

# MJE243 - NPN, MJE253 - PNP

## Complementary Silicon Power Plastic Transistors

These devices are designed for low power audio amplifier and low-current, high-speed switching applications.

### Features

- High Collector-Emitter Sustaining Voltage –  
 $V_{CEO(sus)} = 100 \text{ Vdc (Min)}$
- High DC Current Gain @  $I_C = 200 \text{ mAdc}$   
 $h_{FE} = 40 - 200$   
 $= 40 - 120$
- Low Collector-Emitter Saturation Voltage –  
 $V_{CE(sat)} = 0.3 \text{ Vdc (Max) @ } I_C = 500 \text{ mAdc}$
- High Current Gain Bandwidth Product –  
 $f_T = 40 \text{ MHz (Min) @ } I_C = 100 \text{ mAdc}$
- Annular Construction for Low Leakages  
 $I_{CBO} = 100 \text{ nAdc (Max) @ Rated } V_{CB}$
- Pb-Free Packages are Available\*

### MAXIMUM RATINGS

| Rating                                                                                | Symbol         | Value       | Unit                      |
|---------------------------------------------------------------------------------------|----------------|-------------|---------------------------|
| Collector-Emitter Voltage                                                             | $V_{CEO}$      | 100         | Vdc                       |
| Collector-Base Voltage                                                                | $V_{CB}$       | 100         | Vdc                       |
| Emitter-Base Voltage                                                                  | $V_{EB}$       | 7.0         | Vdc                       |
| Collector Current – Continuous<br>– Peak                                              | $I_C$          | 4.0<br>8.0  | Adc                       |
| Base Current                                                                          | $I_B$          | 10          | Adc                       |
| Total Power Dissipation @ $T_C = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$          | 15<br>120   | W<br>mW/ $^\circ\text{C}$ |
| Total Power Dissipation @ $T_A = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$          | 1.5<br>12   | W<br>mW/ $^\circ\text{C}$ |
| Operating and Storage Junction<br>Temperature Range                                   | $T_J, T_{stg}$ | -65 to +150 | $^\circ\text{C}$          |

### THERMAL CHARACTERISTICS

| Characteristic                             | Symbol        | Max  | Unit               |
|--------------------------------------------|---------------|------|--------------------|
| Thermal Resistance, Junction-to-Case       | $\theta_{JC}$ | 8.34 | $^\circ\text{C/W}$ |
| Thermal Resistance,<br>Junction-to-Ambient | $\theta_{JA}$ | 83.4 | $^\circ\text{C/W}$ |

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

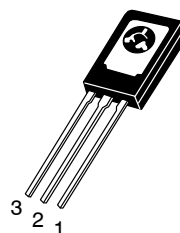
\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.



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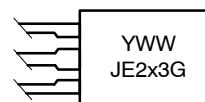
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**4.0 AMPERES  
POWER TRANSISTORS  
COMPLEMENTARY SILICON  
100 VOLTS, 15 WATTS**



TO-225  
CASE 77  
STYLE 1

### MARKING DIAGRAM



Y = Year  
WW = Work Week  
JE2x3 = Device Code  
x = 4 or 5  
G = Pb-Free Package

### ORDERING INFORMATION

| Device  | Package             | Shipping      |
|---------|---------------------|---------------|
| MJE243  | TO-225              | 500 Units/Box |
| MJE243G | TO-225<br>(Pb-Free) | 500 Units/Box |
| MJE253  | TO-225              | 500 Units/Box |
| MJE253G | TO-225<br>(Pb-Free) | 500 Units/Box |

**Preferred** devices are recommended choices for future use and best overall value.

# MJE243 – NPN,      MJE253 – PNP

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

| Characteristic                                                                                                                                       | Symbol         | Min      | Max        | Unit                |
|------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------|------------|---------------------|
| <b>OFF CHARACTERISTICS</b>                                                                                                                           |                |          |            |                     |
| Collector–Emitter Sustaining Voltage<br>( $I_C = 10\text{ mAdc}$ , $I_B = 0$ )                                                                       | $V_{CEO(sus)}$ | 100      | –          | V                   |
| Collector Cutoff Current<br>( $V_{CB} = 100\text{ Vdc}$ , $I_E = 0$ )<br>( $V_{CE} = 100\text{ Vdc}$ , $I_E = 0$ , $T_C = 125^\circ\text{C}$ )       | $I_{CBO}$      | –<br>–   | 0.1<br>0.1 | $\mu\text{A}$<br>mA |
| Emitter Cutoff Current ( $V_{BE} = 7.0\text{ Vdc}$ , $I_C = 0$ )                                                                                     | $I_{EBO}$      | –        | 0.1        | $\mu\text{Adc}$     |
| <b>ON CHARACTERISTICS</b>                                                                                                                            |                |          |            |                     |
| DC Current Gain<br>( $I_C = 200\text{ mAdc}$ , $V_{CE} = 1.0\text{ Vdc}$ )<br>( $I_C = 1.0\text{ Adc}$ , $V_{CE} = 1.0\text{ Vdc}$ )                 | $h_{FE}$       | 40<br>15 | 180<br>–   | –                   |
| Collector–Emitter Saturation Voltage<br>( $I_C = 500\text{ mAdc}$ , $I_B = 50\text{ mAdc}$ )<br>( $I_C = 1.0\text{ Adc}$ , $I_B = 100\text{ mAdc}$ ) | $V_{CE(sat)}$  | –<br>–   | 0.3<br>0.6 | V                   |
| Base–Emitter Saturation Voltage<br>( $I_C = 2.0\text{ Adc}$ , $I_B = 200\text{ mAdc}$ )                                                              | $V_{BE(sat)}$  | –        | 1.8        | V                   |
| Base–Emitter On Voltage<br>( $I_C = 500\text{ mAdc}$ , $V_{CE} = 1.0\text{ Vdc}$ )                                                                   | $V_{BE(on)}$   | –        | 1.5        | V                   |
| <b>DYNAMIC CHARACTERISTICS</b>                                                                                                                       |                |          |            |                     |
| Current–Gain – Bandwidth Product<br>( $I_C = 100\text{ mAdc}$ , $V_{CE} = 10\text{ Vdc}$ , $f_{test} = 10\text{ MHz}$ )                              | $f_T$          | 40       | –          | MHz                 |
| Output Capacitance<br>( $V_{CB} = 10\text{ Vdc}$ , $I_E = 0$ , $f = 0.1\text{ MHz}$ )                                                                | $C_{ob}$       | –        | 50         | pF                  |

# MJE243 – NPN, MJE253 – PNP

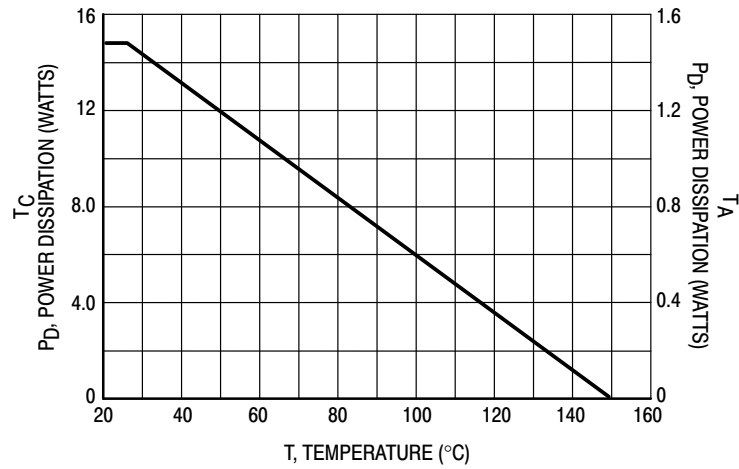


Figure 1. Power Derating

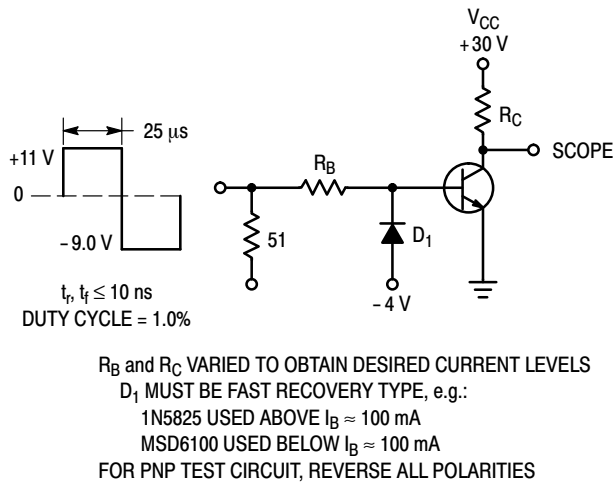


Figure 2. Switching Time Test Circuit

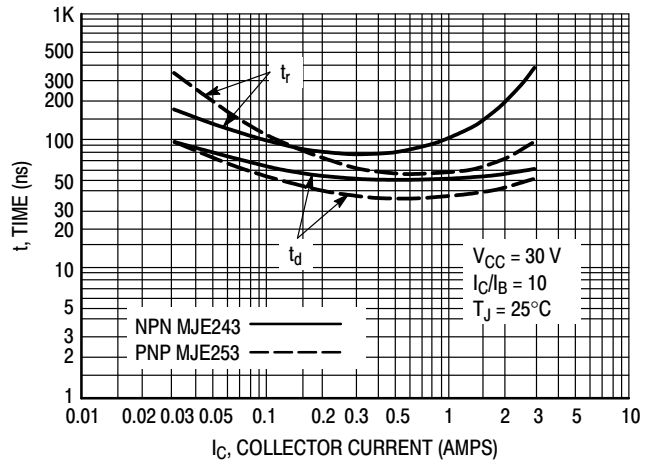


Figure 3. Turn-On Time

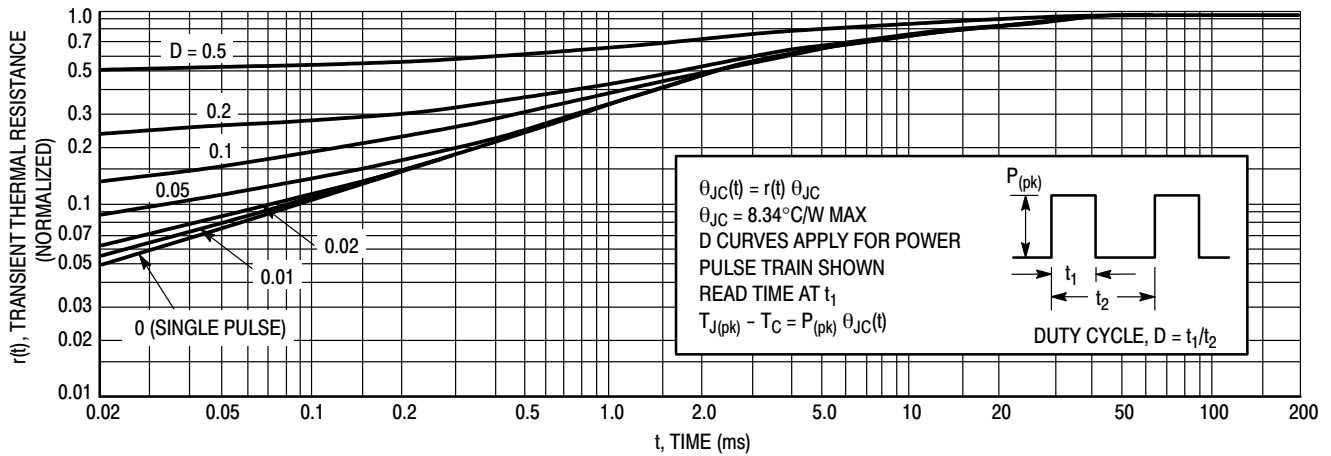


Figure 4. Thermal Response

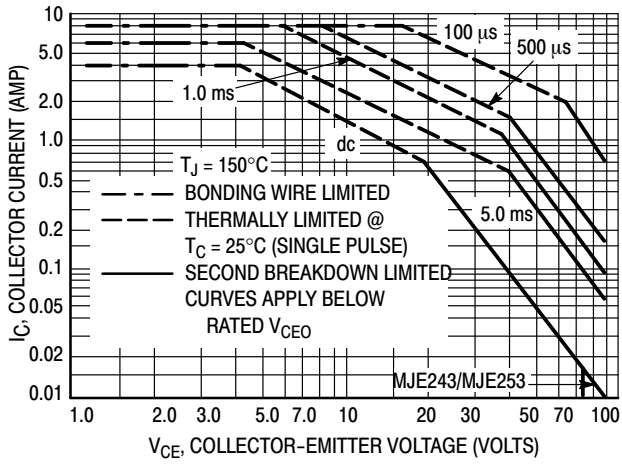


Figure 5. Active Region Safe Operating Area

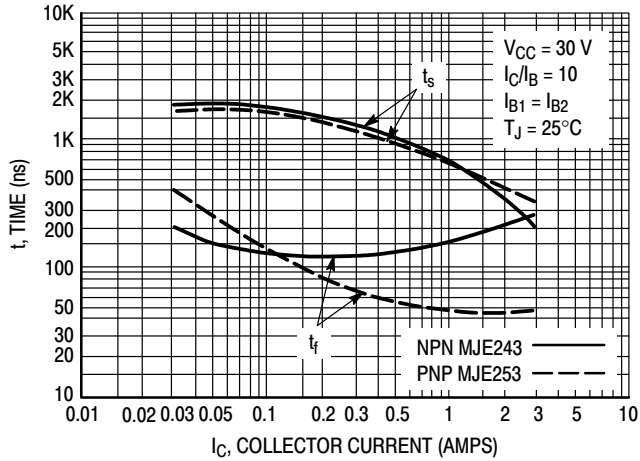


Figure 6. Turn-Off Time

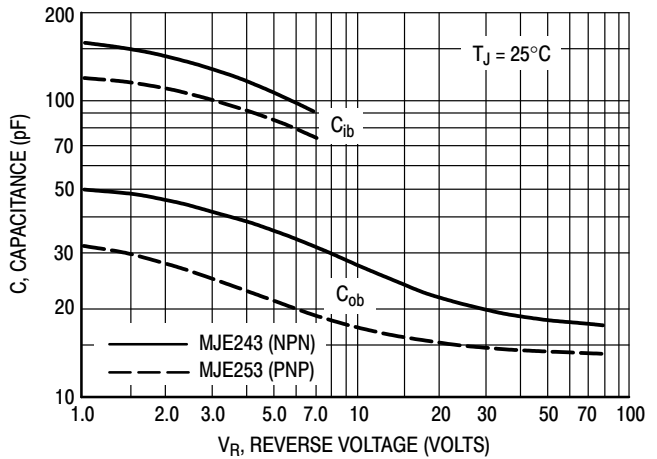


Figure 7. Capacitance

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.

**NPN  
MJE243**

**PNP  
MJE253**

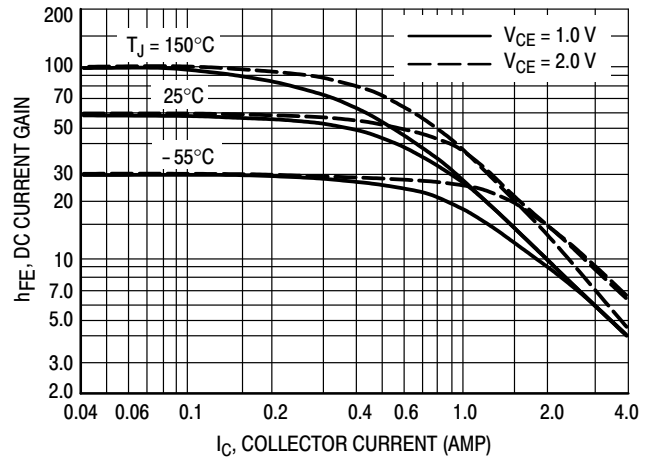
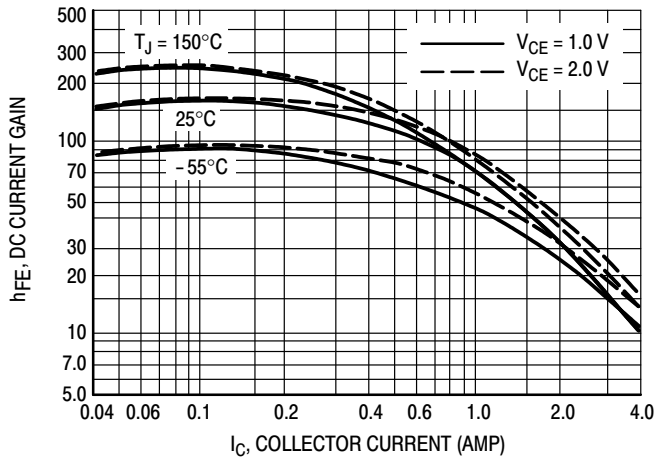


Figure 8. DC Current Gain

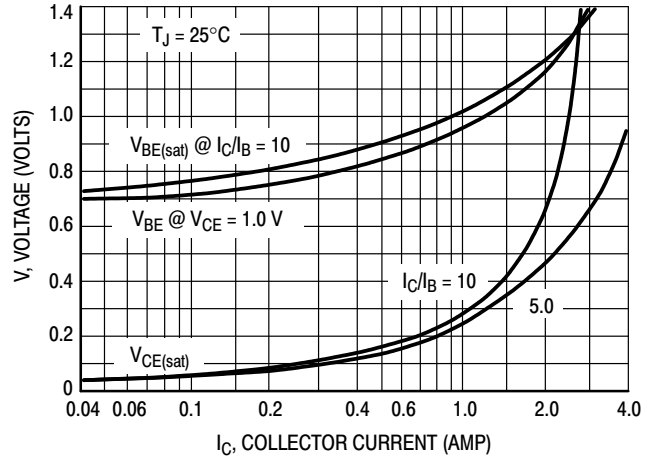
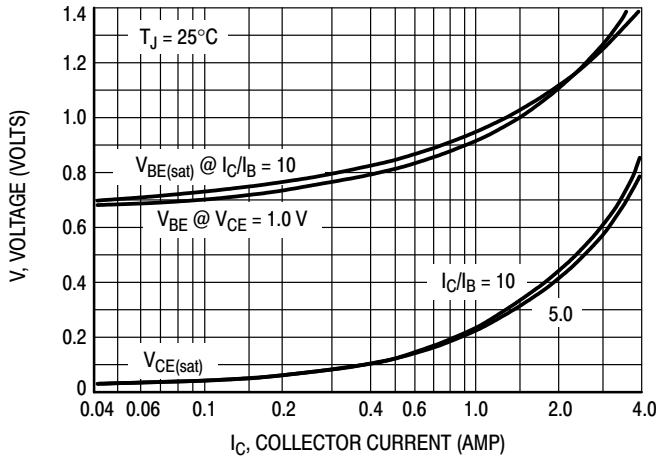


Figure 9. "On" Voltages

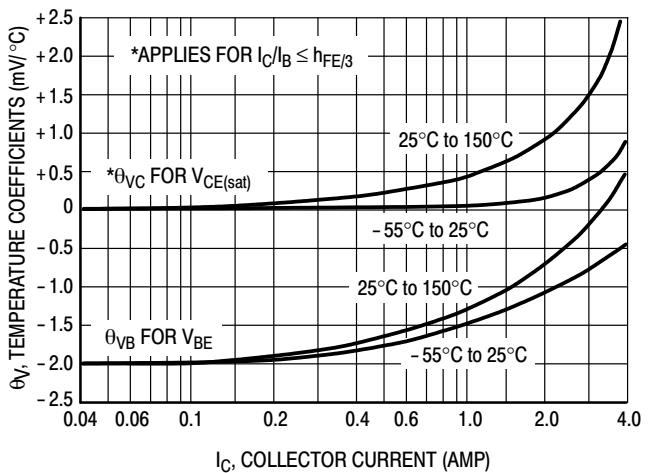
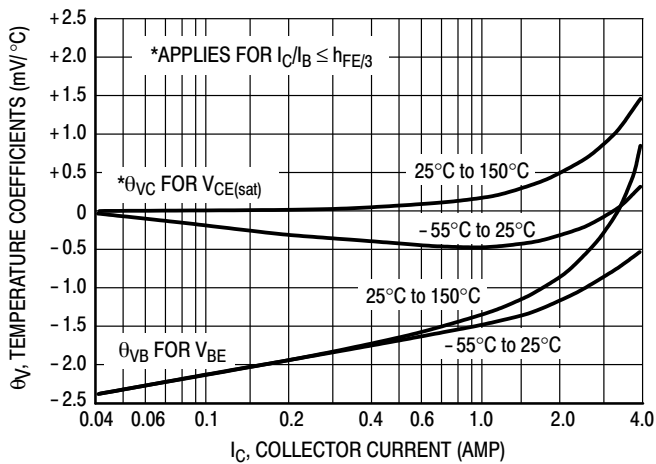
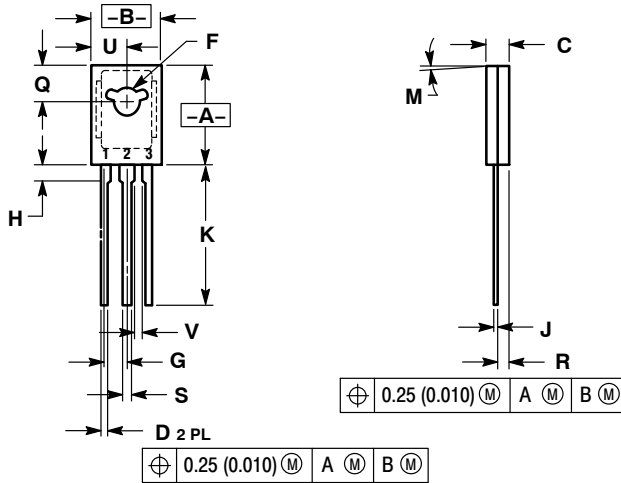


Figure 10. Temperature Coefficients

# MJE243 – NPN, MJE253 – PNP

## PACKAGE DIMENSIONS

TO-225  
CASE 77-09  
ISSUE Z



### NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. 077-01 THRU -08 OBSOLETE, NEW STANDARD 077-09.

| DIM | INCHES    |       | MILLIMETERS |       |
|-----|-----------|-------|-------------|-------|
|     | MIN       | MAX   | MIN         | MAX   |
| A   | 0.425     | 0.435 | 10.80       | 11.04 |
| B   | 0.295     | 0.305 | 7.50        | 7.74  |
| C   | 0.095     | 0.105 | 2.42        | 2.66  |
| D   | 0.020     | 0.026 | 0.51        | 0.66  |
| F   | 0.115     | 0.130 | 2.93        | 3.30  |
| G   | 0.094 BSC |       | 2.39 BSC    |       |
| H   | 0.050     | 0.095 | 1.27        | 2.41  |
| J   | 0.015     | 0.025 | 0.39        | 0.63  |
| K   | 0.575     | 0.655 | 14.61       | 16.63 |
| M   | 5° TYP    |       | 5° TYP      |       |
| Q   | 0.148     | 0.158 | 3.76        | 4.01  |
| R   | 0.045     | 0.065 | 1.15        | 1.65  |
| S   | 0.025     | 0.035 | 0.64        | 0.88  |
| U   | 0.145     | 0.155 | 3.69        | 3.93  |
| V   | 0.040     | ---   | 1.02        | ---   |

### STYLE 1:

1. EMITTER
2. COLLECTOR
3. BASE

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