



US009411421B2

(12) **United States Patent**
Tamura

(10) **Patent No.:** **US 9,411,421 B2**
(45) **Date of Patent:** **Aug. 9, 2016**

(54) **DISPLAY DEVICE**

(75) Inventor: **Hikaru Tamura**, Kanagawa (JP)

(73) Assignee: **Semiconductor Energy Laboratory Co., Ltd.**, Atsugi-shi, Kanagawa-ken (JP)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 63 days.

(21) Appl. No.: **12/693,841**

(22) Filed: **Jan. 26, 2010**

(65) **Prior Publication Data**

US 2010/0188354 A1 Jul. 29, 2010

(30) **Foreign Application Priority Data**

Jan. 28, 2009 (JP) 2009-016534

(51) **Int. Cl.**

G06F 3/01 (2006.01)
G02F 1/1333 (2006.01)
G06F 3/041 (2006.01)
G06F 3/0488 (2013.01)

(52) **U.S. Cl.**

CPC **G06F 3/016** (2013.01); **G02F 1/13338** (2013.01); **G06F 3/041** (2013.01); **G06F 3/0488** (2013.01); **G06F 3/04886** (2013.01)

(58) **Field of Classification Search**

CPC G09G 2310/0262; G09G 3/3433; G06F 3/016; G06F 3/0488; G06F 3/04886; G06F 3/041; G06F 3/00; G02F 1/13338
USPC 345/92, 156-184; 359/227, 228, 291
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,715,505	A *	2/1998	Tombs et al.	399/299
7,084,933	B2	8/2006	Oh	
7,098,880	B2	8/2006	Inoue et al.	
7,148,944	B2	12/2006	Kinoshita et al.	
7,292,227	B2 *	11/2007	Fukumoto et al.	345/173
7,369,209	B2	5/2008	Kinoshita et al.	
7,519,292	B2	4/2009	Takahashi et al.	
8,018,554	B2	9/2011	Fujita	
2003/0218593	A1 *	11/2003	Inoue et al.	345/92

(Continued)

FOREIGN PATENT DOCUMENTS

CN	1501317	A	6/2004
EP	1349141	A	10/2003

(Continued)

OTHER PUBLICATIONS

English translation of (JP 2002-149346, provided by applicant), Inventor Imayama Hirotaka, applicant Hitachi, title touch panel and picturer input-type display device and publication date May 2, 2002.*

(Continued)

Primary Examiner — Aneeta Yodichkas

Assistant Examiner — Saifeldin Elnafia

(74) *Attorney, Agent, or Firm* — Fish & Richardson P.C.

(57) **ABSTRACT**

To provide a display device including a touch sensor, in which input feeling can be obtained and deterioration of image quality is suppressed. The display device includes a touch sensor portion, a display panel, an elastic member, and a support. The touch sensor portion is provided over the display panel. The support is provided below the display panel. The elastic member is provided between the display panel and the support. The elastic member is provided in part of the periphery of a pixel region included in the display panel or in the entire periphery.

22 Claims, 11 Drawing Sheets

