

# General Purpose Transistor

## Medium Power, PNP

### 80 V, 1 A

## BCP53M

The BCP53MTW 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

### MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ )

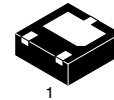
| Rating                                  | Symbol    | Max  | Unit |
|---|-----------|------|------|
| Collector–Emitter Voltage               | $V_{CEO}$ | –80  | Vdc  |
| Collector–Base Voltage                  | $V_{CBO}$ | –100 | Vdc  |
| Emitter–Base Voltage                    | $V_{EBO}$ | –6.0 | 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.

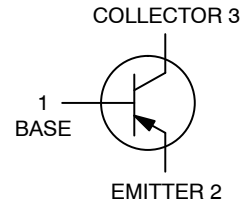
### THERMAL CHARACTERISTICS

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

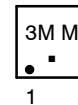
1. Reference SOA Curve
2. Surface–mounted on FR4 board using a 600 mm<sup>2</sup> pad area and 2 oz. Cu
3. Surface–mounted on FR4 board using a 100 mm<sup>2</sup> pad area and 2 oz. Cu



WDFNW3  
CASE 515AA



### MARKING DIAGRAM



3M = 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.

# BCP53M

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

| Characteristics | Symbol | Min | Typ | Max | Unit |
|-----------------|--------|-----|-----|-----|------|
|-----------------|--------|-----|-----|-----|------|

### OFF CHARACTERISTICS

|   |               |      |   |      |    |
|---|---------------|------|---|------|----|
| Collector-Emitter Breakdown Voltage ( $I_C = -1\text{ mA}$ , $I_B = 0\text{ A}$ )         | $V_{(BR)CEO}$ | -80  | - | -    | V  |
| Collector-Base Breakdown Voltage ( $I_C = -100\text{ }\mu\text{A}$ , $I_E = 0\text{ A}$ ) | $V_{(BR)CBO}$ | -100 | - | -    | V  |
| Emitter-Base Breakdown Voltage ( $I_E = -10\text{ }\mu\text{A}$ , $I_C = 0$ )             | $V_{(BR)EBO}$ | -5   | - | -    | V  |
| Collector-Base Cutoff Current ( $V_{CB} = -30\text{ V}$ , $I_E = 0$ )                     | $I_{CBO}$     | -    | - | -100 | nA |
| Emitter-Base Cutoff Current ( $V_{EB} = -5\text{ V}$ , $I_C = 0$ )                        | $I_{EBO}$     | -    | - | -100 | nA |

### ON CHARACTERISTICS (Note 4)

|  |  |               |                             |                       |                             |   |
|--|--|---------------|-----------------------------|-----------------------|-----------------------------|---|
| DC Current Gain<br>( $I_C = -5\text{ mA}$ , $V_{CE} = -2.0\text{ V}$ )<br>( $I_C = -150\text{ mA}$ , $V_{CE} = -2.0\text{ V}$ )<br><br>( $I_C = -500\text{ mA}$ , $V_{CE} = -2.0\text{ V}$ ) | All Part Types<br>BCP53M<br>BCP5310M<br>BCP5316M<br>All Part Types | $h_{FE}$      | 63<br>63<br>63<br>100<br>40 | -<br>-<br>-<br>-<br>- | -<br>250<br>160<br>250<br>- |   |
| Collector-Emitter Saturation Voltage ( $I_C = -500\text{ mA}$ , $I_B = -50\text{ mA}$ )  |  | $V_{CE(sat)}$ | -                           | -                     | -0.50                       | V |
| Base-Emitter Saturation Voltage ( $I_C = -500\text{ mA}$ , $I_B = -50\text{ mA}$ )   |  | $V_{BE(sat)}$ | -                           | -                     | -2.0                        | V |
| Base-Emitter Turn-on Voltage ( $I_C = -500\text{ mA}$ , $V_{CE} = -2.0\text{ V}$ )   |  | $V_{BE(on)}$  | -                           | -                     | -1.0                        | V |

### SMALL SIGNAL CHARACTERISTICS

|  |           |   |     |   |  |                  |
|--|-----------|---|-----|---|--|------------------|
| Transition Frequency ( $I_C = -50\text{ mA}$ , $V_{CE} = -5.0\text{ V}$ , $f = 100\text{ MHz}$ )   | $f_T$     | - | 130 | - |  | MHz              |
| Output Capacitance ( $V_{CB} = 10\text{ V}$ , $f = 1.0\text{ MHz}$ )   | $C_{obo}$ | - | 12  | - |  | pF               |
| Input Capacitance ( $V_{EB} = -0.5\text{ Vdc}$ , $I_C = 0$ , $f = 1.0\text{ MHz}$ )  | $C_{ibo}$ | - | 110 | - |  | pF               |
| Input Impedance ( $I_C = -1.0\text{ mAdc}$ , $V_{CE} = -10\text{ Vdc}$ , $f = 1.0\text{ kHz}$ )  | $h_{ie}$  | - | 5   | - |  | k                |
| Voltage Feedback Ratio ( $I_C = -1.0\text{ mAdc}$ , $V_{CE} = -10\text{ Vdc}$ , $f = 1.0\text{ kHz}$ )   | $h_{re}$  | - | 1   | - |  | $\times 10^{-4}$ |
| Small-Signal Current Gain<br>( $I_C = -1.0\text{ mAdc}$ , $V_{CE} = -10\text{ Vdc}$ , $f = 1.0\text{ kHz}$ )                                     | $h_{fe}$  | - | 200 | - |  | -                |
| Output Admittance ( $I_C = -1.0\text{ mAdc}$ , $V_{CE} = -10\text{ Vdc}$ , $f = 1.0\text{ kHz}$ )  | $H_{oe}$  | - | 10  | - |  | $\mu\text{mhos}$ |
| Noise Figure<br>( $I_C = 0.2\text{ mA}$ , $V_{CE} = 5.0\text{ Vdc}$ , $R_S = 2.0\text{ k}\Omega$ , $f = 1.0\text{ kHz}$ , $BW = 200\text{ Hz}$ ) | NF        | - | 0.8 | - |  | dB               |

### SWITCHING CHARACTERISTICS

|   |       |   |     |   |  |    |
|---|-------|---|-----|---|--|----|
| Delay Time ( $V_{CC} = 30\text{ Vdc}$ , $I_C = 150\text{ mA}$ , $I_{B1} = 15\text{ mA}$ )                             | $t_d$ | - | 18  | - |  | ns |
| Rise Time ( $V_{CC} = 30\text{ Vdc}$ , $I_C = 150\text{ mA}$ , $I_{B1} = 15\text{ mA}$ )                              | $t_r$ | - | 32  | - |  | ns |
| Storage Time ( $V_{CC} = 30\text{ Vdc}$ , $I_C = 150\text{ mA}$ , $I_{B1} = 15\text{ mA}$ , $I_{B2} = 15\text{ mA}$ ) | $t_s$ | - | 660 | - |  | ns |
| Fall Time ( $V_{CC} = 30\text{ Vdc}$ , $I_C = 150\text{ mA}$ , $I_{B1} = 15\text{ mA}$ , $I_{B2} = 15\text{ mA}$ )    | $t_f$ | - | 50  | - |  | 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  $\mu\text{s}$ , Duty Cycle  $\leq 2\%$ .

### ORDERING INFORMATION

| Device          | Marking | Package             | Shipping <sup>†</sup> |
|-----------------|---------|---------------------|-----------------------|
| BCP53MTWG       | 3M      | WDFNW3<br>(Pb-Free) | 3000 / Tape & Reel    |
| BCP5310MTWG     | 3N      |                     |                       |
| BCP5316MTWG     | 3P      |                     |                       |
| NSVBCP53MTWG*   | 3M      |                     |                       |
| NSVBCP5310MTWG* | 3N      |                     |                       |
| NSVBCP5316MTWG* | 3P      |                     |                       |

<sup>†</sup>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

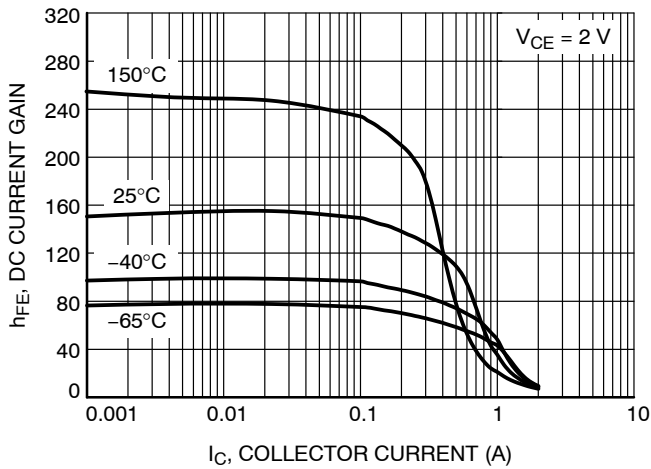


Figure 1. DC Current Gain

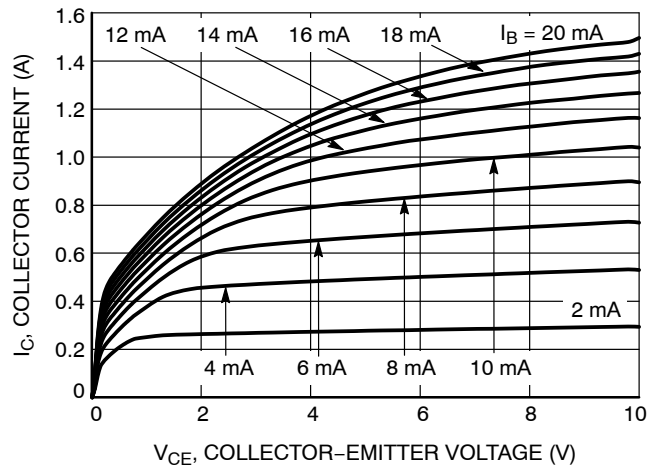


Figure 2. Collector Current vs. Collector Emitter Voltage

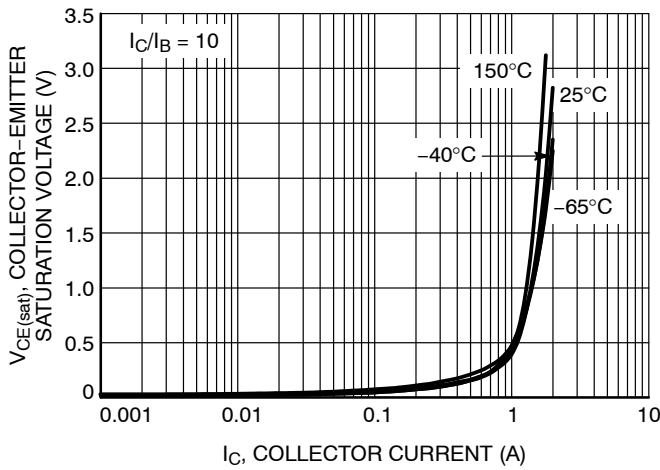


Figure 3. Collector Emitter Saturation Voltage vs. Collector Current

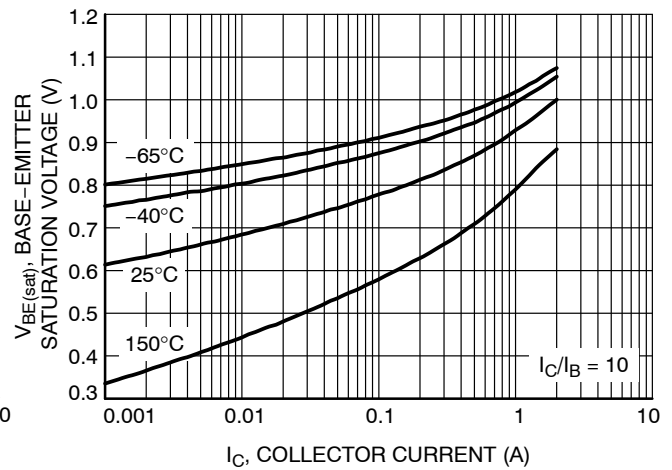


Figure 4. Base Emitter Saturation Voltage vs. Collector Current

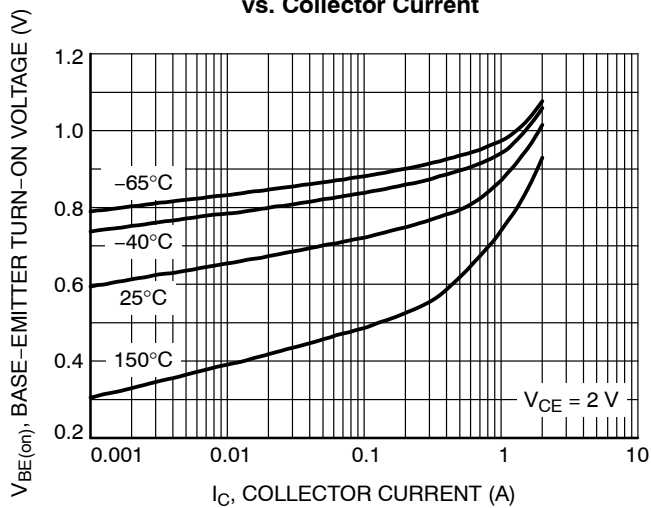
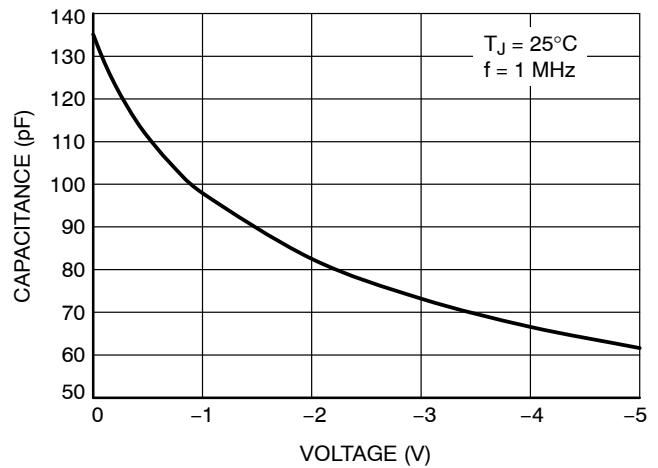
Figure 5. BCP53M, Base Emitter Turn-On Voltage vs. Collector Current  $V_{BE(on)}$ 

Figure 6. Input Capacitance

# BCP53M

## TYPICAL CHARACTERISTICS

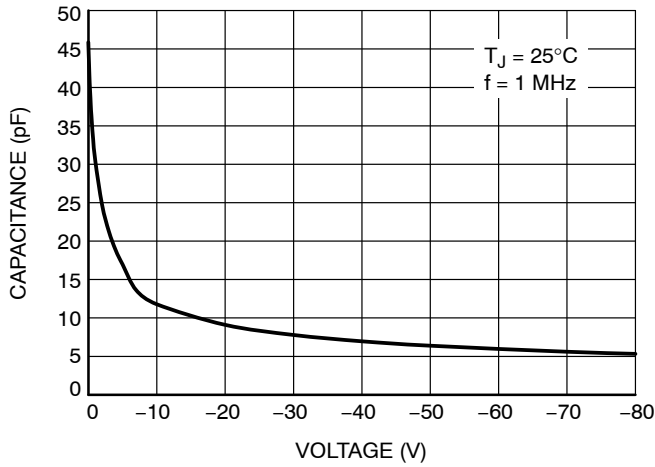


Figure 7. Output Capacitance

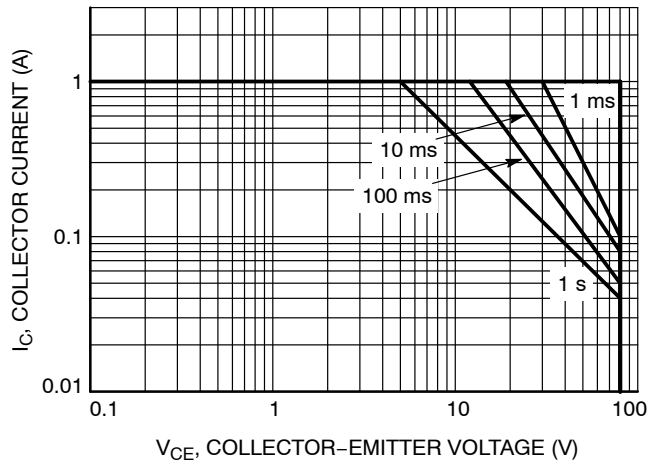


Figure 8. Safe Operating Area

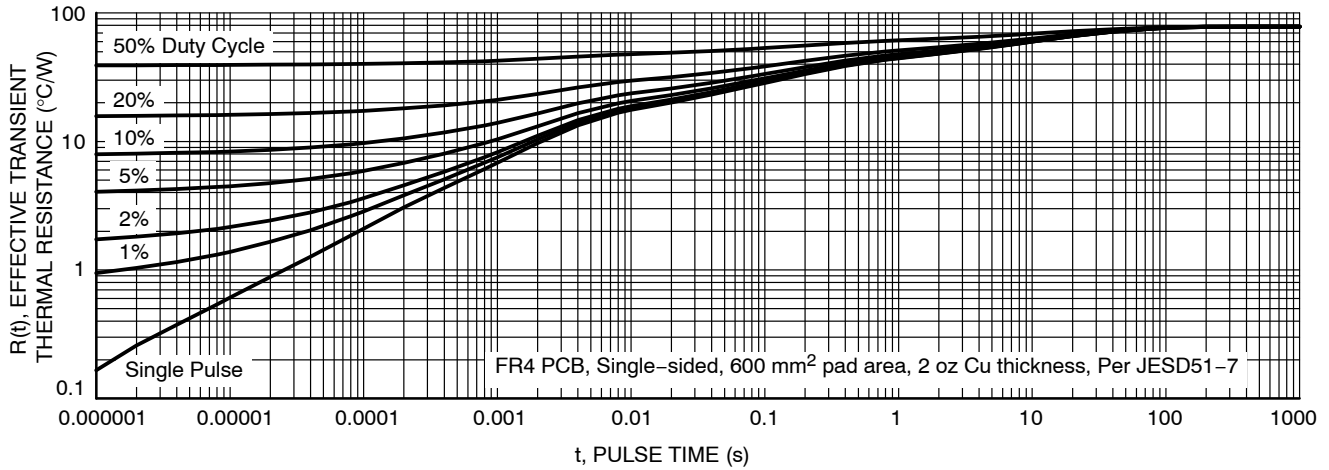


Figure 9. Transient Thermal Impedance from Junction-to-Ambient as a Function of Pulse Duration

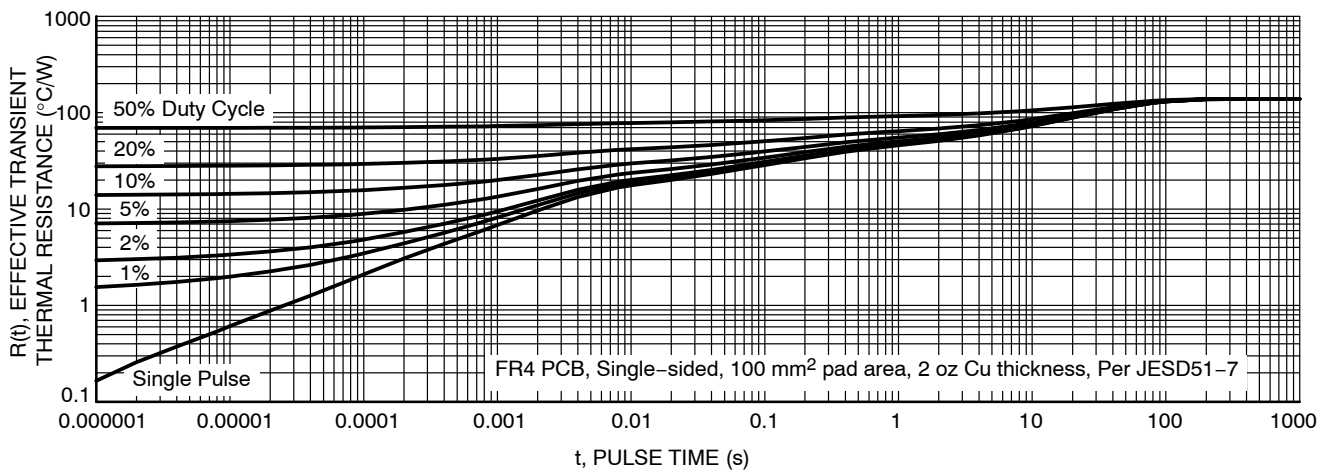


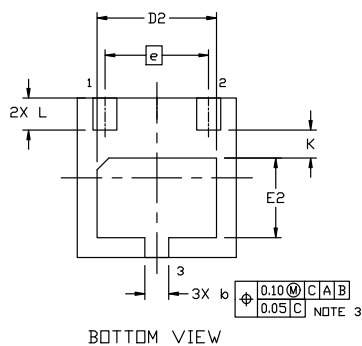
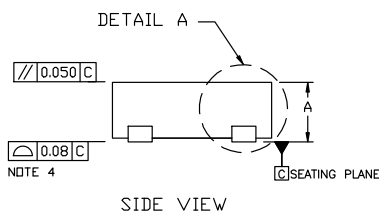
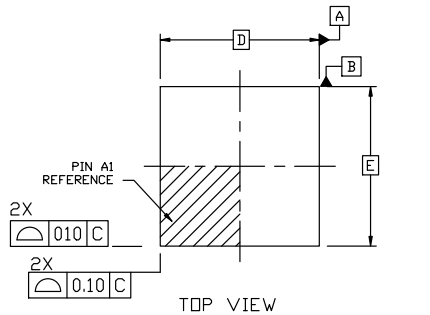
Figure 10. Transient Thermal Impedance from Junction-to-Ambient as a Function of Pulse Duration

# MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS

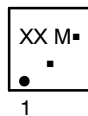


## WDFNW3 2x2, 1.3P CASE 515AA ISSUE A

DATE 26 JUL 2022



### GENERIC MARKING DIAGRAM\*



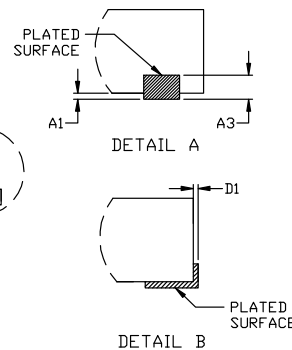
XX = Specific Device Code  
M = Date Code  
▪ = Pb-Free Package

(Note: Microdot may be in either location)

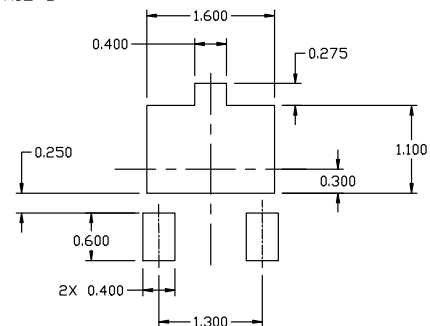
\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.

### 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 FROM THE TERMINAL TIP.
4. COPLANARITY APPLIES TO THE EXPOSED PADS AS WELL AS THE TERMINALS.



| 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, SOLDERM/D.

|                  |                  |  |
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