

# Transistors (Selection Guide by Applications and Functions)

## ■ Silicon Small Signal Transistors

### ● General-use Low Frequency Amplifiers and Others

Application Functions	Package (No.)												V <sub>CE0</sub> <sup>1)</sup> (V)	I <sub>C</sub> (mA)	f <sub>T</sub> (MHz)		
	SS Mini Type (D1)	S Mini Type (D5)	Mini Type (D10)	T Mini Type (D19)	New S Type (D39)	TO-92 (D49)	M Type (D40)	TO-92NL (D51)	TO-92L (D50)	Mini Power Type (D16)	MT1 Type (D42)	MT2 Type (D43)			● f <sub>T</sub> +NV(mV) *V <sub>CE</sub> (V)	● f <sub>T</sub> +I <sub>C</sub> (mA)	
General-use low freq. amplifier	(2SB1462 2SD2216)	(2SB1218A 2SD1819A)	(2SB709A 2SD601A)		(2SA1309A 2SC3311A)	(2SB642 2SD637)					(2SB1320A 2SD1991A)	(2SB1376 2SD2070)	50	100	● 160 ~ 460	*2	
		(2SB1219A 2SD1820A)	(2SB710A 2SD602A)	(Δ2SB1582 ⊙2SD2432)	(2SB1030A 2SD1423A)	(2SA719 / 730 2SC1317 / 1318)	(2SB643 / 644 Δ 2SC638 / 639 Δ)	(2SA1619A 2SC4208A)				(2SB1371A Δ 2SD1982A Δ)	(2SB1377 2SD2071)	25/50	500	● 85 ~ 340	*150 Δ*10
						(2SA720A 2SC1318A)	(2SA1762 2SC4606)	(2SA1533 2SC3939)	(2SA777 2SC1509)	(2SB767 2SD875)				70	500	● 130 ~ 330 (e.g.)	*150
					(2SB1587 2SD2455)	(2SB621A 2SD592A)	(2SB793A 2SD973A)	(2SA1534A 2SC3940A)	(2SA693 / 694 2SC1383 / 1384)	(2SB766A 2SD874A)		(2SB1322A 2SD1994A)		25/50	1A	● 85 ~ 340	*500
		(2SA1791 2SC4656)	(2SA1748 2SC4562)	(2SA1747 2SC4561)										50	50	● 200 ~ 500 (f <sub>T</sub> 250)	*2
										(2SB1440 2SD2185)		(2SB1434 2SD2177)		50	2A	● 120 ~ 340	*200
												(2SB1446 2SD2179)		50	5A	● 120 ~ 340	*500
							(2SB819 2SD1051)			(2SB1599 2SD2457)		(2SB1598 2SD2456)		40	1.5A	● 80 ~ 220	*1A
										(2SA1890 2SC5026)		(2SA1674 2SC4391)		80	1A	● 120 ~ 340	*100
										(2SB1600 2SD2458)				100	1A	● 120 ~ 340	*100
High-h <sub>f</sub> <sub>T</sub> (High V <sub>EB0</sub> )			2SB902			(2SB774 2SD889)											
	2SD2345	2SD1823	2SD1030	Δ2SD2433	2SD1424	2SD1010	2SD1199				2SD1995	2SD2073	40	50	● 400 ~ 2000	*2	
					2SD2460		2SD1458			2SD1483		2SD2259	20	700	● 1000 ~ 2500	*150	
						2SC2925							50	700	● 400 ~ 1000	*150	
Darlington			2SD1478A	Δ 2SD2434		2SD892/A	2SD1205/A						25/50	500	● 2000 ~ 2000	*500	
						2SD893/A	2SD1198/A			2SD1511	2SD2258	25/50	1A	● 4000 ~ 4000	*1A		
											2SD2067	100	2A	● 4000 ~ 4000	*1A		
Low freq. low noise amplifier																	
	(2SB1463 2SD2240A)	(2SB1220 2SD1821A)	(2SB792A 2SD814A)	Δ2SB1583	(2SA1816 2SC4715)	(2SA1123 2SC2631)	(2SB788 2SD958)			(2SA1124 2SC2632)			150/ 185	50	*150	—	
Low V <sub>CE(sat)</sub>		(2SA1531A 2SC3929A)	(2SA1034 / 1035 2SC2405 / 2406)		(2SA1310 2SC3312)	(2SA1127 2SC2634)	(2SB745A 2SD661A)				2SD1993	2SD2072	35/55	50	*150	—	
			2SB970	Δ 2SB1585	2SB1207								10	500	* < 0.3	*400	
			2SD1328	Δ2SD2436	2SD1450	2SD1302	2SD1330			2SD2210	2SD1996	2SD2074	20	500	* < 0.4	*500	
			2SB779	Δ2SB1584	2SA1512	2SA1128	2SB790				2SB1378		20	500	* < 0.4	*500	
			2SD1979	2SD1938		2SD1915							20	300	V <sub>BE(sat)</sub> 25V ● 500 ~ 2500	*4	
		(Δ2SB1618 Δ2SD2482)											10	500	* < 0.17	*250	
										(2SB1537 2SD2357)		(2SB1538 2SD2358)	10	1A	* < 0.15	*500	
		(Δ2SB1619 Δ2SD2483)											20	500	* < 0.2	*250	
										(2SB1539 2SD2359)		(2SB1540 2SD2360)	20	1A	* < 0.2	—	
							2SB835		2SC1518	(2SB956 2SD1280)			18	1A	* < 0.5	*50	
Built-in Zener										(Δ2SB1589 Δ2SD2441)			10	1.5A	* < 0.25	*1A	
							Δ2SB1592						20	3A	* < 0.22	*1.4A	
					2SD2321	2SB976 2SD965	2SB1319 2SB1050 2SD1244	2SB1288 2SD1934	2SB873 2SD966	2SB1073 2SD1119		2SB1398 2SD2249	20	5A	* < 1.0	*3	
										2SB1208 (R <sub>BE</sub> 10kΩ)			20	2A	* < 0.4	*1A	
Built-in Zener			2SD1304	Δ2SD2435									20 ± 3	100	● 160 ~ 460	2	
			2SD1679										18 ± 5	500	● 200 ~ 800	500	

Δ Preliminary ( : Complementary pair

# Transistors (Selection Guide by Applications and Functions)

## ● General-use Low Frequency Amplifiers and Others (continued)

Application Functions	Package (No.)										V <sub>CEO</sub> (V)	I <sub>c</sub> (mA)	f <sub>r</sub> (MHz)	
	S Mini Type (D5)	Mini Type (D10)	T Mini Type (D19)	TO-92 (D49)	M Type (D40)	TO-92NL (D51)	TO-92L (D50)	Mini Power Type (D16)	MT1 Type (D42)	MT2 Type (D43)			● f <sub>FE</sub> +NV(mV) ※V <sub>CE(sat)</sub>	I <sub>E</sub> +I <sub>C</sub> (mA)
High break-down voltage							(2SB789/A 2SD968/A)				100/ 120	500	● 65 ~ 330	*150
						(2SB1297 2SD1937)	(2SB987 2SD1211)		(2SB1473 2SD2225)		120	500	● 90 ~ 330	*150
					(2SB1209 2SD1385)			2SD2413			400	100	● 40 ~	* 30
					2SD1350/A						400/ 500	500	● 30 ~	*30
										2SB1488	400	500	● 80 ~ 280	*50
Display	2SC4417	2SC4444	△ 2SC4971		2SC2188						35	50	500	10
							2SC1360/A			2SC4787				
										2SC4502	45/ 60	50	500	10
TV chroma output				(2SA1018 2SC1473)	(2SB1264 2SD662)	2SB1221	(2SA879 2SC1573/A/B)				200/ 300/ 400	70	80	10
				(2SA1767 2SC1473A)	2SD662B	2SA1858 2SC3941					300/ 400	70	50 80	10
				2SC3187		2SC3965					300	100	140	20

△ Preliminary ( : Complementary pair

## ● High Speed Switch · VCO and High Frequency Type

Application Functions	Package (No.)					V <sub>CEO</sub> V <sub>CE(s)</sub> <sup>1)</sup> (V)	I <sub>c</sub> (mA)	t <sub>s</sub> (ns)
	SS Mini Type (D1)	S Mini Type (D5)	Mini Type (D10)	T Mini Type (D19)	TO-92 (D49)			
High speed switch	2SA1806	2SA1739	2SA1738			15	50	19
VCO and high freq. type			2SC4894	△ 2SC4970		20 <sup>1)</sup>	130	7
	2SC4691	2SC3938	2SC3757	△ 2SC4969	2SC3811	40 <sup>1)</sup>	100	10
		2SC4755	2SC4782			20 <sup>1)</sup>	200	7

△ Preliminary

## ● High Frequency Amplifiers and Others

Functions	Package (No.)										V <sub>CEO</sub> (V)	I <sub>c</sub> (mA)	f <sub>r</sub> (MHz)	
	SS Mini Type (D1)	S Mini Type (D5)	Mini Type (D10) *4 pin (D11)	T Mini Type (D19)	Mini Power Type (D16)	New S Type (D39)	TO-92 (D49)	M Type (D40)	Cross Pack (D36)	I <sub>E</sub> +I <sub>C</sub> (mA)				
AM · FM	Mix. Osc. amp.	2SC4655	2SC3936	2SC2778	2SC4972		2SC3313	2SC829	2SC2647		20	30	230	1
Video IF FM RF amp.	Amp.	(2SA1790 2SC4626)	(2SA1532 2SC3930)	(2SA1022 2SC2295)	△ 2SA1888		(2SA1323 2SC3314)	(2SA838 2SC1359)	(2SA1254 2SC2206)		20	30	250	1
							◆ 2SC1687			2SC2188	35	50	500	10
							◆ 2SC1688				25	30	550	5
V H F	Osc. amp.						2SC4716				18	50	980	10
	Mix.		2SC3932	2SC2480	△ 2SC4974		2SC3354	2SC1215	2SC2636		20	50	1200	D15
				2SC4670	2SC4238							15	50	1300
U H F	RF		2SC3933	2SC3077	△ 2SC4975					2SC2360(H)	20	20	1100	3
			2SC4780	2SC2845			◇ 2SC2671(H)				12	70	4500	20
	Osc.	2SC4809	2SC3935	2SC3130							10	50	1900	5
Micro tuner			2SC4239								10	50	2000	5
1V RF amp.			2SC4068								20	20	1500	1.8
			2SC4410	2SC3707							7	10	4000	1
Wide band amp. SHF IF amp.			2SC4661								9	35	5000	1
			2SC3934	2SC3110							12	30	4500	10
			2SC3937	2SC3704				◇ 2SC2671(F)			14	80	5500	40
		2SC4808	2SC4835	2SC3829		△ 2SC5019		2SC4968			10	80	7600	30
				*2SC4516							10	80	8000	*20
				2SC4805	2SC3904						10	65	9000	20
			*2SC4515							10	50	7000	*10	

◆ Center Emitter (1:C 2:E 3:B) ◇ Center Emitter (1:B 2:E 3:C) ( : Complementary pair

# Transistors (Selection Guide by Applications and Functions)

## ● High Frequency Silicon Transistors for Transmitters

Frequency Band · Application		Type No.	V <sub>CEO</sub> (V)	I <sub>c</sub> (A)	P <sub>o</sub> min. (W)	f <sub>r</sub> min. (MHz)	Package	No.
V H F	175MHz	2SC2851	16	0.3	0.6	1500	TO-92L	D48
		2SC4767	16	0.3	0.6	1500	TO-92NL	D51
		2SC4893	16	0.3	0.6	1500	MT3	D45
		2SC2988	16	0.5	1.8	600	TO-126(b)	D53

## ● High Frequency Silicon Transistors for Tuners (FETs included)

Band	Application	Package (No.)										
		TO-92 (D49)	New S Type (D39)	M Type (D40)	Cross Pack (D36)	Cross Pack (Ceramic) (D37(a), D37(b):*)	SS Mini Type (3 pin) (D1)	S Mini Type (3 pin) (D5)	S Mini Type (4 pin) (D6)	Mini Type (3 pin) (D10)	Mini Type (4 pin) (D10(a))	T Mini Type (3 pin) (D19)
V H F	RF amp.	2SC1215							3SK268		3SK144 3SK202 3SK241	
	Mix	2SC1215	2SC3354	2SC2636				2SC4670		2SC2480 2SC4238	3SK169	
	Osc.	2SC1215	2SC4716 2SC3354	2SC2636				2SC3932		2SC2480		△ 2SC4974
	IF amp.	2SC1215	2SC3354	2SC2636						2SC2480		△ 2SC4974
U H F	RF amp.				2SC2360(H) 3SK183 <sup>2)</sup>			2SC3933 2SC4068 2SC4780		2SC3077 2SC2845	3SK143 3SK184 <sup>2)</sup> 3SK241 <sup>2)</sup>	△ 2SC4975
	Mix.				2SC2360(H)			2SC3937 2SC3933		2SC3077		△ 2SC4975
	Osc.					2SC4809	2SC3935 2SC4239		2SC3130			
S H F	RF amp.											
	Osc.											
	IF amp.	2SC2671(H) 2SC2671(F)							2SC3934 2SC3937 2SC4805	2SC3904 2SC3704 2SC3829 2SC3110	△ 2SC5019 (Mini power type)	
Wide band	RF amp.	2SC2671(H) 2SC2671(F)					2SC4808	2SC3934 2SC3937 2SC4805 2SC4835	3SK269 3SK270 3SK271	2SC3110 2SC3704	3SK139 3SK219 3SK227 △ 3SK247 2SC4516 2SC4515	

△ Preliminary 1)HEMT 2)MES FET

## ■ Silicon Medium Power Transistors

Application Function	Package (No.)								V <sub>CEO</sub> (V)	I <sub>c</sub> (A)	V <sub>CE(sat)</sub> (V)		h <sub>FE</sub>		
	U Type (D41)	TO-126 (D52*, D53)	MT2L Type (D44)	MT3 Type (D45)	MT4 Type (D46)	TO-202 (D54)	TO-220(a) (D56)	TO-220F(a) (D59)			typ. (V)	I <sub>c</sub> (A)	I <sub>b</sub> (mA)	f <sub>r</sub> (MHz)	I <sub>c</sub> (A)
General-use low freq. amplifier						2SA699 2SC1226			32	1.5	0.4	-1.5 2	-150 200	50 ~ 220	1
		2SA885 2SC1846			2SB1413 2SD2133				35	1	< 0.5	0.5	50	85 ~ 340	0.5
		2SB968 2SD1295	2SA886 2SC1847				2SA699A 2SC1226A		40	1.5	0.4	-1.5 2	-150 200	50 ~ 220	1
			2SA963* 2SC2209*						40	1.5	< 1.0	1.5	150	30 ~ 220	1
					2SC4545				40	1.5	1.0	2.0	200	30 ~ 220	1
			2SB1541 2SD2361						50	1	< 0.4	0.5	50	85 ~ 340	0.5
		2SA1096/A 2SC2497/A					2SA748 2SC1398		50/60	2	< 1.0	1.5	150	50 ~ 220	1
		△ 2SB1574 △ 2SD2408		2SB1542 2SD2362	2SB1435 2SD2178				50	2	< 0.3	1.0	50	120 ~ 340	0.2
		△ 2SB1575 △ 2SD2409			2SB1447 2SD2180				50	3	< 0.3	2.0	100	120 ~ 340	0.5

( : Complementary pair

# Transistors (Selection Guide by Applications and Functions)

## ■ Silicon Medium Power Transistors (continued)

Application Functions	Package (No.)								V <sub>CEO</sub> (V)	I <sub>C</sub> (A)	V <sub>CE(sat)</sub>			h <sub>FE</sub> ● f <sub>r</sub> (MHz)	I <sub>C</sub> * I <sub>E</sub> (A)	
	U Type (D41)	TO-126 (D52*, D53)	MT2L Type (D44)	MT3 Type (D45)	MT4 Type (D46)	TO-202 (D54)	TO-220(a) (D56)	TO-220F (D59)			typ. (V)	I <sub>C</sub> (A)	I <sub>B</sub> (mA)			
General-use low freq. amplifier							2SC1398A		50/70	2	0.6	1.0	100	50 ~ 160	1	
	△ 2SB1573 △ 2SD2407		( 2SB1543 2SD2363	2SB1416 2SD2136	( 2SB1417 2SD2137		( 2SB941/A 2SD1266/A		60	3	< 1.2	3.0	375	40 ~ 250	1	
			( 2SB1544 2SD2364		2SB1553				60	3	< 1	2.0	50	300 ~ 700	0.5	
		( 2SA794/A 2SC1567/A							80	1	< 0.3	0.5	50	120 ~ 340	0.1	
				2SB1439 2SD2183					100/120	0.5	0.2	0.5	50	65 ~ 330	0.15	
			( 2SB1545 2SD2365						100	2	< 0.3	1.0	50	120 ~ 340	0.2	
				2SD2341					150	1	< 0.3	0.5	25	120 ~ 340	0.5	
		2SA1698							180	2	< 1	0.5	50	60 ~ 240	0.15	
	△ 2SD2412								200	0.07	< -1.5	-0.05	-5	● 80	*0.01	
								300	0.75	< 1	1.0	200	40 ~ 250	0.3		
Audio drive		( 2SA1110 2SC2590							120	0.5	1.0	0.3	30	65 ~ 330	0.15	
				2SB1414 2SD2134		( 2SA1111/2 2SC2592	( 2SA1535/A 2SC3944/A	150/180	1	0.5	0.5	50	90 ~ 330	0.15		
Low V <sub>CE(sat)</sub>	2SB967								18	5	< 1	3	100	90 ~ 625	2	
		( 2SA900 2C1568							18	1	0.3	1.0	50	90 ~ 360	0.5	
				△ 2SB1593					20	3	0.3	2.6	40	—	—	
		2SC2594*							20	5	0.7	3.0	100	140 ~ 450	0.15	
			2SB1536						20	5	< 1.0	3.0	100	90 ~ 625	2	
Pre-amp.		( 2SA914 2SC1953							150	0.05	< 1.0	0.03	3.0	90 ~ 450	0.01	
Darlington		2SD946/A/B		2SD2220 (80V)					30/60/ 100	1	< 1.8	1.0	1	4000 ~ 40000	1	
	2SD2404								80	1.5	< 1.8	1.0	1	4000 ~ 40000	1	
				2SB1526	( 2SB1418 2SD2138		( 2SB949 2SD1275		60	2	< 2.5	2.0	8	1000 ~ 10000	2	
				2SB1504					60	8	< 1.5	4	8	1000 ~ 10000	4	
		2SD1640		△ 2SD2479					100	2	< 1.5	1.0	1	4000 ~ 40000	1	
		2SD1645					2SD2051		60 ± 10	1	< 1.8	1.0	1	4000 ~ 40000	1	
		2SD2018	2SD2326	2SD2135					60 ± 10	1	< 1.8	1.0	1	6500 ~ 40000	1	
	△ 2SB1576								100	2	< 2.5	1	4	1000 ~ 10000	1	
	△ 2SD2410								200	2	< 2.5	1.5	6	1000 ~ 10000	0.7	
				2SD2242/A		2SD1276/A		60/80	4	< 2.0	3.0	12	1000 ~ 10000	3		
High breakdown voltage		( 2SA914 2SC1953							150	0.05	< 1.0	0.03	3	90 ~ 450	0.01	
		2SB1011							400	0.1	< 2.5	0.05	5	30 ~	0.03	
			2SB1546						400	0.5	< 1.5	0.2	40	80 ~ 280	0.05	
			2SD2366						400	0.5	< 1.5	0.25	50	30 ~	0.03	
Display		2SC3611							2SC3943	V <sub>CE(sat)</sub>	0.15	< 0.5	0.15	15	● 350	*0.11
									2SC4190		40	< 0.3	0.05	5	● 2000	*0.05
T V	Chroma input					2SA1605			200	0.07	< -1.5	-0.05	-5	● 80	*0.01	
			2SC2258						250	0.1	< 1.2	0.05	5	● 100	*0.01	
			2SC3063				2SC2923	2SC4714	2SC3942	300	0.1	< 1.5	0.03	3	● 140	*0.02
									2SA1817	300	0.1	< 1.5	0.03	3	● 350	0.01
									2SC4717	300	0.1	< 0.45	0.03	3	● 350	0.01
									2SC3945	300	0.1	< 1.5	0.05	5	● 100	*0.02
			2SA1375							200	0.07	< 1.5	0.05	5	● 80	*0.01
		2SC2924							300	0.1	< 1.5	0.03	3	● 140	*0.02	
Horizontal drive	2SD1112					2SC2653(H)	2SC1905(H)	2SC3946	300	0.2	< 1.0	0.05	5	● 70	*0.01	
High h <sub>FE</sub>				△ 2SB1630					60	3	< 1.0	2.0	50	350 ~ 625	0.5	
	△ 2SD2453				2SD2139			2SD1273	60	3	< 1.0	2.0	50	500 ~ 2500	0.5	
	△ 2SD2443								20	0.7	< 0.4	0.5	50	1000 ~ 2500	0.15	

△ Preliminary ( : Complementary pair