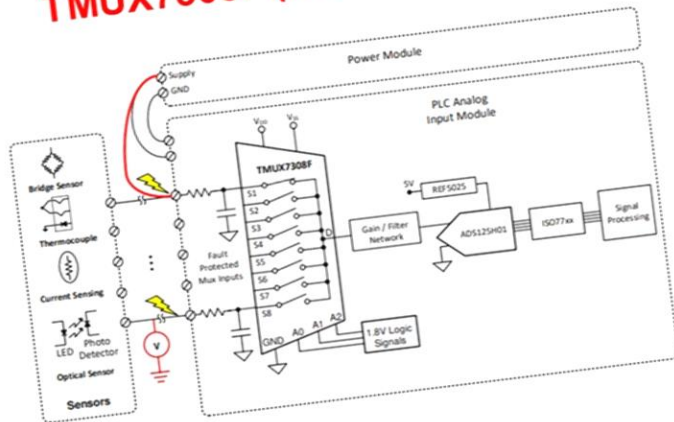


FAULT PROTECTED MUXES IN AIO MODULE

Implementation in AIO module

TMUX7308F (1 Channel 8:1)



VOLTAGE TOLERANCE
FAULT RESPONSE

TI Precision Labs

Protecting against overvoltage events in PLC AIO modules

TI Precision Labs – Switches and Multiplexers

Presented and Prepared by Kameron Hill

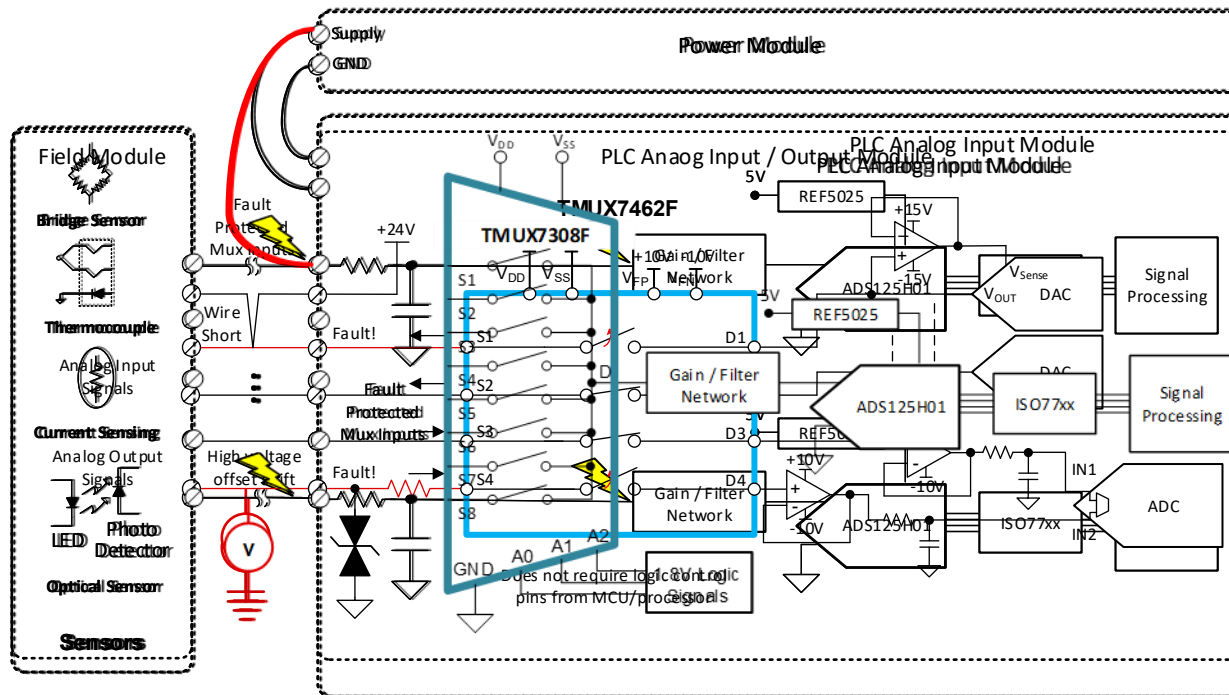
Prerequisite: 2.10 TI Precision Labs- What is Overvoltage Protection

Summary

- Topics
 - Implementing multiplexer in AIO module
 - Example of fault-protected multiplexer in AIO module
 - Fault-response time
 - Input voltage tolerance
- Goals
 - Understand operation of fault-protected multiplexers
 - Understand how input voltage tolerance is calculated

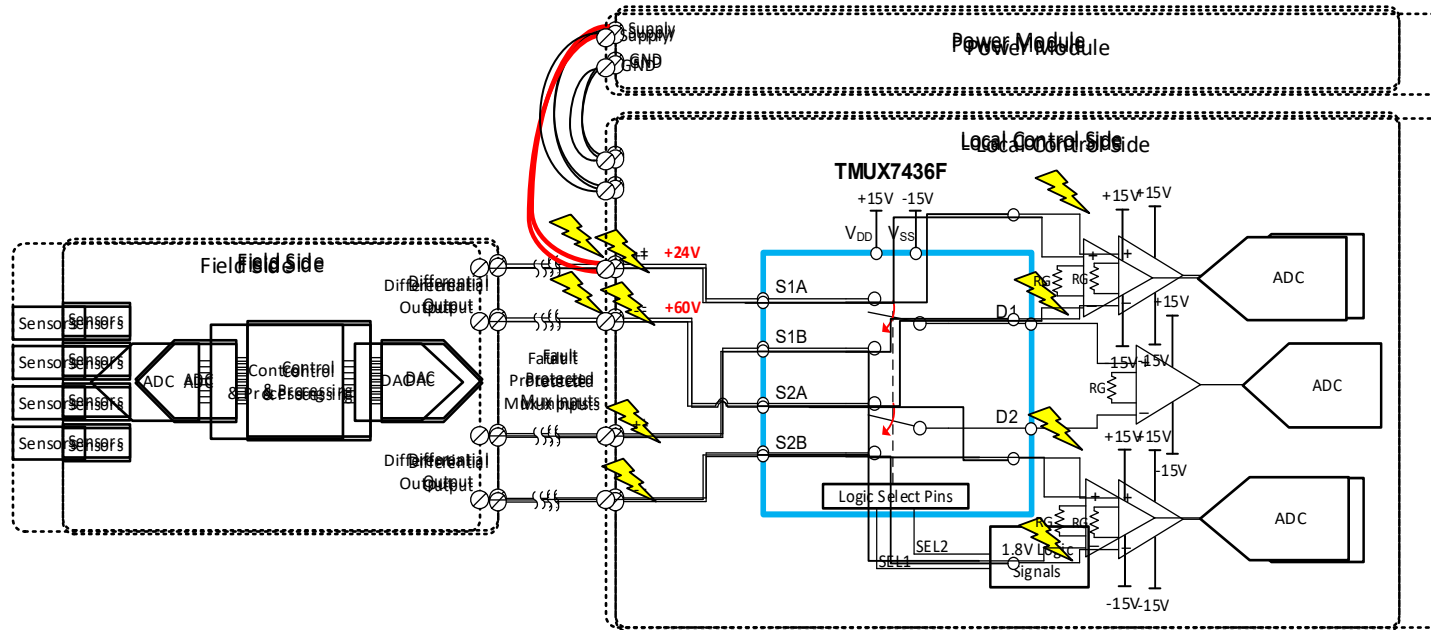
Implementation in AIO module

TMUX7308F 8:1X4

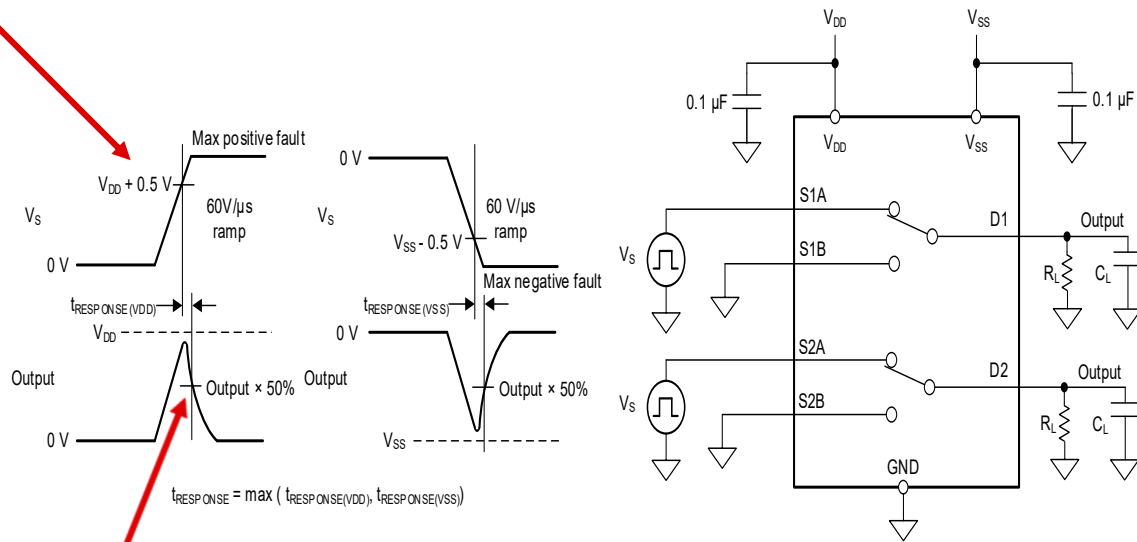


Overvoltage protection example

PARAMETER	VALUE
Positive supply (V_{DD}) mux and ADC	+15 V
Negative supply (V_{SS}) mux and ADC	-15 V
Power board supply voltage	24 V
Input / output signal range non-faulted	-15 V to 15 V
Overvoltage protection levels	-60 V to 60 V
Control logic thresholds	1.8 V compatible, up to 44 V
Temperature range	-40°C to +125°C



Fault-response time and TI current solutions



Device	Config	RON (typ)	CON (typ)	Fault behavior	
				Output behavior	Fault Flag
TMUX7308F	8:1 x 1	250 Ω	20 pF	Pull to primary supply	-
TMUX7309F	4:1 x 2			Pull to primary supply	-
TMUX7348F	8:1 x 1			Pull to fault supply	Specific
TMUX7349F	4:1 x 2	10 Ω	60 pF	Pull to fault supply	Specific
TMUX7411F	1:1 x 4			High impedance	General
TMUX7412F	1:1 x 4			High impedance	General
TMUX7413F	1:1 x 4	10 Ω	28 pF	High impedance	General
TMUX7436F	2:1, x2			Pull to primary supply	Specific

Input voltage tolerance

Example 1

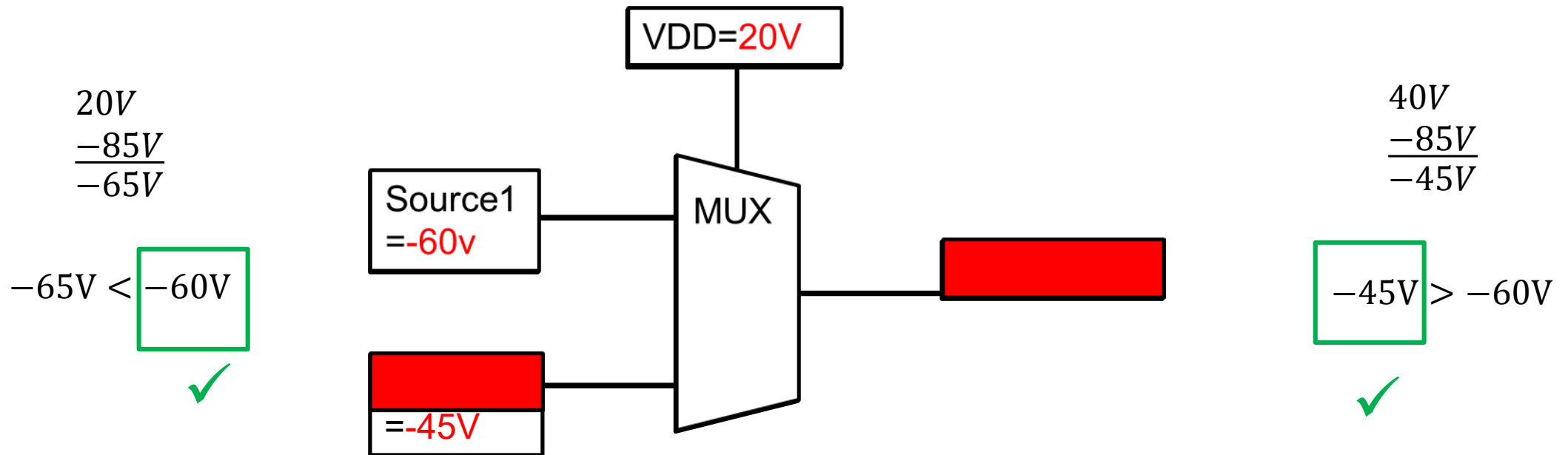
$$f(V_{SUPPLY}, V_{SOURCE}) = \begin{cases} IN\ SPEC & , |V_{SUPPLY} - V_{SOURCE}| \leq 85V \\ OUT\ SPEC & , |V_{SUPPLY} - V_{SOURCE}| \geq 85V \end{cases}$$

$$f(V_{SUPPLY} = 20V) \rightarrow 20V - 85V = -65V < -60V \rightarrow Min = -60V$$

Example 2

$$f(V_{DRAIN}, V_{SOURCE}) = \begin{cases} IN\ SPEC & , |V_{DRAIN} - V_{SOURCE}| \leq 85V \\ OUT\ SPEC & , |V_{DRAIN} - V_{SOURCE}| \geq 85V \end{cases}$$

$$f(V_{DRAIN} = 40V) \rightarrow 40V - 85V = -45V > -60V \rightarrow Min = -45V$$



To find more Switches and Multiplexers technical resources and search products, visit <https://www.ti.com/switches-multiplexers/analog/products.html>