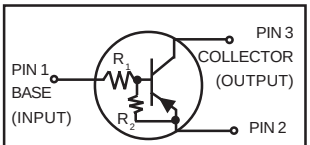
Bias Resistor Transistor

PNP Silicon Surface Mount Transistor with Monolithic Bias Resistor Network

LMUN5111T1 SERIES

PNP SILICON BIAS RESISTOR TRANSISTORS

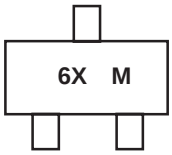
SOT–323 (SC–70)



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–70/SOT–323 package which is designed for low power surface mount applications.

- Simplifies Circuit Design
- Reduces Board Space
- Reduces Component Count
- The SC–70/SOT–323 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



6 X =Specific Device Code
X =(See Marking Table)
M =Date Code

DEVICE MARKING INFORMATION

See specific marking information in the device marking table on page2 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	202 (Note 1)	mW
T_A = 25°C		310 (Note 2)	
Derate above 25°C		1.6 (Note 1)	°C/W
		2.5 (Note 2)	
Thermal Resistance –	$R_{\theta JA}$	618 (Note 1)	°C/W
Junction-to-Ambient		403 (Note 2)	
Thermal Resistance –	$R_{\theta JL}$	280 (Note 1)	°C/W
Junction-to-Lead		332 (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

DEVICE MARKING AND RESISTOR VALUES

Device	Package	Marking	R1 (K)	R2 (K)	Shipping
LMUN5111T1	SC–70/SOT–323	6A	10	10	3000/Tape & Reel
LMUN5112T1	SC–70/SOT–323	6B	22	22	3000/Tape & Reel
LMUN5113T1	SC–70/SOT–323	6C	47	47	3000/Tape & Reel
LMUN5114T1	SC–70/SOT–323	6D	10	47	3000/Tape & Reel
LMUN5115T1 (Note 3)	SC–70/SOT–323	6E	10	∞	3000/Tape & Reel
LMUN5116T1 (Note 3)	SC–70/SOT–323	6F	4.7	∞	3000/Tape & Reel
LMUN5130T1 (Note 3)	SC–70/SOT–323	6G	1.0	1.0	3000/Tape & Reel
LMUN5131T1 (Note 3)	SC–70/SOT–323	6H	2.2	2.2	3000/Tape & Reel
LMUN5132T1 (Note 3)	SC–70/SOT–323	6J	4.7	4.7	3000/Tape & Reel
LMUN5133T1 (Note 3)	SC–70/SOT–323	6K	4.7	47	3000/Tape & Reel
LMUN5134T1 (Note 3)	SC–70/SOT–323	6L	22	47	3000/Tape & Reel
LMUN5135T1 (Note 3)	SC–70/SOT–323	6M	2.2	47	3000/Tape & Reel
LMUN5136T1	SC–70/SOT–323	6N	100	100	3000/Tape & Reel
LMUN5137T1	SC–70/SOT–323	6P	47	22	3000/Tape & Reel

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

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)	LMUN5111T1	I_{EBO}	–	–	0.5	mAdc
	LMUN5112T1		–	–	0.2	
	LMUN5113T1		–	–	0.1	
	LMUN5114T1		–	–	0.2	
	LMUN5115T1		–	–	0.9	
	LMUN5116T1		–	–	1.9	
	LMUN5130T1		–	–	4.3	
	LMUN5131T1		–	–	2.3	
	LMUN5132T1		–	–	1.5	
	LMUN5133T1		–	–	0.18	
	LMUN5134T1		–	–	0.13	
	LMUN5135T1		–	–	0.2	
	LMUN5136T1		–	–	0.05	
	LMUN5137T1		–	–	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
ON CHARACTERISTICS (Note 4)						
DC Current Gain (V_{CE} = 10 V, I_C = 5.0 mA)	LMUN5111T1	h_{FE}	35	60	–	
	LMUN5112T1		60	100	–	
	LMUN5113T1		80	140	–	
	LMUN5114T1		80	140	–	
	LMUN5115T1		160	250	–	
	LMUN5116T1		160	250	–	
	LMUN5130T1		3.0	5.0	–	
	LMUN5131T1		8.0	15	–	
	LMUN5132T1		15	27	–	
	LMUN5133T1		80	140	–	
	LMUN5134T1		80	130	–	
	LMUN5135T1		80	140	–	
	LMUN5136T1		80	150	–	
	LMUN5137T1		80	140	–	
Collector–Emitter Saturation Voltage (I_C = 10 mA, I_E = 0.3 mA) (I_C = 10 mA, I_B = 5 mA) LMUN5130T1/LMUN5131T1 (I_C = 10 mA, I_B = 1 mA) LMUN5115T1/LMUN5116T1/ LMUN5132T1/LMUN5133T1/LMUN5134T1		$V_{CE(sat)}$	–	–	0.25	Vdc
Output Voltage (on)		V_{OL}				Vdc
(V_{CC} = 5.0 V, V_B = 2.5 V, R_L = 1.0 kΩ)	LMUN5111T1		–	–	0.2	
	LMUN5112T1		–	–	0.2	
	LMUN5114T1		–	–	0.2	
	LMUN5115T1		–	–	0.2	
	LMUN5116T1		–	–	0.2	
	LMUN5130T1		–	–	0.2	
	LMUN5131T1		–	–	0.2	
	LMUN5132T1		–	–	0.2	
	LMUN5133T1		–	–	0.2	
	LMUN5134T1		–	–	0.2	
	LMUN5135T1		–	–	0.2	
(V_{CC} = 5.0 V, V_B = 3.5 V, R_L = 1.0 kΩ)	LMUN5113T1		–	–	0.2	
(V_{CC} = 5.0 V, V_B = 5.5 V, R_L = 1.0 kΩ)	LMUN5136T1		–	–	0.2	
(V_{CC} = 5.0 V, V_B = 4.0 V, R_L = 1.0 kΩ)	LMUN5137T1		–	–	0.2	

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
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)	LMUN5130T1 LMUN5115T1 LMUN5116T1 LMUN5131T1 LMUN5132T1	V_{OH}	4.9	–	–	Vdc
Input Resistor	LMUN5111T1	R1	7.0	10	13	kΩ
	LMUN5112T1		15.4	22	28.6	
	LMUN5113T1		32.9	47	61.1	
	LMUN5114T1		7.0	10	13	
	LMUN5115T1		7.0	10	13	
	LMUN5116T1		3.3	4.7	6.1	
	LMUN5130T1		0.7	1.0	1.3	
	LMUN5131T1		1.5	2.2	2.9	
	LMUN5132T1		3.3	4.7	6.1	
	LMUN5133T1		3.3	4.7	6.1	
	LMUN5134T1		15.4	22	28.6	
	LMUN5135T1		1.54	2.2	2.86	
	LMUN5136T1		70	100	130	
	LMUN5137T1		32.9	47	61.1	
Resistor Ratio	LMUN5111T1/LMUN5112T1/LMUN5113T1/ LMUN5136T1	R_1/R_2	0.8	1.0	1.2	
	LMUN5114T1		0.17	0.21	0.25	
	LMUN5115T1/MUN5116T1		–	–	–	
	LMUN5130T1/LMUN5131T1/LMUN5132T1		0.8	1.0	1.2	
	LMUN5133T1		0.055	0.1	0.185	
	LMUN5134T1		0.38	0.47	0.56	
	LMUN5135T1		0.038	0.047	0.056	
	LMUN5137T1		1.7	2.1	2.6	

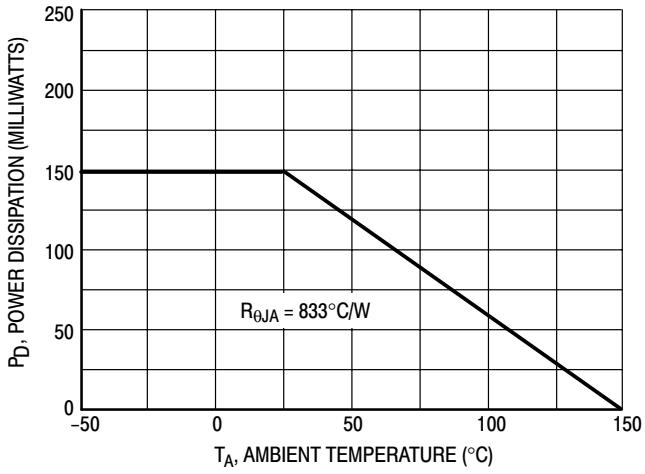


Figure 1. Derating Curve

TYPICAL ELECTRICAL CHARACTERISTICS – LMUN5111T1

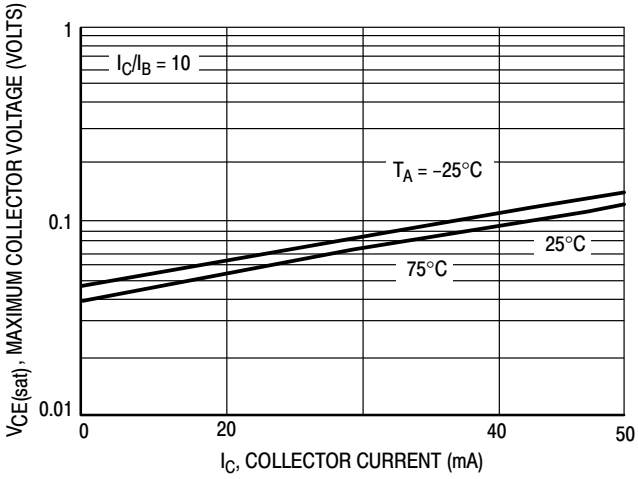


Figure 2. $V_{CE(sat)}$ versus I_C

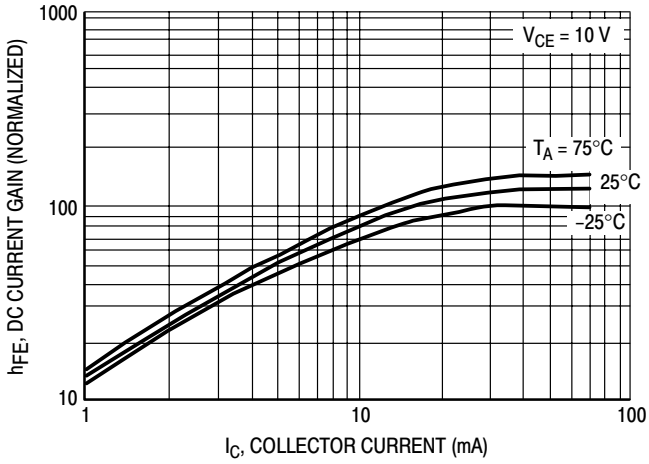


Figure 3. DC Current Gain

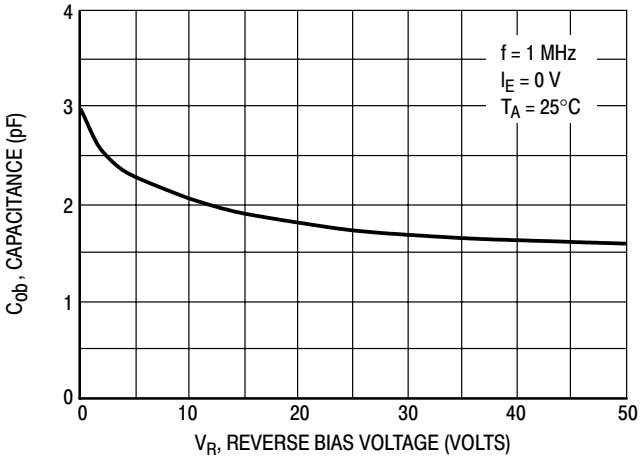


Figure 4. Output Capacitance

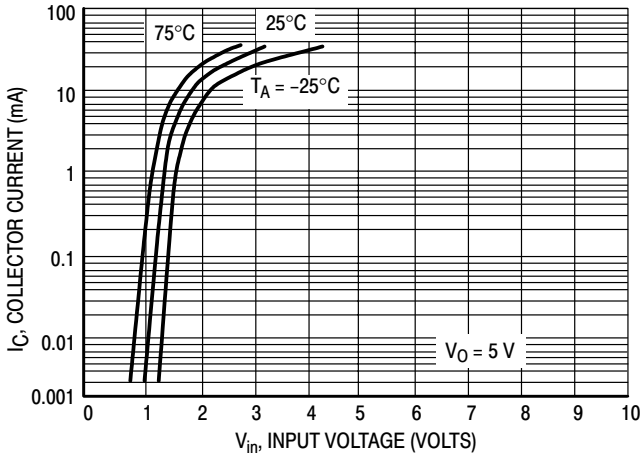


Figure 5. Output Current versus Input Voltage

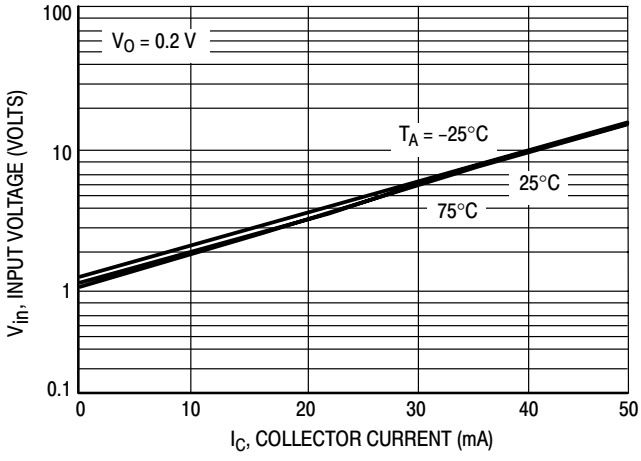


Figure 6. Input Voltage versus Output Current

TYPICAL ELECTRICAL CHARACTERISTICS – LMUN5112T1

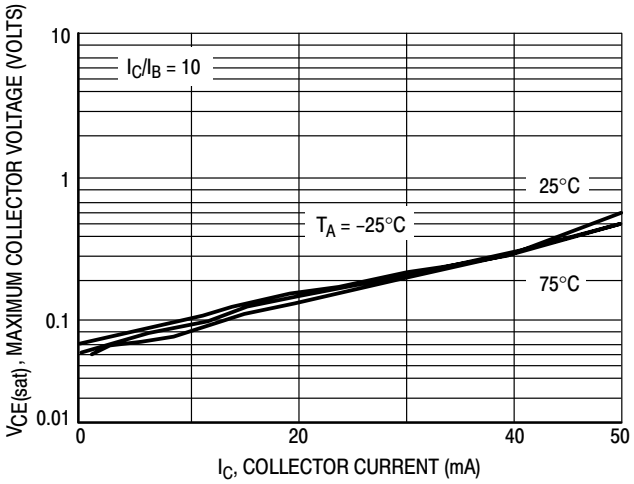


Figure 7. $V_{CE(sat)}$ versus I_C

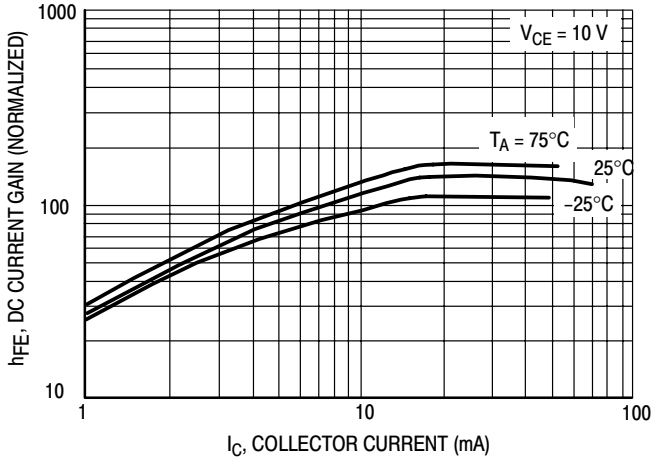


Figure 8. DC Current Gain

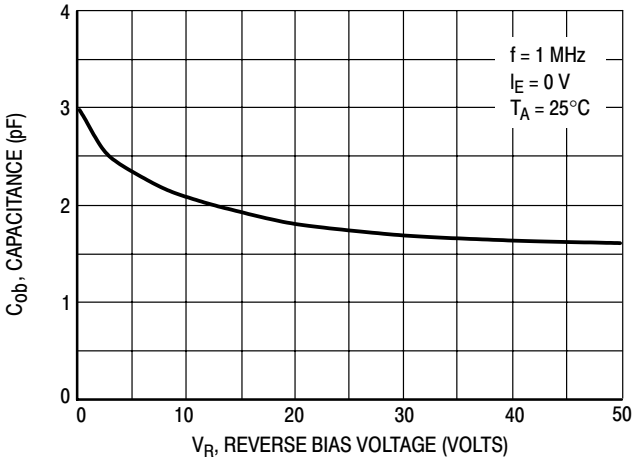


Figure 9. Output Capacitance

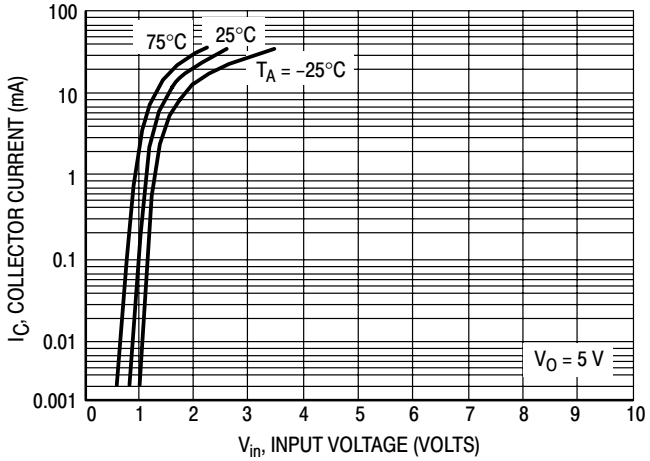


Figure 10. Output Current versus Input Voltage

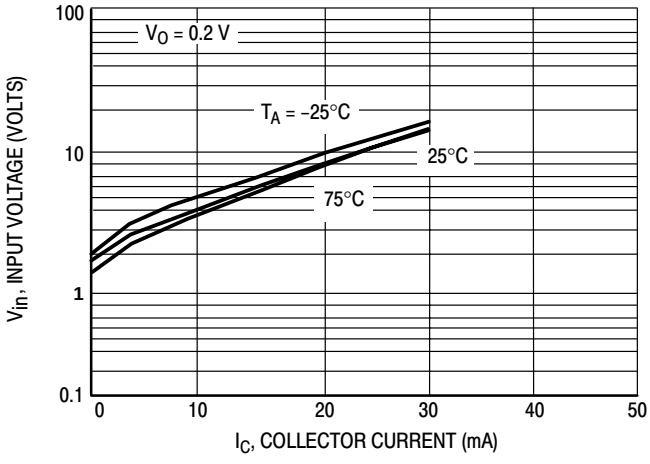


Figure 11. Input Voltage versus Output Current

TYPICAL ELECTRICAL CHARACTERISTICS – LMUN5113T1

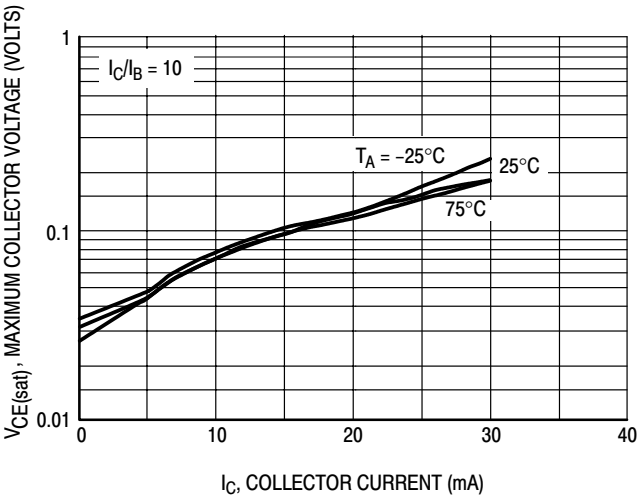


Figure 12. $V_{CE(sat)}$ versus I_C

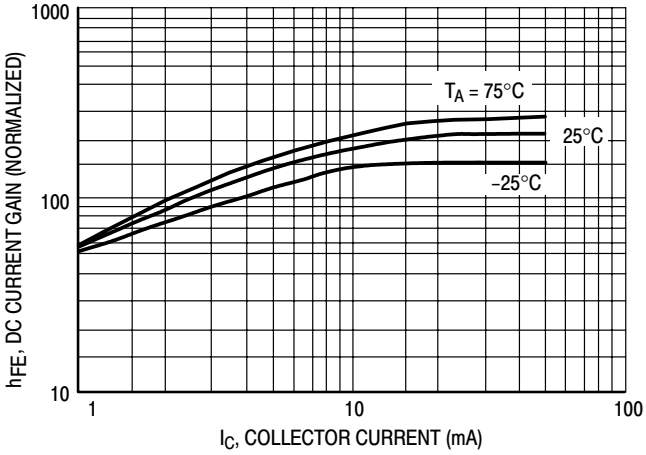


Figure 13. DC Current Gain

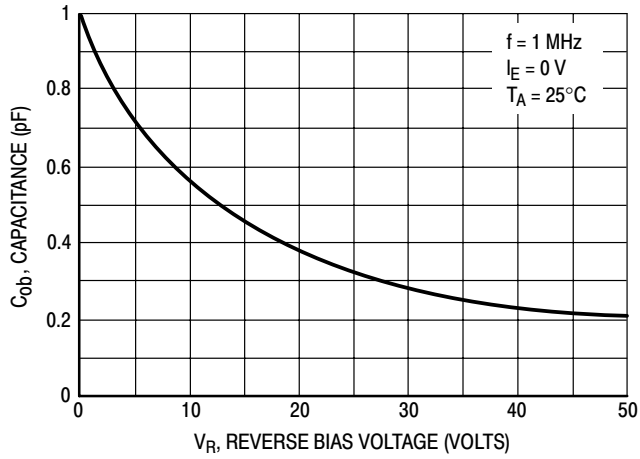


Figure 14. Output Capacitance

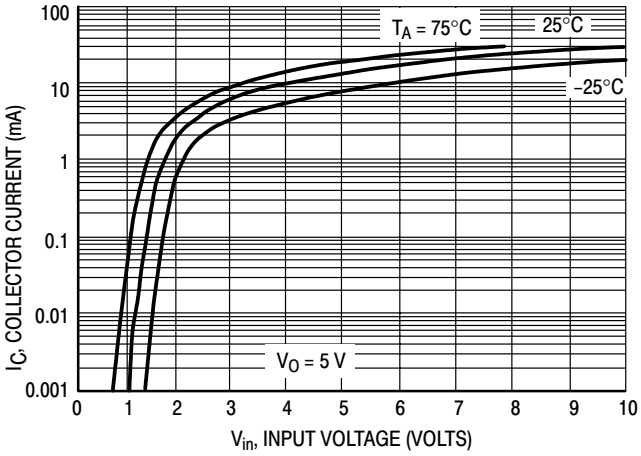


Figure 15. Output Current versus Input Voltage

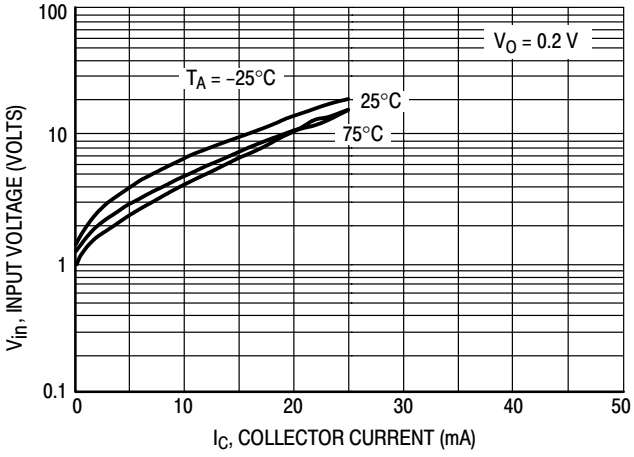


Figure 16. Input Voltage versus Output Current

TYPICAL ELECTRICAL CHARACTERISTICS – LMUN5114T1

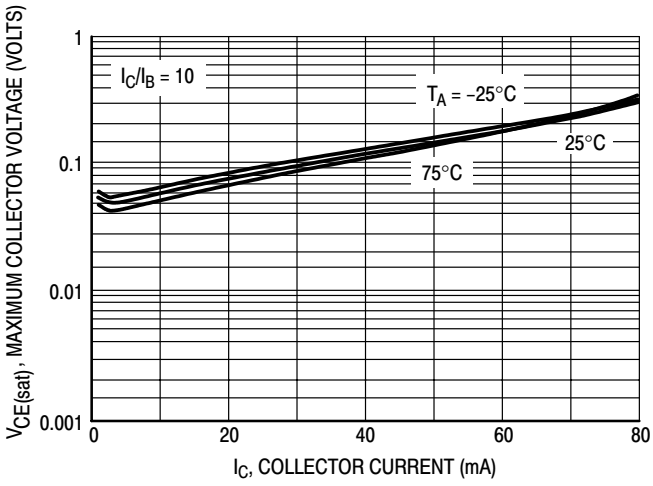


Figure 17. $V_{CE(sat)}$ versus I_C

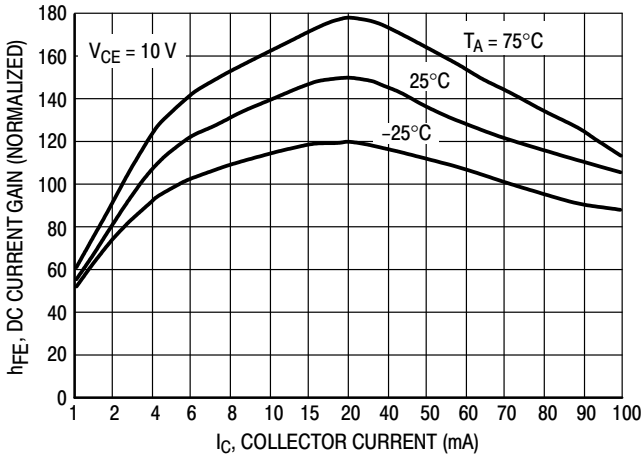


Figure 18. DC Current Gain

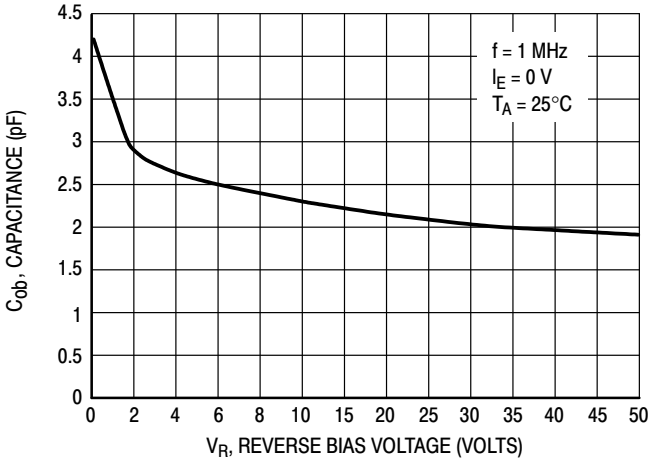


Figure 19. Output Capacitance

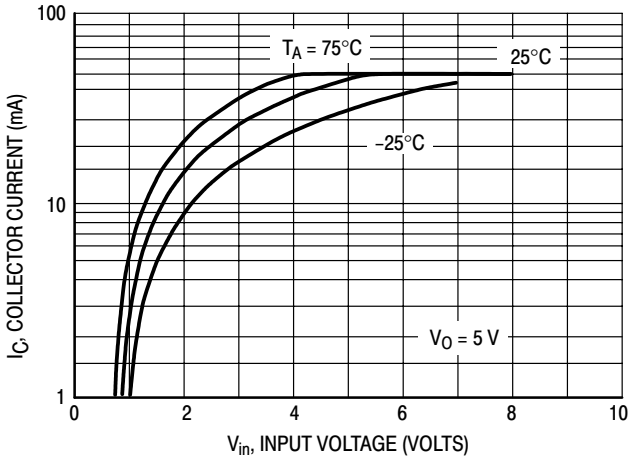


Figure 20. Output Current versus Input Voltage

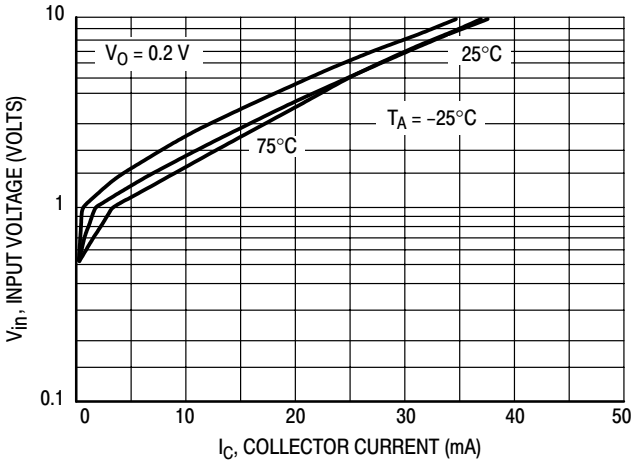


Figure 21. Input Voltage versus Output Current

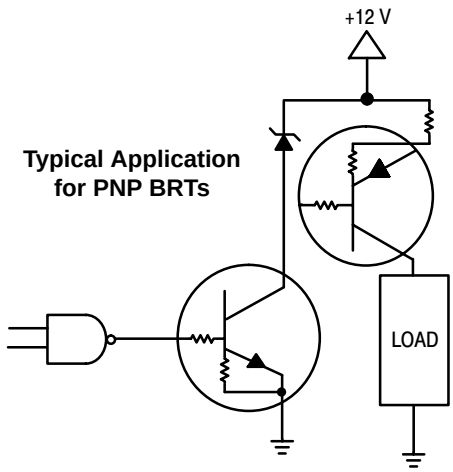


Figure 22. Inexpensive, Unregulated Current Source

TYPICAL ELECTRICAL CHARACTERISTICS — LMUN5132T1

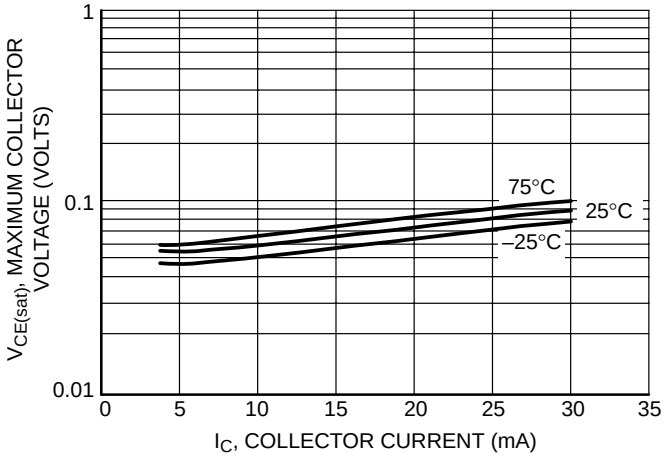


Figure 23. Maximum Collector Voltage versus Collector Current

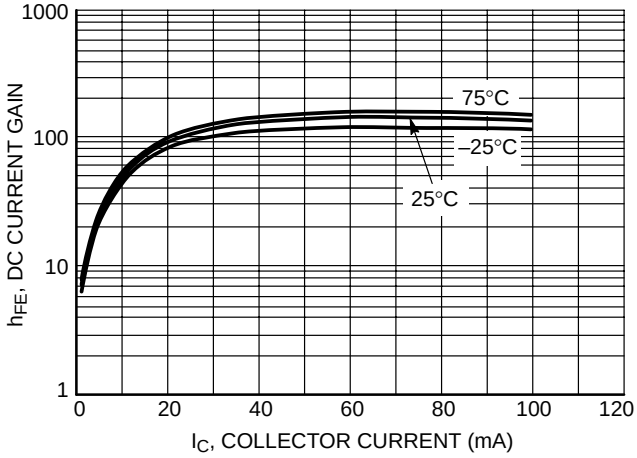


Figure 24. DC Current Gain

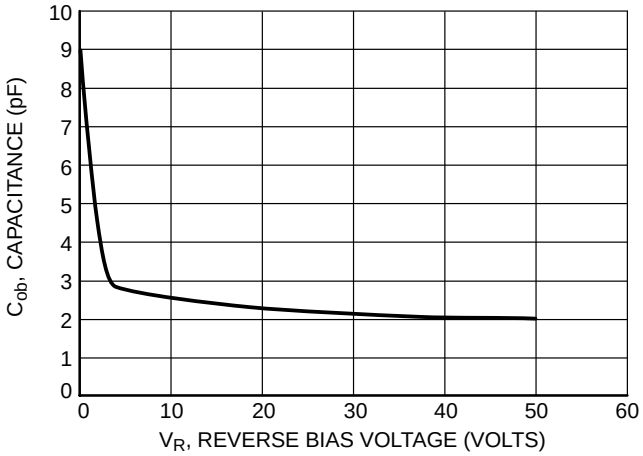


Figure 25. Output Capacitance

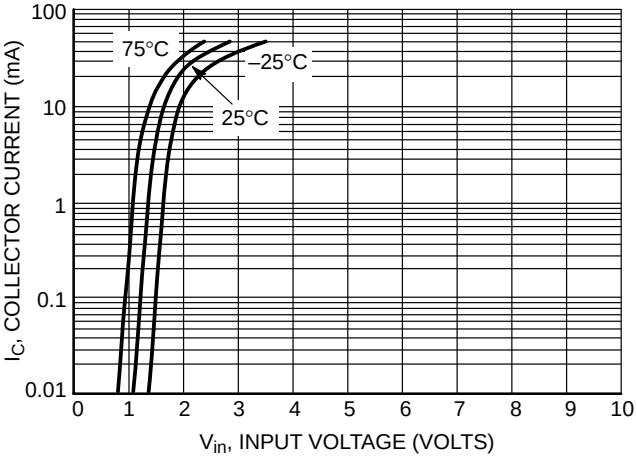


Figure 26. Output Current versus Input Voltage

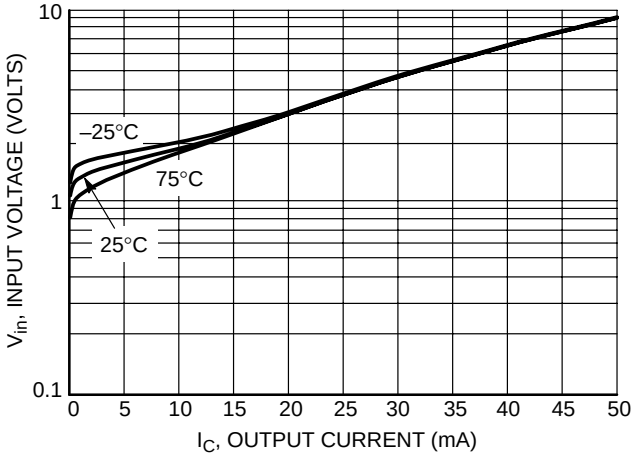


Figure 27. Input Voltage versus Output Current

TYPICAL ELECTRICAL CHARACTERISTICS — LMUN5136T1

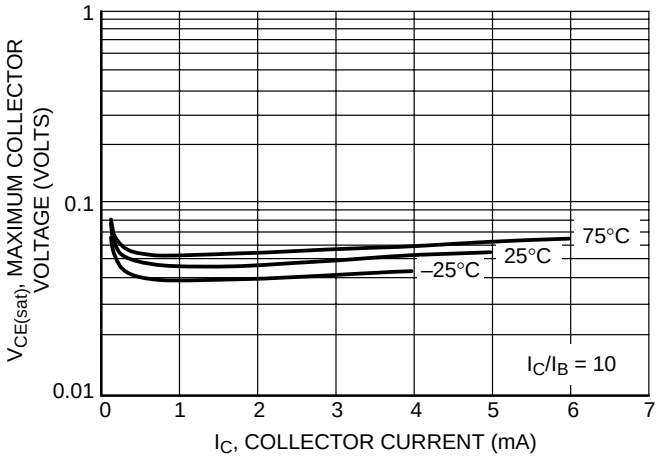


Figure 28. Maximum Collector Voltage versus Collector Current

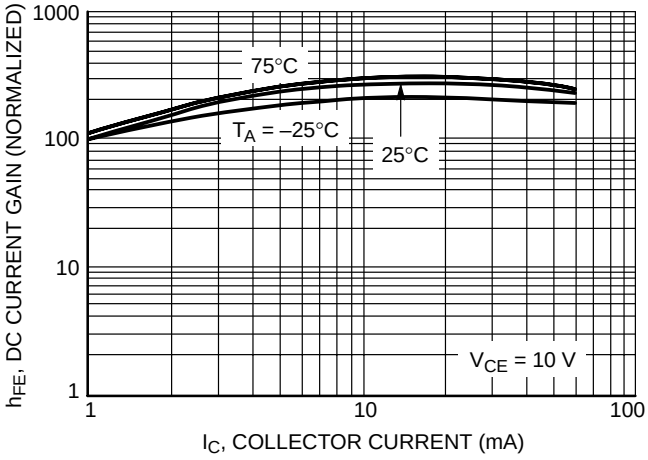


Figure 29. DC Current Gain

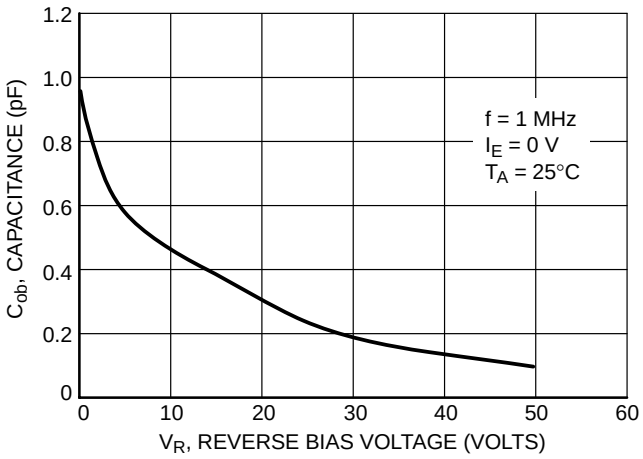


Figure 30. Output Capacitance

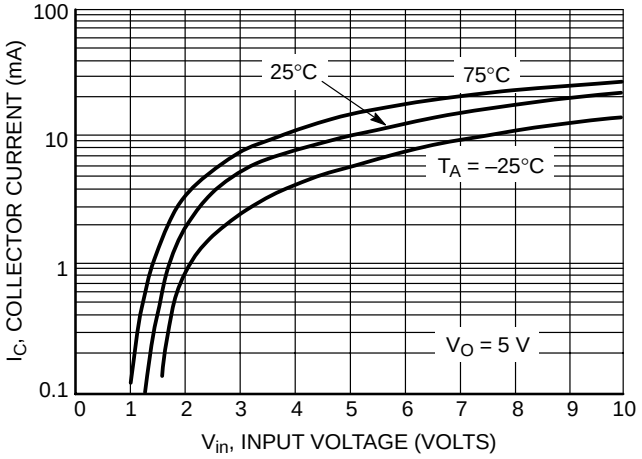


Figure 31. Output Current versus Input Voltage

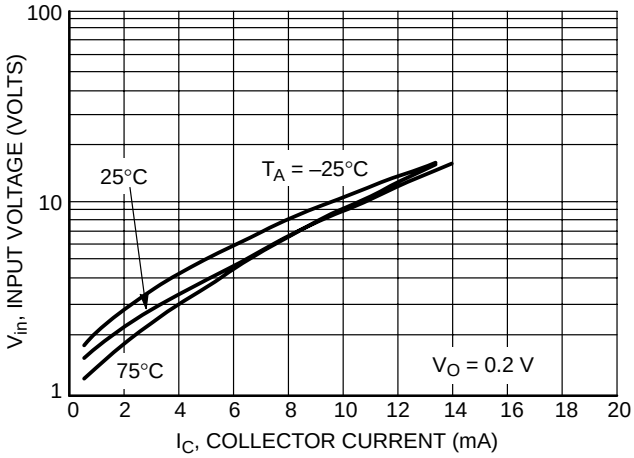


Figure 32. Input Voltage versus Output Current

TYPICAL ELECTRICAL CHARACTERISTICS — LMUN5137T1

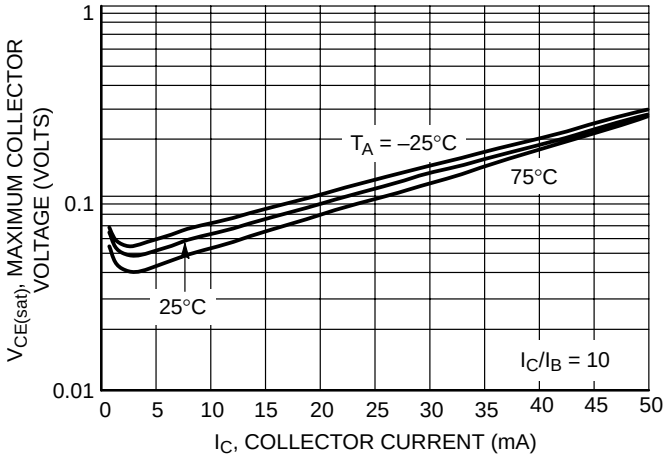


Figure 33. Maximum Collector Voltage versus Collector Current

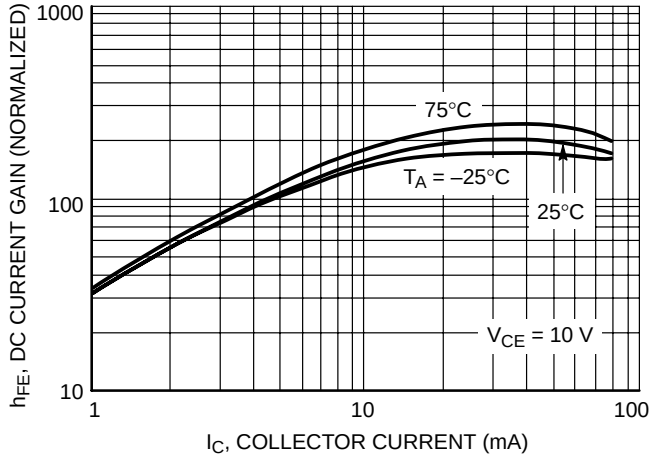


Figure 34. DC Current Gain

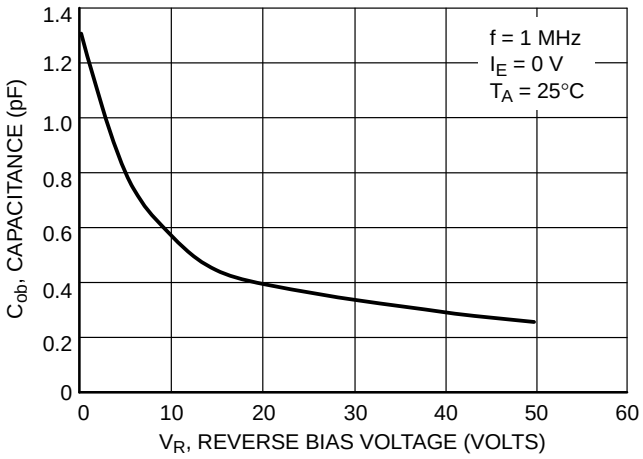


Figure 35. Output Capacitance

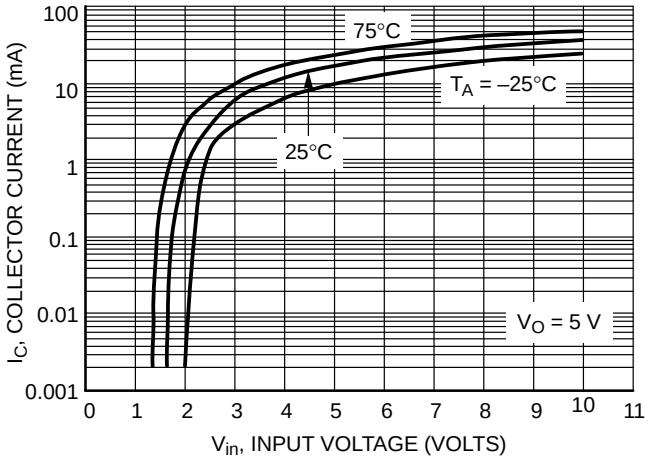


Figure 36. Output Current versus Input Voltage

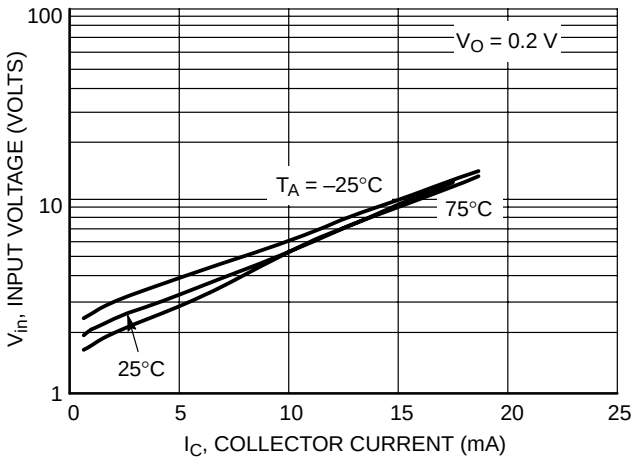
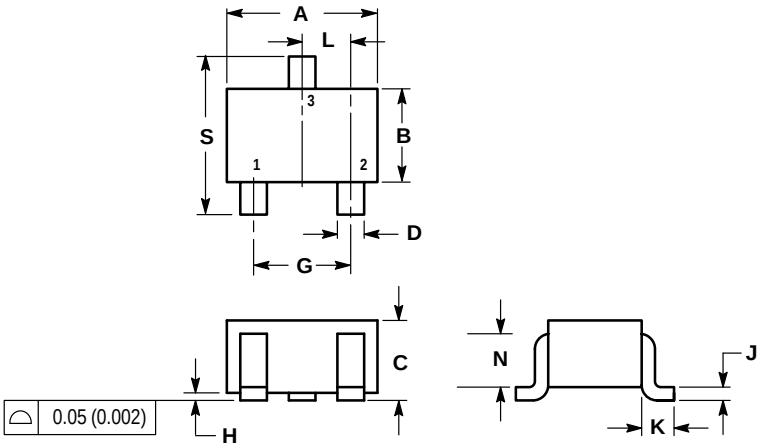


Figure 37. Input Voltage versus Output Current

SC–70 / SOT–323



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

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.071	0.087	1.80	2.20
B	0.045	0.053	1.15	1.35
C	0.032	0.040	0.80	1.00
D	0.012	0.016	0.30	0.40
G	0.047	0.055	1.20	1.40
H	0.000	0.004	0.00	0.10
J	0.004	0.010	0.10	0.25
K	0.017 REF		0.425 REF	
L	0.026 BSC		0.650 BSC	
N	0.028 REF		0.700 REF	
S	0.079	0.095	2.00	2.40

PIN 1. BASE
2. EMITTER
3. COLLECTOR