FMEA ANALYSIS

PROCESS : UART COMMUNICATIONS WITH PC

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References: https://www.weibull.com/hotwire/issue188/fmeacorner188.htm, https://polarion.plm.automation.siemens.com/hubfs/Docs/Guides_and_Manuals/Siemens-PLM-Polarion-How-to-conduct-a-failure-modes-and-effects-analysis-FMEA-wp-60071-A3.pdf

Function	Potential Failure Mode	Potential Effect(s) of Failure	SEV i	Potential Cause(s) of Failure	OCC i	Current Design Controls	DET i	RPN i
Process Step Under Investigation	Potential Modes where functionality could be wrong	Impact on the user if the failure is left unhandled		Reasons the feature could be failing		Remedial Actions taken to prevent the failure		
Adding or Reading Data from Circular Buffer	Buffer becomes full while adding data	Data can be lost due to overwrite	9	Insufficient size of buffer, incorrect buffer full check	3	Return buffer full error preventing data overwrite or increase the buffer size to accommodate more data	3	81
	Buffer becomes empty during read operation	Junk values can be read	8	Incorrect buffer empty check	3	Return buffer empty error preventing junk values to be read and stopping the read operation	3	72
Circular Buffer Initialization	Buffer could be initialized incorrectly	Buffer pointer could be NULL, Buffer HEAD and TAIL pointing incorrectly, Junk values already in Buffer	9	Memory Leak, Large memory allocation due to dynamic allocation	4	Free the allocated memory. To avoid memory wastage allocate new memory with small increments.	4	128
Firmware Update of the Board KL25Z	Hardbricking of the hardware	Board becomes non-functional & Corrupt Firmware	10	Interruption during Firmware Update, Malware	3	Use of Debug Mode for memory access, Modifier programs created by users	5	150
UART	Baud Rate Configuration	Data printed on serial terminal monitor can be garbage	4	Baud Rate different of host PC and KL25Z due to incorrect BDL and BDH Vaues or prescalar inaccurate	7	Select appropriate clock source and calculate correct SBR value to avoid Baud Rate mismatch	4	112
	Communication in Reciever Mode	Communication becomes unreliable to handle data in real time	4	Data gets overwritten as soon as new data gets loaded in reciever buffer	7	Polling or Interrupt approach should be used to check if received data present in receive buffer before writing new data	5	140
	In Polling approach for UART, data is checked periodically according to the configured clock.	Loss of one or more characters depending on CPU and transmit speed	4	Processing Overhead (CPU can be occupied with other tasks)	6	Instead use Interrupt Mode for UART where the Receive and Transmit Interrut flags are checked upon which we put/take data from buffer	4	96