

# Bias Resistor Transistor

## PNP Silicon Surface Mount Transistor with Monolithic Bias Resistor Network

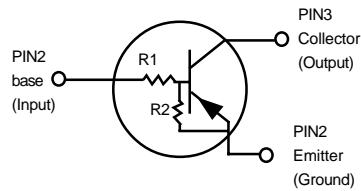
This new series of digital transistors is designed to replace a single device and its external resistor bias network. The BRT (Bias Resistor Transistor) contains a single transistor with a monolithic bias network consisting of two resistors; a series base resistor and a base-emitter resistor. The BRT 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
- 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.



MUN2111RT1  
MUN2112RT1  
MUN2113RT1  
MUN2114RT1  
MUN2115RT1  
MUN2116RT1  
MUN2130RT1  
MUN2131RT1  
MUN2132RT1  
MUN2133RT1  
MUN2134RT1

PNP SILICON  
BIAS RESISTOR  
TRANSISTOR



CASE 318-03, STYLE 1  
(SC-59)

### MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ 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
Total Power Dissipation @ $T_A = 25^\circ\text{C}$ <sup>(1)</sup>	$P_D$	200	mW
Derate above $25^\circ\text{C}$		1.6	mW/ $^\circ\text{C}$

### THERMAL CHARACTERISTICS

Rating	Symbol	Value	Unit
Thermal Resistance — Junction-to-Ambient (surface mounted)	$R_{\theta JA}$	625	$^\circ\text{C}/\text{W}$
Operating and Storage Temperature Range	$T_J, T_{stg}$	-65 to +150	$^\circ\text{C}$
Maximum Temperature for Soldering Purposes		260	$^\circ\text{C}$
Time in Solder Bath	$T_L$	10	Sec

### DEVICE MARKING AND RESISTOR VALUES

Device	Marking	R1 (K)	R2 (K)
MUN2111RT1	6A	10	10
MUN2112RT1	6B	22	22
MUN2113RT1	6C	47	47
MUN2114RT1	6D	10	47
MUN2115RT1 <sup>(2)</sup>	6E	10	$\infty$
MUN2116RT1 <sup>(2)</sup>	6F	4.7	$\infty$
MUN2130RT1 <sup>(2)</sup>	6G	1.0	1.0
MUN2131RT1 <sup>(2)</sup>	6H	2.2	2.2
MUN2132RT1 <sup>(2)</sup>	6J	4.7	4.7
MUN2133RT1 <sup>(2)</sup>	6K	4.7	47
MUN2134RT1 <sup>(2)</sup>	6L	22	47

1. Device mounted on a FR-4 glass epoxy printed circuit board using the minimum recommended footprint.
2. New devices. Updated curves to follow in subsequent data sheets.

## MUN2111RT1 SERIES

### ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
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#### OFF CHARACTERISTICS

Collector-Base Cutoff Current (V <sub>CB</sub> =50V, I <sub>E</sub> = 0)	I <sub>CBO</sub>	-	-	100	nAdc	
Collector-Emitter Cutoff Current (V <sub>CE</sub> = 50 V, I <sub>B</sub> = 0)	I <sub>CEO</sub>	-	-	500	nAdc	
Emitter-Base Cutoff Current (V <sub>EB</sub> = 6.0 V, I <sub>C</sub> = 0)	MUN2111RT1	I <sub>EBO</sub>	-	-	0.5	mAdc
	MUN2112RT1		-	-	0.2	
	MUN2113RT1		-	-	0.1	
	MUN2114RT1		-	-	0.2	
	MUN2115RT1		-	-	0.9	
	MUN2116RT1		-	-	1.9	
	MUN2130RT1		-	-	4.3	
	MUN2131RT1		-	-	2.3	
	MUN2132RT1		-	-	1.5	
	MUN2133RT1		-	-	0.18	
MUN2134RT1		-	-	0.13		
Collector-Base Breakdown Voltage (I <sub>C</sub> = 10 μA, I <sub>E</sub> = 0)	V <sub>(BR)CBO</sub>	50	-	-	Vdc	
Collector-Emitter Breakdown Voltage <sup>(3)</sup> (I <sub>C</sub> =2.0mA, I <sub>B</sub> =0)	V <sub>(BR)CEO</sub>	50	-	-	Vdc	

#### ON CHARACTERISTICS <sup>(3)</sup>

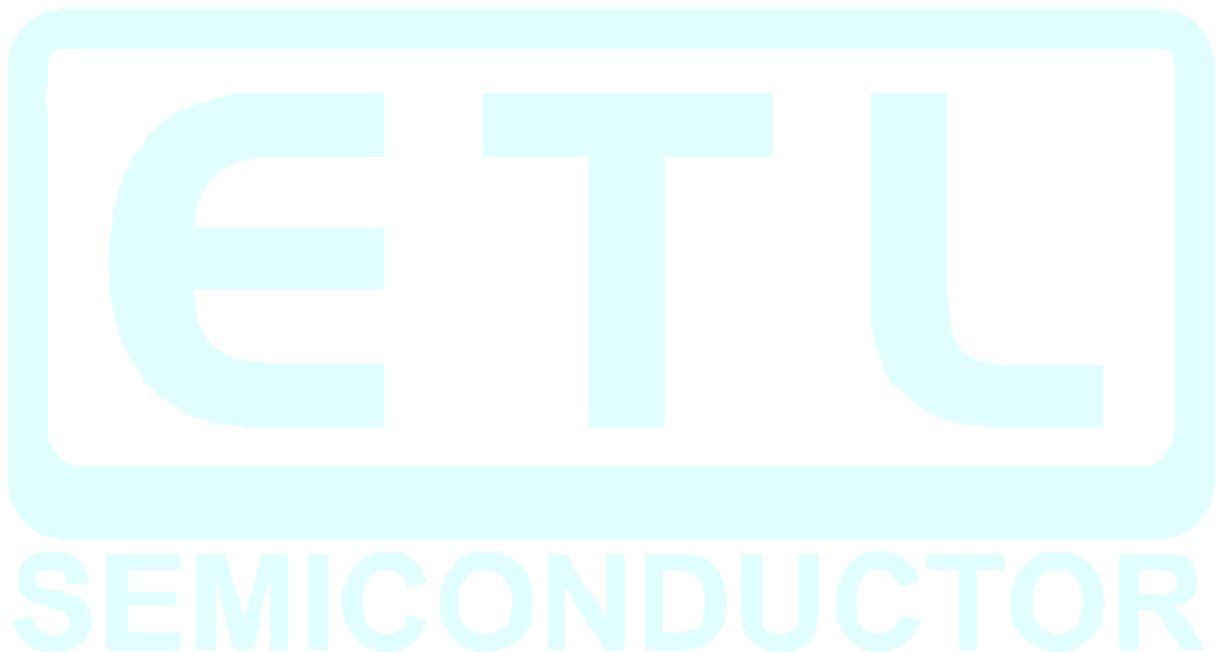
DC Current Gain (V <sub>CE</sub> = 10 V, I <sub>C</sub> = 5.0 mA)	MUN2111RT1	h <sub>FE</sub>	35	60	-
	MUN2112RT1		60	100	-
	MUN2113RT1		80	140	-
	MUN2114RT1		80	140	-
	MUN2115RT1		160	250	-
	MUN2116RT1		160	250	-
	MUN2130RT1		3.0	5.0	-
	MUN2131RT1		8.0	15	-
	MUN2132RT1		15	27	-
	MUN2133RT1		80	140	-
MUN2134RT1		80	130	-	
Collector-Emitter Saturation Voltage (I <sub>C</sub> =10mA, I <sub>E</sub> =0.3mA)	V <sub>CE(sat)</sub>				Vdc
(I <sub>C</sub> = 10 mA, I <sub>B</sub> = 0.3 mA)	MUN2111RT1 MUN2112RT1 MUN2113RT1 MUN2114RT1 MUN2115RT1 MUN2130RT1		-	-	0.25
(I <sub>C</sub> = 10 mA, I <sub>B</sub> = 5.0 mA)	MUN2131RT1		-	-	0.25
(I <sub>C</sub> = 10 mA, I <sub>B</sub> = 1.0 mA)	MUN2116RT1 MUN2132RT1 MUN2134RT1		-	-	0.25
Output Voltage (on)	V <sub>OL</sub>				Vdc
(V <sub>CC</sub> =5.0V, V <sub>B</sub> =2.5V, R <sub>L</sub> =1.0kΩ)	MUN2111RT1 MUN2112RT1 MUN2114RT1 MUN2115RT1 MUN2116RT1 MUN2130RT1 MUN2131RT1 MUN2132RT1 MUN2133RT1 MUN2134RT1		-	-	0.2
(V <sub>CC</sub> =5.0V, V <sub>B</sub> =3.5V, R <sub>L</sub> = 1.0kΩ)	MUN2113RT1		-	-	0.2

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

## MUN211RT1 SERIES

### ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C unless otherwise noted) (Continued)

Characteristic	Symbol	Min	Typ	Max	Unit
Output Voltage (off) (V <sub>CC</sub> = 5.0V, V <sub>B</sub> = 0.5 V, R <sub>L</sub> = 1.0kΩ) (V <sub>CC</sub> = 5.0V, V <sub>B</sub> = 0.050 V, R <sub>L</sub> =1.0kΩ)    MUN2130RT1 (V <sub>CC</sub> = 5.0V, V <sub>B</sub> = 0.25 V, R <sub>L</sub> =1.0kΩ)    MUN2115RT1 MUN2116RT1 MUN2131RT1 MUN2132RT1	V <sub>OH</sub>	4.9	—	—	Vdc
Input Resistor                                   MUN2111RT1 MUN2112RT1 MUN2113RT1 MUN2114RT1 MUN2115RT1 MUN2116RT1 MUN2130RT1 MUN2131RT1 MUN2132RT1 MUN2133RT1 MUN2134RT1	R <sub>1</sub>	7.0 15.4 32.9 7.0 7.0 3.3 0.7 1.5 3.3 3.3 15.4	10 22 47 10 10 4.7 1.0 2.2 4.7 4.7 22	13 28.6 61.1 13 13 6.1 1.3 2.9 6.1 6.1 28.6	kΩ
Resistor Ratio   MUN2111RT1   MUN2112RT1   MUN2113RT1 MUN2114RT1 MUN2115RT1   MUN2116RT1 MUN2130RT1   MUN2131RT1   MUN2132RT1 MUN2133RT1 MUN2134RT1	R <sub>1</sub> /R <sub>2</sub>	0.8 0.17 — 0.8 0.055 0.38	1.0 0.21 — 1.0 0.1 0.47	1.2 0.25 — 1.2 0.185 0.56	



TYPICAL ELECTRICAL CHARACTERISTICS  
MUN2111RT1

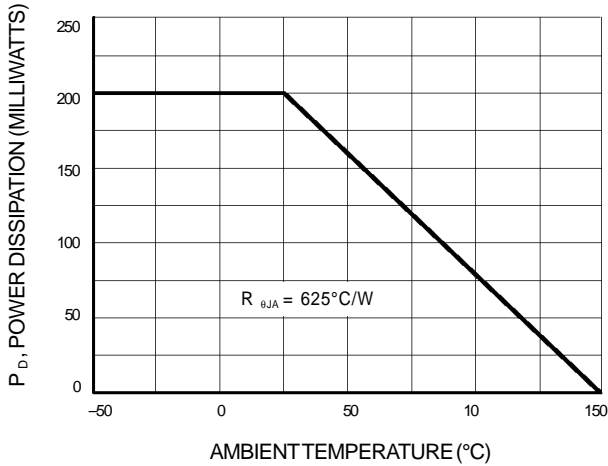


Figure 1. Derating Curve

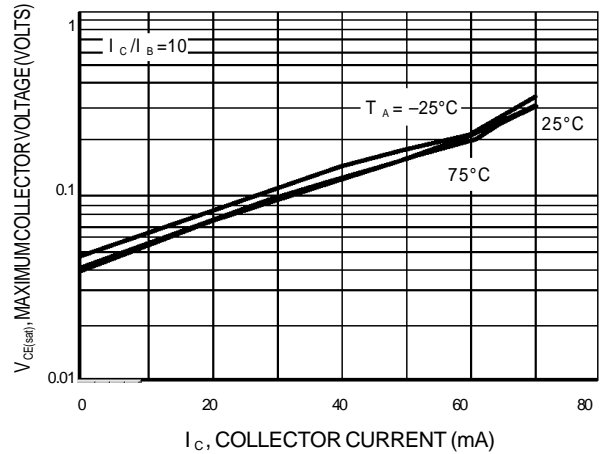


Figure 2.  $V_{CE(sat)}$  versus  $I_C$

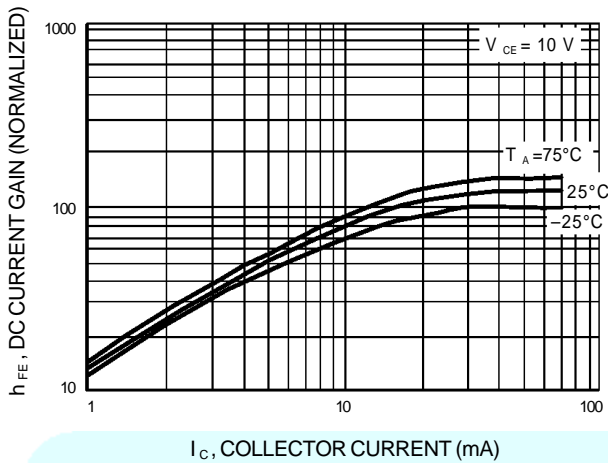


Figure 3. DC Current Gain

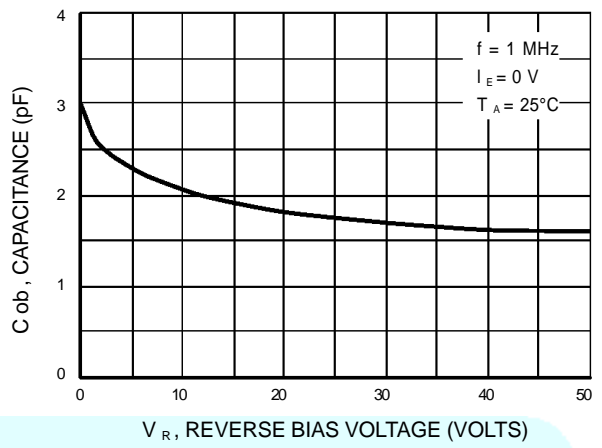


Figure 4. Output Capacitance

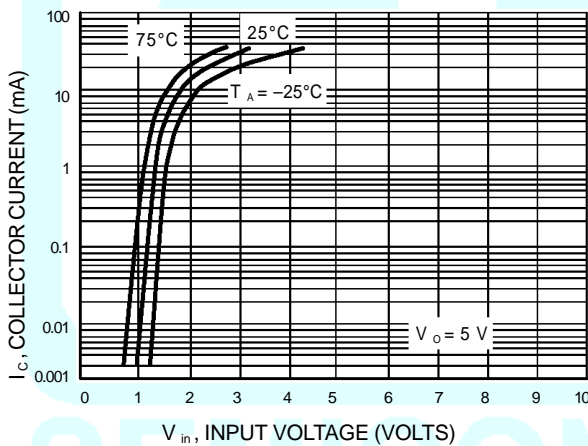


Figure 5. Output Current versus Input Voltage

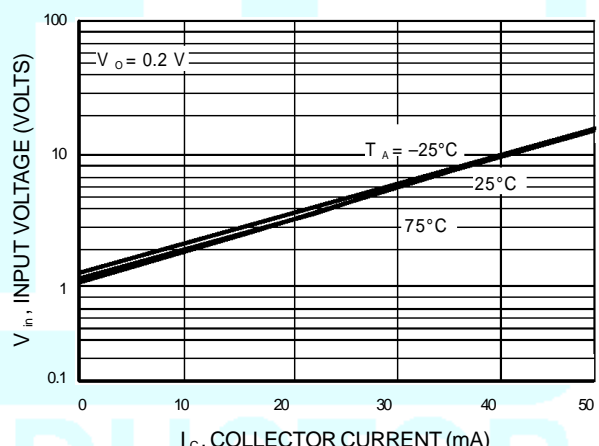
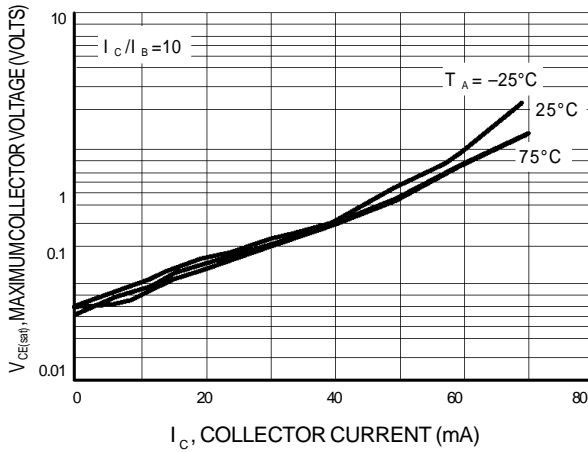


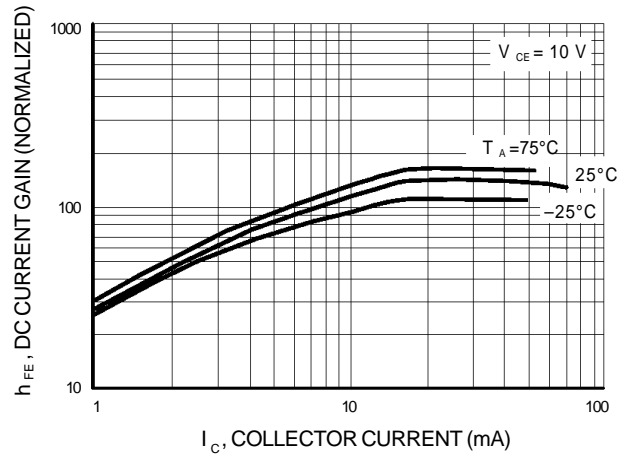
Figure 6. Input Voltage versus Output Current

## MUN2111RT1 SERIES

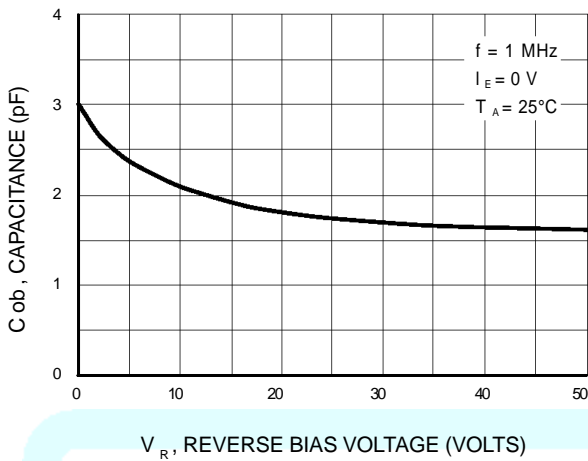
### TYPICAL ELECTRICAL CHARACTERISTICS MUN2112RT1



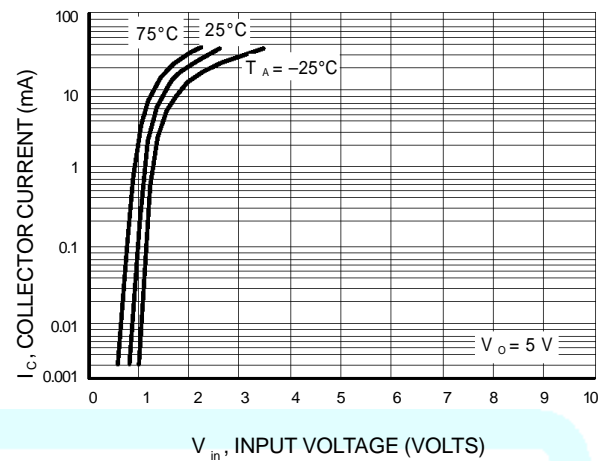
**Figure 7.  $V_{CE(sat)}$  versus  $I_C$**



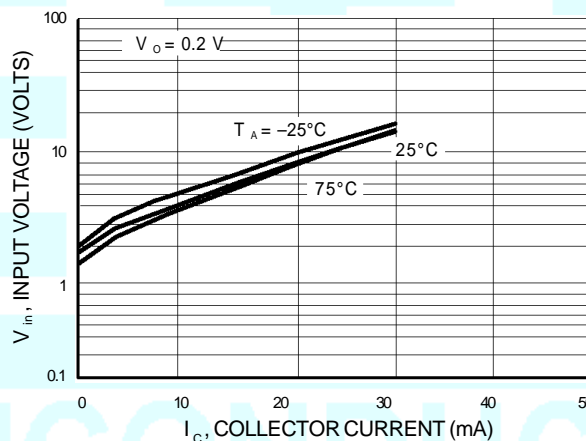
**Figure 8. DC Current Gain**



**Figure 9. Output Capacitance**

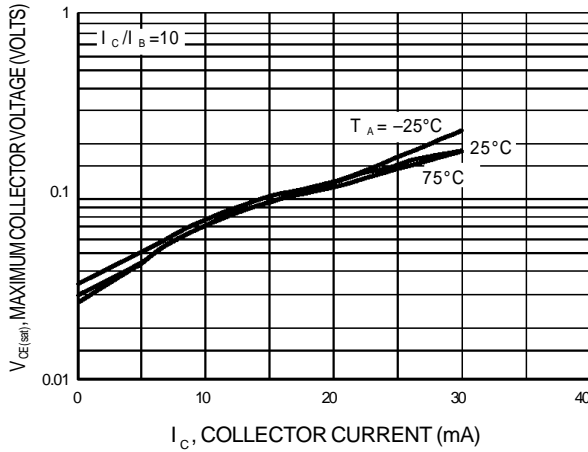


**Figure 10. Output Current versus Input Voltage**

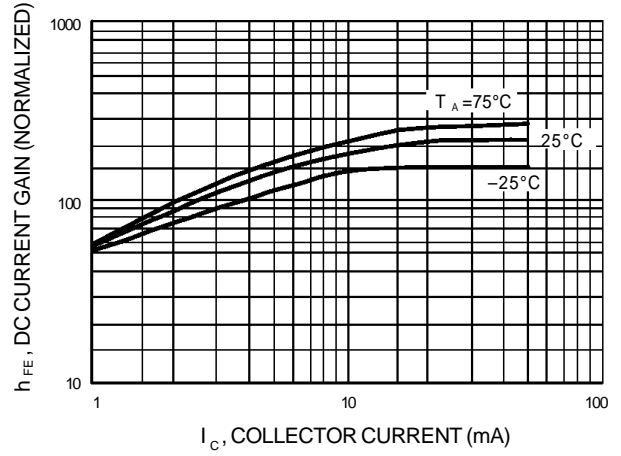


**Figure 11. Input Voltage versus Output Current**

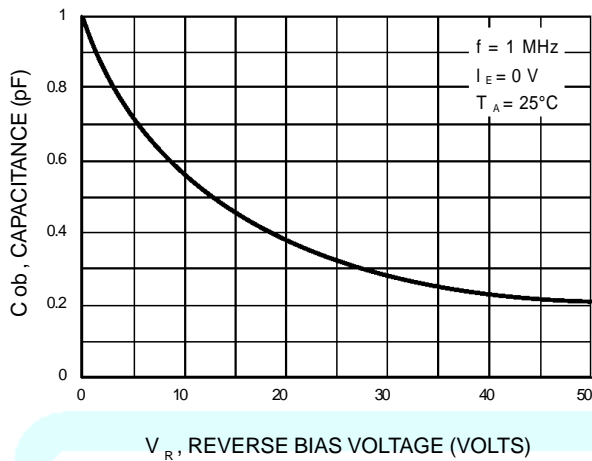
TYPICAL ELECTRICAL CHARACTERISTICS  
MUN2113RT1



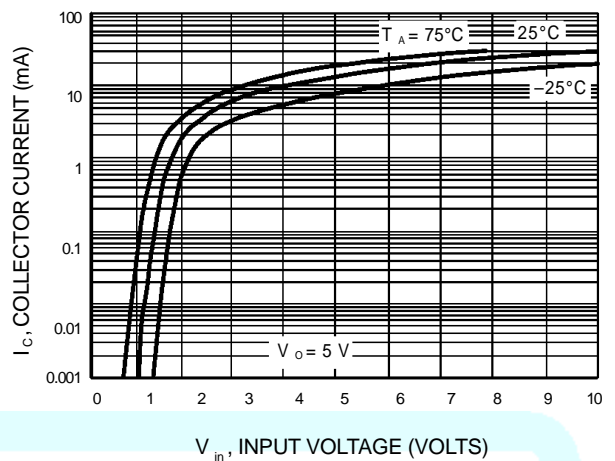
**Figure 12.  $V_{CE(sat)}$  versus  $I_C$**



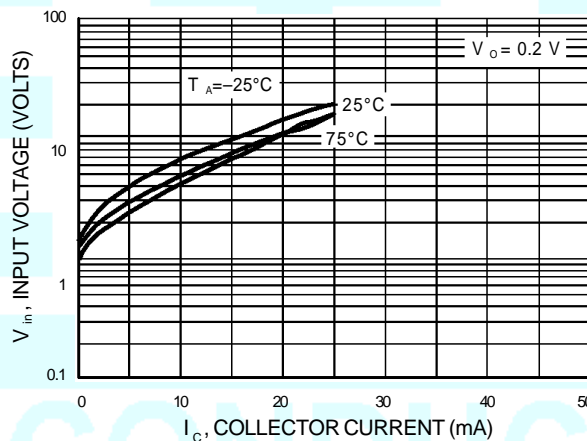
**Figure 13. DC Current Gain**



**Figure 14. Output Capacitance**



**Figure 15. Output Current versus Input Voltage**



**Figure 16. Input Voltage versus Output Current**

TYPICAL ELECTRICAL CHARACTERISTICS  
MUN2114RT1

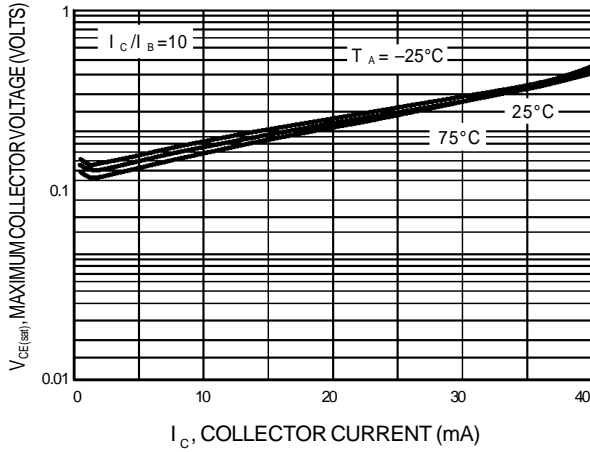


Figure 17.  $V_{CE(sat)}$  versus  $I_C$

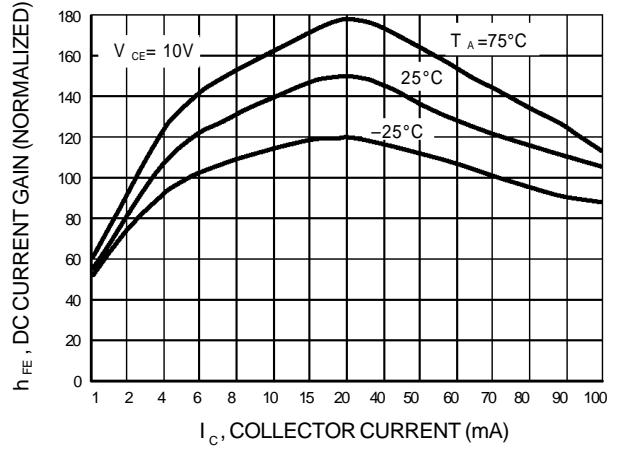


Figure 18. DC Current Gain

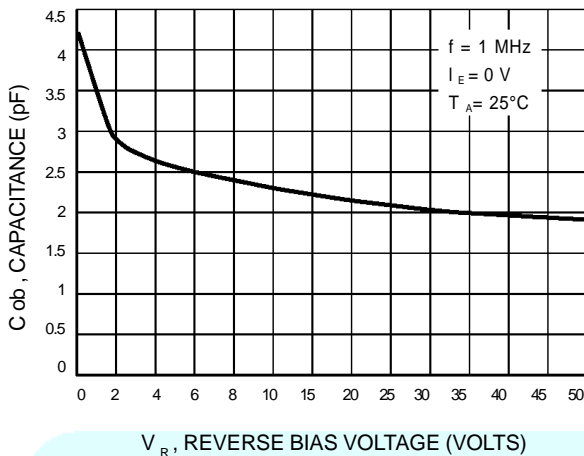


Figure 19. Output Capacitance

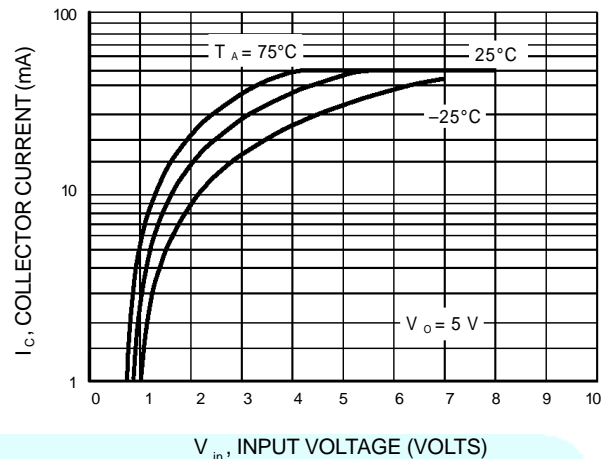


Figure 20. Output Current versus Input Voltage

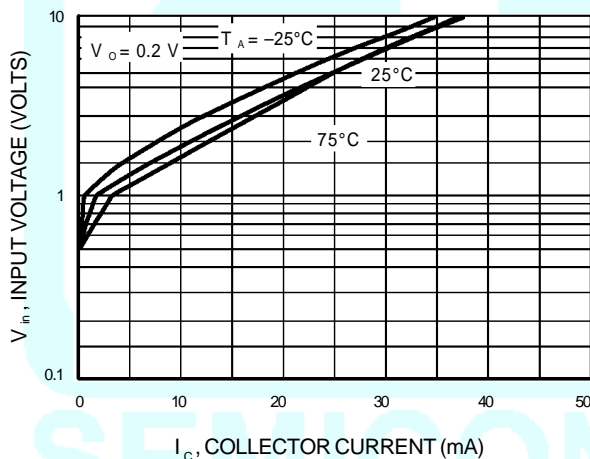


Figure 21. Input Voltage versus Output Current

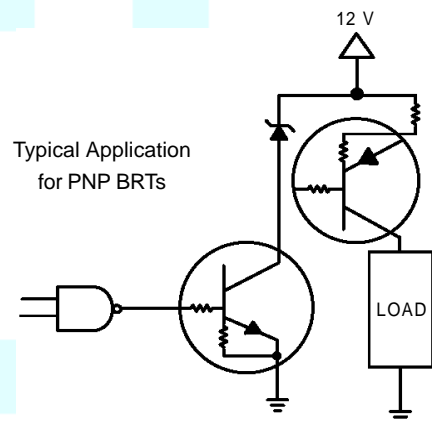


Figure 22. Inexpensive, Unregulated Current Source