

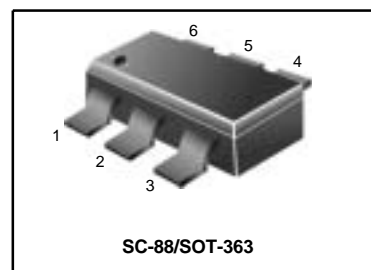
Dual Bias Resistor Transistors

NPN 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 LMUN5211DW1T1 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.

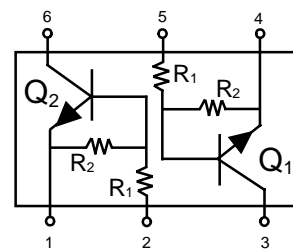
- Simplifies Circuit Design
- Reduces Board Space
- Reduces Component Count
- We declare that the material of product compliance with RoHS requirements.

LMUN5211DW1T1G Series



MAXIMUM RATINGS (T_A = 25°C unless otherwise noted, common for Q₁ and Q₂)

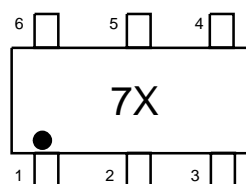
Rating	Symbol	Value	Unit
Collector-Base Voltage	V _{CBO}	50	Vdc
Collector-Emitter Voltage	V _{CEO}	50	Vdc
Collector Current	I _C	100	mAdc



THERMAL CHARACTERISTICS

Characteristic (One Junction Heated)	Symbol	Max	Unit
Total Device Dissipation T _A = 25°C	P _D	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 _{θJA}	670 (Note 1.) 490 (Note 2.)	°C/W
Characteristic (Both Junctions Heated)	Symbol	Max	Unit
Total Device Dissipation T _A = 25°C	P _D	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 _{θJA}	493 (Note 1.) 325 (Note 2.)	°C/W
Thermal Resistance – Junction-to-Lead	R _{θJL}	188 (Note 1.) 208 (Note 2.)	°C/W
Junction and Storage Temperature	T _J , T _{stg}	-55 to +150	°C

MARKING DIAGRAM



7X = 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

LMUN5211DW1T1G Series

DEVICE MARKING , RESISTOR VALUES AND ORDERING INFORMATION

Device	Package	Marking	R1(K)	R2(K)	Shipping
LMUN5211DW1T1G	SOT-363	7A	10	10	3000/Tape&Reel
LMUN5211DW1T3G	SOT-363	7A	10	10	10000/Tape&Reel
LMUN5212DW1T1G	SOT-363	7B	22	22	3000/Tape&Reel
LMUN5212DW1T3G	SOT-363	7B	22	22	10000/Tape&Reel
LMUN5213DW1T1G	SOT-363	7C	47	47	3000/Tape&Reel
LMUN5213DW1T3G	SOT-363	7C	47	47	10000/Tape&Reel
LMUN5214DW1T1G	SOT-363	7D	10	47	3000/Tape&Reel
LMUN5214DW1T3G	SOT-363	7D	10	47	10000/Tape&Reel
LMUN5215DW1T1G	SOT-363	7E	10	∞	3000/Tape&Reel
LMUN5215DW1T3G	SOT-363	7E	10	∞	10000/Tape&Reel
LMUN5216DW1T1G	SOT-363	7F	4.7	∞	3000/Tape&Reel
LMUN5216DW1T3G	SOT-363	7F	4.7	∞	10000/Tape&Reel
LMUN5230DW1T1G	SOT-363	7G	1	1	3000/Tape&Reel
LMUN5230DW1T3G	SOT-363	7G	1	1	10000/Tape&Reel
LMUN5231DW1T1G	SOT-363	7H	2.2	2.2	3000/Tape&Reel
LMUN5231DW1T3G	SOT-363	7H	2.2	2.2	10000/Tape&Reel
LMUN5232DW1T1G	SOT-363	7J	4.7	4.7	3000/Tape&Reel
LMUN5232DW1T3G	SOT-363	7J	4.7	4.7	10000/Tape&Reel
LMUN5233DW1T1G	SOT-363	7K	4.7	47	3000/Tape&Reel
LMUN5233DW1T3G	SOT-363	7K	4.7	47	10000/Tape&Reel
LMUN5234DW1T1G	SOT-363	7L	22	47	3000/Tape&Reel
LMUN5234DW1T3G	SOT-363	7L	22	47	10000/Tape&Reel
LMUN5235DW1T1G	SOT-363	7M	2.2	47	3000/Tape&Reel
LMUN5235DW1T3G	SOT-363	7M	2.2	47	10000/Tape&Reel
LMUN5236DW1T1G	SOT-363	7N	100	100	3000/Tape&Reel
LMUN5236DW1T3G	SOT-363	7N	100	100	10000/Tape&Reel
LMUN5237DW1T1G	SOT-363	7P	47	22	3000/Tape&Reel
LMUN5237DW1T3G	SOT-363	7P	47	22	10000/Tape&Reel

LMUN5211DW1T1G Series

ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted, common for Q₁ and Q₂)

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}	–	–	0.5	mAdc
MUN5211DW1T1, G		–	–	0.2	
MUN5212DW1T1, G		–	–	0.1	
MUN5213DW1T1, G		–	–	0.2	
MUN5214DW1T1, G		–	–	0.9	
MUN5215DW1T1, G		–	–	1.9	
MUN5216DW1T1, G		–	–	4.3	
MUN5230DW1T1, G		–	–	2.3	
MUN5231DW1T1, G		–	–	1.5	
MUN5232DW1T1, G		–	–	0.18	
MUN5233DW1T1, G		–	–	0.13	
MUN5234DW1T1, G		–	–	0.2	
MUN5235DW1T1, G		–	–	0.05	
MUN5236DW1T1, G		–	–	0.13	
MUN5237DW1T1, G		–	–		
Collector-Base Breakdown Voltage ($I_C = 10\ \mu\text{A}, I_E = 0$)	$V_{(BR)CBO}$	50	–	–	Vdc
Collector-Emitter Breakdown Voltage (Note 3) ($I_C = 2.0\text{ mA}, I_B = 0$)	$V_{(BR)CEO}$	50	–	–	Vdc

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

ON CHARACTERISTICS (Note 4)

DC Current Gain ($V_{CE} = 10\text{ V}, I_C = 5.0\text{ mA}$)	h_{FE}	35	60	–	
MUN5211DW1T1, G		60	100	–	
MUN5212DW1T1, G		80	140	–	
MUN5213DW1T1, G		80	140	–	
MUN5214DW1T1, G		160	350	–	
MUN5215DW1T1, G		160	350	–	
MUN5216DW1T1, G		3.0	5.0	–	
MUN5230DW1T1, G		8.0	15	–	
MUN5231DW1T1, G		15	30	–	
MUN5232DW1T1, G		80	200	–	
MUN5233DW1T1, G		80	150	–	
MUN5234DW1T1, G		80	140	–	
MUN5235DW1T1, G		80	150	–	
MUN5236DW1T1, G		80	140	–	
MUN5237DW1T1, G		80	140	–	

LMUN5211DW1T1G Series

ELECTRICAL CHARACTERISTICS

Collector-Emitter Saturation Voltage ($I_C = 10\text{ mA}$, $I_B = 0.3\text{ mA}$)	MUN5211DW1T1, G MUN5212DW1T1, G MUN5213DW1T1, G MUN5214DW1T1, G MUN5235DW1T1, G MUN5236DW1T1, G	$V_{CE(sat)}$	-	-	0.25 0.25 0.25 0.25 0.25 0.25	Vdc
($I_C = 10\text{ mA}$, $I_B = 5\text{ mA}$)	MUN5230DW1T1, G MUN5231DW1T1, G MUN5237DW1T1, G		-	-	0.25 0.25 0.25	
($I_C = 10\text{ mA}$, $I_B = 1\text{ mA}$)	MUN5215DW1T1, G MUN5216DW1T1, G MUN5232DW1T1, G MUN5233DW1T1, G MUN5234DW1T1, G		-	-	0.25 0.25 0.25 0.25 0.25	
Output Voltage (on) ($V_{CC} = 5.0\text{ V}$, $V_B = 2.5\text{ V}$, $R_L = 1.0\text{ k}\Omega$)	MUN5211DW1T1, G MUN5212DW1T1, G MUN5214DW1T1, G MUN5215DW1T1, G MUN5216DW1T1, G MUN5230DW1T1, G MUN5231DW1T1, G MUN5232DW1T1, G MUN5233DW1T1, G MUN5234DW1T1, G MUN5235DW1T1, G	V_{OL}	-	-	0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2	Vdc
($V_{CC} = 5.0\text{ V}$, $V_B = 3.5\text{ V}$, $R_L = 1.0\text{ k}\Omega$)	MUN5213DW1T1, G		-	-	0.2	
($V_{CC} = 5.0\text{ V}$, $V_B = 5.5\text{ V}$, $R_L = 1.0\text{ k}\Omega$)	MUN5236DW1T1, G		-	-	0.2	
($V_{CC} = 5.0\text{ V}$, $V_B = 4.0\text{ V}$, $R_L = 1.0\text{ k}\Omega$)	MUN5237DW1T1, G		-	-	0.2	

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

LMUN5211DW1T1G Series

ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted, common for Q₁ and Q₂),(Continued)

Characteristic	Symbol	Min	Typ	Max	Unit	
ON CHARACTERISTICS (Note 5) (Continued)						
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	–	–	V _{dc}	
MUN5211DW1T1, G		4.9	–	–		
MUN5212DW1T1, G		4.9	–	–		
MUN5213DW1T1, G		4.9	–	–		
MUN5214DW1T1, G		4.9	–	–		
MUN5233DW1T1, G		4.9	–	–		
MUN5234DW1T1, G		4.9	–	–		
MUN5235DW1T1, G		4.9	–	–		
($V_{CC} = 5.0\text{ V}, V_B = 0.050\text{ V}, R_L = 1.0\text{ k}\Omega$)		MUN5230DW1T1, G	4.9	–		–
($V_{CC} = 5.0\text{ V}, V_B = 0.25\text{ V}, R_L = 1.0\text{ k}\Omega$)		MUN5215DW1T1, G	4.9	–		–
MUN5216DW1T1, G		4.9	–	–		
MUN5231DW1T1, G		4.9	–	–		
MUN5232DW1T1, G		4.9	–	–		
MUN5236DW1T1, G		4.9	–	–		
MUN5237DW1T1, G	4.9	–	–			
Input Resistor	R1	7.0	10	13	k Ω	
MUN5211DW1T1, G		15.4	22	28.6		
MUN5212DW1T1, G		32.9	47	61.1		
MUN5213DW1T1, G		7.0	10	13		
MUN5214DW1T1, G		7.0	10	13		
MUN5215DW1T1, G		3.3	4.7	6.1		
MUN5216DW1T1, G		0.7	1.0	1.3		
MUN5230DW1T1, G		1.5	2.2	2.9		
MUN5231DW1T1, G		3.3	4.7	6.1		
MUN5232DW1T1, G		3.3	4.7	6.1		
MUN5233DW1T1, G		15.4	22	28.6		
MUN5234DW1T1, G		1.54	2.2	2.86		
MUN5235DW1T1, G		70	100	130		
MUN5236DW1T1, G		32.9	47	61.1		
Resistor Ratio	R1/R2	0.8	1.0	1.2		
MUN5211DW1T1, G/MUN5212DW1T1, G/ MUN5213DW1T1, G/MUN5236DW1T1, G		0.17	0.21	0.25		
MUN5214DW1T1, G		–	–	–		
MUN5215DW1T1, G/MUN5216DW1T1, G		0.8	1.0	1.2		
MUN5230DW1T1, G/MUN5231DW1T1, G/MUN5232DW1T1, G		0.055	0.1	0.185		
MUN5233DW1T1, G		0.38	0.47	0.56		
MUN5234DW1T1, G		0.038	0.047	0.056		
MUN5235DW1T1, G		1.7	2.1	2.6		
MUN5237DW1T1, G						

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

ALL MUN5211DW1T1 SERIES DEVICES

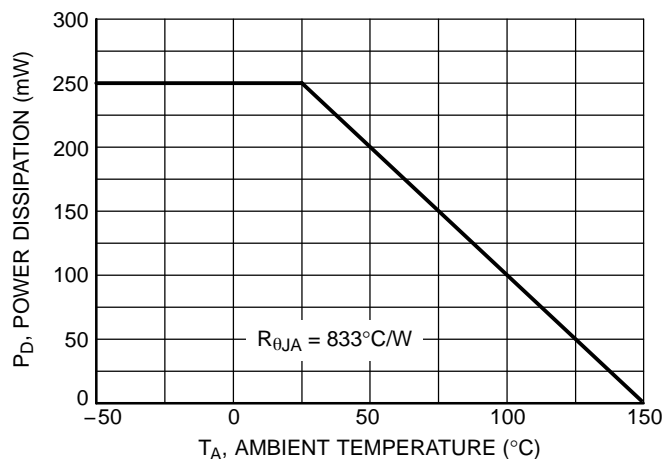


Figure 1. Derating Curve

TYPICAL ELECTRICAL CHARACTERISTICS – LMUN5211DW1T1

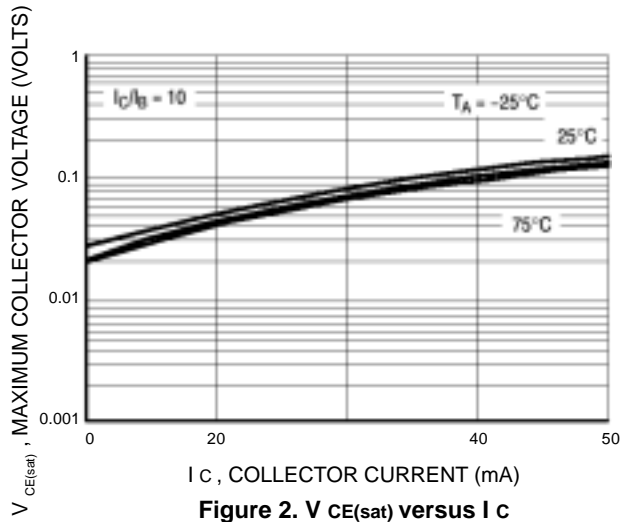


Figure 2. $V_{CE(sat)}$ versus I_C

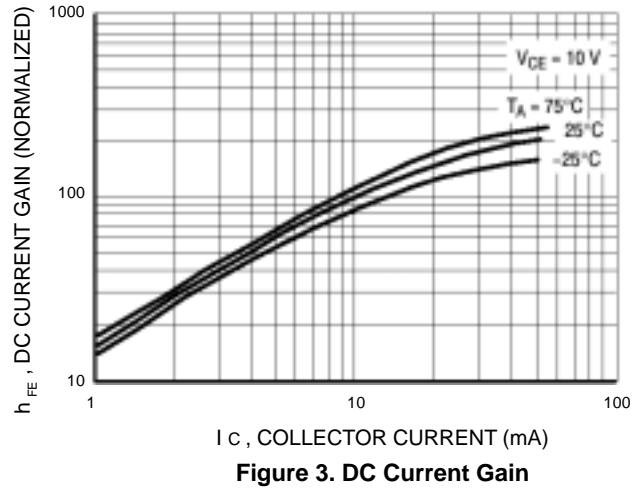


Figure 3. DC Current Gain

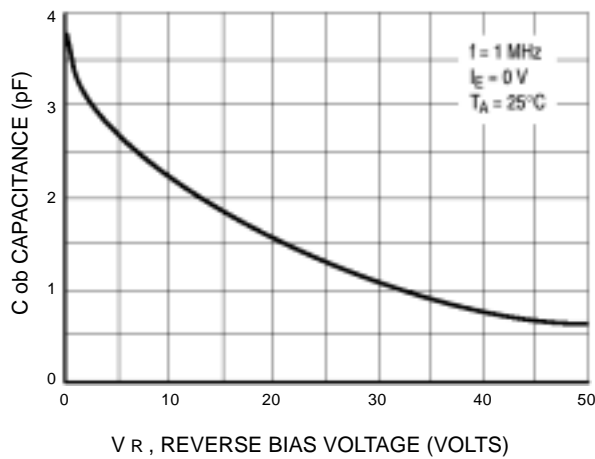


Figure 4. Output Capacitance

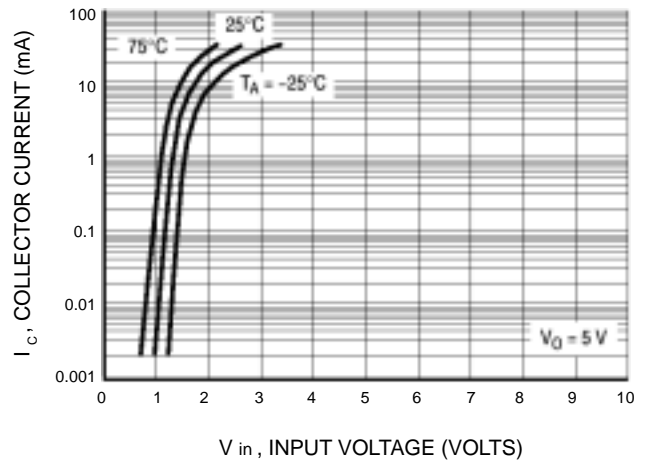


Figure 5. Output Current versus Input Voltage

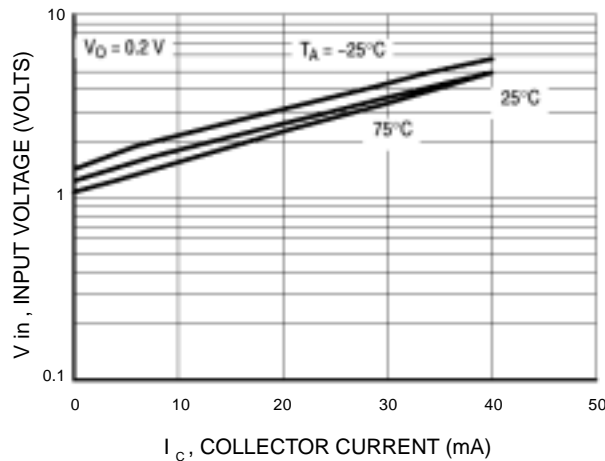
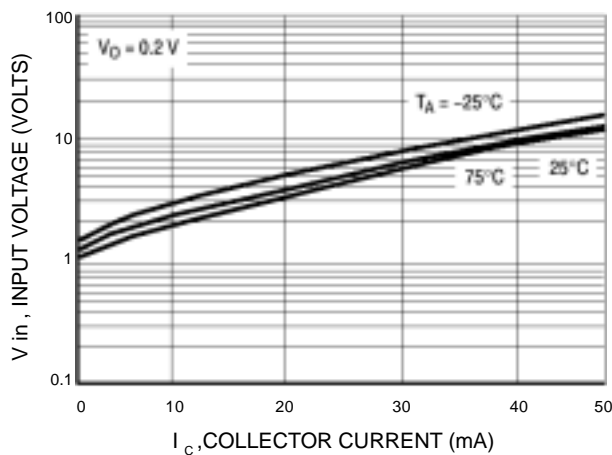
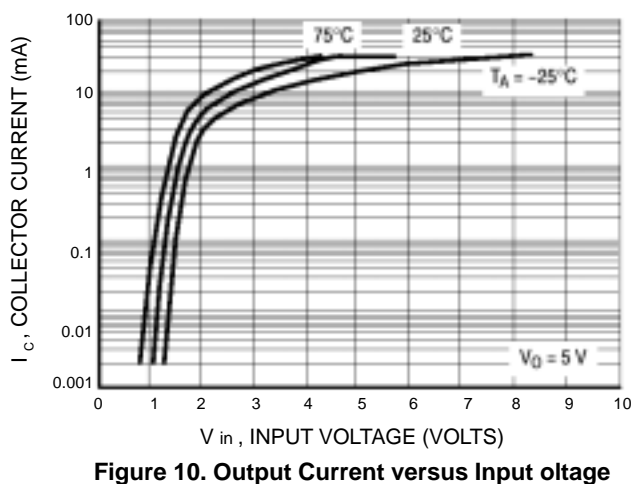
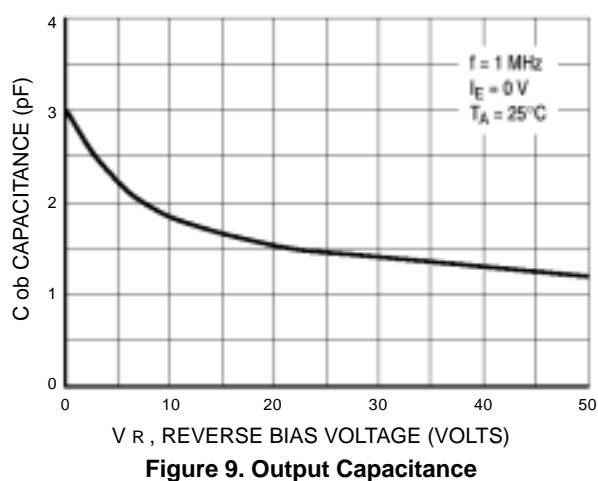
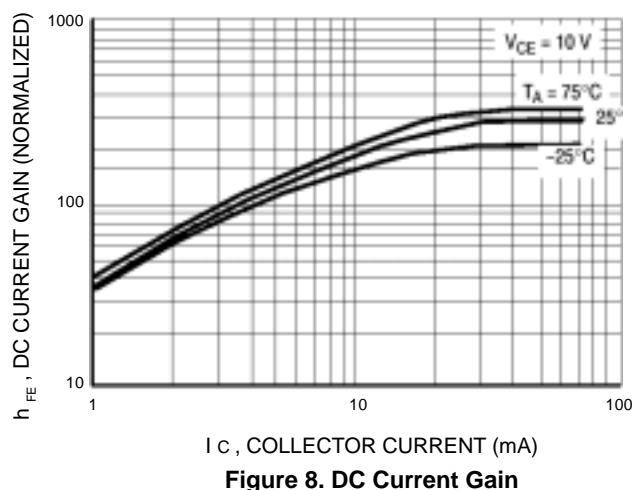
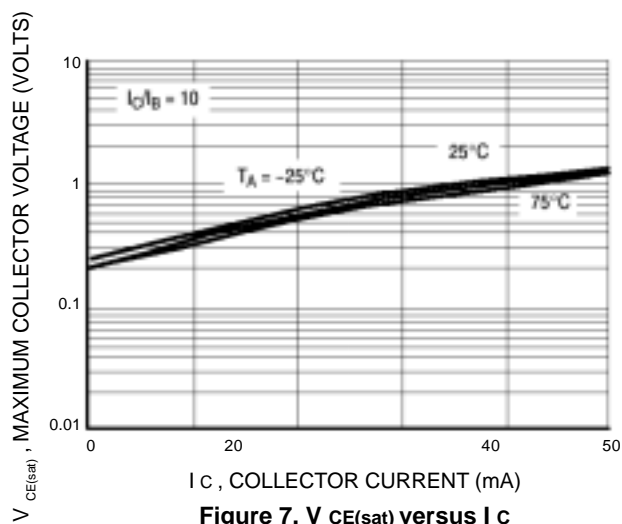


Figure 6. Input Voltage versus Output Current

LMUN5211DW1T1G Series

TYPICAL ELECTRICAL CHARACTERISTICS – LMUN5212DW1T1



LMUN5211DW1T1G Series

TYPICAL ELECTRICAL CHARACTERISTICS – LMUN5213DW1T1

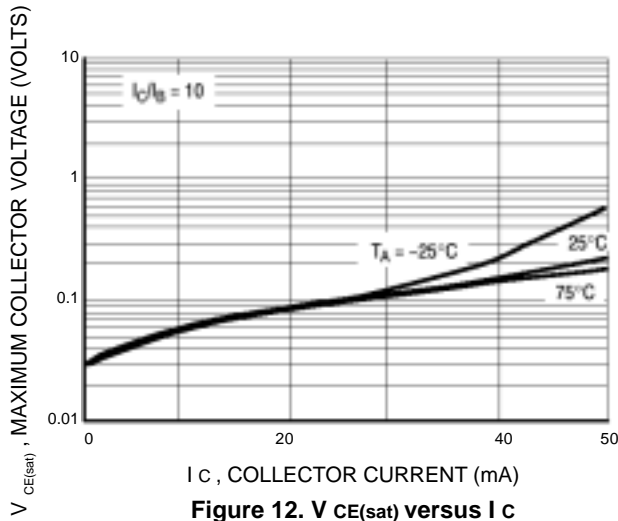


Figure 12. $V_{CE(sat)}$ versus I_c

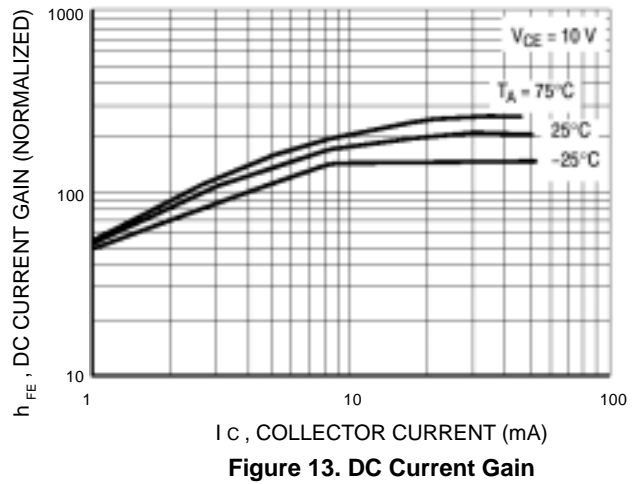


Figure 13. DC Current Gain

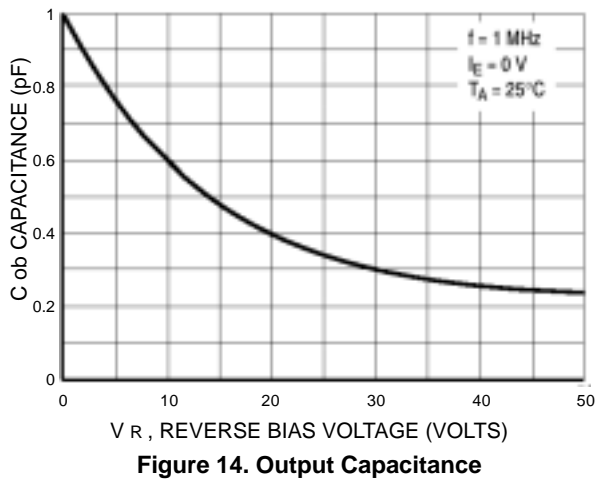


Figure 14. Output Capacitance

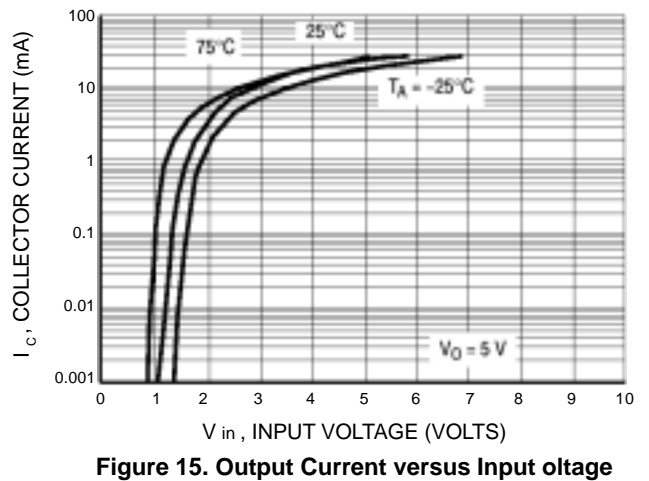


Figure 15. Output Current versus Input Voltage

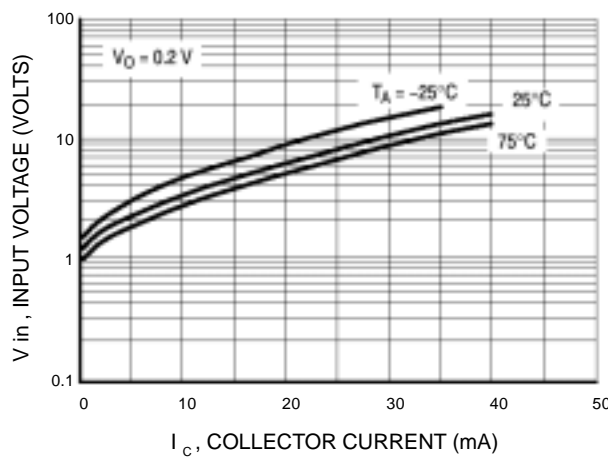


Figure 16. Input Voltage versus Output Current

LMUN5211DW1T1G Series

TYPICAL ELECTRICAL CHARACTERISTICS – LMUN5214DW1T1

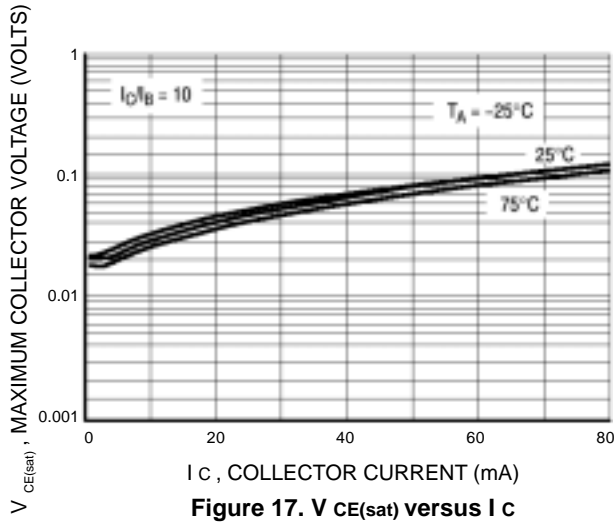


Figure 17. $V_{CE(sat)}$ versus I_C

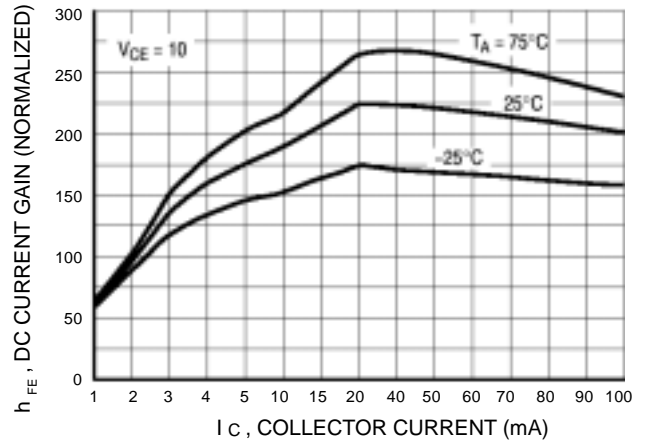


Figure 18. DC Current Gain

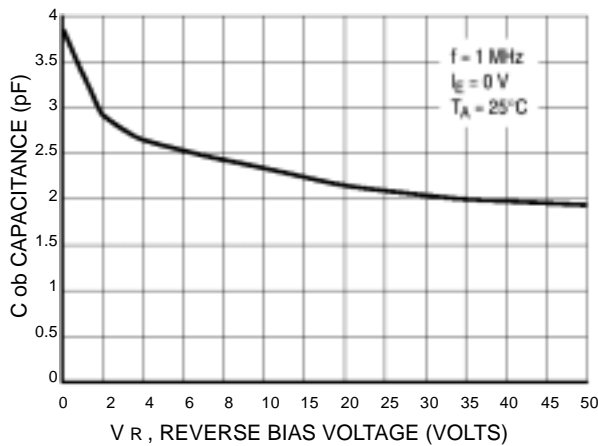


Figure 19. Output Capacitance

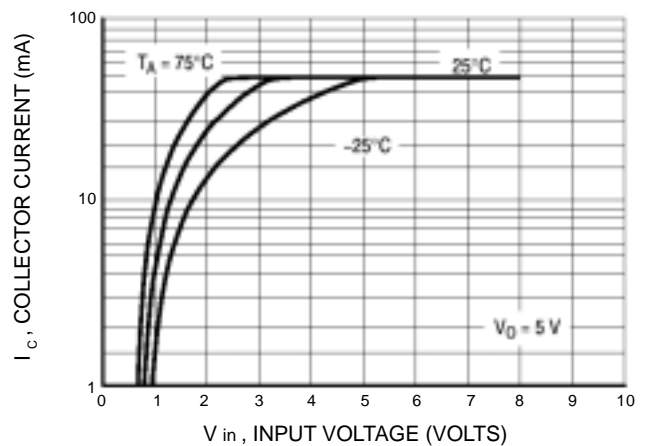


Figure 20. Output Current versus Input Voltage

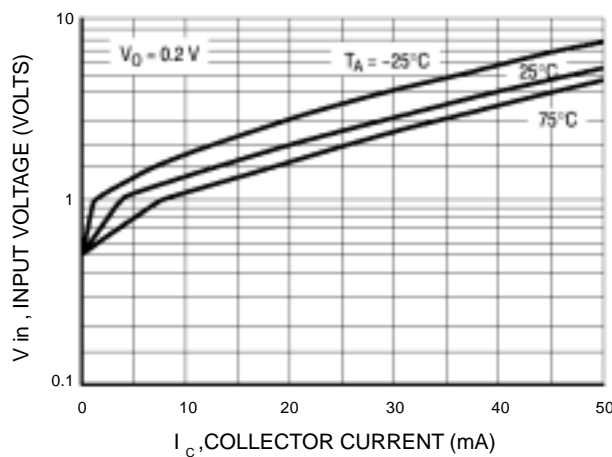
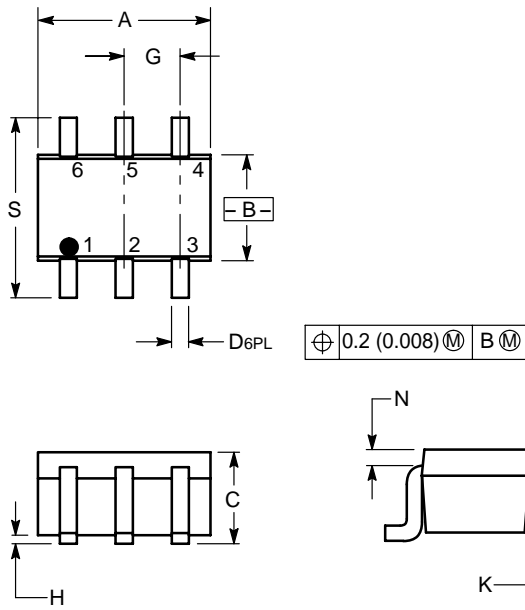


Figure 21. Input Voltage versus Output Current

LMUN5211DW1T1G 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

