LTP5900 MTBF Estimation

1.0 Methods

The following calculations are made in accordance with Telecordia SR-332 Issue 3, Method 1, Case 3. The environment used was GB, GC - Ground Benign, Controlled at +25°C. No temperature rise above ambient is assumed for any part; however, given a maximum average power consumption of less than 4mW any rise above ambient will not be significant. For portions of the circuitry external to the LTC5800 which are duty cycled between different bias points the operational duty cycle is approximated at 20%. In practice these duty cycles will be significantly lower than 20%. The LTC5800, especially when operating as a mote, has the majority of the design operating either at a reduced bias or completely powered down for the vast majority of the time. Even though only a small fraction of the LTC5800 is biased 100% of the time, the LTC5800 FIT value is based upon 100% duty cycle and therefore conservative.

2.0 Calcuations

Item	Quantity	Reference	Value	Part Number	Load		Rated	FIT @25°C	FIT Total @25°C
					Rating	Actual	Temp (°C)	(per 10e9 H)	(per 10e9 H)
1	1	R3	RES, 0, 1/16W, 5%, 0603	Yageo RC0603JR-070RL	0.063	0.000	125	0.003	0.003
2	1	R13	RES, 0, .05W, 0201	Panasonic ERJ-1GE0R00C	0.05	0.000	125	0.001	0.001
3	2	C29	CAP, 100pF 10%, 25V, 0201, C0G	GRM0335C1E101JD01D	25	0.115	125	0.825	1.650
4	5	C6,C7,C15,C32, C36	CAP 100 pF, 5%, 50V, C0G 0402	Rohm MCH155A101JK	50	3.760	125	1.520	7.600
5	10	C9,C10,C11, C12,C17,C18, C19,C20,C21, C24	Cap, 56nF, 6.3V, +/-10%, 0402 SMD	Kemet C0402C563K9RACTU	6.3	1.080	125	2.730	27.300
6	1	C25	CAP, 0.22uF, 6.3V, 10%, X7R, 0402	Taiyo Yuden JMK105B7224KV-F	6.3	0.420	125	3.030	3.030
7	1	C26	CAP, 220PF, 50V, 0402, CER, SMD	Murata GRM1555C1H221JA01D	6.3	3.760	125	1.630	1.630
8	2	C8,C16	CAP, CER, .1UF, 16V, Â±10%, X7R, 0402	Murata GRM155R71C104KA88D	16	3.760	125	3.940	7.880
9	1	C23	CAP 2.2uF 10% 10V X7R 0603 Ceramic Chip Capacitor	Murata GRM188R71A225KE15D	10	3.760	125	4.030	4.030
10	1	C13	CAP, 0.47UF, 10V, +/-10%, 0603, X7R	TDK C1608X7R1A474K	10	0.300	125	3.240	3.240
11	1	L3	INDUCTOR, 2.2UH, 120MA, 0603	Murata LQM18FN2R2M00D	0.120	0.001	125	15.323	15.323
12	4	L5,L6,L7,L8	INDUCTOR, FERRITE CHIP, 470 OHM, 200MA, 0402	Murata BLM15BD471SN1D	0.2	0.001	125	0.132	0.528
13	1	X1	CRYSTAL, 32.768kHz, 8x3.8mm SMD	ECS Inc. ECS-.327-12.5-17X-TR			85	1.650	1.650
14	1	X5	CRYSTAL, 20.000MHZ, 10PF, +/-30PPM	ECS Inc. ECS-200-CDX-0914			85	1.650	1.650
15	1	J4	CONN MMCX STRAIGHT PCB .110" G	Johnson 135-3701-201			155	22.100	22.100
16	2	J1,J2	CONN, HDR, 2MM, 1X11, TH, KEYED	Samtec MTMM-111-04-S-S-175-003			85	6.700	13.400
17	1	SH1	RF SHIELD, RUSSIAN	Fotofab Dust Networks 440-0045			125	0.100	0.100
18	1	U1	QFN-72, IC	Linear Technology LTC5800			105	11.800	11.800
Total FIT (In failures per billion hours):									**122.915**
MTBF (Hours):									**8.14E+06**

3.0 Results

The FIT value for the LTP5902 is estimated to be approximately 123 and the corresponding MTBF is approximately 8,140,000 hours.