Transport MPEG2 source decoder
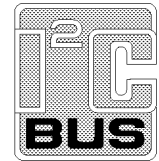
SAA7214

FEATURES

General features

- Conditional access descrambling DVB-compliant
- Stream demultiplexing (TS, PES, program and proprietary streams)
- Internal PR3001 32-bit RISC processor running at 40.5 MHz
- Low-power sleep modes supported across the chip
- Comprehensive driver software and development tool support
- Package: SQFP208.

The following sections specify the features in more detail, in the form of a feature matrix.

External interfaces

The SAA7214 supports the following external interfaces:

- Versatile compressed stream input at 108 Mbits/s
- A 16-bit microcontroller extension bus supporting DRAM, Flash, (E)PROM and external memory mapped
- I/O devices. It also supports a synchronous interface to communicate with the integrated MPEG AVGD decoder SAA7215 at 40.5 Mbytes.
- an IEEE 1284 interface (Centronics) supporting master and slave modes. Usable as a general purpose port
- A dedicated interface to IEEE 1394 devices (such as Philips' PDI 1394 chip set)
- Two UART (RS232) data ports with DMA capabilities (≤187.5 kbits/s) including hardware flow control RxD, TxD, RTS and CTS for modem support
- An elementary UART with DMA capabilities,(e.g. dedicated to front panel devices for instance)
- Two dedicated smart-card reader interfaces (ISO 7816 compatible) with DMA capabilities
- Two I²C-bus master/slave transceivers supporting the standard (100 kbit/s) and fast (400 kbits/s) I²C-bus modes
- 32 general purpose, bidirectional I/O interface pins, the first 8 bits may also be used as interrupt inputs
- One PWM output (8-bit resolution)
- A GP/HS interface supporting stream recording through IEEE 1394 IC
- A JTAG interface for board test support.

CPU related features

The SAA7214 contains an embedded RISC CPU, which incorporates the following features:

- A 32-bit PR3001 core
- 1 kbyte data, and 4 kbytes Instruction caches (write-through style)
- A programmable low-power mode, including wake-up on interrupt
- A memory management unit
- Two fully independent 24-bit timers and one 24-bit timer including watchdog facilities
- A real-time clock unit (active in sleep mode)
- Built-in software debug support
- An on-chip 4 kbytes SRAM for storing code which needs fast execution.

MPEG2 systems features

MPEG2 systems features of the SAA7214 include the following

- Parsing of TS, PS (HW) and proprietary (SW) data streams. Maximum input rate is 108 Mbits/s
- A real-time, DVB compliant descrambler core, incorporating storage for up to 6 control word pairs
- HW section filtering based on 32 different PIDs with a flexible number of filter conditions (8 or 4 byte condition + 8 or 4 byte mask) per PID and a total filter capacity of 40 (8 byte condition checks) or up to 80 (4 byte condition checks) filter conditions.
- 4 TS/PES filters for retrieval for data at TS or PES level for applications such as subtitling, TXT or retrieval of private
- Data
- Flexible DMA based storage of the 32 section sub streams and 4 TS/PES data substreams in the external memory

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- System time base management with a double counter mechanism for clock control and discontinuity handling
- 2 PTS/DTS timers
- A GP/HS filter which can serve as alternate input from for example EEE1394 devices. It can also output either scrambled or descrambled TS to IEEE 1394 devices.

APPLICATIONS

- Digital television decoder environment.

GENERAL DESCRIPTION

SAA7214 system overview

The device is part of a comprehensive source decoding kit which contains all the hardware and software required to receive and decode MPEG2 transport streams, including descrambling, demultiplexing. In addition, it includes a MIPS PR3001 RISC CPU core and several peripheral interfaces such as UARTs, I²C-bus units, and an IEEE 1284 (Centronics) interface. The SAA7214 is therefore capable of performing all controller tasks in digital television applications such as set-top boxes. The SAA7214 is compliant to DVB specification.

The SAA7214 receives transport streams through a versatile stream input interface capable of handling both byte-parallel and bit-serial streams, in various formats, supporting data streams up to and including 13.5 Mbytes/s (108 Mbits/s). The stream data is first applied to an on-chip descrambler incorporating DVB descrambling algorithm, on the basis of 6 control word pairs stored in on-chip RAM. Demultiplexing is subsequently applied to the stream, to separate up to 32 individual data streams.

The demultiplexer section includes clock recovery and timebase management. Program Specific Information (PSI), Service Information (SI), Conditional Access (CA) messages and private data are selected and stored in external memory, for subsequent off-line processing by the internal PR3001 CPU core.

To support advanced board testing facilities, the SAA7214 includes boundary scan test hardware, in accordance with the JTAG standard. The device features a low-power sleep mode, which is capable of sustaining set-top box standby functionality, thus eliminating the need for a separate front-panel controller. The SAA7214 requires a supply voltage of 3.3 V and some devices input and output interfaces are 5 V tolerant. The device is mounted in a SQFP208 package.

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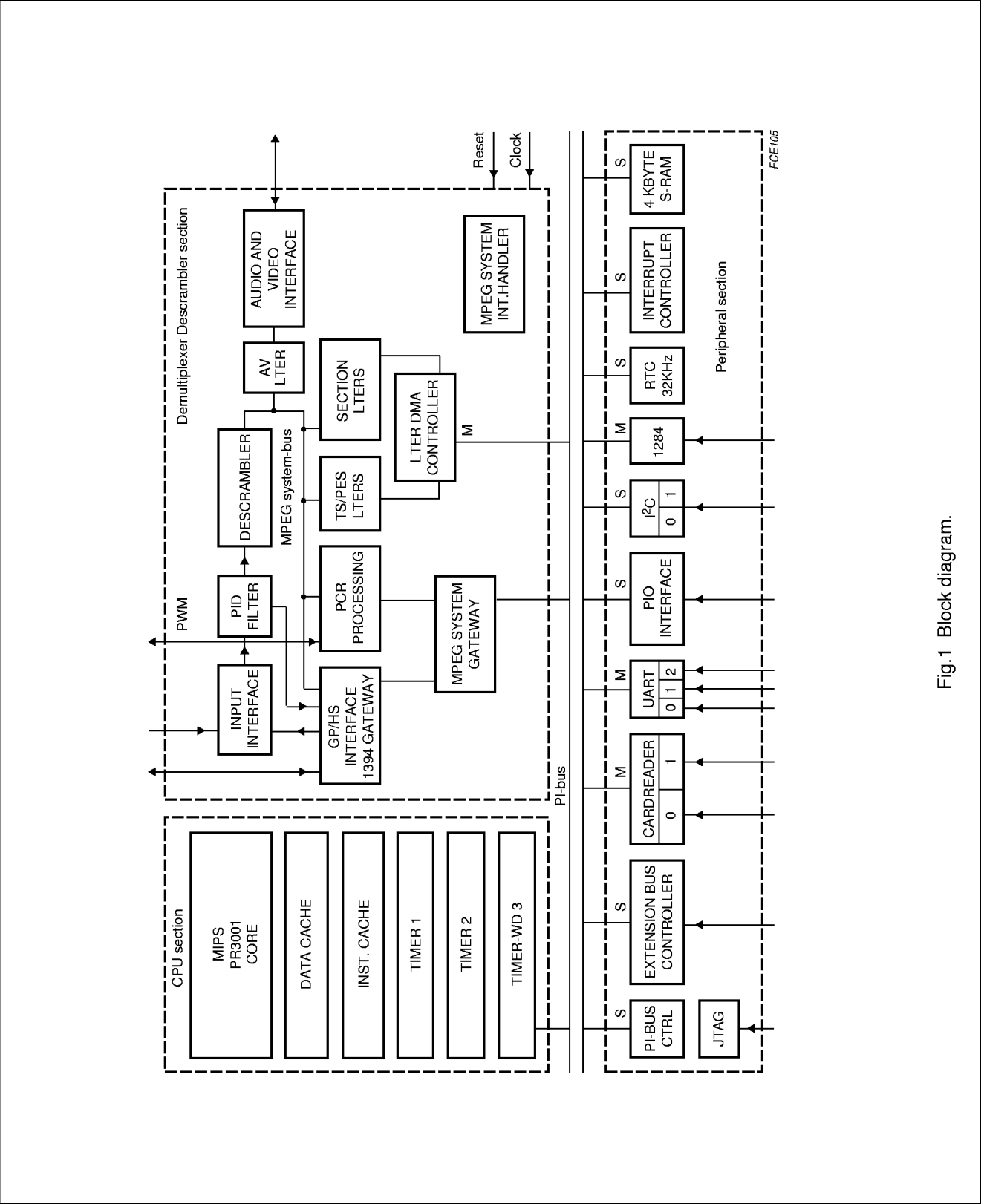
SAA7214

BLOCK DIAGRAM

Fig.1 Block diagram.

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APPLICATION INFORMATION
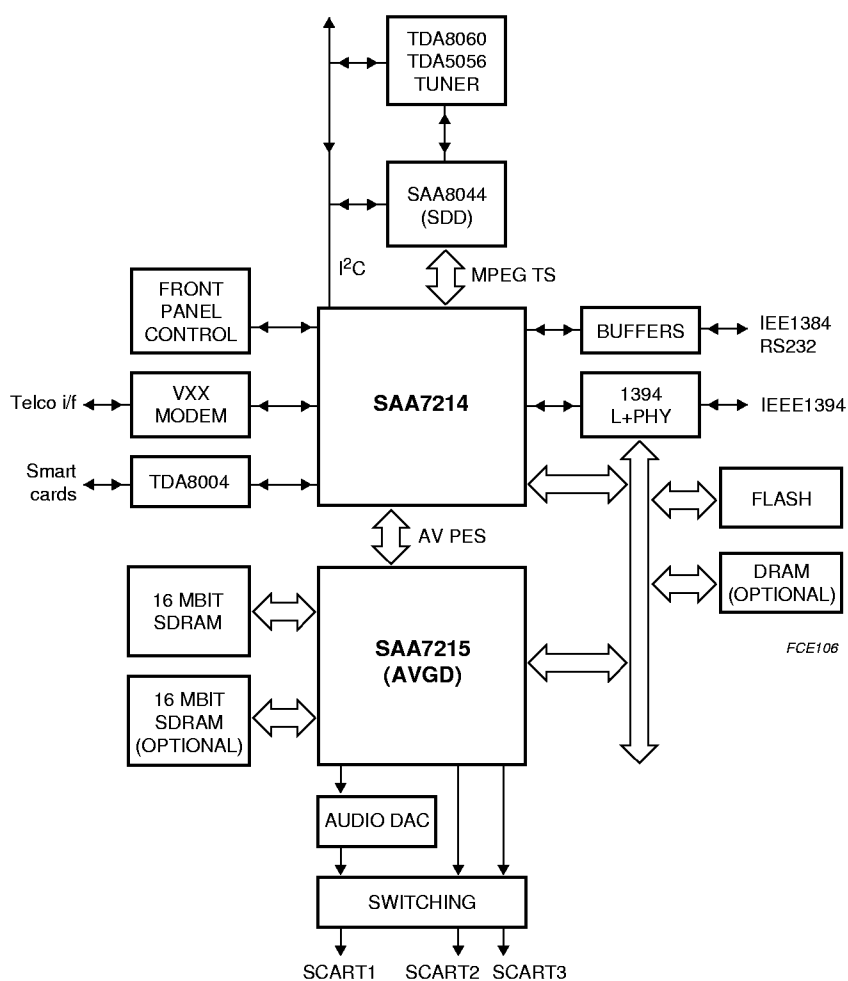

Fig.2 Set-top box example.
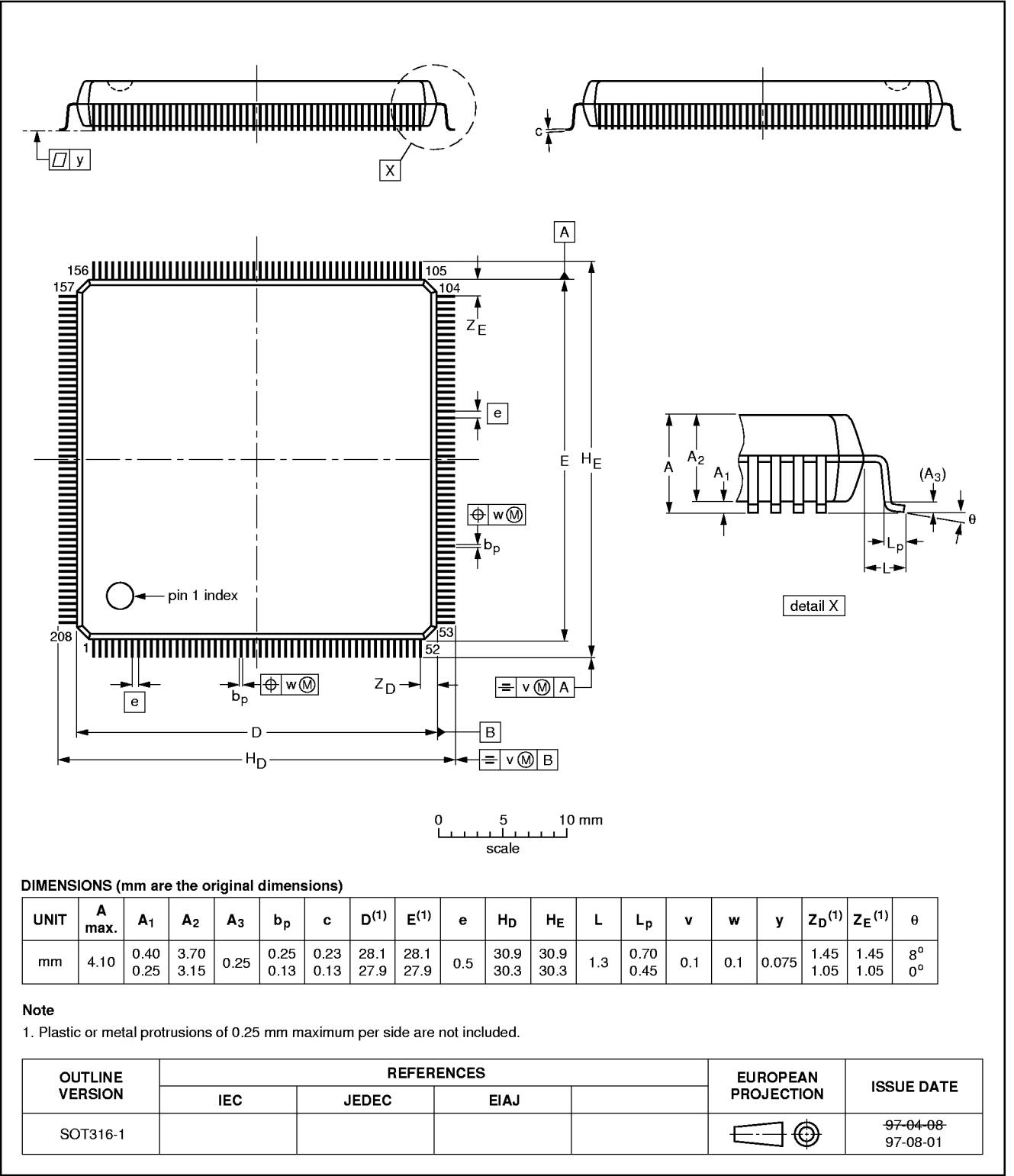
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PACKAGE OUTLINE

SQFP208: plastic shrink quad flat package;
208 leads (lead length 1.3 mm); body 28 x 28 x 3.4 mm

SOT316-1

0   5   10 mm
scale

DIMENSIONS (mm are the original dimensions)

UNIT	A max.	A1	A2	A3	bp	c	D[1]	E[1]	e	HD	HE	L	Lp	v	w	y	ZD[1]	ZE[1]	θ
mm	4.10	0.40 0.25	3.70 3.15	0.25	0.25 0.13	0.23 0.13	28.1 27.9	28.1 27.9	0.5	30.9 30.3	30.9 30.3	1.3	0.70 0.45	0.1	0.1	0.075	1.45 1.05	1.45 1.05	8° 0°

Note

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

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT316-1						97-04-08 97-08-01

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SOLDERING

Introduction to soldering surface mount packages

This text gives a very brief insight to a complex technology. A more in-depth account of soldering ICs can be found in our *"Data Handbook IC26; Integrated Circuit Packages"* (document order number 9398 652 90011).

There is no soldering method that is ideal for all surface mount IC packages. Wave soldering is not always suitable for surface mount ICs, or for printed-circuit boards with high population densities. In these situations reflow soldering is often used.

Reflow soldering

Reflow soldering requires solder paste (a suspension of fine solder particles, flux and binding agent) to be applied to the printed-circuit board by screen printing, stencilling or pressure-syringe dispensing before package placement.

Several methods exist for reflowing; for example, infrared/convection heating in a conveyor type oven. Throughput times (preheating, soldering and cooling) vary between 100 and 200 seconds depending on heating method.

Typical reflow peak temperatures range from 215 to 250 °C. The top-surface temperature of the packages should preferable be kept below 230 °C.

Wave soldering

Conventional single wave soldering is not recommended for surface mount devices (SMDs) or printed-circuit boards with a high component density, as solder bridging and non-wetting can present major problems.

To overcome these problems the double-wave soldering method was specifically developed.

If wave soldering is used the following conditions must be observed for optimal results:

- Use a double-wave soldering method comprising a turbulent wave with high upward pressure followed by a smooth laminar wave.
- For packages with leads on two sides and a pitch (e):
  - larger than or equal to 1.27 mm, the footprint longitudinal axis is **preferred** to be parallel to the transport direction of the printed-circuit board;
  - smaller than 1.27 mm, the footprint longitudinal axis **must** be parallel to the transport direction of the printed-circuit board.

  The footprint must incorporate solder thieves at the downstream end.
- For packages with leads on four sides, the footprint must be placed at a 45° angle to the transport direction of the printed-circuit board. The footprint must incorporate solder thieves downstream and at the side corners.

During placement and before soldering, the package must be fixed with a droplet of adhesive. The adhesive can be applied by screen printing, pin transfer or syringe dispensing. The package can be soldered after the adhesive is cured.

Typical dwell time is 4 seconds at 250 °C.
A mildly-activated flux will eliminate the need for removal of corrosive residues in most applications.

Manual soldering

Fix the component by first soldering two diagonally-opposite end leads. Use a low voltage (24 V or less) soldering iron applied to the flat part of the lead. Contact time must be limited to 10 seconds at up to 300 °C.

When using a dedicated tool, all other leads can be soldered in one operation within 2 to 5 seconds between 270 and 320 °C.

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Suitability of surface mount IC packages for wave and reflow soldering methods

PACKAGE	SOLDERING METHOD	
	WAVE	REFLOW[1]
BGA, SQFP	not suitable	suitable
HLQFP, HSQFP, HSOP, HTSSOP, SMS	not suitable[2]	suitable
PLCC[3], SO, SOJ	suitable	suitable
LQFP, QFP, TQFP	not recommended[3][4]	suitable
SSOP, TSSOP, VSO	not recommended[5]	suitable

Notes

1. All surface mount (SMD) packages are moisture sensitive. Depending upon the moisture content, the maximum temperature (with respect to time) and body size of the package, there is a risk that internal or external package cracks may occur due to vaporization of the moisture in them (the so called popcorn effect). For details, refer to the Drypack information in the *"Data Handbook IC26; Integrated Circuit Packages; Section: Packing Methods"*.

2. These packages are not suitable for wave soldering as a solder joint between the printed-circuit board and heatsink (at bottom version) can not be achieved, and as solder may stick to the heatsink (on top version).

3. If wave soldering is considered, then the package must be placed at a 45° angle to the solder wave direction. The package footprint must incorporate solder thieves downstream and at the side corners.

4. Wave soldering is only suitable for LQFP, TQFP and QFP packages with a pitch (e) equal to or larger than 0.8 mm; it is definitely not suitable for packages with a pitch (e) equal to or smaller than 0.65 mm.

5. Wave soldering is only suitable for SSOP and TSSOP packages with a pitch (e) equal to or larger than 0.65 mm; it is definitely not suitable for packages with a pitch (e) equal to or smaller than 0.5 mm.
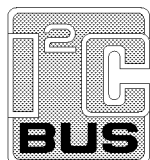
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DEFINITIONS

Data sheet status	
Objective specification	This data sheet contains target or goal specifications for product development.
Preliminary specification	This data sheet contains preliminary data; supplementary data may be published later.
Product specification	This data sheet contains final product specifications.
Limiting values	
Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.	
Application information	
Where application information is given, it is advisory and does not form part of the specification.	

LIFE SUPPORT APPLICATIONS

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