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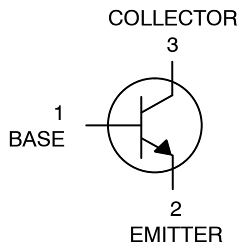
General Purpose Transistor

NPN Silicon

NST3904MX2



Features

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

MAXIMUM RATINGS

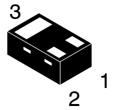
Rating	Symbol	Value	Unit
Collector − Emitter Voltage	V_{CEO}	40	Vdc
Collector − Base Voltage	V_{CBO}	60	Vdc
Emitter − Base Voltage	V_{EBO}	6.0	Vdc
Collector Current − Continuous (Note 1)	I_C	200	mAdc
Collector Current − Peak (Note 1)	I_{CM}	900	mAdc

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

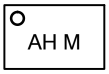
Characteristic	Symbol	Max	Unit
Total Power Dissipation (Note 2) @ T_A = 25°C Derate above 25°C	P_D	 165 1.39	 mW mW/°C
Thermal Resistance, Junction−to−Ambient (Note 2)	$R_{\theta JA}$	720	°C/W
Total Power Dissipation (Note 3) @ T_A = 25°C Derate above 25°C	P_D	 590 4.93	 mW mW/°C
Thermal Resistance, Junction−to−Ambient (Note 3)	$R_{\theta JA}$	203	°C/W
Junction and Storage Temperature Range	T_J, T_{stg}	−55 to +150	°C

1. Reference SOA Curve
2. Surface−mounted on FR4 board using a 0.6 mm^2, 2 oz. Cu pad
3. Surface−mounted on FR4 board using a 100 mm^2, 2 oz. Cu pad



X2DFN3 (1.0 x 0.6 mm)
CASE 714AC

MARKING DIAGRAM



AH = Specific Device Code
M = Date Code

ORDERING INFORMATION

Device	Package	Shipping†
NST3904MX2T5G	X2DFN3 (Pb−Free)	8000 / Tape & Reel

†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.

January, 2022 − Rev. 1

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

OFF CHARACTERISTICS

Characteristic	Symbol	Min	Max	Unit
Collector – Emitter Breakdown Voltage (I_C = 1.0 mAdc, I_B = 0)	$V_{(BR)CEO}$	40	–	Vdc
Collector – Base Breakdown Voltage (I_C = 10 μAdc, I_E = 0)	$V_{(BR)CBO}$	60	–	Vdc
Emitter – Base Breakdown Voltage (I_E = 10 μAdc, I_C = 0)	$V_{(BR)EBO}$	6.0	–	Vdc
Base Cutoff Current (V_{CE} = 30 Vdc, V_{EB} = 3.0 Vdc)	I_{BL}	–	50	nAdc
Collector Cutoff Current (V_{CE} = 30 Vdc, V_{EB} = 3.0 Vdc)	I_{CEX}	–	50	nAdc

ON CHARACTERISTICS (Note 4)

Characteristic	Symbol	Min	Max	Unit
DC Current Gain	H_{FE}			–
(I_C = 0.1 mAdc, V_{CE} = 1.0 Vdc)		40	–	
(I_C = 1.0 mAdc, V_{CE} = 1.0 Vdc)		70	–	
(I_C = 10 mAdc, V_{CE} = 1.0 Vdc)		100	300	
(I_C = 50 mAdc, V_{CE} = 1.0 Vdc)		60	–	
(I_C = 100 mAdc, V_{CE} = 1.0 Vdc)		30	–	
Collector – Emitter Saturation Voltage	$V_{CE(sat)}$			Vdc
(I_C = 10 mAdc, I_B = 1.0 mAdc)		–	0.2	
(I_C = 50 mAdc, I_B = 5.0 mAdc)		–	0.3	
Base – Emitter Saturation Voltage	$V_{BE(sat)}$			Vdc
(I_C = 10 mAdc, I_B = 1.0 mAdc)		0.65	0.85	
(I_C = 50 mAdc, I_B = 5.0 mAdc)		–	0.95	

SMALL – SIGNAL CHARACTERISTICS

Characteristic	Symbol	Min	Max	Unit
Current – Gain – Bandwidth Product (I_C = 10 mAdc, V_{CE} = 20 Vdc, f = 100 MHz)	f_T	250	–	MHz
Output Capacitance (V_{CB} = 5.0 Vdc, I_E = 0, f = 1.0 MHz)	C_{obo}	–	4.0	pF
Input Capacitance (V_{EB} = 0.5 Vdc, I_C = 0, f = 1.0 MHz)	C_{ibo}	–	8.0	pF
Input Impedance (V_{CE} = 10 Vdc, I_C = 1.0 mAdc, f = 1.0 kHz)	h_{ie}	1.0	10	kΩ
Voltage Feedback Ratio (V_{CE} = 10 Vdc, I_C = 1.0 mAdc, f = 1.0 kHz)	h_{re}	0.5	8.0	X 10^{-4}
Small – Signal Current Gain (V_{CE} = 10 Vdc, I_C = 1.0 mAdc, f = 1.0 kHz)	h_{fe}	100	400	–
Output Admittance (V_{CE} = 10 Vdc, I_C = 1.0 mAdc, f = 1.0 kHz)	h_{oe}	1.0	40	μmhos
Noise Figure (V_{CE} = 5.0 Vdc, I_C = 100 μAdc, R_S = 1.0 k ohms, f = 1.0 kHz)	NF	–	5.0	dB

SWITCHING CHARACTERISTICS

Characteristic		Symbol	Min	Max	Unit
Delay Time	(V_{CC} = 3.0 Vdc, V_{BE} = –0.5 Vdc, I_C = 10 mAdc, I_{B1} = 1.0 mAdc)	t_d	–	35	ns
Rise Time		t_r	–	35	
Storage Time	(V_{CC} = 3.0 Vdc, I_C = 10 mAdc, I_{B1} = I_{B2} = 1.0 mAdc)	t_s	–	210	ns
Fall Time		t_f	–	50	

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 ≤ 300 μs, Duty Cycle ≤ 2.0%.

TYPICAL CHARACTERISTICS

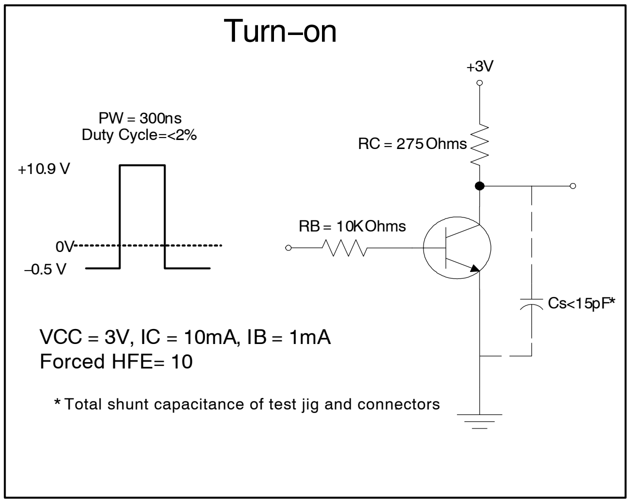


Figure 1. Delay and Rise Time Equivalent Test Circuit

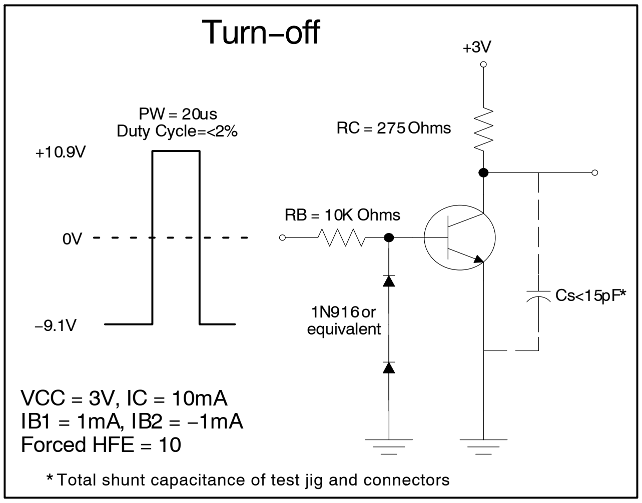


Figure 2. Storage and Fall Time Equivalent Test Circuit

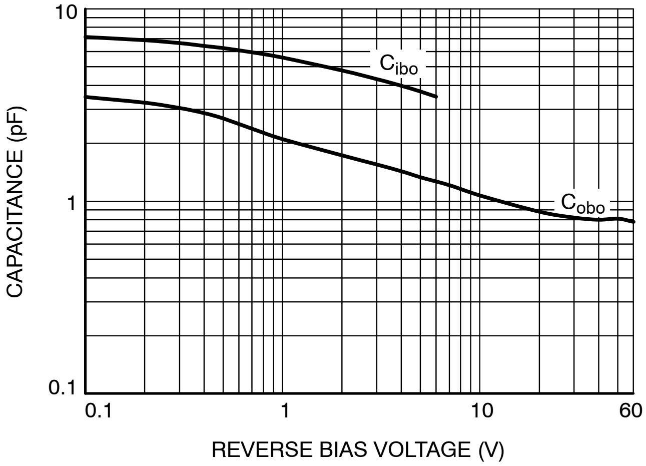


Figure 3. Capacitance

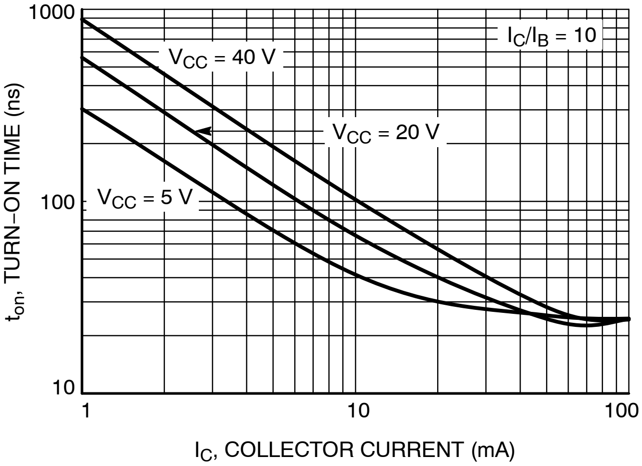


Figure 4. Turn−On Time

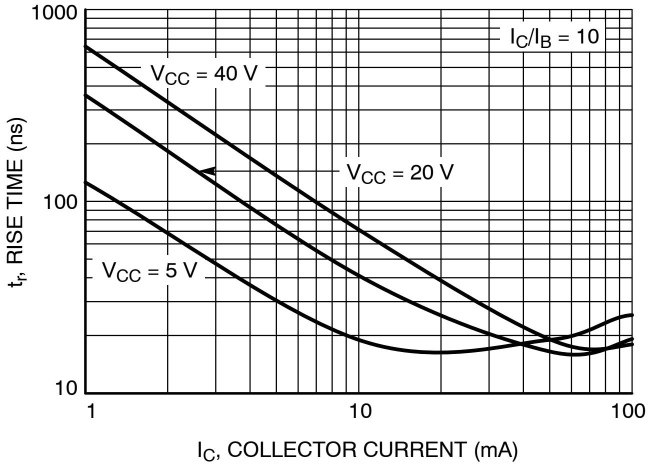


Figure 5. Rise Time

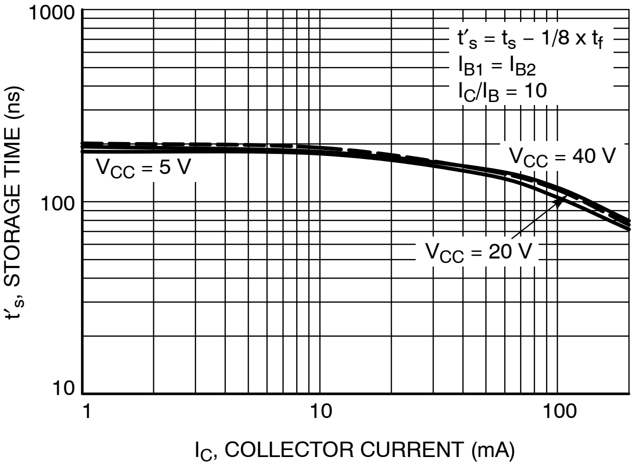


Figure 6. Storage Time

TYPICAL CHARACTERISTICS

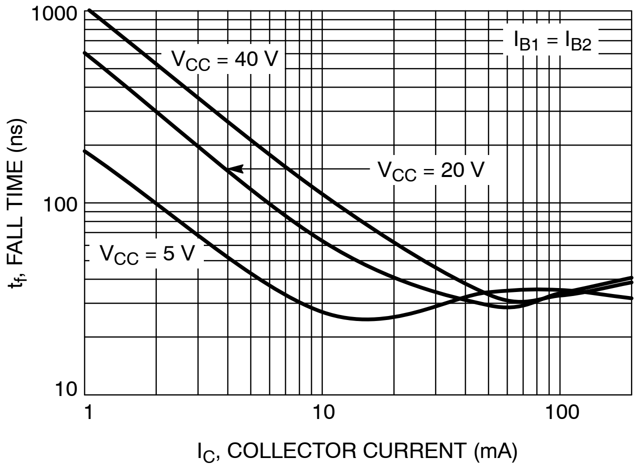


Figure 7. Fall Time

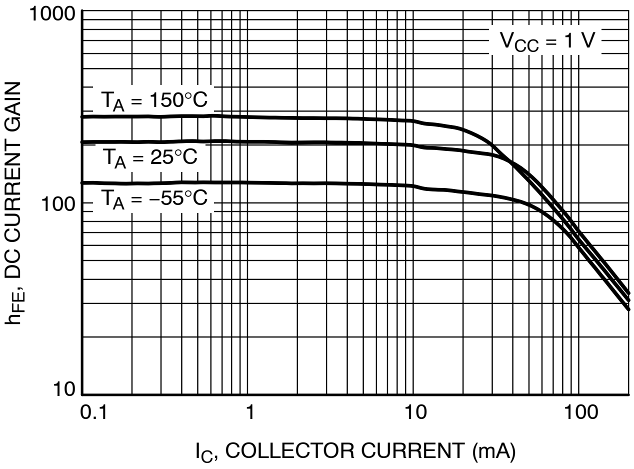


Figure 8. DC Current Gain

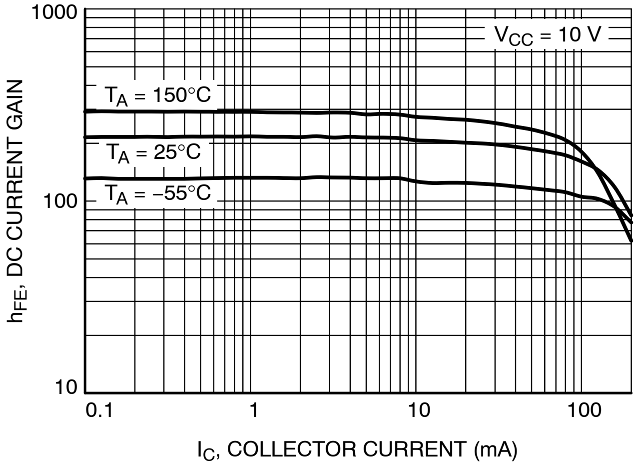


Figure 9. DC Current Gain

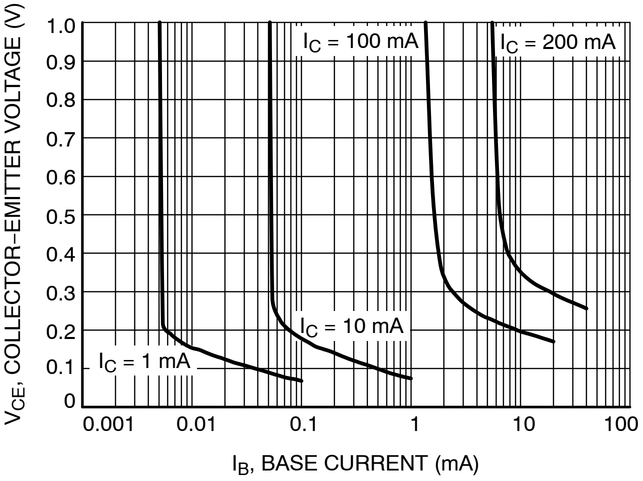


Figure 10. Collector Saturation Region

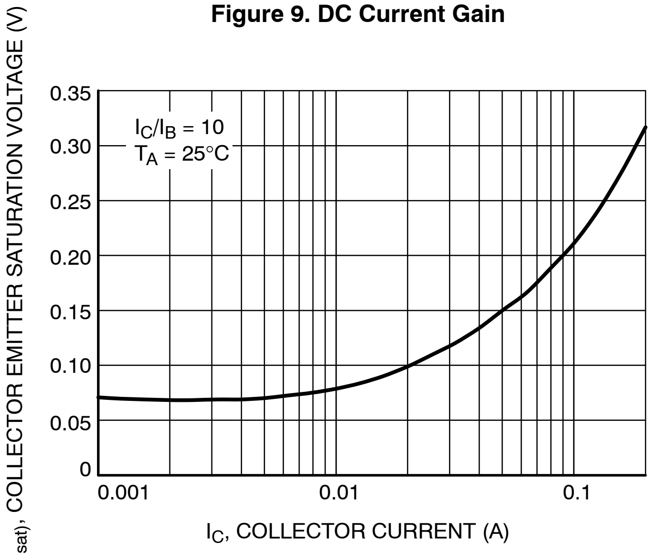


Figure 11. Collector−Emitter Saturation Voltage vs. Collector Current

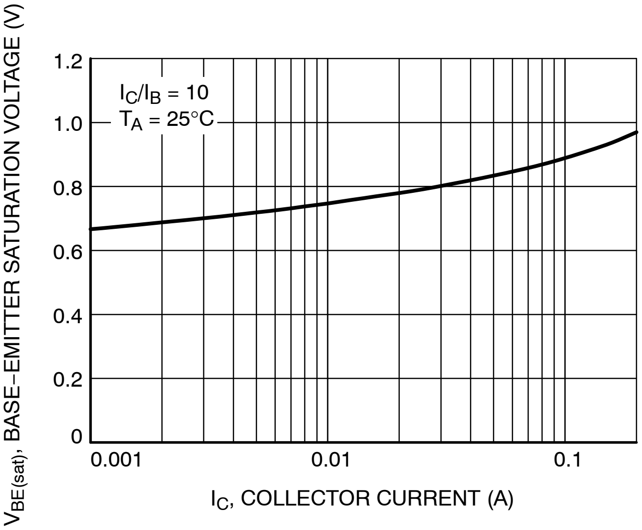


Figure 12. Base−Emitter Saturation Voltage vs. Collector Current

TYPICAL CHARACTERISTICS

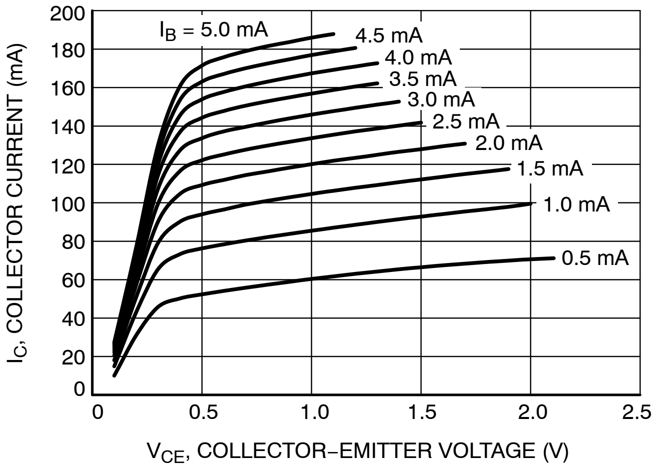


Figure 13. Collector Current vs. Collector−Emitter Voltage

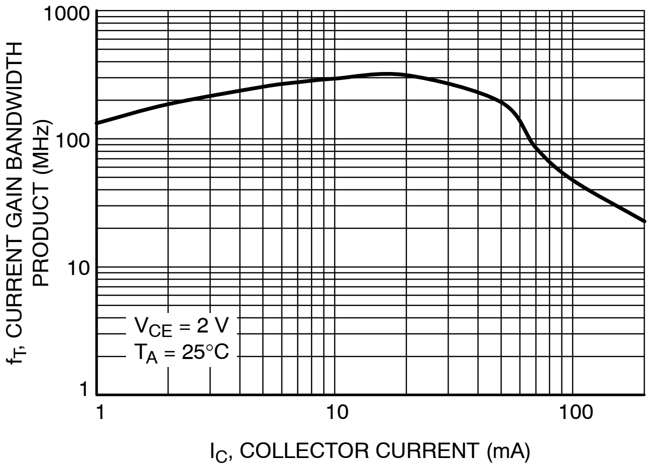


Figure 14. Current Gain Bandwidth vs. Collector Current

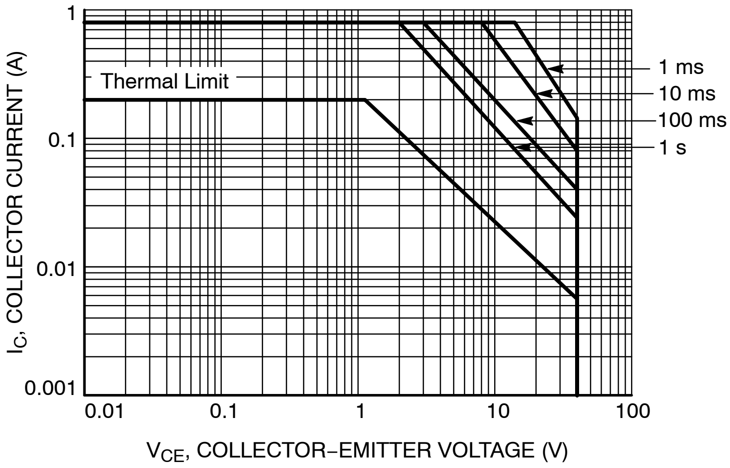
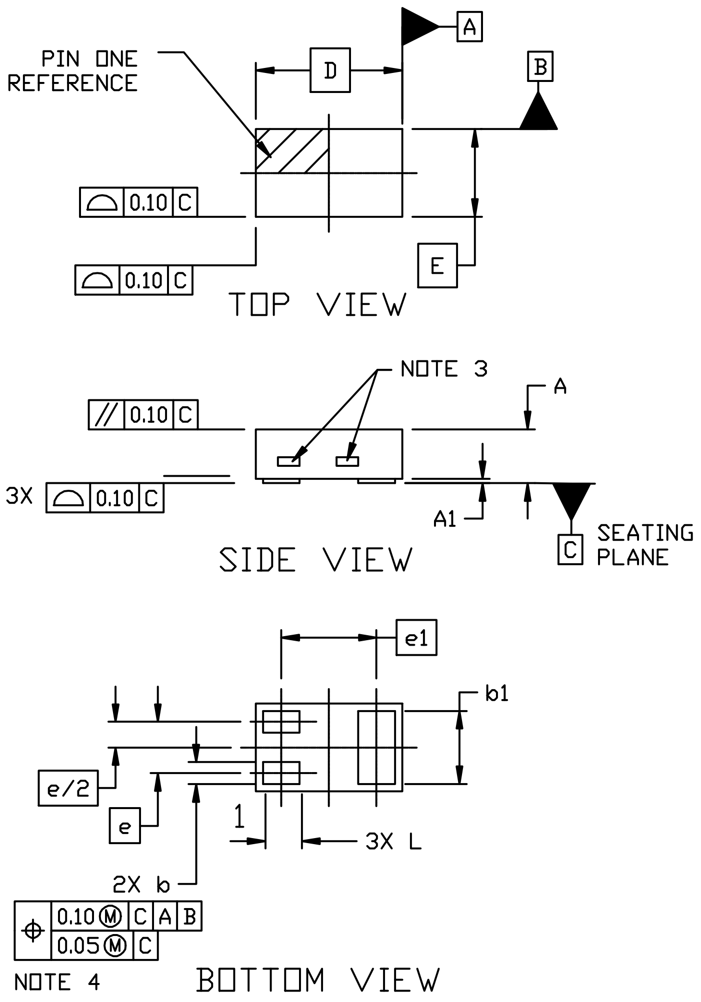


Figure 15. Safe Operating Area

PACKAGE DIMENSIONS

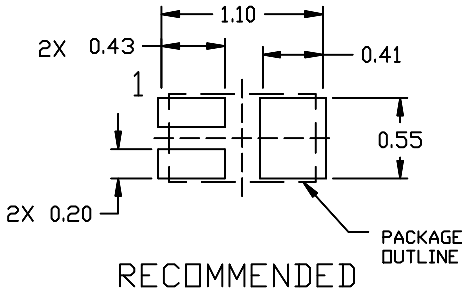
X2DFN3 1.0x0.6, 0.35P
CASE 714AC
ISSUE A



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.

	MILLIMETERS		
DIM	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



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