

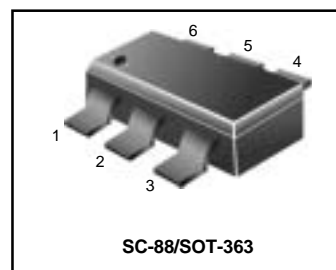
Dual Bias Resistor Transistors

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.

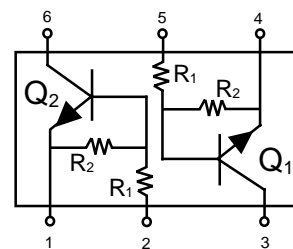
- Simplifies Circuit Design
- Reduces Board Space
- Reduces Component Count
- Pb-Free Package is available

LMUN5211DW1T1 Series



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

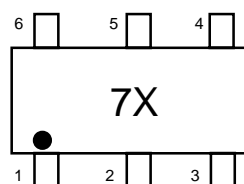
| Rating | Symbol | Value | Unit |
|---------------------------|------------------|-------|------|
| Collector-Base Voltage | V _{CBO} | 50 | Vdc |
| Collector-Emitter Voltage | V _{CEO} | 50 | Vdc |
| Collector Current | I _C | 100 | mAdc |



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

LMUN5211DW1T1 Series

DEVICE MARKING , RESISTOR VALUES AND ORDERING INFORMATION

| Device | Package | Marking | R1(K) | R2(K) | Shipping |
|----------------|---------|-------------|-------|-------|----------------|
| LMUN5211DW1T1 | SOT-363 | 7A | 10 | 10 | 3000/Tape&Reel |
| LMUN5211DW1T1G | SOT-363 | 7A(Pb-Free) | 10 | 10 | 3000/Tape&Reel |
| LMUN5212DW1T1 | SOT-363 | 7B | 22 | 22 | 3000/Tape&Reel |
| LMUN5212DW1T1G | SOT-363 | 7B(Pb-Free) | 22 | 22 | 3000/Tape&Reel |
| LMUN5213DW1T1 | SOT-363 | 7C | 47 | 47 | 3000/Tape&Reel |
| LMUN5213DW1T1G | SOT-363 | 7C(Pb-Free) | 47 | 47 | 3000/Tape&Reel |
| LMUN5214DW1T1 | SOT-363 | 7D | 10 | 47 | 3000/Tape&Reel |
| LMUN5214DW1T1G | SOT-363 | 7D(Pb-Free) | 10 | 47 | 3000/Tape&Reel |
| LMUN5215DW1T1 | SOT-363 | 7E | 10 | ∞ | 3000/Tape&Reel |
| LMUN5215DW1T1G | SOT-363 | 7E(Pb-Free) | 10 | ∞ | 3000/Tape&Reel |
| LMUN5216DW1T1 | SOT-363 | 7F | 4.7 | ∞ | 3000/Tape&Reel |
| LMUN5216DW1T1G | SOT-363 | 7F(Pb-Free) | 4.7 | ∞ | 3000/Tape&Reel |
| LMUN5230DW1T1 | SOT-363 | 7G | 1 | 1 | 3000/Tape&Reel |
| LMUN5230DW1T1G | SOT-363 | 7G(Pb-Free) | 1 | 1 | 3000/Tape&Reel |
| LMUN5231DW1T1 | SOT-363 | 7H | 2.2 | 2.2 | 3000/Tape&Reel |
| LMUN5231DW1T1G | SOT-363 | 7H(Pb-Free) | 2.2 | 2.2 | 3000/Tape&Reel |
| LMUN5232DW1T1 | SOT-363 | 7J | 4.7 | 4.7 | 3000/Tape&Reel |
| LMUN5232DW1T1G | SOT-363 | 7J(Pb-Free) | 4.7 | 4.7 | 3000/Tape&Reel |
| LMUN5233DW1T1 | SOT-363 | 7K | 4.7 | 47 | 3000/Tape&Reel |
| LMUN5233DW1T1G | SOT-363 | 7K(Pb-Free) | 4.7 | 47 | 3000/Tape&Reel |
| LMUN5234DW1T1 | SOT-363 | 7L | 22 | 47 | 3000/Tape&Reel |
| LMUN5234DW1T1G | SOT-363 | 7L(Pb-Free) | 22 | 47 | 3000/Tape&Reel |
| LMUN5235DW1T1 | SOT-363 | 7M | 2.2 | 47 | 3000/Tape&Reel |
| LMUN5235DW1T1G | SOT-363 | 7M(Pb-Free) | 2.2 | 47 | 3000/Tape&Reel |
| LMUN5236DW1T1 | SOT-363 | 7N | 100 | 100 | 3000/Tape&Reel |
| LMUN5236DW1T1G | SOT-363 | 7N(Pb-Free) | 100 | 100 | 3000/Tape&Reel |
| LMUN5237DW1T1 | SOT-363 | 7P | 47 | 22 | 3000/Tape&Reel |
| LMUN5237DW1T1G | SOT-363 | 7P(Pb-Free) | 47 | 22 | 3000/Tape&Reel |

LMUN5211DW1T1 Series

ELECTRICAL CHARACTERISTICS

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

| 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) | LMUN5211DW1T1 | – | – | 0.5 | mAdc |
| | LMUN5212DW1T1 | – | – | 0.2 | |
| | LMUN5213DW1T1 | – | – | 0.1 | |
| | LMUN5214DW1T1 | – | – | 0.2 | |
| | LMUN5215DW1T1 | – | – | 0.9 | |
| | LMUN5216DW1T1 | – | – | 1.9 | |
| | LMUN5230DW1T1 | – | – | 4.3 | |
| | LMUN5231DW1T1 | – | – | 2.3 | |
| | LMUN5232DW1T1 | – | – | 1.5 | |
| | LMUN5233DW1T1 | – | – | 0.18 | |
| | LMUN5234DW1T1 | – | – | 0.13 | |
| | LMUN5235DW1T1 | – | – | 0.2 | |
| | LMUN5236DW1T1 | – | – | 0.05 | |
| | LMUN5237DW1T1 | – | – | 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 |

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

LMUN5211DW1T1 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.) | | | | | | |
| DC Current Gain ($V_{CE} = 10\text{ V}$, $I_C = 5.0\text{ mA}$) | LMUN5211DW1T1 | h_{FE} | 35 | 60 | – | |
| | LMUN5212DW1T1 | | 60 | 100 | – | |
| | LMUN5213DW1T1 | | 80 | 140 | – | |
| | LMUN5214DW1T1 | | 80 | 140 | – | |
| | LMUN5215DW1T1 | | 160 | 350 | – | |
| | LMUN5216DW1T1 | | 160 | 350 | – | |
| | LMUN5230DW1T1 | | 3.0 | 5.0 | – | |
| | LMUN5231DW1T1 | | 8.0 | 15 | – | |
| | LMUN5232DW1T1 | | 15 | 30 | – | |
| | LMUN5233DW1T1 | | 80 | 200 | – | |
| | LMUN5234DW1T1 | | 80 | 150 | – | |
| | LMUN5235DW1T1 | | 80 | 140 | – | |
| | LMUN5236DW1T1 | | 80 | 150 | – | |
| LMUN5237DW1T1 | | 80 | 140 | – | | |
| Collector-Emitter Saturation Voltage ($I_C = 10\text{ mA}$, $I_B = 0.3\text{ mA}$) ($I_C = 10\text{ mA}$, $I_B = 5\text{ mA}$) ($I_C = 10\text{ mA}$, $I_B = 1\text{ mA}$) | $V_{CE(sat)}$ | – | – | 0.25 | Vdc | |
| LMUN5230DW1T1/LMUN5231DW1T1 LMUN5215DW1T1/LMUN5216DW1T1 LMUN5232DW1T1/LMUN5233DW1T1/LMUN5234DW1T1 | | | | | | |
| Output Voltage (on) ($V_{CC} = 5.0\text{ V}$, $V_B = 2.5\text{ V}$, $R_L = 1.0\text{ k}\Omega$) | V_{OL} | – | – | 0.2 | Vdc | |
| LMUN5211DW1T1 | | – | – | 0.2 | | |
| LMUN5212DW1T1 | | – | – | 0.2 | | |
| LMUN5214DW1T1 | | – | – | 0.2 | | |
| LMUN5215DW1T1 | | – | – | 0.2 | | |
| LMUN5216DW1T1 | | – | – | 0.2 | | |
| LMUN5230DW1T1 | | – | – | 0.2 | | |
| LMUN5231DW1T1 | | – | – | 0.2 | | |
| LMUN5232DW1T1 | | – | – | 0.2 | | |
| LMUN5233DW1T1 | | – | – | 0.2 | | |
| LMUN5234DW1T1 | | – | – | 0.2 | | |
| LMUN5235DW1T1 | | – | – | 0.2 | | |
| ($V_{CC} = 5.0\text{ V}$, $V_B = 3.5\text{ V}$, $R_L = 1.0\text{ k}\Omega$) | | | | 0.2 | | |
| ($V_{CC} = 5.0\text{ V}$, $V_B = 5.5\text{ V}$, $R_L = 1.0\text{ k}\Omega$) | | | | 0.2 | | |
| ($V_{CC} = 5.0\text{ V}$, $V_B = 4.0\text{ V}$, $R_L = 1.0\text{ k}\Omega$) | | | | 0.2 | | |
| LMUN5213DW1T1 | | – | – | 0.2 | | |
| LMUN5236DW1T1 | | – | – | 0.2 | | |
| LMUN5237DW1T1 | | – | – | 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 | |
| ($V_{CC} = 5.0\text{ V}$, $V_B = 0.05\text{ V}$, $R_L = 1.0\text{ k}\Omega$) | | | | | | |
| LMUN5230DW1T1 | | | | | | |
| ($V_{CC} = 5.0\text{ V}$, $V_B = 0.25\text{ V}$, $R_L = 1.0\text{ k}\Omega$) | | | | | | |
| LMUN5215DW1T1 | | | | | | |
| LMUN5216DW1T1 | | | | | | |
| LMUN5233DW1T1 | | | | | | |

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

LMUN5211DW1T1 Series

ELECTRICAL CHARACTERISTICS

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

| Characteristic | Symbol | Min | Typ | Max | Unit |
|----------------|--------|-----|-----|-----|------|
|----------------|--------|-----|-----|-----|------|

ON CHARACTERISTICS(Note 6.)

| | | | | | | |
|----------------|-----------------------------|--------------------------------|-------|-------|-------|----|
| Input Resistor | LMUN5211DW1T1 | R ₁ | 7.0 | 10 | 13 | kΩ |
| | LMUN5212DW1T1 | | 15.4 | 22 | 28.6 | |
| | LMUN5213DW1T1 | | 32.9 | 47 | 61.1 | |
| | LMUN5214DW1T1 | | 7.0 | 10 | 13 | |
| | LMUN5215DW1T1 | | 7.0 | 10 | 13 | |
| | LMUN5216DW1T1 | | 3.3 | 4.7 | 6.1 | |
| | LMUN5230DW1T1 | | 0.7 | 1.0 | 1.3 | |
| | LMUN5231DW1T1 | | 1.5 | 2.2 | 2.9 | |
| | LMUN5232DW1T1 | | 3.3 | 4.7 | 6.1 | |
| | LMUN5233DW1T1 | | 3.3 | 4.7 | 6.1 | |
| | LMUN5234DW1T1 | | 15.4 | 22 | 28.6 | |
| | LMUN5235DW1T1 | | 1.54 | 2.2 | 2.86 | |
| | LMUN5236DW1T1 | | 70 | 100 | 130 | |
| | LMUN5237DW1T1 | | 32.9 | 47 | 61.1 | |
| Resistor Ratio | LMUN5211DW1T1/LMUN5212DW1T1 | R ₁ /R ₂ | | | | |
| | LMUN5213DW1T1/LMUN5236DW1T1 | | 0.8 | 1.0 | 1.2 | |
| | LMUN5214DW1T1/LMUN5215DW1T1 | | 0.17 | 0.21 | 0.25 | |
| | LMUN5216DW1T1/LMUN5230DW1T1 | | — | — | — | |
| | LMUN5231DW1T1/LMUN5232DW1T1 | | 0.8 | 1.0 | 1.2 | |
| | LMUN5233DW1T1 | | 0.055 | 0.1 | 0.185 | |
| | LMUN5234DW1T1 | | 0.38 | 0.47 | 0.56 | |
| | LMUN5235DW1T1 | | 0.038 | 0.047 | 0.056 | |
| LMUN5237DW1T1 | | 1.7 | 2.1 | 2.6 | | |

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

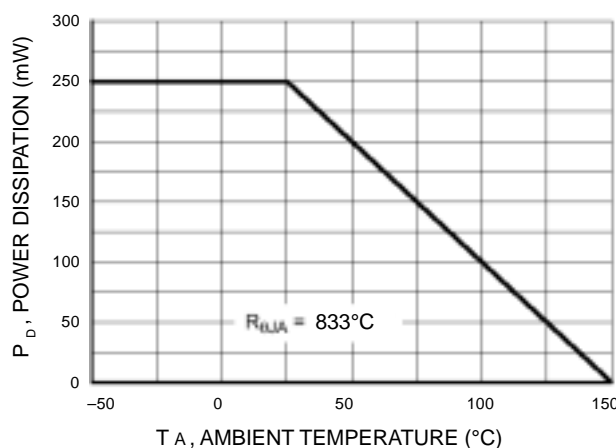


Figure 1. Derating Curve

LMUN5211DW1T1 Series

TYPICAL ELECTRICAL CHARACTERISTICS – LMUN5211DW1T1

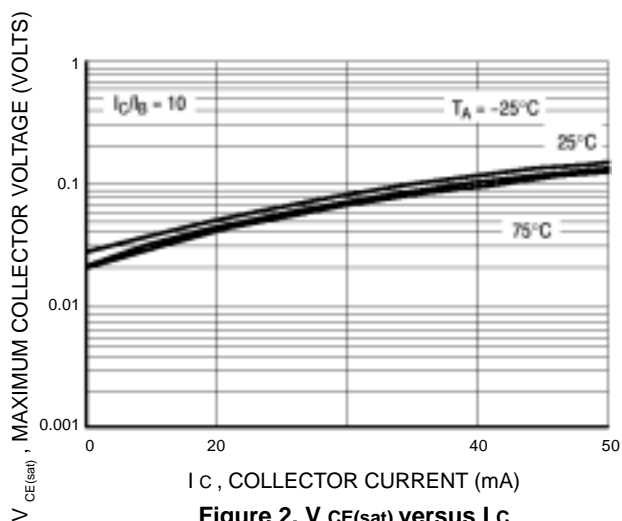


Figure 2. $V_{CE(sat)}$ versus I_C

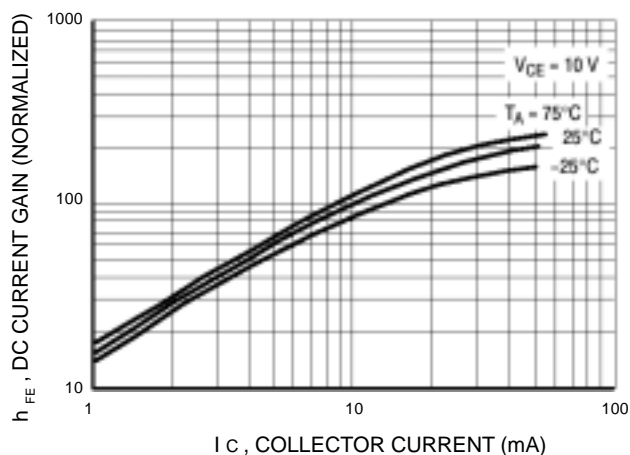


Figure 3. DC Current Gain

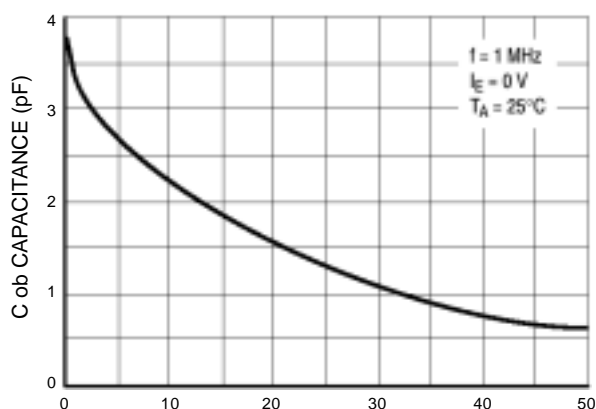


Figure 4. Output Capacitance

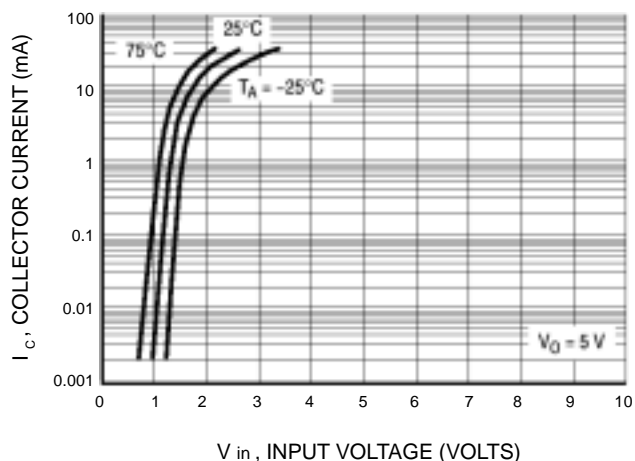


Figure 5. Output Current versus Input Voltage

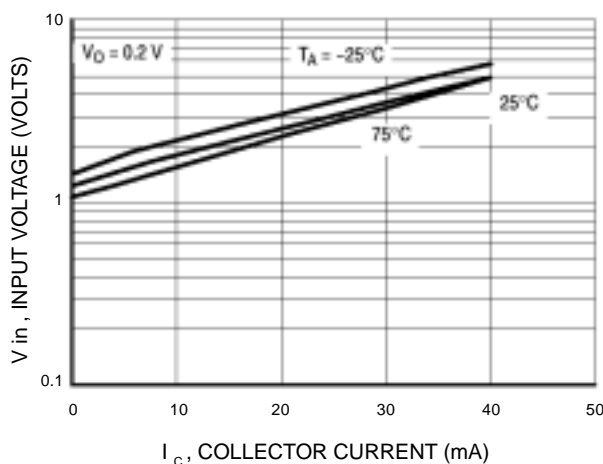
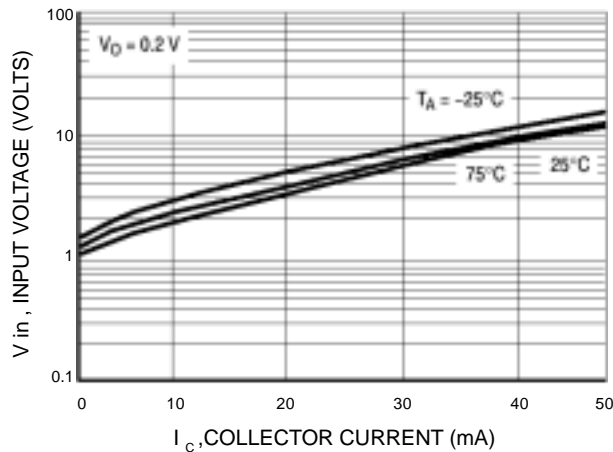
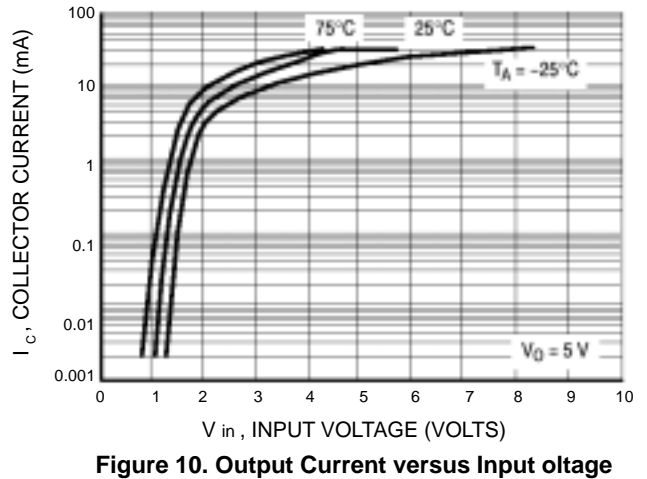
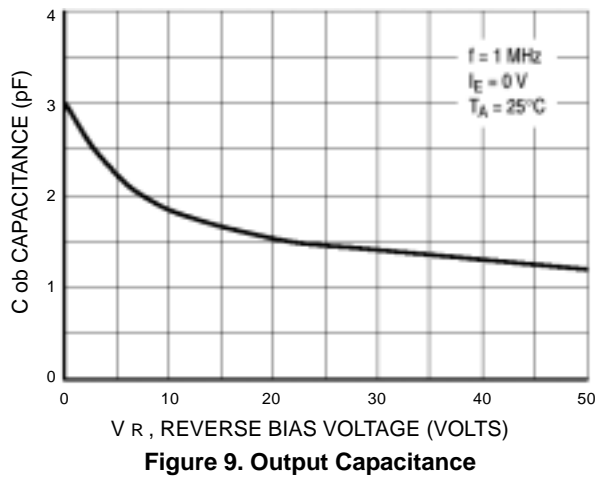
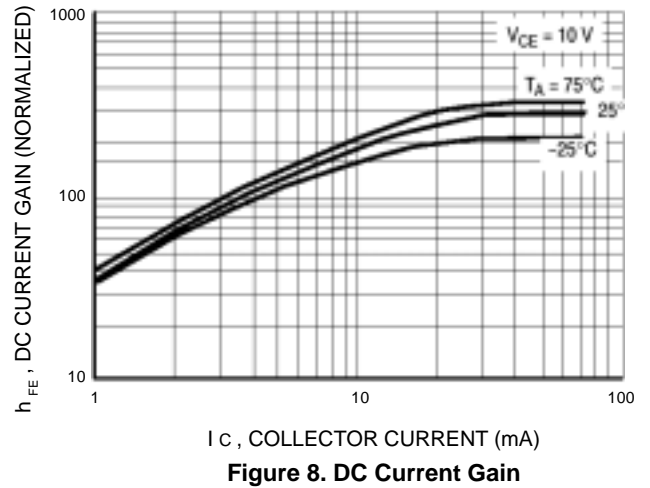
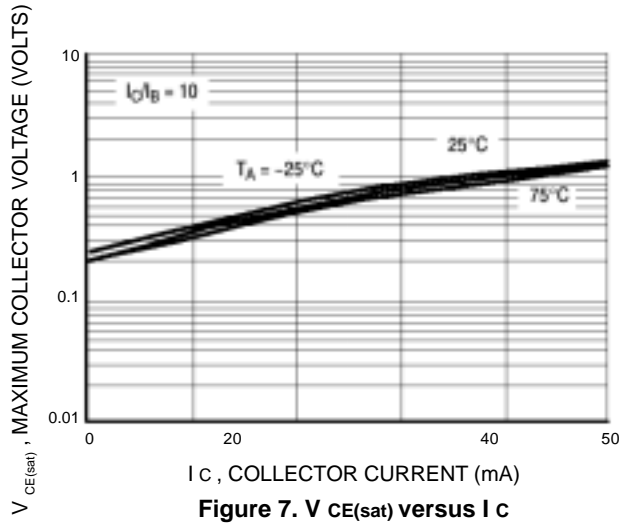


Figure 6. Input Voltage versus Output Current

LMUN5211DW1T1 Series

TYPICAL ELECTRICAL CHARACTERISTICS – LMUN5212DW1T1



LMUN5211DW1T1 Series

TYPICAL ELECTRICAL CHARACTERISTICS – LMUN5213DW1T1

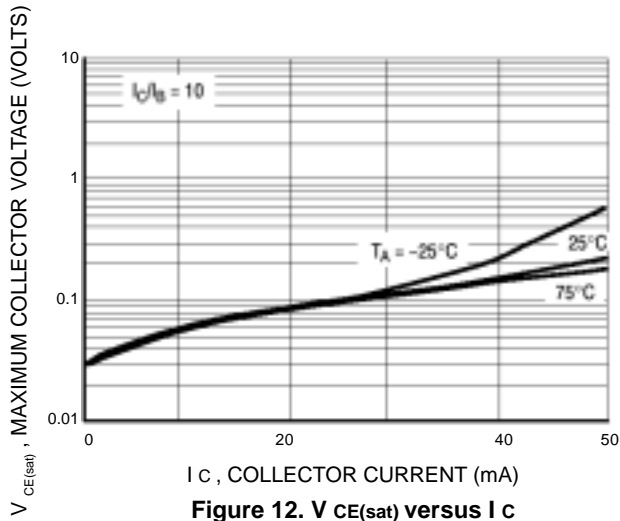


Figure 12. $V_{CE(sat)}$ versus I_c

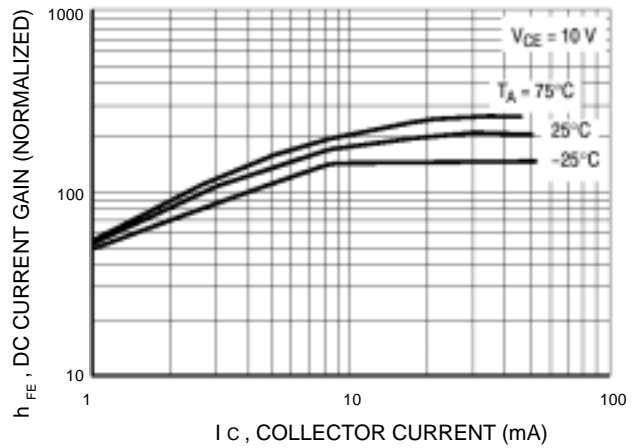


Figure 13. DC Current Gain

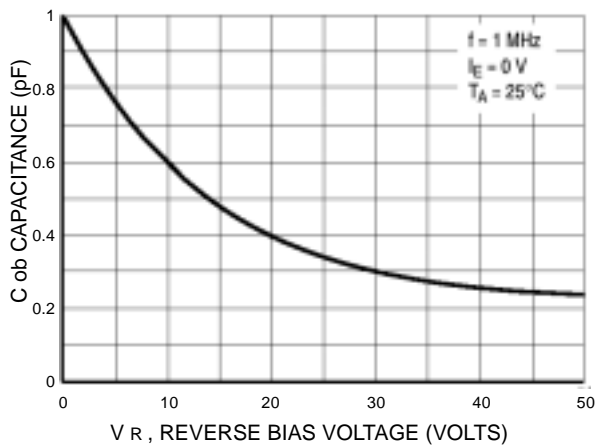


Figure 14. Output Capacitance

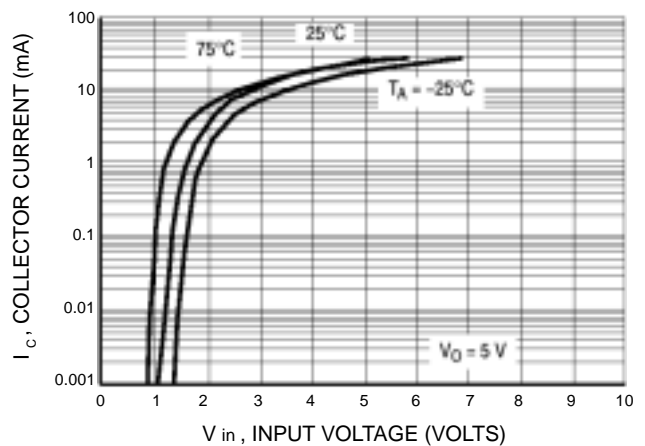


Figure 15. Output Current versus Input Voltage

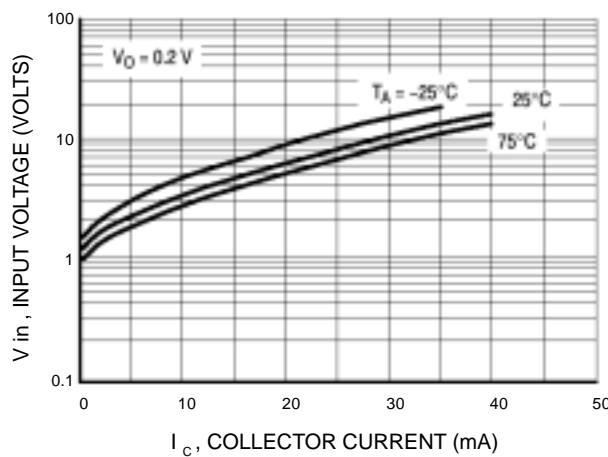
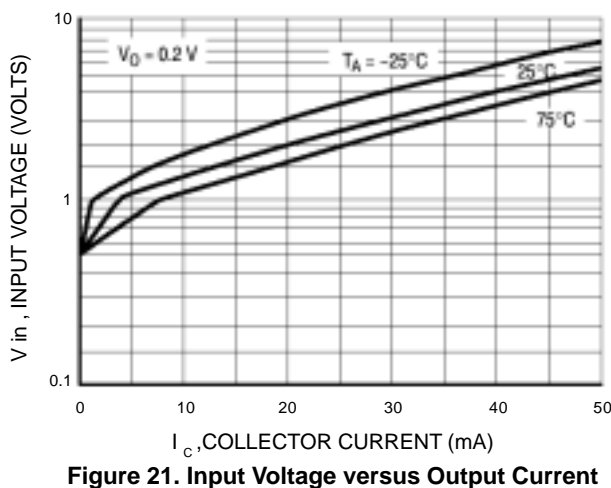
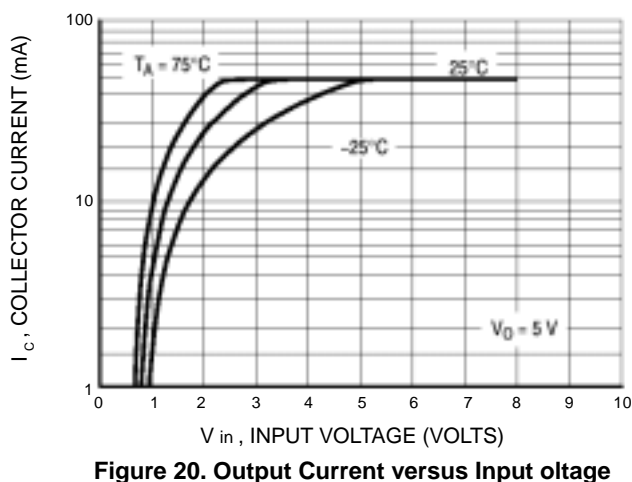
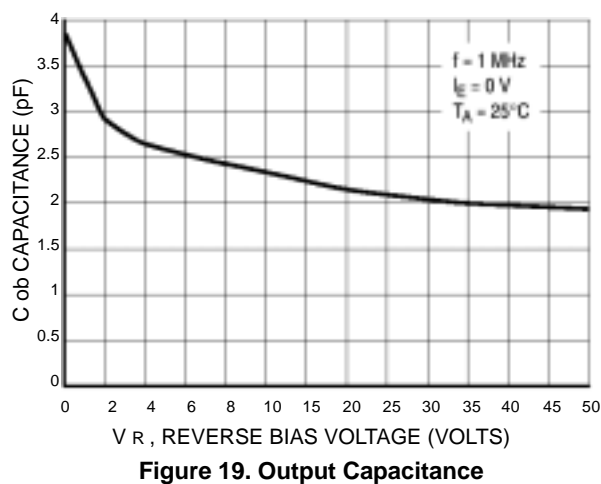
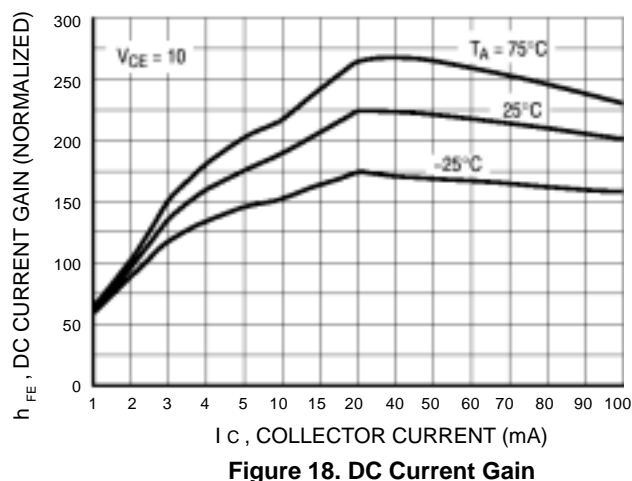
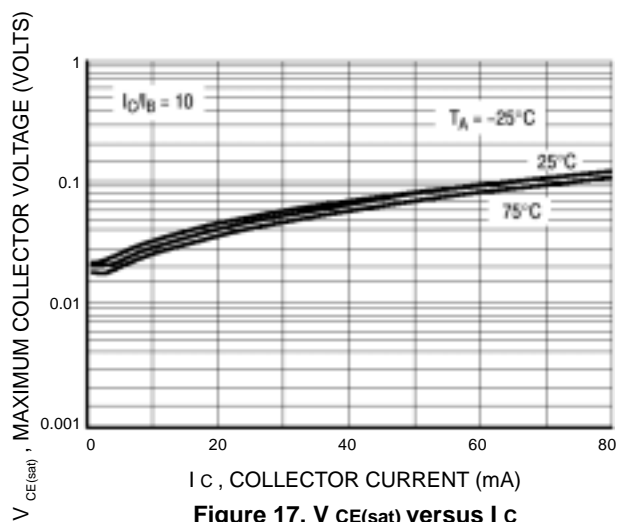


Figure 16. Input Voltage versus Output Current

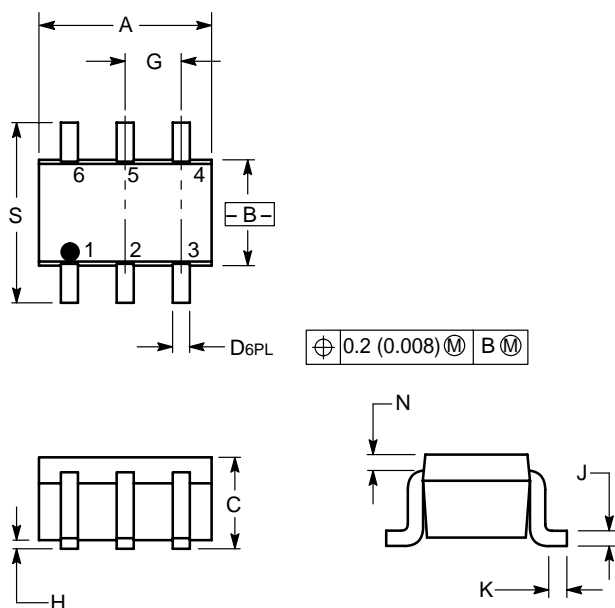
LMUN5211DW1T1 Series

TYPICAL ELECTRICAL CHARACTERISTICS – LMUN5214DW1T1



LMUN5211DW1T1 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

