

PATENT OWNER'S DEMONSTRATIVE EXHIBIT

Cases IPR2016-01249 & IPR2016-01264

August 7, 2017

IP Bridge Exhibit 2050
TSMC v. IP Bridge
IPR2016-01249
IPR2016-01264

U.S. Patent No. 6,887,353 (“*Ding*”)

The present invention pertains to a particular TaN_x/Ta 10 barrier/wetting layer structure which increases the degree of {111} crystal orientation in an overlying copper layer, thereby providing improved electromigration resistance of the copper.

Exhibit1005, 1:10-14.

U.S. Patent No. 6,887,353 (“*Ding*”)

Ding discloses a two-layer “TaN_x/Ta barrier structure” that “provides both a barrier to the diffusion of a copper layer deposited thereover, and enables the formation of a copper layer having a high <111> crystallographic content so that the electromigration resistance of the copper is increased.”

U.S. Patent No. 6,887,353 (“*Ding*”)

We have discovered that tantalum nitride (TaN_x) is a better barrier layer for copper than tantalum (Ta). However, copper deposited directly over TaN_x does not exhibit a sufficiently high degree of $\langle 111 \rangle$ crystal orientation to provide the desired copper electromigration characteristics. We have developed a barrier layer structure comprising a layer of Ta overlying a layer of TaN_x which provides both a barrier to the diffusion of a copper layer deposited thereover, and enables the formation of a copper layer having a high $\langle 111 \rangle$ crystallographic content, so that copper electromigration resistance is increased.

- Exhibit 1005, 3:28-38; ‘01264 Petition, p. 18.

***Ding And Zhang* Disclose Similar Sputter-Deposition Techniques**

Ding:

Subsequent to application of the TaN layer, the nitrogen gas was shut off, the power to tantalum target cathode 110 was reduced from about 4 kW to about 1 kW, and the argon gas feed was maintained. The pressure in the vacuum chamber remained at about 1.7 mT, and the substrate temperature remained at about 25° C.

Exhibit 1005, 7:21-26.

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