

PRELIMINARY PRODUCT INFORMATION



HETERO JUNCTION FIELD EFFECT TRANSISTOR  
**NE3508M04**

L to S BAND LOW NOISE AMPLIFIER  
 N-CHANNEL HJ-FET

**FEATURES**

- Super Low Noise Figure & Associated Gain :  
 NF=0.45dB TYP. Ga=14dB TYP. @f=2GHz, VDS=2V, ID=10mA
- Flat-lead 4-pin tin-type super mini-mold(M04) package (Pb-Free T. )

**APPLICATIONS**

- Satellite Radio(SDARS, DMB, etc.) antenna LNA
- LNA for Micro-wave communication system

**ORDERING INFORMATION**

Part Number	Order Number	Quantity	Marking	Supplying Form
NE3508M04	NE3508M04-A	50pcs (Non reel)	V79	- 8 mm wide emboss taping - Pin1(Source), Pin2(Drain) face the perforation side of the tape
NE3508M04-T2	NE3508M04-T2-A	3 Kpcs/reel		

**Remark** To order evaluation samples, please contact your local NEC sales office.  
 Part number for sample order: NE3508M04

**ABSOLUTE MAXIMUM RATINGS ( TA =+ 25 °C )**

PARAMETER	SYMBOL	RATINGS	UNIT
Drain to Source Voltage	VDS	4.0	V
Gate to Source Voltage	VGS	-3.0	V
Drain Current	ID	IDSS	mA
Gate Current	IG	400	μA
Total Power Dissipation	Ptot <sup>Note</sup>	175	mW
Channel Temperature	Tch	+150	°C
Storage Temperature	Tstg	- 65 to +150	°C

**Note** Mounted on 1.08cm<sup>2</sup> X 1.0mm(t) glass epoxy PCB

**Caution :** Observe precautions when handling because these devices are sensitive to electrostatic discharge.

The information in this document is subject to change without notice. Before using this document, please confirm that this is the latest version.

**RECOMMENDED OPERATING CONDITIONS(TA = +25 °C)**

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT
Drain to Source Voltage	VDS	---	2	3	V
Drain Current	ID	---	10	30	mA
Input Power	Pin	---	---	0	dBm

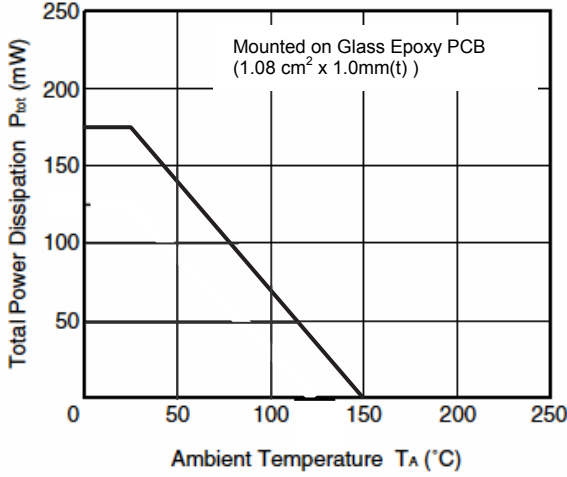
**ELECTRICAL CHARACTERISTICS (TA = +25 °C)**

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Gate to Source Leak Current	IGSO	VGS=-3V	---	1	20	μA
Saturated Drain Current	IDSS	VDS=2V, VGS=0V	60	90	120	mA
Gate to Source Cutoff Voltage	VGS(off)	VDS=2V, ID=100μA	-0.35	-0.5	-0.65	V
Trans conductance	gm	VDS=2V, ID=10mA	100	---	---	mS
Noise Figure	NF	VDS=2V, ID=10mA f=2GHz	---	0.45	0.9	dB
Associated Gain	Ga		12	14	---	dB
Output Power at 1dB Gain Compression Point	Po(1dB)	VDS=3V, ID=30mA(Non-RF) f=2GHz	---	18	---	dBm

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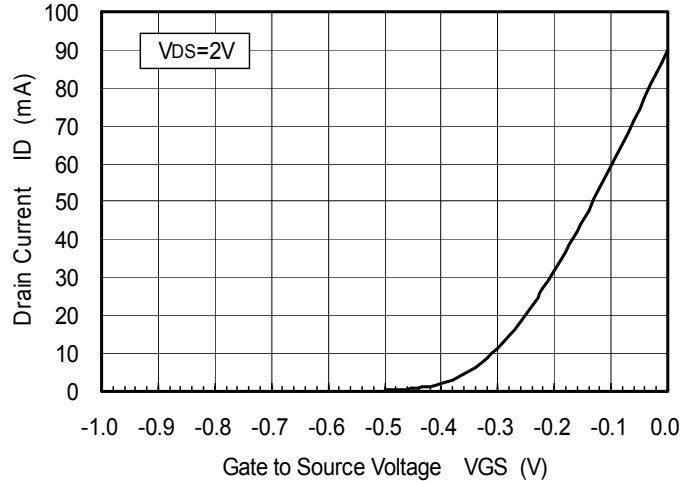
TYPICAL CHARACTERISTICS (TA = +25 °C)

TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE

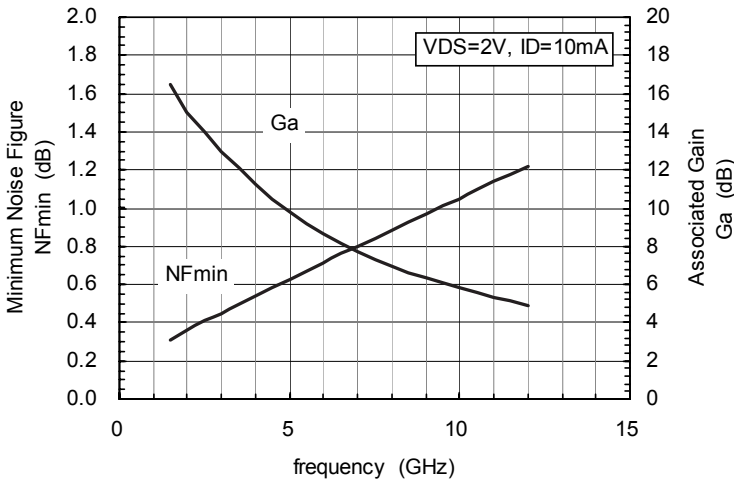


Note) Under examination

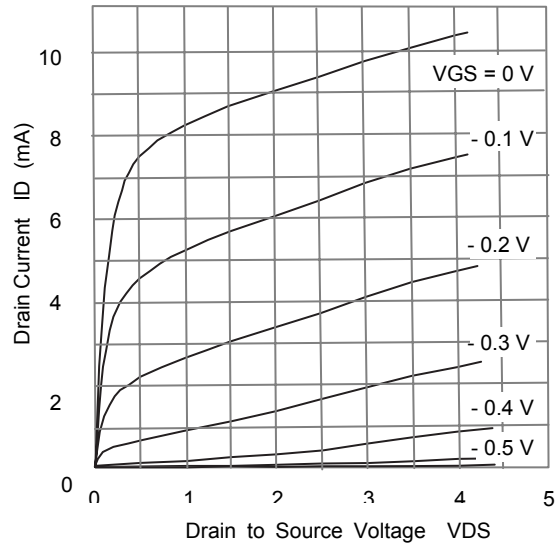
DRAIN CURRENT vs. GATE to SOURCE VOLTAGE



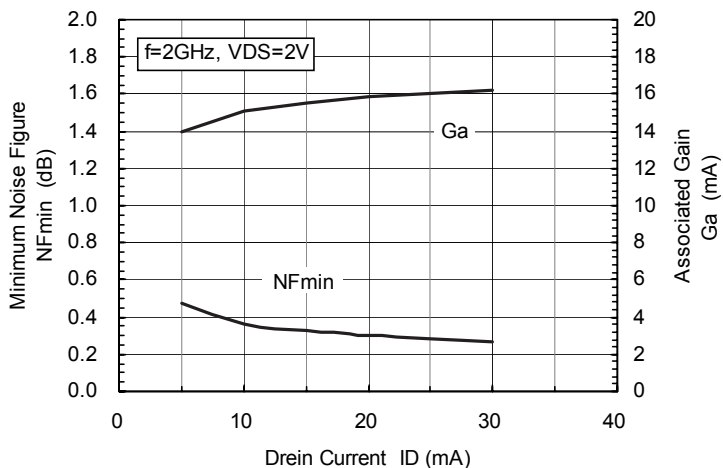
MINIMUM NOISE FIGURE, ASSOCIATED GAIN vs. FREQUENCY



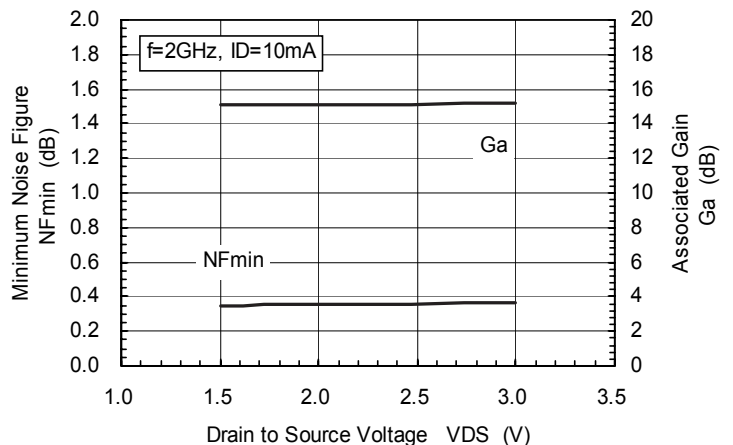
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



MINIMUM NOISE FIGURE, ASSOCIATED GAIN vs. DRAIN CURRENT

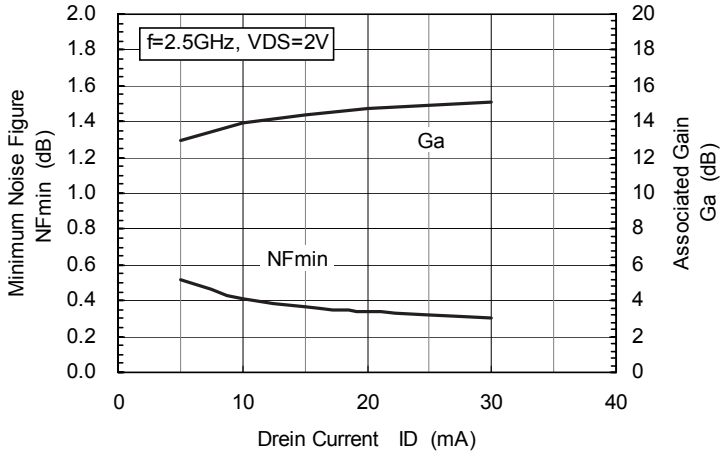


MINIMUM NOISE FIGURE, ASSOCIATED GAIN vs. Drain to Source Voltage

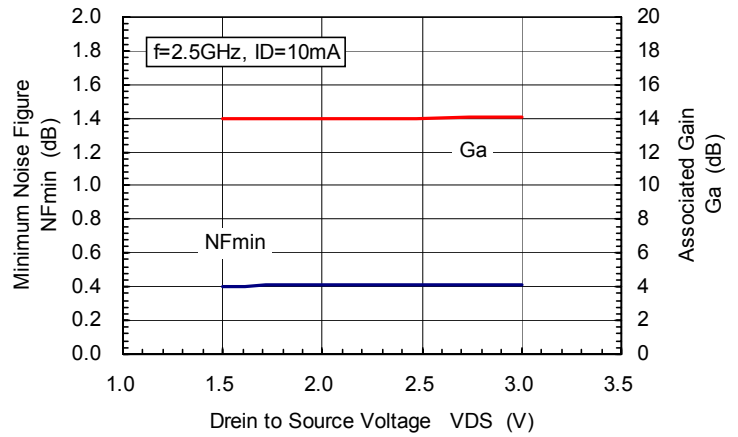


REFERENCE DATA

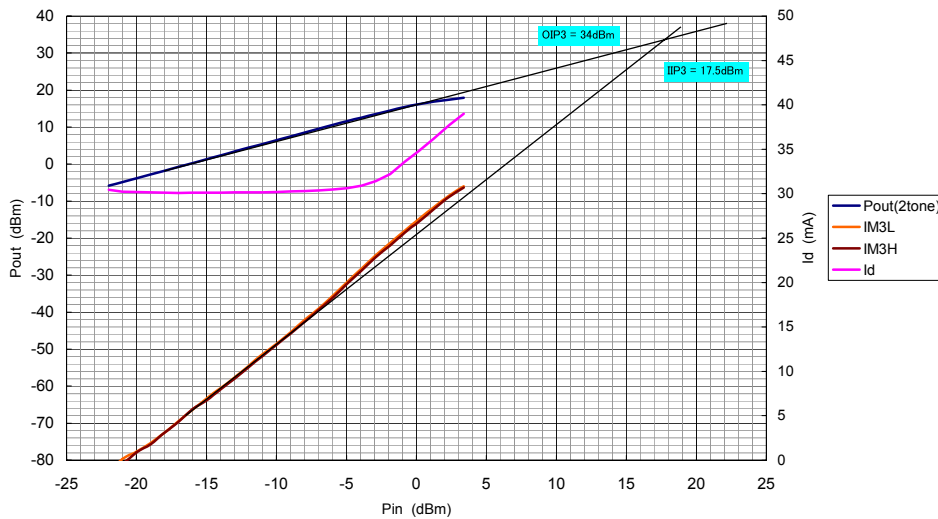
MINIMUM NOISE FIGURE, ASSOCIATED GAIN vs. DREIN CURRENT



MINIMUM NOISE FIGURE, ASSOCIATED GAIN vs. DREIN TO SOURCE VOLTAGE

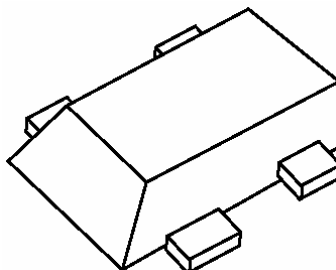


@f=2.5GHz, VDS=3V, ID=30mA(non-RF)



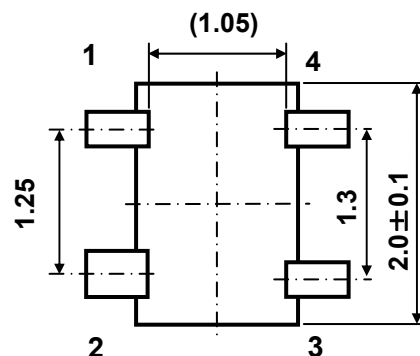
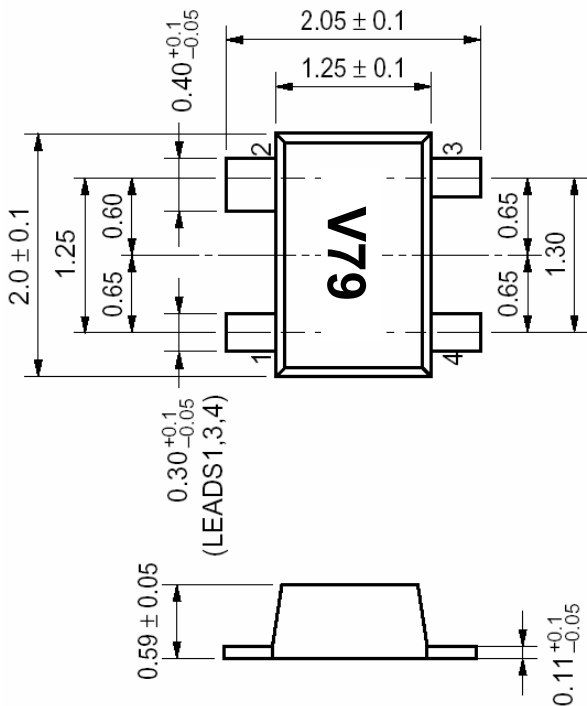
**PACKAGE DIMENSIONS**

**FLAT-LEAD 4-PIN THIN SUPER MINI-MOLD (unit : mm)**



**( Top View )**

**( Bottom View )**



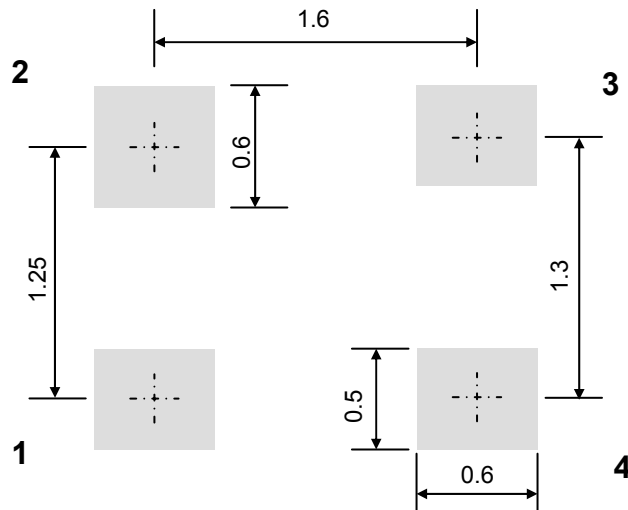
**Pin Connections**

- 1. Source**
- 2. Drain**
- 3. Source**
- 4. Gate**

**MOUNTING PAD DIMENSIONS**

**FLAT-LEAD 4-PIN THIN-TYPE SUPER MINIMOLD(M04) PACKAGE (UNIT: mm)**

( Reference Only )



## Reference Data

## NE3508M04

S-parameter

VDS=2V ID=10mA

freq (GHz)	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
0.1	0.996	-7.5	9.855	173.8	0.007	85.6	0.488	-6.7
0.2	0.987	-14.7	9.767	167.8	0.015	82.6	0.483	-13.2
0.3	0.977	-22.0	9.626	161.9	0.021	77.5	0.477	-19.5
0.4	0.960	-29.1	9.458	156.3	0.033	72.0	0.469	-25.6
0.5	0.940	-36.1	9.266	150.8	0.036	69.9	0.456	-31.9
0.6	0.921	-42.8	9.029	145.4	0.044	66.0	0.448	-37.7
0.7	0.896	-48.0	8.710	141.5	0.052	63.8	0.433	-42.1
0.8	0.875	-52.7	8.434	138.1	0.059	61.9	0.420	-46.0
0.9	0.856	-56.7	8.190	135.2	0.065	60.3	0.409	-49.4
1.0	0.839	-60.3	7.972	132.5	0.070	58.8	0.399	-52.4
1.1	0.814	-65.5	7.737	128.8	0.075	55.9	0.392	-56.3
1.2	0.791	-70.5	7.477	125.1	0.080	54.1	0.382	-60.4
1.3	0.768	-75.2	7.240	121.5	0.083	52.0	0.366	-64.6
1.4	0.751	-79.7	6.989	118.4	0.087	49.9	0.355	-68.4
1.5	0.731	-84.3	6.783	115.0	0.089	47.8	0.344	-72.5
1.6	0.713	-88.6	6.542	111.9	0.094	47.0	0.332	-75.9
1.7	0.694	-92.9	6.343	108.9	0.097	45.5	0.322	-79.8
1.8	0.679	-97.5	6.140	105.9	0.100	43.8	0.311	-83.3
1.9	0.667	-104.1	5.937	102.4	0.103	41.7	0.294	-90.8
2.0	0.656	-110.4	5.744	99.2	0.105	39.8	0.277	-98.0
2.1	0.640	-114.0	5.554	96.7	0.107	39.0	0.272	-101.4
2.2	0.623	-117.7	5.372	94.3	0.109	38.3	0.265	-104.6
2.3	0.615	-122.0	5.224	91.7	0.112	36.8	0.255	-108.1
2.4	0.607	-124.8	5.054	89.6	0.114	35.9	0.252	-111.1
2.5	0.597	-129.0	4.918	87.2	0.118	34.9	0.245	-115.0
2.6	0.586	-132.3	4.774	85.2	0.118	34.0	0.238	-118.1
2.7	0.582	-135.7	4.631	83.0	0.121	33.0	0.234	-120.6
2.8	0.575	-138.7	4.499	80.9	0.123	32.0	0.231	-124.8
2.9	0.567	-141.7	4.391	78.8	0.124	32.6	0.226	-127.4
3.0	0.562	-145.1	4.266	76.8	0.125	31.6	0.220	-131.4
3.1	0.556	-147.8	4.164	74.8	0.128	30.8	0.217	-133.7
3.2	0.553	-151.2	4.061	72.8	0.130	29.6	0.219	-136.1
3.3	0.546	-153.8	3.951	71.0	0.132	28.9	0.212	-139.8
3.4	0.541	-156.5	3.857	69.2	0.133	29.0	0.208	-142.6
3.5	0.540	-159.0	3.767	67.4	0.135	27.8	0.209	-145.8
3.6	0.535	-161.8	3.672	65.6	0.137	27.5	0.205	-148.7
3.7	0.534	-164.5	3.597	63.7	0.140	26.5	0.206	-151.0
3.8	0.531	-166.8	3.515	62.0	0.141	25.7	0.204	-154.1
3.9	0.528	-169.5	3.438	60.4	0.142	25.0	0.202	-157.7
4.0	0.529	-172.0	3.369	58.6	0.144	24.6	0.202	-159.5
4.1	0.526	-174.4	3.292	56.9	0.146	23.5	0.199	-162.8
4.2	0.526	-176.9	3.224	55.2	0.147	22.8	0.200	-165.7
4.3	0.525	-179.2	3.159	53.6	0.150	22.8	0.199	-168.4
4.4	0.524	178.7	3.098	52.1	0.151	21.3	0.201	-171.2
4.5	0.523	176.3	3.035	50.3	0.153	21.8	0.202	-173.5
4.6	0.522	173.9	2.983	48.9	0.154	20.7	0.202	-175.7
4.7	0.521	172.0	2.929	47.3	0.157	20.2	0.200	-178.9
4.8	0.521	169.8	2.876	45.7	0.159	19.9	0.201	179.1
4.9	0.524	167.5	2.815	44.1	0.160	18.8	0.202	176.8
5.0	0.523	165.5	2.765	42.5	0.162	18.3	0.202	173.9
5.1	0.523	163.5	2.723	41.0	0.163	17.6	0.203	171.5
5.2	0.525	161.5	2.676	39.6	0.167	16.9	0.204	168.8
5.3	0.528	159.7	2.631	38.0	0.167	17.0	0.207	167.6
5.4	0.527	157.5	2.583	36.5	0.169	16.0	0.209	164.7
5.5	0.527	155.8	2.540	34.9	0.171	15.5	0.209	162.5
5.6	0.528	153.8	2.501	33.6	0.171	14.7	0.212	161.0
5.7	0.530	151.9	2.464	32.1	0.172	14.2	0.213	157.9
5.8	0.533	150.0	2.427	30.6	0.174	13.6	0.216	156.1
5.9	0.535	148.2	2.386	29.2	0.178	12.6	0.219	154.4

6.0	0.537	146.3	2.353	27.8	0.179	12.2	0.220	151.8
6.1	0.539	144.7	2.317	26.3	0.180	11.0	0.223	149.9
6.2	0.541	143.0	2.283	24.8	0.184	10.5	0.226	147.7
6.3	0.542	141.0	2.249	23.3	0.185	10.1	0.227	145.9
6.4	0.544	139.5	2.217	22.1	0.186	9.2	0.232	143.9
6.5	0.547	137.7	2.187	20.7	0.189	8.7	0.233	142.4
6.6	0.548	136.2	2.158	19.2	0.191	8.1	0.237	140.6
6.7	0.552	134.5	2.126	17.8	0.190	7.7	0.239	138.6
6.8	0.555	132.8	2.103	16.5	0.193	7.1	0.244	136.5
6.9	0.555	131.1	2.074	15.1	0.195	6.2	0.246	134.9
7.0	0.558	129.7	2.041	13.8	0.196	5.3	0.251	133.3
7.1	0.562	128.6	2.008	12.3	0.198	4.7	0.253	131.1
7.2	0.564	126.5	1.990	11.1	0.203	4.9	0.257	129.6
7.3	0.567	125.0	1.963	9.7	0.203	3.7	0.261	128.0
7.4	0.571	123.5	1.935	8.3	0.204	2.3	0.261	126.7
7.5	0.573	122.3	1.913	6.9	0.206	2.4	0.266	124.4
7.6	0.576	120.4	1.891	5.8	0.208	1.1	0.271	123.2
7.7	0.579	119.1	1.863	4.4	0.208	1.3	0.276	121.7
7.8	0.581	117.8	1.846	3.0	0.208	-0.6	0.279	120.3
7.9	0.584	116.3	1.825	1.7	0.212	-0.9	0.281	118.9
8.0	0.587	114.9	1.798	0.3	0.214	-1.8	0.285	117.0
8.1	0.593	113.7	1.780	-1.1	0.217	-2.1	0.290	115.2
8.2	0.593	111.7	1.756	-2.2	0.215	-3.4	0.294	113.8
8.3	0.598	110.7	1.738	-3.3	0.219	-3.8	0.299	112.6
8.4	0.602	109.4	1.715	-4.8	0.218	-4.9	0.301	111.3
8.5	0.606	108.1	1.696	-6.0	0.220	-5.1	0.305	109.9
8.6	0.608	106.5	1.677	-7.4	0.221	-6.2	0.309	108.2
8.7	0.611	105.5	1.660	-8.6	0.223	-7.0	0.314	106.7
8.8	0.615	104.0	1.636	-9.9	0.227	-8.0	0.320	105.2
8.9	0.618	102.6	1.623	-11.3	0.227	-8.5	0.322	103.9
9.0	0.619	101.5	1.601	-12.5	0.228	-8.9	0.326	102.2
9.1	0.625	100.1	1.588	-13.8	0.229	-10.6	0.330	101.7
9.2	0.626	99.0	1.565	-15.1	0.230	-10.7	0.336	99.5
9.3	0.629	97.7	1.550	-16.4	0.234	-11.1	0.339	98.4
9.4	0.632	96.5	1.537	-17.5	0.234	-12.1	0.340	96.7
9.5	0.637	95.3	1.516	-18.9	0.233	-12.9	0.349	96.0
9.6	0.641	94.0	1.499	-19.9	0.238	-13.9	0.353	94.8
9.7	0.643	92.9	1.486	-21.3	0.238	-14.9	0.359	93.7
9.8	0.647	91.5	1.467	-22.5	0.237	-15.5	0.363	92.3
9.9	0.649	90.4	1.456	-23.8	0.239	-15.8	0.368	91.0
10.0	0.650	89.3	1.436	-25.0	0.242	-17.2	0.372	89.3
10.1	0.655	88.1	1.420	-26.1	0.242	-18.1	0.379	88.1
10.2	0.657	87.0	1.406	-27.3	0.245	-19.2	0.383	87.1
10.3	0.662	85.7	1.391	-28.5	0.247	-20.0	0.384	86.1
10.4	0.670	84.5	1.380	-29.7	0.246	-19.8	0.391	84.3
10.5	0.669	83.4	1.360	-31.0	0.247	-21.1	0.397	83.2
10.6	0.673	82.3	1.350	-32.0	0.249	-21.9	0.402	82.6
10.7	0.676	81.2	1.334	-33.3	0.254	-22.9	0.405	81.2
10.8	0.679	80.3	1.322	-34.3	0.250	-23.5	0.409	79.8
10.9	0.683	79.0	1.311	-35.7	0.253	-24.5	0.414	78.9
11.0	0.687	78.1	1.299	-36.9	0.253	-25.6	0.420	77.6
11.1	0.688	76.8	1.281	-38.2	0.254	-26.2	0.423	75.9
11.2	0.693	75.8	1.267	-39.2	0.255	-26.8	0.428	75.3
11.3	0.698	74.6	1.256	-40.4	0.256	-27.6	0.432	74.2
11.4	0.701	73.7	1.245	-41.4	0.257	-28.6	0.438	73.1
11.5	0.705	72.3	1.227	-42.6	0.256	-28.9	0.441	71.7
11.6	0.708	71.5	1.217	-43.8	0.258	-29.9	0.447	70.7
11.7	0.714	70.5	1.203	-45.1	0.259	-31.0	0.450	69.7
11.8	0.715	69.6	1.193	-45.9	0.260	-31.8	0.455	68.3
11.9	0.718	68.5	1.181	-47.1	0.260	-32.7	0.457	68.1
12.0	0.725	67.7	1.168	-48.2	0.262	-33.6	0.466	66.0



## REFERENCE DATA

NE3508M04

Noise-parameter

VDS=2 V ID=10mA

freq (GHz)	Fmin (dB)	Gammaopt		Rn/50 -
		MAG	ANG	
1.5	0.31	0.662	28.9	0.089
2.0	0.36	0.596	44.8	0.089
2.5	0.41	0.530	60.7	0.089
3.0	0.45	0.476	76.7	0.084
3.5	0.50	0.435	92.6	0.077
4.0	0.54	0.406	108.3	0.069
4.5	0.58	0.387	123.9	0.061
5.0	0.63	0.377	139.2	0.053
5.5	0.67	0.376	154.2	0.047
6.0	0.71	0.382	168.8	0.044
6.5	0.76	0.394	-177.1	0.044
7.0	0.80	0.412	-163.6	0.049
7.5	0.84	0.433	-150.7	0.059
8.0	0.88	0.458	-138.6	0.076
8.5	0.93	0.485	-127.2	0.100
9.0	0.97	0.513	-116.6	0.131
9.5	1.01	0.542	-107.0	0.168
10.0	1.05	0.569	-98.4	0.209
10.5	1.10	0.594	-90.9	0.253
11.0	1.14	0.617	-84.5	0.297
11.5	1.18	0.635	-79.3	0.340
12.0	1.22	0.649	-75.4	0.377

**RECOMMENDED SOLDERING CONDITIONS**

This product should be soldered and mounted under the following recommended conditions. For soldering methods and conditions other than those recommended below, contact your nearby sales office.

Soldering Method	Soldering Conditions	Condition Symbol
Infrared Reflow	Peak temperature (package surface temperature) : 260°C or below Time at peak temperature : 10 seconds or less Time at temperature of 220°C or higher : 60 seconds or less Preheating time at 120 to 180°C : 120±30 seconds Maximum number of reflow processes : 3 times Maximum chlorine content of rosin flux (% mass) : 0.2%(Wt.) or below	IR260
Partial Heating	Peak temperature (pin temperature) : 350°C or below Soldering time (per side of device) : 3 seconds or less Maximum chlorine content of rosin flux (% mass) : 0.2%(Wt.) or below	HS350

**Caution Do not use different soldering methods together (except for partial heating).**

Subject: Compliance with EU Directives

CEL certifies, to its knowledge, that semiconductor and laser products detailed below are compliant with the requirements of European Union (EU) Directive 2002/95/EC Restriction on Use of Hazardous Substances in electrical and electronic equipment (RoHS) and the requirements of EU Directive 2003/11/EC Restriction on Penta and Octa BDE.

CEL Pb-free products have the same base part number with a suffix added. The suffix –A indicates that the device is Pb-free. The –AZ suffix is used to designate devices containing Pb which are exempted from the requirement of RoHS directive (\*). In all cases the devices have Pb-free terminals. All devices with these suffixes meet the requirements of the RoHS directive.

This status is based on CEL’s understanding of the EU Directives and knowledge of the materials that go into its products as of the date of disclosure of this information.

Restricted Substance per RoHS	Concentration Limit per RoHS (values are not yet fixed)	Concentration contained in CEL devices	
		-A	-AZ
Lead (Pb)	< 1000 PPM	Not Detected	(*)
Mercury	< 1000 PPM	Not Detected	
Cadmium	< 100 PPM	Not Detected	
Hexavalent Chromium	< 1000 PPM	Not Detected	
PBB	< 1000 PPM	Not Detected	
PBDE	< 1000 PPM	Not Detected	

If you should have any additional questions regarding our devices and compliance to environmental standards, please do not hesitate to contact your local representative.

**Important Information and Disclaimer:** Information provided by CEL on its website or in other communications concerning the substance content of its products represents knowledge and belief as of the date that it is provided. CEL bases its knowledge and belief on information provided by third parties and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. CEL has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. CEL and CEL suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall CEL’s liability arising out of such information exceed the total purchase price of the CEL part(s) at issue sold by CEL to customer on an annual basis.

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