



# MMBD4148

## High-speed switching diode

Rev. 01 — 4 June 2009

Product data sheet

## 1. Product profile

### 1.1 General description

High-speed switching diode, encapsulated in a small SOT23 (TO-236AB) Surface-Mounted Device (SMD) plastic package.

### 1.2 Features

- High switching speed:  $t_{rr} \leq 4$  ns
- Low leakage current
- Repetitive peak reverse voltage:  $V_{RRM} \leq 75$  V
- Low capacitance
- Reverse voltage:  $V_R \leq 75$  V
- Small SMD plastic package

### 1.3 Applications

- High-speed switching
- General-purpose switching

### 1.4 Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_R$	reverse voltage		-	-	75	V
$I_R$	reverse current	$V_R = 75$ V	-	-	0.5	$\mu$ A
$t_{rr}$	reverse recovery time		[1]	-	4	ns

[1] When switched from  $I_F = 10$  mA to  $I_R = 10$  mA;  $R_L = 100$   $\Omega$ ; measured at  $I_R = 1$  mA.

## 2. Pinning information

Table 2. Pinning

Pin	Description	Simplified outline	Graphic symbol
1	anode		
2	not connected		
3	cathode		

### 3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
MMBD4148	-	plastic surface-mounted package; 3 leads	SOT23

### 4. Marking

Table 4. Marking codes

Type number	Marking code <sup>[1]</sup>
MMBD4148	A6*

- [1] \* = -: made in Hong Kong  
 \* = p: made in Hong Kong  
 \* = t: made in Malaysia  
 \* = W: made in China

### 5. Limiting values

Table 5. Limiting values

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

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{RRM}$	repetitive peak reverse voltage		-	75	V
$V_R$	reverse voltage		-	75	V
$I_F$	forward current		<sup>[1]</sup> -	215	mA
$I_{FRM}$	repetitive peak forward current	$t_p \leq 0.5 \mu\text{s}$ ; $\delta \leq 0.25$	-	500	mA
$I_{FSM}$	non-repetitive peak forward current	square wave	<sup>[2]</sup>		
		$t_p = 1 \mu\text{s}$	-	4	A
		$t_p = 1 \text{ms}$	-	1	A
		$t_p = 1 \text{s}$	-	0.5	A
$P_{tot}$	total power dissipation	$T_{amb} \leq 25 \text{ }^\circ\text{C}$	<sup>[1]</sup> -	250	mW
$T_j$	junction temperature		-	150	$^\circ\text{C}$
$T_{amb}$	ambient temperature		-65	+150	$^\circ\text{C}$
$T_{stg}$	storage temperature		-65	+150	$^\circ\text{C}$

[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.

[2]  $T_j = 25 \text{ }^\circ\text{C}$  prior to surge.

## 6. 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]	-	-	500	K/W
$R_{th(j-t)}$	thermal resistance from junction to tie-point		-	-	330	K/W	

[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

## 7. Characteristics

**Table 7. Characteristics**

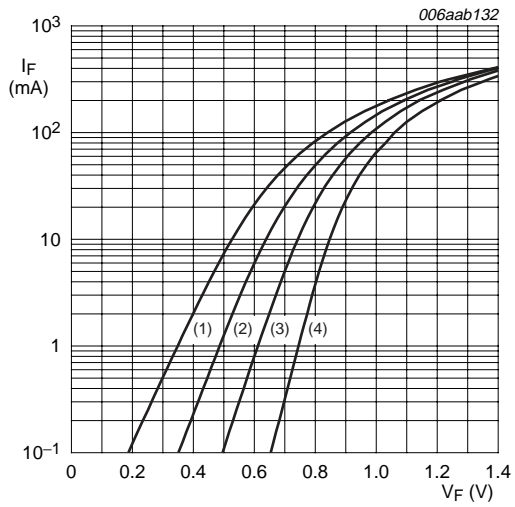
$T_{amb} = 25\text{ °C}$  unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_F$	forward voltage		[1]			
		$I_F = 1\text{ mA}$	-	-	715	mV
		$I_F = 10\text{ mA}$	-	-	855	mV
		$I_F = 50\text{ mA}$	-	-	1	V
		$I_F = 150\text{ mA}$	-	-	1.25	V
$I_R$	reverse current	$V_R = 25\text{ V}$	-	-	30	nA
		$V_R = 75\text{ V}$	-	-	0.5	$\mu\text{A}$
		$V_R = 25\text{ V}; T_j = 150\text{ °C}$	-	-	30	$\mu\text{A}$
		$V_R = 75\text{ V}; T_j = 150\text{ °C}$	-	-	50	$\mu\text{A}$
$C_d$	diode capacitance	$f = 1\text{ MHz}; V_R = 0\text{ V}$	-	-	1.5	pF
$t_{rr}$	reverse recovery time		[2]	-	4	ns
$V_{FR}$	forward recovery voltage		[3]	-	1.75	V

[1] Pulse test:  $t_p \leq 300\ \mu\text{s}$ ;  $\delta \leq 0.02$ .

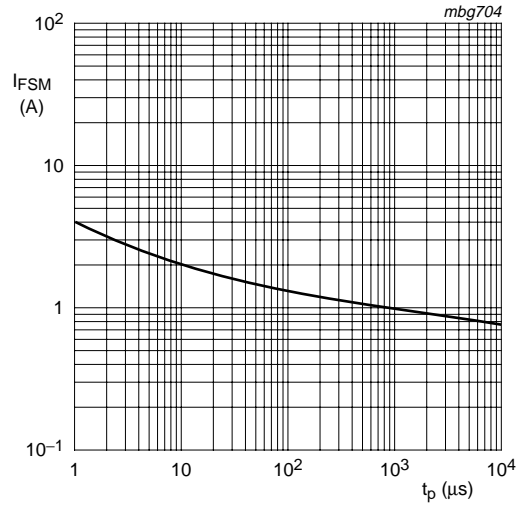
[2] When switched from  $I_F = 10\text{ mA}$  to  $I_R = 10\text{ mA}$ ;  $R_L = 100\ \Omega$ ; measured at  $I_R = 1\text{ mA}$ .

[3] When switched from  $I_F = 10\text{ mA}$ ;  $t_r = 20\text{ ns}$ .



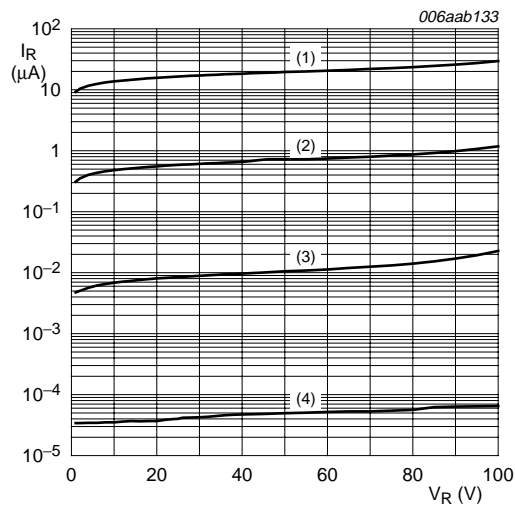
- (1)  $T_{\text{amb}} = 150^\circ\text{C}$
- (2)  $T_{\text{amb}} = 85^\circ\text{C}$
- (3)  $T_{\text{amb}} = 25^\circ\text{C}$
- (4)  $T_{\text{amb}} = -40^\circ\text{C}$

Fig 1. Forward current as a function of forward voltage; typical values



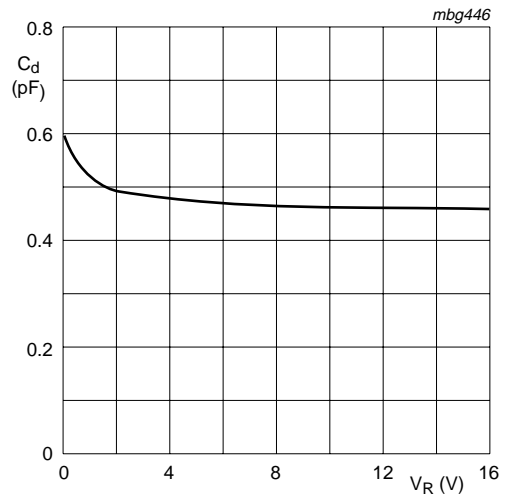
Based on square wave currents.  
 $T_J = 25^\circ\text{C}$ ; prior to surge

Fig 2. Non-repetitive peak forward current as a function of pulse duration; maximum values



- (1)  $T_{\text{amb}} = 150^\circ\text{C}$
- (2)  $T_{\text{amb}} = 85^\circ\text{C}$
- (3)  $T_{\text{amb}} = 25^\circ\text{C}$
- (4)  $T_{\text{amb}} = -40^\circ\text{C}$

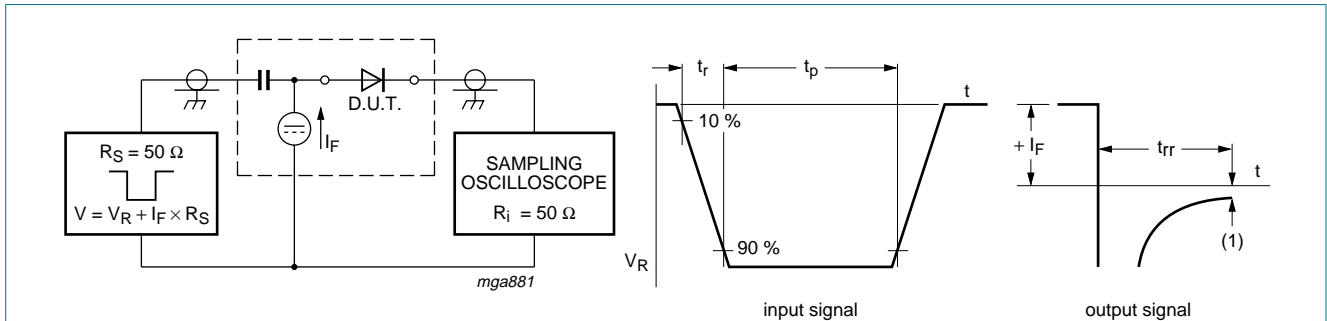
Fig 3. Reverse current as a function of reverse voltage; typical values



$f = 1\text{ MHz}$ ;  $T_{\text{amb}} = 25^\circ\text{C}$

Fig 4. Diode capacitance as a function of reverse voltage; typical values

8. Test information

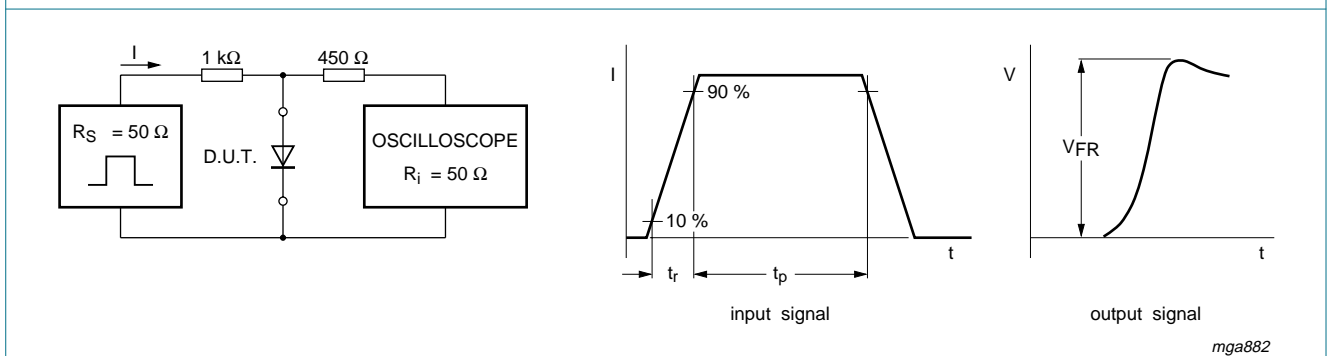


(1)  $I_R = 1 \text{ mA}$

Input signal: reverse pulse rise time  $t_r = 0.6 \text{ ns}$ ; reverse voltage pulse duration  $t_p = 100 \text{ ns}$ ; duty cycle  $\delta = 0.05$

Oscilloscope: rise time  $t_r = 0.35 \text{ ns}$

Fig 5. Reverse recovery time test circuit and waveforms



Input signal: forward pulse rise time  $t_r = 20 \text{ ns}$ ; forward current pulse duration  $t_p \geq 100 \text{ ns}$ ; duty cycle  $\delta \leq 0.005$

Fig 6. Forward recovery voltage test circuit and waveforms

## 9. Package outline

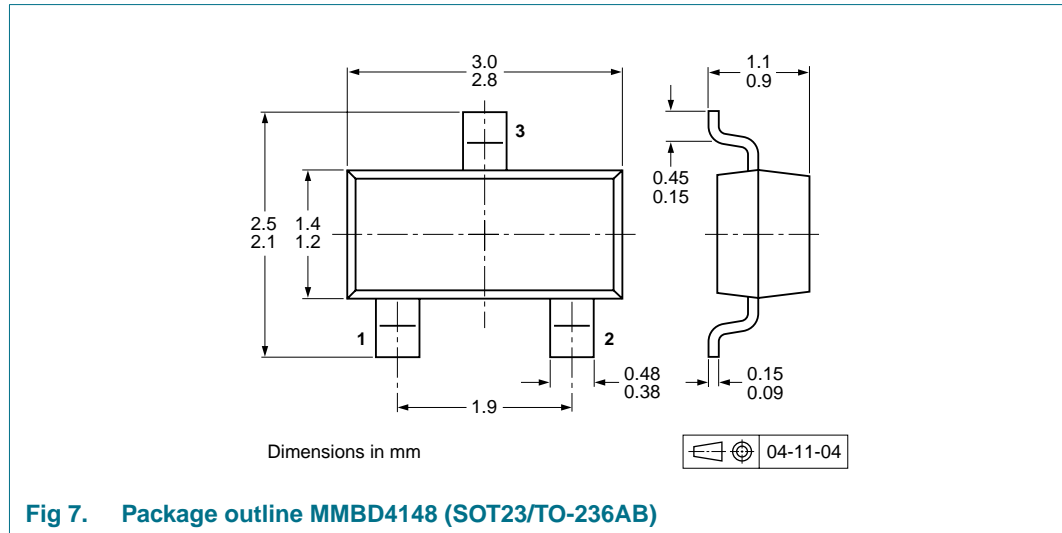


Fig 7. Package outline MMBD4148 (SOT23/TO-236AB)

## 10. Packing information

Please refer to packing information on [www.nexperia.com](http://www.nexperia.com).

11. Soldering

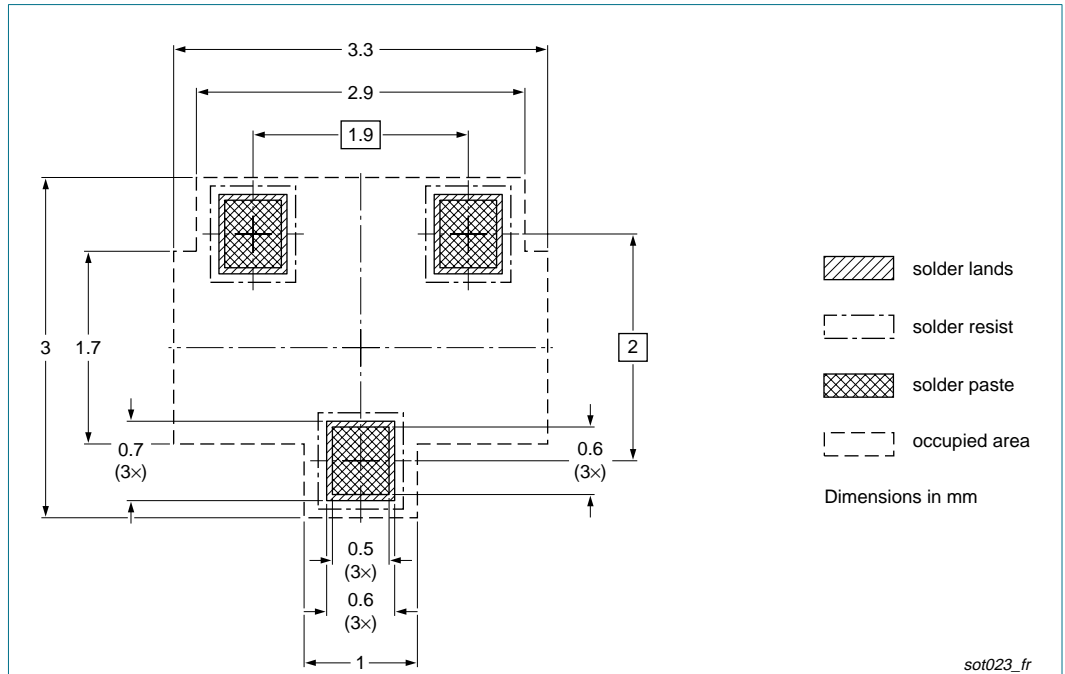


Fig 8. Reflow soldering footprint MMBD4148 (SOT23/TO-236AB)

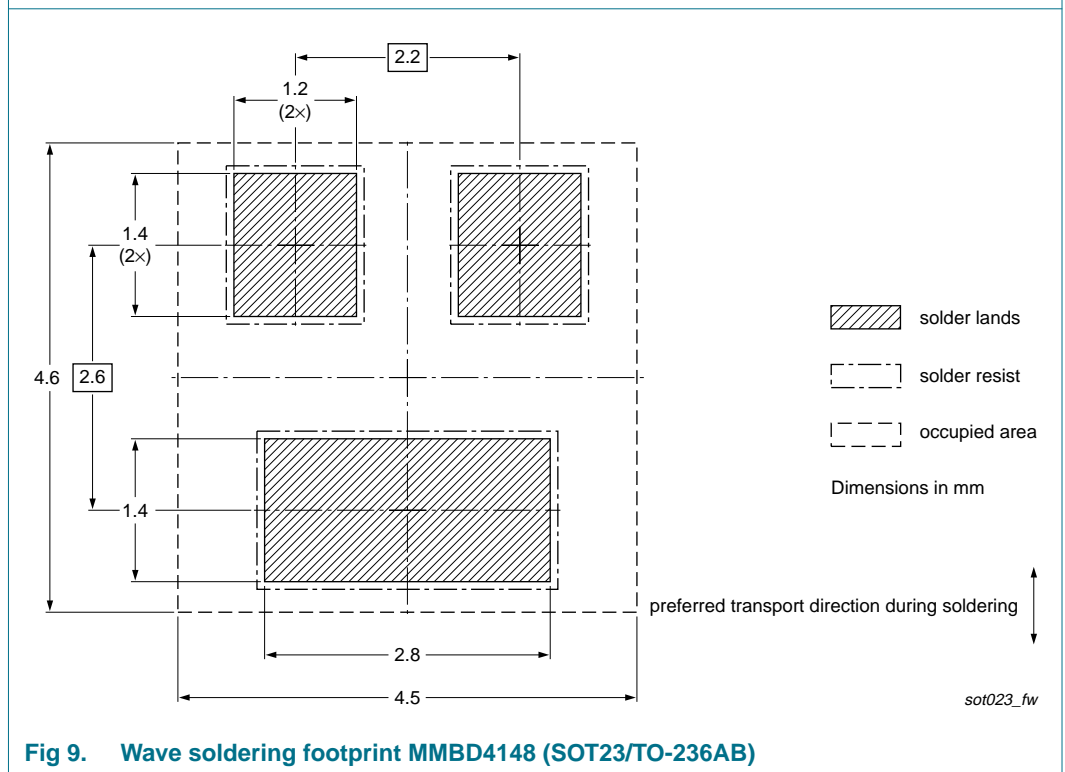


Fig 9. Wave soldering footprint MMBD4148 (SOT23/TO-236AB)

## 12. Revision history

Table 9. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
MMBD4148_1	20090604	Product data sheet	-	-



## 13. Legal information

### 13.1 Data sheet status

Document status <sup>[1][2]</sup>	Product status <sup>[3]</sup>	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".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL <http://www.nexperia.com>.

### 13.2 Definitions

**Draft** — The document is a draft version only. The content is still under internal review and subject to formal approval, which may result in modifications or additions. Nexperia does not give any representations or warranties as to the accuracy or completeness of information included herein and shall have no liability for the consequences of use of such information.

**Short data sheet** — A short data sheet is an extract from a full data sheet with the same product type number(s) and title. A short data sheet is intended for quick reference only and should not be relied upon to contain detailed and full information. For detailed and full information see the relevant full data sheet, which is available on request via the local Nexperia sales office. In case of any inconsistency or conflict with the short data sheet, the full data sheet shall prevail.

### 13.3 Disclaimers

**General** — Information in this document is believed to be accurate and reliable. However, Nexperia does not give any representations or warranties, expressed or implied, as to the accuracy or completeness of such information and shall have no liability for the consequences of use of such information.

**Right to make changes** — Nexperia reserves the right to make changes to information published in this document, including without limitation specifications and product descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof.

**Suitability for use** — Nexperia products are not designed, authorized or warranted to be suitable for use in medical, military, aircraft, space or life support equipment, nor in applications where failure or malfunction of an Nexperia product can reasonably be expected to result in personal injury, death or severe property or environmental

damage. Nexperia accepts no liability for inclusion and/or use of Nexperia products in such equipment or applications and therefore such inclusion and/or use is at the customer's own risk.

**Applications** — Applications that are described herein for any of these products are for illustrative purposes only. Nexperia makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

**Limiting values** — Stress above one or more limiting values (as defined in the Absolute Maximum Ratings System of IEC 60134) may cause permanent damage to the device. Limiting values are stress ratings only and operation of the device at these or any other conditions above those given in the Characteristics sections of this document is not implied. Exposure to limiting values for extended periods may affect device reliability.

**Terms and conditions of sale** — Nexperia products are sold subject to the general terms and conditions of commercial sale, as published at <http://www.nexperia.com/profile/terms>, including those pertaining to warranty, intellectual property rights infringement and limitation of liability, unless explicitly otherwise agreed to in writing by Nexperia. In case of any inconsistency or conflict between information in this document and such terms and conditions, the latter will prevail.

**No offer to sell or license** — Nothing in this document may be interpreted or construed as an offer to sell products that is open for acceptance or the grant, conveyance or implication of any license under any copyrights, patents or other industrial or intellectual property rights.

**Export control** — This document as well as the item(s) described herein may be subject to export control regulations. Export might require a prior authorization from national authorities.

**Quick reference data** — The Quick reference data is an extract of the product data given in the Limiting values and Characteristics sections of this document, and as such is not complete, exhaustive or legally binding.

### 13.4 Trademarks

Notice: All referenced brands, product names, service names and trademarks are the property of their respective owners.

## 14. Contents

<b>1</b>	<b>Product profile</b> . . . . .	<b>1</b>
1.1	General description . . . . .	1
1.2	Features . . . . .	1
1.3	Applications . . . . .	1
1.4	Quick reference data . . . . .	1
<b>2</b>	<b>Pinning information</b> . . . . .	<b>1</b>
<b>3</b>	<b>Ordering information</b> . . . . .	<b>2</b>
<b>4</b>	<b>Marking</b> . . . . .	<b>2</b>
<b>5</b>	<b>Limiting values</b> . . . . .	<b>2</b>
<b>6</b>	<b>Thermal characteristics</b> . . . . .	<b>3</b>
<b>7</b>	<b>Characteristics</b> . . . . .	<b>3</b>
<b>8</b>	<b>Test information</b> . . . . .	<b>5</b>
<b>9</b>	<b>Package outline</b> . . . . .	<b>6</b>
<b>10</b>	<b>Packing information</b> . . . . .	<b>6</b>
<b>11</b>	<b>Soldering</b> . . . . .	<b>7</b>
<b>12</b>	<b>Revision history</b> . . . . .	<b>8</b>
<b>13</b>	<b>Legal information</b> . . . . .	<b>9</b>
13.1	Data sheet status . . . . .	9
13.2	Definitions . . . . .	9
13.3	Disclaimers . . . . .	9
13.4	Trademarks . . . . .	9
<b>14</b>	<b>Contents</b> . . . . .	<b>10</b>

Please be aware that important notices concerning this document and the product(s) described herein, have been included in section 'Legal information'.

© Nexperia B.V. 2009.

All rights reserved.

For more information, please visit: <http://www.nexperia.com>  
For sales office addresses, please send an email to:  
[salesaddresses@nexperia.com](mailto:salesaddresses@nexperia.com)

Date of release: 4 June 2009  
Document identifier: MMBD4148