TDA1308

Class-AB stereo headphone driver

Rev. 5 — 14 March 2011 Product data sheet

1. General description

The TDA1308 is an integrated class-AB stereo headphone driver contained in an SO8 or a TSSOP8 plastic package. The device is fabricated in a 1 μm Complementary Metal Oxide Semiconductor (CMOS) process and has been primarily developed for portable digital audio applications.

2. Features and benefits

- Wide temperature range
- No switch ON/OFF clicks
- Excellent power supply ripple rejection
- Low power consumption
- Short-circuit resistant
- High performance
  - High signal-to-noise ratio
  - High slew rate
  - Low distortion
- Large output voltage swing

3. Quick reference data

Table 1. Quick reference data

V_{DD} = 5 V; V_{SS} = 0 V; T_{amb} = 25 °C; f_i = 1 kHz; R_L = 32 Ω; unless otherwise specified.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{DD}	supply voltage	single supply		3.0	5.0	7.0	V
		dual supply		1.5	2.5	3.5	V
V_{SS}	negative supply voltage	dual supply		–1.5	–2.5	–3.5	V
I_{DD}	supply current	no load		-	3	5	mA
P_{tot}	total power dissipation	no load		-	15	25	mW
P_o	output power	maximum; THD+N < 0.1 %	[1]	-	40	80	mW
THD+N	total harmonic distortion-plus-noise		[1]	-	0.03	0.06	%
			[1]	-	–70	–65	dB
		R_L = 5 kΩ		-	–101	-	dB
S/N	signal-to-noise ratio			100	110	-	dB

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

V_{DD} = 5 V; V_{SS} = 0 V; T_{amb} = 25 °C; f_i = 1 kHz; R_L = 32 Ω; unless otherwise specified.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
α_{cs}	channel separation			-	70	-	dB
		R_L = 5 kΩ	[1]	-	105	-	dB
PSRR	power supply ripple rejection	f_i = 100 Hz; $V_{ripple(p-p)}$ = 100 mV		-	90	-	dB
T_{amb}	ambient temperature			–40	-	+85	°C

[1] V_{DD} = 5 V; $V_{o(p-p)}$ = 3.5 V (at 0 dB).

4. Ordering information

Table 2. Ordering information

Type number	Package		
	Name	Description	Version
TDA1308T	SO8	plastic small outline package; 8 leads; body width 3.9 mm	SOT96-1
TDA1308TT	TSSOP8	plastic thin shrink small outline package; 8 leads; body width 3 mm	SOT505-1

5. Block diagram

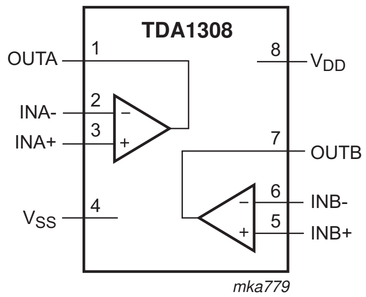


Fig 1. Block diagram

6. Pinning information

6.1 Pinning

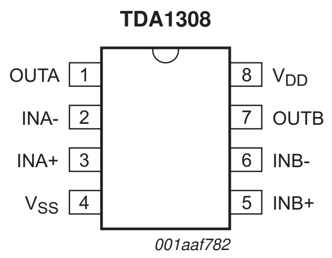


Fig 2. Pin configuration

6.2 Pin description

Table 3. Pin description

Symbol	Pin	Description
OUTA	1	output A
INA–	2	inverting input A
INA+	3	non-inverting input A
V_{SS}	4	negative supply
INB+	5	non-inverting input B
INB–	6	inverting input B
OUTB	7	output B
V_{DD}	8	positive supply

7. Internal circuitry

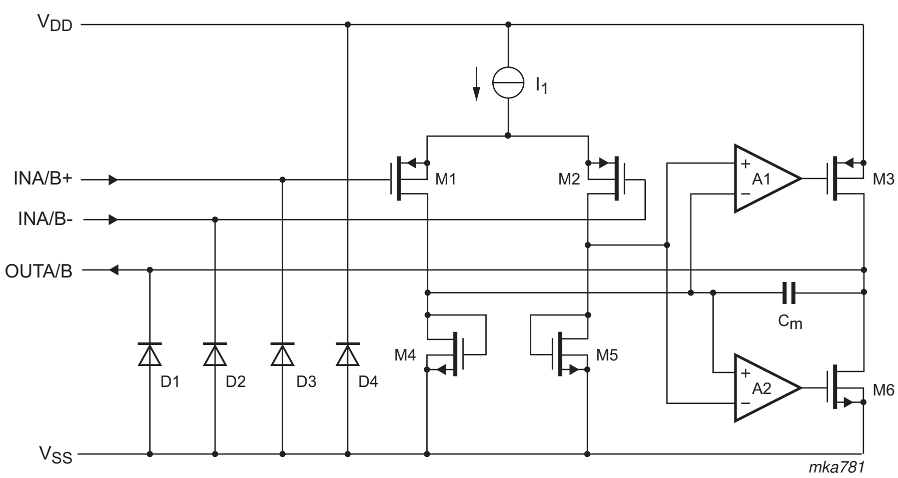


Fig 3. Equivalent schematic diagram

8. Limiting values

Table 4. Limiting values

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

Symbol	Parameter	Conditions		Min	Max	Unit
V_{DD}	supply voltage			0	8.0	V
t_{sc}	short-circuit duration time	output; T_{amb} = 25 °C; P_{tot} = 1 W		20	-	s
T_{stg}	storage temperature			−65	+150	°C
T_{amb}	ambient temperature			−40	+85	°C
V_{ESD}	electrostatic discharge voltage	HBM	[1]	−2	+2	kV
		MM	[2]	−200	+200	V

[1] Human body model (HBM): C = 100 pF; R = 1500 Ω; 3 pulses positive plus 3 pulses negative.

[2] Machine model (MM): C = 200 pF; L = 0.5 mH; R = 0 Ω; 3 pulses positive plus 3 pulses negative.

9. Thermal characteristics

Table 5. Thermal characteristics

Symbol	Parameter	Conditions	Typ	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	SO8	210	K/W
		TSSOP8	220	K/W

10. Characteristics

Table 6. Characteristics

V_{DD} = 5 V; V_{SS} = 0 V; T_{amb} = 25 °C; f_i = 1 kHz; R_L = 32 Ω; unless otherwise specified.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Supplies							
V_{DD}	supply voltage	single supply		3.0	5.0	7.0	V
		dual supply		1.5	2.5	3.5	V
V_{SS}	negative supply voltage	dual supply		−1.5	−2.5	−3.5	V
I_{DD}	supply current	no load		-	3	5	mA
P_{tot}	total power dissipation	no load		-	15	25	mW
Static characteristics							
$\|V_{I(offset)}\|$	input offset voltage			-	10	-	mV
I_{IB}	input bias current			-	10	-	pA
V_{cm}	common-mode voltage			0	-	3.5	pA
$G_{v(ol)}$	open-loop voltage gain	R_L = 5 kΩ		-	70	-	dB
I_O	output current	maximum		-	60	-	mA
R_o	output resistance	THD+N < 0.1 %		-	0.25	-	Ω
ΔV_O	output voltage variation		[1]	0.75	-	4.25	V
		R_L = 16 Ω	[1]	1.5	-	3.5	V
		R_L = 5 kΩ	[1]	0.1	-	4.9	V
α_{cs}	channel separation			-	70	-	dB
		R_L = 5 kΩ	[1]	-	105	-	dB
PSRR	power supply ripple rejection	f_i = 100 Hz; $V_{ripple(p-p)}$ = 100 mV		-	90	-	dB
C_L	load capacitance			-	-	200	pF
Dynamic characteristics							
THD+N	total harmonic distortion-plus-noise		[2]	-	0.03	0.06	%
			[2]	-	−70	−65	dB
		R_L = 5 kΩ	[2]	-	−101	-	dB
		R_L = 5 kΩ	[2]	-	0.0009	-	%
S/N	signal-to-noise ratio			100	110	-	dB
f_1	unity gain frequency	open-loop; R_L = 5 kΩ		-	5.5	-	MHz
P_o	output power	maximum; THD+N < 0.1 %		-	40	80	mW
C_i	input capacitance			-	3	-	pF
SR	slew rate	unity gain inverting		-	5	-	V/μs
B	bandwidth	unity gain inverting		-	20	-	kHz

[1] Values are proportional to V_{DD}; THD+N < 0.1 %.

[2] V_{DD} = 5 V; $V_{o(p-p)}$ = 3.5 V (at 0 dB).

11. Application information

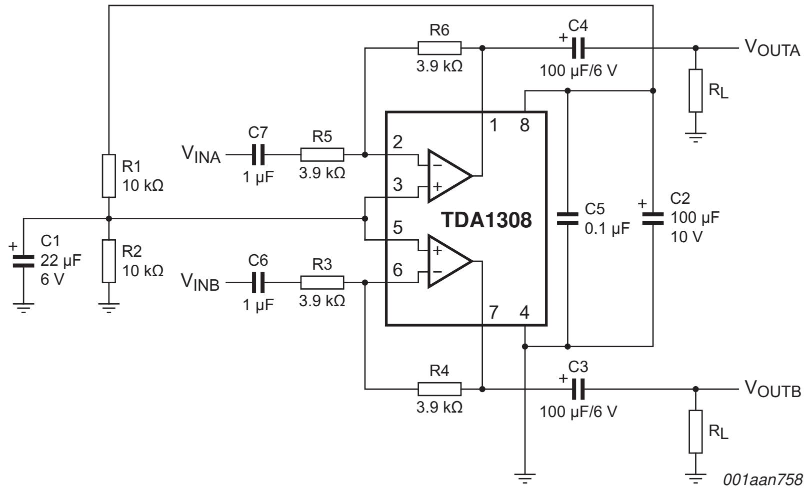


Fig 4. Typical application

12. Test information

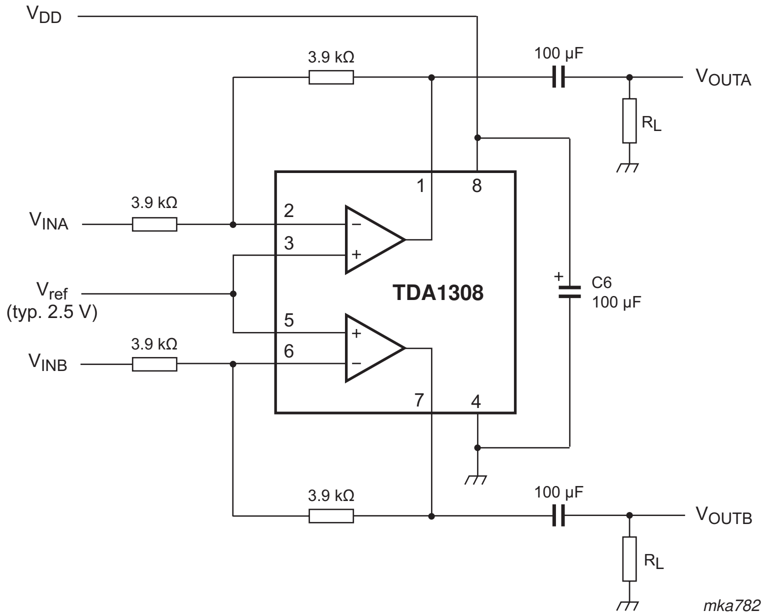


Fig 5. Measurement circuit for inverting application

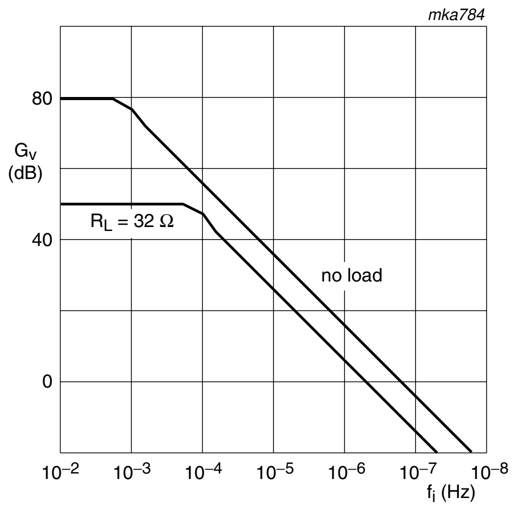


Fig 6. Open-loop gain as a function of input frequency

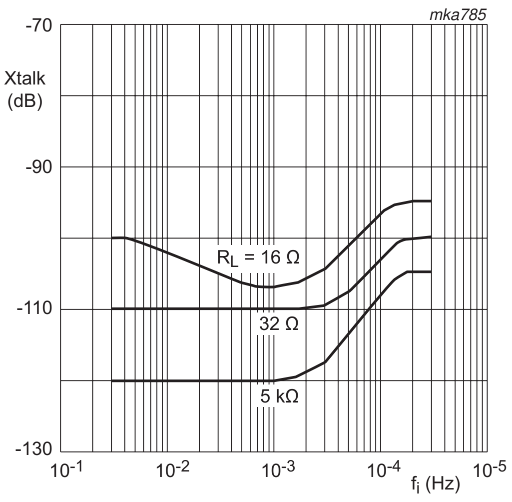


Fig 7. Crosstalk as a function of input frequency

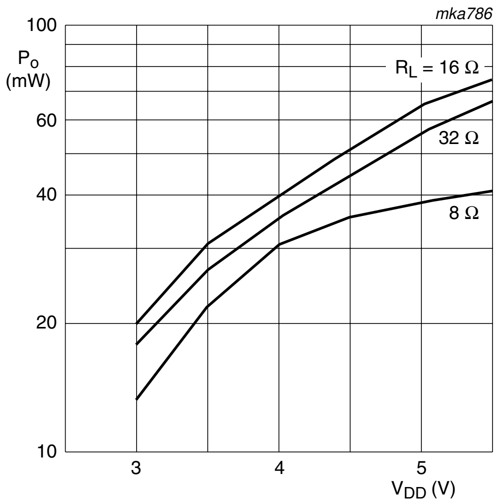


Fig 8. Output power as a function of supply voltage

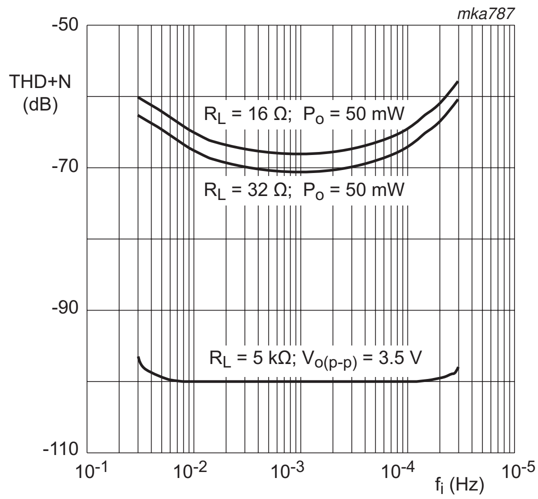


Fig 9. Total harmonic distortion plus noise ratio as a function of input frequency

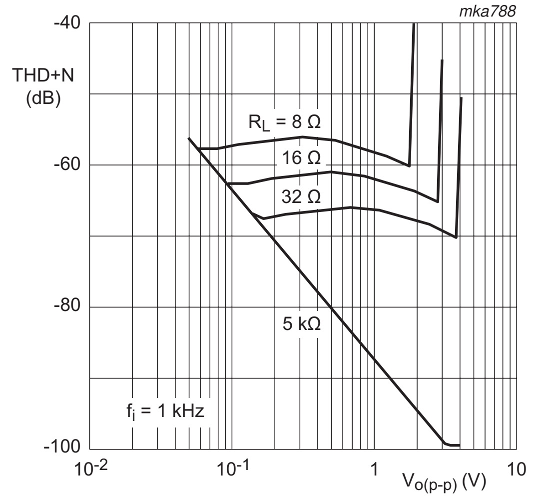
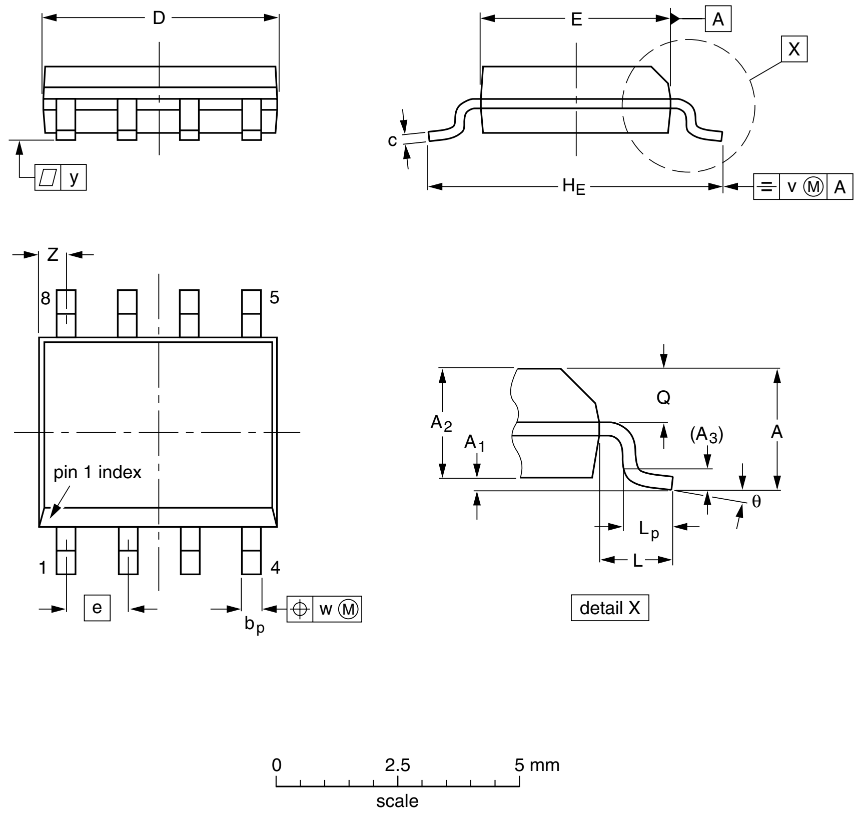


Fig 10. Total harmonic distortion plus noise ratio as a function of output voltage level

13. Package outline

SO8: plastic small outline package; 8 leads; body width 3.9 mm **SOT96-1**



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

UNIT	A max.	A_1	A_2	A_3	b_p	c	D(1)	E(2)	e	H_E	L	L_p	Q	v	w	y	Z(1)	θ
mm	1.75	0.25 0.10	1.45 1.25	0.25	0.49 0.36	0.25 0.19	5.0 4.8	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	0.20 0.19	0.16 0.15	0.05	0.244 0.228	0.041	0.039 0.016	0.028 0.024	0.01	0.01	0.004	0.028 0.012	

Notes

1. Plastic or metal protrusions of 0.15 mm (0.006 inch) maximum per side are not included.
2. Plastic or metal protrusions of 0.25 mm (0.01 inch) maximum per side are not included.

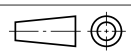
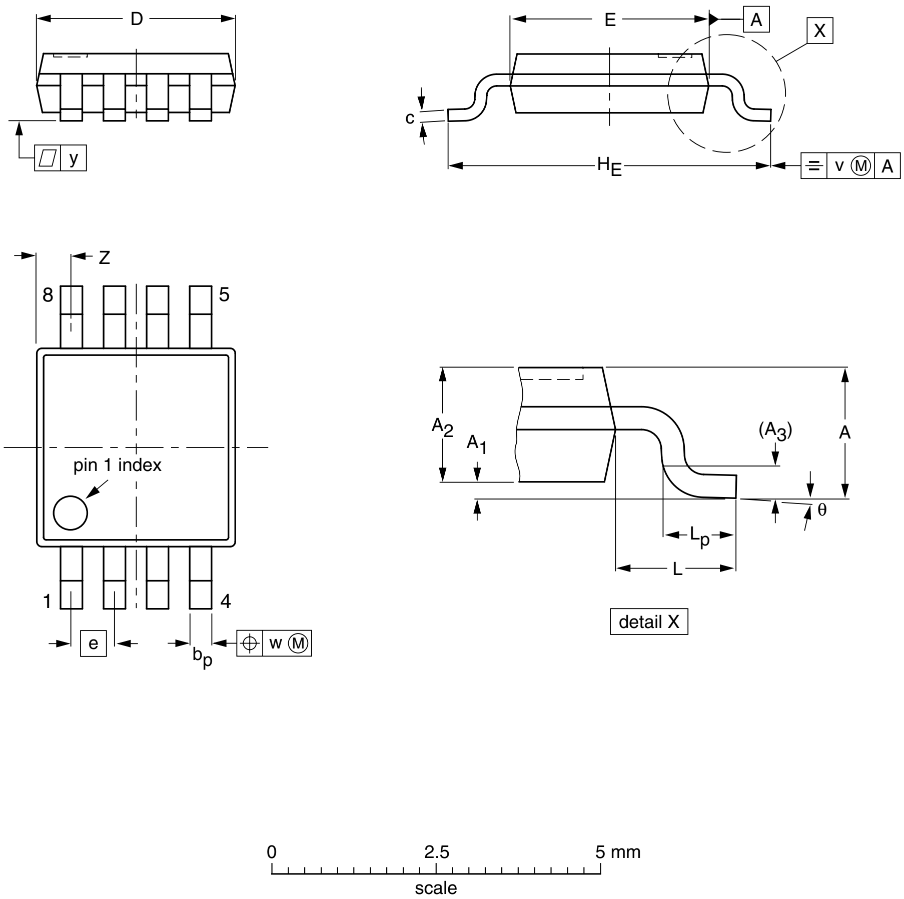
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT96-1	076E03	MS-012				~~99-12-27~~ 03-02-18

Fig 11. Package outline SOT96-1 (SO8)

TSSOP8: plastic thin shrink small outline package; 8 leads; body width 3 mm **SOT505-1**



DIMENSIONS (mm are the original dimensions)

UNIT	A max.	A_1	A_2	A_3	b_p	c	$D^{(1)}$	$E^{(2)}$	e	H_E	L	L_p	v	w	y	$Z^{(1)}$	θ
mm	1.1	0.15 0.05	0.95 0.80	0.25	0.45 0.25	0.28 0.15	3.1 2.9	3.1 2.9	0.65	5.1 4.7	0.94	0.7 0.4	0.1	0.1	0.1	0.70 0.35	6° 0°

Notes

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.
2. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT505-1						~~99-04-09~~ 03-02-18

Fig 12. Package outline SOT505-1 (TSSOP8)

14. Soldering of SMD packages

This text provides a very brief insight into a complex technology. A more in-depth account of soldering ICs can be found in Application Note *AN10365 "Surface mount reflow soldering description"*.

14.1 Introduction to soldering

Soldering is one of the most common methods through which packages are attached to Printed Circuit Boards (PCBs), to form electrical circuits. The soldered joint provides both the mechanical and the electrical connection. There is no single soldering method that is ideal for all IC packages. Wave soldering is often preferred when through-hole and Surface Mount Devices (SMDs) are mixed on one printed wiring board; however, it is not suitable for fine pitch SMDs. Reflow soldering is ideal for the small pitches and high densities that come with increased miniaturization.

14.2 Wave and reflow soldering

Wave soldering is a joining technology in which the joints are made by solder coming from a standing wave of liquid solder. The wave soldering process is suitable for the following:

- Through-hole components
- Leaded or leadless SMDs, which are glued to the surface of the printed circuit board

Not all SMDs can be wave soldered. Packages with solder balls, and some leadless packages which have solder lands underneath the body, cannot be wave soldered. Also, leaded SMDs with leads having a pitch smaller than ~0.6 mm cannot be wave soldered, due to an increased probability of bridging.

The reflow soldering process involves applying solder paste to a board, followed by component placement and exposure to a temperature profile. Leaded packages, packages with solder balls, and leadless packages are all reflow solderable.

Key characteristics in both wave and reflow soldering are:

- Board specifications, including the board finish, solder masks and vias
- Package footprints, including solder thieves and orientation
- The moisture sensitivity level of the packages
- Package placement
- Inspection and repair
- Lead-free soldering versus SnPb soldering

14.3 Wave soldering

Key characteristics in wave soldering are:

- Process issues, such as application of adhesive and flux, clinching of leads, board transport, the solder wave parameters, and the time during which components are exposed to the wave
- Solder bath specifications, including temperature and impurities

14.4 Reflow soldering

Key characteristics in reflow soldering are:

- Lead-free versus SnPb soldering; note that a lead-free reflow process usually leads to higher minimum peak temperatures (see Figure 13) than a SnPb process, thus reducing the process window
- Solder paste printing issues including smearing, release, and adjusting the process window for a mix of large and small components on one board
- Reflow temperature profile; this profile includes preheat, reflow (in which the board is heated to the peak temperature) and cooling down. It is imperative that the peak temperature is high enough for the solder to make reliable solder joints (a solder paste characteristic). In addition, the peak temperature must be low enough that the packages and/or boards are not damaged. The peak temperature of the package depends on package thickness and volume and is classified in accordance with Table 7 and 8

Table 7. SnPb eutectic process (from J-STD-020C)

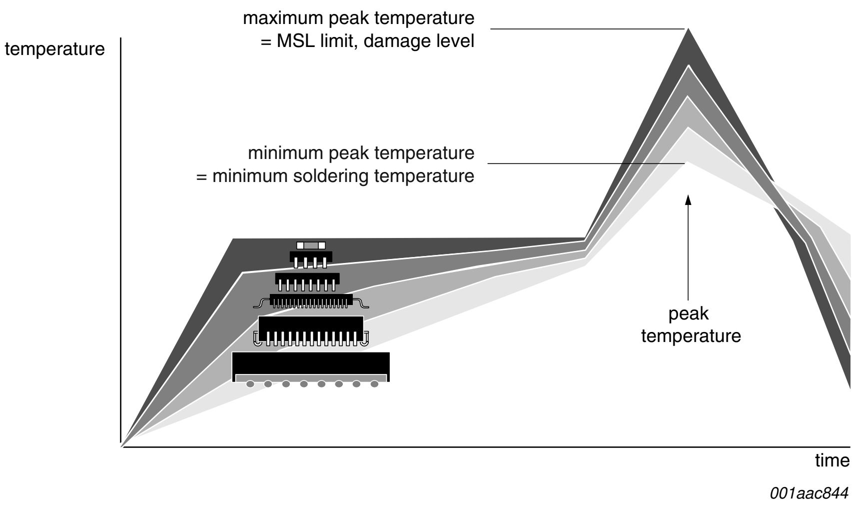
Package thickness (mm)	Package reflow temperature (°C)	
	Volume (mm^3)	
	< 350	≥ 350
< 2.5	235	220
≥ 2.5	220	220

Table 8. Lead-free process (from J-STD-020C)

Package thickness (mm)	Package reflow temperature (°C)		
	Volume (mm^3)		
	< 350	350 to 2000	> 2000
< 1.6	260	260	260
1.6 to 2.5	260	250	245
> 2.5	250	245	245

Moisture sensitivity precautions, as indicated on the packing, must be respected at all times.

Studies have shown that small packages reach higher temperatures during reflow soldering, see Figure 13.



MSL: Moisture Sensitivity Level

Fig 13. Temperature profiles for large and small components

For further information on temperature profiles, refer to Application Note *AN10365 “Surface mount reflow soldering description”*.

15. Revision history

Table 9. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
TDA1308 v.5	20110314	Product data sheet	-	TDA1308_A_4
Modifications:	• Removed all references to type numbers TDA1308, TDA1308A, TDA1308AUK • Changed pin names INA(neg), INA(pos), INB(pos), INB(neg) to INA–, INA+, INB+ and INB– • Updated parameter symbols in Tables 4 and 6, and Figures 7, 9 and 10 • Replaced Figure 4			
TDA1308_A_4	20070125	Product data sheet	-	TDA1308_A_3
TDA1308_A_3	20020719	Product specification	-	TDA1308_A_2
TDA1308_A_2	20020227	Product specification	-	TDA1308_1
TDA1308_1	19940905	Product specification	-	-

16. Legal information

16.1 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.

[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.nxp.com.

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18. Contents

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