

# Dual Bias Resistor Transistors

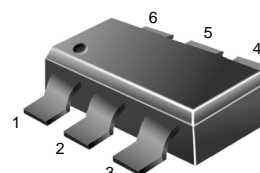
## PNP Silicon Surface Mount Transistors

### with Monolithic Bias Resistor 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. These digital transistors are designed to replace a single device and its external resistor bias network. The BRT eliminates these individual components by integrating them into a single device. In the LMUN5111DW1T1 series, two BRT devices are housed in the SOT-363 package which is ideal for low-power surface mount applications where board space is at a premium.

- . Simplifies Circuit Design
- . Reduces Board Space
- . Reduces Component Count
- . Available in 8 mm, 7 inch/3000 Unit Tape and Reel

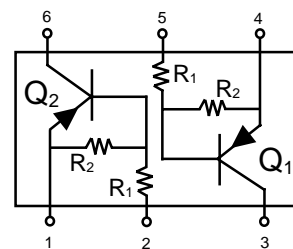
### LMUN5111DW1T1 Series



SC-88/SOT-363

#### MAXIMUM RATINGS (T<sub>A</sub> = 25°C unless otherwise noted, common for Q<sub>1</sub> and Q<sub>2</sub>)

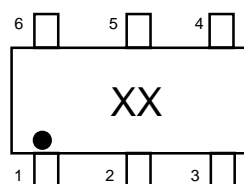
Rating	Symbol	Value	Unit
Collector-Base Voltage	V <sub>CBO</sub>	-50	Vdc
Collector-Emitter Voltage	V <sub>CEO</sub>	-50	Vdc
Collector Current	I <sub>C</sub>	-100	mAdc



#### THERMAL CHARACTERISTICS

Characteristic (One Junction Heated)	Symbol	Max	Unit
Total Device Dissipation T <sub>A</sub> = 25°C	P <sub>D</sub>	187 (Note 1.) 256 (Note 2.)	mW
Derate above 25°C		1.5 (Note 1.) 2.0 (Note 2.)	mW/°C
Thermal Resistance – Junction-to-Ambient	R <sub>θJA</sub>	670 (Note 1.) 490 (Note 2.)	°C/W
Characteristic (Both Junctions Heated)	Symbol	Max	Unit
Total Device Dissipation T <sub>A</sub> = 25°C	P <sub>D</sub>	250 (Note 1.) 385 (Note 2.)	mW
Derate above 25°C		2.0 (Note 1.) 3.0 (Note 2.)	mW/°C
Thermal Resistance – Junction-to-Ambient	R <sub>θJA</sub>	493 (Note 1.) 325 (Note 2.)	°C/W
Thermal Resistance – Junction-to-Lead	R <sub>θJL</sub>	188 (Note 1.) 208 (Note 2.)	°C/W
Junction and Storage Temperature	T <sub>J</sub> , T <sub>stg</sub>	-55 to +150	°C

#### MARKING DIAGRAM



xx = Device Marking  
(See Page 2)

#### DEVICE MARKING INFORMATION

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

1. FR-4 @ Minimum Pad      2. FR-4 @ 1.0 x 1.0 inch Pad

## LMUN5111DW1T1 Series

### DEVICE MARKING AND RESISTOR VALUES

Device	Package	Marking	R <sub>1</sub> (K)	R <sub>2</sub> (K)	Shipping
LMUN5111DW1T1	SOT-363	0A	10	10	3000/Tape & Reel
LMUN5112DW1T1	SOT-363	0B	22	22	3000/Tape & Reel
LMUN5113DW1T1	SOT-363	0C	47	47	3000/Tape & Reel
LMUN5114DW1T1	SOT-363	0D	10	47	3000/Tape & Reel
LMUN5115DW1T1 (Note 3.)	SOT-363	0E	10	—	3000/Tape & Reel
LMUN5116DW1T1 (Note 3.)	SOT-363	0F	4.7	—	3000/Tape & Reel
LMUN5130DW1T1 (Note 3.)	SOT-363	0G	1.0	1.0	3000/Tape & Reel
LMUN5131DW1T1 (Note 3.)	SOT-363	0H	2.2	2.2	3000/Tape & Reel
LMUN5132DW1T1 (Note 3.)	SOT-363	0J	4.7	4.7	3000/Tape & Reel
LMUN5133DW1T1 (Note 3.)	SOT-363	0K	4.7	47	3000/Tape & Reel
LMUN5134DW1T1 (Note 3.)	SOT-363	0L	22	47	3000/Tape & Reel
LMUN5135DW1T1 (Note 3.)	SOT-363	0M	2.2	47	3000/Tape & Reel
LMUN5136DW1T1 (Note 3.)	SOT-363	0N	100	100	3000/Tape & Reel
LMUN5137DW1T1 (Note 3.)	SOT-363	0P	47	22	3000/Tape & Reel

### ELECTRICAL CHARACTERISTICS

(T<sub>A</sub> = 25°C unless otherwise noted, common for Q<sub>1</sub> and Q<sub>2</sub>)

Characteristic	Symbol	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS

Collector-Base Cutoff Current (V <sub>CB</sub> = -50 V, 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)	I <sub>EBO</sub>	—	—	-0.5	mAdc
	LMUN5112DW1T1	—	—	-0.2	
	LMUN5113DW1T1	—	—	-0.1	
	LMUN5114DW1T1	—	—	-0.2	
	LMUN5115DW1T1	—	—	-0.9	
	LMUN5116DW1T1	—	—	-1.9	
	LMUN5130DW1T1	—	—	-4.3	
	LMUN5131DW1T1	—	—	-2.3	
	LMUN5132DW1T1	—	—	-1.5	
	LMUN5133DW1T1	—	—	-0.18	
	LMUN5134DW1T1	—	—	-0.13	
	LMUN5135DW1T1	—	—	-0.2	
	LMUN5136DW1T1	—	—	-0.05	
	LMUN5137DW1T1	—	—	-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 (Note 4.) (I <sub>C</sub> = -2.0 mA, I <sub>B</sub> = 0)	V <sub>(BR)CEO</sub>	-50	—	—	Vdc

### ON CHARACTERISTICS (Note 4.)

Collector-Emitter Saturation Voltage (I <sub>C</sub> = -10 mA, I <sub>E</sub> = -0.3 mA)	V <sub>CE(sat)</sub>	—	—	-0.25	Vdc
(I <sub>C</sub> = -10 mA, I <sub>B</sub> = -5 mA) LMUN5130DW1T1/LMUN5131DW1T1					
(I <sub>C</sub> = -10 mA, I <sub>B</sub> = -1 mA) LMUN5115DW1T1/LMUN5116DW1T1					
LMUN5132DW1T1/LMUN5133DW1T1/LMUN5134DW1T1					

3. New resistor combinations. Updated curves to follow in subsequent data sheets.

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

LMUN5111DW1T1 Series

ELECTRICAL CHARACTERISTICS

( $T_A = 25^\circ\text{C}$  unless otherwise noted, common for  $Q_1$  and  $Q_2$ .) (Continued)

Characteristic	Symbol	Min	Typ	Max	Unit
<b>ON CHARACTERISTICS</b> (Note 5.)					
DC Current Gain	LMUN5111DW1T1 $h_{FE}$	35	60	—	
( $V_{CE} = -10\text{ V}$ , $I_C = -5.0\text{ mA}$ )	LMUN5112DW1T1	60	100	—	
	LMUN5113DW1T1	80	140	—	
	LMUN5114DW1T1	80	140	—	
	LMUN5115DW1T1	160	250	—	
	LMUN5116DW1T1	160	250	—	
	LMUN5130DW1T1	3.0	5.0	—	
	LMUN5131DW1T1	8.0	15	—	
	LMUN5132DW1T1	15	27	—	
	LMUN5133DW1T1	80	140	—	
	LMUN5134DW1T1	80	130	—	
	LMUN5135DW1T1	80	140	—	
	LMUN5136DW1T1	80	130	—	
	LMUN5137DW1T1	80	140	—	
Output Voltage (on)	$V_{OL}$				Vdc
( $V_{CC} = -5.0\text{ V}$ , $V_B = -2.5\text{ V}$ , $R_L = 1.0\text{ k}\Omega$ )	LMUN5111DW1T1	—	—	-0.2	
	LMUN5112DW1T1	—	—	-0.2	
	LMUN5114DW1T1	—	—	-0.2	
	LMUN5115DW1T1	—	—	-0.2	
	LMUN5116DW1T1	—	—	-0.2	
	LMUN5130DW1T1	—	—	-0.2	
	LMUN5131DW1T1	—	—	-0.2	
	LMUN5132DW1T1	—	—	-0.2	
	LMUN5133DW1T1	—	—	-0.2	
	LMUN5134DW1T1	—	—	-0.2	
	LMUN5135DW1T1	—	—	-0.2	
( $V_{CC} = -5.0\text{ V}$ , $V_B = -3.5\text{ V}$ , $R_L = 1.0\text{ k}\Omega$ )	LMUN5113DW1T1	—	—	-0.2	
( $V_{CC} = -5.0\text{ V}$ , $V_B = -5.5\text{ V}$ , $R_L = 1.0\text{ k}\Omega$ )	LMUN5136DW1T1	—	—	-0.2	
( $V_{CC} = -5.0\text{ V}$ , $V_B = -4.0\text{ V}$ , $R_L = 1.0\text{ k}\Omega$ )	LMUN5137DW1T1	—	—	-0.2	
Output Voltage (off) ( $V_{CC} = -5.0\text{ V}$ , $V_B = -0.5\text{ V}$ , $R_L = 1.0\text{ k}\Omega$ )	$V_{OH}$	-4.9	—	—	Vdc
( $V_{CC} = -5.0\text{ V}$ , $V_B = -0.05\text{ V}$ , $R_L = 1.0\text{ k}\Omega$ )	LMUN5130DW1T1				
( $V_{CC} = -5.0\text{ V}$ , $V_B = -0.25\text{ V}$ , $R_L = 1.0\text{ k}\Omega$ )	LMUN5115DW1T1				
	LMUN5116DW1T1				
	LMUN5131DW1T1				
	LMUN5133DW1T1				

## LMUN5111DW1T1 Series

### ELECTRICAL CHARACTERISTICS

( $T_A = 25^\circ\text{C}$  unless otherwise noted, common for  $Q_1$  and  $Q_2$ .) (Continued)

Characteristic		Symbol	Min	Typ	Max	Unit
ON CHARACTERISTICS(Note 5.)						
Input Resistor	LMUN5111DW1T1	$R_1$	7.0	10	13	kΩ
	LMUN5112DW1T1		15.4	22	28.6	
	LMUN5113DW1T1		32.9	47	61.1	
	LMUN5114DW1T1		7.0	10	13	
	LMUN5115DW1T1		7.0	10	13	
	LMUN5116DW1T1		3.3	4.7	6.1	
	LMUN5130DW1T1		0.7	1.0	1.3	
	LMUN5131DW1T1		1.5	2.2	2.9	
	LMUN5132DW1T1		3.3	4.7	6.1	
	LMUN5133DW1T1		3.3	4.7	6.1	
	LMUN5134DW1T1		15.4	22	28.6	
	LMUN5135DW1T1		1.54	2.2	2.86	
	LMUN5136DW1T1		70	100	130	
	LMUN5137DW1T1		32.9	47	61.1	
Resistor Ratio	LMUN5111DW1T1/LMUN5112DW1T1	$R_1/R_2$				
	LMUN5113DW1T1/LMUN5136DW1T1		0.8	1.0	1.2	
	LMUN5114DW1T1/LMUN5115DW1T1		0.17	0.21	0.25	
	LMUN5116DW1T1/LMUN5130DW1T1		—	—	—	
	LMUN5131DW1T1/LMUN5132DW1T1		0.8	1.0	1.2	
	LMUN5133DW1T1		0.055	0.1	0.185	
	LMUN5134DW1T1		0.38	0.47	0.56	
	LMUN5135DW1T1		0.038	0.047	0.056	
	LMUN5137DW1T1		1.7	2.1	2.6	

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

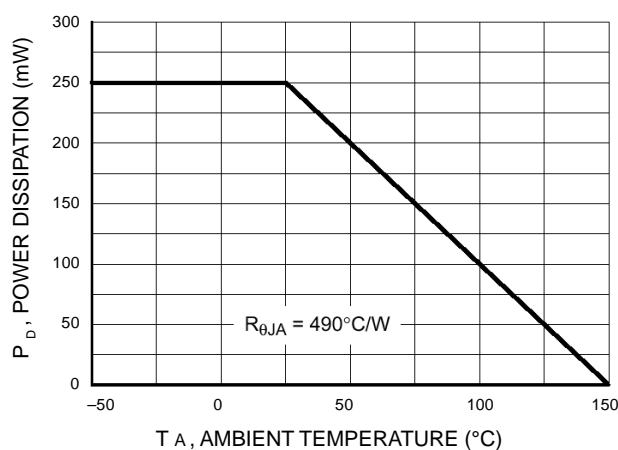
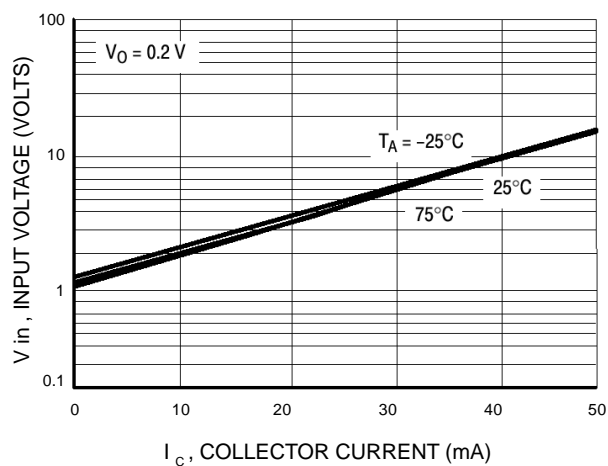
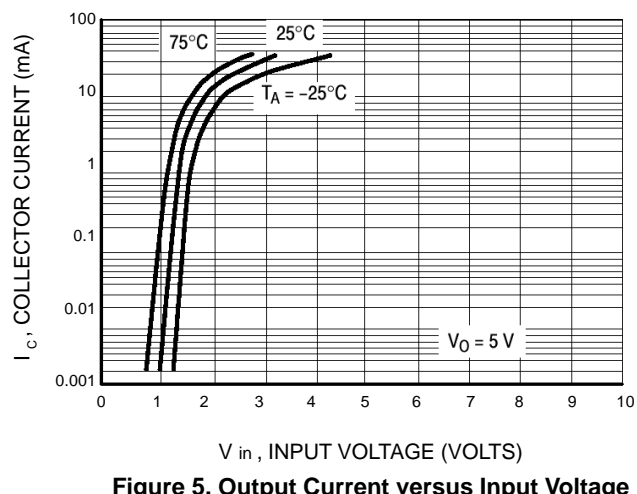
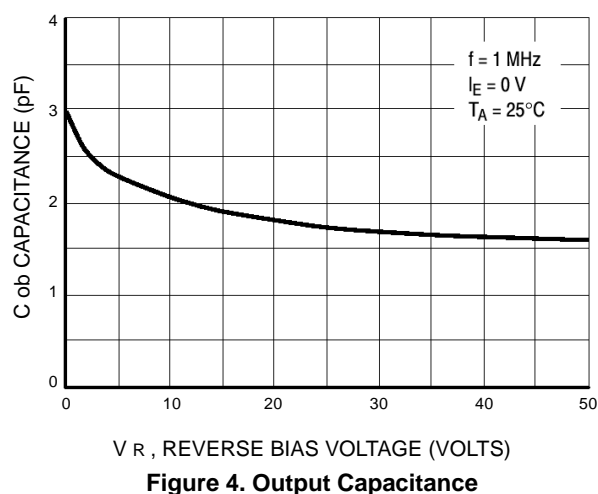
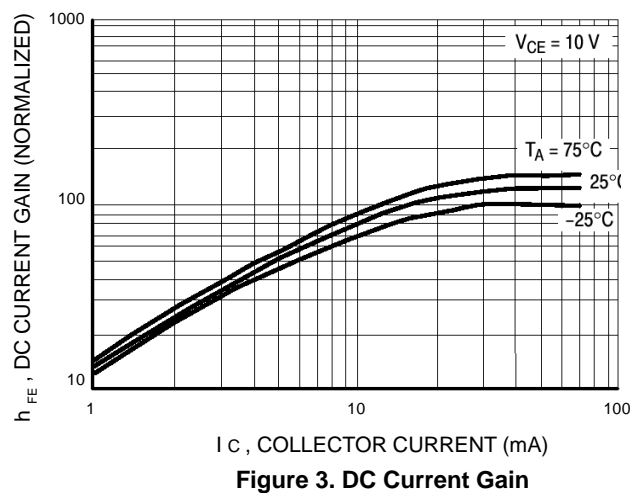
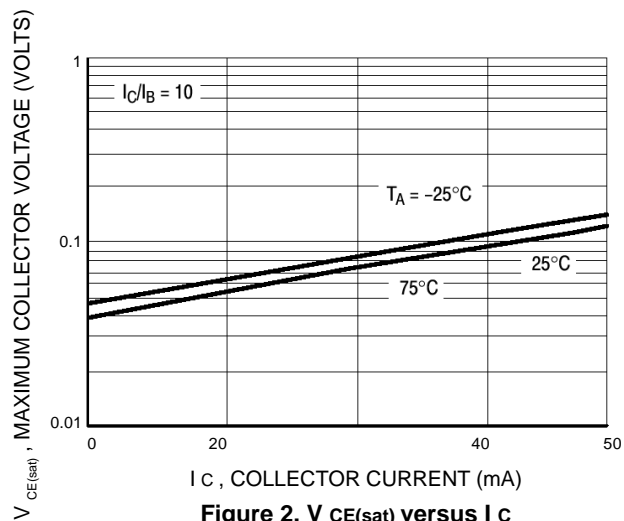


Figure 1. Derating Curve

LMUN5111DW1T1 Series

TYPICAL ELECTRICAL CHARACTERISTICS – LMUN5111DW1T1



## LMUN5111DW1T1 Series

### TYPICAL ELECTRICAL CHARACTERISTICS – LMUN5112DW1T1

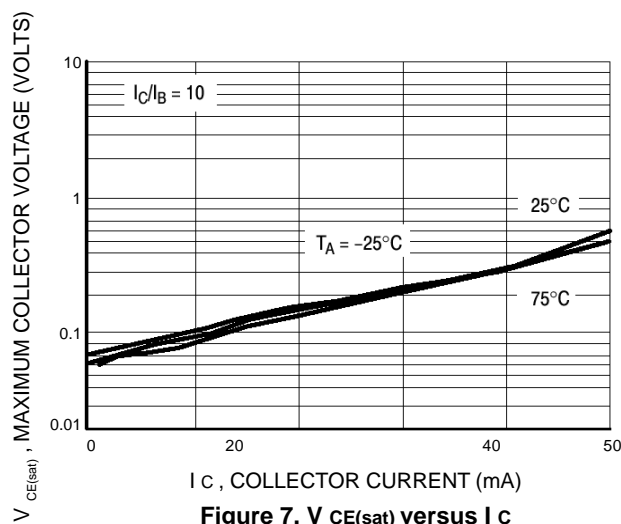


Figure 7.  $V_{CE(sat)}$  versus  $I_C$

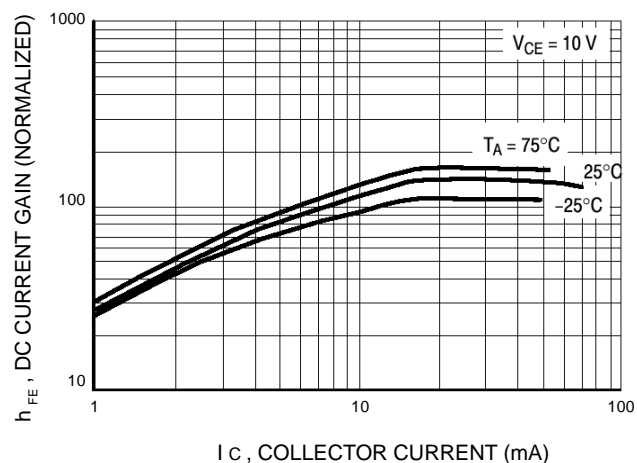


Figure 8. DC Current Gain

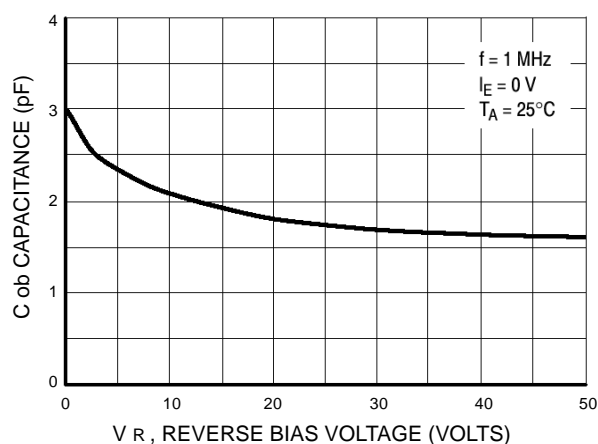


Figure 9. Output Capacitance

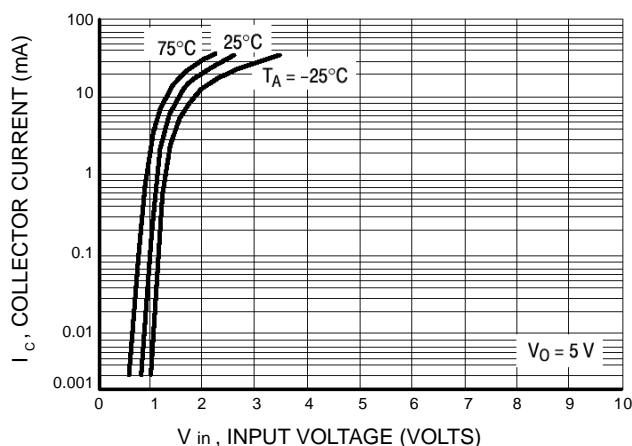


Figure 10. Output Current versus Input voltage

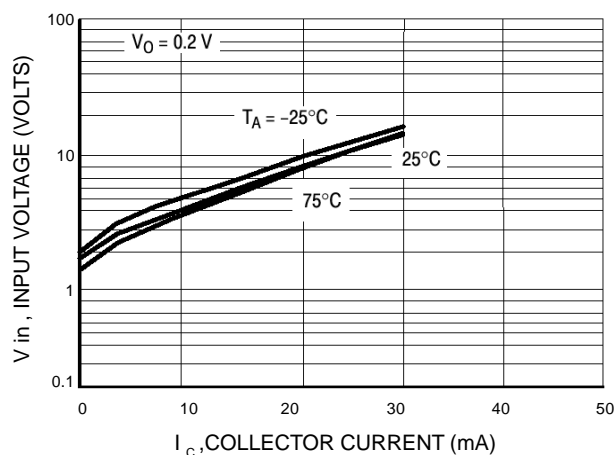


Figure 11. Input Voltage versus Output Current

LMUN5111DW1T1 Series

TYPICAL ELECTRICAL CHARACTERISTICS – LMUN5113DW1T1

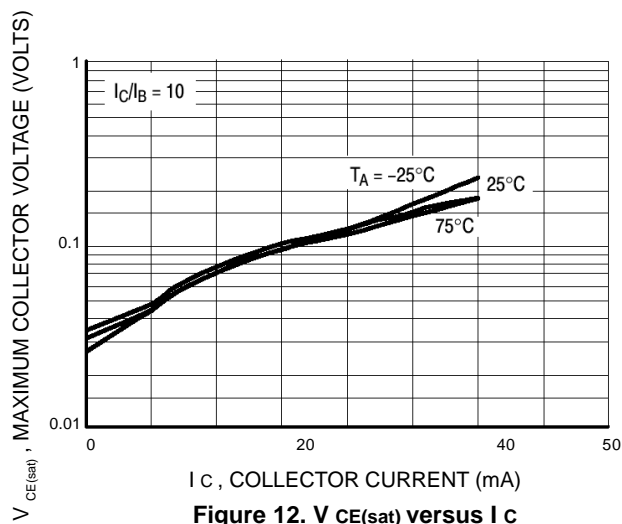


Figure 12.  $V_{CE(sat)}$  versus  $I_C$

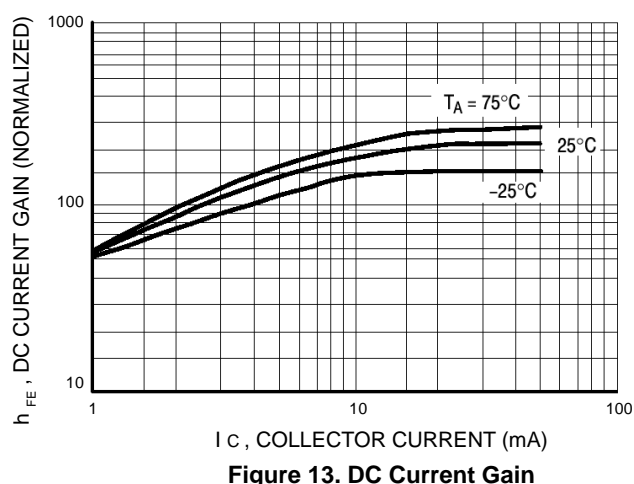


Figure 13. DC Current Gain

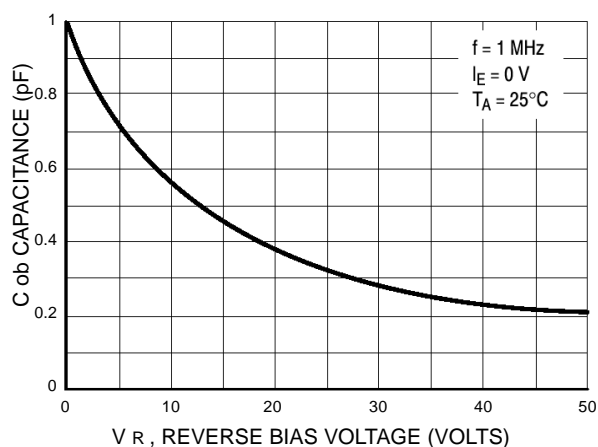


Figure 14. Output Capacitance

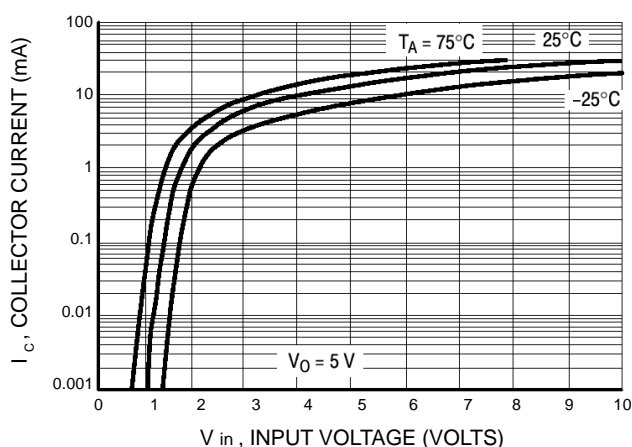


Figure 15. Output Current versus Input voltage

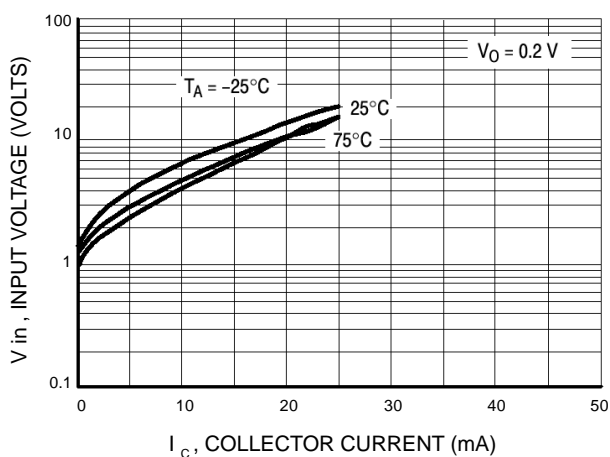
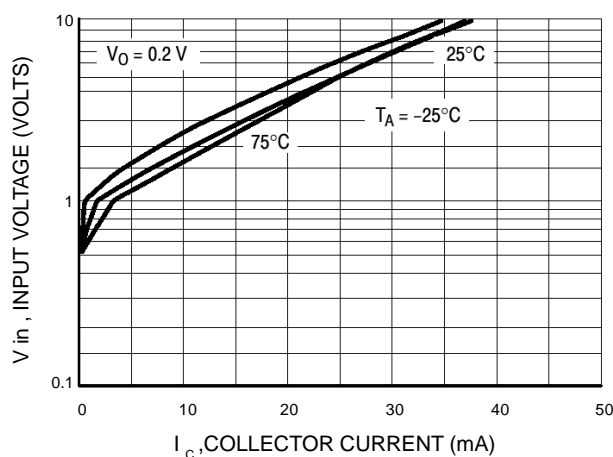
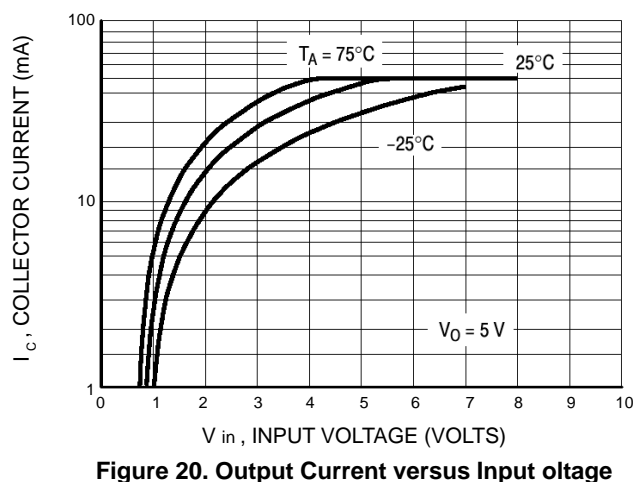
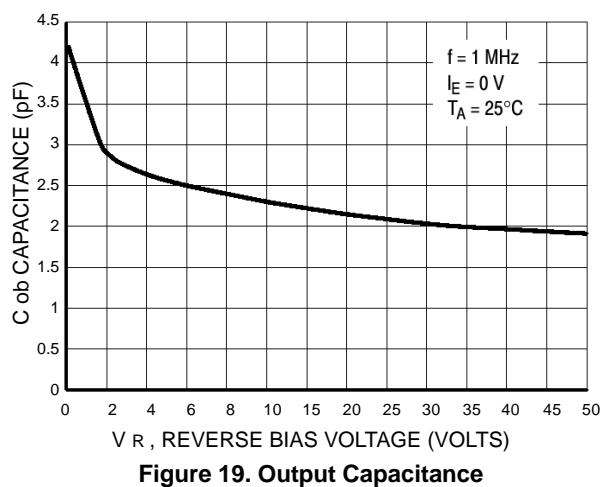
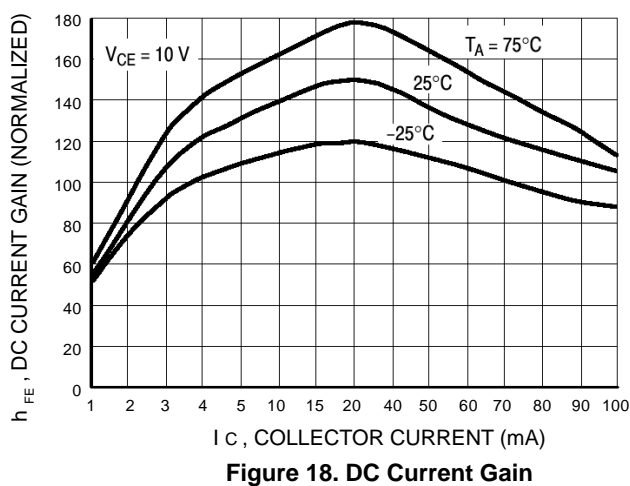
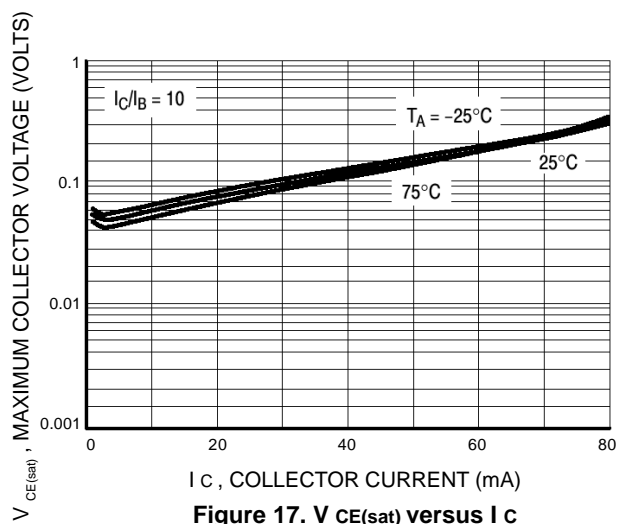


Figure 16. Input Voltage versus Output Current

LMUN5111DW1T1 Series

TYPICAL ELECTRICAL CHARACTERISTICS – LMUN5114DW1T1





LMUN5311DW1T1 Series

TYPICAL ELECTRICAL CHARACTERISTICS – LMUN5115DW1T1

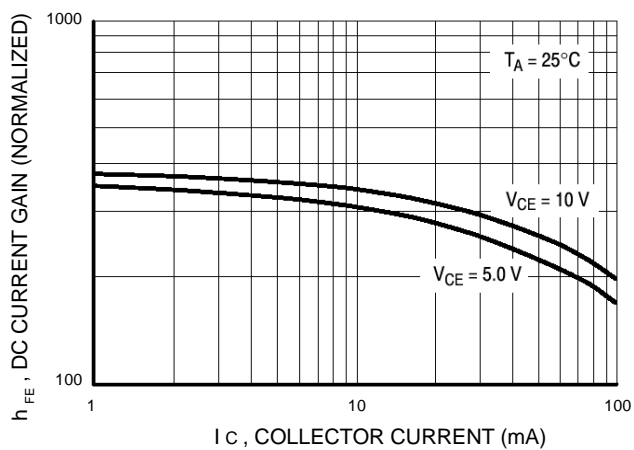


Figure 22. DC Current Gain

TYPICAL ELECTRICAL CHARACTERISTICS – LMUN5116DW1T1

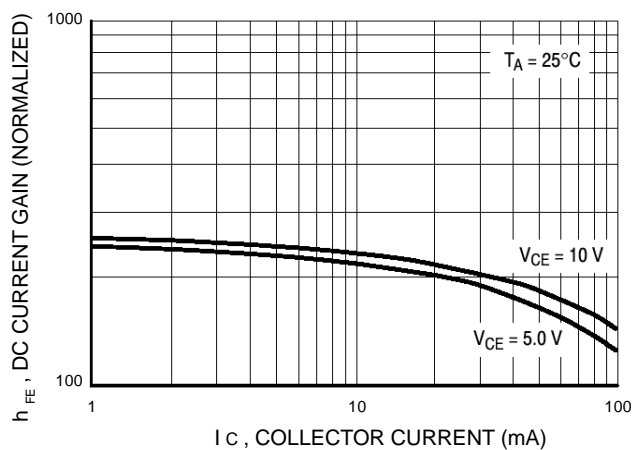
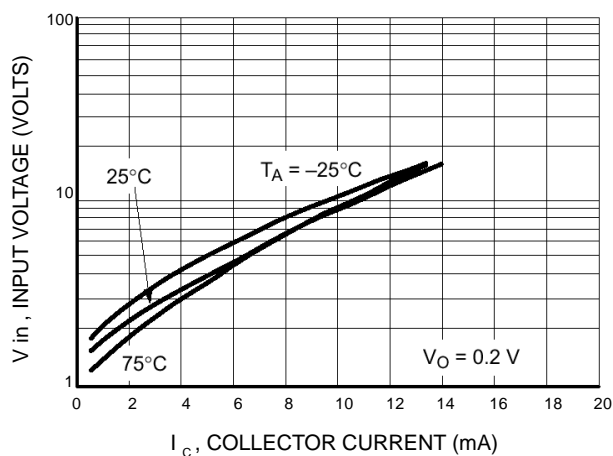
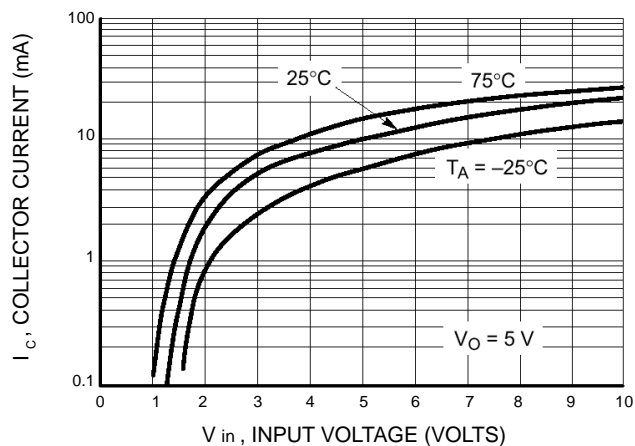
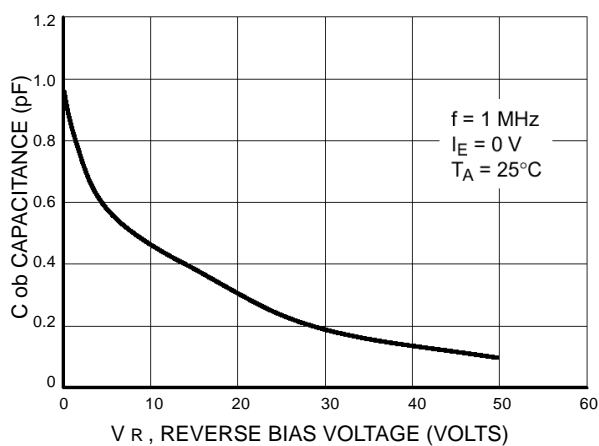
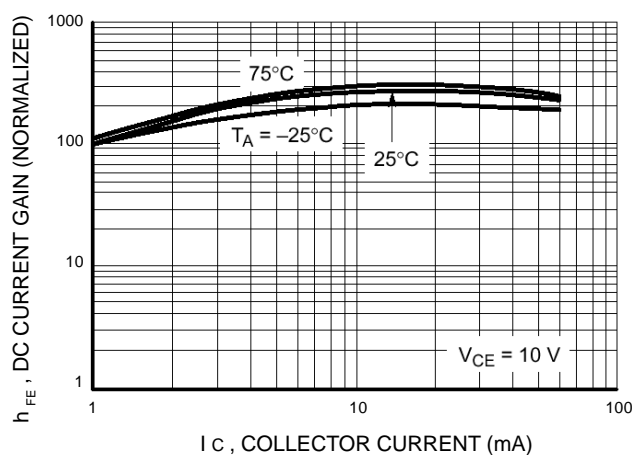
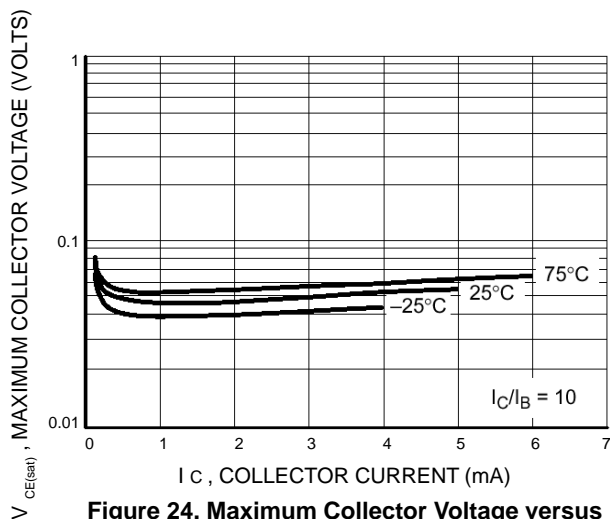


Figure 23. DC Current Gain

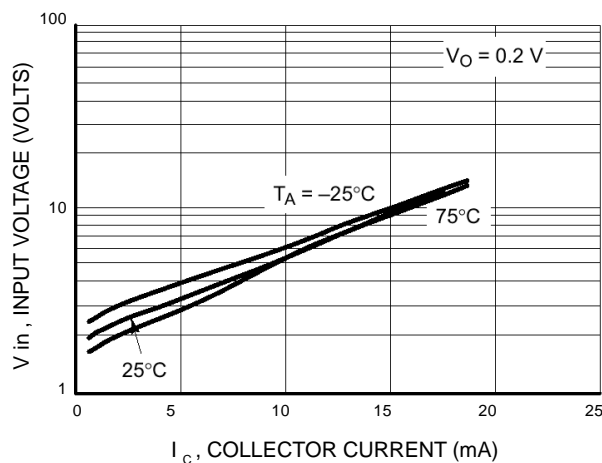
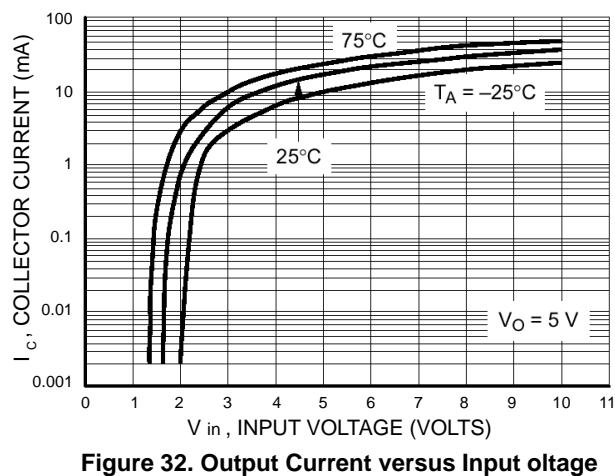
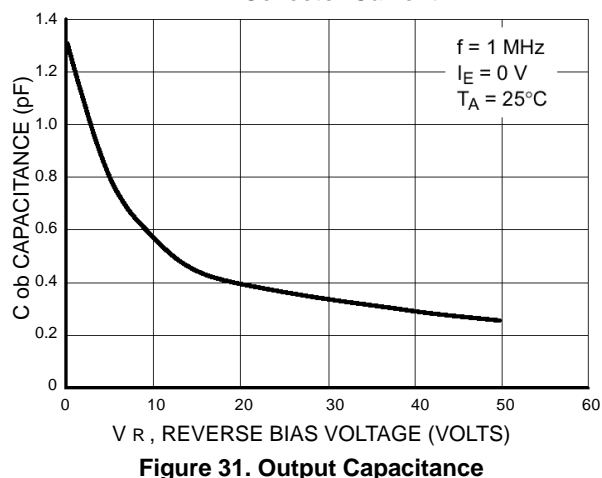
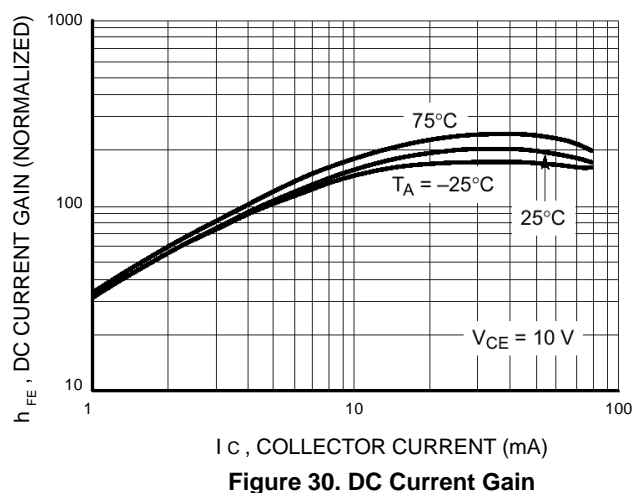
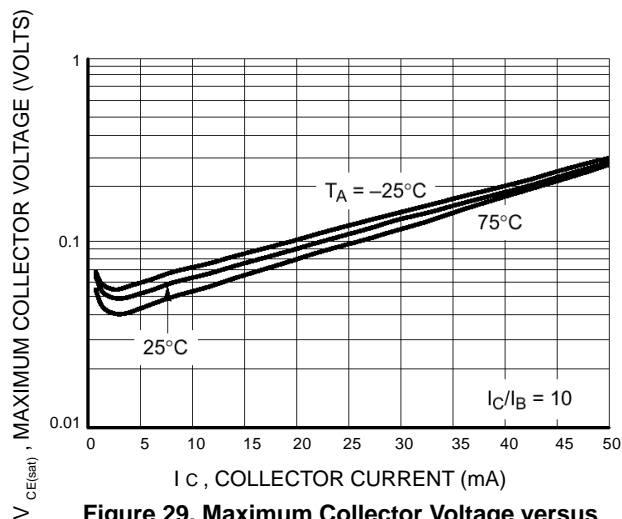
## LMUN5111DW1T1 Series

### TYPICAL ELECTRICAL CHARACTERISTICS – LMUN5136DW1T1



LMUN5111DW1T1 Series

TYPICAL ELECTRICAL CHARACTERISTICS – LMUN5137DW1T1

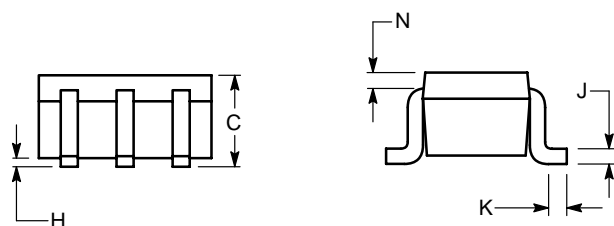
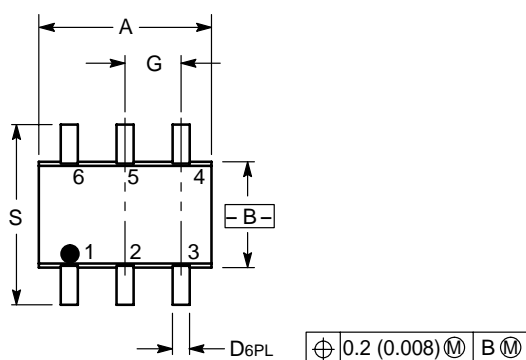


## LMUN5111DW1T1 Series

SC-88/SOT-363

### 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	0.031	0.043	0.80	1.10
D	0.004	0.012	0.10	0.30
G	0.026 BSC		0.65 BSC	
H	---	0.004	---	0.10
J	0.004	0.010	0.10	0.25
K	0.004	0.012	0.10	0.30
N	0.008 REF		0.20 REF	
S	0.079	0.087	2.00	2.20

- PIN 1. EMITTER 2  
 2. BASE 2  
 3. COLLECTOR 1  
 4. EMITTER 1  
 5. BASE 1  
 6. COLLECTOR 2

