

MTBF Prediction Report

Model Name: GTM41133-9016-4.0

Customer: Standard model

Stage: MVT

PCB Rev.: C

Part List Rev.: 1

Spec Rev.: E

Conclusion:

<input checked="" type="checkbox"/>
<input type="checkbox"/>

PASS

FAIL

Prepared By: Michael

Approved By: Jet



**GTM41133-9016-4.0 CMTBF REPORT LIST
PART LIST REV: 01**

COMPONENT	FAILURE RATE	Q'TY
RESISTOR	0.33368255	50
CAPACITOR (except electrolytic)	0.165486038	29
CAPACITOR (electrolytic)	1.022492631	4
Zener Diodes	0.109867366	3
DIODE	0.265006284	12
Integrated Circuits	0.566297635	2
IC-Opto-couplers	0.209993406	1
Magnetic	0.026792852	5
Fuse	0.02	2
Transistor-bipolar GP or sw	0.01436991	4
Transistor-Power MOSFET	2.113829116	5
TOTAL	4.84781778	117
MTBF	206,278.38	
MTBF SPEC.	200,000	
Conclusion	OK	



Input Voltage	NO .	Test Item	Page
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CMTBF TEST REPORT			Test Engineer:	Maichael
Model Name:	GTM41133-9016-4.0	Customer:	Test Date:	2015-4-24
Quantity:	1	Ser. No.:		
<p>1. Purpose: Verify PSU whether or not to meet the customer CMTBF specification.</p> <p>2. Conditions: Input: 120V AC Output: 12V/7.5A Ambient: 25 degree C</p> <p>3. Equipment: Oscilloscope: Tek3054B, AC source: HP6813A, Electronic load:Chroma6310 Multimeter: Agilent34401A, Current Probe Amplifier:Tek TM502A</p> <p>4. Criteria: The life time of the power supply component shall exceed 200,000 hours when 120vac and maximun load at 25°C .Calculated using the formula by the MIL-HDBK-217F.</p> <p>5. REGISTER: Details,please refer to the report content.</p> <p>6. Result: The MTBF value meets customer spec..</p>				



MTBF prediction worksheet - Fuse

Model : GTM41133-9016-4.0

Conditions: Vin=120VAC; Output Load: +12V/7.5A

Amb. : 25°C

Component description			Component specifications	Stress	Failure rate		
Ref. Design	Part No.	Type		I(RMS) A	λ_b	πE	λ_p
FS1	160-27146315(R)	W-F-1814	3.15A/250V	1.346	0.01	1	0.01
FS2	160-27146316(R)	W-F-1814	3.15A/251V	1.36	0.01	1	0.01
TOTAL							0.02



MTBF prediction worksheet - Magnetics

Model : GTM41133-9016-4.0

Conditions: Vin=120VAC; Output Load: +12V/7.5A

Amb. : 25°C

Component description			Component specifications	Stress	Failure rate				
Ref. Design	Part No.	Type	Tcore deg.C	Tcore deg.C	λb	πQ	πE	πC	λp
LF2	OSP-321-02401864®	C	130	74.2	0.000619004	4	1	1	0.002476016
LF1	OSP-321-02403892®	C	130	61	0.000512016	4	1	1	0.002048064
L1	321-02404642®	C	130	72.3	0.000600167	4	1	1	0.002400666
L2	321-02402602(R)	C	130	73.1	0.000607931	4	1	1	0.002431722
T1	OSP-320-02974502(R)	X	130	85.9	0.004359096	4	1	1	0.017436384
TOTAL									0.026792852

MTBF prediction worksheet - Integrated Circuits

Model : GTM41133-9016-4.0

Conditions: Vin=120VAC; Output Load: +12V/7.5A

Amb. : 25°C

Component description				Component specifications					Sress				Failure rate						
Ref. Design	Part No.	Type	Maker	Pin NO.	VCC(max)	Ic (rms)	Rth	Tj	VCC(peak)	Ic(rms)	Ta	Tj(c)	C1	C2	π T	π L	π Q	π E	λ p
					V	A	deg.C/W	deg.C	V	A	deg.C	deg.C							
US1	265-07040001(R)	PWM	NXP	16	38	0.003	124	150	25.79	0.001	69	72.198	0.01	0.0072	2.721	1	10	0.5	0.308051083
US2	269-03130001(R)	Amplifiers	ST	8	36	0.002	175	125	12.67	0.001	68	70.217	0.01	0.0034	2.4124	1	10	0.5	0.258246552
TOTAL																			0.566297635



MTBF prediction worksheet - Zener Diodes

Model : GTM41133-9016-4.0

Conditions: Vin=120VAC; Output Load: +12V/7.5A

Amb. : 25°C

Component description			Component specifications					Stress				Failure rate						
Ref. Desig.	Part No.	Maker	Vz	Iz	Pd	Rth	Tj	Vz	Iz(rms)	Ta	Tj(c)	λb	πE	πQ	πt	πs	πc	λp
			V	I	W	deg.C/W	deg. C	V	A	deg.C	deg.C							
DZ3	211-02107004(R)	PANJIT	16.8	0.25	0.5	450	150	16.42	0.003	82.1	104.27	0.002	1	5.5	3.88547	1	1	0.04274
DZ4	211-02107004(R)	PANJIT	16.8	0.25	0.5	450	150	1.78	0.004	81.9	85.104	0.002	1	5.5	2.95707	1	1	0.032528
DZ5	211-02107004(R)	PANJIT	16.8	0.25	0.5	450	150	5.9	0.003	81.3	89.265	0.002	1	5.5	3.1454	1	1	0.034599
TOTAL																		0.109867

MTBF prediction worksheet - Capacitors, except electrolytic

Model : GTM41133-9016-4.0

Conditions: Vin=120VAC; Output Load: +12V/7.5A

Amb. : 25°C

Component description				Component specifications			Stress			Failure rate				
Ref. Design	Part No.	Type	Maker	Cap.	Vmax rated	temp. rated	Tc	V	V ratio	π_{cv}	λ_b	π_Q	π_E	λ_p
				uF	V	deg C	deg.C	V						
CX1	125-08305475(R)	MPF	DAIN	0.47	275	125	61	119	0.43273	1.724704	0.002778	3	1	0.0143745
C1	125-07074705(R)	MPP	ARATRONI	0.47	400	125	75	172	0.43	1.724704	0.002837	3	1	0.0146793
C2	125-07074705(R)	MPP	ARATRONI	0.47	400	125	75.8	177	0.4425	1.724704	0.003033	3	1	0.0156945
C3	122-12101102(R)	MON	SUCCESS	0.0001	1000	85	74.4	258	0.258	0.680431	0.001295	3	1	0.002644
C7	122-12101102(R)	MON	SUCCESS	0.0001	1000	85	77.2	454	0.454	0.680431	0.003563	3	1	0.0072737
C8	122-12101102(R)	MON	SUCCESS	0.0001	1000	85	76.7	46.95	0.04695	0.680431	0.0008	3	1	0.0016327
C5	122-07101333(R)	MON	SUCCESS	0.0033	630	85	78.4	218	0.34603	0.999587	0.002029	3	1	0.0060849
CY1	122-11044103(R)	MON	TDK	0.01	250	100	75.4	47	0.188	1.129234	0.000989	3	1	0.0033514
CY2	122-11044103(R)	MON	TDK	0.01	250	100	74.3	79	0.316	1.129234	0.001716	3	1	0.0058148
CS2	120-24092203(R)	MON	TDK	2.2	25	125	82.4	3.31	0.1324	2.043856	0.000879	3	1	0.0053907
CS3	120-26093305(R)	MON	TDK	0.33	50	125	81.9	2.58	0.0516	1.658901	0.000813	3	1	0.0040439
CS15	120-26093305(R)	MON	TDK	0.33	50	125	80.8	3	0.06	1.658901	0.000812	3	1	0.0040432
CS1	120-26091006(R)	MON	TDK	1	50	125	82.6	3.31	0.0662	1.874062	0.000819	3	1	0.0046031
CS22	120-26091006(R)	MON	TDK	1	50	125	81.6	12.67	0.2534	1.874062	0.001295	3	1	0.0072783
CS5	120-26091002(R)	MON	TDK	0.0001	50	125	82.3	0.043	0.00086	0.680431	0.000809	3	1	0.0016521
CS24	120-26091002(R)	MON	TDK	0.001	50	125	82.6	12.71	0.2542	0.876564	0.001303	3	1	0.003426
CS10	120-06081005(R)	MON	TDK	0.1	50	125	82.1	1.86	0.0372	1.454735	0.00081	3	1	0.003537
CS16	120-06081005(R)	MON	TDK	0.1	50	125	81.6	25.79	0.5158	1.454735	0.004913	3	1	0.0214428
CS18	120-26071003(R)	MON	TDK	0.001	50	125	80.9	13.24	0.2648	0.876564	0.001361	3	1	0.003578
CS6	120-26091004(R)	MON	TDK	0.01	50	125	82.3	2.5	0.05	1.129234	0.000813	3	1	0.0027546
CS12	120-26091004(R)	MON	TDK	0.01	50	125	81.4	3.99	0.0798	1.129234	0.000823	3	1	0.0027865
CS14	120-26091004(R)	MON	TDK	0.01	50	125	82.3	2.88	0.0576	1.129234	0.000815	3	1	0.0027613
CS11	120-26092202(R)	MON	TDK	0.00022	50	125	80.9	1.38	0.0276	0.742079	0.000807	3	1	0.0017962
CS9	120-26092205(R)	MON	TDK	0.22	50	125	81.6	4.04	0.0808	1.586538	0.000824	3	1	0.0039198
CS4	120-26093302(R)	MON	TDK	0.00033	50	125	82.3	11.29	0.2258	0.775926	0.001154	3	1	0.0026873
CS21	120-26071005(R)	MON	TDK	0.1	50	125	82.7	8.95	0.179	1.454735	0.000982	3	1	0.0042873
CS8	120-26094704(R)	MON	TDK	0.047	50	125	81.3	1.32	0.0264	1.338797	0.000808	3	1	0.0032438
CS7	120-26094705(R)	MON	TDK	0.47	50	125	82.6	3.78	0.0756	1.724704	0.000823	3	1	0.0042583
CS23	120-26091003(R)	MON	TDK	0.001	50	125	81.1	19.02	0.3804	0.876564	0.002451	3	1	0.0064459
TOTAL														0.165486



MTBF prediction worksheet - Capacitors, electrolytic

Model : GTM41133-9016-4.0

Conditions: Vin=120VAC; Output Load: +12V/7.5A

Amb. : 25°C

Component description				Component specifications						Stress			Failure rate				
Ref.Design	Part No.	Type	Maker	Cap. (uF)	Vmax	Ripple current	F	T	Temp.	Tc	V	Vratio	πcv	λb	πQ	πE	λp
				(uF)	V	A			deg.C	deg.C	Vmax						
C4	123-52291158®	ELE	SAMXON	150	420	1.44	1 1.4	2.2	105	74.6	249	0.593	0.2464	0.1925	3	1	0.14232
C6	123-07081477(R)	ELE	SAMXON	47	50	0.295	1	2.44	105	75.2	25.8	0.516	0.2	0.1559	3	1	0.093515
C10	123-37101229(R)	ELE	SAMXON	2200	16	2.36	1	2.44	105	76.9	12.2	0.761	0.3996	0.365	3	1	0.43762
C9	123-37101229(R)	ELE	SAMXON	2200	16	2.36	1	2.44	105	72.2	12.2	0.761	0.3996	0.2911	3	1	0.349038
TOTAL																	1.022493



Component CMTBF analysis worksheet -Transistor-bipolar GP or switch

Model : GTM41133-9016-4.0

Condi ti ons: Vi n=120VAC; Output Load: +12V/7.5A

Amb. : 25°C

Component description				Component specifications					Stress				Failure rate								
Ref.Design	Part No.	Type	Maker	Pd rated	Vceo rated	Ic rated	Rth	Tj rated	Vce, peak	Ic(ave)	Ta	Tj(c)	πT	λb	πS	πR	πA	πQ	πE	λp	
				W	V	A	deg.C/W	deg.C	V	A	deg.C	deg.C									
QS1	227-03412001(R)	PNP	JCST	0.25	60	0.6	500	150	9.1	0.006	81.8	109.1	4.7654	0.00074	0.05	4.549	0.7	5.5	1	0.003088	
QS2	227-03412001(R)	PNP	JCST	0.25	60	0.6	500	150	18.05	0.003	82.1	109.175	4.7706	0.00074	0.05	4.549	0.7	5.5	1	0.003091	
QS4	227-03412001(R)	PNP	JCST	0.25	60	0.6	500	150	7.74	0.005	81.4	100.75	4.2113	0.00074	0.05	4.549	0.7	5.5	1	0.002729	
QS3	224-03470003(R)	NPN	PANJIT	0.3	65	0.1	375	150	45.92	0.004	81.6	150.48	8.1824	0.00074	0.05	4.686	0.7	5.5	1	0.005462	
TOTAL																				0.014370	



MTBF prediction worksheet - Transistor-Power MOSFET

Model : GTM41133-9016-4.0

Conditions: V_{in} =120VAC; Output Load: +12V/7.5A

Amb. : 25°C

Component description				Component specifications							Stress				Failure rate					
Ref. Design	Part No.	Type	Maker	Pd rated	Vds rated	Id rated	Vgs rated	Rth	Rdc(on)	Tj rated	Id(rms)	Pd	Tc	Tj(c)	πT	λb	πA	πQ	πE	λp
				W	V	A	V	deg.C/W	Ohm	deg.C	A	W	deg.C	deg.C						
Q1	226-04217005(R)	M	SILIKRON	34.7	650	20	30	80	0.17	150	0.6	0.06	74.4	79.25	2.194	0.012	2	5.5	1	0.289548
Q2	226-04217005(R)	M	SILIKRON	34.7	650	20	30	80	0.17	150	0.98	0.16	74	86.96	2.406	0.012	2	5.5	1	0.317578
Q3	226-04223002(R)	M	NIKO-SEM	178	150	53	30	0.7	0.026	150	4.69	0.57	82.8	83.2	2.301	0.012	4	5.5	1	0.607504
Q4	226-04223002(R)	M	NIKO-SEM	178	150	53	30	0.7	0.026	150	4.61	0.55	81.5	81.89	2.265	0.012	4	5.5	1	0.597984
QS5	227-03440001(R)	M	PANJIT	0.35	60	0.25	20	357	5	150	0.02	0	82.1	82.5	2.282	0.012	2	5.5	1	0.301215
TOTAL																				2.113829



MTBF prediction worksheet - Resistors

Model : GTM41133-9016-4.0

Conditions: Vin=120VAC; Output Load: +12V/7.5A

Amb. : 25°C

Component description				Component specifications					Stress				Failure Rate				
Ref. Design	Part No.	Type	Maker	Resistance	Power	V rms rated	temp.	K	Tc	Vrms	Power actual	Watt ratio	πR	λb	πQ	πE	λp
				Ohm	W	V	deg.C		deg.C	V	W						
R1	102-32051009(R)	MOF	YAGEO	0.1	2	350	200	1.00	80.5	0.023	0.005	0.00	1.00	0.001123	5.00	1.00	0.005617007
R2	102-32051509(R)	MOF	YAGEO	0.15	2	350	200	1.00	80.4	0.043	0.012	0.01	1.00	0.001128	5.00	1.00	0.005637682
R1A	100-25013309(R)	MOF	YAGEO	0.33	1	350	200	1.00	82.1	0.023	0.002	0.00	1.00	0.001138	5.00	1.00	0.005688971
R2A	100-25013309(R)	MOF	YAGEO	0.33	1	350	200	1.00	81.9	0.043	0.006	0.01	1.00	0.001142	5.00	1.00	0.005708575
RS37	100-12057500(R)	R.CF	YAGEO	7.5	0.25	200	155	1.00	81.9	1.01	0.136	0.54	1.00	0.002299	5.00	1.00	0.011495491
RS20	100-08051003(R)	R.CF	YAGEO	1000	0.125	150	155	1.00	82.3	0.002	0.000	0.00	1.00	0.001137	5.00	1.00	0.005687115
RS22	100-08051003(R)	R.CF	YAGEO	1000	0.125	150	155	1.00	81.5	0.093	0.000	0.00	1.00	0.001130	5.00	1.00	0.005647753
RS23	100-08057502(R)	R.CF	YAGEO	750	0.125	150	155	1.00	80.9	0.128	0.000	0.00	1.00	0.001124	5.00	1.00	0.005618800
RS4	100-08054706(R)	R.CF	YAGEO	4700000	0.125	150	155	1.00	82.3	50.5	0.001	0.00	1.60	0.001144	5.00	1.00	0.009150936
RS6	100-08054706(R)	R.CF	YAGEO	4700000	0.125	150	155	1.00	81.6	80.6	0.001	0.01	1.60	0.001147	5.00	1.00	0.009174370
RS1	100-12054705(R)	R.CF	YAGEO	470000	0.25	200	155	1.00	82.4	57.7	0.007	0.03	1.10	0.001181	5.00	1.00	0.006496602
RS2	100-12054705(R)	R.CF	YAGEO	470000	0.25	200	155	1.00	80.9	60.7	0.008	0.03	1.10	0.001170	5.00	1.00	0.006435641
RS44	100-08014643(R)	R.CF	YAGEO	4640	0.125	150	155	1.00	82.3	2.57	0.001	0.01	1.00	0.001154	5.00	1.00	0.005772030
RS8	100-08055103(R)	R.CF	YAGEO	5100	0.125	150	155	1.00	81.6	1.02	0.000	0.00	1.00	0.001133	5.00	1.00	0.005664208
RS16	100-08051004(R)	R.CF	YAGEO	10000	0.125	150	155	1.00	82.5	4.67	0.002	0.02	1.00	0.001166	5.00	1.00	0.005828044
RS36	100-08051004(R)	MOF	YAGEO	10000	0.125	150	200	1.00	81.7	4.07	0.002	0.01	1.00	0.001151	5.00	1.00	0.005755434
RS48	100-08051004(R)	R.CF	YAGEO	10000	0.125	150	155	1.00	82.3	0.253	0.000	0.00	1.00	0.001137	5.00	1.00	0.005687494
RS55	100-08051004(R)	R.CF	YAGEO	10000	0.125	150	155	1.00	81.6	10.29	0.011	0.08	1.00	0.001262	5.00	1.00	0.006309609
RS31	100-12051004(R)	R.CF	YAGEO	10000	0.25	200	155	1.00	82.5	6.19	0.004	0.02	1.00	0.001162	5.00	1.00	0.005811972
RS14	100-08051001(R)	R.CF	YAGEO	10	0.125	150	155	1.00	81.9	0.306	0.009	0.07	1.00	0.001249	5.00	1.00	0.006246785
RS47	100-08011804(R)	R.CF	YAGEO	18000	0.125	150	155	1.00	82.6	9.83	0.005	0.04	1.00	0.001206	5.00	1.00	0.006030208
RS60	100-12011503(R)	R.CF	YAGEO	1500	0.25	200	155	1.00	81.7	12.17	0.099	0.39	1.00	0.001890	5.00	1.00	0.009450632
RS61	100-12011503(R)	R.CF	YAGEO	1500	0.25	200	155	1.00	82.5	12.17	0.099	0.39	1.00	0.001906	5.00	1.00	0.009528375
TOTAL																	0.154443738

