Data May.9th 2013
Ref No.G2K-R-130507-2

To: Dear customer

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RF DEVICE DEPT PRODUCTS DIVISION
QUALYTY ASSURANCE DEPT PRODUCTS DIVISION
MIYOSHI ELECTRONICS CORPORATION

Subject：Regarding the change to RoHS2 compliant product of RD07MUS2B.
Report of RF characteristics result ,reliability test result.

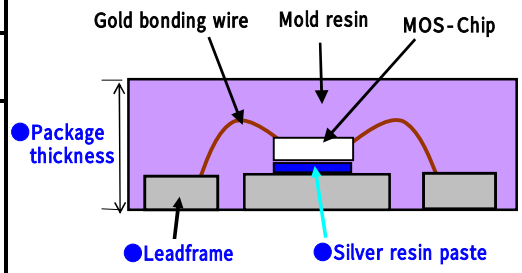
Regarding the change to RoHS2 Compliant Product of RD07MUS2B.＊1)
We evaluated that there is no problem of RF characteristics＊2),DC characteristics＊3),and reliability test＊4).
As a result,new RD07MUS2B is the same as current specification.
New RD07MUS2B is the same quality as current specification and we will guarantee of quality.

＊1) Report number : G2K-R-130201-2 RoHS2 Compliant Product Change Prior notice for MITSUBISHI Silicon RF Power devices.
＊2) Page2-4 shows result of RF characteristics.(Frequency characteristics,Pin-Po characteristics,Load VSWRT Tolerance,S-para)
＊3) Page5 shows result of DC characteristics.(Ciss/Coss/Crss ,VDS-IDS,VGS-IDS)
＊4) Page6 shows result of reliability test . Page7 shows result of Electro-Static Discharge (ESD)

●Products subject、Reason of change、Change schedule

Subject	Product name	Type number
	MOS FET RF Power device.	RD series discrete devices of SLP package

Reason of change	Reason of change	Requirements of RoHS2.
	Changed contents	Change of the material,product site and package thickness.
	Current	New
	Die attach: PbSnAg Solder Leadframe plating:Silver Production site：JAPAN Country-of-origin labeling : Made in Japan Package thickness:0.9mm±0.1mm Standard number Palette spec : RD07MUS2B-1＊＊ Taping reel spec:RD07MUS2B-T1＊＊	Die attach: Silver resin paste Leadframe plating:PPF Production site：THAILAND(EMS company) Country-of-origin labeling : Made in Thailand Package thickness:0.75mm±0.05mm Standard number: Palette spec : RD07MUS2B-2＊＊ Taping reel spec : RD07MUS2B-T2＊＊



Change schedule

	'2013 Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	'2014 Jan	Feb	Mar	Apr	May
Product Change Prior notice.		●															
We will report for RF characteristics,reliability test,and send product change notice.				←→													
Start of provide samples.				←→	CS												
Mass production start for assembly start from July 2013 at EMS company. But test location and shipping location is Japan.							▼shipment start.										
Mass production start for test from Apr 2014 at EMS company.																■Start	
End of life for the PbSnAg solder product by Aug 2013.									★End of life								

●Other

We will send SEMICONDUCTOR SPECIFICATION,if customer request.

●Comparison result of RF characterristics

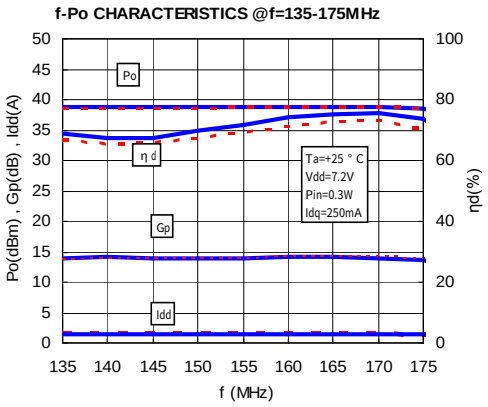
We shows the result for RF characteristics of Freqency characteristics,Pin-Po characteristics,Load VSWRT Tolerance,and S parameter as follows.

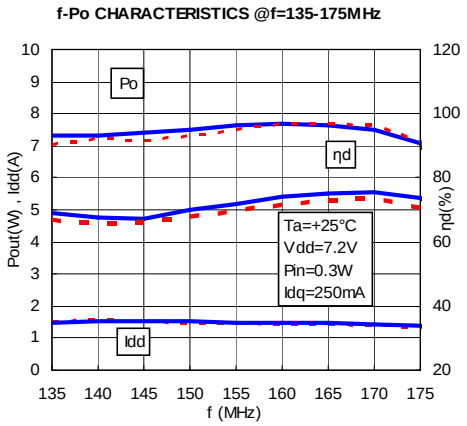
(1) Freqency characteristics

■Result : Freqency characteristics is the same as current specification.

VHF Band@135MHz to 175MHz

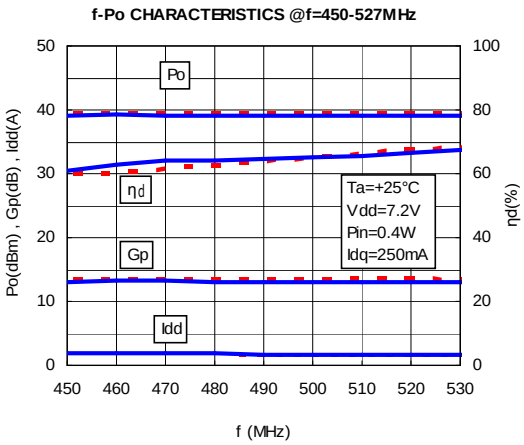
New:Blue line、Current:Broken red line

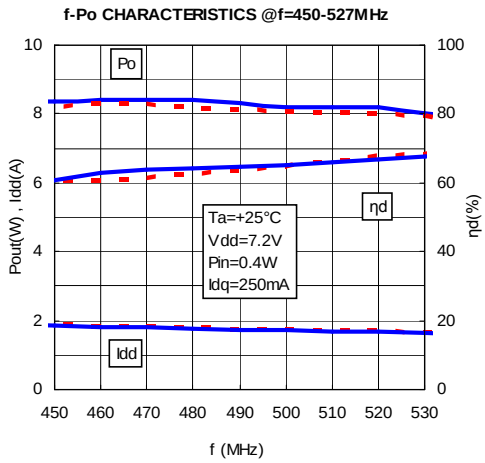




UHF Band@450MHz to 530MHz

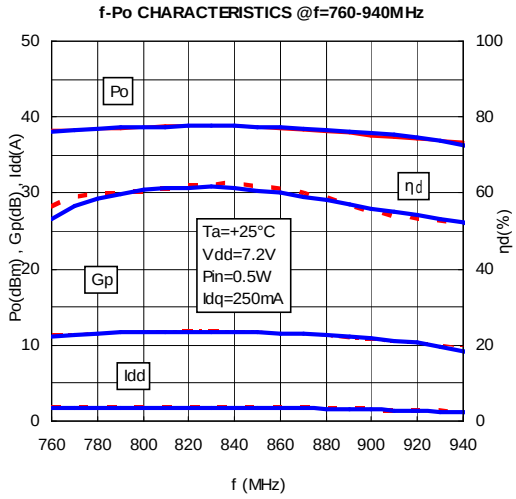
New:Blue line、Current:Broken red line

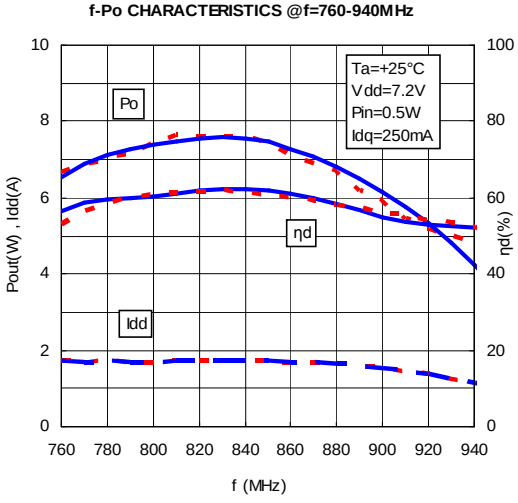




800-900MHz Band@760MHz to 940MHz

New:Blue line、Current:Broken red line

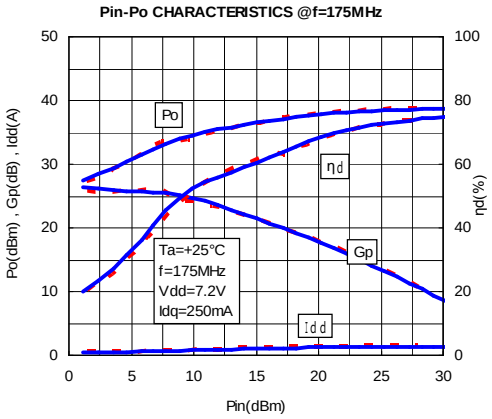


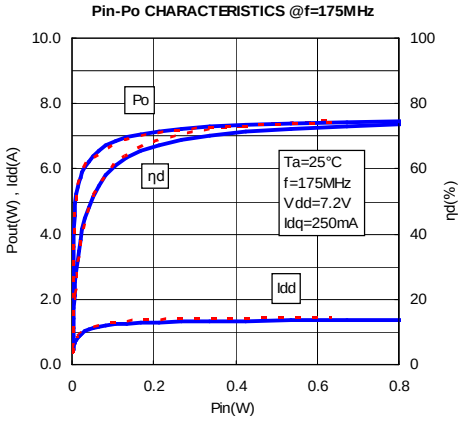


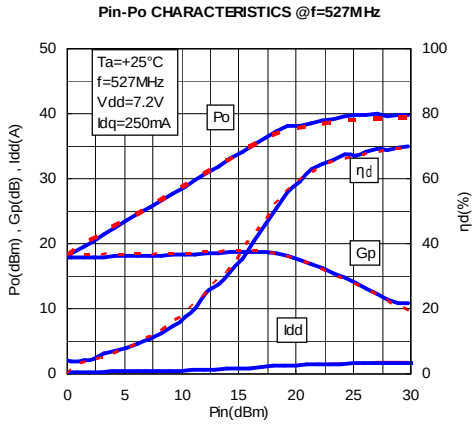
(2)Pin-Po characteristics

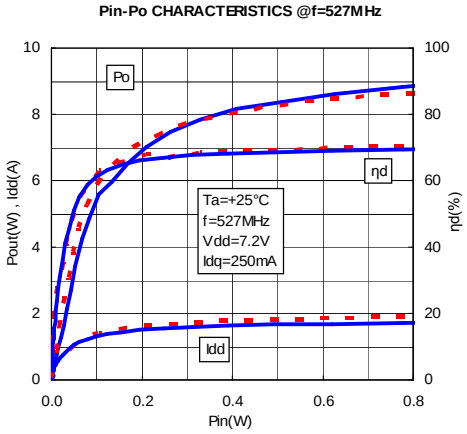
■Result : Pin-Po characteristics is the same as current specification.

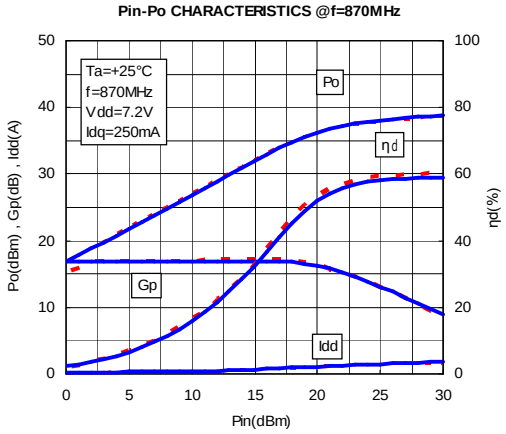
New：Blue line、Current：Broken red line

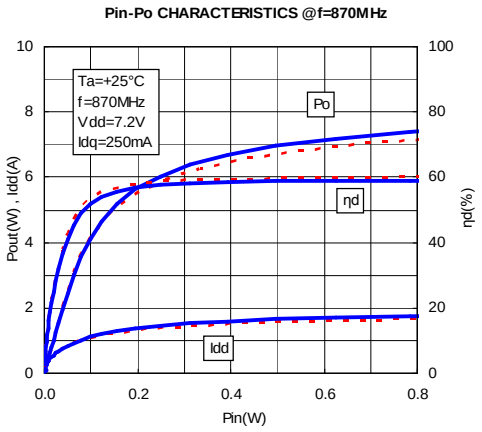












(3)Load VSWRT Tolerance

■Condition：f=135MHz、Vdd=9.5V、Idq=250±10mA(Vgg control), Po=6.6W(Pin control),VSWR=20:1 All phase、Zg=50Ω

■Result : RF Load VSWRT Tolerance is the same as current specification.

There are not degradation and not destroy.

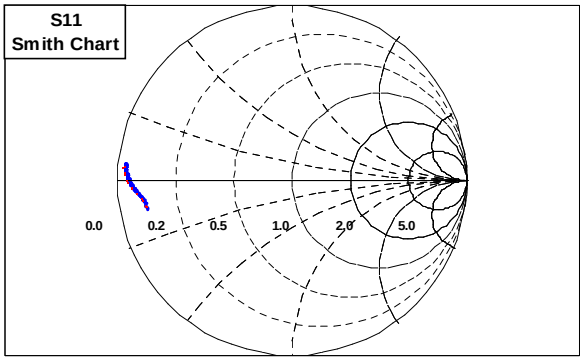
Qty of sample	Failure
40pcs	0pcs

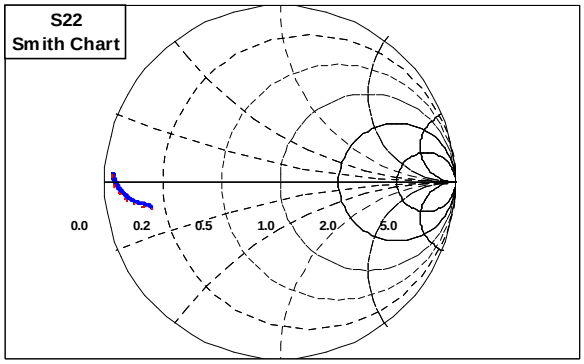
(4) S parameter

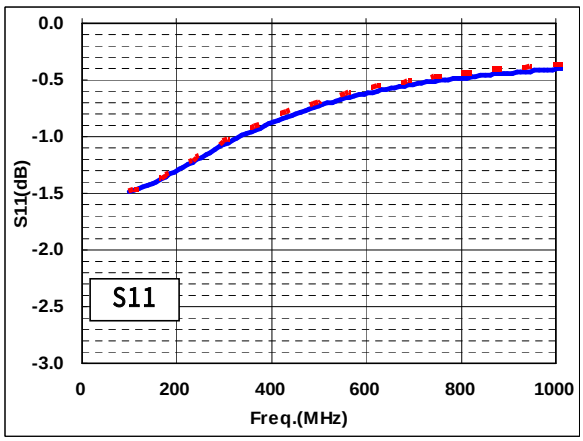
■Condition : Vd=7.2V Idq=0.25A f=100MHz-1GHz(10MHz step)

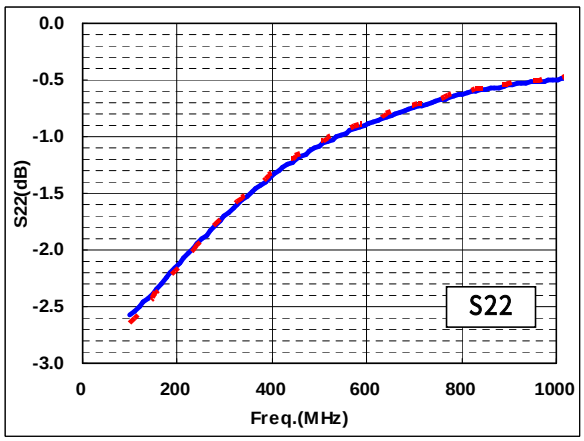
■Results : There is no difference in S11,S22,FK,and K factor.

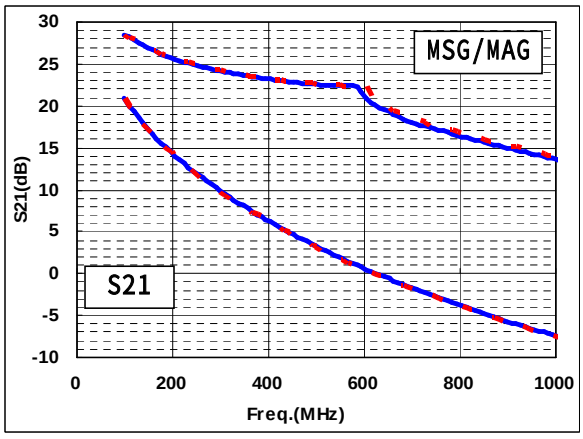
New : Blue line、Current : Broken red line

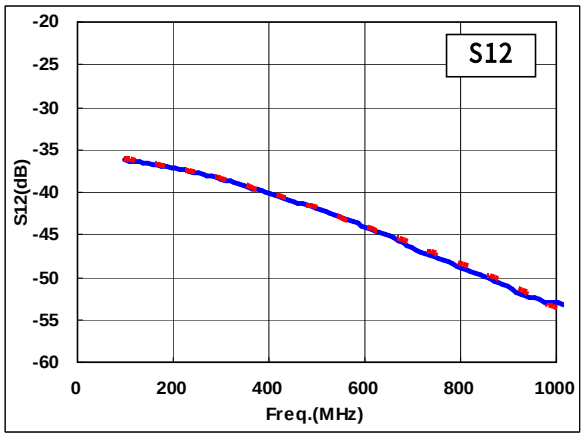


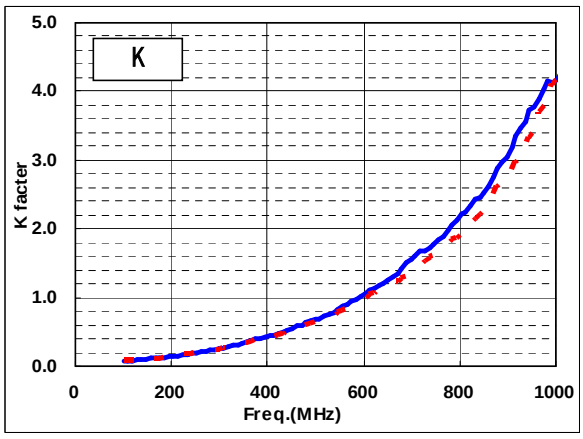












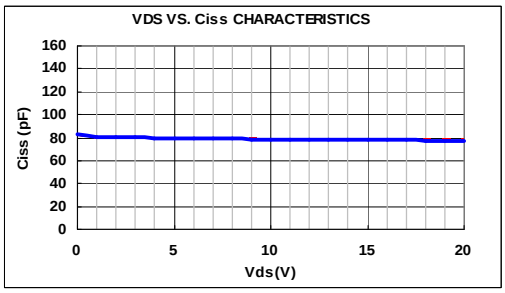
●Comparison result of DC characterristics

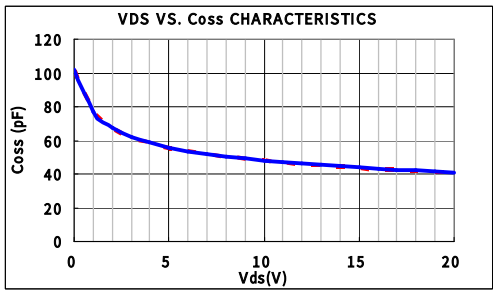
We shows the result for DC characteristics of Ciss/Coss/Crss , VDS-IDS,VGS-IDS as follows.

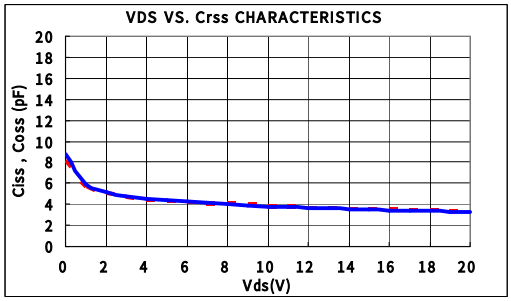
(1) Ciss/Coss/Crss characteristics

■Condition：1MHz、Ta=25℃
■Result：There is no difference in Ciss/Coss/Crss.

New：Blue line、Current：Broken red line



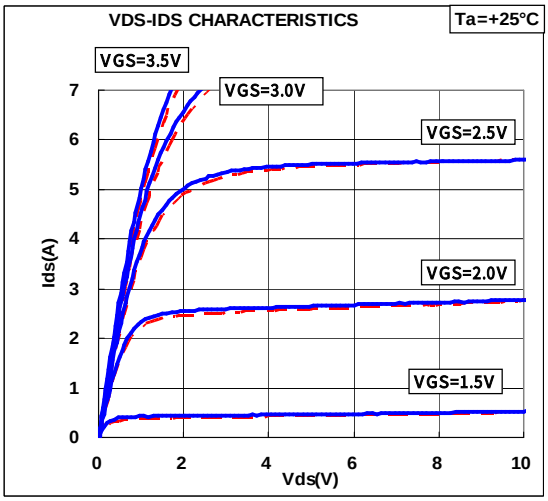


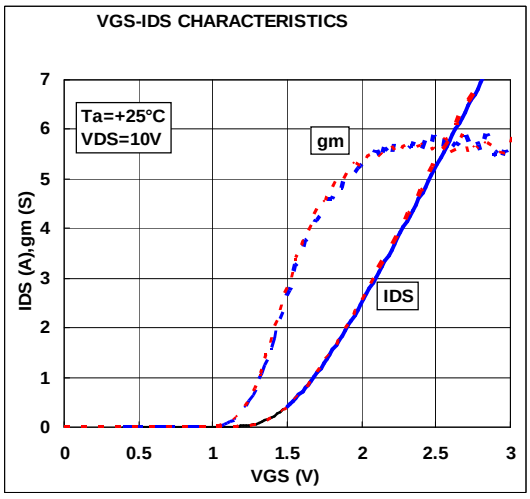


(2)VDS-IDS、VGS-IDS characteristics

■結果：VDS－IDS特性、VGS-IDS特性は現行仕様に差なく、同等の特性結果です。

New：Blue line、Current：Broken red line





●Reliability test

RD07MUS2B (RoHS Compliance device of SLP outline) reliability results
以下表にRD07MUS2Bにて実施した信頼性試験結果を示します。
The following summarizes reliability test results on RD07MUS2B.

■Result : Reliability test result that within failure criteria,same level with current specification.

表1 結果 Table 1 Result

ｸﾞﾙｰﾌﾟ Group	試験項目 Test item	試験条件 Test condition	試験数量 QTY of sample	故障数QTY of failure
1 *	高温保存 High temperature storage	125℃ 1000hours	11	0
2 *	低温保存 Low temperature storage	-40℃ 1000hr	11	0
3 *	耐湿性保存 Humidity storage	85℃/85%RH 1000hr	11	0
4 *	温度ｻｲｸﾙ Temperature cycling	-40℃／125℃ 510cycles 30min/30min	22	0
5 *	熱衝撃 Thermal shock	-40℃／125℃ 100cycles 5min/5min	5	0
6 *	耐基板曲げ Deflection	Distance between fulcrums:90mm Flexure:2mm ,5times	5	0
(7)	RF断続通電試験 (参考試験) RF operation (Reference test)	f=175MHz Vdd=7.2V Po=7W Tj=150℃(4min) /100℃(3min) 10000cycle	4	0

＊Pre-treatment was done before the tests.

Pre-treatment condition:
Baking:125℃24hr→ Moisture soak:30℃,70%RH,192hr→ Reflow:255℃＋5℃,30sec,3time

表2.故障判定基準Table 2 Failure criteria

ｸﾞﾙｰﾌﾟ Group	試験項目 Test	故障判定基準 Failure criteria
1	高温保存 High temperature storage	For Po and Id , More than the following amount △Po=±20% △Id=±20% @ freq=137MHz Pin=300mW Idq=250mA(Vgg adj.) Vdd=7.2V Investigation by means of a microscope. Rthj-c = ±20%
2	低温保存 Low temperature storage	
3	耐湿性保存 Humidity storage	
4	温度ｻｲｸﾙ Temperature cycling	
5	熱衝撃 Thermal shock	For DC check , and internal visual check. Igss@Vgs=5V,Vds=0V ≦1uA, Idss@Vds=17V,Vgs=0V ≦10uA
6	耐基板曲げ Deflection	Internal visual check: nothing chip crack, open wire, etc.
(7)	RF断続通電試験 (参考試験) RF operation (Reference test)	For Po and Id , More than the following amount ΔPo=±20% △Id=±20% @ freq=175MHz Pin=300mW Vdd=7.2V Vgg=Initial Value

●Electro-Static Discharge (ESD)

■Condition: 200pF, 0Kohm (Machine Model)

■Result: There is no difference in Electro-Static Discharge.

NEW

terminals	D-S (+)		D-S (-)		G-S (+)		G-S (-)		G-D (+)		G-D (-)	
	no.	cutoff voltage(V)	no.	voltage(V)	no.	cutoff voltage(V)	no.	cutoff voltage(V)	no.	cutoff voltage(V)	no.	cutoff voltage(V)
Result	201	2900	206	over -3kV	211	800	216	-1400	221	800	226	-1600
	202	2800	207	over -3kV	212	800	217	-1400	222	800	227	-1600
	203	2400	208	over -3kV	213	800	218	-1600	223	800	228	-1600
	204	2700	209	over -3kV	214	800	219	-1600	224	800	229	-1600
	205	2600	210	over -3kV	215	800	220	-1600	225	800	230	-1600
AVE	-	2680	-	over -3kV	-	800	-	-1520	-	800	-	-1600

Current

terminals	D-S (+)		D-S (-)		G-S (+)		G-S (-)		G-D (+)		G-D (-)	
	no.	cutoff voltage(V)	no.	voltage(V)	no.	cutoff voltage(V)	no.	cutoff voltage(V)	no.	cutoff voltage(V)	no.	cutoff voltage(V)
Result	A85	2400	A90	over -3kV	A95	800	A100	-1600	A105	800	A110	-1600
	A86	2800	A91	over -3kV	A96	800	A101	-1400	A106	800	A111	-1600
	A87	2350	A92	over -3kV	A97	800	A102	-1400	A107	800	A112	-1600
	A88	2850	A93	over -3kV	A98	800	A103	-1400	A108	800	A113	-1600
	A89	2800	A94	over -3kV	A99	800	A104	-1400	A109	800	A114	-1600
AVE	-	2640	-	over -3kV	-	800	-	-1440	-	800	-	-1600