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

- Pb−Free Packages are Available
- Simplifies Circuit Design
- Reduces Board Space
- Reduces Component Count
- Available in 8 mm, 7 inch/3000 Unit Tape and Reel

MAXIMUM RATINGS (T_A = 25°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

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

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

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

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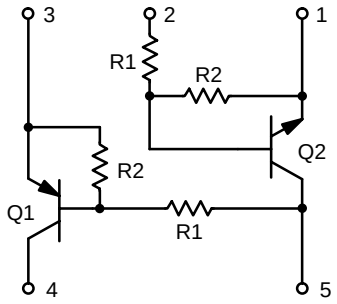
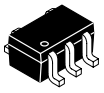
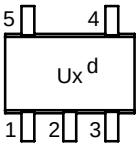


MARKING DIAGRAM



SC−88A/SOT−353
CASE 419A
STYLE 6



Ux = Device Marking
x = 2, 3 or 5
d = Date Code

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.

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

Characteristic		Symbol	Min	Typ	Max	Unit
Q1 TRANSISTOR: PNP						
OFF CHARACTERISTICS						
Collector-Base Cutoff Current (V_{CB} = 50 V, I_E = 0)		I_{CBO}	−	−	100	nAdc
Collector-Emitter Cutoff Current (V_{CB} = 50 V, I_B = 0)		I_{CEO}	−	−	500	nAdc
Emitter-Base Cutoff Current (V_{EB} = 6.0, I_C = 0 mA)	UMC2NT1 UMC3NT1 UMC5NT1	I_{EBO}	− − −	− − −	0.2 0.5 1.0	mAdc
ON CHARACTERISTICS						
Collector-Base Breakdown Voltage (I_C = 10 μA, I_E = 0)		$V_{(BR)CBO}$	50	−	−	Vdc
Collector-Emitter Breakdown Voltage (I_C = 2.0 mA, I_B = 0)		$V_{(BR)CEO}$	50	−	−	Vdc
DC Current Gain (V_{CE} = 10 V, I_C = 5.0 mA)	UMC2NT1 UMC3NT1 UMC5NT1	h_{FE}	60 35 20	100 60 35	− − −	
Collector−Emitter Saturation Voltage (I_C = 10 mA, I_B = 0.3 mA)		$V_{CE(SAT)}$	−	−	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
Output Voltage (off) (V_{CC} = 5.0 V, V_B = 0.5 V, R_L = 1.0 kΩ)		V_{OH}	4.9	−	−	Vdc
Input Resistor	UMC2NT1 UMC3NT1 UMC5NT1	R1	15.4 7.0 3.3	22 10 4.7	28.6 13 6.1	kΩ
Resistor Ratio	UMC2NT1 UMC3NT1 UMC5NT1	R1/R2	0.8 0.8 0.38	1.0 1.0 0.47	1.2 1.2 0.56	
Q2 TRANSISTOR: NPN						
OFF CHARACTERISTICS						
Collector-Base Cutoff Current (V_{CB} = 50 V, I_E = 0)		I_{CBO}	−	−	100	nAdc
Collector-Emitter Cutoff Current (V_{CB} = 50 V, I_B = 0)		I_{CEO}	−	−	500	nAdc
Emitter-Base Cutoff Current (V_{EB} = 6.0, I_C = 0 mA)	UMC2NT1 UMC3NT1 UMC5NT1	I_{EBO}	− − −	− − −	0.2 0.5 0.1	mAdc
ON CHARACTERISTICS						
Collector-Base Breakdown Voltage (I_C = 10 μA, I_E = 0)		$V_{(BR)CBO}$	50	−	−	Vdc
Collector-Emitter Breakdown Voltage (I_C = 2.0 mA, I_B = 0)		$V_{(BR)CEO}$	50	−	−	Vdc
DC Current Gain (V_{CE} = 10 V, I_C = 5.0 mA)	UMC2NT1 UMC3NT1 UMC5NT1	h_{FE}	60 35 80	100 60 140	− − −	
Collector−Emitter Saturation Voltage (I_C = 10 mA, I_B = 0.3 mA)		$V_{CE(SAT)}$	−	−	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
Output Voltage (off) (V_{CC} = 5.0 V, V_B = 0.5 V, R_L = 1.0 kΩ)		V_{OH}	4.9	−	−	Vdc
Input Resistor	UMC2NT1 UMC3NT1 UMC5NT1	R1	15.4 7.0 33	22 10 47	28.6 13 61	kΩ
Resistor Ratio	UMC2NT1 UMC3NT1 UMC5NT1	R1/R2	0.8 0.8 0.8	1.0 1.0 1.0	1.2 1.2 1.2	

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
UMC5NT1	SC−88A/SOT−353	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	U2	22	22	22	22
UMC3NT1	U3	10	10	10	10
UMC3NT2	U3	10	10	10	10
UMC5NT1	U5	4.7	10	47	47
UMC5NT2	U5	4.7	10	47	47

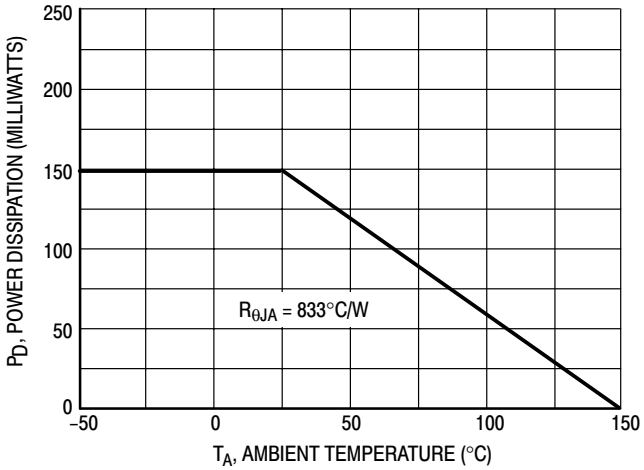


Figure 1. Derating Curve

TYPICAL ELECTRICAL CHARACTERISTICS — UMC2NT1 PNP TRANSISTOR

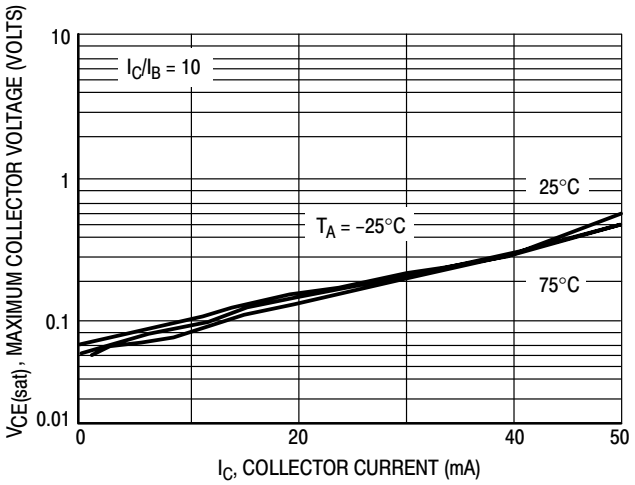


Figure 2. $V_{CE(sat)}$ versus I_C

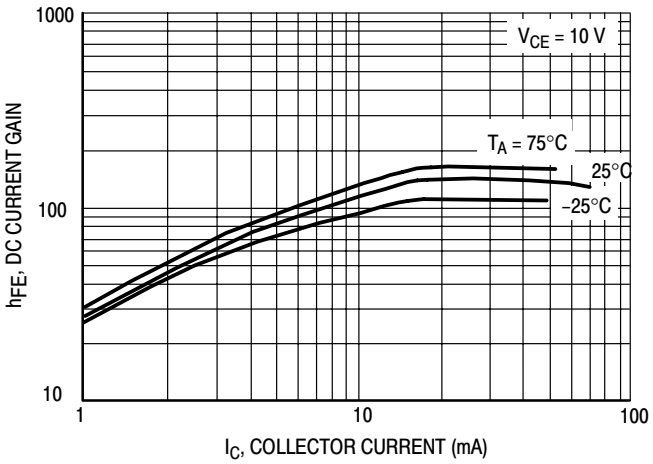


Figure 3. DC Current Gain

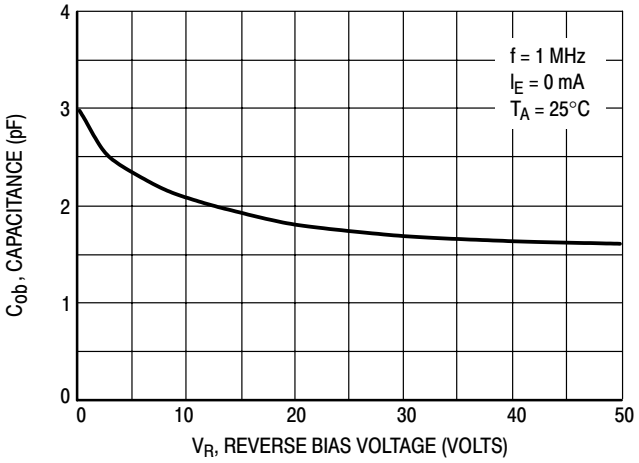


Figure 4. Output Capacitance

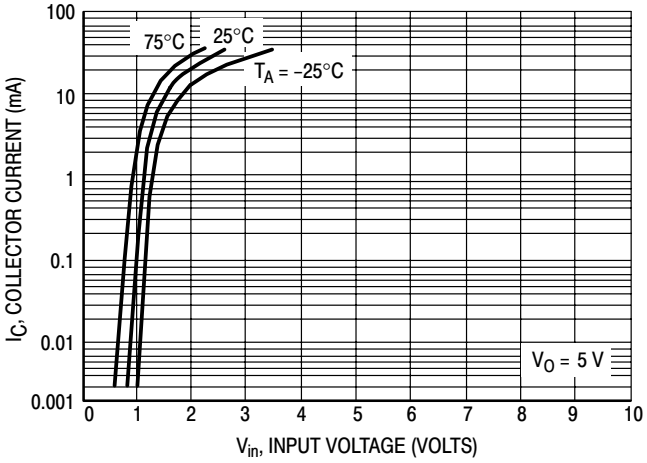


Figure 5. Output Current versus Input Voltage

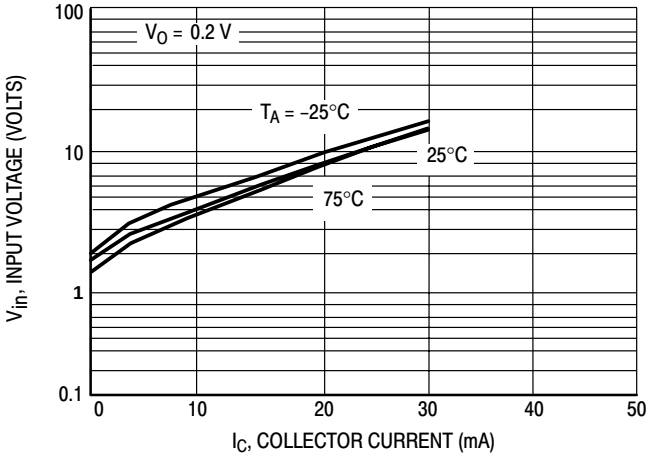


Figure 6. Input Voltage versus Output Current

TYPICAL ELECTRICAL CHARACTERISTICS — UMC2NT1 NPN TRANSISTOR

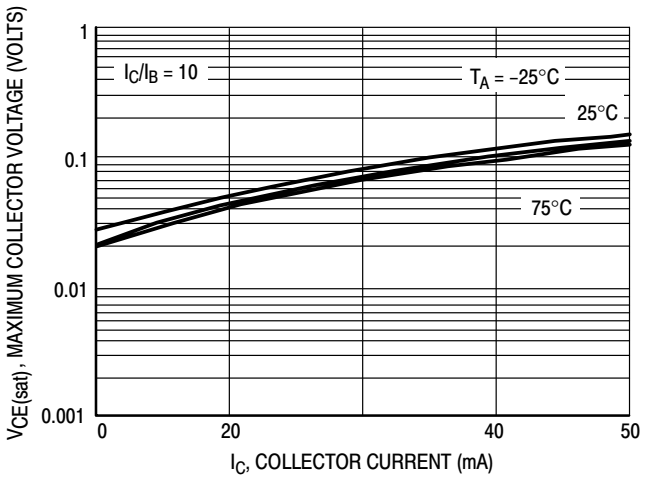


Figure 7. $V_{CE(sat)}$ versus I_C

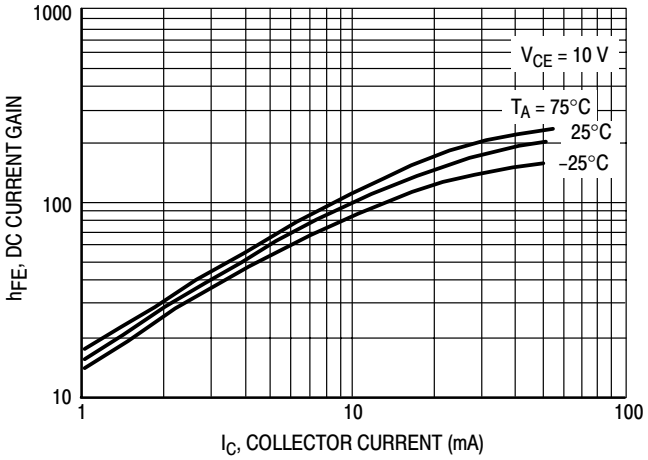


Figure 8. DC Current Gain

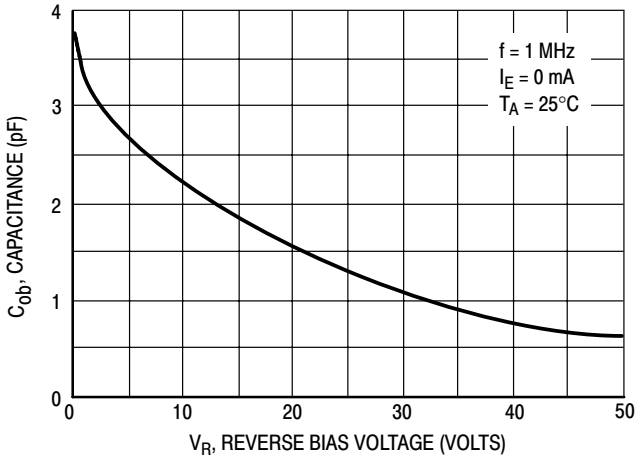


Figure 9. Output Capacitance

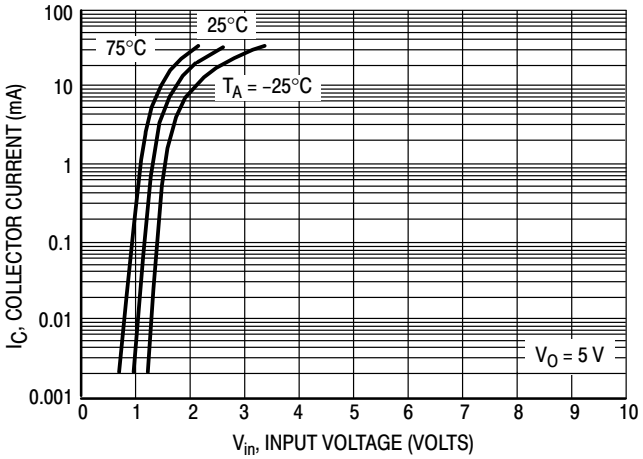


Figure 10. Output Current versus Input Voltage

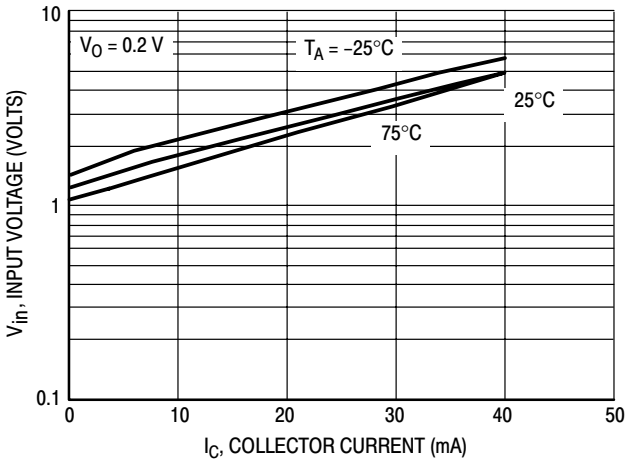


Figure 11. Input Voltage versus Output Current

TYPICAL ELECTRICAL CHARACTERISTICS — UMC3NT1 PNP TRANSISTOR

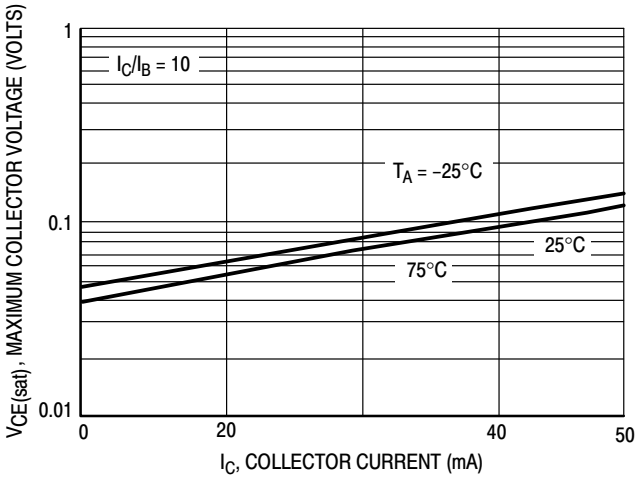


Figure 12. $V_{CE(sat)}$ versus I_C

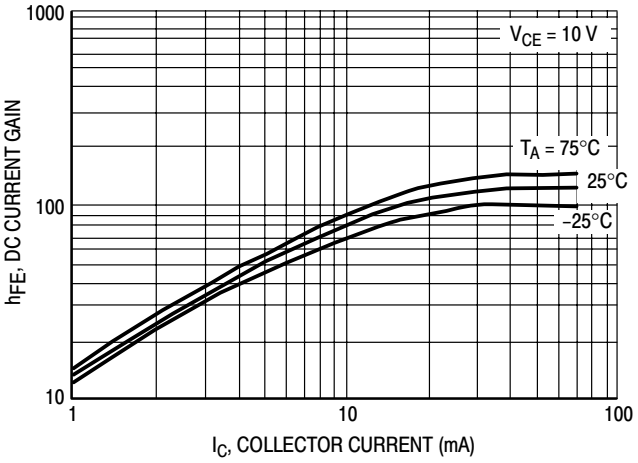


Figure 13. DC Current Gain

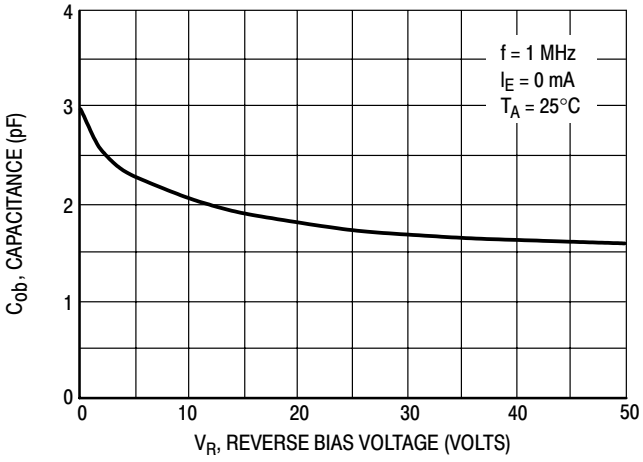


Figure 14. Output Capacitance

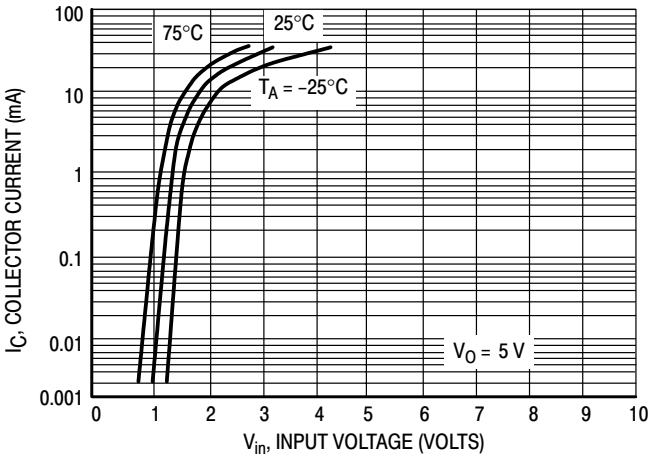


Figure 15. Output Current versus Input Voltage

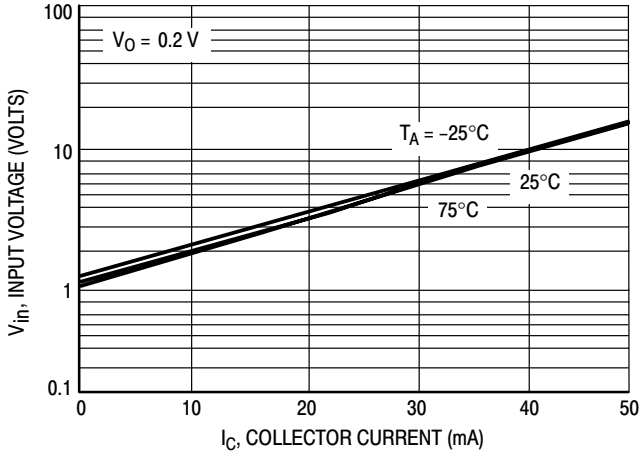


Figure 16. Input Voltage versus Output Current

TYPICAL ELECTRICAL CHARACTERISTICS — UMC3NT1 NPN TRANSISTOR

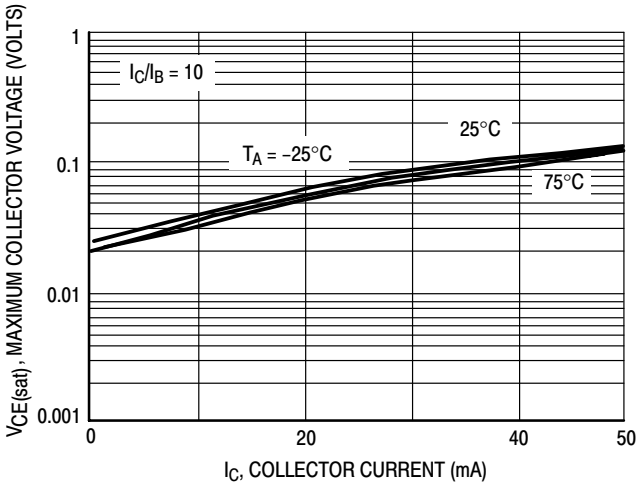


Figure 17. $V_{CE(sat)}$ versus I_C

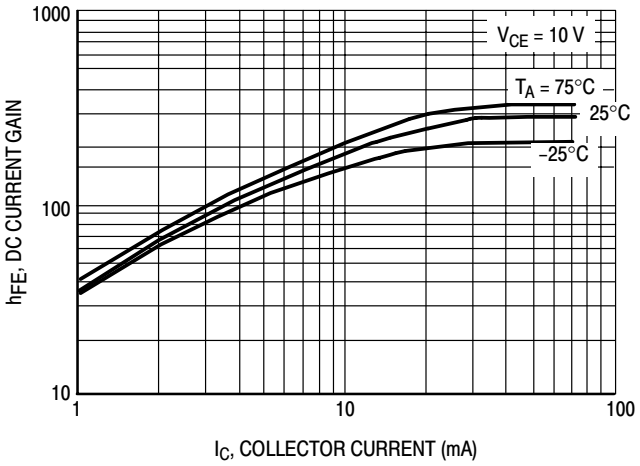


Figure 18. DC Current Gain

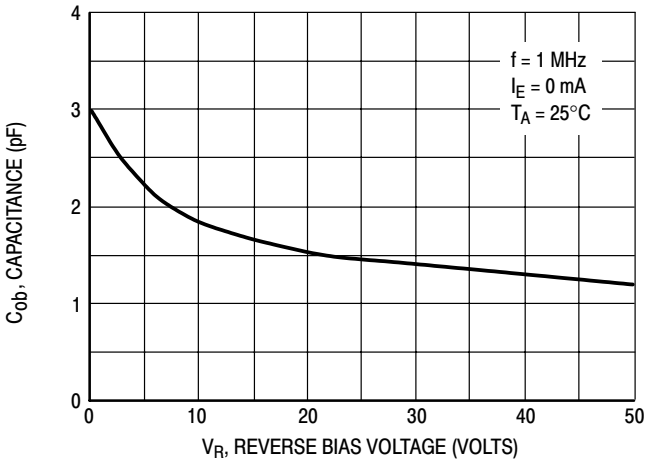


Figure 19. Output Capacitance

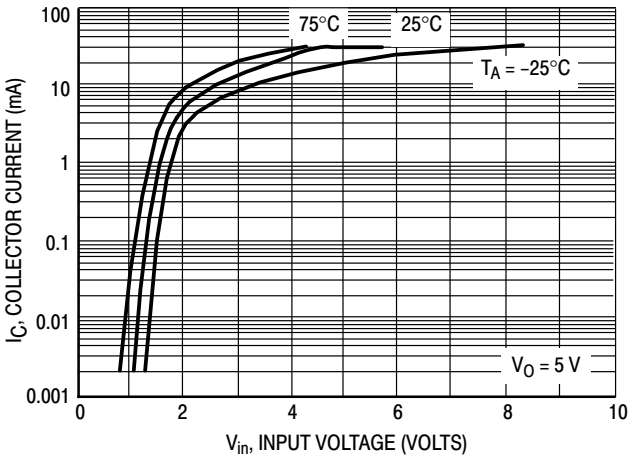


Figure 20. Output Current versus Input Voltage

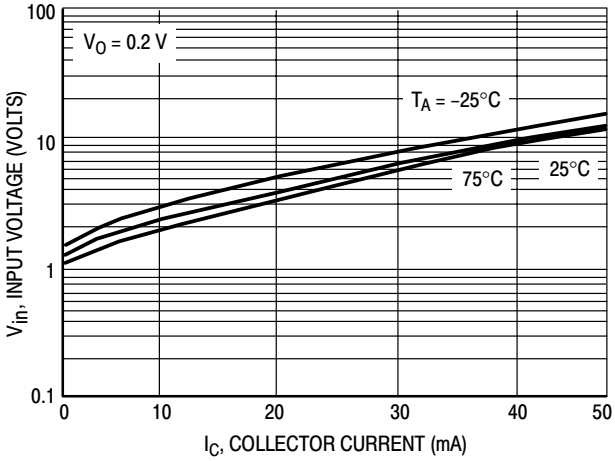


Figure 21. Input Voltage versus Output Current

TYPICAL ELECTRICAL CHARACTERISTICS — UMC5NT1 PNP TRANSISTOR

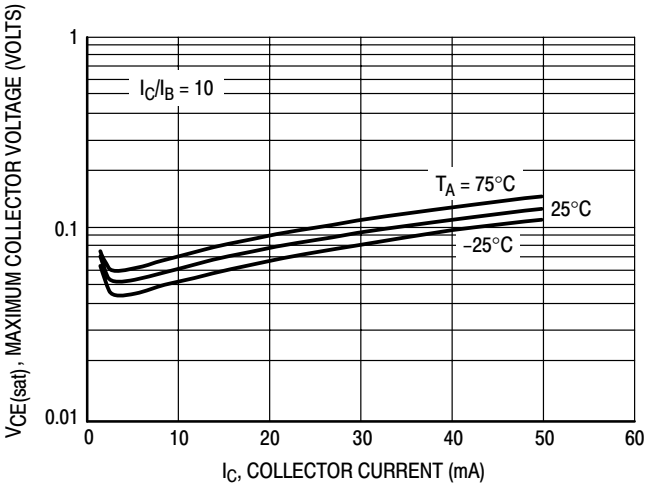


Figure 22. $V_{CE(sat)}$ versus I_C

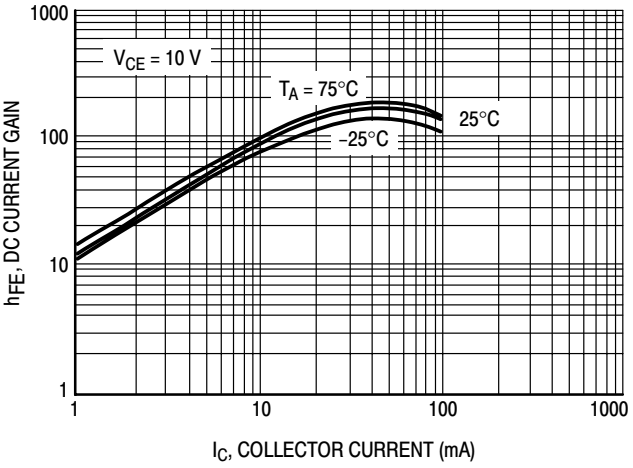


Figure 23. DC Current Gain

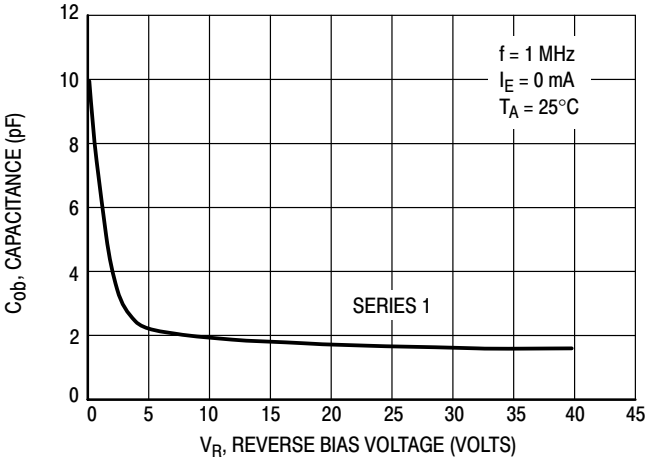


Figure 24. Output Capacitance

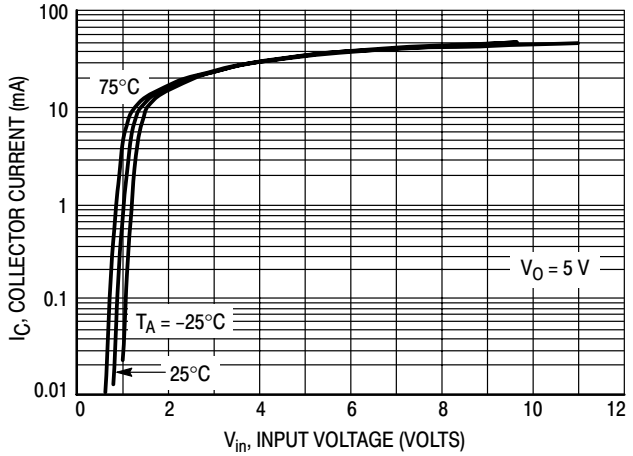


Figure 25. Output Current versus Input Voltage

TYPICAL ELECTRICAL CHARACTERISTICS — UMC5NT1 NPN TRANSISTOR

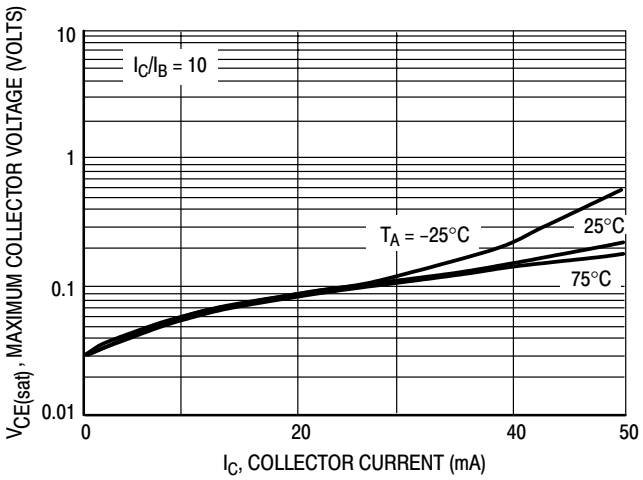


Figure 26. $V_{CE(sat)}$ versus I_C

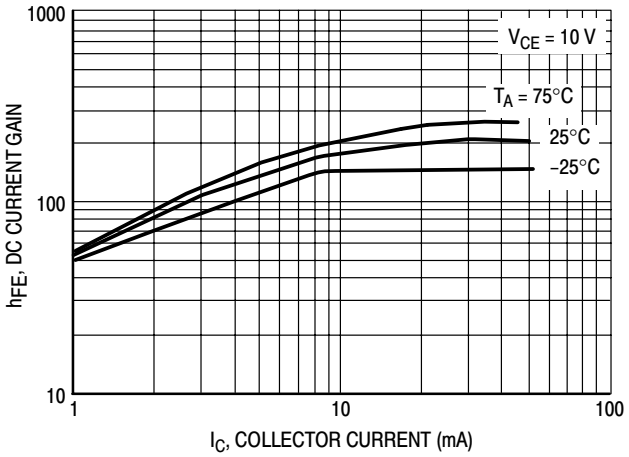


Figure 27. DC Current Gain

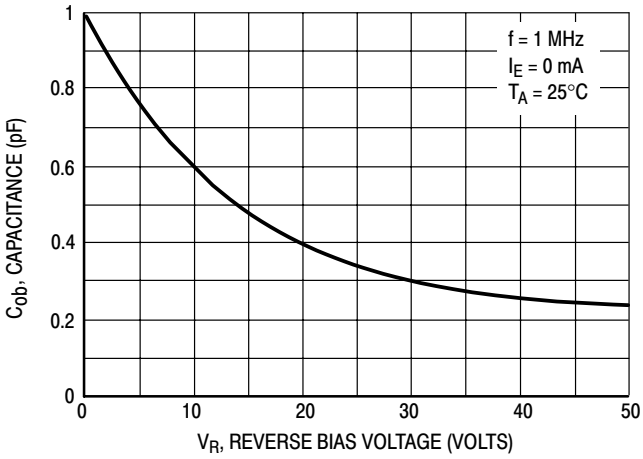


Figure 28. Output Capacitance

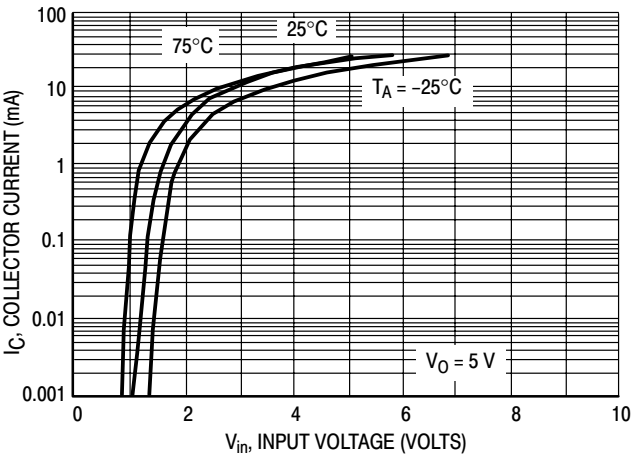


Figure 29. Output Current versus Input Voltage

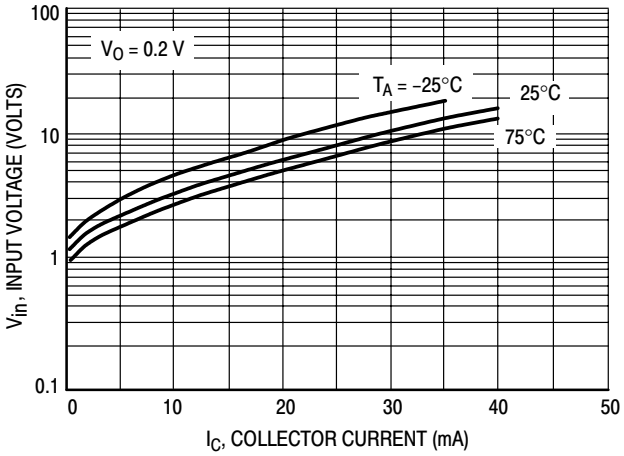
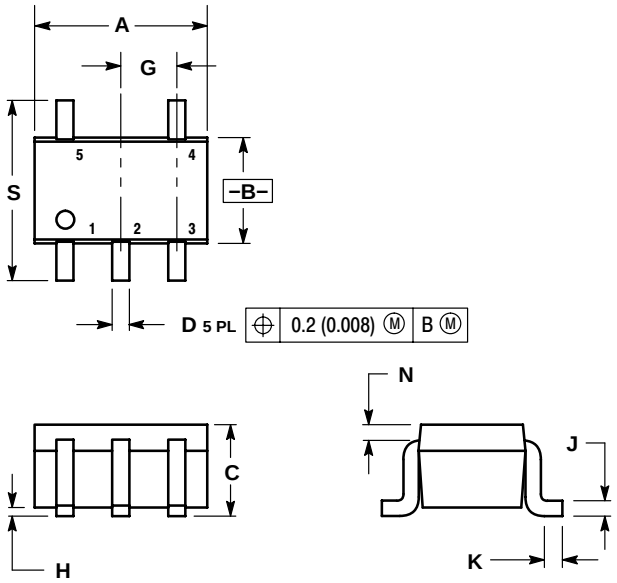


Figure 30. Input Voltage versus Output Current

PACKAGE DIMENSIONS

SC−88A/SOT−353
CASE 419A−02
ISSUE G

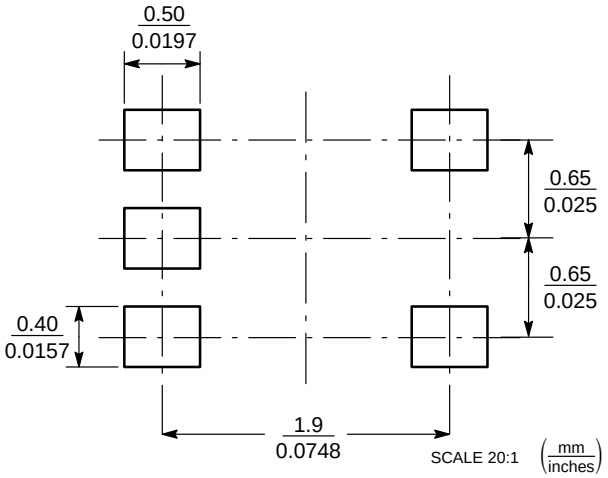


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. 419A−01 OBSOLETE. NEW STANDARD 419A−02.
4. DIMENSIONS A AND B DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

	INCHES		MILLIMETERS	
DIM	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
2. BASE 2
3. EMITTER 1
4. COLLECTOR 1
5. BASE 1/COLLECTOR 2

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.

PUBLICATION ORDERING INFORMATION

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Fax: 480−829−7709 or 800−344−3867 Toll Free USA/Canada
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2−9−1 Kamimeguro, Meguro−ku, Tokyo, Japan 153−0051
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For additional information, please contact your local Sales Representative.