

NSM46211DW6T1G

Dual NPN Transistors

General Purpose NPN Transistor and NPN Transistor with Monolithic Bias Network

NSM46211DW6T1G contains a single NPN transistor with a single NPN bias resistor transistor with a monolithic bias network; a series base resistor and a base-emitter resistor. This device is designed to replace multiple transistors and resistors on customer boards by integrating these components into a single device.

NSM46211DW6T1G is housed in a SC-88/SOT-363 package which is ideal for low power surface mount applications in space constrained applications.

Features

- Simplifies Circuit Design
- Reduces Board Space
- Reduces Component Count
- Q1: NPN
- Q2: NPN BRT, R1 = R2 = 10 k (typical)
- This is a Pb-Free Device

Applications

- Logic Switching
- Amplification
- Driver Circuits
- Interface Circuits

MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$ unless otherwise noted, common for Q₁ and Q₂, - minus sign for Q₁ (PNP) omitted)

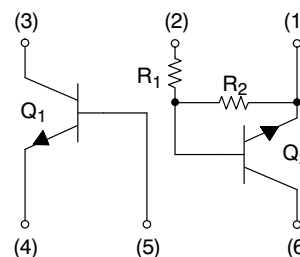
| Rating - Q1 (NPN) | Symbol | Value | Unit |
|--------------------------------|---------------|-------|------|
| Collector-Base Voltage | $V_{(BR)CBO}$ | 80 | Vdc |
| Collector-Emitter Voltage | $V_{(BR)CEO}$ | 65 | Vdc |
| Emitter-Base Voltage | $V_{(BR)EBO}$ | 6.0 | Vdc |
| Collector Current - Continuous | I_C | 100 | mAdc |
| Rating - Q2 (NPN BRT) | Symbol | Value | Unit |
| Collector-Base Voltage | V_{CBO} | 50 | Vdc |
| Collector-Emitter Voltage | V_{CEO} | 50 | Vdc |
| Collector Current | I_C | 100 | mAdc |

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.



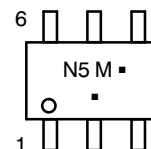
ON Semiconductor®

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SC-88/SOT-363
CASE 419B
STYLE 1

MARKING DIAGRAM



N5 = Device Code
M = Date Code*
▪ = Pb-Free Package
(Note: Microdot may be in either location)
*Date Code orientation and/or position may vary depending upon manufacturing location.

ORDERING INFORMATION

| Device | Package | Shipping† |
|----------------|--------------------|------------------|
| NSM46211DW6T1G | SC-88 (Pb-Free) | 3000/Tape & Reel |

† For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, BRD8011/D.

NSM46211DW6T1G

THERMAL CHARACTERISTICS

| Characteristic (One Junction Heated) | Symbol | Max | Unit |
|--|-----------------|-------------------------------|----------------------------|
| Total Device Dissipation $T_A = 25^\circ\text{C}$ Derate above 25°C | P_D | 180 (Note 1) 1.44 (Note 1) | mW mW/ $^\circ\text{C}$ |
| Thermal Resistance, Junction-to-Ambient | $R_{\theta JA}$ | 692 (Note 1) | $^\circ\text{C/W}$ |
| Characteristic (Both Junctions Heated) | Symbol | Max | Unit |
| Total Device Dissipation, $T_A = 25^\circ\text{C}$ Derate above 25°C | P_D | 230 1.83 | mW mW/ $^\circ\text{C}$ |
| Thermal Resistance, Junction-to-Ambient | $R_{\theta JA}$ | 544 | $^\circ\text{C/W}$ |
| Junction and Storage Temperature | T_J, T_{stg} | -55 to +150 | $^\circ\text{C}$ |

1. FR-4 @ Minimum Pad of 1.45 mm², 1 oz Cu.

ELECTRICAL CHARACTERISTICS - Q1 (NPN) ($T_A = 25^\circ\text{C}$ unless otherwise noted)

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

OFF CHARACTERISTICS

| | | | | | |
|---|---------------|-----|---|-----------|---------------------|
| Collector - Emitter Breakdown Voltage ($I_C = 10\text{ mA}$) | $V_{(BR)CEO}$ | 65 | - | - | V |
| Collector - Emitter Breakdown Voltage ($I_C = 10\ \mu\text{A}$, $V_{EB} = 0$) | $V_{(BR)CES}$ | 80 | - | - | V |
| Collector - Base Breakdown Voltage ($I_C = 10\ \mu\text{A}$) | $V_{(BR)CBO}$ | 80 | - | - | V |
| Emitter - Base Breakdown Voltage ($I_E = 10\ \mu\text{A}$) | $V_{(BR)EBO}$ | 6.0 | - | - | V |
| Collector Cutoff Current ($V_{CB} = 30\text{ V}$) ($V_{CB} = 30\text{ V}$, $T_A = 150^\circ\text{C}$) | I_{CBO} | - | - | 15 5.0 | nA μA |

ON CHARACTERISTICS

| | | | | | |
|--|---------------|----------|------------|-------------|----|
| DC Current Gain ($I_C = 10\ \mu\text{A}$, $V_{CE} = 5.0\text{ V}$) ($I_C = 2.0\text{ mA}$, $V_{CE} = 5.0\text{ V}$) | h_{FE} | - 200 | 150 290 | - 450 | - |
| Collector - Emitter Saturation Voltage ($I_C = 10\text{ mA}$, $I_B = 0.5\text{ mA}$) ($I_C = 100\text{ mA}$, $I_B = 5.0\text{ mA}$) | $V_{CE(sat)}$ | - - | - - | 0.25 0.6 | V |
| Base - Emitter Saturation Voltage ($I_C = 10\text{ mA}$, $I_B = 0.5\text{ mA}$) ($I_C = 100\text{ mA}$, $I_B = 5.0\text{ mA}$) | $V_{BE(sat)}$ | - - | 0.7 0.9 | - - | V |
| Base - Emitter Voltage ($I_C = 2.0\text{ mA}$, $V_{CE} = 5.0\text{ V}$) ($I_C = 10\text{ mA}$, $V_{CE} = 5.0\text{ V}$) | $V_{BE(on)}$ | 580 - | 660 - | 700 770 | mV |

NSM46211DW6T1G

ELECTRICAL CHARACTERISTICS - Q2 (NPN BRT) ($T_A = 25^\circ\text{C}$ unless otherwise noted)

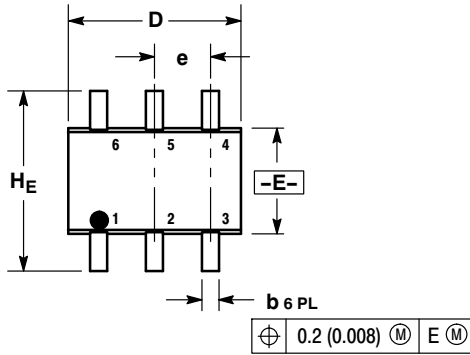
| Characteristic | Symbol | Min | Typ | Max | Unit |
|---|---------------|-----|-----|------|------------------|
| OFF CHARACTERISTICS | | | | | |
| Collector-Base Cutoff Current ($V_{CB} = 50\text{ V}$, $I_E = 0$) | I_{CBO} | - | - | 100 | nAdc |
| Collector-Emitter Cutoff Current ($V_{CE} = 50\text{ V}$, $I_B = 0$) | I_{CEO} | - | - | 500 | nAdc |
| Emitter-Base Cutoff Current ($V_{EB} = 6.0\text{ V}$, $I_C = 0$) | I_{EBO} | - | - | 0.5 | mAdc |
| Collector-Base Breakdown Voltage ($I_C = 10\ \mu\text{A}$, $I_E = 0$) | $V_{(BR)CBO}$ | 50 | - | - | Vdc |
| Collector-Emitter Breakdown Voltage (Note 2) ($I_C = 2.0\text{ mA}$, $I_B = 0$) | $V_{(BR)CEO}$ | 50 | - | - | Vdc |
| ON CHARACTERISTICS (Note 2) | | | | | |
| DC Current Gain ($V_{CE} = 10\text{ V}$, $I_C = 5.0\text{ mA}$) | h_{FE} | 35 | 60 | - | |
| Collector-Emitter Saturation Voltage ($I_C = 10\text{ mA}$, $I_B = 0.3\text{ mA}$) | $V_{CE(sat)}$ | - | - | 0.25 | Vdc |
| 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 |
| 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 |
| Input Resistor | R_1 | 7.0 | 10 | 13 | $\text{k}\Omega$ |
| Resistor Ratio | R_1/R_2 | 0.8 | 1.0 | 1.2 | |

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

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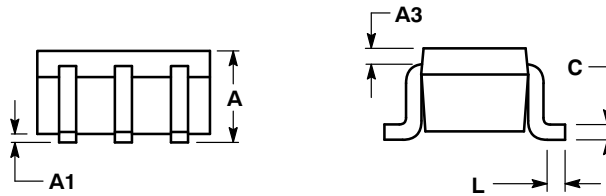
PACKAGE DIMENSIONS

SC-88 (SOT-363)
CASE 419B-02
ISSUE W



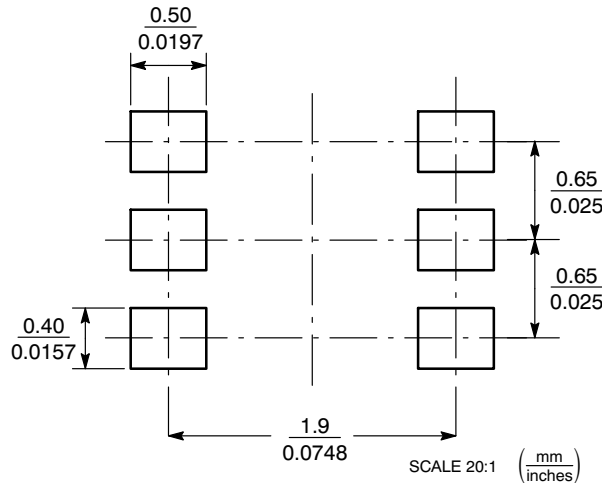
- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.
 3. 419B-01 OBSOLETE, NEW STANDARD 419B-02.

| DIM | MILLIMETERS | | | INCHES | | |
|-----|-------------|------|------|-----------|-------|-------|
| | MIN | NOM | MAX | MIN | NOM | MAX |
| A | 0.80 | 0.95 | 1.10 | 0.031 | 0.037 | 0.043 |
| A1 | 0.00 | 0.05 | 0.10 | 0.000 | 0.002 | 0.004 |
| A3 | 0.20 REF | | | 0.008 REF | | |
| b | 0.10 | 0.21 | 0.30 | 0.004 | 0.008 | 0.012 |
| C | 0.10 | 0.14 | 0.25 | 0.004 | 0.005 | 0.010 |
| D | 1.80 | 2.00 | 2.20 | 0.070 | 0.078 | 0.086 |
| E | 1.15 | 1.25 | 1.35 | 0.045 | 0.049 | 0.053 |
| e | 0.65 BSC | | | 0.026 BSC | | |
| L | 0.10 | 0.20 | 0.30 | 0.004 | 0.008 | 0.012 |
| HE | 2.00 | 2.10 | 2.20 | 0.078 | 0.082 | 0.086 |



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

SOLDERING FOOTPRINT*



*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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