

MUN2111T1 Series

Preferred Devices

Bias Resistor Transistors

PNP Silicon Surface Mount Transistors 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-59 package which is designed for low power surface mount applications.

- Simplifies Circuit Design
- Reduces Board Space
- Reduces Component Count
- Moisture Sensitivity Level: 1
- ESD Rating – Human Body Model: Class 1
– Machine Model: Class B
- The SC-59 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.
- Pb-Free Package is Available

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 |

THERMAL CHARACTERISTICS

| Characteristic | Symbol | Max | Unit |
|---|-----------------|--|---------------------------------|
| Total Device Dissipation $T_A = 25^\circ\text{C}$ Derate above 25°C | P_D | 230 (Note 1) 338 (Note 2) 1.8 (Note 1) 2.7 (Note 2) | mW $^\circ\text{C}/\text{W}$ |
| Thermal Resistance – Junction-to-Ambient | $R_{\theta JA}$ | 540 (Note 1) 370 (Note 2) | $^\circ\text{C}/\text{W}$ |
| Thermal Resistance – Junction-to-Lead | $R_{\theta JL}$ | 264 (Note 1) 287 (Note 2) | $^\circ\text{C}/\text{W}$ |
| Junction and Storage Temperature Range | T_J, T_{stg} | -55 to +150 | $^\circ\text{C}$ |

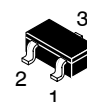
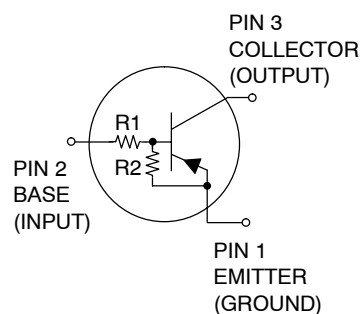
Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur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

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



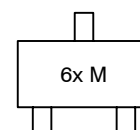
ON Semiconductor®

<http://onsemi.com>



SC-59
CASE 318D
PLASTIC

MARKING DIAGRAM



6x = Specific Device Code*
M = Date Code

ORDERING INFORMATION

See detailed ordering and shipping information on page 2 of this data sheet.

DEVICE MARKING INFORMATION

*See device marking table on page 2 of this data sheet.

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

MUN2111T1 Series

DEVICE MARKING AND RESISTOR VALUES

| Device | Package | Marking | R1 (K) | R2 (K) | Shipping [†] |
|---------------------|--------------------|---------|--------|--------|-----------------------|
| MUN2111T1 | SC-59 | 6A | 10 | 10 | 3000 / Tape & Reel |
| MUN2111T1G | SC-59 (Pb-Free) | 6A | 10 | 10 | 3000 / Tape & Reel |
| MUN2112T1 | SC-59 | 6B | 22 | 22 | 3000 / Tape & Reel |
| MUN2112T1G | SC-59 (Pb-Free) | 6B | 22 | 22 | 3000 / Tape & Reel |
| MUN2113T1 | SC-59 | 6C | 47 | 47 | 3000 / Tape & Reel |
| MUN2113T1G | SC-59 (Pb-Free) | 6C | 47 | 47 | 3000 / Tape & Reel |
| MUN2114T1 | SC-59 | 6D | 10 | 47 | 3000 / Tape & Reel |
| MUN2114T1G | SC-59 (Pb-Free) | 6D | 10 | 47 | 3000 / Tape & Reel |
| MUN2115T1 (Note 3) | SC-59 | 6E | 10 | ∞ | 3000 / Tape & Reel |
| MUN2116T1 (Note 3) | SC-59 | 6F | 4.7 | ∞ | 3000 / Tape & Reel |
| MUN2116T1G (Note 3) | SC-59 (Pb-Free) | 6F | 4.7 | ∞ | 3000 / Tape & Reel |
| MUN2130T1 (Note 3) | SC-59 | 6G | 1.0 | 1.0 | 3000 / Tape & Reel |
| MUN2131T1 (Note 3) | SC-59 | 6H | 2.2 | 2.2 | 3000 / Tape & Reel |
| MUN2132T1 (Note 3) | SC-59 | 6J | 4.7 | 4.7 | 3000 / Tape & Reel |
| MUN2132T1G (Note 3) | SC-59 (Pb-Free) | 6J | 4.7 | 4.7 | 3000 / Tape & Reel |
| MUN2133T1 (Note 3) | SC-59 | 6K | 4.7 | 47 | 3000 / Tape & Reel |
| MUN2134T1 (Note 3) | SC-59 | 6L | 22 | 47 | 3000 / Tape & Reel |
| MUN2136T1 | SC-59 | 6N | 100 | 100 | 3000 / Tape & Reel |
| MUN2137T1 | SC-59 | 6P | 47 | 22 | 3000 / Tape & Reel |
| MUN2140T1 (Note 3) | SC-59 | 6T | 47 | ∞ | 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 resistor combinations. Updated curves to follow in subsequent data sheets.

MUN211T1 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 |
| | MUN211T1 | - | - | 0.2 | |
| | MUN212T1 | - | - | 0.1 | |
| | MUN2113T1 | - | - | 0.2 | |
| | MUN2114T1 | - | - | 0.9 | |
| | MUN2115T1 | - | - | 1.9 | |
| | MUN2116T1 | - | - | 4.3 | |
| | MUN2130T1 | - | - | 2.3 | |
| | MUN2131T1 | - | - | 1.5 | |
| | MUN2132T1 | - | - | 0.18 | |
| | MUN2133T1 | - | - | 0.13 | |
| | MUN2134T1 | - | - | 0.05 | |
| | MUN2136T1 | - | - | 0.13 | |
| | MUN2137T1 | - | - | 0.20 | |
| | MUN2140T1 | - | - | - | |
| 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 | - | |
| | MUN211T1 | 60 | 100 | - | |
| | MUN212T1 | 80 | 140 | - | |
| | MUN2113T1 | 80 | 140 | - | |
| | MUN2114T1 | 160 | 250 | - | |
| | MUN2115T1 | 160 | 250 | - | |
| | MUN2116T1 | 3.0 | 5.0 | - | |
| | MUN2130T1 | 8.0 | 15 | - | |
| | MUN2131T1 | 15 | 27 | - | |
| | MUN2132T1 | 80 | 140 | - | |
| | MUN2133T1 | 80 | 130 | - | |
| | MUN2134T1 | 80 | 150 | - | |
| | MUN2136T1 | 80 | 140 | - | |
| | MUN2137T1 | 120 | 250 | - | |
| | MUN2140T1 | - | - | - | |
| Collector-Emitter Saturation Voltage (I _C = 10 mA, I _B = 0.3 mA) | V _{CE(sat)} | - | - | 0.25 | Vdc |
| | MUN211T1 | - | - | 0.25 | |
| | MUN212T1 | - | - | 0.25 | |
| | MUN2113T1 | - | - | 0.25 | |
| | MUN2114T1 | - | - | 0.25 | |
| | MUN2115T1 | - | - | 0.25 | |
| | MUN2130T1 | - | - | 0.25 | |
| | MUN2136T1 | - | - | 0.25 | |
| | MUN2137T1 | - | - | 0.25 | |
| (I _C = 10 mA, I _B = 5.0 mA) | MUN2131T1 | - | - | 0.25 | |
| (I _C = 10 mA, I _B = 1.0 mA) | MUN2116T1 | - | - | 0.25 | |
| | MUN2132T1 | - | - | 0.25 | |
| | MUN2134T1 | - | - | 0.25 | |
| | MUN2140T1 | - | - | 0.25 | |
| Output Voltage (on) (V _{CC} = 5.0 V, V _B = 2.5 V, R _L = 1.0 kΩ) | V _{OL} | - | - | 0.2 | Vdc |
| | MUN211T1 | - | - | 0.2 | |
| | MUN212T1 | - | - | 0.2 | |
| | MUN2114T1 | - | - | 0.2 | |
| | MUN2115T1 | - | - | 0.2 | |
| | MUN2116T1 | - | - | 0.2 | |
| | MUN2130T1 | - | - | 0.2 | |
| | MUN2131T1 | - | - | 0.2 | |
| | MUN2132T1 | - | - | 0.2 | |
| | MUN2133T1 | - | - | 0.2 | |
| | MUN2134T1 | - | - | 0.2 | |
| (V _{CC} = 5.0 V, V _B = 3.5 V, R _L = 1.0 kΩ) | MUN2113T1 | - | - | 0.2 | |
| | MUN2140T1 | - | - | 0.2 | |
| (V _{CC} = 5.0 V, V _B = 5.5 V, R _L = 1.0 kΩ) | MUN2136T1 | - | - | 0.2 | |
| (V _{CC} = 5.0 V, V _B = 4.0 V, R _L = 1.0 kΩ) | MUN2137T1 | - | - | 0.2 | |

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

MUN211T1 Series

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

| Characteristic | Symbol | Min | Typ | Max | Unit |
|---|-----------|-------|------|-------|------------|
| ON CHARACTERISTICS (Note 4) | | | | | |
| 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 | R1 | 7.0 | 10 | 13 | k Ω |
| | | 15.4 | 22 | 28.6 | |
| | | 32.9 | 47 | 61.1 | |
| | | 7.0 | 10 | 13 | |
| | | 7.0 | 10 | 13 | |
| | | 3.3 | 4.7 | 6.1 | |
| | | 0.7 | 1.0 | 1.3 | |
| | | 1.5 | 2.2 | 2.9 | |
| | | 3.3 | 4.7 | 6.1 | |
| | | 3.3 | 4.7 | 6.1 | |
| | | 15.4 | 22 | 28.6 | |
| | | 70 | 100 | 130 | |
| | | 32.9 | 47 | 61.1 | |
| | | 32.9 | 47 | 61.1 | |
| Resistor Ratio | R_1/R_2 | 0.8 | 1.0 | 1.2 | |
| | | 0.17 | 0.21 | 0.25 | |
| | | – | – | – | |
| | | 0.8 | 1.0 | 1.2 | |
| | | 0.055 | 0.1 | 0.185 | |
| | | 0.38 | 0.47 | 0.56 | |
| | | 1.7 | 2.1 | 2.6 | |

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

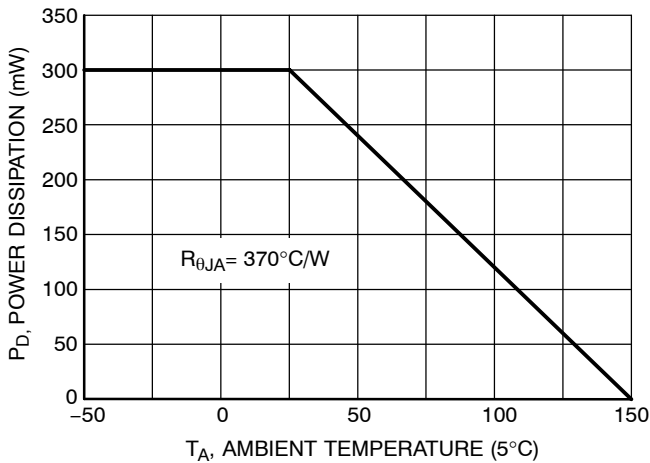


Figure 1. Derating Curve

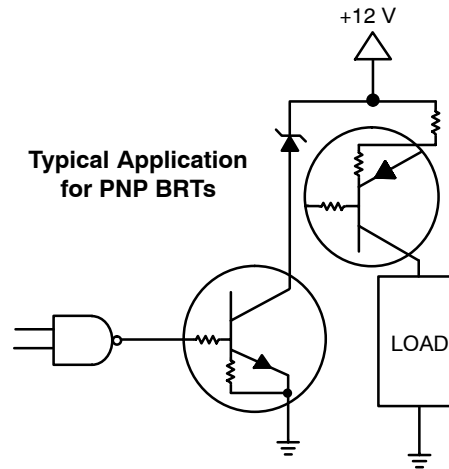


Figure 2. Inexpensive, Unregulated Current Source

MUN2111T1 Series

TYPICAL ELECTRICAL CHARACTERISTICS – MUN2111T1

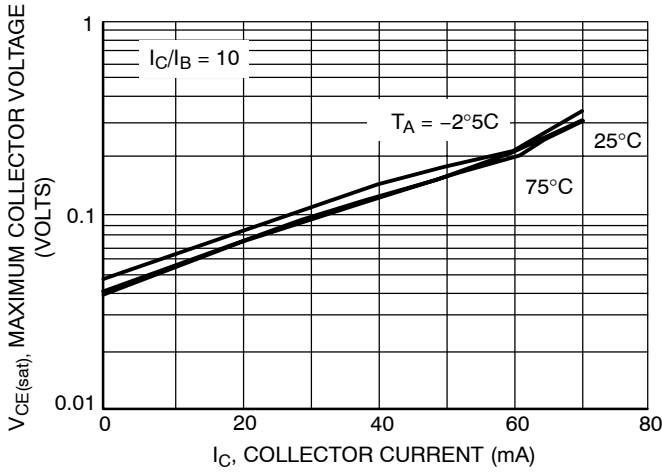


Figure 3. $V_{CE(sat)}$ vs. I_C

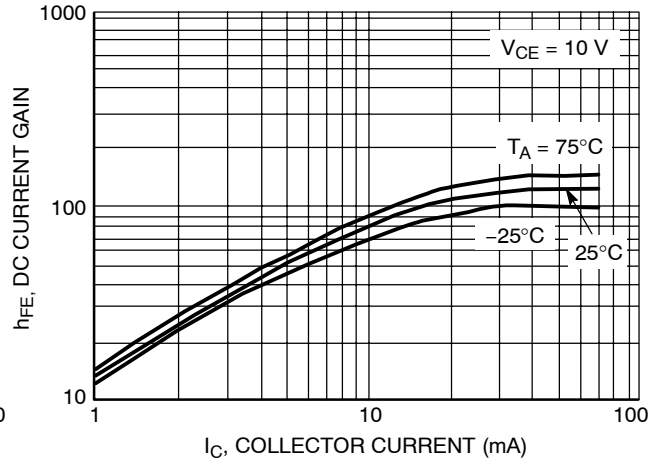


Figure 4. DC Current Gain

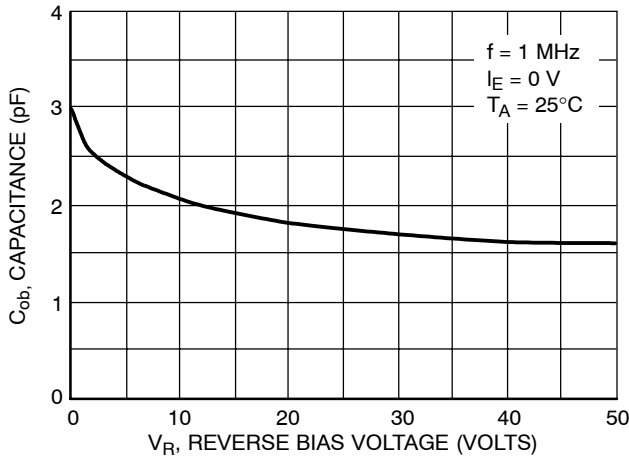


Figure 5. Output Capacitance

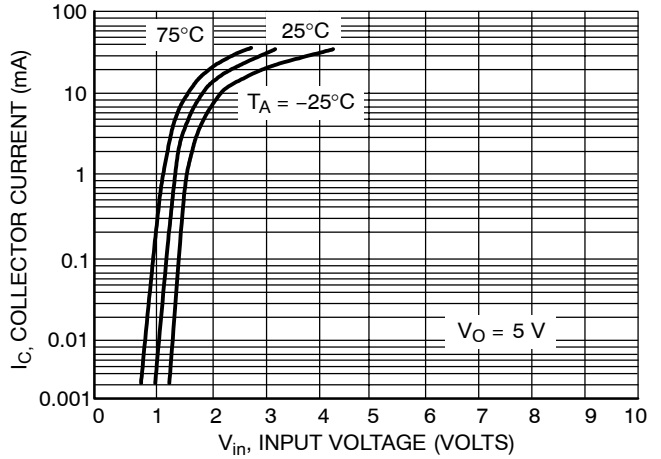


Figure 6. Output Current vs. Input Voltage

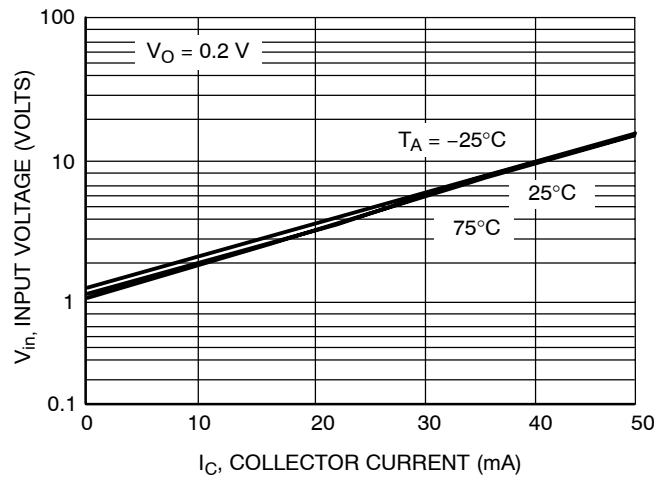


Figure 7. Input Voltage vs. Output Current

MUN2111T1 Series

TYPICAL ELECTRICAL CHARACTERISTICS – MUN2112T1

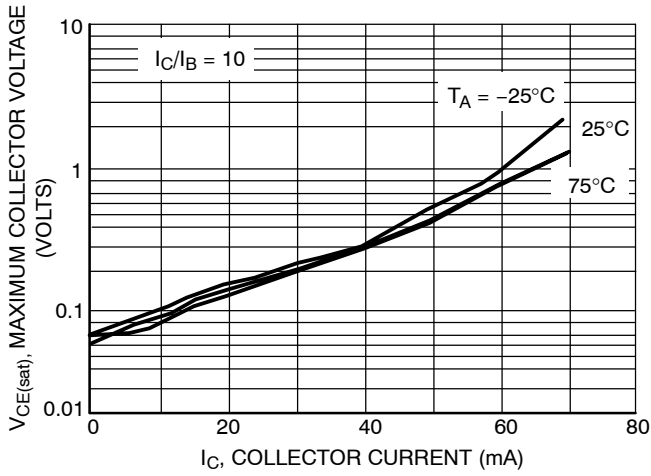


Figure 8. $V_{CE(sat)}$ vs. I_C

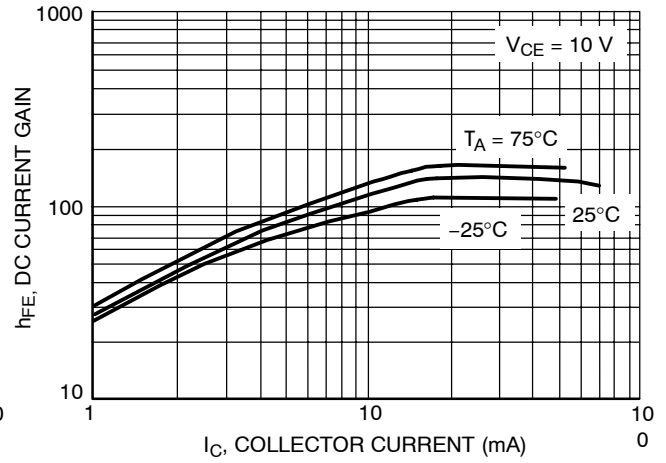


Figure 9. DC Current Gain

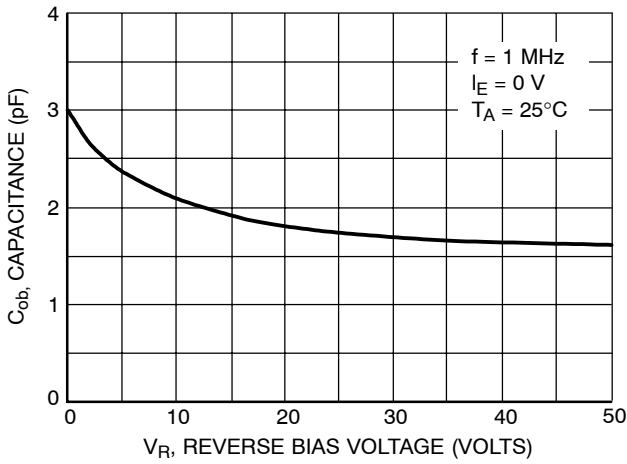


Figure 10. Output Capacitance

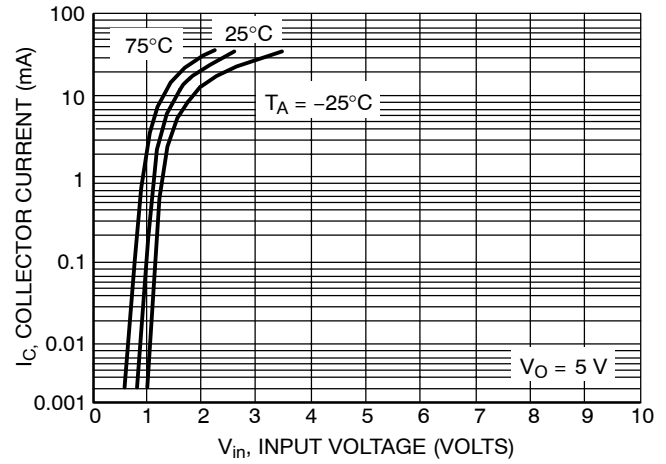


Figure 11. Output Current vs. Input Voltage

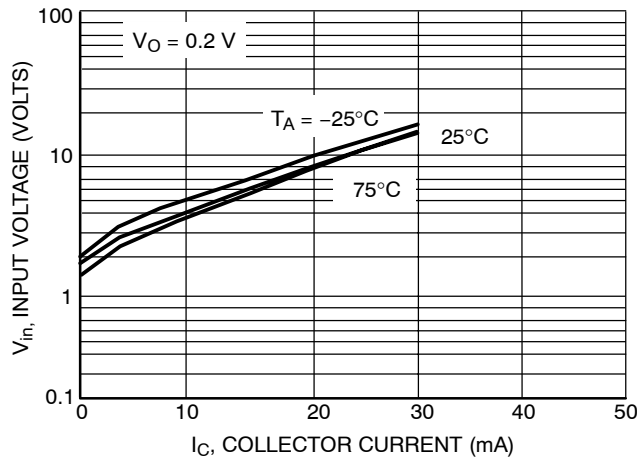


Figure 12. Input Voltage vs. Output Current

MUN2111T1 Series

TYPICAL ELECTRICAL CHARACTERISTICS – MUN2113T1

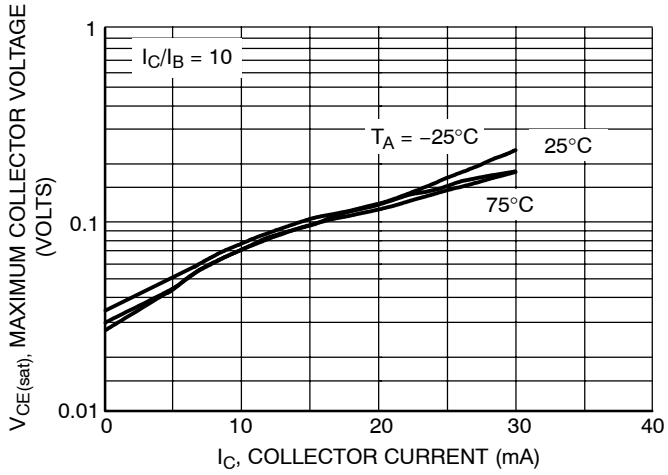


Figure 13. $V_{CE(sat)}$ vs. I_C

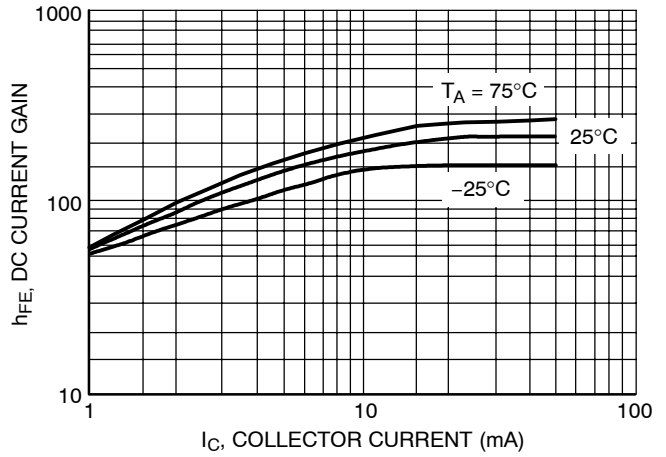


Figure 14. DC Current Gain

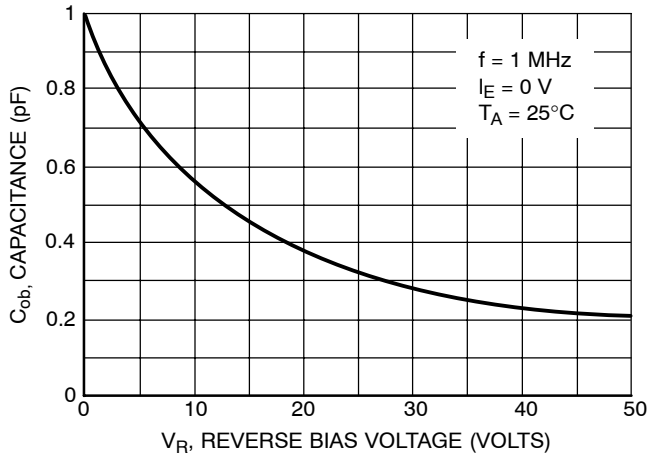


Figure 15. Output Capacitance

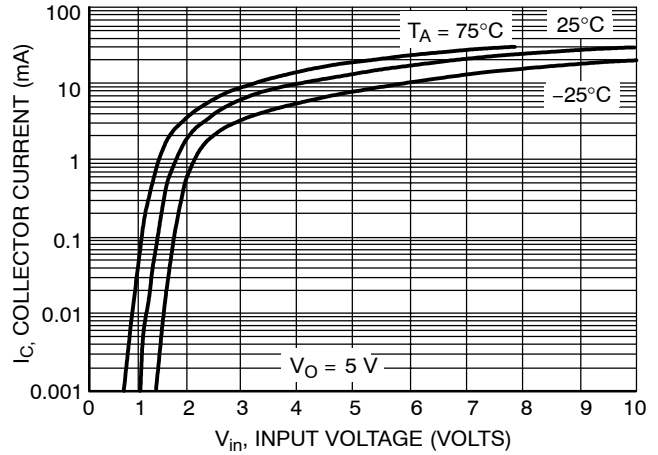


Figure 16. Output Current vs. Input Voltage

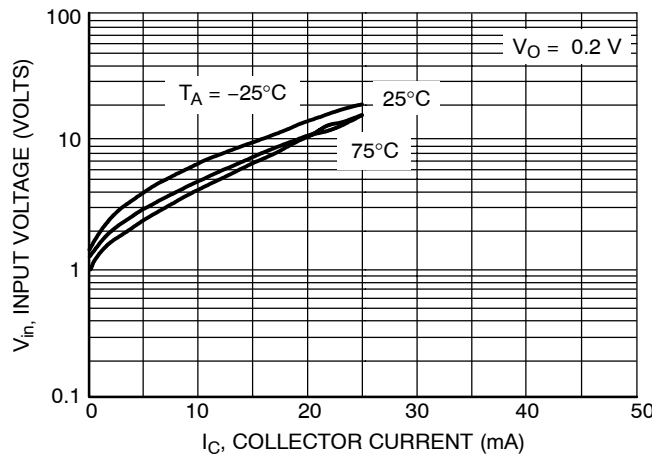


Figure 17. Input Voltage vs. Output Current

MUN2111T1 Series

TYPICAL ELECTRICAL CHARACTERISTICS – MUN2114T1

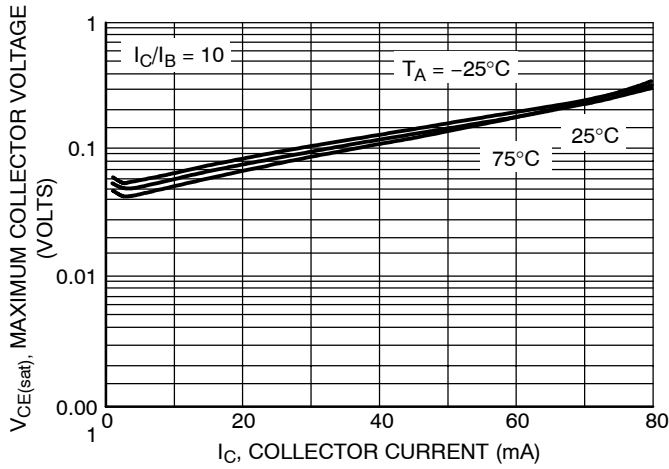


Figure 18. $V_{CE(sat)}$ vs. I_C

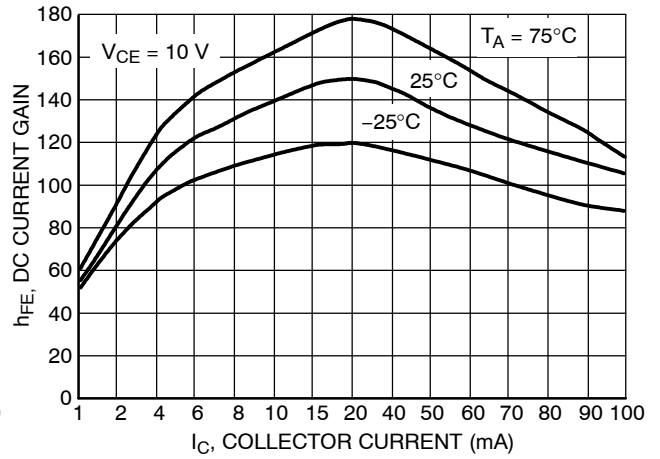


Figure 19. DC Current Gain

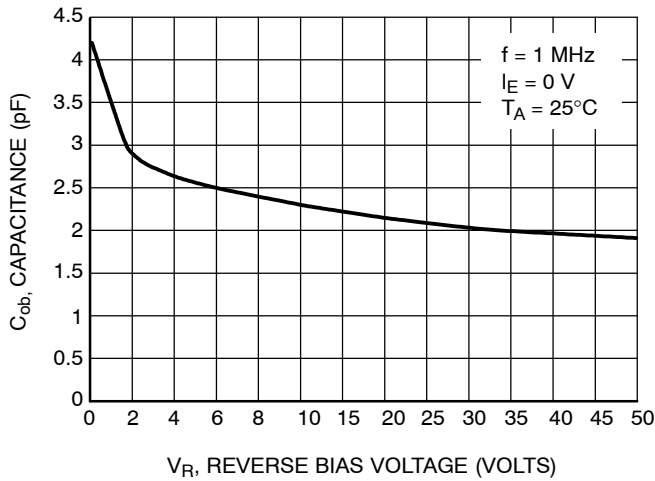


Figure 20. Output Capacitance

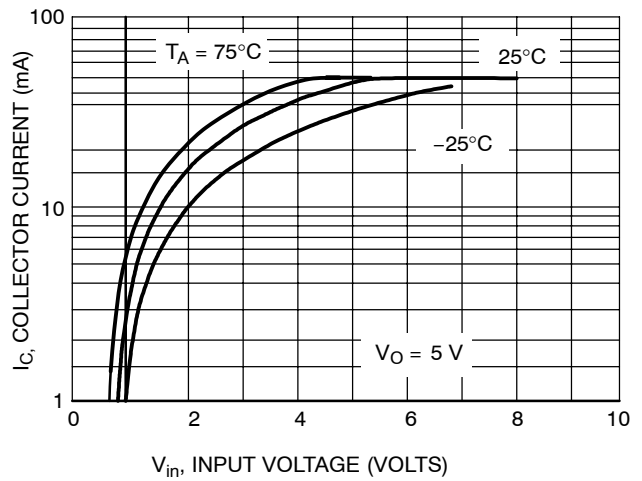


Figure 21. Output Current vs. Input Voltage

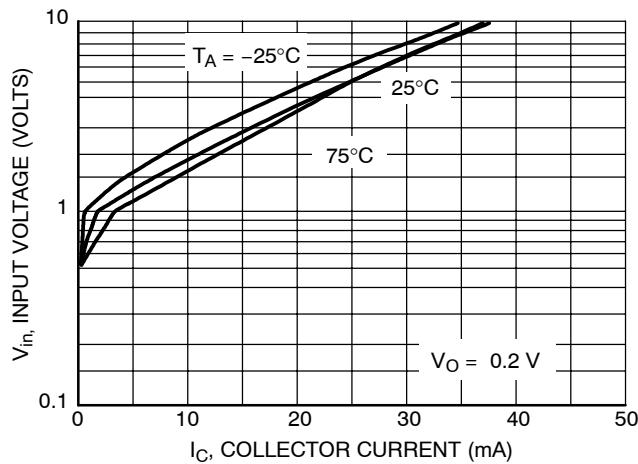


Figure 22. Input Voltage vs. Output Current

MUN2111T1 Series

TYPICAL ELECTRICAL CHARACTERISTICS – MUN2131T1

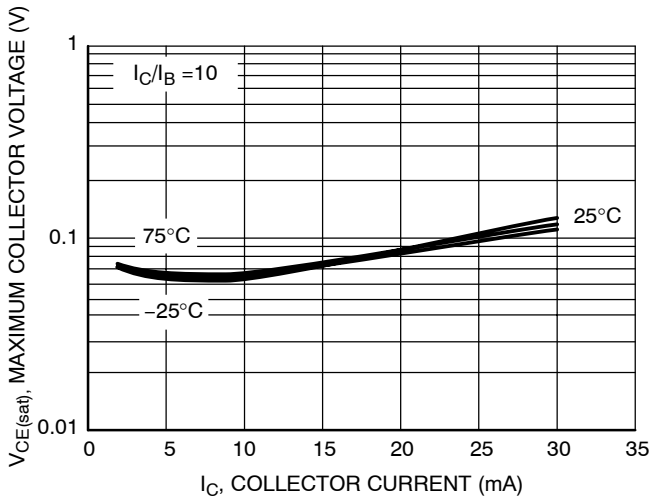


Figure 23. $V_{CE(sat)}$ vs. I_C

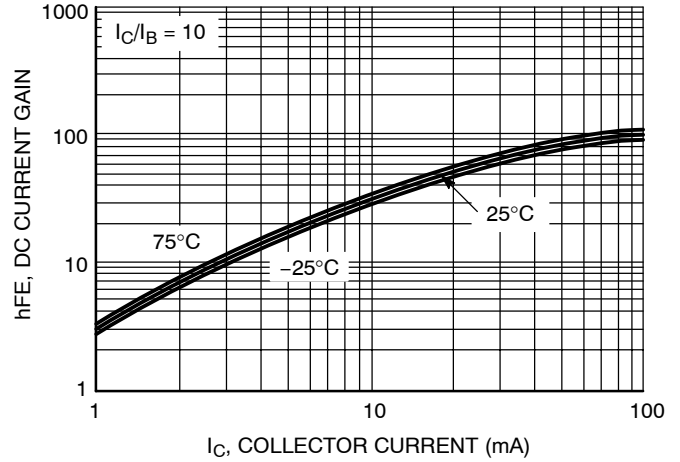


Figure 24. DC Current Gain

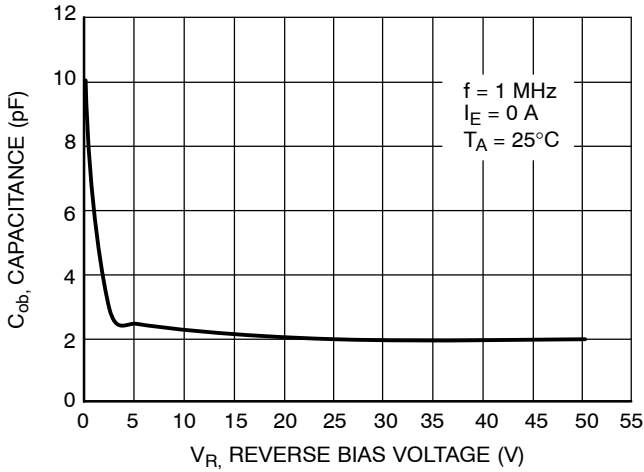


Figure 25. Output Capacitance

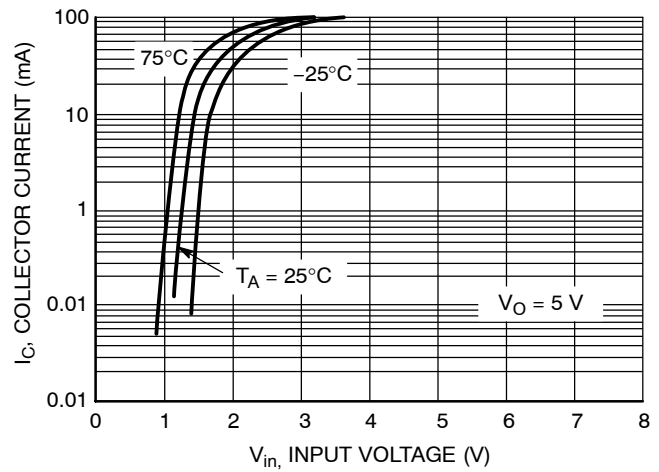


Figure 26. Output Current vs. Input Voltage

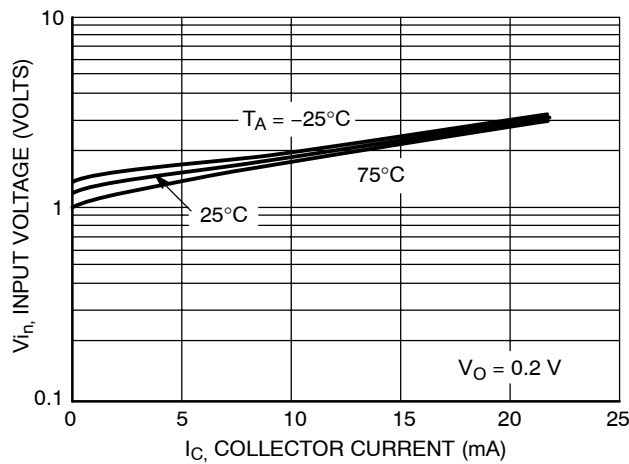


Figure 27. Input Voltage vs. Output Current

MUN2111T1 Series

TYPICAL ELECTRICAL CHARACTERISTICS — MUN2136T1

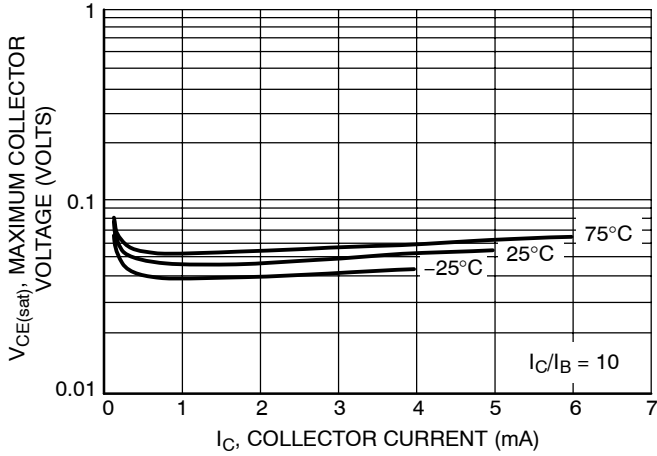


Figure 28. Maximum Collector Voltage vs. Collector Current

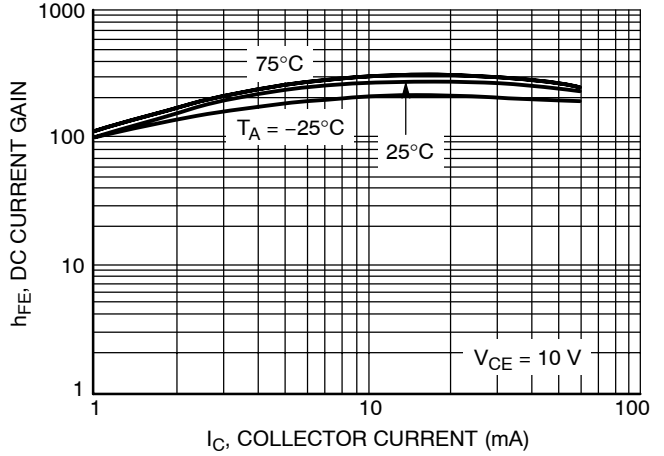


Figure 29. DC Current Gain

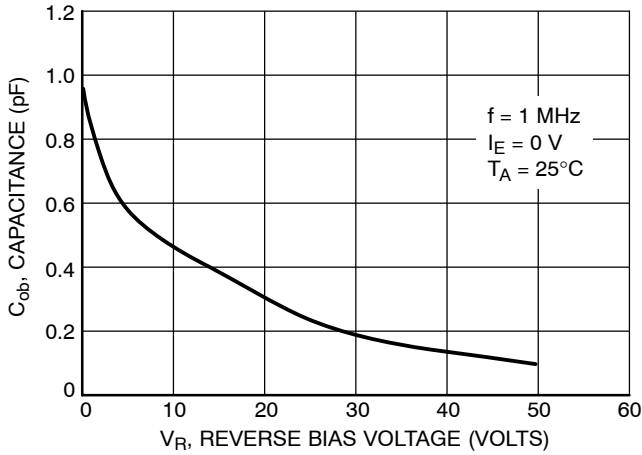


Figure 30. Output Capacitance

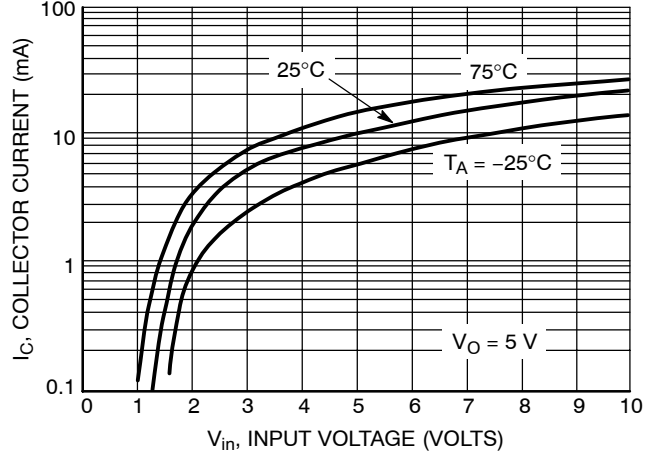


Figure 31. Output Current vs. Input Voltage

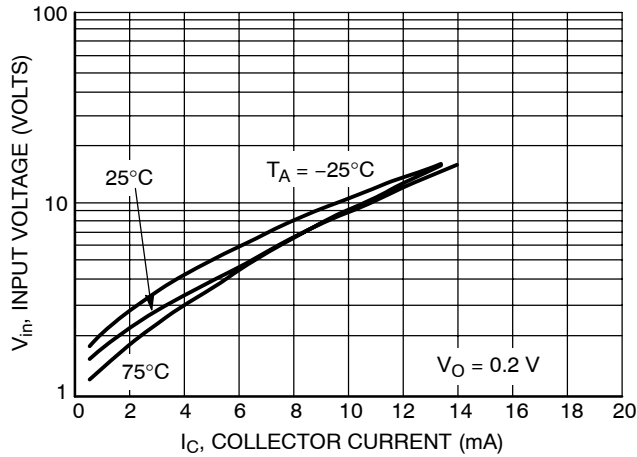


Figure 32. Input Voltage vs. Output Current

MUN2111T1 Series

TYPICAL ELECTRICAL CHARACTERISTICS — MUN2137T1

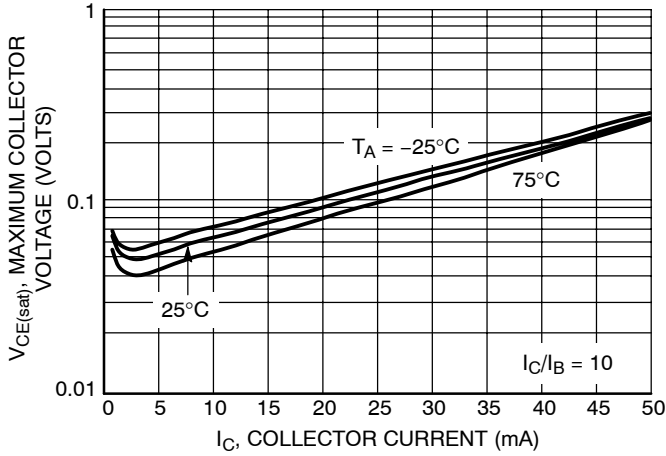


Figure 33. Maximum Collector Voltage vs. Collector Current

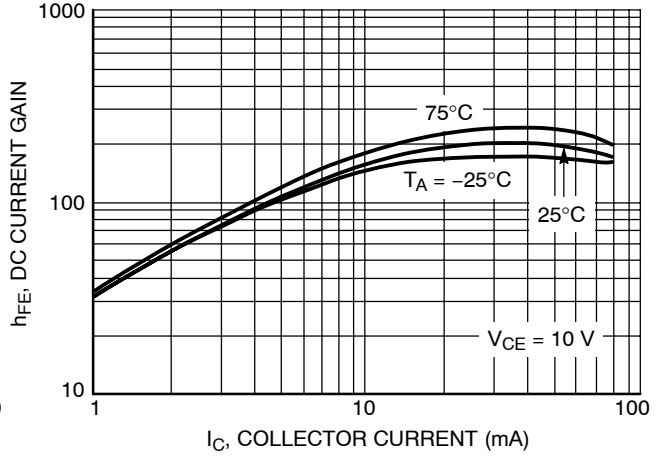


Figure 34. DC Current Gain

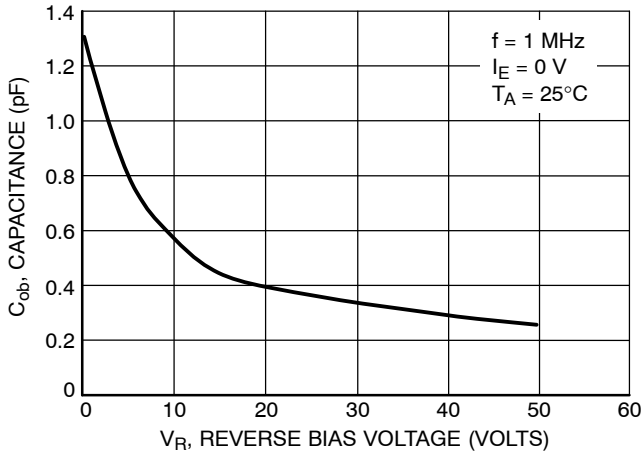


Figure 35. Output Capacitance

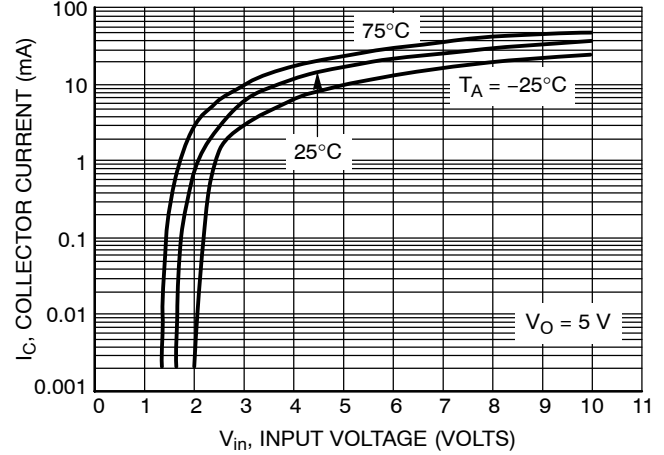


Figure 36. Output Current vs. Input Voltage

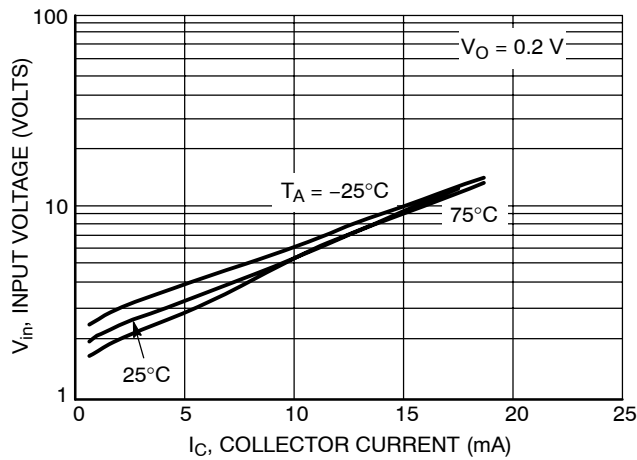
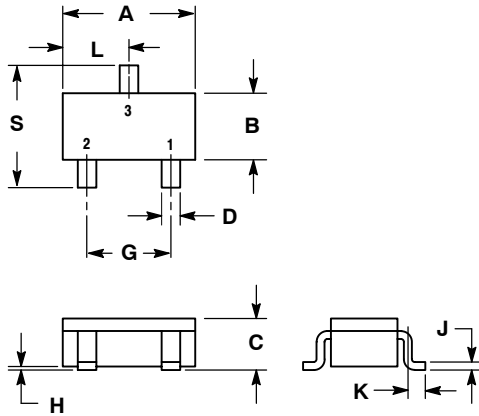


Figure 37. Input Voltage vs. Output Current

MUN2111T1 Series

PACKAGE DIMENSIONS

SC-59
CASE 318D-04
ISSUE F



NOTES:

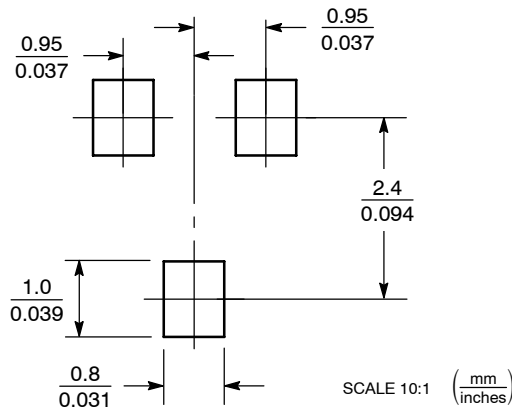
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.

| DIM | MILLIMETERS | | INCHES | |
|-----|-------------|-------|--------|--------|
| | MIN | MAX | MIN | MAX |
| A | 2.70 | 3.10 | 0.1063 | 0.1220 |
| B | 1.30 | 1.70 | 0.0512 | 0.0669 |
| C | 1.00 | 1.30 | 0.0394 | 0.0511 |
| D | 0.35 | 0.50 | 0.0138 | 0.0196 |
| G | 1.70 | 2.10 | 0.0670 | 0.0826 |
| H | 0.013 | 0.100 | 0.0005 | 0.0040 |
| J | 0.09 | 0.18 | 0.0034 | 0.0070 |
| K | 0.20 | 0.60 | 0.0079 | 0.0236 |
| L | 1.25 | 1.65 | 0.0493 | 0.0649 |
| S | 2.50 | 3.00 | 0.0985 | 0.1181 |


STYLE 1:

- PIN 1. EMITTER
2. BASE
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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