

Table 22.33

Power FETs or MOSFETs

Device	Type	VDSS min (V)	RDS(on) max (Ω)	ID max (A)	PD max (W)	Case†	Mfr
BS250P	P-channel	45	14	0.23	0.7	E-line	Z
IRFZ30	N-channel	50	0.050	30	75	TO-220	IR
MTP50N05E	N-channel	50	0.028	25	150	TO-220AB	M
IRFZ42	N-channel	50	0.035	50	150	TO-220	IR
2N7000	N-channel	60	5	0.20	0.4	E-line	Z
VN10LP	N-channel	60	7.5	0.27	0.625	E-line	Z
VN10KM	N-channel	60	5	0.3	1	TO-237	S
ZVN2106B	N-channel	60	2	1.2	5	TO-39	Z
IRF511	N-channel	60	0.6	2.5	20	TO-220AB	M
MTP2955E	P-channel	60	0.3	6	25	TO-220AB	M
IRF531	N-channel	60	0.180	14	75	TO-220AB	M
MTP23P06	P-channel	60	0.12	11.5	125	TO-220AB	M
IRFZ44	N-channel	60	0.028	50	150	TO-220	IR
IRF531	N-channel	80	0.160	14	79	TO-220	IR
ZVP3310A	P-channel	100	20	0.14	0.625	E-line	Z
ZVN2110B	N-channel	100	4	0.85	5	TO-39	Z
ZVP3310B	P-channel	100	20	0.3	5	TO-39	Z
IRF510	N-channel	100	0.6	2	20	TO-220AB	M
IRF520	N-channel	100	0.27	5	40	TO-220AB	M
IRF150	N-channel	100	0.055	40	150	TO-204AE	M
IRFP150	N-channel	100	0.055	40	180	TO-247	IR
ZVP1320A	P-channel	200	80	0.02	0.625	E-line	Z
ZVN0120B	N-channel	200	16	0.42	5	TO-39	Z
ZVP1320B	P-channel	200	80	0.1	5	TO-39	Z
IRF620	N-channel	200	0.800	5	40	TO-220AB	M
MTP6P20E	P-channel	200	1	3	75	TO-220AB	M
IRF220	N-channel	200	0.400	8	75	TO-220AB	M
IRF640	N-channel	200	0.18	10	125	TO-220AB	M

Manufacturers: IR = International Rectifier; M = Motorola; S = Siliconix; Z = Zetex.

†For package shape, size and pin-connection information, see manufacturers' data sheets. Many retail suppliers offer data sheets to buyers free of charge on request. Data books are available from many manufacturers and retailers.

Table 22.34

RF Power Transistors

Device	Output Power (W)	Input Power (W)	Gain (dB)	Typ Supply Voltage (V)	Case	Mfr	Device	Power (W)	Output Power (W)	Input Gain (dB)	Voltage (V)	Case	Mfr
1.5 to 30 MHz, HF SSB/CW							MRF421	100	10	10	12.5-13.6	211-11/1	MO
2SC2086	0.3		13	1.2	TO-92	MI	SD1487	100	7.9	11	12.5	M174	ST
BLV10	1		18	1.2	SOT123	PH	2SC2904	100		11.5	12.5	T-40E	MI
BLV11	2		18	12	SOT123	PH	SD1729	130	8.2	12	28	M174	ST
MRF476	3	0.1	15	12.5-13.6	221A-04/1	MO	MRF422	150	15	10	28	211-11/1	MO
BLW87	6		18	1.2	SOT123	PH	MRF428	150	7.5	13	50	211-11/1	MO
2SC2166	6		13.8	1.2	TO-220	MI	SD1726	150	6	14	50	M174	ST
BLW83	1.0		20	26	SOT123	PH	PT9790	150	4.8	15	50	211-11/1	MO
MRF475	1.2	1.2	10	12.5-13.6	221A-04/1	MO	MRF448	250	15.7	12	50	211-11/1	MO
MRF433	12.5	0.125	20	12.5-13.6	211-07/1	MO	MRF430	600	60	10	50	368-02/1	MO
2SC3133	1.3		14	1.2	TO-220	MI	50 MHz						
MRF485	1.5	1.5	10	28	221 A-04/1	MO	MRF475	4	0.4	10	12.5-13.6	221A-04/1	MO
2SC1969	1.6		1.2	1.2	TO-220	MI	MRF497	40	4	10	12.5-13.6	221A-04/2	MO
BLW50F	1.6		19.5	45	SOT123	PH	SD1446	70	7	10	12.5	M113	ST
MRF406	20	1.25	12	12.5-13.6	221-07/1	MO	MRF492	70	5.6	11	12.5-13.6	211-11/1	MO
SD1285	20	0.65	15	12.5	M113	ST	SD1405	100	20	7	12.5	M174	ST
MRF426	25	0.16	22	28	211-07/1	MO	VHF to 175 MHz						
MRF427	25	0.4	18	50	211-11/1	MO	2N4427	0.7		8	7.5	TO-39	PH
MRF477	40	1.25	15	12.5-13.6	211-11/1	MO	2N3866	1		10	28	TO-39	PH
MRF466	40	1.25	15	28	211-07/1	MO	BFQ42	1.5		8.4	7.5	TO-39	PH
BLW96	50		1.9	40	SOT121	PH	2SC2056	1.6		9	7.2	T-41	MI
2SC3241	75		12.3	12.5	T-45E	MI	2N3553	2.5	0.25	10	28	79-04/1	MO
SDI405	75	3.8	13	12.5	M174	ST	BF043	3		9.4	7.5	TO-39	PH
2SC2097	75		12.3	13.5	T-40E	MI	SD1012	4	0.25	12	12.5	M135	ST
MRF464	80	2.53	10	28	211-11/1	MO							

Table 22.34 continued

Device	Output Power (W)	Input Power (W)	Gain (dB)	Typ Supply Voltage (V)	Case	Mfr	Device	Output Power (W)	Input Power (W)	Gain (dB)	Typ Supply Voltage (V)	Case	Mfr
2SC2627	5		13	12.5	T-40	MI	BLW91	10		9	28	SOT122	PH
2N5641	7	1	8.4	28	144B-05/1	MO	MRF654	15	2.5	7.8	12.5	244-04/1	MO
MRF340	8	0.4	13	28	221A-04/2	MO	2SC3022	18	6	4.7	12.5	T-31 E	MI
BLW29	9		7.4	7.5	SOT120	PH	BLU20/12	20		6.5	12.5	SOT119	PH
SD1143	10	1	10	12.5	M135	ST	BLX94A	25		6	28	SOT48/2	PH
2SC1729	1.4		10	13.5	T-31 E	MI	2SC2695	28		4.9	13.5	T-31 E	MI
SD1014-02	15	3.5	6.3	12.5	M135	ST	BLU30/12	30		6	12.5	SOT119	PH
BLVII	15		8	13.5	SOT123	PH	BLU45/12	45		4.8	12.5	SOT119	PH
2N5642	20	3	8.2	28	145A-09/1	MO	2SC2905	45		4.8	12.5	T-40E	MI
MRF342	24	1.9	11	28	221A-04/2	MO	MRF650	50	15.8	5	12.5	316-01/1	MO
BLW87	25		6	13.5	SOT123	PH	TP5051	50	6	9	24	333A-02/2	MO
2SC1946	28		6.7	13.5	T-31 E	MI	BLU60/12	60		4.4	12.5	SOT119	PH
MRF314	30	3	10	28	211-07/1	MO	2SC3102	60	20	4.8	12.5	T-41 E	MI
SD1018	40	14	4.5	12.5	M135	ST	BLU60/28	60		7	28	SOT119	PH
2N5643	40	6.9	7.6	28	145A-09/1	MO	MRF658	65	25	4.15	12.5	316-01/1	MO
BLW40	40		10	12.5	SOT120	PH	MRF338	80	15	7.3	28	333-04/1	MO
MRF315	45	5.7	9	28	211-07/1	MO	SD1464	100	28.2	5.5	28	M168	ST
PT9733	50	10	7	28	145A-09/1	MO	UHF to 960 MHz						
MRF344	60	15	6	28	221A-04/2	MO	MRF581	0.6	0.06	10	12.5	317-01/2	MO
2SC2694	70		6.7	12.5	T-40	MI	MRF8372	0.75	0.11	8	12.5	751-04/1	MO
BLV75/12	75		6.5	12.5	SOT119	PH	MRF557	1.5	0.23	8	12.5	317D-02/2	MO
MRF316	80	8	10	28	316-01/1	MO	BLV99	2		9	24	SOT172	PH
SD1477	100	25	6	12.5	M111	ST	SD1420	2.1	0.27	9	24	M122	ST
BLW78	100		6	28	SOT121	PH	MRF839	3	0.46	8	12.5	305A-01/1	MO
MRF317	100	12.5	9	28	316-01/1	MO	MRF896	3	0.3	10	24	305-01/1	MO
TP9386	150	15	10	28	316-01/1	MO	MRF891	5	0.63	9	24	319-06/2	MO
220 MHz							2SC2932	6		7.8	12.5	T-31 B	MI
MRF207	1	0.15	8.2	12.5	79-04/1	MO	SD1398	6	0.6	10	24	M142	ST
2N5109	2.5		11	12	TO-205AD	MO	2SC2933	14	3	6.7	12.5	T-31 B	MI
MRF227	3	0.13	13.5	12.5	79-05/5	MO	SD1400-03	14	1.6	9.5	24	M118	ST
MRF208	1.0	1	10	12.5	145A-09/1	MO	MRF873	15	3	7	12.5	319-06/2	MO
MRF226	1.3	1.6	9	12.5	145A-09/1	MO	SD1495-03	30	6	7	24	M142	ST
2SC2133	30		8.2	28	T-40E	MI	SD1424	30	5.3	7.5	24	M156	ST
2SC2134	60		7	28	T-40E	MI	MRF897	30	3	10	24	395B-01/1	MO
2SC2609	100		6	28	T-40E	MI	MRF847	45	16	4.5	12.5	319-06/1	MO
UHF to 512 MHz							BLV101A	50		8.5	26	SOT273	PH
2N4427	0.4		10	12.5	TO-39	PH	SD1496-03	55	10	7.4	24	M142	ST
2SC3019	0.5		14	12.5	T-43	MI	MRF898	60	12	7	24	333A-02/1	MO
MRF581	0.6	0.03	13	12.5	317-01/2	MO	MRF880	90	12.7	8.5	26	375A-01/1	MO
2SC908	1		4	12.5	TO-39	MI	MRF899	150	24	8	26	375A-01/1	MO
2N3866	1		10	28	TO-39	PH	Manufacturer codes:						
2SC2131	1.4		6.7	13.5	TO-39	MI	MI = Mitsubishi; MO = Motorola; PH = Philips;						
BLX65E	2		9	12.5	TO-39	PH	ST = STMicroelectronics						
BLW89	2		12	28	SOT122	PH	There is a bewildering variety of package types, sizes and pin-out connections. (For example, for the 137 different transistors in this table there are 54 different packages.) See the data sheets on each manufacturer's Web pages for details.						
MRF586	2.5		16.5	1.5	79-04	MO	Mitsubishi: www.mitsubishichips.com						
MRF630	3	0.33	9.5	12.5	79-05/5	MO	Motorola: www.freescale.com						
2SC3020	3	0.3	10	12.5	T-31 E	MI	Philips semiconductors: www.semiconductors.philips.com						
BLW80	4		8	12.5	SOT122	PH	STMicroelectronics: www.st.com						
BLW90	4		11	12.5	SOT122	PH							
MRF652	5	0.5	10	12.5	244-04/1	MO							
MRF587	5		16.5	15	244A-01/1	MO							
2SC3021	7	1.2	7.6	12.5	T-31 E	MI							
BLW81	10		6	12.5	SOT122	PH							
MRF653	10	2	7	12.5	244-04/1	MO							

Table 22.35

RF Power Transistors Recommended for New Designs

Device	Output Power (W)	Type	Gain (dB)	Typ Supply Voltage (V)	Case	Mfr	Device	Output Power (W)	Type	Gain (dB)	Typ Supply Voltage (V)	Case	Mfr
1.5 to 30 MHz, HF SSB/CW							VHF to 470 MHz						
MRF171A	30	MOS	20	28	211-07/2	MO	BLT50	1.2	BJT	10	7.5	SOT223	PH
BLF145	30	MOS	24	28	SOT123A	PH	SD2900	5	MOS	13.5	28	M113	ST
MRF148A	30	MOS	18	50	211-07/2	MO	SD1433	10	BJT	7	12.5	M122	ST
SD2918	30	MOS	18	50	M113	ST	SD2902	15	MOS	12.5	28	M113	ST
SD1405	75	BJT	13	12.5	M174	ST	SD2904	30	MOS	10	28	M113	ST
SD1733	75	BJT	14	50	M135	ST	SD2903	30	MOS	13	28	M229	ST
SD1487	100	BJT	11	12.5	M174	ST	SD1488	38	BJT	5.8	12.5	M111	ST
SD1407	125	BJT	15	28	M174	ST	SD1434	45	BJT	5	12.5	M111	ST
SD1729	130	BJT	12	28	M174	ST	MRF392	125	BJT	8	28	744A-01/1	MO
BLF147	150	MOS	17	28	SOT121B	PH	SD2921	150	MOS	12.5	50	M174	ST
BLF177	150	MOS	20	50	SOT121B	PH	VHF to 512 MHz						
BLF175	150	MOS	24	50	SOT123A	PH	BLF521	2	MOS	10	12.5	SOT172D	PH
SD1726	150	BJT	14	50	M174	ST	MRF158	2	MOS	17.5	28	305A-01/2	MO
SD1727	150	BJT	14	50	M164	ST	MRF160	4	MOS	17	28	249-06/3	MO
MRF150	150	MOS	17	50	211-07/2	MO	BLF542	5	MOS	13	28	SOT171A	PH
SD1411	200	BJT	16	40	M153	ST	VLF544	20	MOS	11	28	SOT171A	PH
SD1730	220	BJT	12	28	M174	ST	MRF166C	20	MOS	16	28	319-07/3	MO
SD1731	220	BJT	13	50	M174	ST	MRF166W	40	MOS	14	28	412-01/1	MO
SD1728	250	BJT	14.5	50	M177	ST	BLF546	80	MOS	11	28	SOT268A	PH
SD2923	300	MOS	16	50	M177	ST	MRF393	100	BJT	7.5	28	744A-01/1	MO
SD2933	300	MOS	18	50	M177	ST	MRF275L	100	MOS	8.8	28	333-04/2	MO
MRF154	600	MOS	17	50	368-03/2	MO	BLF548	150	MOS	10	28	SOT262A	PH
50 to 175 MHz							MRF275G	150	MOS	10	28	375-04/2	MO
BLF202	2	MOS	10	12.5	SOT409A	PH	UHF to 960 MHz						
BLF242	5	MOS	13	28	SOT123A	PH	BLT70	0.6	BJT	6	4.8	SOT223	PH
SD1274	30	BJT	10	13.6	M135	ST	BLT80	0.6	BJT	6	7.5	SOT223	PH
BLF245	30	MOS	13	28	SOT123	PH	BLT71/8	1.2	BJT	6	4.8	SOT223	PH
SD1275	40	BJT	9	13.6	M135	ST	BLT81	1.2	BJT	6	7.5	SOT223	PH
BLF246B	60	MOS	14	28	SOT161A	PH	BLF1043	10	MOS	16	26	SOT538A	PH
SD1477	100	BJT	6	12.5	M111	ST	BLF1046	45	MOS	14	26	SOT467C	PH
SD1480	100	BJT	9.2	28	M111	ST	BLF1047	70	MOS	14	26	SOT541A	PH
SD2921	150	MOS	12.5	50	M174	ST	BLF1048	90	MOS	14	26	SOT502A	PH
MRF141	150	MOS	13	28	211-11/2	MO	Notes:						
MRF151	150	MOS	13	50	211-11/2	MO	Manufacturer codes: MI = Mitsubishi; MO = Motorola;						
SD2931	150	MOS	14	50	M174	ST	PH = Philips; ST = STMicroelectronics						
BLF248	300	MOS	10	28	SOT262	PH	There is a bewildering variety of package types, sizes and pin-out connections. (For example, for the 71 different transistors in this table there are 35 different packages.) See the data sheets on each manufacturer's Web pages for details.						
SD2932	300	MOS	15	50	M244	ST	Mitsubishi: www.mitsubishichips.com						
VHF to 220 MHz							Motorola: www.freescale.com						
MRF134	5	MOS	10.6	28	211-07/2	MO	Philips semiconductors: www.semiconductors.philips.com						
MRF136	15	MOS	16	28	211-07/2	MO	STMicroelectronics: www.st.com						
MRF173	80	MOS	13	28	211-11/2	MO							
MRF174	125	MOS	11.8	28	211-11/2	MO							
BLF278	250	MOS	14	50	SOT261A1	PH							

Table 22.36**RF Power Amplifier Modules**

Listed by frequency

<i>Device</i>	<i>Supply (V)</i>	<i>Frequency Range (MHz)</i>	<i>Output Power (W)</i>	<i>Power Gain (dB)</i>	<i>Package[†]</i>	<i>Mfr/ Notes</i>
M57735	17	50-54	14	21	H3C	MI; SSB mobile
M57719N	17	142-163	14	18.4	H2	MI; FM mobile
S-AV17	16	144-148	60	21.7	5-53L	T; FM mobile
S-AV7	16	144-148	28	21.4	5-53H	T; FM mobile
MHW607-1	7.5	136-150	7	38.4	301K-02/3	MO; class C
BGY35	12.5	132-156	18	20.8	SOT132B	P
M67712	17	220-225	25	20	H3B	MI; SSB mobile
M57774	17	220-225	25	20	H2	MI; FM mobile
MHW720-1	12.5	400-440	20	21	700-04/1	MO; class C
MHW720-2	12.5	440-470	20	21	700-04/1	MO; class C
M57789	17	890-915	12	33.8	H3B	MI
MHW912	12.5	880-915	12	40.8	301R-01/1	MO; class AB
MHW820-3	12.5	870-950	18	17.1	301G-03/1	MO; class C

Manufacturer codes: MO = Motorola; MI = Mitsubishi; P = Philips; T = Toshiba.

[†]For package shape, size and pin-connection information, see manufacturers' data sheets. Many retail suppliers offer data sheets to buyers free of charge on request. Data books are available from many manufacturers and retailers.**Table 22.37****Digital Logic Families**

Type	Propagation Delay for CL = 50 pF (ns)		Max Clock Frequency (MHz)	Power Dissipation (CL = 0) @ 1 MHz (mW/gate)	Output Current @ 0.5 V max (mA)	Input Current (Max mA)	Threshold Voltage (V)	Supply Voltage (V)		
	Typ	Max						Min	Typ	Max
CMOS										
74AC	3	5.1	125	0.5	24	0	V+/2	2	5 or 3.3	6
74ACT	3	5.1	125	0.5	24	0	1.4	4.5	5	5.5
74HC	9	18	30	0.5	8	0	V+/2	2	5	6
74HCT	9	18	30	0.5	8	0	1.4	4.5	5	5.5
4000B/74C (10 V)	30	60	5	1.2	1.3	0	V+/2	3	5 - 15	18
4000B/74C (5V)	50	90	2	3.3	0.5	0	V+/2	3	5 - 15	18
TTL										
74AS	2	4.5	105	8	20	0.5	1.5	4.5	5	5.5
74F	3.5	5	100	5.4	20	0.6	1.6	4.75	5	5.25
74ALS	4	11	34	1.3	8	0.1	1.4	4.5	5	5.5
74LS	10	15	25	2	8	0.4	1.1	4.75	5	5.25
ECL										
ECL III	1.0	1.5	500	60	—	—	−1.3	−5.19	−5.2	−5.21
ECL 100K	0.75	1.0	350	40	—	—	−1.32	−4.2	−4.5	−5.2
ECL100KH	1.0	1.5	250	25	—	—	−1.29	−4.9	−5.2	−5.5
ECL 10K	2.0	2.9	125	25	—	—	−1.3	−5.19	−5.2	−5.21
GaAs										
10G	0.3	0.32	2700	125	—	—	−1.3	−3.3	−3.4	−3.5
10G	0.3	0.32	2700	125	—	—	−1.3	−5.1	−5.2	−5.5

Source: Horowitz (W1HFA) and Hill, *The Art of Electronics—2nd edition*, page 570. © Cambridge University Press 1980, 1989. Reprinted with the permission of Cambridge University Press.