

**UNITED STATES  
SECURITIES AND EXCHANGE COMMISSION**  
Washington, D.C. 20549

**FORM S-8**  
**REGISTRATION STATEMENT  
UNDER  
THE SECURITIES ACT OF 1933**

**Rhythm Pharmaceuticals, Inc.**

(Exact name of Registrant as specified in its charter)

**Delaware**  
(State or other jurisdiction of  
incorporation or organization)

**46-2159271**  
(I.R.S. Employer  
Identification Number)

**500 Boylston Street  
11<sup>th</sup> Floor  
Boston, MA 02116**  
(Address of Principal Executive Offices)

**2017 Equity Incentive Plan**  
(Full Title of the Plan)

**Keith M. Gottesdiener, M.D.**  
**Chief Executive Officer and President**  
**Rhythm Pharmaceuticals, Inc.**

**500 Boylston Street  
11<sup>th</sup> Floor  
Boston, MA 02116  
(857) 264-4280**

(Name, address, including zip code, and telephone number, including area code, of agent for service)

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," "smaller reporting company" and "emerging growth company" in Rule 12b-2 of the Exchange Act.

Large accelerated filer	<input type="radio"/>	Accelerated filer	<input type="radio"/>
Non-accelerated filer	<input checked="" type="radio"/> (Do not check if a smaller reporting company)	Smaller reporting company	<input type="radio"/>
		Emerging growth company	<input checked="" type="radio"/>

If an emerging growth company, indicate by check mark if the registrant has elected not to use the extended transition period for complying with any new or revised financial accounting standards provided pursuant to Section 7(a)(2)(B) of the Securities Act.

**CALCULATION OF REGISTRATION FEE**

Title of Each Class of Securities to be Registered	Amount to be Registered(1)	Proposed Maximum Offering Price Per Share	Proposed Maximum Aggregate Offering Price Per Share	Amount of Registration Fee
Common Stock, \$0.001 par value per share				
2017 Equity Incentive Plan	1,091,366(2)	\$ 27.12(3)	\$ 29,595,106.66(3)	\$ 3,684.59
Total	1,091,366			\$ 3,684.59

- Pursuant to Rule 416(a) under the Securities Act of 1933, as amended (the "Securities Act"), this registration statement shall also cover any additional shares of the Registrant's common stock that become issuable under the 2017 Equity Incentive Plan (the "EIP") by reason of any stock dividend, stock split, recapitalization or similar transaction effected without the Registrant's receipt of consideration which would increase the number of outstanding shares of common stock.
- Represents shares of common stock that were automatically added to the shares authorized for issuance under the EIP on January 1, 2018 pursuant to an "evergreen" provision contained in the EIP. Pursuant to such provision, on January 1st of each year commencing in 2018 and continuing through and including January 1, 2027, the number of shares authorized for issuance under the EIP is automatically increased by four percent (4%) of the aggregate number of shares of the Registrant's capital stock outstanding as of December 31st of the preceding calendar year, or such lesser number of shares that may be determined by the Registrant's Board of Directors.
- Estimated solely for the purpose of calculating the amount of the registration fee pursuant to this offering under Rules 457(c) and 457(h) of the Securities Act. The offering price per share and the aggregate offering price for shares reserved for future issuance under the EIP are based on the average of the high and low price per share of the Registrant's common stock as reported on The Nasdaq Global Market ("Nasdaq") on March 9, 2018, which is equal to \$27.12.

This Registration Statement on Form S-8 is being filed for the purpose of registering an additional 1,091,366 shares of common stock of Rhythm Pharmaceuticals, Inc. (the "Company") to be issued pursuant to the Rhythm Pharmaceuticals, Inc. 2017 Equity Incentive Plan. The Company previously registered shares of its Common Stock for issuance under the 2017 Equity Incentive Plan under a Registration Statement on Form S-8 filed with the Securities and Exchange Commission (the "Commission") on October 12, 2017 (File No. 333-220925). Pursuant to General Instruction E to Form S-8, this Registration Statement hereby incorporates by reference the contents of the Registration Statement referenced above.

## PART II

### INFORMATION REQUIRED IN THE REGISTRATION STATEMENT

#### Item 8. Exhibits.

The exhibits to the registration statement are listed in the Exhibit Index attached hereto and incorporated by reference herein.

#### Exhibit Index

Exhibit Number	Exhibit Description	Filed Herewith
5.1	<a href="#">Opinion of Morgan, Lewis &amp; Bockius LLP.</a>	X
23.1	<a href="#">Consent of Ernst &amp; Young LLP, independent registered public accounting firm.</a>	X
23.2	<a href="#">Consent of Morgan, Lewis &amp; Bockius LLP. Reference is made to Exhibit 5.1.</a>	X
24.1	<a href="#">Power of Attorney. Reference is made to the signature page hereto.</a>	X

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### SIGNATURES

Pursuant to the requirements of the Securities Act of 1933, 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 city of Boston, Commonwealth of Massachusetts on March 14, 2018.

#### RHYTHM PHARMACEUTICALS, INC.

By: /s/ Keith M. Gottesdiener  
 Keith M. Gottesdiener  
*President and Chief Executive Officer*

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### POWER OF ATTORNEY

KNOW ALL PERSONS BY THESE PRESENTS, that each person whose signature appears below does hereby constitute and appoint Keith M. Gottesdiener and Hunter Smith and each of them, with full power of substitution and full power to act without the other, his or her true and lawful attorney-in-fact and agent to act for him or her in his or her name, place and stead, in any and all capacities, to sign any and all amendments (including post-effective amendments) to this registration statement, and to file this registration statement, with all exhibits thereto, and other documents in connection therewith, with the Securities and Exchange Commission, granting unto said attorneys-in-fact and agents, and each of them, full power and authority to do and perform each and every act and thing requisite and necessary to be done in order to effectuate the same as fully, to all intents and purposes, as they or he or she might or could do in person, hereby ratifying and confirming all that said attorneys-in-fact and agents, or any of them, may lawfully 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 by the following persons in the capacities and on the date indicated.

Signature	Title	Date
<u>/s/ Keith M. Gottesdiener</u> Keith M. Gottesdiener	Chief Executive Officer, President and Director (Principal Executive Officer)	March 14, 2018
<u>/s/ Hunter Smith</u> Hunter Smith	Chief Financial Officer and Treasurer (Principal Financial and Accounting Officer)	March 14, 2018
<u>/s/ John J. Hulburt</u> John J. Hulburt	Controller	March 14, 2018
<u>/s/ Neil Exter</u> Neil Exter	Director	March 14, 2018

<u>/s/ Todd Foley</u> Todd Foley	Director	March 14, 2018
<u>/s/ Christophe R. Jean</u> Christophe R. Jean	Director	March 14, 2018
<u>/s/ Ed Mathers</u> Ed Mathers	Director	March 14, 2018
<u>/s/ David W. J. McGirr</u> David W. J. McGirr	Director	March 14, 2018
<u>/s/ David P. Meeker</u> David P. Meeker	Director	March 14, 2018

March 14, 2018

Rhythm Pharmaceuticals, Inc.  
500 Boylston Street, 11th Floor  
Boston, MA 02116

Re: Registration Statement on Form S-8; 1,091,366 shares of Common Stock of Rhythm Pharmaceuticals, Inc., par value \$0.001 per share

Ladies and Gentlemen:

We have acted as counsel to Rhythm Pharmaceuticals, Inc., a Delaware corporation (the "Company"), in connection with the registration by the Company of 1,091,366 shares of common stock of the Company, par value \$0.001 per share (the "Shares"), issuable under the Company's 2017 Equity Incentive Plan (the "EIP").

The Shares are included in a registration statement on Form S-8 under the Securities Act of 1933, as amended (the "Act"), filed with the Securities and Exchange Commission (the "Commission") on March 14, 2018 (the "Registration Statement"). This opinion is being furnished in connection with the requirements of Item 601(b)(5) of Regulation S-K under the Act, and no opinion is expressed herein as to any matter pertaining to the contents of the Registration Statement or the related prospectuses, other than as expressly stated herein with respect to the issuance of the Shares.

As such counsel, we have examined such matters of fact and questions of law as we have considered appropriate for purposes of this letter. With your consent, we have relied upon certificates and other assurances of officers of the Company and others as to factual matters without having independently verified such factual matters. We are opining herein as to the General Corporation Law of the State of Delaware (the "DGCL"), and we express no opinion with respect to any other laws.

Subject to the foregoing and the other matters set forth herein, it is our opinion that, as of the date hereof, when the Shares shall have been issued and registered on the books of the transfer agent against payment therefor in the circumstances contemplated by the EIP, assuming that the individual issuances, grants or awards under the EIP are duly authorized by all necessary corporate action and duly issued, granted or awarded and exercised in accordance with the requirements of law and the EIP (and the agreements and awards duly adopted thereunder and in accordance therewith), the issue and sale of the Shares will have been duly authorized by all necessary corporate action of the Company, and the Shares will be validly issued, fully paid and nonassessable. In rendering the foregoing opinion, we have assumed that the Company will comply with all applicable notice requirements regarding uncertificated shares provided in the DGCL.

This opinion is for your benefit in connection with the Registration Statement and may be relied upon by you and by persons entitled to rely upon it pursuant to the applicable provisions of the Act. We consent to your filing this opinion as an exhibit to the Registration Statement. In giving such consent, we do not thereby

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admit that we are in the category of persons whose consent is required under Section 7 of the Act or the rules and regulations of the Commission thereunder.

Very truly yours,

/s/ MORGAN LEWIS & BOCKIUS LLP

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**Consent of Independent Registered Public Accounting Firm**

We consent to the incorporation by reference in the Registration Statement (Form S-8) pertaining to the 2017 Equity Incentive Plan and 2017 Employee Stock Purchase Plan of our report dated March 12, 2018 with respect to the consolidated financial statements of Rhythm Pharmaceuticals, Inc. included in its Annual Report (Form 10-K) for the year ended December 31, 2017, filed with the Securities and Exchange Commission.

/s/ **Ernst & Young LLP**

Boston, Massachusetts  
March 12, 2018

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