

FEATURES

- HIGH GAIN
- SUPPLY VOLTAGE, $V_{CC} = 7.2$ V
- FOR 500 MHz BAND HAND-HELD RADIO APPLICATIONS
- THREE DIFFERENT PACKAGES AVAILABLE
- RUGGED VSWR $\infty: 1$
- HIGH POWER
- HIGH RELIABILITY

DESCRIPTION AND APPLICATIONS

The NE0500-07 series of UHF NPN epitaxial silicon power transistors is designed for hand-held radio applications with a supply voltage of 7.2 V. The series provides the engineer with high performance at a low cost and reliability uncommon to conventional devices. Reliability is assured by 100% screening to NEC's stringent quality control standards. These standards use procedures patterned after MIL-S-19500 and are capable of meeting the test requirements of MIL-STD-750. The series uses a newly developed NEC structure which is far superior to conventional techniques in providing emitter ballasting. The chips are passivated by a layer of Si_3N_4 and then physically protected by a layer of SiO_2 . The series is available in a variety of low cost, rugged packages designed to provide from 1.4 to 6 watts output power. The characteristics and features offered make the NE0500-07 series the ideal choice for hand-held radio applications in the 500 MHz band.

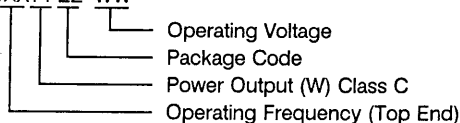
ABSOLUTE MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$)

PART NUMBER ¹ EIAJ ² REGISTERED NUMBER PACKAGE OUTLINE			NE050220-07 20	NE050290 (91)-07 2SC2494K (M) 90, 91	NE050490 (91)-07 2SC2495K (M) 90, 91	NE050690 (91)-07 2SC2906AK (M) 90, 91
SYMBOLS	CHARACTERISTICS	UNITS	RATINGS	RATINGS	RATINGS	RATINGS
V_{CB0}	Collector to Base Voltage	V	25	25	25	25
V_{CE0}	Collector to Emitter Voltage	V	12	12	12	12
V_{EB0}	Emitter to Base Voltage	V	2	2	2	2
I_C	Collector Current	A	0.75	0.75	1.5	3
R_{TH}	Thermal Resistance (Junction-to-Case)	$^\circ\text{C}/\text{W}$	20	20	10	5
P_T	Total Power Device Dissipation ($T_C = 25^\circ\text{C}$)	W	8.75	8.75	17.5	35
T_J	Junction Temperature	$^\circ\text{C}$	200	200	200	200
T_{STG}	Storage Temperature	$^\circ\text{C}$	-65 to +200	-65 to +150	-65 to +150	-65 to +150

Notes:

1. Power Numbering System:

NEXXYZZ-WW



2. Electronic Industrial Association of Japan.

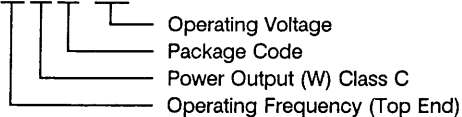
PERFORMANCE SPECIFICATIONS (TA = 25°C)

PART NUMBER ¹ EIAJ ² REGISTERED NUMBER PACKAGE OUTLINE			NE050220-07 20			NE050290 (91)-07 2SC2494K (M) 90, 91			NE050490 (91)-07 2SC2495K (M) 90, 91			NE050690 (91)-07 2SC2906AK (M) 90, 91		
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX
P _{OUT}	Output Power at V _{CC} = 7.2 V, f = 500 MHz P _{IN} = 21 dBm P _{IN} = 29.5 dBm P _{IN} = 34.5 dBm	dBm dBm dBm	30.5	31.5		30.5	31.5		35	36		37.5	38.5	
η _c	Collector Efficiency at V _{CC} = 7.2 V, f = 500 MHz P _{IN} = 21 dBm P _{IN} = 29.5 dBm P _{IN} = 34.5 dBm	% % %	50	60		50	60		55	65		70	80	
V _{SWR}	Voltage Standing Wave Ratio at V _{CC} = 7.2 V, f = 500 MHz P _{OUT} = 3 W P _{OUT} = 6 W P _{OUT} = 7 W		∞			∞			∞			∞		
BV _{CB0}	Collector to Base Breakdown Voltage at I _E = 0 I _C = 0.5 mA I _C = 1 mA I _C = 2 mA	V V V	25			25			25			25		
BV _{CEO}	Collector to Emitter Breakdown Voltage at I _E = 0 I _C = 5 mA I _C = 10 mA I _C = 20 mA	V V V	12			12			12			12		
BV _{EBO}	Emitter to Base Breakdown Voltage at I _C = 0 I _E = 0.5 mA I _E = 1 mA I _E = 2 mA	V V V	2			2			2			2		
I _{CB0}	Collector Cutoff Current at V _{CB} = 20 V, I _E = 0	mA			0.1			0.1			0.2			0.4
I _{EBO}	Emitter Cutoff Current at V _{EB} = 1.5 V, I _C = 0	mA			0.1			0.1			0.2			0.4
h _{FE}	DC Forward Current Gain at V _{CE} = 7.2 V I _C = 100 mA (pulsed) I _C = 200 mA (pulsed) I _C = 400 mA (pulsed)		20	60	200	20	60	200	20	60	200	20	60	200
C _{OB}	Output Capacitance ³ at V _{CB} = 10 V, I _E = 0, f = 1 MHz	pF	4	5		4	5		8	10		16	20	

Notes:

1. Power Numbering System:

NEXYY ZZ-WW

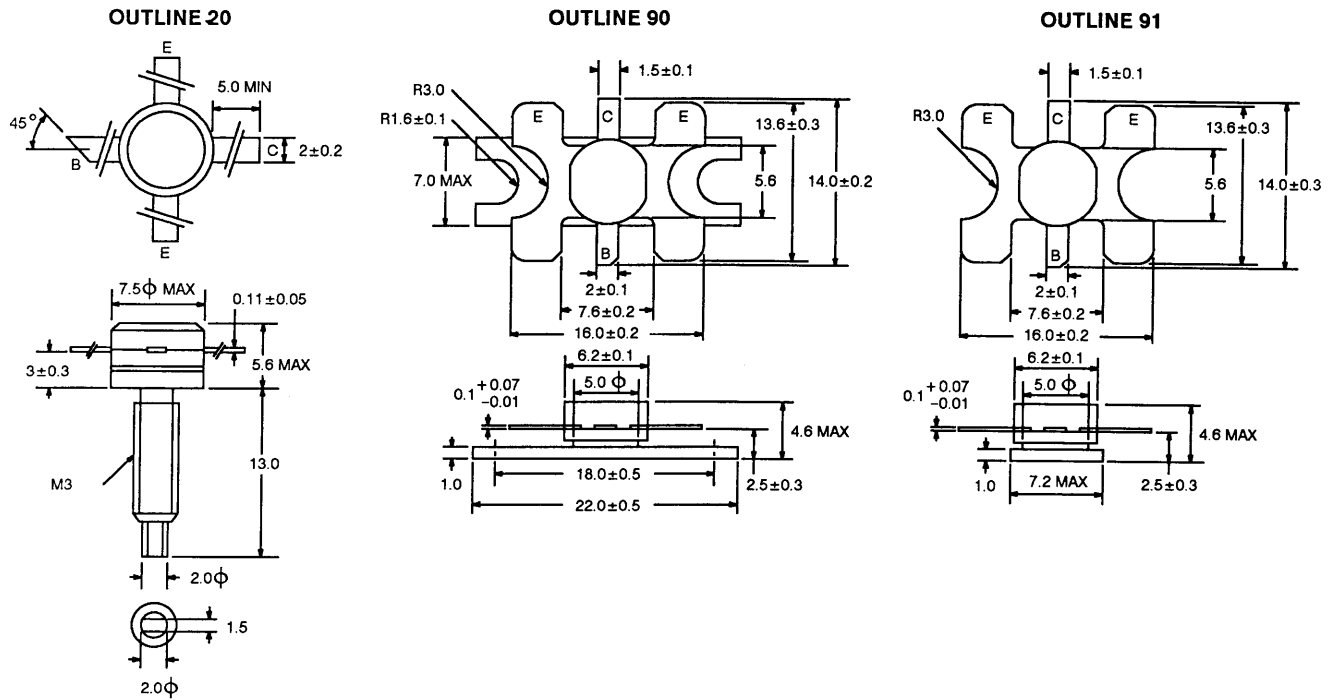


2. Electronic Industrial Association of Japan.

3. Emitter and flange (stud) are grounded.

NE0500-07 SERIES

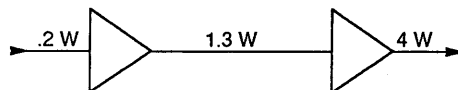
OUTLINE DIMENSIONS (Units in mm)



*All leads insulated from stud.
 **All dimensions are typical unless noted.

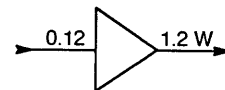
APPLICATIONS

400 MHz RF BAND FOR HAND-HELD RADIO APPLICATIONS ($V_{CC} = 7.2\text{ V}$)

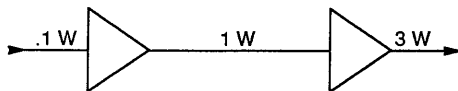


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 NE050290-07
 NE050291-07

NE050490-07
 NE050491-07



NE050220-07
 NE050290-07
 NE050291-07

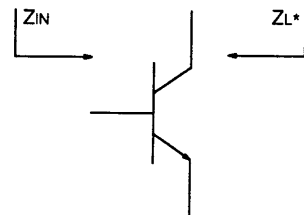


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 NE050291-07

NE050490-07
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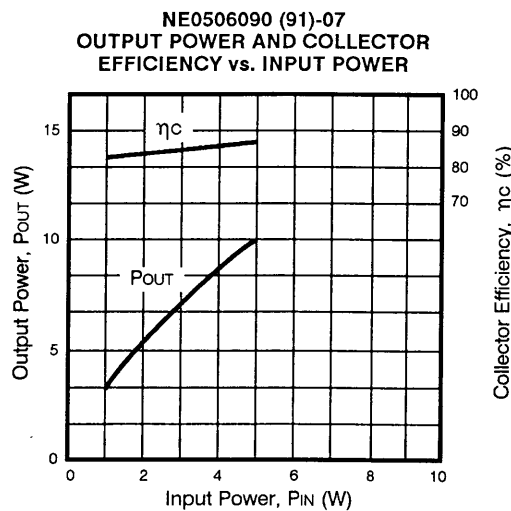
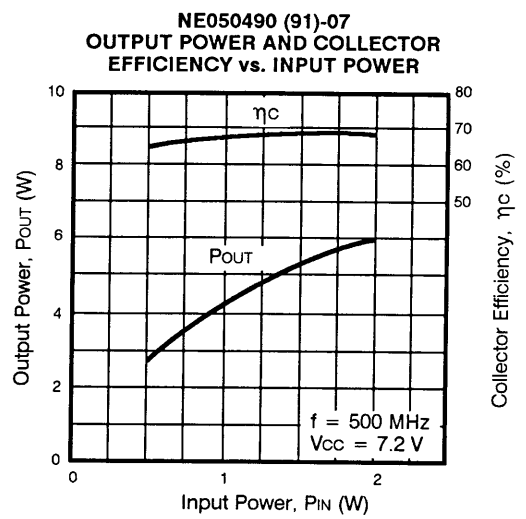
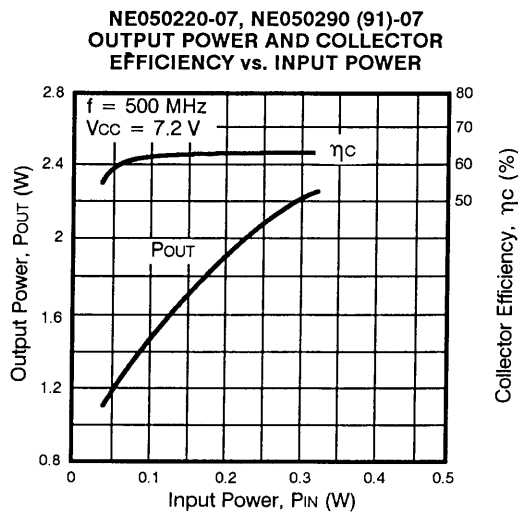
TYPICAL IMPEDANCE

PART NUMBER	FREQUENCY	Z_{IN}		Z_L	
		Real	Imaginary	Real	Imaginary
NE050290-07 NE050291-07	500 MHz	1.15	+J2.18	8.16	-J7.2
NE050490-07 NE050491-07	500 MHz	2.02	+J2.62	4.3	+J0.87
NE050690-07 NE050691-07	500 MHz	2.6	+J3.5	4.6	+J2.6

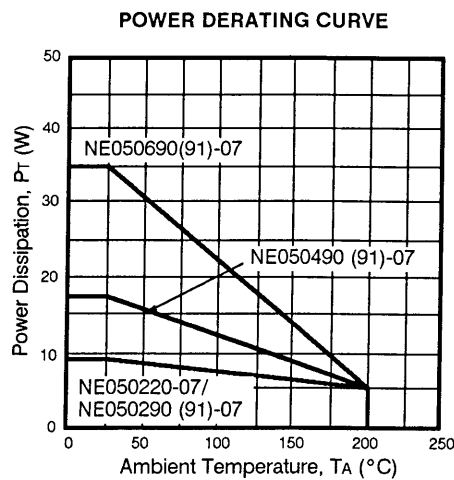


* Z_L is optimum load impedance at rated output power.

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



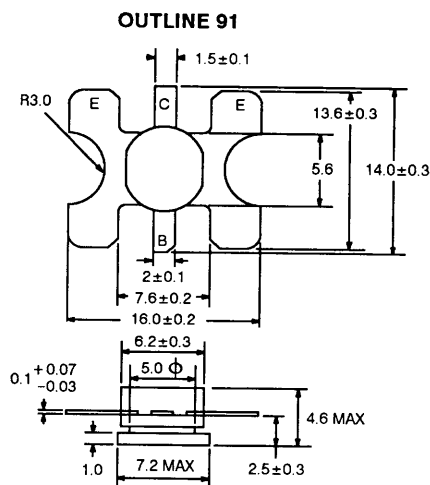
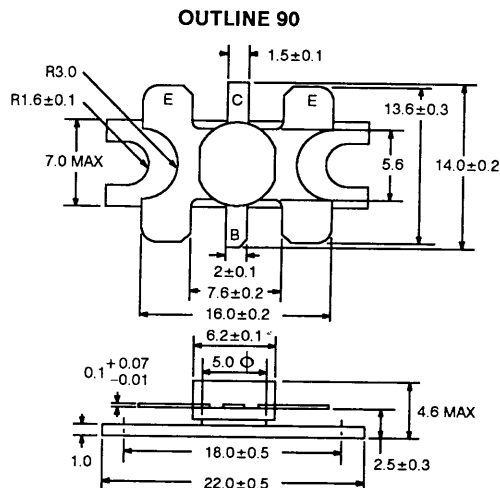
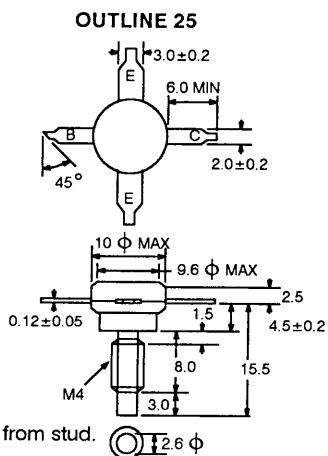
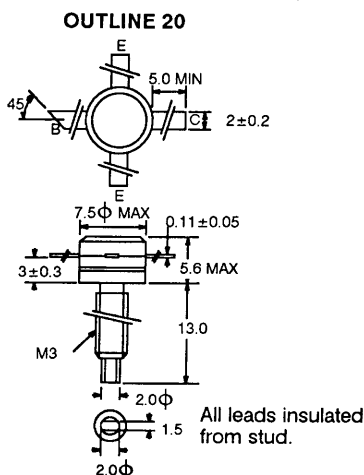
TYPICAL DEVICE CHARACTERISTICS ($T_A = 25^\circ\text{C}$)



FEATURES

- SUPERIOR RF PERFORMANCE
- HIGH GAIN
- SUPPLY VOLTAGE, $V_{cc} = 12.6$ V
- FOR 400 MHz BAND MOBILE RADIO APPLICATIONS
- FOUR DIFFERENT LOW COST PACKAGE STYLES
- RUGGED VSWR $\infty:1$
- HIGH POWER
- HIGH RELIABILITY
- COMMON EMITTER

OUTLINE DIMENSIONS (Units in mm)



DESCRIPTION AND APPLICATIONS

The NE0500-12 series of UHF NPN epitaxial silicon power transistors are designed for mobile radio applications with a nominal supply voltage of 12.6 V. The series provides high performance at a low cost with reliability uncommon to conventional devices. Reliability is assured by 100% screening to NEC's stringent quality control standards. These standards use procedures patterned after MIL-S-19500 and are capable of meeting the test requirements of MIL-STD-750. The series uses

a newly developed NEC structure which is far superior to conventional techniques in providing emitter ballasting. The chips are passivated by a layer of Si_3N_4 and then physically protected by a layer of SiO_2 . The series is available in a variety of low cost, rugged packages designed to provide from 3.5 to 17 watts output power. The characteristics and features offered make the NE0500-12 series the ideal choice for mobile radio applications in the 400 MHz band.

PERFORMANCE SPECIFICATIONS (T_A = 25°C)

PART NUMBER ¹ EIAJ ² REGISTERED NUMBER PACKAGE OUTLINE		PARAMETERS AND CONDITIONS		NE050320-12 2SC2081 20		NE050390 (91)-12 2SC2283K (M) 90 (91)		NE051025-12 2SC2082 25		NE051090 (91)-12 2SC2284K (M) 90 (91)		NE051525-12 2SC2083 25		NE052090 (91)-12 2SC2285K (M) 90 (91)		
SYMBOLS	UNITS	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX
P _{OUT}	Output Power at V _{CC} = 12.6 V, f = 500 MHz PIN = 25 dBm PIN = 34 dBm PIN = 33 dBm PIN = 38 dBm	34.5	35		34.5	35.5		39	39.5		38.5	39.5		41.5	42	
η _C	Collector Efficiency at V _{CC} = 12.6 V, f = 500 MHz PIN = 25 dBm PIN = 34 dBm PIN = 33 dBm PIN = 38 dBm	55	60		50	60		60	70		55	65		65	75	
B _{Vcbo}	Collector to Base Breakdown Voltage at I _E = 0 I _C = 1 mA I _C = 3 mA I _C = 2 mA I _C = 4 mA	38			38			38			38			38		
B _{VEBO}	Emitter to Base Breakdown Voltage at I _C = 0 I _E = 1 mA I _E = 3 mA I _E = 2 mA I _E = 4 mA	3			3			3			3			3		
LV _{CEO}	Collector to Emitter Breakdown Voltage at I _B = 0 I _C = 10 mA I _C = 30 mA I _C = 20 mA I _C = 40 mA	18			18			18			18			18		
I _{CO}	Collector Cutoff Current at V _{CB} = 30 V, I _E = 0			0.25			0.25			0.75			0.75			1
I _{EO}	Emitter Cutoff Current at V _{EB} = 2 V, I _C = 0			0.25			0.25			0.75			0.75			1
h _{FE}	DC Forward Current Gain at V _{CE} = 10 V I _C = 0.2 mA (pulsed) I _C = 0.6 mA (pulsed) I _C = 0.4 mA (pulsed) I _C = 0.8 mA (pulsed)	20	60	200	20	60	200	20	60	200	20	60	200	20	60	200
C _{OB}	Output Capacitance ³ at V _{CB} = 10 V, I _E = 0, f = 1 MHz			6	8		8		17	22		17		24	30	
V _{SWR}	Voltage Standing Wave Ratio Phase = λg/2 V _{CC} = 16 V, P _{OUT} = 5 W V _{CC} = 16 V, P _{OUT} = 10 W V _{CC} = 16 V, P _{OUT} = 20 W	∞			∞			∞			∞			∞		

Notes:

- Power Numbering System
NE^{XX}YY ZZ-WW
 - Operating Voltage
 - Package Code
 - Power Output (W) Class C
 - Operating Frequency (Top End)
- Electronic Industrial Association of Japan.
- Emitter and flange (case) are grounded.

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C)

SYMBOLS	PARAMETERS AND CONDITIONS		UNITS	RATINGS	
	EIAJ ² REGISTERED NUMBER PACKAGE OUTLINE			RATINGS	
V _{ceo}	Collector to Base Voltage		V	38	38
V _{ceo}	Collector to Emitter Voltage		V	18	18
V _{ebo}	Emitter to Base Voltage		V	3	3
I _c	Collector Current		A	0.75	1.5
R _{th}	Thermal Resistance (Junction-to-Case)		°C/W	15	8.8
P _t	Total Device Dissipation		W	10	17
T _j	Junction Temperature		°C	175	175
T _{stg}	Storage Temperature		°C	-65 to +175	-65 to +175

Notes:

1. Power Numbering System

NE_{XXXX}ZZ-WW

Operating Voltage

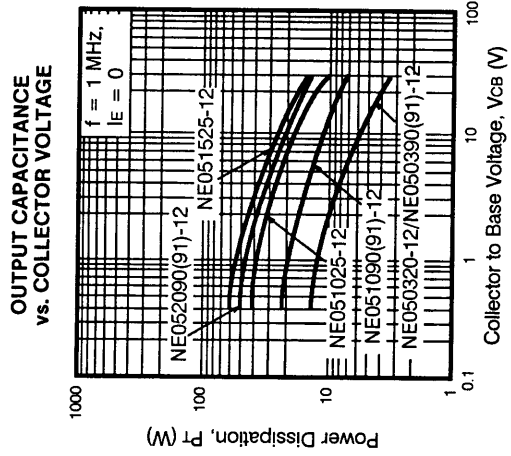
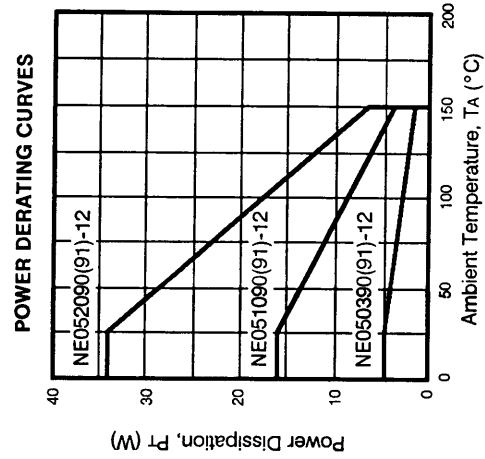
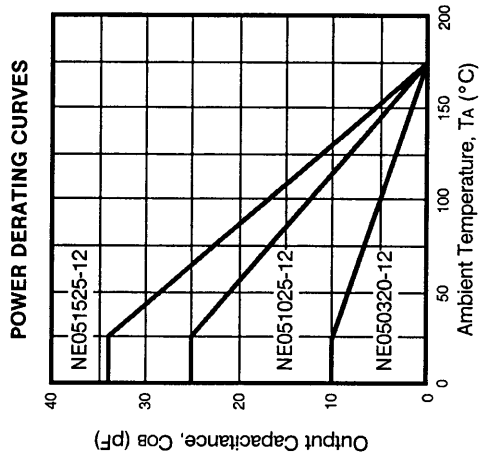
Package Code

Power Output (W) Class C

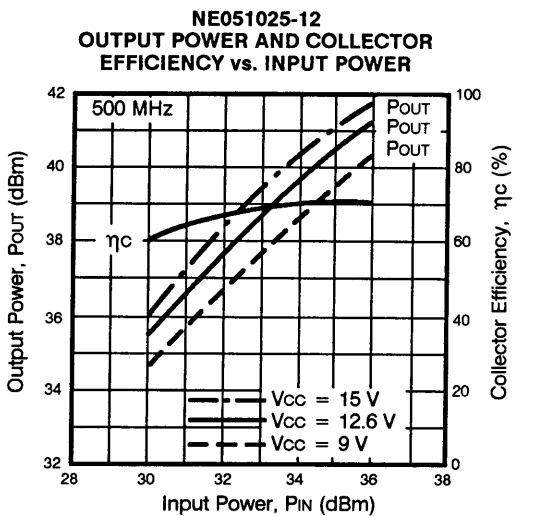
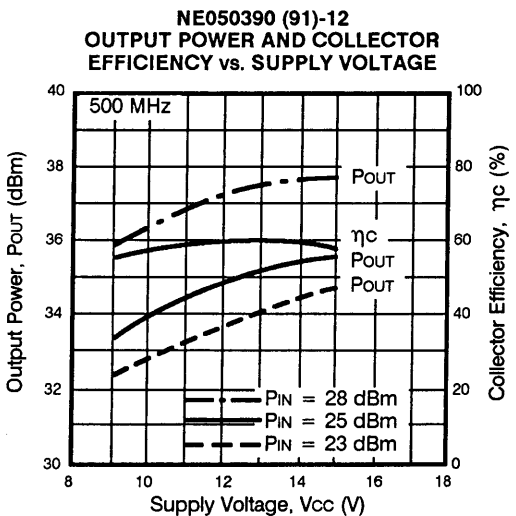
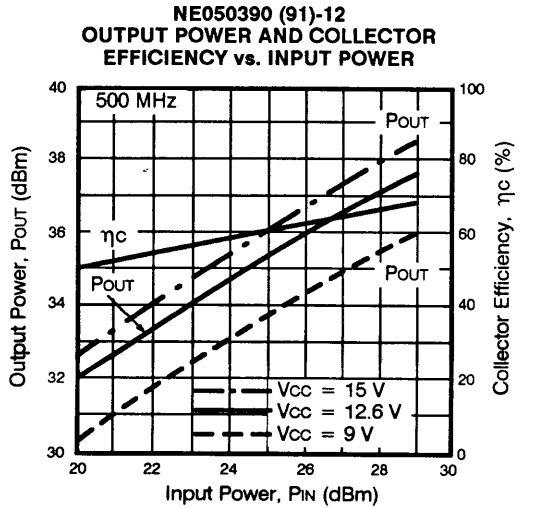
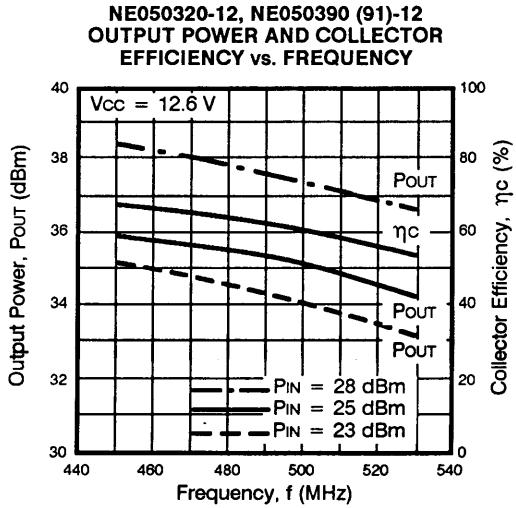
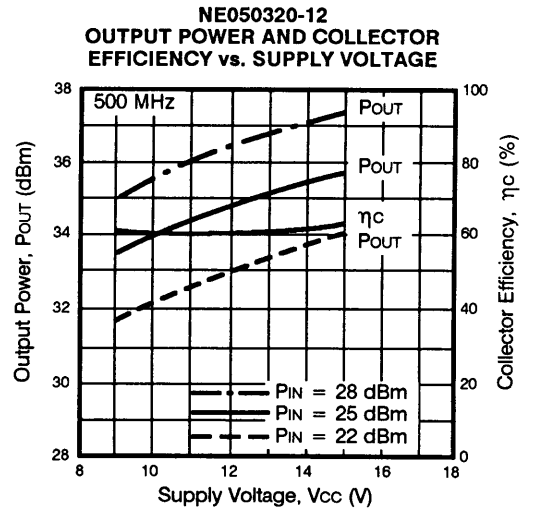
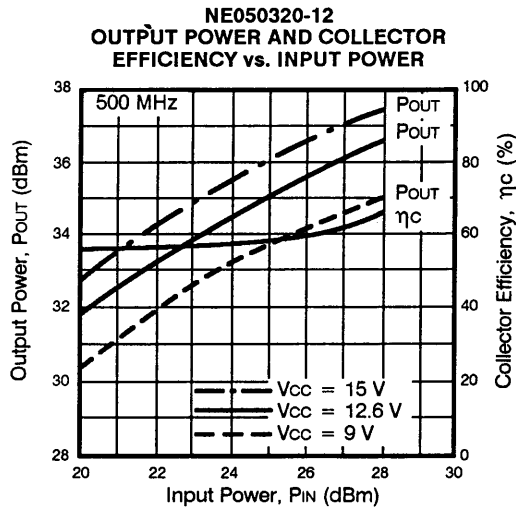
Operating Frequency (Top End)

2. Electronic Industrial Association of Japan.

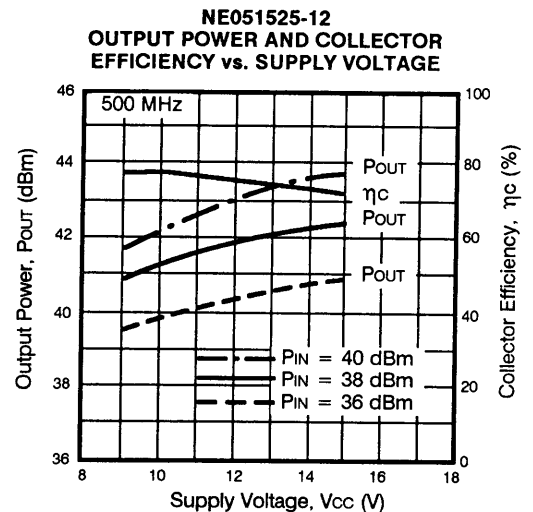
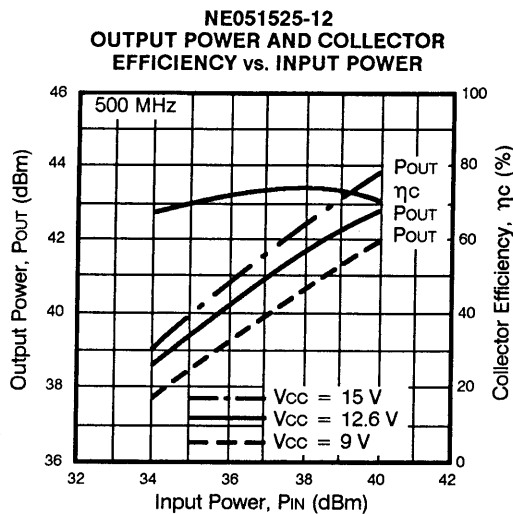
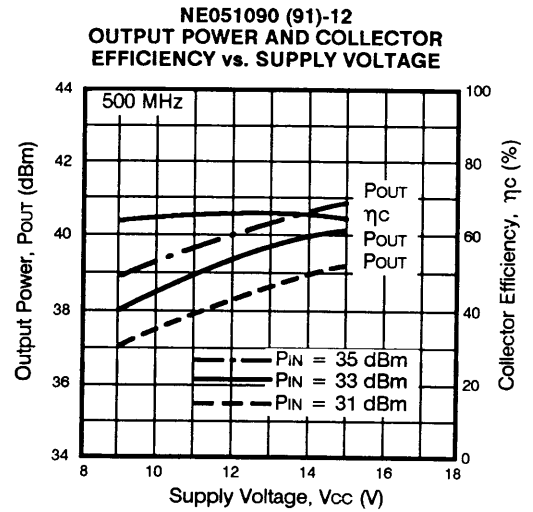
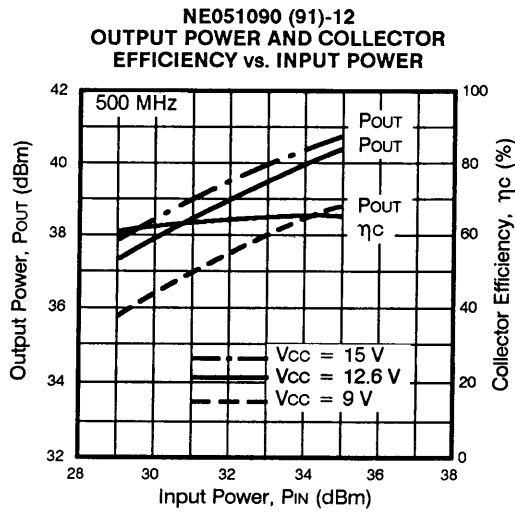
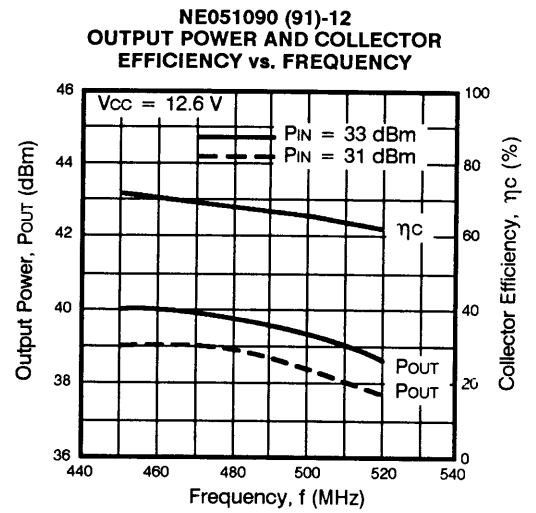
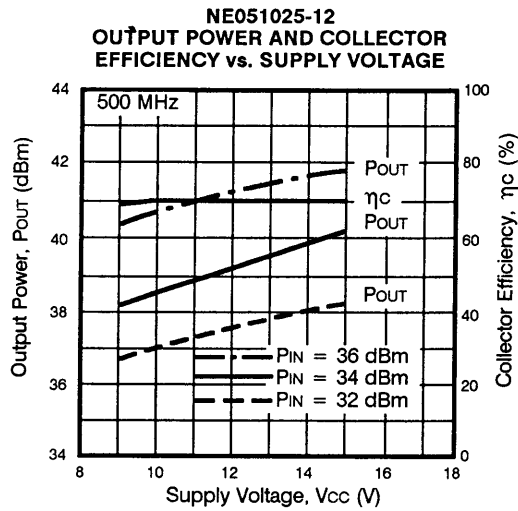
TYPICAL DEVICE CHARACTERISTICS (T_A = 25°C)



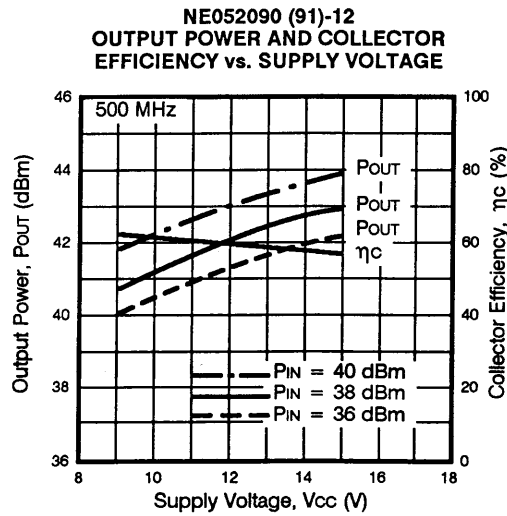
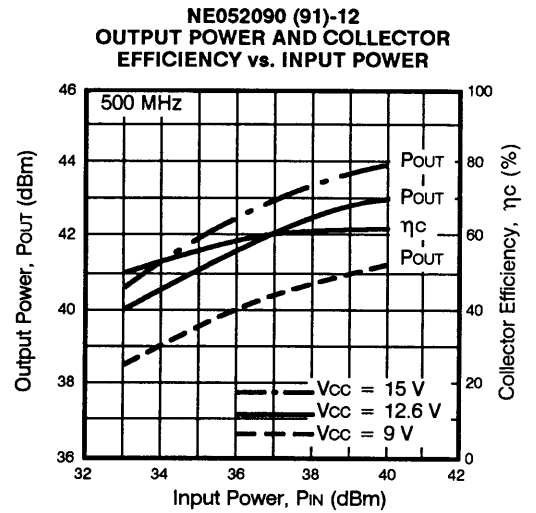
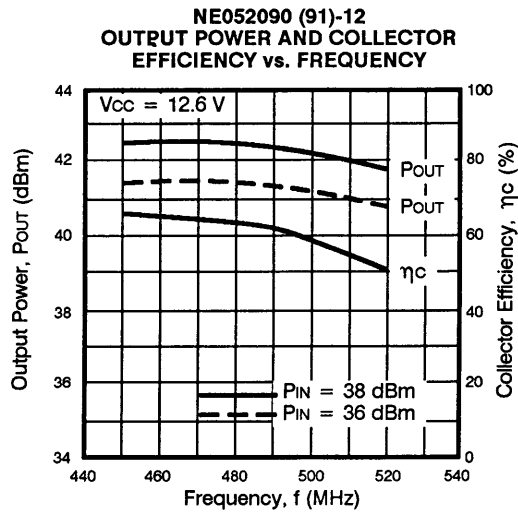
TYPICAL PERFORMANCE CHARACTERISTICS (T_A = 25°C, CLASS C, GROUNDED EMITTER)



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

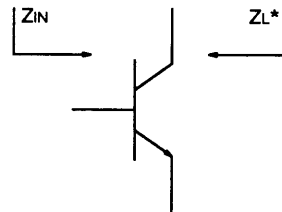


TYPICAL PERFORMANCE CHARACTERISTICS ($T_A = 25^\circ\text{C}$, CLASS C, GROUNDING EMITTER)



TYPICAL IMPEDANCE

PART NUMBER	FREQUENCY	Z_{IN}		Z_L	
		Real	Imaginary	Real	Imaginary
NE050320-12	500 MHz	1.75	+j2.5	12.25	-j10
NE051025-12	500 MHz	2.5	+j3.8	7.0	+j3.0
NE051525-12	500 MHz	1.5	+j6.0	6.0	+j1.8
NE050390 (91)-12	500 MHz	0.5	+j3.5	6.25	-j11.5
NE051090 (91)-12	500 MHz	1.75	+j4.5	8.5	-j1.0
NE052090 (91)-12	500 MHz	1.25	+j3.5	5.75	+j0.8



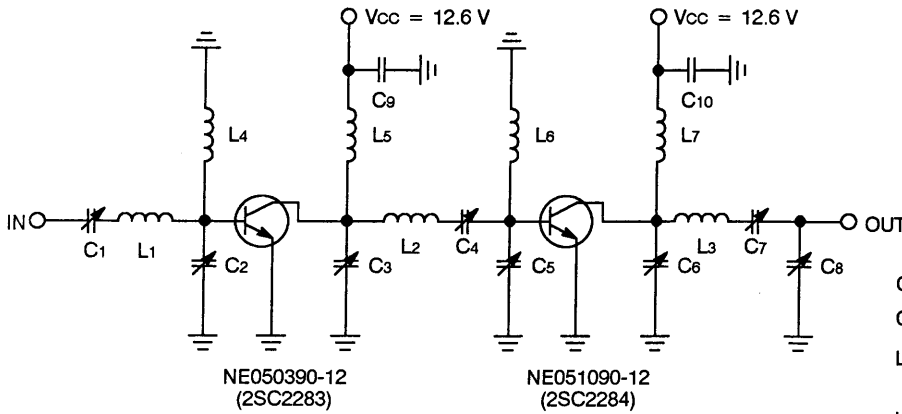
* Z_L is optimum load impedance at rated output power.

2

NE0500-12 SERIES

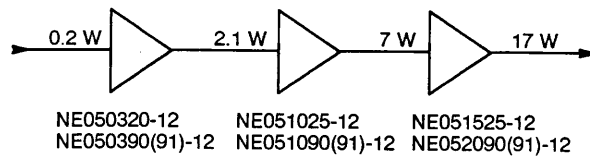
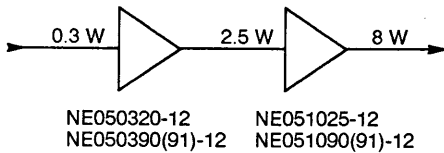
APPLICATIONS

500 MHz POWER AMPLIFIER USING NE050390-12 AND NE051090-12



- C1 to C8 : 10 pF Ceramic Trimmer
- C9, C10 : 1500 pF Ceramic, 10 μ F Electrolytic
- L1 to L3 : 1/2 turns, 20 mm length, 0.6 mm ϕ tin plated copper wire
- L4 : 6 turns, 0.2 mm ϕ enamel coated, 33 Ω resistor
- L5, L7 : 2 turns, 6 mm I.D., 0.6 mm ϕ tin plated copper wire
- L6 : 6 turns, 0.2 mm ϕ enamel coated, 10 Ω resistor

400 MHz RF BAND FOR MOBILE RADIO APPLICATIONS ($V_{cc} = 12.6$ V)



FEATURES

- GOOD RF PERFORMANCE
- HIGH EFFICIENCY: 65% TYP.
- HIGH GAIN NE050214E-12: 9 dB
NE050214-12: 8 dB
- AVAILABLE IN GROUNDED EMITTER TO-39E PACKAGE (14E) FOR HIGH GAIN AND EXCELLENT HEAT DISSIPATION
- REPLACES MEDIUM POWER STUD MOUNT DEVICES

DESCRIPTION AND APPLICATIONS

NEC'S NE0502-12 NPN series of epitaxial UHF power transistors are designed specifically for large volume mobile/portable radio applications in the 335 to 512 MHz band. The series is available in either TO-39 (OUTLINE 14) package with all leads isolated or in TO-39E (OUTLINE 14E) common emitter package. The series offers high efficiency and high gain and is a natural choice for hand held radio applications or as a driver for NEC's NE0500-12 series, offering output powers to 60 Watts with 12.5 Volt operation.

ABSOLUTE MAXIMUM RATINGS (TA = 25°C)

SYMBOLS	PARAMETERS	UNITS	RATINGS
Vcbo	Collector to Base Voltage	V	35
Vceo	Collector to Emitter Voltage	V	18
Vebo	Emitter to Base Voltage	V	3
Ic	Collector Current	A	0.4
Pc	Device Dissipation Free Air (TA = 25°C)	mW	800
Pr	Total Device Dissipation (Tc = 25°C)	W	7
Tj	Junction Temperature	°C	200
Tstg	Storage Temperature	°C	-65 to +200
Rth	Thermal Resistance (Junction-to-Case)	°C/W	20

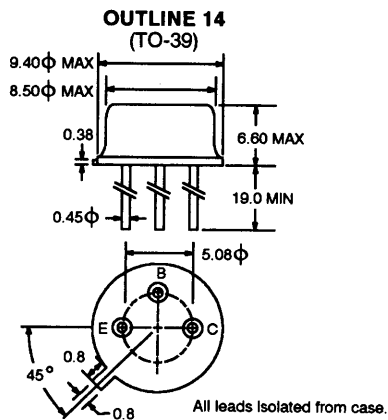
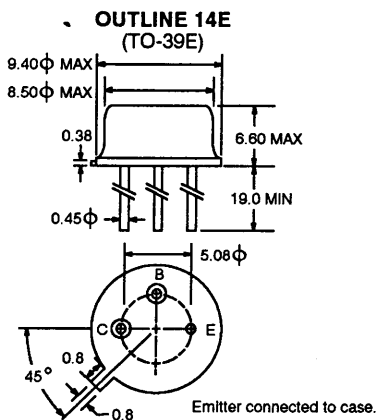
PERFORMANCE SPECIFICATIONS (TA = 25 °C)

PART NUMBER EIAJ ¹ REGISTERED NUMBER PACKAGE OUTLINE			NE050214E-12 2SC2586 14E			NE050214-12 2SC2762 14		
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX	MIN	TYP	MAX
POUT	Power Output at Vcc = 12.6 V, f = 500 MHz, PIN = 23 dBm PIN = 24 dBm	dBm dBm	30.5	32.0		30.0	31.5	
ηc	Collector Efficiency	%	55	65		55	65	
Icbo	Collector Cutoff Current at Vcb = 20 V, Ic = 0	mA			0.1			0.1
Iebo	Emitter Cutoff Current at Veb = 2 V, Ie = 0	mA			0.1			0.1
hFE	DC Forward Current Gain at Vce = 10 V, Ic = 100 mA (pulsed)		20	60	200	20	60	200
Cob	Output Capacitance ² at Vcb = 10 V, Ie = 0, f = 1 MHz	pF		2.5	4		2.5	4

Notes:

1. Electronic Industrial Association of Japan.
2. Emitter and case are grounded.

OUTLINE DIMENSIONS (Units in mm)



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

