Reliability Test Result

Product	Digital Transistor	Package	SOT-346 (SMT3)

1. TEST RESULT

TEST DESCRIPTION		TEST CONDITION	STANDARD	n [pcs]	Pn [pcs]
Soldering Heat Resistance	(1)	260±5℃ , 10sec. , Reflow Soldering , 2 times	JESD22-A111	22	0
	(2)	260±5℃ , 10sec. , Solder-Bath		22	0
	(3)	350±10℃ , 3sec. , Hand Soldering		22	0
Solderability	(1)	245±5℃ , 3sec. , Reflow Soldering	J-STD-002	22	0
	(2)	245±5℃ , 3sec. , Solder-Bath	JESD22-B102	22	0
Thermal Shock		0℃ ～ 100℃ , 100cycles	-	22	0
Temperature Cycle		-55±5℃←→150±5℃ , 200cycles	JESD22-A104	22	0
High Temp. High Humidity Reverse Bias		85±2℃, 85±5%RH, Specified Bias ,1000hours	JESD22-A101	22	0
Pressure Cooker Test		121±2℃ , 100%RH , 203kPa , 100hours	JESD22-A102	22	0
Load Life		25℃ , Pc=Pc max. , 1000hours	-	22	0
High Temperature Reverse Bias		Ta=Tstg max. , Specified Bias , 1000hours	JESD22-A108	22	0
High Temperature Storage		Tstg max. , 1000hours	-	22	0
Low Temperature Storage		Tstg min. , 1000hours	-	22	0
Lead strength (lead pull)		Sample body fixed, pulling lead axis direction, 2.5N , 10±1sec.	JEITA ED-4701/400 Test Method 401	22	0

2. CRITERIA

ITEM	CONDITION	CRITERIA	
Cutoff Current : I_{CBO}	Per specification	Within two times of the standard value.	
Cutoff Current : I_{EBO}	Per specification	Within two times of the standard value.	
DC Current Gain : hFE	Per specification	Changing rate of ±20%	
Physical	Visual check	No outstanding change in physical.	
Solderability	Visual check	Reflow Soldering	Immersed surface, other than the end of pin as cut-surface, must be covered by solder.
		Solder-Bath	More than 95% of the electrode must be covered with solder.

3. JUDGEMENT

No failure is observed from each test item.

4. TEST DESCRIPTION

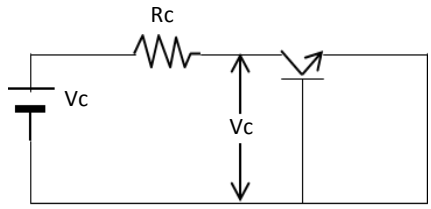
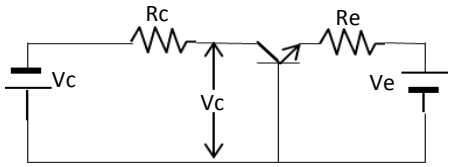
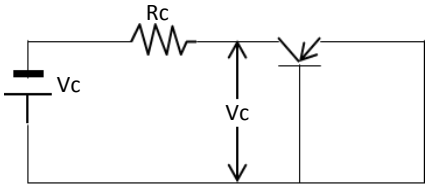
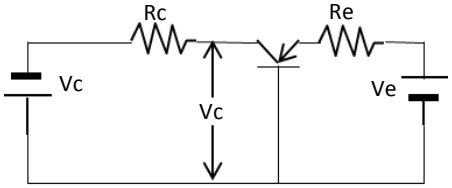
TEST DESCRIPTION		TEST CONDITION	CRITERIA
1. Soldering Heat Resistance *4	(1)	1) Reflow Soldering, 260±5℃(peak) , 10 sec. , 2 times 2) After reflow soldering, leave at room temp. for more than 2h.	・Shall be no mechanical damage. ・See (*1) for criteria on electrical characteristics.
	(2) *3	1) Dip the whole body once into solder bath. 260±5℃, 10±1sec Solder : Sn-3Ag-0.5Cu（Lead free） 2) After dipping, leave at room temp. for more than 2h.	・Shall be no mechanical damage. ・See (*1) for criteria on electrical characteristics.
	(3)	1) Hand Soldering, 350±10℃ , 3sec. 2) After testing, leave at room temp. for more than 2h.	・Shall be no mechanical damage. ・See (*1) for criteria on electrical characteristics.
2. Solderability *5	(1)	1) Reflow Soldering, 245±5℃(peak) , 3sec. Solder : Sn-3Ag-0.5Cu（Lead free）	・ Immersed surface, other than the end of pin as cut-surface, must be covered by solder.
	(2) *3	While body to be immersed, for 10 sec., then into solder bath of 245±5℃. Thereafter leave for natural dry at room temp. then wash off flux in 2-propanol. Solder : Sn-3Ag-0.5Cu（lead free） Flux : 2-propanol（IPA）(rosin 25wt%)	At least 95% of immersed surface, other than the end of pin as cut-surface, of must be covered by solder, which is observed through 10～20X magnifying glass.
3. Thermal Shock *6		1) Temp.&Time (Change within 10 sec,) 95～100℃ (Liquid) , 5min ←→ 0～5℃ (Liquid) , 5min 2) Freq. 100cycles. After completion of test, leave at room temp. for more than 2h.	See (*1) for criteria on electrical characteristics.
4. Temperature Cycle *6		1) Temp.&Time (Change within 5 sec.) 55℃ (air) , 30min ←→ 150℃ (air) , 30min 2) Freq. 200cycles. After completion of test, leave at room temp. for more than 2h.	See (*1) for criteria on electrical characteristics.
5. High Temp. High Humidity Reverse Bias *6		1) Ta=85±3℃, RH=75～90%、Time : 1000h 2) See (*2) for the THB bias. 3) After completion of test, leave at room temp. for more than 2h.	See (*1) for criteria on electrical characteristics.
6. Pressure Cooker Test *6		1) Ta=121℃, 100%RH, P=203KPa [2atm] 2) Time : 100h 3) After completion of test, leave at room temp. for more than 2h.	See (*1) for criteria on electrical characteristics.
7. Load Life *6		1) Ta=25±5℃, P_C/P_C(max), Time : 1000h 2) See (*2) for the THB bias. 3) After completion of test, leave at room temp. for more than 2h.	See (*1) for criteria on electrical characteristics.
8. High Temperature Reverse Bias *6		1) Ta=Tstg(max)±2℃, Time : 1000h 2) See (*2) for the THB bias. 3) After completion of test, leave at room temp. for more than 2h.	See (*1) for criteria on electrical characteristics.
9. High Temperature Storage		1) Ta=Tstg(max), Time : 1000h 2) After completion of test, leave at room temp. for more than 2h.	See (*1) for criteria on electrical characteristics.
10. Low Temperature Storage		1) Ta=Tstg(min), Time : 1000h 2) After completion of test, leave at room temp. for more than 2h.	See (*1) for criteria on electrical characteristics.
11. Lead Strength (Lead Pull)		The sample body is fixed, and keep pulling the lead in lead axis direction with specified load for 10±1s.	Shall be no mechanical damage, detachment, extention between the lead and the package body.

* REMARK

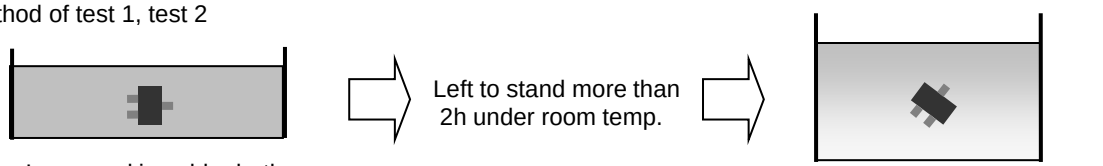
*1 Criteria for electrical characteristics.

Digital Transistors
・I_{CBO}＞Standard ×2
・I_{EBO}＞Standard ×2
・$\frac{\triangle hFE}{hFE}$ ＞±20% （Darlington Transistor ：±40%）

*2 Bias Circuit

THB Bias Circuit	LL Bias Circuit
(NPN)  $V_C = BV_{CEO}$ (max.)	(NPN) 
(PNP)  $V_C = -BV_{CEO}$ (max.)	(PNP) 

*3 Method of test 1, test 2



Immersed in solder bath

Wash off flux in 2-propanol

*4 Preconditioning : The test is carried out after it is left under the high temperature and the high humidity.(85℃,85%,168h)

*5 Preconditioning : Aging is done with the PCT device.（105℃,100%,1.22×10^5Pa,4h）

*6 Preconditioning : Soldering heat resistance(260℃,10s) is carried out. (Reflow Soldering)

Notes

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