

## Monolithic N-Channel Junction FET Switches with High Speed Drivers

AM181/AM281, AM182/AM282 dual driver with SPST switches  
 AM184/AM284, AM185/AM285 dual driver with DPST switches  
 AM187/AM287, AM188/AM288 single driver with SPDT switches  
 AM190/AM290, AM191/AM291 dual driver with SPDT switches

### General Description

These devices combine N-channel junction FETs and bipolar transistors on a single chip for the first time in a new N-channel Bi-FET process.

This technology provides the industry's only low "ON" resistance, high speed, monolithic N-channel junction FET analog switch. Unique circuit techniques are employed to achieve break-before-make switching action and constant "ON" resistance over the analog voltage range. The switch can block 20V peak-to-peak signals, and because of the driver design, an "OFF" isolation greater than 60 dB is achieved at 10 MHz.

### Features

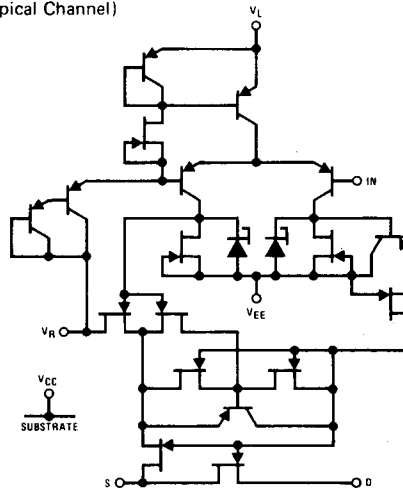
- Interfaces with standard DTL, TTL and CMOS
- Constant "ON" resistance with signals to  $\pm 10V$

- "ON" resistance match  $2\ \Omega$  typ
- "OFF" isolation and crosstalk less than  $-60\ \text{dB}$  at 10 MHz (typ)
- $t_{\text{ON}}/t_{\text{OFF}} = 105\ \text{ns}/95\ \text{ns}$  typ
- Break-before-make action

### Applications

- A-to-D/D-to-A converters
- Data acquisition
- Signal multiplexers
- Sample and hold
- Video switch

### Schematic Diagram (Typical Channel)



### Application Hints\*

V <sub>CC</sub> Positive Supply Voltage (V)	V <sub>EE</sub> Negative Supply Voltage (V)	V <sub>L</sub> Logic Supply Voltage (V)	V <sub>R</sub> Reference Supply Voltage (V)	V <sub>IN</sub> Logic Input Voltage V <sub>INH</sub> Min/ V <sub>INL</sub> Max- (V)	100 Series V <sub>S</sub> Analog Voltage Range (V)	200 Series V <sub>S</sub> Analog Signal Range (V)
+15**	-15	+5	Gnd	2.0/0.8	-7.5 to +15	-10 to +15
+10	-20	+5	Gnd	2.0/0.8	-12.5 to +10	-15 to +10
+12	-12	+5	Gnd	2.0/0.8	-4.5 to +12	-7 to +12

\* Applications Hints are for design aid only, not guaranteed and not subject to production testing

\*\* Electrical Parameter Chart based on V<sub>CC</sub> + 15V, V<sub>EE</sub> = -15V, V<sub>L</sub> = 5V, V<sub>R</sub> = Gnd

AM181/281, 182/282, 184/284, 185/285,  
187/287, 188/288, 190/290, 191/291

## Absolute Maximum Ratings

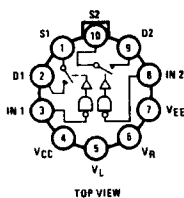
V <sub>CC</sub> - V <sub>EE</sub>	36V	Storage Temperature	-65°C to +150°C
V <sub>CC</sub> - V <sub>D</sub>	33V	Operating Temperature	-55°C to +125°C
V <sub>D</sub> - V <sub>EE</sub>	33V	Power Dissipation*	
V <sub>D</sub> - V <sub>S</sub>	±22V	Metal Can**	450 mW
V <sub>L</sub> - V <sub>EE</sub>	36V	14-Pin DIP***	825 mW
V <sub>L</sub> - V <sub>IN</sub>	8V	16-Pin DIP****	900 mW
V <sub>L</sub> - V <sub>R</sub>	8V		
V <sub>IN</sub> - V <sub>R</sub>	8V		
V <sub>R</sub> - V <sub>EE</sub>	27V		
V <sub>R</sub> - V <sub>IN</sub>	2V		
Current (Any Terminal)	30 mA		

\* All leads soldered to PC board  
 \*\* Derate 6 mW/°C above 75°C  
 \*\*\* Derate 11 mW/°C above 75°C  
 \*\*\*\* Derate 12 mW/°C above 75°C

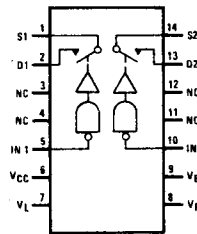
## Connection Diagrams

### AM181/AM281, AM182/AM282<sup>▲</sup>

Metal Can Package  
 See NS Package H10A  
 Order by Part Number  
 Followed by H Suffix



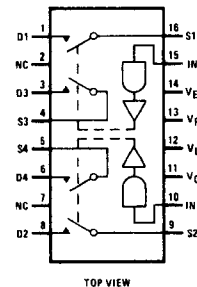
Switch states are for logical "1" input



Dual-In-Line Package  
 See NS Package D14A  
 Order by Part Number  
 Followed by D Suffix

### AM184/AM284, AM185/AM285<sup>▲</sup>

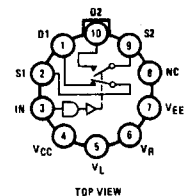
Switch states are for logical "0" input



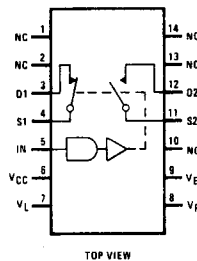
Dual-In-Line Package  
 See NS Package D16A  
 Order by Part Number  
 Followed by D Suffix

### AM187/AM287, AM188/AM288<sup>▲</sup>

Metal Can Package  
 See NS Package H10A  
 Order by Part Number  
 Followed by H Suffix



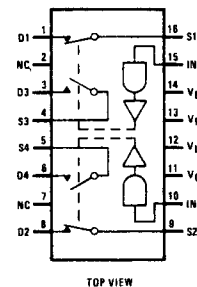
Switch states are for logical "1" input



Dual-In-Line Package  
 See NS Package D14A  
 Order by Part Number  
 Followed by D Suffix

### AM190/AM290, AM191/AM291<sup>▲</sup>

Switch states are for logical "1" input



Dual-In-Line Package  
 See NS Package D16A  
 Order by Part Number  
 Followed by D Suffix

<sup>▲</sup>Consult local sales representative or factory for information concerning the 14-pin flat package

### Electrical Characteristics AM181/AM281, AM182/AM282

dc parameters are 100% tested at 25°C; ac parameters, high and low temperatures, and t<sub>ON</sub>, t<sub>OFF</sub> are sampled to ensure conformance with specifications.

PARAMETER		TEST CONDITIONS, UNLESS NOTED: V <sub>CC</sub> = 15V, V <sub>EE</sub> = -15V, V <sub>L</sub> = 5V, V <sub>R</sub> = 0		MAX LIMITS						UNITS	
				AM181			AM281				
				-55°C	25°C	125°C	-20°C	25°C	85°C		
t <sub>DS(ON)</sub>	Drain-Source "ON" Resistance	I <sub>S</sub> = -10 mA, V <sub>IN</sub> = 0.8V	V <sub>D</sub> = -7.5V		30	30	60	50	50	75	Ω
t <sub>IS(OFF)</sub>	Source "OFF" Leakage Current	V <sub>IN</sub> = 2V	V <sub>S</sub> = 10V, V <sub>D</sub> = -10V, V <sub>CC</sub> = 10V, V <sub>EE</sub> = -20V			1	100		5	100	nA
t <sub>ID(OFF)</sub>	Drain "OFF" Leakage Current		V <sub>D</sub> = 10V, V <sub>S</sub> = -10V, V <sub>CC</sub> = 10V, V <sub>EE</sub> = -20V			1	100		5	100	
			V <sub>D</sub> = 7.5V, V <sub>S</sub> = -7.5V			1	100		5	100	
t <sub>ID(ON) + IS(ON)</sub>	Channel "ON" Leakage Current	V <sub>IN</sub> = 0.8V	V <sub>D</sub> = V <sub>S</sub> = -7.5V			-2	-200		-10	-200	
I <sub>IINL</sub>	Input Current, Input Voltage Low	V <sub>IN</sub> = 0			-250	-250	-250	-250	-250	-250	μA
I <sub>IINH</sub>	Input Current, Input Voltage High	V <sub>IN</sub> = 5V				10	20		10	20	
t <sub>ON</sub>	Turn "ON" Time	See Switching Time Test Circuit				150			180		ns
t <sub>OFF</sub>	Turn "OFF" Time					130			150		
PARAMETER		TEST CONDITIONS, UNLESS NOTED: V <sub>CC</sub> = 15V, V <sub>EE</sub> = -15V, V <sub>L</sub> = 5V, V <sub>R</sub> = 0		MAX LIMITS						UNITS	
				AM182			AM282				
				-55°C	25°C	125°C	-20°C	25°C	85°C		
t <sub>DS(ON)</sub>	Drain-Source "ON" Resistance	I <sub>S</sub> = -10 mA, V <sub>IN</sub> = 0.8V	V <sub>D</sub> = -10V		75	75	100	100	100	150	Ω
t <sub>IS(OFF)</sub>	Source "OFF" Leakage Current	V <sub>IN</sub> = 2V	V <sub>S</sub> = 10V, V <sub>D</sub> = -10V, V <sub>CC</sub> = 10V, V <sub>EE</sub> = -20V			1	100		5	100	nA
t <sub>ID(OFF)</sub>	Drain "OFF" Leakage Current		V <sub>D</sub> = 10V, V <sub>S</sub> = -10V, V <sub>CC</sub> = 10V, V <sub>EE</sub> = -20V			1	100		5	100	
			V <sub>D</sub> = 10V, V <sub>S</sub> = -10V			1	100		5	100	
t <sub>ID(ON) + IS(ON)</sub>	Channel "ON" Leakage Current	V <sub>IN</sub> = 0.8V	V <sub>D</sub> = V <sub>S</sub> = -10V			-2	-200		-10	-200	
I <sub>IINL</sub>	Input Current, Input Voltage Low	V <sub>IN</sub> = 0			-250	-250	-250	-250	-250	-250	μA
I <sub>IINH</sub>	Input Current, Input Voltage High	V <sub>IN</sub> = 5V				10	20		10	20	
t <sub>ON</sub>	Turn "ON" Time	See Switching Time Test Circuit				250			300		ns
t <sub>OFF</sub>	Turn "OFF" Time					130			150		
PARAMETER		TEST CONDITIONS, UNLESS NOTED: V <sub>CC</sub> = 15V, V <sub>EE</sub> = -15V, V <sub>L</sub> = 5V, V <sub>R</sub> = 0		MAX LIMITS						UNITS	
				AM181, AM182			AM281, AM282				
				-55°C	25°C	125°C	-20°C	25°C	85°C		
C <sub>S(OFF)</sub>	Source "OFF" Capacitance	f = 1 MHz	V <sub>S</sub> = -5V, I <sub>D</sub> = 0		9 Typical, (Note 1)						pF
C <sub>D(OFF)</sub>	Drain "OFF" Capacitance		V <sub>D</sub> = -5V, I <sub>S</sub> = 0		6 Typical, (Note 1)						
C <sub>D(ON) + C<sub>S(ON)</sub></sub>	Channel "ON" Capacitance		V <sub>D</sub> = V <sub>S</sub> = 0		14 Typical, (Note 1)						
	"OFF" Isolation	R <sub>L</sub> = 75 Ω		> 60 dB at 10 MHz Typical, (Note 1)							
I <sub>CC</sub>	Positive Supply Current	Both V <sub>IN</sub> = 0, All Channels "ON"			0.1				0.1		mA
I <sub>EE</sub>	Negative Supply Current				-5				-5		
I <sub>L</sub>	Logic Supply Current				4.5				4.5		
I <sub>R</sub>	Reference Supply Current	Both V <sub>IN</sub> = 5V, All Channels "OFF"			-2				-2		
I <sub>CC</sub>	Positive Supply Current				0.1				0.1		
I <sub>EE</sub>	Negative Supply Current				-5				-5		
I <sub>L</sub>	Logic Supply Current				4.5				4.5		
I <sub>R</sub>	Reference Supply Current				-2				-2		

Note 1: Typical values are for Design Aid only, not guaranteed and not subject to production testing.

## Electrical Characteristics AM184/AM284, AM185/AM285

dc parameters are 100% tested at 25°C; ac parameters, high and low temperatures, and t<sub>ON</sub>, t<sub>OFF</sub> are sampled to ensure conformance with specifications.

PARAMETER		TEST CONDITIONS, UNLESS NOTED: V <sub>CC</sub> = 15V, V <sub>EE</sub> = -15V, V <sub>L</sub> = 5V, V <sub>R</sub> = 0		MAX LIMITS						UNITS
				AM184			AM284			
				-55°C	25°C	125°C	-20°C	25°C	85°C	
r <sub>DS(ON)</sub>	Drain-Source ON Resistance	I <sub>S</sub> = -10 mA, V <sub>IN</sub> = 2V	V <sub>D</sub> = -7.5V	30	30	60	50	50	75	Ω
I <sub>S(OFF)</sub>	Source OFF Leakage Current	V <sub>IN</sub> = 0.8V	V <sub>S</sub> = 10V, V <sub>D</sub> = -10V, V <sub>CC</sub> = 10V, V <sub>EE</sub> = -20V		1	100		5	100	nA
I <sub>D(OFF)</sub>	Drain OFF Leakage Current		V <sub>S</sub> = 7.5V, V <sub>D</sub> = -7.5V		1	100		5	100	
			V <sub>D</sub> = 10V, V <sub>S</sub> = -10V, V <sub>CC</sub> = 10V, V <sub>EE</sub> = -20V V <sub>D</sub> = 7.5V, V <sub>S</sub> = -7.5V		1	100		5	100	
I <sub>D(ON)</sub> + I <sub>S(ON)</sub>	Channel ON Leakage Current	V <sub>IN</sub> = 2V	V <sub>D</sub> = V <sub>S</sub> = -7.5V		-2	-200		-10	-200	
I <sub>IINL</sub>	Input Current, Input Voltage Low	V <sub>IN</sub> = 0		-250	-250	-250	-250	-250	-250	μA
I <sub>IINH</sub>	Input Current, Input Voltage High	V <sub>IN</sub> = 5V			10	20		10	20	
t <sub>ON</sub>	Turn ON Time	See Switching Time Test Circuit			150			180		ns
t <sub>OFF</sub>	Turn OFF Time				130			150		
PARAMETER		TEST CONDITIONS, UNLESS NOTED: V <sub>CC</sub> = 15V, V <sub>EE</sub> = -15V, V <sub>L</sub> = 5V, V <sub>R</sub> = 0		MAX LIMITS						UNITS
				AM185			AM285			
				-55°C	25°C	125°C	-20°C	25°C	85°C	
r <sub>DS(ON)</sub>	Drain-Source ON Resistance	I <sub>S</sub> = -10V, V <sub>IN</sub> = 2V	V <sub>D</sub> = -10V	75	75	150	100	100	150	Ω
I <sub>S(OFF)</sub>	Source OFF Leakage Current	V <sub>IN</sub> = 0.8V	V <sub>S</sub> = 10V, V <sub>D</sub> = -10V, V <sub>CC</sub> = 10V, V <sub>EE</sub> = -20V		1	100		5	100	nA
I <sub>D(OFF)</sub>	Drain OFF Leakage Current		V <sub>S</sub> = 10V, V <sub>D</sub> = -10V		1	100		5	100	
			V <sub>D</sub> = 10V, V <sub>S</sub> = -10V, V <sub>CC</sub> = 10V, V <sub>EE</sub> = -20V V <sub>D</sub> = 10V, V <sub>S</sub> = -10V		1	100		5	100	
I <sub>D(ON)</sub> + I <sub>S(ON)</sub>	Channel ON Leakage Current	V <sub>IN</sub> = 2V	V <sub>D</sub> = V <sub>S</sub> = -10V		-2	-200		-10	-200	
I <sub>IINL</sub>	Input Current, Input Voltage Low	V <sub>IN</sub> = 0		-250	-250	-250	-250	-250	-250	μA
I <sub>IINH</sub>	Input Current, Input Voltage High	V <sub>IN</sub> = 5V			10	20		10	20	
t <sub>ON</sub>	Turn ON Time	See Switching Time Test Circuit			250			300		ns
t <sub>OFF</sub>	Turn OFF Time				130			150		
PARAMETER		TEST CONDITIONS, UNLESS NOTED: V <sub>CC</sub> = 15V, V <sub>EE</sub> = -15V, V <sub>L</sub> = 5V, V <sub>R</sub> = 0		MAX LIMITS						UNITS
				AM184, AM185			AM284, AM285			
				-55°C	25°C	125°C	-20°C	25°C	85°C	
C <sub>S(OFF)</sub>	Source OFF Capacitance	f = 1 MHz	V <sub>S</sub> = -5V, I <sub>D</sub> = 0	9 Typical, (Note 1)						pF
C <sub>D(OFF)</sub>	Drain OFF Capacitance		V <sub>D</sub> = -5V, I <sub>S</sub> = 0	6 Typical, (Note 1)						
C <sub>D(ON)</sub> + C <sub>S(ON)</sub>	Channel ON Capacitance		V <sub>D</sub> = V <sub>S</sub> = 0	14 Typical, (Note 1)						
	"OFF" Isolation	R <sub>L</sub> = 75 Ω		> 60 dB at 10 MHz Typical, (Note 1)						
I <sub>CC</sub>	Positive Supply Current	Both V <sub>IN</sub> = 5V, All Channels "ON"			0.1			0.1		mA
I <sub>EE</sub>	Negative Supply Current				-4			-4		
I <sub>L</sub>	Logic Supply Current				4.5			4.5		
I <sub>R</sub>	Reference Supply Current				-2			-2		
I <sub>CC</sub>	Positive Supply Current	Both V <sub>IN</sub> = 0, All Channels "OFF"			0.1			0.1		mA
I <sub>EE</sub>	Negative Supply Current				-5.5			-5.5		
I <sub>L</sub>	Logic Supply Current				4.5			4.5		
I <sub>R</sub>	Reference Supply Current				-2			-2		

**Note 1:** Typical values are for Design Aid only, not guaranteed and not subject to production testing.

AM181/281, 182/282, 184/284, 185/285,  
187/287, 188/288, 190/290, 191/291

7

### Electrical Characteristics AM187/AM287, AM188/AM288

dc parameters are 100% tested at 25°C; ac parameters, high and low temperatures, and tON, tOFF are sampled to ensure conformance with specifications.

PARAMETER	TEST CONDITIONS, UNLESS NOTED: VCC = 15V, VEE = -15V, VL = 5V, VR = 0		MAX LIMITS						UNITS		
			AM187			AM287					
			-55°C	25°C	125°C	-20°C	25°C	85°C			
rDS(ON)	Drain-Source "ON" Resistance	IS = -10 mA, VIN = 2V, Ch. 1 "ON", VIN = 0.8V, Ch. 2 "ON"	VD = -7.5V		30	30	60	50	50	75	Ω
IS(OFF)	Source "OFF" Leakage Current	VIN = 2V, Ch. 2 "OFF", VIN = 0.8V, Ch. 1 "OFF"	VS = 10V, VD = -10V, VCC = 10V, VEE = -20V		1	100		5	100		nA
			VS = 7.5V, VD = -7.5V			1	100		5	100	
ID(OFF)	Drain "OFF" Leakage Current	VIN = 2V, Ch. 2 "OFF", VIN = 0.8V, Ch. 1 "OFF"	VD = 10V, VS = -10V, VCC = 10V, VEE = -20V		1	100		5	100		nA
			VD = 7.5V, VS = -7.5V			1	100		5	100	
ID(ON) + IS(ON)	Channel "ON" Leakage Current	VIN = 2V, Ch. 1 "ON", VIN = 0.8V, Ch. 2 "ON"	VD = VS = -7.5V			-2	-200		-10	-200	
IINL	Input Current, Input Voltage Low	VIN = 0			-250	-250	-250	-250	-250	-250	μA
IINH	Input Current, Input Voltage High	VIN = 5V				10	20		10	20	μA
tON	Turn "ON" Time	See Switching Time Test Circuit				150			180		ns
tOFF	Turn "OFF" Time	See Switching Time Test Circuit				130			150		ns
PARAMETER	TEST CONDITIONS, UNLESS NOTED: VCC = 15V, VEE = -15V, VL = 5V, VR = 0		MAX LIMITS						UNITS		
			AM188			AM288					
			-55°C	25°C	125°C	-20°C	25°C	85°C			
rDS(ON)	Drain-Source "ON" Resistance	IS = -10 mA, VIN = 0.8V, Ch. 2 "ON", VIN = 2V, Ch. 1 "ON"	VD = -10V		75	75	150	100	100	150	Ω
IS(OFF)	Source "OFF" Leakage Current	VIN = 0.8V, Ch. 1 "OFF", VIN = 2V, Ch. 2 "OFF"	VS = 10V, VD = -10V, VCC = 10V, VEE = -20V			1	100		5	100	nA
			VS = 10V, VD = -10V			1	100		5	100	
ID(OFF)	Drain "OFF" Leakage Current	VIN = 0.8V, Ch. 1 "OFF", VIN = 2V, Ch. 2 "OFF"	VD = 10V, VS = -10V, VCC = 10V, VEE = -20V			1	100		5	100	nA
			VD = 10V, VS = -10V			1	100		5	100	
ID(ON) + IS(ON)	Channel "ON" Leakage Current	VIN = 2V, Ch. 1 "ON", VIN = 0.8V, Ch. 2 "ON"	VD = VS = -10V			-2	-200		-10	-200	
IINL	Input Current, Input Voltage Low	VIN = 0			-250	-250	-250	-250	-250	-250	μA
IINH	Input Current, Input Voltage High	VIN = 5V				10	20		10	20	μA
tON	Turn "ON" Time	See Switching Time Test Circuit				250			300		ns
tOFF	Turn "OFF" Time	See Switching Time Test Circuit				130			150		ns
PARAMETER	TEST CONDITIONS, UNLESS NOTED: VCC = 15V, VEE = -15V, VL = 5V, VR = 0		MAX LIMITS						UNITS		
			AM187, AM188			AM287, AM288					
			-55°C	25°C	125°C	-20°C	25°C	85°C			
CS(OFF)	Source "OFF" Capacitance	f = 1 MHz	VS = -5V, ID = 0		9 Typical, (Note 1)						pF
CD(OFF)	Drain "OFF" Capacitance		VD = 5V, IS = 0		6 Typical, (Note 1)						
CD(ON) + CS(ON)	Channel "ON" Capacitance		VD = VS = 0		14 Typical, (Note 1)						
	"OFF" Isolation	RL = 75Ω			> 60 dB at 10 MHz Typical, (Note 1)						
ICC	Positive Supply Current	VIN = 0, Ch. 2 "ON", Ch. 1 "OFF"				0.1			0.1		mA
IEE	Negative Supply Current					-3			-3		
IL	Logic Supply Current					3.2			3.2		
IR	Reference Supply Current					-2			-2		
ICC	Positive Supply Current	VIN = 5V, Ch. 2 "OFF", Ch. 1 "ON"				0.1			0.1		mA
IEE	Negative Supply Current					-3			-3		
IL	Logic Supply Current					3.2			3.2		
IR	Reference Supply Current					-2			-2		

Note 1: Typical values are for Design Aid only, not guaranteed and not subject to production testing.

AM181/281, 182/282, 184/284, 185/285,  
187/287, 188/288, 190/290, 191/291

### Electrical Characteristics AM190/AM290, AM191/AM291

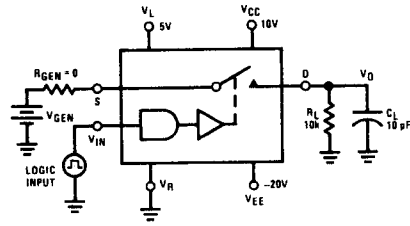
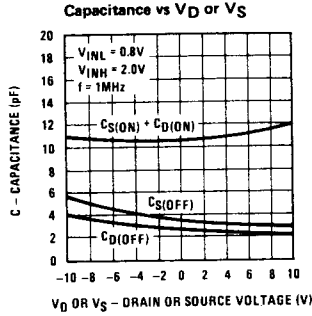
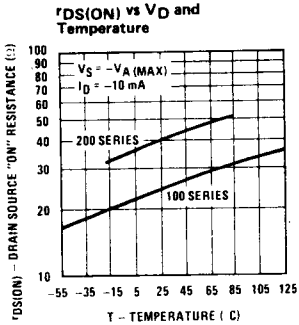
dc parameters are 100% tested at 25°C; ac parameters, high and low temperatures, and t<sub>ON</sub>, t<sub>OFF</sub> are sampled to ensure conformance with specifications.

PARAMETER	TEST CONDITIONS, UNLESS NOTED: V <sub>CC</sub> = 15V, V <sub>EE</sub> = -15V, V <sub>L</sub> = 5V, V <sub>R</sub> = 0		MAX LIMITS						UNITS		
			AM190			AM290					
			-55°C	25°C	125°C	-20°C	25°C	85°C			
r <sub>DS(ON)</sub>	Drain-Source ON Resistance	I <sub>S</sub> = -10 mA, V <sub>IN</sub> = 2V, Ch. 1 and 2 "ON"; V <sub>IN</sub> = 0.8V, Ch. 3 and 4 "ON"	V <sub>D</sub> = -7.5V		30	30	60	50	50	75	Ω
I <sub>S(OFF)</sub>	Source OFF Leakage Current	V <sub>IN</sub> = 2V, Ch. 3 and 4 "OFF"	V <sub>S</sub> = 10V, V <sub>D</sub> = -10V, V <sub>CC</sub> = 10V, V <sub>EE</sub> = -20V		1	100		5	100		nA
I <sub>D(OFF)</sub>	Drain OFF Leakage Current		V <sub>S</sub> = 7.5V, V <sub>D</sub> = -7.5V			1	100		5	100	
I <sub>D(OFF)</sub>	Drain OFF Leakage Current	V <sub>IN</sub> = 0.8V, Ch. 1 and 2 "OFF"	V <sub>D</sub> = 10V, V <sub>S</sub> = -10V, V <sub>CC</sub> = 10V, V <sub>EE</sub> = -20V			1	100		5	100	nA
I <sub>D(OFF)</sub>	Drain OFF Leakage Current	V <sub>IN</sub> = 0.8V, Ch. 3 and 4 "ON"	V <sub>D</sub> = 7.5V, V <sub>S</sub> = -7.5V			1	100		5	100	
I <sub>D(ON)</sub> + I <sub>S(ON)</sub>	Channel ON Leakage Current	V <sub>IN</sub> = 2V, Ch. 1 and 2 "ON"	V <sub>D</sub> = V <sub>S</sub> = 7.5V			-2	-200		-10	-200	μA
I <sub>INL</sub>	Input Current, Input Voltage Low	V <sub>IN</sub> = 0			-250	-250	-250	-250	-250	-250	
I <sub>INH</sub>	Input Current, Input Voltage High	V <sub>IN</sub> = 5V				10	20		10	20	μA
t <sub>ON</sub>	Turn ON Time	See Switching Time Test Circuit							150	180	
t <sub>OFF</sub>	Turn OFF Time	See Switching Time Test Circuit							130	150	
PARAMETER	TEST CONDITIONS, UNLESS NOTED: V <sub>CC</sub> = 15V, V <sub>EE</sub> = -15V, V <sub>L</sub> = 5V, V <sub>R</sub> = 0		MAX LIMITS						UNITS		
			AM191			AM291					
			-55°C	25°C	125°C	-20°C	25°C	85°C			
r <sub>DS(ON)</sub>	Drain-Source ON Resistance	I <sub>S</sub> = -10 mA, V <sub>IN</sub> = 0.8V, Ch. 3 and 4 "ON"; V <sub>IN</sub> = 2V, Ch. 1 and 2 "ON"	V <sub>D</sub> = -10V		75	75	150	100	100	150	Ω
I <sub>S(OFF)</sub>	Source OFF Leakage Current	V <sub>IN</sub> = -0.8V, Ch. 1 and 2 "OFF"	V <sub>S</sub> = 10V, V <sub>D</sub> = -10V, V <sub>CC</sub> = 10V, V <sub>EE</sub> = -20V		1	100		5	100		nA
I <sub>D(OFF)</sub>	Drain OFF Leakage Current		V <sub>S</sub> = 10V, V <sub>D</sub> = -10V			1	100		5	100	
I <sub>D(OFF)</sub>	Drain OFF Leakage Current	V <sub>IN</sub> = 2V, Ch. 3 and 4 "OFF"	V <sub>D</sub> = 10V, V <sub>S</sub> = -10V, V <sub>CC</sub> = 10V, V <sub>EE</sub> = -20V			1	100		5	100	nA
I <sub>D(OFF)</sub>	Drain OFF Leakage Current	V <sub>IN</sub> = 0.8V, Ch. 3 and 4 "ON"	V <sub>D</sub> = 10V, V <sub>S</sub> = -10V			1	100		5	100	
I <sub>D(ON)</sub> + I <sub>S(ON)</sub>	Channel ON Leakage Current	V <sub>IN</sub> = 2V, Ch. 1 and 2 "ON"	V <sub>D</sub> = V <sub>S</sub> = -10V			-2	-200		-10	-200	μA
I <sub>INL</sub>	Input Current, Input Voltage Low	V <sub>IN</sub> = 0			-250	-250	-250	-250	-250	-250	
I <sub>INH</sub>	Input Current, Input Voltage High	V <sub>IN</sub> = 5V				10	20		10	20	μA
t <sub>ON</sub>	Turn ON Time	See Switching Time Test Circuit							250	300	
t <sub>OFF</sub>	Turn OFF Time	See Switching Time Test Circuit							130	150	
PARAMETER	TEST CONDITIONS, UNLESS NOTED: V <sub>CC</sub> = 15V, V <sub>EE</sub> = -15V, V <sub>L</sub> = 5V, V <sub>R</sub> = 0		MAX LIMITS						UNITS		
			AM190, AM191			AM290, AM291					
			-55°C	25°C	125°C	-20°C	25°C	85°C			
C <sub>S(OFF)</sub>	Source OFF Capacitance	f = 1 MHz	V <sub>S</sub> = -5V, I <sub>D</sub> = 0		9 Typical, (Note 1)						pF
C <sub>D(OFF)</sub>	Drain OFF Capacitance		V <sub>D</sub> = 5V, I <sub>S</sub> = 0		6 Typical, (Note 1)						
C <sub>D(ON)</sub> + C <sub>S(ON)</sub>	Channel ON Capacitance		V <sub>D</sub> = V <sub>S</sub> = 0		14 Typical, (Note 1)						
	"OFF" Isolation	RL = 75 Ω	> 60 dB at 10 MHz Typical, (Note 1)								
I <sub>CC</sub>	Positive Supply Current	V <sub>IN</sub> = 0, Ch. 3 and 4 "ON"; Ch. 1 and 2 "OFF"			0.1				0.1		mA
I <sub>EE</sub>	Negative Supply Current				-5				-5		
I <sub>L</sub>	Logic Supply Current				4.5				4.5		
I <sub>R</sub>	Reference Supply Current				-2				-2		
I <sub>CC</sub>	Positive Supply Current				0.1				0.1		
I <sub>EE</sub>	Negative Supply Current	V <sub>IN</sub> = 5V, Ch. 3 and 4 "OFF"; Ch. 1 and 2 "ON"			-5				-5		mA
I <sub>L</sub>	Logic Supply Current				4.5				4.5		
I <sub>R</sub>	Reference Supply Current				-2				-2		

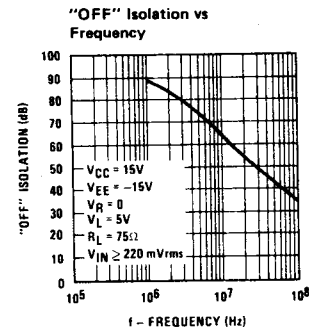
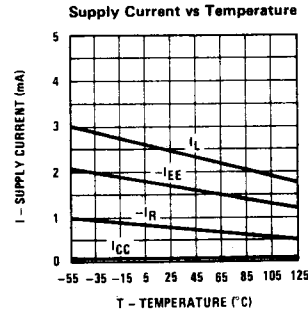
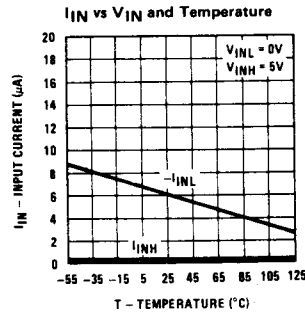
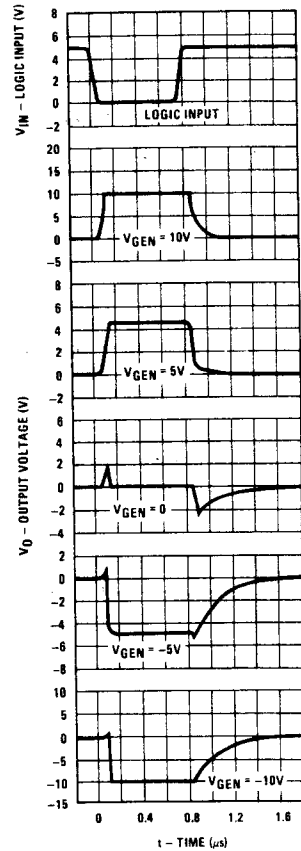
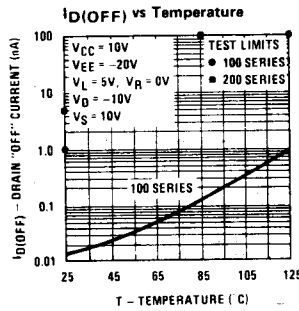
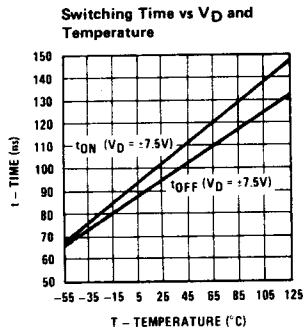
Note 1: Typical values are for Design Aid only, not guaranteed and not subject to production testing.

**Typical Performance Characteristics**  $V_{CC} = 15V, V_{EE} = -15V, V_L = 5V, V_R = 0$  unless otherwise noted.

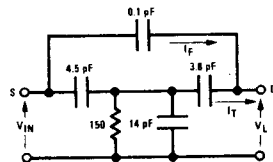
Typical delay, rise, fall, settling times, and switching transients in this circuit.



If  $R_{GEN}, R_L$  or  $C_L$  is increased there will be proportional increases in rise and/or fall RC times.



Equivalent "OFF" Circuit

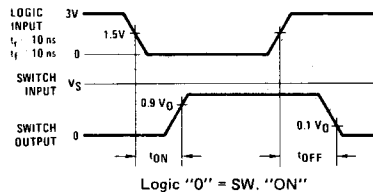
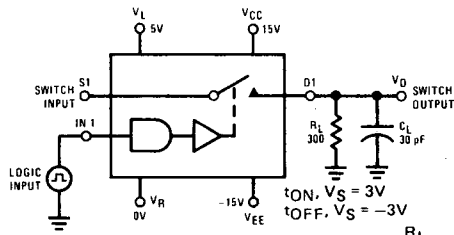


AM181/281, 182/282, 184/284, 185/285,  
187/287, 188/288, 190/290, 191/291

### Switching Time Test Circuit

Switch output waveform shown for  $V_S =$  constant with logic input waveform as shown. Note that  $V_S$  may be + or - as per switching time test circuit.  $V_O$  is the steady

state output with switch "ON". Feedthrough via gate capacitance may result in spikes at leading and trailing edge of output waveform.

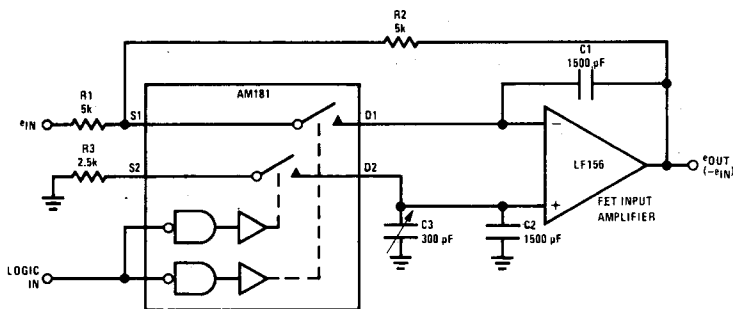


$$V_O = V_S \frac{R_L}{R_L + \tau_{DS(ON)}}$$

(Repeat test for IN2 and S2)

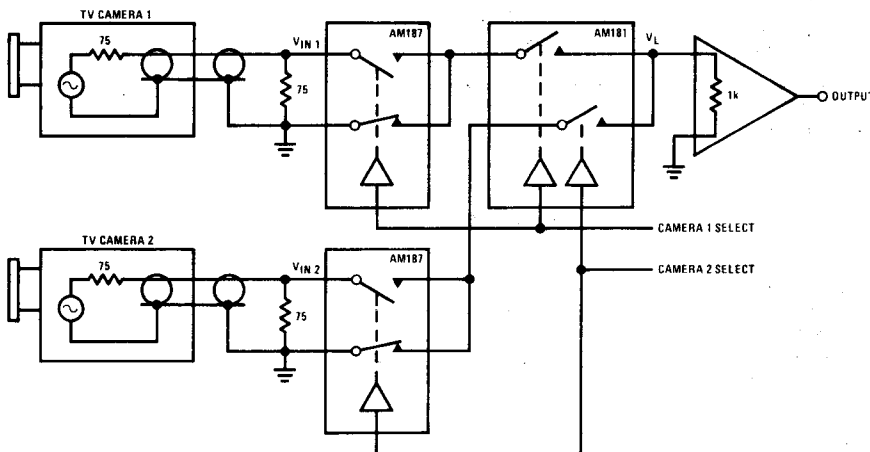
### Typical Applications

#### Low Drift-Compensated Sample and Hold



- Input impedance 5 k $\Omega$
- Slew rate limiting and 3 dB point: 20V swing: 3.2K C; 5V swing: 12K C; small signal: 21K C
- Droop rate @ 25 $^{\circ}$ C 0.5 nV per  $\mu$ s
- Sample to hold offset adjustable to zero
- Acquisition time—98  $\mu$ s
- Aperture time—80 ns
- Aperture uncertainty—2 ns

#### Video Switch with Very High "OFF" Isolation (f = dc to 10 MHz)

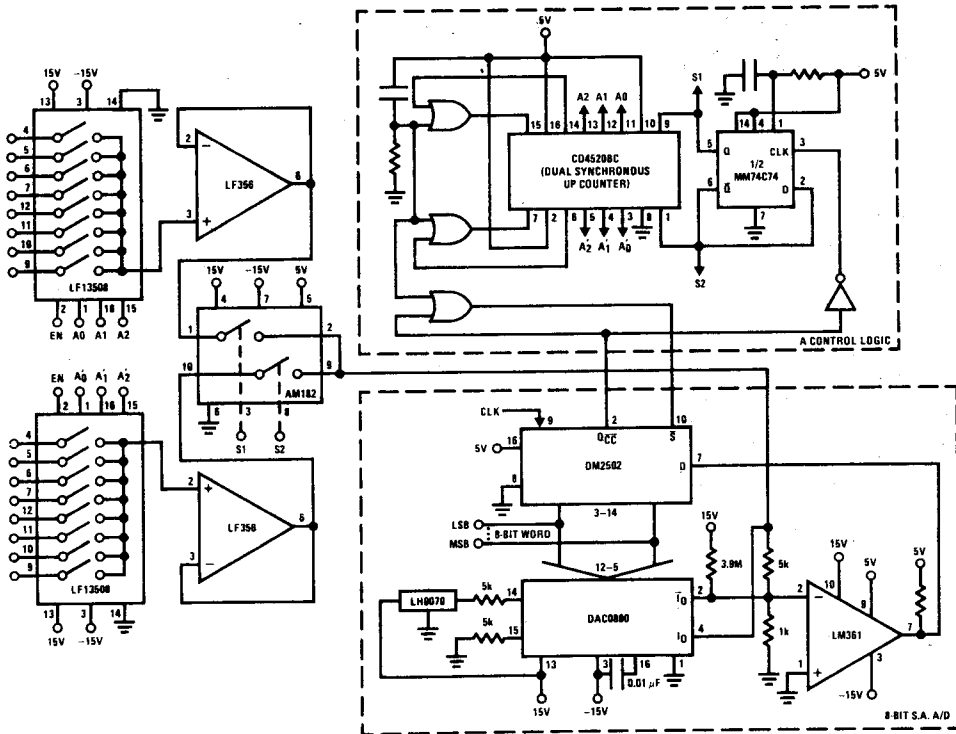


- 116 dB isolation at 10 MHz, "OFF" camera to "ON" camera
- 98 dB isolation at 10 MHz, load from each camera when both cameras are "OFF"
- < 1 dB on insertion loss



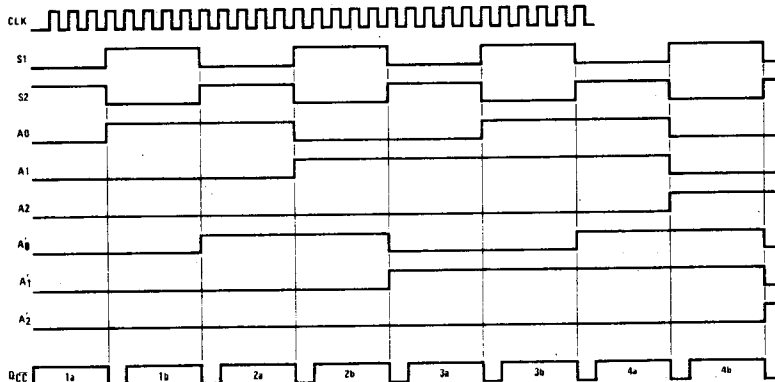
## Typical Applications (Continued)

A 16-Channel Data Acquisition Unit with Second Level Multiplexing



- Maximum A/D clock frequency: 4.5 MHz
- Maximum throughput rate: 31.25k samples/sec
- Minimum switch "ON" time for the 2-channel MUX:  $t_{ON(min)} \leq 1/4.5 \text{ MHz}$
- Maximum input signal bandwidth 15.6 kHz
- Maximum input signal variation during conversion for 8-bit accuracy and 10V full scale:  $\Delta V_{IN}/\Delta T = 19.5 \text{ mV}/\mu\text{s}$

## Timing Diagram



AM181/281, 182/282, 184/284, 185/285,  
187/287, 188/288, 190/290, 191/291

7