Material Declaration Data for Altera's ROHS Compliant Devices (8 DIP – 84 PLCC)

Last Updated: Sept 7, 2010

Package Type	8 PDIP	8 SOIC	16 SOIC	20 PLCC	24 PDIP	28 PLCC	32 TQFP	44 PLCC	44 PQFP	44 TQFP	49 UBGA	68 PLCC	68 MBGA	84 PLCC
Pitch	2.5 mm	1.27 mm	1.27 mm	1.27 mm	2.5 mm	1.27 mm	0.8 mm	1.27 mm	0.8 mm	0.8 mm	0.8 mm	1.27 mm	0.5 mm	1.27 mm
Technology	Wire Bond	Wire Bond	Wire Bond	Wire Bond	Wire Bond	Wire Bond	Wire Bond	Wire Bond	Wire Bond	Wire Bond	Wire Bond	Wire Bond	Wire Bond	Wire Bond
Termination or Ball Finish	Matte Tin (over Cu)	NiPdAu	NiPdAu	Matte Tin (over Cu)	Matte Tin (over Cu)	Matte Tin (over Cu)	Matte Tin (over Cu)	Matte Tin (over Cu)	Matte Tin (over Cu)	Matte Tin (over Cu)	SnAgCu	Matte Tin (over Cu)	SnAgCu	Matte Tin (over Cu)
JESD 97 marking	e3	e4	e4	e3	e3	e3	e3	e3	e3	e3	e1	e3	e1	e3
Whisker mitigation Technique	Anneal [*5]	N/A	N/A	Anneal [*5]	Anneal [*5]	Anneal [*5]	Anneal [*5]	Anneal [*5]	Anneal [*5]	Anneal [*5]	N/A	Anneal [*5]	N/A	Anneal [*5]
Plating thickness	12 um	Ni: 1um, Pd: 0.05um, Au: 0.006um	Ni: 1um, Pd: 0.05um, Au: 0.006um	12 um	12 um	12 um	12 um	12 um	12 um	12 um	N/A	12 um	N/A	12 um
ROHS technology exemption	None	None	None	None	None	None	None	None	None	None	None	None	None	None
Peak Reflow Temperature (IPC/JEDEC J-STD-020C) [*6]	-	260°C	260°C	245°C	-	245°C	260°C	245°C	245°C	260°C	260°C	245°C	260°C	245°C
Is this ROHS-compliant version backward compatible with conventional tin-lead soldering?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No	Yes
Surface Mount (SM) or Through Hole (TH)	TH	SM	SM	SM	TH	SM	SM	SM	SM	SM	SM	SM	SM	SM
JIG-101 Edition 2: DBP (at homogenous material level)	~ 0% [*3]	0.23% [*1]	0.23% [*1]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]
JIG-101 Edition 2: Pb (at homogenous material level)	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]
JIG-101 Edition 2: Brominated Flame Retardants (at homogenous material level)	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	up to 6.4%	~ 0% [*3]	up to 6.4%	~ 0% [*3]
JIG-101 Edition 2: All other Substance categories	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]

*1 Dibutyl phthalate (DBP, CAS # 84-74-2) is present in silver epoxy

*2 Solder bumps in Flip Chip BGA packages contain lead (Pb, CAS # 7439-92-1). This application is exempted by EU ROHS "Lead (Pb) in solders to complete a viable electrical connection between semiconductor die and carrier within integrated circuit Flip Chip packages".

*3 Substance is not present at the Reportable Application or are Not Exceeding the Reporting Threshold level per JIG-101 Edition 2

*4 The following part numbers have MIR/MCR TQFP packages with 245°C peak temperature: EP20K100ETC144-1N, EP20K100ETC144-2N, EP20K160ETC144-2N, EP20K160ETC144-3N, EP20K30ETC144-2N, EP20K30ETC144-3N, EP20K60ETC144-2N, EP20K60ETC144-3N

*5 Annealing: 1 hr at 150°C within 24 hours post plating process

*6 Time within 5° of peak Temperature: 20 to 40 sec

Material Declaration Data for Altera’s ROHS Compliant Devices (88 UBGA – 169 UBGA)

Package Type		88 UBGA	100 FBGA	100 MBGA	100 PQFP	100 TQFP	144 EQFP	144 FBGA	144 MBGA	144 TQFP	148 QFN	160 PQFP	164 MBGA	169 FBGA	169 UBGA
Pitch		0.8 mm	1.0 mm	0.5 mm	0.65 mm	0.50 mm	0.5 mm	1.0 mm	0.5 mm	0.50 mm	0.50 mm	0.65 mm	0.5 mm	1.0 mm	0.8 mm
Technology		Wire Bond	Wire Bond	Wire Bond	Wire Bond	Wire Bond	Wire Bond	Wire Bond	Wire Bond	Wire Bond	Wire Bond	Wire Bond	Wire Bond	Wire Bond	Wire Bond
Termination or Ball Finish		SnAgCu	SnAgCu	SnAgCu	Matte Tin (over Cu)	Matte Tin (over Cu)	Matte Tin (over Cu)	SnAgCu	SnAgCu	Matte Tin (over Cu)	NiAu	Matte Tin (over Cu)	SnAgCu	SnAgCu	SnAgCu
JESD 97 marking		e1	e1	e1	e3	e3	e3	e1	e1	e3	e4	e3	e1	e1	e1
Whisker mitigation Technique		N/A	N/A	N/A	Anneal [*5]	Anneal [*5]	Anneal [*5]	N/A	N/A	Anneal [*5]	N/A	Anneal [*5]	N/A	N/A	N/A
Plating thickness		N/A	N/A	N/A	12 um	12 um	12 um	N/A	N/A	12 um	Au 0.2um Ni 5~15um	12 um	N/A	N/A	N/A
ROHS technology exemption		None	None	None	None	None	None	None	None	None	None	None	None	None	None
Peak Reflow Temperature (IPC/JEDEC J-STD-020C) [*6]		260°C	260°C	260°C	245°C	260°C	260°C	260°C	260°C	260°C [*4]	260°C	245°C	260°C	260°C	260°C
Is this ROHS-compliant version backward compatible with conventional tin-lead soldering?		No	No	No	Yes	Yes	Yes	No	No	Yes	Yes	Yes	No	No	No
Surface Mount (SM) or Through Hole (TH)		SM	SM	SM	SM	SM	SM	SM	SM	SM	SM	SM	SM	SM	SM
JIG-101 Edition 2	DBP (at homogenous material level)	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]
	Pb (at homogenous material level)	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]
	Brominated Flame Retardants (at homogenous material level)	up to 6.4%	up to 6.4%	up to 6.4%	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	up to 6.4%	up to 6.4%	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	up to 6.4%	up to 6.4%	up to 6.4%
	All other Substance categories	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]

*1 Dibutyl phthalate (DBP, CAS # 84-74-2) is present in silver epoxy

*2 Solder bumps in Flip Chip BGA packages contain lead (Pb, CAS # 7439-92-1). This application is exempted by EU ROHS "Lead (Pb) in solders to complete a viable electrical connection between semiconductor die and carrier within integrated circuit Flip Chip packages".

*3 Substance is not present at the Reportable Application or are Not Exceeding the Reporting Threshold level per JIG-101 Edition 2

*4 The following part numbers have MIR/MCR TQFP packages with 245°C peak temperature: EP20K100ETC144-1N, EP20K100ETC144-2N, EP20K160ETC144-2N, EP20K160ETC144-3N, EP20K30ETC144-2N, EP20K30ETC144-3N, EP20K60ETC144-2N, EP20K60ETC144-3N

*5 Annealing: 1 hr at 150°C within 24 hours post plating process

*6 Time within 5° of peak Temperature: 20 to 40 sec

Material Declaration Data for Altera's ROHS Compliant Devices (208 PQFP - 400 FBGA)

Package Type	208 PQFP	208 RQFP	240 PQFP	240 RQFP	256 BGA	256 FBGA	256 MBGA	256 UBGA	304 RQFP	324 FBGA	356 BGA	358 UBGA	400 FBGA
Pitch	0.50 mm	0.50 mm	0.50 mm	0.50 mm	1.27 mm	1.0 mm	0.5 mm	0.8 mm	0.5 mm	1.0 mm	1.27 mm	0.80mm	1.0 mm
Technology	Wire Bond	Wire Bond	Wire Bond	Wire Bond	Wire Bond	Wire Bond	Wire Bond	Wire Bond	Wire Bond	Wire Bond	Wire Bond	Flip Chip	Wire Bond
Termination or Ball Finish	Matte Tin (over Cu)	Matte Tin (over Cu)	Matte Tin (over Cu)	Matte Tin (over Cu)	SnAgCu	SnAgCu	SnAgCu	SnAgCu	Matte Tin (over Cu)	SnAgCu	SnAgCu	SnAgCu	SnAgCu
JESD 97 marking	e3	e3	e3	e3	e1	e1	e1	e1	e3	e1	e1	e1	e1
Whisker mitigation Technique	Anneal [*5]	Anneal [*5]	Anneal [*5]	Anneal [*5]	N/A	N/A	N/A	N/A	Anneal [*5]	N/A	N/A	N/A	N/A
Plating thickness	12 um	12 um	12 um	12 um	N/A	N/A	N/A	N/A	12 um	N/A	N/A	N/A	N/A
ROHS technology exemption	None	None	None	None	None	None	None	None	None	None	None	Yes [*2]	None
Peak Reflow Temperature (IPC/JEDEC J-STD-020C) [*6]	245°C	245°C	245°C	245°C	260°C	260°C	260°C	260°C	245°C	260°C	245°C	260°C	260°C
Is this ROHS-compliant version backward compatible with conventional tin-lead soldering?	Yes	Yes	Yes	Yes	No	No	No	No	Yes	No	No	No	No
Surface Mount (SM) or Through Hole (TH)	SM	SM	SM	SM	SM	SM	SM	SM	SM	SM	SM	SM	SM
JIG-101 Edition 2: DBP (at homogenous material level)	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	0.23% [*1]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	0.23% [*1]	~ 0% [*3]	~ 0% [*3]
JIG-101 Edition 2: Pb (at homogenous material level)	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	37 - 95% [*2]	~ 0% [*3]
JIG-101 Edition 2: Brominated Flame Retardants (at homogenous material level)	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	up to 6.4%	up to 6.4%	up to 6.4%	up to 6.4%	~ 0% [*3]	up to 6.4%	up to 6.4%	up to 6.4%	up to 6.4%
JIG-101 Edition 2: All other Substance categories	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]

*1 Dibutyl phthalate (DBP, CAS # 84-74-2) is present in silver epoxy

*2 Solder bumps in Flip Chip BGA packages contain lead (Pb, CAS # 7439-92-1). This application is exempted by EU ROHS "Lead (Pb) in solders to complete a viable electrical connection between semiconductor die and carrier within integrated circuit Flip Chip packages".

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*4 The following part numbers have MIR/MCR TQFP packages with 245°C peak temperature: EP20K100ETC144-1N, EP20K100ETC144-2N, EP20K160ETC144-2N, EP20K160ETC144-3N, EP20K30ETC144-2N, EP20K30ETC144-3N, EP20K60ETC144-2N, EP20K60ETC144-3N

*5 Annealing: 1 hr at 150°C within 24 hours post plating process

*6 Time within 5° of peak Temperature: 20 to 40 sec

Material Declaration Data for Altera's ROHS Compliant Devices (484 FBGA – 724 BGA)

Package Type		484 FBGA	484 FBGA	484 HBGA	484 UBGA	572 FBGA	600 BGA	652 BGA	652 BGA	672 BGA	672 FBGA	672 FBGA	724 BGA	780 FBGA	780 FBGA
Pitch		1.0 mm	1.0 mm	1.0 mm	0.8 mm	1.0 mm	1.27 mm	1.27 mm	1.27 mm	1.27 mm	1.0 mm	1.0 mm	1.27 mm	1.0 mm	1.0 mm
Technology		Flip Chip	Wire Bond	Flip Chip	Wire Bond	Flip Chip	Wire Bond	Flip Chip	Wire Bond	Wire Bond	Flip Chip	Wire Bond	Flip Chip	Flip Chip	Wire Bond
Termination or Ball Finish		SnAgCu	SnAgCu	SnAgCu	SnAgCu	SnAgCu	SnAgCu	SnAgCu	SnAgCu	SnAgCu	SnAgCu	SnAgCu	SnAgCu	SnAgCu	SnAgCu
JESD 97 marking		e1	e1	e1	e1	e1	e1	e1	e1	e1	e1	e1	e1	e1	e1
Whisker mitigation Technique		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Plating thickness		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ROHS technology exemption		Yes [*2]	None	Yes [*2]	None	Yes [*2]	None	Yes [*2]	None	None	Yes [*2]	None	Yes [*2]	Yes [*2]	None
Peak Reflow Temperature (IPC/JEDEC J-STD-020C) [*6]		245°C	250-260°C	245°C	260°C	260°C	245°C	245°C	245°C	260°C	245°C	260°C	245°C	245°C	245°C
Is this ROHS-compliant version backward compatible with conventional tin-lead soldering?		No	No	No	No	No	No	No	No	No	No	No	No	No	No
Surface Mount (SM) or Through Hole (TH)			SM	SM	SM	SM	SM	SM	SM	SM	SM	SM	SM	SM	SM
JIG-101 Edition 2	DBP (at homogenous material level)	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	0.23% [*1]	~ 0% [*3]	0.23% [*1]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]
	Pb (at homogenous material level)	37 - 95% [*2]	~ 0% [*3]	37 - 95% [*2]	~ 0% [*3]	37 - 95% [*2]	~ 0% [*3]	37 - 95% [*2]	~ 0% [*3]	~ 0% [*3]	37 - 95% [*2]	~ 0% [*3]	37 - 95% [*2]	37 - 95% [*2]	~ 0% [*3]
	Brominated Flame Retardants (at homogenous material level)	up to 6.4%	up to 6.4%	up to 6.4%	up to 6.4%	up to 6.4%	up to 6.4%	up to 6.4%	up to 6.4%	up to 6.4%	up to 6.4%	up to 6.4%	up to 6.4%	up to 6.4%	up to 6.4%
	All other Substance categories	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]	~ 0% [*3]

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*2 Solder bumps in Flip Chip BGA packages contain lead (Pb, CAS # 7439-92-1). This application is exempted by EU ROHS "Lead (Pb) in solders to complete a viable electrical connection between semiconductor die and carrier within integrated circuit Flip Chip packages".

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*5 Annealing: 1 hr at 150°C within 24 hours post plating process

*6 Time within 5° of peak Temperature: 20 to 40 sec

Material Declaration Data for Altera's ROHS Compliant Devices (780 FBGA – 1932 FBGA)

Package Type		780 HBGA	896 FBGA	956 BGA	1020 FBGA	1152 FBGA	1152 HBGA	1508 FBGA	1517 FBGA	1517 HBGA	1760 FBGA	1932 FBGA
Pitch		1.0 mm	1.0 mm	1.27 mm	1.0 mm	1.0 mm	1.0 mm	1.0 mm	1.0 mm	1.0 mm	1.0 mm	1.0 mm
Technology		Flip Chip	Wire Bond	Flip Chip	Flip Chip	Flip Chip	Flip Chip	Flip Chip	Flip Chip	Flip Chip	Flip Chip	Flip Chip
Termination or Ball Finish		SnAgCu	SnAgCu	SnAgCu	SnAgCu	SnAgCu	SnAgCu	SnAgCu	SnAgCu	SnAgCu	SnAgCu	SnAgCu
JESD 97 marking		e1	e1	e1	e1	e1	e1	e1	e1	e1	e1	e1
Whisker mitigation Technique		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Plating thickness		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ROHS technology exemption		Yes *2	None	Yes *2	Yes *2	Yes *2	Yes *2	Yes *2	Yes *2	Yes *2	Yes *2	Yes *2
Peak Reflow Temperature (IPC/JEDEC J-STD-020C) *6		245°C	260°C	245°C	245°C	245°C	245°C	245°C	245°C	245°C	245°C	245°C
Is this ROHS-compliant version backward compatible with conventional tin-lead soldering?		No	No	No	No	No	No	No	No	No	No	No
Surface Mount (SM) or Through Hole (TH)		SM	SM	SM	SM	SM	SM	SM	SM	SM	SM	SM
JIG-101 Edition 2	DBP (at homogenous material level)	~ 0% *3	~ 0% *3	~ 0% *3	~ 0% *3	~ 0% *3	~ 0% *3	~ 0% *3	~ 0% *3	~ 0% *3	~ 0% *3	~ 0% *3
	Pb (at homogenous material level)	37 - 95% *2	~ 0% *3	37 - 95% *2	37 - 95% *2	37 - 95% *2	37 - 95% *2	37 - 95% *2	37 - 95% *2	37 - 95% *2	37 - 95% *2	37 - 95% *2
	Brominated Flame Retardants (at homogenous material level)	up to 6.4%	up to 6.4%	up to 6.4%	up to 6.4%	up to 6.4%	up to 6.4%	up to 6.4%	up to 6.4%	up to 6.4%	up to 6.4%	up to 6.4%
	All other Substance categories	~ 0% *3	~ 0% *3	~ 0% *3	~ 0% *3	~ 0% *3	~ 0% *3	~ 0% *3	~ 0% *3	~ 0% *3	~ 0% *3	~ 0% *3

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*6 Time within 5° of peak Temperature: 20 to 40 sec