MUN5230DW1, NSBC113EDXV6

Dual NPN Bias Resistor Transistors R1 = 1 k Ω , R2 = 1 k Ω

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)}	10	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 [†]
MUN5230DW1T1G, SMUN5230DW1T1G	SOT-363	3,000/Tape & Reel
NSBC113EDXV6T1G	SOT-563	4,000/Tape & Reel

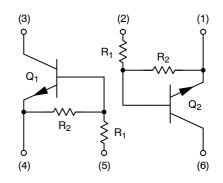
[†]For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.



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PIN CONNECTIONS



MARKING DIAGRAMS



SOT-363 CASE 419B





SOT-563 CASE 463A



7G = 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.

MUN5230DW1, NSBC113EDXV6

THERMAL CHARACTERISTICS

Characteristic		Symbol	Max	Unit
MUN5230DW1 (SOT-363) ONE JUNCTION HEATED				
Total Device Dissipation $T_A = 25^{\circ}C$ Derate above 25°C	(Note 1) (Note 2) (Note 1) (Note 2)	P _D	187 256 1.5 2.0	mW mW/°C
Thermal Resistance, Junction to Ambient	(Note 1) (Note 2)	$R_{ hetaJA}$	670 490	°C/W
MUN5230DW1 (SOT-363) BOTH JUNCTION HEATED (Note 3)				
Total Device Dissipation $T_A = 25^{\circ}C$ Derate above 25°C	(Note 1) (Note 2) (Note 1) (Note 2)	P _D	250 385 2.0 3.0	mW mW/°C
Thermal Resistance, Junction to Ambient	(Note 1) (Note 2)	$R_{ hetaJA}$	493 325	°C/W
Thermal Resistance, Junction to Lead	(Note 1) (Note 2)	$R_{ hetaJL}$	188 208	°C/W
Junction and Storage Temperature Range		T _J , T _{stg}	-55 to +150	°C
NSBC113EDXV6 (SOT-563) ONE JUNCTION HEATED				
Total Device Dissipation T _A = 25°C Derate above 25°C	(Note 1) (Note 1)	P_{D}	357 2.9	mW mW/°C
Thermal Resistance, Junction to Ambient	(Note 1)	$R_{ hetaJA}$	350	°C/W
NSBC113EDXV6 (SOT-563) BOTH JUNCTION HEATED (Note 3)			
Total Device Dissipation T _A = 25°C Derate above 25°C	(Note 1) (Note 1)	P_{D}	500 4.0	mW mW/°C
Thermal Resistance, Junction to Ambient	(Note 1)	$R_{ hetaJA}$	250	°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.

MUN5230DW1, NSBC113EDXV6

ELECTRICAL CHARACTERISTICS ($T_A = 25$ °C, common for Q_1 and Q_2 , unless otherwise noted)

Characteristic	Symbol	Min	Тур	Max	Unit
OFF CHARACTERISTICS	<u> </u>				
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}	-	-	4.3	mAdc
Collector-Base Breakdown Voltage $(I_C = 10 \mu A, I_E = 0)$	V _{(BR)CBO}	50	-	-	Vdc
Collector-Emitter Breakdown Voltage (Note 4) (I _C = 2.0 mA, I _B = 0)	V _{(BR)CEO}	50	-	-	Vdc
ON CHARACTERISTICS					
DC Current Gain (Note 4) (I _C = 5.0 mA, V _{CE} = 10 V)	h _{FE}	3.0	5.0	-	
Collector-Emitter Saturation Voltage (Note 4) (I _C = 10 mA, I _B = 5.0 mA)	V _{CE(sat)}	-	-	0.25	V
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 V, I _C = 20 mA)	V _{i(on)}	-	1.7	-	Vdc
Output Voltage (On) $(V_{CC} = 5.0 \text{ V}, V_B = 2.5 \text{ V}, R_L = 1.0 \text{ k}\Omega)$	V _{OL}	-	-	0.2	Vdc
Output Voltage (Off) (V _{CC} = 5.0 V, V _B = 0.05 V, R _L = 1.0 k Ω)	V _{OH}	4.9	-	-	Vdc
Input Resistor	R1	0.7	1.0	1.3	kΩ
Resistor Ratio	R ₁ /R ₂	0.8	1.0	1.2	

^{4.} Pulsed Condition: Pulse Width = 300 ms, Duty Cycle ≤ 2%.

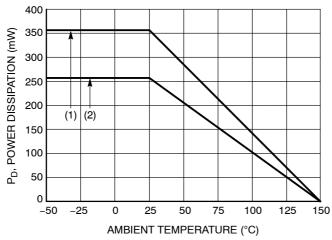


Figure 1. Derating Curve

(1) SOT–363; 1.0×1.0 Inch Pad (2) SOT–563; Minimum Pad

http://onsemi.com

MUN5230DW1, NSBC113EDXV6

TYPICAL CHARACTERISTICS MUN5230DW1, NSBC113EDXV6

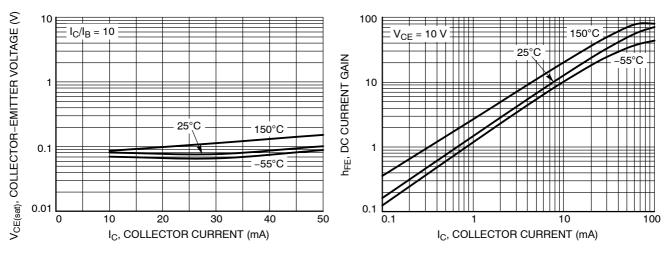


Figure 2. V_{CE(sat)} vs. I_C

Figure 3. DC Current Gain

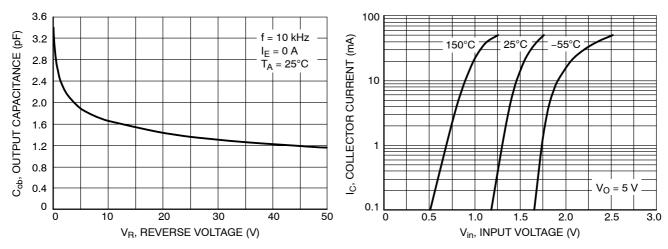


Figure 4. Output Capacitance

Figure 5. Output Current vs. Input Voltage

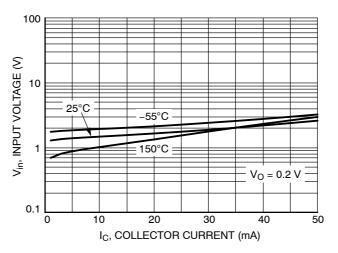
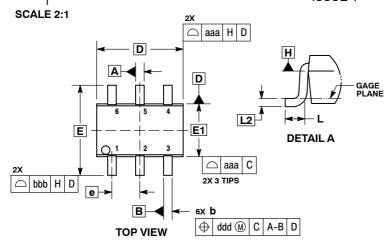
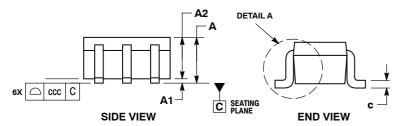


Figure 6. Input Voltage vs. Output Current

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

DATE 11 DEC 2012





NOTES:

- DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
 CONTROLLING DIMENSION: MILLIMETERS.
- 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. DATUMS A AND B ARE DETERMINED AT DATUM H.
- DIMENSIONS 6 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 5 AT MAXIMUM MATERIAL CONDITION. THE DAMBAR CANNOT BE LOCATED ON THE LOWER

	MILLIMETERS				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 BS	С	0	.026 BS	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

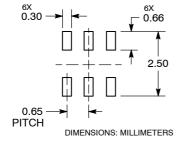
= Date Code*

= 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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MECHANICAL CASE OUTLINE

PACKAGE DIMENSIONS



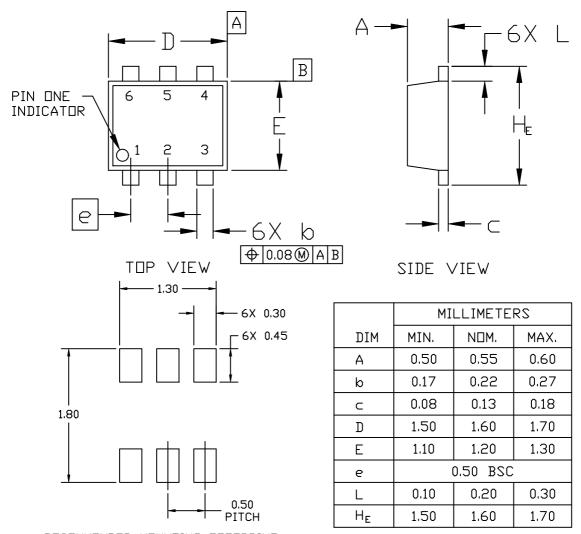


SOT-563, 6 LEAD CASE 463A ISSUE H

DATE 26 JAN 2021

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.



RECOMMENDED MOUNTING FOOTPRINT*

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

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SOT-563, 6 LEAD

CASE 463A ISSUE H

2

1

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. COLLECTUR 2 5. BASE 1 6. COLLECTUR 1	STYLE 3: PIN 1. CATHODE 1 2. CATHODE 1 3. ANODE/ANODE 4. CATHODE 2 5. CATHODE 2 6. ANODE/ANODE
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. SDURCE 5. DRAIN 6. DRAIN	STYLE 9: PIN 1. SDURCE 1 2. GATE 1 3. DRAIN 2 4. SDURCE 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.

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SMUN5235T1G SMUN5330DW1T1G SSVMUN5312DW1T2G RN1303(TE85L,F) RN4605(TE85L,F) TTEPROTOTYPE79

DDTC114EUAQ-7-F EMH15T2R SMUN2214T3G NSBC114TF3T5G NSBC143ZPDP6T5G NSVMUN5113DW1T3G

SMUN5230DW1T1G SMUN5133T1G SMUN2214T1G DTC114EUA-TP NSBA144EF3T5G NSVDTA114EET1G 2SC2223-T1B-A

2SC3912-TB-E SMUN5237DW1T1G SMUN5213DW1T1G SMUN5114DW1T1G SMUN2111T1G NSVDTC144EM3T5G DTC124ECA
TP DTC123TM3T5G DTA114ECA-TP DTA113EM3T5G DCX115EK-7-F DTC113EM3T5G NSVMUN5135DW1T1G

NSVMUN2237T1G NSVDTC143ZM3T5G SMUN5335DW1T2G SMUN5216DW1T1G