Expected term — The Company uses historical employee exercise and option expiration data to estimate the expected term assumption for the Black-Scholes grant-date valuation. The Company believes that this historical data is currently the best estimate of the expected term of a new option, and that generally its employees exhibit similar exercise behavior.

Risk-free interest rate — The yield on zero-coupon U.S. Treasury securities for a period that is commensurate with the expected term assumption is used as the risk-free interest rate.

Expected dividend yield — Expected dividend yield is calculated by annualizing the cash dividend declared by the Company's Board of Directors for the current quarter and dividing that result by the closing stock price on the date of grant. Until such time as the Company's Board of Directors declares a cash dividend for an amount that is different from the current quarter's cash dividend, the current dividend will be used in deriving this assumption. Cash dividends are not paid on options, restricted stock or restricted stock units. In connection with the Acquisition, the Company granted restricted stock awards to replace outstanding restricted stock awards of Linear employees. These restricted stock awards entitle recipients to voting and nonforfeitable dividend rights from the date of grant.

Stock-Based Compensation Expense

The amount of stock-based compensation expense recognized during a period is based on the value of the awards that are ultimately expected to vest. Forfeitures are estimated at the time of grant and revised, if necessary, in subsequent periods if actual forfeitures differ from those estimates. The term “forfeitures” is distinct from “cancellations” or “expirations” and represents only the unvested portion of the surrendered stock-based award. Based on an analysis of its historical forfeitures, the Company has applied an annual forfeiture rate of 5.0% to all unvested stock-based awards as of November 2, 2019. This analysis will be re-evaluated quarterly and the forfeiture rate will be adjusted as necessary. Ultimately, the actual expense recognized over the vesting period will only be for those awards that vest.

Total stock-based compensation expense recognized is as follows:

	2019	2018	2017
Cost of sales	$ 20,628	$ 18,733	$ 12,569
Research and development	75,305	81,444	51,258
Selling, marketing, general and administrative	51,829	50,988	40,361
Special charges	2,538	—	—
Total stock-based compensation expense	$ 150,300	$ 151,165	$ 104,188

As of November 2, 2019 and November 3, 2018, the Company capitalized $6.8 million and $7.1 million, respectively, of stock-based compensation in inventory.

Additional paid-in-capital (APIC) Pool

The Company adopted ASU 2016-09 during fiscal 2018. ASU 2016-09 eliminated the APIC pool and requires that excess tax benefits and tax deficiencies be recorded in the income statement when awards are settled. As a result of this adoption the Company recorded total excess tax benefits of $28.7 million and $26.2 million in fiscal 2019 and fiscal 2018, respectively, from its stock-based compensation payments within income tax expense in its consolidated statements of income.

For fiscal 2017, the APIC pool represented the excess tax benefits related to stock-based compensation that were available to absorb future tax deficiencies. If the amount of future tax deficiencies was greater than the available APIC pool, the Company recorded the excess as income tax expense in its consolidated statements of income. For fiscal 2017, the Company had a sufficient APIC pool to cover any tax deficiencies recorded and as a result, these deficiencies did not affect its results of operations.