

APEX MICROTECHNOLOGY CORPORATION
RELIABILITY PREDICTION
SA07

by

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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 40 C
Internal power dissipation= 5 W
Supply voltage is 28 V
An AC signal is applied.
Product introduction date:
01-May-97

The results of this prediction are:
14.9 failures per million hours; or,
MTBF=67 thousand hours.

Monolithic MOS Digital Devices:

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

IC6	Cpd(pF)= 22	Watts = 1.25	Tj = 150	#/Gates = 10	
Usage:	Vstress = 5	Watts = 0.0006	F(KHz)= 250	Max Tj = 40.061	
C1	PiT			Gates @ F = 3	
0.01	0.337963			Load (pF)= 10	0.00338
IC4	Cpd(pF)= 39	Watts = 1.25	Tj = 150	#/Gates = 10	
Usage:	Vstress = 5	Watts = 0.0003	F(KHz)= 250	Max Tj = 40.032	
C1	PiT			Gates @ F = 1	
0.01	0.3372			Load (pF)= 10	0.003372

Monolithic Bipolar and MOS Linear Devices:

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

IC3		Watts = 1.325	Tj = 125	#/Gates = 56	
Usage:	Vstress = 5	Watts = 0.432		Max Tj = 72.604	
C1	PiT			Nc	
0.01	3.26747			1	0.032675
IC7		Watts = 1.5	Tj = 175	#/Qs = 96	
Usage:	Vstress = 5	Watts = 0.01		Max Tj = 41	
C1	PiT			Nc	
0.01	0.363215			1	0.003632
IC2		Watts = 1.25	Tj = 150	#/Qs = 96	
Usage:	Vstress = 5	Watts = 0.0015		Max Tj = 40.15	
C1	PiT			Nc	
0.01	0.340286			1	0.003403
IC1		Watts = 1	Tj = 150	#/Qs = 96	
Usage:		Watts = 0.0272		Max Tj = 43.4	
C1	PiT			Nc	
0.01	0.435813			1	0.004358

Transistors, Low Frequency, Bipolar:

$$L_p = L_b * P_{IT} * P_{iA} * P_{iR} * P_{iS}$$

Q9		Volts = 40	Watts = 1.2	Tj = 175	'K/W= 125
Usage:	Vstress = 4.8	Vpwr = 2.5	Ic = 1E-07	Vs = 0.12	Power = 3E-07
Lb	PiT	PiR	PiS	Nc	Tj = 40
0.00074	1.404901	1.0698	0.0653	1	7.26E-05

Diodes, Schottky:

$L_p = L_b \cdot P_iT \cdot P_iA \cdot P_iR$ $L_b = 0.027$

D6 Watts = 6.9444 $T_j = 150$ 'K/W= 18
 Usage: Power = 0.03

L_b	P_iT	P_iR	N_c	$T_j =$	
0.027	1.418032	1	1	40.54	0.038287

Sum of all components 0.183777

Hybrid microcircuit:

$L_p = \text{sum} L_c \cdot (1 + .2 \cdot P_iE) \cdot P_iF \cdot P_iQ \cdot P_iL$
 0.183777 1.4 5.8 10 1

Total failures per million hours = 14.923
 Mean time between failures = 67012