MUN5111T1 Series

Preferred Devices

Bias Resistor Transistor

PNP Silicon Surface Mount Transistor 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 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. 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−70/SOT−323 package which is designed for low power surface mount applications.

Features

- Simplifies Circuit Design
- Reduces Board Space
- Reduces Component Count
- The SC−70/SOT−323 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.
- Available in 8 mm embossed tape and reel − Use the Device Number to order the 7 inch/3000 unit reel. Replace “T1” with “T3” in the Device Number to order the 13 inch/10,000 unit reel.
- Pb−Free Packages are Available

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

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Total Device Dissipation T_A = 25°C Derate above 25°C	P_D	202 (Note 1) 310 (Note 2) 1.6 (Note 1) 2.5 (Note 2)	mW °C/W
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	618 (Note 1) 403 (Note 2)	°C/W
Thermal Resistance, Junction-to-Lead	$R_{\theta JL}$	280 (Note 1) 332 (Note 2)	°C/W
Junction and Storage Temperature Range	T_J, T_{stg}	−55 to +150	°C

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

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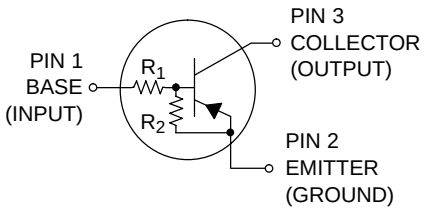
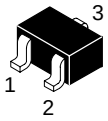
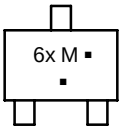
PNP SILICON BIAS RESISTOR TRANSISTORS





SC−70/SOT−323
CASE 419
STYLE 3

MARKING DIAGRAM



6x = Device Code
M = Date Code*
▪ = Pb−Free Package

(Note: Microdot may be in either location)

*Date Code orientation may vary depending upon manufacturing location.

ORDERING INFORMATION

See specific ordering and shipping information in the package dimensions section on page 2 of this data sheet.

Preferred devices are recommended choices for future use and best overall value.

ORDERING INFORMATION AND RESISTOR VALUES

Device	Package	Marking	R1 (K)	R2 (K)	Shipping†
MUN5111T1	SC−70/SOT−323	6A	10	10	3000/Tape & Reel
MUN5111T1G	SC−70/SOT−323 (Pb−Free)	6A	10	10	3000/Tape & Reel
MUN5112T1	SC−70/SOT−323	6B	22	22	3000/Tape & Reel
MUN5112T1G	SC−70/SOT−323 (Pb−Free)	6B	22	22	3000/Tape & Reel
MUN5113T1	SC−70/SOT−323	6C	47	47	3000/Tape & Reel
MUN5113T1G	SC−70/SOT−323 (Pb−Free)	6C	47	47	3000/Tape & Reel
MUN5113T3	SC−70/SOT−323	6C	47	47	10,000/Tape & Reel
MUN5113T3G	SC−70/SOT−323 (Pb−Free)	6C	47	47	10,000/Tape & Reel
MUN5113T1G	SC−70/SOT−323 (Pb−Free)	6C	47	47	3000/Tape & Reel
MUN5114T1	SC−70/SOT−323	6D	10	47	3000/Tape & Reel
MUN5114T1G	SC−70/SOT−323 (Pb−Free)	6D	10	47	3000/Tape & Reel
MUN5115T1 (Note 3)	SC−70/SOT−323	6E	10	∞	3000/Tape & Reel
MUN5115T1G (Note 3)	SC−70/SOT−323 (Pb−Free)	6E	10	∞	3000/Tape & Reel
MUN5116T1 (Note 3)	SC−70/SOT−323	6F	4.7	∞	3000/Tape & Reel
MUN5116T1G (Note 3)	SC−70/SOT−323 (Pb−Free)	6F	4.7	∞	3000/Tape & Reel
MUN5130T1 (Note 3)	SC−70/SOT−323	6G	1.0	1.0	3000/Tape & Reel
MUN5130T1G (Note 3)	SC−70/SOT−323 (Pb−Free)	6G	1.0	1.0	3000/Tape & Reel
MUN5131T1 (Note 3)	SC−70/SOT−323	6H	2.2	2.2	3000/Tape & Reel
MUN5131T1G (Note 3)	SC−70/SOT−323 (Pb−Free)	6H	2.2	2.2	3000/Tape & Reel
MUN5132T1 (Note 3)	SC−70/SOT−323	6J	4.7	4.7	3000/Tape & Reel
MUN5132T1G (Note 3)	SC−70/SOT−323 (Pb−Free)	6J	4.7	4.7	3000/Tape & Reel
MUN5133T1 (Note 3)	SC−70/SOT−323	6K	4.7	47	3000/Tape & Reel
MUN5133T1G (Note 3)	SC−70/SOT−323 (Pb−Free)	6K	4.7	47	3000/Tape & Reel
MUN5134T1 (Note 3)	SC−70/SOT−323	6L	22	47	3000/Tape & Reel
MUN5134T1G (Note 3)	SC−70/SOT−323 (Pb−Free)	6L	22	47	3000/Tape & Reel
MUN5135T1 (Note 3)	SC−70/SOT−323	6M	2.2	47	3000/Tape & Reel
MUN5135T1G (Note 3)	SC−70/SOT−323 (Pb−Free)	6M	2.2	47	3000/Tape & Reel
MUN5136T1	SC−70/SOT−323	6N	100	100	3000/Tape & Reel
MUN5136T1G	SC−70/SOT−323 (Pb−Free)	6N	100	100	3000/Tape & Reel
MUN5137T1	SC−70/SOT−323	6P	47	22	3000/Tape & Reel
MUN5137T1G	SC−70/SOT−323 (Pb−Free)	6P	47	22	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.

3. New devices. Updated curves to follow in subsequent data sheets.

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)	MUN5111T1	I_{EBO}	−	−	0.5	mAdc
	MUN5112T1		−	−	0.2	
	MUN5113T1		−	−	0.1	
	MUN5114T1		−	−	0.2	
	MUN5115T1		−	−	0.9	
	MUN5116T1		−	−	1.9	
	MUN5130T1		−	−	4.3	
	MUN5131T1		−	−	2.3	
	MUN5132T1		−	−	1.5	
	MUN5133T1		−	−	0.18	
	MUN5134T1		−	−	0.13	
	MUN5135T1		−	−	0.2	
	MUN5136T1		−	−	0.05	
	MUN5137T1		−	−	0.13	
Collector−Base Breakdown Voltage (I_C = 10 μA, I_E = 0)		$V_{(BR)CBO}$	50	−	−	Vdc
Collector−Emitter Breakdown Voltage (Note 4) (I_C = 2.0 mA, I_B = 0)		$V_{(BR)CEO}$	50	−	−	Vdc
ON CHARACTERISTICS (Note 4)						
DC Current Gain (V_{CE} = 10 V, I_C = 5.0 mA)	MUN5111T1	h_{FE}	35	60	−	
	MUN5112T1		60	100	−	
	MUN5113T1		80	140	−	
	MUN5114T1		80	140	−	
	MUN5115T1		160	250	−	
	MUN5116T1		160	250	−	
	MUN5130T1		3.0	5.0	−	
	MUN5131T1		8.0	15	−	
	MUN5132T1		15	27	−	
	MUN5133T1		80	140	−	
	MUN5134T1		80	130	−	
	MUN5135T1		80	140	−	
	MUN5136T1		80	150	−	
	MUN5137T1		80	140	−	
Collector−Emitter Saturation Voltage (I_C = 10 mA, I_E = 0.3 mA)		$V_{CE(sat)}$	−	−	0.25	Vdc
(I_C = 10 mA, I_B = 5 mA)	MUN5130T1/MUN5131T1					
(I_C = 10 mA, I_B = 1 mA)	MUN5115T1/MUN5116T1/ MUN5132T1/MUN5133T1/MUN5134T1					
Output Voltage (on)		V_{OL}				Vdc
(V_{CC} = 5.0 V, V_B = 2.5 V, R_L = 1.0 kΩ)	MUN5111T1		−	−	0.2	
	MUN5112T1		−	−	0.2	
	MUN5114T1		−	−	0.2	
	MUN5115T1		−	−	0.2	
	MUN5116T1		−	−	0.2	
	MUN5130T1		−	−	0.2	
	MUN5131T1		−	−	0.2	
	MUN5132T1		−	−	0.2	
	MUN5133T1		−	−	0.2	
	MUN5134T1		−	−	0.2	
	MUN5135T1		−	−	0.2	
(V_{CC} = 5.0 V, V_B = 3.5 V, R_L = 1.0 kΩ)	MUN5113T1		−	−	0.2	
(V_{CC} = 5.0 V, V_B = 5.5 V, R_L = 1.0 kΩ)	MUN5136T1		−	−	0.2	
(V_{CC} = 5.0 V, V_B = 4.0 V, R_L = 1.0 kΩ)	MUN5137T1		−	−	0.2	

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

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

Characteristic	Symbol	Min	Typ	Max	Unit
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) MUN5130T1 (V_{CC} = 5.0 V, V_B = 0.25 V, R_L = 1.0 kΩ) MUN5115T1 MUN5116T1 MUN5131T1 MUN5132T1	V_{OH}	4.9	–	–	Vdc
Input Resistor	R1				kΩ
MUN5111T1		7.0	10	13	
MUN5112T1		15.4	22	28.6	
MUN5113T1		32.9	47	61.1	
MUN5114T1		7.0	10	13	
MUN5115T1		7.0	10	13	
MUN5116T1		3.3	4.7	6.1	
MUN5130T1		0.7	1.0	1.3	
MUN5131T1		1.5	2.2	2.9	
MUN5132T1		3.3	4.7	6.1	
MUN5133T1		3.3	4.7	6.1	
MUN5134T1		15.4	22	28.6	
MUN5135T1		1.54	2.2	2.86	
MUN5136T1		70	100	130	
MUN5137T1		32.9	47	61.1	
Resistor Ratio	R_1/R_2				
MUN5111T1/MUN5112T1/MUN5113T1/MUN5136T1		0.8	1.0	1.2	
MUN5114T1		0.17	0.21	0.25	
MUN5115T1/MUN5116T1		–	–	–	
MUN5130T1/MUN5131T1/MUN5132T1		0.8	1.0	1.2	
MUN5133T1		0.055	0.1	0.185	
MUN5134T1		0.38	0.47	0.56	
MUN5135T1		0.038	0.047	0.056	
MUN5137T1		1.7	2.1	2.6	

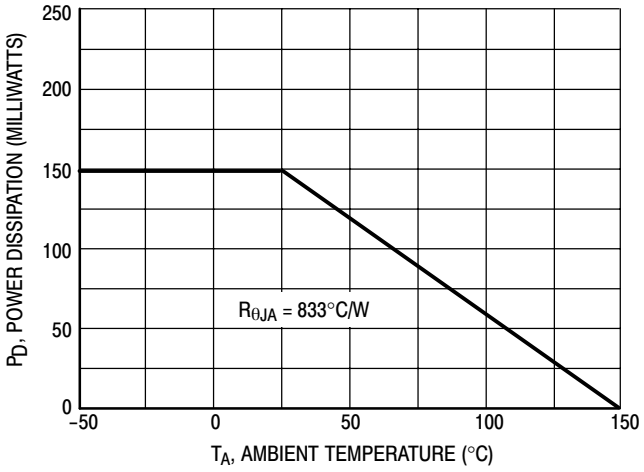


Figure 1. Derating Curve

TYPICAL ELECTRICAL CHARACTERISTICS − MUN5111T1

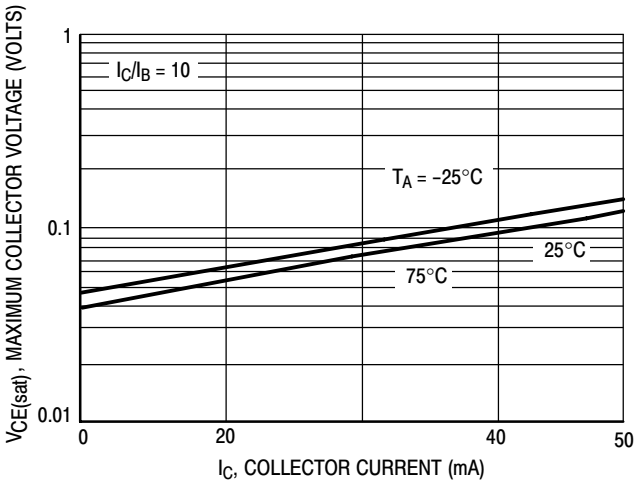


Figure 2. $V_{CE(sat)}$ versus I_C

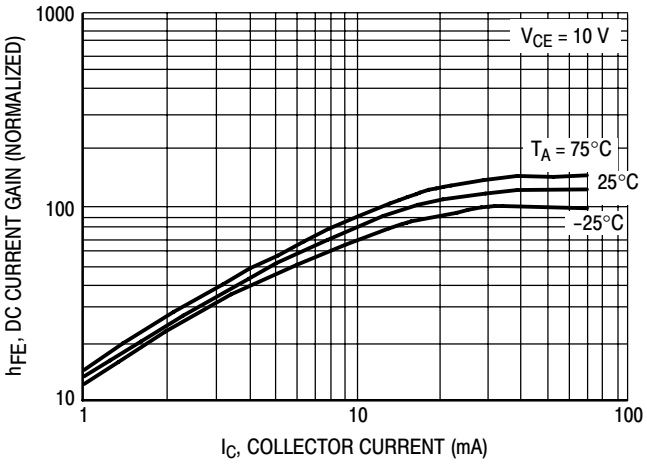


Figure 3. DC Current Gain

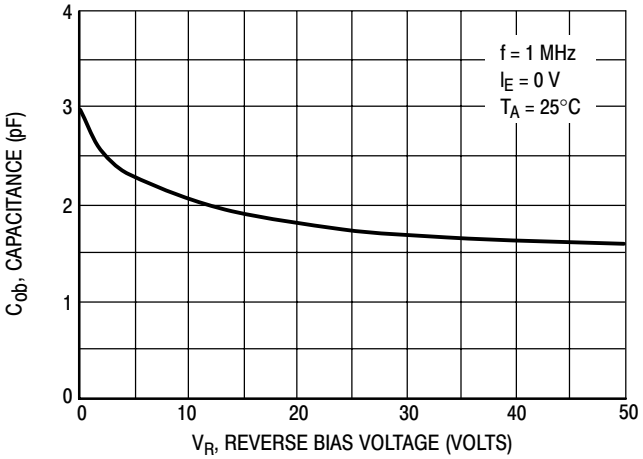


Figure 4. Output Capacitance

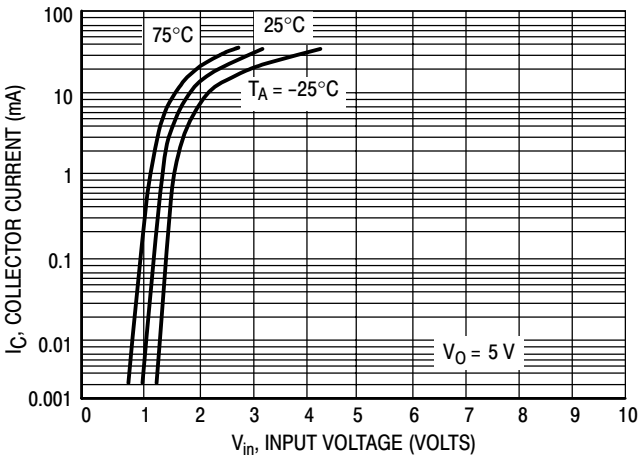


Figure 5. Output Current versus Input Voltage

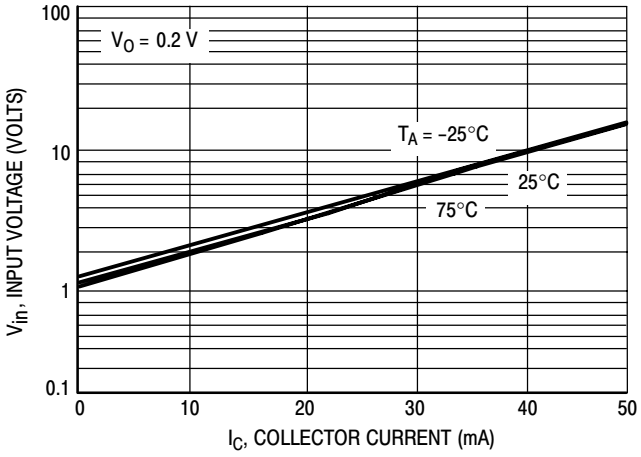


Figure 6. Input Voltage versus Output Current

TYPICAL ELECTRICAL CHARACTERISTICS − MUN5112T1

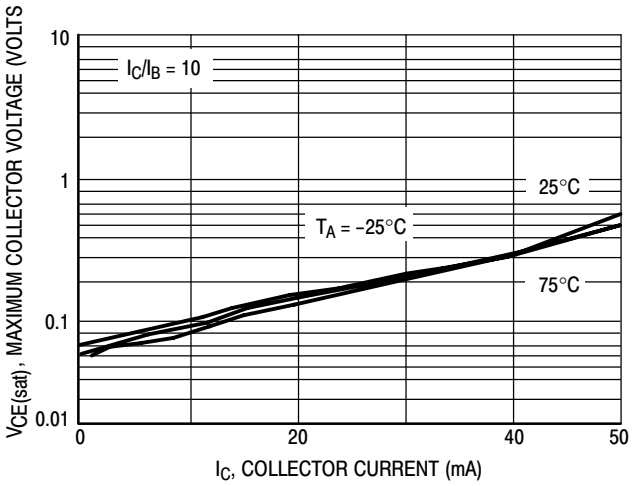


Figure 7. $V_{CE(sat)}$ versus I_C

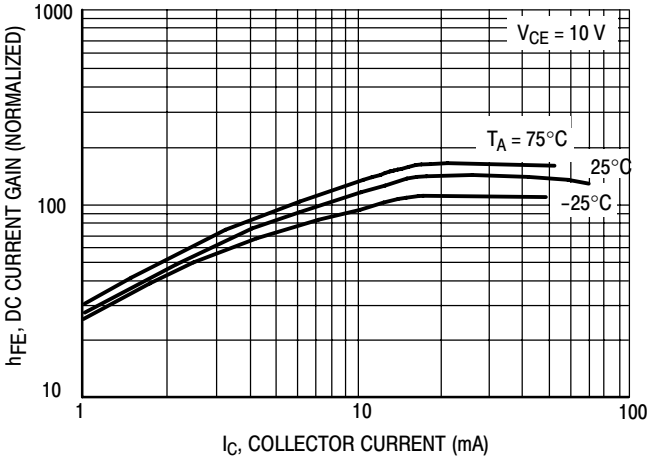


Figure 8. DC Current Gain

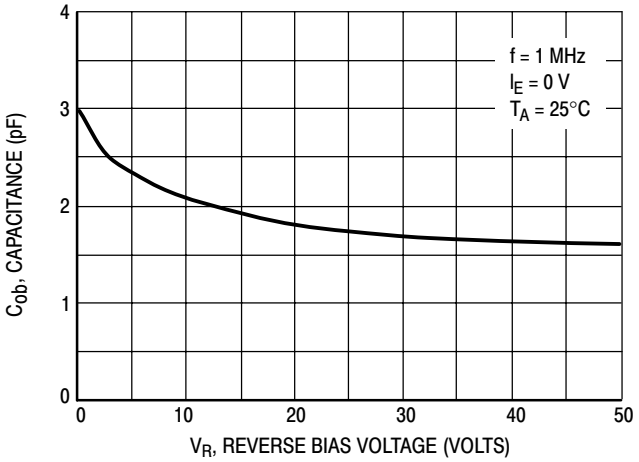


Figure 9. Output Capacitance

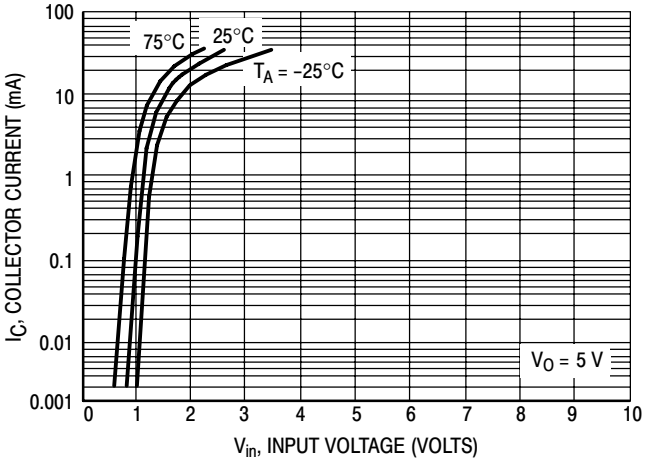


Figure 10. Output Current versus Input Voltage

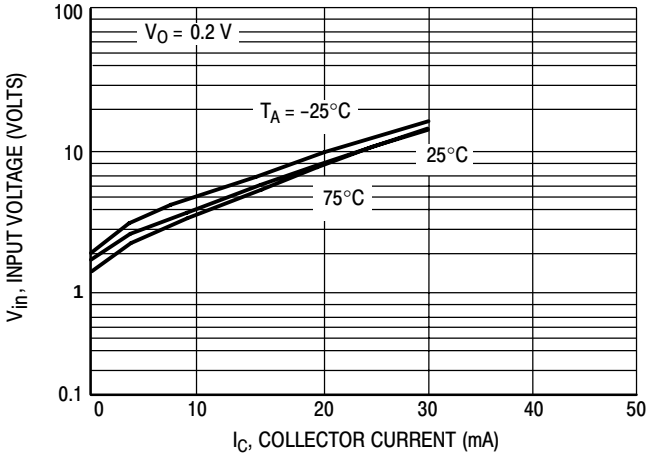


Figure 11. Input Voltage versus Output Current

TYPICAL ELECTRICAL CHARACTERISTICS − MUN5113T1

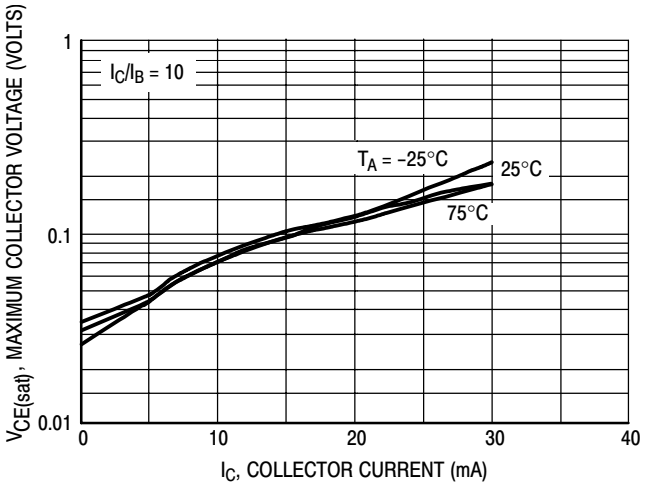


Figure 12. $V_{CE(sat)}$ versus I_C

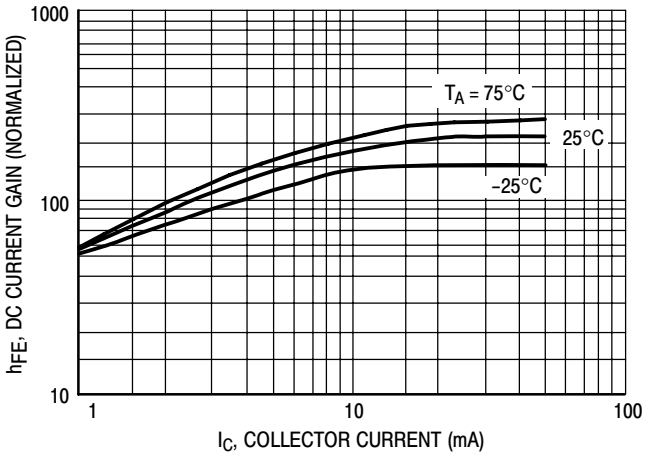


Figure 13. DC Current Gain

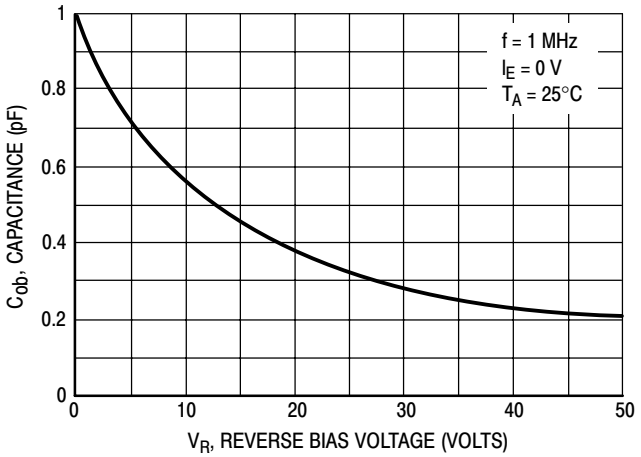


Figure 14. Output Capacitance

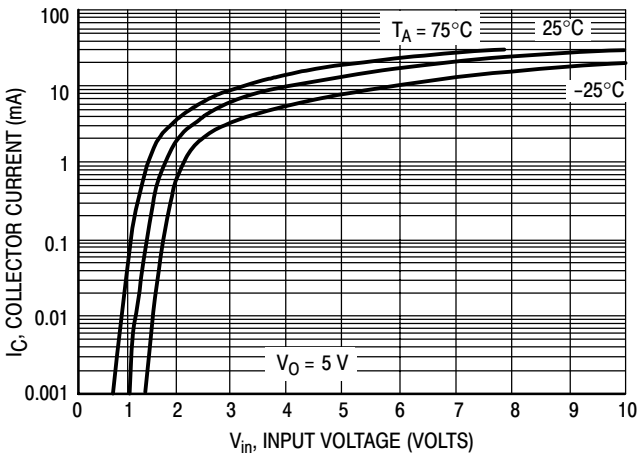


Figure 15. Output Current versus Input Voltage

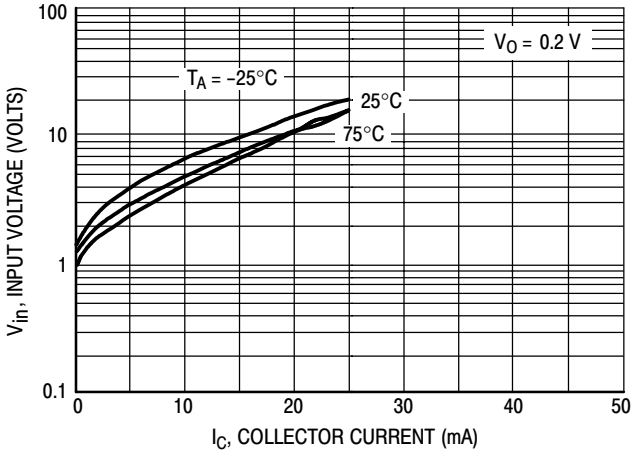


Figure 16. Input Voltage versus Output Current

TYPICAL ELECTRICAL CHARACTERISTICS − MUN5114T1

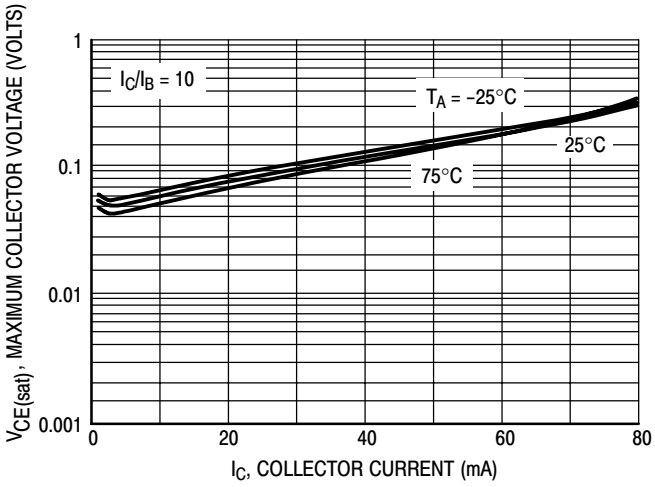


Figure 17. $V_{CE(sat)}$ versus I_C

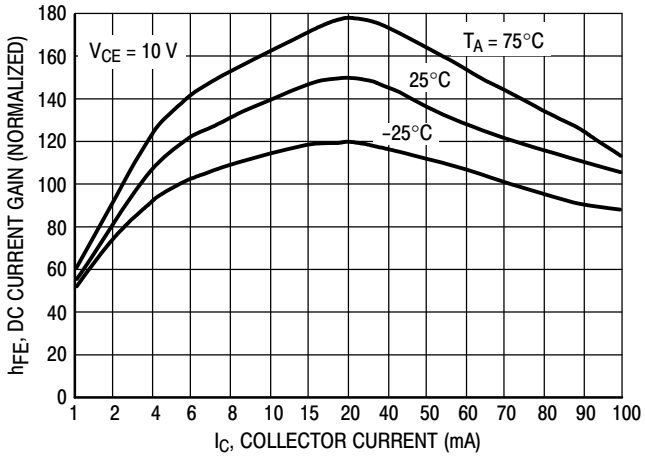


Figure 18. DC Current Gain

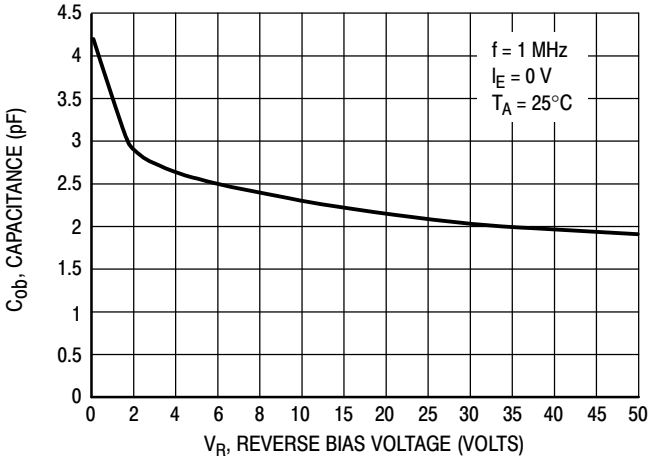


Figure 19. Output Capacitance

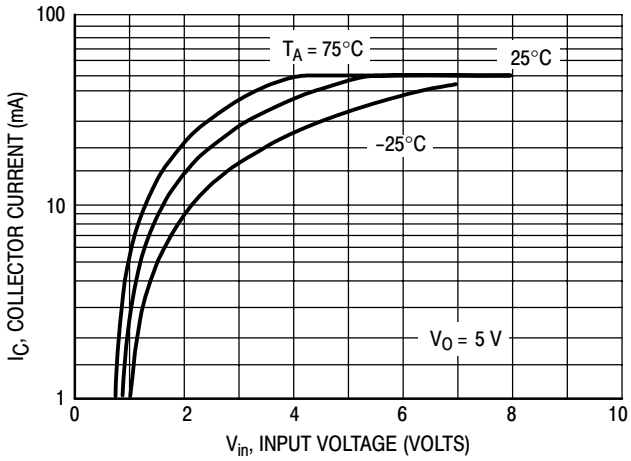


Figure 20. Output Current versus Input Voltage

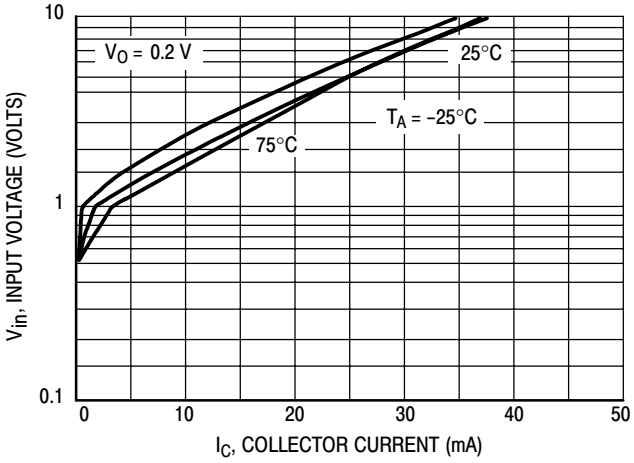


Figure 21. Input Voltage versus Output Current

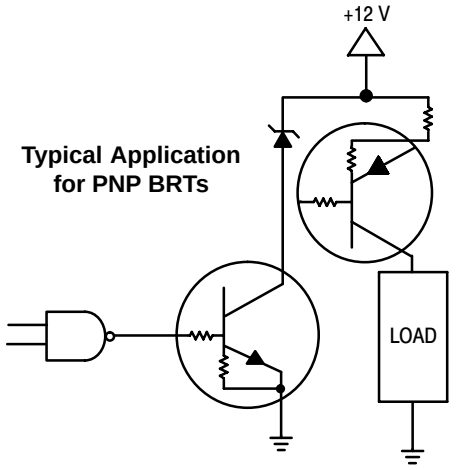


Figure 22. Inexpensive, Unregulated Current Source

TYPICAL ELECTRICAL CHARACTERISTICS — MUN5132T1

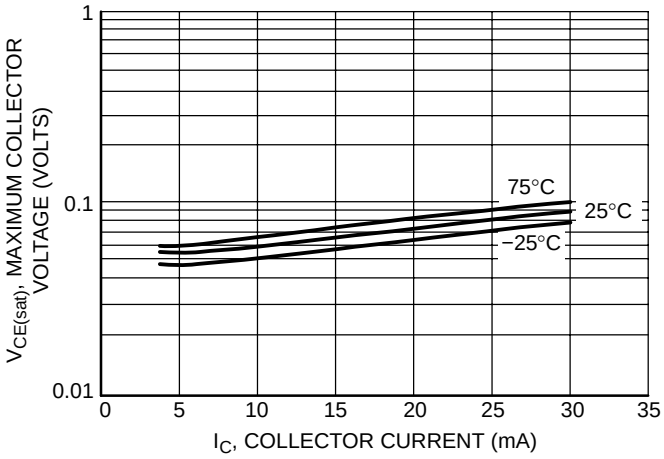


Figure 23. Maximum Collector Voltage versus Collector Current

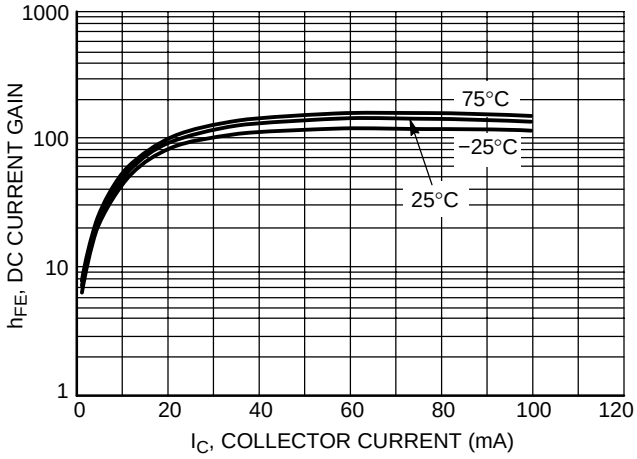


Figure 24. DC Current Gain

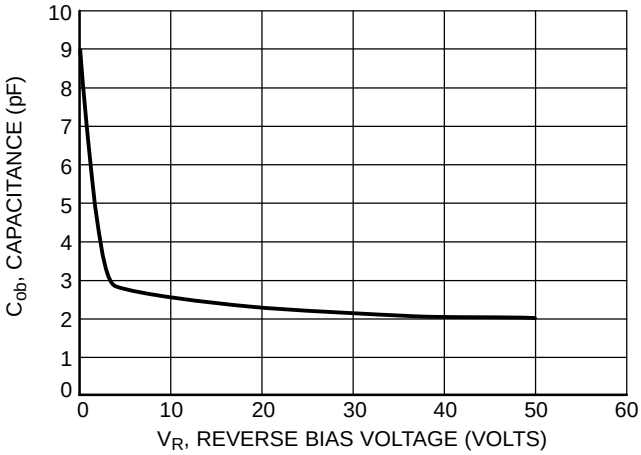


Figure 25. Output Capacitance

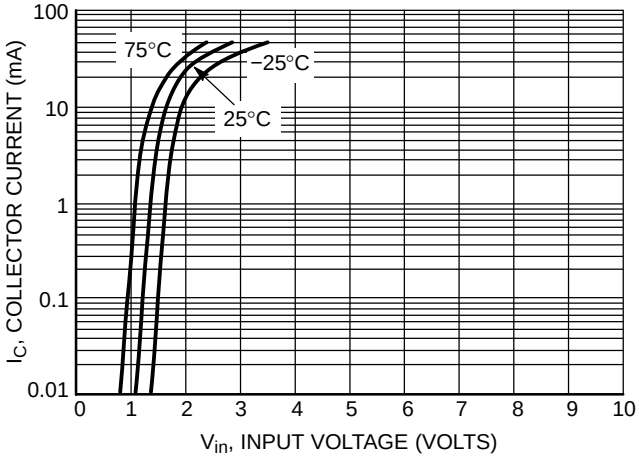


Figure 26. Output Current versus Input Voltage

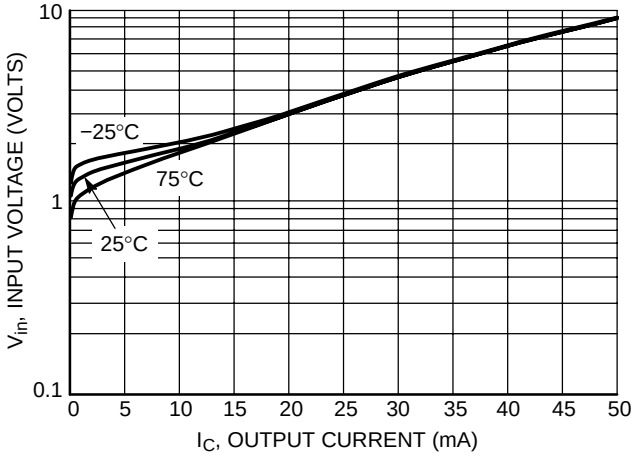


Figure 27. Input Voltage versus Output Current

TYPICAL ELECTRICAL CHARACTERISTICS — MUN5136T1

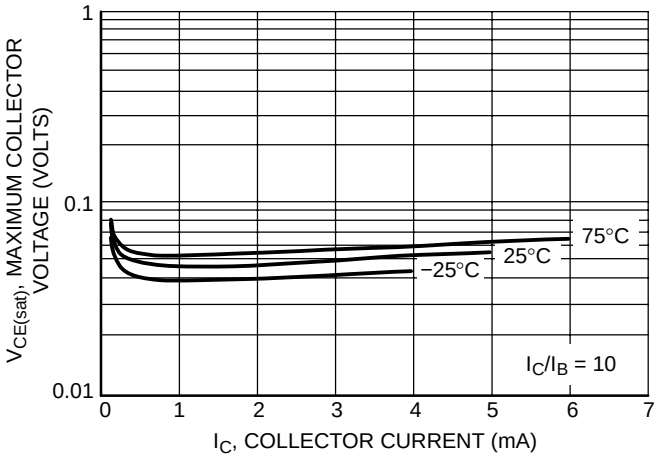


Figure 28. Maximum Collector Voltage versus Collector Current

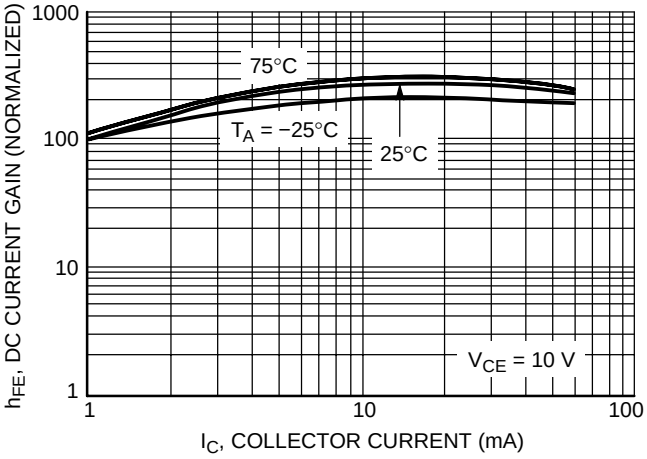


Figure 29. DC Current Gain

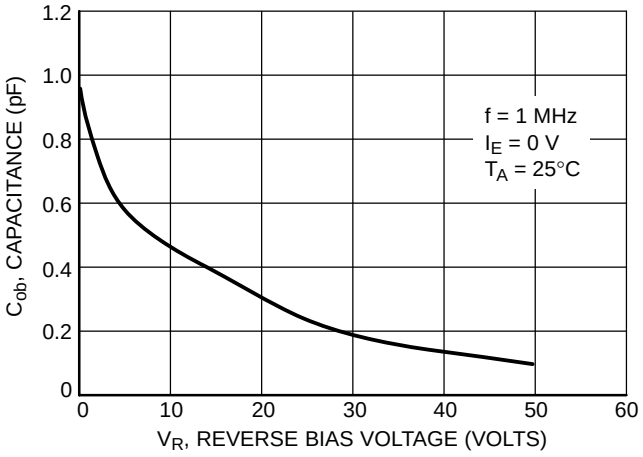


Figure 30. Output Capacitance

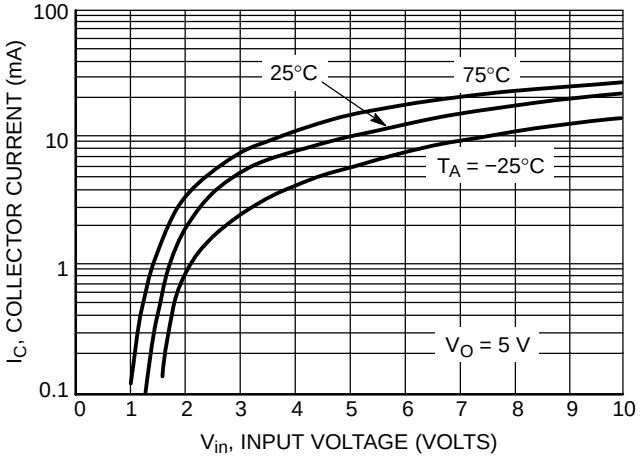


Figure 31. Output Current versus Input Voltage

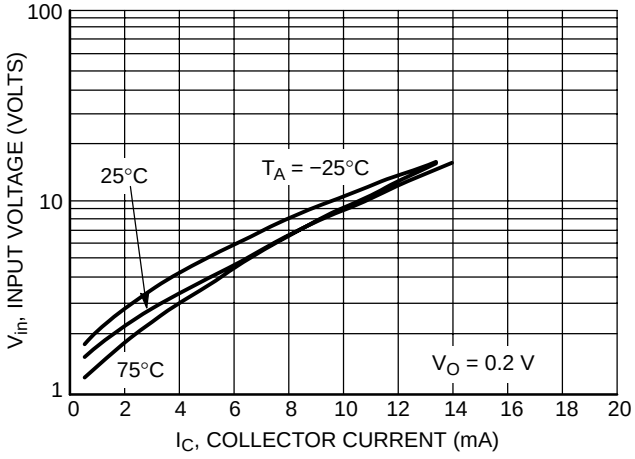


Figure 32. Input Voltage versus Output Current

TYPICAL ELECTRICAL CHARACTERISTICS — MUN5137T1

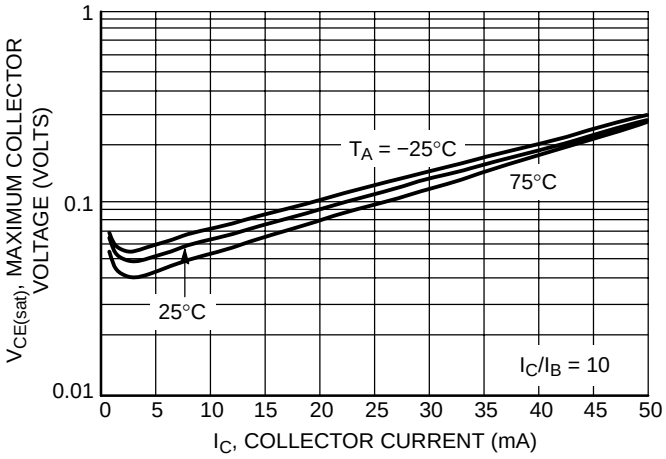


Figure 33. Maximum Collector Voltage versus Collector Current

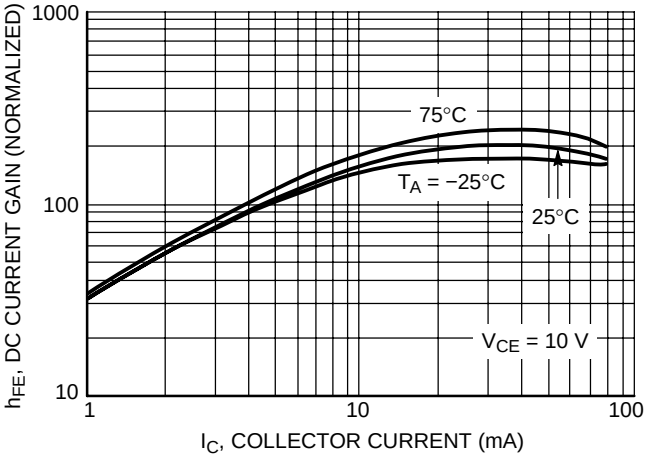


Figure 34. DC Current Gain

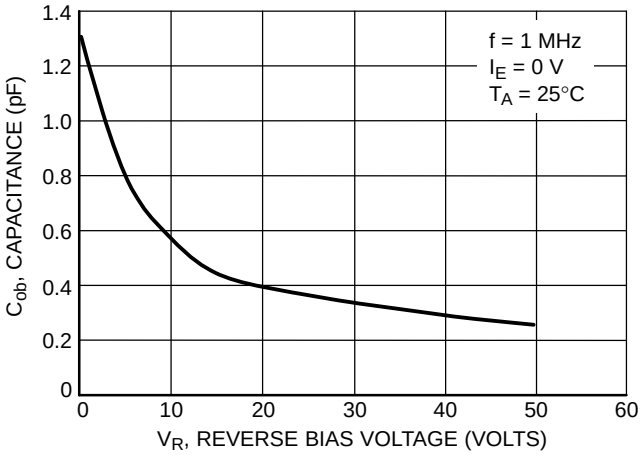


Figure 35. Output Capacitance

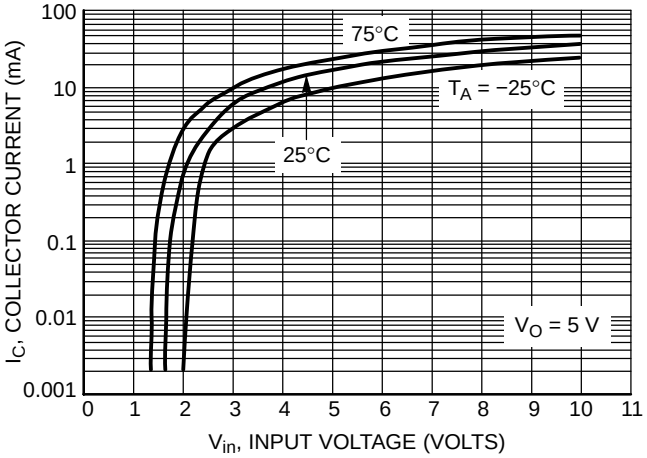


Figure 36. Output Current versus Input Voltage

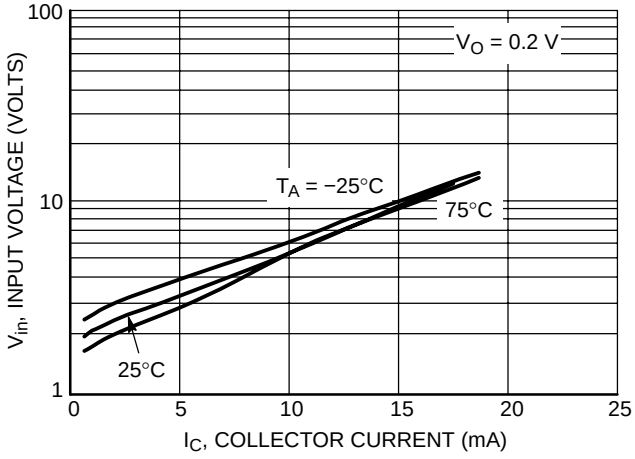
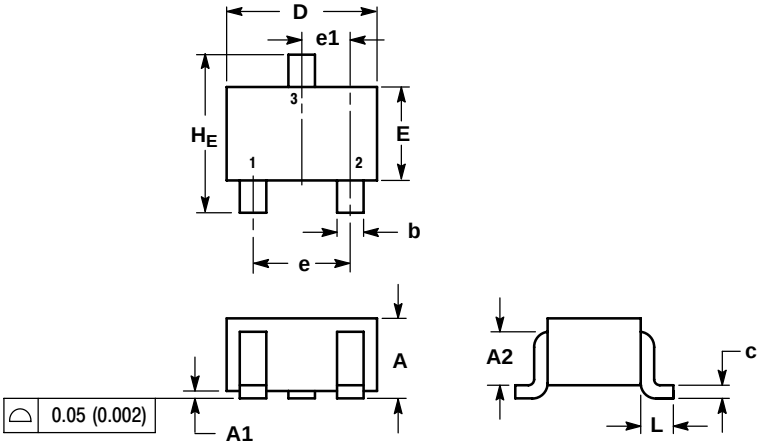


Figure 37. Input Voltage versus Output Current

PACKAGE DIMENSIONS

SC−70/SOT−323
CASE 419−04
ISSUE M

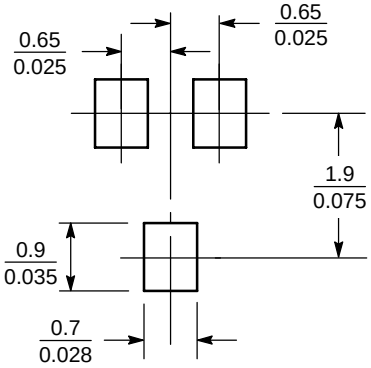


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

	MILLIMETERS			INCHES		
DIM	MIN	NOM	MAX	MIN	NOM	MAX
A	0.80	0.90	1.00	0.032	0.035	0.040
A1	0.00	0.05	0.10	0.000	0.002	0.004
A2		0.7 REF			0.028 REF	
b	0.30	0.35	0.40	0.012	0.014	0.016
c	0.10	0.18	0.25	0.004	0.007	0.010
D	1.80	2.10	2.20	0.071	0.083	0.087
E	1.15	1.24	1.35	0.045	0.049	0.053
e	1.20	1.30	1.40	0.047	0.051	0.055
e1		0.65 BSC			0.026 BSC	
L		0.425 REF			0.017 REF	
H_E	2.00	2.10	2.40	0.079	0.083	0.095

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

SOLDERING FOOTPRINT*



SCALE 10:1 $\left(\frac{\text{mm}}{\text{inches}}\right)$

*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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