

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.

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

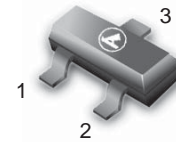
Rating	Symbol	Value	Unit
Collector-Base Voltage	V_{CBO}	50	Vdc
Collector-Emitter Voltage	V_{CEO}	50	Vdc
Collector Current	I_C	100	mAdc

THERMAL CHARACTERISTICS

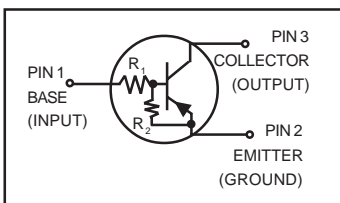
Characteristic	Symbol	Max	Unit
Total Device Dissipation $T_A = 25^\circ\text{C}$ Derate above 25°C	P_D	246 (Note 1.) 400 (Note 2.) 1.5 (Note 1.) 2.0 (Note 2.)	mW $^\circ\text{C}/\text{W}$
Thermal Resistance – Junction-to-Ambient	$R_{\theta JA}$	508 (Note 1.) 311 (Note 2.)	$^\circ\text{C}/\text{W}$
Thermal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

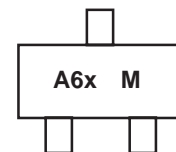
LMUN2111LT1 SERIES



SOT-23



MARKING DIAGRAM



A6x = Device Marking
x = A - L (See Page 2)
M = Date Code

DEVICE MARKING INFORMATION

See specific marking information in the device marking table on page 2 of this data sheet.

LMUN2111LT1 Series

DEVICE MARKING AND RESISTOR VALUES

Device	Package	Marking	R1 (K)	R2 (K)	Shipping
LMUN21110LT1 LMMUN2110LT3	SOT-23	A6O	47	∞	3000/Tape & Reel 10,000/Tape & Reel
LMUN2111LT1 LMMUN2111LT3	SOT-23	A6A	10	10	3000/Tape & Reel 10,000/Tape & Reel
LMUN2112LT1 LMUN2112LT3	SOT-23	A6B	22	22	3000/Tape & Reel 10,000/Tape & Reel
LMUN2113LT1 LMUN2113LT3	SOT-23	A6C	47	47	3000/Tape & Reel 10,000/Tape & Reel
LMUN2114LT1 LMUN2114LT3	SOT-23	A6D	10	47	3000/Tape & Reel 10,000/Tape & Reel
LMUN2115LT1 (Note 3.) LMUN2115LT3	SOT-23	A6E	10	∞	3000/Tape & Reel 10,000/Tape & Reel
LMUN2116LT1 (Note 3.) LMUN2116LT3	SOT-23	A6F	4.7	∞	3000/Tape & Reel 10,000/Tape & Reel
LMUN2130LT1 (Note 3.) LMUN2130LT3	SOT-23	A6G	1.0	1.0	3000/Tape & Reel 10,000/Tape & Reel
LMUN2131LT1 (Note 3.) LMUN2131LT3	SOT-23	A6H	2.2	2.2	3000/Tape & Reel 10,000/Tape & Reel
LMUN2132LT1 (Note 3.) LMUN2132LT3	SOT-23	A6J	4.7	4.7	3000/Tape & Reel 10,000/Tape & Reel
LMUN2133LT1 (Note 3.) LMUN2133LT3	SOT-23	A6K	4.7	47	3000/Tape & Reel 10,000/Tape & Reel
LMUN2134LT1 (Note 3.) LMUN2134LT3	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
----------------	--------	-----	-----	-----	------

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}	–	–	0.1	mAdc
	LMUN2110LT1	–	–	0.5	
	LMUN2111LT1	–	–	0.2	
	LMUN2112LT1	–	–	0.1	
	LMUN2113LT1	–	–	0.2	
	LMUN2114LT1	–	–	0.9	
	LMUN2115LT1	–	–	1.9	
	LMUN2130LT1	–	–	4.3	
	LMUN2131LT1	–	–	2.3	
	LMUN2132LT1	–	–	1.5	
	LMUN2133LT1	–	–	0.18	
	LMUN2134LT1	–	–	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 μs , Duty Cycle < 2.0%

LMUN2111LT1 Series

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

Characteristic	Symbol	Min	Typ	Max	Unit	
ON CHARACTERISTICS (Note 5.)						
DC Current Gain ($V_{CE} = 10\text{ V}$, $I_C = 5.0\text{ mA}$)	LMUN2110LT1 LMUN2111LT1 LMUN2112LT1 LMUN2113LT1 LMUN2114LT1 LMUN2115LT1 LMUN2116LT1 LMUN2130LT1 LMUN2131LT1 LMUN2132LT1 LMUN2133LT1 LMUN2134LT1	h_{FE}	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 ($I_C = 10\text{ mA}$, $I_E = 0.3\text{ mA}$) ($I_C = 10\text{ mA}$, $I_B = 5\text{ mA}$) LMUN2130LT1/LMUN2131LT1 ($I_C = 10\text{ mA}$, $I_B = 1\text{ mA}$) LMUN2115LT1/LMUN2116LT1/ LMUN2132LT1/LMUN2133LT1/LMUN2134LT1		$V_{CE(sat)}$	–	–	0.25	Vdc
Output Voltage (on) ($V_{CC} = 5.0\text{ V}$, $V_B = 2.5\text{ V}$, $R_L = 1.0\text{ k}\Omega$) ($V_{CC} = 5.0\text{ V}$, $V_B = 3.5\text{ V}$, $R_L = 1.0\text{ k}\Omega$)	LMUN2110LT1 LMUN2114LT1 LMUN2111LT1 LMUN2112LT1 LMUN2114LT1 LMUN2115LT1 LMUN2116LT1 LMUN2130LT1 LMUN2131LT1 LMUN2132LT1 LMUN2133LT1 LMUN2134LT1 LMUN2113LT1	V_{OL}	– – – – – – – – – – – – – –	– – – – – – – – – – – – – –	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) ($V_{CC} = 5.0\text{ V}$, $V_B = 0.5\text{ V}$, $R_L = 1.0\text{ k}\Omega$) ($V_{CC} = 5.0\text{ V}$, $V_B = 0.25\text{ V}$, $R_L = 1.0\text{ k}\Omega$) ($V_{CC} = 5.0\text{ V}$, $V_B = 0.050\text{ V}$, $R_L = 1.0\text{ k}\Omega$)	LMUN2115LT1 LMUN2116LT1 LMUN2131LT1 LMUN2132LT1 LMUN2130LT1	V_{OH}	4.9	–	–	Vdc
Input Resistor	LMUN2110LT1 LMUN2111LT1 LMUN2112LT1 LMUN2113LT1 LMUN2114LT1 LMUN2115LT1 LMUN2116LT1 LMUN2130LT1 LMUN2131LT1 LMUN2132LT1 LMUN2133LT1 LMUN2134LT1	R_1	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	LMUN2111LT1/LMUN2112LT1/LMUN2113LT1 LMUN2114LT1 LMUN2115LT1/LMUN2116LT1/LMUN2110LT1 LMUN2130LT1/LMUN2131LT1/LMUN2132LT1 LMUN2133LT1	R_1/R_2	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%

LMUN2111LT1 Series

TYPICAL ELECTRICAL CHARACTERISTICS
LMUN2111LT1

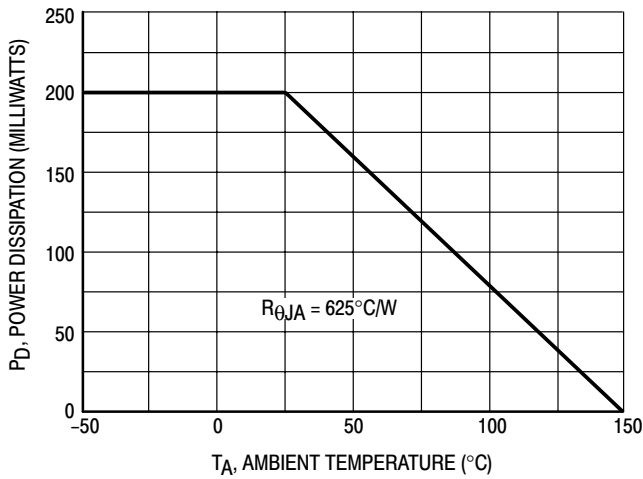


Figure 1. Derating Curve

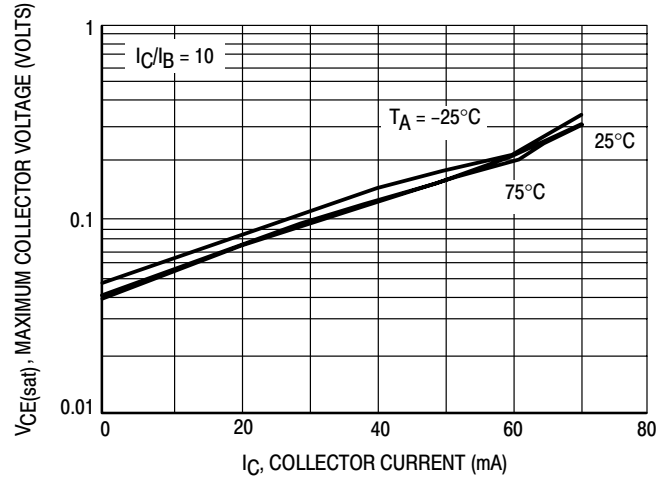


Figure 2. $V_{CE(sat)}$ versus I_C

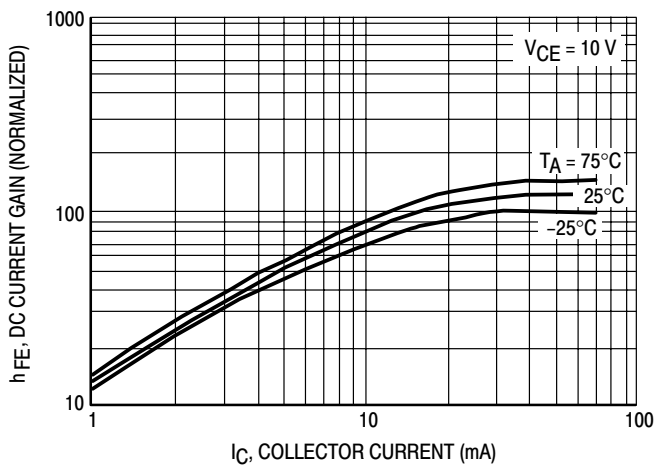


Figure 3. DC Current Gain

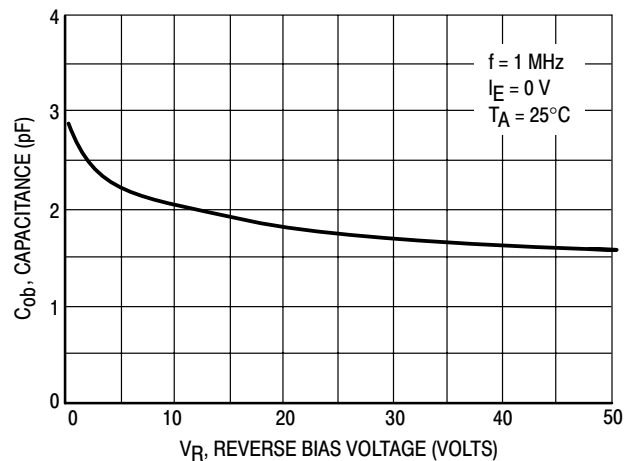


Figure 4. Output Capacitance

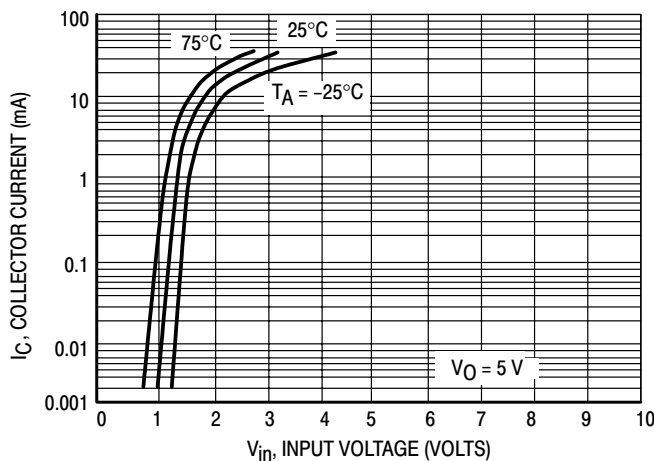


Figure 5. Output Current versus Input Voltage

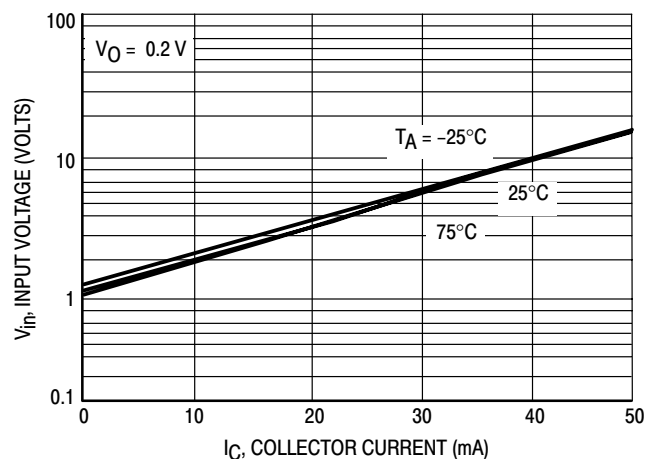


Figure 6. Input Voltage versus Output Current

LMUN2111LT1Series

TYPICAL ELECTRICAL CHARACTERISTICS
LMUN2112LT1

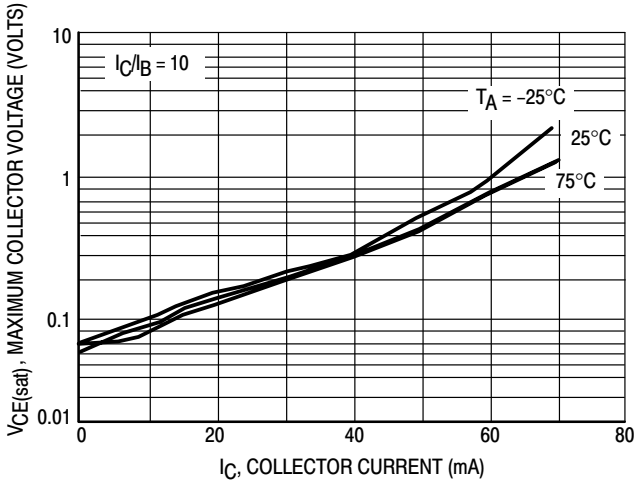


Figure 7. $V_{CE(sat)}$ versus I_C

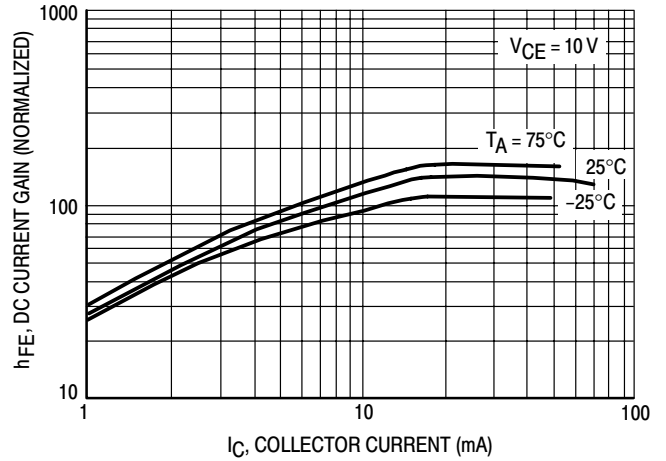


Figure 8. DC Current Gain

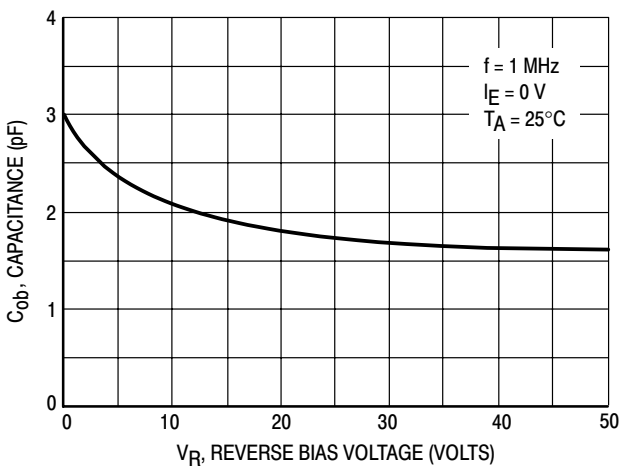


Figure 9. Output Capacitance

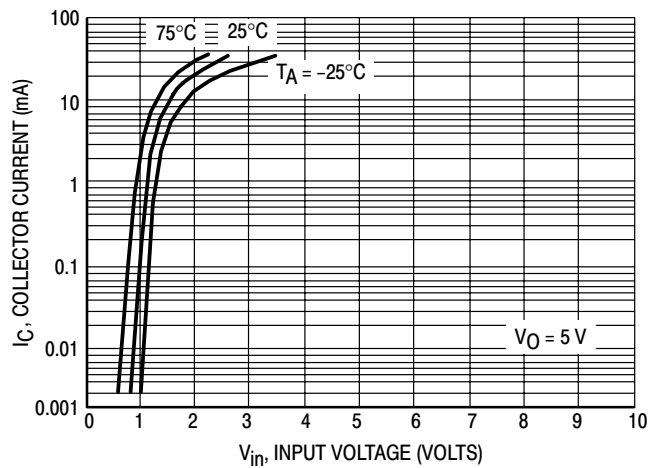


Figure 10. Output Current versus Input Voltage

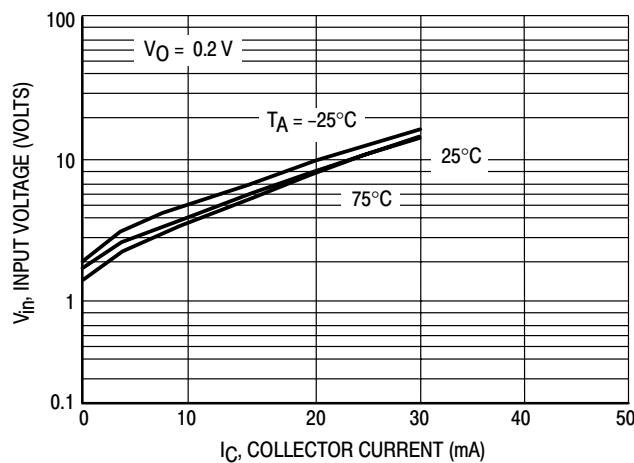


Figure 11. Input Voltage versus Output Current

LMUN2111LT1 Series

TYPICAL ELECTRICAL CHARACTERISTICS
LMUN2113LT1

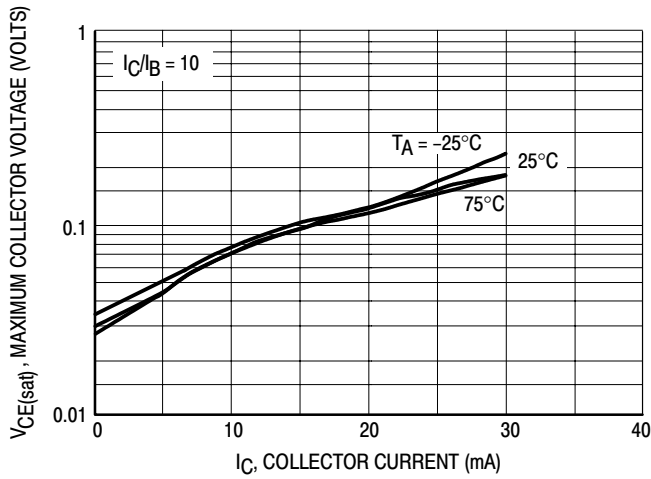


Figure 12. $V_{CE(sat)}$ versus I_C

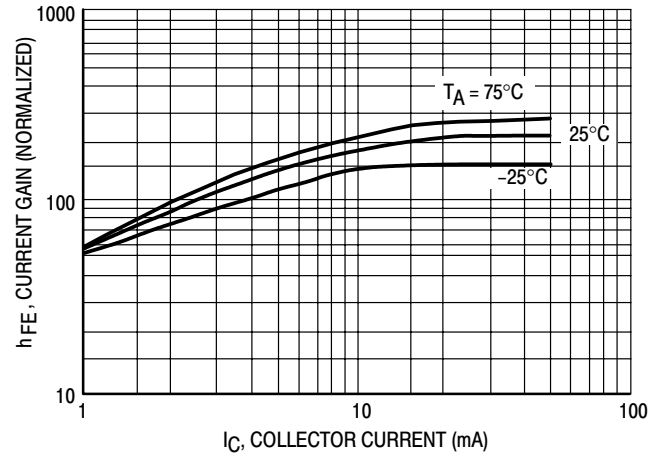


Figure 13. DC Current Gain

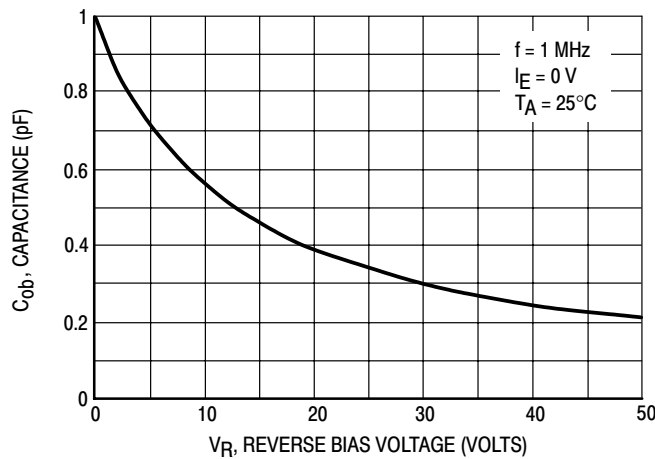


Figure 14. Output Capacitance

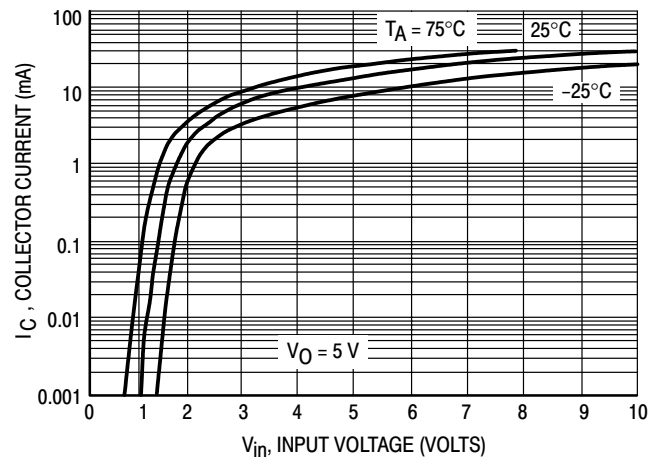


Figure 15. Output Current versus Input Voltage

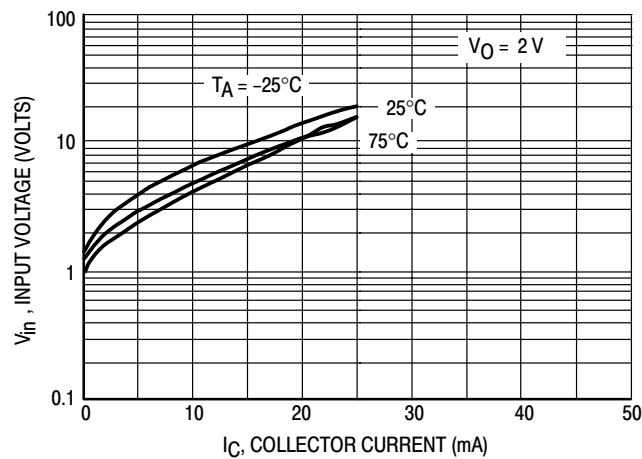


Figure 16. Input Voltage versus Output Current

LMUN2111LT1 Series

TYPICAL ELECTRICAL CHARACTERISTICS
LMUN2114LT1

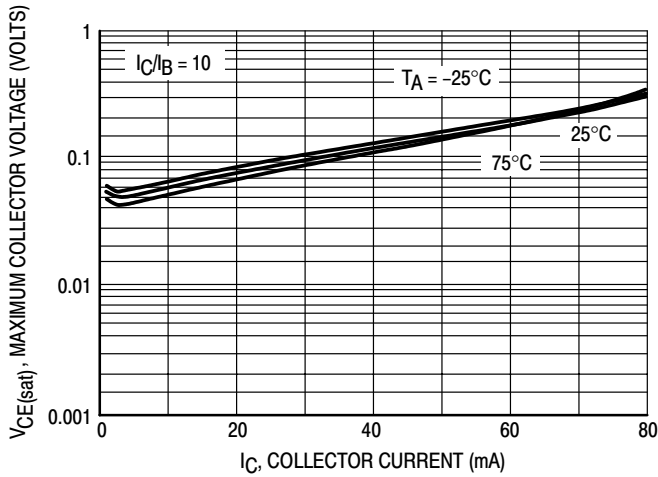


Figure 17. $V_{CE(sat)}$ versus I_C

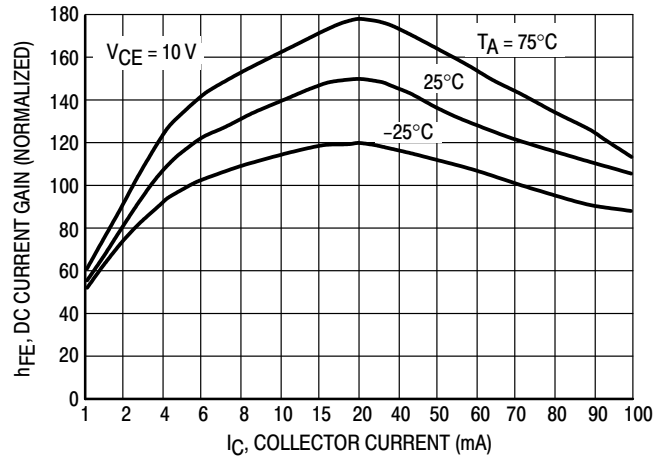


Figure 18. DC Current Gain

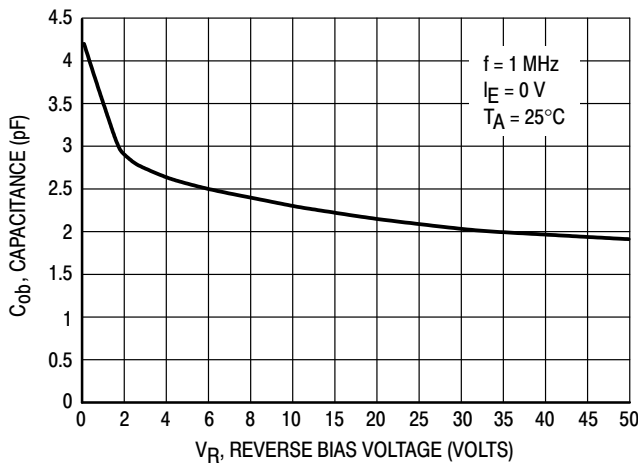


Figure 19. Output Capacitance

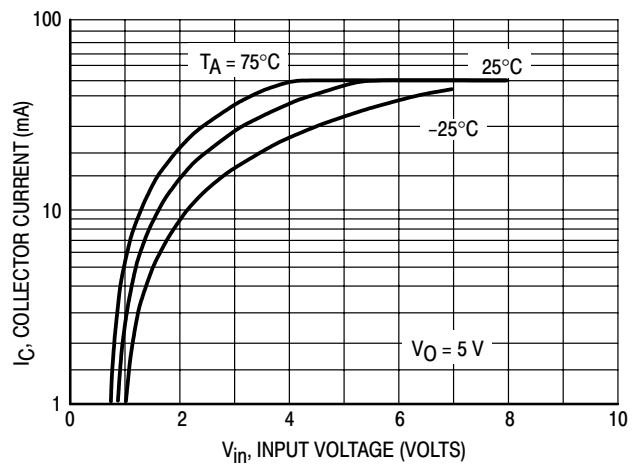


Figure 20. Output Current versus Input Voltage

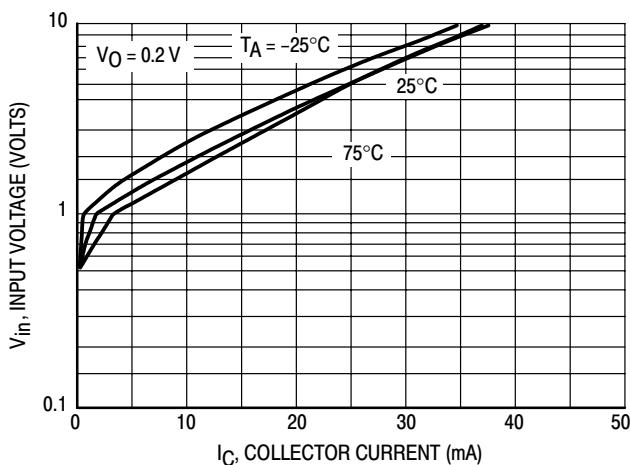


Figure 21. Input Voltage versus Output Current

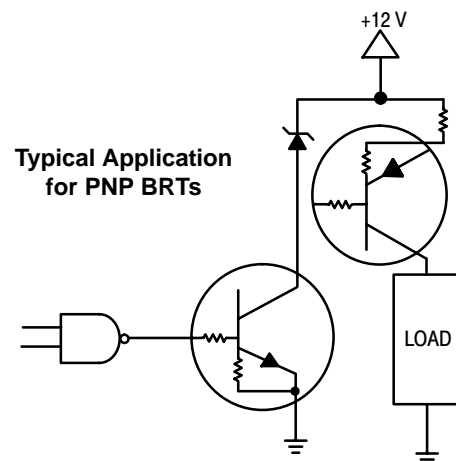
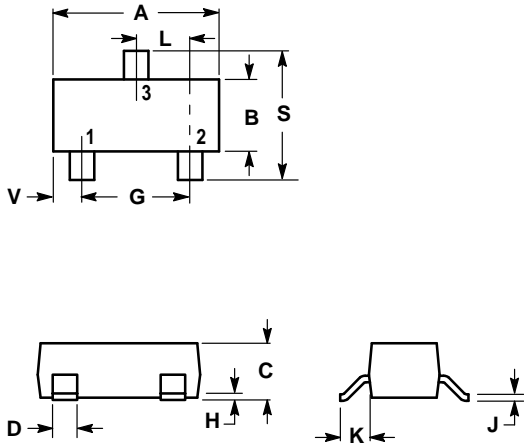


Figure 22. Inexpensive, Unregulated Current Source

LMUN2111LT1 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

