CHAPTER 7

PACKING METHODS

Packing methods   Chapter 7

INTRODUCTION

The chapter contains a survey of the packing methods most frequently used by Philips Semiconductors. It includes information that may be important to customers when making their purchasing decisions, for example the main dimensions, shapes, and packing quantities.

Standardization

For semiconductors, packing serves two important functions. The first and most obvious function is protection during storage and transport to customers. This, of course, applies to all products, not just semiconductors.

The second is to act as a delivery medium for automatic placement machines during equipment manufacture.

To do this effectively, the reels, trays and tubes that components are packed in must meet recognized standards. In this respect, Philips Semiconductors actively cooperates with standardization authorities throughout the world.

In addition, its packing methods meet all major international standards, including those of IEC (International Electrotechnical Commission), JEDEC (Joint Electron Device Engineering Council, USA) and NEDA (National Electronic Distributor Association, USA).

Environmental care

Nowadays, an important issue is environmental impact. Component and equipment manufacturers are continuously working to improve the environment friendliness of their products and packing, and have devoted much effort to eliminating the use of toxic materials and to looking at ways in which materials can be recycled.

In these respects, Philips Semiconductors has taken several important steps on the packing front. These include:

- Reducing the amount of packing material by switching to 'one piece' boxes (instead of boxes with upper and lower parts)
- Changing to 'mono material' to aid recycling. For example, from aluminium-lined boxes to carbon-coated boxes.
- Changing from white boxes to natural brown boxes to eliminate the use of bleach (chlorine) in their manufacture.

The aim is minimum waste and minimum environmental impact. We have already gone a long way towards this in the development of our packing methods. And future developments will take us even further along this route.

For more information relating to environmental issues, refer to Chapter 8 - Environmental data on ICs.

GLOSSARY OF TERMS

Through-hole	mounted onto a PCB by insertion of leads into holes
Surface mount	mounted on the surface of a PCB
Package	container with terminals for an IC chip (also known as an envelope or outline)
Carrier	plastic tube, tray or tape with cavities, which can contain semiconductor products
Packing method	combination of a carrier and a box to protect products during transport and storage
Pin	rigid plastic pin that closes a tube for DIPs by insertion through holes in its end
Plug	flexible plastic plug that closes a tube for PLCCs or SILs by insertion into its end
Turnlock	rigid plastic pin that closes a tube for SOs by insertion into its end and turning to lock in place
SPQ	Smallest Packing Quantity, in one carrier
PQ	Packing Quantity, in a box containing one or more SPQs

For a full definition of IC package abbreviations and their suffixes, refer to *Chapter 2 - IC Package range and dimensions*.

Packing methods

Chapter 7

DRYPACK FOR MOISTURE SENSITIVE SMDs

If packed or stored incorrectly, moisture-sensitive plastic SMDs can easily be damaged after a prolonged exposure to the high temperatures associated with certain soldering methods. If any moisture is present in the plastic package during soldering, it may turn into steam and expand rapidly. Under certain circumstances, the force exerted by this expansion can cause internal delamination or, in the most severe cases, may result in internal or external package cracks (the popcorn effect). This effect is more prominent with infrared and vapour-phase reflow soldering methods when soldering temperatures can reach severe levels.

To avoid this problem, and ensure trouble-free soldering, we deliver moisture-sensitive ICs in a resealable moisture-resistant plastic packing called a DRYPACK.

Moisture sensitivity level

Not all plastic packages are equally sensitive to moisture. To differentiate between types, we assign each IC package a moisture sensitivity level (MSL). The MSL of an IC's package is influenced by:

- chip area and size of the die-pad
- package body size
- package material properties
- moisture content of the package
- temperature and duration of the soldering process.

Determining MSL

We determine moisture sensitivity levels by testing batches of each package according to a detailed specification, which includes moisturizing and infrared-reflow soldering. This soldering method is used as infrared radiation is readily absorbed by the black IC packages and therefore is the most critical soldering process when testing for the popcorn effect.

After moisturizing to predetermined levels, the packages pass through an oven where they are first preheated, then heated to a soldering temperature, and finally cooled. The convection solder reflow requirements are given in Table 1.

To reduce any moisture-related stresses within the packages, they are first preheated to around 125 °C to allow them to dry before they reach their maximum temperature. The longer this preheating time, therefore, the smaller the chance of packages being damaged during the high temperatures associated with soldering.

Although the profile has a low maximum temperature, the packages are exposed to 183 °C and above for a relatively long time. If this maximum temperature is higher than that given in Table 1, the effect of soldering will be more severe compared with the test on which the MSL of the specific IC package is based. If, however, the package is soldered well within its specified floor life limit (see Table 2), a higher soldering temperature can be used as the package's moisture content will be much less.

Table 1 Convection solder reflow requirements[1]

PROFILE PARAMETER	REQUIREMENTS
Ramp-up rate (183 °C to peak)	3 K/s max.
Preheat temperature (125 °C ± 25 °C)	120 s max.
Temperature maintained above 183 °C	60 to 150 s
Time within 5 °C of actual peak temperature	10 to 20 s
Peak temperature range[2]	220 °C +5 /–0 °C or 235 °C +5 /–0 °C
Ramp down rate	6 K/s max.
Time from 25 °C to peak temperature	6 minutes. max.

Notes

1. All temperatures refer to the top side of the package as measured on the centre of the plastic body surface.

2. Peak temperature requirements:

   a) Packages with a thickness ≥ 2.5 mm and all BGA packages: peak temp. 220 °C +5/ –0 °C.

   b) Packages with a thickness < 2.5 mm and all with a package volume ≥ 350mm^3: peak temp. 220 °C +5 /–0 °C.

   c) Packages with a thickness < 2.5 mm and all with a package volume < 350mm^3: 235 °C +5 /–0 °C. (Package volume is defined as body-height × width × length, but excludes external leads and non-integral heatsinks).

Packing methods

Chapter 7

Table 2 Floor life versus moisture sensitivity levels[1]

MSL	CONDITIONS	FLOOR LIFE
1	30 °C / 90% RH	unlimited
2	30 °C / 60% RH	1 year
2a	30 °C / 60% RH	4 weeks
3	30 °C / 60% RH	168 hours
4	30 °C / 60% RH	72 hours
5	30 °C / 60% RH	48 hours
5a	30 °C / 60% RH	24 hours
6[2]	30 °C / 60% RH	6 hours

Notes

1. Packages that are not sensitive to moisture do not require DRYPACK.

2. MSL 6 packages must be baked before use, after which they have a 6-hour floor life.

No problems are associated with wave soldering as the components are only exposed to high temperatures for a short time.

All Philips test centres perform these MSL investigations to the same rigorous specification, and classify the moisture sensitivity of packages into levels ranging from 1 (not sensitive to moisture) to 6 (very sensitive to moisture).

In addition, and as part of our Reliability Monitoring Program, we conduct regular stress tests on our SMDs. As part of these tests, the packages are exposed to a simulated moisturizing and soldering run to reproduce a typical production process, then they are checked both visually and electronically for any signs of deterioration. As a result, we guarantee that if the packages are stored correctly, IC reliability will not be affected after soldering.

Philips DRYPACK

The Philips DRYPACK is a laminated plastic packing that prevents the moisture content of the IC plastic packages rising above 0.1% by weight for up to one year. The DRYPACK must be stored at normal room temperature (between 10 °C and 30 °C), and in an atmosphere of less than 60% relative humidity (RH).

The DRYPACK contains a desiccant and a humidity indicator, used to monitor the moisture content when the bag is opened.

Using ICs from a DRYPACK

Before using ICs from a DRYPACK, it's essential that the humidity indicator is checked. If it shows that the RH has remained below 20% (the colour of the 20% dot is blue), the ICs are ready for use.

As soon as the ICs are removed for the DRYPACK, however, they are immediately exposed to moisture in the atmosphere. To prevent them absorbing excessive moisture, they must be soldered onto the PCB within the specified floor life period given in Table 2. These times are related to the MSL of the package.

If the humidity indicator in a DRYPACK shows an RH of more than 20% (the colour of the 20% dot has changed from blue to pink), the DRYPACK has been damaged, opened, or stored incorrectly. To prevent the popcorn effect in such a situation, the ICs that were in the DRYPACK must first be dried before soldering.

For example, the minimum drying time to reduce the moisture content of an IC package from an initial level of 0.3% by weight to around 0.05% by weight, is given by:

Drying time (hours) = $5 \times$ package thickness (mm) at a drying temperature of 125 °C $\pm$ 5 °C.

Note: High temperatures may deteriorate solderability. It is strongly recommended to dry at a maximum 125 °C $\pm$ 5 °C, and not to dry longer than required.

Resealing a DRYPACK

If some ICs from an opened DRYPACK are not used, the desiccant and the humidity indicator should be reinserted into the DRYPACK and the DRYPACK resealed within half an hour after opening using commercially available heat-sealing equipment

The time a resealed DRYPACK can be stored depends on the time since it was originally packed, and how long it was open before being resealed.

Packing methods

Chapter 7

SURVEY OF IC PACKING METHODS

PACKAGE NAME	CARRIER TYPE		
	TUBE	**TAPE/REEL**	**TRAY**
BGA	–	X	X
DBS	X	–	–
DIP	X	–	–
HBCC	–	X	X
HBGA	–	X	X
HDIP	X	–	–
HLQFP	–	X	X
HQFP	–	X	X
HSOP	X	X	–
HSQFP	–	–	X
HTQFP	–	X	X
HTSSOP	X	X	–
LFBGA	–	X	X
LQFP	–	X	X
MSQFP	–	–	X
PLCC	X	X	–
PMFP	–	X	–
QFP	–	X	X
RBS	X	–	–
SDIP	X	–	–
SIL	X	–	–
SMS	X	X	–
SO	X	X	–
SOJ	X	X	–
SQFP	–	–	X
SSOP	X	X	–
TBS	X	–	–
TFBGA	–	X	X
TO	–	X	–
TQFP	–	X	X
TSSOP	X	X	–
VSO	X	X	–

Packing methods   Chapter 7

PACKING METHODS IN EXPLODED VIEW

Packing for DIP (tube/pin)
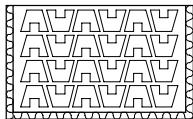
Stacking method

Item	Material	Weight[1] (g)
Box	Cardboard carbon coated	145
Seal	Acrylate	0.2
Labels	Paper	1.65
Endstops	Polyvinylchloride	5.6
Tubes	Polyvinylchloride	840
Strap	Polypropylene	0.7

[1] For DIP, row pitch 0.6"

Printed plano box

Endplug (white)

Stacked tubes

Endplug (green)

Product orientation in tube
(pin 1 towards this side,
this is label side of box)

Strap

Space for additional label

Preprinted Hyatt patent

Preprinted ESD warning

Barcode label

QA seal

Strap

MSC042
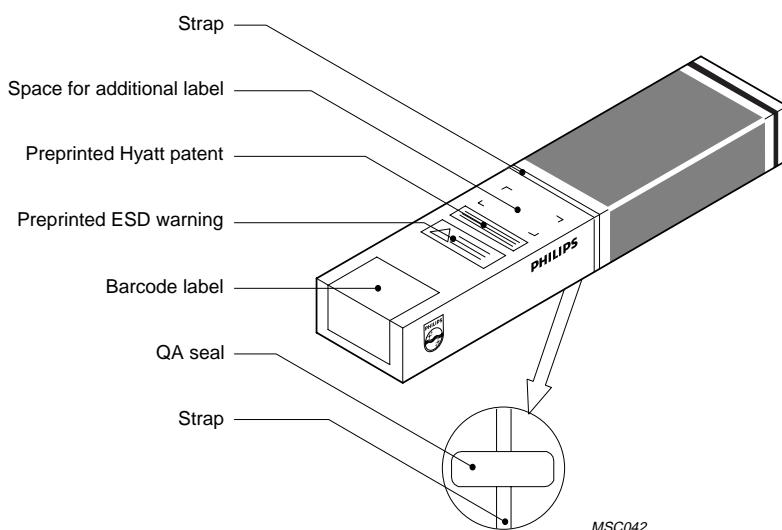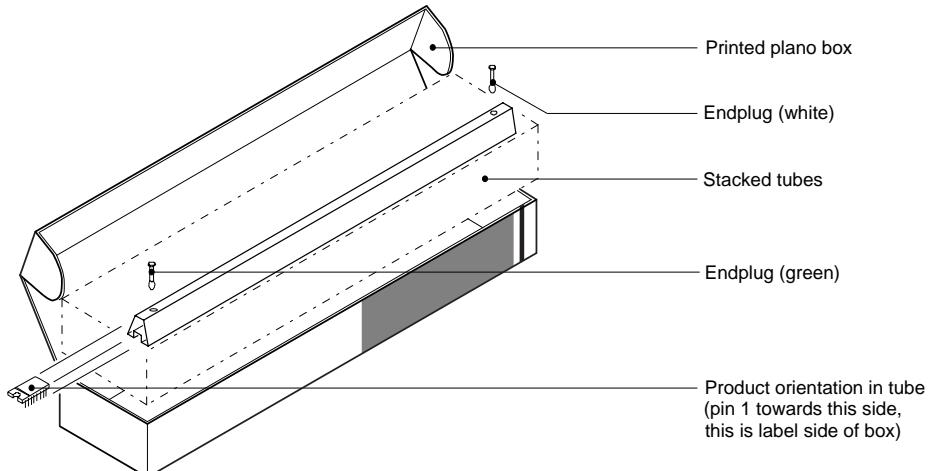
Fig.1 Packing for DIP (tube/pin).

Packing methods

Chapter 7

Packing for PLCC/SIL (tube/plug)

Item	Material	Weight[1] (g)
Box	Cardboard carbon coated	145
Seal	Acrylate	0.2
Labels	Paper	1.65
Endstops	Polyvinylchloride soft	115
Tubes	Polyvinylchloride	1190
Strap	Polypropylene	0.7
Foam	Polyethylene	9
Foam	Ethylenevinylacetate	1

[1] For PLCC84

Stacking method

Printed plano box

Endplug (white)

Foam (optional)

Stacked tubes

Product orientation in tube
(Pin 1 towards this side,
this is label side of box)

Endplug (green)

Strap

Space for additional label

Preprinted Hyatt patent

Preprinted ESD warning

Barcode label

QA seal

Strap

PHILIPS

MSC043
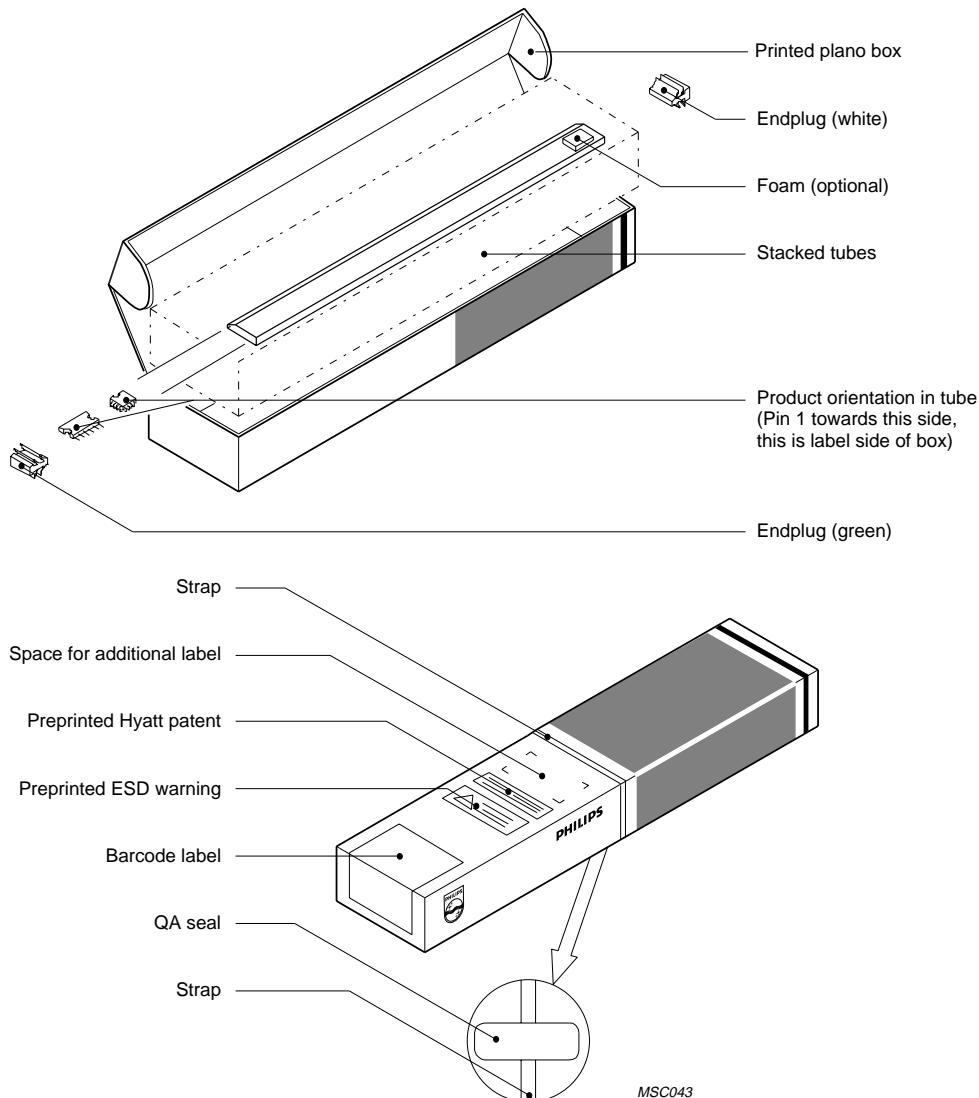
Fig.2 Packing for PLCC/SIL (tube/plug).

Packing methods   Chapter 7

Packing for SO (tube/turnlock)

Item	Material	Weight[1] (g)
Box	Cardboard carbon coated	61
Seal	Acrylate	0.2
Labels	Paper	1.65
Endstops	Polyvinylchloride	4
Tubes	Polyvinylchloride	164

[1] For SO, row pitch 0.15"

Stacking method

Printed plano box

Turnlock (white)

Tube

Stacked tubes

Product orientation in tube
(pin 1 towards this side).

Turnlock (green)

Barcode label

Preprinted ESD warning

Space for additional label

PHILIPS

MSC044

QA seal
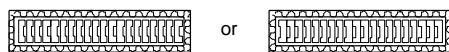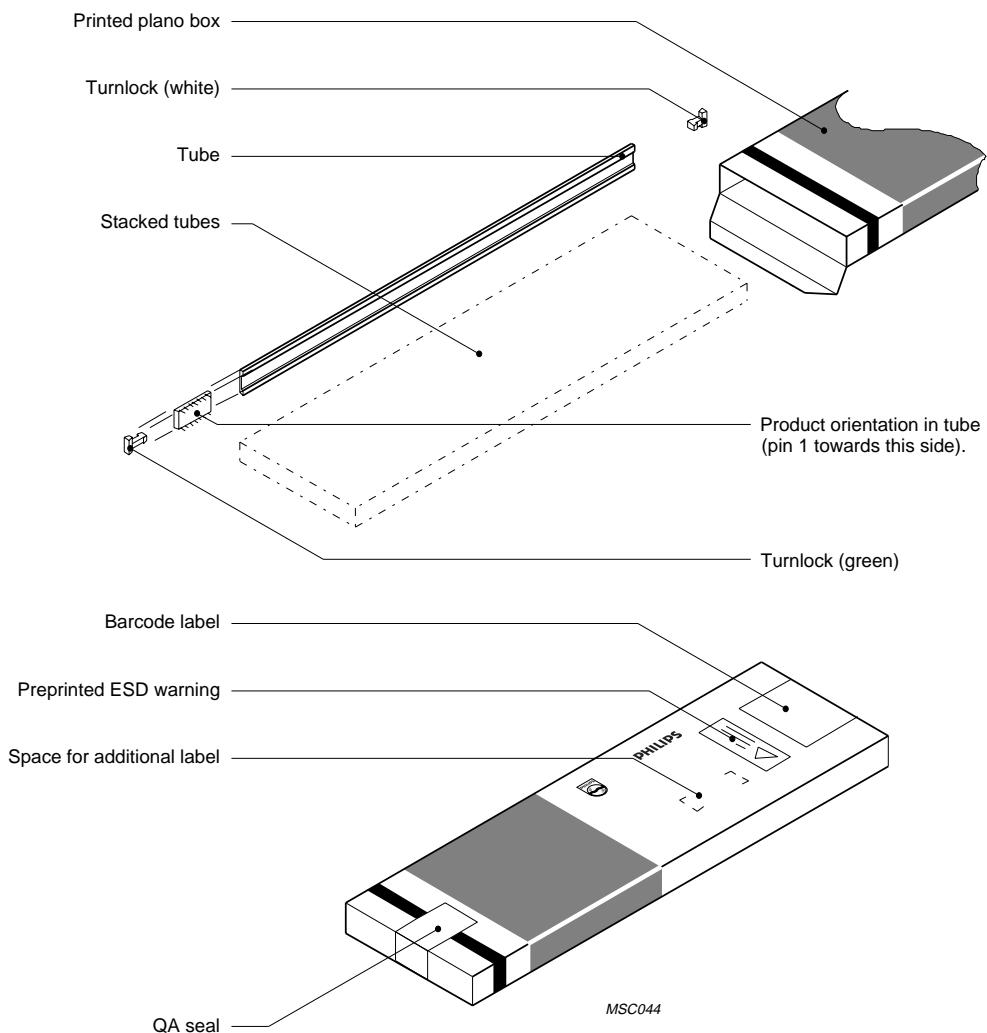
Fig.3 Packing for SO (tube/turnlock).

Packing methods

Chapter 7

Packing for SO/PLCC/QFP (tape/reel)

Item	Material	Weight[1] (g)
Box	Cardboard carbon coated	165
Reel	Polystyrene	310
Cover tape	Polyester	10
Carrier tape	Polystyrene	73
Seals	Acrylate	0.2
Tape	Paper	0.15
Labels	Paper	1.77

[1] For SO large 8/16 pins

Tape

Barcode label

Guard band

Reel assembly

Printed plano box

Cover tape

Carrier tape

Space for additional label

Preprinted ESD warning

Barcode label

Preprinted Hyatt patent

Printed plano box

QA seal

MSC046
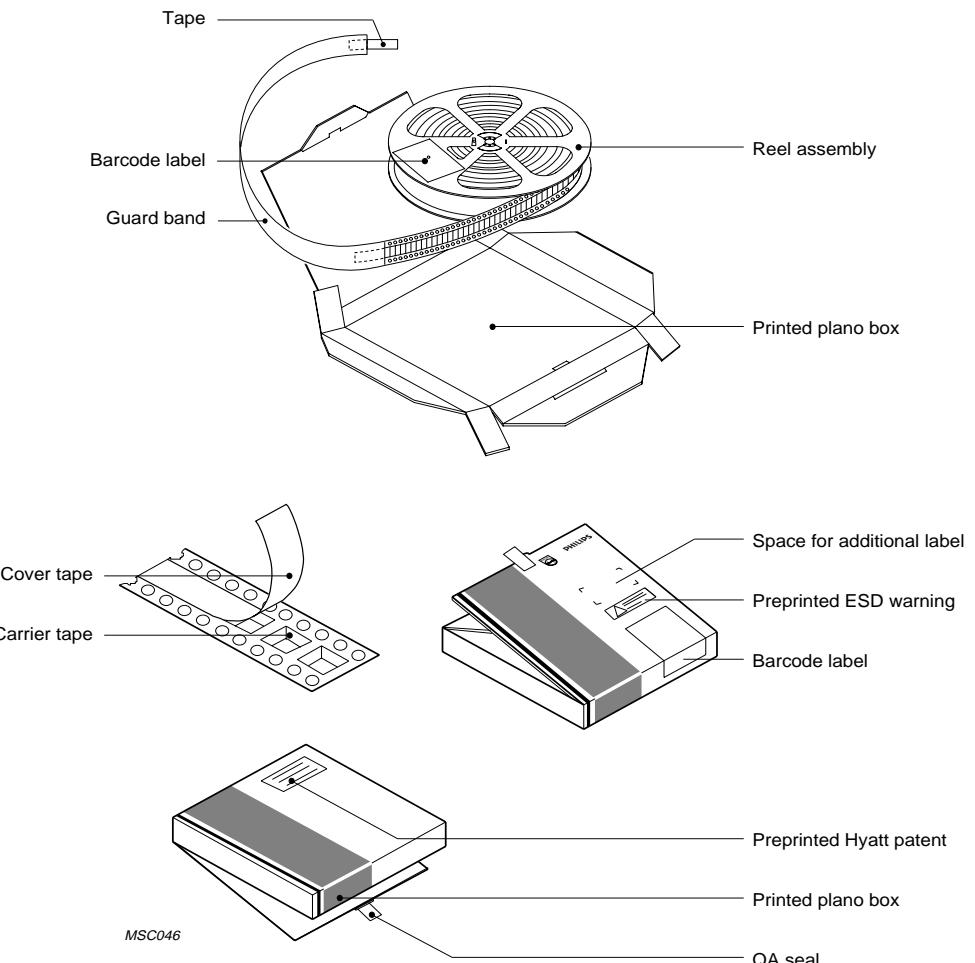
Fig.4 Packing for SO/PLCC/QFP (tape/reel).

Packing methods

Chapter 7

Drypack for tube-packing
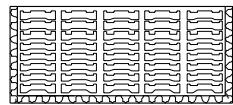
Item	Material	Weight[1] (g)
Box	Cardboard	112
Tubes	Polyvinylchloride	724
Endstops	Polyvinylchloride	10
Bag	Aluminium/Polyethylene/Polyolefine	38
Strap	Polypropylene	0.6
Foam	Polyethylene	2
Labels	Paper	2.8
Dry-Agent	Amorphous Silicic Acid	88
Rel. Hum. Ind.	Paper+$CoCl_2$	1.15

[1] For SO large, row pitch 0.3"

Stacking method

Moisture caution print

Barcode label

Relative humidity indicator

Dry-agent

Fill up plate material

ESD print

Bag

Turnlock (white)

Stacked tubes

Tube

Product orientation in tube (Pin 1 towards this side, this is label side of box)

Turnlock (green)

Drypack ID sticker

Space for additional label

Preprinted Hyatt patent

Preprinted ESD warning

Barcode label

QA seal

PHILIPS

Printed plano box

Strap

MSC045

Fig.5 Drypack for tube-packing.

Packing methods

Chapter 7

Drypack for tape/reel-packing

Item	Material	Weight[1] (g)
Box	Cardboard	203
Reel	Polystyrene	288
Cover tape	Polyester	16
Carrier tape	Polystyrene	177
Seals	Acrylate	0.2
Tape	Paper	0.15
Labels	Paper	3.66
Bag	Aluminium/Polyethylene/Polyolefine	94
Dry-Agent	Amorphous Silicic Acid	88
Rel. Hum. Ind.	Paper+$CoCl_2$	1.15

[1] For TSSOP24, for example

Barcode label

Bag

ESD print

Moisture caution print

Tape

Barcode label

Guard band

Cover tape

Carrier tape

Dry-agent

Relative humidity indicator

ESD embossed

Reel assembly

Printed plano box

Space for additional label

Preprinted ESD warning

Barcode label

Drypack ID sticker

Preprinted Hyatt patent

Printed plano box

QA seal

MSC047
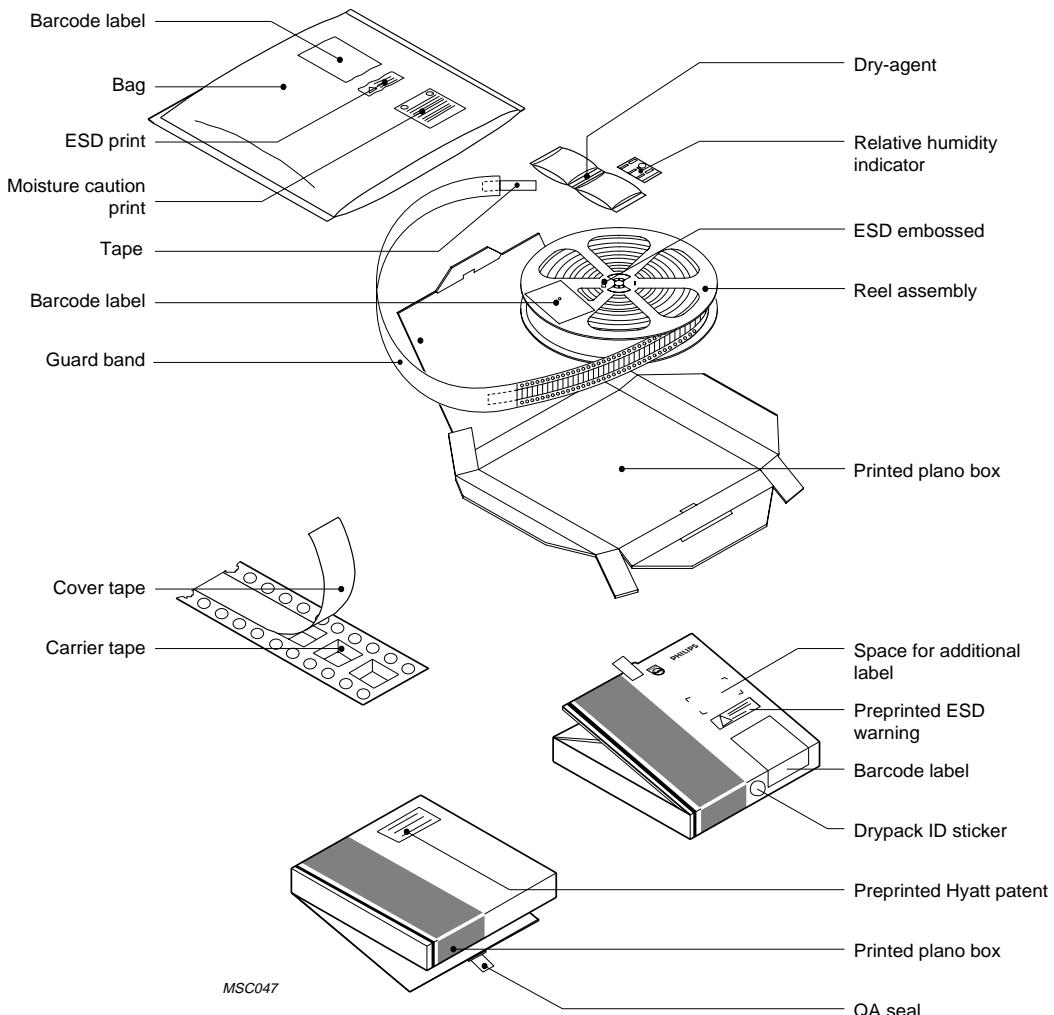
Fig.6 Drypack for tape/reel-packing.

Packing methods

Chapter 7

Drypack for tray-packing

Item	Material	Weight[1] (g)
Box	Cardboard	113
Tray Bakeable	Polyethersulfone (PES)	654
Seal	Acrylate	0.15
Strap	Polypropylene	2.2
Labels	Paper	2.55
Bag	Aluminium/Polyether/Polyolefine	47
Dry-Agent	Amorphous Silicic Acid	88
Rel. Hum. Ind.	Paper + $CoCl_2$	1.15

[1] For QFP 14×20 mm body

ESD warning

Moisture caution print

Bag

Barcode label

Strap

Dry-agent

Relative humidity indicator

Tray

Chamfer

Pin 1

Product orientation in tray

Printed plano box

Chamfer

Pin 1

Printed plano box

Space for additional label

Barcode label

Preprinted ESD warning

QA seal

Drypack ID sticker

Preprinted Hyatt Patent

MSC048
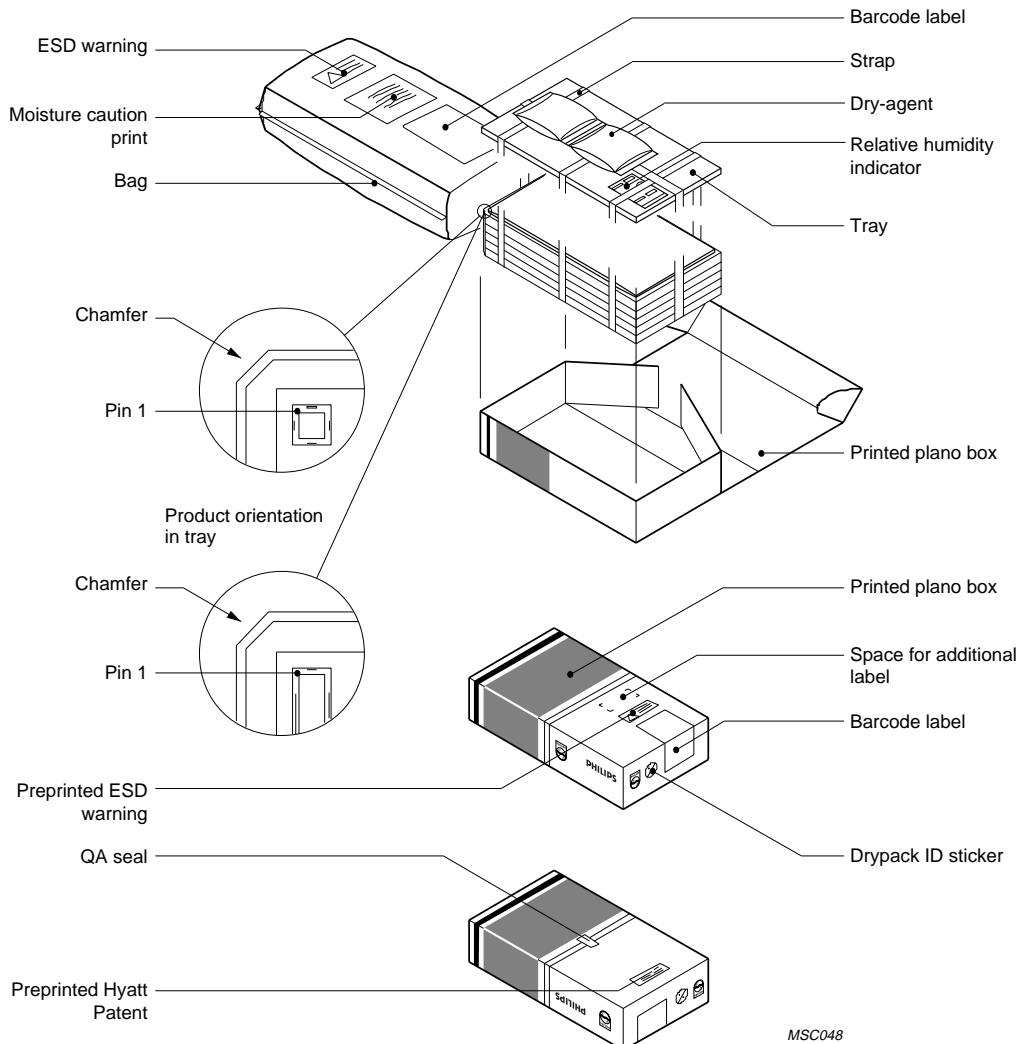
Fig.7 Drypack for tray-packing.

PACKING QUANTITIES, BOX DIMENSIONS AND CARRIER SHAPES

Tube - through hole devices

PACKAGE NAME	PHILIPS PACKAGE TYPE/OUTLINE CODE[1]	CARRIER LENGTH (mm)	END STOP	SPQ	CARRIERS PER BOX	PQ	OUTER BOX DIMENSIONS L × W × H (mm)	CARRIER PROFILE
DBS9MPF	SOT111	501	turnlock	22	34	748	530 × 136 × 65	
SIL9MP	SOT142	501	turnlock	22	34	748	530 × 136 × 65	
SIL9MPF	SOT110	501	turnlock	22	34	748	530 × 136 × 65	
RBS9MPF	SOT352	501	turnlock	22	42	924	530 × 136 × 65	
DBS7P	SOT524	501	turnlock	36	24	864	530 × 136 × 65	
DBS9P	SOT523	501	turnlock	36	24	864	530 × 136 × 65	
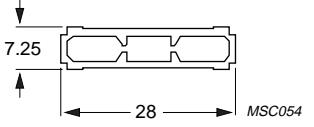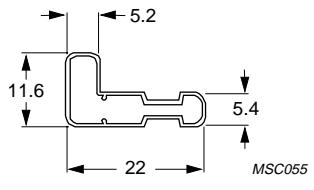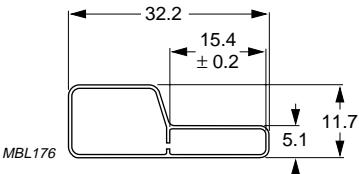
| PACKAGE NAME	PHILIPS PACKAGE TYPE/OUTLINE CODE[1]	CARRIER LENGTH (mm)	END STOP	SPQ	CARRIERS PER BOX	PQ	OUTER BOX DIMENSIONS L × W × H (mm)	CARRIER PROFILE
DBS9P	SOT157	575	plug	23	24	552	595 × 137 × 68	
SMS9P	SOT354	575	plug	23	24	552	595 × 137 × 68	
RDBS13P	SOT462	575	plug	23	24	552	595 × 137 × 68	
RDBS13P	SOT528	575	plug	23	24	552	595 × 137 × 68	
DBS13P	SOT141	575	plug	23	24	552	595 × 137 × 68	
TBS13	SOT578	575	plug	23	24	552	595 × 137 × 68	
DBS17P	SOT243	575	plug	23	24	552	595 × 137 × 68	
DBS17P	SOT475	575	plug	23	24	552	595 × 137 × 68	
RDBS17P	SOT577	575	plug	23	24	552	595 × 137 × 68	
DBS23P	SOT411	575	plug	18	24	432	595 × 137 × 68	
DBS27P	SOT521	575	plug	18	24	432	595 × 137 × 68	
SIL9P	SOT131	575	plug	23	24	552	595 × 137 × 68	
SIL13P	SOT193	575	plug	23	24	552	595 × 137 × 68	
DIP8	SOT97	501	pin	50	40	2000	532 × 142 × 63	

PACKAGE NAME	PHILIPS PACKAGE TYPE/OUTLINE CODE[1]	CARRIER LENGTH (mm)	END STOP	SPQ	CARRIERS PER BOX	PQ	OUTER BOX DIMENSIONS L × W × H (mm)	CARRIER PROFILE
DIP14	SOT27	501	pin	25	40	1000	532 × 142 × 63	
DIP16	SOT38-1	501	pin	22	40	880	532 × 142 × 63	
DIP16	SOT38-4	501	pin	25	40	1000	532 × 142 × 63	
DIP18	SOT102-1	501	pin	22	40	880	532 × 142 × 63	
DIP18	SOT102-2	501	pin	20	40	800	532 × 142 × 63	
DIP18	SOT102-4	501	pin	20	40	800	532 × 142 × 63	
HDIP18	SOT398	501	pin	22	40	880	532 × 142 × 63	
DIP20	SOT146	501	pin	18	40	720	532 × 142 × 63	
DIP22	SOT116	501	pin	17	32	544	530 × 136 × 65	
SDIP24	SOT234	501	pin	21	32	672	532 × 142 × 63	
SDIP32	SOT232	501	pin	16	32	512	532 × 142 × 63	
DIP24	SOT101	501	pin	15	24	360	532 × 142 × 63	
DIP24	SOT222	501	pin	15	40	600	532 × 142 × 63	
DIP24	SOT248	501	pin	15	32	480	530 × 136 × 65	
DIP28	SOT117	501	pin	13	24	312	532 × 142 × 63	
DIP32	SOT201	501	pin	11	24	264	532 × 142 × 63	
DIP40	SOT129	501	pin	9	24	216	532 × 142 × 63	
SDIP42	SOT270	501	pin	12	24	288	532 × 142 × 63	
DIP48	SOT240	501	pin	7	24	168	532 × 142 × 63	
SDIP52	SOT247	501	pin	10	24	240	532 × 142 × 63	
SDIP56	SOT400	501	pin	9	24	216	532 × 142 × 63	
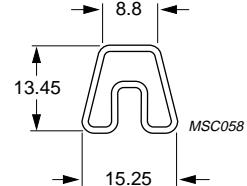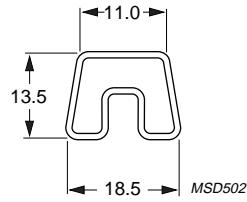
| PACKAGE NAME	PHILIPS PACKAGE TYPE/OUTLINE CODE[1]	CARRIER LENGTH (mm)	END STOP	SPQ	CARRIERS PER BOX	PQ	OUTER BOX DIMENSIONS L × W × H (mm)	CARRIER PROFILE
SDIP64	SOT274	501	pin	8	20	160	532 × 142 × 63	
DIP14	SOT27	575	pin	28	40	1120	595 × 137 × 68	
DIP16	SOT38-1	575	pin	25	40	1000	595 × 137 × 68	
DIP16	SOT38-4	575	pin	28	40	1120	595 × 137 × 68	
DIP18	SOT102-1	575	pin	25	40	1000	595 × 137 × 68	
HDIP18	SOT398	575	pin	25	40	1000	595 × 137 × 68	
DIP20	SOT146	575	pin	20	40	800	595 × 137 × 68	
DIP22	SOT116	575	pin	21	40	840	595 × 137 × 68	
SDIP24	SOT234	575	pin	25	40	1000	595 × 137 × 68	
DIP24	SOT101	575	pin	17	30	510	595 × 137 × 68	
DIP28	SOT117	575	pin	15	30	450	595 × 137 × 68	
DIP32	SOT201	575	pin	13	30	390	595 × 137 × 68	
SDIP32	SOT232	575	pin	19	40	760	595 × 137 × 68	
DIP40	SOT129	575	pin	10	30	300	595 × 137 × 68	
SDIP42	SOT270	575	pin	14	30	420	595 × 137 × 68	
SDIP52	SOT247	575	pin	11	30	330	595 × 137 × 68	
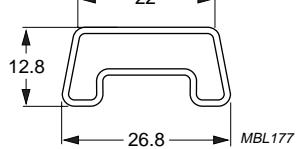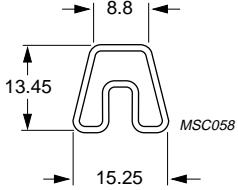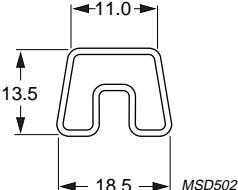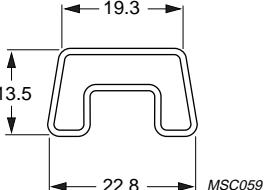
**Note**

1. If only a package type code is given, the data supplied is applicable to all its outline versions.

Tube - surface mount devices

PACKAGE NAME	PHILIPS PACKAGE TYPE/OUTLINE CODE[1]	CARRIER LENGTH (mm)	END STOP	SPQ	CARRIERS PER BOX	PQ	OUTER BOX DIMENSIONS L × W × H		CARRIER PROFILE (mm)
							NON-DRYPACK (mm)	DRYPACK (mm)	
SMS13P	SOT517	575	plug	23	24	552	–	595 × 137 × 68	
SO8	SOT96	515	turnlock	100	20	2000	525 × 83 × 15	528 × 101 × 23	
SO14	SOT108	515	turnlock	57	20	1140	525 × 83 × 15	528 × 101 × 23	
SO16	SOT109	515	turnlock	50	20	1000	525 × 83 × 15	528 × 101 × 23	
SO8	SOT176	515	turnlock	64	40	2560	551 × 90 × 46	572 × 94 × 54	
SO16	SOT162	515	turnlock	48	40	1920	551 × 90 × 46	572 × 94 × 54	
SO20	SOT163	515	turnlock	38	40	1520	551 × 90 × 46	572 × 94 × 54	
SO24	SOT137	515	turnlock	30	40	1200	551 × 90 × 46	572 × 94 × 54	
SO28	SOT136	515	turnlock	27	40	1080	551 × 90 × 46	572 × 94 × 54	
SO32	SOT287	515	turnlock	24	40	960	551 × 90 × 46	572 × 94 × 54	
VSO40	SOT158	515	turnlock	31	40	1240	551 × 90 × 46	572 × 94 × 54	
HSOP20	SOT397	515	turnlock	30	24	720	551 × 90 × 46	572 × 94 × 54	
HSOP20	SOT418	515	turnlock	30	24	720	551 × 90 × 46	572 × 94 × 54	
VSO56	SOT190	495	turnlock	22	28	616	551 × 90 × 46	572 × 94 × 54	
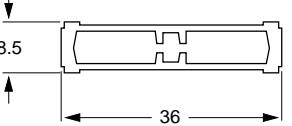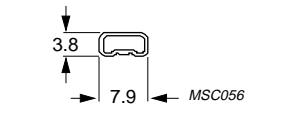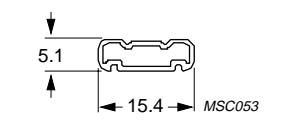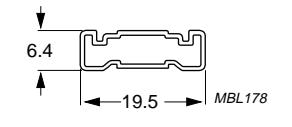
PACKAGE NAME	PHILIPS PACKAGE TYPE/OUTLINE CODE[1]	CARRIER LENGTH (mm)	END STOP	SPQ	CARRIERS PER BOX	PQ	OUTER BOX DIMENSIONS L × W × H		CARRIER PROFILE (mm)
							NON-DRYPACK (mm)	DRYPACK (mm)	
SSOP16	SOT369	511	turnlock	93	18	1674	525 × 83 × 20	530 × 103 × 29	3.45 8.8 MSC049
SSOP20	SOT266	511	turnlock	75	18	1350	525 × 83 × 20	530 × 103 × 29	
SSOP14	SOT337	508	turnlock	78	14	1092	525 × 83 × 20	530 × 103 × 29	4.0 10.6 MSD504
SSOP16	SOT338	508	turnlock	78	14	1092	525 × 83 × 20	530 × 103 × 29	
SSOP20	SOT339	508	turnlock	66	14	924	525 × 83 × 20	530 × 103 × 29	
SSOP24	SOT340	508	turnlock	59	14	826	525 × 83 × 20	530 × 103 × 29	
SSOP28	SOT341	508	turnlock	47	14	658	525 × 83 × 20	530 × 103 × 29	
SSOP16	SOT519	515	turnlock	100	20	2000	525 × 83 × 15	530 × 101 × 23	3.8 7.9 MSC056
SSOP24	SOT556	515	turnlock	57	20	1140	525 × 83 × 15	530 × 101 × 23	
SSOP48	SOT370	515	turnlock	31	51	1581	551 × 90 × 46	572 × 94 × 54	5.0 13.7 MSC562
SSOP56	SOT371	515	turnlock	26	51	1326	551 × 90 × 46	572 × 94 × 54	
TSSOP14	SOT402	510	plug	96	25	2400	525 × 83 × 15	528 × 101 × 23	3.05 7.83 MSC563
TSSOP16	SOT403	510	plug	96	25	2400	525 × 83 × 15	528 × 101 × 23	
TSSOP20	SOT360	510	plug	75	25	1875	525 × 83 × 15	528 × 101 × 23	
HTSSOP20	SOT527	510	plug	75	25	1875	525 × 83 × 15	528 × 101 × 23	
TSSOP24	SOT355	510	plug	63	25	1575	525 × 83 × 15	528 × 101 × 23	
TSSOP28	SOT361	510	plug	51	25	1275	525 × 83 × 15	528 × 101 × 23	
TSSOP30	SOT607	510	plug	63	25	1575	525 × 83 × 15	528 × 101 × 23	
TSSOP38	SOT510	510	plug	51	25	1275	525 × 83 × 15	528 × 101 × 23	
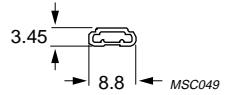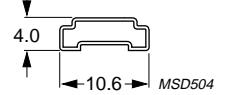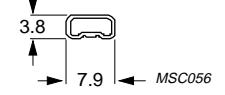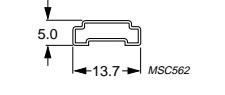
PACKAGE NAME	PHILIPS PACKAGE TYPE/OUTLINE CODE[1]	CARRIER LENGTH (mm)	END STOP	SPQ	CARRIERS PER BOX	PQ	OUTER BOX DIMENSIONS L × W × H		CARRIER PROFILE (mm)
							NON-DRYPACK (mm)	DRYPACK (mm)	
TSSOP32	SOT487	510	plug	44	25	1100	$525 \times 83 \times 15$	$528 \times 101 \times 23$	
HTSSOP32	SOT549	510	plug	44	25	1100	$525 \times 83 \times 15$	$528 \times 101 \times 23$	3.05 / 9.58 MSC564
TSSOP48	SOT362	510	plug	39	25	975	$525 \times 83 \times 15$	$528 \times 101 \times 23$	
TSSOP56	SOT364	510	plug	35	25	875	$525 \times 83 \times 15$	$528 \times 101 \times 23$	
PLCC28	SOT261	491	plug	34	64	2176	$530 \times 136 \times 65$	$554 \times 136 \times 81$	7.1 / 15 MSC062
PLCC44	SOT187	491	plug	26	50	1300	$530 \times 136 \times 65$	$554 \times 136 \times 81$	7.1 / 20.1 MSD503
PLCC44	SOT187	491	plug	26	48	1248	$530 \times 136 \times 65$	$554 \times 136 \times 81$	
PLCC52	SOT238	491	plug	23	44	1012	–	$554 \times 136 \times 81$	7.1 / 22.6 MBL175
PLCC68	SOT188	491	plug	18	36	648	$530 \times 136 \times 65$	$554 \times 136 \times 81$	7.1 / 27.7 MSC057
PLCC84	SOT189	491	plug	15	28	420	$530 \times 136 \times 65$	$554 \times 136 \times 81$	7.1 / 32.8 MS(
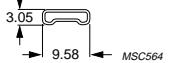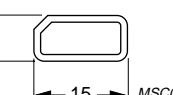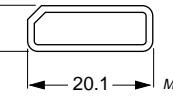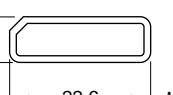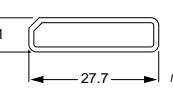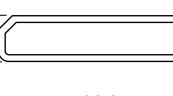
Note

1. If only a package type code is given, the data supplied is applicable to all its outline versions.

Tape and reel - surface mount devices

PACKAGE NAME	PHILIPS PACKAGE TYPE/OUTLINE CODE[1]	CARRIER DIMENSIONS D × W (mm)	SPQ AND PQ	OUTER BOX DIMENSIONS L × W × H	
				NON-DRYPACK (mm)	DRYPACK (mm)
HBCC					
HBCC24	SOT564	330 × 12	3500	341 × 338 × 30	341 × 338 × 39
HBCC32	SOT560	330 × 12	3500	341 × 338 × 30	341 × 338 × 39
LFBGA					
LFBGA56	SOT516	330 × 12	2500	341 × 338 × 26	341 × 338 × 39
LFBGA64	SOT534	330 × 16	t.b.d.	341 × 338 × 30	341 × 338 × 39
LFBGA84	SOT518	330 × 16	t.b.d.	341 × 338 × 30	341 × 338 × 39
LFBGA96	SOT536	330 × 24	3500	341 × 338 × 39	341 × 338 × 49
LFBGA114	SOT537	330 × 24	3500	341 × 338 × 39	341 × 338 × 49
LFBGA156	SOT472	330 × 24	1000	341 × 338 × 39	341 × 338 × 49
TFBGA					
TFBGA56	SOT542	330 × 12	2500	341 × 338 × 26	341 × 338 × 39
TFBGA64	SOT543	330 × 12	2500	341 × 338 × 26	341 × 338 × 39
TFBGA80	SOT557	330 × 16	t.b.d.	341 × 338 × 30	341 × 338 × 39
PLCC					
PLCC28	SOT261	180 × 24	300	191 × 188 × 39	209 × 206 × 48
PLCC28	SOT261	330 × 24	750	341 × 338 × 39	341 × 338 × 49
PLCC44	SOT187	330 × 32	500	341 × 338 × 49	341 × 338 × 68
PLCC52	SOT238	330 × 32	500	341 × 338 × 49	341 × 338 × 61
PLCC68	SOT188	330 × 44	250	341 × 338 × 61	341 × 338 × 68
PLCC84	SOT189	330 × 44	250	341 × 338 × 61	341 × 338 × 68
PMFP					
PMFP8	SOT144	180 × 8 (2 reels)	10000	185 × 185 × 32	–
QFP					
QFP44	SOT307	330 × 24	1500	341 × 338 × 39	341 × 338 × 49
QFP44	SOT205	330 × 32	1000	341 × 338 × 49	341 × 338 × 61
QFP52	SOT379	330 × 24	600	n.a.	341 × 338 × 49
QFP64	SOT319	330 × 44	500	341 × 338 × 61	341 × 338 × 68
QFP64	SOT393	330 × 32	600	341 × 338 × 49	341 × 338 × 61
QFP80	SOT310	330 × 44	500	341 × 338 × 61	341 × 338 × 68
QFP80	SOT318	330 × 44	500	341 × 338 × 61	341 × 338 × 68
QFP80	SOT496	330 × 32	1000	341 × 338 × 49	341 × 338 × 61
QFP100	SOT317	330 × 44	500	341 × 338 × 61	341 × 338 × 68
QFP100	SOT382	330 × 44	500	341 × 338 × 61	341 × 338 × 68

Packing methods

PACKAGE NAME	PHILIPS PACKAGE TYPE/OUTLINE CODE[1]	CARRIER DIMENSIONS D × W (mm)	SPQ AND PQ	OUTER BOX DIMENSIONS L × W × H	
				NON-DRYPACK (mm)	DRYPACK (mm)
LQFP					
LQFP32	SOT358	330 × 16	2000	341 × 338 × 30	341 × 338 × 39
LQFP32	SOT401	330 × 16	2000	341 × 338 × 30	341 × 338 × 39
LQFP44	SOT389	330 × 24	1500	341 × 338 × 39	341 × 338 × 49
LQFP48	SOT313	330 × 16	2000	341 × 338 × 30	341 × 338 × 39
LQFP64	SOT314	330 × 24	1500	341 × 338 × 39	341 × 338 × 49
LQFP64	SOT414	330 × 16	2000	341 × 338 × 30	341 × 338 × 39
LQFP80	SOT315	330 × 24	1000	341 × 338 × 39	341 × 338 × 49
LQFP100	SOT407	330 × 32	1000	341 × 338 × 49	341 × 338 × 61
LQFP128	SOT420	330 × 32	1000	341 × 338 × 49	341 × 338 × 61
LQFP144	SOT486	330 × 44	1750	341 × 338 × 61	341 × 338 × 68
HLQFP					
HLQFP100	SOT470	330 × 32	1000	341 × 338 × 49	341 × 338 × 61
TQFP					
TQFP44	SOT376	330 × 24	1500	341 × 338 × 39	341 × 338 × 49
TQFP80	SOT375	330 × 24	1000	341 × 338 × 39	341 × 338 × 49
HTQFP					
HTQFP32	SOT547	330 × 16	2000	341 × 338 × 30	341 × 338 × 39
HTQFP48	SOT545	330 × 16	2500	341 × 338 × 39	341 × 338 × 49
HTQFP80	SOT513	330 × 24	t.b.d.	341 × 338 × 39	341 × 338 × 49
SMS (SIL power)					
SMS13P	SOT517	330 × 44	500	–	341 × 338 × 68
SO					
SO4	SOT223	330 × 12	4000	341 × 338 × 26	341 × 338 × 39
SO8	SOT96	180 × 12	1000	191 × 188 × 26	209 × 206 × 36
SO8	SOT96	330 × 12	2500	341 × 338 × 26	341 × 338 × 39
SO8	SOT176	180 × 16	500	191 × 188 × 30	209 × 206 × 40
SO8	SOT176	330 × 16	1000	341 × 338 × 30	341 × 338 × 39
SO14	SOT108	180 × 16	1000	191 × 188 × 30	209 × 206 × 40
SO14	SOT108	330 × 16	2500	341 × 338 × 30	341 × 338 × 39
SO16	SOT109	180 × 16	1000	191 × 188 × 30	209 × 206 × 40
SO16	SOT109	330 × 16	2500	341 × 338 × 30	341 × 338 × 39
SO16	SOT162	180 × 16	500	191 × 188 × 30	209 × 206 × 40
SO16	SOT162	330 × 16	1000	341 × 338 × 30	341 × 338 × 39
SO20	SOT163	180 × 24	500	191 × 188 × 39	209 × 206 × 48
SO20	SOT163	330 × 24	2000	341 × 338 × 39	341 × 338 × 49
SO24	SOT137	180 × 24	500	191 × 188 × 39	209 × 206 × 48

Packing methods

Chapter 7

PACKAGE NAME	PHILIPS PACKAGE TYPE/OUTLINE CODE[1]	CARRIER DIMENSIONS D × W (mm)	SPQ AND PQ	OUTER BOX DIMENSIONS L × W × H	
				NON-DRYPACK (mm)	DRYPACK (mm)
SO24	SOT137	330 × 24	1000	341 × 338 × 39	341 × 338 × 49
SO28	SOT136	180 × 24	500	191 × 188 × 39	209 × 206 × 48
SO28	SOT136	330 × 24	1000	341 × 338 × 39	341 × 338 × 49
SO32	SOT287	330 × 32	1000	341 × 338 × 49	341 × 338 × 61
SOJ					
SOJ40	SOT449	330 × 44	750	–	341 × 338 × 68
VSO					
VSO40	SOT158	180 × 24	300	191 × 188 × 39	209 × 206 × 48
VSO40	SOT158	330 × 24	500	341 × 338 × 39	341 × 338 × 49
VSO56	SOT190	330 × 32	500	341 × 338 × 49	341 × 338 × 61
SSOP					
SSOP14	SOT337	330 × 16	2000	341 × 338 × 30	341 × 338 × 39
SSOP16	SOT338	330 × 16	2000	341 × 338 × 30	341 × 338 × 39
SSOP16	SOT369/SOT519	330 × 12	2500	341 × 338 × 26	341 × 338 × 39
SSOP20	SOT266	180 × 16	1000	191 × 188 × 30	209 × 206 × 40
SSOP20	SOT266	330 × 16	2500	341 × 338 × 30	341 × 338 × 39
SSOP20	SOT339	330 × 16	1000	341 × 338 × 30	341 × 338 × 39
SSOP24	SOT340	330 × 16	1000	341 × 338 × 30	341 × 338 × 39
SSOP24	SOT556	330 × 16	2500	341 × 338 × 30	341 × 338 × 39
SSOP28	SOT341	330 × 24	1000	341 × 338 × 39	341 × 338 × 49
SSOP36	SOT378	330 × 24	1000	–	341 × 338 × 49
SSOP48	SOT370	330 × 32	1000	341 × 338 × 49	341 × 338 × 61
SSOP56	SOT371	330 × 32	1000	341 × 338 × 49	341 × 338 × 61
HSSOP					
HSSOP20	SOT397/SOT418	330 × 24	500	341 × 338 × 39	341 × 338 × 49
TSSOP					
TSSOP8	SOT505	330 × 12	2500	341 × 338 × 26	341 × 338 × 39
TSSOP10	SOT552	330 × 12	2500	341 × 338 × 26	341 × 338 × 39
TSSOP14	SOT402	330 × 12	2500	341 × 338 × 26	341 × 338 × 39
TSSOP16	SOT403	330 × 12	2500	341 × 338 × 26	341 × 338 × 39
TSSOP20	SOT360	330 × 16	2500	341 × 338 × 30	341 × 338 × 39
TSSOP24	SOT355	330 × 16	2500	341 × 338 × 30	341 × 338 × 39
TSSOP28	SOT361	330 × 16	2500	341 × 338 × 30	341 × 338 × 39
TSSOP30	SOT607	330 × 16	2500	341 × 338 × 30	341 × 338 × 39
TSSOP32	SOT487	330 × 24	2000	341 × 338 × 39	341 × 338 × 49
TSSOP48	SOT362	330 × 24	2000	341 × 338 × 39	341 × 338 × 49
TSSOP56	SOT364	330 × 24	2000	341 × 338 × 39	341 × 338 × 49

Packing methods   Chapter 7

PACKAGE NAME	PHILIPS PACKAGE TYPE/OUTLINE CODE[1]	CARRIER DIMENSIONS D × W (mm)	SPQ AND PQ	OUTER BOX DIMENSIONS L × W × H	
				NON-DRYPACK (mm)	DRYPACK (mm)
HTSSOP					
HTSSOP20	SOT527	330 × 16	2500	341 × 338 × 30	341 × 338 × 39
HTSSOP32	SOT549	330 × 24	2000	341 × 338 × 39	341 × 338 × 49
TO					
TO-92	SOT465	Ammo pack	2000	341 × 260 × 30	−

Note

1. If only a package type code is given, the data supplied is applicable to all its outline versions.

Packing methods

Carrier tape dimensions - surface mount devices

PACKAGE NAME	PHILIPS PACKAGE TYPE/OUTLINE CODE[1]	CARRIER TAPE DIMENSIONS IN mm (see Fig.8)					
		A0	B0	K0	P1	W	TYPE
HBCC							
HBCC24	SOT564	4.4	4.4	1.1	8	12	A
HBCC32	SOT560	5.4	5.4	1.1	8	12	A
BGA							
BGA156	SOT472	15.3	15.3	2.2	20	24	A
LFBGA							
LFBGA56	SOT516	6.5	6.5	1.7	8	12	A
LFBGA64	SOT534	t.b.d.	t.b.d.	t.b.d.	12	16	A
LFBGA84	SOT518	7.3	7.3	2.3	12	16	A
LFBGA96	SOT536	5.9	13.9	2.2	8	24	A
LFBGA114	SOT537	5.9	16.4	2.2	8	24	A
TFBGA							
TFBGA56	SOT542	6.5	6.5	1.7	8	12	A
TFBGA64	SOT543	6.5	6.5	1.7	8	12	A
TFBGA80	SOT557	7.3	7.3	2.3	12	16	A
PLCC							
PLCC28	SOT261	13.0	13.0	4.9	16	24	A
PLCC44	SOT187	18.0	18.0	5.7	24	32	B
PLCC52	SOT238	20.5	20.5	5.3	24	32	B
PLCC68	SOT188	25.6	25.6	5.8	32	44	B
PLCC84	SOT189	30.7	30.7	5.8	36	44	B
PMFP							
PMFP8	SOT144	specific taping					
QFP							
QFP44	SOT307	13.1	13.1	2.8	24	24	A
QFP52	SOT379	14.2	14.2	2.8	24	24	A
QFP44	SOT205	19.2	19.2	3.0	24	32	B
QFP64	SOT319	19.0	25.0	3.7	32	44	B
QFP64	SOT393	18.0	18.0	3.6	24	32	B
QFP80	SOT310	19.0	25.0	3.7	32	44	B
QFP80	SOT318	19.0	25.0	3.7	32	44	B
QFP80	SOT496	19.2	19.2	3.0	24	32	B
QFP100	SOT317	19.0	25.0	3.7	32	44	B
QFP100	SOT382	19.0	25.0	3.7	32	44	B
LQFP							
LQFP32	SOT358	9.6	9.6	2.2	12	16	A
LQFP32	SOT401	7.4	7.4	1.75	12	16	A

Packing methods   Chapter 7

PACKAGE NAME	PHILIPS PACKAGE TYPE/OUTLINE CODE[(1)]	CARRIER TAPE DIMENSIONS IN mm (see Fig.8)					
		A0	B0	K0	P1	W	TYPE
LQFP44	SOT389	12.35	12.35	2.2	16	24	A
LQFP48	SOT313	9.6	9.6	2.2	12	16	A
LQFP64	SOT314	12.35	12.35	2.2	16	24	A
LQFP64	SOT414	9.6	9.6	2.2	12	16	A
LQFP80	SOT315	14.4	14.4	2.1	20	24	A
LQFP100	SOT407	16.5	16.5	1.9	20	24	A
LQFP128	SOT420	16.5	16.5	1.9	20	24	A
LQFP144	SOT486	22.6	22.6	2.15	32	44	B
HLQFP							
HLQFP100	SOT470	16.5	16.5	1.9	20	24	A
TQFP							
TQFP44	SOT376	12.35	12.35	1.85	16	24	A
TQFP48	SOT545	9.3	9.3	1.8	12	26	A
TQFP80	SOT375	14.4	14.4	2.1	20	24	A
SMS (SIL power)							
SMS13P	SOT517	20.0	24.5	5.2	24	44	B
SO							
SO4	SOT223	7.0	7.4	1.9	8	12	A
SO8	SOT96	6.65	5.4	1.8	8	12	A
SO8	SOT176	10.5	8.0	3.0	12	16	A
SO14	SOT108	6.65	9.65	1.8	8	16	A
SO16	SOT109	6.65	10.45	1.8	8	16	A
SO16	SOT162	11.1	10.95	2.7	12	16	A
SO20	SOT163	11.1	13.5	2.7	12	24	A
SO24	SOT137	11.1	16.1	2.7	12	24	A
SO28	SOT136	11.1	18.5	2.7	12	24	A
SO32	SOT287	10.9	21.2	3.1	16	32	B
SOJ							
SOJ40	SOT449	11.6	26.55	4.4	16	44	B
VSO							
VSO40	SOT158	12.8	16.3	3.0	16	24	A
VSO56	SOT190	16.0	22.3	3.15	20	32	B
SSOP							
SSOP14	SOT337	8.2	6.6	2.5	12	16	A
SSOP16	SOT338	8.2	6.6	2.5	12	16	A
SSOP16	SOT369	6.9	5.4	2.0	8	12	A
SSOP20	SOT266	7.1	7.2	2.0	12	16	A
SSOP20	SOT339	8.2	7.5	2.5	12	16	A

Packing methods

Chapter 7

PACKAGE NAME	PHILIPS PACKAGE TYPE/OUTLINE CODE[1]	CARRIER TAPE DIMENSIONS IN mm (see Fig.8)					
		A0	B0	K0	P1	W	TYPE
SSOP24	SOT340	8.2	8.8	2.5	12	16	A
SSOP24	SOT556	6.65	9.65	1.8	8	16	A
SSOP28	SOT341	8.4	10.9	2.4	12	24	A
SSOP36	SOT378	11.1	16.1	2.7	12	24	A
SSOP48	SOT370	12.0	16.2	3.2	16	32	B
SSOP56	SOT371	12.0	18.7	3.2	16	32	B
HSSOP							
HSSOP20	SOT397	14.7	16.4	4.0	20	32	B
HSSOP20	SOT418	14.7	16.4	4.0	20	32	B
TSSOP							
TSSOP8	SOT505	5.2	3.3	1.6	8	12	A
TSSOP10	SOT552	5.2	3.3	1.6	8	12	A
TSSOP14	SOT402	6.95	5.6	1.6	8	12	A
TSSOP16	SOT403	6.95	5.6	1.6	8	12	A
TSSOP20	SOT360	6.95	7.1	1.6	8	16	A
TSSOP24	SOT355	6.95	8.3	1.6	8	16	A
TSSOP28	SOT361	6.8	10.2	1.6	8	16	A
TSSOP30	SOT607	6.95	8.3	1.6	8	16	A
TSSOP32	SOT487	8.6	11.5	1.5	12	24	A
TSSOP48	SOT362	8.35	13.0	1.6	16	24	A
TSSOP56	SOT364	8.6	14.5	1.8	12	24	A
HTSSOP							
HTSSOP20	SOT527	6.95	7.1	1.6	8	16	A
HTSSOP32	SOT549	8.6	11.5	1.5	12	24	A

Note

1. If only a package type code is given, the data supplied is applicable to all its outline versions.

Packing methods
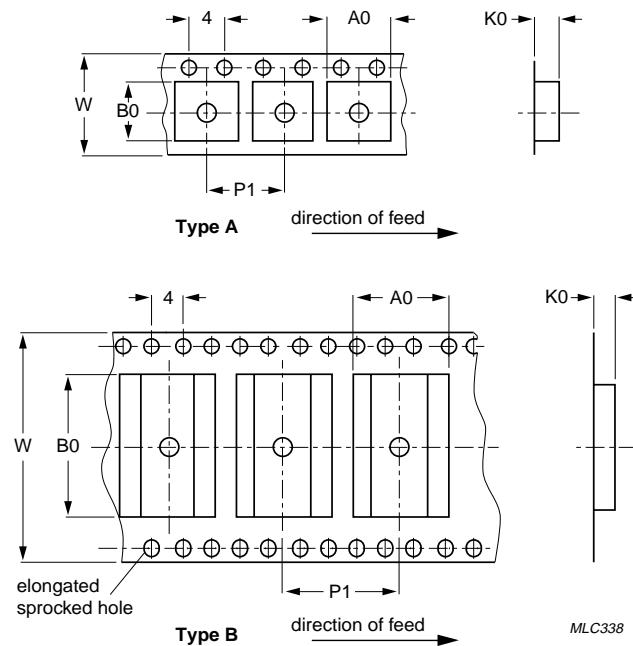
Chapter 7

Fig.8 Carrier tape (dimensions in mm).
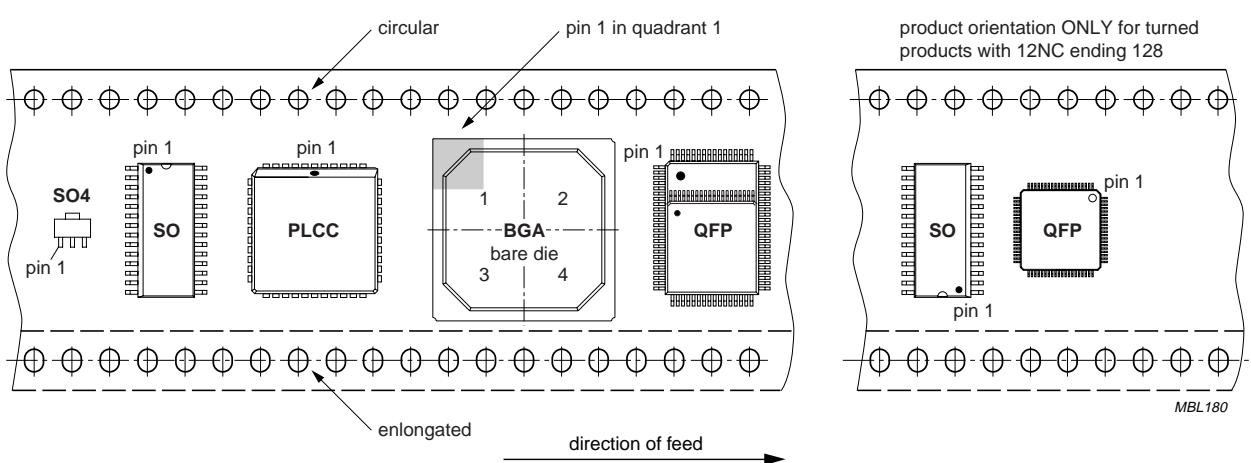
Fig.9 Product orientation in tape.

Packing methods

Chapter 7

JEDEC tray dimensions - surface mount devices (see Fig.10)

| BODY SIZE (mm)	POCKETS	COLUMNS	ROWS	COLUMN DIMENSIONS (mm)		ROW DIMENSIONS (mm)	
				C_m	C_s	R_m	R_s
QFP trays							
40 × 40	12	2	6	77.46	29.22	50.56	31.10
32 × 32	24	3	8	41.38	26.57	37.82	25.13
28 × 28	24	3	8	37.02	30.93	37.02	27.93
24 × 24	40	4	10	31.50	20.70	30.40	20.70
20 × 20	60	5	12	25.20	17.55	25.40	17.80
14 × 20	66	6	11	21.00	15.45	27.00	22.50
14 × 20	72	6	12	21.00	15.45	25.40	17.80
14 × 14	84	6	14	21.00	15.45	21.50	17.75
14 × 14	90	6	15	21.00	15.45	20.30	15.40
12 × 12	119	7	17	18.00	13.95	17.90	14.30
10 × 10	96	6	16	19.86	18.30	18.70	17.25
10 × 10	160	8	20	15.70	13.00	15.20	13.10
7 × 7	250	10	25	12.60	11.25	12.60	11.10
5 × 5	360	12	30	10.50	10.20	10.10	11.05
BGA trays							
35 × 35	24	3	8	38.00	29.95	38.00	29.95
27 × 27	40	4	10	29.20	24.15	29.20	26.10
16 × 16	84	6	14	21.40	14.45	22.00	14.50
15 × 15	126	7	18	17.20	16.35	17.20	11.30
10 × 10	184	8	23	13.15	21.92	12.40	21.10
5.5 × 16	240	15	16	t.b.d.	t.b.d.	t.b.d.	t.b.d.
5.5 × 13.5	285	15	19	t.b.d.	t.b.d.	t.b.d.	t.b.d.
8 × 8	348	12	29	t.b.d.	t.b.d.	t.b.d.	t.b.d.
7 × 7	416	13	32	9.40	11.55	9.40	11.80
6 × 6	429	13	33	8.75	15.45	8.85	15.90
5.5 × 5.5	570	15	38	t.b.d.	t.b.d.	t.b.d.	t.b.d.
5 × 5	640	16	40	t.b.d.	t.b.d.	t.b.d.	t.b.d.
4 × 4	810	18	45	6.50	12.70	6.50	14.50

Packing methods

Chapter 7
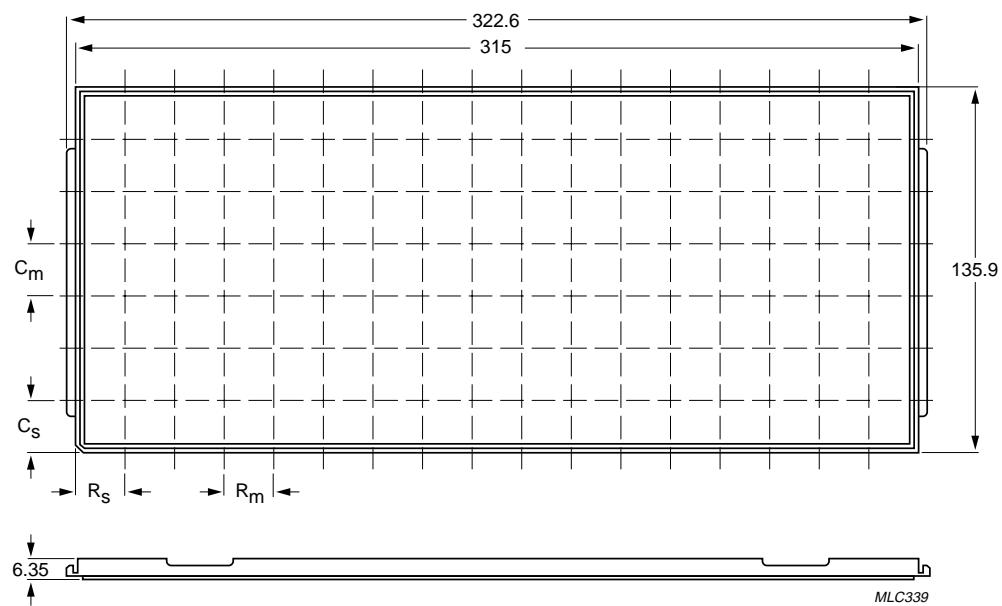
Fig.10 Tray (dimensions in mm).

Packing methods

Chapter 7

Trays - surface mount devices

PACKAGE NAME	PHILIPS PACKAGE TYPE/OUTLINE CODE[1]	PACKAGE BODY	CARRIERS PER BOX	SPQ AND PQ	OUTER BOX DIMENSIONS L × W × H	
					NON-DRYPACK (mm)	DRYPACK (mm)
BGA156	SOT472	15 × 15 mm	1	126	325 × 145 × 22	352 × 183 × 27
			5	630	348 × 148 × 47	356 × 161 × 56
BGA256	SOT466	27 × 27 mm	1	40	325 × 145 × 22	352 × 183 × 27
			5	200	348 × 148 × 47	356 × 161 × 56
BGA256	SOT471	27 × 27 mm	1	40	325 × 145 × 22	352 × 183 × 27
			5	200	348 × 148 × 47	356 × 161 × 56
BGA292	SOT489	27 × 27 mm	1	40	325 × 145 × 22	352 × 183 × 27
			5	200	348 × 148 × 47	356 × 161 × 56
BGA304	SOT550	35 × 35 mm	1	24	325 × 145 × 22	352 × 183 × 27
			5	120	348 × 148 × 47	356 × 161 × 56
BGA316	SOT531	35 × 35 mm	1	24	325 × 145 × 22	352 × 183 × 27
			5	120	348 × 148 × 47	356 × 161 × 56
BGA388	SOT532	35 × 35 mm	1	24	325 × 145 × 22	352 × 183 × 27
			5	120	348 × 148 × 47	356 × 161 × 56
BGA492	SOT514	35 × 35 mm	1	24	325 × 145 × 22	352 × 183 × 27
			5	120	348 × 148 × 47	356 × 161 × 56
HBCC24	SOT564	4 × 4 mm	1	810	325 × 145 × 22	352 × 183 × 27
			5	4050	348 × 148 × 47	356 × 161 × 56
HBCC32	SOT560	5 × 5 mm	1	640	325 × 145 × 22	352 × 183 × 27
			5	3200	348 × 148 × 47	356 × 161 × 56
HBCC292	SOT553	27 × 27 mm	1	40	325 × 145 × 22	352 × 183 × 27
			5	200	348 × 148 × 47	356 × 161 × 56
HBCC352	SOT546	35 × 35 mm	1	24	325 × 145 × 22	352 × 183 × 27
			5	120	348 × 148 × 47	356 × 161 × 56
HLQFP100	SOT470	14 × 14 mm	1	90	325 × 145 × 22	352 × 183 × 27
			5	450	348 × 148 × 47	356 × 161 × 56
HSQFP208	SOT431	28 × 28 mm	1	24	325 × 145 × 22	352 × 183 × 27
			5	120	348 × 148 × 47	356 × 161 × 56
HSQFP240	SOT464	32 × 32 mm	1	24	325 × 145 × 22	352 × 183 × 27
			5	120	348 × 148 × 47	356 × 161 × 56
HTQFP32	SOT547	5 × 5 mm	1	360	325 × 145 × 22	352 × 183 × 27
			5	1800	348 × 148 × 47	356 × 161 × 56
HTQFP48	SOT545	7 × 7 mm	1	250	325 × 145 × 22	352 × 183 × 27
			5	1250	348 × 148 × 47	356 × 161 × 56
HTQFP80	SOT513	14 × 14 mm	1	90	325 × 145 × 22	352 × 183 × 27
			5	450	348 × 148 × 47	356 × 161 × 56
LFBGA56	SOT516	6 × 6 mm	1	429	325 × 145 × 22	352 × 183 × 27
			5	2145	348 × 148 × 47	356 × 161 × 56

Packing methods

PACKAGE NAME	PHILIPS PACKAGE TYPE/OUTLINE CODE[1]	PACKAGE BODY	CARRIERS PER BOX	SPQ AND PQ	OUTER BOX DIMENSIONS L × W × H	
					NON-DRYPACK (mm)	DRYPACK (mm)
LFBGA64	SOT534	8 × 8 mm	1	348	325 × 145 × 22	352 × 183 × 27
			5	1740	348 × 148 × 47	356 × 161 × 56
LFBGA84	SOT518	7 × 7 mm	1	416	325 × 145 × 22	352 × 183 × 27
			5	2080	348 × 148 × 47	356 × 161 × 56
LFBGA96	SOT536	5.5 × 13.5 mm	1	285	325 × 145 × 22	352 × 183 × 27
			5	1425	348 × 148 × 47	356 × 161 × 56
LFBGA114	SOT537	5.5 × 16 mm	1	240	325 × 145 × 22	352 × 183 × 27
			5	1200	348 × 148 × 47	356 × 161 × 56
LFBGA324	SOT571	16 × 16 mm	1	84	325 × 145 × 22	352 × 183 × 27
			5	420	348 × 148 × 47	356 × 161 × 56
LQFP32	SOT358	7 × 7 mm	1	250	325 × 145 × 22	352 × 183 × 27
			5	1250	348 × 148 × 47	356 × 161 × 56
LQFP32	SOT401	5 × 5 mm	1	360	325 × 145 × 22	352 × 183 × 27
			5	1800	348 × 148 × 47	356 × 161 × 56
LQFP44	SOT389	10 × 10 mm	1	160	325 × 145 × 22	352 × 183 × 27
			5	800	348 × 148 × 47	356 × 161 × 56
LQFP48	SOT313	7 × 7 mm	1	250	325 × 145 × 22	352 × 183 × 27
			5	1250	348 × 148 × 47	356 × 161 × 56
LQFP64	SOT314	10 × 10 mm	1	160	325 × 145 × 22	352 × 183 × 27
			5	800	348 × 148 × 47	356 × 161 × 56
LQFP64	SOT414	7 × 7 mm	1	250	325 × 145 × 22	352 × 183 × 27
			5	1250	348 × 148 × 47	356 × 161 × 56
LQFP80	SOT315	12 × 12 mm	1	119	325 × 145 × 22	352 × 183 × 27
			5	595	348 × 148 × 47	356 × 161 × 56
LQFP100	SOT407	14 × 14 mm	1	90	325 × 145 × 22	352 × 183 × 27
			5	450	348 × 148 × 47	356 × 161 × 56
LQFP128	SOT420	14 × 14 mm	1	90	325 × 145 × 22	352 × 183 × 27
			5	450	348 × 148 × 47	356 × 161 × 56
LQFP128	SOT425	14 × 20 mm	1	72	325 × 145 × 22	352 × 183 × 27
			5	360	348 × 148 × 47	356 × 161 × 56
LQFP144	SOT486	20 × 20 mm	1	60	325 × 145 × 22	352 × 183 × 27
			5	300	348 × 148 × 47	356 × 161 × 56
LQFP160	SOT435	24 × 24 mm	1	40	325 × 145 × 22	352 × 183 × 27
			5	200	348 × 148 × 47	356 × 161 × 56
LQFP176	SOT506	24 × 24 mm	1	40	325 × 145 × 22	352 × 183 × 27
			5	200	348 × 148 × 47	356 × 161 × 56
LQFP208	SOT459	28 × 28 mm	1	36	325 × 145 × 22	352 × 183 × 27
			5	180	348 × 148 × 47	356 × 161 × 56

Packing methods

PACKAGE NAME	PHILIPS PACKAGE TYPE/OUTLINE CODE[1]	PACKAGE BODY	CARRIERS PER BOX	SPQ AND PQ	OUTER BOX DIMENSIONS L × W × H	
					NON-DRYPACK (mm)	DRYPACK (mm)
MSQFP240	SOT474	32 × 32 mm	1	24	325 × 145 × 22	352 × 183 × 27
			5	120	348 × 148 × 47	356 × 161 × 56
QFP44	SOT205	14 × 14 mm	1	84	325 × 145 × 22	352 × 183 × 27
			5	420	348 × 148 × 47	356 × 161 × 56
QFP44	SOT307	10 × 10 mm	1	96	325 × 145 × 22	352 × 183 × 27
			5	480	348 × 148 × 47	356 × 161 × 56
QFP52	SOT379	10 × 10 mm	5	480	348 × 148 × 47	356 × 161 × 56
QFP64	SOT319	14 × 20 mm	1	66	325 × 145 × 22	352 × 183 × 27
			5	330	348 × 148 × 47	356 × 161 × 56
QFP64	SOT393	14 × 14 mm	1	84	325 × 145 × 22	352 × 183 × 27
			5	420	348 × 148 × 47	356 × 161 × 56
QFP80	SOT310	14 × 20 mm	1	66	325 × 145 × 22	352 × 183 × 27
			5	330	348 × 148 × 47	356 × 161 × 56
QFP80	SOT318	14 × 20 mm	1	66	325 × 145 × 22	352 × 183 × 27
			5	330	348 × 148 × 47	356 × 161 × 56
QFP80	SOT496	14 × 14 mm	1	84	325 × 145 × 22	352 × 183 × 27
			5	420	348 × 148 × 47	356 × 161 × 56
QFP100	SOT317	14 × 20 mm	1	66	325 × 145 × 22	352 × 183 × 27
			5	330	348 × 148 × 47	356 × 161 × 56
QFP100	SOT382	14 × 20 mm	1	66	325 × 145 × 22	352 × 183 × 27
			5	330	348 × 148 × 47	356 × 161 × 56
QFP120	SOT349	28 × 28 mm	1	24	325 × 145 × 22	352 × 183 × 27
			5	120	348 × 148 × 47	356 × 161 × 56
QFP128	SOT320	28 × 28 mm	1	24	325 × 145 × 22	352 × 183 × 27
			5	120	348 × 148 × 47	356 × 161 × 56
QFP144	SOT573	28 × 28 mm	1	24	325 × 145 × 22	352 × 183 × 27
			5	120	348 × 148 × 47	356 × 161 × 56
QFP160	SOT322	28 × 28 mm	1	24	325 × 145 × 22	352 × 183 × 27
			5	120	348 × 148 × 47	356 × 161 × 56
SQFP128	SOT387	14 × 20 mm	1	66	325 × 145 × 22	352 × 183 × 27
			5	330	348 × 148 × 47	356 × 161 × 56
SQFP208	SOT316	28 × 28 mm	1	24	325 × 145 × 22	352 × 183 × 27
			5	120	348 × 148 × 47	356 × 161 × 56
SQFP240	SOT334	32 × 32 mm	1	24	325 × 145 × 22	352 × 183 × 27
			5	120	348 × 148 × 47	356 × 161 × 56
SQFP304	SOT575	40 × 40 mm	1	12	325 × 145 × 22	352 × 183 × 27
			5	60	348 × 148 × 47	356 × 161 × 56
TFBGA56	SOT542	6 × 6 mm	1	429	325 × 145 × 22	352 × 183 × 27
			5	2145	348 × 148 × 47	356 × 161 × 56

Packing methods

Chapter 7

PACKAGE NAME	PHILIPS PACKAGE TYPE/OUTLINE CODE[1]	PACKAGE BODY	CARRIERS PER BOX	SPQ AND PQ	OUTER BOX DIMENSIONS L $\times$ W $\times$ H	
					NON-DRYPACK (mm)	DRYPACK (mm)
TFBGA64	SOT543	6 $\times$ 6 mm	1	429	325 $\times$ 145 $\times$ 22	352 $\times$ 183 $\times$ 27
			5	2145	348 $\times$ 148 $\times$ 47	356 $\times$ 161 $\times$ 56
TFBGA80	SOT557	7 $\times$ 7 mm	1	416	325 $\times$ 145 $\times$ 22	352 $\times$ 183 $\times$ 27
			5	2580	348 $\times$ 148 $\times$ 47	356 $\times$ 161 $\times$ 56
TQFP44	SOT376	10 $\times$ 10 mm	1	160	325 $\times$ 145 $\times$ 22	352 $\times$ 183 $\times$ 27
			5	800	348 $\times$ 148 $\times$ 47	356 $\times$ 161 $\times$ 56
TQFP64	SOT357	10 $\times$ 10 mm	1	160	325 $\times$ 145 $\times$ 22	352 $\times$ 183 $\times$ 27
			5	800	348 $\times$ 148 $\times$ 47	356 $\times$ 161 $\times$ 56
TQFP80	SOT375	12 $\times$ 12 mm	1	119	325 $\times$ 145 $\times$ 22	352 $\times$ 183 $\times$ 27
			5	595	348 $\times$ 148 $\times$ 47	356 $\times$ 161 $\times$ 56
TQFP100	SOT386	14 $\times$ 14 mm	1	90	325 $\times$ 145 $\times$ 22	352 $\times$ 183 $\times$ 27
			5	450	348 $\times$ 148 $\times$ 47	356 $\times$ 161 $\times$ 56

Note

1. If only a package type code is given, the data supplied is applicable to all its outline versions.