

Electrostatic Discharge

Last updated 1/10/24

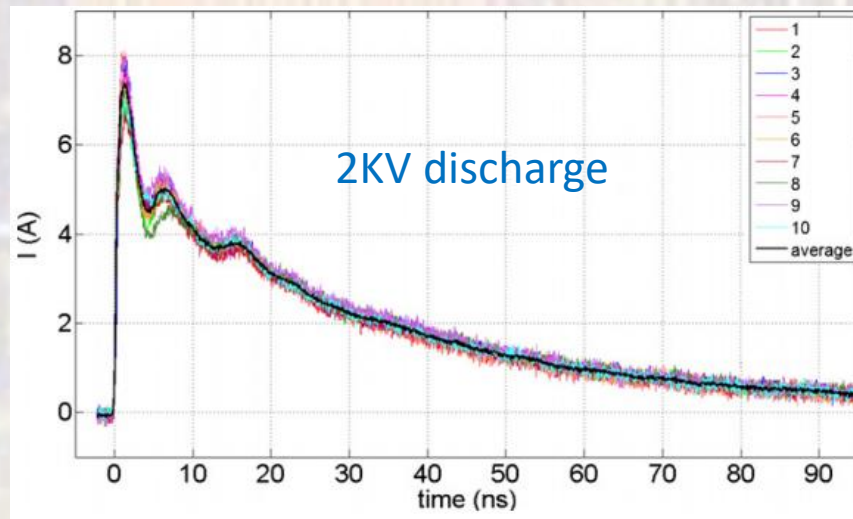
Electrostatic Discharge

- Electrostatic Discharge (ESD)
 - Transfer of a quantity of static electric charge from one object to another
 - Shuffling across a carpeted floor in the winter and touching your little sister's nose
 - Pulling clothes apart coming from the dryer and hearing snaps or seeing flashes
 - Lightning
 - In electronics we typically consider 2 situations
 - A human touching a component
 - A machine touching a component
 - ESD can cause electronic components to fail
 - Those non-working 7-seg display LEDs on your DE10

Electrostatic Discharge

- ESD Characteristics
 - Voltages generated can range from 0V to 10KV or higher
 - Discharges peak in a few nS
 - Large currents can be generated during these short pulses

Typical ESD waveform
Human Body <-> Component



Src: Meas. Sci. Technol. 21 (2010) 105703 (6pp)

Electrostatic Discharge

- Prevention

- Use anti-static transport mechanisms
 - No charge build-up

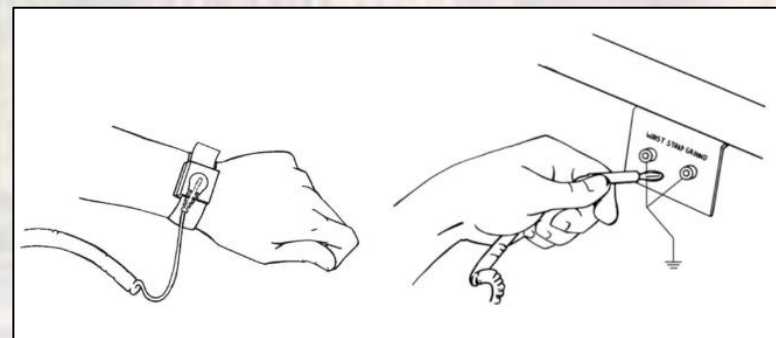


- Prevent contact

- Handle your board by the edges – not the top or bottom
- Anti-static benchtop materials

- Provide alternate discharge mechanisms

- Lab bench ESD wrist straps



Electrostatic Discharge

- Protection
 - Components / systems are usually designed to protect against: 100V, 500V, 1KV, 2KV or 5KV
 - This is done through the use of components integrated into the IC or onto the board/system
 - Large diodes tied to VDD and Gnd, Zener Diodes, ...
 - Prevent the voltage from exceeding a volt or so and shunt the large currents to gnd
 - Filtering resistors
 - In combination with the inherent C – slow down the waveform which leads to lower V and I

5.2 ESD Ratings		TI - MSP432 U-Controller	
		VALUE	UNIT
V _(ESD)	Electrostatic discharge	Human-body model (HBM), per ANSI/ESDA/JEDEC JS-001 ⁽¹⁾ ⁽²⁾	±1000
		Charged-device model (CDM), per JEDEC specification JESD22-C101 ⁽³⁾	±250

(1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process. Pins listed as ±1000 V may actually have higher performance.

(2) All pins except DVSS3 pass HBM up to ±1000 V. The DVSS3 pin is used for TI internal test purposes. Connect the DVSS3 pin to supply ground on the customer application board.

(3) JEDEC document JEP157 states that 250-V CDM allows safe manufacturing with a standard ESD control process. Pins listed as ±250 V may actually have higher performance.