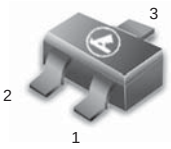
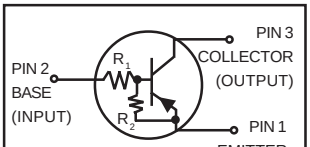
Bias Resistor Transistors

PNP Silicon Surface Mount Transistors with Monolithic Bias Resistor Network

MUN2111T1 SERIES



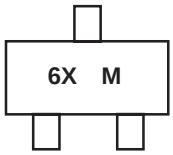
SC–59
CASE 318D, PLASTIC



This new series of digital transistors is designed to replace a single device and its external resistor bias network. The BRT (Bias Resistor Transistor) contains a single transistor with a monolithic bias network consisting of two resistors; a series base resistor and a base–emitter resistor. The BRT eliminates these individual components by integrating them into a single device. The use of a BRT can reduce both system cost and board space. The device is housed in the SC–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.
- Available in 8 mm embossed tape and reel
  Use the Device Number to order the 7 inch/3000 unit reel.

MARKINGDIAGRAM



6X = Specific Device Code*
M = Date Code

DEVICE MARKING INFORMATION

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

ORDERING INFORMATION

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

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

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

MUN2111T1 Series

DEVICE MARKING AND RESISTOR VALUES

Device	Package	Marking	R1 (K)	R2 (K)	Shipping
MUN2111T1	SC–59	6A	10	10	3000/Tape & Reel
MUN2112T1	SC–59	6B	22	22	3000/Tape & Reel
MUN2113T1	SC–59	6C	47	47	3000/Tape & Reel
MUN2114T1	SC–59	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
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
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

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)	MUN2111T1	I_{EBO}	–	–	0.5	mAdc
	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

3. New resistor combinations. Updated curves to follow in subsequent data sheets.
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
ON CHARACTERISTICS (Note 5)						
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	

5. 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
ON CHARACTERISTICS (Note 6) (Continued)						
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	

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

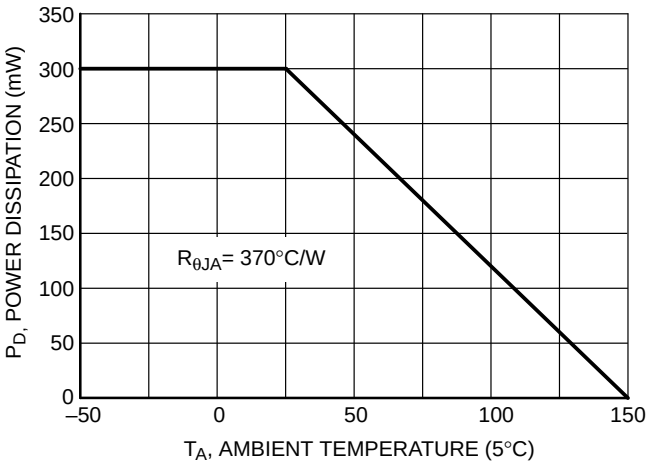


Figure 1. Derating Curve

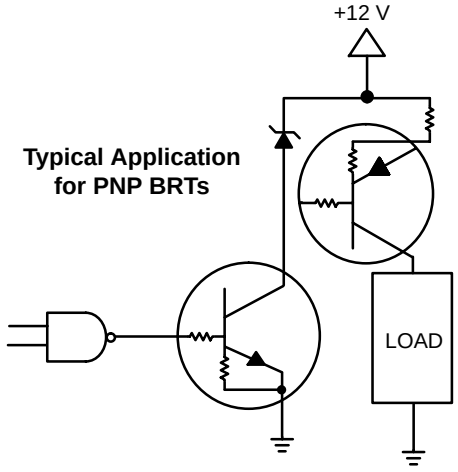


Figure 2. Inexpensive, Unregulated Current Source

TYPICAL ELECTRICAL CHARACTERISTICS – MUN2111T1

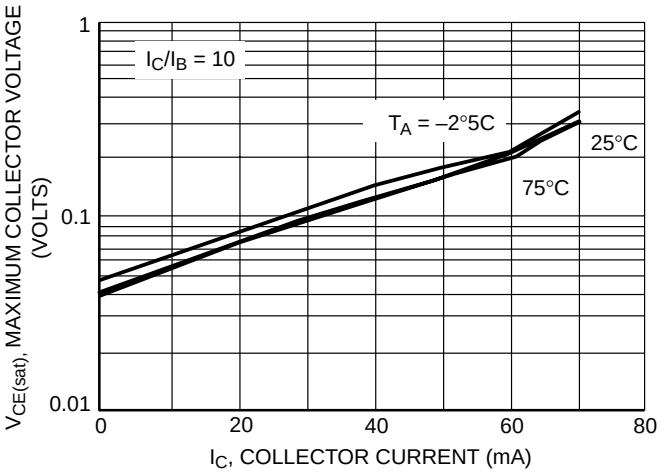


Figure 3. $V_{CE(sat)}$ vs. I_C

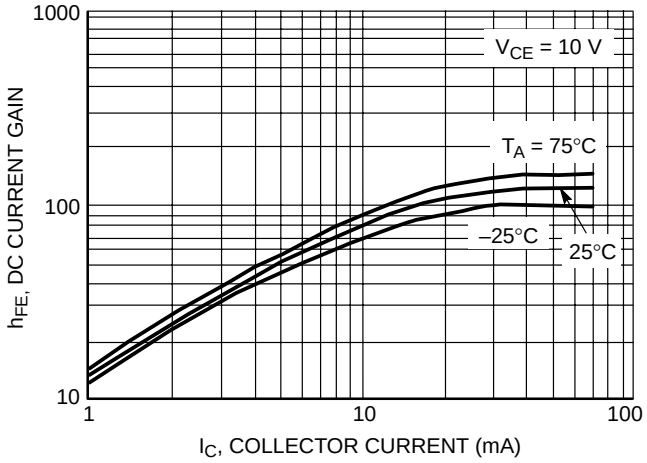


Figure 4. DC Current Gain

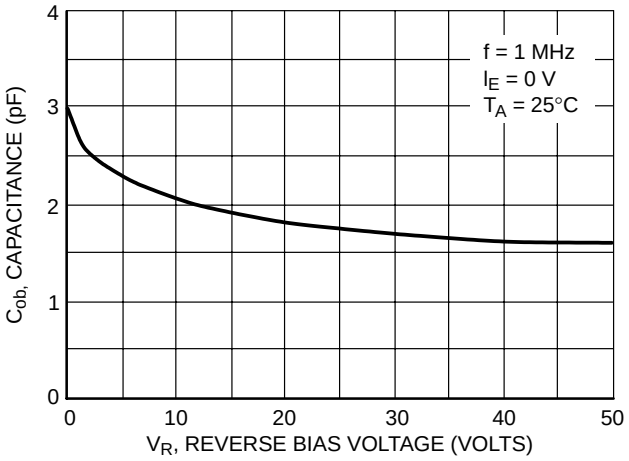


Figure 5. Output Capacitance

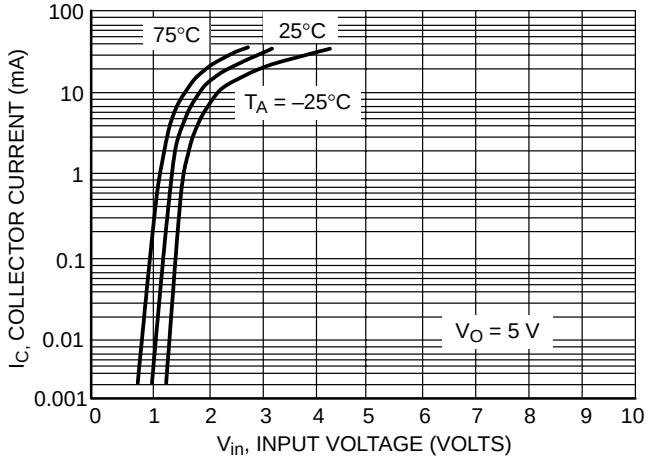


Figure 6. Output Current vs. Input Voltage

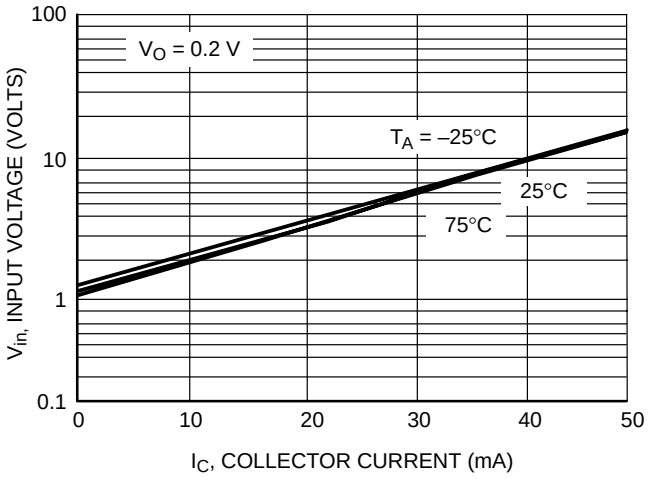


Figure 7. Input Voltage vs. Output Current

TYPICAL ELECTRICAL CHARACTERISTICS – MUN2112T1

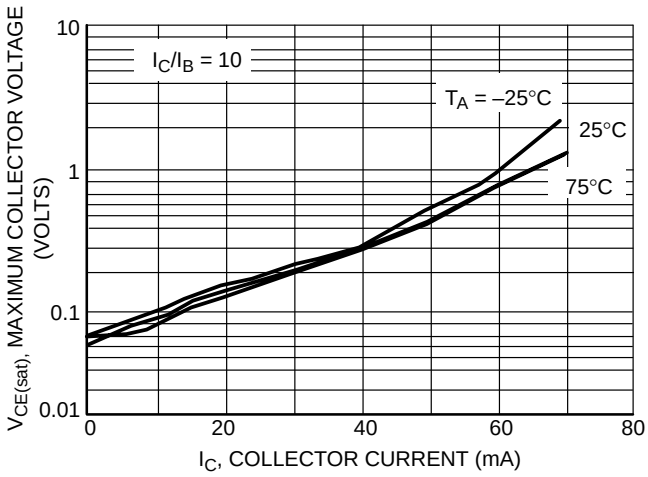


Figure 8. $V_{CE(sat)}$ vs. I_C

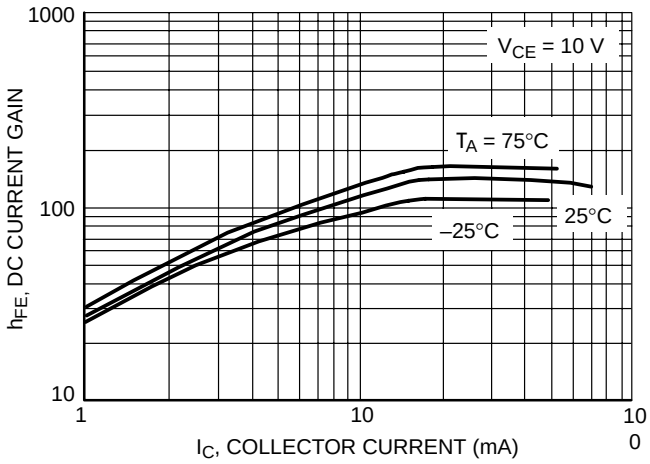


Figure 9. DC Current Gain

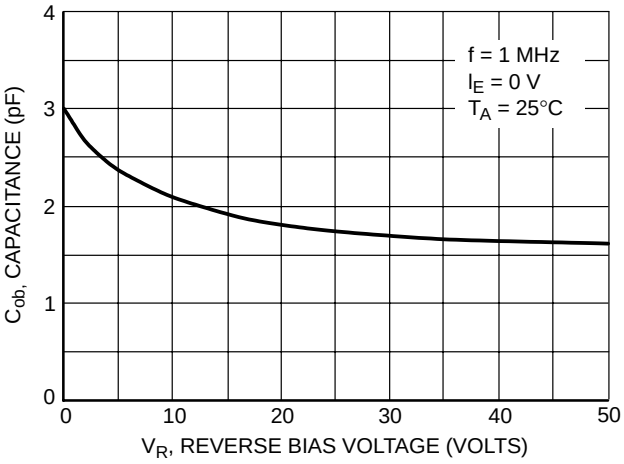


Figure 10. Output Capacitance

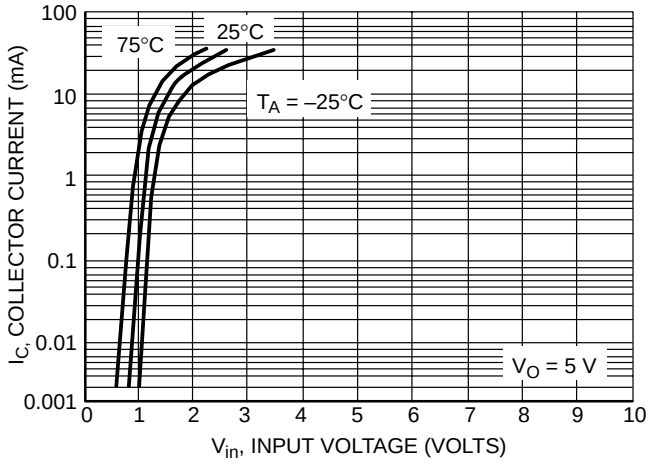


Figure 11. Output Current vs. Input Voltage

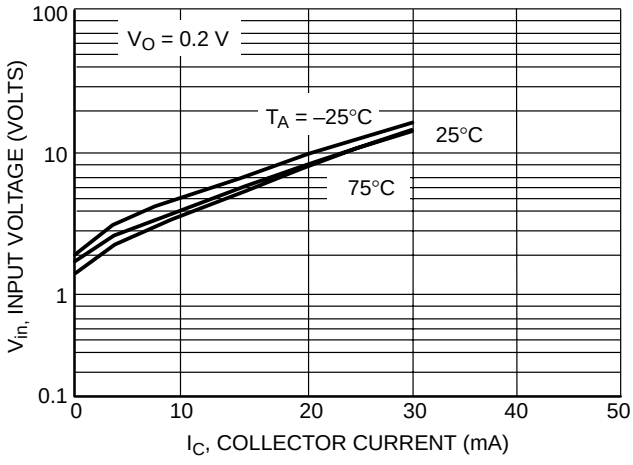


Figure 12. Input Voltage vs. Output Current

TYPICAL ELECTRICAL CHARACTERISTICS – MUN2113T1

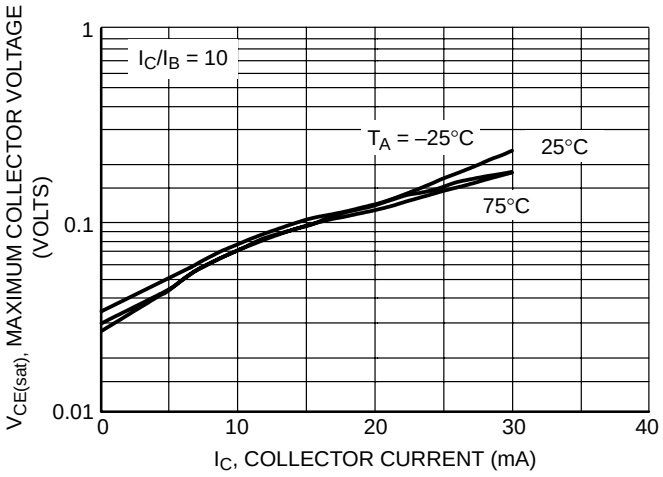


Figure 13. $V_{CE(sat)}$ vs. I_C

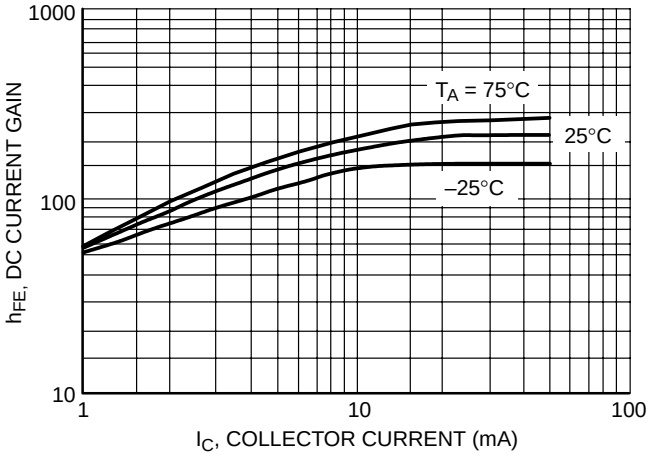


Figure 14. DC Current Gain

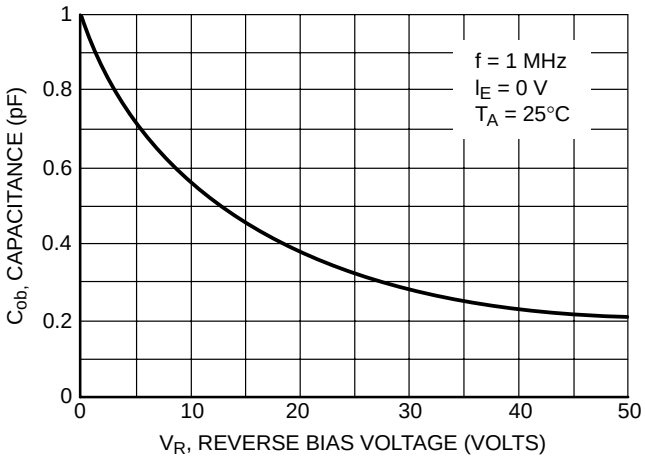


Figure 15. Output Capacitance

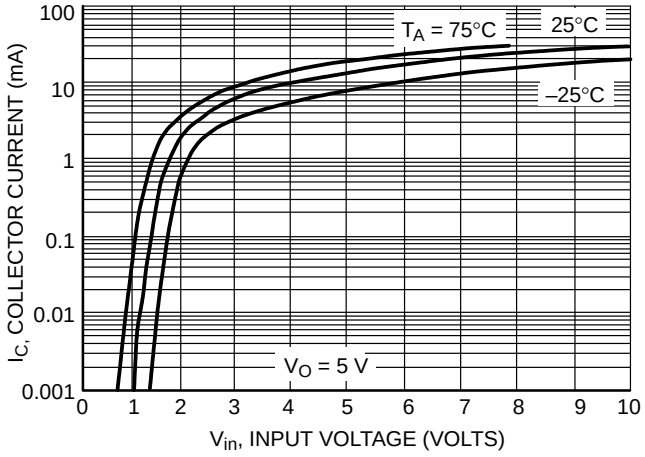


Figure 16. Output Current vs. Input Voltage

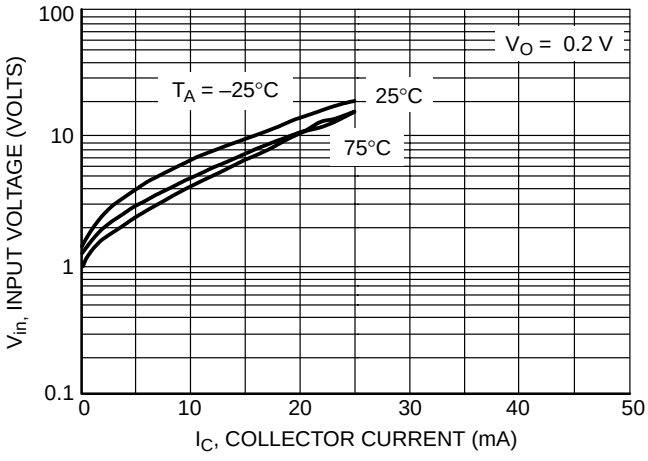


Figure 17. Input Voltage vs. Output Current

TYPICAL ELECTRICAL CHARACTERISTICS – MUN2114T1

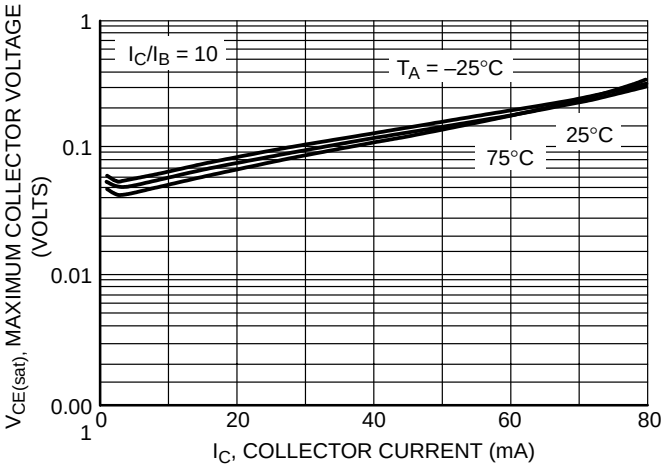


Figure 18. $V_{CE(sat)}$ vs. I_C

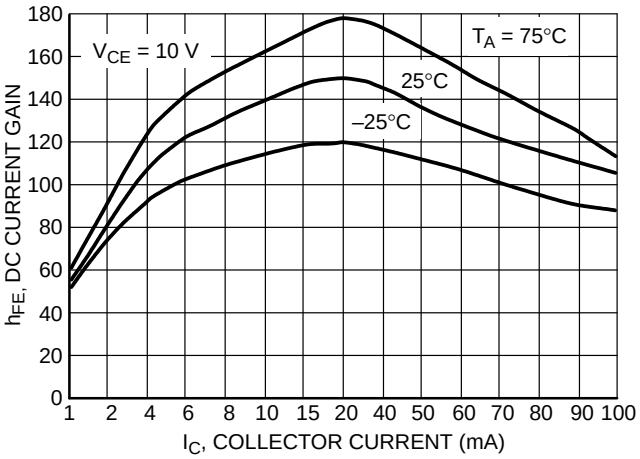


Figure 19. DC Current Gain

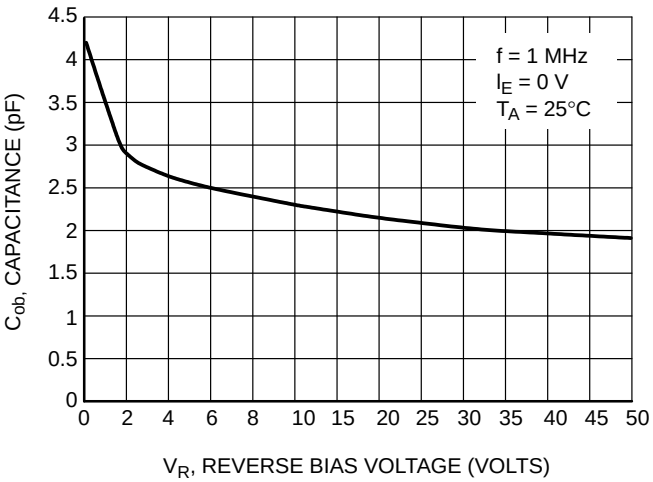


Figure 20. Output Capacitance

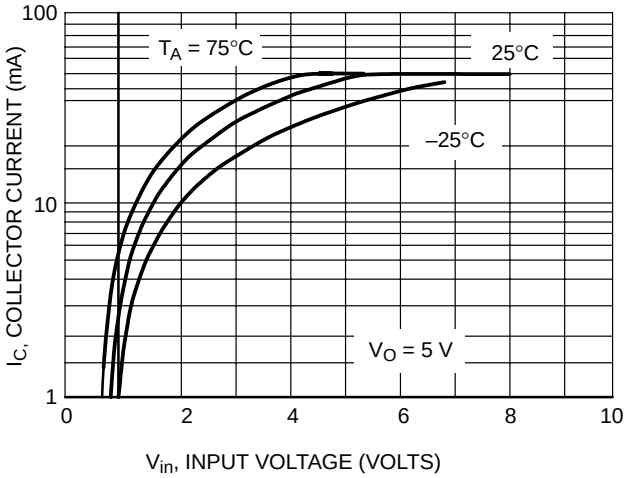


Figure 21. Output Current vs. Input Voltage

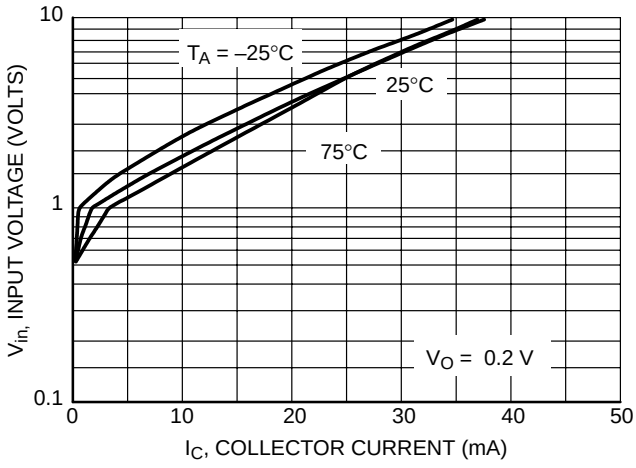


Figure 22. Input Voltage vs. Output Current

TYPICAL ELECTRICAL CHARACTERISTICS – MUN2131T1

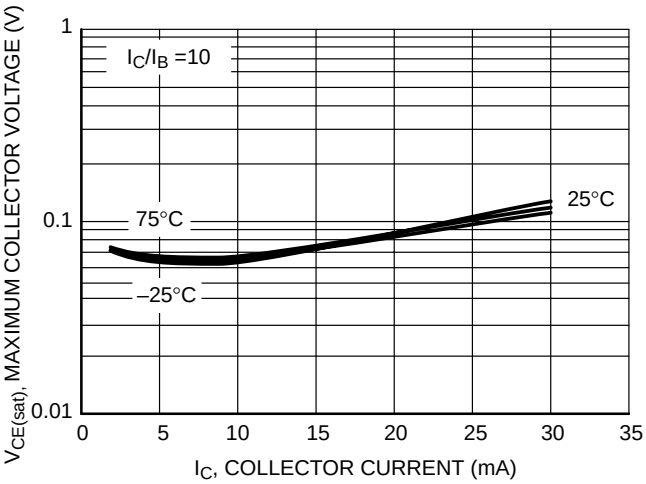


Figure 23. $V_{CE(sat)}$ vs. I_C

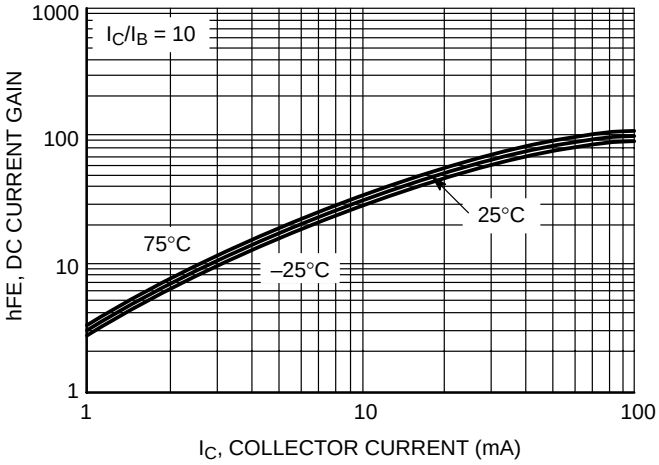


Figure 24. DC Current Gain

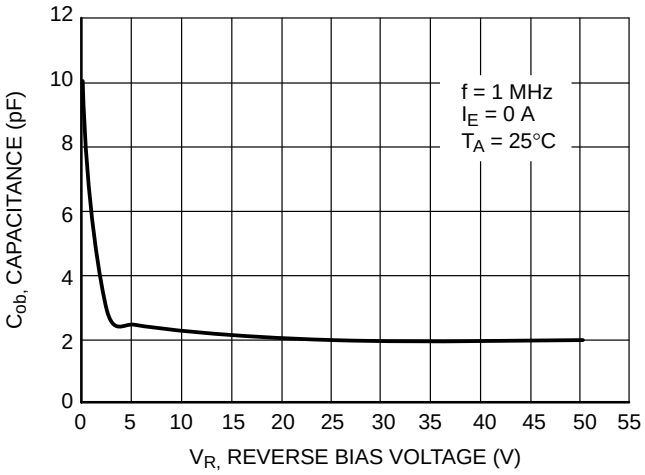


Figure 25. Output Capacitance

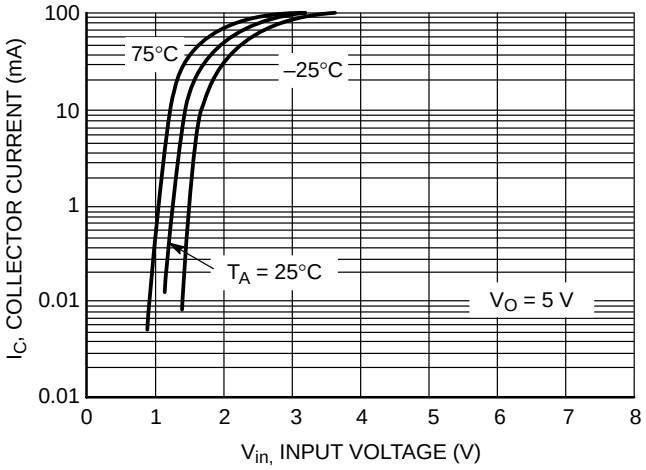


Figure 26. Output Current vs. Input Voltage

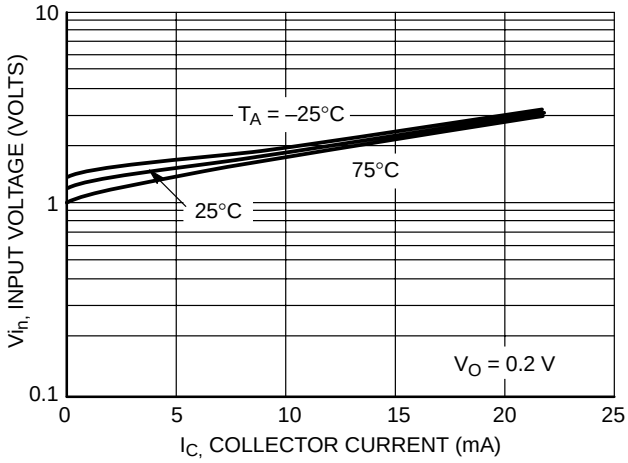


Figure 27. Input Voltage vs. Output Current

TYPICAL ELECTRICAL CHARACTERISTICS — MUN2136T1

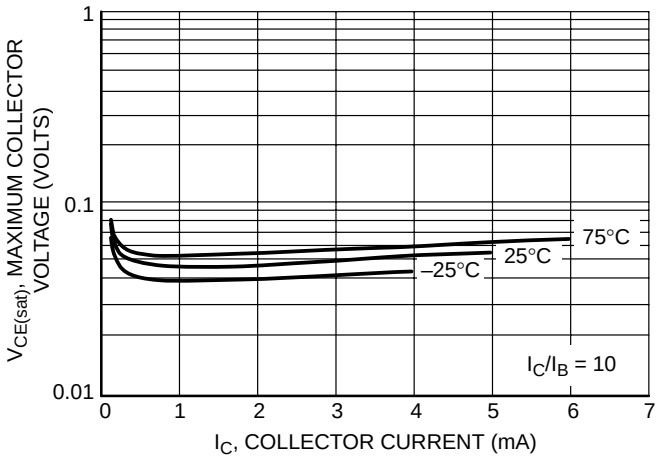


Figure 28. Maximum Collector Voltage versus Collector Current

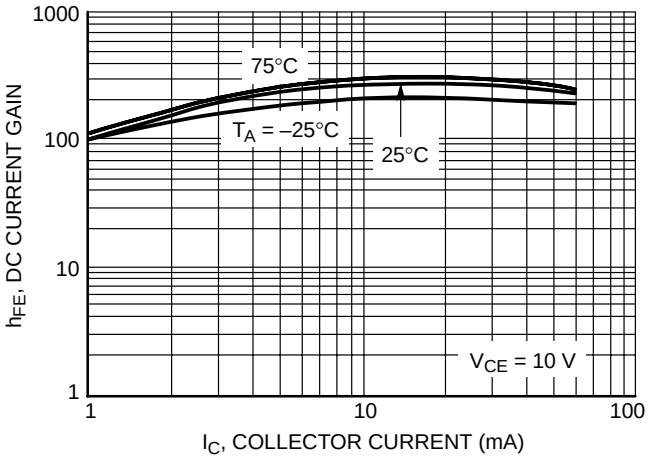


Figure 29. DC Current Gain

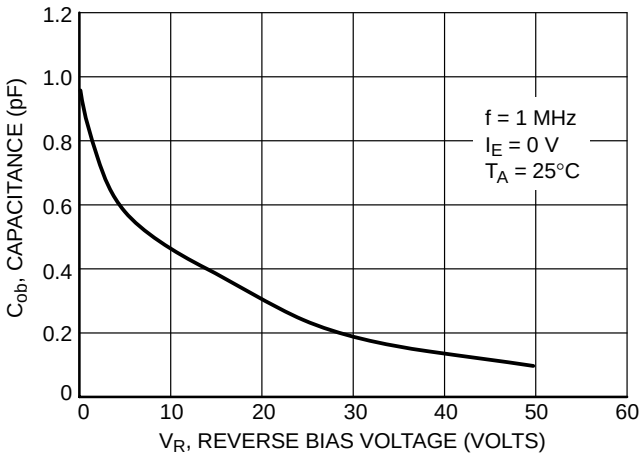


Figure 30. Output Capacitance

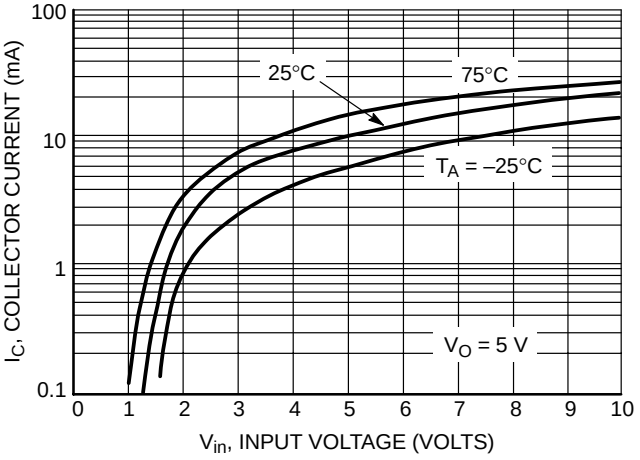


Figure 31. Output Current versus Input Voltage

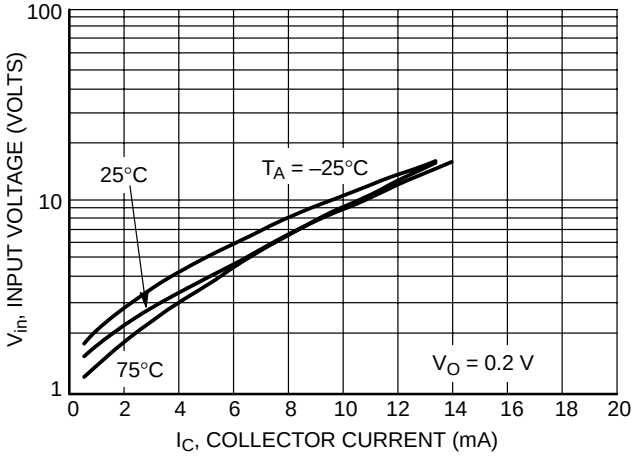


Figure 32. Input Voltage versus Output Current

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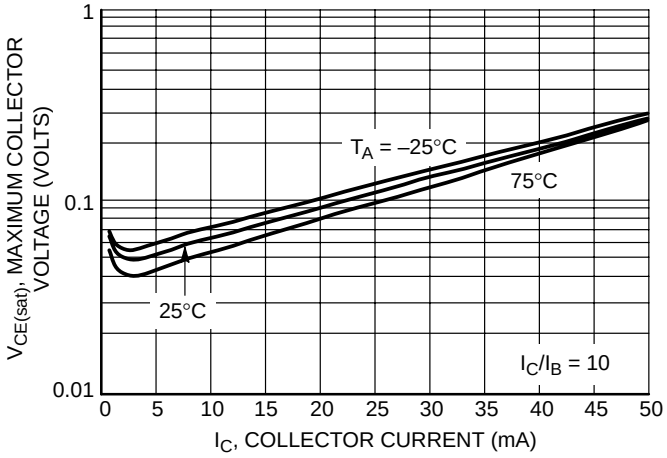

Figure 33. Maximum Collector Voltage versus Collector Current

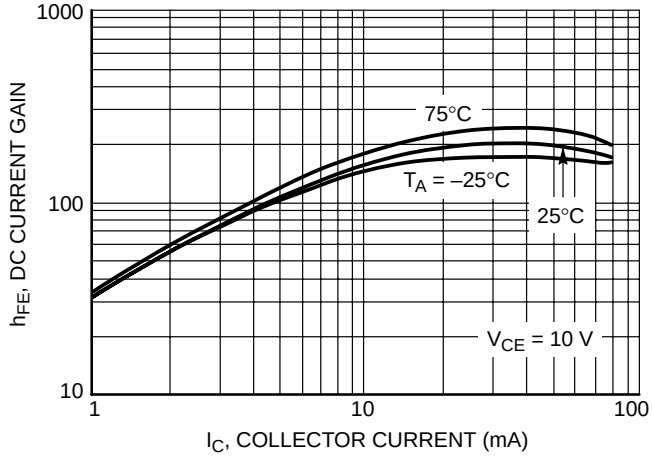

Figure 34. DC Current Gain

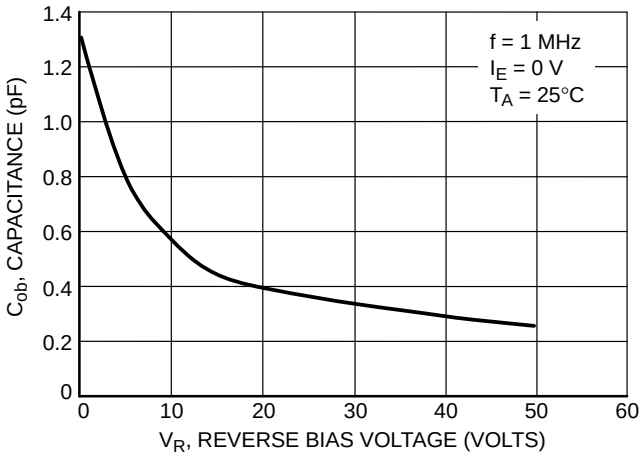

Figure 35. Output Capacitance

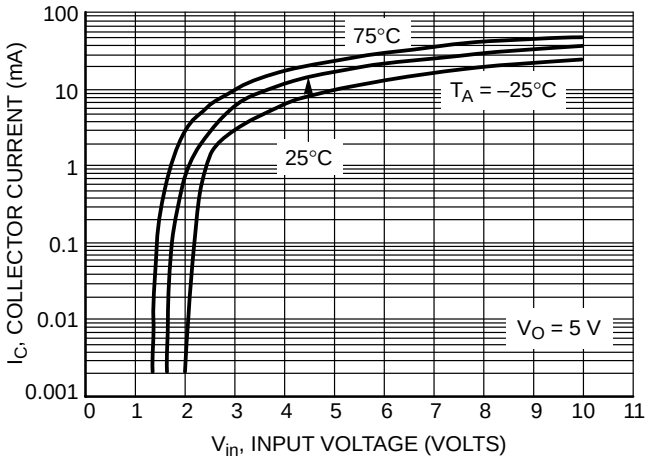

Figure 36. Output Current versus Input Voltage

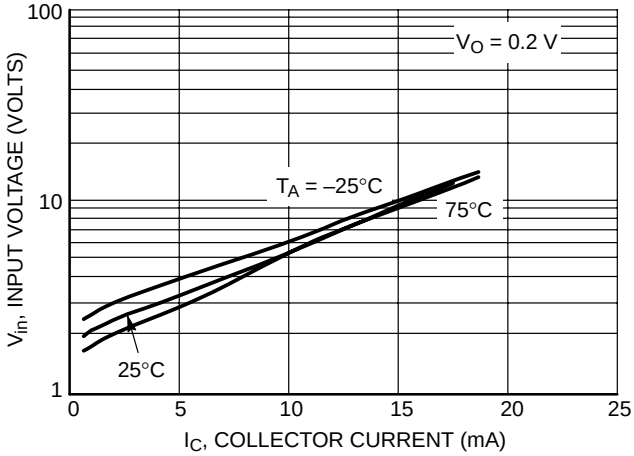

Figure 37. Input Voltage versus Output Current