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.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.

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-tail cells.

3. A bipolar OTA (operational transconductance amplifier) including a quadri-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 a second common output which forms an output pair together with said first common output, wherein said first and said third 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.C being defined so as to become substantially equal to V.T log.e (K/2), where V.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...
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- **5581211**
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Referenced by

<table>
<thead>
<tr>
<th>Patent Number</th>
<th>Title</th>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>5903185</strong></td>
<td>Hybrid differential pairs for flat transconductance</td>
<td>May 11, 1999</td>
</tr>
<tr>
<td><strong>5942939</strong></td>
<td>Amplifier and method of canceling distortion by combining hyperbolic tangent and hyperbolic sine transfer functions</td>
<td>Aug 24, 1999</td>
</tr>
<tr>
<td><strong>6002291</strong></td>
<td>Cubic type temperature function generator with adjustable parameters</td>
<td>Dec 14, 1999</td>
</tr>
<tr>
<td><strong>6137362</strong></td>
<td>Low noise and high</td>
<td>Oct 24, 2000</td>
</tr>
<tr>
<td>Patent Number</td>
<td>Title</td>
<td>Date</td>
</tr>
<tr>
<td>---------------</td>
<td>-----------------------------------------------------------------------</td>
<td>-----------</td>
</tr>
<tr>
<td>6710654</td>
<td>Bipolar class AB folded cascode operational amplifier for high-speed applications</td>
<td>Mar 23, 2004</td>
</tr>
<tr>
<td>6812771</td>
<td>Digitally-controlled, variable-gain mixer and amplifier structures</td>
<td>Nov 2, 2004</td>
</tr>
<tr>
<td>6867650</td>
<td>Variable gain amplifier circuit</td>
<td>Mar 15, 2005</td>
</tr>
<tr>
<td>6882223</td>
<td>Multi-band low noise amplifier</td>
<td>Apr 19, 2005</td>
</tr>
</tbody>
</table>