Introduction

This document provides detailed information which assists designers in meeting the immunity demands of a POE system.

Immunity Demands

The immunity application, which this document describes, is intended to provide a full solution for meeting the following immunity tests.

Common Mode Surge

In the Common Mode Surge test, a surge is applied between the port's lines and the EGND.
This document describes an application designed to endure the following common mode surges:

GR-1089 (USA) Standard
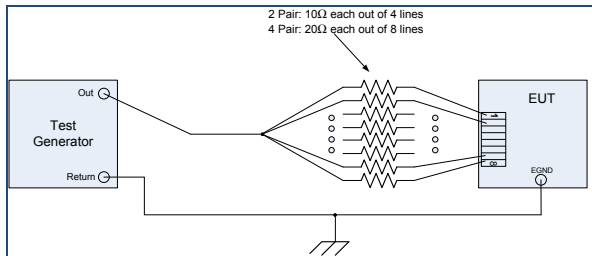
GR-1089 defines a test with the following setup:

Figure 1: GR-1089 Common Surge Test Setup

The parameters of the test are as described in the following table:

Wave Shape	Voltage	Resistance
1.2/50µs	1.5KV	**2 pair** - 10Ω on each exit of the 4 lines
		4 pair - 20Ω on each exit of the 8 lines

ITU-T K21 (International) Standard
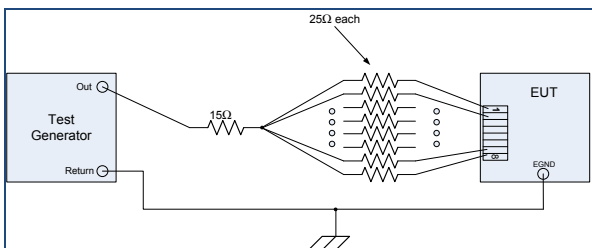
ITU-T K21 defines a test with the following setup:

Figure 2: K21 Common Surge Test Setup

The parameters of the test are as described in the following table:

Wave Shape	Voltage	Resistance
10/700µs	6KV	25Ω per line (+15Ω generator internal)

Differential Mode Surge

Differential Mode Surge is a test in which a surge is applied between the Positive and Negative pairs of the port.
This document describes an application designed to endure the following common mode surges:

GR-1089 (USA) Standard
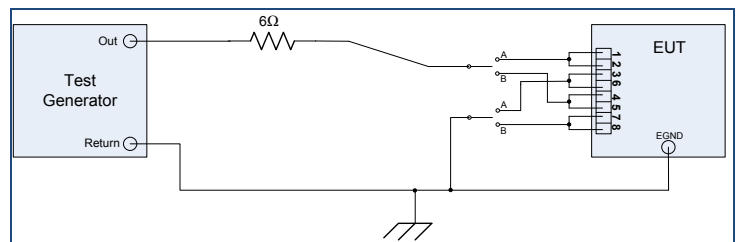
GR-1089 defines a test with the following setup:

Figure 3: GR-1089 Differential Surge Test Setup

The parameters of the test are described in the following table:

Wave Shape	Voltage	Resistance
1.2/50µs	800V	6Ω

ITU-T K21 (International) Standard

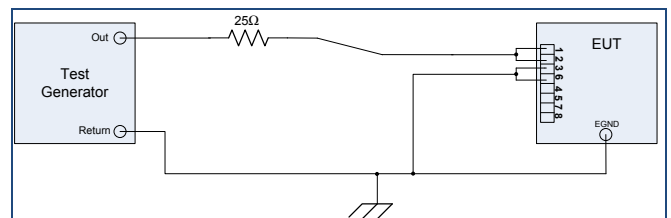ITU-T K21 defines a test with the following setup:

Figure 4: K21 Differential Surge Test Setup

The parameters of the test are described in the following table:

Wave Shape	Voltage	Resistance
10/700µs	1.5KV	25Ω (+15Ω generator internal)

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Microsemi Immunity Application, Technical Explanation

Common Surge Mode

In Common Mode Surge, surge is injected to all pairs relative to EGND. Surge is injected to pairs in both polarities: positive to EGND and negative to EGND. The picture below describes the current path while injecting positive surge to the pair:

Figure 5: Common Mode Positive Surge Current Path

The picture below describes the current path while injecting negative surge to the pair:

Figure 6: Common Mode Negative Surge Current Path

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Differential Surge Mode

In Differential Surge, the surge is injected to a positive pair relative to the negative pair, while negative pair is connected to EGND. The surge is injected in both polarities: positive to EGND and negative to EGND. The picture below describes the current path while injecting positive surge:
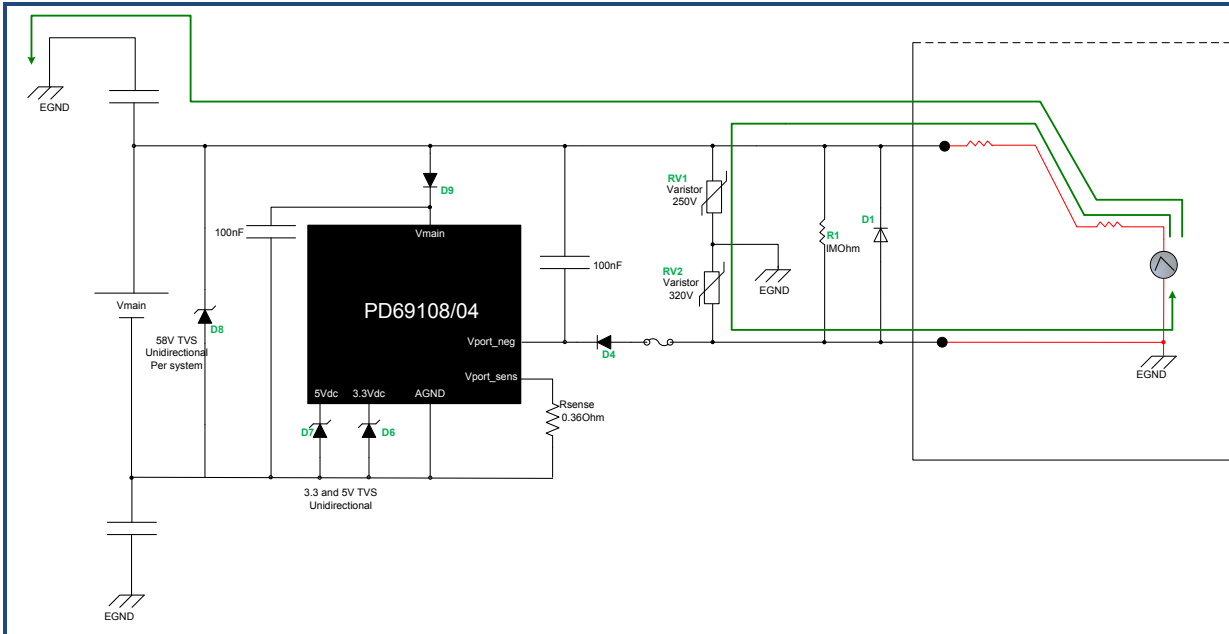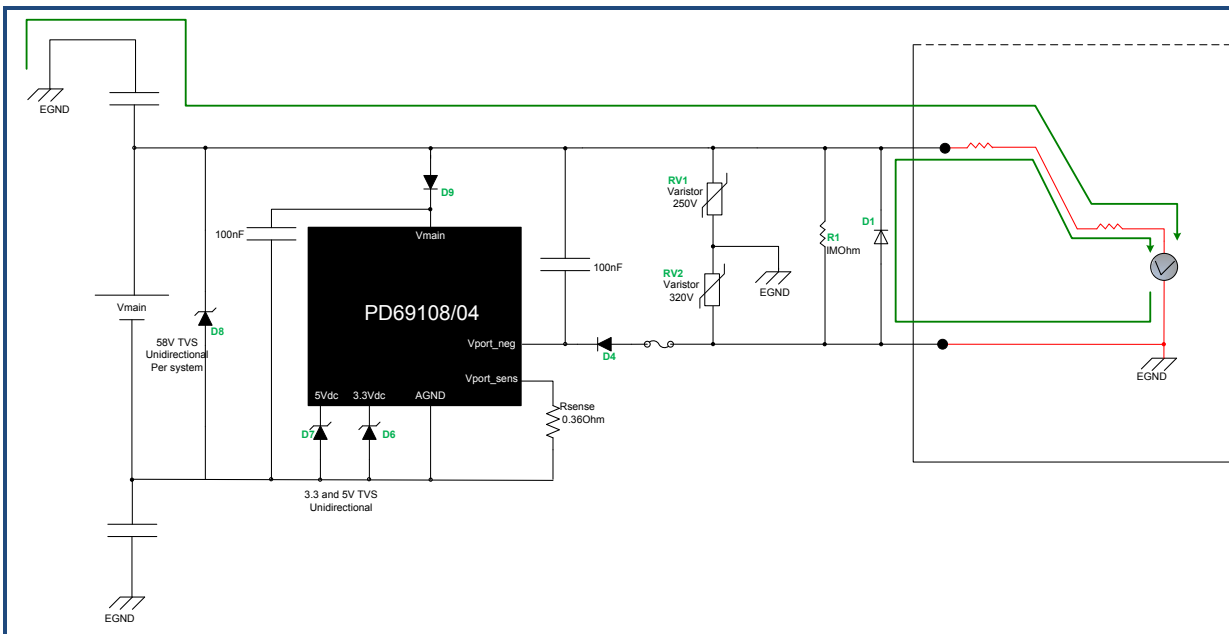

Figure 7: Differential Mode Positive Surge Current Path

The picture below describes the current path while injecting Negative surge:

Figure 8: Differential Mode Negative Surge Current Path

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Application Schematic
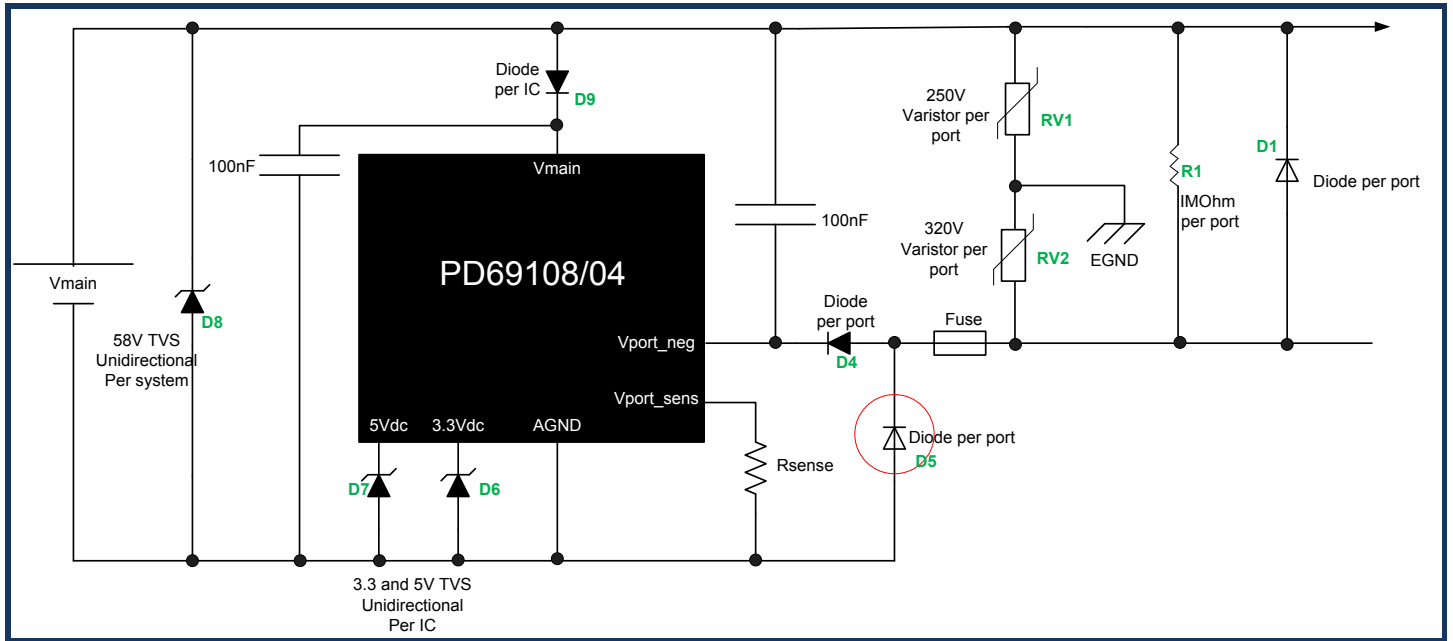
Figure 9: 6KV Application

Application BOM

QTY	Reference	Description	PCB Footprint	Manufacturer	Manufacturer's Part Number
3	D1, D4, D9	Standard Avalanche SMD Rectifier Diode with 1600V Maximum repetitive peak reverse voltage	SMA	Vishay	BYG10Y-E3
1	D6	Unidirectional TVS 3.3V	SOD323	Bourns	CDSOD323- T03
1	D7	Unidirectional TVS 5V	SOD323	Bourns	CDSOD323- T05
1	D8	Unidirectional TVS 58.1V 1500W	SMB	Bourns	SMBJ58A
1	R1	Resistor 1MOhm 250mW 1% 1206 SMT	R1206	Samsung	RC3216F1004CS
1	RV1	Varistor 250V, 6KA pick current (8/20us)	T.H	Epcos	B72214S2251K101
1	RV2	Varistor 320V, 6KA pick current (8/20us)	T.H	Epcos	B72214S2321K101

Note: D5 recommended to be added in PCB layout, but does not need to be assembled at the current application.

Revision History

Revision Level / Date	Para. Affected	Description
0.1 / 27-Jun-2012		Initial Release
0.2 / 18-Mar-2013		

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