

8-Chan/Dual 4-Chan JFET Analog Multiplexers (Overvoltage & Power Supply Loss Protected)

MUX-08/MUX-24

FEATURES

- JFET Switches Rather Than CMOS
- Highly Resistant to Static Discharge Damage
- No SCR Latch-Up Problems
- Digital Inputs Compatible With TTL and CMOS
- 125°C Temperature Tested Dice Available
- MUX-08 Pin Compatible With DG508, HI-508A, IH5108, IH6108, LF11508/12508/13508, AD7506
- MUX-24 Pin Compatible With DG509, HI-509A, IH5208, IH6208, LF11509/12509/13509, AD7507
- Available in Surface Mount Packages
- Available in Die Form

ORDERING INFORMATION †

		PACKAGE		OPERATING
25°C ON RESISTANCE	CERDIP 16-PIN	PLASTIC 16-PIN	LCC 20-CONTACT	TEMPERATURE RANGE
	MUX08AQ*	_	_	MIL
220Ω	MUX08EQ	-	_	IND
	- '	MUX08EP	-	COM
	MUXO8BQ*	_	MUX08BRC/883	MIL
300Ω	MUX08FQ	_	-	IND
30052	_	MUX08FP	_	XIND
	_	MUX08FS ^{††}	-	XIND
	MUX24AQ*	-	_	MiL
220Ω	MUX24EQ	_	_	IND
		MUX24EP	<u>-</u>	COM
	MUX24BQ*	_		MIL
300Ω	MUX24FQ	_	_	IND
30022	_	MUX24FP	_	XIND
	_	MUX24FS ^{††}	_	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.
- ## For availability and burn-in information on SO and PLCC packages, contact your local sales office.

GENERAL DESCRIPTION

The MUX-08 is a monolithic eight-channel analog multiplexer which connects a single output to one of the eight analog inputs depending upon the state of a 3-bit binary address.

The MUX-24 is a monolithic four-channel differential analog multiplexer configured in a double pole, four-position (plus OFF) electronic switch array. A two-bit binary input address connects a pair of independent analog inputs from each four-channel input section to the corresponding pair of independent analog outputs.

All switches in the MUX-08/MUX-24 are turned OFF by applying logic "0" to the ENABLE pin, thereby providing a package select function.

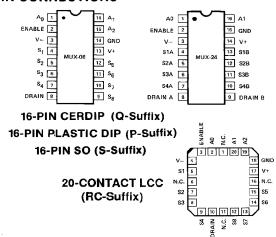
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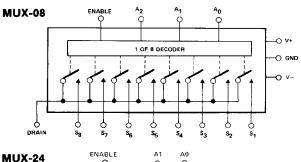
Fabricated with Precision Monolithics' high performance Bipolar-JFET technology, these devices offer low, constant "ON" resistance, low leakage currents and fast settling time with low crosstalk to satisfy a wide variety of applications. These multiplexers do not suffer from latch-up or static charge 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 over the full operating temperature range.

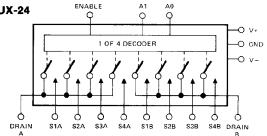
For single sixteen-channel and dual eight-channel models, refer to the MUX-16/MUX-28 data sheet.

PIN CONNECTIONS



FUNCTIONAL DIAGRAMS





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

ABSOLUTE MAXIMUM RATINGS (Note 1)

Operating Temperature Range	• •
MUX-08/24-AQ, BQ, BRC	-55°C to +125°C
MUX-02/24-EQ, FQ	25°C to +85°C
MUX-08/24-EP	0°C to +70°C
MUX-08/24-FP, FS	
Junction Temperature (T _j)	
Storage Temperature Range	-65°C to +150°C
P-Suffix	-65°C to +125°C
Lead Temperature (Soldering, 60 sec)	300°C
Maximum Junction Temperature	
V+ Supply to V- Supply	36V
Logic Input Voltage (-4V or	V-) to V+ Supply

Analog Input Voltage Maximum Current Thro			
PACKAGE TYPE	⊖ _{jA} (Note 2)	Θ _{jC}	UNITS
16-Pin Hermetic DIP (Q)	100	16	.cw
16-Pin Plastic DIP (P)	82	39	°C/W
20-Contact LCC (RC)	98	38	°C/W
16-Pin SO (S)	111	35	°C/W

NOTES:

- Absolute maximum ratings apply to both DICE and packaged parts, unless otherwise noted.
- e is specified for worst case mounting conditions, i.e., e is specified for device in socket for CerDIP, P-DIP, and LCC packages; e is specified for device soldered to printed circuit board for SO package.

ELECTRICAL CHARACTERISTICS at V+ = +15V, V- = -15V and $T_A = 25^{\circ}C$, unless otherwise noted.

					MUX-08A/E MUX-24A/E			UX-08I UX-24I		
PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	MIN	TYP	MAX	UNITS
"ON" Resistance	R _{ON}	$V_{S} \le 10V$, $I_{S} \le 200 \mu A$		_	220	300		300	400	Ω
ΔR _{ON} With Applied Voltage	ΔR_{ON}	$-10V \le V_S \le 10V$, $I_S = 200 \mu A$		_	1	5	_	3	7	%
R _{ON} Match Between Switches	R _{ON} Match	$V_S = 0V$, $I_S = 200 \mu A$		_	7	15	-	9	20	%
Analog Voltage Range	V _A	(Note 6)		+10 -10	+10.4 -15	_	+ 10 -10	+ 10.4 - 15	_	V
Source Current (Switch "OFF")	I _{S (OFF)}	$V_S = 10V, V_D = -10V \text{ (Note 1)}$	·		0.01	1.0		0.01	2.0	nA
Drain Current (Switch "OFF")	I _{D (OFF)}	$V_S = 10V$, $V_D = -10V$ (Note 1)	MUX-08 MUX-24	_	0.1 0.05	1.0 1.0	_	0.1 0.05	2.0 2.0	nA
Leakage Current (Switch "ON")	I _{D (ON)} +I _{S (ON)}	V _D = 10V (Note 1)	MUX-08 MUX-24	_	0.1 0.05	1.0 1.0	_	0.1 0.05	2.0 2.0	nA
Digital Input Current	I _{IN}	V _{IN} = 0.4V to 15V		_	1	10		1	10	μΑ
Digital "0" Enable Current	I _{INL (EN)}	V _{EN} = 0.4V		_	4	10	_	4	10	μΑ
Digital Input Capacitance	C _{DIG}			_	3	_	_	3	_	ρF
Switching Time (t _{TRAN})	t _{PHL} t _{PLH}	(Notes 2, 5) Figure 1 (Test Circuit)		_	1.5 1.0	2.1 1.3	_	1.5 1.0	2.1 1.3	μs
Output Settling Time	t _S	10V Step to 0.10% 10V Step to 0.05% 10V Step to 0.02%		_	2.2 2.7 3.4	- 	_ _ _	2.2 2.7 3.4	_ _ _	μs
Break-Before-Make Delay	topen	Figure 3 (Test Circuit)		_	0.8	-	_	1.0	_	μS
Enable Delay "ON"	t _{ON (EN)}	(Note 5) Figure 2 (Test Circuit)		_	1	2	_	1	2	μS
Enable Delay "OFF"	t _{OFF (EN)}	(Note 5) Figure 2 (Test Circuit)	MUX-08 MUX-24		0.1 0.2	0.4 0.5	_	0.2 0.3	0.4 0.6	μS
"OFF" Isolation	ISO _{OFF}	(Note 4) Figure 5 (Test Circuit)	MUX-08 MUX-24	_	60 66	_	_	60 66		dB
Crosstalk	СТ	(Note 3) Figure 4 (Test Circuit)	MUX-08 MUX-24	_	70 76		_	70 76	_	dB
Source Capacitance	C _{S (OFF)}	Switch "OFF", V _S = 0V, V _D = 0V	MUX-08 MUX-24	_	2.5 2	_	_	2.5 2	-	pF
Drain Capacitance	C _{D(OFF)}	Switch "OFF", V _S = 0V, V _D = 0V	MUX-08 MUX-24	_	7 4	_	_	7	_	pF
Input to Output Capacitance	C _{DS(OFF)}	(Note 4)	MUX-08 MUX-24	_	0.3 0.15	_	_	0.3 0.15	-	pF
Positive Supply Current (All Digital Inputs Logic "0" or "1")	I+	V+ = 15V V+ = 5V		_	10 8	12	_	6 5	12	mA
Negative Supply Current (All Digital Inputs Logic "0" or "1")	I	V+ = -15V V+ = -5V		_	3.0 2.5	3.8	_	2.0 1.8	3.8	mA

ELECTRICAL CHARACTERISTICS at V+ = 15V, V- = -15V and -55° C \leq T_A \leq 125 $^{\circ}$ C, unless otherwise noted.

	2				UX-08			UX-08		
PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	MIN	TYP	MAX	UNITS
"ON" Resistance	R _{ON}	$V_{S} \le 10V, I_{S} \le 200 \mu A$	÷	_		400	_	_	500	Ω
ΔR _{ON} With Applied Voltage	ΔR _{ON}	$-10V \le V_{S} \le 10V$, $I_{S} = 200 \mu A$		_	1.5	_	_	4.5	_	• %
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	+ 10.4 -15	_	+10 -10	+10.4 -15		V
Source Current (Switch "OFF")	I _{S (OFF)}	$V_S = 10V$, $V_D = -10V$ (Notes 1,	7)		_	25	_	_	50	nA
Drain Current (Switch "OFF")	I _{D (OFF)}	V _S = 10V, V _D = -10V (Notes 1, 7)	MUX-08 MUX-24	_	_	100 50	_	_	500 500	nA
Leakage Current (Switch "ON")	I _{D (ON)} +I _{S (ON)}	V _D = 10V (Notes 1, 7)	MUX-08 MUX-24	_	_	100 50	_	_	500 500	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	μΑ
Digital "0" Enable Current	I _{INL (EN)}	V _{EN} = 0.4V		_	.—	20	_	_	20	μΑ
Positive Supply Current	I+	All Digital Inputs Logic "0" or "1"		_	_	15	_		15	mA
Negative Supply Current	I-	All Digital Inputs Logic "0" or "1"		_	_	5	_	_	5	mA

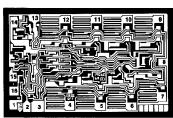
ELECTRICAL CHARACTERISTICS at V+ = 15V, V- = -15V and -25°C \leq T_A +85°C for MUX-08EQ/FQ and MUX-24EQ/FQ 0°C \leq T_A \leq +70°C for MUX-08EP and MUX-24EP; -40°C \leq T_A \leq +85°C for MUX-08FP/FS and MUX-24FP/FS, unless otherwise noted

					UX-08 IUX-24			UX-08		
PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	MIN	TYP	MAX	UNITS
"ON" Resistance	R _{ON}	$V_S \le 10V$, $I_S \le 200 \mu A$				400		_	500	Ω
ΔR _{ON} With Applied Voltage	ΔR_{ON}	$-10V \le V_S \le 10V$, $I_S = 200 \mu A$		_	1.5	_	_	4.5		%
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	+ 10.4 - 15	_	+10 -10	+ 10.4 - 15	_	٧
Source Current (Switch "OFF")	I _{S (OFF)}	$V_S = 10V, V_D = -10V \text{ (Notes 1, 1)}$	7)	_	_	10	_		10	nA
Drain Current (Switch "OFF")	I _{D (OFF)}	$V_S = 10V, V_D = 10V$ (Notes 1, 7)	MUX-08 MUX-24	_	_	100 50		_	100 50	nA
Leakage Current (Switch "ON")	I _{D (ON)} +I _{S (ON)}	V _D = 10V (Notes 1, 7)	MUX-08 MUX-24	_	_	100 50	_	_	100 50	nA
Digital "1" Input Voltage	V _{INH}	(Note 6)		2			2	_	_	V
Digital "0" Input Voltage	V _{INL}	(Note 6)		_	_	8.0	_	_	0.8	V
Digital Input Current	I _{IN}	V _{IN} = 0.4V to 15V		_	_	20	-	_	20	μΑ
Digital "0" Enable Current	I _{INL (EN)}	V _{EN} = 0.4V		_		20			20	μΑ
Positive Supply Current	1+	All Digital Inputs Logic "0" or "1"			_	15	_	_	15	mA
Negative Supply Current	-	All Digital Inputs Logic "0" or "1"		_	_	5	_	_	5	mA

NOTES:

- Conditions applied to leakage tests insure worst case leakages. Exceeding 11V on the analog input may cause an "OFF" channel to turn "ON".
- 2. $R_L = 10M\Omega$, $C_L = 10pF$.
- 3. Crosstalk is measured by driving channel 8 with channel 4 "ON". $R_L=1M\Omega$, $C_L=10$ pF, $V_S=5$ V RMS, f=500kHz.
- 4. "OFF" isolation is measured by driving channel 8 with ALL channels "OFF". R_L = 1k Ω , 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.
- 7. Leakage tests are performed only on military temperature grades at 125° C.

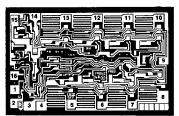
DICE CHARACTERISTICS (125°C TESTED DICE AVAILABLE)



DIE SIZE 0.093×0.059 inch, 5487 sq. mils

 $(2.362 \times 1.500 \text{ mm}, 3543 \text{ sq. mm})$

MUX-24



1. A0 9. S8
2. ENABLE 10. S7
3. V-(SUBSTRATE) 11. S6
4. S1 12. S5
5. S2 13. V+
6. S3 14. GND
7. S4 15. A2
8. DRAIN 16. A1

1. A0 9. DRAIN B
2. ENABLE 10. S4 B
3. V-(SUBSTRATE) 11. S3 B
4. S1 A 12. S2 B
5. S2 A 13. S1 B
6. S3 A 14. V+
7. S4 A 15. GND
8. DRAIN A 16. A1

WAFER TEST LIMITS at V + = 15V, V - = -15V, $T_A = 25^{\circ}$ C, unless otherwise noted. (Note 1)

MUX-08

PARAMETER	SYMBOL	CONDITIONS		MUX-08/ MUX-24NT LIMIT	MUX-08/ MUX-24N LIMIT	MUX-08/ MUX-24G LIMIT	UNITS
"ON" Resistance	R _{ON}	V _S = 0V,		300	300	400	Ω ΜΑΧ
- The sistance	PON	$I_S = 200 \mu A$	T _A = 125°C	400			11 MAX
Digital "1" Input Voltage	V _{INH}	(Note 2)		2	2	2	V MIN
Digital "0" Input Voltage	V _{INL}	(Note 2)		0.8	0.8	0.8	V MAX
Digital "0" Input Current	1	V = 0.4V		10	10	10	0.8103/
Digital o imput current	INL	$V_{IN} = 0.4V$	$T_A = 125$ °C	20		_	μΑ MAX
Digital "0" Enable Current		\/ = 0.4\/		10	10	10	A 144.V
Digital o Eliable Current	I _{INL(EN)}	$V_{IN} = 0.4V$	$T_A = 125$ °C	20	_	_	μΑ ΜΑΧ
Positive Supply Current	1+			12	12	12	^ 144
(All Digital Inputs Logic "0")	17		$T_A = 125^{\circ}C$	15	_		mA MAX
Negative Supply Current	[-			3.8	3.8	3.8	A 140V
(All Digital Inputs Logic "0")	1-		T _A = 125° C	5		-	mA MAX
Analog Input Range	VA	(Note 2)		±10	± 10	±10	V MIN

NOTE:

Electrical tests are performed at wafer probe to the limits shown. Due to variations in assembly mehtods 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-08/24N & G, T_A = 125°C for MUX-08/24NT, unless otherwise noted.

PARAMETER	SYMBOL	CONDITIONS	MUX-08/ MUX-24NT TYPICAL	MUX-08/ MUX-24N TYPICAL	MUX-08/ MUX-24G TYPICAL	UNITS
Switching Time (t _{TRAN})	t _{PHL} t _{PLH}	(Note 1)	1.7 1.1	1.3 0.9	2.1 1.3	μs
Output Settling Time	t _S	10V Step to 0.1% (Note 1)	2.1	1.5	1.9	μS
Break-Before-Make Delay	t _{OPEN}	(Note 1)	0.8	0.8	1.0	μS
Crosstalk	СТ	(Note 1)	70	70	70	dB
ΔR _{ON} With Applied Voltage	ΔR _{ON}	$-10V \le V_S \le 10V$, $I_S = 200 \mu A$	2	2	6	%
Leakage Current (Switch "ON")	I _{D(ON)}	V _D = 10V (Note 1)	20	0.5	0.5	nA
Analog Input Range	V _A		+10.4/-15	+ 10.4/-15	+ 10.4/- 15	ν

NOTES:

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

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

	(UN	(-08	
LOC	SIC	ST/	ATE

A ₂	A ₁	A ₀	EN	"ON" CHANNEL
х	Х	Х	L	NONE
L	L	L	Н	1
L	L	Н	Н	2
L	Н	L	Н	3
L	Н	Н	Н	4
Н	L	L	Н	5
Н	L	Н	Н	6
Н	Н	L	Н	7.
Н	Н	Н	н	8

MUX-24 LOGIC STATE

A ₁	Ao	EN	"ON" CHANNEL
Х	х	L	NONE
L	L	Н	. 1
L.	Н	н	2
Н	L	Н	3
Н	Н	Н	4

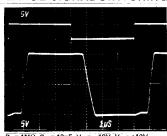
TYPICAL PERFORMANCE CHARACTERISTICS (Applies to all grades, unless otherwise noted.)

MUX-08 BREAK-BEFORE-MAKE SWITCHING



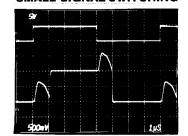
R_L = $1k\Omega$, C_L = 10pF, V₁, 8 = 10VVOLTAGE = 2V/DIVTIME = 200ns/DIV

MUX-08 LARGE-SIGNAL SWITCHING



 $R_L = 1M\Omega$, $C_L = 10pF$, $V_1 = -10V$, $V_8 = +10V$ VOLTAGE = 5V/DIVTIME = $1\mu s/DIV$

MUX-08 SMALL-SIGNAL SWITCHING



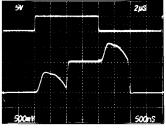
RL = $1M\Omega$, CL = 10pF, V_1 = -500mV, V_8 = +500mVVOLTAGE = 500mV/DIVTIME = $1\mu s/DIV$

MUX-08 SMALL-SIGNAL SWITCHING WITH FILTERING



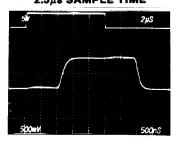
 R_L = 1M\Omega, CL = 500pF, V1 = 500mV, V8 = +500mV VOLTAGE = 500mV/DIV TIME = 1\mu s/DIV

MUX-08 SMALL-SIGNAL SWITCHING WITH 2μ8 SAMPLE TIME



 R_L = 1M Ω , c_L = 10pF, V $_1$ = -500 mV , V $_8$ = +500 mV VOLTAGE = 500 mV/DIV TIME -500 ms/DIV

MUX-08 SMALL-SIGNAL SWITCHING WITH FILTERING AND 2.5μ8 SAMPLE TIME



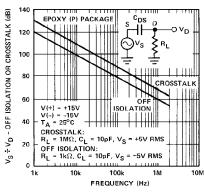
 $R_L=1M\Omega,\,C_L=500pF,\,V_1=-500mV,\,V_8=+500mV$ VOLTAGE = 500mV/DIV TIME = 500ns/DIV

NOTE:

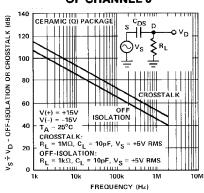
Top waveforms: Digital Input 5V/DIV Bottom waveforms: Multiplexer Output

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

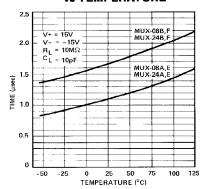
MUX-08 CROSSTALK AND OFF ISOLATION PERFORMANCE OF CHANNEL 8



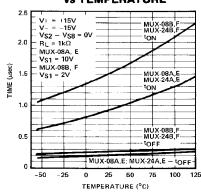
MUX-08 CROSSTALK AND OFF ISOLATION PERFORMANCE OF CHANNEL 8



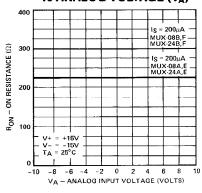
TRANSITION TIMES VS TEMPERATURE



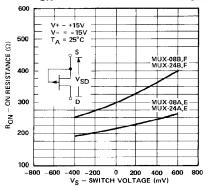
ENABLE DELAY TIMES vs TEMPERATURE



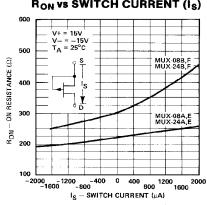
"ON" RESISTANCE (RON) VS ANALOG VOLTAGE (VA)



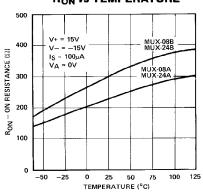
RON VS SWITCH VOLTAGE (VSD)



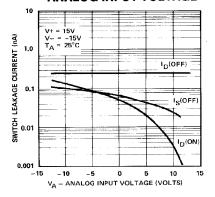
RON VS SWITCH CURRENT (Is)



RON VS TEMPERATURE



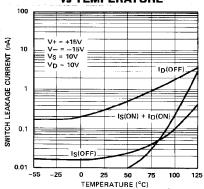
SWITCH LEAKAGE CURRENTS vs ANALOG INPUT VOLTAGE



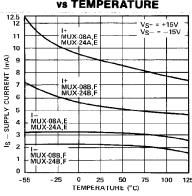
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TYPICAL PERFORMANCE CHARACTERISTICS (Applies to all grades, unless otherwise noted.)

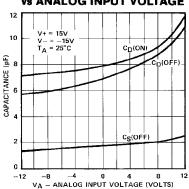
SWITCH LEAKAGE CURRENTS VS TEMPERATURE



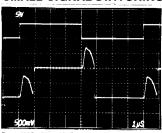
SUPPLY CURRENTS VS TEMPERATURE



MUX-08 SWITCH CAPACITANCES VS ANALOG INPUT VOLTAGE

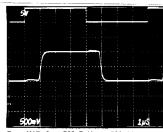


MUX-24 SMALL-SIGNAL SWITCHING



 $R_L = 1M\Omega$, $C_L = 10pF$, $V_1 = -500mV$, $V_4 = +500mV$ VOLTAGE = 500mV/DIV, $TIME = 1\mu s/DIV$

MUX-24 SMALL-SIGNAL SWITCHING WITH FILTERING



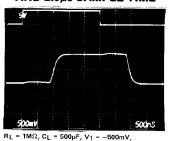
R_L = 1M Ω , C_L = 500pF, V₁ = -500mV, V₄ = +500mV VOLTAGE - 500mV/DIV, TIME - 1 μ s/DIV

MUX-24 SMALL-SIGNAL SWITCHING WITH 2μs SAMPLE TIME



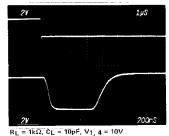
 $R_L = 1M\Omega$, $C_L = 10pF$, $V_1 = -500mV$, $V_4 = +500mV$ VOLTAGE = 500mV/DIV, TIME = 500ms/DIV

MUX-24 SMALL-SIGNAL SWITCHING WITH FILTERING AND 2.5µ8 SAMPLE TIME



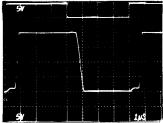
V4 = +500mV VOLTAGE = 500mV/DIV, TIME = 500ns/DIV

MUX-24 BREAK-BEFORE-MAKE SWITCHING



VOLTAGE = 2V/DIV, TIME = 200ns/DIV

MUX-24 LARGE-SIGNAL SWITCHING

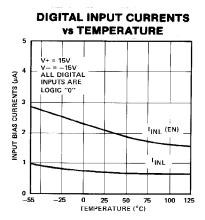


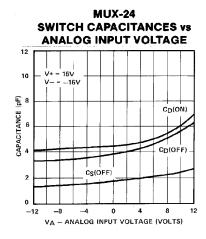
 $R_L = 1M\Omega$, $C_L = 10pF$, $V_1 = -10V$, $V_4 = +10V$ VOLTAGE = 5V/DIV, $TIME = 1\mu s/DIV$

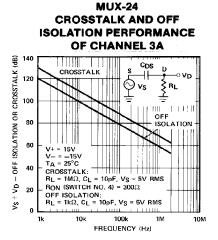
NOTE:

Top waveforms: Digital Input 5V/DIV Bottom waveforms: Multiplexer Output

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

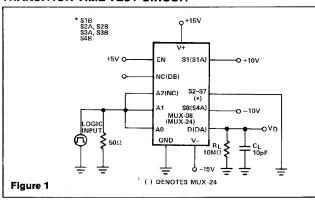




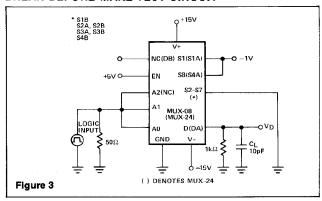


A.C. TEST CIRCUITS

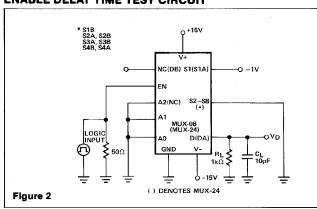
TRANSITION TIME TEST CIRCUIT



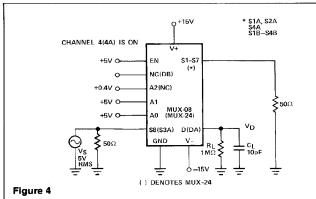
BREAK-BEFORE-MAKE TEST CIRCUIT



ENABLE DELAY TIME TEST CIRCUIT

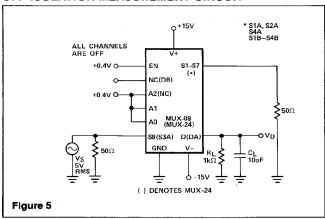


CROSSTALK MEASUREMENT CIRCUIT

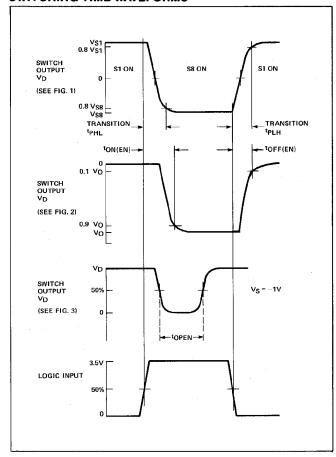


A.C. TEST CIRCUITS

OFF-ISOLATION MEASUREMENT CIRCUIT



SWITCHING TIME WAVEFORMS



APPLICATIONS INFORMATION

These analog multiplexers employ ion-implanted JFETs in a switch configuration designed to assure break-before-make action. The turn-off time is much faster than the turn-on time to guarantee this feature over the full operating temperature and input voltage range. Fabricated with Bipolar-JFET processing, special handling as required with CMOS devices, is not necessary to prevent damage to this multiplexer. Because the digital inputs only require a 2.0V logic "1" input level, power-consuming pull-up resistors are not required for TTL compatibility to insure break-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 ≈ 1.4V.

The "ON" resistance, RON, of the analog switches is constant over the wide input voltage range of -15V to +11V with $V_{SUPPLY} = \pm 15V$. Higher input voltage is tolerable provided that some form of current limiting is employed (such as that of an op-amp output stage) to avoid exceeding junction temperature and power dissipation requirements. For normal operation, however, positive input voltages should be restricted to 11V (or 4V less than the positive supply). This assures that the VGS of an "OFF" switch remains greater than its Vp, and prevents that channel from being falsely turned "ON". When operating with negative input voltages, the gate-tochannel 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 $V_8 = +10V$, the logic input was driven at a 1kHz rate. The positive-going slew rate was 0.3V/µs which is equivalent to a normal I_{DSS} of 3mA. The negative-going slew rate was 0.7V/µs which is equivalent to a "reverse" IDSS of 7mA. Note that when switch 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 IDSS.

CROSSTALK AND OFF-ISOLATION

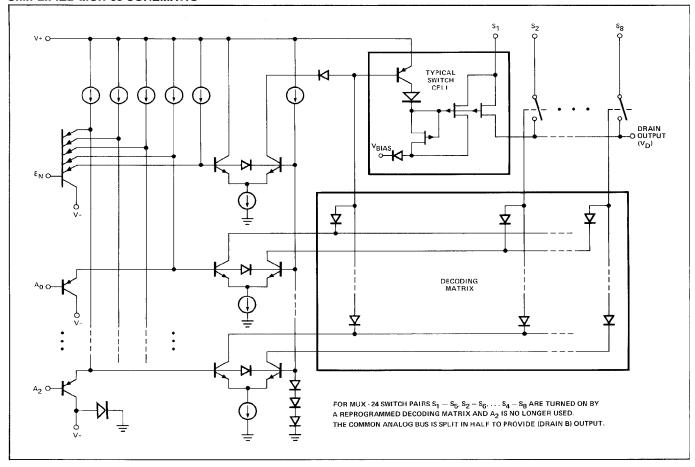
Crosstalk and off-isolation performance is influenced by the type of package selected. Epoxy (P) packaged devices typically exhibit a 12dB improvement in off-isolation (f = 500kHz) performance when compared to ceramic (Q) packaged devices. Epoxy packaged devices typically exhibit a 15dB improvement in crosstalk (f = 500kHz) performance when compared to ceramic (Q) packaged devices.

SINGLE SUPPLY OPERATION OF JFET MULTIPLEXERS

PMI's JFET multiplexers will operate from a single positive supply voltage with the negative supply pin at ground potential. The analog signal range will include ground.

For complete single supply operation information, refer to application note, AN-32.

SIMPLIFIED MUX-08 SCHEMATIC

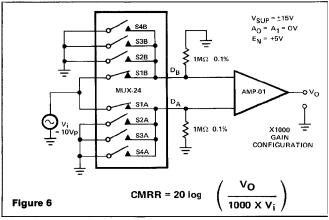


The simplified MUX-08/MUX-24 schematic shows that logic trip points are determined by two forward diode drops. An internal clamping diode between V- and ground prevents excessive current flow between V+ and ground in the event that V- becomes open circuit. The decoding matrix is accomplished by a programmed diode array. The switch cell consists of P channel JFET's with appropriate blocking diodes which ruggedizes the circuit's overvoltage and supply loss characteristics.

DIFFERENTIAL MULTIPLEXERS

One characteristic unique to differential multiplexers (MUX-24) is the ability to reject common-mode signals from becoming differential error signals. Common-mode rejection is a parameter which defines the amount of rejection in terms of dB. The MUX-24 exhibits a 106dB at 60Hz and 101dB at 400Hz of CMRR using the test circuit of Figure 6.

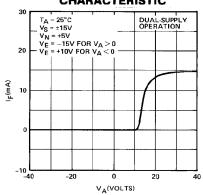
CMRR TEST CIRCUIT



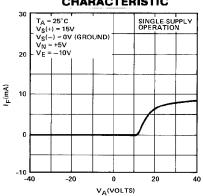
-10-

TYPICAL PERFORMANCE CHARACTERISTICS

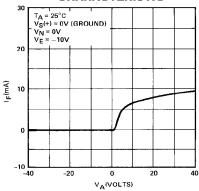
OVERVOLTAGE V-I CHARACTERISTIC



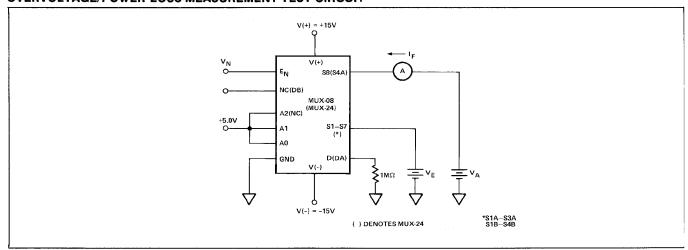
OVERVOLTAGE V-I CHARACTERISTIC



POWER-LOSS V-I CHARACTERISTIC



OVERVOLTAGE/POWER-LOSS MEASUREMENT TEST CIRCUIT



REV. A -11-