

APEX MICROTECHNOLOGY CORPORATION
RELIABILITY PREDICTION
PA12M/883

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	B
Environment is Gb	Ground, Benign
Case temperature is	40 C
Internal Power Dissipation =	50 W
Supply voltage is +/-	45 V
An AC signal is applied.	
Product introduction date:	01-Sep-81

The results of this prediction are:

0.2 failures per million hours; or,
MTBF=5021 thousand hours.

Monolithic Bipolar and MOS Linear Devices:

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

IC1		Watts = 3.14	Tj = 200	#/Qs = 56	
Usage:		Watts = 0.18		Max Tj = 50.032	
C1	PiT			Nc	
0.01	0.710994			1	0.00711

Transistors, Low Frequency, Bipolar:

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

Q3,5,7,8		Volts = 40	Watts = 1.2	Tj = 175	'K/W= 125
Usage:	Vstress = 0.65	Vpwr = 0.65	Ic = 0.025	Vs = 0.0163	Power = 0.0163
Lb	PiT	PiR	PiS	Nc	Tj = 42.031
0.00074	1.467433	1.0698	0.0473	4	0.00022

Q4		Volts = 40	Watts = 1.2	Tj = 175	'K/W= 125
Usage:	Vstress = 1.72	Vpwr = 1.72	Ic = 0.0064	Vs = 0.043	Power = 0.011
Lb	PiT	PiR	PiS	Nc	Tj = 41.376
0.00074	1.447051	1.0698	0.0514	4	0.000236

Q1		Volts = 120	Watts = 1.2	Tj = 200	'K/W= 145.83
Usage:	Vstress = 86	Vpwr = 41	Ic = 0.0075	Vs = 0.7167	Power = 0.3075
Lb	PiT	PiR	PiS	Nc	Tj = 84.844
0.00074	3.275116	1.0698	0.415	1	0.001076

Q2,6		Volts = 120	Watts = 194	Tj = 200	'K/W= 0.9021
Usage:	Vstress = 84	Fraction Output Pwr = 1/	1	Vs = 0.7	Power = 50
Lb	PiT	PiR	PiS	Nc	Tj = 85.103
0.00074	3.289159	7.0224	0.3941	2	0.013473

Capacitors, ceramic general purpose type CK:

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

C1		Volts = 100	pF = 1000		
Usage:	Vstress = 87			S = 0.87	
Lb	PiT	PiC	PiV	Nc	
0.00099	1.92167	0.288	4.0486	1	0.002221

C2		Volts = 100	pF = 2200		
Usage:	Vstress = 1.72			S = 0.0172	
Lb	PiT	PiC	PiV	Nc	
0.00099	1.92167	0.31	1	1	0.000589

217F

C3		Volts =	200	pF =	2200		
Usage:	Vstress =	87		S =		0.435	
Lb	PiT	PiC	Pi V			Nc	
0.00099	1.92167	0.31	1.3811			1	0.000813

Diodes, Low Frequency:

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

Diodes, Zener, $L_b =$ 0.002

D1,4		Volts =	3.1	Watts =	2.5	$T_j =$	175	'K/W=	60
Usage:				$I_c =$	0.0014			Power =	0.0045
Lb	PiT	PiS	PiC			Nc	$T_j =$	40.269	
0.002	1.370068	1	2			1			0.00548

Sum of all components 0.031219

Hybrid microcircuit:

$L_p = \text{sum} L_c * (1 + .2 * P_{iE}) * P_{iF} * P_{iQ} * P_{iL}$

0.031219	1.1	5.8	1	1
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Total failures per million hours = 0.1992

Mean time between failures = 5E+06