Agilent Technologies
Innovating the HP Way

Motion Sensing Products

Reliability Data

HCTL-1100
(40-pin PDIP)
HCTL-1100 #PLC
(44-pin PLCC)

Description

The following cumulative test results have been obtained from testing performed at Agilent Technologies in accordance with the Agilent General Semiconductor Specification.

Table 1. Long-Term Life Performance [1]

Test	Test Conditions	Failures/ Units[2]	Ambient Temp. (°C)[3]	Total Device Hours[4,5,6]	Failure Rate[7]		Point MTTF (hours)[7]
					FITS[8]	%/yr	
High Temperature Operating Life	T_A = 150°C 1,000 hours Dynamic State V_{DD} = 5.5 V	0/514	30	13,470,000	74	0.07	13,470,000
			55	5,602,000	179	0.16	5,602,000
			85	2,298,000	435	0.38	2,298,000
Temperature Humidity Static Operating Life	40 pin PDIP T_A = 85°C RH = 85% 1,000 hours Biased Static State V_{DD} = 5.5 V	0/420	30	42,000,000	24	0.02	42,000,000
			55	4,200,000	238	0.21	4,200,000
			85	420,000	2381	2.10	420,000
	44 pin PLCC T_A = 85°C RH = 85% 1,000 hours Biased Static State V_{DD} =5.5 V	0/492	30	49,200,000	20	0.02	49,200,000
			55	4,920,000	203	0.18	4,920,000
			85	492,000	2033	1.80	492,000

Table 2. Mechanical and Environmental Tests [9]

Test	Test Conditions	Units Tested	Units Failed
Pressure Pot	121°C 2 Atmospheres 95 - 100% RH 240 hours	50	0
Thermal Shock	-55°C to 125°C Liquid-to-liquid No bias 200 cycles Dwell = 5 min., Transfer < 10 sec.	45	0
ESD	1.5 kΩ, 100 pF ±2000 Volts 5 pulses/pin V_{DD} = GND GND = GND All other pins floating	2[10]	0
Latch-Up	All pins tested for source/sink to ±500 mA, V_{DD} = 5.5 Volts	2[10]	0
Solder Process Resistance	Typical solder process with peak temperature of 260°C, 10 sec. duration	32	0

Notes:
1. These results are based on long-term life monitoring of the basic CMOS process and PDIP and PLCC packaging processes in which these products are produced. The relevance of these data derives from the design-independent nature of many failure modes in a CMOS process and packaging system. Design-specific failure modes are addressed by the tests in Table 2.
2. A failure is any part which does not meet data sheet specifications. Data covers the period from February, 1989 to February, 1990.
3. Ambient temperature is shown here for convenience. The failure rate depends on the device junction temperature under operating conditions. The junction temperature rise for this device is less than 5°C under the test conditions used here.
4. The total device hours is the equivalent device hours for 100% on-time at the stated ambient temperature.
5. For High Temperature Operating Life, the estimated life at various temperatures is calculated using an Arrhenius model with an activation energy of 0.3 eV to derate the data from actual test conditions to lower temperatures.
6. For Temperature, Humidity Static Operating Life, extrapolation to lower temperatures assumes an Arrhenius model for electrolytic corrosion with an activation energy of 0.79 eV based on: D.S. Peck, “Comprehensive Model for Humidity Testing Correlation”, Proc. Rel. Phys. Symp., 24, (1986).
7. MTTF is defined as “Mean Time To Failure.” The point MTTF is the total device hours divided by the number of failures. The failure rate is defined as the reciprocal of the MTTF. Where no failures occurred during testing, the point MTTF and failure rate have been calculated assuming one failure.
8. FIT is defined as “Failures in Time.” FITS = Failures/10^9 device-hours. 1142 FITS = 1% / yr. = 10,000 PPM / yr at 100% on-time.
9. These tests were performed with this IC in both the PDIP and PLCC packages.
10. These tests check for circuit design errors. A small sample size is used since the failure rate is expected to be 100% in devices with design-related failure modes.

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Data subject to change.
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