## Complementary Bias Resistor Transistors R1 = 22 k $\Omega$ , R2 = 47 k $\Omega$

# NPN and 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**

- 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<sub>A</sub> = 25°C both polarities Q<sub>1</sub> (PNP) & Q<sub>2</sub> (NPN), 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	Ic	100	mAdc
Input Forward Voltage	V <sub>IN(fwd)</sub>	40	Vdc
Input Reverse Voltage	V <sub>IN(rev)</sub>	7	Vdc

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.

### **ORDERING INFORMATION**

Device	Package	Shipping <sup>†</sup>
MUN5334DW1T1G, NSVMUN5334DW1T1G*	SOT-363	3,000/Tape & Reel
NSBC124XPDXV6T1G, NSVBC124XPDXV6T1G*	SOT-563	4,000/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.

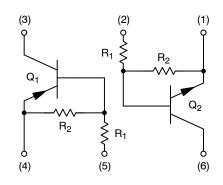
1



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### **PIN CONNECTIONS**



### **MARKING DIAGRAMS**



SOT-363 CASE 419B





SOT-563 CASE 463A



34 = Specific Device Code

M = Date Code\*

• Pb-Free Package

(Note: Microdot may be in either location)

<sup>\*</sup>Date Code orientation may vary depending upon manufacturing location.

## THERMAL CHARACTERISTICS

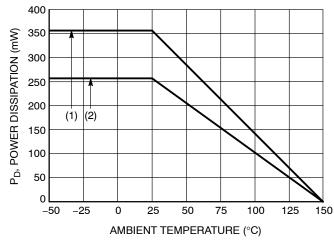
	Characteristic	Symbol	Max	Unit
MUN5334DW1 (SOT-363) ONE J	JUNCTION HEATED	•		
Total Device Dissipation  T <sub>A</sub> = 25°C (Note 1)  (Note 2)  Derate above 25°C (Note 2)	lote 1)	P <sub>D</sub>	187 256 1.5 2.0	mW mW/°C
	ote 1) lote 2)	$R_{ hetaJA}$	670 490	°C/W
MUN5334DW1 (SOT-363) BOTH	JUNCTION HEATED (Note 3)			
Total Device Dissipation $T_A = 25^{\circ}C \qquad \text{(Note 1)}$ $\text{(Note 2)}$ Derate above 25°C  (Note 2)	lote 1)	P <sub>D</sub>	250 385 2.0 3.0	mW mW/°C
Thermal Resistance, Junction to Ambient (Note 2)	lote 1)	$R_{ heta JA}$	493 325	°C/W
Thermal Resistance, Junction to Lead (Note 1) (Note 2)		$R_{ heta JL}$	188 208	°C/W
Junction and Storage Temperatur	re Range	T <sub>J</sub> , T <sub>stg</sub>	-55 to +150	°C
NSBC124XPDXV6 (SOT-563) OF	NE JUNCTION HEATED			
Total Device Dissipation  T <sub>A</sub> = 25°C (Note 1)  Derate above 25°C (N	lote 1)	P <sub>D</sub>	357 2.9	mW mW/°C
Thermal Resistance, Junction to Ambient (N	lote 1)	$R_{\theta JA}$	350	°C/W
NSBC124XPDXV6 (SOT-563) BC	OTH JUNCTION HEATED (Note 3)			
Total Device Dissipation T <sub>A</sub> = 25°C (Note 1) Derate above 25°C (N	lote 1)	P <sub>D</sub>	500 4.0	mW mW/°C
Thermal Resistance, Junction to Ambient (N	lote 1)	$R_{ heta JA}$	250	°C/W
Junction and Storage Temperatur	re Range	T <sub>J</sub> , T <sub>stg</sub>	-55 to +150	°C

FR-4 @ Minimum Pad.
 FR-4 @ 1.0 × 1.0 Inch Pad.
 Both junction heated values assume total power is sum of two equally powered channels.

**ELECTRICAL CHARACTERISTICS** (T<sub>A</sub> = 25°C both polarities Q<sub>1</sub> (PNP) & Q<sub>2</sub> (NPN), unless otherwise noted)

Characteristic	Symbol	Min	Тур	Max	Unit
OFF CHARACTERISTICS	<u> </u>				
Collector-Base Cutoff Current $(V_{CB} = 50 \text{ V}, I_E = 0)$	I <sub>CBO</sub>	-	-	100	nAdc
Collector-Emitter Cutoff Current (V <sub>CE</sub> = 50 V, I <sub>B</sub> = 0)	I <sub>CEO</sub>	-	-	500	nAdc
Emitter-Base Cutoff Current (V <sub>EB</sub> = 6.0 V, I <sub>C</sub> = 0)	I <sub>EBO</sub>	-	-	0.13	mAdc
Collector-Base Breakdown Voltage (I <sub>C</sub> = 10 μA, I <sub>E</sub> = 0)	V <sub>(BR)CBO</sub>	50	-	-	Vdc
Collector-Emitter Breakdown Voltage (Note 4) (I <sub>C</sub> = 2.0 mA, I <sub>B</sub> = 0)	V <sub>(BR)CEO</sub>	50	-	-	Vdc
ON CHARACTERISTICS	<u> </u>				
DC Current Gain (Note 4) (I <sub>C</sub> = 5.0 mA, V <sub>CE</sub> = 10 V)	h <sub>FE</sub>	80	150	-	
Collector-Emitter Saturation Voltage (Note 4) (I <sub>C</sub> = 10 mA, I <sub>B</sub> = 1.0 mA)	V <sub>CE(sat)</sub>	-	-	0.25	V
Input Voltage (Off) ( $V_{CE} = 5.0 \text{ V}, I_{C} = 100 \mu\text{A}$ ) (NPN) ( $V_{CE} = 5.0 \text{ V}, I_{C} = 100 \mu\text{A}$ ) (PNP)	V <sub>i(off)</sub>	- -	0.8 0.9	- -	Vdc
Input Voltage (On) $(V_{CE} = 0.2 \text{ V, } I_{C} = 3.0 \text{ mA}) \text{ (NPN)} $ $(V_{CE} = 0.2 \text{ V, } I_{C} = 3.0 \text{ mA}) \text{ (PNP)}$	V <sub>i(on)</sub>	- -	1.3 1.3	- -	Vdc
Output Voltage (On) $(V_{CC} = 5.0 \text{ V}, V_B = 2.5 \text{ V}, R_L = 1.0 \text{ k}\Omega)$	V <sub>OL</sub>	-	-	0.2	Vdc
Output Voltage (Off) (V <sub>CC</sub> = 5.0 V, V <sub>B</sub> = 0.5 V, R <sub>L</sub> = 1.0 k $\Omega$ )	V <sub>OH</sub>	4.9	-	-	Vdc
Input Resistor	R1	15.4	22	28.6	kΩ
Resistor Ratio	R <sub>1</sub> /R <sub>2</sub>	0.38	0.47	0.56	

<sup>4.</sup> Pulsed Condition: Pulse Width = 300 ms, Duty Cycle ≤ 2%.



(1) SOT–363;  $1.0 \times 1.0$  Inch Pad (2) SOT–563; Minimum Pad

Figure 1. Derating Curve

# TYPICAL CHARACTERISTICS – NPN TRANSISTOR MUN5334DW1, NSBC124XPDXV6

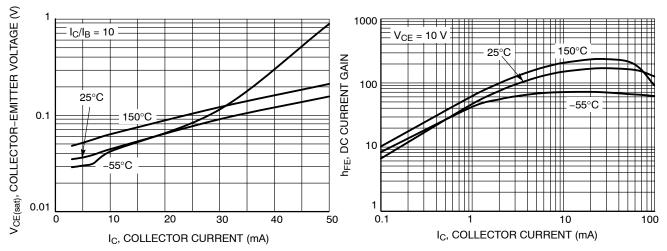


Figure 2. V<sub>CE(sat)</sub> vs. I<sub>C</sub>

Figure 3. DC Current Gain

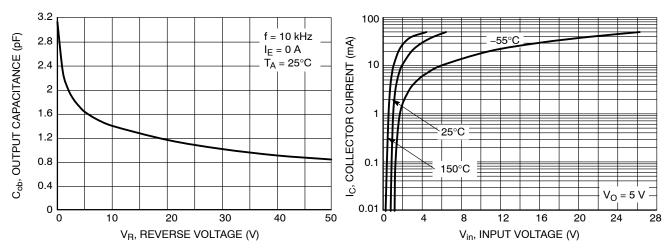


Figure 4. Output Capacitance

Figure 5. Output Current vs. Input Voltage

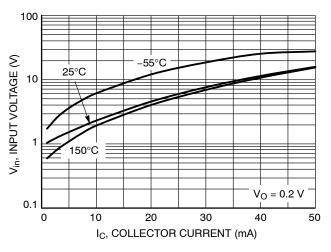


Figure 6. Input Voltage vs. Output Current

# TYPICAL CHARACTERISTICS – PNP TRANSISTOR MUN5334DW1, NSBC124XPDXV6

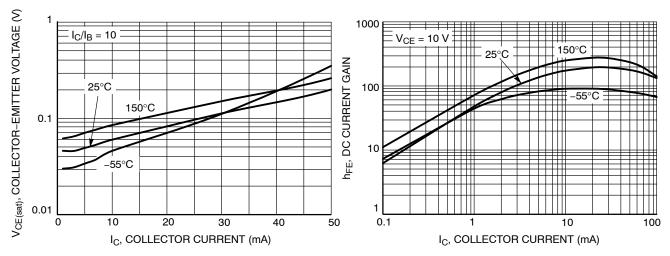


Figure 7. V<sub>CE(sat)</sub> vs. I<sub>C</sub>

Figure 8. DC Current Gain

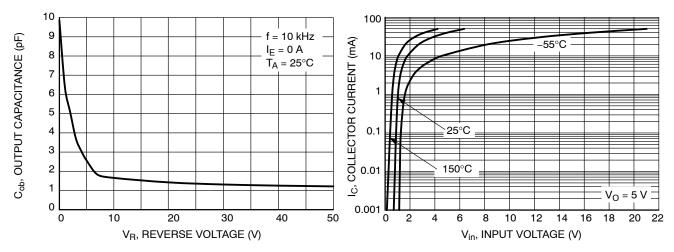


Figure 9. Output Capacitance

Figure 10. Output Current vs. Input Voltage

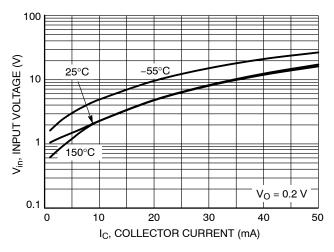
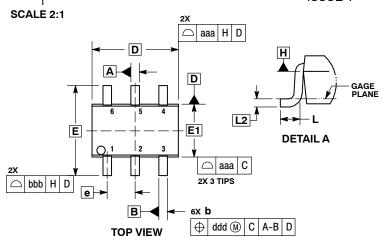


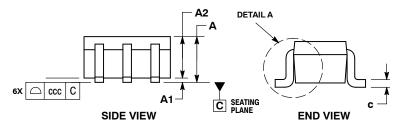
Figure 11. Input Voltage vs. Output Current



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

**DATE 11 DEC 2012** 





#### NOTES:

- 1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M. 1994.
- CONTROLLING DIMENSION: MILLIMETERS.
  DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH,
- 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. DIMENSIONS D AND E1 AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY AND DATUM H. DIMENSIONS b AND B ARE DETERMINED AT DATUM H. DIMENSIONS b AND C APPLY TO THE FLAT SECTION OF THE LEAD BETWEEN 0.08 AND 0.15 FROM THE TIP.

- DIMENSION 6 DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 TOTAL IN
- EXCESS OF DIMENSION 6 AT MAXIMUM MATERIAL CONDITION. THE DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OF THE FOOT.

	MIL	LIMETE	ERS		INCHES	3
DIM	MIN	NOM	MAX	MIN	NOM	MAX
Α			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
С	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
е	0.65 BSC			0.026 BSC		С
L	0.26	0.36	0.46	0.010	0.014	0.018
L2	0.15 BSC			-	0.006 BS	SC
aaa	0.15				0.006	
bbb	0.30				0.012	
ccc		0.10			0.004	
ddd		0.10			0.004	

### **GENERIC MARKING DIAGRAM\***



XXX = Specific Device Code

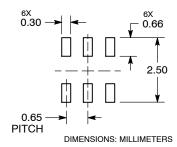
= Date Code\*

= Pb-Free Package

(Note: Microdot may be in either location)

- \*Date Code orientation and/or position may vary depending upon manufacturing 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.

### **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.

### **STYLES ON PAGE 2**

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

**DATE 11 DEC 2012** 

STYLE 1: PIN 1. EMITTER 2 2. BASE 2 3. COLLECTOR 1 4. EMITTER 1 5. BASE 1 6. COLLECTOR 2	STYLE 2: CANCELLED	STYLE 3: CANCELLED	STYLE 4: PIN 1. CATHODE 2. CATHODE 3. COLLECTOR 4. EMITTER 5. BASE 6. ANODE	STYLE 5: PIN 1. ANODE 2. ANODE 3. COLLECTOR 4. EMITTER 5. BASE 6. CATHODE	STYLE 6: PIN 1. ANODE 2 2. N/C 3. CATHODE 1 4. ANODE 1 5. N/C 6. CATHODE 2
STYLE 7: PIN 1. SOURCE 2 2. DRAIN 2 3. GATE 1 4. SOURCE 1 5. DRAIN 1 6. GATE 2	STYLE 8: CANCELLED	STYLE 9: PIN 1. EMITTER 2 2. EMITTER 1 3. COLLECTOR 1 4. BASE 1 5. BASE 2 6. COLLECTOR 2	STYLE 10: PIN 1. SOURCE 2 2. SOURCE 1 3. GATE 1 4. DRAIN 1 5. DRAIN 2 6. GATE 2	STYLE 11: PIN 1. CATHODE 2 2. CATHODE 2 3. ANODE 1 4. CATHODE 1 5. CATHODE 1 6. ANODE 2	STYLE 12: PIN 1. ANODE 2 2. ANODE 2 3. CATHODE 1 4. ANODE 1 5. ANODE 1 6. CATHODE 2
STYLE 13: PIN 1. ANODE 2. N/C 3. COLLECTOR 4. EMITTER 5. BASE 6. CATHODE	STYLE 14: PIN 1. VREF 2. GND 3. GND 4. IOUT 5. VEN 6. VCC	STYLE 15: PIN 1. ANODE 1 2. ANODE 2 3. ANODE 3 4. CATHODE 3 5. CATHODE 2 6. CATHODE 1	STYLE 16: PIN 1. BASE 1 2. EMITTER 2 3. COLLECTOR 2 4. BASE 2 5. EMITTER 1 6. COLLECTOR 1	STYLE 17: PIN 1. BASE 1 2. EMITTER 1 3. COLLECTOR 2 4. BASE 2 5. EMITTER 2 6. COLLECTOR 1	STYLE 18: PIN 1. VIN1 2. VCC 3. VOUT2 4. VIN2 5. GND 6. VOUT1
STYLE 19: PIN 1. I OUT 2. GND 3. GND 4. V CC 5. V EN 6. V REF	STYLE 20: PIN 1. COLLECTOR 2. COLLECTOR 3. BASE 4. EMITTER 5. COLLECTOR 6. COLLECTOR	STYLE 21: PIN 1. ANODE 1 2. N/C 3. ANODE 2 4. CATHODE 2 5. N/C 6. CATHODE 1	STYLE 22: PIN 1. D1 (i) 2. GND 3. D2 (i) 4. D2 (c) 5. VBUS 6. D1 (c)	STYLE 23: PIN 1. Vn 2. CH1 3. Vp 4. N/C 5. CH2 6. N/C	STYLE 24: PIN 1. CATHODE 2. ANODE 3. CATHODE 4. CATHODE 5. CATHODE 6. CATHODE
STYLE 25: PIN 1. BASE 1 2. CATHODE 3. COLLECTOR 2 4. BASE 2 5. EMITTER 6. COLLECTOR 1	STYLE 26: PIN 1. SOURCE 1 2. GATE 1 3. DRAIN 2 4. SOURCE 2 5. GATE 2 6. DRAIN 1	STYLE 27: PIN 1. BASE 2 2. BASE 1 3. COLLECTOR 1 4. EMITTER 1 5. EMITTER 2 6. COLLECTOR 2	STYLE 28: PIN 1. DRAIN 2. DRAIN 3. GATE 4. SOURCE 5. DRAIN 6. DRAIN	STYLE 29: PIN 1. ANODE 2. ANODE 3. COLLECTOR 4. EMITTER 5. BASE/ANODE 6. CATHODE	STYLE 30: PIN 1. SOURCE 1 2. DRAIN 2 3. DRAIN 2 4. SOURCE 2 5. GATE 1 6. DRAIN 1

Note: Please refer to datasheet for style callout. If style type is not called out in the datasheet refer to the device datasheet pinout or pin assignment.

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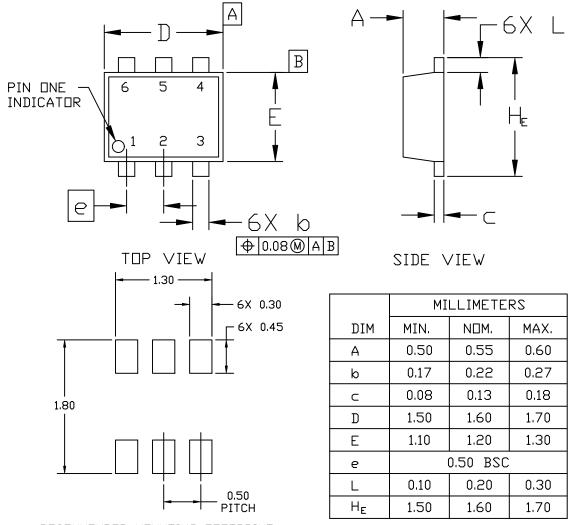


SOT-563, 6 LEAD CASE 463A ISSUE H

**DATE 26 JAN 2021** 

### NOTES:

- DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
- 2. CONTROLLING DIMENSION: MILLIMETERS
- 3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.



### RECOMMENDED MOUNTING FOOTPRINT\*

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

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## **MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS**



### SOT-563, 6 LEAD CASE 463A

**ISSUE H** 

**DATE 26 JAN 2021** 

STYLE 1: PIN 1. EMITTER 1 2. BASE 1 3. COLLECTOR 2 4. EMITTER 2 5. BASE 2 6. COLLECTOR 1	STYLE 2: PIN 1. EMITTER 1 2. EMITTER 2 3. BASE 2 4. COLLECTOR 2 5. BASE 1 6. COLLECTOR 1	STYLE 3: PIN 1. CATHODE 1 2. CATHODE 1 3. ANODE/ANODE 2 4. CATHODE 2 5. CATHODE 2 6. ANODE/ANODE 1
	STYLE 5: PIN 1. CATHODE 2. CATHODE 3. ANODE 4. ANODE 5. CATHODE 6. CATHODE	
	STYLE 8: PIN 1. DRAIN 2. DRAIN 3. GATE 4. SDURCE 5. DRAIN 6. DRAIN	
STYLE 10: PIN 1. CATHODE 1 2. N/C 3. CATHODE 2 4. ANODE 2 5. N/C 6. ANODE 1	STYLE 11: PIN 1. EMITTER 2 2. BASE 2 3. COLLECTOR 1 4. EMITTER 1 5. BASE 1 6. COLLECTOR 2	

## **GENERIC MARKING DIAGRAM\***



XX = Specific Device Code

M = Month Code

= Pb-Free Package

\*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.

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