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UNITED STATES DEPARTMENT OF COMMERCE
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APPLICATION NUMBER	PATENT NUMBER	GROUP ART UNIT	REQUEST ID
11/534,340	7535330	2832	182981

PAIR Correspondence Address/Fee Address Change

The following fields have been changed to Customer Number 22186 on 01/30/2023 via Private PAIR in view of the certification copied below that authorized the change.

- Maintenance Fee Address

The address for Customer Number 22186 is:
22186

MENDELSON DUNLEAVY, P.C.
1500 JOHN F. KENNEDY BLVD., SUITE 910
PHILADELPHIA, PA 19102

I certify, in accordance with 37 CFR 1.4(d)(4) that I am:

An attorney or Agent of Record registered to practice before the Patent and Trademark Office who has been given power of attorney in this application

Signature:	/Steve Mendelsohn/
Name:	Steve Mendelsohn
Registration Number:	35951

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 7,535,330 B2
APPLICATION NO. : 11/534340
DATED : May 19, 2009
INVENTOR(S) : Sean Christopher Erickson et al.

Page 1 of 1

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

In the Claims

Column 6, Lines 46-47 In Claim 17, replace “from a first inductor coil communicating a first cuffent in a first direction;” with --from a first inductor coil communicating a first current in a first direction;--.

Signed and Sealed this
Twenty-first Day of September, 2021



Drew Hirshfeld
*Performing the Functions and Duties of the
Under Secretary of Commerce for Intellectual Property and
Director of the United States Patent and Trademark Office*



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
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Alexandria, Virginia 22313-1450
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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
11/534,340	09/22/2006	Sean Christopher Erickson	LSI.174US01 (05-1991)

CONFIRMATION NO. 5804

POWER OF ATTORNEY NOTICE



OC000000127853995

84654
COCHRAN FREUND & YOUNG LLC
LSI CORPORATION
2026 CARIBOU DRIVE
SUITE 201
FORT COLLINS, CO 80525

Date Mailed: 08/20/2021

NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 08/17/2021.

- The Power of Attorney to you in this application has been revoked by the assignee who has intervened as provided by 37 CFR 3.71. Future correspondence will be mailed to the new address of record(37 CFR 1.33).

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at (571) 272-4000 or (571) 272-4200 or 1-888-786-0101.

/tmwilliams/



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
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Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
11/534,340	09/22/2006	Sean Christopher Erickson	LSI.174US01 (05-1991)

CONFIRMATION NO. 5804

POA ACCEPTANCE LETTER

22186
MENDELSON DUNLEAVY, P.C.
1500 JOHN F. KENNEDY BLVD., SUITE 910
PHILADELPHIA, PA 19102



Date Mailed: 08/20/2021

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 08/17/2021.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at (571) 272-4000 or (571) 272-4200 or 1-888-786-0101.

/tmwilliams/

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Re: Attorney Docket No. 1385.004

In re application of: Sean Christopher Erickson, et al.

Patent No.: 7,535,330
Issued: 05/19/2009

For: Low Mutual Inductance Matched Inductors

PETITION FOR CERTIFICATE OF CORRECTION

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

Enclosed is a Certificate of Correction listing an error that appears in the above-referenced patent. In the following, for ease of identification, the change corresponding to the correction is indicated by underlining.

In Claim 17, please replace "from a first inductor coil communicating a first cuffent in a first direction;" with -- from a first inductor coil communicating a first current in a first direction;--.

Support for the correct spelling is found on page 5 of the Response to Non-final Office Action that was filed on November 10, 2008.

Since the error appears to be made by the U.S. Patent and Trademark Office, no fee is believed to be due. However, the Commissioner is hereby authorized to charge payment of any fees required under 37 CFR §§ 1.20(a) associated with this communication or credit any overpayment to **Mendelsohn Dunleavy, P.C., Deposit Account No. 50-0782.**

Respectfully submitted,

Date: 08/17/2021
Customer No. 22186
Mendelsohn Dunleavy, P.C.
1500 John F. Kennedy Blvd., Suite 910
Philadelphia, Pennsylvania 19102

/Steve Mendelsohn/
Steve Mendelsohn
Registration No. 35,951
Attorney for Applicant
(215) 557-6657 (phone)
(215) 557-8477 (fax)

**UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION**Page 1 of 1

PATENT NO. : 7,535,330

APPLICATION NO.: 11/534,349

ISSUE DATE : 05/19/2009

INVENTOR(S) : Sean Christopher Erickson et al.

It is certified that an error appears or errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

In Claim 17, replace "from a first inductor coil communicating a first current in a first direction;" with --from a first inductor coil communicating a first current in a first direction;--.

MAILING ADDRESS OF SENDER (Please do not use Customer Number below):

Steve Mendelsohn

Mendelsohn Dunleavy, P.C.

1500 John F. Kennedy Blvd., Suite 910, Philadelphia, Pennsylvania 19102

This collection of information is required by 37 CFR 1.322, 1.323, and 1.324. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1.0 hour to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: **Attention Certificate of Corrections Branch, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Under the Paperwork Reduction Act of 1995 no persons are required to respond to a collection of information unless it displays a valid OMB control number

PATENT - POWER OF ATTORNEY OR REVOCATION OF POWER OF ATTORNEY WITH A NEW POWER OF ATTORNEY AND CHANGE OF CORRESPONDENCE ADDRESS	Patent Number	7,535,330
	Issue Date	05/19/2009
	First Named Inventor	Sean Christopher Erickson
	Title	LOW MUTUAL INDUCTANCE MATCHED INDUCTORS
	Attorney Docket No.	LSO.174US01 (05-1991)

I hereby revoke all previous powers of attorney given in the above-identified patent.

☐ A Power of Attorney is submitted herewith.

OR

☒ I hereby appoint Practitioner(s) associated with the Customer Number identified in the box at right as my/our attorney(s) or agent(s) with respect to the patent identified above, and to transact all business in the United States Patent and Trademark Office connected therewith:

22186

OR

☐ I hereby appoint Practitioner(s) named below as my/our attorney(s) or agent(s) with respect to the patent identified above, and to transact all business in the United States Patent and Trademark Office connected therewith:

Practitioner(s) Name	Registration Number

Please recognize or change the correspondence address for the above-identified patent to:

☒ The address associated with the above-identified Customer Number.

OR

☐ The address associated with the Customer Number identified in the box at right:

OR

☐ Firm or
☐ Individual Name
 Address

City

State

Zip

Country

Telephone

Email

I am the:

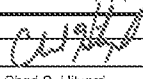
☐ Inventor, having ownership of the patent.

OR

☒ Patent owner.

Statement under 37 CFR 3.73(b) (Form PTO/SB/96) submitted herewith or filed on _____

SIGNATURE of Inventor or Patent Owner

Signature		Date	August 17, 2021
Name	Chad S. Hilyard	Telephone	
Title and Company	General Counsel		

NOTE: Signatures of all the inventors or patent owners of the entire interest or their representative(s) are required. If more than one signature is required, submit multiple forms, check the box below, and identify the total number of forms submitted in the blank below.

☒ A total of 1 forms are submitted.

This collection of information is required by 37 CFR 1.31, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public, which is to update (and by the USPTO to process) the file of a patent or reexamination proceeding. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 15 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

STATEMENT UNDER 37 CFR 3.73(b)

Applicant/Patent Owner: BELL SEMICONDUCTOR, LLC

Application No./Patent No.: 7,535,330

Filed/Issue Date: 05/19/2009

Titled: **LOW MUTUAL INDUCTANCE MATCHED INDUCTORS**

BELL SEMICONDUCTOR, LLC, a corporation

(Name of Assignee)

(Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that it is:

1. ☒ the assignee of the entire right, title, and interest in;
2. ☐ an assignee of less than the entire right, title, and interest in
(The extent (by percentage) of its ownership interest is _____ %); or
3. ☐ the assignee of an undivided interest in the entirety of (a complete assignment from one of the joint inventors was made)

the patent application/patent identified above, by virtue of either:

A. ☐ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel _____, Frame _____, or a copy* is attached.

OR

B. ☒ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

1. From: Inventors To: LSI LOGIC COPORATION

The document was recorded in the United States Patent and Trademark Office at
Reel 018352, Frame 0964, or a copy* is attached.

2. From: LSI LOGIC CORPORATION To: LSI CORPORATION

The document was recorded in the United States Patent and Trademark Office at
Reel 033102, Frame 0270, or a copy* is attached.

3. From: LSI CORPORATION To: AVAGO TECHNOLOGIES GENERAL IP (SINGAPORE) PTE. LTD.

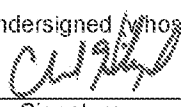
The document was recorded in the United States Patent and Trademark Office at
Reel 035058, Frame 0248, or a copy* is attached.

☒ Additional documents in the chain of title are listed on a supplemental sheet(s).

☒ *As required by 37 CFR 3.73(b)(1)(i), if a copy/copies is/are attached, the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (i.e., a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.


Signature

August 17, 2021
Date

Chad S. Hilyard

Printed or Typed Name

General Counsel

Title or Registration Number

This collection of information is required by 37 CFR 3.73(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

Statement Under 37 CFR 3.73(b) Attachment Sheet
Patent No. 7,535,330

A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

4. From: AVAGO TECHNOLOGIES GENERAL IP (SINGAPORE) PTE. LTD To: BELL SEMICONDUCTOR, LLC

The document was recorded in the United States Patent and Trademark Office at Reel 044886, Frame 0001

Electronic Acknowledgement Receipt

EFS ID:	43531582
Application Number:	11534340
International Application Number:	
Confirmation Number:	5804
Title of Invention:	LOW MUTUAL INDUCTANCE MATCHED INDUCTORS
First Named Inventor/Applicant Name:	Sean Christopher Erickson
Customer Number:	84654
Filer:	Steve Mendelsohn/Eri Yoneda
Filer Authorized By:	Steve Mendelsohn
Attorney Docket Number:	LSI.174US01 (05-1991)
Receipt Date:	17-AUG-2021
Filing Date:	22-SEP-2006
Time Stamp:	15:27:34
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Request for Certificate of Correction	1385-004_Petition_for_Certificate_of_Correction.pdf	134339 43058910617891e56687cad81e06a3b385ef4d64	no	2

Warnings:

Information:					
2	Power of Attorney	1385-004_POA81.pdf	141461	no	1
			12ba4b7fdc5f42f5ffe27b71dac5264187712f20		
Warnings:					
Information:					
3	Assignee showing of ownership per 37 CFR 3.73	1385-004_Statement_under_37_CFR_3_73b.pdf	185834	no	2
			033f626df6ed70dc9019ec238c2425ccc5676662		
Warnings:					
Information:					
Total Files Size (in bytes):			461634		
This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503. <u>New Applications Under 35 U.S.C. 111</u> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application. <u>National Stage of an International Application under 35 U.S.C. 371</u> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course. <u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.					

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CHANGE OF CORRESPONDENCE ADDRESS Application Address to: Commissioner for Patents P.O. Box 1450 Alexandria, VA 22313-1450	Application Number	11/534,340
	Filing Date	09/22/2006
	First Named Inventor	Sean Christopher Erickson
	Art Unit	2832
	Examiner Name	Tuyen T. Nguyen
	Attorney Docket Number	05-1991

Please change the Correspondence Address for the above-identified patent application to:

☒ The address associated with Customer Number: 84654

OR

☐ Firm or Individual Name

Address

City State Zip

Country

Telephone Email

This form cannot be used to change the data associated with a Customer Number. To change the data associated with an existing Customer Number use "Request for Customer Number Data Change" (PTO/SB/124).

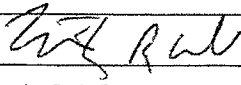
I am the:

☐ Applicant/Inventor

☐ Assignee of record of the entire interest. Statement under 37 CFR 3.73(b) is enclosed. (Form PTO/SB/96).

☒ Attorney or agent of record. Registration Number 36,771

☐ Registered practitioner named in the application transmittal letter in an application without an executed oath or declaration. See 37 CFR 1.33(a)(1). Registration Number _____

Signature 

Typed or Printed Name Timothy Croll, Reg. #36,771

Date 28 APRIL 2009 Telephone (408) 433-7625

NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. Submit multiple forms if more than one signature is required, see below*.

☒ *Total of 1 forms are submitted.

This collection of information is required by 37 CFR 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Electronic Acknowledgement Receipt

EFS ID:	5380328
Application Number:	11534340
International Application Number:	
Confirmation Number:	5804
Title of Invention:	LOW MUTUAL INDUCTANCE MATCHED INDUCTORS
First Named Inventor/Applicant Name:	Sean Christopher Erickson
Customer Number:	84654
Filer:	William Cochran/Pamela Calderwood
Filer Authorized By:	William Cochran
Attorney Docket Number:	LSI.174US01 (05-1991)
Receipt Date:	21-MAY-2009
Filing Date:	22-SEP-2006
Time Stamp:	18:36:04
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Change of Address	LSI174US01_Change_of_Address.pdf	62387 7d70a5ec2ebfb4b06ea2042486000ec69b3da594	no	1

Warnings:

Information:

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

**CHANGE OF
CORRESPONDENCE ADDRESS
Application**Address to:
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Application Number	11/534,340
Filing Date	09/22/2006
First Named Inventor	Sean Christopher Erickson
Art Unit	2832
Examiner Name	Tuyen T. Nguyen
Attorney Docket Number	05-1991

Please change the Correspondence Address for the above-identified patent application to:

☒ The address associated with
Customer Number:

84654

OR

☐ Firm or
Individual Name

Address

City

State

Zip

Country

Telephone

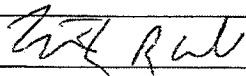
Email

This form cannot be used to change the data associated with a Customer Number. To change the data associated with an existing Customer Number use "Request for Customer Number Data Change" (PTO/SB/124).

I am the:

☐ Applicant/Inventor☐ Assignee of record of the entire interest.
Statement under 37 CFR 3.73(b) is enclosed. (Form PTO/SB/96).☒ Attorney or agent of record. Registration Number 36,771☐ Registered practitioner named in the application transmittal letter in an application without an executed oath or declaration. See 37 CFR 1.33(a)(1). Registration Number _____

Signature

Typed or Printed
Name

Timothy Croll, Reg. #36,771

Date

28 APRIL 2009

Telephone

(408) 433-7625

NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. Submit multiple forms if more than one signature is required, see below.

☒ *Total of 1 forms are submitted.

This collection of information is required by 37 CFR 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Electronic Acknowledgement Receipt

EFS ID:	5258877
Application Number:	11534340
International Application Number:	
Confirmation Number:	5804
Title of Invention:	LOW MUTUAL INDUCTANCE MATCHED INDUCTORS
First Named Inventor/Applicant Name:	Sean Christopher Erickson
Customer Number:	24319
Filer:	William Cochran/Pamela Calderwood
Filer Authorized By:	William Cochran
Attorney Docket Number:	05-1991
Receipt Date:	01-MAY-2009
Filing Date:	22-SEP-2006
Time Stamp:	12:57:47
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Change of Address	LSI174US01.pdf	62767 911cccf375e6fa7806df12f945b6b13d0015 cdb9	no	1

Warnings:

Information:

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/534,340	05/19/2009	7535330	05-1991	5804

24319 7590 04/29/2009
LSI CORPORATION
1621 BARBER LANE
MS: D-105
MILPITAS, CA 95035

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (application filed on or after May 29, 2000)

The Patent Term Adjustment is 265 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (<http://pair.uspto.gov>).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site <http://pair.uspto.gov> for additional applicants):

Sean Christopher Erickson, Fort Collins, CO;
Jason Dee Hudson, Eaton, CO;
Michael J. Saunders, Fort Collins, CO;

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: **Mail** Mail Stop ISSUE FEE
 Commissioner for Patents
 P.O. Box 1450
 Alexandria, Virginia 22313-1450
 or **Ex** (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

24319 7590 01/16/2009

LSI CORPORATION
 1621 BARBER LANE
 MS: D-105
 MILPITAS, CA 95035

04/08/2009 SSITHIB2 00000023 12252 11534340

01 FC:1501 1510.00 DA
 02 FC:1504 300.00 DA



Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

Peter Scott (Depositor's name)
 Peter P. Scott (Signature)
 4/7/2009 (Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/534,340	09/22/2006	Sean Christopher Erickson	05-1991	5804

TITLE OF INVENTION: LOW MUTUAL INDUCTANCE MATCHED INDUCTORS

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	\$1510	\$300	\$0	\$1810	04/16/2009

EXAMINER	ART UNIT	CLASS-SUBCLASS
NGUYEN, TUYEN T	2832	336-200000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

- ☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. Use of a Customer Number is required.

2. For printing on the patent front page, list

(1) the names of up to 3 registered patent attorneys or agents OR, alternatively,

(2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

North, Weber & Baugh

2

3

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

LSI Corporation Logic Corporation

Milpitas, California USA

Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☒ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:

- ☒ Issue Fee
☐ Publication Fee (No small entity discount permitted)
☐ Advance Order - # of Copies

4b. Payment of Fee(s): (Please first reapply any previously paid issue fee shown above)

- ☐ A check is enclosed.
☐ Payment by credit card. Form PTO-2038 is attached.
☐ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number 12-2252 (enclose an extra copy of this form).

5. Change in Entity Status (from status indicated above)

- ☐ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27. ☐ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature

Peter P. Scott

Date

4/7/2009

Typed or printed name

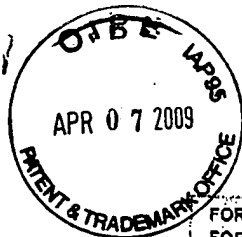
Peter Scott

Registration No.

33,279

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

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FORMTEXT LSI Corporation FORMTEXT 1621 Barber Lane FORMTEXT Milpitas, CA 95035	FORMTEXT 1.800.372.2447 FORMTEXT lsi.com
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FAX COVER SHEET

To:	Commissioner of Patents USPTO	From:	Peter Scott
Company:	LSI Corporation	Department:	Legal
Phone:	571-273-8300	Phone:	719-533-7989
Fax:	571-273-2885	Fax:	719-533-7955
Date:	April 7, 2009	# of Pages:	2 (including cover sheet)
Subject:	Issue Fee Payment - Docket Number: 05-1991		

Application No. 11/534,340
Box: Issue Fee and Publication Fee
PTO85B



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United States Patent and Trademark Office
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Alexandria, Virginia 22313-1450
www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

24319 7590 01/16/2009

LSI CORPORATION
1621 BARBER LANE
MS: D-105
MILPITAS, CA 95035

EXAMINER

NGUYEN, TUYEN T

ART UNIT

PAPER NUMBER

2832

DATE MAILED: 01/16/2009

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

11/534,340

09/22/2006

Sean Christopher Erickson

05-1991

5804

TITLE OF INVENTION: LOW MUTUAL INDUCTANCE MATCHED INDUCTORS

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	\$1510	\$300	\$0	\$1810	04/16/2009

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the SMALL ENTITY status shown above.

If the SMALL ENTITY is shown as YES, verify your current SMALL ENTITY status:

A. If the status is the same, pay the TOTAL FEE(S) DUE shown above.

B. If the status above is to be removed, check box 5b on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and twice the amount of the ISSUE FEE shown above, or

If the SMALL ENTITY is shown as NO:

A. Pay TOTAL FEE(S) DUE shown above, or

B. If applicant claimed SMALL ENTITY status before, or is now claiming SMALL ENTITY status, check box 5a on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and 1/2 the ISSUE FEE shown above.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

PART B - FEE(S) TRANSMITTAL

**Complete and send this form, together with applicable fee(s), to: Mail Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885**

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

24319 7590 01/16/2009

LSI CORPORATION
1621 BARBER LANE
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MILPITAS, CA 95035

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

11/534,340 09/22/2006 Sean Christopher Erickson 05-1991 5804

TITLE OF INVENTION: LOW MUTUAL INDUCTANCE MATCHED INDUCTORS

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
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nonprovisional NO \$1510 \$300 \$0 \$1810 04/16/2009

EXAMINER	ART UNIT	CLASS-SUBCLASS
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NGUYEN, TUYEN T 2832 336-200000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

- ☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
- ☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

- (1) the names of up to 3 registered patent attorneys or agents OR, alternatively, 1 _____
- (2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed. 2 _____
- 3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ☐ Individual ☐ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:

- ☐ Issue Fee
- ☐ Publication Fee (No small entity discount permitted)
- ☐ Advance Order - # of Copies _____

4b. Payment of Fee(s); (Please first reapply any previously paid issue fee shown above)

- ☐ A check is enclosed.
- ☐ Payment by credit card. Form PTO-2038 is attached.
- ☐ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. Change in Entity Status (from status indicated above)

- ☐ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27. ☐ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature _____

Date _____

Typed or printed name _____

Registration No. _____

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/534,340	09/22/2006	Sean Christopher Erickson	05-1991	5804

24319 7590 01/16/2009
LSI CORPORATION
1621 BARBER LANE
MS: D-105
MILPITAS, CA 95035

EXAMINER	
NGUYEN, TUYEN T	
ART UNIT	PAPER NUMBER
2832	
DATE MAILED: 01/16/2009	

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (application filed on or after May 29, 2000)

The Patent Term Adjustment to date is 265 day(s). If the issue fee is paid on the date that is three months after the mailing date of this notice and the patent issues on the Tuesday before the date that is 28 weeks (six and a half months) after the mailing date of this notice, the Patent Term Adjustment will be 265 day(s).

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (<http://pair.uspto.gov>).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

Notice of Allowability	Application No.	Applicant(s)	
	11/534,340	ERICKSON ET AL.	
	Examiner	Art Unit	
	TUYEN T. NGUYEN	2832	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to amendment filed 11/10/2008.
2. ☒ The allowed claim(s) is/are 1-20.
3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) ☐ All b) ☐ Some* c) ☐ None of the:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
 - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
 - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
 - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

- | | |
|--|--|
| 1. ☐ Notice of References Cited (PTO-892) | 5. ☐ Notice of Informal Patent Application |
| 2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) | 6. ☐ Interview Summary (PTO-413),
Paper No./Mail Date _____. |
| 3. ☐ Information Disclosure Statements (PTO/SB/08),
Paper No./Mail Date _____ | 7. ☐ Examiner's Amendment/Comment |
| 4. ☐ Examiner's Comment Regarding Requirement for Deposit
of Biological Material | 8. ☐ Examiner's Statement of Reasons for Allowance |
| | 9. ☐ Other _____. |

/TUYEN T NGUYEN/
Primary Examiner, Art Unit 2832

Search Notes

Application/Control No.

11/534,340

Examiner

TUYEN T. NGUYEN

Applicant(s)/Patent under
Reexamination

ERICKSON ET AL.

Art Unit

2832

SEARCHED

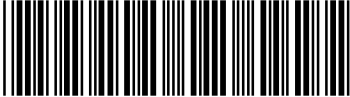
Class	Subclass	Date	Examiner
336	65, 83, 200, 223, 232	1/14/2009	TN
257	531	1/14/2009	TN

INTERFERENCE SEARCHED

Class	Subclass	Date	Examiner
same as above		1/14/2009	TN

**SEARCH NOTES
(INCLUDING SEARCH STRATEGY)**

	DATE	EXMR

Issue Classification 	Application/Control No. 11/534,340	Applicant(s)/Patent under Reexamination ERICKSON ET AL.	
	Examiner TUYEN T. NGUYEN	Art Unit 2832	

ISSUE CLASSIFICATION												
ORIGINAL					CROSS REFERENCE(S)							
CLASS		SUBCLASS			CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)						
336		200										
INTERNATIONAL CLASSIFICATION												
H	0	1	F	5/00								
				/								
				/								
				/								
				/								
NONE (Assistant Examiner) (Date)					/Tuyen T. Nguyen/ Primary Examiner 1/14/2009 (Primary Examiner) (Date)				Total Claims Allowed: 20			
(Legal Instruments Examiner) (Date)									O.G. Print Claim(s) 1	O.G. Print Fig. 4		

☒ Claims renumbered in the same order as presented by applicant												☐ CPA		☐ T.D.		☐ R.1.47	
Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original				
	1		31		61		91		121		151		181				
	2		32		62		92		122		152		182				
	3		33		63		93		123		153		183				
	4		34		64		94		124		154		184				
	5		35		65		95		125		155		185				
	6		36		66		96		126		156		186				
	7		37		67		97		127		157		187				
	8		38		68		98		128		158		188				
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	10		40		70		100		130		160		190				
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	28		58		88		118		148		178		208				
	29		59		89		119		149		179		209				
	30		60		90		120		150		180		210				



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BIB DATA SHEET

CONFIRMATION NO. 5804

SERIAL NUMBER 11/534,340	FILING or 371(c) DATE 09/22/2006 RULE	CLASS 164	GROUP ART UNIT 2832	ATTORNEY DOCKET NO. 05-1991		
APPLICANTS Sean Christopher Erickson, Fort Collins, CO; Jason Dee Hudson, Eaton, CO; Michael J. Saunders, Fort Collins, CO; ** CONTINUING DATA ***** ** FOREIGN APPLICATIONS ***** ** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ** 10/12/2006						
Foreign Priority claimed ☐ Yes ☒ No 35 USC 119(a-d) conditions met ☐ Yes ☒ No Verified and Acknowledged <u>/TUYEN T NGUYEN/</u> Examiner's Signature		☐ Met after Allowance TN Initials	STATE OR COUNTRY CO	SHEETS DRAWINGS 5	TOTAL CLAIMS 20	INDEPENDENT CLAIMS 3
ADDRESS LSI CORPORATION 1621 BARBER LANE MS: D-105 MILPITAS, CA 95035 UNITED STATES						
TITLE Low Mutual Inductance Matched Inductors						
FILING FEE RECEIVED 1000	FEES: Authority has been given in Paper No. _____ to charge/credit DEPOSIT ACCOUNT No. _____ for following:		☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit			

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appl. No. : 11/534,340 Confirmation No.: 5804
Applicant(s) : Sean Christopher Erickson, et al.
Filing Date : September 22, 2006
Title : Low Mutual Inductance Matched Inductors
Group Art Unit : 2832
Examiner : Anh T. Mai
Docket No. : 05-1991

MAIL STOP AMENDMENT
COMMISSIONER FOR PATENTS
P.O. BOX 1450
ALEXANDRIA, VA 22313-1450

November 10, 2008

CERTIFICATE OF MAILING (37 CFR §1.8)

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Dated: November 10, 2008

By: /Aimee S. Marth/
Aimee S. Marth

RESPONSE TO NON-FINAL OFFICE ACTION

Examiner Mai:

This paper is responsive to the Non-Final Office Action, mailed August 13, 2008, (hereinafter, the “Office Action”) having a shortened statutory response period expiring on November 13, 2008. Further examination is respectfully requested in view of the remarks set forth below.

Amendments to the Claims as reflected in the listing of claims which begins on page 2 of this paper.

Remarks/Arguments begin on page 7 of this paper.

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Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of the Claims:

1. (Original) A multiple inductor array comprising:
 - a first node that receives a first current and a second current;
 - a first inductor coil, coupled to the first node and to a second node, that
 - communicates the first current in a clockwise direction and generates a first magnetic field;
 - a second inductor coil, coupled to the first node and to a third node, that
 - communicates the second current in a counter clockwise direction and generates a second magnetic field having an opposing orientation to the first magnetic field; and

wherein the first magnetic field and the second magnetic field at least partially cancel at an interference point.
2. (Original) The array of claim 1 wherein the first inductor coil and the second inductor coil are spiral structures.
3. (Original) The array of claim 1 wherein the first inductor coil and the second inductor coil are octagonal structures.

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4. (Original) The array of claim 1 wherein a change in magnitude of the first magnetic field causes a change in magnitude of the second magnetic field.

5. (Original) The array of claim 1 wherein a change in magnitude of the second magnetic field causes a change in magnitude of the first magnetic field.

6. (Original) The array of claim 1 wherein the first and second currents flow within the same direction.

7. (Original) The array of claim 1 wherein the first and second currents flow in opposing directions.

8. (Original) The array of claim 1 wherein the magnitudes of the first and second currents are related so that a change in the first current causes a corresponding change in the second current in order to cause a reactionary interference cancellation.

9. (Original) The array of claim 1 further comprising a third inductor coil that generates a third magnetic field that cancels at least a portion of the first magnetic field.

10. (Original) The array of claim 1 further comprising a third inductor coil that generates a third magnetic field that cancels at least a portion of the second magnetic field.

11. (Currently Amended) A differential low noise amplifier comprising:
a voltage supply that generates a first current and a second current;

a first inductor coil, coupled to the voltage supply and to a first transistor, that communicates the first current in a first direction and generates a first magnetic field ~~oriented in a first direction~~;

a second inductor coil, coupled to the voltage supply, a second transistor, and in parallel with the first inductor coil, that communicates the second current in a second direction that is opposite to the first direction and generates a second magnetic field ~~oriented in a second direction that is opposite to the first direction~~ having an opposing orientation to the first magnetic field;

a first RLC section that is coupled to the first inductor coil;

a second RLC section that is coupled to the second inductor coil; and

an output that is coupled to the first inductor coil, the second inductor coil, the first transistor, and the second transistor.

12. (Original) The amplifier of claim 11 wherein a first polarity of the first inductor coil is opposite to a second polarity of the second inductor coil.

13. (Original) The amplifier of claim 11 wherein the first and second inductor coils are spiral structured.

14. (Original) The amplifier of claim 11 wherein the first and second inductor coils are octagonal structured.

15. (Original) The amplifier of claim 11 wherein a change in magnitude of the first magnetic field causes a change in magnitude of the second magnetic field.

16. (Original) The amplifier of claim 1 wherein a change in magnitude of the second magnetic field causes a change in magnitude of the first magnetic field.

17. (Currently Amended) A method for reducing the amount of parasitic mutual inductance between inductors, the method comprising:

generating a first magnetic field, from a first inductor coil communicating a first current in a first direction, ~~oriented in a first direction;~~

generating a second magnetic field, from a second inductor coil communicating a second current in a second direction that is opposite to the first direction, ~~oriented in a second direction that is opposite to the first direction~~ the second magnetic field having an opposing orientation to the first magnetic field; and

canceling at least a portion of the first and second magnetic fields by magnetic cancellation resulting from the opposing orientations of the first and second ~~directions~~ magnetic fields.

18. (Original) The method of claim 17 wherein the magnitude of the first and second magnetic fields are related such that a change in the first magnetic field result in a change in the second magnetic field.

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19. (Original) The method of claim 17 wherein the first and second magnetic coils are structured in an octagonal configuration.

20. (Original) The method of claim 17 wherein the first and second magnetic coils are structured in a spiral configuration.

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REMARKS/ARGUMENTS

Claims 1–20 were presented for examination. In the Office Action, claims 1-10 were allowed, claims 11-12, 15-16, 17-18, and 20 were rejected under 35 U.S.C. §102, and claims 13-14 and 19 were rejected under 35 U.S.C. §103. The Applicants hereby respectfully request reconsideration in light of amendments to the claims, and the below remarks, and respectfully request allowance of pending claims 11-20.

Allowable Subject Matter

The Office Action states that the references of record, U.S. Patent No. 7,256,646 B2, issued to Eid et al., (hereinafter, the “Eid reference” or “Eid”), U.S. Patent Application No. US 2005/0195061 A1, filed by Terrovitis et al., (hereinafter, the “Terrovitis reference” or “Terrovitis”), and U.S. Patent No. 6,798,326 B2, issued to Iida et al., (hereinafter, the “Iida reference” or “Iida”), do not teach or suggest the following element of claim 1:

a second inductor coil, coupled to the first node and to a third node, that communicates the second current in a counter clockwise direction and generates a second magnetic field having an opposing orientation to the first magnetic field

Therefore, the Office Action states that independent claim 1 and its dependent claims 2-10, which incorporate the limitations of claim 1, are allowable subject matter.

Rejection of Claims 11-12 and 15-16 under 35 USC §102(e)

The Examiner rejected Claims 11-12 and 15-16 under 35 U.S.C. §102(e) as being anticipated by the Eid reference. The Eid reference teaches the neutralization of

feedback gate-to-drain capacitance (Cgd) in a low-noise amplifier (LNA) circuit by providing a variable capacitor coupled between the control gate of an LNA's first input MOS transistor to the drain of the LNA's second input MOS transistor (Eid, col. 5, lines 59-63).

Claim 11 has been amended to more distinctly claim the invention. Newly amended independent claim 11 states:

11. A differential low noise amplifier comprising:
 - a voltage supply that generates a first current and a second current;
 - a first inductor coil, coupled to the voltage supply and to a first transistor, that communicates the first current in a first direction and generates a first magnetic field;
 - a second inductor coil, coupled to the voltage supply, a second transistor, and in parallel with the first inductor coil, that communicates the second current in a second direction that is opposite to the first direction and generates a second magnetic field having an opposing orientation to the first magnetic field;
 - a first RLC section that is coupled to the first inductor coil;
 - a second RLC section that is coupled to the second inductor coil; and
 - an output that is coupled to the first inductor coil, the second inductor coil, the first transistor, and the second transistor.

As previously discussed, the Office Action states that Eid does not teach or suggest a system comprising a second inductor coil that communicates a second current in a second direction that is opposite to a first direction of a first current in a first inductor coil, and that generates a second magnetic field having an opposing direction to the magnetic field of the first inductor coil.

Additionally, the Office Action asserts that Eid Figure 5 discloses the differential LNA claimed in claim 11. However, Eid Figure 5 is labeled "Prior Art" and is referenced in the Background section of the Eid reference only as an illustration

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of typical basic LNA circuits (Eid col. 3, lines 41-42 and col. 4, lines 50-54). Eid Figure 5 thus is prior art to the Eid reference and therefore cannot be the basis for an assertion that the Eid reference anticipates all of the elements of claim 11.

Based on the above discussion, the Applicants believe that the Eid reference does not teach every element in newly amended claim 11. Accordingly, the Applicants respectfully request that the Examiner withdraw his rejection of claim 11 and allow newly amended claim 11. Additionally, as dependent claims 12 and 15-16 incorporate the limitations of claim 11, the Applicants respectfully request that the rejections of these dependent claims be withdrawn and that these dependent claims are allowable over the Eid reference.

Rejection of Claims 17, 18, and 20 under 35 USC §102(b)

The Examiner rejected Claims 17, 18, and 20 under 35 U.S.C. §102(b) as being anticipated by the Terrovitis reference. The Terrovitis reference teaches a differential circuit layout that uses step symmetry for inductors and mirror symmetry for the rest of the circuit (Terrovitis ¶ 0014).

Claim 17 has been amended to more distinctly claim the invention. Newly amended independent claim 17 states:

17. A method for reducing the amount of parasitic mutual inductance between inductors, the method comprising:

- generating a first magnetic field, from a first inductor coil communicating a first current in a first direction;
- generating a second magnetic field, from a second inductor coil communicating a second current in a second direction that is opposite to the first direction, the second magnetic field having an opposing orientation to the first magnetic field; and

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canceling at least a portion of the first and second magnetic fields by magnetic cancellation resulting from the opposing orientations of the first and second magnetic fields.

As previously discussed, the Office Action states that Terrovitis does not teach or suggest a method comprising generating a second magnetic field from a second inductor coil that communicates a second current in a second direction that is opposite to a first direction of a first current in a first inductor coil, where the second magnetic field has an opposing direction to the magnetic field of the first inductor coil.

In light of the previous discussion, the Applicants believe that the Terrovitis reference does not teach every element in newly amended claim 17. Accordingly, the Applicants respectfully request that the Examiner withdraw his rejection of claim 17 and allow newly amended claim 17. Additionally, as dependent claims 18 and 20 incorporate the limitations of claim 17, the Applicants respectfully request that the rejections of these dependent claims be withdrawn and that these dependent claims are allowable over the Terrovitis reference.

Rejection of Claims 13-14 under 35 USC §103(a)

The Examiner rejected claims 13-14 under 35 U.S.C. §103(a) as being unpatentable over the Eid reference in view of the Iida reference. The Iida reference teaches an inductor element comprising a plurality of conductors having a mutually parallel relationship, and that are helically wound within a plane on a surface of a substrate. This type of inductor element facilitates high-frequency current of an identical phase to flow through the plurality of conductors (Iida, col. 2, lines 18-24).

Claims 13-14 are dependent on claim 11 and thus incorporate all of the limitations of claim 11. As previously discussed, the Eid reference does not teach all of the elements of newly amended claim 11 because it does not teach or suggest a system comprising a second inductor coil that communicates a second current in a second direction that is opposite to a first direction of a first current in a first inductor

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coil, and that generates a second magnetic field having an opposing direction to the magnetic field of the first inductor coil.

The Iida reference discloses an inductor **element**, and teaches that this inductor **element** "...is suitable for application to an integrated circuit" (Iida, col. 2, lines 38-40). The Iida reference does not teach or suggest a system comprising a first inductor and a second inductor. Additionally, it would be improper to combine the Iida reference and the Eid reference since the Eid reference discloses neutralization techniques applied to a differential LNA comprising a plurality of **inductors**, while the Iida reference discloses a type of inductor element comprising a plurality of **conductors**.

In light of this discussion, the Applicants believe that independent claim 11 is both novel and non-obvious in light of the combination of Eid and Iida, and that the Examiner improperly combined the Eid reference and the Iida reference. Accordingly, the Applicants believe that claims 13-14 are novel and unobvious in light of the combination of Eid and Iida, and respectfully request that the Examiner withdraw his rejections and allow claims 13-14.

Rejection of Claim 19 under 35 USC §103(a)

The Examiner rejected claim 19 under 35 U.S.C. §103(a) as being unpatentable over the Terrovitis reference in view of the Iida reference.

Claim 19 is dependent on claim 17 and thus incorporates all of the limitations of claim 17. As previously discussed, the Terrovitis reference does not teach all of the elements of newly amended claim 17 because it does not teach or suggest a system comprising a second inductor coil that communicates a second current in a second direction that is opposite to a first direction of a first current in a first inductor coil, and that generates a second magnetic field having an opposing direction to the magnetic field of the first inductor coil.

As previously discussed, the Iida reference does not teach or suggest a system comprising a first inductor and a second inductor. Additionally, it would be improper

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to combine the Iida reference and the Terrovitis reference since the Terrovitis reference discloses a circuit layout comprising a plurality of **inductors**, while the Iida reference discloses a type of inductor element comprising a plurality of **conductors**.

In light of this discussion, the Applicants believe that independent claim 17 is both novel and non-obvious in light of the combination of Terrovitis and Iida, and that the Examiner improperly combined the Terrovitis reference and the Iida reference. Accordingly, the Applicants believe that claim 19 is novel and unobvious in light of the combination of Terrovitis and Iida, and respectfully request that the Examiner withdraw his rejection and allow claim 19.

CONCLUSION

In view of the above arguments, the Applicants believe that pending claims 11-20 are allowable, and respectfully request a Notice of Allowance for this application from the Examiner.

If any fees are due in connection with the filing of this amendment, the Commissioner is authorized to charge such fees to Deposit Account 502776.

Respectfully submitted,
NORTH WEBER & BAUGH LLP

Date: November 10, 2008

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Electronic Acknowledgement Receipt

EFS ID:	4264487
Application Number:	11534340
International Application Number:	
Confirmation Number:	5804
Title of Invention:	Low Mutual Inductance Matched Inductors
First Named Inventor/Applicant Name:	Sean Christopher Erickson
Customer Number:	24319
Filer:	Sheri Lynn Gish/Aimee Marth
Filer Authorized By:	Sheri Lynn Gish
Attorney Docket Number:	05-1991
Receipt Date:	10-NOV-2008
Filing Date:	22-SEP-2006
Time Stamp:	18:23:41
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		05_1991_OA_Response.pdf	59894 8c2c8410826d5777f98bfc575554bf1090297052	yes	12

	Multipart Description/PDF files in .zip description		
	Document Description	Start	End
	Amendment/Req. Reconsideration-After Non-Final Reject	1	1
	Claims	2	6
	Applicant Arguments/Remarks Made in an Amendment	7	12
Warnings:			
Information:			
Total Files Size (in bytes):		59894	
This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503. <u>New Applications Under 35 U.S.C. 111</u> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application. <u>National Stage of an International Application under 35 U.S.C. 371</u> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course. <u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.			

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875					Application or Docket Number 11/534,340		Filing Date 09/22/2006		☐ To be Mailed	
APPLICATION AS FILED – PART I										
(Column 1)			(Column 2)			SMALL ENTITY ☐ OR		OTHER THAN SMALL ENTITY		
FOR	NUMBER FILED	NUMBER EXTRA	RATE (\$)	FEE (\$)		RATE (\$)	FEE (\$)			
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A				
☐ SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	N/A	N/A			N/A				
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A				
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X \$	=		X \$	=			
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X \$	=		X \$	=			
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$250 (\$125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).									
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))										
* If the difference in column 1 is less than zero, enter "0" in column 2.										
APPLICATION AS AMENDED – PART II										
(Column 1)			(Column 2)			SMALL ENTITY OR		OTHER THAN SMALL ENTITY		
AMENDMENT	11/10/2008	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)		RATE (\$)	ADDITIONAL FEE (\$)	
Total (37 CFR 1.16(i))	* 20	Minus	** 20	= 0	X \$	=		X \$52=	0	
Independent (37 CFR 1.16(h))	* 3	Minus	*** 3	= 0	X \$	=		X \$220=	0	
☐ Application Size Fee (37 CFR 1.16(s))										
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))										
					TOTAL ADD'L FEE			TOTAL ADD'L FEE	0	
(Column 1)			(Column 2)			SMALL ENTITY OR		OTHER THAN SMALL ENTITY		
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)		RATE (\$)	ADDITIONAL FEE (\$)	
Total (37 CFR 1.16(i))	*	Minus	**	=	X \$	=		X \$	=	
Independent (37 CFR 1.16(h))	*	Minus	***	=	X \$	=		X \$	=	
☐ Application Size Fee (37 CFR 1.16(s))										
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))										
					TOTAL ADD'L FEE			TOTAL ADD'L FEE		
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3. ** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20". *** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3". The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.										

Legal Instrument Examiner:
/YOLANDA MIDDLETON/

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.



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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/534,340	09/22/2006	Sean Christopher Erickson	05-1991	5804
24319	7590	08/13/2008		
LSI CORPORATION 1621 BARBER LANE MS: D-105 MILPITAS, CA 95035			EXAMINER MAI, ANH T	
			ART UNIT 2832	PAPER NUMBER
			MAIL DATE 08/13/2008	DELIVERY MODE PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 11/534,340	Applicant(s) ERICKSON ET AL.	
	Examiner Anh T. Mai	Art Unit 2832	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 1-10 is/are allowed.
- 6) ☒ Claim(s) 11-20 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) ☒ Notice of References Cited (PTO-892) | 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____. |
| 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) ☐ Notice of Informal Patent Application |
| 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date ____. | 6) ☐ Other: ____. |

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 11-12, 15-16 rejected under 35 U.S.C. 102(e) as being anticipated by Eid et al. [7256646].

Eid discloses:

- a voltage supply V_{cc} ;
- a first inductor coil L_d , coupled to the voltage supply and to a first transistor 11, that generates a first magnetic field oriented in a first direction;
- a second inductor coil L_d' , coupled to the voltage supply, a second transistor 11', and in parallel with the first inductor coil as seen in figure 5, that generates a second magnetic field oriented in a second direction that is opposite to the first direction;
- a first RLC section [L_g , C_p , R_S] that is coupled to the first inductor coil;
- a second RLC section [L_g' , C_p' , R_S'] that is coupled to the second inductor coil;
- an output V_{out} that is coupled to the first inductor coil, the second inductor coil, the first transistor, and the second transistor, see fig 5.
- the polarity of first inductor coil is opposite to second inductor coil.

Art Unit: 2832

With respect to limitation “that generates a first magnetic field oriented in a first/second direction” is rejected for reciting an inherent operational characteristics derived from the above structure, in this case (i.e., inductor coil coupled to the voltage supply and a transistor 11’). Claims 15-16 are rejected for an inherent operational characteristics derived from the above structure.

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 17, 18, 20 are rejected under 35 U.S.C. 102(b) as being anticipated by Terrovitis [2005/0195061].

Terrovitis discloses:

- generating a first magnetic field, from a first inductor coil, oriented in a first direction;
- generating a second magnetic field, from a second inductor coil, oriented in a second direction that is opposite to the first direction;
- canceling at least a portion of the first and second magnetic fields by magnetic cancellation resulting from the opposing orientations of the first and second directions [see paragraphs 0010, 0011].

With respect to claim 18, it is inherently that a change in first magnetic field results in a change in second magnetic field because they are cancelling each other as discloses in paragraphs [0010, 0011] of Terrovitis.

With respect to claim 20, both inductors 401 having spiral strutures.

Art Unit: 2832

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 13-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Eid et al in view of lida [6798326].

Eid discloses the invention as claimed as cited above except for the inductor is in spiral/octagonal structures. lida discloses an inductor with spiral/octagonal structures as shown in figures 8-10. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to use the spiral/octagonal shape as taught by lida to the inductors as disclosed by Eid. The motivation would have been to provide different configurations of the coil structure. Therefore, it would have been obvious to combine lida with Eid.

7. Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Terrivitis in view of lida.

Terrivitis discloses the invention as claimed as cited above except for the inductor is in octagonal structures. lida discloses an inductor with octagonal structures as shown in figures 8-10. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to use the octagonal shape as taught by lida to the inductors as disclosed by Terrivitis. The motivation would have been to provide different configurations of the coil structure. Therefore, it would have been obvious to combine Terrivitis with Eid.

Art Unit: 2832

Allowable Subject Matter

8. Claims 1-10 are allowed.

Claim 1 recites inter alia, *a second inductor coil, coupled to the first node and to a third node, that communicates the second current in a counter clockwise direction and generates a second magnetic field having an opposing orientation to the first magnetic field.*

The references of record do not teach or suggest the aforementioned limitation, nor would it be obvious to modify those references to include such limitation.

Conclusion

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. See PTO-892 form.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anh T. Mai whose telephone number is 571-272-1995. The examiner can normally be reached on 5/4/9 Schedule.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Elvin Enad can be reached on 571-272-1990. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 2832

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Anh T. Mai/
Primary Examiner, Art Unit 2832

080808

Notice of References Cited	Application/Control No. 11/534,340		Applicant(s)/Patent Under Reexamination ERICKSON ET AL.	
	Examiner Anh T. Mai		Art Unit 2832	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-7,256,646	08-2007	Eid et al.	327/563
*	B	US-6,882,263	04-2005	Yang et al.	336/200
*	C	US-6,577,219	06-2003	Visser, Hendrik Arend	336/200
*	D	US-6,798,326	09-2004	Iida, Sachio	336/200
*	E	US-7,057,488	06-2006	Van Haaren et al.	336/200
*	F	US-7,068,140	06-2006	Chou, Ya-Wei	336/200
*	G	US-7,151,430	12-2006	Mattsson, Thomas	336/200
*	H	US-2005/0195061	09-2005	Terrovitis, Manolis	336/200
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

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*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
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	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Search Notes 	Application/Control No. 11534340	Applicant(s)/Patent Under Reexamination ERICKSON ET AL.
	Examiner Anh T Mai	Art Unit 2832

SEARCHED			
Class	Subclass	Date	Examiner
336	200,223,232	8/8/08	am
333	/181,167,185,24R	8/8/08	am

SEARCH NOTES		
Search Notes	Date	Examiner
Text search only; search history printout	8/8/08	am

INTERFERENCE SEARCH			
Class	Subclass	Date	Examiner

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EAST Search History

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	288	("0243308") or ("5321373") or ("4796687") or ("20060038621") or ("5754667") or ("5757623") or ("20020080002") or ("5635892") or ("6072383") or ("20060282492") or ("5917860") or ("4494167") or ("5426350") or ("5461351") or ("6137390") or ("6249205") or ("4491819") or ("4965509") or ("4999594") or ("5313176") or ("5319343") or ("5420586") or ("5610433") or ("6002319") or ("6037649") or ("6169397") or ("6194987") or ("6218773") or ("6218773") or ("6448873") or ("6642672") or ("20020140524") or ("20020195973") or ("4489286") or ("20050197677") or ("20070045773") or ("4818960") or ("5231078") or ("5243289") or ("5450052") or ("5530415") or ("5538196") or ("5696471") or ("5793272") or ("5884990") or ("6054329") or ("6114937") or ("6114930") or ("6124624") or ("6498325") or ("6980075") or ("7019593") or ("7193869") or ("20040100349") or ("20050140456") or ("20060139971") or ("20060181362") or ("4281263") or ("4321958") or ("4518840") or ("5745838") or ("6380836") or ("4416365") or ("4613841") or ("4129846") or ("4450890") or ("4452297") or ("5350980") or ("5534837") or ("5545916") or ("4347489") or ("4393157") or ("4779070") or ("4978922") or ("4989989") or ("4996472") or ("5392018") or ("5414401") or ("5543773") or ("5572170") or ("5574410") or ("5760456") or ("6222363") or ("6222363") or ("6539083") or ("7005954") or ("7221251") or ("7271690") or ("20050122195") or ("20060080829") or ("20060214760") or ("4092509") or ("4274133") or ("4328538") or ("4612455") or ("4937540") or ("5345150") or ("5389857") or ("5426409") or ("5666047") or	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/08/08 10:40

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L4	7393	(spiral conductor metal winding) with (terminal end node) AND "336"/\$.ccls.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/08/08 11:07
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L6	7695	(magnetic adj field) with cancel \$4	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/08/08 11:08
L7	93	5 and 6	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/08/08 11:08

L8	3308	(336/200,223,232).CCLS.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/08/08 11:16
L9	59	6 and 8	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/08/08 11:16
L10	1610	(spiral conductor metal winding) with (terminal end node) AND 8	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/08/08 11:19
L11	1528	10 and @ad <= "20060922"	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/08/08 11:20
L12	21087	low adj noise adj amplifier	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/08/08 12:03
L13	69	8 and 12	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/08/08 12:03
L14	2792	(333/181,167,185,24r).CCLS.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/08/08 12:04
L16	49	12 and 14	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/08/08 12:04
L17	309	dlna	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/08/08 12:07
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L21	18	12 and (field near cancel\$5)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/08/08 13:55
L22	31	12 and (field near cancel\$6)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/08/08 13:56
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L25	409	12 and transistor and (magnetic adj field)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/08/08 14:01
L26	8	12 and transistor and (magnetic adj field) and (rcl rlc)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/08/08 14:15
L27	56	12 and transistor and (rcl rlc) and inductor	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/08/08 14:24
L28	6	("20040232982" "6624699" "6819182" "7082293").PN. OR ("7256646").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2008/08/08 14:46
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L31	2267	(parasitic near inductance) with (reduc\$3 decreas\$3 minimiz\$3)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/08/08 15:53

L32	28	30 and 31	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/08/08 15:54
L33	914	(field near cancel\$5) with (inductor coil conductor)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/08/08 15:55
L34	1	31 and 33	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/08/08 15:56
L35	11	31 and 14	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/08/08 15:56
L36	12	31 and 8	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/08/08 15:59
L37	7702	(magnetic adj field) with cancel \$5	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/08/08 16:03
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L39	25	37 and 14	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/08/08 16:03
L40	3068	((333/181,167,24r,185) or (455/311)).CCLS.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/08/08 16:41

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APPLICATION NUMBER	FILING OR 371(c) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
11/534,340	09/22/2006	Sean Christopher Erickson	05-1991

CONFIRMATION NO. 5804

24319
LSI CORPORATION
1621 BARBER LANE
MS: D-106
MILPITAS, CA95035

Title: Low Mutual Inductance Matched Inductors

Publication No. US-2008-0074228-A1

Publication Date: 03/27/2008

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

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Pre-Grant Publication Division, 703-605-4283

PLUS Search Results for S/N 11534340, Searched Thu Feb 21 11:38:25 EST 2008
 The Patent Linguistics Utility System (PLUS) is a USPTO automated search system for U.S. Patents from 1971 to the present PLUS is a query-by-example search system which produces a list of patents that are most closely related linguistically to the application searched. This search was prepared by the staff of the Scientific and Technical Information Center, SIRA.

5243308 93	6498325 77	5426409 76
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PLUS Search Results for S/N 11534340, Searched Thu Feb 21 13:18:33 EST 2008
 The Patent Linguistics Utility System (PLUS) is a USPTO automated search system for U.S. Patents from 1971 to the present PLUS is a query-by-example search system which produces a list of patents that are most closely related linguistically to the application searched. This search was prepared by the staff of the Scientific and Technical Information Center, SIRA.

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5450263 69
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LOW MUTUAL INDUCTANCE MATCHED INDUCTORS

INVENTORS

Sean Christopher Erickson

Jason Dee Hudson

Michael J. Saunders

BACKGROUND

A. Technical Field

[0001] This invention relates generally to electro-magnetic induction and interference, and more particularly, to the design of inductor coil elements within a semiconductor device.

B. Background of the Invention

[0002] Technological advancements in semiconductor manufacturing and electronic circuit design have resulted in a continual increase of component density within electrical circuits. These improvements in component density have resulted in a more efficient use of silicon area within the chip and a lower cost of production for each chip.

[0003] As the proximity of electrical components increases, the affects of electrical cross-coupling or crosstalk may significantly degrade the performance of the circuit. The impact of electrical cross-coupling is a more significant issue in circuits that are operating at high frequencies. Oftentimes, these high speed circuits need to be specifically designed to address

interference and cross-coupling in order to comply with electro-magnetic compatibility (“EMC”) requirements.

[0004] The design and placement of electrical components, such as inductors, within a circuit may significantly affect the electro-magnetic emission from a circuit and the cross-coupling therein. For example, inductors that are sufficiently proximate to each other may reduce the electrical performance of each other through parasitic mutual inductance. In particular, inductor coils produce external magnetic fields that can modify electrical characteristics, such as voltage or current responses, of other inductor coils. In order to reduce the amount of inductor cross-coupling, circuit designers have been forced to provide a sufficient distance between inductor coils so that electro-magnetic interference between the coils is reduced.

[0005] Figure 1 illustrates this electro-magnetic interaction between two proximate inductor coils. As shown, a first inductor L_1 **102** and a second inductor L_2 **104** are located sufficiently close to each other so that cross-coupling occurs. The polarity of the inductors, L_1 **102** and L_2 **104**, are shown such that the polarities are symmetrical and current is flowing through the inductors in the same direction. In particular, current I_1 **112** in the first inductor L_1 **102** is flowing in the same direction or substantially similar direction as current I_2 **114** flowing in the second inductor L_2 **104**.

[0006] The magnetic field produced in the first inductor L_1 **102** interferes with the magnetic field produced in the second inductor L_2 **104** resulting in magnetic field interference between the two inductors. This interference may be constructive resulting in larger magnitude magnetic fields. As a result of this interference, the first current I_1 **112** in the first inductor L_1 **102** and the second current I_2 **114** in the second inductor L_2 **104** are undesirably affected by the

interference. As one of the currents changes, the electro-magnetic fields change and affect the other current accordingly.

[0007] Circuits having multiple inductors must properly address this electro-magnetic interference, or cross-coupling, so that the circuit functions consistently and properly. Figure 2 illustrates an exemplary differential low noise amplifier (“DLNA”) in which inductor interference can potentially be an issue. Inductors L_{d1} **202** and L_{d2} **204** are required to be separated by a minimum distance within the semiconductor so that interference falls within a tolerable range. Inductors in series may also be affected by each other when in close proximity. Source inductors L_{s1} **207a** and L_{s2} **207b** share common node and are therefore required to be kept close to the differential FET **209a** and **209b**. Such restriction makes the placement of the inductors difficult to implement on chip.

[0008] One skilled in the art will recognize that the circuit design, including the inductor values and location within the semiconductor, is designed in accordance with a “far resonance” configuration. Other design configurations may also be employed to sufficiently reduce inductor parasitic cross inductance between components therein. These constraints may reduce the component density within circuits as well as present constraints in the design and implementation of various circuits.

SUMMARY OF THE INVENTION

[0009] Multiple inductor structures and methods for providing low mutual inductance between the inductors are described. In various embodiments of the invention, the polarities of the inductors are positioned such that parasitic mutual inductance is reduced by causing electro-magnetic fields to at least partially cancel resulting in a reduction in interference between the inductors. In particular, the polarities of the magnetic fields produced by each inductor are opposite to each other so that at least a partial cancellation results when the fields interfere with each other.

[0010] The inductor design may be implemented in numerous different circuits in which multiple inductors may be located proximate to each other. The field cancellation that occurs at interference points results in a reduction in parasitic mutual induction and a reduction in crosstalk between the inductors. According to various embodiments of the invention, a first inductor is wound in a first direction, creating an inductor coil having an associated polarity. A second inductor is counter wound, relative to the first inductor, creating another inductor coil having a relatively opposite polarity.

[0011] These inductors may have a common node from which the coils begin. Magnetic field cancellation occurs as a result of the oppositely oriented magnetic fields created by the inductor coils. The inductors may be provided in various forms such as conventional octagonal and conventional spiral structures. The number of inductors may vary depending on the circuit in which the present invention is implemented.

[0012] Because the invention minimizes the crosstalk between inductors placed in close proximity to each other, the overall chip geometry may be reduced and component density improved. In implementations such as a DLNA, the counter wound inductor design having a

common node may be utilized. These implementations help in maintaining the reliability of the circuit and components therein.

[0013] Other objects, features and advantages of the invention will be apparent from the drawings, and from the detailed description that follows below.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] Reference will be made to embodiments of the invention, examples of which may be illustrated in the accompanying figures. These figures are intended to be illustrative, not limiting. Although the invention is generally described in the context of these embodiments, it should be understood that it is not intended to limit the scope of the invention to these particular embodiments.

[0015] Figure (“Fig.”) 1 is a general block diagram illustrating mutual inductance caused between inductors.

[0016] Fig. 2 illustrates a schematic diagram of a differential low noise amplifier (“DLNA”).

[0017] Figs. 3a and 3b illustrate a schematic diagram of inductor design according to various embodiments of the invention.

[0018] Fig. 4 shows a conventional spiral inductor design according to various embodiments of the invention.

[0019] Fig. 5 shows an octagonal spiral inductor design according to various embodiments of the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0020] Multiple inductor structures and methods for providing low mutual inductance between the inductors are described. In various embodiments of the invention, the polarities of the inductors are positioned such that parasitic mutual inductance is reduced by causing electro-magnetic fields to at least partially cancel resulting in a reduction in interference between the inductors. The polarities of the magnetic fields produced by each inductor are opposite to each other so that at least a partial cancellation results when the fields interfere with each other. In certain embodiments of the invention, the inductors are counter wound and share a common node resulting in inverse polarities between the inductors. The inductors may be provided in various forms such as conventional octagonal, and conventional spiral.

[0021] In the following description, for purpose of explanation, specific details are set forth in order to provide an understanding of the invention. It will be apparent, however, to one skilled in the art that the invention may be practiced without these details. One skilled in the art will recognize that embodiments of the present invention, some of which are described below, may be incorporated into a number of different circuit implementations utilizing inductor components. Structures and devices shown below in block diagram are illustrative of exemplary embodiments of the invention and are meant to avoid obscuring the invention. Furthermore, shapes of the components within the figures are not intended to be limited to the specified shapes. Rather, the structure of individual inductors may be modified, or otherwise be reshaped.

[0022] Reference in the specification to “one embodiment” or “an embodiment” means that a particular feature, structure, characteristic, or function described in connection with the embodiment is included in at least one embodiment of the invention. The appearances of the

phrase “in one embodiment” in various places in the specification are not necessarily all referring to the same embodiment.

A. Overview

[0023] Figure 3a illustrates a schematic diagram of an inductor pair structure according to various embodiments of the present invention. A first inductor L_1 302 and a second inductor L_2 304 are structured such that one inductor is counter wound with respect to the other. The current flowing in the inductors may be in same direction or may be in opposite directions depending on the circuit design. For example, current I_1 312 in the first inductor L_1 302 may flow in a first direction and current I_2 314 in the second inductor L_2 304 may flow in a second direction that is opposite or substantially opposite of the first direction.

[0024] A positive pole on the first inductor L_1 302 is aligned with a negative pole on the second inductor L_2 304. A negative pole on the first inductor L_1 302 is aligned with a positive pole on the second inductor L_2 304. The current I_1 312 flowing in the first inductor L_1 302 causes a magnetic field in the dielectric of the inductor coil and the orientation of the magnetic field corresponds with the position of the positive and negative poles of the first inductor L_1 302. The current I_2 314 flowing in the second inductor L_2 304 causes a magnetic field having an opposite orientation with respect to the field caused in inductor L_1 302. It is important to note that in other embodiments of the invention, current I_1 312 and current I_2 314 may flow in the same direction.

[0025] Figure 3b illustrates a top view implementation of multiple inductors that cancel parasitic mutual inductance according to various embodiments of the invention. The flow of current as seen from top indicates the flow of current I_1 312 in the first inductor L_2 302 in a counter clockwise direction. The current I_2 314 in the second inductor 304 flows in clockwise

direction. Coil windings of the first inductor L_1 **302** run counter clockwise starting from the top causing a magnetic field oriented out of the plane of the paper depicted in Figure 3b. The second inductor L_2 **304** coil is wound clockwise from top leading to a magnetic field that is oriented into the plane of the paper.

[0026] The opposing orientations of the magnetic fields in each inductor cause at least a partial cancellation of magnetic field at the points of interference. Accordingly, the mutual inductance in the first inductor L_1 **302** coil caused due to the presence of the second inductor L_2 **304** is reduced. Also, the mutual inductance in the second inductor L_2 **304** caused by the first inductor L_1 **302** is also reduced.

[0027] One skilled in the art will recognize that the inductor coils may be manufactured using various methods. In various embodiments of the invention, an inductor coil is created using a multilayer configuration in which coil segments are created on stacked layers in a semiconductor. These layers are electrically coupled using vias connecting the coil segments. A resulting inductor coil is created that vertically penetrates the semiconductor on which an electrical circuit is implemented.

B. Inductance Circuit Design and Manufacturing

[0028] Figure 4 illustrates a schematic spiral inductors design according to various embodiments of the present invention. The inductors design comprises a first inductor L_1 **402** and a second inductor L_2 **404** that is counter wound relative to the first inductor L_1 **402**. Both inductors **402**, **404** have a common node A **406** with current flowing in each inductor as shown in Figure 4. Specifically, the current flows in a first direction from node A **413** to node B₁ **422** and the current flows in a second direction, which is counter to the first direction, from node A

413 to node **B₂ 424**. As previously discussed, the currents in each inductor cause a magnetic field inside the coils of the inductors.

[0029] The current I_1 flowing in the first inductor **L₁ 402** creates a magnetic field oriented out of the paper. The magnetic field produced by the second inductor **L₂ 404** is oriented into the plane of the paper. Interference of the magnetic fields produced by the first inductor **L₁ 402** and the second inductor **L₂ 404** results in a cancellation effect at the points of interference. This cancellation reduces mutual inductance between the two inductors and allows for placement of inductors in a relatively closer proximity to each other.

C. Transient Phase Compliance

[0030] During change of current flowing in an individual inductor, a magnetic field produced by the inductor may change. For example, during a change in the current I_1 **412** flowing in the first inductor **L₁ 402**, a corresponding magnetic field produced by the first inductor **L₁ 402** changes. The effect of the change results in a change in mutual inductance within the second inductor **L₂ 404**.

[0031] The change in mutual inductance may be addressed by changing the magnetic field generated by the second inductor **L₂ 404**. A corresponding change in current through the second inductor **L₂ 404** to effectively cancel the change in the generated magnetic field. The currents flowing within the two inductors may relate to each other such that changes in one current result in a corresponding change in the other current. Accordingly, changes in a generated magnetic field may be compensated by changing the oppositely oriented magnetic field so that appropriate interference cancellation occurs. This interference cancellation results in a reduction of cross talk between the first inductor **L₁ 402** and the second inductor **L₂ 404**.

[0032] One skilled in the art will recognize that the relationship between the first and second currents may be modeled using various techniques. Furthermore, the amount of cancellation may be modeled and varied depending on the magnitude of current change in one of the inductors. Additionally, one skilled in the art will recognize that the structures and manufacturing techniques used to create the inductors may be varied, all of which are intended to fall within the scope of the present invention.

[0033] Figure 5 illustrates an exemplary octagonal spiral inductor structure according to various embodiments of the invention. This octagonal spiral may be implemented to reduce the complexity of manufacturing. Similar to the inductor operation in Figure 4, the current flow in the first inductor L_1 **502** is from node A **513** to node B_1 **522** resulting in a magnetic field as illustrated.

[0034] As previously described, a magnetic field oriented in an opposite direction is used to cancel at least a portion of the magnetic field generated from the first inductor L_1 **502**. Particularly, the current flow in the second inductor L_2 **504** flows in a direction from node A **513** to node B_2 **524** generating an opposing magnetic field. The cancellation at interference points reduces cross talk between the two octagonal spiral inductors.

[0035] In implementations of circuits, such as a DLNA, where it may be advantageous to locate inductors proximate to each other, the present invention may be used. Additionally, the size of buffers between inductors may be reduced as a result of the inductance cancellation.

[0036] While the present invention has been described with reference to certain exemplary embodiments, those skilled in the art will recognize that various modifications may

be provided. Accordingly, the scope of the invention is to be limited only by the following claims.

What is claimed is:

1. A multiple inductor array comprising:
 - a first node that receives a first current and a second current;
 - a first inductor coil, coupled to the first node and to a second node, that
 - communicates the first current in a clockwise direction and generates a first magnetic field;
 - a second inductor coil, coupled to the first node and to a third node, that
 - communicates the second current in a counter clockwise direction and
 - generates a second magnetic field having an opposing orientation to the first magnetic field; and

wherein the first magnetic field and the second magnetic field at least partially cancel at an interference point.
2. The array of claim 1 wherein the first inductor coil and the second inductor coil are spiral structures.
3. The array of claim 1 wherein the first inductor coil and the second inductor coil are octagonal structures.
4. The array of claim 1 wherein a change in magnitude of the first magnetic field causes a change in magnitude of the second magnetic field.

5. The array of claim 1 wherein a change in magnitude of the second magnetic field causes a change in magnitude of the first magnetic field.
6. The array of claim 1 wherein the first and second currents flow within the same direction.
7. The array of claim 1 wherein the first and second currents flow in opposing directions.
8. The array of claim 1 wherein the magnitudes of the first and second currents are related so that a change in the first current causes a corresponding change in the second current in order to cause a reactionary interference cancellation.
9. The array of claim 1 further comprising a third inductor coil that generates a third magnetic field that cancels at least a portion of the first magnetic field.
10. The array of claim 1 further comprising a third inductor coil that generates a third magnetic field that cancels at least a portion of the second magnetic field.
11. A differential low noise amplifier comprising:
 - a voltage supply;
 - a first inductor coil, coupled to the voltage supply and to a first transistor, that generates a first magnetic field oriented in a first direction;

- a second inductor coil, coupled to the voltage supply, a second transistor, and in parallel with the first inductor coil, that generates a second magnetic field oriented in a second direction that is opposite to the first direction;
- a first RLC section that is coupled to the first inductor coil;
- a second RLC section that is coupled to the second inductor coil; and
- an output that is coupled to the first inductor coil, the second inductor coil, the first transistor, and the second transistor.
12. The amplifier of claim 11 wherein a first polarity of the first inductor coil is opposite to a second polarity of the second inductor coil.
13. The amplifier of claim 11 wherein the first and second inductor coils are spiral structured.
14. The amplifier of claim 11 wherein the first and second inductor coils are octagonal structured.
15. The amplifier of claim 11 wherein a change in magnitude of the first magnetic field causes a change in magnitude of the second magnetic field.
16. The amplifier of claim 1 wherein a change in magnitude of the second magnetic field causes a change in magnitude of the first magnetic field.
17. A method for reducing the amount of parasitic mutual inductance between inductors, the method comprising:

generating a first magnetic field, from a first inductor coil, oriented in a first direction;

generating a second magnetic field, from a second inductor coil, oriented in a second direction that is opposite to the first direction; and

canceling at least a portion of the first and second magnetic fields by magnetic cancellation resulting from the opposing orientations of the first and second directions.

18. The method of claim 17 wherein the magnitude of the first and second magnetic fields are related such that a change in the first magnetic field result in a change in the second magnetic field.

19. The method of claim 17 wherein the first and second magnetic coils are structured in an octagonal configuration.

20. The method of claim 17 wherein the first and second magnetic coils are structured in a spiral configuration.

LOW MUTUAL INDUCTANCE MATCHED INDUCTORSABSTRACT OF THE DISCLOSURE

Multiple inductor structures and methods for providing low mutual inductance between the inductors are described. In various embodiments of the invention, the polarities of the inductors are positioned such that parasitic mutual inductance is reduced by causing electromagnetic fields to at least partially cancel resulting in a reduction in interference between the inductors. The polarities of the magnetic fields produced by each inductor are opposite to each other so that at least a partial cancellation results when the fields interfere with each other.

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**DECLARATION FOR UTILITY OR
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(37 CFR 1.16 (e))
required)

Attorney Docket
Number

05-1991

First Named Inventor

Sean Christopher Erickson

COMPLETE IF KNOWN

Application Number

Unassigned

Filing Date

9/22/2006

Art Unit

Unassigned

Examiner Name

Unassigned

I hereby declare that:

Each inventor's residence, mailing address, and citizenship are as stated below next to their name.

I believe the inventor(s) named below to be the original and first inventor(s) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

LOW MUTUAL INDUCTANCE MATCHED INDUCTORS

(Title of the Invention)

the specification of which



Is attached hereto

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Prior Foreign Application Number(s)	Country	Foreign Filing Date (MM/DD/YYYY)	Priority Not Claimed		Certified Copy Attached?	
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[Page 1 of 2]

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NAME OF SOLE OR FIRST INVENTOR:				☐ A petition has been filed for this unsigned inventor		
Given Name (first and middle (if any))				Family Name or Surname		
Sean Christopher				Erickson		
Inventor's Signature				Date		
				9/20/06		
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☒ Additional inventors or a legal representative are being named on the 1 supplemental sheet(s) PTO/BB/02A or 02LR attached hereto.						

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		Page 1 of 1	
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Inventor's Signature <i>J. Dee</i>		Date 9/21/2006	
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Name of Additional Joint Inventor, if any: ☐ A petition has been filed for this unsigned inventor			
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Inventor's Signature <i>Michael J. Saunders</i>		Date 9/29/2006	
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Application Number	Unassigned
Filing Date	9/22/2006
First Named Inventor	Sean Christopher Erickson
Title	Low Mutual Inductance Matched ...
Art Unit	Unassigned
Examiner Name	Unassigned
Attorney Docket Number	05-1991

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SIGNATURE of Applicant or Assignee of Record

Signature		Date	9/20/06
Name	Sean Christopher Erickson	Telephone	970 206 5260
Title and Company	MXS DA Engineer LSI Logic		

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Examiner Name	Unassigned
Attorney Docket Number	05-1991

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Application Number	Unassigned
Filing Date	9/22/2006
First Named Inventor	Sean Christopher Erickson
Title	Low Mutual Inductance Matched ...
Art Unit	Unassigned
Examiner Name	Unassigned
Attorney Docket Number	05-1991

I hereby revoke all previous powers of attorney given in the above-identified application.

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24319

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I am the:

☒ Applicant/Inventor.

☐ Assignee of record of the entire interest. See 37 CFR 3.71.
Statement under 37 CFR 3.73(b) is enclosed. (Form PTO/SB/96)

SIGNATURE of Applicant or Assignee of Record

Signature	<i>Michael J. Saunders</i>	Date	9/20/2006
Name	Michael J. Saunders	Telephone	702256585
Title and Company	Engineer - LSI Logic		

NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. Submit multiple forms if more than one signature is required, see below.

☒ *Total of 3 forms are submitted.

This collection of information is required by 37 CFR 1.31, 1.32 and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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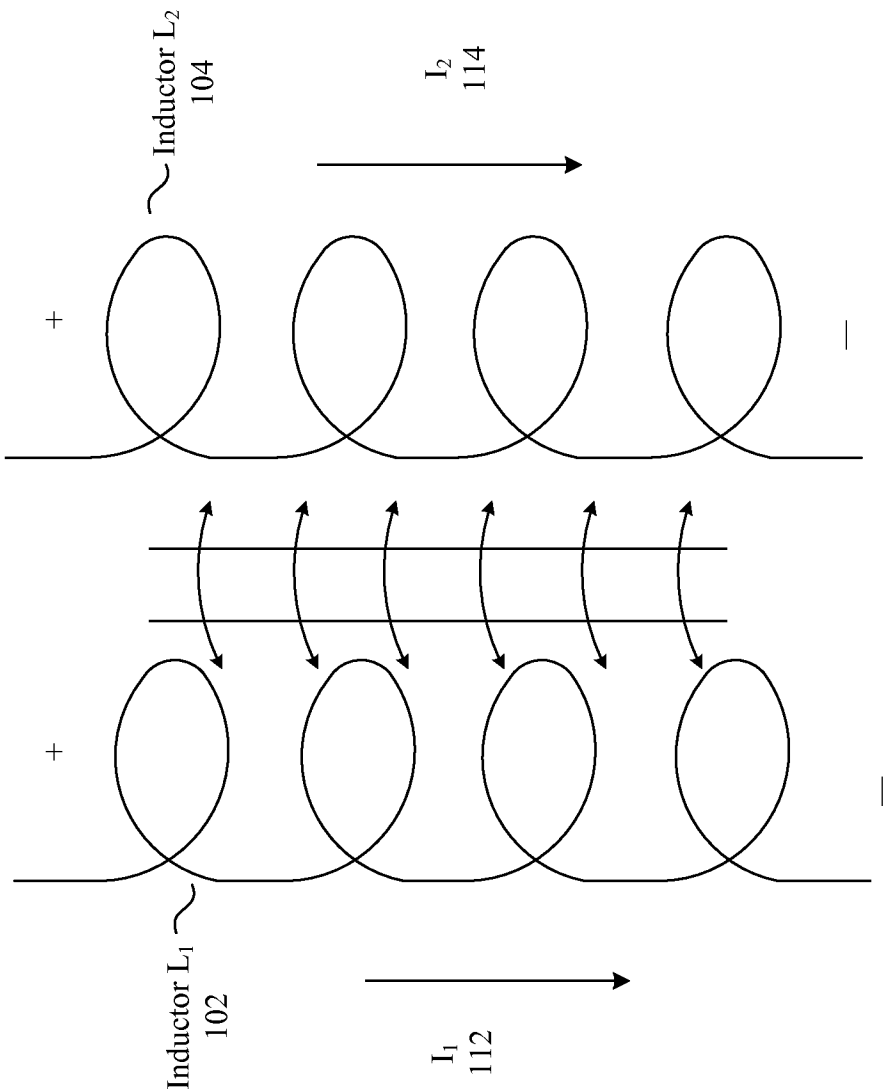


Figure 1

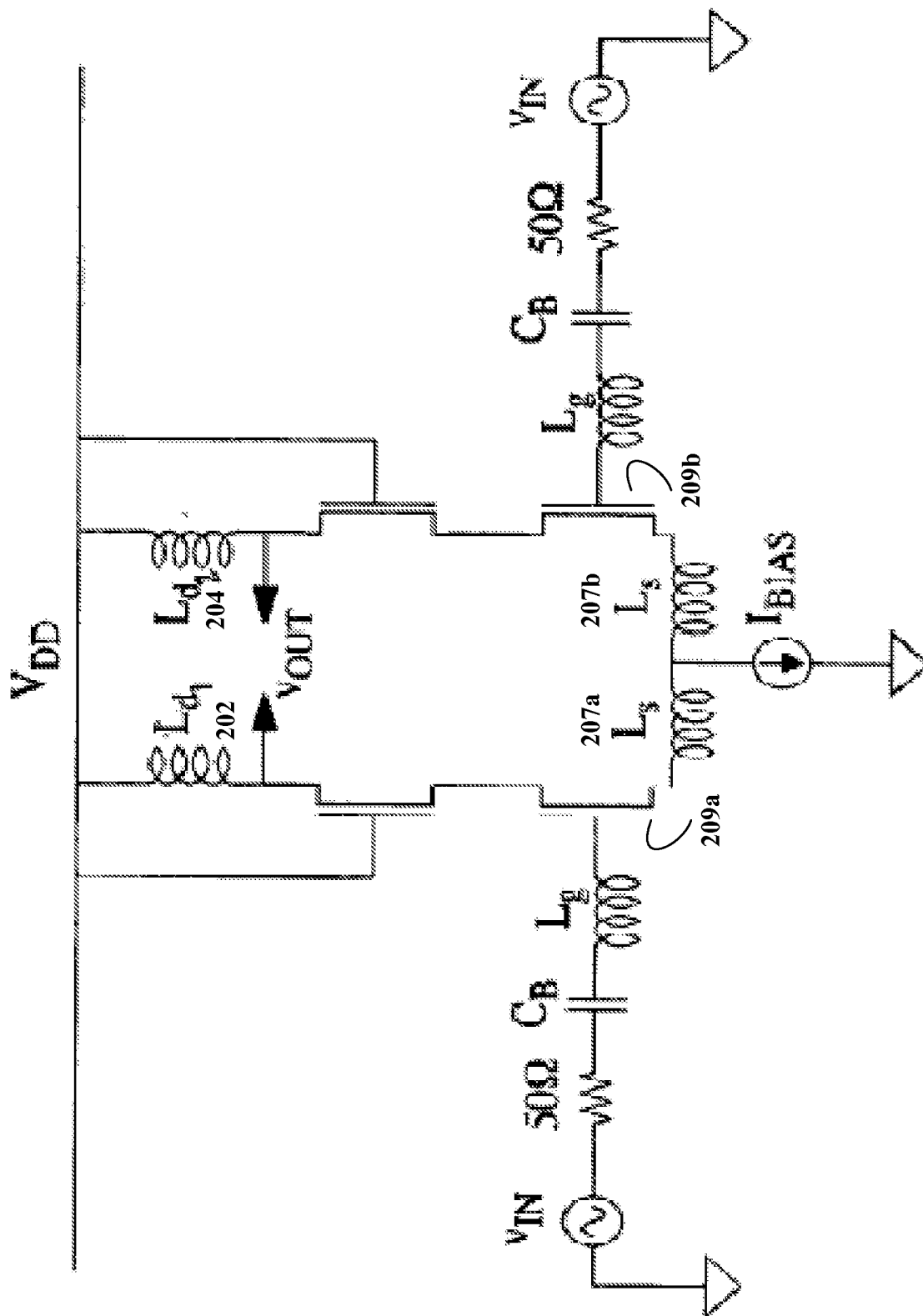


Figure 2

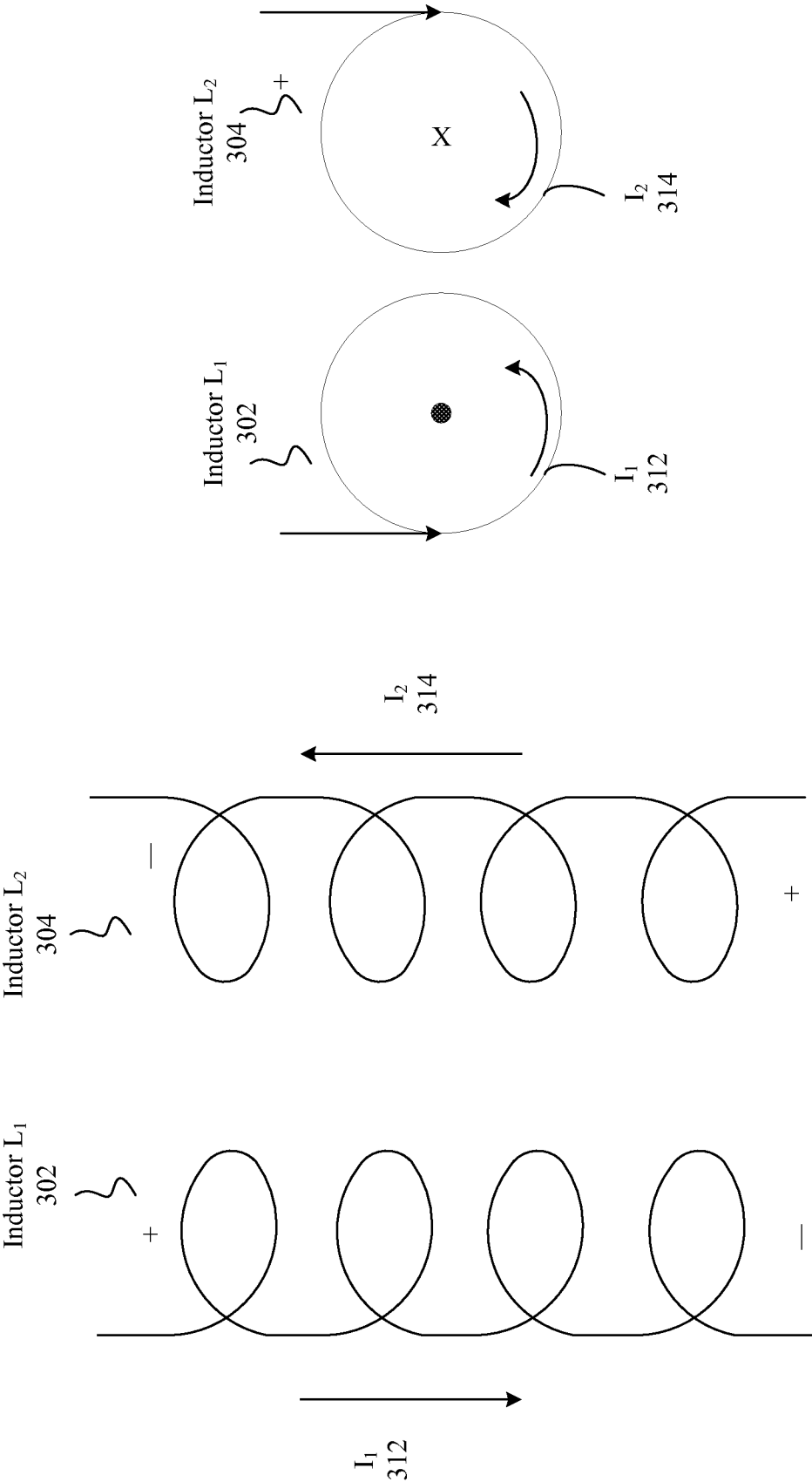


Figure 3a

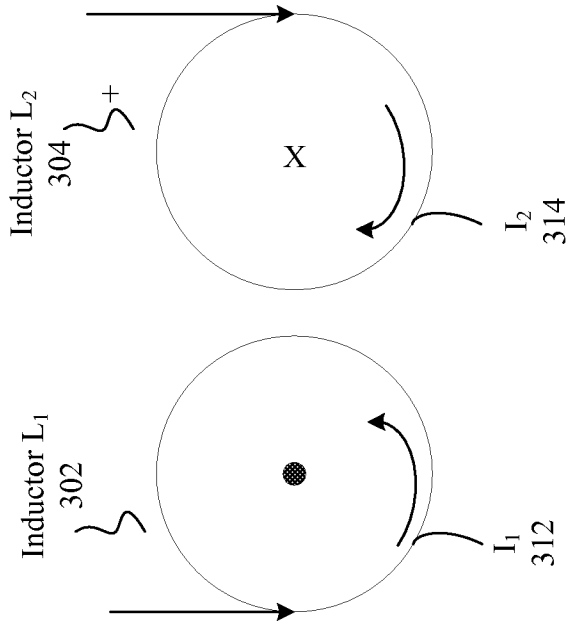


Figure 3b

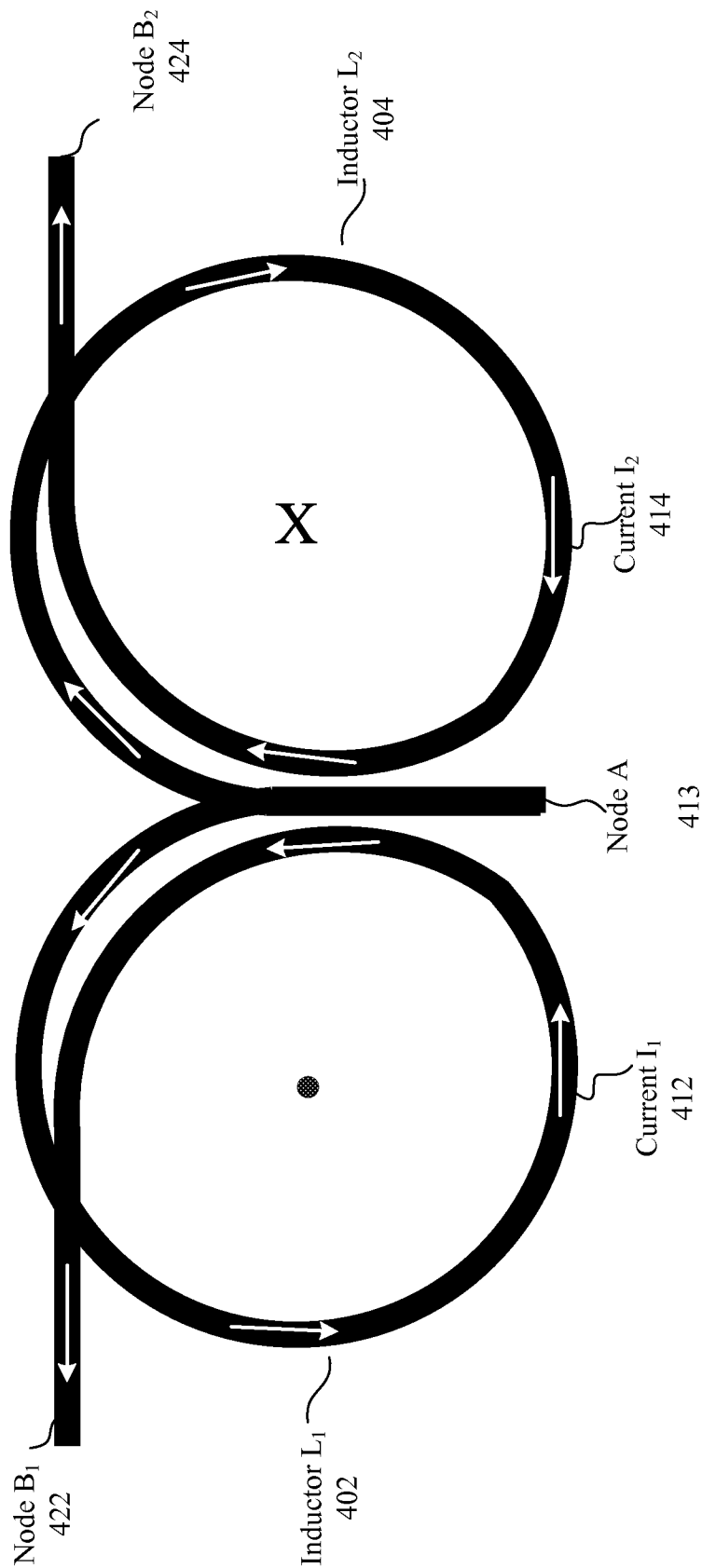


Figure 4

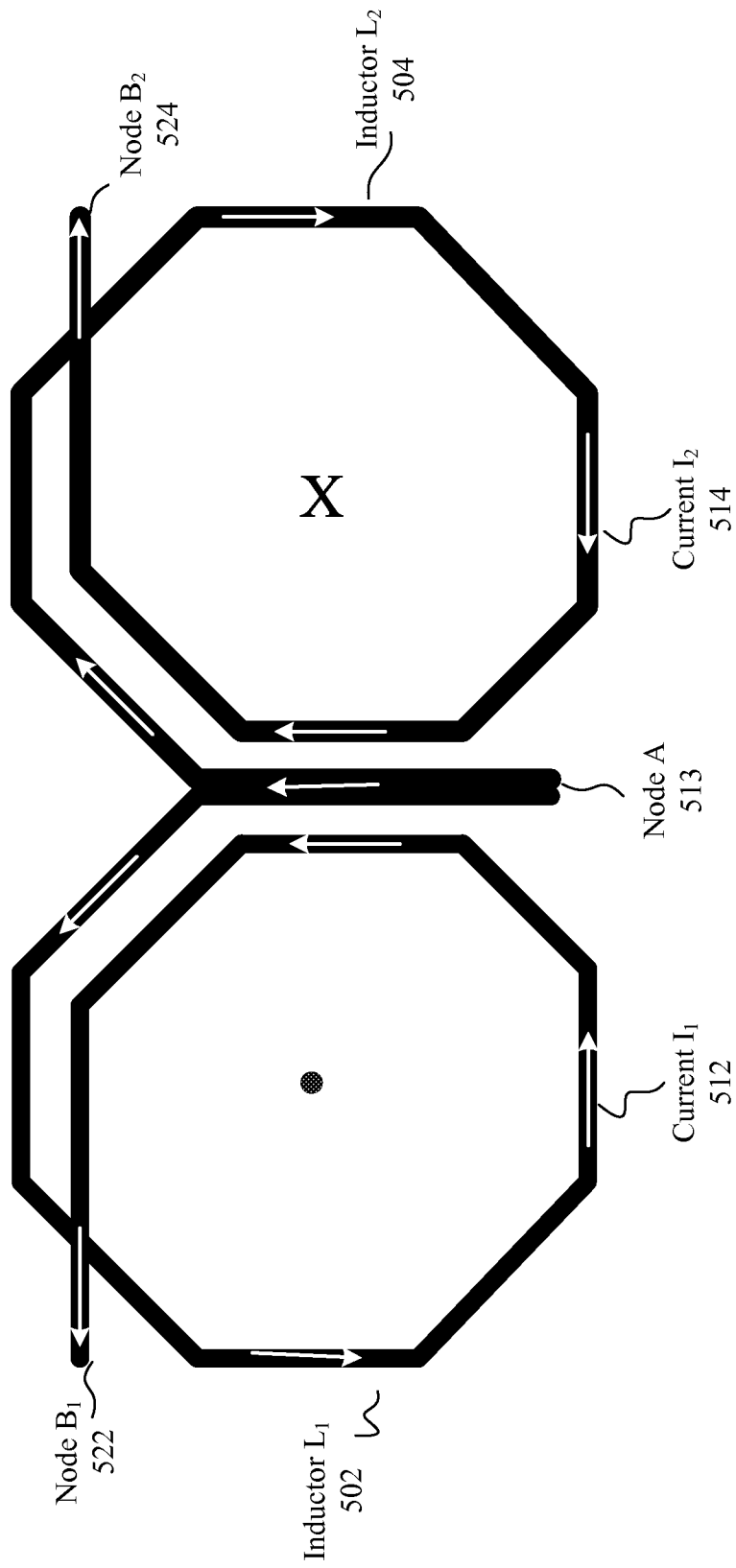


Figure 5

Electronic Patent Application Fee Transmittal

Application Number:				
Filing Date:				
Title of Invention:	Low Mutual Inductance Matched Inductors			
First Named Inventor:	Sean Christopher Erickson			
Filer:	Michael V. North/Ariana Sanchez			
Attorney Docket Number:	05-1991			
Filed as Large Entity				
Utility Filing Fees				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Utility application filing	1011	1	300	300
Utility Search Fee	1111	1	500	500
Utility Examination Fee	1311	1	200	200
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				1000

Electronic Acknowledgement Receipt

EFS ID:	1214934
Application Number:	11534340
Confirmation Number:	5804
Title of Invention:	Low Mutual Inductance Matched Inductors
First Named Inventor:	Sean Christopher Erickson
Customer Number:	24319
Filer:	Michael V. North/Ariana Sanchez
Filer Authorized By:	Michael V. North
Attorney Docket Number:	05-1991
Receipt Date:	22-SEP-2006
Filing Date:	
Time Stamp:	14:14:39
Application Type:	Utility
International Application Number:	

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Document Number	Document Description	File Name	File Size(Bytes)	Multi Part	Pages
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1		1185PatApp.pdf	152873	yes	17
	Multipart Description				
	Doc Desc		Start	End	
	Specification		1	12	
	Claims		13	16	
	Abstract		17	17	
Warnings:					
Information:					
2	Oath or Declaration filed	1185Dec.pdf	87762	no	3
Warnings:					
Information:					
3	Power of Attorney	1185POA.pdf	85889	no	3
Warnings:					
Information:					
4	Drawings	1185AppFig.pdf	81974	no	5
Warnings:					
Information:					
5	Fee Worksheet (PTO-875)	fee-info.pdf	8343	no	2
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National Stage of an International Application under 35 U.S.C. 371

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