

MOODY'S

INVESTORS SERVICE

RATING METHODOLOGY

10 September 2021

TABLE OF CONTENTS

Scope	1
Rating approach	2
Semiconductor scorecard	3
Discussion of the scorecard factors	5
Other considerations	8
Using the scorecard to arrive at a scorecard-indicated outcome	12
Assigning issuer-level and instrument-level ratings	13
Key rating assumptions	14
Limitations	14
Moody's related publications	15

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Rating Methodology Semiconductors

This methodology is no longer in effect. For more information on rating methodologies used by Moody's Investor Services, visit <https://ratings.moodys.com/rating-methodologies>.

This rating methodology replaces the *Semiconductor Methodology* published in December 2020. We have reordered and have made editorial updates to various sections of the methodology, and we have changed the presentation of the scorecard. These updates do not change our methodological approach.

Scope

This methodology applies to companies globally that are primarily* engaged in providing semiconductor products or services for platforms including computers, mobile phones, telecommunications equipment, data center infrastructure, digital consumer electronics, industrial technology and automotive technology. This methodology also applies to semiconductor companies that manufacture and sell equipment used by other semiconductor companies.

Companies that are primarily engaged in the design, manufacture and distribution of technology hardware and communications equipment products are rated under our methodology for diversified technology.¹ Technology companies that sell and support software and related services to consumer or enterprise end-markets are rated under our software industry methodology.²

*The determination of a company's primary business is generally based on the preponderance of the company's business risks, which are usually proportionate to the company's revenues, earnings and cash flows.

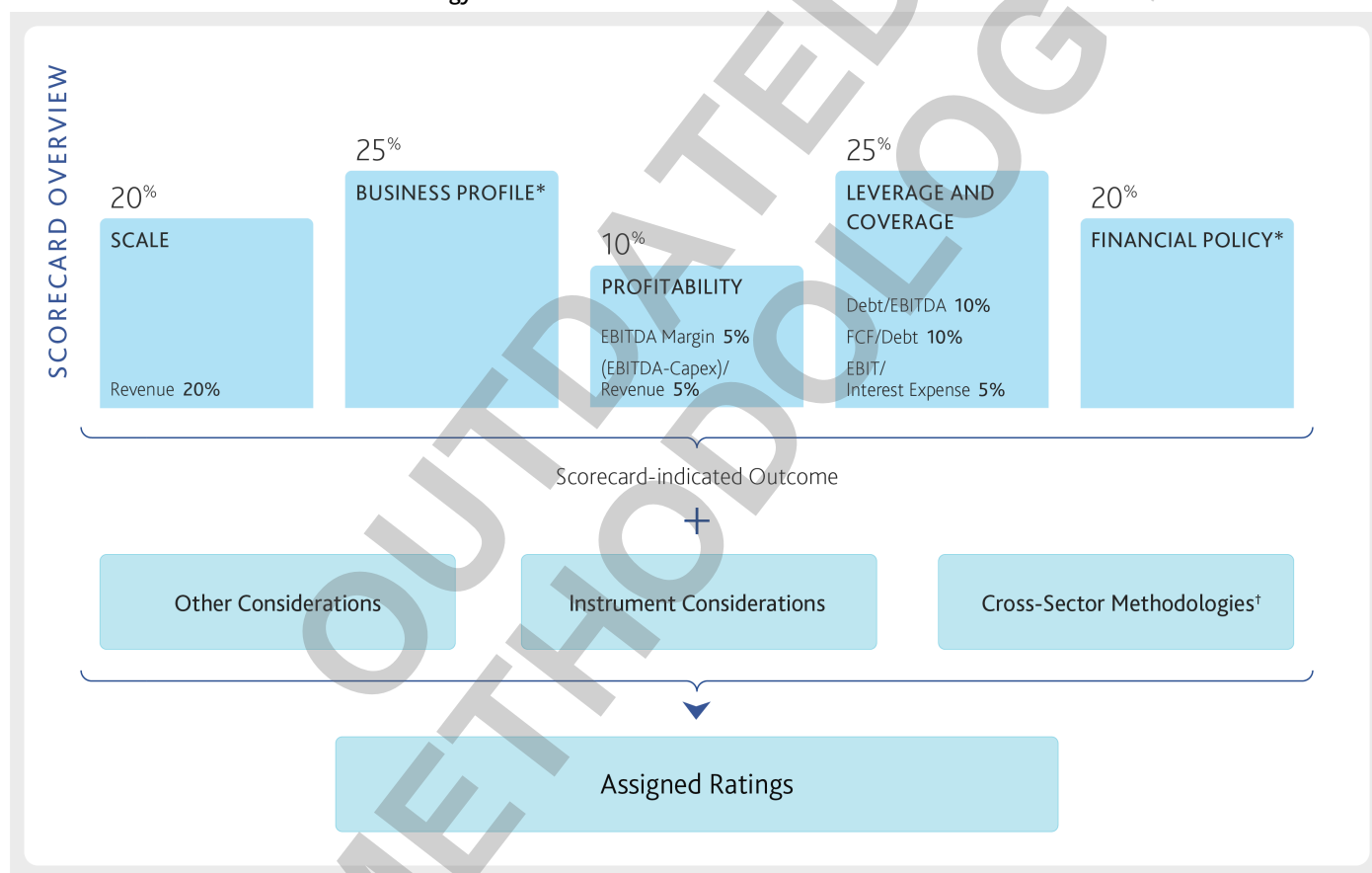
Rating approach

In this rating methodology, we explain our general approach to assessing credit risk of issuers in the semiconductor industry globally, including the qualitative and quantitative factors that are likely to affect rating outcomes in this sector. We seek to incorporate all material credit considerations in ratings and to take the most forward-looking perspective that visibility into these risks and mitigants permits.

The following schematic illustrates our general framework for the analysis of semiconductor companies, which includes the use of a scorecard.³ The scorecard-indicated outcome is not expected to match the actual rating for each company. For more information, see the "Other considerations" and "Limitations" sections.

Exhibit 1

Illustration of the semiconductor methodology framework



* This factor has no sub-factors.

† Some of the methodological considerations described in one or more cross-sector rating methodologies may be relevant to ratings in this sector. A link to a list of our sector and cross-sector methodologies can be found in the "Moody's related publications" section.

Source: Moody's Investors Service

Semiconductor scorecard

For general information about how we use the scorecard and for a discussion of scorecard mechanics, please see the "Using the scorecard to arrive at a scorecard-indicated outcome" section. The scorecard does not include or address every factor that a rating committee may consider in assigning ratings in this sector. Please see the "Other considerations" and "Limitations" sections.

Exhibit 2

Semiconductor scorecard

SCALE (20%)		BUSINESS PROFILE (25%)	PROFITABILITY (10%)		LEVERAGE and COVERAGE (25%)		FINANCIAL POLICY (20%)	
Revenue (USD Billion) ^[1] (20%)	Business Profile (25%)	EBITDA Margin ^[2] (5%)	(EBITDA - CAPEX) / Revenue ^[3] (5%)	Debt / EBITDA ^[4] (10%)	FCF / Debt ^[5] (10%)	EBIT / Interest Expense ^[6] (5%)	Financial Policy (20%)	
Aaa	≥ \$50	Extremely high revenue stability; extremely stable and diverse end markets; extremely high visibility into end-market demand; essentially no customer or product concentration; sole provider or commanding market position across several segments; exceptional intellectual property portfolio; very high barriers to entry in most segments; long product life cycles for essentially all products.	≥ 50%	≥ 35%	≤ 0.5x	≥ 50%	≥ 30x	Expected to have extremely conservative financial policies (including risk and liquidity management); very stable metrics; essentially no event risk that would cause a rating transition; and public commitment to a very strong credit profile over the long term.
Aa	\$30 - \$50	Very high revenue stability; very stable and diverse end markets; very high visibility into end-market demand; very limited customer or product concentration; sole provider or among top two; broad, valuable intellectual property portfolio; very high barriers to entry in some segments; long product life cycles for most products.	35% - 50%	30% - 35%	0.5x - 1x	40% - 50%	20x - 30x	Expected to have very conservative financial policies (including risk and liquidity management); stable metrics; minimal event risk that would cause a rating transition; and public commitment to a strong credit profile over the long term.
A	\$15 - \$30	High revenue stability; stable and diverse end markets; high visibility into end-market demand; limited customer or product concentration; among leading providers, with leadership in at least one market segment; broad intellectual property portfolio; high barriers to entry in some segments; long product life cycles for a large portion of products.	30% - 35%	25% - 30%	1x - 1.5x	30% - 40%	10x - 20x	Expected to have predictable financial policies (including risk and liquidity management) that preserve creditor interests; although modest event risk exists, the effect on leverage is likely to be small and temporary; strong commitment to a solid credit profile.
Baa	\$5 - \$15	Moderate revenue stability; moderately stable and diverse end markets; moderate visibility into end-market demand; somewhat limited customer or product concentration; solid market position with leadership in at least one market niche; moderate barriers to entry in some segments; moderate product differentiation; long product life cycles for some products.	25% - 30%	20% - 25%	1.5x - 2.5x	20% - 30%	5x - 10x	Expected to have financial policies (including risk and liquidity management) that balance the interests of creditors and shareholders; some risk that debt-funded acquisitions or shareholder distributions could lead to a weaker credit profile.

SCALE (20%)		BUSINESS PROFILE (25%)	PROFITABILITY (10%)		LEVERAGE and COVERAGE (25%)		FINANCIAL POLICY (20%)	
Revenue (USD Billion) ^[1] (20%)	Business Profile (25%)	EBITDA Margin ^[2] (5%)	(EBITDA - CAPEX) / Revenue ^[3] (5%)	Debt / EBITDA ^[4] (10%)	FCF / Debt ^[5] (10%)	EBIT / Interest Expense ^[6] (5%)	Financial Policy (20%)	
Ba	\$2 - \$5	Somewhat high revenue volatility; somewhat concentrated sales to cyclical end markets; some visibility into end-market demand; moderate customer or product concentration; established market position, but low barriers to entry; some product differentiation; short to moderate product life cycles.	20% - 25%	15% - 20%	2.5x - 3.5x	10% - 20%	3x - 5x	Expected to have financial policies (including risk and liquidity management) that tend to favor shareholders over creditors; above-average financial risk resulting from shareholder distributions, acquisitions or other significant capital structure changes.
B	\$0.75 - \$2	Highly volatile revenue; concentrated sales to cyclical end markets; limited visibility into end-market demand; high customer or product concentration; somewhat weak market position and low barriers to entry; products are largely undifferentiated; primarily short product life cycles.	15% - 20%	10% - 15%	3.5x - 5x	5% - 10%	1.5x - 3x	Expected to have financial policies (including risk and liquidity management) that favor shareholders over creditors; high financial risk resulting from shareholder distributions, acquisitions or other significant capital structure changes.
Caa	\$0.25 - \$0.75	Extremely volatile revenue; concentrated sales to one cyclical end market; essentially no visibility into end-market demand; very high customer or product concentration; weak market position with essentially no barriers to entry; products are undifferentiated with strong competition; short product life cycles.	10% - 15%	5% - 10%	5x - 7x	0% - 5%	0x - 1.5x	Expected to have financial policies (including risk and liquidity management) that create elevated risk of debt restructuring in varied economic environments.
Ca	< \$0.25	Near-term revenue is difficult to predict with any degree of confidence; extremely high customer or product concentration; extremely weak market position with essentially no barriers to entry; products are undifferentiated with intense competition; or very short product life cycles.	< 10%	< 5%	> 7x	< 0%	< 0x	Expected to have financial policies (including risk and liquidity management) that create elevated risk of debt restructuring even in healthy economic environments.

[1] For the linear scoring scale, the Aaa endpoint value is \$100 billion. A value of \$100 billion or better equates to a numeric score of 0.5. The Ca endpoint value is zero. A value of zero equates to a numeric score of 20.5.

[2] For the linear scoring scale, the Aaa endpoint value is 90%. A value of 90% or better equates to a numeric score of 0.5. The Ca endpoint value is 5%. A value of 5% or worse equates to a numeric score of 20.5.

[3] For the linear scoring scale, the Aaa endpoint value is 80%. A value of 80% or better equates to a numeric score of 0.5. The Ca endpoint value is (5)%. A value of (5)% or worse equates to a numeric score of 20.5.

[4] For the linear scoring scale, the Aaa endpoint value is zero. A value of zero equates to a numeric score of 0.5. The Ca endpoint value is 12x. A value of 12x or worse equates to a numeric score of 20.5, as does a negative Debt/EBITDA value.

[5] For the linear scoring scale, the Aaa endpoint value is 70%. A value of 70% or better equates to a numeric score of 0.5. The Ca endpoint value is (5)%. A value of (5)% or worse equates to a numeric score of 20.5.

[6] For the linear scoring scale, the Aaa endpoint value is 60x. A value of 60x or better equates to a numeric score of 0.5. The Ca endpoint value is (2)x. A value of (2)x or worse equates to a numeric score of 20.5.

Source: Moody's Investors Service

Discussion of the scorecard factors

In this section, we explain our general approach for scoring each scorecard factor or sub-factor, and we describe why they are meaningful as credit indicators.

Factor: Scale (20% weight)

Why it matters

Scale is an important indicator of the overall breadth and depth of a company's business, its pricing power and its success in attracting a variety of customers, as well as its resilience to shocks, such as sudden shifts in demand or rapid cost increases. Scale also can be an indicator of a semiconductor company's research and development capabilities and its negotiating leverage with customers and suppliers.

How we assess it for the scorecard

REVENUE:

Scale is measured (or estimated in the case of forward-looking expectations) using total reported revenue in billions of US dollars.

Factor: Business Profile (25% weight)

Why it matters

The business profile of a semiconductor company is important because it greatly influences its ability to generate sustainable earnings and operating cash flows. Key aspects of a semiconductor company's business profile include its revenue stability and its visibility, or insight into demand; the diversity or concentration of its end markets, customers and products; its market position; and barriers to entry into a market or a business segment.

A semiconductor company's exposure to a variety of end markets and its ability to provide a breadth of products typically lends it revenue stability across business cycles. Semiconductors are used in many different types of products, such as mobile phones, computers, data center infrastructure, industrial equipment and automobiles. The different customer bases for these products generally have different demand patterns and trends. For example, industrial market demand has tended to follow business capital spending patterns and the level of general economic activity, typically resulting in cyclicity for semiconductor companies selling in the industrial market. Demand for mobile phones, on the other hand, has typically followed technology upgrade cycles. Additionally, end-market customer concerns of a potential shortage of semiconductor product supply can result in periods of excess demand and inventory accumulation, which are typically followed by periods of weak demand as inventories are liquidated.

Certain capital-intensive segments of the semiconductor market, in which supply tends to arrive in large, discrete additions to capacity, have typically been characterized by cycles of limited supply, resulting in high prices and high revenue followed by excess supply, typically leading to declines in prices and industry revenue as the new supply reaches the market.

The diversity of products and services as well as visibility into end-market demand are important because they limit a company's vulnerability to the potential loss of any one customer or set of customers. Semiconductor companies with greater visibility into end-market demand, which may result from direct relationships with customers, typically benefit from lower revenue volatility and are better able to manage production capacity than companies with limited visibility.

Market position provides important indications of the extent to which a company's investments in research and development are translated into competitive advantages, and how meaningfully its products and services are differentiated from those of competitors. A strong market position may indicate high customer switching costs, providing resilience through economic cycles and periods of intensifying competition. If a company's semiconductors are critical to the functioning of a customer's product, it may make it difficult for the customer to switch to a competing supplier. Often, these semiconductor companies provide customers with products that incorporate highly valuable intellectual property and thus have strong negotiating leverage, which translates into greater pricing power and higher gross margins.

Companies that sell semiconductors that do not undergo rapid technological obsolescence are typically more likely to benefit from sustained revenue over time. Such semiconductor chips typically represent only a small portion of the end product's overall bill of materials or are incorporated into end products that undergo only gradual innovation over time, such as semiconductors sold into industrial and military equipment end markets. In contrast, companies that sell products with shorter life cycles are more likely to have

greater revenue volatility. These products are typically high-value semiconductor chips that drive required performance improvements in rapidly innovating end markets, such as radiofrequency filtering chips used in smartphones.

Barriers to entry often provide stability to the market by reducing the threat of significant competition from new entrants into the segment. High barriers to entry help maintain the segment's pricing power, and companies that operate in segments with high barriers are thus more likely to have greater revenue stability. Long or expensive development cycles, characteristics of some product segments, generally provide a high barrier to entry. In addition, some new products also require the development of new manufacturing processes or expertise with specialized materials, which may be difficult for a potential new entrant to replicate. On the other hand, products that are manufactured using standard processes and more common materials are typically subject to more intense competition and experience price cycles typical of commodity products.

How we assess it for the scorecard

Scoring for this factor is based on a qualitative assessment of a semiconductor company's revenue stability and visibility into demand; its diversity or concentration of end markets, customers and products; its market position; and barriers to entry.

In assessing revenue stability, we consider a semiconductor company's historical and expected revenue trends. We consider the stability and diversity of its end markets, which are the industries or sectors of its customer base. Examples of end markets include automotive, industrial, mobile phones, telecommunications and data center infrastructure, and consumer electronics. A company with a significant concentration of sales to a single, volatile sector would typically score lower on this factor than a company selling across multiple industries that are influenced by different business or economic trends. A portfolio of products with high switching costs for end customers also typically provides revenue stability.

To assess visibility into demand, we may consider the portion of revenue a company derives from direct sales to customers relative to its reliance on distribution channels, because companies with a greater proportion of direct sales to customers typically have greater visibility into end-market demand. In assessing visibility into demand, we may also consider a company's backlog of orders. A high ratio of backlog to revenue typically indicates good visibility into demand. However, backlog is not always a relevant indicator, and is not always consistently reported.

We also consider a semiconductor company's breadth of products and services and its customer diversity, because a concentration of revenue to a few customers or from a few products tends to increase revenue volatility. We may assess the extent to which increasing sales of some individual products that comprise a company's portfolio tend to compensate for sales declines in other products. All else being equal, companies with a greater product diversity in their portfolio are likely to receive higher scores on this factor.

In assessing a semiconductor company's market position, we rely on a qualitative assessment and third-party information (e.g., market share) where available and consider a company's position across its business segments. We typically consider a company's gross margin, because companies with highly valuable intellectual property generally have higher gross margins than companies that sell commoditized products and services. We also consider barriers to entry. For example, products that require significant investment in research and development or manufacturing equipment may raise entry barriers for companies that are unable to invest in such product development.

We also assess the life cycle of a company's key products. All else being equal, companies with longer product life cycles generally receive higher scores on this factor. We typically consider a long product life cycle to be one in which a product sells for at least five years, a moderate life cycle to be three to five years, and a short one to be one or two years.

Generally, we do not expect a given company's business profile to exactly match each of the attributes listed for a given scoring category. We typically assign the factor score based on the alpha category for which the company has the greatest number of characteristics. However, there may be cases in which one characteristic is sufficiently important to a particular company's credit profile that it has a large influence on the factor score.

Factor: Profitability (10% weight)

Why it matters

Profits matter because they are needed to generate sustainable cash flow and maintain a competitive position, which includes making sufficient investment in research and development and in capital expenditures to maintain market position through ongoing

technological shifts. A semiconductor company's level of profitability, and the sustainability of those profits, may also provide important indications about the value of its products.

This factor comprises two quantitative sub-factors:

EBITDA Margin

The ratio of earnings before interest, taxes, depreciation and amortization to revenue (EBITDA Margin) provides important indications of the value of a semiconductor company's products to customers as well as its success in managing costs and its supply chain.

(EBITDA - Capex) / Revenue

The ratio of EBITDA minus capital expenditures to revenue ((EBITDA – Capex)/Revenue) is an important indicator of profitability adjusted for capital intensity. This ratio is typically a key differentiator among semiconductor companies.

How we assess it for the scorecard

Scoring for this factor is based on two sub-factors: EBITDA Margin; and (EBITDA – Capex)/Revenue.

EBITDA MARGIN:

The numerator is EBITDA, and the denominator is revenue.

(EBITDA – CAPEX) / REVENUE:

The numerator is EBITDA minus capital expenditures, and the denominator is revenue.

Factor: Leverage and Coverage (25% weight)

Why it matters

Leverage and cash flow coverage measures provide important indications of financial flexibility and long-term viability, including a semiconductor company's ability to adapt to changes in the economic and business environment.

The factor comprises three quantitative sub-factors:

Debt / EBITDA

The ratio of total debt to earnings before interest, taxes, depreciation and amortization (Debt/EBITDA) is an indicator of debt serviceability and financial leverage. The ratio is commonly used in this sector as a proxy for comparative financial strength.

FCF / Debt

The ratio of free cash flow to total debt (FCF/Debt) provides a different view of a company's ability to pay its debt compared with Debt/EBITDA, because it compares cash flow generation after working capital movements, capital expenditures and dividends to total debt.

EBIT / Interest Expense

The ratio of earnings before interest and taxes to interest expense (EBIT/Interest Expense) is an indicator of a company's ability to meet its interest obligations.

How we assess it for the scorecard

Scoring for this factor is based on three sub-factors: Debt/EBITDA, FCF/Debt and EBIT/Interest Expense.

DEBT / EBITDA:

The numerator is total debt, and the denominator is EBITDA.

FCF / DEBT:

The numerator is free cash flow, and the denominator is total debt.

EBIT / INTEREST EXPENSE:

The numerator is EBIT, and the denominator is interest expense.

Factor: Financial Policy (20% weight)**Why it matters**

Financial policy encompasses management and board tolerance for financial risk and commitment to a strong credit profile. It is an important rating determinant, because it directly affects debt levels, credit quality, the future direction for the company and the risk of adverse changes in financing and capital structure.

Financial risk tolerance serves as a guidepost to investment and capital allocation. An expectation that management will be committed to sustaining an improved credit profile is often necessary to support an upgrade. For example, we may not upgrade the ratings of a company that has built flexibility within its rating category if we believe the company will use that flexibility to fund a strategic acquisition, cash distribution to shareholders, spin-off or other leveraging transaction. Conversely, a company's credit rating may be better able to withstand a moderate leveraging event if management places a high priority on returning credit metrics to pre-transaction levels and has consistently demonstrated the commitment to do so through prior actions. Liquidity management⁴ is an important aspect of overall risk management and can provide insight into risk tolerance. For example, consistently maintaining a significant level of cash relative to debt may indicate a conservative financial policy.

Many semiconductor companies have historically used acquisitions to spur revenue growth, expand business lines, consolidate market positions, advance cost synergies or seek access to new technology.

How we assess it for the scorecard

We assess the issuer's desired capital structure or targeted credit profile, its history of prior actions, including its track record of risk and liquidity management, and its adherence to its commitments. Attention is paid to management's operating performance and use of cash flow through different phases of economic and industry cycles. For example, a company that consistently maintains cash in excess of debt would likely score higher on this factor, all else being equal. Also of interest is the way in which management responds to key events, such as changes in the credit markets and liquidity environment, legal actions, competitive challenges or regulatory pressures. Considerations include a company's public commitments in this area, its track record for adhering to commitments and our views on the ability of the company to achieve its targets.

When considering event risks in the context of scoring financial policy, we assess the likelihood and potential negative impact of M&A or other types of balance-sheet-transforming events. Management's appetite for M&A activity is assessed, with a focus on the type of transactions (i.e., core competency or new business) and funding decisions. Frequency and materiality of acquisitions and previous financing choices are evaluated. A history of debt-financed or credit-transforming acquisitions will generally result in a lower score for this factor. We may also consider negative repercussions caused by shareholders' willingness to sell the company.

We also consider a company's and its owners' past record of balancing shareholder returns and debtholders' interests. A track record of favoring shareholder returns at the expense of debtholders is likely to be viewed negatively in scoring this factor.

Other considerations

Ratings may reflect consideration of additional factors that are not in the scorecard, usually because the factor's credit importance varies widely among the issuers in the sector or because the factor may be important only under certain circumstances or for a subset of issuers. Such factors include financial controls and the quality of financial reporting; corporate legal structure; the quality and experience of management; assessments of corporate governance as well as environmental and social considerations; exposure to uncertain licensing regimes; and possible government interference in some countries. Regulatory, litigation, liquidity, technology and reputational risk as well as changes to consumer and business spending patterns, competitor strategies and macroeconomic trends also affect ratings.

Following are some examples of additional considerations that may be reflected in our ratings and that may cause ratings to be different from scorecard-indicated outcomes.

Regulatory Considerations

Companies in the semiconductor sector are subject to varying degrees of regulatory oversight. Effects of these regulations may entail limitations on operations, higher costs, and higher potential for technology disruptions and demand substitution. Regional differences in regulation, implementation or enforcement may advantage or disadvantage particular issuers.

Our view of future regulations plays an important role in our expectations of future financial metrics as well as our confidence level in the ability of an issuer to generate sufficient cash flows relative to its debt burden over the medium and longer term. Regulatory considerations may also play a role in our assessment of a semiconductor company's business profile, to the extent that these considerations affect its cost structure or competitive position. For example, changes in regulations or regulatory oversight, such as government restrictions on selling products to certain countries, could place additional cost burdens on companies or result in the erosion of market position for companies that fail to maintain compliance with regulations. In some circumstances, regulatory considerations may also be a rating factor outside the scorecard, for instance when regulatory change is swift.

Environmental, Social and Governance Considerations

Environmental, social and governance (ESG) considerations may affect the ratings of issuers in the semiconductor sector. For information about our approach to assessing ESG issues, please see our methodology that describes our general principles for assessing these risks.⁵

Environmental risks may be a concern for companies that rely on production in areas that are prone to natural disasters, such as earthquakes and typhoons. Semiconductor companies generally sell to other businesses, not directly to consumers, but consumer preferences shaped by environmental or social concerns may influence demand for certain types of products that contain semiconductors. For example, certain types of automobiles may experience greater demand because they are perceived as being more environmentally friendly or socially acceptable than others.

Financial Controls

We rely on the accuracy of audited financial statements to assign and monitor ratings in this sector. The quality of financial statements may be influenced by internal controls, including the proper tone at the top, centralized operations, and consistency in accounting policies and procedures. Auditors' reports on the effectiveness of internal controls, auditors' comments in financial reports and unusual restatements of financial statements or delays in regulatory filings may indicate weaknesses in internal controls.

Management Strategy

The quality of management is an important factor supporting a company's credit strength. Assessing the execution of business plans over time can be helpful in assessing management's business strategies, policies and philosophies and in evaluating management performance relative to performance of competitors and our projections. Management's track record of adhering to stated plans, commitments and guidelines provides insight into management's likely future performance, including in stressed situations.

Excess Cash Balances

Some companies in this sector may maintain cash balances (meaning liquid short-term investments as well as cash) that are far in excess of their operating needs. This excess cash can be an important credit consideration; however, the underlying policy and motivations of the issuer in holding high cash balances are often as or more important in our analysis than the level of cash held. We have observed significant variation in company behavior based on differences in financial philosophy, investment opportunities, availability of committed revolving credit facilities and shareholder pressures.

Most issuers need to retain some level of cash in their business for operational purposes. The level of cash required to run a business can vary based on the region(s) of operation and the specific sub-sectors in which the issuer operates. Some issuers have very predictable cash needs and others have much broader intra-period swings, for instance related to mark-to-market collateral requirements under hedging instruments. Some companies may hold large levels of cash at times because they operate without committed, long-term bank borrowing facilities. Some companies may hold cash on the balance sheet to meet long-term contractual liabilities, whereas other companies with the same types of liabilities have deposited cash into trust accounts that are off balance sheet. The level of cash that issuers are willing to hold can also vary over time based on the cost of borrowing and macroeconomic conditions. The same issuer may place a high value on cash holdings in a major recession or financial crisis but seek to pare cash when inflation is

high. As a result, cash on the balance sheet is most often considered qualitatively, by assessing the issuer's track record and financial and liquidity policies rather than by measuring how a point-in-time cash balance would affect a specific metric.

Across all corporate sectors, an important shareholder-focused motivation for cash holdings, sometimes over very long periods, is cash for acquisitions. In these cases, we do not typically consider that netting cash against the issuer's current level of debt is analytically meaningful; however, the cash may be a material mitigant in our scenario analyses of potential acquisitions, share buybacks or special dividends. Tax minimization strategies have at times been another primary motivation for holding large cash balances. Given shareholder pressures to return excess cash holdings, when these motivations for holding excess cash are eliminated, we generally expect that a large portion of excess cash will be used for dividends and share repurchases.

By contrast, some companies maintain large cash holdings for long periods of time in excess of their operating and liquidity needs solely due to conservative financial policies, which provides a stronger indication of an enduring approach that will benefit creditors. For instance, some companies have a policy to routinely pre-fund upcoming required debt payments well in advance of the stated maturity. Such companies may also have clearly stated financial targets based on net debt metrics and a track record of maintaining their financial profile within those targets.

While the scorecard in this methodology uses leverage and coverage ratios with total (or gross) debt rather than net debt, we do consider excess cash holdings in our rating analysis, including in our assessment of the financial and liquidity policy. For issuers where we have clarity into the extent to which cash will remain on the balance sheet and/or be used for creditor-friendly purposes, excess cash may be considered in a more quantitative manner. While we consider excess cash in our credit assessment for ratings, we do not typically adjust the balance sheet debt for any specific amount because this implies greater precision than we think is appropriate for the uncertain future uses of cash. However, when cash holdings are unusually large relative to debt, we may refer to debt net of cash, or net of a portion of cash, in our credit analysis and press releases in order to provide additional insight into our qualitative assessment of the credit benefit. Alternatively, creditor-friendly use of cash may be factored into our forward view of metrics, for instance when the cash is expected to be used for debt-repayment. We may also cite rating threshold levels for certain issuers based on net debt ratios, particularly when these issuers have publicly stated financial targets based on net debt metrics.

Even when the eventual use for excess cash is likely to be for purposes that do not benefit debtholders, large holdings provide some beneficial cushion against credit deterioration, and cash balances are often considered in our analysis of near-term liquidity sources and uses. Across all corporate sectors, such downside protection is usually more important for low rated companies than for highly rated companies due to differences in credit stability and the typically shorter distance from potential default for issuers at the lower end of the ratings spectrum. For semiconductor companies, given the cyclicity of some end markets and periods of very high capital requirements for some companies, significant excess cash may also be an important rating consideration for companies across all rating categories. As a matter of financial policy, semiconductor companies often choose to hold high levels of cash.

Liquidity

Liquidity is an important rating consideration for all semiconductor companies, although it may not have a substantial impact in discriminating between two issuers with a similar credit profile. Liquidity can be particularly important for companies in highly seasonal operating environments where working capital needs must be considered, and ratings can be heavily affected by extremely weak liquidity. We form an opinion on likely near-term liquidity requirements from the perspective of both sources and uses of cash. For more details on our approach, please see our liquidity cross-sector methodology.⁶

Additional Metrics

The metrics included in the scorecard are those that are generally most important in assigning ratings to companies in this industry; however, we may use additional metrics to inform our analysis of specific companies. These additional metrics may be important to our forward view of metrics that are in the scorecard or other rating factors.

For example, the level of free cash flow is not always an important differentiator of credit profiles. Strong companies with excellent investment opportunities may demonstrate multiyear periods of negative free cash flow while retaining solid access to capital and credit, because these investments will yield stable cash flows in future years. Weaker companies with limited access to credit may have positive free cash flow for a period of time because they have curtailed the investments necessary to maintain their assets and future

cash-generating prospects. However, in some cases, free cash flow can be an important driver of the future liquidity profile of an issuer, which, as noted above, can have a meaningful impact on ratings.

As another example, the amount of cash relative to debt is not always a meaningful differentiator of semiconductor companies' credit profiles, because of the different financial policies companies pursue. A company with an aggressive financial policy may use a large cash balance to fund acquisitions or shareholder returns, whereas a company with a more conservative financial policy may hold significant cash relative to debt to provide it flexibility to continue to invest during industry downturns. In some cases, cash-to-debt may be an important indicator of a semiconductor's company's ability to maintain or improve its competitive position during an industry downturn, which may have a meaningful impact on ratings.

Non-wholly Owned Subsidiaries

Some companies in the semiconductor sector choose to dilute their equity stake in certain material subsidiaries, for example through an initial public offering, which may in some cases negatively impact future financial flexibility. While improving cash holdings on a one-off basis, selling minority interests in subsidiaries may have a negative impact on cash flows available to the parent company that may not be fully reflected in consolidated financial statements.⁷ The parent's share of dividend flows from a non-wholly owned subsidiary is reduced, and minority stakes can increase structural subordination, since dividend flows to minority interest holders are made before the cash flows are available to service debt at the parent company. While less frequent, sale of a minority stake may be accompanied by policies protective of the subsidiary that further limit the parent's financial flexibility, for instance restrictions on cash pooling with other members of the corporate family, limitations on dividends and distributions, or arms-length business requirements. Minority stakeholders may have seats on the board of the subsidiary. In many cases, we consider the impact of non-wholly owned subsidiaries qualitatively. However, in some cases we may find that an additional view of financial results, such as analyzing cash flows on a proportional consolidation basis, may be very useful to augment our analysis based on consolidated financial statements. When equity dilution or structural subordination arising from non-wholly owned subsidiaries is material and negative, the credit impact is captured in ratings but may not be fully reflected in scorecard-indicated outcomes.

For companies that hold material minority interest stakes, consolidated funds from operations typically includes the dividends received from the minority subsidiary, while none of its debt is consolidated. When such dividends are material to the company's cash flows, these cash flows may be subject to interruption if they are required for the minority subsidiary's debt service, capital expenditures or other cash needs. When minority interest dividends are material, we may also find that proportional consolidation or another additional view of financial results is useful to augment our analysis of consolidated financials. We would generally also consider structural subordination in these cases.⁸ When these credit considerations are material, their impact is captured in ratings but may not be fully reflected in scorecard-indicated outcomes.

Event Risk

We also recognize the possibility that an unexpected event could cause a sudden and sharp decline in an issuer's fundamental creditworthiness, which may cause actual ratings to be lower than the scorecard-indicated outcome. Event risks — which are varied and can range from leveraged recapitalizations to sudden regulatory changes or liabilities from an accident — can overwhelm even a stable, well-capitalized firm. Some other types of event risks include M&A, asset sales, spin-offs, litigation, pandemics, significant cyber-crime events and shareholder distributions.

Parental Support

Ownership can provide ratings lift for a particular company in the semiconductor sector if it is owned by a highly rated owner(s) and is viewed to be of strategic importance to those owners. In our analysis of parental support, we consider whether the parent has the financial capacity and strategic incentives to provide support to the issuer in times of stress or financial need (e.g., a major capital investment or advantaged operating agreement), or has already done so in the past. Conversely, if the parent puts a high dividend burden on the issuer, which in turn reduces its flexibility, the ratings would reflect this risk.

Government-related issuers may receive ratings uplift due to expected government support. However, for certain issuers, government ownership can have a negative impact on the underlying Baseline Credit Assessment.⁹ For example, price controls, onerous taxation and high distributions can have a negative effect on an issuer's underlying credit profile.

Other Institutional Support

In some countries, large corporate issuers have received government or banking support in the event of financial difficulties because of their overall importance to the functioning of the economy. In Japan, our corporate ratings consider the support that has operated there for large and systemically important organizations. Over the years, this has resulted in lower levels of default than might otherwise have occurred. Our approach considers whether the presence of group and banking relationships may provide support when systemically important companies encounter significant financial stress.

Seasonality

Seasonality is an important driver of customer demand and can cause swings in cash balances and working capital positions for issuers. Higher volatility creates less room for errors in meeting customer demand or operational execution.

Cyclical Sectors

Scorecard-indicated outcomes in cyclical sectors, such as semiconductors, may be higher than the rating at the top of the economic or industry cycle and lower than the rating at the bottom of the cycle. While using annual financials in the scorecard typically provides very useful insights into recent or near-term results, ratings may also reflect our expectations for the progression of yearly results over a longer period that may include a full economic cycle. However, cyclicalities itself poses many different types of risks to companies, and cycles do not reverse themselves with predictable regularity. A cyclical sector may also be affected by a secular decline or expansion. These considerations may be incorporated qualitatively in ratings.

Using the scorecard to arrive at a scorecard-indicated outcome

1. Measurement or estimation of factors in the scorecard

In the "Discussion of the scorecard factors" section, we explain our analytical approach for scoring each scorecard factor or sub-factor,¹⁰ and we describe why they are meaningful as credit indicators.

The information used in assessing the sub-factors is generally found in or calculated from information in the company's financial statements or regulatory filings, derived from other observations or estimated by Moody's analysts. We may also incorporate non-public information.

Our ratings are forward-looking and reflect our expectations for future financial and operating performance. However, historical results are helpful in understanding patterns and trends of a company's performance as well as for peer comparisons. Financial ratios,¹¹ unless otherwise indicated, are typically calculated based on an annual or 12-month period. However, the factors in the scorecard can be assessed using various time periods. For example, rating committees may find it analytically useful to examine both historical and expected future performance for periods of several years or more.

All of the quantitative credit metrics incorporate our standard adjustments¹² to income statement, cash flow statement and balance sheet amounts for items such as underfunded pension obligations and operating leases. We may also make other analytical adjustments that are specific to a particular company.

2. Mapping scorecard factors to a numeric score

After estimating or calculating each factor or sub-factor, each outcome is mapped to a broad Moody's rating category (Aaa, Aa, A, Baa, Ba, B, Caa or Ca, also called alpha categories) and to a numeric score.

Qualitative factors are scored based on the description by broad rating category in the scorecard. The numeric value of each alpha score is based on the scale below.

Exhibit 3

Aaa	Aa	A	Baa	Ba	B	Caa	Ca
1	3	6	9	12	15	18	20

Source: Moody's Investors Service

Quantitative factors are scored on a linear continuum. For each metric, the scorecard shows the range by alpha category. We use the scale below and linear interpolation to convert the metric, based on its placement within the scorecard range, to a numeric score,

which may be a fraction. As a purely theoretical example, if there were a ratio of revenue to interest for which the Baa range was 50x to 100x, then the numeric score for an issuer with revenue/interest of 99x, relatively strong within this range, would score closer to 7.5, and an issuer with revenue/interest of 51x, relatively weak within this range, would score closer to 10.5. In the text or table footnotes, we define the endpoints of the line (i.e., the value of the metric that constitutes the lowest possible numeric score, and the value that constitutes the highest possible numeric score).

Exhibit 4

Aaa	Aa	A	Baa	Ba	B	Caa	Ca
0.5-1.5	1.5-4.5	4.5-7.5	7.5-10.5	10.5-13.5	13.5-16.5	16.5-19.5	19.5-20.5

Source: Moody's Investors Service

3. Determining the overall scorecard-indicated outcome

The numeric score for each sub-factor (or each factor, when the factor has no sub-factors) is multiplied by the weight for that sub-factor (or factor), with the results then summed to produce an aggregate numeric score. The aggregate numeric score is then mapped back to a scorecard-indicated outcome based on the ranges in the table below.

Exhibit 5

Scorecard-indicated outcome

Scorecard-indicated outcome	Aggregate numeric score
Aaa	$x \leq 1.5$
Aa1	$1.5 < x \leq 2.5$
Aa2	$2.5 < x \leq 3.5$
Aa3	$3.5 < x \leq 4.5$
A1	$4.5 < x \leq 5.5$
A2	$5.5 < x \leq 6.5$
A3	$6.5 < x \leq 7.5$
Baa1	$7.5 < x \leq 8.5$
Baa2	$8.5 < x \leq 9.5$
Baa3	$9.5 < x \leq 10.5$
Ba1	$10.5 < x \leq 11.5$
Ba2	$11.5 < x \leq 12.5$
Ba3	$12.5 < x \leq 13.5$
B1	$13.5 < x \leq 14.5$
B2	$14.5 < x \leq 15.5$
B3	$15.5 < x \leq 16.5$
Caa1	$16.5 < x \leq 17.5$
Caa2	$17.5 < x \leq 18.5$
Caa3	$18.5 < x \leq 19.5$
Ca	$19.5 < x \leq 20.5$
C	$x > 20.5$

Source: Moody's Investors Service

For example, an issuer with an aggregate numeric score of 11.7 would have a Ba2 scorecard-indicated outcome.

In general, the scorecard-indicated outcome is oriented to the corporate family rating (CFR) for speculative-grade issuers and to the senior unsecured rating for investment-grade issuers. For issuers that benefit from rating uplift from parental support, government ownership or other institutional support, we consider the underlying credit strength or Baseline Credit Assessment for comparison to the scorecard-indicated outcome. For an explanation of the Baseline Credit Assessment, please refer to *Rating Symbols and Definitions* and to our cross-sector methodology for government-related issuers.¹³

Assigning issuer-level and instrument-level ratings

After considering the scorecard-indicated outcome, other considerations and relevant cross-sector methodologies, we typically assign a CFR to speculative-grade issuers or a senior unsecured rating for investment-grade issuers. For issuers that benefit from rating uplift from government ownership, we may assign a Baseline Credit Assessment.¹⁴

Individual debt instrument ratings may be notched up or down from the CFR or the senior unsecured rating to reflect our assessment of differences in expected loss related to an instrument's seniority level and collateral. The documents that provide broad guidance for such notching decisions are the rating methodology on loss given default for speculative-grade non-financial companies, the methodology for notching corporate instrument ratings based on differences in security and priority of claim, and the methodology for assigning short-term ratings.¹⁵

Key rating assumptions

For information about key rating assumptions that apply to methodologies generally, please see *Rating Symbols and Definitions*.¹⁶

Limitations

In the preceding sections, we have discussed the scorecard factors and many of the other considerations that may be important in assigning ratings. In this section, we discuss limitations that pertain to the scorecard and to the overall rating methodology.

Limitations of the scorecard

There are various reasons why scorecard-indicated outcomes may not map closely to actual ratings.

The scorecard in this rating methodology is a relatively simple tool that can be used in most cases to approximate credit profiles of companies in this sector and to explain, in summary form, many of the factors that are generally most important in assigning ratings to these companies. Credit loss and recovery considerations, which are typically more important as an issuer gets closer to default, may not be fully captured in the scorecard. The scorecard is also limited by its upper and lower bounds, causing scorecard-indicated outcomes to be less likely to align with ratings for issuers at the upper and lower ends of the rating scale.

The weights for each factor and sub-factor in the scorecard represent an approximation of their importance for rating decisions across the sector, but the actual importance of a particular factor may vary substantially based on an individual company's circumstances.

Factors that are outside the scorecard, including those discussed above in the "Other considerations" section, may be important for ratings, and their relative importance may also vary from company to company. In addition, certain broad methodological considerations described in one or more cross-sector rating methodologies may be relevant to ratings in this sector.¹⁷ Examples of such considerations include the following: how sovereign credit quality affects non-sovereign issuers, the assessment of credit support from other entities, the relative ranking of different classes of debt and hybrid securities, and the assignment of short-term ratings.

We may use the scorecard over various historical or forward-looking time periods. Furthermore, in our ratings we often incorporate directional views of risks and mitigants in a qualitative way.

General limitations of the methodology

This methodology document does not include an exhaustive description of all factors that we may consider in assigning ratings in this sector. Companies in the sector may face new risks or new combinations of risks, and they may develop new strategies to mitigate risk. We seek to incorporate all material credit considerations in ratings and to take the most forward-looking perspective that visibility into these risks and mitigants permits.

Ratings reflect our expectations for an issuer's future performance; however, as the forward horizon lengthens, uncertainty increases and the utility of precise estimates, as scorecard inputs or in other considerations, typically diminishes. Our forward-looking opinions are based on assumptions that may prove, in hindsight, to have been incorrect. Reasons for this could include unanticipated changes in any of the following: the macroeconomic environment, general financial market conditions, industry competition, disruptive technology, or regulatory and legal actions. In any case, predicting the future is subject to substantial uncertainty.

Moody's related publications

Credit ratings are primarily determined through the application of sector credit rating methodologies. Certain broad methodological considerations (described in one or more cross-sector rating methodologies) may also be relevant to the determination of credit ratings of issuers and instruments. A list of sector and cross-sector credit rating methodologies can be found [here](#).

For data summarizing the historical robustness and predictive power of credit ratings, please click [here](#).

For further information, please refer to *Rating Symbols and Definitions*, which is available [here](#).

Moody's Basic Definitions for Credit Statistics (User's Guide) can be found [here](#).

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Endnotes

- [1](#) A link to a list of our sector and cross-sector methodologies can be found in the "Moody's related publications" section.
- [2](#) A link to a list of our sector and cross-sector methodologies can be found in the "Moody's related publications" section.
- [3](#) In our methodologies and research, the terms "scorecard" and "grid" are used interchangeably.
- [4](#) Liquidity management is distinct from the level of liquidity, which is discussed in the "Other considerations" section.
- [5](#) A link to a list of our sector and cross-sector methodologies can be found in the "Moody's related publications" section.
- [6](#) A link to a list of our cross-sector methodologies can be found in the "Moody's related publications" section of this report.
- [7](#) For example, in the case of an equity stake reduction in a subsidiary down to 75%, in the parent's financial statements, all revenue and EBITDA of the subsidiary would typically still be consolidated at the group level.
- [8](#) Proportional consolidation brings a portion of the minority subsidiary's debt onto the balance sheet, but this debt is structurally senior to debt at the parent company, because it is closer to the assets and cash flows of the minority subsidiary.
- [9](#) For an explanation of the Baseline Credit Assessment, please refer to *Rating Symbols and Definitions* and to our cross-sector methodology for government-related issuers. A link to a list of our sector and cross-sector methodologies and a link to *Rating Symbols and Definitions* can be found in the "Moody's related publications" section.
- [10](#) When a factor comprises sub-factors, we score at the sub-factor level. Some factors do not have sub-factors, in which case we score at the factor level.
- [11](#) For definitions of our most common ratio terms, please see *Moody's Basic Definitions for Credit Statistics (User's Guide)*. A link can be found in the "Moody's related publications" section.
- [12](#) For an explanation of our standard adjustments, please see the cross-sector methodology that describes our financial statement adjustments in the analysis of non-financial corporations.
- [13](#) A link to a list of our sector and cross-sector methodologies and a link to *Rating Symbols and Definitions* can be found in the "Moody's related publications" section.
- [14](#) For an explanation of the Baseline Credit Assessment, please refer to *Rating Symbols and Definitions* and to our cross-sector methodology for government-related issuers. A link to a list of our sector and cross-sector methodologies and a link to *Rating Symbols and Definitions* can be found in the "Moody's related publications" section.
- [15](#) A link to a list of our sector and cross-sector rating methodologies can be found in the "Moody's related publications" section.
- [16](#) A link to *Rating Symbols and Definitions* can be found in the "Moody's related publications" section.
- [17](#) A link to a list of our sector and cross-sector methodologies can be found in the "Moody's related publications" section.

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