

MUN2111T1 Series, SMUN2111T1 Series

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.

Features

- 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
- AEC-Q101 Qualified and PPAP Capable
- S Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements
- Pb-Free Packages are Available*

MAXIMUM RATINGS (T_A = 25°C unless otherwise noted)

Rating	Symbol	Value	Unit
Collector – Base Voltage	V _{CB0}	50	Vdc
Collector – Emitter Voltage	V _{CEO}	50	Vdc
Collector Current	I _C	100	mAdc

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.

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

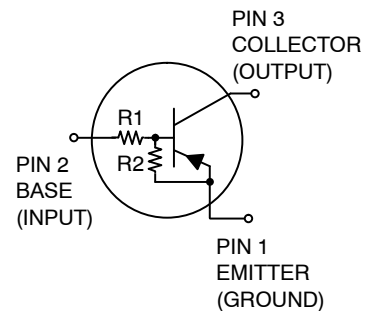


ON Semiconductor®

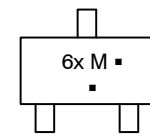
<http://onsemi.com>



SC-59
CASE 318D
PLASTIC



MARKING DIAGRAM



6x = Specific 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 detailed ordering and shipping information on page 5 of this data sheet.

DEVICE MARKING INFORMATION

See device marking table on page 5 of this data sheet.

MUN2111T1 Series, SMUN2111T1 Series

THERMAL CHARACTERISTICS

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

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

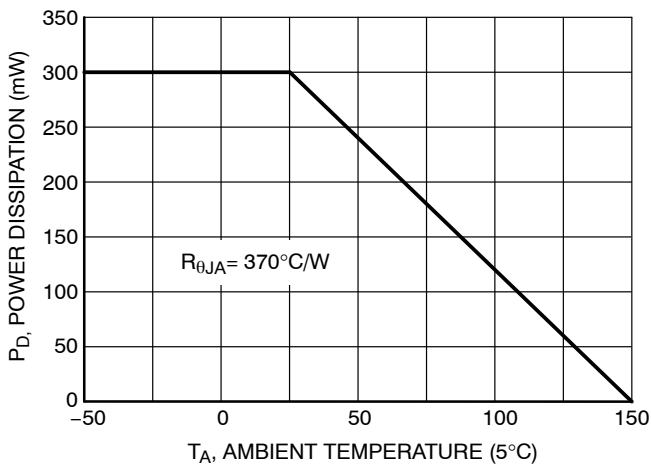


Figure 1. Derating Curve

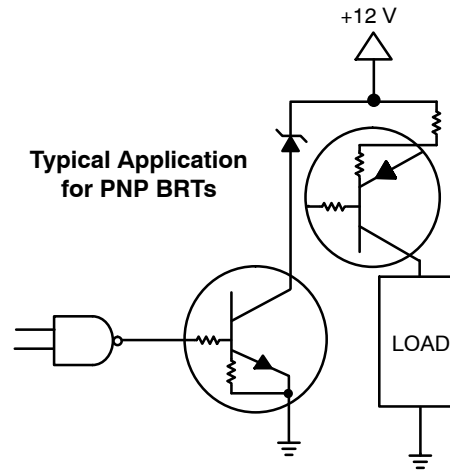


Figure 2. Inexpensive, Unregulated Current Source

MUN2111T1 Series, SMUN2111T1 Series

ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
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 ($V_{EB} = 6.0\text{ V}$, $I_C = 0$)	I_{EBO}				mAdc
MUN2111T1, SMUN2111T1		-	-	0.5	
MUN2112T1, SMUN2112T1		-	-	0.2	
MUN2113T1, SMUN2113T1		-	-	0.1	
MUN2114T1, SMUN2114T1		-	-	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 ($I_C = 10\ \mu\text{A}$, $I_E = 0$)	$V_{(BR)CBO}$	50	-	-	Vdc
Collector-Emitter Breakdown Voltage (Note 3) ($I_C = 2.0\text{ mA}$, $I_B = 0$)	$V_{(BR)CEO}$	50	-	-	Vdc
ON CHARACTERISTICS (Note 3)					
DC Current Gain ($V_{CE} = 10\text{ V}$, $I_C = 5.0\text{ mA}$)	h_{FE}				
MUN2111T1, SMUN2111T1		35	60	-	
MUN2112T1, SMUN2112T1		60	100	-	
MUN2113T1, SMUN2113T1		80	140	-	
MUN2114T1, SMUN2114T1		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 ($I_C = 10\text{ mA}$, $I_B = 0.3\text{ mA}$)	$V_{CE(sat)}$				Vdc
MUN2111T1, SMUN2111T1		-	-	0.25	
MUN2112T1, SMUN2112T1		-	-	0.25	
MUN2113T1, SMUN2113T1		-	-	0.25	
MUN2114T1, SMUN2114T1		-	-	0.25	
MUN2115T1		-	-	0.25	
MUN2130T1		-	-	0.25	
MUN2136T1		-	-	0.25	
MUN2137T1		-	-	0.25	
($I_C = 10\text{ mA}$, $I_B = 5.0\text{ mA}$) MUN2131T1		-	-	0.25	
($I_C = 10\text{ mA}$, $I_B = 1.0\text{ mA}$) MUN2116T1		-	-	0.25	
MUN2132T1		-	-	0.25	
MUN2133T1		-	-	0.25	
MUN2134T1		-	-	0.25	
MUN2140T1		-	-	0.25	

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

MUN2111T1 Series, SMUN2111T1 Series

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

Characteristic	Symbol	Min	Typ	Max	Unit
ON CHARACTERISTICS (Note 3)					
Output Voltage (on) (V _{CC} = 5.0 V, V _B = 2.5 V, R _L = 1.0 kΩ) MUN2111T1, SMUN2111T1 MUN2112T1, SMUN2112T1 MUN2114T1, SMUN2114T1 MUN2115T1 MUN2116T1 MUN2130T1 MUN2131T1 MUN2132T1 MUN2133T1 MUN2134T1 (V _{CC} = 5.0 V, V _B = 3.5 V, R _L = 1.0 kΩ) MUN2113T1 MUN2140T1 (V _{CC} = 5.0 V, V _B = 5.5 V, R _L = 1.0 kΩ) MUN2136T1 (V _{CC} = 5.0 V, V _B = 4.0 V, R _L = 1.0 kΩ) MUN2137T1	V _{OL}	-	-	0.2	Vdc
Output Voltage (off) (V _{CC} = 5.0 V, V _B = 0.5 V, R _L = 1.0 kΩ) MUN2111T1, SMUN2111T1 MUN2112T1, SMUN2112T1 MUN2113T1, SMUN2113T1 MUN2114T1 MUN2133T1 MUN2134T1 MUN2136T1 MUN2137T1 (V _{CC} = 5.0 V, V _B = 0.050 V, R _L = 1.0 kΩ) MUN2130T1 (V _{CC} = 5.0 V, V _B = 0.25 V, R _L = 1.0 kΩ) MUN2115T1 MUN2116T1 MUN2131T1 MUN2132T1 MUN2140T1	V _{OH}	4.9	-	-	Vdc
Input Resistor MUN2111T1, SMUN2111T1 MUN2112T1, SMUN2112T1 MUN2113T1, SMUN2113T1 MUN2114T1 MUN2115T1 MUN2116T1 MUN2130T1 MUN2131T1 MUN2132T1 MUN2133T1 MUN2134T1 MUN2136T1 MUN2137T1 MUN2140T1	R ₁	7.0 15.4 32.9 7.0 7.0 3.3 0.7 1.5 3.3 3.3 15.4 70 32.9 32.9	10 22 47 10 10 4.7 1.0 2.2 4.7 4.7 22 100 47 47	13 28.6 61.1 13 13 6.1 1.3 2.9 6.1 6.1 28.6 130 61.1 61.1	kΩ
Resistor Ratio MUN2111T1/MUN2112T1/MUN2113T1/SMUN2111T1/ SMUN2112T1/SMUN2113T1/MUN2136T1 MUN2114T1, SMUN2114T1 MUN2115T1/MUN2116T1/MUN2140T1 MUN2130T1/MUN2131T1/MUN2132T1 MUN2133T1 MUN2134T1 MUN2137T1	R ₁ /R ₂	0.8 0.17 - 0.8 0.055 0.38 1.7	1.0 0.21 - 1.0 0.1 2.1	1.2 0.25 - 1.2 0.185 0.56 2.6	

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

MUN2111T1 Series, SMUN2111T1 Series

DEVICE MARKING AND RESISTOR VALUES

Device	Package	Marking	R1 (K)	R2 (K)	Shipping†
MUN2111T1	SC-59	6A	10	10	3,000 / Tape & Reel
MUN2111T1G, SMUN2111T1G	SC-59 (Pb-Free)	6A	10	10	
MUN2111T3G, SMUN2111T3G	SC-59 (Pb-Free)	6A	10	10	10,000 / Tape & Reel
MUN2112T1	SC-59	6B	22	22	3,000 / Tape & Reel
MUN2112T1G, SMUN2112T1G	SC-59 (Pb-Free)	6B	22	22	
MUN2113T1	SC-59	6C	47	47	
MUN2113T1G, SMUN2113T1G	SC-59 (Pb-Free)	6C	47	47	
MUN2114T1	SC-59	6D	10	47	
MUN2114T1G, SMUN2114T1G	SC-59 (Pb-Free)	6D	10	47	
MUN2115T1 (Note 4)	SC-59	6E	10	∞	
MUN2115T1G (Note 4)	SC-59 (Pb-Free)	6E	10	∞	
MUN2116T1 (Note 4)	SC-59	6F	4.7	∞	
MUN2116T1G (Note 4)	SC-59 (Pb-Free)	6F	4.7	∞	
MUN2130T1 (Note 4)	SC-59	6G	1.0	1.0	
MUN2130T1G (Note 4)	SC-59 (Pb-Free)	6G	1.0	1.0	
MUN2131T1 (Note 4)	SC-59	6H	2.2	2.2	
MUN2131T1G (Note 4)	SC-59 (Pb-Free)	6H	2.2	2.2	
MUN2132T1 (Note 4)	SC-59	6J	4.7	4.7	
MUN2132T1G (Note 4)	SC-59 (Pb-Free)	6J	4.7	4.7	
MUN2133T1 (Note 4)	SC-59	6K	4.7	47	
MUN2133T1G (Note 4)	SC-59 (Pb-Free)	6K	4.7	47	
MUN2134T1 (Note 4)	SC-59	6L	22	47	
MUN2134T1G (Note 4)	SC-59 (Pb-Free)	6L	22	47	
MUN2136T1	SC-59	6N	100	100	
MUN2136T1G	SC-59 (Pb-Free)	6N	100	100	
MUN2137T1	SC-59	6P	47	22	
MUN2137T1G	SC-59 (Pb-Free)	6P	47	22	
MUN2140T1 (Note 4)	SC-59	6T	47	∞	
MUN2140T1G (Note 4)	SC-59 (Pb-Free)	6T	47	∞	

†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.

4. New resistor combinations. Updated curves to follow in subsequent data sheets.

MUN2111T1 Series, SMUN2111T1 Series

TYPICAL ELECTRICAL CHARACTERISTICS – MUN2111T1, SMUN2111T1

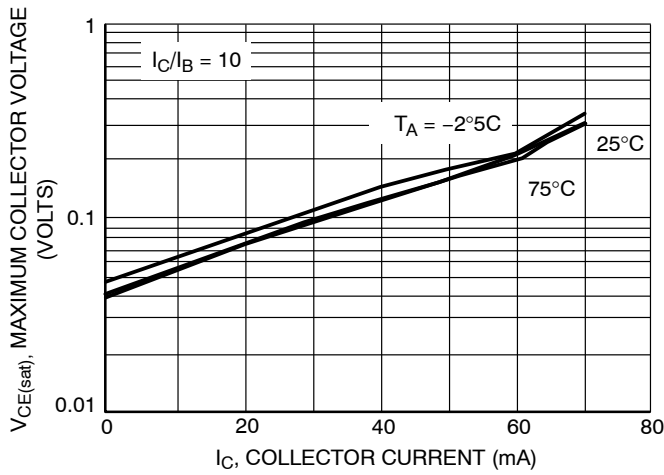


Figure 3. $V_{CE(sat)}$ vs. I_C

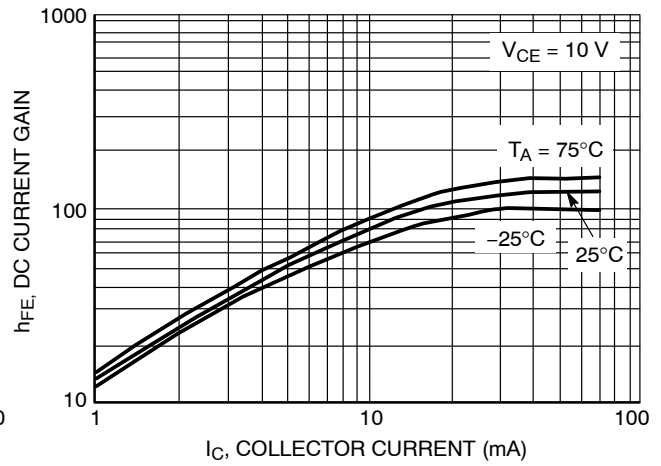


Figure 4. DC Current Gain

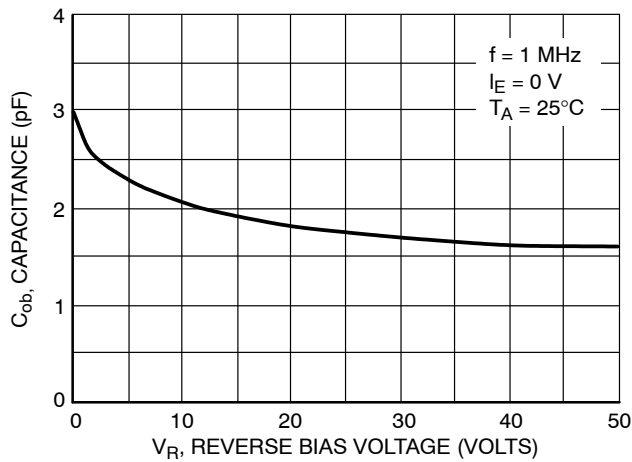


Figure 5. Output Capacitance

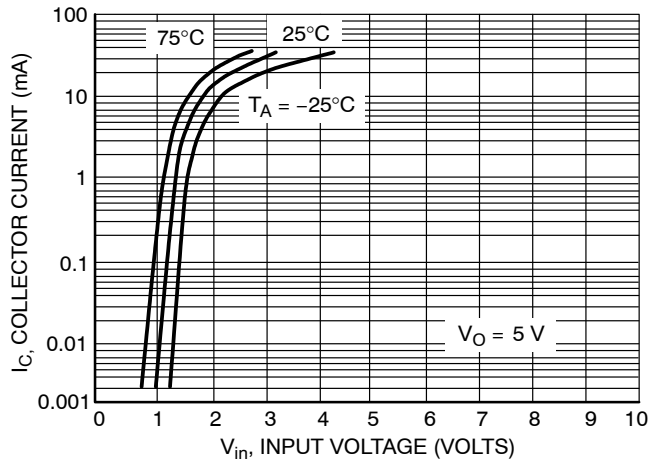


Figure 6. Output Current vs. Input Voltage

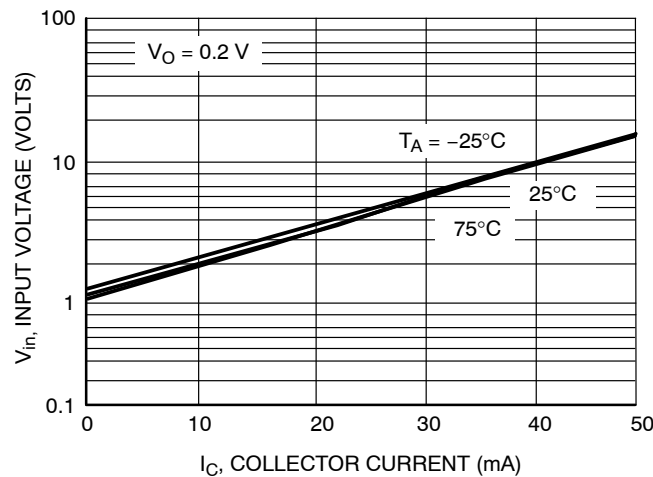


Figure 7. Input Voltage vs. Output Current

MUN2111T1 Series, SMUN2111T1 Series

TYPICAL ELECTRICAL CHARACTERISTICS – MUN2112T1, SMUN2112T1

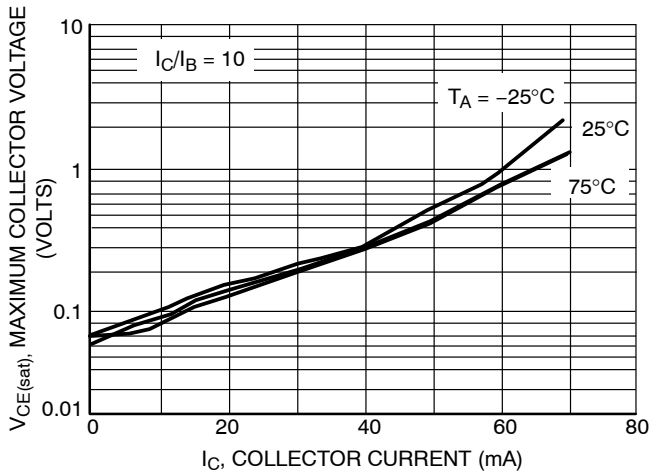


Figure 8. $V_{CE(sat)}$ vs. I_C

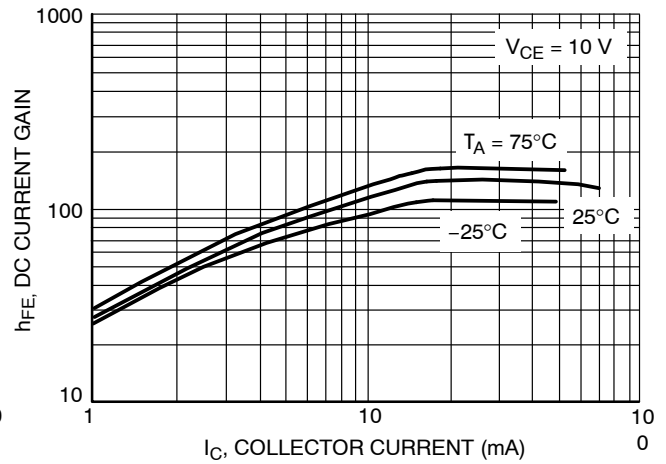


Figure 9. DC Current Gain

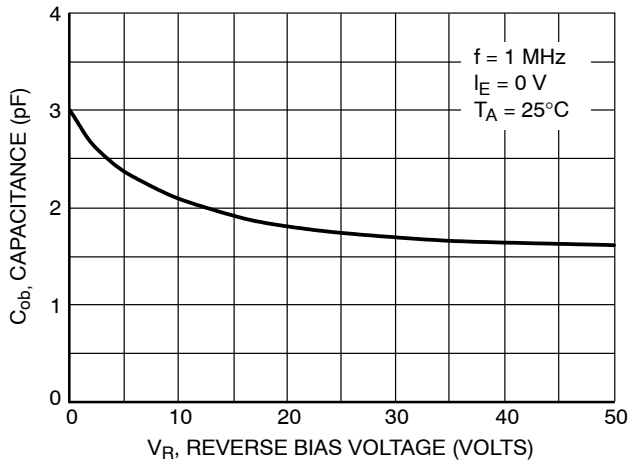


Figure 10. Output Capacitance

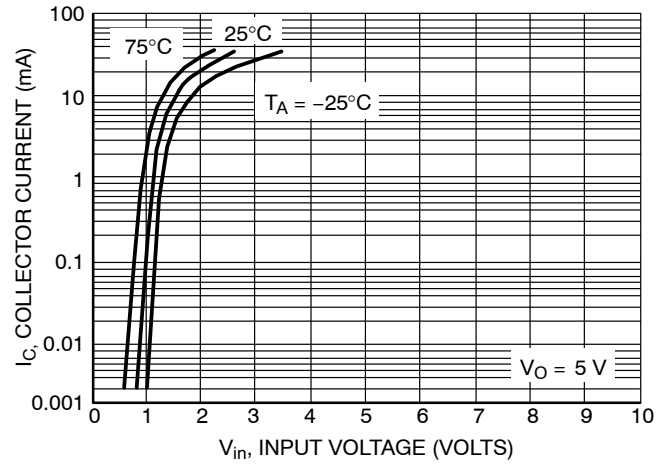


Figure 11. Output Current vs. Input Voltage

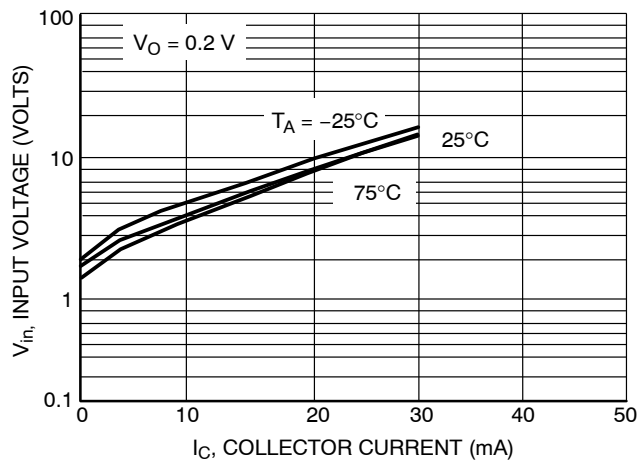


Figure 12. Input Voltage vs. Output Current

MUN2111T1 Series, SMUN2111T1 Series

TYPICAL ELECTRICAL CHARACTERISTICS – MUN2113T1, SMUN2113T1

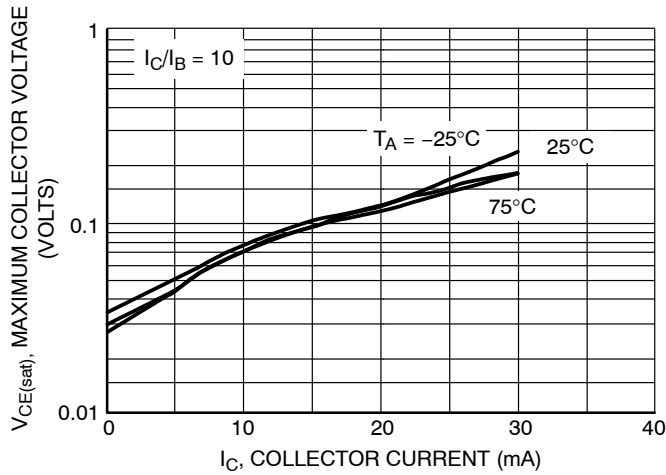


Figure 13. $V_{CE(sat)}$ vs. I_C

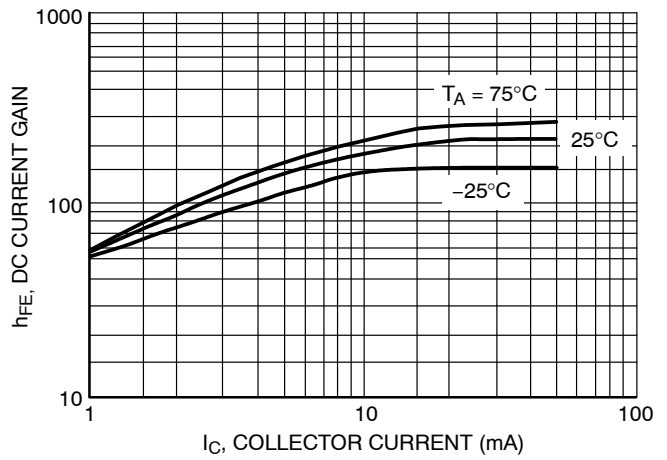


Figure 14. DC Current Gain

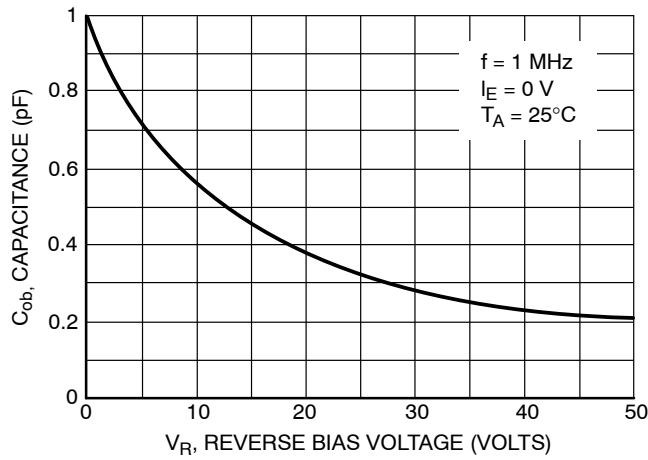


Figure 15. Output Capacitance

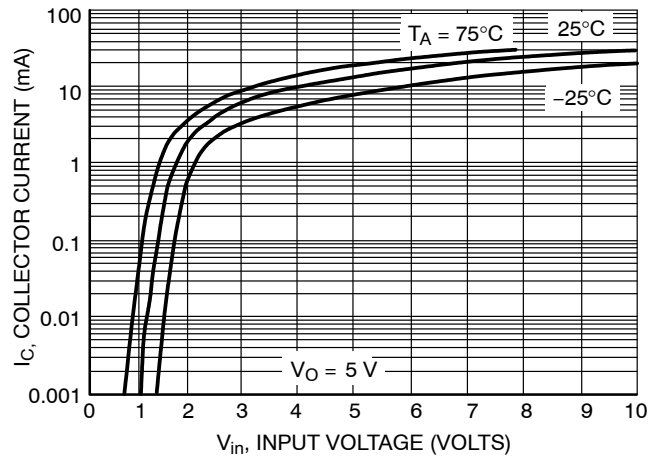


Figure 16. Output Current vs. Input Voltage

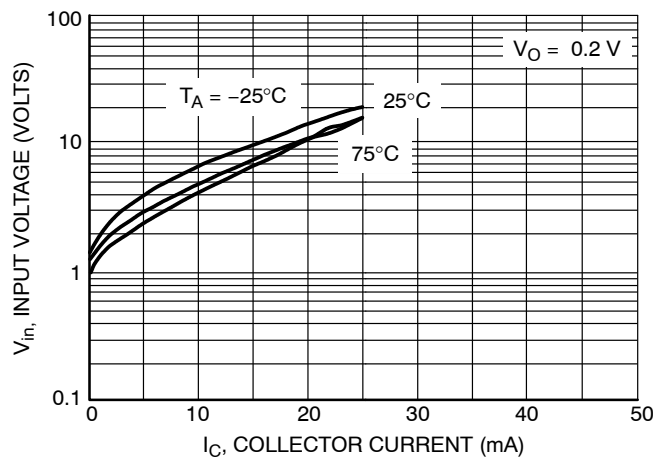


Figure 17. Input Voltage vs. Output Current

MUN2111T1 Series, SMUN2111T1 Series

TYPICAL ELECTRICAL CHARACTERISTICS – MUN2114T1, SMUN2114T1

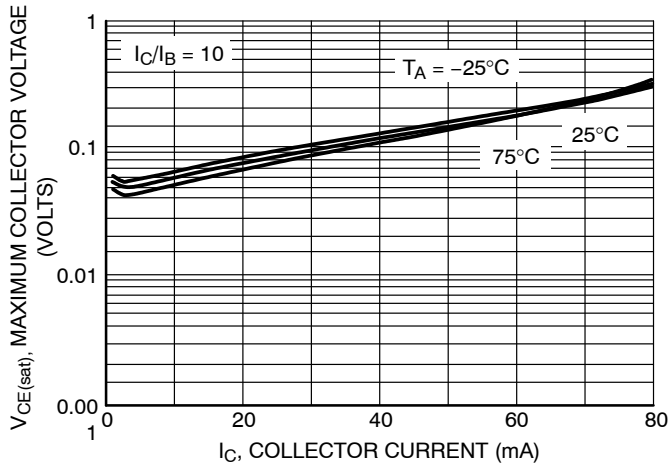


Figure 18. $V_{CE(sat)}$ vs. I_C

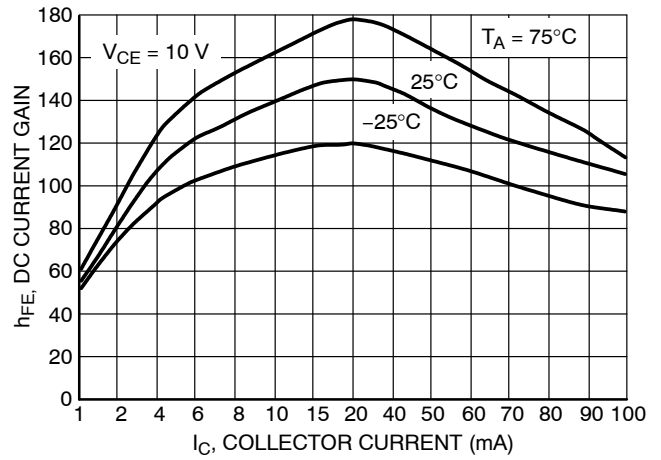


Figure 19. DC Current Gain

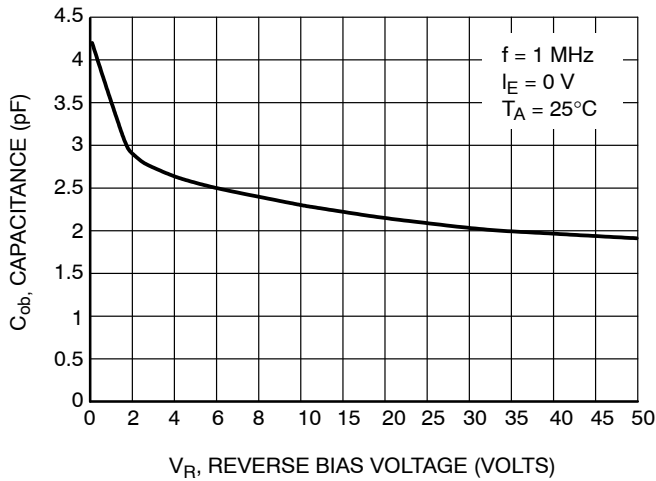


Figure 20. Output Capacitance

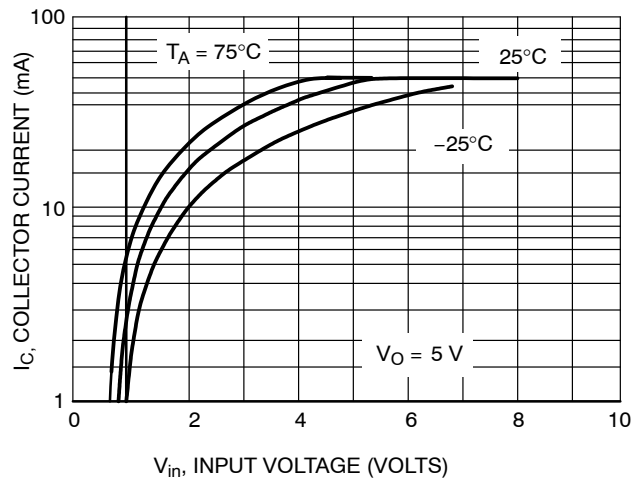


Figure 21. Output Current vs. Input Voltage

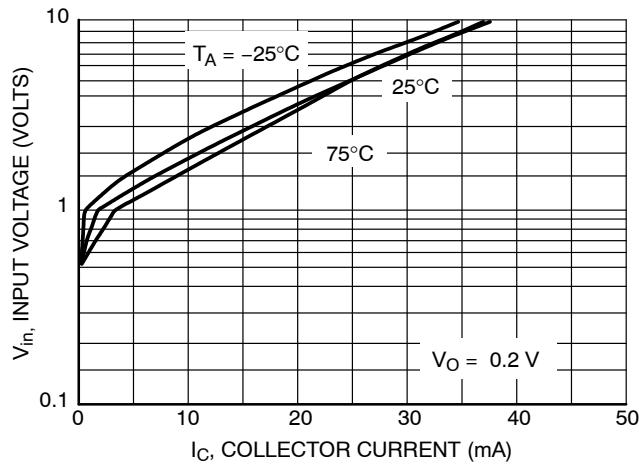


Figure 22. Input Voltage vs. Output Current

MUN2111T1 Series, SMUN2111T1 Series

TYPICAL ELECTRICAL CHARACTERISTICS – MUN2131T1

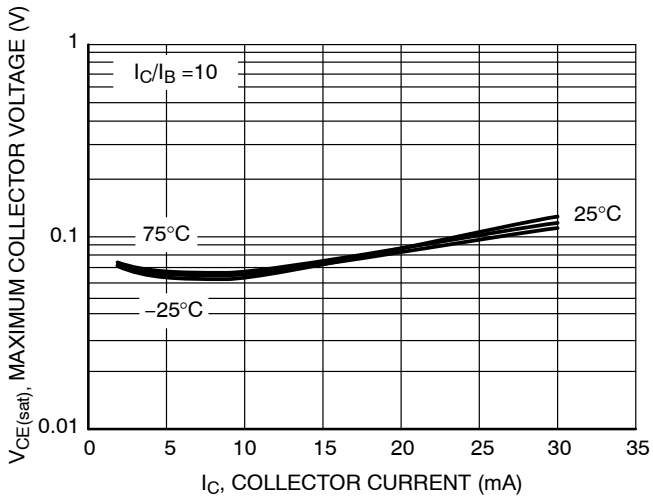


Figure 23. $V_{CE(sat)}$ vs. I_C

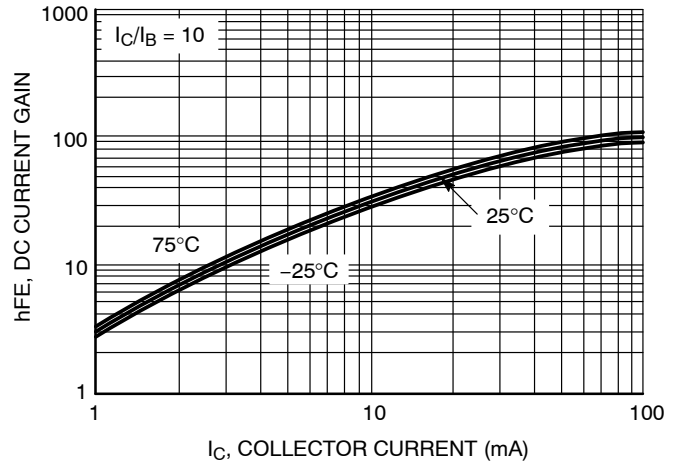


Figure 24. DC Current Gain

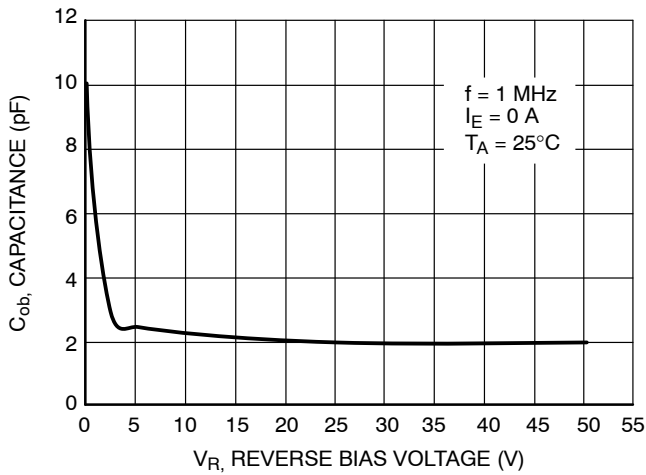


Figure 25. Output Capacitance

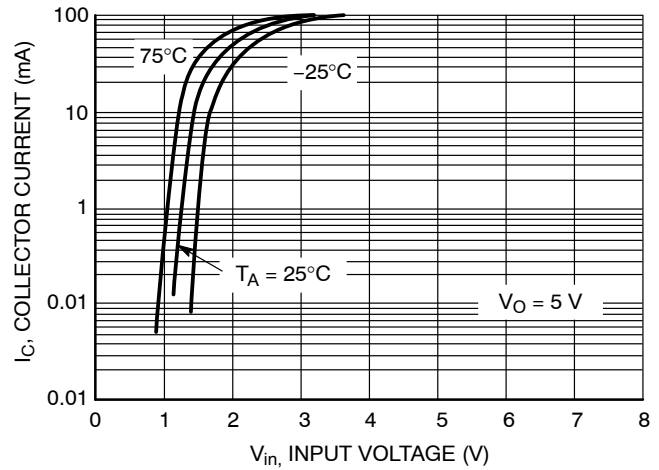


Figure 26. Output Current vs. Input Voltage

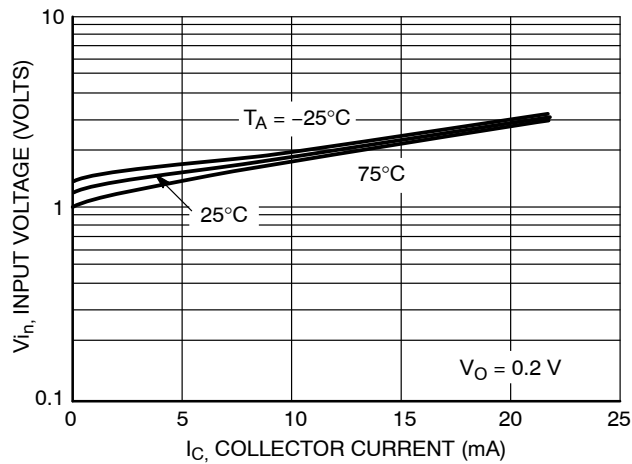


Figure 27. Input Voltage vs. Output Current

MUN2111T1 Series, SMUN2111T1 Series

TYPICAL ELECTRICAL CHARACTERISTICS — MUN2133T1

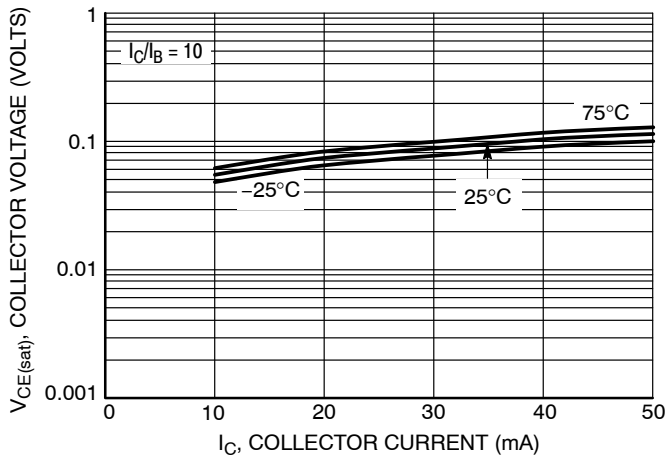


Figure 28. $V_{CE(sat)}$ versus I_C

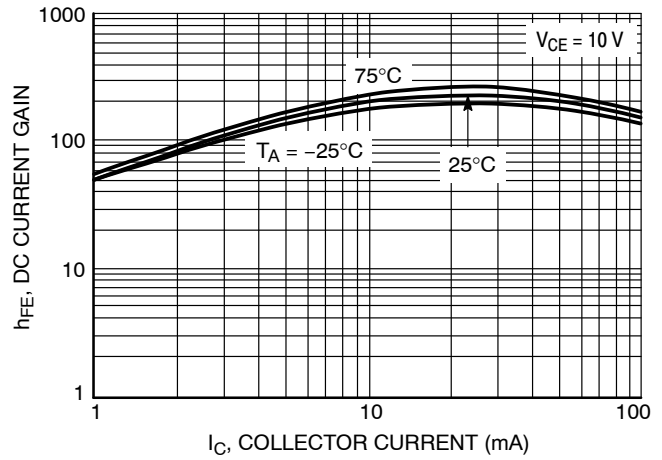


Figure 29. DC Current Gain

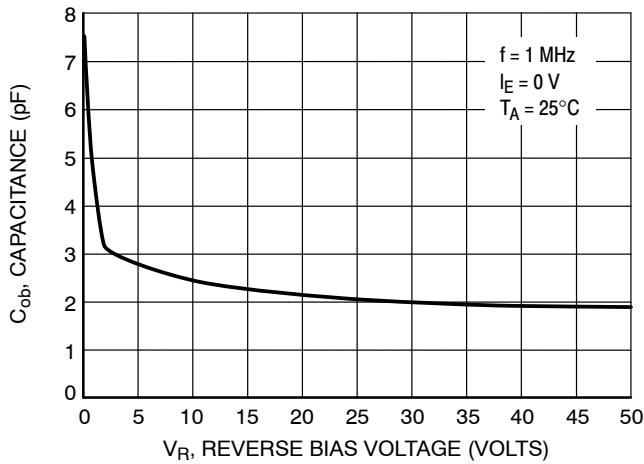


Figure 30. Output Capacitance

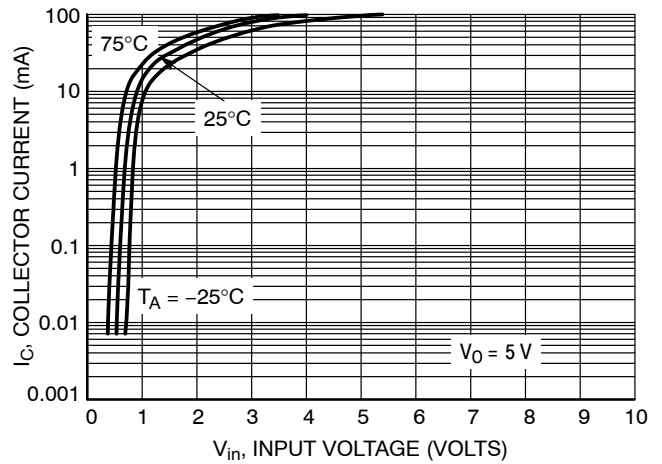


Figure 31. Output Current versus Input Voltage

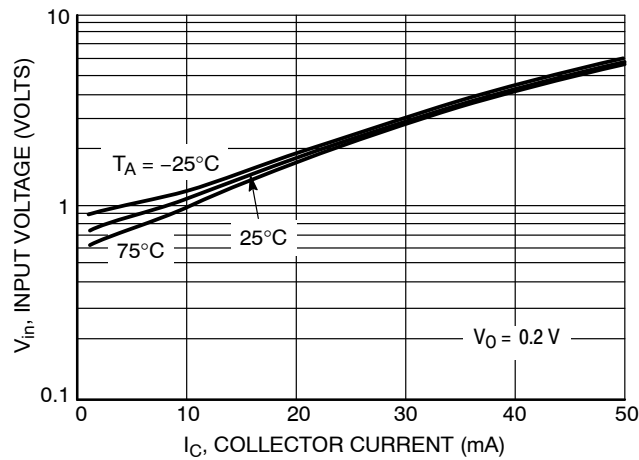


Figure 32. Input Voltage versus Output Current

MUN2111T1 Series, SMUN2111T1 Series

TYPICAL ELECTRICAL CHARACTERISTICS — MUN2136T1

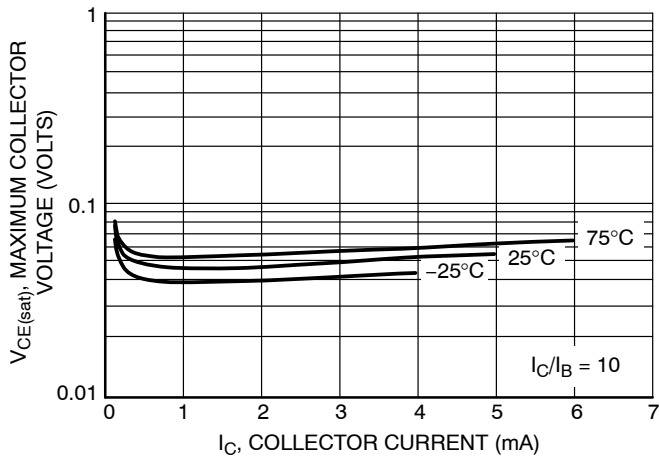


Figure 33. Maximum Collector Voltage vs. Collector Current

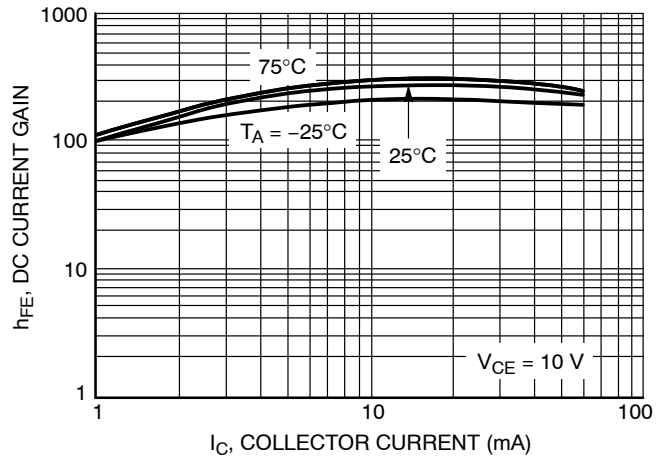


Figure 34. DC Current Gain

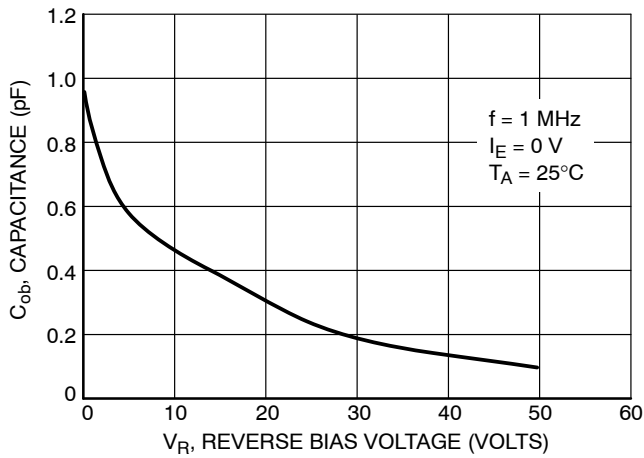


Figure 35. Output Capacitance

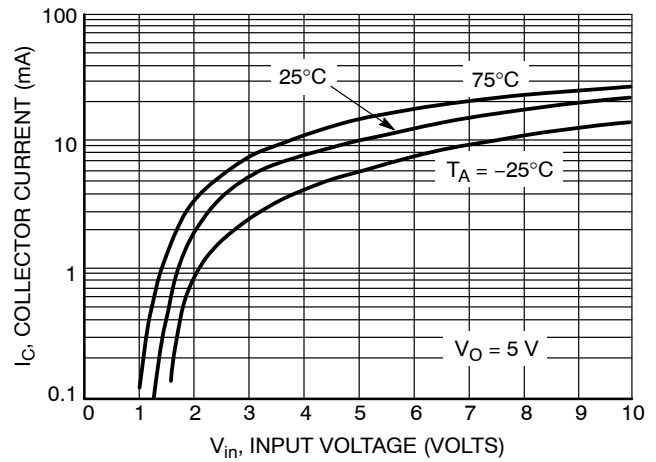


Figure 36. Output Current vs. Input Voltage

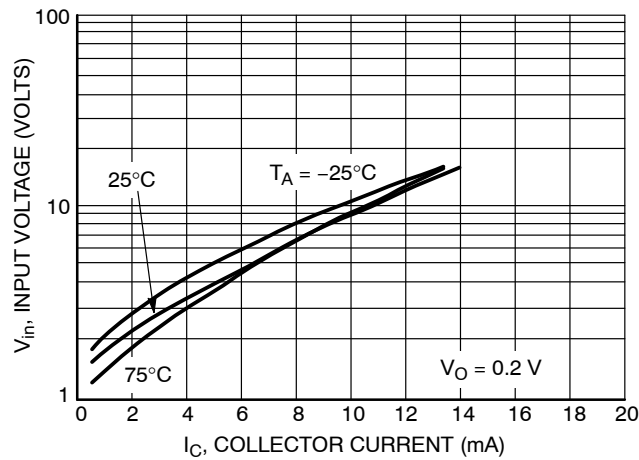


Figure 37. Input Voltage vs. Output Current

MUN2111T1 Series, SMUN2111T1 Series

TYPICAL ELECTRICAL CHARACTERISTICS — MUN2137T1

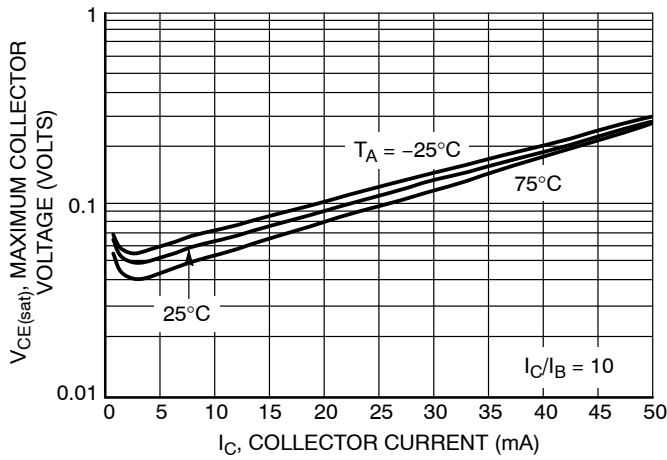


Figure 38. Maximum Collector Voltage vs. Collector Current

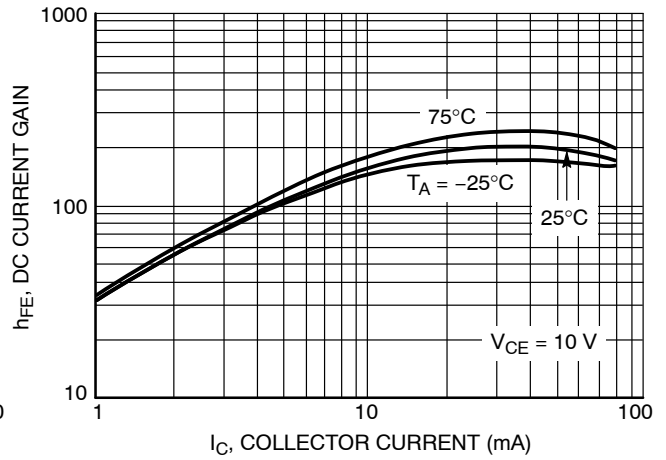


Figure 39. DC Current Gain

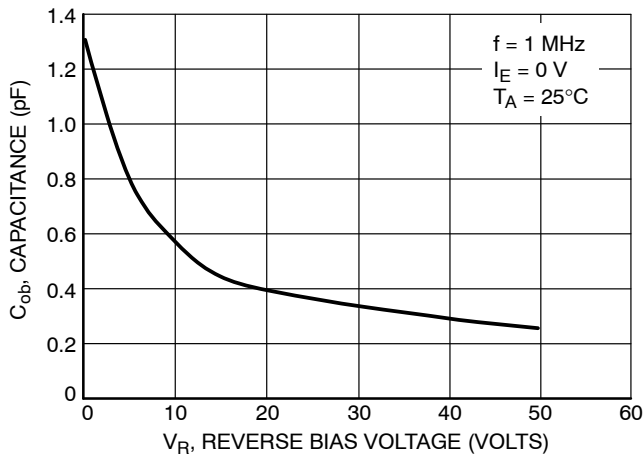


Figure 40. Output Capacitance

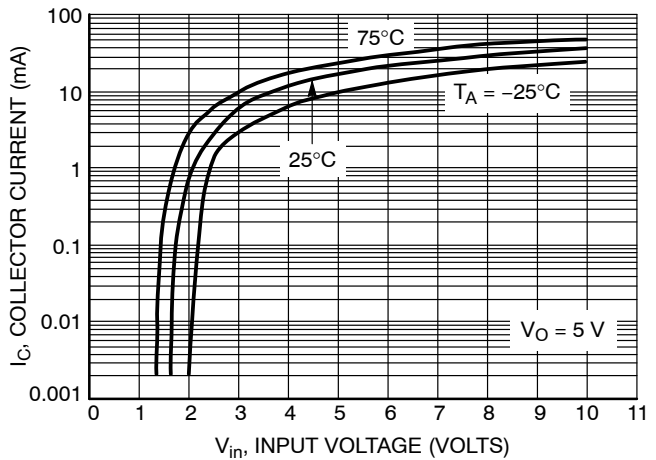


Figure 41. Output Current vs. Input Voltage

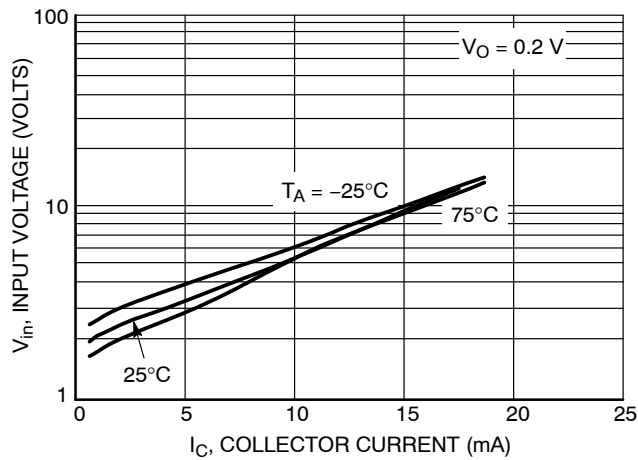
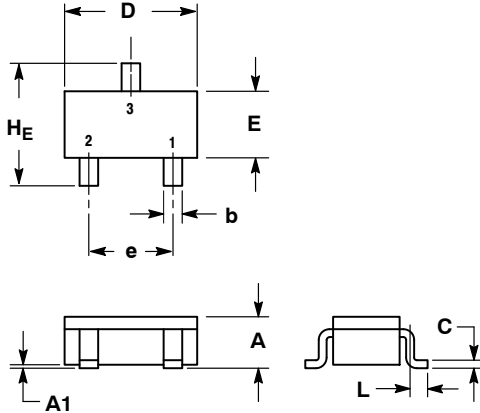


Figure 42. Input Voltage vs. Output Current

MUN2111T1 Series, SMUN2111T1 Series

PACKAGE DIMENSIONS

SC-59
CASE 318D-04
ISSUE G

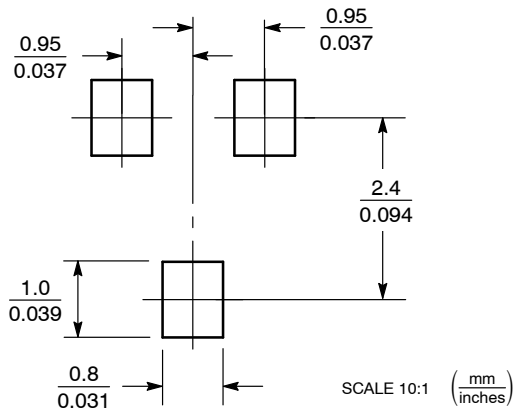


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	1.00	1.15	1.30	0.039	0.045	0.051
A1	0.01	0.06	0.10	0.001	0.002	0.004
b	0.35	0.43	0.50	0.014	0.017	0.020
c	0.09	0.14	0.18	0.003	0.005	0.007
D	2.70	2.90	3.10	0.106	0.114	0.122
E	1.30	1.50	1.70	0.051	0.059	0.067
e	1.70	1.90	2.10	0.067	0.075	0.083
L	0.20	0.40	0.60	0.008	0.016	0.024
HE	2.50	2.80	3.00	0.099	0.110	0.118

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.

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