TAIWAN SEMICONDUCTOR

Date: January 2, 2025

QUALITY & RELIABILITY ENGINEERING
FIT and MTTF Calculation Report

PN Family Series	TQM138KCU, TQM2N7002KCU
Part Description	N-Channel Small Signal MOSFETs
Package Type	SOT-323
Market Segment	Automotive

Test Variables:

Stress Test	=	**HTRB**	
No. of failures	=	0	**units**
Sample Size	=	231	**units**
Test Duration	=	1000	**hours**
Total device hours	=	231000	**hours**
Accelerated Temp (Ta)	=	150	**° C**
Operating Temp (Tu)	=	55	**° C**
Activation Energy (Ea)	=	0.7	**eV**
Confidence Level	=	90	**%**
Boltzman's Constant (k)	=	8.617E-05	**eV / °K**

Calculations:

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

Failure Rate *(@accelerated condition)*

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

= **9967.90** **FIT**

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

= **260.4108858**

Results:

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

= **38** **FIT**

Mean Time to Failure (MTTF) = **26124947** **hours**

= **2982** **years**