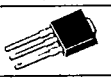
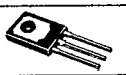
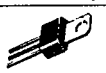
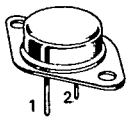
Selection By Package

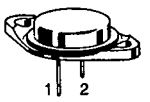
Motorola power transistors are available in a wide variety of metal and plastic packages to match thermal, electrical and cost requirements. The following table compares the basic packages from the standpoint of current, voltage and power capabilities. The devices available in the various packages are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

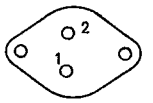
Package		I_C Range (Amps)	V_{CE} Range (Volts)	P_D (Watts)	Page #
	TO-204AA (TO-3) Case 1	2.5–30	40–1500	36–250	2-3
	TO-204AE TYPE Case 197-01	20	450	250	2-3
	TO-204AE Case 197A-02	40–60	60–500	250–300	2-3
	TO-205AD (TO-39) Case 79	0.5–5.0	40–400	5.0–10	2-8
	TO-213AA (TO-66) Case 80	1.0–10	40–325	20–90	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 NPN	Device Type PNP	h_{FE} Min/Max	@ I_C Amp	Resistive Switching t_s µs Max	Resistive Switching t_f µs Max	Resistive Switching @ I_C Amp	f_T MHz Min	P_D (Case) Watts @ 25°C
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 MJ13070		7/35 8 min	3 3	4 1.5	0.8 0.5	3 3	6	100 125
	450	MJ16002 MJ16004 2N6834		5 min 7 min 10/30	5 5 3	3 2.7 2.7	0.3 0.35 0.35	3 3 3	 15	125 125 125
	500	MJ16002A		5 min	5	3	0.3	3		125
	700	MJ8502		7.5 min	1	4	2	2.5		150
	800	MJ8503		7.5 min	1	4	2	2.5		150
	850*	MJ12020		5 min	5		0.13 typ	3	15	125
	1500*	BU208 BU208A BU208D† MJ12004		2.25 min 2.25 min 2.25 min 2.5 min	4.5 4.5 4.5 4.5	 8 typ 	0.6 typ 0.4 typ 0.6 typ 1	4.5 4.5 4.5 4.5	4 typ 4 typ 4 typ 4	60 90 60 100
6	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

$|h_{fe}|$ @ 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 NPN	Device Type PNP	h_{FE} Min/Max	@ I_C Amp	Resistive Switching t_s µs Max	Resistive Switching t_f µs Max	Resistive Switching @ I_C Amp	f_T MHz Min	P_D (Case) Watts @ 25°C
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
	80	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 MJ13080	MJ6503	7/35 15 min 8 min	5 2 5	4 2 1.5	1 0.5 0.5	5 4 5	6	125 125 150
	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
	500	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 2N5877 2N6384## MJ3000##	2N3789 2N3791 2N5875 MJ2500##	15 min 30 min 20/100 1k/20k 1k min	3 3 4 5 5	0.3 typ 0.3 typ 1	0.4 typ 0.4 typ 0.8	5 5 4	4 4 4 20#	150 150 150 100 150
	80	2N3714 2N3716 2N5878 2N6385## MJ3001##	2N3790 2N3792 2N5876 MJ2501##	15 min 30 min 20/100 1k/20k 1k min	3 3 4 5 5	0.3 typ 0.3 typ 1	0.4 typ 0.4 typ 0.8	5 5 4	4 4 4 20#	150 150 150 100 150
	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_CCont Amps Max	$V_{CEO(sus)}$ Volts Min	Device Type NPN	Device Type PNP	h_{FE} Min/Max	@ I_C Amp	Resistive Switching t_s µs Max	Resistive Switching t_f µs Max	Resistive Switching @ I_C Amp	f_T MHz Min	P_D (Case) Watts @ 25°C
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
	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
		MJ16018		4 min	5	4.5 typ	0.2 typ	5		150
	950*	MJ12010		4.2 min	5		1	5		100
12	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
15	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
		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		175
		2N6547		6/30	10	4	0.7	10	6 to 24	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 NPN	Device Type PNP	h_{FE} Min/Max	@ I_C Amp	Resistive Switching t_s µs Max	Resistive Switching t_f µs Max	Resistive Switching @ I_C Amp	f_T MHz Min	P_D (Case) Watts @ 25°C
15		MJ16012		7 min	15	0.9 typ	0.15 typ	10		175
		2N6836		10/30	10	3	0.35	10	10	175
	500	MJ16010A		5 min	15	3	0.4	10		175
	850*	MJ12022		5 min	15		0.1 typ	10		175
16	100		BD318	25 min	5				1	200
		2N5629	2N6029	25/100	8	1.2 typ	1.2 typ	8	1	200
	120	2N5630	2N6030	20/80	8	1.2 typ	1.2 typ	8	1	200
	140	2N3773	2N6609	15/60	8	1.1 typ	1.5 typ	8	4	150
		2N5631	2N6031	15/60	8	1.2 typ	1.2 typ	8	1	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		15/60	10				2	150
		2N6282##	2N6285##	750/18k	10	2.5 typ	2.5 typ	10	4#	160
	75	2N5039		20/100	10	1.5	0.5	10	60	140
	80	2N5303	2N5745	15/60	10	2	1	10	2	200
		2N6283##	2N6286##	750/18k	10	2.5 typ	2.5 typ	10	4#	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		10 min	12	1.8	0.4	12	8	150
		MJ13330		8/40	10	3.5	0.7	10	5 to 40	175
	250	BUV12		10 min	10	1.5	0.5	10	8	150
		MJ13331		8/40	10	3.5	0.7	10	5 to 40	175
	350	MJ10000##		40/400	10	3	1.8	10	10#	175
		MJ10004##		40/400	10	1.5	0.5	10	10#	175
	400	MJ10001##		40/400	10	3	1.8	10	10#	175
		MJ10005##		40/400	10	1.5	0.5	10	10#	175
		MJ13333		10/60	5	4	0.7	10		175
	450	MJ10008##		30/300	10	2	0.6	10	8#	175
		MJ16014		5 min	20	2.7	0.35	20		250
		MJ16016		7 min	20	2.2	0.25	20		250
		2N6837		10/30	15	2.5	0.25	15		250
	500	MJ10009##		30/300	10	2	0.6	10	8#	175
		MJ13335		10/60	5	4	0.7	10		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 NPN	Device Type PNP	h_{FE} Min/Max	@ I_C Amp	Resistive Switching t_s µs Max	Resistive Switching t_f µs Max	Resistive Switching @ I_C Amp	f_T MHz Min	P_D (Case) Watts @ 25°C
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)

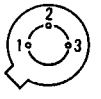
☐ JAN, JTX, JTXV Available

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

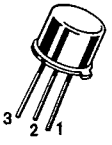
I_C Cont Amps Max	$V_{CEO(sus)}$ Volts Min	Device Type NPN	Device Type PNP	h_{FE} Min/Max	@ I_C Amp	Resistive Switching t_s µs Max	Resistive Switching t_f µs Max	Resistive Switching @ I_C Amp	f_T MHz Min	P_D (Case) Watts @ 25°C
50	200	BUS51•		15 min	50					350
	400	MJ10015•##		10 min	40	2.5	1	20		250
	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)



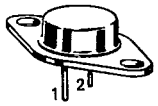
CASE 79-04 (TO-205AD)

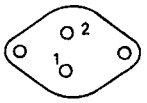
I_C Cont Amps Max	$V_{CEO(sus)}$ Volts Min	Device Type NPN	Device Type PNP	h_{FE} Min/Max	@ I_C Amp	Resistive Switching t_s µs Max	Resistive Switching t_f µs Max	Resistive Switching @ I_C Amp	f_T MHz Min	P_D (Case) Watts @ 25°C
0.5	300		MJ4646	20 min	0.5	0.72*		0.05	40	5
	400		MJ4647	20 min	0.5	0.72*		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
4	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

*t_{off}

JAN, JTX, JTXV Available

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





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

CASE 80-02 (TO-213AA)

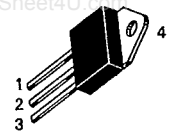
I_CCont Amps Max	$V_{CEO(sus)}$ Volts Min	Device Type NPN	Device Type PNP	h_{FE} Min/Max	@ I_C Amp	Resistive Switching t_s µs Max	Resistive Switching t_f µs Max	Resistive Switching @ I_C Amp	f_T MHz Min	P_D (Case) Watts @ 25°C
1	80	2N4912		20/100	0.5	0.6 typ	0.3 typ	0.5	3	25
	175	2N3583	2N6420	40/200	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
	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
		2N5430		60/240	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

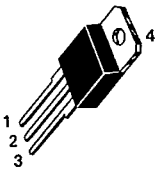
2

☐ 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 NPN	Device Type PNP	h_{FE} Min/Max	@ I_C Amp	Resistive Switching t_s μs Max	Resistive Switching t_f μs Max	Resistive Switching @ I_C Amp	f_T MHz Min	P_D (Case) Watts @ 25°C
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 MJH16002 MJH16004		6 min 5 min 7 min	2.5 5 5	4 3 2.7	0.8 0.3 0.35	2.5 3 3		125 100 100
	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 MJH16106		6 min 6/25	6 8	4 2 typ	0.8 0.1 typ	5 5		125 125
	450	BUW12A MJH16006 MJH16008		6 min 5 min 7 min	5 8 8	4 2.5 2.2	0.8 0.25 0.25	5 5 5		125 125 125
	500	BUT50P##† MJH16006A		30 min 5 min	2 8	0.75 typ 2.5	0.1 typ 0.25	5 5		100 125
	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##† TIP33A TIP140##	BDV64##† TIP34A TIP145##	1k min 20 min 500 min	5 3 10	 2.5 typ	 2.5 typ	 5	 3 4#	125 80 125
	80	BDV65A##† TIP33B TIP141##	BDV64A##† TIP34B TIP146##	1k min 20 min 500 min	5 3 10	 2.5 typ	 2.5 typ	 5	 3 4#	125 80 125
	100	BDV65B##† TIP33C TIP142##	BDV64B##† TIP34C TIP147##	1k min 20 min 500 min	5 3 10	 2.5 typ	 2.5 typ	 5	 3 4#	125 80 125
	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
15	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

(continued)

$|h_{fe}|$ @ 1 MHz, ## Darlington
* $V_{(BR)CEX}$ or $V_{(BR)CES}$
† These devices supplied in Case 340D-01. Consult Motorola for details.

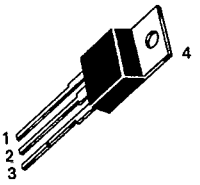
TABLE 4 — PLASTIC TO-218 (continued)

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†		8 min	10	2	0.4	10		150
		MJH13090		8 min	10	2.5	0.5	10		125
		MJH16110		6/20	10	0.8 typ	0.1 typ	10		135
	450	BUV48A†		8 min	8	2	0.4	10		150
		MJH16010		5 min	15	1.2	0.2	10		150
		MJH16012		7 min	15	0.9	0.15	10		150
	500	BUT51P##†		40 min	5	1.1	0.16	10		125
		MJH16010A		5 min	15	3	0.4	10		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†	BD250A†	10 min	15				3	125
		TIP35A	TIP36A	10/75	15	0.6 typ	0.3 typ	10	3	125
	80	BD249B†	BD250B†	10 min	15				3	125
		TIP35B	TIP36B	10/75	15	0.6 typ	0.3 typ	10	3	125
	100	BD249C†	BD250C†	10 min	15				3	125
		TIP35C	TIP36C	10/75	15	0.6 typ	0.3 typ	10	3	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		15 min	0.1				10 typ	30
		MJE2361T		40 min	0.1				10 typ	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 NPN	Device Type PNP	h_{FE} Min/Max	@ I_C Amp	Resistive Switching t_s μs Max	Resistive Switching t_f μs Max	Resistive Switching @ I_C Amp	f_T MHz Min	P_D (Case) Watts @ 25°C
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 NPN	Device Type PNP	h_{FE} Min/Max	@ I_C Amp	Resistive Switching t_s µs Max	Resistive Switching t_f µs Max	Resistive Switching @ I_C Amp	f_T MHz Min	P_D (Case) Watts @ 25°C
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
		TIP102##	TIP107##	1k/20k	3	1.5 typ	1.5 typ	3	4#	80
	120	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
		MJE16106		6/25	8	2 typ	0.1 typ	5		100
	450	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
			D45H4	20 min	4					50
		D44H5	D45H5	40 min	4					50
	60	BDX33A##	BDX34A##	750 min	4				3	70
		BD807	BD808	15 min	4				1.5	90

$|h_{fe}|$ @ 1 MHz, ## Darlington

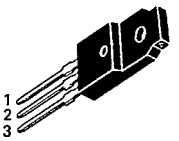
(continued)

TABLE 5 — PLASTIC TO-220 (continued)

I_C Cont Amps Max	$V_{CEO(sus)}$ Volts Min	Device Type NPN	Device Type PNP	h_{FE} Min/Max	@ I_C Amp	Resistive Switching t_s μs Max	Resistive Switching t_f μs Max	Resistive Switching @ I_C Amp	f_T MHz Min	P_D (Case) Watts @ 25°C
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
		D44H11	D45H11	40 min	4	0.5 typ	0.14 typ	5	50 typ	50
		SE9301##	SE9401##	1k min	4				1#	70
	100	BDX33C##	BDX34C##	750 min	3				3	70
		SE9302##	SE9402##	1k min	4				1#	70
12	300	MJE13008		6/30	8	3	0.7	8	4	100
	400	MJE13009		6/30	8	3	0.7	8	4	100
15	30	D44VH1	D45VH1	20 min	4	0.7	0.09	8	50 typ	83
	40	2N6486	2N6489	20/150	5	0.6 typ	0.3 typ	5	5	75
	45	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
	60	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
		D44VH7		20 min	4	0.5	0.09	8	50 typ	85
	80	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
	100	BDW42	BDW47	1 k min	5	1 typ	1.5 typ	5	4	85
	120	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)



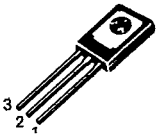
CASE 221C-02

I_C Cont Amps Max	$V_{CEO(sus)}$ Volts Min	Device Type NPN	Device Type PNP	h_{FE} Min/Max	@ I_C Amp	Resistive Switching t_s μs Max	Resistive Switching t_f μs Max	Resistive Switching @ I_C Amp	f_T MHz Min	P_D (Case) Watts @ 25°C
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 NPN	Device Type PNP	h_{FE} Min/Max	@ I_C Amp	Resistive Switching t_s μs Max	Resistive Switching t_f μs Max	Resistive Switching @ I_C Amp	f_T MHz Min	P_D (Case) Watts @ 25°C
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)

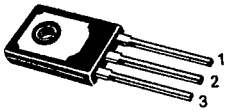
TABLE 7 — PLASTIC TO-225 Type (continued)

I_CCont 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	40/250	0.15				3	30
			BD176.6	40/100	0.15				3	30
			BD176.10	63/160	0.15				3	30
			BD176.16	100/250	0.15				3	30
	60	MJE181	MJE171	50/250	0.1	0.6 typ	0.12 typ	0.1	50	12.5
	80	BD179	BD180	40/250	0.15				3	30
		BD179.6	BD180.6	40/100	0.15				3	30
		BD179.10	BD180.10	63/160	0.15				3	30
		BD179.16	BD180.16	100/250	0.15				3	30
		MJE182	MJE172	50/250	0.1	0.6 typ	0.12 typ	0.1	50	12.5
	200	BUY49P		30 min	0.5				25	20
4	30	BD185		15 min	2				20	40
	40	2N5190	2N5193	25/100	1.5	0.4 typ	0.4 typ	1.5	2	40
		MJE521	MJE371	40 min	1					40
		2N6037##	2N6034##	750/18k	2	1.7 typ	1.2 typ	2	25	40
	45	BD437	BD438	40 min	2				3	36
		BD675##	BD676##	750 min	1.5					40
		BD675A##	BD676A##	750 min	2					40
		BD785	BD786	20 min	2				50	15
			BD776##	750 min	2				20	15
	60	BD189		15 min	2				20	40
			BD440	25 min	2				3	36
		BD677##	BD678##	750 min	1.5					40
		BD677A##	BD678A##	750 min	2					40
		BD787	BD788	20 min	2				50	15
		BD777##	BD778##	750 min	2				20	15
		2N5191	2N5194	25/100	1.5	0.4 typ	0.4 typ	1.5	2	40
		MJE800##	MJE700##	750 min	1.5				1#	40
		MJE801##	MJE701##	750 min	2				1#	40
		2N6038##	2N6035##	750/18k	2	1.7 typ	1.2 typ	2	25	40
	80	2N5192	2N5195	25/100	1.5	0.4 typ	0.4 typ	1.5	2	40
		BD441	BD442	15 min	2				3	36
		BD679##	BD680##	750 min	1.5					40
		BD679A##	BD680A##	750 min	2					40
		BD789	BD790	10 min	2				40	15
		BD779##	BD780##	750 min	2				20	15
		MJE240	MJE250	40/200	0.2	0.15 typ	0.07 typ	2	40	15
		MJE241	MJE251	40/120	0.2	0.15 typ	0.07 typ	2	40	15
		MJE802##	MJE702##	750 min	1.5				1#	40
		MJE803##	MJE703##	750 min	2				1#	40
		2N6039##	2N6036##	750/18k	2	1.7 typ	1.2 typ	2	25	40
	100	BD681##	BD682##	750 min	1.5					40
		BD791	BD792	10 min	2				40	15
		MJE243	MJE253	40/120	0.2	0.15 typ	0.07 typ	2	40	15
		MJE244	MJE254	25 min	0.2	0.15 typ	0.07 typ	2	40	15
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)†

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



CASE 90-05 (TO-225AB)

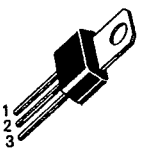
I_C Cont Amps Max	$V_{CEO(sus)}$ Volts Min	Device Type		h_{FE} Min/Max	@ I_C Amp	Resistive Switching			f_T MHz Min	P_D (Case) Watts @ 25°C
		NPN	PNP			t_s μs Max	t_f μs Max	@ I_C Amp		
5	50		MJE105	25/100	2					65
	60	MJE1100## MJE1101##	MJE1090##	750 min 750 min	3A 4A				1 1	70 70
	80	MJE1102## MJE1103##	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

(continued)

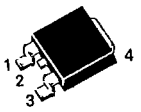
Darlington
† Not recommended for new designs (check TO-225, Table 7 or TO-220, Table 5 for alternates)

TABLE 9 — PLASTIC CASE 152 (continued)

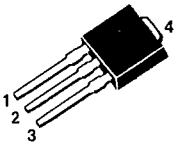
I_CCont Amps Max	$V_{CEO(sus)}$ Volts Min	Device Type		h_{FE} Min/Max	@ I_C Amp	Resistive Switching			f_T MHz Min	P_D (Case) Watts @ 25°C
		NPN	PNP			t_s μs Max	t_f μs Max	@ I_C Amp		
2	60	MPS-U05	MPS-U55	60 min	0.25				50	10
	80	MPS-U06	MPS-U56	60 min	0.25				50	10
	100	MPS-U07	MPS-U57	30 min	0.25				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_CCont 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

Darlington
* 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		2N3740J,/441A TX, TXV	30/100	0.25	1*		1	5	25	TO-213AA/80
		2N3766J,/518 TX, TXV		40/160	0.5	2.5*		0.5	10	25	TO-213AA/80
	80		2N3741J,/441A TX, TXV	30/100	0.25	1*		1	5	25	TO-213AA/80
		2N3767J,/518 TX, TXV		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	2N3791J,/379B TX, TXV	30/120	3	2*		5	4	150	TO-204/1
		2N6384J,/523 TX, TXV		1k/20k	5	10*		5	20	100	TO-204/1
			2N6649J,/527 TX, TXV	1k/20k	5	10*		5	50	85	TO-204/1
	80	2N3716J,/408B TX, TXV	2N3792J,/379B TX, TXV	30/120	3	2*		5	4	150	TO-204/1
		2N6385J,/523 TX, TXV		1k/20k	5	10*		5	20	100	TO-204/1
			2N6650J,/527 TX, TXV	1k/20k	5	10*		5	50	85	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_CCont Amps Max	$V_{CEO(sus)}$ Volts Min	Device Type NPN/#	Device Type PNP/#	h_{FE} Min/Max	@ I_C Amp	Resistive Switching t_s µs Max	Resistive Switching t_f µs Max	Resistive Switching @ I_C Amp	f_T MHz Min	P_D (Case) Watts @ 25°C	Case JEDEC/MOT
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
	100	2N6284J,/504 TX, TXV	2N6287J,/505 TX, TXV	1250/18k	10	10*		10	8	175	TO-204/1
25	100		2N6437J,/508 TX, TXV	30/120	10	1		10	40	200	TO-204/1
	120		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_CCont Amps Max	$V_{CEO(sus)}$ Volts Min	Device Type NPN	Device Type PNP	h_{FE} Min/Max	@ I_C Amp	Resistive Switching t_s µs Max	Resistive Switching t_f µs Max	Resistive Switching @ I_C Amp	$\|h_{fe}\|$ @ 1 MHz Min	P_D (Case) Watts @ 25°C	Case JEDEC/MOT
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	TIP117	1k min	1	2 typ	1 typ	1	25	50	TO-220/221A
		MJD112	MJD117	1000 min	2	1.7 typ	1.3 typ	2	25	20	TO-252/369A-04
		MJE270	MJE271	1.5k min	0.12				6	25	TO-225AA/77

(continued)

TABLE 12 — POWER DARLINGTONS (continued)

I_C Cont Amps Max	$V_{CEO(sus)}$ Volts Min	Device Type NPN	Device Type PNP	h_{FE} Min/Max	@ I_C Amp	Resistive Switching t_s μs Max	Resistive Switching t_f μs Max	Resistive Switching @ I_C Amp	$\|h_{fe}\|$ @ 1 MHz Min	P_D (Case) Watts @ 25°C	Case JEDEC/MOT
4	40	MJE3300	MJE3310	1k min	1				20	15	TO-225AA/77R
		2N6037	2N6034	750/1k	2	1.7 typ	1.2 typ	2	25	40	TO-225AA/77
	45	BD675	BD676	750 min	1.5					40	TO-225AA/77
		BD675A	BD676A	750 min	2					40	TO-225AA/77
			BD778	750 min	2				20	15	TO-225AA/77
	60	BD677	BD678	750 min	1.5					15	TO-225AA/77
		BD677A	BD678A	750 min	2					40	TO-225AA/77
		BD777	BD778	750 min	2				20	40	TO-225AA/77
		MJE3301		1k min	1				20	15	TO-225AA/77R
		MJE800	MJE700	750 min	1.5				1	40	TO-225AA/77
		MJE800T	MJE700T	750 min	1.5				1	40	TO-220/221A
		MJE801	MJE701	750 min	2				1	40	TO-225AA/77
		2N6038	2N6035	750/18k	2	1.7 typ	1.2 typ	2	25	40	TO-225AA/77
		2N6294	2N6296	750/18k	2	0.9 typ	0.7 typ	2	4	50	TO-213AA/80
	80	BD679	BD680	750 min	1.5					40	TO-225AA/77
		BD679A	BD680A	750 min	2					40	TO-225AA/77
		BD779	BD780	750 min	2				20	15	TO-225AA/77
		MJD6039	MJD6036	1k/12k	2	1.7 typ	1.2 typ	2	25	20	TO-252/369A-04
		MJE802	MJE702	750 min	1.5					40	TO-225AA/77
		MJE803	MJE703	750 min	2					40	TO-225AA/77
		2N6039	2N6038	750/18k	2	1.7 typ	1.2 typ	2	25	40	TO-225AA/77
		2N6295	2N6297	750/18k	2	0.9 typ	0.7 typ	2	4	50	TO-213AA/80
	100	BD681	BD682	750 min	1.5					40	TO-225AA/77
5	60	MJE1100	MJE1090	750 min	3A				1	70	TO-225AB/90
		MJE1101	MJE1091	750 min	4A				1	70	TO-225AB/90
		TIP120	TIP125	1k min	3	1.5 typ	1.5 typ	3	4	65	TO-220/221A
	80	MJE1102	MJE1092	750 min	3A				1	70	TO-225AB/90
		MJE1103	MJE1102	750 min	4A				1	70	TO-225AB/90
		TIP121	TIP126	1k min	3	1.5 typ	1.5 typ	3	4	65	TO-220/221A
	100	MJF122	MJF127	2k min	3	1.5 typ	1.5 typ	3	4	28	—/221C-02
		TIP122	TIP127	1k min	3	1.5 typ	1.5 typ	3	4	65	TO-220/221A
7	300	MJ3041		250 min	2.5					100	TO-204/1
	350	MJ3042		250 min	2.5					100	TO-204/1
	375	BU522		250 min	2.5				7.5	75	TO-220/221A
	425	BU522A		250 min	2.5				7.5	75	TO-220/221A
	450	BU522B		250 min	2.5				7.5	75	TO-220/221A
8	40	2N6386		1k/20k	3				20	65	TO-220/221A
	45	BDX53	BDX54	750 min	3				4	60	TO-220/221A
		BD895	BD896	750 min	3				1	70	TO-220/221A
		BD895A	BD896A	750 min	4				1	70	TO-220/221A
	60	BDX53A	BDX54A	750 min	3				4	60	TO-220/221A
		BD897	BD898	750 min	3				1	70	TO-220/221A
		BD897A	BD898A	750 min	4				1	70	TO-220/221A
		MJ1000	MJ900	1k min	3					90	TO-204/1
		TIP100	TIP105	1k/20k	3	1.5 typ	1.5 typ	3	4	80	TO-220/221A
		2N6043	2N6040	1k/10k	4	1.5 typ	1.5 typ	3	4	75	TO-220/221A
		2N6300	2N6298	750k/18k	4	1.5 typ	1.5 typ	4	4	75	TO-213AA/80
		2N6055	2N6053	750k/18k	4	1.5 typ	1.5 typ	4	4	100	TO-204/1
		MJE6043	MJE6040	1k/20k	4	1.5 typ	1.5 typ	4	2	75	TO-225AB/90
	80	BDX53B	BDX54B	750 min	3				4	60	TO-220/221A
		BD899	BD900	750 min	3				1	70	TO-220/221A
		BD899A	BD900A	750 min	4				1	70	TO-220/221A

(continued)

TABLE 12 — POWER DARLINGTONS (continued)

I_CCont Amps Max	$V_{CEO(sus)}$ Volts Min	Device Type NPN	Device Type PNP	h_{FE} Min/Max	@ I_C Amp	Resistive Switching t_s μs Max	Resistive Switching t_f μs Max	Resistive Switching @ I_C Amp	$\|h_{fe}\|$ @ 1 MHz Min	P_D (Case) Watts @ 25°C	Case JEDEC/MOT
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
		MJE6044	MJE6041	1k/20k	4	1.5 typ	1.5 typ	4	2	75	TO-225AB/90
	100	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	65	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
		TIP140	TIP145	500 min	10	2.5 typ	2.5 typ	5	4	125	TO-218/340
	80	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
		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
	100	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
	120	BDV65C	BDV64C	1k min	5					125	TO-218/340D
		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
		MJ10006•		30/300	5	1.5	0.5	5	10	150	TO-204/1
	400	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_CCont Amps Max	$V_{CEO(sus)}$ Volts Min	Device Type NPN	Device Type PNP	h_{FE} Min/Max	@ I_C Amp	Resistive Switching t_s μs Max	Resistive Switching t_f μs Max	Resistive Switching @ I_C Amp	$\|h_{fe}\|$ @ 1 MHz Min	P_D (Case) Watts @ 25°C	Case JEDEC/MOT
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-U45#	MPS-U51A MPS-U95#	50 min 4k min	1 1				50 100	10 10	—/152 —/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
	60		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 NPN	Device Type PNP	h_{FE} Min/Max	@ I_C Amp	Resistive Switching t_s μs Max	Resistive Switching t_f μs Max	Resistive Switching @ I_C Amp	f_T MHz Min	P_D (Case) Watts @ 25°C	Case JEDEC/MOT
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)

I_{C}Cont Amps Max	$V_{CEO(sus)}$ Volts Min	Device Type NPN	Device Type PNP	h_{FE} Min/Max	@ I_C Amp	Resistive Switching t_s μs Max	Resistive Switching t_f μs Max	Resistive Switching @ I_C Amp	f_T MHz Min	P_D (Case) Watts @ 25°C	Case JEDEC/MOT
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

$V_{CEO} \geq 200$ V

Devices are listed in descending order of $V_{CEO(sus)}$, and I_CCont

$V_{CEO(sus)}$ Volts Min	I_CCont Amps Max	V_{CEV} Volts Min	Device Type NPN unless otherwise noted	h_{FE} Min/Max	@ I_C Amp	Resistive Switching t_s μs Max	Resistive Switching t_f μs Max	Resistive Switching @ I_C Amp	f_T MHz Min	P_D (Case) Watts @ 25°C	Case JEDEC/MOT
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	MJE16034	4 min	3	2	1.5	2		80	TO-220/221A
		1500	MJH16034	4 min	3	2	1.5	2		125	TO-218/340
800	10	1400	MJ8505★	7.5 min	1.5	4	2	5			TO-204/1
		1500	MJ16018★	4 min	5	4.5 typ	0.2 typ	5			TO-204/1
		1500	MJH16018★	4 min	5	4.5 typ	0.2 typ	5			TO-218/340
	5	1400	MJ8503★	7.5 min	1	4	2	2.5			TO-204/1
		1400	MJE8503★	7.5 min	1	4	2	2.5			TO-220/221A
	2.5	1400	MJ8501★	7.5 min	0.5	4	2	1			TO-204/1
		1400	MJE8501★	7.5 min	0.5	4	2	1			TO-220/221A
750	20	1000	MJ10024##★	50/600	20	5	1.8	10			TO-204/1
	8	1500	MJ12005	5 min	5		·1	5	4 typ		TO-204/1
		1500	MJH12005				0.4 typ	5	4	100	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 * 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 t_s μs Max	Resistive Switching t_f μs Max	Resistive Switching @ I_C Amp	f_T MHz Min	P_D (Case) Watts @ 25°C	Case JEDEC/MOT
750	3	1500	MJE16032	4 min	3	2	1.5	2		80	TO-220/221A
		1500	MJH16032	4 min	3	2	1.5	2		125	TO-218/340
	2.5	1500	MJ12002★	1.11 min	2		1	2	4 typ		TO-204/1
		1500	MJE12007★	1.1 min	2		1	2	4 typ		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	MJ10011#	20 min	4		1	4			TO-204/1
		1500	BU508,A	2.25 min	4.5	8 typ	0.5 typ	4.5	7	125	TO-218/340
		1500	BU508D,AD	2.25 min	4.5	8 typ	0.5 typ	4.5	7	125	TO-218/340
	5	1200	MJ8502★	7.5 min	1	4	2	2.5			TO-204/1
		1200	MJE8502★	7.5 min	1	4	2	2.5			TO-220/221A
		1500	BU208A	2.25 min	4.5	8 typ	0.4 typ	4.5	4 typ	90	TO-204/1
		1500	BU208D	2.25 min	4.5		0.6 typ	4.5			TO-204/1
	2.5	1200	MJE8500★	7.5 min	0.5	4	2	1			TO-220/221A
600	10	700	MJ10014##★	10/250	10	2.5	0.8	10			TO-204/1
500	50	750	MJ10016##★	10 min	40	2.5	1	20			TO-204/197
		850	BUT34##	15 min	32	3	1.5	32		250	TO-204/197
	25	850	BUT14##	15 min	16	2.8	0.8	16		175	TO-204/1
	20	600	MJ10009##★	30/300	10	2	0.6	10	8**		TO-204/1
		800	MJ13335★	10/60	5	4	0.7	10			TO-204/1
	15	850	BUT51P##	40 min	5	1.1	0.16	10		125	TO-218/340D
		1000	MJ16010A★	5 min	15	3	0.4	10			TO-204/1
		1000	MJH16010A★	5 min	15	3	0.4	10			TO-218/340
	8	850	BUT50P##	30 min	2	0.75 typ	0.1 typ	5		100	TO-218/340D
		1000	MJ16006A★	5 min	15	3	0.4	10			TO-204/1
		1000	MJH16006A★	5 min	15	3	0.4	10			TO-218/340
	5	1000	MJ16002A★	5 min	15	3	0.3	3			TO-204/1
		1000	MJH16002A★	5 min	15	3	0.3	3			TO-218/340
450	30	850	MJ16020	5 min	30	1.8	0.2	20		250	TO-204/1
		850	MJ16022	7 min	30	1.5	0.15	20		250	TO-204/1
		1000	BUS98A	8 min	16	2.3	0.4	16		250	TO-204/197
	20	650	MJ10008##★	30/300	10	2	0.6	10	8**		TO-204/1
		850	2N6837★	10/30	15	2.5	0.25	15	15		TO-204/1
		850	MJ16014★	5 min	20	2.7	0.35	20			TO-204/197
		850	MJ16016★	7 min	20	2.2	0.25	20			TO-204/197
	15	850	2N6836★	10/30	10	3	0.35	10	10		TO-204/1
		850	MJ12022★	5 min	15		0.1 typ	10			TO-204/1
		850	MJ16010★	5 min	15	1.2 typ	0.2 typ	10			TO-204/1
		850	MJ16012★	7 min	15	0.9 typ	0.15 typ	10			TO-204/1
		850	MJH16010★	5 min	15	1.2	0.2	10		175	TO-218/340
		850	MJH16012★	7 min	15	0.9	0.15	10		150	TO-218/340
		1000	BUX48A	8 min	10	2	0.4	10		175	TO-204/1

(continued)

★ Designers Data Sheet characterization
Darlington ## Darlington with speed-up diode * t_{off} ** $|h_{fe}|$ @ 1 MHz

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 t_s µs Max	Resistive Switching t_f µs Max	Resistive Switching @ I_C Amp	f_T MHz Min	P_D (Case) Watts @ 25°C	Case JEDEC/MOT
450	15	1000	BUV48A	8 min	8	2	0.4	10		150	TO-218/340D
	9	1000	BUS47A	7 min	5	2	0.4	5		150	TO-204/1
		1000	BUS47AP	7 min	6	2	0.4	6		128	TO-218/340D
	8	850	2N6835★	7.5/3	5	2.5	0.25	5	10		TO-204/1
		850	MJE16080	5 min	8	2	0.5	5		80	TO-220/221A
		850	MJ12021★	5 min	8		0.1 typ	8			TO-204/1
		850	MJ16006★	5 min	8	2.5	0.25	5			TO-204/1
		850	MJ16008★	7 min	8	2.2	0.25	5			TO-204/1
		850	MJH16006★	5 min	8	2.5	0.25	5			TO-218/340
		850	MJH16008★	7 min	8	2.2	0.25	5			TO-218/340
		1000	BUW12A	6 min	5	4	0.8	5		125	TO-218/340
	5	850	2N6834★	10/30	3	2.7	0.35	3			TO-204/1
		850	MJ12020★	5 min	5		0.13 typ	3			TO-204/1
		850	MJ16002★	5 min	5	3	0.3	3	15		TO-204/1
		850	MJ16004★	8 min	3	2.7	0.35	3			TO-204/1
		850	MJE16002★	5 min	5	3	0.3	3			TO-220/221A
		850	MJE16004★	7 min	5	2.7	0.35	3			TO-220/221A
		850	MJH16002★	5 min	5	3	0.3	3			TO-218/340
		850	MJH16004★	7 min	5	2.7	0.35	3			TO-218/340
		1000	BUW11A	6 min	2.5	4	0.8	2.5		125	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	MJ10001#★	40/400	10	3	1.8	10	10**		TO-204/1
		500	MJ10005#★	40/400	10	1.5	0.5	10	10**		TO-204/1
		500	MJ13333★	10/60	5	4	0.7	10			TO-204/1
	15	650	MJ13090★	8 min	10	2.5	0.5	10			TO-204/1
		650	MJ16110	6/20	15	0.8 typ	0.1 typ	10		175	TO-204/1
		650	MJH16110	6/20	15	0.8 typ	0.1 typ	10		135	TO-218/340
		850	2N6547★	6/30	10	4	0.7	10	6 to 24		TO-204/1
		850	BUX48	8 min	10	2	0.4	10		175	TO-204/1
		850	BUV48	8 min	10	2	0.4	10		150	TO-218/340D
	12	700	MJE13009★	6/30	8	3	0.7	8	4**		TO-220/221A
	10	950	MJ12010	4.2 min	5		1	5	6 typ		TO-204/1
		550	MJ10012#	100/2k	6	6	15	15	6		TO-204/1
		500	MJ10003#★	30/300	5	2.5	1	5	10**		TO-204/1
		500	MJ10007##★	30/300	5	1.1	0.25	5	10**		TO-204/1
		450	MJ13015★	8/20	5	2	0.5	5			TO-204/1
	9	850	BUS47	7 min	6	2	0.4	6		150	TO-204/1
		850	BUS47P	7 min	5	2	0.4	6		128	TO-218/340D

★ 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 t_s μs Max	Resistive Switching t_f μs Max	Resistive Switching @ I_C Amp	f_T MHz Min	P_D (Case) Watts @ 25°C	Case JEDEC/MOT
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
		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
325	30	400	BUV23	8 min	16	1.8	0.4	16	8	250	TO-204/197
	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
300	15	650	2N6546★	6/30	10	4	0.7	10	6 to 24		TO-204/1
	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
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 t_s μs Max	Resistive Switching t_f μs Max	Resistive Switching @ I_C Amp	f_T MHz Min	P_D (Case) Watts @ 25°C	Case JEDEC/MOT
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

★ Designers Data Sheet characterization
Darlington ## Darlington with speed-up diode * t_{off} ** $|h_{fe}|$ @ 1 MHz