



Common Stock

SUNSHINE HEART, INC.

This prospectus supplement amends the existing base prospectus that forms a part of the Registration Statement on Form S-3 (File No. 333-182273), which became effective April 5, 2013, to update the section entitled "Description of Common Stock" set forth in each existing base prospectus, and the section set forth in this prospectus supplement entitled "Description of Common Stock" replaces and supersedes in its entirety the section entitled "Description of Common Stock" set forth in the existing base prospectus.

On June 14, 2013, the Board of Directors of Sunshine Heart, Inc. (the "Company") authorized and declared a dividend of one right to purchase one-thousandth of a share of a newly authorized series of preferred stock for each outstanding share of Common Stock of the Company. The Company's shares of common stock trade on the NASDAQ Capital Market ("Nasdaq") under the trading symbol "SSH." On September 18, 2013, the last reported sale price of our common stock on Nasdaq was \$11.35 per share.

We are an "emerging growth company" under the U.S. federal securities laws and are subject to reduced public company reporting requirements. Investing in our securities involves risks. See "Risk Factors" on page 10 of the existing base prospectus and in the applicable prospectus supplement.

This prospectus supplement should be read in conjunction with the existing base prospectus dated April 5, 2013.

Neither the Securities and Exchange Commission nor any state securities commission has approved or disapproved of these securities or determined if this prospectus supplement or the accompanying prospectus is truthful or complete. Any representation to the contrary is a criminal offense.

The date of this prospectus supplement is September 18, 2013.

DESCRIPTION OF COMMON STOCK

In this section entitled "Description of Capital Stock," unless otherwise indicated, the terms "we," "us," "our Company," "the Company" and "Sunshine Heart" refer to Sunshine Heart, Inc., a Delaware corporation, together with its wholly owned subsidiary. The descriptions set forth below of the common stock and preferred stock (as hereinafter described) constitute brief summaries of certain provisions of the Company's Fourth Amended and Restated Certificate of Incorporation, as amended, referred to in this section as our "certificate of incorporation," and the Company's Amended and Restated Bylaws, as amended, referred to in this section as our "bylaws," and are qualified in their entirety by reference to the relevant provisions of such documents. See "Where You Can Find More Information" and "Incorporation of Certain Documents by Reference" for information on how to obtain copies of these documents.

General Terms

We are authorized to issue up to 100,000,000 shares of common stock, with a par value of \$0.0001 per share and up to 40,000,000 shares of preferred stock, with a par value of \$0.0001 per share, 30,000 shares of which have been designated "Series A Junior Participating Preferred Stock."

Outstanding Common Stock

As of September 6, 2013, we had 12,384,890 shares of our common stock issued and outstanding and we had 286 holders of record of our common stock. As of September 6, 2013, we had outstanding options to acquire 1,655,162 shares of common stock held by employees, directors, and consultants granted options to purchase our common stock, outstanding restricted stock unit awards covering 10,597 restricted shares of common stock held by directors, as well as outstanding warrants to purchase 1,633,230 shares of common stock held by employees, directors, consultants, and investors.

Common Stock

Holders of our common stock are entitled to receive dividends when, if and as declared by our board of directors out of funds legally available.

Holders of our common stock are entitled to one vote for each share on each matter properly submitted to our stockholders for their vote; provided however, that except as otherwise required by law, holders of our common stock will not be entitled to vote on any amendment to our certificate of incorporation (including any certificate of designation filed with respect to any series of preferred stock) that relates solely to the terms of a series of outstanding preferred stock if the holders of such affected series are entitled, either separately or together as a class with the holders of one or more other such

series, to vote thereon by law or pursuant to our certificate of incorporation (including any certificate of designation filed with respect to any series of preferred stock).

Subject to the voting restrictions described above, holders of our common stock may adopt, amend or repeal our bylaws and/or alter certain provisions of our certificate of incorporation with the affirmative vote of the stockholders of at least 66-2/3% of the voting power of all of the then-outstanding shares of our capital stock entitled to vote generally in the election of directors, voting together as a single class, in addition to any vote of the holders of a class or series of our stock required by law or our certificate of incorporation. The certain provisions of our certificate of incorporation that may be altered only by the super-majority vote described above relate to:

- the number of directors on our board of directors, the classification of our board of directors and the terms of the members of our board of directors;
- the limitations on removal of any of our directors described below under “—Anti-Takeover Effects of Certain Provisions of Delaware Law and Our Certificate of Incorporation, Bylaws and Stockholder Rights Plan;”

S-1

- the ability of our directors to fill any vacancy on our board of directors by the affirmative vote of a majority of the directors then in office under certain circumstances;
- the ability of our board of directors to adopt, amend or repeal our bylaws and the super-majority vote of our stockholders required to adopt, amend or repeal our bylaws described above;
- the limitation on action of our stockholders by written action described below under “—Anti-Takeover Effects of Certain Provisions of Delaware Law and Our Certificate of Incorporation, Bylaws and Stockholder Rights Plan;”
- the choice of forum provision described below under “—Choice of Forum;”
- the limitations on director liability and indemnification described below under the heading “—Limitation on Liability of Directors and Indemnification;” and
- the super-majority voting requirement to amend our certificate of incorporation described above.

Holders of our common stock do not have any conversion, redemption or preemptive rights pursuant to our organizational documents. In the event of our dissolution, liquidation or winding up, holders of our common stock are entitled to share ratably in any assets remaining after the satisfaction in full of the prior rights of creditors and the aggregate of any liquidation preference pursuant to the terms of any certificate of designation filed with respect to any series of preferred stock. The rights, preferences, and privileges of the holders of our common stock are subject to, and may be adversely affected by, the rights of the holders of shares of any series of preferred stock that we may designate and issue in the future.

The foregoing description of our authorized capital, outstanding common stock and common stock is a summary only and is qualified in its entirety by reference to our certificate of incorporation and bylaws, both of which are exhibits to the registration statement of which this prospectus is a part and have been filed with the SEC and are available at the SEC’s website at www.sec.gov.

All outstanding shares of our common stock are fully paid and non-assessable.

Series A Junior Participating Preferred Stock

On June 14, 2013, our board of directors authorized 30,000 shares of Series A Junior Participating Preferred Stock, in connection with the Company’s adoption of a stockholder rights plan. The terms of the Series A Junior Participating Preferred Stock are further described below under “—Anti-Takeover Effects of Certain Provisions of Delaware Law and Our Certificate of Incorporation, Bylaws and Stockholder Rights Plan—Stockholder Rights Plan.”

Anti-Takeover Effects of Certain Provisions of Delaware Law and Our Certificate of Incorporation, Bylaws and Stockholder Rights Plan

Certificate of Incorporation and Bylaws

Certain provisions of our certificate of incorporation and bylaws may be considered as having an anti-takeover effect, such as those provisions:

- providing for our board of directors to be divided into three classes with staggered three-year terms, with only one class of directors being elected at each annual meeting of our stockholders and the other classes continuing for the remainder of their respective three-year terms;

S-2

- authorizing our board of directors to issue from time to time any series of preferred stock and fix the voting powers, designation, powers, preferences and rights of the shares of such series of preferred stock;
- prohibiting stockholders from acting by written consent in lieu of a meeting;
- requiring advance notice of stockholder intention to put forth director nominees or bring up other business at a stockholders’ meeting;
- prohibiting stockholders from calling a special meeting of stockholders;

- requiring a 66-2/3% super-majority stockholder approval in order for stockholders to alter, amend or repeal certain provisions of our certificate of incorporation;
- requiring a 66-2/3% super-majority stockholder approval in order for stockholders to adopt, amend or repeal our bylaws;
- providing that, subject to the rights of the holders of any series of preferred stock to elect additional directors under specified circumstances, neither the board of directors nor any individual director may be removed without cause;
- creating the possibility that our board of directors could prevent a coercive takeover of our company due to the significant amount of authorized, but unissued shares of our common stock and preferred stock;
- providing that, subject to the rights of the holders of any series of preferred stock, the number of directors shall be fixed from time to time exclusively by our board of directors pursuant to a resolution adopted by a majority of the total number of authorized directors; and
- providing that any vacancies on our board of directors under certain circumstances will be filled only by a majority of our board of directors then in office, even less than a quorum, and not by the stockholders.

Stockholder Rights Plan

In addition, on June 14, 2013, we adopted a stockholder rights plan (the “Rights Plan”), which entitles the holders of the rights to purchase from the Company 1/1,000th of a share of Series A Junior Participating Preferred Stock, par value \$0.0001 per share, at a purchase price of \$35.00 per share, as adjusted (a “Right”), upon certain trigger events. In connection therewith, on June 14, 2013, the Company’s board of directors authorized 30,000 shares of Series A Junior Participating Preferred Stock and it declared a dividend of one Right per each share of common stock of the Company outstanding as of June 24, 2013. Each 1/1,000th of a share of Series A Junior Participating Preferred Stock has terms that are substantially the economic and voting equivalent of one share of the Company’s common stock. However, until a Right is exercised or exchanged in accordance with the provisions of the Rights Plan, the holder thereof will have no rights as a stockholder of the Company, including, but not limited to, the right to vote for the election of directors or upon any matter submitted to stockholders of the Company. The Rights Plan has a three-year term and the board of directors may terminate the Rights Plan at any time (subject to the redemption of the Rights for a nominal value). The Rights may cause substantial dilution to a person or group (together with all affiliates and associates of such person or group and any person or group of persons acting in concert therewith) that acquires beneficial ownership of 15% or more of the Company’s stock on terms not approved by the board of directors or takes other specified actions.

S-3

Delaware Law

We are also subject to Section 203 of the DGCL, which in general prohibits a Delaware corporation from engaging in any business combination with any interested stockholder for a period of three years following the date that the stockholder became an interested stockholder, unless:

- prior to that date, our board of directors approved either the business combination or the transaction that resulted in the stockholder becoming an interested stockholder;
- upon consummation of the transaction that resulted in the stockholder becoming an interested stockholder, the interested stockholder owned at least 85% of our voting stock outstanding at the time the transaction commenced, excluding for purposes of determining the number of shares outstanding (but not the outstanding voting stock owned by the interested stockholder) those shares owned by (i) persons who are directors and also officers and (ii) employee stock plans in which employee participants do not have the right to determine confidentially whether shares held subject to the plan will be tendered in a tender or exchange offer; or
- on or subsequent to that date, the business combination is approved by our board of directors and authorized at an annual or special meeting of stockholders, and not by written consent, by the affirmative vote of at least 66-2/3% of the outstanding voting stock that is not owned by the interested stockholder.

In general, Section 203 defines an interested stockholder as an entity or person beneficially owning 15% or more of the outstanding voting stock of the corporation and any entity or person affiliated with or controlling or controlled by any of these entities or persons.

The above-summarized provisions of the DGCL and our certificate of incorporation, bylaws and Rights Plan could make it more difficult to acquire us by means of a tender offer, a proxy contest or otherwise, or to remove incumbent officers and directors. These provisions are expected to discourage certain types of coercive takeover practices and takeover bids that our board of directors may consider inadequate and to encourage persons seeking to acquire control of us to first negotiate with our board of directors. We believe that the benefits of increased protection of our ability to negotiate with the proponent of an unfriendly or unsolicited proposal to acquire or restructure us outweigh the disadvantages of discouraging takeover or acquisition proposals because, among other things, negotiation of these proposals could result in an improvement of their terms.

Choice of Forum

Our certificate of incorporation provides that, unless we consent in writing otherwise, the Court of Chancery of the State of Delaware will be the sole and exclusive forum for any (i) derivative action or proceeding brought on our behalf; (ii) action asserting a breach of fiduciary duty owed by any of our directors, officers or other employees or any of our stockholders; (iii) action asserting a claim pursuant to the DGCL; or (iv) action asserting a claim that is governed by the internal affairs doctrine.

Limitation on Liability of Directors and Indemnification

Our certificate of incorporation limits the liability of our directors to the fullest extent permitted by Delaware law. Delaware law provides that directors of a corporation will not be personally liable for monetary damages for breach of their fiduciary duties as directors, except for liability for any:

- breach of their duty of loyalty to us or our stockholders;

· act or omission not in good faith or that involves intentional misconduct or a knowing violation of law;

S-4

· unlawful payments of dividends or unlawful stock repurchases or redemptions as provided in Section 174 of the DGCL; or

· transaction from which the directors derived an improper personal benefit.

These limitations of liability do not apply to liabilities arising under federal securities laws and do not affect the availability of equitable remedies such as injunctive relief or rescission.

Our bylaws provide that we will indemnify and advance expenses to our directors and officers to the fullest extent permitted by law or, if applicable, pursuant to indemnification agreements. They further provide that we may choose to indemnify our other employees or agents from time to time. Subject to certain exceptions and procedures, our bylaws also require us to advance to any person who was or is a party, or is threatened to be made a party, to any proceeding by reason of the person's service as one of our directors or officers all expenses incurred by the person in connection with such proceeding.

Section 145(g) of the DGCL and our bylaws also permit us to secure insurance on behalf of any officer, director, employee or other agent for any liability arising out of his or her actions in connection with their services to us, regardless of whether our bylaws permit indemnification. We maintain a directors' and officers' liability insurance policy.

We entered into indemnification agreements with each of our directors and executive officers that provide, in general, that we will indemnify them to the fullest extent permitted by law in connection with their service to us or on our behalf and, subject to certain exceptions and procedures, that we will advance to them all expenses that they incur in connection with any proceeding to which they are, or are threatened to be, a party.

At present, there is no pending litigation or proceeding involving any of our directors or officers as to which indemnification is required or permitted, and we are not aware of any threatened litigation or proceeding that may result in a claim for indemnification.

Insofar as indemnification for liabilities arising under the Securities Act may be permitted to directors, officers and controlling persons of the Company pursuant to the foregoing provisions, or otherwise, the Company has been advised that in the opinion of the SEC this indemnification is against public policy as expressed in the Securities Act and is therefore unenforceable.

Listing

Our common stock is listed on Nasdaq under the symbol "SSH." CDIs representing beneficial ownership of our common stock were listed on the ASX under the symbol "SHC" until we officially delisted from the ASX at the close of trading on May 6, 2013.

Transfer Agent and Registrar

The transfer agent and registrar for transfers of shares of our common stock is American Stock Transfer & Trust Company, LLC ("AST"). AST's address is 6201 15th Avenue, Brooklyn, New York 11219 and its telephone number is (800) 937-5449.

S-5
