

# General Purpose Transistor

## PNP Silicon

### NST3906MX2

#### Features

- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

#### MAXIMUM RATINGS

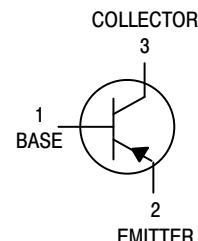
| Rating                                  | Symbol    | Value | Unit |
|---|-----------|-------|------|
| Collector-Emitter Voltage               | $V_{CEO}$ | -40   | Vdc  |
| Collector-Base Voltage                  | $V_{CBO}$ | -40   | Vdc  |
| Emitter-Base Voltage                    | $V_{EBO}$ | -5.0  | Vdc  |
| Collector Current - Continuous (Note 1) | $I_C$     | -200  | mAdc |
| Collector Current - Peak (Note 1)       | $I_{CM}$  | -800  | mAdc |

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 $25^\circ\text{C}$ | $P_D$           | 165<br>1.39    | mW<br>mW/ $^\circ\text{C}$ |
| Thermal Resistance,<br>Junction-to-Ambient (Note 2)   | $R_{\theta JA}$ | 720            | $^\circ\text{C}/\text{W}$  |
| Total Power Dissipation (Note 3)<br>@ $T_A = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$           | 590<br>4.93    | mW<br>mW/ $^\circ\text{C}$ |
| Thermal Resistance,<br>Junction-to-Ambient (Note 3)   | $R_{\theta JA}$ | 203            | $^\circ\text{C}/\text{W}$  |
| Junction and Storage Temperature Range  | $T_J, T_{stg}$  | -55 to<br>+150 | $^\circ\text{C}$           |

1. Reference SOA Curve
2. Surface-mounted on FR4 board using a  $0.6\text{ mm}^2$ , 2 oz. Cu pad
3. Surface-mounted on FR4 board using a  $100\text{ mm}^2$ , 2 oz. Cu pad



#### MARKING DIAGRAM



AF = Specific Device Code

M = Date Code

#### ORDERING INFORMATION

| Device        | Package             | Shipping <sup>†</sup> |
|---------------|---------------------|-----------------------|
| NST3906MX2T5G | X2DFN3<br>(Pb-Free) | 8000 / Tape & Reel    |

<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.

# NST3906MX2

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

| Characteristic  | Symbol  | Min                         | Max                     | Unit             |
|---|---|-----------------------------|-------------------------|------------------|
| <b>OFF CHARACTERISTICS</b>  |   |                             |                         |                  |
| Collector – Emitter Breakdown Voltage<br>( $I_C = -1.0 \text{ mA}, I_B = 0$ )   | $V_{(\text{BR})\text{CEO}}$   | -40                         | -                       | Vdc              |
| Collector – Base Breakdown Voltage<br>( $I_C = -10 \mu\text{A}, I_E = 0$ )  | $V_{(\text{BR})\text{CBO}}$   | -40                         | -                       | Vdc              |
| Emitter – Base Breakdown Voltage<br>( $I_E = -10 \mu\text{A}, I_C = 0$ )  | $V_{(\text{BR})\text{EBO}}$   | -5.0                        | -                       | Vdc              |
| Base Cutoff Current<br>( $V_{CE} = -30 \text{ Vdc}, V_{EB} = -3.0 \text{ Vdc}$ )  | $I_{BL}$  | -                           | -50                     | nAdc             |
| Collector Cutoff Current<br>( $V_{CE} = -30 \text{ Vdc}, V_{EB} = -3.0 \text{ Vdc}$ )   | $I_{CEX}$   | -                           | -50                     | nAdc             |
| <b>ON CHARACTERISTICS (Note 4)</b>  |   |                             |                         |                  |
| DC Current Gain<br>( $I_C = -0.1 \text{ mA}, V_{CE} = -1.0 \text{ Vdc}$ )<br>( $I_C = -1.0 \text{ mA}, V_{CE} = -1.0 \text{ Vdc}$ )<br>( $I_C = -10 \text{ mA}, V_{CE} = -1.0 \text{ Vdc}$ )<br>( $I_C = -50 \text{ mA}, V_{CE} = -1.0 \text{ Vdc}$ )<br>( $I_C = -100 \text{ mA}, V_{CE} = -1.0 \text{ Vdc}$ ) | $H_{FE}$  | 60<br>80<br>100<br>60<br>30 | -<br>-<br>300<br>-<br>- | -                |
| Collector – Emitter Saturation Voltage<br>( $I_C = -10 \text{ mA}, I_B = -1.0 \text{ mA}$ )<br>( $I_C = -50 \text{ mA}, I_B = -5.0 \text{ mA}$ )  | $V_{CE(\text{sat})}$  | -<br>-                      | -0.25<br>-0.4           | Vdc              |
| Base – Emitter Saturation Voltage<br>( $I_C = -10 \text{ mA}, I_B = -1.0 \text{ mA}$ )<br>( $I_C = -50 \text{ mA}, I_B = -5.0 \text{ mA}$ )   | $V_{BE(\text{sat})}$  | -0.65<br>-                  | -0.85<br>-0.95          | Vdc              |
| <b>SMALL-SIGNAL CHARACTERISTICS</b>   |   |                             |                         |                  |
| Current – Gain – Bandwidth Product<br>( $I_C = -10 \text{ mA}, V_{CE} = -20 \text{ Vdc}, f = 100 \text{ MHz}$ )   | $f_T$   | 250                         | -                       | MHz              |
| Output Capacitance<br>( $V_{CB} = -5.0 \text{ Vdc}, I_E = 0, f = 1.0 \text{ MHz}$ )   | $C_{obo}$   | -                           | 4.5                     | pF               |
| Input Capacitance<br>( $V_{EB} = -0.5 \text{ Vdc}, I_C = 0, f = 1.0 \text{ MHz}$ )  | $C_{ibo}$   | -                           | 10                      | pF               |
| Input Impedance<br>( $I_C = -1.0 \text{ mA}, V_{CE} = -10 \text{ Vdc}, f = 1.0 \text{ kHz}$ )   | $h_{ie}$  | 2.0                         | 12                      | k $\Omega$       |
| Voltage Feedback Ratio<br>( $I_C = -1.0 \text{ mA}, V_{CE} = -10 \text{ Vdc}, f = 1.0 \text{ kHz}$ )  | $h_{re}$  | 0.1                         | 10                      | $\times 10^{-4}$ |
| Small-Signal Current Gain<br>( $I_C = -1.0 \text{ mA}, V_{CE} = -10 \text{ Vdc}, f = 1.0 \text{ kHz}$ )   | $h_{fe}$  | 100                         | 400                     | -                |
| Output Admittance<br>( $I_C = -1.0 \text{ mA}, V_{CE} = -10 \text{ Vdc}, f = 1.0 \text{ kHz}$ )   | $h_{oe}$  | 3.0                         | 60                      | $\mu\text{mhos}$ |
| Noise Figure<br>( $I_C = -100 \mu\text{A}, V_{CE} = -5.0 \text{ Vdc}, R_S = 1.0 \text{ k}\Omega, f = 1.0 \text{ kHz}$ )   | NF  | -                           | 4.0                     | dB               |
| <b>SWITCHING CHARACTERISTICS</b>  |   |                             |                         |                  |
| Delay Time  | $(V_{CC} = -3.0 \text{ Vdc}, V_{BE} = 0.5 \text{ Vdc}, I_C = -10 \text{ mA}, I_{B1} = -1.0 \text{ mA})$ | $t_d$                       | -                       | 35               |
| Rise Time   |   | $t_r$                       | -                       | 35               |
| Storage Time  | $(V_{CC} = -3.0 \text{ Vdc}, I_C = -10 \text{ mA}, I_{B1} = I_{B2} = -1.0 \text{ mA})$                  | $t_s$                       | -                       | 225              |
| Fall Time   |   | $t_f$                       | -                       | 75               |

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 Test: Pulse Width  $\leq 300 \mu\text{s}$ , Duty Cycle  $\leq 2.0\%$ .

## TYPICAL CHARACTERISTICS

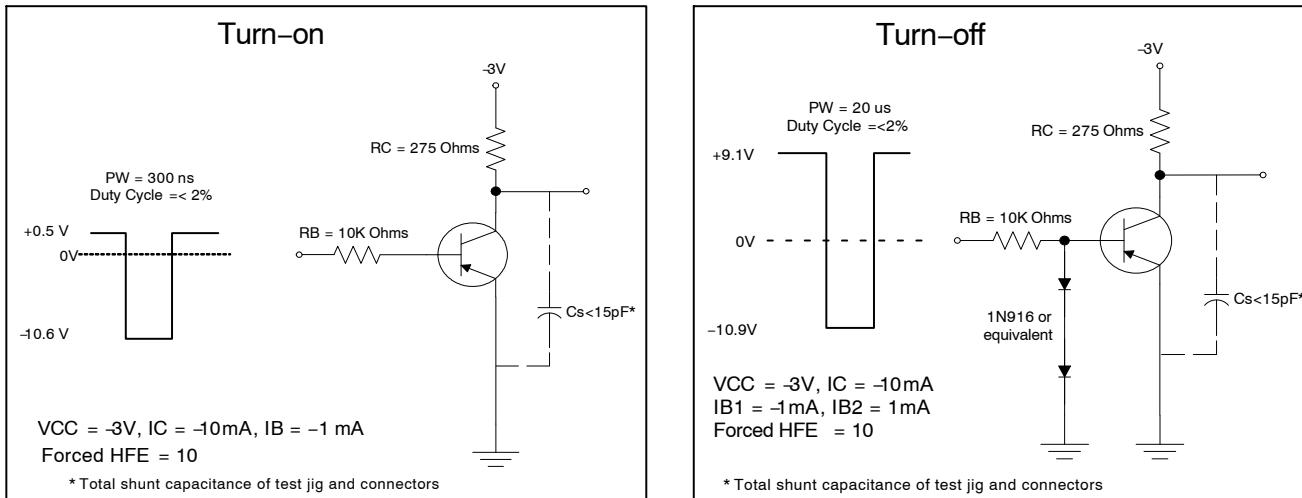


Figure 1. Delay and Rise Time Equivalent Test Circuit

Figure 2. Storage and Fall Time Equivalent Test Circuit

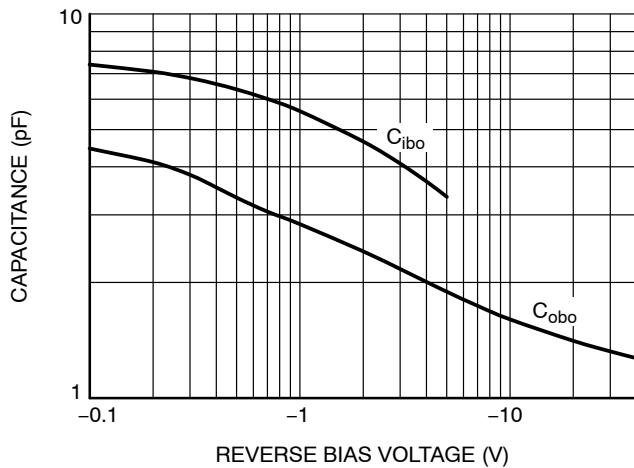


Figure 3. Capacitance

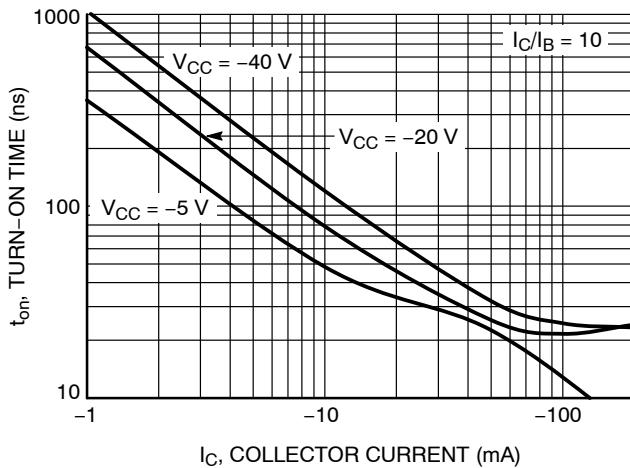


Figure 4. Turn-On Time

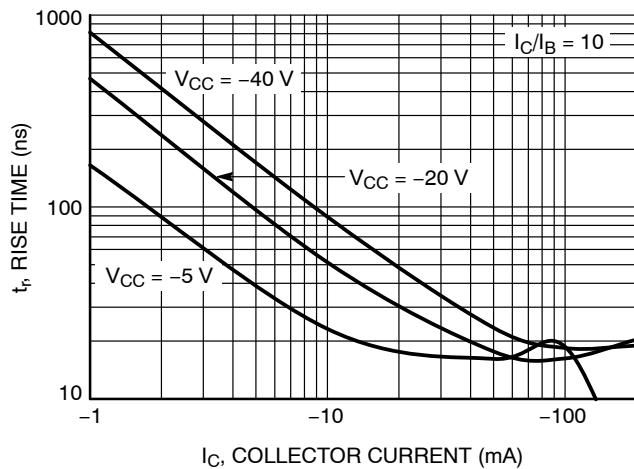


Figure 5. Rise Time

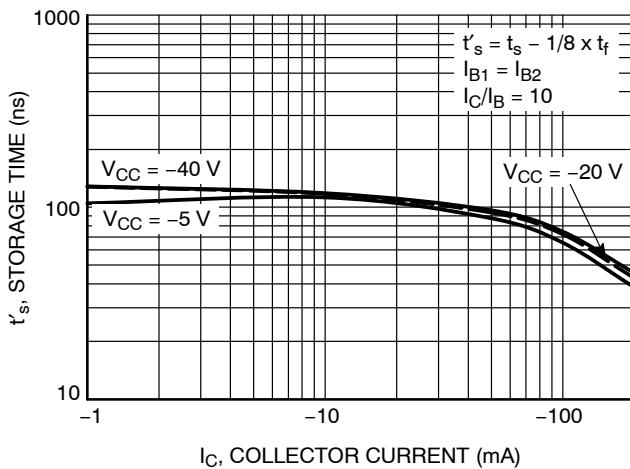


Figure 6. Storage Time

## TYPICAL CHARACTERISTICS

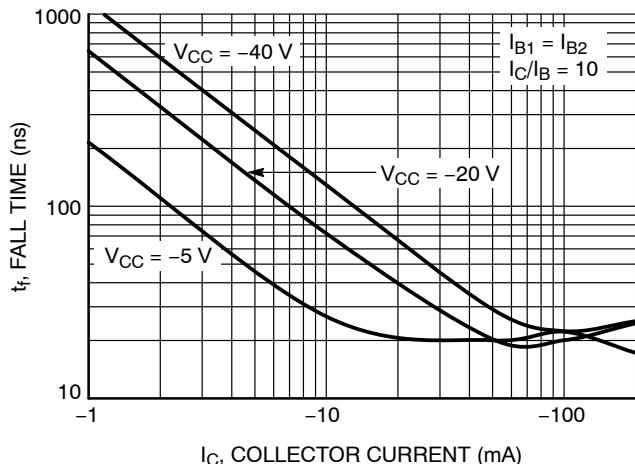


Figure 7. Fall Time

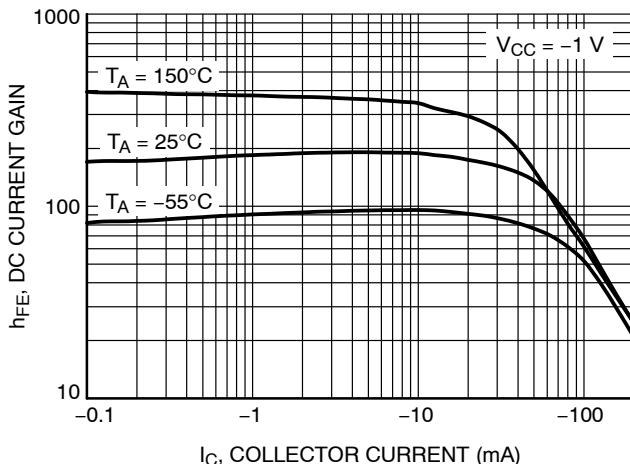


Figure 8. DC Current Gain

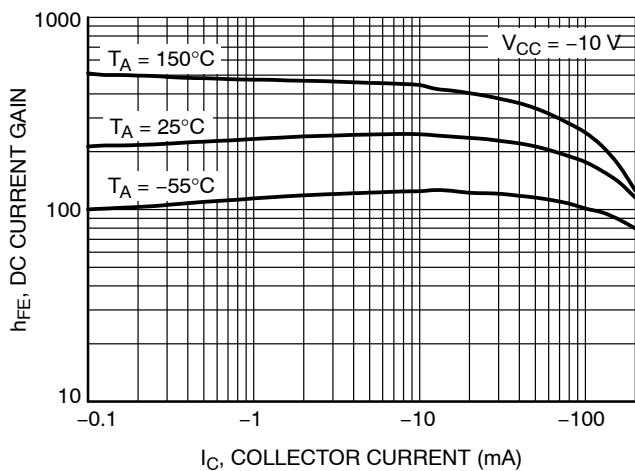


Figure 9. DC Current Gain

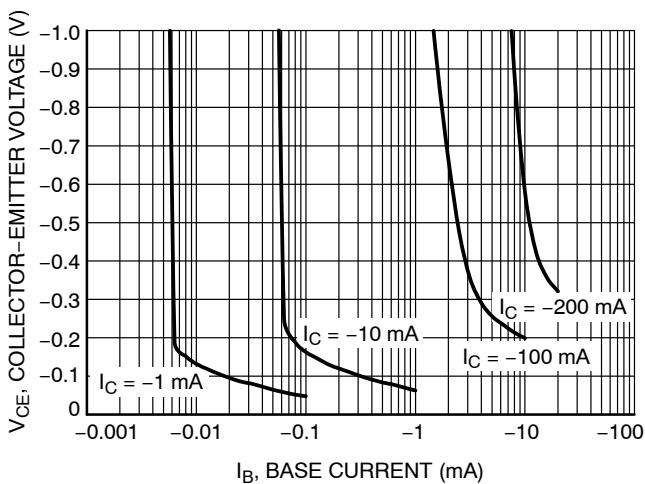


Figure 10. Collector Saturation Region

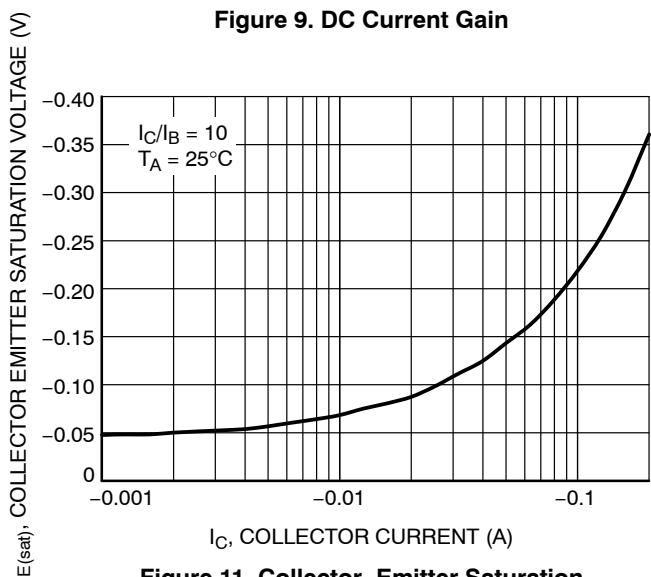


Figure 11. Collector-Emitter Saturation Voltage vs. Collector Current

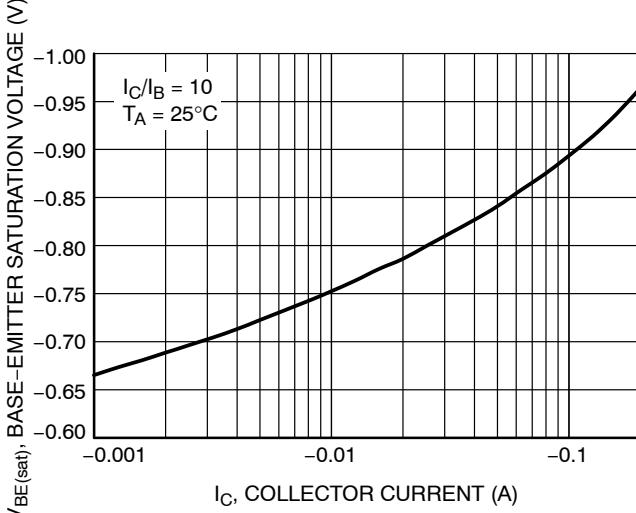
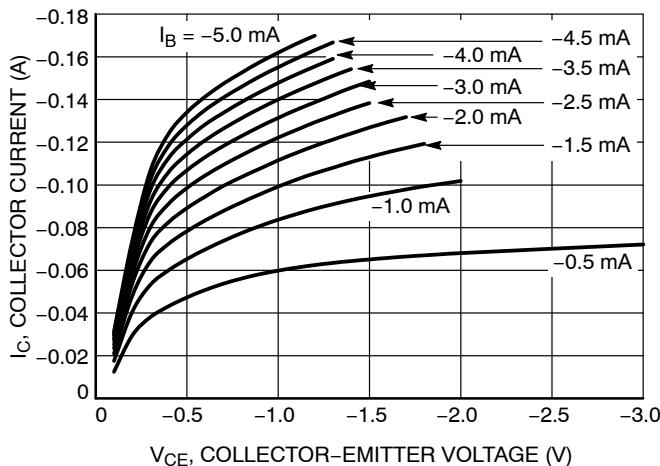
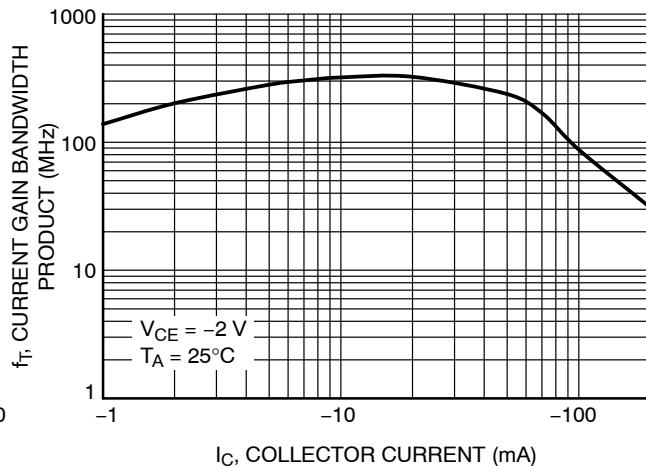


Figure 12. Base-Emitter Saturation Voltage vs. Collector Current

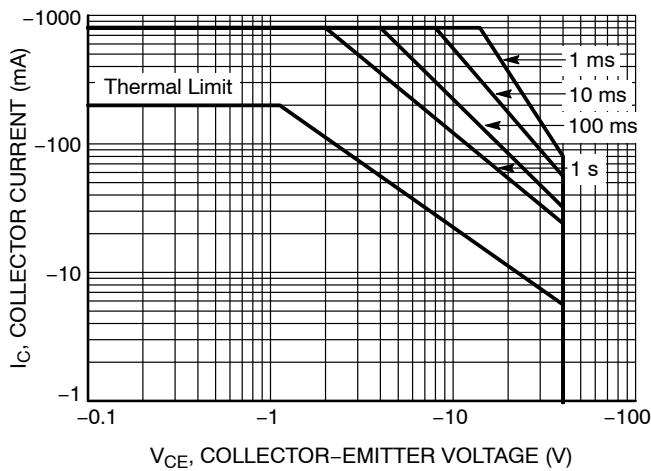
**TYPICAL CHARACTERISTICS**



**Figure 13. Collector Current vs.  
Collector-Emitter Voltage**



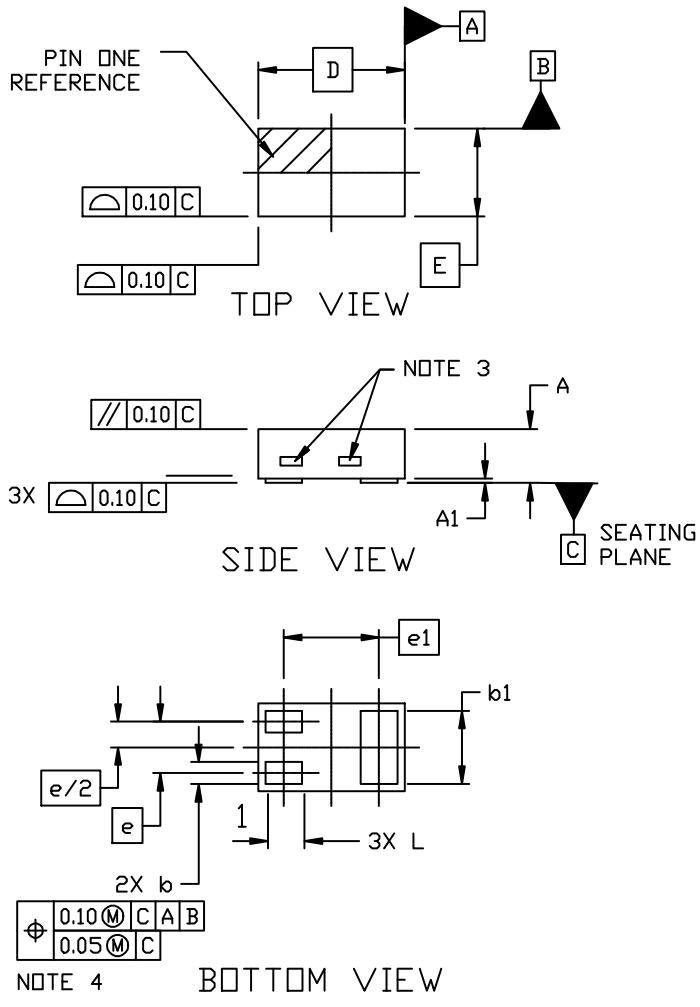
**Figure 14. Current Gain Bandwidth vs.  
Collector Current**



**Figure 15. Safe Operating Area**

## PACKAGE DIMENSIONS

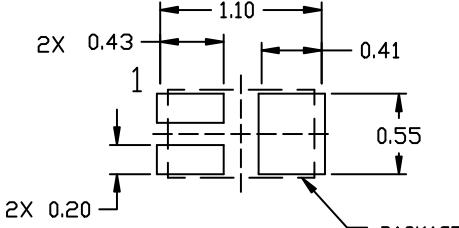
**X2DFN3 1.0x0.6, 0.35P**  
 CASE 714AC  
 ISSUE A



## NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS
3. EXPOSED COPPER ALLOWED AS SHOWN.
4. ALL PAD LOCATIONS CONTROLLED WITH THIS POSITIONAL TOLERANCE.

| DIM | MILLIMETERS |      |      |
|-----|-------------|------|------|
|     | MIN.        | MAX. | MAX. |
| A   | 0.34        | 0.37 | 0.40 |
| A1  | 0.00        | ---  | 0.05 |
| b   | 0.10        | 0.15 | 0.20 |
| b1  | 0.45        | 0.50 | 0.55 |
| D   | 0.95        | 1.00 | 1.05 |
| E   | 0.55        | 0.60 | 0.65 |
| e   | 0.35 BSC    |      |      |
| e1  | 0.65 BSC    |      |      |
| L   | 0.20        | 0.25 | 0.30 |



RECOMMENDED  
 MOUNTING FOOTPRINT

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