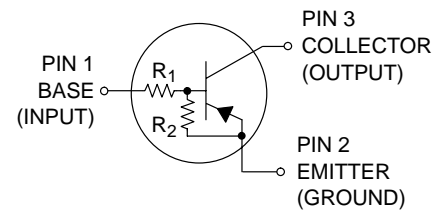
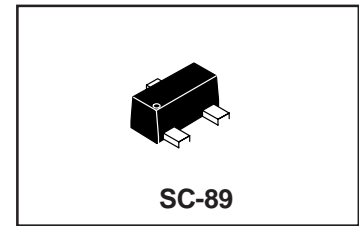


# Bias Resistor Transistors

## PNP Silicon Surface Mount Transistors with Monolithic Bias Resistor Network

This new series of digital transistors is designed to replace a single device and its external resistor bias network. The BRT (Bias Resistor Transistor) contains a single transistor with a monolithic bias network consisting of two resistors; a series base resistor and a base-emitter resistor. The BRT eliminates these individual components by integrating them into a single device. The use of a BRT can reduce both system cost and board space. The device is housed in the SC-89 package which is designed for low power surface mount applications.

- Simplifies Circuit Design
- Reduces Board Space
- Reduces Component Count
- The SC-89 package can be soldered using wave or reflow. The modified gull-winged leads absorb thermal stress during soldering eliminating the possibility of damage to the die.
- We declare that the material of product compliance with RoHS requirements.



### MAXIMUM RATINGS (T<sub>A</sub> = 25°C unless otherwise noted)

Rating	Symbol	Value	Unit
Collector-Base Voltage	V <sub>CB0</sub>	50	Vdc
Collector-Emitter Voltage	V <sub>CEO</sub>	50	Vdc
Collector Current	I <sub>C</sub>	100	mAdc

### THERMAL CHARACTERISTICS

Rating	Symbol	Value	Unit
Total Device Dissipation, FR-4 Board (Note 1) @ T <sub>A</sub> = 25°C Derate above 25°C	P <sub>D</sub>	200 1.6	mW mW/°C
Thermal Resistance, Junction-to-Ambient (Note 1)	R <sub>θJA</sub>	600	°C/W
Total Device Dissipation, FR-4 Board (Note 2) @ T <sub>A</sub> = 25°C Derate above 25°C	P <sub>D</sub>	300 2.4	mW mW/°C
Thermal Resistance, Junction-to-Ambient (Note 2)	R <sub>θJA</sub>	400	°C/W
Junction and Storage Temperature Range	T <sub>J</sub> , T <sub>stg</sub>	-55 to +150	°C

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.

1. FR-4 @ Minimum Pad.
2. FR-4 @ 1.0 × 1.0 Inch Pad.



# DTA601~611, DTA617, DTA622

## ORDERING INFORMATION AND RESISTOR VALUES

Device	Marking	R1 (K)	R2 (K)	Package	Shipping†
DTA602	6A	10	10	SC-89	3000 Tape & Reel
DTA603	6B	22	22	SC-89	3000 Tape & Reel
DTA604	6C	47	47	SC-89	3000 Tape & Reel
DTA607	6D	10	47	SC-89	3000 Tape & Reel
DTA611	6E	10	∞	SC-89	3000 Tape & Reel
DTA610	6F	4.7	∞	SC-89	3000 Tape & Reel
DTA617	6H	2.2	2.2	SC-89	3000 Tape & Reel
DTA601	43	4.7	4.7	SC-89	3000 Tape & Reel
DTA606	6K	4.7	47	SC-89	3000 Tape & Reel
DTA608	6L	22	47	SC-89	3000 Tape & Reel
DTA605	6M	2.2	47	SC-89	3000 Tape & Reel
DTA622	6N	100	100	SC-89	3000 Tape & Reel
DTA609	6P	47	22	SC-89	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.

## ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>					
Collector-Base Cutoff Current (V <sub>CB</sub> = 50 V, I <sub>E</sub> = 0)	I <sub>CBO</sub>	-	-	100	nAdc
Collector-Emitter Cutoff Current (V <sub>CE</sub> = 50 V, I <sub>B</sub> = 0)	I <sub>CEO</sub>	-	-	500	nAdc
Emitter-Base Cutoff Current (V <sub>EB</sub> = 6.0 V, I <sub>C</sub> = 0)	I <sub>EBO</sub>	-	-	0.5	mAdc
DTA602		-	-	0.2	
DTA603		-	-	0.1	
DTA604		-	-	0.2	
DTA607		-	-	0.9	
DTA611		-	-	1.9	
DTA610		-	-	2.3	
DTA617		-	-	1.5	
DTA601		-	-	0.18	
DTA606		-	-	0.13	
DTA608		-	-	0.2	
DTA605		-	-	0.05	
DTA622		-	-	0.13	
DTA609		-	-		
Collector-Base Breakdown Voltage (I <sub>C</sub> = 10 μA, I <sub>E</sub> = 0)	V <sub>(BR)CBO</sub>	50	-	-	Vdc
Collector-Emitter Breakdown Voltage (Note 3) (I <sub>C</sub> = 2.0 mA, I <sub>B</sub> = 0)	V <sub>(BR)CEO</sub>	50	-	-	Vdc

3. Pulse Test: Pulse Width < 300 μs, Duty Cycle < 2.0%



# DTA601~611, DTA617, DTA622

## ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit	
<b>ON CHARACTERISTICS</b> (Note 4)						
DC Current Gain (V <sub>CE</sub> = 10 V, I <sub>C</sub> = 5.0 mA)	DTA602 DTA603 DTA604 DTA607 DTA611 DTA610 DTA617 DTA601 DTA606 DTA608 DTA605 DTA622 DTA609	h <sub>FE</sub>	35 60 80 80 160 160 8.0 15 80 80 80 80 80	60 100 140 140 250 250 15 27 140 130 140 150 140	- - - - - - - - - - - - -	-
Collector-Emitter Saturation Voltage (I <sub>C</sub> = 10 mA, I <sub>B</sub> = 0.3 mA) (I <sub>C</sub> = 10 mA, I <sub>B</sub> = 5 mA) (I <sub>C</sub> = 10 mA, I <sub>B</sub> = 1 mA)	DTA617 DTA611 / DTA610 DTA606 / DTA608 DTA601	V <sub>CE(sat)</sub>	-	-	0.25	Vdc
Output Voltage (on) (V <sub>CC</sub> = 5.0 V, V <sub>B</sub> = 2.5 V, R <sub>L</sub> = 1.0 kΩ)  (V <sub>CC</sub> = 5.0 V, V <sub>B</sub> = 3.5 V, R <sub>L</sub> = 1.0 kΩ) (V <sub>CC</sub> = 5.0 V, V <sub>B</sub> = 5.5 V, R <sub>L</sub> = 1.0 kΩ) (V <sub>CC</sub> = 5.0 V, V <sub>B</sub> = 4.0 V, R <sub>L</sub> = 1.0 kΩ)	DTA602 DTA603 DTA604 DTA607 DTA611 DTA610 DTA617 DTA601 DTA606 DTA608 DTA605 DTA622 DTA609	V <sub>OL</sub>	- - - - - - - - - - - - -	- - - - - - - - - - - - -	0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2	Vdc
Output Voltage (off) (V <sub>CC</sub> = 5.0 V, V <sub>B</sub> = 0.5 V, R <sub>L</sub> = 1.0 kΩ) (V <sub>CC</sub> = 5.0 V, V <sub>B</sub> = 0.25 V, R <sub>L</sub> = 1.0 kΩ)	DTA611 DTA610 DTA617 DTA601	V <sub>OH</sub>	4.9	-	-	Vdc
Input Resistor	DTA602 DTA603 DTA604 DTA607 DTA611 DTA610 DTA617 DTA601 DTA606 DTA608 DTA605 DTA622 DTA609	R <sub>1</sub>	7.0 15.4 32.9 7.0 7.0 3.3 1.5 3.3 3.3 15.4 1.54 70 32.9	10 22 47 10 10 4.7 2.2 4.7 4.7 22 2.2 100 47	13 28.6 61.1 13 13 6.1 2.9 6.1 6.1 28.6 2.86 130 61.1	kΩ
Resistor Ratio	DTA602 / DTA603 DTA604 / DTA622 DTA607 DTA611 / DTA610 DTA617 / DTA601 DTA606 DTA608 DTA605 DTA609	R <sub>1</sub> /R <sub>2</sub>	0.8 0.8 0.17 - 0.8 0.055 0.38 0.038 1.7	1.0 1.0 0.21 - 1.0 0.1 0.47 0.047 2.1	1.2 1.2 0.25 - 1.2 0.185 0.56 0.056 2.6	-

4. Pulse Test: Pulse Width < 300 μs, Duty Cycle < 2.0%



# DTA601~611, DTA617, DTA622

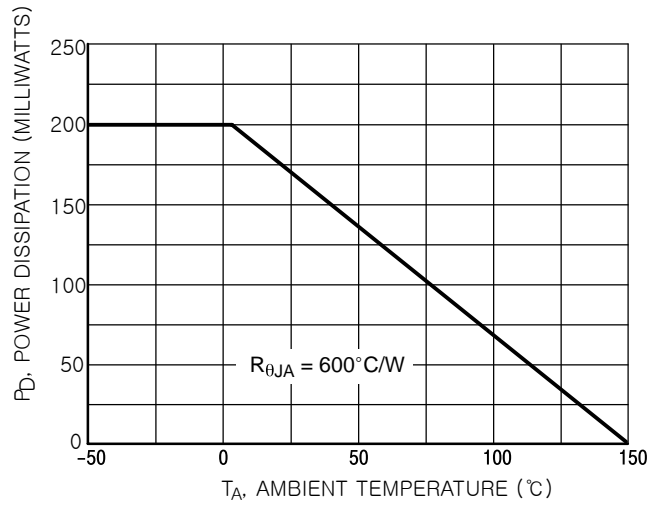


Figure 1. Derating Curve

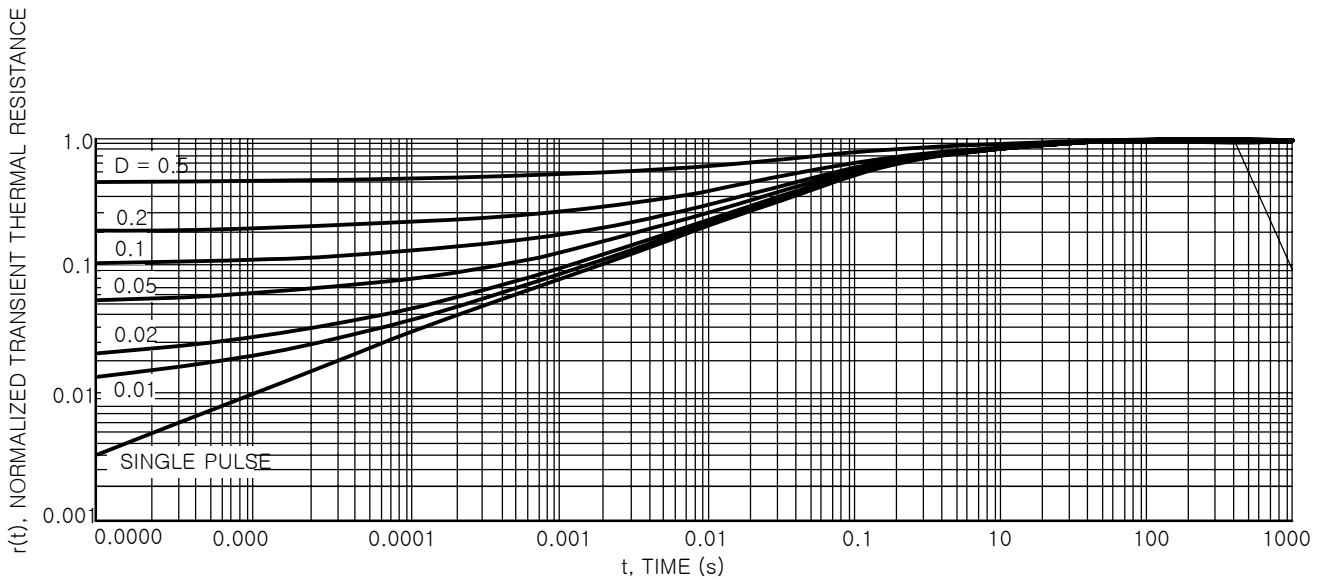


Figure 2. Normalized Thermal Response

## TYPICAL ELECTRICAL CHARACTERISTICS - DTA602

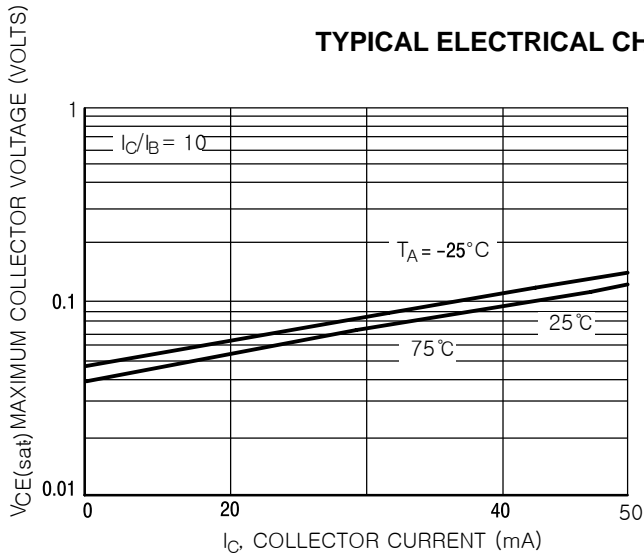


Figure 3.  $V_{CE(sat)}$  versus  $I_C$

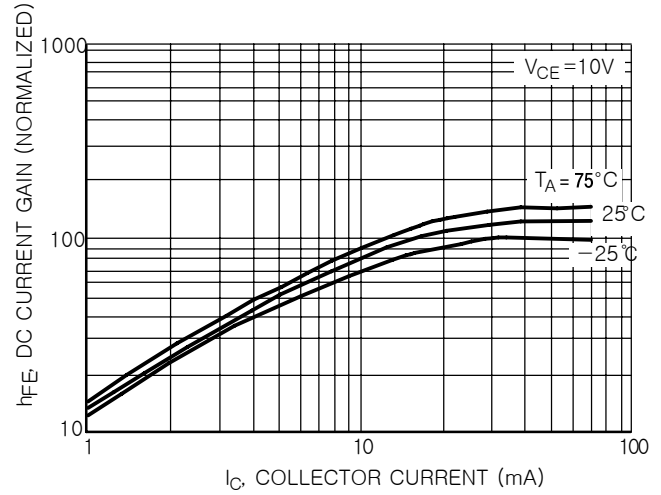


Figure 4. DC Current Gain

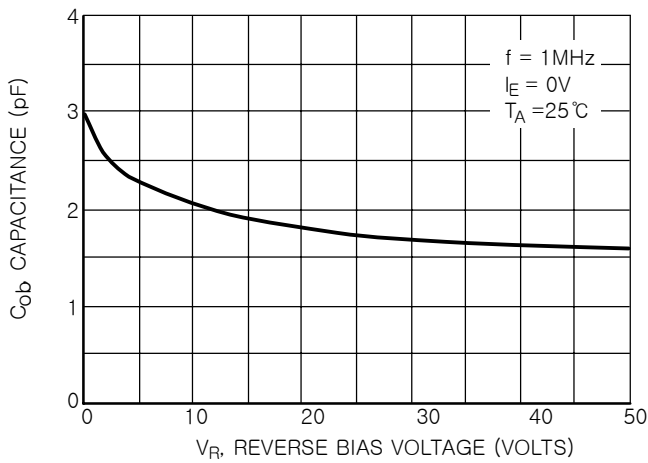


Figure 5. Output Capacitance

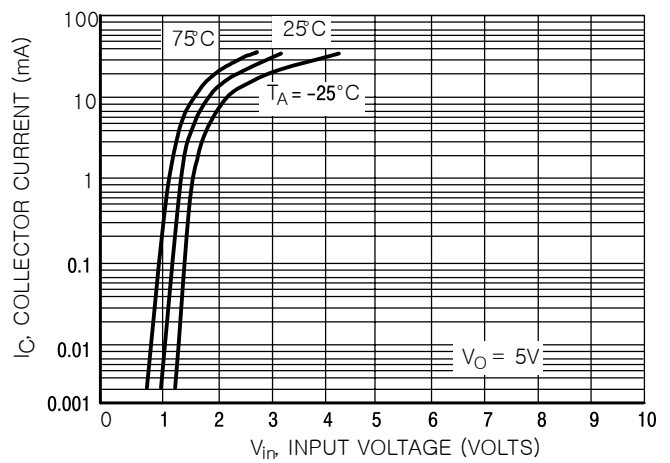


Figure 6. Output Current versus Input Voltage

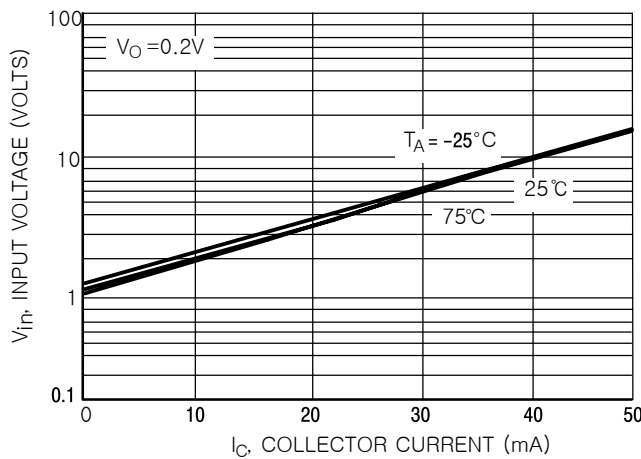


Figure 7. Input Voltage versus Output Current

## TYPICAL ELECTRICAL CHARACTERISTICS - DTA617

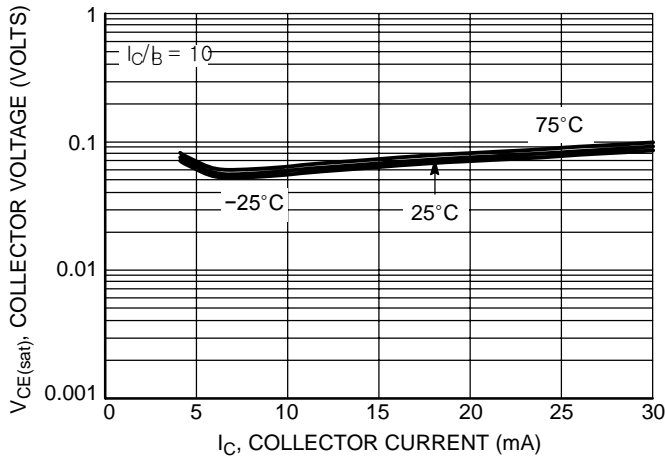


Figure 8.  $V_{CE(sat)}$  versus  $I_C$

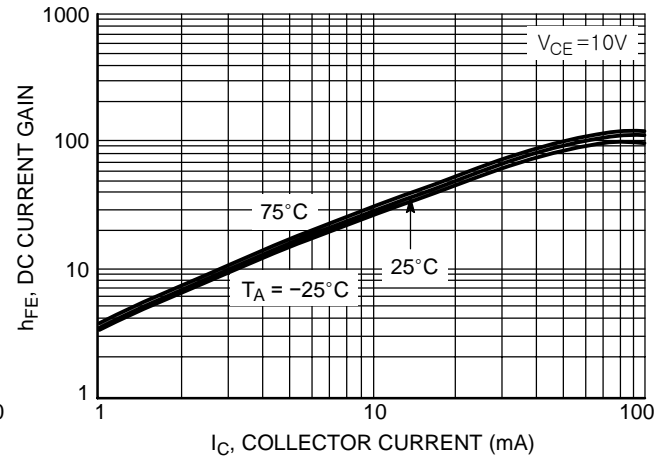


Figure 9. DC Current Gain

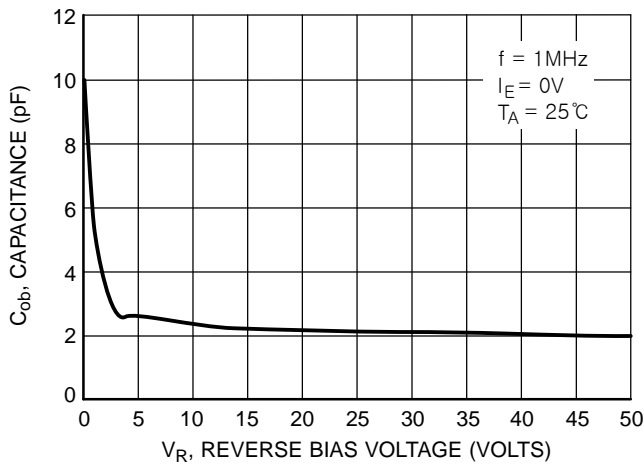


Figure 10. Output Capacitance

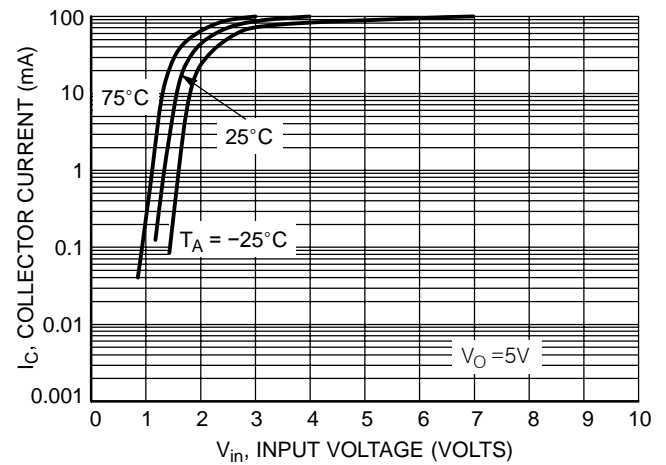


Figure 11. Output Current versus Input Voltage

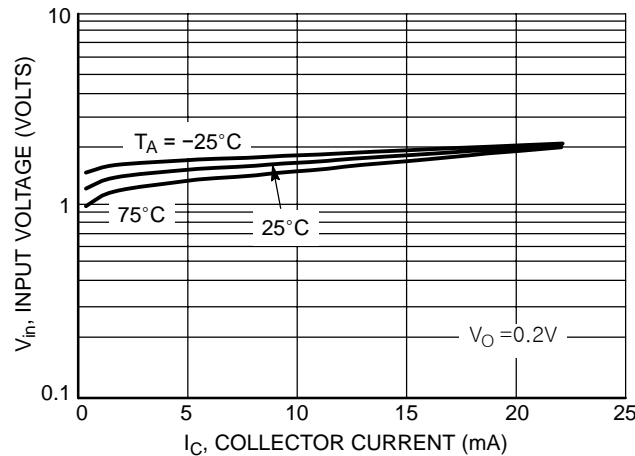


Figure 12. Input Voltage versus Output Current

## TYPICAL ELECTRICAL CHARACTERISTICS – DTA603

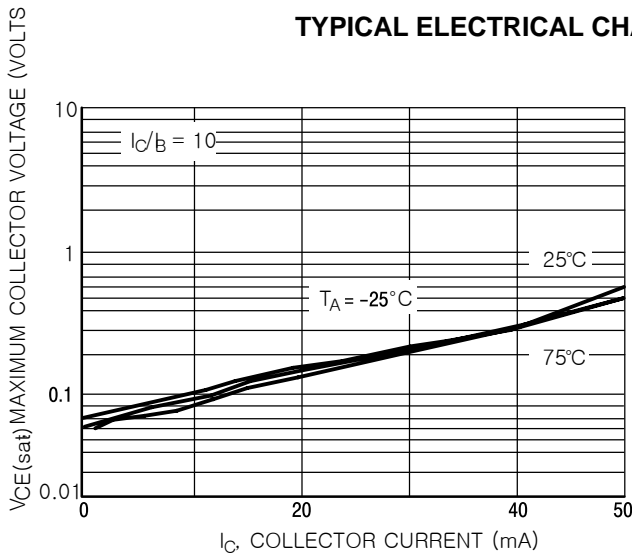


Figure 13.  $V_{CE(sat)}$  versus  $I_C$

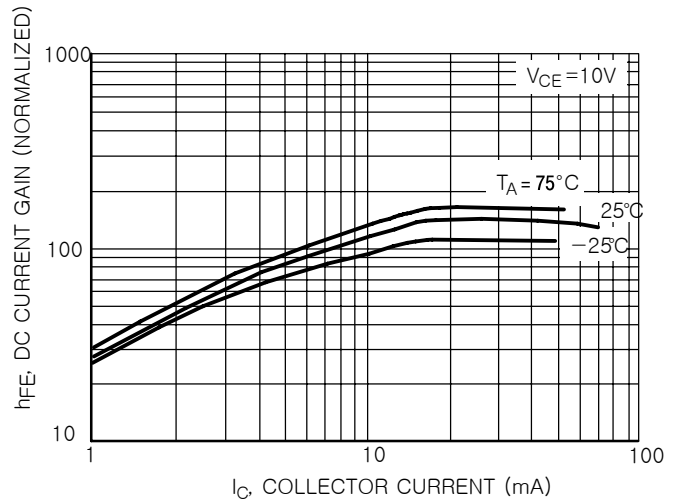


Figure 14. DC Current Gain

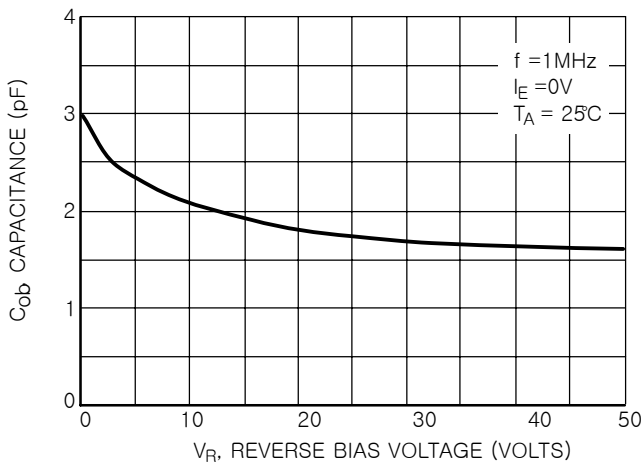


Figure 15. Output Capacitance

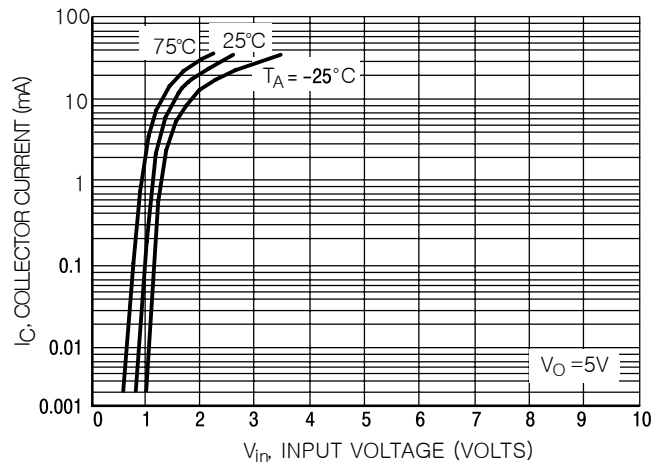


Figure 16. Output Current versus Input Voltage

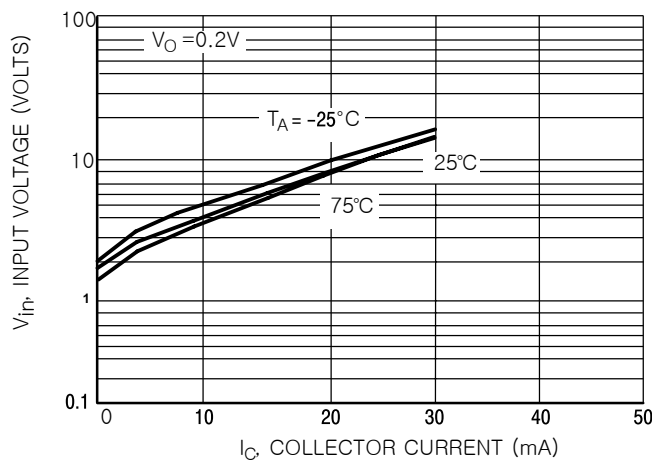


Figure 17. Input Voltage versus Output Current

## TYPICAL ELECTRICAL CHARACTERISTICS – DTA604

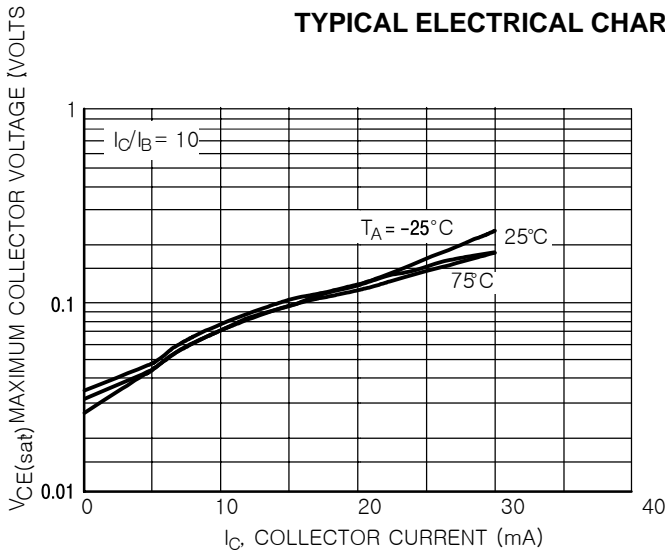


Figure 18.  $V_{CE(sat)}$  versus  $I_C$

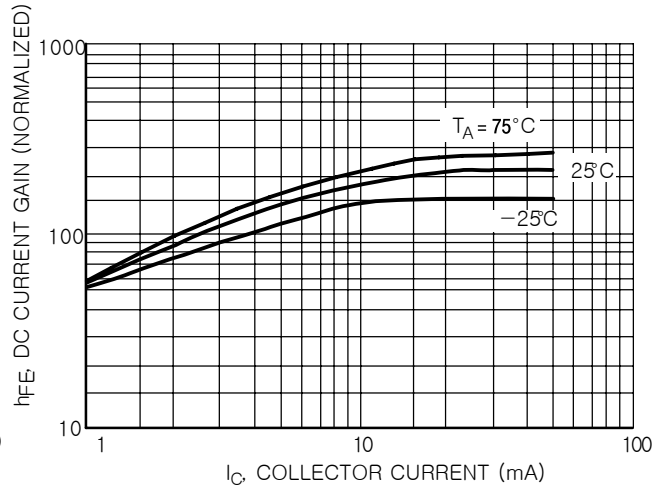


Figure 19. DC Current Gain

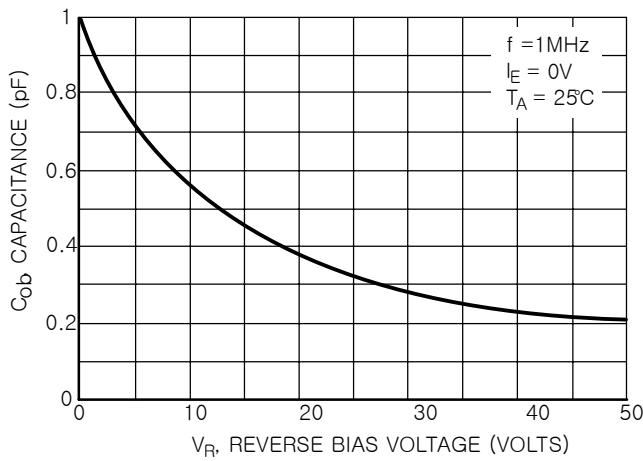


Figure 20. Output Capacitance

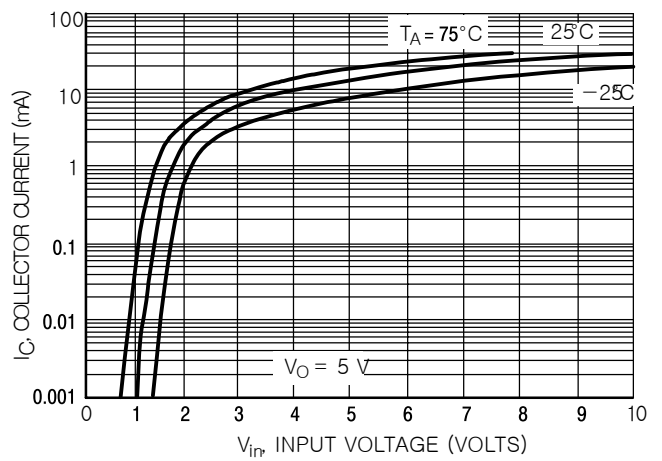


Figure 21. Output Current versus Input Voltage

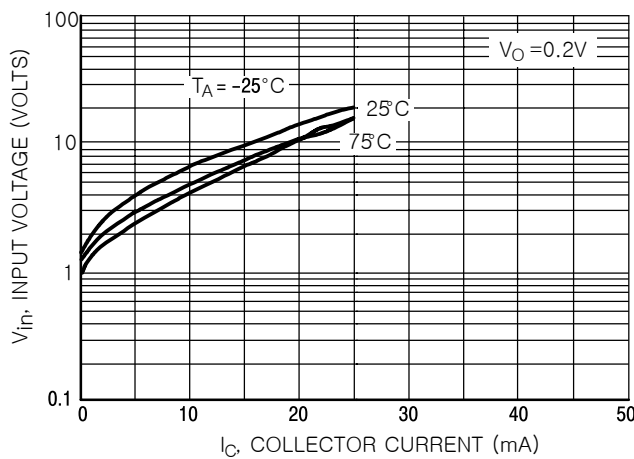
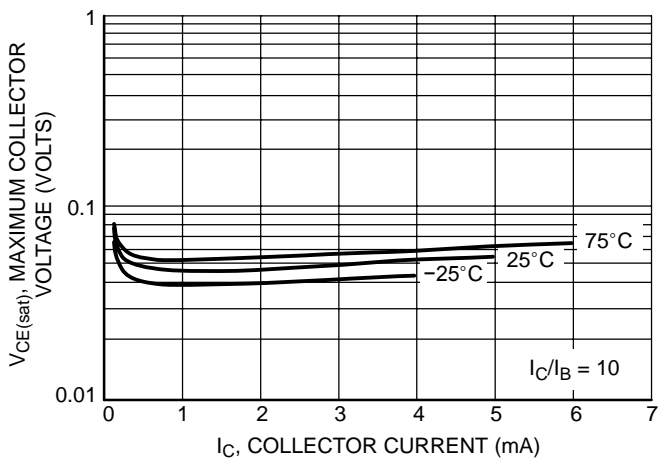


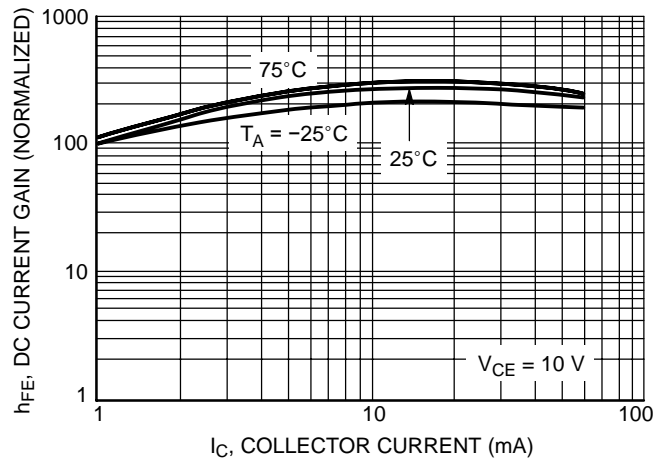
Figure 22. Input Voltage versus Output Current



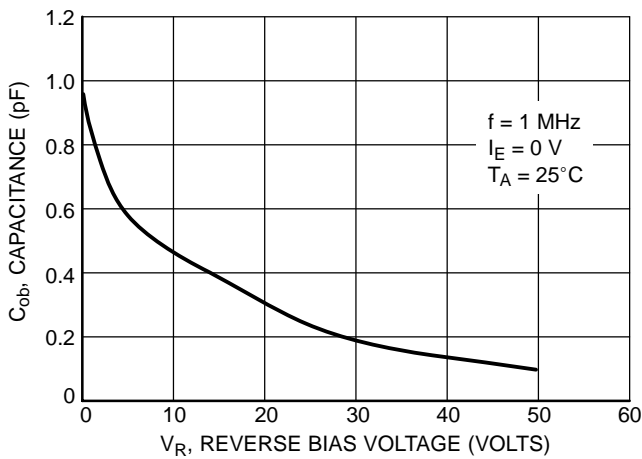
## TYPICAL ELECTRICAL CHARACTERISTICS — DTA622



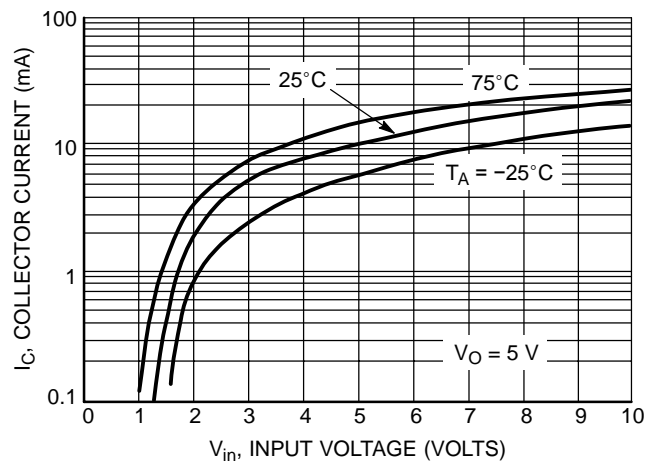
**Figure 29. Maximum Collector Voltage versus Collector Current**



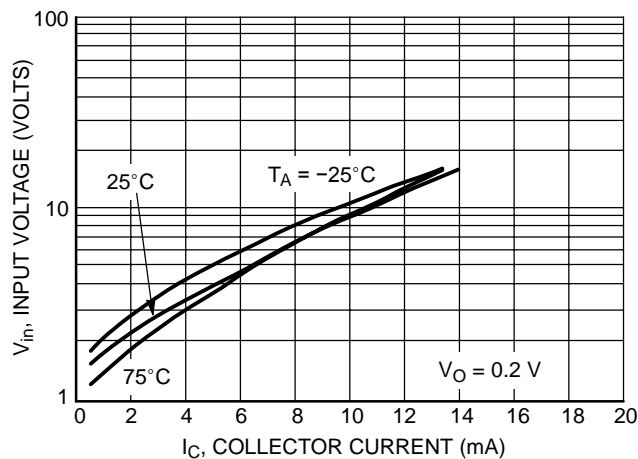
**Figure 30. DC Current Gain**



**Figure 31. Output Capacitance**



**Figure 32. Output Current versus Input Voltage**



**Figure 33. Input Voltage versus Output Current**



## TYPICAL ELECTRICAL CHARACTERISTICS — DTA609

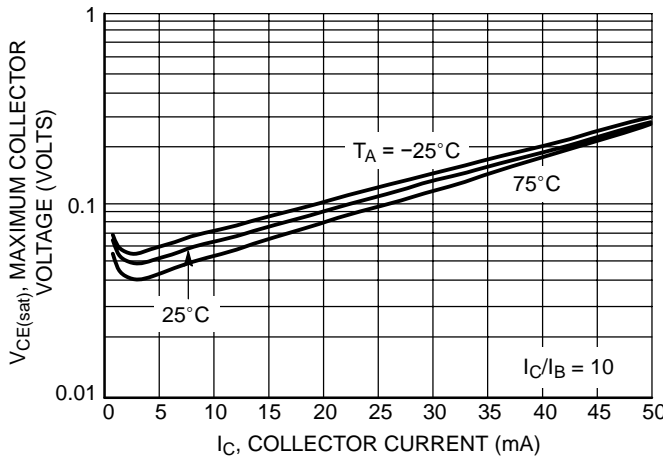


Figure 34. Maximum Collector Voltage versus Collector Current

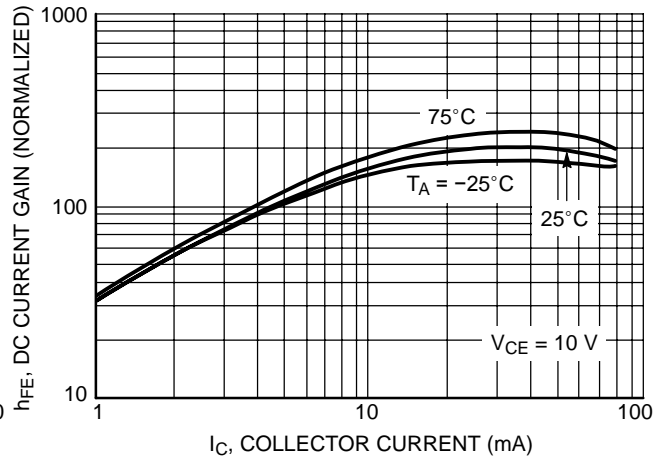


Figure 35. DC Current Gain

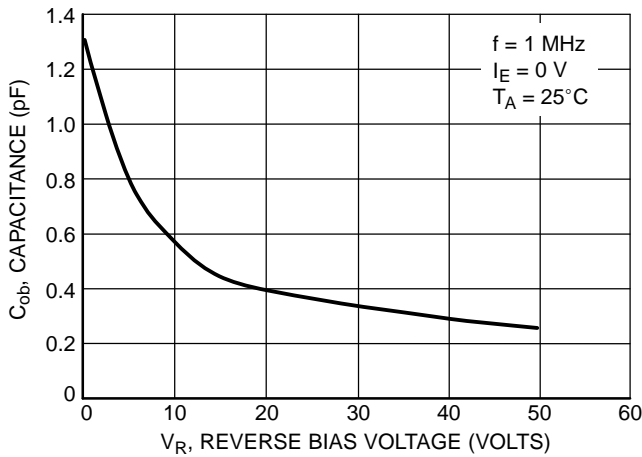


Figure 36. Output Capacitance

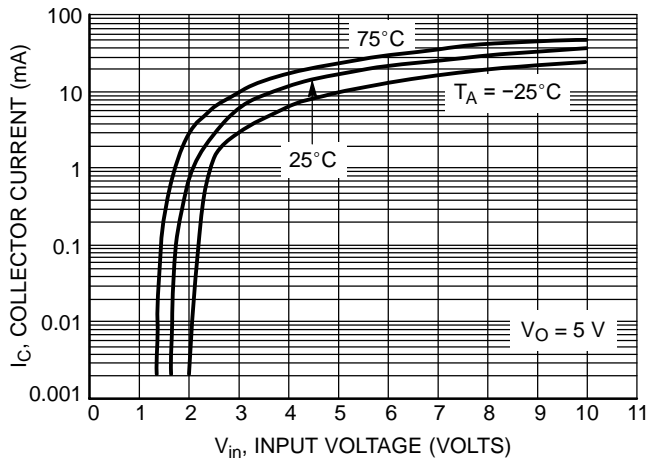


Figure 37. Output Current versus Input Voltage

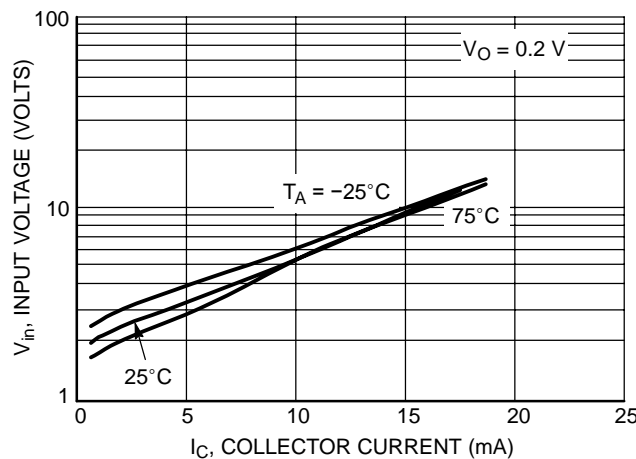
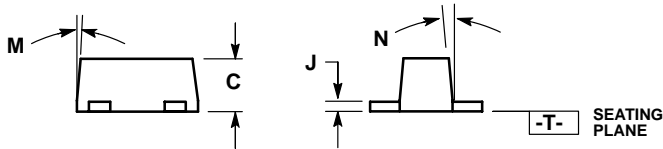
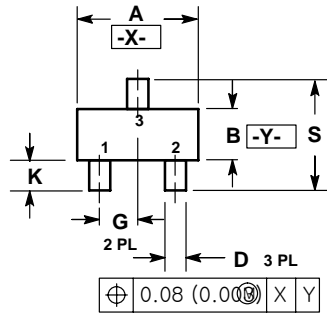


Figure 38. Input Voltage versus Output Current

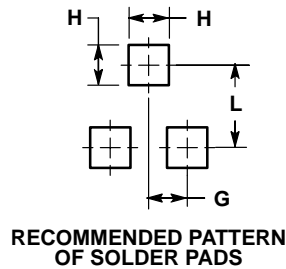
## SC-89



**NOTES:**

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETERS
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. 463C-01 OBSOLETE, NEW STANDARD 463C-02.

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	1.50	1.60	1.70	0.059	0.063	0.067
B	0.75	0.85	0.95	0.030	0.034	0.040
C	0.60	0.70	0.80	0.024	0.028	0.031
D	0.23	0.28	0.33	0.009	0.011	0.013
G	0.50 BSC			0.020 BSC		
H	0.53 REF			0.021 REF		
J	0.10	0.15	0.20	0.004	0.006	0.008
K	0.30	0.40	0.50	0.012	0.016	0.020
L	1.10 REF			0.043 REF		
M	--	--	10 °	--	--	10 °
N	--	--	10 °	--	--	10 °
S	1.50	1.60	1.70	0.059	0.063	0.067





TYPICAL ELECTRICAL CHARACTERISTICS  
DTC117

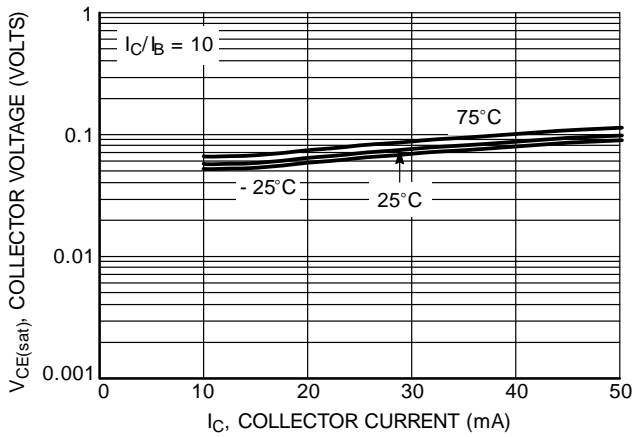


Figure 37.  $V_{CE(sat)}$  versus  $I_C$

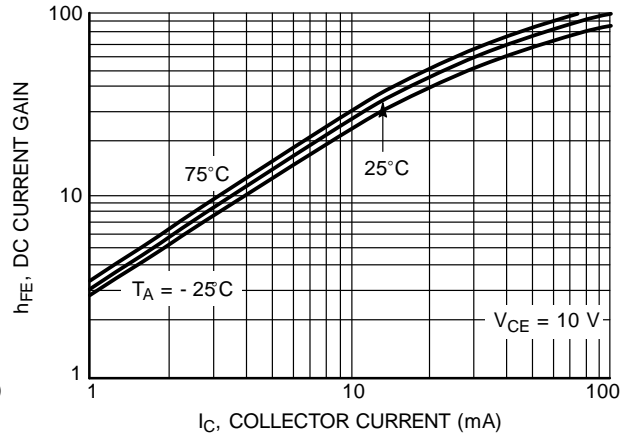


Figure 38. DC Current Gain

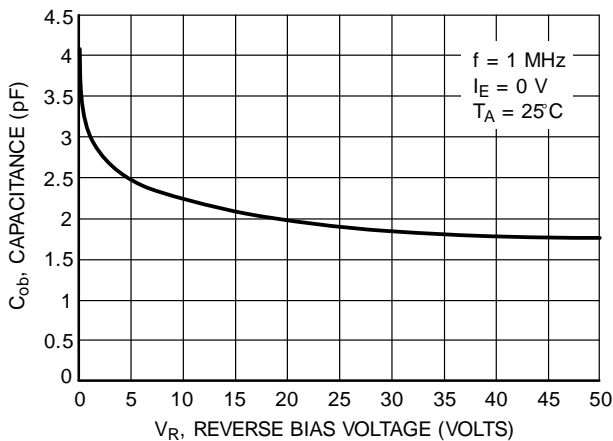


Figure 39. Output Capacitance

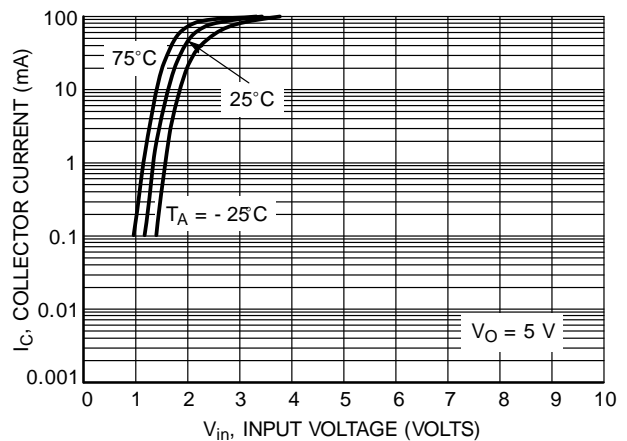


Figure 40. Output Current versus Input Voltage

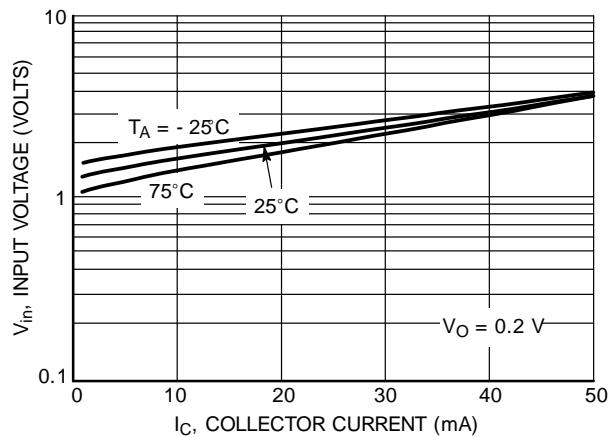


Figure 41. Input Voltage versus Output Current

TYPICAL ELECTRICAL CHARACTERISTICS  
DTC108

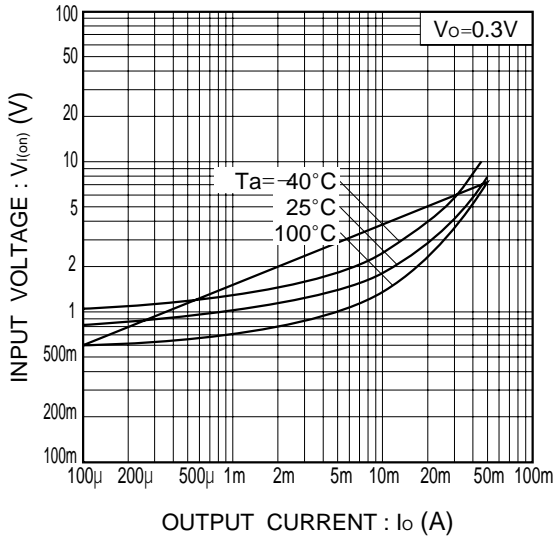


Fig.1 Input voltage vs. output current (ON characteristics)

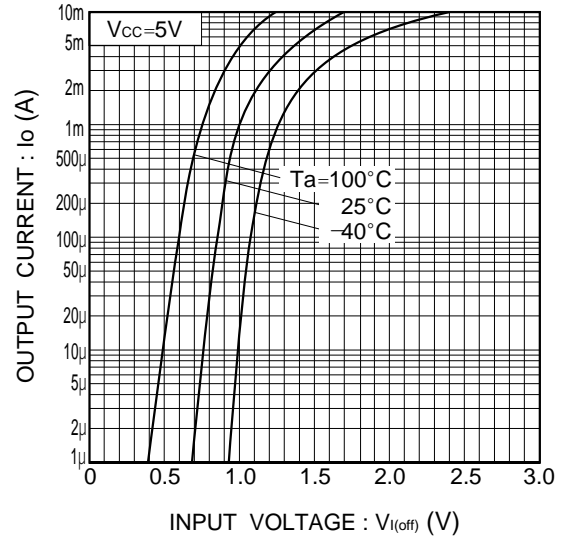


Fig.2 Output current vs. input voltage (OFF characteristics)

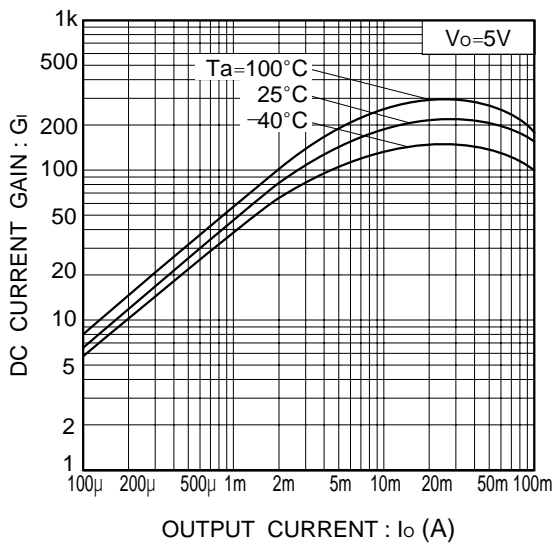


Fig.3 DC current gain vs. output current

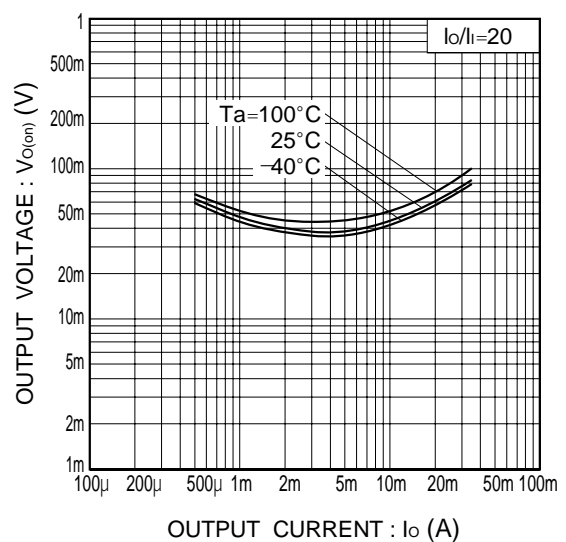


Fig.4 Output voltage vs. output current

TYPICAL ELECTRICAL CHARACTERISTICS  
DTC123

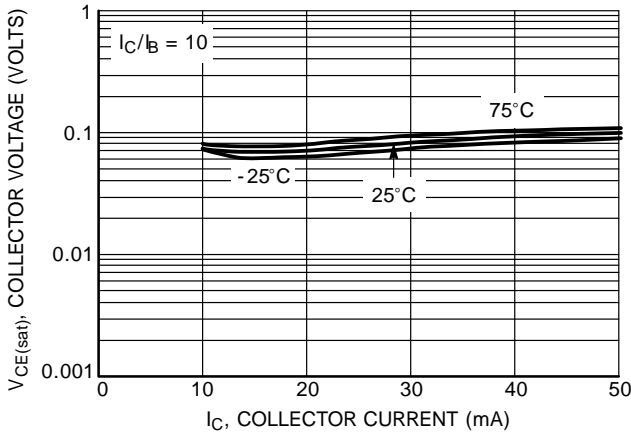


Figure 32.  $V_{CE(sat)}$  versus  $I_C$

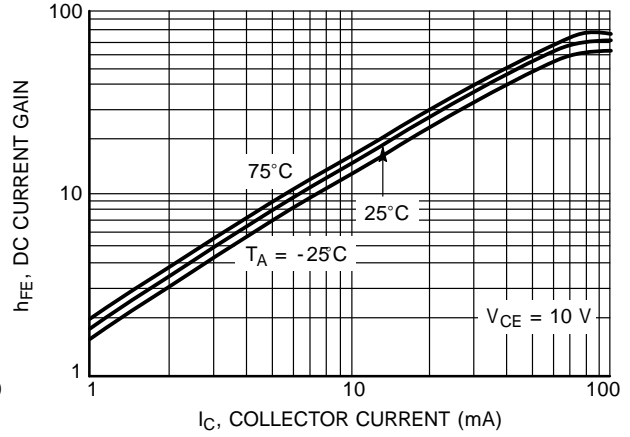


Figure 33. DC Current Gain

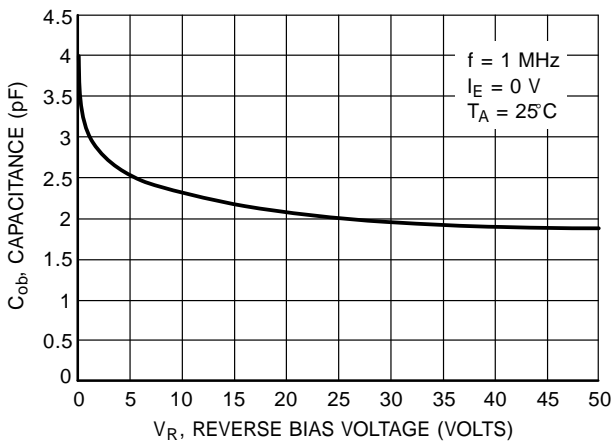


Figure 34. Output Capacitance

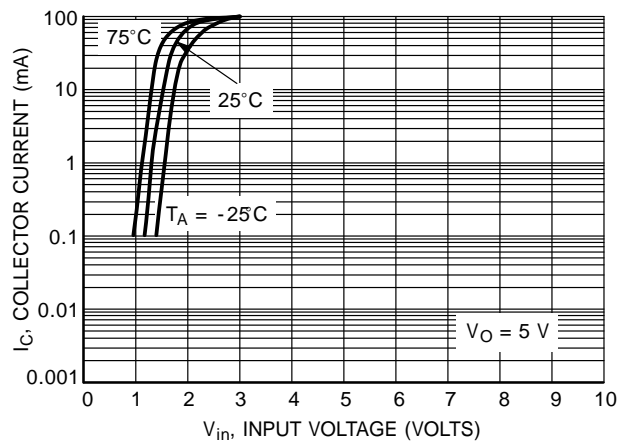


Figure 35. Output Current versus Input Voltage

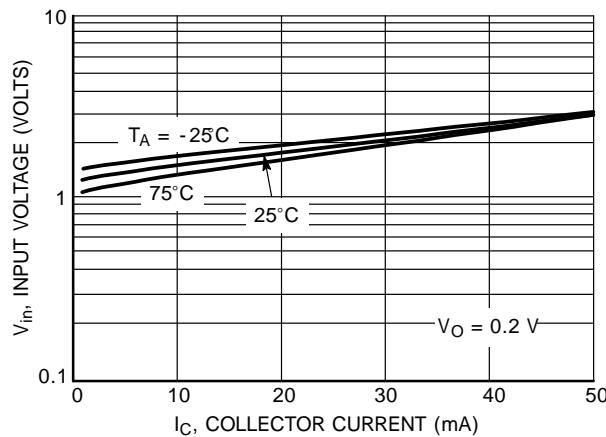


Figure 36. Input Voltage versus Output Current

TYPICAL APPLICATIONS FOR NPN BRTs

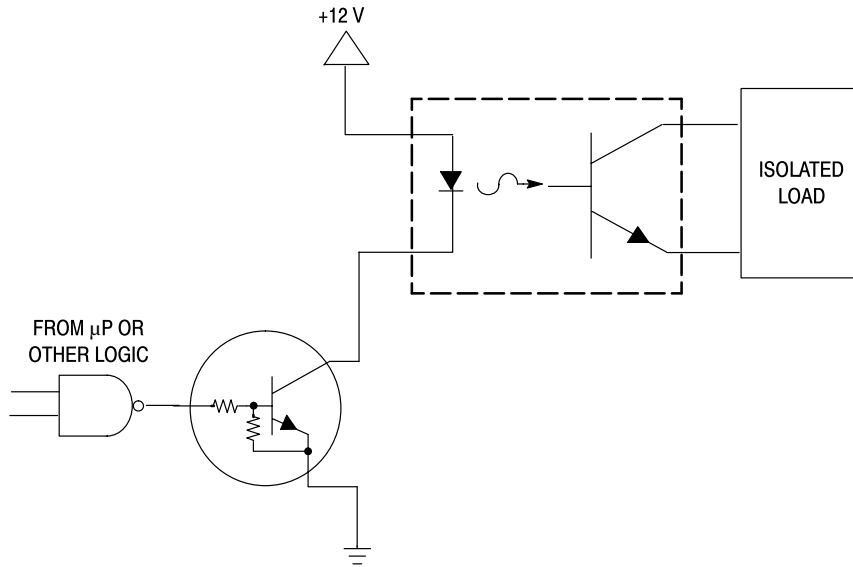


Figure 32. Level Shifter: Connects 12 or 24 Volt Circuits to Logic

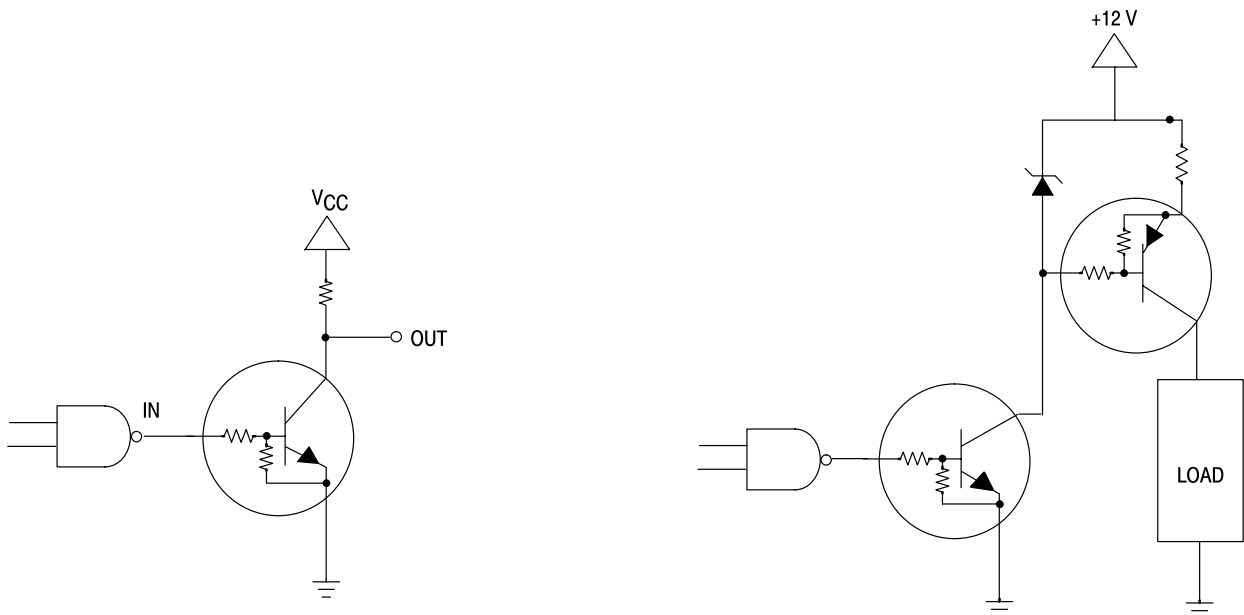
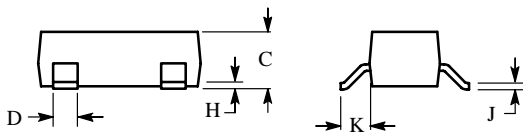
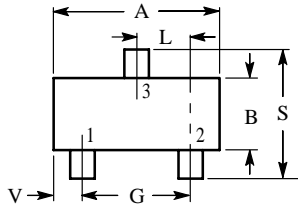


Figure 33. Open Collector Inverter: Inverts the Input Signal

Figure 34. Inexpensive, Unregulated Current Source

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NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.1102	0.1197	2.80	3.04
B	0.0472	0.0551	1.20	1.40
C	0.0350	0.0440	0.89	1.11
D	0.0150	0.0200	0.37	0.50
G	0.0701	0.0807	1.78	2.04
H	0.0005	0.0040	0.013	0.100
J	0.0034	0.0070	0.085	0.177
K	0.0140	0.0285	0.35	0.69
L	0.0350	0.0401	0.89	1.02
S	0.0830	0.1039	2.10	2.64
V	0.0177	0.0236	0.45	0.60

