

**NEC**<sup>®</sup>**CLASS A, 2.3 GHz,  
15 VOLT POWER TRANSISTOR****NEL2300  
SERIES****FEATURES**

- **HIGH LINEAR POWER:**  $P_{1dB} = 2.8 \text{ W}$
- **HIGH GAIN:**  $G_{1dB} = 6.5 \text{ dB}$
- **WIDE BANDWIDTH**
- **HERMETIC & LOW COST PLASTIC PACKAGES**
- **COMMON EMITTER**

**ABSOLUTE MAXIMUM RATINGS** ( $T_A = 25^\circ\text{C}$ )

SYMBOLS	PARAMETERS	UNITS	RATINGS
$V_{CB0}$	Collector to Base Voltage	V	45
$V_{CE0}$	Collector to Emitter Voltage	V	20
$V_{EB0}$	Emitter to Base Voltage	V	3
$I_c$	Collector Current		
	NEL2301	A	0.6
	NEL2302	A	1.1
	NEL2303	A	2
$T_J$	Junction Temperature	$^\circ\text{C}$	200
$T_{STG}$	Storage Temperature	$^\circ\text{C}$	-65 to +200
$T_{SDR}$	Soldering Temperature	$^\circ\text{C}$	230 for 10 sec.

**DESCRIPTION AND APPLICATIONS**

This L-band linear power transistor series incorporates a Pt-Si/Ti/Pt/Au metallization system, emitter ballasting and silicon nitride passivation for performance and reliability. A variety of hermetic packages and a plastic package are available for wide band amplifier and oscillator applications.

**PERFORMANCE SPECIFICATIONS** ( $T_A = 25^\circ\text{C}$ )

PART NUMBER PACKAGE OUTLINE			NEL2301 20, 53, 54, 57, 63, 97			NEL2302 20, 53, 57, 63, 97			NEL2303 20, 53, 57, 63, 97		
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX
$P_{TEST}$	Output Power at Test Point* at $V_{CE} = 15 \text{ V}$ , $f = 2.3 \text{ GHz}$ , $P_{IN} = 22 \text{ dBm}$ , $I_c = 200 \text{ mA}$ $P_{IN} = 27 \text{ dBm}$ , $I_c = 350 \text{ mA}$ $P_{IN} = 30 \text{ dBm}$ , $I_c = 600 \text{ mA}$	dBm dBm dBm	29	30		32	33		34	35	
$P_{1dB}$	Output Power at 1 dB Compression Point at $V_{CE} = 15 \text{ V}$ , $f = 2.3 \text{ GHz}$ $I_c = 200 \text{ mA}$ $I_c = 350 \text{ mA}$ $I_c = 600 \text{ mA}$	dBm dBm dBm		29.5			32.5			34.5	
$G_{1dB}$	Gain at 1 dB Compression Point at $V_{CE} = 15 \text{ V}$ , $f = 2.3 \text{ GHz}$ $I_c = 200 \text{ mA}$ $I_c = 350 \text{ mA}$ $I_c = 600 \text{ mA}$	dB dB dB		8			7.5			6.5	
$\eta$	Collector Efficiency	%		30			32			30	

\* $P_{IN}$  for the "20" package is 1.5 dB higher than the other packages.

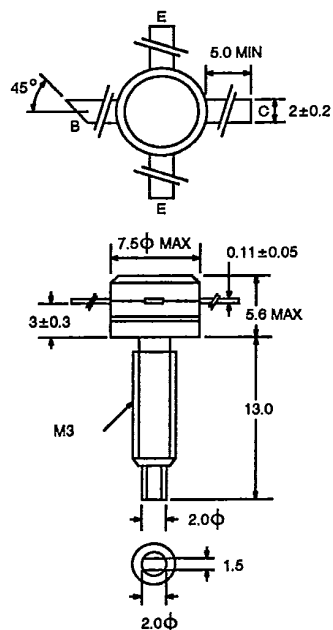
T-33-07  
T-33-09**ELECTRICAL CHARACTERISTICS** ( $T_A = 25^\circ\text{C}$ )

PART NUMBER PACKAGE OUTLINE			NEL2301 20, 53, 54, 57, 63, 97			NEL2302 20, 53, 57, 63, 97			NEL2303 20, 53, 57, 63, 97		
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX
BV <sub>CSO</sub>	Collector to Base Breakdown Voltage at $I_E = 0$ $I_C = 1\text{ mA}$ $I_C = 2\text{ mA}$ $I_C = 4\text{ mA}$	V V V	45			45			45		
BV <sub>CEO</sub>	Collector to Emitter Breakdown Voltage at $I_B = 0$ $I_C = 2.5\text{ mA}$ $I_C = 5\text{ mA}$ $I_C = 10\text{ mA}$	V V V	20			20			20		
BV <sub>ESB</sub>	Emitter to Base Breakdown Voltage at $I_C = 0$ $I_E = 0.5\text{ mA}$ $I_E = 1\text{ mA}$ $I_E = 2\text{ mA}$	V V V	3			3			3		
I <sub>CBO</sub>	Collector Cutoff Current at $V_{CB} = 30\text{ V}$ , $I_E = 0$	mA			0.25			0.5			1
I <sub>ESB</sub>	Emitter Cutoff Current at $V_{EB} = 2\text{ V}$ , $I_C = 0$	mA			0.25			0.5			1
h <sub>FE</sub>	DC Forward Current Gain at $V_{CE} = 5\text{ V}$ , $I_C = 100\text{ mA}$ $I_C = 200\text{ mA}$ $I_C = 400\text{ mA}$		15	40	120	15	40	120	15	40	120
C <sub>OB</sub>	Output Capacitance at $V_{CB} = 20\text{ V}$ , $f = 1\text{ MHz}$ , $I_E = 0$	pF		1.2	2		2.4	4		5	8
R $\theta_{JC}$	Thermal Resistance (Junction-to-Case)	$^\circ\text{C/W}$			16			10			6
P <sub>T</sub>	Total Power Dissipation ( $T_C = 25^\circ\text{C}$ )	W			11			18			29

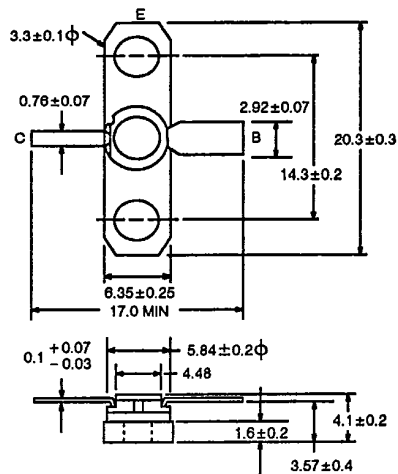
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OUTLINE DIMENSIONS (Units in mm)

OUTLINE 20

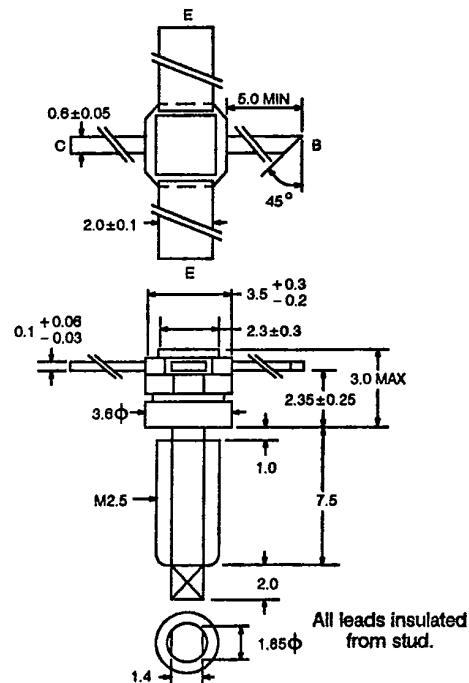


OUTLINE 53

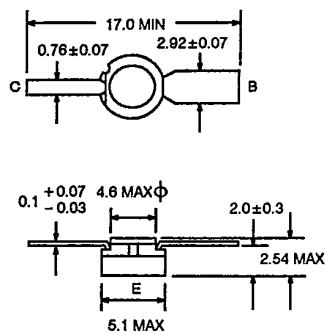


\*53B has emitter and base reversed.

OUTLINE 54

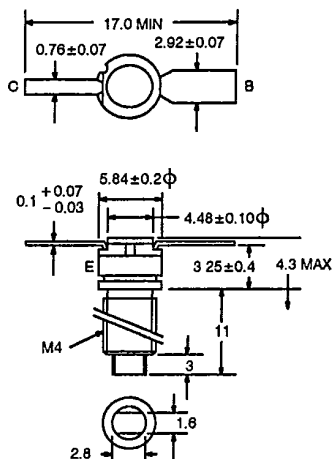


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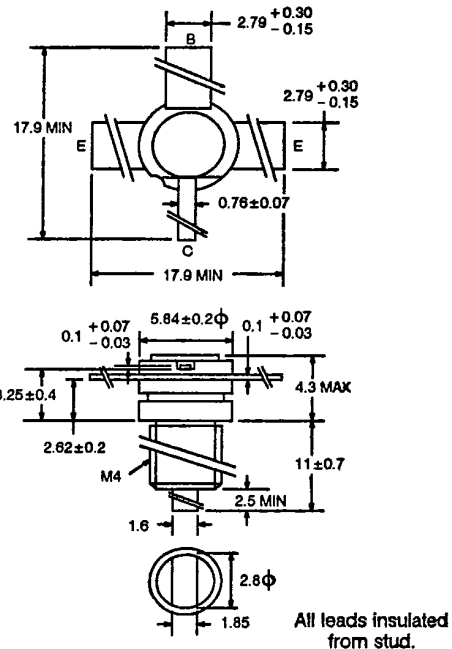


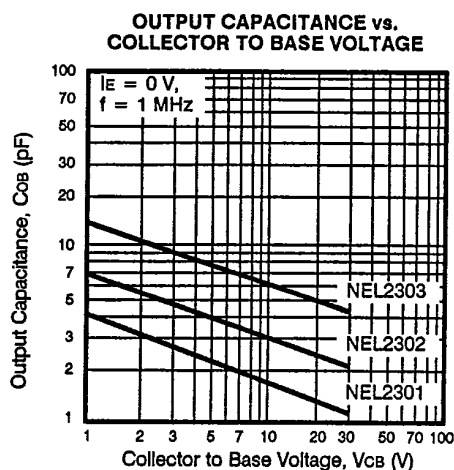
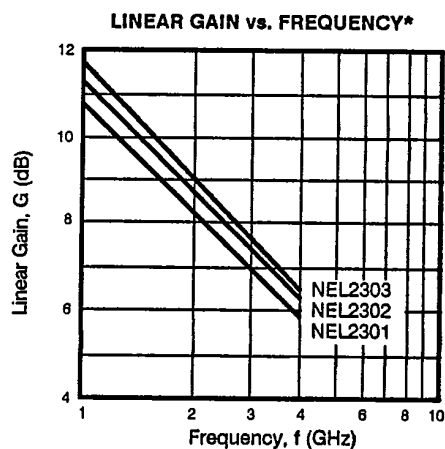
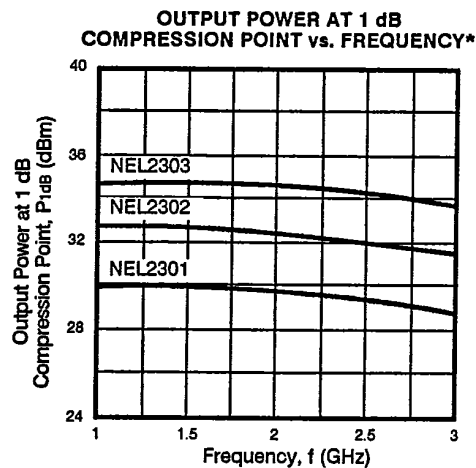
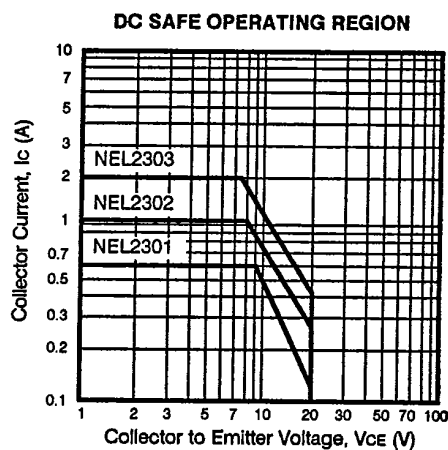
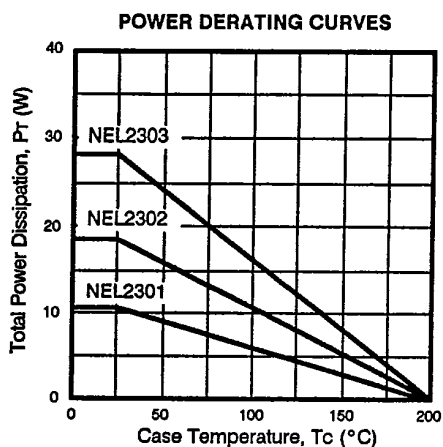
\*57B has emitter and base reversed.

OUTLINE 63



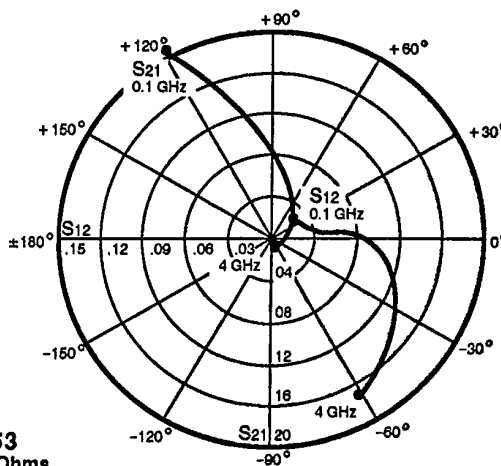
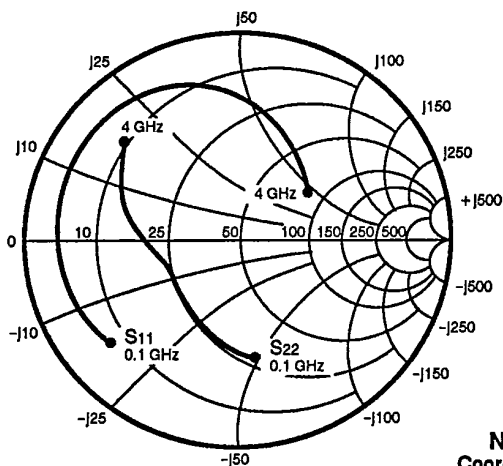
OUTLINE 97



TYPICAL DEVICE CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ )TYPICAL PERFORMANCE CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ )

\*Gain for the "20" package is 1.5 dB lower than the other packages.

## TYPICAL COMMON EMITTER SCATTERING PARAMETERS



**NEL230153**  
Coordinates in Ohms  
Frequency in GHz  
(V<sub>CE</sub> = 15 V, I<sub>C</sub> = 200 mA)

## S-MAGN AND ANGLES:

V<sub>CE</sub> = 15 V, I<sub>C</sub> = 200 mA

FREQUENCY (MHz)

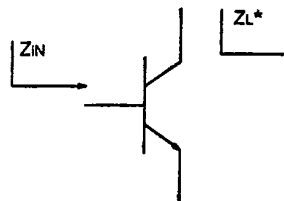
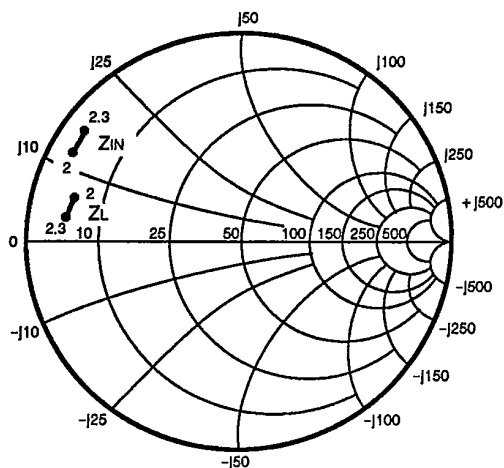
	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
100	.73	-147	20.34	118	.02	35	.59	-81
200	.82	-166	11.72	99	.03	19	.43	-111
500	.86	176	5.16	76	.03	15	.36	-146
1000	.88	160	2.65	51	.03	14	.38	-164
1500	.87	147	1.86	28	.04	13	.43	-168
2000	.84	134	1.48	5	.05	6	.47	-176
2500	.82	120	1.27	-16	.07	-2	.52	172
3000	.75	103	1.14	-39	.08	-14	.57	163
3500	.64	76	1.10	-65	.10	-33	.63	151
4000	.43	31	1.08	-99	.13	-63	.70	139

## LARGE SIGNAL IMPEDANCES

**NEL230153**

Large Signal Impedances

(V<sub>CE</sub> = 15 V, I<sub>C</sub> = 200 mA, P<sub>out</sub> = 29 dBm)

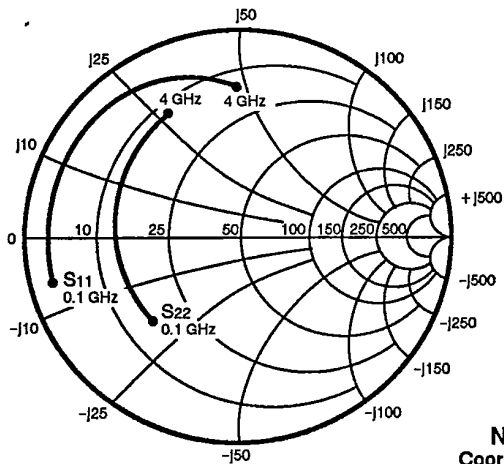


FREQUENCY	Z <sub>IN</sub>	Z <sub>L</sub> *
2	3.3 + j13.5	6.6 + j6.5
2.3	3.3 + j16.8	6.6 + j3.6

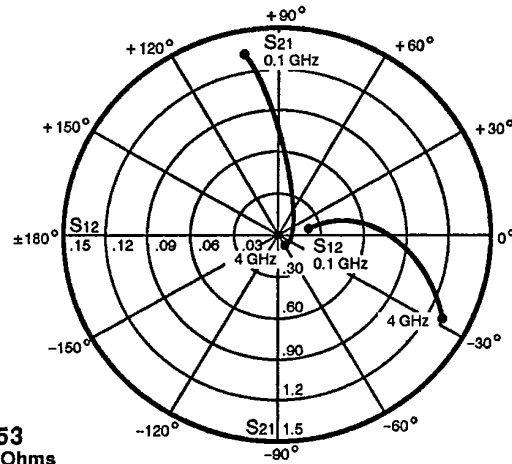
\*Z<sub>L</sub> is optimum load impedance at rated output power.

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## TYPICAL COMMON EMITTER SCATTERING PARAMETERS



**NEL230253**  
Coordinates in Ohms  
Frequency in GHz  
(VCE = 15 V, IC = 350 mA)



## S-MAGN AND ANGLES:

VCE = 15 V, IC = 350 mA

FREQUENCY (MHz)

	S11		S21		S12		S22	
100	.87	-167	13.30	103	.02	20	.54	-134
200	.89	-176	7.04	90	.02	10	.52	-155
500	.91	174	3.00	73	.03	13	.53	-173
1000	.92	161	1.53	51	.04	17	.57	175
1500	.92	152	1.07	30	.04	17	.59	167
2000	.91	141	.84	9	.05	12	.60	159
2500	.90	130	.71	-8	.06	8	.61	151
3000	.86	120	.61	-27	.08	-1	.63	140
3500	.83	106	.58	-44	.10	-11	.65	129
4000	.75	90	.60	-65	.13	-28	.67	120

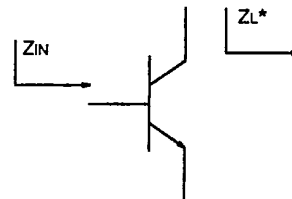
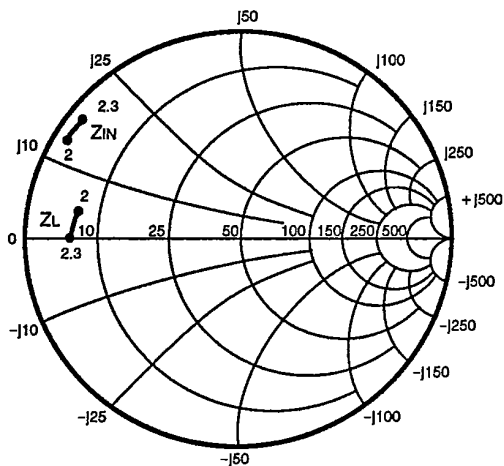
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## LARGE SIGNAL IMPEDANCES

**NEL230253**

Large Signal Impedances

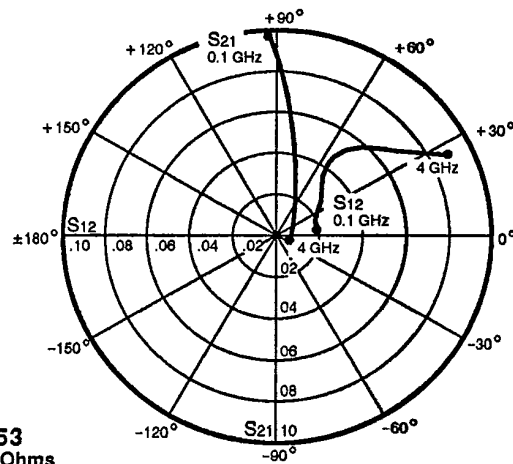
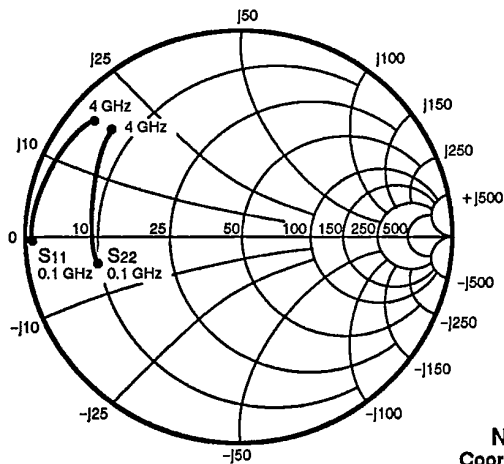
(VCE = 15 V, IC = 350 mA, POUT = 32 dBm)



FREQUENCY	ZIN	ZL*
2	2 + j14	7 + j2.5
2.3	2 + j17	7 - j0

\*ZL is optimum load impedance at rated output power.

# TYPICAL COMMON EMITTER SCATTERING PARAMETERS



**NEL230353**  
Coordinates in Ohms  
Frequency in GHz  
(V<sub>CE</sub> = 17 V, I<sub>C</sub> = 600 mA)

## S-MAGN AND ANGLES:

V<sub>CE</sub> = 17 V, I<sub>C</sub> = 600 mA

FREQUENCY (MHz)

	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
100	.96	-179	9.98	93	.02	15	.67	-168
200	.96	178	5.20	86	.02	6	.68	-177
500	.95	173	2.11	73	.02	26	.70	175
1000	.97	167	1.11	55	.03	35	.72	165
1500	.97	161	.72	39	.03	41	.74	157
2000	.92	155	.54	24	.04	40	.75	154
2500	.94	152	.43	12	.05	43	.74	150
3000	.92	148	.35	2	.06	37	.77	145
3500	.91	143	.33	-8	.07	33	.78	140
4000	.90	139	.32	-17	.09	28	.80	138