

PATENT ASSIGNMENT COVER SHEET

Electronic Version v1.1
Stylesheet Version v1.2

EPAS ID: PAT3190641

SUBMISSION TYPE:	NEW ASSIGNMENT
NATURE OF CONVEYANCE:	ASSIGNMENT

CONVEYING PARTY DATA

Name	Execution Date
LSI CORPORATION	09/02/2014

RECEIVING PARTY DATA

Name:	SEAGATE TECHNOLOGY LLC
Street Address:	10200 S. DE ANZA BLVD.
City:	CUPERTINO
State/Country:	CALIFORNIA
Postal Code:	95014

PROPERTY NUMBERS Total: 24

Property Type	Number
Application Number:	13777484
Application Number:	13675874
Application Number:	13748260
Application Number:	13755757
Application Number:	13778728
Application Number:	13765253
Application Number:	13729966
Application Number:	13724905
Application Number:	13743858
Application Number:	14022781
Application Number:	13874590
Application Number:	13963074
Application Number:	13688654
Application Number:	13721739
Application Number:	13768215
Application Number:	13780229
Application Number:	13796264
Application Number:	13934999
Application Number:	13860068
Application Number:	13750200

PATENT

Property Type	Number
Application Number:	13788303
Application Number:	13804671
Application Number:	13856179
Application Number:	13853282

CORRESPONDENCE DATA

Fax Number: (405)553-2855

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NAME OF SUBMITTER:	RANDALL K. MCCARTHY
SIGNATURE:	/Randall K. McCarthy/
DATE SIGNED:	01/21/2015

Total Attachments: 57

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PATENT ASSIGNMENT

THIS PATENT ASSIGNMENT is made as of September 2, 2014 by LSI CORPORATION, a Delaware corporation, hereinafter referred to as the ASSIGNOR, and SEAGATE TECHNOLOGY LLC, a Delaware limited liability company, hereinafter referred to as the ASSIGNEE.

ASSIGNOR is the owner of certain patents and patent applications identified on Schedule "A" attached hereto (the "ASSIGNED PATENTS").

ASSIGNEE desires to acquire the entire right, title and interest of ASSIGNOR in and to said ASSIGNED PATENTS.

For good and valuable consideration paid by the ASSIGNEE, the receipt of which is hereby acknowledged, ASSIGNOR does hereby sell, assign and transfer to the ASSIGNEE, ASSIGNOR's entire right, title and interest in and to the ASSIGNED PATENTS, in the U.S. and every foreign country, and all patent rights, including extensions or derivations thereof, both foreign and domestic, that exist and may issue on the ASSIGNED PATENTS. ASSIGNEE hereby authorizes and requests the Commissioner of Patents that all U.S. patents that issue on the ASSIGNED PATENTS shall issue to ASSIGNEE. This assignment includes assignment to ASSIGNEE of the right to make application in its own behalf for protection of the ASSIGNED PATENTS and any patents issued on the ASSIGNED PATENTS, in the U.S. and countries foreign to the U.S., and to claim under the Patent Cooperation Treaty, the International Convention and/or other international arrangement for any such application the date of any earlier U.S. application (or any other application on the invention) to gain priority with respect to other applications. The ASSIGNED PATENTS and all patents that issue on the ASSIGNED PATENTS shall be held and enjoyed by the ASSIGNEE, its successors and assigns as fully and entirely as the same would have been held and enjoyed by the ASSIGNOR had this assignment not been made, including without limitation the exclusive right to enforce and to damages for the past, present or future infringement of such patents.

ASSIGNOR covenants and agrees to execute such further and confirmatory assignments in recordable form as the ASSIGNEE may require to vest record title of said respective ASSIGNED PATENTS in ASSIGNEE.

[Signature page follows]

IN WITNESS WHEREOF, the ASSIGNOR has caused this Assignment to be executed by a duly authorized officer.

LSI CORPORATION

By: 

Name: Hock E. Tan

Title: Chief Executive Officer

ACKNOWLEDGMENT

State of California)
) ss:
County of Santa Clara)

On this 2nd day of September, 2014, before me, the undersigned, personally appeared Hock E. Tan, personally known to me or proved to me on the basis of satisfactory evidence to be the person who executed this instrument on behalf of the corporation named herein, and acknowledged that s/he executed it in such representative capacity.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal.

Notary Public

My Commission Expires on _____

see attached


[Project Maui – Patent Assignment (U.S.)]

PATENT
REEL: 034770 FRAME: 0863

CALIFORNIA ALL-PURPOSE ACKNOWLEDGMENT

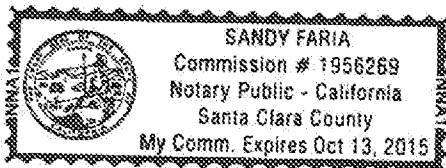
CIVIL CODE § 1169

State of California

County of SANTA CLARA

On 9/2/2014 before me, SANDY FARIA
Date Here Insert Name and Title of the Officer

personally appeared HOCK E. TAN
Name(s) of Signer(s)



who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Place Notary Seal Above

Signature: [Signature]

Signature of Notary Public

OPTIONAL

Though the information below is not required by law, it may prove valuable to persons relying on the document and could prevent fraudulent removal and reattachment of this form to another document.

Description of Attached Document

Title or Type of Document: PATENT ASSIGNMENT

Document Date: SEPT. 2, 2014 Number of Pages: _____

Signer(s) Other Than Named Above: _____

Capacity(ies) Claimed by Signer(s)

Signer's Name: _____

☐ Corporate Officer — Title(s): _____

☐ Individual

☐ Partner — ☐ Limited ☐ General

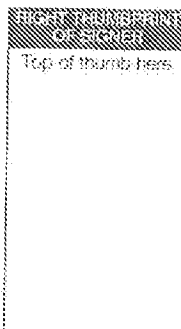
☐ Attorney in Fact

☐ Trustee

☐ Guardian or Conservator

☐ Other: _____

Signer Is Representing: _____



Signer's Name: _____

☐ Corporate Officer — Title(s): _____

☐ Individual

☐ Partner — ☐ Limited ☐ General

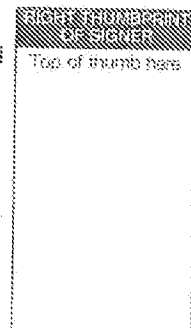
☐ Attorney in Fact

☐ Trustee

☐ Guardian or Conservator

☐ Other: _____

Signer Is Representing: _____



**SCHEDULE A
ASSIGNED PATENTS**

L09-0615US1	<u>Context Execution in a Media Controller Architecture</u>	Nov 23, 2010	12952205	Oct 23, 2012	8296480	US	Issued
L09-0616US1	<u>Coalescing Multiple Contexts into a Single Data Transfer in a Media Controller Architecture</u>	Nov 23, 2010	12952201	Jun 12, 2012	8200857	US	Issued
L09-0689US1	<u>Command Tag Checking in a Multi-Initiator Media Controller Architecture</u>	Nov 23, 2010	12952207	Jan 8, 2013	8352689	US	Issued
L09-0690US1	<u>Context Processing for Multiple Active Write Commands in a Media Controller Architecture</u>	Nov 23, 2010	12952200	Nov 12, 2013	8583839	US	Issued
L12-0066US1	<u>Memory device having collaborative filtering to reduce noise</u>	Aug 17, 2012	13588043	Apr 29, 2014	8711620	US	Issued
L12-0099US1	<u>Multi-Tier</u>	Dec 31,	13731551			US	Pending

	<u>Detection and Decoding in Flash Memories</u>	2012					
L12-0248US1	<u>Detection and Decoding in Flash Memories with Selective Binary and Non-Binary Decoding</u>	Jan 31, 2013	13755717			US	Pending
L12-0286US1	<u>Detection and Decoding in Flash Memories Using Correlation of Neighboring Bits</u>	Dec 31, 2012	13731766			US	Pending
L12-0326US1	<u>Accelerated soft read for multi-level cell nonvolatile memories</u>	Oct 15, 2012	13651975			US	Pending
L12-0484US1	<u>Soft Decision Compensation for Flash Channel Variation</u>	Aug 4, 2012	13567025			US	Allowed
L12-0598US1	<u>Managing a dynamically variable cache space</u>	Mar 23, 2012	61614548			US	Expired
L12-0598US2	<u>System for Dynamically Adaptive Caching</u>	Aug 3, 2012	13566204			US	Pending

L12-0645US1	<u>Fast tracking for flash channels</u>	Jun 26, 2012	13533130			US	Pending
L12-0667US1	<u>Combined Wu and Chase Decoding of Cyclic Codes</u>	Jul 12, 2012	13547463	Mar 18, 2014	8674860	US	Issued
L12-0668US1	<u>Combined Koetter-Vardy and Chase Decoding of Cyclic Codes</u>	Jun 27, 2012	13534287			US	Allowed
L12-0674US1	<u>Mixed Granularity Higher-Level Redundancy for Non-Volatile Memory</u>	Aug 2, 2012	13565752			US	Allowed
L12-0689US1	<u>Lookup Engine with Pipelined Access, Speculative Add and Lock-in-Hit Function</u>	Aug 31, 2012	13600464	Jul 8, 2014	8775727	US	Issued
L12-0704US1	<u>Single-Read Based Soft-Decision Decoding of Non-Volatile Memory</u>	Aug 4, 2012	13567024			US	Pending
L12-0781US1	<u>Detection and Decoding in Flash Memories with Error Correlations</u>	Feb 28, 2013	13780203			US	Pending

	<u>for a Plurality of Bits within a Sliding Window</u>						
L12-0810US1	<u>Threshold Optimization For Flash Memory</u>	Aug 24, 2012	13593811			US	Allowed
L12-1126US1	<u>Flash Memory Read Error Rate Reduction</u>	Jul 23, 2012	13555444			US	Pending
L12-1254US1	<u>Method to Shorten Hash Chains in Lempel-Ziv Compression of Data with Repetitive Symbols</u>	Oct 24, 2012	13659036			US	Pending
L12-1260US1	<u>Flash Memory Read Scrub and Channel Tracking</u>	Aug 29, 2012	13597489			US	Allowed
L12-1358US1	<u>Flash channel parameter management with read scrub</u>	Oct 1, 2012	13632294			US	Pending
L12-1398US1	<u>Optimizing BitStream Encoding for Compression</u>	Oct 15, 2012	13651627	Jul 29, 2014	8791843	US	Issued
L12-1540US1	<u>Optimizing Compression Engine Throughput via Run Pre-</u>	Oct 15, 2012	13651655			US	Pending

	<u>Processing</u>						
L12-1556US1	<u>Inter-cell interference cancellation in flash memories</u>	Feb 27, 2013	13778860			US	Allowed
L12-1638US1	<u>Read Disturb Effect Determination</u>	Nov 15, 2012	13677938			US	Pending
L12-1954US1	<u>Reduced Complexity Reliability Computations for Flash Memories</u>	Feb 26, 2013	13777484			US	Pending
L12-1959US1	<u>Fractional RAISE(TM)</u>	Aug 13, 2012	61682561			US	Expired
L12-1959US2	<u>Fractional Redundant Array of Silicon Independent Elements</u>	Nov 13, 2012	13675874			US	Pending
L12-2076US1	<u>Storage Device Out-of-Space Handling</u>	Jan 23, 2013	13748260			US	Pending
L12-2090US1	<u>Integrated-Interleaved LDPC Codes</u>	Jan 31, 2013	13755757			US	Pending
L12-2092US1	<u>Cell-level statistics collection for detection and decoding in flash memories</u>	Feb 27, 2013	13778728			US	Pending

L12-2102US1	<u>Low-Density Parity-Check Decoder Disparity Preprocessing</u>	Jan 30, 2013	13753987			US	Pending
L12-2112US1	<u>Chained, Scalable Storage Devices</u>	Feb 12, 2013	13765253			US	Pending
L12-2232US1	<u>Read Disturb Handling for Non-Volatile Solid State Media</u>	Dec 28, 2012	13729966			US	Pending
L12-2283US1	<u>Method to apply fine grain wear leveling and garbage collection</u>	Dec 21, 2012	13724905			US	Pending
L12-2283US2	<u>Method to apply fine grain wear leveling and garbage collection</u>	Jan 17, 2013	13743858			US	Pending
L12-2306US1	<u>Maintaining Ordering via a Multi-Level Map of a Solid-State Media</u>	Sep 10, 2013	14022781			US	Pending
L12-2313US1	<u>Device Sleep Partitioning and Keys</u>	Mar 15, 2013	61789337			US	Expired
L12-2313US2	<u>Device Sleep Partitioning</u>	May 1, 2013	13874590			US	Pending

	<u>and Keys</u>						
L12-2381US1	<u>Trim Mechanism Using Multi-Level Mapping in a Solid-State Media</u>	Mar 14, 2013	61783555			US	Expired
L12-2381US2	<u>Trim Mechanism Using Multi-Level Mapping in a Solid-State Media</u>	Aug 9, 2013	13963074			US	Pending
L12-2419US1	<u>Lempel-Ziv Data Compression with Shortened Hash Chains Based on Repetitive Patterns</u>	Mar 14, 2013	13803946			US	Allowed
L12-2514US2	<u>Scalable Storage Protection</u>	Nov 29, 2012	13688654			US	Pending
L12-2611US1	<u>Management of non-valid decision patterns of soft read retry</u>	Dec 20, 2012	13721739			US	Pending
L12-2612US1	<u>An adaptive architecture of channel detector for NAND flash channels</u>	Feb 20, 2013	61766853			US	Expired
L12-2612US2	<u>An adaptive architecture</u>	Feb 25, 2013	13775559			US	Pending

	<u>of channel detector for NAND flash channels</u>						
L12-2748US1	<u>Compensation Loop for Read Voltage Adaptation</u>	Feb 1, 2013	13757027			US	Allowed
L12-2753US1	<u>Unified Message-Based Communications</u>	Mar 15, 2013	61789574			US	Expired
L12-2753US2	<u>Unified Message-Based Communications</u>	Apr 17, 2013	13864494			US	Pending
L12-2913US1	<u>Non-Volatile Memory Channel Control Using a General Purpose Programmable Processor in Combination with a Low Level Programmable Sequencer</u>	Feb 15, 2013	13768215			US	Pending
L12-2940US1	<u>Statistical Adaptive Error Correction for FLASH</u>	Feb 12, 2013	13765034			US	Allowed
L12-3180US1	<u>Use Physical-to-logical Address Map speed up</u>	Feb 28, 2013	13780229			US	Pending

	<u>Recycle in SSD</u>						
L12-3274US1	<u>Self Recoverable Solid State Drive Concept and Methodology</u>	Mar 6, 2013	61773337			US	Expired
L12-3274US2	<u>Self Recoverable Solid State Drive Concept and Methodology</u>	Mar 12, 2013	13796264			US	Pending
L12-3290US1	<u>Log-Likelihood Ratio (LLR) Dampening in Low-Density Parity-Check (LDPC) Decoders</u>	Nov 21, 2012	61729178			US	Expired
L12-3290US2	<u>Log-Likelihood Ratio (LLR) Dampening in Low-Density Parity-Check (LDPC) Decoders</u>	Jul 3, 2013	13934999			US	Pending
L12-3305US1	<u>A Priori Information Based Post-Processing in Low-Density Parity-Check Code Decoders</u>	Mar 26, 2013	61805195			US	Expired
L12-3305US2	<u>A Priori Information Based Post-Processing in</u>	Apr 10, 2013	13860068			US	Pending

	<u>Low-Density Parity-Check Code Decoders</u>						
L12-3321US1	<u>Host-based, Controller-Opaque Manufacturing-Testing of NVM</u>	Jan 25, 2013	13750200			US	Pending
L12-3397US1	<u>Partial R-Block Recycling</u>	Mar 6, 2013	61773437			US	Expired
L12-3397US2	<u>Partial R-Block Recycling</u>	Mar 7, 2013	13788303			US	Pending
L12-3607US1	<u>Policy for flash memory read operations</u>	Dec 11, 2012	61735908			US	Expired
L12-3607US2	<u>Policy for flash memory read operations</u>	Mar 14, 2013	13804671			US	Pending
L12-3608US1	<u>Method of optimizing solid state drive soft retry voltages</u>	Mar 25, 2013	61804853			US	Expired
L12-3608US2	<u>Method of optimizing solid state drive soft retry voltages</u>	Apr 3, 2013	13856179			US	Pending
L12-3609US1	<u>Dynamic LLR quantization for SSD controllers</u>	Mar 22, 2013	61804265			US	Expired
L12-3609US2	<u>Dynamic Log Likelihood</u>	Mar 29, 2013	13853282			US	Pending

	<u>Ratio Quantization for Solid State Drive Controllers</u>						
L12-3617US1	<u>A Recovery Strategy that Reduces Errors Misidentified as Reliable</u>	Mar 14, 2013	13804495			US	Pending
L12-3619US1	<u>Error correction code rate management for flash memory</u>	Dec 11, 2012	61735917			US	Expired
L12-3619US2	<u>Error correction code rate management for flash memory</u>	Mar 13, 2013	13798696			US	Pending
L12-3620US1	<u>Flash memory read error recovery policy with soft-decision LDPC decoder</u>	Dec 11, 2012	61735923			US	Expired
L12-3620US2	<u>Flash memory read error recovery policy with soft-decision LDPC decoder</u>	Mar 13, 2013	13798864			US	Pending
L12-3679US1	<u>Retention detection and channel tracking policy</u>	Mar 12, 2013	61777048			US	Expired

	<u>in flash memory based storage systems</u>						
L12-3679US2	<u>Retention detection and channel tracking policy in flash memory based storage systems</u>	Mar 15, 2013	13832633			US	Pending
L12-3685US1	<u>Generating Partially Sparse Generator Matrix for a Quasi-Cyclic Low-Density Parity-Check Encoder</u>	Mar 26, 2013	61805270			US	Expired
L12-3685US2	<u>Generating Partially Sparse Generator Matrix for a Quasi-Cyclic Low-Density Parity-Check Encoder</u>	Mar 28, 2013	13852852			US	Pending
L13-0088US1	<u>Flash memory data recovery after power failure</u>	Mar 14, 2013	61781744			US	Expired
L13-0088US2	<u>Flash memory data recovery after power failure</u>	Apr 1, 2013	13854263			US	Pending
L13-0102US1	<u>Storage</u>	Mar 14,	61782122			US	Expired

	<u>Device Assisted Data De-Duplication</u>	2013					
L13-0102US2	<u>Storage Device Assisted Data De-Duplication</u>	Jul 11, 2013	13939345			US	Pending
L13-0258US1	<u>Host Command Based Read Disturb Methodology</u>	Apr 2, 2013	13855116			US	Pending
L13-0287US1	<u>I/O Device with Multi-Reducible-Unit Mapping</u>	Mar 14, 2013	61782089			US	Expired
L13-0287US2	<u>Locating Data in Non-Volatile Memory</u>	Aug 8, 2013	13962558			US	Pending
L13-0371US1	<u>Systems and Methods for Enhanced Data Recovery in a Solid State Memory System</u>	Sep 26, 2013	61883123			US	Pending
L13-0371US2	<u>Systems and Methods for Enhanced Data Recovery in a Solid State Memory System</u>	Oct 7, 2013	14047423			US	Pending
L13-0547US1	<u>A Novel Flash Translation</u>	Apr 30, 2013	61817441			US	Expired

	<u>Layer with Lower Write Amplification</u>						
L13-0547US2	<u>A Novel Flash Translation Layer with Lower Write Amplification</u>	May 8, 2013	13889521			US	Pending
L13-0699US1	<u>Systems and Methods for Inter-cell Interference Mitigation in a Flash Memory</u>	May 22, 2013	61826464			US	Expired
L13-0699US2	<u>Systems and Methods for Inter-cell Interference Mitigation in a Flash Memory</u>	Jun 6, 2013	13912063			US	Pending
L13-0720US1	<u>Method and Apparatus for Generation of Soft Decision Error Correction Code Information</u>	Mar 14, 2013	61782837			US	Expired
L13-0720US2	<u>Method and Apparatus for Generation of Soft Decision Error Correction Code Information</u>	May 14, 2013	13893832			US	Pending
L13-0741US1	<u>Method to Protect Data in DRAM</u>	May 29, 2013	61828425			US	Expired

L13-0741US2	<u>Method to Protect Data in DRAM</u>	Jun 6, 2013	13911443			US	Pending
L13-0765US1	<u>Data Decoder with Trapping Set Flip Bit Mapper</u>	Jul 19, 2013	61856359			US	Expired
L13-0765US2	<u>Data Decoder with Trapping Set Flip Bit Mapper</u>	Aug 2, 2013	13958162			US	Pending
L13-0781US1	<u>Elastic RAISE (TM)</u>	May 24, 2013	61827190			US	Expired
L13-0781US2	<u>Elastic RAISE (TM)</u>	May 29, 2013	13904362			US	Pending
L13-0835US1	<u>Detection/Erase of Random Write Errors using Converged Hard Decisions</u>	Nov 11, 2013	61902450			US	Pending
L13-0835US2	<u>Detection/Erase of Random Write Errors using Converged Hard Decisions</u>	Jan 9, 2014	14150810			US	Pending
L13-0853US1	<u>Incremental programming pulse optimization to reduce write errors</u>	Nov 11, 2013	61902380			US	Pending
L13-0853US2	<u>Incremental</u>	Jan 8, 2014	14150482			US	Pending

	<u>programming pulse optimization to reduce write errors</u>						
L13-0863US1	<u>Flash Memory Reference Voltage Detection with Tracking of Cross-Points of Cell Voltage Distributions Using Histograms</u>	Sep 27, 2013	61883491			US	Pending
L13-0863US2	<u>Flash Memory Reference Voltage Detection with Tracking of Cross-Points of Cell Voltage Distributions Using Histograms</u>	Oct 21, 2013	14059229			US	Pending
L13-0895US1	<u>Shortening of Polar Codes</u>	Sep 16, 2013	61878163			US	Pending
L13-0895US2	<u>Shortening of Polar Codes</u>	Sep 23, 2013	14033854			US	Pending
L13-0920US1	<u>Flash Memory Read Retry Using Histograms</u>	Oct 3, 2013	61886180			US	Pending
L13-0920US2	<u>Flash Memory Read Retry Using Histograms</u>	Oct 11, 2013	14052252			US	Pending

L13-0922US1	<u>Generating Soft Decoding Information for Flash Memory Error Correction Using Hard Decision Patterns</u>	Oct 17, 2013	61892328			US	Pending
L13-0922US2	<u>Generating Soft Decoding Information for Flash Memory Error Correction Using Hard Decision Patterns</u>	Oct 28, 2013	14064524			US	Pending
L13-0923US1	<u>Reduction or Elimination of Latency Penalty Associated with Adjusting Read Thresholds for Non-Volatile Memory</u>	Nov 1, 2013	61898947			US	Pending
L13-0923US2	<u>Reduction or Elimination of a Latency Penalty Associated with Adjusting Read Thresholds for Non-Volatile Memory</u>	Nov 22, 2013	14087520			US	Pending
L13-0928US1	<u>Virtual Bands Concentration</u>	Aug 29, 2013	61870936			US	Pending

	<u>(VBC) Method for Self Encrypting Drives</u>						
L13-0928US2	<u>Virtual Bands Concentration (VBC) Method for Self Encrypting Drives</u>	Sep 23, 2013	14033753			US	Pending
L13-0932US1	<u>Eliminating or Reducing Programming Errors When Programming Flash Memory Cells</u>	Nov 26, 2013	61909211			US	Pending
L13-0932US2	<u>Eliminating or Reducing Programming Errors When Programming Flash Memory Cells</u>	Dec 3, 2013	14094900			US	Pending
L13-0936US1	<u>Preventing Programming Errors from Occurring When Programming Flash Memory Cells</u>	Dec 20, 2013	61918778			US	Pending
L13-0936US2	<u>Preventing Programming Errors from Occurring When Programming Flash Memory Cells</u>	Jan 6, 2014	14147825			US	Pending

L13-0953US1	<u>Active Recycling for Solid State Drive</u>	Nov 15, 2013	14080950			US	Pending
L13-0993US1	<u>A Method of Erase State Handling in NAND Flash Channel Tracking</u>	Sep 18, 2013	61879318			US	Pending
L13-0993US2	<u>A Method of Erase State Handling in NAND Flash Channel Tracking</u>	Sep 30, 2013	14041110			US	Pending
L13-1021US1	<u>Non-Volatile Memory with Channel Tracking- Based Retry Read Voltage</u>	Nov 27, 2013	61909447			US	Pending
L13-1021US2	<u>Non-Volatile Memory with Channel Tracking- Based Retry Read Voltage</u>	Dec 20, 2013	14135837			US	Pending
L13-1025US1	<u>Systems and Methods for Latency Based Data Recycling in a Solid State Memory System</u>	Oct 17, 2013	61892429			US	Pending
L13-1025US2	<u>Systems and Methods for Latency Based</u>	Nov 5, 2013	14072530			US	Pending

	<u>Data Recycling in a Solid State Memory System</u>						
L13-1043US1	<u>Non-Uniform Channel LLR Quantization for SSD Controllers</u>	Oct 21, 2013	61893335			US	Pending
L13-1043US2	<u>Systems and Methods for Soft Data Utilization in a Solid State Memory System</u>	Nov 5, 2013	14072574			US	Pending
L13-1045US1	<u>Method to Implement Unaligned Data Bands for Self Encrypting SSDs</u>	Oct 30, 2013	61897366			US	Pending
L13-1045US2	<u>Method to Implement Unaligned Data Bands for Self Encrypting SSDs</u>	Nov 22, 2013	14088143			US	Pending
L13-1048US1	<u>Mitigating Write Errors in MLC FLASH through adaptive ECC decoding</u>	Feb 11, 2014	61938292			US	Pending
L13-1048US2	<u>Mitigating Write Errors in MLC FLASH</u>	Feb 28, 2014	14194180			US	Pending

	<u>through adaptive ECC decoding</u>						
L13-1051US1	<u>A LLR Generation Scheme Using Pre-Defined (fixed) LLR LUTs for SSD Controllers</u>	Nov 27, 2013	61909529			US	Pending
L13-1051US2	<u>A LLR Generation Scheme Using Pre-Defined (fixed) LLR LUTs for SSD Controllers</u>	Dec 20, 2013	14136380			US	Pending
L13-1085US1	<u>Tracking and Utilizing Second Level Map Index for Recycling of Solid State Drive Blocks</u>	Nov 27, 2013	14092285			US	Pending
L13-1088US1	<u>Flash Channel with Selective Decoder Likelihood Dampening</u>	Nov 28, 2013	61910100			US	Pending
L13-1088US2	<u>Flash Channel with Selective Decoder Likelihood Dampening</u>	Nov 29, 2013	14093110			US	Pending
L13-1096US1	<u>Capacitance Coupling Parameter Estimation in flash</u>	Jan 6, 2014	61923915			US	Pending

	<u>memories</u>						
L13-1096US2	<u>Capacitance Coupling Parameter Estimation in flash memories</u>	Jan 15, 2014	14155687			US	Pending
L13-1100US1	<u>A Variable-Size Flash Translation Layer Optimized for Sequential Read</u>	Aug 16, 2013	61866672			US	Expired
L13-1100US2	<u>A Variable-Size Flash Translation Layer Optimized for Sequential Read</u>	Oct 9, 2013	61888681			US	Pending
L13-1100US3	<u>A Variable-Size Flash Translation Layer Optimized for Sequential Read</u>	Oct 16, 2013	14055336			US	Pending
L13-1115US1	<u>Systems and Methods for Suz-Zero Threshold Characterization in a Memory Cell</u>	Oct 28, 2013	61896590			US	Pending
L13-1115US2	<u>Systems and Methods for Suz-Zero Threshold</u>	Nov 20, 2013	14085553			US	Pending

	<u>Characterization in a Memory Cell</u>						
L13-1128US1	<u>Systems and Methods for Soft Decision Generation in a Solid State Memory System</u>	Nov 16, 2013	61905185			US	Pending
L13-1128US2	<u>Systems and Methods for Soft Decision Generation in a Solid State Memory System</u>	Dec 16, 2013	14108226			US	Pending
L13-1144US1	<u>TRANSLATION LAYER PARTITIONED BETWEEN A HOST AND A CONTROLLER</u>	Sep 3, 2013	61873357			US	Pending
L13-1144US2	<u>TRANSLATION LAYER PARTITIONED BETWEEN A HOST AND A CONTROLLER</u>	Oct 21, 2013	61893383			US	Pending
L13-1144US3	<u>TRANSLATION LAYER PARTITIONED BETWEEN A HOST AND A CONTROLLER</u>	Oct 23, 2013	14060799			US	Pending
L13-1158US1	<u>Dynamic Per-Decoder Control of LLR and Decoding</u>	Nov 11, 2013	61902407			US	Pending

	<u>Parameters</u>						
L13-1158US2	<u>Dynamic Per-Decoder Control of LLR and Decoding Parameters</u>	Nov 27, 2013	14092215			US	Pending
L13-1174US1	<u>Using unsatisfied parity checks in an LDPC-encoded storage systems as quality metric</u>	Nov 7, 2013	61901064			US	Pending
L13-1174US2	<u>Using unsatisfied parity checks in an LDPC-encoded storage systems as quality metric</u>	Dec 10, 2013	14101679			US	Pending
L13-1183US1	<u>Interleaving Codewords over Multiple Flash Planes for Increased Reliability and Predictable High Performance</u>	Jan 13, 2014	61926516			US	Pending
L13-1183US2	<u>Interleaving Codewords over Multiple Flash Planes for Increased Reliability and Predictable High Performance</u>	Jan 16, 2014	14156693			US	Pending

L13-1192US1	<u>Decoding System and Method for Electronic Non-Volatile Computer Storage Apparatus</u>	Feb 7, 2014	61937040			US	Pending
L13-1192US2	<u>Decoding System and Method for Electronic Non-Volatile Computer Storage Apparatus</u>	Mar 7, 2014	14200659			US	Pending
L13-1205US1	<u>Multi-read retry for NVM read channels in the presence of a limited read window</u>	Dec 10, 2013	61914056			US	Pending
L13-1205US2	<u>Multi-read retry for NVM read channels in the presence of a limited read window</u>	Dec 20, 2013	14136283			US	Pending
L13-1206US1	<u>Bit-line defect detection using unsatisfied parity checks in an LDPC-encoded storage systems</u>	Nov 27, 2013	61909540			US	Pending

L13-1206US2	<u>Bit-line defect detection using unsatisfied parity checks in an LDPC-encoded storage systems</u>	Dec 9, 2013	14100280			US	Pending
L13-1215US1	<u>A New Method to Distribute RAISE R-Page over Different Page Types by Leveraging Their Error Rates Variation</u>	Dec 20, 2013	61918952			US	Pending
L13-1215US2	<u>A New Method to Distribute RAISE R-Page over Different Page Types by Leveraging Their Error Rates Variation</u>	Feb 5, 2014	14173108			US	Pending
L13-1219US1	<u>Systems and Methods for Differential Message Scaling in a Decoding Proces</u>	Apr 3, 2014	61974894			US	Pending
L13-1219US2	<u>Systems and Methods for Differential Message</u>	Apr 24, 2014	14261333			US	Pending

	<u>Scaling in a Decoding Proces</u>						
L13-1248US1	<u>Methods for soft decoding of polar codes</u>	Mar 6, 2014	61948777			US	Pending
L13-1248US2	<u>Methods for soft decoding of polar codes</u>	Mar 19, 2014	14219279			US	Pending
L13-1252US1	<u>General Framework for Collecting Statistics from Soft Reads</u>	Jan 13, 2014	61926488			US	Pending
L13-1252US2	<u>General Framework for Collecting Statistics from Soft Reads</u>	Feb 17, 2014	14181893			US	Pending
L13-1257US1	<u>Refresh, Run, Aggregate Decoder Recovery</u>	Feb 18, 2014	61941378			US	Pending
L13-1257US2	<u>Refresh, Run, Aggregate Decoder Recovery</u>	Mar 18, 2014	14218626			US	Pending
L13-1298US1	<u>Systems and Methods for Hard Error Reduction in a Solid State Memory Device</u>	Feb 6, 2014	61936599			US	Pending
L13-1298US2	<u>Systems and Methods for Hard Error</u>	Feb 11, 2014	14178201			US	Pending

	<u>Reduction in a Solid State Memory Device</u>						
L13-1301US1	<u>Systems and Methods for Last Written Page Handling in a Memory Device</u>	Feb 11, 2014	61938241			US	Pending
L13-1301US2	<u>Systems and Methods for Last Written Page Handling in a Memory Device</u>	Feb 27, 2014	14192831			US	Pending
L13-1307US1	<u>Improve System Performance via Control the Threshold Voltage Distribution Width of Hot-read Data</u>	Feb 17, 2014	61940561			US	Pending
L13-1307US2	<u>Improve System Performance via Control the Threshold Voltage Distribution Width of Hot-read Data</u>	Feb 26, 2014	14191263			US	Pending
L13-1314US1	<u>Periodically Updating a Log Likelihood Ratio (LLR) Table in a Flash Memory</u>	Feb 27, 2014	61945268			US	Pending

	<u>Controller</u>						
L13-1314US2	<u>Periodically Updating a Log Likelihood Ratio (LLR) Table in a Flash Memory Controller</u>	Mar 6, 2014	14198862			US	Pending
L13-1388US1	<u>Hot-read Data Aggregation and Code Selection</u>	Feb 14, 2014	61938936			US	Pending
L13-1388US2	<u>Hot-read Data Aggregation and Code Selection</u>	Feb 27, 2014	14192110			US	Pending
L13-1428US1	<u>A method of adjusting LLR values to compensate misplacement of read voltages</u>	Feb 26, 2014	61944696			US	Pending
L13-1428US2	<u>A method of adjusting LLR values to compensate misplacement of read voltages</u>	Mar 3, 2014	14195058			US	Pending
L14-0030US1	<u>Methods and Systems for Reducing Decoder Error Floor for an Electronic Non-Volatile Computer Storage</u>	Apr 9, 2014	61977399			US	Pending

L14-0030US2	<u>Methods and Systems for Reducing Decoder Error Floor for an Electronic Non-Volatile Computer Storage</u>	May 9, 2014	14273719			US	Pending
L14-0038US1	<u>ECC Selection in NAND flash Controller with Multiple ECCs</u>	Apr 4, 2014	61975202			US	Pending
L14-0038US2	<u>ECC Selection in NAND flash Controller with Multiple ECCs</u>	Apr 29, 2014	14264419			US	Pending
L14-0050US1	<u>Manufacturer self-test for solid-state drives</u>	Mar 24, 2014	14223407			US	Pending
L14-0055US1	<u>Estimating Read Reference Voltage Based on Disparity and Derivative Metrics</u>	Jun 9, 2014	14299195			US	Pending
L14-0062US1	<u>Online Histogram and Soft-information Learning</u>	Apr 10, 2014	14249714			US	Pending
L14-0075US1	<u>Read operation policy for</u>	Apr 8, 2014	61976854			US	Pending

	<u>system data during booting up of SSD drives</u>						
L14-0075US2	<u>Read operation policy for system data during booting up of SSD drives</u>	May 5, 2014	14269590			US	Pending
L14-0080US1	<u>Bad die detection in solid state drives</u>	Apr 2, 2014	61974078			US	Pending
L14-0080US2	<u>Bad die detection in solid state drives</u>	Apr 28, 2014	14263189			US	Pending
L14-0087US1	<u>Soft Read Handling of Read Noise</u>	Apr 10, 2014	14249450			US	Pending
L14-0109US1	<u>Data Recovery once ECC Fails to Correct the Data</u>	Apr 29, 2014	61985610			US	Pending
L14-0109US2	<u>Data Recovery once ECC Fails to Correct the Data</u>	May 9, 2014	14273920			US	Pending
L14-0184US1	<u>Fixed point conversion of LLR values based on correlation</u>	May 20, 2014	14282380			US	Pending
L14-0197US1	<u>A New Flash Command</u>	May 22, 2014	14284875			US	Pending

	<u>that Reports Count of Cell Program Failures</u>						
L14-0236US1	<u>A method of dynamically updating LLRs for SSDs</u>	May 19, 2014	14280884			US	Pending
L14-0242US1	<u>On-Die Flash ECC to mitigate write errors in multi step programming of MLC and TLC memories</u>	Jun 19, 2014	14308911			US	Pending
L14-0243US1	<u>Directed LLR perturbation in layered LDPC decoders</u>	Jul 2, 2014	14322376			US	Pending
L14-0244US1	<u>Inter-cell interference estimation based on pattern dependent histogram</u>	Jun 16, 2014	14305293			US	Pending
L14-0245US1	<u>Cell-to-cell Program Interference Aware Data Recovery when ECC Fails with Optimum Reading</u>	Jun 16, 2014	14305208			US	Pending
L14-0273US1	<u>Methods for write mapping</u>	Jun 23, 2014	14311645			US	Pending

	<u>to handle</u> <u>hard errors in</u> <u>soft ECC</u>						
SAF1P001	<u>SYSTEM,</u> <u>METHOD,</u> <u>AND</u> <u>COMPUTER</u> <u>PROGRAM</u> <u>PRODUCT FOR</u> <u>DELAYING AN</u> <u>OPERATION</u> <u>THAT</u> <u>REDUCES A</u> <u>LIFETIME OF</u> <u>MEMORY</u>	Sep 7, 2007	11852082	Oct 5, 2010	7809900	US	Issued
SAF1P001+	<u>SYSTEM,</u> <u>METHOD,</u> <u>AND</u> <u>COMPUTER</u> <u>PROGRAM</u> <u>PRODUCT FOR</u> <u>DELAYING AN</u> <u>OPERATION</u> <u>THAT</u> <u>REDUCES A</u> <u>LIFETIME OF</u> <u>MEMORY</u>	Nov 20, 2006	60860843			US	Expired
SAF1P002	<u>SYSTEM,</u> <u>METHOD,</u> <u>AND</u> <u>COMPUTER</u> <u>PROGRAM</u> <u>PRODUCT FOR</u> <u>REDUCING</u> <u>MEMORY</u> <u>WRITE</u> <u>OPERATIONS</u> <u>USING</u> <u>DIFFERENCE</u> <u>INFORMATIO</u> <u>N</u>	Sep 7, 2007	11852104	Mar 8, 2011	7904619	US	Issued

SAF1P002+	<u>SYSTEM,</u> <u>METHOD,</u> <u>AND</u> <u>COMPUTER</u> <u>PROGRAM</u> <u>PRODUCT FOR</u> <u>REDUCING</u> <u>MEMORY</u> <u>WRITE</u> <u>OPERATIONS</u> <u>USING</u> <u>DIFFERENCE</u> <u>INFORMATIO</u> <u>N</u>	Dec 4, 2006	60873630			US	Expired
SAF1P003	<u>MULTI-</u> <u>MEMORY</u> <u>DEVICE</u> <u>SYSTEM AND</u> <u>METHOD FOR</u> <u>MANAGING A</u> <u>LIFETIME</u> <u>THEREOF</u>	Sep 7, 2007	11852117	Jun 29, 2010	7747813	US	Issued
SAF1P003+	<u>MULTI-</u> <u>MEMORY</u> <u>DEVICE</u> <u>SYSTEM AND</u> <u>METHOD FOR</u> <u>MANAGING A</u> <u>LIFETIME</u> <u>THEREOF</u>	Jan 7, 2007	60878242			US	Expired
SAF1P004	<u>MEMORY</u> <u>LIFETIME</u> <u>GAUGING</u> <u>SYSTEM,</u> <u>METHOD AND</u> <u>COMPUTER</u> <u>PROGRAM</u> <u>PRODUCT</u>	Sep 7, 2007	11852129	Mar 8, 2011	7904764	US	Issued
SAF1P006	<u>SYSTEM,</u> <u>METHOD,</u>	Nov 19, 2007	11942623	Jan 3, 2012	8090980	US	Issued

	<u>AND</u> <u>COMPUTER</u> <u>PROGRAM</u> <u>PRODUCT FOR</u> <u>PROVIDING</u> <u>DATA</u> <u>REDUNDANCY</u> <u>IN A</u> <u>PLURALITY OF</u> <u>STORAGE</u> <u>DEVICES</u>						
SAF1P008	<u>SYSTEM,</u> <u>METHOD,</u> <u>AND</u> <u>COMPUTER</u> <u>PROGRAM</u> <u>PRODUCT FOR</u> <u>INCREASING</u> <u>SPARE SPACE</u> <u>IN MEMORY</u> <u>TO EXTEND A</u> <u>LIFETIME OF</u> <u>THE MEMORY</u>	Nov 28, 2007	11946753			US	Pending
SAF1P009	<u>SYSTEM,</u> <u>METHOD,</u> <u>AND</u> <u>COMPUTER</u> <u>PROGRAM</u> <u>PRODUCT FOR</u> <u>INCREASING A</u> <u>LIFETIME OF A</u> <u>PLURALITY OF</u> <u>BLOCKS OF</u> <u>MEMORY</u>	Nov 19, 2007	11942631	Mar 8, 2011	7903486	US	Issued
SAF1P010	<u>SYSTEM AND</u> <u>METHOD FOR</u> <u>PROVIDING</u> <u>DATA</u> <u>REDUNDANCY</u> <u>AFTER</u> <u>REDUCING</u> <u>MEMORY</u>	Nov 19, 2007	11942629	Mar 8, 2011	7904672	US	Issued

	<u>WRITES</u>						
SAF1P011	<u>SYSTEM, METHOD AND A COMPUTER PROGRAM PRODUCT FOR WRITING DATA TO DIFFERENT STORAGE DEVICES BASED ON WRITE FREQUENCY</u>	Nov 19, 2007	11942640	Dec 7, 2010	7849275	US	Issued
SAF1P014	<u>SYSTEM, METHOD, AND COMPUTER PROGRAM PRODUCT FOR PROVIDING AN EXTENDED CAPABILITY TO A SYSTEM</u>	Jul 15, 2008	12173631			US	Pending
SAF1P015	<u>SYSTEM, METHOD, AND COMPUTER PROGRAM PRODUCT FOR TRANSPAREN I COMMUNICA TION BETWEEN A STORAGE DEVICE AND AN APPLICATION</u>	Jul 15, 2008	12173643			US	Pending
SAF1P016	<u>SYSTEM, METHOD,</u>	Jul 15, 2008	12173654			US	Abando ned

	<u>AND</u> <u>COMPUTER</u> <u>PROGRAM</u> <u>PRODUCT FOR</u> <u>INTERFACING</u> <u>COMPUTING</u> <u>DEVICE</u> <u>HARDWARE</u> <u>OF A</u> <u>COMPUTING</u> <u>DEVICE AND</u> <u>AN</u> <u>OPERATING</u> <u>SYSTEM</u> <u>UTILIZING A</u> <u>VIRTUALIZATI</u> <u>ON LAYER</u>						
SAF1P018	<u>SYSTEM,</u> <u>METHOD,</u> <u>AND</u> <u>COMPUTER</u> <u>PROGRAM</u> <u>PRODUCT FOR</u> <u>CONVERTING</u> <u>DATA IN A</u> <u>BINARY</u> <u>REPRESENTAT</u> <u>ION TO A</u> <u>NON-POWER</u> <u>OF TWO</u> <u>REPRESENTAT</u> <u>ION</u>	Sep 9, 2008	12207379			US	Pending
SAF1P019	<u>SYSTEM,</u> <u>METHOD,</u> <u>AND</u> <u>COMPUTER</u> <u>PROGRAM</u> <u>PRODUCT FOR</u> <u>RENDERING</u> <u>AT LEAST A</u> <u>PORTION OF</u> <u>DATA USELESS</u> <u>IN</u>	Dec 8, 2008	12330183			US	Pending

	<u>IMMEDIATE RESPONSE TO A DELETE COMMAND</u>						
SAF1P025	<u>SYSTEM, METHOD, AND COMPUTER PROGRAM PRODUCT FOR CONVERTING LOGICAL BLOCK ADDRESS DE- ALLOCATION INFORMATIO N IN A FIRST FORMAT TO A SECOND FORMAT</u>	Mar 27, 2009	12413307	Jan 3, 2012	8090905	US	Issued
SAF1P026	<u>SYSTEM, METHOD, AND COMPUTER PROGRAM PRODUCT FOR SENDING LOGICAL BLOCK ADDRESS DE- ALLOCATION STATUS INFORMATIO N</u>	Mar 27, 2009	12413312	Jul 24, 2012	8230159	US	Issued
SAF1P027	<u>SYSTEM, METHOD, AND COMPUTER PROGRAM PRODUCT FOR HARDENING DATA STORED</u>	Mar 27, 2009	12413329			US	Abando ned

	<u>ON A SOLID STATE DISK</u>						
SAF1P028	<u>SYSTEM, METHOD, AND COMPUTER PROGRAM PRODUCT FOR ORDERING A PLURALITY OF WRITE COMMANDS ASSOCIATED WITH A STORAGE DEVICE</u>	Jul 2, 2009	12497327			US	Abando ned
SAF1P029	<u>SYSTEM, METHOD, AND COMPUTER PROGRAM PRODUCT FOR INTERFACING ONE OR MORE STORAGE DEVICES WITH A PLURALITY OF BRIDGE CHIPS</u>	Jul 6, 2009	12498162			US	Pending
SAF1P031	<u>SYSTEM, METHOD, AND COMPUTER PROGRAM PRODUCT FOR INSERTING A GAP IN INFORMATIO N SENT FROM A DRIVE TO A HOST DEVICE</u>	Jul 17, 2009	12505333	Mar 20, 2012	8140712	US	Issued

SAF1P032	<u>SYSTEM, METHOD, AND COMPUTER PROGRAM PRODUCT FOR REDUCING A RATE OF DATA TRANSFER TO AT LEAST A PORTION OF MEMORY</u>	Jul 20, 2009	12506068	Aug 20, 2013	8516166	US	Issued
SAF1P033	<u>SYSTEM, METHOD, AND COMPUTER PROGRAM PRODUCT FOR MAINTAINING A DIRECT CONNECTION BETWEEN AN INITIATOR AND A DRIVE</u>	Jul 23, 2009	12508259			US	Abandoned
SAF1P034	<u>SYSTEM, METHOD, AND COMPUTER PROGRAM PRODUCT FOR SENDING FAILURE INFORMATION FROM A SERIAL ATA (SATA) SOLID STATE DRIVE (SSD) TO A HOST DEVICE</u>	Oct 5, 2009	12573792	Jan 31, 2012	8108737	US	Issued
SF-001-1	<u>DELAYING AN OPERATION</u>	Jul 26, 2010	12843851	Jul 24, 2012	8230183	US	Issued

	<u>THAT</u> <u>REDUCES A</u> <u>LIFETIME OF</u> <u>MEMORY</u>						
SF-002-1	<u>TECHNIQUES</u> <u>FOR</u> <u>REDUCING</u> <u>MEMORY</u> <u>WRITE</u> <u>OPERATIONS</u> <u>USING</u> <u>COALESCING</u> <u>MEMORY</u> <u>BUFFERS AND</u> <u>DIFFERENCE</u> <u>INFORMATIO</u> <u>N</u>	Mar 7, 2011	13042231	Mar 19, 2013	8402184	US	Issued
SF-002-2	<u>TECHNIQUES</u> <u>FOR</u> <u>REDUCING</u> <u>MEMORY</u> <u>WRITE</u> <u>OPERATIONS</u> <u>USING</u> <u>COALESCING</u> <u>MEMORY</u> <u>BUFFERS AND</u> <u>DIFFERENCE</u> <u>INFORMATIO</u> <u>N</u>	Mar 15, 2013	13840609	Mar 11, 2014	8671233	US	Issued
SF-002-3	<u>TECHNIQUES</u> <u>FOR</u> <u>REDUCING</u> <u>MEMORY</u> <u>WRITE</u> <u>OPERATIONS</u> <u>USING</u> <u>COALESCING</u> <u>MEMORY</u> <u>BUFFERS AND</u> <u>DIFFERENCE</u> <u>INFORMATIO</u>	Mar 7, 2014	14201020			US	Pending

	<u>N</u>						
SF-003-1	<u>MULTI-MEMORY DEVICE SYSTEM AND METHOD FOR MANAGING A LIFETIME THEREOF</u>	Jun 24, 2010	12822442	Jul 24, 2012	8230164	US	Issued
SF-004-1	<u>MEMORY LIFETIME GAUGING SYSTEM, METHOD AND COMPUTER PROGRAM PRODUCT</u>	Mar 7, 2011	13042237	May 1, 2012	8171356	US	Issued
SF-006-1	<u>TECHNIQUES FOR PROVIDING DATA REDUNDANCY IN A PLURALITY OF STORAGE DEVICES</u>	Dec 31, 2011	13342027			US	Pending
SF-009-1	<u>Techniques For Increasing A Lifetime of Blocks of Memory</u>	Mar 7, 2011	13042242	Dec 25, 2012	8339881	US	Issued
SF-009-2	<u>Techniques For Increasing A Lifetime of Blocks of Memory</u>	Aug 10, 2012	13572257	Sep 10, 2013	8531900	US	Issued
SF-009-3	<u>Techniques For Increasing A Lifetime of</u>	Aug 8, 2013	13962779	Apr 15, 2014	8699287	US	Issued

	<u>Blocks of Memory</u>						
SF-009-4	<u>Techniques for Increasing A Lifetime of Blocks of Memory</u>	Apr 8, 2014	14247399			US	Pending
SF-010-1	<u>Techniques for providing data redundancy after reducing memory writes</u>	Mar 7, 2011	13042252	Aug 6, 2013	8504783	US	Issued
SF-010-2	<u>Techniques for providing data redundancy after reducing memory writes</u>	Jul 16, 2013	13943446	May 13, 2014	8725960	US	Issued
SF-010-2US2	<u>Techniques for providing data redundancy after reducing memory writes</u>	May 11, 2014	14274769			US	Pending
SF-011-1	<u>SYSTEM, METHOD AND A COMPUTER PROGRAM PRODUCT FOR WRITING DATA TO DIFFERENT STORAGE DEVICES BASED ON WRITE</u>	Nov 30, 2010	12956926	Jul 24, 2012	8230184	US	Issued

	<u>FREQUENCY</u>						
SF-025-1	<u>LOGICAL BLOCK ADDRESS DE- ALLOCATION INFORMATIO N FORMAT CONVERSION TECHNIQUES</u>	Jan 1, 2012	13342099			US	Abando ned
SF-031-1	<u>SYSTEM, METHOD, AND COMPUTER PROGRAM PRODUCT FOR INSERTING A GAP IN INFORMATIO N SENT FROM A DRIVE TO A HOST DEVICE</u>	Mar 19, 2012	13423808	Apr 16, 2013	8423680	US	Issued
SF-031-2	<u>SYSTEM, METHOD, AND COMPUTER PROGRAM PRODUCT FOR INSERTING A GAP IN INFORMATIO N SENT FROM A DRIVE TO A HOST DEVICE</u>	Apr 7, 2013	13858064	Dec 24, 2013	8615609	US	Issued
SF-031-3	<u>SYSTEM, METHOD, AND COMPUTER PROGRAM PRODUCT FOR INSERTING A GAP IN</u>	Dec 12, 2013	14104468			US	Pending

	<u>INFORMATION SENT FROM A DRIVE TO A HOST DEVICE</u>						
SF-032-1	<u>Techniques for Reducing a Rate of Data Transfer to at Least a Portion of Memory</u>	Aug 14, 2013	13966457			US	Pending
SF-034-1	<u>Sending Failure Information From A Solid State Drive (SSD) To A Host Device</u>	Jan 30, 2012	13361654	May 28, 2013	8453018	US	Issued
SF-034-2	<u>Sending Failure Information From A Solid State Drive (SSD) To A Host Device</u>	May 22, 2013	13899780	Jul 15, 2014	8782473	US	Issued
SF-10-01	<u>LDPC Erasure Decoding for Flash Memories</u>	Mar 12, 2010	61313681			US	Expired
SF-10-01BUS	<u>LDPC Erasure Decoding for Flash Memories</u>	Mar 11, 2011	13583617			US	Pending
SF-10-02	<u>Accessing Compressed Data of Varying-Sized Quanta in Non-Volatile</u>	Mar 22, 2010	61316373			US	Expired

	<u>Memory</u>						
SF-10-025US	<u>STORAGE SYSTEM LOGICAL BLOCK ADDRESS DE- ALLOCATION MANAGEMENT I</u>	Dec 12, 2011	13260709	Mar 11, 2014	8671258	US	Issued
SF-10-025US2	<u>STORAGE SYSTEM DATA HARDENING</u>	Dec 31, 2012	13732318	Mar 11, 2014	8671259	US	Issued
SF-10-025US3	<u>STORAGE SYSTEM LOGICAL BLOCK ADDRESS DE- ALLOCATION MANAGEMENT AND DATA HARDENING</u>	Mar 7, 2014	14201058			US	Pending
SF-10-028US	<u>SYSTEM, METHOD, AND COMPUTER PROGRAM PRODUCT FOR ORDERING A PLURALITY OF WRITE COMMANDS ASSOCIATED WITH A STORAGE DEVICE</u>	Dec 20, 2011	13379607			US	Pending
SF-10-02US	<u>Accessing Compressed Data of Varying-Sized Quanta in</u>	Mar 21, 2011	13053175			US	Pending

	<u>Non-Volatile Memory</u>						
SF-10-03	<u>Adaptive ECC Techniques for Flash Memory Based Data Storage</u>	Oct 27, 2010	61407178			US	Expired
SF-10-03US	<u>ADAPTIVE ECC TECHNIQUES FOR FLASH MEMORY BASED DATA STORAGE</u>	Apr 12, 2013	13879383			US	Pending
SF-10-04	<u>Cross-Decoding for Non-Volatile Storage</u>	Dec 12, 2010	61422198			US	Expired
SF-10-04US	<u>Cross-Decoding for Non-Volatile Storage</u>	Dec 12, 2011	13323769	May 6, 2014	8719663	US	Issued
SF-10-04US2	<u>Cross-Decoding for Non-Volatile Storage</u>	May 1, 2014	14267814			US	Pending
SF-10-05	<u>SCALABLE STORAGE DEVICES</u>	Jun 18, 2010	61356443			US	Expired
SF-10-05B	<u>SCALABLE STORAGE DEVICES</u>	Jun 16, 2011	61497525			US	Expired
SF-10-05-US2	<u>SCALABLE STORAGE DEVICES</u>	Dec 7, 2012	13702976	Mar 18, 2014	8677068	US	Issued
SF-10-05-US3	<u>SCALABLE</u>	Mar 4, 2014	14197010			US	Pending

	<u>STORAGE DEVICES</u>						
SF-10-06	<u>SELF- JOURNALING AND HIERARCHICAL CONSISTENCY FOR NON- VOLATILE STORAGE</u>	Oct 5, 2011	61543707			US	Expired
SF-10-06-PCT	<u>SELF- JOURNALING AND HIERARCHICAL CONSISTENCY FOR NON- VOLATILE STORAGE</u>	Oct 4, 2012	PCTUS20120585 83			US	Pending
SF-10-06US	<u>SELF- JOURNALING AND HIERARCHICAL CONSISTENCY FOR NON- VOLATILE STORAGE</u>	May 17, 2013				US	Pending
SF-10-08	<u>Encrypted- Transport Solid-State Disk Controller</u>	Apr 29, 2011	61480518			US	Expired
SF-10-08US1	<u>Encrypted- Transport Solid-State Disk Controller</u>	Oct 17, 2013	14112322			US	Pending
SF-10-09	<u>Adaptive ECC Techniques for Flash</u>	Sep 15, 2010	61383017			US	Expired

	<u>Memory Based Data Storage</u>						
SF-10-09NP	<u>Encryption Key Destruction For Secure Data Erasure</u>	Sep 15, 2011	13234134			US	Pending
SF-10-10	<u>DYNAMIC HIGHER-LEVEL REDUNDANCY MODE MANAGEMEN T WITH INDEPENDENT SILICON ELEMENTS</u>	Dec 1, 2010	61418846			US	Expired
SF-10-10US	<u>DYNAMIC HIGHER-LEVEL REDUNDANCY MODE MANAGEMEN T WITH INDEPENDENT SILICON ELEMENTS</u>	May 24, 2013	13989659			US	Pending
SF-10-11US1	<u>Non-Deterministic Encryption</u>	Jan 23, 2013	61755951			US	Expired
SF-10-11US2	<u>Non-Deterministic Encryption</u>	Jan 20, 2014	14158955			US	Pending
SF-10-12US1	<u>Storage Address Space to NVM Address, Span, and Length Mapping/Con verting</u>	Jan 22, 2013	61755169			US	Expired

SF-10-12US2	<u>Storage Address Space to NVM Address, Span, and Length Mapping/Converting</u>	Jan 17, 2014	14158380			US	Pending
SF-10-13US1	<u>Tamper Sensor</u>	Mar 14, 2013				US	Expired
SF-10-13US2	<u>Tamper Sensor</u>	Mar 6, 2014	14199761			US	Pending
SF-10-14	<u>Higher-Level Redundancy Information Computation</u>	Jan 18, 2011	61433918			US	Expired
SF-10-14US	<u>Higher-Level Redundancy Information Computation</u>	Jul 15, 2013	13979805	Feb 18, 2014	8656101	US	Issued
SF-10-14US2	<u>Higher-Level Redundancy Information Computation</u>	Feb 14, 2014	14181252			US	Pending
SF-11-01US1	<u>Selective Data Banding</u>	Jan 22, 2013	61755442			US	Expired
SF-11-01US2	<u>Management of and Region Selection for Writes to Non-Volatile Memory</u>	Jan 19, 2014	14158827			US	Pending
SF-11-02US1	<u>Zero/One Balance Management in a Solid-State Disk</u>	May 4, 2012	13464433			US	Pending

	<u>Controller</u>						
SF-11-03US1	<u>Scalable Data Structures for Control and Management of Non-Volatile Storage</u>	Oct 15, 2012	13652301			US	Pending
SF-11-04	<u>Variable Over-Provisioning for Non-Volatile Storage</u>	Apr 26, 2011	61479249			US	Expired
SF-11-04US1	<u>Variable Over-Provisioning for Non-Volatile Storage</u>	Nov 11, 2013	14112221			US	Pending
SF-11-05	<u>Selective Enablement Of Status Coalescing Via Host Transfer Rate Detection</u>	Feb 8, 2011	61440710			US	Expired
SF-11-05US2	<u>Selective Enablement Of Status Coalescing Via Host Transfer Rate Detection</u>	Aug 1, 2013	13983251			US	Pending
SF-11-07US1	<u>Device Power Control</u>	Mar 14, 2013	61786110			US	Expired
SF-11-08US1	<u>Storage Device Power Failure Infrastructure</u>	Mar 10, 2013				US	Expired

SF-11-08US2	<u>Storage Device Power Failure Infrastructure</u>	Mar 7, 2014	14201106			US	Pending
SF-11-09US1	<u>Enhanced Queue Management</u>	Mar 14, 2013				US	Expired
SF-11-09US2	<u>Enhanced Queue Management</u>	Mar 13, 2014	14209028			US	Pending
SF-11-10US1	<u>Lock-Free Communication Storage Request Reordering</u>	Mar 14, 2013	61786170			US	Expired
SF-11-10US2	<u>Lock-Free Communication Storage Request Reordering</u>	Mar 6, 2014	14199691			US	Pending
SF-11-11	<u>Techniques For Secure Storage Hijacking Protection</u>	Jul 27, 2011	61511989			US	Expired
SF-11-11US1	<u>Techniques For Secure Storage Hijacking Protection</u>	Jul 26, 2012	14131665			US	Pending
SF-11-12	<u>Management Of Device Firmware Update Effects As Seen By A Host</u>	Jun 7, 2011	61494262			US	Expired

SF-11-12US1	<u>Management Of Device Firmware Update Effects As Seen By A Host</u>	Nov 21, 2013	14119375			US	Pending
SF-11-14US1	<u>Measuring Cell Damage for Wear Leveling in a Non-Volatile Memory</u>	Sep 15, 2012	13620982			US	Pending
SF-11-15	<u>I/O DEVICE AND COMPUTING HOST INTEROPERATION</u>	Aug 9, 2011	61521739			US	Expired
SF-11-15A	<u>I/O DEVICE AND COMPUTING HOST INTEROPERATION</u>	Sep 6, 2011	61531551			US	Expired
SF-11-15B	<u>I/O DEVICE AND COMPUTING HOST INTEROPERATION</u>	Oct 5, 2011	61543666			US	Expired
SF-11-15-US1	<u>I/O DEVICE AND COMPUTING HOST INTEROPERATION</u>	Jul 5, 2013	13936010			US	Pending
SF-11-15US2	<u>I/O DEVICE</u>	Feb 5, 2014	14237331			US	Pending

	<u>AND COMPUTING HOST INTEROPERATI ON</u>						
SF-11-16US1	<u>Decoupled Locking DMA Architecture</u>	Jan 31, 2013	61758770			US	Expired
SF-11-16US2	<u>Decoupled Locking DMA Architecture</u>	Jan 22, 2014	14161290			US	Pending
SF-11-17	<u>Virtual Drive Manufacturin g Model</u>	Nov 14, 2011	61599201			US	Expired
SF-11-17US	<u>Storage Device Firmware and Manufacturin g Software</u>	May 21, 2013	13988741			US	Pending
SF-11-17US1	<u>Virtual Drive Manufacturin g Model</u>	Mar 30, 2012	13436639			US	Pending
SF-11-18US1	<u>Non-Volatile Memory Program Failure Recovery via Redundant Arrays</u>	Dec 27, 2012	13728573			US	Pending
SF-11-19US1	<u>Retention Drift Clock</u>	Feb 10, 2013	61762955			US	Expired
SF-11-19US2	<u>Retention Drift Clock</u>	Jan 31, 2014	14170008			US	Pending