

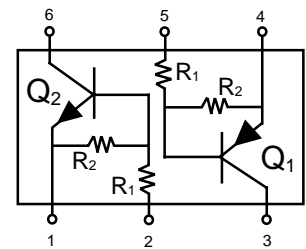
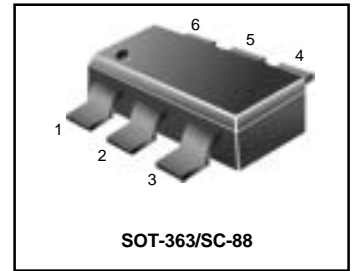
Dual Bias Resistor Transistors

NPN and PNP Silicon Surface Mount

Transistors with Monolithic Bias Resistor 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. 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 DWX Series, two complementary BRT devices are housed in the SOT-363 package which is ideal for low power surface mount applications where board space is at a premium.

- Simplifies Circuit Design
- Reduces Board Space
- Reduces Component Count
- Pb-Free Package is available



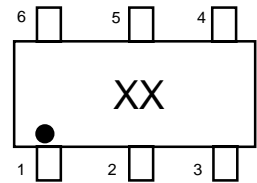
MAXIMUM RATINGS (T_A = 25°C unless otherwise noted, common for Q₁ and Q₂, – minus sign for Q₁(PNP) omitted)

Rating	Symbol	Value	Unit
Collector-Base Voltage	V _{CBO}	50	Vdc
Collector-Emitter Voltage	V _{CEO}	50	Vdc
Collector Current	I _C	100	mAdc

THERMAL CHARACTERISTICS

Characteristic (One Junction Heated)	Symbol	Max	Unit
Total Device Dissipation T _A = 25°C Derate above 25°C	P _D	187 (Note 1.) 256 (Note 2.) 1.5 (Note 1.) 2.0 (Note 2.)	mW mW/°C
Thermal Resistance – Junction-to-Ambient	R _{θJA}	670 (Note 1.) 490 (Note 2.)	°C/W
Characteristic (Both Junctions Heated)	Symbol	Max	Unit
Total Device Dissipation T _A = 25°C Derate above 25°C	P _D	250 (Note 1.) 385 (Note 2.) 2.0 (Note 1.) 3.0 (Note 2.)	mW mW/°C
Thermal Resistance – Junction-to-Ambient	R _{θJA}	493 (Note 1.) 325 (Note 2.)	°C/W
Thermal Resistance – Junction-to-Lead	R _{θJL}	188 (Note 1.) 208 (Note 2.)	°C/W
Junction and Storage Temperature	T _J , T _{stg}	–55 to +150	°C

MARKING DIAGRAM



xx = Device Marking
(See Page 2)

DEVICE MARKING INFORMATION

See specific marking information in the device marking table on page 2 of this data sheet.

1. FR-4 @ Minimum Pad 2. FR-4 @ 1.0 x 1.0 inch Pad



DWX Series

ORDERING, SHIPPING, DEVICE MARKING AND RESISTOR VALUES

Device	Package	Marking	R1(K)	R2(K)	Shipping
DWX302	SOT-363	11	10	10	3000/Tape&Reel
DWX303	SOT-363	12	22	22	3000/Tape&Reel
DWX304	SOT-363	13	47	47	3000/Tape&Reel
DWX307	SOT-363	14	10	47	3000/Tape&Reel
DWX311	SOT-363	15	10	∞	3000/Tape&Reel
DWX310	SOT-363	16	4.7	∞	3000/Tape&Reel
DWX323	SOT-363	30	1	1	3000/Tape&Reel
DWX317	SOT-363	31	2.2	2.2	3000/Tape&Reel
DWX301	SOT-363	32	4.7	4.7	3000/Tape&Reel
DWX306	SOT-363	33	4.7	47	3000/Tape&Reel
DWX308	SOT-363	34	22	47	3000/Tape&Reel
DWX305	SOT-363	35	2.2	47	3000/Tape&Reel



DWX Series

ELECTRICAL CHARACTERISTICS

(T_A = 25°C unless otherwise noted, common for Q₁ and Q₂, - minus sign for Q₁ (PNP) omitted) (Continued)

Characteristic	Symbol	Min	Typ	Max	Unit	
ON CHARACTERISTICS (Note 4)						
DC Current Gain (V _{CE} = 10 V, I _C = 5.0 mA)	DWX302 DWX303 DWX304 DWX307 DWX311 DWX310 DWX323 DWX317 DWX301 DWX306 DWX308 DWX305	h _{FE}	35 60 80 80 160 160 3.0 8.0 15 80 80 80	60 100 140 140 350 350 5.0 15 30 200 150 140	- - - - - - - - - - - -	
Collector-Emitter Saturation Voltage (I _C = 10 mA, I _B = 0.3 mA) (I _C = 10 mA, I _B = 5 mA) (I _C = 10 mA, I _B = 1 mA)	DWX323 / DWX317 DWX310 / DWX311 DWX301 / DWX306 / DWX308	V _{CE(sat)}	-	-	0.25	Vdc
Output Voltage (on) (V _{CC} = 5.0 V, V _B = 2.5 V, R _L = 1.0 kΩ)	DWX302 DWX303 DWX304 DWX307 DWX311 DWX310 DWX323 DWX317 DWX301 DWX306 DWX308 DWX305	V _{OL}	-	-	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 _{CC} = 5.0 V, V _B = 0.5 V, R _L = 1.0 kΩ) (V _{CC} = 5.0 V, V _B = 0.050 V, R _L = 1.0 kΩ) (V _{CC} = 5.0 V, V _B = 0.25 V, R _L = 1.0 kΩ)	DWX323 DWX311 DWX310 DWX317	V _{OH}	4.9	-	-	Vdc
Input Resistor	DWX302 DWX303 DWX304 DWX307 DWX311 DWX310 DWX323 DWX317 DWX301 DWX306 DWX308 DWX305	R1	7.0 15.4 32.9 7.0 7.0 3.3 0.7 1.5 3.3 3.3 15.4 1.54	10 22 47 10 10 4.7 1.0 2.2 4.7 4.7 22 2.2	13 28.6 61.1 13 13 6.1 1.3 2.9 6.1 6.1 28.6 2.86	k Ω
Resistor Ratio	DWX302 / DWX303 / DWX304 DWX307 DWX310 / DWX311 DWX323 / DWX317 / DWX301 DWX306 DWX308 DWX305	R1/R2	0.8 0.17 - 0.8 0.055 0.38 0.038	1.0 0.21 - 1.0 0.1 0.47 0.047	1.2 0.25 - 1.2 0.185 0.56 0.056	

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



DWX Series

ELECTRICAL CHARACTERISTICS

($T_A = 25^\circ\text{C}$ unless otherwise noted, common for Q_1 and Q_2 , - minus sign for Q_1 (PNP) omitted)

Characteristic	Symbol	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

Collector-Base Cutoff Current ($V_{CB} = 50\text{ V}$, $I_E = 0$)	I_{CBO}	-	-	100	nAdc
Collector-Emitter Cutoff Current ($V_{CE} = 50\text{ V}$, $I_B = 0$)	I_{CEO}	-	-	500	nAdc
Emitter-Base Cutoff Current ($V_{EB} = 6.0\text{ V}$, $I_C = 0$)	DWX302	-	-	0.5	mAdc
	DWX303	-	-	0.2	
	DWX304	-	-	0.1	
	DWX307	-	-	0.2	
	DWX311	-	-	0.9	
	DWX310	-	-	1.9	
	DWX323	-	-	4.3	
	DWX317	-	-	2.3	
	DWX301	-	-	1.5	
	DWX306	-	-	0.18	
	DWX308	-	-	0.13	
DWX305	-	-	0.2		
Collector-Base Breakdown Voltage ($I_C = 10\ \mu\text{A}$, $I_E = 0$)	$V_{(BR)CBO}$	50	-	-	Vdc
Collector-Emitter Breakdown Voltage (Note 3) ($I_C = 2.0\text{ mA}$, $I_B = 0$)	$V_{(BR)CEO}$	50	-	-	Vdc

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

ALL DWX Series SERIES DEVICES

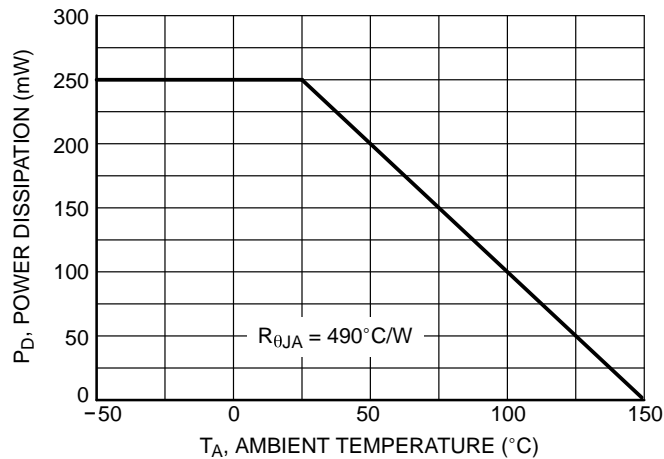


Figure 1. Derating Curve

DWX Series

TYPICAL ELECTRICAL CHARACTERISTICS – DWX302 NPN TRANSISTOR

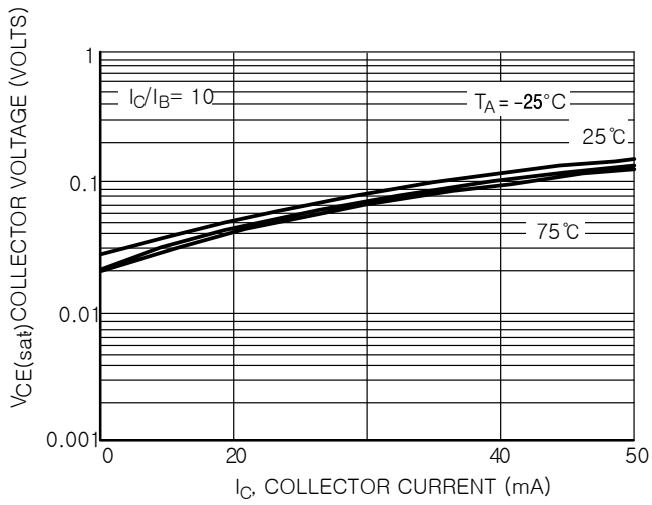


Figure 2. $V_{CE(sat)}$ versus I_C

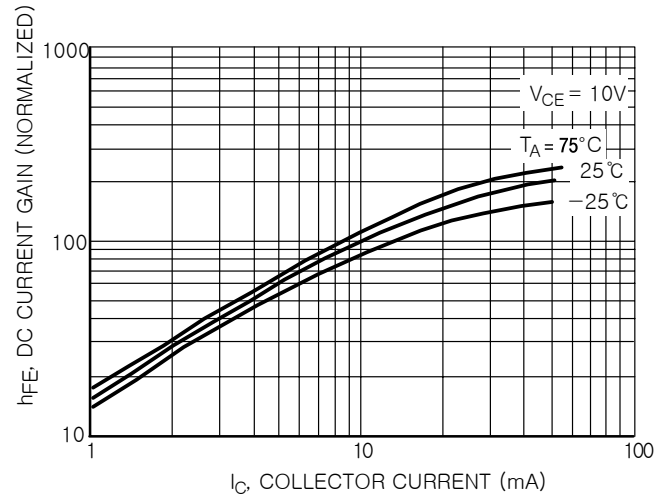


Figure 3. DC Current Gain

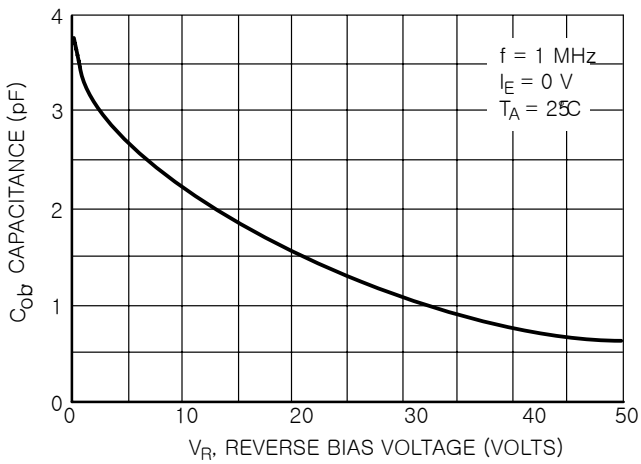


Figure 4. Output Capacitance

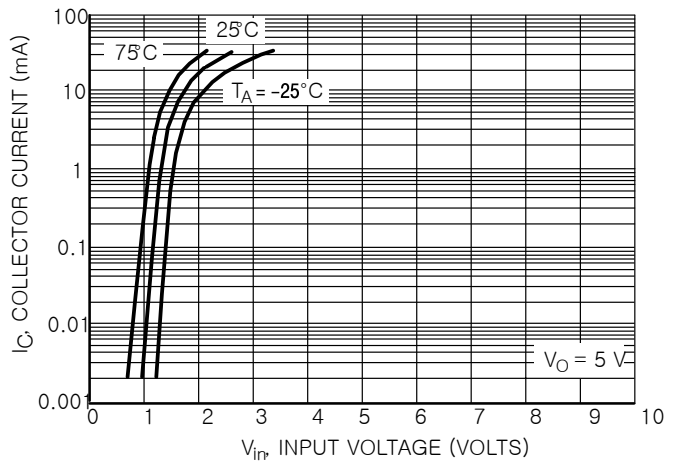


Figure 5. Output Current versus Input Voltage

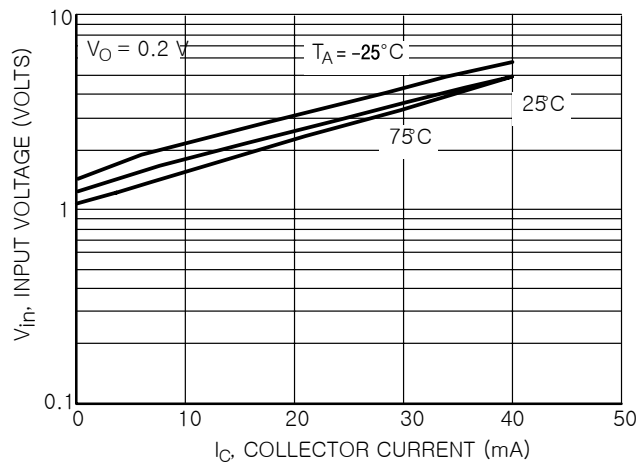


Figure 6. Input Voltage versus Output Current

DWC Series

TYPICAL ELECTRICAL CHARACTERISTICS – DWX302 PNP TRANSISTOR

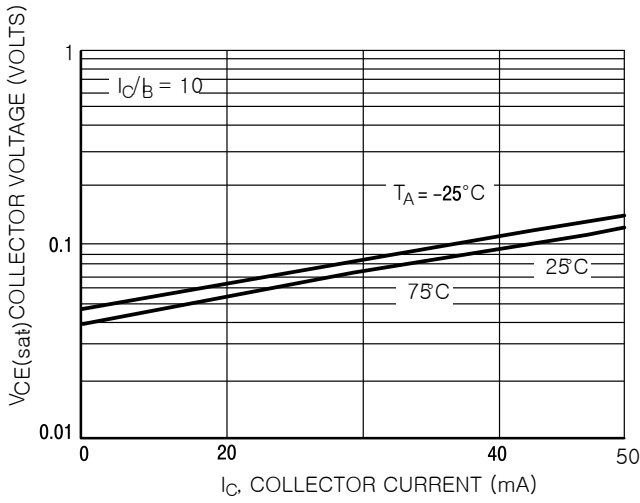


Figure 7. $V_{CE(sat)}$ versus I_C

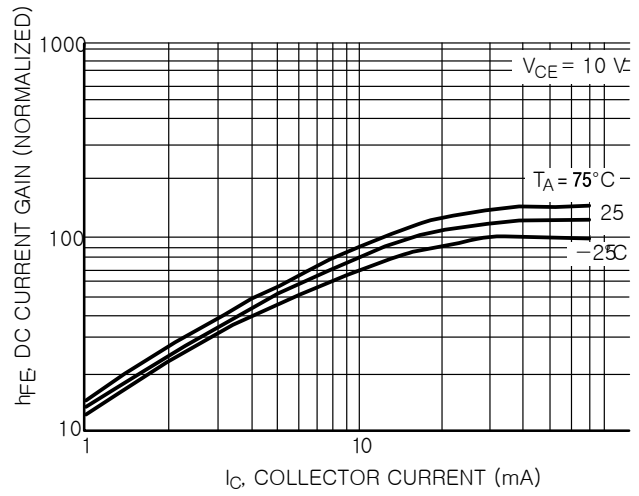


Figure 8. DC Current Gain

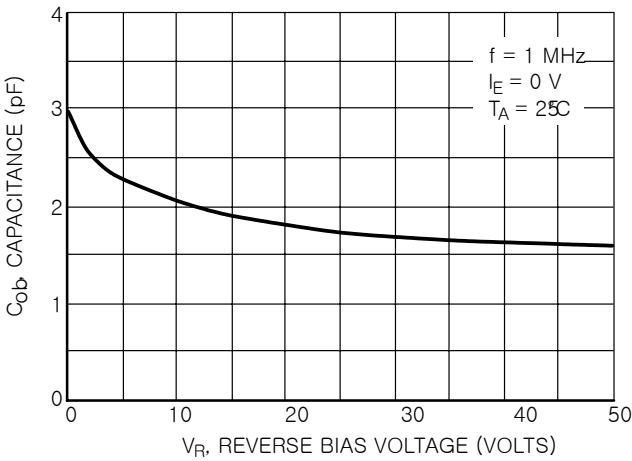


Figure 9. Output Capacitance

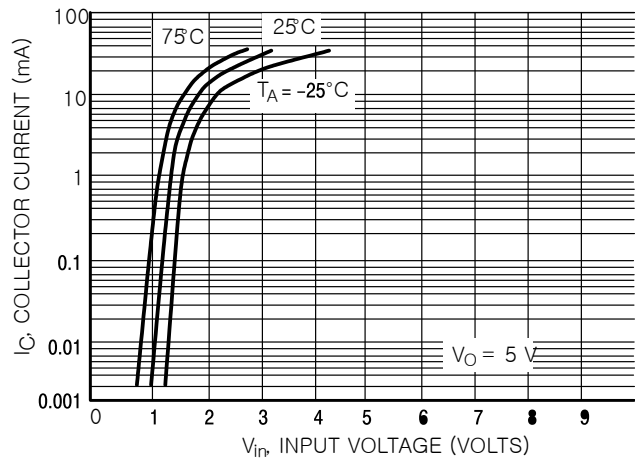


Figure 10. Output Current versus Input Voltage

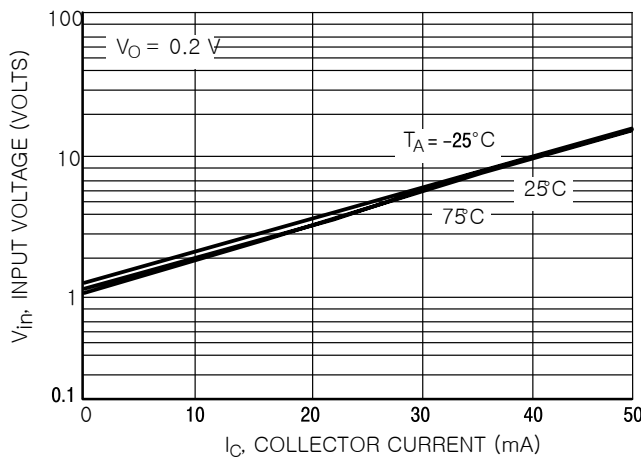


Figure 11. Input Voltage versus Output Current

DWX Series

TYPICAL ELECTRICAL CHARACTERISTICS – DWX303 NPN TRANSISTOR

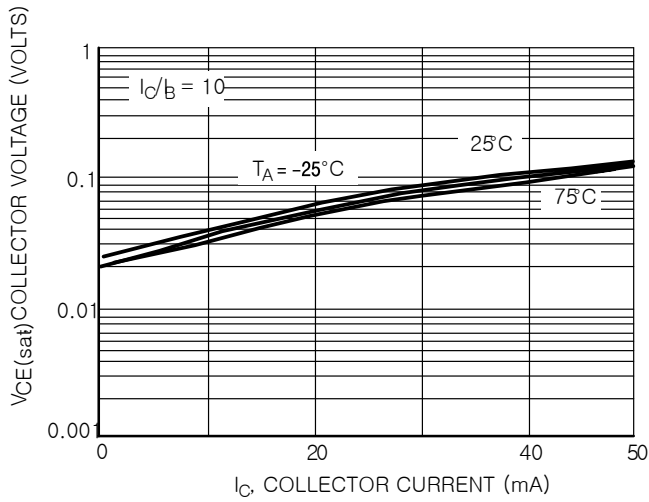


Figure 12. $V_{CE(sat)}$ versus I_C

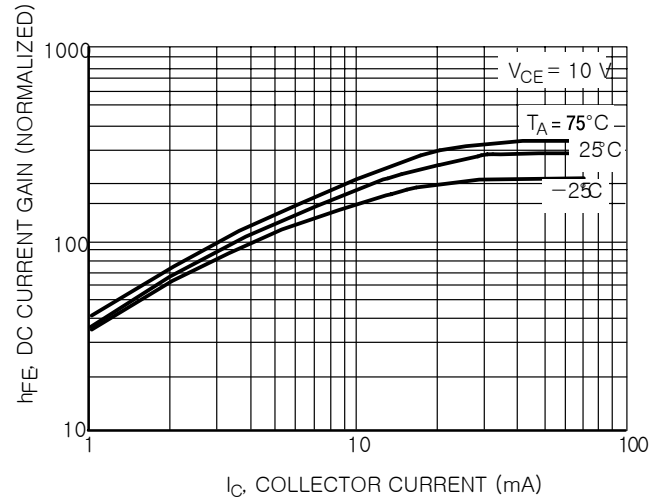


Figure 13. DC Current Gain

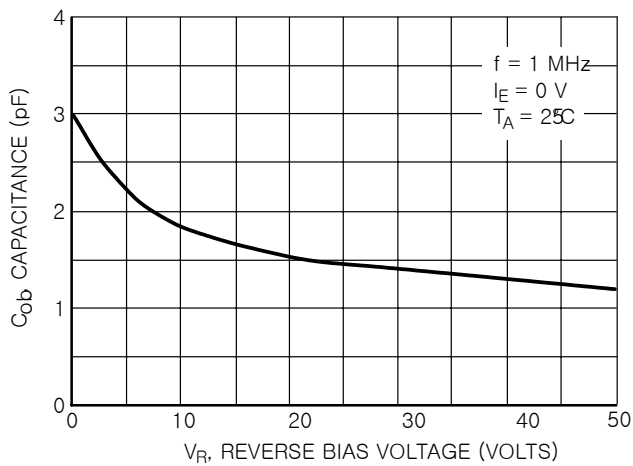


Figure 14. Output Capacitance

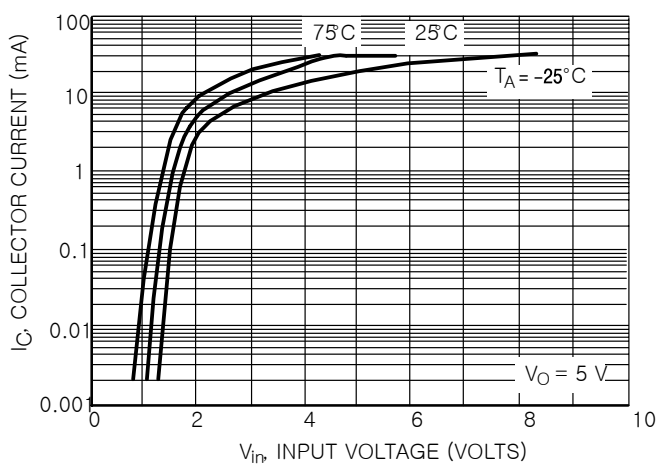


Figure 15. Output Current versus Input Voltage

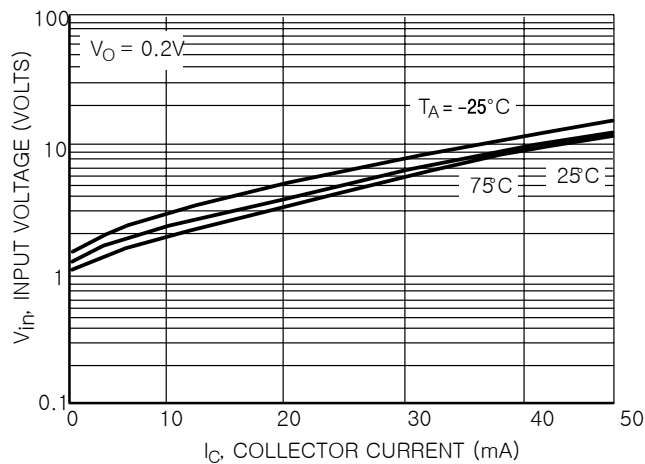


Figure 16. Input Voltage versus Output Current

DWX Series

TYPICAL ELECTRICAL CHARACTERISTICS – DWX303 PNP TRANSISTOR

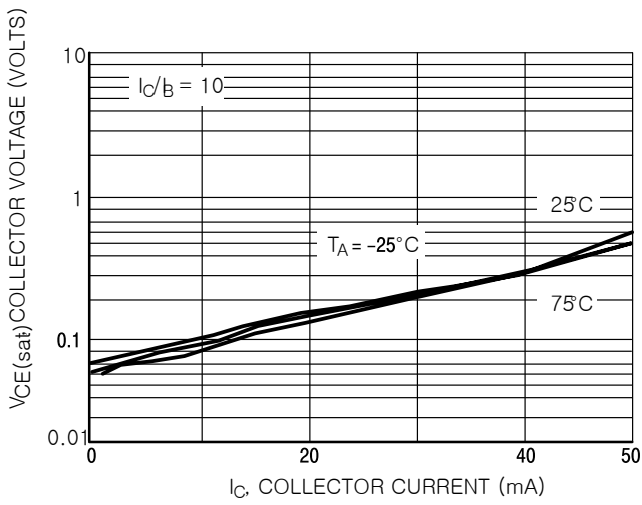


Figure 17. $V_{CE(sat)}$ versus I_C

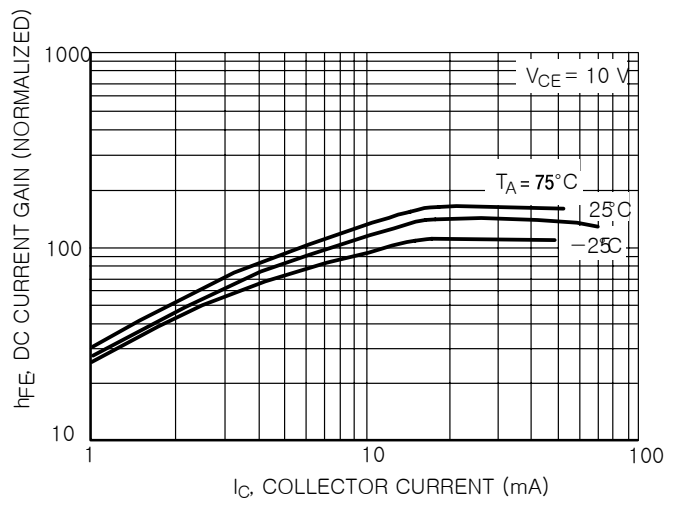


Figure 18. DC Current Gain

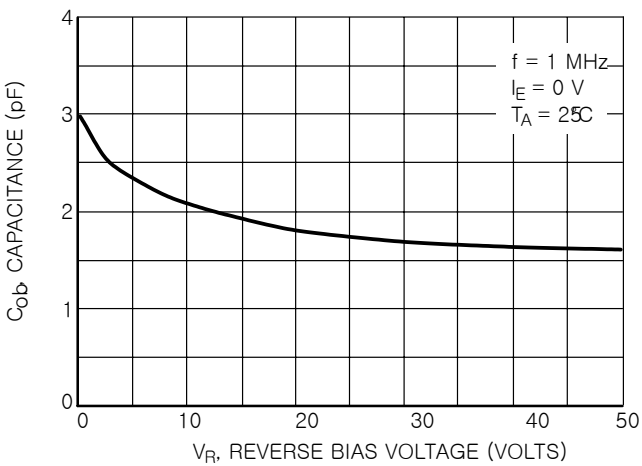


Figure 19. Output Capacitance

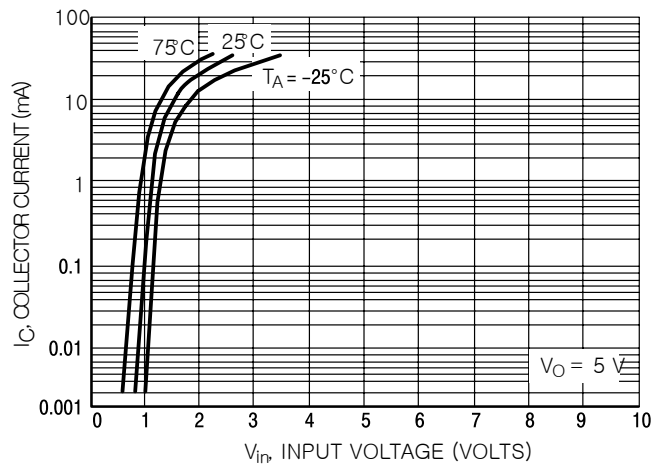


Figure 20. Output Current versus Input Voltage

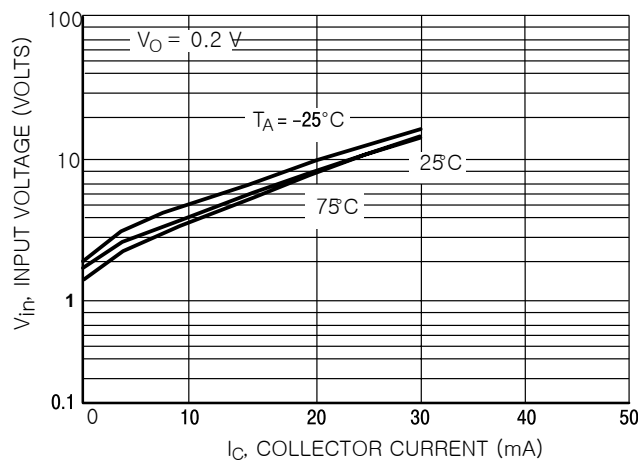


Figure 21. Input Voltage versus Output Current

DWX Series

TYPICAL ELECTRICAL CHARACTERISTICS – DWX304 NPN TRANSISTOR

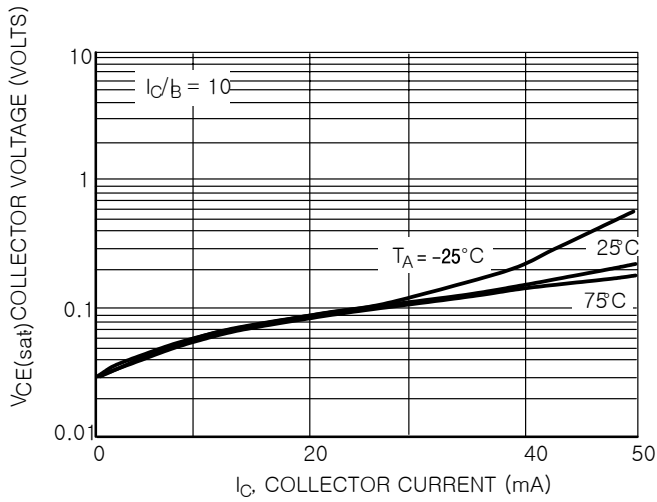


Figure 22. $V_{CE(sat)}$ versus I_C

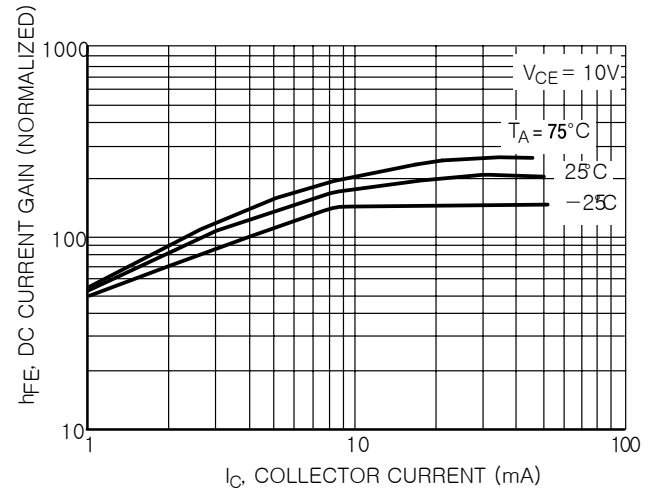


Figure 23. DC Current Gain

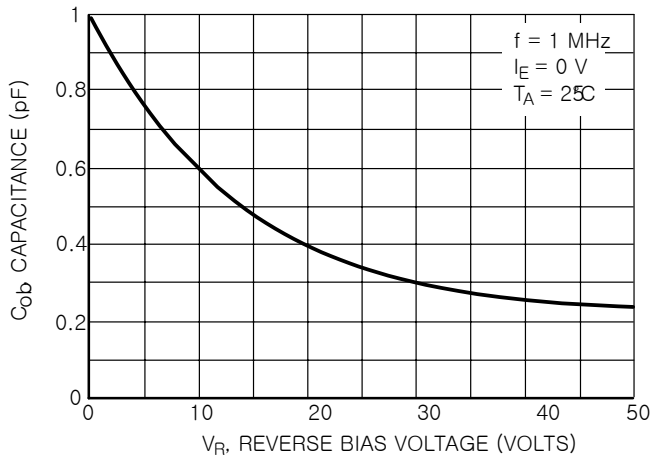


Figure 24. Output Capacitance

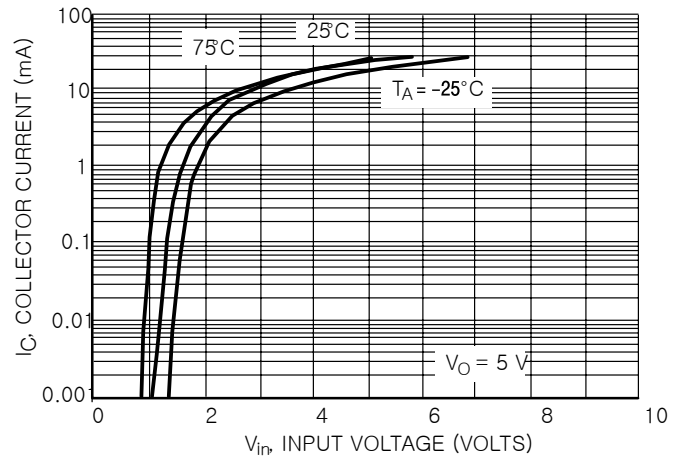


Figure 25. Output Current versus Input Voltage

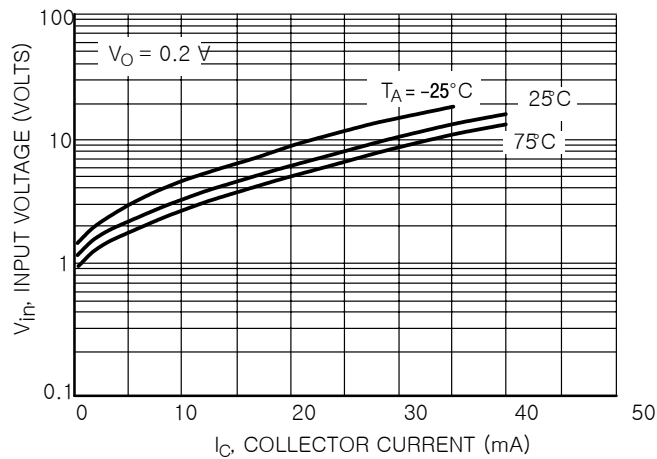


Figure 26. Input Voltage versus Output Current



DWX Series

TYPICAL ELECTRICAL CHARACTERISTICS – DWX304 PNP TRANSISTOR

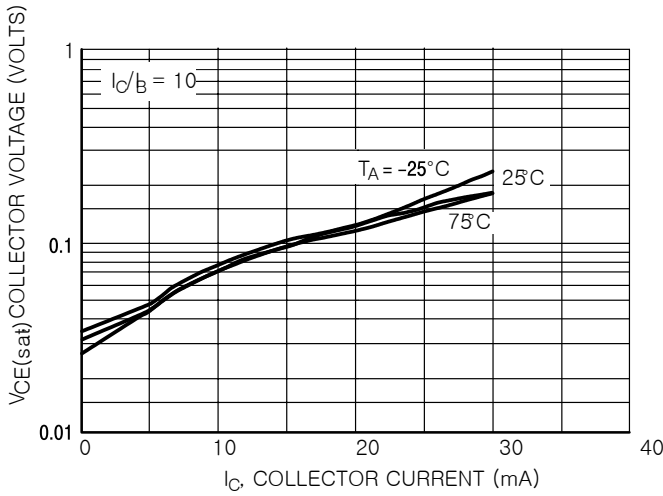


Figure 27. $V_{CE(sat)}$ versus I_C

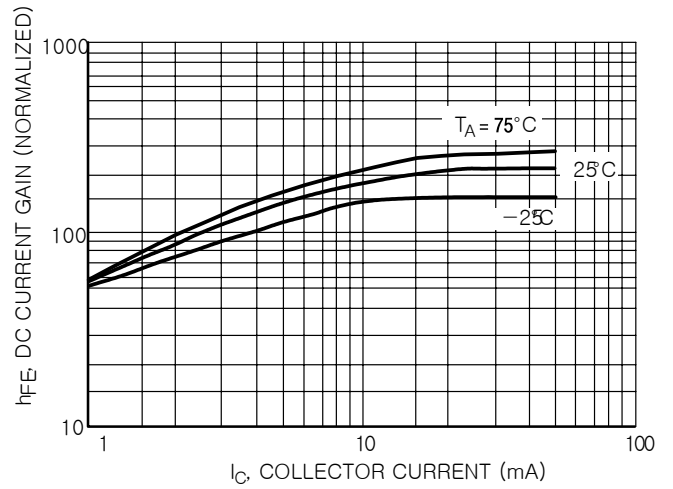


Figure 28. DC Current Gain

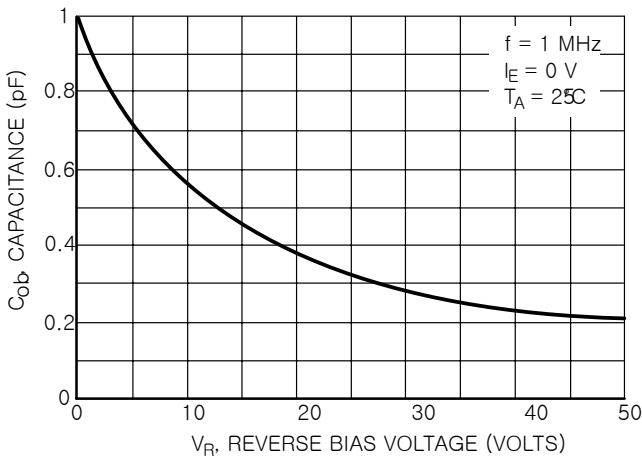


Figure 29. Output Capacitance

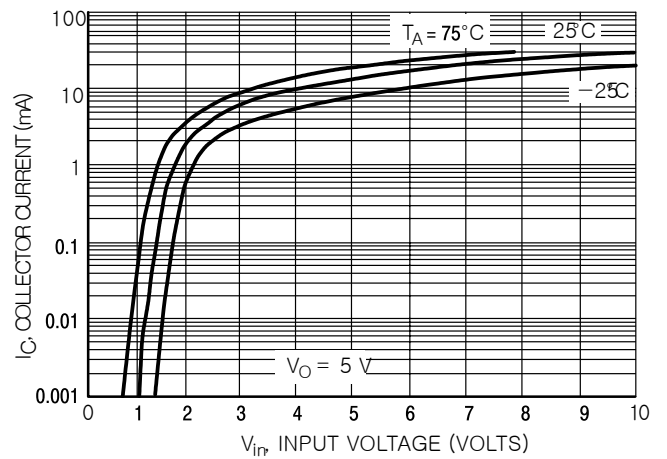


Figure 30. Output Current versus Input Voltage

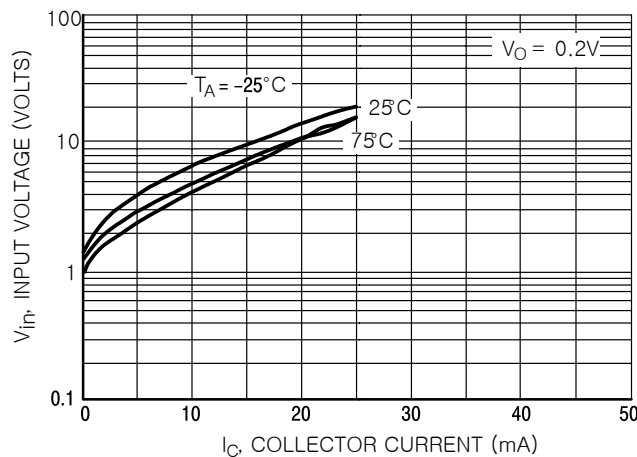


Figure 31. Input Voltage versus Output Current

DWX Series

TYPICAL ELECTRICAL CHARACTERISTICS – DWX307 NPN TRANSISTOR

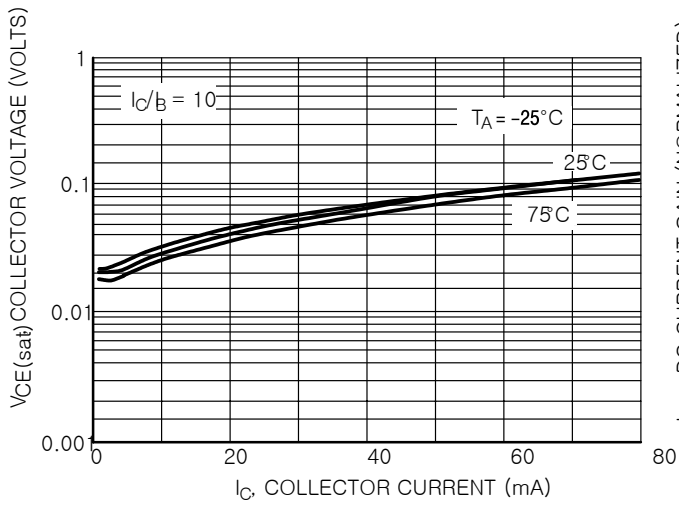


Figure 32. $V_{CE(sat)}$ versus I_C

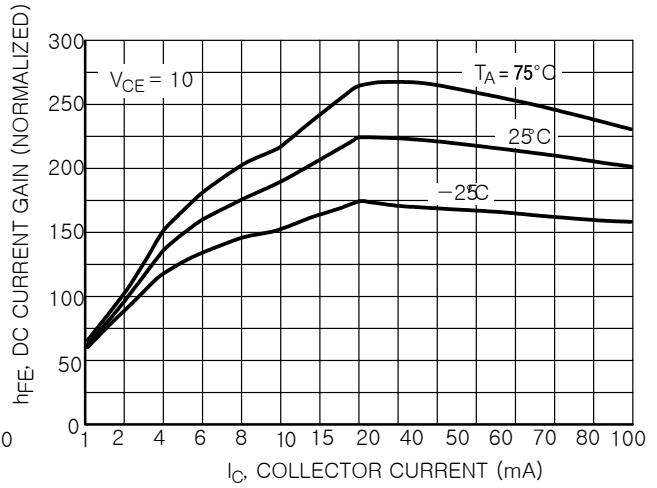


Figure 33. DC Current Gain

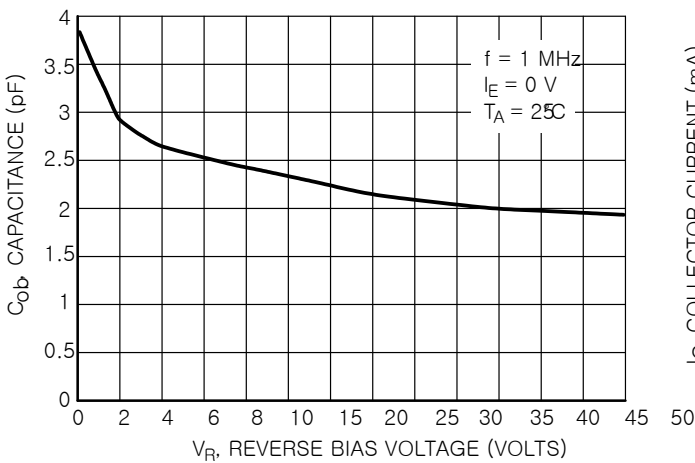


Figure 34. Output Capacitance

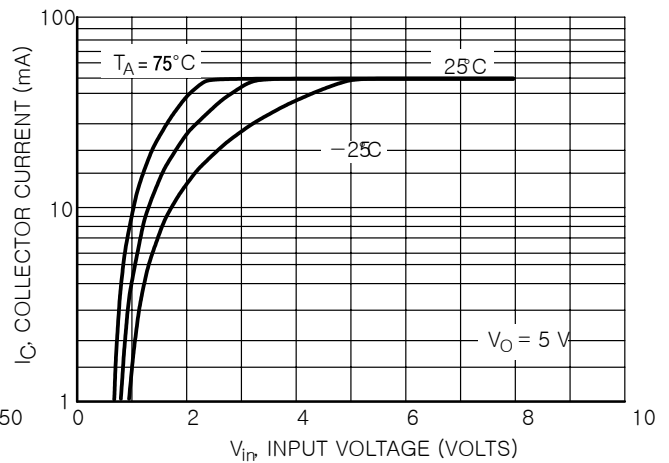


Figure 35. Output Current versus Input Voltage

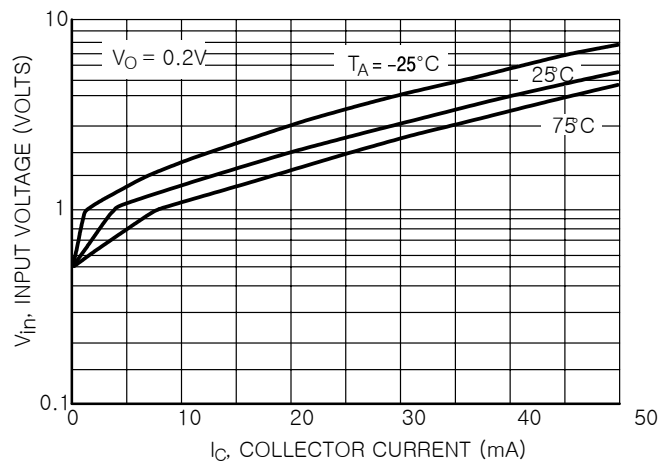


Figure 36. Input Voltage versus Output Current

DWX Series

TYPICAL ELECTRICAL CHARACTERISTICS – DWX307 TRANSISTOR

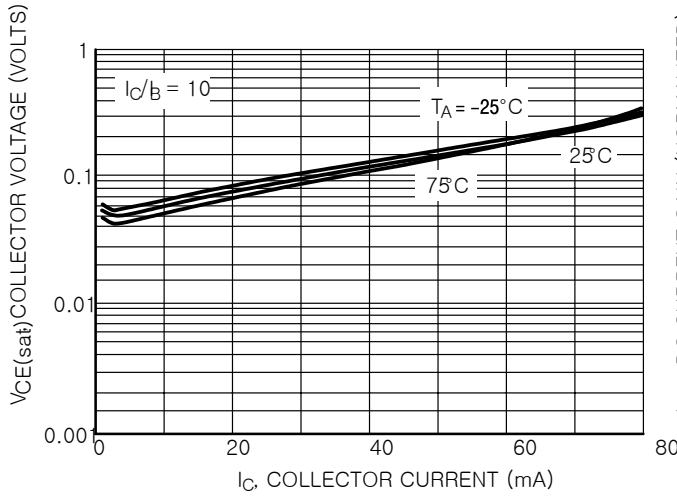


Figure 37. $V_{CE(sat)}$ versus I_C

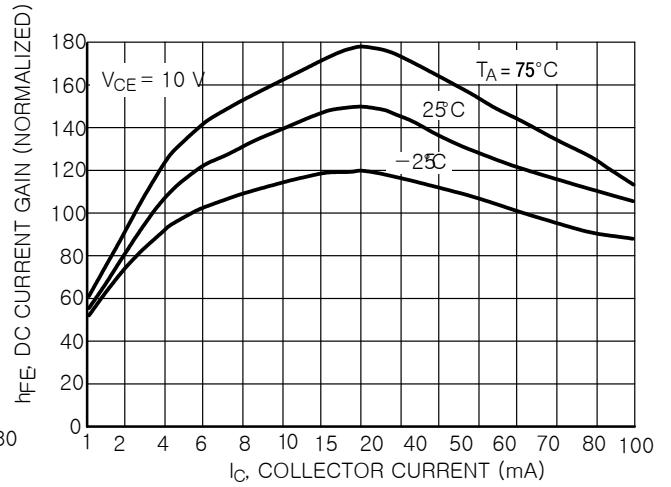


Figure 38. DC Current Gain

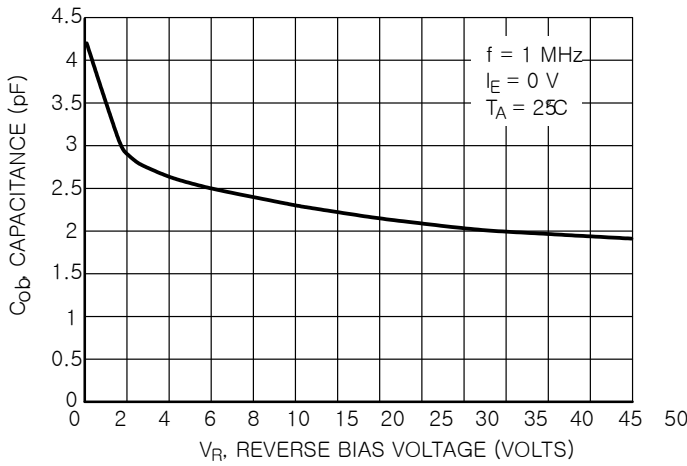


Figure 39. Output Capacitance

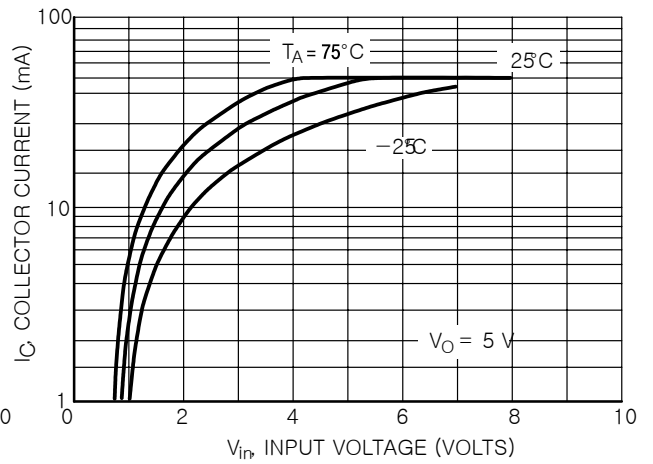


Figure 40. Output Current versus Input Voltage

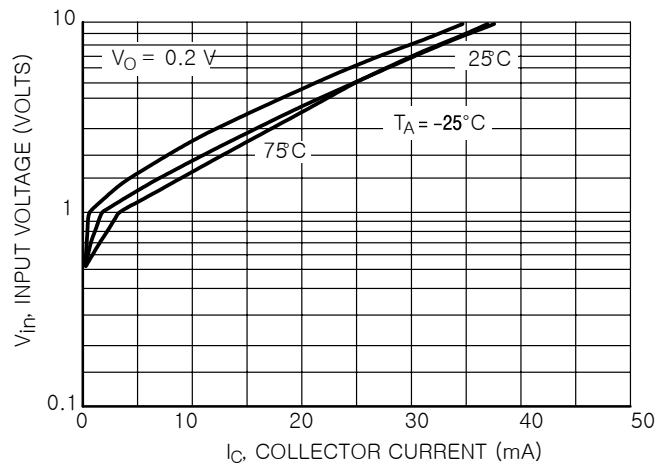


Figure 41. Input Voltage versus Output Current

DWX Series

TYPICAL ELECTRICAL CHARACTERISTICS — DWX311 NPN TRANSISTOR

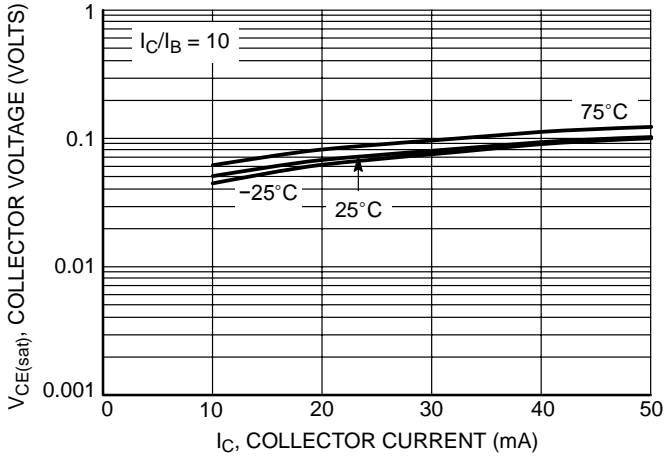


Figure 42. $V_{CE(sat)}$ versus I_C

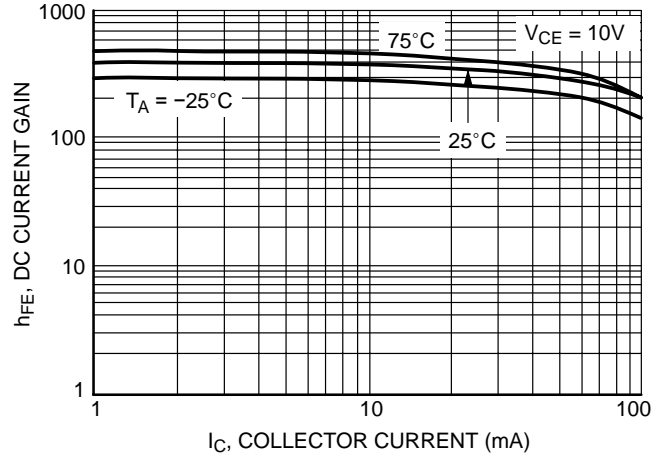


Figure 43. DC Current Gain

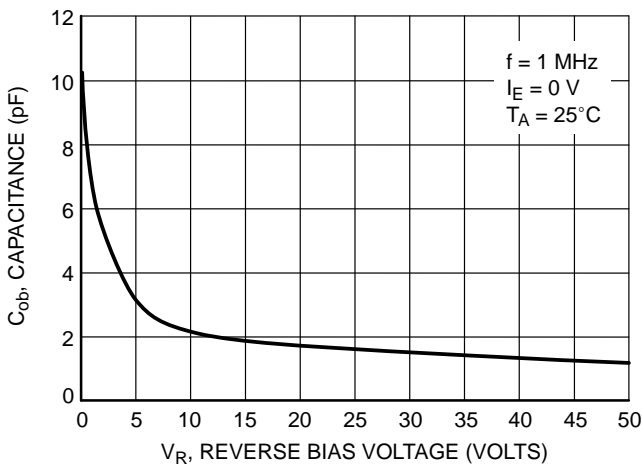


Figure 44. Output Capacitance

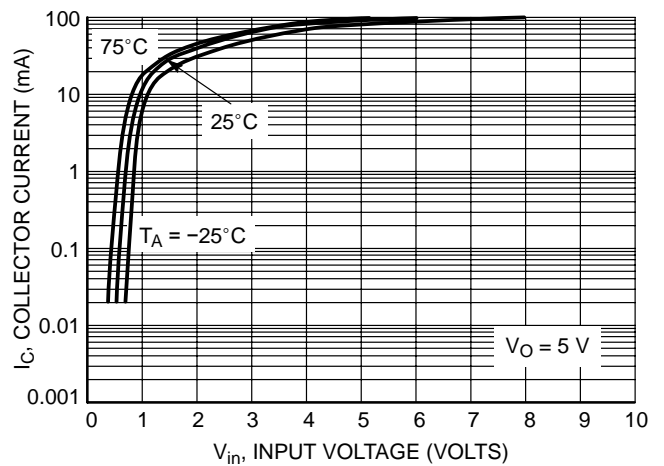


Figure 45. Output Current versus Input Voltage

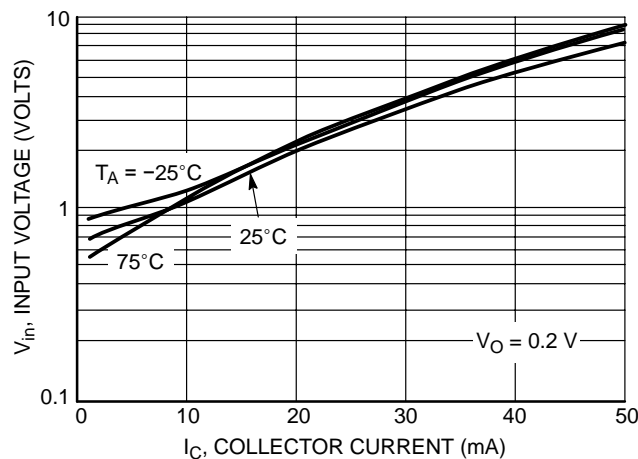


Figure 46. Input Voltage versus Output Current

DWX Series

TYPICAL ELECTRICAL CHARACTERISTICS — DWX311 PNP TRANSISTOR

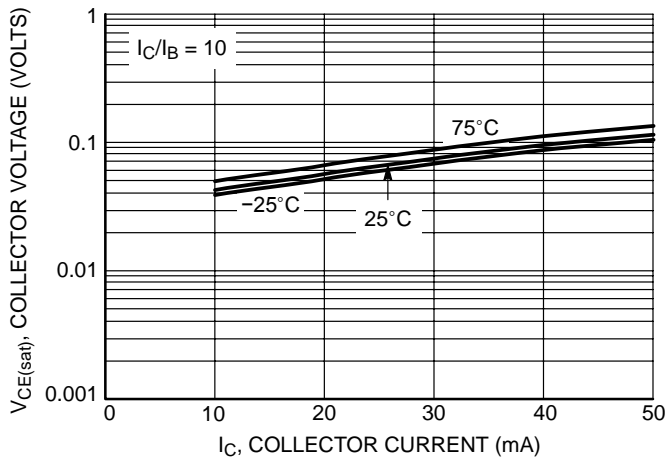


Figure 47. $V_{CE(sat)}$ versus I_C

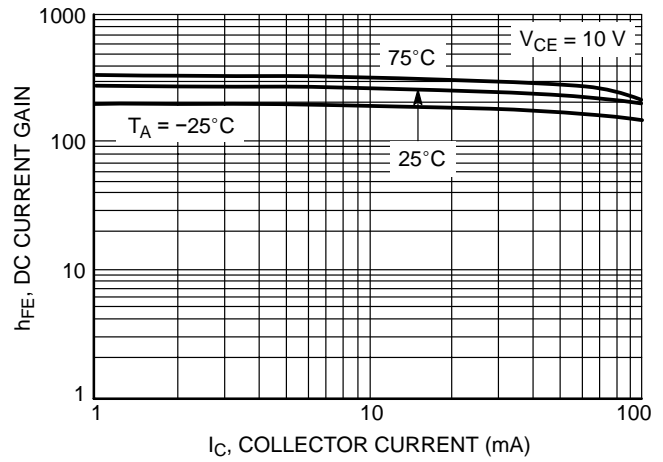


Figure 48. DC Current Gain

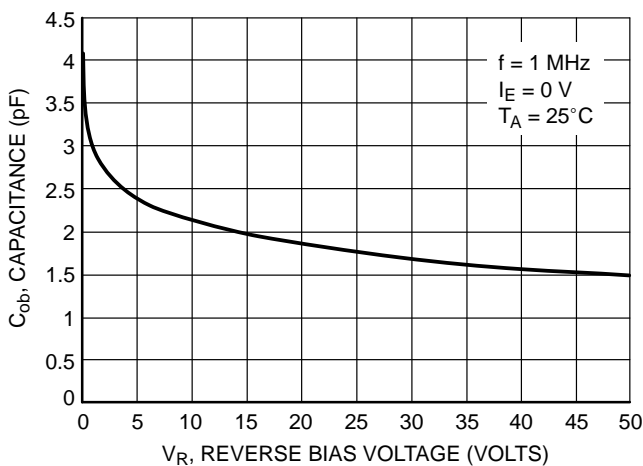


Figure 49. Output Capacitance

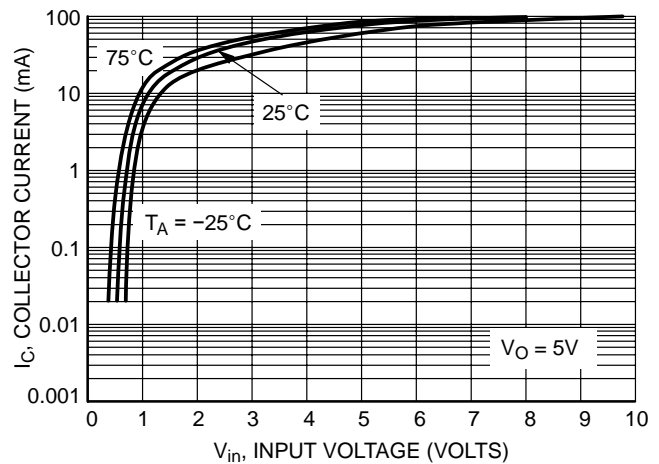


Figure 50. Output Current versus Input Voltage

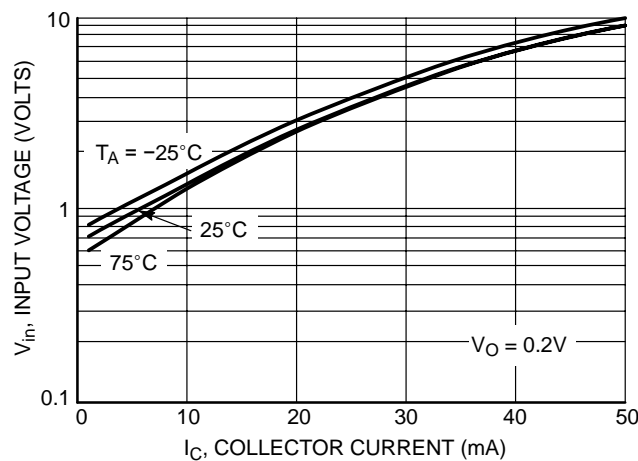


Figure 51. Input Voltage versus Output Current

DWX Series

TYPICAL ELECTRICAL CHARACTERISTICS — DWX310 NPN TRANSISTOR

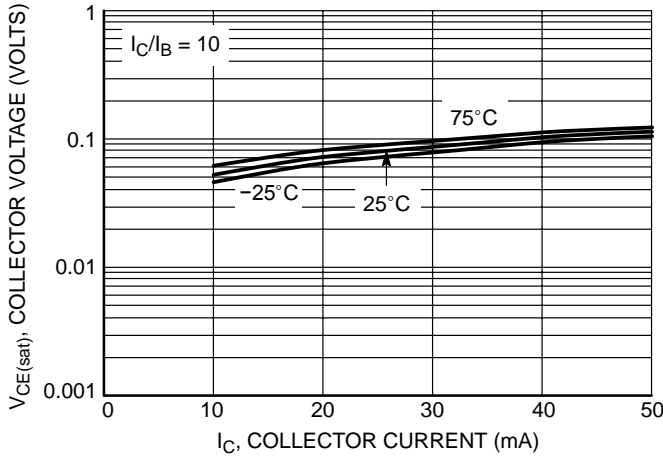


Figure 52. $V_{CE(sat)}$ versus I_C

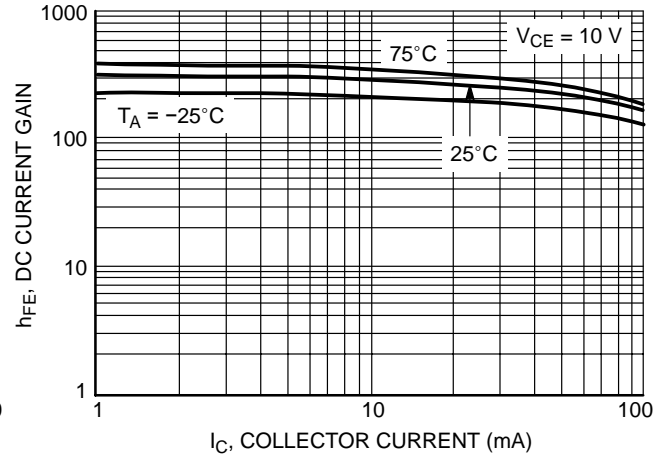


Figure 53. DC Current Gain

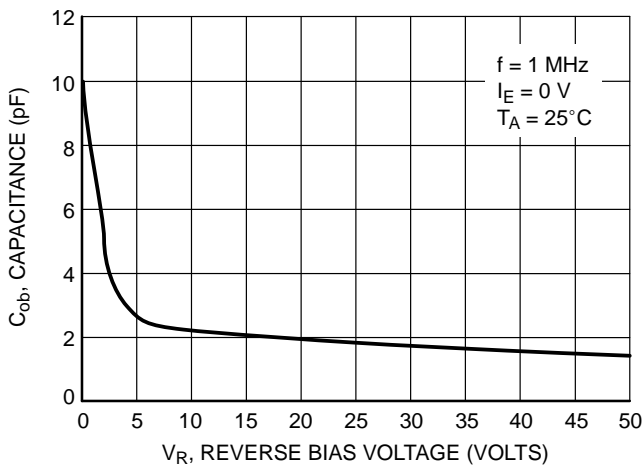


Figure 54. Output Capacitance

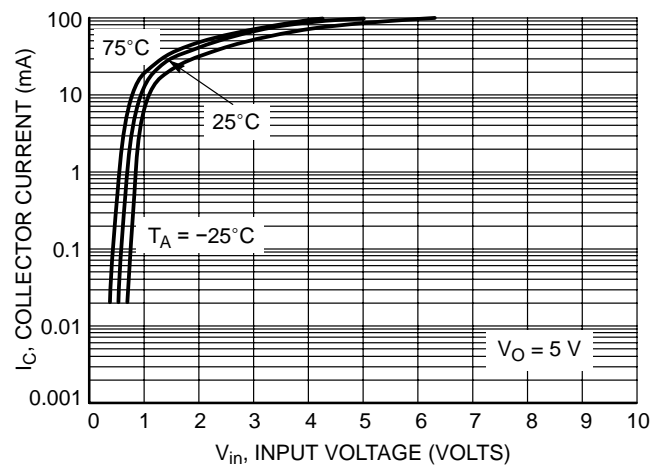


Figure 55. Output Current versus Input Voltage

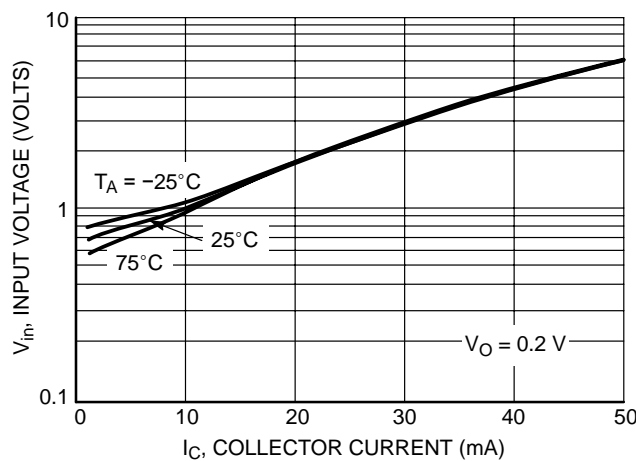


Figure 56. Input Voltage versus Output Current

DWX Series

TYPICAL ELECTRICAL CHARACTERISTICS — DWX310 PNP TRANSISTOR

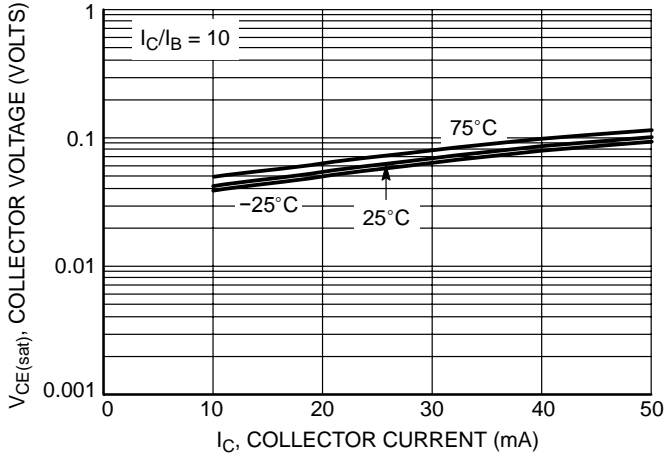


Figure 57. $V_{CE(sat)}$ versus I_C

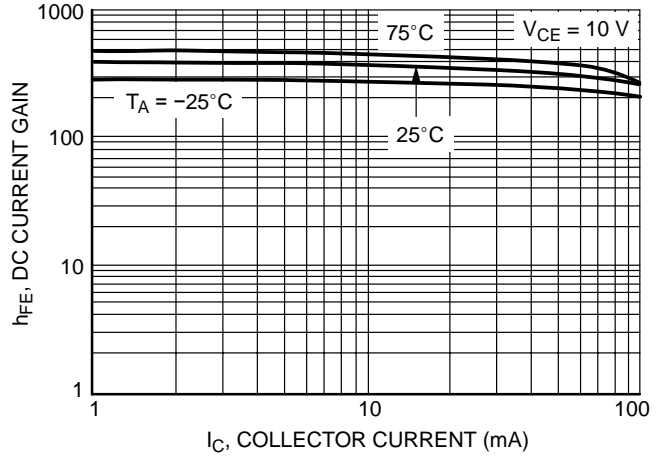


Figure 58. DC Current Gain

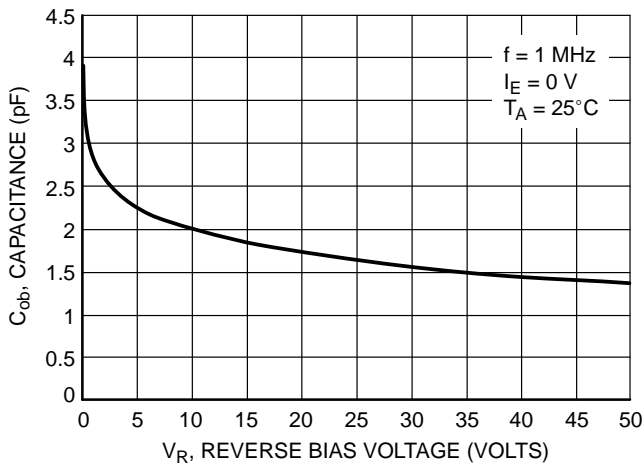


Figure 59. Output Capacitance

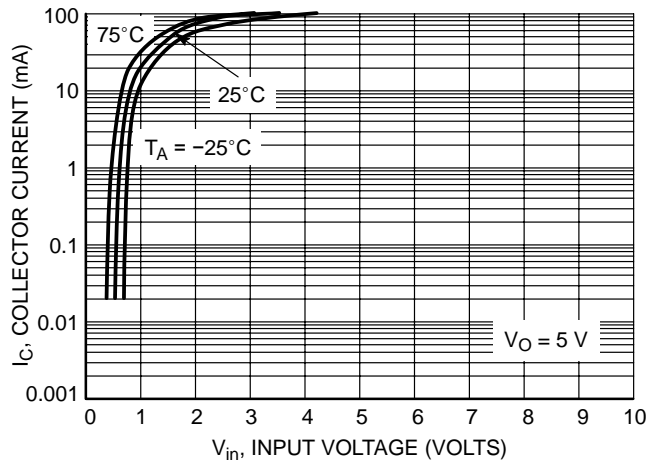


Figure 60. Output Current versus Input Voltage

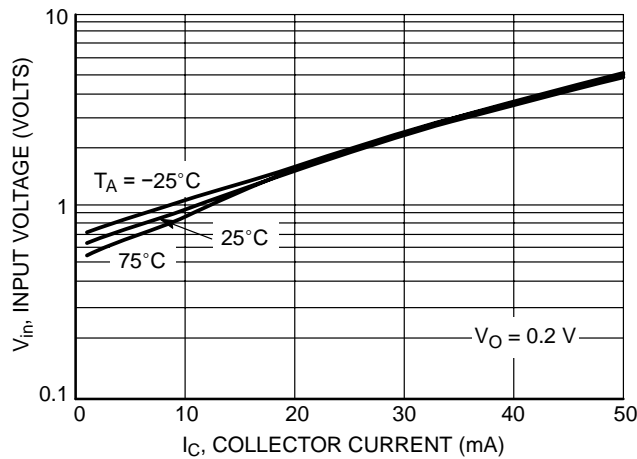


Figure 61. Input Voltage versus Output Current



DWX Series

TYPICAL ELECTRICAL CHARACTERISTICS — DWX323 NPN TRANSISTOR

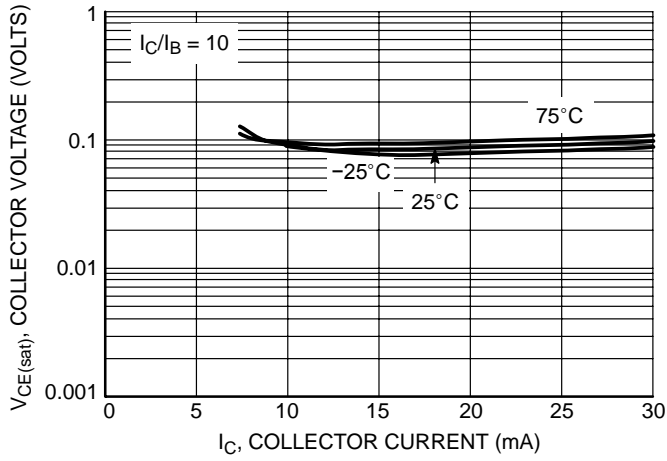


Figure 62. $V_{CE(sat)}$ versus I_C

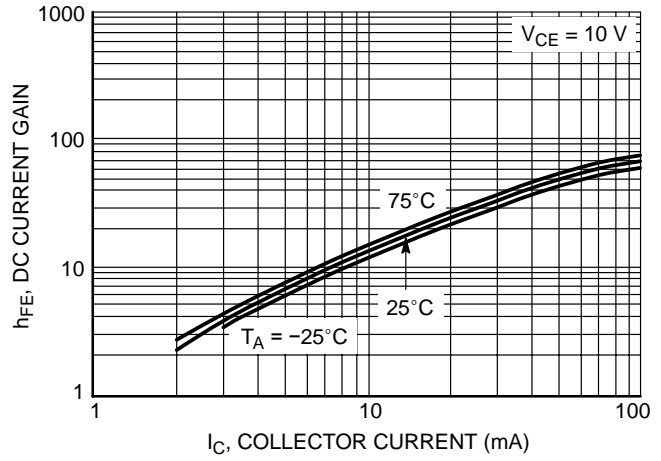


Figure 63. DC Current Gain

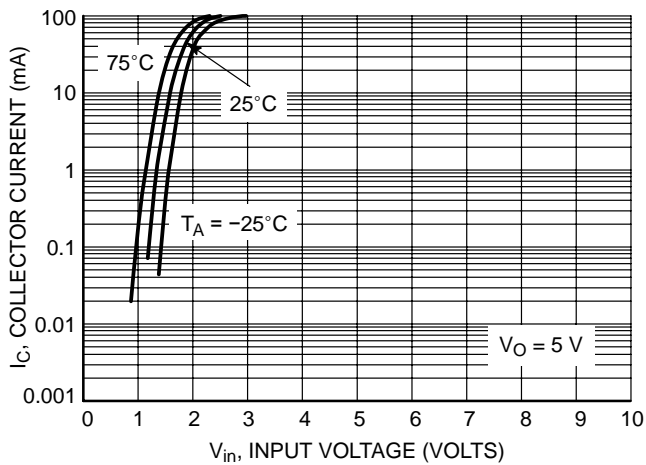


Figure 64. Output Current versus Input Voltage

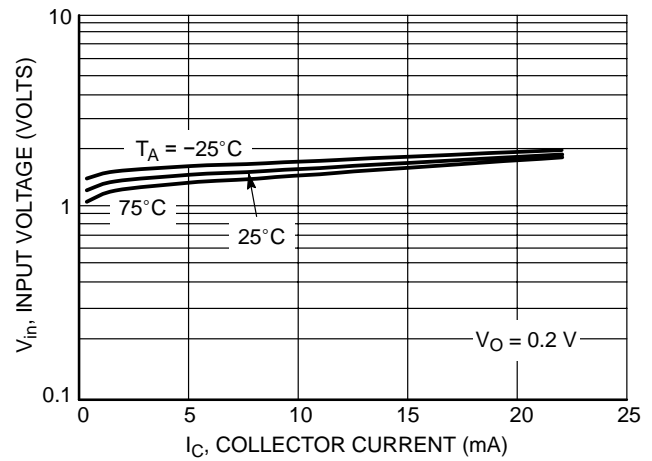


Figure 65. Input Voltage versus Output Current

DWX Series

TYPICAL ELECTRICAL CHARACTERISTICS — DWX323 PNP TRANSISTOR

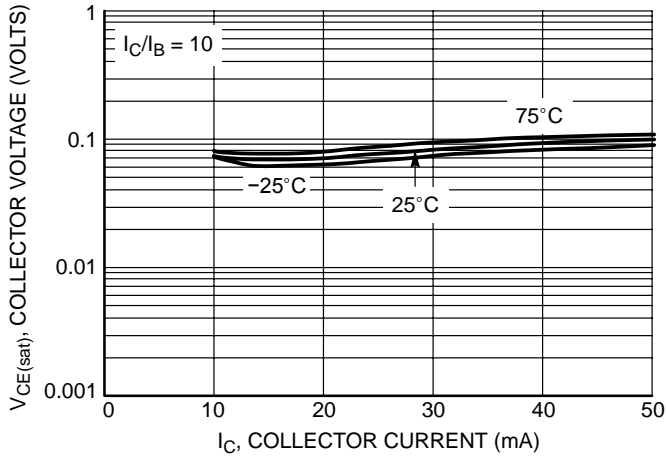


Figure 66. $V_{CE(sat)}$ versus I_C

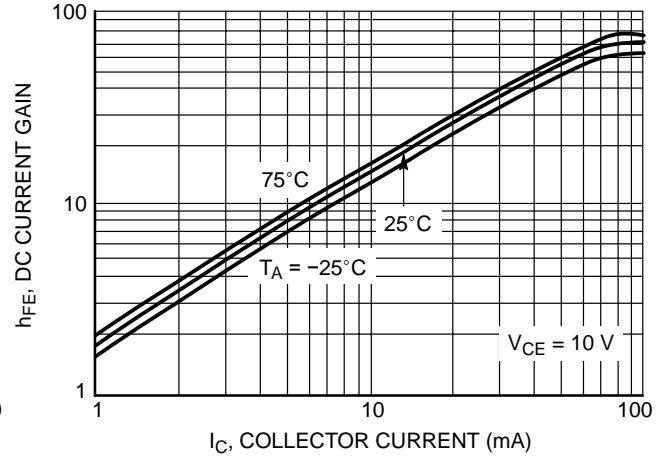


Figure 67. DC Current Gain

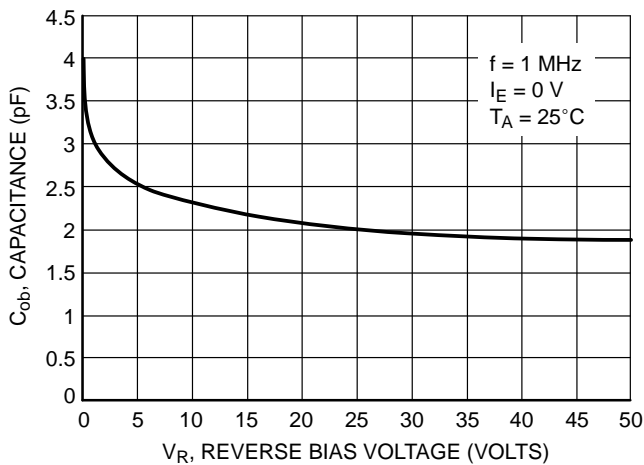


Figure 68. Output Capacitance

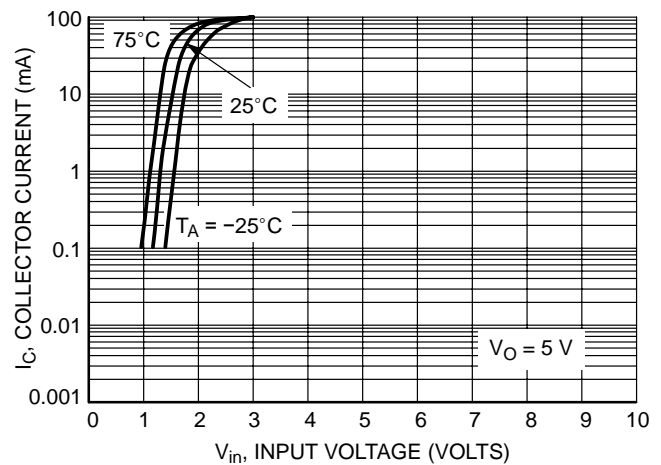


Figure 69. Output Current versus Input Voltage

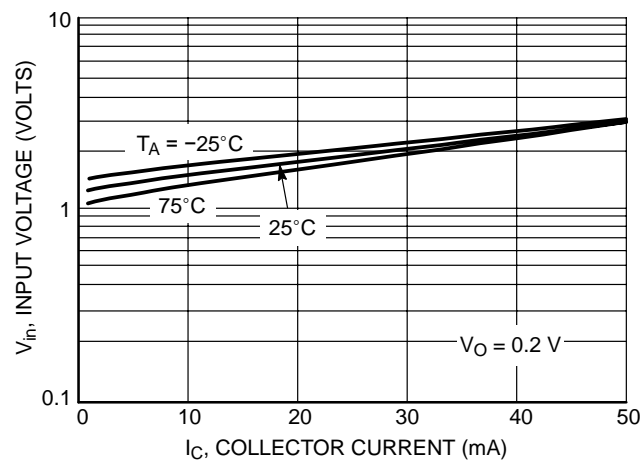


Figure 70. Input Voltage versus Output Current

DWX Series

TYPICAL ELECTRICAL CHARACTERISTICS — DWX317 NPN TRANSISTOR

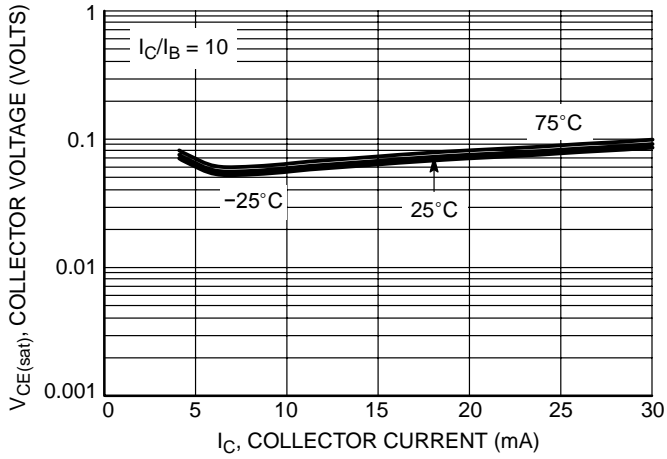


Figure 71. $V_{CE(sat)}$ versus I_C

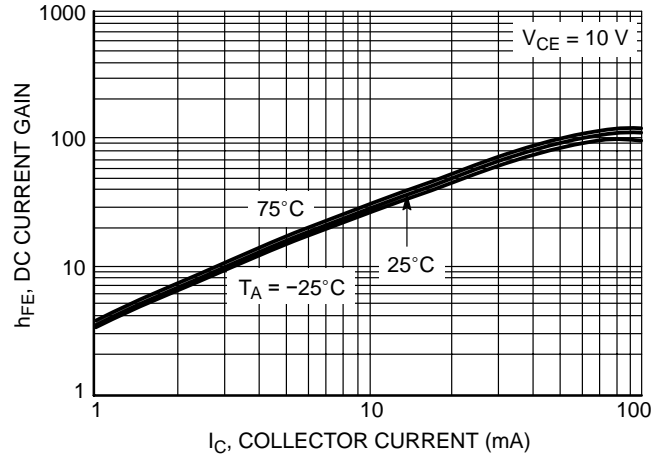


Figure 72. DC Current Gain

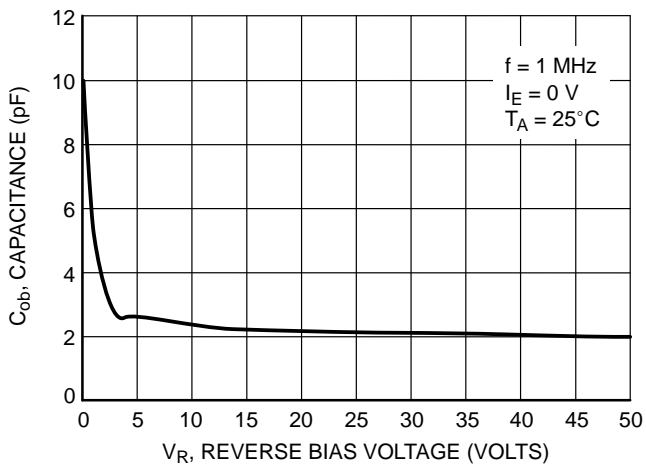


Figure 73. Output Capacitance

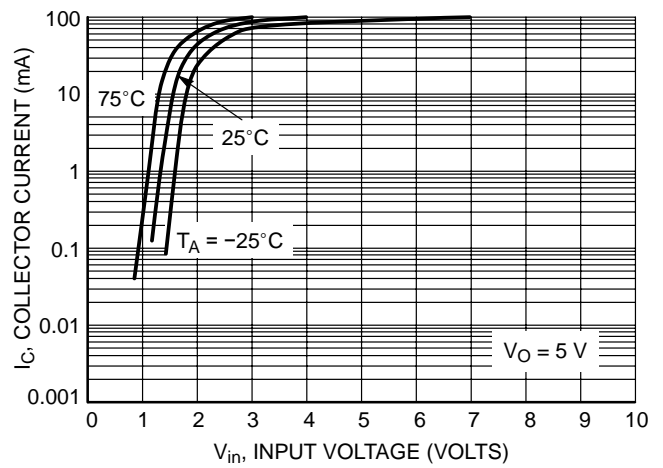


Figure 74. Output Current versus Input Voltage

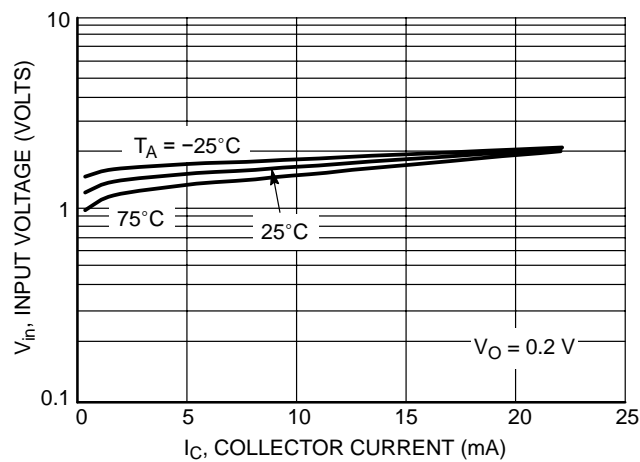


Figure 75. Input Voltage versus Output Current

DWX Series

TYPICAL ELECTRICAL CHARACTERISTICS — DWX317 TRANSISTOR

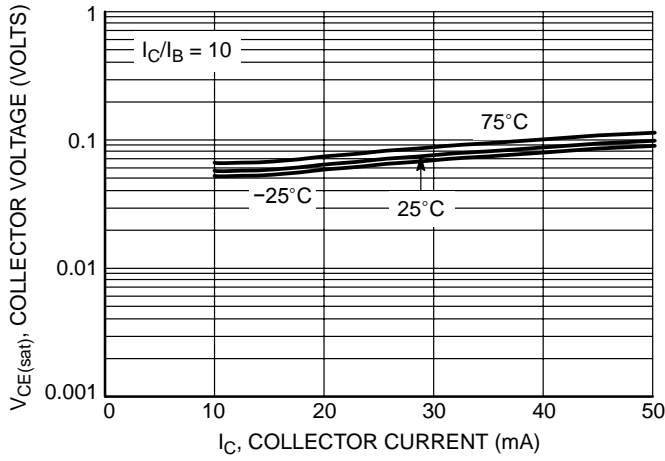


Figure 76. $V_{CE(sat)}$ versus I_C

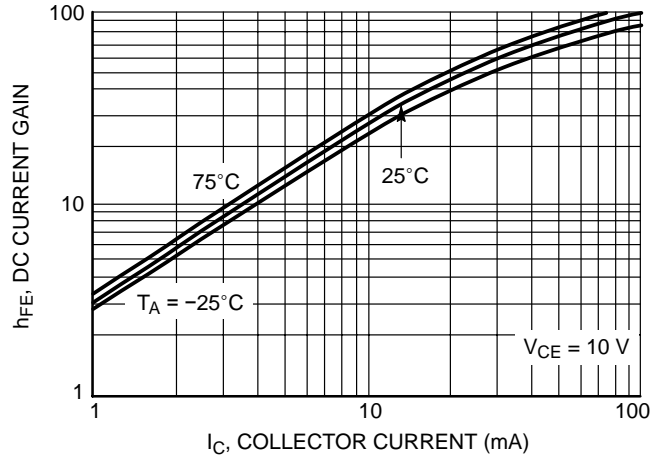


Figure 77. DC Current Gain

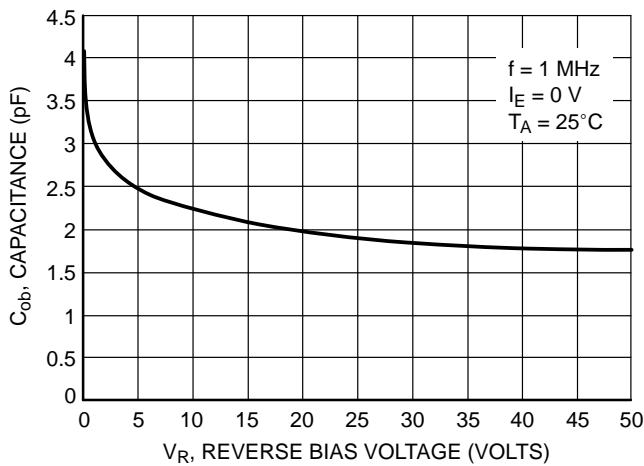


Figure 78. Output Capacitance

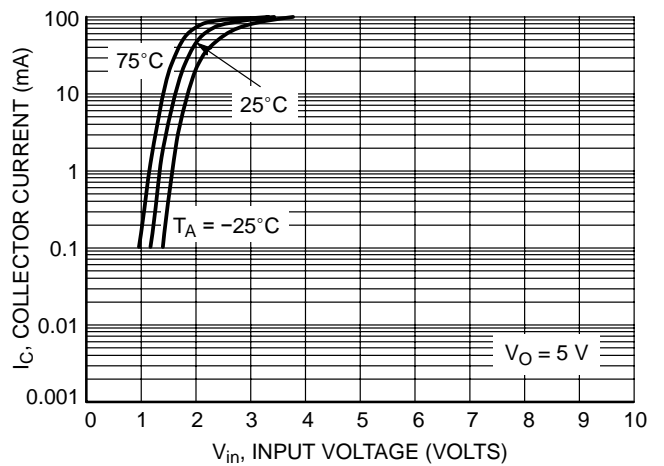


Figure 79. Output Current versus Input Voltage

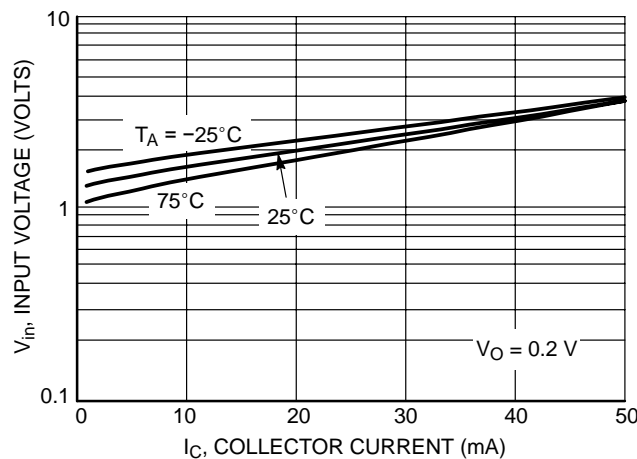


Figure 80. Input Voltage versus Output Current

DWX Series

TYPICAL ELECTRICAL CHARACTERISTICS — DWX301 NPN TRANSISTOR

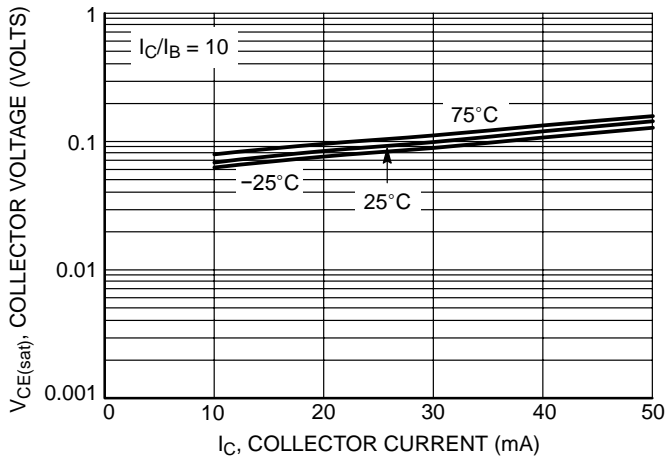


Figure 81. $V_{CE(sat)}$ versus I_C

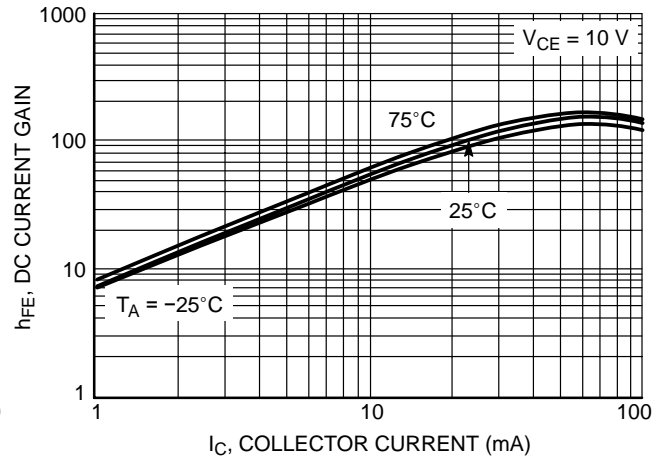


Figure 82. DC Current Gain

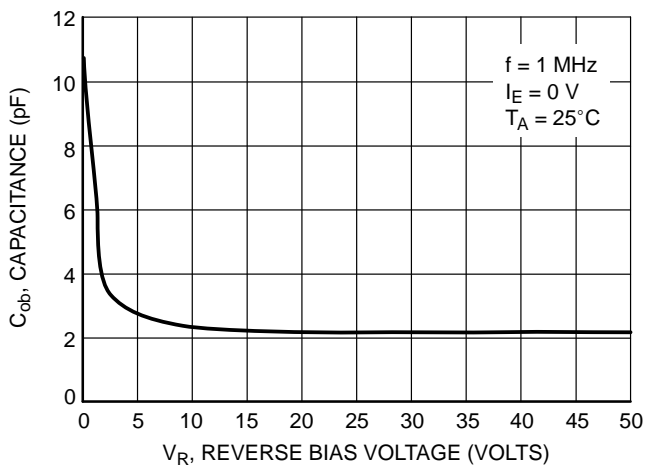


Figure 83. Output Capacitance

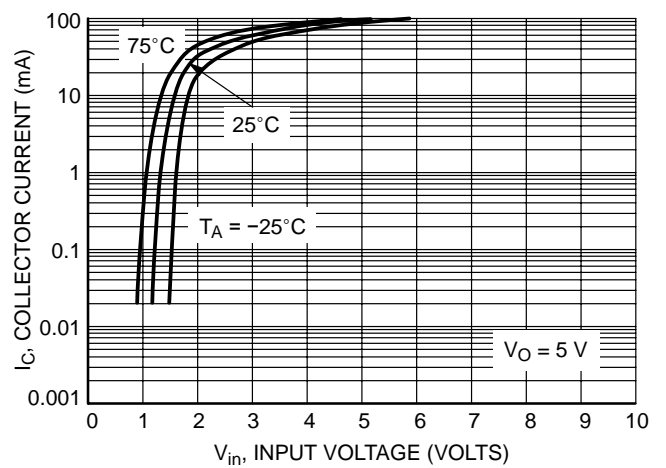


Figure 84. Output Current versus Input Voltage

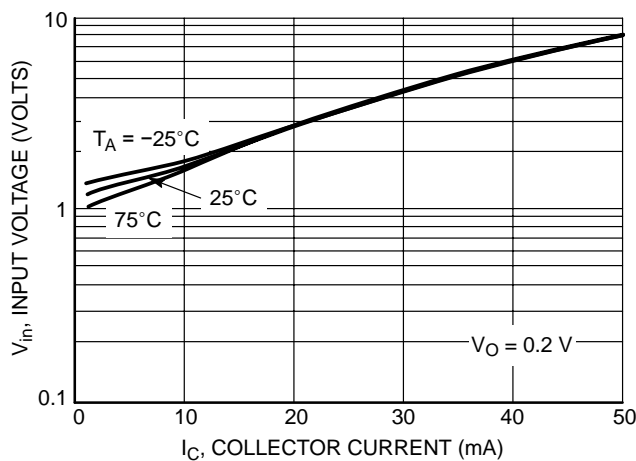


Figure 85. Input Voltage versus Output Current

DWX Series

TYPICAL ELECTRICAL CHARACTERISTICS — DWX301 PNP TRANSISTOR

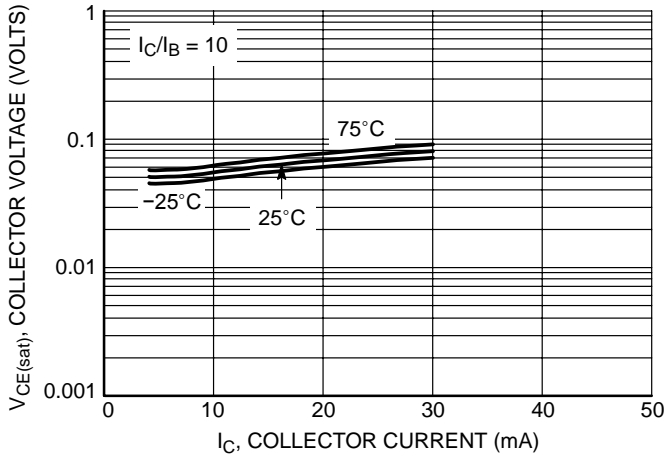


Figure 86. $V_{CE(sat)}$ versus I_C

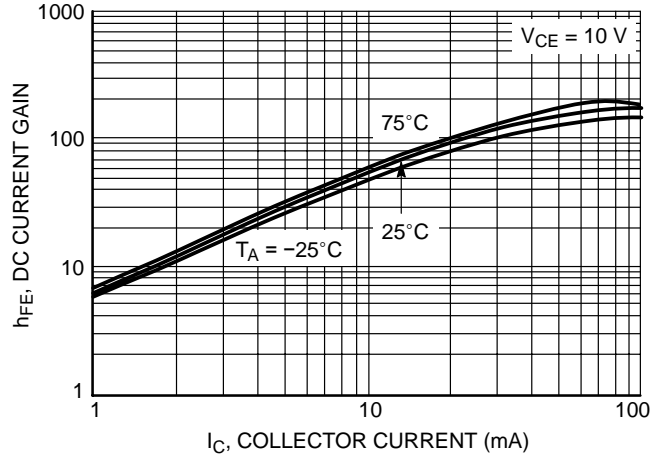


Figure 87. DC Current Gain

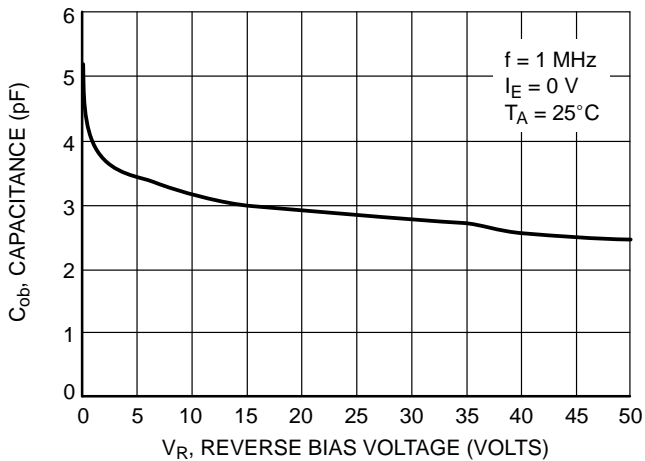


Figure 88. Output Capacitance

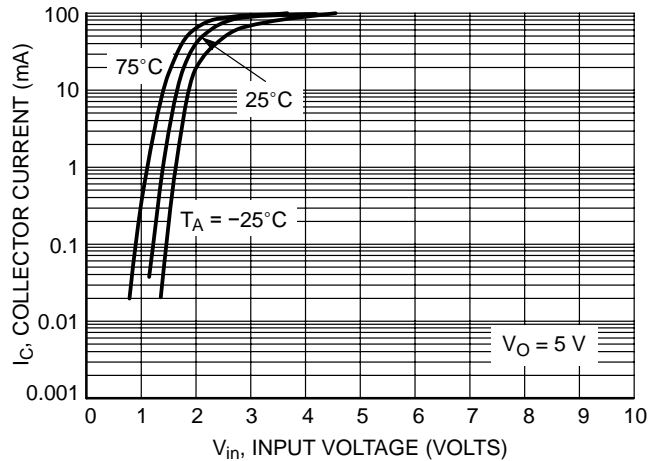


Figure 89. Output Current versus Input Voltage

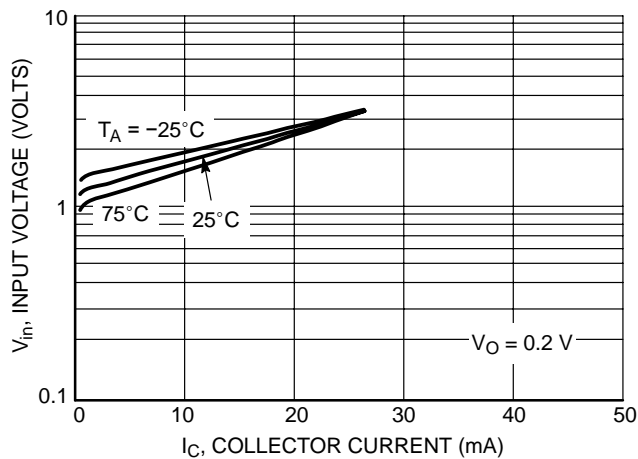


Figure 90. Input Voltage versus Output Current

DWX Series

TYPICAL ELECTRICAL CHARACTERISTICS — DWX306 NPN TRANSISTOR

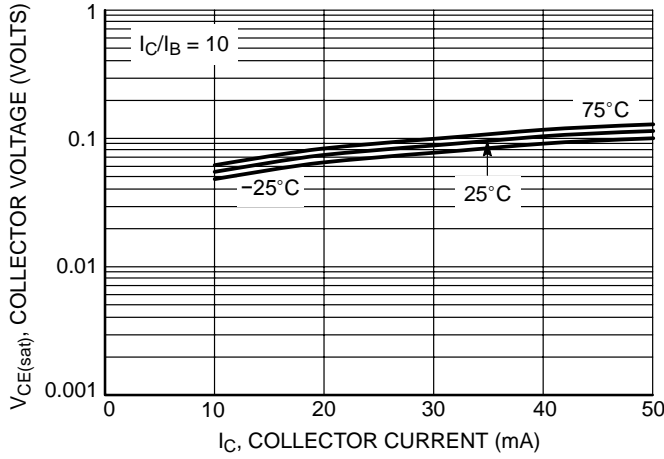


Figure 91. $V_{CE(sat)}$ versus I_C

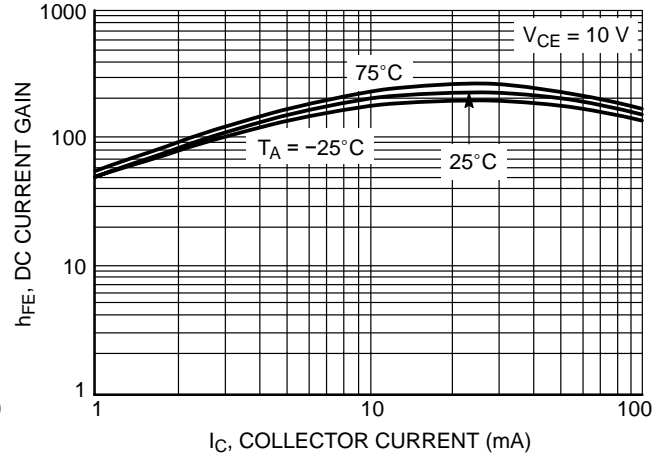


Figure 92. DC Current Gain

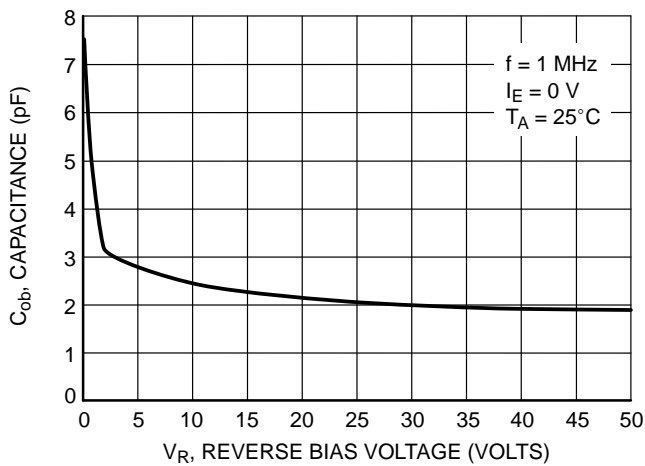


Figure 93. Output Capacitance

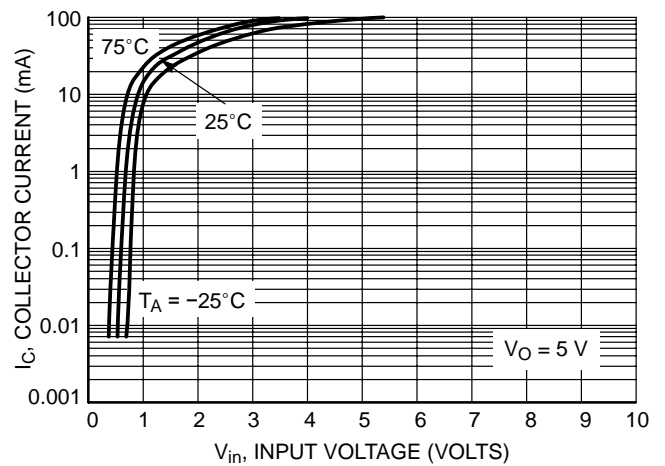


Figure 94. Output Current versus Input Voltage

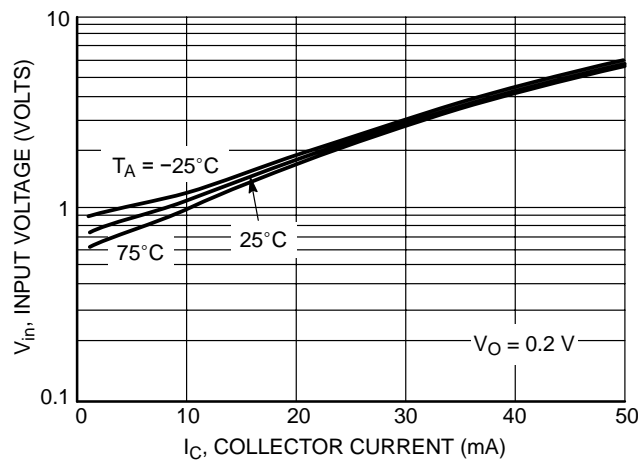


Figure 95. Input Voltage versus Output Current

DWX Series

TYPICAL ELECTRICAL CHARACTERISTICS — DWX306 PNP TRANSISTOR

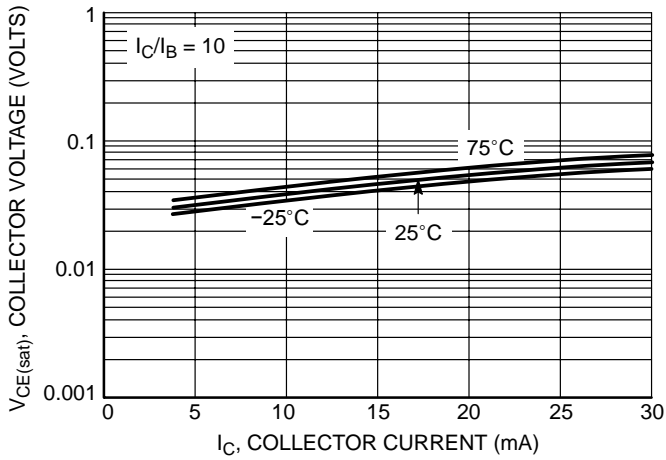


Figure 96. $V_{CE(sat)}$ versus I_C

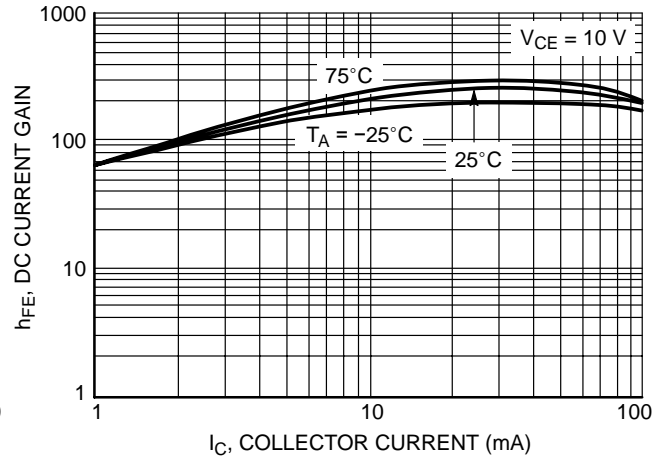


Figure 97. DC Current Gain

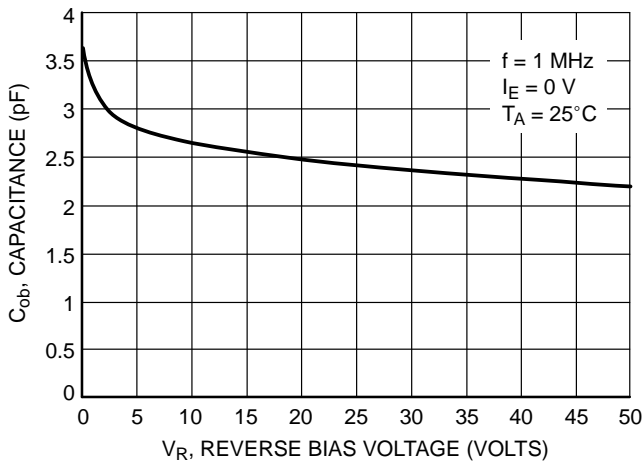


Figure 98. Output Capacitance

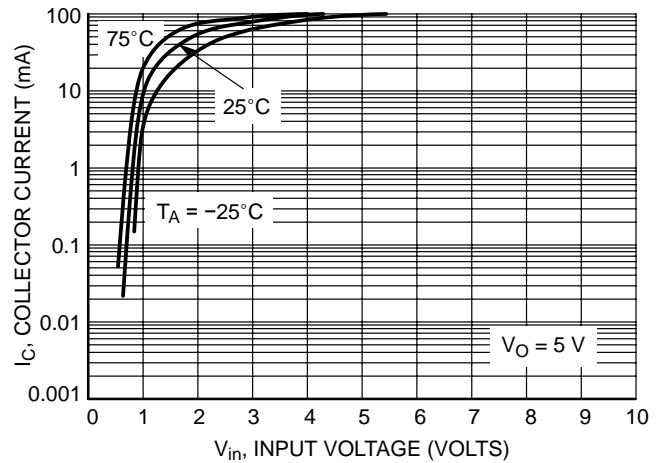


Figure 99. Output Current versus Input Voltage

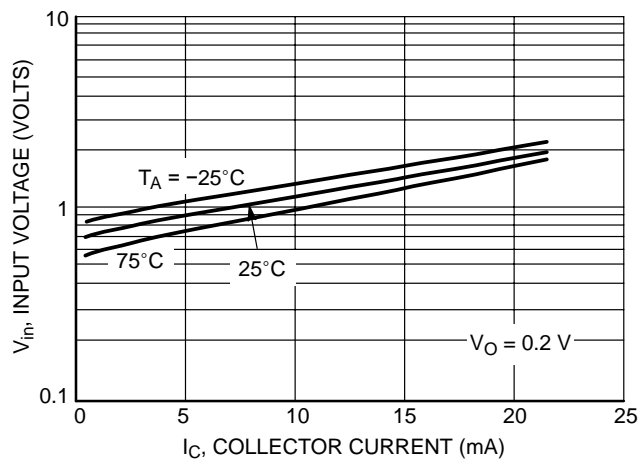


Figure 100. Input Voltage versus Output Current



DWX Series

TYPICAL ELECTRICAL CHARACTERISTICS — DWX308 NPN TRANSISTOR

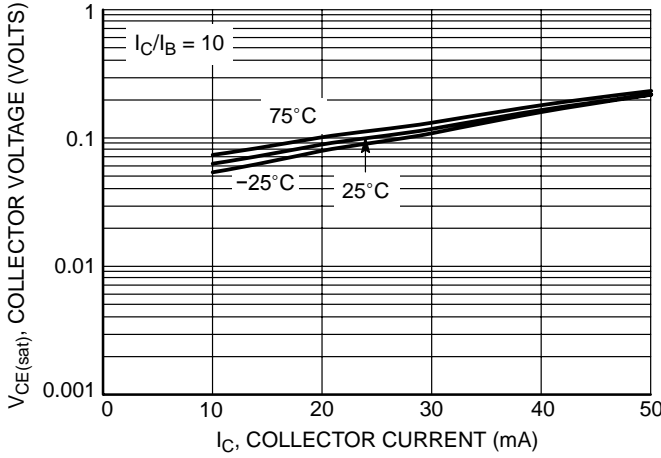


Figure 101. $V_{CE(sat)}$ versus I_C

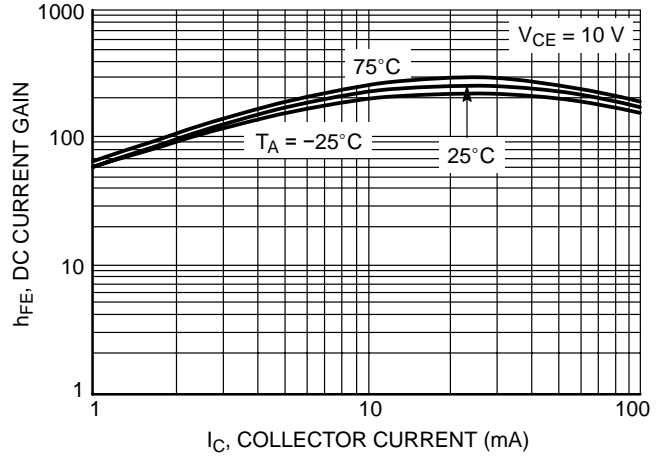


Figure 102. DC Current Gain

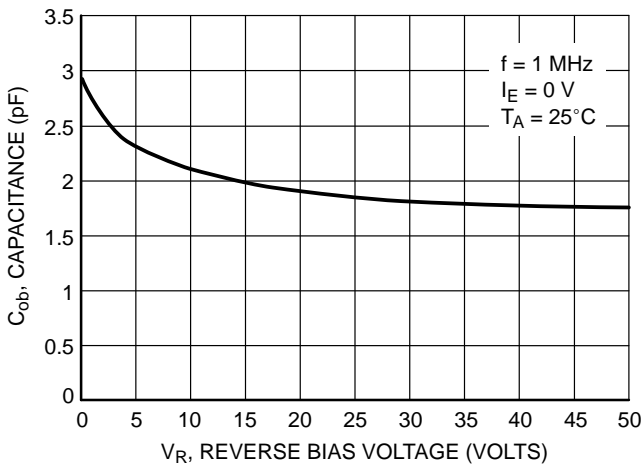


Figure 103. Output Capacitance

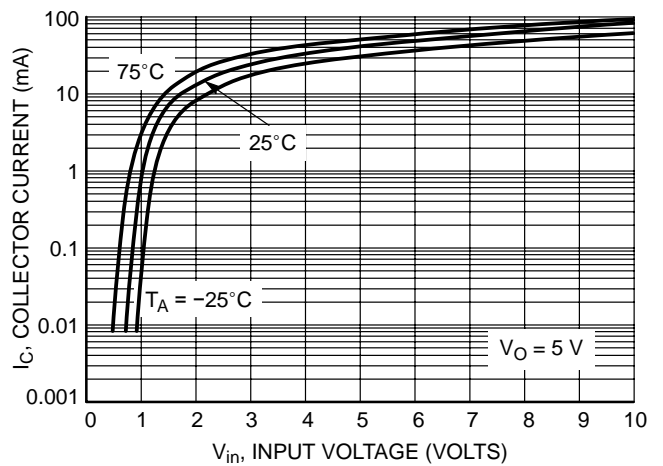


Figure 104. Output Current versus Input Voltage

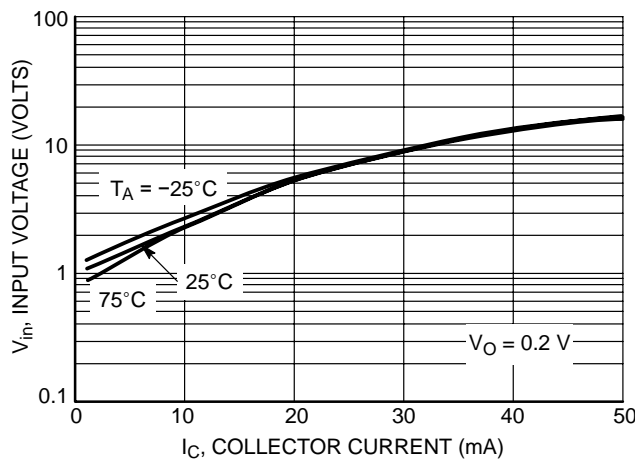


Figure 105. Input Voltage versus Output Current

DWX Series

TYPICAL ELECTRICAL CHARACTERISTICS — DWX308 PNP TRANSISTOR

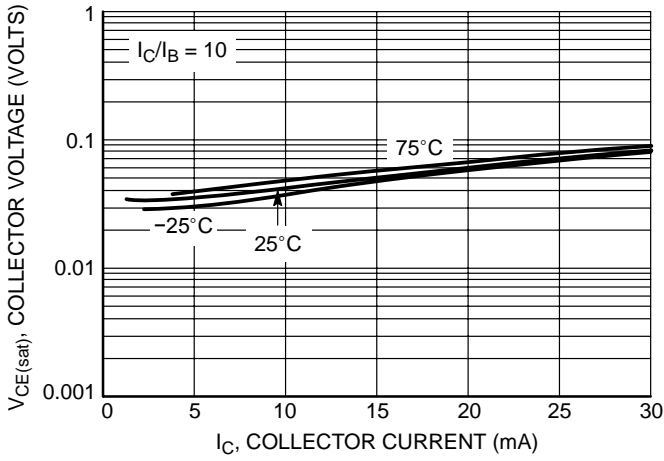


Figure 106. $V_{CE(sat)}$ versus I_C

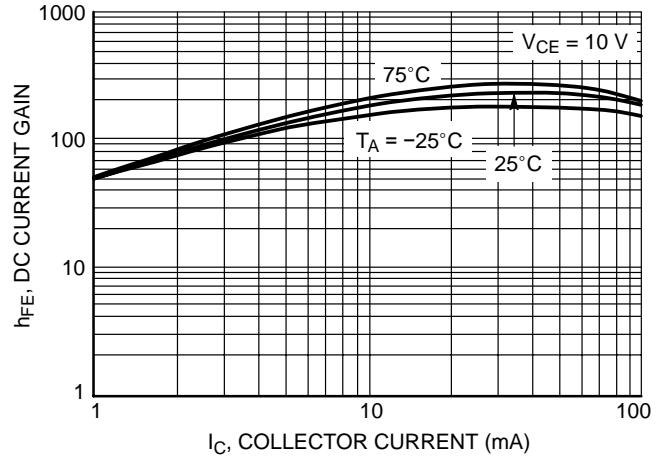


Figure 107. DC Current Gain

DWX Series

TYPICAL ELECTRICAL CHARACTERISTICS — DWX305 NPN TRANSISTOR

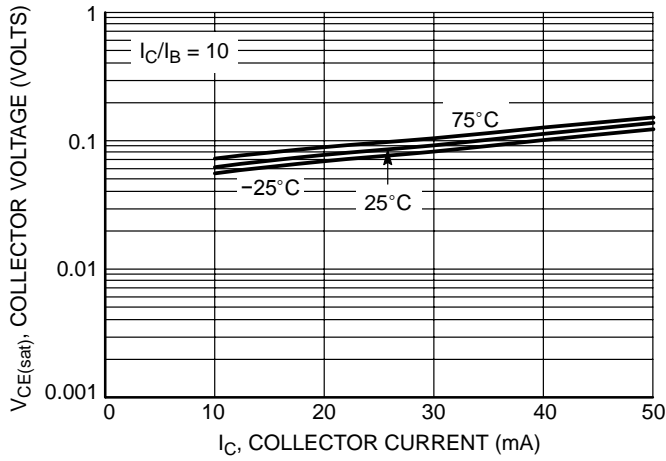


Figure 108. $V_{CE(sat)}$ versus I_C

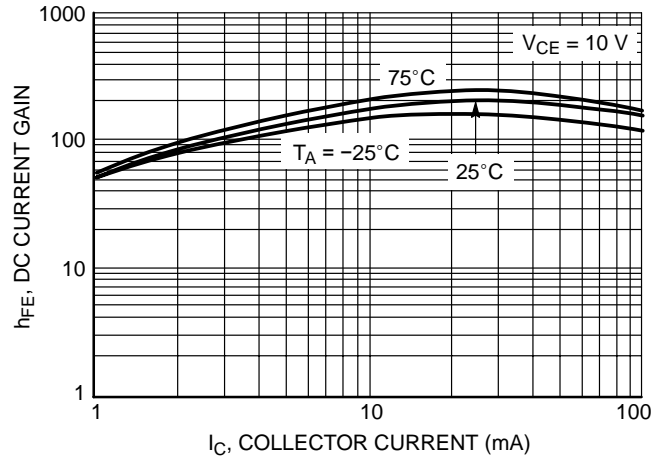


Figure 109. DC Current Gain

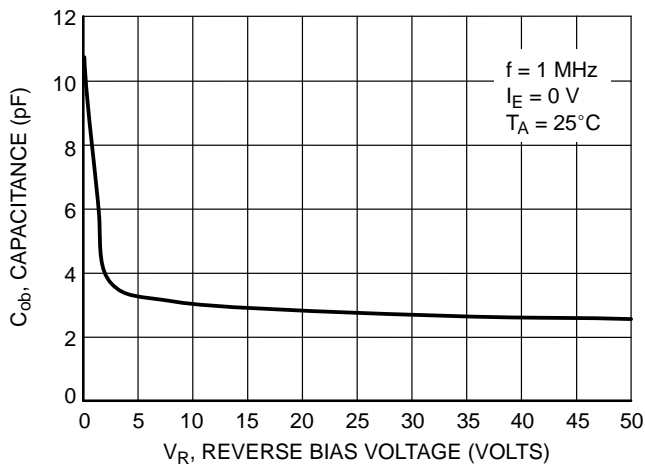


Figure 110. Output Capacitance

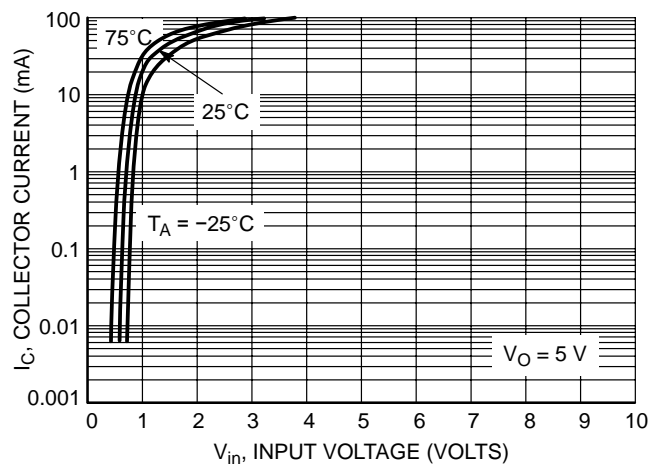


Figure 111. Output Current versus Input Voltage

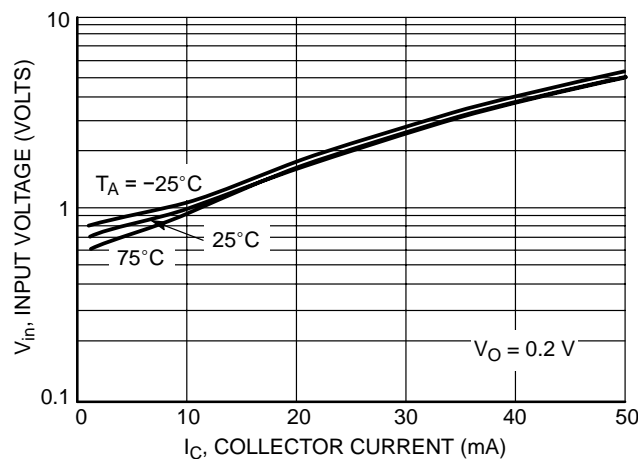


Figure 112. Input Voltage versus Output Current

DWX Series

TYPICAL ELECTRICAL CHARACTERISTICS — DWX305 PNP TRANSISTOR

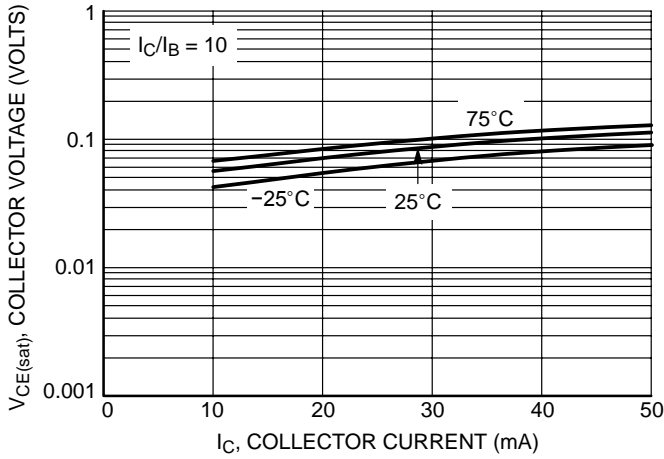


Figure 113. $V_{CE(sat)}$ versus I_C

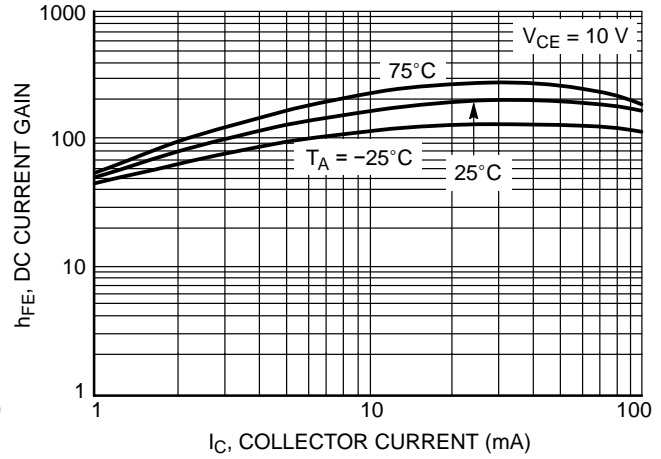


Figure 114. DC Current Gain

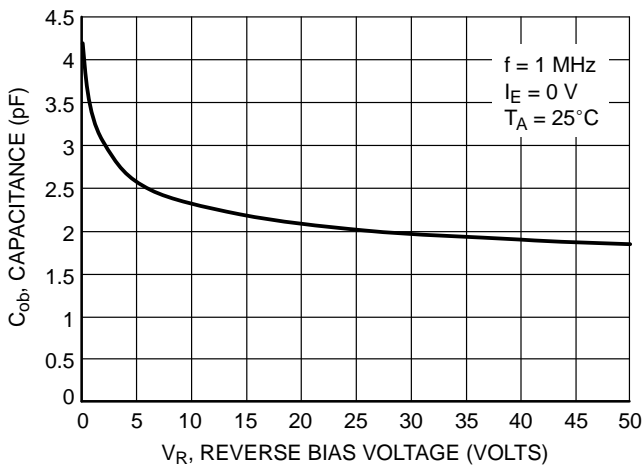


Figure 115. Output Capacitance

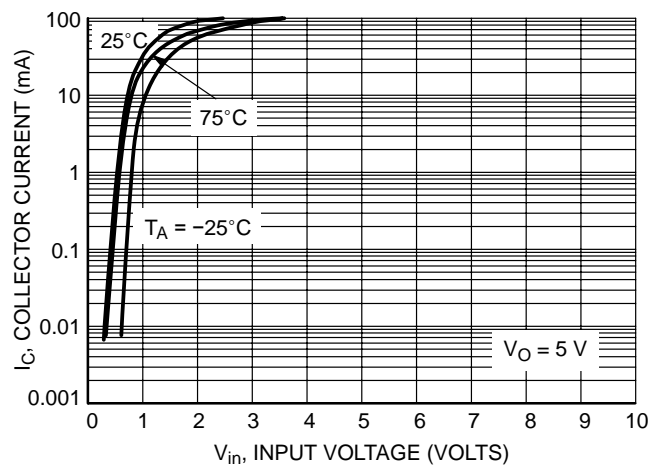


Figure 116. Output Current versus Input Voltage

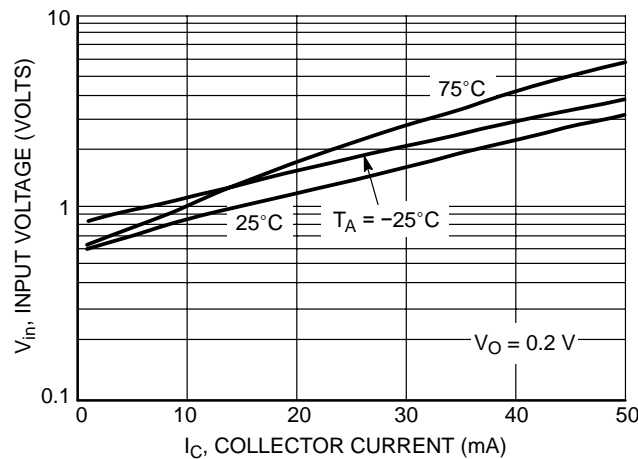
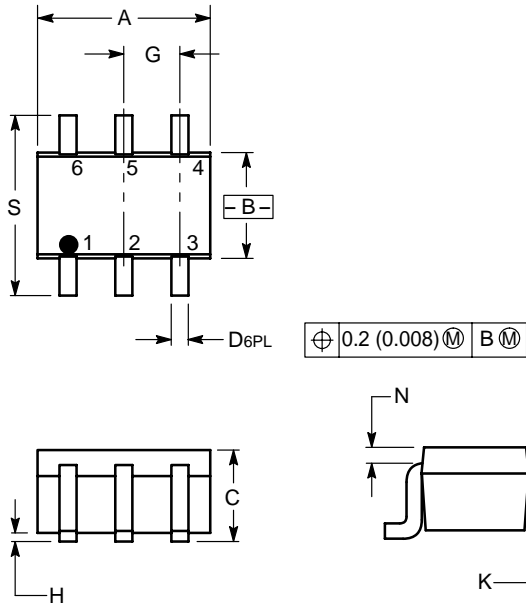


Figure 117. Input Voltage versus Output Current

SC-88/SOT-363



NOTES:

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

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

- PIN 1. EMITTER 2
 2. BASE 2
 3. COLLECTOR 1
 4. EMITTER 1
 5. BASE 1
 6. COLLECTOR 2

