NEC

N-CHANNEL GaAs MESFET

NEZ1011-2E, NEZ1414-2E

2W X, Ku-BAND POWER GaAs MESFET

DESCRIPTION

The NEZ1011-2E and NEZ1414-2E are power GaAs MESFETs which provide high gain, high efficiency and high output in X, Ku-band. The internal input and output matching enables guaranteed performance to be achieved with only a 50 Ω external circuit. To reduce thermal resistance the device has a PHS (Plated Heat Sink) structure. The device incorporates a WSi (tungsten silicide) gate structure for high reliability.

FEATURES

- High Output Power : $P_{o\ (1\ dB)}$ = +34.0 dBm typ.
- High Linear Gain : 8.5 dB typ. (NEZ1011-2E), 7.5 dB typ. (NEZ1414-2E)
- High Efficiency : 30 % typ.
- Input and Output Internally Matched for Optimum performance

ORDERING INFORMATION

Part Number	Package
NEZ1011-2E NEZ1414-2E	T-78

Remark To order evaluation samples, please contact your local NEC sales office.
(Part number for sample order: NEZ1011-2E, NEZ1414-2E)

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C)

Operation in excess of any one of these parameters may result in permanent damage.

Parameter	Symbol	Ratings	Unit
Drain to Source Voltage	V_{DS}	15	V
Gate to Source Voltage	V_{GS}	–7	V
Drain Current	I_{DS}	3.0 (NEZ1011-2E) 2.5 (NEZ1414-2E)	A
Gate Forward Current	I_{GF}	+20	mA
Gate Reverse Current	I_{GR}	–20	mA
Total Power Dissipation	P_T	15	W
Channel Temperature	T_{ch}	175	°C
Storage Temperature	T_{stg}	–65 to +175	°C

Caution Please handle this device at static-free workstation, because this is an electrostatic sensitive device.

The information in this document is subject to change without notice.

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RECOMMENDED OPERATING LIMITS

Characteristics	Symbol	Test Condition	MIN.	TYP.	MAX.	Unit
Drain to Source Voltage	V_{DS}		9.0	9.0	9.0	V
Gain Compression	Gcomp				3	dB
Channel Temperature	T_{ch}				+130	°C
Gate Resistance[Note]	R_g		200	1000	1000	Ω

Note R_g is the series resistance between the gate supply and the FET gate.

[NEZ1011-2E]
ELECTRICAL CHARACTERISTICS (T_A = 25°C)

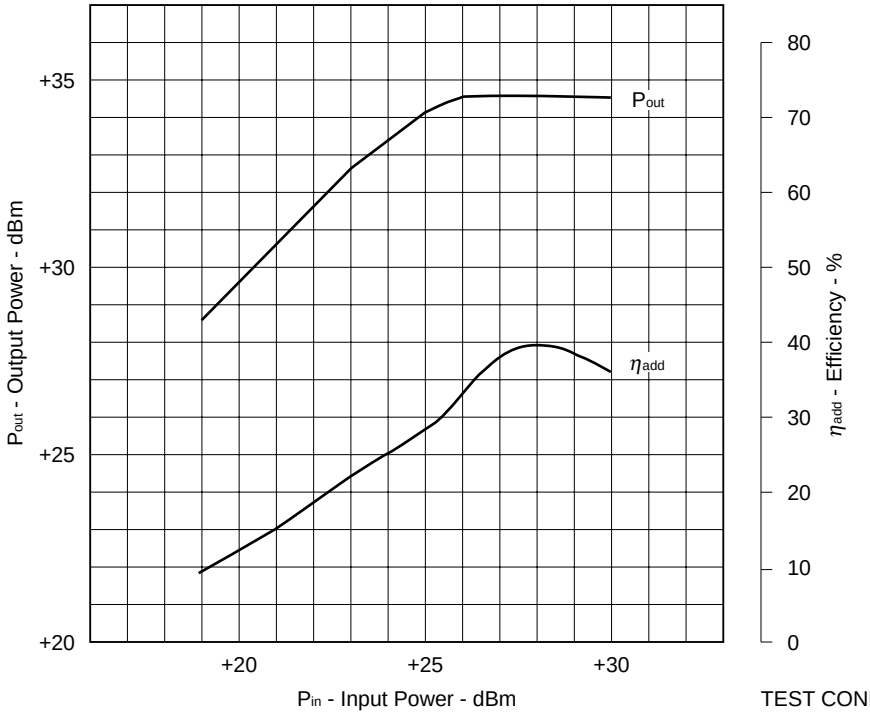
Characteristics	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Saturated Drain Current	I_{DSS}	V_{DS} = 1.5 V, V_{GS} = 0 V	0.7	1.6	2.5	A
Pinch-off Voltage	V_p	V_{DS} = 2.5 V, I_{DS} = 10 mA	–2.5	–1.3	–0.5	V
Gate to Drain Breakdown Voltage	BV_{GD}	I_{GD} = 10 mA		15		V
Thermal Resistance	R_{th}	Channel to Case		5.5	7.0	°C/W
Linear Gain	G_L	f = 10.7, 11.2, 11.7 GHz V_{DS} = 9.0 V I_{DS} = 0.7 A (RF OFF) R_g = 1 kΩ	8.0	8.5		dB
Output Power at 1 dB Gain Comp.	$P_{o\,(1\,dB)}$		33.0	34.0		dBm
Drain Current at 1 dB Gain Comp.	$I_{DS\,(1\,dB)}$			0.8	1.0	A
Power Added Efficiency at 1 dB Gain Compression Point	$\eta_{add\,(1\,dB)}$			30		%
3rd Order Intermodulation Distortion	IM_3	P_{out} = +27.5 dBm (2 tone)		–40		dBc

[NEZ1414-2E]
ELECTRICAL CHARACTERISTICS (T_A = 25°C)

Characteristics	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Saturated Drain Current	I_{DSS}	V_{DS} = 1.5 V, V_{GS} = 0 V	0.7	1.6	3.0	A
Pinch-off Voltage	V_p	V_{DS} = 2.5 V, I_{DS} = 10 mA	–3.0	–1.3	–0.5	V
Gate to Drain Breakdown Voltage	BV_{GD}	I_{GD} = 10 mA		15		V
Thermal Resistance	R_{th}	Channel to Case		5.5	7.0	°C/W
Linear Gain	G_L	f = 14.0 to 14.5 GHz V_{DS} = 9.0 V I_{DS} = 0.7 A (RF OFF) R_g = 1 kΩ	7.0	7.5		dB
Output Power at 1 dB Gain Comp.	$P_{o\,(1\,dB)}$		33.0	34.0		dBm
Drain Current at 1 dB Gain Comp.	$I_{DS\,(1\,dB)}$			0.8	1.0	A
Power Added Efficiency at 1 dB Gain Compression Point	$\eta_{add\,(1\,dB)}$			30		%

[NEZ1011-2E] TYPICAL CHARACTERISTICS (T_A = 25°C)

OUTPUT POWER, DRAIN CURRENT AND EFFICIENCY
vs. INPUT POWER



TEST CONDITIONS
V_{ds} : 9.0 (V)
I_{ds} : 0.7 (A)

[NEZ1011-2E] TYPICAL S-PARAMETERS

V_{ds} = 9.0 V, I_{ds} = 0.7 A

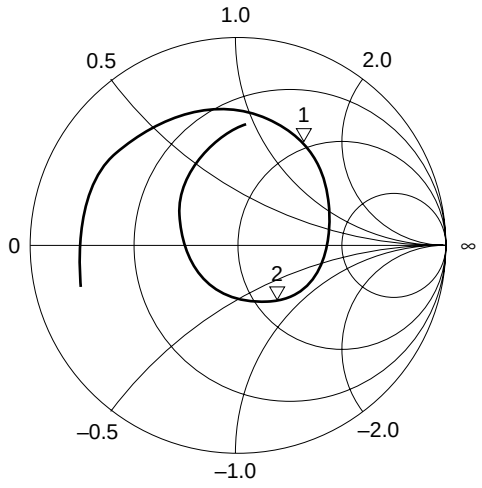
START 9.5 GHz, STOP 13 GHz, STEP 100 MHz

Marker

1: 10.7 GHz

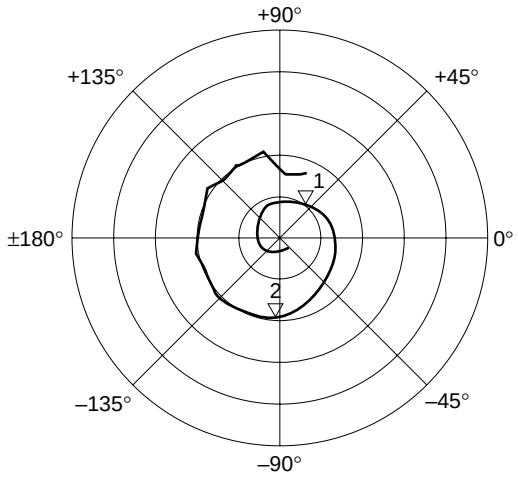
2: 11.7 GHz

S_{11}



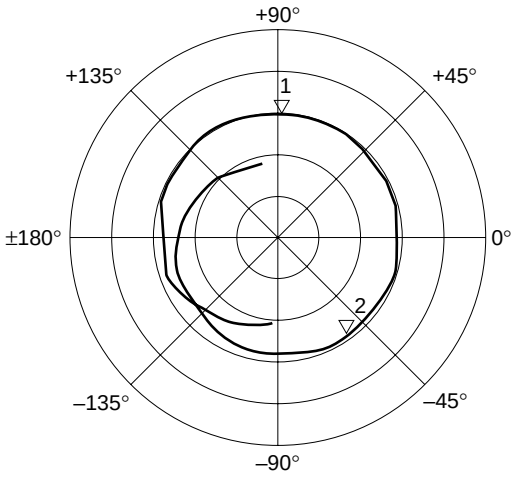
R_{max} = 1

S_{12}



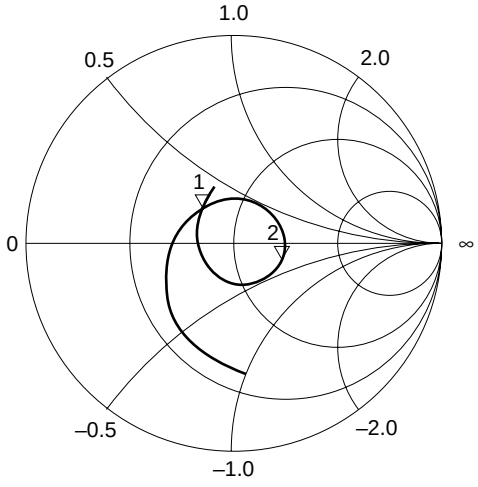
R_{max} = 0.25

S_{21}



R_{max} = 5

S_{22}



R_{max} = 1

[NEZ1011-2E] TYPICAL S-PARAMETERS

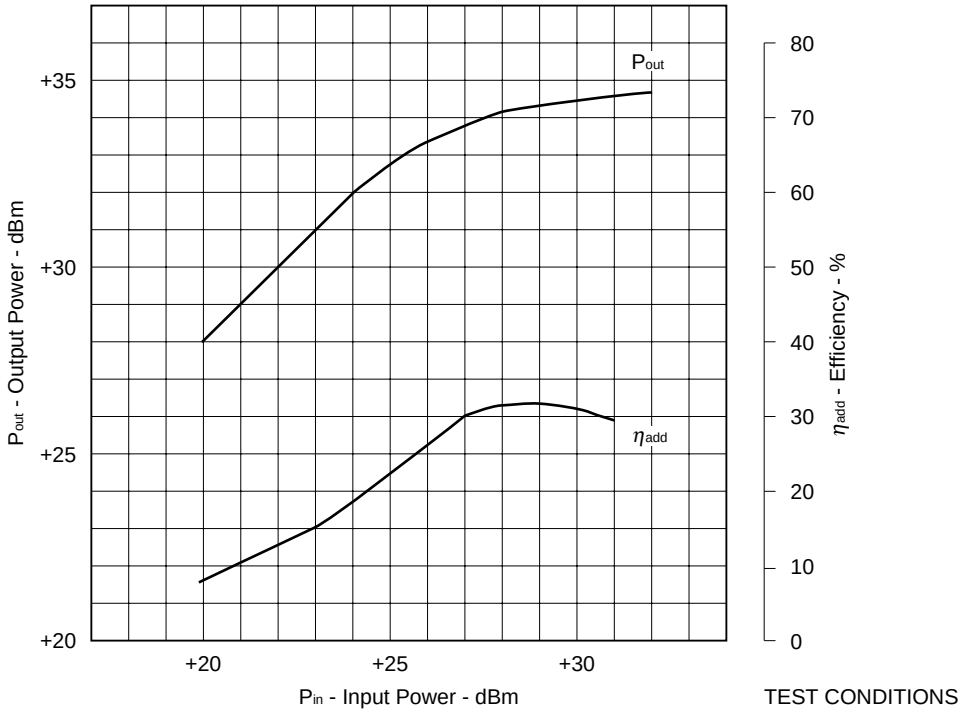
MAG. AND ANG.

V_{ds} = 9.0 V, I_{ds} = 0.7 A

FREQUENCY	S_{11}		S_{12}		S_{21}		S_{22}	
GHz	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
9.50	0.764	–167.277	0.015	–43.230	2.130	–95.531	0.635	–83.968
9.60	0.761	–178.028	0.016	–65.634	2.340	–111.739	0.611	–91.286
9.70	0.758	171.529	0.016	–91.498	2.425	–123.950	0.584	–98.187
9.80	0.753	160.103	0.017	–118.516	2.517	–134.894	0.553	–106.003
9.90	0.746	148.570	0.021	–141.838	2.750	–151.673	0.516	–114.652
10.0	0.736	136.528	0.024	–171.701	2.799	–167.695	0.476	–123.658
10.1	0.722	124.575	0.028	167.511	2.790	176.393	0.432	–133.644
10.2	0.706	112.284	0.032	144.823	2.912	161.709	0.388	–145.015
10.3	0.686	100.666	0.035	121.478	2.927	146.204	0.344	–157.688
10.4	0.668	89.224	0.040	105.970	2.942	131.119	0.299	–172.088
10.5	0.645	77.773	0.044	87.091	2.970	116.345	0.260	171.488
10.6	0.624	67.151	0.050	70.741	2.970	101.187	0.229	152.876
10.7	0.598	56.412	0.054	54.078	2.945	86.551	0.208	131.672
10.8	0.578	46.466	0.059	37.806	2.944	72.072	0.200	109.753
10.9	0.554	36.030	0.062	21.296	2.917	57.262	0.202	89.248
11.0	0.528	26.451	0.066	6.098	2.906	43.390	0.212	70.797
11.1	0.507	16.580	0.070	–7.465	2.920	29.090	0.222	54.193
11.2	0.478	6.600	0.074	–22.940	2.902	14.522	0.237	39.808
11.3	0.456	–3.277	0.075	–35.751	2.889	0.451	0.248	26.634
11.4	0.422	–13.834	0.079	–49.149	2.933	–14.070	0.256	14.662
11.5	0.394	–24.217	0.084	–63.862	2.901	–29.339	0.264	3.065
11.6	0.358	–36.871	0.086	–77.583	2.874	–43.606	0.265	–8.418
11.7	0.318	–49.672	0.096	–92.366	2.890	–56.908	0.262	–19.614
11.8	0.279	–65.213	0.096	–107.789	2.905	–73.786	0.257	–31.209
11.9	0.240	–84.430	0.100	–123.743	2.857	–89.725	0.246	–43.300
12.0	0.209	–107.600	0.105	–138.506	2.845	–105.536	0.233	–55.965
12.1	0.200	–138.676	0.097	–155.009	2.824	–120.676	0.214	–71.338
12.2	0.212	–167.414	0.103	–170.320	2.638	–138.590	0.193	–87.955
12.3	0.252	166.906	0.098	175.893	2.617	–153.421	0.174	–107.656
12.4	0.309	147.122	0.095	160.769	2.572	–167.311	0.160	–130.767
12.5	0.361	131.557	0.105	143.930	2.409	174.881	0.155	–155.714
12.6	0.416	118.401	0.097	131.537	2.256	158.493	0.163	178.469
12.7	0.469	107.640	0.102	116.588	2.162	143.945	0.183	155.527
12.8	0.519	98.604	0.106	99.572	2.023	130.613	0.211	135.870
12.9	0.559	89.444	0.082	84.259	1.844	116.717	0.246	119.252
13.0	0.597	81.722	0.088	66.604	1.863	102.174	0.287	104.110

[NEZ1414-2E] TYPICAL CHARACTERISTICS (T_A = 25°C)

OUTPUT POWER, DRAIN CURRENT AND EFFICIENCY
vs. INPUT POWER



TEST CONDITIONS
V_{ds} : 9.0 (V)
I_{ds} : 0.7 (A)

[NEZ1414-2E] TYPICAL S-PARAMETERS

V_{ds} = 9.0 V, I_{ds} = 0.7 A

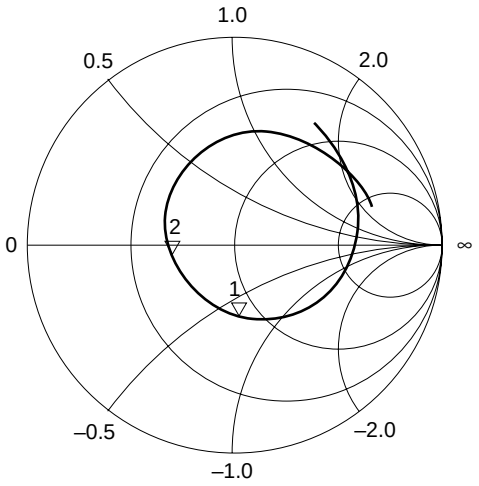
START 12.5 GHz, STOP 16 GHz, STEP 100 MHz

Marker

1: 14.0 GHz

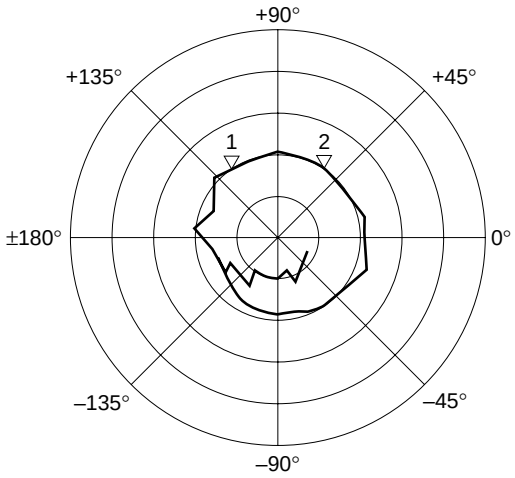
2: 14.5 GHz

S_{11}



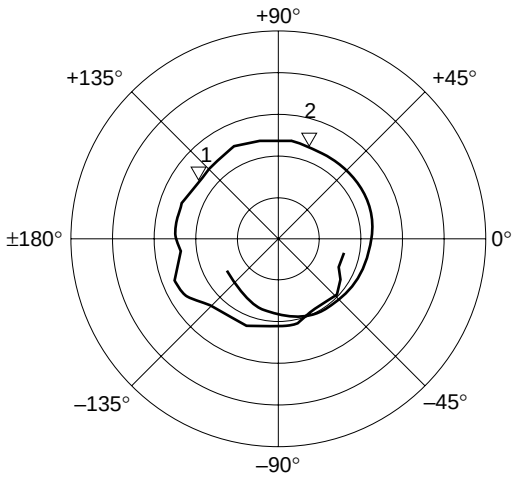
R_{max} = 1

S_{12}



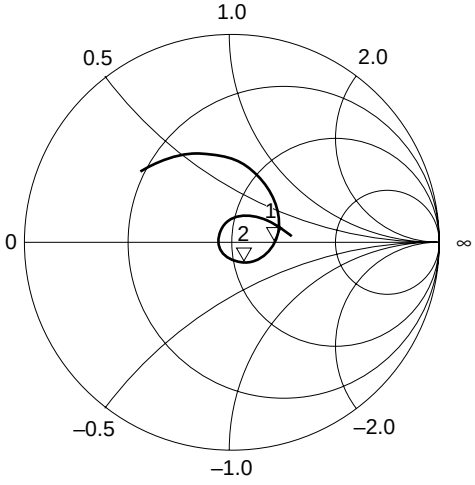
R_{max} = 0.25

S_{21}



R_{max} = 5

S_{22}



R_{max} = 1

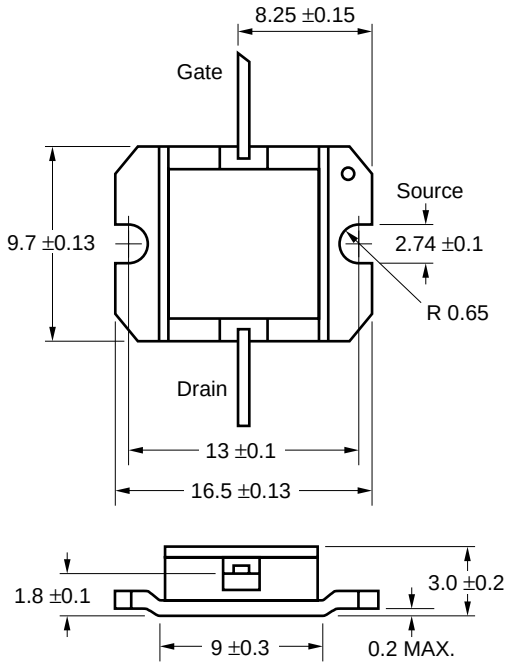
[NEZ1414-2E] TYPICAL S-PARAMETERS

MAG. AND ANG.

V_{ds} = 9.0 V, I_{ds} = 0.7 A

FREQUENCY	S_{11}		S_{12}		S_{21}		S_{22}	
GHz	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
12.5	0.720	54.026	0.041	–23.488	1.670	–12.914	0.559	139.492
12.6	0.714	47.272	0.042	–33.909	1.618	–27.927	0.536	132.577
12.7	0.703	40.563	0.046	–49.053	1.805	–33.613	0.513	125.731
12.8	0.694	33.714	0.054	–67.659	1.905	–41.620	0.489	118.906
12.9	0.681	25.911	0.042	–75.730	1.883	–59.438	0.469	110.831
13.0	0.665	18.142	0.049	–91.627	2.076	–70.774	0.444	102.528
13.1	0.647	10.006	0.048	–106.322	2.139	–85.459	0.423	94.278
13.2	0.619	1.522	0.050	–123.298	2.226	–106.292	0.397	85.041
13.3	0.598	–7.303	0.065	–121.906	2.244	–117.709	0.376	76.035
13.4	0.564	–16.994	0.066	–147.244	2.269	–129.798	0.354	66.079
13.5	0.528	–25.513	0.078	–144.394	2.572	–146.964	0.331	56.921
13.6	0.489	–35.940	0.076	–164.810	2.705	–157.354	0.308	46.382
13.7	0.458	–46.827	0.094	174.594	2.394	–172.475	0.291	35.057
13.8	0.417	–58.735	0.083	160.842	2.514	172.741	0.267	23.990
13.9	0.379	–71.139	0.104	137.769	2.483	160.220	0.245	12.747
14.0	0.345	–86.020	0.098	123.598	2.337	143.589	0.222	0.830
14.1	0.316	–100.664	0.095	110.275	2.380	130.321	0.199	–10.034
14.2	0.299	–117.676	0.100	95.196	2.475	115.146	0.177	–21.527
14.3	0.283	–135.202	0.094	85.165	2.473	100.169	0.155	–33.131
14.4	0.286	–153.247	0.096	73.113	2.387	85.738	0.132	–45.132
14.5	0.294	–171.013	0.098	56.700	2.393	72.248	0.113	–57.855
14.6	0.316	172.686	0.099	46.372	2.363	58.619	0.092	–72.397
14.7	0.341	157.476	0.103	29.217	2.329	44.378	0.074	–89.862
14.8	0.371	143.634	0.108	13.049	2.311	30.331	0.059	–113.198
14.9	0.404	130.878	0.107	0.943	2.279	15.402	0.048	–143.105
15.0	0.434	119.410	0.113	–17.401	2.226	0.717	0.046	–178.465
15.1	0.470	107.612	0.104	–31.285	2.173	–13.915	0.054	147.862
15.2	0.500	96.950	0.102	–45.363	2.138	–28.618	0.068	121.138
15.3	0.535	86.060	0.099	–59.856	2.067	–43.793	0.087	100.050
15.4	0.563	75.185	0.091	–74.474	2.002	–58.791	0.109	81.796
15.5	0.592	64.542	0.093	–86.447	1.930	–74.024	0.134	65.785
15.6	0.614	54.164	0.089	–101.479	1.858	–88.826	0.162	51.196
15.7	0.643	43.880	0.089	–115.807	1.768	–104.195	0.197	38.392
15.8	0.667	33.519	0.085	–129.917	1.668	–119.138	0.231	26.433
15.9	0.693	24.111	0.081	–143.437	1.558	–134.157	0.268	15.119
16.0	0.714	14.872	0.076	–159.317	1.473	–148.375	0.311	5.747

PACKAGE DIMENSIONS (UNIT: mm)



RECOMMENDED SOLDERING CONDITIONS

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

Soldering Method	Soldering Conditions	Recommended Condition Symbol
Partial Heating	Pin temperature: 260°C Time: 5 seconds or less (per pin row)	–

For details of recommended soldering conditions, please contact your local NEC sales office.

[MEMO]

Caution

The Great Care must be taken in dealing with the devices in this guide.
The reason is that the material of the devices is GaAs (Gallium Arsenide), which is designated as harmful substance according to the law concerned.
Keep the law concerned and so on, especially in case of removal.

M4 96.5