CLAIMS

1. A circuit system for sensing a current of a distributed load circuit, comprising: a distribution network comprising a plurality of resistive paths; and a current sense circuit, comprising: a first distributed voltage averaging circuit, comprising: a plurality of resistive circuits, wherein each resistive circuit of the plurality of resistive circuits comprises: an input node configured to be electrically coupled to a path node of a corresponding resistive path of the plurality of resistive paths corresponding to the distribution network configured to distribute voltage from a corresponding voltage supply to a corresponding distributed load circuit; an output node; and the input nodes of the plurality of resistive circuits coupled to the path nodes of the corresponding resistive paths electrically independent of each other; and a first voltage output node electrically coupled to the output node of each resistive circuit of the first distributed voltage averaging circuit and having a first average voltage of the distributed load circuit; a second distributed voltage averaging circuit, comprising: a plurality of resistive circuits, wherein each resistive circuit of the plurality of resistive circuits comprises: an input node electrically coupled to a path node of a corresponding resistive path of the plurality of resistive paths corresponding to the distribution network; an output node; and the input nodes of the plurality of resistive circuits coupled to the path nodes of the corresponding resistive paths electrically independent of each other; and a second voltage output node electrically coupled to the output node of each resistive circuit of the second distributed voltage averaging circuit and having a second average voltage of the distributed load circuit; and an amplifier comprising: a first input node electrically coupled to the first voltage output node; a second input node electrically coupled to the second voltage output node; and an output node; the amplifier configured to: provide an output voltage on the output node of the amplifier proportional to a total current of the distributed load circuit; and have a gain that corresponds to an effective resistance of the plurality of resistive paths; wherein: the distribution network comprises a power plane; and each resistive path among the plurality of resistive paths comprises a resistive portion of the power plane.

2. The circuit system of claim 1, wherein: each resistive circuit among the plurality of

resistive circuits of the first distributed voltage averaging circuit further comprises at least one resistor; and each resistive circuit among the plurality of resistive circuits of the second distributed voltage averaging circuit further comprises at least one resistor.

3. The circuit system of claim 1, wherein: the distribution network further comprises the power plane disposed in a package; and each resistive path among the plurality of resistive paths further comprises a resistor disposed in the package.

4. The circuit system of claim 1, wherein: the distribution network further comprises: a package plane electrically coupled to the distributed load circuit; and a plurality of vertical interconnect accesses (vias) that interconnect the power plane and the package plane; and each resistive path among the plurality of resistive paths further comprises a via of the plurality of vias.

5. The circuit system of claim 1, wherein each resistive path among the plurality of resistive paths has a substantially equal resistance.

6. The circuit system of claim 1, wherein at least one resistive path among the plurality of resistive paths has a resistance that is neither equal nor substantially equal to a resistance of the remaining resistive paths.

7. The circuit system of claim 1, wherein: the input node of each resistive circuit of the first distributed voltage averaging circuit is electrically coupled to a node of a corresponding resistive path of the plurality of resistive paths; and the input node of each resistive circuit of the second distributed voltage averaging circuit is electrically coupled to another node of the corresponding resistive path of the plurality of resistive paths.

8. The circuit system of claim 1, wherein: the input node of each resistive circuit of the first distributed voltage averaging circuit is electrically coupled to a node of a corresponding resistive path of the plurality of resistive paths; and the input node of each resistive circuit of the second distributed voltage averaging circuit is electrically

coupled to a node of a corresponding resistive path of the plurality of resistive paths that is not electrically coupled to the first distributed voltage averaging circuit.

9. The circuit system of claim 1 integrated into an integrated circuit (IC).

10. The circuit system of claim 1 integrated into a device selected from the group consisting of: a set top box; an entertainment unit; a navigation device; a communications device; a fixed location data unit; a mobile location data unit; a global positioning system (GPS) device; a mobile phone; a cellular phone; a smart phone; a session initiation protocol (SIP) phone; a tablet; a phablet; a server; a computer; a portable computer; a mobile computing device; a wearable computing device; a desktop computer; a personal digital assistant (PDA); a monitor; a computer monitor; a television; a tuner; a radio; a satellite radio; a music player; a digital music player; a portable music player; a digital video player; a video player; a digital video disc (DVD) player; a portable digital video player; an automobile; a vehicle component; avionics systems; a drone; and a multicopter.

11. A circuit system for sensing a current of a distributed load circuit, comprising: a means for distributing voltage from a voltage supply to a distributed load circuit, comprising a plurality of resistive paths; a means for determining a first average voltage of a voltage at each of a plurality of first path nodes that are electrically independent of each other, wherein each first path node of the plurality of first path nodes corresponds to a resistive path of the plurality of resistive paths corresponding to the means for distributing voltage from the voltage supply to the distributed load circuit; a means for determining a second average voltage of a voltage at each of a plurality of second path nodes that are electrically independent of each other, wherein each second path node of the plurality of second path nodes corresponds to a resistive path of the plurality of resistive paths corresponding to the means for distributing voltage from the voltage supply to the distributed load circuit; and a means for providing an output voltage correlating to a difference of the first average voltage and the second average voltage, wherein the output voltage is proportional to a total current of the distributed load circuit, and the means for providing the output voltage correlating to the difference of

the first average voltage and the second average voltage has a gain corresponding to an effective resistance of the plurality of resistive paths; wherein: the means for distributing voltage from the voltage supply to the distributed load circuit further comprises a power plane; and each resistive path among the plurality of resistive paths comprises a resistive portion of the power plane.

12. The circuit system of claim 11, wherein: the means for distributing voltage from the voltage supply to the distributed load circuit further comprises the power plane disposed in a package; and each resistive path among the plurality of resistive paths comprises a resistor disposed in the package.

13. The circuit system of claim 11, wherein: the means for distributing voltage from the voltage supply to the distributed load circuit further comprises: a package plane electrically coupled to the distributed load circuit; and a plurality of vertical interconnect accesses (vias) that interconnect the power plane and the package plane; and each resistive path among the plurality of resistive paths comprises a via of the plurality of vias.

14. A method for sensing a current of a distributed load circuit independent of current distribution, comprising: determining a first average voltage of a voltage at each of a plurality of first path nodes that are electrically independent of each other, wherein each first path node of the plurality of first path nodes corresponds to a resistive path of a plurality of resistive paths corresponding to a distribution network configured to distribute voltage from a corresponding voltage supply to a corresponding distributed load circuit; determining a second average voltage of a voltage at each of a plurality of second path nodes that are electrically independent of each other, wherein each second path node of the plurality of second path nodes corresponds to a resistive path of the plurality of resistive paths corresponding to the distribution network; and providing an output voltage correlating to a difference of the first average voltage and the second average voltage, wherein the output voltage is proportional to a total current of the distributed load circuit, and the output voltage is based on an effective resistance of the plurality of resistive paths; wherein: determining the first average voltage comprises

determining the first average voltage corresponding to a plurality of resistive portions of a power plane of the distribution network; and determining the second average voltage comprises determining the second average voltage corresponding to the plurality of resistive portions of the power plane.

15. The method of claim 14, wherein: determining the first average voltage comprises determining the first average voltage corresponding to a plurality of resistors disposed in a package electrically coupled to the distribution network, wherein the distribution network comprises the power plane; and determining the second average voltage comprises determining the second average voltage corresponding to the plurality of resistors disposed in the package.

16. The method of claim 14, wherein: determining the first average voltage comprises determining the first average voltage corresponding to a plurality of vertical interconnect accesses (vias) that electrically couple the distribution network and the distributed load circuit, wherein the distribution network comprises the power plane; and determining the second average voltage comprises determining the second average voltage corresponding to the plurality of vias.

17. A circuit system, comprising: a package comprising a distribution network, wherein the distribution network comprises a plurality of resistive paths and is configured to distribute voltage from a corresponding voltage supply to a corresponding distributed load circuit; a semiconductor die comprising the distributed load circuit, wherein the distributed load circuit comprises a plurality of circuits; a circuit configured to sense a current of the distributed load circuit, comprising: a first distributed voltage averaging circuit, comprising: a plurality of resistive circuits, wherein each resistive circuit of the plurality of resistive circuits comprises: an input node electrically coupled to a path node of a corresponding resistive path; an output node; and the input nodes of the plurality of resistive circuits coupled to the path nodes of the corresponding resistive paths electrically independent of each other; and a first voltage output node electrically coupled to the output node of each resistive circuit of the first distributed voltage averaging circuit and having a first average voltage of the distributed load circuit; a

second distributed voltage averaging circuit, comprising: a plurality of resistive circuits, wherein each resistive circuit of the plurality of resistive circuits comprises: an input node electrically coupled to a path node of a corresponding resistive path; an output node; and the input nodes of the plurality of resistive circuits coupled to the path nodes of the corresponding resistive paths electrically independent of each other; and a second voltage output node electrically coupled to the output node of each resistive circuit of the second distributed voltage averaging circuit and having a second average voltage of the distributed load circuit; and an amplifier comprising: a first input node electrically coupled to the first voltage output node; a second input node electrically coupled to the second voltage output node; and an output node; the amplifier configured to provide an output voltage on the output node of the amplifier proportional to a total current of the distributed load circuit, wherein the amplifier has a gain that corresponds to an effective resistance of the plurality of resistive paths; an analog-to-digital converter comprising: an input node coupled to the output node of the amplifier; and an output node having a digital signal that is a digital representation of the output voltage; and a control circuit configured to: receive the digital signal; and responsive to the digital signal exceeding a defined threshold value, adjust one or more parameters of one or more circuits of the plurality of circuits of the distributed load circuit such that the total current is less than or equal to a maximum current level; wherein: the distribution network comprises a power plane; and each resistive path among the plurality of resistive paths comprises a resistive portion of the power plane.

18. The circuit system of claim 17, wherein: the distributed load circuit comprises a multiprocessor circuit; and each circuit of the one or more circuits comprises a processor core circuit disposed in the multiprocessor circuit.

19. The circuit system of claim 17, wherein: the distribution network comprises the power plane disposed in the package; and each resistive path among the plurality of resistive paths comprises a resistor disposed in the package.

20. The circuit system of claim 17, wherein: the distribution network comprises: a package plane electrically coupled to the distributed load circuit; and a plurality of

vertical interconnect accesses (vias) that interconnect the power plane and the package plane; and each resistive path among the plurality of resistive paths comprises a via of the plurality of vias.

21. The circuit system of claim 17, wherein: each resistive circuit among the plurality of resistive circuits of the first distributed voltage averaging circuit comprises at least one resistor; and each resistive circuit among the plurality of resistive circuits of the second distributed voltage averaging circuit comprises at least one resistor.

22. The circuit system of claim 17, wherein each resistive path among the plurality of resistive paths has a substantially equal resistance.

23. The circuit system of claim 17, wherein at least one resistive path among the plurality of resistive paths has a resistance that is neither equal nor substantially equal to a resistance of the remaining resistive paths.

24. The circuit system of claim 17, wherein: the input node of each resistive circuit of the first distributed voltage averaging circuit is electrically coupled to a node of a corresponding resistive path of the plurality of resistive paths; and the input node of each resistive circuit of the second distributed voltage averaging circuit is electrically coupled to another node of the corresponding resistive path of the plurality of resistive paths.

25. The circuit system of claim 17, wherein: the input node of each resistive circuit of the first distributed voltage averaging circuit is electrically coupled to a node of a corresponding resistive path of the plurality of resistive paths; and the input node of each resistive circuit of the second distributed voltage averaging circuit is electrically coupled to a node of a corresponding resistive path of the plurality of resistive paths that is not electrically coupled to the first distributed voltage averaging circuit.