

## 1. Product profile

### 1.1 General description

Hyperfast epitaxial rectifier diode in a SOD113 (2-lead TO-220F) plastic package specifically for use in CCM PFC applications for reduced switching losses.

### 1.2 Features and benefits

- Allows use of smaller MOSFETs and heatsinks
- Isolated package
- Low reverse recovery current
- Low thermal resistance
- Reduces switching losses in associated MOSFET
- Superfast switching

### 1.3 Applications

- Continuous Current Mode (CCM) Power Factor Correction (PFC)
- Desk top computer power supplies
- Flat panel TV power supplies
- Power supply adapters
- Server power supplies
- Telecom power supplies

### 1.4 Quick reference data

Table 1. Quick reference

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{RRM}$	repetitive peak reverse voltage		-	-	600	V
$I_{F(AV)}$	average forward current	square-wave pulse; $\delta = 0.5$ ; $T_h \leq 93\text{ °C}$ ; see <a href="#">Figure 1</a> and <a href="#">2</a>	-	-	8	A
$I_{FSM}$	non-repetitive peak forward current	$T_{j(init)} = 25\text{ °C}$ ; $t_p = 10\text{ ms}$ ; sine-wave pulse	-	-	110	A
		$T_{j(init)} = 25\text{ °C}$ ; $t_p = 8.3\text{ ms}$ ; sine-wave pulse	-	-	120	A
$R_{th(j-h)}$	thermal resistance from junction to heatsink	with heatsink compound; see <a href="#">Figure 3</a>	-	2.5	3	K/W

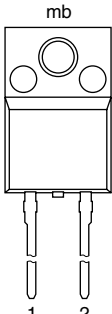



**Table 1. Quick reference ...continued**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Dynamic characteristics</b>						
$t_{rr}$	reverse recovery time	$I_F = 8\text{ A}$ ; $V_R = 400\text{ V}$ ; $di_F/dt = 200\text{ A}/\mu\text{s}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; see <a href="#">Figure 6</a>	-	12.5	-	ns
		$I_F = 8\text{ A}$ ; $V_R = 400\text{ V}$ ; $di_F/dt = 200\text{ A}/\mu\text{s}$ ; $T_j = 125\text{ }^\circ\text{C}$ ; see <a href="#">Figure 6</a> and <a href="#">7</a>	-	21	-	ns
$Q_r$	recovered charge	$I_F = 8\text{ A}$ ; $V_R = 400\text{ V}$ ; $di_F/dt = 200\text{ A}/\mu\text{s}$ ; $T_j = 125\text{ }^\circ\text{C}$ ; see <a href="#">Figure 5</a> and <a href="#">6</a>	-	40	-	nC
<b>Static characteristics</b>						
$V_F$	forward voltage	$I_F = 8\text{ A}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; see <a href="#">Figure 4</a>	-	2.35	3.2	V
		$I_F = 8\text{ A}$ ; $T_j = 150\text{ }^\circ\text{C}$ ; see <a href="#">Figure 4</a>	-	2	2.4	V

## 2. Pinning information

**Table 2. Pinning information**

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	K	cathode		 001aaa020
2	A	anode		
mb	n.c.	mounting base; isolated		

**SOD113 (TO-220F)**

## 3. Ordering information

**Table 3. Ordering information**

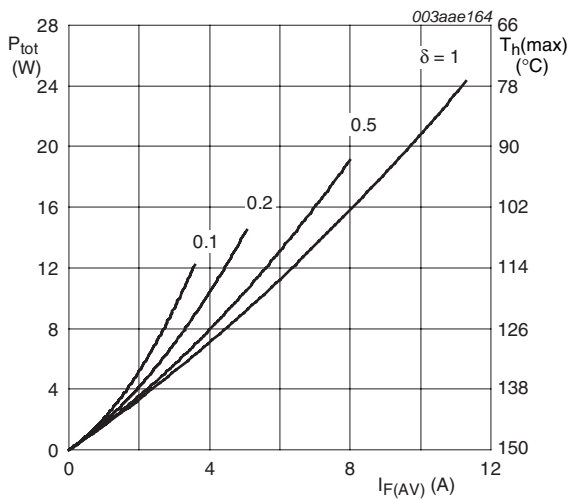
Type number	Package		Version
	Name	Description	
BYC58X-600	TO-220F	plastic single-ended package; isolated heatsink mounted; 1 mounting hole; 2-lead TO-220 "full pack"	SOD113

### 4. Limiting values

**Table 4. Limiting values**

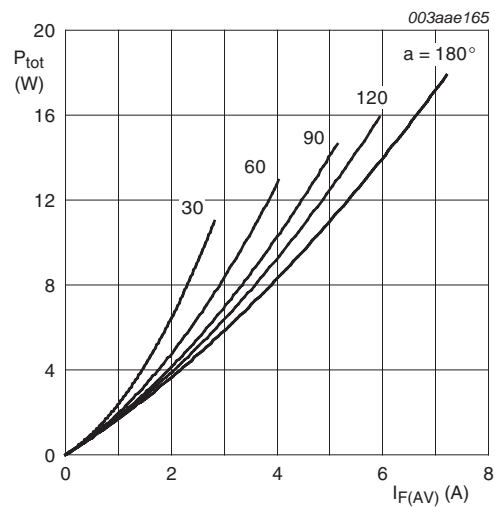
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{RRM}$	repetitive peak reverse voltage		-	600	V
$V_{RWM}$	crest working reverse voltage		-	600	V
$I_{F(AV)}$	average forward current	square-wave pulse; $\delta = 0.5$ ; $T_h \leq 93\text{ }^\circ\text{C}$ ; see <a href="#">Figure 1</a> and <a href="#">2</a>	-	8	A
$I_{FRM}$	repetitive peak forward current	square-wave pulse; $\delta = 0.5$ ; $t_p = 25\text{ }\mu\text{s}$	-	16	A
$I_{FSM}$	non-repetitive peak forward current	$t_p = 10\text{ ms}$ ; sine-wave pulse; $T_{j(\text{init})} = 25\text{ }^\circ\text{C}$	-	110	A
		$t_p = 8.3\text{ ms}$ ; sine-wave pulse; $T_{j(\text{init})} = 25\text{ }^\circ\text{C}$	-	120	A
$T_{\text{stg}}$	storage temperature		-40	150	$^\circ\text{C}$
$T_j$	junction temperature		-	150	$^\circ\text{C}$



$$I_F = I_{F(RMS)} \times \sqrt{\delta}$$

**Fig 1. Forward power dissipation as a function of average forward current; square waveform; maximum values**



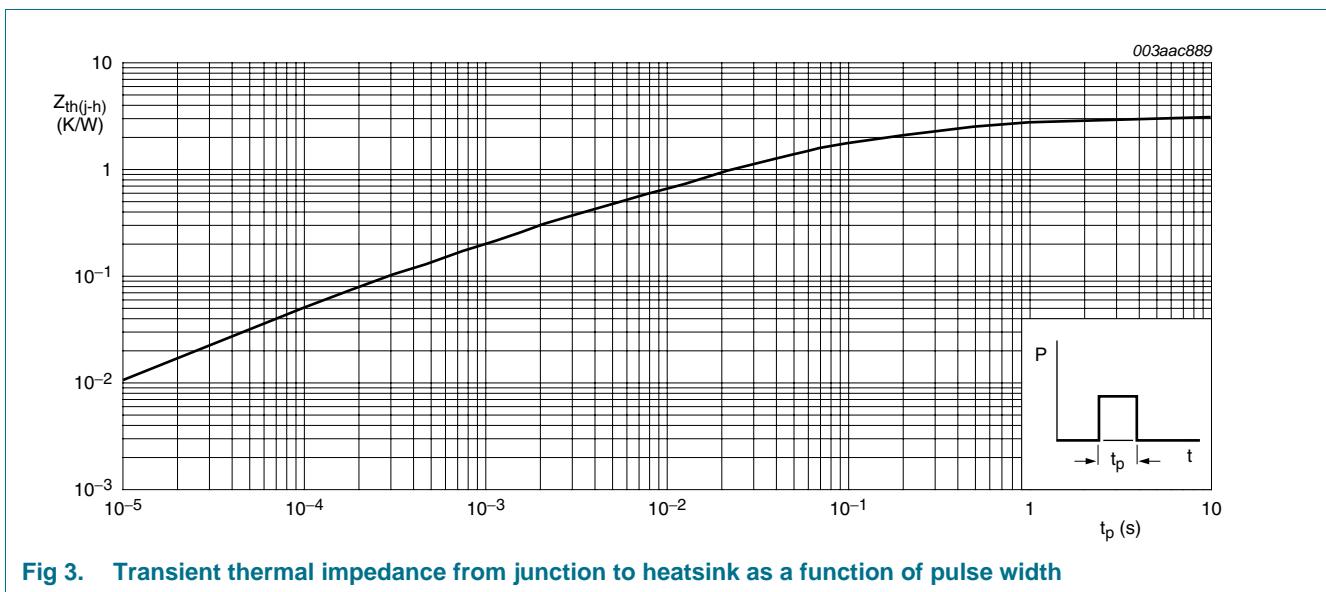
$$a = \text{form factor} = I_{F(RMS)} \div I_{F(AV)}$$

**Fig 2. Forward power dissipation as a function of average forward current; sinusoidal waveform; maximum values**

## 5. Thermal characteristics

**Table 5. Thermal characteristics**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-h)}$	thermal resistance from junction to heatsink	with heatsink compound; see <a href="#">Figure 3</a>	-	2.5	3	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient free air	in free air	-	55	-	K/W



**Fig 3. Transient thermal impedance from junction to heatsink as a function of pulse width**

## 6. Isolation characteristics

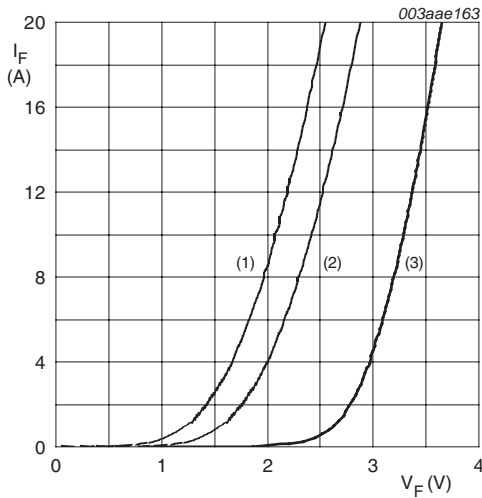
**Table 6. Isolation characteristics**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{isol(RMS)}$	RMS isolation voltage	50 Hz ≤ f ≤ 60 Hz; RH ≤ 65 %; from all pins to external heatsink; sinusoidal waveform; clean and dust free	-	-	2500	V
$C_{isol}$	isolation capacitance	f = 1 MHz; from cathode to external heatsink	-	10	-	pF

7. Characteristics

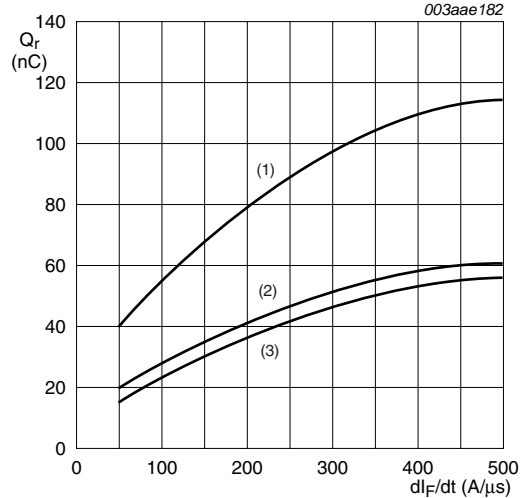
Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$V_F$	forward voltage	$I_F = 8\text{ A}; T_j = 25\text{ °C};$ see <a href="#">Figure 4</a>	-	2.35	3.2	V
		$I_F = 8\text{ A}; T_j = 150\text{ °C};$ see <a href="#">Figure 4</a>	-	2	2.4	V
$I_R$	reverse current	$V_R = 600\text{ V}; T_j = 25\text{ °C}$	-	-	150	$\mu\text{A}$
<b>Dynamic characteristics</b>						
$Q_r$	recovered charge	$I_F = 8\text{ A}; V_R = 400\text{ V}; dI_F/dt = 200\text{ A}/\mu\text{s}; T_j = 125\text{ °C};$ see <a href="#">Figure 5</a> and <a href="#">6</a>	-	40	-	nC
$t_{rr}$	reverse recovery time	$I_F = 8\text{ A}; V_R = 400\text{ V}; dI_F/dt = 200\text{ A}/\mu\text{s}; T_j = 25\text{ °C};$ see <a href="#">Figure 6</a>	-	12.5	-	ns
		$I_F = 8\text{ A}; V_R = 400\text{ V}; dI_F/dt = 200\text{ A}/\mu\text{s}; T_j = 125\text{ °C};$ see <a href="#">Figure 6</a> and <a href="#">7</a>	-	21	-	ns
$I_{RM}$	peak reverse recovery current	$I_F = 8\text{ A}; V_R = 400\text{ V}; dI_F/dt = 200\text{ A}/\mu\text{s}; T_j = 125\text{ °C}$	-	4	5.5	A



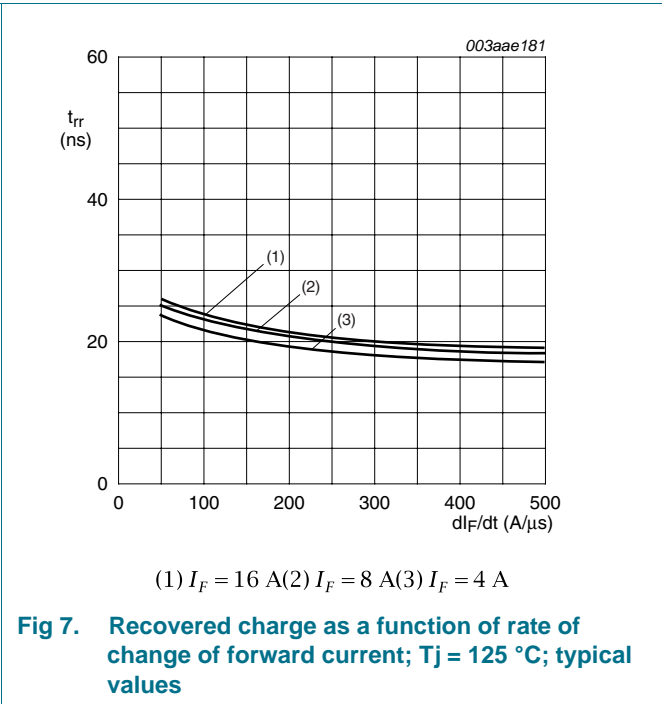
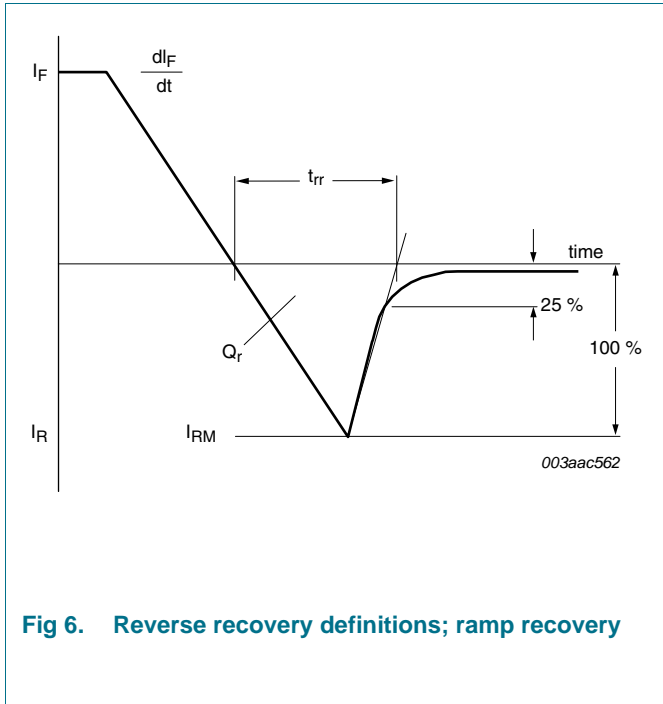
- (1)  $T_j = 150\text{ °C};$  typical values
- (2)  $T_j = 150\text{ °C};$  maximum values
- (3)  $T_j = 25\text{ °C};$  maximum values

Fig 4. Forward current as a function of forward voltage



- (1)  $I_F = 16\text{ A}$  (2)  $I_F = 8\text{ A}$  (3)  $I_F = 4\text{ A}$

Fig 5. Recovered charge as a function of rate of change of forward current;  $T_j = 125\text{ °C};$  typical values



8. Package outline

Plastic single-ended package; isolated heatsink mounted;  
1 mounting hole; 2-lead TO-220 'full pack'

SOD113

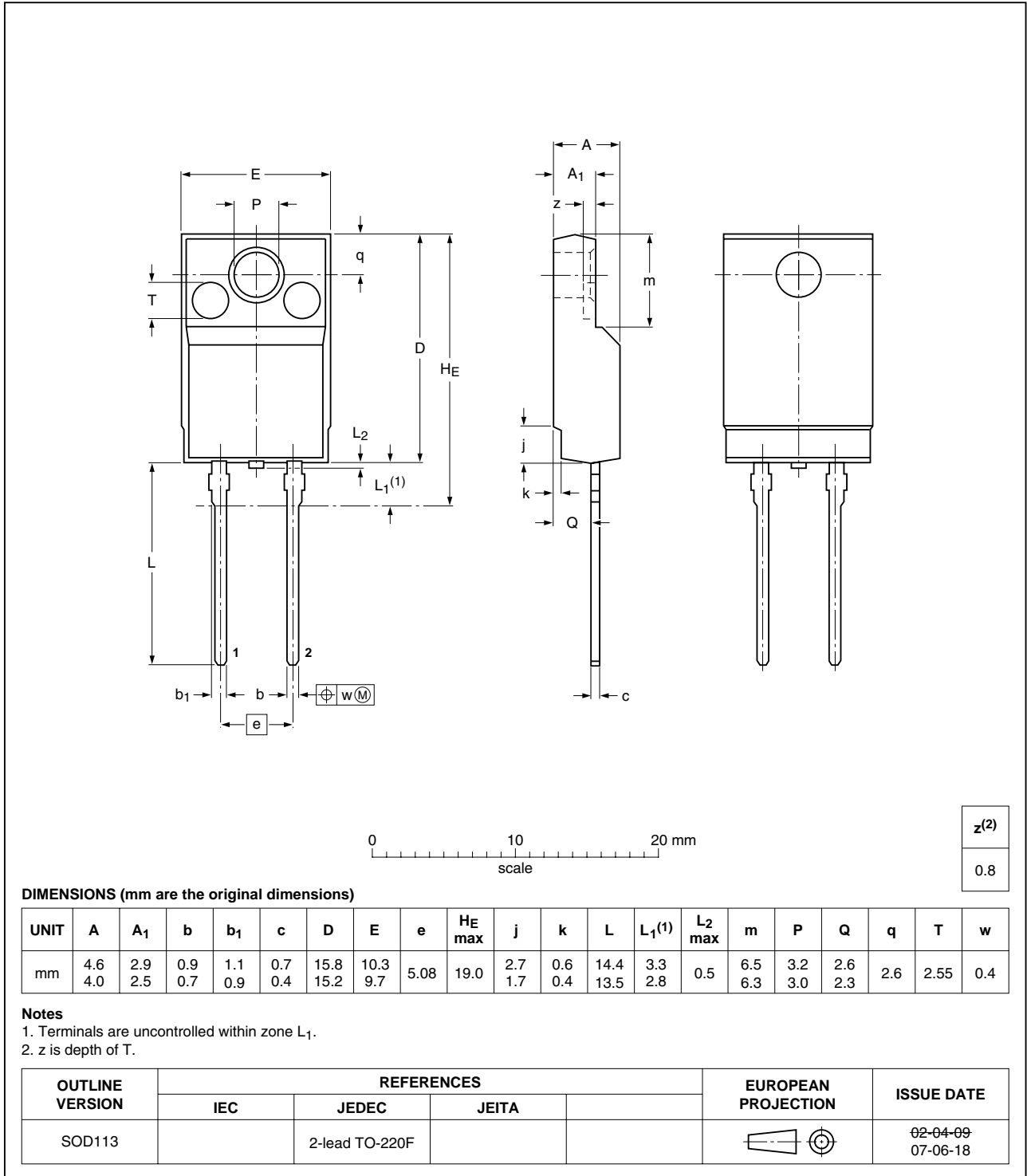


Fig 8. Package outline SOD113 (TO-220F)

## 9. Revision history

Table 8. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BYC58X-600_1	20100223	Product data sheet	-	-



## 10. Legal information

### 10.1 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.

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## 12. Contents

<b>1</b>	<b>Product profile</b> . . . . .	<b>1</b>
1.1	General description . . . . .	1
1.2	Features and benefits . . . . .	1
1.3	Applications . . . . .	1
1.4	Quick reference data . . . . .	1
<b>2</b>	<b>Pinning information</b> . . . . .	<b>2</b>
<b>3</b>	<b>Ordering information</b> . . . . .	<b>2</b>
<b>4</b>	<b>Limiting values</b> . . . . .	<b>3</b>
<b>5</b>	<b>Thermal characteristics</b> . . . . .	<b>4</b>
<b>6</b>	<b>Isolation characteristics</b> . . . . .	<b>4</b>
<b>7</b>	<b>Characteristics</b> . . . . .	<b>5</b>
<b>8</b>	<b>Package outline</b> . . . . .	<b>7</b>
<b>9</b>	<b>Revision history</b> . . . . .	<b>8</b>
<b>10</b>	<b>Legal information</b> . . . . .	<b>9</b>
10.1	Data sheet status . . . . .	9
10.2	Definitions . . . . .	9
10.3	Disclaimers . . . . .	9
10.4	Trademarks . . . . .	10
<b>11</b>	<b>Contact information</b> . . . . .	<b>10</b>

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