

ALPHANUMERIC INDEX — CROSS-REFERENCE (Continued)

Industry Part Number	Motorola Direct Replacement	Motorola Similar Replacement	Page Number	Industry Part Number	Motorola Direct Replacement	Motorola Similar Replacement	Page Number
MJ723	MJ802	MJ12002	3-637	MJD44H11	MJD44H11		3-808
MJ802			3-526	MJD44H11-1	MJD44H11-1		3-808
MJ804			3-644	MJD45H11	MJD45H11		3-808
MJ8100			3-158	MJD45H11-1	MJD45H11-1		3-808
MJ8500			3-546	MJD47	MJD47		3-812
MJ8501	MJ8501		3-546	MJD47-1	MJD47-1		3-812
MJ8502			3-552	MJD50	MJD50		3-812
MJ8503			3-552	MJD50-1	MJD50-1		3-812
MJ8504			3-558	MJD6036	MJD6036		3-848
MJ8505			3-558	MJD6036-1	MJD6036-1		3-848
MJ900	MJ900		3-528	MJD6039	MJD6039		3-848
MJ901			3-528	MJD6039-1	MJD6039-1		3-848
MJ920			3-147	MJE101			3-904
MJ921			3-147	MJE102			3-904
MJD112			3-816	MJE103			3-904
MJD112-1	MJD112		3-816	MJE104		MJE2955	3-904
MJD117			3-816	MJE105	MJE105		3-860
MJD117-1			3-816	MJE105K			3-1083
MJD122			3-822	MJE1090	MJE1090		—
MJD122-1			3-822	MJE1091	MJE1093		—
MJD127	MJD127		3-822	MJE1092	MJE1092		—
MJD127-1			3-822	MJE1093	MJE1093		—
MJD13003			3-854	MJE1100	MJE1100		—
MJD13003-1			3-822	MJE1101	MJE1101		—
MJD148			3-828	MJE1102	MJE1102		—
MJD148-1	MJD148-1		—	MJE1103	MJE1103		—
MJD200			3-832	MJE12007	MJE12007		3-936
MJD200-1			3-832	MJE1290			3-131
MJD210			3-832	MJE1291			3-131
MJD210-1			3-832	MJE13002	MJE13002		3-938
MJD29	MJD31		3-797	MJE13003	MJE13003		3-938
MJD29-1			3-797	MJE13004	MJE13004		3-944
MJD2955			3-844	MJE13005	MJE13005		3-944
MJD2955-1			3-844	MJE13006	MJE13006		3-950
MJD29C			3-797	MJE13007	MJE13007		3-950
MJD29C1	MJD31C1		3-797	MJE13008	MJE13008		3-958
MJD30			3-797	MJE13009	MJE13009		3-958
MJD30-1			3-797	MJE13070	MJE13070		3-966
MJD3055			3-844	MJE13071			3-976
MJD3055-1			3-844	MJE1320	MJE1320		3-892
MJD30C	MJD32C		3-797	MJE15028	MJE15028		3-972
MJD30C1			3-797	MJE15029	MJE15029		3-972
MJD31			3-797	MJE15030	MJE15030		3-972
MJD31-1			3-797	MJE15031	MJE15031		3-972
MJD31C			3-797	MJE16002	MJE16002		3-976
MJD31C1	MJD32C1		3-797	MJE16004	MJE16004		3-976
MJD32			3-797	MJE16032	MJE16032		3-984
MJD32-1			3-797	MJE16034	MJE16034		3-984
MJD32C			3-797	MJE1660	MJE1660		3-898
MJD32C1			3-797	MJE1661	MJE1661		3-898
MJD340	MJD340		3-840	MJE170	MJE170		3-862
MJD340-1			3-840	MJE171	MJE171		3-862
MJD350			3-840	MJE172	MJE172		3-862
MJD350-1			3-840	MJE180	MJE180		3-862
MJD41C			3-801	MJE181	MJE181		3-862
MJD41C1	MJD41C1		3-840	MJE182	MJE182		3-862
MJD42C			3-801	MJE200	MJE200		3-866
MJD42C-1			3-840	MJE201			3-904
MJD44E3			3-805	MJE2010			3-1083
MJD44E3-1			3-805	MJE2011			3-1083

*Consult Motorola if a direct replacement is necessary.

TABLE 5 — PLASTIC TO-220 (Continued)

I _C Cont Amps Max	V _{CEO(sus)} Volts Min	Device Type		hFE 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 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	4 8 typ 8 typ	1 0.5 typ 0.5 typ	4 4.5 4.5			TO-204/1 TO-218/340 TO-218/340
		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 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
	600	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
		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
		1000 1000	MJ16002A★ MJH16002A★	5 min 5 min	15 15	3 3	0.3 0.3	3 3			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
		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	30	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
	20	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 0.35 1.2 typ 0.9 typ 1.2 0.9 2	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
		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 0.35 1.2 typ 0.9 typ 1.2 0.9 2	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
	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 0.35 1.2 typ 0.9 typ 1.2 0.9 2	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
	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
	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 0.35 1.2 typ 0.9 typ 1.2 0.9 2	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)

HORIZONTAL DEFLECTION TRANSISTOR

... specifically designed for use in small screen black and white deflection circuits.

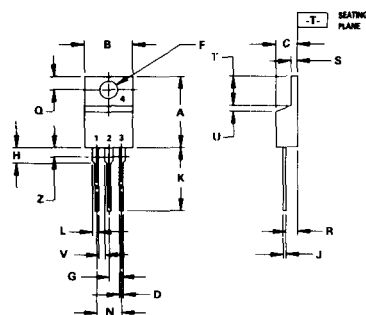
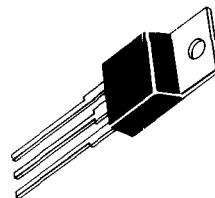
- Collector-Emitter Voltage – $V_{CEX} = 1500$ Volts
- Glassivated Base-Collector Junction
- Switching Times with Inductive Loads –
 $t_f = 0.65 \mu s$ (Typ) @ $I_C = 2.0$ A

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	$V_{CEO(sus)}$	750	Vdc
Collector-Emitter Voltage	V_{CEX}	1500	Vdc
Emitter-Base Voltage	V_{EBO}	5.0	Vdc
Collector Current – Continuous	I_C	2.5	Adc
Base Current – Continuous	I_B	2.0	Adc
Emitter Current – Continuous	I_E	4.5	Adc
Total Power Dissipation @ $T_C = 25^\circ C$ Derate above $25^\circ C$	P_D	65 0.65	Watts W/ $^\circ C$
Operating and Storage Junction Temperature Range	T_J, T_{Stg}	-65 to +125	$^\circ C$

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	1.54	$^{\circ}\text{C/W}$



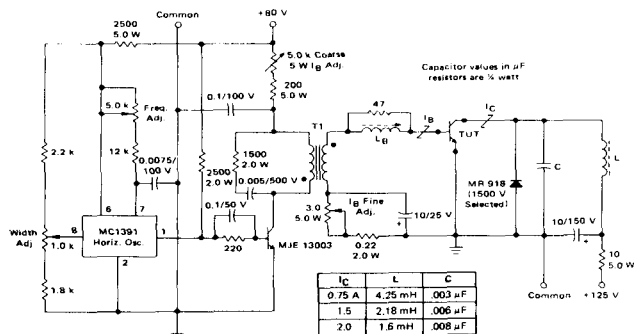
- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.
 3. DIM Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	14.48	15.75	0.570	0.620
B	9.66	10.26	0.380	0.405
C	4.07	4.82	0.160	0.190
D	0.64	0.88	0.025	0.035
E	3.61	3.77	0.142	0.147
G	2.42	2.82	0.096	0.110
H	2.86	3.93	0.110	0.156
J	0.46	0.71	0.018	0.028
K	12.70	14.27	0.500	0.562
L	1.15	1.39	0.045	0.055
N	4.83	5.33	0.190	0.210
Q	2.54	3.04	0.100	0.120
R	2.04	2.79	0.080	0.110
S	1.15	1.39	0.045	0.055
T	5.97	6.47	0.235	0.255
U	0.60	1.27	0.000	0.090
V	1.15		0.045	
Z		2.04		0.080

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

CASE 221A-04
TO-220AB

FIGURE 1 – TEST CIRCUIT



DRIVER TRANSFORMER (T1)

Motorola part number 25D68782A-05-1/4" laminate "E" iron core. Primary Inductance - 39 mH. Secondary Inductance - 22 mH. Leakage Inductance with primary shorted - 2.0 μ H. Primary 260 turns #28 AWG enamel wire, Secondary 17 turns, #22 AWG enamel wire.

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

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS (1)					
Collector-Emitter Sustaining Voltage ($I_C = 50\text{ mAdc}$, $I_B = 0$)	$V_{CE(sus)}$	750	—	—	Vdc
Collector Cutoff Current ($V_{CE} = 1500\text{ Vdc}$, $V_{BE} = 0$)	I_{CES}	—	—	1.0	mAdc
Emitter Cutoff Current ($V_{BE} = 5.0\text{ Vdc}$, $I_C = 0$)	I_{EBO}	—	—	0.1	mAdc
ON CHARACTERISTICS (1)					
Collector-Emitter Saturation Voltage ($I_C = 2.0\text{ Adc}$, $I_B = 0.66\text{ Adc}$)	$V_{CE(sat)}$	—	—	5.0	Vdc
Base-Emitter Saturation Voltage ($I_C = 2.0\text{ Adc}$, $I_B = 0.66\text{ Adc}$)	$V_{BE(sat)}$	—	—	1.5	Vdc
DYNAMIC CHARACTERISTICS					
Output Capacitance ($V_{CB} = 10\text{ Vdc}$, $I_E = 0$, $f = 0.1\text{ MHz}$)	C_{ob}	—	50	—	pF
Current Gain — Bandwidth Product (1) ($I_C = 0.1\text{ Adc}$, $V_{CE} = 5.0\text{ Vdc}$, $f_{test} = 1.0\text{ MHz}$)	f_T	—	4.0	—	MHz
SWITCHING CHARACTERISTICS					
Fall Time ($I_C = 2.0\text{ Adc}$, $I_{B1} = 0.6\text{ Adc}$, $L_B = 12\text{ }\mu\text{H}$)	t_f	—	0.65	1.0	μs

(1) Pulse Test: Pulse Width $\leq 300\text{ }\mu\text{s}$, Duty Cycle = 2%.

