

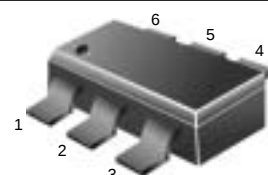
Dual Bias Resistor Transistors

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



SC-88/SOT-363

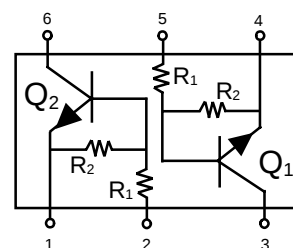
MAXIMUM RATINGS (T_A = 25°C unless otherwise noted, common for Q₁ and Q₂)

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

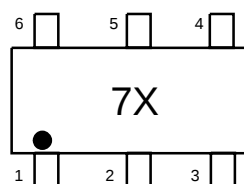
THERMAL CHARACTERISTICS

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

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



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.

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 ($I_C = 10\text{ }\mu\text{A}$, $I_E = 0$)	$V_{(BR)CBO}$	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 ($V_{CE} = 10\text{ V}$, $I_C = 5.0\text{ mA}$)	MUN5211DW1T1, G	h_{FE}	35	60	–	
	MUN5212DW1T1, G		60	100	–	
	MUN5213DW1T1, G		80	140	–	
	MUN5214DW1T1, G		80	140	–	
	MUN5215DW1T1, G		160	350	–	
	MUN5216DW1T1, G		160	350	–	
	MUN5230DW1T1, G		3.0	5.0	–	
	MUN5231DW1T1, G		8.0	15	–	
	MUN5232DW1T1, G		15	30	–	
	MUN5233DW1T1, G		80	200	–	
	MUN5234DW1T1, G		80	150	–	
	MUN5235DW1T1, G		80	140	–	
	MUN5236DW1T1, G		80	150	–	
	MUN5237DW1T1, G		80	140	–	

LMUN5211DW1T1G Series

ELECTRICAL CHARACTERISTICS

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

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

LMUN5211DW1T1G 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) (Continued)					
Output Voltage (off) ($V_{CC} = 5.0\text{ V}$, $V_B = 0.5\text{ V}$, $R_L = 1.0\text{ k}\Omega$) ($V_{CC} = 5.0\text{ V}$, $V_B = 0.050\text{ V}$, $R_L = 1.0\text{ k}\Omega$) ($V_{CC} = 5.0\text{ V}$, $V_B = 0.25\text{ V}$, $R_L = 1.0\text{ k}\Omega$)	V_{OH}	4.9 4.9 4.9 4.9 4.9 4.9 4.9 4.9 4.9 4.9 4.9 4.9 4.9 4.9	– – – – – – – – – – – – – –	– – – – – – – – – – – – – –	Vdc
Input Resistor	R_1	7.0 15.4 32.9 7.0 7.0 3.3 0.7 1.5 3.3 3.3 15.4 1.54 70 32.9	10 22 47 10 10 4.7 1.0 2.2 4.7 4.7 22 2.2 100 47	13 28.6 61.1 13 13 6.1 1.3 2.9 6.1 6.1 28.6 2.86 130 61.1	k Ω
Resistor Ratio	R_1/R_2	0.8 0.17 – 0.8 0.055 0.38 0.038 1.7	1.0 0.21 – 1.0 0.1 0.47 0.047 2.1	1.2 0.25 – 1.2 0.185 0.56 0.056 2.6	

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

ALL MUN5211DW1T1 SERIES DEVICES

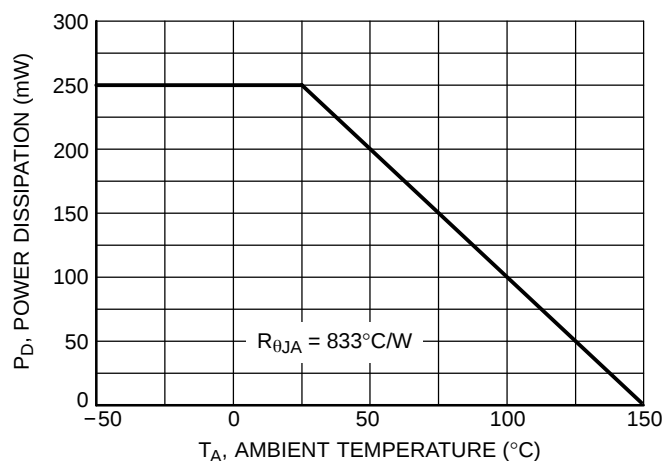
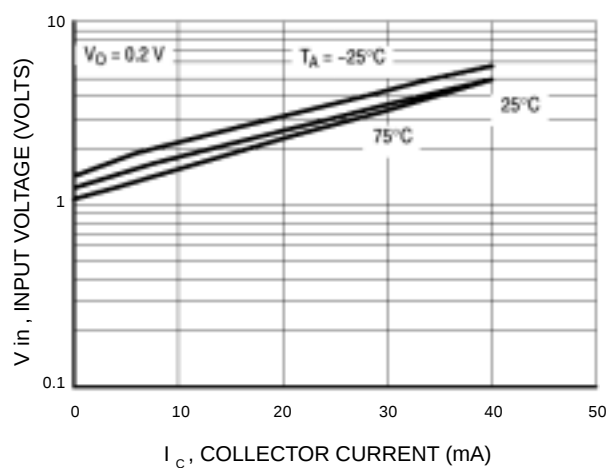
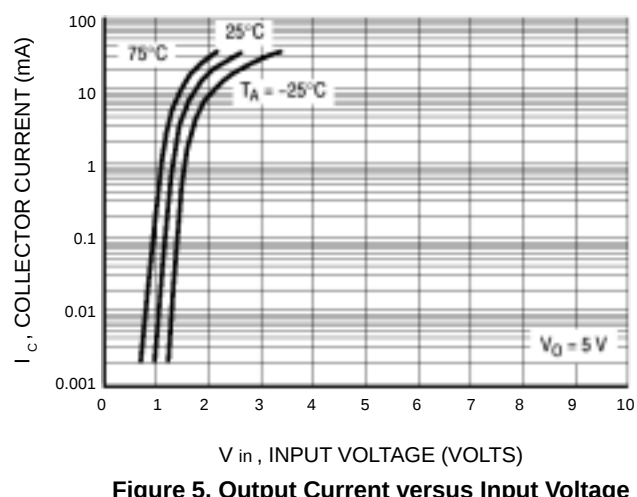
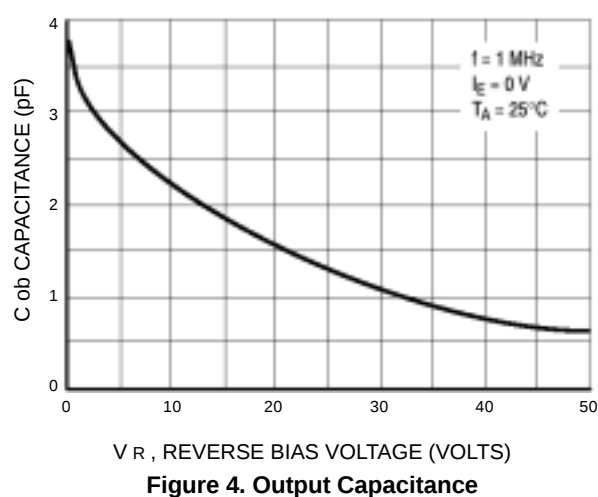
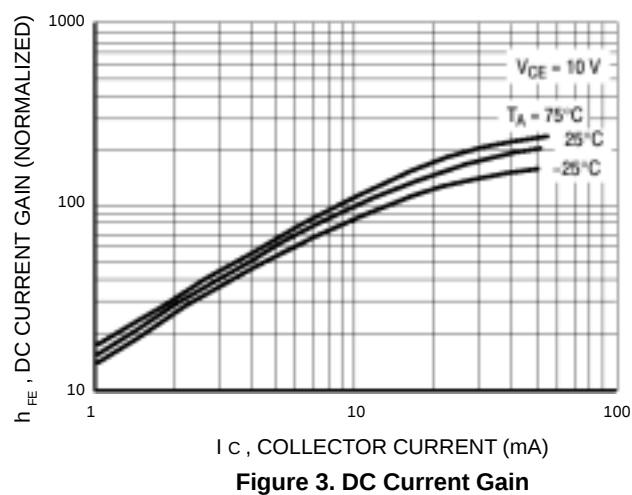
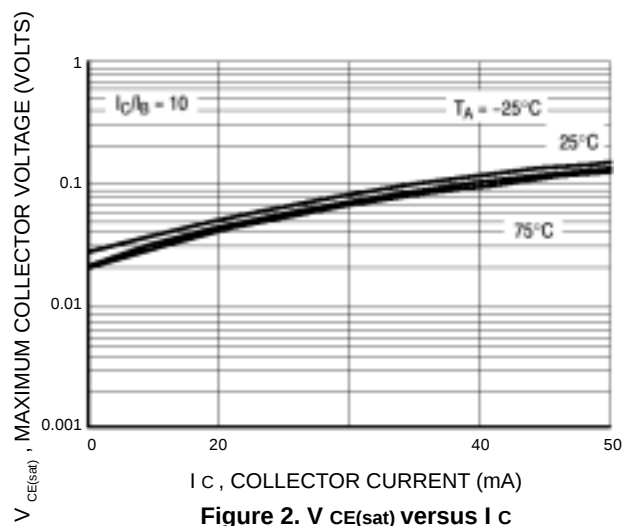


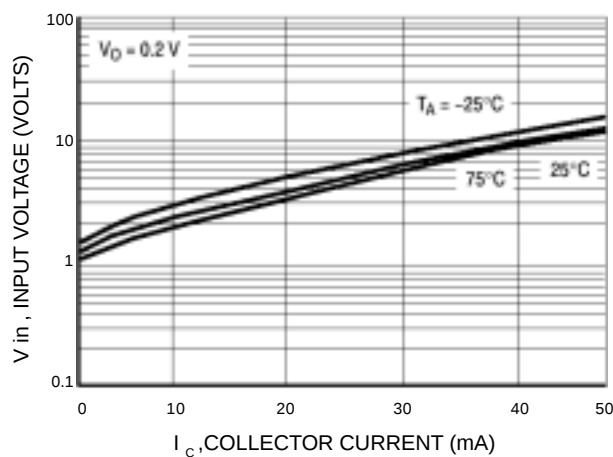
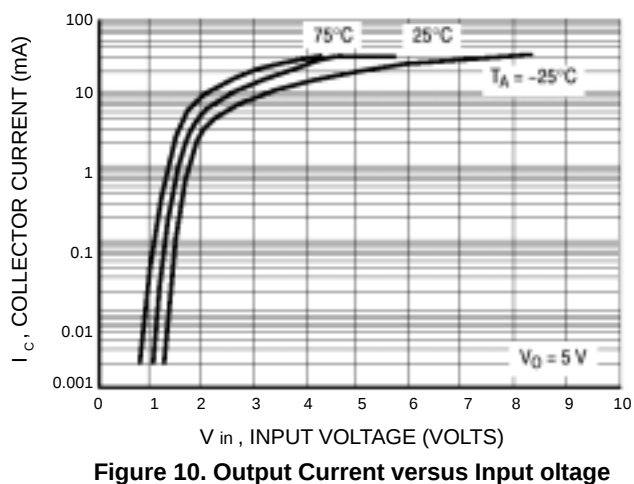
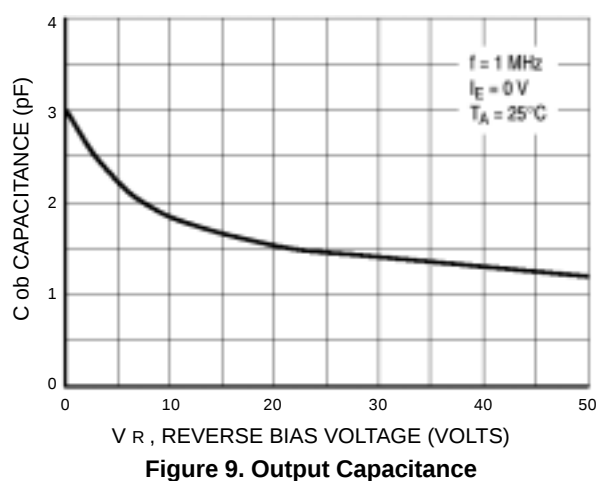
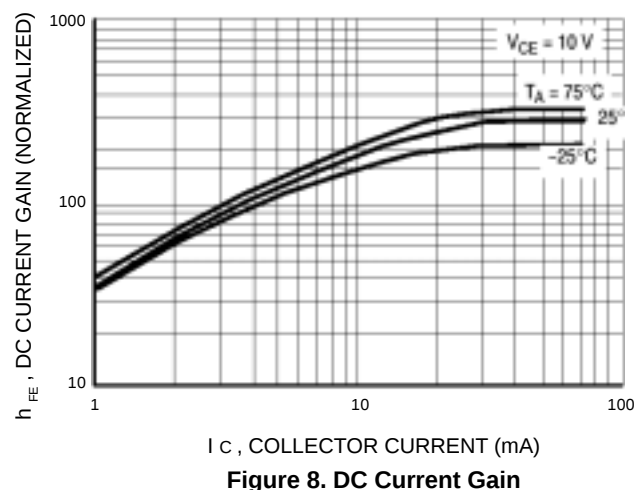
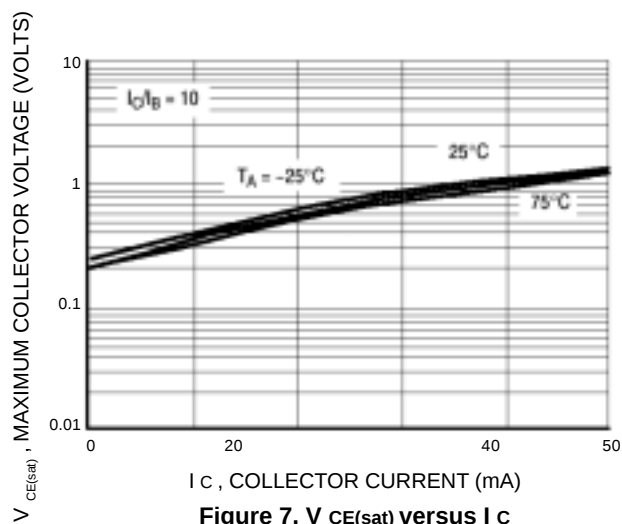
Figure 1. Derating Curve

TYPICAL ELECTRICAL CHARACTERISTICS – LMUN5211DW1T1



LMUN5211DW1T1G Series

TYPICAL ELECTRICAL CHARACTERISTICS – LMUN5212DW1T1



LMUN5211DW1T1G Series

TYPICAL ELECTRICAL CHARACTERISTICS – LMUN5213DW1T1

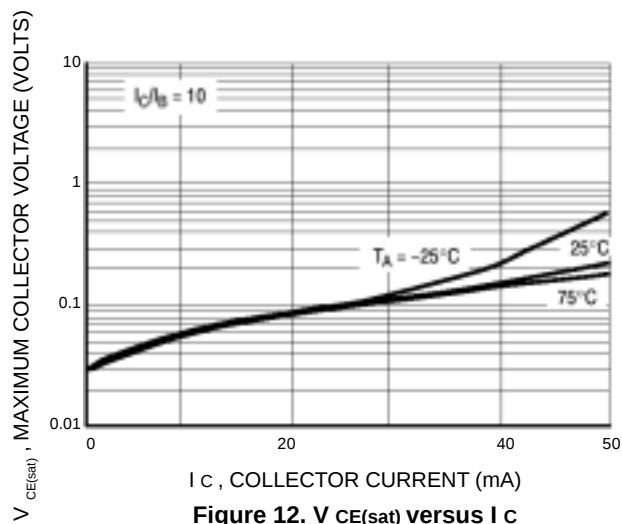


Figure 12. $V_{CE(sat)}$ versus I_C

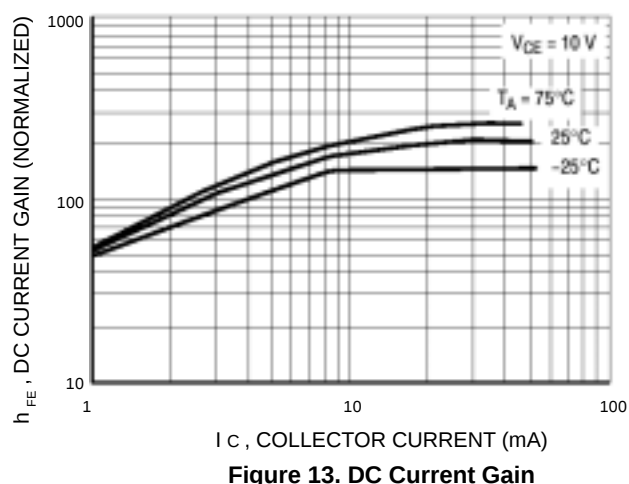


Figure 13. DC Current Gain

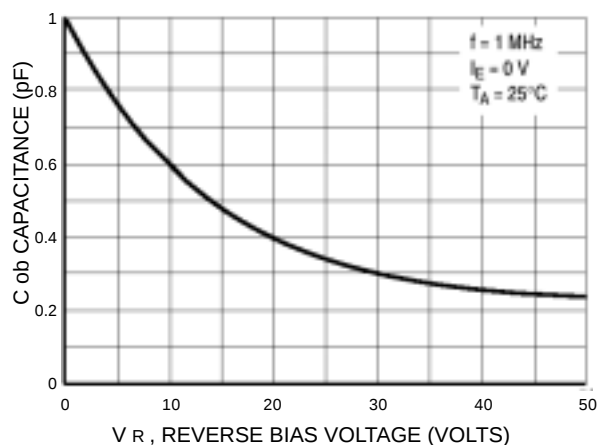


Figure 14. Output Capacitance

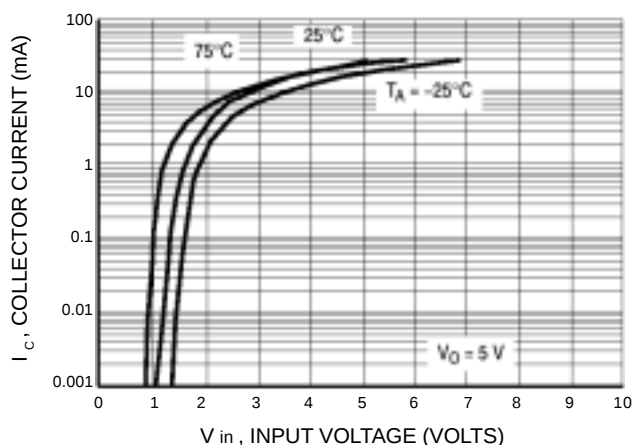


Figure 15. Output Current versus Input voltage

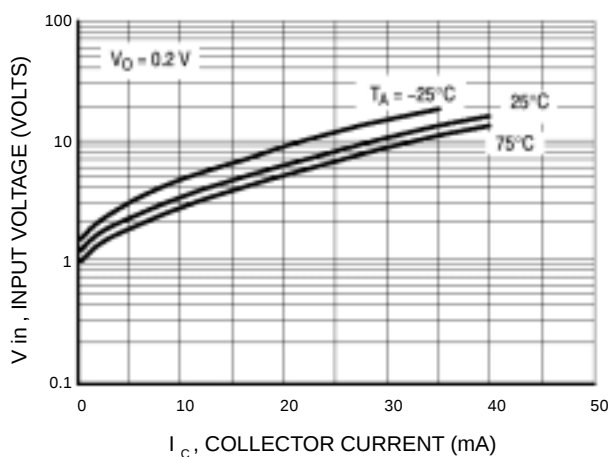
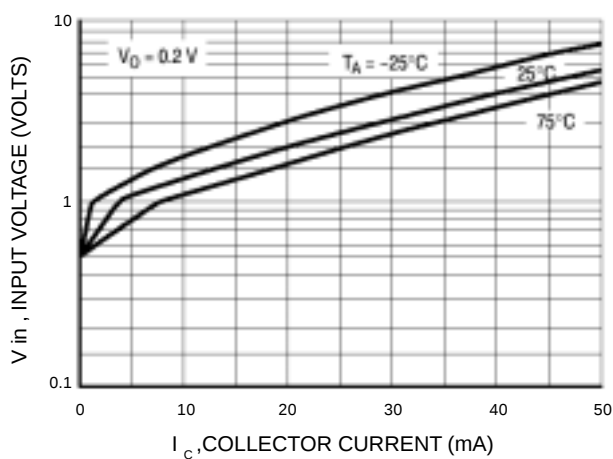
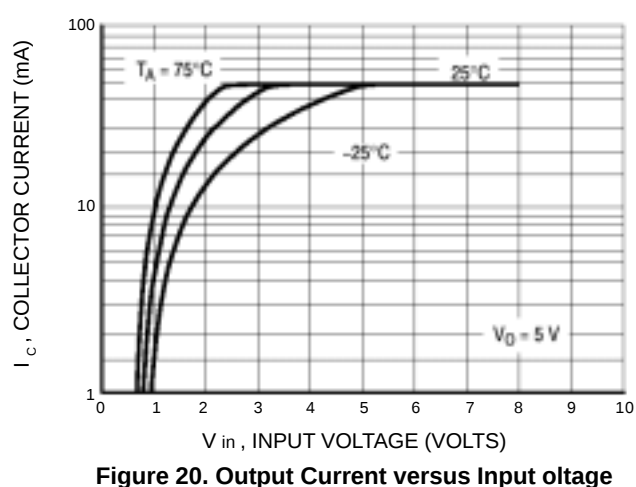
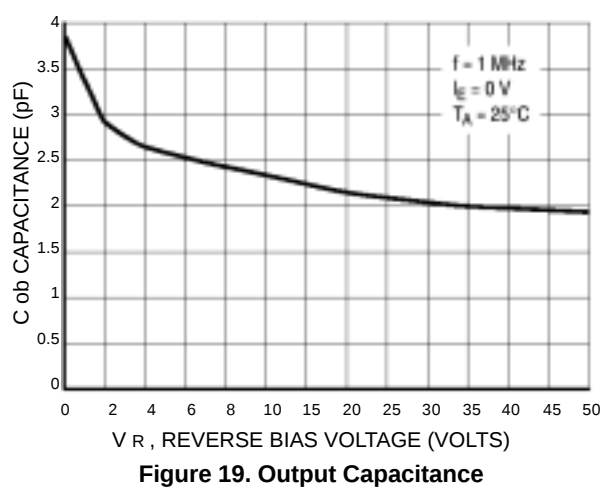
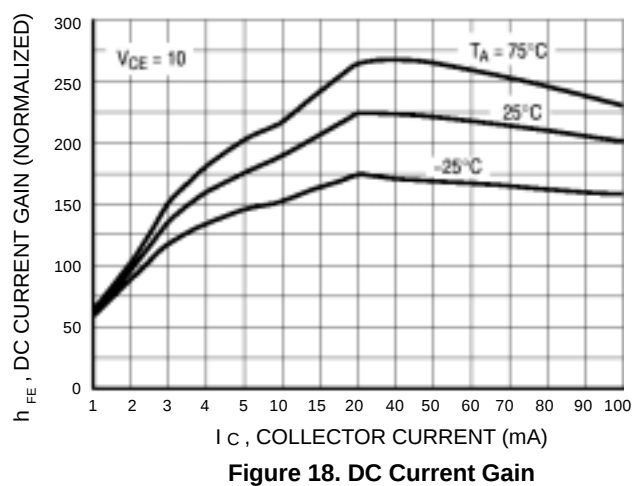
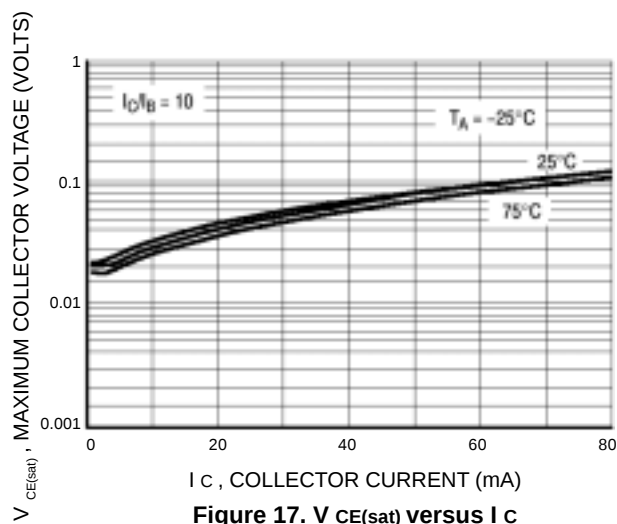


Figure 16. Input Voltage versus Output Current

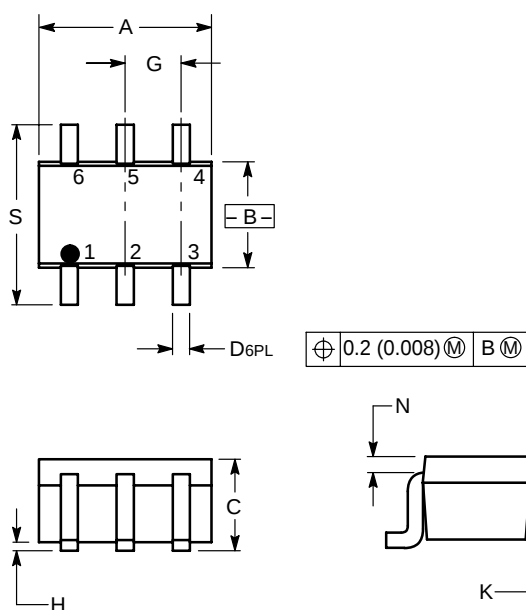
LMUN5211DW1T1G Series

TYPICAL ELECTRICAL CHARACTERISTICS – LMUN5214DW1T1



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

