SEMICONDUCTOR

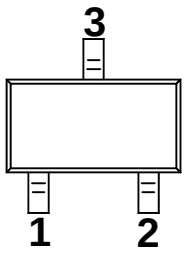
DATA SHEET

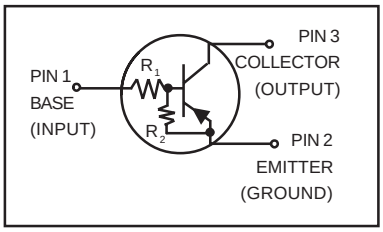
MUN211 Series

Bias Resistor Transistors

PNP Silicon Surface Mount Transistors with Monolithic Bias Resistor Network

SOT–23 (TO–236AB)





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 SOT-23 package which is designed for low power surface mount applications.

- Simplifies Circuit Design
- Reduces Board Space
- Reduces Component Count
- The SOT-23 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.

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	246 (Note 1.) 400 (Note 2.) 1.5 (Note 1.) 2.0 (Note 2.)	mW °C/W
Thermal Resistance – Junction-to-Ambient	$R_{\theta JA}$	508 (Note 1.) 311 (Note 2.)	°C/W
Thermal Resistance – Junction-to-Lead	$R_{\theta JL}$	174 (Note 1.) 208 (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

DEVICE MARKING AND RESISTOR VALUES

Device	Package	Marking	R1 (K)	R2 (K)	Shipping
MUN2110	SOT-23	A6O	47	∞	3000/Tape & Reel
MUN2111	SOT-23	A6A	10	10	3000/Tape & Reel
MUN2112	SOT-23	A6B	22	22	3000/Tape & Reel
MUN2113	SOT-23	A6C	47	47	3000/Tape & Reel
MUN2114	SOT-23	A6D	10	47	3000/Tape & Reel
MUN2115	SOT-23	A6E	10	∞	3000/Tape & Reel
MUN2116	SOT-23	A6F	4.7	∞	3000/Tape & Reel
MUN2130	SOT-23	A6G	1.0	1.0	3000/Tape & Reel
MUN2131	SOT-23	A6H	2.2	2.2	3000/Tape & Reel
MUN2132	SOT-23	A6J	4.7	4.7	3000/Tape & Reel
MUN2133	SOT-23	A6K	4.7	47	3000/Tape & Reel
MUN2134	SOT-23	A6L	22	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)	MUN2110	I_{EBO}	–	–	0.1	mAdc
	MUN2111		–	–	0.5	
	MUN2112		–	–	0.2	
	MUN2113		–	–	0.1	
	MUN2114		–	–	0.2	
	MUN2115		–	–	0.9	
	MUN2116		–	–	1.9	
	MUN2130		–	–	4.3	
	MUN2131		–	–	2.3	
	MUN2132		–	–	1.5	
	MUN2133		–	–	0.18	
	MUN2134		–	–	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

3. New devices. 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 (V_{CE} = 10 V, I_C = 5.0 mA)	MUN2110	h_{FE}	80	140	–	
	MUN2111		35	60	–	
	MUN2112		60	100	–	
	MUN2113		80	140	–	
	MUN2114		80	140	–	
	MUN2115		160	250	–	
	MUN2116		160	250	–	
	MUN2130		3.0	5.0	–	
	MUN2131		8.0	15	–	
	MUN2132		15	27	–	
	MUN2133		80	140	–	
	MUN2134		80	130	–	
Collector-Emitter Saturation Voltage (I_C = 10 mA, I_B = 0.3 mA) (I_C = 10 mA, I_B = 5 mA) MUN2130/MUN2131 (I_C = 10 mA, I_B = 1 mA) MUN2115/MUN2116/MUN2132/MUN2133/MUN2134		$V_{CE(sat)}$	–	–	0.25	Vdc
Output Voltage (on) (V_{CC} = 5.0 V, V_B = 2.5 V, R_L = 1.0 kΩ)	MUN2110	V_{OL}	–	–	0.2	Vdc
	MUN2114		–	–	0.2	
	MUN2111		–	–	0.2	
	MUN2112		–	–	0.2	
	MUN2114		–	–	0.2	
	MUN2115		–	–	0.2	
	MUN2116		–	–	0.2	
	MUN2130		–	–	0.2	
	MUN2131		–	–	0.2	
	MUN2132		–	–	0.2	
	MUN2133		–	–	0.2	
	MUN2134		–	–	0.2	
(V_{CC} = 5.0 V, V_B = 3.5 V, R_L = 1.0 kΩ)	MUN2113		–	–	0.2	
Output Voltage (off) (V_{CC} = 5.0 V, V_B = 0.5 V, R_L = 1.0 kΩ)		V_{OH}	4.9	–	–	Vdc
(V_{CC} = 5.0 V, V_B = 0.25 V, R_L = 1.0 kΩ)	MUN2115					
	MUN2116					
	MUN2131					
	MUN2132					
(V_{CC} = 5.0 V, V_B = 0.050 V, R_L = 1.0 kΩ)	MUN2130					
Input Resistor	MUN2110	R_1	32.9	47	61.1	k Ω
	MUN2111		7.0	10	13	
	MUN2112		15.4	22	28.6	
	MUN2113		32.9	47	61.1	
	MUN2114		7.0	10	13	
	MUN2115		7.0	10	13	
	MUN2116		3.3	4.7	6.1	
	MUN2130		0.7	1.0	1.3	
	MUN2131		1.5	2.2	2.9	
	MUN2132		3.3	4.7	6.1	
	MUN2133		3.3	4.7	6.1	
	MUN2134		15.4	22	28.6	
Resistor Ratio MUN2111/MUN2112/MUN2113		R_1/R_2	0.8	1.0	1.2	
MUN2114			0.17	0.21	0.25	
MUN2115/MUN2116/MUN2110			–	–	–	
MUN2130/MUN2131/MUN2132			0.8	1.0	1.2	
MUN2133			0.055	0.1	0.185	

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

DEVICE CHARACTERISTICS

MUN211 Series

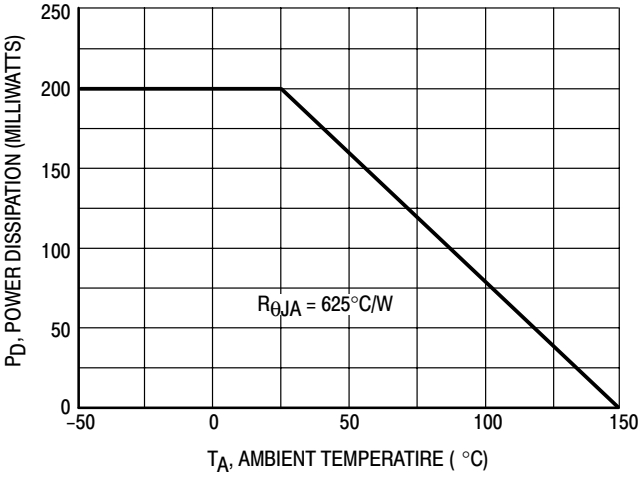


Figure 1. Derating Curve

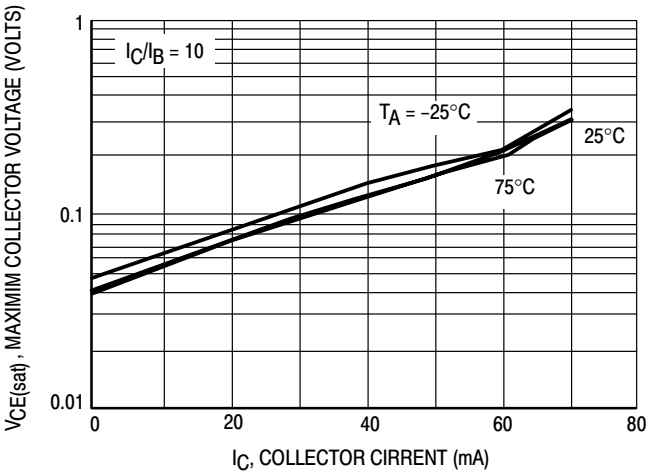


Figure 2. $V_{CE(sat)}$ versus I_C

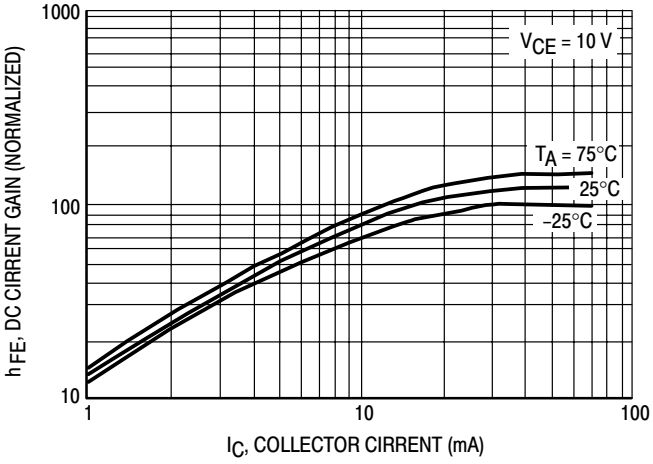


Figure 3. DC Current Gain

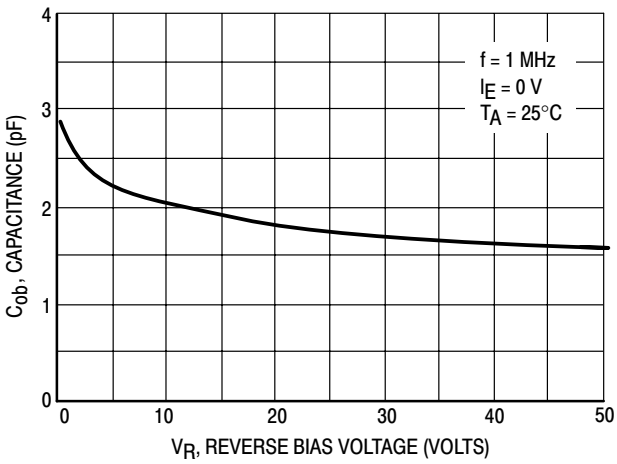


Figure 4. Output Capacitance

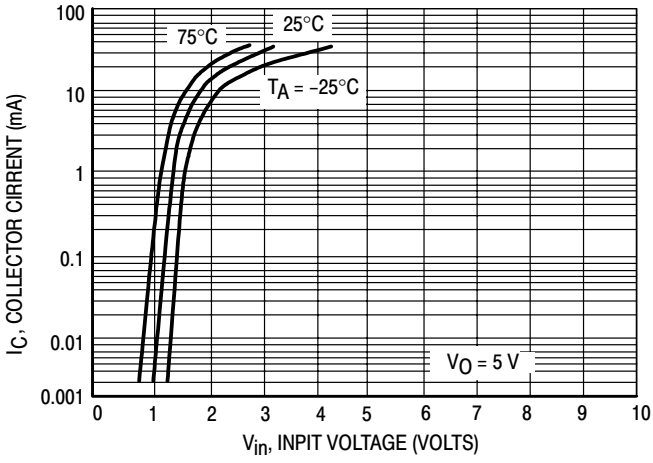


Figure 5. Output Current versus Input Voltage

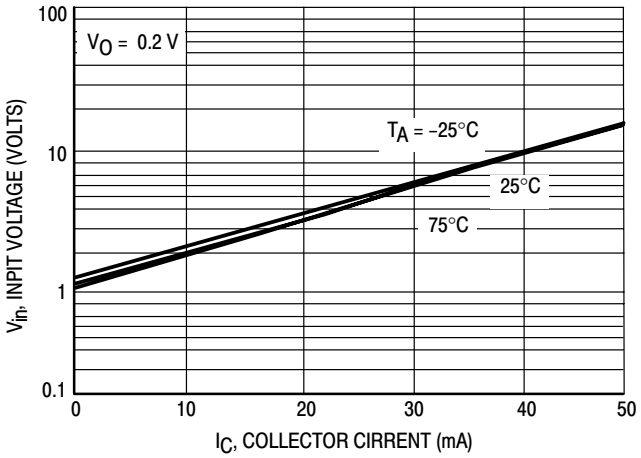


Figure 6. Input Voltage versus Output Current

DEVICE CHARACTERISTICS

MUN211 Series

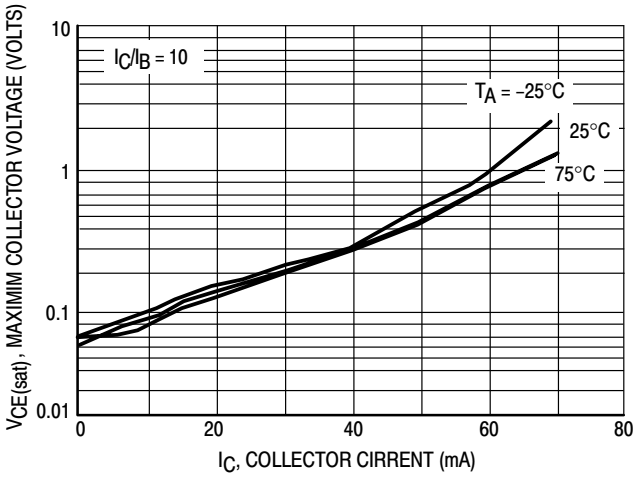


Figure 7. $V_{CE(sat)}$ versus I_C

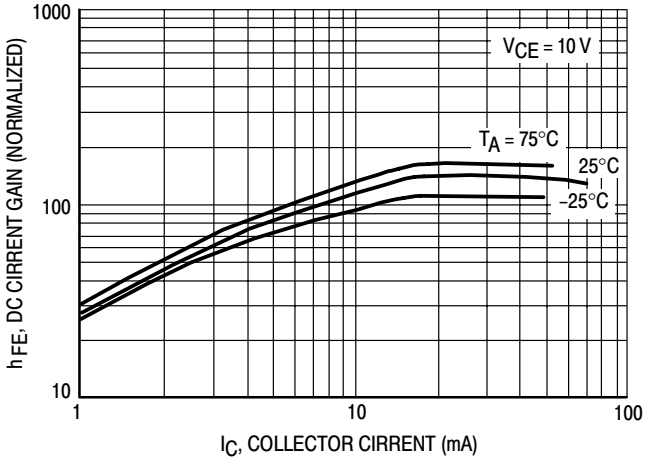


Figure 8. DC Current Gain

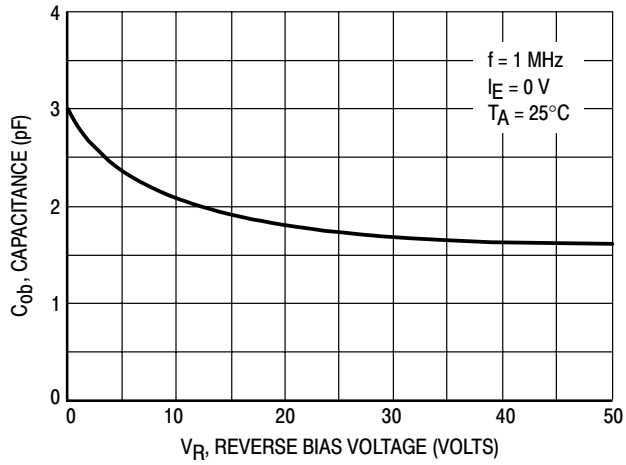


Figure 9. Output Capacitance

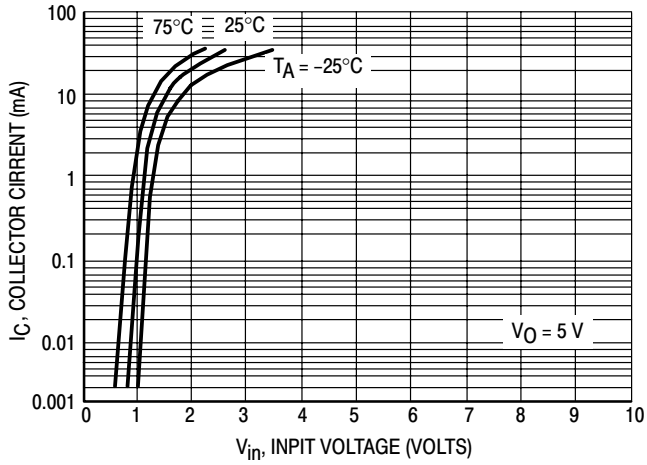


Figure 10. Output Current versus Input Voltage

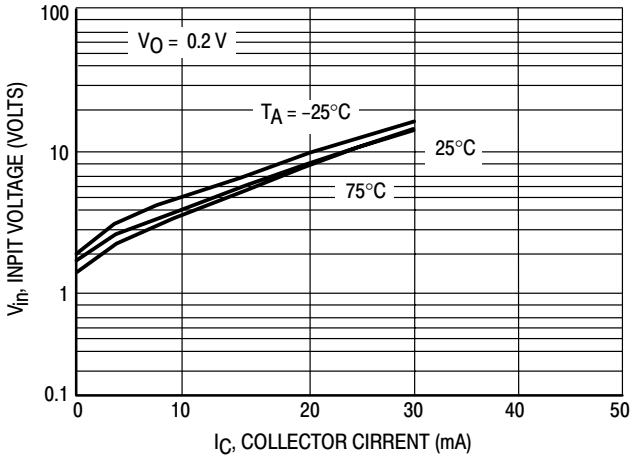


Figure 11. Input Voltage versus Output Current

DEVICE CHARACTERISTICS

MUN211 Series

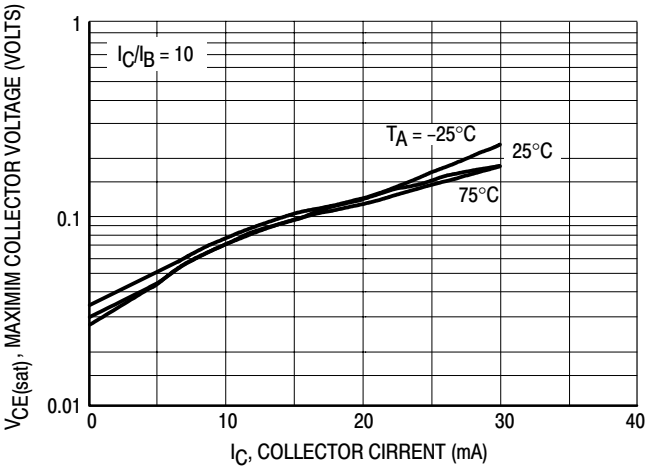


Figure 12. $V_{CE(sat)}$ versus I_C

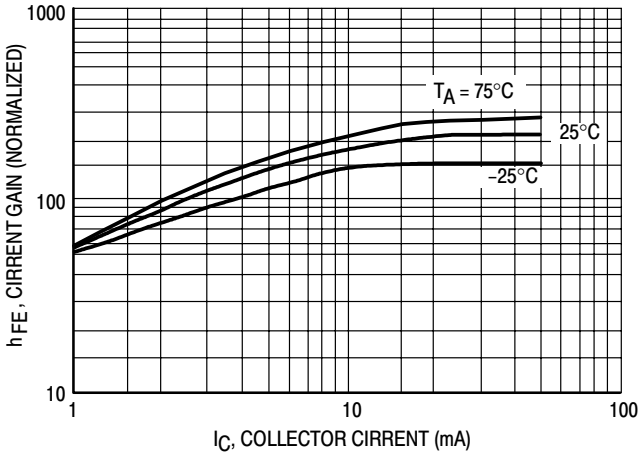


Figure 13. DC Current Gain

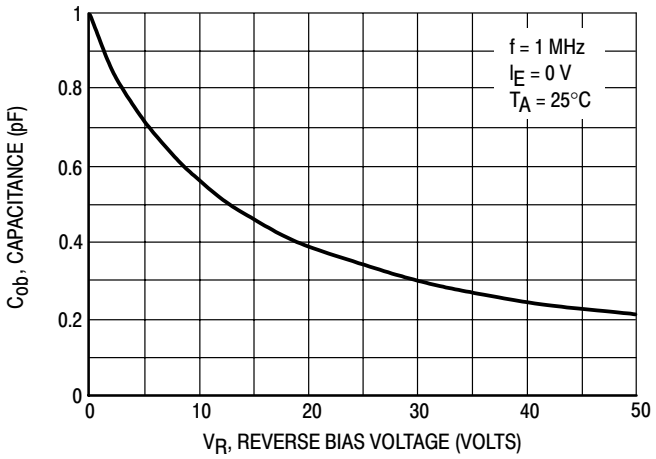


Figure 14. Output Capacitance

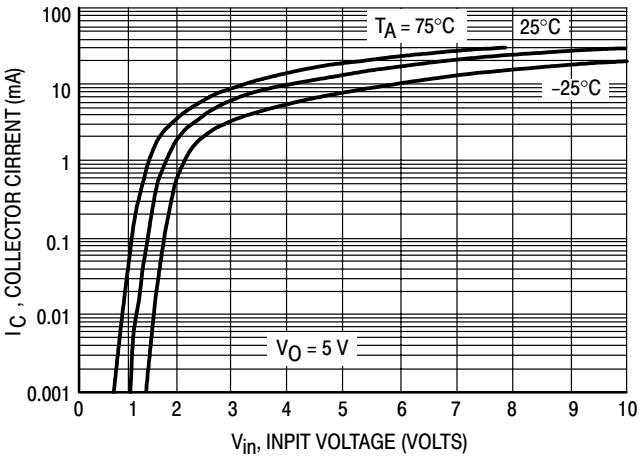


Figure 15. Output Current versus Input Voltage

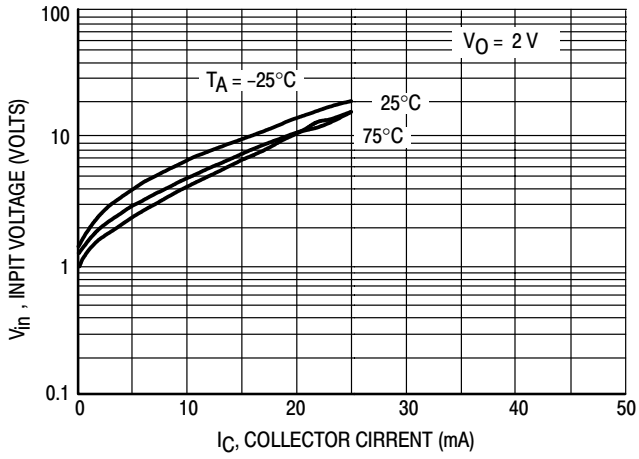


Figure 16. Input Voltage versus Output Current

DEVICE CHARACTERISTICS

MUN211 Series

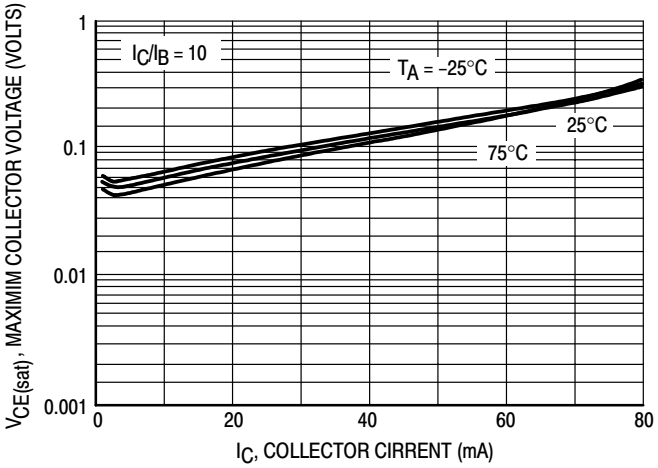


Figure 17. $V_{CE(sat)}$ versus I_C

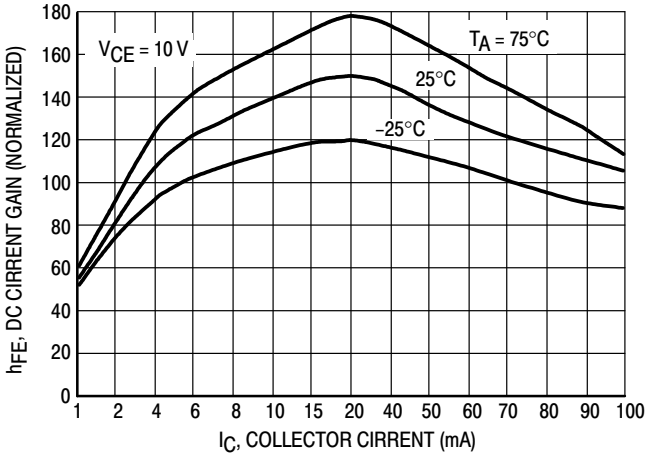


Figure 18. DC Current Gain

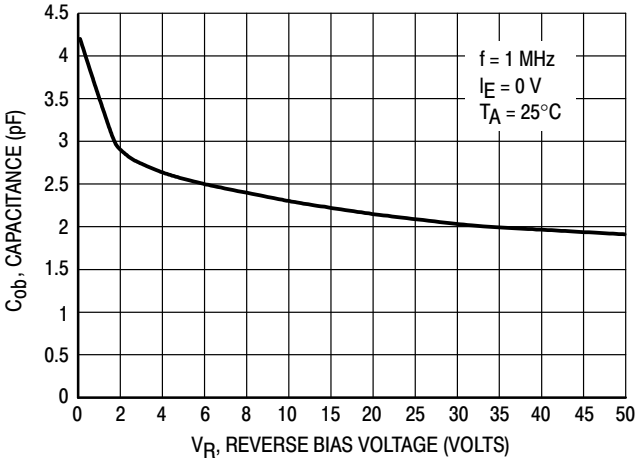


Figure 19. Output Capacitance

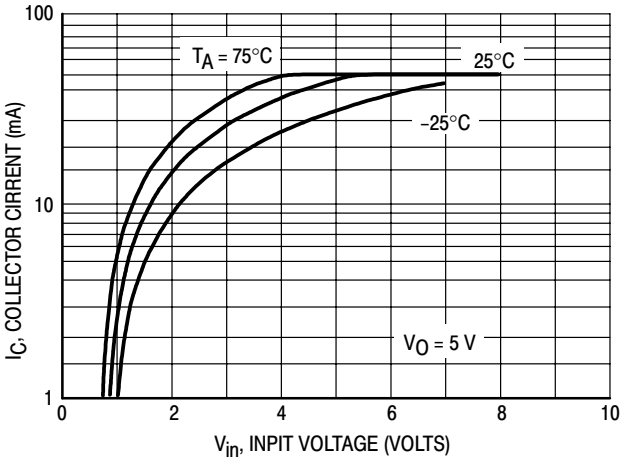


Figure 20. Output Current versus Input Voltage

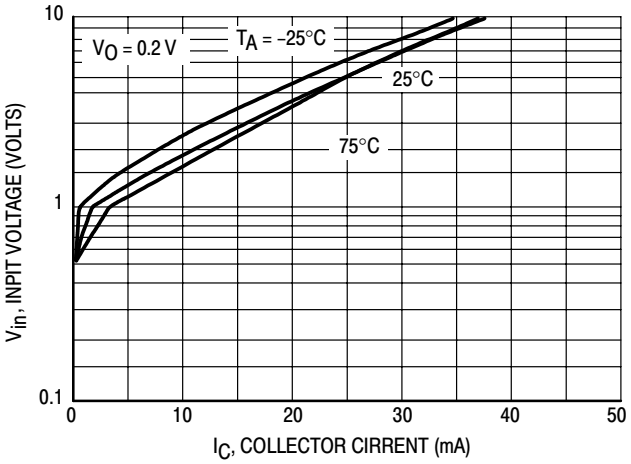


Figure 21. Input Voltage versus Output Current

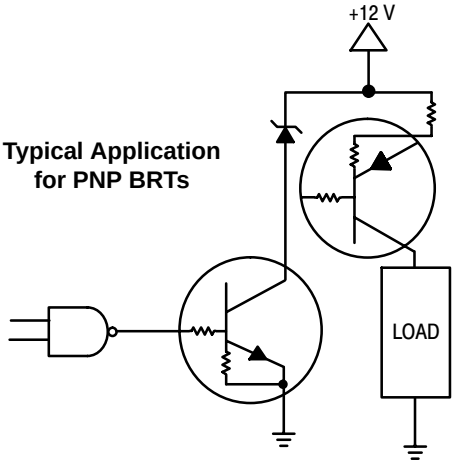
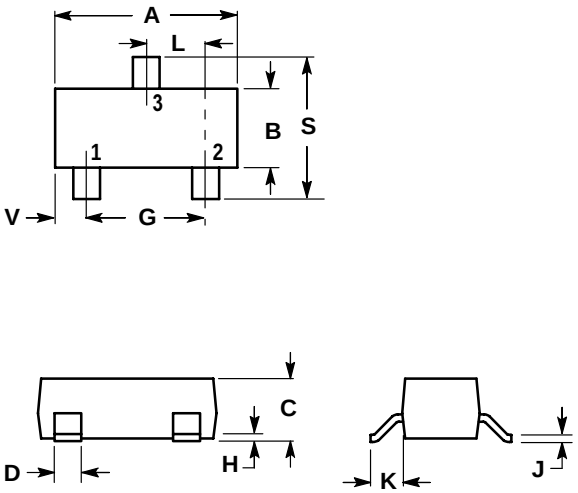


Figure 22. Inexpensive, Unregulated Current Source

PACKAGE OUTLINE & DIMENSIONS

MUN211 Series

SOT-23



NOTES:

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

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.1102	0.1197	2.80	3.04
B	0.0472	0.0551	1.20	1.40
C	0.0350	0.0440	0.89	1.11
D	0.0150	0.0200	0.37	0.50
G	0.0701	0.0807	1.78	2.04
H	0.0005	0.0040	0.013	0.100
J	0.0034	0.0070	0.085	0.177
K	0.0140	0.0285	0.35	0.69
L	0.0350	0.0401	0.89	1.02
S	0.0830	0.1039	2.10	2.64
V	0.0177	0.0236	0.45	0.60

PIN 1. BASE
2. EMITTER
3. COLLECTOR