

Accepted Manuscript

Regular paper

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PII: S1434-8411(17)30714-8
DOI: <http://dx.doi.org/10.1016/j.aeue.2017.06.014>
Reference: AEUE 51932

To appear in: *International Journal of Electronics and Communications*

Received Date: 28 March 2017

Accepted Date: 12 June 2017

Please cite this article as: P. Prommee, P. Thongdit, K. Angkeaw, Log-domain High-order Low-pass and Band-pass filters, *International Journal of Electronics and Communications* (2017), doi: <http://dx.doi.org/10.1016/j.aeue.2017.06.014>

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Log-domain High-order Low-pass and Band-pass filters

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Abstract

Continuous time current-mode high-order low-pass and band-pass filters based on the log-domain concept are presented in this paper. The passive RLC ladder networks are used as the prototype to achieve the proposed filter by simulating the RLC network synthesis method. The achieved filters have inherited the good sensitivity performance from the RLC passive prototype. Fifth-order RLC ladder low-pass filter and sixth-order RLC ladder band-pass filter are used as prototypes and the signal flow graph (SFG) technique is used for the synthesis. The SFG can identify group of integrators and several signal paths. Log-domain lossy and lossless integrators based on BJT technology are deployed to achieve the integrators for realization of proposed filters. The simulations were carried out and the results exhibited several features which are in agreement with the RLC prototype. The frequency response of filters along 100kHz to 10MHz can be electronically tuned through 5 μ A-500 μ A of bias currents. The THD lower than 1% of LP and BP filters were measured at 10MHz input. The multi-tone tested was included in the paper for verifying the performance of proposed LP and BP filters. The intermodulation distortions around -50dB and -60dB were also investigated for the proposed LP and BP filters.

Keywords : ladder filters; tunable; log-domain integrator; translinear; BJT

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