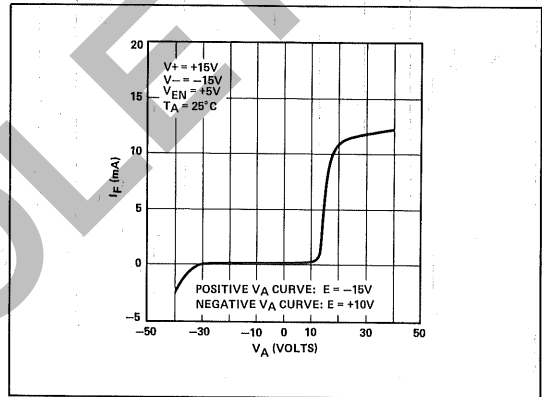
APPLICATIONS INFORMATION

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.
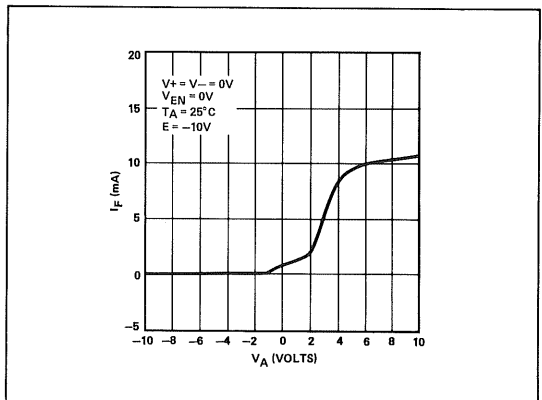
The "ON" resistance, R_{ON} of the analog switches is constant over the wide input voltage range of $-15V$ to $+11V$ with $V_{SUPPLY} = \pm 15V$. The overvoltage and supply-loss V-I characteristics shown indicate typical performance when the multiplexer is subjected to abnormal signals. For normal operation, 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 0.01μF 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/μSec which is equivalent to a normal I_{DSS} of 3mA. The negative-going slew rate was 0.7V/μsec 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

SIMPLIFIED SCHEMATIC (MUX-16)

FOR MUX-28 SWITCH PAIRS $S_1 - S_9$, $S_2 - S_{10}$, $\cdots$ $S_8 - S_{16}$ ARE TURNED ON BY A REPROGRAMMED DECODING MATRIX AND A_3 IS NO LONGER USED.

THE COMMON ANALOG BUS IS SPLIT IN HALF TO PROVIDE (DRAIN B) OUTPUT.