

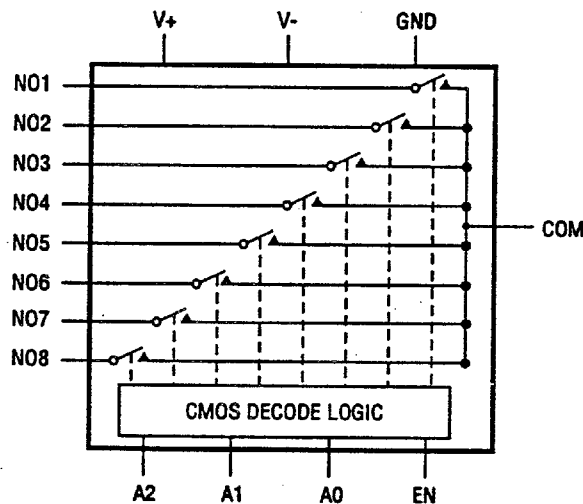
Radiation Hardened 358RP

8 Channel Fault Protected Analog Multiplexer

*For Space
Applications*

SEI's 358RP (RP for RAD-PAK®) 8 Channel single-ended (1 of 8) multiplexers with fault protection features a minimum 100 kilorad (Si) total dose tolerance. Using SEI's radiation hardened RAD-PAK® packaging technology, the 358RP is fully equivalent to the industry standard 358. Using a series N-channel, P-channel, N-channel structure, these multiplexers provide significantly improved fault protection. If the power supplies to the fault-protected multiplexer are inadvertently turned off while input voltages are still applied, all channels in the multiplexer are turned off, and only a few nanoamperes of leakage current will flow into the inputs. This protects not only the multiplexer and the circuitry driven by the multiplexer, but also protects the sensors or signal sources which drive the multiplexer.

All digital inputs have logic thresholds of 0.8V and 2.4V, ensuring both TTL and CMOS compatibility without requiring pullup resistors. Break-before-make operation is guaranteed. Power supply currents have been reduced and typical power dissipation is less than 2 milliwatts.



358RP 8-CHANNEL SINGLE-ENDED MULTIPLEXER

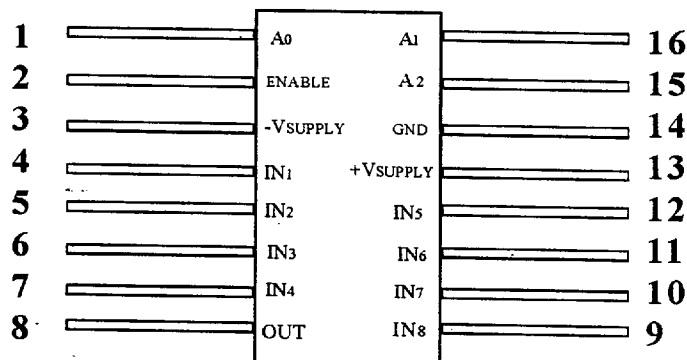


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Radiation Hardened 358RP

8 Channel Fault-Protected
Analog Multiplexer



**358RP PIN CONFIGURATION
TOP VIEW**

Features:

- 8 Channel Fault-Protected Analog Multiplexer
- Pin Compatible with Industry Standard 358/508
- RAD-PAK[®] Radiation Hardened Against Natural Space Radiation
- Total Dose Hardness >100 krad (Si)
 - No Single Event Latchup
- Package:
 - 16 Pin RAD-PAK[®] flat pack
 - 16 Pin RAD-PAK[®] DIP
- All switches off with power supplies off
- On channel turns OFF if overvoltage occurs
- Only nanoamperes of input current under all fault conditions
- Operates from ± 4.5 to ± 18 V supplies
- All digital inputs are TTL and CMOS compatible
- Significantly reduced power consumption

Specifications and design are subject to change without notice.



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358RP ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN	MAX	UNITS
Voltage between Supply Pins	V_{CC} V^+ V^-		+44 +22 -22	V
Digital Input Overvoltage	V_{EN}, V_A { $V_{supply(+)}$ } { $V_{supply(-)}$ }	-4	+4	V
Analog Input Overvoltage (with Multiplexer Power On)	V_S { $V_{supply(+)}$ } { $V_{supply(-)}$ }	-20	+20	V
Analog Input Overvoltage (with Multiplexer Power Off)	V_S { $V_{supply(+)}$ } { $V_{supply(-)}$ }	-35	+35	V
Continuous Current, S or D			20	mA
Peak Current, S or D (Pulsed at 1ms, 10% duty cycle max)			40	mA
Power Dissipation (Note 1)	P_d		1.28	W
Operating Temperature Range	T_A	-55	+125	°C
Storage Temperature Range	T_S	-65	+150	°C

Note 1: Derate 12.8mW/°C above $T_A = +75^\circ\text{C}$



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358RP ELECTRICAL CHARACTERISTICS

Supplies = +15V, -15V; V_{AH} (Logic Level High) = +2.4V, V_{AL} (Logic Level Low) = +0.8V, T_A = -55°C to +125°C (unless otherwise noted).

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNIT
STATIC							
ON Resistance	$r_{DS(ON)}$	$V_D = \pm 10V, I_S = 100\mu A$ $V_{AL} = 0.8V, V_{AH} = 2.4V$	+25°C Full		1.2 1.5	1.5 1.8	k Ω
OFF Input Leakage	$I_{S(OFF)}$	$V_S = \pm 10V, V_D = \mp 10V$ $V_{EN} = 0.8V$	+25°C Full		0.03	0.5 50	nA
OFF Output Leakage	$I_{D(OFF)}$	$V_D = \pm 10V, V_S = \mp 10V$ $V_{EN} = 0.8V$	+25°C Full		0.1	1.0 200	nA
ON Channel Leakage Current	$I_{D(ON)}$	$V_{S(ALL)} = V_D = \pm 10V$ (Note 2) $V_{AH} = V_{EN} = 2.4V$	+25°C Full		0.1	2.0 200	nA
Analog Signal Range	V_{AN}	(Note 1)	Full	-15		+15	V
FAULT							
Output Leakage Current (with Overvoltage)	$I_{D(OFF)}$	$V_D = 0V$ (Note 2) Analog Overvoltage = $\pm 33V$	+25°C Full		4.0	2.0	nA μA
Input Leakage Current (with Overvoltage)	$I_{S(OFF)}$	$V_{IN} = \pm 25V$ $V_O = \pm 10V$ (Note 2)	+25°C			5.0	μA
Input Leakage Current (w. Power Supplies Off)	$I_{S(OFF)}$	$V_{IN} = \pm 25V$ $V_{EN} = V_O = 0V$ $A_0 = A_1 = A_2 = 0V$ or 5V	+25°C			2.0	μA
INPUT							
Input Low Threshold	V_{AL}		Full			0.8	V
Input High Threshold	V_{AH}		Full	2.4			V
Input Leakage Current (High or Low)	I_A	$V_A = 4V$ or 0V (Note 3)	Full			1.0	μA
DYNAMIC							
Access Time	t_A		+25°C		0.5	1.0	μs
Break-Before-Make Delay	$t_{ON} - t_{OFF}$	$V_{EN} = \pm 5V, V_{IN} = \pm 10V$ A_0, A_1, A_2 Strobed	+25°C	25	80		ns



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358RP ELECTRICAL CHARACTERISTICS: (continue)

Supplies = +15V, -15V; V_{AH} (Logic Level High) = +2.4V, V_{AL} (Logic Level Low) = +0.8V, T_A = -55°C to +125°C (unless otherwise noted).

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
DYNAMIC (continue)							
Enable Delay (ON)	$t_{ON(EN)}$		+25°C Full		300	500 1000	ns
Enable Delay (OFF)	$t_{OFF(EN)}$		+25°C Full		300	500 1000	ns
Settling Time (0.1%) (0.01%)	t_{SETT}		+25°C		1.2 3.5		μs
"OFF Isolation"	OFF _(ISO)	$V_{EN} = 0.8V$, $R_L = 1k\Omega$ $C_L = 15pF$, $V = 7V_{RMS}$ $f = 100kHz$	+ 25 °C	50	68		dB
Channel Input Capacitance	$C_{S(OFF)}$		+ 25 °C		5		pF
Channel Output Capacitance	$C_{D(OFF)}$		+ 25 °C		25		pF
Digital Input Capacitance	C_A		+ 25 °C		0.1		pF
SUPPLY							
Positive Supply Current	I^+	$V_{EN} = 0.8V$ or 2.4V All $V_A = 0V$ or 5V	+ 25 °C Full		0.1 0.3	0.6 0.7	mA
Negative Supply Current	I^-	$V_{EN} = 0.8V$ or 2.4V All $V_A = 0V$ or 5V	+ 25 °C Full		0.01 0.02	0.1 0.2	mA
Power Supply Range for Continuous Operation	V_{OP}	(Note 4)	+ 25 °C	±4.5		±18	V

Note 1: When the analog signal exceeds +13.5V or -12V the blocking action of the gate structure goes into operation. Only leakage currents flow and the channel on resistance rises to infinity.

Note 2: The Value shown is the steady state value. The transient leakage is typically 10μA.

Note 3: Digital input leakage is primarily due to the clamp diodes. Typical leakage is less than 1nA at 25 °C.

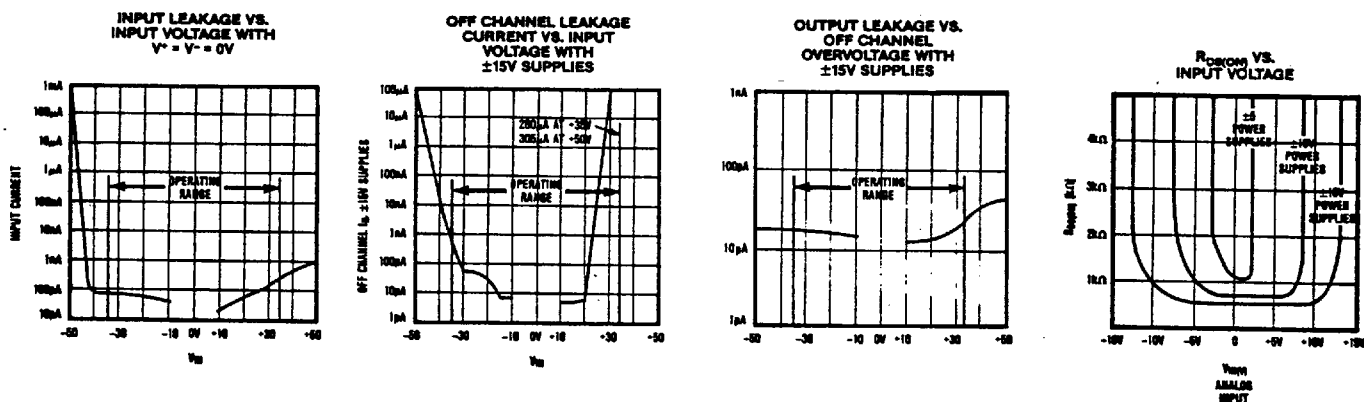
Note 4: Electrical characteristics, such as ON Resistance, will change when power supplies other than ±15V are used



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358RP Typical Operating Characteristics



Truth Table - 358RP

A2	A1	A0	EN	ON SWITCH
X	X	X	0	NONE
0	0	0	1	1
0	0	1	1	2
0	1	0	1	3
0	1	1	1	4
1	0	0	1	5
1	0	1	1	6
1	1	0	1	7
1	1	1	1	8

Note: Logic "0" = $V_{AL} \leq 0.8V$, Logic "1" = $V_{AH} \geq 2.4V$

358RP PINOUT DESCRIPTION

PIN	SYMBOL	DESCRIPTION
1	A ₂	Address Input
2	EN	Enable Input
3	V ₋	Negative Supply Voltage Input
4	IN ₁	Analog Input
5	IN ₂	Analog Input
6	IN ₃	Analog Input
7	IN ₄	Analog Input
8	OUT	Output
9	IN ₅	Analog Input
10	IN ₆	Analog Input
11	IN ₇	Analog Input
12	IN ₈	Analog Input
13	V ₊	Positive Supply Voltage
14	GND	Ground
15	A ₁	Address Input
16	A ₀	Address Input

358RP Package Ordering Guide

Package Style	Case Outline	Description
D	D-16	16 Pin Dual In Line Package
F	F-16	16 Pin Flat Package

Note:

1/ For outline information, see Appendix A (Package Information - Outline Dimension)



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