

# **MTBF Prediction Report**

**Model Name: GTM43004P12024**

**Customer: Standard model**

**Stage: MVT**

**PCB Rev.: 1**

**Part List Rev.: 2**

**Spec Rev.: A**

**Conclusion:**

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

**PASS**

**FAIL**

**Prepared By: Michael**

**Approved By: Jet**



**GTM43004P12024-T2 CMTBF REPORT LIST**  
**PART LIST REV: 09**

| COMPONENT                         | FAILURE RATE | Q'TY |
|-----------------------------------|--------------|------|
| CAPACITOR ( except electrolytic ) | 0.317823697  | 28   |
| CAPACITOR ( electrolytic )        | 0.834475497  | 5    |
| DIODE                             | 1.292451552  | 9    |
| Integrated Circuits               | 0.097605732  | 2    |
| Resistors                         | 0.258693748  | 46   |
| KA431                             | 0.027937564  | 1    |
| IC-Opto-couplers                  | 0.28705289   | 1    |
| Magnetic                          | 0.023430034  | 6    |
| Fuse                              | 0.02         | 2    |
| Transistor-bipolar GP or sw       | 0.003981957  | 2    |
| Transistor-Power MOSFET           | 1.771657075  | 4    |
| TOTAL                             | 4.93510975   | 106  |
| MTBF                              | 202,629.74   |      |
| MTBF SPEC.                        | 200,000      |      |
| Conclusion                        | OK           |      |

| Input Voltage | NO . | Test Item                          | Page  |
|---------------|------|------------------------------------|-------|
|               |      | Cover,Report,Part list,and summary | 1~4   |
| 240V          | 1    | Fuse                               | 5     |
|               | 2    | Magnetics                          | 6     |
|               | 3    | KA431                              | 7     |
|               | 4    | Integrated Circuits                | 8     |
|               | 5    | IC - Opto-couplers                 | 9     |
|               | 6    | Diode                              | 10    |
|               | 7    | Capacitors, except electrolytic    | 11    |
|               | 8    | Capacitors, electrolytic           | 12    |
|               | 9    | Transistor-bipolar GP or sw        | 13    |
|               | 10   | Transistor-Power MOSFET            | 14    |
|               | 11   | Resistor                           | 15~16 |

|                   |                   |           |  |                |           |
|-------------------|-------------------|-----------|--|----------------|-----------|
| CMTBF TEST REPORT |                   |           |  | Test Engineer: | Maichael  |
| Model Name:       | GTM43004P12024-T2 | Customer: |  | Test Date:     | 2015-8-26 |
| Quantity:         | 1                 | Ser. No.: |  |                |           |

**1. Purpose:**  
Verify PSU whether or not to meet the customer CMTBF specification.

**2. Conditions:**  
Input: 240V AC  
Output: 24V/5A  
Ambient: 25 degree C

**3. Equipment:**  
Oscilloscope: Tek3054B, AC source: HP6813A, Electronic load:Chroma6310  
Multimeter: Agilent34401A, Current Probe Amplifier:Tek TM502A

**4. Criteria:**  
The life time of the power supply component shall exceed 200,000 hours when 240vac and maximun load at 25℃ .Calculated using the formula by the MIL-HDBK-217F.

**5. REGISTER:**  
Details,please refer to the report content.

**6. Result:**  
The MTBF value meets customer spec..



## MTBF prediction worksheet - Fuse

Model : GTM43004P12024-T2

Conditions:  $V_{in}=240VAC$ ; Output Load:  $+24V/5A$

Amb. : 25°C

| Component description |                 |          | Component specifications | Stress   | Failure rate |         |             |
|-----------------------|-----------------|----------|--------------------------|----------|--------------|---------|-------------|
| Ref. Design           | Part No.        | Type     |                          | I(RMS) A | $\lambda_b$  | $\pi E$ | $\lambda_p$ |
| FS1                   | 160-32115400(R) | W-F-1814 | 4A/250V                  | 0.93     | 0.01         | 1       | 0.01        |
| FS2                   | 160-32115400(R) | W-F-1814 | 4A/250V                  | 0.93     | 0.01         | 1       | 0.01        |
| TOTAL                 |                 |          |                          |          |              |         | 0.02        |

## MTBF prediction worksheet - Magnetics





## MTBF prediction worksheet - Integrated Circuits

Model : GTM43004P12024-T2

Conditions: Vin=240AC; Output Load: +24V/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     | πT     | πL | πQ | πE  | λp          |
|                       |                 |            |          |                          | V        | A        | deg.C/W | deg.C | V         | A       | deg.C | deg.C  |              |        |        |    |    |     |             |
| US1                   | 265-07040001(R) | PWM        | NXP      | 16                       | 38       | 0.5      | 124     | 150   | 33.3      | 0.002   | 68.3  | 76.558 | 0.01         | 0.0072 | 0.2378 | 1  | 10 | 0.5 | 0.059732395 |
| US2                   | 265-03108001(R) | Amplifiers | NIKO-SEM | 8                        | 30       | 0.005    | 23      | 150   | 19.8      | 0.003   | 66.3  | 67.666 | 0.01         | 0.0034 | 0.2087 | 1  | 10 | 0.5 | 0.037873337 |
| TOTAL                 |                 |            |          |                          |          |          |         |       |           |         |       |        |              |        |        |    |    |     | 0.097605732 |

Component CMTBF analysis worksheet - IC-Opto-couplers

Model :GTM43004P12024-T2

Conditions:Vin=240AC; Output Load:+24V/5A

Amb.:25℃

| Component description |               |      |        | Component specifications |             |             |         |       | Worse case stress in application |             |         |       |       |       |       |       | Failure rate |        |    |          |           |
|-----------------------|---------------|------|--------|--------------------------|-------------|-------------|---------|-------|----------------------------------|-------------|---------|-------|-------|-------|-------|-------|--------------|--------|----|----------|-----------|
| Ref. Design           | Part No.      | Type | Maker  | P/Pc                     | VR/Vce(max) | IF/Ice(rms) | Rth     | Tj    | VR/Vce(max)                      | IF/Ice(rms) | P/Pc    |       | Ta    | Tj    | πT    | λb    | πQ           | πE     | λp |          |           |
|                       |               |      |        | W                        | V           | A           | deg.C/W | deg.C | Vpeak(V)                         | Ratio       | Irms(A) | Ratio | W     | Ratio | deg.C | deg.C |              |        |    |          |           |
| U1                    | 250-00510001® | PHO  | LITEON | 0.07                     | 6           | 0.05        | 400     | 100   | 1.45                             | 0.242       | 0.004   | 0.08  | 0.006 | 0.08  | 66.9  | 69.22 | 3.3527       | 0.0055 | 8  | 1        | 0.1475188 |
|                       |               |      |        | 0.15                     | 35          | 0.05        | 425     | 100   | 2.14                             | 0.061       | 0.004   | 0.08  | 0.009 | 0.06  | 66.9  | 70.54 | 3.1712       | 0.0055 | 8  | 1        | 0.1395341 |
| TOTAL                 |               |      |        |                          |             |             |         |       |                                  |             |         |       |       |       |       |       |              |        |    | 0.287053 |           |

**MTBF prediction worksheet - Diodes**

Model: GTM43004P12024-T2

Conditions: Vin=240AC; Output Load: +24V/5A

Amb.: 25°C

| Component description |                 |      |        | Component specifications |          |     |         |          |   | Stress  |           |         |       |       | Failure Rate |    |     |        |      |        |        |
|-----------------------|-----------------|------|--------|--------------------------|----------|-----|---------|----------|---|---------|-----------|---------|-------|-------|--------------|----|-----|--------|------|--------|--------|
| Ref.Design            | Part No.        | Type | Maker  | Vr                       | If, ave. | Vf  | Rth     | Tj rated | K | Vr.peak | Vr, ratio | If, ave | Ta    | Tj(c) | λb           | πE | πQ  | πt     | πs   | πc     | λp     |
|                       |                 |      |        | V                        | A        | V   | deg.C/W | deg.C    |   | V       |           | A       | deg.C | deg.C |              |    |     |        |      |        |        |
| BD1                   | 202-07716001(R) | BRG  | LH     | 600                      | 6        | 1   | 2.2     | 150      | 1 | 385     | 0.642     | 0.578   | 56.4  | 57.67 | 0.005        | 1  | 5.5 | 1.2612 | 0.34 | 1      | 0.0118 |
| D1                    | 206-04370001(R) | FR   | PANJIT | 600                      | 8        | 1.7 | 5       | 150      | 1 | 403     | 0.672     | 0.411   | 60.5  | 63.99 | 0.069        | 1  | 5.5 | 1.3123 | 0.38 | 1      | 0.1893 |
| D2                    | 208-00870001(R) | FR   | PANJIT | 1000                     | 3        | 1.7 | 20      | 150      | 1 | 510     | 0.51      | 0.008   | 68.1  | 68.37 | 0.069        | 1  | 5.5 | 1.3478 | 0.19 | 1      | 0.0996 |
| D3                    | 206-01407004(R) | FR   | PANJIT | 200                      | 1        | 1.2 | 50      | 125      | 1 | 153     | 0.765     | 0.003   | 64.4  | 64.58 | 0.069        | 1  | 5.5 | 1.3171 | 0.52 | 1      | 0.2607 |
| DS2                   | 207-02110001(R) | FR   | PANJIT | 75                       | 0.15     | 2   | 450     | 150      | 1 | 8.28    | 0.11      | 0.004   | 64.5  | 68.1  | 0.069        | 1  | 5.5 | 1.3456 | 0.05 | 1      | 0.0276 |
| DS3                   | 207-02110001(R) | FR   | PANJIT | 75                       | 0.15     | 2   | 450     | 150      | 1 | 7.64    | 0.102     | 0.003   | 65.3  | 68    | 0.069        | 1  | 5.5 | 1.3447 | 0.05 | 1      | 0.0276 |
| DS4                   | 207-02110001(R) | FR   | PANJIT | 75                       | 0.15     | 2   | 450     | 150      | 1 | 5.86    | 0.078     | 0.003   | 66.3  | 69    | 0.069        | 1  | 5.5 | 1.3528 | 0.05 | 1      | 0.0277 |
| DS5                   | 207-02110001(R) | FR   | PANJIT | 75                       | 0.15     | 2   | 450     | 150      | 1 | 64      | 0.853     | 0.004   | 64.6  | 68.2  | 0.069        | 1  | 5.5 | 1.3464 | 0.68 | 1      | 0.3475 |
| DS6                   | 207-02110001(R) | FR   | PANJIT | 75                       | 0.15     | 2   | 450     | 150      | 1 | 60.3    | 0.804     | 0.002   | 66.5  | 68.3  | 0.069        | 1  | 5.5 | 1.3472 | 0.59 | 1      | 0.3006 |
| TOTAL                 |                 |      |        |                          |          |     |         |          |   |         |           |         |       |       |              |    |     |        |      | 1.2925 |        |

### MTBF prediction worksheet - Capacitors, except electrolytic

Model : GTM43004P12024-T2

Conditions:  $V_{in}=240AC$ ; Output Load:  $+24V/5A$

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 | πcv          | λb       | πQ | πE | λp        |
|                       |                 |      |       | uF                       | V          | deg C       | deg.C  | V      |         |              |          |    |    |           |
| CY1                   | 122-40034153(R) | MPF  | TDK   | 0.0015                   | 400        | 125         | 58.4   | 105    | 0.2625  | 0.692998     | 0.001152 | 3  | 1  | 0.0023949 |
| CY3                   | 122-40034153(R) | MPF  | TDK   | 0.0015                   | 400        | 125         | 55.3   | 109    | 0.2725  | 0.692998     | 0.001197 | 3  | 1  | 0.0024895 |
| CX1                   | 125-08045475(R) | DIS  | UTX   | 0.47                     | 275        | 125         | 51.3   | 239    | 0.86909 | 1.304045     | 0.018788 | 3  | 1  | 0.0734996 |
| C1                    | 122-30081106(R) | DIS  | TDK   | 1                        | 450        | 125         | 57.2   | 385    | 0.85556 | 1.416973     | 0.018256 | 3  | 1  | 0.0776045 |
| C2                    | 122-30081106(R) | DIS  | TDK   | 1                        | 450        | 125         | 58.3   | 246    | 0.54667 | 1.416973     | 0.005336 | 3  | 1  | 0.022685  |
| CS1                   | 120-24091006(R) | MON  | TDK   | 1                        | 25         | 125         | 66.9   | 4.44   | 0.1776  | 1.416973     | 0.000936 | 3  | 1  | 0.0039794 |
| CS2                   | 120-24091006(R) | MON  | TDK   | 1                        | 25         | 125         | 67.6   | 4.46   | 0.1784  | 1.416973     | 0.00094  | 3  | 1  | 0.0039965 |
| CS3                   | 120-24091006(R) | MON  | TDK   | 1                        | 25         | 125         | 68.2   | 7.16   | 0.2864  | 1.416973     | 0.001455 | 3  | 1  | 0.0061855 |
| CS11                  | 120-26092202(R) | MON  | TDK   | 0.00022                  | 50         | 125         | 67.6   | 1.33   | 0.0266  | 0.561084     | 0.000777 | 3  | 1  | 0.0013085 |
| CS13                  | 120-26091003(R) | MON  | TDK   | 0.001                    | 50         | 125         | 66.9   | 33.36  | 0.6672  | 0.662768     | 0.009304 | 3  | 1  | 0.0184984 |
| CS6                   | 120-26091004(R) | MON  | TDK   | 0.01                     | 50         | 125         | 66.2   | 4.9    | 0.098   | 0.853811     | 0.000801 | 3  | 1  | 0.002051  |
| CS12                  | 120-26091004(R) | MON  | TDK   | 0.01                     | 50         | 125         | 67.6   | 3.58   | 0.0716  | 0.853811     | 0.000787 | 3  | 1  | 0.0020168 |
| CS14                  | 120-06081005(R) | MON  | TDK   | 0.1                      | 50         | 125         | 67.2   | 2.4    | 0.048   | 1.099922     | 0.000779 | 3  | 1  | 0.0025709 |
| CS8                   | 120-26094704(R) | MON  | TDK   | 0.0047                   | 50         | 125         | 68.2   | 1.08   | 0.0216  | 0.785765     | 0.000778 | 3  | 1  | 0.0018349 |
| CS10                  | 120-26091005(R) | MON  | TDK   | 0.1                      | 50         | 125         | 68.6   | 2.4    | 0.048   | 1.099922     | 0.000782 | 3  | 1  | 0.0025809 |
| CS16                  | 120-26091005(R) | MON  | TDK   | 0.1                      | 50         | 125         | 67.9   | 32.04  | 0.6408  | 1.099922     | 0.008354 | 3  | 1  | 0.0275664 |
| CS18                  | 120-26091005(R) | MON  | TDK   | 0.1                      | 50         | 125         | 66.8   | 22.34  | 0.4468  | 1.099922     | 0.003335 | 3  | 1  | 0.0110063 |
| CS9                   | 120-26092205(R) | MON  | TDK   | 0.22                     | 50         | 125         | 66.2   | 0.78   | 0.0156  | 1.199577     | 0.000774 | 3  | 1  | 0.002785  |
| CS15                  | 120-26093305(R) | MON  | TDK   | 0.33                     | 50         | 125         | 67.6   | 2.68   | 0.0536  | 1.254291     | 0.000781 | 3  | 1  | 0.0029397 |
| CS7                   | 120-26094705(R) | MON  | TDK   | 0.47                     | 50         | 125         | 67.2   | 3.3    | 0.066   | 1.304045     | 0.000784 | 3  | 1  | 0.0030679 |
| CS4                   | 120-26093302(R) | MON  | TDK   | 0.00033                  | 50         | 125         | 66.5   | 9.38   | 0.1876  | 0.586676     | 0.000964 | 3  | 1  | 0.0016963 |
| CS5                   | 120-26093302(R) | MON  | TDK   | 0.00033                  | 50         | 125         | 66.1   | 1.94   | 0.0388  | 0.586676     | 0.000775 | 3  | 1  | 0.0013644 |
| CS20                  | 120-26094702(R) | MON  | TDK   | 0.00047                  | 50         | 125         | 67.2   | 2.5    | 0.05    | 0.609948     | 0.00078  | 3  | 1  | 0.0014264 |
| C8                    | 120-31131003(R) | MON  | TDK   | 0.001                    | 1000       | 125         | 67.3   | 112    | 0.112   | 0.662768     | 0.000817 | 3  | 1  | 0.0016235 |
| C3                    | 120-31131002(R) | MON  | TDK   | 0.0001                   | 1000       | 125         | 68.2   | 479    | 0.479   | 0.514472     | 0.003945 | 3  | 1  | 0.0060893 |
| C5                    | 120-31131002(R) | MON  | TDK   | 0.0001                   | 1000       | 125         | 67.6   | 542    | 0.542   | 0.514472     | 0.005358 | 3  | 1  | 0.008269  |
| C7A                   | 122-07001223(R) | MON  | TDK   | 0.0022                   | 630        | 125         | 66.6   | 160.92 | 0.25543 | 0.722817     | 0.001253 | 3  | 1  | 0.0027165 |
| C12                   | 120-30131004(R) | MON  | TDK   | 0.01                     | 630        | 125         | 66.2   | 419    | 0.66508 | 0.853811     | 0.009205 | 3  | 1  | 0.0235767 |
| TOTAL                 |                 |      |       |                          |            |             |        |        |         |              |          |    |    | 0.3178237 |





## Component CMTBF analysis worksheet -Transistor-bipolar GP or switch

Model : GTM43004P12024-T2

Conditions:  $V_{in}=240AC$ ; Output Load:  $+24V/5A$

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  |              |        |      |       |     |     |    |          |
| Q3                    | 224-03440001(R) | NPN  | PANJIT  | 0.3                      | 40         | 0.2      | 417     | 150      | 18.38     | 0.004   | 67.2  | 97.858 | 4.03         | 0.0007 | 0.05 | 3.915 | 0.7 | 5.5 | 1  | 0.002247 |
| Q4                    | 222-03410001(R) | PNP  | FAIRCHI | 0.35                     | 40         | 0.2      | 357     | 150      | 9.9       | 0.004   | 67.6  | 81.737 | 3.11         | 0.0007 | 0.05 | 3.915 | 0.7 | 5.5 | 1  | 0.001735 |
| TOTAL                 |                 |      |         |                          |            |          |         |          |           |         |       |        |              |        |      |       |     |     |    | 0.003982 |





