MUN2111T1 Series

Preferred Devices

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 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−59 package which is designed for low power surface mount applications.

- Simplifies Circuit Design
- Reduces Board Space
- Reduces Component Count
- Moisture Sensitivity Level: 1
- ESD Rating − Human Body Model: Class 1
  − Machine Model: Class B
- The SC−59 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.
- Pb−Free Package is 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

THERMAL CHARACTERISTICS

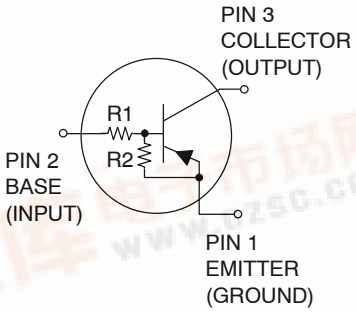
Characteristic	Symbol	Max	Unit
Total Device Dissipation T_A = 25°C Derate above 25°C	P_D	230 (Note 1) 338 (Note 2) 1.8 (Note 1) 2.7 (Note 2)	mW °C/W
Thermal Resistance − Junction−to−Ambient	$R_{\theta JA}$	540 (Note 1) 370 (Note 2)	°C/W
Thermal Resistance − Junction−to−Lead	$R_{\theta JL}$	264 (Note 1) 287 (Note 2)	°C/W
Junction and Storage Temperature Range	T_J, T_{stg}	−55 to +150	°C

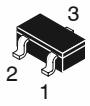
Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur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

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

ON Semiconductor®

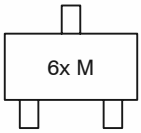
http://onsemi.com





SC−59
CASE 318D
PLASTIC

MARKING DIAGRAM



6x = Specific Device Code*
M = Date Code

ORDERING INFORMATION

See detailed ordering and shipping information on page 2 of this data sheet.

DEVICE MARKING INFORMATION

*See device marking table on page 2 of this data sheet.

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

Publication Order Number:

DEVICE MARKING AND RESISTOR VALUES

Device	Package	Marking	R1 (K)	R2 (K)	Shipping†
MUN2111T1	SC−59	6A	10	10	3000 / Tape & Reel
MUN2111T1G	SC−59 (Pb−Free)	6A	10	10	3000 / Tape & Reel
MUN2112T1	SC−59	6B	22	22	3000 / Tape & Reel
MUN2112T1G	SC−59 (Pb−Free)	6B	22	22	3000 / Tape & Reel
MUN2113T1	SC−59	6C	47	47	3000 / Tape & Reel
MUN2113T1G	SC−59 (Pb−Free)	6C	47	47	3000 / Tape & Reel
MUN2114T1	SC−59	6D	10	47	3000 / Tape & Reel
MUN2114T1G	SC−59 (Pb−Free)	6D	10	47	3000 / Tape & Reel
MUN2115T1 (Note 3)	SC−59	6E	10	∞	3000 / Tape & Reel
MUN2116T1 (Note 3)	SC−59	6F	4.7	∞	3000 / Tape & Reel
MUN2116T1G (Note 3)	SC−59 (Pb−Free)	6F	4.7	∞	3000 / Tape & Reel
MUN2130T1 (Note 3)	SC−59	6G	1.0	1.0	3000 / Tape & Reel
MUN2131T1 (Note 3)	SC−59	6H	2.2	2.2	3000 / Tape & Reel
MUN2132T1 (Note 3)	SC−59	6J	4.7	4.7	3000 / Tape & Reel
MUN2132T1G (Note 3)	SC−59 (Pb−Free)	6J	4.7	4.7	3000 / Tape & Reel
MUN2133T1 (Note 3)	SC−59	6K	4.7	47	3000 / Tape & Reel
MUN2134T1 (Note 3)	SC−59	6L	22	47	3000 / Tape & Reel
MUN2136T1	SC−59	6N	100	100	3000 / Tape & Reel
MUN2137T1	SC−59	6P	47	22	3000 / Tape & Reel
MUN2140T1 (Note 3)	SC−59	6T	47	∞	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 resistor combinations. 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	MUN2111T1	I_{EBO}	–	–	0.5	mAdc
(V_{EB} = 6.0 V, I_C = 0)	MUN2112T1		–	–	0.2	
	MUN2113T1		–	–	0.1	
	MUN2114T1		–	–	0.2	
	MUN2115T1		–	–	0.9	
	MUN2116T1		–	–	1.9	
	MUN2130T1		–	–	4.3	
	MUN2131T1		–	–	2.3	
	MUN2132T1		–	–	1.5	
	MUN2133T1		–	–	0.18	
	MUN2134T1		–	–	0.13	
	MUN2136T1		–	–	0.05	
	MUN2137T1		–	–	0.13	
	MUN2140T1		–	–	0.20	
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	MUN2111T1	h_{FE}	35	60	–	
(V_{CE} = 10 V, I_C = 5.0 mA)	MUN2112T1		60	100	–	
	MUN2113T1		80	140	–	
	MUN2114T1		80	140	–	
	MUN2115T1		160	250	–	
	MUN2116T1		160	250	–	
	MUN2130T1		3.0	5.0	–	
	MUN2131T1		8.0	15	–	
	MUN2132T1		15	27	–	
	MUN2133T1		80	140	–	
	MUN2134T1		80	130	–	
	MUN2136T1		80	150	–	
	MUN2137T1		80	140	–	
	MUN2140T1		120	250	–	
Collector–Emitter Saturation Voltage		$V_{CE(sat)}$				Vdc
(I_C = 10 mA, I_B = 0.3 mA)	MUN2111T1		–	–	0.25	
	MUN2112T1		–	–	0.25	
	MUN2113T1		–	–	0.25	
	MUN2114T1		–	–	0.25	
	MUN2115T1		–	–	0.25	
	MUN2130T1		–	–	0.25	
	MUN2136T1		–	–	0.25	
	MUN2137T1		–	–	0.25	
(I_C = 10 mA, I_B = 5.0 mA)	MUN2131T1		–	–	0.25	
(I_C = 10 mA, I_B = 1.0 mA)	MUN2116T1		–	–	0.25	
	MUN2132T1		–	–	0.25	
	MUN2134T1		–	–	0.25	
	MUN2140T1		–	–	0.25	
Output Voltage (on)		V_{OL}				Vdc
(V_{CC} = 5.0 V, V_B = 2.5 V, R_L = 1.0 kΩ)	MUN2111T1		–	–	0.2	
	MUN2112T1		–	–	0.2	
	MUN2114T1		–	–	0.2	
	MUN2115T1		–	–	0.2	
	MUN2116T1		–	–	0.2	
	MUN2130T1		–	–	0.2	
	MUN2131T1		–	–	0.2	
	MUN2132T1		–	–	0.2	
	MUN2133T1		–	–	0.2	
	MUN2134T1		–	–	0.2	
(V_{CC} = 5.0 V, V_B = 3.5 V, R_L = 1.0 kΩ)	MUN2113T1		–	–	0.2	
	MUN2140T1		–	–	0.2	
(V_{CC} = 5.0 V, V_B = 5.5 V, R_L = 1.0 kΩ)	MUN2136T1		–	–	0.2	
(V_{CC} = 5.0 V, V_B = 4.0 V, R_L = 1.0 kΩ)	MUN2137T1		–	–	0.2	

4. 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)						
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)	MUN2130T1 MUN2115T1 MUN2116T1 MUN2131T1 MUN2132T1 MUN2140T1	V_{OH}	4.9	–	–	Vdc
Input Resistor	MUN2111T1	R1	7.0	10	13	kΩ
	MUN2112T1		15.4	22	28.6	
	MUN2113T1		32.9	47	61.1	
	MUN2114T1		7.0	10	13	
	MUN2115T1		7.0	10	13	
	MUN2116T1		3.3	4.7	6.1	
	MUN2130T1		0.7	1.0	1.3	
	MUN2131T1		1.5	2.2	2.9	
	MUN2132T1		3.3	4.7	6.1	
	MUN2133T1		3.3	4.7	6.1	
	MUN2134T1		15.4	22	28.6	
	MUN2136T1		70	100	130	
	MUN2137T1		32.9	47	61.1	
	MUN2140T1		32.9	47	61.1	
Resistor Ratio	MUN2111T1/MUN2112T1/MUN2113T1/ MUN2136T1	R_1/R_2	0.8	1.0	1.2	
	MUN2114T1		0.17	0.21	0.25	
	MUN2115T1/MUN2116T1/MUN2140T1		–	–	–	
	MUN2130T1/MUN2131T1/MUN2132T1		0.8	1.0	1.2	
	MUN2133T1		0.055	0.1	0.185	
	MUN2134T1		0.38	0.47	0.56	
	MUN2137T1		1.7	2.1	2.6	

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

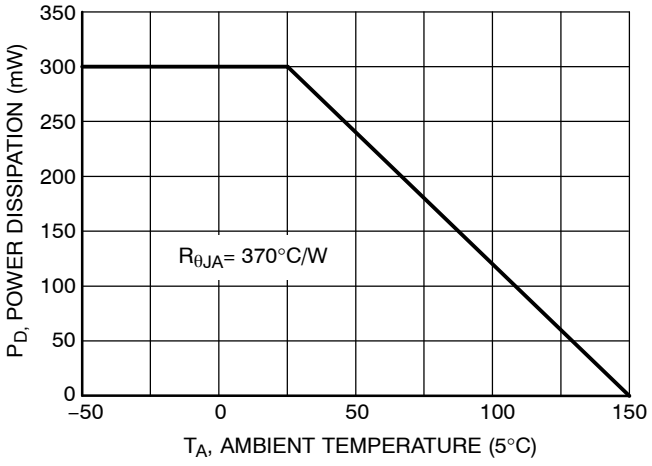


Figure 1. Derating Curve

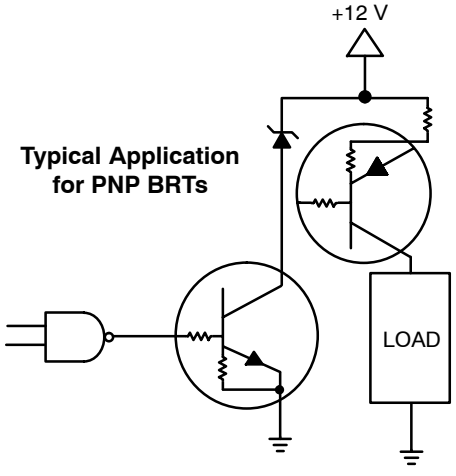


Figure 2. Inexpensive, Unregulated Current Source

TYPICAL ELECTRICAL CHARACTERISTICS – MUN2111T1

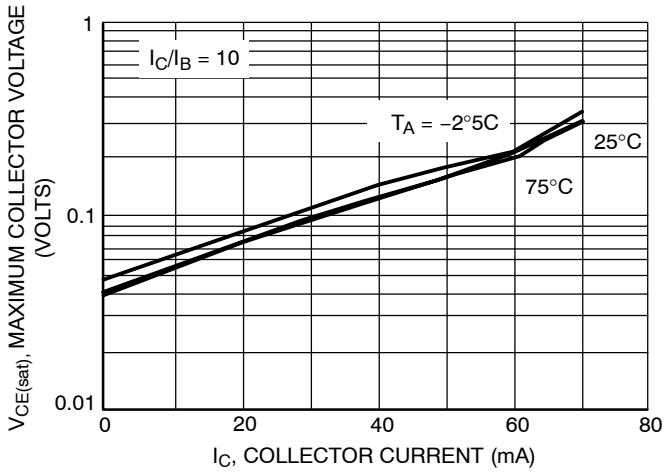


Figure 3. $V_{CE(sat)}$ vs. I_C

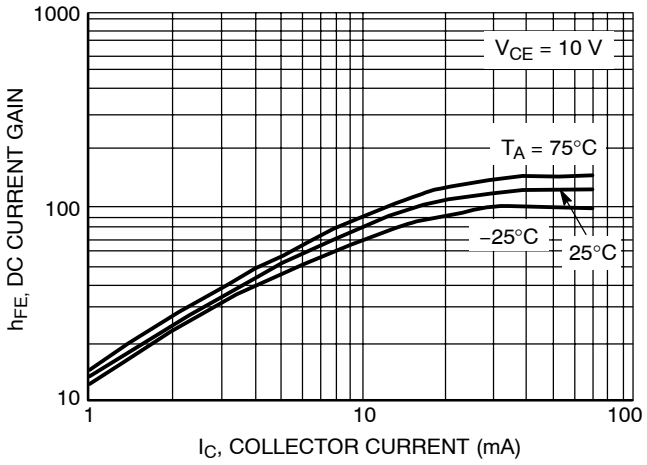


Figure 4. DC Current Gain

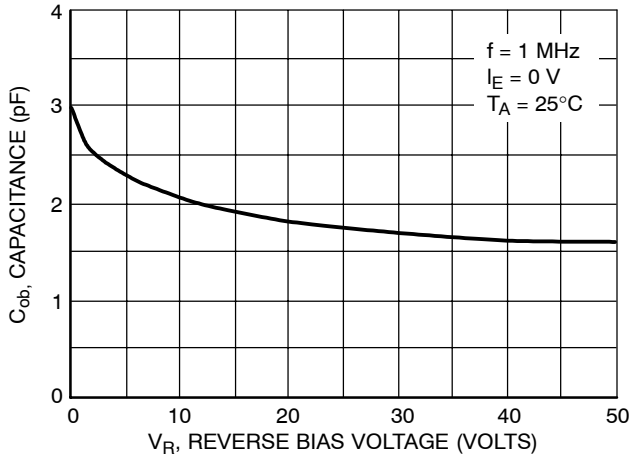


Figure 5. Output Capacitance

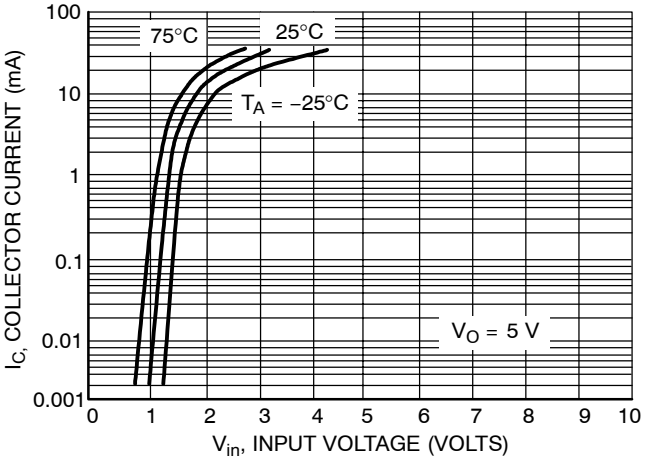


Figure 6. Output Current vs. Input Voltage

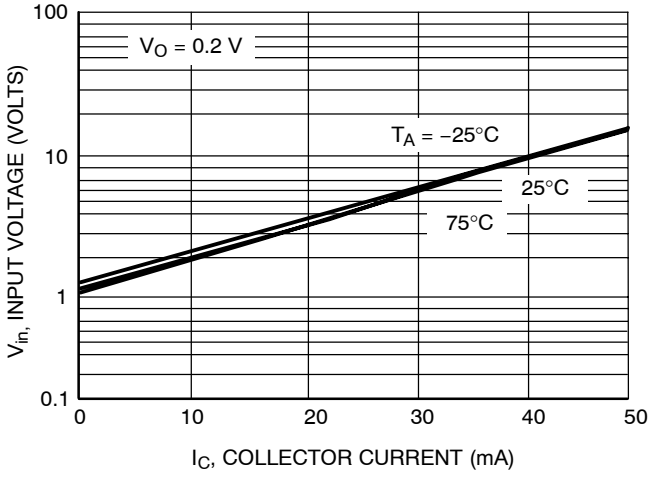


Figure 7. Input Voltage vs. Output Current

TYPICAL ELECTRICAL CHARACTERISTICS – MUN2112T1

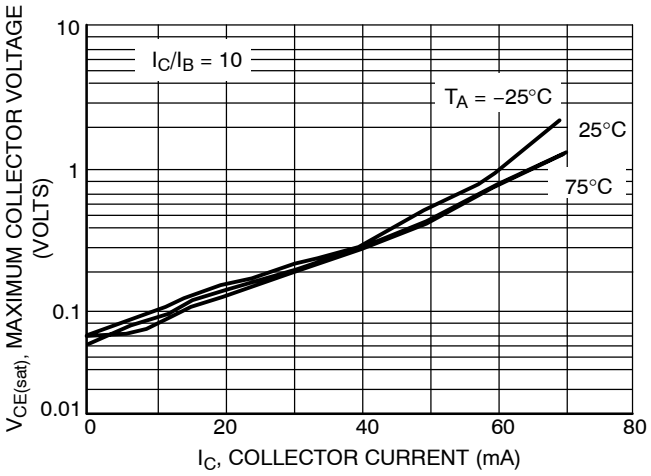


Figure 8. $V_{CE(sat)}$ vs. I_C

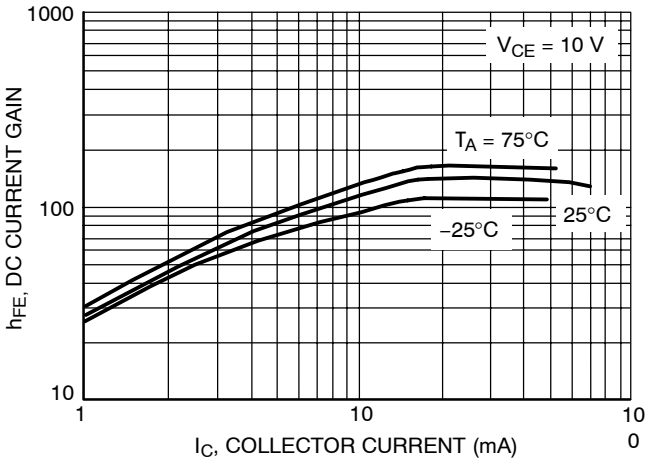


Figure 9. DC Current Gain

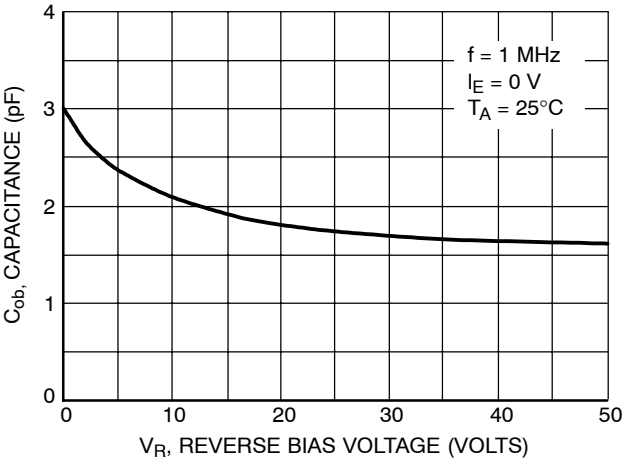


Figure 10. Output Capacitance

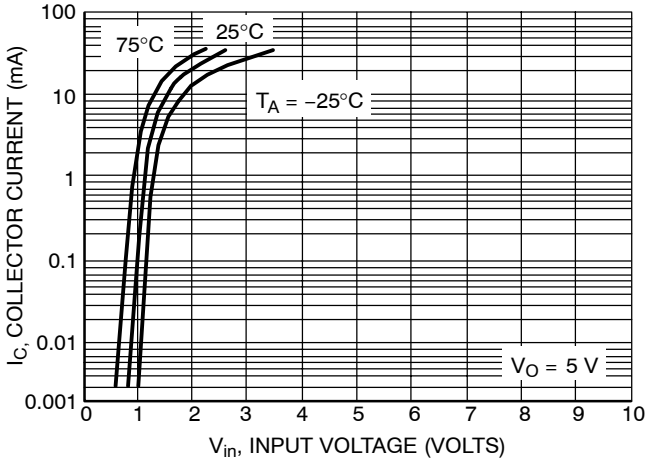


Figure 11. Output Current vs. Input Voltage

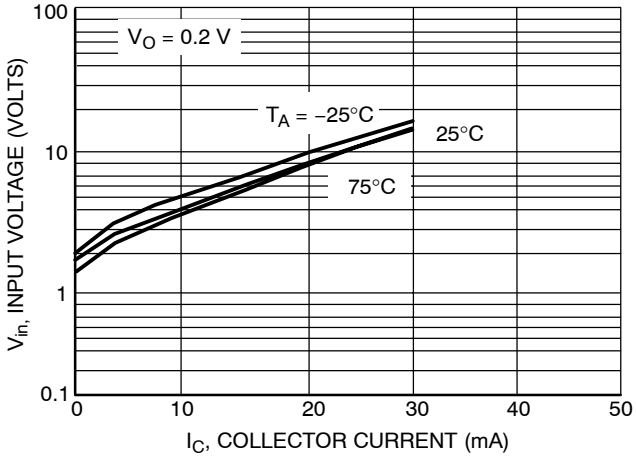


Figure 12. Input Voltage vs. Output Current

TYPICAL ELECTRICAL CHARACTERISTICS – MUN2113T1

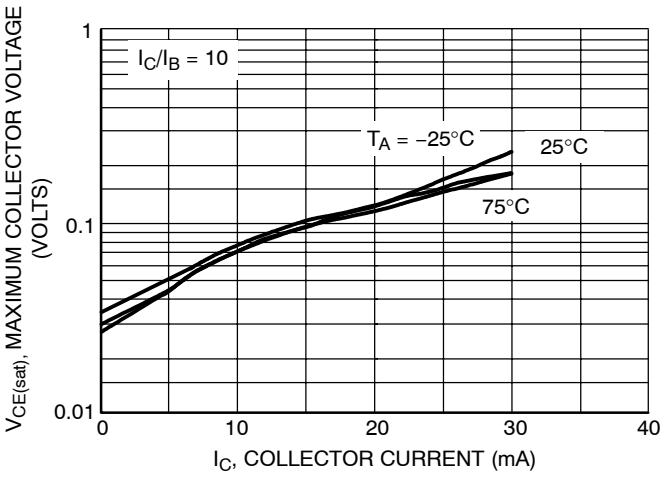


Figure 13. $V_{CE(sat)}$ vs. I_C

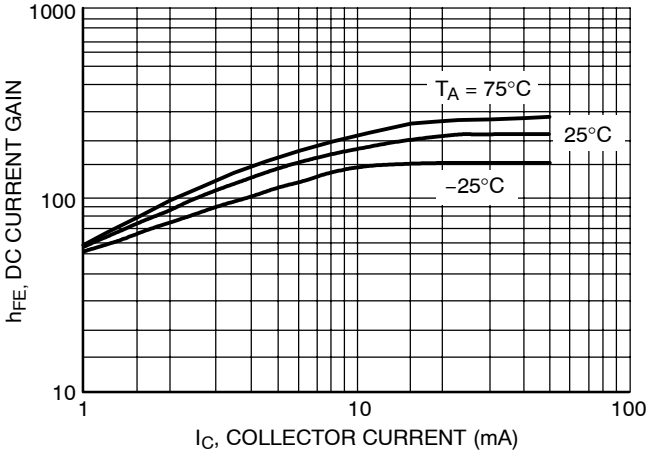


Figure 14. DC Current Gain

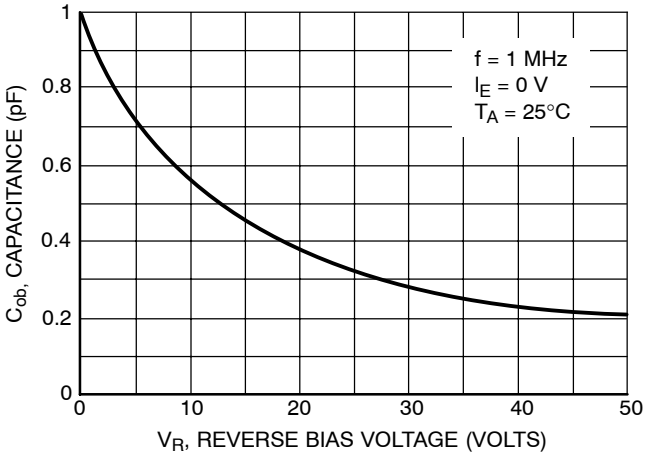


Figure 15. Output Capacitance

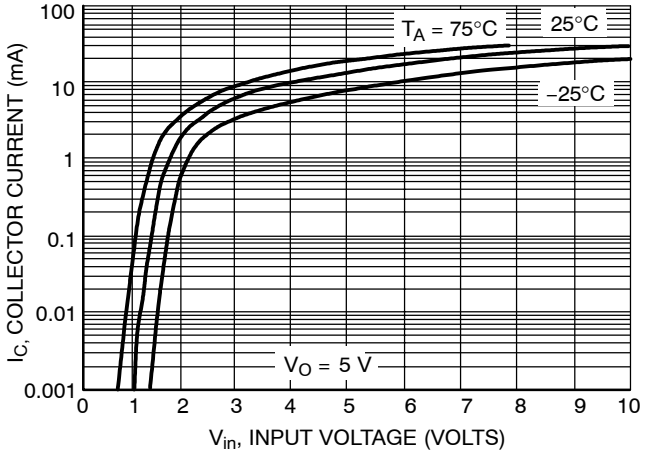


Figure 16. Output Current vs. Input Voltage

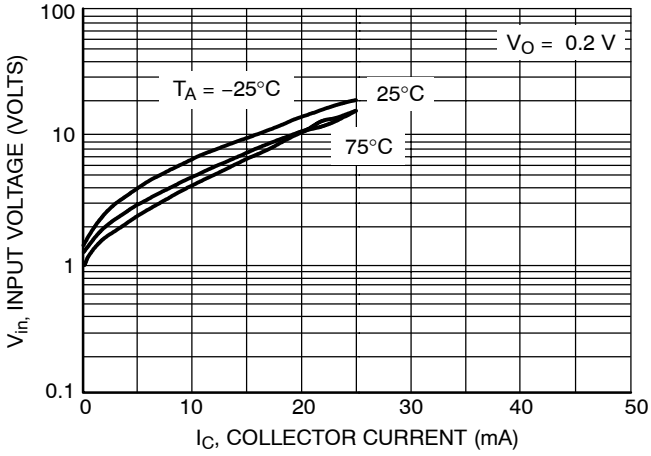


Figure 17. Input Voltage vs. Output Current

TYPICAL ELECTRICAL CHARACTERISTICS – MUN2114T1

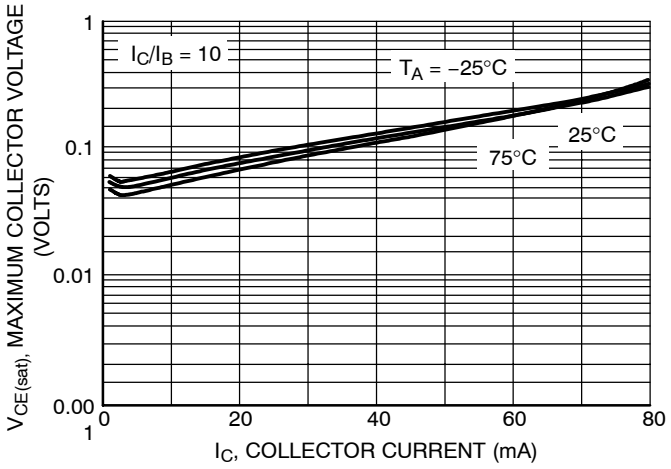


Figure 18. $V_{CE(sat)}$ vs. I_C

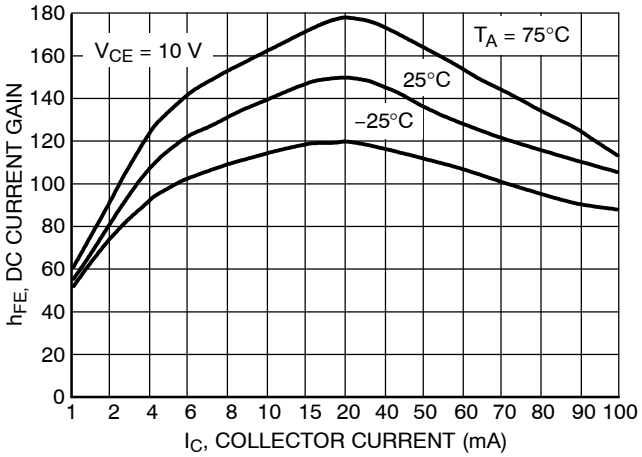


Figure 19. DC Current Gain

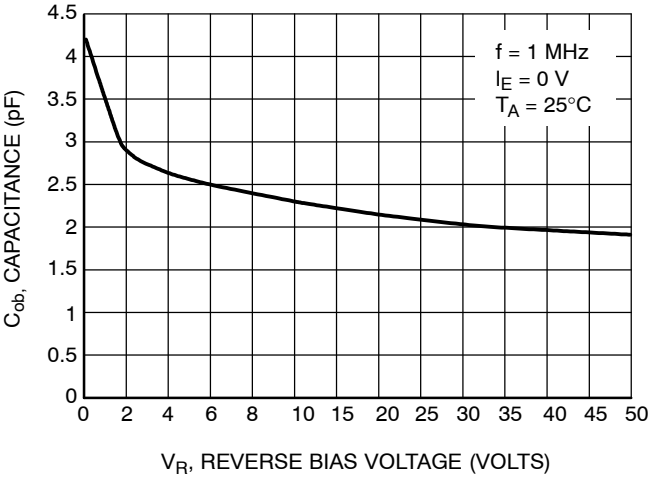


Figure 20. Output Capacitance

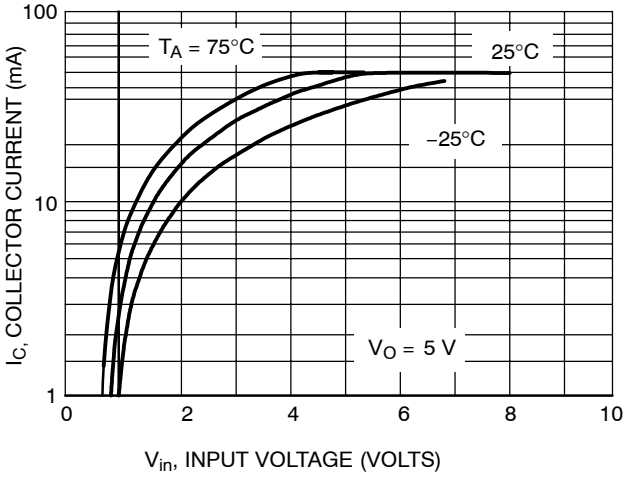


Figure 21. Output Current vs. Input Voltage

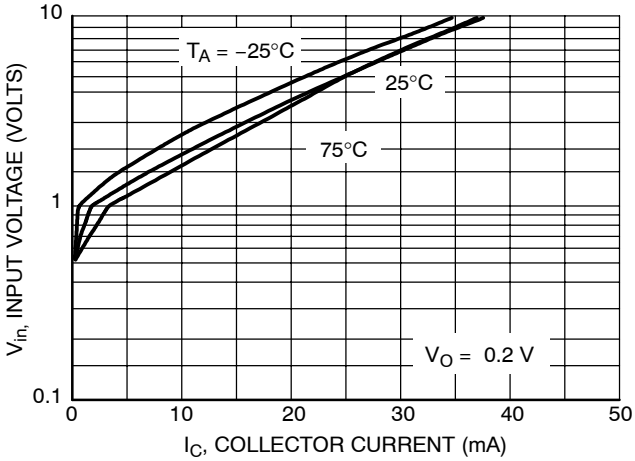


Figure 22. Input Voltage vs. Output Current

TYPICAL ELECTRICAL CHARACTERISTICS – MUN2131T1

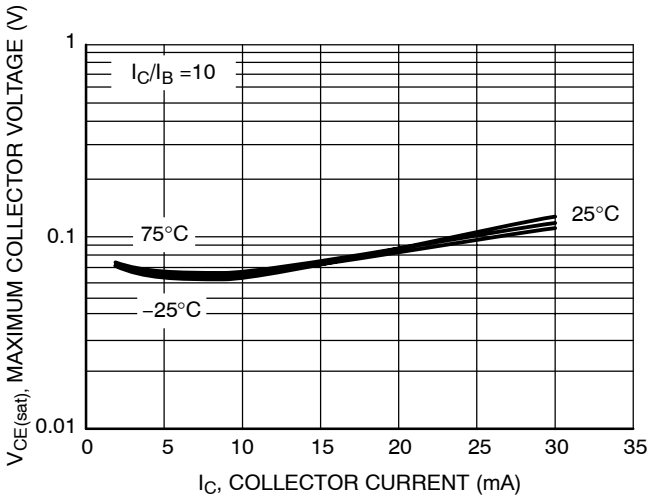


Figure 23. $V_{CE(sat)}$ vs. I_C

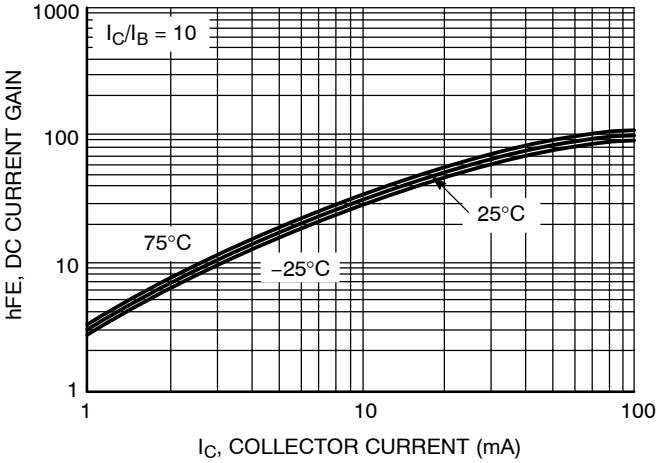


Figure 24. DC Current Gain

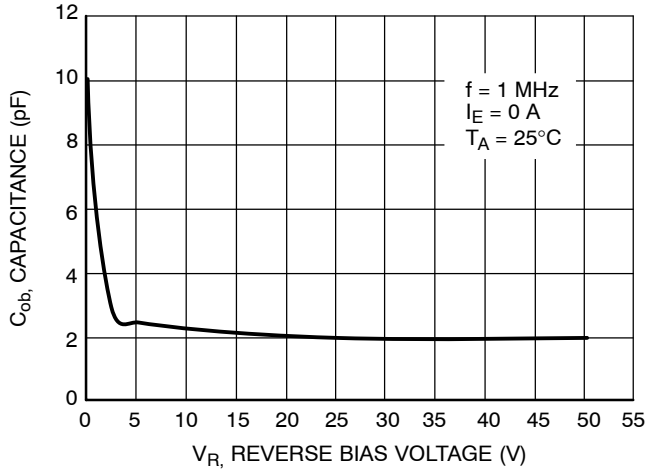


Figure 25. Output Capacitance

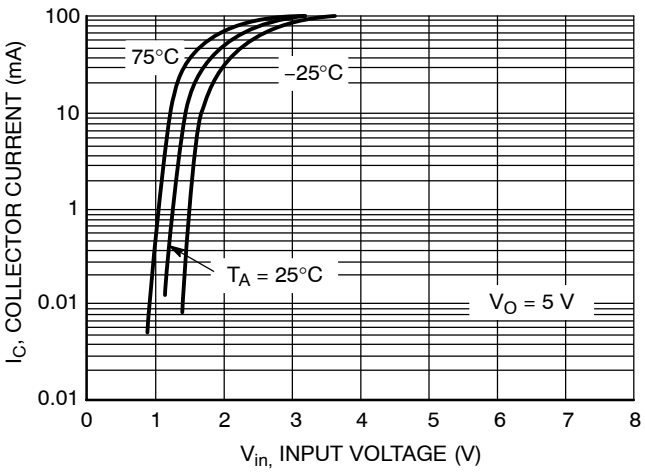


Figure 26. Output Current vs. Input Voltage

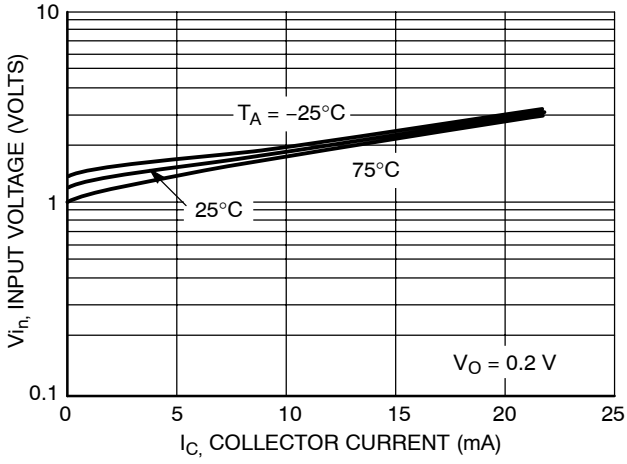


Figure 27. Input Voltage vs. Output Current

TYPICAL ELECTRICAL CHARACTERISTICS — MUN2136T1

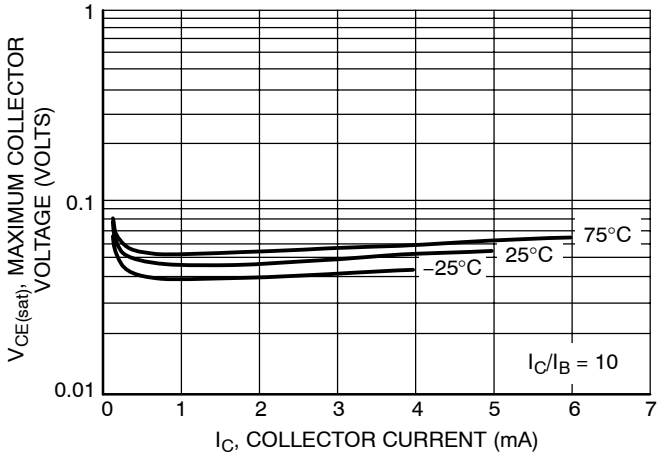


Figure 28. Maximum Collector Voltage vs. Collector Current

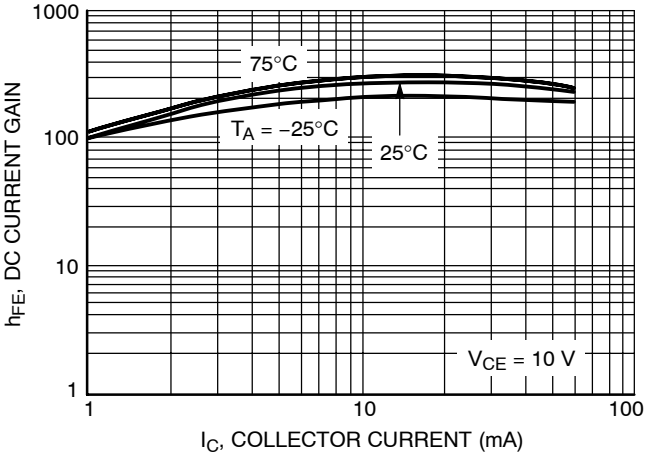


Figure 29. DC Current Gain

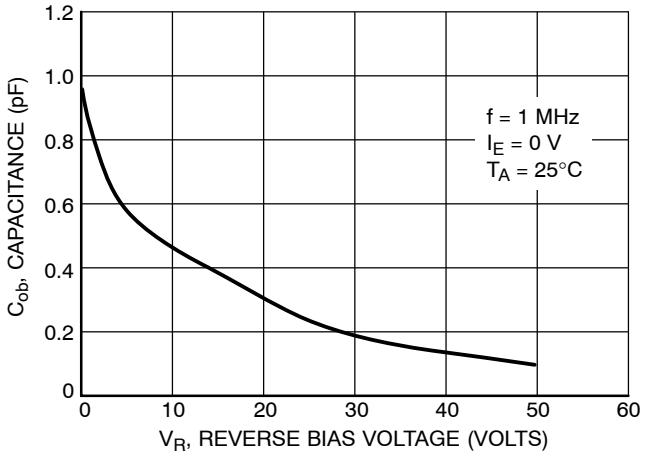


Figure 30. Output Capacitance

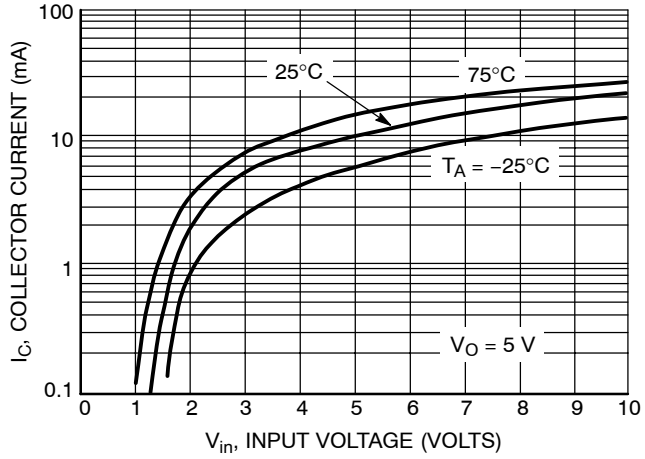


Figure 31. Output Current vs. Input Voltage

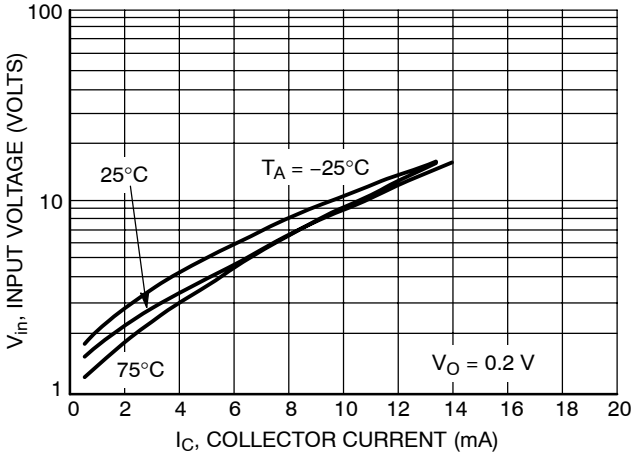


Figure 32. Input Voltage vs. Output Current

TYPICAL ELECTRICAL CHARACTERISTICS — MUN2137T1

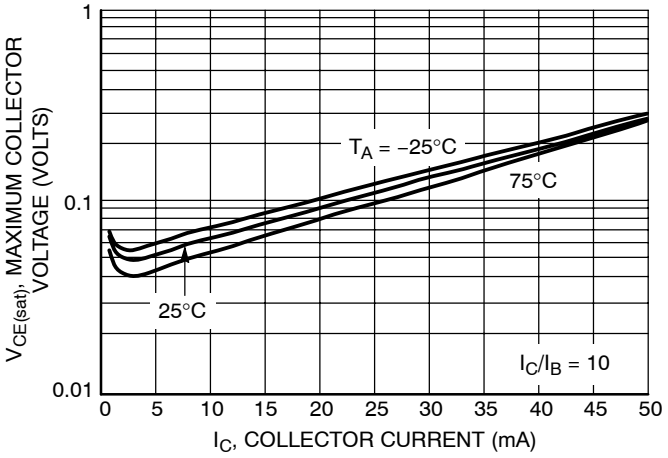


Figure 33. Maximum Collector Voltage vs. Collector Current

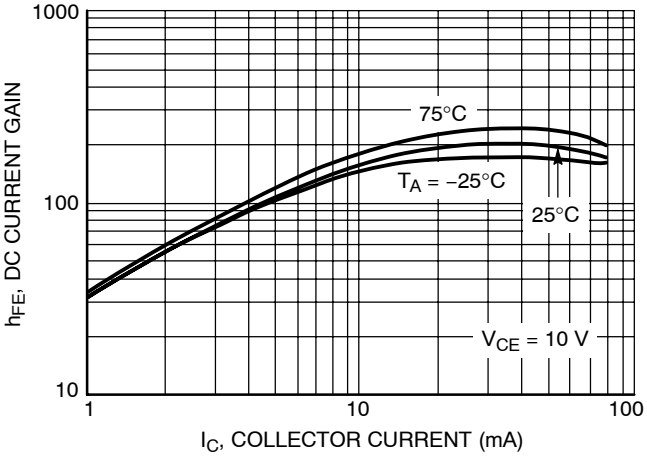


Figure 34. DC Current Gain

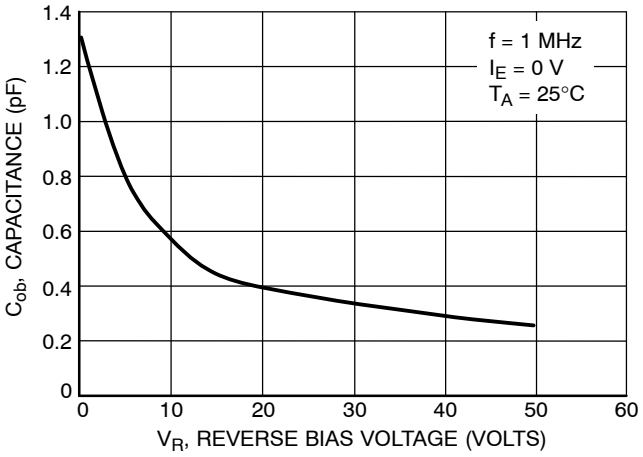


Figure 35. Output Capacitance

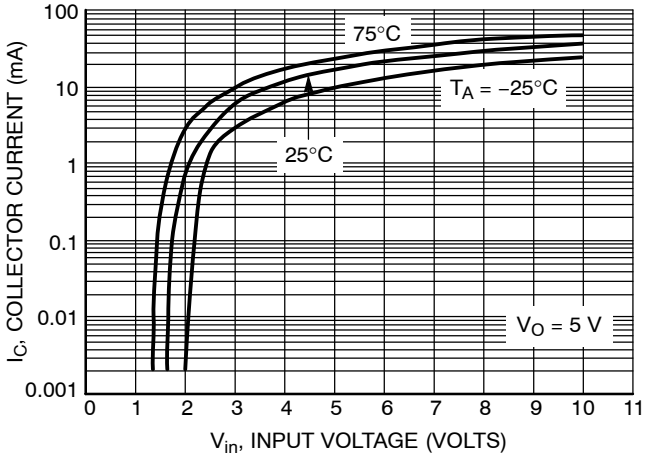


Figure 36. Output Current vs. Input Voltage

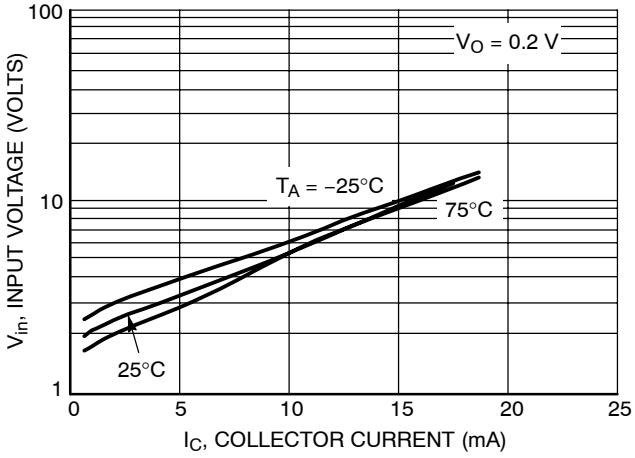
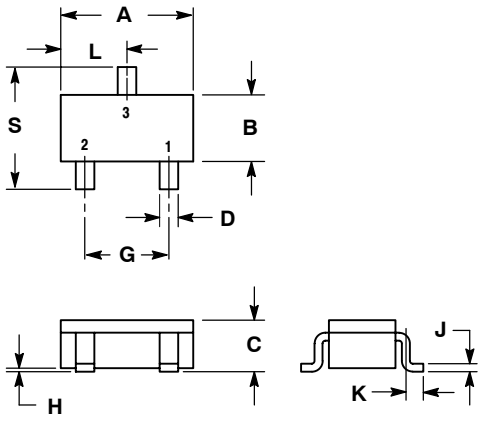


Figure 37. Input Voltage vs. Output Current

PACKAGE DIMENSIONS

SC−59
CASE 318D−04
ISSUE F

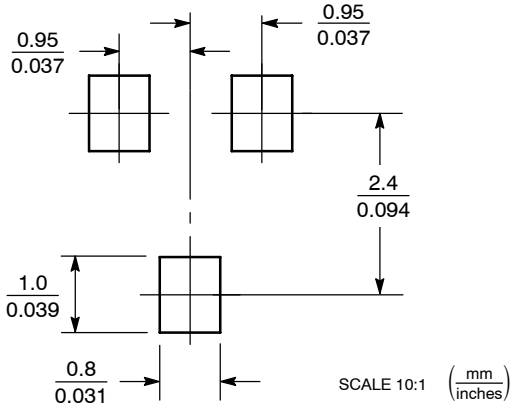


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	2.70	3.10	0.1063	0.1220
B	1.30	1.70	0.0512	0.0669
C	1.00	1.30	0.0394	0.0511
D	0.35	0.50	0.0138	0.0196
G	1.70	2.10	0.0670	0.0826
H	0.013	0.100	0.0005	0.0040
J	0.09	0.18	0.0034	0.0070
K	0.20	0.60	0.0079	0.0236
L	1.25	1.65	0.0493	0.0649
S	2.50	3.00	0.0985	0.1181

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

SOLDERING FOOTPRINT*



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

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Literature Distribution Center for ON Semiconductor
P.O. Box 61312, Phoenix, Arizona 85082−1312 USA
Phone: 480−829−7710 or 800−344−3860 Toll Free USA/Canada
Fax: 480−829−7709 or 800−344−3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support: 800−282−9855 Toll Free USA/Canada

Japan: ON Semiconductor, Japan Customer Focus Center
2−9−1 Kamimeguro, Meguro−ku, Tokyo, Japan 153−0051
Phone: 81−3−5773−3850

ON Semiconductor Website: http://onsemi.com

Order Literature: http://www.onsemi.com/litorder

For additional information, please contact your local Sales Representative.