

# MUN5113DW1, NSBA144EDXV6, NSBA144EDP6

## Dual PNP Bias Resistor Transistors R1 = 47 kΩ, R2 = 47 kΩ

### PNP Transistors with Monolithic Bias Resistor Network

This series of digital transistors is designed to replace a single device and its external resistor bias network. The Bias Resistor Transistor (BRT) contains a single transistor with a monolithic bias network consisting of two resistors; a series base resistor and a base-emitter resistor. The BRT eliminates these individual components by integrating them into a single device. The use of a BRT can reduce both system cost and board space.

#### Features

- S and NSV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable
- Simplifies Circuit Design
- Reduces Board Space
- Reduces Component Count
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

#### MAXIMUM RATINGS

(T<sub>A</sub> = 25°C, common for Q1 and Q2, unless otherwise noted)

Rating	Symbol	Max	Unit
Collector-Base Voltage	V <sub>CBO</sub>	50	Vdc
Collector-Emitter Voltage	V <sub>CEO</sub>	50	Vdc
Collector Current - Continuous	I <sub>C</sub>	100	mAdc
Input Forward Voltage	V <sub>IN(fwd)</sub>	40	Vdc
Input Reverse Voltage	V <sub>IN(rev)</sub>	10	Vdc

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.

#### ORDERING INFORMATION

Device	Package	Shipping†
MUN5113DW1T1G, SMUN5113DW1T1G	SOT-363	3,000 / Tape & Reel
NSBA144EDXV6T1G	SOT-563	4,000 / Tape & Reel
NSBA144EDXV6T5G	SOT-563	8,000 / Tape & Reel
NSBA144EDP6T5G	SOT-963	8,000 / Tape & Reel

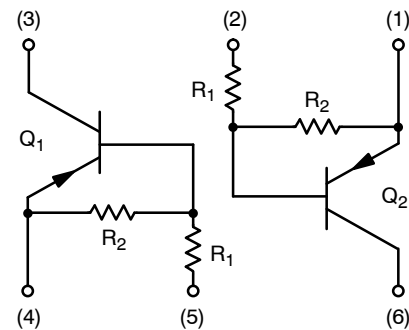
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.



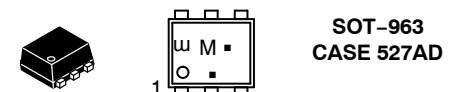
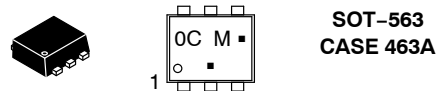
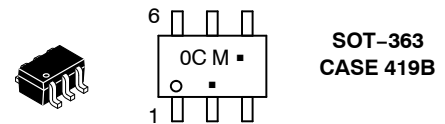
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#### PIN CONNECTIONS



#### MARKING DIAGRAMS



0C/m = Specific Device Code  
M = Date Code\*  
▪ = Pb-Free Package

(Note: Microdot may be in either location)

\*Date Code orientation may vary depending upon manufacturing location.

# MUN5113DW1, NSBA144EDXV6, NSBA144EDP6

## THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
<b>MUN5113DW1 (SOT-363) One Junction Heated</b>			
Total Device Dissipation $T_A = 25^\circ\text{C}$	$P_D$	187	mW
Derate above $25^\circ\text{C}$		256	mW/°C
		1.5	mW/°C
		2.0	mW/°C
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	670	°C/W
		490	°C/W
<b>MUN5113DW1 (SOT-363) Both Junction Heated (Note 3)</b>			
Total Device Dissipation $T_A = 25^\circ\text{C}$	$P_D$	250	mW
Derate above $25^\circ\text{C}$		385	mW/°C
		2.0	mW/°C
		3.0	mW/°C
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	493	°C/W
		325	°C/W
Thermal Resistance, Junction to Lead	$R_{\theta JL}$	188	°C/W
		208	°C/W
Junction and Storage Temperature Range	$T_J, T_{stg}$	-55 to +150	°C
<b>NSBA144EDXV6 (SOT-563) One Junction Heated</b>			
Total Device Dissipation $T_A = 25^\circ\text{C}$	$P_D$	357	mW
Derate above $25^\circ\text{C}$		2.9	mW/°C
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	350	°C/W
<b>NSBA144EDXV6 (SOT-563) Both Junction Heated (Note 3)</b>			
Total Device Dissipation $T_A = 25^\circ\text{C}$	$P_D$	500	mW
Derate above $25^\circ\text{C}$		4.0	mW/°C
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	250	°C/W
Junction and Storage Temperature Range	$T_J, T_{stg}$	-55 to +150	°C
<b>NSBA144EDP6 (SOT-963) One Junction Heated</b>			
Total Device Dissipation $T_A = 25^\circ\text{C}$	$P_D$	231	mW
Derate above $25^\circ\text{C}$		269	mW/°C
		1.9	mW/°C
		2.2	mW/°C
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	540	°C/W
		464	°C/W
<b>NSBA144EDP6 (SOT-963) Both Junction Heated (Note 3)</b>			
Total Device Dissipation $T_A = 25^\circ\text{C}$	$P_D$	339	mW
Derate above $25^\circ\text{C}$		408	mW/°C
		2.7	mW/°C
		3.3	mW/°C
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	369	°C/W
		306	°C/W
Junction and Storage Temperature Range	$T_J, T_{stg}$	-55 to +150	°C

- FR-4 @ Minimum Pad.
- FR-4 @ 1.0 x 1.0 Inch Pad.
- Both junction heated values assume total power is sum of two equally powered channels.
- FR-4 @ 100 mm<sup>2</sup>, 1 oz. copper traces, still air.
- FR-4 @ 500 mm<sup>2</sup>, 1 oz. copper traces, still air.

# MUN5113DW1, NSBA144EDXV6, NSBA144EDP6

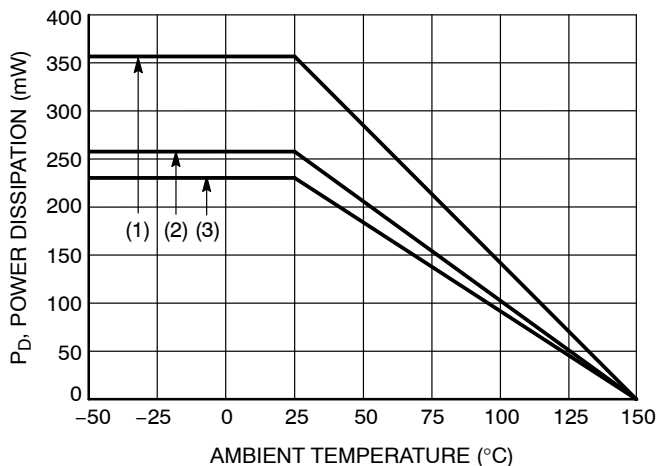
## ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ , common for $Q_1$ and $Q_2$ , unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>					
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 ( $V_{EB} = 6.0\text{ V}$ , $I_C = 0$ )	$I_{EBO}$	-	-	0.1	mAdc
Collector-Base Breakdown Voltage ( $I_C = 10\ \mu\text{A}$ , $I_E = 0$ )	$V_{(BR)CBO}$	50	-	-	Vdc
Collector-Emitter Breakdown Voltage (Note 6) ( $I_C = 2.0\text{ mA}$ , $I_B = 0$ )	$V_{(BR)CEO}$	50	-	-	Vdc

## ON CHARACTERISTICS

DC Current Gain (Note 6) ( $I_C = 5.0\text{ mA}$ , $V_{CE} = 10\text{ V}$ )	$h_{FE}$	80	140	-	
Collector-Emitter Saturation Voltage (Note 6) ( $I_C = 10\text{ mA}$ , $I_B = 0.3\text{ mA}$ )	$V_{CE(sat)}$	-	-	0.25	Vdc
Input Voltage (off) ( $V_{CE} = 5.0\text{ V}$ , $I_C = 100\ \mu\text{A}$ )	$V_{i(off)}$	-	1.2	-	Vdc
Input Voltage (on) ( $V_{CE} = 0.2\text{ V}$ , $I_C = 3.0\text{ mA}$ )	$V_{i(on)}$	-	2.0	-	Vdc
Output Voltage (on) ( $V_{CC} = 5.0\text{ V}$ , $V_B = 3.5\text{ V}$ , $R_L = 1.0\text{ k}\Omega$ )	$V_{OL}$	-	-	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	$R_1$	32.9	47	61.1	$\text{k}\Omega$
Resistor Ratio	$R_1/R_2$	0.8	1.0	1.2	

6. Pulsed Condition: Pulse Width = 300 msec, Duty Cycle  $\leq$  2%.



- (1) SOT-363; 1.0 x 1.0 inch Pad
- (2) SOT-563; Minimum Pad
- (3) SOT-963; 100 mm<sup>2</sup>, 1 oz. copper trace

Figure 1. Derating Curve

TYPICAL CHARACTERISTICS  
MUN5113DW1, NSBA144EDXV6

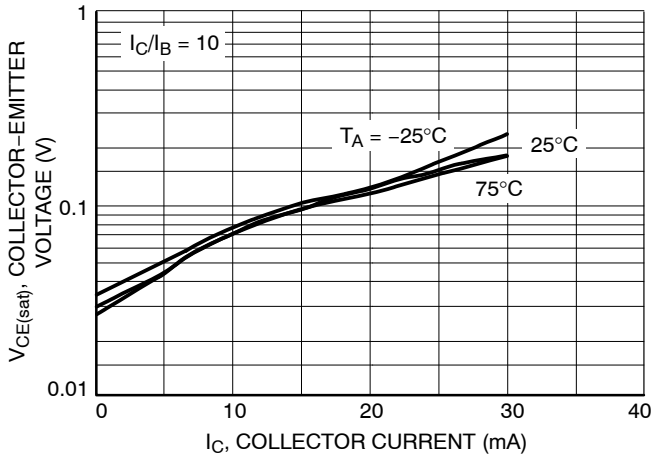


Figure 2.  $V_{CE(sat)}$  vs.  $I_C$

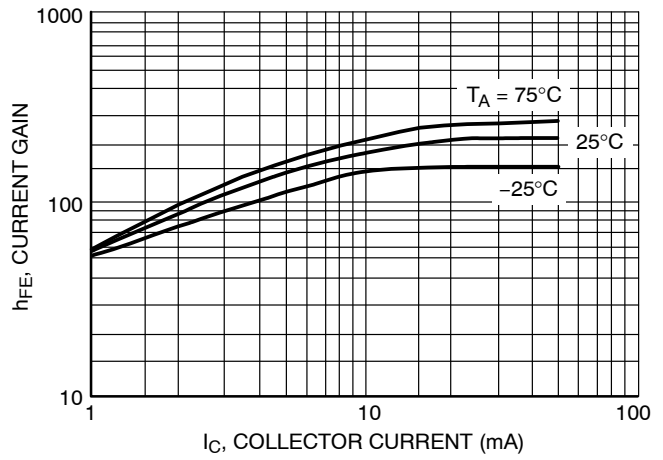


Figure 3. DC Current Gain

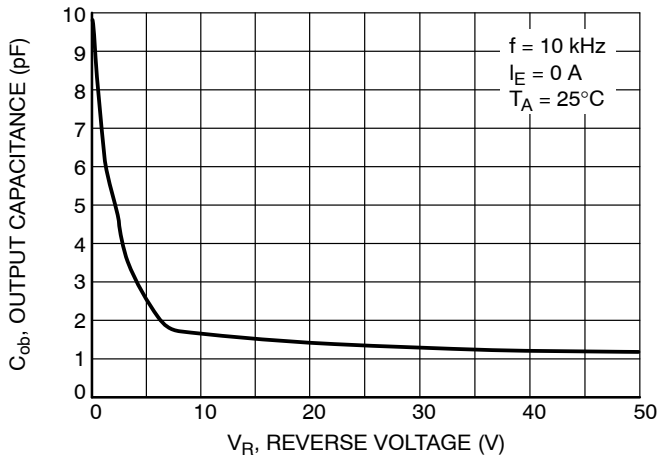


Figure 4. Output Capacitance

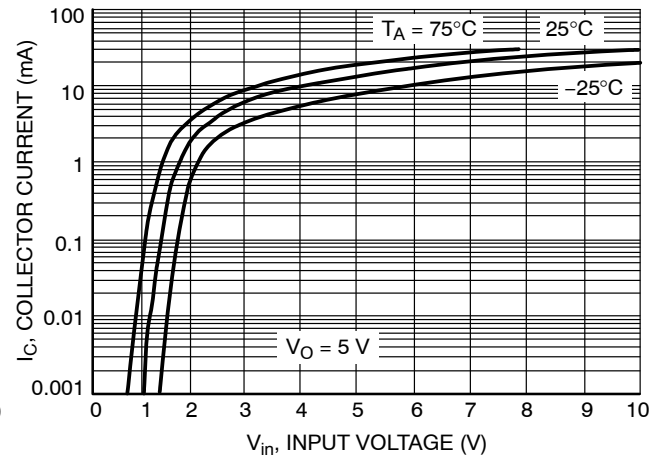


Figure 5. Output Current vs. Input Voltage

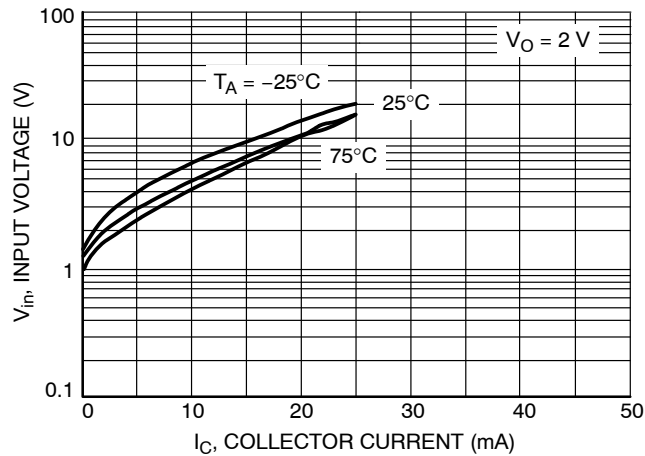


Figure 6. Input Voltage vs. Output Current

TYPICAL CHARACTERISTICS  
NSBA144EDP6

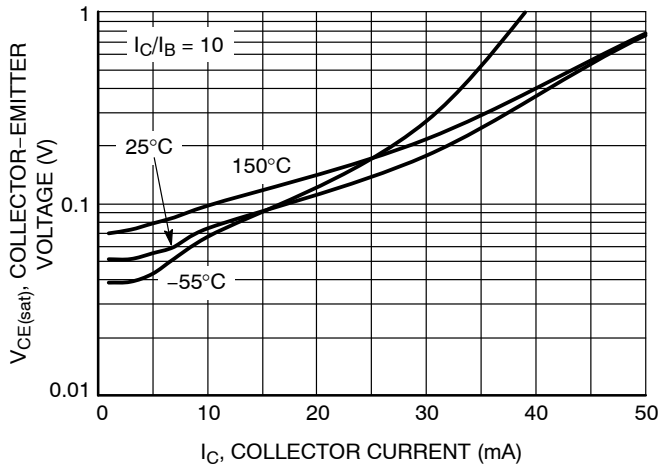


Figure 7.  $V_{CE(sat)}$  vs.  $I_C$

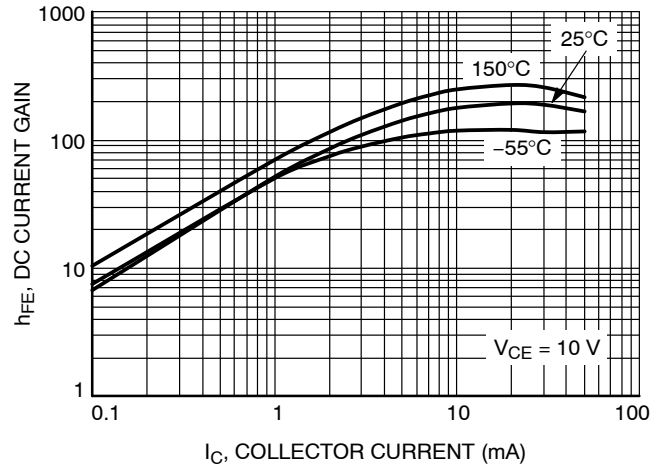


Figure 8. DC Current Gain

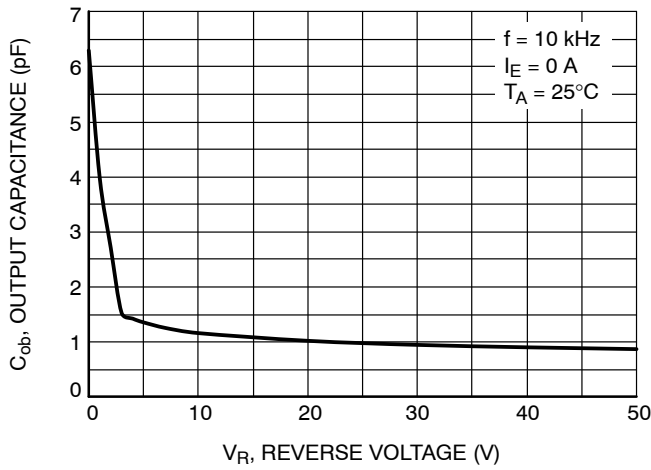


Figure 9. Output Capacitance

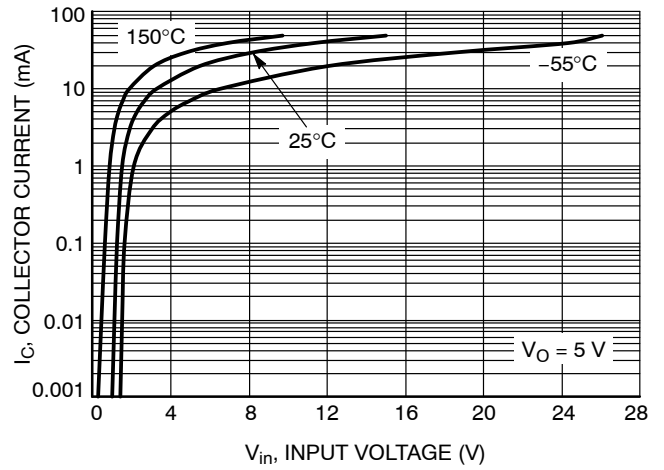


Figure 10. Output Current vs. Input Voltage

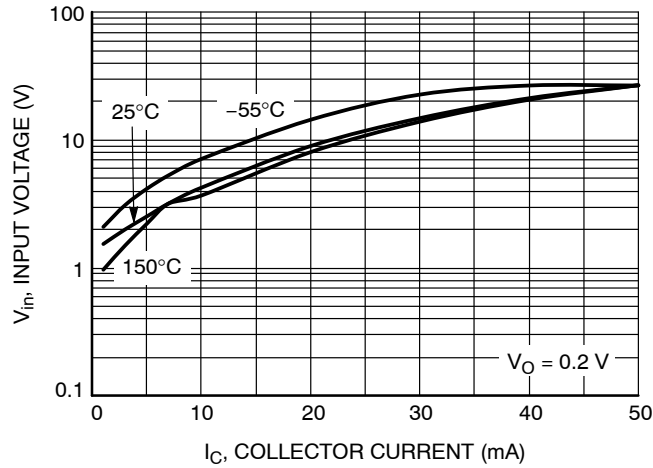
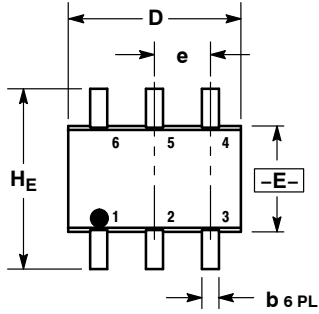


Figure 11. Input Voltage vs. Output Current

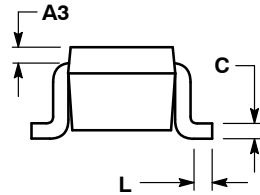
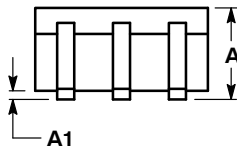
# MUN5113DW1, NSBA144EDXV6, NSBA144EDP6

## PACKAGE DIMENSIONS

SC-88/SC70-6/SOT-363  
CASE 419B-02  
ISSUE W



b 6 PL  
⊕ 0.2 (0.008) (M) E (M)

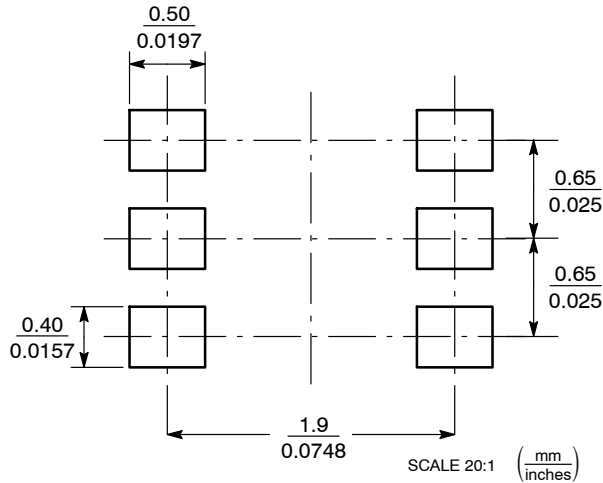


NOTES:

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

### SOLDERING FOOTPRINT\*



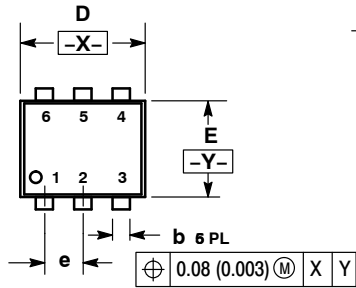
### SC-88/SC70-6/SOT-363

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

# MUN5113DW1, NSBA144EDXV6, NSBA144EDP6

## PACKAGE DIMENSIONS

SOT-563, 6 LEAD  
CASE 463A  
ISSUE F

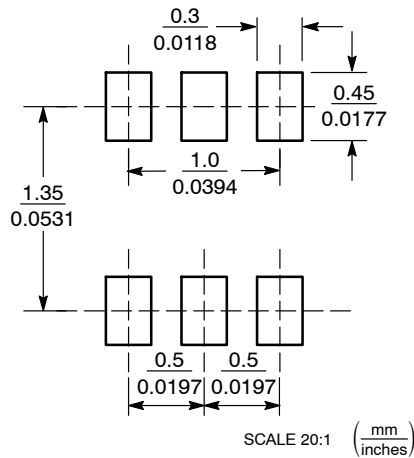


NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETERS
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.50	0.55	0.60	0.020	0.021	0.023
b	0.17	0.22	0.27	0.007	0.009	0.011
C	0.08	0.12	0.18	0.003	0.005	0.007
D	1.50	1.60	1.70	0.059	0.062	0.066
E	1.10	1.20	1.30	0.043	0.047	0.051
e	0.5 BSC			0.02 BSC		
L	0.10	0.20	0.30	0.004	0.008	0.012
HE	1.50	1.60	1.70	0.059	0.062	0.066

### SOLDERING FOOTPRINT\*

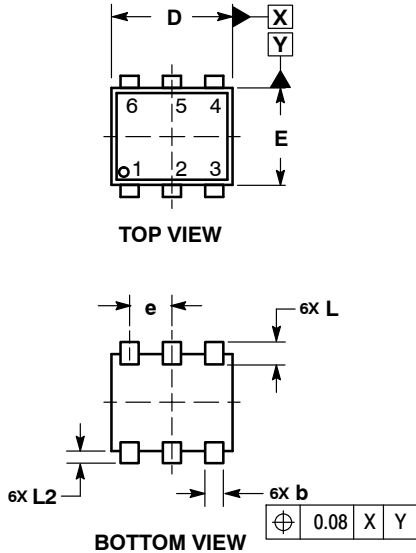


\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

# MUN5113DW1, NSBA144EDXV6, NSBA144EDP6

## PACKAGE DIMENSIONS

### SOT-963 CASE 527AD ISSUE E

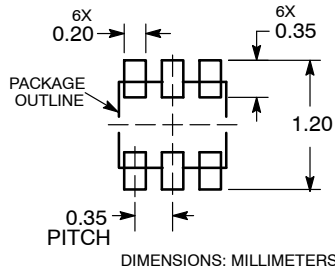


#### NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

MILLIMETERS			
DIM	MIN	NOM	MAX
A	0.34	0.37	0.40
b	0.10	0.15	0.20
C	0.07	0.12	0.17
D	0.95	1.00	1.05
E	0.75	0.80	0.85
e	0.35 BSC		
H <sub>E</sub>	0.95	1.00	1.05
L	0.19 REF		
L2	0.05	0.10	0.15

### RECOMMENDED MOUNTING FOOTPRINT



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