TAIWAN SEMICONDUCTOR

AMF20230197

QUALITY & RELIABILITY ENGINEERING
FIT and MTTF Calculation Report

November 23, 2023

PN Family Series	**TQM033NB04CR**
Part Description	40V, 121A, Single N-Channel Power MOSFET
Package Type	PDFN56U

Test Variables:

Stress Test	=	**HTRB**	
No. of failures	=	0	**units**
Sample Size	=	640	**units**
Test Duration	=	1000	**hours**
Total device hours	=	640000	**hours**
Accelerated Temp (Ta)	=	175	**° C**
Operating Temp (Tu)	=	55	**° C**
Activation Energy (Ea)	=	1.0	**eV**
Confidence Level	=	90	**%**
Boltzmann's Constant (k)	=	8.617E-05	**eV / °K**

Calculations:

Chi squared value = **4.6051702** @ 90% Confidence Level

Failure Rate *(@accelerated condition)*

$$= \frac{\text{(Chi squared value)}}{2\text{*(Sample Size)*(Test Duration)}}$$

= **3597.79** **FIT**

Acceleration Factor, AF = $e^{(Ea/k)(1/Tu\ -\ 1/Ta)}$

= **13056.6478**

Results:

Failure Rate *(@operating condition)* = (Failure Rate *@accelerated condition*) / (AF)

= **0.28** **FIT**

Mean Time to Failure (MTTF) = **3.629E+09** **hours**

= **414278** **years**