

APEX MICROTECHNOLOGY CORPORATION
RELIABILITY PREDICTION
PA10M/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 +/-	36 V
An AC signal is applied.	
Product introduction date:	01-Aug-80

The results of this prediction are:

0.16 failures per million hours; or,
MTBF=6356 thousand hours.

Monolithic Bipolar and MOS Linear Devices:

$L_p = C1 * PiT$

IC1		Watts = 3.14	Tj = 200	#Qs = 56	
Usage:		Watts = 0.1		Max Tj = 45.573	
C1	PiT			Nc	
0.01	0.512782			1	0.005128

Transistors, Low Frequency, Bipolar:

$L_p = L_b * PiT * PiR * PiS$

Q3,5,7,8		Volts = 40	Watts = 1.2	Tj = 175	'K/W= 125
Usage:	Vstress = 0.65	Vpwr = 0.65	Ic = 0.0001	Vs = 0.0163	Power = 7E-05
Lb	PiT	PiR	PiS	Nc	Tj = 40.008
0.00074	1.405146	1.0698	0.0473	4	0.000211

Q4		Volts = 40	Watts = 1.2	Tj = 175	'K/W= 125
Usage:	Vstress = 0.65	Vpwr = 0.65	Ic = 0.0034	Vs = 0.0163	Power = 0.0022
Lb	PiT	PiR	PiS	Nc	Tj = 40.274
0.00074	1.413235	1.0698	0.0473	1	5.29E-05

Q1		Volts = 120	Watts = 1.2	Tj = 200	'K/W= 145.83
Usage:	Vstress = 66.6	Vpwr = 33	Ic = 0.005	Vs = 0.555	Power = 0.165
Lb	PiT	PiR	PiS	Nc	Tj = 64.063
0.00074	2.275332	1.0698	0.2514	1	0.000453

Q2,6		Volts = 100	Watts = 83	Tj = 200	'K/W= 2.1084
Usage:	Vstress = 69	Fraction Output Pwr = 1/	1	Vs = 0.69	Power = 5
Lb	PiT	PiR	PiS	Nc	Tj = 50.542
0.00074	1.750735	5.1293	0.3821	2	0.005078

Capacitors, ceramic general purpose type CK:

$L_p = L_b * PiT * PiC * PiV$ Lb = 0.00099

C1,2		Volts = 100	pF = 470		
Usage:	Vstress = 69			S = 0.69	
Lb	PiT	PiC	PiV	Nc	
0.00099	1.92167	0.269	2.5209	2	0.002585

C3		Volts = 45	pF = 26		
Usage:	Vstress = 2			S = 0.0444	
Lb	PiT	PiC	PiV	Nc	
0.00099	1.92167	0.208	1.0004	1	0.000395

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:			$I_c = 0.0011$		Power = 0.0036	
Lb	PiT	PiS	PiC	Nc	$T_j = 40.214$	
0.002	1.368569	1	2	1		0.005474
Sum of all components						0.019376

Hybrid microcircuit:

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

0.019376 1.4 5.8 1 1

Total failures per million hours = 0.1573

Mean time between failures = 6E+06