US 20220368122A1

(19) United States

(12) Patent Application Publication (10) Pub. No.: US 2022/0368122 A1

Dua et al. (43) Pub. Date: Nov. 17, 2022

(54) **DRIVER ASSISTED ESD PROTECTION APPARATUS AND METHOD**

(71) Applicant: **Intel Corporation**, Santa Clara, CA (US)

(72) Inventors: **Raj Singh Dua**, Ludhiana (IN); **Sanjay Joshi**, Bangalore (IN); **Harry Muljono**, San Ramon, CA (US); **Balkaran Gill**, Cornelius, OR (US)

(21) Appl. No.: **17/876,351**

(22) Filed: **Jul. 28, 2022**

Related U.S. Application Data

(62) Division of application No. 17/125,824, filed on Dec. 17, 2020, now Pat. No. 11,444,445.

(30) **Foreign Application Priority Data**

Jun. 11, 2020 (IN) 202041024525

Publication Classification

(51) **Int. Cl.**
H02H 3/08 (2006.01)

(52) **U.S. Cl.**
CPC ***H02H 3/08*** (2013.01)

(57) **ABSTRACT**

Analog Front End (AFE) driver or transmitter is used for ESD protection of an input-output (IO) pin, thus reducing ESD diode count and subsequently lowering the pad capacitance to achieve high performance in IO circuits like double data rate (DDR) TO, PCI Express (Peripheral Component Interconnect Express), etc. The channel of active devices that constitute AFE driver are used to connect an IO pad to discharge the ESD current to ground, thus providing an alternative path to ESD current and subsequently reducing the ESD diode count. An additional p-type device (Driver Path Enabler (DPE)) is coupled between the IO pad and a gate terminal of the AFE driver. This additional p-type device triggers the channel of the AFE driver. This p-type device is controlled by an RC based structure which cuts the p-type device off during regular operations when power is ramped-up.