













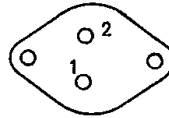
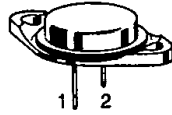
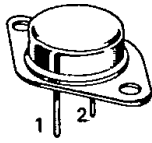


Selection By Package

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 MJ13070 | | 7/35 | 3 | 4 | 0.8 | 3 | 6 | 100 |
| | | | | 8 min | 3 | 1.5 | 0.5 | 3 | 125 | |
| | 450 | MJ16002 MJ16004 2N6834 | | 5 min | 5 | 3 | 0.3 | 3 | 125 | |
| | | | | 7 min | 5 | 2.7 | 0.35 | 3 | 125 | |
| | | | | 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 |
| 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 | 4.5 | 8 typ | 0.6 typ | 4.5 | 4 typ | 60 | |
| | | | 2.25 min | 4.5 | | 0.4 typ | 4.5 | 4 typ | 90 | |
| | | | 2.25 min | 4.5 | | 0.6 typ | 4.5 | 4 typ | 60 | |
| | | | 2.5 min | 4.5 | | 1 | 4.5 | 4 | 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)

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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## | MJ900## | 1k min | 3 | 1.5 typ | 1.5 typ | 4 | 4# | 90 | |
| | | 2N6055## | 2N6053## | 750/18k | 4 | | | | | 100 | |
| | 80 | MJ1001## | MJ901## | 1k min | 3 | 1.5 typ | 1.5 typ | 4 | 4# | 90 | |
| | | 2N6056## | 2N6054## | 750/18k | 4 | | | | | 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 | |
| | 400 | 2N6545 | | | 7/35 | 5 | 4 | 1 | 5 | 6 | 125 |
| | | | MJ6503 | | 15 min | 2 | 2 | 0.5 | 4 | | 125 |
| | | | MJ13080 | | 8 min | 5 | 1.5 | 0.5 | 5 | | 150 |
| | 450 | MJ16006 | | | 5 min | 8 | 2.5 | 0.25 | 5 | 10 | 150 |
| | | | MJ16008 | | 7 min | 8 | 2.2 | 0.25 | 5 | | 150 |
| | | | 2N6835 | | 10/30 | 5 | 2.5 | 0.25 | 5 | | 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 | | 2N3789 | 15 min | 3 | 0.3 typ | 0.4 typ | 5 | 4 | 150 | |
| | | | 2N3791 | 30 min | 3 | 0.3 typ | 0.4 typ | 5 | 4 | 150 | |
| | | | 2N5875 | 20/100 | 4 | 1 | 0.8 | 4 | 4 | 150 | |
| | | | 2N6384## | 1k/20k | 5 | | | | 20# | 100 | |
| | | | MJ3000## | MJ2500## | 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 | | 15/60 | 5 | 0.9 typ | 0.9 typ | 5 | 1 | 150 | | |
| | 2N3442 | | 20/70 | 4 | | | | | 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 _{CE0(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 | |
| 600 | MJ10014## | | 10/250 | 10 | 2.5 | 0.8 | 10 | | 175 | |
| 700 | MJ8504 | | 7.5 min | 1.5 | 4 | 2 | 6 | | 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 | 176 |
| | | 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# | 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 | 20/100 | 10 | 1 | 0.8 | 10 | 4 | 200 |
| | | | 2N6436 | 30/120 | 10 | 1 | 0.25 | 10 | 40 | 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 | 20 | 1.2 | 0.25 | 20 | 8 | 150 |
| | | | | 10 min | 20 | 1.55 | 0.45 | 15 | 10 | 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 | 2N4398 | 15/60 | 15 | 2 | 1 | 10 | 2 | 150 |
| | | 2N5301 | | 15/60 | 15 | | | | 2 | 200 |
| | 60 | 2N5302 | 2N4399 | 15/60 | 15 | 2 | 1 | 10 | 2 | 200 |
| | | MJ11012## | MJ11011## | 1k min | 20 | | | | 4# | 200 |
| | 90 | BUX39 | MJ11013## | 8 min | 20 | 1 | 0.25 | 20 | 8 | 120 |
| | | MJ11014## | | 1k min | 20 | | | | 4# | 200 |
| | 100 | 2N6328 | MJ4502 | 6/30 | 30 | | | | 3 | 200 |
| | | MJ802 | | 25/100 | 7.5 | | | | 2 | 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 | 0.4 | 20 | | 250 | |
| | | | | | 3 | 0.8 | 20 | | 250 | |
| 450 | BUS98A● BUX98A MJ16020● MJ16022● | | 8 min | 16 | 2.3 | 0.4 | 16 | | 250 | |
| | | | | | 3 | 0.8 | 16 | | 250 | |
| | | | 5 min | 30 | 1.8 | 0.2 | 20 | | 250 | |
| | | | 7 min | 30 | 1.5 | 0.15 | 20 | | 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 | 40 | 1.1 | 0.35 | 20 | 8 | 350 |
| | | | | 10 min | 20 | | | | | 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● | 2N5683● | 15/60 | 25 | 0.5 typ | 0.3 typ | 25 | 2 | 300 |
| | | MJ11028●## | MJ11029●## | 400 min | 50 | | | | | 300 |
| | 80 | 2N5686● | 2N5684● | 15/60 | 25 | 0.5 typ | 0.3 typ | 25 | 2 | 300 |
| | | | 2N6377● | 30/120 | 20 | 0.8 | 0.25 | 20 | 30 | 250 |
| | 90 | MJ11030●## | MJ11031●## | 400 min | 50 | | | | | 300 |
| | 100 | 2N6274● | 2N6378● | 30/120 | 20 | 0.8 | 0.25 | 20 | 30 | 250 |
| | 120 | 2N6275● | 2N6379● | 30/120 | 20 | 0.8 | 0.25 | 20 | 30 | 250 |
| MJ11032●## | | MJ11033●## | 400 min | 50 | | | | | 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)

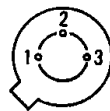
 JAN, JTX, JTXV Available

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

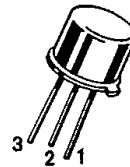
| I _C Cont Amps Max | V _{CEO(sus)} Volts Min | Device Type | | h _{FE} Min/Max | @ I _C Amp | Resistive Switching | | | f _T MHz Min | P _D (Case) Watts @ 25°C |
|------------------------------------|---------------------------------------|------------------------|----------|----------------------------|-------------------------|-----------------------------|-----------------------------|-------------------------|------------------------------|------------------------------------------|
| | | 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)

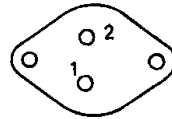
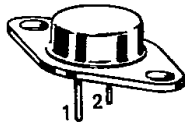
| I _C Cont Amps Max | V _{CEO(sus)} Volts Min | Device Type | | h _{FE} Min/Max | @ I _C Amp | Resistive Switching | | | f _T MHz Min | P _D (Case) Watts @ 25°C |
|------------------------------------|---------------------------------------|------------------|------------------|----------------------------|-------------------------|-----------------------------|-----------------------------|-------------------------|------------------------------|------------------------------------------|
| | | 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 |
| 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 |

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

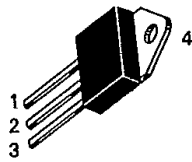
CASE 80-02 (TO-213AA)

| 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 | 2N3585 | 2N6212 | 10/100 | 1 | 2.5 | 0.6 | 1 | 20 | 35 |
| | | 2N4240 | 2N6422 | 25/100 | 1 | 4 | 3 | 1 | 10 | 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 | 2N3767 | 2N3741 | 30/100 | 0.25 | 1.3 typ | 0.27 typ | 0.25 | 4 | 25 |
| | | 2N6295## | 2N6297## | 40/160 | 0.5 | 0.9 typ | 0.09 typ | 0.5 | 10 | 20 |
| | | | | 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 |

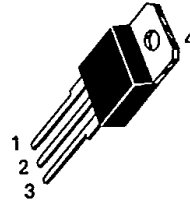
|h_{FE}| @ 1 MHz, ## Darlington

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 | 3 | 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 |
| MJH16006A | | | 5 min | 8 | 2.5 | 0.25 | 5 | | 125 | |
| 700 | BU508,A | | 2.25 min | 4.5 | 8 typ | 0.5 typ | 4.5 | 7 | | 125 |
| | BU508D,AD | | 2.25 min | 4.5 | 8 typ | 0.5 typ | 4.5 | 7 | | 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 |
| 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 |

|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 | | |
| | 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

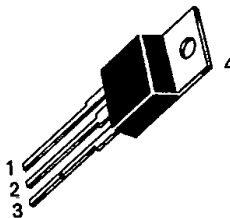
† These devices supplied in Case 340D-01. Consult Motorola for details.

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 | | |
| 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 _{CE0(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 |

|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 | | |
| | | | | | | | | | | |
| 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 | | | | | 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 |
| | | D44H5 | D45H4 | 20 min | 4 | | | | | 50 |
| 60 | BDX33A## | BDX34A## | 750 min | 4 | | | | 3 | 70 | |
| | BD807 | BD808 | 15 min | 4 | | | | 1.5 | 90 | |

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

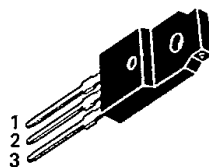
(continued)

TABLE 5 — PLASTIC TO-220 (continued)

| I _C Cont Amps Max | V _{CEO(sus)} Volts Min | Device Type | | 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 D44H8 | D45H7 D45H8 D45H9 | 20 min 40 min 40 min | 4 4 4 | | | | | 50 50 50 |
| | | MJE2801T MJE3055T 2N6387## SE9300## | MJE2955T 2N6667## SE9400## | 25/100 20/70 1k/20k 1k min | 3 4 5 4 | | | | | 75 75 65 70 |
| | | BDX33B## BD809 D44E3## | BDX34B## BD810 | 750 min 15 min 1000 min | 3 4 5 | 2 typ | 0.5 typ | 10 | 3 1.5 | 70 90 50 |
| | | 2N6388## D44H10 D44H11 SE9301## | D45H12 2N6668## D45H10 D45H11 SE9401## | 40 min 1k/20k 20 min 40 min 1k min | 4 5 4 4 4 | 0.5 typ 0.5 typ | 0.14 typ 0.14 typ | 5 5 | 20# 50 typ 50 typ 1# | 50 65 50 70 |
| | | BDX33C## SE9302## | BDX34C## SE9402## | 750 min 1k min | 3 4 | | | | 3 1# | 70 70 |
| | | BDX33B## BD809 D44E3## | BDX34B## BD810 | 750 min 15 min 1000 min | 3 4 5 | 2 typ | 0.5 typ | 10 | 3 1.5 | 70 90 50 |
| | 2N6388## D44H10 D44H11 SE9301## | D45H12 2N6668## D45H10 D45H11 SE9401## | 40 min 1k/20k 20 min 40 min 1k min | 4 5 4 4 4 | 0.5 typ 0.5 typ | 0.14 typ 0.14 typ | 5 5 | 20# 50 typ 50 typ 1# | 50 65 50 70 | |
| | BDX33C## SE9302## | BDX34C## SE9402## | 750 min 1k min | 3 4 | | | | 3 1# | 70 70 | |
| | 12 | 300 | MJE13008 | | 6/30 | 8 | 3 | 0.7 | 8 | 4 |
| 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 D44VH4 | BDW44 D45VH4 | 1 k min 20 min | 5 4 | 1 typ 0.5 | 1.5 typ 0.09 | 5 8 | 4 50 typ | 85 83 |
| | | 2N6487 BDW40 D44VH7 | 2N6490 BDW45 | 20/150 1 k min 20 min | 5 5 4 | 0.6 typ 1 typ 0.5 | 0.3 typ 1.5 typ 0.09 | 5 5 8 | 5 4 50 typ | 75 85 85 |
| | 80 | 2N6488 BDW41 D44VH10 | 2N6491 BDW46 D45VH10 | 20/150 1 k min 20 min | 5 5 4 | 0.6 typ 1 typ 0.5 | 0.3 typ 1.5 typ 0.09 | 5 5 8 | 5 4 50 typ | 75 85 83 |
| | | 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)



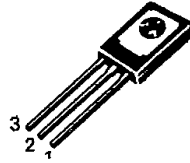
CASE 221C-02

| I _C Cont Amps Max | V _{CEO(sus)} Volts Min | Device Type | | 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 | BD166 | 15 min | 0.5 | | | | 6 | 20 |
| | | BD135 | BD136 | 40/250 | 0.15 | | | | | 12.5 |
| | | BD135.6 | BD136.6 | 40/100 | 0.15 | | | | | 12.5 |
| | | BD135.10 | BD136.10 | 63/160 | 0.15 | | | | | 12.5 |
| | | BD135.16 | BD136.16 | 100/250 | 0.15 | | | | | 12.5 |
| | 60 | BD167 | BD138 | 15 min | 0.5 | | | | 6 | 20 |
| | | BD137 | BD138.6 | 40/250 | 0.15 | | | | | 12.5 |
| 80 | BD137.6 | BD138.10 | 40/100 | 0.15 | | | | 6 | 12.5 | |
| | BD137.10 | BD138.16 | 63/160 | 0.15 | | | | | 12.5 | |
| | BD137.16 | | 100/250 | 0.15 | | | | | 12.5 | |
| 300 | BD169 | BD140 | 15 min | 0.5 | | | | 6 | 20 | |
| | BD139 | BD140.6 | 40/250 | 0.15 | | | | | 12.5 | |
| 400 | BD139.6 | BD140.10 | 40/100 | 0.15 | | | | 5 | 40 | |
| | BD139.10 | BD140.16 | 63/160 | 0.15 | | | | | 40 | |
| | | MJE13002* | | 5/25 | 1 | 4 | 0.7 | 1 | | |
| | | MJE13003* | | 5/25 | 1 | 4 | 0.7 | 1 | | |
| 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)

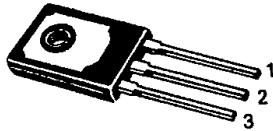
| I _C Cont Amps Max | V _{CE0} (sus) Volts Min | Device Type | | h _{FE} Min/Max | @ I _C Amp | Resistive Switching | | | f _T MHz Min | P _D (Case) Watts @ 25°C | | |
|------------------------------------|----------------------------------------|------------------------------|---------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|-------------------------|------------------------------|------------------------------------------|--------------------------------------------------|----------------------------------------------------------------|
| | | 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 | | |
| | | 60 | MJE181 | MJE171 | 50/250 | 0.1 | 0.6 typ | 0.12 typ | 0.1 | 50 | 12.5 | |
| | | 80 | BD179 BD179.6 BD179.10 BD179.16 | BD180 BD180.6 BD180.10 BD180.16 | 40/250 40/100 63/160 100/250 | 0.15 0.15 0.15 0.15 | | | | | 3 3 3 3 | 30 30 30 30 |
| | | | 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 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 | | |
| | | 45 | 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 25 min | 2 2 | | | | 20 3 | 40 36 | |
| | | | BD677## BD677A## BD787 BD777## 2N5191 MJE800## MJE801## 2N6038## | BD440 BD678## BD678A## BD788 BD778## 2N5194 MJE700## MJE701## 2N6035## | 750 min 750 min 20 min 750 min 25/100 750 min 750 min 750/18k | 1.5 2 2 2 1.5 1.5 2 2 | 0.4 typ 0.4 typ | 0.4 typ 0.4 typ | 1.5 2 | 2 1# 1# 25 | 40 40 40 15 15 40 40 40 | |
| | | | 80 | 2N5192 BD441 BD679## BD679A## BD789 BD779## MJE240 MJE241 MJE802## MJE803## 2N6039## | 2N5195 BD442 BD680## BD680A## BD790 BD780## MJE250 MJE251 MJE702## MJE703## 2N6036## | 25/100 15 min 750 min 750 min 10 min 750 min 40/200 40/120 750 min 750 min 750/18k | 1.5 2 1.5 2 2 2 0.2 0.2 1.5 2 2 | 0.4 typ 0.4 typ | 0.4 typ 0.4 typ | 1.5 2 2 2 | 2 3 40 20 40 40 1# 1# 25 | 40 36 40 40 15 15 15 15 40 40 40 |
| | | 100 | | BD681## BD791 MJE243 MJE244 | BD682## BD792 MJE253 MJE254 | 750 min 10 min 40/120 25 min | 1.5 2 0.2 0.2 | | | 2 2 | 40 40 40 | 40 15 15 15 |
| | | | | | | | | 0.15 typ 0.15 typ | 0.07 typ 0.07 typ | 2 2 | 40 40 | 15 15 |
| | | | | | | | | 1.7 typ | 1.2 typ | 2 | 25 | 40 |
| | 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 | | |
| 5 | 60 | MJE1100## MJE1101## | MJE1090## | 750 min 750 min | 3A 4A | | | | 1 1 | 70 70 |
| | | 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 |
| 12 | 80 | 2N5991 | | 20/120 | 6 | 0.5 typ | 0.25 typ | 6 | 2 | 100 |
| | | 15 | 40 | MJE1660 | | 20/100 | 5 | | | 3 |
| 15 | 60 | MJE1661 | | 20/100 | 5 | | | | 3 | 90 |

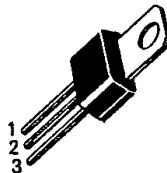
|h_{FE}| @ 1 MHz, ## Darlington

† 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 | | |
| 0.8 | 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)

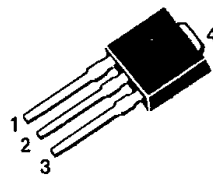
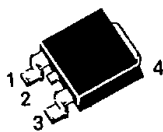
† Not recommended for new designs (check TO-225, Table 7 or TO-220, Table 5 for alternates)

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



STYLE 1:

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

CASE 369A-04

CASE 369-03

| 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 |

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 | 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 | 30/120 | 3 | 2* | | 5 | 4 | 150 | TO-204/1 |
| | | | | 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 2N6385J,/523 TX, TXV | 2N3792J,/379B TX, TXV | 30/120 | 3 | 2* | | 5 | 4 | 150 | TO-204/1 | |
| | | | 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

2

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 |
| | | 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 |
| | | 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 |
| | | 2N5686J/464 TX, TXV | 2N5684J/466 TX, TXV | 15/60 | 25 | 3* | | 25 | 2 | 300 | TO-204/197 |
| | | 2N6274J/514 TX, TXV | 2N6378J/515 TX, TXV | 30/120 | 20 | 1.05* | | 20 | 30 | 250 | TO-204/197 |
| | | | 2N6379J/515 TX, TXV | 30/120 | 20 | 1.05* | | 20 | 30 | 250 | TO-204/197 |
| | | 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 |
| | | TIP110 | TIP115 | 1k min | 1 | 2 typ | 1 typ | 1 | 25 | 50 | TO-220/221A |
| | | TIP111 | TIP116 | 1k min | 1 | 2 typ | 1 typ | 1 | 25 | 50 | TO-220/221A |
| | | 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 |
|------------------------------------|---------------------------------------|-------------|---------|----------------------------|-------------------------|-----------------------------|-----------------------------|-------------------------|-------------------------------------|------------------------------------------|-------------------|
| | | | | | | t _s μs Max | f _f μs Max | @ I _C Amp | | | |
| | | NPN | PNP | | | | | | | | |
| 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 | | | | 20 | 40 | TO-225AA/77 |
| | | BD776 | BD776 | 750 min | 2 | | | | | 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 | 2N6036 | 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 _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 | | | | 4 | 90 | TO-204/1 | |
| | | TIP101 | TIP106 | 1k/20k | 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 | |
| | | BDX53C | BDX54C | 750 min | 3 | | | | 4 | 60 | TO-220/221A | |
| | | BD901 | BD902 | 750 min | 3 | | | | 1 | 70 | TO-220/221A | |
| | 100 | 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 | |
| | | 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 | 0.65 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 | |
| | 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 | | | | 3 | 125 | TO-218/340D | | |
| | BDX33D | BDX34D | 750 min | 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 _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 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 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* | | 50/800 | 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 | |
| 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 | 20/100 | 10 | 1 | 0.8 | 10 | 4 | 200 | TO-204/1 |
| | | | 2N6436 | 30/120 | 10 | 1 | 0.25 | 10 | 40 | 200 | 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 |
| 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 _{CE0(sus)} Volts Min | Device Type | | hFE 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 | | | |
| | | 40 | 160 | | | BUV21N | | 10 min | | | |
| 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_{CE0} ≥ 200 VDevices are listed in descending order of V_{CE0(sus)}, and I_C Cont

| V _{CE0(sus)} Volts Min | I _C Cont Amps Max | V _{CEV} Volts Min | Device Type NPN unless otherwise noted | hFE 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 | | | |
| 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 | 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 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 | |
| 750 | 20 | 1000 | MJ10024##★ | 50/600 | 20 | 5 | 1.8 | 10 | | | TO-204/1 |
| | 8 | 1500 | MJ12005 | 5 min | 5 | | 1 | 5 | 4 typ | 100 | TO-204/1 |
| | | 1500 | MJH12005 | | | | 0.4 typ | 5 | 4 | | 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 | | | 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 |
| 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 |
| | 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 |
| 450 | 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 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)

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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 | | | | |
| 450 | 15 | 1000 | BUV48A | 8 min | 8 | 2 | 0.4 | 10 | | 150 | TO-218/340D | |
| | 9 | 1000 1000 | BUS47A | 7 min | 5 | 2 | 0.4 | 5 | | 150 | TO-204/1 | |
| | | | 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 | 80 | TO-204/1 | |
| | | 850 | MJE16080 | 5 min | 8 | 2 | 0.5 | 5 | | | 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 | MJ16009★ | 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 | 15 | 125 | TO-204/1 | |
| | | 850 | MJ12020★ | 5 min | 5 | | 0.13 typ | 3 | | | TO-204/1 | |
| | | 850 | MJ16002★ | 5 min | 5 | 3 | 0.3 | 3 | | | 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 | 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 | | | 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 | 6 to 24 | 175 | TO-204/1 | |
| | | 650 | MJ16110 | 6/20 | 15 | 0.8 typ | 0.1 typ | 10 | | | 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 | | | 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 6 10** 10** | | TO-204/1 | | |
| | 550 | MJ10012# | 100/2k | 6 | 6 | 15 | 15 | | | TO-204/1 | | |
| | 500 | MJ10003#★ | 30/300 | 5 | 2.5 | 1 | 5 | | | TO-204/1 | | |
| | 500 | MJ10007##★ | 30/300 | 5 | 1.1 | 0.25 | 5 | | | 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 | | | 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 | 80 | 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 | | | TO-220/221A | |
| | | 850 | BUW12 | 6 min | 6 | 4 | 0.8 | 5 | | | TO-218/340 | |
| | | 850 | BUX84 | 30 min | 0.1 | 3.5 | 1.4 | 1 | | | 4 | 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 | 125 | TO-204/1 | |
| | | 850 | BUW11 | 6 min | 3 | 4 | 0.8 | 3 | | | 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 | 4 | TO-204/1 | |
| | | 600 | MJE13006★ | 6/30 | 5 | 3 | 0.7 | 5 | | | 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 | | | 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 | BUV22 | 10 min | 20 | 1.1 | 0.35 | 20 | 8 | 250 | TO-204/1 |
| | | 350 | BUS52 | 15 min | 40 | | | | | 350 | TO-204/1 |
| | 20 | 300 | BUV12 | 10 min | 10 | 1.5 | 0.5 | 10 | 8 | 150 | TO-204/1 |
| | | 450 | MJ13331★ | 8/40 | 10 | 3.5 | 0.7 | 10 | 5/40 | | TO-204/1 |
| | 15 | 250 | MJ11021#-PNP | 100 min | 15 | | | | 3# | | TO-204/1 |
| | | 250 | MJ11022# | 100 min | 15 | | | | 3# | | TO-204/1 |
| | 8 | 500 | 2N6306 | 15/75 | 3 | 1.6 | 0.4 | 3 | 5 | | TO-204/1 |
| 400 | | MJ6502-PNP★ | 15 min | 2 | 2 | 0.5 | 4 | | | TO-204/1 | |
| 5 | 500 | MJ3029 | 30 min | 0.4 | 1 | 1 | 3 | | | TO-204/1 | |
| | 350 | 2N6497 | 10/75 | 2.5 | 1.8 | 0.8 | 2.5 | 5 | | TO-220/221A | |
| 2 | 375 | 2N3584 | 25/100 | 1 | 4 | 3 | 1 | 10 | | TO-213AA/80 | |
| | 375 | 2N6421-PNP | 25/100 | 1 | 4 | 3 | 1 | 10 | | 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 | BUV11 | 10 min | 12 | 1.8 | 0.4 | 12 | 8 | 150 | TO-204/1 |
| | | 400 | MJ13330★ | 8/40 | 10 | 3.5 | 0.7 | 10 | 5/40 | | TO-204/1 |
| | 15 | 225 | 2N6249 | 10/50 | 10 | 3.5 | 1 | 10 | 2.5 | | TO-204/1 |
| 250 | | BUX41 | 8 min | 8 | 1.5 | 0.4 | 8 | 8 | 120 | TO-204/1 | |
| 200 | | MJ11019#-PNP | 100 min | 15 | | | | 3# | | TO-204/1 | |
| 200 | MJ11020# | 100 min | 15 | | | | 3# | | 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

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