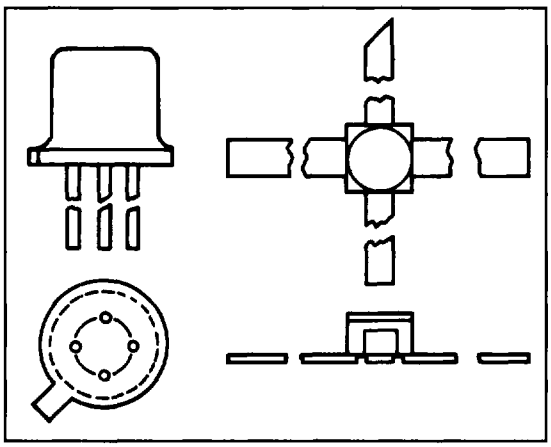
Silicon Low Noise Bipolar Transistors



Features

- LOW NOISE THROUGH 2.5 GHz
- HERMETIC PACKAGE
- CAN BE SCREENED TO JAN, JANTX, JANTXV LEVELS

Description

The series of Silicon NPN bipolar transistors are designed for low noise amplifiers in the frequency range of 60 MHz through 2 GHz. These devices are offered in several different families with different fT, Gain and dynamic range characteristics. They are offered in a series of hermetic, R.F. packages and as chips. Also offered are a family of low power, high fT oscillator transistors useful in applications up to 3 GHz.

Transistor Selection Guide

Series	Geometry	Nominal fT (GHz)	Nominal Optimum Noise Figure at Current (mA)	Nominal Current Range	I_C (Max.) (mA)	Useful Frequency Range (MHz)
42161	72	7.0	3	0.5-7.0	20	500-2500
42111	60	5.5	5	3.0-20.0	125	100-1500
42141	63	4.5	3	1.0-10.0	50	300-2000
42151	63	4.5	3	1.0-10.0	50	300-2000
42000	60	2.5	5	5.0-40.0	125	10-750
42197	60	1.2	5	5.0-40.0	125	10-750
42020	20	1.8	1	1.0-3.0	40	10-600
42051	55	1.8	2	1.0-5.0	50	10-600
42217	55	1.8	2	1.0-5.0	50	10-600
42120	70	1.5	1	0.9-3.0	80	10-600
42181	02	2.8	20	10.0-60.0	300	10-1600

NOTE: For more information and S-parameters request Bulletin #5220.

Typical Performance Curves

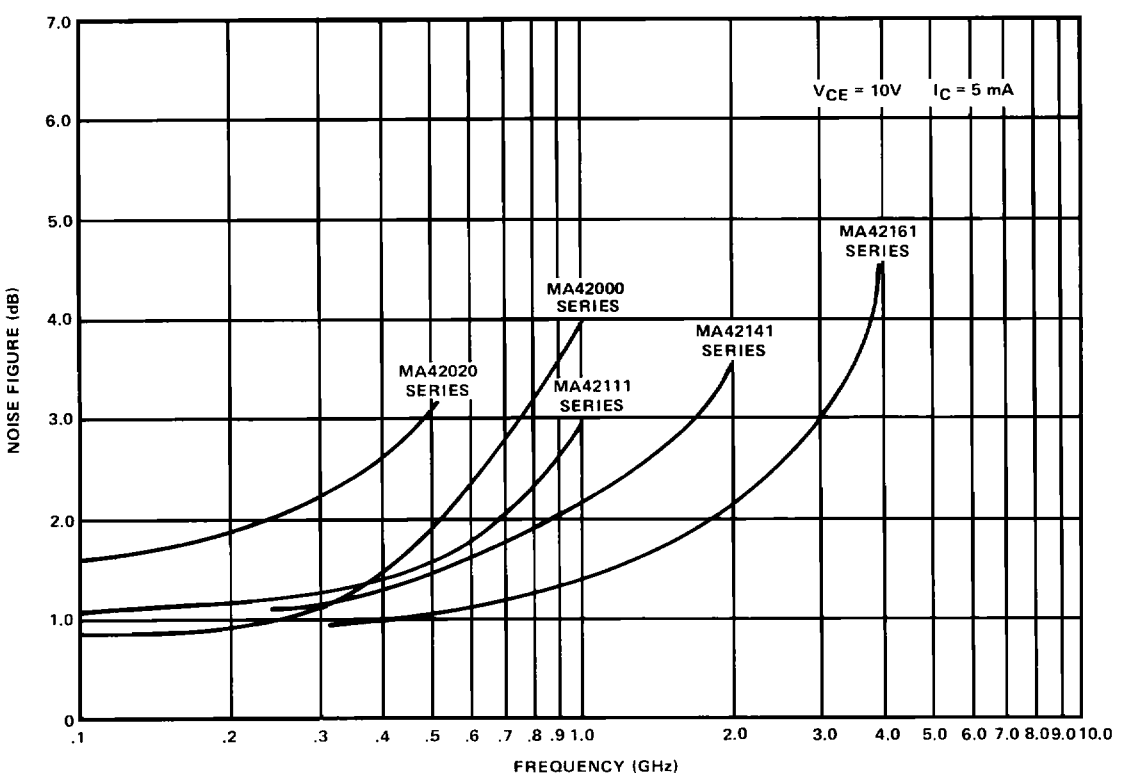


FIGURE A. Noise Figure vs. Frequency

Typical Performance Curves (Cont'd)

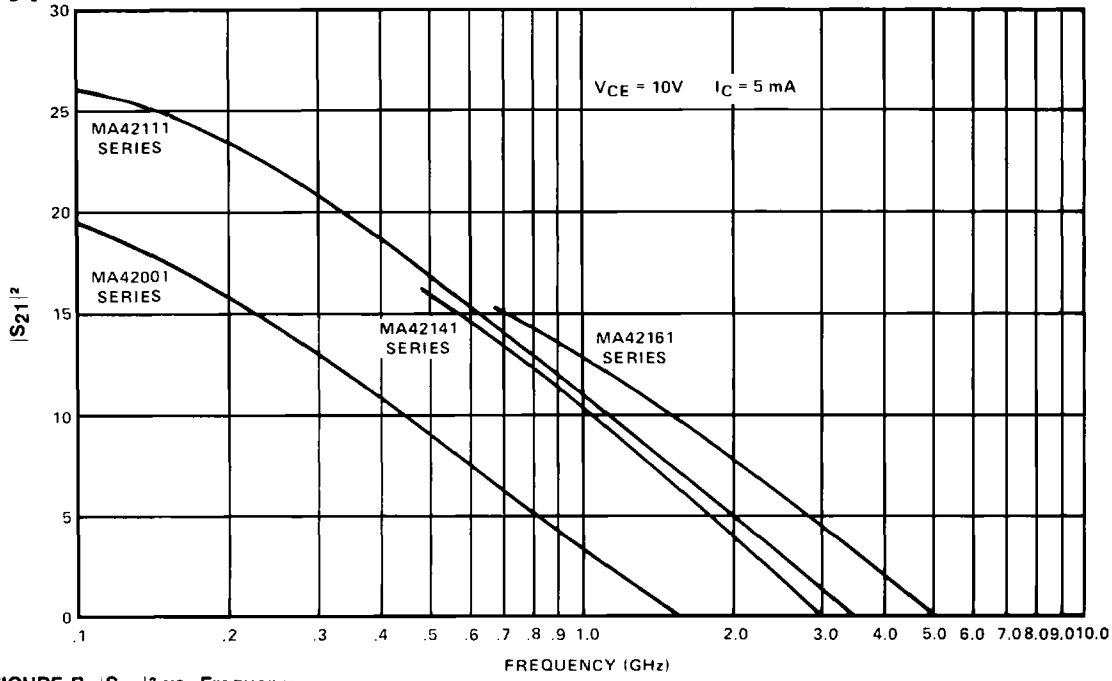


FIGURE B. $|S_{21}|^2$ vs. Frequency

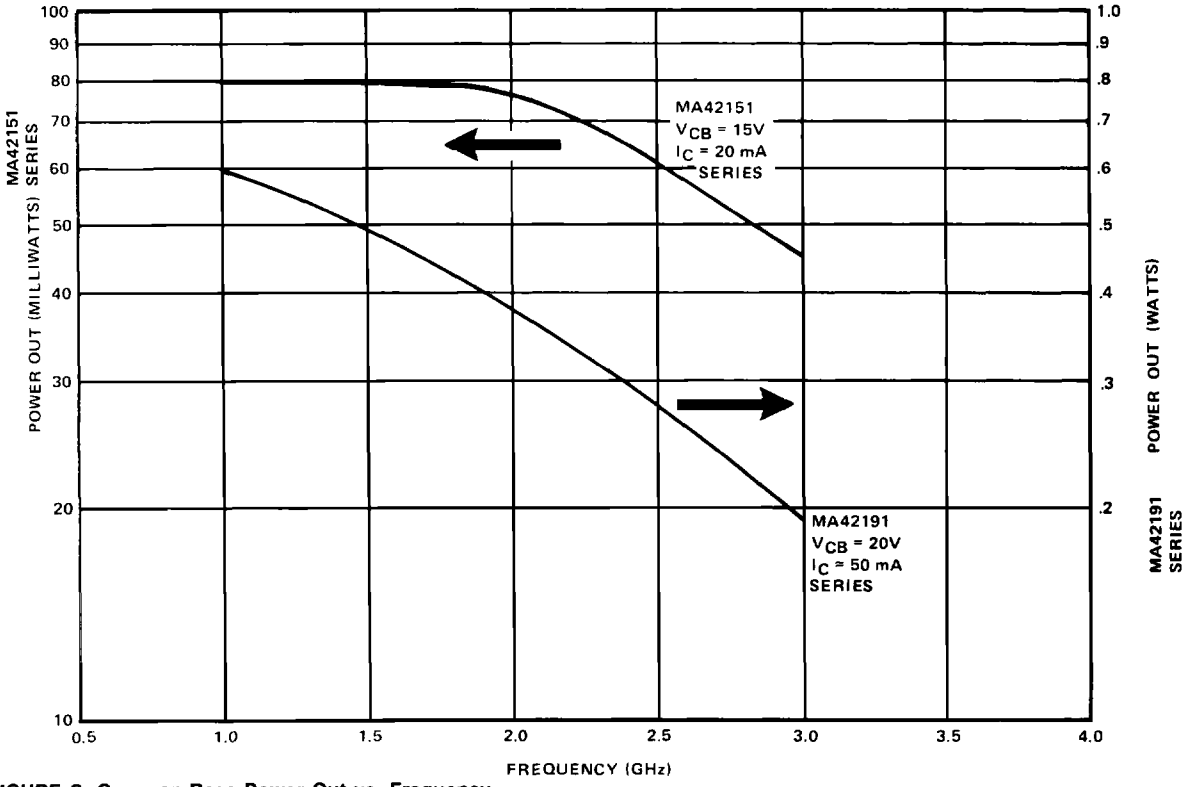


FIGURE C. Common-Base Power Out vs. Frequency

Silicon Low Noise Bipolar Transistors

MA42160 Series

Description

Nominal fT = 7 GHz
Nominal Current Range = 0.5 to 7 mA
I_C Max. = 20 mA
Frequency Range = 500 MHz to 4 GHz
Geometry = 72

The MA42161 is a low noise silicon planar epitaxial transistor for.5 to 4.0 GHz amplifiers. These transistors feature high power gain, typically 14.0 dB gain at 2.0 GHz and a low intrinsic noise figure of typically 2.3 dB at 2.0 GHz. These transistors when housed in case style 511, may also be used in low level oscillators from 1-5 GHz.

Specifications @ $T_A = 25°C$

Model[1,6] Number	Test Frequency (GHz)	Maximum[2] Noise Figure (dB)	Maximum[2] Unilateral Gain (dB)	Nominal[2] $\|S_{21E}\|^2$ (dB)	Nominal[2] Gain @ Optimum Noise Figure (dB)
MA42161	2.0	2.5	12	8.0	11.0
MA42161	1.0	1.5	18	12.5	15.0
MA42162	2.0	3.0	12	8.0	11.0
MA42162	1.0	1.9	18	12.5	15.0
2N6618	2.0	2.2	12	8.0	11.0

NOTES:
1. 1 dB compression point is – 5 dBm.
2. Test conditions I_C = 3mA, V_{CE} = 10 volts.
3. Nominal current transfer ratio is 80, I_C = 10μA.
4. The minimum collector to base breakdown voltage is 20 volts; I_C = 10μA.
5. The nominal collector to emitter sustaining voltage is 12 volts; I_C = 1.0 mA.
6. Available in ODS 511 & 535 packages. To order, add package as suffix to the model number i.e., MA42161-511

MAXIMUM RATINGS (Case Temperature 25°C unless otherwise noted)

Storage Temperature	– 65°C to + 200°C
Operating Junction Temperature	200°C
Lead Temperature (60 seconds)	250°C
Total Device Power Dissipation	(Case Style 511) - 0.25W
V_{cbo} Collector to Base Voltage	20 V
V_{ceo} Collector to Emitter Voltage	12 V
V_{ebo} Emitter to Base Voltage	1.5 V
I_C Continuous Collector Current	20 mA

ENVIRONMENTAL RATINGS PER MIL-STD 750

	Method	Level
Storage Temperature	1031	– 65°C to + 200°C
Temperature Cycle	1051	10 cycles – 65°C to + 200°C
Shock	2016	500 g's
Vibration	2056	15 g's
Constant Acceleration	2006	20,000 g's
Humidity	1021	10 days

MA42140 Series

Description

Nominal fT = 4.5 GHz
Nominal Current Range = 1 to 10 mA
I_C Max. = 50 mA
Frequency Range = 300 MHz to 2.0 GHz
Geometry = 63

The MA42140 series of NPN silicon planar transistors features excellent high frequency current gain at medium current levels.

The MA42141 series has low noise figures from the frequency range of 0.5 to 2 GHz. These transistors are useful in RF amplifiers and low level oscillators from 100 MHz to 2 GHz.

Specifications @ $T_A = 25°C$

Model Number	Case Style	Test Frequency (GHz)	Maximum[2] Noise Figure (dB)	Maximum Unilateral Gain (dB)	Nominal[4] $B_{V_{ebo}}$ (Volts)
MA42141	509	1.00	2.5	17	1.5
MA42142	509	1.00	3.0	17	1.5
MA42143	509	0.45	1.7	18	1.5
2N5651	509	0.45	2.0	21	3.5
2N5662	509	0.45	2.5	21	3.5

NOTES:
1. The standard case style for all the MA42140 series is case style 509. The MA42141, MA42142 and MA42143 are also available in case styles 510 and 511. To order, add the case style as a suffix to the basic model number, i.e.: MA42142-510).
2. The collector current = 5 mA.
3. The minimum collector to base breakdown voltage is 27 volts, $I_C = 10\ \mu A$.
4. $I_E = 10\ \mu A$.
5. The minimum collector to emitter breakdown voltage is 20 volts $I_C = 500\ \mu A$.
6. The maximum collector cutoff current is 100 nA. $V_{CB} = 10$ volts.
7. Nominal current transfer ratio is 100, $I_C = 5$ mA, $V_{CE} = 10$ volts.

MAXIMUM RATINGS (Case Temperature 25°C unless otherwise noted)

Total Device Power Dissipation	509 Case — 400 mW 510 Case — 700 mW 511 Case — 700 mW
V_{cbo} Collector to Base Voltage	27 V
V_{ebo} Emitter to Base Voltage	3 V
I_C Collector Current	50 mA
Storage Temperature	−65°C to +200°C
Operating Junction Temperature	+200°C
Hermeticity	$5 \times (10)^{-8}$ cc/sec of He
Lead Temperature (Soldering — 10 seconds each lead)	250°C

ENVIRONMENTAL RATINGS PER MIL-STD-750

	Method	Level
Storage Temperature	1031	−65°C to +200°C
Temperature Cycle	1051	10 cycles −65°C to +200°C
Shock	2016	500 g's
Vibration	2056	15 g's
Constant Acceleration	2006	20,000 g's
Humidity	1021	10 days

MA42110 Series

Description

Nominal fT = 5.5 GHz
Nominal Current Range = 3 to 20 mA
I_C Max. = 125 mA
Frequency Range = 100 MHz to 1.5 GHz
Geometry = 60

The MA42110 series of silicon NPN bipolar transistors is designed to give a very low noise figure and wide dynamic range up to approximately 4 GHz. Gold metallization is employed in the construction of these devices resulting in rugged, highly reliable transistors.

Specifications @ $T_A = 25°C$

Model Number	Case Style	Test Frequency (MHz)	Maximum[2] Noise Figure (db @ mA)	Maximum[4] Unilateral Gain (dB)	Minimum $\|S_{21E}\|^2$	Nominal[2] Gain @ Opt. NF (dB)
MA42111	509	450	1.5	14	13.0	13
MA42111	510	450	1.5	17	15.5	15
MA42111	511	450	1.5	19	16.0	15
MA42112	509	450	1.8	14	13.0	13
MA42112	510	450	1.8	17	15.5	15
MA42112	511	450	1.8	19	16.0	15
MA42113	509	450	2.1	14	13.0	13
MA42113	510	450	2.1	17	15.5	15
MA42113	511	450	2.1	19	16.0	15

NOTES:

1. When ordering, specify the desired case style by adding it as a suffix to the basic model number, i.e., MA42111-510.
2. The maximum noise figure is measured as follows:
   V_{CE} = 10 volts
   I_C = 5 mA
   Frequency = 450 MHz.
3. For the maximum unilateral gain, 1 dB compression point is equal to 0 dBm.
4. Gu (max) (dB) = 10 log $\dfrac{|S_{21E}|^2}{(1-|S_{11E}|^2)(1-|S_{22E}|^2)}$
5. Minimum $|S_{21E}|^2$ is: V_{CE} = 10 volts, I_C = 20 mA, and the frequency = 450 MHz.
6. The minimum collector current to base breakdown voltage is is 20 volts, where I_C = 10 μA.
7. The minimum emitter to base breakdown voltage is 1.5 volts, where I_E = 10 μA.
8. The maximum collector cutoff current is 10 μA, where V_{CB} = 10 volts.
9. The nominal current transfer ratio is 125 where V_{CE} = 10 volts, I_C = 5 mA.

MAXIMUM RATINGS (Case Temperature 25°C unless otherwise noted)

Total Device Power Dissipation	509 Case — 450 mW 510 Case — 1.2 W 511 Case — 750 mW
V_{cbo} Collector to Base Voltage	20 V
V_{ebo} Emitter to Base Voltage	2.5 V
Collector Current	125 mA
Storage Temperature	−65°C to +200°C
Operating Junction Temperature	+200°C
Hermeticity	5 X $(10)^{-8}$ cc/sec of He
Lead Temperature (Soldering — 10 seconds each lead)	250°C

ENVIRONMENTAL RATINGS PER MIL-STD-750

	Method	Level
Storage Temperature	1031	−65°C to +200°C
Temperature Cycle	1051	10 cycles, −65°C to +200°C
Shock	2016	500 g's
Vibration	2056	15 g's
Constant Acceleration	2006	20,000 g's
Humidity	1021	10 days

MA42000 Series

Description

NPN SILICON PLANAR TRANSISTORS

Nominal fT = 2.5 GHz
Nominal Current Range = 5 to 40 mA
I_C Max. = 125 mA
Frequency Range = 10 MHz to 750 GHz
Geometry = 60

This series of NPN silicon bipolar transistors is designed to provide low noise figures at frequencies from 10 to 750 MHz. These transistors have flat noise figures over a wide dynamic range. This series is recommended for such applications as IF and RF amplifiers from 10 to 750 MHz.

Specifications @ $T_A = 25°C$

Model Number	Case[1] Style	Test Frequency (MHz)	Maximum[2] Noise Figure (dB @ mA)	Maximum[3] Unilateral Gain (dB)	Maximum[4] cbo (nA)	Minimum[5] BV_{cbo} (Volts)	Minimum[6] BV_{ebo} (Volts)
2N6665	509	60	1.0 @ 5.0	28	10	20	2.5
MA42001	509	60	1.0 @ 5.0	28	10	20	2.5
MA42014	509	60	1.3 @ 5.0	28	10	20	2.5
MA42002	509	60	1.5 @ 5.0	28	10	20	2.5
MA42004	509	60	1.5 @ 15.0	30	10	20	2.5
MA42003	509	60	2.0 @ 5.0	30	10	20	2.5
MA42005	509	60	2.0 @ 20.0	30	10	20	2.5
MA42006	510	60	4.0 @ 40.0	35	10	20	2.5
MA42008	511	450	2.0 @ 5.0	18	10	20	2.5
MA42009	509	450	2.5 @ 5.0	14	10	20	2.5
MA42010	509	450	3.0 @ 20.0	15	10	20	2.5
MA42011	509	450	3.5 @ 20.0	15	10	20	2.5
MA42010	510	450	3.5 @ 40.0	20	10	20	2.5
MA42011	510	450	4.0 @ 40.0	20	10	20	2.5
MA42015	510	450	4.0 @ 60.0	20	10	20	2.5
MA42016	510	450	4.5 @ 60.0	20	10	20	2.5
MA42012	510	450	5.0 @ 60.0	20	10	20	2.5

NOTES:
1. The desired case style must be added as a suffix to the model number, i.e., MA42001-509.
2. VCE = 10 Volts.
3. Gu (MAX) (dB) = 10 LOG $\frac{|S21E|2}{|1-(S11E)2\ (1-|S22E|2)}$
4. VCB = 10 Volts.
5. Collector current = 10 μA.
6. Emitter current = 10 A.

MAXIMUM RATINGS (Case Temperature 25°C unless otherwise noted)

Total Device Power Dissipation	509 Case — 450 mW 510 Case — 1.2 W 511 Case — 750 mW
V_{cbo} Collector to Base Voltage	20 V
V_{ebo} Emitter to Base Voltage	3 V
Collector Current	125 mA
Storage Temperature	−65°C to +200°C
Operating Junction Temperature	+200°C
Hermeticity	5 X $(10)^{-8}$ cc/sec of He
Lead Temperature (Soldering — 10 seconds each lead)	250°C

ENVIRONMENTAL RATINGS PER MIL-STD-750

	Method	Level
Storage Temperature	1031	−65°C to +200°C
Temperature Cycle	1051	10 cycles −65°C to +200°C
Shock	2016	500 g's
Vibration	2056	15 g's
Constant Acceleration	2006	20,000 g's
Humidity	1021	10 days

MA42020 Series and 2N2857

Description

Nominal fT = 1.8 GHz
Nominal Current Range = 1-5 mA
I_C Max. = 50 mA
Frequency = 10 MHz to 600 MHz
Geometry = 20

This series of NPN silicon planar transistors, packaged in the 509 case style are useful for low noise, high gain amplifiers from 10 to 600 MHz. All these transistors have gold metallization resulting in a rugged, highly reliable transistor.

Specifications @ $T_A = 25°C$

Model[1] Number	Test Frequency (MHz)	Maximum[4] Noise Figure (dB @ mA)	Maximum[5] Unilateral Gain (dB)	Minimum[6] BV_{cbo} (Volts)	Minimum[7] BV_{ebo} (Volts)
MA42020	60	1.6 @ 1.5	23	30	2.5
MA42021	60	2.0 @ 1.5	23	30	2.5
MA42022	60	2.5 @ 1.5	23	30	2.5
MA42023	60	2.0 @ 1.5	23	30	2.5
MA42024	60	3.0 @ 1.5	23	30	2.5
MA42025	450	2.5 @ 1.0	13	30	2.5
MA42026	450	3.0 @ 1.0	10	30	2.5
MA42027	450	3.5 @ 1.0	10	30	2.5
MA42028	450	4.0 @ 1.5	10	30	2.5
2N5031	450	2.5 @ 1.0	10	30	2.5
2N3570	450	2.5 @ 1.5	10	30	2.5
2N3953	450	3.0 @ 1.0	10	30	2.5
2N5032	450	3.0 @ 1.0	10	30	2.5
2N3880	450	3.5 @ 1.5	10	30	2.5
2N3839	450	3.9 @ 1.5	10	30	2.5
2N3571	450	4.0 @ 2.0	10	30	2.5
2N5054	450	4.0 @ 2.0	10	30	2.5
2N3683	450	4.5 @ 1.5	10	30	2.5
2N2857*	450	4.5 @ 1.5	10	30	2.5
2N5179	450	4.5 @ 2.0	10	30	2.5
2N5053	450	5.0 @ 2.0	10	30	2.5
2N3572	450	6.0 @ 2.0	10	30	2.5

NOTES:
1. This series of NPN silicon planar transistors is packaged in case style 509.
2. Maximum collector cutoff current is 10 μA, where V_{CB} = 15 volts.
3. The nominal current transfer ratio is 120 where V_{CE} = 1 volt, and I_C = 3 mA.
4. V_{CE} = 6 volts.
5. GU (max) can be derived from S-Parameter data:

$$\text{Gu (Max) (dB)} = 10 \log \frac{|S_{21E}|^2}{(1-|S_{11E}|^2)(1-|S_{22E}|^2)}$$

6. I_C = 1 μA.
7. I_E = 10 μA.

* This transistor can be screened to JAN level screening.

MA42050 Series
Description

Nominal fT = 1.8 GHz
Nominal Current Range = 1 to 5 mA
I_C Max. = 40 mA
Frequency Range = 10 MHz to 600 GHz
Geometry = 55

The MA42050 series of NPN silicon planar transistors will give high gain and low noise figure characteristics in VHF amplifier applications. The refractory gold metallization techniques employed in the construction of these devices results in rugged, highly reliable transistors. This series is recommended for low power oscillators from 100 MHz to 16 GHz.

Specifications @ $T_A = 25°C$

Model[1] Number	Test Frequency (MHz)	Maximum[4] Noise Figure (dB @ mA)	Maximum[5] Unilateral Gain (dB)	Minimum[6] BV_{cbo} (Volts)	Minimum[7] BV_{ebo} (Volts)
MA42051	450	2.2 @ 3.0	18	20	2.5
MA42052	450	2.5 @ 3.0	18	20	2.5
MA42056	1000	4.5 @ 3.0	11	20	2.5

NOTES:
1. The MA42051 and MA42052 are available in the 509, 510, 511 case styles. The MA42056 is available in the 510 and 511 case styles. When ordering, specify the desired case style as a suffix to the basic model number, i.e., MA42051-510.
2. Gu (MAX) (dB) = 10 LOG $\dfrac{|S21E|2}{|1-|S11E|2\,(1-|S22E|2)}$
3. IC = 10 μA.
4. IE = 10 μA.
5. VCE = 1 Volts; IC = 3 mA; Nominal current transfer ratio = 75.
5. VCB = 10 Volts; Maximum collector current = 40.0 mA.

MAXIMUM RATINGS (Case Temperature 25°C unless otherwise noted)

Total Device Power	509 Case — 300 mW 510 Case — 450 mW 511 Case — 350 mW
V_{cbo} Collector to Base Voltage	20 V
V_{ebo} Emitter to Base Voltage	2.5 V
Collector Current	40 mA
Storage Temperature	−65°C to +200°C
Hermeticity	5 X $(10)^{-6}$ cc/sec of He
Operating Junction Temperature	+200°C
Lead Temperature (Soldering — 10 seconds each lead)	230°C

ENVIRONMENTAL RATINGS PER MIL-STD-750

	Method	Level
Storage Temperature	1031	−65°C to +200°C
Temperature Cycle	1051	10 cycles −65°C to +200°C
Shock	2016	500 g's
Vibration	2056	15 g's
Constant Acceleration	2006	20,000 g's
Humidity	1021	10 days

Silicon Low Noise Bipolar Transistors

MA42120 Series

Description

Nominal fT = 1.5 GHz
Nominal Current Range = .4 to 3 mA
I_C Max. = 80 mA
Frequency = 100 to 600 MHz
Geometry = 70

This series of NPN epitaxial silicon planar transistors is designed for 100 MHz to 1 GHz amplifiers and low power oscillators up to 4 GHz. The high gain bandwidth products make the MA42122 and MA42123 useful to 1.0 GHz , while the MA42121 has the maximum frequency of oscillation of 4.2 GHz. Two case styles are offered, case stye 508 for low power oscillator applications and case style 509 for small signal IF and RF amplifiers.

Specifications @ $T_A = 25°C$

Model[1] Number	Case Style	Maximum[2] Noise Figure (dB)	Maximum[2] Unilateral Gain G_u (dB)	Minimum[4] Gain Bandwidth f_T (GHz)	Maximum[4] Available Gain G_A(dB)	Maximum[3,5] Frequency Oscillation (GHz)
MA42120	508	—	13	1.0	—	3.8
MA42121	508	—	13	1.3	12.8	4.2
MA42122	509	3.5	14	1.0	—	—
MA42123	509	3.0	14	1.3	13.8	

NOTES:
1. When ordering, specify the package, by adding the case style as a suffix to the basic model number, i.e, MA42120-508.
2. The test frequency for the MA42120 series is 450 MHz.
3. V_{CE} = 10 volts, I_C = 20 mA, Frequency = 500 MHz.
4. V_{CE} = 10 volts, I_C = 20 mA, Frequency = 1 GHz.
5. The maximum frequency of oscillation is calculated from S-parameters, Fmax is the frequency at which the extrapolated Ga (max) is 0 dB.
6. I_C = 10 μA., I_E = 0.
7. The minimum collector to base breakdown voltage is 30 volts.
8. The nominal neutralized power gain for the MA42123-509 is 17.0 dB.
9. The collector current for the MA42122 and MA42124 is 1.5 mA.

MAXIMUM RATINGS (Case temperature 25°C unless otherwise noted)

Total Power Dissipation	508 case — 1.0 W 509 case — .5 W
V_{cbo} Collector to Base Voltage	30 V
V_{ebo} Emitter to Base Voltage	4.0 V
V_{ces} Collector to Emitter Voltage	30 V
I_C Collector Current	80 mA
Storage Temperature	−65°C to +200°C
Operating Junction Temperature	+200°C
Lead Temperature (Soldering — 10 seconds each lead)	+250°C
Hermeticity	5 X $(10)^{-8}$ cc/sec of He

ENVIRONMENTAL RATINGS PER MIL-STD-750

	Method	Level
Storage Temperature	1031	−65°C to +200°C
Temperature Cycle	1051	10 cycles, −65°C to +200°C
Shock	2016	500 g's
Vibration	2056	15 g's
Constant Acceleration	2006	20,000 g's
Humidity	1021	10 days

MA42151 and MA42191 Series

Description

Nominal fT — 4.5 GHz
Nominal Current Range - 1 to 10 mA
I_C Max. - 100 mA
Frequency - 300 MHz to 2.0 GHz
Geometry - 63

These NPN planar transistors are characterized for local oscillator use in to 1.0 to 3.0 GHz range. The MA42151 when mounted in a common base package (case style 510) exhibits a typical Fmax of 9.5 GHz at 20 mA collector current and at 3.0 GHz has a guaranteed power output. The MA42191 in case style 510 exhibits a typical Fmax of 6.0 GHz at 50 mA collector current and has a guaranteed power output at 2.0 GHz. This transistor is available in the hermetically sealed case style 510 stripline package and meets the MIL-S-19500 environmental ratings and test requirements of MIL-STD-750/883.

Specifications @ $T_A = 25°C$

Model[1] Number	Minimum[2] BV_{cbo} (Volts)	Minimum[3] BV_{ebo} (Volts)	Minimum[4] BV_{ceo} (Volts)	Minimum[5] Oscillator Power (mW)	Collector[6] Current (mA)	Nominal[7] Current Transfer Ratio
MA42151	27	1.5	20	20	50	60
MA42191	30	3.5	25	350	300	40

NOTES:
1. The standard case style for the MA42151 and MA42191 is case style 510. The MA42151 is also available in the hermetically sealed 511 stripline package and meets the MIL-S-19500 environmental ratings and tests requirements of MIL-STD-750/883.
2. I_C = 10 μA for MA42151; I_C = 100 μA for MA42191.
3. I_E = 10 μA.
4. I_C = 500 μA.
5. I_C = 100 μA.
6. V_{CE} = 10 volts; IC = 5 mA
7. V_{CE} = 5 volts: IC = 100 mA.

MAXIMUM RATINGS FOR MA42191 (Case temperature 25°C unless otherwise noted)

Total Device Power	510 case — 3.0 W
V_{cbo} Collector to Base Voltage	30V
V_{ebo} Emitter to Base Voltage	3.5 V
V_{ceo} Collector to Emitter Voltage	25 V
Collector Current	300 mA
Storage Temperature	−65°C to +200°C
Hermeticity	5 X $(10)^{-8}$ cc/sec of He
Operating Junction Temperature	+200°C
Lead Temperature (soldering — 10 seconds each lead)	+230°C

ENVIRONMENTAL RATINGS PER MIL-STD-750

	Method	Level
Storage Temperature	1031	−65°C to +200 °C
Temperature Cycle	1051	10 cycles, −65°C to +200°C
Shock	2016	500 g's
Vibration	2056	15 g's
Constant Acceleration	2006	20,000 g's
Humidity	1021	10 days

MA42181 Transistors

Description

Nominal fT = 2.8 GHz
Nominal Current Range = 10 to 60 mA
I_C Max. = 300 mA
Frequency Range = 10 MHz to 1 GHz
Geometry = 02

The MA42181 transistor is designed for wide dynamic range amplifier applications from 100 MHz to 3 GHz. Other applications include second stage high dynamic range amplifiers and low level oscillators.

Specifications @ $T_A = 25°C$

Model Number	Case[1] Style	Minimum[1] BV_{cbo} (Volts)	Minimum[2] BV_{ebo} (Volts)	Minimum[3] BV_{ceo} (Volts)	Compress[5] Point 1 dB (dBm)	Maximum[8] Unilateral Gain (dB)
MA42181	510	30	3.5	25	+25	8.4

NOTES:
1. I_C = 100 μA.
2. I_E = 10 μA.
3. I_C = 100 μA.
4. Nominal current transfer ratio is 60; VCE = 15 Volts; IC = 100 mA.
5. VCE = 15 Volts; IC = 60 mA; ZG = ZL = 500 Ohms; Frequency = 1 GHz.
6. The nominal |S21E| 2 is 2.0 dB; VCE = 15 Volts; IC = 60 mA; Frequency = 2 GHz.
7. The nominal gain at optimum noise figure is 14.5 dB; VCE = 15 Volts; IC = 60 mA; Frequency = 1 GHz.
8. VCE = 15 Volts; IC = 60 mA; Frequency = 1 GHz.

MAXIMUM RATINGS (Case Temperature 25°C unless otherwise noted)

Total Device Power	510 Case — 3.0 mW
V_{cbo} Collector to Base Voltage	30 V
V_{ebo} Emitter to Base Voltage	25 V
Collector Current	300 mA
Storage Temperature	−65°C to +200°C
Operating Junction Temperature	+200°C
Hermeticity	5 X $(10)^{-8}$ cc/sec of He
Lead Temperature (Soldering — 10 seconds each lead)	230°C

ENVIRONMENTAL RATINGS PER MIL-STD-750

	Method	Level
Storage Temperature	1031	−65°C to +200°C
Temperature Cycle	1051	10 cycles −65°C to +200°C
Shock	2016	500 g's
Vibration	2056	15 g's
Constant Acceleration	2006	20,000 g's
Humidity	1021	10 days

Case Styles

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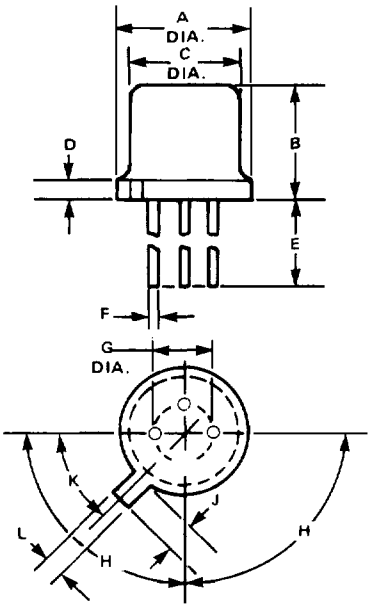

DIM.	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
A	0.350	0.370	8,89	9,40
B	0.240	0.260	6,11	6,60
C	0.315	0.335	8,00	8,51
D	— —	0.040	— —	1,02
E	0.500	— —	12,70	— —
F	0.016	0.021	0,41	0,53
G	0.190	0.210	4,83	5,33
H	89°	91°	89°	91°
J	0.029	0.043	0,74	1,09
K	43°	47°	43°	47°
L	0.028	0.034	0,71	0,86

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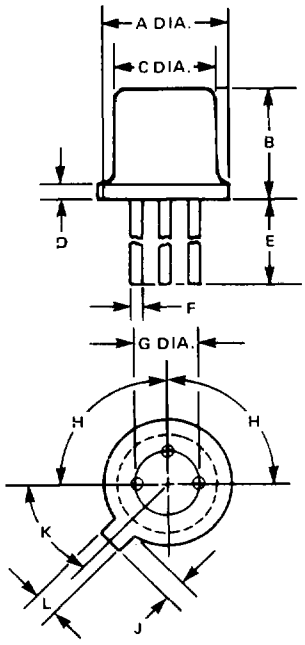

DIM.	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
A	0.209	0.230	5,31	5,84
B	0.170	0.210	4,32	5,33
C	0.178	0.195	4,52	4,95
D	— —	0.030	— —	0,76
E	0.500	— —	12,70	— —
F	0.016	0.021	0,41	0,53
G	0.090	0.110	2,29	2,75
H	89°	91°	89°	91°
J	0.028	0.048	0,71	1,22
K	43°	47°	43°	47°
L	0.036	0.046	0,91	1,17

Case Styles (Cont'd)

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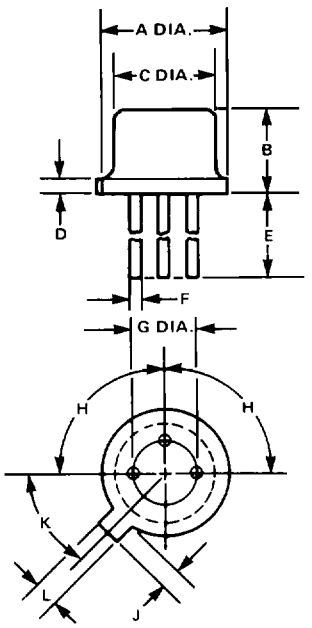
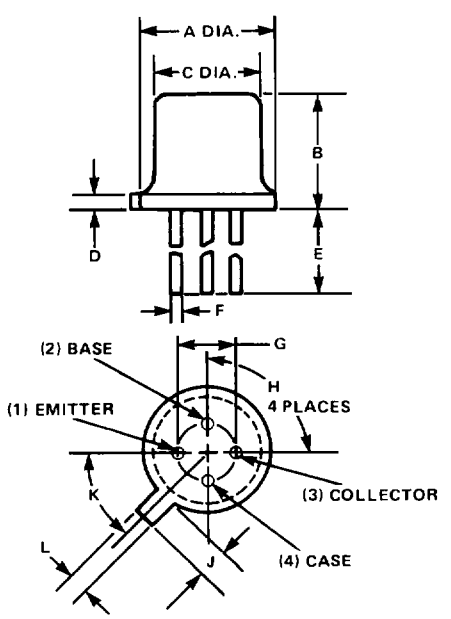


DIM.	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
A	0.209	0.230	5,31	5,84
B	0.065	0.085	1,65	2,16
C	0.178	0.195	4,52	4,95
D	— —	0.030	— —	0,76
E	0.500	— —	12,70	— —
F	0.016	0.021	0,41	0,53
G	0.090	0.110	2,29	2,75
H	89°	91°	89°	91°
J	0.028	0.048	0,71	1,22
K	43°	47°	43°	47°
L	0.036	0.046	0,91	1,17

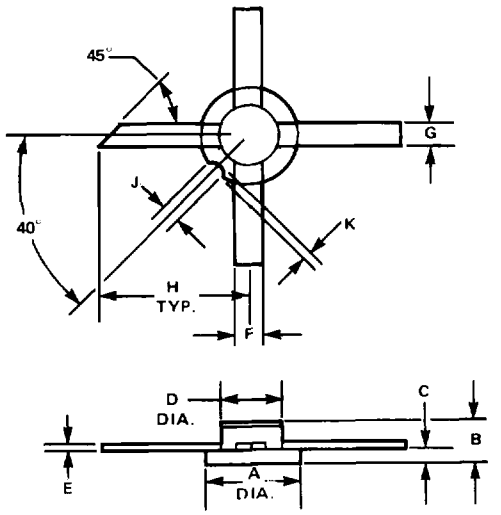
509



DIM.	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
A	0.209	0.230	5,31	5,84
B	0.170	0.210	4,32	5,33
C	0.178	0.195	4,52	4,95
D	— —	0.020	— —	0,51
E	0.500	— —	12,70	— —
F	0.016	0.019	0,41	0,48
G	0.090	0.110	2,29	2,79
H	89°	91°	89°	91°
J	0.028	0.048	0,71	1,22
K	43°	47°	43°	47°
L	0.036	0.046	0,91	1,17

Case Styles (Cont'd)

510



DIM.	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
A	0.195	0.215	4,95	5,46
B	0.043	0.063	1,09	1,60
C	0.016	0.024	0,41	0,61
D	0.129	0.141	3,28	3,58
E	0.0015	0.0045	0,04	0,11
F	0.054	0.066	1,37	1,68
G	0.024	0.036	0,61	0,91
H	0.279	0.321	7,09	8,15
J	0.030 REF.		0,76 REF.	
K	0.150 REF.		0,38 REF.	

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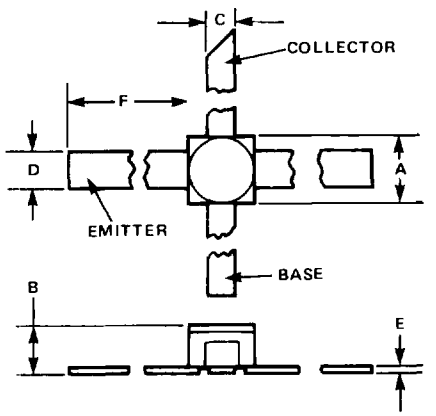

DIM.	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
A	0.095	0.105	2,41	2,68
B	— —	0.050	— —	1,27
C	0.016	0.024	0,41	0,61
D	0.036	0.044	0,91	1,12
E	0.002	0.006	0,05	0,15
F	0.190	0.260	4,83	6,60