

MUN5111T1 Series

Preferred Devices

Bias Resistor Transistor

PNP Silicon Surface Mount Transistor with Monolithic Bias Resistor Network

This new series of digital transistors is designed to replace a single device and its external resistor bias network. The Bias Resistor Transistor (BRT) contains a single transistor with a monolithic bias network consisting of two resistors; a series base resistor and a base-emitter resistor. The BRT eliminates these individual components by integrating them into a single device. The use of a BRT can reduce both system cost and board space. The device is housed in the SC-70/SOT-323 package which is designed for low power surface mount applications.

Features

- Pb-Free Packages are Available
- Simplifies Circuit Design
- Reduces Board Space
- Reduces Component Count
- The SC-70/SOT-323 package can be soldered using wave or reflow. The modified gull-winged leads absorb thermal stress during soldering eliminating the possibility of damage to the die.
- Available in 8 mm embossed tape and reel – Use the Device Number to order the 7 inch/3000 unit reel. Replace “T1” with “T3” in the Device Number to order the 13 inch/10,000 unit reel.

MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$ unless otherwise noted)

| Rating | Symbol | Value | Unit |
|---------------------------|-----------|-------|------|
| Collector-Base Voltage | V_{CBO} | 50 | Vdc |
| Collector-Emitter Voltage | V_{CEO} | 50 | Vdc |
| Collector Current | I_C | 100 | mAdc |

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.

THERMAL CHARACTERISTICS

| Characteristic | Symbol | Max | Unit |
|---|-----------------|--|--------------------------|
| Total Device Dissipation $T_A = 25^\circ\text{C}$ Derate above 25°C | P_D | 202 (Note 1) 310 (Note 2) 1.6 (Note 1) 2.5 (Note 2) | mW $^\circ\text{C/W}$ |
| Thermal Resistance, Junction-to-Ambient | $R_{\theta JA}$ | 618 (Note 1) 403 (Note 2) | $^\circ\text{C/W}$ |
| Thermal Resistance, Junction-to-Lead | $R_{\theta JL}$ | 280 (Note 1) 332 (Note 2) | $^\circ\text{C/W}$ |
| Junction and Storage Temperature Range | T_J, T_{stg} | -55 to +150 | $^\circ\text{C}$ |

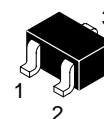
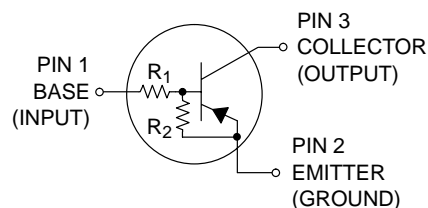
1. FR-4 @ Minimum Pad
2. FR-4 @ 1.0 x 1.0 inch Pad



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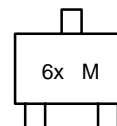
<http://onsemi.com>

PNP SILICON BIAS RESISTOR TRANSISTORS



SC-70/SOT-323
CASE 419
STYLE 3

MARKING DIAGRAM



6x = Specific Device Code
(See Order Info Table)
M = Date Code

ORDERING INFORMATION

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

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

MUN511T1 Series

ORDERING INFORMATION AND RESISTOR VALUES

| Device | Package | Marking | R1 (K) | R2 (K) | Shipping† |
|------------------------|----------------------------|---------|--------|--------|--|
| MUN511T1 | SC-70/SOT-323 | 6A | 10 | 10 | 3000/Tape & Reel |
| MUN511T1G | SC-70/SOT-323 (Pb-Free) | 6A | 10 | 10 | 3000/Tape & Reel |
| MUN5112T1 | SC-70/SOT-323 | 6B | 22 | 22 | 3000/Tape & Reel |
| MUN5112T1G | SC-70/SOT-323 (Pb-Free) | 6B | 22 | 22 | 3000/Tape & Reel |
| MUN5113T1 MUN5113T3 | SC-70/SOT-323 | 6C | 47 | 47 | 3000/Tape & Reel 10,000/Tape & Reel |
| MUN5113T1G | SC-70/SOT-323 (Pb-Free) | 6C | 47 | 47 | 3000/Tape & Reel |
| MUN5114T1 | SC-70/SOT-323 | 6D | 10 | 47 | 3000/Tape & Reel |
| MUN5114T1G | SC-70/SOT-323 (Pb-Free) | 6D | 10 | 47 | 3000/Tape & Reel |
| MUN5115T1 (Note 3) | SC-70/SOT-323 | 6E | 10 | ∞ | 3000/Tape & Reel |
| MUN5115T1G (Note 3) | SC-70/SOT-323 (Pb-Free) | 6E | 10 | ∞ | 3000/Tape & Reel |
| MUN5116T1 (Note 3) | SC-70/SOT-323 | 6F | 4.7 | ∞ | 3000/Tape & Reel |
| MUN5130T1 (Note 3) | SC-70/SOT-323 | 6G | 1.0 | 1.0 | 3000/Tape & Reel |
| MUN5130T1G (Note 3) | SC-70/SOT-323 (Pb-Free) | 6G | 1.0 | 1.0 | 3000/Tape & Reel |
| MUN5131T1 (Note 3) | SC-70/SOT-323 | 6H | 2.2 | 2.2 | 3000/Tape & Reel |
| MUN5131T1G (Note 3) | SC-70/SOT-323 (Pb-Free) | 6H | 2.2 | 2.2 | 3000/Tape & Reel |
| MUN5132T1 (Note 3) | SC-70/SOT-323 | 6J | 4.7 | 4.7 | 3000/Tape & Reel |
| MUN5132T1G (Note 3) | SC-70/SOT-323 (Pb-Free) | 6J | 4.7 | 4.7 | 3000/Tape & Reel |
| MUN5133T1 (Note 3) | SC-70/SOT-323 | 6K | 4.7 | 47 | 3000/Tape & Reel |
| MUN5133T1G (Note 3) | SC-70/SOT-323 (Pb-Free) | 6K | 4.7 | 47 | 3000/Tape & Reel |
| MUN5134T1 (Note 3) | SC-70/SOT-323 | 6L | 22 | 47 | 3000/Tape & Reel |
| MUN5135T1 (Note 3) | SC-70/SOT-323 | 6M | 2.2 | 47 | 3000/Tape & Reel |
| MUN5136T1 | SC-70/SOT-323 | 6N | 100 | 100 | 3000/Tape & Reel |
| MUN5137T1 | SC-70/SOT-323 | 6P | 47 | 22 | 3000/Tape & Reel |

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

3. New devices. Updated curves to follow in subsequent data sheets.

MUN511T1 Series

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

| Characteristic | Symbol | Min | Typ | Max | Unit |
|---|----------------------|-----|-----|------|------|
| OFF CHARACTERISTICS | | | | | |
| Collector–Base Cutoff Current (V _{CB} = 50 V, I _E = 0) | I _{CBO} | – | – | 100 | nAdc |
| Collector–Emitter Cutoff Current (V _{CE} = 50 V, I _B = 0) | I _{CEO} | – | – | 500 | nAdc |
| Emitter–Base Cutoff Current (V _{EB} = 6.0 V, I _C = 0) | I _{EBO} | – | – | 0.5 | mAdc |
| | MUN5111T1 | – | – | 0.2 | |
| | MUN5112T1 | – | – | 0.1 | |
| | MUN5113T1 | – | – | 0.2 | |
| | MUN5114T1 | – | – | 0.9 | |
| | MUN5115T1 | – | – | 1.9 | |
| | MUN5116T1 | – | – | 4.3 | |
| | MUN5130T1 | – | – | 2.3 | |
| | MUN5131T1 | – | – | 1.5 | |
| | MUN5132T1 | – | – | 0.18 | |
| | MUN5133T1 | – | – | 0.13 | |
| | MUN5134T1 | – | – | 0.2 | |
| | MUN5135T1 | – | – | 0.05 | |
| | MUN5136T1 | – | – | 0.13 | |
| | MUN5137T1 | – | – | | |
| Collector–Base Breakdown Voltage (I _C = 10 μA, I _E = 0) | V _{(BR)CBO} | 50 | – | – | Vdc |
| Collector–Emitter Breakdown Voltage (Note 4) (I _C = 2.0 mA, I _B = 0) | V _{(BR)CEO} | 50 | – | – | Vdc |

ON CHARACTERISTICS (Note 4)

| | | | | | |
|--|----------------------|-----|-----|------|-----|
| DC Current Gain (V _{CE} = 10 V, I _C = 5.0 mA) | h _{FE} | 35 | 60 | – | |
| | MUN5111T1 | 60 | 100 | – | |
| | MUN5112T1 | 80 | 140 | – | |
| | MUN5113T1 | 80 | 140 | – | |
| | MUN5114T1 | 160 | 250 | – | |
| | MUN5115T1 | 160 | 250 | – | |
| | MUN5116T1 | 3.0 | 5.0 | – | |
| | MUN5130T1 | 8.0 | 15 | – | |
| | MUN5131T1 | 15 | 27 | – | |
| | MUN5132T1 | 80 | 140 | – | |
| | MUN5133T1 | 80 | 130 | – | |
| | MUN5134T1 | 80 | 140 | – | |
| | MUN5135T1 | 80 | 150 | – | |
| | MUN5136T1 | 80 | 140 | – | |
| | MUN5137T1 | | | | |
| Collector–Emitter Saturation Voltage (I _C = 10 mA, I _E = 0.3 mA) (I _C = 10 mA, I _B = 5 mA) MUN5130T1/MUN5131T1 (I _C = 10 mA, I _B = 1 mA) MUN5115T1/MUN5116T1/ MUN5132T1/MUN5133T1/MUN5134T1 | V _{CE(sat)} | – | – | 0.25 | Vdc |
| Output Voltage (on) (V _{CC} = 5.0 V, V _B = 2.5 V, R _L = 1.0 kΩ) | V _{OL} | – | – | 0.2 | Vdc |
| | MUN5111T1 | – | – | 0.2 | |
| | MUN5112T1 | – | – | 0.2 | |
| | MUN5114T1 | – | – | 0.2 | |
| | MUN5115T1 | – | – | 0.2 | |
| | MUN5116T1 | – | – | 0.2 | |
| | MUN5130T1 | – | – | 0.2 | |
| | MUN5131T1 | – | – | 0.2 | |
| | MUN5132T1 | – | – | 0.2 | |
| | MUN5133T1 | – | – | 0.2 | |
| | MUN5134T1 | – | – | 0.2 | |
| | MUN5135T1 | – | – | 0.2 | |
| (V _{CC} = 5.0 V, V _B = 3.5 V, R _L = 1.0 kΩ) | MUN5113T1 | – | – | 0.2 | |
| (V _{CC} = 5.0 V, V _B = 5.5 V, R _L = 1.0 kΩ) | MUN5136T1 | – | – | 0.2 | |
| (V _{CC} = 5.0 V, V _B = 4.0 V, R _L = 1.0 kΩ) | MUN5137T1 | – | – | 0.2 | |

4. Pulse Test: Pulse Width < 300 μs, Duty Cycle < 2.0%

MUN511T1 Series

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

| Characteristic | Symbol | Min | Typ | Max | Unit |
|---|-----------|-------|-------|-------|------------|
| Output Voltage (off) ($V_{CC} = 5.0\text{ V}$, $V_B = 0.5\text{ V}$, $R_L = 1.0\text{ k}\Omega$) ($V_{CC} = 5.0\text{ V}$, $V_B = 0.050\text{ V}$, $R_L = 1.0\text{ k}\Omega$) ($V_{CC} = 5.0\text{ V}$, $V_B = 0.25\text{ V}$, $R_L = 1.0\text{ k}\Omega$) | V_{OH} | 4.9 | – | – | Vdc |
| Input Resistor | | | | | |
| MUN5111T1 | R1 | 7.0 | 10 | 13 | k Ω |
| MUN5112T1 | | 15.4 | 22 | 28.6 | |
| MUN5113T1 | | 32.9 | 47 | 61.1 | |
| MUN5114T1 | | 7.0 | 10 | 13 | |
| MUN5115T1 | | 7.0 | 10 | 13 | |
| MUN5116T1 | | 3.3 | 4.7 | 6.1 | |
| MUN5130T1 | | 0.7 | 1.0 | 1.3 | |
| MUN5131T1 | | 1.5 | 2.2 | 2.9 | |
| MUN5132T1 | | 3.3 | 4.7 | 6.1 | |
| MUN5133T1 | | 3.3 | 4.7 | 6.1 | |
| MUN5134T1 | | 15.4 | 22 | 28.6 | |
| MUN5135T1 | | 1.54 | 2.2 | 2.86 | |
| MUN5136T1 | | 70 | 100 | 130 | |
| MUN5137T1 | | 32.9 | 47 | 61.1 | |
| Resistor Ratio | | | | | |
| MUN5111T1/MUN5112T1/MUN5113T1/ MUN5136T1 | R_1/R_2 | 0.8 | 1.0 | 1.2 | |
| MUN5114T1 | | 0.17 | 0.21 | 0.25 | |
| MUN5115T1/MUN5116T1 | | – | – | – | |
| MUN5130T1/MUN5131T1/MUN5132T1 | | 0.8 | 1.0 | 1.2 | |
| MUN5133T1 | | 0.055 | 0.1 | 0.185 | |
| MUN5134T1 | | 0.38 | 0.47 | 0.56 | |
| MUN5135T1 | | 0.038 | 0.047 | 0.056 | |
| MUN5137T1 | | 1.7 | 2.1 | 2.6 | |

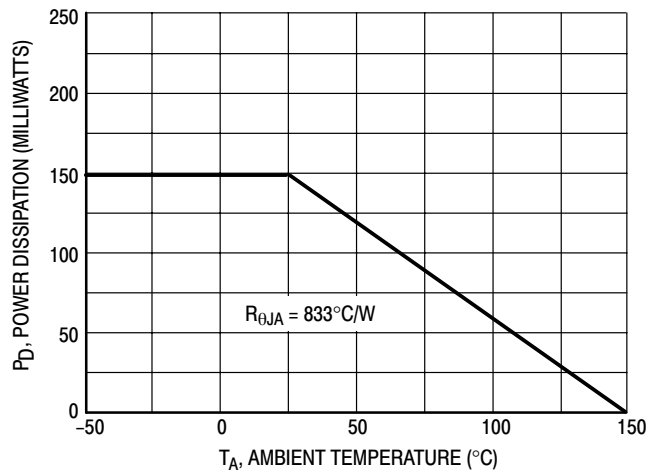


Figure 1. Derating Curve

MUN511T1 Series

TYPICAL ELECTRICAL CHARACTERISTICS – MUN511T1

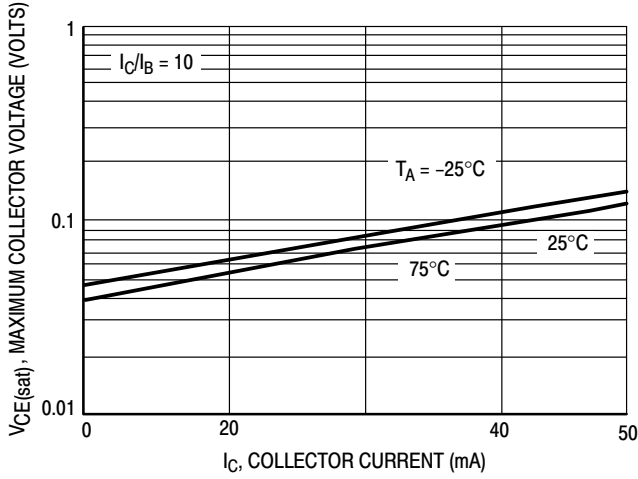


Figure 2. $V_{CE(sat)}$ versus I_C

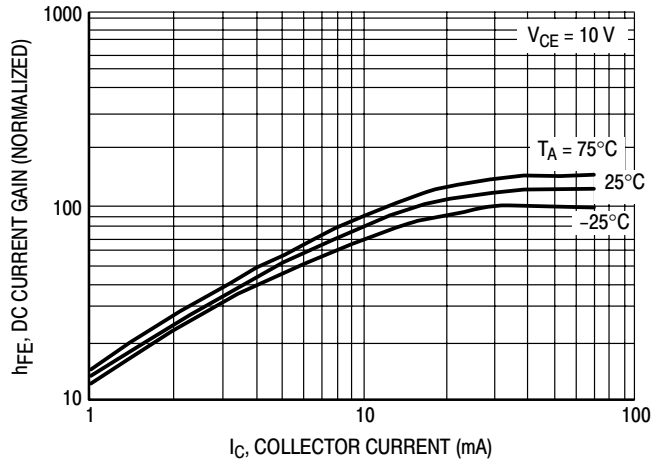


Figure 3. DC Current Gain

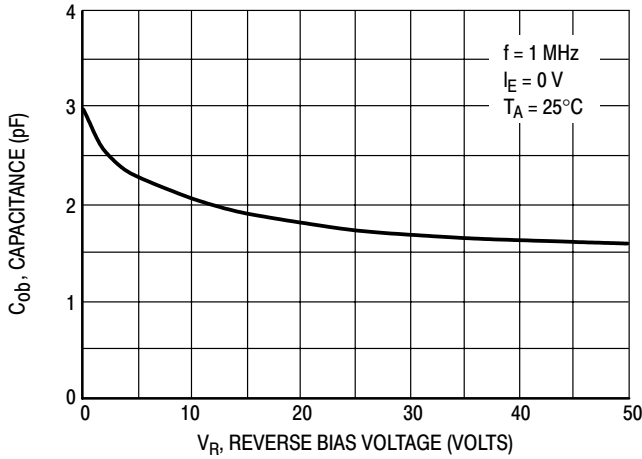


Figure 4. Output Capacitance

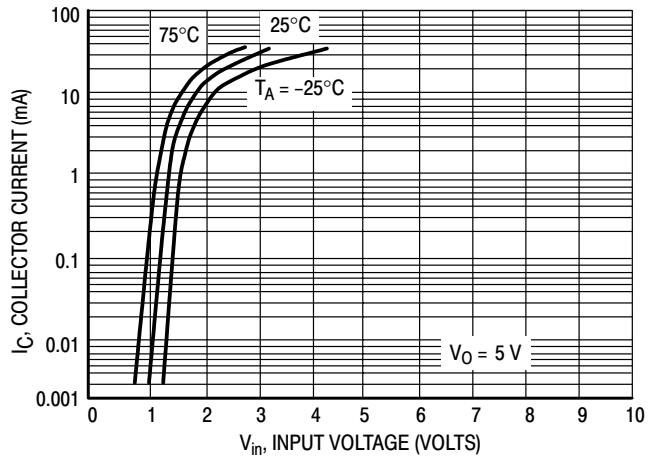


Figure 5. Output Current versus Input Voltage

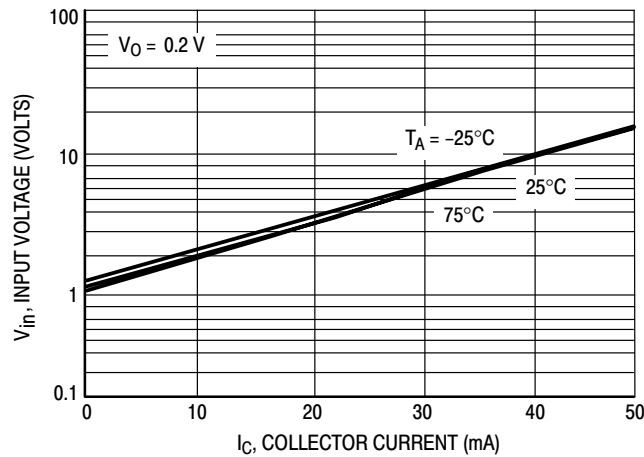


Figure 6. Input Voltage versus Output Current

MUN511T1 Series

TYPICAL ELECTRICAL CHARACTERISTICS – MUN511T1

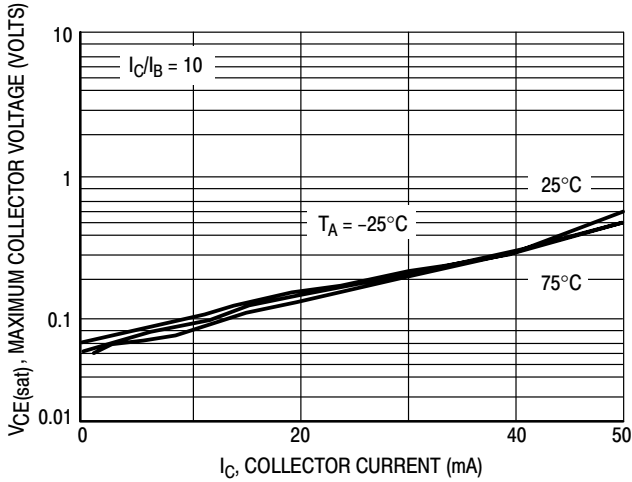


Figure 7. $V_{CE(sat)}$ versus I_C

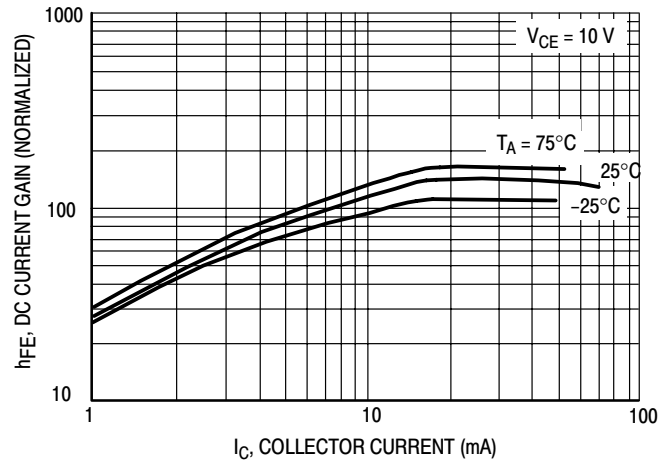


Figure 8. DC Current Gain

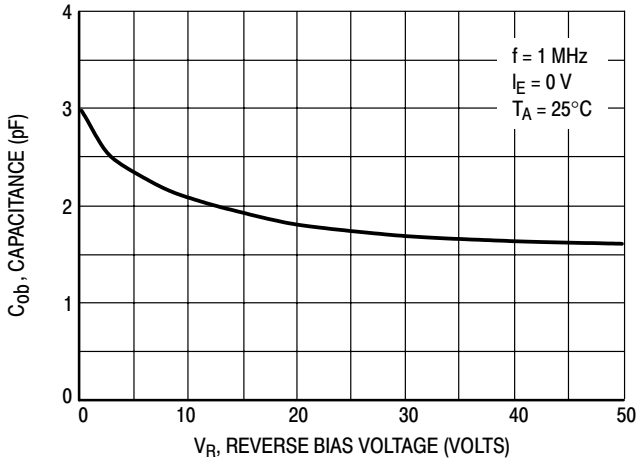


Figure 9. Output Capacitance

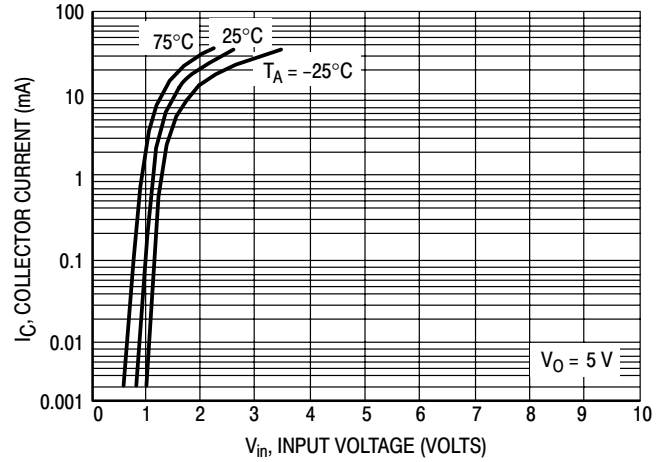


Figure 10. Output Current versus Input Voltage

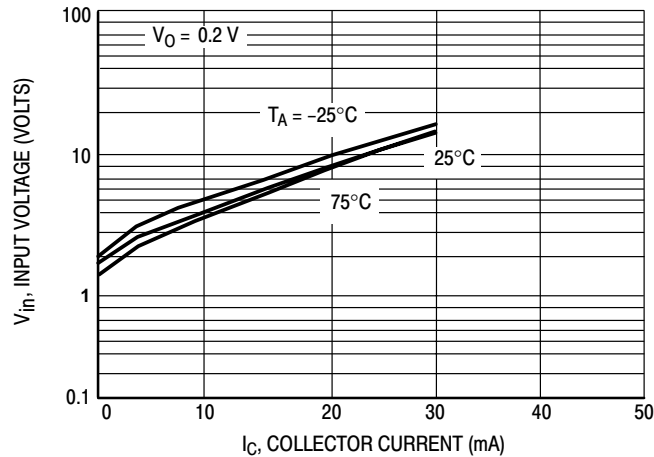


Figure 11. Input Voltage versus Output Current

MUN511T1 Series

TYPICAL ELECTRICAL CHARACTERISTICS – MUN5113T1

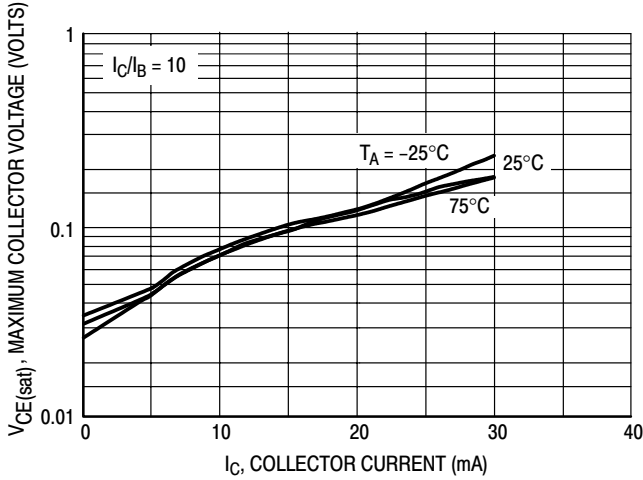


Figure 12. $V_{CE(sat)}$ versus I_C

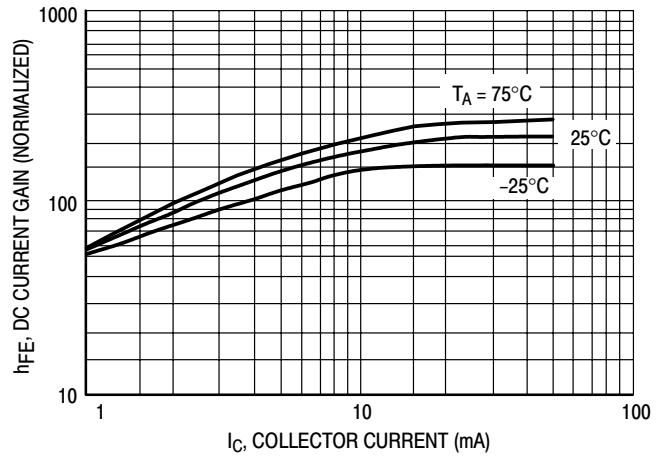


Figure 13. DC Current Gain

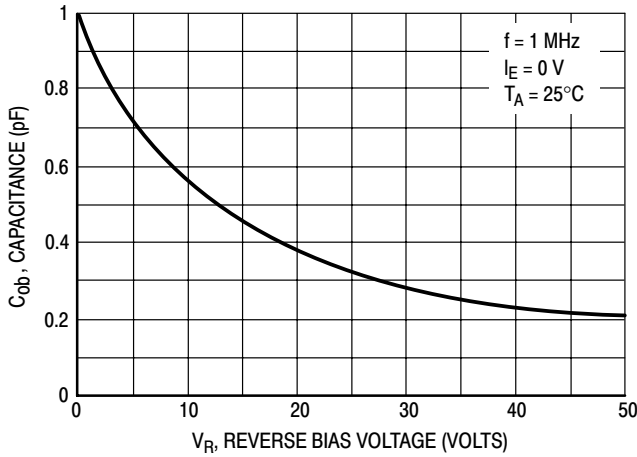


Figure 14. Output Capacitance

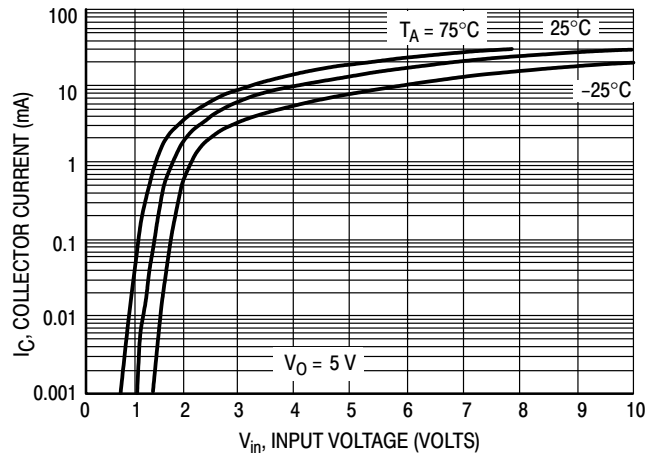


Figure 15. Output Current versus Input Voltage

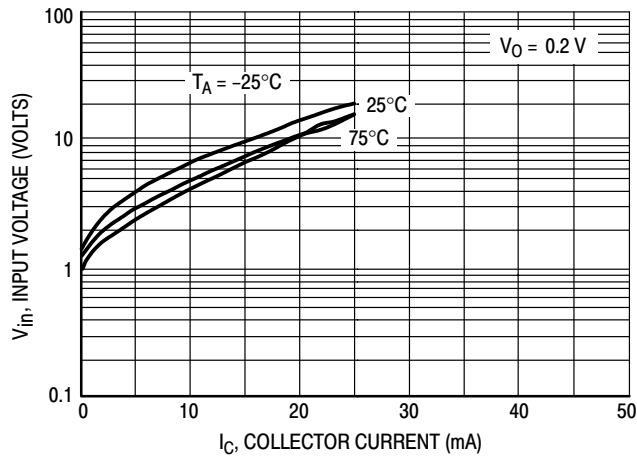


Figure 16. Input Voltage versus Output Current

MUN5111T1 Series

TYPICAL ELECTRICAL CHARACTERISTICS – MUN5114T1

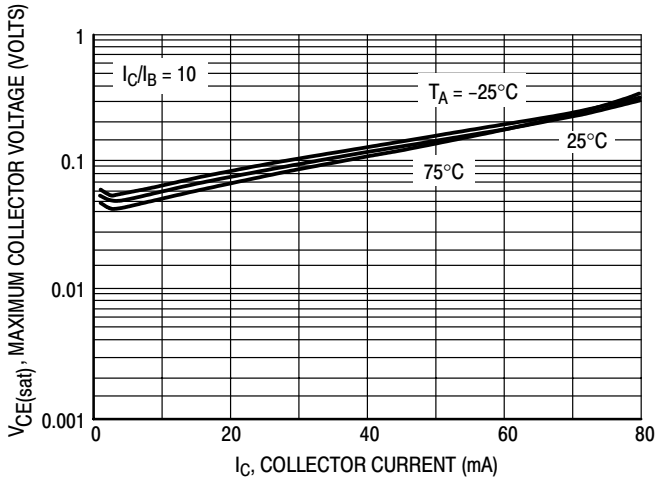


Figure 17. $V_{CE(sat)}$ versus I_C

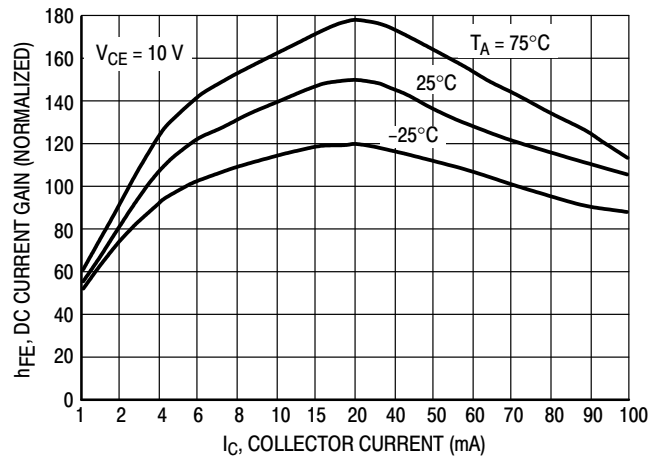


Figure 18. DC Current Gain

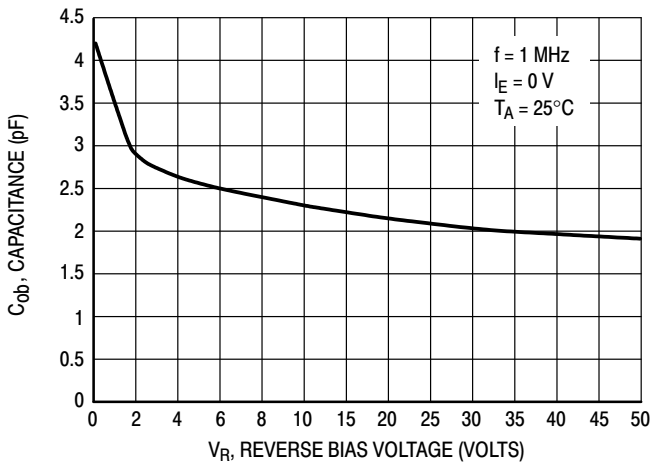


Figure 19. Output Capacitance

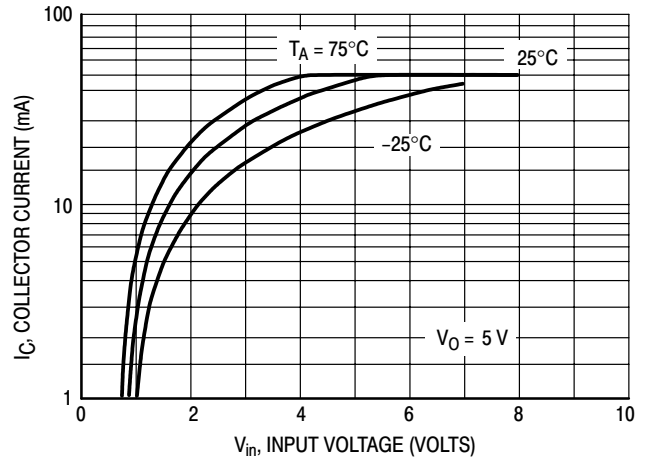


Figure 20. Output Current versus Input Voltage

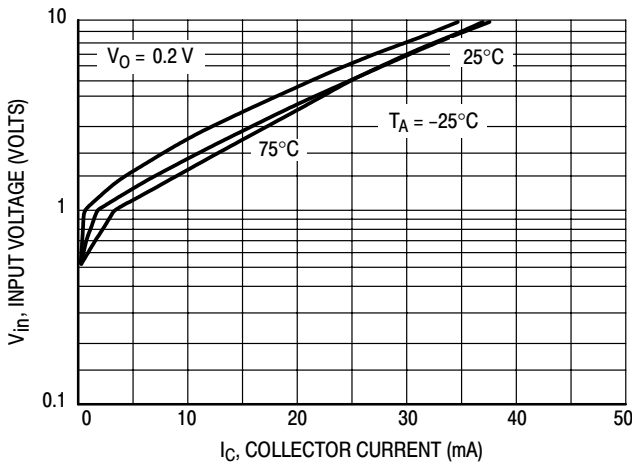


Figure 21. Input Voltage versus Output Current

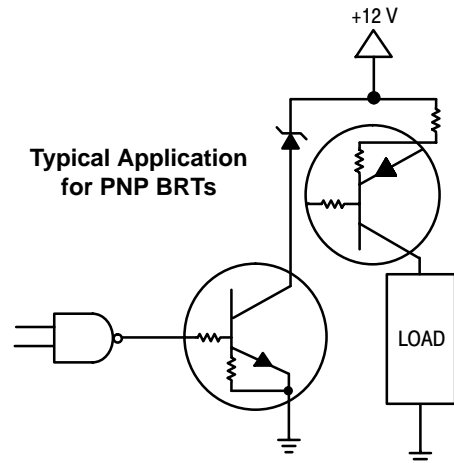


Figure 22. Inexpensive, Unregulated Current Source

MUN5111T1 Series

TYPICAL ELECTRICAL CHARACTERISTICS — MUN5132T1

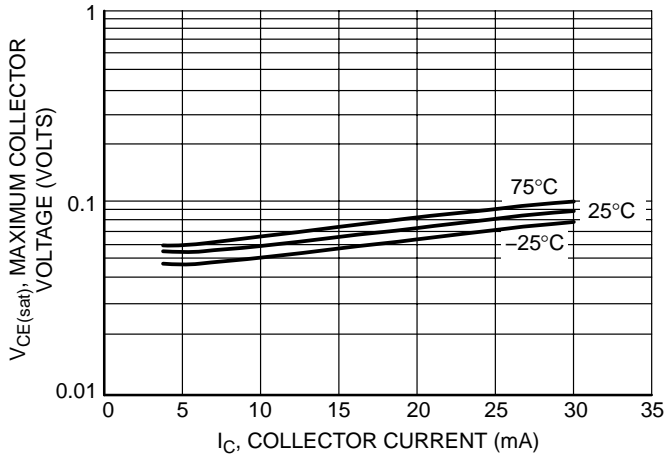


Figure 23. Maximum Collector Voltage versus Collector Current

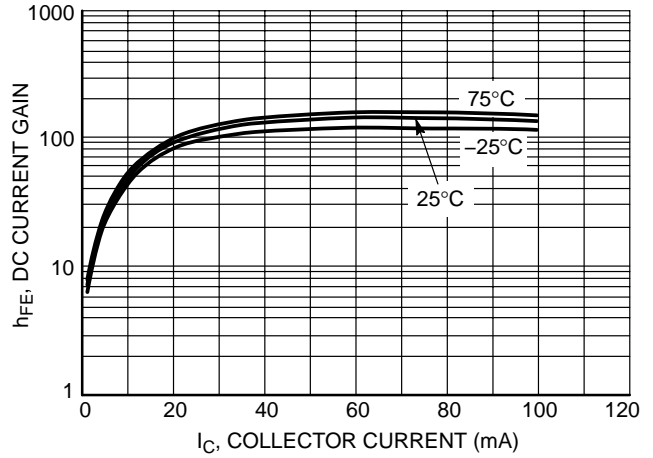


Figure 24. DC Current Gain

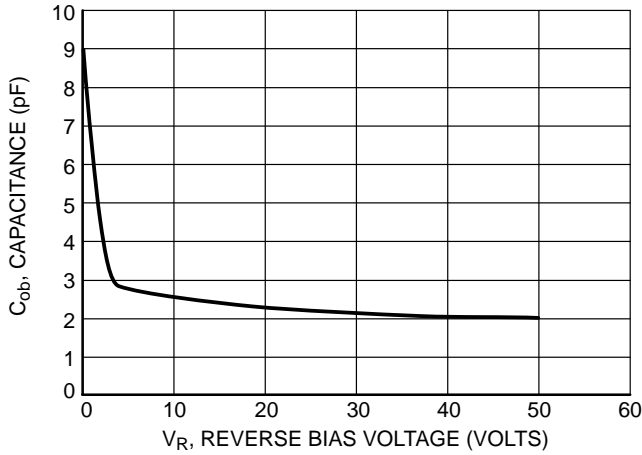


Figure 25. Output Capacitance

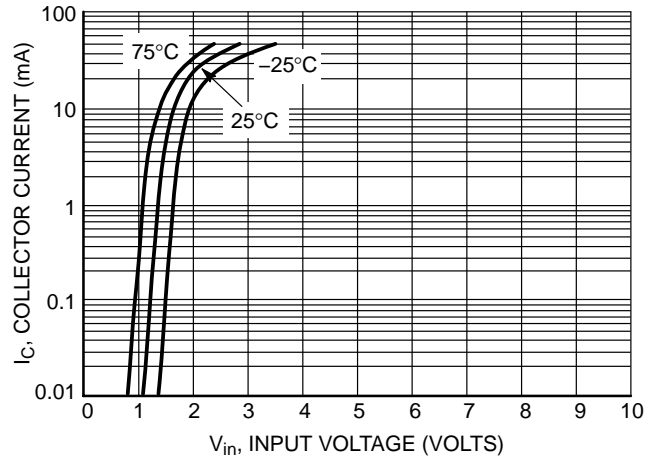


Figure 26. Output Current versus Input Voltage

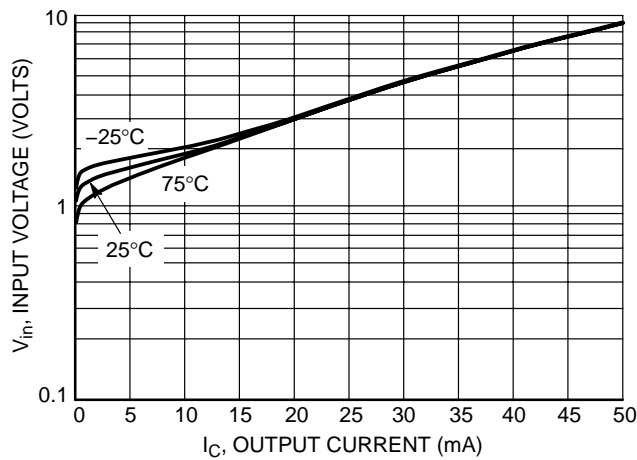


Figure 27. Input Voltage versus Output Current

MUN511T1 Series

TYPICAL ELECTRICAL CHARACTERISTICS — MUN5136T1

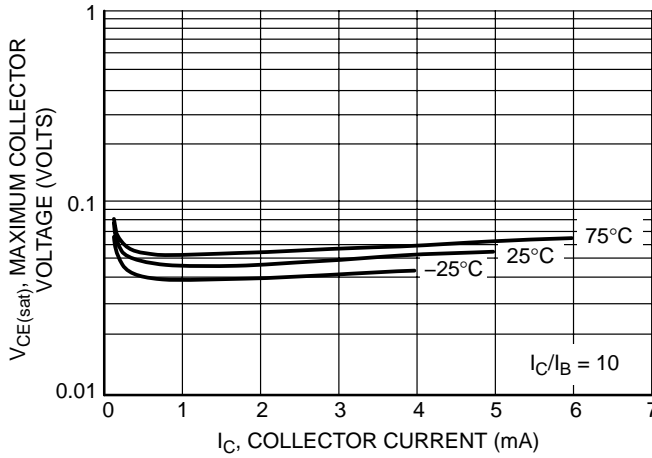


Figure 28. Maximum Collector Voltage versus Collector Current

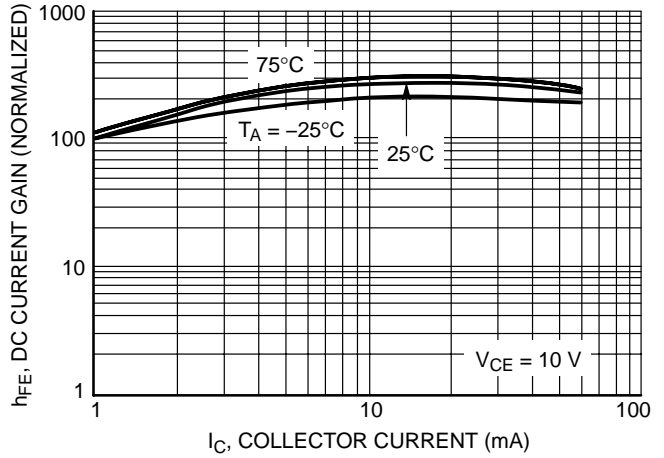


Figure 29. DC Current Gain

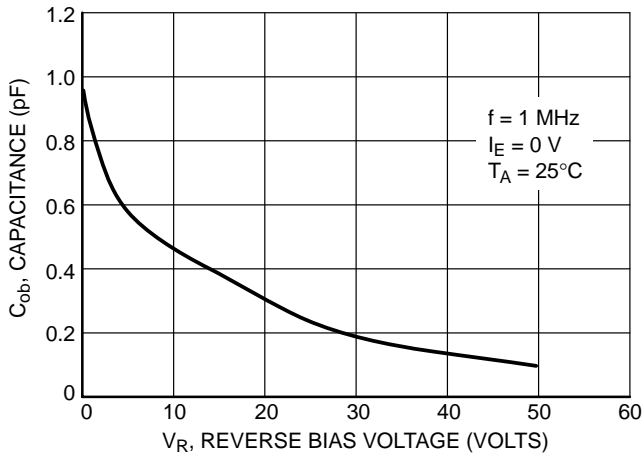


Figure 30. Output Capacitance

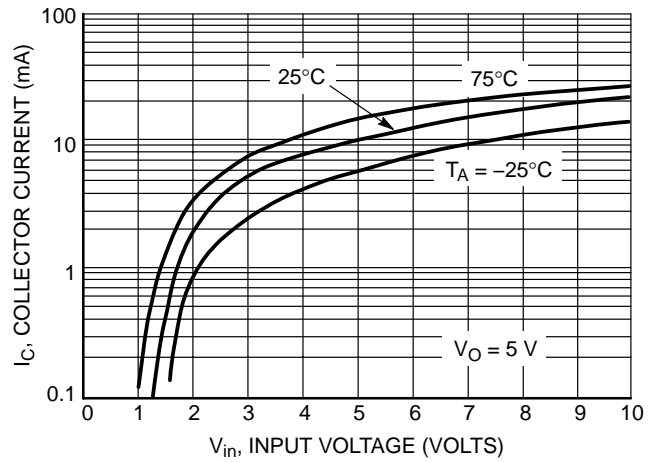


Figure 31. Output Current versus Input Voltage

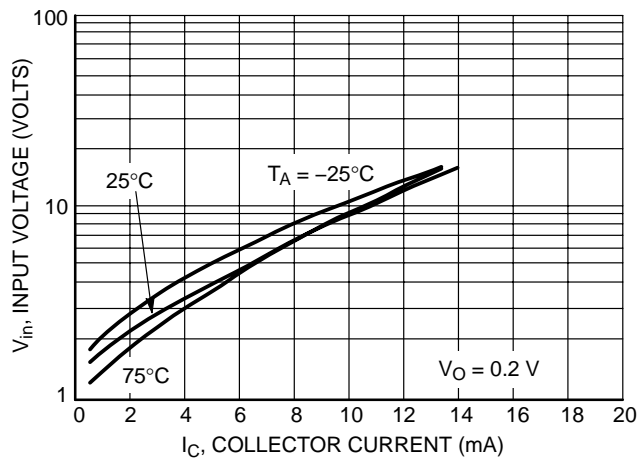


Figure 32. Input Voltage versus Output Current

MUN511T1 Series

TYPICAL ELECTRICAL CHARACTERISTICS — MUN5137T1

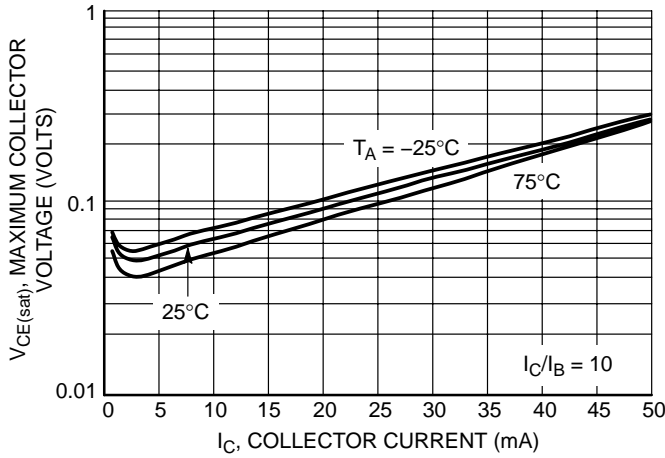


Figure 33. Maximum Collector Voltage versus Collector Current

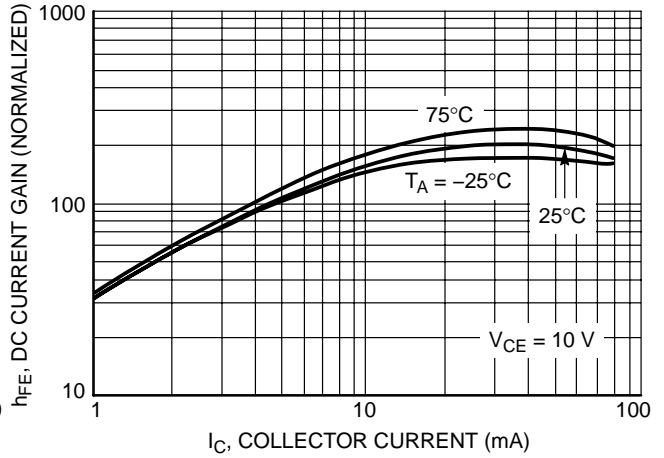


Figure 34. DC Current Gain

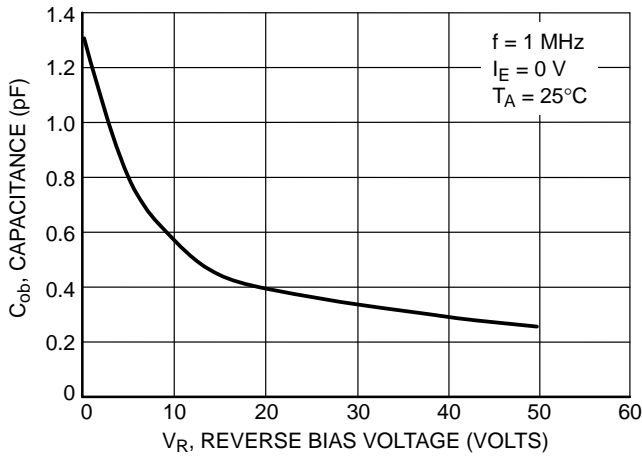


Figure 35. Output Capacitance

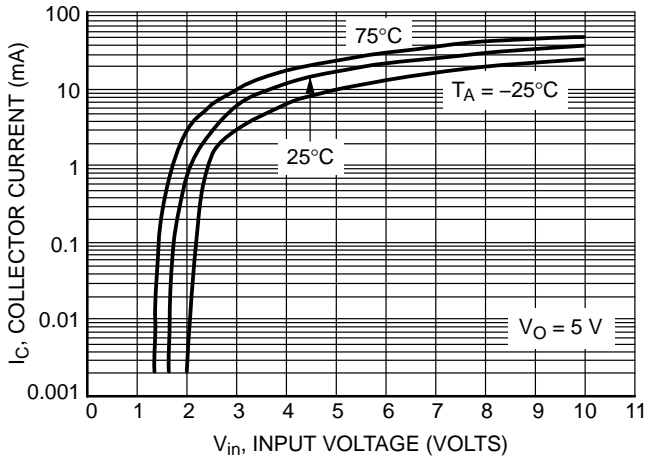


Figure 36. Output Current versus Input Voltage

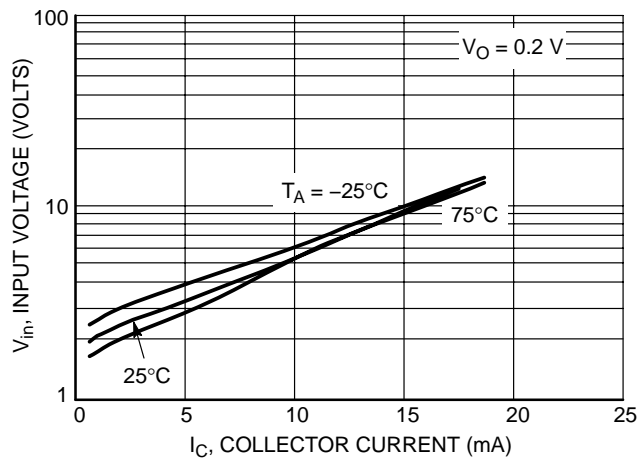
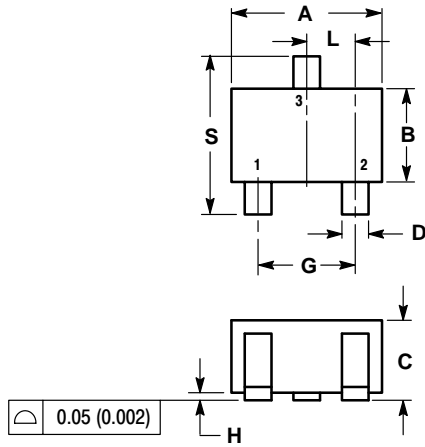


Figure 37. Input Voltage versus Output Current

MUN511T1 Series

PACKAGE DIMENSIONS

SC-70/SOT-323
CASE 419-04
ISSUE L



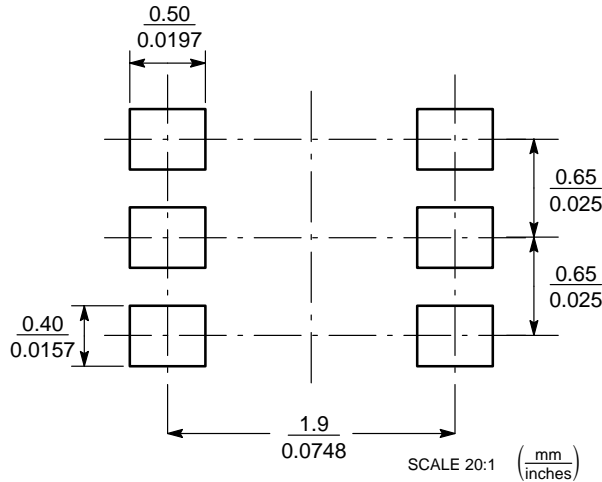
NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

| DIM | INCHES | | MILLIMETERS | |
|-----|-----------|-------|-------------|------|
| | MIN | MAX | MIN | MAX |
| A | 0.071 | 0.087 | 1.80 | 2.20 |
| B | 0.045 | 0.053 | 1.15 | 1.35 |
| C | 0.032 | 0.040 | 0.80 | 1.00 |
| D | 0.012 | 0.016 | 0.30 | 0.40 |
| G | 0.047 | 0.055 | 1.20 | 1.40 |
| H | 0.000 | 0.004 | 0.00 | 0.10 |
| J | 0.004 | 0.010 | 0.10 | 0.25 |
| K | 0.017 REF | | 0.425 REF | |
| L | 0.026 BSC | | 0.650 BSC | |
| N | 0.028 REF | | 0.700 REF | |
| S | 0.079 | 0.095 | 2.00 | 2.40 |

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

SOLDERING FOOTPRINT*



*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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