NSB1011XV6T5

Dual Bias Resistor Transistors

NPN Silicon Surface Mount Transistors with Monolithic Bias Resistor Network

The BRT (Bias Resistor Transistor) contains a single transistor with a monolithic bias network consisting of two resistors; a series base resistor and a base−emitter resistor. These digital transistors are designed to replace a single device and its external resistor bias network. The BRT eliminates these individual components by integrating them into a single device. In the NSB1011XV6T5, two BRT devices are housed in the SOT−563 package which is ideal for low power surface mount applications where board space is at a premium.

- Simplifies Circuit Design
- Reduces Board Space
- Reduces Component Count
- This device is manufactured with a Pb−Free external lead finish only.

MAXIMUM RATINGS
(T_A = 25°C unless otherwise noted, common for Q_1 and Q_2)

Rating	Symbol	Value	Unit
Collector-Base Voltage	V_{CBO}	50	Vdc
Collector-Emitter Voltage	V_{CEO}	50	Vdc
Collector Current	I_C	100	mAdc

THERMAL CHARACTERISTICS

Characteristic (One Junction Heated)	Symbol	Max	Unit
Total Device Dissipation T_A = 25°C Derate above 25°C	P_D	357 (Note 1) 2.9 (Note 1)	mW mW/°C
Thermal Resistance – Junction-to-Ambient	$R_{\theta JA}$	350 (Note 1)	°C/W

| Characteristic (Both Junctions Heated)	Symbol	Max	Unit
Total Device Dissipation T_A = 25°C Derate above 25°C	P_D	500 (Note 1) 4.0 (Note 1)	mW mW/°C
Thermal Resistance – Junction-to-Ambient	$R_{\theta JA}$	250 (Note 1)	°C/W
Junction and Storage Temperature Range	T_J, T_{stg}	−55 to +150	°C

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.
1. FR−4 @ Minimum Pad.

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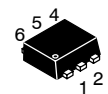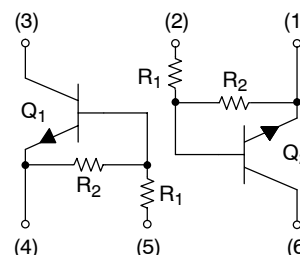
**SOT−563
CASE 463A
PLASTIC**

MARKING DIAGRAM

UT = Specific Device Code
(see table on following page)
D = Date Code

ORDERING INFORMATION

Device	Package	Shipping[†]
NSB1011XV6T5	SOT−563 (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.

Preferred devices are recommended choices for future use and best overall value.

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

Characteristic	Symbol	Min	Typ	Max	Unit
Q1 **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}	–	–	0.5	mAdc
Collector-Base Breakdown Voltage (I_C = 10 μA, I_E = 0)	$V_{(BR)CBO}$	50	–	–	Vdc
Collector-Emitter Breakdown Voltage (Note 2) (I_C = 2.0 mA, I_B = 0)	$V_{(BR)CEO}$	50	–	–	Vdc
ON CHARACTERISTICS (Note 2)					
DC Current Gain (V_{CE} = 10 V, I_C = 5.0 mA)	h_{FE}	35	60	–	–
Collector-Emitter Saturation Voltage (I_C = 10 mA, I_B = 0.3 mA)	$V_{CE(sat)}$	–	–	0.25	Vdc
Output Voltage (on) (V_{CC} = 5.0 V, V_B = 2.5 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	R1	7.0	10	13	kΩ
Resistor Ratio	R1/R2	0.8	1.0	1.2	–
Q2 **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}	–	–	0.2	mAdc
Collector-Base Breakdown Voltage (I_C = 10 μA, I_E = 0)	$V_{(BR)CBO}$	50	–	–	Vdc
Collector-Emitter Breakdown Voltage (Note 2) (I_C = 2.0 mA, I_B = 0)	$V_{(BR)CEO}$	50	–	–	Vdc
ON CHARACTERISTICS (Note 2)					
DC Current Gain (V_{CE} = 10 V, I_C = 5.0 mA)	h_{FE}	80	140	–	–
Collector-Emitter Saturation Voltage (I_C = 10 mA, I_B = 0.3 mA)	$V_{CE(sat)}$	–	–	0.25	Vdc
Output Voltage (on) (V_{CC} = 5.0 V, V_B = 2.5 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	R1	1.54	2.2	2.86	kΩ
Resistor Ratio	R1/R2	0.038	0.047	0.056	–

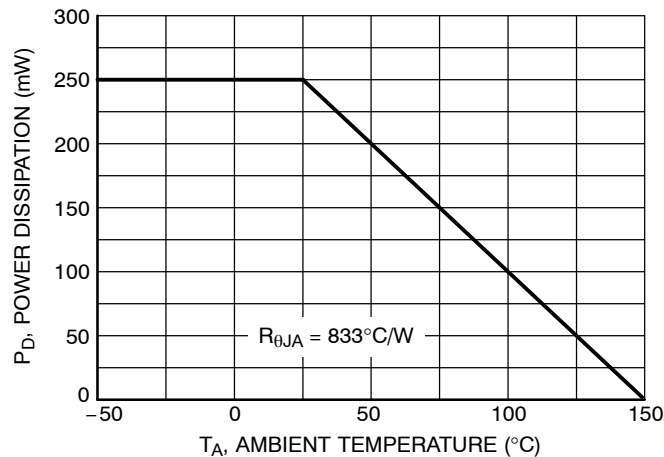2. Pulse Test: Pulse Width < 300 μs, Duty Cycle < 2.0%.

Figure 1. Derating Curve
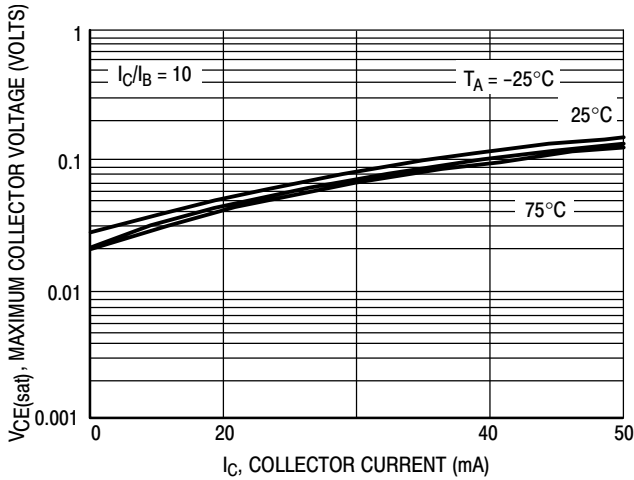
TYPICAL ELECTRICAL CHARACTERISTICS — Q1

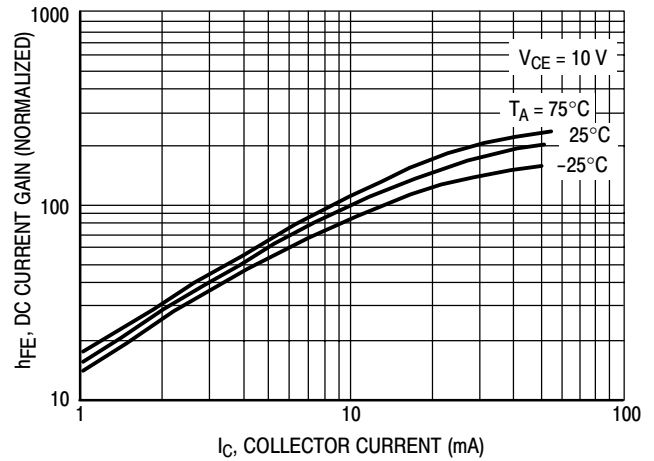**Figure 2. $V_{CE(sat)}$ versus I_C**

Figure 3. DC Current Gain
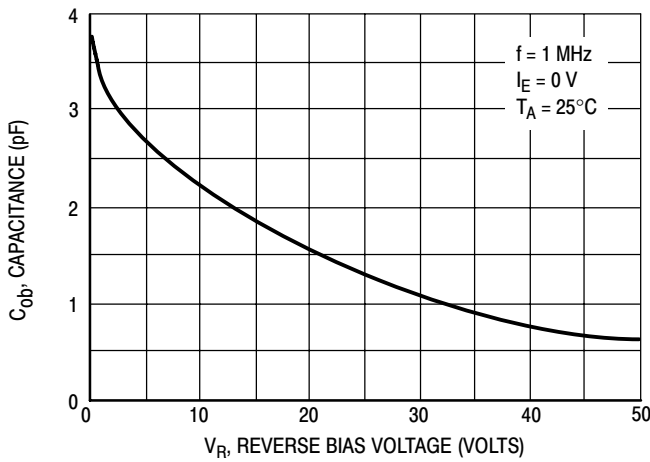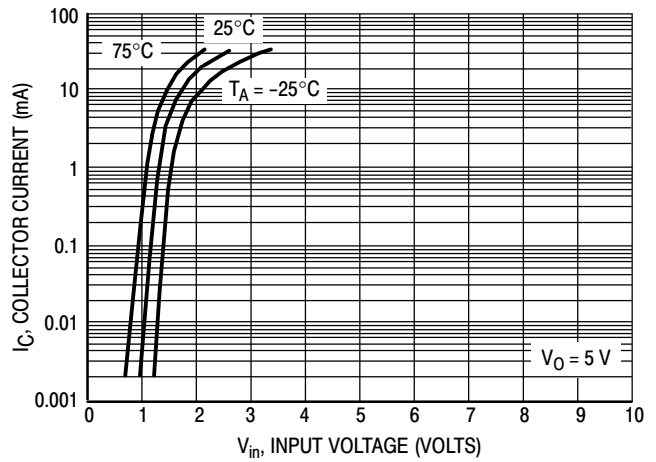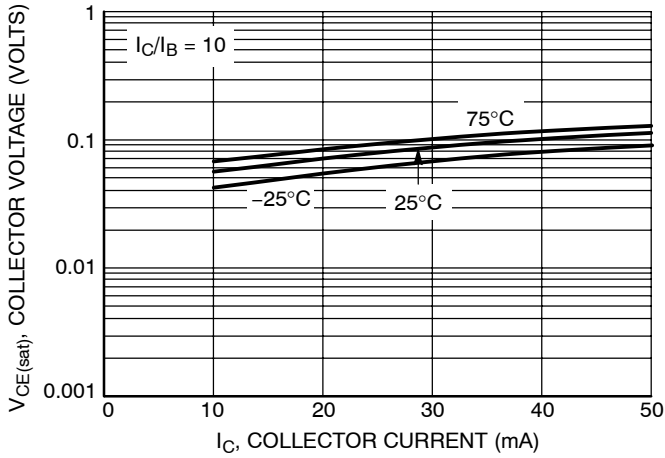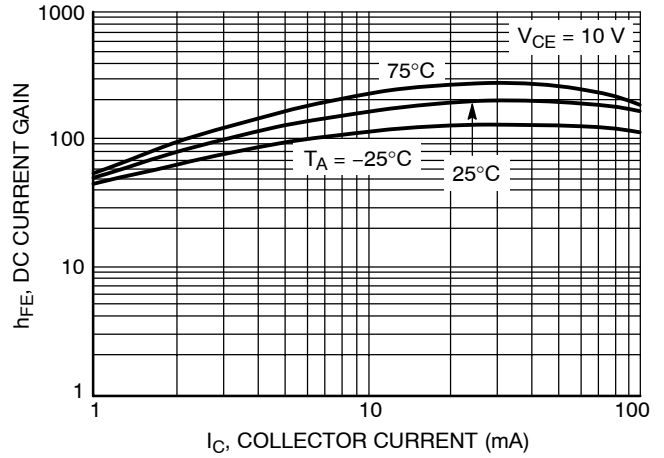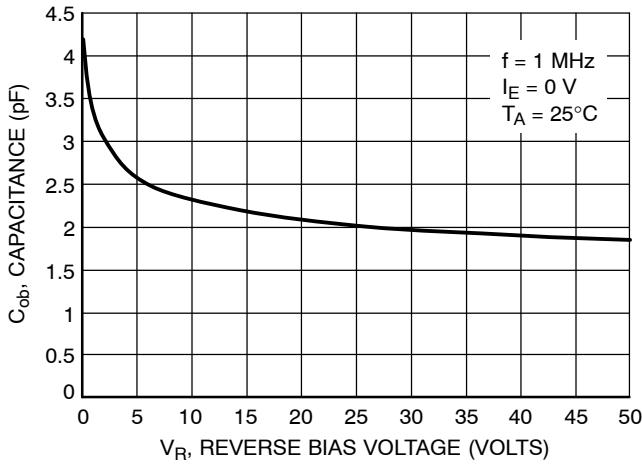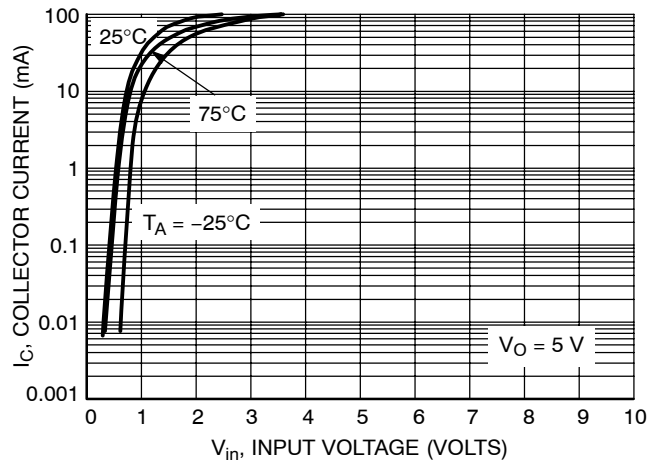
Figure 4. Output Capacitance
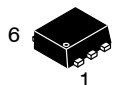
Figure 5. Output Current versus Input Voltage
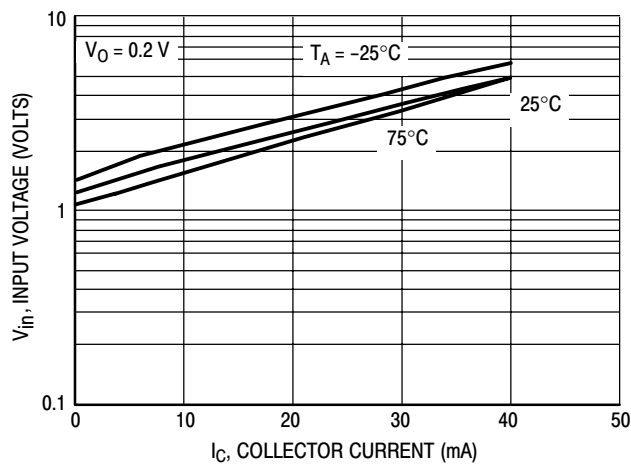
Figure 6. Input Voltage versus Output Current

NSB1011XV6T5

TYPICAL ELECTRICAL CHARACTERISTICS — Q2

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

Figure 8. DC Current Gain

Figure 9. Output Capacitance

Figure 10. Output Current versus Input Voltage
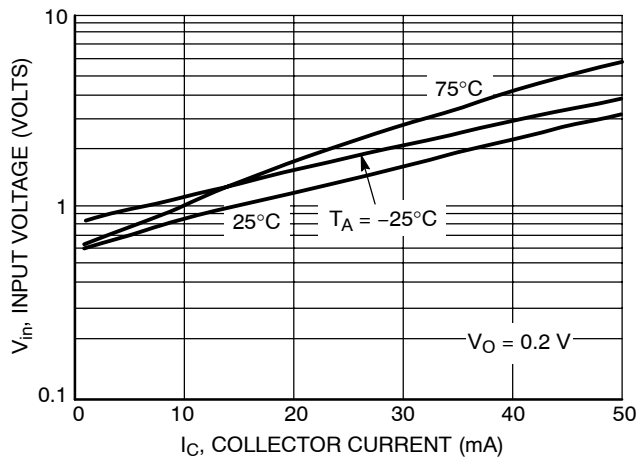
Figure 11. Input Voltage versus Output Current

SOT−563, 6 LEAD
CASE 463A
ISSUE H

DATE 26 JAN 2021

6

1

SCALE 4:1

NOTES:
1. 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.

TOP VIEW

SIDE VIEW

PIN ONE INDICATOR

6X L

H_E

6X b

⊕ 0.08 Ⓜ A B

1.30

6X 0.30

6X 0.45

1.80

0.50 PITCH

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.
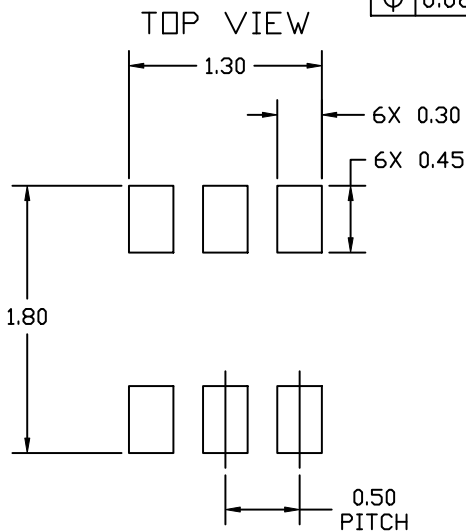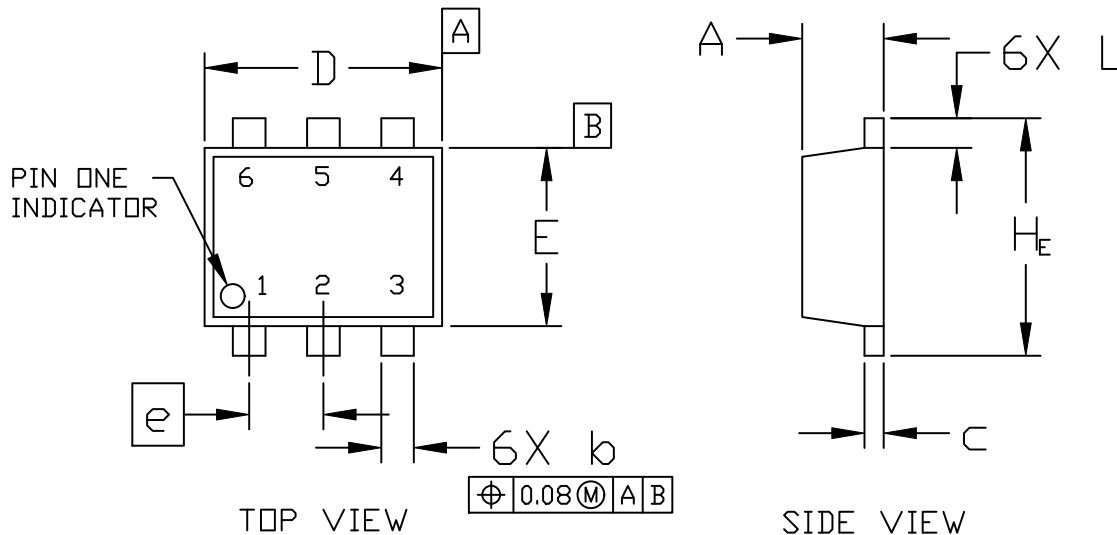
DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.50	0.55	0.60
b	0.17	0.22	0.27
c	0.08	0.13	0.18
D	1.50	1.60	1.70
E	1.10	1.20	1.30
e	0.50 BSC		
L	0.10	0.20	0.30
H_E	1.50	1.60	1.70

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DESCRIPTION:	SOT−563, 6 LEAD		PAGE 1 OF 2

SOT−563, 6 LEAD
CASE 463A
ISSUE H

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 4:
PIN 1. COLLECTOR
    2. COLLECTOR
    3. BASE
    4. EMITTER
    5. COLLECTOR
    6. COLLECTOR

STYLE 5:
PIN 1. CATHODE
    2. CATHODE
    3. ANODE
    4. ANODE
    5. CATHODE
    6. CATHODE

STYLE 6:
PIN 1. CATHODE
    2. ANODE
    3. CATHODE
    4. CATHODE
    5. CATHODE
    6. CATHODE

STYLE 7:
PIN 1. CATHODE
    2. ANODE
    3. CATHODE
    4. CATHODE
    5. ANODE
    6. CATHODE

STYLE 8:
PIN 1. DRAIN
    2. DRAIN
    3. GATE
    4. SOURCE
    5. DRAIN
    6. DRAIN

STYLE 9:
PIN 1. SOURCE 1
    2. GATE 1
    3. DRAIN 2
    4. SOURCE 2
    5. GATE 2
    6. DRAIN 1

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***
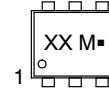
XX = Specific Device Code
M = Month Code
▪ = Pb−Free Package

*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.

DOCUMENT NUMBER:	98AON11126D	
DESCRIPTION:	**SOT−563, 6 LEAD**	**PAGE 2 OF 2**

PUBLICATION ORDERING INFORMATION

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