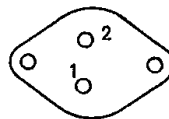
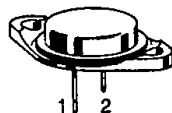
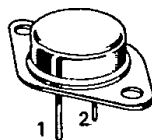


Selection By Package

Motorola power transistors are available in a wide variety of metal and plastic packages to match thermal, electrical and cost requirements. The following table compares the basic packages from the standpoint of current, voltage and power capabilities. The devices available in the various packages are tabulated on the succeeding pages.

Package	IC Range (Amps)	VCE Range (Volts)	PD (Watts)	Page #
 TO-204AA (TO-3) Case 1	2.5-30	40-1500	36-250	2-3
 TO-204AE TYPE Case 197-01	20	450	250	2-3
 TO-204AE Case 197A-02	40-60	60-500	250-300	2-3
 TO-205AD (TO-39) Case 79	0.5-5.0	40-400	5.0-10	2-8
 TO-213AA (TO-66) Case 80	1.0-10	40-325	20-90	2-9
 DPAK Case 369	0.5-10	40-400	12.5-20	2-18
 DPAK Case 369A	0.5-10	40-400	12.5-20	2-18
 TO-218AC Case 340	5.0-25	40-1500	80-150	2-10
 TO-218 TYPE Case 340D-01	6.0-25	60-850	100-150	2-10
 TO-220AB Case 221A	0.5-15	30-1800	15-125	2-11
 Case 221C	1-10	60-400	20-50	2-14
 TO-225AA TYPE (TO-126 TYPE) Case 77	0.3-5.0	25-400	12.5-40	2-15
 TO-225AB (TO-127 TYPE) Case 90	5.0-15	40-100	65-100	2-17
 Case 152	0.5-2.0	30-300	10	2-17

Bipolar Power Transistors

TABLE 1 — METAL TO-204 (Formerly TO-3), TO-204AE


STYLE 1:
PIN 1. BASE
2. EMITTER
CASE. COLLECTOR

CASE 1-06 — 40 mil pins (TO-204AA)

CASE 197-01 — 60 mil pins (TO-204AE TYPE)

CASE 197A-02 — 60 mil pins (TO-204AE)

I _C Cont Amps Max	V _{CEO(sus)} Volts Min	Device Type		h _{FE} Min/Max	@ I _C Amp	Resistive Switching			f _T MHz Min	P _D (Case) Watts @ 25°C
		NPN	PNP			t _s μs Max	t _f μs Max	@ I _C Amp		
2.5	800	MJ8501		7.5 min	0.5	4	2	1		125
	1500*	MJ12002		1.11 min	2		1	2	4 typ	75
3.5	325	2N3902		30/90	1	1.2 typ	0.1 typ	1	2.8	100
4	1500*	MJ12003		2.5 min	3		1	3		100
5	200	MJ410		30/90	1				2.5	100
	250	MJ3029		30 min	0.4		1	3		125
	300	MJ411		30/90	1				2.5	100
	400	2N6543		7/35	3	4	0.8	3	6	100
		MJ13070		8 min	3	1.5	0.5	3		125
	450	MJ16002		5 min	5	3	0.3	3		125
		MJ16004		7 min	5	2.7	0.35	3		125
		2N6834		10/30	3	2.7	0.35	3	15	125
	500	MJ16002A		5 min	5	3	0.3	3		125
	700	MJ8502		7.5 min	1	4	2	2.5		150
6	800	MJ8503		7.5 min	1	4	2	2.5		150
	850*	MJ12020		5 min	5		0.13 typ	3	15	125
	1500*	BU208		2.25 min	4.5	8 typ	0.6 typ	4.5	4 typ	60
		BU208A		2.25 min	4.5		0.4 typ	4.5	4 typ	90
		BU208D†		2.25 min	4.5		0.6 typ	4.5	4 typ	60
		MJ12004		2.5 min	4.5		1	4.5	4	100
	100	2N5758		25/100	3	0.7 typ	0.5 typ	3	1	150
	120	2N5759		20/80	3	0.7 typ	0.5 typ	3	1	150
	140	2N5760		15/60	3	0.7 typ	0.5 typ	3	1	150

I_{hfe} @ 1 MHz, ## Darlington

* V_{(BR)CEX} or V_{(BR)CES}

† D Suffix on this device signifies internal C-E Diode

(continued)

TABLE 1 — METAL TO-204, TO-204AE (continued)

I _C Cont Amps Max	V _{CEO} (sus) Volts Min	Device Type		h _{FE} Min/Max	@ I _C Amp	Resistive Switching			f _T MHz Min	P _D (Case) Watts @ 25°C
		NPN	PNP			t _s μs Max	t _f μs Max	@ I _C Amp		
6	375	BU326		30 typ	0.6	3.5	1**	2.5	6	90
	400	BU326A		30 typ	0.6	3.5	1**	2.5	6	90
7.5	80	2N3448		40/120	5	2	0.35	5	10	115
8	60	MJ1000## 2N6055##	MJ900## 2N6053##	1k min 750/18k	3 4	1.5 typ	1.5 typ	4	4#	90 100
		MJ1001## 2N6056##	MJ901## 2N6054##	1k min 750/18k	3 4	1.5 typ	1.5 typ	4	4#	90 100
	250	2N6306		15/75	3	1.6	0.4	3	5	125
	300	2N6307		15/75	3	1.6	0.4	3	5	125
	350	2N6308		12/60	3	1.6	0.4	5	5	125
	400	2N6545	MJ6503	7/35 15 min	5 2	4 2	1 0.5	5 4	6	125 125
		MJ13080		8 min	5	1.5	0.5	5		150
	450	MJ16006 MJ16008 2N6835		5 min 7 min 10/30	8 8 5	2.5 2.2 2.5	0.25 0.25 0.25	5 5 5	10	150 150 150
		MJ16006A		5 min	8	3	0.4	5		150
	850*	MJ12021		5 min	8		0.1 typ	5		150
	1400*	MJ10011##		20 min	4		1	4		80
	1500*	MJ12005		5 min	5		1	5		100
9	400	BUX47		7 min	6	2	0.4	6		150
	450	BUX47A		7 min	5	2	0.4	5		150
10	40	2N6383##	2N6648##	1k/20k	5				20#	100
	60	2N3715	2N3789	15 min	3	0.3 typ	0.4 typ	5	4	150
		2N5877	2N3791	30 min	3	0.3 typ	0.4 typ	5	4	150
		2N6384##	2N5875	20/100	4	1	0.8	4	4	150
		MJ3000##	MJ2500##	1k/20k	5				20#	100
				1k min	5					150
	80	2N3714	2N3790	15 min	3	0.3 typ	0.4 typ	5	4	150
		2N3716	2N3792	30 min	3	0.3 typ	0.4 typ	5	4	150
		2N5878	2N5876	20/100	4	1	0.8	4	4	150
		2N6385##		1k/20k	5				20#	100
		MJ3001##	MJ2501##	1k min	5					150
140	2N5634 2N3442			15/60 20/70	5 4	0.9 typ	0.9 typ	5	1	150 117

* V_(BR)CEX, # |h_{FE}| @ 1 MHz, ## Darlington

(continued)

☐ JAN, JTX, JTXV Available

TABLE 1 — METAL TO-204, TO-204AE (continued)

I _C Cont Amps Max	V _{CE(sus)} Volts Min	Device Type		h _{FE} Min/Max	@ I _C Amp	Resistive Switching			f _T MHz Min	P _D (Case) Watts @ 25°C
		NPN	PNP			t _s μs Max	t _f μs Max	@ I _C Amp		
10	250	MJ15011	MJ15012	20/100	2					200
	300	MJ3041##		250 min	2.5					175
	325	MJ413		20/80	0.5				2.5	125
		MJ423		30/90	1				2.5	125
		MJ431		15/35	2.5				2.5	125
	350	BU323##		150 min	6	7.5 typ	5.2 typ	6		175
		MJ3042##		250 min	2.5					175
		MJ13014		8/20	5	2	0.5	5		150
		MJ10002##		3/300	5	2.5	1	5	10#	150
		MJ10006##		30/300	5	1.5	0.5	5	10#	150
	400	BU323A##		150 min	6	7.5 typ	5.2 typ	6		175
		MJ10007##		30/300	5	1.5	0.5	5	10#	150
		MJ10012##		100/2k	6	15	15	6		175
		MJ13015		8/20	5	2	0.5	5		150
12	600	MJ10014##		10/250	10	2.5	0.8	10		175
	700	MJ8504		7.5 min	1.5	4	2	5		175
	800	MJ8505		7.5 min	1.5	4	2	5		175
	950*	MJ16018		4 min	5	4.5 typ	0.2 typ	5		150
		MJ12010		4.2 min	5		1	5		100
15	60	2N6057##	2N6050##	750/18k	6	1.6 typ	1.5 typ	6	4#	150
	80	2N6058##	2N6051##	750/18k	6	1.6 typ	1.5 typ	6	4#	150
	100	2N6059##	2N6052##	750/18k	6	1.6 typ	1.5 typ	6	4#	150
	60	2N3055	MJ2955	20/70	4	0.7 typ	0.3 typ	4	2.5	115
		2N3055A	MJ2955A	20/70	4				0.8	115
		2N6576##		2k/20k	4	2	7	10	10-200#	120
		2N5881	2N5879	20/100	6	1	0.8	6	4	160
	80	2N5882	2N5880	20/100	6	1	0.8	6	4	160
	90	2N6577##		2k/20k	4	2	7	10	10-200#	120
	120	MJ15015	MJ15016	20/70	4				1	180
	120	2N6578##		2k/20k	4	2	7	10	10-200#	120
	140	MJ15001	MJ15002	25/150	4				2	200
	150	MJ11018##	MJ11017##	100 min	15				3#	175
	200	BUX41		8 min	8	1.5	0.4	8	8	120
		2N6249		10/50	10	3.5	1	10	2.5	175
		MJ11020##	MJ11019##	100 min	15				3#	175
	250	MJ11022##	MJ11021##	100 min	15				3#	175
	275	2N6250		8/50	10	3.5	1	10	2.5	175
	300	2N6546		6/30	10	4	0.7	10	6 to 24	175
	325	BUX13		8 min	8	2.5	0.8	8	8	150
	400	BUX48		8 min	10	2	0.4	10	6 to 24	175
		2N6547		6/30	10	4	0.7	10		175
		MJ13090		8 min	10	2.5	0.5	10		175
		MJ16110		6/20	15	0.8 typ	0.1 typ	10		175
	450	BUX48A		8 min	8	2	0.4	10		175
		MJ16010		5 min	15	1.2 typ	0.2 typ	10		175

* V(BR)CEX, # |h_{FE}| @ 1 MHz, ## Darlington

(continued)



JAN, JTX, JTXV Available

TABLE 1 — METAL TO-204, TO-204AE (continued)

I _C Cont Amps Max	V _{CEO(sus)} Volts Min	Device Type		h _{FE} Min/Max	@ I _C Amp	Resistive Switching			f _T MHz Min	P _D (Case) Watts @ 25°C
		NPN	PNP			t _s μs Max	t _f μs Max	@ I _C Amp		
15		MJ16012 2N6836		7 min 10/30	15 10	0.9 typ 3	0.15 typ 0.35	10 10	10	175 175
	500	MJ16010A		5 min	15	3	0.4	10		175
	850*	MJ12022		5 min	15		0.1 typ	10		175
16	100	2N5629	BD318 2N6029	25 min 25/100	5 8	1.2 typ	1.2 typ	8	1 1	200 200
	120	2N5630	2N6030	20/80	8	1.2 typ	1.2 typ	8	1	200
	140	2N3773 2N5631	2N6609 2N6031	15/60 15/60	8 8	1.1 typ 1.2 typ	1.5 typ 1.2 typ	8 8	4 1	150 200
	200	MJ15022	MJ15023	15/60	8				5	250
	250	MJ15024	MJ15025	15/60	8				5	250
18	160	BUX41N		8 min	12	1.2	0.25	12	8	120
20	60	2N3772 2N6282##	2N6285##	15/60 750/18k	10 10	2.5 typ	2.5 typ	10	2 4#	150 160
	75	2N5039		20/100	10	1.5	0.5	10	60	140
	80	2N5303 2N6283##	2N5745 2N6286##	15/60 750/18k	10 10	2 2.5 typ	1 2.5 typ	10 10	2 4#	200 160
	90	2N5038		20/100	12	1.5	0.5	12	60	140
	100	2N6284##	2N6287##	750/18k	10	2.5 typ	2.5 typ	10	4#	160
	125	BUX40		8 min	15	1	0.25	15	8	120
	140	MJ15003	MJ15004	25/150	5				2	250
	160	BUV11N		10 min	15	1.2	0.25	15	8	150
	200	BUV11 MJ13330		10 min 8/40	12 10	1.8 3.5	0.4 0.7	12 10	8 5 to 40	150 175
	250	BUV12 MJ13331		10 min 8/40	10 10	1.5 3.5	0.5 0.7	10 10	8 5 to 40	150 175
	350	MJ10000## MJ10004##		40/400 40/400	10 10	3 1.5	1.8 0.5	10 10	10# 10#	175 175
	400	MJ10001## MJ10005## MJ13333		40/400 40/400 10/60	10 10 5	3 1.5 4	1.8 0.5 0.7	10 10 10	10# 10# 10#	175 175 175
	450	MJ10008## MJ16014 MJ16016 2N6837		30/300 5 min 7 min 10/30	10 20 20 15	2 2.7 2.2 2.5	0.6 0.35 0.25 0.25	10 20 20 15	8#	175 250 250 250
	500	MJ10009## MJ13335		30/300 10/60	10 5	2 4	0.6 0.7	10 10	8#	175 175
	700	BUT15##		15 min	12	2.5	0.8	12		175
	750	MJ10024##		50/600	20	5	1.8	10		250
	850	MJ10025##		50/600	20	5	1.8	10		250

* V_{(BR)CEX}, # |h_{FE}| @ 1 MHz, ## Darlington

(continued)



JAN, JTX, JTXV Available

TABLE 1 — METAL TO-204, TO-204AE (continued)

I _C Cont Amps Max	V _{CEO} (sus) Volts Min	Device Type		h _{FE} Min/Max	@ I _C Amp	Resistive Switching			f _T MHz Min	P _D (Case) Watts @ 25°C
		NPN	PNP			t _s μs Max	t _f μs Max	@ I _C Amp		
25	60	2N5885	2N5883	20/100	10	1	0.8	10	4	200
	80	2N5886	2N5884 2N6436	20/100 30/120	10 10	1 1	0.8 0.25	10 10	4 40	200 200
	100	2N6338	2N6437	30/120	10	1	0.25	10	40	200
	120	2N6339	2N6438	30/120	10	1	0.25	10	40	200
	125	BUV10 BUV10N		10 min 10 min	20 20	1.2 1.55	0.25 0.45	20 15	8 10	150 175
	140	2N6340		30/120	10	1	0.25	10	40	200
	150	2N6341		30/120	10	1	0.25	10	40	200
	500	BUT14##		15 min	16	2.8	0.8	16		175
28	400	BUT13##		20 min	20	2.6	0.8	18		175
30	40	2N3771 2N5301	2N4398	15/60 15/60	15 15	2	1	10	2 2	150 200
	60	2N5302 MJ11012##	2N4399 MJ11011##	15/60 1k min	15 20	2	1	10	2 4#	200 200
	90	BUX39 MJ11014##	MJ11013##	8 min 1k min	20 20	1	0.25	20	8 4#	120 200
	100	2N6328 MJ802	MJ4502	6/30 25/100	30 7.5				3 2	200 200
	120	MJ11016##	MJ11015##	1k min	20				4#	200
	325	BUV23•		8 min	16	1.8	0.4	16	8	250
	400	BUS98• BUX98		8 min	20	2.3 3	0.4 0.8	20 20		250 250
	450	BUS98A• BUX98A MJ16020• MJ16022•		8 min 5 min 7 min	16 30 30	2.3 3 1.8 1.5	0.4 0.8 0.2 0.15	16 16 20 20		250 250 250 250
40	160	BUV21N•		10 min	40	1	0.2	40	8	250
	200	BUV21•		10 min	25	1.8	0.4	25	8	150
	250	BUS52• BUV22•		15 min 10 min	40 20	1.1	0.35	20	8	350 250
	350	MJ10022•##		50/600	120	2.5	0.9	20		250
	400	MJ10023•##		50/600	10	2.5	0.9	20		250
	700	BUT35•##		15 min	24	4	1.2	24		250
50	60	2N5685• MJ11028•##	2N5683• MJ11029•##	15/60 400 min	25 50	0.5 typ	0.3 typ	25	2	300 300
	80	2N5686•	2N5684• 2N6377•	15/60 30/120	25 20	0.5 typ 0.8	0.3 typ 0.25	25 20	2 30	300 250
	90	MJ11030•##	MJ11031•##	400 min	50					300
	100	2N6274•	2N6378•	30/120	20	0.8	0.25	20	30	250
	120	2N6275• MJ11032•##	2N6379• MJ11033•##	30/120 400 min	20 50	0.8	0.25	20	30	250 300
	125	BUV20•		10 min	50	1.2	0.25	50	8	250
	150	2N6277•		30/120	20	0.8	0.25	20	30	250

• Modified TO-3 60 mil pins, # [h_{FE}] @ 1 MHz, ## Darlington

(continued)

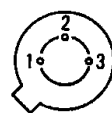
 JAN, JTX, JTXV Available

TABLE 1 — METAL TO-204, TO-204AE (continued)

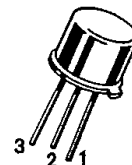
I _C Cont Amps Max	V _{CEO(sus)} Volts Min	Device Type		h _{FE} Min/Max	@ I _C Amp	Resistive Switching			f _T MHz Min	P _D (Case) Watts @ 25°C
		NPN	PNP			t _s μs Max	t _f μs Max	@ I _C Amp		
50	200	BUS51●		15 min	50					350
	400	MJ10015●###		10 min	40	2.5	1	20		250
	500	BUT34●## MJ10016●###		15 min 10 min	32 40	3 2.5	1.5 1	32 20		250 250
56	400	BUT33●##		20 min	36	3.3	1.6	36		250
60	60	MJ14000●	MJ14001●	15/100	50					300
	80	MJ14002●	MJ14003●	15/100	50					300
	200	MJ10020●###		75 min	15	3.5	0.5	30		250
	250	MJ10021●###		75 min	15	3.5	0.5	30		250
70	125	BUS50●		15 min	50					350

● Modified TO-3, 60 mil pins, # |h_{FE}| @ 1 MHz, ## Darlington

TABLE 2 — METAL TO-205 (Formerly TO-39)



STYLE 1:
PIN 1. EMITTER
2. BASE
3. COLLECTOR
(Pin 3 connected to case)



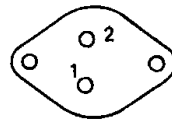
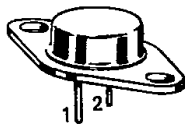
CASE 79-04 (TO-205AD)

I _C Cont Amps Max	V _{CEO(sus)} Volts Min	Device Type		h _{FE} Min/Max	@ I _C Amp	Resistive Switching			f _T MHz Min	P _D (Case) Watts @ 25°C
		NPN	PNP			t _s μs Max	t _f μs Max	@ I _C Amp		
0.5	300		MJ4646	20 min	0.5	0.72*		0.05	40	5
	400		MJ4647	20 min	0.5	0.72*		0.05	30	5
3	40		2N3719 2N3867	25/180 40/200	1 1.5	0.4* 0.4*		1 1.5	60 60	6 6
	60		2N3720 2N3868	25/180 30/150	1 1.5	0.4* 0.4*		1 1.5	60 60	6 6
	80		2N6303	30/150	1.5	0.4*		1.5	60	6
	60	2N4877		20/100	4	1.5	0.5	4	4	10
5	80	2N5336 2N5337	2N6190 2N6191	30/120 60/240	2 2	2 2	0.2 0.2	2 2	30 30	6 6
	100	2N5338 2N5339	2N6193	30/120 60/240	2 2	2 2	0.2 0.2	2 2	30 30	10 6

☐ JAN, JTX, JTXV Available
*t_{off}

TABLE 3 — METAL TO-213 (Formerly TO-66)

T-91-01



STYLE 1:
PIN 1. BASE
2. EMITTER
CASE. COLLECTOR

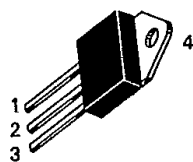
CASE 80-02 (TO-213AA)

I _C Cont Amps Max	V _{CEO(sus)} Volts Min	Device Type		h _{FE} Min/Max	@ I _C Amp	Resistive Switching			f _T MHz Min	P _D (Case) Watts @ 25°C
		NPN	PNP			t _s μs Max	t _f μs Max	@ I _C Amp		
1	80	2N4912		20/100	0.5	0.6 typ	0.3 typ	0.5	3	25
	175	2N3583	2N6420	40/200	0.5	2 typ	0.23 typ	0.5	10	35
	225	2N3738		40/200	0.1	3 typ	0.3 typ	0.1	10	20
	300	2N3739		40/200	0.1	3 typ	0.3 typ	0.1	10	20
2	225		2N6211	10/100	1	2.5	0.6	1	20	35
	250	2N3584	2N6421	25/100	1	4	3	1	10	35
	300		2N6212	10/100	1	2.5	0.6	1	20	35
		2N3585	2N6422	25/100	1	4	3	1	10	35
		2N4240		30/150	0.75	6	3	0.75	15	35
	350		2N6213	10/100	1	2.5	0.6	1	20	35
3	140	2N3441		25/100	0.5				0.2	25
4	60		2N3740	30/100	0.25	1.3 typ	0.27 typ	0.25	4	25
		2N3054,A		25/100	0.5	1 typ	0.3 typ	0.5	3	75
		2N3766		40/160	0.5	0.9 typ	0.09 typ	0.5	10	20
		2N6294##	2N6296##	750/18k	2	0.9 typ	0.7 typ	2	4#	50
4	80		2N3741	30/100	0.25	1.3 typ	0.27 typ	0.25	4	25
		2N3767		40/160	0.5	0.9 typ	0.09 typ	0.5	10	20
		2N6295##	2N6297##	750/18k	2	0.9 typ	0.7 typ	2	4	50
5	80	2N4233A		25/100	1.5	0.5 typ	0.2 typ	1.5	4	75
7	60		2N6317	20/100	2.5	1	0.8	2.5	4	90
	80	2N5428		60/240	2	2	0.2	2	30	40
			2N6318	20/100	2.5	1	0.8	2.5	4	90
	100	2N5429		30/120	2	2	0.2	2	30	40
8	60	2N6300##	2N6298##	750/18k	4	1.5 typ	1.5 typ	4	4#	75
	80	2N6301##	2N6299##	750/18k	4	1.5 typ	1.5 typ	4	4#	75

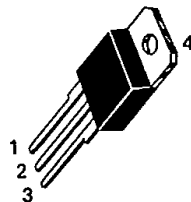
|h_{FE}| @ 1 MHz, ## Darlington

JAN, JTX, JTXV Available

TABLE 4 — PLASTIC TO-218



STYLE 1:
PIN 1. BASE
2. COLLECTOR
3. EMITTER
4. COLLECTOR



STYLE 1:
PIN 1. BASE
2. COLLECTOR
3. EMITTER
4. COLLECTOR

CASE 340-02 (TO-218AC)

I _C Cont Amps Max	V _{CEO(sus)} Volts Min	Device Type		h _{FE} Min/Max	@ I _C Amp	Resistive Switching			f _T MHz Min	P _D (Case) Watts @ 25°C
		NPN	PNP			t _s μs Max	t _f μs Max	@ I _C Amp		
3	750	MJH16032		4 min	3	2	1.5	2		125
	850	MJH16034		4 min	3	2	1.5	2		125
5	400	BUW11		6 min	3	4	0.8	3		125
	450	BUW11A		6 min	2.5	4	0.8	2.5		125
		MJH16002		5 min	5	3	0.3	3		100
		MJH16004		7 min	5	2.7	0.35	3		100
	500	MJH16002A		5 min	5	3	0.3	3		100
	1500*	MJH12004		2.5 min	4.5	—	1	4.5	4	100
6	375	BU426†		30 typ	0.6	2 typ	0.5 typ	2.5	6 typ	113
	400	BU426A†		30 typ	0.6	2 typ	0.5 typ	2.5	6 typ	113
8	400	BUW12		6 min	6	4	0.8	5		125
		MJH16106		6/25	8	2 typ	0.1 typ	5		125
	450	BUW12A		6 min	5	4	0.8	5		125
		MJH16006		5 min	8	2.5	0.25	5		125
		MJH16008		7 min	8	2.2	0.25	5		125
	500	BUT50P##†		30 min	2	0.75 typ	0.1 typ	5		100
		MJH16008A		5 min	8	2.5	0.25	5		125
	700	BU508,A BU508D,AD		2.25 min 2.25 min	4.5 4.5	8 typ 8 typ	0.5 typ 0.5 typ	4.5 4.5	7 7	125 125
	750	MJH12005					0.4 typ	5	4	100
9	400	BUV47†		7 min	5	2	0.4	6		128
	450	BUV47A†		7 min	6	2	0.4	6		128
10	40	TIP33	TIP34	20 min	3				3	80
	60	BDV65##†	BDV64##†	1k min	5				3	125
		TIP33A	TIP34A	20 min	3				4#	80
		TIP140##	TIP145##	500 min	10	2.5 typ	2.5 typ	5		125
	80	BDV65A##†	BDV64A##†	1k min	5				3	125
		TIP33B	TIP34B	20 min	3				4#	80
		TIP141##	TIP146##	500 min	10	2.5 typ	2.5 typ	5		125
	100	BDV65B##†	BDV64B##†	1k min	5				3	125
		TIP33C	TIP34C	20 min	3				4#	80
		TIP142##	TIP147##	500 min	10	2.5 typ	2.5 typ	5		125
15	120	BDV65C##†	BDV64C##†	1k min	5					125
	200	BU323P##†		150 min	6	15	15	6		125
	250	BU323AP##†		150 min	6	15	15	6		125
	400	MJH10012##		100/2k	6	15	15	6		118
	800	MJH16018		4 min	5	4.5 typ	0.2 typ	5		150
	60	TIP3055	TIP2955	5 min	10				2.5	80
	150	MJH11018##	MJH11017##	400/15k	10				3#	150
	200	MJH11020##	MJH11019##	400/15k	10				3#	150
	250	MJH11022##	MJH11021##	400/15k	10				3#	150

|h_{FE}| @ 1 MHz, ## Darlington* V_{(BR)CEX} or V_{(BR)CES}

† These devices supplied in Case 340D-01. Consult Motorola for details.

(continued)

TABLE 4 — PLASTIC TO-218 (continued)

I _C Cont Amps Max	V _{CEO} (sus) Volts Min	Device Type		h _{FE} Min/Max	@ I _C Amp	Resistive Switching			f _T MHz Min	P _D (Case) Watts @ 25°C
		NPN	PNP			t _s μs Max	t _f μs Max	@ I _C Amp		
15	400	BUV48† MJH13090 MJH16110		8 min 8 min 6/20	10 10 10	2 2.5 0.8 typ	0.4 0.5 0.1 typ	10 10 10		150 125 135
	450	BUV48A† MJH16010 MJH16012		8 min 5 min 7 min	8 15 15	2 1.2 0.9	0.4 0.2 0.15	10 10 10		150 150 150
	500	BUT51P##† MJH16010A		40 min 5 min	5 15	1.1 3	0.16 0.4	10 10		125 150
16	100	MJE4340	MJE4350	15 min	8	1.2 typ	1.2 typ	8	1	125
	120	MJE4341	MJE4351	15 min	8	1.2 typ	1.2 typ	8	1	125
	140	MJE4342	MJE4352	15 min	8	1.2 typ	1.2 typ	8	1	125
	160	MJE4343	MJE4353	15 min	8	1.2 typ	1.2 typ	8	1	125
20	60	MJH6282##	MJH6285##	750/18k	10				4#	125
	80	MJH6283##	MJH6286##	750/18k	10				4#	125
	100	MJH6284##	MJH6287##	750/18k	10				4#	125
25	40	TIP35	TIP36	10/75	15	0.6 typ	0.3 typ	10	3	125
	45	BD249†	BD250†	10 min	15				3	125
	60	BD249A† TIP35A	BD250A† TIP36A	10 min 10/75	15 15	0.6 typ	0.3 typ	10	3 3	125 125
	80	BD249B† TIP35B	BD250B† TIP36B	10 min 10/75	15 15	0.6 typ	0.3 typ	10	3 3	125 125
	100	BD249C† TIP35C	BD250C† TIP36C	10 min 10/75	15 15	0.6 typ	0.3 typ	10	3 3	125 125

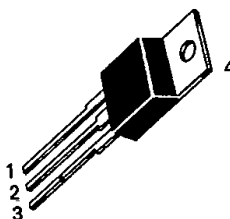
[h_{FE}] @ 1 MHz, ## Darlington

† These devices supplied in Case 340D-01. Consult Motorola for details.

2

TABLE 5 — PLASTIC TO-220

STYLE 1:
PIN 1. BASE
2. COLLECTOR
3. EMITTER
4. COLLECTOR



CASE 221A-04 (TO-220AB)

I _C Cont Amps Max	V _{CEO} (sus) Volts Min	Device Type		h _{FE} Min/Max	@ I _C Amp	Resistive Switching			f _T MHz Min	P _D (Case) Watts @ 25°C
		NPN	PNP			t _s μs Max	t _f μs Max	@ I _C Amp		
0.5	350	MJE2360T MJE2361T		15 min 40 min	0.1 0.1				10 typ 10 typ	30 30
1	40	TIP29	TIP30	15/75	1	0.6 typ	0.3 typ	1	3	30
	60	TIP29A	TIP30A	15/75	1	0.6 typ	0.3 typ	1	3	30
	80	TIP29B	TIP30B	15/75	1	0.6 typ	0.3 typ	1	3	30
	100	TIP29C	TIP30C	15/75	1	0.6 typ	0.3 typ	1	3	30
	250	TIP47		30/150	0.3	2 typ	0.18 typ	0.3	10	40
	300	TIP48		30/150	0.3	2 typ	0.18 typ	0.3	10	40
	350	TIP49		30/150	0.3	2 typ	0.18 typ	0.3	10	40
	400	TIP50		30/150	0.3	2 typ	0.18 typ	0.3	10	40

(continued)

TABLE 5 — PLASTIC TO-220 (Continued)

I _C Cont Amps Max	V _{CEO} (sus) Volts Min	Device Type		h _{FE} Min/Max	@ I _C Amp	Resistive Switching			f _T MHz Min	P _D (Case) Watts @ 25°C
		NPN	PNP			t _s μs Max	t _f μs Max	@ I _C Amp		
2	45	BD239	BD240	15 min	1				3	30
	60	BD239A TIP110##	BD240A TIP115##	15 min 500 min	1 2	1.7 typ	1.3 typ	2	3 25#	30 50
	80	BD239B TIP111##	BD240B TIP116##	15 min 500 min	1 2	1.7 typ	1.3 typ	2	3 25#	30 50
	100	BD239C TIP112##	BD240C TIP117##	25 min 500 min	1 2	1.7 typ	1.3 typ	2	3 25#	30 50
	400	BUX84		30 min	0.1	3.5	1.4	1	4	50
	450	BUX85		30 min	0.1	3.5	1.4	1	4	50
	900	MJE1320		3 min	1	4 typ	0.8 typ	1		80
2.5	700	MJE8500		7.5 min	0.5	4	2	1		65
	750	MJE12007		1.1 min	2		1	2	4 typ	65
	800	MJE8501		7.5 min	0.5	4	2	1		65
3	40	TIP31	TIP32	25 min	1	0.6 typ	0.3 typ	1	3	40
	45	BD241	BD242	25 min	1				3	40
	60	BD241A TIP31A	BD242A TIP32A	25 min 25 min	1 1	0.6 typ	0.3 typ	1	3 3	40 40
	80	BD241B TIP31B	BD242B TIP32B	25 min 25 min	1 1	0.6 typ	0.3 typ	1	3 3	40 40
	100	BD241C TIP31C	BD242C TIP32C	25 min 25 min	1 1	0.6 typ	0.3 typ	1	3 3	40 40
	750	MJE16032		4 min	3	2	1.5	2		80
	850	MJE16034		4 min	3	2	1.5	2		80
4	45	2N6121	2N6124	25/100	1.5	0.4 typ	0.3 typ	1.5	2.5	40
	60	2N6122 BD535 MJE800T##	2N6125 MJE700T##	25/100 25 min 750 min	1.5 2 1.5	0.4 typ	0.3 typ	1.5	2.5 3 1#	40 50 40
	80	2N6123		20/80	1.5	0.4 typ	0.3 typ	1.5	2.5	40
	300	MJE13004		6/30	3	3	0.7	3	4	60
	400	MJE13005		6/30	3	3	0.7	3	4	60
5	60	TIP120##	TIP125##	1k min	3	1.5 typ	1.5 typ	3	4#	65
	80	TIP121##	TIP126##	1k min	3	1.5 typ	1.5 typ	3	4#	65
	100	TIP122##	TIP127##	1k min	3	1.5 typ	1.5 typ	4	4#	75
	250	2N6497		10/75	2.5	1.8	0.8	2.5	5	80
	300	2N6498		10/75	2.5	1.8	0.8	2.5	5	80
	400	MJE13070		8 min	3	1.5	0.5	3		80
	450	MJE16002 MJE16004		5 min 7 min	5 5	3 2.7	0.3 0.35	3 3		80 80
	700	MJE8502		7.5 min	1	4	2	2.5		80
	800	MJE8503		7.5 min	1	4	2	2.5		80
6	40	TIP41	TIP42	15/75	3	0.4 typ	0.15 typ	3	3	65
	45	BD243	BD244	15 min	3				3	65
	60	BD243A TIP41A	BD244A TIP42A	15 min 15/75	3 3	0.4 typ	0.15 typ	3	3 3	65 65
	80	BD243B TIP41B	BD244B TIP42B	15 min 15/75	3 3	0.4 typ	0.15 typ	3	3 3	65 65
	100	BD243C TIP41C	BD244C TIP42C	15 min 15/75	3 3	0.4 typ	0.15 typ	3	3 3	65 65
7	30	2N6288	2N6111	30/150	3	0.4 typ	0.15 typ	3	4	40

|h_{FE}| @ 1 MHz, ## Darlington

(continued)

TABLE 5 — PLASTIC TO-220 (continued)

I _C Cont Amps Max	V _{CEO(sus)} Volts Min	Device Type		h _{FE} Min/Max	@ I _C Amp	Resistive Switching			f _T MHz Min	P _D (Case) Watts @ 25°C
						t _s μs Max	t _f μs Max	@ I _C Amp		
		NPN	PNP							
7	45	BD795	BD796	25 min	3				3	65
	50	2N6290	2N6109	30/150	2.5	0.4 typ	0.15 typ	3	4	40
	60	BD797	BD798	25 min	3				3	65
	70	2N6292	2N6107	30/150	3	0.4 typ	0.15 typ	3	4	40
	80	BD799	BD800	15 min	3				3	65
	100	BD801	BD802	15 min	3				3	65
	150	BU407,D		30 min	1.5		0.75	5	10	60
	200	BU406,D		30 min	1.5		0.75	5	10	60
	375	BU522##		250 min	2.5				7.5	75
	425	BU522A##		250 min	2.5				7.5	75
	450	BU522B##		250 min	2.5				7.5	75
8	40	2N6386##		1k/20k	3				20#	65
	45	BDX53##	BDX54##	750 min	3				4#	60
		BD895##	BD896##	750 min	3				1#	70
		BD895A##	BD896A##	750 min	4				1#	70
	60	2N6043##	2N6040##	1k/10k	4	1.5 typ	1.5 typ	3	4#	75
		BDX53A##	BDX54A##	750 min	3				4#	60
		BD897##	BD898##	750 min	3				1#	70
		BD897A##	BD898A##	750 min	4				1#	70
		TIP100##	TIP105##	1k/20k	3	1.5 typ	1.5 typ	3	4#	80
	80	2N6044##	2N6041##	1k/10k	4	1.5 typ	1.5 typ	3	4#	75
		BDX53B##	BDX54B##	750 min	3				4#	60
		BD899##	BD900##	750 min	3				1#	70
		BD899A##	BD900A##	750 min	4				1#	70
		TIP101##	TIP106##	1k/20k	3	1.5 typ	1.5 typ	3	4#	80
	100	2N6045##	2N6042##	1k/10k	3	1.5 typ	1.5 typ	3	4#	75
		BDX53C##	BDX54C##	750 min	3				4#	60
		BD901##	BD902##	750 min	3				1#	70
	120	TIP102##	TIP107##	1k/20k	3	1.5 typ	1.5 typ	3	4#	80
		BDX53D##	BDX54D##	750 min	3				4#	60
		MJE15028	MJE15029	20 min	4				30	50
	150	MJE15030	MJE15031	20 min	4				30	50
		BU807##		100 min	5	0.55 typ	0.2 typ	5		60
	200	BU806##		100 min	5	0.55 typ	0.2 typ	5		60
	300	MJE13006		5/30	5	3	0.7	5	4	80
		MJE5740##		200 min	4	8 typ	2 typ	6		80
			MJE5850	15 min	2	2	0.5	4		80
	350	MJE5741##		200 min	4	8 typ	2 typ	6		80
			MJE5851	15 min	2	2	0.5	4		80
	400	MJE5742##		200 min	4	8 typ	2 typ	6		80
		MJE13007		5/30	5	3	0.7	5	4	80
			MJE5852	15 min	2	2	0.5	4		80
		MJE16080		5 min	8	2	0.5	5		80
	450	MJE16106		6/25	8	2 typ	0.1 typ	5		100
		MJE16081		5 min	8	2	0.5	5		80
10	30		D45H1	20 min	4					50
			D45H2	40 min	4					50
	40	D44E1##		1000 min	5	2 typ	0.5 typ	10		50
	45	BDX33##	BDX34##	750 min	4				3	70
		BD805	BD806	15 min	4				1.5	90
		D44H5	D45H4	20 min	4					50
	60		D45H5	40 min	4					50
		BDX33A##	BDX34A##	750 min	4				3	70
		BD807	BD808	15 min	4				1.5	90

|h_{FE}| @ 1 MHz, ## Darlington

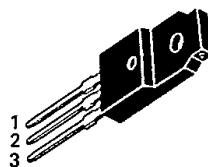
(continued)

TABLE 5 — PLASTIC TO-220 (continued)

I _C Cont Amps Max	V _{CEO(sus)} Volts Min	Device Type		h _{FE} Min/Max	@ I _C Amp	Resistive Switching			f _T MHz Min	P _D (Case) Watts @ 25°C
		NPN	PNP			t _s μs Max	t _f μs Max	@ I _C Amp		
10	60	D44H7	D45H7	20 min	4					50
		D44H8	D45H8	40 min	4					50
			D45H9	40 min	4					50
		MJE2801T		25/100	3					75
		MJE3055T	MJE2955T	20/70	4					75
		2N6387##	2N6667##	1k/20k	5				20#	65
		SE9300##	SE9400##	1k min	4				1#	70
	80	BDX33B##	BDX34B##	750 min	3				3	70
		BD809	BD810	15 min	4				1.5	90
		D44E3##		1000 min	5	2 typ	0.5 typ	10		50
			D45H12	40 min	4					50
		2N6388##	2N6668##	1k/20k	5				20#	65
		D44H10	D45H10	20 min	4	0.5 typ	0.14 typ	5	50 typ	50
12	100	D44H11	D45H11	40 min	4	0.5 typ	0.14 typ	5	50 typ	50
		SE9301##	SE9401##	1k min	4				1#	70
		BDX33C##	BDX34C##	750 min	3				3	70
		SE9302##	SE9402##	1k min	4				1#	70
		MJE13008		6/30	8	3	0.7	8	4	100
		MJE13009		6/30	8	3	0.7	8	4	100
	15	D44VH1	D45VH1	20 min	4	0.7	0.09	8	50 typ	83
		2N6486	2N6489	20/150	5	0.6 typ	0.3 typ	5	5	75
		BDW39	BDW44	1 k min	5	1 typ	1.5 typ	5	4	85
		D44VH4	D45VH4	20 min	4	0.5	0.09	8	50 typ	83
		2N6487	2N6490	20/150	5	0.6 typ	0.3 typ	5	5	75
		BDW40	BDW45	1 k min	5	1 typ	1.5 typ	5	4	85
15	60	D44VH7		20 min	4	0.5	0.09	8	50 typ	85
		2N6488	2N6491	20/150	5	0.6 typ	0.3 typ	5	5	75
		BDW41	BDW46	1 k min	5	1 typ	1.5 typ	5	4	85
		D44VH10	D45VH10	20 min	4	0.5	0.09	8	50 typ	83
		BDW42	BDW47	1 k min	5	1 typ	1.5 typ	5	4	85
		BDW43	BDW48	1 k min	5	1 typ	1.5 typ	5	4	85

|h_{FE}| @ 1 MHz, ## Darlington

TABLE 6 — PLASTIC Full Pak (TO-220 Type)



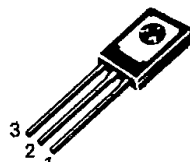
CASE 221C-02

I _C Cont Amps Max	V _{CEO(sus)} Volts Min	Device Type		h _{FE} Min/Max	@ I _C Amp	Resistive Switching			f _T MHz Min	P _D (Case) Watts @ 25°C
		NPN	PNP			t _s μs Max	t _f μs Max	@ I _C Amp		
1	250	MJF47		30/150	0.3	2 typ	0.17 typ	0.3	10	28
5	100	MJF122##	MJF127##	2000 min	3	1.5 typ	1.5 typ	3	4#	28
8	80		MJF6107	30/90	2	0.5 typ	0.13 typ	2	4	35
	100	MJF102##	MJF107##	3000 min	3	1.5 typ	1.5 typ	3	4#	35
	150	MJF15030	MJF15031	40 min	3	1 typ	0.15 typ	3	30	35
10	60	MJF3055	MJF2955	20/100	4				2	40

|h_{FE}| @ 1 MHz, ## Darlington

TABLE 7 — PLASTIC TO-225 Type (Formerly TO-126 Type)

STYLE 1:
PIN 1. EMITTER
2. COLLECTOR
3. BASE



STYLE 3:
PIN 1. BASE
2. COLLECTOR
3. EMITTER

CASE 77-06

I _C Cont Amps Max	V _{CEO} (sus) Volts Min	Device Type		h _{FE} Min/Max	@ I _C Amp	Resistive Switching			f _T MHz Min	P _D (Case) Watts @ 25°C
		NPN	PNP			t _s μs Max	t _f μs Max	@ I _C Amp		
0.3	250	MJE3440		40/160	0.02				15	15
	350	MJE3439		40/160	0.02				15	15
0.5	150	MJE341		25/200	0.05				15	20.8
	200	MJE344		30/300	0.05				15	20.8
	250	2N5655 BD157		30/250 30/240	0.1 0.05	3.5 typ	0.24 typ	0.1	10	20 20
	300	BD158 BD232 MJE340 2N5656	MJE350	30/240 20 min 30/240 30/250	0.05 0.15 0.05 0.1	3.5 typ	0.24 typ	0.1	10	20 20 20.8 20
	350	2N5657 BD159		30/250 30/240	0.1 0.05	3.5 typ	0.24 typ	0.1	10	20 20
1	40	2N4921	2N4918	20/100	0.5	0.6 typ	0.3 typ	0.5	3	30
	60	2N4922	2N4919	20/100	0.5	0.6 typ	0.3 typ	0.5	3	30
	80	2N4923	2N4920	20/100	0.5	0.6 typ	0.3 typ	0.5	3	30
1.5	45	BD165 BD135 BD135.6 BD135.10 BD135.16	BD166 BD136 BD136.6 BD136.10 BD136.16	15 min 40/250 40/100 63/160 100/250	0.5 0.15 0.15 0.15 0.15				6	20 12.5 12.5 12.5 12.5
	60	BD167 BD137 BD137.6 BD137.10 BD137.16	BD138 BD138.6 BD138.10 BD138.16	15 min 40/250 40/100 63/160 100/250	0.5 0.15 0.15 0.15 0.15				6	20 12.5 12.5 12.5 12.5
	80	BD169 BD139 BD139.6 BD139.10 BD139.16	BD140 BD140.6 BD140.10 BD140.16	15 min 40/250 40/100 63/160 100/250	0.5 0.15 0.15 0.15 0.15				6	20 12.5 12.5 12.5 12.5
	300	MJE13002●		5/25	1	4	0.7	1	5	40
	400	MJE13003●		5/25	1	4	0.7	1	5	40
2	45		BD234	25 min	1				3	25
	60	BD235	BD236	25 min	1				3	25
	80	BD237		25 min	1				3	25
	100	MJE270##	MJE271##	1.5k min	0.12				6	15
3	30	MJE520	MJE370	25 min	1					25
	40	MJE180	MJE170	50/250	0.1	0.6 typ	0.12 typ	0.1	50	12.5

● Case 77 (Style 3), # |h_{FE}| @ 1 MHz, ## Darlington

(continued)

TABLE 7 — PLASTIC TO-225 Type (continued)

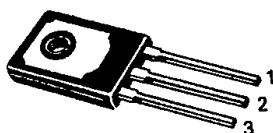
I _C Cont Amps Max	V _{CEO} (sus) Volts Min	Device Type		h _{FE} Min/Max	@ I _C Amp	Resistive Switching			f _T MHz Min	P _D (Case) Watts @ 25°C
		NPN	PNP			t _s μs Max	t _f μs Max	@ I _C Amp		
3	45		BD176 BD176.6 BD176.10 BD176.16	40/250 40/100 63/160 100/250	0.15 0.15 0.15 0.15				3 3 3 3	30 30 30 30
		MJE181	MJE171	50/250	0.1	0.6 typ	0.12 typ	0.1	50	12.5
		BD179 BD179.6 BD179.10 BD179.16 MJE182	BD180 BD180.6 BD180.10 BD180.16 MJE172	40/250 40/100 63/160 100/250 50/250	0.15 0.15 0.15 0.15 0.1				3 3 3 3 50	30 30 30 30 12.5
		BUY49P		30 min	0.5				25	20
	200									
4	30	BD185		15 min	2				20	40
	40	2N5190 MJE521 2N6037##	2N5193 MJE371 2N6034##	25/100 40 min 750/18k	1.5 1 2	0.4 typ 1.7 typ	0.4 typ 1.2 typ	1.5 2	2 25	40 40 40
		BD437 BD675## BD675A## BD785	BD438 BD676## BD676A## BD786 BD776##	40 min 750 min 750 min 20 min 750 min	2 1.5 2 2 2				3 50 20	36 40 40 15 15
	60	BD189		15 min	2				20	40
		BD677## BD677A## BD787 BD777## 2N5191 MJE800## MJE801## 2N6038##	BD440 BD678## BD678A## BD788 BD778## 2N5194 MJE700## MJE701## 2N6035##	25 min 750 min 750 min 20 min 750 min 25/100 750 min 750 min 750/18k	2 2 1.5 2 2 1.5 1.5 2 2	0.4 typ 1.7 typ	0.4 typ 1.2 typ	1.5 2	2 3 50 20 40 1# 1# 25	36 40 40 15 15 40 40 40
		BD679## BD679A## BD789 BD779## MJE240 MJE241 MJE802## MJE803## 2N6039##	BD442 BD680## BD680A## BD790 BD780## MJE250 MJE251 MJE702## MJE703## 2N6036##	15 min 750 min 750 min 10 min 750 min 40/200 40/120 750 min 750 min 750/18k	2 1.5 2 2 2 0.2 0.2 1.5 2 2	0.4 typ 0.15 typ 0.15 typ 1.7 typ	0.4 typ 0.07 typ 0.07 typ 1.2 typ	1.5 2 2 2	2 3 40 20 40 40 1# 1# 25	40 36 40 40 15 15 15 40 40 40
		BD681## BD791 MJE243 MJE244	BD682## BD792 MJE253 MJE254	750 min 10 min 40/120 25 min	1.5 2 0.2 0.2	0.15 typ 0.15 typ	0.07 typ 0.07 typ	2 2	40 40 40	40 15 15 15
	100									
5	25	MJE200	MJE210	45/180	2	0.13 typ	0.035 typ	2	65	15

● Case 77 (Style 3), # |h_{FE}| @ 1 MHz, ## Darlington

TABLE 8 — PLASTIC TO-225 Type (Formerly TO-127 Type)†

T-91-01

STYLE 2:
PIN 1. EMITTER
2. COLLECTOR
3. BASE



CASE 90-05 (TO-225AB)

I _C Cont Amps Max	V _{CEO} (sus) Volts Min	Device Type		h _{FE} Min/Max	@ I _C Amp	Resistive Switching			f _T MHz Min	P _D (Case) Watts @ 25°C
		NPN	PNP			t _s μs Max	t _f μs Max	@ I _C Amp		
5	50		MJE105	25/100	2					65
	60	MJE1100## MJE1101##	MJE1090##	750 min 750 min	3A 4A				1 1	70 70
	80	MJE1102## MJE1103##	MJE1092## MJE1093##	750 min 750 min	3A 4A				1 1	70 70
8	60	MJE6043##	MJE6040##	1k/20k	4	1.5 typ	1.5 typ	4	4#	75
	80	MJE6044##	MJE6041##	1k/20k	4	1.5 typ	1.5 typ	4	4#	75
	100	MJE6045##		1k/20k	4	1.5 typ	1.5 typ	4	4#	75
10	60	MJE2801 MJE3055	MJE2901 MJE2955	25/100 20/70	3 4				2	90 90
12	40	2N5989		20/120	6	0.5 typ	0.25 typ	6	2	100
	80	2N5991		20/120	6	0.5 typ	0.25 typ	6	2	100
15	40	MJE1660		20/100	5				3	90
	60	MJE1661		20/100	5				3	90

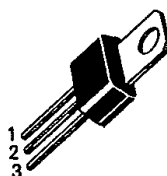
|h_{FE}| @ 1 MHz, ## Darlington

† Not recommended for new designs (check TO-220, Table 5 for alternates)

2

TABLE 9 — PLASTIC CASE 152†

STYLE 1:
PIN 1. EMITTER
2. BASE
3. COLLECTOR



(COLLECTOR CONNECTED TO TAB)

I _C Cont Amps Max	V _{CEO} (sus) Volts Min	Device Type		h _{FE} Min/Max	@ I _C Amp	Resistive Switching			f _T MHz Min	P _D (Case) Watts @ 25°C
		NPN	PNP			t _s μs Max	t _f μs Max	@ I _C Amp		
0.5	300	MPS-U10	MPS-U60	30 min	0.03				60	10
0.8	40	MPS-U02	MPS-U52	30 min	0.5				150	10
1	120	MPS-U03		40 min	0.01				100	10
	180	MPS-U04		40 min	0.01				100	10
2	30	MPS-U01	MPS-U51	50 min	1				50	10
	40	MPS-U01A MPS-U45##	MPS-U51A MPS-U95##	50 min 4k min	1 1				50 100	10 10

Darlington

(continued)

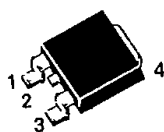
† Not recommended for new designs (check TO-225, Table 7 or TO-220, Table 5 for alternates)

TABLE 9 — PLASTIC CASE 152 (continued)

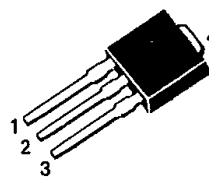
I _C Cont Amps Max	V _{CEO} (sus) Volts Min	Device Type		h _{FE} Min/Max	@ I _C Amp	Resistive Switching			f _T MHz Min	P _D (Case) Watts @ 25°C
		NPN	PNP			t _s μs Max	t _f μs Max	@ I _C Amp		
2	60	MPS-U05	MPS-U55	60 min	0.25				50	10
	80	MPS-U06	MPS-U56	60 min	0.25				50	10
	100	MPS-U07	MPS-U57	30 min	0.25				50	10

Darlington

TABLE 10 — DPAK — SURFACE MOUNT POWER PACKAGE



CASE 369A-04



CASE 369-03

STYLE 1:

1. BASE
2. COLLECTOR
3. EMITTER
4. COLLECTOR

I _C Cont Amps Max	V _{CEO} (sus) Volts Min	Device Type*		h _{FE} Min/Max	@ I _C Amp	Resistive Switching			f _T MHz Min	P _D (Case) Watts @ 25°C
		NPN	PNP			t _s μs Typ	t _f μs Typ	@ I _C Amp		
0.5	300	MJD340	MJD350	30/240	0.05					15
1	250	MJD47		30/150	0.3	2	0.2	0.3	10	15
	400	MJD50		30/150	0.3	2	0.2	0.3	10	20
1.5	400	MJD13003		5/25	1	4 max	0.7 max	1	4	15
2	100	MJD112##	MJD117##	1000 min	2	1.7	1.3	2	25#	20
3	40	MJD31	MJD32	10 min	1	0.6	0.3	1	3	15
	100	MJD31C	MJD32C	10 min	1	0.6	0.3	1	3	15
4	45	MJD148		30 min	4				3	20
	80	MJD6039##	MJD6036##	1k/12k	2	1.7	1.2	2	25	20
5	25	MJD200	MJD210	45/180	2	0.15	0.04	2	65	12.5
6	100	MJD41C	MJD42C	15/75	3	0.4	0.15	3	3	20
8	80	MJD44H11	MJD45H11	40 min	4	0.5	0.14	5	50 typ	20
	100	MJD122##	MJD127##	1k/12k	4	1.5	2	4	4#	20
10	60	MJD3055	MJD2955	20/100	4	1.5	1.5	3	2	20
	80	MJD44E3##		1k min	5	2	0.5	10		20

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* Case 369-03 may be ordered by adding -1 suffix to part number.

TABLE 11 — MILITARY SPECIFIED POWER TRANSISTORS

I _C Cont Amps Max	V _{CEO(sus)} Volts Min	Device Type		h _{FE} Min/Max	@ I _C Amp	Resistive Switching			f _T MHz Min	P _D (Case) Watts @ 25°C	Case JEDEC/MOT
		NPN/#	PNP/#			t _s μs Max	t _f μs Max	@ I _C Amp			
1	300	2N3739J,/402A TX, TXV		40/200	0.1	3.5*		0.5	10	20	TO-213AA/80
3	40		2N3867SJ,/350A TX, TXV	40/200	1.5	0.5	0.1	1.5	60	10	TO-205AD/79
	60		2N3868SJ,/350A TX, TXV	30/150	1.5	0.055	0.035	1.5	60	5	TO-205AD/79
4	60	2N3766J,/518 TX, TXV	2N3740J,/441A TX, TXV	30/100	0.25	1*		1	5	25	TO-213AA/80
				40/160	0.5	2.5*		0.5	10	25	TO-213AA/80
	80	2N3767J,/518 TX, TXV	2N3741J,/441A TX, TXV	30/100	0.25	1*		1	5	25	TO-213AA/80
				40/160	0.5	2.5*		0.5	10	25	TO-213AA/80
5	100	2N5339J,/560 TX, TXV	2N6193J,/561 TX, TXV	60/240	2	2	0.2	2	30	6	TO-205AD/79
8	60	2N6300J,/540 TX, TXV	2N6298J,/540 TX, TXV	750/18k	4	8*		4	25	75	TO-213AA/80
	80	2N6301J,/540 TX, TXV	2N6299J,/540 TX, TXV	750/18k	4	8*		4	25	75	TO-213AA/80
	250	2N6306J,/498 TX		15/75	3	3*		3	5	125	TO-204/1
	300	2N6671J,/536 TX, TXV		10/40	5	2.5	0.4	5	15	150	TO-204/1
	350	2N6308J,/498 TX		12/60	3	3*		3	5	125	TO-204/1
	400	2N6673J,/536 TX, TXV		10/40	5	2.5	0.4	5	15	150	TO-204/1
10	40	2N6383J,/523 TX, TXV	2N6648J,/527 TX, TXV	1k/20k	5	10*		5	20	100	TO-204/1
	60	2N3715J,/408B TX, TXV 2N6384J,/523 TX, TXV	2N3791J,/379B TX, TXV 2N6649J,/527 TX, TXV	30/120	3	2*		5	4	150	TO-204/1
				1k/20k	5	10*		5	20	100	TO-204/1
				1k/20k	5	10*		5	50	85	TO-204/1
	80	2N3716J,/408B TX, TXV 2N6385J,/523 TX, TXV	2N3792J,/379B TX, TXV 2N6650J,/527 TX, TXV	30/120	3	2*		5	4	150	TO-204/1
				1k/20k	5	10*		5	20	100	TO-204/1
12	80	2N6058J,/502 TX, TXV	2N6051J,/501 TX, TXV	1k/18k	6	10*		5	10	150	TO-204/1
	100	2N6059J,/502 TX, TXV	2N6052J,/501 TX, TXV	1k/18k	6	10*		5	10	150	TO-204/1
15	300	2N6546J,/525 TX		12/60	5	4.7*		10	6	175	TO-204/1
		2N6674J,/537 TX, TXV**		8/20	10	2.5	0.5	10	15	175	TO-204/1

MIL-S-19500 Detailed
Spec. shown by
Device Type

* t_{off}

** Consult
Factory for
qualification
status

TABLE 11 — MILITARY SPECIFIED POWER TRANSISTORS (continued)

I _C Cont Amps Max	V _{CEO(sus)} Volts Min	Device Type		h _{FE} Min/Max	@ I _C Amp	Resistive Switching			f _T MHz Min	P _D (Case) Watts @ 25°C	Case JEDEC/MOT
		NPN/#	PNP/#			t _s μs Max	t _f μs Max	@ I _C Amp			
15	400	2N6547J,/525 TX		12/60	5	4.7*		10	6	175	TO-204/1
		2N6675J,/537 TX, TXV**		8/20	10	2.5	0.5	10	15	175	TO-204AA/1
20	75	2N5039J,/439 TX, TXV		30/150	2	2*		10	60	140	TO-204/1
	80	2N5303J,/456A TX, TXV	2N5745J,/433 TX, TXV	15/60	10	3*		10	2	200	TO-204/1
		2N6283J,/504 TX, TXV	2N6286J,/505 TX, TXV	1250/18k	10	10*		10	8	175	TO-204/1
	90	2N5038J,/439 TX, TXV		50/200	2	2*		12	60	140	TO-204/1
25	100		2N6437J,/508 TX, TXV	30/120	10	1		10	40	200	TO-204/1
			2N6438J,/509 TX, TXV	30/120	10	1		10	40	200	TO-204/1
30	60	2N5302J,/456A TX, TXV	2N4399J,/433 TX, TXV	15/60	15	3*		10	2	200	TO-204/1
50	60	2N5685J,/464 TX, TXV	2N5683J,/466 TX, TXV	15/60	25	3*		25	2	300	TO-204/197
	80	2N5686J,/464 TX, TXV	2N5684J,/466 TX, TXV	15/60	25	3*		25	2	300	TO-204/197
	100	2N6274J,/514 TX, TXV	2N6378J,/515 TX, TXV	30/120	20	1.05*		20	30	250	TO-204/197
	120		2N6379J,/515 TX, TXV	30/120	20	1.05*		20	30	250	TO-204/197
	150	2N6277J,/514 TX, TXV**		30/120	20	1.05*		20	30	250	TO-204/197

MIL-S-19500 Detailed
Spec. shown by
Device Type

* t_{off}

** Consult
Factory for
qualification
status.

TABLE 12 — POWER DARLINGTONS

I _C Cont Amps Max	V _{CEO(sus)} Volts Min	Device Type		h _{FE} Min/Max	@ I _C Amp	Resistive Switching			h _{FE} @ 1 MHz Min	P _D (Case) Watts @ 25°C	Case JEDEC/MOT
		NPN	PNP			t _s μs Max	t _f μs Max	@ I _C Amp			
2	40	MPS-U45	MPS-U95	4k min	1				100	10	/152
	60	TIP110	TIP115	1k min	1	2 typ	1 typ	1	25	50	TO-220/221A
	80	TIP111	TIP116	1k min	1	2 typ	1 typ	1	25	50	TO-220/221A
	100	TIP112 MJD112 MJE270	TIP117 MJD117 MJE271	1k min 1000 min 1.5k min	1 2 0.12	2 typ 1.7 typ	1 typ 1.3 typ	1 2	25 25 6	50 20 25	TO-220/221A TO-252/369A-04 TO-225AA/77

(continued)

TABLE 12 — POWER DARLINGTONS (continued)

I _C Cont Amps Max	V _{CEO(sus)} Volts Min	Device Type		h _{FE} Min/Max	@ I _C Amp	Resistive Switching			h _{FE} @ 1 MHz Min	P _D (Case) Watts @ 25°C	Case JEDEC/MOT
		NPN	PNP			t _s μs Max	t _f μs Max	@ I _C Amp			
4	40	MJE3300 2N6037	MJE3310 2N6034	1k min 750/1k	1 2	1.7 typ	1.2 typ	2	20 25	15 40	TO-225AA/77R TO-225AA/77
		BD675 BD675A	BD676 BD676A BD776	750 min 750 min 750 min	1.5 2 2				20	40 40 15	TO-225AA/77 TO-225AA/77 TO-225AA/77
	60	BD677 BD677A BD777 MJE3301 MJE800 MJE800T MJE801 2N6038 2N6294	BD678 BD678A BD778 MJE700 MJE700T MJE701 2N6035 2N6296	750 min 750 min 750 min 1k min 750 min 750 min 750 min 750/18k 750/18k	1.5 2 2 1 1.5 1.5 2 2 2	1.7 typ 0.9 typ	1.2 typ 0.7 typ	2 2	20 20 1 1 1 25 4	15 40 40 15 40 40 40 40 50	TO-225AA/77 TO-225AA/77 TO-225AA/77 TO-225AA/77R TO-225AA/77 TO-225AA/77 TO-220/221A TO-225AA/77 TO-225AA/77 TO-213AA/80
		BD679 BD679A BD779 MJD6039 MJE802 MJE803 2N6039 2N6295	BD680 BD680A BD780 MJD6036 MJE702 MJE703 2N6036 2N6297	750 min 750 min 750 min 1k/12k 750 min 750 min 750/18k 750/18k	1.5 2 2 2 1.5 2 2 2	1.7 typ 1.7 typ 0.9 typ	1.2 typ 1.2 typ 0.7 typ	2 2 2	20 25 25 4	40 40 15 20 40 40 40 50	TO-225AA/77 TO-225AA/77 TO-225AA/77 TO-252/369A-04 TO-225AA/77 TO-225AA/77 TO-225AA/77 TO-213AA/80
		BD681	BD682	750 min	1.5					40	TO-225AA/77
	60	MJE1100 MJE1101 TIP120	MJE1090 MJE1091 TIP125	750 min 750 min 1k min	3A 4A 3	1.5 typ	1.5 typ	3	1 1 4	70 70 65	TO-225AB/90 TO-225AB/90 TO-220/221A
		MJE1102 MJE1103 TIP121	MJE1092 MJE1102 TIP126	750 min 750 min 1k min	3A 4A 3	1.5 typ	1.5 typ	3	1 1 4	70 70 65	TO-225AB/90 TO-225AB/90 TO-220/221A
		MJF122 TIP122	MJF127 TIP127	2k min 1k min	3 3	1.5 typ 1.5 typ	1.5 typ 1.5 typ	3 3	4 4	28 65	—/221C-02 TO-220/221A
	7	MJ3041		250 min	2.5					100	TO-204/1
		MJ3042		250 min	2.5					100	TO-204/1
		BU522		250 min	2.5				7.5	75	TO-220/221A
		BU522A		250 min	2.5				7.5	75	TO-220/221A
		BU522B		250 min	2.5				7.5	75	TO-220/221A
8	40	2N6386		1k/20k	3				20	65	TO-220/221A
	45	BDX53 BD895 BD895A	BDX54 BD896 BD896A	750 min 750 min 750 min	3 3 4				4 1 1	60 70 70	TO-220/221A TO-220/221A TO-220/221A
		BDX53A BD897 BD897A MJ1000 TIP100 2N6043 2N6300 2N6055 MJE6043	BDX54A BD898 BD898A MJ900 TIP105 2N6040 2N6298 2N6053 MJE6040	750 min 750 min 750 min 1k min 1k/20k 1k/10k 750k/18k 750k/18k 1k/20k	3 3 4 3 3 4 4 4 4	1.5 typ 1.5 typ 1.5 typ 1.5 typ 1.5 typ	1.5 typ 1.5 typ 1.5 typ 1.5 typ 1.5 typ	3 3 4 4 4 4 4 4	4 1 1 4 4 4 4 2	60 70 70 90 80 75 75 100 75	TO-220/221A TO-220/221A TO-220/221A TO-204/1 TO-220/221A TO-220/221A TO-213AA/80 TO-204/1 TO-225AB/90
		BDX53B BD899 BD899A	BDX54B BD900 BD900A	750 min 750 min 750 min	3 3 4				4 1 1	60 70 70	TO-220/221A TO-220/221A TO-220/221A

(continued)

TABLE 12 — POWER DARLINGTONS (continued)

I _C Cont Amps Max	V _{CEO} (sus) Volts Min	Device Type		h _{FE} Min/Max	@ I _C Amp	Resistive Switching			h _{FE} @ 1 MHz Min	P _D (Case) Watts @ 25°C	Case JEDEC/MOT
		NPN	PNP			t _s μs Max	t _f μs Max	@ I _C Amp			
8	80	MJ1001	MJ901	1k min	3					90	TO-204/1
		TIP101	TIP106	1k/20k	3	1.5 typ	1.5 typ	3	4	80	TO-220/221A
		2N6044	2N6041	1k/10k	4	1.5 typ	1.5 typ	3	4	75	TO-220/221A
		2N6301	2N6299	750k/18k	4	1.5 typ	1.5 typ	4	4	75	TO-213A/80
		2N6056	2N6054	750k/18k	4	1.5 typ	1.5 typ	4	4	100	TO-204A/1
	100	MJE6044	MJE6041	1k/20k	4	1.5 typ	1.5 typ	4	2	75	TO-225AB/90
		BDX53C	BDX54C	750 min	3				4	60	TO-220/221A
		BD901	BD902	750 min	3				1	70	TO-220/221A
		MJE6045		1k/20k	4	1.5 typ	1.5 typ	4	2	75	TO-225AB/90
		MJD122	MJD127	1k/12k	4	1.5 typ	2 typ	4	4	20	TO-252/369A-04
		MJF102	MJF107	3k min	3	1.5 typ	1.5 typ	3	4	35	—/221C-02
		TIP102	TIP107	1k/20k	3	1.5 typ	1.5 typ	3	4	80	TO-220/221A
		2N6045	2N6042	1k/10k	4	1.5 typ	1.5 typ	3	4	75	TO-220/221A
	120	BDX53D	BDX54D	750 min	3				4	60	TO-220/221A
	150	BU807●		100 min	5	0.55 typ	0.2 typ	5		60	TO-220/221A
	200	BU806●		100 min	5	0.55 typ	0.2 typ	5		60	TO-220/221A
	300	MJE5740		200/400	4	8 typ	2 typ	6		80	TO-220/221A
	350	MJE5741		200/400	4	8 typ	2 typ	6		80	TO-220/221A
	400	MJE5742		200/400	4	8 typ	2 typ	6		80	TO-220/221A
	500	BUT50P●		30 min	2	0.75 typ	0.1 typ	5		100	TO-218/340D
	1400*	MJ10011		20 min	4			1	4	80	TO-204/1
10	40	2N6383	2N6648	1k/20k	5				20	100	TO-204/1
		D44E1		1000 min	5	2 typ	0.5 typ	10		50	TO-220/221A
	45	BDX33	BDX34	750 min	4				3	70	TO-220/221A
	60	BDV65	BDV64	1k min	5					125	TO-218/340D
		BDX33A	BDX34A	750 min	4				3	70	TO-220/221A
		MJ3000	MJ2500	1k min	5					150	TO-204/1
		2N6387	2N6667	1k/20k	5				20	85	TO-220/221A
		2N6384		1k/20k	5				20	100	TO-204/1
		D44E2		1000 min	5	2 typ	0.5 typ	10		50	TO-220/221A
	80	TIP140	TIP145	500 min	10	2.5 typ	2.5 typ	5	4	125	TO-218/340
		2N6388	2N6668	1k/20k	5				20	65	TO-220/221A
		2N6385		1k/20k	5				20	100	TO-204/1
		BDV65A	BDV64A	1k min	5					125	TO-218/340D
		BDX33B	BDX34B	750 min	3				3	70	TO-220/221A
		D44E3		1000 min	5	2 typ	0.5 typ	10		50	TO-220/221A
	100	MJD44E3		1k min	5	2 typ	0.5 typ	10		20	TO-252/369A-04
		TIP141	TIP146	500 min	10	2.5 typ	2.5 typ	5	4	125	TO-218/340
		BDV65B	BDV64B	1k min	5					125	TO-218/340D
		BDX33C	BDX34C	750 min	3				3	70	TO-220/221A
		TIP142	TIP147	500 min	10	2.5 typ	2.5 typ	5	4	125	TO-218/340
		BDV65C	BDV64C	1k min	5					125	TO-218/340D
	120	BDX33D	BDX34D	750 min	3				3	70	TO-220/221A
	200	BU323P		150 min	6	15	15	6		125	TO-218/340D
	250	BU323AP		150 min	6	15	15	6		125	TO-218/340D
	350	BU323		150 min	6	7.5 typ	5.2 typ	6		175	TO-204/1
		MJ10002		30/300	5	2.5	1	5	10	150	TO-204/1
	400	MJ10006●		30/300	5	1.5	0.5	5	10	150	TO-204/1
		BU323A		150 min	6	7.5 typ	5.2 typ	6		175	TO-204/1
		MJH10012		100/2k	6	15	15	6		118	TO-218/340
		MJ10007●		30/300	5	1.5	0.5	5	10	150	TO-204/1

● Darlington with speed-up diode.

(continued)

TABLE 12 — POWER DARLINGTONS (continued)

I _C Cont Amps Max	V _{CEO} (sus) Volts Min	Device Type		h _{FE} Min/Max	@ I _C Amp	Resistive Switching			h _{FE} @ 1 MHz Min	P _D (Case) Watts @ 25°C	Case JEDEC/MOT
		NPN	PNP			t _s μs Max	t _f μs Max	@ I _C Amp			
10	400	MJ10012		100/2k	6	15	15	6		175	TO-204/1
	600	MJ10014*		10/250	10	2.5	0.8	10		175	TO-204/1
12	60	2N6057	2N6050	750/18k	6	1.6 typ	1.5 typ	6	4	150	TO-204/1
	80	2N6058	2N6051	750/18k	6	1.6 typ	1.5 typ	6	4	150	TO-204/1
	100	2N6059	2N6052	750/18k	6	1.6 typ	1.5 typ	6		150	TO-204/1
	1000	BUT16*		5 min	8	3.3	1.5	8		150	TO-204/1
15	60	2N6576		2k/20k	4	2	7	10	10/200	120	TO-204/1
	90	2N6577		2k/20k	4	2	7	10	10/200	120	TO-204/1
	120	2N6578		2k/20k	4	2	7	10	10/200	120	TO-204/1
	150	MJ11018 MJH11018	MJ11017 MJH11017	100 min 100 min	15 15				3 3	175 150	TO-204/1 TO-218/340
	200	MJ11020 MJH11020	MJ11019 MJH11019	100 min 100 min	15 15				3 3	175 150	TO-204/1 TO-218/340
	250	MJ11022 MJH11022	MJ11021 MJH11021	100 min 100 min	15 15				3 3	175 150	TO-204/1 TO-218/340
	500	BUT51P		40 min	5	1.1	0.16	10		125	TO-218/340D
20	60	2N6282 MJH6282	2N6285 MJH6285	750/18k 750/18k	10 10	2.5 typ 2.5 typ	2.5 typ 2.5 typ	10 10	4 4	160 125	TO-204/1 TO-218/340
	80	2N6283 MJH6283	2N6286 MJH6286	750/18k 750/18k	10 10	2.5 typ 2.5 typ	2.5 typ 2.5 typ	10 10	4 4	160 125	TO-204/1 TO-218/340
	100	2N6284 MJH6284	2N6287 MJH6287	750/18k 750/18k	10 10	2.5 typ 2.5 typ	2.5 typ 2.5 typ	10 10	4 4	160 125	TO-204/1 TO-218/340
	350	MJ10000 MJ10004*		40/400 40/400	10 10	3 1.5	1.8 0.5	10	10 10	175 175	TO-204/1 TO-204/1
	400	MJ10001 MJ10005*		40/400 40/400	10 10	3 1.5	1.8 0.5	10	10 10	175 175	TO-204/1 TO-204/1
	450	MJ10008*		30/300	10	2	0.6	10	8	175	TO-204/1
	500	MJ10009*		30/300	10	2	0.6	10	8	175	TO-204/1
	700	BUT15*		15 min	12	2.5	0.8	12		175	TO-204/1
	750	MJ10024*		50/600	5	5	1.8	10		250	TO-204/1
	850	MJ10025*		50/600	5	5	1.8	10		250	TO-204/1
25	500	BUT14*		15 min	16	2.8	0.8	16		175	TO-204/1
28	400	BUT13*		20 min	20	2.6	0.8	18		175	TO-204/1
30	60	MJ11012	MJ11011	1k min	20				4	200	TO-204/1
	90	MJ11014	MJ11013	1k min	20				4	200	TO-204/1
	120	MJ11016	MJ11015	1k min	20				4	200	TO-204/1
40	350	MJ10022*		50/600	10	2.5	0.9	20		250	TO-204/197
	400	MJ10023*		50/600	10	2.5	0.9	20		250	TO-204/197
	700	BUT35*		15 min	24	4	1.2	24		250	TO-204/197
50	60	MJ11028	MJ11029	400 min	50					300	TO-204/197

* Darlington with speed-up diode.

(continued)

TABLE 12 — POWER DARLINGTONS (continued)

I _C Cont Amps Max	V _{CEO(sus)} Volts Min	Device Type		h _{FE} Min/Max	@ I _C Amp	Resistive Switching			h _{FE} @ 1 MHz Min	P _D (Case) Watts @ 25°C	Case JEDEC/MOT
		NPN	PNP			t _s μs Max	t _f μs Max	@ I _C Amp			
50	90	MJ11030	MJ11031	400 min	50					300	TO-204/197
	120	MJ11032	MJ11033	400 min	50					300	TO-204/197
	400	MJ10015●		10 min	40	2.5	0.5	20	10	250	TO-204/197
	500	BUT34● MJ10016●		15 min 10 min	32 40	3 2.5	1.5 0.5	32 20	10	250 250	TO-204/197 TO-204/197
56	400	BUT33●		20 min	36	3.3	1.6	36		250	TO-204/197
60	200	MJ10020●		75/1k min	15	3.5	0.5	30		250	TO-204/197
	250	MJ10021●		75/1k min	15	3.5	0.5	30		250	TO-204/197

● Darlington with speed-up diode.

TABLE 13 — POWER SWITCHING TRANSISTORS

V_{CEO} < 200 V

I _C Cont Amps Max	V _{CEO(sus)} Volts Min	Device Type		h _{FE} Min/Max	@ I _C Amp	Resistive Switching			f _T MHz Min	P _D (Case) Watts @ 25°C	Case JEDEC/MOT
		NPN	PNP			t _s μs Max	t _f μs Max	@ I _C Amp			
0.8	40	MPS-U02	MPS-U52	30 min	0.5				150	10	—/152
1	120	MPS-U03		40 min	0.1				100	10	—/152
	180	MPS-U04		40 min	0.1				100	10	—/152
2	30	MPS-U01	MPS-U51	50 min	1				50	10	—/152
	40	MPS-U01A	MPS-U51A	50 min	1				50	10	—/152
		MPS-U45#	MPS-U95#	4k min	1				100	10	—/152
	60	MPS-U05	MPS-U55	60 min	0.25				50	10	—/152
	80	MPS-U06	MPS-U56	60 min	0.25				50	10	—/152
	100	MPS-U07	MPS-U57	60 min	0.25				50	10	—/152
3	40		2N3719 2N3867	25/180 40/200	2 2	0.4* 0.4*		1 1	60 60	6 6	TO-205AA/31 TO-205AA/31
			2N3720 2N3868	25/180 30/150	2 2	0.4* 0.4*		1 1	60 60	6 6	TO-205AA/31 TO-205AA/31
	80		2N6303	30/150	2	0.4*		1	60	6	TO-205AA/31

Darlington

* t_{off} @ 1 MHz

(continued)

TABLE 13 — POWER SWITCHING TRANSISTORS (continued)

I _C Cont Amps Max	V _{CEO} (sus) Volts Min	Device Type		h _{FE} Min/Max	@ I _C Amp	Resistive Switching			f _T MHz Min	P _D (Case) Watts @ 25°C	Case JEDEC/MOT
		NPN	PNP			t _s μs Max	t _f μs Max	@ I _C Amp			
4	30	BD185		15 min	2				20	40	TO-225AA/77
	45	BD785	BD786	20 min	2				50	15	TO-225AA/77
	60	2N4877 BD189 BD787	BD788	20/100 15 min 20 min	4 2 2	1.5	0.5	4	30 20 50	10 40 15	TO-205AD/79 TO-225AA/77 TO-225AA/77
	80	BD789	BD790	10 min	2				40	15	TO-225AA/77
	100	BD791	BD792	10 min	2				40	15	TO-225AA/77
5	80	2N5337	2N6191	60/240	2	2	0.2	2	30	10	TO-205AD/79
	100	2N5339	2N6193	60/240	2	2	0.2	2	30	10	TO-205AD/79
7	60	2N6315	2N6317	20/100	2.5	1	0.8	2.5	4	90	TO-213AA/80
	80	2N5428 2N6316	2N6318	60/240 20/100	2 2.5	2 1	0.2 0.8	2 2.5	30 4	60 90	TO-213AA/80 TO-213AA/80
	100	2N5430		60/240	2	2	0.2	2	30	60	TO-213AA/80
7.5	60	2N3447		40/120	5	2	0.35	5	10	115	TO-204/1
	80	2N3448		40/120	5	2	0.35	5	10	115	TO-204/1
8	120	MJE15028	MJE15029	20 min	4	0.4 typ	0.18 typ	5	30	50	TO-220/221A
	150	MJE15030	MJE15031	20 min	4	0.4 typ	0.18 typ	5	30	50	TO-220/221A
10	60	2N5877	2N5875	20/100	4	1	0.8	4	4	150	TO-204/1
	80	2N5878	2N5876	20/100	4	1	0.8	4	4	150	TO-204/1
15	60	2N5881	2N5879	20/100	6	1	0.8	6	4	160	TO-204/1
	80	2N5882	2N5880	20/100	6	1	0.8	6	4	160	TO-204/1
18	160	BUX41N		8 min	12	1.2	0.25	12	8	120	TO-204/1
20	75	2N5039		20/100	10	1.5	0.5	10	60	140	TO-204/1
	80	2N5303	2N5745	15/60	10	2	1	10	2	200	TO-204/1
	90	2N5038		20/100	12	1.5	0.5	12	60	140	TO-204/1
	125	BUX40		8 min	15	1	0.25	15	8	120	TO-204/1
	160	BUV11N		10 min	15	1.2	0.25	15	8	150	TO-204/1
25	60	2N5885	2N5883	20/100	10	1	0.8	10	4	200	TO-204/1
	80	2N5886	2N5884 2N6436	20/100 30/120	10 10	1 1	0.8 0.25	10 10	4 40	200 200	TO-204/1 TO-204/1
	100	2N6338	2N6437	30/120	10	1	0.25	10	40	200	TO-204/1
	120	2N6339	2N6438	30/120	10	1	0.25	10	40	200	TO-204/1
	125	BUV10 BUV10N		10 min 10 min	20 20	1.2 1.55	0.25 0.45	20 15	8 10	150 175	TO-204/1 TO-204/1
	140	2N6340		30/120	10	1	0.25	10	40	200	TO-204/1
	150	2N6341		30/120	10	1	0.25	10	40	200	TO-204/1
30	40	2N5301	2N4398	15/60	15	2	1	10	2	200	TO-204/1
	60	2N5302	2N4399	15/60	15	2	1	10	2	200	TO-204/1
	90	BUX39		8 min	20	1	0.25	20	8	120	TO-204/1

(continued)

TABLE 13 — POWER SWITCHING TRANSISTORS (continued)

IC Cont Amps Max	VCE(sus) Volts Min	Device Type		hFE Min/Max	@ IC Amp	Resistive Switching			fT MHz Min	PD (Case) Watts @ 25°C	Case JEDEC/MOT
		NPN	PNP			ts μs Max	tf μs Max	@ IC Amp			
40	160	BUV21N		10 min	40	1	0.2	40	8	250	TO-204/197
50	80		2N6377	30/120	20	0.8					TO-204/197
	100	2N6274	2N6378	30/120	20	0.8	0.25	20	30	250	TO-204/197
	120	2N6275	2N6379	30/120	20	0.8	0.25	20	30	250	TO-204/197
	125	BUV20		10 min	50	1.2	0.25	50	8	250	TO-204/197
	140	2N6276		30/120	20	0.8	0.25	20	30	250	TO-204/197
70	125	BUS50		15 min	50					350	TO-204/197

TABLE 14 — SWITCHMODE POWER TRANSISTORS

VCEO ≥ 200 V

Devices are listed in descending order of VCEO(sus), and IC Cont

VCEO(sus) Volts Min	IC Cont Amps Max	VCEV Volts Min	Device Type NPN unless otherwise noted	hFE Min/Max	@ IC Amp	Resistive Switching			fT MHz Min	PD (Case) Watts @ 25°C	Case JEDEC/MOT
						ts μs Max	tf μs Max	@ IC Amp			
900	2	1800	MJE1320	3 min	1	4 typ	0.8 typ	1		80	TO-220/221A
850	20	1200	MJ10025##★	50/600	20	5	1.8	10			TO-204/1
	3	1500 1500	MJE16034 MJH16034	4 min 4 min	3 3	2 2	1.5 1.5	2 2		80 125	TO-220/221A TO-218/340
800	10	1400 1500 1500	MJ8505★ MJ16018★ MJH16018★	7.5 min 4 min 4 min	1.5 5 5	4 4.5 typ 4.5 typ	2 0.2 typ 0.2 typ	5 5 5			TO-204/1 TO-204/1 TO-218/340
		1400 1400	MJ8503★ MJE8503★	7.5 min 7.5 min	1 1	4 4	2 2	2.5 2.5			TO-204/1 TO-220/221A
		1400 1400	MJ8501★ MJE8501★	7.5 min 7.5 min	0.5 0.5	4 4	2 2	1 1			TO-204/1 TO-220/221A
	5	1400 1400									
	2.5	1400 1400									
750	20	1000	MJ10024##★	50/600	20	5	1.8	10			TO-204/1
	8	1500 1500	MJ12005 MJH12005	5 min	5		1 0.4 typ	5 5	4 typ 4	100	TO-204/1 TO-218/340
	5	1500	MJ12004★	2.5 min	4.5		1	4.5	4 typ		TO-204/1
	4	1500	MJ12003	2.5 min	3		1	3	4 typ		TO-204/1

★ Designers Data Sheet characterization

Darlington

Darlington with speed-up diode

* toff

** |hfe| @ 1 MHz

(continued)

TABLE 14 — SWITCHMODE POWER TRANSISTORS (continued)

V _{CEO(sus)} Volts Min	I _C Cont Amps Max	V _{CEV} Volts Min	Device Type NPN unless otherwise noted	h _{FE} Min/Max	@ I _C Amp	Resistive Switching			f _T MHz Min	P _D (Case) Watts @ 25°C	Case JEDEC/MOT
						t _s μs Max	t _f μs Max	@ I _C Amp			
750	3	1500 1500	MJE16032 MJH16032	4 min 4 min	3 3	2 2	1.5 1.5	2 2		80 125	TO-220/221A TO-218/340
	2.5	1500 1500	MJ12002★ MJE12007★	1.11 min 1.1 min	2 2		1 1	2 2	4 typ 4 typ		TO-204/1 TO-220/221A
700	40	1000	BUT35##	15 min	24	4	1.2	24		250	TO-204/197
	20	1000	BUT15##	15 min	12	2.5	0.8	12		175	TO-204/1
	10	1200	MJ8504★	7.5 min	1.5	4	2	5			TO-204/1
	8	1400 1500 1500	MJ10011# BU508,A BU508D,AD	20 min 2.25 min 2.25 min	4 4.5 4.5	8 typ 8 typ	1 0.5 typ 0.5 typ	4 4.5 4.5	7 7	125 125	TO-204/1 TO-218/340 TO-218/340
	5	1200 1200 1500 1500	MJ8502★ MJE8502★ BU208A BU208D	7.5 min 7.5 min 2.25 min 2.25 min	1 1 4.5 4.5	4 4 8 typ	2 2 0.4 typ 0.6 typ	2.5 2.5 4.5 4.5	4 typ	90	TO-204/1 TO-220/221A TO-204/1 TO-204/1
	2.5	1200	MJE8500★	7.5 min	0.5	4	2	1			TO-220/221A
	10	700	MJ10014###★	10/250	10	2.5	0.8	10			TO-204/1
500	50	750 850	MJ10016###★ BUT34##	10 min 15 min	40 32	2.5 3	1 1.5	20 32		250	TO-204/197 TO-204/197
	25	850	BUT14##	15 min	16	2.8	0.8	16		175	TO-204/1
	20	600 800	MJ10009###★ MJ13335★	30/300 10/60	10 5	2 4	0.6 0.7	10 10	8**		TO-204/1 TO-204/1
	15	850 1000 1000	BUT51P## MJ16010A★ MJH16010A★	40 min 5 min 5 min	5 15 15	1.1 3 3	0.16 0.4 0.4	10 10 10		125	TO-218/340D TO-204/1 TO-218/340
	8	850 1000 1000	BUT50P## MJ16006A★ MJH16006A★	30 min 5 min 5 min	2 15 15	0.75 typ 3 3	0.1 typ 0.4 0.4	5 10 10		100	TO-218/340D TO-204/1 TO-218/340
	5	1000 1000	MJ16002A★ MJH16002A★	5 min 5 min	15 15	3 3	0.3 0.3	3 3			TO-204/1 TO-218/340
	30	850 850 1000	MJ16020 MJ16022 BUS98A	5 min 7 min 8 min	30 30 16	1.8 1.5 2.3	0.2 0.15 0.4	20 20 16		250 250 250	TO-204/1 TO-204/1 TO-204/197
450	20	650 850 850 850	MJ10008###★ 2N6837★ MJ16014★ MJ16016★	30/300 10/30 5 min 7 min	10 15 20 20	2 2.5 2.7 2.2	0.6 0.25 0.35 0.25	10 15 20 20	8** 15		TO-204/1 TO-204/1 TO-204/197 TO-204/197
	15	850 850 850 850 850 850 1000	2N6836★ MJ12022★ MJ16010★ MJ16012★ MJH16010★ MJH16012★ BUX48A	10/30 5 min 5 min 7 min 5 min 7 min 8 min	10 15 15 15 15 15 10	3 1.2 typ 0.9 typ 1.2 0.9 2	0.35 0.1 typ 0.2 typ 0.15 typ 0.2 0.15 0.4	10 10 10 10 10 10 10	10	175 150 175	TO-204/1 TO-204/1 TO-204/1 TO-204/1 TO-218/340 TO-218/340 TO-204/1

★ Designers Data Sheet characterization

Darlington ## Darlington with speed-up diode

* t_{off}** |h_{FE}| @ 1 MHz

(continued)

TABLE 14 — SWITCHMODE POWER TRANSISTORS (continued)

V _{CEO(sus)} Volts Min	I _C Cont Amps Max	V _{CEV} Volts Min	Device Type NPN unless otherwise noted	h _{FE} Min/Max	@ I _C Amp	Resistive Switching			f _T MHz Min	P _D (Case) Watts @ 25°C	Case JEDEC/MOT
						t _s μs Max	t _f μs Max	@ I _C Amp			
450	15	1000	BUV48A	8 min	8	2	0.4	10		150	TO-218/340D
	9	1000 1000	BUS47A BUS47AP	7 min 7 min	5 6	2 2	0.4 0.4	5 6		150 128	TO-204/1 TO-218/340D
	8	850 850 850 850 850 850 850 1000	2N6835★ MJE16080 MJ12021★ MJ16006★ MJ16008★ MJH16006★ MJH16008★ BUW12A	7.5/3 5 min 5 min 5 min 7 min 5 min 7 min 6 min	5 8 8 8 8 8 8 5	2.5 2 2.5 2.2 2.5 2.2 2.2 4	0.25 0.5 0.1 typ 0.25 0.25 0.25 0.25 0.8	5 5 8 5 5 5 5 5	10	80 125	TO-204/1 TO-220/221A TO-204/1 TO-204/1 TO-204/1 TO-218/340 TO-218/340 TO-218/340
	5	850 850 850 850 850 850 850 1000	2N6834★ MJ12020★ MJ16002★ MJ16004★ MJE16002★ MJE16004★ MJH16002★ MJH16004★ BUW11A	10/30 5 min 5 min 8 min 5 min 7 min 5 min 7 min 6 min	3 5 5 3 5 5 5 5 2.5	2.7 3 3 2.7 3 2.7 2.7 4	0.35 0.13 typ 0.3 0.35 0.3 0.35 0.3 0.35 0.8	3 3 3 3 3 3 3 3 2.5	15	 125	TO-204/1 TO-204/1 TO-204/1 TO-204/1 TO-220/221A TO-220/221A TO-218/340 TO-218/340 TO-218/340
	3	1000	BUX85	30 min	0.1	3.5	1.4	1	4	50	TO-220/221A
400	56	600	BUT33##	20 min	36	3.3	1.6	36		250	TO-204/197
	50	650	MJ10015##★	10 min	40	2.5	1	20			TO-204/197
	40	600	MJ10023##★	50/600	10	2.5	0.9	20			TO-204/197
	30	850	BUS98	8 min	20	2.3	0.4	20		250	TO-204/197
	28	600	BUT13##	20 min	20	2.6	0.8	18		175	TO-204/1
	20	500 500 500	MJ10001#★ MJ10005#★ MJ13333★	40/400 40/400 10/60	10 10 5	3 1.5 4	1.8 0.5 0.7	10 10 10	10** 10**		TO-204/1 TO-204/1 TO-204/1
	15	650 650 650 850 850 850	MJ13090★ MJ16110 MJH16110 2N6547★ BUX48 BUV48	8 min 6/20 6/20 6/30 8 min 8 min	10 15 15 10 10 10	2.5 0.8 typ 0.8 typ 4 2 2	0.5 0.1 typ 0.1 typ 0.7 0.4 0.4	10 10 10 10 10 10	6 to 24	175 135 175 150	TO-204/1 TO-204/1 TO-218/340 TO-204/1 TO-204/1 TO-218/340D
	12	700	MJE13009★	6/30	8	3	0.7	8	4**		TO-220/221A
	10	950 550 500 500 450	MJ12010 MJ10012# MJ10003#★ MJ10007##★ MJ13015★	4.2 min 100/2k 30/300 30/300 8/20	5 6 5 5 5	6 2.5 1.1 2	1 15 1 0.25 0.5	5 15 5 5 5	6 typ 6 10** 10**		TO-204/1 TO-204/1 TO-204/1 TO-204/1 TO-204/1
	9	850 850	BUS47 BUS47P	7 min 7 min	6 5	2 2	0.4 0.4	6 6		150 128	TO-204/1 TO-218/340D

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Darlington ## Darlington with speed-up diode

* t_{off}** |h_{FE}| @ 1 MHz

(continued)

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TABLE 14 — SWITCHMODE POWER TRANSISTORS (continued)

V _{CEO(sus)} Volts Min	I _C Cont Amps Max	V _{CEV} Volts Min	Device Type NPN unless otherwise noted	h _{FE} Min/Max	@ I _C Amp	Resistive Switching			f _T MHz Min	P _D (Case) Watts @ 25°C	Case JEDEC/MOT
						t _s μs Max	t _f μs Max	@ I _C Amp			
400	8	850	2N6545★	7/35	5	4	1	5	6		TO-204/1
		800	MJE5742#	200/400	4	8 typ	2 typ	6			TO-220/221A
		800	MJE16080	5 min	8	2	0.5	5		80	TO-220/221A
		850	BUW12	6 min	6	4	0.8	5		125	TO-218/340
		850	BUX84	30 min	0.1	3.5	1.4	1	4	50	TO-220/221A
		700	MJE13007★	6/30	5	3	0.7	5	4		TO-220/221A
		650	MJ13080★	8 min	5	1.5	0.5	5			TO-204/1
		650	MJE16106	6/25	8	2 typ	0.1 typ	5		100	TO-220/221A
		650	MJH16106	6/25	8	2 typ	0.1 typ	5		125	TO-218/340
		450	MJ6503-PNP★	15 min	2	2	0.5	4			TO-204/1
		450	MJE5852-PNP★	15 min	2	2	0.5	4			TO-220/221A
	6	900	BU326A	30 typ	0.6	3.5	1**	2.5	6	90	TO-204/1
		900	BU426A	30 typ	0.6	2 typ	0.5 typ	2.5	6 typ	113	TO-218/340D
	5	850	2N6543★	7/35	3	4	0.8	3	6		TO-204/1
		850	BUW11	6 min	3	4	0.8	3		125	TO-218/340
		650	MJ13070★	8 min	3	1.5	0.5	3			TO-204/1
		650	MJE13070★	8 min	3	1.5	0.5	3			TO-220/221A
	4	700	MJE13005★	6/30	3	3	0.7	3	4		TO-220/221A
	1.5	700	MJE13003★	5/25	1	4	0.7	1	5		TO-225AA/77R
	0.5	400	MJ4647-PNP	20 min	0.5	0.72*		0.05	40		TO-205AD/79
375	6	800	BU326	30 typ	0.6	3.5	1**	2.5	6	90	TO-204/1
		800	BU426	30 typ	0.6	2 typ	0.5 typ	2.5	6 typ	113	TO-218/340D
350	40	450	MJ10022##★	50/600	10	2.5	0.9	20			TO-204/197
	20	450	MJ10000#★	40/400	10	3	1.8	10	10**		TO-204/1
		450	MJ10004##★	40/400	10	1.5	0.5	10	10**		TO-204/1
	15	375	2N6251	6/50	10	3.5	1	10	2.5		TO-204/1
	10	450	MJ10002#★	30/300	5	2.5	1	5	10**		TO-204/1
		450	MJ10006##★	30/300	5	1.5	0.5	5	10**		TO-204/1
		400	MJ13014★	8/20	5	2	0.5	5			TO-204/1
	8	700	2N6308	12/60	3	1.6	0.4	5	5		TO-204/1
325	30	700	MJE5741#	200/400	4	8 typ	2 typ	6			TO-220/221A
		400	MJE5851-PNP	15 min	2	2	0.5	4			TO-220/221A
	2	400	2N6213-PNP	10/100	1	2.5	0.6	1	4		TO-213AA/80
		400	BUV23	8 min	16	1.8	0.4	16	8	250	TO-204/197
300	15	400	BUX13	8 min	8	2.5	0.8	8	8	150	TO-204/1
	5	350	2N6235	25/125	1	3.5	0.5	1	20		TO-213AA/80
	15	650	2N6546★	6/30	10	4	0.7	10	6 to 24		TO-204/1
300	12	600	MJE13008★	6/30	8	3	0.7	8	4**		TO-220/221A
	8	600	2N6307	15/75	3	1.6	0.4	3	5		TO-204/1
		600	MJE13006★	6/30	5	3	0.7	5	4		TO-220/221A
		600	MJE5740	200/400	4	8 typ	2 typ	6			TO-220/221A
		350	MJE5850-PNP★	15 min	2	2	0.5	4			TO-220/221A
	5	400	2N6498	10/75	2.5	1.8	0.8	2.5	5		TO-220/221A
	4	600	MJE13004★	6/30	3	3	0.7	3	4		TO-220/221A
	2	500	2N3585	25/100	1	4	3	1	10		TO-213AA/80
		500	2N6422-PNP	25/100	1	4	3	1	10		TO-213AA/80
		350	2N6212-PNP	10/100	1	2.5	0.6	1	4		TO-213AA/80
	1.5	600	MJE13002★	5/25	1	4	0.7	1	5		TO-225AA/77R

★ Designers Data Sheet characterization

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Darlington with speed-up diode

* t_{off}** |h_{FE}| @ 1 MHz

(continued)

TABLE 14 — SWITCHMODE POWER TRANSISTORS (continued)

V _{CEO(sus)} Volts Min	I _C Cont Amps Max	V _{CEV} Volts Min	Device Type NPN unless otherwise noted	h _{FE} Min/Max	@ I _C Amp	Resistive Switching			f _T MHz Min	P _D (Case) Watts @ 25°C	Case JEDEC/MOT
						t _s μs Max	t _f μs Max	@ I _C Amp			
300	0.5	300	MJ4646-PNP	20 min	0.5	0.72*		0.05	40		TO-205AD/79
275	15	300	2N6250	8/50	10	3.5	1	10	2.5		TO-204/1
250	60	350	MJ10021##★	25 min	30	3.5	0.5	30			TO-204/197
	40	300 350	BUV22 BUS52	10 min 15 min	20 40	1.1	0.35	20	8	250 350	TO-204/1 TO-204/1
	20	300 450	BUV12 MJ13331★	10 min 8/40	10 10	1.5 3.5	0.5 0.7	10 10	8 5/40	150	TO-204/1 TO-204/1
	15	250 250	MJ11021#-PNP MJ11022#	100 min 100 min	15 15				3# 3#		TO-204/1 TO-204/1
	8	500 400	2N6306 MJ6502-PNP★	15/75 15 min	3 2	1.6 2	0.4 0.5	3 4	5		TO-204/1 TO-204/1
	5	500 350	MJ3029 2N6497	30 min 10/75	0.4 2.5	1.8	1 0.8	3 2.5	5		TO-204/1 TO-220/221A
	2	375 375	2N3584 2N6421-PNP	25/100 25/100	1 1	4 4	3 3	1 1	10 10		TO-213AA/80 TO-213AA/80
	1	250	2N5344-PNP	25/100	0.5	0.6	0.1	0.5	60		TO-213AA/80
225	2	275	2N6211	10/100	1	2.5	0.6	1	20		TO-213AA/80
200	60	300	MJ10020##★	25 min	30	3.5	0.5	30			TO-204/197
	50	300	BUS51	15 min	50					350	TO-204/1
	40	250	BUV21	10 min	25	1.8	0.4	25	8	150	TO-204/1
	20	250 400	BUV11 MJ13330★	10 min 8/40	12 10	1.8 3.5	0.4 0.7	12 10	8 5/40	150	TO-204/1 TO-204/1
	15	225 250 200 200	2N6249 BUX41 MJ11019#-PNP MJ11020#	10/50 8 min 100 min 100 min	10 8 15 15	3.5 1.5	1 0.4	10 8	2.5 8 3# 3#	120	TO-204/1 TO-204/1 TO-204/1 TO-204/1
	3	250	BUY49P	30 min	0.5				25	20	TO-225AA/77

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Darlington ## Darlington with speed-up diode

* t_{off}** |h_{FE}| @ 1 MHz