APEX MICROTECHNOLOGY CORPORATION
RELIABILITY PREDICTION
PA89

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		Commercial	
Environment is	Gf	Ground, Fixed	
Case temperature is		35	C
Internal Power Dissipation =		10	W
Supply voltage is +/-		400	V

An AC signal is applied.
Product introduction date: 01-Apr-90

The results of this prediction are:
62.2 failures per million hours; or,
MTBF=16.1 thousand hours.

Transistors, Low Frequency, Bipolar:
Lp = Lb * PiT * PiR * PiS

Q26,36			Volts =	40	Watts =	1.2	Tj =	175	'K/W=	125	
Usage:	Vstress =	0.65	Vpwr =	0.65	Ic =	1E-05	Vs =	0.0163	Power =	7E-06	
Lb	PiT		PiR	PiS				Nc	Tj =	35.001	
0.00074	1.25903		1.0698	0.0473				2			9.43E-05

Q1			Volts =	20	Watts =	0.38	Tj =	150	'K/W=	328.95	
Usage:	Vstress =	0.65	Vpwr =	0.65	Ic =	0.0007	Vs =	0.0325	Power =	0.0004	
Lb	PiT		PiR	PiS				Nc	Tj =	35.139	
0.00074	1.262911		0.6991	0.0498				1			3.25E-05

Q2			Volts =	20	Watts =	0.38	Tj =	150	'K/W=	328.95	
Usage:	Vstress =	3	Vpwr =	3	Ic =	0.0007	Vs =	0.15	Power =	0.002	
Lb	PiT		PiR	PiS				Nc	Tj =	35.641	
0.00074	1.277095		0.6991	0.0716				1			4.73E-05

Transistors, Low Frequency, Si JFET: Lb = 0.0045
Lp = Lb * PiT

Q30,31,34,35			Volts =	30	Watts =	0.8	Tj =	150	'K/W=	156.25	
Usage:			Vpwr =	1.5	Id =	1E-06			Power =	2E-06	
Lb	PiT							Nc	Tj =	35	
0.0045	1.233353							4			0.0222

Q57,59,60,61			Volts =	30	Watts =	0.8	Tj =	150	'K/W=	156.25	
Usage:			Vpwr =	2.5	Id =	1E-06			Power =	3E-06	
Lb	PiT							Nc	Tj =	35	
0.0045	1.233357							4			0.0222

Q58			Volts =	30	Watts =	0.8	Tj =	150	'K/W=	156.25	
Usage:			Vpwr =	4	Id =	1E-06			Power =	4E-06	
Lb	PiT							Nc	Tj =	35.001	
0.0045	1.233363							1			0.00555

Q25A,B			Volts =	25	Watts =	0.55	Tj =	150	'K/W=	227.27	
Usage:			Vpwr =	3.285	Id =	0.0007			Power =	0.0021	
Lb	PiT							Nc	Tj =	35.485	
0.0045	1.245533							2			0.01121

Transistors, Low Frequency, Si MOSFET: Lb = 0.012
Lp = Lb * PiT

Q8,14,20,42,50,56		Volts =	450	Watts =	25	Tj =	150	'K/W=	5	
Usage:		Fraction Output Pwr = 1/			3			Power =	3.3333	
Lb	PiT						Nc	Tj =	51.667	
0.012	1.699907						6			0.122393
Q3,11,17		Volts =	450	Watts =	4	Tj =	150	'K/W=	31.25	
Usage:		Vpwr =	133.33	Id =	8E-05			Power =	0.0107	
Lb	PiT						Nc	Tj =	35.333	
0.012	1.241709						3			0.044702
Q5,28,33,41,43,52		Volts =	450	Watts =	4	Tj =	150	'K/W=	31.25	
Usage:		Vpwr =	263.9	Id =	0.0025			Power =	0.6545	
Lb	PiT						Nc	Tj =	55.452	
0.012	1.820134						6			0.13105
Q6,51		Volts =	450	Watts =	4	Tj =	150	'K/W=	31.25	
Usage:		Vpwr =	3	Id =	8E-05			Power =	0.0002	
Lb	PiT						Nc	Tj =	35.007	
0.012	1.233523						2			0.029605
Q7,13,19,44,45,47,48,53,55		Volts =	450	Watts =	4	Tj =	150	'K/W=	31.25	
Usage:		Vpwr =	133.33	Id =	0.0013			Power =	0.1733	
Lb	PiT						Nc	Tj =	40.417	
0.012	1.37403						9			0.148395
Q9,10,15,16,22,23		Volts =	450	Watts =	4	Tj =	150	'K/W=	31.25	
Usage:		Vpwr =	133.33	Id =	0.0007			Power =	0.0867	
Lb	PiT						Nc	Tj =	37.708	
0.012	1.302402						6			0.093773
Q21,32,40,46,49,54		Volts =	450	Watts =	4	Tj =	150	'K/W=	31.25	
Usage:		Vpwr =	133.33	Id =	0.0003			Power =	0.04	
Lb	PiT						Nc	Tj =	36.25	
0.012	1.264902						6			0.091073
Q29		Volts =	450	Watts =	4	Tj =	150	'K/W=	31.25	
Usage:		Vpwr =	6	Id =	0.0013			Power =	0.0075	
Lb	PiT						Nc	Tj =	35.234	
0.012	1.239222						2			0.029741

Capacitors, ceramic general purpose type CK:

Lp = Lb * PiT * PiC * PiV Lb = 0.00099

C1			Volts =	100	pF =	470			
Usage:	Vstress =	0.65				S =	0.0065		
Lb	PiT	PiC	Pi V				Nc		
0.00099	1.556644	0.269	1				1		0.000415
C2			Volts =	100	pF =	470			
Usage:	Vstress =	5.3				S =	0.053		
Lb	PiT	PiC	Pi V				Nc		
0.00099	1.556644	0.269	1.0007				1		0.000416
C3			Volts =	100	pF =	15000			
Usage:	Vstress =	6				S =	0.06		
Lb	PiT	PiC	Pi V				Nc		
0.00099	1.556644	0.368	1.001				1		0.000568
C4,5,6,7,8,9			Volts =	500	pF =	68			
Usage:	Vstress =	133.3				S =	0.2667		
Lb	PiT	PiC	Pi V				Nc		
0.00099	1.556644	0.226	1.0878				6		0.002277

Diodes, Low Frequency:

Lp = Lb * PiT * PiS * PiC

Diodes, Zener, Lb = 0.002

D1,4			Volts =	3.1	Watts =	2.5	Tj =	175	'K/W=	60
Usage:					Ic =	8E-05			Power =	0.0002
Lb	PiT	PiS	PiC					Nc	Tj =	35.014
0.002	1.233696	1	2					2		0.00987

Sum of all components 0.765612

Hybrid microcircuit:

Lp=sumLc*(1+.2*PiE) * PiF * PiQ * PiL

0.765612	1.4	5.8	10	1

Total failures per million hours = 62.168

Mean time between failures = 16086