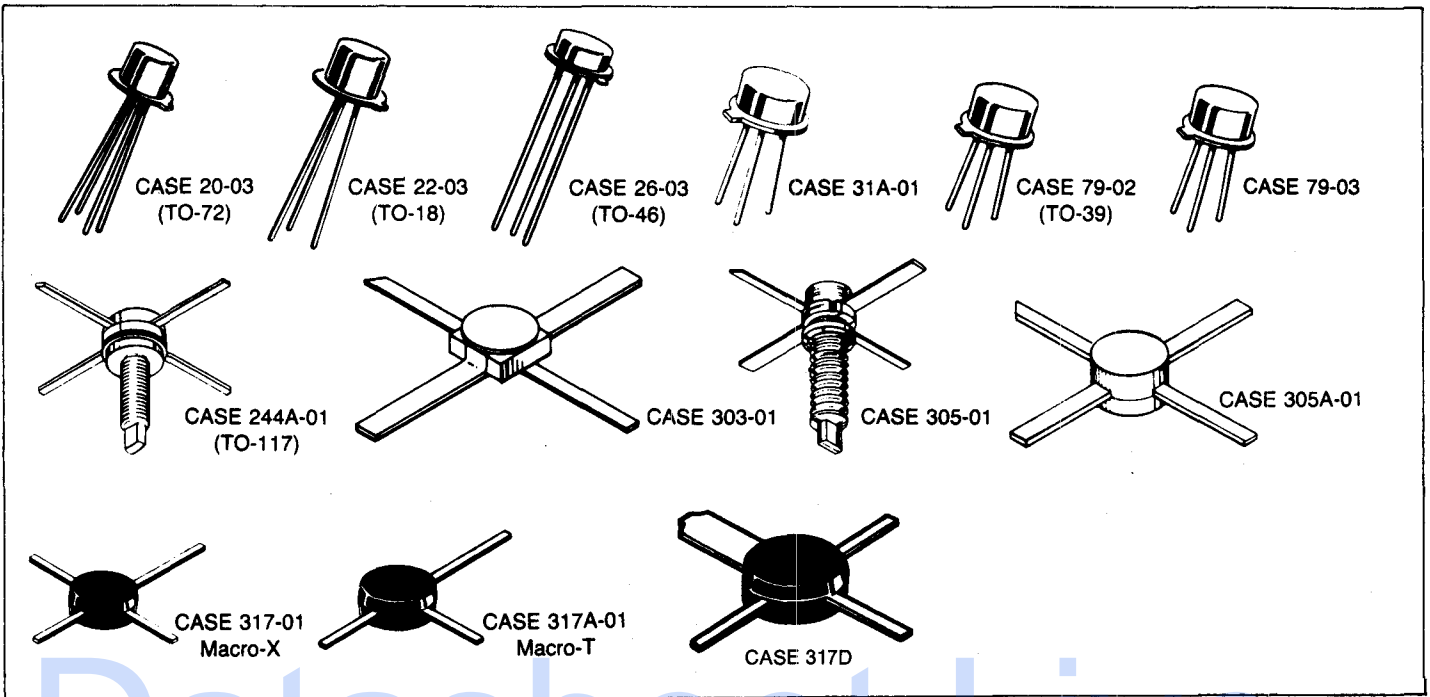


# RF Small-Signal Transistors

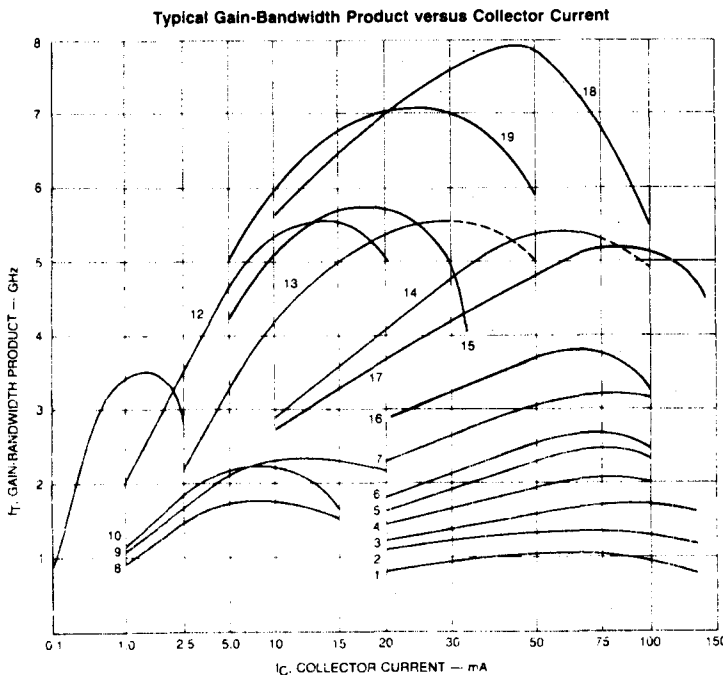
3



Motorola's small-signal, low power RF transistor product range includes transistors with gain-bandwidths of 1.0 GHz to 8.0 GHz operating at currents of 0.25 mA to over 140 mA.

These devices are available in a wide variety of package types; metal can, plastic Macro-X and Macro-T, hermetic ceramic and microminiature. Most of these transistors are fully

characterized with y or s parameters; and in addition, there are non-saturated switching characteristics, low power driver specifications, and noise figure limits. QPL types with JAN, JTX and JTXV processing levels are available as well as Hi Rel processing to meet unique customer requirements.



## RF Small-Signal Transistors

Motorola small-signal and medium power RF transistors with gain-bandwidth products from 1.0 GHz to 8.0 GHz operate with currents from 0.25 mA to over 140 mA. The following chart, combined with the tables of package options, enables the circuit designer to select the optimum device from Motorola's wide range of transistor/package combinations.

- |  |                                   |
|--|-----------------------------------|
| 1 2N3866, 2N3866A                        | 10 2N4957, 2N4958, 2N4959, PNP    |
| 2 2N5160, MM4018, PNP                    | 12 2N6603, BFR90, MRF901, MRF904  |
| 3 2N3948, 2N4427, MRF207                 | 13 2N6604, BFR91, MRF911, MRF914  |
| 4 2N5109, 2N5943                         | 14 BFR96, MRF961, MRF962, MRF965  |
| 5 2N5583, PNP                            | 15 BFW92A                         |
| 6 2N5836, 2N5837                         | 16 MRF559                         |
| 7 MRF511, MRF517, MRF525                 | 17 MRF580, MRF581, MRF586, MRF587 |
| 8 2N2857, 2N3939, 2N5179, MRF501, MRF502 | 18 MRF571, MRF572                 |
| 9 BFX89, BFY90                           | 19 MRF536, MRF534, MM4049, PNP    |

## RF SMALL-SIGNAL TRANSISTORS (continued)

### UHF and Microwave Oscillators

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

3

Device Type	Test Conditions		P <sub>out</sub> mW Min	f <sub>T</sub> MHz Typ	Package
	f MHz	V <sub>CC</sub> Volts			
2N5179	500	10	20	1800	TO-72
2N2857	500	10	30	1800	TO-72
2N3839	500	6.0	30	1800	TO-72
MM8009	1680	20	200	1400	TO-39
2N5108	1680	20	300	1400	TO-39
2N3866	400	15	1000	1000	TO-39

\*Typical

### Low-Noise Transistors

The low-noise devices listed are produced with carefully controlled  $r_b'$  and  $f_T$  to optimize device noise performance. Devices listed in the matrix are classified according to noise figure performance versus frequency.

NF dB	Frequency MHz						Polarity
	60	100	200	450	1000	2000	
1.5	2N5829 2N5031	2N5829 2N5031	MRF904	MRF571	MRF572/MRF2369		PNP NPN
2.0	2N4957	2N4957	2N5829 2N5031	MRF904	MRF901		PNP NPN
2.5	2N4958	2N4958	2N4957 2N5032	2N5829 2N5031	MRF901 2N6603	MRF572	PNP NPN NPN
3.0	2N4959 2N2857	2N4959 2N2857	2N4958	2N4957	2N5829 MRF901 2N6604	2N6603	PNP NPN NPN
3.5	2N4959 2N5179	2N4959 2N5179	2N4959 2N2857	2N4958 2N5032	2N4957 2N5031	MRF901	PNP NPN
4.0	2N4959 2N5179	2N4959 2N5179	2N4959 2N5179	2N4959 2N2857	2N4958 2N5031	2N6604	PNP NPN
4.5	2N4959 2N5179	2N4959 2N5179	2N4959 2N5179	2N4959 2N2857	2N4959 2N5032		PNP NPN

## RF SMALL-SIGNAL TRANSISTORS (continued)

### CATV, MATV, and Class A Linear Transistors

The devices listed below are excellent for Class A linear CATV/MATV applications and are listed according to increasing gain-bandwidth ( $f_T$ ). More information concerning the device for your specific linear design needs can be obtained through your local Motorola Sales Office or Motorola distributor.

3

Device Type	Nominal Test Conditions $V_{CE}/I_C$ Volts/mA	$f_T$ MHz Min	Noise Figure	Distortion Specifications				Package
			Max/Freq. dB/MHz	2nd Order IMD	3rd Order IMD	12 Ch. Cross- Mod.	Output Level dBmV	
MRF501	6/5	600	4.5*/200					TO-72
MRF502	6/5	800	4.0*/200					TO-72
2N5179	6/5	900	4.5/200					TO-72
BFY90	5/2	1000	5.0/500					TO-72
BFX89	5/25	1200	6.5/500					TO-72
2N5109	15/50	1200	3.0*/200					TO-39
2N5943	15/50	1200	3.4/200	-50		-42	+50	TO-39
MRF511	20/80	1500	7.3*/200	-50	-65	-57	+50	244A-01
MRF517	15/60	2200	7.5/300	-60	-72	-57	+45	TO-39
BFW92A	5/2	4500*	3.0*/500					317A-01
MRF586	14/70	4500*	3.0/500	-50	-72		+50	TO-39
BFR90	10/14	5000*	2.4*/500					317A-01
BFR91	5/35	5000*	1.9*/500					317A-01
BFR96	10/50	5000*	3.0*/500					317A-01
MRF961	10/50	5000*	2.0*/500					317-01
MRF962	10/50	5000*	2.0*/500					303-01
MRF965	10/50	5000*	2.0*/500					TO-46
MRF581	10/75	5000*	3.0/500		-65		+50	317-01
MRF587	14/70	5500*	3.0/500	-52	-72		+50	244A-01

\*Typ

### High-Speed Switches

The transistors listed below are for use as high-frequency current-mode switches. They are also suitable for RF amplifier and oscillator applications. The devices are listed in ascending order of collector current.

Device Type	Test Conditions $I_C/V_{CE}$ mA/Volts	$f_T$ MHz Min	$r_b' C_C$ Max	Package
2N3959	10/10	1300	25	TO-18
2N3960	10/10	1600	40	TO-18
2N5835	10/6.0	2500	5.0**	TO-72
MM4049*	20/5.0	4000	15	TO-72
MRF914	20/10	4500**	—	TO-72
2N5943	50/15	1200	5.5**	TO-39
2N5583*	50/10	1000	8.0**	TO-39
2N5836	50/6.0	2000	6.0**	TO-46
2N5837	100/3.0	1700	6.0**	TO-46

\*PNP \*\*Typ

## RF SMALL-SIGNAL TRANSISTORS (continued)

### TO-72 METAL CAN

Device Type	Gain — BW		Noise Figure			Gain		Maximum Ratings		
	f <sub>T</sub> GHz	I <sub>C</sub> mA	NF dB	f MHz	I <sub>C</sub> mA	dB Min	f MHz	V <sub>(BR)CEO</sub> V	I <sub>C</sub> mA	P <sub>T</sub> mW
2N5031	1.0	5.0	2.5	450	1.0	14	450	10	20	200
2N4958*	1.0	2.0	3.3	450	2.0	16	450	30	30	200
2N4959*	1.0	2.0	3.8	450	2.0	15	450	30	30	200
2N5829*	1.2	2.0	2.5	450	2.0	17	450	30	30	200
2N4957*	1.2	2.0	3.0	450	2.0	17	450	30	30	200
MRF501	1.2	5.0	4.0	200	1.5	15**	200	15	50	200
MRF502	1.2	5.0	4.0	200	1.5	15**	200	15	50	200
BFX89	1.2	25	6.5	500	2.0	19	200	15	50	200
BFY90	1.4	25	5.0	500	2.0	21	200	15	50	200
2N5179	1.4	10	4.5	200	1.5	15	200	12	50	200
2N2857	1.6	8.0	4.1	450	1.5	12.5	450	15	40	200
MRF904	4.0	15	1.5	450	5.0	16	450	15	30	200
MRF914	4.5	20	2.0	500	5.0	15	500	12	40	200

\*PNP

\*\*Typ

### HIGH VOLTAGE RF DEVICES

The devices listed below are designed for high voltage, high f<sub>T</sub> applications similar to those in medium and high resolution colour video display monitors.

Device Type	V <sub>(BR)CBO</sub> V	Gain — BW		Case Outline
		f <sub>T</sub> GHz	I <sub>C</sub> mA	
MRF544	120	1.4	400	TO-39
MRF545*	100	1.2	400	TO-39
MRF542	120	1.4	400	317D-01
MRF543*	100	1.2	400	317D-01

\*PNP