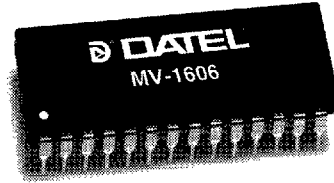## FEATURES

- ±0.01% accuracy
- Low "ON" resistance
- Break-before-make switching
- Dielectrically isolated CMOS technology
- Single-ended or differential inputs
- Fast settling times
- DTL/TTL/CMOS compatible
- 350kHz sampling rates

GENERAL DESCRIPTION

The MV and MVD Series analog multiplexers are 4, 8 and 16-channel monolithic devices featuring a low ON resistance of 270 Ohms. These units are manufactured with CMOS technology using the dielectric isolation process. There are 8 and 16-channel single-ended models and 4 and 8-channel differential models in this Series. Channel addressing is done with a 2, 3 or 4-bit binary code. An inhibit input enables or disables the entire device to permit expansion of the numbers of channels by using several devices together. Another important feature is break-before-make switching, which ensures that no two channels are ever momentarily shorted together.

With a high impedance load, transfer accuracies of ±0.01% can be achieved at channel sampling rates up to 350kHz. These multiplexers are ideal for multichannel data acquisition systems where the multiplexer operates into a high-impedance load such as a sample-hold, buffer amplifier, or instrumentation amplifier.

These multiplexers are packaged in 16 and 28-pin ceramic DIP's. Standard versions operate over 0 to +70°C while the MVD-409M and the MV-1606M operate from −55 to +125°C. The MV and MVD Series are similar in specifications to DATEL's MX and MXD Series multiplexers. The MX and MXD Series are recommended where input over-voltage protection to 20 Volts above supply voltage is required and where higher channel ON resistance can be tolerated.

Figure 1. MV Series Functional Block Diagram

INPUT/OUTPUT CONNECTIONS

PIN	FUNCTION MV-808	FUNCTION MVD-409	PIN	FUNCTION MV-808	FUNCTION MVD-409
1	CA2	CA2	16	CA1	CA1
2	+5V	+5V	15	−V$_S$	−V$_S$
3	INHIBIT	INHIBIT	14	+V$_S$	+V$_S$
4	CA4	B OUT	13	1 IN	1A IN
5	8 IN	4B IN	12	OUT	A OUT
6	7 IN	3B IN	11	2 IN	2A IN
7	6 IN	2B IN	10	3 IN	3A IN
8	5 IN	1B IN	9	4 IN	4A IN

PIN	FUNCTION MV-1606	FUNCTION MVD-807	PIN	FUNCTION MV-1606	FUNCTION MVD-807
1	+V$_S$	+V$_S$	28	OUT	A OUT
2	N.C.	B OUT	27	−V$_S$	−V$_S$
3	N.C.	N.C.	26	8 IN	8A IN
4	16 IN	8B IN	25	7 IN	7A IN
5	15 IN	7B IN	24	6 IN	6A IN
6	14 IN	6B IN	23	5 IN	5A IN
7	13 IN	5B IN	22	4 IN	4A IN
8	12 IN	4B IN	21	3 IN	3A IN
9	11 IN	3B IN	20	2 IN	2A IN
10	10 IN	2B IN	19	1 IN	1A IN
11	9 IN	1B IN	18	INHIBIT	INHIBIT
12	GND	GND	17	CA1	CA1
13	N.C.	N.C.	16	CA2	CA2
14	CA8	N.C.	15	CA4	CA4

NOTES: CA = Channel address   V$_S$ = Supply voltage   N.C. = No connection

ABSOLUTE MAXIMUM RATINGS

PARAMETERS	MV-808	MV-1606 MV-1606M	MVD-409 MVD-409M	MVD-807
Power Supply				
Analog	±20V	±20V	±20V	±20V
Digital	+30V	—	+30V	—
Input Voltage				
Analog	±IV$_S$ + 2VI	±IV$_S$ + 2VI	±IV$_S$ + 2VI	±IV$_S$ + 2VI
Digital	±V$_S$	±IV$_S$ + 4VI	±V$_S$	±IV$_S$ + 4VI
Power Dissipation	780mW	1200mW	780mW	1200mW

FUNCTIONAL SPECIFICATIONS

(Typical at +25°C and ±15V supplies (and +5V supply for MV-808 and MVD-409), unless otherwise noted.)

ANALOG INPUTS	MV-808	MV-1606 MV-1606M	MVD-409 MVD-409M	MVD-807
Number of Channels	8	16	4	8
Type	Single-ended	Single-ended	Differential	Differential
Input Voltage Range	±15V	±15V	±15V	±15V
Channel ON				
Resistance ①	250Ω	270Ω	250Ω	270Ω
Resistance Over Temperature (maximum) ②	500Ω	500Ω	500Ω	500Ω
Leakage	100pA	1nA	50pA	1nA
Channel OFF				
Input Leakage	20pA	30pA	20pA	30pA
Output Leakage	100pA	1nA	50pA	1nA
Input Capacitance	4pF	10pF	4pF	10pF
Output Capacitance	20pF	52pF	10pF	30pF
DIGITAL INPUTS ③				
Logic "0" Threshold (maximum)	+0.4V	+0.8V	+0.4V	+0.8V
Logic "1" Threshold (minimum) ④	+4.0V	+2.4V	+4.0V	+2.4V
Input Current (maximum, high or low)	1µA	1µA	1µA	1µA
Channel Address Coding	3 bits	4 bits	2 bits	3 bits
Channel Inhibit (all channels OFF)	Logic "1"	Logic "0"	Logic "1"	Logic "0"
PERFORMANCE				
Transfer Error (maximum)	±0.01%	±0.01%	±0.01%	±0.01%
Crosstalk (10kHz)	−86dB	−86dB	−86dB	−86dB
Common Mode Rejection	—	—	120dB	120dB
Settling Time (20V to ±0.1%)	1.1µs	1.2µs	1.1µs	1.2µs
Settling Time (20V to ±0.01%)	2.8µs ⑤	2.4µs	2.8µs ⑤	2.4µs
Turn ON Time	350ns	300ns	350ns	300ns
Turn OFF Time	250ns	220ns	250ns	220ns
Inhibit/Enable Delay	300ns	300ns	300ns	300ns
Break-Before-Make Delay	100ns	80ns	100ns	80ns
POWER REQUIREMENTS				
Power Supply Voltage	±15V	±15V	±15V	±15V
Power Supply Current (maximum)	+0.5, −1mA	+3, −1mA	+0.5, −1mA	+3, −1mA
Digital Supply Voltage	+5V	—	+5V	—
Digital Supply Current (maximum)	+1mA	—	+1mA	—
PHYSICAL/ENVIRONMENTAL				
Operating Temperature Range	0 to +70°C	0 to +70°C	0 to +70°C	0 to +70°C
MV-1606M and MVD-409M Operating Temperature Range	—	−55 to +125°C	−55 to +125°C	−55 to +125°C
Storage Temperature Range	−65 to +150°C	−65 to +150°C	−65 to +150°C	−65 to +150°C
Package	16-pin DIP	28-pin DIP	16-pin DIP	28-pin DIP

Footnotes:
① For MV-1606M, typical value is 170 Ohms.
② For MV-1606M, maximum value is 400 Ohms.
③ Channel address and inhibit inputs.
④ For MV-808 and MVD-409: to drive from DTL/TTL logic, 1k pull-up resistors to +5V should be used.
⑤ Settling to ±0.025%.

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TECHNICAL NOTES

1. The transfer accuracy of the MV Series multiplexers depends on both the source resistance and load resistance. For example, with zero source resistance and assuming 500 Ohms maximum channel ON resistance, the load impedance must be at least 5 megohms to achieve 0.01% accuracy. In practice, it is recommended that a load impedance of 10^8 Ohms or more be used. This is a typical input impedance value for most IC operational amplifiers connected in the follower mode or for IC sample-holds (see DATEL's SHM-1C-1, SHM-LM-2, or SHM-20). Source resistance should be kept as low as possible so that accuracy or settling time are not degraded. Less than 250 Ohms is recommended.

2. For differential operation, either two unity-gain buffers or an instrumentation amplifier (such as DATEL's AM-551) is recommended as the output load. To maintain high CMR, source impedance unbalance must be kept to a minimum, and amplifiers with high CMR should be used.

3. The maximum analog input overvoltage for the MV series is $\pm|V_S + 2V|$. It should be noted that the logic (channel address) inputs are protected with resistors and clamp diodes but the analog inputs are not. Because the analog inputs are not protected, the low ON resistance is achieved.

4. Channel expansion is accomplished by use of the inhibit input of the multiplexers. To expand the number of channels, use multiple multiplexers with the inhibit inputs connected to a decoder. See Figure 2.

5. For the MV-808 and MVD-409, it is recommended that 1k pull-up resistors to the +5V logic supply be used when the logic inputs are driven from DTL or TTL circuits. Only these two models require a +5V logic supply.

CHANNEL ADDRESSING

MV-808, MVD-807

CA 4 2 1	MVD-807 Inhibit	MV-808 Inhibit	ON Channel
X X X	0	1	None
0 0 0	1	0	1
0 0 1	1	0	2
0 1 0	1	0	3
0 1 1	1	0	4
1 0 0	1	0	5
1 0 1	1	0	6
1 1 0	1	0	7
1 1 1	1	0	8

MV-1606

CA 8 4 2 1	Inhibit	ON Channel
X X X X	0	None
0 0 0 0	1	1
0 0 0 1	1	2
0 0 1 0	1	3
0 0 1 1	1	4
0 1 0 0	1	5
0 1 0 1	1	6
0 1 1 0	1	7
0 1 1 1	1	8
1 0 0 0	1	9
1 0 0 1	1	10
1 0 1 0	1	11
1 0 1 1	1	12
1 1 0 0	1	13
1 1 0 1	1	14
1 1 1 0	1	15
1 1 1 1	1	16

MVD-409

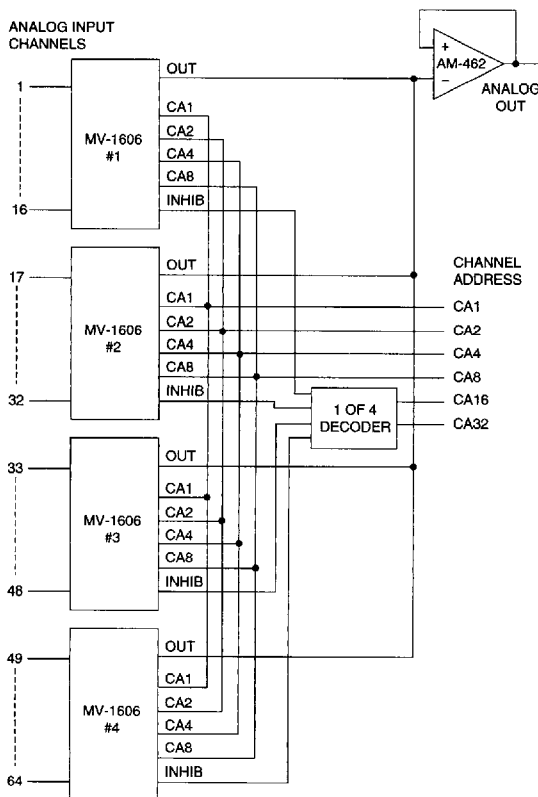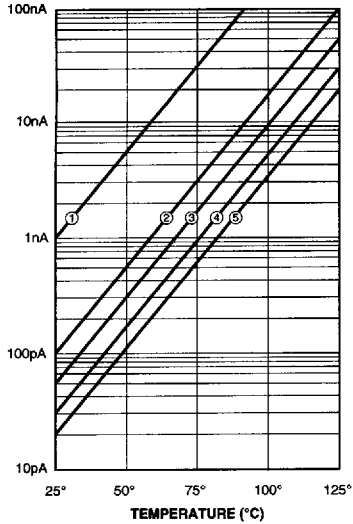| CA2	CA1	Inhibit	ON Channel
X	X	1	None
0	0	0	1
0	1	0	2
1	0	0	3
1	1	0	4

Figure 2. Expansion to 64 Channels

PERFORMANCE GRAPHS

① MV-1606, MVD-807 CHANNEL OFF OUTPUT LEAKAGE
② MV-808 CHANNEL OFF OUTPUT LEAKAGE
③ MVD-409 CHANNEL OFF OUTPUT LEAKAGE
④ MV-1606, MVD-807 CHANNEL OFF INPUT LEAKAGE
⑤ MV-808, MVD-409 CHANNEL OFF INPUT LEAKAGE
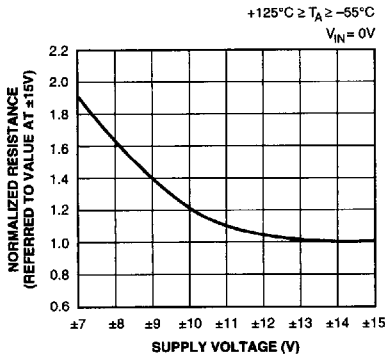
Figure 3. Leakage Current vs. Temperature

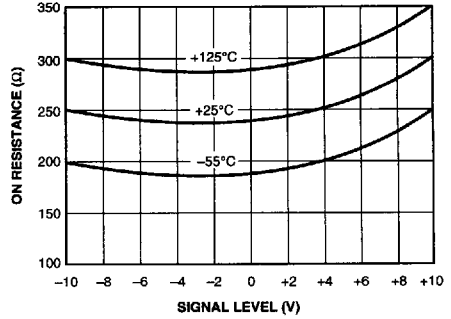**Figure 4. Normalized ON Resistance vs. Supply Voltage**
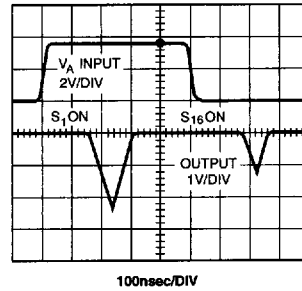

Figure 5. ON Resistance vs. Temperature
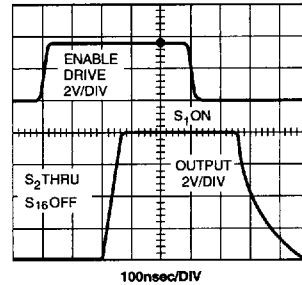

Figure 6. Break-Before-Make Delay (t_{OPEN})
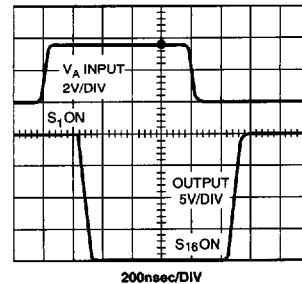

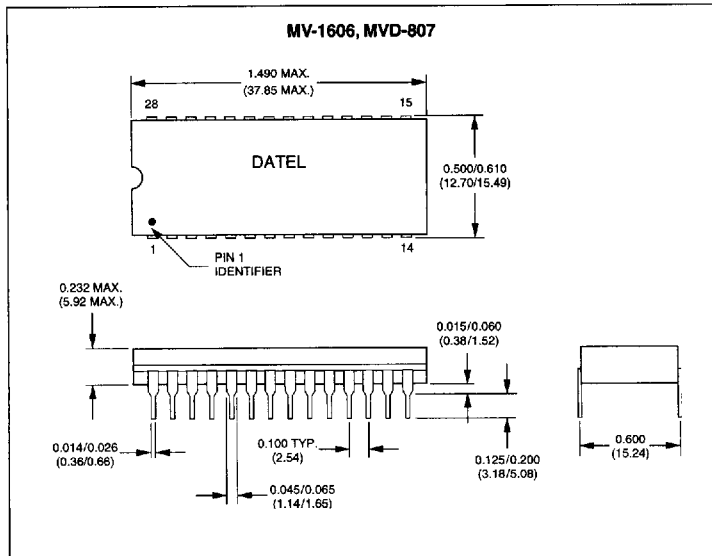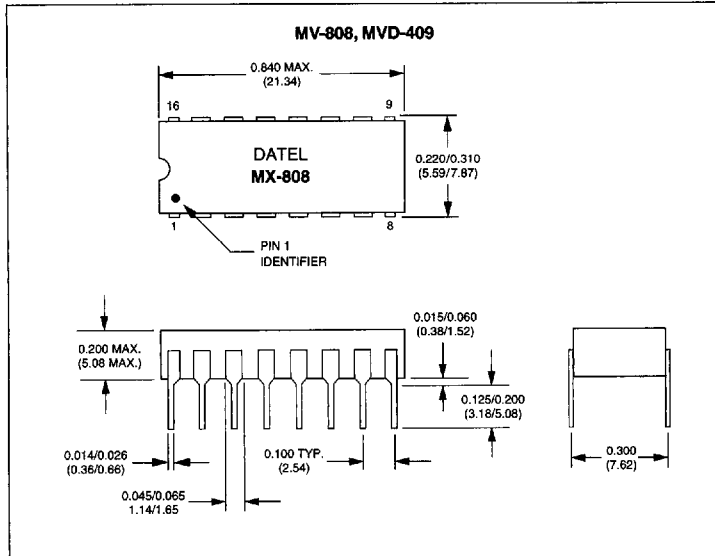**Figure 7. Enable Delay ($t_{ON(EN)}$, $t_{OFF(EN)}$)**

Figure 8. Access Time

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MECHANICAL DIMENSIONS INCHES (mm)

MV-808, MVD-409

PIN 1 IDENTIFIER

MV-1606, MVD-807

PIN 1 IDENTIFIER

ORDERING INFORMATION

MODEL	CHANNELS	OPERATING TEMP. RANGE
MV-808	8 S.E.	0 to +70°C
MV-1606	16 S.E.	0 to +70°C
MV-1606M	16 S.E.	−55 to +125°C
MVD-409	4 Diff.	0 to +70°C
MVD-409M	4 Diff.	−55 to +125°C
MVD-807	8 Diff.	0 to +70°C