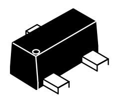
SEMICONDUCTOR
TECHNICAL DATA

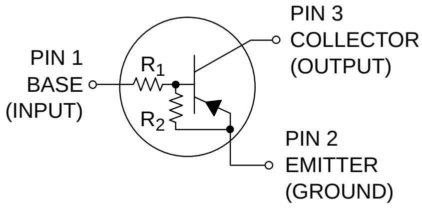
DTA601~611, DTA617, DTA622

Bias Resistor Transistors

PNP Silicon Surface Mount Transistors with Monolithic Bias Resistor Network



SC-89



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_A = 25°C unless otherwise noted)

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

THERMAL CHARACTERISTICS

Rating	Symbol	Value	Unit
Total Device Dissipation, FR−4 Board (Note 1) @ T_A = 25°C Derate above 25°C	P_D	200 1.6	mW mW/°C
Thermal Resistance, Junction−to−Ambient (Note 1)	$R_{\theta JA}$	600	°C/W
Total Device Dissipation, FR−4 Board (Note 2) @ T_A = 25°C Derate above 25°C	P_D	300 2.4	mW mW/°C
Thermal Resistance, Junction−to−Ambient (Note 2)	$R_{\theta JA}$	400	°C/W
Junction and Storage Temperature Range	T_J, T_{stg}	−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.

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_A = 25°C unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
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 V, I_C = 0)	DTA602	I_{EBO}	−	−	0.5	mAdc
	DTA603		−	−	0.2	
	DTA604		−	−	0.1	
	DTA607		−	−	0.2	
	DTA611		−	−	0.9	
	DTA610		−	−	1.9	
	DTA617		−	−	2.3	
	DTA601		−	−	1.5	
	DTA606		−	−	0.18	
	DTA608		−	−	0.13	
	DTA605		−	−	0.2	
	DTA622		−	−	0.05	
	DTA609		−	−	0.13	
Collector−Base Breakdown Voltage (I_C = 10 μA, I_E = 0)		$V_{(BR)CBO}$	50	−	−	Vdc
Collector−Emitter Breakdown Voltage (Note 3) (I_C = 2.0 mA, I_B = 0)		$V_{(BR)CEO}$	50	−	−	Vdc

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

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

Characteristic		Symbol	Min	Typ	Max	Unit
ON CHARACTERISTICS (Note 4)						
DC Current Gain	DTA602	h_{FE}	35	60	–	–
(V_{CE} = 10 V, I_C = 5.0 mA)	DTA603		60	100	–	
	DTA604		80	140	–	
	DTA607		80	140	–	
	DTA611		160	250	–	
	DTA610		160	250	–	
	DTA617		8.0	15	–	
	DTA601		15	27	–	
	DTA606		80	140	–	
	DTA608		80	130	–	
	DTA605		80	140	–	
	DTA622		80	150	–	
	DTA609		80	140	–	
Collector−Emitter Saturation Voltage (I_C = 10 mA, I_B = 0.3 mA)		$V_{CE(sat)}$	–	–	0.25	Vdc
(I_C = 10 mA, I_B = 5 mA)	DTA617					
(I_C = 10 mA, I_B = 1 mA)	DTA611 / DTA610					
	DTA606 / DTA608					
	DTA601					
Output Voltage (on)		V_{OL}				Vdc
(V_{CC} = 5.0 V, V_B = 2.5 V, R_L = 1.0 kΩ)	DTA602		–	–	0.2	
	DTA603		–	–	0.2	
	DTA604		–	–	0.2	
	DTA607		–	–	0.2	
	DTA611		–	–	0.2	
	DTA610		–	–	0.2	
	DTA617		–	–	0.2	
	DTA601		–	–	0.2	
	DTA606		–	–	0.2	
	DTA608		–	–	0.2	
(V_{CC} = 5.0 V, V_B = 3.5 V, R_L = 1.0 kΩ)	DTA605		–	–	0.2	
(V_{CC} = 5.0 V, V_B = 5.5 V, R_L = 1.0 kΩ)	DTA622		–	–	0.2	
(V_{CC} = 5.0 V, V_B = 4.0 V, R_L = 1.0 kΩ)	DTA609		–	–	0.2	
Output Voltage (off) (V_{CC} = 5.0 V, V_B = 0.5 V, R_L = 1.0 kΩ)		V_{OH}	4.9	–	–	Vdc
(V_{CC} = 5.0 V, V_B = 0.25 V, R_L = 1.0 kΩ)	DTA611					
	DTA610					
	DTA617					
	DTA601					
Input Resistor	DTA602	R1	7.0	10	13	kΩ
	DTA603		15.4	22	28.6	
	DTA604		32.9	47	61.1	
	DTA607		7.0	10	13	
	DTA611		7.0	10	13	
	DTA610		3.3	4.7	6.1	
	DTA617		1.5	2.2	2.9	
	DTA601		3.3	4.7	6.1	
	DTA606		3.3	4.7	6.1	
	DTA608		15.4	22	28.6	
	DTA605		1.54	2.2	2.86	
	DTA622		70	100	130	
	DTA609		32.9	47	61.1	
Resistor Ratio		R_1/R_2				–
	DTA602 / DTA603		0.8	1.0	1.2	
	DTA604 / DTA622		0.8	1.0	1.2	
	DTA607		0.17	0.21	0.25	
	DTA611 / DTA610		–	–	–	
	DTA617/ DTA601		0.8	1.0	1.2	
	DTA606		0.055	0.1	0.185	
	DTA608		0.38	0.47	0.56	
	DTA605		0.038	0.047	0.056	
	DTA609		1.7	2.1	2.6	

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

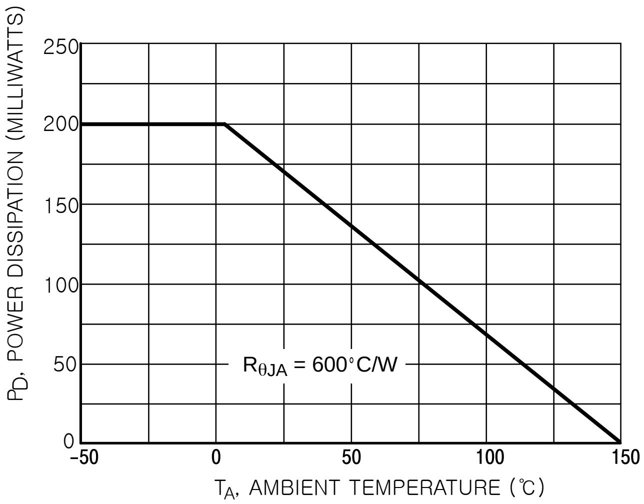


Figure 1. Derating Curve

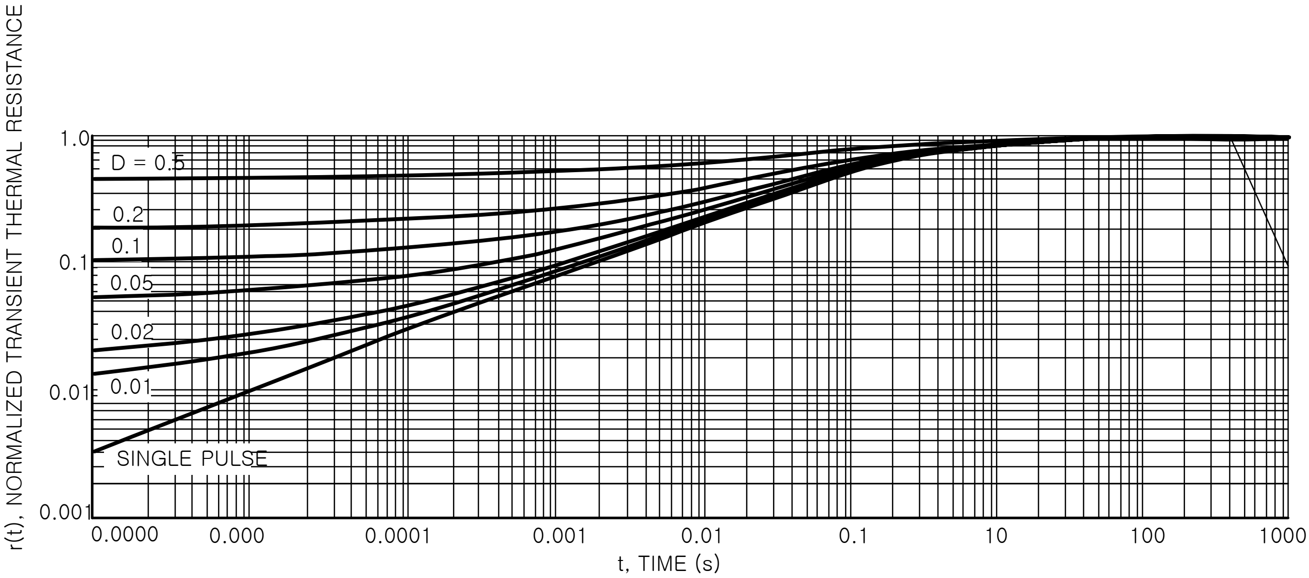


Figure 2. Normalized Thermal Response

TYPICAL ELECTRICAL CHARACTERISTICS – DTA602

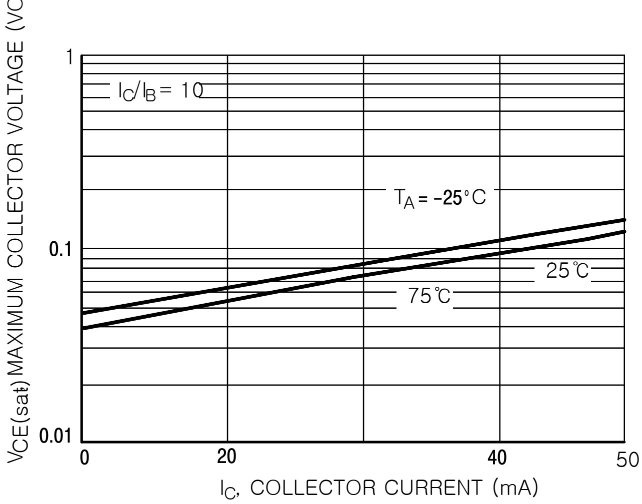


Figure 3. $V_{CE(sat)}$ versus I_C

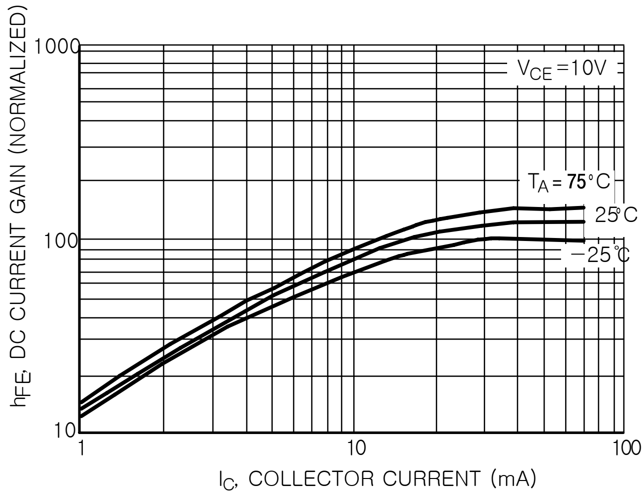


Figure 4. DC Current Gain

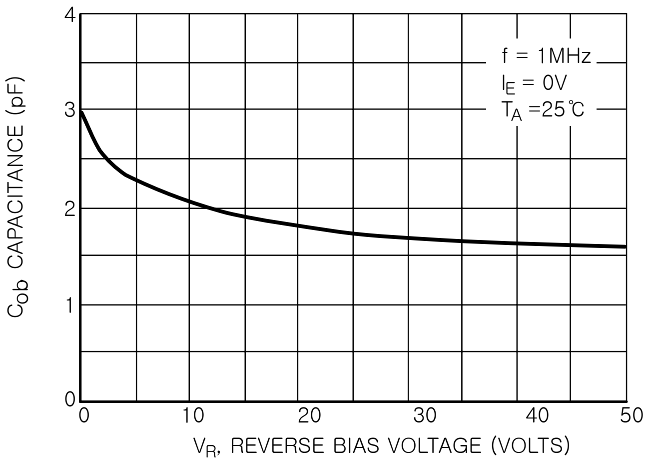


Figure 5. Output Capacitance

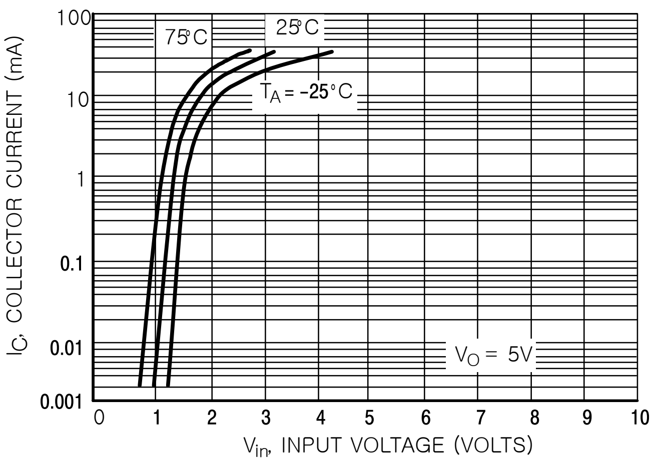


Figure 6. Output Current versus Input Voltage

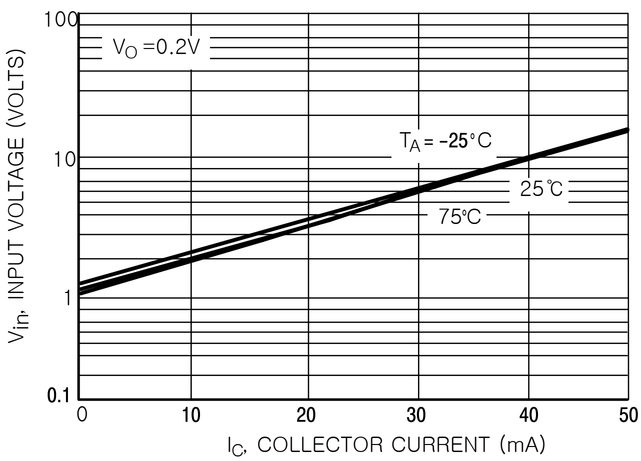


Figure 7. Input Voltage versus Output Current

TYPICAL ELECTRICAL CHARACTERISTICS − DTA617

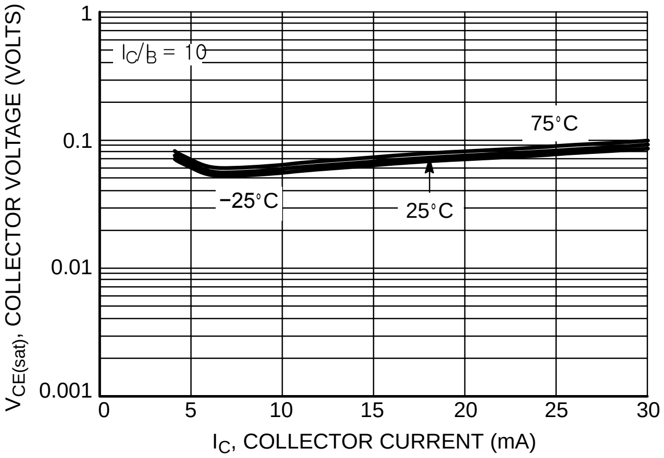


Figure 8. $V_{CE(sat)}$ versus I_C

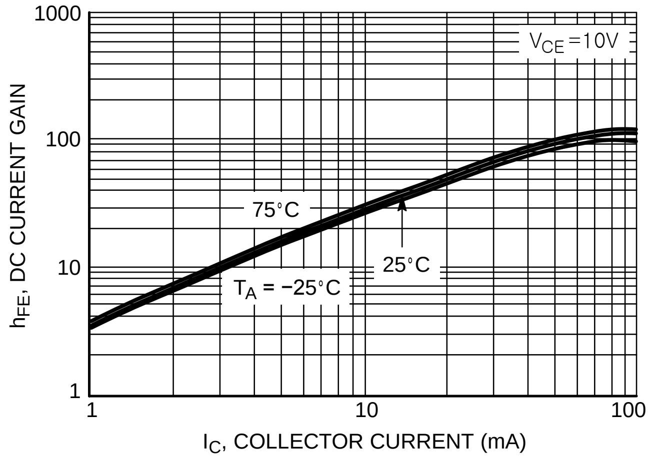


Figure 9. DC Current Gain

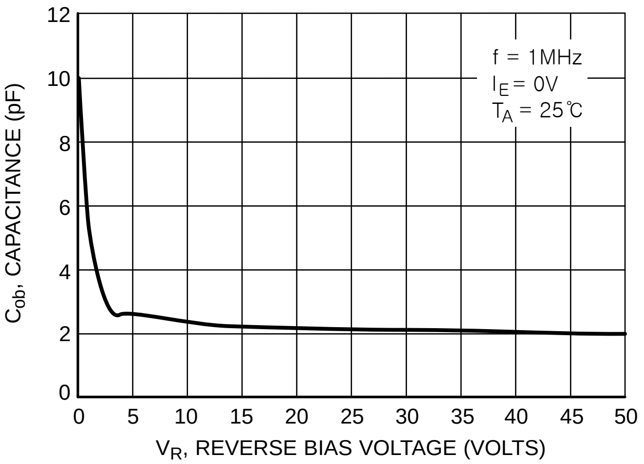


Figure 10. Output Capacitance

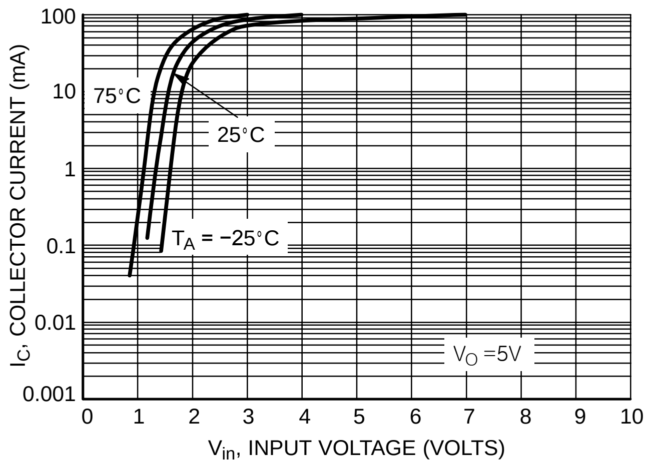


Figure 11. Output Current versus Input Voltage

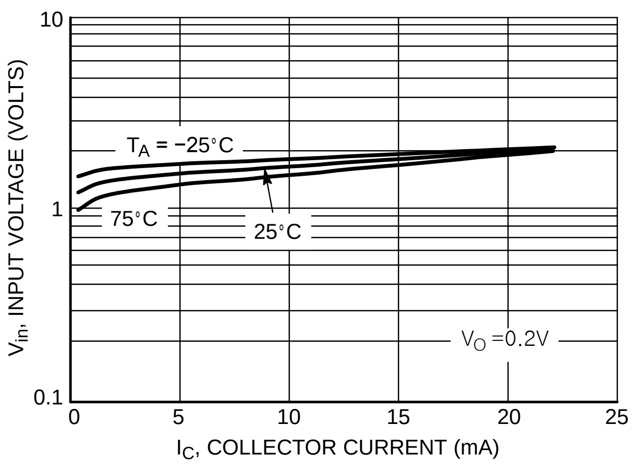


Figure 12. Input Voltage versus Output Current

TYPICAL ELECTRICAL CHARACTERISTICS − DTA603

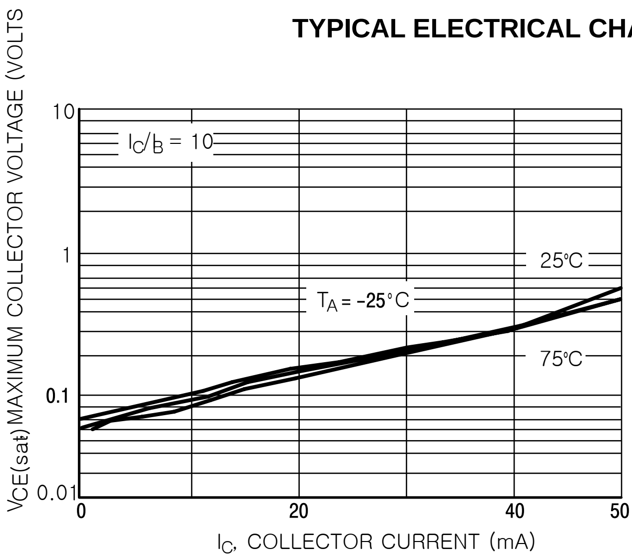


Figure 13. $V_{CE(sat)}$ versus I_C

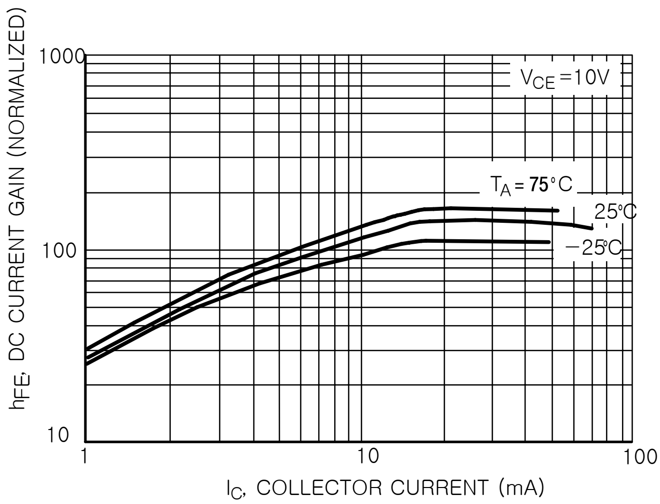


Figure 14. DC Current Gain

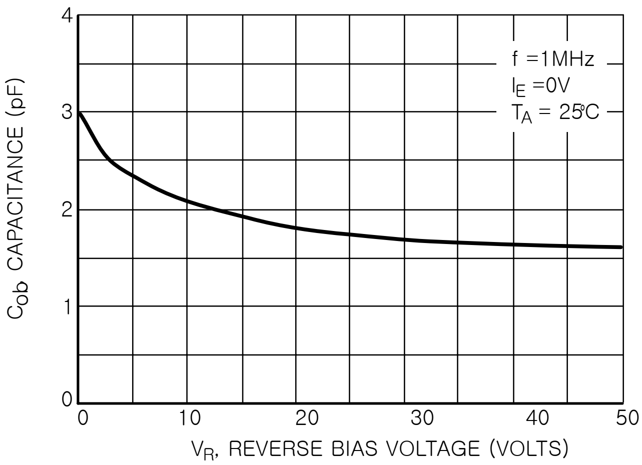


Figure 15. Output Capacitance

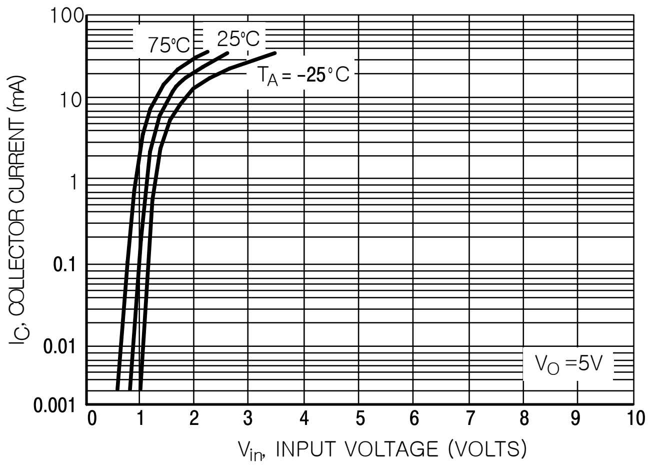


Figure 16. Output Current versus Input Voltage

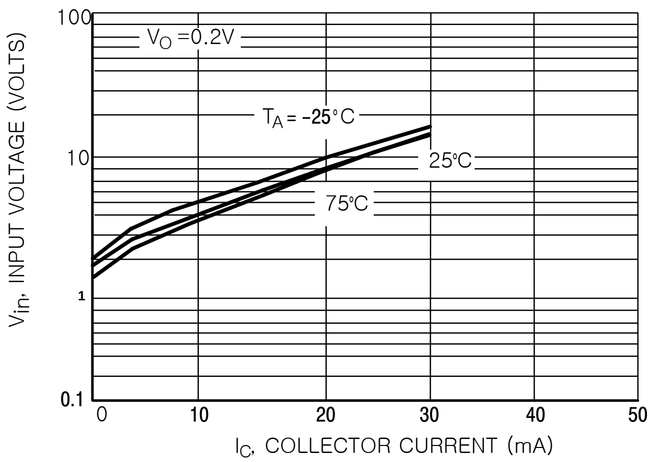


Figure 17. Input Voltage versus Output Current

TYPICAL ELECTRICAL CHARACTERISTICS − DTA604

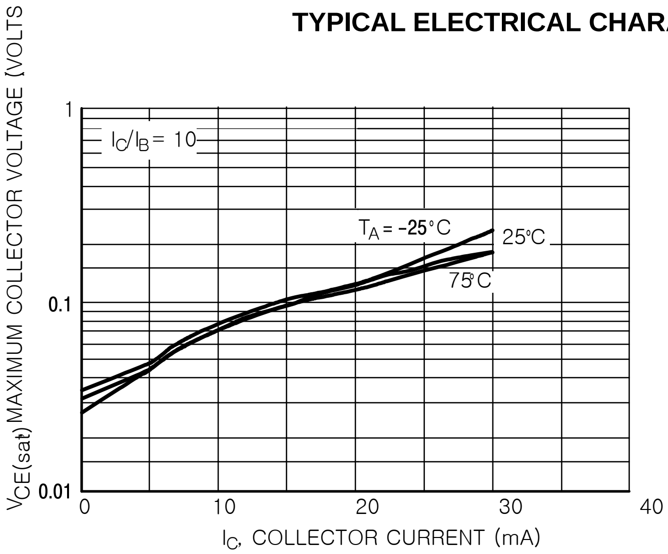


Figure 18. $V_{CE(sat)}$ versus I_C

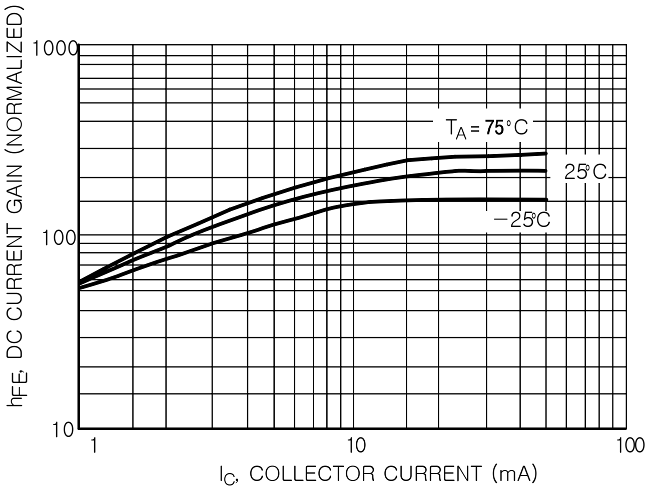


Figure 19. DC Current Gain

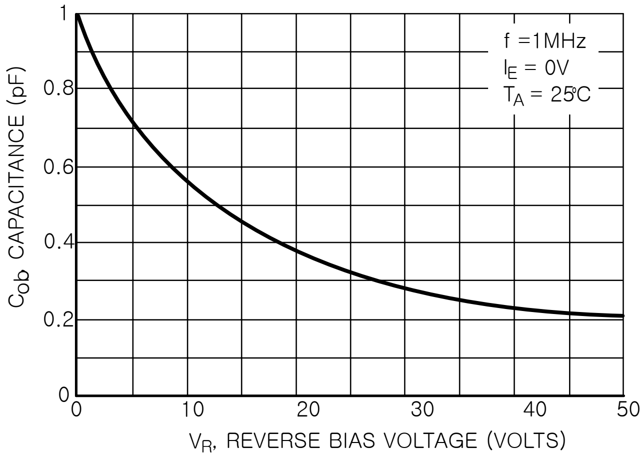


Figure 20. Output Capacitance

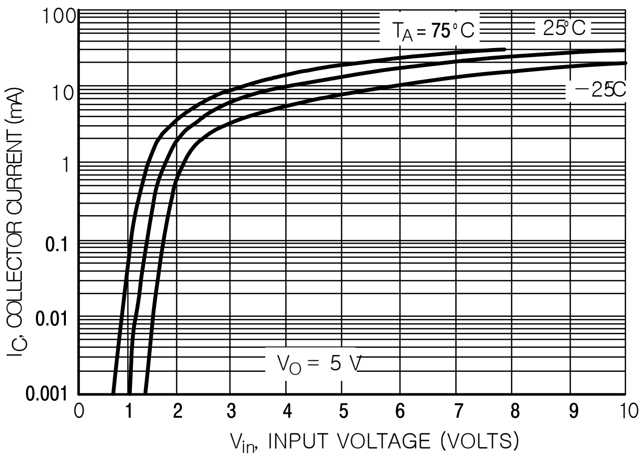


Figure 21. Output Current versus Input Voltage

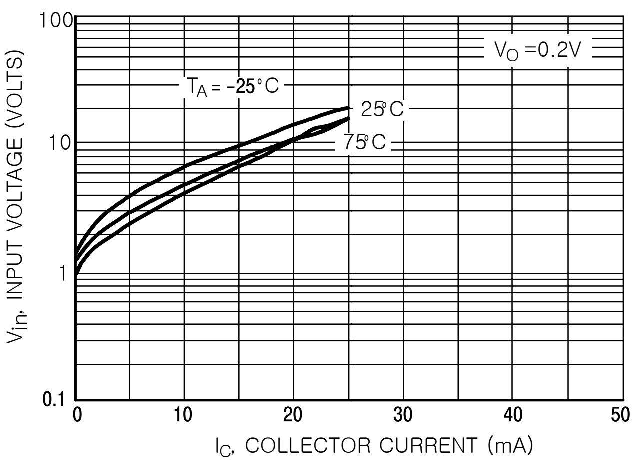


Figure 22. Input Voltage versus Output Current

TYPICAL ELECTRICAL CHARACTERISTICS — DTA622

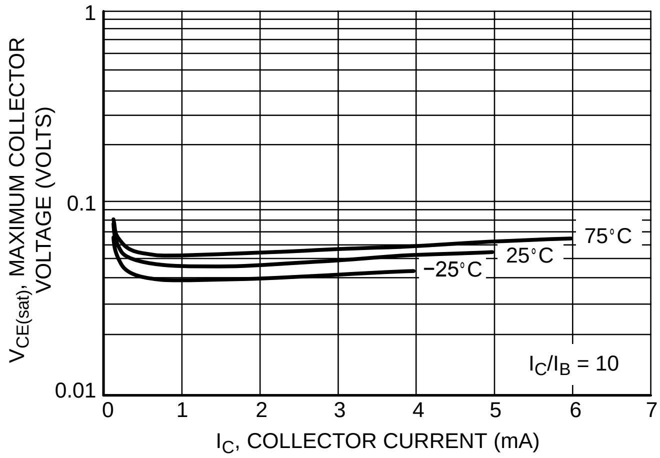


Figure 29. Maximum Collector Voltage versus Collector Current

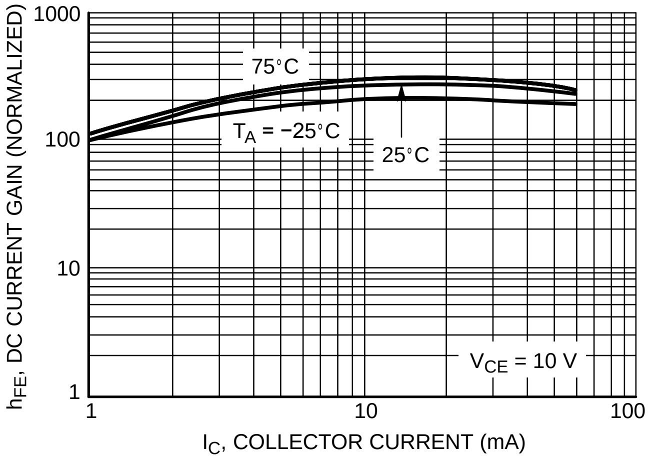


Figure 30. DC Current Gain

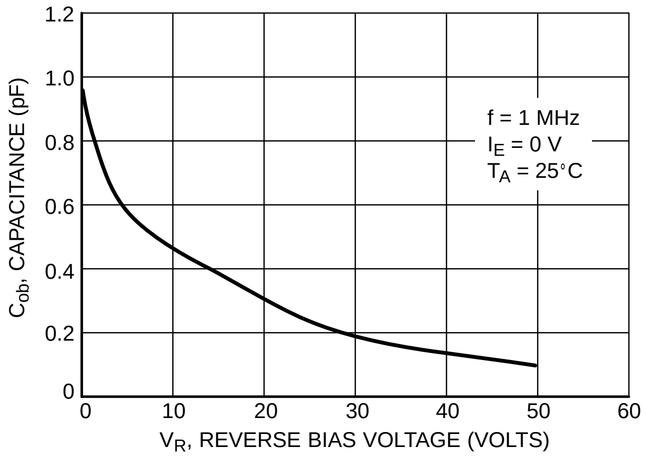


Figure 31. Output Capacitance

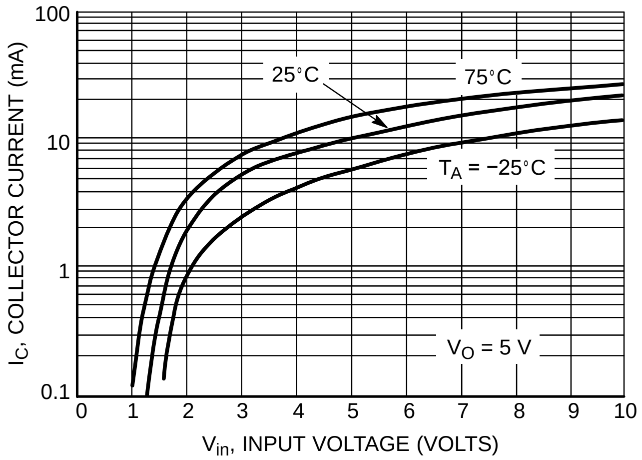


Figure 32. Output Current versus Input Voltage

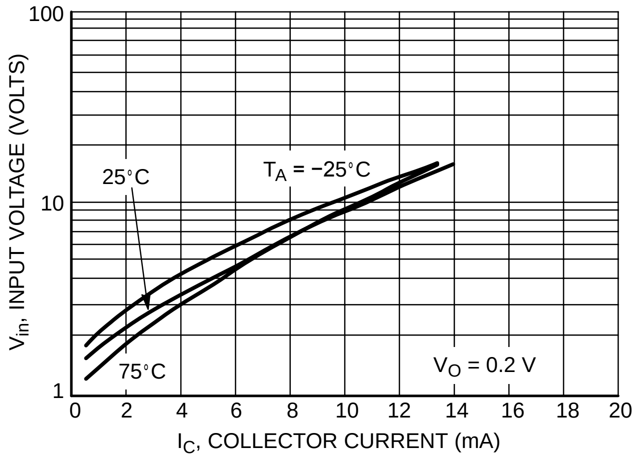


Figure 33. Input Voltage versus Output Current

TYPICAL ELECTRICAL CHARACTERISTICS — DTA609

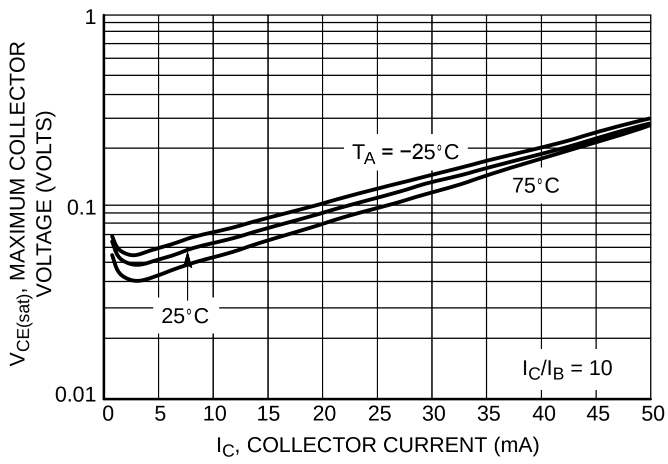


Figure 34. Maximum Collector Voltage versus Collector Current

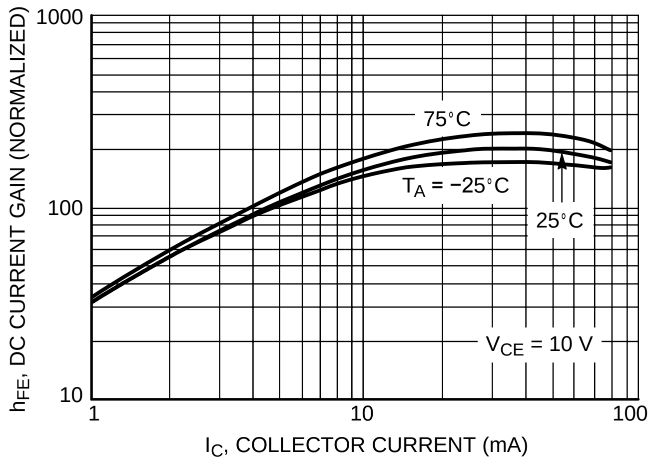


Figure 35. DC Current Gain

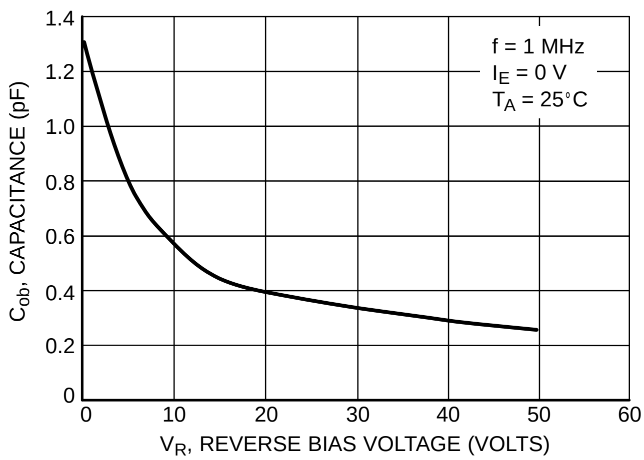


Figure 36. Output Capacitance

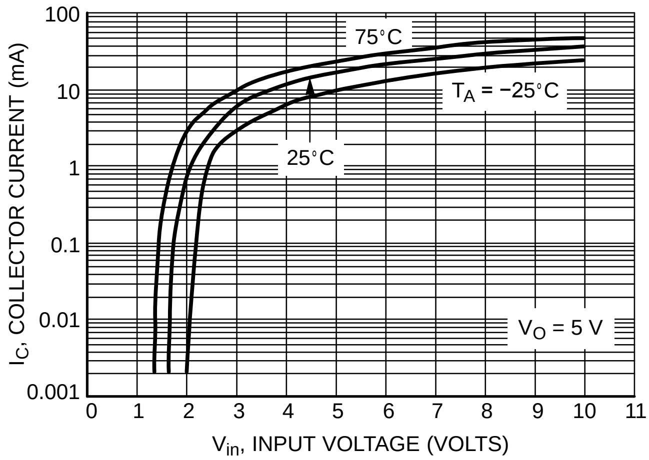


Figure 37. Output Current versus Input Voltage

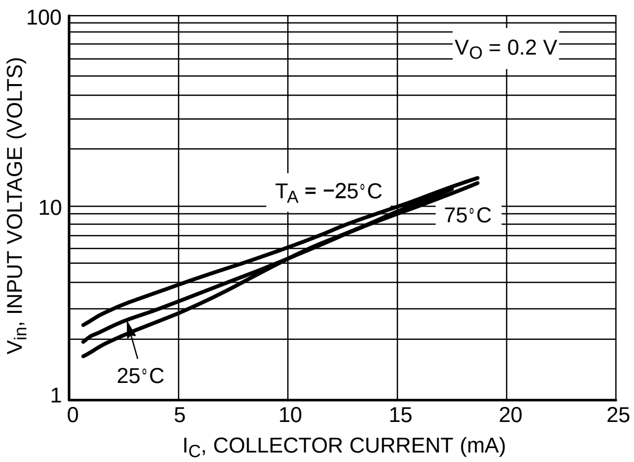
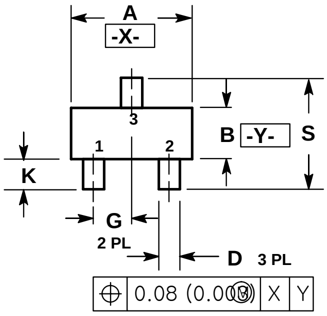
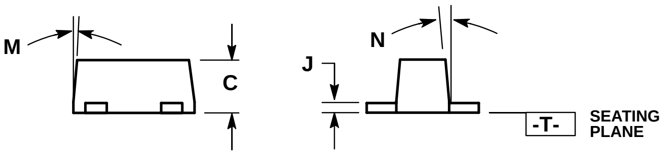


Figure 38. Input Voltage versus Output Current

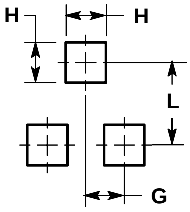
SC−89





NOTES:
1. D MENSIONING AND TOLERANC NG PER ANSI Y14.5M, 1982.
2. CONTROLLING D MENSION: M LLIMETERS
3. MAXIMUM LEAD THICKNESS NCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. 463C-01 OBSOLETE, NEW STANDARD 463C-02.

	MILLIMETERS			INCHES		
DIM	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



RECOMMENDED PATTERN OF SOLDER PADS

TYPICAL ELECTRICAL CHARACTERISTICS
DTC117

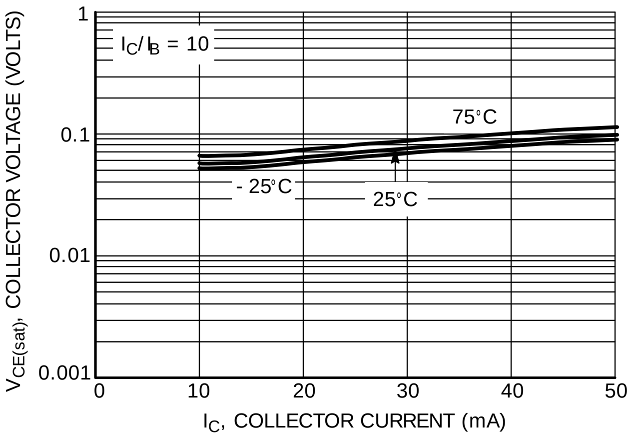


Figure 37. $V_{CE(sat)}$ versus I_C

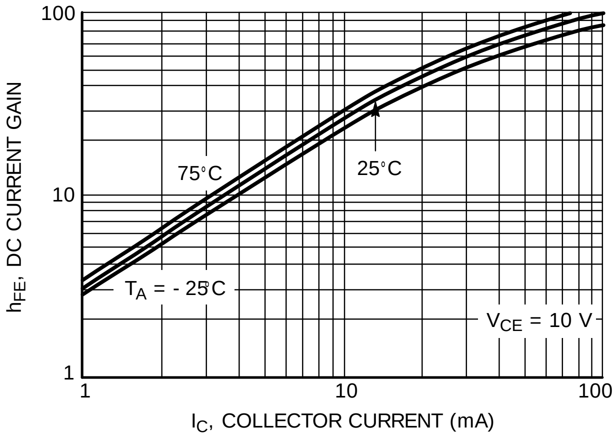


Figure 38. DC Current Gain

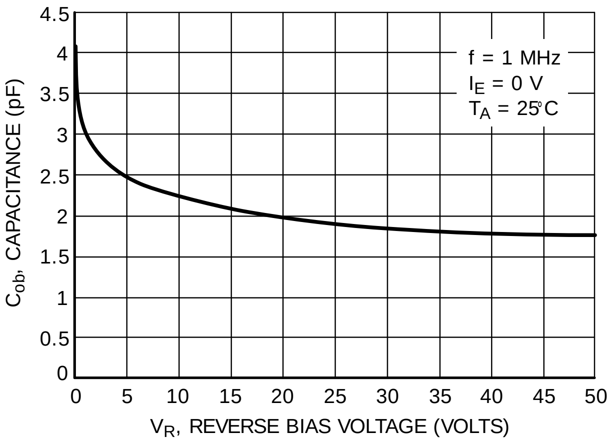


Figure 39. Output Capacitance

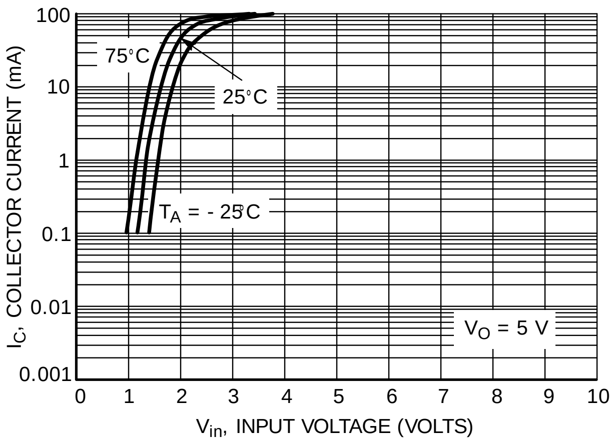


Figure 40. Output Current versus Input Voltage

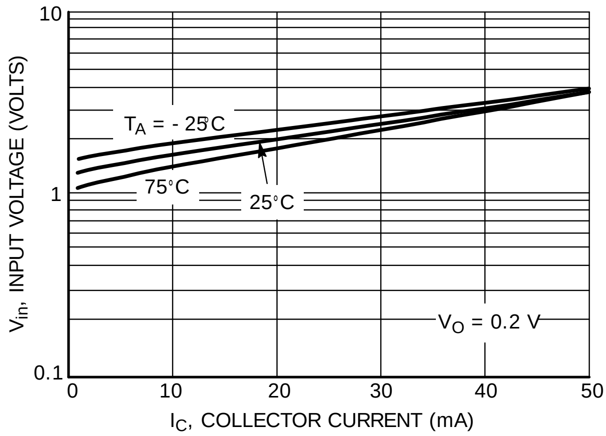


Figure 41. Input Voltage versus Output Current

TYPICAL ELECTRICAL CHARACTERISTICS
DTC108

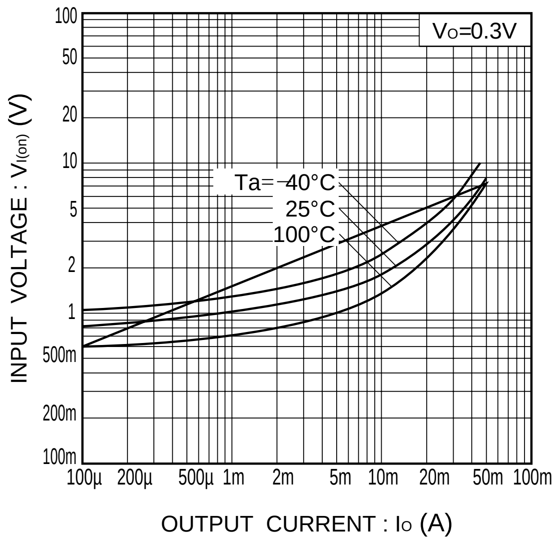


Fig.1 Input voltage vs. output current (ON characteristics)

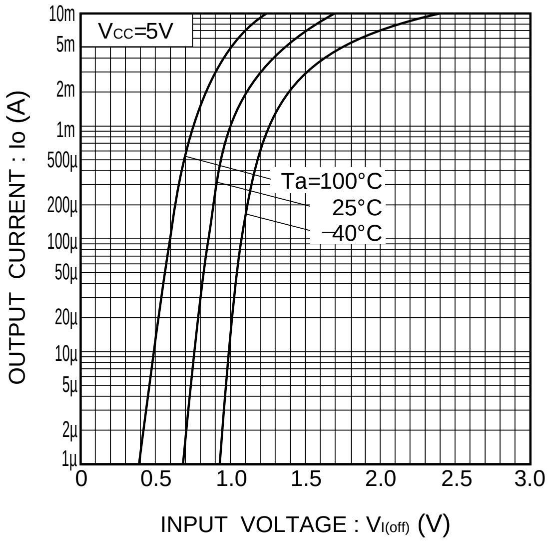


Fig.2 Output current vs. input voltage (OFF characteristics)

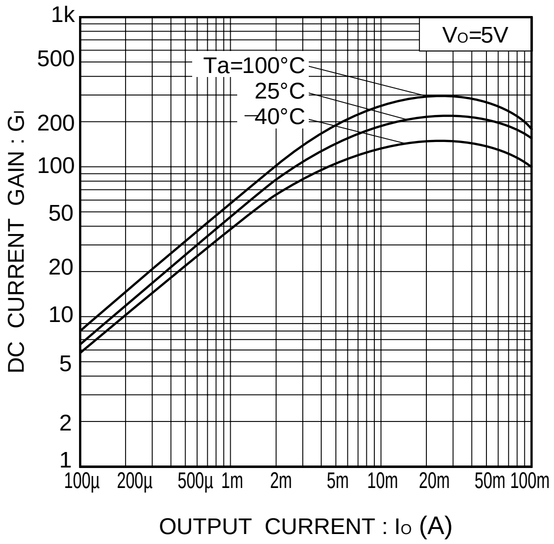


Fig.3 DC current gain vs. output current

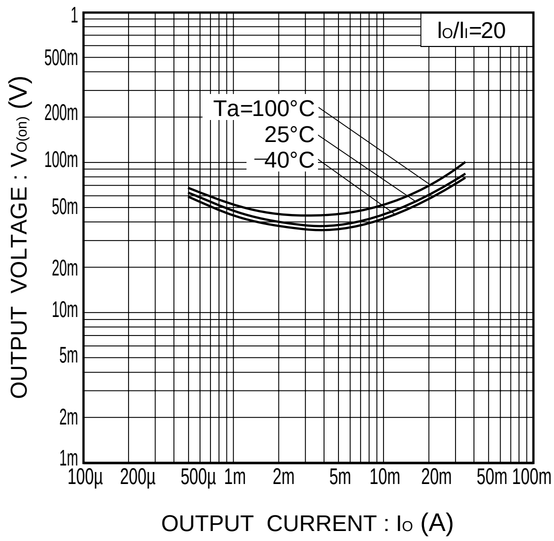


Fig.4 Output voltage vs. output current

TYPICAL ELECTRICAL CHARACTERISTICS
DTC123

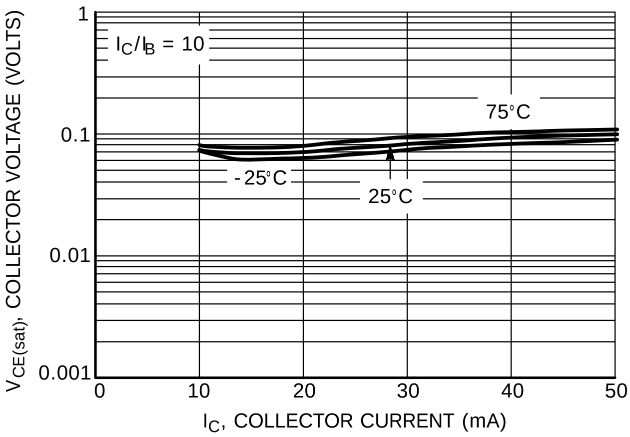


Figure 32. $V_{CE(sat)}$ versus I_C

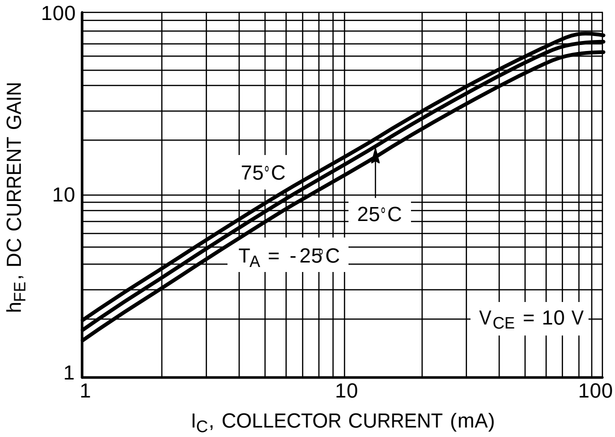


Figure 33. DC Current Gain

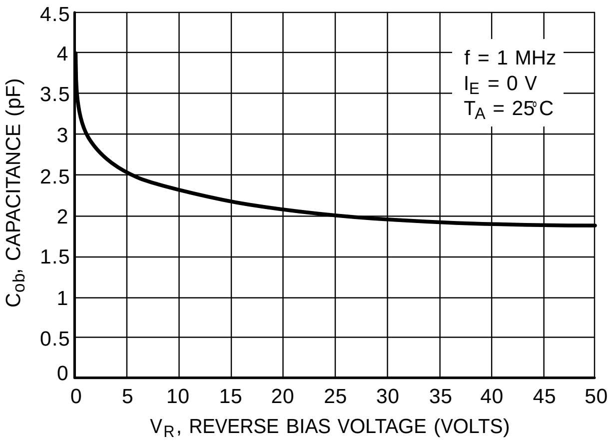


Figure 34. Output Capacitance

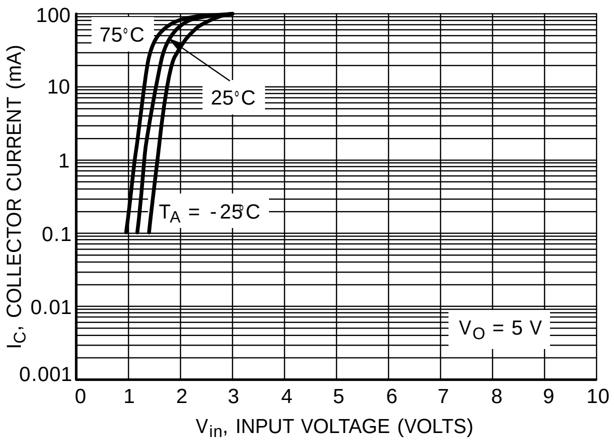


Figure 35. Output Current versus Input Voltage

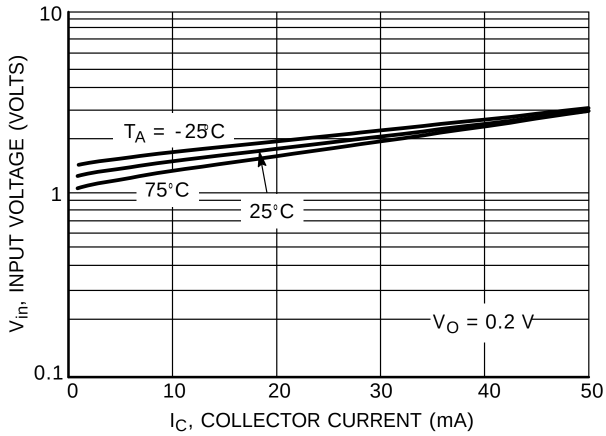


Figure 36. Input Voltage versus Output Current

TYPICAL APPLICATIONS FOR NPN BRTs

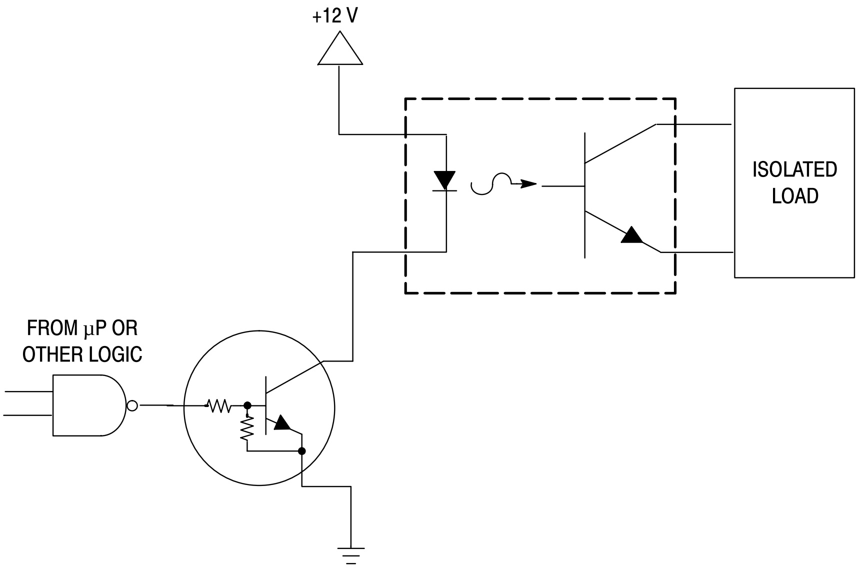


Figure 32. Level Shifter: Connects 12 or 24 Volt Circuits to Logic

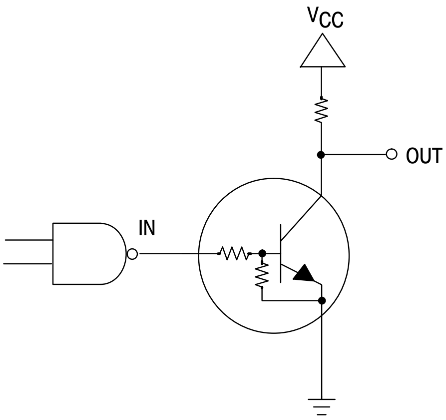


Figure 33. Open Collector Inverter: Inverts the Input Signal

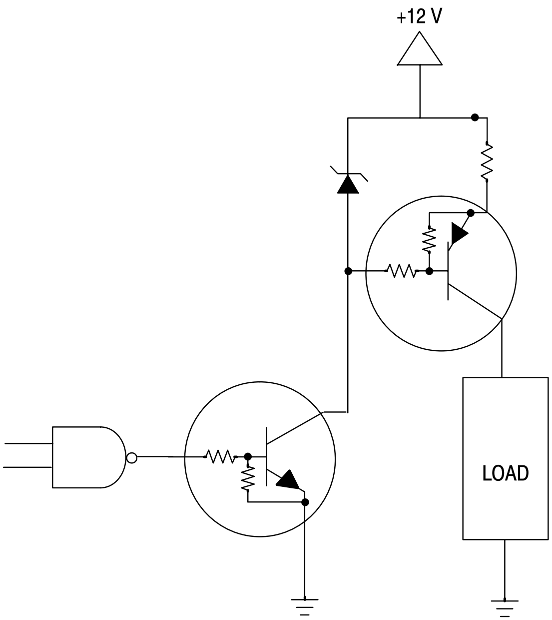
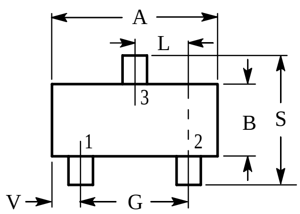
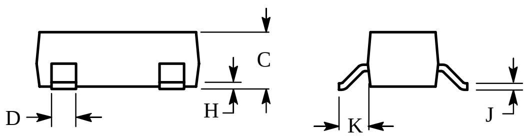


Figure 34. Inexpensive, Unregulated Current Source

SOT-23





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