

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
BDX10C	2N3055A		3-9	BDY93	BU326A		3-363
BDX18	MJ2955		3-6	BDY93/01	BU326A		3-363
BDX33	BDX33		3-334	BDY94	BU326A		3-363
BDX33A	BDX33A		3-334	BDY94/01	BU326A		3-363
BDX33B	BDX33B		3-334	BDY96	BUX47		3-499
BDX33C	BDX33C		3-334	BDY96-1	BUX47		3-499
BDX33D	BDX33D		3-334	BDY96/01	BUX47		3-499
BDX34	BDX34		3-334	BDY97	BUX47		3-499
BDX34A	BDX34A		3-334	BDY97-1	BUX47		3-499
BDX34B	BDX34B		3-334	BF380	MPS-U10		3-1052
BDX34C	BDX34C		3-334	BF380-5	MPS-U10		3-1052
BDX34D	BDX34D		3-334	BF381	MPS-U10		3-1052
BDX35	TIP42C		3-1083	BF382	MPS-U10		3-1052
BDX36	TIP42D		3-1083	BF382-5	MPS-U10		3-1052
BDX37	TIP42D		3-1083	BU104P	BU406		3-366
BDX42	BD775		—	BU105		MJ12003	3-642
BDX43	BD777		3-302	BU108	BU208		3-343
BDX44	BD779		3-302	BU109P	BU407		3-366
BDX45	BD776		3-302	BU124	BU426		3-368
BDX46	BD778		3-302	BU126		MJE13005	3-944
BDX47	BD779		3-302	BU126A		MJE13005	3-944
BDX53	BDX53		3-338	BU134	MJ423		3-524
BDX53A	BDX53A		3-338	BU137		MJ10025	3-623
BDX53B	BDX53B		3-338	BU157		MJ10025	3-623
BDX53C	BDX53C		3-338	BU180		MJE5741	3-914
BDX53D	BDX53D		3-338	BU180A		MJE5742	3-914
BDX54	BDX54		3-338	BU204	BU207		3-343
BDX54A	BDX54A		3-338	BU205	BU208		3-343
BDX54B	BDX54B		3-338	BU205A		MJ12003	3-642
BDX54C	BDX54C		3-338	BU207	BU207		3-343
BDX54D	BDX54D		3-338	BU208	BU208		3-343
BDX70		2N6487	3-207	BU208A	BU208A		3-348
BDX71		2N6487	3-207	BU208D	BU208D		3-353
BDX72		2N6488	3-207	BU221	BU326A		3-363
BDX73		2N6488	3-207	BU222	BU326A		3-363
BDX74		2N6486	3-207	BU223	MJ431		3-524
BDX75		2N6486	3-207	BU223A	MJ431		3-524
BDX77	BD799		3-312	BU322	BU323		3-355
BDX78	BD800		3-314	BU322A	BU323A		3-355
BDX83	MJ3000		3-530	BU323	BU323A		3-355
BDX83A	MJ3000		3-530	BU323A	BU323A		3-355
BDX83B	MJ3001		3-530	BU323AP	BU323AP		3-359
BDX83C	2N6284		3-172	BU323P	BU323P		3-359
BDX84	MJ2500		3-530	BU326	BU326A		3-363
BDX84A	MJ2500		3-530	BU326A	BU326A		3-363
BDX84B	MJ2501		3-530	BU406	BU406		3-366
BDX84C	2N6287		3-172	BU406D	BU406D		3-366
BDX91	2N3715		3-26	BU407	BU407		3-366
BDX92	2N3791		3-56	BU407D	BU407D		3-366
BDX93	2N3716		3-26	BU426	BU426		3-368
BDX94	2N3792		3-56	BU426A	BU426A		3-368
BDX95		2N5882	3-123	BU433	BU426		3-368
BDX96	2N5880		3-123	BU500		MJ12005	3-650
BDY29	2N5303		3-93	BU508	BU508		3-372
BDY34	BD785		3-304	BU508A	BU508A		3-372
BDY37	2N3773		3-52	BU508AD	BU508AD		3-372
BDY80		2N6122	3-154	BU508D	BU508D		3-372
BDY81		2N6122	3-154	BU522	BU522		3-377
BDY82		2N6125	3-154	BU522A	BU522A		3-377
BDY83		2N6125	3-154	BU522B	BU522B		3-377

*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		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		
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
8	450	BU522B##		250 min	2.5				7.5	75
	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					50
		BU807##		100 min	5	0.55 typ	0.2 typ	5	30	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
	350		MJE5850	15 min	2	2	0.5	4		80
		MJE5741##		200 min	4	8 typ	2 typ	6		80
	400		MJE5851	15 min	2	2	0.5	4		80
		MJE5742W##		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
10	30			5 min	8	2	0.5	5		80
				6/25	8	2 typ	0.1 typ	5		100
	450	MJE16080		5 min	8					80
		MJE16106		6/25	8					100
	40			5 min	8					80
				6/25	8					100
	45			5 min	8					80
				6/25	8					100
10	30			5 min	8					80
				6/25	8					100
	40			5 min	8					80
				6/25	8					100
	45			5 min	8					80
				6/25	8					100
	60			5 min	8					80
				6/25	8					100

h_{FE} @ 1 MHz, ## Darlington

(continued)

TABLE 12 — POWER DARLINGTONS (continued)

I _C Cont Amps Max	V _{CEO} (sus) Volts Min	Device Type		hFE 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				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					40 40 15	TO-225AA/77 TO-225AA/77 TO-225AA/77
	60	BD677 BD677A BD777	BD678 BD678A BD778	750 min 750 min 750 min	1.5 2 2					15 40 40	TO-225AA/77 TO-225AA/77 TO-225AA/77
		MJE3301 MJE800 MJE800T	MJE700 MJE700T	1k min 750 min 750 min	1 1.5 1.5				20 20 1	15 40 40	TO-225AA/77R TO-225AA/77 TO-225AA/77
		MJE801 2N6038 2N6294	MJE701 2N6035 2N6296	750 min 750/18k 750/18k	2 2 2	1.7 typ 0.9 typ	1.2 typ 0.7 typ	2 2	1 25 4	40 40 50	TO-225AA/77 TO-225AA/77 TO-213AA/80
		BD679 BD679A BD779	BD680 BD680A BD780	750 min 750 min 750 min	1.5 2 2					40 40 15	TO-225AA/77 TO-225AA/77 TO-225AA/77
		MJD6039 MJE802 MJE803	MJD6036 MJE702 MJE703	1k/12k 750 min 750 min	2 1.5 2	1.7 typ 1.7 typ	1.2 typ 1.2 typ	2 2	20 25 4	15 20 40	TO-252/369A-04 TO-225AA/77 TO-225AA/77
		2N6039 2N6295	2N6036 2N6297	750/18k 750/18k	2 2	0.9 typ 0.7 typ	0.7 typ 0.7 typ	2 2	25 4	40 50	TO-225AA/77 TO-213AA/80
	100	BD681	BD682	750 min	1.5					40	TO-225AA/77
5	60	MJE1100 MJE1101 TIP120	MJE1090 MJE1091 TIP125	750 min 750 min 1k min	3A 4A 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	1.5 typ 1.5 typ	3 3	1 1 4	70 70 65	TO-225AB/90 TO-225AB/90 TO-220/221A
	100	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	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 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	BDX54A BD898 BD898A	750 min 750 min 750 min	3 3 4				4 1 1	60 70 70	TO-220/221A TO-220/221A TO-220/221A
		MJ1000 TIP100 2N6043	MJ900 TIP105 2N6040	1k min 1k/20k 1k/10k	3 3 4	1.5 typ 1.5 typ	1.5 typ 1.5 typ	3 3	4 4 4	90 80 75	TO-204/1 TO-220/221A TO-220/221A
	60	2N6300 2N6055 MJE6043	2N6298 2N6053 MJE6040	750k/18k 750k/18k 1k/20k	4 4 4	1.5 typ 1.5 typ 1.5 typ	1.5 typ 1.5 typ 1.5 typ	4 4 4	4 4 2	75 100 75	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
	80										

(continued)

BU522
BU522A
BU522B

HIGH VOLTAGE SILICON POWER DARLINGTONS

Power Transistor mainly intended for use as ignition circuit output transistor.

- Specified minimum sustaining voltage:
 $V_{CE(sus)} = 350 \text{ V (BU522)}$
at $I_C = 1 \text{ A}$ 400 V (BU522A)
425 V (BU522B)
- High S.O.A. capability:
 $V_{CE} = 350 \text{ V (BU522) at } I_C = 5 \text{ A}$
400 V (BU522A, BU522B)
- Low $V_{CE(sat)} = 2.0 \text{ V max. at } I_C = 4 \text{ A (BU522A, BU522B)}$

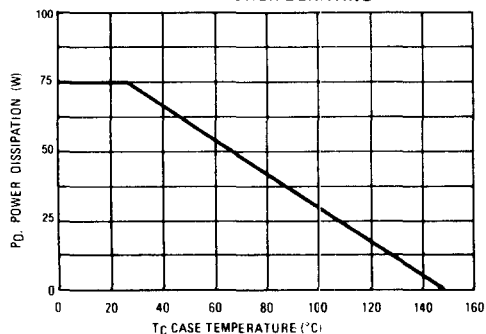
MAXIMUM RATINGS

Rating	Symbol	BU522	BU522A	BU522B	Unit
Collector-Emitter Voltage Sust.	$V_{CE(sus)}$	350	400	425	Vdc
Collector-Emitter Voltage	V_{CER}	375	425	450	Vdc
Collector-Base Voltage	V_{CBO}	400	450	475	Vdc
Emitter-Base Voltage	V_{EBO}	5.0			Vdc
Collector Current - Continuous	I_C	7.0			Adc
Base Current	I_B	2.0			Adc
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C	P_D	75 0.60			Watts W/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	T_J, T_{stg}	-65 to 150			$^\circ\text{C}$

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max.	Unit
Thermal Resistance, Junction to Case	θ_{JC}	1.67	$^\circ\text{C/W}$

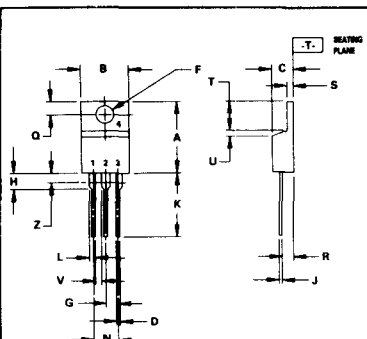
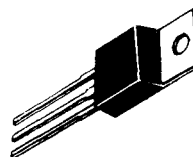
FIGURE 1 - POWER DERATING



7 AMPERES

**DARLINGTON
TRIPLE DIFFUSED
POWER TRANSISTORS
NPN SILICON**

**375, 425, 450 VOLTS
75 WATTS**



NOTES:

- DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
- CONTROLLING DIMENSION: INCH.
- 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	0.84	0.86	0.035	0.035
F	3.61	3.73	0.142	0.147
G	2.42	2.96	0.095	0.105
H	2.80	3.93	0.110	0.155
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	2.70	0.080	0.110
S	1.15	1.39	0.045	0.055
T	5.97	6.47	0.235	0.255
U	0.00	1.27	0.000	0.050
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**

BU522, BU522A, BU522B

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

Characteristic	Symbol	Min.	Typ.	Max.	Unit
OFF CHARACTERISTICS					
Collector-Emitter Sustaining Voltage (See Figure 2) ($I_C = 1.0 \text{ A}$) See Figure 2 BU522 BU522A BU522B	$V_{CE(sus)}$	350 400 425			Vdc
Collector Cutoff Current (Rated V_{CE} , $R_{BE} = 270 \Omega$)	I_{CER}			1.0	mA _{dc}
Collector Cutoff Current (Rated V_{CBO} , $I_E = 0$)	I_{CBO}			1.0	mA _{dc}
Emitter Cutoff Current ($V_{EB} = 5.0 \text{ Vdc}$, $I_C = 0$)	I_{EBO}			40	mA _{dc}

ON CHARACTERISTICS

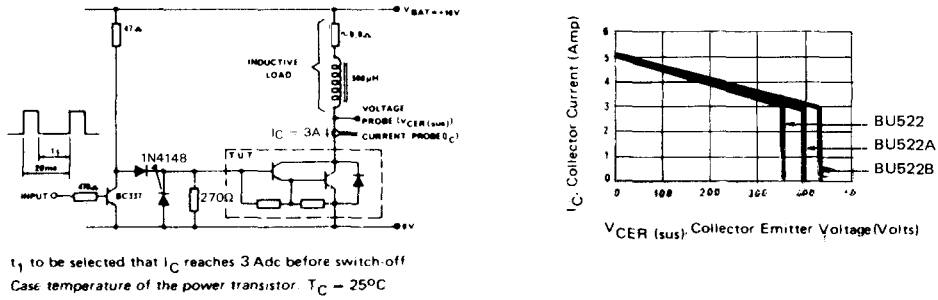
DC Current Gain ($I_C = 2.5 \text{ Adc}$, $V_{CE} = 5 \text{ Vdc}$)	h_{FE}	250			
Collector-Emitter Saturation Voltage ($I_C = 4 \text{ Adc}$, $I_B = 80 \text{ mA}$) BU522 BU522A, BU522B	$V_{CE(sat)}$			2.5 2	Vdc
Base-Emitter Saturation Voltage ($I_C = 4 \text{ Adc}$, $I_B = 80 \text{ mA}$)	$V_{BE(sat)}$			2.5	Vdc

DYNAMIC CHARACTERISTICS

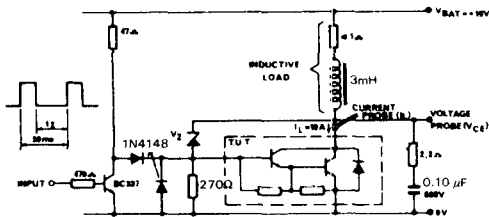
Current Gain – Bandwidth Product ($I_C = 0.3 \text{ mA}$, $V_{CE} = 5.0 \text{ Vdc}$, $f_{test} = 1.0 \text{ MHz}$)	f_T		7.5		MHz
Output Capacitance ($V_{CB} = 10 \text{ Vdc}$, $I_E = 0$, $f = 0.1 \text{ MHz}$)	C_{ob}		150		pF

BU522, BU522A, BU522B

FIGURE 2 – SUSTAINING VOLTAGE TEST $V_{CER(sus)}$



Test conditions of the Collector-Base Clamping Circuit:



Clamping device characteristics:

$V_Z = 350\text{ V (BU522)} \pm 1\% \text{ at } I_Z = 20\text{ mA}$
 400 V (BU522A/B)

Clamping duration is around $45\text{ }\mu\text{sec (BU522)}$
 $40\text{ }\mu\text{sec (BU522A/B)}$

t_2 to be selected that I_L reaches 5 A dc before switch-off

Case temperature of the power transistor: $T_C = 25^\circ\text{C}$.

FIGURE 3 – S.O.A. TEST