National Semiconductor

General Purpose Amplifiers and Switches

Type No.	Case Style	V_{CBO} (V) Min	V_{CEO} (V) Min	V_{EBO} (V) Min	I_{CES}* I_{CBO} (nA) @ V_{CB} (V) Max	h_{FE} Min	h_{FE} Max	@ I_C (mA) & V_{CE} (V)	$V_{CE(SAT)}$ (V) & $V_{BE(SAT)}$ (V) @ I_C (mA) Max	C_{OB} (pF) Max	f_T (MHz) @ I_C (mA) Min	Max	t_{OFF} (ns) Max	NF (dB) Max	Test Conditions	Process No.
2N2904	TO-5	60	40	5	20 @ 50	20		500 @ 10	0.4 & 1.3 @ 150	8	200	50	100		(Note 2)	63
						40	120	150 @ 10								
						35		10 @ 10	1.6 & 2.6 @ 500							
						25		1 @ 10								
						20		0.1 @ 10								
2N2904A	TO-5	60	60	5	10 @ 50	40		500 @ 10	0.4 & 1.3 @ 150	8	200	50	100		(Note 2)	63
						40		150 @ 10								
						40		10 @ 10	1.6 & 2.6 @ 500							
						40	120	1 @ 10								
						40		0.1 @ 10								
2N2905 also Avail. JAN/TX/V Versions	TO-5	60	40	5	20 @ 50	30		500 @ 10	0.4 & 1.3 @ 150	8	200	50	100		(Note 2)	63
						100	300	150 @ 10								
						75		10 @ 10	1.6 & 2.6 @ 500							
						50		1 @ 10								
						35		0.1 @ 10								
2N2905A also Avail. JAN/TX/V Versions	TO-5	60	60	5	10 @ 50	50		500 @ 10	0.4 & 1.3 @ 150	8	200	50	100		(Note 2)	63
						100	300	150 @ 10								
						100		10 @ 10	1.6 & 2.6 @ 500							
						100		1 @ 10								
						75		0.1 @ 10								
2N2906	TO-18	60	40	5	20 @ 50	20		500 @ 10	0.4 & 1.3 @ 150	8	200	50	100		(Note 2)	63
						40	120	150 @ 10								
						35		10 @ 10	1.6 & 2.6 @ 500							
						25		1 @ 10								
						20		0.1 @ 10								

General Purpose Amplifiers and Switches (Continued)

Type No.	Case Style	V_{CBO} (V) Min	V_{CEO} (V) Min	V_{EBO} (V) Min	I_{CES}* I_{CBO} (nA) Max @ V_{CB} (V)	h_{FE} Min	h_{FE} Max	@ I_C (mA)	& V_{CE} (V)	$V_{CE(SAT)}$ (V) Max &	$V_{BE(SAT)}$ (V) Min	$V_{BE(SAT)}$ (V) Max	@ I_C (mA)	C_{OB} (pF) Max	f_T (MHz) Min	f_T (MHz) Max	@ I_C (mA)	t_{OFF} (ns) Max	NF (dB) Max	Test Conditions	Process No.
2N2906A	TO-18	60	60	5	10 @ 50	40		500	10	0.4		1.3	150	8	200		50	100		(Note 2)	63
						40	120	150	10												
						40		10	10	1.6		2.6	500								
						40		1	10												
						40		0.1	10												
2N2907 also Avail. JAN/TX/V Versions	TO-18	60	40	5	20 @ 50	35		500	10	0.4		1.3	150	8	200		50	100		(Note 2)	63
						100	300	150	10												
						75		10	10	1.6		2.6	500								
						50		1	10												
						35		0.1	10												
2N2907A also Avail. JAN/TX/V Versions	TO-18	60	60	5	10 @ 50	50		500	10	0.4		1.3	150	8	200		50	100		(Note 2)	63
						100	300	150	10												
						100		10	10	1.6		2.6	500								
						100		1	10												
						75		0.1	10												
2N3638		Same as PN3638																			63
2N3638A		Same as PN3638A																			63
2N3644		Same as PN3644																			63
2N3645		Same as PN3645																			63
2N3702	TO-92 (94)	40	25	5	100 @ 20	60	300	50	5	0.25			50	12	100		50				63
2N3703	TO-92 (94)	50	30	5	100 @ 20	30	150	50	5	0.25			50	12	100		50				63
2N4142		Same as PN4142																			63
2N4143		Same as PN4143																			63
2N4290	TO-92 (94)	30	20	5	500 @ 20	50	300	100	10	0.4		1.5	100	10	100		10				63
						40		10	10												
						20		0.1	10												
2N4291	TO-92 (94)	40	30	6	200 @ 30	100	300	100	10	0.4		1.5	100	10	100		10				63
						50		10	10												
						30		0.1	10												

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General Purpose Amplifiers and Switches (Continued)

Type No.	Case Style	V_{CBO} (V) Min	V_{CEO} (V) Min	V_{EBO} (V) Min	I_{CES}* I_{CBO} (nA) @ V_{CB} (V) Max	h_{FE} Min	h_{FE} Max	@ I_C (mA)	& V_{CE} (V)	$V_{CE(SAT)}$ (V) & Max	$V_{BE(SAT)}$ (V) @ Min	$V_{BE(SAT)}$ (V) @ Max	I_C (mA)	C_{OB} (pF) Max	f_T (MHz) @ Min	f_T (MHz) @ Max	I_C (mA)	t_{OFF} (ns) Max	NF (dB) Max	Test Conditions	Process No.
2N4402	TO-92 (94)	40	40	5		20		500	2	0.4	0.7	0.95	150	10	150		20	255		(Note 4)	63
						50	150	150	2												
						50		10	1	0.75		1.3	500								
						30		1	1												
2N4403	TO-92 (92)	40	40	5		20		500	2					10	200		20	255		(Note 4)	63
						100	300	150	2	0.4	0.75	0.95	150								
						100		10	1												
						60		1	1	0.75		1.3	500								
						30		0.1	1												
2N4971		Same as PN2906																			63
2N4972		Same as PN2907																			63
2N5142		Same as PN5142																			63
2N5143		Same as PN5143																			63
2N5221	TO-92 (92)	15	15	3	100	10	30	600	50	10	0.5		1.1	150	15	100		20				63
							30		10	10												
2N5226	TO-92 (92)	25	25	4	300	15	30	600	50	10	0.8		1.0	100	20	50		20				63
							25		10	10												
2N5354	TO-92 (94)	25	25	4	100	25	40	120	50	1	0.25			50	8							63
2N5355	TO-92 (94)	25	25	4	100	25	100	300	50	1	0.25			50	8							63
2N5365	TO-92 (94)	40	40	4	100	40	20		300	5	0.25		1.1	50	8							63
							40	120	50	1												
							32		2	1	1.0		2.0	200								
2N5366	TO-92 (94)	40	40	4	100	40	40		300	5	0.25		1.1	50	8							63
							100	300	50	1												
							80		2	1	1.0		2.0	200								
2N5447	TO-92 (97)	40	25	5			60	300	50	8	0.25			50	12	100		50				63
2N5817	TO-92 (97)	50	40	5	100	25	25		500	2	0.75		1.2	500	15	100		50				63
							100	200	2	2												

General Purpose Amplifiers and Switches (Continued)

Type No.	Case Style	V_{CBO} (V) Min	V_{CEO} (V) Min	V_{EBO} (V) Min	I_{CES}* I_{CBO} (nA) Max	@ V_{CB} (V)	h_{FE} Min	Max	@ I_C (mA)	& V_{CE} (V)	$V_{CE(SAT)}$ (V) Max	& $V_{BE(SAT)}$ (V) Min	Max	@ I_C (mA)	C_{OB} (pF) Max	f_T (MHz) Min	Max	@ I_C (mA)	t_{OFF} (ns) Max	NF (dB) Max	Test Conditions	Process No.
MPQ2907	TO-116	60	40	5	50	50	75		10	10	0.4		1.3	150	8	200		20				63
							100		150	10												
							50		300	10	1.6		2.6	300								
MPS3638	TO-92 (92)	Same as PN3638																				63
MPS3638A	TO-92 (92)	Same as PN3638A																				63
MPS3644	TO-92 (92)	Same as PN3644																				63
MPS3645	TO-92 (92)	Same as PN3645																				63
MPS3702	TO-92 (92)	40	25	5	100	20	60	300	50	5	0.25			50	12	100		50				63
MPS3703	TO-92 (92)	50	30	5	100	20	30	150	50	5	0.25			50	12	100		50				63
MPS6533	TO-92 (92)	40	40	4	50	30	25		500	10	0.5		1.0	100	6							63
							40	120	100	1												
							30		10	1												
MPS6534	TO-92 (92)	40	40	4	50	30	50		500	10	0.3		1.0	100	6							63
							90	270	100	1												
							60		10	1												
MPS6535	TO-92 (92)	30	30	4	100	20	30		100	1	0.5		1.2	100	6							63
PN2906	TO-92 (92)	60	40	5	20	50	20		500	10	0.4		1.3	150	8	200		50	100		(Note 2)	63
							40	120	150	10												
							35		10	10	1.6		2.6	500								
							25		1	10												
							20		0.1	10												

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General Purpose Amplifiers and Switches (Continued)

Type No.	Case Style	V_{CBO} (V) Min	V_{CEO} (V) Min	V_{EBO} (V) Min	I_{CES}* I_{CBO} (nA) Max	@ V_{CB} (V)	h_{FE} Min	h_{FE} Max	@ I_C (mA)	& V_{CE} (V)	$V_{CE(SAT)}$ (V) Max	& $V_{BE(SAT)}$ (V) Min	$V_{BE(SAT)}$ (V) Max	@ I_C (mA)	C_{OB} (pF) Max	f_T (MHz) Min	f_T (MHz) Max	@ I_C (mA)	t_{OFF} (ns) Max	NF (dB) Max	Test Conditions	Process No.
PN2906A	TO-92 (92)	60	60	5	10	50	40		500	10	0.4		1.3	150	8	200		50	100		(Note 2)	63
							40	120	150	10												
							40		10	10	1.6		2.6	500								
							40		1	10												
							40		0.1	10												
PN2907	TO-92 (92)	60	40	5	20	50	30		500	10	0.4		1.3	150	8	200		50	100		(Note 2)	63
							100	300	150	10												
							75		10	10	1.6		2.6	500								
							60		1	10												
							35		0.1	10												
PN2907A	TO-92 (92)	60	60	5	20	50	50		500	10	0.4		1.3	150	8	200		50	100		(Note 2)	63
							100	300	150	10												
							100		10	10	1.6		2.6	500								
							100		1	10												
							75		0.1	10												
PN3638	TO-92 (92)	25	25	4	35*	15	20		300	2	0.25		1.1	50	20	100		50	170		(Note 1)	63
							20		50	1												
							30		10	10	1.0	0.8	2.0	300								
PN3836A	TO-92 (92)	25	25	4	25*	15	20		300	2	0.25		1.1	50	10	150		50	170		(Note 1)	63
							100		50	1												
							100		10	10	1/0	0.8	2.0	300								
							80		1	10												
PN3644	TO-92 (92)	45	45	5	35*	30	20		300	2	0.25		1.0	50	8	200		20	100		(Note 4)	63
							100	300	150	10												
							80	240	50	1	0.4		1.3	150								
							100		10	10												
							80		1	10	1.0	0.8	2.0	300								
							40		0.1	10												
PN3645	TO-92 (92)	60	60	5	35*	50	20		300	2	0.25		1.0	50	8	200		20	100		(Note 4)	63
							100	300	150	10												
							80	240	50	1	0.4		1.3	150								
							100		10	10												
							80		1	10	1.0	0.8	2.0	300								
							40		0.1	10												

General Purpose Amplifiers and Switches (Continued)

Type No.	Case Style	V_{CBO} (V) Min	V_{CEO} (V) Min	V_{EBO} (V) Min	I_{CES}* I_{CBO} (nA) Max @ V_{CB} (V)	h_{FE} Min	h_{FE} Max	@ I_C (mA)	& V_{CE} (V)	$V_{CE(SAT)}$ (V) Max	& $V_{BE(SAT)}$ (V) Min	$V_{BE(SAT)}$ (V) Max	@ I_C (mA)	C_{OB} (pF) Max	f_T (MHz) Min	f_T (MHz) Max	@ I_C (mA)	t_{OFF} (ns) Max	NF (dB) Max	Test Conditions	Process No.
PN4142	TO-92 (92)	60	40	5		20		500	10	0.4		1.3	150	8	200	50		100		(Note 12)	63
						20		150	1												
						40	120	150	10	1.6		2.6	500								
						35		10	10												
						25		1	10												
						20		0.1	10												
PN4143	TO-92 (92)	60	40	5		30		500	10	0.4		1.3	150	8	200	50		100		(Note 12)	63
						50		150	1												
						100	300	150	10	1.6		2.6	500								
						75		10	10												
						50		1	10												
						35		0.1	10												
PN5142	TO-92 (92)	20	20	4	50* 12	15		300	10	0.5		1.5	50	10	100	50		200		(Note 1)	63
						30		50	1	0.2	0.8	2.5	300								
PN5143	TO-92 (92)	20	20	4	50* 12	15		300	10	0.5		1.5	50	10	100	50		200		(Note 1)	63
						30		50	1	0.2	0.8	2.5	300								
TIS91	TO-92 (94)	40	40	4	100 20	100	300	50	2	0.25	0.6	1.0	50								63
TIS92	TO-92 (97)	40	40	5	100 20	100	300	50	2	0.25	0.6	1.0	50								63
TIS93	TO-92 (97)	40	40	5	100 20	100	300	50	2	0.25			50								63
TN2904A	TO-237 (91)	60	60	5	10 50	40		0.1	10	0.4		1.3	150	8	200	50		100		(Note 2)	63
						40		1.0	10	1.6		2.6	500								
						40		10	10												
						40	120	150	10												
						40		500	10												
TN2905	TO-237 (91)	60	40	5	20 50	30		500	10	0.4		1.3	150	8	200	50		100		(Note 2)	63
						100	300	150	10												
						75		10	10	1.6		2.6	500								
						50		1	10												
						35		0.1	10												

General Purpose Amplifiers and Switches (Continued)

Type No.	Case Style	V_{CBO} (V) Min	V_{CEO} (V) Min	V_{EBO} (V) Min	I_{CES}* I_{CBO} (nA) Max	@ V_{CB} (V)	h_{FE} Min	Max	@ I_C (mA)	& V_{CE} (V)	$V_{CE(SAT)}$ (V) Max	& $V_{BE(SAT)}$ (V) Min	Max	@ I_C (mA)	C_{OB} (pF) Max	f_T (MHz) Min	Max	@ I_C (mA)	t_{OFF} (ns) Max	NF (dB) Max	Test Conditions	Process No.
TN2905A	TO-237 (91)	60	60	5	10	50	50		500	10	0.4		1.3	150	8	200		50	100		(Note 2)	63
							100	300	150	10												
							100		10	10	1.6		2.6	500								
							100		1	10												
							75		0.1	10												
2N3905	TO-92 (92)	40	40	5			15		100	1	0.25	0.65	0.85	10	4.5	200		10	260	5	(Notes 5, 8)	66
							30		50	1												
							50	150	10	1	0.4		0.95	50								
							40		1	1												
							30		0.1	1												
2N3906	TO-92 (92)	40	40	5			30		100	1	0.25	0.65	0.85	10	4.5	250		10	300	4	(Notes 5, 8)	66
							80		50	1												
							100	300	10	1	0.4		0.95	50								
							80		1	.1												
							60		0.1	1												
2N4121		Same as PN4121																				66
2N4122		Same as PN4122																				66
2N4125	TO-92 (92)	30	30	4	50	20	25		50	1	0.4		0.95	50	4.5	200		10		5	(Note 8)	66
							50	150	2	1												
2N4126	TO-92 (92)	25	25	4	50	20	60		50	1	0.4		0.95	50	4.5	250		10		4	(Note 8)	66
							120	360	2	1												
2N4916		Same as PN4916																				66
2N4917		Same as PN4917																				66
2N5138		Same as PN5138																				66
2N5139		Same as PN5139																				66
MPQ3906	TO-116	60	40	6	50	30	40		0.1	1	0.25		0.85	10	4.5							66
							60		1	1												
							75		10	1												

General Purpose Amplifiers and Switches (Continued)

Type No.	Case Style	V_{CBO} (V) Min	V_{CEO} (V) Min	V_{EBO} (V) Min	I_{CES}* I_{CBO} (nA) Max	@ V_{CB} (V)	h_{FE} Min	h_{FE} Max	@ I_C (mA)	& V_{CE} (V)	$V_{CE(SAT)}$ (V) Max	& $V_{BE(SAT)}$ (V) Min	$V_{BE(SAT)}$ (V) Max	@ I_C (mA)	C_{OB} (pF) Max	f_T (MHz) Min	f_T (MHz) Max	@ I_C (mA)	t_{OFF} (ns) Max	NF (dB) Max	Test Conditions	Process No.
MPQ6700	TO-116	40	40	5	50	30	30		0.1		0.25		0.9	10	4.5	200		10				66 (2)
							50		1													23 (2)
							70		10													
MPS3905	TO-92 (92)	40	40	5			30		0.1	1	0.25	0.65	0.85	10	4.5	200		10		5	(Note 8)	66
							40		1	1												
							50	150	10	1												
							30		50	1												
							15		100	1	0.4		0.95	50								
MPS3906	TO-92 (92)	40	40	5			60		0.1	1	0.25	0.65	0.85	10	4.5	250		10		4	(Note 8)	66
							80		1	1												
							100	300	10	1												
							60		50	1												
							30		100	1	0.4		0.95	50								
MPS6516	TO-92 (92)	40	40	4	50	30	30		100	10	0.5			50	4							66
							50	100	2	10												
MPS6517	TO-92 (92)	40	40	4	50	30	60		100	10	0.5			50	4							66
							90	180	2	10												
MPS6518	TO-92 (92)		40	4	500	30	90		100	10	0.5			50	4							66
							150	300	2	10												
PN3251	TO-92 (92)	50	40	5			80		0.1	1	0.25	0.6	0.9	10	6	300		10		6	(Note 6)	66
							90		0.001	1												
							100	300	10	1	0.5		1.2	50								
							30		50	1												
PN4121	TO-92 (92)	40	40	5	25*	30	15		50	1	0.13		0.75	1	4.5	400		10	150	4	(Notes 11, 8)	66
							70	200	10	1	0.14	0.7	0.9	10								
							60		1	1	0.3		1.1	50								
							40		0.1	1												
PN4122	TO-92 (92)	40	40	5	25*	30	30		50	1	0.13		0.75	1	4.5	450		10	150	4	(Notes 11, 8)	66
							150	300	10	1												
							150		1	1	0.14	0.7	0.9	10								
							100		0.1	1	0.3		1.1	50								

General Purpose Amplifiers and Switches (Continued)

Type No.	Case Style	V_{CBO} (V) Min	V_{CEO} (V) Min	V_{EBO} (V) Min	I_{CES}* I_{CBO} (nA) Max	@ V_{CB} (V)	h_{FE} Min	h_{FE} Max	@ I_C (mA)	& V_{CE} (V)	$V_{CE(SAT)}$ (V) Max	& $V_{BE(SAT)}$ (V) Min	$V_{BE(SAT)}$ (V) Max	@ I_C (mA)	C_{OB} (pF) Max	f_T (MHz) Min	f_T (MHz) Max	@ I_C (mA)	t_{OFF} (ns) Max	NF (dB) Max	Test Conditions	Process No.
PN4916	TO-92 (92)	30	30	5	25*	15	15	200	50	1	0.13		0.75	1	4.5	400		10	150	4	(Notes 13, 8)	66
							70		10	1	0.14	0.7	0.9	10								
							60		1	1	0.3	0.75	1.1	50								
							40		0.1	1												
PN4917	TO-92 (92)	30	30	5	25*	15	30		50	1	0.13		0.75	1	4.5	450		10	150	4	(Notes 13, 8)	66
							150	300	10	1	0.14	0.7	0.9	10								
							150		1	1	0.3	0.75	1.1	50								
							100		0.1	1												
PN5138	TO-92 (92)	30	30	5	50	20	50		10	10	0.3		1.0	10	7	30		0.5				66
							50		1	10												
							50	800	0.1	10												
PN5139	TO-92 (92)	20	20	5	50*	15	15		50	10	0.2	0.7	1.0	10	5	300		10	200		(Note 13)	66
							40		10	1												
							40		1	10												
							30		0.1	10	0.5	0.75	1.25	50								
ST3906	TO-92 (92)	40	40	5			60		0.1	1	0.25	0.65	0.85	10	4.5	250		10				66
							80		1	1	0.4		0.95	50								
							100	300	10	1												
							60		50	1												
							30		300	1												
2N6076	TO-92 (94)	25	25	5	100	25	100	300	10	10	0.25		0.8	10								68
MPQ200	TO-116	60	45	6	50	50	80		0.1	1	0.2		0.85	10	6	250		20		4	(Note 8)	68
							100	450	10	1												
							100		100	1	0.4		1.0	200								
							100	350	150	5												
PN200	TO-92 (92)	60	45	6	50	50	80		0.1	1	0.2		0.85	10	6	250		20		4	(Note 8)	68
							100	450	10	1												
							100		100	1	0.4		1.0	200								
							100	350	150	5												

General Purpose Amplifiers and Switches (Continued)

Type No.	Case Style	V_{CBO} (V) Min	V_{CEO} (V) Min	V_{EBO} (V) Min	I_{CES}* I_{CBO} (nA) Max	@ V_{CB} (V)	h_{FE} Min	h_{FE} Max	@ I_C (mA)	& V_{CE} (V)	$V_{CE(SAT)}$ (V) Max	& $V_{BE(SAT)}$ (V) Min	$V_{BE(SAT)}$ (V) Max	@ I_C (mA)	C_{OB} (pF) Max	f_T (MHz) Min	f_T (MHz) Max	@ I_C (mA)	t_{OFF} (ns) Max	NF (dB) Max	Test Conditions	Process No.
PN200A	TO-92 (92)	60	45	6	50	50	300	600	10	1	0.2		0.85	10	6	250		20		4	(Note 8)	68
							100		100	1												
							250		0.1	5	0.4		1.0	200								
PN201	TO-92 (92)	80	65	6	50	60	60		0.1	1	0.2		0.85	10	4.5	100		10		4	(Note 8)	69
							75	375	10	1												
							50		100	1	0.4		1.0	200								
2N5400	TO-92 (92)	130	120	5	100	100	40		50	5	0.2		1.0	10	6	100	400	10		8	(Note 9)	74
							40	180	10	5												
							30		1	5	0.5		1.0	50								
2N5401	TO-92 (92)	160	150	5	50	120	50		50	5	0.2		1.0	10	6	100	300	10		8	(Note 9)	74
							60	240	10	5												
							50		1	5	0.5		1.0	50								
MPSL51	TO-92 (92)	100	100	4	1 μA	50	40	250	50	5	0.25		1.2	10	8	60		10				74
											0.3		1.2	50								
PN4888	TO-92 (92)	150	150	6	50	100	40	400	10	10	0.5		0.9	10	4	30		60				74
							30		1	10												
PN4889	TO-92 (92)	150	150	6	10	100	80	300	10	10	0.5		0.9	10	4	40	160	1		4	(Note 15)	74
							70		1	10										10	(Note 16)	
							60		0.1	10										3	(Note 17)	
																				3	(Note 18)	

TEST CONDITIONS:

Note 1: I_C = 300 mA, V_{CC} = 10V, I_{B1} = I_{B2} = 30 mA.
Note 2: I_C = 150 mA, V_{CC} = 6V, I_{B1} = I_{B2} = 15 mA.
Note 3: I_C = 300 mA, V_{CC} = 15V, I_{B1} = I_{B2} = 30 mA.
Note 4: I_C = 300 mA, V_{CC} = 30V, I_{B1} = I_{B2} = 30 mA.
Note 5: I_C = 10 mA, V_{CC} = 3V, I_{B1} = I_{B2} = 1 mA.
Note 6: I_C = 100 μA, V_{CE} = 5V, f = 100 Hz.
Note 7: I_C = 30 μA, V_{CE} = 5V, f = 1 kHz.
Note 8: I_C = 100 μA, V_{CE} = 5V, f = 1 kHz.
Note 9: I_C = 250 μA, V_{CE} = 5V, f = 1 kHz.
Note 10: I_C = 10 μA, V_{CE} = 5V, f = 1 kHz.
Note 11: I_C = 50 mA, V_{CC} = 30V, I_{B1} = I_{B2} = 5 mA.
Note 12: I_C = 150 mA, V_{CC} = 30V, I_{B1} = I_{B2} = 15 mA.
Note 13: I_C = 50 mA, V_{CC} = 10V, I_{B1} = I_{B2} = 5 mA.
Note 14: I_C = 500 mA, V_{CC} = 30V, I_{B1} = I_{B2} = 50 mA.
Note 15: I_C = 100 μA, V_{CC} = 10V, f = 1 kHz.
Note 16: I_C = 200 μA, V_{CE} = 5V, f = 1 kHz.
Note 17: I_C/I_B = 40.
Note 18: I_C/I_B = 20.

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