

MUN5213DW1, NSBC144EDXV6, NSBC144EDP6

Dual NPN Bias Resistor Transistors

R1 = 47 kΩ, R2 = 47 kΩ

NPN 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

- Simplifies Circuit Design
- Reduces Board Space
- Reduces Component Count
- S and 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°C, common for Q₁ and Q₂, unless otherwise noted)

Rating	Symbol	Max	Unit
Collector-Base Voltage	V _{CBO}	50	Vdc
Collector-Emitter Voltage	V _{CEO}	50	Vdc
Collector Current – Continuous	I _C	100	mAdc
Input Forward Voltage	V _{IN(fwd)}	40	Vdc
Input Reverse Voltage	V _{IN(rev)}	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 [†]
MUN5213DW1T1G, SMUN5213DW1T1G*	SOT-363	3,000 / Tape & Reel
MUN5213DW1T3G, NSVMUN5213DW1T3G*	SOT-363	10,000 / Tape & Reel
NSBC144EDXV6T1G	SOT-563	4,000 / Tape & Reel
NSBC144EDXV6T5G	SOT-563	8,000 / Tape & Reel
NSBC144EDP6T5G	SOT-963	8,000 / Tape & Reel

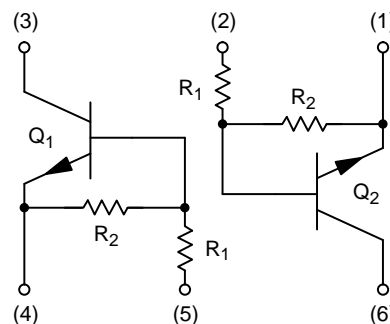
[†]For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.



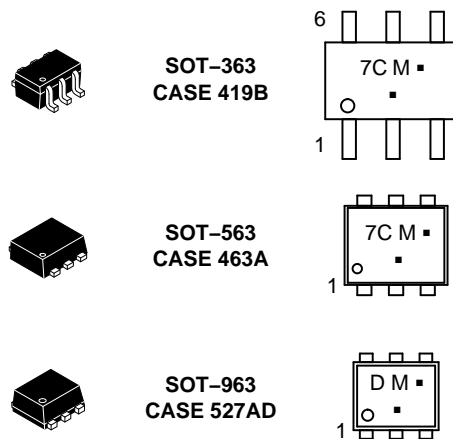
ON Semiconductor®

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PIN CONNECTIONS



MARKING DIAGRAMS



7C/D = 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.

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THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
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MUN5213DW1 (SOT-363) ONE JUNCTION HEATED

Total Device Dissipation $T_A = 25^\circ\text{C}$	(Note 1)	P_D	187	mW
	(Note 2)		256	
Derate above 25°C	(Note 1)		1.5	mW/ $^\circ\text{C}$
	(Note 2)		2.0	
Thermal Resistance, Junction to Ambient	(Note 1)	$R_{\theta JA}$	670	$^\circ\text{C/W}$
	(Note 2)		490	

MUN5213DW1 (SOT-363) BOTH JUNCTION HEATED (Note 3)

Total Device Dissipation $T_A = 25^\circ\text{C}$	(Note 1)	P_D	250	mW
	(Note 2)		385	
Derate above 25°C	(Note 1)		2.0	mW/ $^\circ\text{C}$
	(Note 2)		3.0	
Thermal Resistance, Junction to Ambient	(Note 1)	$R_{\theta JA}$	493	$^\circ\text{C/W}$
	(Note 2)		325	
Thermal Resistance, Junction to Lead	(Note 1)	$R_{\theta JL}$	188	$^\circ\text{C/W}$
	(Note 2)		208	
Junction and Storage Temperature Range		T_J, T_{stg}	-55 to +150	$^\circ\text{C}$

NSBC144EDXV6 (SOT-563) ONE JUNCTION HEATED

Total Device Dissipation $T_A = 25^\circ\text{C}$	(Note 1)	P_D	357	mW
Derate above 25°C	(Note 1)		2.9	mW/ $^\circ\text{C}$
Thermal Resistance, Junction to Ambient	(Note 1)	$R_{\theta JA}$	350	$^\circ\text{C/W}$

NSBC144EDXV6 (SOT-563) BOTH JUNCTION HEATED (Note 3)

Total Device Dissipation $T_A = 25^\circ\text{C}$	(Note 1)	P_D	500	mW
Derate above 25°C	(Note 1)		4.0	mW/ $^\circ\text{C}$
Thermal Resistance, Junction to Ambient	(Note 1)	$R_{\theta JA}$	250	$^\circ\text{C/W}$
Junction and Storage Temperature Range		T_J, T_{stg}	-55 to +150	$^\circ\text{C}$

NSBC144EDP6 (SOT-963) ONE JUNCTION HEATED

Total Device Dissipation $T_A = 25^\circ\text{C}$	(Note 4)	P_D	231	MW
	(Note 5)		269	
Derate above 25°C	(Note 4)		1.9	mW/ $^\circ\text{C}$
	(Note 5)		2.2	
Thermal Resistance, Junction to Ambient	(Note 4)	$R_{\theta JA}$	540	$^\circ\text{C/W}$
	(Note 5)		464	

NSBC144EDP6 (SOT-963) BOTH JUNCTION HEATED (Note 3)

Total Device Dissipation $T_A = 25^\circ\text{C}$	(Note 4)	P_D	339	MW
	(Note 5)		408	
Derate above 25°C	(Note 4)		2.7	mW/ $^\circ\text{C}$
	(Note 5)		3.3	
Thermal Resistance, Junction to Ambient	(Note 4)	$R_{\theta JA}$	369	$^\circ\text{C/W}$
	(Note 5)		306	
Junction and Storage Temperature Range		T_J, T_{stg}	-55 to +150	$^\circ\text{C}$

1. FR-4 @ Minimum Pad.
2. FR-4 @ 1.0×1.0 Inch Pad.
3. Both junction heated values assume total power is sum of two equally powered channels.
4. FR-4 @ 100 mm^2 , 1 oz. copper traces, still air.
5. FR-4 @ 500 mm^2 , 1 oz. copper traces, still air.

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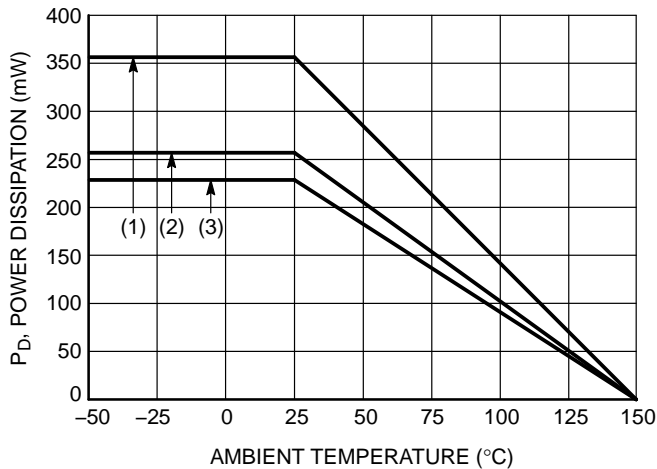
ELECTRICAL CHARACTERISTICS (T_A = 25°C, common for Q₁ and Q₂, unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector-Base Cutoff Current (V _{CB} = 50 V, I _E = 0)	I _{CBO}	-	-	100	nAdc
Collector-Emitter Cutoff Current (V _{CE} = 50 V, I _B = 0)	I _{CEO}	-	-	500	nAdc
Emitter-Base Cutoff Current (V _{EB} = 6.0 V, I _C = 0)	I _{EBO}	-	-	0.1	mAdc
Collector-Base Breakdown Voltage (I _C = 10 μA, I _E = 0)	V _{(BR)CBO}	50	-	-	Vdc
Collector-Emitter Breakdown Voltage (Note 6) (I _C = 2.0 mA, I _B = 0)	V _{(BR)CEO}	50	-	-	Vdc

ON CHARACTERISTICS

DC Current Gain (Note 6) (I _C = 5.0 mA, V _{CE} = 10 V)	h _{FE}	80	140	-	
Collector-Emitter Saturation Voltage (Note 6) (I _C = 10 mA, I _B = 0.3 mA)	V _{CE(sat)}	-	-	0.25	V
Input Voltage (Off) (V _{CE} = 5.0 V, I _C = 100 μA)	V _{i(off)}	-	1.2	-	Vdc
Input Voltage (On) (V _{CE} = 0.2 V, I _C = 3.0 mA)	V _{i(on)}	-	1.9	-	Vdc
Output Voltage (On) (V _{CC} = 5.0 V, V _B = 3.5 V, R _L = 1.0 kΩ)	V _{OL}	-	-	0.2	Vdc
Output Voltage (Off) (V _{CC} = 5.0 V, V _B = 0.5 V, R _L = 1.0 kΩ)	V _{OH}	4.9	-	-	Vdc
Input Resistor	R ₁	32.9	47	61.1	kΩ
Resistor Ratio	R ₁ /R ₂	0.8	1.0	1.2	

6. Pulsed Condition: Pulse Width = 300 ms, Duty Cycle ≤ 2%.



- (1) SOT-363; 1.0 × 1.0 Inch Pad
- (2) SOT-563; Minimum Pad
- (3) SOT-963; 100 mm², 1 oz. Copper Trace

Figure 1. Derating Curve

TYPICAL CHARACTERISTICS
MUN5213DW1, NSBC144EDXV6

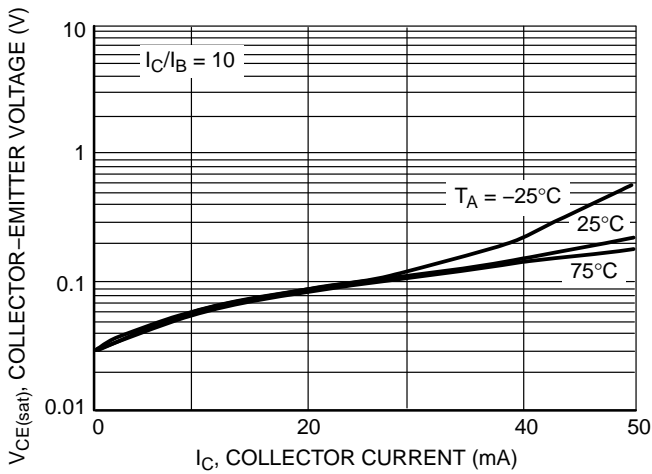


Figure 2. $V_{CE(sat)}$ vs. I_C

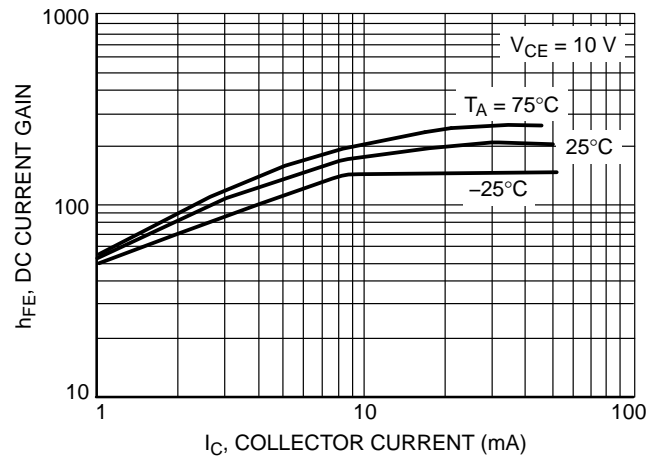


Figure 3. DC Current Gain

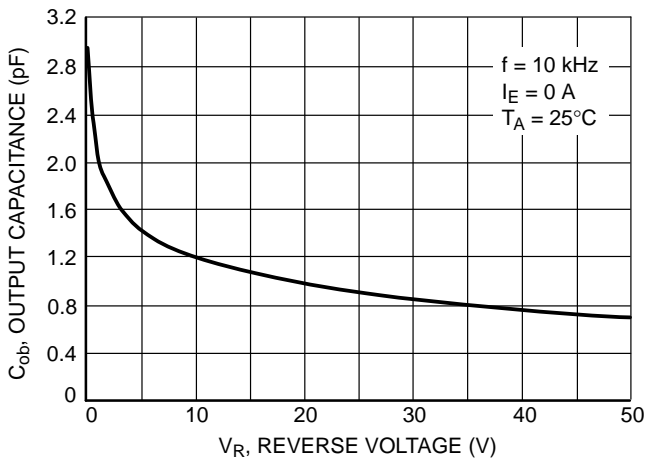


Figure 4. Output Capacitance

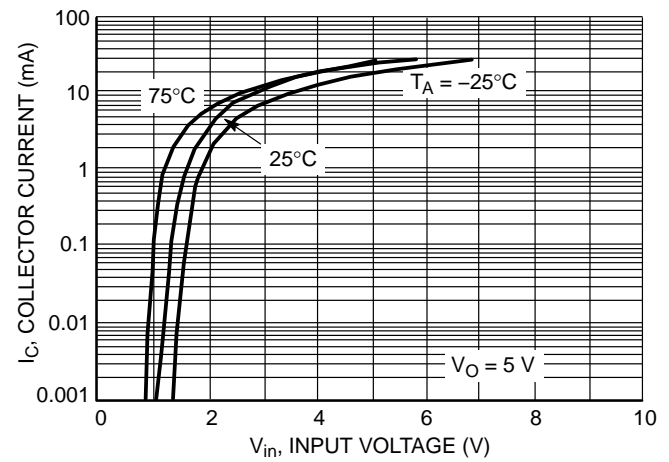


Figure 5. Output Current vs. Input Voltage

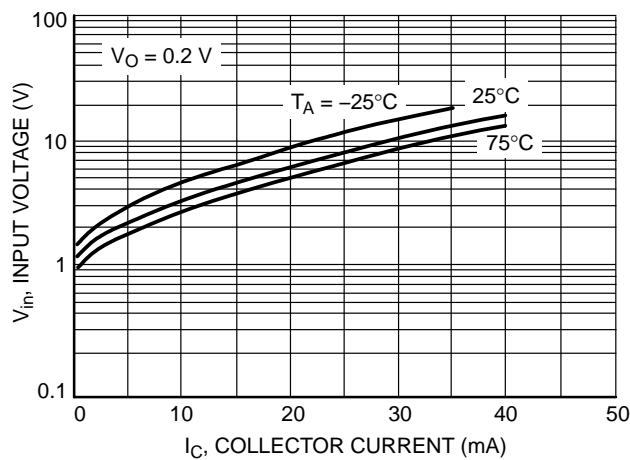


Figure 6. Input Voltage vs. Output Current

TYPICAL CHARACTERISTICS
NSBC144EDP6

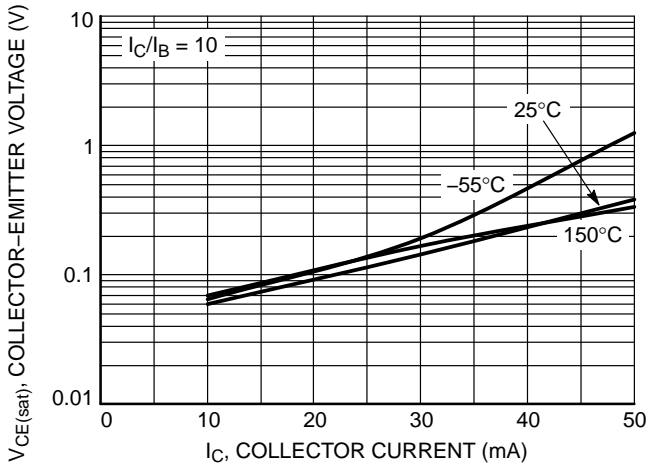


Figure 7. $V_{CE(sat)}$ vs. I_C

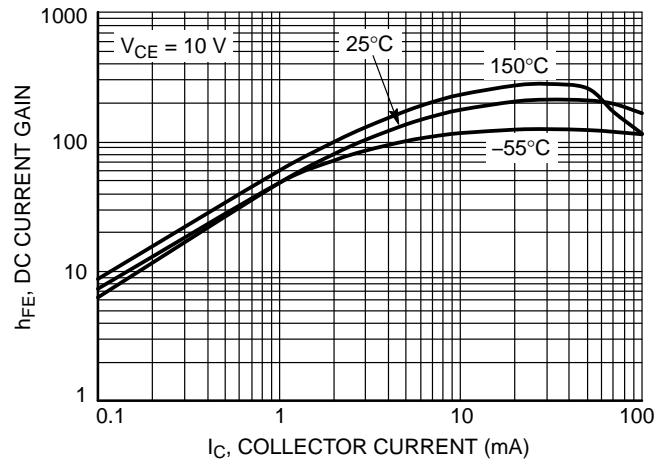


Figure 8. DC Current Gain

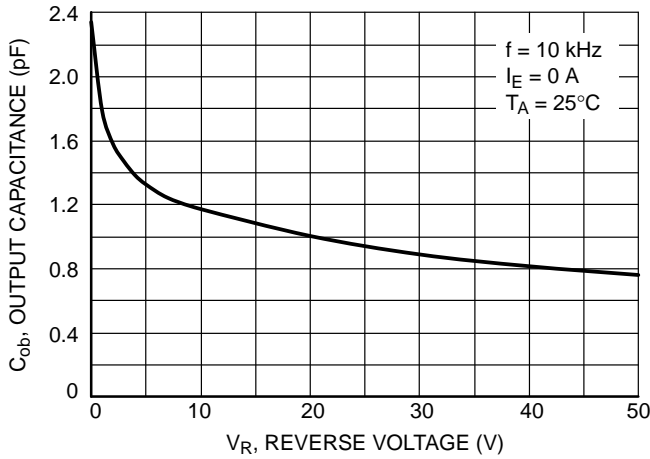


Figure 9. Output Capacitance

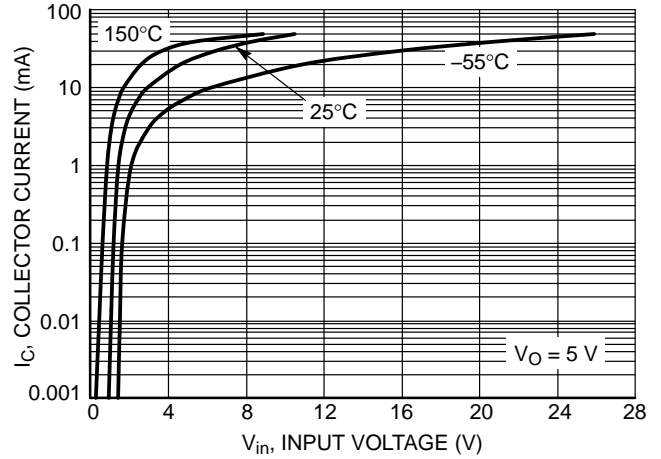


Figure 10. Output Current vs. Input Voltage

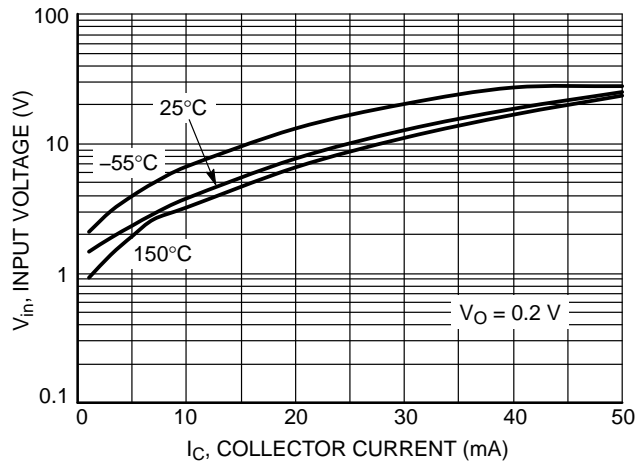
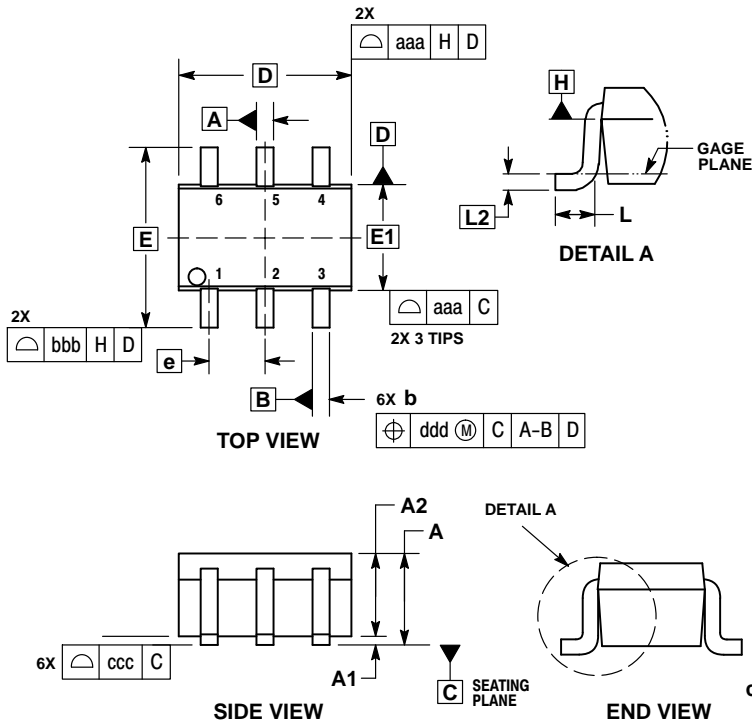


Figure 11. Input Voltage vs. Output Current

MUN5213DW1, NSBC144EDXV6, NSBC144EDP6

PACKAGE DIMENSIONS

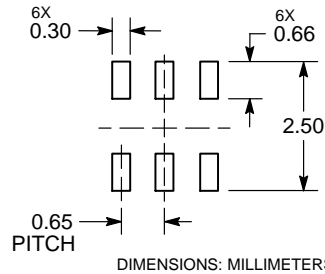
SC-88/SC70-6/SOT-363
CASE 419B-02
ISSUE Y



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
 2. CONTROLLING DIMENSION: MILLIMETERS.
 3. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.20 PER END.
 4. DIMENSIONS D AND E1 AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY AND DATUM H.
 5. DATUMS A AND B ARE DETERMINED AT DATUM H.
 6. DIMENSIONS b AND c APPLY TO THE FLAT SECTION OF THE LEAD BETWEEN 0.08 AND 0.15 FROM THE TIP.
 7. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 TOTAL IN EXCESS OF DIMENSION b AT MAXIMUM MATERIAL CONDITION. THE DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OF THE FOOT.

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	---	---	1.10	---	---	0.043
A1	0.00	---	0.10	0.000	---	0.004
A2	0.70	0.90	1.00	0.027	0.035	0.039
b	0.15	0.20	0.25	0.006	0.008	0.010
C	0.08	0.15	0.22	0.003	0.006	0.009
D	1.80	2.00	2.20	0.070	0.078	0.086
E	2.00	2.10	2.20	0.078	0.082	0.086
E1	1.15	1.25	1.35	0.045	0.049	0.053
e	0.65 BSC			0.026 BSC		
L	0.26	0.36	0.46	0.010	0.014	0.018
L2	0.15 BSC			0.006 BSC		
aaa	0.15			0.006		
bbb	0.30			0.012		
ccc	0.10			0.004		
ddd	0.10			0.004		

RECOMMENDED SOLDERING FOOTPRINT*

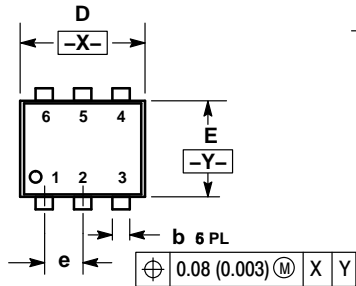


*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

MUN5213DW1, NSBC144EDXV6, NSBC144EDP6

PACKAGE DIMENSIONS

SOT-563, 6 LEAD
CASE 463A
ISSUE F

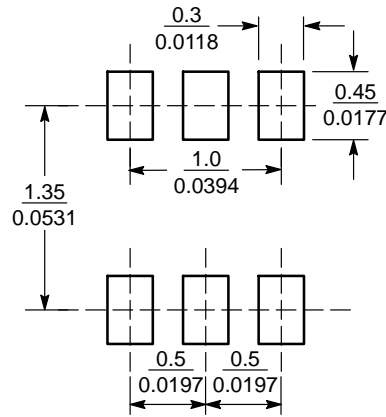


NOTES:

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*



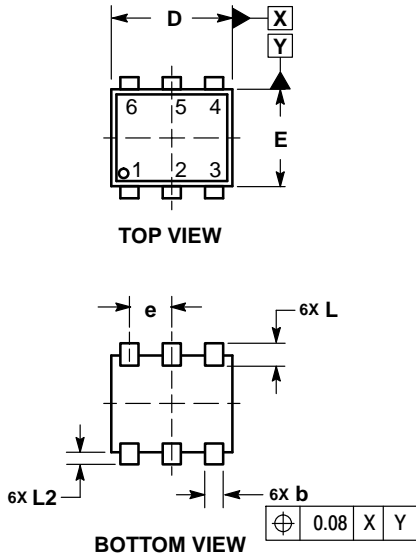
SCALE 20:1 ($\frac{\text{mm}}{\text{inches}}$)

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

MUN5213DW1, NSBC144EDXV6, NSBC144EDP6

PACKAGE DIMENSIONS

SOT-963 CASE 527AD ISSUE E

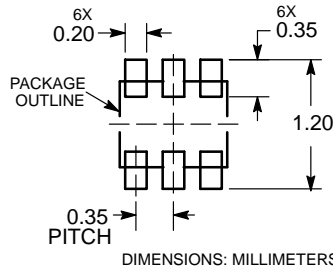


NOTES:

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.

DIM	MILLIMETERS		
	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_E	0.95	1.00	1.05
L	0.19 REF		
L2	0.05	0.10	0.15

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.

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