Dual Common Base-Collector Bias Resistor Transistors

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

UMC2NT1G, NSVUMC2NT1G, UMC3NT1G, NSVUMC3NT1G, UMC5NT1G, NSVUMC5NT2G

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*

SC−88A/SOT−353
CASE 419A
STYLE 6
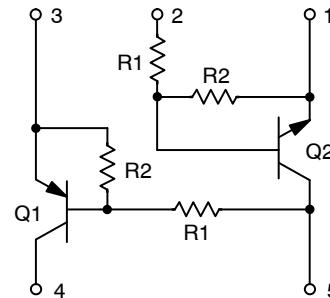
MARKING DIAGRAM
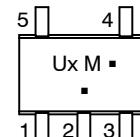
Ux	= Device Marking
x	= 2, 3 or 5
M	= Date Code
▪	= Pb−Free Package

(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.

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

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.

UMC2NT1G, NSVUMC2NT1G, UMC3NT1G, NSVUMC3NT1G, UMC5NT1G, NSVUMC5NT2G

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
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.

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_{CE} = 50 V, I_B = 0)	I_{CEO}	–	–	500	nAdc
Emitter-Base Cutoff Current (V_{EB} = 6.0, I_C = 0 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 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) UMC2NT1G, NSVUMC2NT1G UMC3NT1G, NSVUMC3NT1G UMC5NT1G/T2G, NSVUMC5NT2G	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 UMC2NT1G UMC3NT1G UMC5NT1G/T2G	R1	 15.4 7.0 3.3	 22 10 4.7	 28.6 13 6.1	kΩ
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°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
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_{CE} = 50 V, I_B = 0)	I_{CEO}	–	–	500	nAdc

Emitter-Base Cutoff Current
(V_{EB} = 6.0, I_C = 0 mA)
   UMC2NT1G
   UMC3NT1G
   UMC5NT1G/T2G
	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)
   UMC2NT1G
   UMC3NT1G
   UMC5NT1G/T2G
	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 = 3.5 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
   UMC2NT1G
   UMC3NT1G
   UMC5NT1G/T2G
	R1	15.4
		7.0
		33
			22
			10
			47
				28.6
				13
				61
					kΩ

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	

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
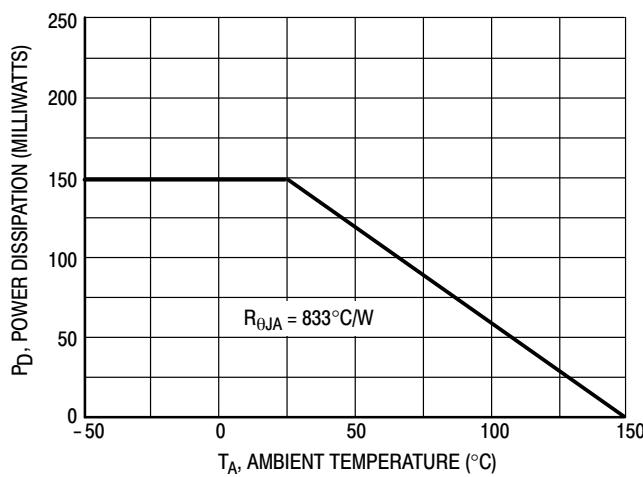
Figure 1. Derating Curve

TYPICAL ELECTRICAL CHARACTERISTICS — UMC2NT1G, NSVUMC2NT1G PNP TRANSISTOR
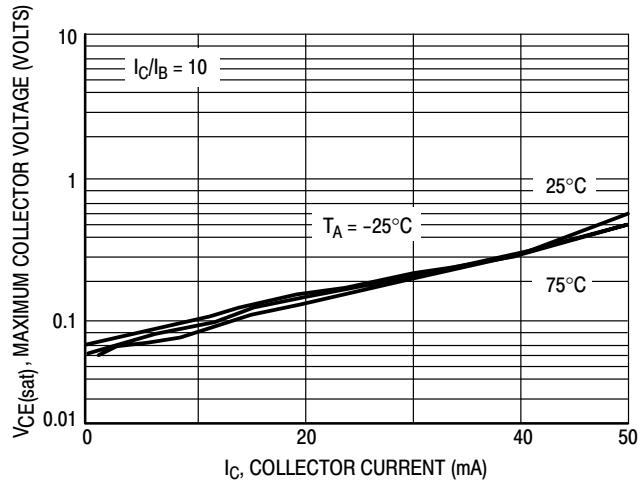
Figure 2. $V_{CE(sat)}$ versus I_C
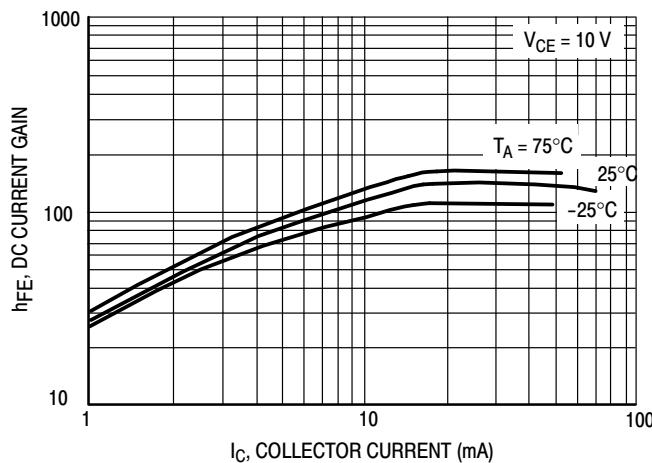
Figure 3. DC Current Gain
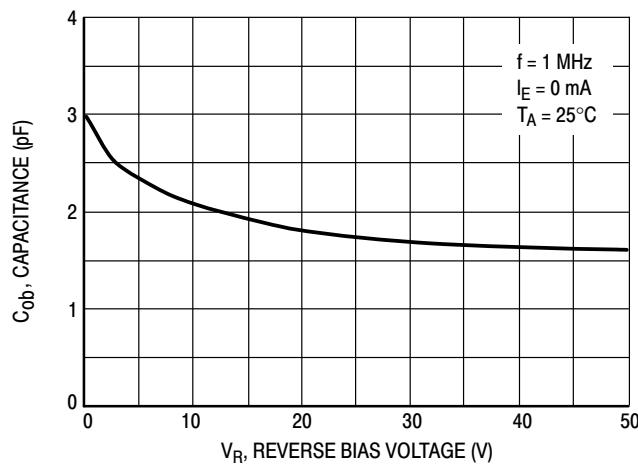
**Figure 4. Output Capacitance**
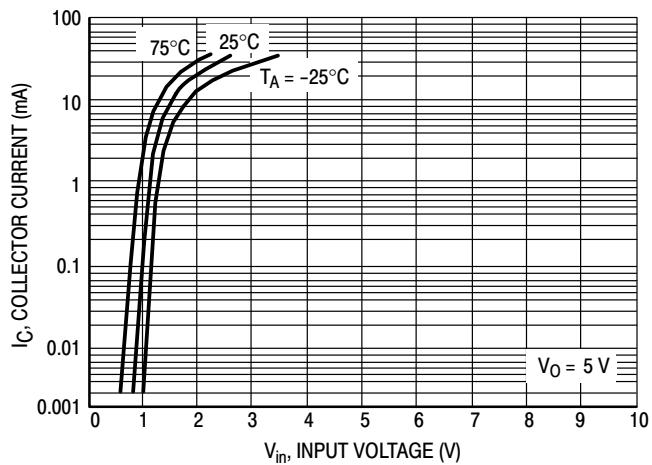
Figure 5. Output Current versus Input Voltage
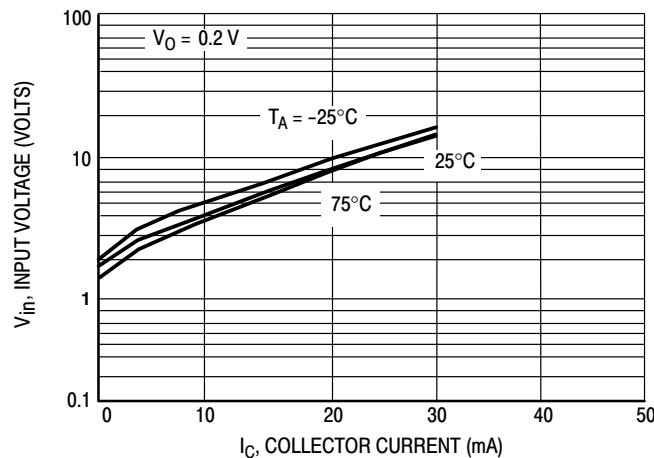
Figure 6. Input Voltage versus Output Current

TYPICAL ELECTRICAL CHARACTERISTICS — UMC2NT1G, NSVUMC2NT1G NPN TRANSISTOR
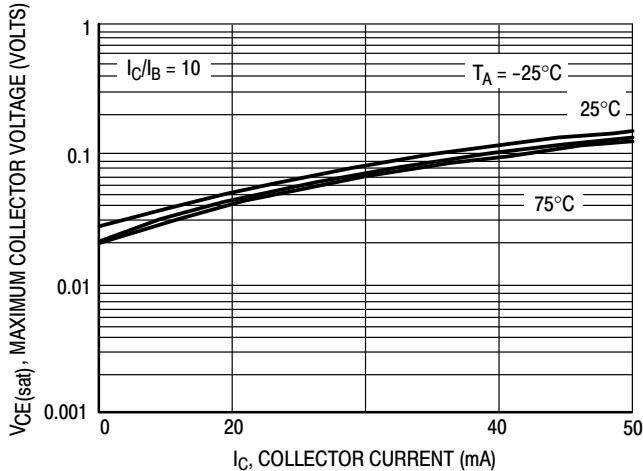
Figure 7. $V_{CE(sat)}$ versus I_C
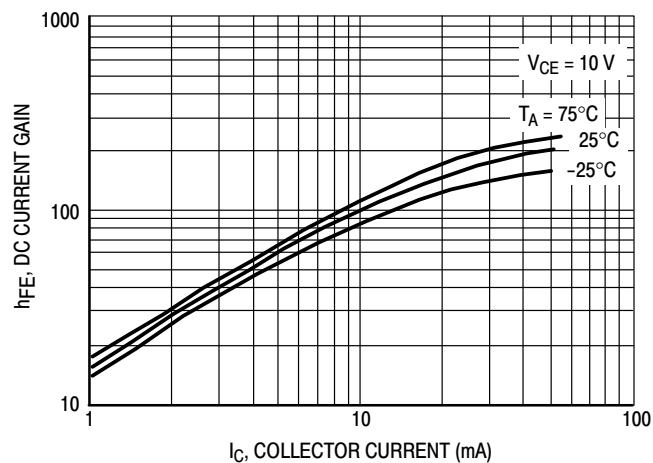
Figure 8. DC Current Gain
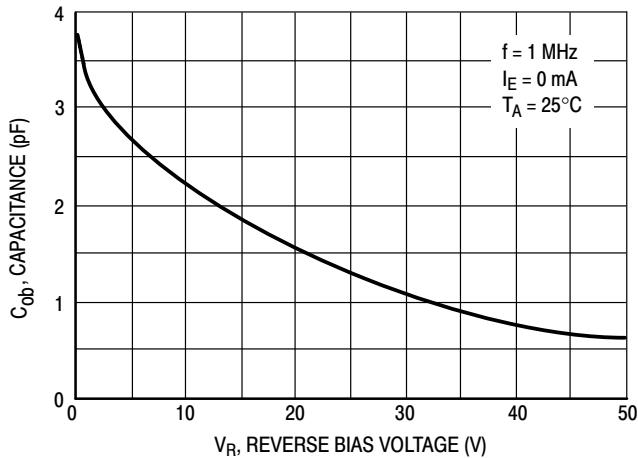
Figure 9. Output Capacitance
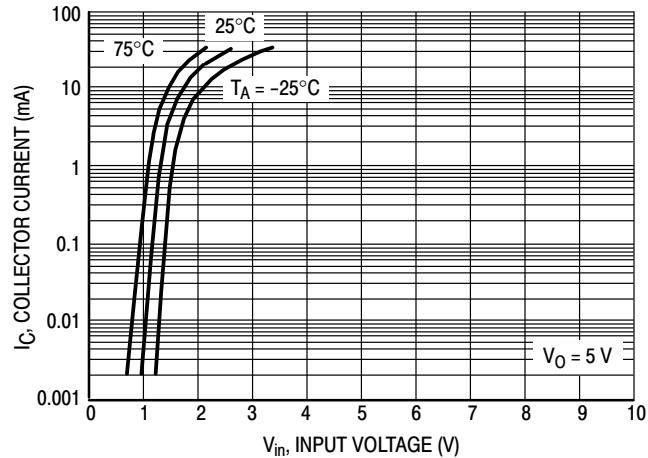
Figure 10. Output Current versus Input Voltage
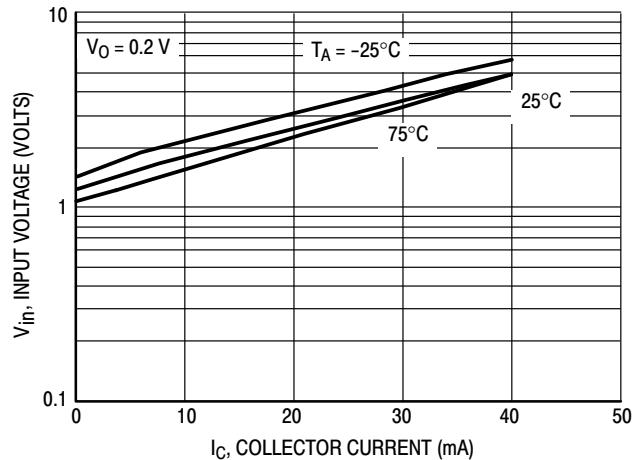
Figure 11. Input Voltage versus Output Current

TYPICAL ELECTRICAL CHARACTERISTICS — UMC3NT1G PNP TRANSISTOR
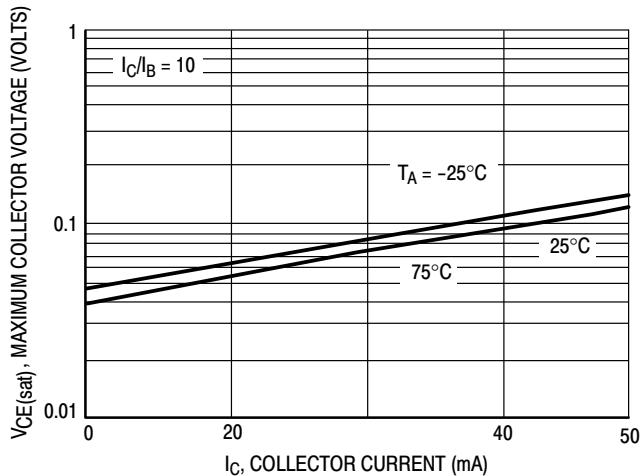
Figure 12. $V_{CE(sat)}$ versus I_C
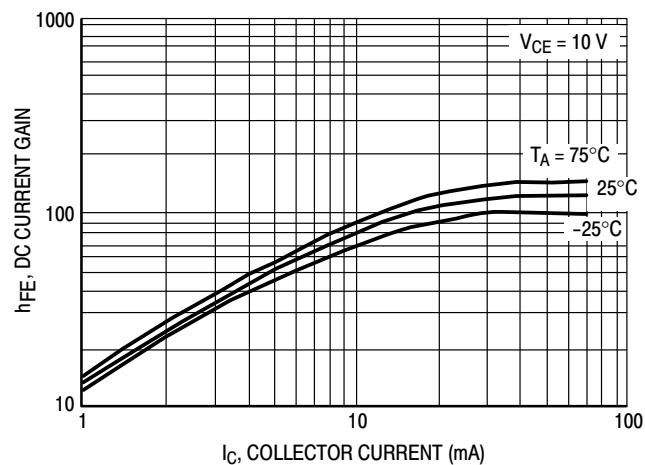
Figure 13. DC Current Gain
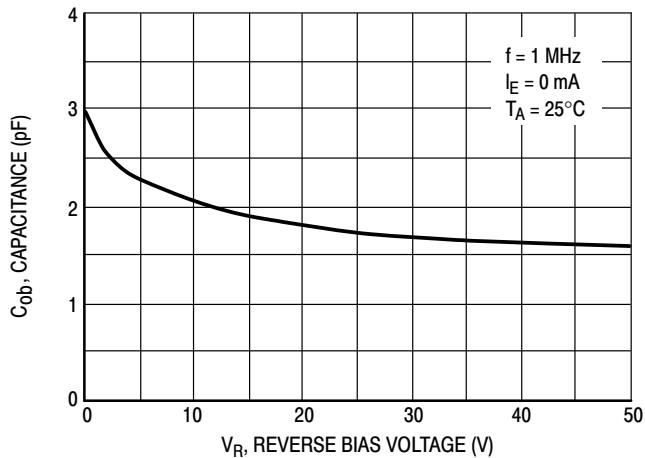
Figure 14. Output Capacitance
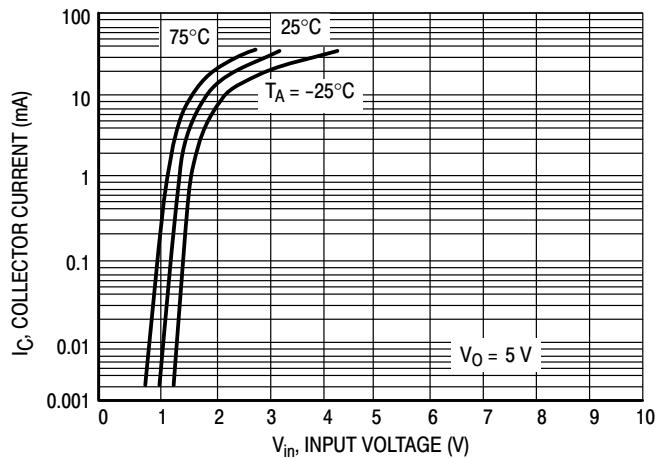
Figure 15. Output Current versus Input Voltage
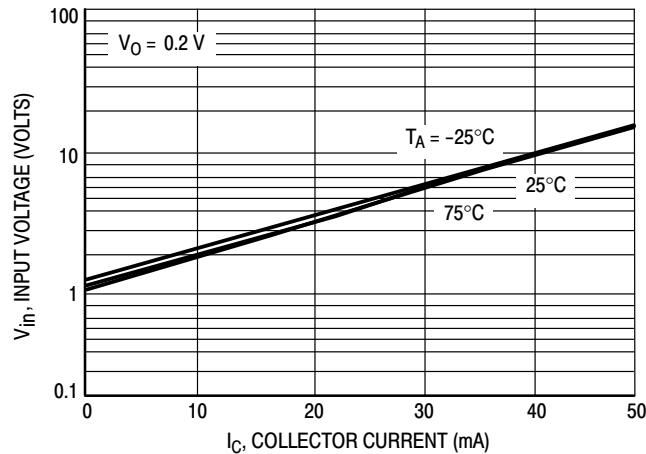
Figure 16. Input Voltage versus Output Current

TYPICAL ELECTRICAL CHARACTERISTICS — UMC3NT1G NPN TRANSISTOR
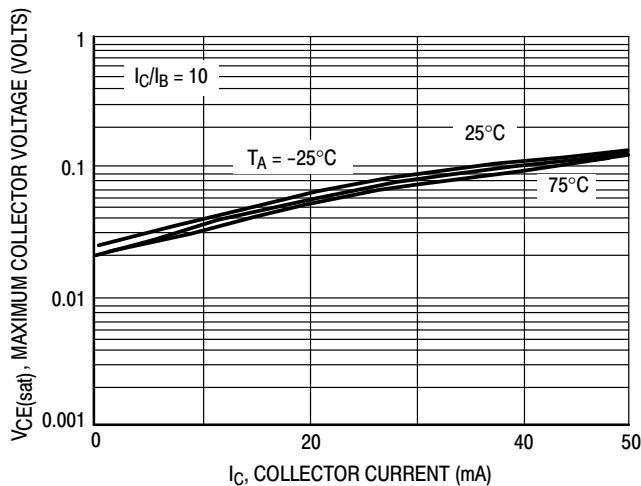
Figure 17. $V_{CE(sat)}$ versus I_C
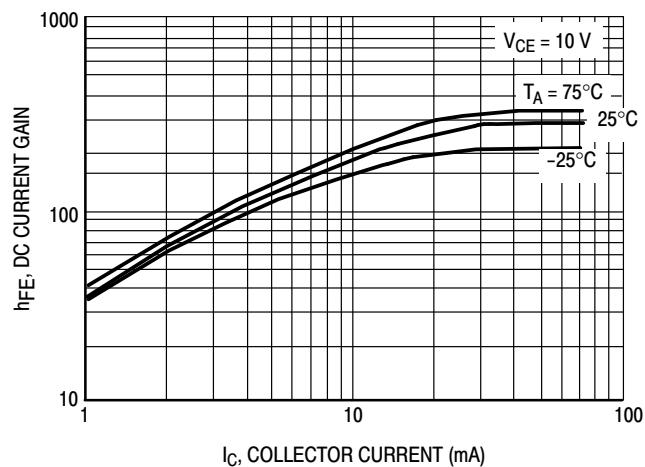
Figure 18. DC Current Gain
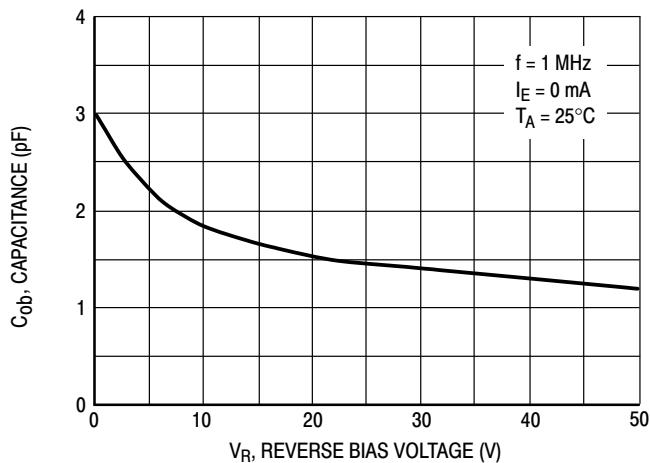
Figure 19. Output Capacitance
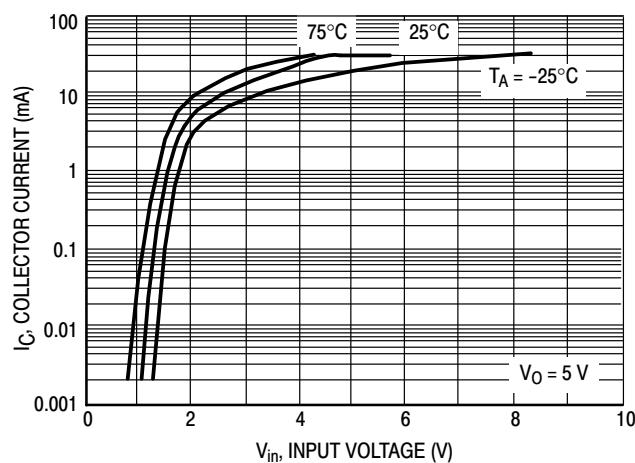
Figure 20. Output Current versus Input Voltage
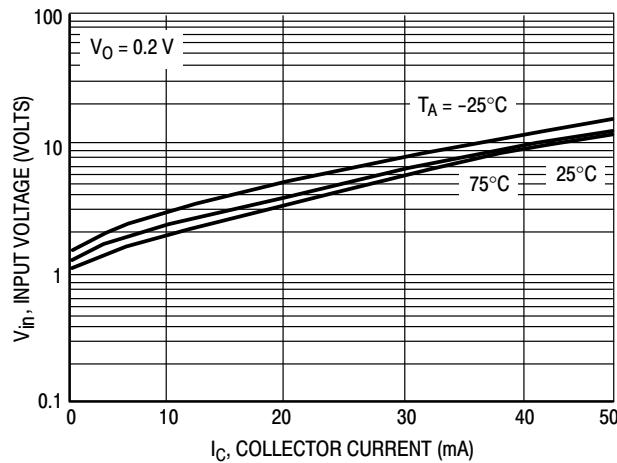
Figure 21. Input Voltage versus Output Current

TYPICAL ELECTRICAL CHARACTERISTICS — UMC5NT1G PNP TRANSISTOR
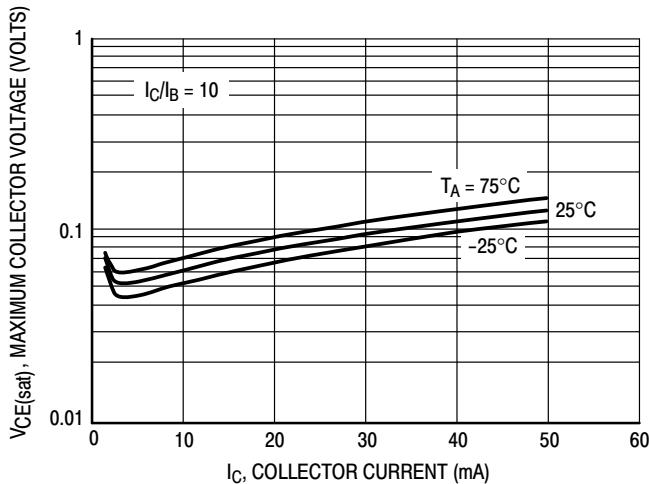
Figure 22. $V_{CE(sat)}$ versus I_C
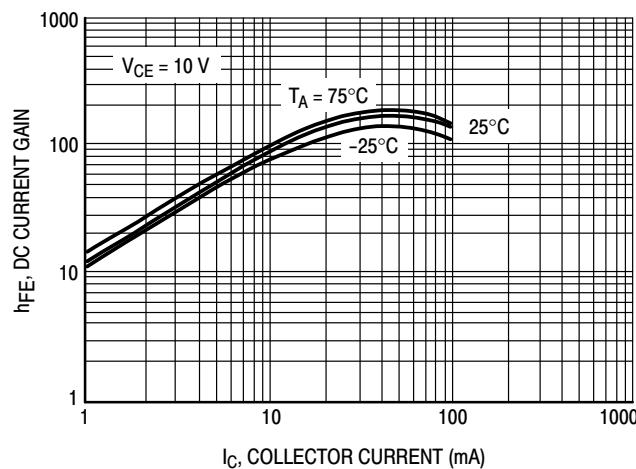
Figure 23. DC Current Gain
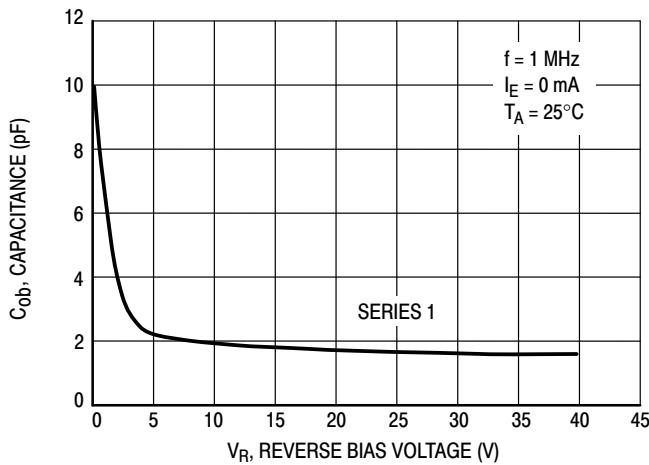
Figure 24. Output Capacitance
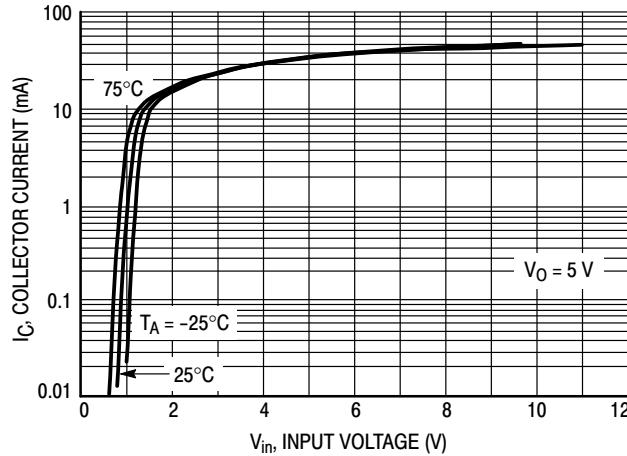
Figure 25. Output Current versus Input Voltage

TYPICAL ELECTRICAL CHARACTERISTICS — UMC5NT1G NPN TRANSISTOR
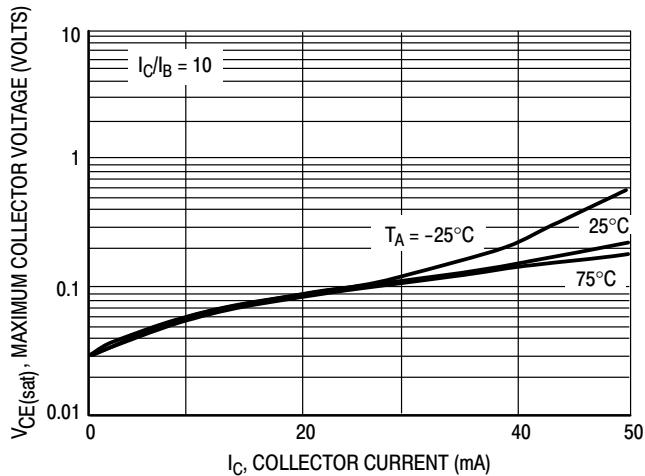
Figure 26. $V_{CE(sat)}$ versus I_C
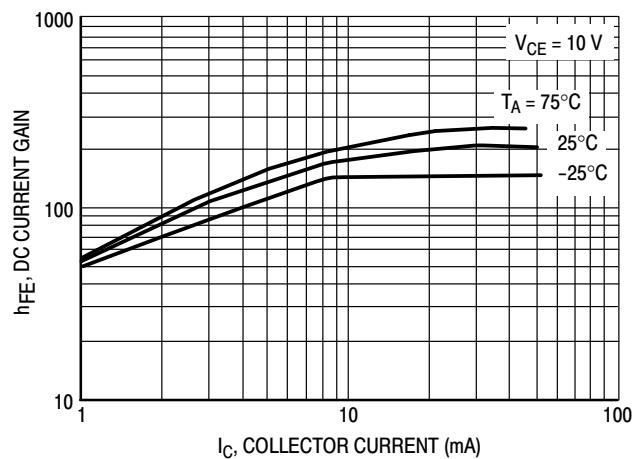
Figure 27. DC Current Gain
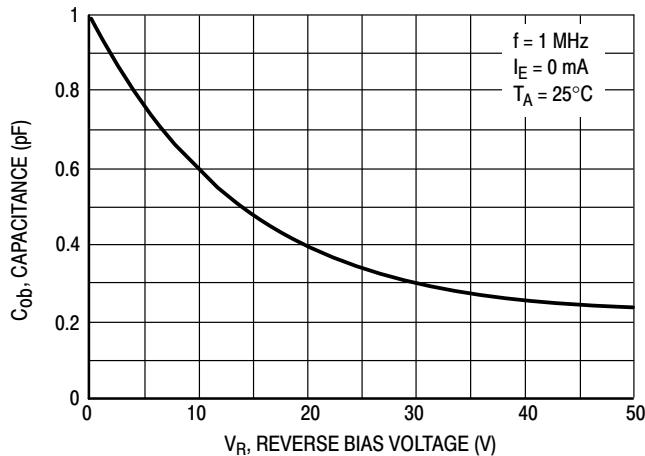
Figure 28. Output Capacitance
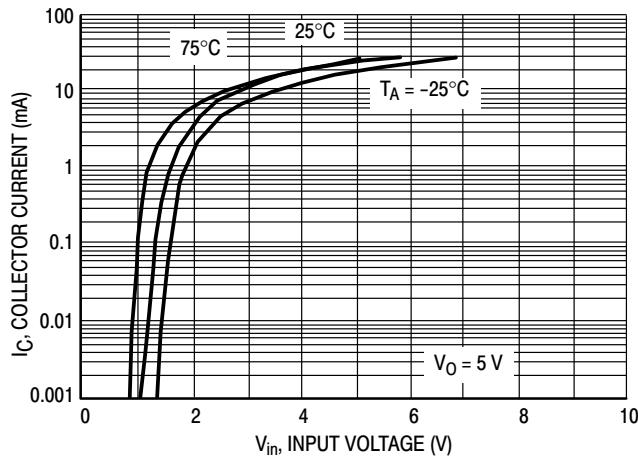
Figure 29. Output Current versus Input Voltage
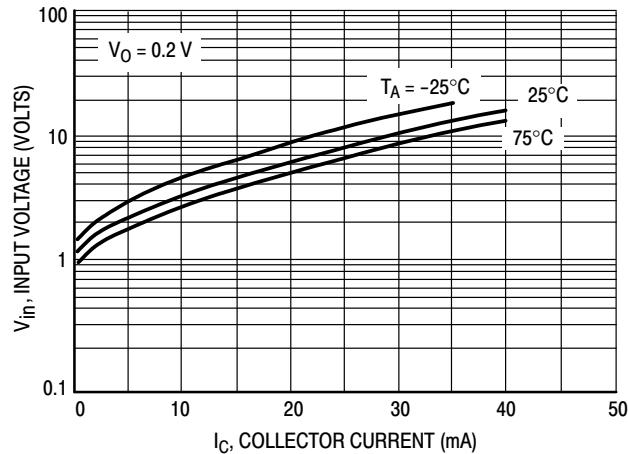
Figure 30. Input Voltage versus Output Current

MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS

ON Semiconductor®

SC−88A (SC−70−5/SOT−353)
CASE 419A−02
ISSUE L

SCALE 2:1

DATE 17 JAN 2013

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

D 5 PL | ⊕ | 0.2 (0.008) Ⓜ | B Ⓜ

SOLDER FOOTPRINT

0.50 / 0.0197

0.65 / 0.025

0.65 / 0.025

0.40 / 0.0157

1.9 / 0.0748

SCALE 20:1 (mm / inches)

GENERIC MARKING DIAGRAM*

XXXM▪
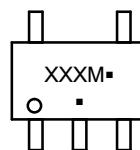
XXX = Specific Device Code
M = Date Code
▪ = Pb−Free Package

(Note: Microdot may be in either location)

*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.

STYLE 1:
PIN 1. BASE
2. EMITTER
3. BASE
4. COLLECTOR
5. COLLECTOR

STYLE 2:
PIN 1. ANODE
2. EMITTER
3. BASE
4. COLLECTOR
5. CATHODE

STYLE 3:
PIN 1. ANODE 1
2. N/C
3. ANODE 2
4. CATHODE 2
5. CATHODE 1

STYLE 4:
PIN 1. SOURCE 1
2. DRAIN 1/2
3. SOURCE 1
4. GATE 1
5. GATE 2

STYLE 5:
PIN 1. CATHODE
2. COMMON ANODE
3. CATHODE 2
4. CATHODE 3
5. CATHODE 4

STYLE 6:
PIN 1. EMITTER 2
2. BASE 2
3. EMITTER 1
4. COLLECTOR
5. COLLECTOR 2/BASE 1

STYLE 7:
PIN 1. BASE
2. EMITTER
3. BASE
4. COLLECTOR
5. COLLECTOR

STYLE 8:
PIN 1. CATHODE
2. COLLECTOR
3. N/C
4. BASE
5. EMITTER

STYLE 9:
PIN 1. ANODE
2. CATHODE
3. ANODE
4. ANODE
5. 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.

PUBLICATION ORDERING INFORMATION

◊

X-ON Electronics

Largest Supplier of Electrical and Electronic Components

Click to view similar products for Bipolar Transistors - Pre-Biased *category:*

Click to view products by ON Semiconductor *manufacturer:*

Other Similar products are found below :

RN1607(TE85L,F)　DTA124GKAT146　DTA144WETL　DTA144WKAT146　DTC113EET1G　DTC115TKAT146　DTC144ECA-TP　DTC144VUAT106　MUN5241T1G　BCR158WH6327XTSA1　NSBA114TDP6T5G　NSBA143ZF3T5G　NSBC114YF3T5G　NSBC123TF3T5G　SMUN5235T1G　SMUN5330DW1T1G　SSVMUN5312DW1T2G　RN1303(TE85L,F)　RN4605(TE85L,F)　TTEPROTOTYPE79　DDTC114EUAQ-7-F　EMH15T2R　SMUN2214T3G　NSBC114TF3T5G　NSBC143ZPDP6T5G　NSVMUN5113DW1T3G　SMUN5230DW1T1G　SMUN5133T1G　SMUN2214T1G　DTC114EUA-TP　NSBA144EF3T5G　NSVDTA114EET1G　2SC2223-T1B-A　2SC3912-TB-E　SMUN5237DW1T1G　SMUN5213DW1T1G　SMUN5114DW1T1G　SMUN2111T1G　NSVDTC144EM3T5G　DTC124ECA-TP　DTC123TM3T5G　DTA114ECA-TP　DTA113EM3T5G　DCX115EK-7-F　DTC113EM3T5G　NSVMUN5135DW1T1G　NSVDTC143ZM3T5G　SMUN5335DW1T2G　SMUN5216DW1T1G　NSVMUN5312DW1T2G