

MJE200G (NPN), MJE210G (PNP)

Complementary Silicon Power Plastic Transistors

These devices are designed for low voltage, low-power, high-gain audio amplifier applications.

Features

- High DC Current Gain
- Low Collector–Emitter Saturation Voltage
- High Current–Gain – Bandwidth Product
- Annular Construction for Low Leakage
- These Devices are Pb–Free and are RoHS Compliant*

MAXIMUM RATINGS

| Rating | Symbol | Value | Unit |
|--|----------------|--------------|---------------------------|
| Collector–Emitter Voltage | V_{CEO} | 40 | Vdc |
| Collector–Base Voltage | V_{CB} | 25 | Vdc |
| Emitter–Base Voltage | V_{EB} | 8.0 | Vdc |
| Collector Current – Continuous | I_C | 5.0 | Adc |
| Collector Current – Peak | I_{CM} | 10 | Adc |
| Base Current | I_B | 1.0 | Adc |
| Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C | P_D | 15 0.12 | W mW/ $^\circ\text{C}$ |
| Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C | P_D | 1.5 0.012 | W mW/ $^\circ\text{C}$ |
| Operating and Storage Junction Temperature Range | T_J, T_{stg} | –65 to +150 | $^\circ\text{C}$ |

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

THERMAL CHARACTERISTICS

| Characteristic | Symbol | Max | Unit |
|---|-----------------|------|--------------------|
| Thermal Resistance, Junction–to–Case | $R_{\theta JC}$ | 8.34 | $^\circ\text{C/W}$ |
| Thermal Resistance, Junction–to–Ambient | $R_{\theta JA}$ | 83.4 | $^\circ\text{C/W}$ |

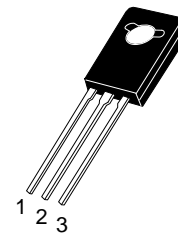
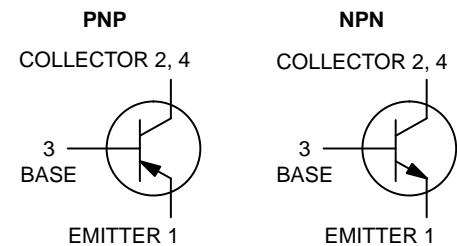
*For additional information on our Pb–Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.



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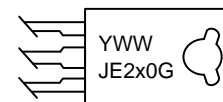
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5.0 AMPERES POWER TRANSISTORS COMPLEMENTARY SILICON 25 VOLTS, 15 WATTS



**TO-225
CASE 77-09
STYLE 1**

MARKING DIAGRAM



Y = Year
 WW = Work Week
 JE2x0 = Device Code
 x = 0 or 1
 G = Pb–Free Package

ORDERING INFORMATION

| Device | Package | Shipping |
|----------|---------------------|-----------------|
| MJE200G | TO–225 (Pb–Free) | 500 Units / Box |
| MJE210G | TO–225 (Pb–Free) | 500 Units / Box |
| MJE210TG | TO–225 (Pb–Free) | 500 Units / Box |

MJE200G (NPN), MJE210G (PNP)

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

| Characteristic | Symbol | Min | Max | Unit |
|----------------|--------|-----|-----|------|
|----------------|--------|-----|-----|------|

OFF CHARACTERISTICS

| | | | | |
|--|---------------|----|-----|-------------------------|
| Collector-Emitter Sustaining Voltage (Note 1) ($I_C = 10\text{ mAdc}$, $I_B = 0$) | $V_{CE(sus)}$ | 25 | - | Vdc |
| Collector Cutoff Current ($V_{CB} = 40\text{ Vdc}$, $I_E = 0$) ($V_{CB} = 40\text{ Vdc}$, $I_E = 0$, $T_J = 125^\circ\text{C}$) | I_{CBO} | - | 100 | nAdc μAdc |
| Emitter Cutoff Current ($V_{BE} = 8.0\text{ Vdc}$, $I_C = 0$) | I_{EBO} | - | 100 | nAdc |

ON CHARACTERISTICS

| | | | | |
|--|---------------|----------------|--------------------|-----|
| DC Current Gain (Note 1) ($I_C = 500\text{ mAdc}$, $V_{CE} = 1.0\text{ Vdc}$) ($I_C = 2.0\text{ Adc}$, $V_{CE} = 1.0\text{ Vdc}$) ($I_C = 5.0\text{ Adc}$, $V_{CE} = 2.0\text{ Vdc}$) | h_{FE} | 70 45 10 | - 180 - | - |
| Collector-Emitter Saturation Voltage (Note 1) ($I_C = 500\text{ mAdc}$, $I_B = 50\text{ mAdc}$) ($I_C = 2.0\text{ Adc}$, $I_B = 200\text{ mAdc}$) ($I_C = 5.0\text{ Adc}$, $I_B = 1.0\text{ Adc}$) | $V_{CE(sat)}$ | - - - | 0.3 0.75 1.8 | Vdc |
| Base-Emitter Saturation Voltage (Note 1) ($I_C = 5.0\text{ Adc}$, $I_B = 1.0\text{ Adc}$) | $V_{BE(sat)}$ | - | 2.5 | Vdc |
| Base-Emitter On Voltage (Note 1) ($I_C = 2.0\text{ Adc}$, $V_{CE} = 1.0\text{ Vdc}$) | $V_{BE(on)}$ | - | 1.6 | Vdc |

DYNAMIC CHARACTERISTICS

| | | | | |
|--|----------|--------|-----------|-----|
| Current-Gain - Bandwidth Product (Note 2) ($I_C = 100\text{ mAdc}$, $V_{CE} = 10\text{ Vdc}$, $f_{test} = 10\text{ MHz}$) | f_T | 65 | - | MHz |
| Output Capacitance ($V_{CB} = 10\text{ Vdc}$, $I_E = 0$, $f = 0.1\text{ MHz}$) MJE200G MJE210G | C_{ob} | - - | 80 120 | pF |

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

1. Pulse Test: Pulse Width = 300 μs , Duty Cycle $\approx 2.0\%$.

2. $f_T = |h_{fe}| \cdot f_{test}$.

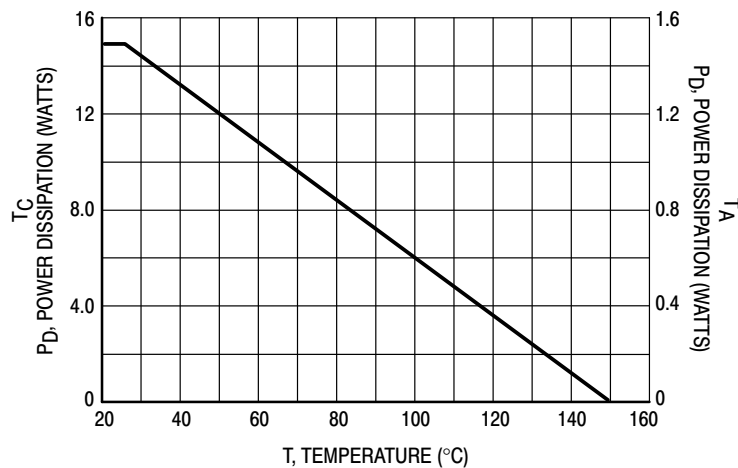


Figure 1. Power Derating

MJE200G (NPN), MJE210G (PNP)

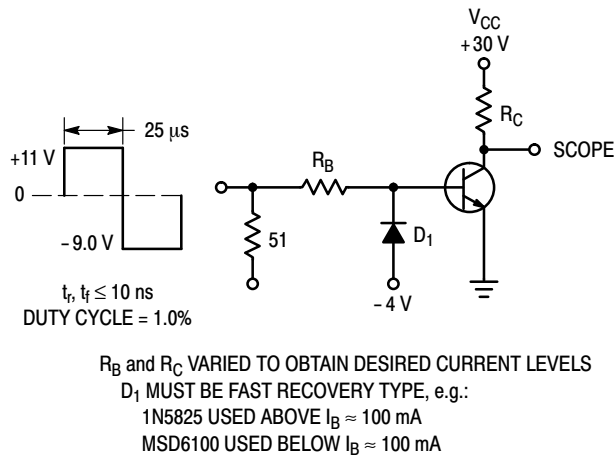


Figure 2. Switching Time Test Circuit

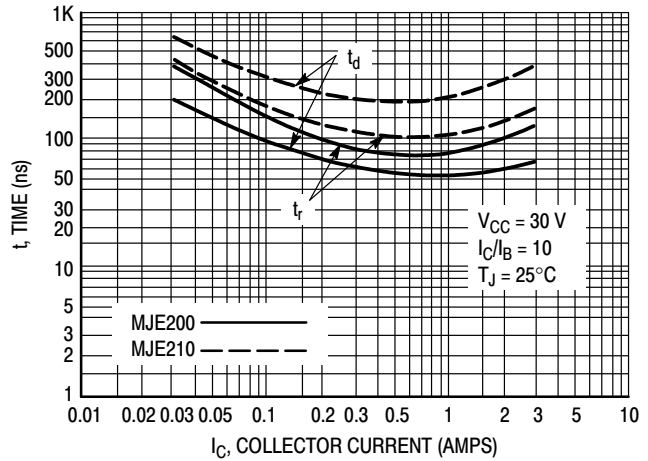


Figure 3. Turn-On Time

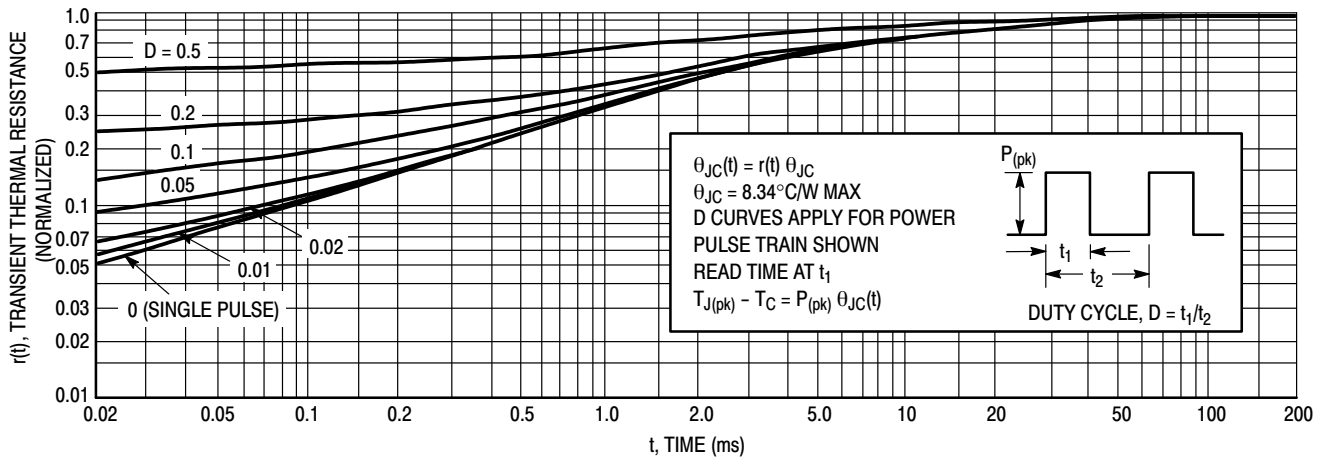


Figure 4. Thermal Response

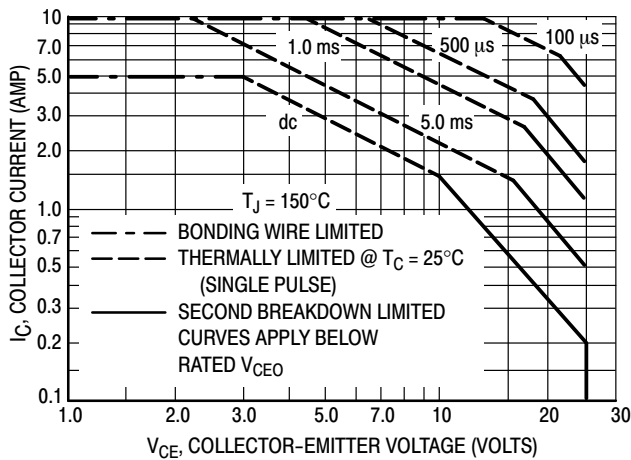


Figure 5. Active Region Safe Operating Area

There are two limitations on the power handling ability of a transistor: average junction temperature and second breakdown. Safe operating area curves indicate $I_C - V_{CE}$ limits of the transistor that must be observed for reliable operation; i.e., the transistor must not be subjected to greater dissipation than the curves indicate.

The data of Figure 5 is based on $T_{J(pk)} = 150^\circ\text{C}$; T_C is variable depending on conditions. Second breakdown pulse limits are valid for duty cycles to 10% provided $T_{J(pk)} \leq 150^\circ\text{C}$. $T_{J(pk)}$ may be calculated from the data in Figure 4. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

MJE200G (NPN), MJE210G (PNP)

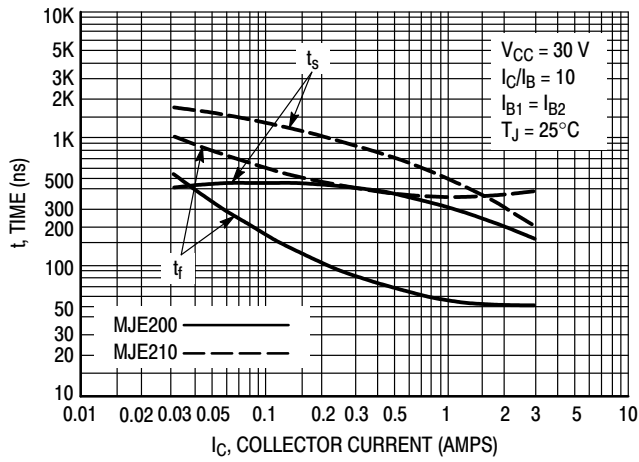


Figure 6. Turn-Off Time

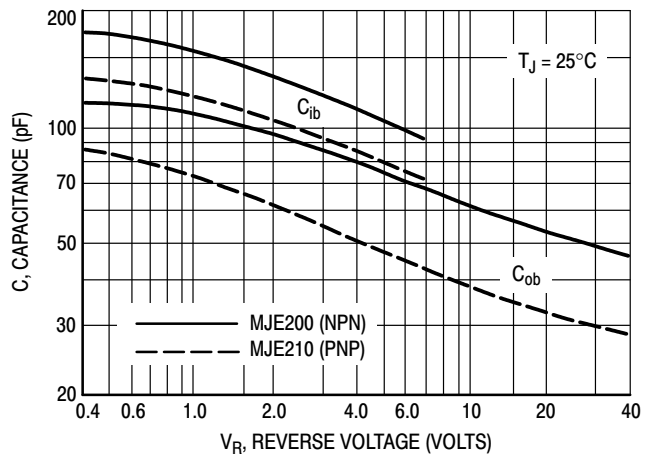


Figure 7. Capacitance

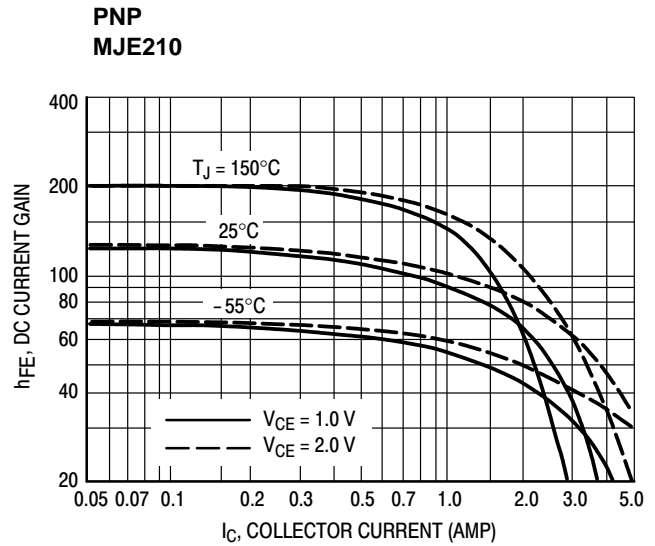
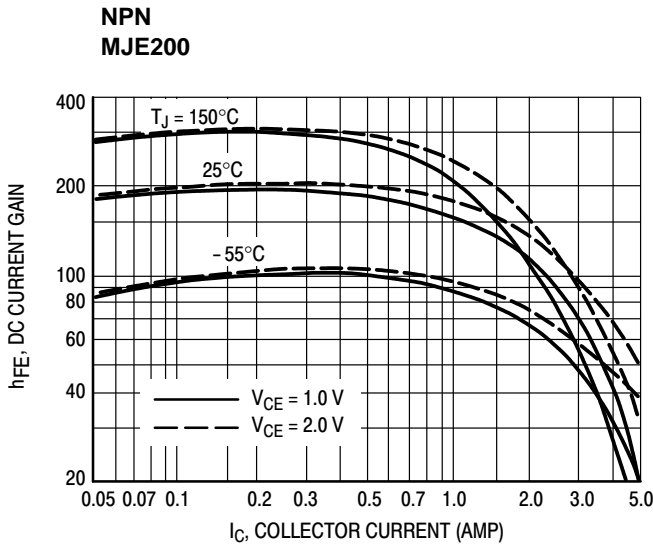


Figure 8. DC Current Gain

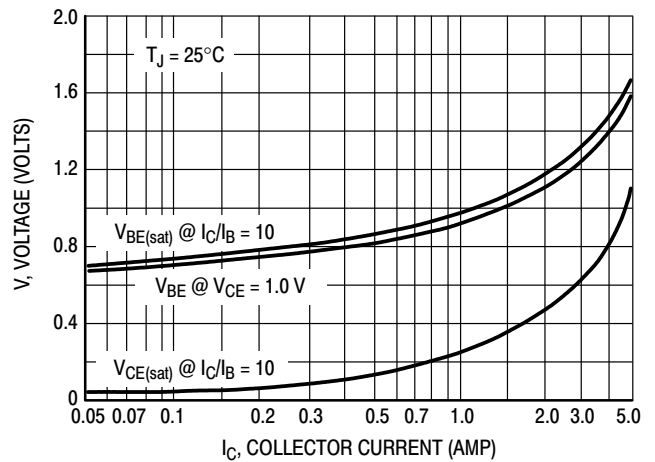
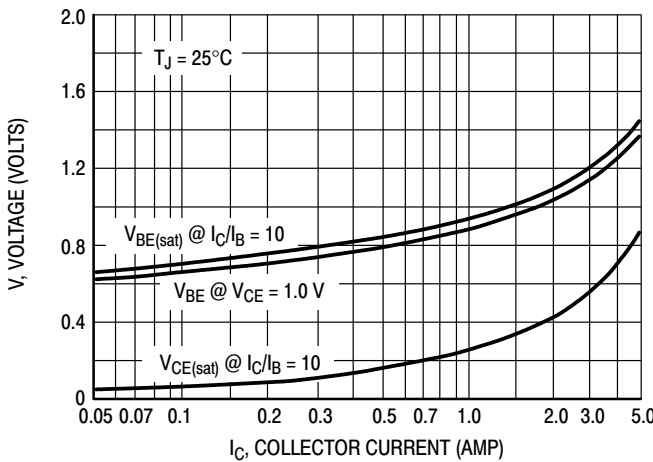


Figure 9. "On" Voltage

MJE200G (NPN), MJE210G (PNP)

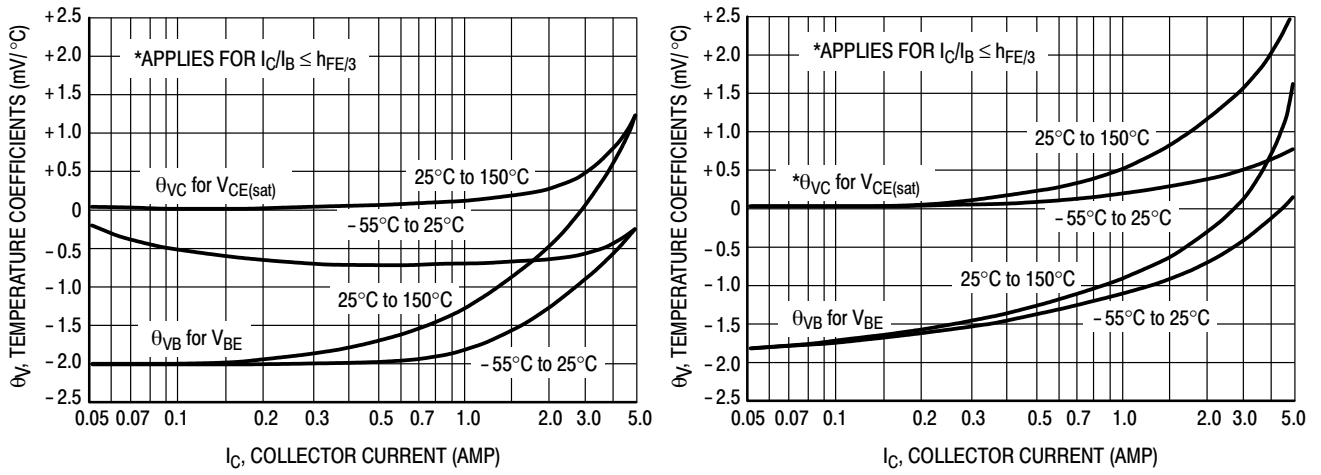
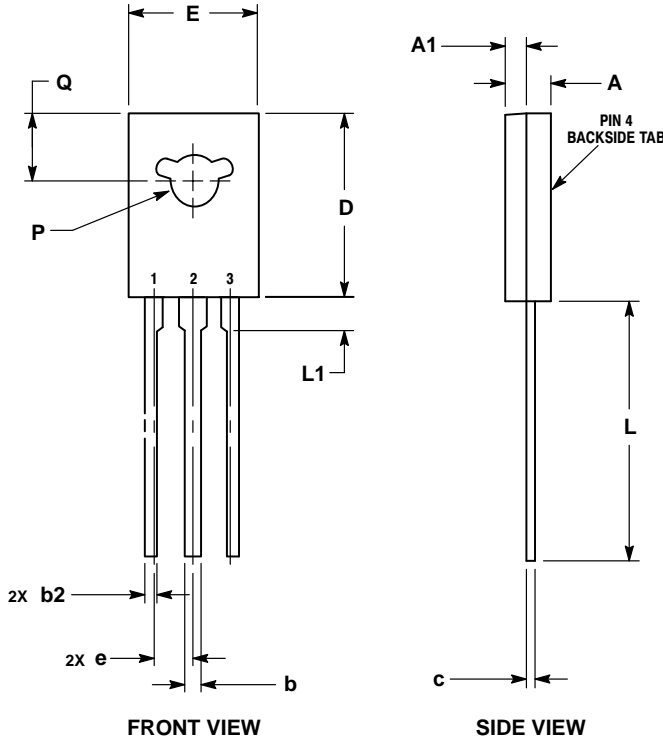
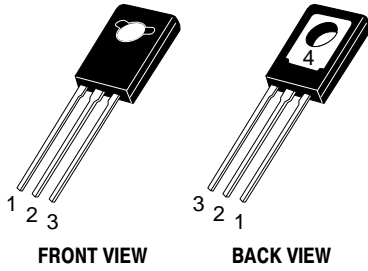


Figure 10. Temperature Coefficients

MJE200G (NPN), MJE210G (PNP)

PACKAGE DIMENSIONS

TO-225
CASE 77-09
ISSUE AC



NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. NUMBER AND SHAPE OF LUGS OPTIONAL.

| DIM | MILLIMETERS | |
|-----|-------------|-------|
| | MIN | MAX |
| A | 2.40 | 3.00 |
| A1 | 1.00 | 1.50 |
| b | 0.60 | 0.90 |
| b2 | 0.51 | 0.88 |
| c | 0.39 | 0.63 |
| D | 10.60 | 11.10 |
| E | 7.40 | 7.80 |
| e | 2.04 | 2.54 |
| L | 14.50 | 16.63 |
| L1 | 1.27 | 2.54 |
| P | 2.90 | 3.30 |
| Q | 3.80 | 4.20 |

STYLE 1:

- PIN 1. EMITTER
- 2., 4. COLLECTOR
3. BASE

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