

TIP41, TIP41A, TIP41B, TIP41C (NPN); TIP42, TIP42A, TIP42B, TIP42C (PNP)



ON Semiconductor®

<http://onsemi.com>

Complementary Silicon Plastic Power Transistors

Designed for use in general purpose amplifier and switching applications.

Features

- ESD Ratings: Machine Model, C; > 400 V
Human Body Model, 3B; > 8000 V
- Epoxy Meets UL 94 V-0 @ 0.125 in
- Pb-Free Packages are Available*

MAXIMUM RATINGS

| Rating | Symbol | Value | Unit |
|---|----------------|-----------------------|--------------------------|
| Collector-Emitter Voltage TIP41, TIP42 TIP41A, TIP42A TIP41B, TIP42B TIP41C, TIP42C | V_{CEO} | 40 60 80 100 | Vdc |
| Collector-Base Voltage TIP41, TIP42 TIP41A, TIP42A TIP41B, TIP42B TIP41C, TIP42C | V_{CB} | 40 60 80 100 | Vdc |
| Emitter-Base Voltage | V_{EB} | 5.0 | Vdc |
| Collector Current- Continuous Peak | I_C | 6.0 10 | Adc |
| Base Current | I_B | 2.0 | Adc |
| Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C | P_D | 65 0.52 | W W/ $^\circ\text{C}$ |
| Total Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above 25°C | P_D | 2.0 0.016 | W W/ $^\circ\text{C}$ |
| Unclamped Inductive Load Energy (Note 1) | E | 62.5 | mJ |
| Operating and Storage Junction, Temperature Range | T_J, T_{stg} | -65 to +150 | $^\circ\text{C}$ |

THERMAL CHARACTERISTICS

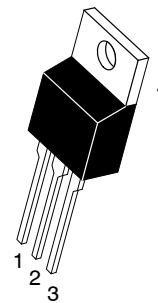
| Characteristic | Symbol | Max | Unit |
|---|-----------------|------|---------------------------|
| Thermal Resistance, Junction-to-Case | $R_{\theta JC}$ | 1.67 | $^\circ\text{C}/\text{W}$ |
| Thermal Resistance, Junction-to-Ambient | $R_{\theta JA}$ | 57 | $^\circ\text{C}/\text{W}$ |

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. $I_C = 2.5\text{ A}$, $L = 20\text{ mH}$, $P.R.F. = 10\text{ Hz}$, $V_{CC} = 10\text{ V}$, $R_{BE} = 100\ \Omega$.

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

**6 AMPERE
COMPLEMENTARY SILICON
POWER TRANSISTORS
40-60-80-100 VOLTS,
65 WATTS**



MARKING DIAGRAM



**TO-220AB
CASE 221A
STYLE 1**

STYLE 1:
PIN 1. BASE
2. COLLECTOR
3. EMITTER
4. COLLECTOR

TIP4xx = Device Code
xx = 1, 1A, 1B, 1C
2, 2A, 2B, 2C
A = Assembly Location
Y = Year
WW = Work Week
G = Pb-Free Package

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 2 of this data sheet.

TIP41, TIP41A, TIP41B, TIP41C (NPN); TIP42, TIP42A, TIP42B, TIP42C (PNP)

ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted)

| Characteristic | Symbol | Min | Max | Unit | |
|---|--|-----------------------|-----------------------|--------------------------|------|
| OFF CHARACTERISTICS | | | | | |
| Collector–Emitter Sustaining Voltage (Note 2) (I _C = 30 mAdc, I _B = 0) | TIP41, TIP42 TIP41A, TIP42A TIP41B, TIP42B TIP41C, TIP42C | V _{CEO(sus)} | 40 60 80 100 | – – – – | Vdc |
| Collector Cutoff Current (V _{CE} = 30 Vdc, I _B = 0) (V _{CE} = 60 Vdc, I _B = 0) | TIP41, TIP41A, TIP42, TIP42A TIP41B, TIP41C, TIP42B, TIP42C | I _{CEO} | – – | 0.7 0.7 | mAdc |
| Collector Cutoff Current (V _{CE} = 40 Vdc, V _{EB} = 0) (V _{CE} = 60 Vdc, V _{EB} = 0) (V _{CE} = 80 Vdc, V _{EB} = 0) (V _{CE} = 100 Vdc, V _{EB} = 0) | TIP41, TIP42 TIP41A, TIP42A TIP41B, TIP42B TIP41C, TIP42C | I _{CES} | – – – – | 400 400 400 400 | μAdc |
| Emitter Cutoff Current (V _{BE} = 5.0 Vdc, I _C = 0) | | I _{EBO} | – | 1.0 | mAdc |
| ON CHARACTERISTICS (Note 2) | | | | | |
| DC Current Gain (I _C = 0.3 Adc, V _{CE} = 4.0 Vdc) (I _C = 3.0 Adc, V _{CE} = 4.0 Vdc) | | h _{FE} | 30 15 | – 75 | – |
| Collector–Emitter Saturation Voltage (I _C = 6.0 Adc, I _B = 600 mAdc) | | V _{CE(sat)} | – | 1.5 | Vdc |
| Base–Emitter On Voltage (I _C = 6.0 Adc, V _{CE} = 4.0 Vdc) | | V _{BE(on)} | – | 2.0 | Vdc |
| DYNAMIC CHARACTERISTICS | | | | | |
| Current–Gain — Bandwidth Product (I _C = 500 mAdc, V _{CE} = 10 Vdc, f _{test} = 1.0 MHz) | | f _T | 3.0 | – | MHz |
| Small–Signal Current Gain (I _C = 0.5 Adc, V _{CE} = 10 Vdc, f = 1.0 kHz) | | h _{fe} | 20 | – | – |

2. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%.

ORDERING INFORMATION

| Device | Package | Shipping |
|---------|---------------------|-----------------|
| TIP41 | TO–220 | 50 Units / Rail |
| TIP41G | TO–220 (Pb–Free) | 50 Units / Rail |
| TIP41A | TO–220 | 50 Units / Rail |
| TIP41AG | TO–220 (Pb–Free) | 50 Units / Rail |
| TIP41B | TO–220 | 50 Units / Rail |
| TIP41BG | TO–220 (Pb–Free) | 50 Units / Rail |
| TIP41C | TO–220 | 50 Units / Rail |
| TIP41CG | TO–220 (Pb–Free) | 50 Units / Rail |
| TIP42 | TO–220 | 50 Units / Rail |
| TIP42G | TO–220 (Pb–Free) | 50 Units / Rail |
| TIP42A | TO–220 | 50 Units / Rail |
| TIP42AG | TO–220 (Pb–Free) | 50 Units / Rail |
| TIP42B | TO–220 | 50 Units / Rail |
| TIP42BG | TO–220 (Pb–Free) | 50 Units / Rail |
| TIP42C | TO–220 | 50 Units / Rail |
| TIP42CG | TO–220 (Pb–Free) | 50 Units / Rail |

TIP41, TIP41A, TIP41B, TIP41C (NPN); TIP42, TIP42A, TIP42B, TIP42C (PNP)

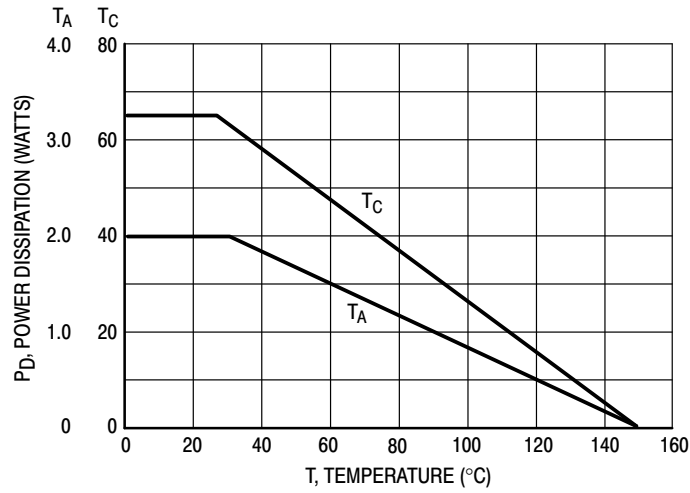


Figure 1. Power Derating

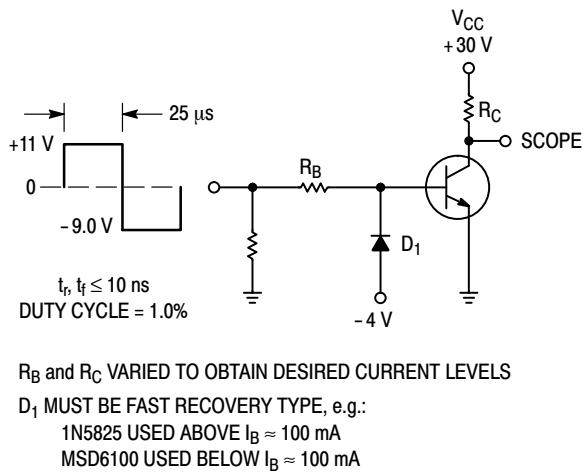


Figure 2. Switching Time Test Circuit

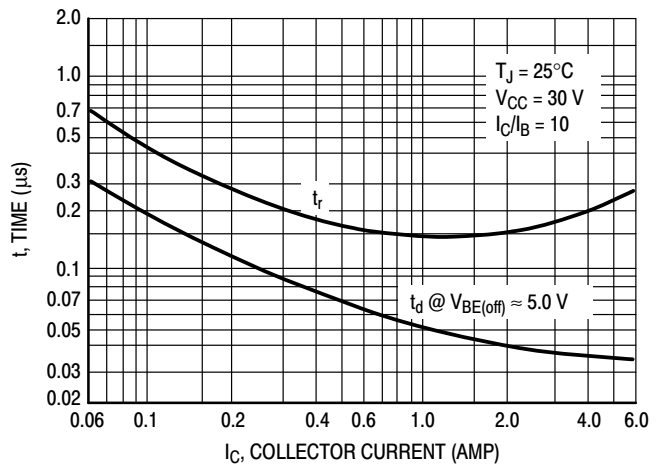


Figure 3. Turn-On Time

TIP41, TIP41A, TIP41B, TIP41C (NPN); TIP42, TIP42A, TIP42B, TIP42C (PNP)

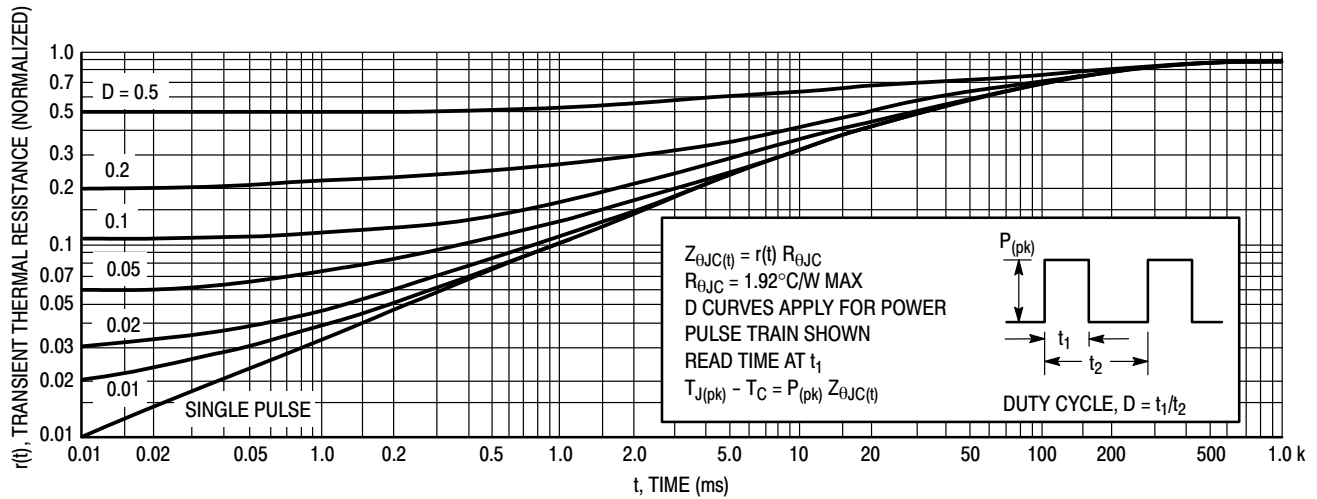


Figure 4. Thermal Response

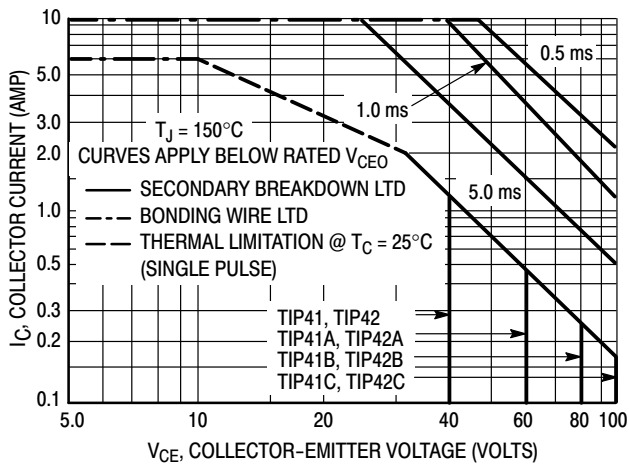


Figure 5. Active-Region Safe Operating Area

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.

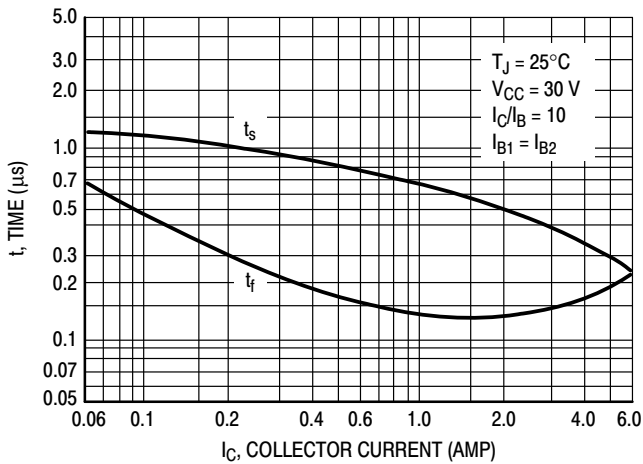


Figure 6. Turn-Off Time

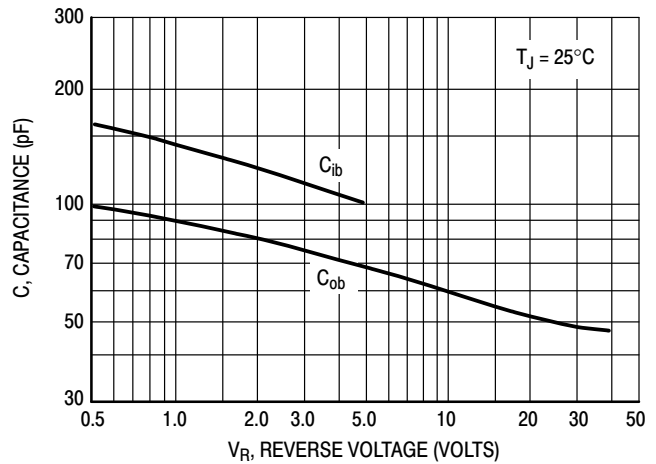


Figure 7. Capacitance

TIP41, TIP41A, TIP41B, TIP41C (NPN); TIP42, TIP42A, TIP42B, TIP42C (PNP)

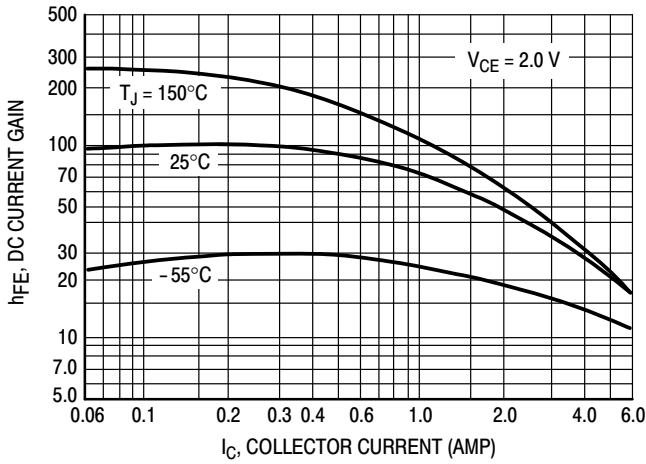


Figure 8. DC Current Gain

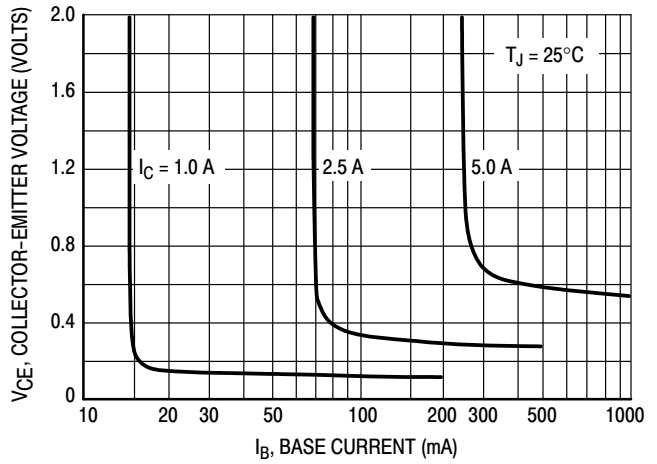


Figure 9. Collector Saturation Region

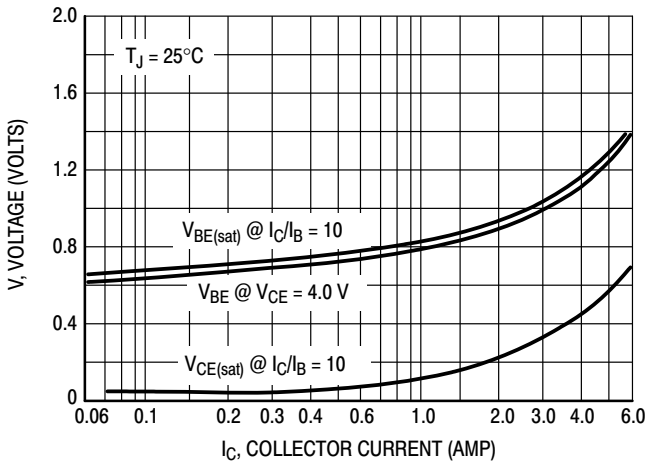


Figure 10. "On" Voltages

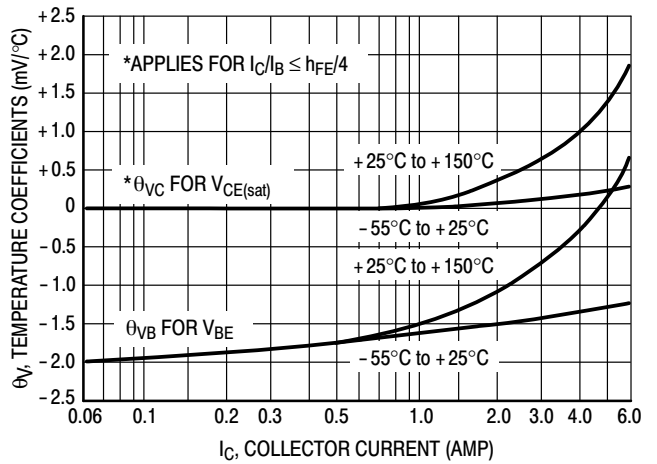


Figure 11. Temperature Coefficients

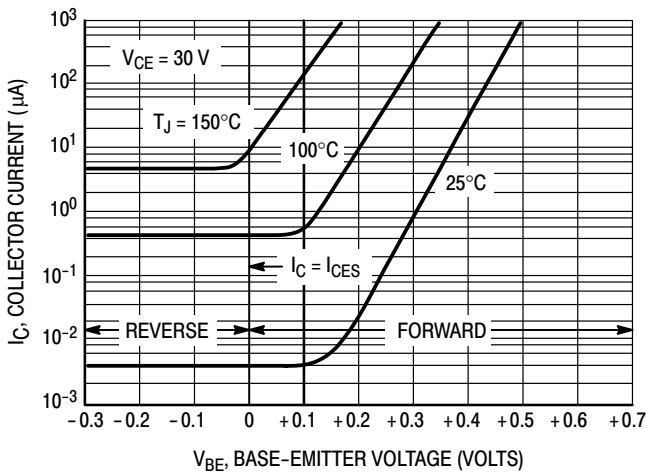


Figure 12. Collector Cut-Off Region

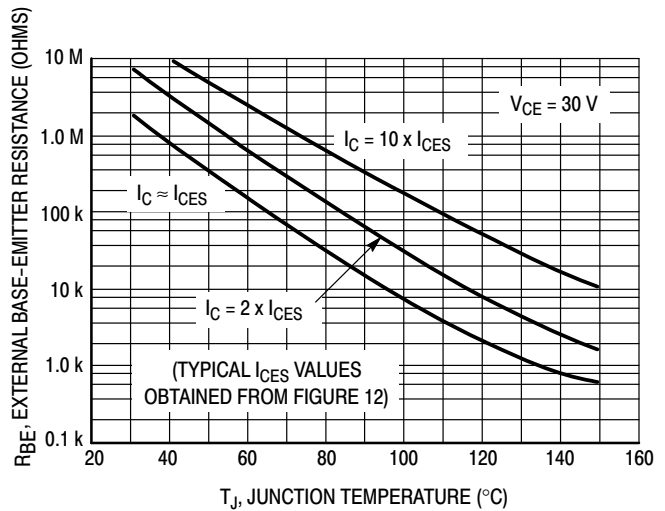
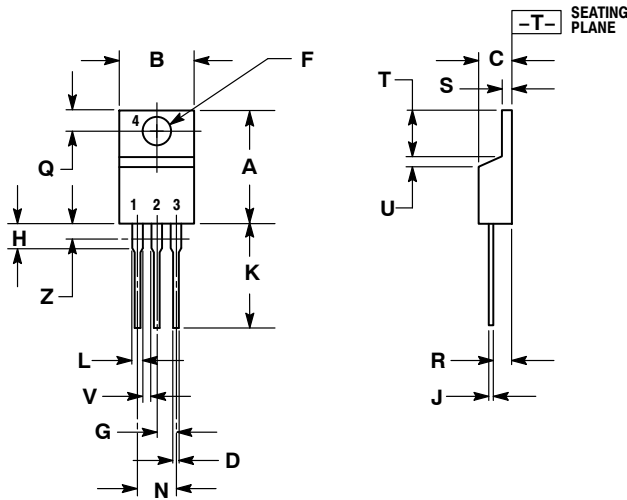


Figure 13. Effects of Base-Emitter Resistance

TIP41, TIP41A, TIP41B, TIP41C (NPN); TIP42, TIP42A, TIP42B, TIP42C (PNP)

PACKAGE DIMENSIONS

TO-220 CASE 221A-09 ISSUE AG



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.
 3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.

| DIM | INCHES | | MILLIMETERS | |
|-----|--------|-------|-------------|-------|
| | MIN | MAX | MIN | MAX |
| A | 0.570 | 0.620 | 14.48 | 15.75 |
| B | 0.380 | 0.405 | 9.66 | 10.28 |
| C | 0.160 | 0.190 | 4.07 | 4.82 |
| D | 0.025 | 0.036 | 0.64 | 0.91 |
| F | 0.142 | 0.161 | 3.61 | 4.09 |
| G | 0.095 | 0.105 | 2.42 | 2.66 |
| H | 0.110 | 0.161 | 2.80 | 4.10 |
| J | 0.014 | 0.025 | 0.36 | 0.64 |
| K | 0.500 | 0.562 | 12.70 | 14.27 |
| L | 0.045 | 0.060 | 1.15 | 1.52 |
| N | 0.190 | 0.210 | 4.83 | 5.33 |
| Q | 0.100 | 0.120 | 2.54 | 3.04 |
| R | 0.080 | 0.110 | 2.04 | 2.79 |
| S | 0.045 | 0.055 | 1.15 | 1.39 |
| T | 0.235 | 0.255 | 5.97 | 6.47 |
| U | 0.000 | 0.050 | 0.00 | 1.27 |
| V | 0.045 | --- | 1.15 | --- |
| Z | --- | 0.080 | --- | 2.04 |

- STYLE 1:
1. BASE
 2. COLLECTOR
 3. EMITTER
 4. COLLECTOR

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TIP41A/D