

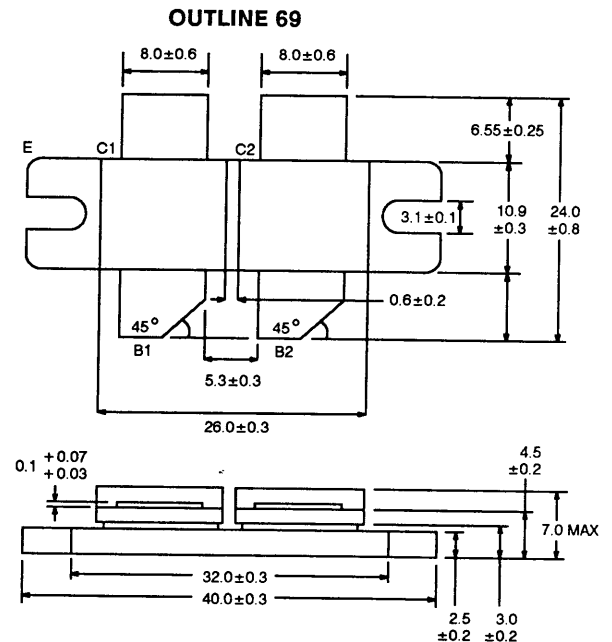
### FEATURES

- **HIGH POWER AND HIGH GAIN:**  $V_{CC} = 28\text{ V}$ , Class AB  
NEM080C69-28:  $P_o = 49.6\text{ dBm}$ ,  $G_P = 5.6\text{ dB}$  (TYP)  
NEM060C69-28:  $P_o = 50.2\text{ dBm}$ ,  $G_P = 8.2\text{ dB}$  (TYP)
- **GOLD METALLIZATION**
- **PUSH-PULL STRUCTURE**
- **INTERNALLY MATCHED**
- **IDEAL FOR TV TRANSMITTER APPLICATIONS**

### DESCRIPTION

NEM060C69-28 and NEM080C69-28 are NPN epitaxial UHF power bipolars designed specifically for broadcast and other high power applications operating at 620 and 860 MHz, respectively. With an exceptionally high power output of over 100 watts, this series also provides high gain, high efficiency, and high resistance to burn-out with load mismatch.

### OUTLINE DIMENSIONS (Units in mm)



### ELECTRICAL SPECIFICATIONS ( $T_A = 25^\circ\text{C}$ )

PART NUMBER EIAJ <sup>1</sup> REGISTERED NUMBER PACKAGE OUTLINE			NEM060C69-28 2SC3660 69			NEM080C69-28 2SC3660A 69		
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX	MIN	TYP	MAX
$I_{CBO}^2$	Collector Cutoff Current at $V_{CB} = 30\text{ V}$ , $I_E = 0$	mA			8			8
$I_{EBO}^2$	Emitter Cutoff Current at $V_{EB} = 2\text{ V}$ , $I_C = 0$	mA			8			8
$h_{FE}^2$	DC Forward Current Gain $V_{CE} = 10\text{ V}$ , $I_C = 2\text{ A}$		30	60	100	30	60	100
$C_{OB}^2$	Output Capacitance at $V_{CB} = 28\text{ V}$ , $I_E = 0$ , $f = 1\text{ MHz}$	pF		120	200		120	200
$P_{OUT}$	Output Power at $V_{CC} = 28\text{ V}$ , Class AB $f = 620\text{ MHz}$ , $P_{IN} = 42\text{ dBm}$ , $I_Q = 100\text{ mA} \times 2$ $f = 860\text{ MHz}$ , $P_{IN} = 44\text{ dBm}$ , $I_Q = 400\text{ mA} \times 2$	dBm dBm	49.5	50.2		49	49.6	
$\eta_C$	Collector Efficiency at $V_{CC} = 28\text{ V}$ , Class AB, $f = 620\text{ MHz}$ , $P_{IN} = 42\text{ dBm}$ , $I_Q = 100\text{ mA} \times 2$ $f = 860\text{ MHz}$ , $P_{IN} = 42\text{ dBm}$ , $I_Q = 400\text{ mA} \times 2$	% %	50	60		40	50	

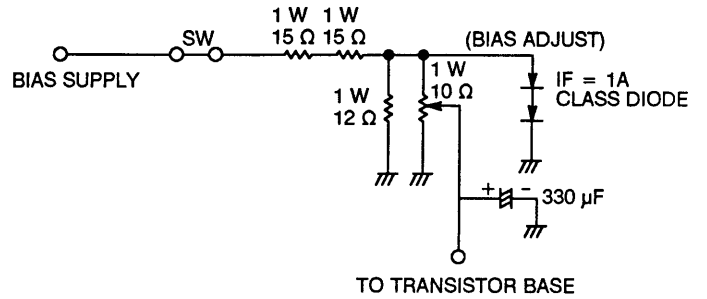
1. Electronic Industrial Association of Japan  
2. Each Side

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

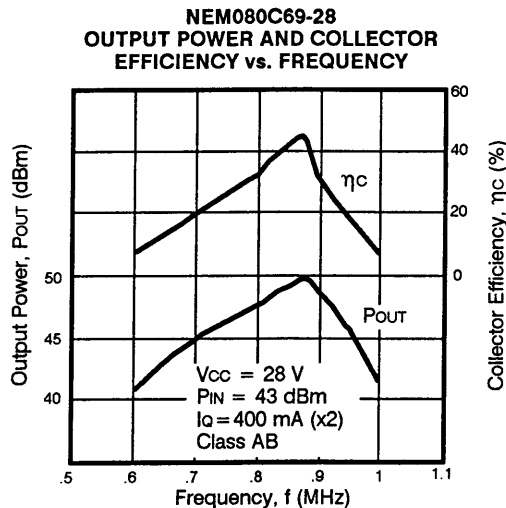
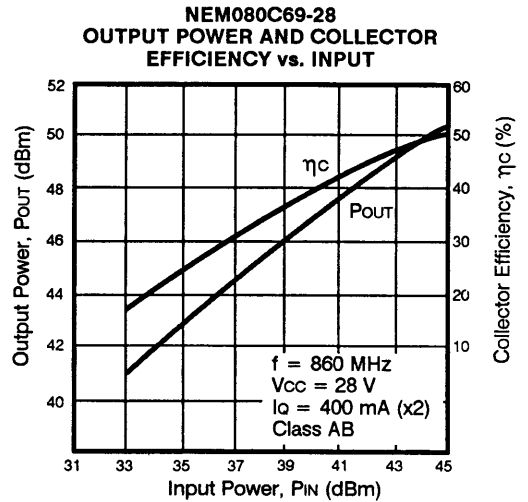
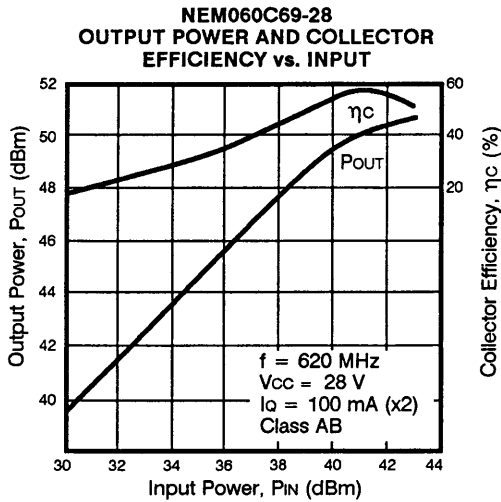
SYMBOLS	PARAMETERS	UNITS	RATINGS
Vcbo	Collector to Base Voltage	V	55
Vceo	Collector to Emitter Voltage	V	32
Vebo	Emitter to Base Voltage	V	3
Ic	Collector Current	A	24
Rth	Thermal Resistance (Junction-to-Case)	°C/W	0.55
Pt	Total Power Dissipation (Tc = 25°C)	W	320
Tj	Junction Temperature	°C	200
Tstg	Storage Temperature	°C	-65 to +150

**BASE BIAS CIRCUIT**

**NEM080C69-28**

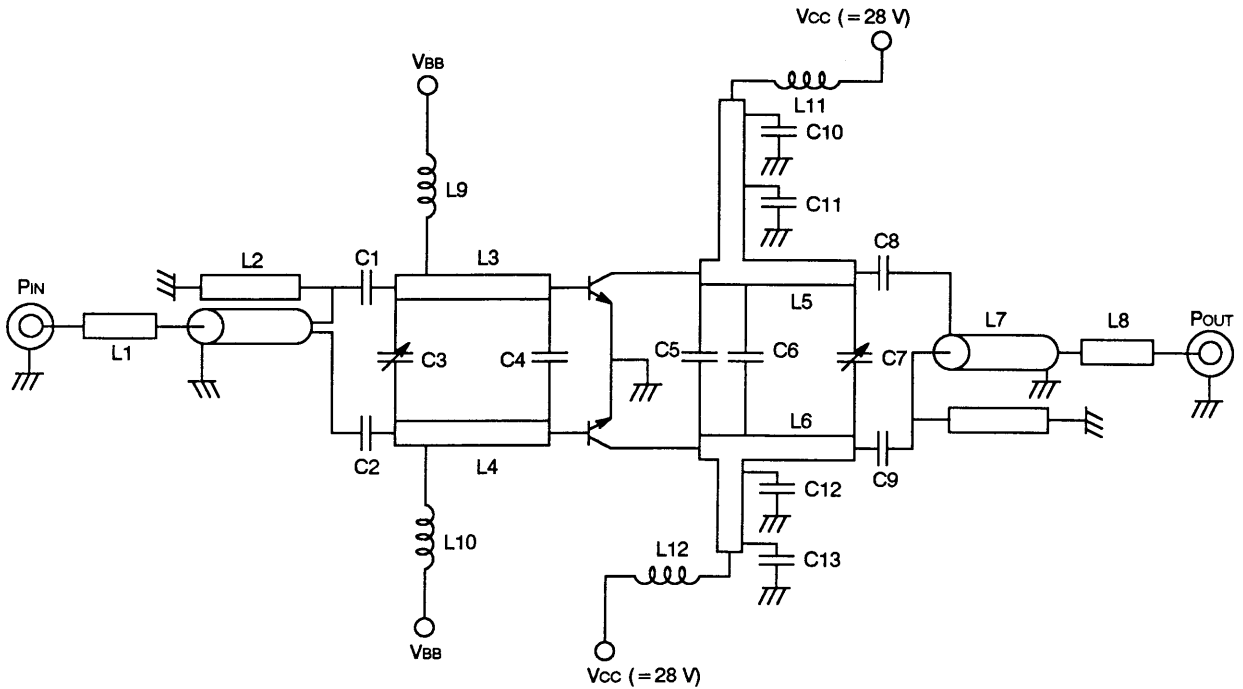


**TYPICAL PERFORMANCE CHARACTERISTICS** (TA = 25°C)



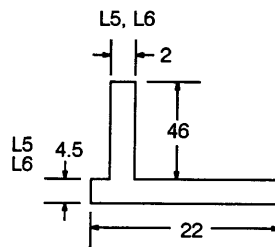
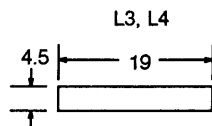
TEST CIRCUIT SCHEMATIC

NEM080C69-28



- C1, C2 = 10 pF Chip
- C3, C7 = 10 pF Variable
- C4, C5 = 8 pF Chip
- C6 = 1 pF Chip
- C8, C9 = 12 pF Chip
- C10, C13 = 1000 pF Chip
- C11, C12 = 10,000 pF Chip

- L1 Micro strip line 28 mm x 4.5 mm
- L2 and L7 50 Ω semi rigid 75 mm long
- L3-6 Micro strip line



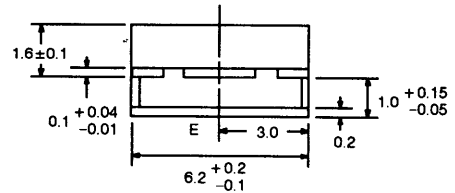
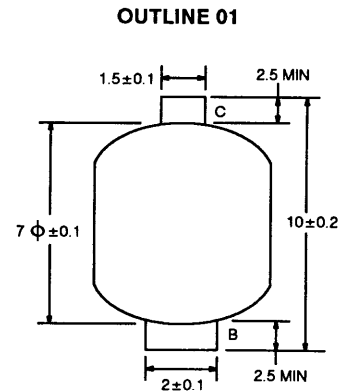
- L9, L10 5 turns 5 mm dia. 0.6 mm wire
- L11, L12 5 turns 6 mm dia. 1.2 mm wire

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### FEATURES

- HIGH POWER AND GAIN
- LOW COST
- WIDE BANDWIDTH
- SMALL PACKAGE
- GOLD METALLIZATION
- RUGGED VSWR:  $\infty$

### OUTLINE DIMENSIONS (Units in mm)



### DESCRIPTION AND APPLICATIONS

The NE0900-07 and NEM0900-07 series of NPN silicon epitaxial UHF power transistors are designed specifically for hand-held radio applications with a supply voltage of 7.2 V. The series is available in a chip carrier package offering power levels of 1, 3 and 7 watts in the 800 to 900 MHz band. The input matching network is incorporated for the NEM0900-07 series to simplify circuit designs. The series features high gain, power, efficiency, and resistance to burn-out resulting from load mismatch.

### PERFORMANCE SPECIFICATIONS (T<sub>A</sub> = 25°C)

PART NUMBER PACKAGE OUTLINE			NE090101-07 01			NEM090301-07 01			NEM090701-07 01		
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX
P <sub>out</sub>	Output Power at V <sub>cc</sub> = 7.2 V, f = 940 MHz, P <sub>IN</sub> = 0.1 W P <sub>IN</sub> = 0.7 W P <sub>IN</sub> = 2.3 W	W W W	0.8	1		2.5	3.2		5	6.3	
$\eta_c$	Collector Efficiency at V <sub>cc</sub> = 7.2 V, f = 940 MHz, P <sub>IN</sub> = 0.1 W P <sub>IN</sub> = 0.7 W P <sub>IN</sub> = 2.3 W		50	55		55	65		55	65	

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

PART NUMBER PACKAGE OUTLINE			NE090101-07 01			NEM090301-07 01			NEM090701-07 01		
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX
ICBO	Collector Cutoff Current at VCB = 15 V, IE = 0	mA			0.1			0.25			0.5
IEBO	Emitter Cutoff Current at VEB = 1.5 V, IC = 0	mA			0.1			0.25			0.5
hFE	DC Forward Current Gain at VCE = 7 V, IC = 0.1 A (pulsed) IC = 0.2 A (pulsed) IC = 0.4 A (pulsed)		20	60	200	20	60	200	20	60	200
COB	Output Capacitance* at VCB = 10 V, IE = 0, f = 1 MHz	pF			5			20			40

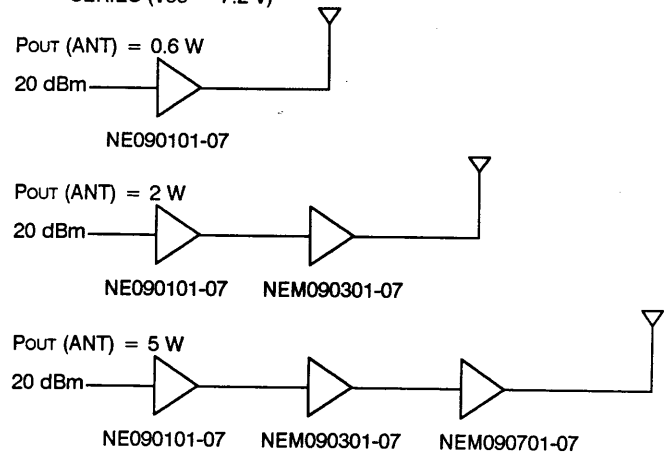
\*The emitter terminal should be connected to the guard terminal at the three-terminal capacitance bridge.

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

SYMBOLS	PARAMETERS	UNITS	RATINGS
VcBo	Collector to Base Voltage	V	20
VcEO	Collector to Emitter Voltage	V	12
VEBO	Emitter to Base Voltage	V	2
IC	Collector Current NE090101-07 NEM090301-07 NEM090701-07	A	0.5 1.5 3.0
PT	Total Power Dissipation NE090101-07 NEM090301-07 NEM090701-07	W	8.3 17.5 35
TJ	Junction Temperature	°C	200
TSTG	Storage Temperature	°C	-65 to +150

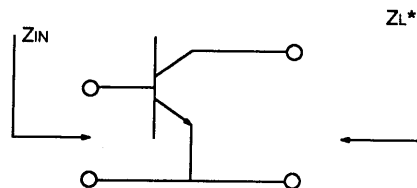
**APPLICATIONS**

RECOMMENDED LINE UP FOR NE0900-07 AND NEM0900-07 SERIES (VCC = 7.2 V)



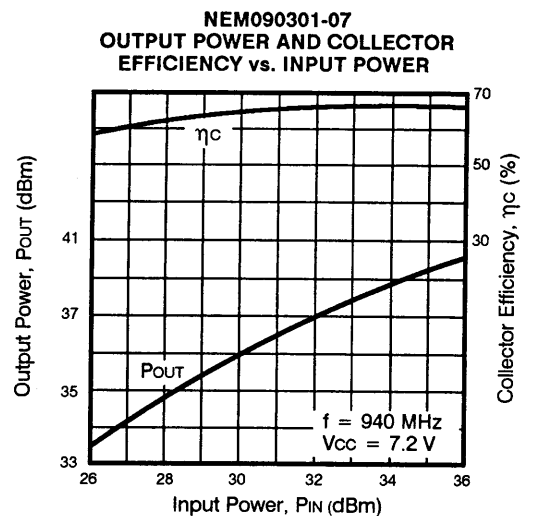
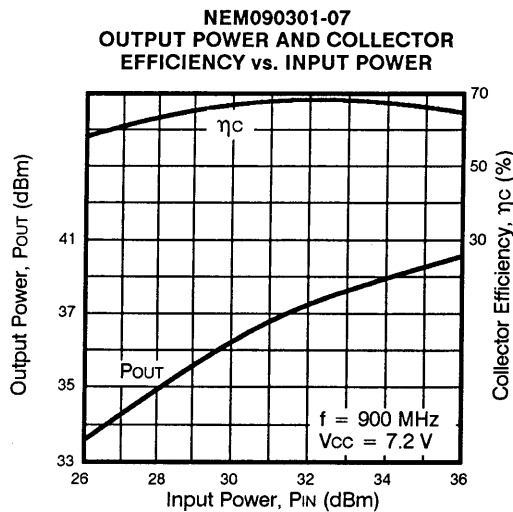
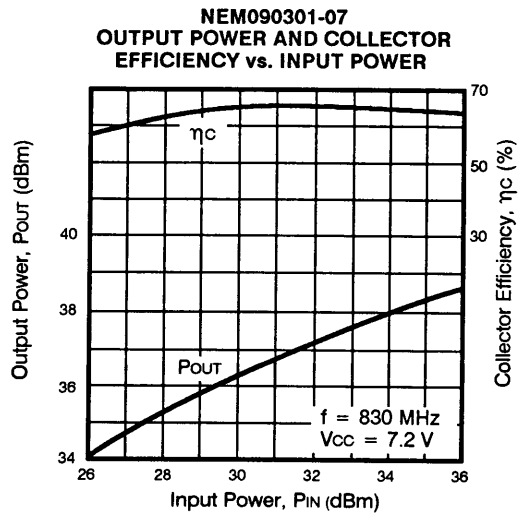
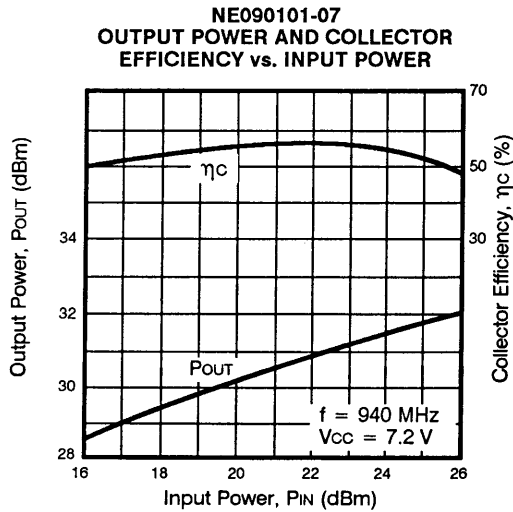
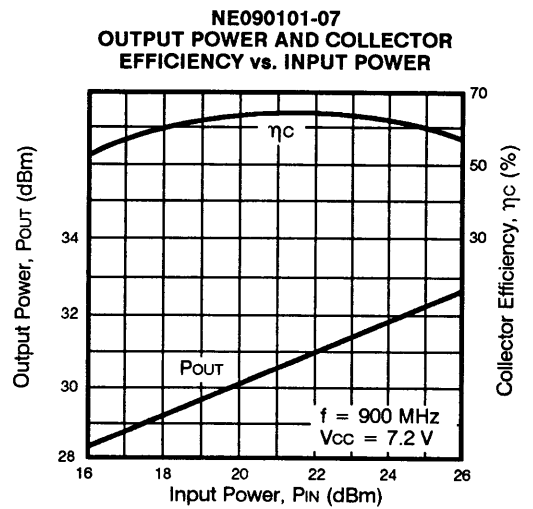
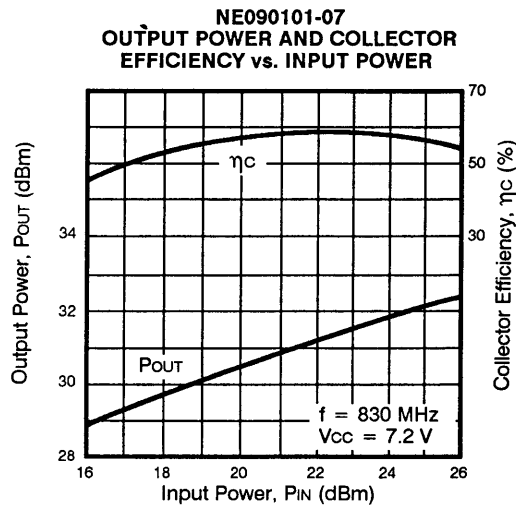
**TYPICAL IMPEDANCE**

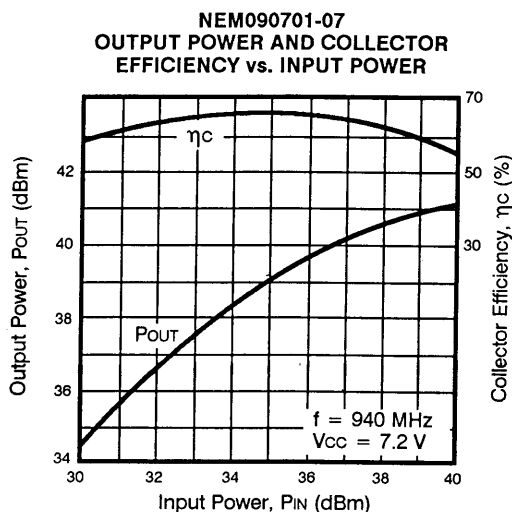
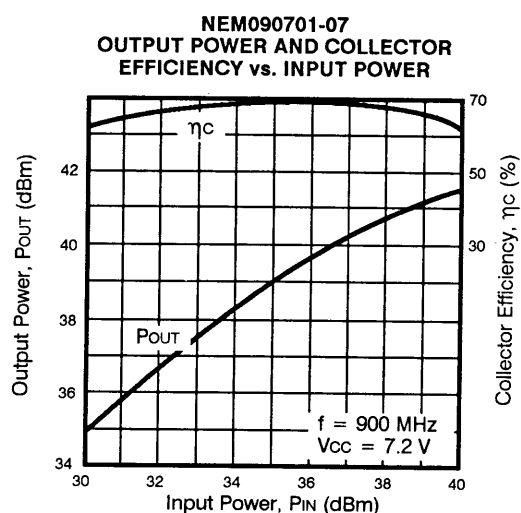
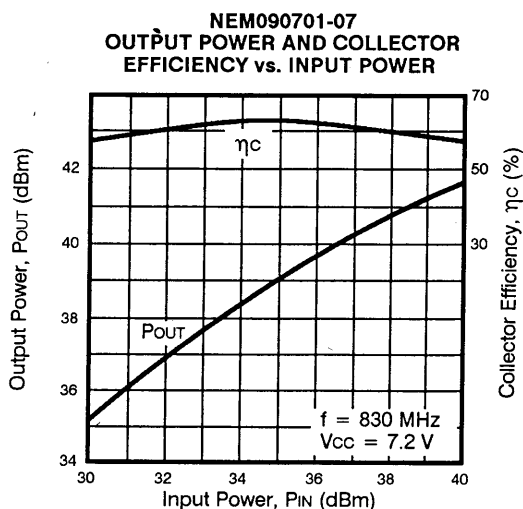
PART NUMBER	FREQUENCY (MHz)	ZIN (Ω)	ZL (Ω)
NE090101-07	830	2.9 +j4.4	11.3 -j2.5
	900	2.6 +j5.7	9.2 -j3.8
	940	2.0 +j5.7	6.9 -j0.9
NEM090301-07	830	3.5 +j6.6	3.5 +j2.6
	900	5.6 +j7.4	2.9 +j3.0
	940	7.3 +j7.3	2.9 +j3.5
NEM090701-07	830	2.3 +j4.8	2.3 +j3.5
	900	2.9 +j5.7	2.9 +j3.9
	940	2.9 +j6.1	2.6 +j4.8



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

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



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

## ASSEMBLY INSTRUCTION AND BEO WARNING

## HANDLING PRECAUTIONS

This product contains beryllia (beryllium oxide) ceramic. Beryllium oxide powder or vapor is highly toxic. If it is inhaled, it can cause difficulty in breathing. Neither dismantle nor chemically treat this product. Do not dispose of the product with common household or industrial waste.

## INSTALLATION PROCEDURE

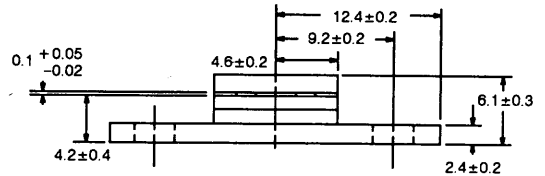
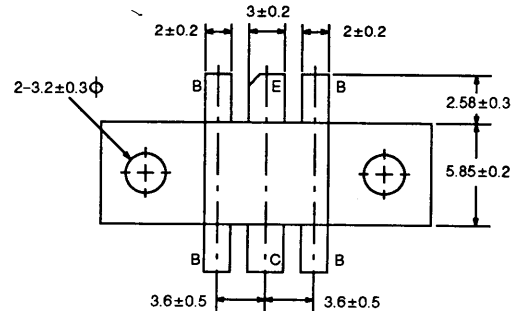
- Solder the emitter surface to the heat sink. Then solder the base and the collector leads to the printed circuit board. A soldering temperature of  $260^\circ\text{C}$  or less for 10 seconds or less is recommended.
- To relieve stress, leave a gap between the printed circuit board and the leads to the base and the emitter.
- When soldering the emitter terminal surface to the heat sink, make sure that the solder covers the entire collector terminal surface and that it is securely fixed to the heat sink. Improper soldering will result in increased thermal resistance, etc. The use of a flux, a soldering temperature of  $200^\circ\text{C}$  or less, and a reflow within 1 minute are recommended.
- If the base of the emitter lead or the heat sink surface is either soldered at a temperature that is too high or soldered for too long, the connection may peel. Follow the temperature and the time recommendations given above.

### FEATURES

- HIGH POWER
- HIGH GAIN
- TITANIUM/PLATINUM/GOLD METALLIZATION FOR HIGH RELIABILITY
- SUPERIOR RF PERFORMANCE
- RUGGED VSWR  $\infty$  : 1 at  $V_{CC} = 24$  V
- LOW COST PACKAGES
- COMMON BASE

### OUTLINE DIMENSIONS (Units in mm)

OUTLINE 81B



All dimensions typical unless noted.

### DESCRIPTION AND APPLICATIONS

NEC's NEM0900 series of NPN epitaxial UHF power transistors is designed specifically for base stations in the 800 & 960 MHz band. The series is available in a low cost metal-ceramic stripline package offering power levels of 20, 40, and 60 watts. Internal matching is incorporated to simplify circuit design. The series provides high gain, high efficiency, and high tolerance to load mismatch.

### PERFORMANCE SPECIFICATIONS (TA = 25°C)

PART NUMBER EIAJ* REGISTERED NUMBER PACKAGE OUTLINE			NEM092081B-28 2SC3537 81B			NEM094081B-28 2SC3538 81B			NEM096081B-28 2SC3539 81B		
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX
P <sub>OUT</sub>	Output Power at V <sub>CC</sub> = 24 V, f = 900 MHz, P <sub>IN</sub> = 2.5 W P <sub>IN</sub> = 6.3 W P <sub>IN</sub> = 10 W	W W W	15.8	20		32	40		50	63	
η <sub>c</sub>	Collector Efficiency at V <sub>CC</sub> = 24 V, f = 900 MHz, P <sub>IN</sub> = 2.5 W P <sub>IN</sub> = 6.3 W P <sub>IN</sub> = 10 W	% % %	50	60		50	60		45	50	

\*Electronic Industrial Association of Japan.



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

PART NUMBER EIAJ* REGISTERED NUMBER PACKAGE OUTLINE			NEM092081B-28 2SC3537 81B			NEM094081B-28 2SC3538 81B			NEM096081B-28 2SC3539 81B		
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX
ICBO	Collector Cutoff Current at Vcb = 30 V, IE = 0	mA			2			4			8
IEBO	Emitter Cutoff Current at VEB = 2 V, IC = 0	mA			2			4			8
hFE	DC Forward Current Gain at VCE = 10 V (pulsed) IC = 1 A IC = 2 A IC = 3 A		20	60	200	20	60	200	20	60	200
COB	Output Capacitance** at Vcb = 28 V, IE = 0, f = 1 MHz	pF		25	40		50	80		80	140

\*Electronic Industrial Association of Japan.

\*\*Emitter and Case is grounded.

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

PART NUMBER EIAJ* REGISTERED NUMBER PACKAGE OUTLINE			NEM092081B-28 2SC3537 81B	NEM094081B-28 2SC3538 81B	NEM096081B-28 2SC3539 81B
SYMBOLS	PARAMETERS	UNITS	RATINGS	RATINGS	RATINGS
VCBO	Collector to Base Voltage	V	50	50	50
VCER**	Collector to Emitter Voltage	V	50	50	50
VEBO	Emitter to Base Voltage	V	3	3	3
IC	Collector Current	A	3	6	9
RTH	Thermal Resistance (Junction-to-Case)	°C/W	4	1.6	1.1
PT	Total Power Dissipation (Tc = 25°C)	W	50	110	170
TJ	Junction Temperature	°C	200	200	200
TSTG	Storage Temperature	°C	-65 to +150	-65 to +150	-65 to +150

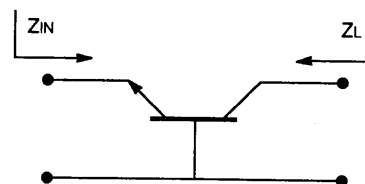
\*Electronic Industrial Association of Japan.

\*\*RBE = 10 Ω

**TYPICAL IMPEDANCE**

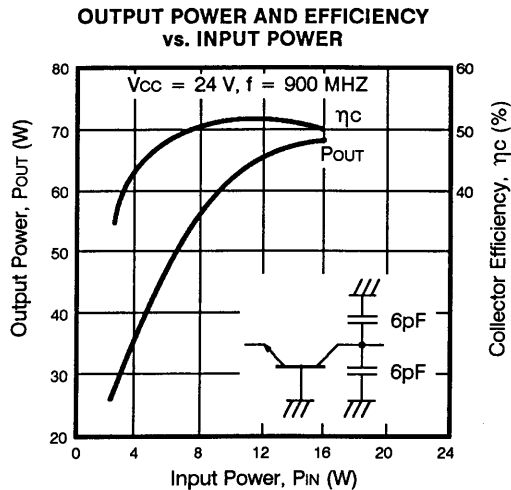
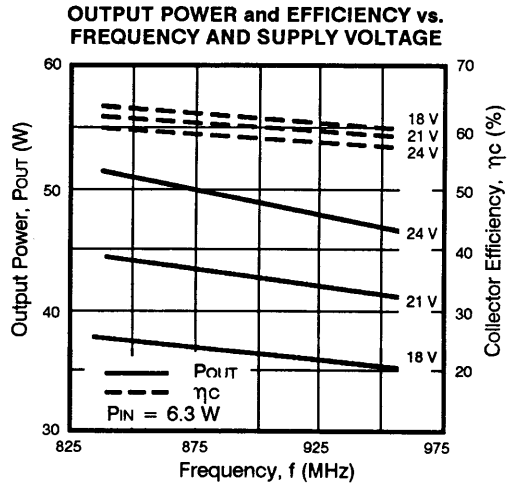
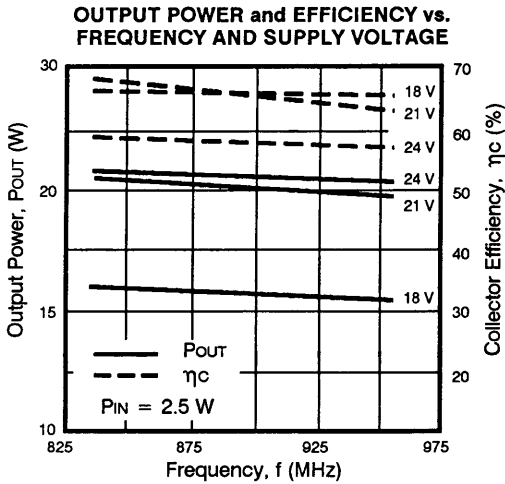
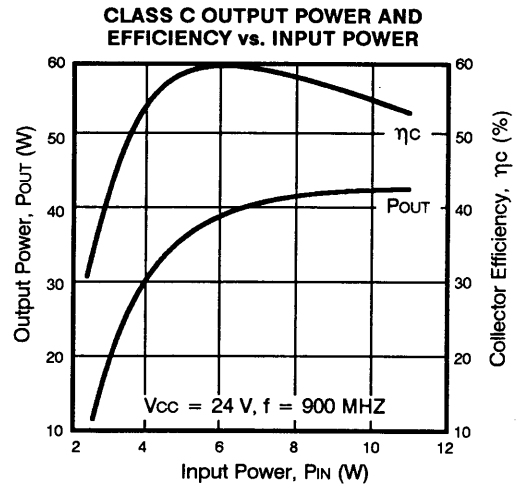
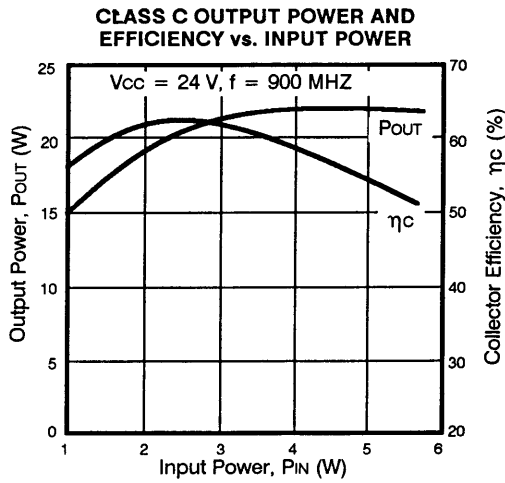
TYPICAL LARGE SIGNAL INPUT AND OUTPUT  
IMPEDANCES OF THE NEM0900-28 Series  
At Vcc = 24 V, f = 900 MHz

PART NUMBER	INPUT POWER Pin (dBm)	OUTPUT POWER Pout (dBm)	ZIN (Ω)	ZL (Ω)
NEM092081B-28	34	43	4.09 + j6.31	4.03 - j1.74
NEM094081B-28	38	46	2.93 + j7	2.87 - j0.43
NEM096081B-28	40	48.3	0.8 + j1.75	2.25 + j0.4



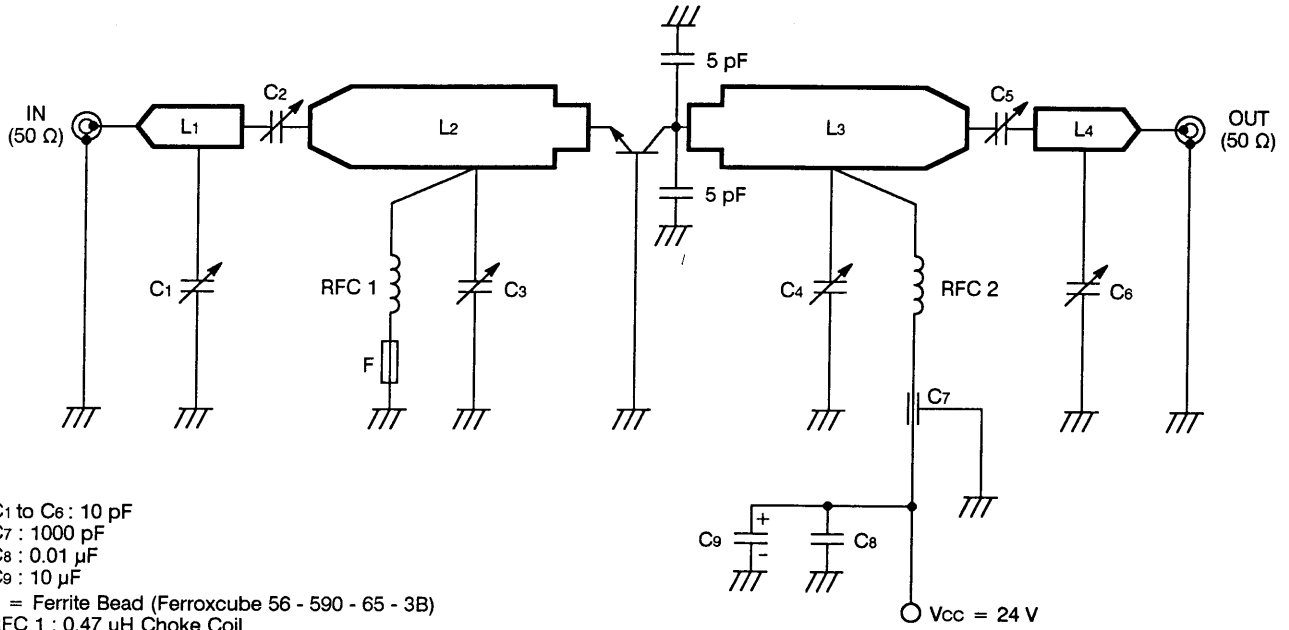
ZL is optimum load impedance at rated output power.

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

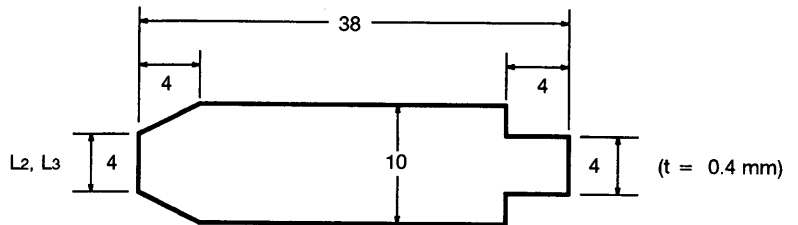
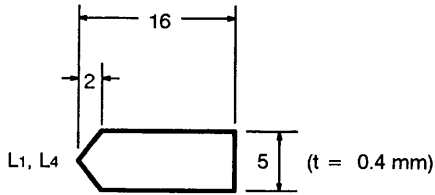


TEST CIRCUIT DIAGRAM\*

NEM092081B-28, NEM094081B-28, NEM096081B-28



- C1 to C6: 10 pF
- C7: 1000 pF
- C8: 0.01 μF
- C9: 10 μF
- F = Ferrite Bead (Ferroxcube 56 - 590 - 65 - 3B)
- RFC 1: 0.47 μH Choke Coil
- RFC 2: Copper, Silver Plated (w = 3 mm, t = 0.4 mm) 10 mm ID 1/2 Turn



\*Application Note TEA-561 is available upon request. This note describes a microstrip design using the NEM096081B-28 in the 860 to 920 MHz band

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