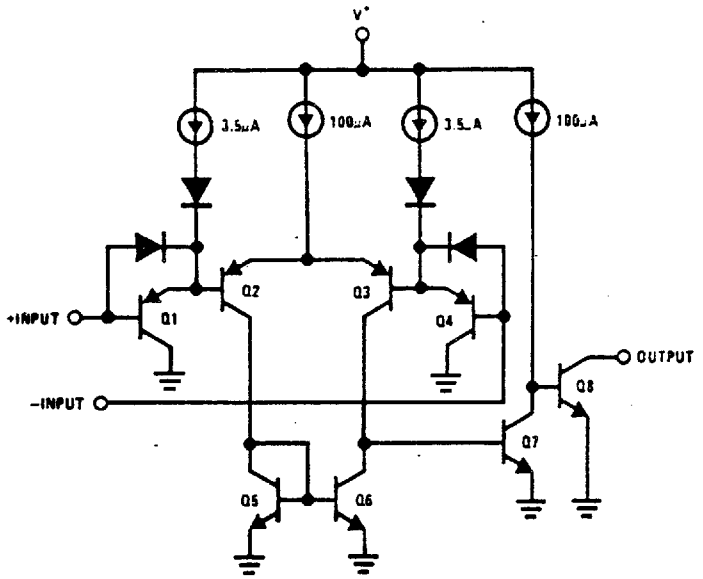
Radiation Hardened

139RP

Low Power, Low Offset Voltage Quad Comparators



For Space Applications

SEI's 139RP (RP for RAD-PAK®) low power, low offset voltage quad comparator features a minimum 100 kilorad (Si) total dose tolerance. Combined with SEI's radiation hardened RAD-PAK® packaging, the 139RP is fully equivalent to National Semiconductor Corporation's LM139. This device consists of four independent precision voltage comparators with an offset voltage specification as low as 2 mV max for all four comparators. These were designed specifically to operate from a single power supply over a wide range of voltages. Operation from split power supplies is also possible and the low power supply current drain is independent of the magnitude of the power supply voltage. These comparators also have a unique characteristic in that the input common-mode voltage range includes ground, even though operated from a single power supply voltage. Application areas include limit comparators, simple analog to digital converters; pulse, squarewave and time delay generators; wide range VCO; MOS clock timers; multivibrators and high voltage digital logic gates. This device was designed to directly interface with TTL and CMOS. When operated from both plus and minus power supplies, they will directly interface with MOS logic, which is where the low power drain of the device is a distinct advantage over standard comparators. The RAD-PAK® technology incorporates radiation shielding in the microcircuit package. It eliminates box shielding while providing lifetime in orbit.

SEI 139RP RAD HARD QUAD COMPARATOR

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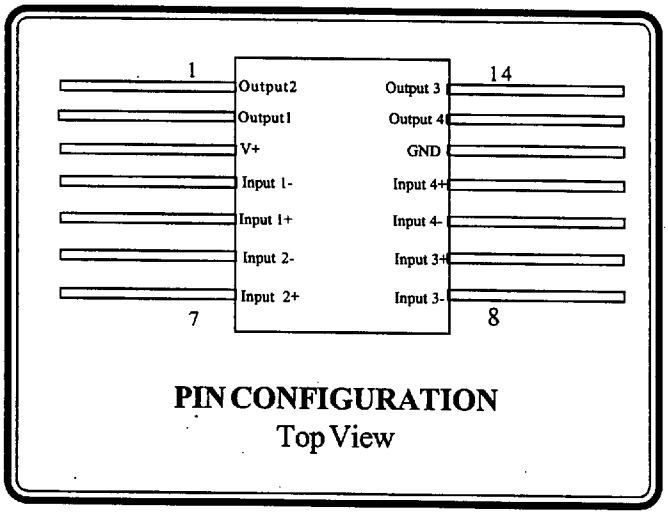

PIN CONFIGURATION
Top View

Features:

- Four independent voltage comparators
- Pin Compatible to National Semiconductor
- Corporation's LM139
- RAD-PAK® Radiation Hardened Against Natural Space Radiation
- Total Dose Hardness >100 krad (Si)
- Package:
  - 14 Pin RAD-PAK® flat pack (0.340 in. x 0.255 in.)
  - Weight – 3 grams
  - 14 Pin RAD-PAK® DIP (0.800 in. x 0.310 in.)
  - Weight - 3 grams
- Compatible with all forms of logic
- Low Input Biasing Current - 25 nA
- Wide Single Supply Voltage Range of Dual Supplies
- Very Low Supply Current Drain
- Low Input Offset Current and Offset Voltage
- Input Common-mode Voltage Range includes GND
- Differential Input Voltage Range Equal to the Power Supply Voltage
- Low Output Saturation Voltage
- Screening per TM 5004
- QCI per TM5005

TQM
Total Quality Management

Oct. 1995

For Further Information Contact:
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139RP ABSOLUTE MAXIMUM RATINGS

PARAMETER	MIN	TYP	MAX	UNIT
Supply Voltage		$36V_{DC}$ or $18V_{DC}$		
Differential Input Voltage		$36V_{DC}$		
Input Voltage	$-0.3V_{DC}$		$+136V_{DC}$	
Output Short-Circuit to GND		Continuous		
Input Current $V_{IN}<-0.3V_{DC}$		50		mA
Storage Temperature Range	-65		+150	°C
Lead Temperature (Soldering, 10 seconds)		260		°C
Operating Temperature Range	-55		+125	°C

139RP ELECTRICAL CHARACTERISTICS[4]

PARAMETER	MIN	TYP	MAX	UNIT
Input Offset Voltage[1]			9.0	mV_{DC}
Input Offset Current $I_{IN(+)}$-$I_{IN(-)}$, V_{CM}=0V			100	nA_{DC}
Input Bias Current $I_{IN(+)}$ or $I_{IN(-)}$ with Output in Linear Range, V_{CM}=0V			300	nA_{DC}
Input Common-Mode Voltage Range V^+=30V_{DC}[2]	0		V^+-2.0	V_{DC}
Saturation Voltage $V_{IN(-)}$=1V_{DC}, $V_{IN(+)}$=0, $V_{SINK}\leq$4mA			700	mV_{DC}
Output Leakage Current $V_{IN(+)}$=1V_{DC}, $V_{IN(-)}$=0, V_O=30V_{DC}			1.0	uA_{DC}
Differential Input Voltage Keep all V_{IN}'s$\geq$0V_{DC}(or V^-, if used)[3]			36	V_{DC}

Notes:

1. At output switch point, V_O=1.4 V_{DC}, R_S=0 Ohm with V^+ from 5 V_{DC} to 30 V_{DC}; and over the full input common-mode range (0 V_{DC} to V^+ -1.5V_{DC}), at 25°C.
2. The input common-mode voltage or either input signal voltage should not be allowed to go negative by more than 0.3V. The upper end of the common-mode voltage range is V^+ -1.5V at 25°C, but either or both inputs can go to +30 V_{DC} without damage, independent of the magnitude of V^+.
3. Positive excursions of input voltage may exceed the power supply level. As long as the other voltage remains within the common-mode range, the comparator will provide a proper output state. The low input voltage state must not be less than -0.3 V_{DC} at a temperature of 25°C.
4. V^+=5.0 V_{DC}, -55°C$\leq T_A\leq$+125°C.

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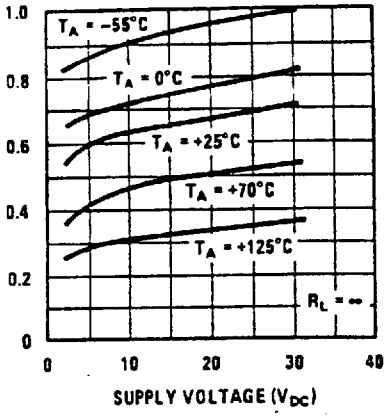
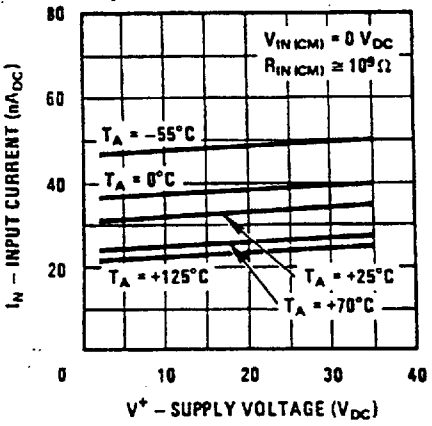
139RP TYPICAL PERFORMANCE CHARACTERISTICS

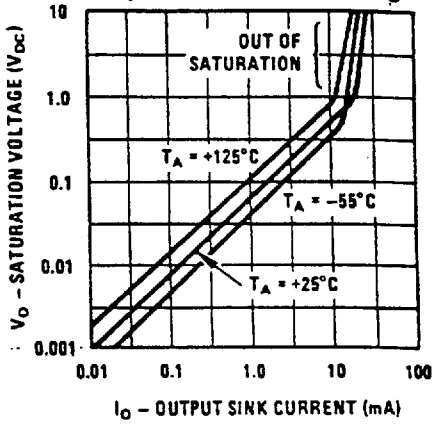
Supply Current



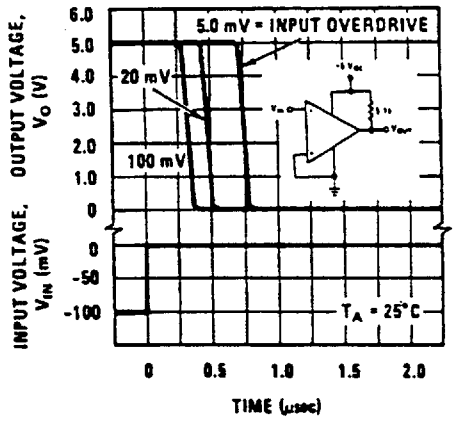
Input Current



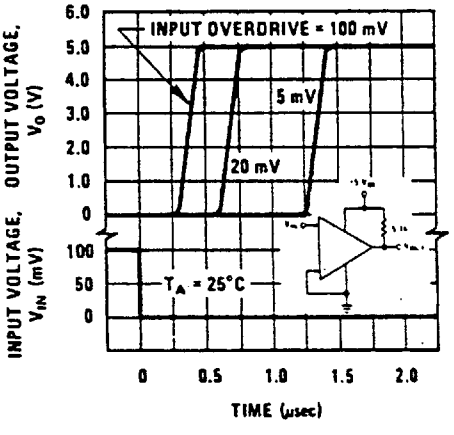
Output Saturation Voltage



Response Time for Various Input Overdrives—Negative Transition



Response Time for Various Input Overdrives—Positive Transition



139RP Package Ordering Guide

Package Style	Case Outline 1/	Description
D	D-14	14 Pin Dual In Line Package
F	F-14	14 Pin Flat Package

Note:

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

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