

TYPE	MATERIAL	POLARITY	REPLACE- MENT	PAGE NUMBER	USE	MAXIMUM RATINGS						ELECTRICAL CHARACTERISTICS									
						P _D @ 25°C	P _{Point} Ref	T _J °C	V _{CB} (volts)	V _{CE--} (volts)	Subscript	h _{FE} @ I _C		V _{CE(SAT)} @ I _C		h _{FE}	Subscript	f _T Units	Subscript		
												(min)	(max)	Units	(volts)					Units	
2N992	G	P	2N3250 2N3248	8-61 8-208 8-204	RFC	67M	A	75	20	20	R	40		1.0M		40	E				
2N993	G	P			RFC	67M	A	75	20	20	R	40		1.0M		40	E				
2N994	G	P			HSS	200M	A	150	15	6.0	0	45	140	10M	0.18	10M					
2N995	S	P			RFA	360M	A	200	20	15	0	35	140	20M	0.2	20M			100M	T	
2N995A	S	P			RFA	360M	A	200	20	15	0	35	140	20M	0.2	20M			100M	T	
2N996	S	P			RFA	360M	A	200	15	12	0	35		20M	0.3	60M			100M	T	
2N997	S	N			AFA	500M	A	175	75	40	0	35		100*	1.6	50M					
2N998	S	N			SPP	500M	A	200	100	60	0				1.2	100M	1000	E			
2N999	S	N			SPP	500M	A	200	60	60	0				1.6	100M					
2N1000	G	N			MSA	150M	A	100	40	25	0			40	10M	0.25	100M			7.0M	E
2N1003	G	N			RFA	120M	A	100	35	20	U										
2N1004	G	P			WID	120M	A	100	35	20	U										
2N1005	S	N			AFA	150M	A	175	15	15	0	10	25	10M	0.6	10M					
2N1006	S	N			AFA	150M	A	175	15	15	0	25	150	10M	0.6	10M					
2N1007	G	P	LPA	35W	C	95	25	20	0	50	250	1.0A	1.0	2.0A			60K	T			
2N1008	G	P	AFA	0.3W	C	85	20	15	R				0.25	0.1A							
2N1008A	G	P	AFA	0.3W	C	85	40	35	R				0.25	0.1A							
2N1008B	G	P	AFA	0.3W	C	85	60	55	R				0.25	0.1A							
2N1009	G	P	AFA	0.4W	C	85	35	35	R				0.25	0.1A			7.5K	E			
2N1010	G	N	APC	20M	A	55	10	10	0												
2N1011	G	P	LPA	35W	C	95	80	80	S	30	75	3.0A	1.5	3.0A	20	E	5.0K	E			
2N1012	G	N	MSA	150M	A	100	40	25	0	20		100M	0.2	100M			3.0M	E			
2N1014	G	P	LPA	50M	A	100	100	65	0	40	50	4.0A	0.8	4.0A			0.5M	E			
2N1015	S	N	PMS	150W	C	150	30	30	V	10		2.0A	1.5	2.0A							
2N1015A	S	N	PMS	150W	C	150	60	60	V	10		2.0A	1.5	2.0A							
2N1015B	S	N	PMS	150W	C	150	100	100	V	10		2.0A	1.5	2.0A							
2N1015C	S	N	PMS	150W	C	150	150	150	V	10		2.0A	1.5	2.0A							
2N1015D	S	N	PMS	150W	C	150	200	200	V	10		2.0A	1.5	2.0A							
2N1015E	S	N	PMS	150W	C	150	250	250	V	10		2.0A	1.5	2.0A							
2N1015F	S	N	PMS	150W	C	150	300	300	V	10		2.0A	1.5	2.0A							
2N1016	S	N	PMS	150W	C	150	30	30	V	10		5.0A	2.5	5.0A							
2N1016A	S	N	PMS	150W	C	150	60	60	V	10		5.0A	2.5	5.0A							
2N1016B	S	N	PMS	150W	C	150	100	100	V	10		5.0A	2.5	5.0A							
2N1016C	S	N	PMS	150W	C	150	150	150	V	10		5.0A	2.5	5.0A							
2N1016D	S	N	PMS	150W	C	150	200	200	V	10		5.0A	2.5	5.0A							
2N1016E	S	N	PMS	150W	C	150	250	250	V	10		5.0A	2.5	5.0A							
2N1016F	S	N	PMS	150W	C	150	300	300	V	10		5.0A	2.5	5.0A							
2N1017	G	P	MSA	150M	A	85	30	10	0	70		20M	2.6	200M			15M	B			
2N1018	G	P	MSS	200M	A	100	30	6.0	0	70		70M	2.6	200M			20M	B			
2N1021	G	P	LPA	50W	C	95	100	100	X	23	70	1.0A	1.0	5.0A							
2N1021A	G	P	LPA	150W	C	100	100	30	0	30	90	5.0A	0.5	5.0A			200K	T			
2N1022	G	P	LPA	50W	C	95	120	120	X	23	70	5.0A	1.0	5.0A							
2N1022A	G	P	LPA	150W	C	100	120	55	0	30	90	5.0A	0.5	5.0A			200K	T			
2N1023	G	P	RFA	120M	A	100	40	40	0	20	175	1.5M									
2N1024	S	P	AFA	0.25W	A	175	18	15	U						9.0	E	1.0M	B			
2N1025	S	P	AFA	0.25W	A	175	40	35	U						9.0	E	1.0M	B			
2N1026	S	P	AFA	0.25W	A	175	40	35	U						18	E	2.0M	B			
2N1027	S	P	AFA	0.25W	A	175	18	15	U						18	E	4.0M	B			
2N1028	S	P	AFA	0.25W	A	175	12	10	U						9.0	E	7.2M	T			
2N1029	G	P	LPA	90W	C	100	50	20	0	20	60	10A	1.0	10A							
2N1029A	G	P	LPA	90W	C	100	60	30	0	20	60	10A	1.0	10A							
2N1029B	G	P	LPA	90W	C	100	90	60	0	20	60	10A	1.0	10A							
2N1029C	G	P	LPA	90W	C	100	100	70	0	20	60	10A	1.0	10A							
2N1030	G	P	LPA	90W	C	100	50	20	0	50	100	10A	1.0	10A							
2N1030A	G	P	LPA	90W	C	100	60	30	0	50	100	10A	1.0	10A							
2N1030B	G	P	LPA	90W	C	100	90	60	0	50	100	10A	1.0	10A							
2N1030C	G	P	LPA	90W	C	100	100	70	0	50	100	10A	1.0	10A							
2N1031	G	P	LPA	90W	C	100	50	30	S	20	60	10A	1.0	10A			2.0K	E			
2N1031A	G	P	LPA	90W	C	100	60	40	S	20	60	10A	1.0	10A			2.0K	E			
2N1031B	G	P	LPA	90W	C	100	90	70	S	20	60	10A	1.0	10A			2.0K	E			
2N1031C	G	P	LPA	90W	C	100	100	80	S	20	60	10A	1.0	10A			2.0K	E			
2N1032	G	P	LPA	90W	C	100	50	30	S	50	100	10A	1.0	10A	25	E	2.0K	E			
2N1032A	G	P	LPA	90W	C	100	60	40	S	50	100	10A	1.0	10A	25	E	2.0K	E			
2N1032B	G	P	LPA	90W	C	100	90	70	S	50	100	10A	1.0	10A	25	E	2.0K	E			
2N1032C	G	P	LPA	90W	C	100	100	80	S	50	100	10A	1.0	10A	25	E	2.0K	E			
2N1034	S	P	AFA	250M	A	160	50	40	0				0.5	8.0M	9.0	E	150K	B			
2N1035	S	P	AFA	250M	A	160	50	35	0				0.4	8.0M	18	E	200K	B			
2N1036	S	P	AFA	250M	A	160	50	30	0				0.3	8.0M	34	E	300K	B			
2N1037	S	P	AFA	250M	A	160	50	35	0				0.5	8.0M	9.0	E	150K	B			
2N1038	G	P	LPA	20W	C	95	40	40	V	20	60	1.0A	0.25	1.0A	18	E	8.0K	E			
2N1039	G	P	LPA	20W	C	95	60	60	V	20	60	1.0A	0.25	1.0A	18	E	8.0K	E			
2N1040	G	P	LPA	20W	C	95	80	80	V	20	60	1.0A	0.25	1.0A	18	E	8.0K	E			
2N1041	G	P	LPA	20W	C	95	100	100	V	20	60	1.0A	0.25	1.0A	18	E	8.0K	E			
2N1042	G	P	LPA	20W	C	100	40	40	V	20	60	3.0A	0.75	3.0A	2.0	E	250K	T			
2N1043	G	P	LPA	20W	C	100	60	60	V	20	60	3.0A	0.25	1.0A			250K	T			
2N1044	G	P	LPA	20W	C	100	80	80	V	20	60	3.0A	0.25	1.0A			250K	T			
2N1045	G	P	LPA	20W	C	100	100	100	V	20	60	3.0A	0.25	1.0A			250K	T			
2N1046	G	P	HPA	50W	C	100	100	50	0	40		5.0A	0.2	500M			15M	T			
2N1046A	G	P	HPA	50W	C	100	130	50	0	40		5.0A	0.4								

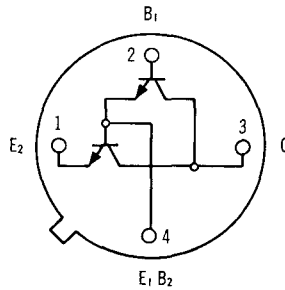
2N998
2N999

$V_{CB} = 60 - 100 \text{ V}$
 $I_C = 500 \text{ mA}$



Darlington amplifiers containing two NPN silicon anular transistors are designed for applications requiring very high-gain, low-noise, and high-input impedance.

CASE 20(8)
(TO-72)



MAXIMUM RATINGS

Rating	Symbol	2N998	2N999	Unit
Collector-Emitter Voltage	V_{CEO}	60	60	Vdc
Collector-Base Voltage	V_{CB}	100	60	Vdc
Emitter-Base Voltage	V_{EB}	15		Vdc
Collector Current	I_C	500		mAdc
Total Device Dissipation @ $T_A = 25^\circ\text{C}$ Derate above 25°C	P_D	0.5	2.86	Watt mW/ $^\circ\text{C}$
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C	P_D	1.8	10.3	Watts mW/ $^\circ\text{C}$
Operating Junction Temperature	T_J	200		$^\circ\text{C}$
Storage Temperature Range	T_{stg}	-65 to +300		$^\circ\text{C}$

2N998, 2N999 (continued)

ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
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OFF CHARACTERISTICS

Collector-Emitter Sustaining Voltage* ($I_C = 30\text{ mAdc}$, $I_B = 0$)		$BV_{CEO(sus)}^*$	60	—	Vdc
Collector-Base Breakdown Voltage ($I_C = 100\ \mu\text{Adc}$, $I_E = 0$)	2N998 2N999	BV_{CBO}	100 60	—	Vdc
Emitter-Base Breakdown Voltage ($I_E = 100\ \mu\text{Adc}$, $I_C = 0$)		BV_{EBO}	15	—	Vdc
Collector Cutoff Current ($V_{CB} = 90\text{ Vdc}$, $I_E = 0$)	2N998	I_{CBO}	—	0.01	μAdc
($V_{CB} = 90\text{ Vdc}$, $I_E = 0$, $T_A = 150^\circ\text{C}$)	2N998		—	15	
($V_{CB} = 60\text{ Vdc}$, $I_E = 0$)	2N999		—	0.01	
($V_{CB} = 60\text{ Vdc}$, $I_E = 0$, $T_A = 150^\circ\text{C}$)	2N999		—	10	
Emitter Cutoff Current ($V_{BE} = 10\text{ Vdc}$, $I_C = 0$)		I_{EBO}	—	0.01	μAdc

ON CHARACTERISTICS

DC Current Gain* ($I_C = 1\text{ mAdc}$, $V_{CE} = 5\text{ Vdc}$)	2N998	h_{FE}^*	800	—	—
($I_C = 10\text{ mAdc}$, $V_{CE} = 5\text{ Vdc}$)	2N998		1,600	8,000	
($I_C = 100\text{ mAdc}$, $V_{CE} = 5\text{ Vdc}$)	2N998		2,000	—	
($I_C = 0.1\text{ mAdc}$, $V_{CE} = 10\text{ Vdc}$)	2N999		1,000	—	
($I_C = 10\text{ mAdc}$, $V_{CE} = 10\text{ Vdc}$)	2N999		4,000	—	
($I_C = 100\text{ mAdc}$, $V_{CE} = 10\text{ Vdc}$)	2N999		7,000	70,000	
($I_C = 100\text{ mAdc}$, $V_{CE} = 10\text{ Vdc}$, $T_A = -55^\circ\text{C}$)	2N999		1,000	—	
($I_C = 10\text{ mAdc}$, $V_{CE} = 5\text{ Vdc}$, measured across each transistor within the device)	2N998		25	—	
($I_C = 10\text{ mAdc}$, $V_{CE} = 10\text{ Vdc}$, measured across each transistor within the device)	2N999		25	—	

DYNAMIC CHARACTERISTICS

Output Capacitance ($V_{CB} = 10\text{ Vdc}$, $I_E = 0$, $f = 140\text{ kHz}$)	2N998 2N999	C_{ob}	— —	30 20	pF
Input Capacitance ($V_{BE} = 0.5\text{ Vdc}$, $I_C = 0$, $f = 140\text{ kHz}$)	2N998 2N999	C_{ib}	— —	50 10	pF
Small-Signal Current Gain ($I_C = 1\text{ mAdc}$, $V_{CE} = 5\text{ Vdc}$, $f = 1\text{ kHz}$)	2N998	h_{fe}	1,000	—	—
Noise Figure** ($I_C = 0.1\text{ mAdc}$, $V_{CE} = 10\text{ Vdc}$, $R_S = 5\text{ kohms}$, $f = 1\text{ kHz}$, Bandwidth = 200 Hz)	2N998	NF**	—	6	dB

*Pulse Test: Pulse Width = 300 μs , Duty Cycle = 1%

**Measured with constant current supply of 20 μAdc connected to the emitter of the input transistor. (See Figure 1)

FIGURE 1 — NOISE FIGURE TEST CIRCUIT

