

**UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
WASHINGTON, DC 20549**

FORM S-8

REGISTRATION STATEMENT UNDER THE SECURITIES ACT OF 1933

AXCELIS TECHNOLOGIES, INC.

(Exact name of registrant as specified in its charter)

Delaware
(State or other jurisdiction of incorporation)

34-1818596
(I.R.S. Employer Identification No.)

108 Cherry Hill Drive, Beverly, Massachusetts 01915
(Address of Principal Executive Offices and Zip Code)

2012 EQUITY INCENTIVE PLAN
(Full title of the plan)

LYNNETTE C. FALLON
Axcelis Technologies, Inc.
108 Cherry Hill Drive
Beverly, Massachusetts 01915
(617) 787-4000
(Name, address and telephone number of agent for service)

with copies to:

MATTHEW C. DALLETT
Locke Lord LLP
111 Huntington Avenue
Boston, Massachusetts 02199-7613
(617) 239-0100

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, or a smaller reporting company. See the definitions of "large accelerated filer," "accelerated filer" and "smaller reporting company" in Rule 12b-2 of the Exchange Act. (Check one):

Large accelerated filer

Accelerated filer

Non-accelerated filer (Do not check if a smaller reporting company)

Smaller reporting company

CALCULATION OF REGISTRATION FEE

Title of securities to be registered	Amount to be registered	Proposed maximum offering price per share	Proposed maximum aggregate offering price	Amount of registration fee
Common Stock, \$.001 par value	4,000,000 shares(1) \$	2.39(2) \$	9,560,000(2) \$	962.69

(1) Includes pursuant to Rule 416 under the Securities Act of 1933 (the "Securities Act"), such additional number of shares of the Registrant's Common Stock as may be issued upon a stock split, stock dividend, or similar transaction.

(2) Pursuant to Rules 457(c) and 457(h) under the Securities Act, the proposed maximum offering price per share and the maximum aggregate offering price for the shares have been estimated solely for the purpose of calculating the registration fee on the basis of the average of the high and low prices of the Registrant's Common Stock, as reported by the Nasdaq Global Select market on May 20, 2016.

The Registrant hereby increases the number of shares of its Common Stock, \$0.001 par value per share (the "Common Stock"), registered for issuance under its 2012 Equity Incentive Plan by 4,000,000 shares. Pursuant to General Instruction E to Form S-8, the Registrant incorporates by reference into this Registration Statement the entire contents of its Registration Statement on Form S-8 (File No. 333-181750) filed with the Securities and Exchange Commission (the "Commission") on May 30, 2012 relating to the registration of 3,800,000 shares of Common Stock authorized for issuance under the 2012 Equity Incentive Plan. The Registrant also incorporates by reference the Registration Statements on Forms S-8 (Commission File Nos. 333-188967, 333-196157, and 333-204544) with the Commission relating to the registration of 3,250,000, 1,500,000, and 2,500,000 shares of Common Stock for issuance under the 2012 Equity Incentive Plan on May 31, 2013, May 22, 2014, and May 29, 2015 respectively.

SIGNATURES

Pursuant to the requirements of the Securities Act of 1933, as amended, the Registrant certifies that it has reasonable grounds to believe that it meets all of the requirements for filing on Form S-8 and has duly caused this Registration Statement to be signed on its behalf by the undersigned, thereunto duly authorized, in the Town of Beverly, Massachusetts, on the 27th day of May, 2016.

AXCELIS TECHNOLOGIES, INC.

By: /s/ Mary G. Puma
 Mary G. Puma, *Chief Executive Officer and President*

POWER OF ATTORNEY

We, the undersigned officers and directors of Axcelis Technologies, Inc., hereby severally constitute and appoint Mary G. Puma, Kevin J. Brewer, and Lynnette C. Fallon, and each of them singly, our true and lawful attorneys-in-fact, with full power to them in any and all capacities, to sign any and all amendments to this Registration Statement on Form S-8 (including any post-effective amendments thereto) for the registration of 4,000,000 shares, and to file the same, with exhibits thereto and other documents in connection therewith, with the Commission, with respect to the registration of shares under the Axcelis Technologies, Inc. 2012 Equity Incentive Plan, hereby ratifying and confirming all that each of said attorneys-in-fact may do or cause to be done by virtue hereof.

Pursuant to the requirements of the Securities Act of 1933, as amended, this Registration Statement has been signed below by the following persons in the capacities and on the dates indicated.

<u>Signature</u>	<u>Title</u>	<u>Date</u>
<u>/s/ Mary G. Puma</u> Mary G. Puma	Director and Principal Executive Officer	*
<u>/s/ Kevin J. Brewer</u> Kevin J. Brewer	Principal Accounting and Financial Officer	*
<u>/s/ Richard J. Faubert</u> Richard J. Faubert	Director	*
<u>/s/ R. John Fletcher</u> R. John Fletcher	Director	*
<u>/s/ Arthur L. George, Jr.</u> Arthur L. George, Jr.	Director	*
<u>/s/ Joseph P. Keithley</u> Joseph P. Keithley	Director	*
<u>/s/ John T. Kurtzweil</u> John T. Kurtzweil	Director	*

<u>/s/ Barbara J. Lundberg</u> Barbara J. Lundberg	Director	*
<u>/s/ Patrick H. Nettles</u> Patrick H. Nettles	Director	*

*May 27, 2016

EXHIBIT INDEX

<u>Exhibit Number</u>	<u>Description</u>
4.1*	Amended and Restated Certificate of Incorporation of the Registrant, as adopted May 6, 2009. Incorporated by reference to Exhibit 3.1 of the Registrant's Form 8-K filed with the Commission on May 11, 2009.
4.2*	Bylaws of the Registrant, as amended as of May 13, 2014. Incorporated by reference to Exhibit 3.1 of the Registrant's Form 8-K filed with the Commission on May 19, 2014.
5.1	Opinion of Locke Lord LLP as to the legality of the shares being registered hereunder. Filed herewith.
10.1*	Axcelis Technologies, Inc. 2012 Equity Incentive Plan, as amended through May 4, 2015. Incorporated by reference to the appendix to the Registrant's Proxy Statement on Schedule 14A filed with the Commission on March 14, 2016.
23.1	Consent of Locke Lord LLP (included in the Opinion filed as Exhibit 5.1).
23.2	Consent of Ernst & Young LLP, Independent Registered Public Accounting Firm. Filed herewith.
24.1	Power of Attorney (contained on the signature page hereto).

* Indicates exhibit previously filed with the Securities and Exchange Commission and incorporated herein by reference. Exhibits filed with Forms 10-Q or 8-K of Axcelis Technologies, Inc. were filed under Commission File No. 000-30941.

[Letterhead of Locke Lord LLP]

May 27, 2016

Axcelis Technologies, Inc.
108 Cherry Hill Drive
Beverly, MA 01915

Locke Lord Edwards
111 Huntington Avenue
Boston, MA 02199
Telephone: 617-239-0100
Fax: 617-227-4420
www.lockelord.com

Ladies and Gentlemen:

This opinion is furnished to you in connection with a registration statement on Form S-8 (the "Registration Statement") filed on or about the date hereof with the Securities and Exchange Commission under the Securities Act of 1933, as amended, for the registration of 4,000,000 shares of common stock, \$0.001 par value (the "Shares"), of Axcelis Technologies, Inc., a Delaware corporation (the "Company"). The Shares are issuable under the Company's 2012 Equity Incentive Plan (the "Plan").

We are familiar with the actions taken by the Company in connection with the proposed issuance of the Shares. For purposes of our opinion, we have examined and relied upon such documents, records, certificates and other instruments as we have deemed necessary.

Based on the foregoing, we are of the opinion that the Shares have been duly authorized and, when the Shares have been issued and sold in accordance with the terms of the Plan, the Shares will be validly issued, fully paid and nonassessable.

We hereby consent to the filing of this opinion as an exhibit to the Registration Statement.

It is understood that this opinion is to be used only in connection with the offer and sale of Shares while the Registration Statement is in effect.

Very truly yours,

/s/ Locke Lord LLP

Atlanta | Austin | Boston | Chicago | Dallas | Hartford | Hong Kong | Houston | Istanbul | London | Los Angeles | Miami | Morristown | New Orleans
New York | Orange County | Providence | Sacramento | San Francisco | Stamford | Tokyo | Washington DC | West Palm Beach

CONSENT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

We consent to the incorporation by reference in this Registration Statement (Form S-8 to be filed on May 27, 2016) pertaining to the 2012 Equity Incentive Plan of Axcelis Technologies, Inc. of our reports dated March 4, 2016, with respect to the consolidated financial statements and schedule of Axcelis Technologies, Inc., and the effectiveness of internal control over financial reporting of Axcelis Technologies, Inc., included in its Annual Report (Form 10-K) for the year ended December 31, 2015, filed with the Securities and Exchange Commission.

/s/ Ernst & Young LLP

Boston, Massachusetts
May 27, 2016
