

APEX MICROTECHNOLOGY CORPORATION  
RELIABILITY PREDICTION  
PA84M/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 Gf	Ground, Fixed
Case temperature is	40 C
Internal Power Dissipation =	5 W
Supply voltage is +/-	120 V
An AC signal is applied.	
Product introduction date:	01-Aug-81

The results of this prediction are:

0.43 failures per million hours; or,  
MTBF=2306 thousand hours.

## Transistors, Low Frequency, Bipolar:

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

Q7		Volts = 40	Watts = 1.2	Tj = 175	'K/W= 125	
Usage:	Vstress = 1.3	Vpwr = 1.3	lc = 1E-06	Vs = 0.0325	Power = 1E-06	
Lb	PiT	PiR	PiS	Nc	Tj = 40	
0.00074	1.404905	1.0698	0.04977	1		5.54E-05
Q11		Volts = 40	Watts = 1.2	Tj = 175	'K/W= 125	
Usage:	Vstress = 1.13	Vpwr = 1.13	lc = 0.003	Vs = 0.0283	Power = 0.0034	
Lb	PiT	PiR	PiS	Nc	Tj = 40.424	
0.00074	1.417787	1.0698	0.049119	1		5.51E-05
Q6,17		Volts = 300	Watts = 26	Tj = 150	'K/W= 4.8077	
Usage:	Vstress = 235	Fraction Output Pwr = 1/	1	Vs = 0.7833	Power = 5	
Lb	PiT	PiR	PiS	Nc	Tj = 64.038	
0.00074	2.274314	3.3384	0.510298	2		0.005734
Q8,9		Volts = 300	Watts = 1.15	Tj = 150	'K/W= 108.7	
Usage:	Vstress = 110.3	Vpwr = 110.3	lc = 0.0005	Vs = 0.3677	Power = 0.0552	
Lb	PiT	PiR	PiS	Nc	Tj = 45.995	
0.00074	1.595022	1.0531	0.140672	1		0.000175
Q15		Volts = 300	Watts = 1.15	Tj = 150	'K/W= 108.7	
Usage:	Vstress = 111.6	Vpwr = 111.6	lc = 0.0012	Vs = 0.372	Power = 0.1295	
Lb	PiT	PiR	PiS	Nc	Tj = 54.071	
0.00074	1.87862	1.0531	0.142574	1		0.000209
Q3,16		Volts = 300	Watts = 1.15	Tj = 150	'K/W= 108.7	
Usage:	Vstress = 232.9	Vpwr = 118.3	lc = 4E-09	Vs = 0.7763	Power = 5E-07	
Lb	PiT	PiR	PiS	Nc	Tj = 40	
0.00074	1.404902	1.0531	0.499344	2		0.001093
Q5		Volts = 300	Watts = 1.15	Tj = 150	'K/W= 108.7	
Usage:	Vstress = 110.2	Vpwr = 110.2	lc = 0.0002	Vs = 0.3673	Power = 0.0176	
Lb	PiT	PiR	PiS	Nc	Tj = 41.917	
0.00074	1.46385	1.0531	0.140526	1		0.00016
Q1		Volts = 20	Watts = 0.38	Tj = 150	'K/W= 328.95	
Usage:	Vstress = 0.65	Vpwr = 0.65	lc = 0.0005	Vs = 0.0325	Power = 0.0003	
Lb	PiT	PiR	PiS	Nc	Tj = 40.107	
0.00074	1.408144	0.6991	0.04977	1		3.63E-05



Diodes, Low Frequency:  
 $L_p = L_b * P_{iT} * P_{iS} * P_{iC}$

Diodes, Zener,  $L_b = 0.002$

D1			Volts = 3.1	Watts = 2.5	Tj = 175	'K/W= 60	
Usage:				lc = 0.001		Power = 0.0031	
Lb	PiT	PiS	PiC		Nc	Tj = 40.186	
0.002	1.367828	1	2		1		0.005471

D2			Volts = 3.1	Watts = 2.5	Tj = 175	'K/W= 60	
Usage:				lc = 0.0014		Power = 0.0044	
Lb	PiT	PiS	PiC		Nc	Tj = 40.266	
0.002	1.369977	1	2		1		0.00548

Sum of all components 0.053397

Hybrid microcircuit:

$L_p = \sum L_c * (1 + 2 * P_{iE}) * P_{iF} * P_{iQ} * P_{iL}$   
 0.053397 1.4 5.8 1 1

Total failures per million hours = 0.433584

Mean time between failures = 2306360