

MOTOROLA SEMICONDUCTORS



Datasheet.Live

IN STOCK

AT
HAMILTON ELECTRO SALES

11965 SANTA MONICA BLVD.
LOS ANGELES 25, CALIFORNIA

BRADSHAW 2-9154

RESTRICTED-23
WPS Document Control
OIC _____

Defense (c)1

A REPORT ON MOTOROLA SEMICONDUCTOR RELIABILITY

During the past year great strides have been made in Motorola's Quality Assurance Program to provide assurance of reliability . . . as well as a reliable product. Among the specific achievements were the following:

LOT ACCEPTANCE — More than 20,000,000 device hours of life testing under accelerated life test conditions (high temperature, operation at maximum rated conditions) were accumulated on standard devices — transistors, diodes, and rectifiers. In addition, many millions of device hours were accumulated on "non-standard" devices.

TEMPERATURE VS FAILURE RATE — Three special programs were made to study the effect of temperature on failure rate for 1) Motorola milliwatt transistors, 2) Motorola doorknob (TO-36) power transistors, and 3) Motorola germanium mesa switching transistors.

Motorola milliwatt transistors — Extensive tests, including 10,000 hour life test data, suggest failure rates at 25°C and 50 mW of less than 0.007% / 1000 hours. Only 2 catastrophic failures occurred in almost 2 million device hours of testing.

Motorola TO-36 germanium power transistors — Although rated for a maximum junction temperature of 100°C, these transistors were tested at temperatures as high as 150°C (50°C above maximum rating) because so few failures occurred at 85°C, 100°C and 120°C. A total of 3,618,332 device hours were accumulated at these temperatures. Other tests performed indicated excellent parameter stability.

Motorola germanium mesa transistors — Environmental as well as operating and storage life tests were performed. In 3,083,675 device hours at a storage temperature of 100°C, only 4 failures occurred.

LOT ACCEPTANCE ENVIRONMENTAL TESTING — More than 27,000 device tests were run to standard military specifications, not including many additional tests performed 100% as a part of manufacturing, nor any of the in-process sampling conducted by Production or Quality Control. Motorola offers some 55 military type devices, an indication of the quality standards met by Motorola semiconductor components in general.

MECHANICAL RELIABILITY IMPROVEMENTS — Motorola is constantly improving device reliability and there are specific programs underway which have already resulted in substantial gains in mechanical reliability.

ACCELERATED LIFE TESTING FOR RELIABILITY — By running life tests on large numbers of devices at many combinations of ambient temperature, voltage, and power dissipation, Motorola is obtaining failure mode information, determining the relationship between parameter changes and various stresses and also is establishing realistic levels of operation for the circuit engineer. Devices are being tested in 3 such matrices. The results of these tests are continually being applied to make possible superior devices.

THE COVER: Temperature must be accurately controlled as epitaxial layers are grown on wafers of germanium and silicon. Here an optical pyrometer is used to check the exact surface temperature of silicon wafers during this process stage. Motorola was first to introduce the epitaxial process on production transistors.

MOTOROLA MESA TRANSISTORS



THE EPITAXIAL MESA TRANSISTOR—A MAJOR DEVELOPMENT

The newest, most advanced production technique for transistors to be introduced in recent years to the semiconductor industry was that of the "epitaxial" mesa transistor. The first volume production of these new transistors was announced during late 1960 by Motorola.

The epitaxially grown mesa transistor results from a process combining the inherent mesa transistor advantages of high frequency cutoff and rugged physical structure with the alloy transistor advantage of low saturation resistance.

Formerly, the collector high resistivity thickness of a mesa device was that of the entire wafer into which the base and emitter regions were diffused. With the new epitaxial transistors, however, the major portion of wafer

thickness is now material having a very low resistivity. The thin epitaxial collector layer is high-resistivity material grown on top of the bulk material to obtain a high voltage rating, but adds little to saturation resistance of the transistor.

This very thin region of high-resistivity material also reduces collector capacity and thus increases the frequency limits of the transistor. Furthermore, the physical area of the emitter may be reduced, since smaller area devices now yield acceptable saturation resistance. This results in still higher frequency characteristics. In short, the epitaxial process has extended the bounds of transistor design and has made possible rugged, high-power, higher-frequency transistors.

Type	MAXIMUM RATINGS							Electrical Characteristics			EPITAXIAL SILICON SWITCHES (NPN)
	Case	P _D mW	T _J °C	V _{CB} volts	V _{EB} volts	I _C mA		h _{FE} @ I _C (typ)	f _T mc		
2N706	22	300	175	25	3	—		40	10	450	
2N706A	22	300	175	25	5	—		40	10	450	
2N706B	22	300	175	25	5	—		40	10	450	
2N753	22	300	175	25	5	—		75	10	450	
2N834	22	300	175	40	5	—		40	10	500	
2N707	22	300	175	56	4	—		12	10	450	EPITAXIAL SILICON AMPLIFIERS (NPN)
2N707A	22	300	175	70	5	—		30	10	500	
2N828	22	300	100	15	2.5	200		40	10	400	EPITAXIAL GERMANIUM SWITCH (PNP)
2N695	21	75	100	15	3.5	50		40	10	360	
2N705	22	150	100	15	3.5	50		40	10	325	GERMANIUM SWITCHES (PNP)
USN2N705	22	150	100	15	3.5	50		40	10	325	
2N710	22	150	100	15	2.0	50		40	10	325	
2N711	22	150	100	12	1.0	50		30	10	300	
2N700	21	75	100	25	0.2	50	7 db @ 200 mc	2*	800		GERMANIUM AMPLIFIERS (PNP)
2N700A	21	75	100	25	0.2	50	8 db @ 200 mc	2*	800		
2N700A (SIG. C)	21	75	100	25	0.2	50	8 db @ 200 mc	2*	800		
2N741	22	150	100	15	1.0	100		25	5	360	
2N741A	22	150	100	20	1.0	100		25	5	360	
2N1561	23	3(w)	100	25	3.0	500	8 db @ 160 mc	50	500		
2N1562	23	3(w)	100	25	2.0	500	7 db @ 160 mc	50	450		
2N1692	24	3(w)	100	25	3.0	500	8 db @ 160 mc	50	500		
2N1693	24	3(w)	100	25	2.0	500	7 db @ 160 mc	50	450		

Now, all silicon mesa transistors from Motorola are epitaxial devices — offering new levels of frequency and power performance never before available. Many new Motorola germanium mesa types are also manufactured with the epitaxial process providing greatly improved performance characteristics.

Motorola supplies an extremely wide range of mesa transistors, enabling you to select the device best suited for your particular design requirements. And, when you specify "Motorola Mesas" you are assured of highest reliability . . . the key factor in their selection for the most critical applications.

*h_{fe} @ I_E(mA)

SEE PAGE 10 FOR OUTLINE DRAWINGS

Since Motorola is constantly adding new devices, be sure to request information on units that may have been introduced since the printing of this catalog.



MOTOROLA POWER TRANSISTORS

118 TYPES OFFERED
IN "DIAMOND"
TO-3 CASE

- 3, 5, 10, 15 & 25 AMPS
- 90 WATTS POWER DISSIPATION
- UP TO 120 VOLTS
- 0.8° C/W MAXIMUM THERMAL RESISTANCE
- SPECIAL "MEG-A-LIFE" UNITS OFFER MILITARY-QUALITY FOR INDUSTRIAL APPLICATIONS
- 100°C JUNCTION TEMPERATURE



MOTOROLA POWER TRANSISTOR HANDBOOK . . .
a valuable reference piece dealing exclusively with power transistor theory, design considerations, and applications. Only \$2 per copy from your Motorola semiconductor distributor.

	MAXIMUM RATINGS								Electrical Characteristics			
	Type	Case	P _c watts	T _j °C	BV _{CBO} volts	BV _{CES} volts	I _c amps	min	h _{FE} @ I _c max	amps	f _{ae} (typ) kc	
3-AMP INDUSTRIAL POWER TRANSISTORS	2N1359	1	90	100	50	40	3	35	90	1	7	
	2N1360	1	90	100	50	40	3	60	140	1	5	
	2N375	1	90	100	80	60	3	35	90	1	7	
	2N618	1	90	100	80	60	3	60	140	1	5	
	2N1362	1	90	100	100	75	3	35	90	1	7	
	2N1363	1	90	100	100	75	3	60	140	1	5	
	2N1364	1	90	100	120	100	3	35	90	1	7	
	2N1365	1	90	100	120	100	3	60	140	1	5	
	2N297A	1	90	100	80	50	3	40	100	0.5	5	
	2N1011	1	90	100	80	80	5	30	75	3	5	
AUTOMOTIVE 2-WATT	2N176	2	90	100	40	30	3	45	35	4		
	2N178	2	40	90	40	30	3	50	30	6		
	2N554	2	40	90	15	16	3	50	35	6		
	2N555	2	40	90	30	30	3	50	35	6		
	2N669	2	90	100	40	30	3	90	40	3		
AUTOMOTIVE 4-WATT	2N350A	2	90	100	50	40	3	30	31	5		
	2N351A	2	90	100	50	40	4	45	33	5		
	2N376A	2	90	100	50	40	5	60	35	5		
5-AMP INDUSTRIAL POWER TRANSISTORS	2N1529	1	90	100	40	30	5	20	40	3	10	
	2N1530	1	90	100	60	45	5	20	40	3	10	
	2N1531	1	90	100	80	60	5	20	40	3	10	
	2N1532	1	90	100	100	75	5	20	40	3	10	
	2N1533	1	90	100	120	90	5	20	40	3	10	
	2N1534	1	90	100	40	30	5	35	70	3	8.5	
	2N1535	1	90	100	60	45	5	35	70	3	8.5	
	2N1536	1	90	100	80	60	5	35	70	3	8.5	
	2N1537	1	90	100	100	75	5	35	70	3	8.5	
	2N1538	1	90	100	120	90	5	35	70	3	8.5	
	2N1539	3	90	100	40	30	5	50	100	3	4	
	2N1540	3	90	100	60	45	5	50	100	3	4	
	2N1541	3	90	100	80	60	5	50	100	3	4	
	2N1542	3	90	100	100	75	5	50	100	3	4	
	2N1543	3	90	100	120	90	5	50	100	3	4	
	2N1544	3	90	100	40	30	5	75	150	3	4	
	2N1545	3	90	100	60	45	5	75	150	3	4	
	2N1546	3	90	100	80	60	5	75	150	3	4	
	2N1547	3	90	100	100	75	5	75	150	3	4	
	2N1548	3	90	100	120	90	5	75	150	3	4	
10-AMP INDUSTRIAL POWER TRANSISTORS	Case 4	Case 3										
	2N627	MN61A	90	100	40	30	10	10	30	10	5	
	2N628	MN62A	90	100	60	45	10	10	30	10	5	
	2N629	MN63A	90	100	80	60	10	10	30	10	5	
	2N630	MN64A	90	100	100	75	10	10	30	10	5	
	Case 3	Case 4										
	—	2N1120	90	100	80	70	15	20	50	10	5	
	2N1549	MP1549	90	100	40	30	15	10	30	10	10	
	2N1550	MP1550	90	100	60	45	15	10	30	10	10	
	2N1551	MP1551	90	100	80	60	15	10	30	10	10	
15-AMP INDUSTRIAL POWER TRANSISTORS	2N1552	MP1552	90	100	100	75	15	10	30	10	10	
	2N1553	MP1553	90	100	40	30	15	30	60	10	6	
	2N1554	MP1554	90	100	60	45	15	30	60	10	6	
	2N1555	MP1555	90	100	80	60	15	30	60	10	6	
	2N1556	MP1556	90	100	100	75	15	30	60	10	6	
	2N1557	MP1557	90	100	40	30	15	50	100	10	5	
	2N1558	MP1558	90	100	60	45	15	50	100	10	5	
	2N1559	MP1559	90	100	80	60	15	50	100	10	5	
	2N1560	MP1560	90	100	100	75	15	50	100	10	5	

SEE PAGE 10 FOR OUTLINE DRAWINGS

MOTOROLA POWER TRANSISTORS



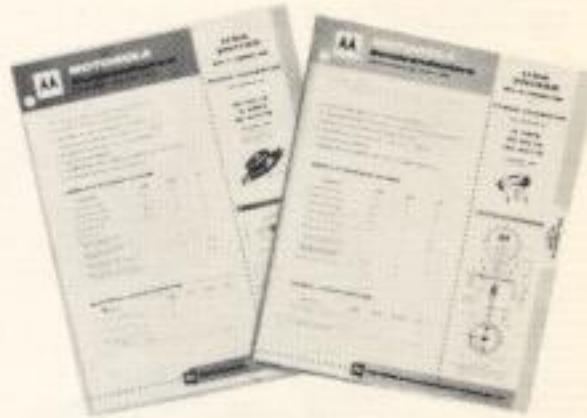
		MAXIMUM RATINGS					Electrical Characteristics				
Type	Case	P _c watts	T _J °C	BV _{CB} volts	BV _{CES} volts	I _C amps	min	h _{FE} @ I _C max	amps	f _{ae} (typ) kc	
2N441	5	150	100	40	40	15	20	40	5	10	15-AMP INDUSTRIAL POWER TRANSISTORS (CONTINUED)
2N442	5	150	100	50	45	15	20	40	5	10	
2N443	5	150	100	60	50	15	20	40	5	10	
2N174	5	150	100	80	70	15	25	50	5	10	
2N174A	6	150	100	80	70	15	25	50	5	10	
2N1358	5	150	100	80	70	15	25	50	5	10	
2N1100	5	150	100	100	80	15	25	50	5	10	
2N1412	5	150	100	100	80	15	25	50	5	10	
2N277	5	150	100	40	40	15	35	70	5	10	
2N278	5	150	100	50	45	15	35	70	5	10	
2N173	5	150	100	60	50	15	35	70	5	10	
2N1099	5	150	100	80	70	15	35	70	5	10	
2N1162	3	90	100	BV _{CBO}	50	35	25	15	65	25	4
2N1163	4	90	100		50	35	25	15	65	25	4
2N1164	3	90	100	80	60	25	15	65	25	4	25-AMP INDUSTRIAL POWER TRANSISTORS
2N1165	4	90	100	80	60	25	15	65	25	4	
2N1166	3	90	100	100	75	25	15	65	25	4	
2N1167	4	90	100	100	75	25	15	65	25	4	
2N1529A	1	90	100	40	30	5	20	40	3	10	
2N1530A	1	90	100	60	45	5	20	40	3	10	
2N1531A	1	90	100	80	60	5	20	40	3	10	
2N1532A	1	90	100	100	75	5	20	40	3	10	"MEG-A-LIFE" INDUSTRIAL POWER TRANSISTORS
2N1534A	1	90	100	40	30	5	35	70	3	8.5	
2N1535A	1	90	100	60	45	5	35	70	3	8.5	
2N1536A	1	90	100	80	60	5	35	70	3	8.5	
2N1537A	1	90	100	100	75	5	35	70	3	8.5	
2N1539A	3	90	100	40	30	5	50	100	3	4	
2N1540A	3	90	100	60	45	5	50	100	3	4	
2N1541A	3	90	100	80	60	5	50	100	3	4	
2N1542A	3	90	100	100	75	5	50	100	3	4	
2N1544A	3	90	100	40	30	5	75	15	3	4	
2N1545A	3	90	100	60	45	5	75	150	3	4	(5-AMP)
2N1546A	3	90	100	80	60	5	75	150	3	4	
2N1547A	3	90	100	100	75	5	75	150	3	4	
2N1549A	3	90	100	40	30	15	10	30	10	10	
2N1550A	3	90	100	60	45	15	10	30	10	10	
2N1551A	3	90	100	80	60	15	10	30	10	10	(15-AMP)
2N1552A	3	90	100	100	75	15	10	30	10	10	
2N1553A	3	90	100	40	30	15	30	60	10	6	
2N1554A	3	90	100	60	45	15	30	60	10	6	
2N1555A	3	90	100	80	60	15	30	60	10	6	
2N1556A	3	90	100	100	75	15	30	60	10	6	(25-AMP)
2N1557A	3	90	100	40	30	15	50	100	10	5	
2N1558A	3	90	100	60	45	15	50	100	10	5	
2N1559A	3	90	100	80	60	15	50	100	10	5	
2N1560A	3	90	100	100	75	15	50	100	10	5	
2N1162A	3	90	100	50	35	25	15	65	25	4	MILITARY TYPES
2N1163A	4	90	100	50	35	25	15	65	25	4	
2N1164A	3	90	100	80	60	25	15	65	25	4	
2N1165A	4	90	100	80	60	25	15	65	25	4	
2N1166A	3	90	100	100	75	25	15	65	25	4	
2N1167A	4	90	100	100	75	25	15	65	25	4	
JAN2N174	6	150	100	80	70	15	25	50	5	100*	
USA2N297A	1	90	100	80	50	3	40	100	0.5	5	*f _{ab}
USA2N1011	1	90	100	80	80	5	30	75	3	5	
USA2N1120	3	90	100	80	70	15	20	50	10	5	
USA2N1358	5	150	100	80	70	15	25	50	5	100*	
USN2N1412	5	150	100	100	80	15	25	50	5	—	

SEE PAGE 10 FOR OUTLINE DRAWINGS

In most cases power transistors in the TO-3 package will have the new low silhouette case.

14 TYPES OFFERED
IN "DOORKNOB"
TO-36 CASE

- 15 AMPS - 150 WATTS
- 40 to 100 VOLTS
- REQUIRES 30% LESS HEADROOM THAN OTHER TO-36 PACKAGES
- 43% LESS THERMAL RESISTANCE (0.5°C/W)
- IMPROVED COLD WELD
- 100°C JUNCTION TEMPERATURE



FOR COMPLETE
TECHNICAL INFORMATION . . .

on specific devices, write to
your nearest Motorola
Semiconductor District Office
or to Motorola Semiconductor
Products Inc., Technical
Information Center,
5005 E. McDowell,
Phoenix, Arizona.

MILITARY
TYPES

*f_{ab}



MOTOROLA MILLIWATT TRANSISTORS

The rugged proven-design "quad-mount" structure provides outstanding mechanical stability for Motorola Milliwatt Transistors in industrial audio and switching applications. A 125°C vacuum bake assures reliability.

Motorola Milliwatt Transistors are available under the Motorola "Meg-A-Life" quality assurance program. Units are subjected to exhaustive military-type electrical, environmental, mechanical, and high-temperature storage tests.

	MAXIMUM RATINGS								Electrical Characteristics			
	Type	Case	P _c mW	T _j °C	BV _{CBO} volts	BV _{CER} (R = 10k) volts	I _c mA	h _{FE} (V _{CE} = 6V, I _c = 1 mA)			f _{ab} mc typ	
								min	typ	max		
TO-5 INDUSTRIAL MILLIWATT TRANSISTORS	2N331	31	200	100	30	V _{EB} = 12	200	30	50	70	1.5	
	2N398	31	50	85	105	V _{pt} — 105	100	20*	65*	—	1.0	
	2N398A	31	150	100	105	V _{pt} — 105	200	20*	65*	—	1.0	
	2N464	31	200	100	45	40	100	14	26	—	0.7	
	2N465	31	200	100	45	30	100	27	45	—	0.8	
	2N466	31	200	100	35	20	100	56	90	—	1.0	
	2N467	31	200	100	35	15	100	112	180	—	1.2	
	2N650	31	200	100	45	30	500	30	49	70	1.5	
	2N651	31	200	100	45	30	500	50	80	120	2.0	
	2N652	31	200	100	45	30	500	100	130	225	2.5	
	2N653	31	200	100	30	25	250	30	49	70	1.5	
	2N654	31	200	100	30	25	250	50	80	125	2.0	
	2N655	31	200	100	30	25	250	100	130	250	2.5	
	2N1185	31	200	100	45	30	500	190	260	400	3.0	
	2N1186	31	200	100	60	45	500	30	49	70	1.5	
	2N1187	31	200	100	60	45	500	50	80	120	2.0	
	2N1188	31	200	100	60	45	500	100	130	225	2.5	
	2N1191	31	200	100	40	25	200	30	40	70	1.5	
	2N1192	31	200	100	40	25	200	50	75	125	2.0	
	2N1193	31	200	100	40	25	200	100	160	250	2.5	
	2N1194	31	200	100	40	25	200	190	280	500	3.0	
TO-5 "MEG-A-LIFE" MILLIWATT TRANSISTORS	2N650A	31	200	100	45	30	500	30	49	70	1.5	
	2N651A	31	200	100	45	30	500	50	80	120	2.0	
	2N652A	31	200	100	45	30	500	100	130	225	2.5	
MILITARY TYPES	JAN2N331	31	200	100	30	V _{EB} = 12	200	30	50	70	1.5	
	USAF2N461	31	200	100	45	35 (R = 1K)	100	0.968**	—	0.985**	0.7	
	USA2N465	31	200	100	40	40	100	27	45	66	0.8	
	JAN2N466	31	200	100	35	35	100	54	90	130	1.0	
	USA2N467	31	200	100	35	35	100	110	180	260	1.2	

SEE PAGE 10 FOR OUTLINE DRAWINGS

THE MOTOROLA "MEG-A-LIFE"® RELIABILITY PROGRAM

To provide advance assurance of component reliability, Motorola now offers industrial Power and Milliwatt transistors under its "Meg-A-Life" quality assurance program. With proven design and excellent process control, the final step is to verify the reliability of the semiconductor component to the user. Under the Motorola "Meg-A-Life" reliability program, quality assurance engineers subject each production lot of units to exhaustive military-type electrical, environmental, mechanical, and life tests.

Motorola offers a certificate available to the purchaser of 100 or more "Meg-A-Life" units that guarantees that the production lot from which the units were taken has met all of the published specifications. A copy of the life test results is available for the user's Quality Control Department. All tests under the Motorola "Meg-A-Life" program are conducted in accordance with MIL-S-19500 (general military specification for transistors), with sampling based upon MIL-STD-105.

* "Meg-A-Life" a Motorola trademark.

MOTOROLA REFERENCE DIODES



ELECTRICAL CHARACTERISTICS					
Type	Case	Voltage Range @ 7.5 mA (25°C Ambient) Volts	Voltage-Temperature Coefficient %/°C	Temperature Range °C	Maximum Dynamic Impedance* Ohms
1N821	51	5.9 — 6.5	0.01	-55 to +100	15
1N821A	51	5.9 — 6.5	0.01	-55 to +100	10
1N823	51	5.9 — 6.5	0.005	-55 to +100	15
1N823A	51	5.9 — 6.5	0.005	-55 to +100	10
1N825	51	5.9 — 6.5	0.002	-55 to +100	15
1N825A	51	5.9 — 6.5	0.002	-55 to +100	10
1N827	51	5.9 — 6.5	0.001	-55 to +100	15
1N827A	51	5.9 — 6.5	0.001	-55 to +100	10
@ 10 mA					
1N3154	51	8.0 — 8.8	0.01	-55 to +100	15
1N3154A	51	8.0 — 8.8	0.01	-55 to +150	15
1N3155	51	8.0 — 8.8	0.005	-55 to +100	15
1N3155A	51	8.0 — 8.8	0.005	-55 to +150	15
1N3156	51	8.0 — 8.8	0.002	-55 to +100	15
1N3156A	51	8.0 — 8.8	0.002	-55 to +150	15
1N3157	51	8.0 — 8.8	0.001	-55 to +100	15
@ 7.5 mA					
1N935	51	8.55 — 9.45	0.01	0 to +75	20
1N935A	51	8.55 — 9.45	0.01	-55 to +100	20
1N935B	51	8.55 — 9.45	0.01	-55 to +150	20
1N936	51	8.55 — 9.45	0.005	0 to +75	20
1N936A	51	8.55 — 9.45	0.005	-55 to +100	20
1N936B	51	8.55 — 9.45	0.005	-55 to +150	20
1N937	51	8.55 — 9.45	0.002	0 to +75	20
1N937A	51	8.55 — 9.45	0.002	-55 to +100	20
1N937B	51	8.55 — 9.45	0.002	-55 to +150	20
1N938	51	8.55 — 9.45	0.001	0 to +75	20
1N938A	51	8.55 — 9.45	0.001	-55 to +100	20
1N938B	51	8.55 — 9.45	0.001	-55 to +150	20
1N939	51	8.55 — 9.45	0.0005	0 to +75	20
1N939A	51	8.55 — 9.45	0.0005	-55 to +100	20
1N939B	51	8.55 — 9.45	0.0005	-55 to +150	20
@ 10 mA					
1N2620	52	8.9 — 9.7	0.01	0 to +75	15
1N2620A	52	8.9 — 9.7	0.01	-55 to +100	15
1N2620B	52	8.9 — 9.7	0.01	-55 to +150	15
1N2621	52	8.9 — 9.7	0.005	0 to +75	15
1N2621A	52	8.9 — 9.7	0.005	-55 to +100	15
1N2621B	52	8.9 — 9.7	0.005	-55 to +150	15
1N2622	52	8.9 — 9.7	0.002	0 to +75	15
1N2622A	52	8.9 — 9.7	0.002	-55 to +100	15
1N2622B	52	8.9 — 9.7	0.002	-55 to +150	15
1N2623	52	8.9 — 9.7	0.001	0 to +75	15
1N2623A	52	8.9 — 9.7	0.001	-55 to +100	15
1N2623B	52	8.9 — 9.7	0.001	-55 to +150	15
1N2624	52	8.9 — 9.7	0.0005	0 to +75	15
1N2624A	52	8.9 — 9.7	0.0005	-55 to +100	15
1N2624B	52	8.9 — 9.7	0.0005	-55 to +150	15
@ 7.5 mA					
1N941	51	11.12 — 12.28	0.01	0 to +75	30
1N941A	51	11.12 — 12.28	0.01	-55 to +100	30
1N941B	51	11.12 — 12.28	0.01	-55 to +150	30
1N942	51	11.12 — 12.28	0.005	0 to +75	30
1N942A	51	11.12 — 12.28	0.005	-55 to +100	30
1N942B	51	11.12 — 12.28	0.005	-55 to +150	30
1N943	51	11.12 — 12.28	0.002	0 to +75	30
1N943A	51	11.12 — 12.28	0.002	-55 to +100	30
1N943B	51	11.12 — 12.28	0.002	-55 to +150	30
1N944	51	11.12 — 12.28	0.001	0 to +75	30
1N944A	51	11.12 — 12.28	0.001	-55 to +100	30
1N944B	51	11.12 — 12.28	0.001	-55 to +150	30
1N945	51	11.12 — 12.28	0.0005	0 to +75	30
1N945A	51	11.12 — 12.28	0.0005	-55 to +100	30
1N945B	51	11.12 — 12.28	0.0005	-55 to +150	30

*The maximum dynamic zener impedance is derived from the 60-cycle AC voltage which results when an AC current having an rms value equal to 10% of the DC zener current ($I_{z(t)}$) is superimposed on $I_{z(t)}$.

SEE PAGE 10 FOR OUTLINE DRAWINGS

SUBMINIATURE 6.2 VOLT REFERENCE DIODES (400mW)

SUBMINIATURE 8.4 VOLT REFERENCE DIODES (400mW)

SUBMINIATURE 9.0 VOLT REFERENCE DIODES (1/2 WATT)

MINIATURE 9.3 VOLT REFERENCE DIODES (3/4 WATT)

SUBMINIATURE 11.7 VOLT REFERENCE DIODES (1/2 WATT)

Ultra-low dynamic impedance, plus temperature coefficients as low as 0.0005% / °C, and temperature ranges as wide as -55°C to +150°C, make Motorola temperature-compensated reference diodes extremely stable voltage reference sources for the most critical applications.

Each of these hermetically-sealed, precision-constructed silicon diodes is designed for high-reliability service under the most exacting mechanical and environmental operating conditions . . . and each is thoroughly performance-tested prior to shipment.

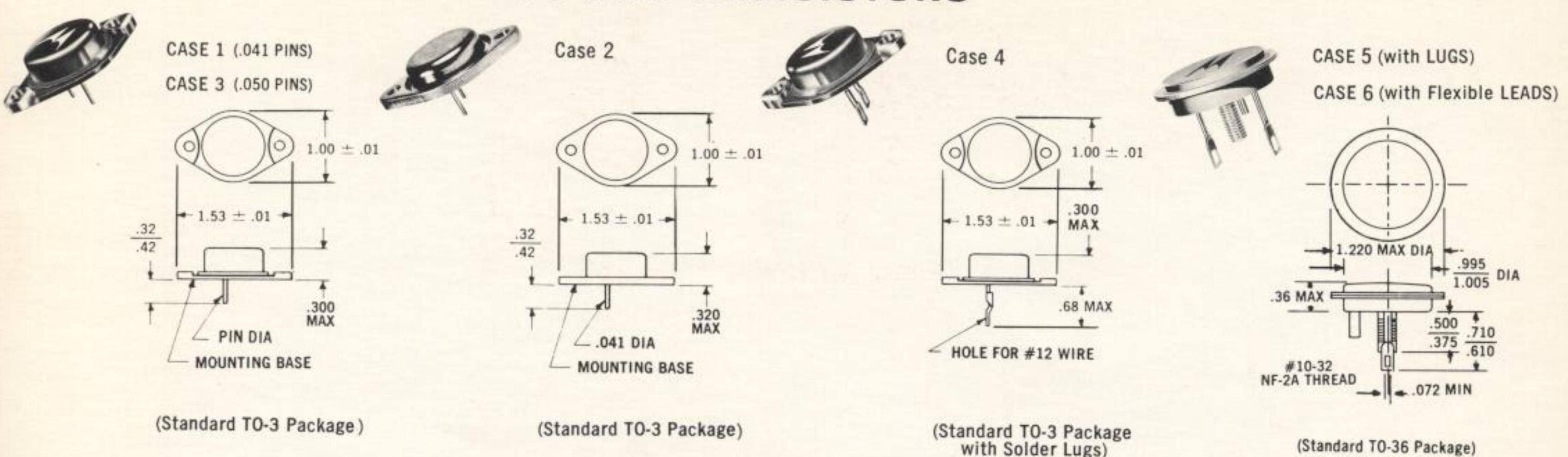


FOR COMPLETE TECHNICAL INFORMATION . . . on specific devices, write to your nearest Motorola Semiconductor District Office or to Motorola Semiconductor Products Inc., Technical Information Center, 5005 E. McDowell, Phoenix, Arizona.

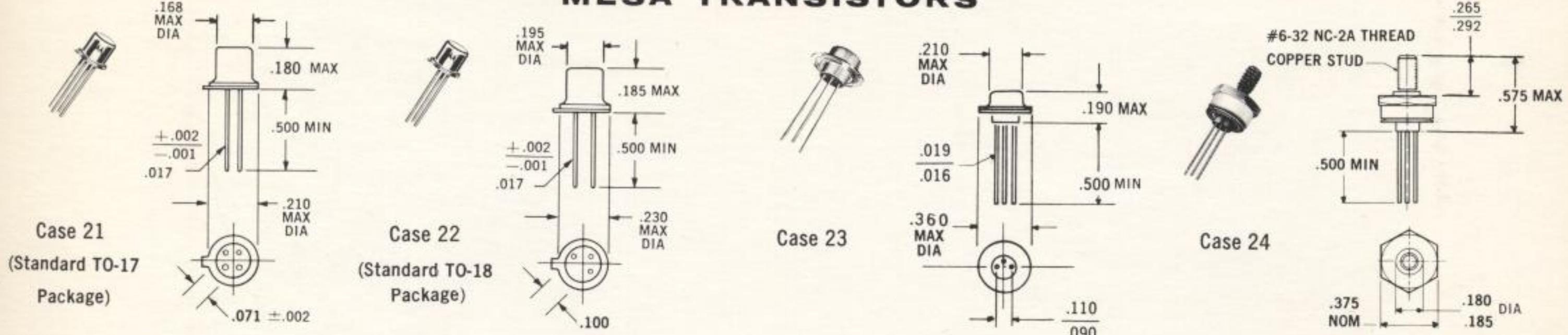
MOTOROLA DEVICE OUTLINE DIMENSIONS

ALL DIMENSIONS ARE IN INCHES - SEE DATA SHEETS FOR COMPLETE OUTLINE DIMENSIONS

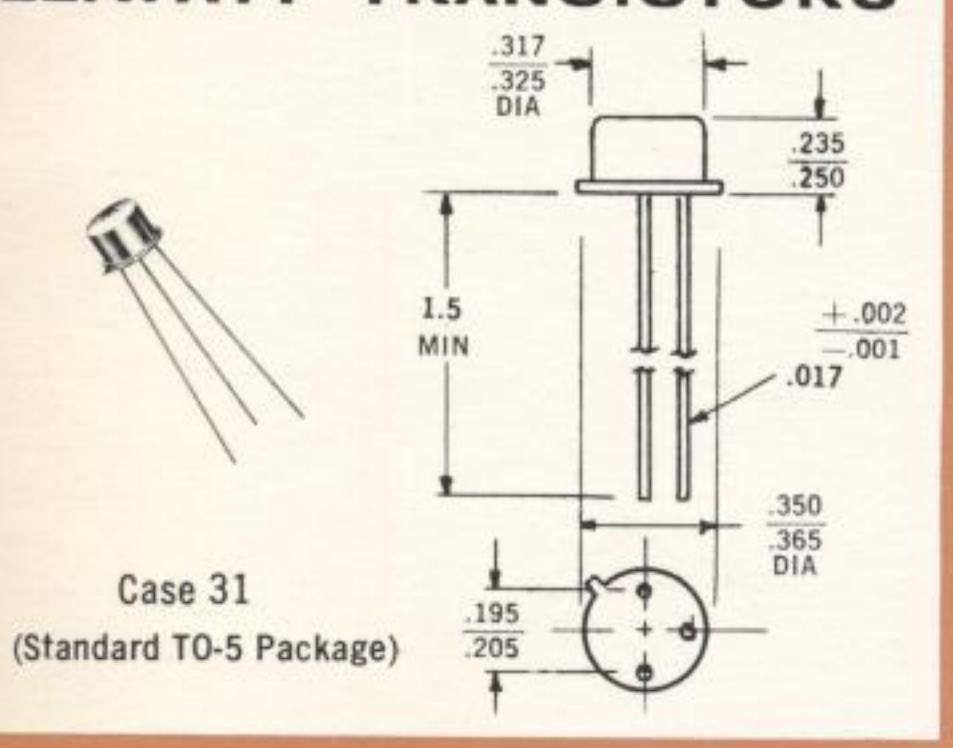
POWER TRANSISTORS



MESA TRANSISTORS

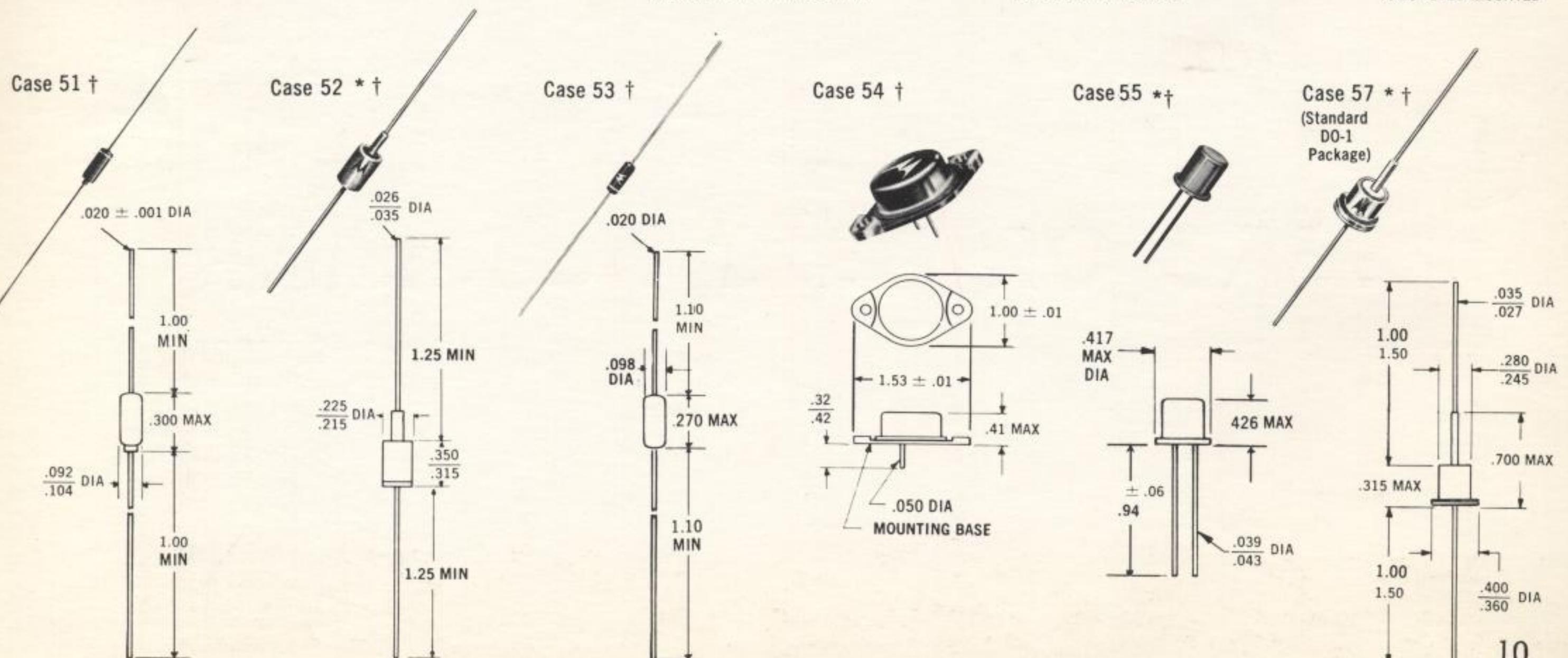
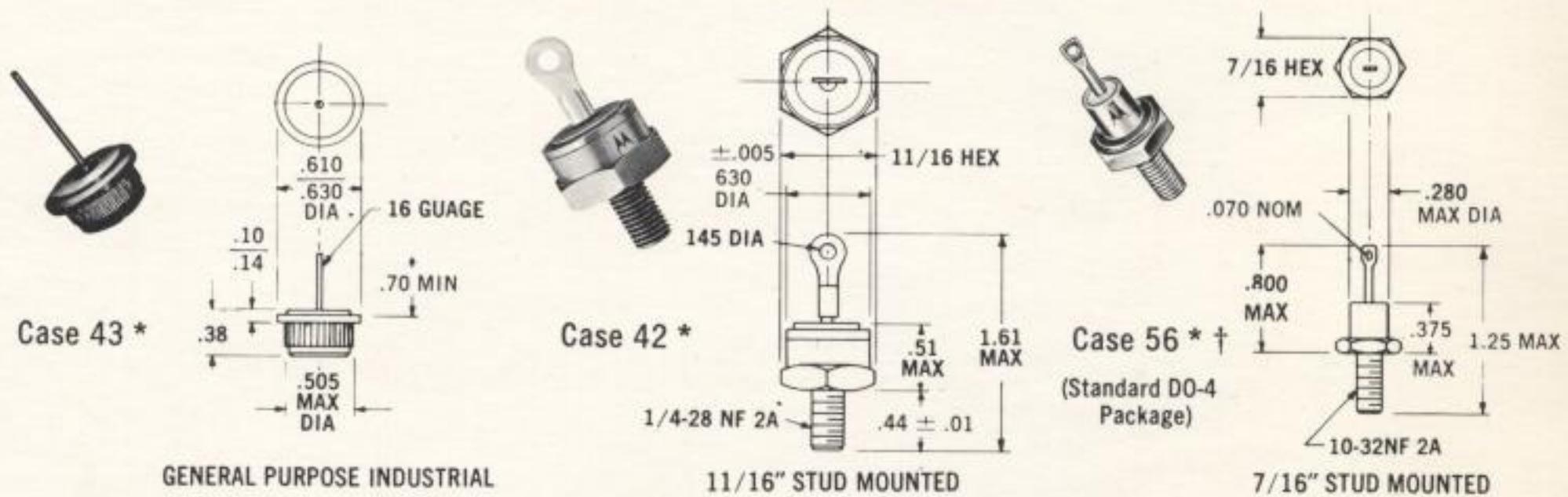


MILLIWATT TRANSISTORS



SILICON RECTIFIERS *

& ZENER DIODES †



MOTOROLA **MIL TYPE**

SEMICONDUCTORS

Motorola currently offers military-type semiconductors from all product categories, including transistors, rectifiers, and zener diodes . . . added proof of the quality and reliability inherent in all Motorola devices for both the Industrial and the Military user.

POWER TRANSISTORS

2N174 (JAN)	MIL-T-19500/13A
2N297A (SIG. C)	MIL-T-19500A/36
2N1011 (SIG. C)	MIL-T-19500A/67
2N1120 (SIG. C)	MIL-T-19500/68
2N1358 (SIG. C)	MIL-S-19500/122

MILLIWATT TRANSISTORS

2N331 (JAN)	MIL-T-19500/4A
2N461 (USAF)	MIL-T-19500/45
2N465 (SIG. C)	MIL-T-19500/50A
2N466 (JAN)	MIL-S-19500/51B
2N467 (SIG. C)	MIL-T-19500/52B

MESA TRANSISTORS

2N700A (SIG. C)	MIL-S-19500/123
2N705 (USN)	MIL-S-19500/86

SILICON RECTIFIERS

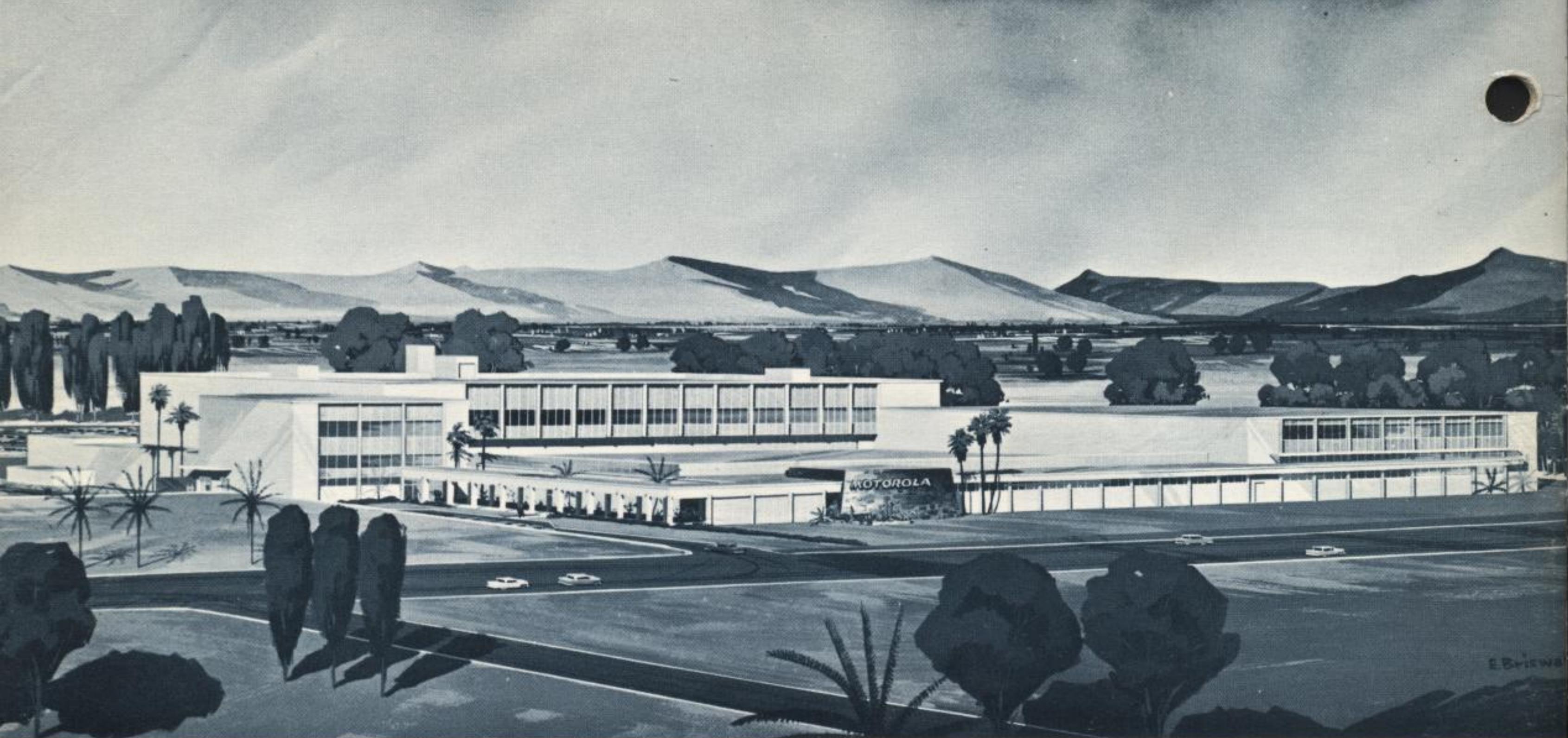
1N253 (JAN)	MIL-E-1/1024A
1N254 (JAN)	MIL-E-1/989B
1N255 (JAN)	MIL-E-1/990B
1N256 (JAN)	MIL-E-1/991B
1N538 (JAN)	MIL-E-1/1084A
1N540 (JAN)	MIL-E-1/1085A
1N547 (JAN)	MIL-E-1/1083A

SILICON ZENER DIODES*

MIL-S-19500B/124 (SIG. C) ($\pm 5\%$ Series)

1N2970B *	1N2985B	1N3001B
1N2971B	1N2986B	1N3002B
1N2972B	1N2988B	1N3003B
1N2973B	1N2989B	1N3004B
1N2974B	1N2990B	1N3005B
1N2975B	1N2991B	1N3007B
1N2976B	1N2992B	1N3008B
1N2977B	1N2993B	1N3009B
1N2979B	1N2995B	1N3011B
1N2980B	1N2997B	1N3012B
1N2982B	1N2999B	1N3014B
1N2984B	1N3000B	1N3015B

*Reverse polarities (suffix RB) are available in all zener diodes listed.
These also meet MIL-S-19500B/124.



MOTOROLA SEMICONDUCTORS

At Motorola's Semiconductor Products Division some of the world's top scientists and engineers are engaged in continuous research and development programs to make reliable semiconductor components a byword at Motorola.

The modern Motorola semiconductor center in Phoenix, Arizona, was one of the first to be designed and constructed for the complex processes involved in the manufacturing of high-quality semiconductor devices. Advanced equipment, much of which has been designed by Motorola engineers, places the production, development, and basic research areas among the world's finest.

Reliability is designed into Motorola semiconductor components from the very beginning. With its original concept of reliable components, Motorola has produced millions of dependable, performance-proven semiconductors.

**FOR IMMEDIATE DELIVERY
WRITE OR CALL**

HAMILTON ELECTRO SALES

11965 Santa Monica Blvd.

Los Angeles 25, California

BRadshaw 2-9154

YOUR AUTHORIZED MOTOROLA SEMICONDUCTOR DISTRIBUTOR