

# UMC2NT1, UMC3NT1, UMC5NT1

Preferred Devices

## 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 UMC2NT1 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
- Pb-Free Packages are Available

**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.

#### THERMAL CHARACTERISTICS

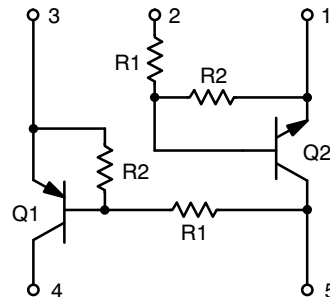
Thermal Resistance - Junction-to-Ambient (surface mounted)	$R_{\theta JA}$	833	$^\circ\text{C/W}$
Operating and Storage Temperature Range	$T_J, T_{stg}$	-65 to +150	$^\circ\text{C}$
Total Package Dissipation @ $T_A = 25^\circ\text{C}$ (Note 1)	$P_D$	150	mW

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



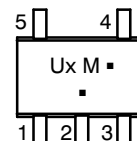
ON Semiconductor®

<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 3 of this data sheet.

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

# UMC2NT1, UMC3NT1, UMC5NT1

## 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 ( $V_{CB} = 50\text{ V}$ , $I_B = 0$ )	$I_{CEO}$	-	-	500	nAdc
Emitter-Base Cutoff Current ( $V_{EB} = 6.0$ , $I_C = 0\text{ mA}$ )	$I_{EBO}$	-	-	0.2	mAdc
	UMC2NT1, G	-	-	0.5	
	UMC3NT1, G	-	-	1.0	
	UMC5NT1, G / T2, G	-	-		

#### 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 ( $V_{CE} = 10\text{ V}$ , $I_C = 5.0\text{ mA}$ )	$h_{FE}$	60	100	-	
	UMC2NT1, G	35	60	-	
	UMC3NT1, G	20	35	-	
	UMC5NT1, G / T2, G				
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	15.4	22	28.6	$\text{k}\Omega$
	UMC2NT1, G	7.0	10	13	
	UMC3NT1, G	3.3	4.7	6.1	
	UMC5NT1, G / T2, G				
Resistor Ratio	R1/R2	0.8	1.0	1.2	
	UMC2NT1, G	0.8	1.0	1.2	
	UMC3NT1, G	0.38	0.47	0.56	
	UMC5NT1, G / T2, G				

### 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 ( $V_{CB} = 50\text{ V}$ , $I_B = 0$ )	$I_{CEO}$	-	-	500	nAdc
Emitter-Base Cutoff Current ( $V_{EB} = 6.0$ , $I_C = 0\text{ mA}$ )	$I_{EBO}$	-	-	0.2	mAdc
	UMC2NT1, G	-	-	0.5	
	UMC3NT1, G	-	-	0.1	
	UMC5NT1, G / T2, G	-	-		

#### 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 ( $V_{CE} = 10\text{ V}$ , $I_C = 5.0\text{ mA}$ )	$h_{FE}$	60	100	-	
	UMC2NT1, G	35	60	-	
	UMC3NT1, G	80	140	-	
	UMC5NT1, G / T2, G				
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	15.4	22	28.6	$\text{k}\Omega$
	UMC2NT1, G	7.0	10	13	
	UMC3NT1, G	33	47	61	
	UMC5NT1, G / T2, G				
Resistor Ratio	R1/R2	0.8	1.0	1.2	
	UMC2NT1, G	0.8	1.0	1.2	
	UMC3NT1, G	0.8	1.0	1.2	
	UMC5NT1, G / T2, G	0.8	1.0	1.2	

# UMC2NT1, UMC3NT1, UMC5NT1

## ORDERING INFORMATION

Device	Package	Shipping†
UMC2NT1	SC-88A/SOT-353	3000 / Tape & Reel
UMC2NT1G	SC-88A/SOT-353 (Pb-Free)	3000 / Tape & Reel
UMC3NT1	SC-88A/SOT-353	3000 / Tape & Reel
UMC3NT1G	SC-88A/SOT-353 (Pb-Free)	3000 / Tape & Reel
UMC3NT2	SC-88A/SOT-353	3000 / Tape & Reel
UMC3NT2G	SC-88A/SOT-353 (Pb-Free)	3000 / Tape & Reel
UMC5NT1	SC-88A/SOT-353	3000 / Tape & Reel
UMC5NT1G	SC-88A/SOT-353 (Pb-Free)	3000 / Tape & Reel
UMC5NT2	SC-88A/SOT-353	3000 / Tape & Reel
UMC5NT2G	SC-88A/SOT-353 (Pb-Free)	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.

## DEVICE MARKING AND RESISTOR VALUES

Device	Marking	Transistor 1 - PNP		Transistor 2 - NPN	
		R1 (K)	R2 (K)	R1 (K)	R2 (K)
UMC2NT1, G	U2	22	22	22	22
UMC3NT1, G	U3	10	10	10	10
UMC3NT2, G	U3	10	10	10	10
UMC5NT1, G	U5	4.7	10	47	47
UMC5NT2, G	U5	4.7	10	47	47

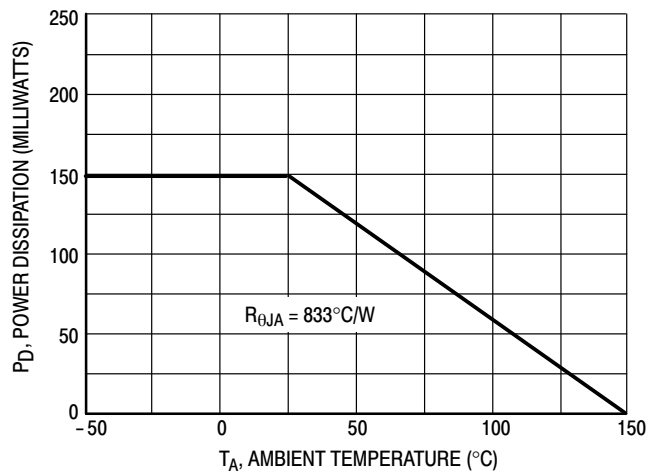


Figure 1. Derating Curve

# UMC2NT1, UMC3NT1, UMC5NT1

## TYPICAL ELECTRICAL CHARACTERISTICS — UMC2NT1 PNP TRANSISTOR

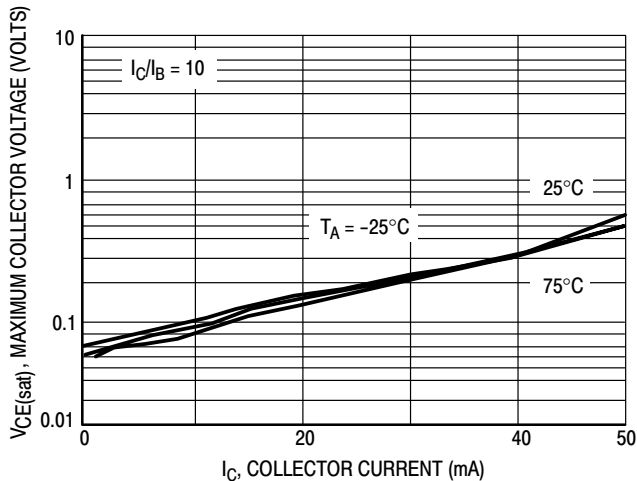


Figure 2.  $V_{CE(sat)}$  versus  $I_C$

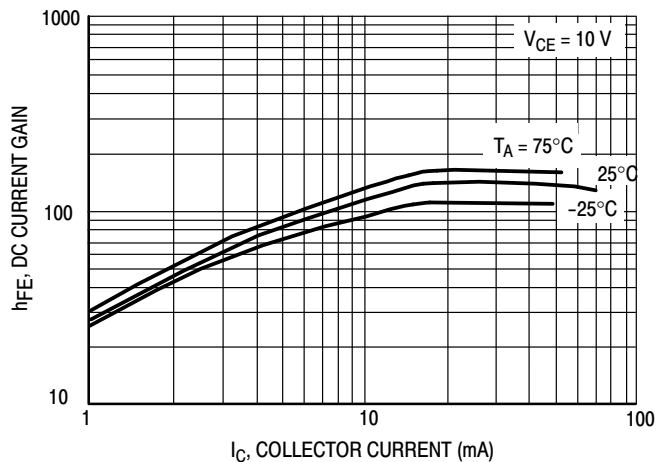


Figure 3. DC Current Gain

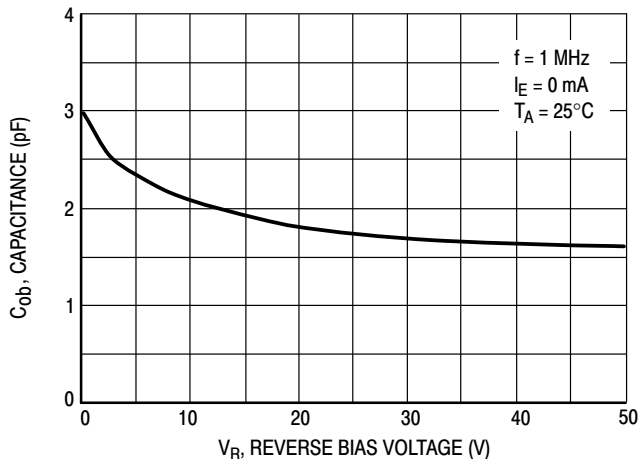


Figure 4. Output Capacitance

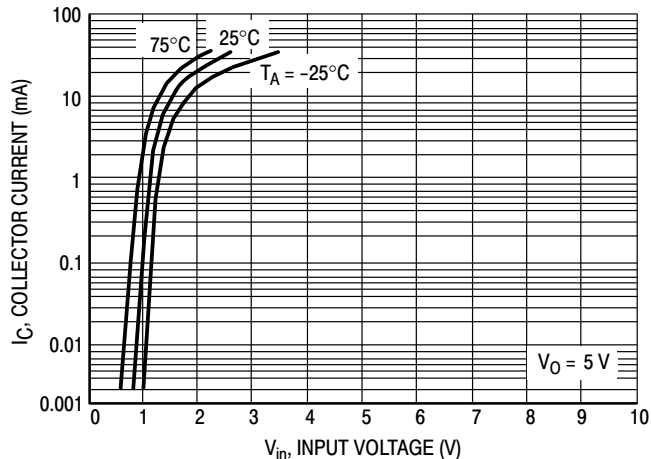


Figure 5. Output Current versus Input Voltage

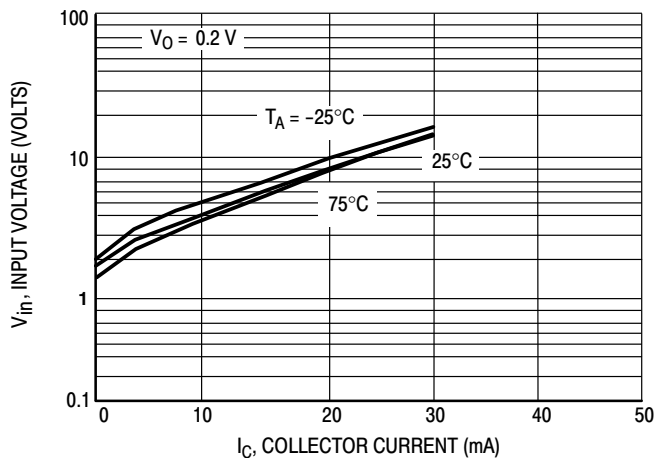


Figure 6. Input Voltage versus Output Current

# UMC2NT1, UMC3NT1, UMC5NT1

## TYPICAL ELECTRICAL CHARACTERISTICS — UMC2NT1 NPN TRANSISTOR

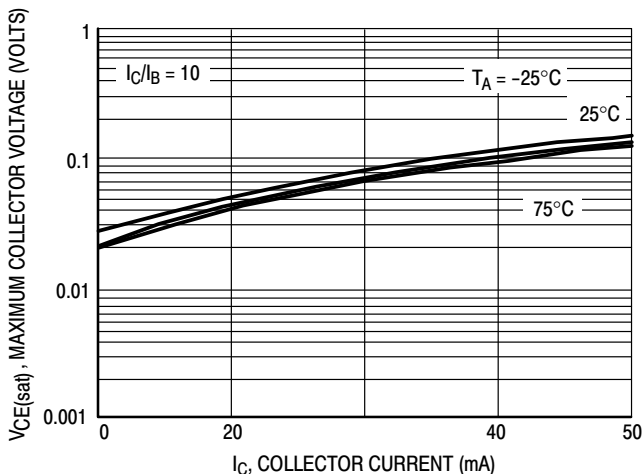


Figure 7.  $V_{CE(sat)}$  versus  $I_C$

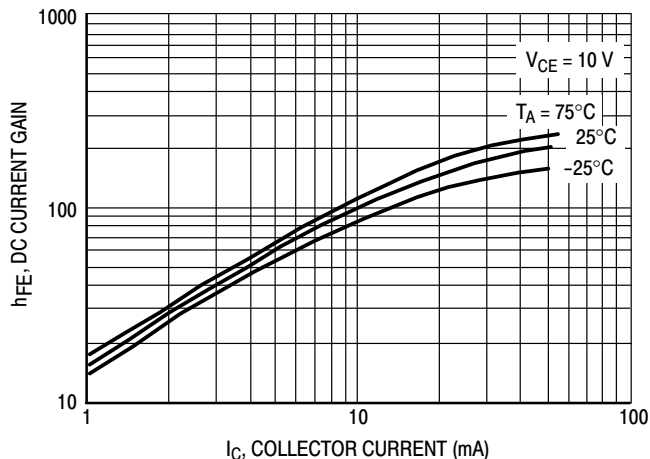


Figure 8. DC Current Gain

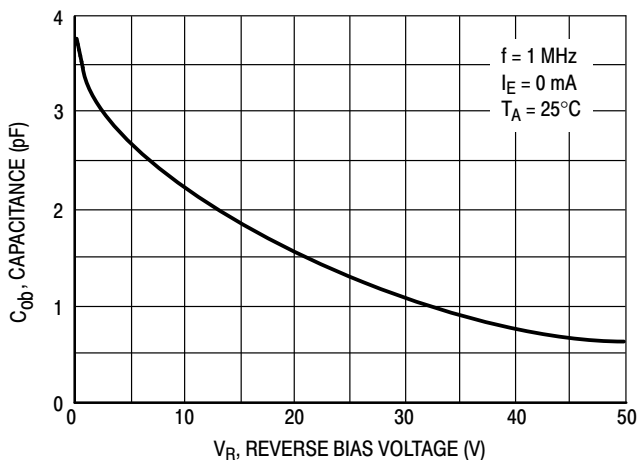


Figure 9. Output Capacitance

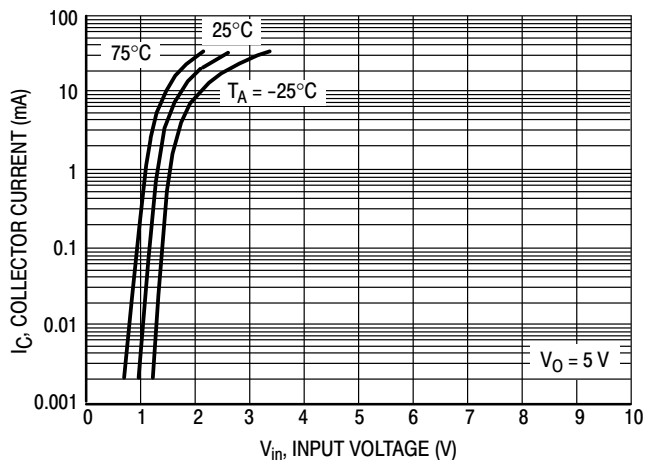


Figure 10. Output Current versus Input Voltage

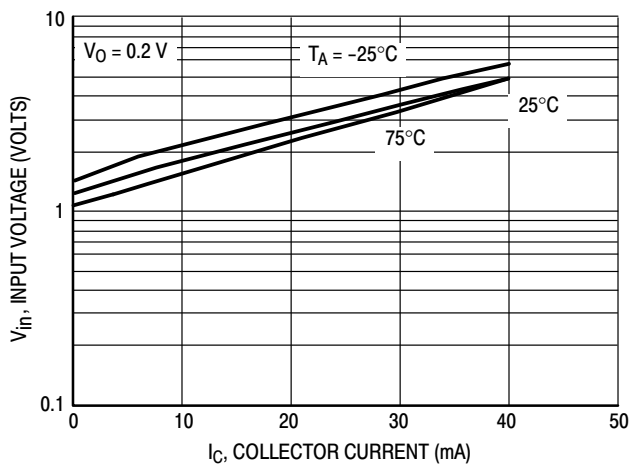


Figure 11. Input Voltage versus Output Current

# UMC2NT1, UMC3NT1, UMC5NT1

## TYPICAL ELECTRICAL CHARACTERISTICS — UMC3NT1 PNP TRANSISTOR

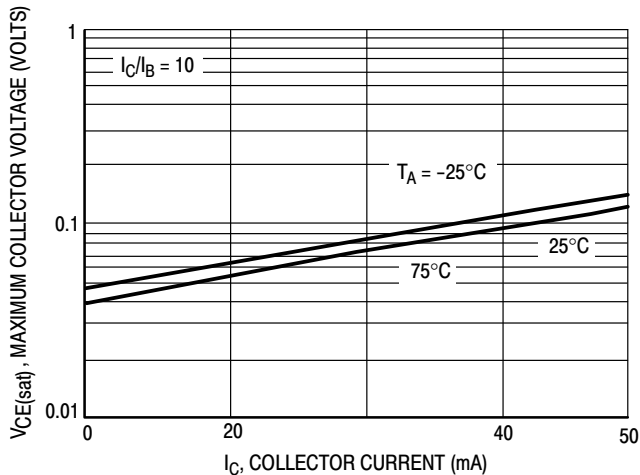


Figure 12.  $V_{CE(sat)}$  versus  $I_C$

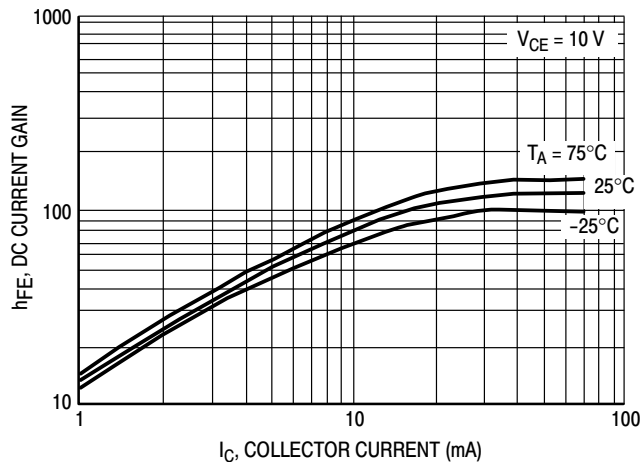


Figure 13. DC Current Gain

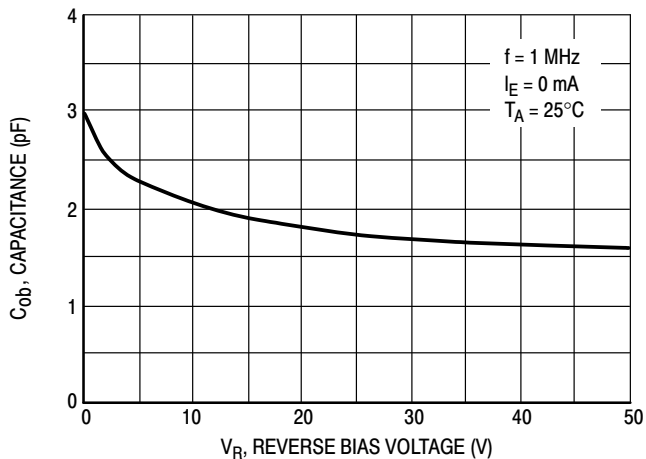


Figure 14. Output Capacitance

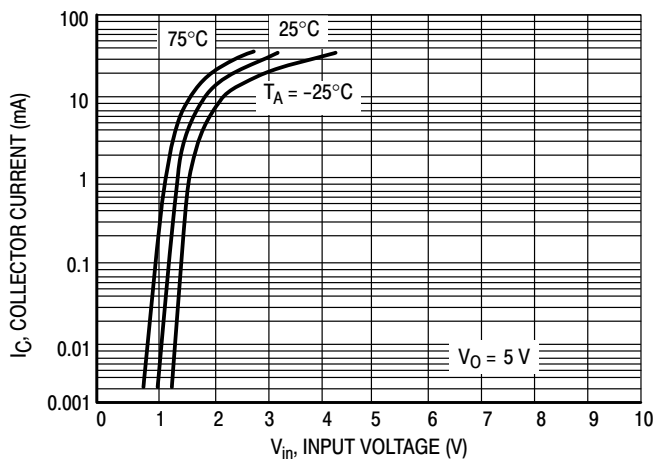


Figure 15. Output Current versus Input Voltage

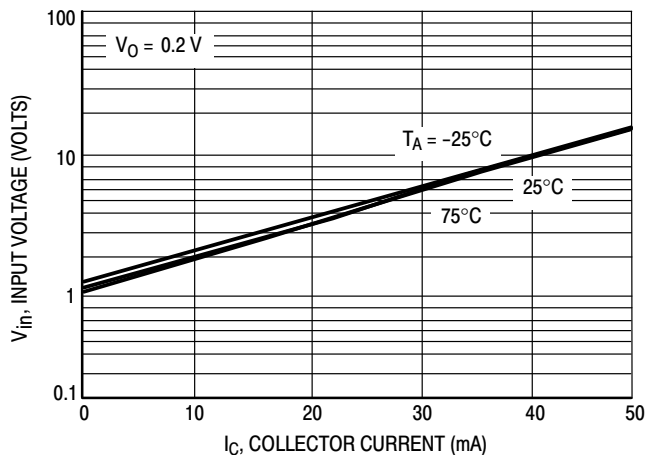


Figure 16. Input Voltage versus Output Current

# UMC2NT1, UMC3NT1, UMC5NT1

## TYPICAL ELECTRICAL CHARACTERISTICS — UMC3NT1 NPN TRANSISTOR

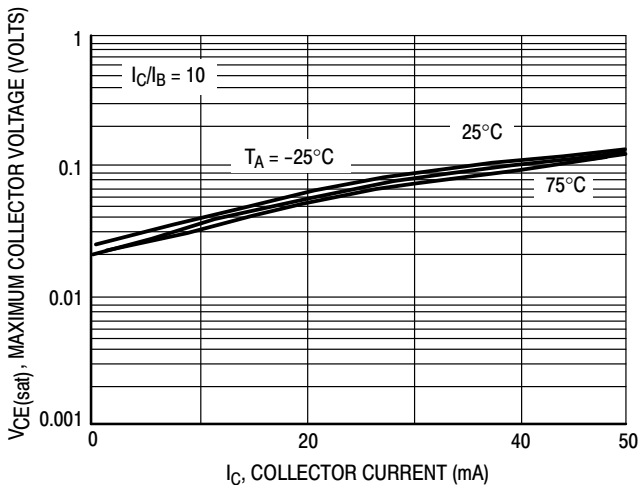


Figure 17.  $V_{CE(sat)}$  versus  $I_C$

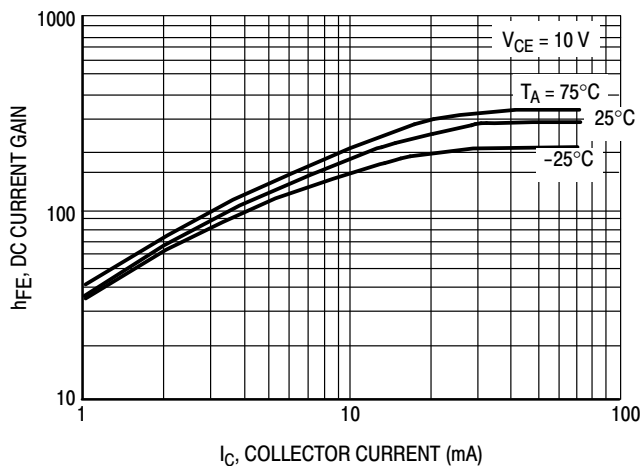


Figure 18. DC Current Gain

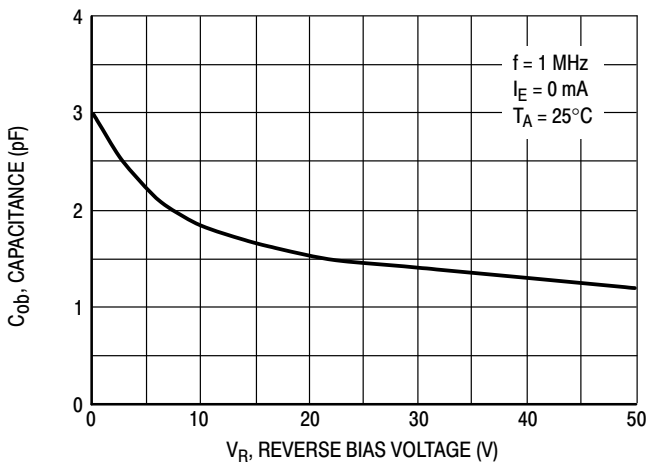


Figure 19. Output Capacitance

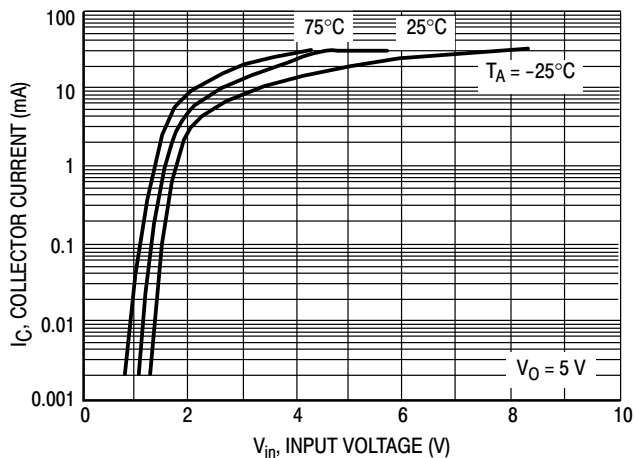


Figure 20. Output Current versus Input Voltage

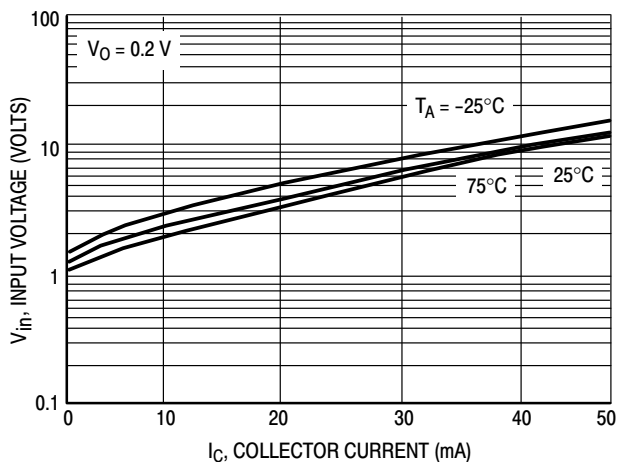


Figure 21. Input Voltage versus Output Current

# UMC2NT1, UMC3NT1, UMC5NT1

## TYPICAL ELECTRICAL CHARACTERISTICS — UMC5NT1 PNP TRANSISTOR

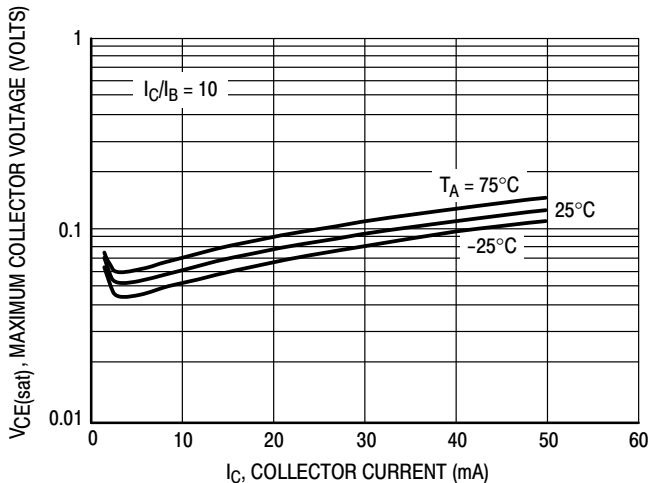


Figure 22.  $V_{CE(sat)}$  versus  $I_C$

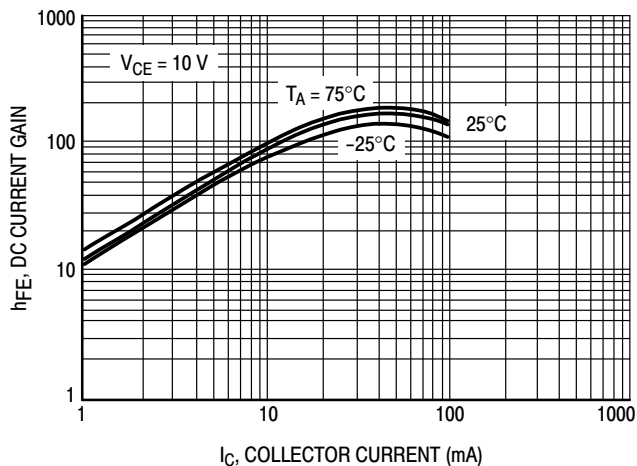


Figure 23. DC Current Gain

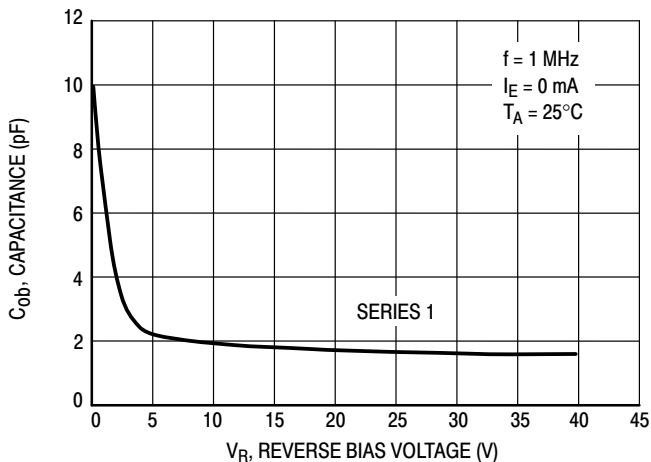


Figure 24. Output Capacitance

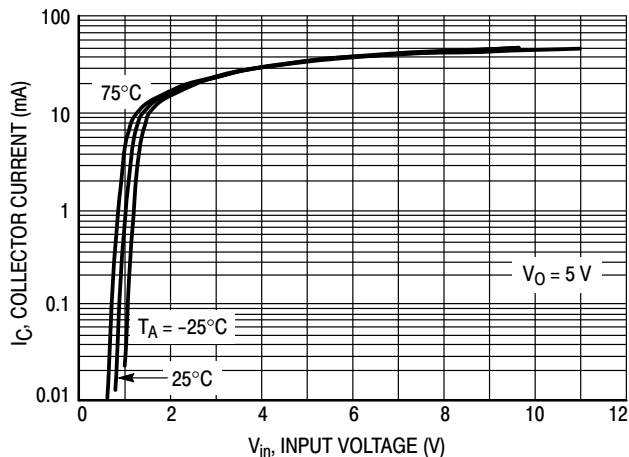


Figure 25. Output Current versus Input Voltage



# UMC2NT1, UMC3NT1, UMC5NT1

## TYPICAL ELECTRICAL CHARACTERISTICS — UMC5NT1 NPN TRANSISTOR

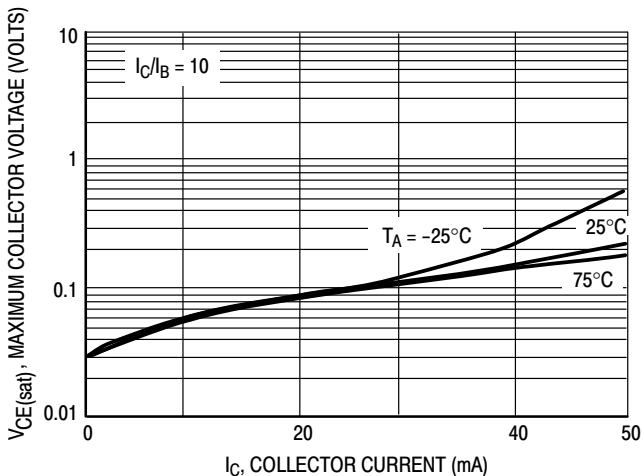


Figure 26.  $V_{CE(sat)}$  versus  $I_C$

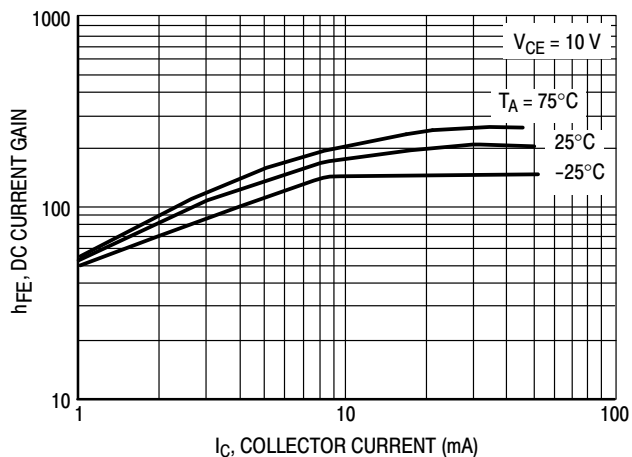


Figure 27. DC Current Gain

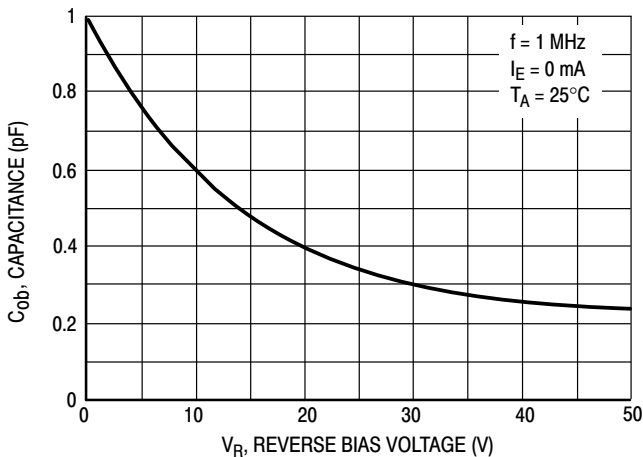


Figure 28. Output Capacitance

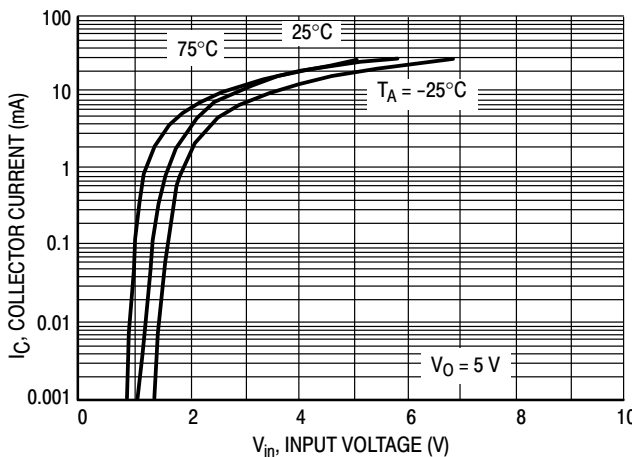


Figure 29. Output Current versus Input Voltage

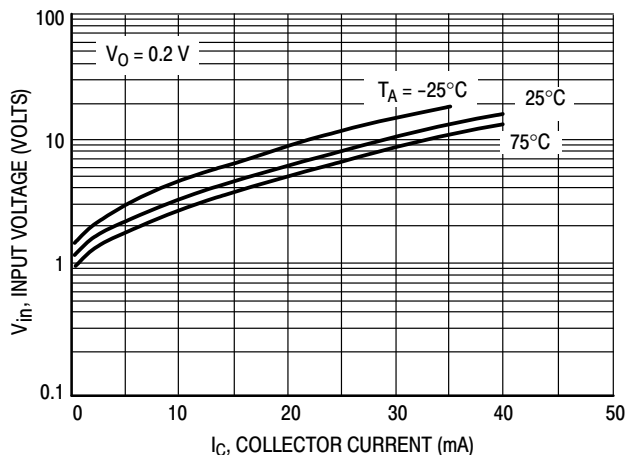
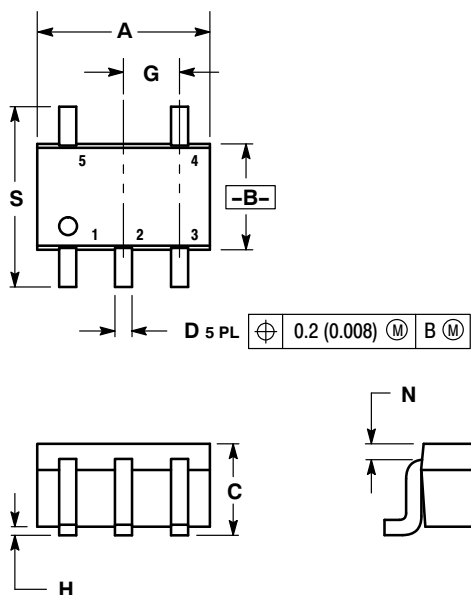


Figure 30. Input Voltage versus Output Current

# UMC2NT1, UMC3NT1, UMC5NT1

## PACKAGE DIMENSIONS

SC-88A, SOT-353, SC-70  
CASE 419A-02  
ISSUE J



### 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:

1. EMITTER 2
2. BASE 2
3. EMITTER 1
4. COLLECTOR
5. COLLECTOR 2/BASE 1

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