

APEX MICROTECHNOLOGY CORPORATION
RELIABILITY PREDICTION
PA02M/883

by

Granger Scofield

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	B
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:

0.11 failures per million hours; or,
MTBF=9202 thousand hours.

Monolithic Bipolar and MOS Linear Devices:

$$L_p = C_1 * P_{iT}$$

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:

$$L_p = L_b * P_{iT} * P_{iR} * P_{iS}$$

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:

$$L_p = L_b * P_{iT} * P_{iC} * P_{iV} \quad L_b = 0.00099$$

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:

$$L_p = L_b * P_{iT} * P_{iS} * P_{iC}$$

217F

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:

$Lp = \text{sum}Lc * (1 + .2 * PiE) * PiF * PiQ * PiL$

0.013383 1.4 5.8 1 1

Total failures per million hours = 0.1087

Mean time between failures = 9E+06