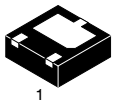
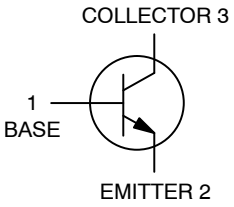
# General Purpose Transistor Medium Power, NPN
## 80 V, 1 A

# BCP56M




**WDFNW3**
**CASE 515AA**

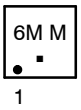
The BCP56MTW is designed for general purpose amplifier applications. It is housed in DFN2020−3 offering superior thermal performance. The transistor is ideal for medium−power surface mount applications where board space and reliability are at a premium.




### Specification Features

- Wettable Flank Package for Optimal Automated Optical Inspection (AOI)
- NSV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC−Q101 Qualified and PPAP Capable
- These Devices are Pb−Free, Halogen Free/BFR Free and are RoHS Compliant

### MARKING DIAGRAM




6M = Specific Device Code
M = Date Code

### ORDERING INFORMATION

See detailed ordering, marking and shipping information in the package dimensions section on page 2 of this data sheet.

### MAXIMUM RATINGS ($T_A$ = 25°C)

| Rating | Symbol | Max | Unit |
|---|---|---|---|
| Collector−Emitter Voltage | $V_{CEO}$ | 80 | Vdc |
| Collector−Base Voltage | $V_{CBO}$ | 100 | Vdc |
| Emitter−Base Voltage | $V_{EBO}$ | 6.0 | Vdc |
| Collector Current − Continuous (Note 1) | $I_C$ | 1.0 | A |
| Collector Current − Peak (Note 1) | $I_{CM}$ | 2.0 | A |

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

### THERMAL CHARACTERISTICS

| Characteristic | Symbol | Max | Unit |
|---|---|---|---|
| Total Power Dissipation (Note 2) @ $T_A$ = 25°C<br>Derate above 25°C | $P_D$ | 1.5 | W |
| Thermal Resistance, Junction−to−Ambient (Note 2) | $R_{\theta JA}$ | 78 | °C/W |
| Total Power Dissipation (Note 3) @ $T_A$ = 25°C<br>Derate above 25°C | $P_D$ | 875 | mW |
| Thermal Resistance, Junction−to−Ambient (Note 3) | $R_{\theta JA}$ | 138 | °C/W |
| Junction and Storage Temperature Range | $T_J$, $T_{stg}$ | −65 to +150 | °C |

1. Reference SOA Curve
2. Surface−mounted on FR4 board using a 600 $mm^2$ pad area and 2 oz. Cu
3. Surface−mounted on FR4 board using a 100 $mm^2$ pad area and 2 oz. Cu

## ELECTRICAL CHARACTERISTICS ($T_A$ = 25°C unless otherwise noted)

| Characteristics | | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | | |
| Collector−Emitter Breakdown Voltage ($I_C$ = 1 mA, $I_B$ = 0 A) | | $V_{(BR)CEO}$ | 80 | – | – | V |
| Collector−Base Breakdown Voltage ($I_C$ = 100 μA, $I_E$ = 0 A) | | $V_{(BR)CBO}$ | 100 | – | – | V |
| Emitter−Base Breakdown Voltage ($I_E$ = 10 μA, $I_C$ = 0) | | $V_{(BR)EBO}$ | 5 | – | – | V |
| Collector−Base Cutoff Current ($V_{CB}$ = 30 V, $I_E$ = 0) | | $I_{CBO}$ | – | – | 100 | nA |
| Emitter−Base Cutoff Current ($V_{EB}$ = 5 V, $I_C$ = 0) | | $I_{EBO}$ | – | – | 100 | nA |
| **ON CHARACTERISTICS** (Note 4) | | | | | | |
| DC Current Gain | | $h_{FE}$ | | | | |
| ($I_C$ = 5 mA, $V_{CE}$ = 2.0 V) | All Part Types | | 63 | – | – | |
| ($I_C$ = 150 mA, $V_{CE}$ = 2.0 V) | BCP56M | | 63 | – | 250 | |
| | BCP5610M | | 63 | – | 160 | |
| | BCP5616M | | 100 | – | 250 | |
| ($I_C$ = 500 mA, $V_{CE}$ = 2.0 V) | All Part Types | | 40 | – | – | |
| Collector−Emitter Saturation Voltage ($I_C$ = 500 mA, $I_B$ = 50 mA) | | $V_{CE(sat)}$ | – | – | 0.50 | V |
| Base−Emitter Saturation Voltage ($I_C$ = 500 mA, $I_B$ = 50 mA) | | $V_{BE(sat)}$ | – | – | 2.0 | V |
| Base−Emitter Turn−on Voltage ($I_C$ = 500 mA, $V_{CE}$ = 2.0 V) | | $V_{BE(on)}$ | – | – | 1.0 | V |
| **SMALL SIGNAL CHARACTERISTICS** | | | | | | |
| Transition Frequency ($I_C$ = 10 mA, $V_{CE}$ = 5.0 V, f = 100 MHz) | | $f_T$ | – | 140 | – | MHz |
| Output Capacitance ($V_{CB}$ = 10 V, f = 1.0 MHz) | | $C_{obo}$ | – | 65 | – | pF |
| Input Capacitance ($V_{EB}$ = −0.5 Vdc, $I_C$ = 0, f = 1.0 MHz) | | $C_{ibo}$ | – | 130 | – | pF |
| Input Impedance ($I_C$ = −1.0 mAdc, $V_{CE}$ = −10 Vdc, f = 1.0 kHz) | | $h_{ie}$ | – | 4 | – | k |
| Voltage Feedback Ratio ($I_C$ = −1.0 mAdc, $V_{CE}$ = −10 Vdc, f = 1.0 kHz) | | $h_{re}$ | – | 0.4 | – | X $10^{-4}$ |
| Small−Signal Current Gain ($I_C$ = −1.0 mAdc, $V_{CE}$ = −10 Vdc, f = 1.0 kHz) | | $h_{fe}$ | – | 135 | – | – |
| Output Admittance ($I_C$ = −1.0 mAdc, $V_{CE}$ = −10 Vdc, f = 1.0 kHz) | | $H_{oe}$ | – | 4 | – | μmhos |
| Noise Figure ($I_C$ = 0.2 mA, $V_{CE}$ = 5.0 Vdc, $R_S$ = 2.0 kΩ, f = 1.0 kHz, BW = 200 Hz) | | NF | – | 1 | – | dB |
| **SWITCHING CHARACTERISTICS** | | | | | | |
| Delay Time ($V_{CC}$ = 30 Vdc, $I_C$ = 150 mA, $I_{B1}$ = 15 mA) | | $t_d$ | – | 20 | – | ns |
| Rise Time ($V_{CC}$ = 30 Vdc, $I_C$ = 150 mA, $I_{B1}$ = 15 mA) | | $t_r$ | – | 20 | – | ns |
| Storage Time ($V_{CC}$ = 30 Vdc, $I_C$ = 150 mA, $I_{B1}$ = 15 mA, $I_{B2}$ = 15 mA) | | $t_s$ | – | 900 | – | ns |
| Fall Time ($V_{CC}$ = 30 Vdc, $I_C$ = 150 mA, $I_{B1}$ = 15 mA, $I_{B2}$ = 15 mA) | | $t_f$ | – | 110 | – | ns |

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

4. Pulse Condition: Pulse Width = 300 μs, Duty Cycle ≤ 2%.

## ORDERING INFORMATION

| Device | Marking | Package | Shipping† |
|---|---|---|---|
| BCP56MTWG | 6M | WDFNW3 (Pb−Free) | 3000 / Tape & Reel |
| BCP5610MTWG | 6N | | |
| BCP5616MTWG | 6P | | |
| NSVBCP56MTWG* | 6M | | |
| NSVBCP5610MTWG* | 6N | | |
| NSVBCP5616MTWG* | 6P | | |

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

*NSV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC−Q100 Qualified and PPAP Capable.

## TYPICAL CHARACTERISTICS

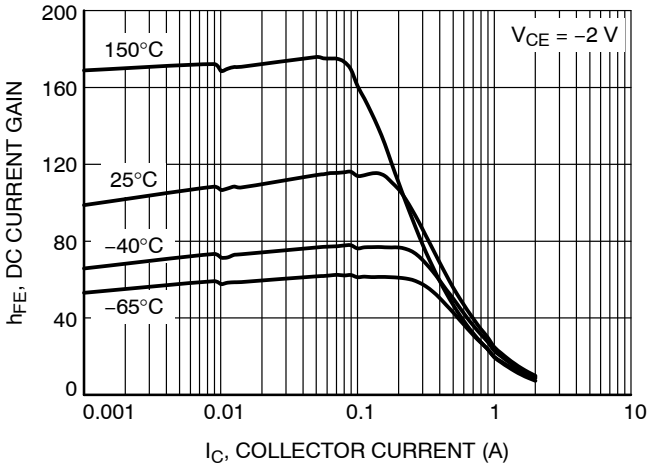



**Figure 1. DC Current Gain**

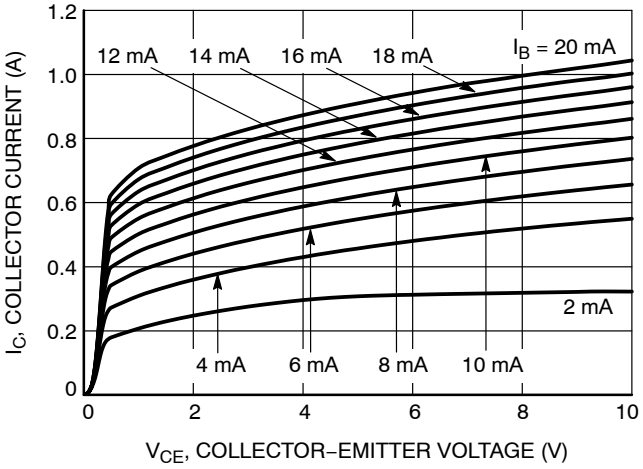



**Figure 2. Collector Current vs. Collector Emitter Voltage**

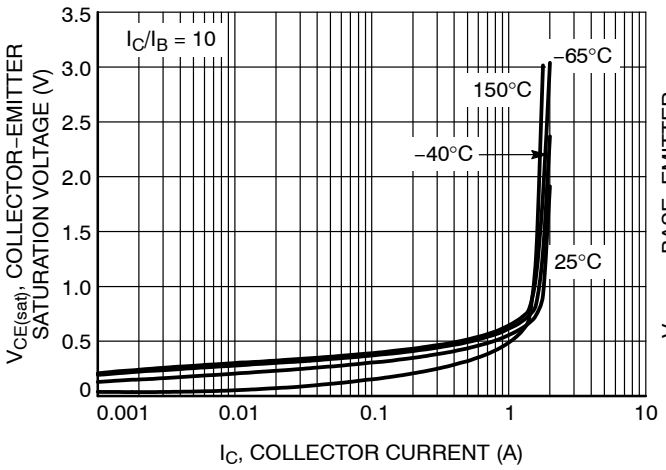



**Figure 3. Collector Emitter Saturation Voltage vs. Collector Current**

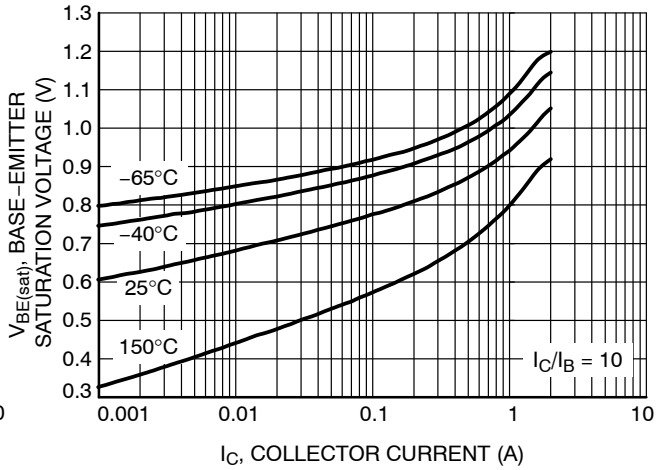



**Figure 4. Base Emitter Saturation Voltage vs. Collector Current**

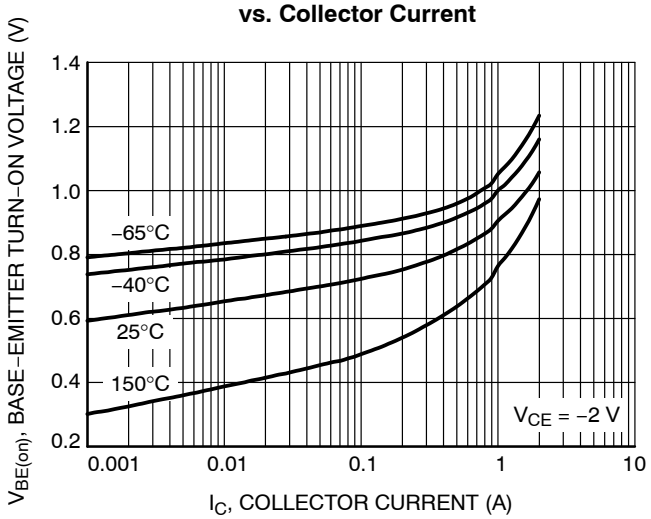



**Figure 5. BCP53M, Base Emitter Turn−On Voltage vs. Collector Current $V_{BE(on)}$**

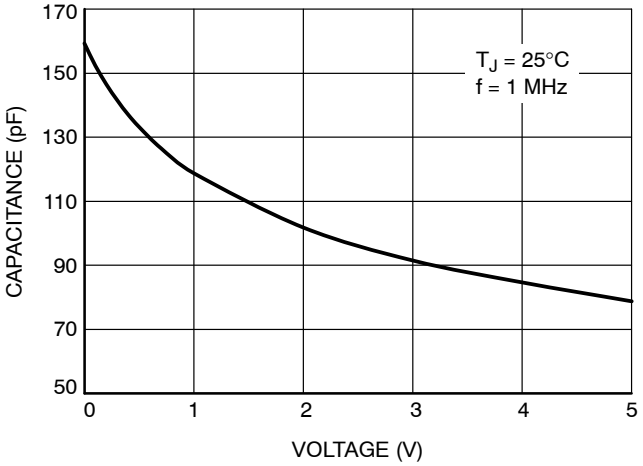



**Figure 6. Input Capacitance**

## TYPICAL CHARACTERISTICS

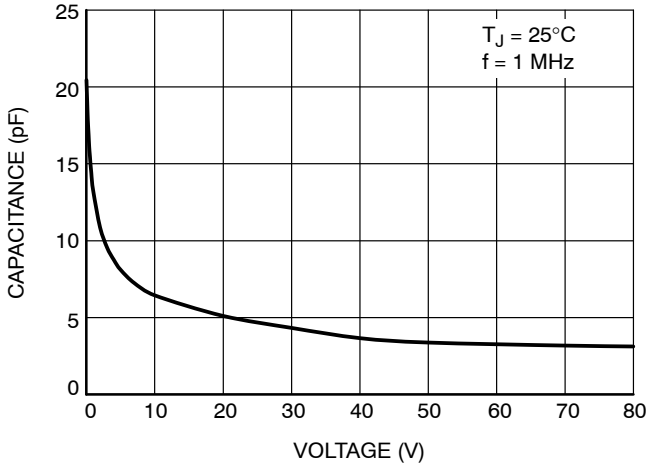



**Figure 7. Output Capacitance**

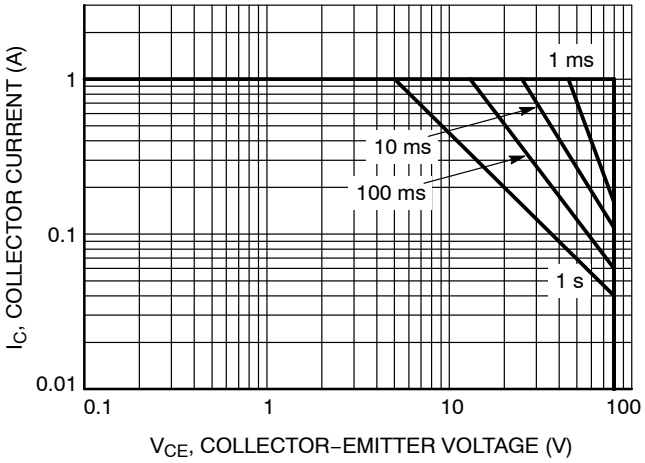



**Figure 8. Safe Operating Area**

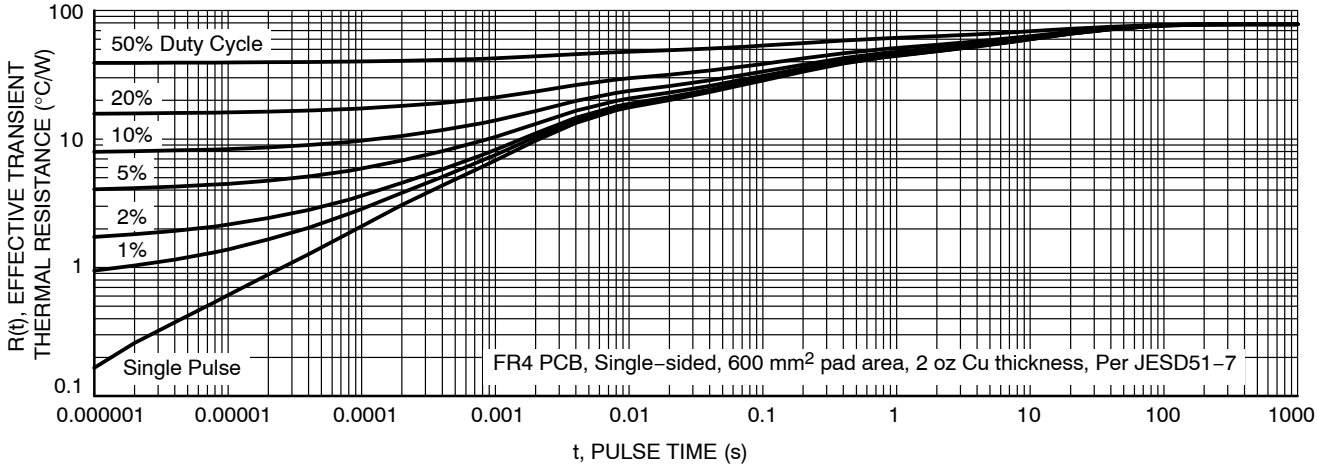



**Figure 9. Transient Thermal Impedance from Junction−to−Ambient as a Function of Pulse Duration**

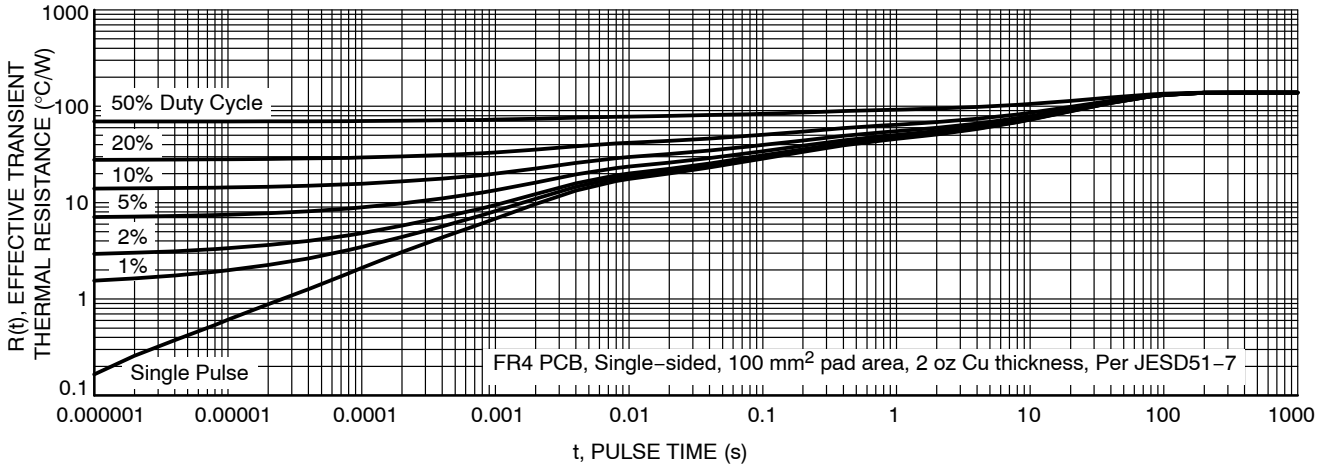
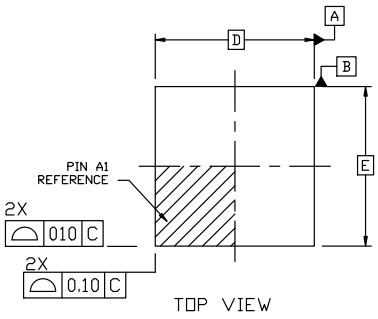


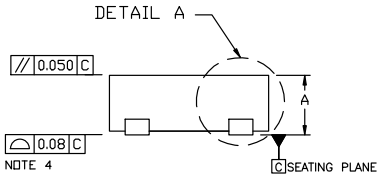

**Figure 10. Transient Thermal Impedance from Junction−to−Ambient as a Function of Pulse Duration**

**WDFNW3 2x2, 1.3P**
CASE 515AA
ISSUE A

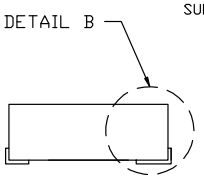
DATE 26 JUL 2022



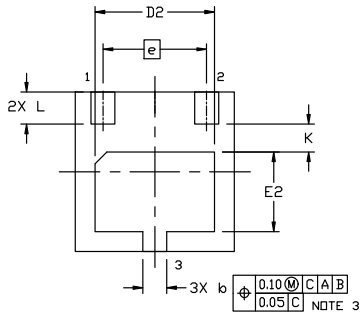

TOP VIEW




SIDE VIEW



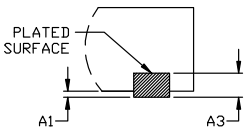

END VIEW



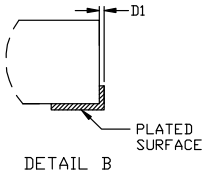

BOTTOM VIEW

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
2. CONTROLLING DIMENSION: MILLIMETERS
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.30MM FORM THE TERMINAL TIP.
4. COPLANARITY APPLIES TO THE EXPOSED PADS AS WELL AS THE TERMINALS.

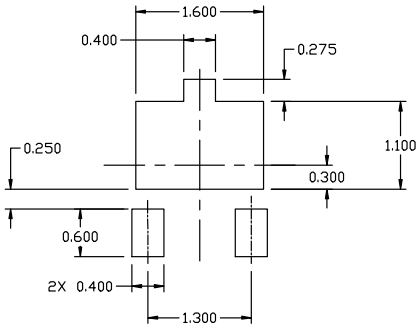



DETAIL A




DETAIL B

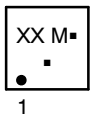
| DIM | MILLIMETERS | | |
|---|---|---|---|
| | MIN. | NOM. | MAX. |
| A | 0.70 | 0.75 | 0.80 |
| A1 | 0.00 | --- | 0.05 |
| A3 | 0.20 REF | | |
| b | 0.25 | 0.30 | 0.35 |
| D | 2.00 BSC | | |
| D1 | 0.00 | --- | 0.04 |
| D2 | 1.40 | 1.50 | 1.60 |
| E | 2.00 BSC | | |
| E2 | 0.90 | 1.00 | 1.10 |
| e | 1.30 BSC | | |
| K | 0.35 REF | | |
| L | 0.35 | 0.40 | 0.45 |




RECOMMENDED
MOUNTING 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.

## GENERIC MARKING DIAGRAM*




XX = Specific Device Code
M = Date Code
▪ = Pb−Free Package

(Note: Microdot may be in either location)

*This information is generic. Please refer to device data sheet for actual part marking. Pb−Free indicator, “G” or microdot “▪”, may or may not be present. Some products may not follow the Generic Marking.

| | | |
|---|---|---|
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| **DESCRIPTION:** | **WDFNW3 2x2, 1.3P** | **PAGE 1 OF 1** |

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