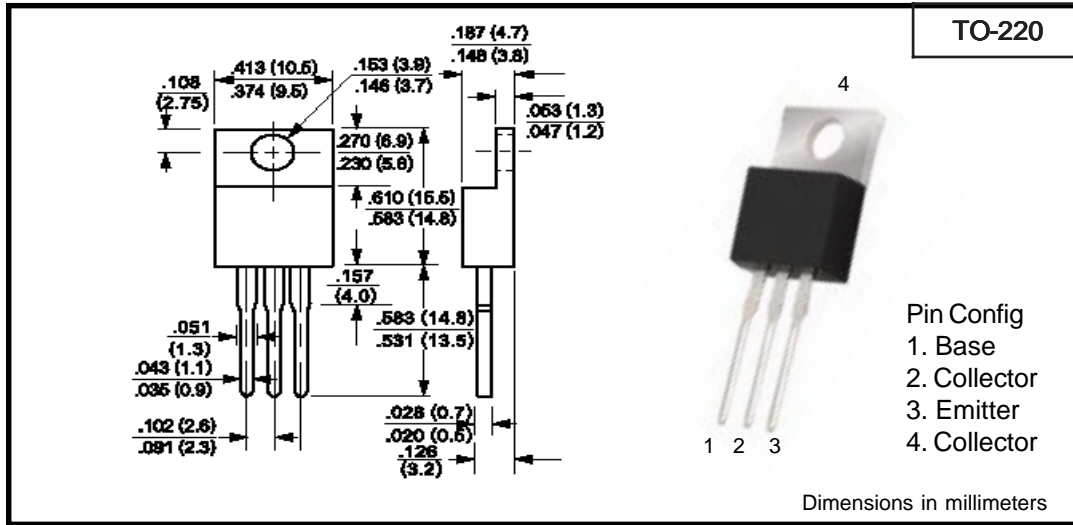


TO-220 - Power Transistors and Darlingtonts



Electrical Characteristics (Ta=25°C)

| Part # | Polarity | V_{CBO} | V_{CEO} | V_{EBO} | P_D | I_C | I_{CES} | @ V_{CE} | h_{FE} | h_{FE} | @ I_C | V_{CE} | $V_{CE}^{(SAT)}$ | $V_{BE}^{(SAT)}$ | @ I_C | f_T | @ I_C |
|--------|----------|------------|------------|------------|-------|-------|-------------------|------------|-----------|----------|------------|----------|------------------|------------------|------------|----------------|---------|
| | | (V) Min | (V) Min | (V) Min | | | | | | | | | | | | | |
| 2N5294 | NPN | 80 | 70 | 7 | 36 | 4 | 500 ⁴ | 50 | 30 | 120 | 0.5 | 4 | 1.0 | | 0.5 | 0.8 | 200 |
| 2N5296 | NPN | 60 | 40 | 5 | 36 | 4 | 500 ⁴ | 50 | 30 | 120 | 1.0 | 4 | 1.0 | | 1.0 | 0.8 | 200 |
| 2N5298 | NPN | 80 | 60 | 5 | 36 | 4 | 500 ⁴ | 50 | 20 | 80 | 1.5 | 4 | 1.0 | | 1.5 | 0.8 | 200 |
| 2N6107 | PNP | 80 | 70 | 5 | 40 | 7 | 1000 ¹ | 60 | 30 2.3 | 150 | 2.0 7.0 | 4 4 | 3.5 1.0 | | 7.0 2.0 | 10 | 500 |
| 2N6109 | PNP | 60 | 50 | 5 | 40 | 7 | 1000 ¹ | 40 | 30 2.3 | 150 | 2.5 7.0 | 4 4 | 3.5 1.0 | | 7.0 2.5 | 10 | 500 |
| 2N6121 | NPN | 45 | 45 | 5 | 40 | 4 | 1000 ¹ | 45 | 25 10 | 100 | 1.5 4.0 | 2 2 | 0.6 1.4 | | 1.5 4.0 | 2.5 | 1000 |
| 2N6290 | NPN | 60 | 50 | 5 | 40 | 7 | 1000 ¹ | 40 | 30 2.3 | 150 | 2.5 7.0 | 4 4 | 1.0 3.5 | | 2.5 7.0 | 4 | 500 |
| 2N6292 | NPN | 80 | 70 | 5 | 40 | 7 | 1000 ¹ | 60 | 30 2.3 | 150 | 2.0 7.0 | 4 4 | 1.0 3.5 | | 2.0 7.0 | 4 | 500 |
| BD239C | NPN | 115 | 100 | 5 | 30 | 2 | 200 | 100 | 40 15 | | 0.2 1.0 | 4 4 | 0.7 | | 1.0 | 3 | 200 |
| BD240C | PNP | 115 | 100 | 5 | 30 | 2 | 200 | 100 | 40 15 | | 0.2 1.0 | 4 4 | 0.7 | | 1.0 | 3 | 200 |
| BD241A | NPN | 70 | 60 | 5 | 40 | 3 | 200 | 60 | 25 10 | | 1.0 3.0 | 4 4 | 1.2 | | 3.0 | 3 | 500 |
| BD241C | NPN | 115 | 100 | 5 | 40 | 3 | 200 | 100 | 25 10 | | 1.0 3.0 | 4 4 | 1.2 | | 3.0 | 3 | 500 |
| BD242C | PNP | 115 | 100 | 5 | 40 | 3 | 200 | 60 | 25 10 | | 1.0 3.0 | 4 4 | 1.2 | | 3.0 | 3 ⁵ | 200 |
| BD243C | NPN | 100 | 100 | 5 | 65 | 6 | 400 | 100 | 30 15 | | 0.3 3.0 | 4 4 | 1.5 | | 6.0 | 3 | 500 |

¹ I_{CE0} ² I_{CBO} ³ V_{CES} ⁴ I_{CER} ⁵ f_T Typical Values

| Part # | Polarity | V_{CBO} | V_{CEO} | V_{EBO} | P_D (W) | I_C (A) | I_{CES} (μ A) | @ V_{CE} | h_{FE} | h_{FE} | @ I_C (A) | V_{CE} (V) | $V_{CE(SAT)}$ | $V_{BE(SAT)}$ | @ I_C (A) | f_T | @ I_C (mA) |
|----------|----------|-----------------|------------|------------|--------------|--------------|-------------------------|------------|----------|----------|----------------|-----------------|---------------|---------------|----------------|-------------------|-----------------|
| | | (V) Min | (V) Min | (V) Min | | | | | Min | Max | | | Max | (V) Max | | (V) Max | |
| BD244C | PNP | 100 | 100 | 5 | 65 | 8 | 400 | 100 | 30 | | 0.3 | 4 | 1.5 | | 6.0 | 3.0 ⁵ | 500 |
| BD911 | NPN | 100 | 100 | 5 | 90 | 15 | 1000 ¹ | 50 | 40 | 250 | 0.5 | 4 | 1.0 | | 5.0 | 3.0 | 500 |
| | | | | | | | | | 15 | 150 | 5.0 | 4 | 3.0 | 2.5 | 10.0 | | |
| | | | | | | | | | 5 | | 10.0 | 4 | | | | | |
| BD912 | PNP | 100 | 100 | 5 | 90 | 15 | 1000 ¹ | 50 | 40 | 250 | 0.5 | 4 | 1.0 | | 5.0 | 3.0 | 500 |
| | | | | | | | | | 15 | 150 | 5.0 | 4 | 3.0 | 2.5 | 10.0 | | |
| | | | | | | | | | 5 | | 10.0 | 4 | | | | | |
| BU407 | NPN | 330 | 150 | 6 | 60 | 7 | 100 | 200 | | | | | 1.0 | 1.3 | 5.0 | 10.0 | 500 |
| C44C11 | NPN | 90 ³ | 80 | 5 | 30 | 4 | 10 | 90 | 100 | 220 | 0.2 | 1 | 0.5 | | 1.0 | 50.0 ⁵ | 20 |
| | | | | | | | | | 20 | | 2.0 | 1 | | | | | |
| C44C8 | NPN | 70 ³ | 60 | 5 | 30 | 4 | 10 | 70 | 100 | 220 | 0.2 | 1 | 0.5 | | 1.0 | 50.0 ⁵ | 20 |
| | | | | | | | | | 20 | | 2.0 | 1 | | | | | |
| C45C5 | PNP | 55 ³ | 45 | 5 | 30 | 4 | 10 | 50 | 40 | 120 | 0.2 | 1 | 0.5 | 1.3 | 1.0 | 40.0 ⁵ | 20 |
| | | | | | | | | | 20 | | 1.0 | 1 | | | | | |
| C45C8 | PNP | 70 ³ | 60 | 5 | 30 | 4 | 10 | 70 | 40 | 120 | 0.2 | 1 | 0.5 | | 1.0 | 40.0 ⁵ | 20 |
| | | | | | | | | | 20 | | 1.0 | 1 | | | | | |
| C45C11 | PNP | 90 ³ | 80 | 5 | 30 | 4 | 10 | 90 | 40 | 120 | 0.2 | 1 | 0.5 | 1.3 | 1.0 | 40.0 | 20 |
| | | | | | | | | | 20 | | 1.0 | 1 | | | | | |
| CD13005 | NPN | 600 | 400 | 9 | 60 | 2 | 100 ² | 600 | 8 | 40 | 0.5 | 5 | 0.5 | 1 | 0.5 | 4.0 | 100 |
| CSA614Y | PNP | 80 | 55 | 5 | 25 | 3 | 50 ² | 50 | 120 | 240 | 0.5 | 5 | 0.5 | | 1.0 | | |
| CSA940 | PNP | 150 | 150 | 5 | 25 | 1.5 | 10 ² | 120 | 40 | 140 | 0.5 | 10 | 1.5 | | 0.5 | 4.0 ⁵ | 500 |
| CSA968 | PNP | 160 | 160 | 5 | 25 | 1.5 | 1.0 ² | 160 | 70 | 240 | 0.1 | 5 | 1.5 | | 0.5 | 100 ⁵ | 100 |
| CSA1012Y | PNP | 60 | 50 | 5 | 25 | 5 | 1.0 ² | 50 | 120 | 240 | 1.0 | 1 | 0.4 | 1.2 | 3.0 | 80 ⁵ | 1000 |
| | | | | | | | | | 30 | | 3.0 | 1 | | | | | |
| CSB857 | PNP | 70 | 50 | 5 | 40 | 4 | 1.0 ² | 50 | 60 | 320 | 1.0 | 4 | 1.0 | | 2.0 | 15.0 ⁵ | 500 |
| | | | | | | | | | 35 | | 0.1 | 4 | | | | | |
| CSB1370E | PNP | 60 | 60 | 5 | 30 | 3 | 10 ² | 60 | 100 | 200 | 0.5 | 5 | 1.5 | 1.5 | 2.0 | 15.0 ⁵ | |
| CSC2073 | NPN | 150 | 150 | 5 | 25 | 1.5 | 10 ² | 120 | 40 | 140 | 0.5 | 10 | 1.5 | | 0.5 | 4.0 ⁵ | 500 |
| CSC2233 | NPN | 200 | 60 | 5 | 40 | 4 | 10 ² | 170 | 30 | 150 | 1.0 | 5 | 1.0 | 1.5 | 4.0 | 8.0 ⁵ | 500 |
| | | | | | | | | | 20 | | 4.0 | 5 | | | | | |
| CSC2238 | NPN | 160 | 160 | 5 | 25 | 1.5 | 1.0 ² | 160 | 70 | 240 | 0.1 | 5 | 1.5 | | 0.5 | 100 ⁵ | 100 |
| CSC3255S | NPN | 80 | 60 | 5 | 40 | 10 | 100 ² | 40 | 70 | 250 | 1.0 | 2 | 0.6 | | 5.0 | 100 ⁵ | 1000 |
| CSD313 | NPN | 60 | 60 | 5 | 30 | 3 | 100 | 20 | 40 | | 0.1 | 2 | 1.0 | | 2.0 | 8.0 ⁵ | 500 |
| | | | | | | | | | 40 | 320 | 1.0 | 2 | | | | | |
| CSD88O | NPN | 60 | 60 | 7 | 30 | 3 | 100 ² | 60 | 60 | 300 | 0.5 | 5 | 1.0 | | 3.0 | 3.0 ⁵ | 500 |
| MJE2955T | PNP | 70 | 60 | 5 | 75 | 10 | 700 ¹ | 30 | 20 | 100 | 4.0 | 4 | 1.1 | | 4.0 | 2.0 ⁵ | 500 |
| | | | | | | | | | 5 | | 10.0 | 4 | 8.0 | | 10.0 | | |
| MJE3055T | NPN | 70 | 60 | 5 | 75 | 10 | 700 ¹ | 30 | 20 | 100 | 4.0 | 4 | 1.1 | | 4.0 | 2.0 | 500 |
| | | | | | | | | | 5 | | 10.0 | 4 | 80 | | 10.0 | | |
| MJE15028 | NPN | 120 | 120 | 5 | 50 | 8 | 100 ¹ | 120 | 40 | | 0.1 | 2 | 0.5 | | 1.0 | 30.0 | 500 |
| | | | | | | | | | 40 | | 2.0 | 2 | | | | | |
| | | | | | | | | | 40 | | 3.0 | 2 | | | | | |
| | | | | | | | | | 20 | | 4.0 | 2 | | | | | |
| MJE15029 | PNP | 120 | 120 | 5 | 50 | 8 | 100 ¹ | 150 | 40 | | 0.1 | 2 | 0.5 | | 1.0 | 30.0 | 500 |
| | | | | | | | | | 40 | | 2.0 | 2 | | | | | |
| | | | | | | | | | 40 | | 3.0 | 2 | | | | | |
| | | | | | | | | | 20 | | 4.0 | 2 | | | | | |
| MJE15030 | NPN | 150 | 150 | 5 | 50 | 8 | 100 ¹ | 120 | 40 | | 0.1 | 2 | 0.5 | | 1.0 | 30.0 | 500 |
| | | | | | | | | | 40 | | 2.0 | 2 | | | | | |
| | | | | | | | | | 40 | | 3.0 | 2 | | | | | |
| | | | | | | | | | 20 | | 4.0 | 2 | | | | | |
| MJE15031 | PNP | 150 | 150 | 5 | 50 | 8 | 100 ¹ | 150 | 40 | | 0.1 | 2 | 0.5 | | 1.0 | 30.0 | 500 |
| | | | | | | | | | 40 | | 2.0 | 2 | | | | | |
| | | | | | | | | | 40 | | 3.0 | 2 | | | | | |
| | | | | | | | | | 20 | | 4.0 | 2 | | | | | |

| Part # | Polarity | V _{CBO} (V) Min | V _{CEO} (V) Min | V _{EBO} (V) Min | P _D (W) | I _C (A) | I _{CES} (μ A) Max | @ V _{CE} | h _{FE} Min | h _{FE} Max | @ I _C (A) | V _{CE} (V) | V _{CE(SAT)} (V) Max | V _{BE(SAT)} (V) Max | @ I _C (A) | f _T (MHz) Min | @ I _C (mA) |
|--------|----------|--------------------------------|--------------------------------|--------------------------------|-----------------------|-----------------------|---------------------------------------|-------------------|------------------------|------------------------|-------------------------|------------------------|------------------------------------|------------------------------------|-------------------------|--------------------------------|--------------------------|
| TIP29C | NPN | 100 | 100 | 5 | 30 | 1 | 200 | 100 | 40 15 | | 0.2 1.0 | 4 4 | 0.7 | | 1.0 | 3.0 | 200 |
| TIP30C | PNP | 100 | 100 | 5 | 30 | 1 | 200 | 100 | 40 15 | | 0.2 1.0 | 4 4 | 0.7 | | 1.0 | 3.0 | 200 |
| TIP31C | NPN | 100 | 100 | 5 | 40 | 3 | 200 | 100 | 10 25 | 50 | 3.0 1.0 | 4 4 | 1.2 | | 3.0 | 3.0 | 500 |
| TIP32 | PNP | 40 | 40 | 5 | 40 | 3 | 200 | 40 | 10 25 | 50 | 3.0 1.0 | 4 4 | 1.2 | | 3.0 | 3.0 | 500 |
| TIP32C | PNP | 100 | 100 | 5 | 40 | 3 | 200 | 100 | 10 25 | 50 | 3.0 1.0 | 4 4 | 1.2 | | 3.0 | 3.0 | 500 |
| TIP41C | NPN | 100 | 100 | 5 | 65 | 6 | 400 | 100 | 15 30 | 75 | 3.0 0.3 | 4 4 | 1.5 | | 6.0 | 3.0 | 500 |
| TIP42C | PNP | 100 | 100 | 5 | 65 | 6 | 400 | 100 | 15 30 | 75 | 3.0 0.3 | 4 4 | 1.5 | | 6.0 | 3.0 | 500 |
| TIP47 | NPN | 350 | 250 | 5 | 40 | 1 | 1000 | 350 | 30 10 | 150 | 0.3 1.0 | 10 10 | 1.0 | | 1.0 | 10.0 | 200 |
| TIP49 | NPN | 450 | 350 | 5 | 40 | 1 | 1000 | 450 | 30 10 | 150 | 0.3 1.0 | 10 10 | 1.0 | | 1.0 | 10.0 | 200 |
| TIP50 | NPN | 500 | 400 | 5 | 40 | 1 | 1000 | 500 | 30 10 | 150 | 0.3 1.0 | 10 10 | 1.0 | | 1.0 | 10.0 | 200 |
| TIP102 | NPN | 100 | 100 | 5 | 80 | 8 | 50 ¹ | 50 | 1000 200 | 20000 | 3.0 8.0 | 4 4 | 2.0 2.5 | | 3.0 8.0 | | |
| TIP105 | PNP | 60 | 60 | 5 | 80 | 8 | 50 ¹ | 30 | 1000 200 | 20000 | 3.0 8.0 | 4 4 | 2.0 2.5 | | 3.0 8.0 | | |
| TIP106 | PNP | 80 | 80 | 5 | 80 | 8 | 50 ¹ | 40 | 1000 200 | 20000 | 3.0 8.0 | 4 4 | 2.0 2.5 | | 3.0 8.0 | | |
| TIP107 | PNP | 100 | 100 | 5 | 80 | 8 | 50 ¹ | 50 | 1000 200 | 20000 | 3.0 8.0 | 4 4 | 2.0 2.5 | | 3.0 8.0 | | |
| TIP110 | NPN | 60 | 60 | 5 | 50 | 2 | 2000 ¹ | 30 | 1000 500 | | 1.0 2.0 | 4 4 | 2.5 | | 2.0 | | |
| TIP112 | NPN | 100 | 100 | 5 | 50 | 2 | 2000 ¹ | 50 | 1000 500 | | 1.0 2.0 | 4 4 | 2.5 | | 2.0 | | |
| TIP115 | PNP | 60 | 60 | 5 | 50 | 2 | 2000 ¹ | 30 | 1000 500 | | 1.0 2.0 | 4 4 | 2.5 | | 2.0 | | |
| TIP116 | PNP | 80 | 80 | 5 | 50 | 2 | 2000 ¹ | 40 | 1000 500 | | 1.0 2.0 | 4 4 | 2.5 | | 2.0 | | |
| TIP117 | PNP | 100 | 100 | 5 | 50 | 2 | 2000 ¹ | 50 | 1000 500 | | 1.0 2.0 | 4 4 | 2.5 | | 2.0 | | |
| TIP120 | NPN | 60 | 60 | 5 | 65 | 5 | 500 ¹ | 30 | 1000 1000 | | 0.5 3.0 | 3 3 | 2.0 4.0 | | 3.0 5.0 | | |
| TIP121 | NPN | 80 | 80 | 5 | 65 | 5 | 500 ¹ | 40 | 1000 1000 | | 3.0 0.5 | 3 3 | 2.0 4.0 | | 3.0 5.0 | | |
| TIP122 | NPN | 100 | 100 | 5 | 65 | 5 | 500 ¹ | 50 | 1000 1000 | | 3.0 0.5 | 3 3 | 2.0 4.0 | | 3.0 5.0 | | |
| TIP125 | PNP | 60 | 60 | 5 | 65 | 5 | 500 ¹ | 30 | 1000 1000 | | 0.5 3.0 | 3 3 | 2.0 4.0 | | 3.0 5.0 | | |
| TIP126 | PNP | 80 | 80 | 5 | 65 | 5 | 500 ¹ | 40 | 1000 1000 | | 3.0 0.5 | 3 3 | 2.0 4.0 | | 3.0 5.0 | | |
| TIP127 | PNP | 100 | 100 | 5 | 65 | 5 | 500 ¹ | 50 | 1000 1000 | | 3.0 0.5 | 3 3 | 2.0 4.0 | | 3.0 5.0 | | |
| TIP132 | NPN | 100 | 100 | 5 | 70 | 8 | 200 ² | 100 | 5000 | | 1.0 | 4 | 2.0 | | 4.0 | | |

¹ I_{CEO} ² I_{CBO} ³ V_{CES} ⁴ I_{CER} ⁵ f_T Typical Values



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