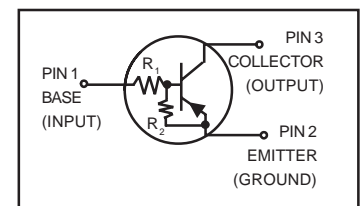


## Bias Resistor Transistors

### 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 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.
- Available in 8 mm embossed tape and reel. Use the Device Number to order the 7 inch/3000 unit reel. Replace “T1” with “T3” in the Device Number to order the 13 inch/10,000 unit reel.
- We declare that the material of product compliance with RoHS requirements.
- S- prefix for automotive and other applications requiring unique site and control change requirements; AEC-Q101 qualified and PPAP capable.



#### 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

#### THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Total Device Dissipation $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	246 (Note 1.) 400 (Note 2.) 1.5 (Note 1.) 2.0 (Note 2.)	mW $^\circ\text{C/W}$
Thermal Resistance – Junction-to-Ambient	$R_{\theta JA}$	508 (Note 1.) 311 (Note 2.)	$^\circ\text{C/W}$
Thermal Resistance – Junction-to-Lead	$R_{\theta JL}$	174 (Note 1.) 208 (Note 2.)	$^\circ\text{C/W}$
Junction and Storage Temperature Range	$T_J, T_{stg}$	-55 to +150	$^\circ\text{C}$

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
LMUN2110LT1G LMUN2110LT3G	SOT-23	A6O	47	∞	3000/Tape & Reel 10,000/Tape & Reel
LMUN2111LT1G LMUN2111LT3G	SOT-23	A6A	10	10	3000/Tape & Reel 10,000/Tape & Reel
LMUN2112LT1G LMUN2112LT3G	SOT-23	A6B	22	22	3000/Tape & Reel 10,000/Tape & Reel
LMUN2113LT1G LMUN2113LT3G	SOT-23	A6C	47	47	3000/Tape & Reel 10,000/Tape & Reel
LMUN2114LT1G LMUN2114LT3G	SOT-23	A6D	10	47	3000/Tape & Reel 10,000/Tape & Reel
LMUN2115LT1G (Note 3.) LMUN2115LT3G	SOT-23	A6E	10	∞	3000/Tape & Reel 10,000/Tape & Reel
LMUN2116LT1G (Note 3.) LMUN2116LT3G	SOT-23	A6F	4.7	∞	3000/Tape & Reel 10,000/Tape & Reel
LMUN2130LT1G (Note 3.) LMUN2130LT3G	SOT-23	A6G	1.0	1.0	3000/Tape & Reel 10,000/Tape & Reel
LMUN2131LT1G (Note 3.) LMUN2131LT3G	SOT-23	A6H	2.2	2.2	3000/Tape & Reel 10,000/Tape & Reel
LMUN2132LT1G (Note 3.) LMUN2132LT3G	SOT-23	A6J	4.7	4.7	3000/Tape & Reel 10,000/Tape & Reel
LMUN2133LT1G (Note 3.) LMUN2133LT3G	SOT-23	A6K	4.7	47	3000/Tape & Reel 10,000/Tape & Reel
LMUN2134LT1G (Note 3.) LMUN2134LT3G	SOT-23	A6L	22	47	3000/Tape & Reel 10,000/Tape & Reel

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

Characteristic	Symbol	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>					
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 ( $V_{EB} = 6.0\text{ V}$ , $I_C = 0$ )	LMUN2110LT1G	–	–	0.1	mAdc
	LMUN2111LT1G	–	–	0.5	
	LMUN2112LT1G	–	–	0.2	
	LMUN2113LT1G	–	–	0.1	
	LMUN2114LT1G	–	–	0.2	
	LMUN2115LT1G	–	–	0.9	
	LMUN2116LT1G	–	–	1.9	
	LMUN2130LT1G	–	–	4.3	
	LMUN2131LT1G	–	–	2.3	
	LMUN2132LT1G	–	–	1.5	
	LMUN2133LT1G	–	–	0.18	
	LMUN2134LT1G	–	–	0.13	
Collector-Base Breakdown Voltage ( $I_C = 10\ \mu\text{A}$ , $I_E = 0$ )	$V_{(BR)CBO}$	50	–	–	Vdc
Collector-Emitter Breakdown Voltage (Note 4.) ( $I_C = 2.0\text{ mA}$ , $I_B = 0$ )	$V_{(BR)CEO}$	50	–	–	Vdc

3. New devices. Updated curves to follow in subsequent data sheets.

4. Pulse Test: Pulse Width < 300  $\mu\text{s}$ , Duty Cycle < 2.0%

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

Characteristic	Symbol	Min	Typ	Max	Unit	
<b>ON CHARACTERISTICS (Note 5.)</b>						
DC Current Gain (V <sub>CE</sub> = 10 V, I <sub>C</sub> = 5.0 mA)	LMUN2110LT1G LMUN2111LT1G LMUN2112LT1G LMUN2113LT1G LMUN2114LT1G LMUN2115LT1G LMUN2116LT1G LMUN2130LT1G LMUN2131LT1G LMUN2132LT1G LMUN2133LT1G LMUN2134LT1G	h <sub>FE</sub>	80 35 60 80 80 160 160 3.0 8.0 15 80 80	140 60 100 140 140 250 250 5.0 15 27 140 130	– – – – – – – – – – – –	
Collector-Emitter Saturation Voltage (I <sub>C</sub> = 10 mA, I <sub>B</sub> = 0.3 mA) (I <sub>C</sub> = 10 mA, I <sub>B</sub> = 5 mA) LMUN2130LT1G/LMUN2131LT1G (I <sub>C</sub> = 10 mA, I <sub>B</sub> = 1 mA) LMUN2115LT1G/LMUN2116LT1G/ LMUN2132LT1G/LMUN2133LT1G/LMUN2134LT1G		V <sub>CE(sat)</sub>	–	–	0.25	Vdc
Output Voltage (on) (V <sub>CC</sub> = 5.0 V, V <sub>B</sub> = 2.5 V, R <sub>L</sub> = 1.0 kΩ)	LMUN2110LT1G LMUN2114LT1G LMUN2111LT1G LMUN2112LT1G LMUN2114LT1G LMUN2115LT1G LMUN2116LT1G LMUN2130LT1G LMUN2131LT1G LMUN2132LT1G LMUN2133LT1G LMUN2134LT1G LMUN2113LT1G	V <sub>OL</sub>	– – – – – – – – – – – – – –	– – – – – – – – – – – – – –	0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2	Vdc
Output Voltage (off) (V <sub>CC</sub> = 5.0 V, V <sub>B</sub> = 0.5 V, R <sub>L</sub> = 1.0 kΩ) (V <sub>CC</sub> = 5.0 V, V <sub>B</sub> = 0.25 V, R <sub>L</sub> = 1.0 kΩ)  (V <sub>CC</sub> = 5.0 V, V <sub>B</sub> = 0.050 V, R <sub>L</sub> = 1.0 kΩ)	LMUN2115LT1G LMUN2116LT1G LMUN2131LT1G LMUN2132LT1G LMUN2130LT1G	V <sub>OH</sub>	4.9	–	–	Vdc
Input Resistor	LMUN2110LT1G LMUN2111LT1G LMUN2112LT1G LMUN2113LT1G LMUN2114LT1G LMUN2115LT1G LMUN2116LT1G LMUN2130LT1G LMUN2131LT1G LMUN2132LT1G LMUN2133LT1G LMUN2134LT1G	R <sub>1</sub>	32.9 7.0 15.4 32.9 7.0 7.0 3.3 0.7 1.5 3.3 3.3 15.4	47 10 22 47 10 10 4.7 1.0 2.2 4.7 4.7 22	61.1 13 28.6 61.1 13 13 6.1 1.3 2.9 6.1 6.1 28.6	k Ω
Resistor Ratio	LMUN2111LT1G/LMUN2112LT1G/LMUN2113LT1G LMUN2114LT1G LMUN2115LT1G/LMUN2116LT1G/LMUN2110LT1G LMUN2130LT1G/LMUN2131LT1G/LMUN2132LT1G LMUN2133LT1G	R <sub>1</sub> /R <sub>2</sub>	0.8 0.17 – 0.8 0.055	1.0 0.21 – 1.0 0.1	1.2 0.25 – 1.2 0.185	

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

## TYPICAL ELECTRICAL CHARACTERISTICS LMUN2111LT1G

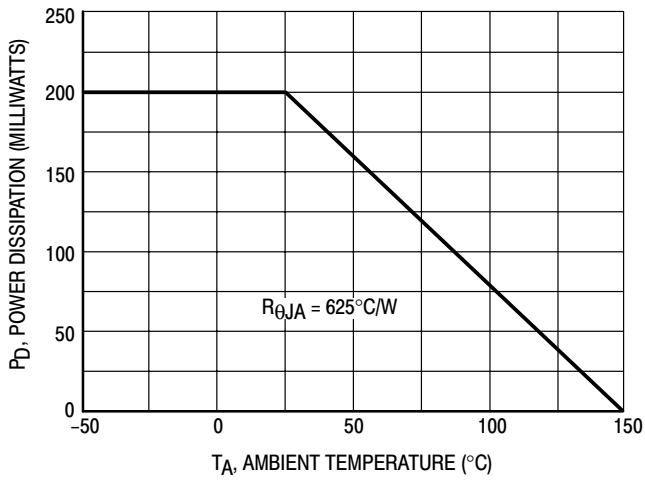


Figure 1. Derating Curve

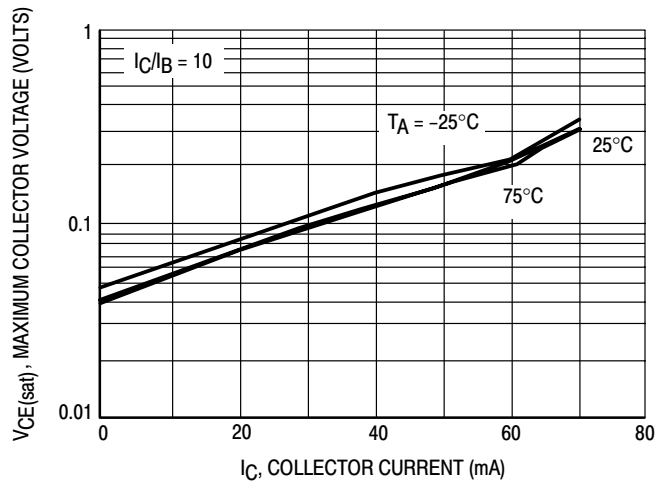


Figure 2.  $V_{CE(sat)}$  versus  $I_C$

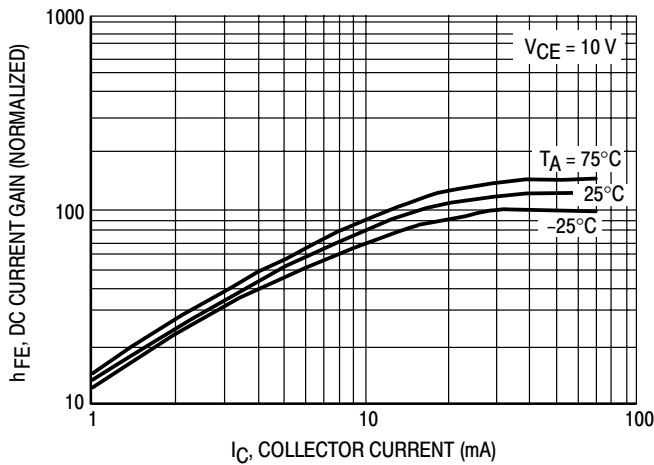


Figure 3. DC Current Gain

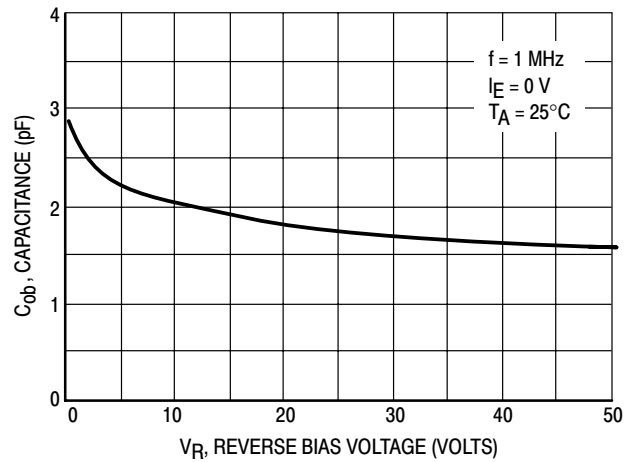


Figure 4. Output Capacitance

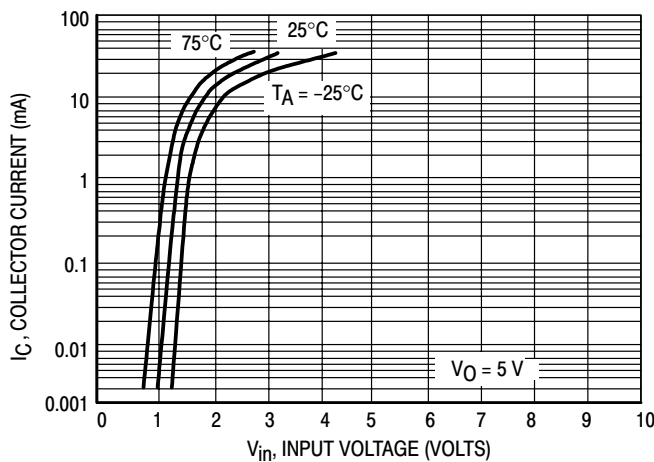


Figure 5. Output Current versus Input Voltage

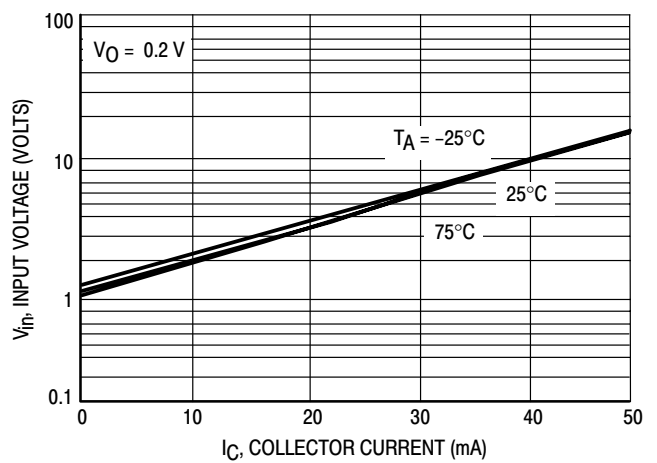


Figure 6. Input Voltage versus Output Current

## TYPICAL ELECTRICAL CHARACTERISTICS LMUN2112LT1G

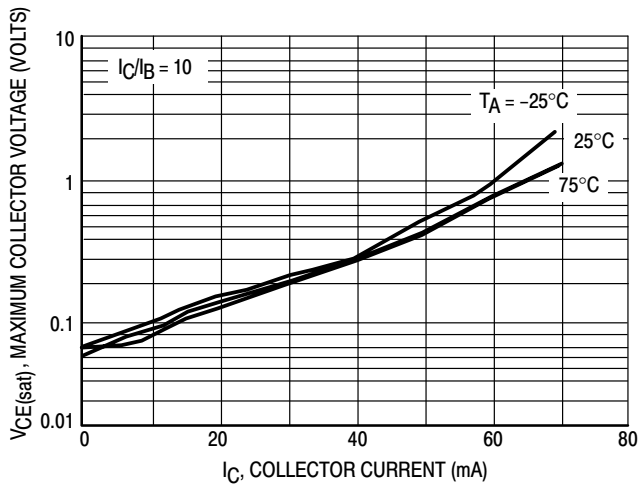


Figure 7.  $V_{CE(sat)}$  versus  $I_C$

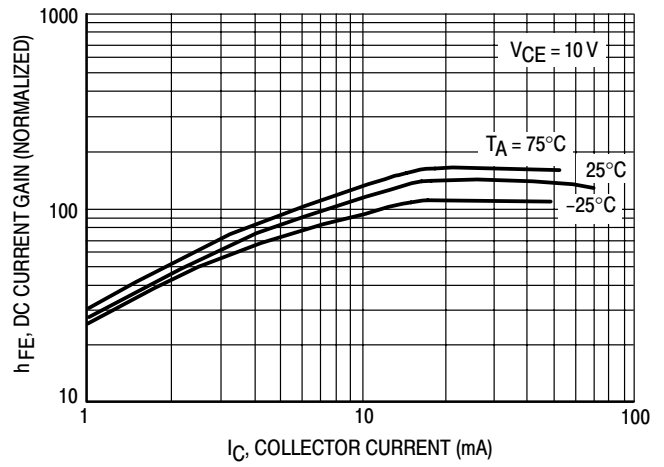


Figure 8. DC Current Gain

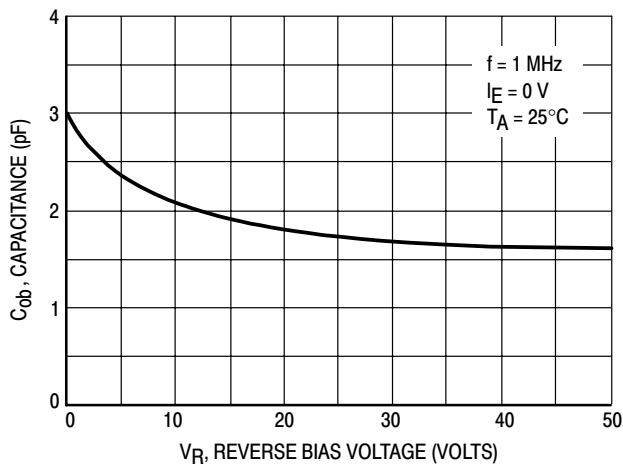


Figure 9. Output Capacitance

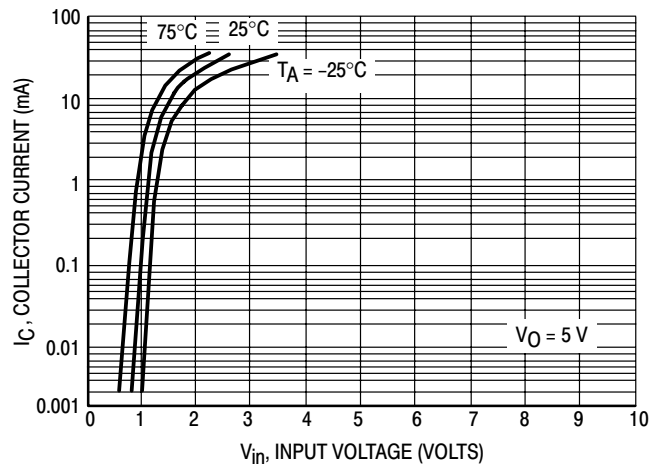


Figure 10. Output Current versus Input Voltage

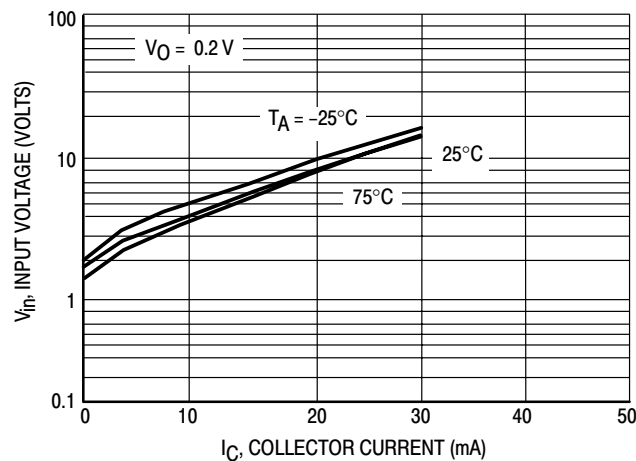


Figure 11. Input Voltage versus Output Current

## TYPICAL ELECTRICAL CHARACTERISTICS LMUN2113LT1G

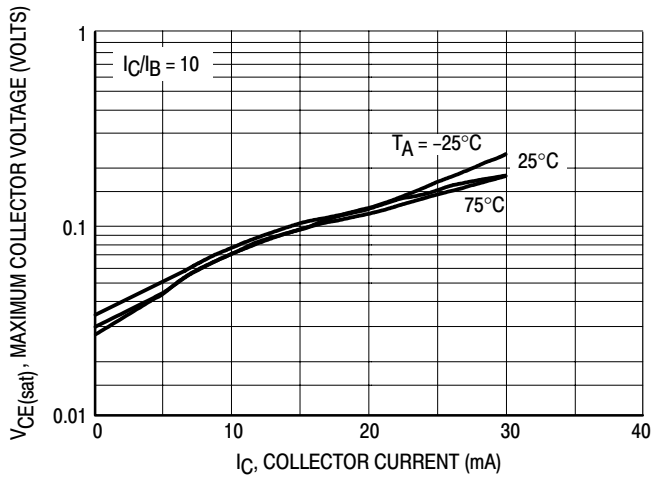


Figure 12.  $V_{CE(sat)}$  versus  $I_C$

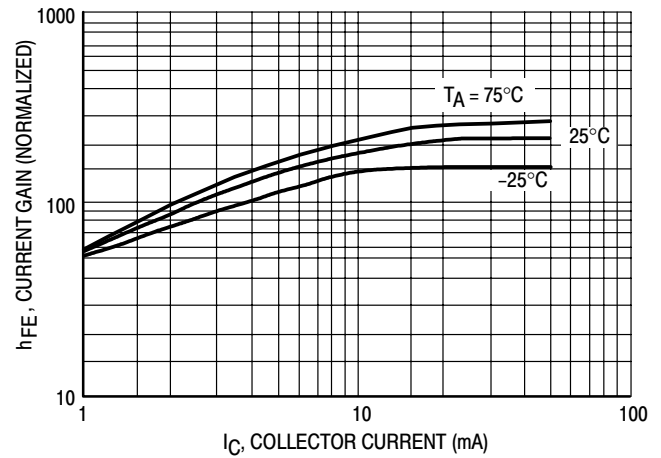


Figure 13. DC Current Gain

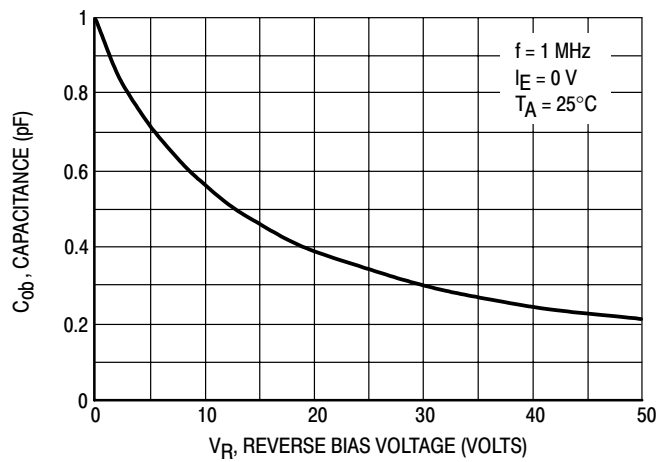


Figure 14. Output Capacitance

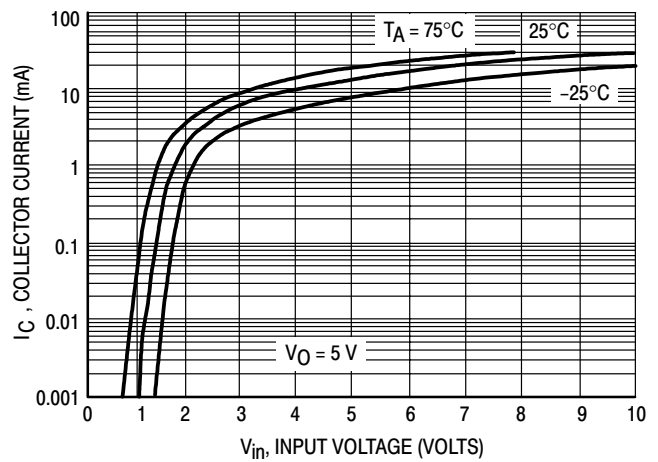


Figure 15. Output Current versus Input Voltage

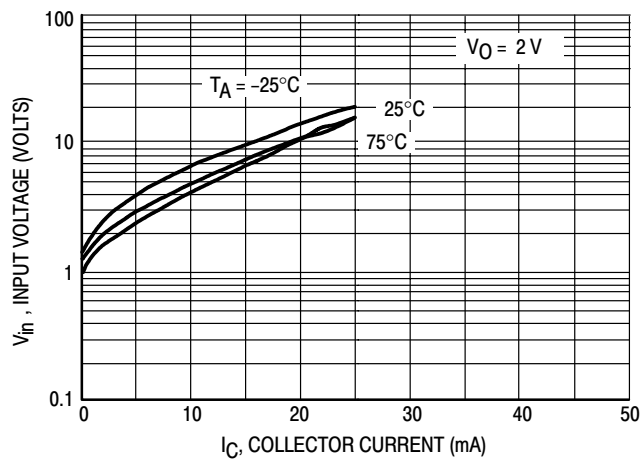


Figure 16. Input Voltage versus Output Current

## TYPICAL ELECTRICAL CHARACTERISTICS LMUN2114LT1G

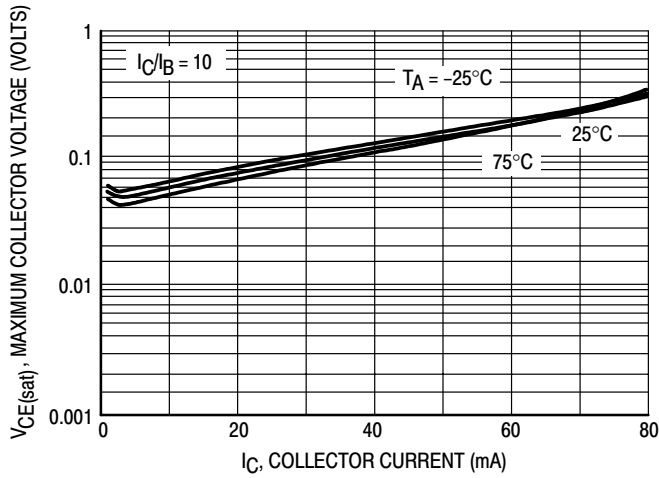


Figure 17.  $V_{CE(sat)}$  versus  $I_C$

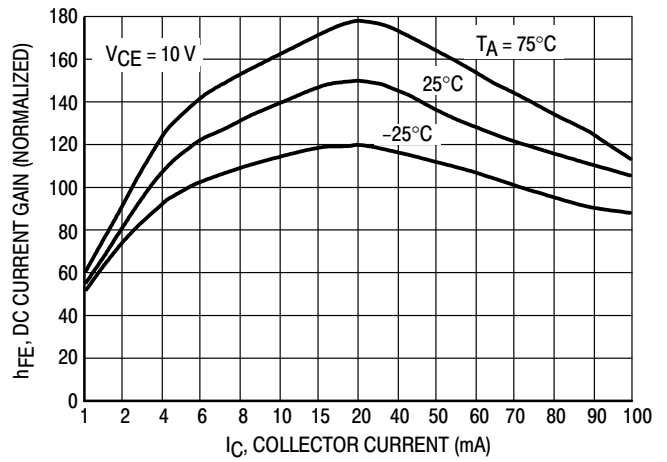


Figure 18. DC Current Gain

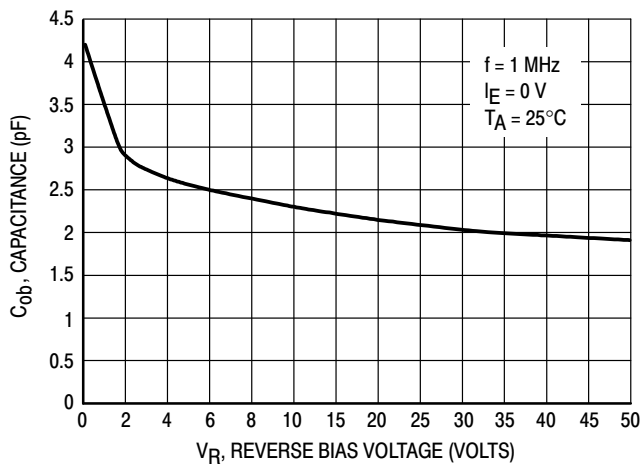


Figure 19. Output Capacitance

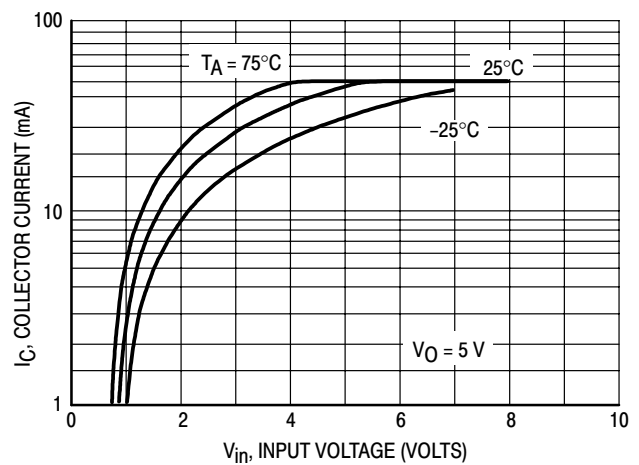


Figure 20. Output Current versus Input Voltage

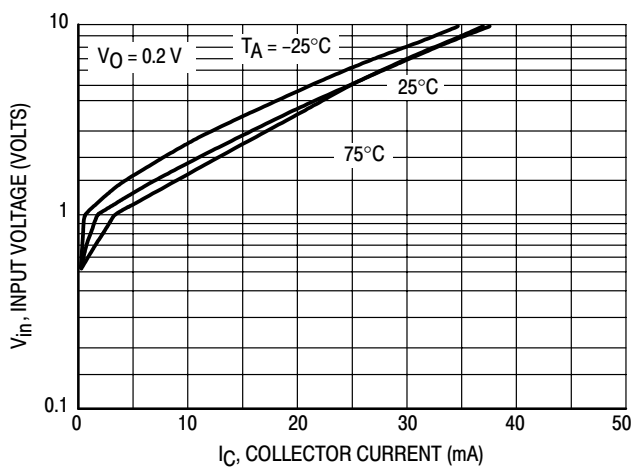


Figure 21. Input Voltage versus Output Current

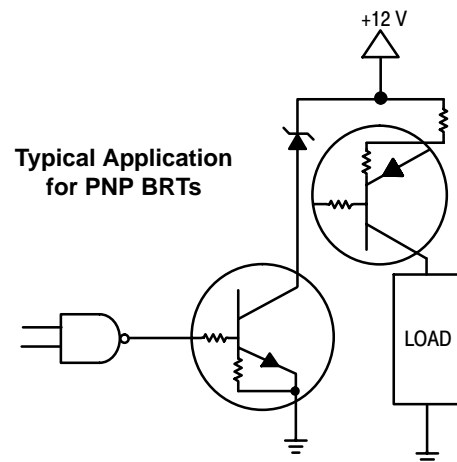
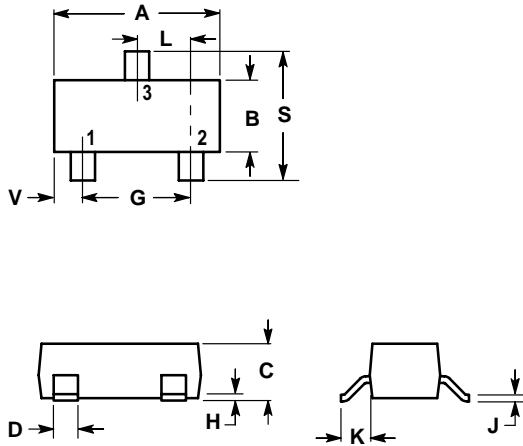


Figure 22. Inexpensive, Unregulated Current Source

## 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

