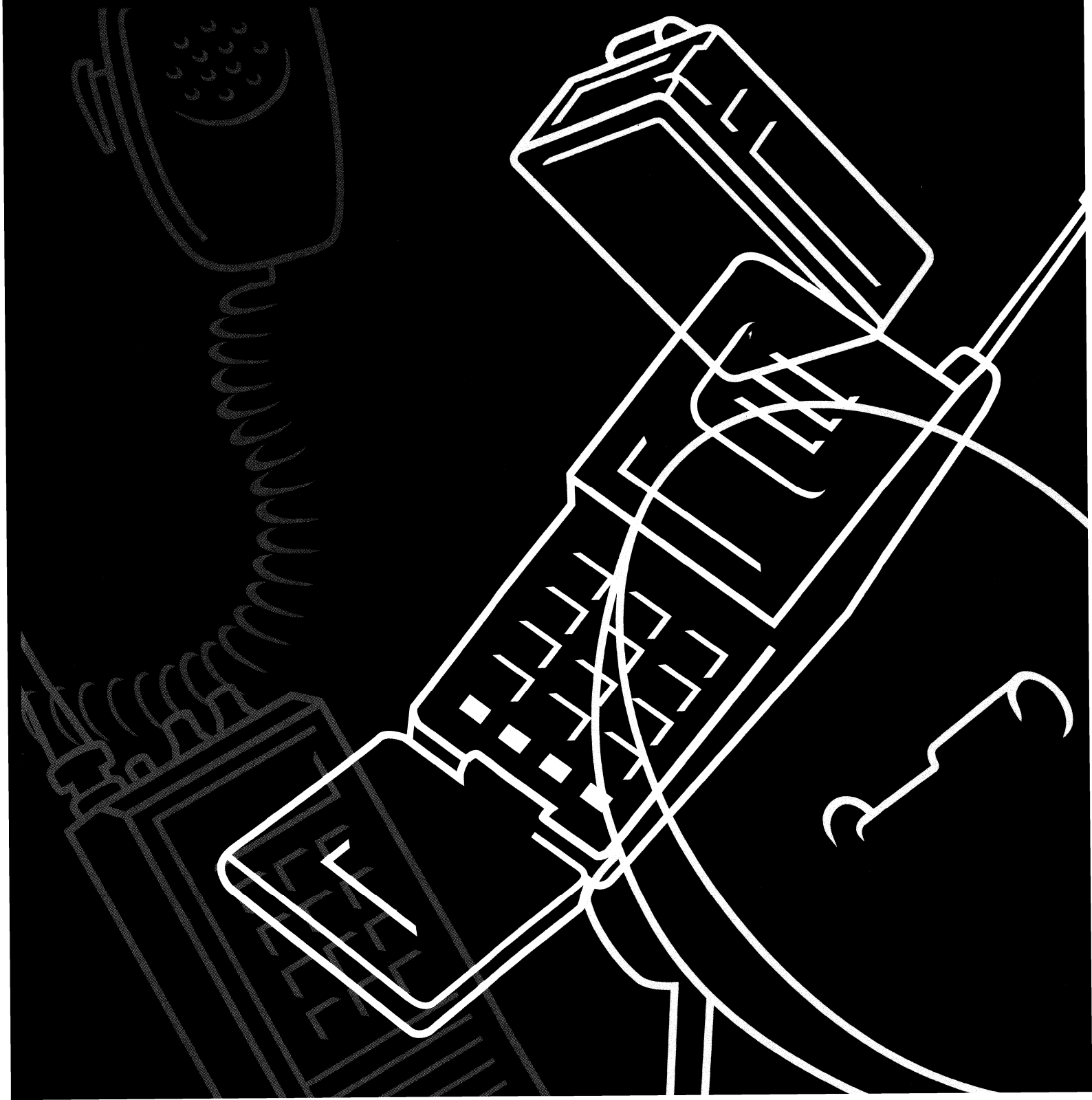
MOTOROLA

SG46/D
REV 12

RF Products

Selector Guide & Cross Reference-1994



How to Use This Selector Guide

Introduction:

This new selector guide combines the RF products of Motorola Phoenix, Motorola Toulouse (France), and Motorola Hong Kong.

General:

The products in this guide are separated FIRST into major categories such as Power FETs, Power Bipolar, Small Signal Bipolar, Integrated Circuits, and Amplifiers. SECOND, within each category parts are listed by frequency band except for small signal transistors which are divided by application: Low noise, linear amplifiers, switches, oscillators. THIRD, within a frequency band transistors are further grouped by operating voltage and, finally, output power.

To Replace Devices in an Existing Design:

Consult the Index and Cross Reference to determine Motorola's closest replacement device.

To Replace Devices Not Recommended for New Design:

Consult the Index and Cross Reference to determine Motorola's closest replacement device.

Parts listed in the Index and Cross Reference followed by an asterisk are devices Not Recommended for New Design. These are products that are outmoded or have a technology or package that has reached the end of its life cycle.

Remember:

Applications assistance is only a phone call away — call the nearest Semiconductor Sales office or 1-800-521-6274.

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MOTOROLA DEVICE CLASSIFICATIONS

In an effort to provide up-to-date information to the customer regarding the status of any given device, Motorola has classified all devices into three categories: "Preferred" products, "Current" products and "Not Recommended for New Design" products.

PREFERRED PRODUCTS

A Preferred Type is a device which is recommended as a first choice for future use. These devices are "preferred" by virtue of their performance, price, functionality, or combination of attributes which offer the overall "best" value to the customer. This category contains both advanced and mature devices which will remain available for the foreseeable future.

"Preferred Devices" are highlighted in bold, italic print throughout the RF Selector Guide.

CURRENT PRODUCTS

Device types identified as "current" may not be a first choice for **new** designs, but will continue to be available because of the popularity and/or standardization or volume usage in current production designs. These products can be acceptable for new designs but the preferred types are considered better alternatives for long term usage.

Any device in the RF Selector Guide that has not been identified as a "preferred device" is a "current" device.

NOT RECOMMENDED FOR NEW DESIGN PRODUCTS

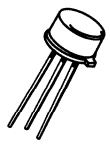
Products designated as "Not Recommended for New Design" have become obsolete as dictated by poor market acceptance, or a technology or package that is reaching the end of its life cycle. Devices in this category have an uncertain future and do not represent a good selection for new device designs or long term usage. Refer to the Index and Cross Reference for recommended replacements to "Not Recommended for New Design" products. Devices "Not Recommended for New Design" are identified in the Index and Cross Reference by an asterisk.

RF Discrete Transistors

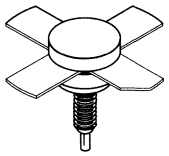
In the following pages, the reader will find the most extensive group of RF Discrete Transistors offered by any semiconductor manufacturer anywhere in the world today.

From Bipolar to FET, from Low Power to High Power, the user can choose from a variety of packages. They include plastic, metal can and ceramic that are microstrip circuit compatible or surface mountable. Many are designed for automated assembly equipment.

Major sub-headings are MOSFETs, Power Bipolar and Small Signal Bipolar.



CASE 79-05
STYLE 7
(TO-39 CE)



CASE 145A-09
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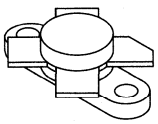

CASE 211-07
STYLE 1, 2
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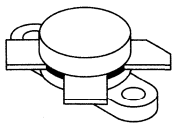

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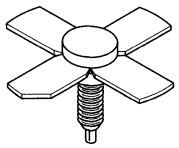

CASE 244
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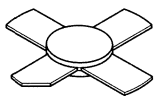

CASE 249
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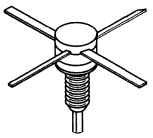
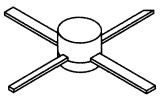


CASE 305
STYLE 1
(.204″ STUD)



CASE 305A
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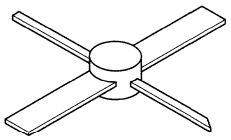
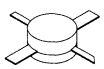
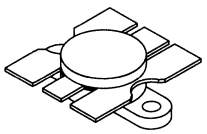


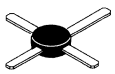
CASE 305C
STYLE 1



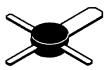
CASE 305D
STYLE 1



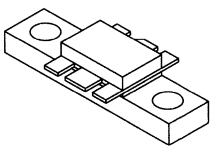
CASE 316-01
STYLE 1, 2
(.500″ CQ)



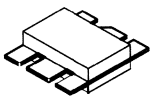
CASE 317
STYLE 1, 2
(MACRO-X)



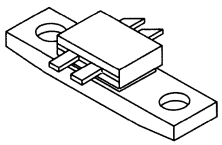
CASE 317D
STYLE 2



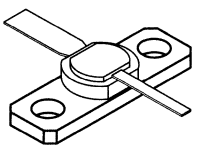
CASE 319
STYLE 1, 2, 3
(CS-12)



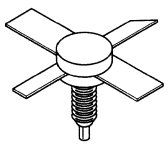
CASE 319A
STYLE 2



CASE 319B
STYLE 1



CASE 328A-03
STYLE 1, 5



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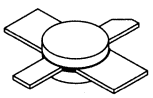

CASE 332A
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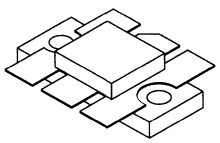
(.280″ PILL)



CASE 333
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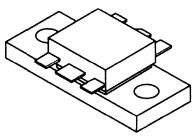
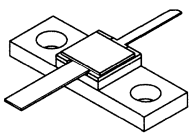
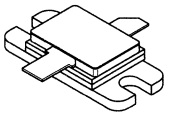


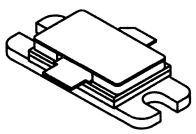
CASE 333A
STYLE 1, 2
(MAAC PAC)



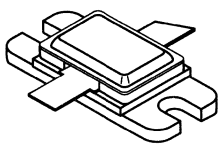
CASE 336E
STYLE 1



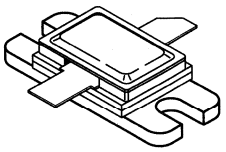
CASE 355C
STYLE 1



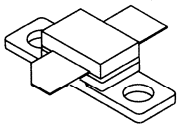
CASE 355D
STYLE 1



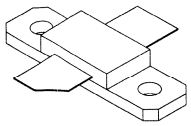
CASE 355E
STYLE 1



CASE 355G
STYLE 1



CASE 360A
STYLE 1



CASE 360B
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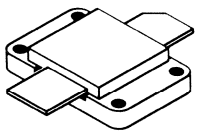
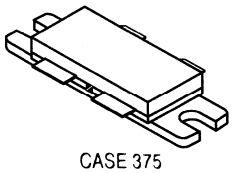


CASE 368
STYLE 2
(HOG PAC)



CASE 375
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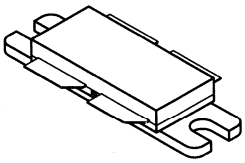

CASE 375A
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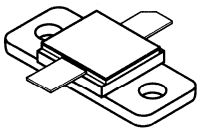

CASE 376B
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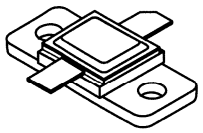

CASE 376C
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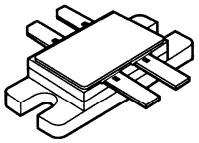

CASE 382
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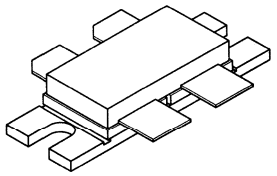

CASE 390B
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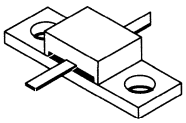

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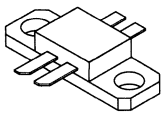

CASE 395B
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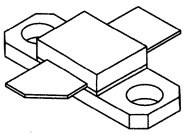

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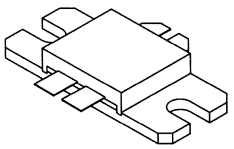

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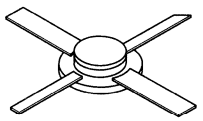

CASE 400
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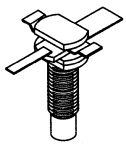

CASE 401
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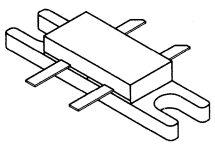
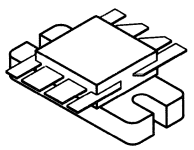


CASE 412
STYLE 1

CASE 430
STYLE 2



CASE 744A
STYLE 1, 2

CASE 751
STYLE 1
(SO-8)

RF Power MOSFETs

Motorola RF Power MOSFETs are constructed using a planar process to enhance manufacturing repeatability. They are *N-channel field effect transistors* with an oxide insulated gate which controls vertical current flow.

Compared with bipolar transistors, RF Power FETs exhibit higher gain, higher input impedance, enhanced thermal stability and lower noise. The FETs listed in this section are specified for operation in RF Power Amplifiers and are grouped by frequency range of operation and type of application. Arrangement within each group is first by order of voltage then by increasing output power.

Table 1. To 150 MHz HF/SSB

For military and commercial HF/SSB fixed, mobile, and marine transmitters.

Device	P_{out} Output Power Watts	P_{in} Input Power Typical Watts	G_{ps} Typical Gain dB @ 30 MHz	Typical IMD		θ_{JC} °C/W	Package/Style
				d_3 dB	d_{11} dB		
V_{DD} = 28 Volts							
MRF138	30	0.6	17	−30	−60	1.5	211-07/2
MRF140	150	4.7	15	−30	−60	0.6	211-11/2
V_{DD} = 50 Volts							
MRF148	30	0.5	18	−35	−60	1.5	211-07/2
MRF150	150	2.9	17	−32	−60	0.6	211-11/2
MRF154	600	12	17	−25	—	0.13	368/2
MRF157	600	6	20	−25	—	0.13	368/2

Table 2. To 225 MHz VHF AM/FM

For VHF military and commercial aircraft radio transmitters.

Device	P_{out} Output Power Watts	P_{in} Input Power Typical Watts	G_{ps} (Typ)/Freq. dB/MHz	η Efficiency Typical %	θ_{JC} °C/W	Package/Style
V_{DD} = 28 Volts						
MRF134	5	0.2	14/150	55	10	211-07/2
MRF136	15	0.38	16/150	60	3.2	211-07/2
MRF166	20	0.5	16/150	60	3.2	211-07/2
MRF136Y	30	1.2	14/150	54	1.8	319B/1
MRF137	30	0.75	16/150	60	1.8	211-07/2
MRF171	45	1.4	15/150	60	1.5	211-07/2
MRF173	80	4	13/150	65	0.8	211-11/2
MRF173CQ	80	4	13/150	65	0.8	316-01/2
MRF175LV	100	4	14/225	65	0.65	333/1
MRF174	125	8.3	11.8/150	60	0.65	211-11/2
MRF141	150	10	10/175	55	0.6	211-11/2
MRF175GV	200	8	14/225	65	0.44	375/2
MRF141G	300	13	10/175	55	0.35	375/2
V_{DD} = 50 Volts						
MRF151	150	7.5	13/175	45	0.6	211-11/2
MRF176GV	200	4	17/225	55	0.44	375/2
MRF151G	300	7.5	16/175	55	0.35	375/2

Table 3. To 500 MHz UHF AM/FM

For VHF/UHF military and commercial aircraft radio transmitters.

Device	P_{out} Output Power Watts	P_{in} Input Power Typical Watts	G_{ps} (Typ)/Freq. dB/MHz	η Efficiency Typical %	θ_{JC} °C/W	Package/Style
V_{DD} = 28 Volts						
MRF158	2	0.02	20/400	55	13.2	305A/2
MRF158R	2	0.02	20/400	55	22	79-05/7
MRF161	5	0.4	13.5/400	45	10	244/3
MRF162	15	0.65	13.6/400	50	3.5	244/3
MRF166C	20	0.4	17/400	55	2.5	319/3
MRF164W	20	0.4	17/400	50	1.5	412/1
MRF163	25	1.6	12/400	50	2	244/3
MRF175LU	100	10	10/400	55	0.65	333/1
MRF175GU	150	9.5	12/400	55	0.44	375/2
MRF177	100	6.4	12/400	60	0.65	744A/2
MRF177M	100	6.4	12/400	60	0.65	390B/1
V_{DD} = 50 Volts						
MRF176GU	150	6	14/400	50	0.44	375/2

Table 4. To 520 MHz

Designed for broadband VHF & UHF commercial and industrial applications. The high gain and broadband performance of these devices make them ideal for large-signal, common-source amplifier applications in 12.5 volt mobile and base station operation.

Device	P_{out} Output Power Watts	P_{in}(Max) Input Power Watts	G_{PE} (Min)/Freq. Power Gain dB/MHz	θ_{JC} °C/W	Package/Style
V_{CC} = 7.5 Volts					
MRF5003★	3	0.336	10.5/512	14	430/2
V_{CC} = 12.5 Volts					
MRF5015★	15	1.3	11.5/512	3.5	319/3
MRF5035★	35	6.2	7.5/512	1.8	316-01/3

Table 5. To 1.0 GHz

For HF/VHF/UHF military and commercial radio transmitters.

Device	P_{out} Output Power Watts	P_{in} Input Power Typical Watts	G_{ps} (Typ)/Freq. dB/MHz	η Efficiency Typical %	θ_{JC} °C/W	Package/Style
V_{DD} = 28 Volts						
MRF182★	30	1.5	13/1000	55	2.1	360B/1
MRF183★	45	2.8	12/1000	55	1.5	360B/1

★New Product

RF Power Bipolar Transistors

Motorola's broad line of bipolar RF power transistors are characterized for operation in RF power amplifiers. Typical applications are in military and commercial landmobile, avionics and marine radio transmitters. Groupings are by frequency band and type of application. Within each group, the arrangement of devices is by major supply voltage rating, then in the order of increasing output power. All devices are NPN polarity except where otherwise noted.

HF Transistors

Table 6. 1.5 – 30 MHz, HF/SSB

Designed for broadband operation, these devices feature specified Intermodulation Distortion at rated power output. Applications include mobile, marine, fixed station, and amateur HF/SSB equipment, operating from 12.5, 13.6, 28, or 50 volt supplies.

Device	P_{out} Output Power Watts	P_{in} (Max) Input Power Watts	G_{PE} (Min) Gain @ 30 MHz dB	θ_{JC} °C/W	Package/Style
V_{CC} = 12.5 or 13.6 Volts					
MRF421	100 PEP/CW	10	10	0.6	211-11/1
V_{CC} = 28 Volts					
MRF426	25 PEP/CW	0.16	22	2.5	211-07/1
MRF464	80 PEP/CW	2.53	15	0.7	211-11/1
MRF422	150 PEP/CW	15	10	0.6	211-11/1
V_{CC} = 50 Volts					
MRF429	150 PEP/CW	7.5	13	0.8	211-11/1
MRF448	250 PEP/CW	15.7	12	0.6	211-11/1

Table 7. 14 – 30 MHz, CB/Amateur Band

These HF transistors are designed for economical, high-volume use in CW, AM and SSB applications.

V_{CC} = 12.5 or 13.6 Volts					
MRF455	60	3	13	1	211-07/1
MRF454	80	5	12	0.7	211-11/1

Table 8. 27 – 50 MHz, Low-Band FM Band

For use in the FM "Low-Band," for Mobile communications.

Device	P_{out} Output Power Watts	P_{in} (Max) Input Power Watts	G_{PE} (Min) Gain @ 50 MHz dB	θ_{JC} °C/W	Package/Style
V_{CC} = 12.5 or 13.6 Volts					
MRF492	70	5.6	11	0.7	211-11/1

VHF Transistors

Table 9. 30 – 200 MHz Band

Designed for Military Radio and Commercial Aircraft VHF bands, these 28-volt devices include the all-gold metallized MRF314/15/16/17 high-reliability series.

Device	P_{out} Output Power Watts	P_{in} (Max) Input Power Watts	G_{PE} (Min)/Freq. Power Gain dB/MHz	θ_{JC} °C/W	Package/Style
V_{CC} = 28 Volts					
MRF314	30	3	10/150	2.2	211-07/1
MRF315	45	5.7	9/150	1.6	211-07/1
MRF316(2)	80	8	10/150	0.8	316-01/1
MRF317(2)	100	12.5	9/150	0.65	316-01/1

(2)Internal Impedance Matched

VHF Transistors (continued)

Table 10. 136 – 174 MHz High Band

The "workhorse" VHF FM High-Band is served by Motorola with the broadest range of devices and package combinations in the industry.

Device	P_{out} Output Power Watts	P_{in} (Max) Input Power Watts	G_{PE} (Min) Gain @ 175 MHz dB	θ_{JC} °C/W	Package/Style
V_{CC} = 12.5 Volts					
MRF4427	1	0.016	18(19)	125(1)	751/1
MRF553	1.5	0.11	11.5	25	317D/2
MRF2628	15	0.95	12	4	244/1
MRF1946	30	3	10	1.6	211-07/1
MRF1946A	30	3	10	1.8	145A-09/1
MRF224	40	14.3	4.5	2.2	211-07/1
MRF240	40	5	9	2.2	145A-09/1
MRF247(2)	75	15	7	0.7	316-01/1

UHF Transistors

Table 11. 100 – 400 MHz Band

Stringent requirements of the UHF Military band are met by MRF325, 326, 327, 329 and 2N6439 types, with all-gold metal systems, specified ruggedness and programmed wirebond construction, to assure consistent input impedances for internally matched parts.

Device	P_{out} Output Power Watts	P_{in} (Max) Input Power Watts	G_{PE} (Min) Gain @ 400 MHz dB	θ_{JC} °C/W	Package/Style
V_{CC} = 28 Volts					
MRF325(2)	30	4.3	8.5	2.2	316-01/1
MRF326(2)	40	8	9	1.6	316-01/1
2N6439(2)	60	10	7.8	1.2	316-01/1
MRF327(2)	80	14.9	7.3	0.7	316-01/1
MRF329(2)	100	20	7	0.7	333/1
MRF392(3)	125	19.8	8	0.7	744A/1
2N6985(3)	125	19.8	8	0.7	382/1

Table 12. 100 – 500 MHz Band

Similar to the 100–400 MHz transistors, these devices have bandwidth capabilities allowing their use to 500 MHz. All have nitride passivated die, gold metal systems, specified ruggedness and controlled wirebond construction to meet the stringent requirements of military space applications.

Device	P_{out} Output Power Watts	P_{in} (Max) Input Power Watts	G_{PE} (Min)/Freq. Power Gain dB/MHz	θ_{JC} °C/W	Package/Style
V_{CC} = 28 Volts					
MRF313	1	0.03	15/400	28.5	305A/1
MRF321	10	0.62	12/400	6.4	244/1
MRF323	20	2	10/400	3.2	244/1
MRF393(3)	100	18	7.5/500	0.7	744A/1
2N6986(3)	100	18	7.5/500	0.7	382/1

(1)$R_{\theta JA}$. Thermal Resistance Junction to Ambient.
(2)Internal Impedance Matched
(3)Internal Impedance Matched Push-Pull Transistors
(19)Typical

UHF Transistors (continued)

Table 13. 400 – 512 MHz Band

Higher power output devices in this UHF power transistor series feature internally input-matched construction, are designed for broadband operation, and have guaranteed ruggedness under output mismatch and RF overdrive conditions. Devices are specified for handheld, mobile and base station operation.

Device	P_{out} Output Power Watts	P_{in} (Max) Input Power Watts	G_{PE} (Min)/Freq. Power Gain dB/MHz	θ_{JC} °C/W	Package/Style
V_{CC} = 12.5 Volts					
MRF581 (4)	0.6	0.03	13/500	40	317/2
MRF555	1.5	0.15	10/470	25	317D/2
MRF652	5	0.5	10/512	7	244/1
MRF652S	5	0.5	10/512	7	249/1
MRF653	10	2	7/512	4	244/1
MRF653S	10	2	7/512	4	249/1
MRF641(2)	15	2.5	7.8/470	4	316-01/1
MRF654 (2)	15	2.5	7.8/512	4	244/1
MRF644(2)	25	5.9	6.2/470	1.7	316-01/1
MRF650 (2)	50	15.8	5.0/512	1.3	316-01/1
MRF658 (2)	65	25	4.15/512	1	316-01/1
V_{CC} = 24 Volts					
TP5002S	1.5	0.075	13/470	21	249-05/1
TP5051	50	6	9/470	1.2	333A/2

900 MHz Transistors

Table 14. 870 – 960 MHz Band

Designed specifically for the 900 MHz mobile radio band, types MRF840 through MRF847 offer superior gain and ruggedness, using the unique CS-12 package, which minimizes common-element impedance, and thus maximizes gain and stability. Devices are listed for mobile and base station applications.

Device	P_{out} Output Power Watts	P_{in} (Max) Input Power Watts	G_{PE} (Min)/Freq. Power Gain dB/MHz	θ_{JC} °C/W	Package/Style
V_{CC} = 12.5 Volts — Class C — Si Bipolar					
MRF559(5)	0.5	0.08	8/870	50	317/2
MRF581 (5)	0.6	0.06	10(19)/870	40	317/2
MRF837(5)	0.75	0.11	8/870	40	317/1
MRF8372 (5)	0.75	0.11	8/870	45	751/1
MRF557 (5)	1.5	0.23	8/870	25	317D/2
MRF839F(5)	3	0.46	8/870	9	319/2
MRF840(2)(6)	10	2.5	6/870	3.1	319/1
MRF842(2)(6)	20	5	6/870	1.5	319/1
MRF844(2)(6)	30	9	5.2/870	1.5	319/1
MRF847 (2)(6)	45	16	4.5/870	1	319/1

(2)Internal Impedance Matched
(4)Small signal gain. P_o is Typ.
(5)Common Emitter Configuration
(6)Common Base Configuration
(19)Typical

900 MHz Transistors (continued)

Table 14. 800 – 960 MHz Band (continued)

Device	P_{out} Output Power Watts	Class	P_{in}(Max) Input Power Watts	Gp (Min)/Freq. Power Gain dB/MHz	θ_{JC} °C/W	Package/Style
V_{CC} = 24 Volts — Si Bipolar						
MRF890	2	C	0.25	9/900	25	305/1
MRF890S	2	C	0.25	9/900	25	305A/1
TP3019S	2	AB or A	0.25	9/960	14	305A/1
TP3007S★	2	AB	0.25	9/960	21	305C/1
MRF857★	2.1 (CW)	A	0.4	12.5/900	8.4	305/1
MRF857S★	2.1 (CW)	A	0.4	12.5/900	8.4	305D/1
MRF896	3	AB or A	0.3	10/900	7	305/1
MRF896S	3	AB or A	0.3	10/900	7	305D/1
MRF858★	3.6 (CW)	A	0.85	11/900	6.9	319/2
TP3008★	4	AB	0.28	11.5/960	5	319/2
MRF891	5	AB	0.63	9/900	7	319/2
MRF891S	5	C	0.63	9/900	7	319A/2
MRF860★	13.7 (CW)	A	3.25	11/900	1.9	395B/1
MRF892(2)	14	C	2	8.5/900	3.5	319/1
MRF861★	27 (CW)	A	8	9.5/900	0.92	375A/1
MRF894(2)	30	C	6	7/900	1.5	319/1
MRF897(3)	30	AB	3	10/900	1.7	395B/1
TP3034★	35	AB	7	7/960	2.3	319/2
MRF862★	36 (CW)	A	13.6	9/900	0.75	375A/1
MRF898(2)	60	C	12	7/900	1	333A/1
V_{CC} = 26 Volts — Si Bipolar						
TP3020A	2.2	A	0.28	9/960	20	244/1
TP3005	4	AB or A	0.57	8.5/960	7	319/2
TP3006	5	AB	0.63	9/960	7	319/2
TP3022B	15	AB	2.12	8.5/960	6	319/2
TP3032	21	AB	4	7.5/960	3.3	319/2
TP3024B(3)	35.5	AB	6.35	7.5/960	3	395/1
TP3061(2)	45	AB	7.13	8/960	1.2	333A/2
TP3064	50	AB	8.9	7.5/960	1.2	333A/2
TP3062(3)	60	AB	12	7/960	1.2	398/1
MRF880(3)	90	AB	12.7	8.5/900	1.3	375A/1
TP3069★	100	AB	18	7.5/960	0.7	375A/1
MRF899(3)	150	AB	24	8/900	0.8	375A/1

(2)Internal Impedance Matched

(3)Internal Impedance Matched Push-Pull Transistors

★New Product

1.5 GHz Transistors

Table 15. 1400 – 1600 MHz Band

Device	P_{out} Output Power Watts	Class	P_{in}(Max) Input Power Watts	Gp (Min)/Freq. Power Gain dB/MHz	θ_{JC} °C/W	Package/Style
MRF15030★	30	A, AB	3.1	9/1490	1.4	395C/1
MRF15090★	90	A, AB	10.8	7.5/1490	0.7	375A/1

Microwave Transistors

Table 16. L-Band Pulse Power

These products are designed to operate in short pulse width, 10 µs, low duty cycle, 1%, power amplifiers operating in the 960–1215 MHz band. All devices have internal impedance matching. The prime application is avionics equipment for distance measuring (DME), area navigation (TACAN) and interrogation (IFF).

Device	P_{out} Output Power Watts	P_{in}(Max) Input Power Watts	G_P (Min) Gain @ 1090 MHz dB	θ_{JC} °C/W	Package/Style
V_{CC} = 18 Volts — Class A & AB Common Emitter					
MRF1000MA	0.2	0.02	10	25	332-04/2
MRF1000MB	0.2	0.02	10	25	332A/2
V_{CC} = 35 Volts — Class B & C Common Base					
MRF1002MA	2	0.2	10	25	332-04/1
MRF1002MB	2	0.2	10	25	332A/1
MRF1004MA	4	0.4	10	25	332-04/1
MRF1004MB	4	0.4	10	25	332A/1
V_{CC} = 50 Volts — Class C Common Base					
MRF1015MA	15	1.5	10	10	332-04/1
MRF1015MB	15	1.5	10	10	332A/1
MRF1035MA	35	3.5	10	5	332-04/1
MRF1035MB	35	3.5	10	5	332A/1
MRF1090MA	90	9	10	0.6	332-04/1
MRF1090MB	90	9	10	0.6	332A/1
MRF1150MA	150	25	7.8	0.3	332-04/1
MRF1150MB	150	25	7.8	0.3	332A/1

Table 17. L-Band Long Pulse Power

These products are designed for pulse power amplifier applications in the 960–1215 MHz frequency range. They are capable of handling up to 10 µs pulses in long pulse trains resulting in up to a 50% duty cycle over a 3.5 millisecond interval. Overall duty cycle is limited to 25% maximum. The primary applications for devices of this type are military systems, specifically JTIDS and commercial systems, specifically Mode S. Package types are hermetic.

Device	P_{out} Output Power Watts	P_{in}(Max) Input Power Watts	G_{PB} (Min) Gain @ 1215 MHz dB	θ_{JC} °C/W	Package/Style
V_{CC} = 28 Volts — Class C Common Base					
MRF10005	5	0.71	8.5	8	336E/1
V_{CC} = 36 Volts — Class C Common Base					
MRF10031	30	3	10	3	376B/1
MRF10120	120	19	8	0.6	355C/1

★New Product

Microwave Transistors (continued)

Table 17. L-Band Long Pulse Power (continued)

Device	P_{out} Output Power Watts	P_{in}(Max) Input Power Watts	G_{PB} (Min) Gain @ 1215 MHz dB	θ_{JC} °C/W	Package/Style
V_{CC} = 50 Volts					
MRF10070	70	7	10(7)	0.4	376C/1
MRF10150	150	15	10(7)	0.25	376B/1
MRF10350	350	45	9(7)	0.11	355E/1
MRF10500	500	56	9(7)	0.12	355D/1
MRF1375	375	80	6.7	0.12	355G/1
MRF1500	500	151	5.2	0.1	355G/1

Table 18. 2 GHz Narrowband CW

The MRW2000 Series of NPN Silicon microwave power transistors are designed for common base service in amplifier or oscillator applications in the 1–2.3 GHz frequency range.

Device	P_{out} Output Power Watts	P_{in}(Max) Input Power Watts	G_{PB} (Min) Gain @ 2 GHz dB	θ_{JC} °C/W	Package/Style
V_{CC} = 28 Volts — Class B & C Common Base					
MRW2001	1	0.13	9	35	328A-03/1
MRW2003	3	0.48	8	15	328A-03/1
MRW2005	5	0.8	8	8.5	328A-03/1
MRW2010	10	2	7	6	328A-03/1

Table 19. 3 GHz Narrowband CW

The MRW3000 Series are the industry's first 100% VSWR tolerant 3 GHz devices. They are common-base configured in hermetic packages and rated for 28 volt operation.

Device	P_{out} Output Power Watts	P_{in}(Max) Input Power Watts	G_{PB} (Min) Gain @ 3.0 GHz dB	θ_{JC} °C/W	Package/Style
V_{CC} = 28 Volts					
MRW3001	1	0.2	7	35	328A-03/1
MRW3003	3	0.75	6	17	328A-03/1
MRW3005	5	1.6	5	8.5	328A-03/1

Table 20. 0.6 – 2.7 GHz Broadband Common Base

The MicRoAmp transistor employs MOS capacitors and other matching elements to transform the input, and in some devices, the output impedance, to a more manageable level prior to the point where package parasitics can reduce the bandwidth capability (U.S. Patent 3,713,006). These devices are assembled in common-base configuration and include an all-gold metal system and diffused ballast resistors for long life.

Device	Instantaneous Frequency Range F_L-F_H (MHz)	Output Power Min Watts	Gain Min dB	θ_{JF} °C/W	Package/Style
V_{CC} = 22 Volts					
MRAL1720-20	1700–2000	20	6	2.5	394/1
MRAL2023-3	2000–2300	3	8	16	394/1
MRAL2023-6	2000–2300	6	6.8	8	394/1
MRAL2023-18	2000–2300	18	6.5	2.5	394/1
MRAL2327-3	2300–2700	3	6.6	16	394/1
MRAL2327-12	2300–2700	12	7	4.5	394/1
V_{CC} = 28 Volts					
MRA1417-6	1400–1700	6	7.4	8	394/1

(7)Typical @ 1090 MHz

Microwave Transistors (continued)

Table 21. Power Oscillator

This oscillator device, a **common collector** configuration with diffused ballast resistors, gold metallization and hermetic package, provides high reliability in severe environmental conditions and is fully characterized for power oscillator applications.

Device	Operating Conditions V_{CE}/I_C V/mA	Output Power (Typ) — Watts/@ Freq. — GHz				Package/Style
		Minimum	P_o @ Low f	P_o @ Mid f	P_o @ High f	
TP62601	20/220	1.25/2	1.85/2	1.35/2.5	0.85/3	328A-03/5

Linear Transistors

The following sections describe a wide variety of devices specifically characterized for linear amplification. Included are medium power and high power parts covering frequencies from 100 MHz–4 GHz.

Table 22. To 1 GHz, Class A

These devices offer a selection of performance and price for linear amplification to 1 GHz. The "MRA" prefix parts are input matched and feature high overdrive and extreme ruggedness capability.

Device	P_o @ 1 dB Comp. Point Watts	G_{SS} (Min)/Freq. Small Signal Gain dB/MHz	Bias Point (Vdc/A)	θ_{JC} °C/W	Package/Style
V_{CC} = 19 Volts					
MRA1000-7L	7	9/1000	19/1.2	4	145A-09/1
MRA1000-14L	14	8/1000	19/2.4	2.1	145A-09/1
V_{CC} = 25 Volts					
MRF1029(9)	1.5	8/1000	25/0.2	12	244/1
MRF1030(9)	3	7.5/1000	25/0.4	6	244/1
MRF1031(9)	4.5	7/1000	25/0.6	3.5	244/1
MRF1032(9)	6	6.5/1000	25/0.85	3.5	244/1

Table 23. To 2 GHz, Class A

These parts offer low cost alternatives to matched devices used primarily as pre-drivers to 2 GHz.

Device	P_o @ 1 dB Comp. Point Watts	G_{SS} (Min)/Freq. Small Signal Gain dB/MHz	Bias Point (Vdc/A)	θ_{JC} °C/W	Package/Style
V_{CC} = 20 Volts					
MRF3094(9)	0.5	10.5/2000	20/0.12	40	328A-03/1
MRF3104(9)	0.5	10.5/2000	20/0.12	40	305A/1
MRF3095(9)	0.8	9/2000	20/0.12	35	328A-03/1
MRF3105(9)	0.8	9/2000	20/0.12	35	305A/1
MRF3096(9)	1.6	9/2000	20/0.24	22	328A-03/1
MRF3106(9)	1.6	9/2000	20/0.24	22	305A/1
MRF2000-5L(10)	5	7/2000	19/0.6	10	360A/1

(9)Former Prefix was "RF"

(10)Former prefix was "MRA."

Linear Transistors (continued)

Table 24. UHF Ultra Linear for TV Applications

The following devices have been characterized for ultra-linear applications such as low-power TV transmitters in Band IV and Band V. Each features diffused ballast resistors and an all-gold metal system to provide enhanced reliability and ruggedness.

Device	P_{ref}(Min) Watts	G_P (Min)/Freq. Small Signal Gain dB/MHz	3 Tone IMD(8) dB	θ_{JC} °C/W	Package/Style
V_{CC} = 20 Volts					
TPV596A	0.5	11.5/860	−58	20	244/1
TPV597	1	10.5/860	−58	9	244/1
TPV598	4	7/860	−60	5	244/1
V_{CC} = 25 Volts					
TPV595A	14	8.5/860	−47	2.5	395/1
TPV695A	14	9.5/860	−47	2.5	395B/1
TPV7025	25	8.5/860	−45	1.5	398/1
TPV6030	20/35(11)	9.5/860	−51/−	1.1	375A/1
V_{CC} = 28 Volts					
TPV8100B	100(11)	8.5/860	—	0.7	398/1
TPV8200B	150(11)	8/860	—	0.7	375A/1

Table 25. Microwave Linear for PCN Applications

The following devices have been developed for linear amplifiers in the 1.5−2 GHz region and have characteristics particularly suitable for PCN base station applications.

Device	P_{out} Watts	Class	Bias Point Vdc/mA	Gain (Typ)/Freq dB/MHz	θ_{JC} °C/W	Package/Style
MRF6401(12) ★	0.5	A	20/80	10/1880	30	305C/1
MRF6402(13) ★	4.5	AB	26/40	10/1880	5	319/2
MRF6404(16) ★	30	AB	26/150	9/1880	1.4	395C/1

Table 26. Microwave Linear Power

Common emitter microwave devices are offered for a wide variety of uses in small and medium signal, Class A, AB and C applications up to 4 GHz. The use of all-gold metal systems, diffused ballast resistors and hermetic packaging results in devices that display excellent reliability even in a military environment.

Device	G_{SS} (Min) @ Freq. Small Signal Gain dB/GHz	1 dB Comp. Watts	P_{sat} Watts	−30 dB IMD Watts	Emitter Current mA	Package/Style
V_{DD} = 20 Volts						
MRW52602	6/2	3.6	5	3	440	328A-03/1
MRW52604	5/2	7.2	10	6	880	328A-03/1
MRW53502	5/3	1.6	2	1.5	230	401/1
MRW53601	6/3	0.8	1	0.8	120	328A-03/1
MRW54001	5/4	0.5	0.8	0.5	120	400/1
MRW54601	6/4	0.5	0.8	0.5	120	328A-03/1

(8)Vision Carrier: − 8 dB; Sound Carrier: − 7 dB; Sideband Carrier: − 16 dB

(11)Output power at 1 dB compression in Class AB

(12)Formerly known as "TP4001S"

(13)Formerly known as "TP4004"

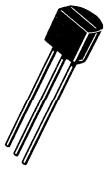
(16)Formerly known as "TP4035"

★New Product

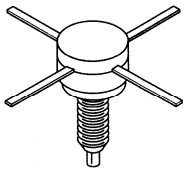
RF Small Signal Bipolar Transistors

Motorola's broad line of RF Small Signal Transistors includes NPN and PNP Silicon Bipolar Transistors characterized for low noise amplifiers, mixers, oscillators, multipliers, non-saturated switches and low-power drivers.

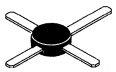
These devices are available in a wide variety of package types: plastic Macro-X and Macro-T, ceramic and surface mounted. Most of these transistors are fully characterized with s-parameters.



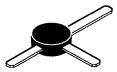
CASE 29-04
STYLE 2
(TO-226AA)



CASE 244A
STYLE 1, 3

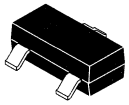


CASE 317
STYLE 2
(MACRO-X)

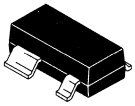


CASE 317A
STYLE 2
(MACRO-T)

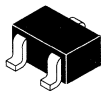
CASE 317D
STYLE 2, 3
(POWER MACRO)



CASE 318-07
STYLE 6
(SOT-23)



CASE 318A
STYLE 1
LOW PROFILE
(SOT-143)



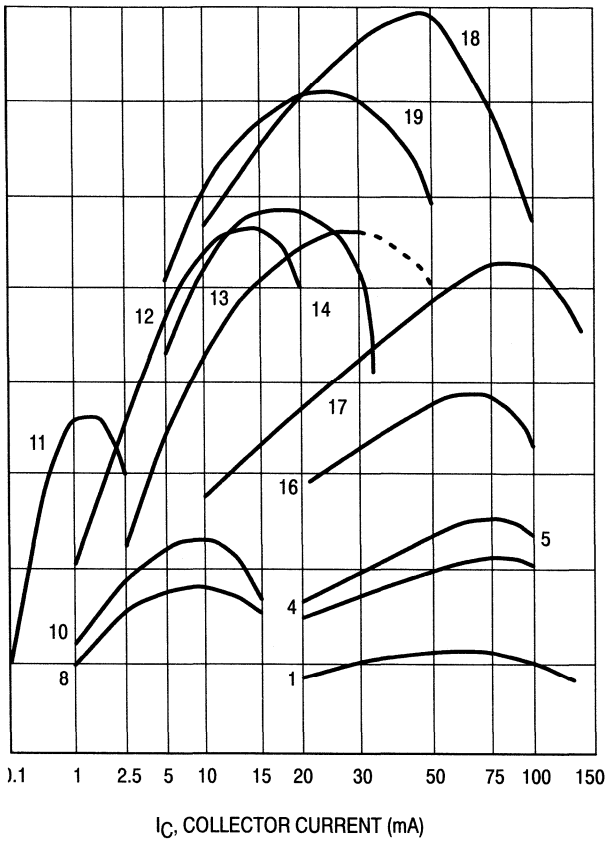
CASE 419
STYLE 3
(SC-70/SOT-323)

CASE 751
STYLE 1
(SO-8)

RF Small Signal Bipolar Transistors

RF Small Signal Transistor Gain Characteristics

Curve numbers apply to transistors listed in the subsequent tables.

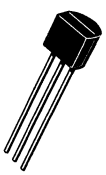


Selection by Package

In small-signal RF applications, the package style is often determined by the end application or circuit construction technique. To aid the circuit designer in device selection, the Motorola broad range of RF small-signal amplifier transistors is organized by package. Devices for other applications such as oscillators or switches are shown in the appropriate preceding tables. **These devices are NPN polarity unless otherwise designated.**

Plastic SOE Case

Table 1. Plastic SOE Case

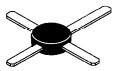
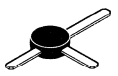
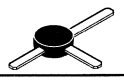
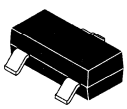
Device	Gain-Bandwidth @ f_T Typ GHz	@ I_C mA	Curve No. Page 17	NF @ f Typ dB	MHz	Gain @ f Typ dB	MHz	Maximum Ratings $V_{(BR)CEO}$ Volts	I_C mA	P_T mW	Package
Case 29-04/2, TO-226AA											
MPS536(17)	5	−20	19	4.5	500	14	500	−10	−30	625	
LP1001	5	10	—	2.7	500	12.5	1000	15	—	625	
LP1001A	5	10	—	3.2	1000	12.5	1000	15	—	625	
LP1983	4.5	15	—	2.4	900	12	900	15	30	300	
MPS901(29)	4.5	15	12	2.4	900	12	900	15	30	300	
MPS911(29)	7	30	13	1.7	500	16.5	500	12	40	625	
MPS571(29)	8	50	18	2	500	14	500	10	80	625	
MPS3866(29)	0.8	50	1	—	—	10	400	30	400	625	

(17)PNP

(29)Packaging Options Available in Tape and Reel and Fan Fold Box

Selection by Package (continued)

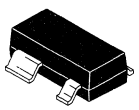
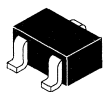
Table 1. Plastic SOE Case (continued)

Device	Gain-Bandwidth @ f_T Typ GHz	@ I_C mA	Curve No. Page 17	NF @ f Typ dB	f MHz	Gain @ f Typ dB	f MHz	Maximum Ratings $V_{(BR)CEO}$ Volts	I_C mA	P_T mW	Package
Case 317/2 — MACRO-X											
MRF521(17)	4.2	−50	—	2.8	1000	11	1000	−10	−70	750	
MRF901	4.5	15	12	2	1000	12	1000	15	30	375	
MRF941	8	15	—	2.1	2000	12.5	2000	10	50	400	
MRF951	7.5	30	—	2.1	2000	12.5	2000	10	100	1000	
MRF571	8	50	18	1.5	1000	12	1000	10	70	1000	
MRF581	5	75	17	2	500	15.5	500	18	200	2500	
MRF581A	5	75	17	1.8	500	15.5	500	15	200	2500	
MRF837	5	75	17	—	—	10	870	16	200	2500	
MRF559	3	100	16	—	—	13	512	18	150	2000	
Case 317A/2 — MACRO-T											
BFR90	5	14	12	2.4	500	18	500	15	30	180	
BFR96	4.5	50	14	2	500	14.5	500	15	100	500	
Case 317D/2,3											
MRF553	—	—	—	—	—	13	175	16	500	3000	
MRF555	—	—	—	—	—	12.5	470	16	400	3000	
MRF557	—	—	—	—	—	9	870	16	400	3000	
Case 318-07/6 — SOT–23											
MMBR521LT1(17)	3.4	−35	—	1.5	500	15	500	−10	−70	312	
MMBR536LT1(17)	5.5	−20	19	4.5	500	14	500	−10	−30	350	
MMBR4957LT1(17)	1.2	−2	10	3	450	17	450	−30	−30	350	
MMBR931LT1	3	1	11	4.3	1000	10	1000	5	5	350	
MMBR5031LT1	1	5	—	2.5	450	17	450	10	20	350	
MMBR5179LT1	1.4	5	8	4.5	200	15	200	12	50	350	
BFR92ALT1	3.4	14	—	3.0	500	15	—	15	25	350	
MMBR920LT1	4.5	14	—	2.4	500	15	500	15	35	350	
MMBR901LT1	4	15	12	1.9	1000	12	1000	15	30	350	
MMBR941LT1	8	15	—	2.1	2000	8.5	2000	10	50	400	
MMBR941BLT1	8	15	—	2.1	2000	8.5	2000	10	50	400	
BFS17LT1	1.3	25	—	5	30	—	—	15	—	350	
BFR93ALT1	3.4	30	—	2.5	30	—	—	12	35	350	
MMBR911LT1	6	30	13	2	500	17	500	12	40	350	
MMBR951LT1	8	30	—	2.1	2000	7.5	2000	10	100	500	
MMBR951ALT1	8	30	—	2.1	2000	7.5	2000	10	100	500	
MMBR571LT1	8	50	18	2	500	16.5	500	10	80	350	

(17)PNP

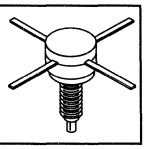
Selection by Package (continued)

Table 1. Plastic SOE Case (continued)

Device	Gain-Bandwidth @ f_T Typ GHz	@ I_C mA	Curve No. Page 17	NF @ f Typ dB	MHz	Gain @ f Typ dB	MHz	Maximum Ratings $V_{(BR)CEO}$ Volts	I_C mA	P_T mW	Package
Case 318A/1 — SOT–143											
MRF5211LT1 (17)	4.2	–50	—	2.8	1000	11	1000	–10	–70	580	
MRF9331LT1	5	1	—	2.5	1000	12.5	1000	8	1	50	
MRF9011LT1	3.8	15	12	2.3	1000	10.2	1000	15	30	300	
MRF9411LT1	8	15	—	2.1	2000	9.5	2000	10	50	400	
MRF9411BLT1	8	15	—	2.1	2000	9.5	2000	10	50	400	
MRF9511LT1	8	30	—	2.1	2000	9	2000	10	100	500	
MRF0211LT1	5.5	40	18	1.8	1000	9.5	1000	15	70	580	
MRF5711LT1	8	50	18	1.6	1000	13.5	1000	10	70	580	
Case 419/3 — SC-70/SOT-323											
MRF947T1	8	15	—	2.1	1500	10.5	1500	10	50	175	
MRF947BT1	8	15	—	2.1	1500	10.5	1500	10	50	175	
MRF957T1	8	30	—	2.0	1500	9	1500	10	100	175	
Case 751/1 — SO-8											
MRF5583(17)(18)	2.1	–35	5	—	—	1.5	250	–30	–500	1000	
MRF5943 (18)	1.5	35	4	3.4	200	12	250	30	400	1000	
MRF3866 (18)	0.8	50	1	—	—	10.5	400	30	400	1000	
MRF4427(18)	1.6	50	1	—	—	18	175	20	400	1000	
MRFQ17(18)	2.25	50	5	—	—	12	500	25	300	1000	
MRF5812 (18)	5.5	75	17	2	500	15.5	500	15	200	1500	
MRF8372 (18)	5	75	17	—	—	10	870	16	200	1500	

Ceramic SOE Case

Table 2. Ceramic SOE Case

Device	Gain-Bandwidth @ f_T Typ GHz	@ I_C mA	Curve No. Page 17	N @ f Typ dB	MHz	Gain @ f Typ dB	MHz	Maximum Ratings $V_{(BR)CEO}$ Volts	I_C mA	P_T mW	Package
Case 244A/1,3											
MRF587	5.5	90	17	3	500	13	500	15	200	5000	

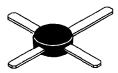
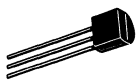
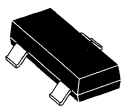
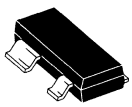
(17)PNP

(18)Tape and Reel Packaging Options Available

Selection by Application

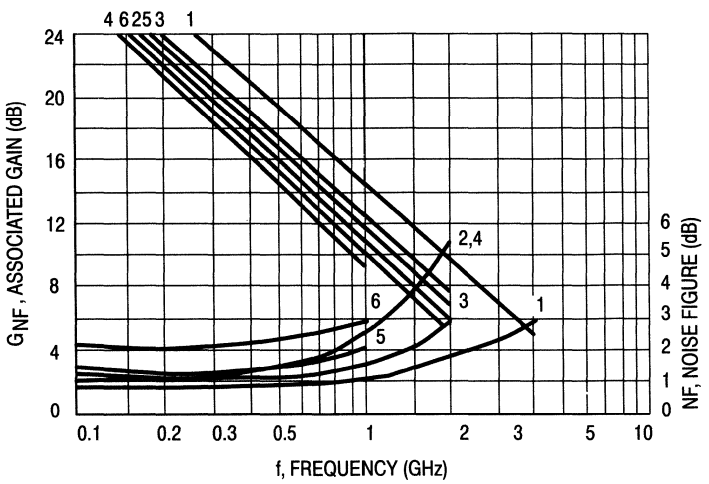
Table 3. Low Noise

The Small-Signal devices listed are designed for low noise and high gain amplifier mixer, and multiplier applications. Each transistor type is available in various packages. **Polarity is NPN unless otherwise noted.**

Package	Name	Case Number	Curve Number (See figure below)					
			1	2(17)	3	4	5	6
	MACRO-X	317/2	MRF941 MRF951(20)	MRF521	MRF571	***MRF581***	MRF901	—
	TO-226AA	29-04/2	—	—	MPS571	—	MPS901	MPS911
	SOT-23	318-07/6	***MMBR941LT1*** ***MMBR951LT1(20)***	***MMBR521LT1***	***MMBR571LT1***	—	***MMBR901LT1***	MMBR911LT1
	SC-70/ SOT-323	419/3	MRF947T1 MRF947BT1 MRF957T1(20)	—	—	—	—	—
	SOT-143	318A/1	***MRF9411LT1*** ***MRF9511LT1(20)***	***MRF5211LT1***	***MRF5711LT1*** MRF0211LT1(17)	—	***MRF9011LT1***	—
	SO-8	751/1	—	—	—	***MRF5812***	—	—

(17)PNP

(20)Higher Current Version



Gain and Noise Figure versus Frequency

Selection by Application (continued)

Table 4. CATV, MATV and Class A Linear

For Class A linear CATV/MATV applications. Listed according to increasing gain bandwidth (f_T).

Device	Nominal Test Conditions V_{CE}/I_C Volts/mA	f_T Typ MHz	Noise Figure	Distortion Specifications				$V_{(BR)CEO}$ V	Package/ Style
			Typ/Freq. dB/MHz	2nd Order IMD dBc	3rd Order IMD dBc	12 Ch. Cross-Mod. dBc	Output Level dBmV		
MMBR5179LT1	6/5	1500	4/450					12	318-07/6
MRF5943	15/50	1500	3.4/200					30	751/1
MRF5583(17)	10/–100	1500						–30	751/1
MMBR4957LT1(17)	10/–2	2000	3/450					–30	318-07/6
MMBR5031LT1	6/5	2000	1.9/450					10	318-07/6
MRFQ17	12.5/50	2200						25	751/1
MMBR920LT1	10/14	4500	2.4/500					15	318-07/6
BFR96	10/50	4500	2/500					15	317A/2
BFR90	10/14	5000	2.4/500					15	317A/2
MRF581	10/75	5000	2.7/300		–65		+50	18	317/2
MRF581A	10/75	5000	1.8/500		–65		+50	15	317/2
MRF5812	10/75	5000	1.8/500		–65		+50	15	751/1
LP1001		5000	2.7/500					15	29-04/2
LP1001A		5000	3.2/1000					15	29-04/2
MRF587	15/90	5500	3/500	–52	–72		+50	17	244A/1

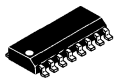
Table 5. UHF and Microwave Oscillators

The transistors listed below are for UHF and microwave oscillator applications as initial signal sources or as output stages of limited range transmitters. Devices are listed in order of increasing output power.

Device	Test Conditions		P_{out} Min mW	f_T Typ MHz	Package/Style
	f MHz	V_{CC} Volts			
MPS3866	400	15	1000	800	29-04/2
MRF3866	400	15	1000	800	751/1

(17)PNP

CASE 751
(SO-8)



CASE 751B
(SO-16)

RF Integrated Circuits

Motorola's RF integrated circuit devices provide an integrated solution for the personal communications market. These devices are available in plastic SOIC-8 or SOIC-16 packages.

RF Integrated Circuits

The MRFIC2001 through MRFIC2006 device series is Motorola's first introduction of an integrated solution for the personal communications market. Although designed as a chip set solution for CT2, the partitioning of the functions makes the use of these devices ideal in other 900 MHz personal communications systems such as cordless telephone (915 MHz), GSM, and ISM designs.

To 1.0 GHz

Table 1. Down Converter

Device	RF Freq. Range MHz	IF Freq. Range MHz	Supply Volt. Range V	Supply Current mA (Typ)	Conv. Gain dB (Typ)	Output Level, 1 dB Comp. dBm (Typ)	Package
MRFIC2001★(18)	500–1000	0–250	2.7–5.0	4.7	23	–10	751

Table 2. Upmixer

Device	RF Freq. Range MHz	IF Freq. Range MHz	Supply Volt. Range V	Supply Current mA (Typ)	Conv. Gain dB (Typ)	Output Level, 1 dB Comp. dBm (Typ)	Package
MRFIC2002★(18)	500–1000	0–250	2.7–5.0	5.5	10	–18	751
MRFIC2101★(18)	800–1000	0–250	4.75	45	26.5	4.5	751B

Table 3. Antenna Switch

Device	Freq. Range MHz	Supply Volt. Range V	Supply Current μA (Typ)	Recommended Input Power dBm	Insertion Loss Port RF1 to RF2 /RF1 to RF3 dB (Typ)	Isolation Port RF1 to RF2 /RF1 to RF3 dB (Typ)	Package
MRFIC2003★(18)	100–1000	2.8–6.0	<10	17	0.8/0.5	23/20	751

Table 4. Driver and Ramp

Device	Freq. Range MHz	Supply Volt. Range V	Supply Current TX/RX mA (Typ)	Small Signal Gain dB (Typ)	Gain Control dB (Typ)	P_{out}, 1 dB Compression dBm (Typ)	Package
MRFIC2004★(18)	800–1000	2.7–4.0	11/0.7	21.5	34	–1	751B

Table 5. Integrated Power Amplifier

Device	Freq. Range MHz	Supply Volt. Range V	Supply Current mA (Typ)	Small Signal Gain dB (Typ)	Return Loss Input/Output dB (Typ)	P_{out}, 1 dB Compression dBm (Typ)	Package
MRFIC2006★(18)	500–1000	1.8–4.0	46	23	15	15.5	751
MRFIC2101★(18)	800–1000	4.75	38	16	—	18	751B

(18)Tape and Reel Packaging Options Available

★New Product

To 1.8 GHz

Designed specifically for DECT and JPHP, the MRFIC1801 through MRFIC1804 device series offers complete transmit and receive functions, less Lo and filters, for a typical 1.8 GHz cordless telephone. This chip set is also applicable in other 1.9 GHz and 2.4 GHz personal communications systems.

Table 6. Antenna Switch

Device	Operating Freq. Range GHz	Supply Volt. Range V	Supply Current TX Mode μA (Typ)	Leakage Current μA (Typ)	Insertion Loss TX Mode dB (Typ)	P_{in}, 1 dB Compression dBm (Typ)	Package
MRFIC1801★ (18)	1.5–2.5	2.7–5.5	300	45	0.6	29	751

Table 7. Upconverter

Device	RF Output Freq. Range GHz	Supply Volt. Range V	Supply Current TX Mode mA (Typ)	Conversion Gain dB (Typ)	Recommended IF Input MHz (Typ)	P_{out}, 1 dB Compression dBm (Typ)	Package
MRFIC1803★ (18)	1.7–2.0	2.7–3.3	28	10	70–325	–2	751B

Table 8. Amplifier and Downmixer

Device	IF Output Freq. Range MHz	Supply Volt. Range V	Supply Current RX Mode mA (Typ)	Mixer Conv. Gain dB (Typ)	LNA Gain dB (Typ)	LNA Noise Fig. dB (Typ)	Package
MRFIC1804★ (18)	70–325	2.7–3.3	7	4	15.5	2.3	751B

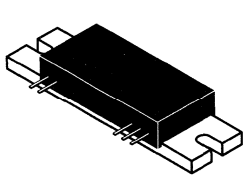
(18) Tape and Reel Packaging Options Available

★New Product

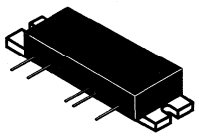
RF Amplifiers

Motorola's line of RF amplifiers designed and specified for use in land mobile radios, CATV distribution systems and general purpose wideband amplification applications. They feature small size, matched inputs and outputs, high stability and guaranteed performance specifications. For the user they offer the benefits of smaller and less complex system designs, in less time and at lower overall cost.

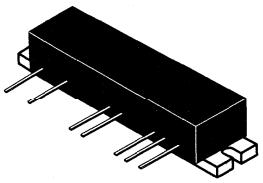
Each amplifier uses modern transistor chips which are gold metallized and have silicon nitride passivation for increased reliability and long life. Chip and wire construction features MOS capacitors and laser trimmed nichrome resistors. Circuit substrates and metallization have been selected for optimum performance cost and reliablity.



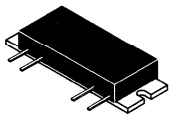
CASE 301AA
STYLE 1



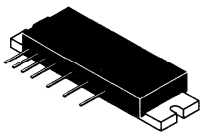
CASE 301E
STYLE 1



CASE 301F
STYLE 1



CASE 301H
STYLE 2



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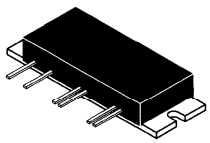
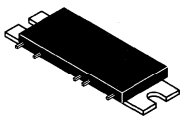


CASE 301K
STYLE 3



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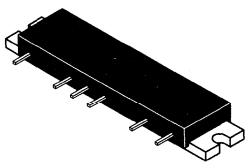
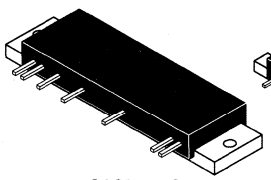
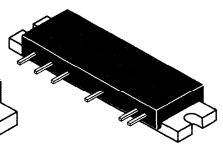
STYLE 1



CASE 301R
STYLE 1



CASE 301S
STYLE 1



CASE 301T
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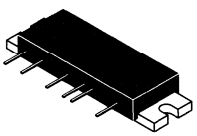
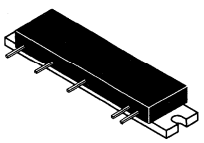
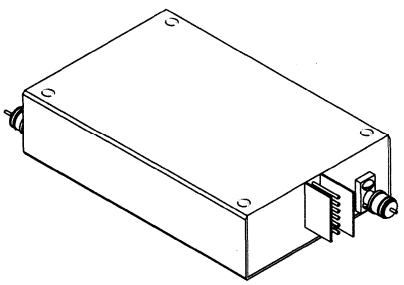


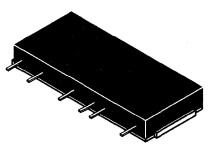
CASE 301V
STYLE 1



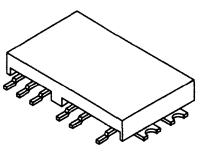
CASE 301Y
STYLE 1



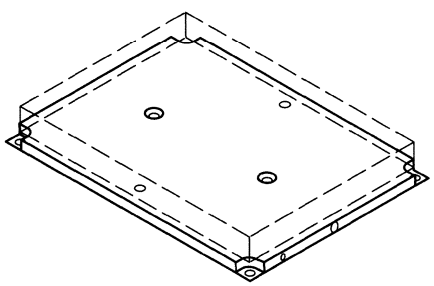
CASE 389B
STYLE 1



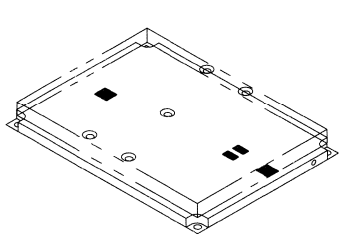
CASE 413A
STYLE 1



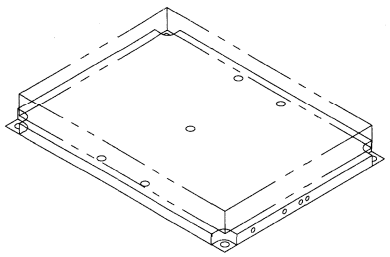
CASE 420A
STYLE 1



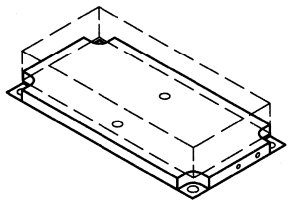
CASE 429
STYLE 1



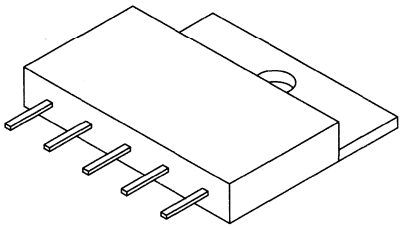
CASE429A
STYLE 1



CASE 429C
STYLE 1



CASE 429E
STYLE 1



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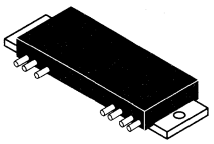

CASE 700
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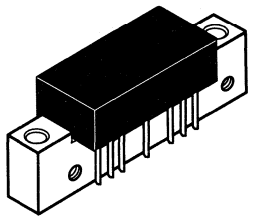
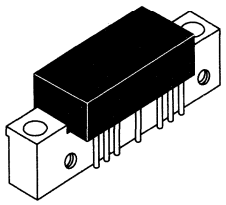
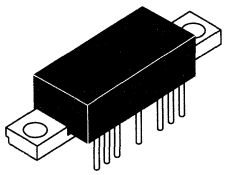


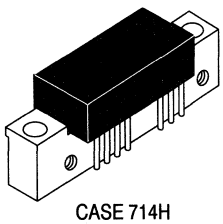
CASE 714
STYLE 1



CASE 714F
STYLE 1



CASE 714G
STYLE 1



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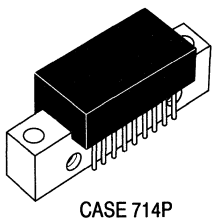
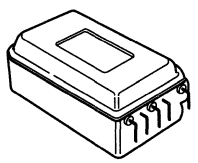
STYLE 1



CASE 714P
STYLE 2, 3



CASE 825A
STYLE 1

RF Amplifiers

High Power

Complete amplifiers with 50 ohm in/out impedances are available for a variety of applications including land mobile radios, base stations, TV transmitters and other uses requiring large-signal amplification, both linear and Class C. Frequencies covered range from 68–950 MHz with power levels extending to 180 watts.

Land Mobile/Portable

The advantages of small size, reproducibility and overall lower cost become more pronounced with increasing frequency of operation. These amplifiers offer a wide range in power levels and gain, with guaranteed performance specifications for bandwidth, stability and ruggedness.

Table 1. VHF/UHF, Class C

Device	P_{out} Output Power Watts	P_{in} Input Power Watts	f Frequency MHz	G_P Power Gain, Min dB	V_{CC} Supply Voltage Volts	Package/Style
68–210 MHz, VHF Band — Class C (Silicon Bipolar Die)						
MHW105	5	0.001	68–88	37	7.5	301K/3
MHW607-1	7	0.001	136–150	38.4	7.5	301K/3
MHW607-2	7	0.001	146–174	38.4	7.5	301K/3
MHW607-3	7	0.001	174–195	38.4	7.5	301K/3
MHW607-4	7	0.001	184–210	38.4	7.5	301K/3
400–512 MHz, UHF Band — Class C (Silicon Bipolar Die)						
MHW704-1	3	0.001	400 – 440	34.8	7.5	301J/1
MHW704-2	3	0.001	440 – 470	34.8	7.5	301J/1
MHW707-1	7	0.001	403 – 440	38.4	7.5	301J/1
MHW707-2	7	0.001	440 – 470	38.4	7.5	301J/1
MHW707-3	7	0.001	470 – 500	38.4	7.5	301J/1
MHW707-4	7(23)	0.001	490 – 512	38.4(23)	7.5	301J/1
MHW720A1(22)	20	0.15	400 – 440	21	12.5	700/1
MHW720A2(22)	20	0.15	440 – 470	21	12.5	700/1
MHW720A3	20	0.15	450 – 458	21	12.5	700/1
806–960 MHz, UHF Band — Class C (Silicon Bipolar Die)						
MHW851-1	1.6	0.001	820–850	32	6	301N/1
MHW851-2	1.6	0.001	870–905	32	6	301N/1
MHW851-3	2	0.001	890–915	33	6	301N/1
MHW851-4	1.6	0.001	915–925	32	6	301N/1
MHW803-1	2	0.001	820–850	33	7.5	301E/1
MHW803-2	2	0.001	806–870	33	7.5	301E/1
MHW803-3	2	0.001	870–905	33	7.5	301E/1
MHW804-1	4	0.001	800–870	36	7.5	301F/1
MHW804-2	4	0.001	896–940	36	7.5	301F/1
MHW806A1(22)	6	0.03	820–850	23	12.5	301H/2
MHW806A2(22)	6	0.03	806–870	23	12.5	301H/2
MHW806A3(22)	6	0.04	890–915	21.7	12.5	301H/2
MHW806A4(22)	6	0.04	870–950	21.7	12.5	301H/2
MHW812A3(22)	12	0.1	890–915	20.8	13	301H/2
806 – 960 MHz, UHF Band — Class C (G_aA_S FET Die)						
MHW9002-1(22)	1.4	0.005	824–849	24.5	5.8	420A/1
MHW9002-2(22)	1.4	0.005	870–905	24.5	5.8	420A/1
MHW9002-3(22)	1.6	0.005	890–915	25	5.8	420A/1
MHW9002-4(22)	1.4	0.005	898–925	24.5	5.8	420A/1

(22)Designed for Wide Range P_{out} Level Control

(23)P_o @ f = 490 MHz. P_o = 6.5 W @ f = 512 MHz

High Power: Land Mobile/Portable (continued)

Table 2. UHF, Linear

Device	P_{out} Output Power Watts	P_{in} Input Power Watts	f Frequency MHz	G_P Power Gain, Min dB	V_{CC} Supply Voltage Volts	Package/Style
806–960 MHz, UHF Band — Class AB (Silicon Bipolar Die)						
MHW927A(22)	6(24)	0.001	824–849	37.8	12.5	301AA/1
MHW927B(22)	6(24)	0.001	824–849	37.8	12.5	301AA/1
880–915 MHz (for GSM) — Class AB (Silicon Bipolar Die)						
MHW903(22)	3.5	0.001	890–915	35.4	7.2	413A/1
MHW953(22)	3.5	0.001	890–915	35.4	7.2	301V/1
MHW954(22)	3.5	0.1	890–915	15.4	7.2	301Y/1
MHW909(22)	9	0.1	890–915	19.5	7.2	301T/1
MHW912(22)	12	0.001	890–915	40.8	12.5	301R/1
MHW914(22)	14	0.001	890–915	41.4	12.5	301R/1
MHW915(22)	14	0.1	890–915	21.4	12.5	301T/1
MHW932(22)	32	0.1	890–915	26	12.5	301S/1

TV Transmitters

Table 3. UHF Ultra Linear for TV Applications

These amplifiers are characterized for ultra-linear applications in Band IV and Band V TV transmitters.

Device	Frequency MHz	P_{ref} Watts	G_P (Min)/Freq. Power Gain dB/MHz	3 Tone(8) IMD 1 dB	3 Tone(25) IMD 2 dB	V_{CC} Volts	Package/Style
ATV6031	470–860	20	10.5/860	–50	–53	26.5	389B/1
MRFA2600(26)★	470–860	20	10.5/860	–50	–53	26.5	429A/1
ATV6060	470–860	40	9/860	–50	–53	25.5	389U/1
MRFA2602(28)★	470–860	40	9/860	–50	–53	25.5	429C/1
RFA8090B★	470–860	95(11)	8/860	—	—	28	429E/1
RFA8180B★	470–860	180(11)	8/860	—	—	28	429/1

(8)Vision Carrier: – 8 dB; Sound Carrier: – 7 dB; Sideband Carrier: – 16 dB

(11)Output power at 1 dB compression in Class AB

(22)Designed for Wide Range P_{out} Level Control

(24)Average Power; Peak Power is twice average power

(25)Vision Carrier: – 8 dB; Sound Carrier: – 10 dB; Sideband Carrier: – 16 dB

(26)Formerly known as "RFA6031"

(28)Formerly known as "RFA6060"

★New Product

Low Power

The following categories describe a wide range of complete amplifier assemblies both hybrid and monolithic for use in CATV distribution systems, instrumentation, communications and military equipment. A variety of power levels and frequencies of operation is offered for many applications.

CATV Distribution

Motorola Hybrids are manufactured using die technology which has set new standards for CATV system performance and reliability. These hybrids have been optimized to provide premium performance in all CATV systems up to 152 channels.

Table 4. 5–200 MHz Hybrids

Device	Hybrid Gain (Nominal) dB	Channel Loading Capacity	Maximum Distortion Specifications: Output Level dBmV	2nd Order Test[30] dB	Composite Triple Beat dB: 22 CH	Composite Triple Beat dB: 26 CH	Cross Modulation dB: 22 CH	Cross Modulation dB: 26 CH	Noise Figure @ 175 MHz dB	Package/ Style
Reverse Amplifiers										
MHW1134	13	22	+50	–72	–73	–71[19]	–65	–65[19]	7	714/1
MHW1224	22	22	+50	–72	–71	–68[19]	–62	–62[19]	5.5	714/1
MHW1244	24	22	+50	–72	–70	–68[19]	–61	–61[19]	5	714/1

Table 5. 40–450 MHz Hybrids

Device	Hybrid Gain (Nominal) dB	Channel Loading Capacity	Maximum Distortion Specifications: Output Level dBmV	2nd Order Test dB	Composite Triple Beat dB: 60 CH	Cross Modulation dB: 60 CH	Noise Figure @ 450 MHz dB: Typ	Package/ Style
Conventional Hybrids								
MHW5122A	12	60	+46	–72[31]	–58	–61	7	714/1
MHW5142A	14	60	+46	–74[31]	–61	–62	6	714/1
MHW5172A	17	60	+46	–74[31]	–60	–62	6	714/1
MHW5182A	18	60	+46	–72[31]	–61	–59	5.5	714/1
MHW5183	18	60	+46	–62[31][32]	–58	–57	4.5	714/1
MHW5222A	22	60	+46	–72[31]	–60	–59	4.5	714/1
MHW5272A	27	60	+46	–72[31]	–59	–60	5.5	714/1
MHW5342A	34	60	+46	–72[31]	–59	–59	5	714/1
MHW5382A	38	60	+46	–70[31]	–59	–59	4	714/1
CA97901	21.2[44]	30	+46	–65	–65	–65	5.5	714F/1
Power Doubling Hybrids								
MHW5185B★	18	60	+46	–67[32]	–67	–67	5.5	714/1
MHW5205	20	60	+46	–58[33]	–64	–64	5.5	714/1
MHW5225	22	60	+46	–69[31]	–62	–60	5	714/1
Feedforward Hybrids								
MFF124B	24	60	+46	–84[31]	–79	–75	10[34]	825A/1

[19]Typical
[30]Channels 2 and A @ 7
[31]Channels 2 and M13 @ M22
[32]Composite 2nd order; V_{out} = +46 dBmV/ch
[33]Composite 2nd order IMD, 60 channel flat
[34]Maximum
[44]Hi-Slope Trunk Amplifier. The specified gain is at 450 MHz.
★New Product

Low Power: CATV Distribution (continued)

Table 6. 40–550 MHz Hybrids

Device	Hybrid Gain (Nom.) dB	Channel Loading Capacity	Maximum Distortion Specifications: Output Level dBmV	2nd Order Test dB	Composite Triple Beat dB: 77 CH	Composite Triple Beat dB: 87 CH	Cross Modulation dB: 77 CH	Cross Modulation dB: 87 CH	Noise Figure @ 550 MHz dB Typ	Package/ Style
Conventional Hybrids										
MHW6122	12	77	+44	–74(35)	–56	—	–62	—	7	714/1
MHW6142	14	77	+44	–72(35)	–59	—	–62	—	6.5	714/1
MHW6172	17	77	+44	–70(35)	–59	—	–62	—	6	714/1
MHW6182	18	77	+44	–72(35)	–58	—	–62	—	6	714/1
MHW6183	18	77	+44	–58(36)	–58	—	–58	—	5	714/1
MHW6222	22	77	+44	–66(35)	–57	—	–57	—	5	714/1
MHW6272	27	77	+44	–64(35)	–57	—	–57	—	6	714/1
MHW6342	34	77	+44	–64(35)	–57	—	–57	—	5.5	714/1
Power Doubling Hybrids										
MHW6185B★	18	77	+44	–65(36)	–65	—	–68	—	6	714/1
MHW6205★	20	77	+44	–60(36)	–64	—	–67	—	7.5	714/1
MHW6225★	22	77	+44	–55(36)	–62	—	–63	—	7.0	714/1
Feedforward Hybrids										
MFF224B	24	77	+44	–86(35)	–75	—	–70	—	11(34)	825A/1

Table 7. 40–600 MHz Hybrids

Device	Hybrid Gain (Nom.) dB	Channel Loading Capacity	Maximum Distortion Specifications: Output Level dBmV	2nd Order Test dB	Composite Triple Beat dB: 85 CH	Composite Triple Beat dB: 87 CH	Cross Modulation dB: 85 CH	Cross Modulation dB: 87 CH	Noise Figure @ 600 MHz dB Typ	Package/ Style
Conventional Hybrids										
MHW6182-6	18	87	+44	–56(36)	—	–57	—	–55	6	714/1
MHW6222-6	22	87	+44	–56(36)	—	–56	—	–56	6	714/1
Power Doubling Hybrids										
MHW6185-6★	18	87	+44	–60(36)	—	–62	—	–66	5(34)	714/1
Feedforward Hybrids										
MFF324B	24	85	+44	–86(38)	–73	—	–68	—	12.5	825A/1

(34)Maximum

(35)Channels 2 and M30 @ M39

(36)Composite 2nd order; V_{out} = +44 dBmV/ch

(37)600 MHz versions of the Conventional and Power Doubling Hybrids are available upon request. Please consult factory.

(38)Channels 2 and M39 @ M48

★New Product

Low Power: CATV Distribution (continued)

Table 8. 40–750/860 MHz Hybrids

Device	Hybrid Gain (Nom.) dB	Channel Loading Capacity	Maximum Distortion Specifications: Output Level dBmV	2nd Order Test dB	Composite Triple Beat dB: 110 CH	Composite Triple Beat dB: 128 CH	Cross Modulation dB: 110 CH	Cross Modulation dB: 128 CH	Noise Figure Typ dB: @ 750 MHz	Noise Figure Typ dB: @ 860 MHz	Package/ Style
Conventional Hybrids											
MHW7182★	18	110	+44	−62(39)	−62	—	−64	—	5.5	—	714/1
MHW8182★	18	128	+38	−60(40)	—	−60	—	−60	—	6.0	714/1
MHW7222★	22	110	+40	−55(39)	−60	—	−60	—	5.5	—	714/1
MHW8222★	22	128	+38	−56(40)	—	−60	—	−60	—	6.4	714/1

Table 9. 40–860 MHz Hybrids

Device	Gain (Typ) dB	Frequency MHz	V_{CC} Volts	2nd Order IMD (Max) @ V_{out} = 50 dBmV/ch	DIN45004B @ f=860 MHz (Min) dBμV	Noise Figure @ 860 MHz (Max) dB	Package/ Style
Conventional Hybrids							
CA901	17	40 – 860	24	−60	120	8	714P/2
CA901A	17	40 – 860	24	−64	120	8	714P/2
Power Doubling Hybrids							
CA902	17	40 – 860	28	−63	123	9.5	714P/2
CA902A	17	40 – 860	28	−67	123	9.5	714P/2
CA922	17	40 – 860	24	−63	123	9.5	714P/2
CA922A	17	40 – 860	24	−67	123	9.5	714P/2
CA912	17	40 – 860	15	−63	123	9.5	714P/3
CA912A	17	40 – 860	15	−67	123	9.5	714P/3

Table 10. 40–1000 MHz Hybrids

Device	Hybrid Gain (Nom.) dB	Channel Loading Capacity	Maximum Distortion Specifications: Output Level dBmV	2nd Order Test dB	Composite Triple Beat dB: 128 CH	Composite Triple Beat dB: 152 CH	Cross Modulation dB: 128 CH	Cross Modulation dB: 152 CH	Noise Figure @ 1000 MHz dB: Typ	Package/ Style
Conventional Hybrids										
MHW9182★	18	152	+38	−59(40)	—	−59	—	−59	6.5	714/1

(39)Composite 2nd order; V_{out} = +40 dBmV/ch

(40)Composite 2nd Order; V_{out} = +38 dBmV/ch

★New Product

Low Power: CATV Distribution (continued)

Table 11. Standard Linear Hybrids

The CA series of RF linear hybrid amplifiers consists of a family of medium power, broadband gain blocks in the CATV industry standard "CA" package. These amplifiers were designed for multi-purpose RF applications where linearity, dynamic range and wide bandwidth are of primary concern. Each amplifier is available in various package options. Eleven parts are available as indicated in a low profile package. Arrangement within the group is in order of increasing maximum frequency.

Device	BW MHz	Gain Flatness Typ ±dB	Gain/Freq. Typ dB/MHz	P_{1dB} Typ dBm	NF/Freq. Typ dB/MHz	3rd Order Intercept Point/Freq. Typ dBm/MHz	VSWR Max 50 Ω/75Ω	V_S/I_S Typ V/mA	Case/ Style
CA2830C	5–200	0.5	34.5/100	29	4.7/200	46/200	2/—	24/300	714F/1
CA2832C	1–200	0.5	35.5/100	33	5/200	47/200	2/—	28/435	714F/1
CA2833C	5–200	0.5	34.5/100	29	4.7/200	46/200	2/—	24/300	714G/1
CA2842C	10–400	0.5	22/100	32	4/100	44/300	1.5/—	24/230	714F/1
CA2810C	10–450	1.5	34/50	30	—/300	43/300	2/1.3	24/310	714F/1
CA2818C	10–400	0.5	18.5/50	30	5/200	45/200	2/—	24/205	714F/1
CA4800C(41)	10–1000	1	17.5/1000	26	7.5/1000	38/1000	2.6/—	24/220	714P/2
CA4812C	10–1000	1	17.5/1000	26	7.5/1000	38/1000	2.6/—	12/380	714P/3
CA4815C(41)	10–1000	1	17.5/1000	26	7.5/1000	38/1000	2.6/—	15/380	714P/3
CA5800C	10–1000	1	15.5/1000	30	8.5/1000	40.5/1000	2.6/—	28/400	714P/2
CA5801(41)	50–1000	1	17.5/1000	30	8.5/1000	41.5/1000	2.6/—	28/400	714P/2
CA5815C(41)	10–1000	1	15.5/1000	30	8.5/1000	40.5/1000	2.6/—	15/700	714P/3

(41)Available in thin flange package (714T) by adding suffix "S" after part number, i.e. CA4800CS.

CRT Drivers

Table 12. Video Amplifiers

These complete hybrid amplifiers are specifically designed for CRT driver applications requiring high frequency response and high voltage, such as high resolution color graphics video monitors. Gold metallized die and substrates are used to insure high reliability and improved ruggedness.

Device	V_{CC} (nom) Volts	Gain(42) V/V	t_r/t_f (Typ)(43) nsec	3 dB BW (Typ)(43) MHz	V_{out} (Max) Volts	Load	Package/Style
CR2428★	60	12	2.0	145	50 P-P	6 to 20 pF	431A/1
CR3428★	80	12	2.2	130	70 P-P	6 to 20 pF	431A/1

(42)Insertion Gain; 50 Ohm Source

(43)Capacitive Load 8.5 pF, V_{out} = 40 V P-P

★New Product

Literature

Application Notes and Engineering Bulletins of special interest to designers of RF equipment are listed below and are available through Motorola sales offices or distributors.

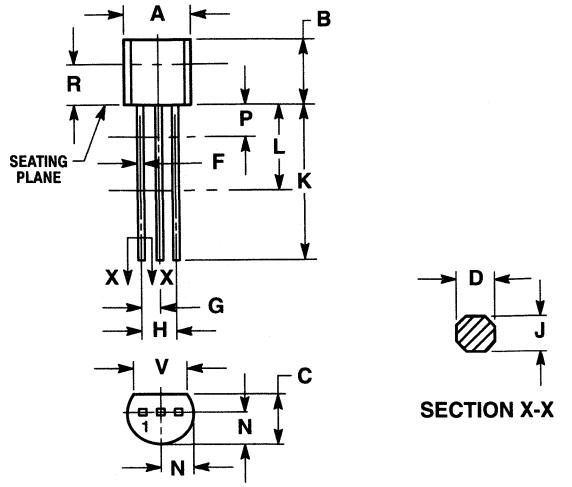
AN438	300 W, 88 – 108 MHz Amplifier Using the TP1940 MOSFETs Push-Pull Transistor
AN555	Mounting Stripline-Opposed Emitter (SOE) Transistors
AN593	Broadband Linear Power Amplifiers Using Push-Pull Transistors
AN721	Impedance Matching Networks Applied to RF Power Transistors
AN758	A Two-Stage 1 kW Solid-State Linear Amplifier
AN779	Low-Distortion 1.6 to 30 MHz SSB Driver Design
AN790	Thermal Rating of RF Power Transistors
AN791	A Simplified Approach to VHF Power Amplifier Design
AN793	A 15-Watt AM Aircraft Transmitter Power Amplifier Using Low-Cost Plastic Transistors
AN860	Power MOSFETs Versus Bipolar Transistors
AN878	VHF MOS Power Applications
AN923	800 MHz Test Fixture Design
AN938	Mounting Techniques for PowerMacro Transistor
AN955	A Cost Effective VHF Amplifier for Land Mobile Radios
AN1020	A High Performance Video Amplifier for High Resolution CRT Applications
AN1021	A Hybrid Video Amplifier for High Resolution CRT Applications
AN1022	Mechanical and Thermal Considerations in Using RF Linear Hybrid Amplifiers
AN1023	Mounting Techniques for RF Hermetic Packages
AN1024	RF Linear Hybrid Amplifiers
AN1025	Reliability Considerations in Design and Use of RF Integrated Circuits
AN1026	Extending the Range of an Intermodulation Distortion Test
AN1027	Reliability/Performance Aspects of CATV Amplifier
AN1028	35/50 Watt Broadband (160–240 MHz) Push-Pull TV Amplifier Band III
AN1029	TV Transposers Band IV and V, P_O = 0.5 W/1W
AN1030	1 W/2 W Broadband TV Amplifier, Band IV and V
AN1032	How Load VSWR Affects Non-Linear Circuits
AN1033	Match Impedances in Microwave Amplifiers
AN1034	Three Balun Designs for Push-Pull Amplifiers
AN1037	Solid State Power Amplifier — 300 Watt, FM
AN1038	1.2 V, 40–900 MHz Broadband Amplifier With the TP3400 Transistor
AN1039	470–860 MHz — Broadband Amplifier — 5W
AN1040	Mounting Considerations for Power Semiconductors
AN1041	Mounting Procedures for Very High Power RF Transistors
AN1047	Electrical Characteristics of the CR2424 and CR2425 CRT Driver Hybrid Amplifiers
AN1061	Reflecting on Transmission Line Effects
AN1103	Using the CR3424 for High Resolution CRT Applications
AN1106	Considerations in Using the MHW801/851 Series RF Power Modules
AN1107	Understanding RF Datasheet Parameters
AN1306	Thermal Distortion in Video Amplifiers
AR141	Applying Power MOSFETs in Class D/E RF Power Amplifier Design
AR144S	Switching MOSFETs Suit Linear 500-W HF Amp
AR165S	RF Power MOSFETs
AR176	New MOSFETs Simplify High Power RF Amplifier Design
AR179	RF Power Transistors Catapult Into High-Power Systems
AR305	Building Push-Pull, Multioctave, VHF Power Amplifiers
AR313	Wideband RF Power Amplifier
AR346	RF POWER FETs, Their Characteristics and Applications
AR347	A Compact 1-kW 2–50 MHz Solid State Linear Amplifier
AR510	VSWR Protection of Solid State RF Power Amplifiers
AR511	Biasing Solid State Amplifiers to Linear Operation

Literature (continued)

EB17A	Simple VHF Broadband Design Uses CQ Transistor Lineup
EB27A	Get 300 Watts PEP Linear Across 2 to 30 MHz From This Push-Pull Amplifier
EB29	The Comon Emitter TO-39 and Its Advantages
EB46	A Single-Device, 80-Watt, 50 Ohm VHF Amplifier
EB53	Two VHF High Band Gain Blocks from 20 dB, 30 Watt Amplifier Chain
EB63	140 Watt (PEP) Amateur Radio Linear Amplifier 2–30 MHz
EB70A	Frequency Multiplication Simplified by Internal Shield in MRF629
EB74	A Ten Watt 225–400 MHz Amplifier
EB77	A 60-Watt 225–400 MHz Amplifier-2N6439
EB89	A 1-Watt, 2.3 GHz Amplifier
EB90	Low-Cost VHF Amplifier Has Broadband Performance
EB93	60-Watt VHF Amplifier Uses Splitting/Combining Techniques
EB104	Get 600 Watts RF from Four Power FETs
EB105	A 30 Watt, 800 MHz Amplifier Design
EB107	Mounting Considerations for Motorola RF Power Modules
EB109	Low Cost UHF Device Gives Broadband Performance at 3.0 Watts Output

Consult your nearest Motorola sales office or franchised distributor for copies of desired notes.

Package Outlines

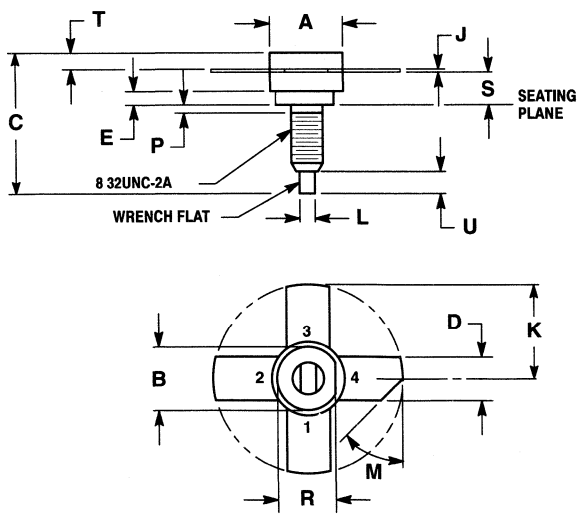


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. CONTOUR OF PACKAGE BEYOND DIM R IS UNCONTROLLED.
4. DIM F APPLIES BETWEEN P AND L. DIM D AND J APPLIES BETWEEN L AND K MINIMUM. LEAD DIM IS UNCONTROLLED IN P AND BEYOND DIM K MINIMUM.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.175	0.205	4.45	5.20
B	0.170	0.210	4.32	5.33
C	0.125	0.165	3.18	4.19
D	0.016	0.022	0.41	0.55
F	0.016	0.019	0.41	0.48
G	0.045	0.055	1.15	1.39
H	0.095	0.105	2.42	2.66
J	0.015	0.020	0.39	0.50
K	0.500	—	12.70	—
L	0.250	—	6.35	—
N	0.080	0.105	2.04	2.66
P	—	0.100	—	2.54
R	0.115	—	2.93	—
V	0.135	—	3.43	—

STYLE 2:
PIN 1. BASE
2. EMITTER
3. COLLECTOR

CASE 29-04

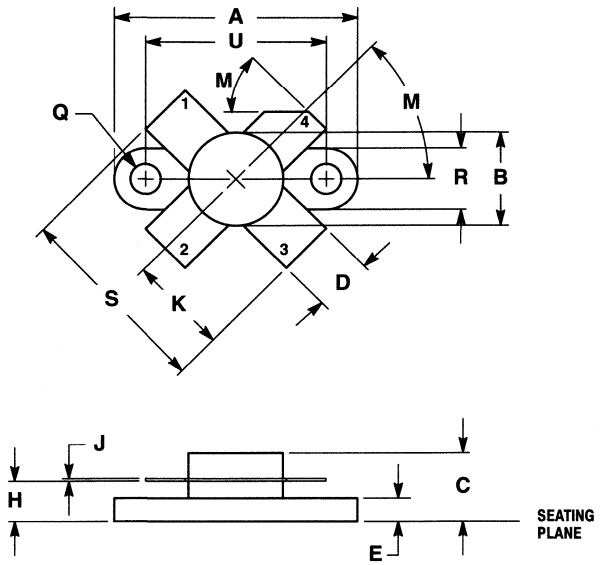


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.370	0.385	9.40	9.78
B	0.320	0.330	8.13	8.38
C	0.670	0.790	17.02	20.07
D	0.215	0.235	5.46	5.97
E	0.070	—	1.78	—
J	0.003	0.007	0.08	0.18
K	0.490	—	12.45	—
L	0.055	0.070	1.40	1.78
M	45° NOM		45° NOM	
P	—	0.050	—	1.27
R	0.299	0.307	7.59	7.80
S	0.158	0.178	4.01	4.52
T	0.083	0.100	2.11	2.54
U	0.098	0.132	2.49	3.35

STYLE 1:
PIN 1. EMITTER
2. BASE
3. EMITTER
4. COLLECTOR

CASE 145A-09



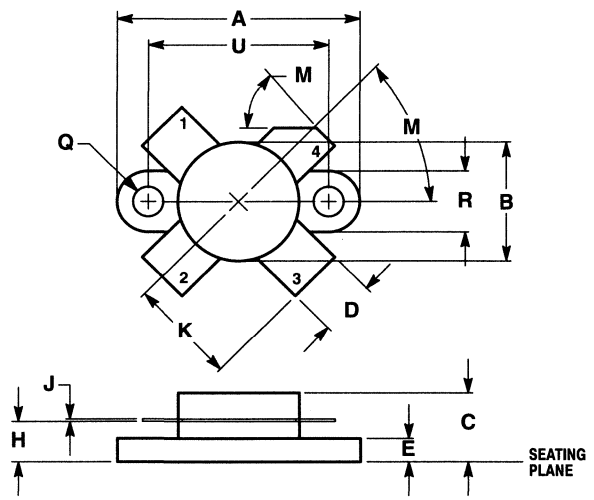
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.960	0.990	24.39	25.14
B	0.370	0.390	9.40	9.90
C	0.229	0.281	5.82	7.13
D	0.215	0.235	5.47	5.96
E	0.085	0.105	2.16	2.66
H	0.150	0.180	3.81	4.57
J	0.004	0.006	0.11	0.15
K	0.395	0.405	10.04	10.28
M	40°	50°	40°	50°
Q	0.113	0.130	2.88	3.30
R	0.245	0.255	6.23	6.47
S	0.790	0.810	20.07	20.57
U	0.720	0.730	18.29	18.54

STYLE 1:
PIN 1. EMITTER
2. BASE
3. EMITTER
4. COLLECTOR

STYLE 2:
PIN 1. SOURCE
2. GATE
2. SOURCE
2. DRAIN

CASE 211-07



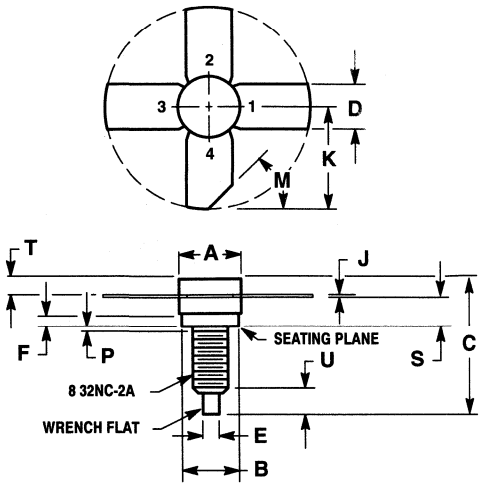
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.960	0.990	24.39	25.14
B	0.465	0.510	11.82	12.95
C	0.229	0.275	5.82	6.98
D	0.216	0.235	5.49	5.96
E	0.084	0.110	2.14	2.79
H	0.144	0.178	3.66	4.52
J	0.003	0.007	0.08	0.17
K	0.435	—	11.05	—
M	45° NOM		45° NOM	
Q	0.115	0.130	2.93	3.30
R	0.246	0.255	6.25	6.47
U	0.720	0.730	18.29	18.54

STYLE 1:
PIN 1. EMITTER
2. BASE
3. EMITTER
4. COLLECTOR

STYLE 2:
PIN 1. SOURCE
2. GATE
3. SOURCE
4. DRAIN

CASE 211-11

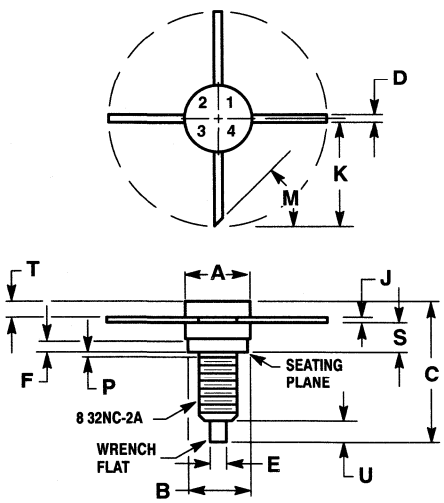


DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	7.06	7.26	0.278	0.286
B	6.20	6.50	0.244	0.256
C	14.99	16.51	0.590	0.650
D	5.46	5.96	0.215	0.235
E	1.40	1.65	0.055	0.065
F	1.52	—	0.060	—
J	0.08	0.17	0.003	0.007
K	11.05	—	0.435	—
M	45° NOM		45° NOM	
P	—	1.27	—	0.050
S	3.00	3.25	0.118	0.128
T	1.40	1.77	0.055	0.070
U	2.92	3.68	0.115	0.145

STYLE 1:
PIN 1. EMITTER
2. BASE
3. EMITTER
4. COLLECTOR

STYLE 3:
PIN 1. SOURCE
2. GATE
3. SOURCE
4. DRAIN

CASE 244-04

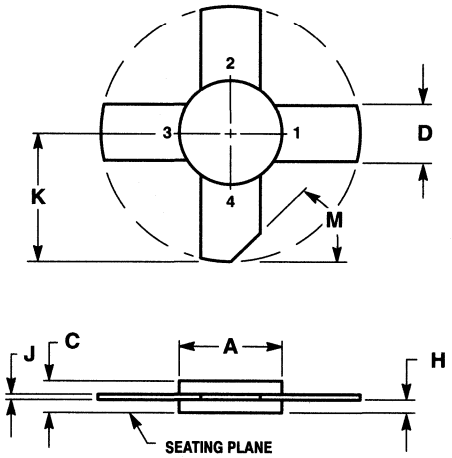


DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	7.06	7.26	0.278	0.286
B	6.20	6.50	0.244	0.256
C	15.24	16.51	0.600	0.650
D	0.66	0.86	0.026	0.034
E	1.40	1.65	0.055	0.065
F	1.52	—	0.060	—
J	0.10	0.15	0.004	0.006
K	11.17	—	0.440	—
M	45° NOM		45° NOM	
P	—	1.27	—	0.050
S	2.74	3.35	0.108	0.132
T	1.40	1.78	0.055	0.070
U	2.92	3.68	0.115	0.145

STYLE 1:
PIN 1. EMITTER
2. BASE
3. EMITTER
4. COLLECTOR

STYLE 3:
PIN 1. BASE
2. EMITTER
3. BASE
4. COLLECTOR

CASE 244A-01

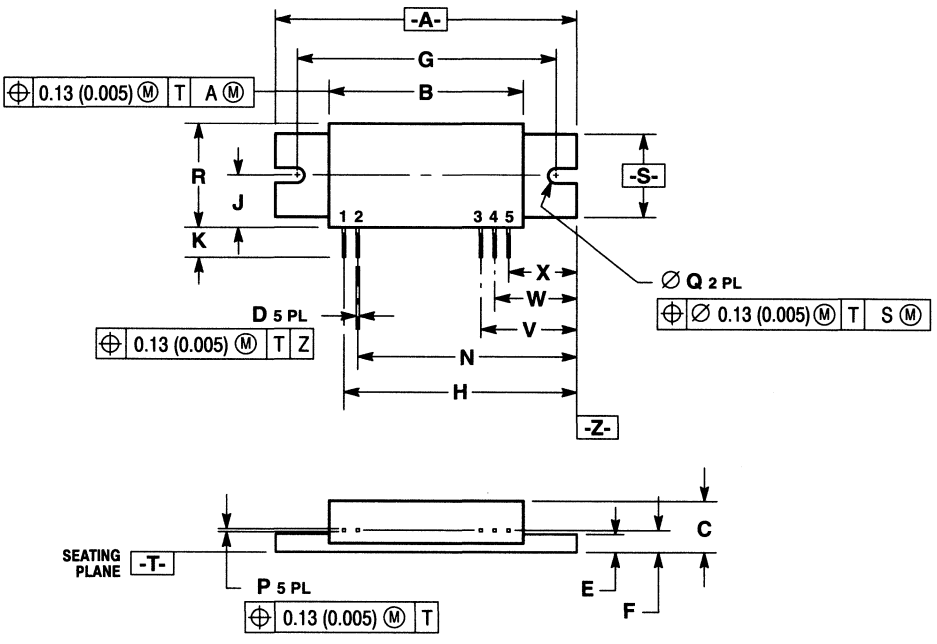


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. SEATING PLANE = GROUND AND IS CONNECTED TO PIN 1 AND 3.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.278	0.286	7.06	7.26
C	0.112	0.136	2.84	3.45
D	0.215	0.235	5.46	5.97
H	0.055	0.065	1.40	1.65
J	0.003	0.007	0.08	0.18
K	0.435	—	11.05	—
M	45° REF		45° REF	

STYLE 1:
PIN 1. EMITTER
2. BASE
3. EMITTER
4. COLLECTOR

CASE 249-05



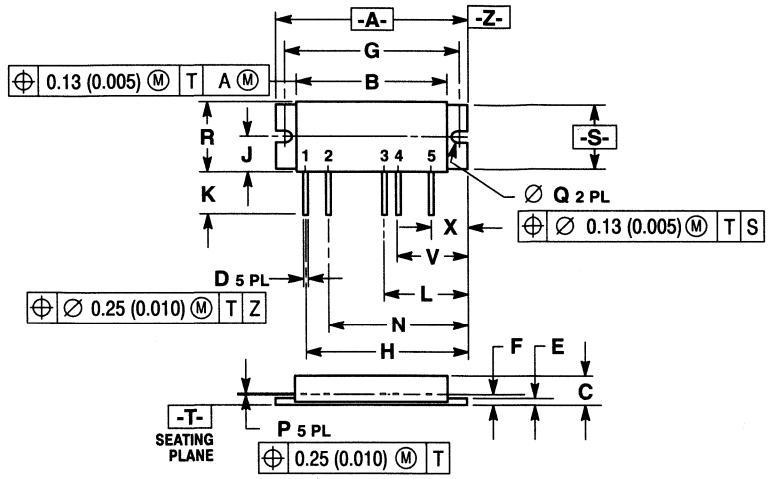
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION F TO CENTER OF LEADS.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	2.190	2.210	55.63	56.13
B	1.395	1.415	35.44	35.94
C	0.355	0.380	9.02	9.65
D	0.018	0.022	0.46	0.55
E	0.120	0.135	3.05	3.42
F	0.164 BSC		4.16 BSC	
G	1.900 BSC		48.26 BSC	
H	1.700 BSC		43.18 BSC	
J	0.345	0.385	8.77	9.77
K	0.225	—	5.72	—
N	1.600 BSC		40.64 BSC	
P	0.008	0.012	0.21	0.30
Q	0.150	0.160	3.81	4.06
R	0.690	0.770	17.53	19.55
S	0.595	0.615	15.12	15.62
V	0.700 BSC		17.78 BSC	
W	0.600 BSC		15.24 BSC	
X	0.500 BSC		12.70 BSC	

STYLE 1:
PIN 1. RF INPUT
2. V_{BIAS} (8.0 V)
3. V_{CC2} (12.5 V)
4. V_{CC3} (12.5 V)
5. RF OUTPUT

CASE 301AA-01

PACKAGE OUTLINES (continued)

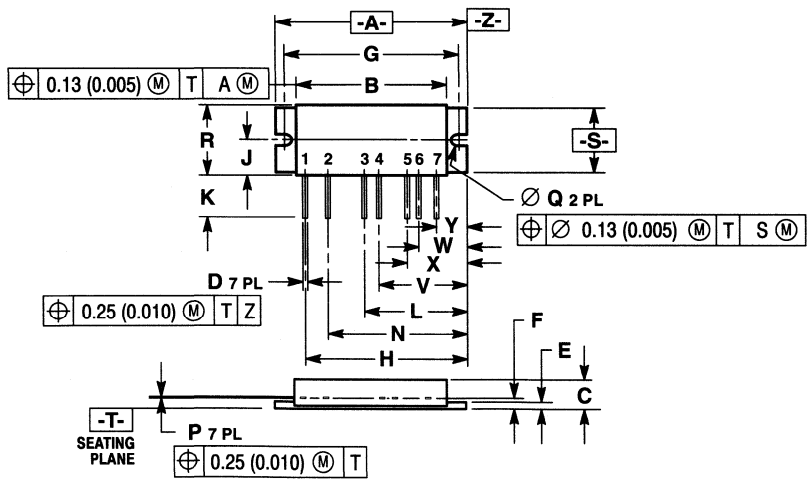


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION F TO CENTER OF LEADS.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	1.760	1.780	44.71	45.21
B	1.370	1.390	34.80	35.30
C	0.245	0.265	6.23	6.73
D	0.018	0.022	0.46	0.55
E	0.080	0.100	2.04	2.54
F	0.130 BSC		3.30 BSC	
G	1.650 BSC		41.91 BSC	
H	1.485 BSC		37.72 BSC	
J	0.267	0.278	6.79	7.06
K	0.230	0.300	5.85	7.62
L	0.785 BSC		19.94 BSC	
N	1.285 BSC		32.64 BSC	
P	0.008	0.012	0.21	0.30
Q	0.120	0.130	3.05	3.30
R	0.535	0.555	13.59	14.09
S	0.445	0.465	11.31	11.81
V	0.685 BSC		17.40 BSC	
X	0.385 BSC		9.78 BSC	

STYLE 1:
PIN 1. RF INPUT/V CONT
2. VS1
3. VS2
4. VS3
5. RF OUTPUT
CASE: GROUND

CASE 301E-04

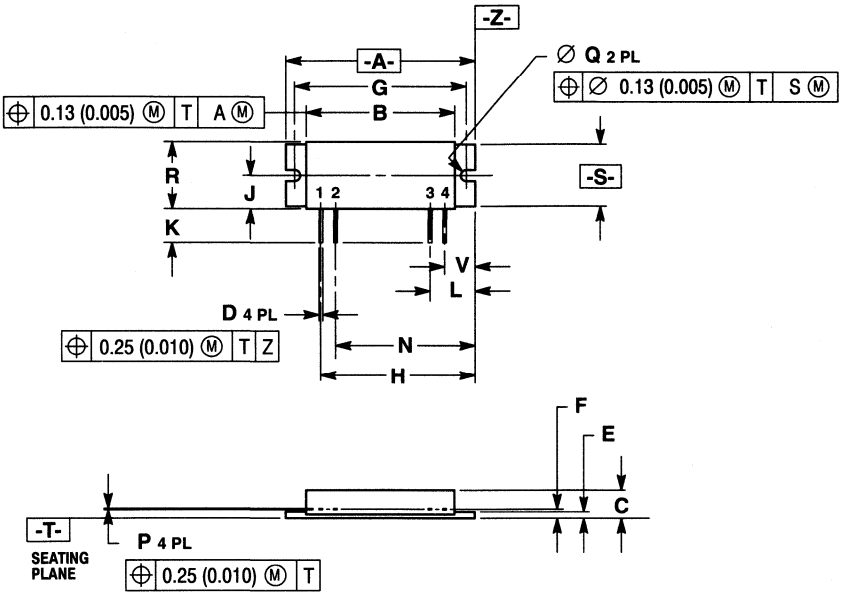


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION F TO CENTER OF LEADS.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	2.380	2.395	60.46	60.83
B	1.970	1.990	50.04	50.54
C	0.250	0.265	6.35	6.73
D	0.018	0.022	0.46	0.55
E	0.085	0.100	2.16	2.54
F	0.132 BSC		3.35 BSC	
G	2.260 BSC		57.40 BSC	
H	2. 042 BSC		51.87 BSC	
J	0.267	0.278	6.78	7.06
K	0.230	0.300	5.85	7.62
L	1.242 BSC		31.55 BSC	
N	1.742 BSC		44.25 BSC	
P	0.008	0.012	0.21	0.30
Q	0.120	0.130	3.05	3.30
R	0.535	0.555	13.59	14.09
S	0.445	0.465	11.31	11.81
V	1.142 BSC		29.01 BSC	
W	0.542 BSC		13.77 BSC	
X	0.642 BSC		16.31 BSC	
Y	0.342 BSC		8.69 BSC	

STYLE 1:
PIN 1. RF INPUT/V CONT
2. VS1
3. VS2
4. VS3
5. VS4
6. VS5
7. RF OUTPUT
CASE: GROUND

CASE 301F-03

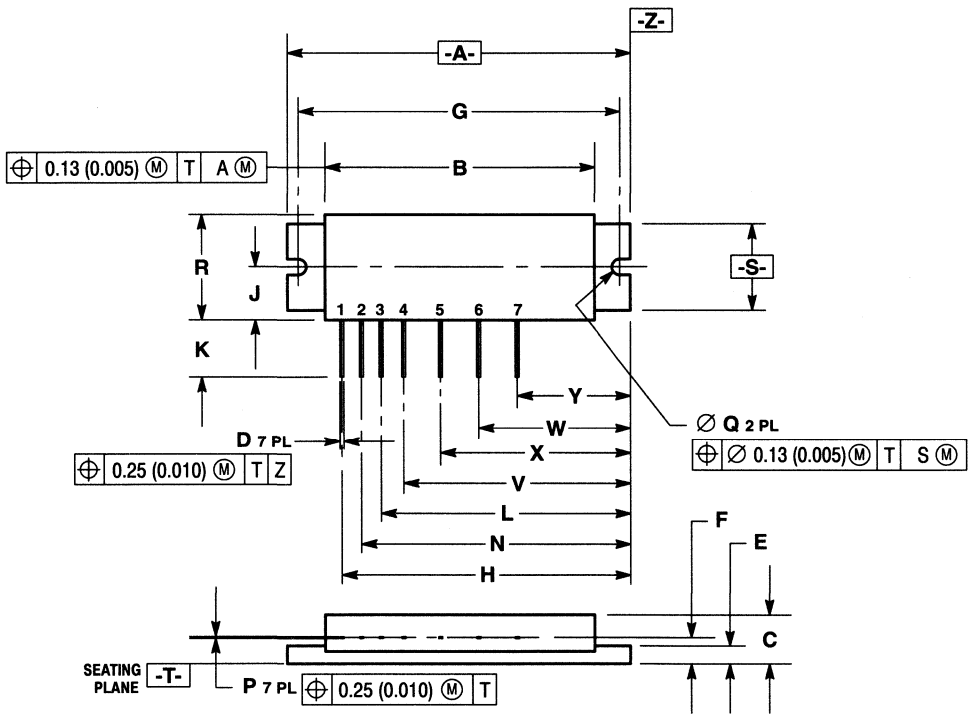


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION F TO CENTER OF LEADS.

DIM	INCHES MIN	INCHES MAX	MILLIMETERS MIN	MILLIMETERS MAX
A	1.890	1.910	48.01	48.51
B	1.170	1.190	29.72	30.22
C	0.350	0.376	8.89	9.55
D	0.018	0.022	0.46	0.55
E	0.120	0.135	3.05	3.42
F	0.160 BSC		4.06 BSC	
G	1.600 BSC		40.64 BSC	
H	1.400 BSC		35.56 BSC	
J	0.345	0.385	8.77	9.77
K	0.225	—	5.72	—
L	0.700 BSC		17.78 BSC	
N	1.300 BSC		33.02 BSC	
P	0.008	0.012	0.21	0.30
Q	0.150	0.160	3.81	4.06
R	0.685	0.770	17.40	19.55
S	0.595	0.610	15.12	15.49
V	0.500 BSC		12.70 BSC	

STYLE 2:
PIN 1. RF INPUT
2. +DC (CONTROL)
3. +DC (SUPPLY)
4. RF OUTPUT
CASE: GROUND

CASE 301H-03



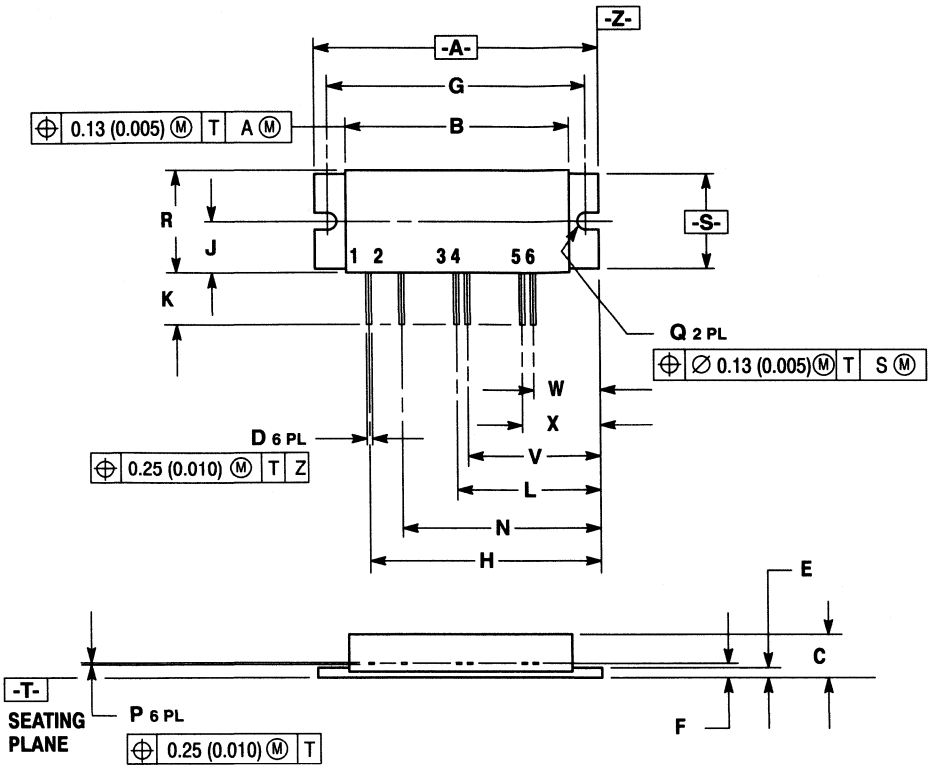
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION F TO CENTER OF LEADS.

DIM	INCHES MIN	INCHES MAX	MILLIMETERS MIN	MILLIMETERS MAX
A	1.765	1.780	44.84	45.21
B	1.370	1.390	34.80	35.30
C	0.250	0.265	6.35	6.73
D	0.018	0.022	0.46	0.55
E	0.085	0.100	2.16	2.54
F	0.132 BSC		3.35 BSC	
G	1.654 BSC		42.02 BSC	
H	1.487 BSC		37.77 BSC	
J	0.267	0.278	6.79	7.06
K	0.150	0.450	3.81	11.43
L	1.287 BSC		32.69 BSC	
N	1.387 BSC		35.23 BSC	
P	0.008	0.012	0.21	0.30
Q	0.120	0.130	3.05	3.30
R	0.535	0.555	13.59	14.09
S	0.445	0.465	11.31	11.81
V	1.187 BSC		30.15 BSC	
W	0.787 BSC		19.99 BSC	
X	0.987 BSC		25.07 BSC	
Y	0.587 BSC		14.91 BSC	

STYLE 1:
PIN 1. RF INPUT
2. VSI
3. VCONT
4. VS2
5. VS3
6. VS4
7. RF OUTPUT
CASE: GROUND

CASE 301J-02

PACKAGE OUTLINES (continued)

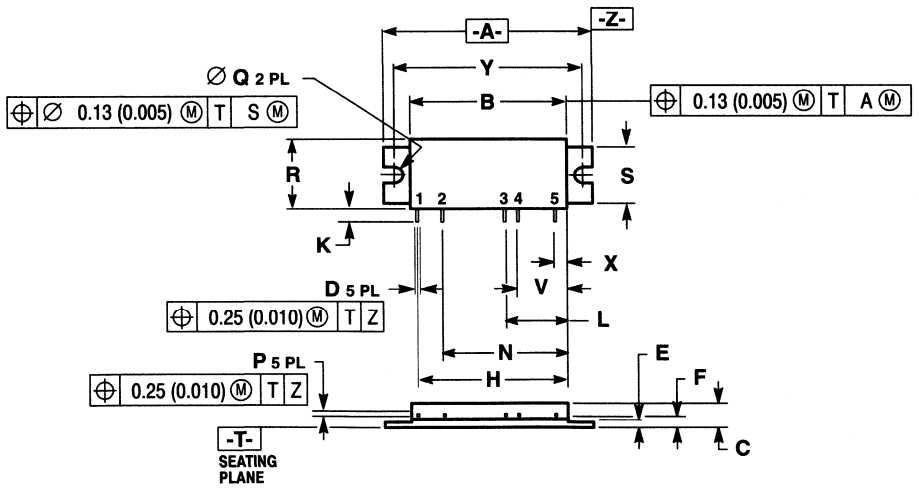


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION F TO CENTER OF LEADS.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	1.770	1.785	44.96	45.34
B	1.370	1.390	34.80	35.31
C	0.250	0.265	6.35	6.73
D	0.018	0.022	0.46	0.55
E	0.085	0.100	2.16	2.54
F	0.132 BSC		3.35 BSC	
G	1.655 BSC		42.04 BSC	
H	1.490 BSC		37.85 BSC	
J	0.267	0.278	6.78	7.06
K	0.230	0.300	5.85	7.62
L	0.990 BSC		25.15 BSC	
N	1.290 BSC		32.77 BSC	
P	0.008	0.012	0.21	0.30
Q	0.120	0.130	3.05	3.30
R	0.535	0.555	13.59	14.09
S	0.445	0.465	11.31	11.81
V	0.890 BSC		22.61 BSC	
W	0.285 BSC		7.24 BSC	
X	0.390 BSC		9.91 BSC	

STYLE 3:
PIN 1. RF INPUT
2. VS1
3. VCONT
4. VS2
5. VS3
6. RF OUTPUT
CASE: GROUND

CASE 301K-02

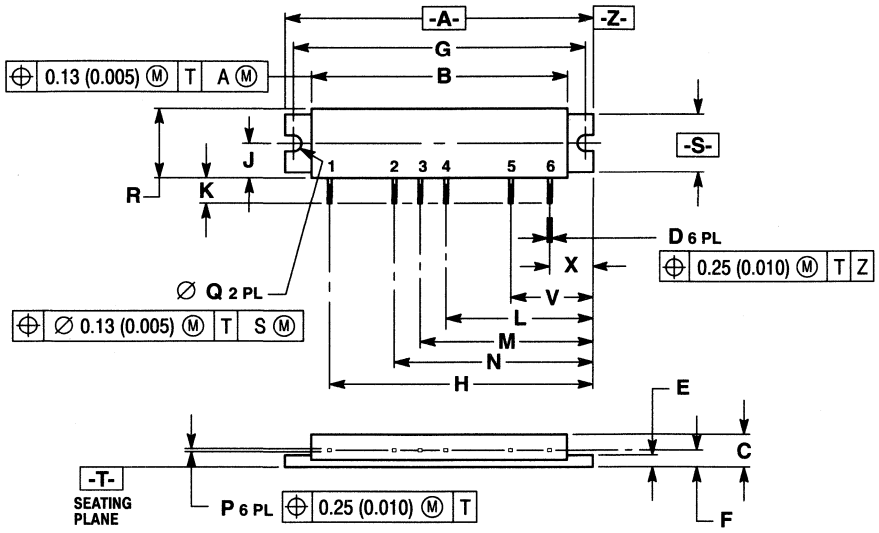


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION F TO CENTER OF LEADS.

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	42.80	43.05	1.685	1.695
B	32.01	32.38	1.260	1.275
C	4.45	4.75	0.175	0.187
D	0.46	0.55	0.018	0.022
E	1.02	1.14	0.040	0.045
F	1.96	2.41	0.077	0.095
H	30.61 BSC		1.205 BSC	
K	2.54	—	0.100	—
L	12.83 BSC		0.505 BSC	
N	25.53 BSC		1.005 BSC	
P	0.21	0.30	0.008	0.012
Q	3.05	3.30	0.120	0.130
R	13.85	14.22	0.545	0.560
S	11.43	11.68	0.450	0.460
V	10.29 BSC		0.405 BSC	
X	2.67 BSC		0.105 BSC	
Y	38.99 BSC		1.535 BSC	

STYLE 1:
PIN 1. RF INPUT/V CONT
2. VS1
3. VS2
4. VS3
5. RF OUTPUT
CASE: GROUND

CASE 301N-02

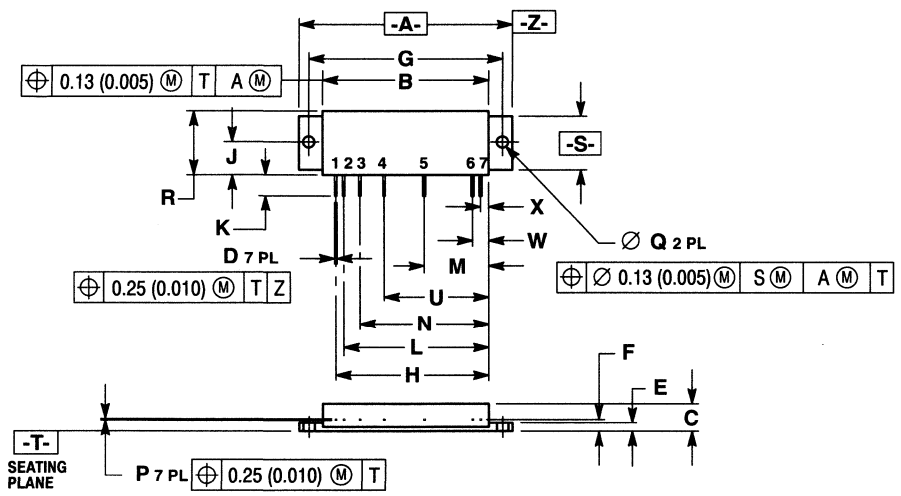


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION F TO CENTER OF LEADS.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	2.380	2.395	60.46	60.83
B	1.970	1.990	50.04	50.54
C	0.250	0.265	6.35	6.73
D	0.018	0.022	0.46	0.55
E	0.085	0.100	2.16	2.54
F	0.132 BSC		3.35 BSC	
G	2.260 BSC		57.40 BSC	
H	2.042 BSC		51.87 BSC	
J	0.267	0.278	6.78	7.06
K	0.177	0.217	4.49	5.51
L	1.142 BSC		29.01 BSC	
M	1.342 BSC		34.09 BSC	
N	1.542 BSC		39.17 BSC	
P	0.008	0.012	0.21	0.30
Q	0.120	0.130	3.05	3.30
R	0.535	0.555	13.59	14.09
S	0.445	0.465	11.31	11.81
V	0.642 BSC		16.31 BSC	
X	0.342 BSC		8.69 BSC	

STYLE 1:
PIN 1. RF INPUT/VCONT
2. VS1
3. VS2
4. Vb
5. VS3
6. RF OUTPUT

CASE 301R-01

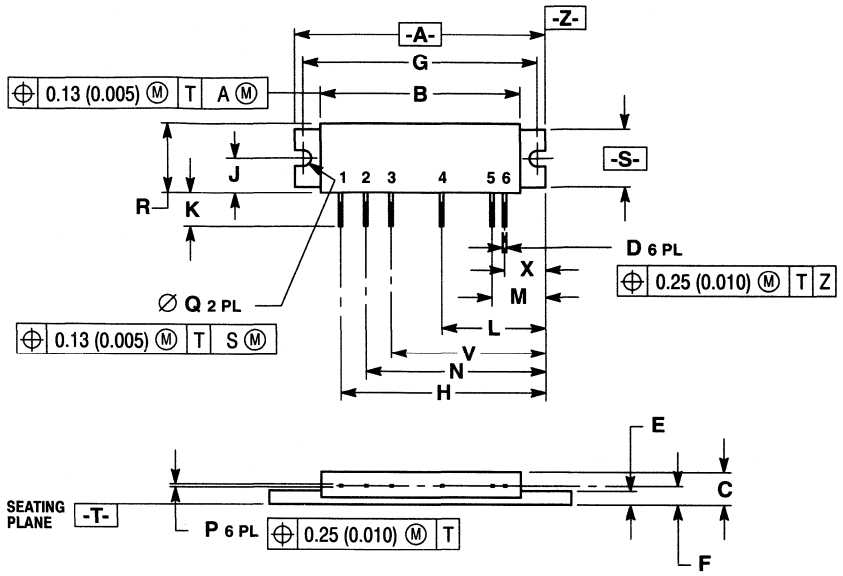


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION F TO CENTER OF LEADS.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	2.640	2.660	67.06	67.56
B	2.040	2.085	51.82	52.95
C	0.335	0.360	8.51	9.14
D	0.018	0.022	0.46	0.56
E	0.100	0.115	2.54	2.92
F	0.147 BSC		3.73 BSC	
G	2.405 BSC		61.09 BSC	
H	1.900 BSC		48.26 BSC	
J	0.400	0.440	10.16	11.18
K	0.177	0.217	4.50	5.51
L	1.800 BSC		45.72 BSC	
M	0.800 BSC		20.32 BSC	
N	1.600 BSC		40.64 BSC	
P	0.008	0.012	0.21	0.30
Q	0.136	0.146	3.45	3.71
R	0.800	0.820	20.32	20.83
S	0.670	0.690	17.02	17.53
U	1.300 BSC		33.02 BSC	
W	0.200 BSC		5.08 BSC	
X	0.100 BSC		2.54 BSC	

STYLE 1:
PIN 1. RF INPUT
2. DC TERMINAL, Vs1
3. DC TERMINAL, Vs2
4. DC TERMINAL, Vb
5. DC TERMINAL, Vs3
6. DC TERMINAL, Vs4
7. RF OUTPUT

CASE 301S-02

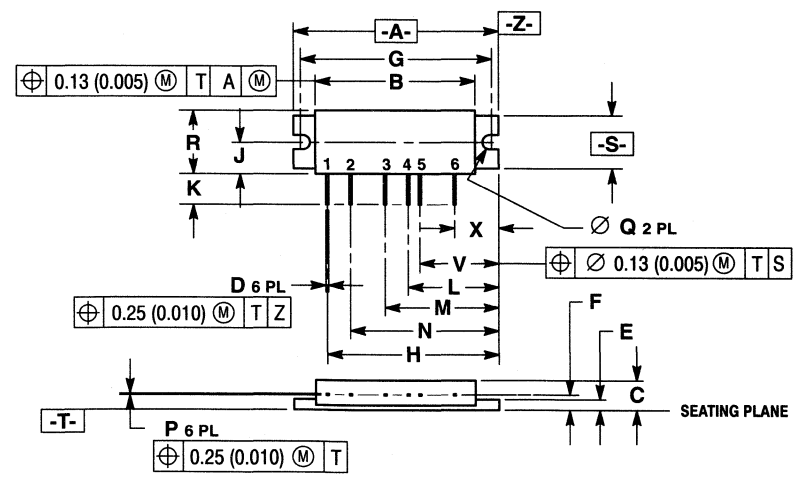


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION F TO CENTER OF LEADS.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	1.970	1.990	50.04	50.55
B	1.570	1.590	39.88	40.39
C	0.245	0.265	6.23	6.73
D	0.018	0.022	0.46	0.56
E	0.100	0.115	2.54	2.92
F	0.147 BSC		3.73 BSC	
G	1.860 BSC		47.24 BSC	
H	1.625 BSC		41.28 BSC	
J	0.267	0.278	6.78	7.06
K	0.177	0.217	4.50	5.51
L	0.825 BSC		20.96 BSC	
M	0.425 BSC		10.80 BSC	
N	1.425 BSC		36.20 BSC	
P	0.008	0.012	0.20	0.30
Q	0.120	0.130	3.05	3.30
R	0.535	0.555	13.59	14.10
S	0.445	0.465	11.30	11.81
V	1.225 BSC		31.12 BSC	
X	0.325 BSC		8.26 BSC	

STYLE 1:
PIN 1. RF INPUT
2. DC TERMINAL, Vs1
3. DC TERMINAL, Vs2
4. DC TERMINAL, Vb
5. DC TERMINAL, Vs3
6. RF OUTPUT

CASE 301T-02

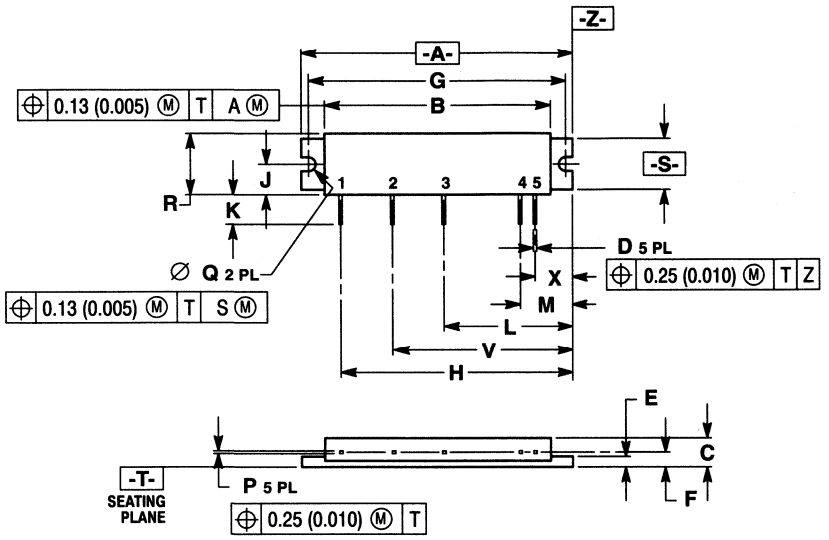


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION F TO CENTER OF LEADS.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	1.760	1.780	44.71	45.21
B	1.370	1.390	34.80	35.30
C	0.245	0.265	6.23	6.73
D	0.018	0.022	0.46	0.55
E	0.080	0.100	2.04	2.54
F	0.130 BSC		3.30 BSC	
G	1.650 BSC		41.91 BSC	
H	1.485 BSC		37.72 BSC	
J	0.267	0.278	6.79	7.06
K	0.177	0.217	4.50	5.51
L	0.785 BSC		19.94 BSC	
M	0.985 BSC		25.02 BSC	
N	1.285 BSC		32.64 BSC	
P	0.008	0.012	0.21	0.30
Q	0.120	0.130	3.05	3.30
R	0.535	0.555	13.59	14.09
S	0.445	0.465	11.31	11.81
V	0.685 BSC		17.40 BSC	
X	0.385 BSC		9.78 BSC	

STYLE 1:
PIN 1. RF INPUT/V CONT
2. VS1
3. Vb
4. VS2
5. VS3
6. RF OUTPUT
CASE: GROUND

CASE 301V-02

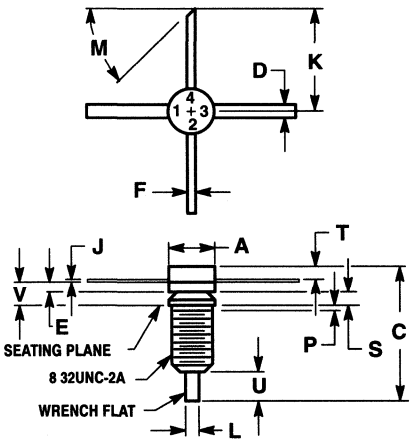


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION F TO CENTER OF LEADS.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	1.970	1.990	50.04	50.55
B	1.570	1.590	39.88	40.39
C	0.245	0.265	6.23	6.73
D	0.018	0.022	0.46	0.56
E	0.100	0.115	2.54	2.92
F	0.147 BSC		3.73 BSC	
G	1.860 BSC		47.24 BSC	
H	1.625 BSC		41.28 BSC	
J	0.267	0.278	6.78	7.06
K	0.177	0.217	4.50	5.51
L	0.825 BSC		20.96 BSC	
M	0.425 BSC		10.80 BSC	
P	0.008	0.012	0.20	0.30
Q	0.120	0.130	3.05	3.30
R	0.535	0.555	13.59	14.10
S	0.445	0.465	11.30	11.81
V	1.225 BSC		31.12 BSC	
X	0.325 BSC		8.26 BSC	

STYLE 1:
PIN 1. RF INPUT
2. DC TERMINAL, Vs1
3. DC TERMINAL, Vb
4. DC TERMINAL, Vs2
5. RF OUTPUT

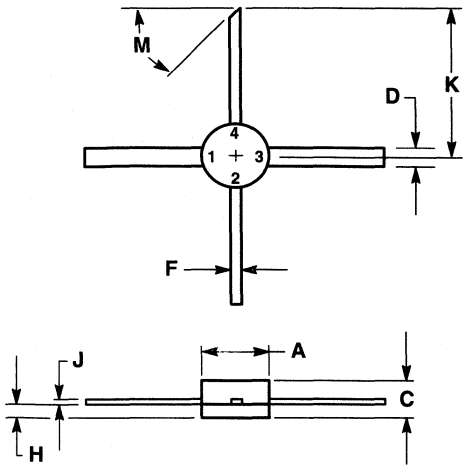
CASE 301Y-02



	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.200	0.220	5.08	5.59
C	0.550	0.640	13.97	16.26
D	0.055	0.065	1.40	1.65
E	0.040	0.050	1.02	1.27
F	0.025	0.035	0.64	0.89
J	0.003	0.007	0.08	0.18
K	0.435	—	11.05	—
L	0.055	0.065	1.40	1.65
M	45° NOM		45° NOM	
P	—	0.050	—	1.27
S	0.055	0.065	1.40	1.65
T	0.055	0.070	1.40	1.78
U	0.110	0.150	2.79	3.81
V	0.095	0.115	2.41	2.92

STYLE 1:
PIN 1. EMITTER
2. BASE
3. EMITTER
4. COLLECTOR

CASE 305-01



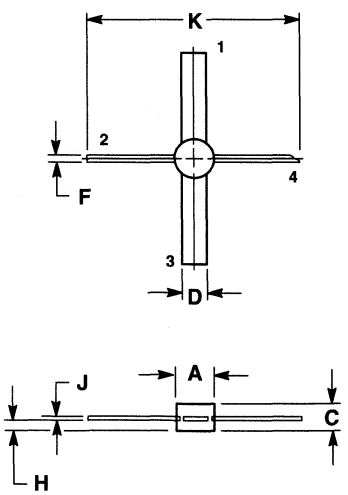
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.200	0.220	5.08	5.59
C	0.095	0.130	2.41	3.30
D	0.055	0.065	1.40	1.65
F	0.025	0.035	0.64	0.89
H	0.040	0.050	1.02	1.27
J	0.003	0.007	0.08	0.18
K	0.435	—	11.05	—
M	45° REF		45° REF	

STYLE 1:
PIN 1. EMITTER
2. BASE
3. EMITTER
4. COLLECTOR

STYLE 2:
PIN 1. SOURCE
2. GATE
3. SOURCE
4. DRAIN

CASE 305A-01

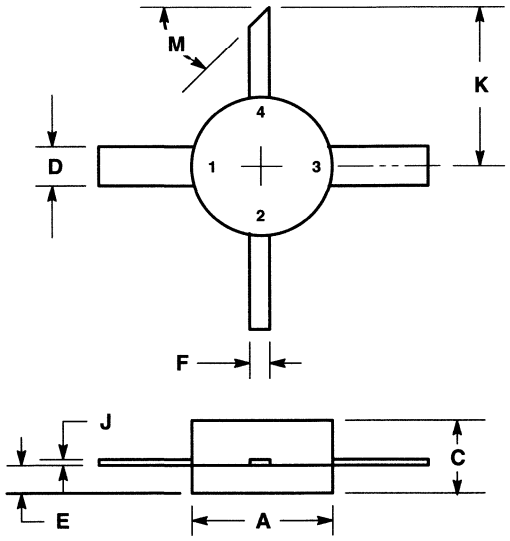


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	5.08	5.33	0.200	0.210
C	—	3.17	—	0.125
D	3.18	3.42	0.125	0.135
F	0.64	0.88	0.025	0.035
H	1.15	1.39	0.045	0.055
J	0.11	0.15	0.004	0.006
K	30.10	30.35	1.185	1.195

STYLE 1:
PIN 1. EMITTER
2. BASE
3. EMITTER
4. COLLECTOR

CASE 305C-01

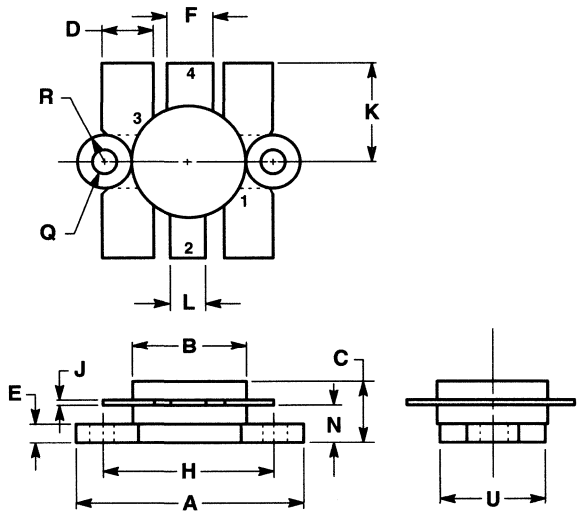


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.200	0.220	5.08	5.59
C	0.095	0.130	2.41	3.30
D	0.055	0.065	1.40	1.65
E	0.040	0.050	1.02	1.27
F	0.025	0.035	0.64	0.89
J	0.003	0.007	0.08	0.18
K	0.235	0.265	5.97	6.73
M	45° NOM		45° NOM	

STYLE 1:
PIN 1. EMITTER
2. BASE
3. EMITTER
4. COLLECTOR

CASE 305D-01



NOTES:
1. FLANGE IS ISOLATED IN ALL STYLES.

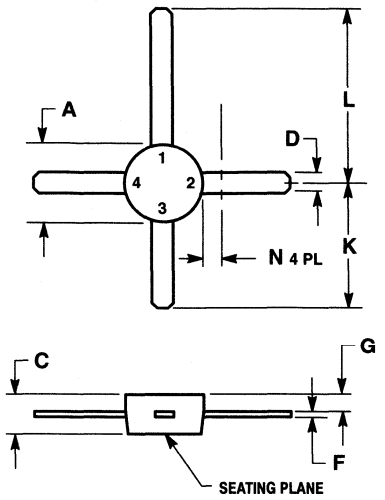
	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	24.38	25.14	0.960	0.990
B	12.45	12.95	0.490	0.510
C	5.97	7.62	0.235	0.300
D	5.33	5.58	0.210	0.220
E	2.16	3.04	0.085	0.120
F	5.08	5.33	0.200	0.210
H	18.29	18.54	0.720	0.730
J	0.10	0.15	0.004	0.006
K	10.29	11.17	0.405	0.440
L	3.81	4.06	0.150	0.160
N	3.81	4.31	0.150	0.170
Q	2.92	3.30	0.115	0.130
R	3.05	3.30	0.120	0.130
U	11.94	12.57	0.470	0.495

STYLE 1:
PIN 1. EMITTER
2. COLLECTOR
3. EMITTER
4. BASE

STYLE 2:
PIN 1. BASE
2. COLLECTOR
3. BASE
4. EMITTER

STYLE 3:
PIN 1. SOURCE
2. DRAIN
3. SOURCE
4. GATE

CASE 316-01



NOTES:
1. DIMENSION D NOT APPLICABLE IN ZONE N.

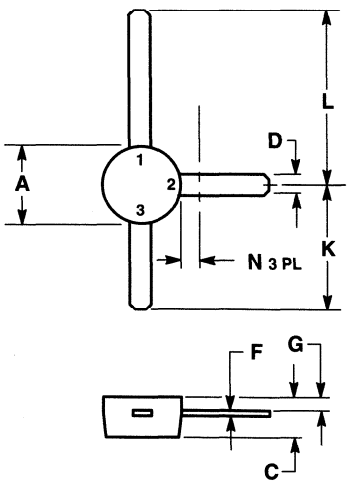
	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	4.44	5.21	0.175	0.205
C	1.90	2.54	0.075	0.100
D	0.84	0.99	0.033	0.039
F	0.20	0.30	0.008	0.012
G	0.76	1.14	0.030	0.045
K	7.24	8.13	0.285	0.320
L	10.54	11.43	0.415	0.450
N	—	1.65	—	0.065

STYLE 1:
PIN 1. DRAIN
2. SOURCE
3. GATE 1
4. GATE 2

STYLE 2:
PIN 1. COLLECTOR
2. EMITTER
3. BASE
4. EMITTER

STYLE 3:
PIN 1. OUTPUT
2. GROUND
3. INPUT
4. GROUND

CASE 317-01

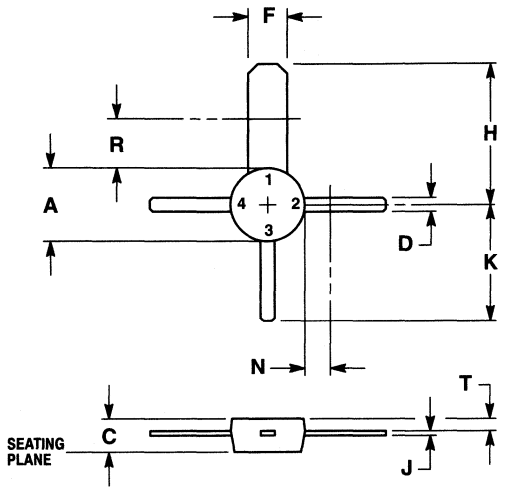


NOTES:
1. DIMENSION D NOT APPLICABLE IN ZONE N.

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	4.44	5.21	0.175	0.205
C	1.90	2.54	0.075	0.100
D	0.84	0.99	0.033	0.039
F	0.20	0.30	0.008	0.012
G	0.76	1.14	0.030	0.045
K	7.24	8.13	0.285	0.320
L	10.54	11.43	0.415	0.450
N	—	1.65	—	0.065

STYLE 2:
PIN 1. COLLECTOR
2. EMITTER
3. BASE

CASE 317A-01



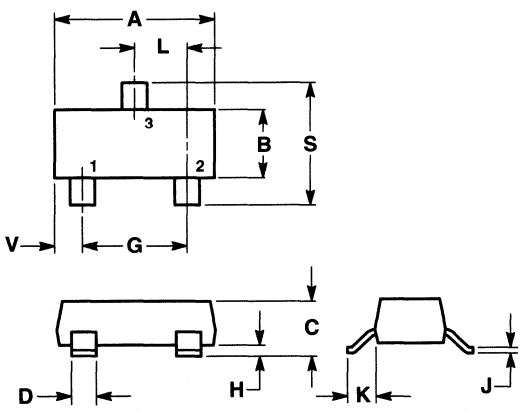
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. LEAD DIMENSIONS UNCONTROLLED WITHIN DIMENSION N AND R.

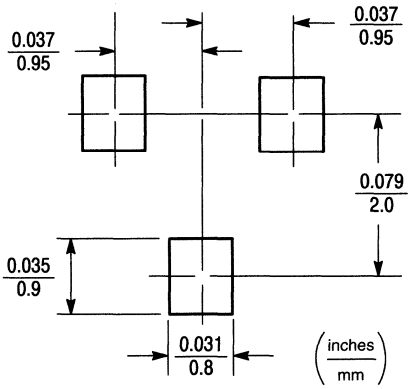
	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.175	0.205	4.45	5.20
C	0.075	0.100	1.91	2.54
D	0.033	0.039	0.84	0.99
F	0.097	0.104	2.46	2.64
H	0.348	0.383	8.84	9.72
J	0.008	0.012	0.21	0.30
K	0.285	0.320	7.24	8.12
N	—	0.065	—	1.65
R	—	0.128	—	3.25
T	0.025	0.040	0.64	1.01

STYLE 2:
PIN 1. COLLECTOR
2. EMITTER
3. BASE
4. EMITTER

STYLE 3:
PIN 1. COLLECTOR
2. BASE
3. EMITTER
4. BASE

CASE 317D-02





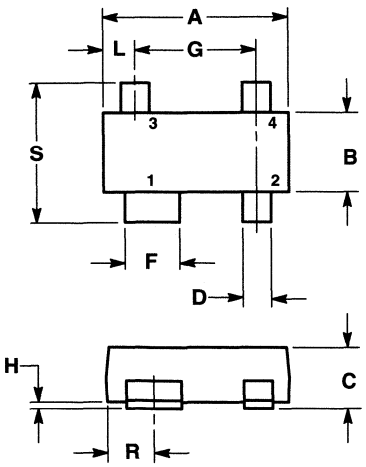
SOT-23 FOOTPRINT

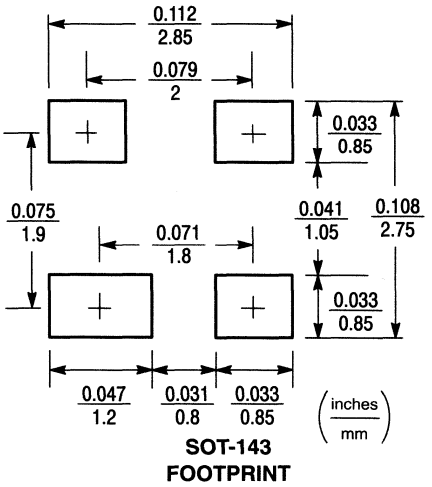
STYLE 6:
PIN 1. BASE
2. EMITTER
3. COLLECTOR

NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.1102	0.1197	2.80	3.04
B	0.0472	0.0551	1.20	1.40
C	0.0350	0.0440	0.89	1.11
D	0.0150	0.0200	0.37	0.50
G	0.0701	0.0807	1.78	2.04
H	0.0005	0.0040	0.013	0.100
J	0.0034	0.0070	0.085	0.177
K	0.0180	0.0236	0.45	0.60
L	0.0350	0.0401	0.89	1.02
S	0.0830	0.0984	2.10	2.50
V	0.0177	0.0236	0.45	0.60

CASE 318-07





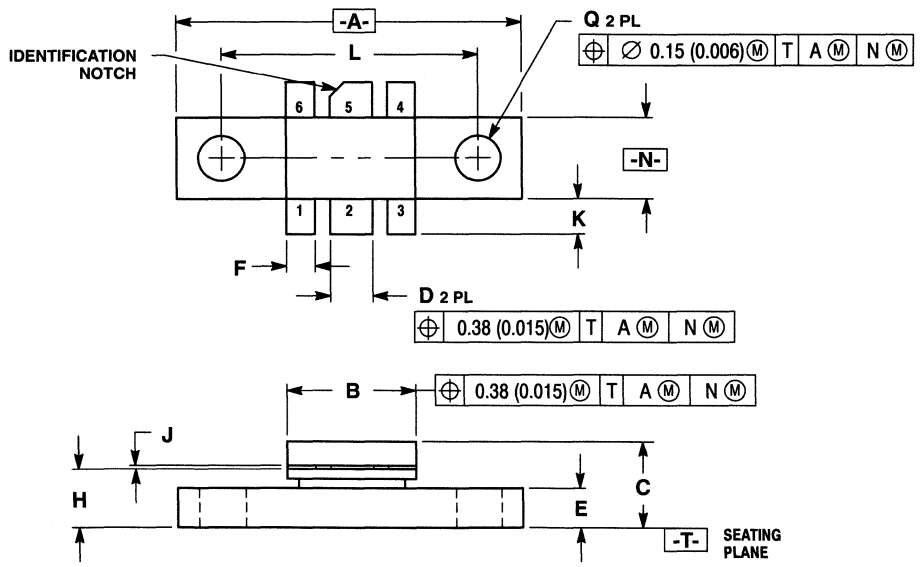
SOT-143 FOOTPRINT

STYLE 1:
PIN 1. COLLECTOR
2. EMITTER
3. EMITTER
4. BASE

NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	2.80	3.04	0.110	0.120
B	1.20	1.39	0.047	0.055
C	0.84	1.14	0.033	0.045
D	0.39	0.50	0.015	0.020
F	0.79	0.93	0.031	0.037
G	1.78	2.03	0.070	0.080
H	0.013	0.10	0.0005	0.004
J	0.08	0.15	0.003	0.006
K	0.46	0.60	0.018	0.024
L	0.445	0.60	0.0175	0.024
R	0.72	0.83	0.028	0.033
S	2.11	2.48	0.083	0.098

CASE 318A-05



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

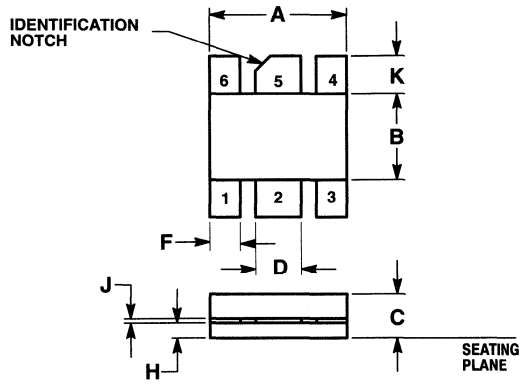
	INCHES		MILLIMETER	
DIM	MIN	MAX	MIN	MAX
A	0.965	0.985	24.52	25.01
B	0.355	0.375	9.02	9.52
C	0.230	0.260	5.85	6.60
D	0.115	0.125	2.93	3.17
E	0.102	0.114	2.59	2.90
F	0.075	0.085	1.91	2.15
H	0.160	0.170	4.07	4.31
J	0.004	0.006	0.11	0.15
K	0.090	0.110	2.29	2.79
L	0.725 BSC		18.42 BSC	
N	0.225	0.241	5.72	6.12
Q	0.125	0.135	3.18	3.42

STYLE 1:
PIN 1. BASE (COMMON)
2. EMITTER (INPUT)
3. BASE (COMMON)
4. BASE (COMMON)
5. COLLECTOR (OUTPUT)
6. BASE (COMMON)

STYLE 2:
PIN 1. EMITTER (COMMON)
2. BASE (INPUT)
3. EMITTER (COMMON)
4. EMITTER (COMMON)
5. COLLECTOR (OUTPUT)
6. EMITTER (COMMON)

STYLE 3:
PIN 1. SOURCE (COMMON)
2. GATE (INPUT)
3. SOURCE (COMMON)
4. SOURCE (COMMON)
5. DRAIN (OUTPUT)
6. SOURCE (COMMON)

CASE 319-07

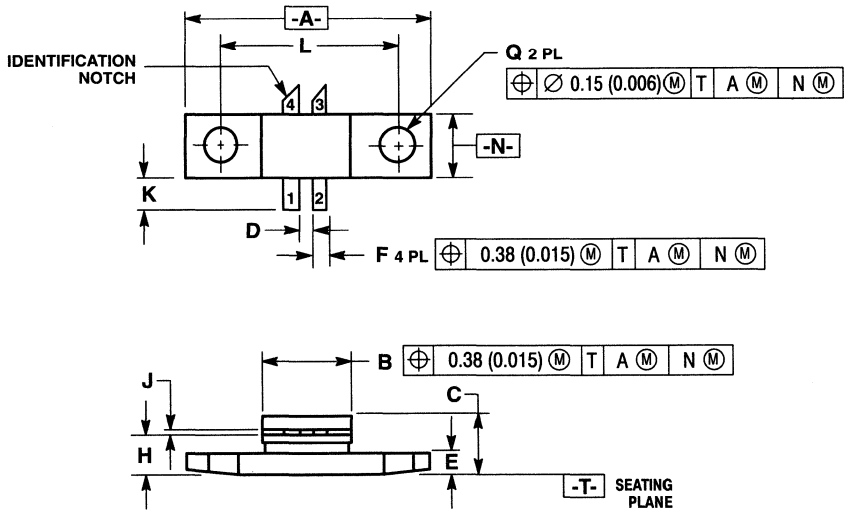


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.355	0.365	9.02	9.27
B	0.225	0.235	5.72	5.96
C	0.110	0.125	2.80	3.17
D	0.115	0.125	2.93	3.17
F	0.075	0.085	1.91	2.15
H	0.035	0.045	0.89	1.14
J	0.004	0.006	0.11	0.15
K	0.090	0.110	2.29	2.79

STYLE 2:
PIN 1. EMITTER
2. BASE
3. EMITTER
4. EMITTER
5. COLLECTOR
6. EMITTER

CASE 319A-02

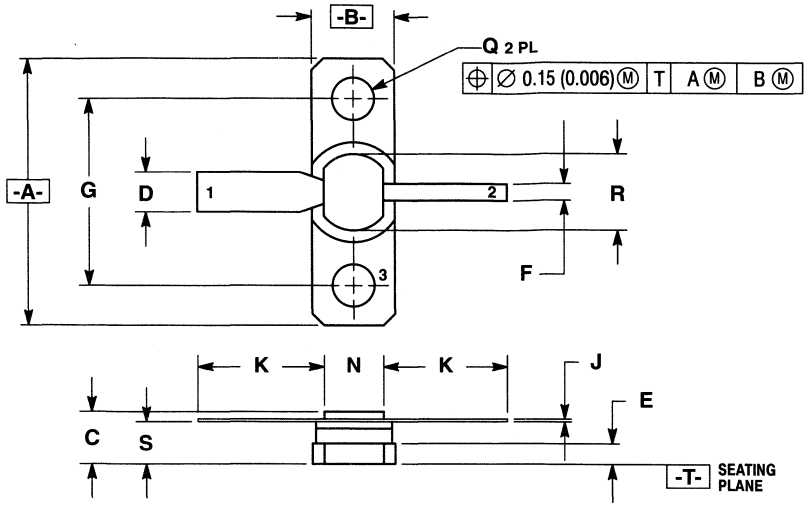


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.965	0.985	24.51	25.02
B	0.355	0.375	9.02	9.52
C	0.230	0.260	5.84	6.60
D	0.055	0.065	1.40	1.65
E	0.102	0.114	2.59	2.90
F	0.055	0.065	1.40	1.65
H	0.160	0.170	4.06	4.31
J	0.004	0.006	0.10	0.15
K	0.120	0.140	3.05	3.55
L	0.725 BSC		18.42 BSC	
N	0.225	0.241	5.72	6.12
Q	0.125	0.135	3.18	3.42

STYLE 1:
PIN 1. GATE (INPUT)
2. GATE (INPUT)
3. DRAIN (OUTPUT)
4. DRAIN (OUTPUT)
SOURCE IS FLANGE

CASE 319B-02



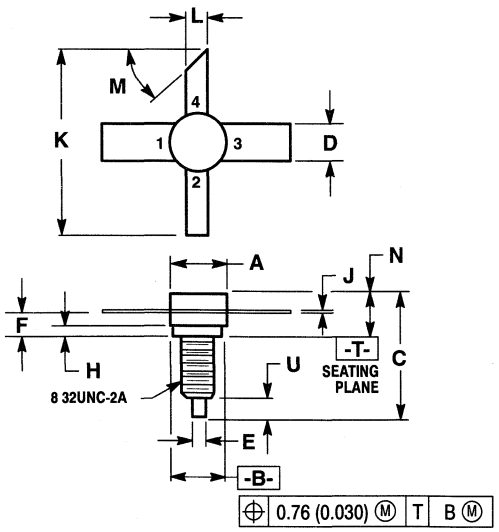
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M. 1982.
2. CONTROLLING DIMENSION: INCH.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.795	0.805	20.20	20.45
B	0.245	0.255	6.23	6.47
C	0.145	0.170	3.69	4.31
D	0.115	0.125	2.93	3.17
E	0.055	0.065	1.40	1.65
F	0.045	0.055	1.15	1.39
G	0.562 BSC		14.27 BSC	
J	0.003	0.006	0.08	0.15
K	0.260	0.375	6.60	9.52
N	0.175	0.185	4.45	4.69
Q	0.120	0.135	3.05	3.42
R	0.225	0.235	5.72	5.97
S	0.120	0.130	3.05	3.30

STYLE 1:
PIN 1. EMITTER
2. COLLECTOR
3. BASE

STYLE 5:
PIN 1. EMITTER
2. BASE
3. COLLECTOR

CASE 328A-03

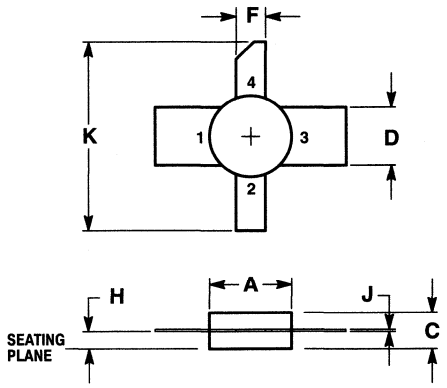


NOTES:
1. DIMENSION K APPLIES TWO PLACES.
2. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1973.

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	6.86	7.62	0.270	0.300
B	6.10	6.60	0.240	0.260
C	16.26	16.76	0.640	0.660
D	4.95	5.21	0.195	0.205
E	1.40	1.65	0.055	0.065
F	2.67	4.32	0.105	0.170
H	1.40	1.65	0.055	0.065
J	0.08	0.18	0.003	0.007
K	15.24	—	0.600	—
L	2.41	2.67	0.095	0.105
M	45° NOM		45° NOM	
N	4.57	6.22	0.180	0.245
U	2.92	3.68	0.115	0.145

STYLE 2:
PIN 1. EMITTER
2. BASE
3. EMITTER
4. COLLECTOR

CASE 332-04

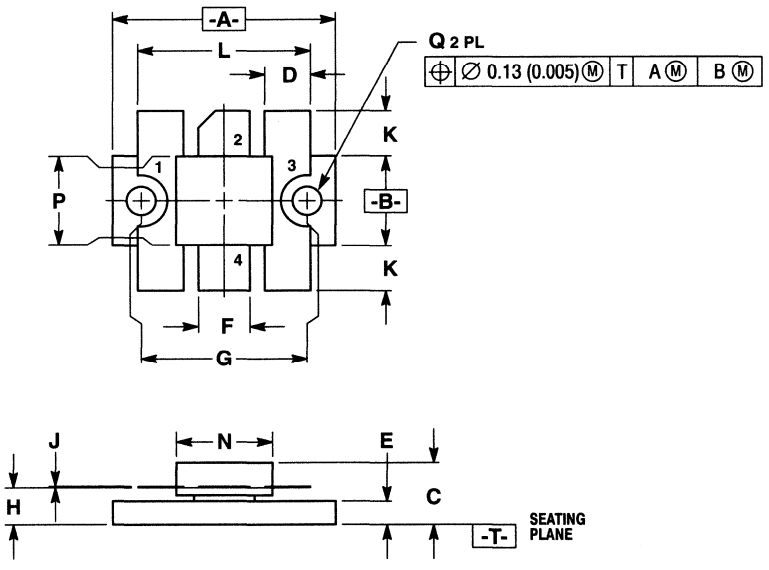


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.270	0.290	6.86	7.36
C	0.115	0.135	2.93	3.42
D	0.195	0.205	4.96	5.20
F	0.095	0.105	2.42	2.66
H	0.050	0.070	1.27	1.77
J	0.003	0.007	0.08	0.17
K	0.600	—	15.24	—

STYLE 1:
PIN 1. BASE
2. EMITTER
3. BASE
4. COLLECTOR

CASE 332A-03

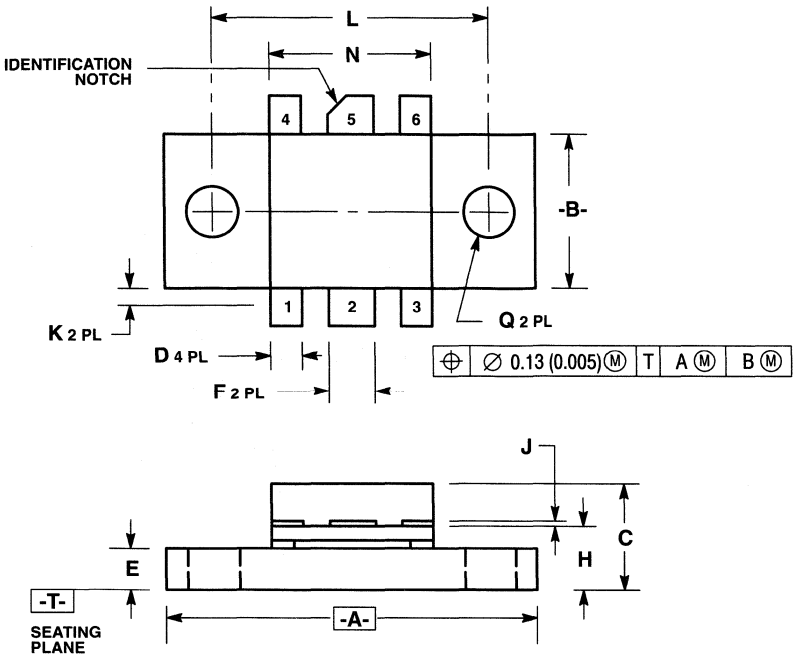


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.965	0.985	24.51	25.02
B	0.390	0.410	9.91	10.41
C	0.250	0.290	6.73	7.36
D	0.190	0.210	4.83	5.33
E	0.095	0.115	2.42	2.92
F	0.215	0.235	5.47	5.96
G	0.725 BSC		18.42 BSC	
H	0.155	0.175	3.94	4.44
J	0.004	0.006	0.10	0.15
K	0.195	0.205	4.95	5.21
L	0.740	0.770	18.80	19.55
N	0.415	0.425	10.54	10.80
P	0.390	0.400	9.91	10.16
Q	0.120	0.135	3.05	3.42

STYLE 1:
PIN 1. EMITTER
2. COLLECTOR
3. EMITTER
4. BASE

CASE 333-04



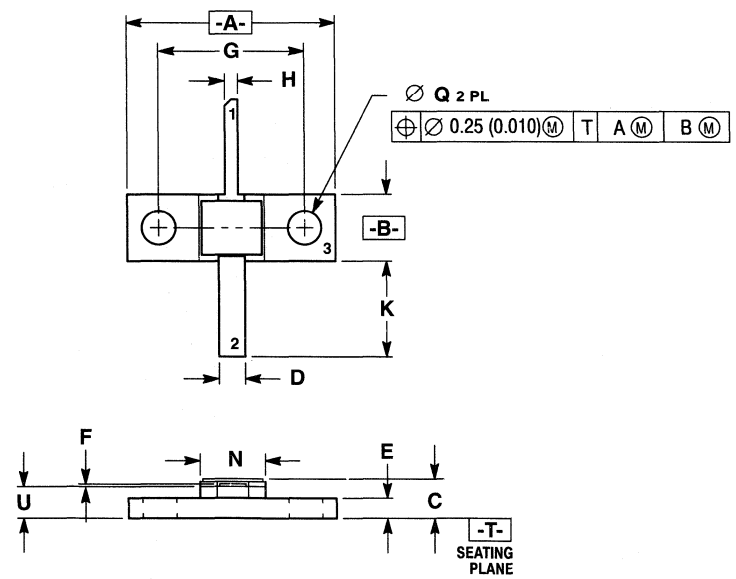
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.965	0.985	24.52	25.01
B	0.390	0.410	9.91	10.41
C	0.250	0.290	6.35	7.36
D	0.075	0.090	1.91	2.28
E	0.095	0.115	2.42	2.92
F	0.110	0.130	2.80	3.30
H	0.155	0.175	3.94	4.44
J	0.004	0.006	0.11	0.15
K	0.090	0.116	2.29	2.94
L	0.725 BSC		18.41 BSC	
N	0.415	0.435	10.55	11.04
Q	0.120	0.135	3.05	3.42

STYLE 1:
PIN 1. BASE
2. EMITTER
3. BASE
4. BASE
5. COLLECTOR
6. BASE

STYLE 2:
PIN 1. EMITTER
2. BASE
3. EMITTER
4. EMITTER
5. COLLECTOR
6. EMITTER

CASE 333A-02

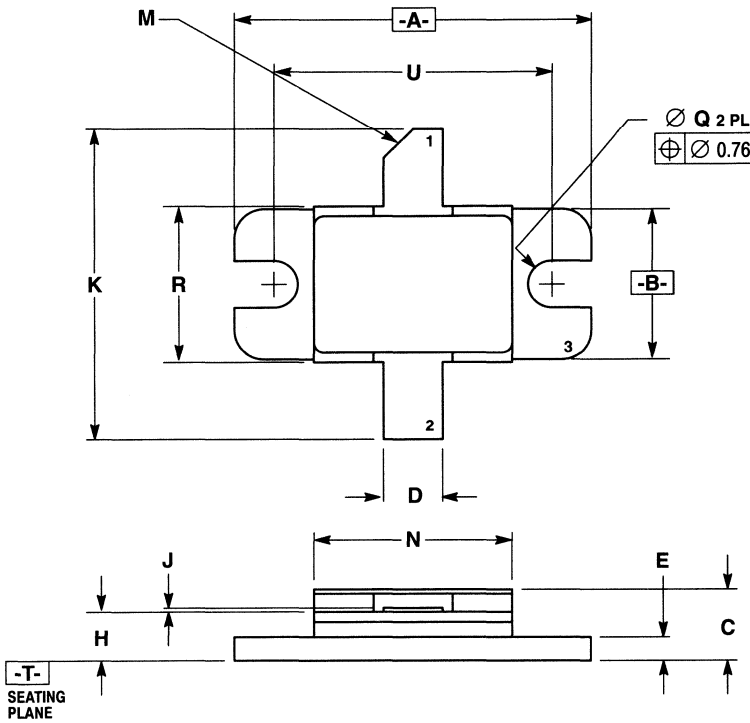


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	20.07	20.57	0.790	0.810
B	6.43	6.78	0.253	0.267
C	3.66	4.06	0.144	0.160
D	2.37	2.71	0.093	0.107
E	1.88	2.03	0.074	0.080
F	0.06	0.15	0.002	0.006
G	14.22 BSC		0.560 BSC	
H	1.10	1.44	0.043	0.057
K	8.79	10.10	0.346	0.394
N	6.18	6.52	0.243	0.257
Q	3.18	3.42	0.125	0.135
U	2.98	3.25	0.117	0.128

STYLE 1:
PIN 1. COLLECTOR
2. EMITTER
3. BASE

CASE 336E-02

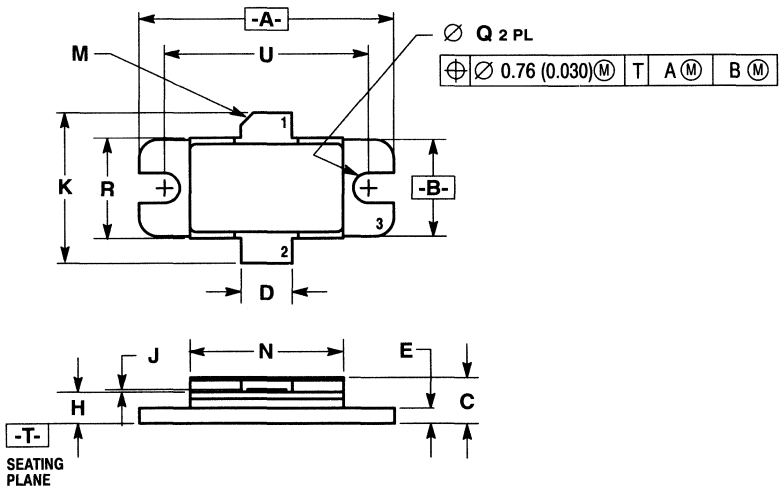


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.890	0.910	22.61	23.11
B	0.375	0.395	9.53	10.03
C	0.150	0.165	3.81	4.19
D	0.145	0.155	3.69	3.93
E	0.055	0.065	1.40	1.65
H	0.120	0.130	3.05	3.30
J	0.003	0.006	0.08	0.15
K	0.770	0.830	19.56	21.08
M	45° REF		45° REF	
N	0.490	0.510	12.45	12.95
Q	0.115	0.125	2.93	3.17
R	0.395	0.405	10.04	10.28
U	0.700 BSC		17.78 BSC	

STYLE 1:
PIN 1. COLLECTOR
2. EMITTER
3. BASE

CASE 355C-02

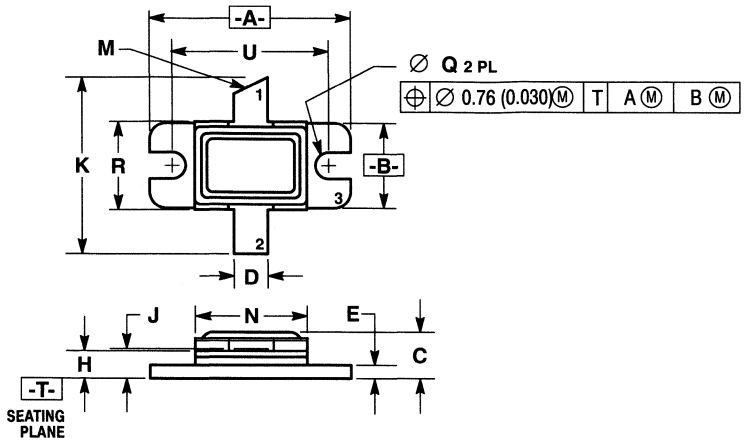


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.990	1.010	25.15	25.65
B	0.375	0.395	9.53	10.03
C	0.150	0.165	3.81	4.19
D	0.195	0.205	4.95	5.21
E	0.055	0.065	1.40	1.65
H	0.120	0.130	3.05	3.30
J	0.003	0.006	0.08	0.15
K	0.570	0.630	14.48	16.00
M	45° REF		45° REF	
N	0.590	0.610	14.99	15.49
Q	0.115	0.125	2.92	3.18
R	0.395	0.405	10.03	10.29
U	0.800 BSC		20.32 BSC	

STYLE 1:
PIN 1. COLLECTOR
2. EMITTER
3. BASE

CASE 355D-02

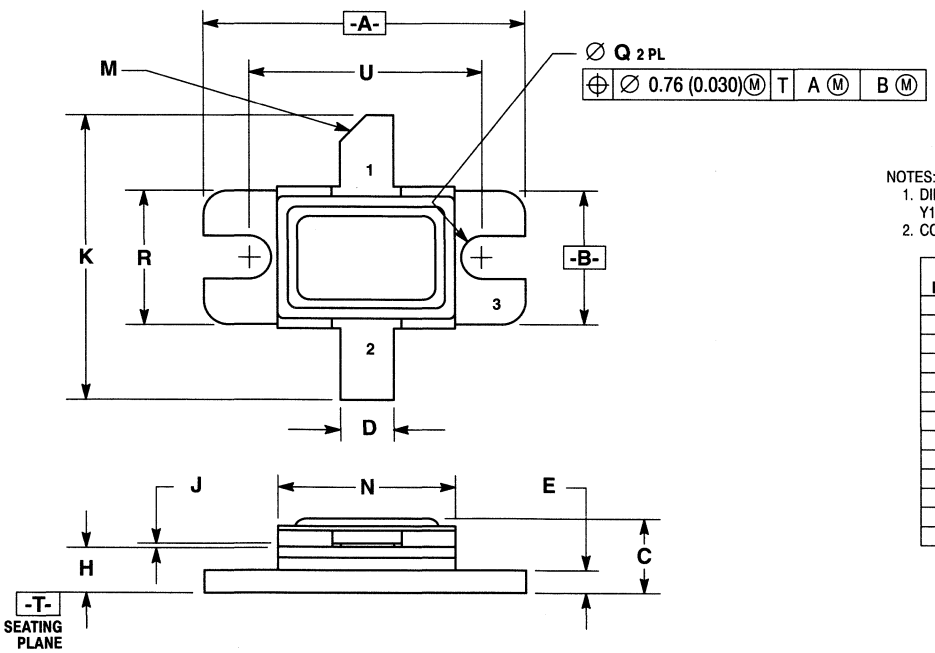


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.890	0.910	22.61	23.11
B	0.375	0.395	9.53	10.03
C	0.190	0.210	4.83	5.33
D	0.145	0.155	3.69	3.93
E	0.055	0.065	1.40	1.65
H	0.120	0.130	3.05	3.30
J	0.003	0.006	0.08	0.15
K	0.770	0.830	19.56	21.08
M	45° REF		45° REF	
N	0.490	0.510	12.45	12.95
Q	0.115	0.125	2.93	3.17
R	0.395	0.405	10.04	10.28
U	0.700 BSC		17.78 BSC	

STYLE 1:
PIN 1. COLLECTOR
2. EMITTER
3. BASE

CASE 355E-01

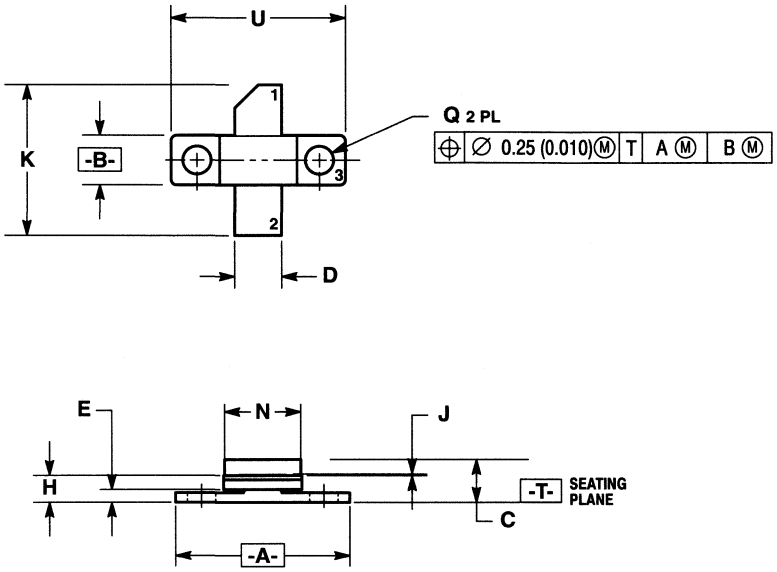


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.890	0.910	22.61	23.11
B	0.375	0.395	9.53	10.03
C	0.190	0.210	4.83	5.33
D	0.145	0.155	3.69	3.93
E	0.055	0.065	1.40	1.65
H	0.120	0.130	3.05	3.30
J	0.003	0.006	0.08	0.15
K	0.770	0.830	19.56	21.08
M	45° REF		45° REF	
N	0.490	0.510	12.45	12.95
Q	0.115	0.125	2.93	3.17
R	0.395	0.405	10.04	10.28
U	0.650 BSC		16.51 BSC	

STYLE 1:
PIN 1. COLLECTOR
2. EMITTER
3. BASE

CASE 355G-01

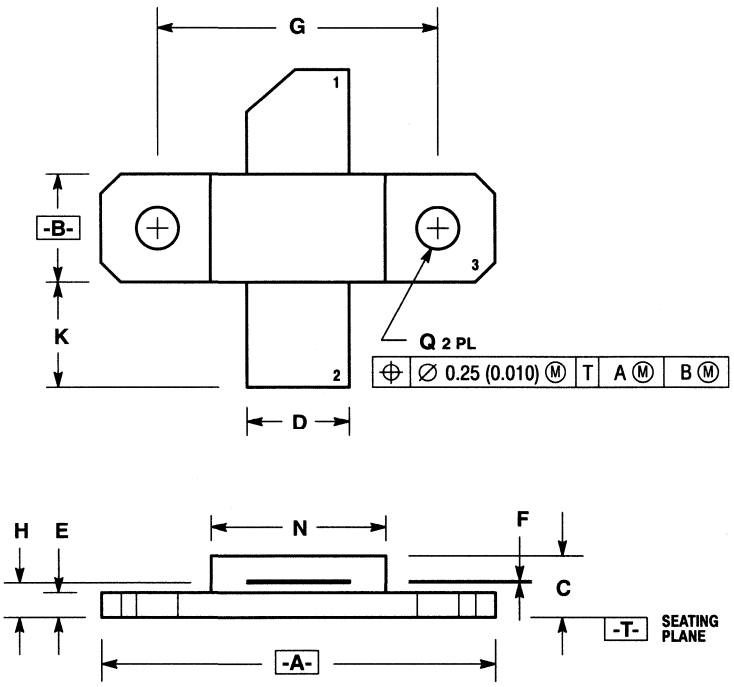


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.795	0.805	20.19	20.45
B	0.225	0.235	5.71	5.97
C	0.184	0.216	4.67	5.49
D	0.210	0.220	5.33	5.59
E	0.055	0.065	1.40	1.65
H	0.115	0.135	2.92	3.43
J	0.004	0.006	0.10	0.15
K	0.670	0.730	17.02	18.54
N	0.345	0.355	8.76	9.02
Q	0.125	0.135	3.18	3.43
U	0.560 BSC		14.22 BSC	

STYLE 1:
PIN 1. COLLECTOR
2. EMITTER
3. BASE

CASE 360A-01

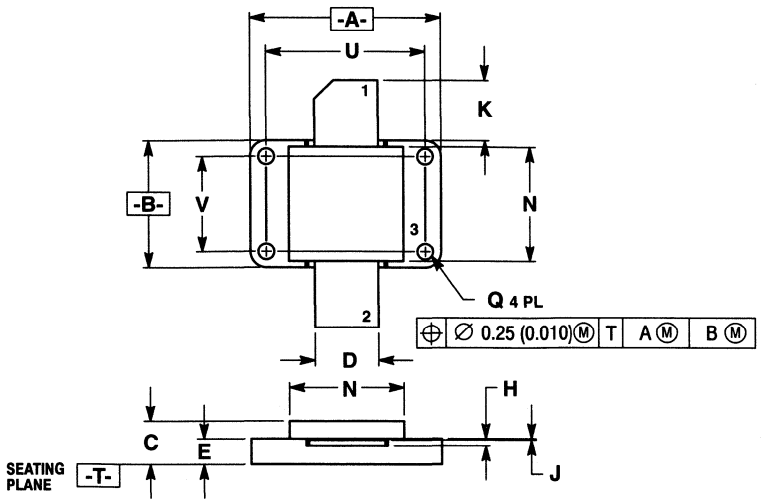


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.790	0.810	20.07	20.57
B	0.220	0.240	5.59	6.09
C	0.125	0.175	3.18	4.45
D	0.205	0.225	5.21	5.71
E	0.050	0.070	1.27	1.77
F	0.004	0.006	0.11	0.15
G	0.562 BSC		14.27 BSC	
H	0.070	0.090	1.78	2.29
K	0.215	0.255	5.47	6.47
N	0.350	0.370	8.89	9.39
Q	0.120	0.140	3.05	3.55

STYLE 1:
PIN 1. DRAIN
2. GATE
3. SOURCE

CASE 360B-01

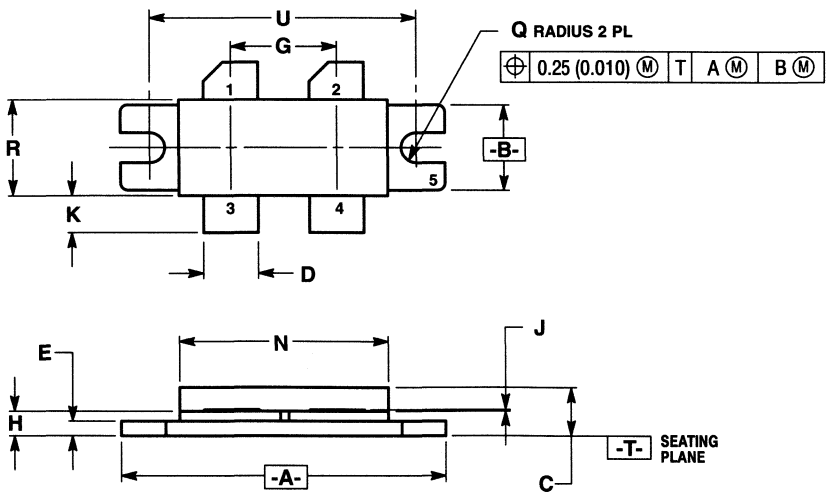


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	1.490	1.510	37.85	38.35
B	0.990	1.010	25.15	25.65
C	0.330	0.350	8.38	8.89
D	0.490	0.510	12.45	12.95
E	0.195	0.205	4.95	5.21
H	0.045	0.055	1.14	1.39
J	0.004	0.006	0.10	0.15
K	0.425	0.500	10.80	12.70
N	0.890	0.910	22.87	23.11
Q	0.120	0.130	3.05	3.30
U	1.250 BSC		31.75 BSC	
V	0.750 BSC		19.05 BSC	

STYLE 2:
PIN 1. DRAIN
2. GATE
3. SOURCE

CASE 368-02



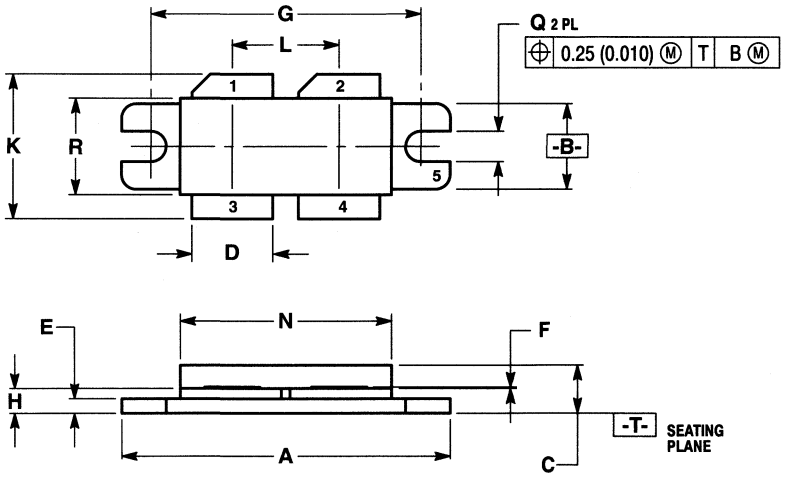
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	1.330	1.350	33.79	34.29
B	0.370	0.410	9.40	10.41
C	0.190	0.230	4.83	5.84
D	0.215	0.235	5.47	5.96
E	0.050	0.070	1.27	1.77
G	0.430	0.440	10.92	11.18
H	0.102	0.112	2.59	2.84
J	0.004	0.006	0.11	0.15
K	0.185	0.215	4.83	5.33
N	0.845	0.875	21.46	22.23
Q	0.053	0.074	1.35	1.87
R	0.390	0.410	9.91	10.41
U	1.100 BSC		27.94 BSC	

STYLE 1:
PIN 1. COLLECTOR
2. COLLECTOR
3. BASE
4. BASE
5. EMITTER

STYLE 2:
PIN 1. DRAIN
2. DRAIN
3. GATE
4. GATE
5. SOURCE

CASE 375-03

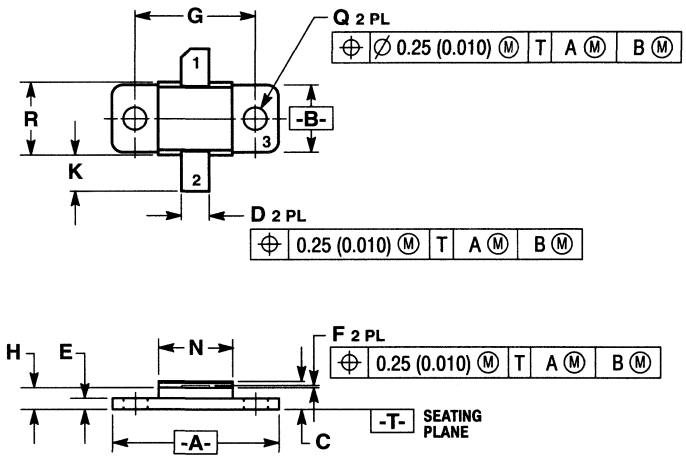


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	1.330	1.350	33.79	34.29
B	0.375	0.395	9.52	10.03
C	0.180	0.205	4.57	5.21
D	0.320	0.340	8.13	8.64
E	0.060	0.070	1.52	1.77
F	0.004	0.006	0.11	0.15
G	1.100 BSC		27.94 BSC	
H	0.082	0.097	2.08	2.46
K	0.580	0.620	14.73	15.75
L	0.435 BSC		11.05 BSC	
N	0.845	0.875	21.46	22.23
Q	0.118	0.130	3.00	3.30
R	0.390	0.410	9.91	10.41

STYLE 1:
PIN 1. COLLECTOR
2. COLLECTOR
3. BASE
4. BASE
5. EMITTER

CASE 375A-01

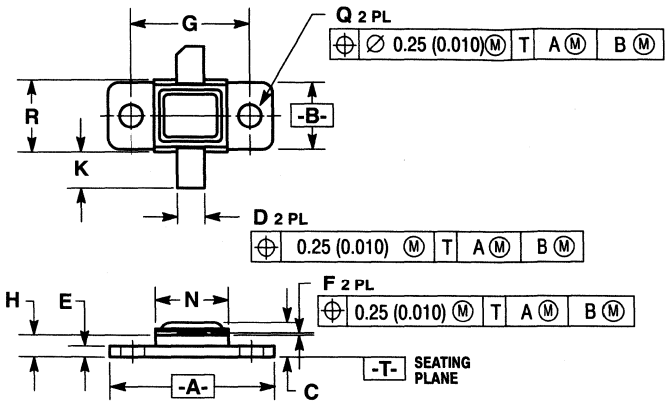


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.890	0.910	22.61	23.11
B	0.370	0.400	9.40	10.16
C	0.145	0.160	3.69	4.06
D	0.140	0.160	3.56	4.06
E	0.055	0.065	1.40	1.65
F	0.003	0.006	0.08	0.15
G	0.650 BSC		16.51 BSC	
H	0.110	0.130	2.80	3.30
K	0.180	0.220	4.57	5.59
N	0.390	0.410	9.91	10.41
Q	0.115	0.135	2.93	3.42
R	0.390	0.410	9.91	10.41

STYLE 1:
PIN 1. COLLECTOR
2. EMITTER
3. BASE

CASE 376B-02

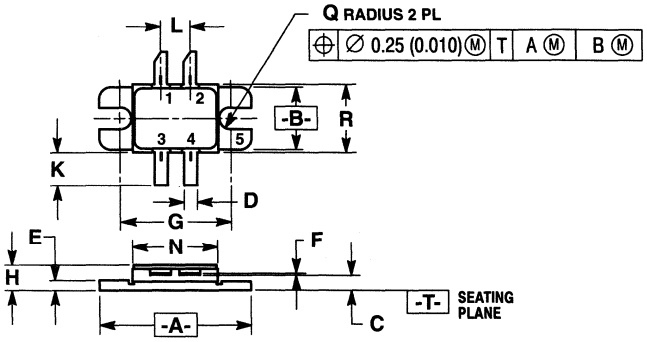


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.890	0.910	22.61	23.11
B	0.370	0.400	9.40	10.16
C	0.190	0.210	4.83	5.33
D	0.140	0.160	3.56	4.06
E	0.055	0.065	1.40	1.65
F	0.003	0.006	0.08	0.15
G	0.650 BSC		16.51 BSC	
H	0.110	0.130	2.80	3.30
K	0.180	0.220	4.57	5.59
N	0.390	0.410	9.91	10.41
Q	0.115	0.135	2.93	3.42
R	0.390	0.410	9.91	10.41

STYLE 1:
PIN 1. COLLECTOR
2. EMITTER
3. BASE

CASE 376C-01

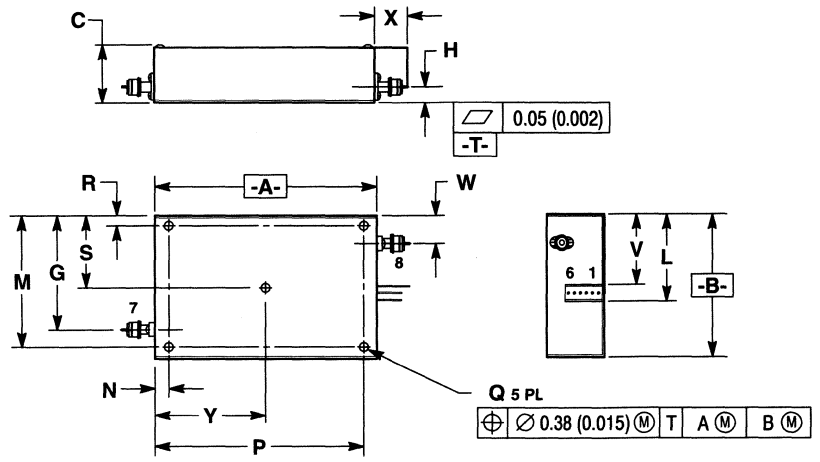


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982
2. CONTROLLING DIMENSION: INCH.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.890	0.910	22.61	23.11
B	0.370	0.400	9.40	10.16
C	0.105	0.135	2.67	3.42
D	0.065	0.085	1.66	2.15
E	0.055	0.065	1.40	1.65
F	0.003	0.006	0.08	0.15
G	0.650 BSC		16.51 BSC	
H	0.150	0.175	3.81	4.44
K	0.190	0.210	4.83	5.33
L	0.155	0.190	3.94	4.82
N	0.490	0.510	12.45	12.95
Q	0.060	0.070	1.53	1.77
R	0.390	0.410	9.91	10.41

STYLE 1:
PIN 1. COLLECTOR
2. COLLECTOR
3. BASE
4. BASE
5. EMITTER

CASE 382-01

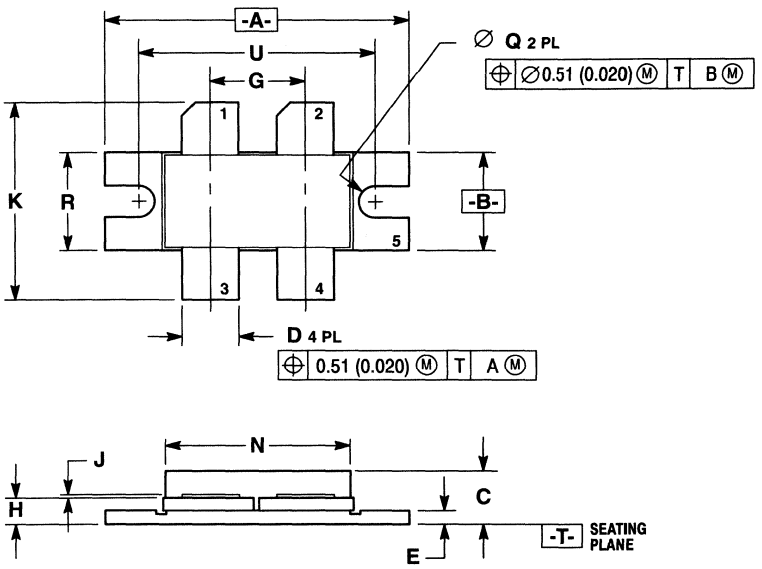


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	133.7	134.2	5.26	5.28
B	—	86.0	—	3.38
C	—	36.2	—	1.42
G	68.1	68.3	2.68	2.70
H	9.1	9.7	0.36	0.38
L	51.2	51.5	2.02	2.03
M	79.6 BSC		3.13 BSC	
N	8.5 BSC		0.33 BSC	
P	125.5 BSC		4.94 BSC	
Q	4.4	4.6	0.17	0.18
R	6.2 BSC		0.24 BSC	
S	35.2 BSC		1.38 BSC	
V	42.1	42.6	1.66	1.68
W	17.5	17.9	0.69	0.70
X	—	13.5	—	0.53
Y	67.0 BSC		2.64 BSC	

STYLE 1:
PIN 1. +V SUPPLY 26.5V
2. DO NOT USE
3. GROUND
4. TEST POINT (Ic1)
5. TEST POINT (Ic2)
6. OPTION
7. RF INPUT
8. RF OUTPUT

CASE 389B-02

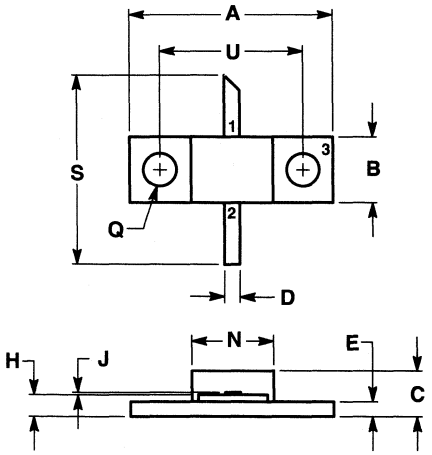


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	1.190	1.210	30.23	30.73
B	0.375	0.400	9.53	10.16
C	0.190	0.230	4.83	5.84
D	0.215	0.235	5.46	5.96
E	0.050	0.070	1.27	1.77
G	0.385 BSC		9.78 BSC	
H	0.090	0.115	2.29	2.92
J	0.002	0.005	0.06	0.12
K	0.535	0.565	13.59	14.35
N	0.750	0.780	19.05	19.81
Q	0.106	0.148	2.70	3.75
R	0.375	0.395	9.53	10.03
U	0.935 BSC		23.75 BSC	

STYLE 1:
PIN 1. DRAIN
2. DRAIN
3. GATE
4. GATE
5. SOURCE

CASE 390B-02

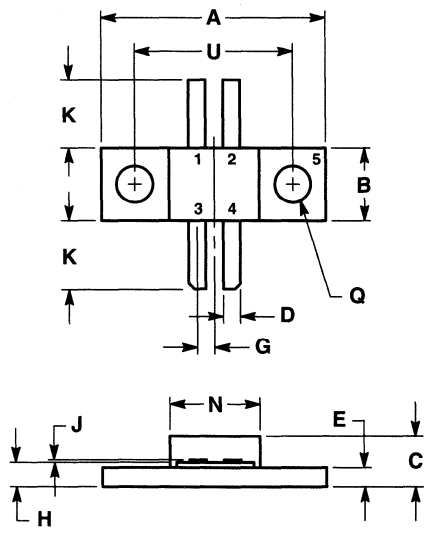


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.795	0.805	20.19	20.45
B	0.255	0.265	6.48	6.73
C	0.156	0.176	3.96	4.47
D	0.055	0.065	1.40	1.65
E	0.057	0.063	1.45	1.60
H	0.081	0.089	1.98	2.34
J	0.002	0.006	0.05	0.15
N	0.316	0.326	8.03	8.28
Q	0.125	0.135	3.18	3.43
S	0.620	0.680	15.75	17.27
U	0.552	0.572	14.02	14.53

STYLE 1:
PIN 1. COLLECTOR
2. EMITTER
3. BASE

CASE 394-03

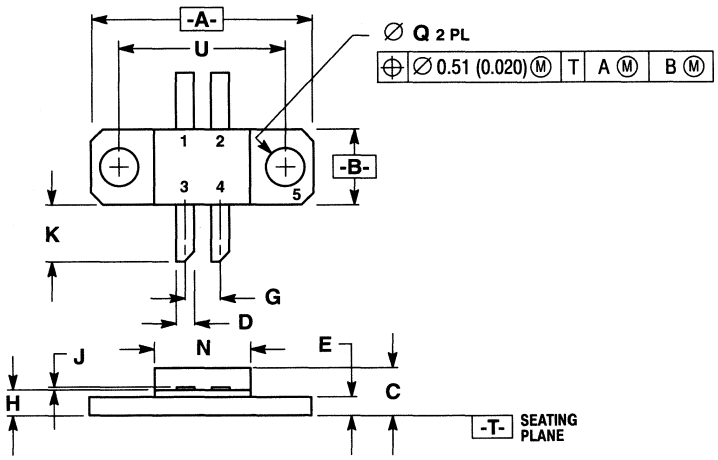


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.795	0.805	20.19	20.45
B	0.255	0.265	6.48	6.73
C	0.161	0.189	4.09	4.80
D	0.055	0.065	1.40	1.65
E	0.055	0.065	1.40	1.65
G	0.055	0.065	1.40	1.65
H	0.075	0.095	1.90	2.41
J	0.003	0.006	0.08	0.15
K	0.170	0.220	4.32	5.59
N	0.260	0.266	6.60	6.76
Q	0.125	0.135	3.18	3.42
U	0.552	0.572	14.03	14.52

STYLE 1:
PIN 1. BASE
2. BASE
3. COLLECTOR
4. COLLECTOR
5. EMITTER

CASE 395-02



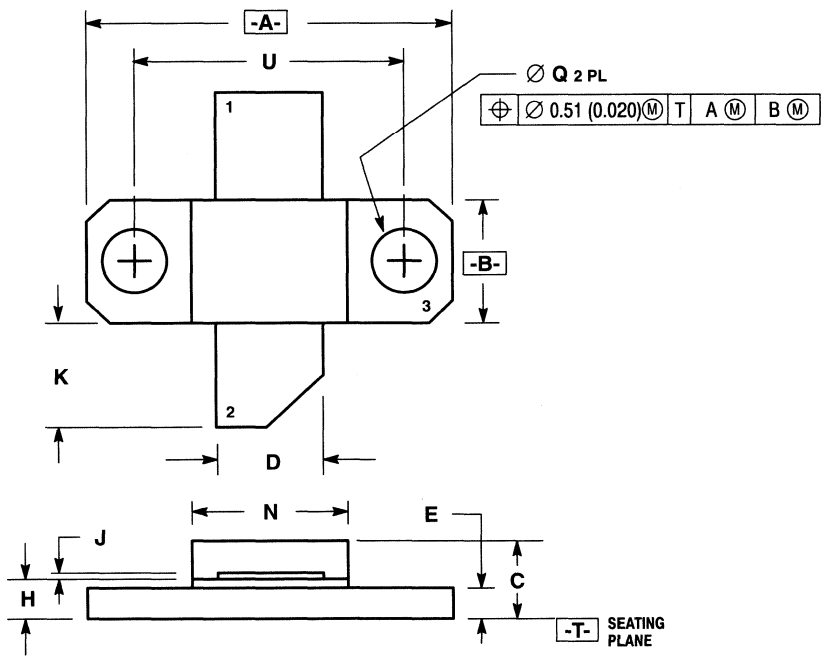
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.739	0.750	18.77	19.05
B	0.240	0.260	6.10	6.60
C	0.165	0.198	4.19	5.03
D	0.055	0.065	1.40	1.65
E	0.055	0.070	1.40	1.78
G	0.110	0.130	2.79	3.30
H	0.079	0.091	2.01	2.31
J	0.003	0.005	0.08	0.13
K	0.180	0.220	4.57	5.59
N	0.315	0.330	8.00	8.38
Q	0.125	0.135	3.18	3.42
U	0.560 BSC		14.23 BSC	

STYLE 1:
PIN 1. BASE
2. BASE
3. COLLECTOR
4. COLLECTOR
5. EMITTER

STYLE 2:
PIN 1. GATE
2. GATE
3. DRAIN
4. DRAIN
5. SOURCE

CASE 395B-01

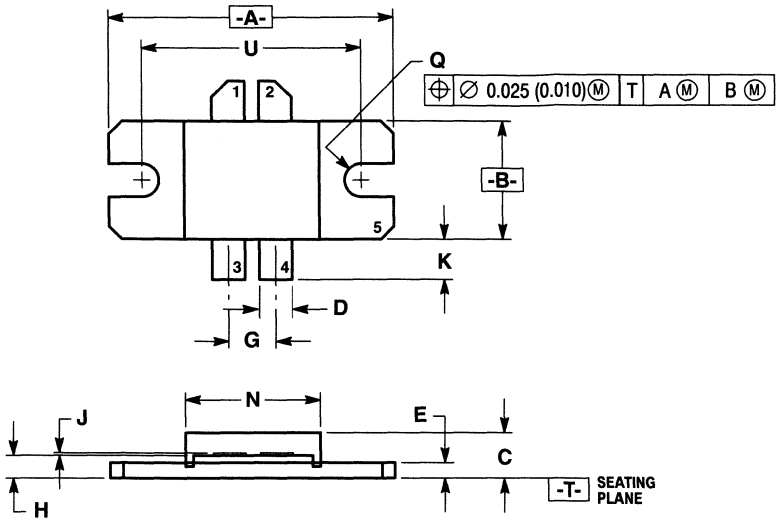


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.739	0.750	18.77	19.05
B	0.240	0.260	6.10	6.60
C	0.165	0.198	4.19	5.03
D	0.215	0.225	5.46	5.72
E	0.055	0.070	1.40	1.78
H	0.079	0.091	2.01	2.31
J	0.004	0.006	0.10	0.15
K	0.210	0.240	5.33	6.10
N	0.315	0.330	8.00	8.38
Q	0.125	0.135	3.18	3.42
U	0.560 BSC		14.23 BSC	

STYLE 1:
PIN 1. BASE
2. COLLECTOR
3. EMITTER

CASE 395C-01

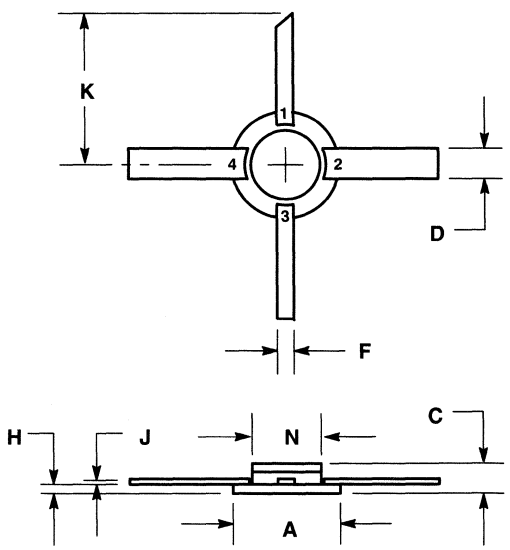


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	1.094	1.110	27.79	28.19
B	0.457	0.465	11.61	11.81
C	0.172	0.182	4.37	4.62
D	0.121	0.131	3.08	3.32
E	0.055	0.065	1.40	1.65
G	0.177	0.185	4.50	4.69
H	0.081	0.091	2.06	2.31
J	0.002	0.004	0.06	0.10
K	0.142	0.163	3.60	4.14
N	0.510	0.520	12.95	13.21
Q	0.125	0.135	3.18	3.42
U	0.844 BSC		21.44 BSC	

STYLE 1:
PIN 1. COLLECTOR
2. COLLECTOR
3. BASE
4. BASE
5. EMITTER

CASE 398-02

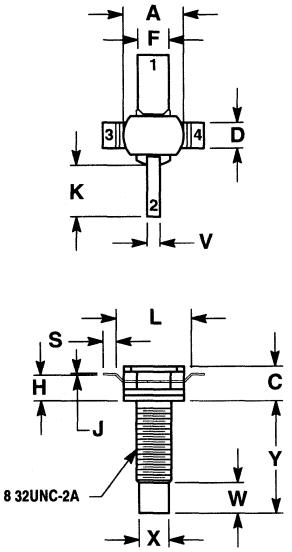


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.203	0.207	5.16	5.25
C	0.049	0.065	1.25	1.65
D	0.055	0.065	1.40	1.65
F	0.025	0.035	0.64	0.88
H	0.017	0.023	0.44	0.58
J	0.002	0.004	0.06	0.10
K	0.280	0.320	7.12	8.12
N	0.123	0.133	3.13	3.37

STYLE 1:
PIN 1. COLLECTOR
2. EMITTER
3. BASE
4. EMITTER

CASE 400-01

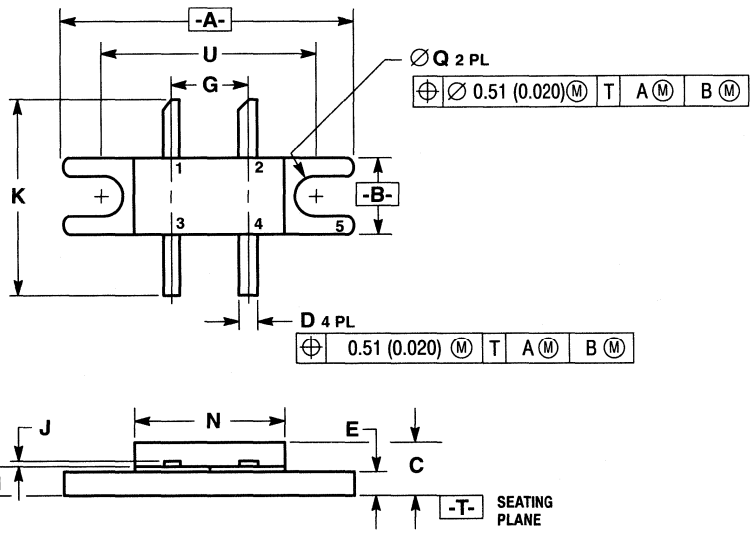


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.225	0.240	5.72	6.09
C	—	0.175	—	4.44
D	0.095	0.105	2.42	2.66
F	0.115	0.125	2.93	3.17
H	0.115	0.135	2.93	3.42
J	0.003	0.007	0.08	0.17
K	0.200	—	5.08	—
L	0.280	0.300	7.12	7.62
S	0.050	—	1.27	—
V	0.045	0.055	1.15	1.39
W	0.115	0.145	2.92	3.68
X	0.110	0.120	2.80	3.04
Y	0.420	0.460	10.67	11.68

STYLE 1:
PIN 1. BASE
2. COLLECTOR
3. EMITTER
4. EMITTER

CASE 401-02



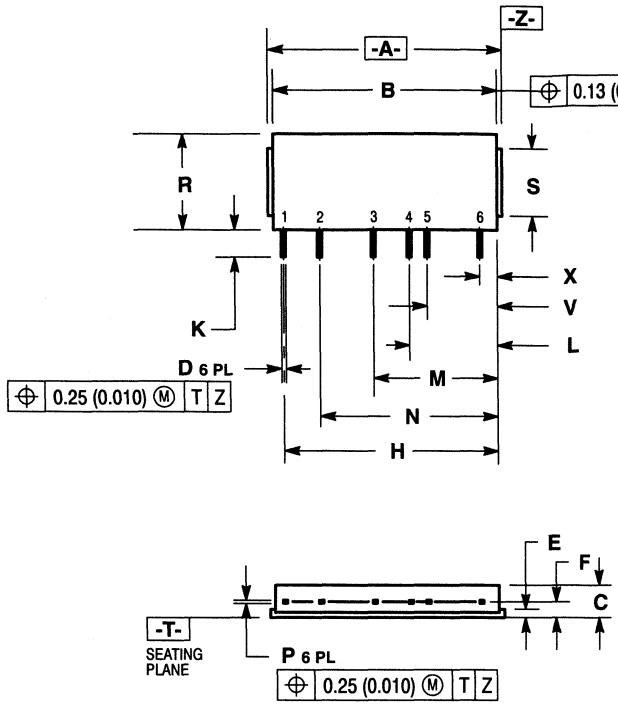
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.965	0.985	24.52	25.01
B	0.245	0.265	6.23	6.73
C	0.165	0.185	4.20	4.69
D	0.050	0.070	1.27	1.77
E	0.070	0.080	1.78	2.03
G	0.254 BSC		6.45 BSC	
H	0.095	0.105	2.42	2.66
J	0.003	0.006	0.08	0.15
K	0.625	0.675	15.88	17.14
N	0.495	0.520	12.58	13.20
Q	0.120	0.140	3.05	3.55
U	0.725 BSC		18.42 BSC	

STYLE 1:
PIN 1. DRAIN
2. DRAIN
3. GATE
4. GATE
5. SOURCE

CASE 412-01

PACKAGE OUTLINES (continued)

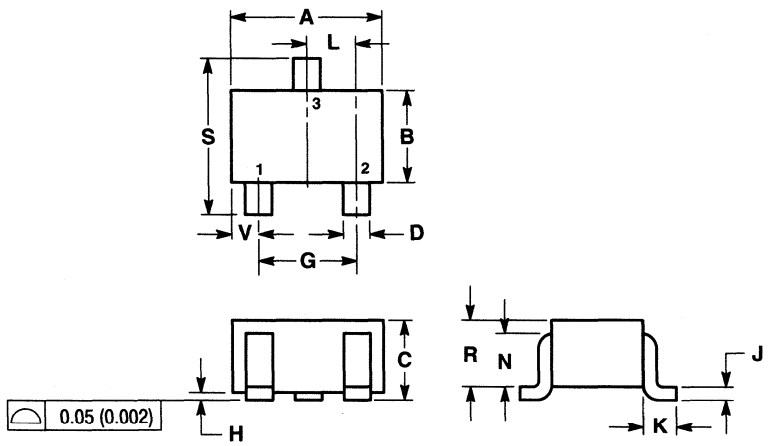


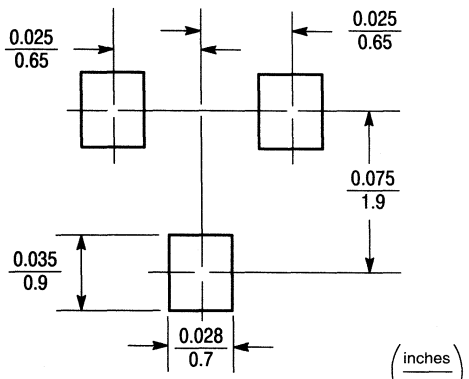
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION F TO CENTER OF LEADS.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	1.290	1.305	32.77	33.14
B	1.260	1.275	32.01	32.38
C	0.175	0.180	4.45	4.57
D	0.018	0.022	0.46	0.55
E	0.040	0.045	1.02	1.14
F	0.077	0.095	1.96	2.41
H	1.205 BSC		30.61 BSC	
K	0.100	—	2.54	—
L	0.505 BSC		12.83 BSC	
M	0.705 BSC		17.91 BSC	
N	1.005 BSC		25.53 BSC	
P	0.008	0.012	0.21	0.30
R	0.545	0.560	13.85	14.22
S	0.375	0.390	9.53	9.90
V	0.405 BSC		10.29 BSC	
X	0.105 BSC		2.67 BSC	

STYLE 1:
PIN 1. RF INPUT/V CONT
2. DC TERMINAL, VS1
3. DC TERMINAL, VB
4. DC TERMINAL, VS2
5. DC TERMINAL, VS3
6. RF OUTPUT
CASE: GROUND

CASE 413A-01





SC-70/SOT-323 FOOTPRINT

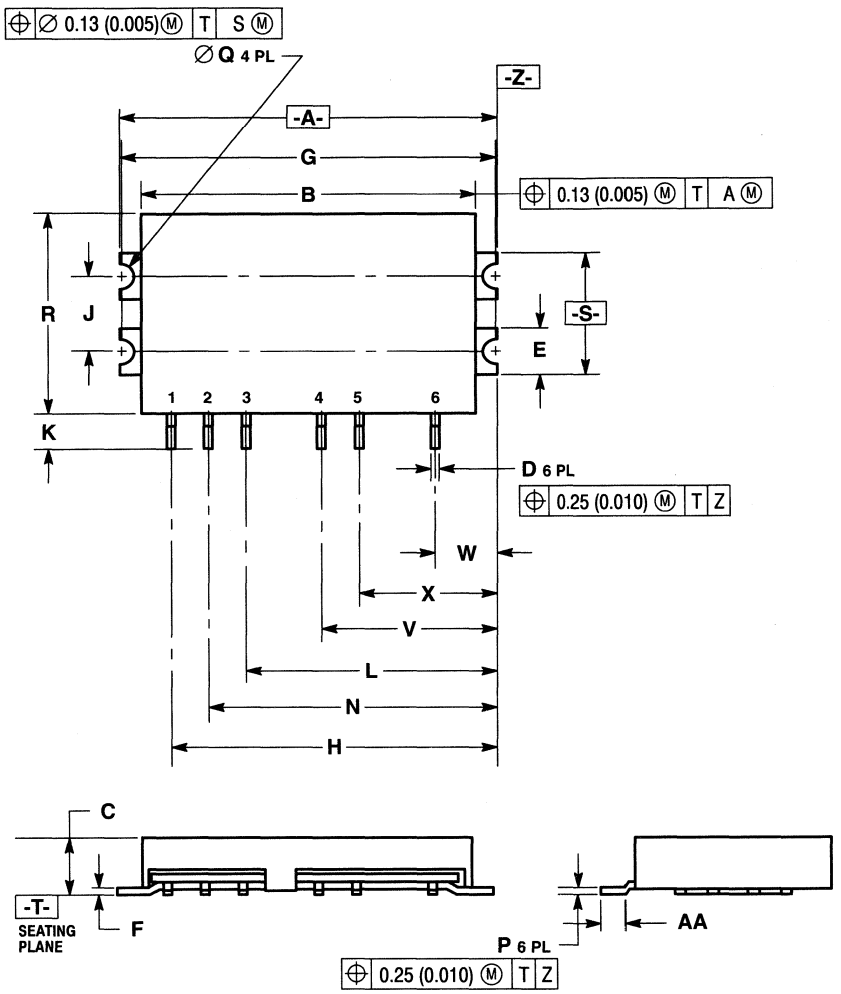
STYLE 3:
PIN 1. BASE
2. EMITTER
3. COLLECTOR

NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.071	0.087	1.80	2.20
B	0.045	0.053	1.15	1.35
C	0.035	0.049	0.90	1.25
D	0.012	0.016	0.30	0.40
G	0.047	0.055	1.20	1.40
H	0.000	0.004	0.00	0.10
J	0.004	0.010	0.10	0.25
K	0.017 REF		0.425 REF	
L	0.026 BSC		0.65 BSC	
N	0.028 REF		0.70 REF	
R	0.031	0.039	0.80	1.00
S	0.079	0.087	2.00	2.20
V	0.012	0.016	0.30	0.40

CASE 419-02

PACKAGE OUTLINES (continued)

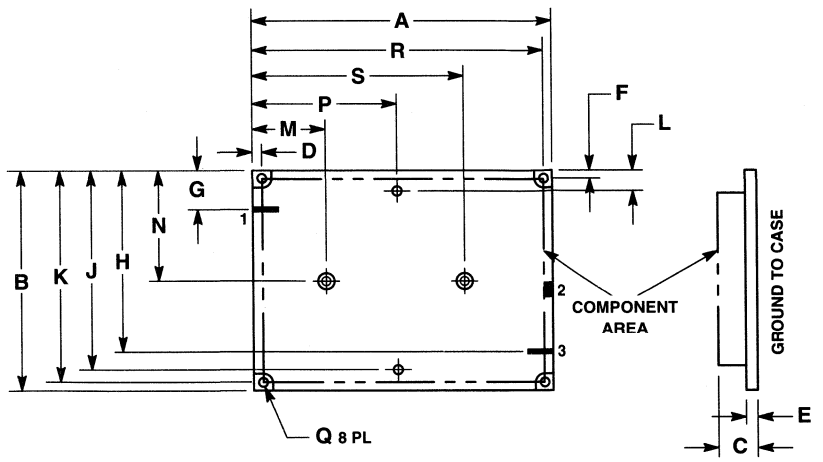


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	24.74	25.00	0.974	0.984
B	21.80	22.20	0.858	0.874
C	3.64	4.00	0.143	0.157
D	0.46	0.55	0.018	0.022
E	2.80	3.20	0.110	0.126
F	0.17	0.43	0.007	0.017
G	24.50 BSC		0.965 BSC	
H	21.50 BSC		0.846 BSC	
J	5.00 BSC		0.197 BSC	
K	2.20	2.48	0.087	0.097
L	16.50 BSC		0.650 BSC	
N	19.00 BSC		0.748 BSC	
P	0.21	0.30	0.008	0.12
Q	1.37	1.63	0.054	0.064
R	13.17	13.43	0.519	0.529
S	7.80	8.20	0.307	0.323
V	11.50 BSC		0.453 BSC	
W	4.00 BSC		0.157 BSC	
X	9.00 BSC		0.354 BSC	
AA	1.37	1.63	0.054	0.064

STYLE 1:
PIN 1. P IN
2. VGG1
3. VDD1
4. VGG2
5. VDD2
6. P OUT

CASE 420A-01

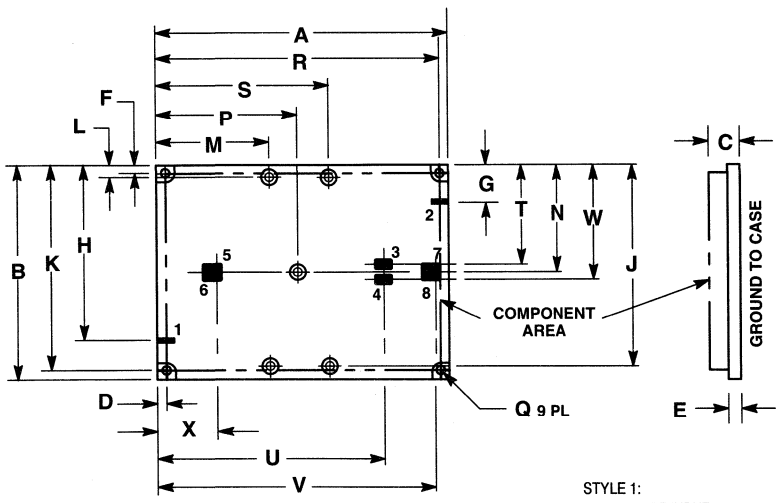


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	114.88	115.12	4.523	4.532
B	84.88	85.12	3.342	3.351
C	—	15.00	—	0.591
D	3.40	3.60	0.134	0.142
E	4.50	4.90	0.177	0.193
F	3.40	3.60	0.134	0.142
G	14.60	15.40	0.575	0.606
H	69.60	70.40	2.740	2.772
J	76.90	77.10	3.205	3.035
K	81.40	81.60	3.205	3.213
L	7.90	8.10	0.311	0.319
M	27.40	27.60	1.079	1.087
N	42.40	42.60	1.669	1.677
P	54.90	55.10	2.161	2.169
Q	3.10	3.40	0.122	0.134
R	111.40	111.60	4.386	4.394
S	80.90	81.10	3.185	3.193

STYLE 1:
PIN 1. RF INPUT
2. DC VOLTAGE
3. RF OUTPUT
GROUND TO PLANE

CASE 429-02

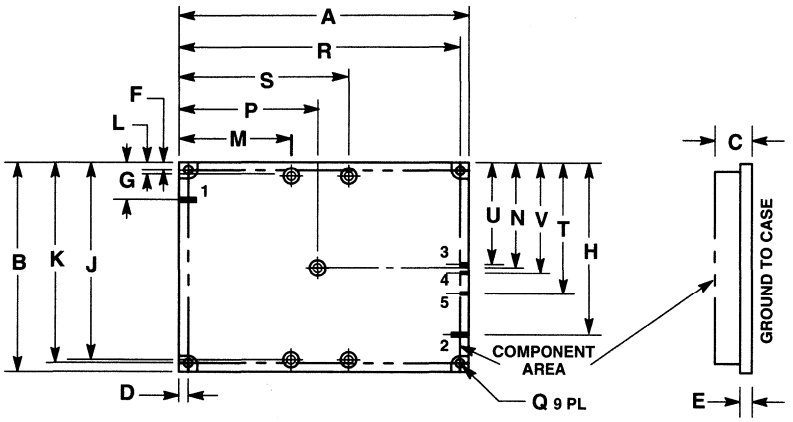


STYLE 1:
PIN 1. RF INPUT
2. RF OUTPUT
3. $+V_{CC}1$ - (GROUND TO CASE)
4. $+V_{CC}2$ - (GROUND TO CASE)
5. BIAS REMOTE
6. GROUND (BIAS REMOTE ONLY)
7. RF DETECTION
8. GROUND (RF DETECTION ONLY)

NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	4.523	4.532	114.88	115.12
B	3.342	3.351	84.88	85.12
C	—	0.472	—	12.0
D	0.134	0.142	3.4	3.6
E	0.177	0.193	4.5	4.9
F	0.134	0.142	3.4	3.6
G	0.575	0.606	14.6	15.4
H	2.740	2.772	69.6	70.4
J	3.146	3.154	79.9	80.1
K	3.205	3.213	81.4	81.6
L	0.193	0.201	4.9	5.1
M	1.728	1.736	43.9	44.1
N	1.669	1.677	42.4	42.6
P	2.154	2.161	54.7	54.9
Q	0.122	0.134	3.1	3.4
R	4.386	4.394	111.4	111.6
S	2.634	2.642	66.9	67.1
T	1.539	1.571	39.1	39.9
U	3.492	3.524	88.7	89.5
V	4.311	4.343	109.5	110.3
W	1.776	1.807	45.1	45.9
X	0.906	0.937	23.0	23.8

CASE 429A-01

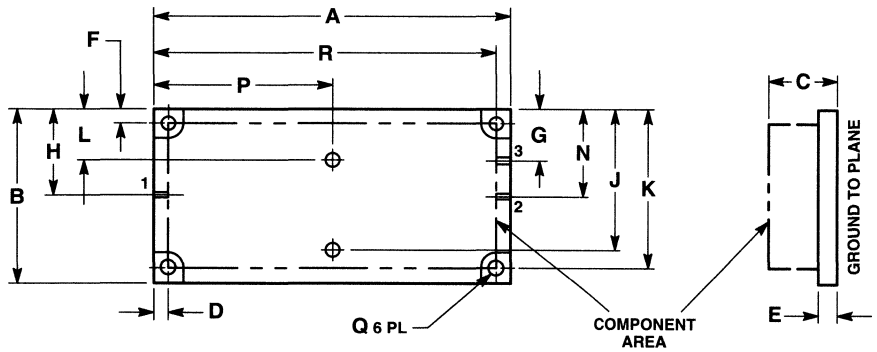


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	4.523	4.532	114.88	115.12
B	3.342	3.351	84.88	85.12
C	—	0.669	—	17.0
D	0.134	0.142	3.4	3.6
E	0.177	0.193	4.5	4.9
F	0.134	0.142	3.4	3.6
G	0.575	0.606	14.6	15.4
H	2.740	2.772	69.6	70.4
J	3.146	3.154	79.9	80.1
K	3.205	3.213	81.4	81.6
L	0.193	0.201	4.9	5.1
M	1.728	1.736	43.9	44.1
N	1.669	1.677	42.4	42.6
P	2.155	2.163	54.73	54.93
Q	0.122	0.134	3.1	3.4
R	4.386	4.394	111.4	111.6
S	2.634	2.642	66.9	67.1
T	2.106	2.138	53.5	54.3
U	1.602	1.634	40.7	41.5
V	1.713	1.744	43.5	44.3

STYLE 1:
PIN 1. RF INPUT
2. RF OUTPUT
3. $+V_{CC1}$
4. $+V_{CC2}$
5. RF DETECTION GROUND TO CASE

CASE 429C-01

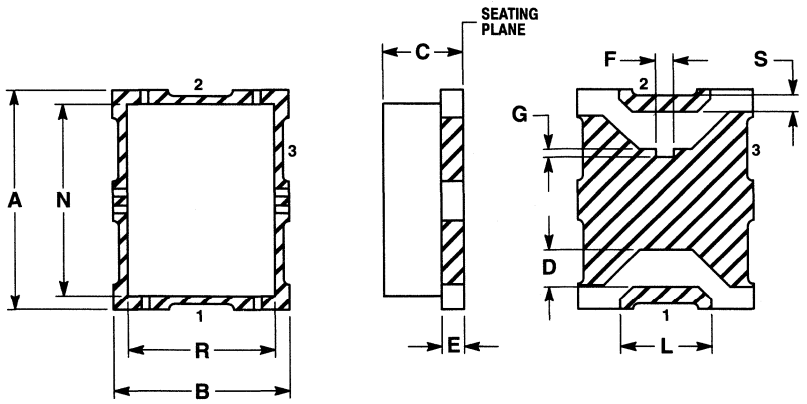


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	3.342	3.351	84.88	85.12
B	1.669	1.678	42.38	42.62
C	—	0.669	—	17.00
D	0.124	0.132	3.15	3.35
E	0.177	0.193	4.50	4.90
F	0.124	0.132	3.15	3.35
G	0.476	0.508	12.10	12.90
H	0.909	0.941	23.10	23.90
J	1.354	1.362	34.40	34.60
K	1.541	1.549	39.15	39.35
L	0.488	0.496	12.40	12.60
N	0.909	0.941	23.10	23.90
P	1.569	1.577	39.85	40.05
Q	0.122	0.134	3.10	3.40
R	3.215	3.222	81.65	81.85

STYLE 1:
PIN 1. RF INPUT
2. RF OUTPUT
3. $+V_{CC}$
GROUND TO CASE

CASE 429E-01

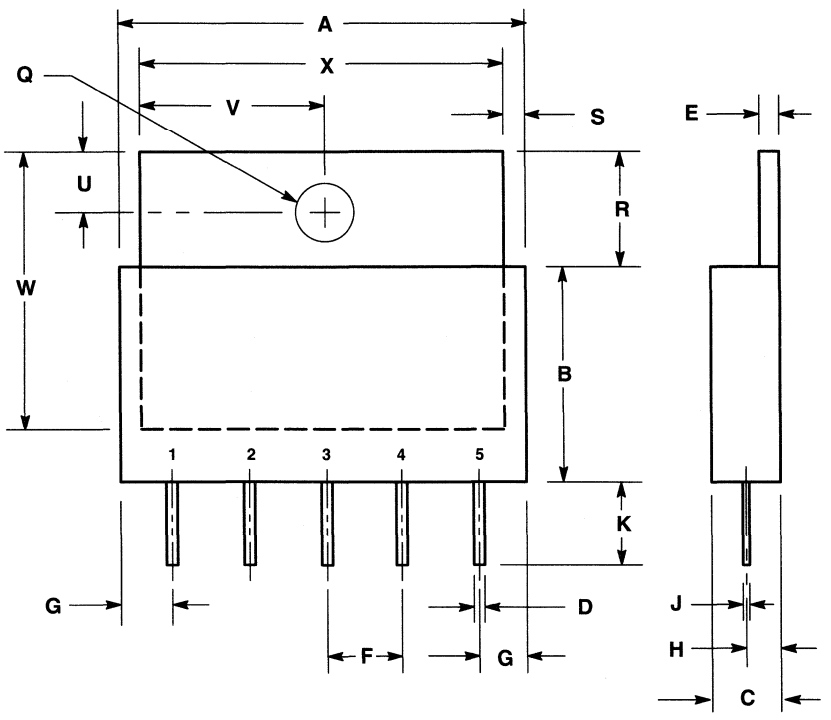


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.260	0.270	6.60	6.86
B	0.200	0.210	5.08	5.33
C	0.090	0.104	2.29	2.64
D	0.040	0.050	1.02	1.27
E	0.022	0.028	0.56	0.71
F	0.015	0.025	0.38	0.64
G	0.005	0.015	0.13	0.38
L	0.100	0.110	2.54	2.79
N	0.226	0.236	5.74	5.99
R	0.166	0.176	4.22	4.47
S	0.025	0.035	0.64	0.89

STYLE 2:
PIN 1. GATE
2. DRAIN
3. SOURCE

CASE 430-01

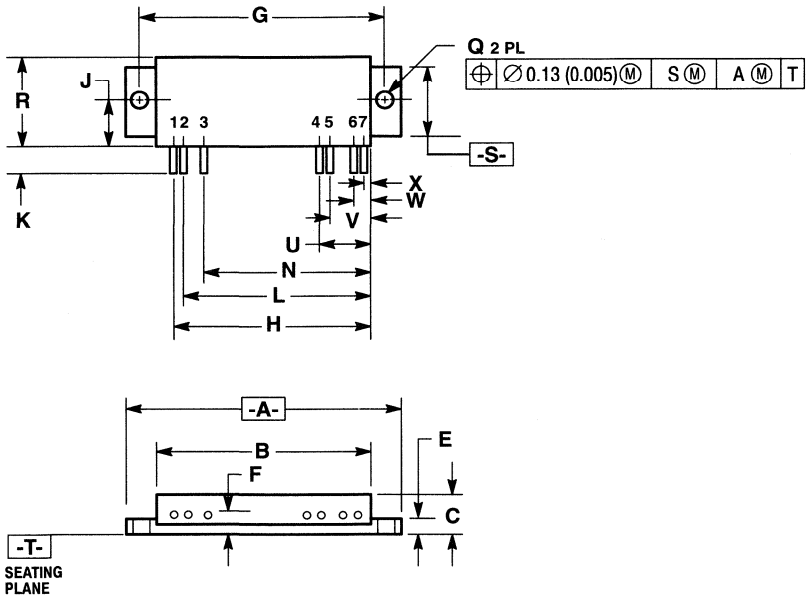


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	1.055	1.065	26.80	27.05
B	0.550	0.565	13.97	14.35
C	0.175	0.185	4.45	4.70
D	0.020	—	0.51	—
E	0.045	0.055	1.14	1.40
F	0.195	0.205	4.95	5.21
G	0.125	0.135	3.18	3.43
H	0.080	0.090	2.03	2.29
J	0.010	—	0.25	—
K	0.215	0.225	5.46	5.72
Q	0.145	0.155	3.68	3.94
R	0.300	0.320	7.62	8.13
S	0.045	0.055	1.14	1.40
U	0.155	0.165	3.94	4.19
V	0.470	0.480	11.94	12.19
W	0.730	0.740	18.54	18.80
X	0.945	0.955	24.00	24.26

STYLE 1:
PIN 1. V_{in}
2. GROUND
3. $+V_{CC}$
4. GROUND
5. V_{out}

CASE 431A-02

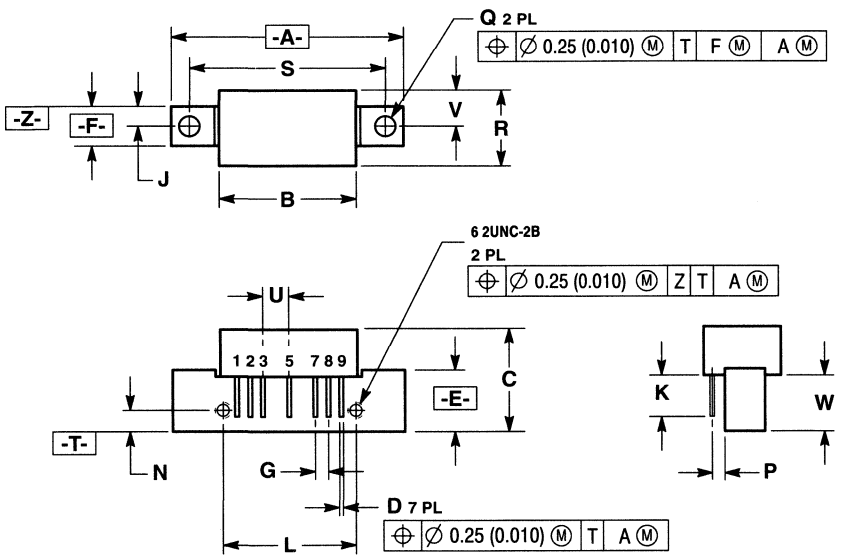


NOTES:
1. CONTROLLING DIMENSION: INCH.
2. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	2.640	2.660	67.06	67.56
B	2.040	2.085	51.82	52.95
C	0.335	0.360	8.51	9.14
E	0.100	0.115	2.54	2.92
F	0.085	0.115	2.16	2.92
G	2.405 BSC		61.09 BSC	
H	1.885	1.915	47.88	48.64
J	0.400	0.440	10.16	11.18
K	0.230	0.300	5.85	7.62
L	1.785	1.815	45.34	46.10
N	1.585	1.615	40.26	41.02
Q	0.136	0.146	3.46	3.70
R	0.800	0.820	20.32	20.82
S	0.670	0.690	17.02	17.52
U	0.485	0.515	12.32	13.08
V	0.385	0.415	9.78	10.54
W	0.185	0.215	4.70	5.46
X	0.085	0.115	2.16	2.92

STYLE 1:
PIN 1. RF OUTPUT
2. GROUND
3. D.C. TERMINAL
4. GROUND
5. D.C. GAIN
6. GROUND
7. RF INPUT

CASE 700-04

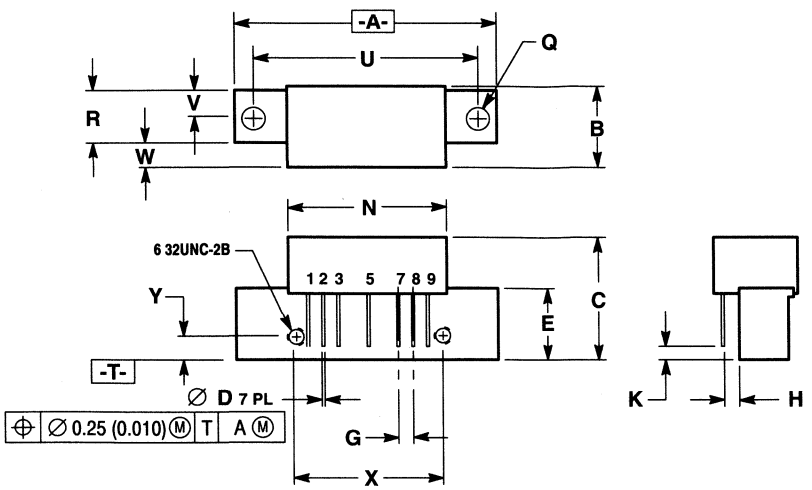


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	—	1.775	—	45.08
B	—	1.085	—	27.56
C	—	0.840	—	21.34
D	0.018	0.022	0.46	0.56
E	0.465	0.510	11.81	12.95
F	0.300	0.325	7.62	8.25
G	0.100 BSC		2.54 BSC	
J	0.156 BSC		3.96 BSC	
K	0.315	0.355	8.00	8.50
L	1.00 BSC		25.40 BSC	
N	0.165 BSC		4.19 BSC	
P	0.100 BSC		2.54 BSC	
Q	0.148	0.168	3.76	4.27
R	—	0.595	—	15.11
S	1.500 BSC		38.10 BSC	
U	0.200 BSC		5.08 BSC	
V	0.280 BSC		7.11 BSC	
W	0.435	0.450	11.05	11.43

STYLE 1:
PIN 1. RF INPUT
2. GROUND
3. GROUND
4. DELETED
5. VDC
6. DELETED
7. GROUND
8. GROUND
9. RF OUTPUT

CASE 714-06



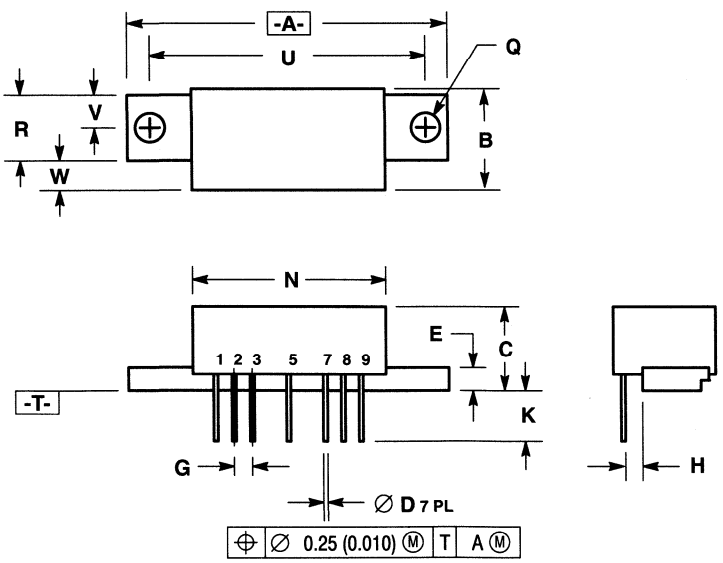
NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	—	1.775	—	45.09
B	—	0.585	—	14.85
C	—	0.870	—	22.09
D	0.019	0.022	0.49	0.55
E	0.490	0.510	12.45	12.95
G	0.100 BSC		2.54 BSC	
H	0.100 BSC		2.54 BSC	
K	0.070	0.110	1.78	2.79
N	1.040	1.060	26.42	26.92
Q	0.148	0.210	3.76	5.33
R	0.305	0.325	7.75	8.25
U	1.490	1.510	37.85	38.35
V	0.152	0.163	3.87	4.14
W	0.165	0.175	4.20	4.44
X	0.990	1.010	25.15	25.65
Y	0.160	0.170	4.07	4.31

STYLE 1:
PIN 1. RF INPUT
2. GROUND
3. GROUND
5. + V_{CC}
7. GROUND
8. GROUND
9. RF OUTPUT

CASE 714F-02



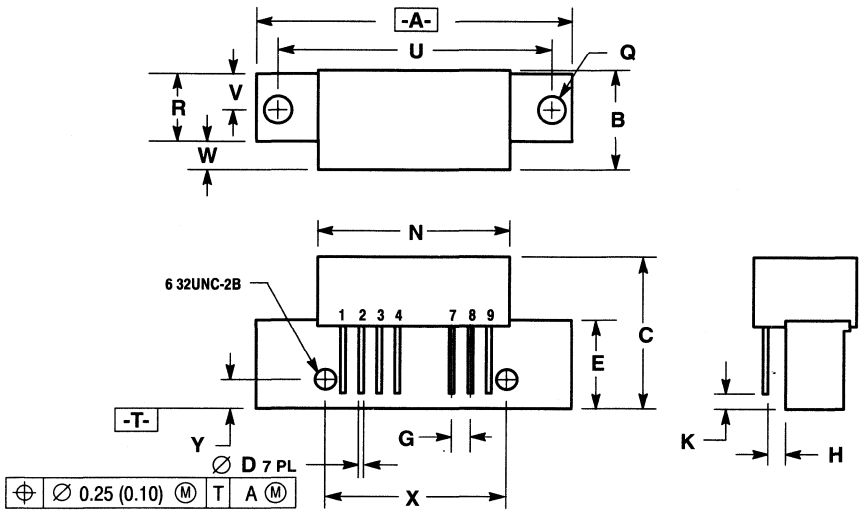
NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	—	1.775	—	45.09
B	0.550	0.570	13.97	14.47
C	0.430	0.470	10.93	11.93
D	0.017	0.020	0.44	0.50
E	0.120	0.130	3.05	3.30
G	0.100 BSC		2.54 BSC	
H	0.100 BSC		2.54 BSC	
K	0.255	0.305	6.48	7.74
N	1.040	1.060	26.42	26.92
Q	0.150	0.160	3.81	4.06
R	0.310	0.320	7.88	8.12
U	1.490	1.510	37.85	38.35
V	0.155	0.160	3.94	4.06
W	0.160	0.180	4.07	4.57

STYLE 1:
PIN 1. RF INPUT
2. GROUND
3. GROUND
5. +V_{CC}
7. GROUND
8. GROUND
9. RF OUTPUT

CASE 714G-02

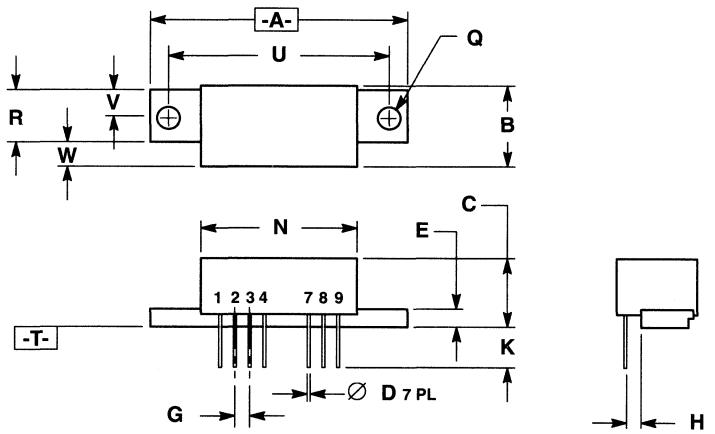


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	—	1.775	—	45.09
B	—	0.585	—	14.85
C	—	0.870	—	22.09
D	0.019	0.022	0.49	0.55
E	0.490	0.510	12.45	12.95
G	0.100 BSC		2.54 BSC	
H	0.100 BSC		2.54 BSC	
K	0.070	0.110	1.78	2.79
N	1.040	1.060	26.42	26.92
Q	0.148	0.210	3.76	5.33
R	0.305	0.325	7.75	8.25
U	1.490	1.510	37.85	38.35
V	0.152	0.163	3.87	4.14
W	0.165	0.175	4.20	4.44
X	0.990	1.010	25.15	25.65
Y	0.160	0.170	4.07	4.31

STYLE 1:
PIN 1. RF INPUT
2. GROUND
3. GROUND
4. $-V_{CC}$
7. GROUND
8. GROUND
9. RF OUTPUT

CASE 714H-02

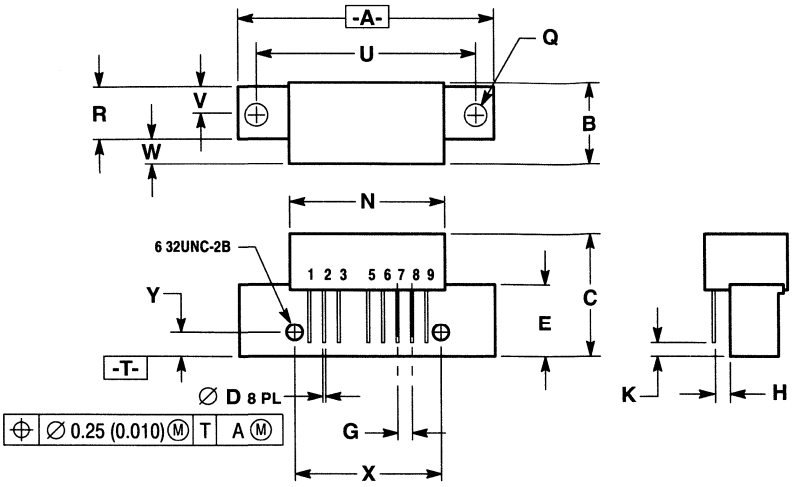


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	—	1.755	—	45.09
B	0.550	0.570	13.97	14.47
C	0.430	0.470	10.93	11.93
D	0.017	0.020	0.44	0.50
E	0.205	0.130	3.05	3.30
G	0.100		2.54 BSC	
H	0.100		2.54 BSC	
K	0.255	0.305	6.48	7.74
N	1.040	1.060	26.42	26.92
Q	0.150	0.160	3.81	4.06
R	0.310	0.320	7.88	8.12
U	1.490	1.510	37.85	38.35
V	0.155	0.160	3.94	4.06
W	0.160	0.180	4.07	4.57

STYLE 1:
PIN 1. RF INPUT
2. GROUND
3. GROUND
4. $-V_{CC}$
7. GROUND
8. GROUND
9. RF OUTPUT

CASE 714L-02

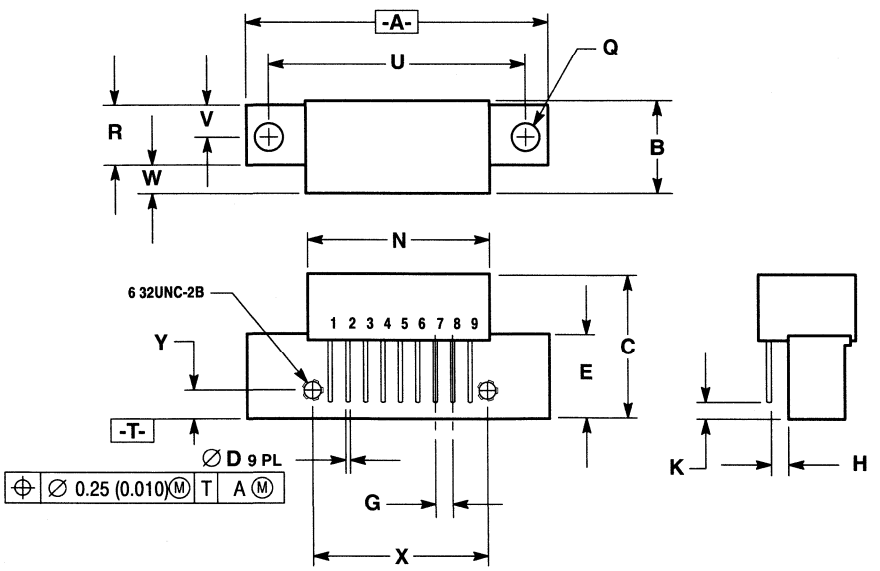


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	—	1.755	—	44.09
B	—	0.585	—	14.85
C	—	0.870	—	22.09
D	0.019	0.022	0.49	0.55
E	0.490	0.510	12.45	12.95
G	0.100 BSC		2.54 BSC	
H	0.100 BSC		2.54 BSC	
K	0.070	0.110	1.78	2.79
N	1.040	1.060	26.42	26.92
Q	0.148	0.210	3.76	5.33
R	0.305	0.325	7.75	8.25
U	1.490	1.510	37.85	38.35
V	0.152	0.163	3.87	4.14
W	0.165	0.175	4.20	4.44
X	0.990	1.010	25.15	25.65
Y	0.160	0.170	4.07	4.31

STYLE 1:
PIN 1. RF INPUT
2. GROUND
3. GROUND
5. V_{CC} 1
6. V_{CC} 2
7. GROUND
8. GROUND
9. RF OUTPUT

CASE 714M-02



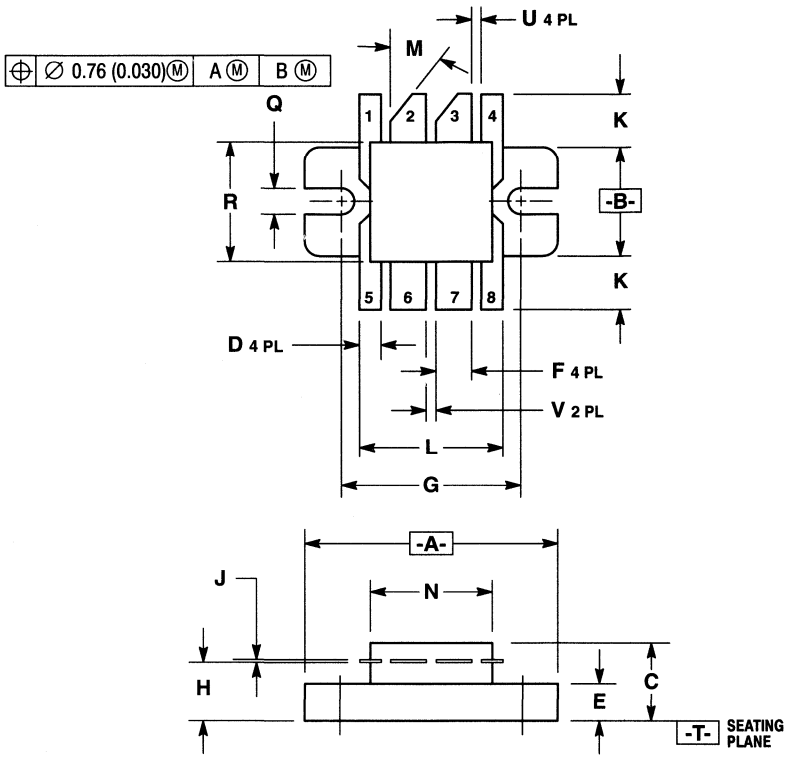
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982
2. CONTROLLING DIMENSION: INCH.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	—	1.755	—	44.57
B	—	0.585	—	14.85
C	—	0.870	—	22.09
D	0.019	0.022	0.49	0.55
E	0.490	0.510	12.45	12.95
G	0.100 BSC		2.54 BSC	
H	0.100 BSC		2.54 BSC	
K	0.070	0.110	1.78	2.79
N	1.040	1.060	26.42	26.92
Q	0.148	0.210	3.76	5.33
R	0.305	0.325	7.75	8.25
U	1.490	1.510	37.85	38.35
V	0.152	0.163	3.87	4.14
W	0.165	0.175	4.20	4.44
X	0.990	1.010	25.15	25.65
Y	0.160	0.170	4.07	4.31

STYLE 2:
PIN 1. RF INPUT
2. GROUND
3. GROUND
4. RESISTOR-GROUND
5. GROUND
6. GROUND
7. GROUND
8. V_{CC} 1
9. RF OUTPUT

STYLE 3:
PIN 1. RF INPUT
2. GROUND
3. GROUND
4. V_{CC} 1
5. GROUND
6. GROUND
7. GROUND
8. V_{CC} 2
9. RF OUTPUT

CASE 714P-02



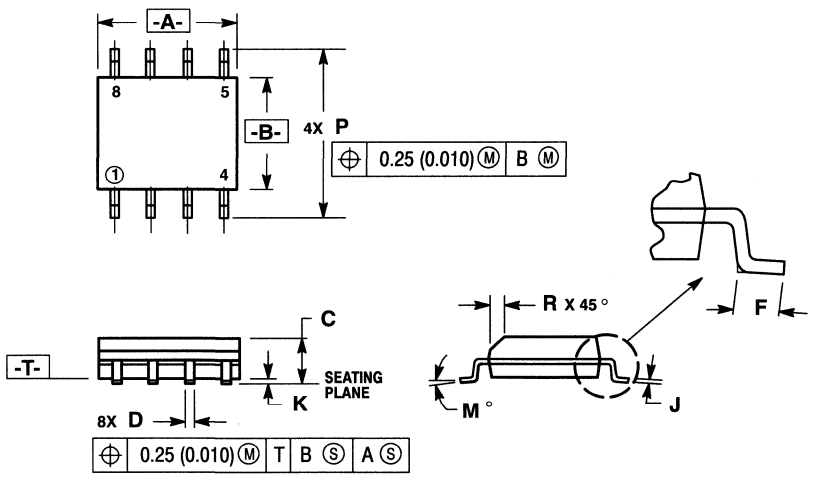
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.

DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	22.60	23.11	0.890	0.910
B	9.52	10.03	0.375	0.395
C	6.65	7.16	0.262	0.282
D	1.60	1.95	0.063	0.077
E	2.94	3.40	0.116	0.134
F	2.87	3.22	0.113	0.127
G	16.51 BSC		0.650 BSC	
H	4.01	4.36	0.158	0.172
J	0.07	0.15	0.003	0.006
K	4.34	4.90	0.171	0.193
L	12.44	12.95	0.490	0.510
M	45 ° NOM		45 ° NOM	
N	10.51	11.02	0.414	0.434
Q	3.04	3.35	0.120	0.132
R	9.90	10.41	0.390	0.410
U	1.02	1.27	0.040	0.050
V	0.64	0.89	0.025	0.035

STYLE 1:
PIN 1. EMITTER (COMMON)
2. COLLECTOR
3. COLLECTOR
4. EMITTER (COMMON)
5. EMITTER (COMMON)
6. BASE
7. BASE
8. EMITTER (COMMON)

STYLE 2:
PIN 1. SOURCE (COMMON)
2. DRAIN
3. DRAIN
4. SOURCE (COMMON)
5. SOURCE (COMMON)
6. GATE
7. GATE
8. SOURCE (COMMON)

CASE 744A-01



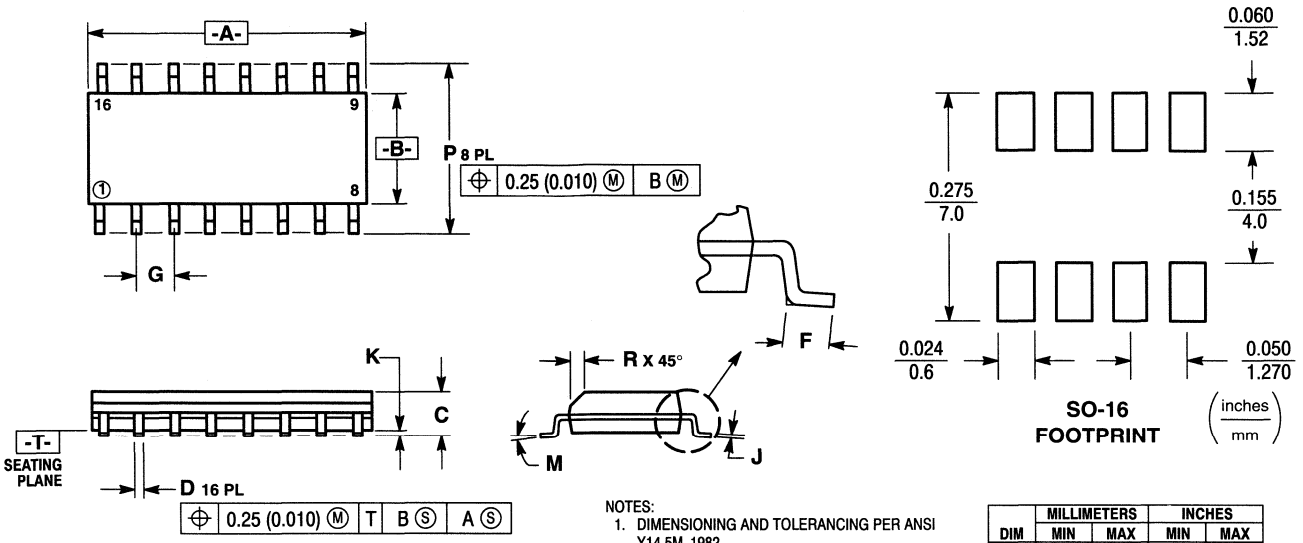
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.

DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	4.80	5.00	0.189	0.196
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.054	0.068
D	0.35	0.49	0.014	0.019
F	0.40	1.25	0.016	0.049
G	1.27 BSC		0.050 BSC	
J	0.18	0.25	0.007	0.009
K	0.10	0.25	0.004	0.009
M	0°	7°	0°	7°
P	5.80	6.20	0.229	0.244
R	0.25	0.50	0.010	0.019

STYLE 1:
PIN 1. EMITTER
2. COLLECTOR
3. COLLECTOR
4. EMITTER
5. EMITTER
6. BASE
7. BASE
8. EMITTER

CASE 751-05

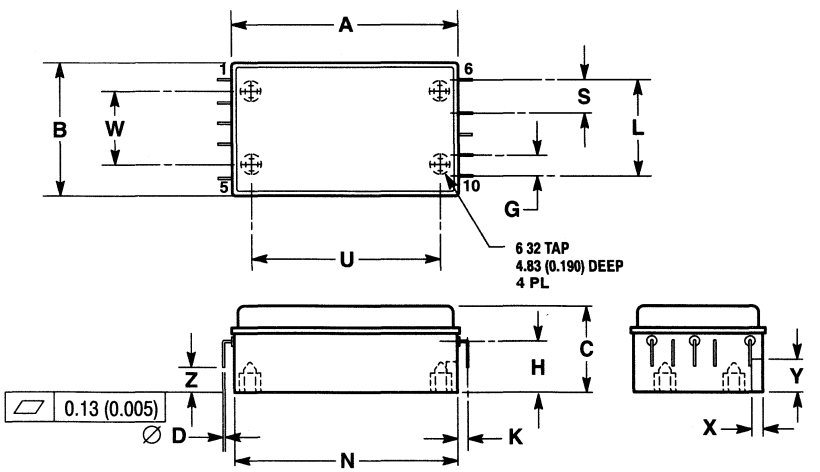
PACKAGE OUTLINES (continued)



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	9.80	10.00	0.386	0.393
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.054	0.068
D	0.35	0.49	0.014	0.019
F	0.40	1.25	0.016	0.049
G	1.27 BSC		0.050 BSC	
J	0.19	0.25	0.008	0.009
K	0.10	0.25	0.004	0.009
M	0°	7°	0°	7°
P	5.80	6.20	0.229	0.244
R	0.25	0.50	0.010	0.019

CASE 751B-05



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	2.107	2.150	53.52	54.61
B	1.225	1.250	31.12	31.75
C	0.805	0.845	20.45	21.46
D	0.018	0.022	0.46	0.56
G	0.190	0.210	4.83	5.33
H	0.490	0.510	12.45	12.95
K	0.100	0.120	2.54	3.05
L	0.910	0.930	23.12	23.62
N	2.053	2.083	52.15	52.90
S	0.310	0.330	7.87	8.38
U	1.785	1.815	45.34	46.10
W	0.690	0.710	17.53	18.03
X	0.090	0.110	2.29	2.79
Y	0.290	0.310	7.37	7.87
Z	0.230	0.270	5.84	6.86

STYLE 1:
PIN 1. 24 V
2. GROUND
3. INPUT
4. GROUND
5. TEST
6. TEST
7. GROUND
8. OUTPUT
9. GROUND
10. 24 V

CASE 825A-02

Index and Cross Reference

The Index and Cross Reference provides a listing of Motorola's closest replacement devices to industry standard devices. It is Motorola's intent to provide suitable replacement devices and to encourage the device user to investigate these alternatives.

Several guidelines are used to determine Motorola's closest replacement devices. For low power devices, guidelines are based on dc voltage ratings, cutoff frequency, current rating, junction capacitance, and noise figure. The high power guidelines are dc voltage ratings, output power, gain, frequency of operation and output capacitance.

New chip technologies and packaging requirements are constantly evolving to meet the explosive demands of the Communications market. Motorola's portfolio of RF devices reflects this growth and the changes in the Communications market.

Products listed with an asterisk are designated as "Not Recommended for New Design." These devices have become obsolete as dictated by poor market acceptance, or a technology or package that is reaching the end of its life cycle. Products "Not Recommended for New Design" have an uncertain future and do not represent a good selection for new device designs or long term usage.

INDEX AND CROSS REFERENCE (continued)

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2N3296	MRF134	6
2N3375	MRF134	6
2N3478	MMBR5179LT1	18, 21
2N3600	MMBR5179LT1	18, 21
2N3632	MRF134	6
2N3733	MRF134	6
2N3818	MRF134	6
2N3839*	MMBR5179LT1	18, 21
2N3866*	MRF3866	19, 21
2N3866A*	MRF3866	19, 21
2N3880	MMBR5031LT1	18, 21
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2N3925	MRF5003	7
2N3927	MRF2628	9
2N3948*	MRF4427	9, 19
2N3959*	MRF9011LT1	19, 20
2N3960*	MRF9011LT1	19, 20
2N3961	MRF134	6
2N4012	MRF134	6
2N4040	MRF321	9
2N4072	MRF5003	7
2N4073	MRF4427	9, 19
2N4130	MRF464	8
2N4427*	MRF4427	9, 19
2N4428*	MRF3866	19, 21
2N4932	MRF2628	9
2N4957*	MMBR4957LT1	18, 21
2N4958*	MMBR4957LT1	18, 21
2N4959*	MMBR4957LT1	18, 21
2N5016	MRF323	9
2N5031*	MMBR5031LT1	18, 21
2N5032*	MMBR5031LT1	18, 21
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2N5180	MMBR5179LT1	18, 21
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2N5424	MRF2628	9
2N5583*	MRF5583	19, 21
2N5589	MRF5003	7
2N5590*	MRF2628	9
2N5591*	MRF1946	9
2N5636*	MRF321	9
2N5637	MRF323	9
2N5641*	MRF134	6
2N5642*	MRF166C	7
2N5643*	MRF137	6
2N5644	MRF5003	7
2N5645	MRF652	10
2N5646	MRF653	10
2N5688	MRF2628	9
2N5689	MRF2628	9
2N5690	MRF1946	9
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2N5699	MRF652	10
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2N5713	MRF137	6
2N5774	MRF321	9
2N5775	MRF325	9
2N5829	MMBR4957LT1	18, 21
2N5835*	MRF9011LT1	19, 20
2N5836*	MRF951	18, 20
2N5837*	MRF951	18, 20
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2N5842	MRF571	18, 20
2N5847	MRF2628	9
2N5848	MRF1946	9
2N5862*	MRF316	8
2N5914	MRF5003	7
2N5915	MRF653	10
2N5918	MRF321	9
2N5919A	MRF323	9
2N5941	MRF138	6
2N5942	MRF464	8
2N5943*	MRF5943	19, 21
2N5944*	MRF5003	7
2N5945*	MRF652	10
2N5946*	MRF653	10
2N5947	MRF587	19, 21
2N5992	MRF2628	9
2N5993	MRF1946	9
2N5994	MRF315	8
2N5995	MRF2628	9
2N5996	MRF1946	9
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2N6083*	MRF1946	9
2N6084*	MRF1946	9
2N6093	MRF464	8
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2N6105	MRF325	9
2N6136	MRF644	10
2N6166*	MRF173	6
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2N6199	MRF137	6
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2N6986	2N6986	9
2SA1161	MMBR536LT1	18
2SA1223	MMBR536LT1	18
2SA1228	MMBR536LT1	18
2SA1230	MMBR536LT1	18
2SA1245	MMBR4957LT1	18, 21
2SA711	MRF9011LT1	19, 20
2SA800	MMBR536LT1	18
2SC1043	MRF587	19, 21
2SC1081	MRF654	10
2SC1090-1	MMBR911LT1	18, 20
2SC1119	MRF901	18, 20
2SC1251	MRF587	19, 21
2SC1252	MRF5812	19, 20, 21
2SC1253	MRF5812	19, 20, 21
2SC1256	MRF5003	7
2SC1257	MRF2628	9
2SC1258	MRF2628	9
2SC1259	MRF1946	9
2SC1260	MMBR5179LT1	18, 21
2SC1268	MRF571	18, 20
2SC1275	MMBR5179LT1	18, 21
2SC1297	MRF137	6
2SC1298	MRF315	8
2SC1336	MRF571	18, 20
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2SC1592	MRF587	19, 21
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2SC1594	MRF587	19, 21
2SC1600	MRF5812	19, 20, 21
2SC1605A	MRF2628	9
2SC1606	MRF5003	7
2SC1689	MRF315	8
2SC1729	MRF2628	9
2SC1763	MRF464	8
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2SC1808	MRF652	10
2SC1946	MRF1946	9
2SC1946A	MRF1946	9
2SC1947	MRF5003	7
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2SC1966	MRF652	10
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2SC2026	MPS911	17, 20
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INDUSTRY PART NUMBER	MOTOROLA CLOSEST REPLACEMENT	PAGE NO.
2SC2100	MRF492	8
2SC2101	MRF2628	9
2SC2102	MRF2628	9
2SC2103A	MRF1946	9
2SC2104	MRF652	10
2SC2105	MRF653	10
2SC2106	MRF654	10
2SC2131	MRF5003	7
2SC2148	MMBR911LT1	18, 20
2SC2149	MRF571	18, 20
2SC2174	MRF571	18, 20
2SC2181	MRF224	9
2SC2217	MRF571	18, 20
2SC2218	MRF571	18, 20
2SC2222	MRF653	10
2SC2280	MRF5003	7
2SC2281	MRF653	10
2SC2282	MRF2628	9
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2SC2351	MMBR571LT1	18, 20
2SC2367	MRF571	18, 20
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2SC2420	MRF1946	9
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2SC2570	MPS571	17, 20
2SC2586	MRF5003	7
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2SC2629	MRF1946	9
2SC2630	MRF247	9
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2SC2759	MMBR911LT1	18, 20
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2SC2887	MRF321	9
2SC2888	MRF314	8
2SC2889	MRF315	8
2SC2890	MRF316	8
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