Selector Guide

WIRELESS RF PRODUCT SELECTOR GUIDE

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MOTOROLA
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wireless

Wireless RF Product Selector Guide

Offering a broad portfolio of RF products, Motorola serves both the wireless infrastructure and subscriber markets. Motorola RF Solutions is the leader in RF technology—today AND tomorrow—and is the answer for developers who are creating innovative new products to meet their customers' need for wireless connections. Motorola pioneered RF technology and continues to drive future innovations, delivering significantly higher measurable performance over our competitors—in most cases, 15 to 30 percent. Motorola RF Solutions supports developers through unequaled integration, high terminal impedance, the most comprehensive RF toolkit in the industry, and access to our global support team. Motorola is committed to the development of new products and expansion of our product offerings to meet the increasing global demands of ISM band and personal communications systems, including cellular phone, broadband data, TV broadcast, land mobile and CATV systems.

How to Use This Selector Guide

The RF Monolithic Integrated Circuits and the RF/IF Integrated Circuits products in this guide are divided into three major functional categories: RF Front End ICs, RF/IF Subsystem ICs and Frequency Synthesis. Each of these categories is further subdivided based on circuit functionality. This structure differentiates highly integrated subsystem ICs from fundamental circuit building blocks and discrete transistors.

The Power LDMOS Transistors, Power GaAs Transistors, Power Amplifier ICs and Modules and CATV Distribution Amplifier Modules are FIRST divided into major categories by frequency band. SECOND, within each category, parts are listed by power level. THIRD, within a frequency band, transistors are further grouped by operating voltage and, finally, output power.

Applications Assistance

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

Access Data On-Line!

Use the Motorola SPS Internet to access Motorola Semiconductor Product data at http://www.motorola.com/semiconductors or http://www.motorola.com/rf. The SPS Internet provides you with instant access to parametric search, part number search, product summary pages, data sheets, selector guide information, application information, design tools, package outlines, on-line technical support and much more.

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Wireless RF Product Selector Guide

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ACCESS DATA ON-LINE! - USE MOTOROLA'S SPS INTERNET SERVER

Motorola Semiconductors has provided a World Wide Web Server to deliver Motorola SPS technical data to the global Internet community. Available online are Part Number Search, Parametric Search, the Product Library, Documentation Library, Tools Library, Industry Focus sites, Design Resource sites, Technical Helpline, Technical Training and Where to Buy at the following URL: http://www.motorola.com/semiconductors.

See the RF and IF Design Resource site at http://www.motorola.com/rf for specific Wireless RF Product support information for:

- Data sheets
- Applications notes
- Selector guides
- Packaging information
- Application information
- Models
- Reference designs
- Reference design simulations
- Circuit board artwork
- Roadmaps
- Press releases
- Events

Design Tools and Data Available On-line for Your Design-in Process

RF Reference Designs

RF Power Reference Designs provide:

- RF Performance Tuned for Specific Standard Broadcast Formats
- Low Cost Component Selection
- Complete BOM, Layout, PCB and All Design Information Available
- Integral Temperature Compensated Bias Circuits Included
- Extensive RF Characterizations

Motorola is pleased to offer application-specific reference designs. These application-specific reference designs show some of the many possible uses of our high power RF transistors. They provide the customer's design engineers with a fast and accurate tool to both evaluate the performance envelope and fully characterize the devices under a variety of different operating conditions.

Low-cost component selection was chosen so that the end users could transition the design and its entire Bill of Materials into a high volume base station manufacturing process and still be cost competitive with other competing technologies.

The circuit board is made of a recently developed ceramic loaded thermoset plastic woven glass material that offers very low material costs, low PCB fabrication cost, and yet still has an exceptionally low dissipation factor giving low RF loss. The dielectric constant of this material is high enough to allow for compact, distributed element matching structures, yet of a reasonable value to make it relatively insensitive to fabrication and etching variations.

The circuit's matching and decoupling capacitors utilize a low-cost silicon dioxide dielectric process rather than the traditional porcelain multi-layered assemblies, and they offer low ESRs, very high Q's and tight capacitance value tolerances.

The reference design data sheet contains a wealth of information that customers can use to better understand the range and capabilities of the Motorola devices. Included on the data sheet are such basics as the intended end use application (GSM, W-CDMA, etc.), the typical performance level expected (2% EVM, -40 dBc ACP, etc.) and some device features such as ESD protection and good thermal stability. For more information, go to http://www.motorola.com/rf and select Tools//Reference Designs.

RF LDMOS Models

Motorola continues to populate its LDMOS Model Library with the LDMOS MET (Motorola's Electro Thermal) models and with the LDMOS Root models. All product models available in the RF LDMOS Model Library (Root and MET) include package, bond wire and internal matching network effects.

The Motorola Electro Thermal (MET) model for RF LDMOS transistors is a nonlinear model that examines both electrical and thermal phenomena and can account for dynamic self-heating effects of device performance. It is specifically tailored to model high power RF LDMOS transistors used in wireless base station applications.

Implemented in the Agilent® EEsof® EDA Advanced Design System, APLAC® Analog Design Tool, Applied Wave Research Microwave Office™, Ansoft® Serenade Design Environment and Eagleware™ GENESYS™ Microwave and RF Design Suite, the MET LDMOS model is capable of performing small-signal, large-signal, harmonic-balance, noise and transient simulations. Because of its ability to simulate self-heating effects, the MET model is more accurate than existing models, enabling circuit designers

to predict prototype performance more accurately and reduce design cycle time.

The current release of the MET LDMOS model is available for these tools:

- Agilent EEsof ADS® (UNIX and PC) nonlinear circuit simulator
- APLAC Analog Design Tool
- Applied Wave Research Microwave™ Office
- Ansoft Serenade Design Environment
- Eagleware GENESYS Microwave and RF Design Suite

The LDMOS Model Library is available for all major computer platforms supported by these simulators.

For more information and latest releases supported, go to

http://www.motorola.com/rf/models.

RF Power Reference Design Simulations

- Provides a link between Reference Designs and MET models
- Example designs exist for a wide selection of Motorola RF devices
- Demonstrates how to design an amplifier using microwave stripline techniques in the Agilent® ADS® environment
- Provides “real-world” tutorial on how to use nonlinear models
- Example designs for all major applications: GSM, CDMA, W-CDMA, TDMA
- Models provide examples of CW and 2-tone signal simulation
- Simulation files are provided royalty-free to allow for reuse and adaptation
- The device selection and applications are being continually updated
- Provides feedback path from customers to improve usability and accuracy of models

Reference Design Simulations

In the past, Motorola has provided application-specific reference designs that are targeted to provide a pre-designed circuit suitable for a specific application. Additionally, Motorola has also provided modeling tools, specifically MET models, to facilitate design using Computer Aided Engineering (CAE) techniques. These two pieces of the puzzle are excellent design tools; however, they are never linked to each other, leaving the customer to figure out the best way to blend the two tools to their advantage. Reference Design Simulations are designed to provide the link between these two tools.

Tools Provided

Reference Design Simulations provide an example application of MET models in a pre-designed application circuit. Motorola has taken the time to characterize specific reference design circuits in ”software form.” The simulations have been chosen to represent a wide selection of RF devices under many of the major communication standards, including GSM, CDMA, W-CDMA and TDMA.

Learning Tools

Reference Design Simulations provide examples of how to use nonlinear models of RF transistors. Specifically, the user will also learn how to design an amplifier using microwave stripline matching techniques. To provide the most accurate modeling results, each simulation provides examples for CW, 2-tone and modulated signals, as applicable.

Reference Design Simulation Availability

The Reference Design Simulation circuits are available as downloadable Agilent ADS projects from the Motorola SPS web site. These simulation files are provided royalty-free to allow for reuse and adaptation to other application requirements.

Go to http://www.motorola.com/rf and select Tools/Software Tools/Reference Design Simulations.

Literature Centers

Printed literature can be obtained from the Literature Centers upon request. For those items that incur a cost, the U.S. Literature Center will accept Master Card and Visa.

USA/EUROPE/Locations Not Listed:

Motorola Literature Distribution
P.O. Box 5405
Denver, Colorado 80217
Phone: 1-800-521-6274 or 1-480-768-2130

JAPAN:

Motorola Japan Ltd.
SPS, Technical Information Center
3-20-1, Minami-Azabu. Minato-ku
Tokyo 106-8573 Japan
Phone: 81-3-3440-3569

ASIA/PACIFIC:

Motorola Semiconductors H.K. Ltd.
Silicon Harbour Centre
2 Dai King Street, Tai Po Industrial Estate
Tai Po, N.T., Hong Kong
Phone: 852-26668334

RF Front End ICs

Motorola's RF Front End integrated circuit devices provide an integrated solution for the personal communications market. These devices are available in plastic SOT-343, SOT-363, TSSOP-16, TSSOP-20EP, QFN-20, QFN-24, or QFN-32 packages.

Evaluation Boards

Evaluation boards are available for RF Front End Integrated Circuits. For a complete list of currently available boards and ones in development for newly introduced product, please contact your local Motorola Distributor or Sales Office.

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RF Front End ICs

RFICs

Upconverters/Exciters

Product	RF Freq. Range MHz	Supply Volt. Range Vdc	Supply Current mA (Typ)	Standby Current mA (Typ)	Conv. Gain dB (Typ)	Output IP3 dBm (Typ)	Packaging	System Applicability
MC13751FC[18b]	800 to 900 1900 to 1950	2.7 to 2.9	53	0.025	21.5 23	24	1307/ QFN-24	TDMA, PCS

Downconverters

Product	Input Freq. MHz	LO Freq. Vdc	IF Freq. (MHz)	Gain (dB)	NF (dB)	IIP3 (dBm)	Supply Current	Packaging	System Applicability
MC13770[42] (LNA)	2100 to 2170	n/a	n/a	15 -5.0	1.5 5.0	0 20	3.0 mA 10 mA	1345/ QFN-12	W-CDMA, PCS, PDC
MC13770[43] (Mixer)	2110 to 2170	2300 to 2360 2490 to 2550	190 380	10.0	8.0	-3.0	5.0 mA	1345/ QFN-12	W-CDMA, PCS, PDC

Power Amplifiers

Product	Freq. Range MHz	Supply Volt. Range Vdc	Saturated P_{out} dBm (Typ)	PAE % (Typ)	Gain P_{out}/P_{in} dB (Typ)	Packaging	System Applicability
MRFIC0970[18b]	800 to 1000	2.8 to 5.5	35.2	53	30.2	1308/ QFN-20	GSM, ISM
MRFIC1870[18b]	1700 to 2000	2.8 to 5.5	33	45	28	1308/ QFN-20	DCS1800, PCS
MMM5047	824 to 849	3.0 to 4.5	30 28 32	27.9 37.1 44.8	31.3 30.8 31.1	1440/ 9x12 mm Module	AMPS, TDMA, GSM850
	1850 to 1910		30 32	32.3 39.9	31.6 31.5		TDMA, PCS1900
MMM5062[18m]	800 to 1000 1700 to 2000	2.7 to 5.5	33.4 34.0	54 43	36.2 31.0	1383/ 7x7 mm Module	GSM850, GSM900, DCS1800, PCS1900
MMM5063	800 to 2000	2.7 to 5.5	34.0 35.2 33.8	44 43 53	— — —	1383/ 7x7 mm Module	GSM900, DCS1800, PCS1900

[18]Tape and Reel Packaging Options: a) R1 = 500 units; b) R2 = 2,500 units; c) T1 = 3,000 units; d) T3 = 10,000 units; e) R2 = 1,500 units; f) T1 = 1,000 units; g) R2 = 4,000 units; h) R1 = 1,000 units; i) R3 = 250 units; j) T1 = 500 units; k) R2 = 450 units; l) T1 = 5,000 units; m) R2 = 2,000 units; n) R4 = 100 units; o) R6 = 150 units.

[42]In LNA section, specifications are represented in High Gain Mode first and Bypass Mode second.

[43]In Mixer section, LO frequency ranges are specified for 190 MHz and 380 MHz IF.

RF Building Blocks

Amplifiers

Product	RF Freq. Range MHz	Supply Volt. Range Vdc	Supply Current mA (Typ)	Standby Current μA (Typ)	Small Signal Gain dB (Typ)	Output IP3 dBm (Typ)	NF dB (Typ)	Packaging	System Applicability
MBC13720[18c]	400 to 2500	2.5 to 3.0	9.0	<20	14.5 @ 1900 MHz	24.5 @ 1900 MHz	1.38 @ 1900 MHz	419B/ SOT-363	ISM900, 2400, PCS, CDMA
MBC13916[18c]	100 to 2500	2.7 to 5.0	4.7	—	19 @ 900 MHz	16.5 @ 900 MHz	0.9 @ 900 MHz	SOT-343R	General Purpose Cascode Amp for VCOs, Buffers, & LNAs

[18]Tape and Reel Packaging Options: a) R1 = 500 units; b) R2 = 2,500 units; c) T1 = 3,000 units; d) T3 = 10,000 units; e) R2 = 1,500 units; f) T1 = 1,000 units; g) R2 = 4,000 units; h) R1 = 1,000 units; i) R3 = 250 units; j) T1 = 500 units; k) R2 = 450 units; l) T1 = 5,000 units; m) R2 = 2,000 units; n) R4 = 100 units; o) R6 = 150 units.

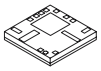
RF Front End Integrated Circuit Packages

CASE 419B
(SOT–363)

CASE 1307
(QFN–24)

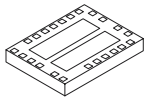
CASE 1308
(QFN–20)

CASE 1345
(QFN–12)



CASE 1383
(7x7 Module)

CASE 1404
(SOT–343R)



CASE 1440
(9x12 Module)

SCALE 1:1

RF/IF Subsystems

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RF/IF Subsystems

Tranceivers

Product	V_{CC}	I_{CC}	Max Input Freq.	Sensitivity	PLLS	Baseband BW	System Applicability	Packaging
MC13190FC[18b]	2.5 - 3.0V	12 mA Rx 64 mA Tx 78 mA SB	2.5 GHz	-68 dBm @ 15 dBm S/N	1	5 MHz	2.4 GHz ISM	1311/ QFN-32

Miscellaneous Functions

ADCs/DACs

Product	Function	I/O Format	Resolution	Number of Analog Channels	On-Chip Oscillator	Other Features	Suffix/ Packaging
MC144110[25b]	DAC	Serial	6 Bits	6	n/a	Emitter-Follower Outputs	DW/751D
MC144111[25b]				4			DW/751G

Encoders/Decoders

Product	Function	Number of Address Lines	Maximum Number of Address Codes	Number of Data Bits	Operation	Suffix/ Packaging
MC145026[25b]	Encoder	Depends on Decoder	Depends on Decoder	Depends on Decoder	Simplex	P/648, D/751B
MC145027[25b]	Decoder	5	243	4	Simplex	P/648, DW/751G
MC145028[25b]		9	19,683	0	Simplex	

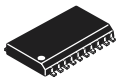
[18]Tape and Reel Packaging Options: a) R1 = 500 units; b) R2 = 2,500 units; c) T1 = 3,000 units; d) T3 = 10,000 units; e) R2 = 1,500 units; f) T1 = 1,000 units; g) R2 = 4,000 units; h) R1 = 1,000 units; i) R3 = 250 units; j) T1 = 500 units; k) R2 = 450 units; l) T1 = 5,000 units; m) R2 = 2,000 units; n) R4 = 100 units; o) R6 = 150 units.

[25]Device available only from Lansdale Semiconductor **after**: a) 3Q03; b) 3Q04.

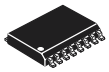
RF/IF Subsystems Packages

CASE 648
P SUFFIX
(DIP–16)

CASE 751B
D SUFFIX
(SO–16)



CASE 751D
DW SUFFIX
(SO–20L)



CASE 751G
DW SUFFIX
(SO–16W)

CASE 1311
(QFN–32)

Frequency Synthesis

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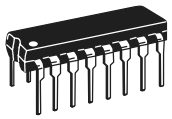
Frequency Synthesis

Single PLL Synthesizers

Product	Maximum Frequency (MHz)	Supply Voltage (V)	Nominal Supply Current (mA)	Features	Packaging
MC145151-2[25b]	20 @ 5.0 V	3.0 to 9.0	7.5 @ 5 V	Parallel Interface	DW/751F
MC145152-2[25b]	20 @ 5.0 V	3.0 to 9.0	7.5 @ 5 V	Parallel Interface, Uses External Dual-Modulus Prescaler	DW/751F
MC145157-2[25a]	20 @ 5.0 V	3.0 to 9.0	7.5 @ 5 V	Serial Interface	DW/751G
MC145158-2[25a]	20 @ 5.0 V	3.0 to 9.0	7.5 @ 5 V	Serial Interface, Uses External Dual-Modulus Prescaler	DW/751G
MC145170-2	100 @ 3.0 V 185 @ 4.5 V	2.7 to 5.5	2 @ 3 V 6 @ 5 V	Serial Interface, Auxiliary Reference Divider, Evaluation Kit - MC145170EVK	P/648, D/751B, DT/948C

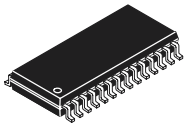
[25]Device available only from Lansdale Semiconductor **after**: a) 3Q03; b) 3Q04.

Frequency Synthesis Packages

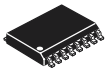


CASE 648
P SUFFIX
(DIP–16)

CASE 751B
D SUFFIX
(SO–16)



CASE 751F
DW SUFFIX
(SO–28L)



CASE 751G
DW SUFFIX
(SO–16W)

CASE 948C
DT SUFFIX
(TSSOP–16)

Motorola RF Transistors

Motorola continues to be the industry leader in RF transistor technology. Our current portfolio ranges from high gain and low noise devices at microwave frequencies to high power devices for fixed RF and microwave applications. Technical innovation combined with world-class manufacturing capability allows Motorola to offer world class product, service and support to its customers.

From our LDMOS and GaAs portfolio, the user can choose from a variety of packages. They include plastic and ceramic that are microstrip circuit compatible or surface mountable. Many are designed for automated assembly equipment.

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Motorola RF Transistors

RF High Power LDMOS Transistors

Motorola LDMOS technology is ideally suited for RF power amplifier applications. Several families of products have been targeted for specific markets including VHF and UHF portable/land mobile, 900 MHz linear cellular, GSM, TDMA and CDMA, digital television, GSM EDGE, PCS, UMTS, and W-CDMA.
With the unique LDMOS characteristics, these parts offer superior thermal performance. This is due to the simplified package design, which offers excellent Class AB intermodulation performance under medium peak-to-average ratios providing a superior device choice for advanced digital modulations formats or high gain applications.

Table 1. Mobile - To 520 MHz

Designed for broadband VHF and 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 12.5/7.5 volt mobile, portable and base station operation.

Product	Frequency Band[37]		P_{out} Watts	Test Signal	V_{DD} Volts	Gain (Typ)/Freq. dB/MHz	η Eff. (Typ) %	θ_{JC} °C/W	Pkg/Style
VHF & UHF, Land Mobile Radio, Class AB									
MRF1513T1[18f]	U	400-520	3 CW	1-Tone	7.5/12.5	11/520	55	4.0	466/1
MRF1511T1[18f]	U	135-175	8 CW	1-Tone	7.5	11.5/175	55	2.0	466/1
MRF1517T1[18f]	U	430-520	8 CW	1-Tone	7.5	11/520	55	2.0	466/1
MRF1518T1[18f]	U	400-520	8 CW	1-Tone	12.5	11/520	55	2.0	466/1
MRF1535T1[18j]	U	400-520	35 CW	1-Tone	12.5	10(Min)/520	50(Min)	0.90	1264/1
MRF1535FT1[18j]	U	400-520	35 CW	1-Tone	12.5	10(Min)/520	50(Min)	0.90	1264A/1
MRF1550T1[18j]	U	135-175	50 CW	1-Tone	12.5	10(Min)/175	50(Min)	0.75	1264/1
MRF1550FT1[18j]	U	135-175	50 CW	1-Tone	12.5	10(Min)/175	50(Min)	0.75	1264A/1
MRF1570T1[18j]★	U	400-470	70 CW	1-Tone	12.5	10(Min)/470	50(Min)	0.75	1366/1
MRF1570FT1[18j]★	U	400-470	70 CW	1-Tone	12.5	10(Min)/470	50(Min)	0.75	1366A/1

Table 2. TV Broadcast - To 1.0 GHz

Product	Frequency Band[37]		P_{out} Watts	Test Signal	V_{DD} Volts	Gain (Typ)/Freq. dB/MHz	η Eff. (Typ) %	θ_{JC} °C/W	Pkg/Style
470 - 1000 MHz, Class AB									
MRF373AR1[18a]	U	470-860	75 CW	1-Tone	32	18.2/860	60	0.89	360B/1
MRF373ALSR1[18a]	U	470-860	75 CW	1-Tone	32	18.2/860	60	0.63	360C/1
MRF374A	U	470-860	130 PEP	2-Tone	32	17.3/860	41.2	0.58	375F/1
MRF372	I	470-860	180 PEP	2-Tone	32	17/860	36	0.5	375G/1
MRF377★	I/O	470-860	45 AVG	OFDM	32	18.2/860	23	0.36	375G/1
MRF377R3[18i]★	I/O	470-860	45 AVG	OFDM	32	18.2/860	23	0.36	375G/1

[18]Tape and Reel Packaging Options: a) R1 = 500 units; b) R2 = 2,500 units; c) T1 = 3,000 units; d) T3 = 10,000 units; e) R2 = 1,500 units; f) T1 = 1,000 units; g) R2 = 4,000 units; h) R1 = 1,000 units; i) R3 = 250 units; j) T1 = 500 units; k) R2 = 450 units; l) T1 = 5,000 units; m) R2 = 2,000 units; n) R4 = 100 units; o) R6 = 150 units.

[37]U = Unmatched; I = Input; I/O = Input/Output.

★New Product

Table 3. Cellular - To 1.0 GHz

Product	Frequency Band[37]	P_{out} (Typ) Watts	Test Signal	V_{DD} Volts	Gain (Typ)/Freq. dB/MHz	η Eff. (Typ) %	θ_{JC} °C/W	Pkg/ Style
800 - 1.0 GHz, Class AB								
MRF9002R2[18e]	U	960	(3x) 2 PEP[41]	2-Tone	26	18/960	50	12	978/-
MRF9030MBR1[18a]★	U	945	30 PEP	2-Tone	26	20/945	41	1.08	1337/1
MRF9030MR1[18a]	U	945	30 PEP	2-Tone	26	20/945	41	1.08	1265/1
MRF9030R1[18a]	U	945	30 PEP	2-Tone	26	19/945	41.5	1.9	360B/1
MRF9030LSR1[18a]★	U	945	30 PEP	2-Tone	26	19/945	41.5	1.5	360C/1
MRF9045MBR1[18a]	U	945	45 PEP	2-Tone	28	19/945	41	0.85	1337/1
MRF9045MR1[18a]	U	945	45 PEP	2-Tone	28	19/945	41	0.85	1265/1
MRF9045R1[18a]	U	945	45 PEP	2-Tone	28	18.8/945	42	1.4	360B/1
MRF9045LSR1[18a]	U	945	45 PEP	2-Tone	28	18.8/945	42	1.0	360C/1
MRF5S9070MR1[18a,46c]	U	880	14.5 AVG	N-CDMA	26	18/880	30	—	1265/1
MRF9060MBR1[18a]	U	945	60 PEP	2-Tone	26	18/945	40	0.56	1337/1
MRF9060MR1[18a]★	U	945	60 PEP	2-Tone	26	18/945	40	0.56	1265/1
MRF9060R1[18a]	U	945	60 PEP	2-Tone	26	17/945	40	1.1	360B/1
MRF9060LSR1[18a]	U	945	60 PEP	2-Tone	26	17/945	40	0.8	360C/1
MRF6522-70	I	921-960	70 CW	1-Tone	26	16/921,960	58	1.1	465D/1
MRF6522-70R3[18i]	I	921-960	70 CW	1-Tone	26	16/921,960	58	1.1	465D/1
MRF9080	I	921-960	70 CW	1-Tone	26	18.5/921,960	52	0.7	465/1
MRF9080R3[18i]	I	921-960	70 CW	1-Tone	26	18.5/921,960	52	0.7	465/1
MRF9080LSR3[18i]★	I	921-960	70 CW	1-Tone	26	18.5/921,960	52	0.7	465A/1
MRF9085	I	880	90 PEP	2-Tone	26	17.9/880	40	0.7	465/1
MRF9085R3[18i]	I	880	90 PEP	2-Tone	26	17.9/880	40	0.7	465/1
MRF9085LSR3[18i]	I	880	90 PEP	2-Tone	26	17.9/880	40	0.7	465A/1
MRF5S9100MR1[18a,46c]	I	880	23 AVG	N-CDMA	26	17/880	30	—	1486/1
MRF5S9100MBR1[18a,46c]	I	880	23 AVG	N-CDMA	26	17/880	30	—	1484/1
MRF9100★	I/O	921-960	100 CW	1-Tone	26	17/960	51	1.0	465/1
MRF9100R3[18i]★	I/O	921-960	100 CW	1-Tone	26	17/960	51	1.0	465/1
MRF9100SR3[18i]★	I/O	921-960	100 CW	1-Tone	26	17/960	51	1.0	465A/1
MRF5S9101MR1[18a,46c]	I	921-960	105 CW	1-Tone	26	16.5/960	56	—	1486/1
MRF5S9101MBR1[18a,46c]	I	921-960	105 CW	1-Tone	26	16.5/960	56	—	1484/1
MRF9120	I	880	120 PEP	2-Tone	26	16.5/880	39	0.45	375B/1
MRF9120S	I	880	120 PEP	2-Tone	26	16.5/880	39	0.45	375H/1
MRF9120R3[18i]	I	880	120 PEP	2-Tone	26	16.5/880	39	0.45	375B/1
MRF9130L★	I	921-960	130 CW	1-Tone	28	16.5/921,960	48	0.6	465/1
MRF9130LR3[18i]★	I	921-960	130 CW	1-Tone	28	16.5/921,960	48	0.6	465/1
MRF9130LSR3[18i]★	I	921-960	130 CW	1-Tone	28	16.5/921,960	48	0.6	465A/1
MRF9135L★	I	880	25 AVG	N-CDMA	26	17.8/880	25	0.6	465/1
MRF9135LR3[18i]★	I	880	25 AVG	N-CDMA	26	17.8/880	25	0.6	465/1
MRF9135LSR3[18i]★	I	880	25 AVG	N-CDMA	26	17.8/880	25	0.6	465A/1
MRF9180	I	880	170 PEP	2-Tone	26	17.5/880	39	0.45	375D/1
MRF9180R6[18o]	I	880	170 PEP	2-Tone	26	17.5/880	39	0.45	375D/1
MRF9200L[46b]	I/O	880	40 AVG	N-CDMA	26	17.5/880	25	0.37	465B/1
MRF9200LS[46b]	I/O	880	40 AVG	N-CDMA	26	17.5/880	25	0.37	465C/1
MRF9200LSR3[18i,46b]	I/O	880	40 AVG	N-CDMA	26	17.5/880	25	0.37	465C/1
MRF9210★	I/O	880	40 AVG	N-CDMA	26	16.5/880	25.5	0.31	375G/1
MRF9210R3[18i]★	I/O	880	40 AVG	N-CDMA	26	16.5/880	25.5	0.31	375G/1

[18]Tape and Reel Packaging Options: a) R1 = 500 units; b) R2 = 2,500 units; c) T1 = 3,000 units; d) T3 = 10,000 units; e) R2 = 1,500 units; f) T1 = 1,000 units; g) R2 = 4,000 units; h) R1 = 1,000 units; i) R3 = 250 units; j) T1 = 500 units; k) R2 = 450 units; l) T1 = 5,000 units; m) R2 = 2,000 units; n) R4 = 100 units; o) R6 = 150 units.

[37]U = Unmatched; I = Input; I/O = Input/Output.

[41]Three individual transistors in a single package.

[46]To be introduced: a) 3Q03; b) 4Q03; c) 1Q04

★New Product

Table 4. PCS and 3G - To 2.1 GHz

Product	Frequency Band[37]		P_{out} (Typ) Watts	Test Signal	V_{DD} Volts	Gain (Typ)/Freq. dB/MHz	η Eff. (Typ) %	θ_{JC} °C/W	Pkg/ Style
1805 - 1990 MHz, Class AB (GSM1800, GSM1900, GSM EDGE and PCS TDMA)									
MRF18030AR3[18i]	I/O	1805-1880	30 CW	1-Tone	26	14/1805,1880	50	2.1	465E/1
MRF18030ASR3[18i]	I/O	1805-1880	30 CW	1-Tone	26	14/1805,1880	50	2.1	465F/1
MRF18030BR3[18i]	I/O	1930-1990	30 CW	1-Tone	26	14/1930,1990	50	2.1	465E/1
MRF18030BSR3[18i]	I/O	1930-1990	30 CW	1-Tone	26	14/1930,1990	50	2.1	465F/1
MRF18060A	I/O	1805-1880	60 CW	1-Tone	26	13/1805,1880	45	0.97	465/1
MRF18060AR3[18i]	I/O	1805-1880	60 CW	1-Tone	26	13/1805,1880	45	0.97	465/1
MRF18060ASR3[18i]	I/O	1805-1880	60 CW	1-Tone	26	13/1805,1880	45	0.97	465A/1
MRF18060ALSR3[18i]	I/O	1805-1880	60 CW	1-Tone	26	13/1805,1880	45	0.97	465A/1
MRF18060B	I/O	1930-1990	60 CW	1-Tone	26	13/1930,1990	45	0.97	465/1
MRF18060BR3[18i]	I/O	1930-1990	60 CW	1-Tone	26	13/1930,1990	45	0.97	465/1
MRF18060BSR3[18i]	I/O	1930-1990	60 CW	1-Tone	26	13/1930,1990	45	0.97	465A/1
MRF18060BLSR3[18i]	I/O	1930-1990	60 CW	1-Tone	26	13/1930,1990	45	0.97	465A/1
MRF18085A★	I/O	1805-1880	85 CW	1-Tone	26	15/1805,1880	52	0.79	465/1
MRF18085AR3[18i]★	I/O	1805-1880	85 CW	1-Tone	26	15/1805,1880	52	0.79	465/1
MRF18085ALSR3[18i]★	I/O	1805-1880	85 CW	1-Tone	26	15/1805,1880	52	0.79	465A/1
MRF18085B★	I/O	1930-1990	85 CW	1-Tone	26	12.5/1930,1990	50	0.79	465/1
MRF18085BR3[18i]★	I/O	1930-1990	85 CW	1-Tone	26	12.5/1930,1990	50	0.79	465/1
MRF18085BLSR3[18i]★	I/O	1930-1990	85 CW	1-Tone	26	12.5/1930,1990	50	0.79	465A/1
MRF18090A	I/O	1805-1880	90 CW	1-Tone	26	13.5/1805,1880	52	0.70	465B/1
MRF18090B	I/O	1930-1990	90 CW	1-Tone	26	13.5/1930,1990	45	0.7	465B/1
MRF18090BS	I/O	1930-1990	90 CW	1-Tone	26	13.5/1930,1990	45	0.7	465C/1
1.9 GHz, Class AB (2-CH N-CDMA and W-CDMA)									
MRF19030R3[18i]	I/O	1930-1990	30 PEP	2-Tone	26	13/1990	36	2.1	465E/1
MRF19030SR3[18i]	I/O	1930-1990	30 PEP	2-Tone	26	13/1990	36	2.1	465F/1
MRF19045R3[18i]	I/O	1930-1990	9.5 AVG	N-CDMA	26	14.5/1990	23.5	1.65	465E/1
MRF19045SR3[18i]	I/O	1930-1990	9.5 AVG	N-CDMA	26	14.5/1990	23.5	1.65	465F/1
MRF5S19060MR1[46c]	I/O	1930-1990	12 AVG	N-CDMA	28	13.5/1990	23	—	1486/1
MRF19060	I/O	1930-1990	60 PEP	2-Tone	26	12.5/1990	36	0.97	465/1
MRF19060R3[18i]	I/O	1930-1990	60 PEP	2-Tone	26	12.5/1990	36	0.97	465/1
MRF19060SR3[18i]	I/O	1930-1990	60 PEP	2-Tone	26	12.5/1990	36	0.97	465A/1
MRF19085	I/O	1930-1990	18 AVG	N-CDMA	26	13/1990	23	0.79	465/1
MRF19085R3[18i]	I/O	1930-1990	18 AVG	N-CDMA	26	13/1990	23	0.79	465/1
MRF19085SR3[18i]	I/O	1930-1990	18 AVG	N-CDMA	26	13/1990	23	0.79	465A/1
MRF19085LSR3[18i]	I/O	1930-1990	18 AVG	N-CDMA	26	13/1990	23	0.79	465A/1
MRF5S19090LR3[18i]★	I/O	1930-1990	18 AVG	N-CDMA	28	14.5/1990	25.8	0.67	465/1
MRF5S19090LSR3[18i]★	I/O	1930-1990	18 AVG	N-CDMA	28	14.5/1990	25.8	0.67	465A/1
MRF19090	I/O	1930-1990	90 PEP	2-Tone	26	11.5/1990	35	0.65	465B/1
MRF19090R3[18i]	I/O	1930-1990	90 PEP	2-Tone	26	11.5/1990	35	0.65	465B/1
MRF19090S	I/O	1930-1990	90 PEP	2-Tone	26	11.5/1990	35	0.65	465C/1
MRF19090SR3[18i]	I/O	1930-1990	90 PEP	2-Tone	26	11.5/1990	35	0.65	465C/1
MRF5S19100LR3[18i]★	I/O	1930-1990	22 AVG	N-CDMA	28	13.9/1990	25.5	0.74	465/1
MRF5S19100LSR3[18i]★	I/O	1930-1990	22 AVG	N-CDMA	28	13.9/1990	25.5	0.74	465A/1

[18]Tape and Reel Packaging Options: a) R1 = 500 units; b) R2 = 2,500 units; c) T1 = 3,000 units; d) T3 = 10,000 units; e) R2 = 1,500 units; f) T1 = 1,000 units; g) R2 = 4,000 units; h) R1 = 1,000 units; i) R3 = 250 units; j) T1 = 500 units; k) R2 = 450 units; l) T1 = 5,000 units; m) R2 = 2,000 units; n) R4 = 100 units; o) R6 = 150 units.

[37]U = Unmatched; I = Input; I/O = Input/Output.

[46]To be introduced: a) 3Q03; b) 4Q03; c) 1Q04

★New Product

Table 4. PCS and 3G - To 2.1 GHz (continued)

Product	Frequency Band[37]	P_{out} (Typ) Watts	Test Signal	V_{DD} Volts	Gain (Typ)/Freq. dB/MHz	η Eff. (Typ) %	θ_{JC} °C/W	Pkg/ Style
1.9 GHz, Class AB (2-CH N-CDMA and W-CDMA) (continued)								
MRF6S19100L[9]	I/O	1930-1990	22 AVG	N-CDMA	28	16/1990	28	—	465/1
MRF6S19100LS[9]	I/O	1930-1990	22 AVG	N-CDMA	28	16/1990	28	—	465A/1
MRF19120[3]	I/O	1930-1990	120 PEP	2-Tone	26	11.7/1990	34	0.45	375D/1
MRF19125	I/O	1930-1990	24 AVG	N-CDMA	26	13.5/1990	22	0.53	465B/1
MRF5S19130★	I/O	1930-1990	26 AVG	N-CDMA	28	13.5/1990	25	—	465B/1
MRF5S19130R3[18i]★	I/O	1930-1990	26 AVG	N-CDMA	28	13.5/1990	25	—	465B/1
MRF5S19130S★	I/O	1930-1990	26 AVG	N-CDMA	28	13.5/1990	25	—	465C/1
MRF5S19130SR3[18i]★	I/O	1930-1990	26 AVG	N-CDMA	28	13.5/1990	25	—	465C/1
MRF5S19150★	I/O	1930-1990	34 AVG	N-CDMA	28	14/1990	26	0.49	465B/1
MRF5S19150R3[18i]★	I/O	1930-1990	34 AVG	N-CDMA	28	14/1990	26	0.49	465B/1
MRF5S19150S★	I/O	1930-1990	34 AVG	N-CDMA	28	14/1990	26	0.49	465C/1
MRF5S19150SR3[18i]★	I/O	1930-1990	34 AVG	N-CDMA	28	14/1990	26	0.49	465C/1
MRF5P20180R6★	I/O	1930-1990	38 AVG	W-CDMA	28	14/1990	26	0.43	375D/1
2.0 GHz, Class A, AB								
MRF281SR1[18a]	U	1930-2000	4 PEP	2-Tone	26	12.5/2000	33	5.74	458B/1
MRF281ZR1[18a]	U	1930-2000	4 PEP	2-Tone	26	12.5/2000	33	5.74	458C/1
MRF282SR1[18a]	U	1930-2000	10 PEP	2-Tone	26	11.5/2000	28(min)	4.2	458B/1
MRF282ZR1[18a]	U	1930-2000	10 PEP	2-Tone	26	11.5/2000	28(min)	4.2	458C/1
MRF284R1[18a]	U	1930-2000	30 PEP	2-Tone	26	10.5/2000	35	2.0	360B/1
MRF284LSR1[18a]	U	1930-2000	30 PEP	2-Tone	26	10.5/2000	35	2.0	360C/1
2.1 GHz, Class AB (2-CH W-CDMA, UMTS)								
MRF21010R1[18a]	U	2110-2170	10 PEP	2-Tone	28	13.5/2170	35	5.5	360B/1
MRF21010LSR1[18a]	U	2110-2170	10 PEP	2-Tone	28	13.5/2170	35	5.5	360C/1
MRF21030R3[18i]	I/O	2110-2170	30 PEP	2-Tone	28	13/2170	33	2.1	465E/1
MRF21030SR3[18i]	I/O	2110-2170	30 PEP	2-Tone	28	13/2170	33	2.1	465F/1
MRF21045R3[18i]	I/O	2110-2170	10 AVG	W-CDMA	28	15/2170	23.5	1.65	465E/1
MRF21045SR3[18i]	I/O	2110-2170	10 AVG	W-CDMA	28	15/2170	23.5	1.65	465F/1
MRF21060	I/O	2110-2170	60 PEP	2-Tone	28	12.5/2170	34	1.02	465/1
MRF21060R3[18i]	I/O	2110-2170	60 PEP	2-Tone	28	12.5/2170	34	1.02	465/1
MRF21060SR3[18i]	I/O	2110-2170	60 PEP	2-Tone	28	12.5/2170	34	1.02	465A/1
MRF21085	I/O	2110-2170	19 AVG	W-CDMA	28	13.6/2170	23	0.78	465/1
MRF21085R3[18i]	I/O	2110-2170	19 AVG	W-CDMA	28	13.6/2170	23	0.78	465A/1
MRF21085LSR3[18i]	I/O	2110-2170	19 AVG	W-CDMA	28	13.6/2170	23	0.78	465A/1
MRF21085SR3[18i]	I/O	2110-2170	19 AVG	W-CDMA	28	13.6/2170	23	0.78	465A/1
MRF21090	I/O	2110-2170	90 PEP	2-Tone	28	11.7/2170	33	0.65	465B/1
MRF21090R3[18i]	I/O	2110-2170	90 PEP	2-Tone	28	11.7/2170	33	0.65	465B/1
MRF21090S	I/O	2110-2170	90 PEP	2-Tone	28	11.7/2170	33	0.65	465C/1
MRF5S21090L★	I/O	2110-2170	19 AVG	W-CDMA	28	14.5/2170	26	0.78	465/1
MRF5S21090LR3[18i]★	I/O	2110-2170	19 AVG	W-CDMA	28	14.5/2170	26	0.78	465/1
MRF5S21090LSR3[18i]★	I/O	2110-2170	19 AVG	W-CDMA	28	14.5/2170	26	0.78	465A/1
MRF5S21100LR3[18i]★	I/O	2110-2170	23 AVG	W-CDMA	28	13.5/2170	26	0.70	465/1
MRF5S21100LSR3[18i]★	I/O	2110-2170	23 AVG	W-CDMA	28	13.5/2170	26	0.70	465A/1
MRF6S21100L[9]	I/O	2110-2170	23 AVG	W-CDMA	28	16/2170	28	—	465/1
MRF6S21100LS[9]	I/O	2110-2170	23 AVG	W-CDMA	28	16/2170	28	—	465A/1

[3]Internal Impedance Matched Push-Pull Transistors

[9]In development.

[18]Tape and Reel Packaging Options: a) R1 = 500 units; b) R2 = 2,500 units; c) T1 = 3,000 units; d) T3 = 10,000 units; e) R2 = 1,500 units; f) T1 = 1,000 units; g) R2 = 4,000 units; h) R1 = 1,000 units; i) R3 = 250 units; j) T1 = 500 units; k) R2 = 450 units; l) T1 = 5,000 units; m) R2 = 2,000 units; n) R4 = 100 units; o) R6 = 150 units.

[37]U = Unmatched; I = Input; I/O = Input/Output.

★New Product

Table 4. PCS and 3G - To 2.1 GHz (continued)

Product	Frequency Band[37]		P_{out} (Typ) Watts	Test Signal	V_{DD} Volts	Gain (Typ)/Freq. dB/MHz	η Eff. (Typ) %	θ_{JC} °C/W	Pkg/ Style
2.1 GHz, Class AB (2-CH W-CDMA, UMTS) (continued)									
MRF21120[3]	I/O	2110-2170	120 PEP	2-Tone	28	11.4/2170	34.5	0.45	375D/1
MRF21120R6[3,18o]	I/O	2110-2170	120 PEP	2-Tone	28	11.4/2170	34.5	0.45	375D/1
MRF21125	I/O	2110-2170	20 AVG	W-CDMA	28	13/2170	18	0.53	465B/1
MRF21125S	I/O	2110-2170	20 AVG	W-CDMA	28	13/2170	18	0.53	465C/1
MRF21125SR3[18i]	I/O	2110-2170	20 AVG	W-CDMA	28	13/2170	18	0.53	465C/1
MRF5S21130★	I/O	2110-2170	28 AVG	W-CDMA	28	13.5/2170	26	0.54	465B/1
MRF5S21130R3[18i]★	I/O	2110-2170	28 AVG	W-CDMA	28	13.5/2170	26	0.54	465B/1
MRF5S21130S★	I/O	2110-2170	28 AVG	W-CDMA	28	13.5/2170	26	0.54	465C/1
MRF5S21130SR3[18i]★	I/O	2110-2170	28 AVG	W-CDMA	28	13.5/2170	26	0.54	465C/1
MRF5S21150★	I/O	2110-2170	33 AVG	W-CDMA	28	12.5/2170	25	0.47	465B/1
MRF5S21150R3[18i]★	I/O	2110-2170	33 AVG	W-CDMA	28	12.5/2170	25	0.47	465B/1
MRF5S21150S★	I/O	2110-2170	33 AVG	W-CDMA	28	12.5/2170	25	0.47	465C/1
MRF5S21150SR3[18i]★	I/O	2110-2170	33 AVG	W-CDMA	28	12.5/2170	25	0.47	465C/1
MRF5P21180★	I/O	2110-2170	38 AVG	W-CDMA	28	14/2170	25.5	0.43	375D/1
MRF5P21180R6[18o]★	I/O	2110-2170	38 AVG	W-CDMA	28	14/2170	25.5	0.43	375D/1
MRF21180[3]	I/O	2110-2170	38 AVG	W-CDMA	28	12.1/2170	22	0.46	375D/1
MRF21180R6[3,18o]	I/O	2110-2170	38 AVG	W-CDMA	28	12.1/2170	22	0.46	375D/1
MRF5P21240R6[18o]★	I/O	2110-2170	52 AVG	W-CDMA	28	13/2170	24	0.35	375D/1

[3]Internal Impedance Matched Push-Pull Transistors

[18]Tape and Reel Packaging Options: a) R1 = 500 units; b) R2 = 2,500 units; c) T1 = 3,000 units; d) T3 = 10,000 units; e) R2 = 1,500 units; f) T1 = 1,000 units; g) R2 = 4,000 units; h) R1 = 1,000 units; i) R3 = 250 units; j) T1 = 500 units; k) R2 = 450 units; l) T1 = 5,000 units; m) R2 = 2,000 units; n) R4 = 100 units; o) R6 = 150 units.

[37]U = Unmatched; I = Input; I/O = Input/Output.

★New Product

RF Power GaAs Transistors

Motorola power GaAs transistors are made using an InGaAs PHEMT epitaxial structure for superior RF efficiency and linearity. The FETs listed in this section are designed for operation in base station infrastructure RF power amplifiers and are grouped according to frequency range and type of application. Parts are listed first by order of operating voltage, then by increasing output power.

Table 1. 3.5 GHz - Linear Transistors

Product	Frequency Band[37]		P_{out} (Typ) Watts	Test Signal	V_{DD} Volts	Gain (Typ)/Freq. dB/GHz	η Eff. (Typ) %	θ_{JC} °C/W	Pkg/ Style
3.5 GHz, Class AB (WLL, BWA, W-CDMA)									
MRFG35002MT1[18f,46c]	U	3.5 G	0.2 AVG	W-CDMA[44]	12	10/3.5	30	—	—
MRFG35003MT1[18f]★	U	3.5 G	0.3 AVG	W-CDMA[44]	12	11.5/3.5	25	—	466/1
MRFG35003M6T1[18f]★	U	3.5 G	0.45 AVG	W-CDMA[44]	6	9/3.5	24	—	466/1
MRFG35005MT1[18f]★	U	3.5 G	0.45 AVG	W-CDMA[44]	12	11/3.5	25	—	466/1
MRFG35010	U	3.5 G	1 AVG	W-CDMA[44]	12	10/3.5	30	4.8[15]	360D/1
MRFG35010MT1[18f]★	U	3.5 G	0.9 AVG	W-CDMA[44]	12	10/3.5	28	—	466/1
MRFG35030[46b]	I/O	3.5 G	3.5 AVG	W-CDMA[44]	12	11/3.5	23	—	1490/1

[15]Class A = 5.3

[18]Tape and Reel Packaging Options: a) R1 = 500 units; b) R2 = 2,500 units; c) T1 = 3,000 units; d) T3 = 10,000 units; e) R2 = 1,500 units; f) T1 = 1,000 units; g) R2 = 4,000 units; h) R1 = 1,000 units; i) R3 = 250 units; j) T1 = 500 units; k) R2 = 450 units; l) T1 = 5,000 units; m) R2 = 2,000 units; n) R4 = 100 units; o) R6 = 150 units.

[37]U = Unmatched; I = Input; I/O = Input/Output.

[44]Peak-to-Average Power Ratio = 10 dB

[46]To be introduced: a) 3Q03; b) 4Q03; c) 1Q04

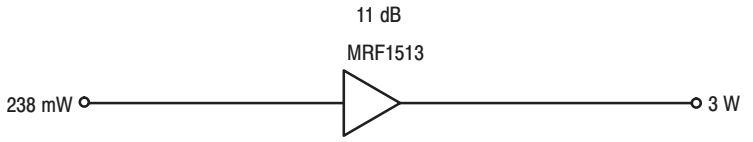
★New Product

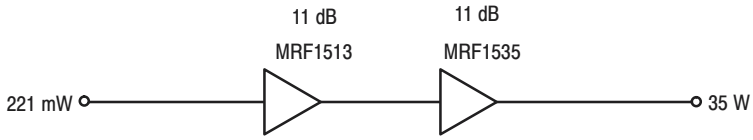
RF Low Power Transistors

Product	Gain - Bandwidth		NFmin @ f		Gain @ f		Maximum Ratings		Packaging
	f_τ Typ GHz	I_C mA	Typ dB	GHz	Typ dB	GHz	V(BR) CEO Volts	I_C mA	
MBC13900[18c]	15	20	1.0	1.0	17	1.0	7.0	20	318M/
			1.3	2.0	14	2.0			SOT-343

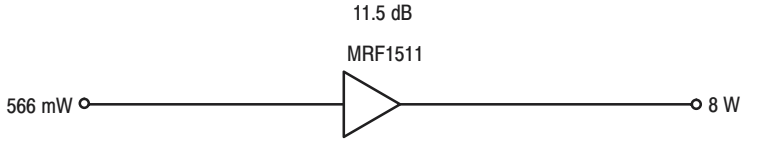
[18]Tape and Reel Packaging Options: a) R1 = 500 units; b) R2 = 2,500 units; c) T1 = 3,000 units; d) T3 = 10,000 units; e) R2 = 1,500 units; f) T1 = 1,000 units; g) R2 = 4,000 units; h) R1 = 1,000 units; i) R3 = 250 units; j) T1 = 500 units; k) R2 = 450 units; l) T1 = 5,000 units; m) R2 = 2,000 units; n) R4 = 100 units; o) R6 = 150 units.

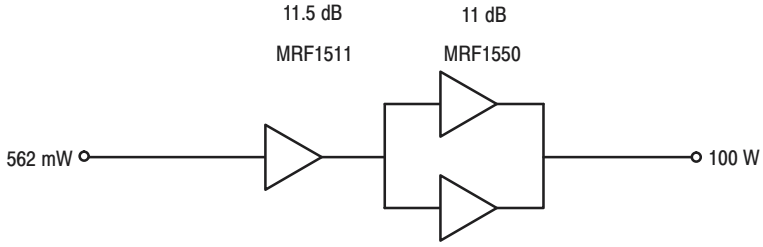
RF High Power Amplifier Line-ups



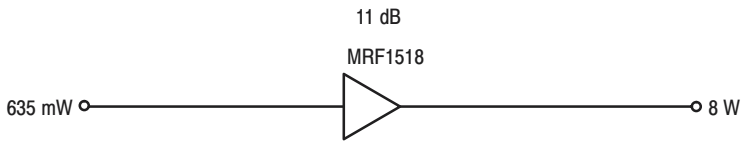


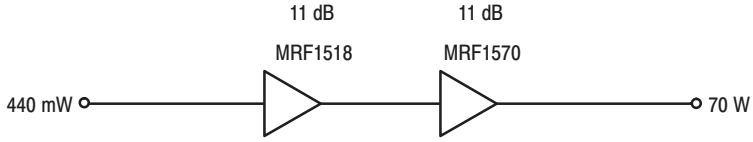
Mobile - UHF 400 - 520 MHz





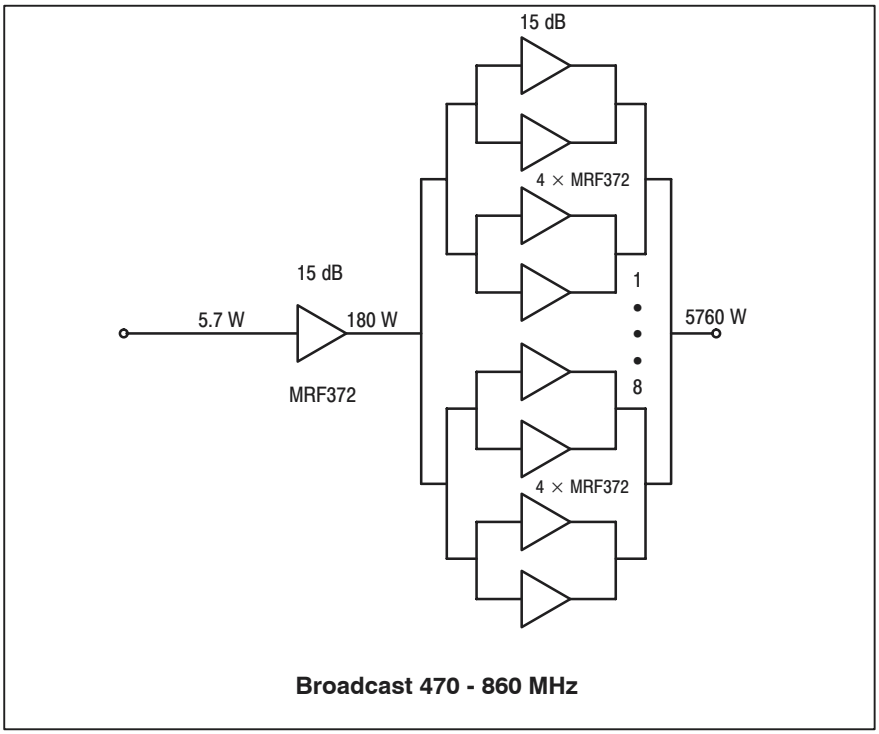
Mobile - VHF 135 - 175 MHz



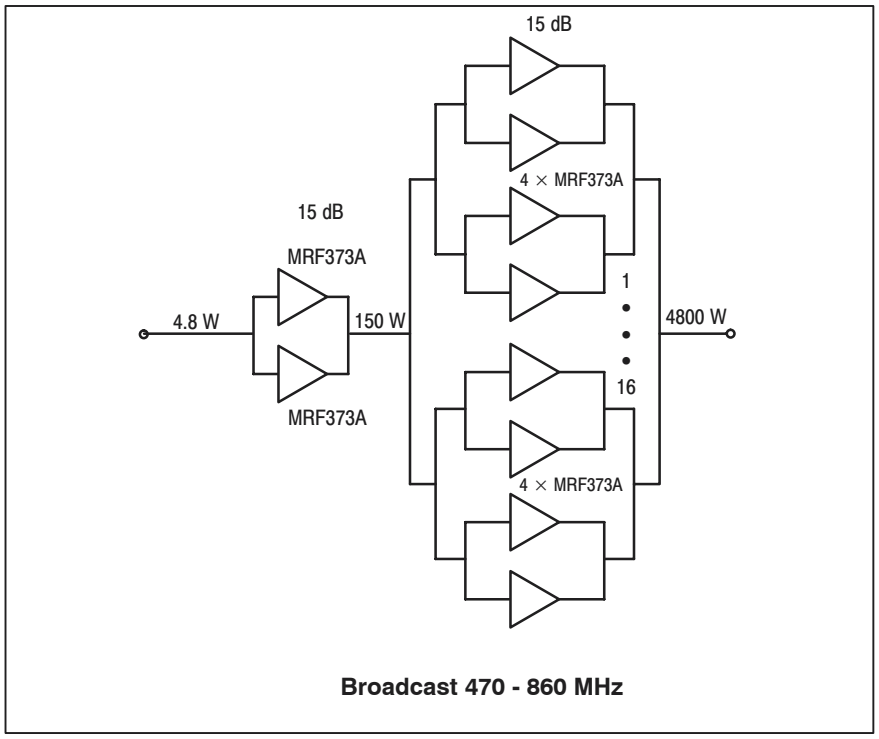


Mobile - UHF 400 - 470 MHz

RF High Power Amplifier Line-ups (continued)

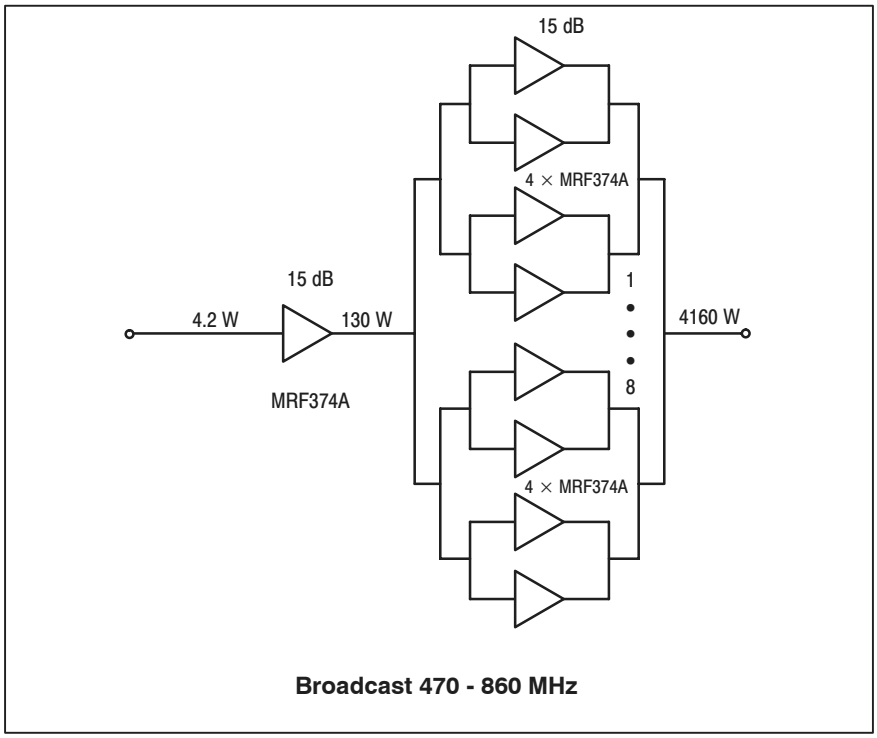


Broadcast 470 - 860 MHz

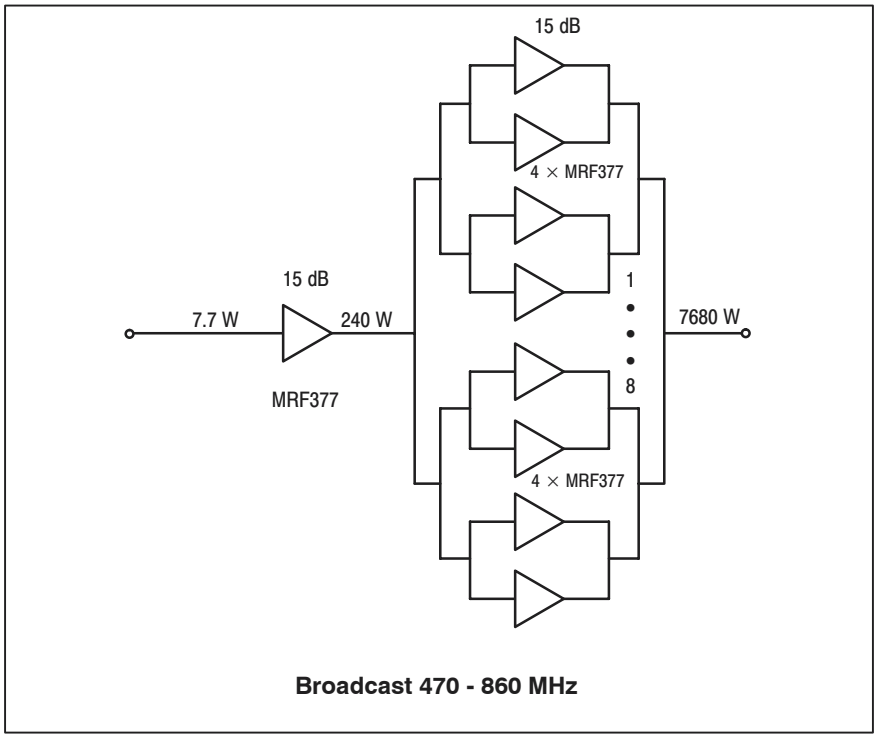


Broadcast 470 - 860 MHz

RF High Power Amplifier Line-ups (continued)



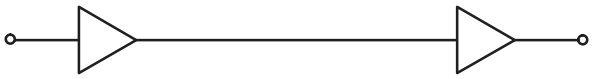
Broadcast 470 - 860 MHz



Broadcast 470 - 860 MHz

RF High Power Amplifier Line-ups (continued)

GSM and EDGE - 900 MHz

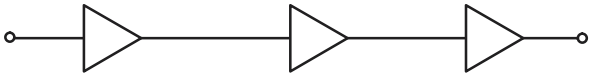


Ceramic	MRF9030	MRF9045	MRF9100
		MRF9060	MRF9120
		MRF6522-70	MRF9130L
		MRF9080	MRF9135L
		MRF9085	MRF9180
			MRF9200L
			MRF9210

Hybrid	MHL9838
	MHL9236
	MHL9318

Plastic	MRF9002R2	MRF9030M
	MHVIC910HR2	MRF9045M
	MHVIC915R2	MRF9060M
	MW4IC915	MRF5S9070MR1
	MWIC930	MRF5S9100M
		MRF5S9101M

GSM and EDGE - 1800 MHz



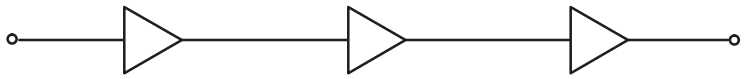
Ceramic		MRF18030A	MRF18060A
			MRF18085A
			MRF18090A

Hybrid	MHL18336
	MHL18926
	MHPA18010

Plastic	MHVIC1905R2
	MHVIC2114R2
	MHVIC2115R2
	MW4IC2020
	MW5IC2030

RF High Power Amplifier Line-ups (continued)

GSM and EDGE - 1900 MHz



Ceramic		MRF18030B	MRF18060B MRF18085B MRF18090B
Hybrid	MHPA19010 MHL19338 MHL19926 MHL19936		
Plastic	MHVIC1905R2 MHVIC2114R2 MHVIC2115R2 MW4IC2020 MW5IC2030		

N-CDMA - 1900 MHz

Ceramic	MRF21010	MRF19030 MRF19045	MRF19060 MRF19085 MRF19090 MRF5S19090L	MRF5S19100 MRF19120 MRF19125 MRF5S19130 MRF5S19150 MRF5P20180R6
Hybrid	MHL19338 MHL19926 MHL19936 MHPA19010			
Plastic	MHVIC1905R2 MHVIC2114R2 MHVIC2115R2 MW4IC2020 MW4IC2230		MRF5S19060MR1	

RF High Power Amplifier Line-ups (continued)

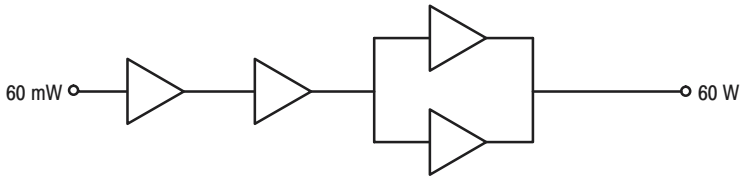
W-CDMA - 2200 MHz

Ceramic	MRF21010	MRF21030	MRF21060	MRF21120	MRF5S21090L
		MRF21045	MRF21085	MRF21125	MRF5S21100L
			MRF21090	MRF21180	MRF6S21100L
					MRF5S21130
					MRF5P21150
					MRF5P21180
					MRF5P21240

Hybrid	MHL21336	MHPA21010

Plastic	MHVIC1905R2
	MHVIC2114R2
	MHVIC2115R2
	MW4IC2230
	MW5IC2030

WLL - 3500 MHz

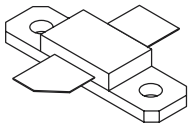


Ceramic	MRFG35010	MRFG35030

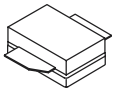
Plastic	MRFG35002M	MRFG35005M
	MRFG35003M	MRFG35010M
	MRFG35003M6	

RF Transistor Packages

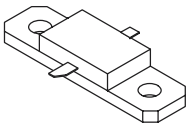
CASE 318M
(SOT-343)



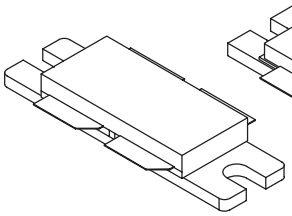
CASE 360B
STYLE 1
(NI-360)



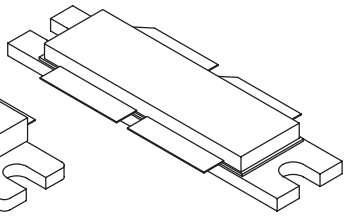
CASE 360C
STYLE 1
(NI-360S)



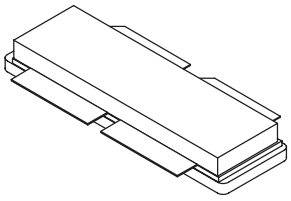
CASE 360D
STYLE 1
(NI-360HF)



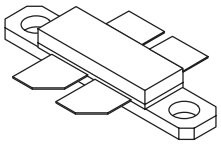
CASE 375B
STYLE 1
(NI-860)



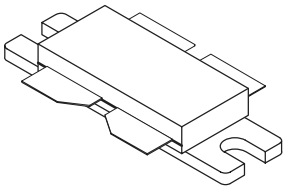
CASE 375D
STYLE 1
(NI-1230)



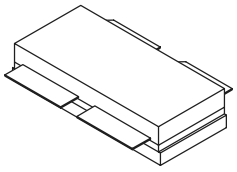
CASE 375E
STYLE 1
(NI-1230S)



CASE 375F
STYLE 1
(NI-650)



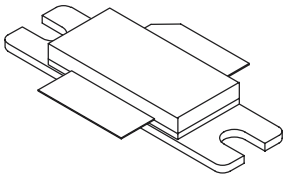
CASE 375G
STYLE 1
(NI-860C3)



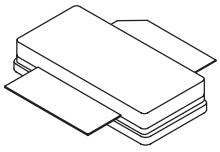
CASE 375H
STYLE 1
(NI-860S)

CASE 458B
STYLE 1
(NI-200S)

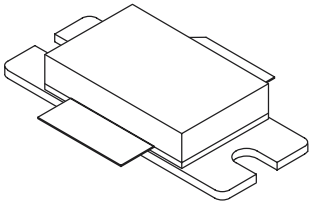
CASE 458C
STYLE 1
(NI-200Z)



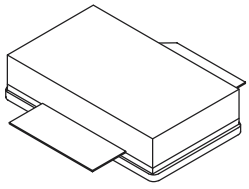
CASE 465
STYLE 1
(NI-780)



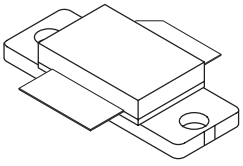
CASE 465A
STYLE 1
(NI-780S)



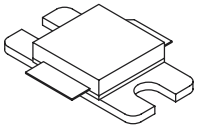
CASE 465B
STYLE 1
(NI-880)



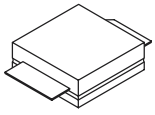
CASE 465C
STYLE 1
(NI-880S)



CASE 465D
STYLE 1
(NI-600)



CASE 465E
STYLE 1
(NI-400)

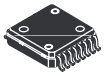


CASE 465F
STYLE 1
(NI-400S)

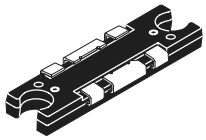
CASE 466
STYLE 1
PLASTIC
(PLD-1.5)

SCALE 1:1

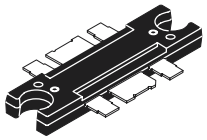
RF Transistor Packages (continued)



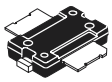
CASE 978
PLASTIC
(PFP–16)



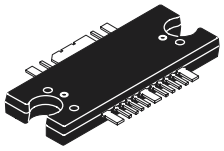
CASE 1264
STYLE 1
PLASTIC
(TO–272–6 Wrap)



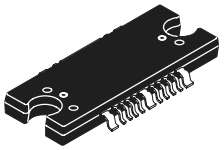
CASE 1264A
STYLE 1
PLASTIC
(TO–272–6)



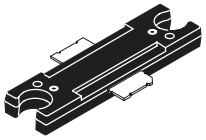
CASE 1265
STYLE 1
PLASTIC
(TO–270–2)



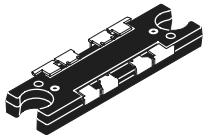
CASE 1329
STYLE 1
PLASTIC
(TO–272 WB–16)



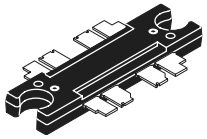
CASE 1329A
STYLE 1
PLASTIC
(TO–272 WB–16 Gull)



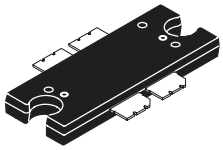
CASE 1337
STYLE 1
PLASTIC
(TO–272–2)



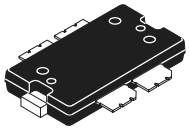
CASE 1366
STYLE 1
PLASTIC
(TO–272–8 Wrap)



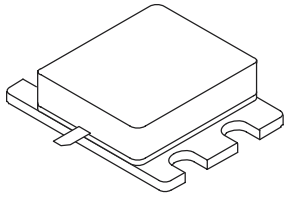
CASE 1366A
STYLE 1
PLASTIC
(TO–272–8)



CASE 1484
STYLE 1
PLASTIC
(TO–272 WB–4)



CASE 1486
STYLE 1
PLASTIC
(TO–270 WB–4)



CASE 1490
STYLE 1
(HF–600)

SCALE 1:1

Motorola RF Amplifier ICs and Modules

Motorola's RF portfolio includes many hybrid designs optimized to perform in narrowband base station transmitter applications and IC designs optimized for wideband applications. Motorola modules feature two or more active transistors (LDMOS or GaAs die technology) and their associated 50 ohm matching networks. Circuit substrate and metallization have been selected for optimum performance and reliability. For PA designers, IC driver devices offer the benefits of multiple gain stages in one package with most of the decoupling and matching circuitry incorporated into a single low-cost plastic device.

Table of Contents

Motorola RF Amplifier ICs and Modules

Complete amplifiers with 50 ohm input impedances are available for all popular base station transmitter systems, including GSM and CDMA, covering frequencies from 800 MHz up to 2.2 GHz.

Base Stations

Designed for applications such as macrocell drivers and microcell output stage, these Class AB amplifiers are ideal for base station systems with power requirements up to 30 watts.

Table 1. Base Station IC Drivers

Product	Frequency MHz	P1dB Watts	Gain (Typ) dB	Supply Voltage Volts	Class	System Application	Die Technology	Pkg/Style
MHVIC915R2[18e]★	746-960	15	30	26	AB	N-CDMA, GSM/GSM EDGE	LDMOS	978/-
MWIC930R1[18a]★	746-960	30	30	27	AB	N-CDMA, GSM/GSM EDGE	LDMOS	1329/1
MWIC930GR1[18a]★	746-960	30	30	27	AB	N-CDMA, GSM/GSM EDGE	LDMOS	1329A/1
MW4IC915MBR1[18a]★	860-960	15	30	26	AB	N-CDMA, GSM/GSM EDGE	LDMOS	1329/1
MW4IC915GMBR1[18a]★	860-960	15	30	26	AB	N-CDMA, GSM/GSM EDGE	LDMOS	1329A/1
MW4IC001MR4[18n,46c]	880-2170	0.85	13.5	28	AB	N-CDMA W-CDMA GSM/GSM EDGE	LDMOS	466/1
MHVIC910HR2[18e]	921-960	10	39	26	AB	GSM900	LDMOS	978/-
MW4IC2020MBR1[18a]★	1805-1990	20	29	26	AB	N-CDMA, GSM/GSM EDGE	LDMOS	1329/1
MW4IC2020GMBR1[18a]★	1805-1990	20	29	26	AB	N-CDMA, GSM/GSM EDGE	LDMOS	1329A/1
MHVIC1905R2[18e,46c]	1890-1920	5	40	26	AB	GSM/GSM EDGE N-CDMA, PHS	LDMOS	978/-
MW5IC2030MBR1[18a,46c]	1930-1990	30	23	27	AB	GSM/GSM EDGE W-CDMA, PHS	LDMOS	1329/1
MW5IC2030GMBR1[18a,46c]	1930-1990	30	23	27	AB	GSM/GSM EDGE W-CDMA, PHS	LDMOS	1329A/1
MHVIC2115R2[18e]★	2110-2170	15	34	26	AB	W-CDMA	LDMOS	978/-
MHVIC2114R2[18e,46c]	2110-2170	15	32	27	AB	W-CDMA	LDMOS	978/-
MW4IC2230MBR1[18a]★	2110-2170	30	31.5	28	AB	W-CDMA	LDMOS	1329/1
MW4IC2230GMBR1[18a]★	2110-2170	30	31.5	28	AB	W-CDMA	LDMOS	1329A/1

[18]Tape and Reel Packaging Options: a) R1 = 500 units; b) R2 = 2,500 units; c) T1 = 3,000 units; d) T3 = 10,000 units; e) R2 = 1,500 units; f) T1 = 1,000 units; g) R2 = 4,000 units; h) R1 = 1,000 units; i) R3 = 250 units; j) T1 = 500 units; k) R2 = 450 units; l) T1 = 5,000 units; m) R2 = 2,000 units; n) R4 = 100 units; o) R6 = 150 units.

[46]To be introduced: a) 3Q03; b) 4Q03; c) 1Q04

★New Product

Table 2. Base Station Module Drivers

Designed for applications such as macrocell drivers and microcell output stage, these Class AB amplifiers are ideal for base station systems with power requirements up to 10 watts.

Product	Frequency MHz	P1dB Watts	Gain (Min) dB	Supply Voltage Volts	Class	System Application	Die Technology	Pkg/Style
MHPA18010★	1805-1880	10	24.5	28	AB	N-CDMA	LDMOS	301AP/3
MHPA19010★	1930-1990	10	24.5	28	AB	PCS1900	LDMOS	301AP/3
MHPA21010★	2110-2170	10	23.7	28	AB	W-CDMA	LDMOS	301AP/3

Table 3. Base Station Module Pre-Drivers

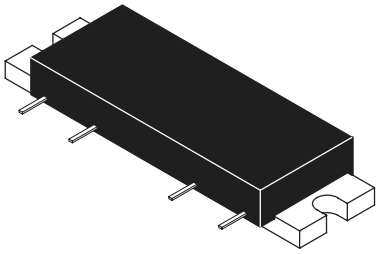
These 50 ohm amplifiers are recommended for modern multi-tone CDMA, TDMA and UMTS base station pre-driver applications. Their high third-order intercept point, tight phase and gain control, and excellent group delay characteristics make these devices ideal for use in high-power feedforward loops.

Ultra-Linear (for CDMA, W-CDMA, TDMA, Analog) - Class A (LDMOS Die) - Lateral MOSFETs

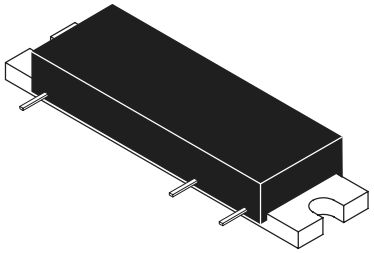
Product	Frequency Band MHz	V_{DD} (Nom.) Volts	I_{DD} (Nom.) mA	Gain (Nom.) dB	Gain Flatness (Typ) dB	P_{1dB} (Typ) dBm	3rd Order Intercept (Typ) dBm	NF (Typ) dB	Pkg/ Style
MHL9838	800-925	28	770	31	.1	39	50	3.7	301AP/1
MHL9236	800-960	26	550	30.5	.1	34	47	3.5	301AP/1
MHL9236M	800-960	26	550	30.5	.1	34	47	3.5	301AP/2
MHL9318	860-900	28	500	17.5	.1	35.5	49	3.0	301AS/1
MHL18336	1800-1900	26	500	30	.2	36	46	4.2	301AP/1
MHL18926	1805-1880	26	1100	28.6	.3	40	50	4.2	301AY/1
MHL19338	1900-2000	28	500	30	.1	36	46	4.2	301AP/1
MHL19926	1930-1990	26	1000	29.4	.3	40	50	4.2	301AY/1
MHL19936	1900-2000	26	1400	29	.2	41	49.5	4.2	301AY/1
MHL21336	2110-2170	26	500	31	.15	35	45	4.5	301AP/1

★New Product

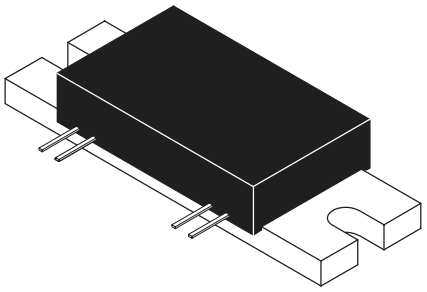
RF Amplifier ICs and Modules Packages



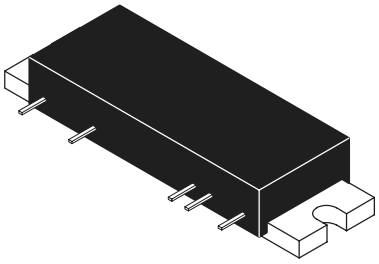
CASE 301AP
STYLE 1, 2, 3



CASE 301AS
STYLE 1

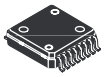


CASE 301AW
STYLE 1

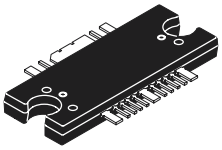


CASE 301AY
STYLE 1

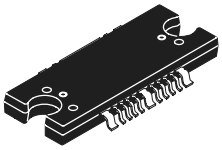
Case 466
Style 1
PLASTIC
(PLD-1.5)



CASE 978
PLASTIC
(PFP-16)



CASE 1329
STYLE 1
PLASTIC
(TO-272 WB-16)



CASE 1329A
STYLE 1
PLASTIC
(TO-272 WB-16 Gull)

SCALE 1:1

Motorola RF General Purpose Linear Amplifier Modules

Motorola general purpose linear amplifier modules are designed and specified for 50 ohm applications where linearity and dynamic range are essential.

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Motorola RF General Purpose Linear Amplifier Modules

This device has been optimized for 50 ohm applications. It was designed for multi-purpose applications where linearity and dynamic range are of primary concern.

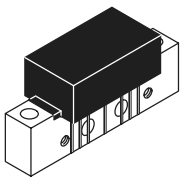
General Purpose Linear Amplifier Modules — Class A — Silicon Bipolar

Product	Frequency Band MHz	V_{CC} (Nom) Volts	I_{CC} (Nom) mA	Gain (Nom) @ 100 MHz dB	Gain Flatness (Typ) dB	P_{1dB} (Typ) @ 200 MHz dBm	3rd Order Intercept (Typ) dBm	NF (Typ) @ 200 MHz dB	Pkg/Style
MHW1345★	10 - 200	24	310	34.5	1.0	28	44	3.8	1302/1

Note: Possible replacement for CA2830C.

★New Product

RF General Purpose Linear Amplifier Module Package



CASE 1302
STYLE 1

SCALE 1:2

Motorola CATV Distribution Amplifier Modules

Motorola Hybrids are manufactured using the latest CATV generation 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. Additions to our CATV product family include 40-870 MHz high output gallium arsenide (GaAs) power doublers as well as low distortion, low power consumption reverse amplifiers.

Table of Contents

Motorola CATV Distribution Amplifier Modules

Motorola Hybrids are manufactured using the latest generation 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.

Forward Amplifier Modules

40-1000 MHz Hybrids, V_{CC} = 24 Vdc, Class A — Silicon Bipolar

Product	Hybrid Gain (Nom) @ 50 MHz dB	Channel Loading Capacity	Maximum Distortion Specifications: Output Level dBmV/CH	2nd Order Test dBc	Composite Triple Beat dBc 152 CH	Cross Modulation dBc 152 CH	DC Current mA Typ	Noise Figure @ 1000 MHz dB Max	Pkg/ Style
Preamplifiers									
MHW9182B	18.5	152	+38	-63[40]	-61	-61	210	7.5	714Y/1
MHW9242A	23.2	152	+38	-61[40]	-58	-59	318	8.0	1302/1

40-870 MHz High Output Hybrids, V_{CC} = 24 Vdc, Class A — GaAs

Product	Hybrid Gain (Nom) @ 870 MHz dB	Channel Loading Capacity	Maximum Distortion Specifications: Output Level dBmV/CH	2nd Order Test dBc	Composite Triple Beat dBc 132 CH	Cross Modulation dBc 132 CH	DC Current mA Typ	Noise Figure @ 870 MHz dB Max	Pkg/ Style
Preamplifiers									
MHW9146★	14.3	132	+44	-60[36]	-60	-55	245	5.5	1302/1
MHW9186★	18.5	132	+44	-60[36]	-58	-52	250	5.0	1302/1
MHW9206★	20.2	132	+44	-59[36]	-57	-51	245	4.5	1302/1
MHW9236★	23.8	132	+44	-60[36]	-60	-50	255	6.5	1302/1
MHW9276★	27.9	132	+44	-60[36]	-60	-53	250	6.5	1302/1
Power Doublers									
MHW9187	20	132	+48	-62[34]	-56	-55	425	4.5	1302/1
MHW9188★	20.3	132	+48	-62[34]	-56	-55	425	4.5	1302/1
MHW9189[35]★	20.3	132	+48	-62[34]	-56	-55	425	4.5	1302/2
MHW9227★	22.1	132	+48	-62[34]	-56	-55	425	4.5	1302/1
MHW9247★	24.9	132	+48	-62[34]	-56	-54	440	7.0	1302/1
MHW9267★	27.6	132	+48	-60[34]	-56	-54	440	7.0	1302/1

[34]Composite 2nd Order; V_{out} = +48 dBmV/ch

[35]Mirror image of MHW9188

[36]Composite 2nd Order; V_{out} = +44 dBmV/ch

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

★New Product

CATV Distribution: Forward Amplifier Modules (continued)

40-870 MHz High Output MMIC, V_{CC} = 24 Vdc, Class A — GaAs

Product	Hybrid Gain (Nom) @ 870 MHz dB	Channel Loading Capacity	Maximum Distortion Specifications: Output Level dBmV/CH	2nd Order Test dBc	Composite Triple Beat dBc 132 CH	Cross Modulation dBc 132 CH	DC Current mA Typ	Noise Figure @ 870 MHz dB Max	Pkg/ Style
Preamplifiers									
MMG1001R2[18e]★	18.5	132	+44	-58	-56	-52	250	5.0	978/—
Power Doublers									
MMG2001R2[18e]★	19.5	132	+48	-60	-54	-53	425	4.5	978/—

40-870 MHz Hybrids, V_{CC} = 24 Vdc, Class A — Silicon Bipolar

Product	Hybrid Gain (Nom) @ 870 MHz dB	Channel Loading Capacity	Maximum Distortion Specifications: Output Level dBmV/CH	2nd Order Test dBc	Composite Triple Beat dBc 128 CH	Cross Modulation dBc 128 CH	DC Current mA Typ	Noise Figure @ 870 MHz dB Max	Pkg/ Style
Preamplifiers									
MHW8202B★	20.9	128	+38	-66[40]	-63	-62	220	7.0	1302/1
MHW8272A	27.2	128	+38	-64[40]	-64	-62	310	7.0	1302/1

40-860 MHz Hybrids, V_{CC} = 24 Vdc, Class A — Silicon Bipolar

Product	Hybrid Gain (Nom) @ 50 MHz dB	Channel Loading Capacity	Maximum Distortion Specifications: Output Level dBmV/CH	2nd Order Test dBc	Composite Triple Beat dBc 128 CH	Cross Modulation FM = 55 MHz dBc 128 CH	DC Current mA Typ	Noise Figure @ 860 MHz dB Max	Pkg/ Style
Preamplifiers									
MHW8182B	18.5	128	+38	-64[40]	-66	-65	220	7.5	714Y/1
MHW8222B	21.9	128	+38	-60[40]	-64	-63	220	7.0	1302/1
MHW8242A	24	128	+38	-62[40]	-64	-62	318	7.5	1302/1
Power Doublers									
MHW8185L[21]	18.5	128	+40	-62[39]	-63	-64	365	8.5*	714Y/1
MHW8185	18.8	128	+40	-62[39]	-64	-64	400	8.0	714Y/1
MHW8205L[22]	19.5	128	+40	-60[39]	-63	-64	365	8.5*	714Y/1
MHW8205	19.8	128	+40	-60[39]	-63	-64	400	8.0	714Y/1

*@ 870 MHz

[18]Tape and Reel Packaging Options: a) R1 = 500 units; b) R2 = 2,500 units; c) T1 = 3,000 units; d) T3 = 10,000 units; e) R2 = 1,500 units; f) T1 = 1,000 units; g) R2 = 4,000 units; h) R1 = 1,000 units; i) R3 = 250 units; j) T1 = 500 units; k) R2 = 450 units; l) T1 = 5,000 units; m) R2 = 2,000 units; n) R4 = 100 units; o) R6 = 150 units.

[21]Low DC Current Version of MHW8185; Typical I_{CC} @ Vdc = 24 V is 365 mA.

[22]Low DC Current Version of MHW8205; Typical I_{CC} @ Vdc = 24 V is 365 mA.

[39]Composite 2nd Order; V_{out} = +40 dBmV/ch

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

★New Product

CATV Distribution: Forward Amplifier Modules (continued)

40-750 MHz Hybrids, V_{CC} = 24 Vdc, Class A — Silicon Bipolar

Product	Hybrid Gain (Nom) @ 50 MHz dB	Channel Loading Capacity	Maximum Distortion Specifications				DC Current mA Typ	Noise Figure @ 750 MHz dB Max	Pkg/ Style
			Output Level dBmV/CH	2nd Order Test dBc	Composite Triple Beat dBc 110 CH	Cross Modulation FM = 55 MHz dBc 110 CH			
Preamplifiers									
MHW7182B	18.5	110	+40	-63[39]	-66	-64	220	6.5	714Y/1
MHW7222B	21.9	110	+40	-60[39]	-61	-60	220	6.5	1302/1
MHW7242A	24	110	+40	-62[39]	-63	-61	318	7.0	1302/1
MHW7272A	27.2	110	+40	-64[39]	-64	-60	310	6.5	1302/1
MHW7292A ★	29	110	+40	-60[39]	-60	-60	310	6.5*	1302/1
								*@ 770 MHz	
Power Doublers									
MHW7185CL	18.5	110	+44	-64[36]	-61	-63	370	7.5	714Y/1
MHW7185C	18.8	110	+44	-64[36]	-62	-63	400	7.5	714Y/1
MHW7205CL	19.5	110	+44	-63[36]	-61	-62	365	7.5	714Y/1
MHW7205C	19.8	110	+44	-63[36]	-61	-62	400	7.5	714Y/1

40-550 MHz Hybrids, V_{CC} = 24 Vdc, Class A — Silicon Bipolar

Product	Hybrid Gain (Nom) @ 50 MHz dB	Channel Loading Capacity	Maximum Distortion Specifications				DC Current mA Typ	Noise Figure @ 550 MHz dB Max	Pkg/ Style
			Output Level dBmV/CH	2nd Order Test dBc	Composite Triple Beat dBc 77 CH	Cross Modulation dBc 77 CH			
Forward Amplifiers									
MHW6342T	34.5	77	+44	-57[36]	-57	-57	310	6.5	1302/1

[36]Composite 2nd Order; V_{out} = +44 dBmV/ch

[39]Composite 2nd Order; V_{out} = +40 dBmV/ch

★New Product

Reverse Amplifier Modules

5-200 MHz Hybrids, V_{CC} = 24 Vdc, Class A — Silicon Bipolar

Product	Hybrid Gain (Nom) @ 10 MHz dB	Channel Loading Capacity	Maximum Distortion Specifications: Output Level dBmV/CH	2nd Order Test[30] dBc	Composite Triple Beat dBc: 22 CH	Composite Triple Beat dBc: 26 CH	Cross Modulation dBc: 22 CH	Cross Modulation dBc: 26 CH	DC Current mA Typ	Noise Figure @ 175 MHz dB Max	Pkg/ Style
MHW1244	24	22, 26	+50	-72	-68	-67.5[19]	-61	-61[19]	210	5.0	1302/1

Low Current Amplifiers — 5-200 MHz Hybrids, V_{CC} = 24 Vdc, Class A — Silicon Bipolar

Product	Hybrid Gain (Nom) @ 5 MHz dB	Channel Loading Capacity	Maximum Distortion Specifications: Output Level dBmV/CH	2nd Order Test dBc: 6 CH	2nd Order Test dBc: 10 CH	Composite Triple Beat dBc: 6 CH	Composite Triple Beat dBc: 10 CH	Cross Modulation dBc: 6 CH	Cross Modulation dBc: 10 CH	DC Current mA Typ	Noise Figure @ 200 MHz dB Max	Pkg/ Style
MHW1223LA	22.7	6,10	+50	-68	-65	-75	-66	-65	-60	95	7.0	1302/1
MHW1253LA	25.5	6,10	+50	-68	-66	-75	-66	-65	-61	95	6.5	1302/1
MHW1303LA	30.8	6,10	+50	-68	-65	-74	-64	-64	-58	95	5.7	1302/1

Low Current Amplifiers — 5-150 MHz Hybrids, V_{CC} = 24 Vdc, Class A — Silicon Bipolar

Product	Hybrid Gain (Nom) @ 5 MHz dB	Channel Loading Capacity	Maximum Distortion Specifications: Output Level dBmV/CH	2nd Order Test dBc: 6 CH	2nd Order Test dBc: 10 CH	Composite Triple Beat dBc: 6 CH	Composite Triple Beat dBc: 10 CH	Cross Modulation dBc: 6 CH	Cross Modulation dBc: 10 CH	DC Current mA Typ	Noise Figure @ 150 MHz dB Max	Pkg/ Style
MHW1353LA	35.2	6,10	+50	-68	-65	-73	-62	-63	-57	95	5.4	1302/1

Low Current Amplifiers — 5-65 MHz Hybrids, V_{CC} = 24 Vdc, Class A — Silicon Bipolar

Product	Hybrid Gain (Nom) @ 5 MHz dB	Channel Loading Capacity	Maximum Distortion Specifications: Output Level dBmV/CH	2nd Order Test dBc: 6 CH	2nd Order Test dBc: 10 CH	Composite Triple Beat dBc: 6 CH	Composite Triple Beat dBc: 10 CH	Cross Modulation dBc: 6 CH	Cross Modulation dBc: 10 CH	DC Current mA Typ	Noise Figure @ 65 MHz dB Max	Pkg/ Style
MHW1224LA	22.7	6,10	+50	-68	-65	-75	-66	-65	-60	95	7.0	1302/1
MHW1254LA	25.5	6,10	+50	-68	-66	-75	-66	-65	-61	95	6.5	1302/1
MHW1304LA	30.8	6,10	+50	-68	-65	-74	-64	-64	-58	95	5.7	1302/1
MHW1354LA	35.2	6,10	+50	-68	-65	-73	-62	-63	-57	95	5.4	1302/1

[19]Typical

[30]Channels 2 and A @ 7

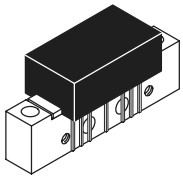
CATV Distribution: Reverse Amplifier Modules (continued)

Low Current Amplifiers — 5-50 MHz Hybrids, V_{CC} = 24 Vdc, Class A — Silicon Bipolar

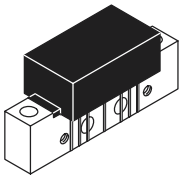
Product	Hybrid Gain (Nom) @ 5 MHz dB	Channel Loading Capacity	Maximum Distortion Specifications				DC Current mA Typ	Noise Figure @ 50 MHz dB Max	Pkg/ Style
			Output Level dBmV/CH	2nd Order Test[30] dBc	Composite Triple Beat dBc 3 CH	Cross Modulation dBc 4 CH			
MHW1254L	25	4	+50	-70	-70	-62	115	4.5	1302/1

[30]Channels 2 and A @ 7

CATV Distribution Amplifier Module Packages



CASE 714Y
STYLE 1



CASE 1302
STYLE 1, 2

SCALE 1:2

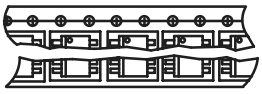
RF and IF Tape and Reel Specifications

Embossed Tape and Reel is used to facilitate automatic pick and place equipment feed requirements. The tape is used as the shipping container for various products and requires a minimum of handling. The antistatic/conductive tape provides a secure cavity for the product when sealed with the “peel-back” cover tape.

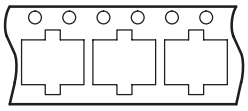
- Two Reel Sizes Available (7″ and 13″)
- Used for Automatic Pick and Place Feed Systems
- Minimizes Product Handling
- EIA 481, -1, -2
- SOT-363 in 8 mm Tape
- Micro-8, QFN-32, PLD-1, PLD-1.5, NI-200S, NI-200Z in 12 mm Tape
- SO-16/16L, TSSOP-16 in 16 mm Tape
- SO-20L, SO-28L, TO-270-2 in 24 mm Tape
- NI-360, NI-360S, NI-400, NI-400S, NI-600, TO-270 WB-4 in 32 mm Tape
- TO-272-2, TO-272-6 Wrap, TO-272-6, TO-272-8 Wrap, TO-272-8, TO-272 WB-4, TO-272 WB-16 in 44 mm Tape
- NI-780, NI-780S, NI-860, NI-880, NI-880S, NI-1230 in 56 mm Tape

Use the standard device title and add the required suffix as listed in the option table on the following page. Note that the individual reels have a finite number of devices depending on the type of product contained in the tape. Also note the minimum lot size is one full reel for each line item, and orders are required to be in increments of the single reel quantity.

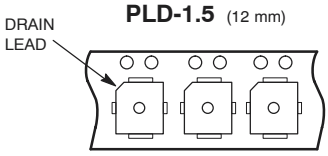
Micro-8 (12 mm)
SO-16/16L (16 mm)
SO-20L, SO-28L (24 mm)



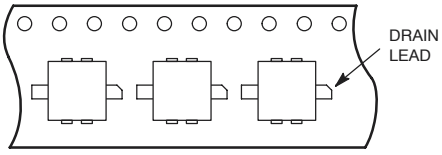
PLD-1 (12 mm)



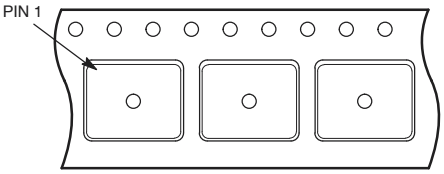
PLD-1.5 (12 mm)



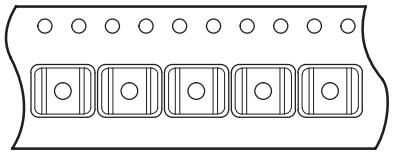
NI-200S, NI-200Z (12 mm)



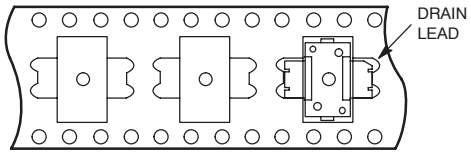
PFP-16 (16 mm)



TSSOP-16 (16 mm)

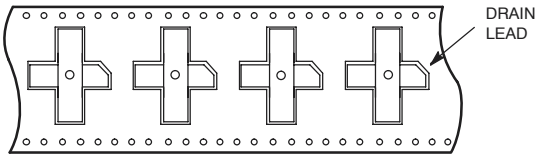


TO-270-2 (24 mm)

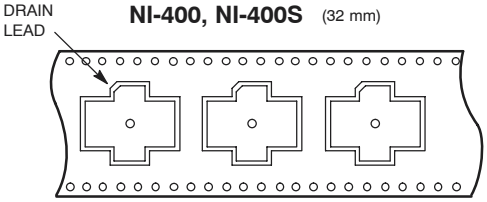


DIRECTION
OF FEED

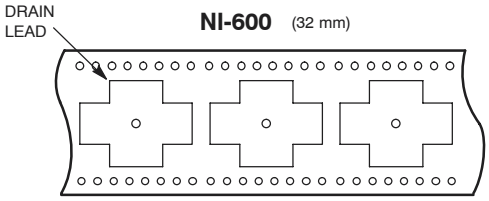
NI-360, NI-360S (32 mm)



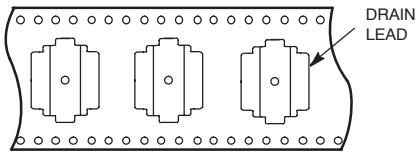
NI-400, NI-400S (32 mm)



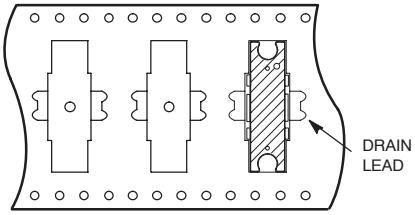
NI-600 (32 mm)



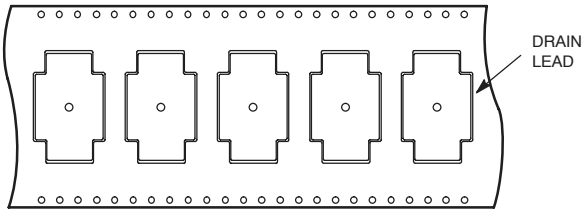
TO-270 WB-4 (32 mm)



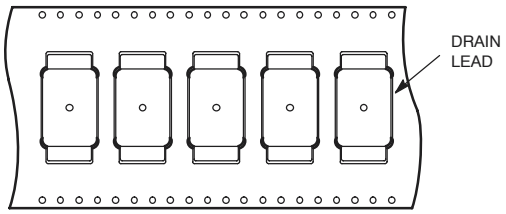
TO-272-2, TO-272-6 Wrap, TO-272-6, TO-272-8, TO-272-8 Wrap (44 mm)



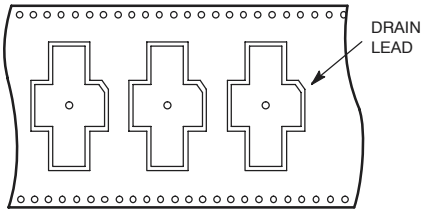
TO-272 WB-4, TO-272 WB-16 (44 mm)

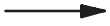


TO-272 WB-16 Gull (44 mm)



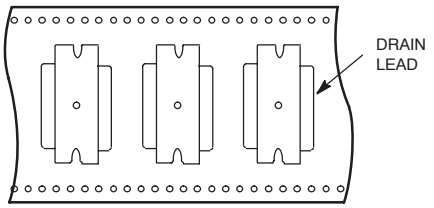
NI-780, NI-780S (56 mm)



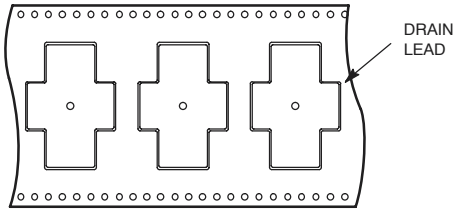


DIRECTION
OF FEED

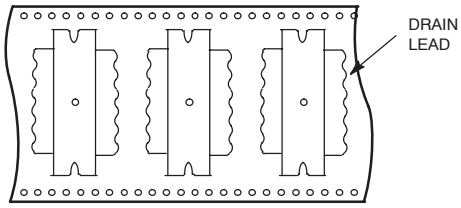
NI-860 (56 mm)



NI-880, NI-880S (56 mm)



NI-1230 (56 mm)



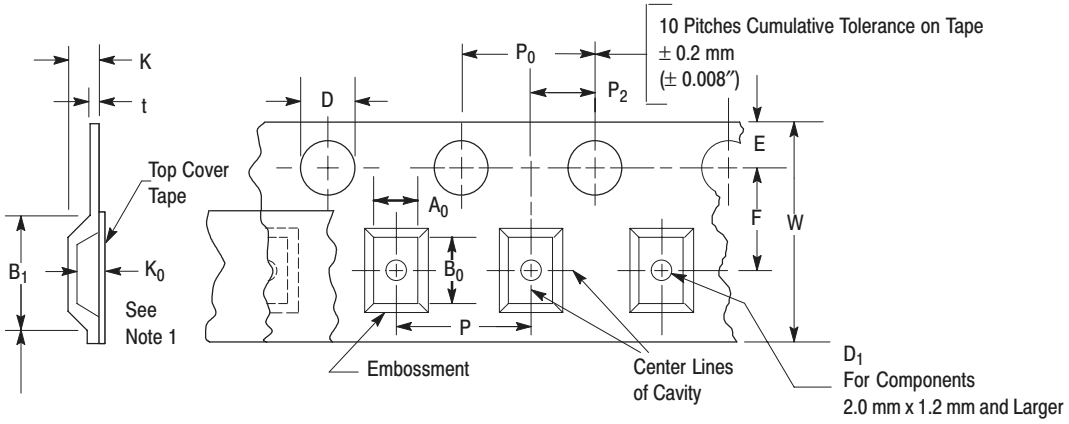
DIRECTION
OF FEED

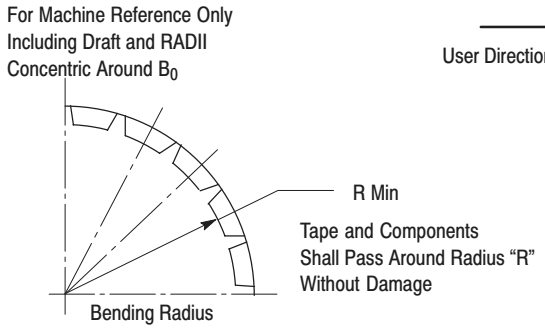
RF and IF EMBOSSED TAPE AND REEL ORDERING INFORMATION

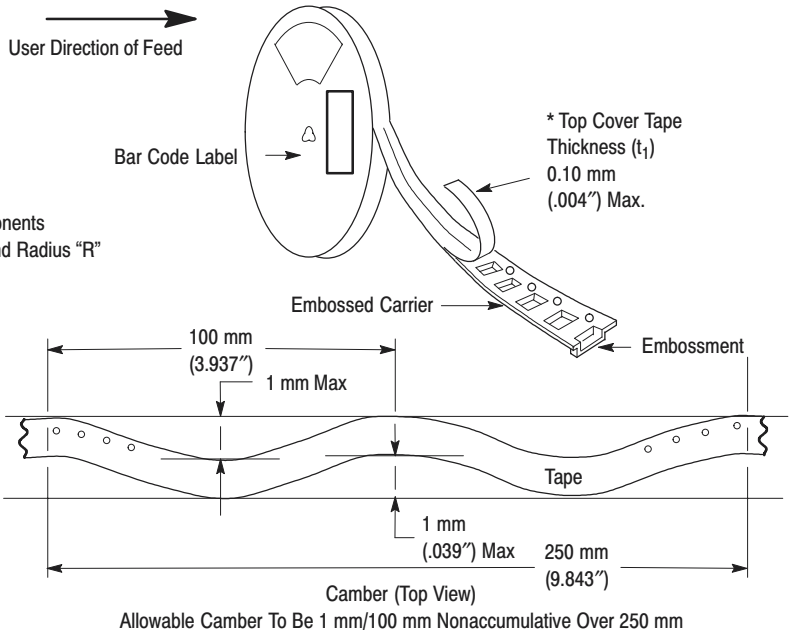
Package	Tape Width (mm)	Pitch mm (inch)	Reel Size mm (inch)	Devices Per Reel and Minimum Order Quantity	Device Suffix
Micro-8	12	8.0 ± 0.1 (.315 ± .003)	330 (13)	2,500	R2
NI-200S (458B)	12	12.0 ± 0.1 (.471 ± .004)	178 (7)	500	R1
NI-200Z (458C)	12	12.0 ± 0.1 (.471 ± .004)	178 (7)	500	R1
NI-360 (360B)	32	24.0 ± 0.1 (.945 ± .004)	330 (13)	500	R1
NI-360S (360C)	32	24.0 ± 0.1 (.945 ± .004)	330 (13)	500	R1
NI-400 (465E)	32	32.0 ± 0.1 (1.26 ± .004)	330 (13)	250	R3
NI-400S (465F)	32	32.0 ± 0.1 (1.26 ± .004)	330 (13)	250	R3
NI-600 (465D)	32	32.0 ± 0.1 (1.26 ± .004)	330 (13)	250	R3
NI-780 (465)	56	32.0 ± 0.1 (1.26 ± .004)	330 (13)	250	R3
NI-780S (465A)	56	32.0 ± 0.1 (1.26 ± .004)	330 (13)	250	R3
NI-860 (375B, 375G)	56	28.0 ± 0.1 (1.10 ± .004)	330 (13)	250	R3
NI-880 (465B)	56	32.0 ± 0.1 (1.26 ± .004)	330 (13)	250	R3
NI-880S (465C)	56	32.0 ± 0.1 (1.26 ± .004)	330 (13)	250	R3
NI-1230 (375D)	56	32.0 ± 0.1 (1.26 ± .004)	330 (13)	150	R6
PLD-1	12	8.0 ± 0.1 (.315 ± .004)	178 (7)	1,000	T1
PLD-1.5	12	8.0 ± 0.1 (.315 ± .004)	178 (7)	1,000	T1
PFP-16	16	12.0 ± 0.1 (.472 ± .004)	330 (13)	1,500	R2
QFN-24	12	8.0 ± 0.1 (.315 ± .004)	178 (7)	2,500	R2
QFN-32 (5x5 mm)	12	8.0 ± 0.1 (.315 ± .004)	178 (7)	2,500	R2
SO-16/16L	16	8.0 ± 0.1 (.315 ± .004)	330 (13)	2,500	R2
SO-20L	24	12.0 ± 0.1 (.472 ± .004)	330 (13)	1,000	R2
SO-28L	24	12.0 ± 0.1 (.472 ± .004)	330 (13)	1,000	R2
SOT-363	8	4.0 ± 0.1 (.157 ± .004)	178 (7)	3,000	T1
TO-270-2 (1265)	24	16.0 ± 0.1 (.631 ± .004)	330 (13)	500	R1
TO-270 WB-4 (1486)	32	24.0 ± 0.1 (.944 ± .004)	330 (13)	500	R1
TO-272-6 Wrap (1264), TO-272-6 (1264A)	44	16.0 ± 0.1 (.631 ± .004)	330 (13)	500	T1
TO-272-8 Wrap (1366), TO-272-8 (1366A)	44	20.0 ± 0.1 (.787 ± .004)	330 (13)	500	T1
TO-272-2 (1337)	44	16.0 ± 0.1 (.631 ± .004)	330 (13)	500	R1
TO-272 WB-16 (1329)	44	20.0 ± 0.1 (.788 ± .004)	330 (13)	500	R1
TO-272 WB-16 Gull (1329A)	44	16.0 ± 0.1 (.631 ± .004)	330 (13)	500	R1
TO-272 WB-4 (1484)	44	20.0 ± 0.1 (.788 ± .004)	330 (13)	500	R1
TSSOP-16	16	8.0 ± 0.1 (.315 ± .004)	330 (13)	2,500	R2

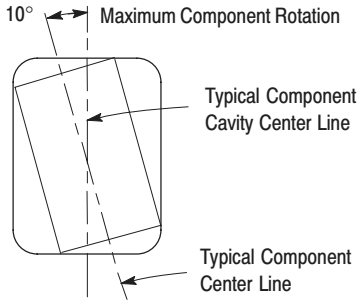
EMBOSSED TAPE AND REEL DATA FOR DISCRETES

CARRIER TAPE SPECIFICATIONS









DIMENSIONS

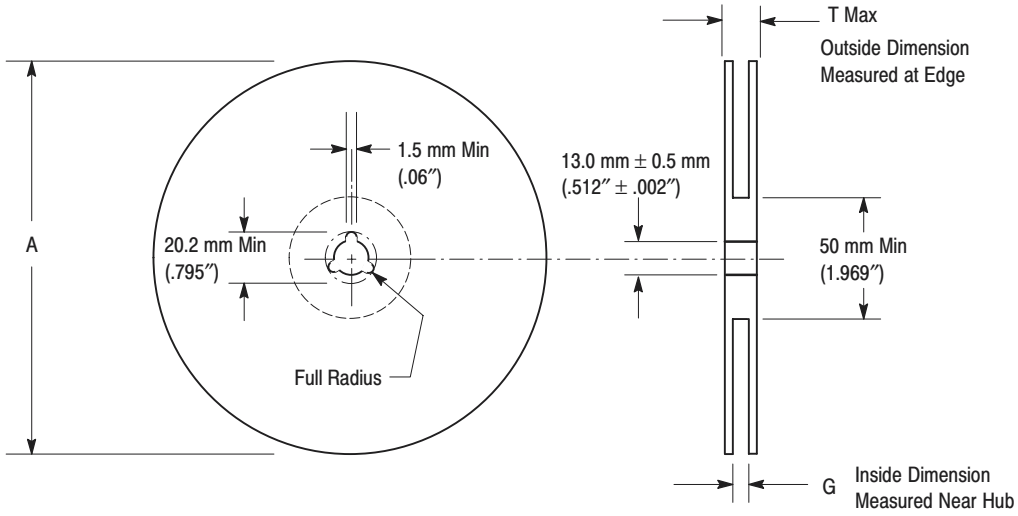
Tape Size	B_1 Max	D	D_1	E_1	F	K	P_0	P_2	R Min	t Max	W Max
12 mm	8.2 mm (.323″)	1.5+0.1 mm −0.0 (.059+.004″ −0.0)	1.5 mm Min (.060″)	1.75±0.1 mm (.069±.004″)	5.5±0.05 mm (.217±.002″)	6.4 mm Max (.252″)	4.0±0.1 mm (.157±.004″)	2.0±0.1 mm (.079±.004″)	30 mm (1.18″)	0.4 mm (.016″)	12±.30 mm (.470±.012″)
16 mm	12.1 mm (.476″)				7.5±0.10 mm (.295±.004″)	7.9 mm Max (.311″)					16.3 mm (.642″)
24 mm	20.1 mm (.791″)				11.5±0.1 mm (.453±.004″)	11.9 mm Max (.468″)					24.3 mm (.957″)
32 mm	23.0 mm (.906″)		1.5 mm Min (.059″)		14.2±0.1 mm (.559±.004″)	4.6 mm (.181″) NI-360/S			50 mm (1.969″)	0.6 mm (.024″)	32.2 mm (1.272″)
						4.3 mm (.169″) NI-400/S					
						5.34 mm (.210″) NI-600/S					
	19.7 mm (.776″) TO-270 WB-4		2.0 mm Min (.079″)			3.5 mm (.138″) TO-270 WB-4					32.0 mm± 0.3 mm (1.260±.012″) TO-270 WB-4
44 mm	35.0 mm (1.378″)				11.5±0.1 mm (.453±.004″)	15.9 mm Max (.625″)		2.0±0.15 mm (.079±.006″)			44±.30 mm (1.732±.012″)
	24.0 mm (.946″) TO-272 WB-4, TO-272 WB-16				20.2±0.15 mm (0.796±.006″)	2.92 mm (.115″) TO-272 WB-4, TO-272 WB-16	20.0±0.1 mm (.788±.004″) TO-272 WB-4, TO-272 WB-16			.318 mm (.012″) TO-272 WB-4, TO-272 WB-16	
	23.77 mm (.936″) TO-272 WB-16 Gull					3.20 mm (.126″) TO-272 WB-16 Gull	16.0±0.1 mm (.630±.004″) TO-272 WB-16 Gull			.343 mm (.013″) TO-272 WB-16 Gull	
56 mm	34.7 mm (1.366″)				26.2 ±0.15 mm (1.031±.006″)	4.5 mm (0.177″) NI-780/S	4.0±0.1 mm (.157±.004″)			0.6 mm (.024″)	56±.30 mm (2.205± .012″)
						5.0 mm (0.197″) NI-860					
						5.23 mm (0.206″) NI-880/S					
	41.6 mm (1.638″) NI-1230					5.2 mm (0.205″) NI-1230					

Metric dimensions govern — English are in parentheses for reference only.

NOTE 1: A_0, B_0, and K_0 are determined by component size. The clearance between the components and the cavity must be within .05 mm min. to .50 mm max., the component cannot rotate more than 10° within the determined cavity.

NOTE 2: Pitch information is contained in the Embossed Tape and Reel Ordering Information on pg. 48.

EMBOSSED TAPE AND REEL DATA FOR DISCRETES



Size	A Max	G	T Max
12 mm	330 mm (12.992″)	12.4 mm + 2.0 mm, -0.0 (.49″ + .079″, -0.00)	18.4 mm (.72″)
16 mm	360 mm (14.173″)	16.4 mm + 2.0 mm, -0.0 (.646″ + .078″, -0.00)	22.4 mm (.882″)
24 mm	360 mm (14.173″)	24.4 mm + 2.0 mm, -0.0 (.961″ + .070″, -0.00)	30.4 mm (1.197″)
32 mm	360 mm (14.163″)	32.4 mm + 2.0 mm, -0.0 (1.276″+ 0.79″, -0.00)	38.4 mm (1.512″)
44 mm	330 mm (12.992″)	44.4 mm + 2.0 mm, -0.0 (1.748″+ 0.79″, -0.00)	50.4 mm (1.984″)
44 mm TO-272 WB-4, WB-16, WB-16 Gull	330 mm (12.992″)	45.3 mm + 0.5 mm, -0.0 (1.785″+ 0.02″, -0.00)	50.4 mm (1.984″)
56 mm	330 mm (12.992″)	56.4 mm + 2.0 mm, -0.0 (2.220″+ 0.79″, -0.00)	62 mm (2.441″)

Reel Dimensions

Metric Dimensions Govern — English are in parentheses for reference only

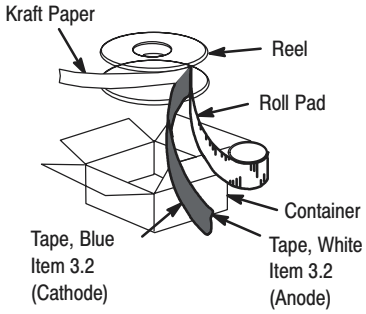


Figure 1. Reel Packing

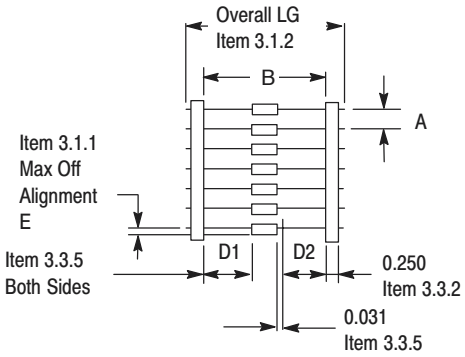


Figure 2. Component Spacing

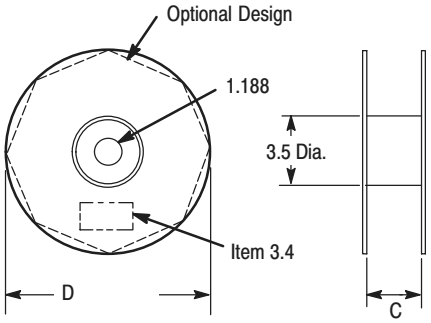


Figure 3. Reel Dimensions

Applications and Product Literature

Application Notes, Engineering Bulletins and Article Reprints of special interest to designers of RF and RF/IF equipment are listed below. This technical documentation is available on the Motorola Semiconductor Product Sector Web site or is available through the Motorola Literature Distribution Center. Phone and fax numbers for ordering literature are listed on the back cover of this book and in our Accessing Data On-line section.

Application Notes

AN211A Field Effect Transistors in Theory and Practice
AN419 UHF Amplifier Design Using Data Sheet Design Curves
AN423 Field Effect Transistor RF Amplifier Design Techniques
AN535 Phase-Locked-Loop Design Fundamentals
AN548A Microstrip Design Techniques for UHF Amplifiers
AN721 Impedance Matching Networks Applied to RF Power Transistors
AN923 800 MHz Test Fixture Design
AN955 A Cost Effective VHF Amplifier for Land Mobile Radios
AN1022 Mechanical and Thermal Considerations in Using RF Linear Hybrid Amplifiers
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 Design
AN1032 How Load VSWR Affects Non-Linear Circuits
AN1033 Match Impedances in Microwave Amplifiers
AN1034 Three Balun Designs for Push-Pull Amplifiers
AN1040 Mounting Considerations for Power Semiconductors
AN1207 The MC145170 in Basic HF and VHF Oscillators
AN1253 An Improved PLL Design Method Without ϖn and ζ
AN1277 Offset Reference PLLs for Fine Resolution or Fast Hopping
AN1526 RF Power Device Impedances: Practical Considerations
AN1530 Motorola Advanced Amplifier Concept Package
AN1539 An IF Communication Circuit Tutorial
AN1602 3.6 V and 4.8 V GSM/DCS1800 Dual Band PA Application with DECT Capability Using Standard Motorola RFIC's
AN1617 Mounting Recommendations for Copper Tungsten Flanged Transistors
AN1639 Phase Noise Measurement Using the Phase Lock Technique
AN1643 RF LDMOS Power Modules for GSM Base Station Application: Optimum Biasing Circuit
AN1670 60 Watts, GSM 900 MHz, LDMOS Two-Stage Amplifier
AN1671 MC145170 PSpice Modeling Kit
AN1696 Broadband Intermodulation Performance Development Using the Rohde & Schwarz Vector Network Analyzer ZVR
AN1697 GSM900/DCS/1800 Dual-Band 3.6 V Power Amplifier Solution with Open Loop Control Scheme
AN1907 Surface Mount Solder Attach Method for the MRF9045MR1 in the TO-270 Plastic RF Package
AN1908 Solder Mounting Method for the MRF19090S and Similar Packages
AN1923 Mounting Method with Mechanical Fasteners for the MRF19090 and Similar Packages
AN1938 Sensitivity of High Power RF Transistors to Source and Output Loads
AN1941 Modeling Thermal Effects in RF LDMOS Transistors
AN1944 Generating Temperature-Dependent IV Curves Using ADS
AN1946 Interfacing Motorola's MC13190 2.4 GHz Transceiver IC with HC08 Family MCU's
AN1949 Mounting Method for the MHVIC910HR2 (PFP-16) and Similar Surface Mount Packages
AN4005 Thermal Management and Mounting Method for the PLD 1.5 RF Power Surface Mount Package

Article Reprints

AR164 Good RF Construction Practices and Techniques
AR254 Phase-Locked Loop Design Articles
AR510 VSWR Protection of Solid State RF Power Amplifiers
AR511 Biasing Solid State Amplifiers to Linear Operation
AR579 CAD of a Broadband, Class-C 65 Watt UHF Power Amplifier
AR581 Procedure Performs Thermal Measurements on Pulsed Devices
AR612 Plastic Packages Hold Power RF MOSFETs
AR624 Aluminum-Based Metallization Enhances Device Reliability
AR628 Impedance Measurements for High Power RF Transistors Using the TRL Method
AR629 Digital Predistortion Techniques for RF Power Amplifiers with CDMA Applications

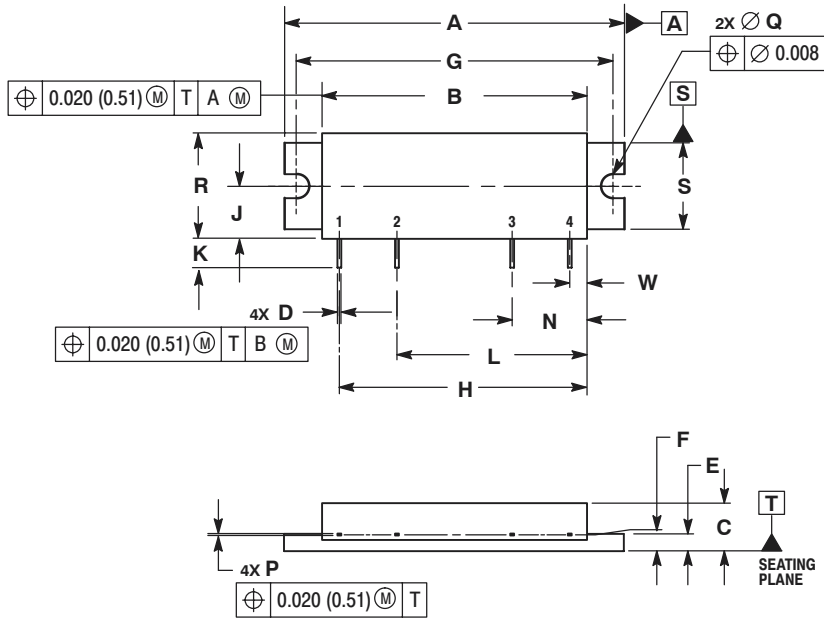
Engineering Bulletins

EB38	Measuring the Intermodulation Distortion of Linear Amplifiers
EB105	A 30 Watt, 800 MHz Amplifier Design
EB209	Mounting Method for RF Power Leadless Surface Mount Transistors
EB211	Thermal Management and Solder Mounting Method for the MRF286, 60 Watt Power Device in a CuW (Copper Tungsten) Base Package
EB213	Surge-Ringing Wave Clamp for GaAs CATV Module Protection

Product Literature

DL110/D	Wireless RF Product Device Data Library
DL209/D	CATV Distribution Amplifier Module Device Data Book
SG46/D	Wireless RF Product Selector Guide

Case Dimensions



NOTES:
1. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION "F" TO CENTER OF LEADS.

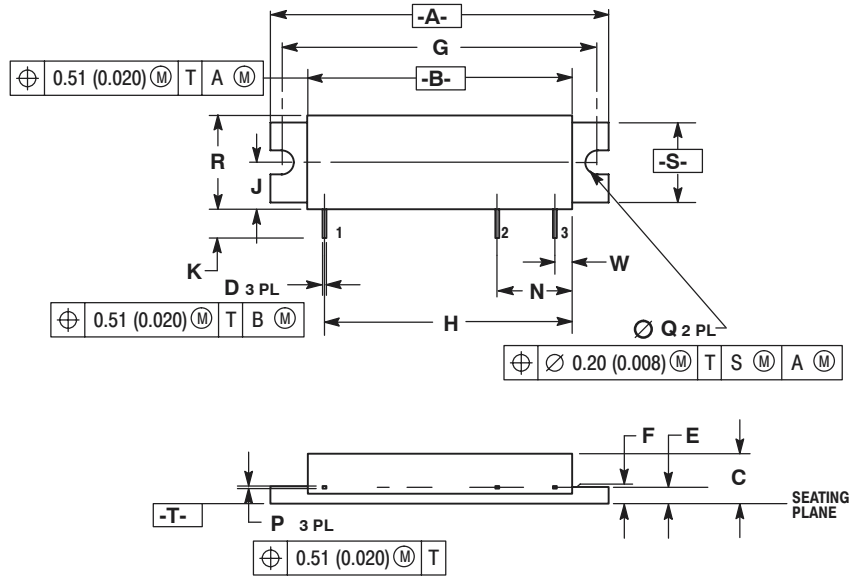
	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	1.760	1.780	44.70	45.21
B	1.370	1.390	34.80	35.31
C	0.245	0.265	6.22	6.73
D	0.017	0.023	0.43	0.58
E	0.080	0.100	2.03	2.54
F	0.086 BSC		2.18 BSC	
G	1.650 BSC		41.91 BSC	
H	1.290 BSC		32.77 BSC	
J	0.266	0.280	6.76	7.11
K	0.125	0.165	3.18	4.19
L	0.990 BSC		25.15 BSC	
N	0.390 BSC		9.91 BSC	
P	0.008	0.013	0.20	0.33
Q	0.118	0.132	3.00	3.35
R	0.535	0.555	13.59	14.10
S	0.445	0.465	11.30	11.81
W	0.090 BSC		2.29 BSC	

STYLE 1:
PIN 1. RF INPUT
2. VDD1
3. VDD2
4. RF OUTPUT
CASE: GROUND

STYLE 2:
PIN 1. RF OUTPUT
2. VDD2
3. VDD1
4. RF INPUT
CASE: GROUND

STYLE 3:
PIN 1. RF INPUT
2. VBIAS
3. VDD
4. RF OUTPUT
CASE: GROUND

CASE 301AP-02
ISSUE C



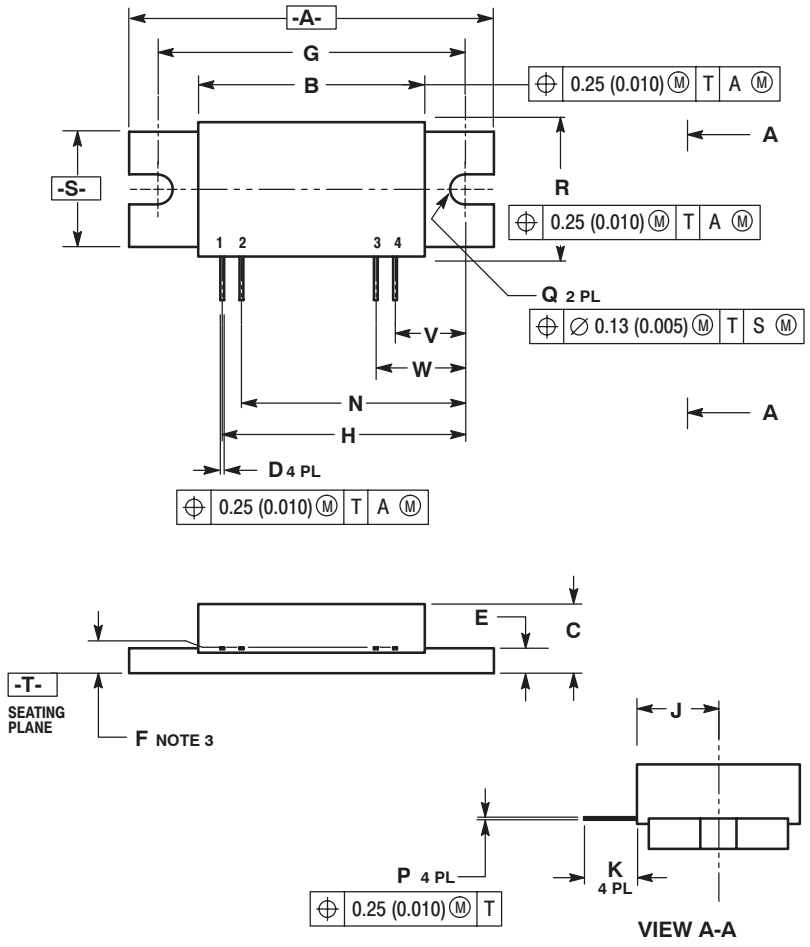
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION F TO CENTER OF LEADS.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	1.760	1.780	44.70	45.21
B	1.370	1.390	34.80	35.31
C	0.245	0.265	6.22	6.73
D	0.017	0.023	0.43	0.58
E	0.080	0.100	2.03	2.54
F	0.086 BSC		2.18 BSC	
G	1.650 BSC		41.91 BSC	
H	1.290 BSC		32.77 BSC	
J	0.266	0.280	6.76	7.11
K	0.125	0.165	3.18	4.19
N	0.390 BSC		9.91 BSC	
P	0.008	0.013	0.20	0.33
Q	0.118	0.132	3.00	3.35
R	0.535	0.555	13.59	14.10
S	0.445	0.465	11.30	11.81
W	0.090 BSC		2.29 BSC	

STYLE 1:
PIN 1. RF INPUT
2. VDD
3. RF OUTPUT
CASE: GROUND

CASE 301AS-01
ISSUE A

CASE DIMENSIONS (continued)



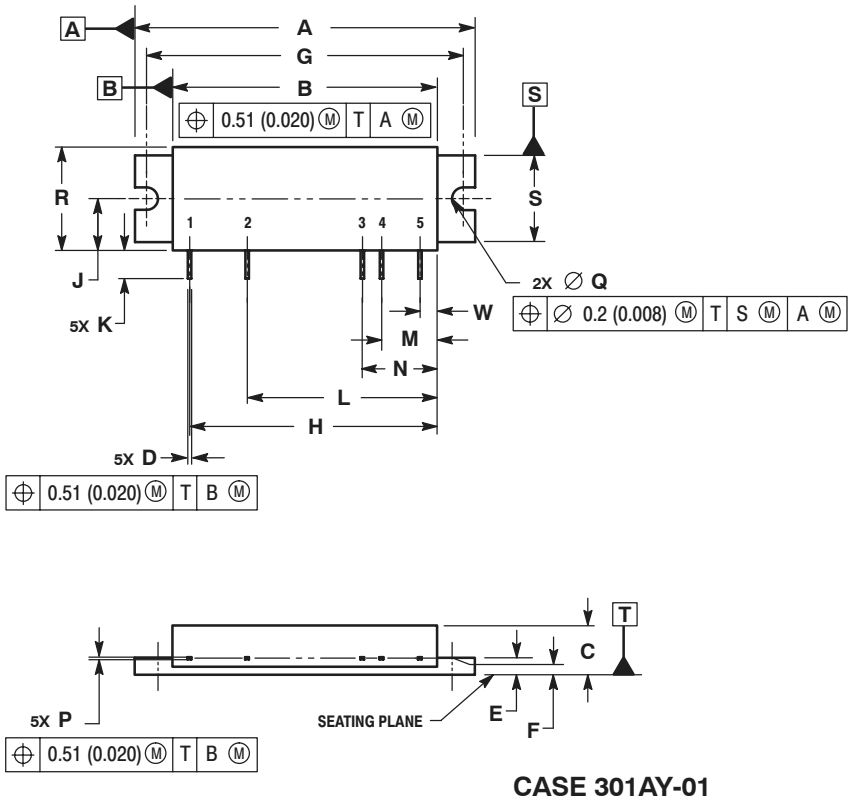
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION F IS FROM THE BOTTOM OF HEATSINK TO THE TOP OF THE LEAD.
4. DIMENSION P TO BE MEASURED AS LEAD EXITS COVER.
5. FLANGE FLATNESS 0.038 (0.0015) MAXIMUM CONVEX, 0.063 (0.0025) MAXIMUM CONCAVE.
6. ADHESIVE MATERIAL SHALL BE INCLUDED IN THE DIMENSIONS LISTED.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	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	0.115	0.135	2.92	3.42
F	0.170 BSC		4.31 BSC	
G	1.600 BSC		40.64 BSC	
H	1.265 BSC		32.13 BSC	
J	0.325	0.375	8.25	9.52
K	0.225	---	5.72	---
N	1.165 BSC		29.59 BSC	
P	0.010 REF		0.25 REF	
Q	0.150	0.160	3.81	4.06
R	0.685	0.705	17.40	17.90
S	0.598	0.612	15.18	15.54
V	0.365 BSC		9.27 BSC	
W	0.465 BSC		11.81 BSC	

STYLE 1:
PIN 1. RF IN
2. V BIAS
3. V SUPPLY
4. RF OUT

CASE 301AW-02
ISSUE B

CASE DIMENSIONS (continued)



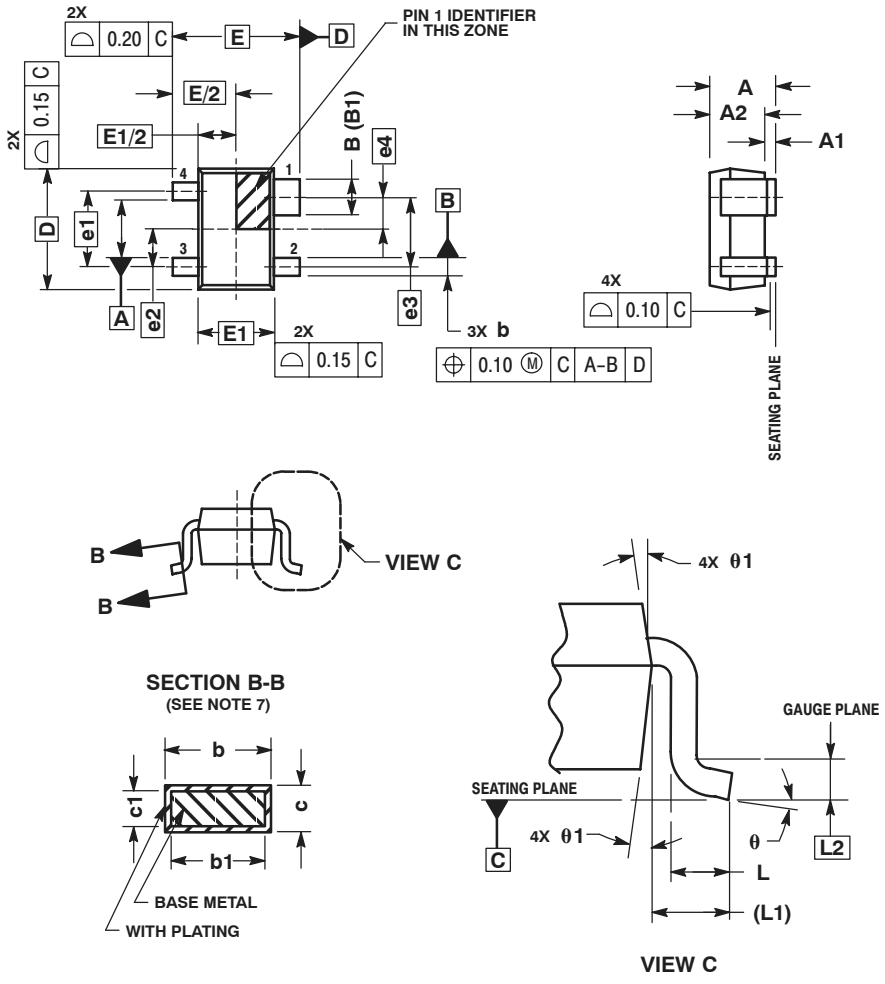
NOTES:
1. CONTROLLING DIMENSION: MILLIMETER.
2. INTERPRET DIMENSIONS AND TOLERANCES PER ANSI Y14.5M, 1982.
3. DIMENSION F TO CENTER LINE OF LEADS.

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	44.7	45.21	1.760	1.780
B	34.8	35.31	1.370	1.390
C	6.22	6.73	0.245	0.265
D	0.43	0.58	0.017	0.023
E	2.03	2.54	0.080	0.100
F	2.18 BSC		0.086 BSC	
G	41.91 BSC		1.650 BSC	
H	32.77 BSC		1.290 BSC	
J	6.76	7.11	0.266	0.280
K	3.18	4.19	0.125	0.165
L	25.15 BSC		0.990 BSC	
M	7.37 BSC		0.290 BSC	
N	9.91 BSC		0.390 BSC	
P	0.2	0.33	0.008	0.013
Q	3	3.35	0.118	0.132
R	13.59	14.1	0.535	0.555
S	11.3	11.81	0.445	0.465
W	2.29 BSC		0.090 BSC	

STYLE 1:
PIN 1. RF INPUT
2. VDD1
3. VDD2
4. VDD3
5. RF OUTPUT
CASE: GROUND

CASE 301AY-01
ISSUE O

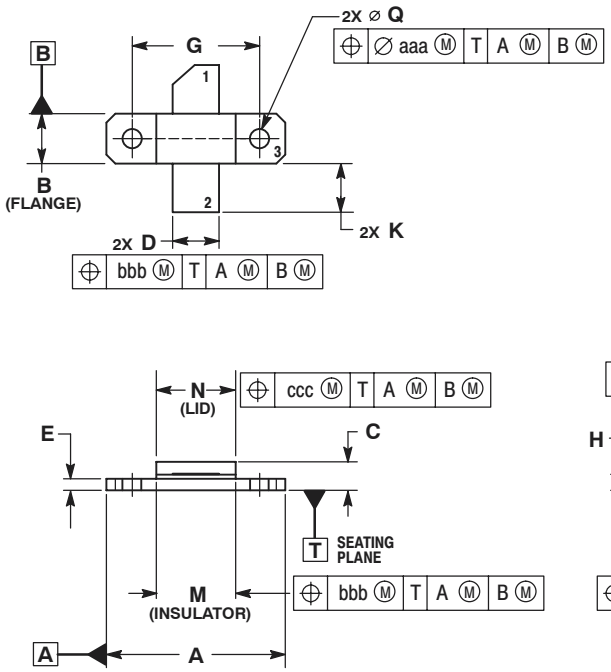
CASE DIMENSIONS (continued)



NOTES:
1. DIMENSIONS ARE IN MILLIMETERS.
2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.
3. DIMENSION D DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH, PROTRUSIONS OR GATE BURRS SHALL NOT EXCEED 0.15mm PER END. DIMENSION E1 DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.15mm PER SIDE.
4. DIMENSIONS D AND E1 ARE DETERMINED AT THE OUTMOST EXTREMES OF THE PLASTIC BODY EXCLUSIVE OF MOLD FLASH, TIE BAR BURRS, GATE BURRS AND INTERLEAD FLASH, BUT INCLUDING ANY MISMATCH BETWEEN THE TOP AND BOTTOM OF PLASTIC BODY.
5. DATUMS A, B AND D TO BE DETERMINED 0.10mm FROM THE LEAD TIP.
6. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
7. THESE DIMENSIONS APPLY TO THE FLAT SECTION OF THE LEAD BETWEEN 0.08mm AND 0.15mm FROM THE LEAD TIP.

	MILLIMETERS	
DIM	MIN	MAX
A	---	1.10
A1	0.00	0.10
A2	0.80	1.00
b	0.25	0.40
b1	0.25	0.35
B	0.55	0.70
B1	0.55	0.65
c	0.10	0.25
c1	0.08	0.20
D	2.00 BSC	
E	2.10 BSC	
E1	1.25 BSC	
e1	1.30 BSC	
e2	0.65 BSC	
e3	1.15 BSC	
e4	0.50 BSC	
L	0.26	0.46
L1	0.425 REF	
L2	0.15 BSC	
θ	0 °	8 °
θ1	4 °	10 °

CASE 318M-01
ISSUE O
SOT-343

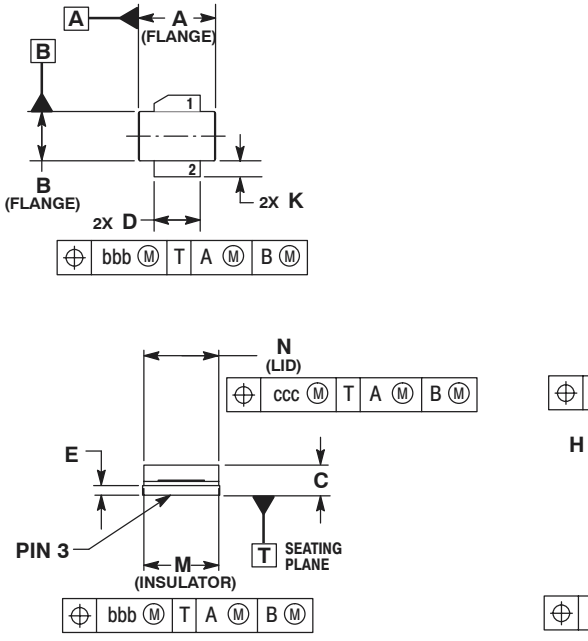


NOTES:
1. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M–1994.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION H IS MEASURED 0.030 (0.762) AWAY FROM PACKAGE BODY.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.795	0.805	20.19	20.45
B	0.225	0.235	5.72	5.97
C	0.125	0.175	3.18	4.45
D	0.210	0.220	5.33	5.59
E	0.055	0.065	1.40	1.65
F	0.004	0.006	0.10	0.15
G	0.562 BSC		14.28 BSC	
H	0.077	0.087	1.96	2.21
K	0.220	0.250	5.59	6.35
M	0.355	0.365	9.02	9.27
N	0.357	0.363	9.07	9.22
Q	0.125	0.135	3.18	3.43
R	0.227	0.233	5.77	5.92
S	0.225	0.235	5.72	5.97
aaa	0.005 REF		0.13 REF	
bbb	0.010 REF		0.25 REF	
ccc	0.015 REF		0.38 REF	

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

CASE 360B-05
ISSUE F
NI-360

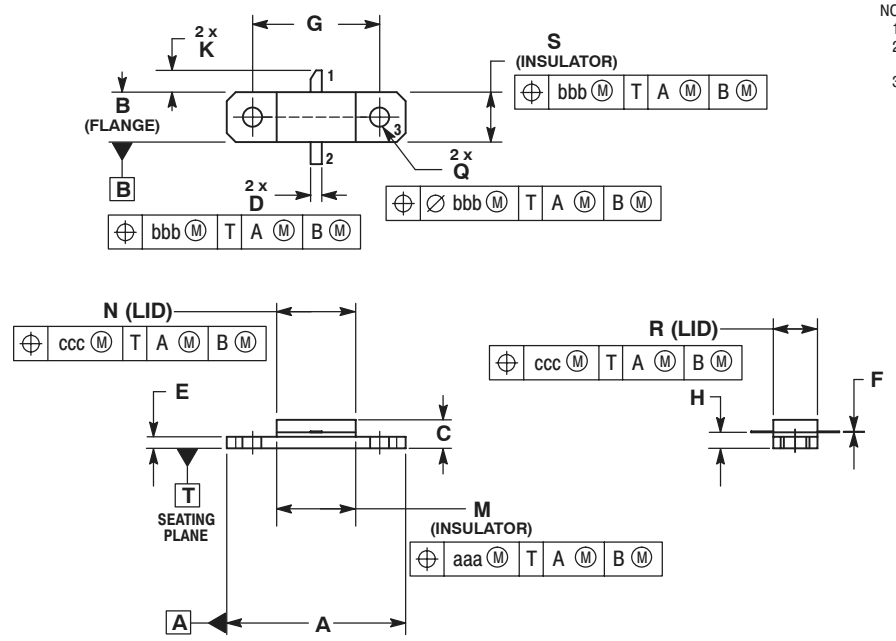


NOTES:
1. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M–1994.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION H IS MEASURED 0.030 (0.762) AWAY FROM PACKAGE BODY.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.375	0.385	9.53	9.78
B	0.225	0.235	5.72	5.97
C	0.105	0.155	2.67	3.94
D	0.210	0.220	5.33	5.59
E	0.035	0.045	0.89	1.14
F	0.004	0.006	0.10	0.15
H	0.057	0.067	1.45	1.70
K	0.085	0.115	2.16	2.92
M	0.355	0.365	9.02	9.27
N	0.357	0.363	9.07	9.22
R	0.227	0.23	5.77	5.92
S	0.225	0.235	5.72	5.97
aaa	0.005 REF		0.13 REF	
bbb	0.010 REF		0.25 REF	
ccc	0.015 REF		0.38 REF	

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

CASE 360C-05
ISSUE D
NI-360S

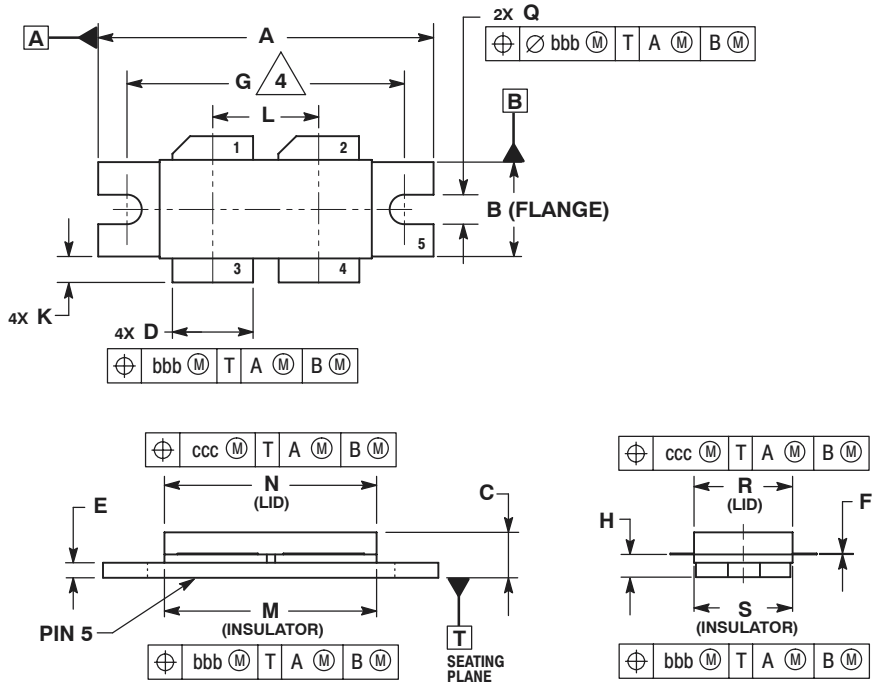


NOTES:
1. CONTROLLING DIMENSION: INCH.
2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M–1994.
3. DIMENSION H IS MEASURED .030 (0.762) AWAY FROM PACKAGE BODY.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	.795	.805	20.19	20.45
B	.225	.235	5.72	5.97
C	.125	.176	3.18	4.47
D	.034	.044	0.89	1.12
E	.055	.065	1.40	1.65
F	.004	.006	0.10	0.15
G	.562 BSC		14.28 BSC	
H	.077	.087	1.96	2.21
K	.085	.115	2.16	2.92
M	.355	.365	9.02	9.27
N	.355	.365	9.96	10.16
Q	.125	.135	3.18	3.43
R	.225	.235	5.72	5.97
S	.225	.235	5.72	5.97
aaa	.005		0.13	
bbb	.010		0.25	
ccc	.015		0.38	

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

CASE 360D-02
ISSUE B
NI-360HF



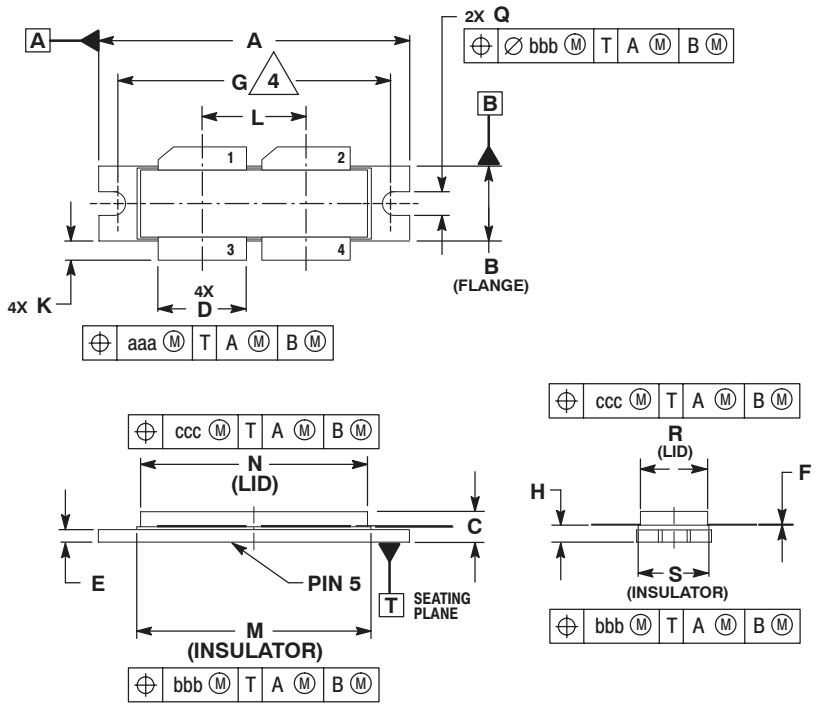
NOTES:
1. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M–1994.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION H IS MEASURED 0.030 (0.762) AWAY FROM PACKAGE BODY.
4. RECOMMENDED BOLT CENTER DIMENSION OF 1.140 (28.96) BASED ON M3 SCREW.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	1.335	1.345	33.91	34.16
B	0.380	0.390	9.65	9.91
C	0.180	0.224	4.57	5.69
D	0.325	0.335	8.26	8.51
E	0.060	0.070	1.52	1.78
F	0.004	0.006	0.10	0.15
G	1.100 BSC		27.94 BSC	
H	0.097	0.107	2.46	2.72
K	0.085	0.115	2.16	2.92
L	0.425 BSC		10.80 BSC	
M	0.852	0.868	21.64	22.05
N	0.851	0.869	21.62	22.07
Q	0.118	0.138	3.00	3.51
R	0.395	0.405	10.03	10.29
S	0.394	0.406	10.01	10.31
bbb	0.010 REF		0.25 REF	
ccc	0.015 REF		0.38 REF	

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

CASE 375B-04
ISSUE E
NI-860

CASE DIMENSIONS (continued)

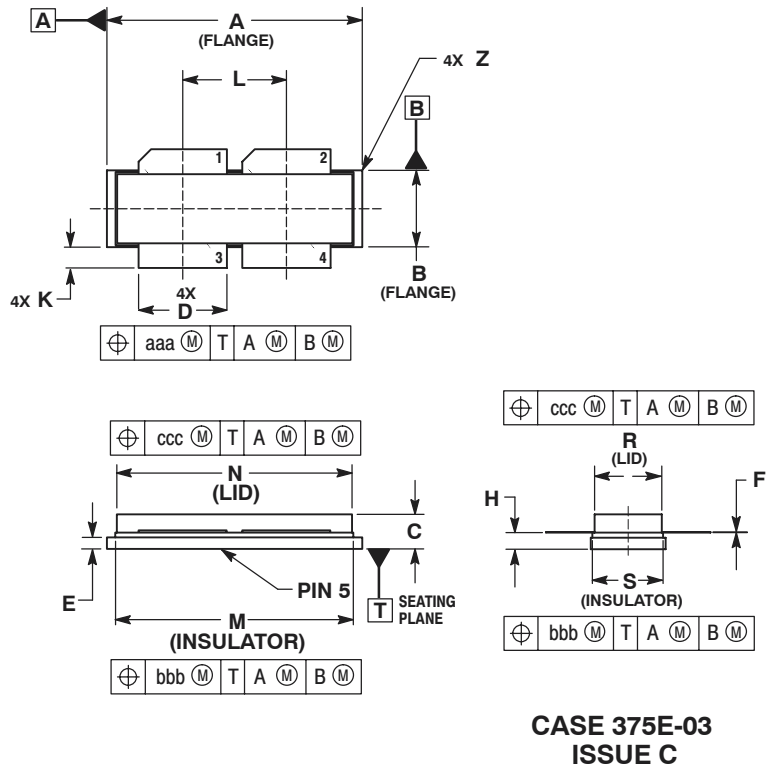


NOTES:
1. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M–1994.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION H IS MEASURED 0.030 (0.762) AWAY FROM PACKAGE BODY.
4. RECOMMENDED BOLT CENTER DIMENSION OF 1.52 (38.61) BASED ON M3 SCREW.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	1.615	1.625	41.02	41.28
B	0.395	0.405	10.03	10.29
C	0.150	0.200	3.81	5.08
D	0.455	0.465	11.56	11.81
E	0.062	0.066	1.57	1.68
F	0.004	0.007	0.10	0.18
G	1.400 BSC		35.56 BSC	
H	0.079	0.089	2.01	2.26
K	0.117	0.137	2.97	3.48
L	0.540 BSC		13.72 BSC	
M	1.219	1.241	30.96	31.52
N	1.218	1.242	30.94	31.55
Q	0.120	0.130	3.05	3.30
R	0.355	0.365	9.01	9.27
S	0.365	0.375	9.27	9.53
aaa	0.013 REF		0.33 REF	
bbb	0.010 REF		0.25 REF	
ccc	0.020 REF		0.51 REF	

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

CASE 375D-04
ISSUE C
NI-1230



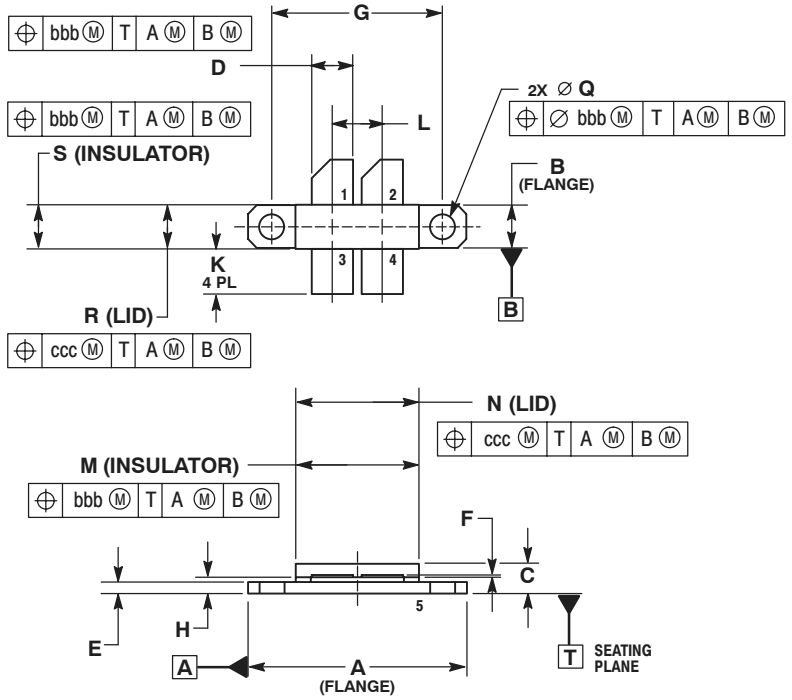
NOTES:
1. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M–1994.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION H IS MEASURED 0.030 (0.762) AWAY FROM PACKAGE BODY.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	1.325	1.335	33.66	33.91
B	0.395	0.405	10.03	10.29
C	0.150	0.200	3.81	5.08
D	0.455	0.465	11.56	11.81
E	0.062	0.066	1.57	1.68
F	0.004	0.007	0.10	0.18
H	0.079	0.089	2.01	2.26
K	0.117	0.137	2.97	3.48
L	0.540 BSC		13.72 BSC	
M	1.219	1.241	30.96	31.52
N	1.218	1.242	30.94	31.55
R	0.355	0.365	9.01	9.27
S	0.365	0.375	9.27	9.53
Z	0	0.040	0	1.02
aaa	0.013 REF		0.33 REF	
bbb	0.010 REF		0.25 REF	
ccc	0.020 REF		0.51 REF	

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

CASE 375E-03
ISSUE C
NI-1230S

CASE DIMENSIONS (continued)

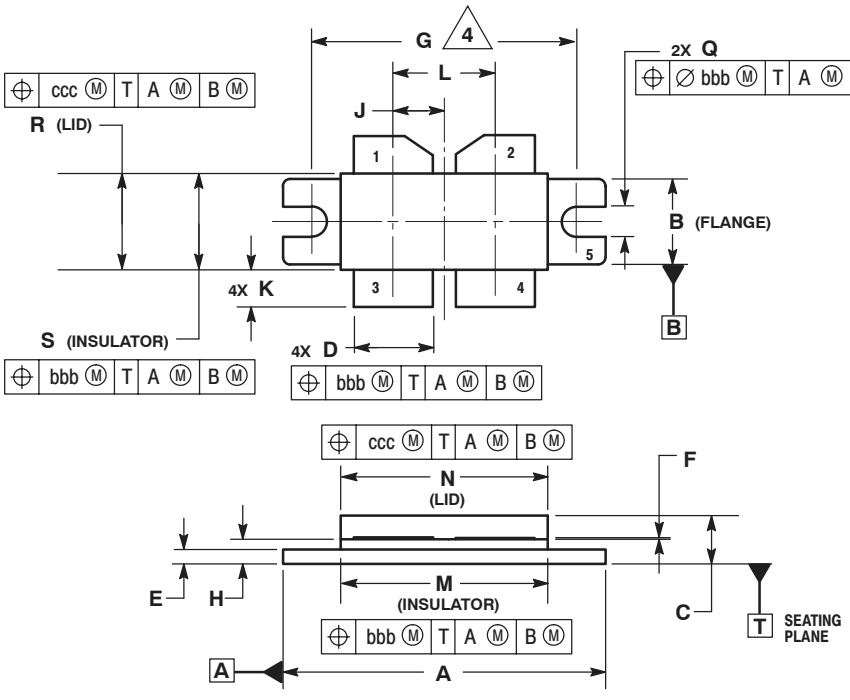


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1994.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION H IS MEASURED 0.030 (0.762) AWAY FROM PACKAGE BODY.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	1.135	1.145	28.80	29.10
B	0.225	0.235	5.72	5.97
C	0.135	0.178	3.43	4.52
D	0.210	0.220	5.33	5.59
E	0.055	0.065	1.40	1.65
F	0.004	0.006	0.11	0.15
G	0.900 BSC		22.86 BSC	
H	0.077	0.087	1.96	2.21
K	0.220	0.250	5.59	6.35
L	0.260 BSC		6.60 BSC	
M	0.643	0.657	16.33	16.69
N	0.638	0.650	16.20	16.50
Q	∅.125	∅.135	∅3.175	∅3.43
R	0.227	0.233	5.77	5.92
S	0.225	0.235	5.715	5.97
bbb	0.010 BSC		0.254 BSC	
ccc	0.015 BSC		0.381 BSC	

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

CASE 375F-04
ISSUE D
NI-650



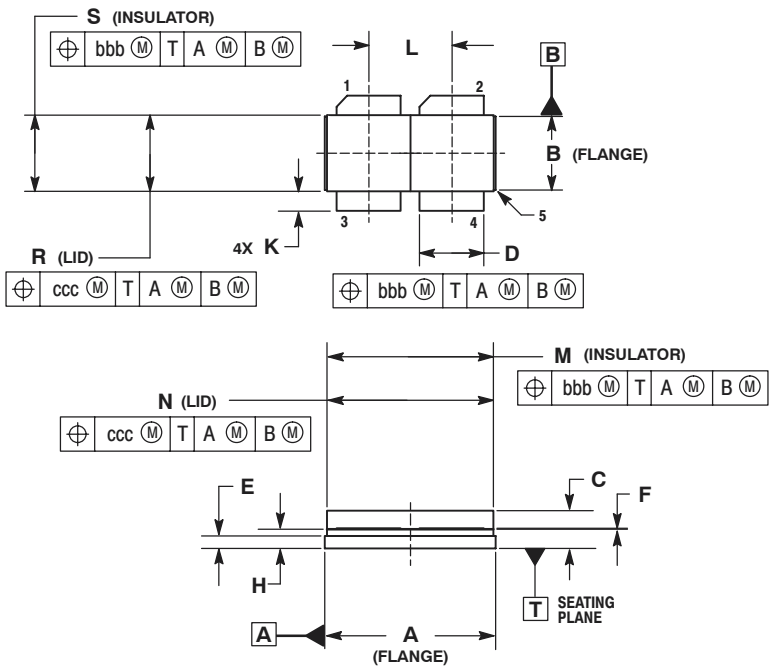
NOTES:
1. CONTROLLING DIMENSION: INCH.
2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M–1994.
3. DIMENSION H TO BE MEASURED 0.030 (0.762) AWAY FROM PACKAGE BODY.
4. RECOMMENDED BOLT CENTER DIMENSION OF 1.140 (28.96) BASED ON 3M SCREW.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	1.335	1.345	33.91	34.16
B	0.380	0.390	9.65	9.91
C	0.180	0.224	4.57	5.69
D	0.325	0.335	8.26	8.51
E	0.060	0.070	1.52	1.78
F	0.004	0.006	0.10	0.15
G	1.100 BSC		27.94 BSC	
H	0.097	0.107	2.46	2.72
J	0.2125 BSC		5.397 BSC	
K	0.135	0.165	3.43	4.19
L	0.425 BSC		10.8 BSC	
M	0.852	0.868	21.64	22.05
N	0.851	0.869	21.62	22.07
Q	0.118	0.138	3.00	3.30
R	0.395	0.405	10.03	10.29
S	0.394	0.406	10.01	10.31
bbb	0.010 REF		0.25 REF	
ccc	0.015 REF		0.38 REF	

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

CASE 375G-04
ISSUE E
NI-860C3

CASE DIMENSIONS (continued)

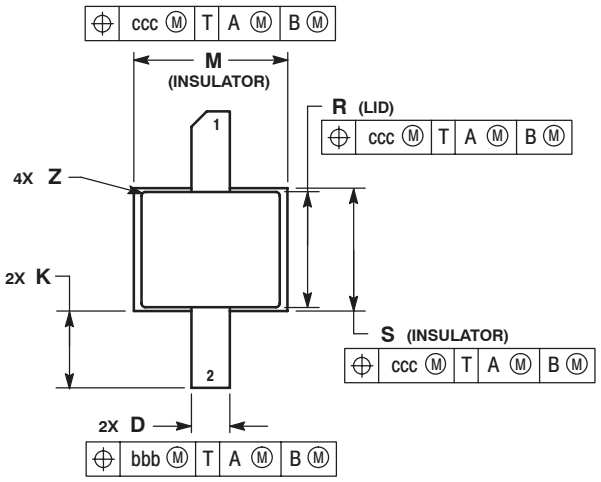


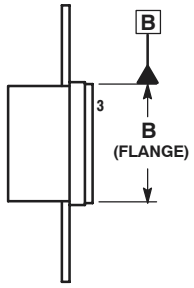
NOTES:
1. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M–1994.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION "H" TO BE MEASURED 0.030 (0.762) INCHES FROM PACKAGE BODY.

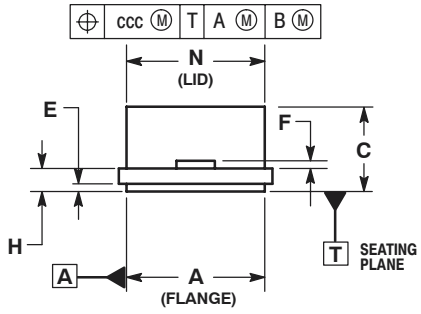
	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	.885	.895	22.48	22.73
B	.380	.390	9.65	9.91
C	.180	.224	4.57	5.69
D	.325	.335	8.26	8.51
E	.060	.070	1.52	1.78
F	.004	.006	0.10	0.15
H	.097	.107	2.46	2.72
K	.085	.115	2.16	2.92
L	.425 BSC		10.8 BSC	
M	.852	.868	21.64	22.05
N	.851	.869	21.62	22.07
R	.395	.405	10.03	10.29
S	.394	.406	10.01	10.31
bbb	.010 REF		0.25 REF	
ccc	.015 REF		0.38 REF	

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

CASE 375H-03
ISSUE B
NI-860S





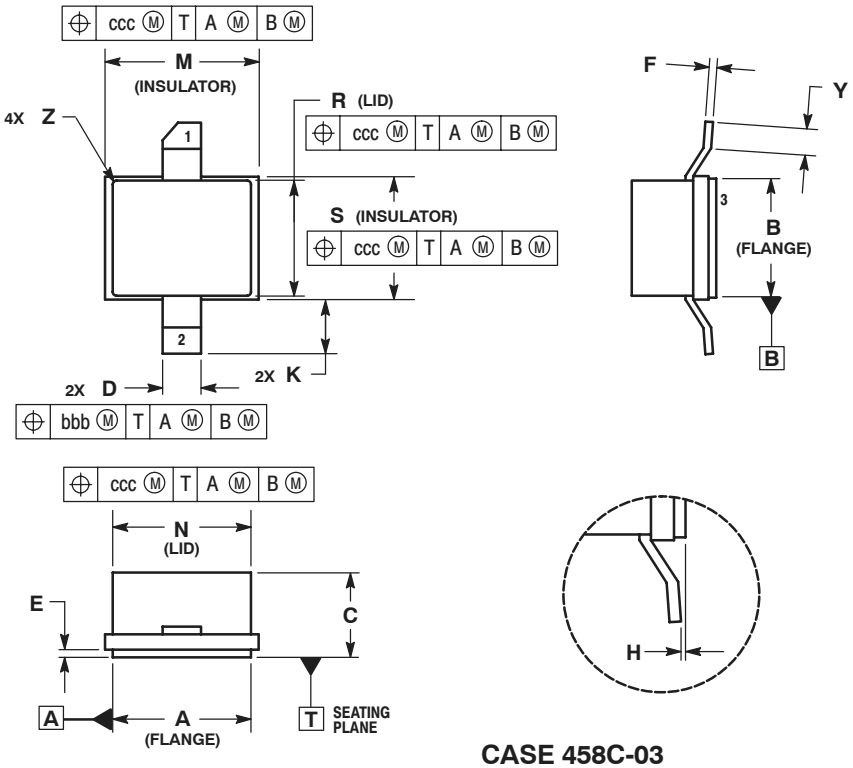


NOTES:
1. CONTROLLING DIMENSIONS: INCHES.
2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.
3. ALL DIMENSIONS ARE SYMMETRICAL ABOUT CENTERLINE UNLESS OTHERWISE NOTED.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.180	0.190	4.572	4.83
B	0.140	0.150	3.556	3.81
C	0.082	0.116	2.083	2.946
D	0.047	0.053	1.194	1.346
E	0.004	0.010	0.102	0.254
F	0.004	0.006	0.102	0.152
H	0.025	0.031	0.635	0.787
K	0.060	0.110	1.524	2.794
M	0.197	0.203	5.004	5.156
N	0.177	0.183	4.496	4.648
R	0.147	0.153	3.734	3.886
S	0.157	0.163	3.988	4.14
Z	---	0.020	---	0.508
bbb	0.010 REF		0.254 REF	
ccc	0.015 REF		0.381 REF	

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

CASE 458B-03
ISSUE D
NI-200S

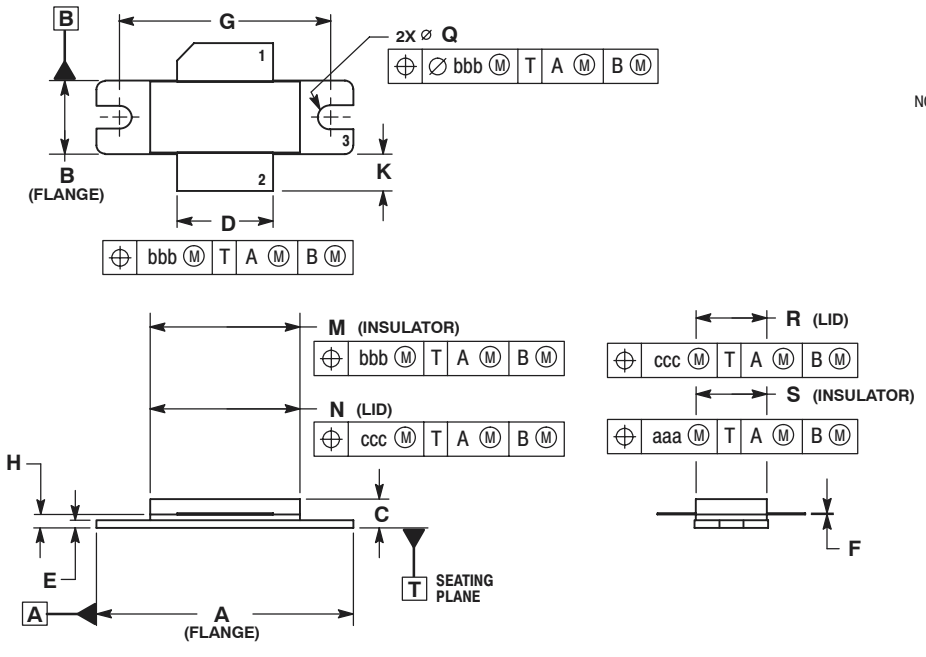


NOTES:
1. CONTROLLING DIMENSIONS: INCHES.
2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.
3. DIMENSION H (PACKAGE COPLANARITY): THE BOTTOM OF LEADS AND REFERENCE PLANE T MUST BE COPLANAR WITHIN DIMENSION H.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.180	0.190	4.572	4.830
B	0.140	0.150	3.556	3.810
C	0.082	0.116	2.083	2.946
D	0.047	0.053	1.194	1.346
E	0.004	0.010	0.102	0.254
F	0.004	0.006	0.102	0.152
H	0.000	0.004	0.000	0.102
K	0.050	0.090	1.270	2.286
M	0.197	0.203	5.004	5.156
N	0.177	0.183	4.496	4.648
R	0.147	0.153	3.734	3.886
S	0.157	0.163	3.988	4.140
Y	0.020	0.040	0.508	1.016
Z	---	R .020	---	R .508
bbb	.010 REF		0.254 REF	
ccc	.015 REF		0.381 REF	

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

CASE 458C-03
ISSUE D
NI-200Z



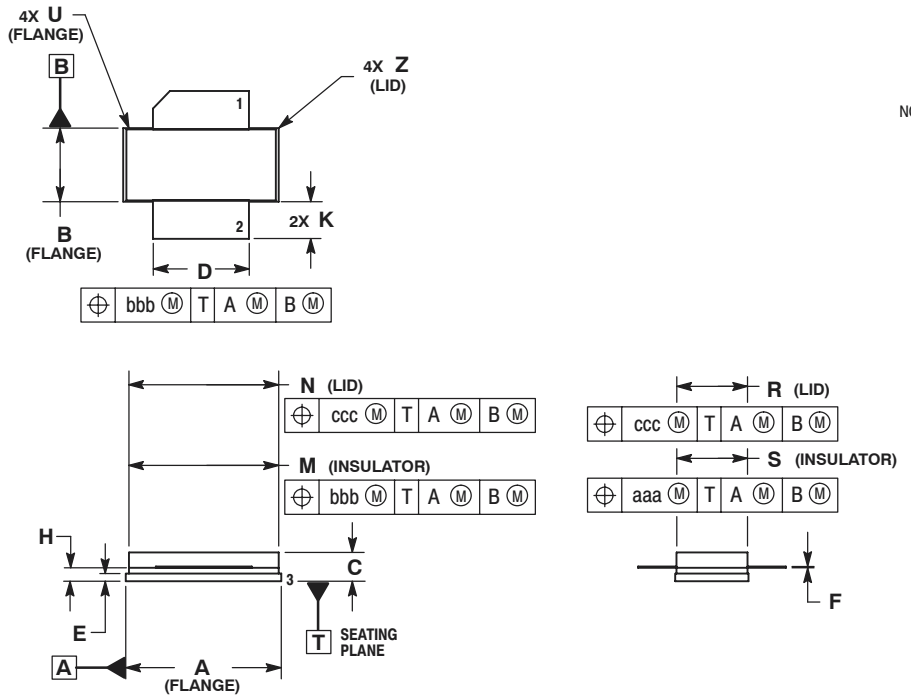
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M–1994.
2. CONTROLLING DIMENSION: INCH.
3. DELETED
4. DIMENSION H IS MEASURED 0.030 (0.762) AWAY FROM PACKAGE BODY.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	1.335	1.345	33.91	34.16
B	0.380	0.390	9.65	9.91
C	0.125	0.170	3.18	4.32
D	0.495	0.505	12.57	12.83
E	0.035	0.045	0.89	1.14
F	0.003	0.006	0.08	0.15
G	1.100 BSC		27.94 BSC	
H	0.057	0.067	1.45	1.70
K	0.170	0.210	4.32	5.33
M	0.774	0.786	19.66	19.96
N	0.772	0.788	19.60	20.00
Q	Ø.118	Ø.138	Ø3.00	Ø3.51
R	0.365	0.375	9.27	9.53
S	0.365	0.375	9.27	9.52
aaa	0.005 REF		0.127 REF	
bbb	0.010 REF		0.254 REF	
ccc	0.015 REF		0.381 REF	

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

CASE 465-06
ISSUE F
NI-780

CASE DIMENSIONS (continued)

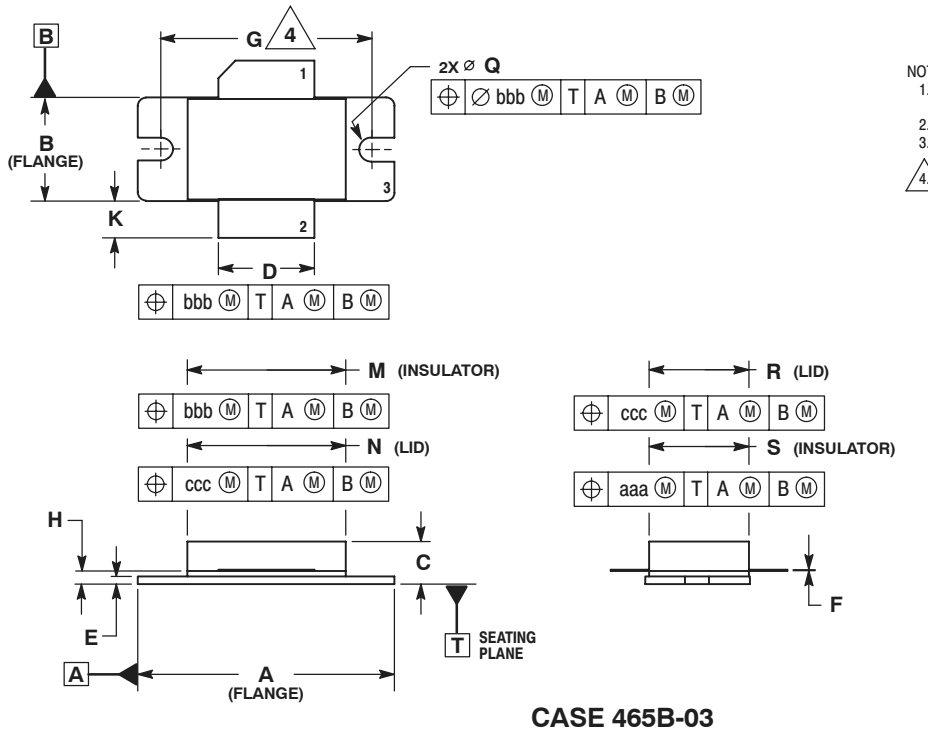


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M–1994.
2. CONTROLLING DIMENSION: INCH.
3. DELETED
4. DIMENSION H IS MEASURED 0.030 (0.762) AWAY FROM PACKAGE BODY.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.805	0.815	20.45	20.70
B	0.380	0.390	9.65	9.91
C	0.125	0.170	3.18	4.32
D	0.495	0.505	12.57	12.83
E	0.035	0.045	0.89	1.14
F	0.003	0.006	0.08	0.15
H	0.057	0.067	1.45	1.70
K	0.170	0.210	4.32	5.33
M	0.774	0.786	19.61	20.02
N	0.772	0.788	19.61	20.02
R	0.365	0.375	9.27	9.53
S	0.365	0.375	9.27	9.52
U	---	0.040	---	1.02
Z	---	0.030	---	0.76
aaa	0.005 REF		0.127 REF	
bbb	0.010 REF		0.254 REF	
ccc	0.015 REF		0.381 REF	

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

CASE 465A-06
ISSUE F
NI-780S



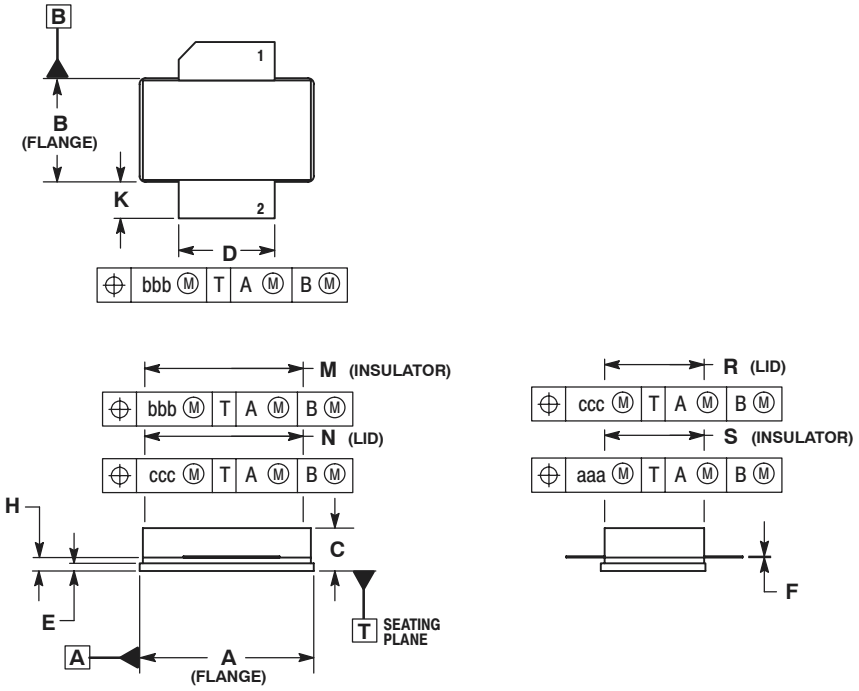
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M–1994.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION H IS MEASURED 0.030 (0.762) AWAY FROM PACKAGE BODY.
4. RECOMMENDED BOLT CENTER DIMENSION OF 1.16 (29.57) BASED ON M3 SCREW.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	1.335	1.345	33.91	34.16
B	0.535	0.545	13.6	13.8
C	0.147	0.200	3.73	5.08
D	0.495	0.505	12.57	12.83
E	0.035	0.045	0.89	1.14
F	0.003	0.006	0.08	0.15
G	1.100 BSC		27.94 BSC	
H	0.057	0.067	1.45	1.70
K	0.175	0.205	4.44	5.21
M	0.872	0.888	22.15	22.55
N	0.871	0.889	19.30	22.60
Q	⌀.118	⌀.138	⌀3.00	⌀3.51
R	0.515	0.525	13.10	13.30
S	0.515	0.525	13.10	13.30
aaa	0.007 REF		0.178 REF	
bbb	0.010 REF		0.254 REF	
ccc	0.015 REF		0.381 REF	

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

CASE 465B-03
ISSUE C
NI-880

CASE DIMENSIONS (continued)

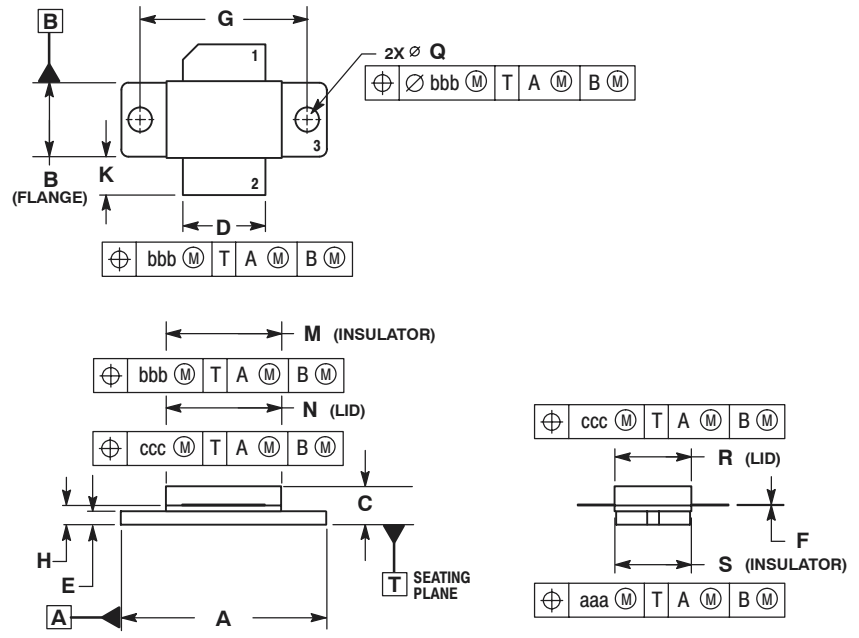


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M–1994.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION H IS MEASURED 0.030 (0.762) AWAY FROM PACKAGE BODY.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.905	0.915	22.99	23.24
B	0.535	0.545	13.60	13.80
C	0.147	0.200	3.73	5.08
D	0.495	0.505	12.57	12.83
E	0.035	0.045	0.89	1.14
F	0.003	0.006	0.08	0.15
H	0.057	0.067	1.45	1.70
K	0.170	0.210	4.32	5.33
M	0.872	0.888	22.15	22.55
N	0.871	0.889	19.30	22.60
R	0.515	0.525	13.10	13.30
S	0.515	0.525	13.10	13.30
aaa	0.007 REF		0.178 REF	
bbb	0.010 REF		0.254 REF	
ccc	0.015 REF		0.381 REF	

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

CASE 465C-02
ISSUE A
NI-880S



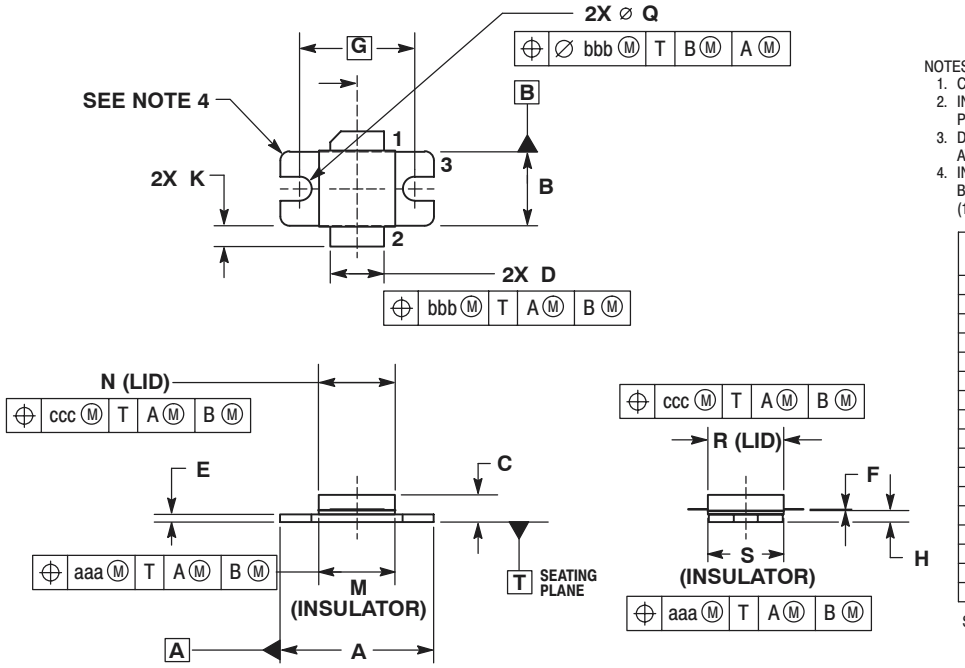
NOTES:
1. INTERPRET DIMENSIONS AND TOLERANCES PER ANSI Y14.5M–1994.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION H IS MEASURED 0.030 (0.762) AWAY FROM PACKAGE BODY.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	1.065	1.075	27.05	27.30
B	0.380	0.390	9.65	9.91
C	0.160	0.205	4.06	5.21
D	0.425	0.435	10.80	11.05
E	0.060	0.070	1.52	1.78
F	0.004	0.006	0.10	0.15
G	0.870 BSC		22.10 BSC	
H	0.096	0.106	2.44	2.69
K	0.190	0.223	4.83	5.66
M	0.594	0.606	15.09	15.39
N	0.591	0.601	15.01	15.27
Q	0.124	0.130	3.15	3.30
R	0.394	0.404	10.01	10.26
S	0.395	0.405	10.03	10.29
aaa	0.005 REF		0.13 REF	
bbb	0.010 REF		0.25 REF	
ccc	0.015 REF		0.38 REF	

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

CASE 465D-05
ISSUE D
NI-600

CASE DIMENSIONS (continued)

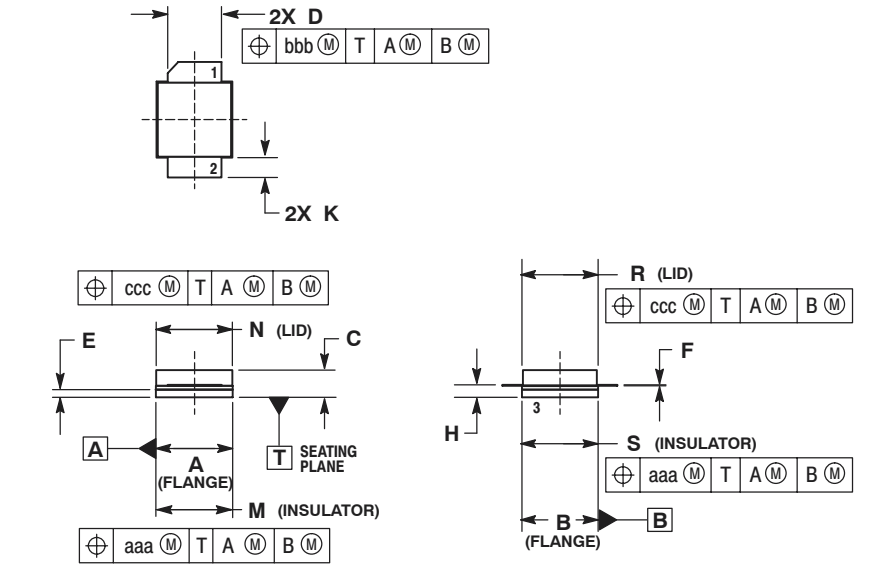


NOTES:
1. CONTROLLING DIMENSION: INCH.
2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.
3. DIMENSION H IS MEASURED 0.030 (0.762) AWAY FROM PACKAGE BODY.
4. INFORMATION ONLY: CORNER BREAK (4X) TO BE .060±.005 (1.52±0.13) RADIUS OR .06±.005 (1.52±0.13) x 45° CHAMFER.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	.795	.805	20.19	20.44
B	.380	.390	9.65	9.9
C	.125	.163	3.17	4.14
D	.275	.285	6.98	7.24
E	.035	.045	0.89	1.14
F	.004	.006	0.10	0.15
G	.600 BSC		15.24 BSC	
H	.057	.067	1.45	1.7
K	.092	.122	2.33	3.1
M	.395	.405	10	10.3
N	.395	.405	10	10.3
Q	⌀.120	⌀.130	⌀ 3.05	⌀ 3.3
R	.395	.405	10	10.3
S	.395	.405	10	10.3
aaa	.005 BSC		0.127 BSC	
bbb	.010 BSC		0.254 BSC	
ccc	.015 BSC		0.381 BSC	

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

CASE 465E-04
ISSUE E
NI-400



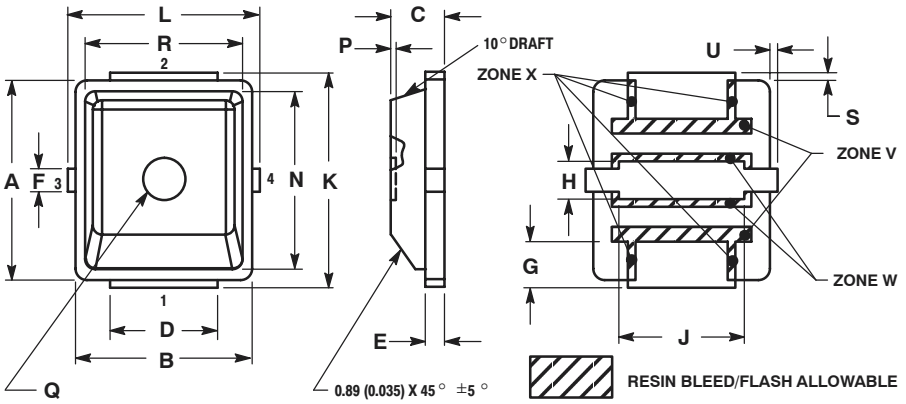
NOTES:
1. CONTROLLING DIMENSION: INCH.
2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M–1994.
3. DIMENSION H IS MEASURED 0.030 (0.762) AWAY FROM PACKAGE BODY.

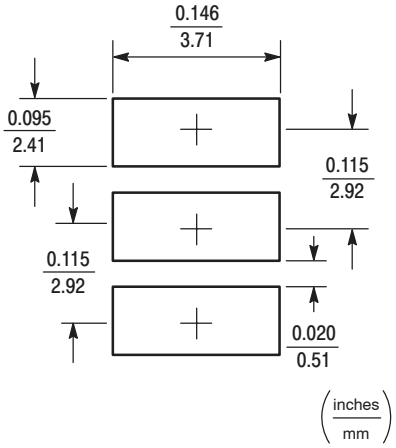
	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	.395	.405	10.03	10.29
B	.395	.405	10.03	10.29
C	.125	.163	3.18	4.14
D	.275	.285	6.98	7.24
E	.035	.045	0.89	1.14
F	.004	.006	0.10	0.15
H	.057	.067	1.45	1.70
K	.092	.122	2.34	3.10
M	.395	.405	10.03	10.29
N	.395	.405	10.03	10.29
R	.395	.405	10.03	10.29
S	.395	.405	10.03	10.29
aaa	.005 REF		0.127 REF	
bbb	.010 REF		0.254 REF	
ccc	.015 REF		0.38 REF	

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

CASE 465F-04
ISSUE C
NI-400S

CASE DIMENSIONS (continued)





SOLDER FOOTPRINT

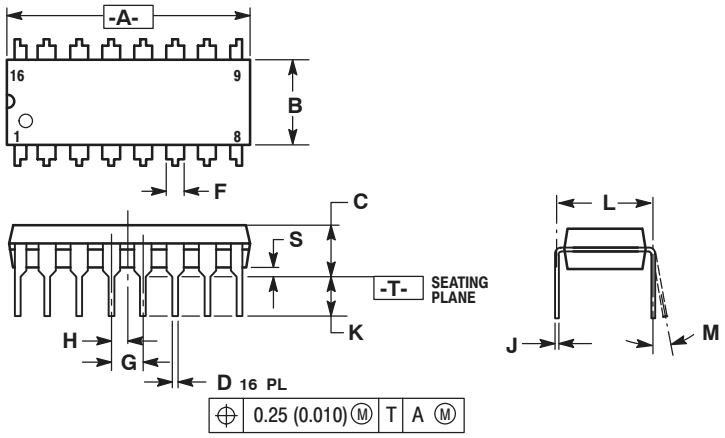
STYLE 1:
PIN 1. DRAIN
2. GATE
3. SOURCE
4. SOURCE

NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH
3. RESIN BLEED/FLASH ALLOWABLE IN ZONE V, W, AND X.

CASE 466-02
ISSUE B
PLD-1.5
PLASTIC

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.255	0.265	6.48	6.73
B	0.225	0.235	5.72	5.97
C	0.065	0.072	1.65	1.83
D	0.130	0.150	3.30	3.81
E	0.021	0.026	0.53	0.66
F	0.026	0.044	0.66	1.12
G	0.050	0.070	1.27	1.78
H	0.045	0.063	1.14	1.60
J	0.160	0.180	4.06	4.57
K	0.273	0.285	6.93	7.24
L	0.245	0.255	6.22	6.48
N	0.230	0.240	5.84	6.10
P	0.000	0.008	0.00	0.20
Q	0.055	0.063	1.40	1.60
R	0.200	0.210	5.08	5.33
S	0.006	0.012	0.15	0.31
U	0.006	0.012	0.15	0.31
ZONE V	0.000	0.021	0.00	0.53
ZONE W	0.000	0.010	0.00	0.25
ZONE X	0.000	0.010	0.00	0.25

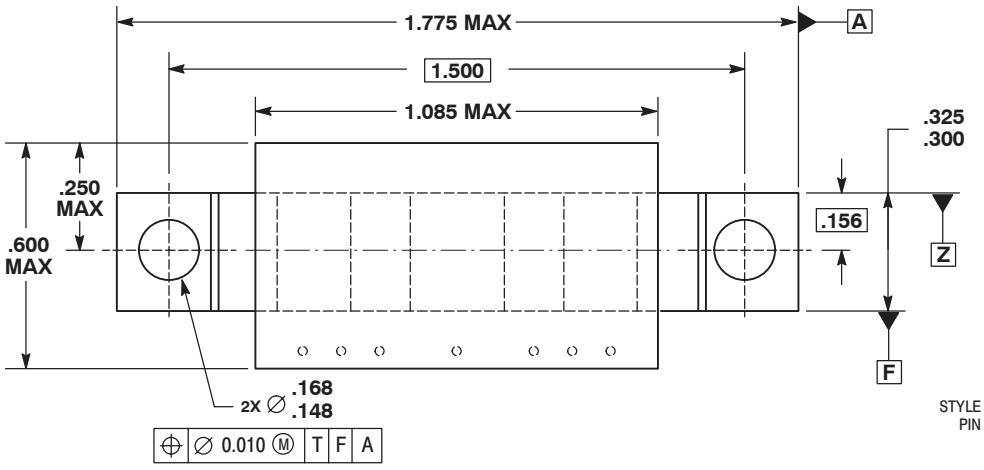
CASE DIMENSIONS (continued)



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
4. DIMENSION B DOES NOT INCLUDE MOLD FLASH.
5. ROUNDED CORNERS OPTIONAL.

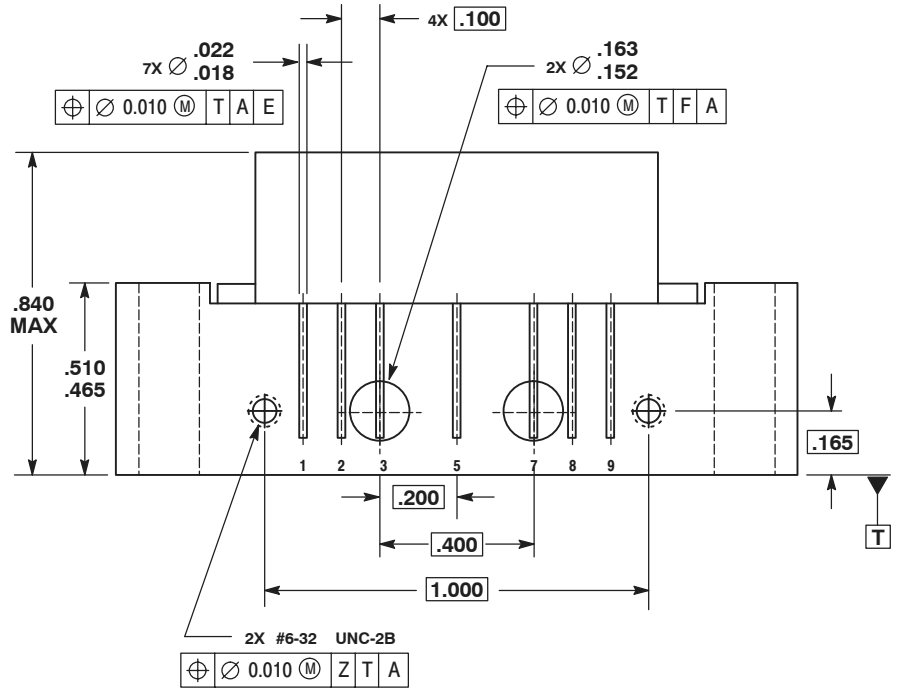
	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.740	0.770	18.80	19.55
B	0.250	0.270	6.35	6.85
C	0.145	0.175	3.69	4.44
D	0.015	0.021	0.39	0.53
F	0.040	0.70	1.02	1.77
G	0.100 BSC		2.54 BSC	
H	0.050 BSC		1.27 BSC	
J	0.008	0.015	0.21	0.38
K	0.110	0.130	2.80	3.30
L	0.295	0.305	7.50	7.74
M	0 °	10 °	0 °	10 °
S	0.020	0.040	0.51	1.01

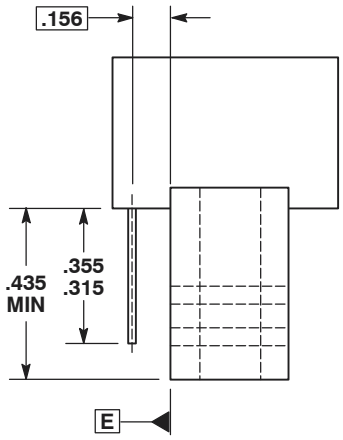
CASE 648-08
ISSUE R
DIP-16



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

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

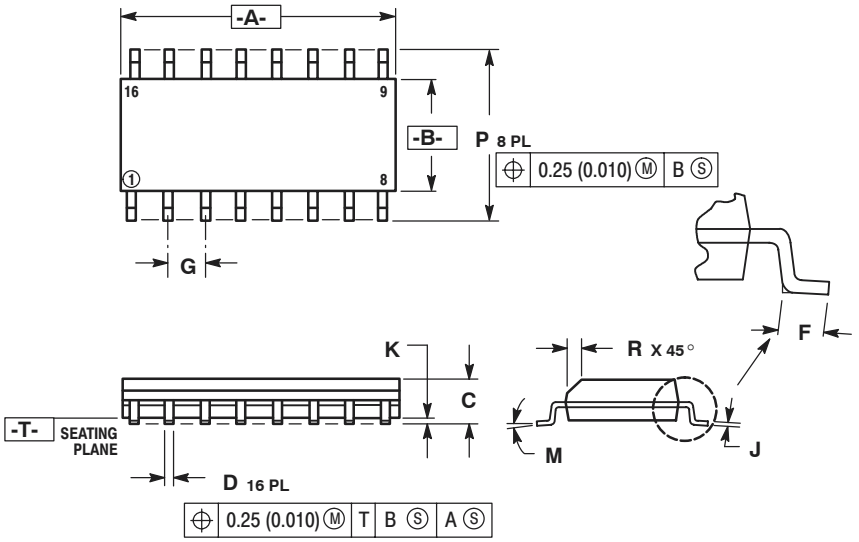




NOTES:
1. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: INCH.

CASE 714Y-04
ISSUE E

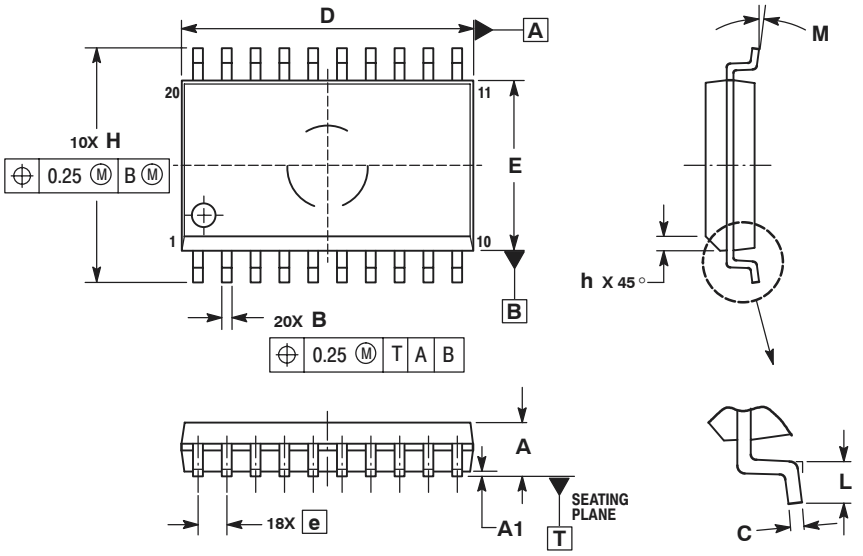
CASE DIMENSIONS (continued)



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.

	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

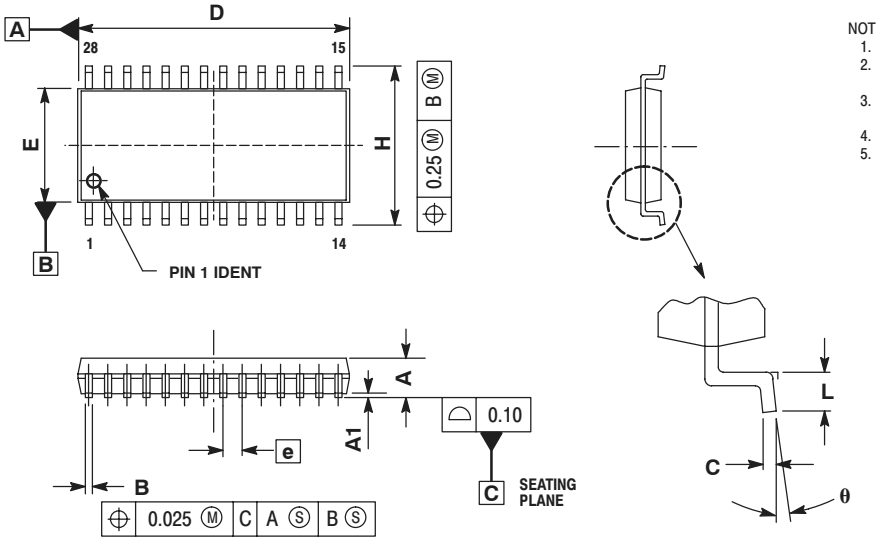
CASE 751B-05
ISSUE J
SO-16



NOTES:
1. DIMENSIONS ARE IN MILLIMETERS.
2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.
3. DIMENSIONS D AND E DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 PER SIDE.
5. DIMENSION B DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE PROTRUSION SHALL BE 0.13 TOTAL IN EXCESS OF B DIMENSION AT MAXIMUM MATERIAL CONDITION.

	MILLIMETERS	
DIM	MIN	MAX
A	2.35	2.65
A1	0.10	0.25
B	0.35	0.49
C	0.23	0.32
D	12.65	12.95
E	7.40	7.60
e	1.27 BSC	
H	10.05	10.55
h	0.25	0.75
L	0.40	1.00
θ	0°	7°

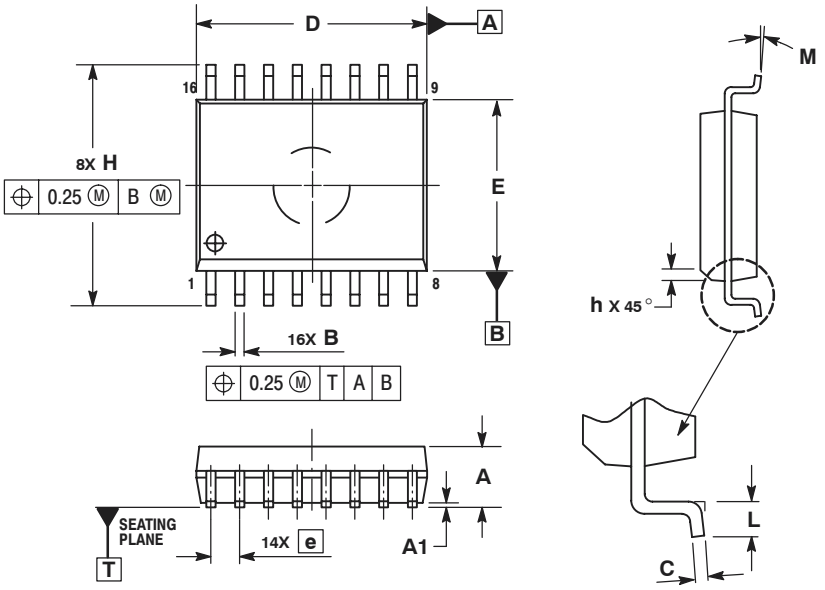
CASE 751D-06
ISSUE G
SO-20L



NOTES:
1. DIMENSIONS ARE IN MILLIMETERS.
2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.
3. DIMENSIONS D AND E DO NOT INCLUDE MOLD PROTRUSIONS.
4. MAXIMUM MOLD PROTRUSION 0.015 PER SIDE.
5. DIMENSION B DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.13 TOTAL IN EXCESS OF B DIMENSION AT MAXIMUM MATERIAL CONDITION.

	MILLIMETERS	
DIM	MIN	MAX
A	2.35	2.65
A1	0.13	0.29
B	0.35	0.49
C	0.23	0.32
D	17.80	18.05
E	7.40	7.60
e	1.27 BSC	
H	10.05	10.55
L	0.41	0.90
θ	0 °	8 °

CASE 751F-05
ISSUE F
SO-28L

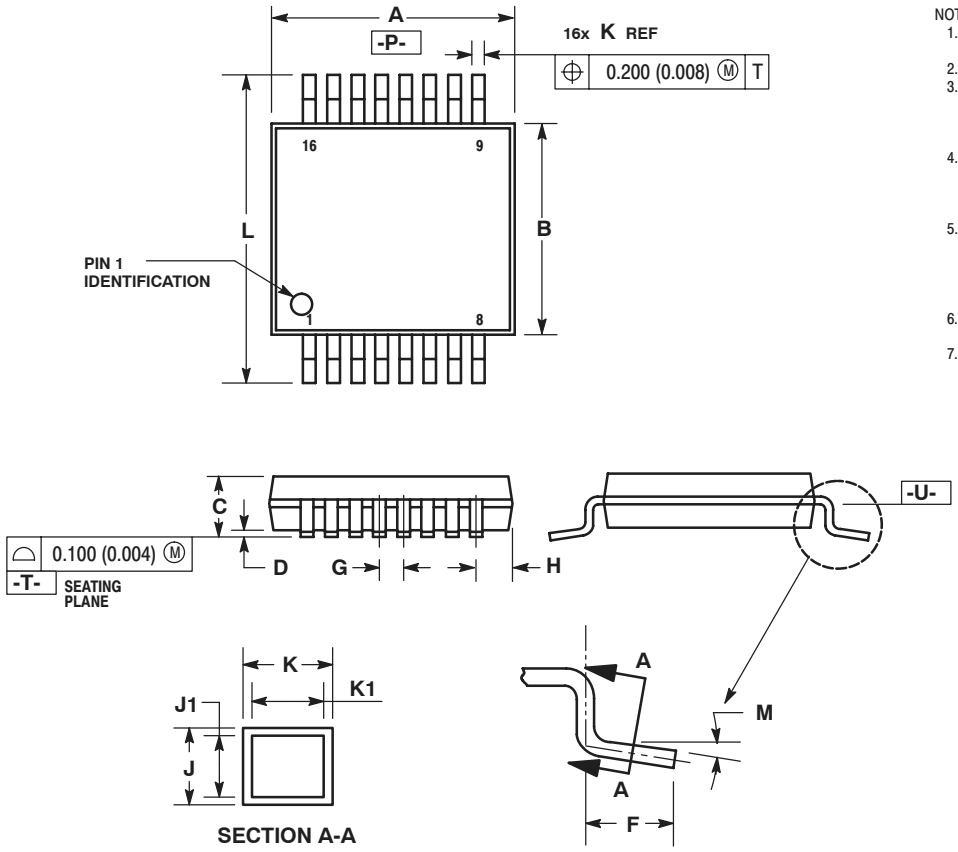


NOTES:
1. DIMENSIONS ARE IN MILLIMETERS.
2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.
3. DIMENSIONS D AND E DO NOT INLCUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 PER SIDE.
5. DIMENSION B DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.13 TOTAL IN EXCESS OF THE B DIMENSION AT MAXIMUM MATERIAL CONDITION.

	MILLIMETERS	
DIM	MIN	MAX
A	2.35	2.65
A1	0.10	0.25
B	0.35	0.49
C	0.23	0.32
D	10.15	10.45
E	7.40	7.60
e	1.27 BSC	
H	10.05	10.55
h	0.25	0.75
L	0.40	1.00
M	0 °	7 °

CASE 751G-04
ISSUE C
SO-16W

CASE DIMENSIONS (continued)

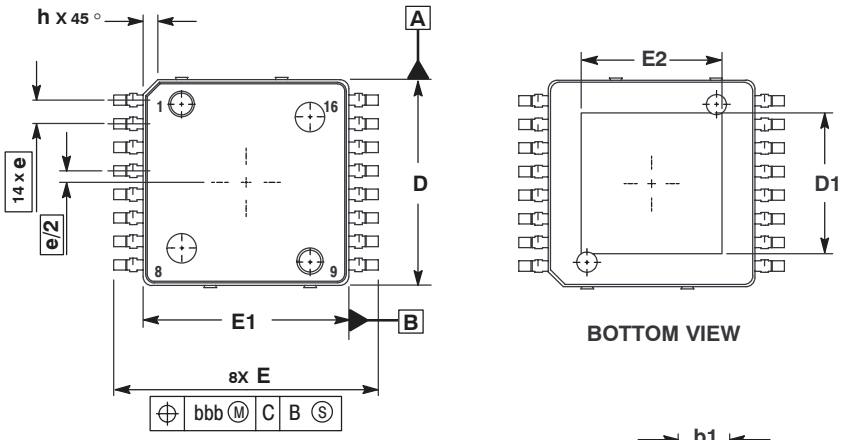


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
4. DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 (0.010) PER SIDE.
5. DIMENSION K DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) TOTAL EXCESS OF THE K DIMENSION AT MAXIMUM MATERIAL CONDITION.
6. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
7. DIMENSIONS A AND B ARE TO BE DETERMINED AT DATUM PLANE –U–.

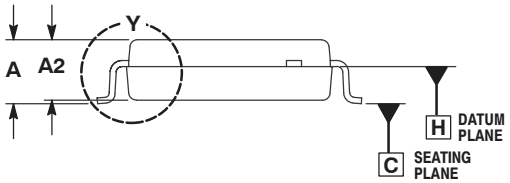
	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	---	5.10	---	0.200
B	4.30	4.50	0.169	0.177
C	---	1.20	---	0047
D	0.05	0.25	0.002	0.010
F	0.45	0.55	0.018	0.022
G	0.65 BSC		0.026 BSC	
H	0.22	0.23	0.009	0.010
J	0.09	0.24	0.004	0.009
J1	0.09	0.18	0.004	0.007
K	0.16	0.32	0.006	0.013
K1	0.16	0.26	0.006	0.010
L	6.30	6.50	0.248	0.256
M	0°	10°	0°	10°

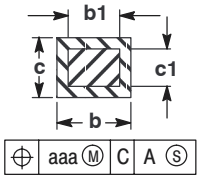
CASE 948C-03
ISSUE B
TSSOP-16

CASE DIMENSIONS (continued)

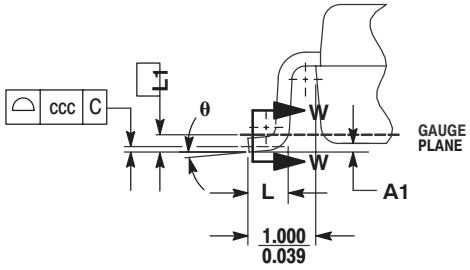


BOTTOM VIEW





SECT W-W

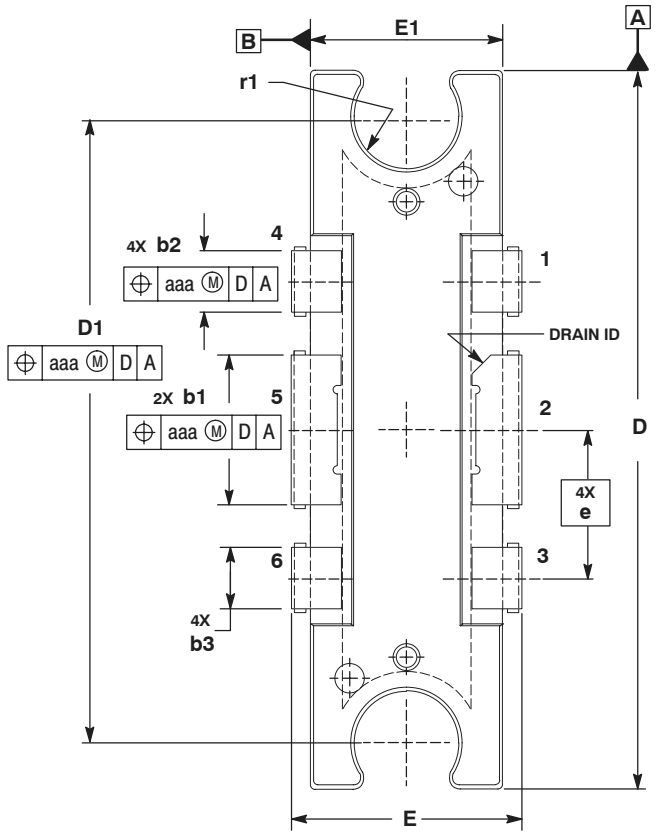


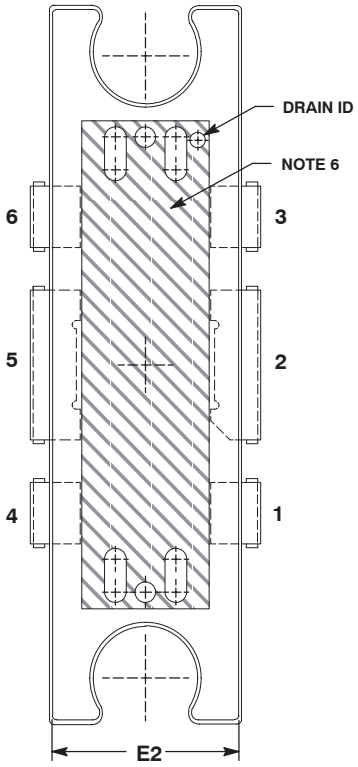
DETAIL Y

NOTES:
1. CONTROLLING DIMENSION: MILLIMETER.
2. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.
3. DATUM PLANE -H- IS LOCATED AT BOTTOM OF LEAD AND IS COINCIDENT WITH THE LEAD WHERE THE LEAD EXITS THE PLASTIC BODY AT THE BOTTOM OF THE PARTING LINE.
4. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE PROTRUSION IS 0.250 PER SIDE. DIMENSIONS D AND E1 DO INCLUDE MOLD MISMATCH AND ARE DETERMINED AT DATUM PLANE -H-.
5. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION IS 0.127 TOTAL IN EXCESS OF THE b DIMENSION AT MAXIMUM MATERIAL CONDITION.
6. DATUMS -A- AND -B- TO BE DETERMINED AT DATUM PLANE -H-.

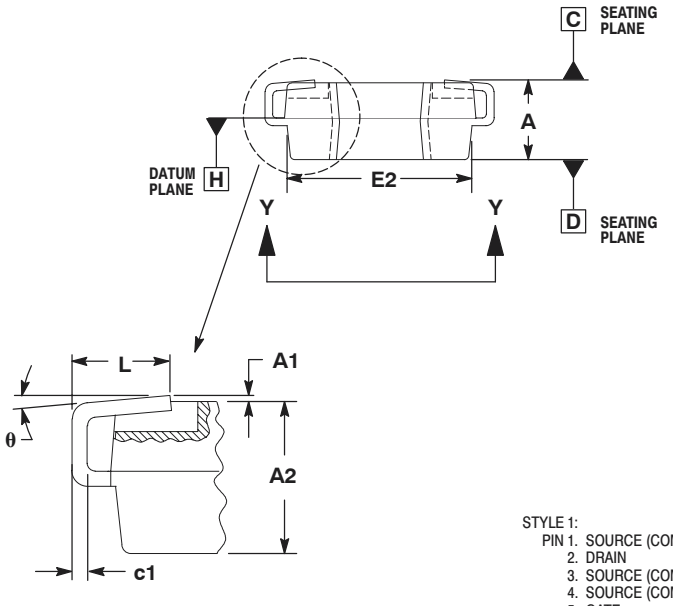
	MILLIMETERS	
DIM	MIN	MAX
A	2.000	2.300
A1	0.025	0.100
A2	1.950	2.100
D	6.950	7.100
D1	4.372	5.180
E	8.850	9.150
E1	6.950	7.100
E2	4.372	5.180
L	0.466	0.720
L1	0.250 BSC	
b	0.300	0.432
b1	0.300	0.375
c	0.180	0.279
c1	0.180	0.230
e	0.800 BSC	
h	---	0.600
θ	0°	7°
aaa	0.200	
bbb	0.200	
ccc	0.100	

CASE 978-03
ISSUE B
PFP-16
PLASTIC





VIEW Y-Y

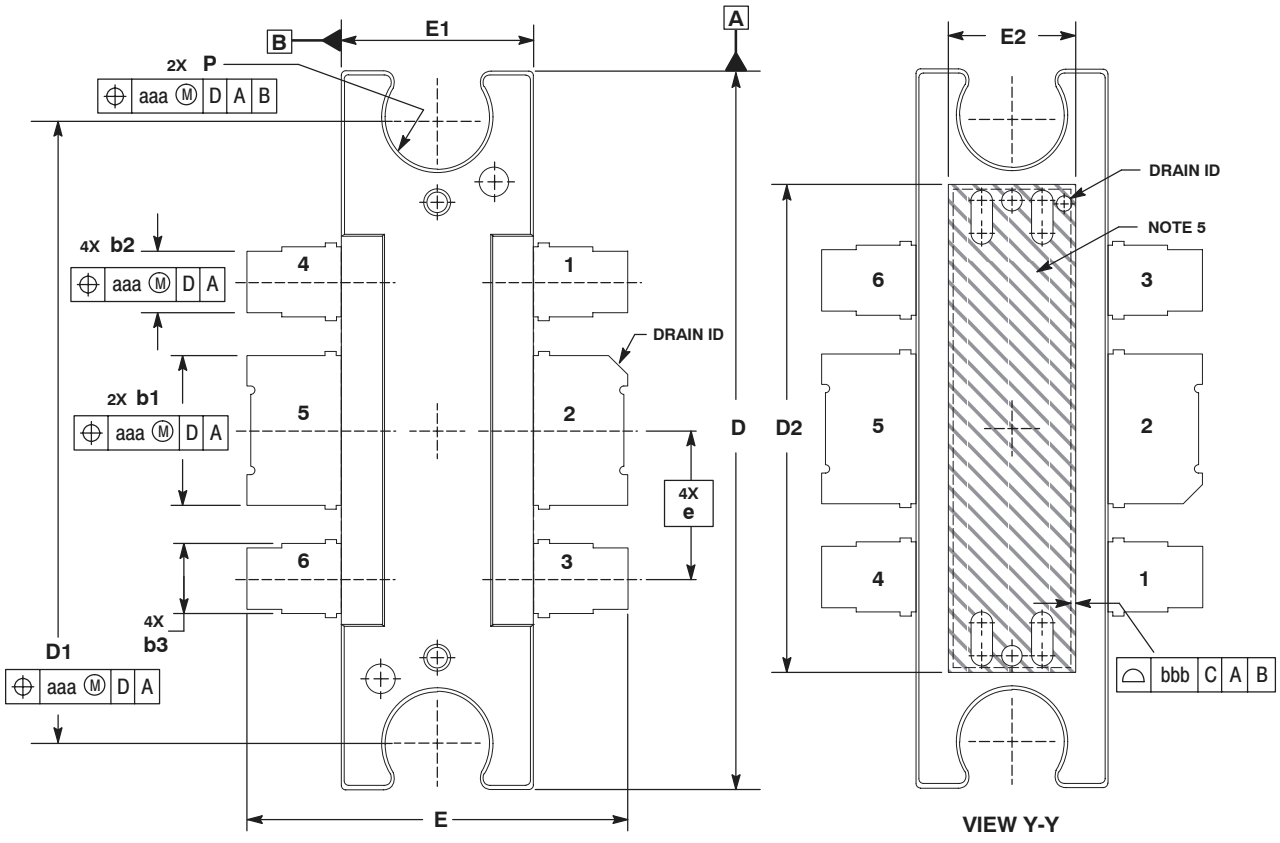


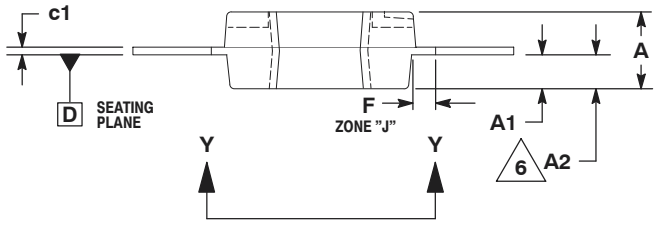
STYLE 1:
PIN 1. SOURCE (COMMON)
2. DRAIN
3. SOURCE (COMMON)
4. SOURCE (COMMON)
5. GATE
6. SOURCE (COMMON)

NOTES:
1. CONTROLLING DIMENSION: INCH .
2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.
3. DATUM PLANE –H– IS LOCATED AT TOP OF LEAD AND IS COINCIDENT WITH THE LEAD WHERE THE LEAD EXITS THE PLASTIC BODY AT THE TOP OF THE PARTING LINE.
4. DIMENSION D AND E1 DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE PROTRUSION IS 0.006 PER SIDE. DIMENSION D AND E1 DO INCLUDE MOLD MISMATCH AND ARE DETERMINED AT DATUM PLANE –H–.
5. DIMENSIONS b1 AND b3 DO NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.005 TOTAL IN EXCESS OF THE b1 AND b2 DIMENSIONS AT MAXIMUM MATERIAL CONDITION.
6. CROSSHATCHING REPRESENTS THE EXPOSED AREA OF THE HEAT SLUG.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.098	0.108	2.49	2.74
A1	0.000	0.004	0.00	0.10
A2	0.100	0.104	2.54	2.64
D	0.928	0.932	23.57	23.67
D1	0.806	0.814	20.47	20.68
E	0.296	0.304	7.52	7.72
E1	0.248	0.252	6.30	6.40
E2	0.241	0.245	6.12	6.22
L	0.060	0.070	1.52	1.78
b1	0.193	0.199	4.90	5.05
b2	0.078	0.084	1.98	2.13
b3	0.088	0.094	2.24	2.39
c1	0.007	0.011	0.18	0.28
e	0.193 BSC		4.90 BSC	
r1	0.063	0.068	1.60	1.73
θ	0°	6°	0°	6°
aaa	0.004		0.10	

CASE 1264-09
ISSUE J
TO-272-6 Wrap
PLASTIC



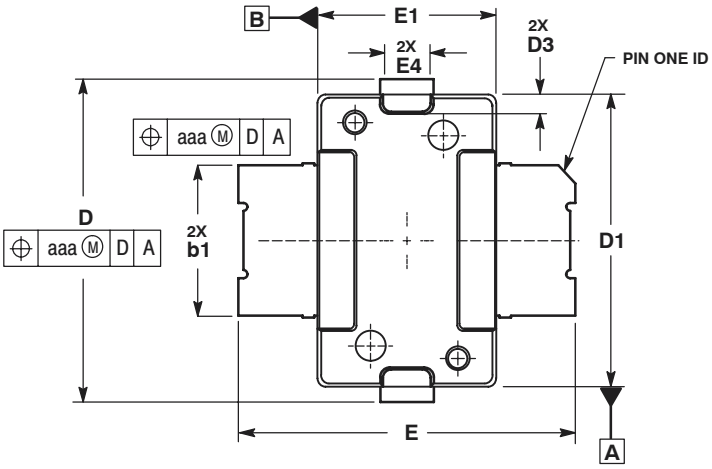


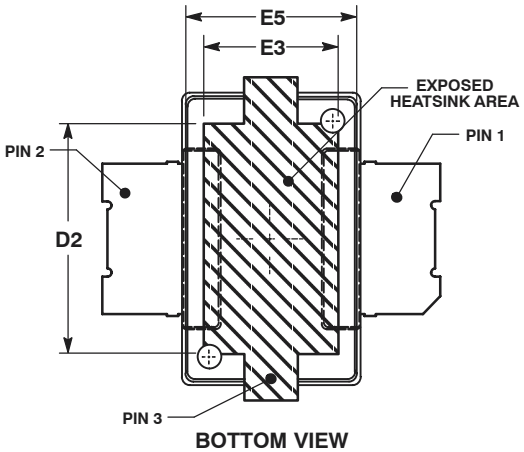
NOTES:
1. CONTROLLING DIMENSION: INCH.
2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.
3. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE PROTRUSION IS 0.006 PER SIDE. DIMENSIONS D AND E1 DO INCLUDE MOLD MISMATCH AND ARE DETERMINED AT DATUM PLANE –H–.
4. DIMENSIONS b1 AND b3 DO NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.005 TOTAL IN EXCESS OF THE b1 AND b2 DIMENSIONS AT MAXIMUM MATERIAL CONDITION.
5. CROSSHATCHING REPRESENTS THE EXPOSED AREA OF THE HEAT SLUG.
6. DIMENSION A2 APPLIES WITHIN ZONE J ONLY.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.098	0.106	2.49	2.69
A1	0.038	0.044	0.96	1.12
A2	0.040	0.042	1.02	1.07
D	0.926	0.934	23.52	23.72
D1	0.810 BSC		20.57 BSC	
D2	0.608 BSC		15.44 BSC	
E	0.492	0.500	12.50	12.70
E1	0.246	0.254	6.25	6.45
E2	0.170 BSC		4.32 BSC	
F	0.025 BSC		0.64 BSC	
P	0.126	0.134	3.20	3.40
b1	0.193	0.199	4.90	5.05
b2	0.078	0.084	1.98	2.13
b3	0.088	0.094	2.24	2.39
c1	0.007	0.011	0.178	0.279
e	0.193 BSC		4.90 BSC	
aaa	0.004		0.10	
bbb	0.008		0.20	

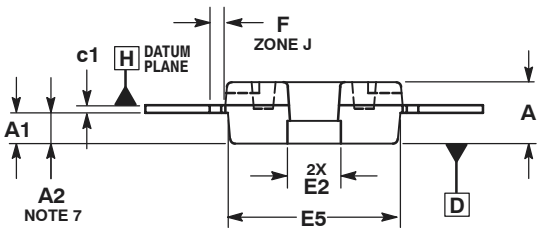
STYLE 1:
PIN 1. SOURCE (COMMON)
2. DRAIN
3. SOURCE (COMMON)
4. SOURCE (COMMON)
5. GATE
6. SOURCE (COMMON)

CASE 1264A-02
ISSUE A
TO-272-6
PLASTIC





BOTTOM VIEW



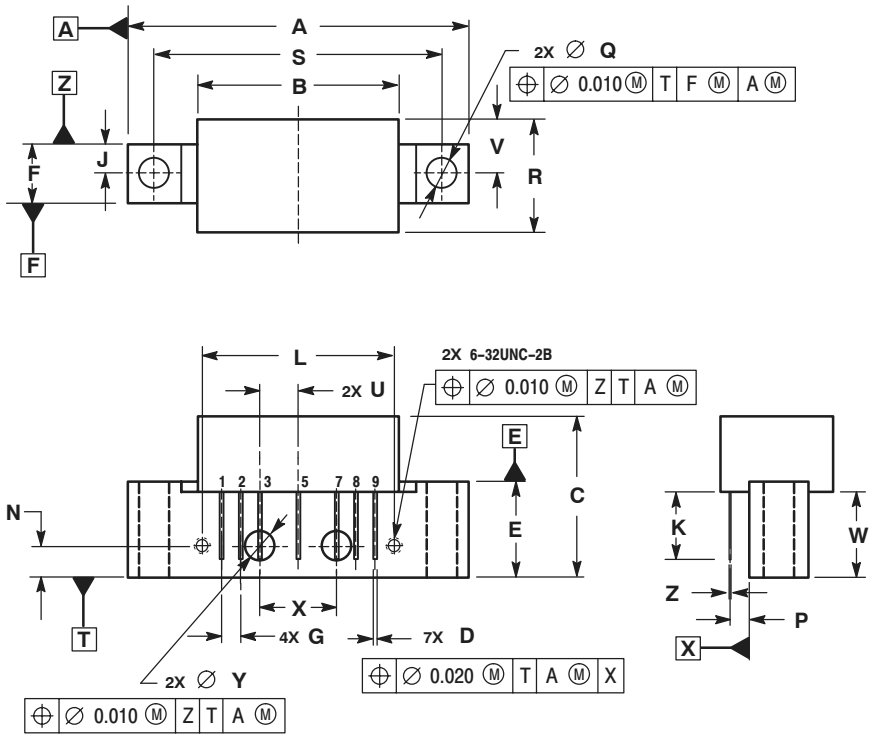
NOTES:
1. CONTROLLING DIMENSION: INCH.
2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M–1994.
3. DATUM PLANE –H– IS LOCATED AT TOP OF LEAD AND IS COINCIDENT WITH THE LEAD WHERE THE LEAD EXITS THE PLASTIC BODY AT THE TOP OF THE PARTING LINE.
4. DIMENSIONS "D1" AND "E1" DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE PROTRUSION IS .006 PER SIDE. DIMENSIONS "D1" AND "E1" DO INCLUDE MOLD MISMATCH AND ARE DETERMINED AT DATUM PLANE –H–.
5. DIMENSION b1 DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE .005 TOTAL IN EXCESS OF THE b1 DIMENSION AT MAXIMUM MATERIAL CONDITION.
6. DATUMS –A– AND –B– TO BE DETERMINED AT DATUM PLANE –H–.
7. DIMENSION A2 APPLIES WITHIN ZONE "J" ONLY.
8. DIMENSIONS "D" AND "E2" DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE PROTRUSION IS .003 PER SIDE. DIMENSIONS "D" AND "E2" DO INCLUDE MOLD MISMATCH AND ARE DETERMINED AT DATUM PLANE –D–.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	.078	.082	1.98	2.08
A1	.039	.043	0.99	1.09
A2	.040	.042	1.02	1.07
D	.416	.424	10.57	10.77
D1	.378	.382	9.60	9.70
D2	.290	.320	7.37	8.13
D3	.016	.024	0.41	0.61
E	.436	.444	11.07	11.28
E1	.238	.242	6.04	6.15
E2	.066	.074	1.68	1.88
E3	.150	.180	3.81	4.57
E4	.058	.066	1.47	1.68
E5	.231	.235	5.87	5.97
F	.025 BSC		0.64 BSC	
b1	.193	.199	4.90	5.06
c1	.007	.011	0.18	0.28
aaa	.004		0.10	

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

CASE 1265-08
ISSUE G
TO-270-2
PLASTIC

CASE DIMENSIONS (continued)

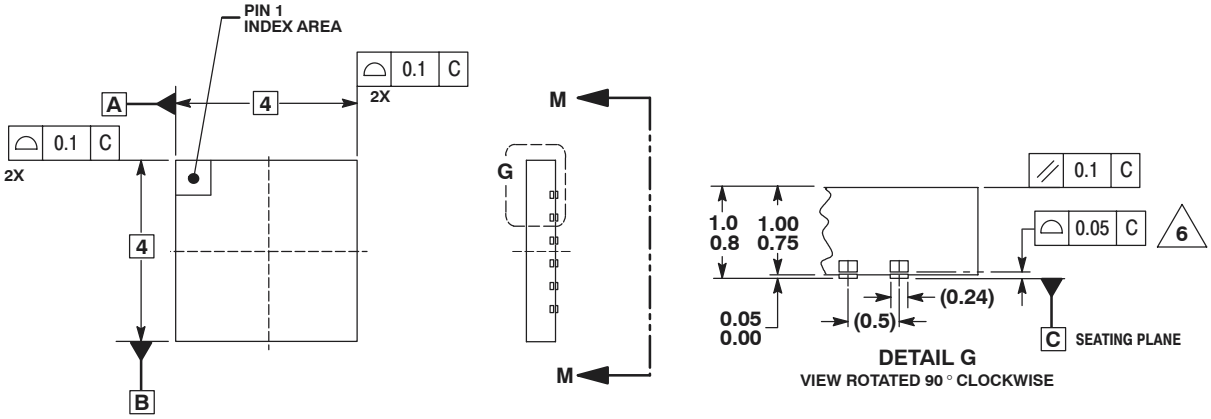


NOTES:
1. DIMENSIONS ARE IN INCHES.
2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.

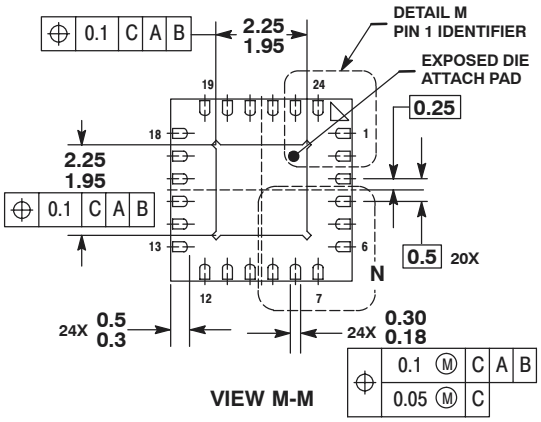
	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	---	1.775	---	45.085
B	---	1.085	---	27.559
C	---	0.840	---	21.336
D	0.015	0.021	0.381	0.533
E	0.465	0.510	11.811	12.954
F	0.300	0.325	7.62	8.255
G	0.100 BSC		2.540 BSC	
J	0.156 BSC		3.962 BSC	
K	0.315	0.355	8.001	9.017
L	1.000 BSC		25.400 BSC	
N	0.165 BSC		4.191 BSC	
P	0.100 BSC		2.540 BSC	
Q	0.148	0.168	3.759	4.267
R	---	0.600	---	15.24
S	1.500 BSC		38.100 BSC	
U	0.200 BSC		5.080 BSC	
V	---	0.250	---	6.350
W	0.435	---	11.049	---
X	0.400 BSC		10.160 BSC	
Y	0.152	0.163	3.861	4.140
Z	0.009	0.011	0.229	0.279

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

CASE 1302-01
ISSUE B

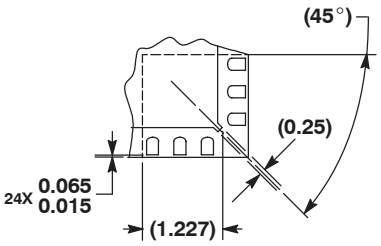


DETAIL G
VIEW ROTATED 90 ° CLOCKWISE

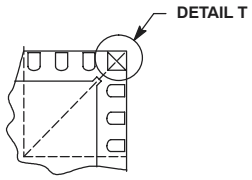


VIEW M-M

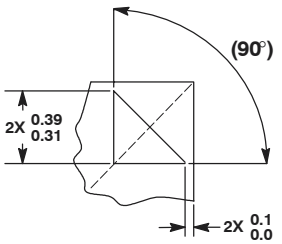
NOTES:
1. ALL DIMENSIONS ARE IN MILLIMETERS.
2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.
3. THE COMPLETE JEDEC DESIGNATOR FOR THIS PACKAGE IS: HF-PQFP-N.
4. CORNER CHAMFER MAY NOT BE PRESENT. DIMENSIONS OF OPTIONAL FEATURES ARE FOR REFERENCE ONLY.
5. CORNER LEADS CAN BE USED FOR THERMAL OR GROUND AND ARE TIED TO THE DIE ATTACH PAD. THESE LEADS ARE NOT INCLUDED IN THE LEAD COUNT.
6. COPLANARITY APPLIES TO LEADS, CORNER LEADS, AND DIE ATTACH PAD.
7. FOR ANVIL SINGULATED QFN PACKAGES, MAXIMUM DRAFT ANGLE IS 12°.



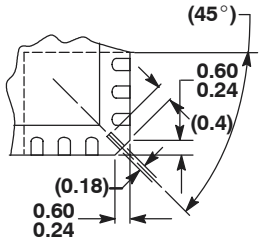
DETAIL N
PREFERRED CORNER CONFIGURATION
4



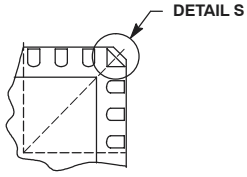
DETAIL M
PREFERRED PIN 1 BACKSIDE IDENTIFIER



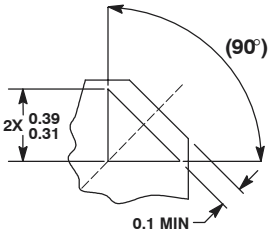
DETAIL T
PREFERRED PIN 1 BACKSIDE IDENTIFIER



DETAIL N
CORNER CONFIGURATION OPTION
4 5

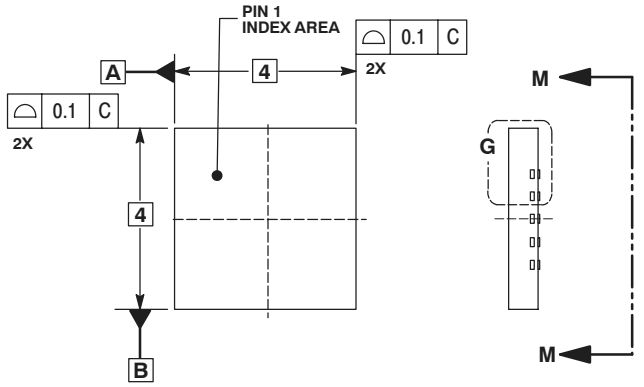


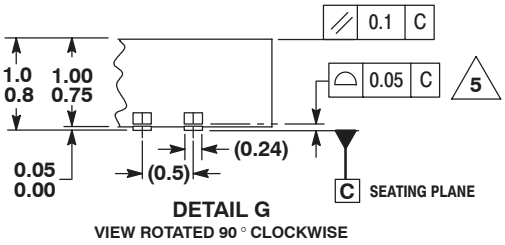
DETAIL M
PIN 1 BACKSIDE IDENTIFIER OPTION



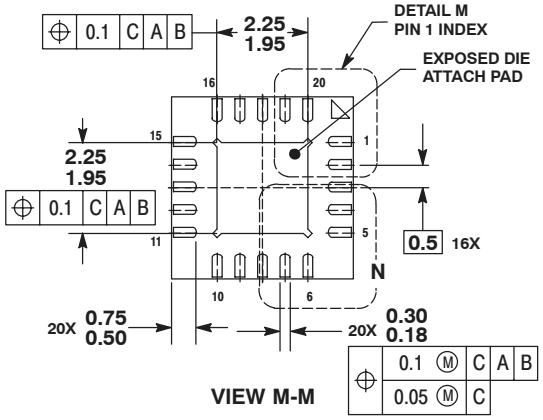
DETAIL S
PIN 1 BACKSIDE IDENTIFIER OPTION

CASE 1307-01
ISSUE B
QFN-24



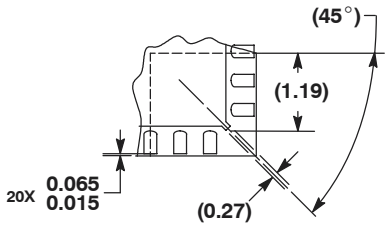


DETAIL G
VIEW ROTATED 90 ° CLOCKWISE



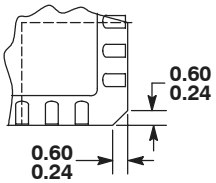
VIEW M-M

NOTES:
1. ALL DIMENSIONS ARE IN MILLIMETERS.
2. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
3. THE COMPLETE JEDEC DESIGNATOR FOR THIS PACKAGE IS: HF-PQFP-N.
4. CORNER CHAMFER MAY NOT BE PRESENT. DIMENSIONS OF OPTIONAL FEATURES ARE FOR REFERENCE ONLY.
5. COPLANARITY APPLIES TO LEADS, CORNER LEADS, AND DIE ATTACH PAD.
6. FOR ANVIL SINGULATED QFN PACKAGES, MAXIMUM DRAFT ANGLE IS 12°.



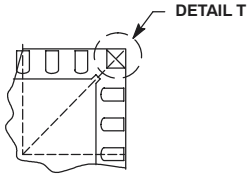
DETAIL N
PREFERRED CORNER CONFIGURATION

4

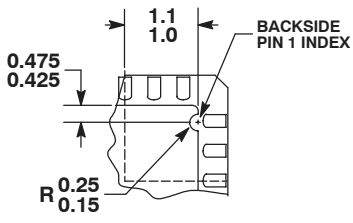


DETAIL N
CORNER CONFIGURATION OPTION

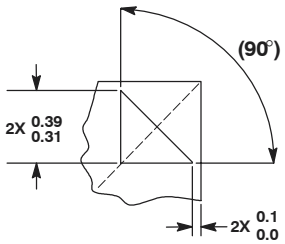
4



DETAIL M
PREFERRED BACKSIDE PIN 1 INDEX

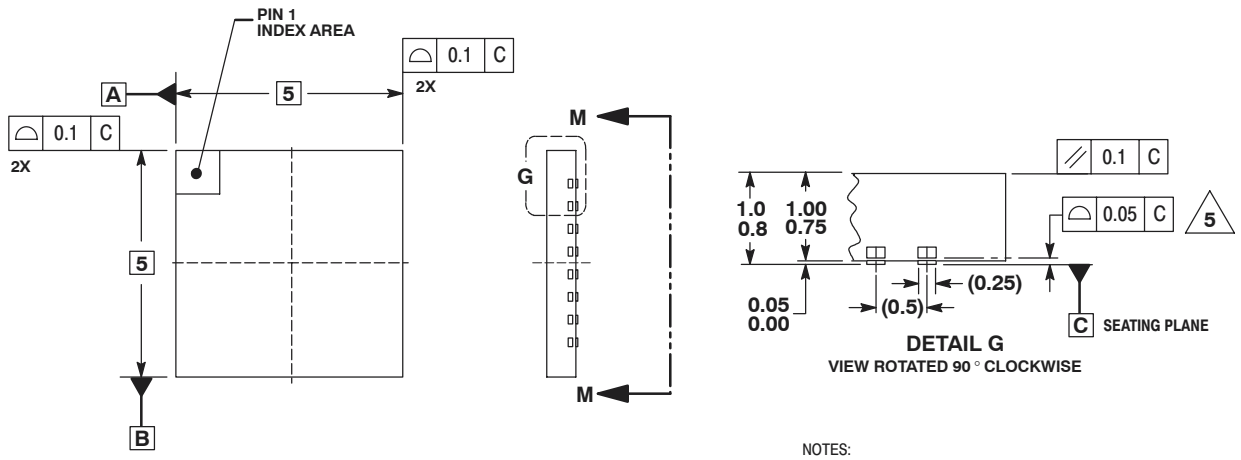


DETAIL M
BACKSIDE PIN 1 INDEX OPTION



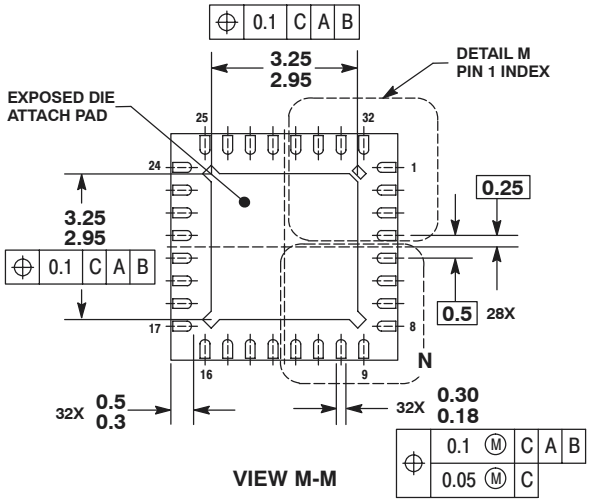
DETAIL T
PREFERRED BACKSIDE PIN 1 INDEX

CASE 1308-02
ISSUE C
QFN-20

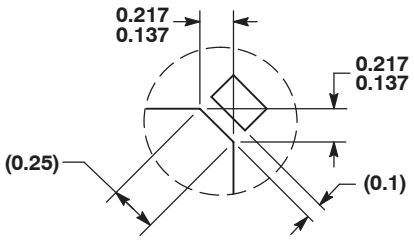


DETAIL G
VIEW ROTATED 90 ° CLOCKWISE

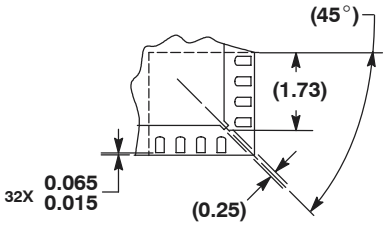
NOTES:
1. ALL DIMENSIONS ARE IN MILLIMETERS.
2. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
3. THE COMPLETE JEDEC DESIGNATOR FOR THIS PACKAGE IS: HF-PQFP-N.
4. CORNER CHAMFER MAY NOT BE PRESENT. DIMENSIONS OF OPTIONAL FEATURES ARE FOR REFERENCE ONLY.
5. COPLANARITY APPLIES TO LEADS, CORNER LEADS, AND DIE ATTACH PAD.
6. FOR ANVIL SINGULATED QFN PACKAGES, MAXIMUM DRAFT ANGLE IS 12°.



VIEW M-M

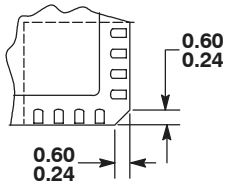


DETAIL S
PREFERRED BACKSIDE PIN 1 INDEX



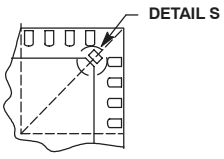
DETAIL N
PREFERRED CORNER CONFIGURATION

4

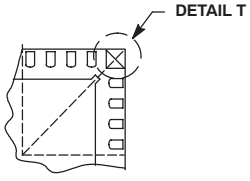


DETAIL N
CORNER CONFIGURATION OPTION

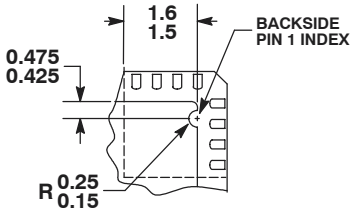
4



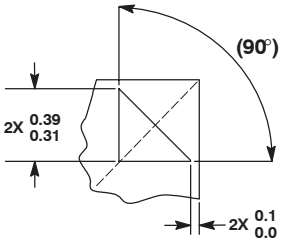
DETAIL M
PREFERRED BACKSIDE PIN 1 INDEX



DETAIL M
BACKSIDE PIN 1 INDEX OPTION

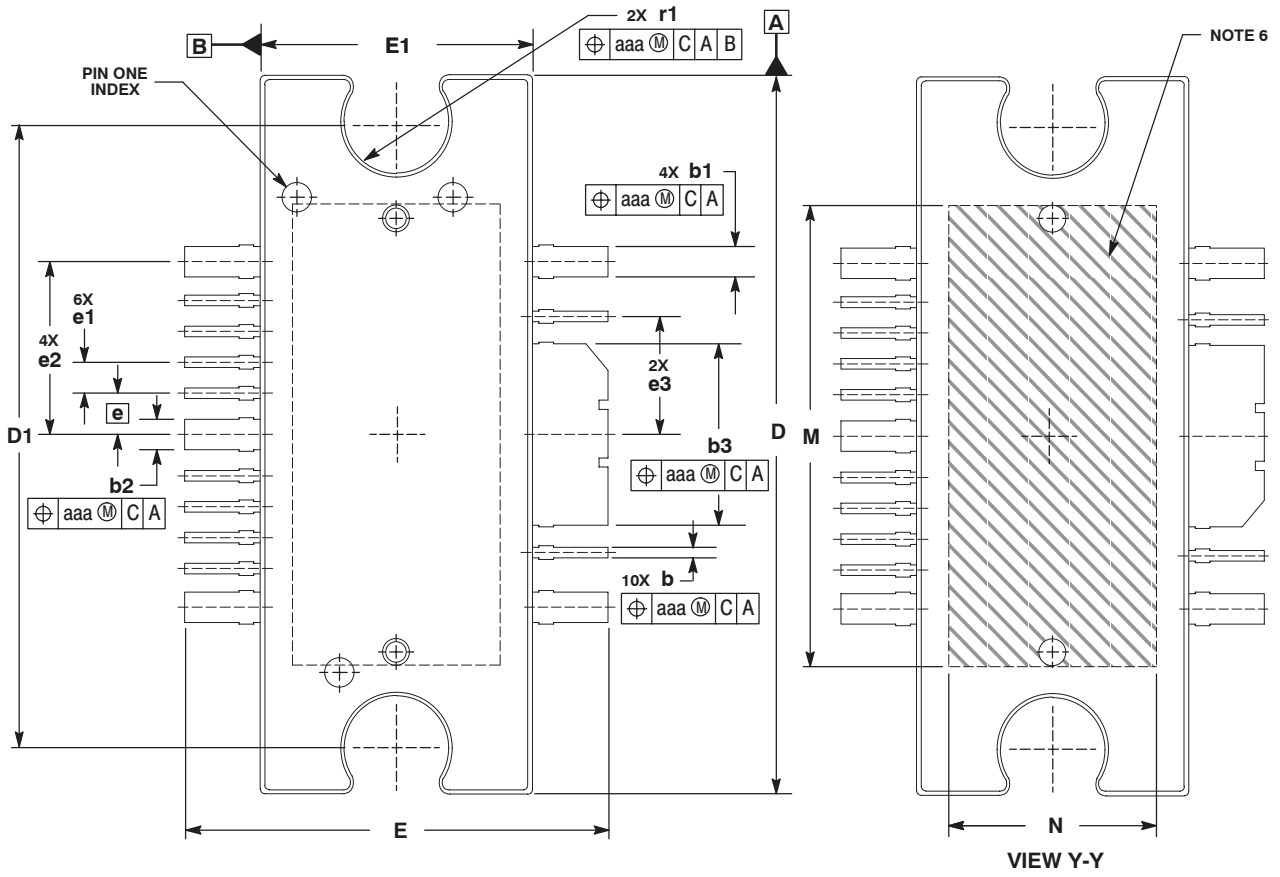


DETAIL M
BACKSIDE PIN 1 INDEX OPTION



DETAIL T
BACKSIDE PIN 1 INDEX OPTION

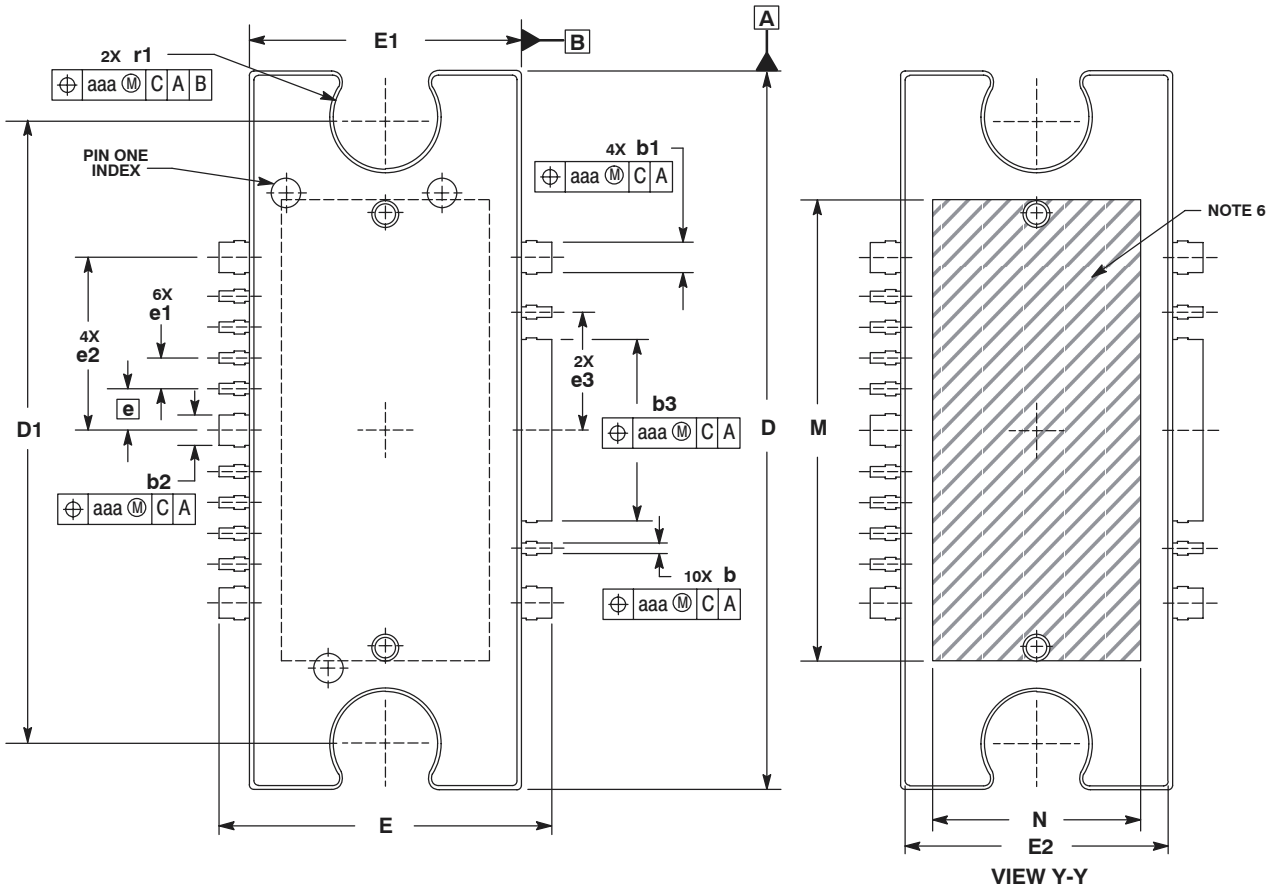
CASE 1311-03
ISSUE E
QFN-32, 5x5 mm

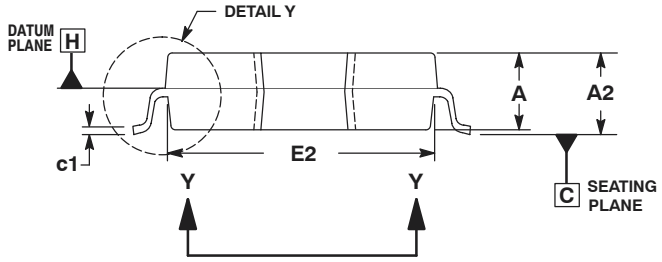


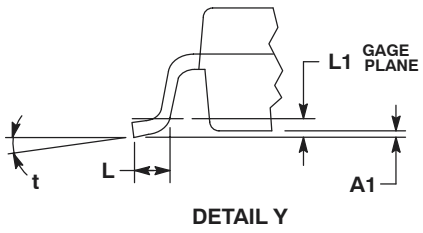
NOTES:
1. CONTROLLING DIMENSION: INCH.
2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M–1994.
3. DATUM PLANE –H– IS LOCATED AT TOP OF LEAD AND IS COINCIDENT WITH THE LEAD WHERE THE LEAD EXITS THE PLASTIC BODY AT THE TOP OF THE PARTING LINE.
4. DIMENSIONS "D" AND "E1" DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE PROTRUSION IS .006 (0.15) PER SIDE. DIMENSIONS "D" AND "E1" DO INCLUDE MOLD MISMATCH AND ARE DETERMINED AT DATUM PLANE –H–.
5. DIMENSIONS "b", "b1", "b2" AND "b3" DO NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE .005 (0.13) TOTAL IN EXCESS OF THE "b", "b1", "b2" AND "b3" DIMENSIONS AT MAXIMUM MATERIAL CONDITION.
6. HATCHING REPRESENTS THE EXPOSED AREA OF THE HEAT SLUG.
7. DIM A2 APPLIES WITHIN ZONE "J" ONLY.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	.100	.104	2.54	2.64
A1	.038	.044	0.96	1.12
A2	.040	.042	1.02	1.07
D	.928	.932	23.57	23.67
D1	.810 BSC		20.57 BSC	
E	.551	.559	14.00	14.20
E1	.353	.357	8.97	9.07
E2	.346	.350	8.79	8.89
F	.025 BSC		0.64 BSC	
M	.600	---	15.24	---
N	.270	---	6.86	---
b	.011	.017	0.28	0.43
b1	.037	.043	0.94	1.09
b2	.037	.043	0.94	1.09
b3	.225	.231	5.72	5.87
c1	.007	.011	.18	.28
e	.054 BSC		1.37 BSC	
e1	.040 BSC		1.02 BSC	
e2	.224 BSC		5.69 BSC	
e3	.150 BSC		3.81 BSC	
r1	.063	.068	1.6	1.73
aaa	.004		.10	

CASE 1329-09
ISSUE J
TO-272 WB-16
PLASTIC





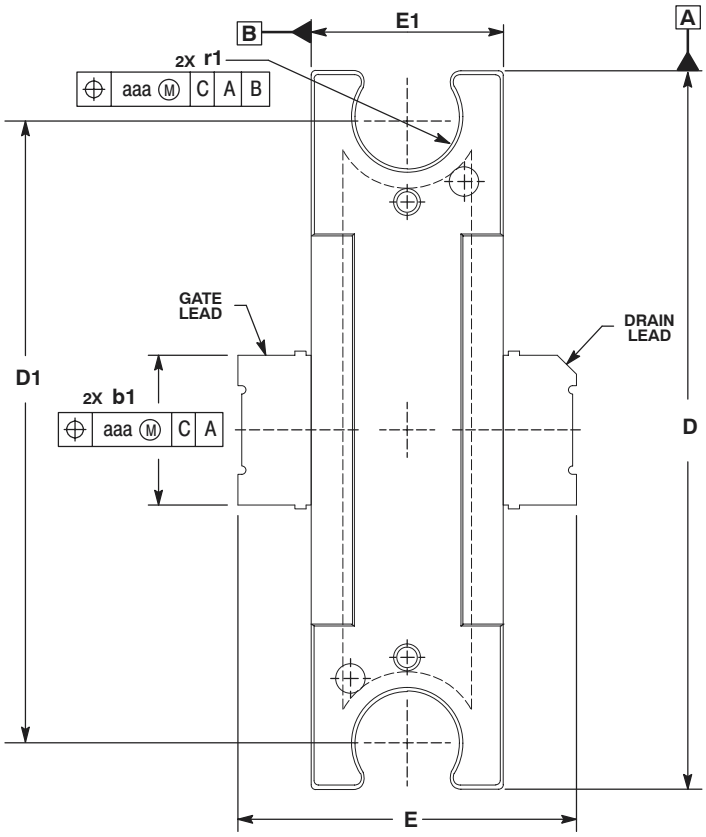


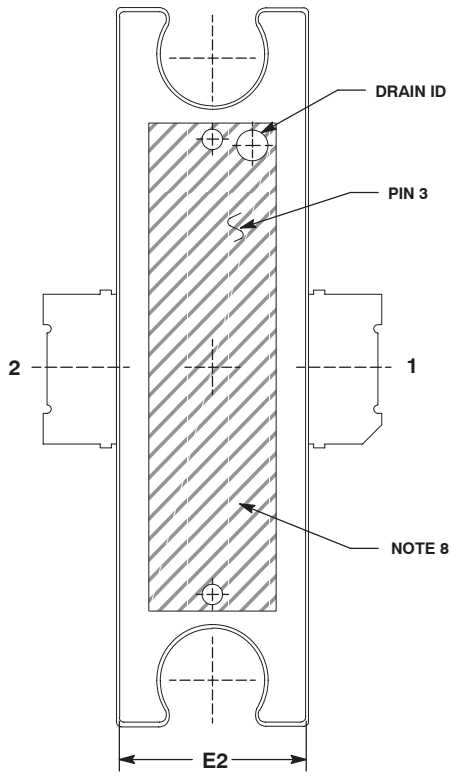
DETAIL Y

NOTES:
1. CONTROLLING DIMENSION: INCH.
2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M–1994.
3. DATUM PLANE –H– IS LOCATED AT TOP OF LEAD AND IS COINCIDENT WITH THE LEAD WHERE THE LEAD EXITS THE PLASTIC BODY AT THE TOP OF THE PARTING LINE.
4. DIMENSIONS "D" AND "E1" DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE PROTRUSION IS .006 (0.15) PER SIDE. DIMENSIONS "D" AND "E1" DO INCLUDE MOLD MISMATCH AND ARE DETERMINED AT DATUM PLANE –H–.
5. DIMENSIONS "b", "b1", "b2" AND "b3" DO NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE .005 (0.13) TOTAL IN EXCESS OF THE "b", "b1", "b2" AND "b3" DIMENSIONS AT MAXIMUM MATERIAL CONDITION.
6. HATCHING REPRESENTS THE EXPOSED AREA OF THE HEAT SINK.

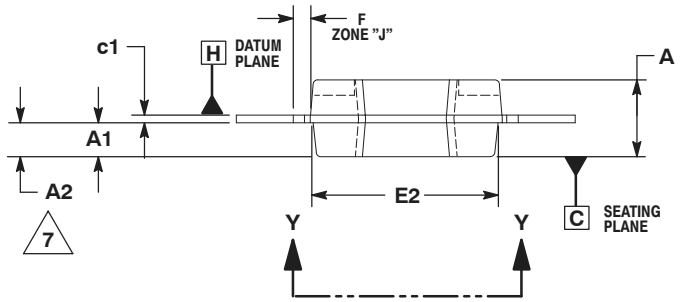
	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	.100	.104	2.54	2.64
A1	.001	.004	0.02	0.10
A2	.099	.110	2.51	2.79
D	.928	.932	23.57	23.67
D1	.810 BSC		20.57 BSC	
E	.429	.437	10.90	11.10
E1	.353	.357	8.97	9.07
E2	.346	.350	8.79	8.89
L	.018	.024	4.90	5.06
L1	.01 BSC		0.25 BSC	
M	.600	---	15.24	---
N	.270	---	6.86	---
b	.011	.017	0.28	0.43
b1	.037	.043	0.94	1.09
b2	.037	.043	0.94	1.09
b3	.225	.231	5.72	5.87
c1	.007	.011	.18	.28
e	.054 BSC		1.37 BSC	
e1	.040 BSC		1.02 BSC	
e2	.224 BSC		5.69 BSC	
e3	.150 BSC		3.81 BSC	
r1	.063	.068	1.6	1.73
t	2°	8°	2°	8°
aaa	.004		.10	

CASE 1329A-03
ISSUE B
TO-272 WB-16 Gull
PLASTIC





VIEW Y-Y

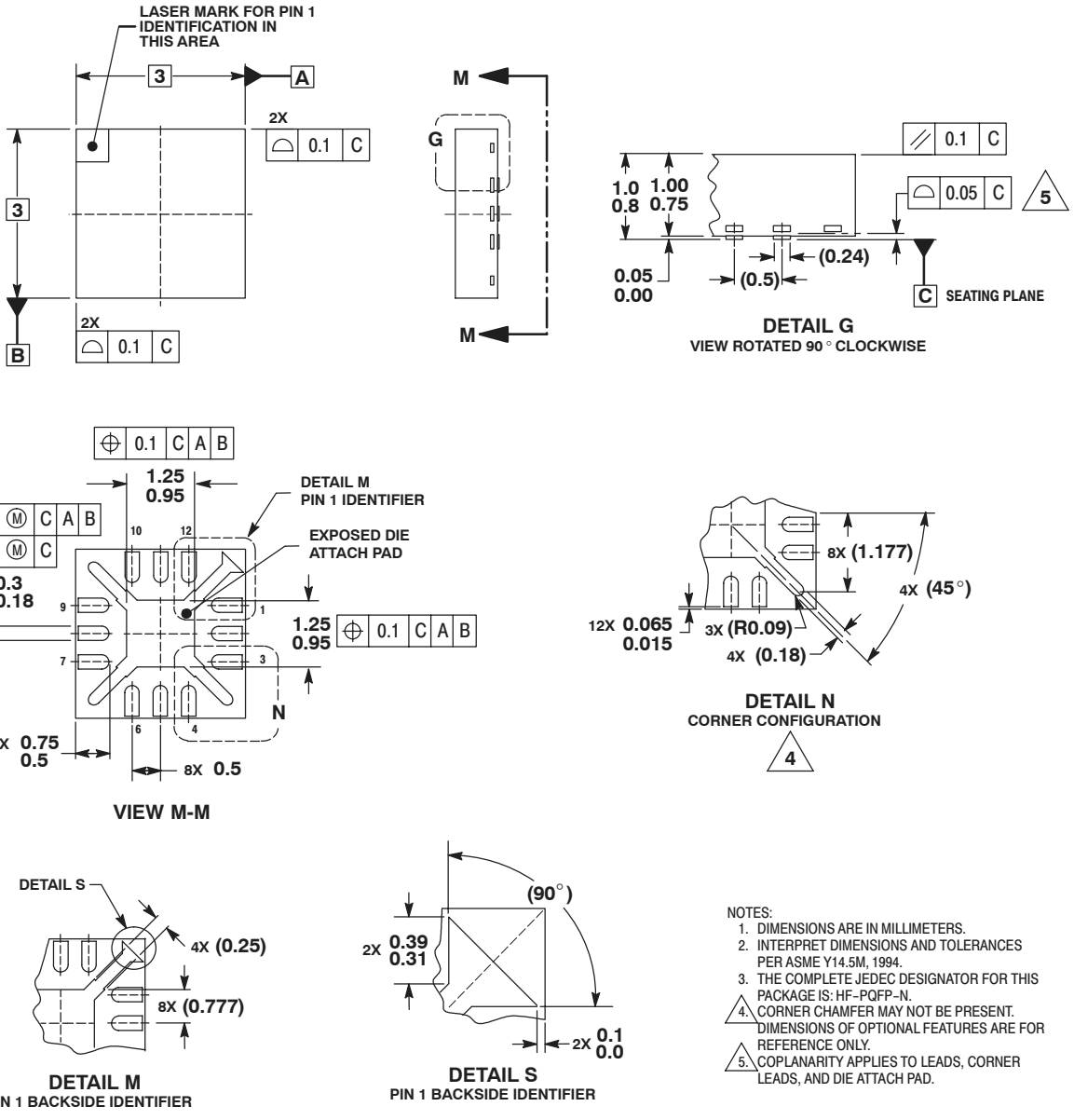


NOTES:
1. CONTROLLING DIMENSION: INCH.
2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.
3. DATUM PLANE -H- IS LOCATED AT THE TOP OF LEAD AND IS COINCIDENT WITH THE LEAD WHERE THE LEAD EXITS THE PLASTIC BODY AT THE TOP OF THE PARTING LINE.
4. DIMENSIONS "D" AND "E1" DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE PROTRUSION IS .006 PER SIDE. DIMENSIONS "D" AND "E1" DO INCLUDE MOLD MISMATCH AND ARE DETERMINED AT DATUM PLANE -H-.
5. DIMENSION "b1" DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE .005 TOTAL IN EXCESS OF THE "b1" DIMENSION AT MAXIMUM MATERIAL CONDITION.
6. DATUMS -A- AND -B- TO BE DETERMINED AT DATUM PLANE -H-.
7. DIMENSION A2 APPLIES WITHIN ZONE "J" ONLY.
8. CROSSHATCHING REPRESENTS THE EXPOSED AREA OF THE HEAT SLUG.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	.100	.104	2.54	2.64
A1	.039	.043	0.99	1.09
A2	.040	.042	1.02	1.07
D	.928	.932	23.57	23.67
D1	.810 BSC		20.57 BSC	
E	.438	.442	11.12	11.23
E1	.248	.252	6.30	6.40
E2	.241	.245	6.12	6.22
F	.025 BSC		0.64 BSC	
b1	.193	.199	4.90	5.05
c1	.007	.011	.18	.28
r1	.063	.068	1.60	1.73
aaa	.004		.10	

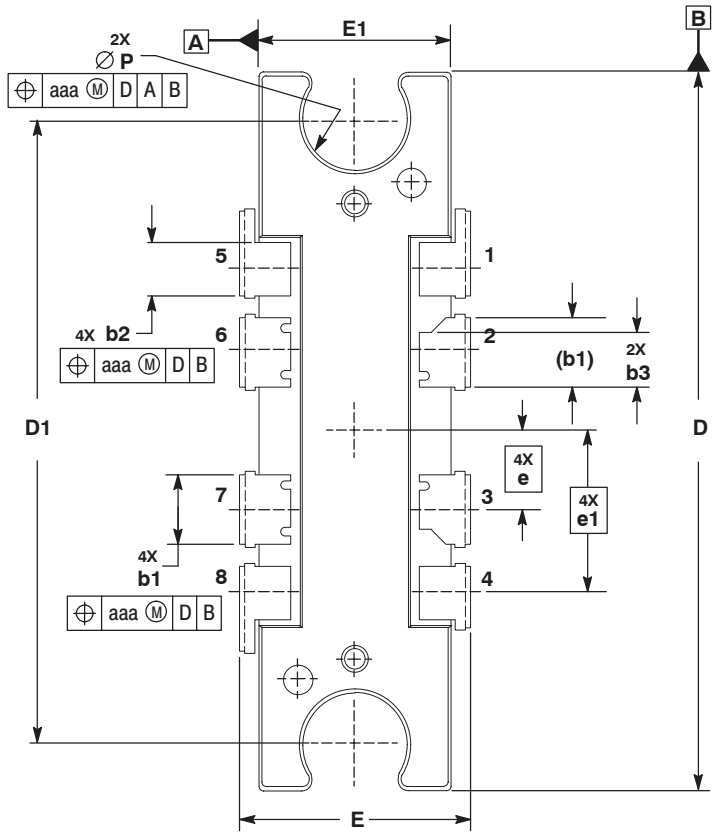
STYLE 1:
PIN 1. DRAIN
2. GATE
3. SOURCE

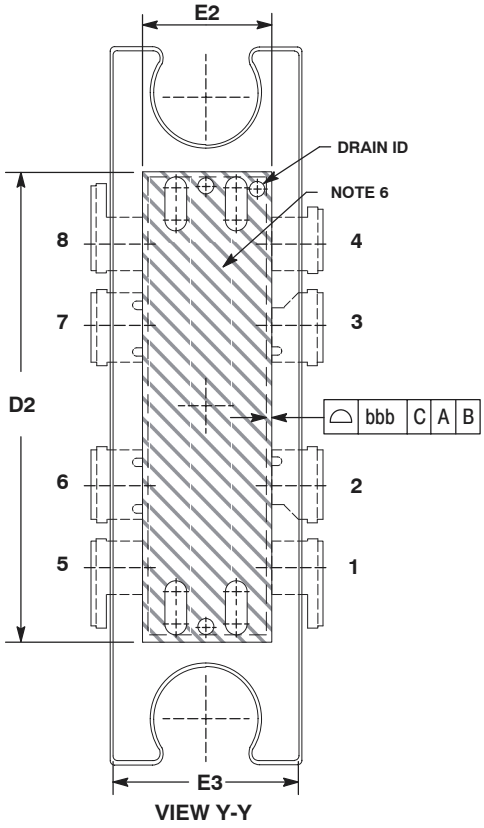
CASE 1337-03
ISSUE B
TO-272-2
PLASTIC



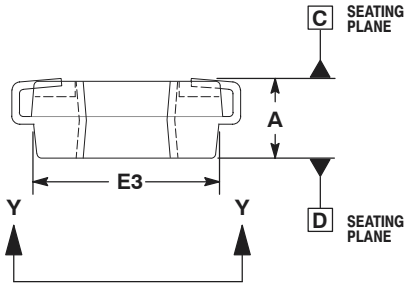
NOTES:
1. DIMENSIONS ARE IN MILLIMETERS.
2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.
3. THE COMPLETE JEDEC DESIGNATOR FOR THIS PACKAGE IS: HF-PQFP-N.
4. CORNER CHAMFER MAY NOT BE PRESENT. DIMENSIONS OF OPTIONAL FEATURES ARE FOR REFERENCE ONLY.
5. COPLANARITY APPLIES TO LEADS, CORNER LEADS, AND DIE ATTACH PAD.

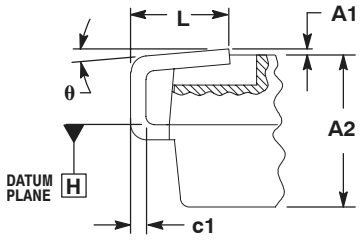
CASE 1345-01
ISSUE A
QFN-12





VIEW Y-Y



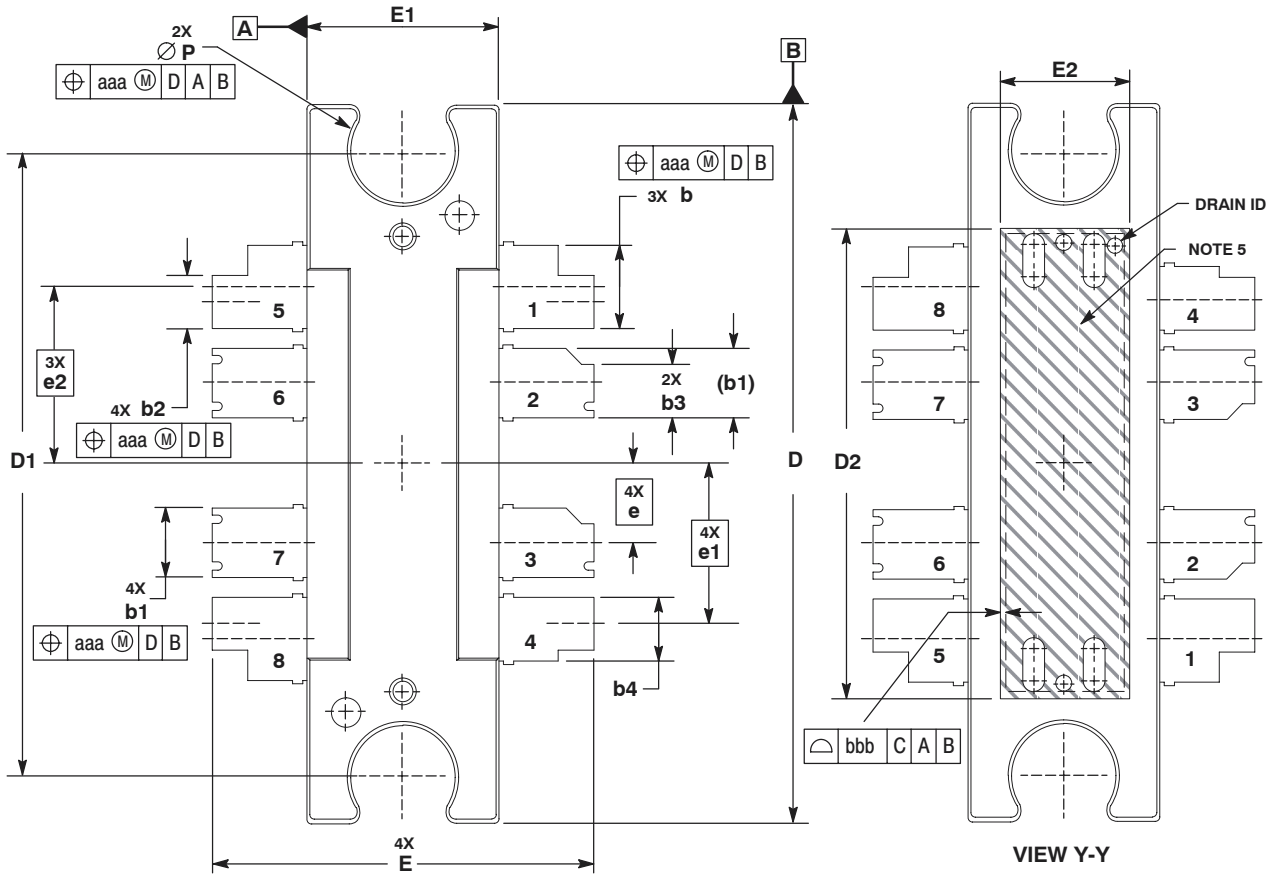


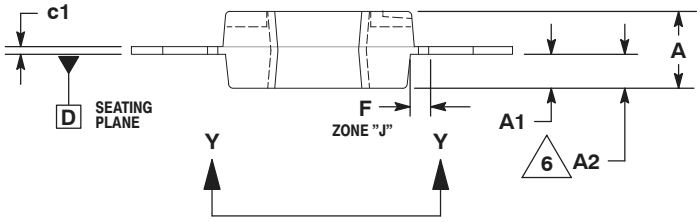
STYLE 1:
PIN 1. SOURCE (COMMON)
2. DRAIN
3. DRAIN
4. SOURCE (COMMON)
5. SOURCE (COMMON)
6. GATE
7. GATE
8. SOURCE (COMMON)

NOTES:
1. CONTROLLING DIMENSION: INCH .
2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.
3. DATUM PLANE -H- IS LOCATED AT TOP OF LEAD AND IS COINCIDENT WITH THE LEAD WHERE THE LEAD EXITS THE PLASTIC BODY AT THE TOP OF THE PARTING LINE.
4. DIMENSION D AND E1 DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE PROTRUSION IS 0.006 PER SIDE. DIMENSION D AND E1 DO INCLUDE MOLD MISMATCH AND ARE DETERMINED AT DATUM PLANE -H-.
5. DIMENSIONS b1 AND b2 DO NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.005 TOTAL IN EXCESS OF THE b1 AND b2 DIMENSIONS AT MAXIMUM MATERIAL CONDITION.
6. CROSSHATCHING REPRESENTS THE EXPOSED AREA OF THE HEAT SLUG.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.098	0.108	2.49	2.74
A1	0.000	0.004	0.00	0.10
A2	0.100	0.104	2.54	2.64
D	0.928	0.932	23.57	23.67
D1	0.810 BSC		20.57 BSC	
D2	0.608 BSC		15.44 BSC	
E	0.296	0.304	7.52	7.72
E1	0.248	0.252	6.30	6.40
E2	0.170 BSC		4.32 BSC	
E3	0.241	0.245	6.12	6.22
L	0.060	0.070	1.52	1.78
P	0.126	0.134	3.20	3.40
b1	0.088	0.094	2.24	2.39
b2	0.066	0.072	1.68	1.83
b3	0.067	0.073	1.70	1.85
c1	0.007	0.011	0.178	0.279
e	0.104 BSC		2.64 BSC	
e1	0.210 BSC		5.33 BSC	
θ	0°	6°	0°	6°
aaa	0.004		0.10	
bbb	0.008		0.20	

CASE 1366-04
ISSUE C
TO-272-8 Wrap
PLASTIC



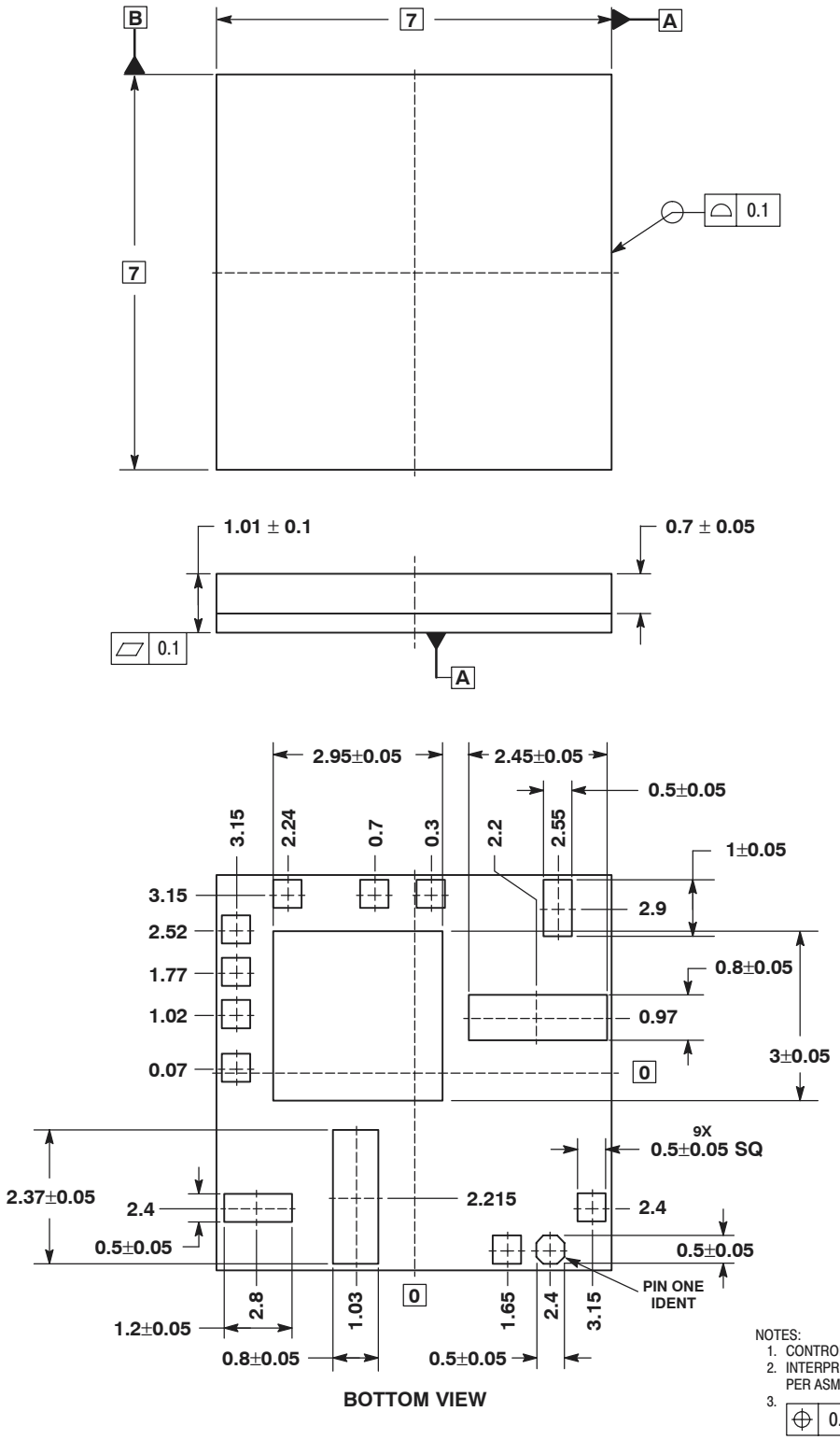


STYLE 1:
PIN 1. SOURCE (COMMON)
2. DRAIN
3. DRAIN
4. SOURCE (COMMON)
5. SOURCE (COMMON)
6. GATE
7. GATE
8. SOURCE (COMMON)

NOTES:
1. CONTROLLING DIMENSION: INCH.
2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.
3. DIMENSIONS "D" AND "E1" DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE PROTRUSION IS 0.006 PER SIDE. DIMENSIONS "D" AND "E1" DO INCLUDE MOLD MISMATCH AND ARE DETERMINED AT DATUM PLANE –H–.
4. DIMENSIONS "b" AND "b1" DO NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.005 TOTAL IN EXCESS OF THE "b1" AND "b2" DIMENSIONS AT MAXIMUM MATERIAL CONDITION.
5. CROSSHATCHING REPRESENTS THE EXPOSED AREA OF THE HEAT SLUG.
6. DIMENSION A2 APPLIES WITHIN ZONE "J" ONLY.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.098	0.106	2.49	2.69
A1	0.038	0.044	0.96	1.12
A2	0.040	0.042	1.02	1.07
D	0.926	0.934	23.52	23.72
D1	0.810 BSC		20.57 BSC	
D2	0.608 BSC		15.44 BSC	
E	0.492	0.500	12.50	12.70
E1	0.246	0.254	6.25	6.45
E2	0.170 BSC		4.32 BSC	
F	0.025 BSC		0.64 BSC	
P	0.126	0.134	3.20	3.40
b	0.105	0.111	2.67	2.82
b1	0.088	0.094	2.24	2.39
b2	0.066	0.072	1.68	1.83
b3	0.067	0.073	1.70	1.85
b4	0.077	0.083	1.96	2.11
c1	0.007	0.011	0.178	0.279
e	0.104 BSC		2.64 BSC	
e1	0.210 BSC		5.33 BSC	
e2	0.229 BSC		5.82 BSC	
aaa	0.004		0.10	
bbb	0.008		0.20	

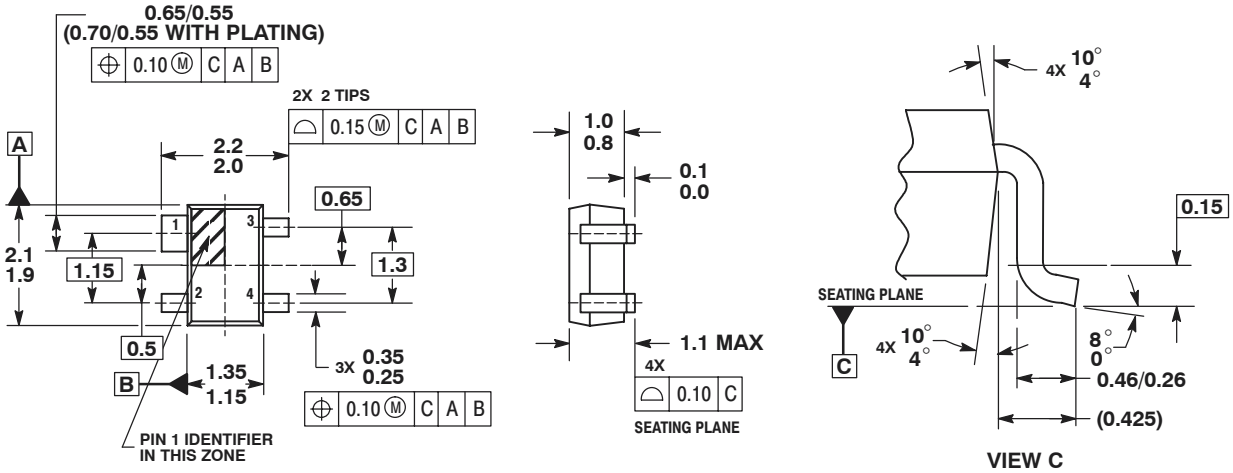
CASE 1366A-02
ISSUE A
TO-272-8
PLASTIC

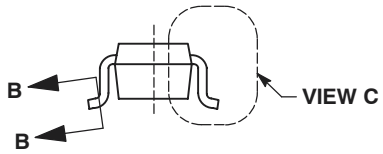


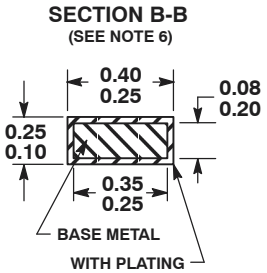
BOTTOM VIEW

NOTES:
1. CONTROLLING DIMENSION: MILLIMETERS.
2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.
3. ⌖ 0.1 Ⓛ A B C
   APPLIES TO ALL PAD LOCATIONS.

CASE 1383-02
ISSUE A
7x7 mm Module

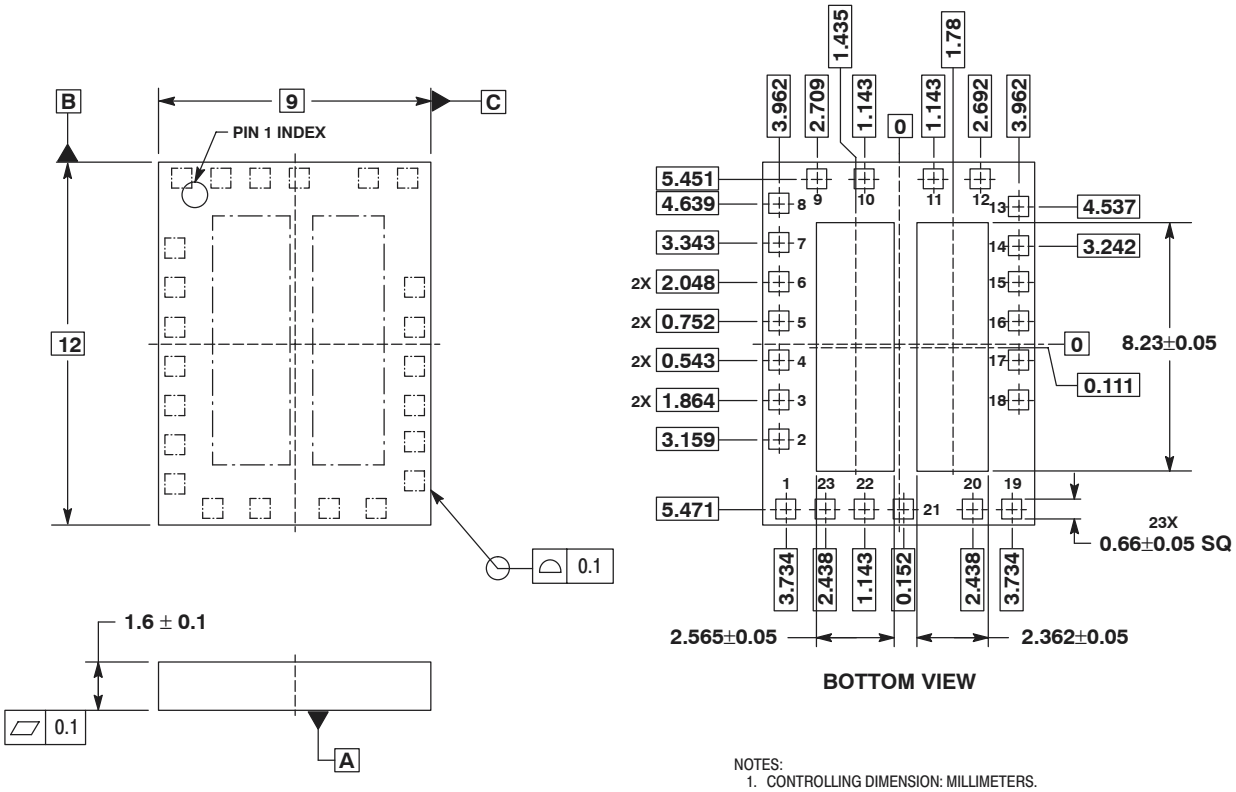






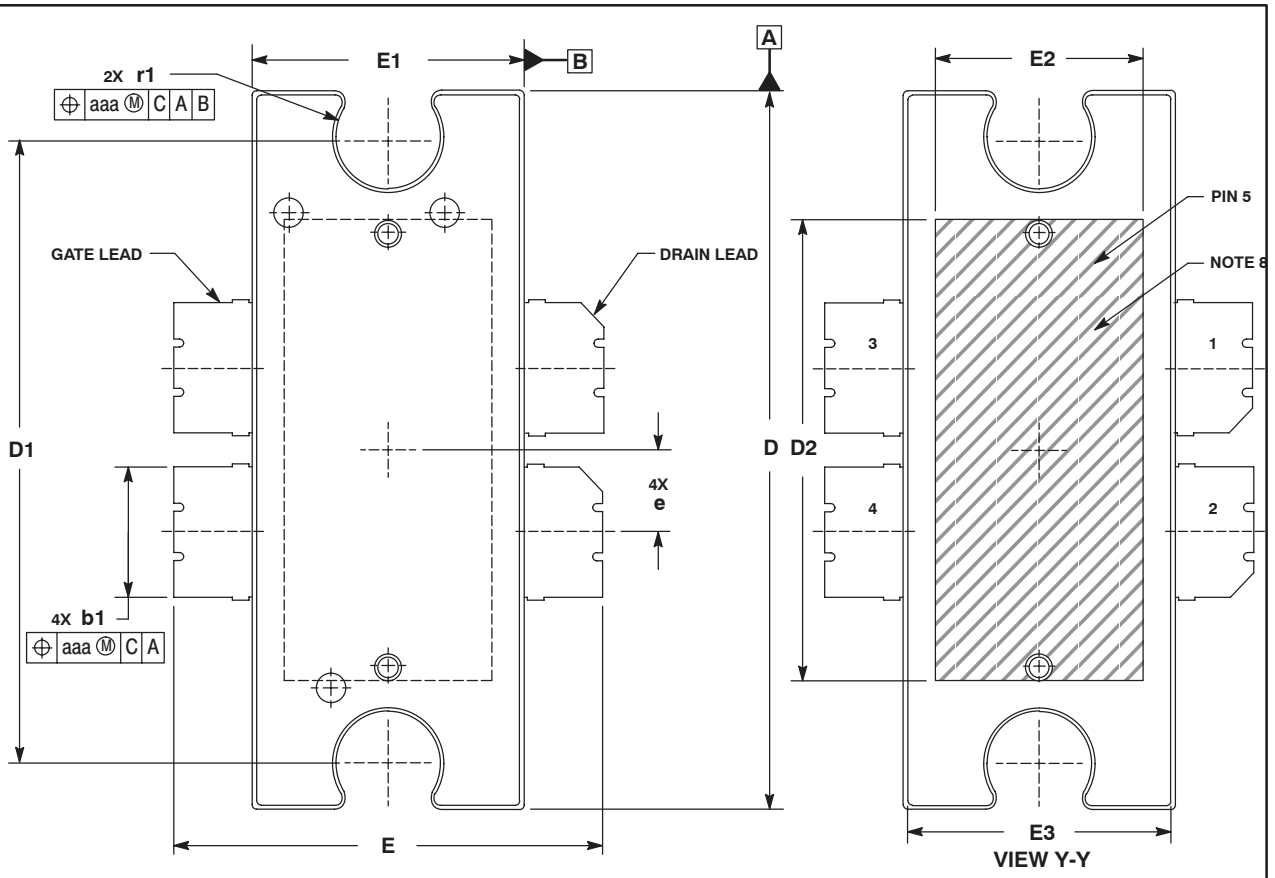
NOTES:
1. DIMENSIONS ARE IN MILLIMETERS.
2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.
3. DIMENSION AT DATUM A AND B DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.
4. DIMENSION AT DATUM A AND B ARE DETERMINED AT THE OUTMOST EXTREMES OF THE PLASTIC BODY EXCLUSIVE OF MOLD FLASH, TIE BAR BURRS, GATE BURRS AND INTERLEAD FLASH, BUT INCLUDING ANY MISMATCH BETWEEN THE TOP AND BOTTOM OF PLASTIC BODY.
5. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
6. THESE DIMENSIONS APPLY TO THE FLAT SECTION OF THE LEAD BETWEEN 0.08mm AND 0.15mm FROM THE LEAD TIP.

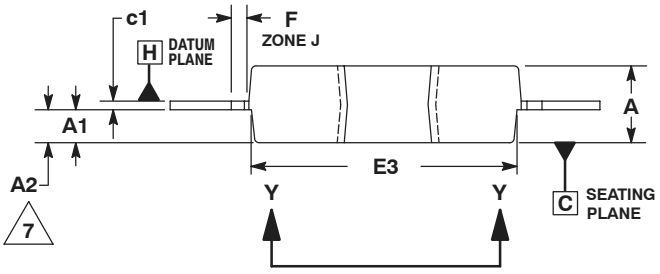
CASE 1404-01
ISSUE O
Plastic
SOT-343R



NOTES:
1. CONTROLLING DIMENSION: MILLIMETERS.
2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.
3. ⌖ 0.1 Ⓛ A B C
   APPLIES TO ALL PAD LOCATIONS.

CASE 1440-01
ISSUE O
9x12 mm Module



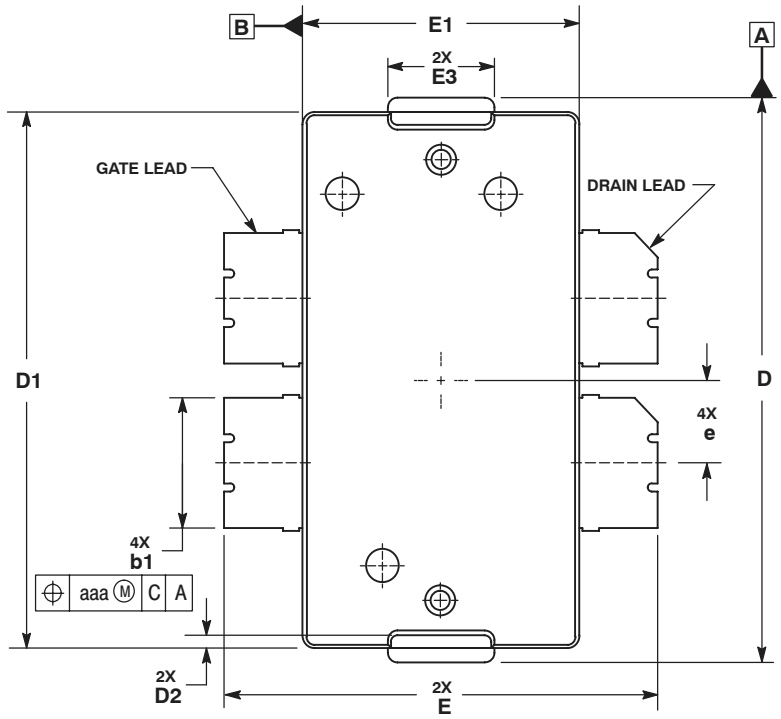


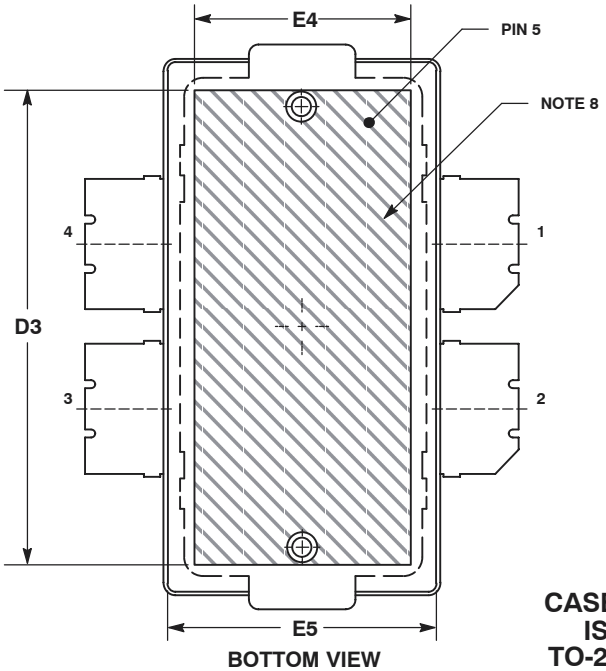
NOTES:
1. CONTROLLING DIMENSION: INCH.
2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M–1994.
3. DATUM PLANE –H– IS LOCATED AT TOP OF LEAD AND IS COINCIDENT WITH THE LEAD WHERE THE LEAD EXITS THE PLASTIC BODY AT THE TOP OF THE PARTING LINE.
4. DIMENSIONS "D" AND "E1" DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE PROTRUSION IS .006 PER SIDE. DIMENSIONS "D" AND "E1" DO INCLUDE MOLD MISMATCH AND ARE DETERMINED AT DATUM PLANE –H–.
5. DIMENSION "b1" DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE .005 TOTAL IN EXCESS OF THE "b1" DIMENSION AT MAXIMUM MATERIAL CONDITION.
6. DATUMS –A– AND –B– TO BE DETERMINED AT DATUM PLANE –H–.
7. DIMENSION A2 APPLIES WITHIN ZONE "J" ONLY.
8. HATCHING REPRESENTS THE EXPOSED AREA OF THE HEAT SLUG.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	.100	.104	2.54	2.64
A1	.039	.043	0.99	1.09
A2	.040	.042	1.02	1.07
D	.928	.932	23.57	23.67
D1	.810 BSC		20.57 BSC	
D2	.600	---	15.24	---
E	.551	.559	14	14.2
E1	.353	.357	8.97	9.07
E2	.270	---	6.86	---
E3	.346	.350	8.79	8.89
F	.025 BSC		0.64 BSC	
b1	.164	.170	4.17	4.32
c1	.007	.011	.18	.28
r1	.063	.068	1.60	1.73
e	.106 BSC		2.69 BSC	
aaa	.004		.10	

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

CASE 1484-02
ISSUE A
TO-272 WB-4
PLASTIC





BOTTOM VIEW

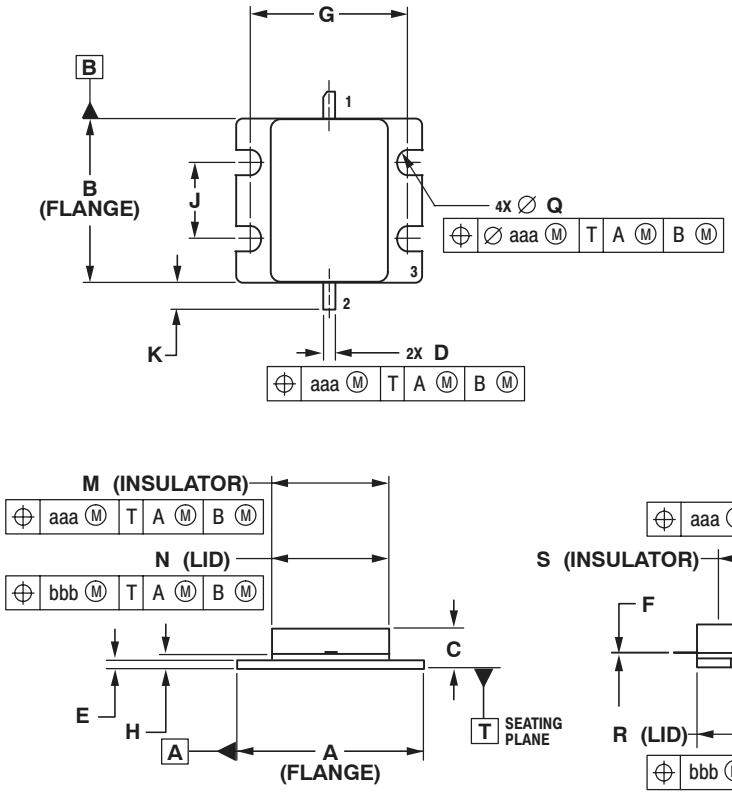
STYLE 1:
PIN 1. DRAIN
2. DRAIN
3. GATE
4. GATE
5. SOURCE

NOTES:
1. CONTROLLING DIMENSION: INCH.
2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M–1994.
3. DATUM PLANE –H– IS LOCATED AT THE TOP OF LEAD AND IS COINCIDENT WITH THE LEAD WHERE THE LEAD EXITS THE PLASTIC BODY AT THE TOP OF THE PARTING LINE.
4. DIMENSIONS "D" AND "E1" DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE PROTRUSION IS .006 PER SIDE. DIMENSIONS "D" AND "E1" DO INCLUDE MOLD MISMATCH AND ARE DETERMINED AT DATUM PLANE –H–.
5. DIMENSION "b1" DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE .005 TOTAL IN EXCESS OF THE "b1" DIMENSION AT MAXIMUM MATERIAL CONDITION.
6. DATUMS –A– AND –B– TO BE DETERMINED AT DATUM PLANE –H–.
7. DIMENSION A2 APPLIES WITHIN ZONE "J" ONLY.
8. HATCHING REPRESENTS THE EXPOSED AREA OF THE HEAT SLUG.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	.100	.104	2.54	2.64
A1	.039	.043	0.99	1.09
A2	.040	.042	1.02	1.07
D	.722	.730	18.34	18.54
D1	.688	.692	17.48	17.58
D2	.011	.019	0.28	0.48
D3	.600	---	15.24	---
E	.551	.559	14	14.2
E1	.353	.357	8.97	9.07
E2	.132	.140	3.35	3.56
E3	.124	.132	3.15	3.35
E4	.270	---	6.86	---
E5	.346	.350	8.79	8.89
F	.025 BSC		0.64 BSC	
b1	.164	.170	4.17	4.32
c1	.007	.011	0.18	0.28
e	.106 BSC		2.69 BSC	
aaa	.004		0.10	

CASE 1486-02
ISSUE A
TO-270 WB-4
PLASTIC

CASE DIMENSIONS (continued)



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1994.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION H IS MEASURED .030 (0.762) AWAY FROM PACKAGE BODY.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.948	0.958	24.08	24.33
B	0.680	0.690	17.27	17.53
C	0.147	0.182	3.73	4.62
D	0.055	0.065	1.40	1.65
E	0.035	0.045	0.89	1.14
F	0.003	0.006	0.08	0.15
G	0.803 BSC		20.40 BSC	
H	0.057	0.067	1.45	1.70
J	0.315 BSC		8.00	
K	0.095	0.125	2.41	3.18
M	0.595	0.605	15.11	15.37
N	0.594	0.606	15.09	15.39
Q	0.092	0.112	2.34	2.84
R	0.678	0.692	17.22	17.58
S	0.680	0.690	17.27	17.23
aaa	0.004		0.10	
bbb	0.015		0.38	

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

CASE 1490-01
ISSUE O
HF-600

SELECTOR GUIDE PRODUCT INDEX

Selector Guide Product Index (continued)

Selector Guide Product Index (continued)

Selector Guide Product Index (continued)

END OF LIFE PRODUCT INDEX

Motorola SPS follows the industry standard "EIA-724 Product Life Cycle Data Model" to track the life cycle of its product. This model tracks the product's life cycle from "Product Newly Introduced" to "Product Phase Out." Products can be phased for a variety of reasons: improved product performance, change in technology roadmap, process obsolescence, market decline, etc. When products are discontinued, a suggested possible replacement device or an alternative source of supply for discontinued devices are made available when possible.

For a list of discontinued devices with possible alternative suppliers, please contact your local Motorola sales office or authorized distributor, or visit the following URL:

http://www.motorola.com/rf

Wireless Infrastructure RF Products

Product	Last Order Date	Last Ship Date	Possible Replacement
Not Recommended for New Design			
MHW1224	—	—	MHW1224LA
MHW1304L	—	—	MHW1304LA
MRF18090AS	—	—	MRF18085ALSR3 or MRF18085AR3
MRF19125S	—	—	MRF19125 or MRF5S19130S
MRF19125SR3	—	—	MRF19125 or MRF5S19130SR3
End of Life			
CA2810C	Past	Past	MHW6342T
CA2830C	Past	Past	MHW6342T
CA2832C	Past	Past	None
CA901	Past	Past	MHW8182B
CA901A	Past	Past	MHW8182B
CA922	Past	Past	MHW8185
CA922A	Past	Past	MHW8185
MHL8018	Past	Past	None
MHL8115	Past	Past	None
MHL8118	Past	Past	None
MHW1810-001	8/29/03	2/29/04	MW4IC2020MBR1
MHW1810-002	8/29/03	2/29/04	MW4IC2020MBR1
MHW1910-001	8/29/03	2/29/04	MW4IC2020MBR1
MHW5182A	Past	Past	MHW7182B
MHW5222A	Past	Past	None
MHW6181	Past	Past	MHW7182B
MHW6182	Past	Past	MHW7182B
MHW6272	Past	Past	MHW7272A
MHW7222A	Past	Past	MHW7222B
MHW7292	Past	Past	None
MHW8185LR	Past	Past	None
MHW8185R	Past	Past	None
MHW8205R	Past	Past	None
MHW8292	Past	Past	None
MHW910	Past	Past	MHVIC910HR2
MHW916	Past	Past	None
MRF1507T1	Past	Past	MRF1511T1 or MRF1517T1

END OF LIFE PRODUCT INDEX — continued

Product	Last Order Date	Last Ship Date	Possible Replacement
End of Life - continued			
MRF182	Past	Past	MRF9030R1
MRF182R1	7/31/04	7/31/04	MRF9030R1
MRF182LSR1	7/31/04	7/31/04	MRF9030LSR1
MRF182SR1	Past	Past	MRF9030LSR1
MRF183	Past	Past	MRF9045R1
MRF183S	Past	Past	MRF9045MR1 or MRF9045LSR1
MRF183SR1	7/31/04	7/31/04	MRF9045MR1 or MRF9045LSR1
MRF183LSR1	7/31/04	7/31/04	MRF9045MR1 or MRF9045LSR1
MRF184	Past	Past	MRF9060R1
MRF184SR1	Past	Past	MRF9060LSR1 or MRF9060MR1
MRF184R1	7/31/04	7/31/04	MRF9060R1
MRF184LSR1	7/31/04	7/31/04	MRF9060LSR1 or MRF9060MR1
MRF185	7/31/04	7/31/04	MRF9080
MRF186	7/31/04	7/31/04	MRF9120
MRF187	Past	Past	MRF9085
MRF187S	Past	Past	MRF9085SR3
MRF187SR1	7/31/04	7/31/04	MRF9085SR3
MRF19120S	—	—	MRF19120
MRF1946	Past	Past	MRF1535T1
MRF1946A	Past	Past	MRF1535T1
MRF20030R	Past	Past	MRF19030R3
MRF20060R	Past	Past	MRF19060
MRF20060RS	Past	Past	MRF19060
MRF21120S	Past	Past	MRF21120
MRF21180S	—	—	MRF21180 or MRF5P21180
MRF247	5/31/03	11/30/03	MRF1550T1
MRF2628	Past	Past	None
MRF373	7/31/04	7/31/04	MRF373AR1
MRF373S	Past	Past	MRF373ALSR1
MRF373LSR1	7/31/04	7/31/04	MRF373ALSR1
MRF374	7/31/04	7/31/04	MRF374A
MRF492	Past	Past	MRF1550T1
MRF5015	Past	Past	None
MRF6401	Past	Past	None
MRF6404	Past	Past	MRF9030R1
MRF646	Past	Past	MRF1550T1
MRF648	Past	Past	MRF1550T1
MRF650	5/31/03	11/30/03	MRF1550T1
MRF652	Past	Past	MRF1518T1
MRF6522-060	7/31/04	7/31/04	MRF9060R1
MRF6522-10R1	7/31/04	7/31/04	MRF282SR1
MRF6522-5R1	7/31/04	7/31/04	MRF282ZR1 or MRF9002R2
MRF652S	Past	Past	MRF1518T1

END OF LIFE PRODUCT INDEX — continued

Product	Last Order Date	Last Ship Date	Possible Replacement
End of Life - continued			
MRF847	Past	Past	MRF9045R1
MRF857S	Past	Past	MRF9002R2
MRF897	Past	Past	MRF9045LSR1
MRF897R	Past	Past	MRF9045R1
MRF898	Past	Past	MRF9060R1
MRF899	Past	Past	MRF9180
MRF9180S	—	—	MRF9180
TPV8100B	Past	Past	None

For information on Wireless RF and IF handset products, see After Market Support at the following URL:
http://www.motorola.com/rf

AFTER MARKET SUPPORT

For a list of discontinued devices with possible alternative suppliers, please contact your local Motorola sales office or authorized distributor, or visit the following URL:

http://www.motorola.com/rf

For Wireless Infrastructure products transferred to another manufacturer, see the list of Wireless Infrastructure RF products below. After market support on these parts is available through M/A-COM. For additional information, contact M/A-COM Customer Service at (310) 320-6160 x 354 (voice), clarkj@tycoelectronics.com (email) or (310) 618-9191 (FAX).

2N6439	MRF137	MRF171A	MRF317
MRF10005	MRF140	MRF173	MRF321
MRF1000MB	MRF141	MRF173CQ	MRF323
MRF10031	MRF141G	MRF174	MRF327
MRF1004MB	MRF148A	MRF175GU	MRF392
MRF10120	MRF150	MRF175GV	MRF393
MRF10150	MRF151	MRF175LU	MRF421
MRF10350	MRF151G	MRF176GU	MRF422
MRF10502	MRF154	MRF176GV	MRF426
MRF1090MA	MRF157	MRF177	MRF428
MRF1090MB	MRF158	MRF275G	MRF429
MRF1150MA	MRF160	MRF275L	MRF448
MRF1150MB	MRF16006	MRF3104	MRF454
MRF134	MRF16030	MRF313	MRF455
MRF136	MRF166C	MRF314	MRF587
MRF136Y	MRF166W	MRF316	

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81-3-3440-3569

ASIA/PACIFIC:

Motorola Semiconductors H.K. Ltd.
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Tai Po Industrial Estate, Tai Po, N.T. Hong Kong
852-26668334

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