

# HEF4555B-Q100

## 1-of-4 decoder/demultiplexer

Rev. 2 — 15 October 2018

Product data sheet

## 1. General description

The HEF4555B-Q100 contains two 1-of-4 decoders/demultiplexers. Each has two address inputs (nA0 and nA1, an active LOW enable input (nE) and four mutually exclusive outputs which are active HIGH (nY0 to nY3). When used as a decoder, nE when HIGH, forces nY0 to nY3 LOW. When used as a demultiplexer, the appropriate output is selected by the information on nA0 and nA1 with nE as data input. All unselected outputs are LOW.

It operates over a recommended  $V_{DD}$  power supply range of 3 V to 15 V referenced to  $V_{SS}$  (usually ground). Unused inputs must be connected to  $V_{DD}$ ,  $V_{SS}$ , or another input.

This product has been qualified to the Automotive Electronics Council (AEC) standard Q100 (Grade 3) and is suitable for use in automotive applications.

## 2. Features and benefits

- Automotive product qualification in accordance with AEC-Q100 (Grade 3)
  - Specified from -40 °C to +85 °C
- Fully static operation
- 5 V, 10 V, and 15 V parametric ratings
- Standardized symmetrical output characteristics
- ESD protection:
  - MIL-STD-883, method 3015 exceeds 2000 V
  - HBM JESD22-A114F exceeds 2000 V
  - MM JESD22-A115-A exceeds 200 V (C = 200 pF, R = 0 Ω)
- Complies with JEDEC standard JESD 13-B

## 3. Applications

- Code conversion
- Address decoding
- Demultiplexing: when using the enable input as data input

## 4. Ordering information

**Table 1. Ordering information**

All types operate from -40 °C to +85 °C.

Type number	Package		
	Name	Description	Version
HEF4555BT-Q100	SO16	plastic small outline package; 16 leads; body width 3.9 mm	SOT109-1

### 5. Functional diagram

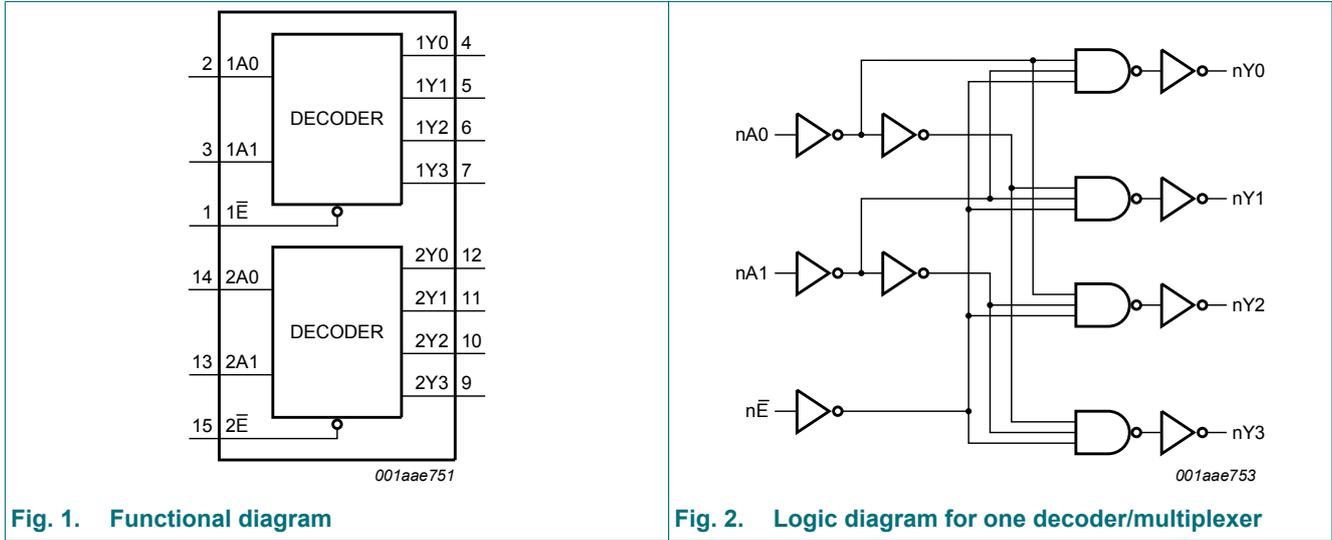


Fig. 1. Functional diagram

Fig. 2. Logic diagram for one decoder/multiplexer

### 6. Pinning information

#### 6.1. Pinning

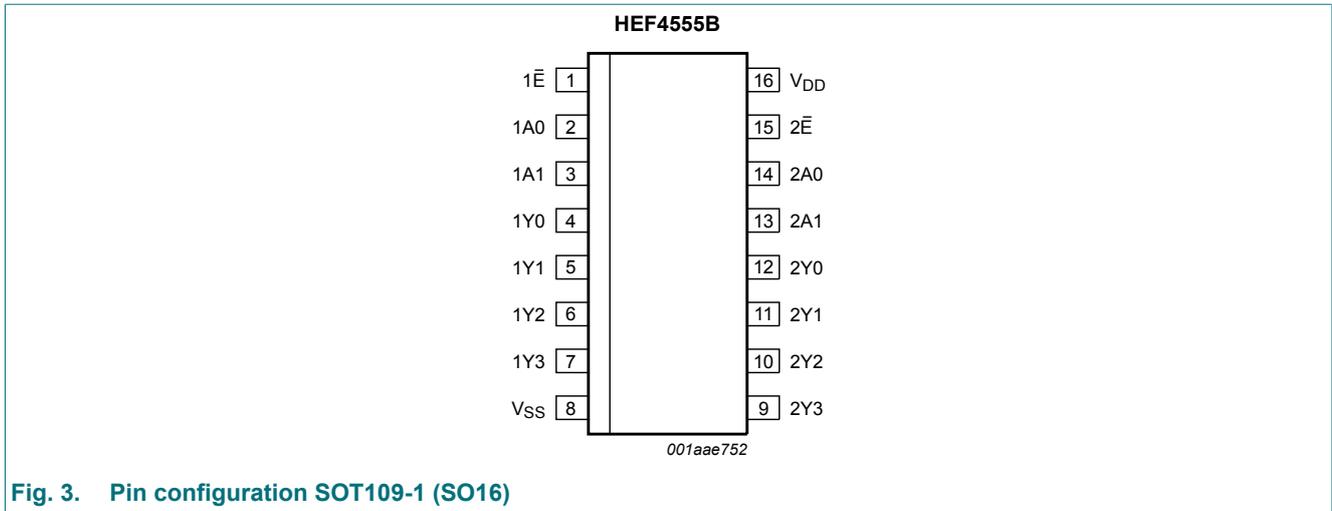


Fig. 3. Pin configuration SOT109-1 (SO16)

#### 6.2. Pin description

Table 2. Pin description

Symbol	Pin	Description
1A0, 1A1, 2A0, 2A1	2, 3, 14, 13	address input
1E, 2E	1, 15	enable input (active LOW)
1Y0, 1Y1, 1Y2, 1Y3, 2Y0, 2Y1, 2Y2, 2Y3	4, 5, 6, 7, 12, 11, 10, 9	output (active HIGH)
V <sub>DD</sub>	16	supply voltage
V <sub>SS</sub>	8	ground (GND)

## 7. Functional description

**Table 3. Function selection**

H = HIGH voltage level; L = LOW voltage level; X = don't care.

Inputs			Outputs			
nE	nA0	nA1	nY0	nY1	nY2	nY3
L	L	L	H	L	L	L
L	H	L	L	H	L	L
L	L	H	L	L	H	L
L	H	H	L	L	L	H
H	X	X	L	L	L	L

## 8. Limiting values

**Table 4. Limiting values**

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

Symbol	Parameter	Conditions	Min	Max	Unit
V <sub>DD</sub>	supply voltage		-0.5	+18	V
I <sub>IK</sub>	input clamping current	V <sub>I</sub> < -0.5 V or V <sub>I</sub> > V <sub>DD</sub> + 0.5 V	-	±10	mA
V <sub>I</sub>	input voltage		-0.5	V <sub>DD</sub> + 0.5	V
I <sub>OK</sub>	output clamping current	V <sub>O</sub> < -0.5 V or V <sub>O</sub> > V <sub>DD</sub> + 0.5 V	-	±10	mA
I <sub>I/O</sub>	input/output current		-	±10	mA
I <sub>DD</sub>	supply current		-	50	mA
T <sub>stg</sub>	storage temperature		-65	+150	°C
T <sub>amb</sub>	ambient temperature		-40	+85	°C
P <sub>tot</sub>	total power dissipation	SO16 package [1]	-	500	mW
P	power dissipation	per output	-	100	mW

[1] For SO16 package: P<sub>tot</sub> derates linearly with 8 mW/K above 70 °C.

## 9. Recommended operating conditions

**Table 5. Recommended operating conditions**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V <sub>DD</sub>	supply voltage		3	-	15	V
V <sub>I</sub>	input voltage		0	-	V <sub>DD</sub>	V
T <sub>amb</sub>	ambient temperature	in free air	-40	-	+85	°C
Δt/ΔV	input transition rise and fall rate	V <sub>DD</sub> = 5 V	-	-	3.75	μs/V
		V <sub>DD</sub> = 10 V	-	-	0.5	μs/V
		V <sub>DD</sub> = 15 V	-	-	0.08	μs/V

## 10. Static characteristics

**Table 6. Static characteristics**

$V_{SS} = 0\text{ V}$ ;  $V_I = V_{SS}$  or  $V_{DD}$  unless otherwise specified.

Symbol	Parameter	Conditions	V <sub>DD</sub>	T <sub>amb</sub> = -40 °C		T <sub>amb</sub> = 25 °C		T <sub>amb</sub> = 85 °C		Unit
				Min	Max	Min	Max	Min	Max	
V <sub>IH</sub>	HIGH-level input voltage	I <sub>O</sub>   < 1 μA	5 V	3.5	-	3.5	-	3.5	-	V
			10 V	7.0	-	7.0	-	7.0	-	V
			15 V	11.0	-	11.0	-	11.0	-	V
V <sub>IL</sub>	LOW-level input voltage	I <sub>O</sub>   < 1 μA	5 V	-	1.5	-	1.5	-	1.5	V
			10 V	-	3.0	-	3.0	-	3.0	V
			15 V	-	4.0	-	4.0	-	4.0	V
V <sub>OH</sub>	HIGH-level output voltage	I <sub>O</sub>   < 1 μA; V <sub>I</sub> = V <sub>SS</sub> or V <sub>DD</sub>	5 V	4.95	-	4.95	-	4.95	-	V
			10 V	9.95	-	9.95	-	9.95	-	V
			15 V	14.95	-	14.95	-	14.95	-	V
V <sub>OL</sub>	LOW-level output voltage	I <sub>O</sub>   < 1 μA; V <sub>I</sub> = V <sub>SS</sub> or V <sub>DD</sub>	5 V	-	0.05	-	0.05	-	0.05	V
			10 V	-	0.05	-	0.05	-	0.05	V
			15 V	-	0.05	-	0.05	-	0.05	V
I <sub>OH</sub>	HIGH-level output current	V <sub>O</sub> = 2.5 V	5 V	-	-1.7	-	-1.4	-	-1.1	mA
		V <sub>O</sub> = 4.6 V	5 V	-	-0.52	-	-0.44	-	-0.36	mA
		V <sub>O</sub> = 9.5 V	10 V	-	-1.3	-	-1.1	-	-0.9	mA
		V <sub>O</sub> = 13.5 V	15 V	-	-3.6	-	-3.0	-	-2.4	mA
I <sub>OL</sub>	LOW-level output current	V <sub>O</sub> = 0.4 V	5 V	0.52	-	0.44	-	0.36	-	mA
		V <sub>O</sub> = 0.5 V	10 V	1.3	-	1.1	-	0.9	-	mA
		V <sub>O</sub> = 1.5 V	15 V	3.6	-	3.0	-	2.4	-	mA
I <sub>I</sub>	input leakage current	V <sub>DD</sub> = 15 V	15 V	-	±0.3	-	±0.3	-	±1.0	μA
I <sub>DD</sub>	supply current	I <sub>O</sub> = 0 A; V <sub>I</sub> = V <sub>SS</sub> or V <sub>DD</sub>	5 V	-	20	-	20	-	150	μA
			10 V	-	40	-	40	-	300	μA
			15 V	-	80	-	80	-	600	μA
C <sub>I</sub>	input capacitance		-	-	-	7.5	-	-	pF	

## 11. Dynamic characteristics

**Table 7. Dynamic characteristics**

$V_{SS} = 0\text{ V}$ ;  $T_{amb} = 25\text{ °C}$ ; for test circuit see Fig. 5; unless otherwise specified.

Symbol	Parameter	Conditions	$V_{DD}$	Extrapolation formula	Min	Typ	Max	Unit
$t_{PHL}$	HIGH to LOW propagation delay	nAn to nYn; see Fig. 4	5 V [1]	$88\text{ ns} + (0.55\text{ ns/pF})C_L$	-	115	230	ns
			10 V	$34\text{ ns} + (0.23\text{ ns/pF})C_L$	-	45	90	ns
			15 V	$22\text{ ns} + (0.16\text{ ns/pF})C_L$	-	30	65	ns
		n $\bar{E}$ to nYn; see Fig. 4	5 V [1]	$98\text{ ns} + (0.55\text{ ns/pF})C_L$	-	125	250	ns
			10 V	$39\text{ ns} + (0.23\text{ ns/pF})C_L$	-	50	95	ns
			15 V	$22\text{ ns} + (0.16\text{ ns/pF})C_L$	-	30	65	ns
$t_{PLH}$	LOW to HIGH propagation delay	nAn to nYn; see Fig. 4	5 V [1]	$113\text{ ns} + (0.55\text{ ns/pF})C_L$	-	140	280	ns
			10 V	$44\text{ ns} + (0.23\text{ ns/pF})C_L$	-	55	105	ns
			15 V	$32\text{ ns} + (0.16\text{ ns/pF})C_L$	-	40	75	ns
		n $\bar{E}$ to nYn; see Fig. 4	5 V [1]	$123\text{ ns} + (0.55\text{ ns/pF})C_L$	-	150	295	ns
			10 V	$44\text{ ns} + (0.23\text{ ns/pF})C_L$	-	55	110	ns
			15 V	$32\text{ ns} + (0.16\text{ ns/pF})C_L$	-	40	75	ns
$t_t$	transition time	nYn; see Fig. 4	5 V [1][2]	$10\text{ ns} + (1.00\text{ ns/pF})C_L$	-	60	120	ns
			10 V	$9\text{ ns} + (0.42\text{ ns/pF})C_L$	-	30	60	ns
			15 V	$6\text{ ns} + (0.28\text{ ns/pF})C_L$	-	20	40	ns

[1] The typical values of the propagation delay and transition times are calculated from the extrapolation formulas shown ( $C_L$  in pF).

[2] Transition time  $t_t$  is the same as the HIGH to LOW and LOW to HIGH transition times  $t_{THL}$  and  $t_{TLH}$ .

**Table 8. Dynamic power dissipation  $P_D$**

$P_D$  can be calculated from the formulas shown.  $V_{SS} = 0\text{ V}$ ;  $t_r = t_f \leq 20\text{ ns}$ ;  $T_{amb} = 25\text{ °C}$ .

Symbol	Parameter	$V_{DD}$	Typical formula for $P_D$ ( $\mu\text{W}$ )	Where:
$P_D$	dynamic power dissipation	5 V	$P_D = 4500 \times f_i + \Sigma(f_o \times C_L) \times V_{DD}^2$	$f_i$ = input frequency in MHz, $f_o$ = output frequency in MHz, $C_L$ = output load capacitance in pF, $V_{DD}$ = supply voltage in V, $\Sigma(f_o \times C_L)$ = sum of the outputs.
		10 V	$P_D = 18800 \times f_i + \Sigma(f_o \times C_L) \times V_{DD}^2$	
		15 V	$P_D = 45700 \times f_i + \Sigma(f_o \times C_L) \times V_{DD}^2$	

11.1. Waveforms and test circuit

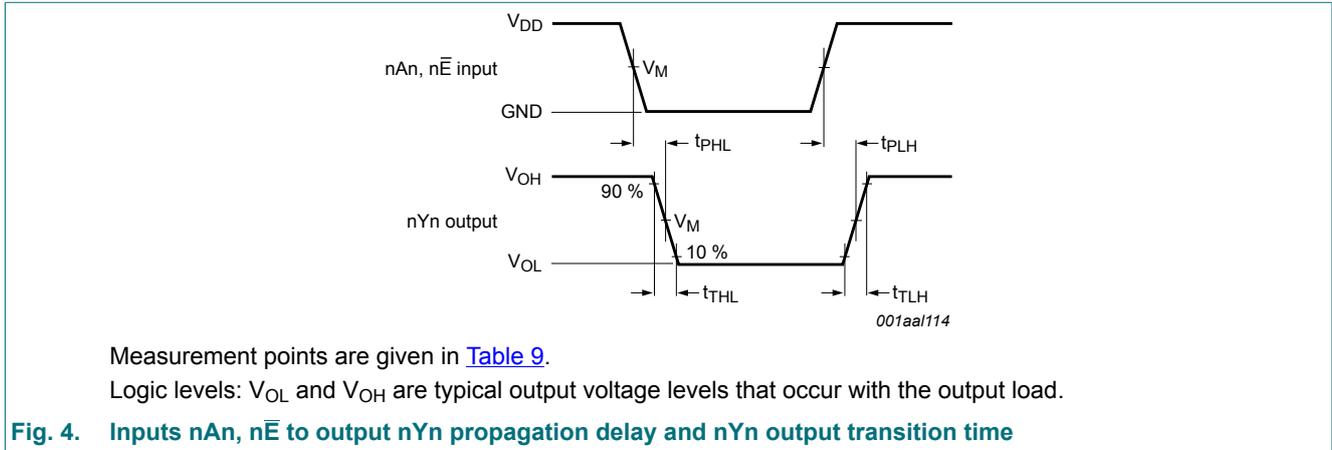


Table 9. Measurement points

Supply voltage	Input	Output
$V_{DD}$	$V_M$	$V_M$
5 V to 15 V	$0.5V_{DD}$	$0.5V_{DD}$

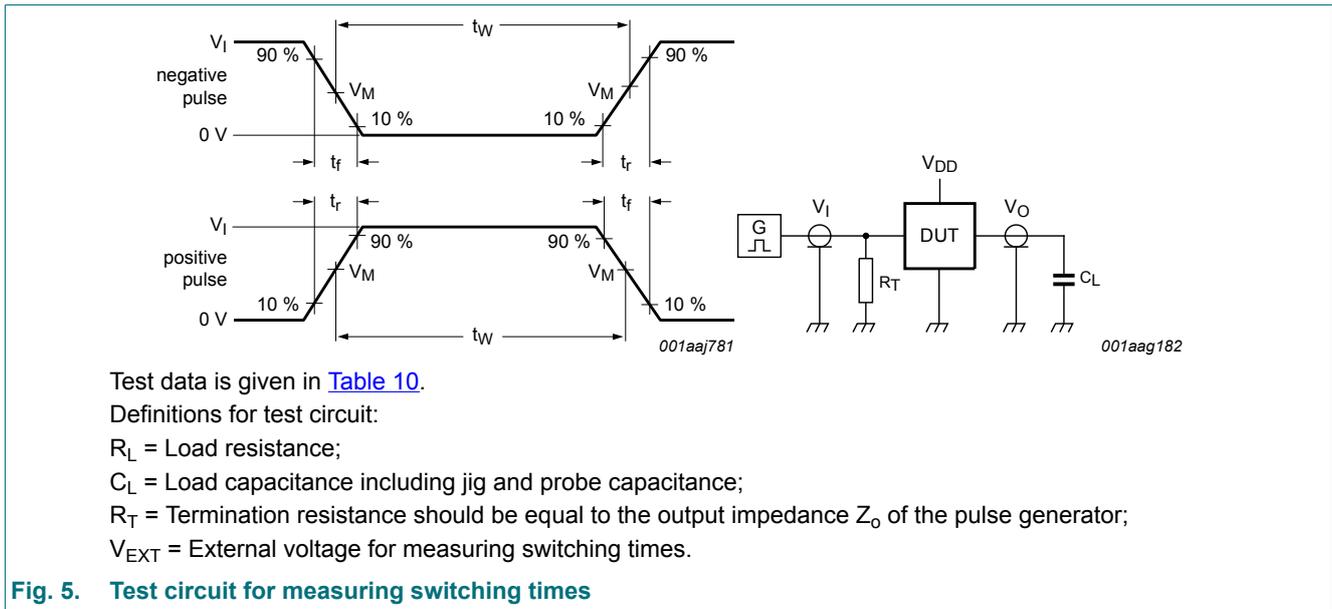


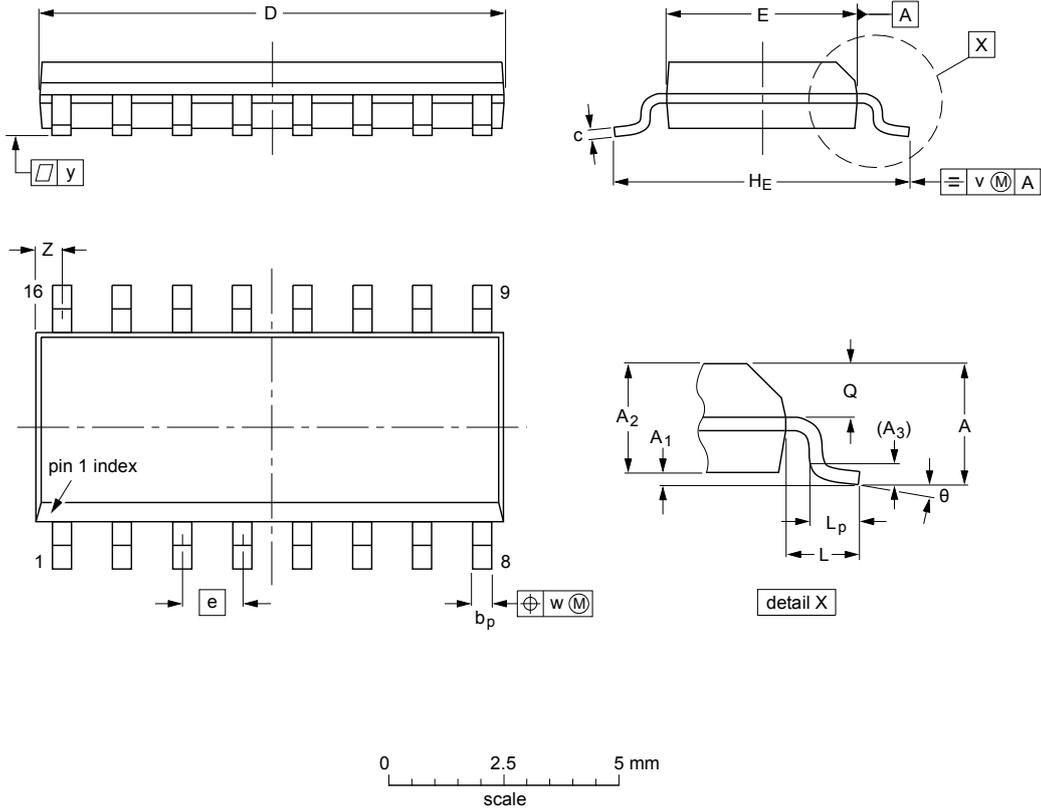
Table 10. Test data

Supply voltage	Input	Load
$V_{DD}$	$V_I$	$C_L$
5 V to 15 V	$V_{DD}$	$50 \text{ pF}$

## 12. Package outline

SO16: plastic small outline package; 16 leads; body width 3.9 mm

SOT109-1



**DIMENSIONS** (inch dimensions are derived from the original mm dimensions)

UNIT	A max.	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	b <sub>p</sub>	c	D <sup>(1)</sup>	E <sup>(1)</sup>	e	H <sub>E</sub>	L	L <sub>p</sub>	Q	v	w	y	Z <sup>(1)</sup>	θ
mm	1.75	0.25 0.10	1.45 1.25	0.25	0.49 0.36	0.25 0.19	10.0 9.8	4.0 3.8	1.27	6.2 5.8	1.05	1.0 0.4	0.7 0.6	0.25	0.25	0.1	0.7 0.3	8° 0°
inches	0.069	0.010 0.004	0.057 0.049	0.01	0.019 0.014	0.0100 0.0075	0.39 0.38	0.16 0.15	0.05	0.244 0.228	0.041	0.039 0.016	0.028 0.020	0.01	0.01	0.004	0.028 0.012	

**Note**

1. Plastic or metal protrusions of 0.15 mm (0.006 inch) maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT109-1	076E07	MS-012				99-12-27 03-02-19

Fig. 6. Package outline SOT109-1 (SO16)

## 13. Abbreviations

Table 11. Abbreviations

Acronym	Description
DUT	Device Under Test
ESD	ElectroStatic Discharge
HBM	Human Body Model
MIL	Military
MM	Machine Model

## 14. Revision history

Table 12. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
HEF4555B_Q100 v.2	20181015	Product data sheet	-	HEF4555B_Q100 v.1
Modifications:	<ul style="list-style-type: none"> <li>The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia.</li> <li>Legal texts have been adapted to the new company name where appropriate.</li> </ul>			
HEF4555B_Q100 v.1	20131021	Product data sheet	-	-

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### 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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