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Flexible and stretchable circuits for smart wearables (Article)

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Abstract

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Flexible and stretchable circuits have recently gained traction in the market due to the popularity of wearables and the rapid advancement in microsensors, big data and the Internet of Everything. For devices to be truly wearable, they need to conform to the shape of the human body, allowing ease of use, with sensors being pervasive but not intrusive. To allow this, electronics engineers need to shift their mindsets of manufacturing transistors, circuits and sensors on rigid planar surfaces to flexible, multidimensional and free-form substrates. This review manuscript describes the motivation for designing such circuits, its fabrication techniques, design considerations, performance evaluation and applications. It is expected that stretchable circuits will be a new way forward for integrated circuit technology and will continue to push the boundaries of manufacturing processes in the years to come.

Author keywords

Flexible circuit Smart wearables Stretchable circuit

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References (19)

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- 1 Stoppa, M., Chiolerio, A.
Wearable electronics and smart textiles: A critical review
(2014) *Sensors (Switzerland)*, 14 (7), pp. 11957-11992. Cited 325 times.
<http://www.mdpi.com/1424-8220/14/7/11957/pdf>
doi: 10.3390/s140711957

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(2017) *IEEE Electron Device
Letters*

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<http://www.hindawi.com/journals/js/biblio.html>

doi: 10.1155/2016/9391850

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- 3 Jang, K.-I., Chung, H.U., Xu, S., Lee, C.H., Luan, H., Jeong, J., Cheng, H., (...), Rogers, J.A.
Soft network composite materials with deterministic and bio-inspired designs

(2015) *Nature Communications*, 6, art. no. 6566. Cited 76 times.

<http://www.nature.com/ncomms/index.html>

doi: 10.1038/ncomms7566

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- 4 Ma, Z.
An electronic second skin

(2011) *Science*, 333 (6044), pp. 830-831. Cited 37 times.

<http://www.sciencemag.org/content/333/6044/830.full.pdf>

doi: 10.1126/science.1209094

[View at Publisher](#)

- 5 Ochoa, M., Rahimi, R., Ziaie, B.
Flexible sensors for chronic wound management

(2014) *IEEE Reviews in Biomedical Engineering*, 7, art. no. 6690145, pp. 73-86. Cited 19 times.

doi: 10.1109/RBME.2013.2295817

[View at Publisher](#)

- 6 Hocheng, H., Chen, C.-M.
Design, fabrication and failure analysis of stretchable electrical routings

(2014) *Sensors (Switzerland)*, 14 (7), pp. 11855-11877. Cited 14 times.

<http://www.mdpi.com/1424-8220/14/7/11855/pdf>

doi: 10.3390/s140711855

[View at Publisher](#)

- 7 Rae, P.J., Dattelbaum, D.M.
The properties of poly(tetrafluoroethylene) (PTFE) in compression

(2004) *Polymer*, 45 (22), pp. 7615-7625. Cited 188 times.

doi: 10.1016/j.polymer.2004.08.064

[View at Publisher](#)

- 8 Ostmann, A., Viero, R., Seckel, M., Löher, T., Reichl, H.
Stretchable circuit board technology in textile applications

(2009) *IMPACT Conference 2009 International 3D IC Conference - Proceedings*, art. no. 5382138, pp. 216-219. Cited 6 times.

ISBN: 978-142444341-3

doi: 10.1109/IMPACT.2009.5382138

[View at Publisher](#)

- 9 Kim, K.-S., Jung, K.-H., Jung, S.-B.
Design and fabrication of screen-printed silver circuits for stretchable electronics
(2014) *Microelectronic Engineering*, 120, pp. 216-220. Cited 13 times.
doi: 10.1016/j.mee.2013.07.003
[View at Publisher](#)
-
- 10 Lin, H., Pan, K., Yang, F., Qin, Q.
Analysis of stress concentration phenomenon in stretchable interconnects
(2015) *2015 International Conference on Mechatronics, Electronic, Industrial and Control Engineering (MEIC-15)*
-
- 11 Kim, K.-S., Jung, K.-H., Jung, S.-B.
Design and fabrication of screen-printed silver circuits for stretchable electronics
(2014) *Microelectronic Engineering*, 120, pp. 216-220. Cited 13 times.
doi: 10.1016/j.mee.2013.07.003
[View at Publisher](#)
-
- 12 Zhu, Z., Liu, T., Li, G., Li, T., Inoue, Y.
Wearable sensor systems for infants
(2015) *Sensors (Switzerland)*, 15 (2), pp. 3721-3749. Cited 25 times.
<http://www.mdpi.com/1424-8220/15/2/3721/pdf>
doi: 10.3390/s150203721
[View at Publisher](#)
-
- 13 Shull, P.B., Jirattigalachote, W., Hunt, M.A., Cutkosky, M.R., Delp, S.L.
Quantified self and human movement: A review on the clinical impact of wearable sensing and feedback for gait analysis and intervention
(2014) *Gait and Posture*, 40 (1), pp. 11-19. Cited 85 times.
www.elsevier.com/locate/gaitpost
doi: 10.1016/j.gaitpost.2014.03.189
[View at Publisher](#)
-
- 14 *Real-Time Neuroimaging and Cognitive Monitoring Using Wearable Dry EEG - IEEE Xplore Document*
[Online]. Available: [Accessed: 27-May-2017]
<http://ieeexplore.ieee.org/abstract/document/7274673/>
-
- 15 Chen, W., Oetomo, S.B., Feijs, L., Bouwstra, S., Ayoola, I., Dols, S.
Design of an integrated sensor platform for vital sign monitoring of newborn infants at Neonatal Intensive Care Units
(2010) *Journal of Healthcare Engineering*, 1 (4), pp. 535-554. Cited 9 times.
<http://multi-science.metapress.com/content/k7293601393u5t63/fulltext.pdf>
doi: 10.1260/2040-2295.1.4.535
[View at Publisher](#)
-
- 16 Tao, W., Liu, T., Zheng, R., Feng, H.
Gait analysis using wearable sensors
(2012) *Sensors*, 12 (2), pp. 2255-2283. Cited 244 times.
<http://www.mdpi.com/1424-8220/12/2/2255/pdf>
doi: 10.3390/s120202255
[View at Publisher](#)
-

- 17 Tadano, S., Takeda, R., Sasaki, K., Fujisawa, T., Tohyama, H.
Gait characterization for osteoarthritis patients using wearable gait sensors (H-Gait systems)

(2016) *Journal of Biomechanics*, 49 (5), pp. 684-690. Cited 9 times.
www.elsevier.com/locate/jbiomech
doi: 10.1016/j.jbiomech.2016.01.017

[View at Publisher](#)

- 18 Lei, K.F., Lee, K.-F., Lee, M.-Y.
A flexible PDMS capacitive tactile sensor with adjustable measurement range for plantar pressure measurement

(2014) *Microsystem Technologies*, 20 (7), pp. 1351-1358. Cited 25 times.
<http://www.springerlink.com/content/0946-7076>
doi: 10.1007/s00542-013-1918-5

[View at Publisher](#)

- 19 Guo, R., Yu, Y., Zeng, J., Liu, X., Zhou, X., Niu, L., Gao, T., (...), Zheng, Z.
Biomimicking Topographic Elastomeric Petals (E-Petals) for Omnidirectional Stretchable and Printable Electronics

(2015) *Advanced Science*, 2 (3), art. no. 1400021. Cited 25 times.
[http://onlinelibrary.wiley.com/journal/10.1002/\(ISSN\)2198-3844](http://onlinelibrary.wiley.com/journal/10.1002/(ISSN)2198-3844)
doi: 10.1002/advs.201400021

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