

Messrs DIGI-KEY CORPORATION

Mar. 17, 2017

Piezo&Protection Device Bussiness Group
 TDK Corporation

Application for process change

Responsible person of QA E.Takahashi

Responsible person of Technolgy H.Tosaka

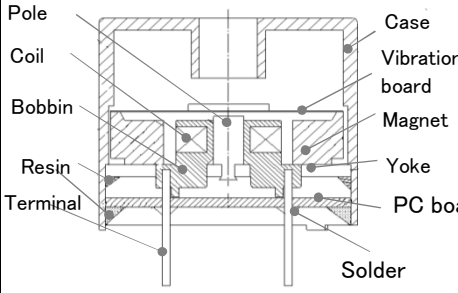
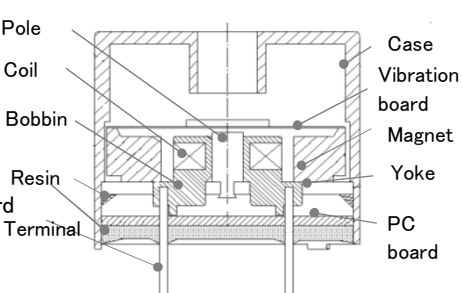
Responsible person T.Sato

We apply for process change as follows.
 So please give us your directions using a "RESPONSE"
 Sheet shown bellow.

TELNo.0184-35-5345
 FAXNo.0184-35-5089

Title	Electromagnetic buzzer SD1614T5-B5M		
Your Part No.	SD1614T5-B5M	TDK Item	SD1614T5-B5M

Change item: The soldering change to resin which fix the terminal and PC board

<p>Before change</p> <ul style="list-style-type: none"> Fix the terminal with soldering in PC board  <p>Labels: Pole, Coil, Bobbin, Resin, Terminal, Case, Vibration board, Magnet, Yoke, PC board, Solder</p> <p>TDK Item:SD1614T5-B5M</p>	<p>After change</p> <ul style="list-style-type: none"> Fix the terminal with full coating of PC board Eliminate soldering  <p>Labels: Pole, Coil, Bobbin, Resin, Terminal, Case, Vibration board, Magnet, Yoke, PC board</p> <p>TDK Item:SD1614T5-B5ME</p>	<p>Attachment:</p> <ul style="list-style-type: none"> Appearance before & after and change point Characteristic Comparision before and & change Terminal tensile strength comparison Terminal tensile strength check of each test(for reference) Reliability test report <p>Special Instructions :</p>
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Reason for change

- This is one of the activities of foreign materials reduction.

It is also the permanent solution of low sound pressure caused by soldering ball.

✕In order to prevent the soldering ball leap into the case , currently we distinguish the tools before and after soldering.

We also increse the frequency of cleaning and do the additional check.

Schedule date to carry out:	Afetr your apporval	Deadline for response we hope	24-Apr-17	Attachment: <input checked="" type="radio"/> Yes <input type="radio"/> No
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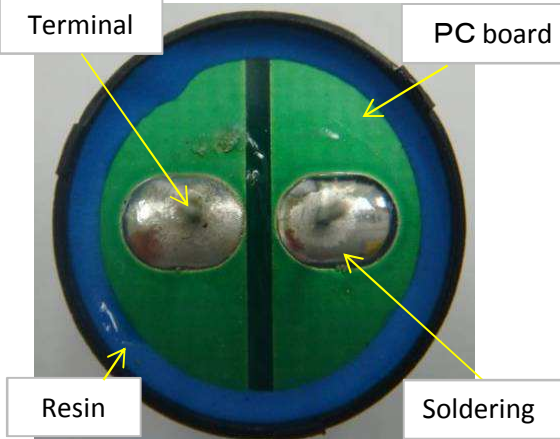
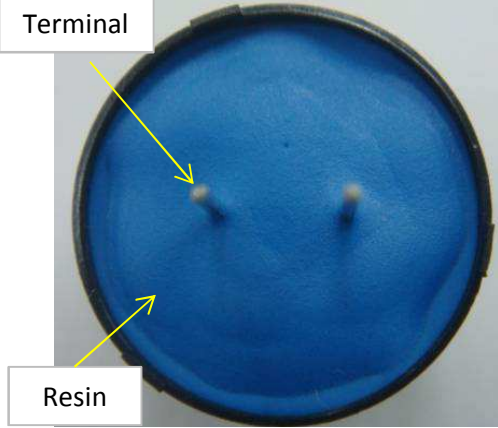
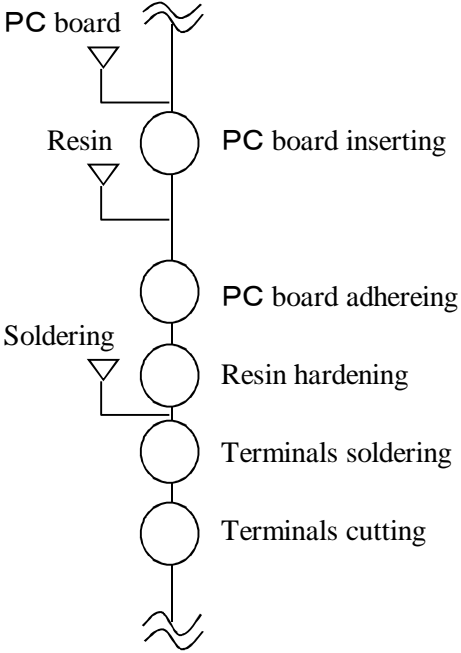
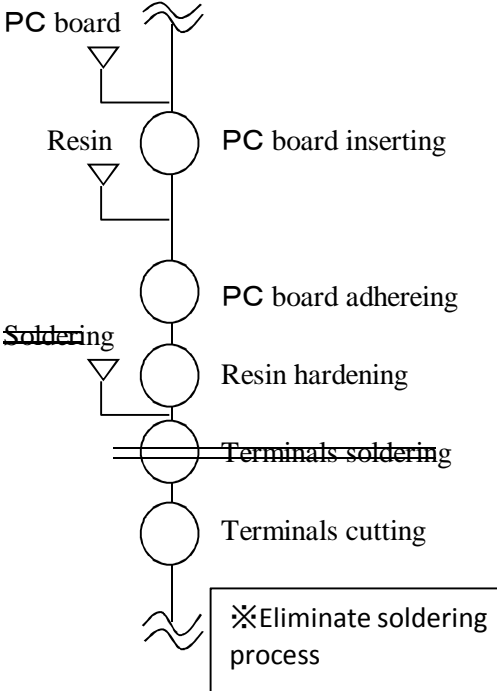
To Piezo&Protection Device Bussiness Group
 TDK Corporation

Date entered:

Responsible person _____
 Person in charge _____
 Position of person in charge _____

Column for approval	Directions
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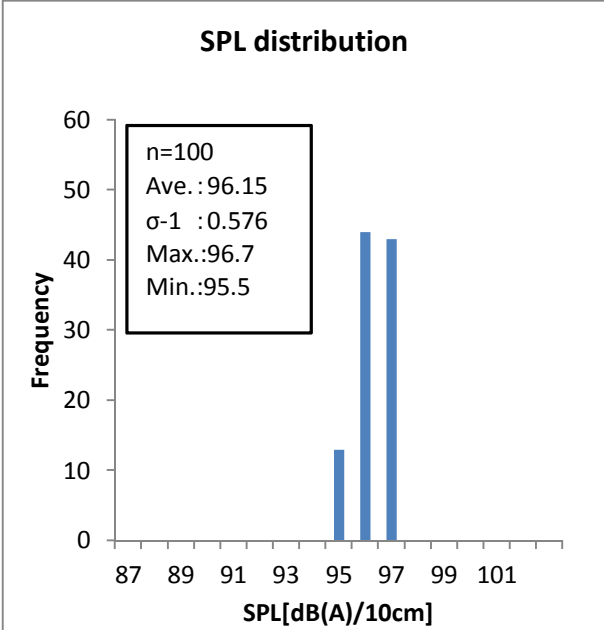
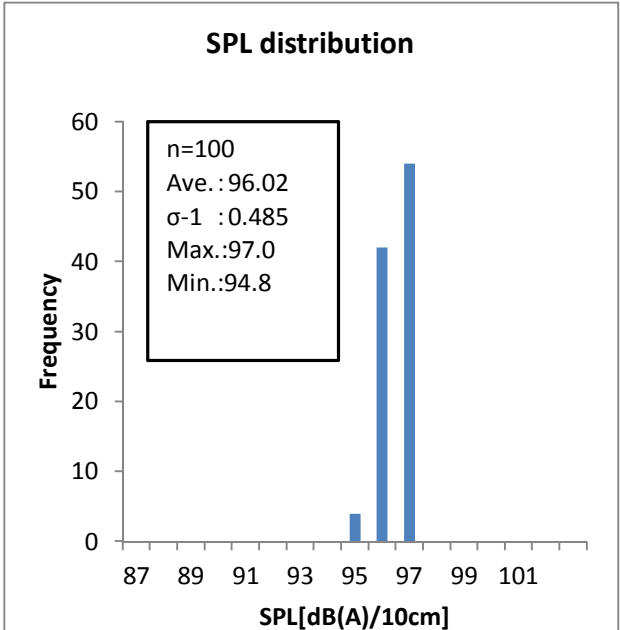
【Appearance before&after chang and change point 】

	Before Change	After change
<p>Pictures</p>		
<p>Struture change point</p>	<ul style="list-style-type: none"> •Fix the terminla with soldering •Coating with resin only for outer circumference 	<ul style="list-style-type: none"> •Fix the terminal with resin •Coating with resin for full PC board •Eliminate soldering
<p>Process change point</p>		
<p>Materials</p>	<p>After change,no other materials changed except for the elimination of soldering between terminals and PC board.</p>	

【Characteristic Comparison before & after change (SPL)】

Result :

Except for the change point, we used the same lot of all materials and compared the SPL of before change and after change. We found no differences between before change and after change.
 For the change this time, there is no change in the cave area of the case. And it will not influence the SPL.

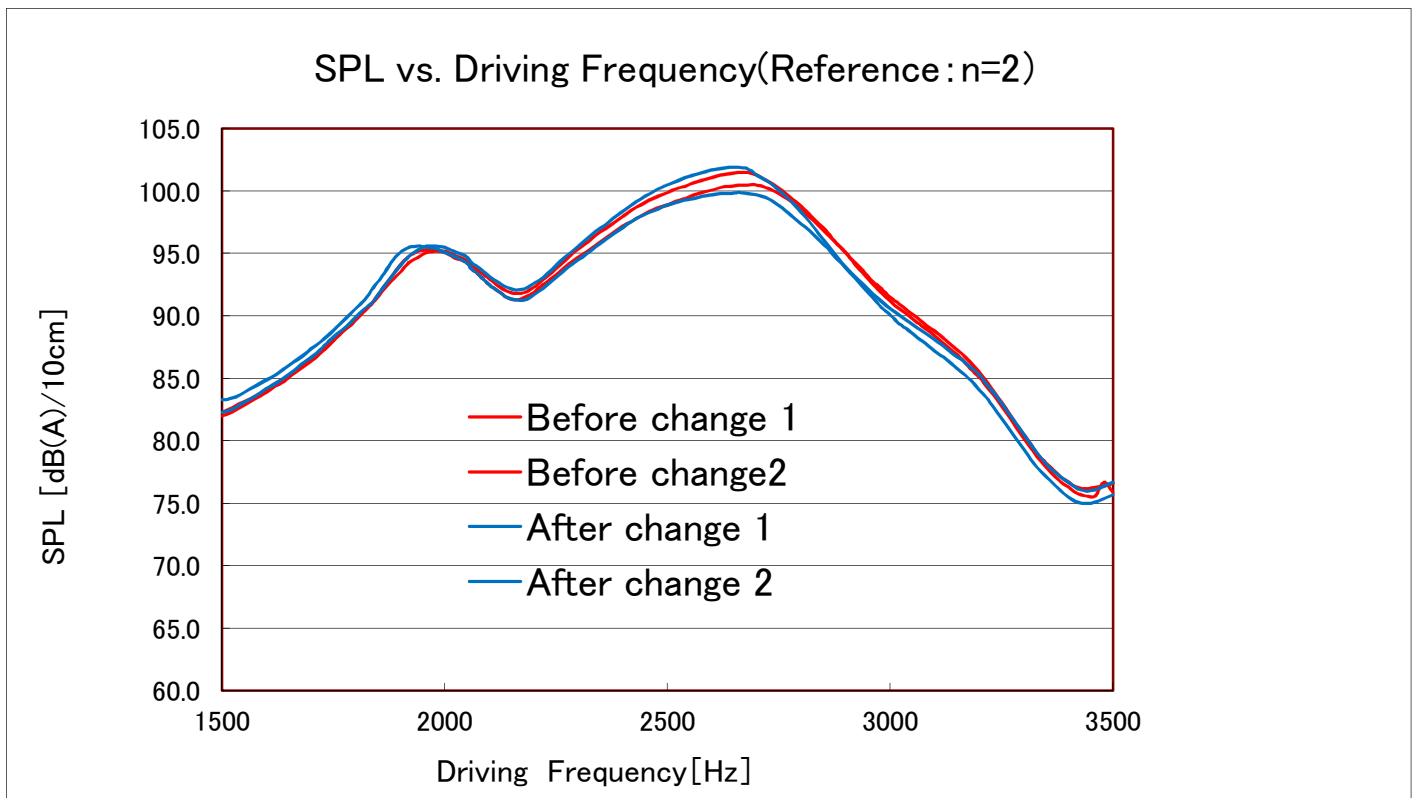
	Before change	After change
SPL	<p>Driving condition: 12Vo-p 2048Hz duty50% square wave</p>  <p>SPL distribution</p> <p>n=100 Ave.: 96.15 σ-1 : 0.576 Max.: 96.7 Min.: 95.5</p>	<p>Driving condition: 12Vo-p 2048Hz duty50% square wave</p>  <p>SPL distribution</p> <p>n=100 Ave.: 96.02 σ-1 : 0.485 Max.: 97.0 Min.: 94.8</p>

【Characteristic Comparison before & after change (SPL vs Frequency)】

Result :

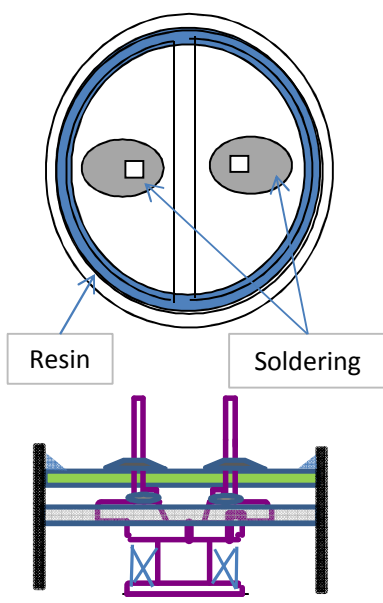
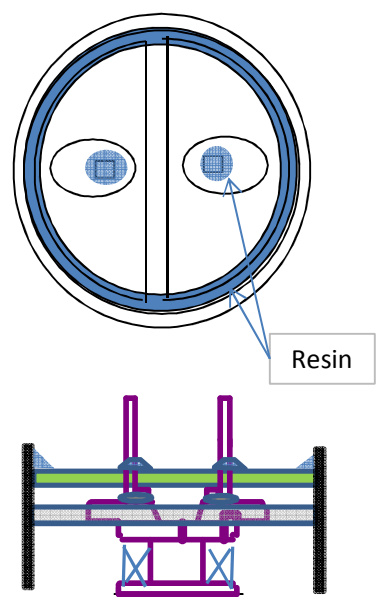
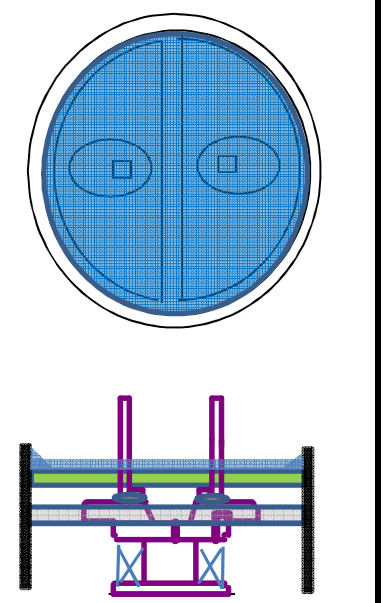
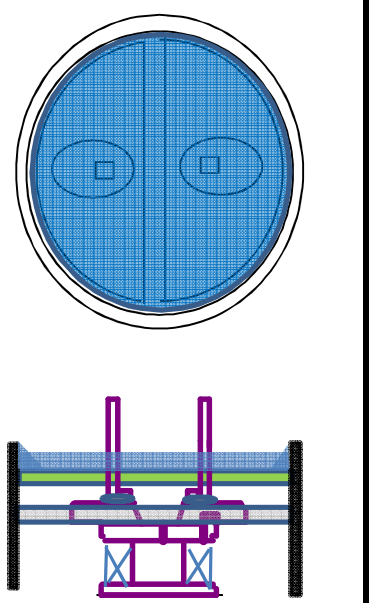
Except for the change point, we used the same lot of all materials and compared the frequency of before change and after change. We found no differences between before change and after change. For the change this time, there is no change in the cave area of the case. And it will not influence the frequency.

12Vo-p 2048Hz duty50% square wave



【Terminal tensile strength Comparison before & after change】

Though the terminal tensile strength is lower than current product, it is much larger than the specification required which is 10N 10s.
We judge that the terminal tensile strength is OK for you to use.

	Before change	After change		
		The resin quantity will be moderate when production. Appearance standard : can not see the PC board. resin not higher over the case.		
		Less resin only round the termina (the round of the terminal is coated)	Moderate resin (Resin high: half of case)	More resin (Resin high: Top of case)
Sample	 <p>Labels: Resin, Soldering</p>	 <p>Label: Resin</p>		
Terminal tensile strength	n=22 Ave. 165.9 N Max. 199.1 N Min. 134.2 N	n=22 Ave. 105.9 N Max. 125.4 N Min. 87.7 N	n=22 Ave. 125.45 N Max. 148.04 N Min. 108.66 N	n=22 Ave. 158.20 N Max. 187.52 N Min. 142.42 N

【Terminal tensile strength after each test (For reference)】

After test, we can't find any obvious drop of the terminals, and we judged it test OK.

Item	Before test	Sample : moderate resin				
		Thermal cycle test	Vibration test	Shock test	Soldering heat resistance①	Soldering heat resistance②
Test condition	—	-40°C ⇔ +85°C 各0.5h 1000 Cycles	30m/S ² 10~200Hz sweep 15min X,Y,Z directionn 8h each	1000m/S ² 6ms X Y Z X' Y' Z' 3times each °	260°C 10 s	350°C 3 s
Terminal tensile strength	n=22 Ave. 125.45N Max. 148.0N Min. 108.7N	n=10 Ave. 126.93N Max. 141.8N Min. 118.6N	n=10 Ave. 124.90N Max. 143.1N Min. 104.3N	n=10 Ave. 129.80N Max. 143.6N Min. 104.9N	n=10 Ave. 122.38N Max. 143.1N Min. 111.1N	n=10 Ave. 127.56N Max. 135.7N Min. 116.6N

Reliability Test Report

December 22, 2016

Piezo & Protection Devices Business Group

TDK Corporation

Unit Products

Title: Electromagnetic buzzer SD1614TT series

Purpose: Perform as customer required

Result: No problem

No	Items	Test condition	Quantity	Test result	Remarks
1	Thermal cycle test	-40°C ⇔ 85°C 30min each 1000 cycles	22	no abnormality	
2	Vibration test	10~200Hz sweep 15min 30m/s ² X,Y,Z directionn 8h each	22	no abnormality	
3	Shock test	1000m/s ² ,6ms X,Y,Z, X',Y',Z' 3times each	22	no abnormality	
4	Soldering heat resistance ①	260°C 10s	22	no abnormality	
5	Soldering heat resistance ②	350°C 3s	22	no abnormality	

TEST REPORT

TEST REPORT											
PART No.	SD1614TT-B3M										
QUANTITY	22pcs										
DATE	START 2016/11/4	TEMP.& HUM.	24°C 53%								
	FINISH 2016/12/21	TEMP.& HUM.	23°C 41%								
ITEM	1. Thermal cycle test										
	INITIAL DATA			FINAL DATA			VARIATIONS OF DATA			APPEAR -ANCE	RESULTS
CHARACTERISTICS	P2048			P2048		RDC	P2048				
UNITS	(dB)			(dB)		(Ω)	(dB)				
MAX.LIMITS	-			-		-	5				
MIN.LIMITS	85			-		-	-5				
SAMPLE No.1	96.1			96.5			0.4			OK	OK
2	96.3			96.1			-0.2			OK	OK
3	95.7			95.8			0.1			OK	OK
4	96.3			96.3			0.0			OK	OK
5	96.4			96.0			-0.4			OK	OK
6	96.4			96.7			0.3			OK	OK
7	96.2			96.3			0.1			OK	OK
8	96.6			96.7			0.1			OK	OK
9	96.8			96.8			0.0			OK	OK
10	96.2			96.3			0.1			OK	OK
11	95.6			95.6			0.0			OK	OK
12	96.0			95.9			-0.1			OK	OK
13	95.8			96.2			0.4			OK	OK
14	95.4			95.9			0.5			OK	OK
15	95.9			96.2			0.3			OK	OK
16	96.3			96.1			-0.2			OK	OK
17	96.0			96.3			0.3			OK	OK
18	95.6			95.8			0.2			OK	OK
19	96.8			96.9			0.1			OK	OK
20	96.2			96.2			0.0			OK	OK
21	96.3			95.9			-0.4			OK	OK
22	96.2			95.7			-0.5			OK	OK
AVE.	96.30			96.35			0.05				
MAX.	96.8			96.8			0.4				
MIN.	95.7			95.8			-0.4				
RELIABILITY TEST CONDITIONS						MEASUREMENT CONDITIONS					
-40°C ⇔ 85°C						INPUT VOLTAGE : 12 Volt ,Square wave 50% duty cycles					
30min each 1000 cycles						FREQUENCY : 2048Hz					
						SPL : at. 10cm from source & A weighting					
MEASURE						MARK P2048 : SPL at 2048Hz					
SPL METER :RION NA60											

TEST REPORT

PART No.	SD1614TT-B3M										
QUANTITY	22pcs										
DATE	START 2016/11/4	TEMP.& HUM.	24°C 53%								
	FINISH 2016/11/8	TEMP.& HUM.	25°C 43%								
ITEM	Vibration test										
	INITIAL DATA			FINAL DATA			VARIATIONS OF DATA			APPEAR -ANCE	RESULTS
CHARACTERISTICS	P2048			P2048		RDC	P2048				
UNITS	(dB)			(dB)		(Ω)	(dB)				
MAX.LIMITS	-			-		-	5				
MIN.LIMITS	85			-		-	-5				
SAMPLE No.1	95.9			95.9			0.0			OK	OK
2	96.3			95.8			-0.5			OK	OK
3	96.5			96.3			-0.2			OK	OK
4	96.2			95.9			-0.3			OK	OK
5	96.2			95.9			-0.3			OK	OK
6	95.5			95.4			-0.1			OK	OK
7	96.6			96.7			0.1			OK	OK
8	96.0			96.0			0.0			OK	OK
9	95.7			95.5			-0.2			OK	OK
10	96.5			96.1			-0.4			OK	OK
11	96.5			95.9			-0.6			OK	OK
12	96.8			96.8			0.0			OK	OK
13	96.7			96.8			0.1			OK	OK
14	95.4			94.6			-0.8			OK	OK
15	95.3			94.7			-0.6			OK	OK
16	96.6			96.5			-0.1			OK	OK
17	95.8			95.8			0.0			OK	OK
18	95.8			95.7			-0.1			OK	OK
19	96.9			96.6			-0.3			OK	OK
20	96.4			96.6			0.2			OK	OK
21	96.0			96			0.0			OK	OK
22	96.2			96.4			0.2			OK	OK
AVE.	96.14			95.95			-0.19				
MAX.	96.6			96.7			0.1				
MIN.	95.5			95.4			-0.5				
RELIABILITY TEST CONDITIONS						MEASUREMENT CONDITIONS					
10~200Hz sweep 15min						INPUT VOLTAGE : 12 Volt ,Square wave 50% duty cycles					
30m/s ²						FREQUENCY : 2048Hz					
X,Y,Z directionn 8h each						SPL : at. 10cm from source & A weighting					
MEASURE						MARK P2048 : SPL at 2048Hz					
SPL METER :RION NA60											

TEST REPORT

TEST REPORT											
PART No.	SD1614TT-B3M										
QUANTITY	22pcs										
DATE	START 2016/11/4	TEMP.& HUM.	24°C 53%								
	FINISH 2016/11/8	TEMP.& HUM.	25°C 43%								
ITEM	Shock test										
	INITIAL DATA			FINAL DATA			VARIATIONS OF DATA			APPEAR -ANCE	RESULTS
CHARACTERISTICS	P2048			P2048		RDC	P2048				
UNITS	(dB)			(dB)		(Ω)	(dB)				
MAX.LIMITS	-			-		-	5				
MIN.LIMITS	85			-		-	-5				
SAMPLE No.1	96.2			96.0			-0.2			OK	OK
2	95.9			94.8			-1.1			OK	OK
3	96.3			95.6			-0.7			OK	OK
4	96.8			96.7			-0.1			OK	OK
5	96.2			96.1			-0.1			OK	OK
6	96.9			97.0			0.1			OK	OK
7	95.8			96.0			0.2			OK	OK
8	96.3			96.6			0.3			OK	OK
9	96.1			96.1			0.0			OK	OK
10	96.3			96.2			-0.1			OK	OK
11	96.1			96.5			0.4			OK	OK
12	95.8			95.7			-0.1			OK	OK
13	95.8			95.9			0.1			OK	OK
14	96.2			96.1			-0.1			OK	OK
15	96.3			96			-0.3			OK	OK
16	97.1			96.8			-0.3			OK	OK
17	96.4			96.6			0.2			OK	OK
18	95.4			96			0.6			OK	OK
19	96.3			96.2			-0.1			OK	OK
20	96.5			96.5			0.0			OK	OK
21	96.3			96.1			-0.2			OK	OK
22	96.2			95.7			-0.5			OK	OK
AVE.	96.28			96.11			-0.17				
MAX.	96.9			97.0			0.3				
MIN.	95.8			94.8			-1.1				
RELIABILITY TEST CONDITIONS 1000m/s ² ,6ms X,Y,Z, X',Y',Z' 3times each					MEASUREMENT CONDITIONS INPUT VOLTAGE : 12 Volt ,Square wave 50% duty cycles FREQUENCY : 2048Hz SPL : at. 10cm from source & A weighting						
MEASURE SPL METER :RION NA60					MARK P2048 : SPL at 2048Hz						

TEST REPORT

PART No.	SD1614TT-B3M										
QUANTITY	22pcs										
DATE	START 2016/11/4	TEMP.& HUM.	24°C 53%								
	FINISH 2016/11/8	TEMP.& HUM.	25°C 43%								
ITEM	Soldering heat resistance①										
	INITIAL DATA			FINAL DATA			VARIATIONS OF DATA			APPEAR -ANCE	RESULTS
CHARACTERISTICS	P2048			P2048		RDC	P2048				
UNITS	(dB)			(dB)		(Ω)	(dB)				
MAX.LIMITS	-			-		-	5				
MIN.LIMITS	85			-		-	-5				
SAMPLE No.1	96.3			95.8			-0.5			OK	OK
2	95.8			96.5			0.7			OK	OK
3	96.3			95.8			-0.5			OK	OK
4	96.3			95.9			-0.4			OK	OK
5	94.8			95.1			0.3			OK	OK
6	95.8			95.8			0.0			OK	OK
7	96.3			96.3			0.0			OK	OK
8	96.3			96.3			0.0			OK	OK
9	96.3			96.5			0.2			OK	OK
10	96.1			96.3			0.2			OK	OK
11	96.3			95.2			-1.1			OK	OK
12	95.8			96.3			0.5			OK	OK
13	95.8			96.2			0.4			OK	OK
14	96.3			95.8			-0.5			OK	OK
15	95.8			95.2			-0.6			OK	OK
16	95.8			95.6			-0.2			OK	OK
17	96.3			96.4			0.1			OK	OK
18	96.1			96.3			0.2			OK	OK
19	96.3			96.3			0.0			OK	OK
20	96.3			96.3			0.0			OK	OK
21	96.1			95.7			-0.4			OK	OK
22	96.4			95.8			-0.6			OK	OK
AVE.	96.03			96.03			0.00				
MAX.	96.3			96.5			0.7				
MIN.	94.8			95.1			-0.5				
RELIABILITY TEST CONDITIONS 260°C 10s						MEASUREMENT CONDITIONS INPUT VOLTAGE : 12 Volt ,Square wave 50% duty cycles FREQUENCY : 2048Hz SPL : at. 10cm from source & A weighting					
MEASURE SPL METER :RION NA60						MARK P2048 : SPL at 2048Hz					

TEST REPORT

PART No.	SD1614TT-B3M										
QUANTITY	22pcs										
DATE	START 2016/11/4	TEMP.& HUM.	24°C 53%								
	FINISH 2016/11/8	TEMP.& HUM.	25°C 43%								
ITEM	Soldering heat resistance②										
	INITIAL DATA			FINAL DATA			VARIATIONS OF DATA			APPEAR -ANCE	RESULTS
CHARACTERISTICS	P2048			P2048		RDC	P2048				
UNITS	(dB)			(dB)		(Ω)	(dB)				
MAX.LIMITS	-			-		-	5				
MIN.LIMITS	85			-		-	-5				
SAMPLE No.1	94.5			94.5			0.0			OK	OK
2	96.7			96.5			-0.2			OK	OK
3	95.5			96.0			0.5			OK	OK
4	96.5			95.8			-0.7			OK	OK
5	95.5			95.9			0.4			OK	OK
6	96.8			96.7			-0.1			OK	OK
7	96.5			96.5			0.0			OK	OK
8	95.7			95.5			-0.2			OK	OK
9	95.9			95.9			0.0			OK	OK
10	96.9			95.6			-1.3			OK	OK
11	96.6			96.8			0.2			OK	OK
12	96.5			96.5			0.0			OK	OK
13	96.5			95.5			-1.0			OK	OK
14	96.5			96.9			0.4			OK	OK
15	96.3			96.6			0.3			OK	OK
16	95.6			95.9			0.3			OK	OK
17	96.1			96.0			-0.1			OK	OK
18	95.7			96.2			0.5			OK	OK
19	95.9			96.1			0.2			OK	OK
20	96.5			96.5			0.0			OK	OK
21	96.5			96.4			-0.1			OK	OK
22	97.0			97.0			0.0			OK	OK
AVE.	96.05			95.89			-0.16				
MAX.	96.9			96.7			0.5				
MIN.	94.5			94.5			-1.3				
RELIABILITY TEST CONDITIONS						MEASUREMENT CONDITIONS					
350°C 3s						INPUT VOLTAGE : 12 Volt ,Square wave 50% duty cycles					
						FREQUENCY : 2048Hz					
						SPL : at. 10cm from source & A weighting					
MEASURE						MARK					
SPL METER :RION NA60						P2048 : SPL at 2048Hz					