

Radiation Hardened 328RP

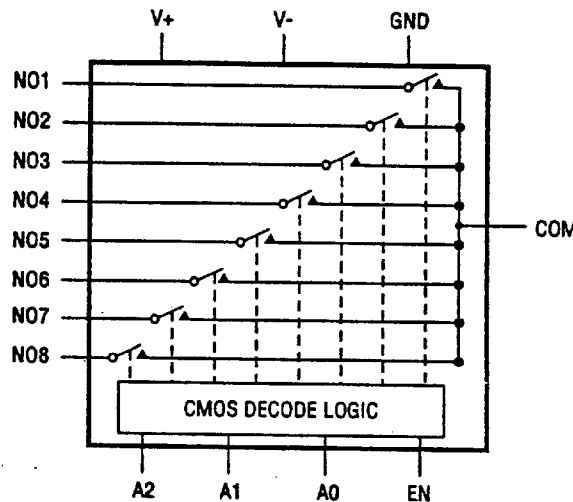
8-Channel, Ultra-Low
Leakage, Monolithic CMOS
Analog Multiplexers

*For Space
Applications*

SEI's 328RP (RP for RAD-PAK[®]) monolithic, CMOS analog multiplexer features a minimum 100kilorad(Si) total dose tolerance. Using SEI's radiation hardened RAD-PAK[®] packaging technology, the 328RP is a pin-for-pin replacement for the industry standard DG508. The 328RP is a single-ended, 1-of-8 device. Designed to provide the lowest possible "on" and "off" leakages, these multiplexers switch signals from high source impedance, providing the mux operates into a high input impedance op amp or A/D converter.

Adding an external 40kW resistor to each input makes the 328RP an excellent fault-tolerant multiplexer. Low leakage (less than 1pA at 25°C) and 2.5kW on resistance allow the circuit to sustain 110V AC faults indefinitely while maintaining an error of less than 40nV for normal signals (i.e., 1pA times 40kW).

The 328RP works equally well with a single supply of 10V to 30V or dual supplies of +5V to +18V. The 328RP also performs well with unbalanced combinations of supply voltage, such as +12V and -5V or +5V and -15V. Low-power dissipation (1.9mW with +15V supplies) allows use of the multiplexers in portable applications.



328RP 8-CHANNEL SINGLE-ENDED MULTIPLEXER



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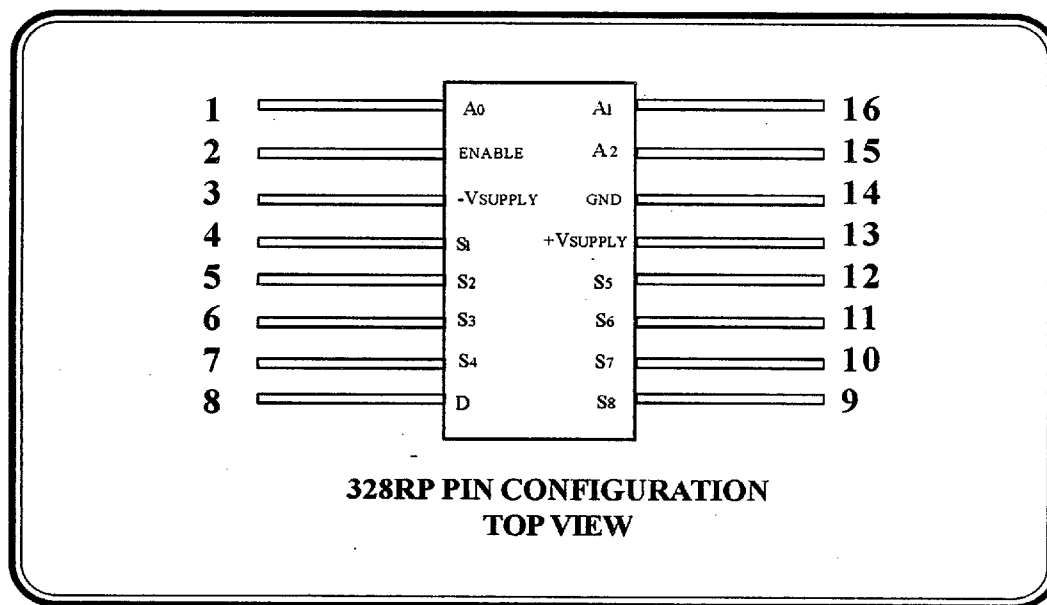
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SEI 328RP RADHARD 8-CHANNEL MULTIPLEXER

Radiation Hardened

328RP

8 Channel, Ultra-Low Leakage,
Monolithic CMOS Analog Multiplexers



Features:

- Ultra-Low Leakage Analog Multiplexer
- Pin Compatible with Industry Standard DG508
- RAD-PAK® Radiation Hardened Against Natural Space Radiation
- Total Dose Hardness >100krad (Si)
 - No Single Event Latchup
- Package
 - 16 Pin RAD-PAK® Flat Pack
 - 16 Pin RAD-PAK® DIP
- Ultra-Low "Off and "On" Leakage: 1pA Typ
- Bi-Directional Operation (Use as Mux or Demux)
- TTL and CMOS-Logic Compatible
- Analog-Signal Range Includes Power-Supply Rails
- Switching Speeds Less Than 1.5µs
- Screening per TM5004
- QCI per TM5005

Specifications and design are subject to change without notice.



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328RP ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN	MAX	UNITS
Voltage Referenced to V- V+ GND			+44 +25	V
Digital Inputs (Note 1)	V_S, V_D	-2	V++ 2	V
Current (Any Terminal, Except S or D)			30	mA
Continuous Current, S or D			10	mA
Peak Current, S or D (Pulsed at 1ms, 10% duty cycle max)			40	mA
Power Dissipation Derate 12mW/°C above +75°C	P_d		900	mW
Operating Temperature Range	T_A	-55	+125	°C
Storage Temperature Range	T_s	-65	+150	°C

Note 1: Electrical characteristics, such as On Resistance, will change when power supplies other than $\pm 15V$ are used. Power-supply range is a design characteristic, not production tested.



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328RP ELECTRICAL CHARACTERISTICS (Over Temperature)
 V+ = +15V, -15V; GND = 0V, T_A = T_{MIN} to T_{MAX} (unless otherwise noted).

PARAMETER	SYMBOL	TEST CONDITIONS	LIMITS			UNITS
			MIN	TYP (Note 2)	MAX	
SWITCH						
Analog-Signal Range	V _{ANALOG}		±15			V
Drain-Source On Resistance	r _{DS(on)}	V _D = 10V, I _S = 100µA	Seq. Each Switch On	2.2	4	kΩ
		V _D = -10V, I _S = 100µA	V _{AL} = 0.8V V _{AH} = 2.4V	1.5	4	
Source-Off Leakage Current	I _{S(off)}	V _S = 10V, V _D = -10V	V _{EN} = 0V		±5	nA
		V _S = -10V, V _D = 10V		±5		
Drain-Off Leakage Current	I _{D(off)}	V _D = 10V, V _S = -10V	V _{EN} = 0V		±20	nA
		V _D = -10V, V _S = 10V		±20		
Drain-On Leakage Current	I _{D(on)}	V _{S(all)} = V _D = 10V	Seq. Each Switch On V _{AL} = 0.8V V _{AH} = 2.4V		±20	nA
		V _{S(all)} = V _D = -10V		±20		
INPUT						
Address Input Current, Input Voltage High	I _{AH}	V _A = 2.4V		0.01	±1	µA
		V _A = 15V		0.01	±1	
Address Input Current, Input Voltage Low	I _{AL}	V _{EN} = 2.4V	All V _A = 0V	0.01	±1	µA
		V _{EN} = 0V		0.01	±1	
DYNAMIC						
Switching Time of Multiplexer	t _{transition}				1.0	µs
Break-Before-Make Interval	t _{open}			0.2		µs
Enable Turn-On Time	t _{on(EN)}				1.0	µs
Enable Turn-Off Time	t _{off(EN)}				0.7	µs
OFF Isolation	OIRR	V _{EN} = 0V, R _L = 1kΩ C _L = 15pF, V _S = 7VRMS f = 500kHz		84		dB



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328RP ELECTRICAL CHARACTERISTICS: (continue)

PARAMETER	SYMBOL	TEST CONDITIONS	TEMP	LIMITS			UNITS
				MIN	TYP (Note 2)	MAX	
DYNAMIC (continue)							
Source-Off Capacitance	$C_{S(off)}$	$V_s = 0V$	$V_{EN} = 0V$ $f = 1MHz$		1.8		pF
Drain-Off Capacitance	$C_{D(off)}$	$V_D = 0V$	$V_{EN} = 0V$ $f = 1MHz$		8.0		pF
Charge Injection	$Q_{(inj)}$	$V_A = +10V$			2		pC
		$V_A = 0V$			3		
		$V_A = -10V$			4		
SUPPLY							
Positive Supply Current	I^+	$V_{EN} = 2.4V$	$V_A = 0V/5V$		4.5	200	μA
Negative Supply Current	I^-	$V_{EN} = 2.4V$	$V_A = 0V/5V$		1	-100	
Power Supply Range for Continuous Operation (Note 1)	V_{OP}			± 5		± 18	V

Note 1: Electrical characteristics, such as On Resistance, will change when power supplies other than $\pm 15V$ are used. Power-supply range is a design characteristic, not production tested.

Note 2: Typical values are for DESIGN AID ONLY, not guaranteed or subject to production testing.

328RP Package Ordering Guide

Package Style	Case Outline	1/	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)

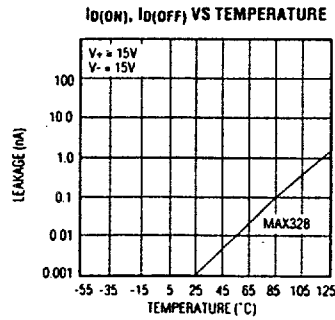
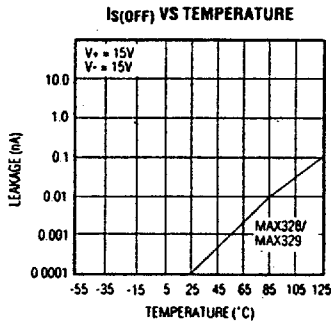
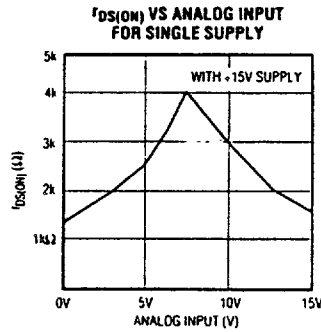
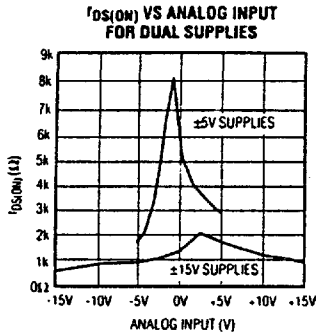


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328RP Typical Operating Characteristics



Truth Table - 328RP

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} ≤ 0.8V, Logic "1" = V_{AH} ≥ 2.4V

328RP PINOUT DESCRIPTION

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



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