BAT165A-Q

40 V, 0.75 A medium power Schottky barrier rectifier

28 September 2022 Product data sheet

1. General description

Medium power Schottky barrier rectifier with an integrated guard ring for stress protection, encapsulated in a very small SOD323 (SC-76) Surface-Mounted Device (SMD) plastic package.

2. Features and benefits

- Forward current: $I_F \leq 0.75$ A
- Reverse voltage: $V_R \leq 40$ V
- Low forward voltage typ. $V_F = 640$ mV
- Low reverse current typ. $I_R = 1.5$ µA
- Very small SMD plastic package
- Qualified according to AEC-Q101 and recommended for use in automotive applications

3. Applications

- Low voltage rectification
- High efficiency DC-to-DC conversion
- Switch mode power supply
- Reverse polarity protection
- Low power consumption application
- Automotive applications

4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
I_F	forward current	$\delta = 1$; $T_{sp} \leq 93$ °C		-	-	0.75	A
V_R	reverse voltage	$T_j = 25$ °C		-	-	40	V
V_F	forward voltage	$I_F = 750$ mA; $t_p \leq 300$ µs; $\delta \leq 0.02$; $T_j = 25$ °C		-	640	740	mV
I_R	reverse current	$V_R = 40$ V; pulsed; $T_j = 25$ °C		-	1.5	8	µA
		$V_R = 40$ V; pulsed; $T_j = 65$ °C		-	30	900	µA

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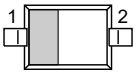
5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	K	cathode	 SOD323	 sym001
2	A	anode		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BAT165A-Q	SOD323	plastic, surface-mounted package; 2 leads; 1.3 mm pitch; 1.7 mm x 1.25 mm x 0.95 mm body	SOD323

7. Marking

Table 4. Marking codes

Type number	Marking code
BAT165A-Q	2G

8. Limiting values

Table 5. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions		Min	Max	Unit
V_R	reverse voltage	T_j = 25 °C		-	40	V
I_F	forward current	δ = 1; $T_{sp} \leq$ 93 °C		-	0.75	A
$I_{F(AV)}$	average forward current	50 Hz ≤ f ≤ 60 Hz; pulsed sinusoidal; $T_{amb} \leq$ 93 °C		-	0.5	A
I_{FSM}	non-repetitive peak forward current	t_p = 8 ms; square wave; $T_{j(init)}$ = 25 °C		-	8	A
P_{tot}	total power dissipation	$T_{amb} \leq$ 25 °C	[1]	-	380	mW
			[2]	-	555	mW
T_j	junction temperature			-	150	°C
T_{amb}	ambient temperature			-55	150	°C
T_{stg}	storage temperature			-65	150	°C

[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.
[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for cathode 1 cm^2.

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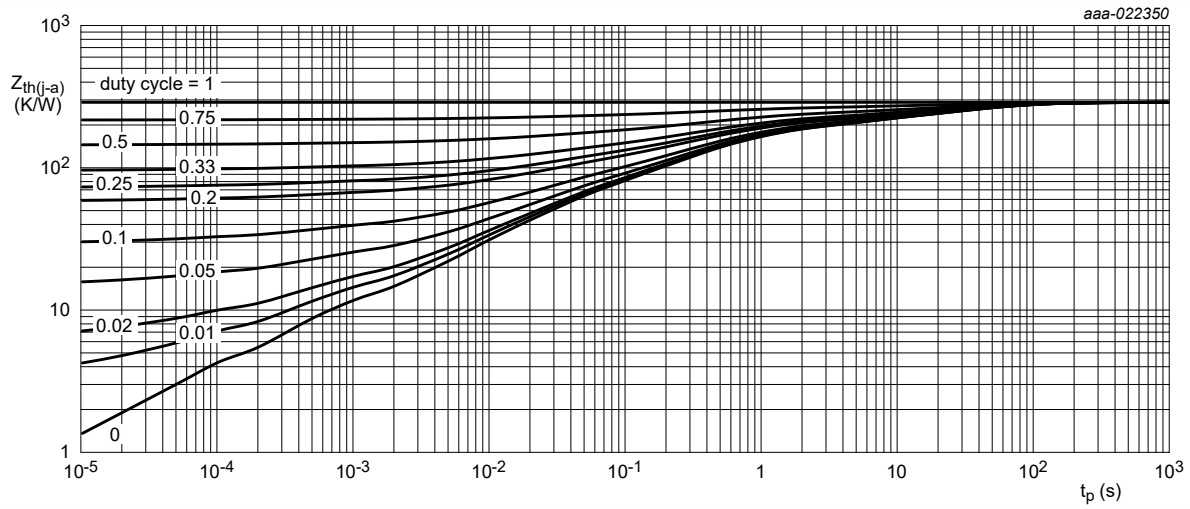
9. Thermal characteristics

Table 6. Thermal characteristics

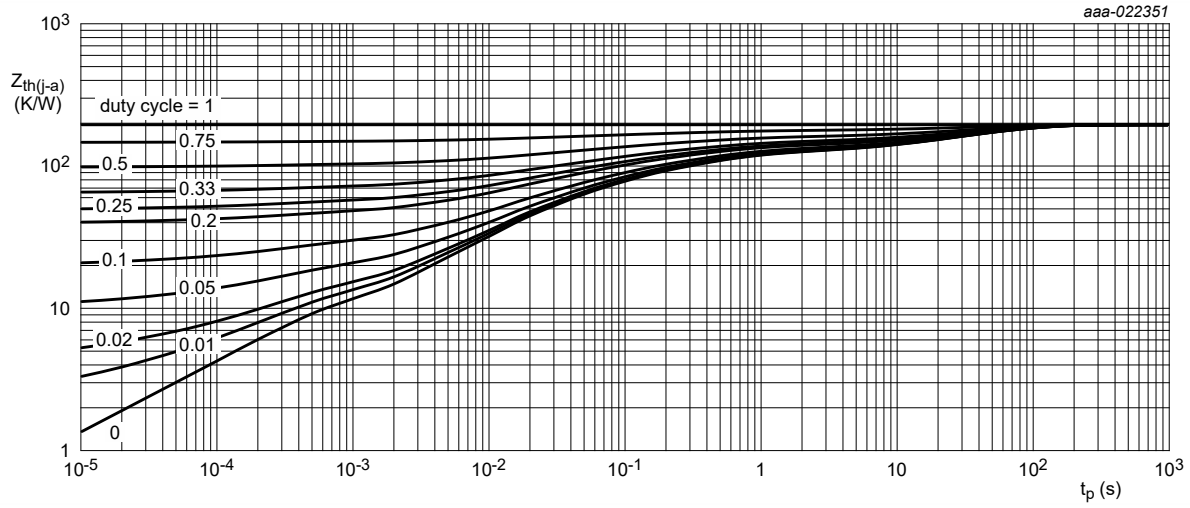
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1] [2]	-	-	330	K/W
			[1] [3]	-	-	225	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point		[4]	-	-	45	K/W

[1] For Schottky barrier diodes thermal runaway has to be considered, as in some applications the reverse power losses P_R are a significant part of the total power losses.
[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.
[3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for cathode 1 cm^2.
[4] Soldering point of cathode tab.



FR4 PCB, standard footprint

Fig. 1. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values



FR4 PCB, mounting pad for cathode 1 cm^2

Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

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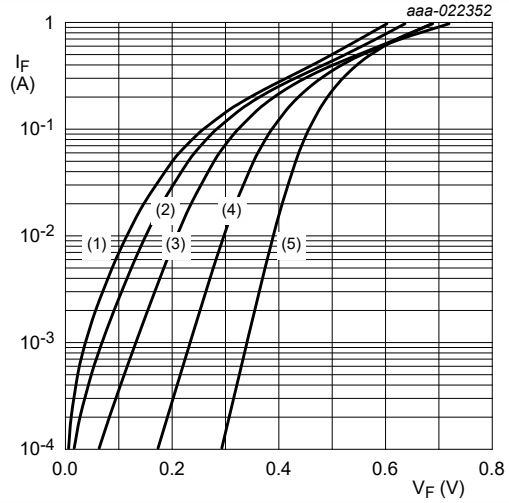
10. Characteristics

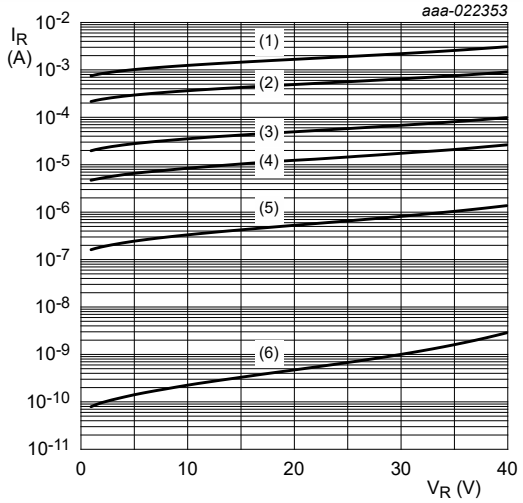
Table 7. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$V_{(BR)R}$	reverse breakdown voltage	I_R = 1 mA; $t_p \leq$ 300 µs; pulsed; δ ≤ 0.02; T_j = 25 °C		40	-	-	V
V_F	forward voltage	I_F = 10 mA; $t_p \leq$ 300 µs; δ ≤ 0.02; T_j = 25 °C		-	300	380	mV
		I_F = 100 mA; $t_p \leq$ 300 µs; δ ≤ 0.02; T_j = 25 °C		-	390	470	mV
		I_F = 250 mA; $t_p \leq$ 300 µs; δ ≤ 0.02; T_j = 25 °C		-	455	540	mV
		I_F = 500 mA; $t_p \leq$ 300 µs; δ ≤ 0.02; T_j = 25 °C		-	550	640	mV
		I_F = 750 mA; $t_p \leq$ 300 µs; δ ≤ 0.02; T_j = 25 °C		-	640	740	mV
I_R	reverse current	V_R = 30 V; pulsed; T_j = 25 °C		-	1	5	µA
		V_R = 40 V; pulsed; T_j = 25 °C		-	1.5	8	µA
		V_R = 40 V; pulsed; T_j = 65 °C		-	30	900	µA
		V_R = 5 V; pulsed; T_j = 125 °C		-	290	700	µA
		V_R = 40 V; pulsed; T_j = 125 °C		-	1	8	mA
C_d	diode capacitance	V_R = 10 V; f = 1 MHz; T_j = 25 °C		-	9	12	pF



pulsed condition
(1) T_j = 150 °C
(2) T_j = 125 °C
(3) T_j = 85 °C
(4) T_j = 25 °C
(5) T_j = -40 °C

Fig. 3. Forward current as a function of forward voltage; typical values



pulsed condition
(1) T_j = 150 °C
(2) T_j = 125 °C
(3) T_j = 85 °C
(4) T_j = 65 °C
(5) T_j = 25 °C
(6) T_j = −40 °C

Fig. 4. Reverse current as a function of reverse voltage; typical values

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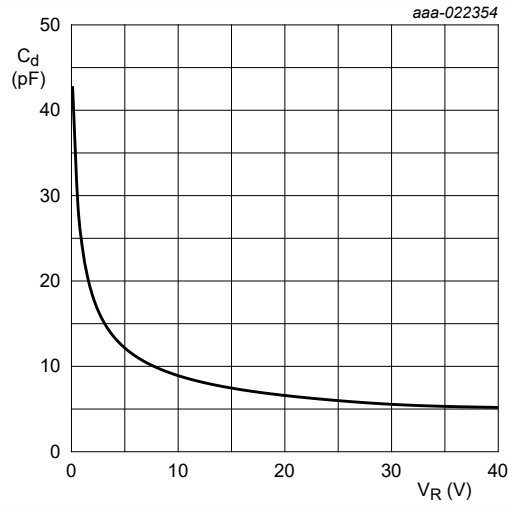
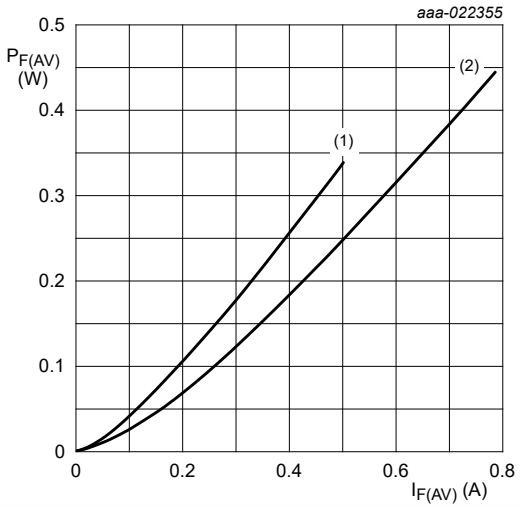


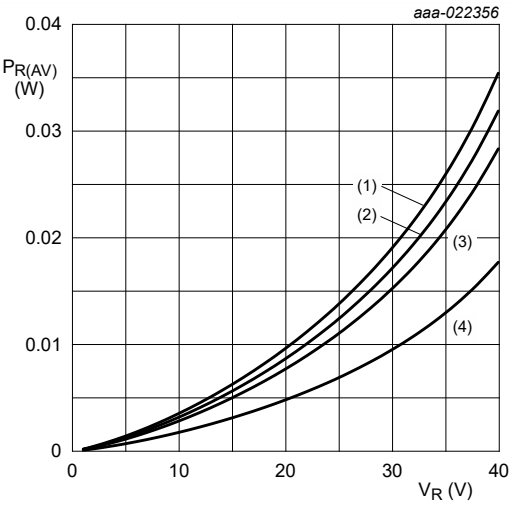
f = 1 MHz; T_{amb} = 25 °C

Fig. 5. Diode capacitance as a function of reverse voltage; typical values



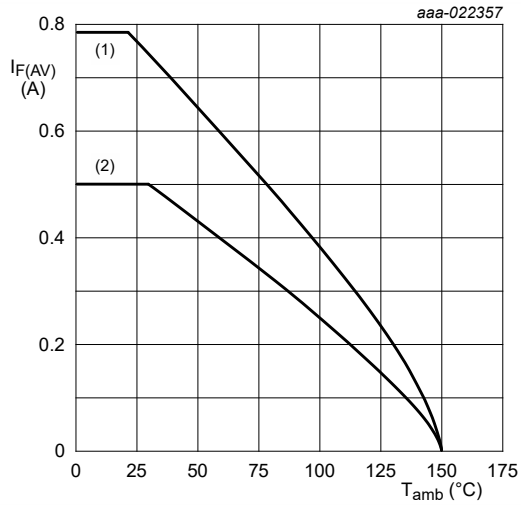
T_j = 150 °C
(1) δ = 0.5 sinusoidal
(2) δ = 1

Fig. 6. Average forward power dissipation as a function of average forward current; typical values



T_j = 125 °C
(1) δ = 1; DC
(2) δ = 0.9; f = 20 kHz
(3) δ = 0.8; f = 20 kHz
(4) δ = 0.5; f = 20 kHz

Fig. 7. Average reverse power dissipation as a function of reverse voltage; typical values



FR4 PCB, standard footprint
T_j = 150 °C
(1) δ = 1; DC
(2) δ = 0.5; f = 50 Hz/60 Hz; pulsed sinusoidal

Fig. 8. Average forward current as a function of ambient temperature; typical values

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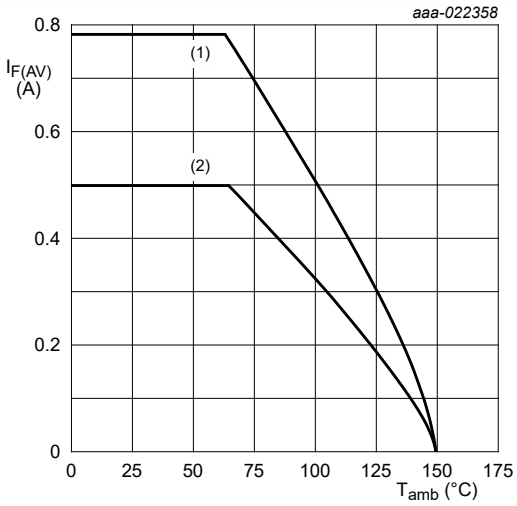
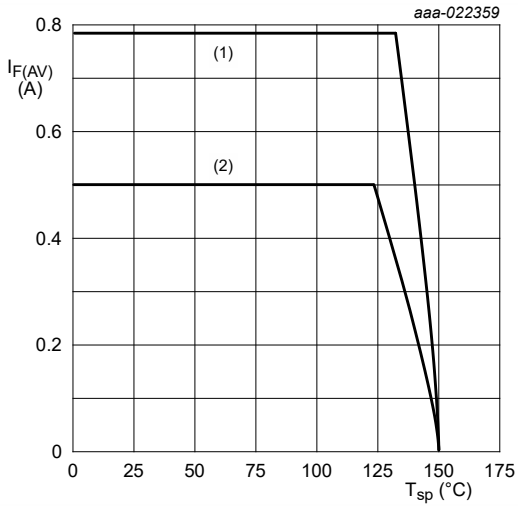


FR4 PCB, mounting pad for cathode 1 cm^2
T_j = 150 °C
(1) δ = 1; DC
(2) δ = 0.5; f = 50 Hz/60 Hz; pulsed sinusoidal

Fig. 9. Average forward current as a function of ambient temperature; typical values



T_j = 150 °C
(1) δ = 1; DC
(2) δ = 0.5; f = 50 Hz/60 Hz; pulsed sinusoidal

Fig. 10. Average forward current as a function of solder point temperature; typical values

11. Test information

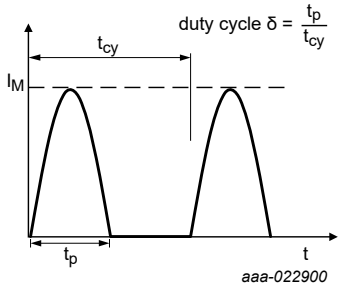


Fig. 11. Duty cycle definition: sinusoidal

The current ratings for the sinusoidal waveforms are calculated according to the equations: $I_{F(AV)} = I_M \times 0.3183$ with I_M defined as peak current, $I_{RMS} = I_{F(AV)}$ at DC, and $I_{RMS} = I_M \times \sqrt{(\delta/2)}$ with I_{RMS} defined as RMS current.

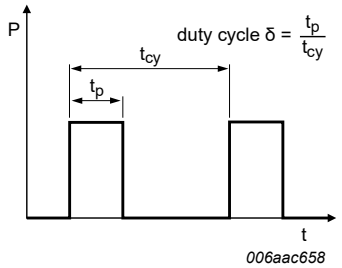


Fig. 12. Duty cycle definition: square wave

Quality information

This product has been qualified in accordance with the Automotive Electronics Council (AEC) standard Q101 - Stress test qualification for discrete semiconductors, and is suitable for use in automotive applications.

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12. Package outline

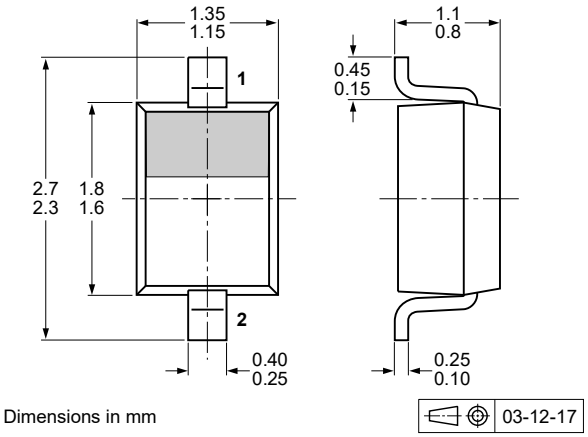

Fig. 13. Package outline SOD323

13. Soldering

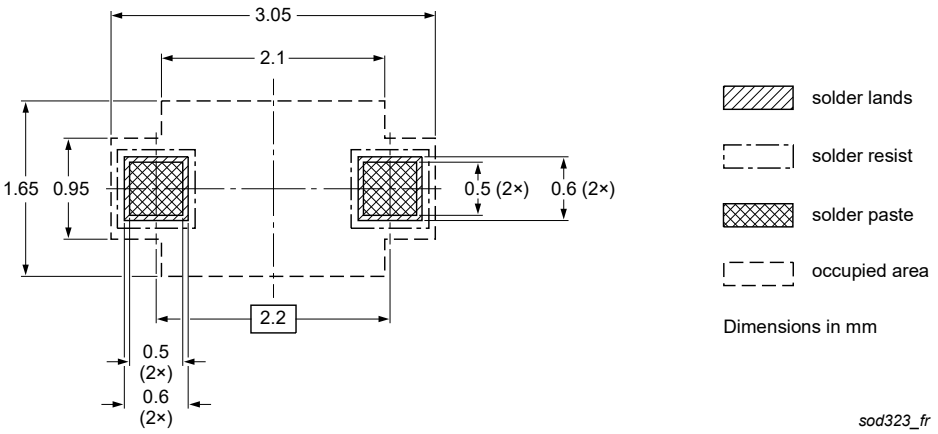

Fig. 14. Reflow soldering footprint for SOD323

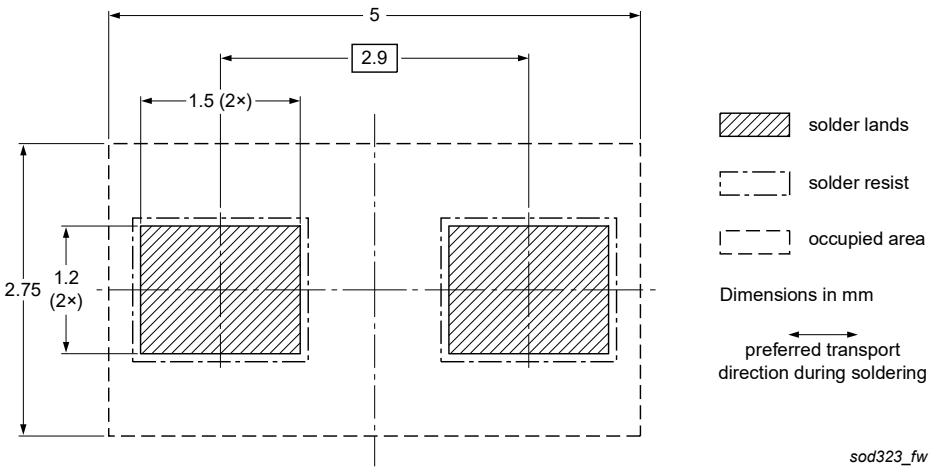

Fig. 15. Wave soldering footprint for SOD323

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14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
BAT165A-Q v.1	20220928	Product data sheet	-	-

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15. Legal information

Data sheet status

Document status [1][2]	Product status [3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

[1] Please consult the most recently issued document before initiating or completing a design.
[2] The term 'short data sheet' is explained in section "Definitions".
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Date of release: 28 September 2022