

APEX MICROTECHNOLOGY CORPORATION
RELIABILITY PREDICTION
PA02

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 =	12 W
Supply voltage is +/-	15 V
An AC signal is applied.	
Product introduction date:	01-Jul-83

The results of this prediction are:

1.09 failures per million hours; or,
MTBF=920 thousand hours.

Monolithic Bipolar and MOS Linear Devices:

$$L_p = C1 * PiT$$

IC1		Watts = 1.68	Tj = 200	#Qs = 28		
Usage:		Watts = 0.08		Max Tj = 48.333		
C1	PiT				Nc	
0.01	0.628435				1	0.006284

Transistors, Low Frequency, Bipolar:

$$L_p = L_b * PiT * PiR * PiS$$

Q2,7		Volts = 40	Watts = 1.2	Tj = 175	'K/W= 125	
Usage:	Vstress = 0.99	Vpwr = 0.99	Ic = 0.0025	Vs = 0.0248	Power = 0.0025	
Lb	PiT	PiR	PiS		Nc	Tj = 40.309
0.00074	1.414301	1.0698	0.0486		2	0.000109

Q4,5		Volts = 40	Watts = 1.2	Tj = 175	'K/W= 125	
Usage:	Vstress = 28.8	Fraction Output Pwr = 1/25		Vs = 0.72	Power = 0.48	
Lb	PiT	PiR	PiS		Nc	Tj = 100
0.00074	4.16368	1.0698	0.4193		2	0.002764

Q1,8		Volts = 40	Watts = 1.2	Tj = 175	'K/W= 125	
Usage:	Vstress = 1.3	Vpwr = 1.3	Ic = 1E-05	Vs = 0.0325	Power = 1E-05	
Lb	PiT	PiR	PiS		Nc	Tj = 40.002
0.00074	1.404949	1.0698	0.0498		2	0.000111

Q25		Volts = 120	Watts = 59.5	Tj = 150	'K/W= 2.1008	
Usage:	Vstress = 28.8	Fraction Output Pwr = 1/1		Vs = 0.24	Power = 12	
Lb	PiT	PiR	PiS		Nc	Tj = 65.21
0.00074	2.324272	4.5349	0.0947		2	0.001477

Capacitors, ceramic general purpose type CK:

$$L_p = L_b * PiT * PiC * PiV \quad L_b = 0.00099$$

C2		Volts = 45	pF = 47			
Usage:	Vstress = 2.5			S = 0.0556		
Lb	PiT	PiC	PiV		Nc	
0.00099	1.92167	0.219	1.0008		1	0.000417

Diodes, Low Frequency:

$$L_p = L_b * PiT * PiS * PiC$$

Diodes, Power Rectifier, Fast Recovery, Lb = 0.025

D2			Volts = 150	Watts = 4.29	Tj = 175	'K/W= 34.965
Usage:			Volts = 15	Ic = 0.001	Vs = 0.1	Power = 0.0007
Lb	PiT	PiS	PiC		Nc	Tj = 40.023
0.025	1.6451	0.054	1		1	0.002221

Sum of all components 0.013383

Hybrid microcircuit:

$Lp = \sum Lc * (1 + .2 * PiE) * PiF * PiQ * PiL$
 0.013383 1.4 5.8 10 1

Total failures per million hours = 1.0867

Mean time between failures = 920194