

APEX MICROTECHNOLOGY CORPORATION
RELIABILITY PREDICTION
SA50

by

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Date of prediction: 15-Mar-01

This reliability prediction is based on MIL-HDBK-217F,
December 2, 1991 including Notice 2, February 28, 1995.

Conditions of this prediction are as follows:

Hybrid quality level is	Commercial
Environment is Gf	Ground, Fixed
Case temperature is	40 C
Internal Power Dissipation =	5 W
Supply voltage is	28 V
An AC signal is applied.	
Product introduction date:	01-Jun-94

The results of this prediction are:

9.33 failures per million hours; or,
MTBF=107 thousand hours.

Monolithic MOS Digital Devices:

$$L_p = C_1 * P_i T$$

Monolithic Bipolar and MOS Linear Devices:

$$L_p = C_1 * P_i T$$

IC1		Watts = 1.325	Tj = 125	#/Qs = 56	
Usage:		Watts = 0.432		Max Tj = 72.604	
C1	PiT			Nc	
0.01	3.26747			1	0.032675

IC1		Watts = 0.22	Tj = 135	#/Qs = 30	
Usage:		Watts = 0.0011		Max Tj = 40.54	
C1	PiT			Nc	
0.01	0.350636			1	0.003506

Transistors, Low Frequency, Si MOSFET: Lb = 0.012

$$L_p = L_b * P_i T$$

Q10,13		Volts = 100	Watts = 60	Tj = 175	'K/W= 2.5
Usage:		Fraction Output Pwr = 1/	2		Power = 2.5
Lb	PiT			Nc	Tj = 46.25
0.012	1.537218			2	0.036893

Q11,12		Volts = 100	Watts = 60	Tj = 175	'K/W= 2.5
Usage:		Fraction Output Pwr = 1/	20		Power = 0.25
Lb	PiT			Nc	Tj = 40.625
0.012	1.379647			2	0.033112

Capacitors, ceramic general purpose type CK:

$$L_p = L_b * P_i T * P_i C * P_i V \quad L_b = 0.00099$$

C1		Volts = 50	pF = 10000		
Usage:	Vstress = 12			S = 0.24	
Lb	PiT	PiC	Pi V	Nc	
0.00099	1.92167	0.355	1.064	1	0.000718

C2,3		Volts = 25	pF = 100000		
Usage:	Vstress = 11.4			S = 0.456	
Lb	PiT	PiC	Pi V	Nc	
0.00099	1.92167	0.437	1.439	2	0.00239

217F

C4		Volts =	50	pF =	270		
Usage:	Vstress =	8		S =		0.16	
Lb	PiT	PiC	Pi V			Nc	
0.00099	1.92167	0.256	1.019			1	0.000497

Diodes, Low Frequency:
 $L_p = L_b * P_iT * P_iS * P_iC$

Diodes, Switching, Lb = 0.001

D3-6		Volts =	100	Watts =	0.38	Tj =	175	'K/W=	394.74
Usage:		Volts =	11	Ic =	0.001	Vs =	0.11	Power =	0.0007
Lb	PiT	PiS	PiC				Nc	Tj =	40.257
0.001	1.657271	0.054	2				4		0.000716

Diodes, Power Rectifier, Fast Recovery, Lb = 0.025

D1,2		Volts =	100	Watts =	4.29	Tj =	175	'K/W=	34.965
Usage:		Volts =	28	Ic =	0.001	Vs =	0.28	Power =	0.0007
Lb	PiT	PiS	PiC				Nc	Tj =	40.023
0.025	1.6451	0.054	1				2		0.004442

Sum of all components 0.114949

Hybrid microcircuit:

$L_p = \text{sum} L_c * (1 + .2 * P_iE) * P_iF * P_iQ * P_iL$
 0.114949 1.4 5.8 10 1

Total failures per million hours = 9.3338
 Mean time between failures = 107137