



# THE DATASHEET OF UMC2NT1



# Dual Common Base-Collector Bias Resistor Transistors

NPN and PNP Silicon Surface Mount  
 Transistors with Monolithic Bias  
 Resistor Network

## UMC2NT1G, NSVUMC2NT1G, UMC3NT1G, NSVUMC3NT1G, UMC5NT1G/T2G, NSVUMC5NT1G/T2G

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

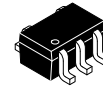
- Simplifies Circuit Design
- Reduces Board Space
- Reduces Component Count
- Available in 8 mm, 7 inch/3000 Unit Tape and Reel
- NSV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb-Free, Halogen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

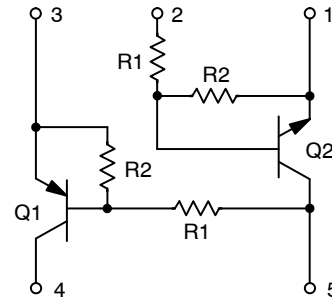
Rating	Symbol	Value	Unit
Collector-Base Voltage	$V_{CBO}$	50	Vdc
Collector-Emitter Voltage	$V_{CEO}$	50	Vdc
Collector Current	$I_C$	100	mAdc

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

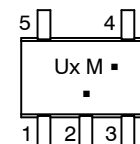
\*For additional information on our Pb-Free strategy and soldering details, please download the **onsemi** Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.



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/T2G, NSVUMC5NT1G/T2G

**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
<b>THERMAL CHARACTERISTICS</b>			
Thermal Resistance – Junction-to-Ambient (surface mounted)	$R_{\theta JA}$	833	$^\circ\text{C/W}$
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
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## 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, NSVUMC5NT1G/T2G	$I_{EBO}$	–	–	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, NSVUMC5NT1G/T2G	$h_{FE}$	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 $\Omega$
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/T2G,  
NSVUMC5NT1G/T2G**

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

Characteristic	Symbol	Min	Typ	Max	Unit
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**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 ( $V_{EB} = 6.0$ , $I_C = 0\text{ mA}$ ) UMC2NT1G UMC3NT1G UMC5NT1G/T2G	$I_{EBO}$	- - -	- - -	0.2 0.5 0.1	mAdc

**ON CHARACTERISTICS**

Collector-Base Breakdown Voltage ( $I_C = 10\text{ }\mu\text{A}$ , $I_E = 0$ )	$V_{(BR)CBO}$	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 UMC3NT1G UMC5NT1G/T2G	$h_{FE}$	60 35 80	100 60 140	- - -	
Collector-Emitter Saturation Voltage ( $I_C = 10\text{ mA}$ , $I_B = 0.3\text{ mA}$ )	$V_{CE(SAT)}$	-	-	0.25	Vdc
Output Voltage (on) ( $V_{CC} = 5.0\text{ V}$ , $V_B = 3.5\text{ V}$ , $R_L = 1.0\text{ k}\Omega$ )	$V_{OL}$	-	-	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 33	22 10 47	28.6 13 61	k $\Omega$
Resistor Ratio UMC2NT1G UMC3NT1G UMC5NT1G/T2G	R1/R2	0.8 0.8 0.8	1.0 1.0 1.0	1.2 1.2 1.2	

# UMC2NT1G, NSVUMC2NT1G, UMC3NT1G, NSVUMC3NT1G, UMC5NT1G/T2G, NSVUMC5NT1G/T2G

## ORDERING INFORMATION

Device	Package	Shipping <sup>†</sup>
UMC2NT1G, NSVUMC2NT1G*	SC-88A/SOT-353 (Pb-Free)	3,000 / Tape & Reel
UMC3NT1G, NSVUMC3NT1G*	SC-88A/SOT-353 (Pb-Free)	3,000 / Tape & Reel
UMC3NT2G	SC-88A/SOT-353 (Pb-Free)	3,000 / Tape & Reel
UMC5NT1G, NSVUMC5NT1G*	SC-88A/SOT-353 (Pb-Free)	3,000 / Tape & Reel
UMC5NT2G, 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.

\*NSV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable.

## 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, NSVUMC5NT1G	U5	4.7	10	47	47
UMC5NT2G, NSVUMC5NT2G	U5	4.7	10	47	47

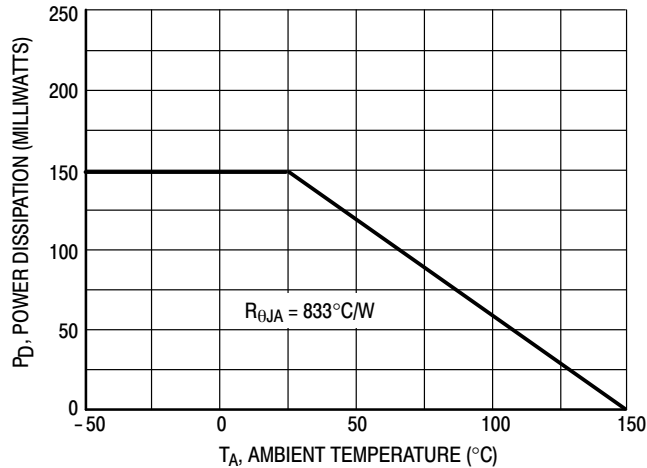


Figure 1. Derating Curve

UMC2NT1G, NSVUMC2NT1G, UMC3NT1G, NSVUMC3NT1G, UMC5NT1G/T2G, NSVUMC5NT1G/T2G

TYPICAL ELECTRICAL CHARACTERISTICS — UMC2NT1G, NSVUMC2NT1G PNP TRANSISTOR

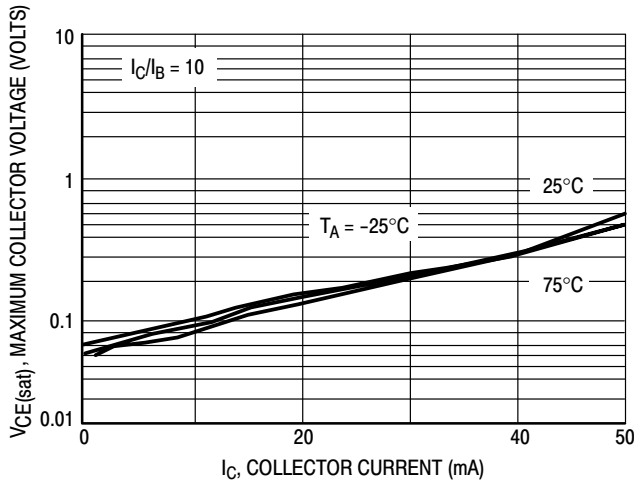


Figure 2.  $V_{CE(sat)}$  versus  $I_C$

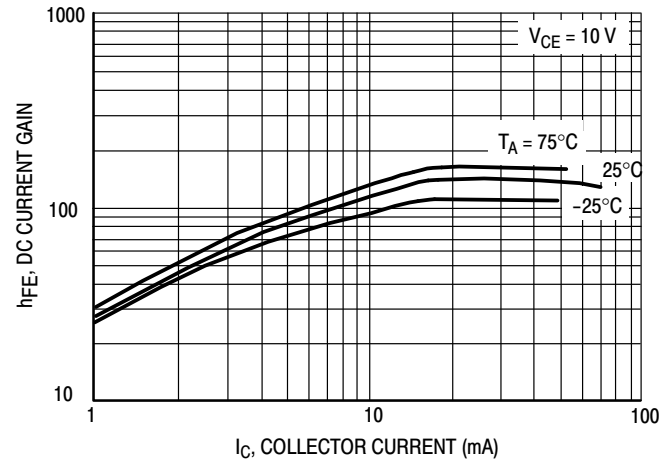


Figure 3. DC Current Gain

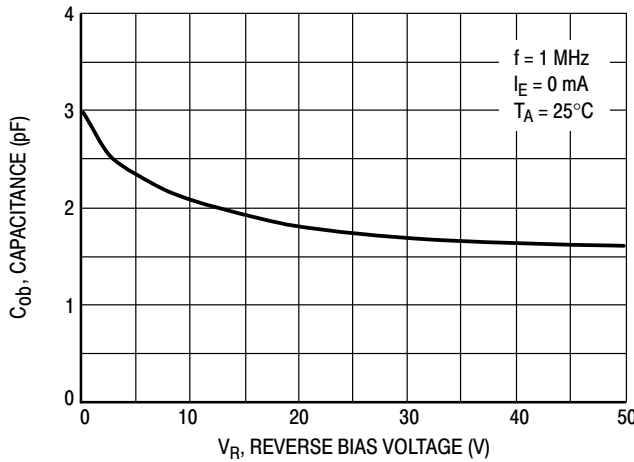


Figure 4. Output Capacitance

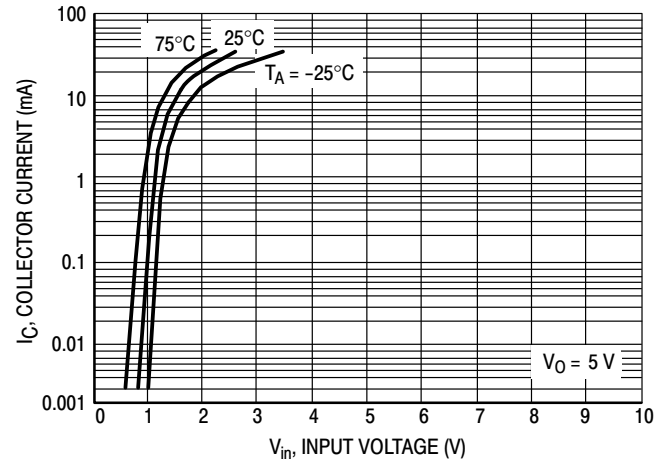


Figure 5. Output Current versus Input Voltage

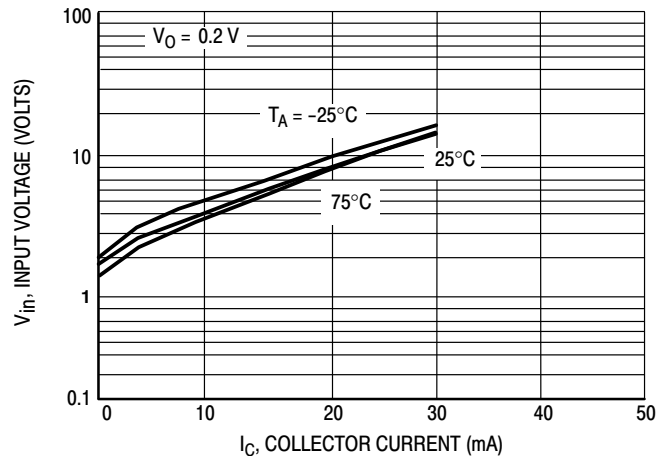


Figure 6. Input Voltage versus Output Current

UMC2NT1G, NSVUMC2NT1G, UMC3NT1G, NSVUMC3NT1G, UMC5NT1G/T2G, NSVUMC5NT1G/T2G

TYPICAL ELECTRICAL CHARACTERISTICS — UMC2NT1G, NSVUMC2NT1G NPN TRANSISTOR

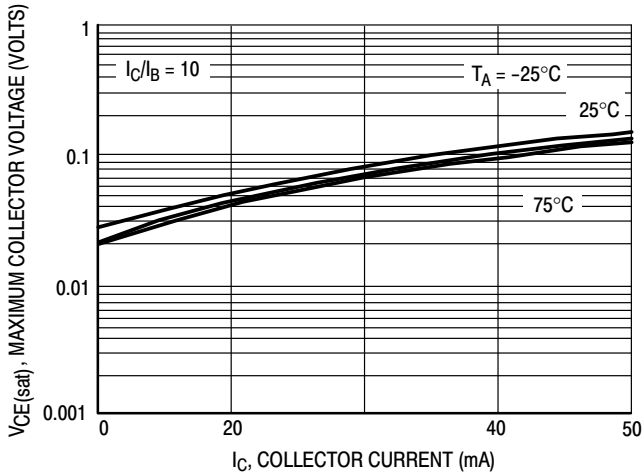


Figure 7.  $V_{CE(sat)}$  versus  $I_C$

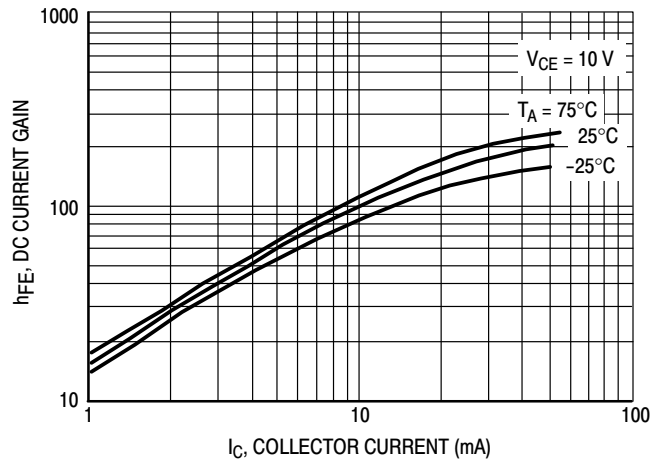


Figure 8. DC Current Gain

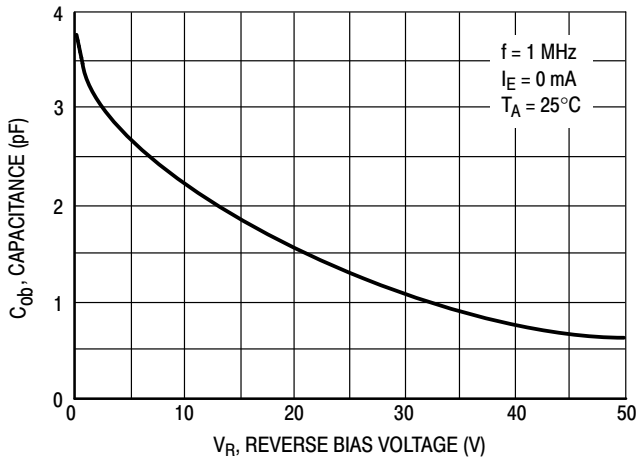


Figure 9. Output Capacitance

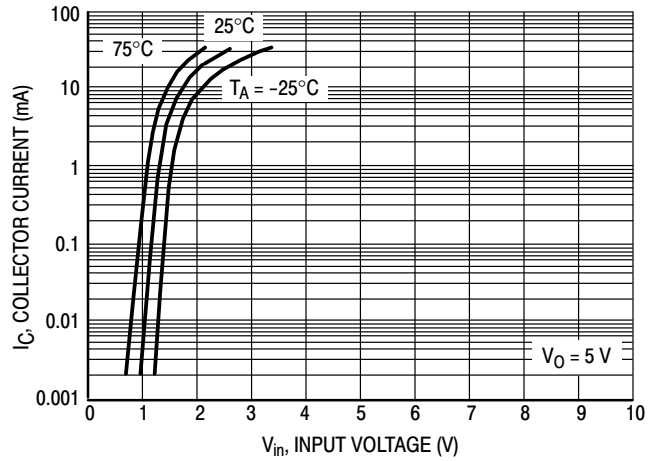


Figure 10. Output Current versus Input Voltage

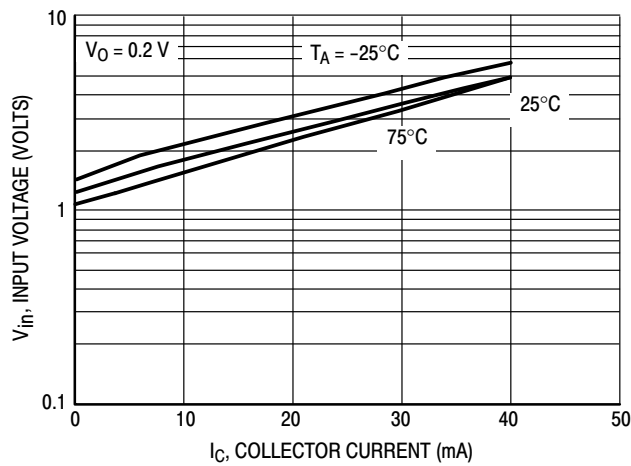


Figure 11. Input Voltage versus Output Current

UMC2NT1G, NSVUMC2NT1G, UMC3NT1G, NSVUMC3NT1G, UMC5NT1G/T2G, NSVUMC5NT1G/T2G

TYPICAL ELECTRICAL CHARACTERISTICS — UMC3NT1G PNP TRANSISTOR

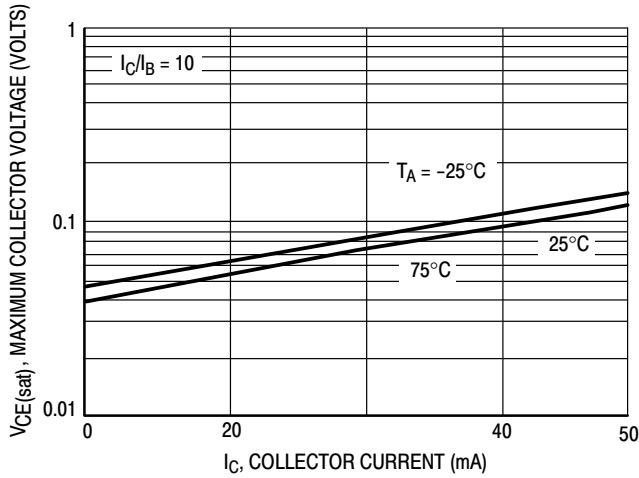


Figure 12.  $V_{CE(sat)}$  versus  $I_C$

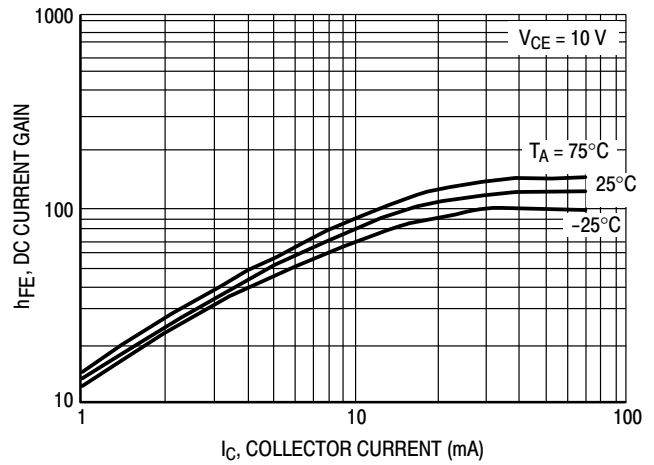


Figure 13. DC Current Gain

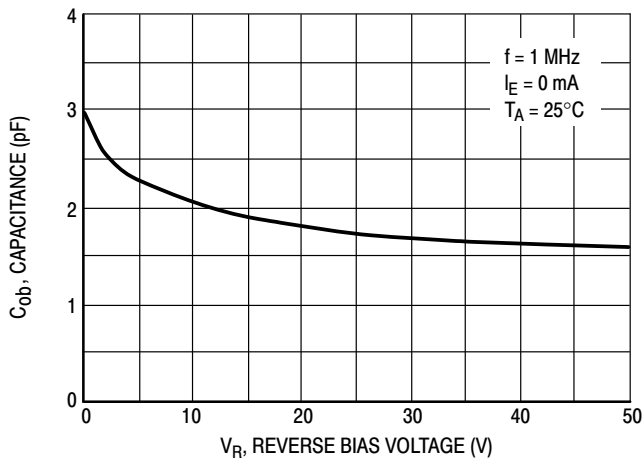


Figure 14. Output Capacitance

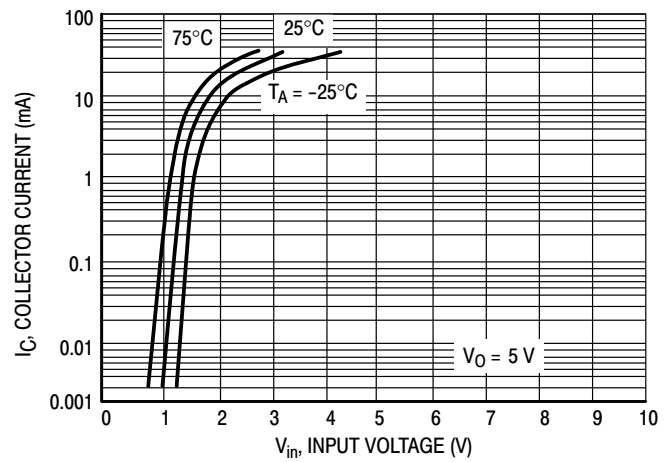


Figure 15. Output Current versus Input Voltage

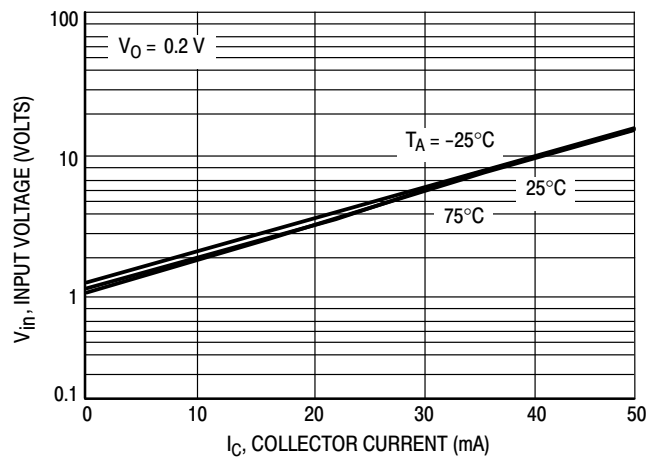


Figure 16. Input Voltage versus Output Current

UMC2NT1G, NSVUMC2NT1G, UMC3NT1G, NSVUMC3NT1G, UMC5NT1G/T2G,  
NSVUMC5NT1G/T2G

TYPICAL ELECTRICAL CHARACTERISTICS — UMC3NT1G NPN TRANSISTOR

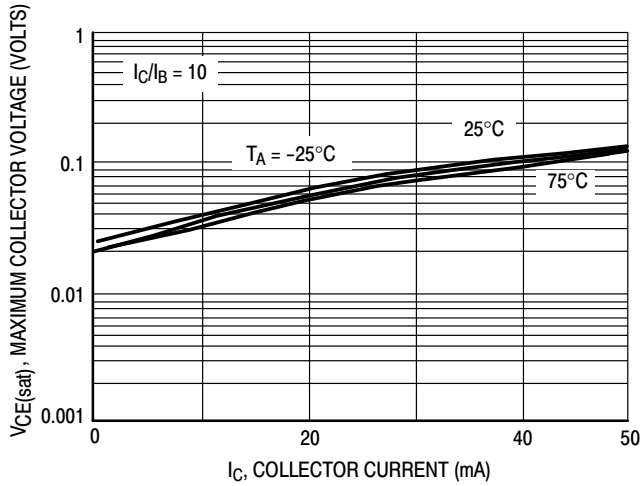


Figure 17.  $V_{CE(sat)}$  versus  $I_C$

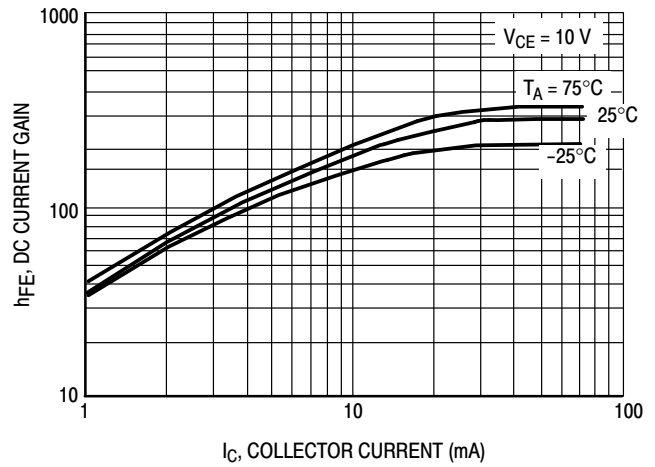


Figure 18. DC Current Gain

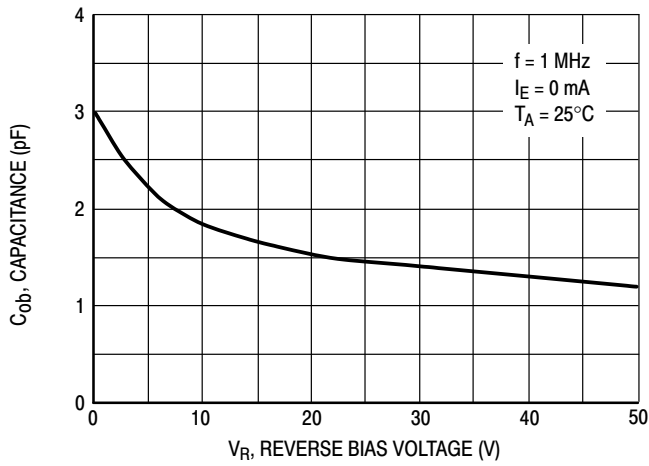


Figure 19. Output Capacitance

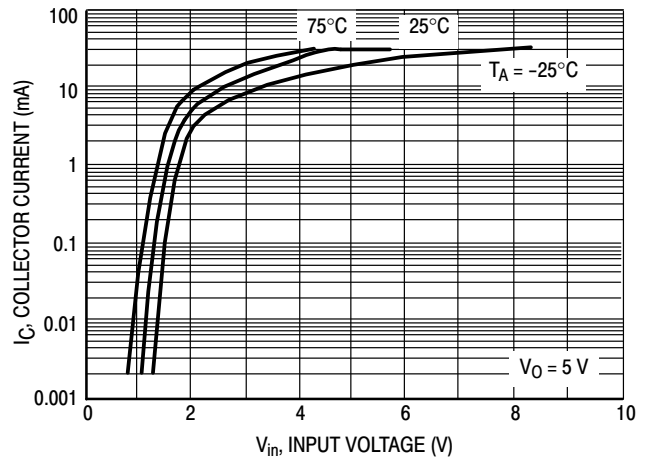


Figure 20. Output Current versus Input Voltage

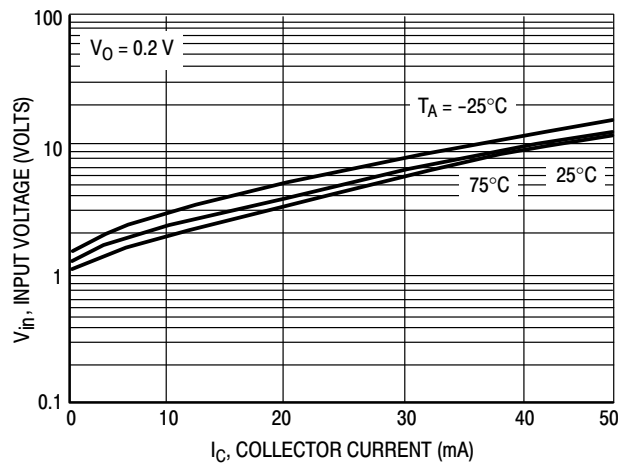


Figure 21. Input Voltage versus Output Current

UMC2NT1G, NSVUMC2NT1G, UMC3NT1G, NSVUMC3NT1G, UMC5NT1G/T2G,  
NSVUMC5NT1G/T2G

TYPICAL ELECTRICAL CHARACTERISTICS — UMC5NT1G PNP TRANSISTOR

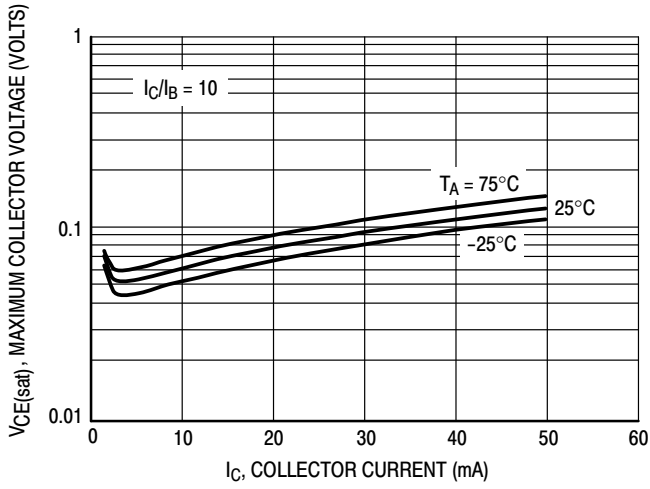


Figure 22.  $V_{CE(sat)}$  versus  $I_C$

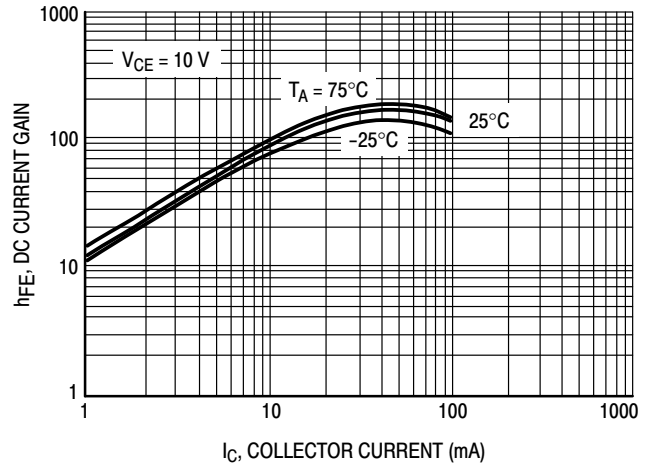


Figure 23. DC Current Gain

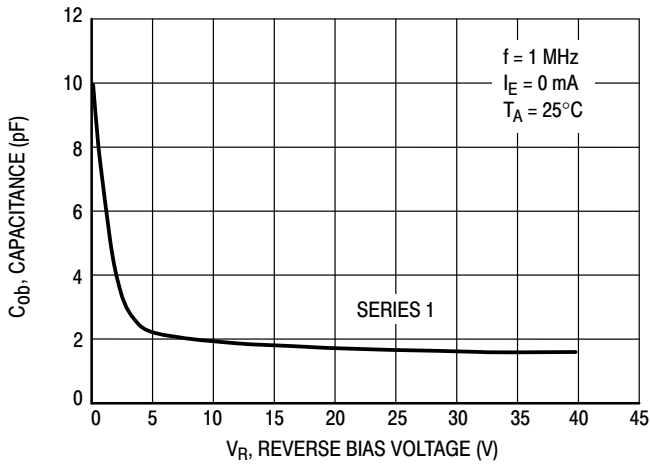


Figure 24. Output Capacitance

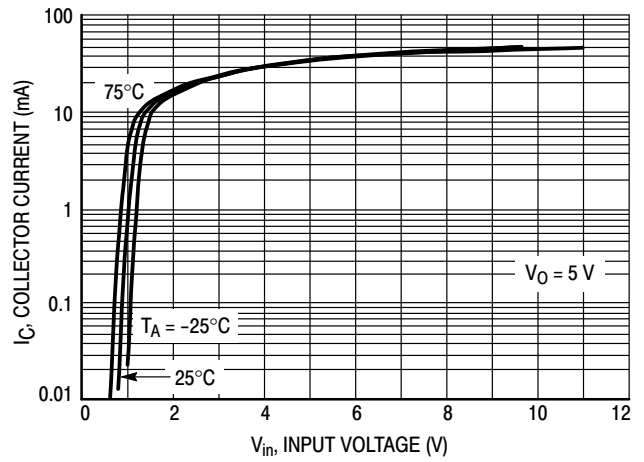


Figure 25. Output Current versus Input Voltage

UMC2NT1G, NSVUMC2NT1G, UMC3NT1G, NSVUMC3NT1G, UMC5NT1G/T2G,  
NSVUMC5NT1G/T2G

TYPICAL ELECTRICAL CHARACTERISTICS — UMC5NT1G NPN TRANSISTOR

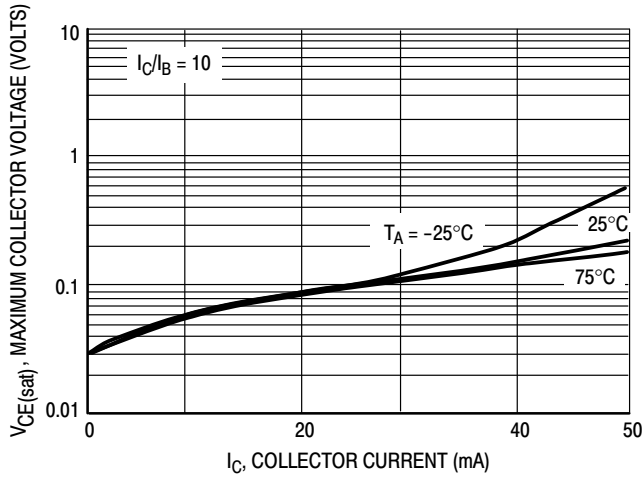


Figure 26.  $V_{CE(sat)}$  versus  $I_C$

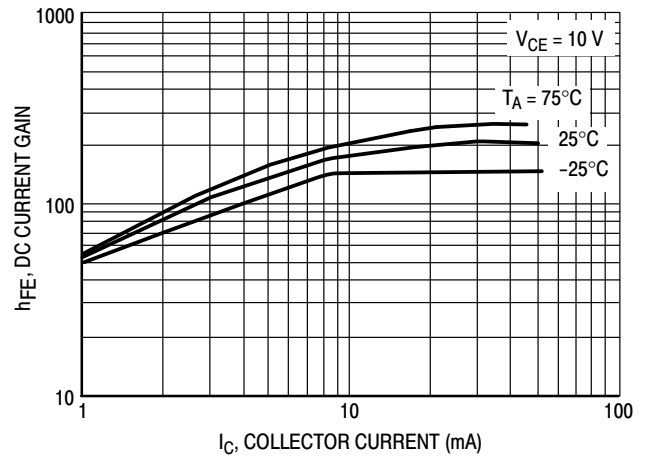


Figure 27. DC Current Gain

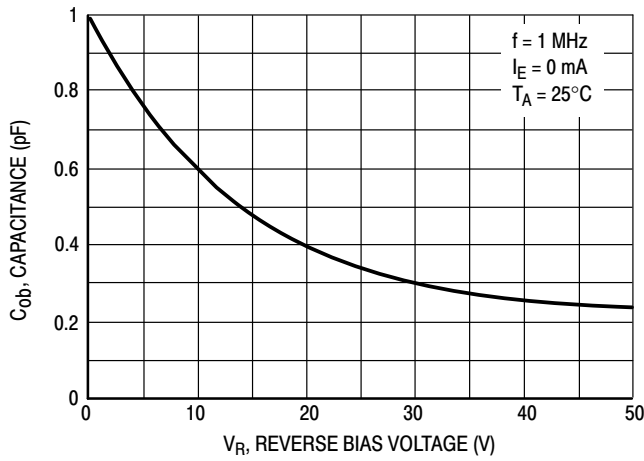


Figure 28. Output Capacitance

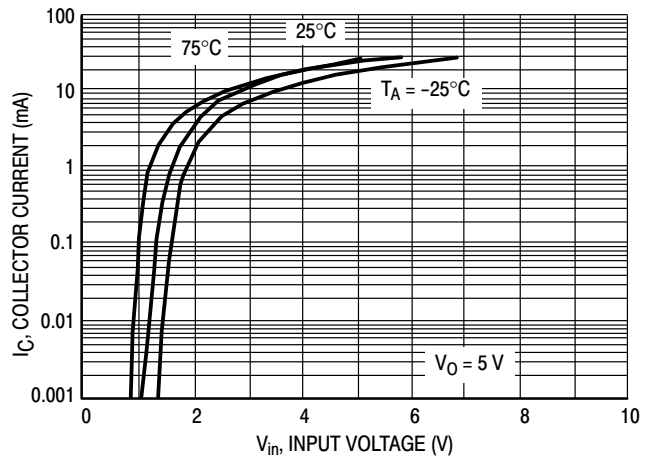


Figure 29. Output Current versus Input Voltage

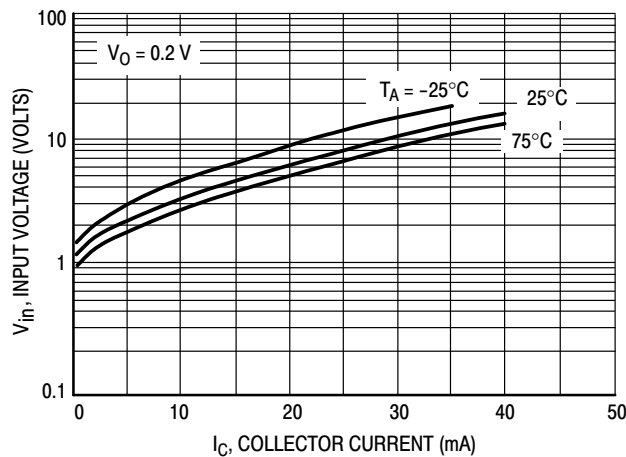


Figure 30. Input Voltage versus Output Current

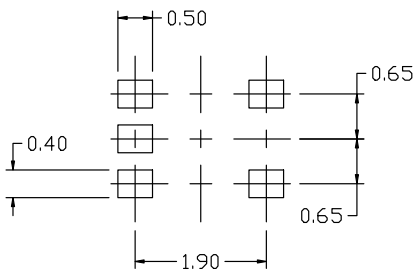
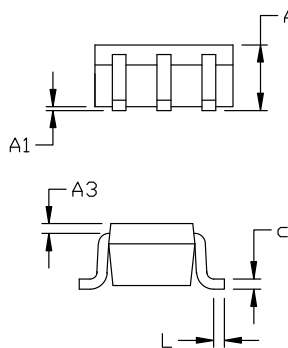
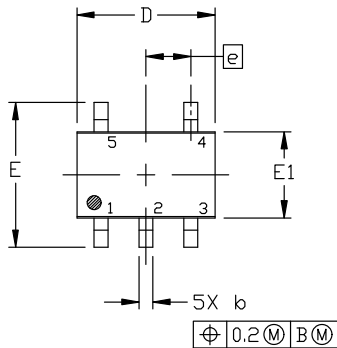
# MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



SCALE 2:1

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

DATE 11 APR 2023



### RECOMMENDED MOUNTING FOOTPRINT

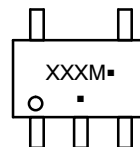
\* For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERM/D.

### NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETERS
3. 419A-01 OBSOLETE. NEW STANDARD 419A-02
4. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.1016MM PER SIDE.

DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.80	0.95	1.10
A1	---	---	0.10
A3	0.20 REF		
b	0.10	0.20	0.30
c	0.10	---	0.25
D	1.80	2.00	2.20
E	2.00	2.10	2.20
E1	1.15	1.25	1.35
e	0.65 BSC		
L	0.10	0.15	0.30

### GENERIC MARKING DIAGRAM\*



\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.

XXX = Specific Device Code

M = Date Code

▪ = Pb-Free Package

(Note: Microdot may be in either location)

#### STYLE 1:

- PIN 1. BASE
- EMITTER
- BASE
- COLLECTOR
- COLLECTOR

#### STYLE 2:

- PIN 1. ANODE
- EMITTER
- BASE
- COLLECTOR
- CATHODE

#### STYLE 3:

- PIN 1. ANODE 1
- N/C
- ANODE 2
- CATHODE 2
- CATHODE 1

#### STYLE 4:

- PIN 1. SOURCE 1
- DRAIN 1/2
- SOURCE 1
- GATE 1
- GATE 2

#### STYLE 5:

- PIN 1. CATHODE
- COMMON ANODE
- CATHODE 2
- CATHODE 3
- CATHODE 4

#### STYLE 6:

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

#### STYLE 7:

- PIN 1. BASE
- EMITTER
- BASE
- COLLECTOR
- COLLECTOR

#### STYLE 8:

- PIN 1. CATHODE
- COLLECTOR
- N/C
- BASE
- EMITTER

#### STYLE 9:

- PIN 1. ANODE
- CATHODE
- ANODE
- ANODE
- ANODE

Note: Please refer to datasheet for style callout. If style type is not called out in the datasheet refer to the device datasheet pinout or pin assignment.

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