Please write customer's name to submit.

Shift to Lead(Pb)-Free Packages for System LSI Products (2nd Stage)

In consideration of the global environmental issues, Toshiba has been making efforts in reducing the use of lead compound. As a part of such efforts, we intend to implement the following plan for Lead(Pb)-free products.

We would like to announce the shift to the product with no Lead(Pb) (Lead(Pb)-free products) as follows. Please let us have your comments, requests and questions concerning the plan, if any, through our sales representative.

Your cooperation to the shift would be much appreciated.

Please write the applicable Part No. in reference from the list.

1. Applicable Part No.

2. Content of Lead(Pb)-Free

For the outer leads of semiconductor products, Sn-Pb (tin-lead) has been used conventionally. A shift to Lead(Pb)- free products is to be implemented on a package type basis.
There is a possibility that material of package is changed to correspond to Lead(Pb)-free.

3. Purpose of Change

In consideration of the influence to the global environment, we are going to reduce the use of Lead (Pb)-free.

4. Contents of Change for Subject Products

The material of lead finish is changed as follows.

Current (containing Lead(Pb))	New (Lead(Pb)-free))
Sn-Pb (tin/lead) Plating	Sn-Ag (tin/silver) Plating
Sn-Pb (tin/lead) Dipping	Sn-Ag (tin/silver) Plating

5. Timing of Change

As we intend to start the shift from the production of June 2004, we would appreciate your cooperation. (Refer to the attachment.)
We would like to ask your judgment and approval on this shift by April 28, 2004.
The start of delivery might be delayed according to the stock containing Pb.
If you wish to perform evaluation on Lead(Pb)-free products, please ask our sales representative to supply you with samples for it.

6. Recommended mounting conditions

It is necessary to increase the heat resistance temperature for Lead(Pb)-free products, since it becomes higher in temperature than that of the conventional products containing Pb. The mounting conditions of semiconductors are classified as follows according to the soldering methods.

(1) Mounting temperature

The maximum heat resistance assured temperature of reflow soldering is increased from present 240? to 260? . However, for the package with a great heat capacity (cubic capacity of 2,000 mm3 or above), the maximum temperature is 250? , for the temperature does not easily go up due to the capacity.
Please refer to the profile in the attachment " Implementation of Lead(Pb)-free Finish of System LSI Semiconductor Products (manufactured in Japan)" for the recommended mounting conditions.

Note) Heat resistance guaranty : Mount under 30°C/60% or less within 168h
- Reflow times : less than twice
- Reflow condition : (Max temperature 260°C) 230°C within 50sec.

(2) Condition after opening moisture-proof bag

The maximum usable time of Lead (Pb)-free products out of moisture-proof bag (168 hours under 30? , 60%RH or less), is basically equivalent to that of the conventional products.

(3) Solderability

On the assumption that Sn-Ag-Cu solder is used for mounting, the solder dipping method and Meniscograph proved its meeting the criteria of 245? for 5 sec. for solderability of Lead(Pb) –f ree products.

Additionally, we performed the solder-joint intensity test after mounting in the reflow temperature profile (maximum temperature of 235?) and compared the result with that of the conventional parts containing Pb proving it is equivalent in quality as a result for further confirmation.

7. Reliability

The reliability of Lead(Pb)-free products has been evaluated according to the classifications of package and terminal finish (the evaluation of solder heat-resistance of the package and reliability after the heat-resistance test) and confirmed to be equivalent to the conventional products.

Please refer to the reliability test result in the attachment " Implementation of Lead(Pb)-free Finish of System LSI Semiconductor Products (manufactured in Japan)".

8. How to distinguish the Lead-free product

Discrimination whether lead(Pb) or lead(Pb)-free is possible from the marking on products and/or the label of a carton box.

Package Category	Product Name / Mark on Product	Discrimination mark on a label
Terminal finish with Lead (not used Lead (Pb) inside package) to Lead-Free	Add “G” to the end of full code	Lead (Pb)-Free
Terminal finish with Lead (used Lead inside package) to Lead-Free	Add “Q” to the end of full code	Lead (Pb)-Free Finish

Yours faithfully,

S. Matsumoto
Manager / IC QA Sect.
Quality Assurance Dept.
Kitakyushu Operations

Kitakyushu Operations / Quality Assurance Dept.

Address : 1-10-1, Shimoitozu, Kokura-kitaku,
Kitakyushu-city, Fukuoka, 803-8686, Japan

Tel : (093) 562-1472
Fax : (093) 562-1476

· Pb-free Recommended Package (Product List) to be changed (2nd Stage)

2004/3/31

PKG Local Name	Standard PKG Name	P K G Type	SBU	Product Code	Produce Name before Change	Product Name after Change (G/Q/(F)/(Q))	Pb-free Family Name registered in (Kitakyushu)	Production Line is available from	Mass Production is available from
MFP16 (30 series)	SSOP16-P-225-1.00A	SMD	AUDIO	401A0430	KIA6206F	KIA6206FG	KIA6206FG	May	June
QFP44(.8) 2.3T	QFP44-P-1010-0.8B	SMD	A-D for Industry	40297490	T1796BF	T1796BFG	T1796BFG	June	July
MFP16 (30 series)	SSOP16-P-225-1.00A	SMD	A-D for Industry	401A0516	T2BD9F	T2BD9FG	T2BD9FG	May	June
N-DIP36	SDIP36-P-500-1.78	THD	TV	40385647	TA1217AN	TA1217ANG	TA1217ANG	May	June
N-DIP36	SDIP36-P-500-1.78	THD	TV	40385657	TA1219AN	TA1219ANG	TA1219ANG	May	June
N-DIP36	SDIP36-P-500-1.78	THD	TV	40385655	TA1219N	TA1219NG	TA1219NG	May	June
N-DIP20	SDIP20-P-300-1.78	THD	TV	40385685	TA1226N	TA1226NG	TA1226NG	May	June
N-DIP54	SDIP54-P-600-1.78	THD	TV	40385776	TA1232AN	TA1232ANG	TA1232ANG	May	June
MFP24	SSOP24-P-300-1.00	SMD	TV	401A0087	TA1238F(DRY)	TA1238FG(DRY)	TA1238FG	May	June
MFP24	SSOP24-P-300-1.00	SMD	TV	40385832	TA1238F(EL,DRY)	TA1238FG(EL,DRY)	TA1238FG	May	June
MFP24	SSOP24-P-300-1.00	SMD	TV	40385825	TA1243CF	TA1243CFG	TA1243CFG	May	June
MFP24	SSOP24-P-300-1.00	SMD	TV	40385826	TA1243CF(EL)	TA1243CFG(EL)	TA1243CFG	May	June
MFP16 (30 series)	SSOP16-P-225-1.00A	SMD	TV	40385891	TA1249F(EL)	TA1249FG(EL)	TA1249FG	May	June
MFP24(Cu)	SSOP24-P-300-1.00B	SMD	TV	40386012	TA1267AF(EL)	TA1267AFG(EL)	TA1267AFG	May	June
MFP24(Cu)	SSOP24-P-300-1.00B	SMD	TV	40386013	TA1267AF(FAO2,EL)	TA1267AFG(FAO2,EL)	TA1267AFG	May	June
MFP24(Cu)	SSOP24-P-300-1.00B	SMD	TV	40386031	TA1267F(EL)	TA1267FG(EL)	TA1267FG	May	June
QFP48	QFP48-P-1014-0.8	SMD	TV	40386049	TA1270AF(J)	TA1270AFG	TA1270AFG	May	June
QFP48	QFP48-P-1014-0.8	SMD	TV	401A0238	TA1270BF(J)	TA1270BFG	TA1270BFG	May	June
MFP24	SSOP24-P-300-1.00	SMD	TV	40386286	TA1272AF(EL)	TA1272AFG(EL)	TA1272AFG	May	June
MFP24(Cu)	SSOP24-P-300-1.00B	SMD	TV	40386198	TA1274F(EL)	TA1274FG(EL)	TA1274FG	May	June
MFP24(Cu)	SSOP24-P-300-1.00B	SMD	TV	401A7861	TA1274F(FA03A4,EL)	TA1274FG(FA03A4,EL)	TA1274FG	May	June
MFP24(Cu)	SSOP24-P-300-1.00B	SMD	TV	401A8426	TA1274F(FA03A5,EL)	TA1274FG(FA03A5,EL)	TA1274FG	May	June
µPFP80(.8)	QFP80-P-1420-0.80C	SMD	TV	401A0352	TA1276AF	TA1276AFG	TA1276AFG	May	June
MFP16 (30 series)	SSOP16-P-225-1.00A	SMD	TV	40386242	TA1286AF(MMC,ER)	TA1286AFG(MMC,ER)	TA1286AFG	May	June
MFP16 (30 series)	SSOP16-P-225-1.00A	SMD	TV	401A8422	TA1286AF(MMC,NL,ER	TA1286AFG(MM,NL,ER	TA1286AFG	May	June
MFP16 (30 series)	SSOP16-P-225-1.00A	SMD	TV	40386238	TA1287F	TA1287FG	TA1287FG	May	June
MFP16 (30 series)	SSOP16-P-225-1.00A	SMD	TV	40386241	TA1287F(EL)	TA1287FG(EL)	TA1287FG	Completed	Supplying
VSOP16H	SSOP16-P-225-0.65B	SMD	TV	40386252	TA1290FN(EL,DRY)	TA1290FNG(EL,DRY)	TA1290FNG	May	June
MFP24	SSOP24-P-300-1.00	SMD	A-D for Industry	401A0135	TA1294F(EL,DRY)	TA1294FG(EL,DRY)	TA1294FG	May	June
MFP24	SSOP24-P-300-1.00	SMD	TV	40386520	TA1304F	TA1304FG	TA1304FG	May	June
MFP24	SSOP24-P-300-1.00	SMD	TV	401A0119	TA1304F(EL)	TA1304FG(EL)	TA1304FG	May	June
MFP30	SSOP30-P-375-1.00	SMD	TV	401A7627	TA1318AF	TA1318AFG	TA1318AFG	May	June
MFP30	SSOP30-P-375-1.00	SMD	TV	401A8052	TA1318AF(DRY,EL)	TA1318AFG(DRY,EL)	TA1318AFG	May	June
MFP30	SSOP30-P-375-1.00	SMD	TV	401A7646	TA1318AF(EL)	TA1318AFG(EL)	TA1318AFG	May	June
MFP16 (30 series)	SSOP16-P-225-1.00A	SMD	TV	401A7915	TA1326F(EL)	TA1326FG(EL)	TA1326FG	May	June
MFP16 (30 series)	SSOP16-P-225-1.00A	SMD	TV	401A7935	TA1326F(EL,ALPS)	TA1326FG(EL,ALPS)	TA1326FG	May	June
VSOP16	SSOP16-P-225-0.65B	SMD	TV	401A9408	TA1326FNG(EL)	TA1326FNG(EL)	TA1326FNG	May	June
µPFP80(.8)	QFP80-P-1420-0.80C	SMD	TV	401A8494	TA1336AF	TA1336AFG	TA1336AFG	May	June
MFP30	SSOP30-P-375-1.00	SMD	TV	401A9372	TA1340AF(DRY,EL)	TA1340AFG(DRY,EL)	TA1340AFG	May	June
MFP30	SSOP30-P-375-1.00	SMD	TV	401A7177	TA1340F	TA1340FG	TA1340FG	May	June
MFP30	SSOP30-P-375-1.00	SMD	TV	401A7432	TA1340F(DRY,EL)	TA1340FG(DRY,EL)	TA1340FG	May	June
MFP30	SSOP30-P-375-1.00	SMD	TV	401A8905	TA1340F(HIT,DRY,EL	TA1340FG(HIT,DRYEL	TA1340FG	May	June
MFP24	SSOP24-P-300-1.00	SMD	TV	401A8278	TA1358AF(EL,HIT)	TA1358AFG(EL,HIT)	TA1358AFG	May	June
MFP16 (30 series)	SSOP16-P-225-1.00A	SMD	AUDIO	40385017	TA2003F	TA2003FG	TA2003FG	May	June
MFP16 (30 series)	SSOP16-P-225-1.00A	SMD	AUDIO	40385018	TA2003F(EL)	TA2003FG(EL)	TA2003FG	May	June
MFP16 (30 series)	SSOP16-P-225-1.00A	SMD	AUDIO	40385050	TA2009F	TA2009FG	TA2009FG	May	June
MFP16 (30 series)	SSOP16-P-225-1.00A	SMD	AUDIO	40385052	TA2009F(EL)	TA2009FG(EL)	TA2009FG	May	June
MFP16 (30 series)	SSOP16-P-225-1.00A	SMD	AUDIO	40385051	TA2009F(ER)	TA2009FG(ER)	TA2009FG	May	June
VSOP16H	SSOP16-P-225-0.65B	SMD	AUDIO	40385192	TA2030FN(EL)	TA2030FNG(EL)	TA2030FNG	May	June
MFP16 (30 series)	SSOP16-P-225-1.00A	SMD	AUDIO	40385253	TA2040AF	TA2040AFG	TA2040AFG	May	June
MFP16 (30 series)	SSOP16-P-225-1.00A	SMD	AUDIO	40385383	TA2061AF	TA2061AFG	TA2061AFG	May	June
MFP16 (30 series)	SSOP16-P-225-1.00A	SMD	AUDIO	40385379	TA2061AF(EL)	TA2061AFG(EL)	TA2061AFG	May	June
MFP16 (30 series)	SSOP16-P-225-1.00A	SMD	AUDIO	401A7937	TA2061AF(EL,FVCO)	TA2061AFG(EL,FVCO)	TA2061AFG	May	June
MFP16 (30 series)	SSOP16-P-225-1.00A	SMD	AUDIO	401A9212	TA2061AF(EL,FVCOCA	TA2061AFG(ELFVCOC/	TA2061AFG	May	June
MFP16 (30 series)	SSOP16-P-225-1.00A	SMD	AUDIO	40385378	TA2062F(EL)	TA2062FG(EL)	TA2062FG	May	June
MFP16 (30 series)	SSOP16-P-225-1.00A	SMD	AUDIO	40385388	TA2063F(ER,PAIO)	TA2063FG(ER,PAIO)	TA2063FG	May	June
MFP24	SSOP24-P-300-1.00	SMD	AUDIO	40385527	TA2066F(EL)	TA2066FG(EL)	TA2066FG	May	June
VSOP16	SSOP16-P-225-0.65B	SMD	AUDIO	401A8279	TA2083AFN(EL)	TA2083AFNG(EL)	TA2083AFNG	May	June
QFP44(.8) 2.7T	QFP44-P-1010-0.8A	SMD	AUDIO	40385739	TA2093F	TA2093FG	TA2093FG	May	June
QFP48	QFP48-P-1014-0.8	SMD	AUDIO	401A0116	TA2101AF(J,FJTN)	TA2101AF(F,FJTN)	TA2101AF(F)	May	June
VQFP64(.65)	QFP64-P-1212-0.65A	SMD	AUDIO	401A0378	TA2102AF(FJTN,DIV2	TA2102AF(F,FJTNDIV	TA2102AF(F)	May	June
MFP24	SSOP24-P-300-1.00	SMD	AUDIO	40386125	TA2109F	TA2109FG	TA2109FG	May	June
MFP24	SSOP24-P-300-1.00	SMD	AUDIO	40386129	TA2109F(EL)	TA2109FG(EL)	TA2109FG	May	June
MFP24	SSOP24-P-300-1.00	SMD	AUDIO	40386162	TA2111F(EL)	TA2111FG(EL)	TA2111FG	May	June
VSOP24H	SSOP24-P-300-0.65A	SMD	AUDIO	40386089	TA2120FN(EL)	TA2120FNG(EL)	TA2120FNG	May	June
QFP48	QFP48-P-1014-0.8	SMD	AUDIO	401A0221	TA2126F(J,CLAR)	TA2126F(F,CLAR)	TA2126F(F)	May	June
QON24	QON24-P-0505-0.5	SMD	AUDIO	401A0411	TA2131FL(EB)	TA2131FLG(EB)	TA2131FLG	May	June
QON24	QON24-P-0505-0.5	SMD	AUDIO	40386527	TA2131FL(EL)	TA2131FLG(EL)	TA2131FLG	May	June
VSOP24H	SSOP24-P-300-0.65A	SMD	AUDIO	401A0404	TA2131FN(EL)	TA2131FNG(EL)	TA2131FNG	May	June
MFP16 (30 series)	SSOP16-P-225-1.00A	SMD	AUDIO	401A0258	TA2132AF(EL)	TA2132AFG(EL)	TA2132AFG	May	June
MFP16 (30 series)	SSOP16-P-225-1.00A	SMD	AUDIO	401A7056	TA2132BF(EL)	TA2132BFG(EL)	TA2132BFG	May	June
MFP24	SSOP24-P-300-1.00	SMD	AUDIO	401A0041	TA2133F(PA2028A,EL	TA2133F(F,PA2028AE	TA2133FG	May	June
MFP24	SSOP24-P-300-1.00	SMD	AUDIO	40387020	TA2136F	TA2136FG	TA2136FG	May	June
MFP24	SSOP24-P-300-1.00	SMD	AUDIO	401A0271	TA2145AF	TA2145AFG	TA2145AFG	May	June
MFP24	SSOP24-P-300-1.00	SMD	AUDIO	401A0413	TA2145AF(EL)	TA2145AFG(EL)	TA2145AFG	May	June
MFP24	SSOP24-P-300-1.00	SMD	AUDIO	401A0251	TA2147F	TA2147FG	TA2147FG	May	June
MFP24	SSOP24-P-300-1.00	SMD	AUDIO	401A0479	TA2147F(EL)	TA2147FG(EL)	TA2147FG	May	June
VSOP24H	SSOP24-P-300-0.65A	SMD	AUDIO	401A7585	TA2149BFN(EL)	TA2149BFNG(EL)	TA2149BFNG	May	June
VSOP24H	SSOP24-P-300-0.65A	SMD	AUDIO	401A0371	TA2149FN(EL)	TA2149FNG(EL)	TA2149FNG	May	June
QON24	QON24-P-0505-0.5	SMD	AUDIO	401A7060	TA2152FL(EL)	TA2152FLG(EL)	TA2152FLG	May	June
MFP24	SSOP24-P-300-1.00	SMD	AUDIO	401A7235	TA2157F(EL)	TA2157FG(EL)	TA2157FG	May	June
VSOP30H	SSOP30-P-300-0.65	SMD	AUDIO	401A7208	TA2160FN(EL)	TA2160FNG(EL)	TA2160FNG	May	June
QON24	QON24-P-0505-0.5	SMD	AUDIO	401A8206	TA2170FL(EL)	TA2170FLG(EL)	TA2170FLG	May	June
VSOP16	SSOP16-P-225-0.65B	SMD	Telecom	40381084	TA31133FN(EL)	TA31133FNG(EL)	TA31133FNG	May	June
MFP16 (30 series)	SSOP16-P-225-1.00A	SMD	Telecom	40381160	TA31136F	TA31136FG	TA31136FG	May	June
MFP16 (30 series)	SSOP16-P-225-1.00A	SMD	Telecom	40381161	TA31136F(EL)	TA31136FG(EL)	TA31136FG	May	June
MFP16 (30 series)	SSOP16-P-225-1.00A	SMD	Telecom	40381181	TA31136F(ND)	TA31136FG(ND)	TA31136FG	May	June
VSOP16	SSOP16-P-225-0.65B	SMD	Telecom	40381206	TA31161FN(EL)	TA31161FNG(EL)	TA31161FNG	May	June
VSOP16	SSOP16-P-225-0.65B	SMD	Telecom	40381209	TA31161FN(EL,MATU)	TA31161FNG(EL,MATU	TA31161FNG	May	June
VSOP16	SSOP16-P-225-0.65B	SMD	Telecom	40381204	TA31161FN(ND,EL)	TA31161FNG(ND,EL)	TA31161FNG	May	June
TQON24	TQON24-P-0404-0.5	SMD	Telecom	401A8589	TA31165CFT	Originally Pb-free (marking on packing label)		Completed	Supplying
TQON24	TQON24-P-0404-0.5	SMD	Telecom	401A7422	TA31331FT	Originally Pb-free (marking on packing label)		Completed	Supplying
TQON24	TQON24-P-0404-0.5	SMD	Telecom	401A8461	TA31332FT(HINO,EB)	Originally Pb-free (marking on packing label)		Completed	Supplying
MFP24	SSOP24-P-300-1.00	SMD	A-D for Industry	401A0123	TA6004F(EL,CANON)	TA6004FG(EL,CANON)	TA6004FG	May	June
QON16	QON16-P-0404-0.65	SMD	A-D for Industry	40382017	TA6005FL(EL)	TA6005FLG(EL)	TA6005FLG	May	June
QON16	QON16-P-0404-0.65	SMD	A-D for Industry	40382018	TA6006FL(EL)	TA6006FLG(EL)	TA6006FLG	May	June
VQFP64(.5) 2.0	QFP64-P-1010-0.5C	SMD	A-D for Industry	401A0468	TA6008AF	TA6008AFG	TA6008AFG	May	June
SON10(AOI)	SON10-P-0.65	SMD	A-D for Industry	401A7578	TA6009FM(EL)	TA6009FMG(EL)	TA6009FMG	May	June
VSOP10	SSOP10-P-0.65	SMD	A-D for Industry	40382021	TA6009FN(EL)	TA6009FNG(EL)	TA6009FNG	May	June
VQFP64(.5) 2.0	QFP64-P-1010-0.5C	SMD	A-D for Industry	401A0225	TA6015F-A5	TA6015FG-A5	TA6015FG-A5	May	June

· Pb-free Recommended Package (Product List) to be changed (2nd Stage)

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PKG Local Name	Standard PKG Name	P K G Type	SBU	Product Code	Produce Name before Change	Product Name after Change (G/Q/(F)/(Q))	Pb-free Family Name registered in (Kitakyushu)	Production Line is available from	Mass Production is available from
VQFP64(.5) 2.0	QFP64-P-1010-0.5C	SMD	A-D for Industry	401A0496	TA6018AF	TA6018AFG	TA6018AFG	May	June
VSOP10	SSOP10-P-0.65	SMD	A-D for Industry	401A8192	TA6038FN(EL)	TA6038FNG(EL)	TA6038FNG	May	June
VSOP10	SSOP10-P-0.65	SMD	A-D for Industry	401A7910	TA6039FN(EL)	TA6039FNG(EL)	TA6039FNG	May	June
MSIP7	HSIP7-P-2.54	THD	A-D for Industry	40320340	TA7257P	Originally Pb-free (marking on packing label)		Completed	Supplying
PFP20	HSOP20-P-450-1.00	SMD	A-D for Industry	40320730	TA7259F	TA7259FG	TA7259FG	May	June
DIP14FIN	HDIP14-P-500-2.54A	THD	A-D for Industry	40320355	TA7259P	Originally Pb-free (marking on packing label)		Completed	Supplying
MSIP7	HSIP7-P-2.54	THD	A-D for Industry	40320447	TA7267BP	Originally Pb-free (marking on packing label)		Completed	Supplying
MSIP7	HSIP7-P-2.54	THD	A-D for Industry	40320440	TA7267P	Originally Pb-free (marking on packing label)		Completed	Supplying
DIP14FIN	HDIP14-P-500-2.54A	THD	A-D for Industry	40320575	TA7279AP	Originally Pb-free (marking on packing label)		Completed	Supplying
DIP14FIN	HDIP14-P-500-2.54A	THD	A-D for Industry	40320570	TA7279P	Originally Pb-free (marking on packing label)		Completed	Supplying
DIP14FIN	HDIP14-P-500-2.54A	THD	A-D for Industry	40320640	TA7289P	Originally Pb-free (marking on packing label)		Completed	Supplying
DIP14FIN	HDIP14-P-500-2.54A	THD	A-D for Industry	40320642	TA7289P(HA)	TA7289PQ(HA)	TA7289PQ	May	June
PFP16	HSOP16-P-300-1.00	SMD	A-D for Industry	401A7112	TA7291AF	TA7291AFG	TA7291AFG	May	June
PFP16	HSOP16-P-300-1.00	SMD	A-D for Industry	401A9385	TA7291AF(EL)	TA7291AF(F,EL)	TA7291AF(F)	May	June
PFP16	HSOP16-P-300-1.00	SMD	A-D for Industry	40320667	TA7291F	TA7291F(F)	TA7291F(F)	May	June
PFP16	HSOP16-P-300-1.00	SMD	A-D for Industry	40320667	TA7291F	TA7291FG	TA7291FG	May	June
PFP16	HSOP16-P-300-1.00	SMD	A-D for Industry	40320650	TA7291F(EL)	TA7291F(F,EL)	TA7291F(F)	May	June
PFP16	HSOP16-P-300-1.00	SMD	A-D for Industry	40320650	TA7291F(EL)	TA7291FG(EL)	TA7291FG	May	June
PFP16	HSOP16-P-300-1.00	SMD	A-D for Industry	40320648	TA7291F(HIT)	TA7291FG(HIT)	TA7291FG	May	June
PFP16	HSOP16-P-300-1.00	SMD	A-D for Industry	40320649	TA7291F(HIT,ER)	TA7291FG(HIT,ER)	TA7291FG	May	June
FLP8	SOP8-P-225-1.27	SMD	AUDIO	40325524	TA7358F(MATG,EL)	TA7358FG(MATG,EL)	TA7358FG	May	June
DIP42	DIP42-P-600-2.54	THD	TV	40357030	TA7698AP	TA7698APG	TA7698APG	May	June
MFP24	SSOP24-P-300-1.00	SMD	A-D for Industry	40357550	TA7712F	TA7712FG	TA7712FG	May	June
MFP24	SSOP24-P-300-1.00	SMD	A-D for Industry	401A0443	TA7712F(EL)	TA7712FG(EL)	TA7712FG	May	June
MFP16 (30 series)	SSOP16-P-225-1.00A	SMD	A-D for Industry	40357965	TA7745F	TA7745FG	TA7745FG	May	June
MFP16 (30 series)	SSOP16-P-225-1.00A	SMD	A-D for Industry	40357970	TA7745F(EL)	TA7745FG(EL)	TA7745FG	May	June
MFP16 (30 series)	SSOP16-P-225-1.00A	SMD	AUDIO	40358155	TA7765AF	TA7765AFG	TA7765AFG	May	June
MFP16 (30 series)	SSOP16-P-225-1.00A	SMD	AUDIO	40358159	TA7765AF(EL)	TA7765AFG(EL)	TA7765AFG	May	June
PFP16	HSOP16-P-300-1.00	SMD	A-D for Industry	40358245	TA7774F	TA7774F(F)	TA7774F(F)	May	June
PFP16	HSOP16-P-300-1.00	SMD	A-D for Industry	40358245	TA7774F	TA7774FG	TA7774FG	May	June
PFP16	HSOP16-P-300-1.00	SMD	A-D for Industry	40358244	TA7774F(EL)	TA7774F(F,EL)	TA7774F(F)	May	June
PFP16	HSOP16-P-300-1.00	SMD	A-D for Industry	40358244	TA7774F(EL)	TA7774FG(EL)	TA7774FG	Completed	Supplying
PFP16	HSOP16-P-300-1.00	SMD	A-D for Industry	40358259	TA7774F(MBSSZ,EL)	TA7774FG(MBSSZ,EL)	TA7774FG	May	June
PFP16	HSOP16-P-300-1.00	SMD	A-D for Industry	401A8615	TA7774F(NEC,EL)	TA7774FG(NEC,EL)	TA7774FG	May	June
MFP16 (30 series)	SSOP16-P-225-1.00A	SMD	AUDIO	40358382	TA7787AF	TA7787AFG	TA7787AFG	May	June
MFP16 (30 series)	SSOP16-P-225-1.00A	SMD	AUDIO	401A8328	TA7787AF(EL)	TA7787AFG(EL)	TA7787AFG	May	June
MFP16 (30 series)	SSOP16-P-225-1.00A	SMD	AUDIO	40358435	TA7792F	TA7792FG	TA7792FG	May	June
MFP16 (30 series)	SSOP16-P-225-1.00A	SMD	AUDIO	401A8604	TA7792F(EL)	TA7792FG(EL)	TA7792FG	May	June
LSIP12	HSIP12-P-2.54	THD	Automotive	40377349	TA8068L(LC1,K1)	Originally Pb-free (marking on packing label)		Completed	Supplying
MFP16 (30 series)	SSOP16-P-225-1.00A	SMD	AUDIO	40377631	TA8106F(TP1)? (EL)	TA8106FG(EL)	TA8106FG	May	June
MFP16 (30 series)	SSOP16-P-225-1.00A	SMD	AUDIO	40377661	TA8109AF	TA8109AFG	TA8109AFG	May	June
MFP16 (30 series)	SSOP16-P-225-1.00A	SMD	AUDIO	401A9777	TA8116F(EL)	TA8116FG(EL)	TA8116FG	May	June
MFP16 (30 series)	SSOP16-P-225-1.00A	SMD	AUDIO	40377737	TA8116F(VS,EL)	TA8116FG(VS,EL)	TA8116FG	May	June
MFP24	SSOP24-P-300-1.00	SMD	AUDIO	40377791	TA8122AF	TA8122AFG	TA8122AFG	May	June
MFP24	SSOP24-P-300-1.00	SMD	AUDIO	40377819	TA8123AF	TA8123AFG	TA8123AFG	May	June
MFP24	SSOP24-P-300-1.00	SMD	AUDIO	40377197	TA8155F	TA8155FG	TA8155FG	May	June
MFP24	SSOP24-P-300-1.00	SMD	AUDIO	40377198	TA8155F(ER)	TA8155FG(ER)	TA8155FG	May	June
MFP10	SSOP10-P-225-1.00	SMD	AUDIO	40377845	TA8158F	TA8158FG	TA8158FG	May	June
MFP10	SSOP10-P-225-1.00	SMD	AUDIO	40377756	TA8158F(ER)	TA8158FG(ER)	TA8158FG	May	June
MFP10	SSOP10-P-225-1.00	SMD	AUDIO	40377220	TA8161F	TA8161FG	TA8161FG	May	June
MFP16 (30 series)	SSOP16-P-225-1.00A	SMD	AUDIO	40377177	TA8176F	TA8176FG	TA8176FG	May	June
QFP44(.8) 2.3T	QFP44-P-1010-0.8B	SMD	AUDIO	40377747	TA8191F	TA8191FG	TA8191FG	June	July
HSIP10	HSIP10-P-2.54B	THD	AUDIO	401A0068	TA8265K	Originally Pb-free (marking on packing label)		Completed	Supplying
SOP20	SOP20-P-300-1.27	SMD	A-D for Industry	40378493	TA8310F	TA8310FG	TA8310FG	May	June
SOP20	SOP20-P-300-1.27	SMD	A-D for Industry	40378492	TA8310F(EL)	TA8310FG(EL)	TA8310FG	May	June
SOP20	SOP20-P-300-1.27	SMD	A-D for Industry	401A0423	TA8310F(EL,KOTOB1)	TA8310FG(EL,KOTOB1)	TA8310FG	May	June
MFP30	SSOP30-P-375-1.00	SMD	A-D for Industry	401A7846	TA84005F(ER)	TA84005FG(ER)	TA84005FG	May	June
MFP10	SSOP10-P-225-1.00	SMD	A-D for Industry	40377921	TA8409F	TA8409FG	TA8409FG	May	June
MFP10	SSOP10-P-225-1.00	SMD	A-D for Industry	40377885	TA8409F(EL)	TA8409FG(EL)	TA8409FG	May	June
PFP20	HSOP20-P-450-1.00	SMD	A-D for Industry	401A0211	TA8428F	TA8428FG	TA8428FG	May	June
PFP20	HSOP20-P-450-1.00	SMD	A-D for Industry	401A0315	TA8428F(EL)	TA8428FG(EL)	TA8428FG	May	June
MSIP7	HSIP7-P-2.54	THD	A-D for Industry	40378538	TA8428K(S)	Originally Pb-free (marking on packing label)		Completed	Supplying
MFP10	SSOP10-P-225-1.00	SMD	A-D for Industry	40378750	TA8462F	TA8462FG	TA8462FG	May	June
MFP10	SSOP10-P-225-1.00	SMD	A-D for Industry	401A0457	TA8462F(EL)	TA8462FG(EL)	TA8462FG	May	June
PFP20	HSOP20-P-450-1.00	SMD	A-D for Industry	40378803	TA8470AF	TA8470AFG	TA8470AFG	May	June
PFP20	HSOP20-P-450-1.00	SMD	A-D for Industry	40378804	TA8470AF(KUMA)	TA8470AF(F,KUMA)	TA8470AF(F)	May	June
PFP20	HSOP20-P-450-1.00	SMD	A-D for Industry	40378824	TA8474F(ER)	TA8474FG(ER)	TA8474FG	May	June
DIP14FIN	HDIP14-P-500-2.54A	THD	A-D for Industry	40378714	TA8483AP	Originally Pb-free (marking on packing label)		Completed	Supplying
DIP14FIN	HDIP14-P-500-2.54A	THD	A-D for Industry	401A0153	TA8483CP	Originally Pb-free (marking on packing label)		Completed	Supplying
MFP16 (30 series)	SSOP16-P-225-1.00A	SMD	A-D for Industry	40378399	TA8540BF	TA8540BFG	TA8540BFG	May	June
MFP16 (30 series)	SSOP16-P-225-1.00A	SMD	A-D for Industry	40378329	TA8540BF(EL)	TA8540BFG(EL)	TA8540BFG	May	June
ZIP16	ZIP16-P-1.27	THD	A-D for Industry	40378325	TA8540BZ	Originally Pb-free (marking on packing label)		Completed	Supplying
MFP16 (30 series)	SSOP16-P-225-1.00A	SMD	A-D for Industry	401A8941	TA8541F(EL)	TA8541FG(EL)	TA8541FG	May	June
MFP24	SSOP24-P-300-1.00	SMD	A-D for Industry	40378282	TA8554F(CANON,EL)	TA8554FG(CANON,EL)	TA8554FG	May	June
VQFP64(.5) 2.0	QFP64-P-1010-0.5C	SMD	A-D for Industry	40378285	TA8555F	TA8555FG	TA8555FG	May	June
VSOP16	SSOP16-P-225-0.65B	SMD	A-D for Industry	40378252	TA8562FN(EL)	TA8562FNG(EL)	TA8562FNG	May	June
VSOP10	SSOP10-P-0.65	SMD	A-D for Industry	40378256	TA8563FN(EL)	TA8563FNG(EL)	TA8563FNG	May	June
MFP16 (30 series)	SSOP16-P-225-1.00A	SMD	TV	40379330	TA8637BF	TA8637BFG	TA8637BFG	May	June
MFP16 (30 series)	SSOP16-P-225-1.00A	SMD	TV	40379329	TA8637BF(EL)	TA8637BFG(EL)	TA8637BFG	May	June
MFP24	SSOP24-P-300-1.00	SMD	TV	40379575	TA8667F	TA8667FG	TA8667FG	May	June
MFP24	SSOP24-P-300-1.00	SMD	TV	40379576	TA8667F(EL)	TA8667FG(EL)	TA8667FG	May	June
MFP30	SSOP30-P-375-1.00	SMD	TV	40383063	TA8676F	TA8676FG	TA8676FG	May	June
MFP30	SSOP30-P-375-1.00	SMD	TV	401A0285	TA8676F(EL,DRY)	TA8676FG(EL,DRY)	TA8676FG	May	June
N-DIP54	SDIP54-P-600-1.78	THD	TV	40383205	TA8690AN	TA8690ANG	TA8690ANG	May	June
MFP30	SSOP30-P-375-1.00	SMD	TV	40383256	TA8695AF(EL)	TA8695AFG(EL)	TA8695AFG	May	June
MFP30	SSOP30-P-375-1.00	SMD	TV	40383260	TA8696F	TA8696FG	TA8696FG	May	June
MFP30	SSOP30-P-375-1.00	SMD	TV	40383261	TA8696F(EL)	TA8696FG(EL)	TA8696FG	May	June
N-DIP20	SDIP20-P-300-1.78	THD	TV	40383305	TA8700AN	TA8700ANG	TA8700ANG	May	June
N-DIP36	SDIP36-P-500-1.78	THD	TV	40383720	TA8747N	TA8747NG	TA8747NG	May	June
N-DIP36	SDIP36-P-500-1.78	THD	TV	40384205	TA8801AN	TA8801ANG	TA8801ANG	May	June
MFP30	SSOP30-P-375-1.00	SMD	TV	40384252	TA8804F(LGAL)	TA8804FG(LGAL)	TA8804FG	May	June
MFP30	SSOP30-P-375-1.00	SMD	TV	40384257	TA8804F(SHRP)	TA8804F(F,SHRP)	TA8804F(F)	May	June
MFP24	SSOP24-P-300-1.00	SMD	TV	40384260	TA8805F	TA8805FG	TA8805FG	May	June
MFP24	SSOP24-P-300-1.00	SMD	TV	40384261	TA8805F(EL)	TA8805FG(EL)	TA8805FG	May	June
N-DIP20	SDIP20-P-300-1.78	THD	TV	40384370	TA8814N	TA8814NG	TA8814NG	May	June
MFP30	SSOP30-P-375-1.00	SMD	TV	40384390	TA8819F	TA8819FG	TA8819FG	May	June
MFP30	SSOP30-P-375-1.00	SMD	TV	40384391	TA8819F(EL)	TA8819FG(EL)	TA8819FG	May	June
MFP30	SSOP30-P-375-1.00	SMD	TV	40384392	TA8819F(ER)	TA8819FG(ER)	TA8819FG	May	June
N-DIP54	SDIP54-P-600-1.78	THD	TV	40384763	TA8851BN	TA8851BNG	TA8851BNG	May	June
N-DIP54	SDIP54-P-600-1.78	THD	TV	40384761	TA8851CN	TA8851CNG	TA8851CNG	May	June
N-L-DIP24	HDIP24-P-500-2.00	THD	Automotive	40384136	TA8907BL	Originally Pb-free (marking on packing label)		Completed	Supplying

· Pb-free Recommended Package (Product List) to be changed (2nd Stage)

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PKG Local Name	Standard PKG Name	P K G Type	SBU	Product Code	Produce Name before Change	Product Name after Change (G/Q/(F)/(Q))	Pb-free Family Name registered in (Kitakyushu)	Production Line is available from	Mass Production is available from
MW15(ZIP)	HZIP15-P-1.27B	THD	Automotive	40384115	TA8924H(AISN)	TA8924HQ(AISN)	TA8924HQ	May	June
ZIP16	ZIP16-P-1.27	THD	Automotive	40384065	TA8926Z(KOITS)	TA8926ZG(KOITS)	TA8926ZG	May	June
MW15(ZIP)	HZIP15-P-1.27B	THD	Automotive	40384987	TA8930H(KOITS)	TA8930H(F,KOITS)	TA8930H(F)	May	June
ZIP16	ZIP16-P-1.27	THD	Automotive	401A0014	TA8941AZ(KOITS)	TA8941AZG(KOITS)	TA8941AZG	May	June
ZIP16	ZIP16-P-1.27	THD	Automotive	40384942	TA8943Z(KOITS)	TA8943ZG(KOITS)	TA8943ZG	May	June
MFP10	SSOP10-P-225-1.00	SMD	A-D for Industry	40100430	TB1004AF	TB1004AFG	TB1004AFG	May	June
MFP10	SSOP10-P-225-1.00	SMD	A-D for Industry	40100432	TB1004AF(EL)	TB1004AFG(EL)	TB1004AFG	May	June
MFP10	SSOP10-P-225-1.00	SMD	A-D for Industry	40100868	TB1022F	TB1022FG	TB1022FG	May	June
MFP10	SSOP10-P-225-1.00	SMD	A-D for Industry	40100869	TB1022F(EL)	TB1022FG(EL)	TB1022FG	May	June
MFP10	SSOP10-P-225-1.00	SMD	A-D for Industry	40101186	TB1027F(EL)	TB1027FG(EL)	TB1027FG	May	June
QFP48	QFP48-P-1014-0.8	SMD	TV	401A8165	TB1274AF(J,DRY)	TB1274BFG(DRY)	TB1274BFG	Completed	Supplying
QFP48	QFP48-P-1014-0.8	SMD	TV	401A7344	TB1274AF(J,FP)	TB1274BFG(FP)	TB1274BFG	May	June
QFP48	QFP48-P-1014-0.8	SMD	TV	401A2334	TB1274F(J)	TB1274BFG	TB1274BG	May	June
MFP30	SSOP30-P-375-1.00	SMD	AUDIO	40100043	TB2104F(A,DRY)	TB2104FG(A,DRY)	TB2104FG(A)	May	June
MFP30	SSOP30-P-375-1.00	SMD	AUDIO	40100044	TB2104F(A,EL,DRY)	TB2104FG(A,EL,DRY)	TB2104FG(A)	May	June
QFP44(.8) 2.3T	QFP44-P-1010-0.8B	SMD	AUDIO	40100674	TB2111AFA(PM2007A)	TB2111AFA(FPM2007A	TB2111AFA(F)	June	July
QFP44(.8) 2.3T	QFP44-P-1010-0.8B	SMD	AUDIO	40101304	TB2117F(PM2006A)	TB2117FG(PM2006A)	TB2117FG	June	July
MFP24	SSOP24-P-300-1.00	SMD	AUDIO	40101862	TB2118F	TB2118FG	TB2118FG	May	June
MFP24	SSOP24-P-300-1.00	SMD	AUDIO	40101887	TB2118F(EL)	TB2118FG(EL)	TB2118FG	May	June
VQFP64(.65)	QFP64-P-1212-0.65A	SMD	AUDIO	401A7438	TB2123AF	TB2123AFG	TB2123AFG	May	June
VQFP64(.65)	QFP64-P-1212-0.65A	SMD	AUDIO	401A7998	TB2123AFG(FJTN2)	TB2123AF(F,FJTN2)	TB2123AF(F)	May	June
MFP24	SSOP24-P-300-1.00	SMD	AUDIO	401A7976	TB2134F	TB2134FG	TB2134FG	May	June
MFP24	SSOP24-P-300-1.00	SMD	AUDIO	401A8100	TB2134F(EL)	TB2134FG(EL)	TB2134FG	May	June
QON48	QON48-P-0707-0.50	SMD	Telecom	401A2405	TB31167FL(EF)	TB31167FLG(EF)	TB31167FLG	May	June
TQON48	TQON48-P-0505-0.5B	SMD	Telecom	401A7979	TB31177FT(EB)	Originally Pb-free (marking on packing label)		Completed	Supplying
VSOP16	SSOP16-P-225-0.65B	SMD	Telecom	40101106	TB31202FN(EL)	TB31202FNG(EL)	TB31202FNG	May	June
VSOP16	SSOP16-P-225-0.65B	SMD	Telecom	40102034	TB312209AFN(FN)	TB31209AFNG(EL)	TB31209AFNG	May	June
TQON24	TQON24-P-0404-0.5	SMD	Telecom	401A7439	TB31256FT	Originally Pb-free (marking on packing label)		Completed	Supplying
TQON16	TQON16-P-0303-0.5	SMD	Telecom	401A8332	TB31257FT	Originally Pb-free (marking on packing label)		Completed	Supplying
TQON16	TQON16-P-0303-0.5	SMD	Telecom	401A8623	TB31257FT(EB)	Originally Pb-free (marking on packing label)		Completed	Supplying
TQON16	TQON16-P-0303-0.5	SMD	Telecom	401A7386	TB31356AFT	Originally Pb-free (marking on packing label)		Completed	Supplying
TQON16	TQON16-P-0303-0.5	SMD	Telecom	401A8112	TB31356AFT(EB)	Originally Pb-free (marking on packing label)		Completed	Supplying
TQON16	TQON16-P-0303-0.5	SMD	Telecom	401A8113	TB31356AFT(EF)	Originally Pb-free (marking on packing label)		Completed	Supplying
QFP52	QFP52-P-1010-0.65	SMD	A-D for Industry	401A2279	TB6055AF(EL)	TB6055AFG(EL)	TB6055AFG	May	June
VQFP64(.5) 2.0	QFP64-P-1010-0.5C	SMD	A-D for Industry	401A2432	TB6057F	TB6057FG	TB6057FG	May	June
VQFP64(.5) 2.0	QFP64-P-1010-0.5C	SMD	A-D for Industry	401A2477	TB6059F	TB6059FG	TB6059FG	May	June
VQFP64(.5) 2.0	QFP64-P-1010-0.5C	SMD	A-D for Industry	401A8307	TB6059F(CS)	TB6059FG(CS)	TB6059FG	May	June
SOP20	SOP20-P-300-1.27	SMD	A-D for Industry	40100180	TB62003F	TB62003FG	TB62003FG	May	June
SOP20	SOP20-P-300-1.27	SMD	A-D for Industry	401A8703	TB62003F(EL)	TB62003FG(EL)	TB62003FG	May	June
SOP20	SOP20-P-300-1.27	SMD	A-D for Industry	40100181	TB62004F	TB62004FG	TB62004FG	May	June
SOP20	SOP20-P-300-1.27	SMD	A-D for Industry	401A2265	TB62004F(EL)	TB62004FG(EL)	TB62004FG	May	June
SOP20	SOP20-P-300-1.27	SMD	A-D for Industry	40100183	TB62007F	TB62007FG	TB62007FG	May	June
HSOP36(.65)	HSOP36-P-450-0.65	SMD	A-D for Industry	401A2125	TB62200AF(EL)	TB62200AFG(EL)	TB62200AFG	May	June
HSOP36(.65)	HSOP36-P-450-0.65	SMD	A-D for Industry	401A2311	TB62201AF(EL)	TB62201AFG(EL)	TB62201AFG	May	June
HSOP36(.65)	HSOP36-P-450-0.65	SMD	A-D for Industry	401A7403	TB62202AF(EL)	TB62202AFG(EL)	TB62202AFG	Completed	Supplying
HSOP36(.65)	HSOP36-P-450-0.65	SMD	A-D for Industry	401A7925	TB62205F(EL)	TB62205FG(EL)	TB62205FG	May	June
HSOP36(.65)	HSOP36-P-450-0.65	SMD	A-D for Industry	401A9767	TB62207F(EL)	TB62207FG(EL)	TB62207FG	May	June
HSOP36(.65)	HSOP36-P-450-0.65	SMD	A-D for Industry	401A7183	TB62209F(EL)	TB62209F(F,EL)	TB62209F(F)	May	June
HSOP36(.65)	HSOP36-P-450-0.65	SMD	A-D for Industry	401A7183	TB62209F(EL)	TB62209FG(EL)	TB62209FG	Completed	Supplying
HSOP36(.65)	HSOP36-P-450-0.65	SMD	A-D for Industry	401A8363	TB62300F(EL)	TB62300FG(EL)	TB62300FG	May	June
SON8(AOI)	SON8-P-0.65	SMD	A-D for Industry	401A8756	TB62503FM(EL)	TB62503FMG(EL)	TB62503FMG	May	June
THQFP80	HQFP80-P-1212-0.50	SMD	A-D for Industry	40100975	TB62601F	TB62601FG	TB62601FG	June	July
SOP20	SOP20-P-300-1.27	SMD	A-D for Industry	40100363	TB62702F	TB62702FG	TB62702FG	May	June
SOP20	SOP20-P-300-1.27	SMD	A-D for Industry	40100364	TB62702F(EL)	TB62702FG(EL)	TB62702FG	May	June
MFP16 (30 series)	SSOP16-P-225-1.00A	SMD	A-D for Industry	40102205	TB62705CF	TB62705CF(F)	TB62705CF(F)	May	June
MFP16 (30 series)	SSOP16-P-225-1.00A	SMD	A-D for Industry	40102205	TB62705CF	TB62705CFG	TB62705CFG	May	June
MFP16 (30 series)	SSOP16-P-225-1.00A	SMD	A-D for Industry	40102204	TB62705CF(EL)	TB62705CF(F,EL)	TB62705CF(F)	May	June
MFP16 (30 series)	SSOP16-P-225-1.00A	SMD	A-D for Industry	40102204	TB62705CF(EL)	TB62705CFG(EL)	TB62705CFG	May	June
MFP24(Cu)	SSOP24-P-300-1.00B	SMD	A-D for Industry	40102218	TB62706BF	TB62706BF(F)	TB62706BF(F)	May	June
MFP24(Cu)	SSOP24-P-300-1.00B	SMD	A-D for Industry	40102218	TB62706BF	TB62706BFG	TB62706BFG	May	June
MFP24(Cu)	SSOP24-P-300-1.00B	SMD	A-D for Industry	40102217	TB62706BF(EL)	TB62706BF(F,EL)	TB62706BF(F)	May	June
MFP24(Cu)	SSOP24-P-300-1.00B	SMD	A-D for Industry	40102217	TB62706BF(EL)	TB62706BFG(EL)	TB62706BFG	May	June
MFP24	SSOP24-P-300-1.00	SMD	A-D for Industry	40101367	TB62707F	TB62707F(F)	TB62707F(F)	May	June
MFP24	SSOP24-P-300-1.00	SMD	A-D for Industry	401A2039	TB62707F(EL)	TB62707F(F,EL)	TB62707F(F)	May	June
MFP24	SSOP24-P-300-1.00	SMD	A-D for Industry	401A2039	TB62707F(EL)	TB62707FG(EL)	TB62707FG	May	June
MFP24	SSOP24-P-300-1.00	SMD	A-D for Industry	40101399	TB62709F	TB62709FG	TB62709FG	May	June
MFP24	SSOP24-P-300-1.00	SMD	A-D for Industry	40101396	TB62709F(EL)	TB62709FG(EL)	TB62709FG	May	June
MFP24	SSOP24-P-300-1.00	SMD	A-D for Industry	40102235	TB62710F	TB62710FG	TB62710FG	May	June
MFP24	SSOP24-P-300-1.00	SMD	A-D for Industry	40102223	TB62713F	TB62713FG	TB62713FG	May	June
QFP48	QFP48-P-1014-0.8	SMD	A-D for Industry	401A2084	TB62717F(J)	TB62717F(F)	TB62717F(F)	May	June
QFP48	QFP48-P-1014-0.8	SMD	A-D for Industry	401A2084	TB62717F(J)	TB62717FG	TB62717FG	May	June
THQFP64	HQFP64-P-1010-0.50	SMD	A-D for Industry	401A2247	TB62718AF	TB62718AFG	TB62718AFG	May	June
THQFP64	HQFP64-P-1010-0.50	SMD	A-D for Industry	401A2276	TB62718AF(NICHIA)	TB62718AF(F,NICHIA	TB62718AF(F)	May	June
MFP24(Cu)	SSOP24-P-300-1.00B	SMD	A-D for Industry	401A8044	TB62726AF	TB62726AFG	TB62726AFG	May	June
MFP24(Cu)	SSOP24-P-300-1.00B	SMD	A-D for Industry	401A8339	TB62726AF(EL)	TB62726AFG(EL)	TB62726AFG	May	June
MFP24(Cu)	SSOP24-P-300-1.00B	SMD	A-D for Industry	401A2328	TB62726F	TB62726FG	TB62726FG	May	June
MFP24(Cu)	SSOP24-P-300-1.00B	SMD	A-D for Industry	401A7732	TB62726F(EL)	TB62726FG(EL)	TB62726FG	May	June
SOT23-6(AOI)	SSOP6-P-0.95B	SMD	A-D for Industry	401A7393	TB62731FU	TB62731FUG	TB62731FUG	May	June
SOT23-6(AOI)	SSOP6-P-0.95B	SMD	A-D for Industry	401A8095	TB62731FU(EL)	TB62731FUG(EL)	TB62731FUG	May	June
SOT23-6(AOI)	SSOP6-P-0.95B	SMD	A-D for Industry	401A8325	TB62731FU(HINO,EL)	TB62731FUG(HINO,EL	TB62731FUG	May	June
SOT23-6(AOI)	SSOP6-P-0.95B	SMD	A-D for Industry	401A8321	TB62732FU(EL)	TB62732FUG(EL)	TB62732FUG	May	June
PFP16	HSOP16-P-300-1.00	SMD	A-D for Industry	401A2316	TB62802F	TB62802FG	TB62802FG	May	June
PFP16	HSOP16-P-300-1.00	SMD	A-D for Industry	401A2476	TB62802F(EL)	TB62802FG(EL)	TB62802FG	May	June
MFP24	SSOP24-P-300-1.00	SMD	A-D for Industry	40100520	TB6504F	TB6504FG	TB6504FG	May	June
MFP24	SSOP24-P-300-1.00	SMD	A-D for Industry	401A2418	TB6504F(EL)	TB6504FG(EL)	TB6504FG	May	June
VQFP64(.5) 1.4	LQFP64-P-1010-0.50A	SMD	A-D for Industry	40101768	TB6519AF	TB6519AFG	TB6519AFG	May	June
VQFP64(.5) 1.4	LQFP64-P-1010-0.50A	SMD	A-D for Industry	40101760	TB6519F	TB6519FG	TB6519FG	May	June
MFP24(Cu)	SSOP24-P-300-1.00B	SMD	A-D for Industry	40102155	TB6526AF	TB6526AFG	TB6526AFG	May	June
MFP24(Cu)	SSOP24-P-300-1.00B	SMD	A-D for Industry	401A2330	TB6526AF(EL)	TB6526AFG(EL)	TB6526AFG	May	June
MFP24(Cu)	SSOP24-P-300-1.00B	SMD	A-D for Industry	401A2389	TB6526F(ELP)	TB6526FG(ELP)	TB6526FG	May	June
DIP24	DIP24-P-600-2.54	THD	A-D for Industry	40101743	TB6528P	Originally Pb-free (marking on packing label)		Completed	Supplying
VQFP64(.5) 1.4	LQFP64-P-1010-0.50A	SMD	A-D for Industry	40102161	TB6534F(DRY)	TB6534FG(DRY)	TB6534FG	May	June
VQFP64(.5) 1.4	LQFP64-P-1010-0.50A	SMD	A-D for Industry	401A2133	TB6535AF(MAT-O,DRY	TB6535AFG(MAT-ODRY	TB6535AFG	May	June
MFP24	SSOP24-P-300-1.00	SMD	A-D for Industry	401A6046	TB6537F	TB6537FG	TB6537FG	May	June
MFP24	SSOP24-P-300-1.00	SMD	A-D for Industry	401A6047	TB6537F(EL)	TB6537FG(EL)	TB6537FG	May	June
MFP30	SSOP30-P-375-1.00	SMD	A-D for Industry	401A7415	TB6539F	TB6539FG	TB6539FG	May	June
MFP30	SSOP30-P-375-1.00	SMD	A-D for Industry	401A7875	TB6539F(EL)	TB6539FG(EL)	TB6539FG	May	June
MFP30	SSOP30-P-375-1.00	SMD	A-D for Industry	401A7816	TB6539F(EL,DRY)	TB6539FG(EL,DRY)	TB6539FG	May	June
HSOP36(.65)	HSOP36-P-450-0.65	SMD	A-D for Industry	401A7796	TB6545AF(KUMA,DRY)	TB6545AF(F,KUMADRY	TB6545AF(F)	May	June
HSOP36(.65)	HSOP36-P-450-0.65	SMD	A-D for Industry	401A7495	TB6545F(KUMA,DRY)	TB6545F(F,KUMA,DRY	TB6545F(F)	May	June

· Pb-free Recommended Package (Product List) to be changed (2nd Stage)

2004/3/31

PKG Local Name	Standard PKG Name	P K G Type	SBU	Product Code	Produce Name before Change	Product Name after Change (G/Q/(F)/(Q))	Pb-free Family Name registered in (Kitakyushu)	Production Line is available from	Mass Production is available from
VQFP48(.5)	LQFP48-P-0707-0.50	SMD	A-D for Industry	401A7405	TB6546F(DRY)	TB6546FG(DRY)	TB6546FG	May	June
MFP24	SSOP24-P-300-1.00	SMD	A-D for Industry	401A2444	TB6548F	TB6548FG	TB6548FG	May	June
PFP20	HSOP20-P-450-1.00	SMD	A-D for Industry	401A7797	TB6549F	TB6549FG	TB6549FG	May	June
PFP20	HSOP20-P-450-1.00	SMD	A-D for Industry	401A7999	TB6549F(EL)	TB6549FG(EL)	TB6549FG	May	June
MFP24	SSOP24-P-300-1.00	SMD	A-D for Industry	401A7581	TB6551F	TB6551FG	TB6551FG	May	June
MFP24	SSOP24-P-300-1.00	SMD	A-D for Industry	401A8329	TB6551F(EL,DRY)	TB6551FG(EL,DRY)	TB6551FG	May	June
MFP30	SSOP30-P-375-1.00	SMD	A-D for Industry	401A9809	TB6556F(EL,DRY)	TB6556FG(EL,DRY)	TB6556FG	May	June
N-DIP36	SDIP36-P-500-1.78	THD	Automotive	40101917	TB9241N(KANS)	TB9241N(F,KANS)	TB9241N(F)	May	June
N-DIP54	SDIP54-P-600-1.78	THD	Automotive	40101918	TB9248N(KANS)	TB9248N(F,KANS)	TB9248N(F)	May	June
N-DIP36	SDIP36-P-500-1.78	THD	Automotive	40101691	TB9250N(NS)	TB9250NG(NS)	TB9250NG	May	June
N-DIP36	SDIP36-P-500-1.78	THD	Automotive	40101649	TB9258N(NS)	TB9258NG(NS)	TB9258NG	May	June
PFP16	HSOP16-P-300-1.00	SMD	A-D for Industry	40274029	TD62064AF(S)	TD62064AFG(S)	TD62064AFG(S)	May	June
PFP16	HSOP16-P-300-1.00	SMD	A-D for Industry	40274387	TD62064AF(S,EL)	TD62064AF(F,S,EL)	TD62064AF(F,S)	May	June
PFP16	HSOP16-P-300-1.00	SMD	A-D for Industry	40274387	TD62064AF(S,EL)	TD62064AFG(S,EL)	TD62064AFG(S)	May	June
PFP16	HSOP16-P-300-1.00	SMD	A-D for Industry	40274376	TD62064BF	TD62064BFG	TD62064BFG	May	June
PFP16	HSOP16-P-300-1.00	SMD	A-D for Industry	40274368	TD62064BF(EL)	TD62064BF(F,EL)	TD62064BF(F)	May	June
PFP16	HSOP16-P-300-1.00	SMD	A-D for Industry	40274368	TD62064BF(EL)	TD62064BFG(EL)	TD62064BFG	May	June
PFP16	HSOP16-P-300-1.00	SMD	A-D for Industry	40274395	TD62074AF	TD62074AFG	TD62074AFG	May	June
PFP16	HSOP16-P-300-1.00	SMD	A-D for Industry	40274398	TD62074AF(EL)	TD62074AFG(EL)	TD62074AFG	May	June
FLP18	SOP18-P-375-1.27	SMD	Analog-Digital for Industry	40274484	TD62083AF(S,EL)	TD62083AFG(S,EL)	TD62083AFG(S)	May	June
PFP16	HSOP16-P-300-1.00	SMD	A-D for Industry	40274580	TD62107F	TD62107FG	TD62107FG	May	June
PFP16	HSOP16-P-300-1.00	SMD	A-D for Industry	40274583	TD62107F(EL)	TD62107FG(EL)	TD62107FG	May	June
PFP16	HSOP16-P-300-1.00	SMD	A-D for Industry	40274589	TD62164AF	TD62164AFG	TD62164AFG	May	June
PFP16	HSOP16-P-300-1.00	SMD	A-D for Industry	40274579	TD62164AF(EL)	TD62164AFG(EL)	TD62164AFG	May	June
PFP16	HSOP16-P-300-1.00	SMD	A-D for Industry	40275164	TD62308AF(S)	TD62308AFG(S)	TD62308AFG(S)	May	June
PFP16	HSOP16-P-300-1.00	SMD	A-D for Industry	40275227	TD62308AF(S,45,RIC	TD62308AFG(S,RICO)	TD62308AFG(S)	May	June
PFP16	HSOP16-P-300-1.00	SMD	A-D for Industry	40275162	TD62308AF(S,EL)	TD62308AF(F,S,EL)	TD62308AF(F,S)	May	June
PFP16	HSOP16-P-300-1.00	SMD	A-D for Industry	40275162	TD62308AF(S,EL)	TD62308AFG(S,EL)	TD62308AFG(S)	May	June
PFP16	HSOP16-P-300-1.00	SMD	A-D for Industry	40274904	TD62308BF	TD62308BFG	TD62308BFG	May	June
PFP16	HSOP16-P-300-1.00	SMD	A-D for Industry	40275127	TD62308BF(EL)	TD62308BFG(EL)	TD62308BFG	May	June
PFP16	HSOP16-P-300-1.00	SMD	A-D for Industry	40274705	TD62309F	TD62309FG	TD62309FG	May	June
PFP16	HSOP16-P-300-1.00	SMD	A-D for Industry	40274703	TD62309F(EL)	TD62309FG(EL)	TD62309FG	May	June
PFP16	HSOP16-P-300-1.00	SMD	A-D for Industry	40274713	TD62318AF	TD62318AFG	TD62318AFG	May	June
PFP16	HSOP16-P-300-1.00	SMD	A-D for Industry	40274711	TD62318AF(EL)	TD62318AFG(EL)	TD62318AFG	May	June
FLP18	SOP18-P-375-1.27	SMD	A-D for Industry	40274725	TD62381F	TD62381FG	TD62381FG	May	June
SOP20	SOP20-P-300-1.27	SMD	A-D for Industry	40274890	TD62386AF	TD62386AFG	TD62386AFG	May	June
SOP20	SOP20-P-300-1.27	SMD	A-D for Industry	40274895	TD62387AF	TD62387AFG	TD62387AFG	May	June
SOP20	SOP20-P-300-1.27	SMD	A-D for Industry	40274898	TD62387AF(EL)	TD62387AFG(EL)	TD62387AFG	May	June
SOP20	SOP20-P-300-1.27	SMD	A-D for Industry	40274905	TD62388AF	TD62388AFG	TD62388AFG	May	June
MFP30	SSOP30-P-375-1.00	SMD	A-D for Industry	40276081	TD62650F(FUJI,EL)	TD62650F(F,FUJI,EL	TD62650F(F)	May	June
FLP18	SOP18-P-375-1.27	SMD	A-D for Industry	40275167	TD62783AF(S,EL)	TD62783AFG(S,EL)	TD62783AFG(S)	May	June
FLP18	SOP18-P-375-1.27	SMD	A-D for Industry	40277097	TD62785F	TD62785FG	TD62785FG	May	June
FLP18	SOP18-P-375-1.27	SMD	A-D for Industry	40277091	TD62785F(EL)	TD62785FG(EL)	TD62785FG	May	June
MFP16 (30 series)	SSOP16-P-225-1.00A	SMD	A-D for Industry	40277610	TD62930F	TD62930FG	TD62930FG	May	June
MFP16 (30 series)	SSOP16-P-225-1.00A	SMD	A-D for Industry	40277609	TD62930F(EL)	TD62930FG(EL)	TD62930FG	May	June
MFP24	SSOP24-P-300-1.00	SMD	A-D for Industry	401A2324	TD62C854F	TD62C854FG	TD62C854FG	May	June
MFP24	SSOP24-P-300-1.00	SMD	A-D for Industry	401A7074	TD62C854F(TCCJ,EL)	TD62C854FG(TCCJ,EL	TD62C854FG	May	June
VPFP60	SSOP60-P-0.65	SMD	A-D for Industry	40278193	TD62C949RAF	TD62C949RAFG	TD62C949RAFG	May	June
VPFP60	SSOP60-P-0.65	SMD	A-D for Industry	40278194	TD62C949RAF(FTBDK)	TD62C949RAFG(FTBDK	TD62C949RAFG	May	June
VPFP60	SSOP60-P-0.65	SMD	A-D for Industry	40278215	TD62C950LF	TD62C950LFG	TD62C950LFG	May	June
VPFP60	SSOP60-P-0.65	SMD	A-D for Industry	40278210	TD62C950RF	TD62C950RFG	TD62C950RFG	May	June
VPFP60	SSOP60-P-0.65	SMD	A-D for Industry	40278212	TD62C950RF(FTBDK)	TD62C950RFG(FTBDK)	TD62C950RFG	May	June
N-DIP20	SDIP20-P-300-1.78	THD	TV	40272595	TD6359N	TD6359NG	TD6359NG	May	June
N-DIP20	SDIP20-P-300-1.78	THD	TV	40273115	TD6381N	TD6381NG	TD6381NG	May	June
VSOP16H	SSOP16-P-225-0.65B	SMD	TV	401A7871	TD7624BFN(EL,DRY)	TD7624BFNG(EL,DRY)	TD7624BFNG	May	June
VSOP16H	SSOP16-P-225-0.65B	SMD	TV	40281134	TD7626FN(EL)	TD7626FNG(EL)	TD7626FNG	May	June

Implementation of Lead(Pb)-free Finish of System LSI Semiconductor Products

TOSHIBA Corporation Semiconductor Company
System LSI Quality&Reliability Engineering Department

Index

[1] Content of Lead(Pb)-Free

1-1. Definition of Lead(Pb)-Free part

The “Lead-Free Soldering Roadmap: Ver. 2.1, 2002” published by the Japan Electronics and Information Technology Industries Association (JEITA) classifies the products into the following phases in view of the heat resistance in packaging, types of component parts and materials. The Lead(Pb) free part should comply with the requirement of Phase 1 and the Pb content in the sections specifically designated under Phase 2 or Phase 3 should be less than 0.1 wt%. Toshiba follows suit.

(Classifications of Lead(Pb) free parts)

Phase	Classification	Contents
Phase1	Parts that withstand Lead(Pb) free soldering	Parts with the solder heat resistance to withstand Pb free soldering.
Phase2	Parts with Lead(Pb) free terminals	No Pb should be contained in the plating of the terminals to be fitted to the board and electrodes of the part. However, inclusion of Pb in the components and materials of the part is acceptable.
Phase3	Lead(Pb) free parts	No Pb is contained in any sections of the part including internal connections and/or components and materials.

[JEITA Lead-Free Soldering Roadmap: Ver. 2.1, 2002]

1-2. Terminal finish

The terminal finish of the package products will be made free from Pb, for lead type and Ball type, according to the materials shown in Table 2 “Lead-Free on Terminal finish”. The materials for Lead (Pb)-Free differ according to the production site and the package type. Refer to Attachment 1 “Lead free Implementation Schedule by Package type” for the manner for individual packages. In connection with the products for which Lead(Pb)- free has already been implemented by the use of Sn plating or Ni/Pd/Au, they are also included in the list of package types.
While certain products are not listed in the attachment 1, there are some products for which the shift and merger/abolition are carried out at the same time. Therefore, the relevant information on such products will be supplied on an individual product basis.

(Lead-Free on Terminal finish)

Object：System LSI product
Domestic production article

Package Type	Current finish with Lead (Pb)	New one (Lead-Free Type)	Remarks
Lead Type	Sn-Pb Plating	Sn-Ag Plating	
		Sn-Bi Plating	
		Ni/Pd/Au Plating (PPF)	PPF： Pre Plated Frame
	Sn-Pb Dipping	Sn-Ag Plating	
Ball Type	Sn-Pb Ball	Sn-Ag-Cu Ball	

1-3. Recommended mounting conditions

It is necessary to increase the heat resistance of the package of Lead(Pb)-Free products requires a higher temperature than that of the conventional products containing Pb. The mounting conditions of semiconductors are classified as follows according to the soldering methods.

(1) Mounting temperature

The maximum heat resistance assured temperature of reflow soldering is increased from present 240℃ to 260℃. However, for the package with a great heat capacity (cubic capacity of 2,000 mm3 or above), the maximum temperature is 250℃ for the temperature does not easily go up due to the capacity.

Please refer to Attachment 2: “Implementation of Lead(Pb)-free Finish of System LSI Semiconductor Products” for the recommended mounting conditions.

Further, the “Hat type reflow profile” with comparatively low temperature (around 240℃) and long peak temperature holding time is used for certain cases recently. For the heat resistance in this profile, please ask our representative for information with the specific product.

(2) Condition after opening moisture-proof bag

The maximum usable time of Lead (Pb)-free products out of moisture-proof bag , i.e.168 hours under 30℃, 60%RH or less, is basically equivalent to that of the conventional products.

(Recommended Profile for mounting Package)

Soldering Method	Package cubic capacity	Condition(*1)	Current Package	New(Lead-Free Package)	Difference
Reflow soldering (Parts withstand reflow soldering)	—	the term of validity after open the Moisture-proof bag	Example: Mountable within 168h under 30℃/60%RH or less environment	Condition is the same as conventional products	+
	Less than 2000mm³	Max.Temp.(*2)	240℃ or less	260℃ or less	@
		Time	210℃ /30sec or less	230℃ /50sec or less	
		N (*4)	Up to twice	Up to twice	
	Over 2000mm³	Max.Temp.(*2)	240℃ or less	250℃ or less	@
		Time	210℃ /30sec or less	220℃ /50sec or less	
		N (*4)	Up to twice	Up to twice	
Flow soldering (Parts withstand flow soldering)	—	the term of validity after open the Moisture-proof bag	Example: Mountable within 168h under 30℃/60%RH or less environment	Condition is the same as conventional products	+
	—	Max.Temp.(*2)	260℃ or less	260℃ or less	+
		Time	10sec or less	10sec or less	
		N (*4)	Once	Once	
Localized Heating	—	Max.Temp.(*3)	350℃ or less	350℃ or less	+
		Time	3sec or less	3sec or less	
		N (*4)	Once	Once	
		Max.Temp.(*3)	260℃ or less	260℃ or less	
		Time	10sec or less	10sec or less	
		N (*4)	Once	Once	

+：same as current, @：Condition change

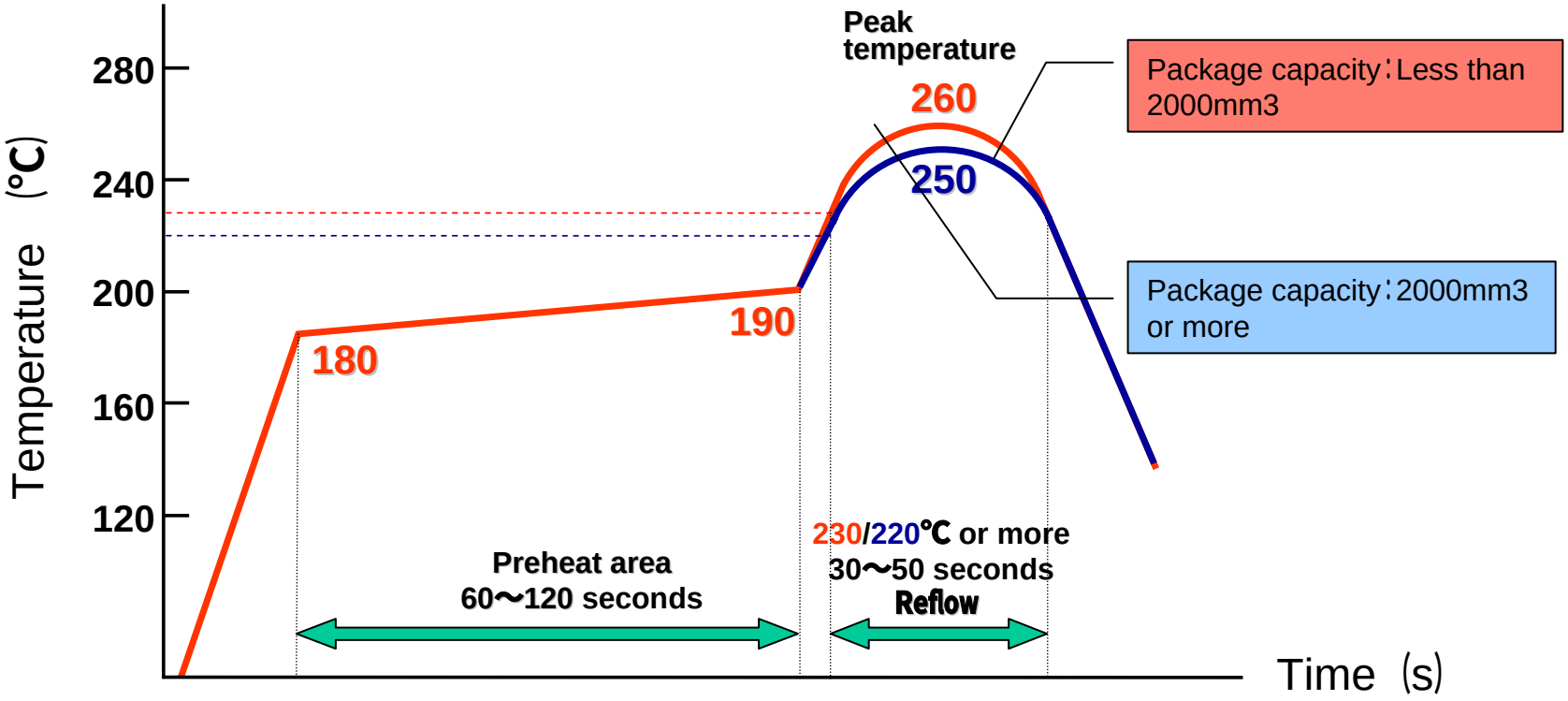
(*1) Conditions shown in above table are representative and some products have different one in the reflow soldering

(*2) Temperature of the top of the package body

(*3) Temperature of the terminal of the package

(*4) the maximum number of possible mounting package

Lead free part recommended mounting profile (Reflow)



・Temperature shows surface temperature of package body

(3)Solderability

On the assumption that Sn-Ag-Cu solder is used for mounting, the solder dipping method and Meniscograph proved its meeting the criteria of 245℃ for 5 sec. for solderability of Lead(Pb) -Free products.
Additionally, we performed the solder-joint intensity test after mounting in the reflow temperature profile (maximum temperature of 235℃) and compared the result with that of the conventional parts containing Pb proving it is equivalent in quality as a result for further confirmation.
However, the performance may differ according not only to the material of terminal finish but also to the actual mounting conditions in your side such as reflow temperature profile, ambient conditions of reflow, solder material, and type of flux contained in cream solder, etc.
Therefore, it is requested to evaluate the solderability under the actual mounting conditions at your side beforehand in the use of our Lead (Pb)-Free products.

【Solderability Test Result】

Refer to the 3rd section for a detailed examination result

Mounting Solder		Terminal Finish		
		Current With Lead(Pb)	Lead-Free Package	Judgment (solder dipping method and Wetting balance method)
		Sn-Pb	Sn-Ag , Sn-Bi , Ni/Pd/Au	
Current With Lead(Pb)	Sn-Pb Melting Point:183℃	230℃, 5sec	230℃, 5sec	O.K.
Lead-Free	Sn-Ag-Cu Melting Point:220℃	245℃, 5sec	245℃, 5sec	O.K.

[2] Reliability of Lead(Pb)-Free product

The reliability has been evaluated according to the classifications of package and terminal finish (the evaluation of solder heat-resistance of the package and reliability after the heat-resistance test) and confirmed to be equivalent to the conventional products. The contents of an evaluation and results are shown below.

2-1. Solderability

The purpose of Solderability evaluation

The purpose of Solderability testing is checking whether the regular Solderability being obtained by performing plating processing of a lead normally. As for the evaluation method, (1) solder dipping method and (2) wetting balance method are regulationized by IEC (International Electrotechnical Commission), JIS (Japanese Industrial Standards), JEITA (Japan Electronics and Information Technology Industries Association), etc.

The experimental feature

Ⅰ.Although there is an advantage to which a solder dipping method can observe the wet-ability in the lead whole region, there is a problem of being hard to quantify wet-ability by the numerical value.

Ⅱ.Although there is an advantage as which a lead gets wet and a wetting balance method can evaluate process, there is a problem of being easy to receive the influence by heat capacity of a tool.

Related regulation

Ⅰ. dipping method

・IEC 68-2-58 (1995) Solderability resistance to dissolution of metallization and to soldering heat of Surface Mounting Devices (SMDs)

・JIS C 0050 (1996) The solderability examination method

・EIAJ ET-7402 (1997) The soldering examination method of a surface mounted device

Ⅱ. wetting balance method

・IEC68-2-69 (1995) Solderability testing of electronic components for surface mount technology by the wetting balance method

・JIS C 0053 (1996) The solderability testing method (wetting balance method)

・EIAJ ET-7401 (1996) The solderability testing method of the surface mounted device by the wetting balance method

Evaluation method Ⅰ : Solder dipping method

About a solder dipping method

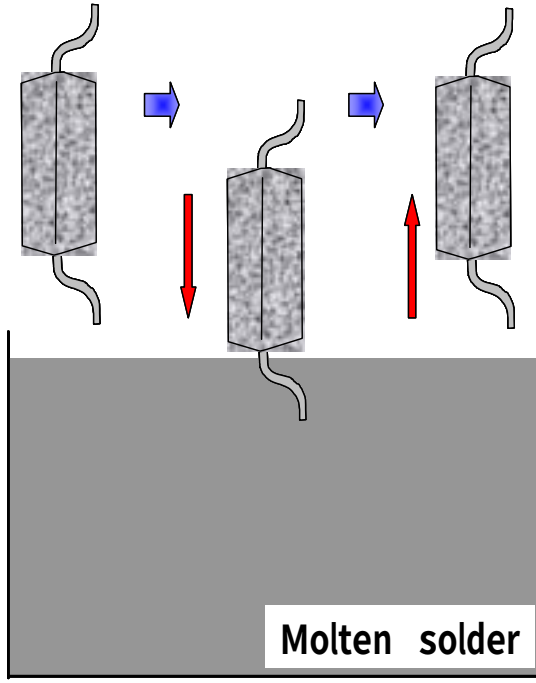
It is the system which makes the terminal lead part of a package dipped in a molten solder.
Each field is made dipped about the package which has a lead in the four directions like QFP.

Evaluation of Solder dipping method

The lead dipped to the molten solder is pulled up, and it observes under a microscope.
The Solderability to a terminal lead gets wet and is taken as the pass at 95% or more of rates.

Evaluation flow

- It is a flux coating to a terminal lead part. (Non-active type)
- It is dipped to solder bath
- Microscope observation (10 to 20 times)



(1) Evaluation conditions (Solder dipping method)

Terminal Finish / Molten solder	Current plating (Sn-Pb)	Lead(Pb)-Free plating (Sn-Ag , Sn-Bi ,Ni/Pd/Au)
Current (Sn-Pb)	230℃、5Sec	230℃、5sec
Lead free (Sn-Ag-Cu)	245℃、5Sec	245℃、5sec

※Flux used is non-active type

(2) Evaluation result (Solder dipping method)

Molten solder	temperature	Current Sn-Pb plating	Sn-Ag plating	Sn-Bi plating	Ni/Pd/Au
Current (Sn-Pb)	230°C	O	O	O	O
Lead free (Sn-Ag-Cu)	245°C	O	O	O	O

[Judgment criteria: 95% or more of rates of a solderability]

As a result of checking the solderability by the solder dipping method by each plating material, it was confirmed that criteria was cleared.

Evaluation method Ⅱ：Wetting balance method

About wetting balance method

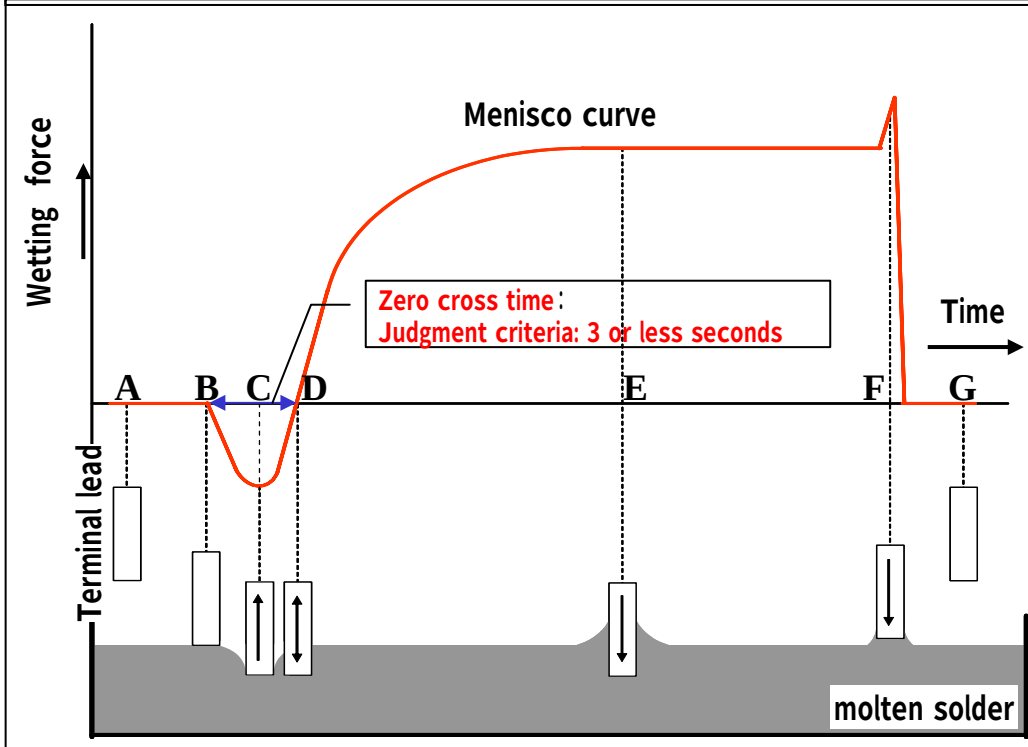
It is what plotted change of the force at the time of making a terminal lead dipped in a molten solder for every time, and the plotted curve is called Menisco curve.

Meaning of Menisco curve

Time	The state of a terminal lead
A	Test start
B	It is a dipping start to a solder bath
C	Attainment and the maximum force pushed up from a solder bath at this time join the regular dipping depth
D	The force pushed up from a solder bath and the force (wetting force) drawn in a solder bath will be in a balanced state
E	Solder wets available and the maximum wetting force is added
F	It pulls up from a solder bath
G	Test end

Evaluation flow

Flux coating (non-active type) to a terminal. →Menisco→Zero cross time reading



※The direction of the force received since the arrow during terminal lead has the molten solder lead is expressed.

The Solderability of a terminal finish is judged in time between B to D (Zero cross time)

(1) Evaluation conditions (Wetting balance method

Terminal Finish / Molten solder	Current plating (Sn-Pb)	Lead(Pb)-Free plating (Sn-Ag , Sn-Bi , Ni/Pd/Au)
Current (Sn-Pb)	230℃	230℃
Lead free (Sn-Ag-Cu)	245℃	245℃

※ Flux used is non-active type

(2) Evaluation result (Wetting balance method)

Molten solder	temperature	Current Sn-Pb plating	Sn-Ag plating	Sn-Bi plating	Ni/Pd/Au
Current (Sn-Pb)	230°C	O	O	O	O
Lead free (Sn-Ag-Cu)	245°C	O	O	O	O

[Judgment criteria: Less than Zero cross time 3 second]

As a result of checking the Solderability by the wetting balance method by each plating material, it checked that a Zero cross time was 3 or less seconds.
In addition, since the influence of a wetting balance method of a tool, the heat capacity of a sample, etc. is large, results are reference, not guaranteed.

2-2. Solder Joint reliability

(1) Evaluation conditions

TCT Conditions：-40℃ (30min) ～125℃ (30min) ／Cycle
Solder joint strength check point: initial, 100, 300 and 500 cycles.

(2) Evaluation result

	Mounting solder	Reflow max temp	Sn-Pb plating	Sn-Ag plating	Sn-Bi plating	Ni/Pd/Au
nitial solder joint	Current (Sn-Pb)	230℃	PASS	PASS	PASS	PASS
strength	Lead free (Sn-Ag-Cu)	230～235℃	PASS	PASS	PASS	PASS
fter	Current (Sn-Pb)	230℃	PASS	PASS	PASS	PASS
temperature cycle	Lead free (Sn-Ag-Cu)	230～235℃	PASS	PASS	PASS	PASS

[Judgment criteria : More than connecting strength 5N

As a result of checking a solder joint reliability evaluation by each plating material, it checked that it was more than joint strength 5N.
(Note) By this evaluation, it is carrying out at a temperature lower than the reflow MAX temperature of 230-235℃ and assumption mounting temperature of Sn-Ag-Cu solder. However, the performance may differ according not only to the material of terminal finish but also to the actual mounting conditions in your side such as reflow temperature profile, ambient conditions of reflow, solder material, and type of flux contained in cream solder, etc. Therefore, it is requested to evaluate the solderability under the actual mounting conditions at your side beforehand in the use of our Lead (Pb)-Free products.

Solder Joint reliability (component specification)

Substrate specification

Size	180mm×180mm×1.6mm
Kind (two kinds)	・CEM-3
	・FR-4
Surface treatment (two kinds)	・Cu preflux
	・HAL treatment (Sn-Ag-Cu)

Part specification

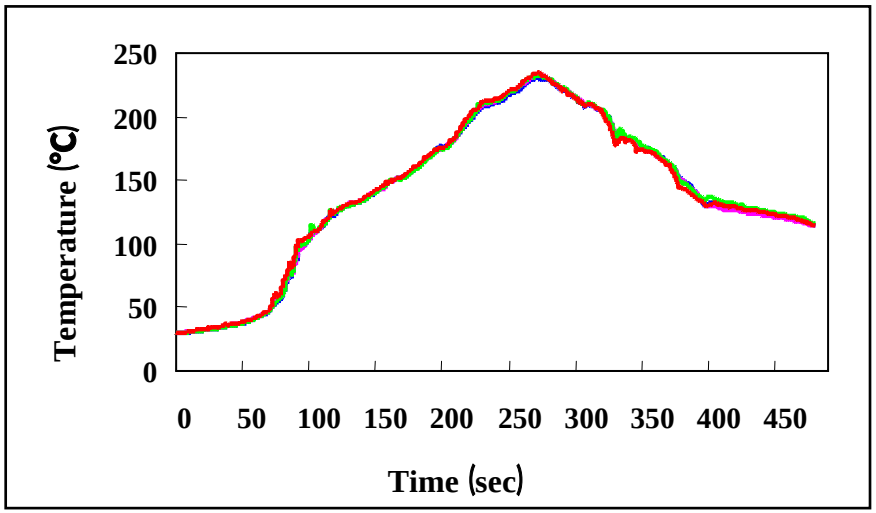
QFP	Body Size	Plating spec	
		Composition	Thickness
0.5mm pitch 208 pin type	28mm×28mm	Sn-Ag	10μm
		Sn-Bi	10μm
		Sn-Pb	10μm
		Ni/Pd/Au	−

Solder Joint reliability (Substrate mounting conditions)

Mounting conditions

Composition	Sn-3wt%Ag-0.5wt%Cu	**Sn-37wt%Pb**
Peak temperature (lead part)	230～235℃	**230℃**
Molten time	30～40s	**30～40s**
Preheating time	50s	**50s**
Temperature at the time of a preheating end (lead part)	180～190℃	**180～190℃**
Reflow atmosphere	Nitrogen (O_2concentration：1000ppm or less)	

Profile example (Sn-Ag-Cu)



Solder Joint reliability (Evaluation conditions)

Temperature cycle conditions

TCT conditions：-40℃ (30min.) ～125℃ (30min.) ／Cycle

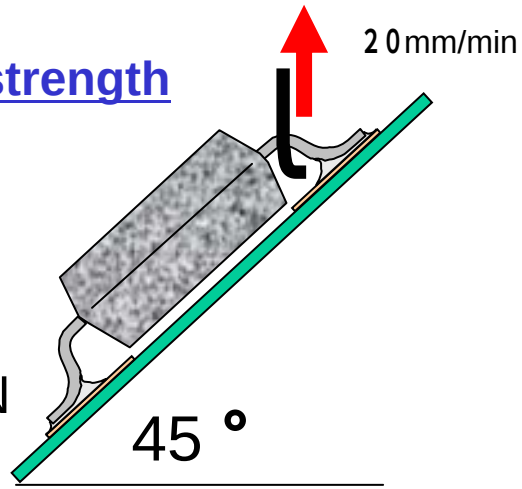
Read out points： Initial, 100, 300 and 500 Cycles

Measuring method of Solder joint strength

Lead pull speed：20mm/min

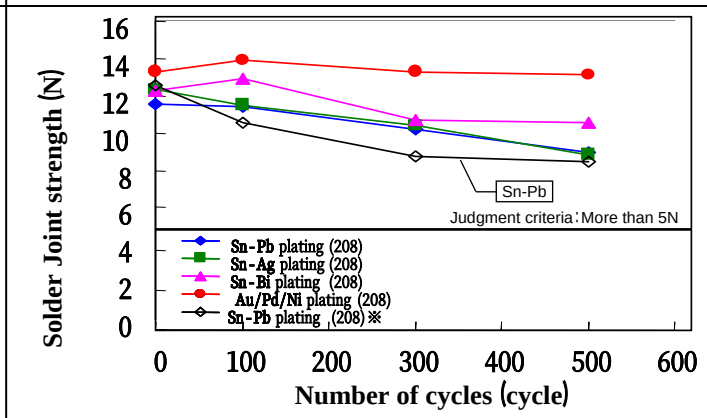
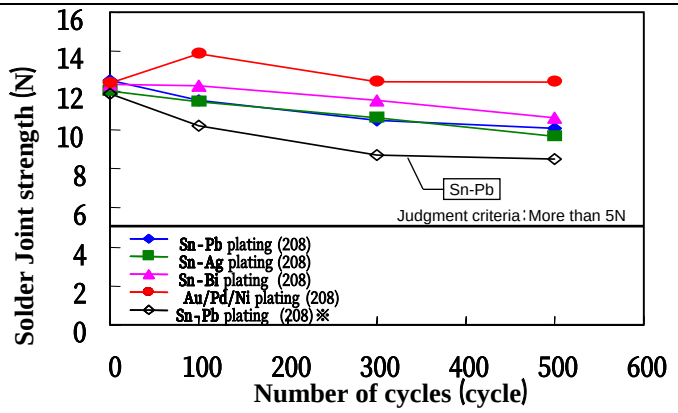
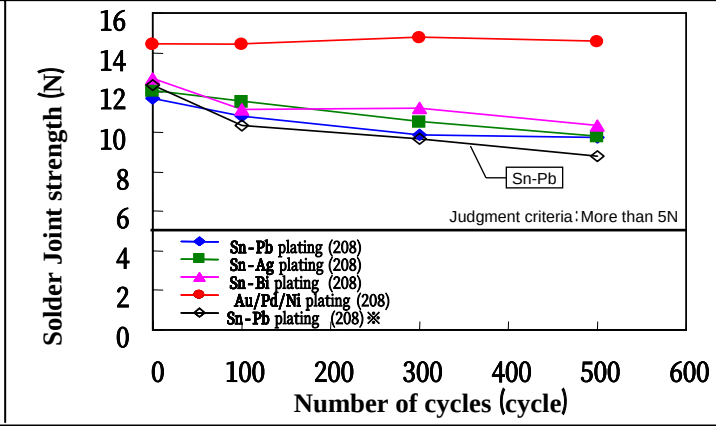
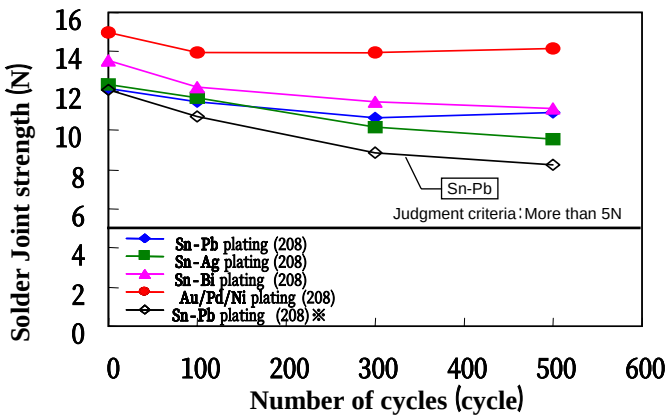
Tool ：Load cell

Judgment criteria：More than 5N



Reference

Solder joint reliability (average strength)

	Cu preflux treatment	HAL treatment
CEM-3 substrate		
FR-4 substrate		

※ Ref.：It mounts with Sn-Pb solder paste

Solder Joint strength of Lead-free plating confirmed that it was equivalent to the current article.

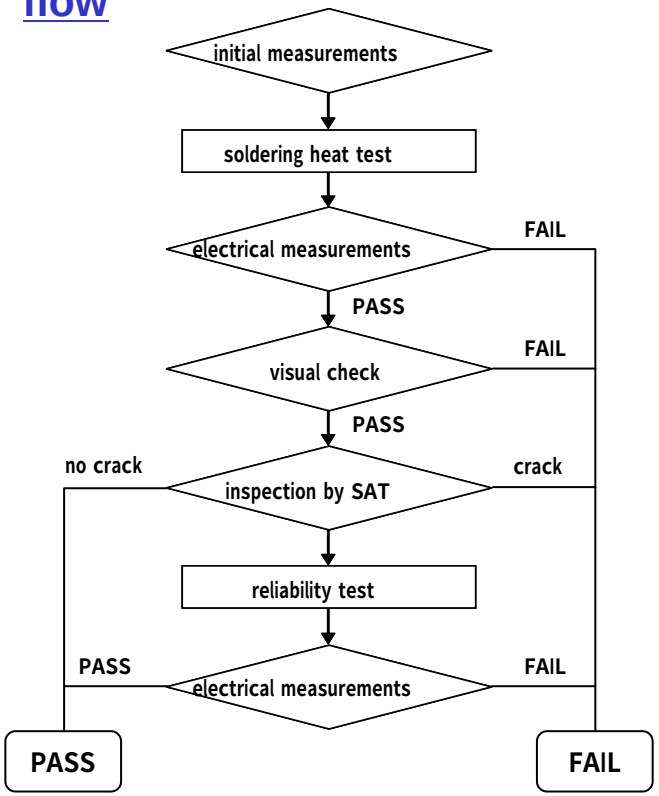
2-3. Reliability

Contents of a reliability evaluation

・By grouping packages in it's structure and the terminal finish used, and reliability evaluation is carried out.

・All the items of a reliability evaluation are performed by a representative package.

flow



Reliability evaluation item

Package structure	Package uder test	Test item
Group1	Representative package	Pressure cooker
		Temperature cycle
		Temperatur humidity bias
Group2	Representative package	Pressure cooker
		Temperature cycle
		Temperatur humidity bias

⋮

2-3-1 Heat-resistant test result

It is confirmed that reliability of Lead(Pb)-Free finish equivalent to the current article.

【Heat-resistant test result】

Package Type	Terminal Finish	Test conditions		Heat-resistant test result			Judgment
		Moisture absorption	Reflow heating	electrical measurements fault	visual fault	Crack	
SSOP30	Sn-Ag	30°C/70% 264h	260°C、3 times	0/60	0/60	0/60	PASS
QFP48	Sn-Ag	30°C/70% 264h	260°C、3 times	0/30	0/30	0/30	PASS
QFP64	Sn-Ag	30°C/70% 264h	260°C、3 times	0/60	0/60	0/60	PASS
QFP64	Ni/Pd/Au (Pd PPF)	30°C/70% 120h	260°C、3 times	0/30	0/30	0/30	PASS
QFP80	Ni/Pd/Au (Pd PPF)	30°C/70% 216h	260°C、3 times	0/30	0/30	0/30	PASS
QFP208	Ni/Pd/Au (Pd PPF)	30°C/70% 216h	250°C、3 times	0/60	0/60	0/60	PASS
HQFP240	Sn-Bi	30°C/70% 216h	250°C、3 times	0/60	0/60	0/60	PASS
HQFP296	Sn-Bi	30°C/70% 96h	260°C、3 times	0/60	0/60	0/60	PASS
TBGA420	Sn-Ag-Cu	30°C/70% 216h	260°C、3 times	0/60	0/60	0/60	PASS
TBGA520	Sn-Ag-Cu	30°C/70% 216h	260°C、3 times	0/60	0/60	0/60	PASS
TBGA768	Sn-Ag-Cu	30°C/70% 216h	260°C、3 times	0/60	0/60	0/60	PASS

2-3-2 Reliability test result

It is confirmed that reliability of Lead(Pb)-Free finish equivalent to the current article.

【Reliability test result】

Package	Terminal Finish	Test item	Test conditions	Judgment time	Reliability test result	Judgment
SS0P30	Sn-Ag	Pressure cooker	127°C/100%	120h	0/100	PASS
		Temperature cycle	-65～150°C	300cycle	0/100	PASS
		Temperatur humidity bias	85°C/85%RH.Bias	1000h	0/100	PASS
QFP48	Sn-Ag	Pressure cooker	127°C/100%	120h	0/30	PASS
		Temperature cycle	-65～150°C	300cycle	0/30	PASS
QFP64	Sn-Ag	Pressure cooker	127°C/100%	120h	0/100	PASS
		Temperature cycle	-65～150°C	300cycle	0/100	PASS
QFP64	Ni/Pd/Au (Pd PPF)	Pressure cooker	127°C/100%	120h	0/100	PASS
		Temperature cycle	-65～150°C	300cycle	0/100	PASS
QFP80	Ni/Pd/Au (Pd PPF)	Pressure cooker	127°C/100%	120h	0/100	PASS
		Temperature cycle	-65～150°C	300cycle	0/100	PASS
QFP208	Ni/Pd/Au (Pd PPF)	Pressure cooker	127°C/100%	120h	0/100	PASS
		Temperature cycle	-65～150°C	300cycle	0/100	PASS
		Temperatur humidity bias	85°C/85%RH.Bias	1000h	0/100	PASS
HQFP240	Sn-Bi	Pressure cooker	127°C/100%	120h	0/100	PASS
		Temperature cycle	-65～150°C	300cycle	0/100	PASS
HQFP296	Sn-Bi	Pressure cooker	127°C/100%	120h	0/100	PASS
		Temperature cycle	-65～150°C	300cycle	0/100	PASS
TBGA 420	Sn-Ag-Cu	Pressure cooker	127°C/100%	120h	0/100	PASS
		Temperature cycle	-65～150°C	300cycle	0/100	PASS
		Temperatur humidity bias	85°C/85%RH.Bias	1000h	0/100	PASS
TBGA 520	Sn-Ag-Cu	Pressure cooker	127°C/100%	120h	0/100	PASS
		Temperature cycle	-65～150°C	300cycle	0/100	PASS
		Temperatur humidity bias	85°C/85%RH.Bias	1000h	0/100	PASS

[3] How to distinguish the Lead(Pb)-Free product

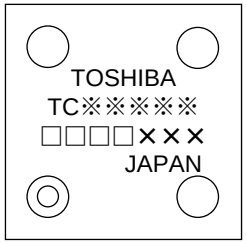
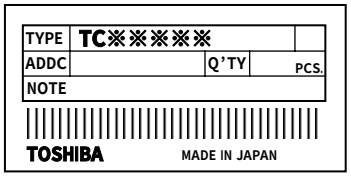
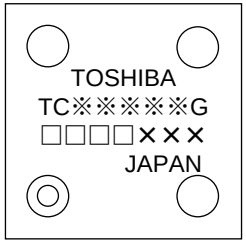
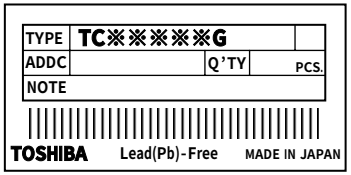
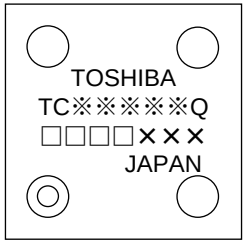
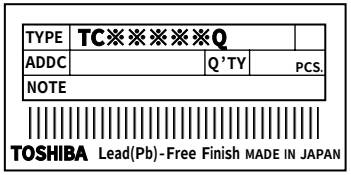
Discrimination whether lead(Pb) or lead(Pb)-free is possible from the marking on products and/or the label of a carton box as shown in a table.

【Discrimination】

Package Category	Product Name	Discrimination mark on a label
Terminal finish with Lead (not used Lead (Pb) inside package) to Lead-Free	Add “G” to the end of full code	Lead (Pb) -Free
Terminal finish with Lead (used Lead inside package) to Lead-Free	Add “Q” to the end of full code	Lead (Pb) -Free Finish
Terminal finish is Lead(Pb)-Free originally (not used Lead(Pb) inside package as well) *	Not Changed	Lead (Pb) -Free
Terminal finish is Lead(Pb)-Free originally (used Lead(Pb) inside package) *	Not Changed	Lead (Pb) -Free Finish

※ With regard to the products which not used Lead (Pb) for terminal finish originally, discrimination mark will be added to only a label for the packing.

-The example of discrimination-

Parts	Product name	Mark of package body	Discrimination mark on a label
current parts	TC※※※※※		
Lead-free parts	TC※※※※※G		
Lead-free terminal parts	TC※※※※※Q		

※ With regard to the products which not used Lead (Pb) for terminal finish originally, discrimination mark will be added to only a label for the packing.

END