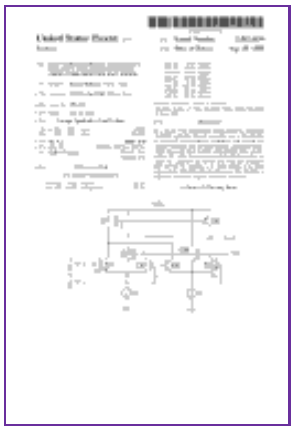
Low-voltage bipolar OTA having a linearity in transconductance over a wide input voltage range...

Katsuji Kimura

Patent summary



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Abstract | Drawing | Description | Claims

Abstract

In a bipolar OTA (operational transconductance amplifier) including a plurality of triple-tail cells, each of the plurality of triple-tail cells comprises a transistor pair of first and second transistors (Q1 and Q2) forming a differential input/output pair and a third transistor (Q3) applied with a control voltage (V.sub.C). The transistor pair and the third transistor are driven by a common tail current. The OTA has transistors (Q7 and Q8) for applying a dc offset voltage to an input signal of the differential input/output pair. The plurality of triple-tail cells have outputs connected in parallel.

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Inventor: Katsuji Kimura
Assignee: NEC Corporation

Current U.S. Classification
330/252; 330/254; 330/261

International Classification
H03F 345

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Citations

Patent Number	Title	Issue date
4723110	Transconductance amplifier	Feb 2, 1988
4951003	Differential transconductance circuit	Aug 21, 1990
5481224	Differential amplifier circuit having a driver with square	Jan 2, 1996

Claims

What is claimed is:

1. A bipolar OTA (operational transconductance amplifier) including a plurality of triple-tall cells each of which comprises a transistor pair of first and second transistors forming a differential input/output pair and a third transistor applied with a control voltage, said transistor pair and said third transistor being driven by a common tail current, said OTA comprising means for applying a dc offset voltage to an input signal of said differential input/output pair, said plurality of triple-tail cells having outputs connected in parallel.

2. A bipolar OTA as claimed in claim 1, wherein a current which flows through the third transistor of each of said plurality of triple-tail cells is distributed into two distributed currents which are equal to each other and which are added to a differential output current of each of said plurality of triple-tall cells.

3. A bipolar OTA (operational transconductance amplifier) including a quardri-tail cell which comprises a transistor pair of first and second transistors forming a differential input/output pair and third and fourth transistors applied with a control voltage in common, said transistor pair and said third and said fourth transistors being driven by a common tail current, said first and said third transistors having outputs which are connected to each other to form a first common output, said second and said fourth transistors having outputs which are connected to each other to form second common output which forms an output pair together with said first common output, wherein said first and said second transistors have emitters of a first common emitter area, said third and said fourth transistors have emitters of a second common emitter area which is equal to K (K being a positive number) times said first common emitter area, said control voltage V.sub.C being defined so as to become substantially equal to V.sub.T log.sub.e (K/2), where V.sub.T represents the thermal voltage (26 mV at room temperature).

4. A bipolar OTA (operational transconductance amplifier) including a plurality of triple-tail cells each of which comprises a transistor pair of first and second transistors forming a differential input/output pair and a third transistor applied with a control voltage, said transistor pair and said third transistor being driven by a common tail current, said plurality of triple-tail cells having outputs connected in parallel and inputs connected in parallel, the control voltages of the third transistors of said plurality of triple-tail cells being different from each other.

5. A bipolar OTA as claimed in claim 4, wherein a current which flows through the third transistor of each of said plurality of triple-tail cells is distributed into two distributed

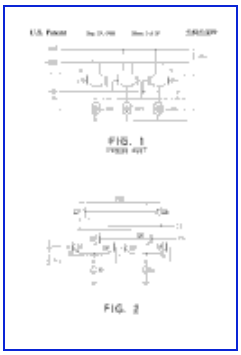
	driver with square-law characteristic	
5485119	MOS transconductance amplifier having squaring circuit for LSI implementation	Jan 16, 1996
5500623	Differential amplifier circuit with almost linear transconductance	Mar 19, 1996
5512855	Constant-current circuit operating in saturation region	Apr 30, 1996
5521542	Logarithmic amplifier circuit using triple-tail cells	May 28, 1996
5561392	Logarithmic amplifier employing cascaded full-wave rectifiers including emitter-coupled pairs with unbalanced emitter degeneration as logarithmic elements	Oct 1, 1996
5578965	Tunable operational transconductance amplifier and two-quadrant multiplier employing MOS transistors	Nov 26, 1996
5581211	Squaring circuit capable of widening a range of an input voltage	Dec 3, 1996

Referenced by

Patent Number	Title	Issue date
5903185	Hybrid differential pairs for flat transconductance	May 11, 1999
5942939	Amplifier and method of canceling distortion by combining hyperbolic tangent and hyperbolic sine transfer functions	Aug 24, 1999
6002291	Cubic type temperature function generator with adjustable parameters	Dec 14, 1999
6137362	Low noise and high	Oct 24, 2000

currents which are equal to each other and which are added to a differential output current of said plurality of triple-tail cells.

Drawings



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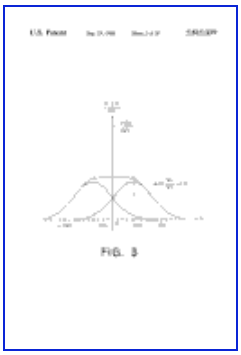

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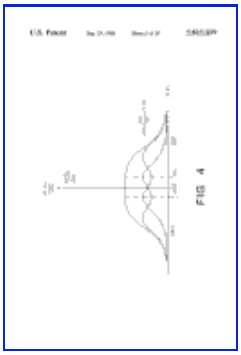

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	input dynamic range differential amplifier stage	
6710654	Bipolar class AB folded cascode operational amplifier for high-speed applications	Mar 23, 2004
6812771	Digitally-controlled, variable-gain mixer and amplifier structures	Nov 2, 2004
6867650	Variable gain amplifier circuit	Mar 15, 2005
6882223	Multi-band low noise amplifier	Apr 19, 2005