

UMC2NT1G, NSVUMC2NT1G, UMC3NT1G, NSVUMC3NT1G, UMC5NT1G, NSVUMC5NT2G

Dual Common Base-Collector Bias Resistor Transistors

NPN and PNP Silicon Surface Mount Transistors with Monolithic Bias Resistor 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. These digital transistors are designed to replace a single device and its external resistor bias network. The BRT eliminates these individual components by integrating them into a single device. In the UMC2NT1G series, two complementary BRT devices are housed in the SOT-353 package which is ideal for low power surface mount applications where board space is at a premium.

Features

- Simplifies Circuit Design
- Reduces Board Space
- Reduces Component Count
- Available in 8 mm, 7 inch/3000 Unit Tape and Reel
- AEC-Q101 Qualified and PPAP Capable
- NSV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant*

MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$ unless otherwise noted, common for Q_1 and Q_2 , - minus sign for Q_1 (PNP) omitted)

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

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.

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



ON Semiconductor®

<http://onsemi.com>



SC-88A/SOT-353
CASE 419A
STYLE 6



MARKING DIAGRAM



Ux = Device Marking
x = 2, 3 or 5
M = Date Code
▪ = Pb-Free Package

(Note: Microdot may be in either location)

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 4 of this data sheet.

UMC2NT1G, NSVUMC2NT1G, UMC3NT1G, NSVUMC3NT1G, UMC5NT1G, NSVUMC5NT2G

MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$ unless otherwise noted, common for Q_1 and Q_2 , – minus sign for Q_1 (PNP) omitted)

| Rating | Symbol | Value | Unit |
|---|-----------------|-------------|---------------------------|
| THERMAL CHARACTERISTICS | | | |
| Thermal Resistance – Junction-to-Ambient (surface mounted) | $R_{\theta JA}$ | 833 | $^\circ\text{C}/\text{W}$ |
| Operating and Storage Temperature Range | T_J, T_{stg} | -65 to +150 | $^\circ\text{C}$ |
| Total Package Dissipation @ $T_A = 25^\circ\text{C}$ (Note 1) | P_D | 150 | mW |

1. Device mounted on a FR-4 glass epoxy printed circuit board using the minimum recommended footprint.

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

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

Q1 TRANSISTOR: PNP

OFF CHARACTERISTICS

| | | | | | |
|---|-----------|---|---|-------------------|------|
| Collector-Base Cutoff Current ($V_{CB} = 50\text{ V}, I_E = 0$) | I_{CBO} | – | – | 100 | nAdc |
| Collector-Emitter Cutoff Current ($V_{CE} = 50\text{ V}, I_B = 0$) | I_{CEO} | – | – | 500 | nAdc |
| Emitter-Base Cutoff Current ($V_{EB} = 6.0, I_C = 0\text{ mA}$) UMC2NT1G, NSVUMC2NT1G UMC3NT1G, NSVUMC3NT1G UMC5NT1G/T2G, NSVUMC5NT2G | I_{EBO} | – | – | 0.2 0.5 1.0 | mAdc |

ON CHARACTERISTICS

| | | | | | |
|---|---------------|--------------------|--------------------|--------------------|------------|
| Collector-Base Breakdown Voltage ($I_C = 10\ \mu\text{A}, I_E = 0$) | $V_{(BR)CBO}$ | 50 | – | – | Vdc |
| Collector-Emitter Breakdown Voltage ($I_C = 2.0\text{ mA}, I_B = 0$) | $V_{(BR)CEO}$ | 50 | – | – | Vdc |
| DC Current Gain ($V_{CE} = 10\text{ V}, I_C = 5.0\text{ mA}$) UMC2NT1G, NSVUMC2NT1G UMC3NT1G, NSVUMC3NT1G UMC5NT1G/T2G, NSVUMC5NT2G | h_{FE} | 60 35 20 | 100 60 35 | – – – | |
| Collector-Emitter Saturation Voltage ($I_C = 10\text{ mA}, I_B = 0.3\text{ mA}$) | $V_{CE(SAT)}$ | – | – | 0.25 | Vdc |
| Output Voltage (on) ($V_{CC} = 5.0\text{ V}, V_B = 2.5\text{ V}, R_L = 1.0\text{ k}\Omega$) | V_{OL} | – | – | 0.2 | Vdc |
| Output Voltage (off) ($V_{CC} = 5.0\text{ V}, V_B = 0.5\text{ V}, R_L = 1.0\text{ k}\Omega$) | V_{OH} | 4.9 | – | – | Vdc |
| Input Resistor UMC2NT1G UMC3NT1G UMC5NT1G/T2G | R1 | 15.4 7.0 3.3 | 22 10 4.7 | 28.6 13 6.1 | k Ω |
| Resistor Ratio UMC2NT1G UMC3NT1G UMC5NT1G/T2G | R1/R2 | 0.8 0.8 0.38 | 1.0 1.0 0.47 | 1.2 1.2 0.56 | |

**UMC2NT1G, NSVUMC2NT1G, UMC3NT1G, NSVUMC3NT1G, UMC5NT1G,
NSVUMC5NT2G**

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

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

**Q2 TRANSISTOR: NPN
OFF CHARACTERISTICS**

| | | | | | |
|--|-----------|---|---|-----|------|
| Collector-Base Cutoff Current ($V_{CB} = 50\text{ V}$, $I_E = 0$) | I_{CBO} | - | - | 100 | nAdc |
| Collector-Emitter Cutoff Current ($V_{CE} = 50\text{ V}$, $I_B = 0$) | I_{CEO} | - | - | 500 | nAdc |
| Emitter-Base Cutoff Current ($V_{EB} = 6.0$, $I_C = 0\text{ mA}$) | I_{EBO} | | | | mAdc |
| UMC2NT1G | | - | - | 0.2 | |
| UMC3NT1G | | - | - | 0.5 | |
| UMC5NT1G/T2G | | - | - | 0.1 | |

ON CHARACTERISTICS

| | | | | | |
|---|---------------|------|-----|------|------------------|
| Collector-Base Breakdown Voltage ($I_C = 10\ \mu\text{A}$, $I_E = 0$) | $V_{(BR)CBO}$ | 50 | - | - | Vdc |
| Collector-Emitter Breakdown Voltage ($I_C = 2.0\text{ mA}$, $I_B = 0$) | $V_{(BR)CEO}$ | 50 | - | - | Vdc |
| DC Current Gain ($V_{CE} = 10\text{ V}$, $I_C = 5.0\text{ mA}$) | h_{FE} | | | | |
| UMC2NT1G | | 60 | 100 | - | |
| UMC3NT1G | | 35 | 60 | - | |
| UMC5NT1G/T2G | | 80 | 140 | - | |
| Collector-Emitter Saturation Voltage ($I_C = 10\text{ mA}$, $I_B = 0.3\text{ mA}$) | $V_{CE(SAT)}$ | - | - | 0.25 | Vdc |
| Output Voltage (on) ($V_{CC} = 5.0\text{ V}$, $V_B = 2.5\text{ V}$, $R_L = 1.0\text{ k}\Omega$) | V_{OL} | - | - | 0.2 | Vdc |
| Output Voltage (off) ($V_{CC} = 5.0\text{ V}$, $V_B = 0.5\text{ V}$, $R_L = 1.0\text{ k}\Omega$) | V_{OH} | 4.9 | - | - | Vdc |
| Input Resistor | R1 | | | | $\text{k}\Omega$ |
| UMC2NT1G | | 15.4 | 22 | 28.6 | |
| UMC3NT1G | | 7.0 | 10 | 13 | |
| UMC5NT1G/T2G | | 33 | 47 | 61 | |
| Resistor Ratio | R1/R2 | | | | |
| UMC2NT1G | | 0.8 | 1.0 | 1.2 | |
| UMC3NT1G | | 0.8 | 1.0 | 1.2 | |
| UMC5NT1G/T2G | | 0.8 | 1.0 | 1.2 | |

UMC2NT1G, NSVUMC2NT1G, UMC3NT1G, NSVUMC3NT1G, UMC5NT1G, NSVUMC5NT2G

ORDERING INFORMATION

| Device | Package | Shipping† |
|-------------|-----------------------------|---------------------|
| UMC2NT1G | SC-88A/SOT-353 (Pb-Free) | 3,000 / Tape & Reel |
| NSVUMC2NT1G | SC-88A/SOT-353 (Pb-Free) | 3,000 / Tape & Reel |
| UMC3NT1G | SC-88A/SOT-353 (Pb-Free) | 3,000 / Tape & Reel |
| NSVUMC3NT1G | SC-88A/SOT-353 (Pb-Free) | 3,000 / Tape & Reel |
| UMC3NT2G | SC-88A/SOT-353 (Pb-Free) | 3,000 / Tape & Reel |
| UMC5NT1G | SC-88A/SOT-353 (Pb-Free) | 3,000 / Tape & Reel |
| UMC5NT2G | SC-88A/SOT-353 (Pb-Free) | 3,000 / Tape & Reel |
| NSVUMC5NT2G | SC-88A/SOT-353 (Pb-Free) | 3,000 / 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.

DEVICE MARKING AND RESISTOR VALUES

| Device | Marking | Transistor 1 - PNP | | Transistor 2 - NPN | |
|-----------------------|---------|--------------------|--------|--------------------|--------|
| | | R1 (K) | R2 (K) | R1 (K) | R2 (K) |
| UMC2NT1G, NSVUMC2NT1G | U2 | 22 | 22 | 22 | 22 |
| UMC3NT1G, NSVUMC3NT1G | U3 | 10 | 10 | 10 | 10 |
| UMC3NT2G | U3 | 10 | 10 | 10 | 10 |
| UMC5NT1G | U5 | 4.7 | 10 | 47 | 47 |
| UMC5NT2G, NSVUMC5NT2G | U5 | 4.7 | 10 | 47 | 47 |

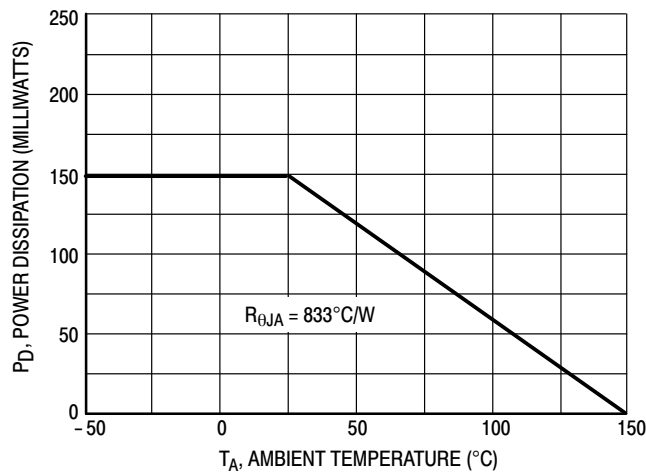


Figure 1. Derating Curve

**UMC2NT1G, NSVUMC2NT1G, UMC3NT1G, NSVUMC3NT1G, UMC5NT1G,
NSVUMC5NT2G**

TYPICAL ELECTRICAL CHARACTERISTICS — UMC2NT1G, NSVUMC2NT1G PNP TRANSISTOR



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

UMC2NT1G, NSVUMC2NT1G, UMC3NT1G, NSVUMC3NT1G, UMC5NT1G, NSVUMC5NT2G

TYPICAL ELECTRICAL CHARACTERISTICS — UMC2NT1G, NSVUMC2NT1G NPN TRANSISTOR



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

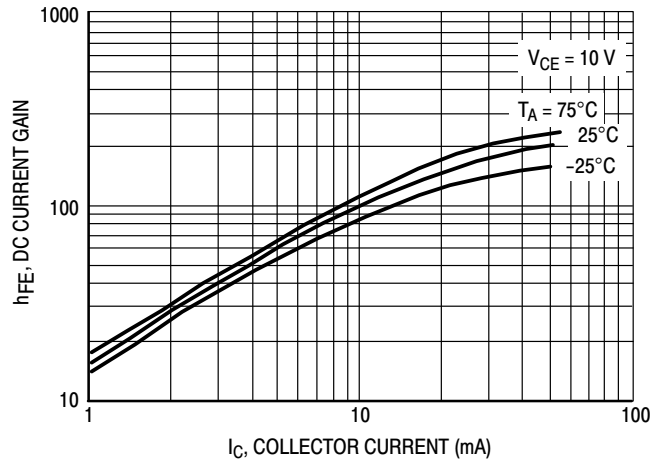


Figure 8. DC Current Gain



Figure 9. Output Capacitance

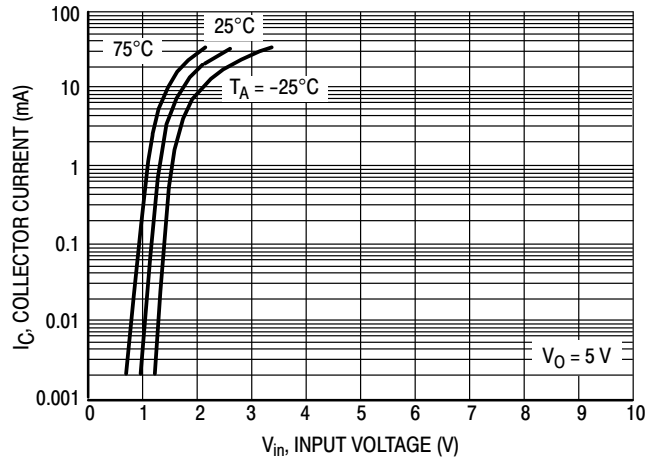


Figure 10. Output Current versus Input Voltage

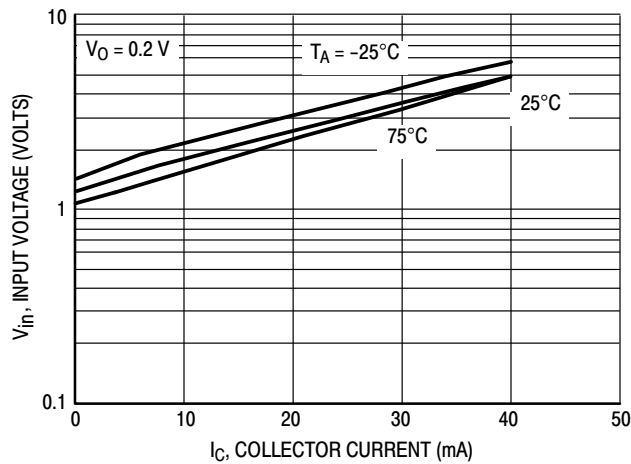


Figure 11. Input Voltage versus Output Current

UMC2NT1G, NSVUMC2NT1G, UMC3NT1G, NSVUMC3NT1G, UMC5NT1G, NSVUMC5NT2G

TYPICAL ELECTRICAL CHARACTERISTICS — UMC3NT1G PNP TRANSISTOR

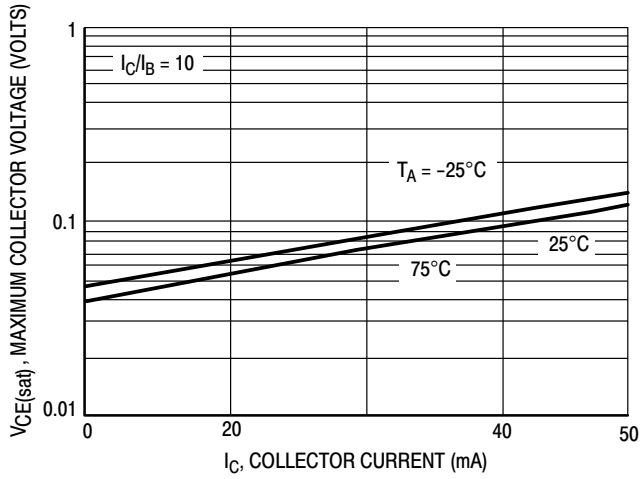


Figure 12. $V_{CE(sat)}$ versus I_C

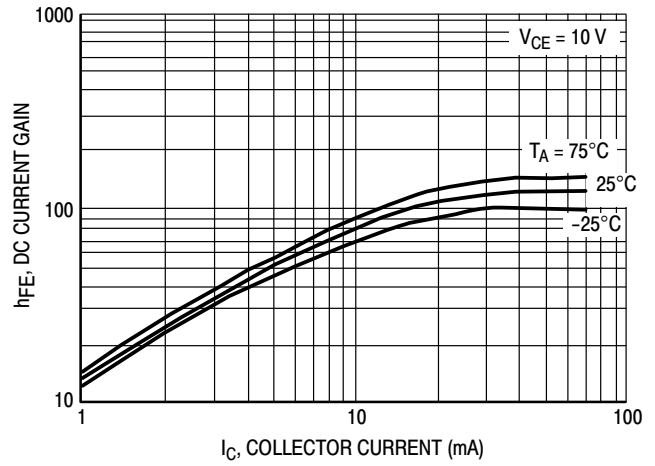


Figure 13. DC Current Gain

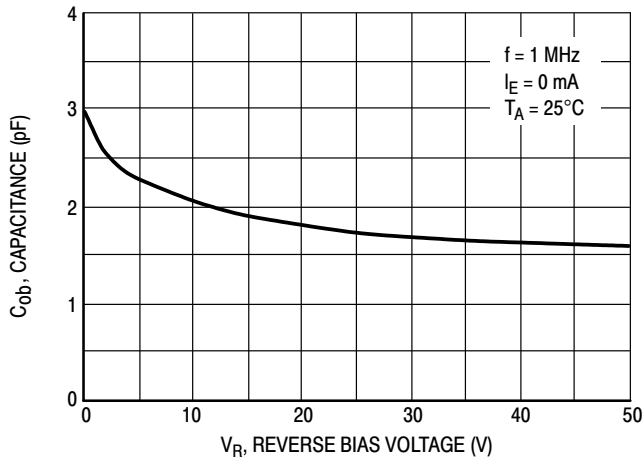


Figure 14. Output Capacitance

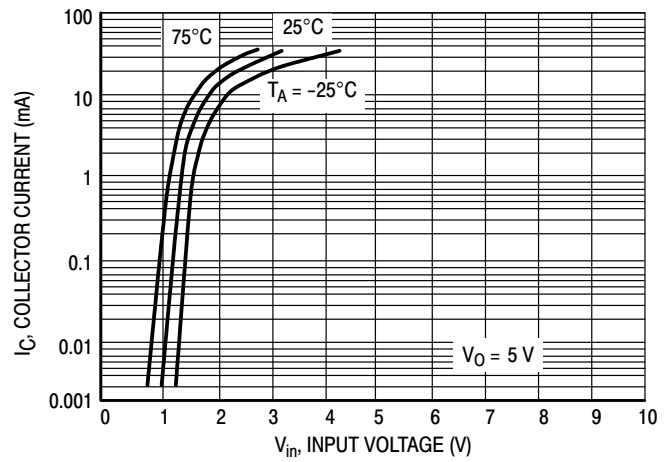


Figure 15. Output Current versus Input Voltage

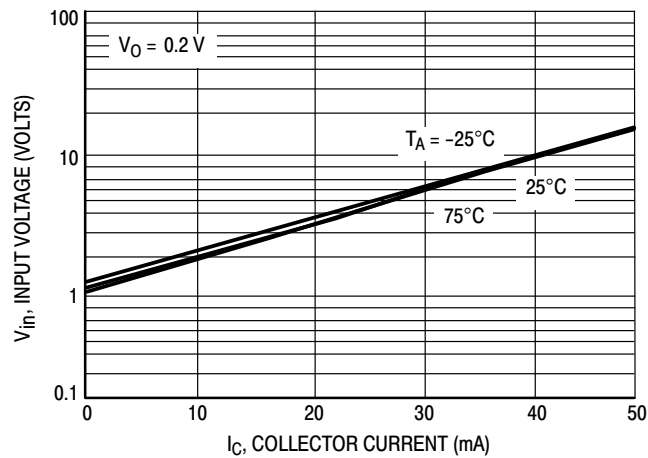


Figure 16. Input Voltage versus Output Current

UMC2NT1G, NSVUMC2NT1G, UMC3NT1G, NSVUMC3NT1G, UMC5NT1G, NSVUMC5NT2G

TYPICAL ELECTRICAL CHARACTERISTICS — UMC3NT1G NPN TRANSISTOR

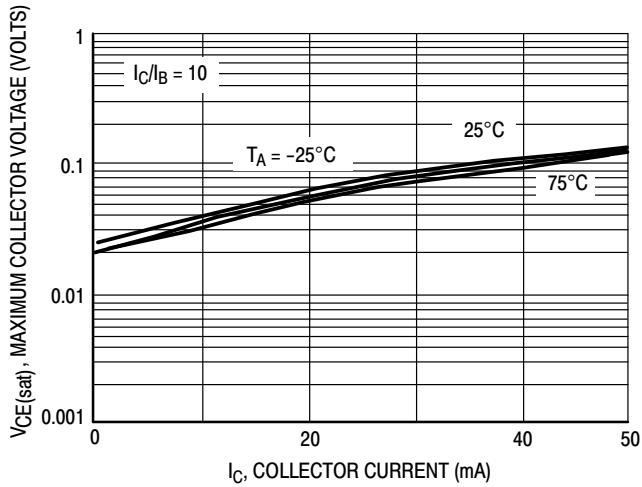


Figure 17. $V_{CE(sat)}$ versus I_C

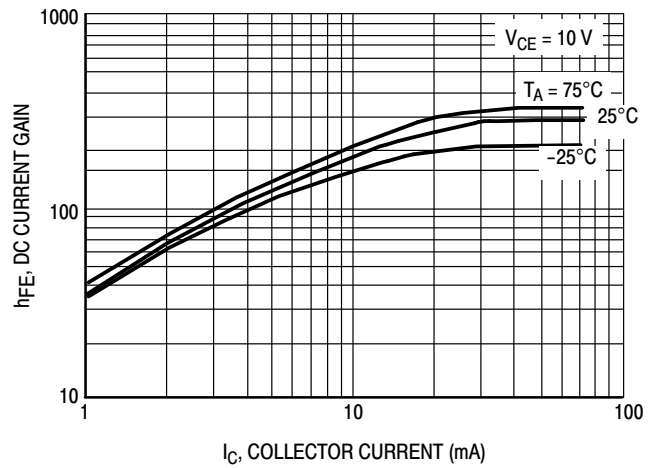


Figure 18. DC Current Gain

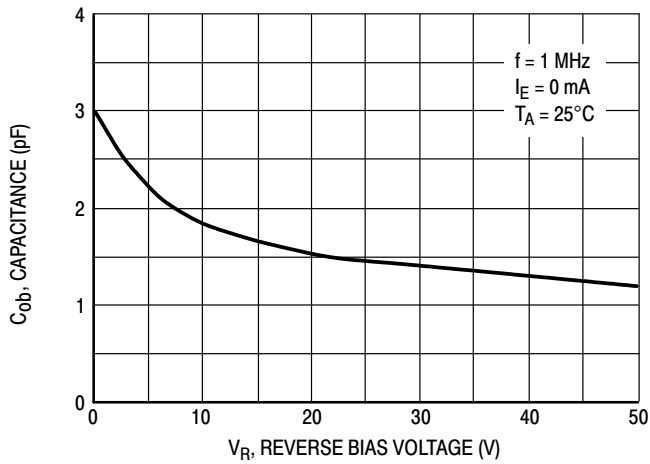


Figure 19. Output Capacitance

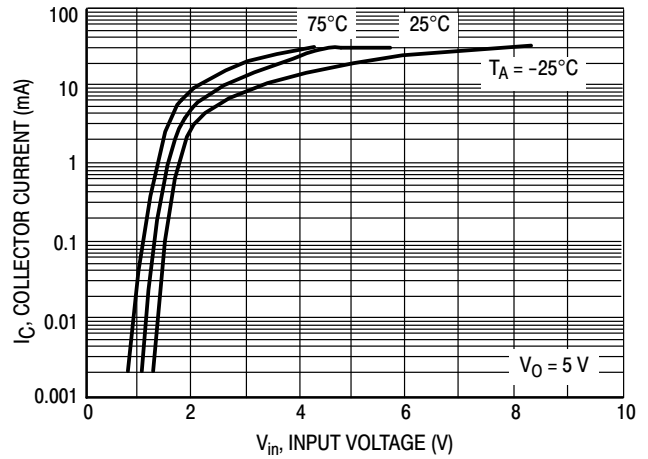


Figure 20. Output Current versus Input Voltage



Figure 21. Input Voltage versus Output Current

UMC2NT1G, NSVUMC2NT1G, UMC3NT1G, NSVUMC3NT1G, UMC5NT1G, NSVUMC5NT2G

TYPICAL ELECTRICAL CHARACTERISTICS — UMC5NT1G PNP TRANSISTOR



Figure 22. $V_{CE(sat)}$ versus I_C

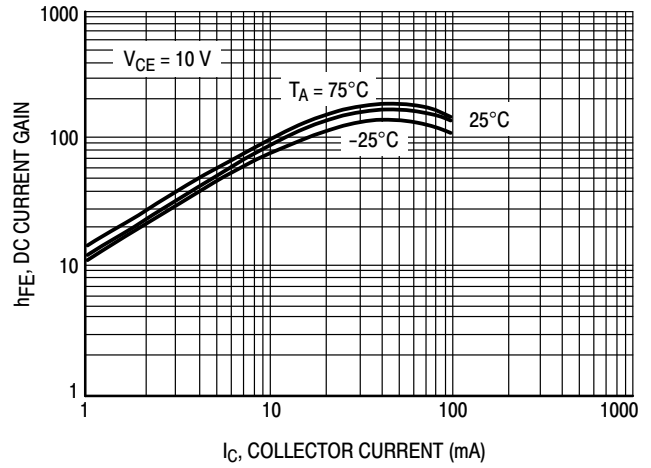


Figure 23. DC Current Gain



Figure 24. Output Capacitance

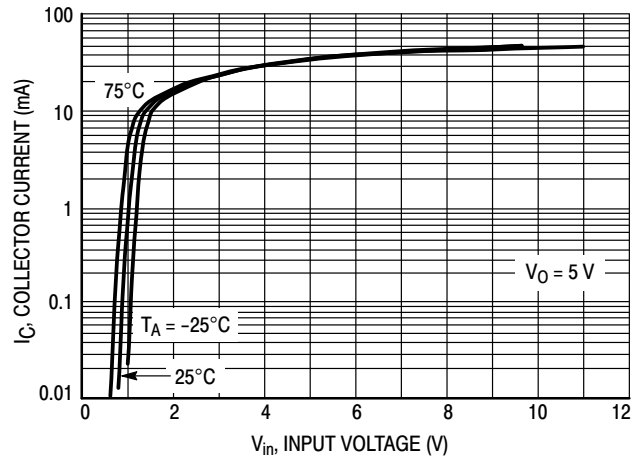


Figure 25. Output Current versus Input Voltage

UMC2NT1G, NSVUMC2NT1G, UMC3NT1G, NSVUMC3NT1G, UMC5NT1G, NSVUMC5NT2G

TYPICAL ELECTRICAL CHARACTERISTICS — UMC5NT1G NPN TRANSISTOR

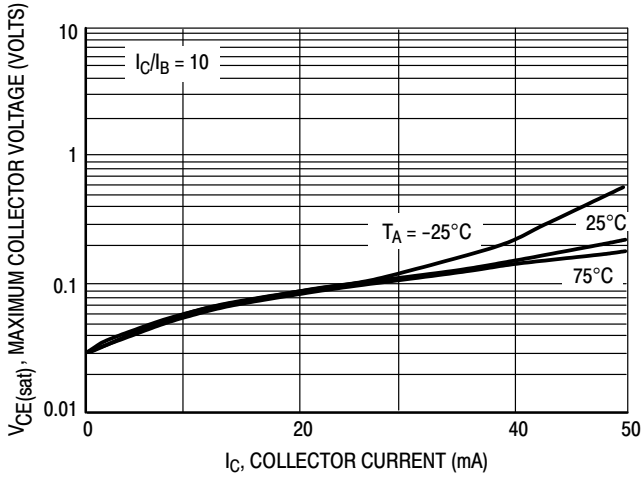


Figure 26. $V_{CE(sat)}$ versus I_C

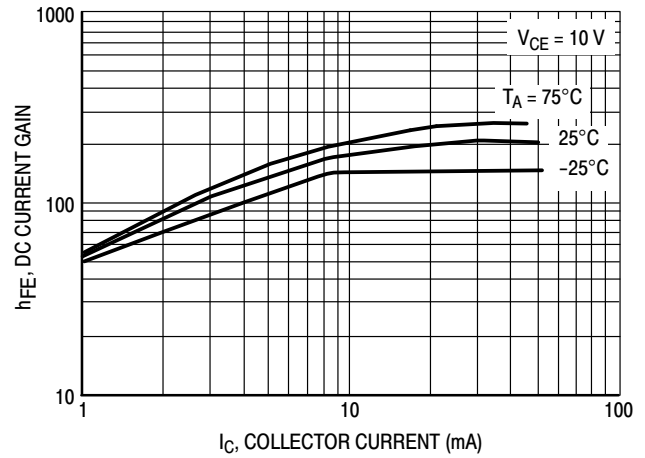


Figure 27. DC Current Gain



Figure 28. Output Capacitance



Figure 29. Output Current versus Input Voltage



Figure 30. Input Voltage versus Output Current

UMC2NT1G, NSVUMC2NT1G, UMC3NT1G, NSVUMC3NT1G, UMC5NT1G, NSVUMC5NT2G

PACKAGE DIMENSIONS

SC-88A (SC-70-5/SOT-353)
CASE 419A-02
ISSUE K



NOTES:

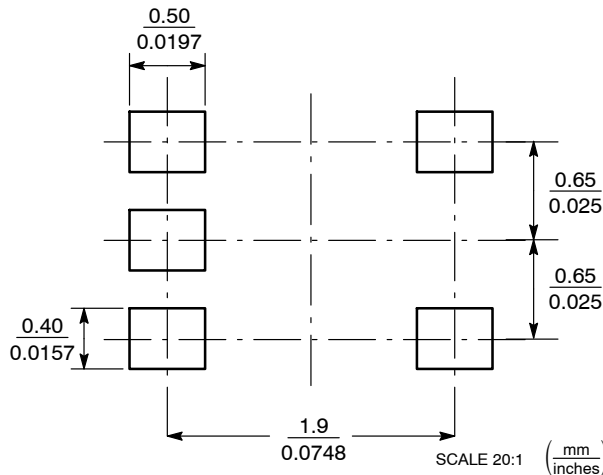
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. 419A-01 OBSOLETE. NEW STANDARD 419A-02.
4. DIMENSIONS A AND B DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

| 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 | 0.031 | 0.043 | 0.80 | 1.10 |
| D | 0.004 | 0.012 | 0.10 | 0.30 |
| G | 0.026 BSC | | 0.65 BSC | |
| H | --- | 0.004 | --- | 0.10 |
| J | 0.004 | 0.010 | 0.10 | 0.25 |
| K | 0.004 | 0.012 | 0.10 | 0.30 |
| N | 0.008 REF | | 0.20 REF | |
| S | 0.079 | 0.087 | 2.00 | 2.20 |

STYLE 6:

- PIN 1. EMITTER 2
- BASE 2
- EMITTER 1
- COLLECTOR
- COLLECTOR 2/BASE 1

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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