

APEX MICROTECHNOLOGY CORPORATION  
RELIABILITY PREDICTION  
PA83M/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 =	5 W
Supply voltage is +/-	120 V
An AC signal is applied.	
Product introduction date:	01-May-81

The results of this prediction are:

0.44 failures per million hours; or,  
MTBF=2255 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	Ic = 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	Ic = 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	Ic = 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	Ic = 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	Ic = 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	Ic = 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	Ic = 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



C1  
 Usage: Vstress = 1.05 S = 0.0233  
 Lb PiT PiC Pi V Nc  
 0.00099 1.92167 0.219 1.0001 1 0.000417

Diodes, Low Frequency:  
 $L_p = L_b * PiT * PiS * PiC$

Diodes, Zener, Lb = 0.002

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

D2  
 Usage: Volts = 3.1 Watts = 2.5 Tj = 175 'K/W= 60  
 Ic = 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 0.054605

Hybrid microcircuit:

$L_p = \text{sum} L_c * (1 + .2 * PiE) * PiF * PiQ * PiL$   
 0.054605 1.4 5.8 1 1

Total failures per million hours = 0.443392

Mean time between failures = 2255339