Qualification Test Results on NE272 ser es

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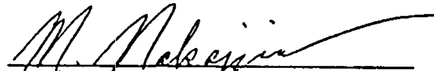

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This report presents the qualification test results on NE272 series.

1.Test Device

NE272
Al GaAs /In GaAs hetero-junction FET

2.Qualification tests

A series of qualification tests consists of following items

1)High temperature DC Bias Test (H T P T)
2)High temperature Reverse Bias Test (H T R B T)

The test conditions and sample size are shown in Table 1.
The test parameters were measured before and after the tests.

3.Test Results

The summary of qualification test result is presented in Table 3-1,3-2.

1)High Temperature DC Bias Test
The following condition has been adopted:

V_{DS}=2V I_D=10mA Tch=175℃

The test results are shown in Table 3-1 and Fig.1(1)～Fig.1(8)
The test elapsed for 5000 hours under the above condition.
The changes of all parameters are within the delta criteria.

2)High temperature DC Bias Test
The following condition has been adopted:

V_{GDS}= 4V Tch=150℃

The test results are shown in Table 3-2 and Fig.2(1)～Fig.2(8).
The test elapsed for 5000 hours under the above condition.
The changes of all parameters are within the delta criteria.

4.Conclusion

From the series of qualification test results described above

t is concluded that:

1)There is no degradation up to 5000 hours at Tch=175℃ in High temperature DC bias test.
2)There is no degradation up to 5000 hours at Tch=150℃ in High temperature Reverse bias test.

NE272 is qua fied for high reliabi ity applications.

Table 1 Test Item and Test condition

Test Item	Test Condition	Sample size	Remarks
High temperature DC bias test	V_{DS}=2V, I_D=10mA. Tch=175℃ 5000 hours or up to F(t)>50%	10	Test is continued ; No degradation up to 5000
High temperature reverse bias test	V_{G-DS}=−4V, Tch=150℃ 5000 hours or up to F(t)>50%	10	Test is continued ; No degradation up to 5000

Table 2 Delta Parameters and Criteria

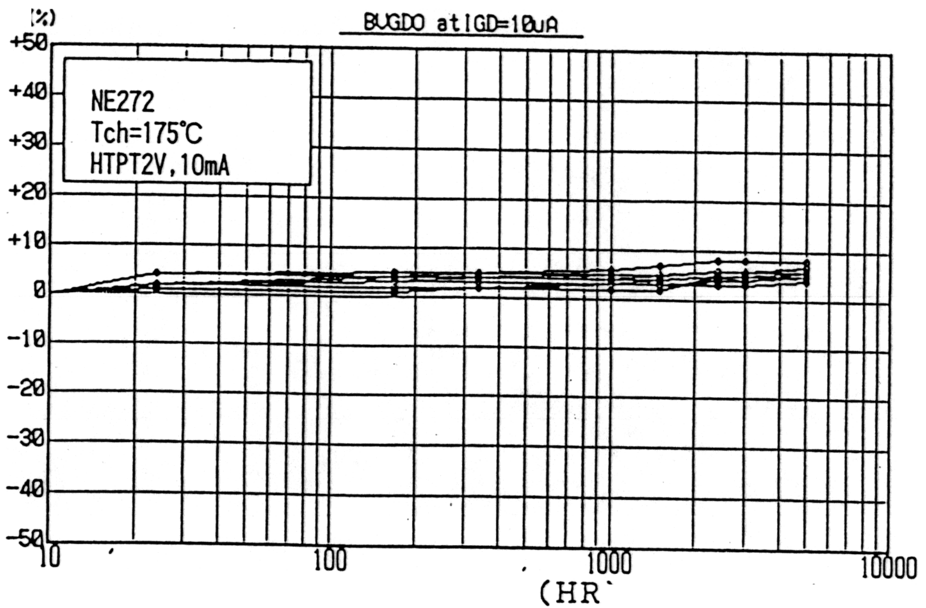
Parameter	Test condition	Delta Criteria
I_{DSS}	V_{DS}=2V, V_{GS}=0V	+20% ～ −20%
gm	V_{DS}=2V, I_D=10mA	+20% ～ −20%
$V_{GS(off)}$	V_{DS}=2V, I_D=100 μA	+20% ～ −20%
I_{GSO}	V_{GS}=−3V	+500nA or 100% whichever is greater
BV_{GDO}	I_{GD}=−10 μA	+20% ～ −20%
V_{GF}	I_{GF}=1 μA	+20% ～ −20%
NF	V_{DS}=2V, I_D=10mA f=12GHz	+0.2dB ～ −0.2dB
Ga		+0.5dB ～ −0.5dB

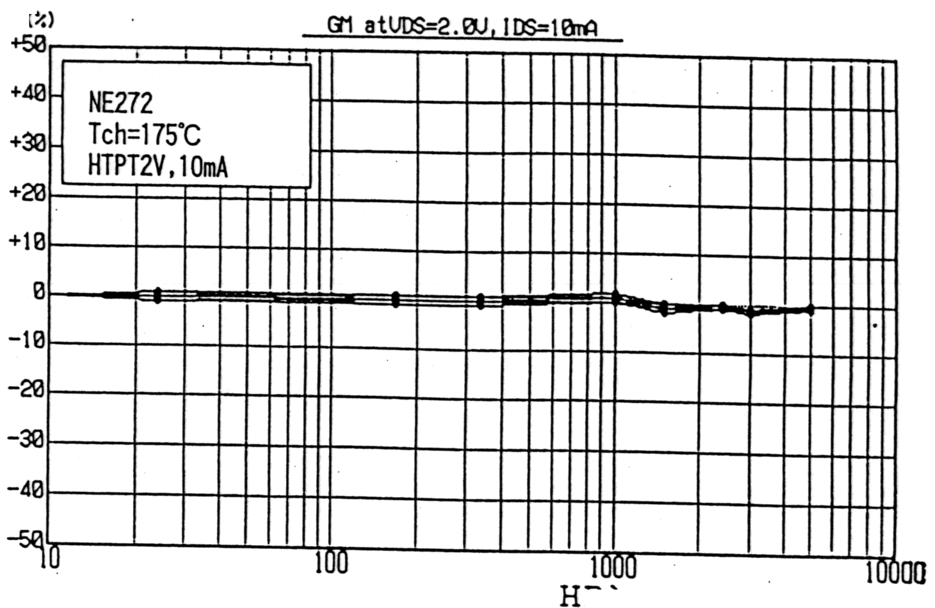
Table 3-1. Summary of Qualification Test Result

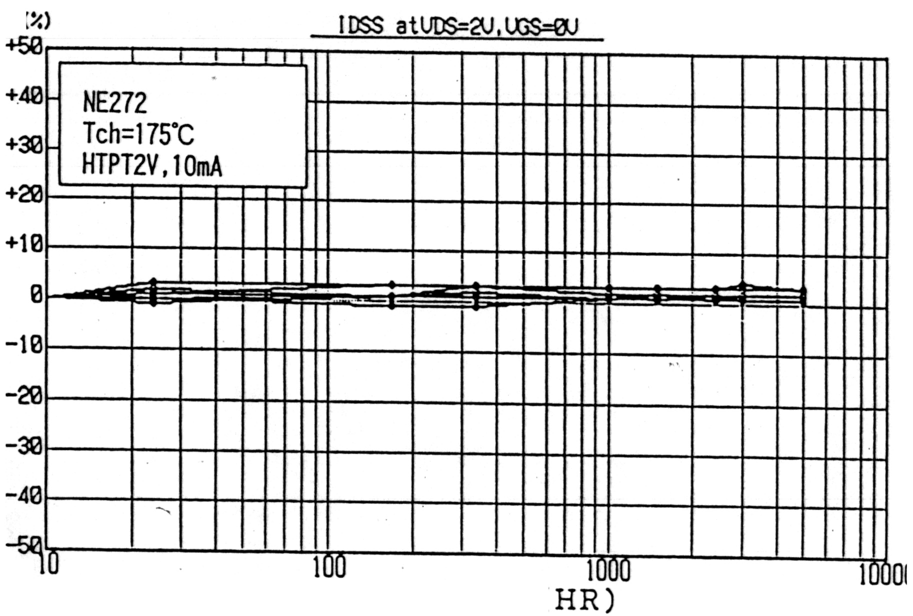
TEST ITEM	TEST CONDITION	CUMULATIVE FAILURE NUMBER WITH ELAPSED TIME						REF. FIG. OR TABLE
		168H	336H	1000H	1500H	3000H	5000H	
HIGH TEMPERATURE DC BIAS TEST	V_{DS} = 2V I_D = 10mA Tch=175℃	0/10	0/10	0/10	0/10	0/10	0/10	FIG. 1

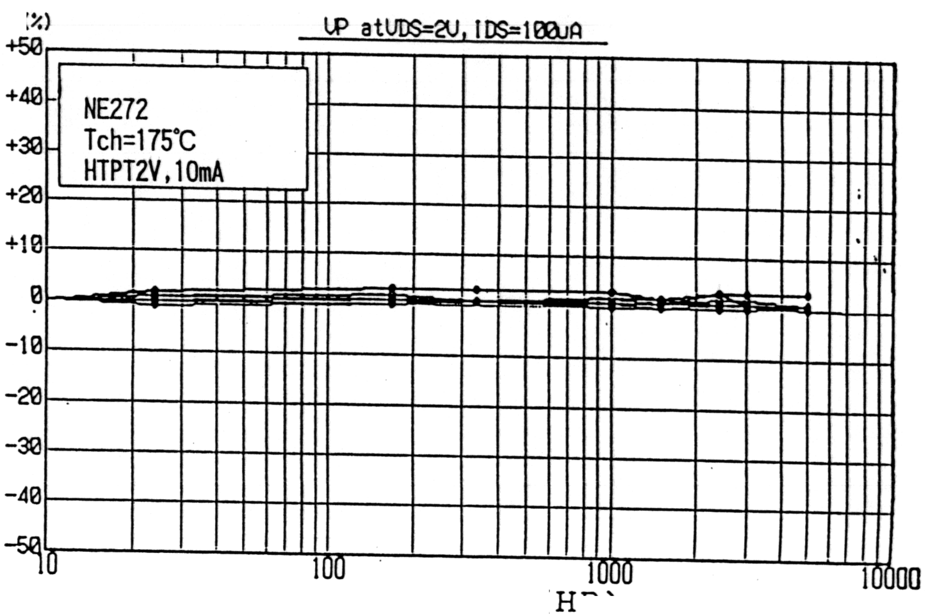
Table 3-2. Summary of Qualification Test Result

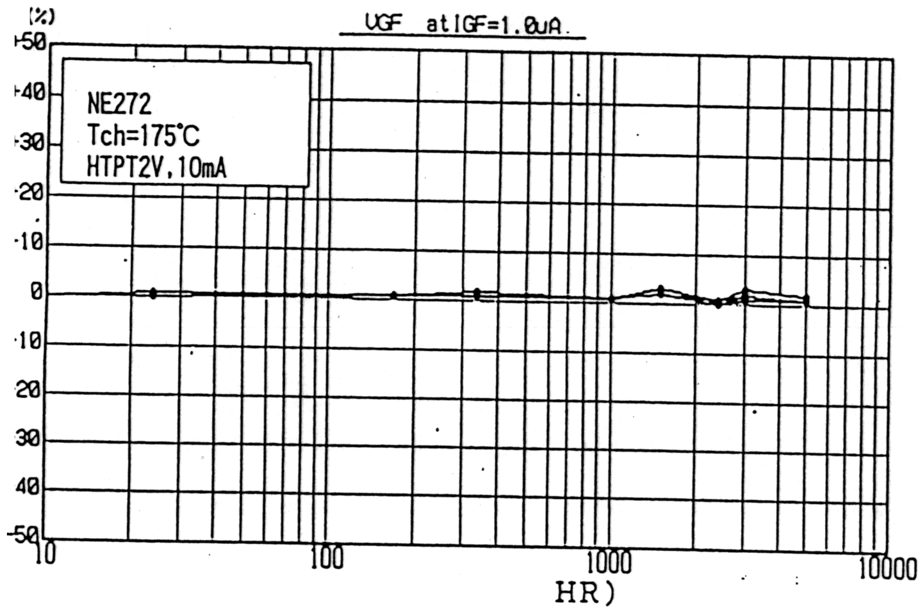
TEST ITEM	TEST CONDITION	CUMULATIVE FAILURE NUMBER WITH ELAPSED TIME						REF. FIG. OR TABLE
		168H	336H	1000H	1500H	3000H	5000H	
HIGH TEMPERATURE REVERSE BIAS TEST	$V_{G\text{-}DS}$ = -4V Tch=150℃	0/10	0/10	0/10	0/10	0/10	0/10	FIG. 2

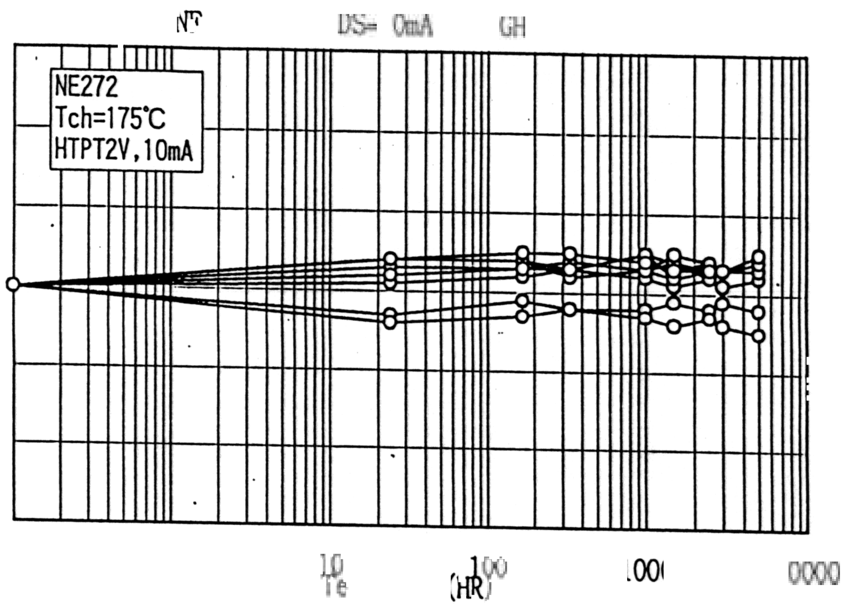

BUGDO atIGD=10uA
NE272
Tch=175°C
HTPT2V,10mA
(%)
+50
+40
+30
+20
+10
0
-10
-20
-30
-40
-50
10
100
1000
10000
(HR

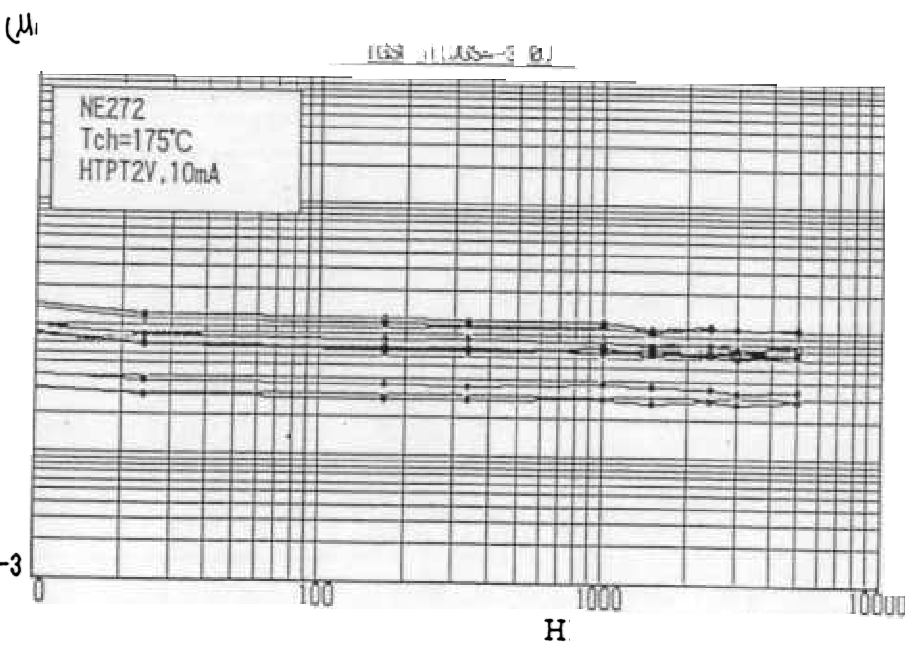

GM atUDS=2.0V,IDS=10mA
NE272
Tch=175°C
HTPT2V,10mA
(%)
+50
+40
+30
+20
+10
0
-10
-20
-30
-40
-50
10
100
1000
10000

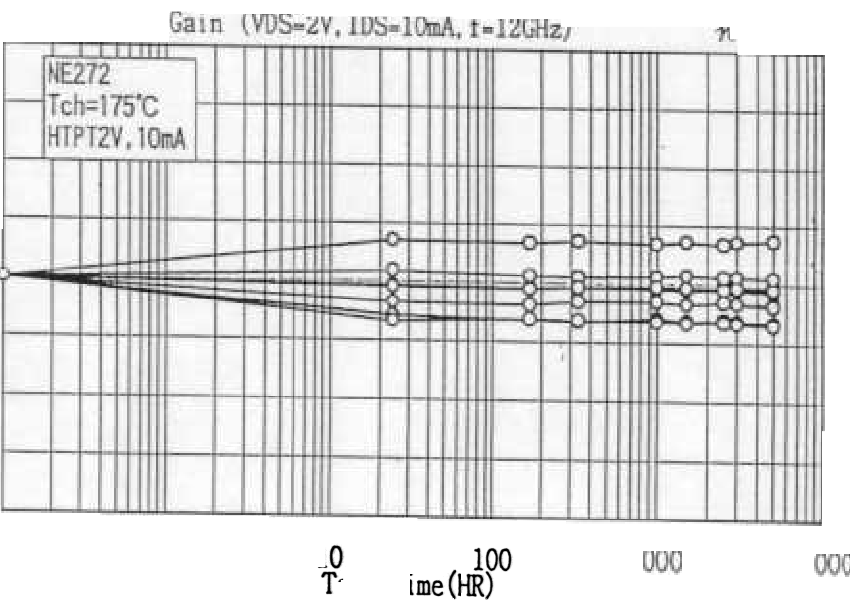

IDSS atUDS=2V,UGS=0V
NE272
Tch=175°C
HTPT2V,10mA
(%)
+50
+40
+30
+20
+10
0
-10
-20
-30
-40
-50
10
100
1000
HR)


VP atUDS=2V,IDS=100uA
NE272
Tch=175°C
HTPT2V,10mA
(%)
+50
+40
+30
+20
+10
0
-10
-20
-30
-40
-50
10
100
1000
10000

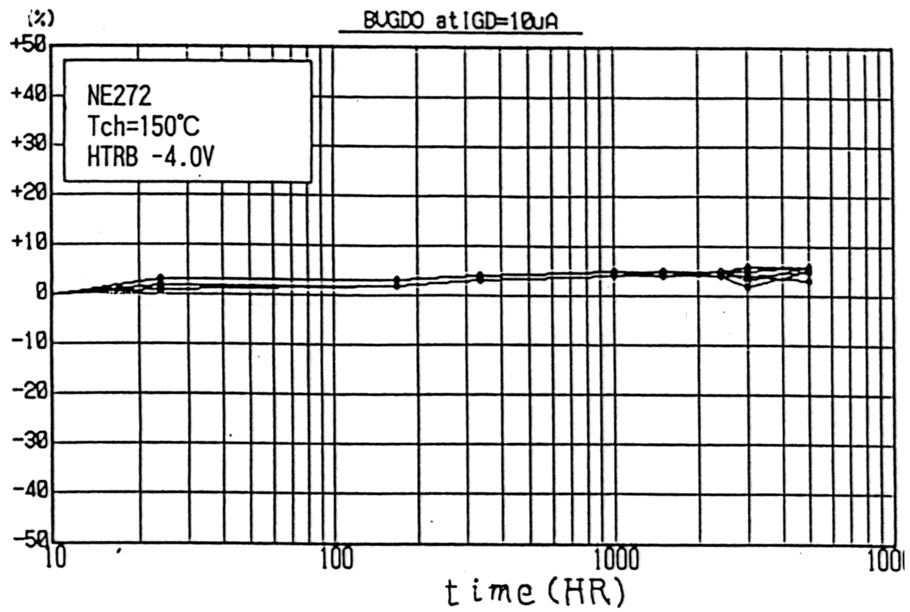

VGF at IGF=1.0uA
(%)
+50
+40
+30
+20
+10
0
-10
-20
-30
-40
-50
NE272
Tch=175°C
HTPT2V,10mA
10
100
1000
10000
HR)

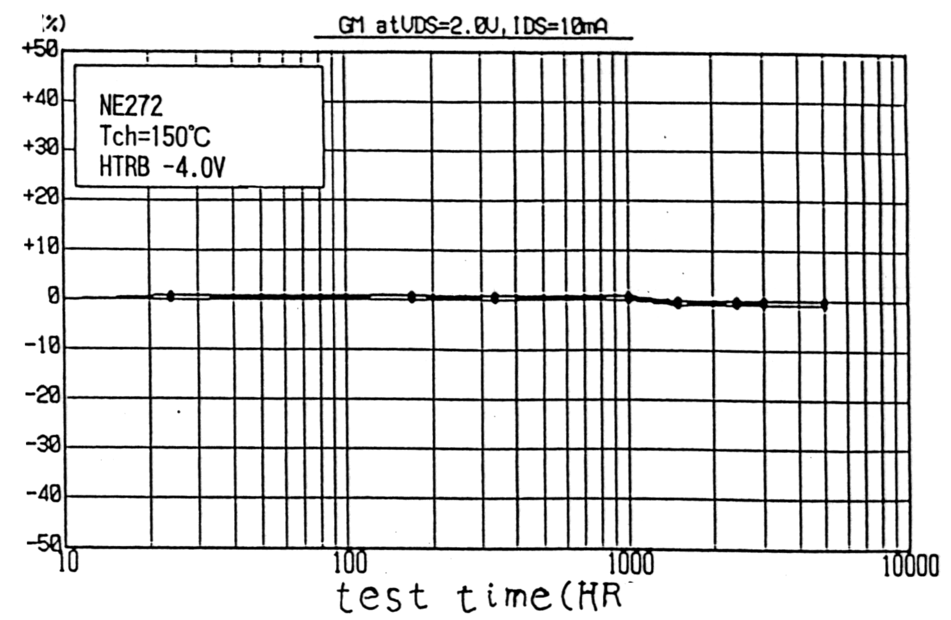

DS= 0mA
GH
NE272
Tch=175°C
HTPT2V,10mA
(dB)
10
100
(HR)

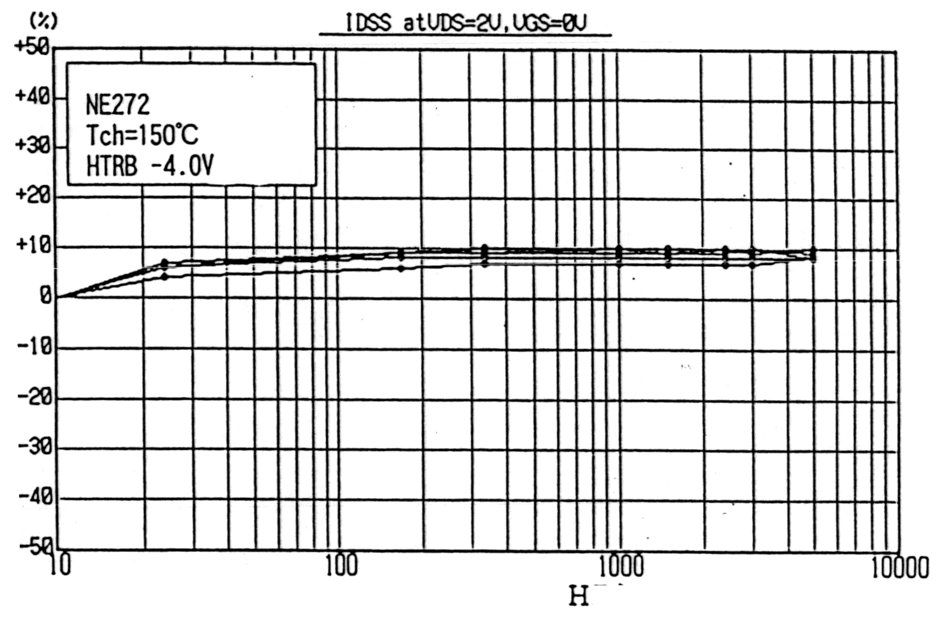

NE272
Tch=175°C
HTPT2V,10mA
-3
0
100
1000
10000
H

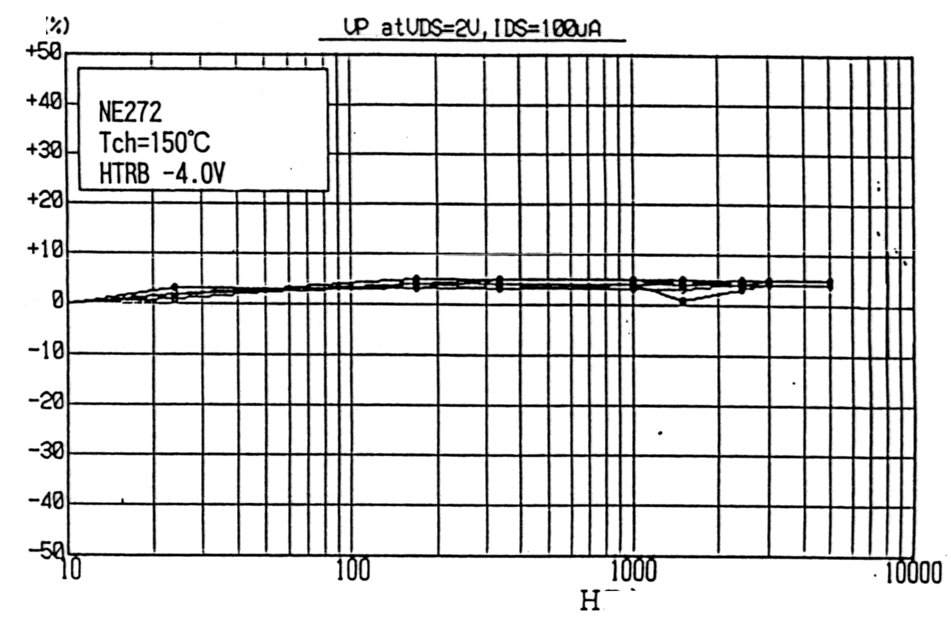

NE272
Tch=175°C
HTPT2V,10mA
△Gain(dB)
100
ime(HR)

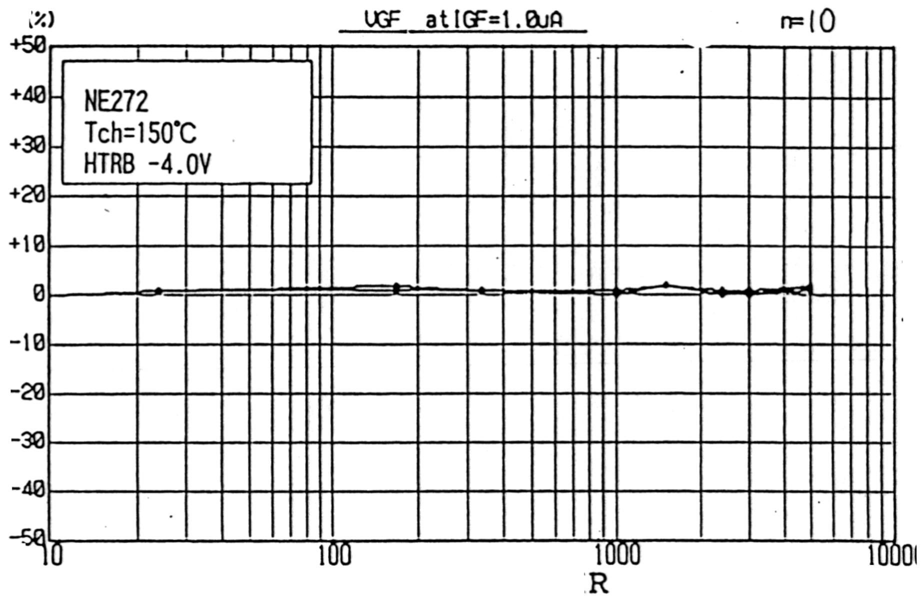
(

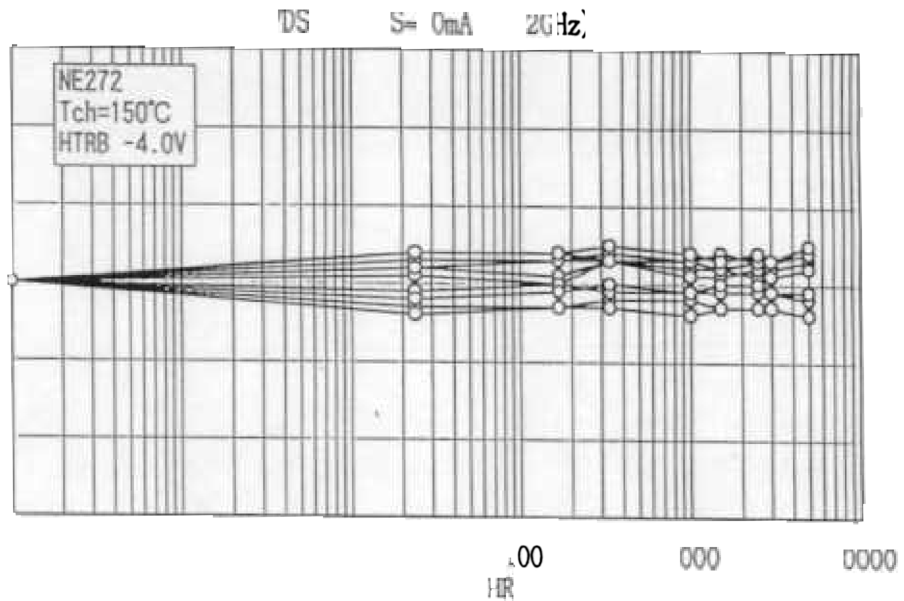

BVGDO at IGD=10uA
(%)
+50
+40
+30
+20
+10
0
-10
-20
-30
-40
-50
NE272
Tch=150°C
HTRB -4.0V
10
100
1000
time (HR)

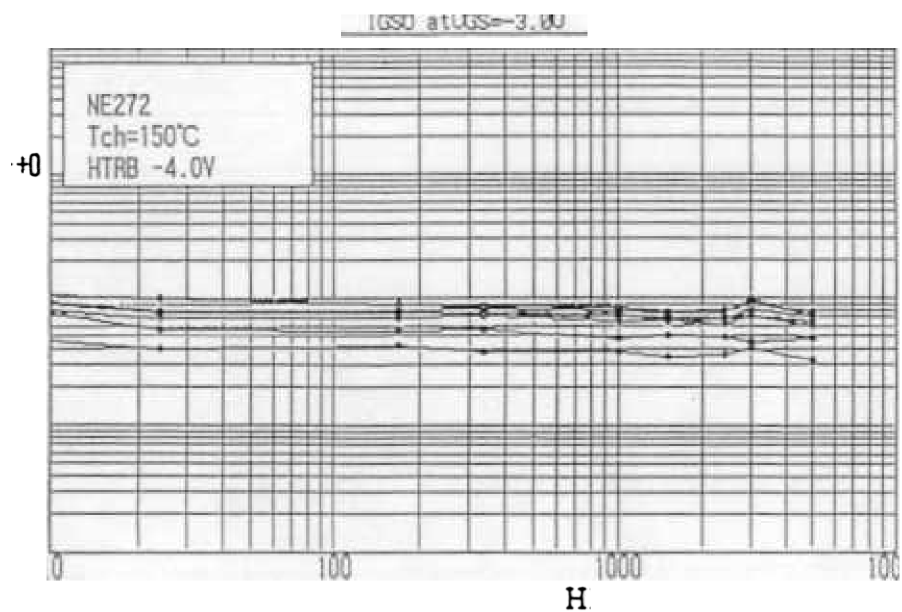

GM atVDS=2.0V, IDS=10mA
(%)
+50
+40
+30
+20
+10
0
-10
-20
-30
-40
-50
NE272
Tch=150°C
HTRB -4.0V
10
100
1000
10000
test time (HR

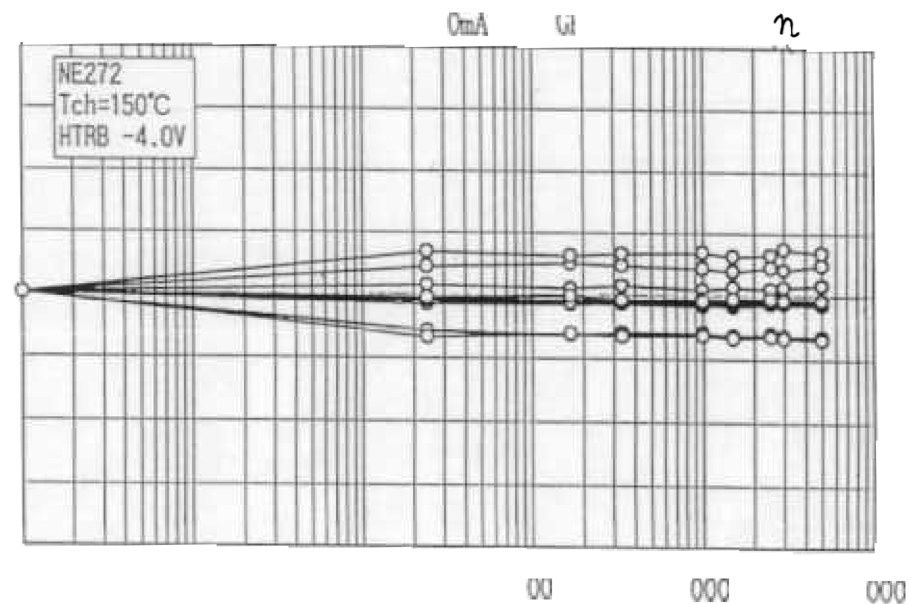

IDSS atVDS=2V, VGS=0V
(%)
+50
+40
+30
+20
+10
0
-10
-20
-30
-40
-50
NE272
Tch=150°C
HTRB -4.0V
10
100
1000
10000


VP atVDS=2V, IDS=100uA
(%)
+50
+40
+30
+20
+10
0
-10
-20
-30
-40
-50
NE272
Tch=150°C
HTRB -4.0V
10
100
1000
10000


(%)
VGF at IGF=1.0uA
n=10
NE272
Tch=150°C
HTRB -4.0V
+50
+40
+30
+20
+10
0
-10
-20
-30
-40
-50
10
100
1000
R


S= 0mA
NE272
Tch=150°C
HTRB -4.0V


NE272
Tch=150°C
HTRB -4.0V
+0
100
1000
H


0mA
NE272
Tch=150°C
HTRB -4.0V