Complementary Bias Resistor Transistors R1 = 47 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_A = 25°C both polarities Q₁ (PNP) & Q₂ (NPN), unless otherwise noted)

Rating	Symbol	Max	Unit
Collector-Base Voltage	V _{CBO}	50	Vdc
Collector-Emitter Voltage	V _{CEO}	50	Vdc
Collector Current – Continuous	۱ _C	100	mAdc
Input Forward Voltage	V _{IN(fwd)}	40	Vdc
Input Reverse Voltage	V _{IN(rev)}	10	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 [†]
MUN5313DW1T1G, SMUN5313DW1T1G*	SOT-363	3,000/Tape & Reel
SMUN5313DW1T3G*	SOT-363	10,000/Tape & Reel
NSBC144EPDXV6T1G NSVBC144EPDXV6T1G*	SOT-563	4,000/Tape & Reel
NSBC144EPDXV6T5G	SOT-563	8,000/Tape & Reel
NSBC144EPDP6T5G	SOT-963	8,000/Tape & Reel

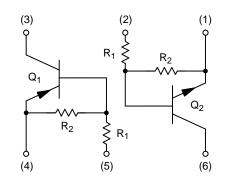
⁺For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.



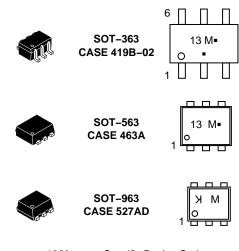
ON Semiconductor®

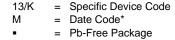
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PIN CONNECTIONS



MARKING DIAGRAMS





(Note: Microdot may be in either location)

*Date Code orientation may vary depending upon manufacturing location.

THERMAL CHARACTERISTICS

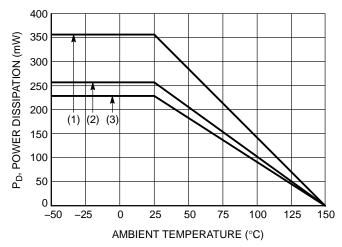
	Characteristic	Symbol	Max	Unit
MUN5313DW1 (SOT–363) ON	E JUNCTION HEATED			
Total Device Dissipation $T_A = 25^{\circ}C$ (Note 1) (Note 2) Derate above 25^{C} (Note 2)	(Note 1)	PD	187 256 1.5 2.0	mW mW/°C
Thermal Resistance, Junction to Ambient	(Note 1) (Note 2)	R _{θJA}	670 490	°C/W
MUN5313DW1 (SOT-363) BO	TH JUNCTION HEATED (Note 3)			
Total Device Dissipation $T_A = 25^{\circ}C$ (Note 1) (Note 2) Derate above 25^{C} (Note 2)	(Note 1)	PD	250 385 2.0 3.0	mW mW/°C
Thermal Resistance, Junction to Ambient (Note 2)	(Note 1)	R _{θJA}	493 325	°C/W
Thermal Resistance, Junction to Lead (Note 1) (Note 2)		R _{θJL}	188 208	°C/W
Junction and Storage Temperation	ature Range	T _J , T _{stg}	-55 to +150	°C
NSBC144EPDXV6 (SOT-563)	ONE JUNCTION HEATED			
Total Device Dissipation $T_A = 25^{\circ}C$ (Note 1) Derate above $25^{\circ}C$	(Note 1)	P _D	357 2.9	mW mW/°C
Thermal Resistance, Junction to Ambient	(Note 1)	R _{θJA}	350	°C/W
NSBC144EPDXV6 (SOT-563)	BOTH JUNCTION HEATED (Note 3)			
Total Device Dissipation $T_A = 25^{\circ}C$ (Note 1) Derate above $25^{\circ}C$	(Note 1)	P _D	500 4.0	mW mW/°C
Thermal Resistance, Junction to Ambient	(Note 1)	$R_{ extsf{ heta}JA}$	250	°C/W
Junction and Storage Tempera	ature Range	T _J , T _{stg}	-55 to +150	°C
NSBC144EPDP6 (SOT-963)	ONE JUNCTION HEATED			
Total Device Dissipation $T_A = 25^{\circ}C$ (Note 4) (Note 5) Derate above 25^{C} (Note 5)	(Note 4)	PD	231 269 1.9 2.2	MW mW/°C
Thermal Resistance, Junction to Ambient (Note 5)	(Note 4)	R _{θJA}	540 464	°C/W
NSBC144EPDP6 (SOT-963)	BOTH JUNCTION HEATED (Note 3)			
Total Device Dissipation $T_A = 25^{\circ}C$ (Note 4) (Note 5) Derate above 25^{C} (Note 5)	(Note 4)	PD	339 408 2.7 3.3	MW mW/°C
Thermal Resistance, Junction to Ambient (Note 5)	(Note 4)	R _{0JA}	369 306	°C/W
Junction and Storage Tempera	atura Dagara	T _J , T _{stg}	-55 to +150	°C

FR-4 @ 1.0 × 1.0 Inch Pad.
FR-4 @ 1.0 × 1.0 Inch Pad.
Both junction heated values assume total power is sum of two equally powered channels.
FR-4 @ 100 mm², 1 oz. copper traces, still air.
FR-4 @ 500 mm², 1 oz. copper traces, still air.

ELECTRICAL CHARACTERISTICS ($T_A = 25^{\circ}C$ both polarities Q_1 (PNP) & Q_2 (NPN), unless otherwise noted)	
--	--

Characteristic	Symbol	Min	Тур	Max	Unit
OFF CHARACTERISTICS					
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 $(I_C = 10 \ \mu A, I_E = 0)$	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	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 _{i(off)}	-	1.2 1.2		Vdc
Input Voltage (On) ($V_{CE} = 0.2 \text{ V}, I_C = 3.0 \text{ mA}$) (NPN) ($V_{CE} = 0.2 \text{ V}, I_C = 3.0 \text{ mA}$) (PNP)	V _{i(on)}	-	1.9 2.0		Vdc
Output Voltage (On) (V _{CC} = 5.0 V, V _B = 3.5 V, R _L = 1.0 k Ω)	V _{OL}	-	-	0.2	Vdc
Output Voltage (Off) $(V_{CC} = 5.0 \text{ V}, \text{ V}_{B} = 0.5 \text{ V}, \text{ R}_{L} = 1.0 \text{ k}\Omega)$	V _{OH}	4.9	-	-	Vdc
Input Resistor	R1	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 $\leq 2\%$.

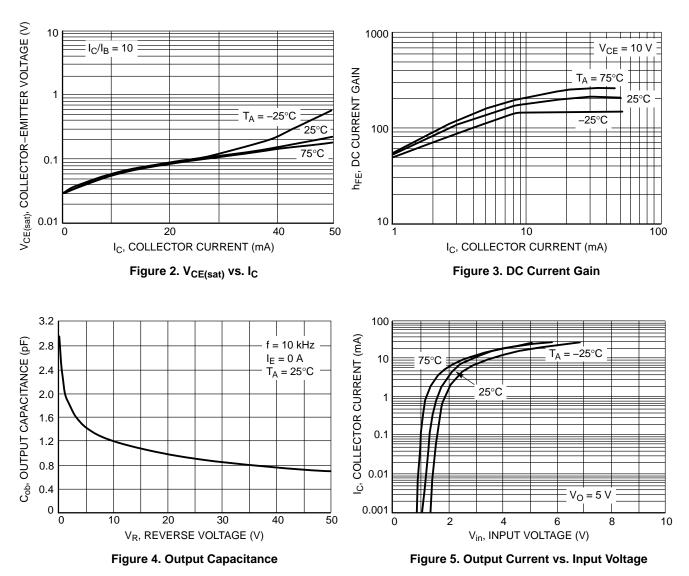


(1) SOT–363; 1.0 \times 1.0 Inch Pad

(2) SOT-563; Minimum Pad

(3) SOT-963; 100 mm², 1 oz. Copper Trace

Figure 1. Derating Curve



TYPICAL CHARACTERISTICS – NPN TRANSISTOR MUN5313DW1, NSBC144EPDXV6

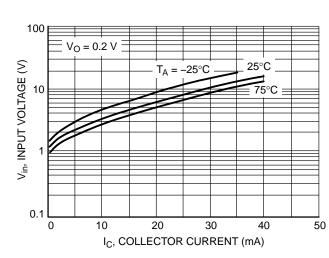
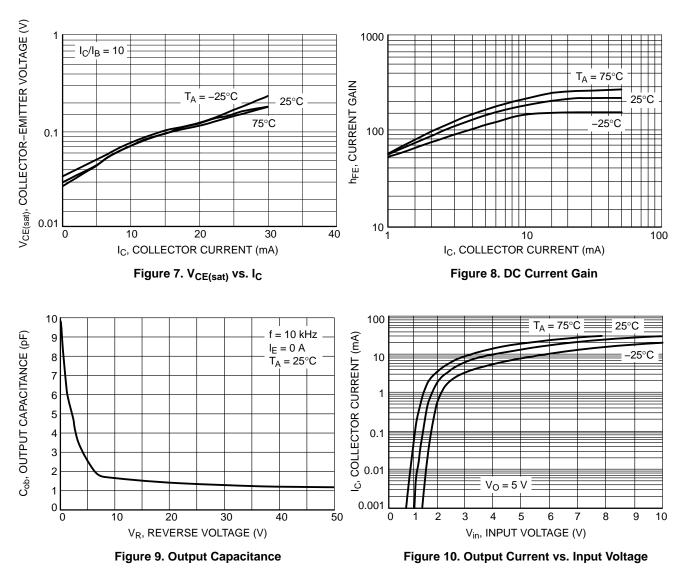


Figure 6. Input Voltage vs. Output Current

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TYPICAL CHARACTERISTICS – PNP TRANSISTOR MUN5313DW1, NSBC144EPDXV6

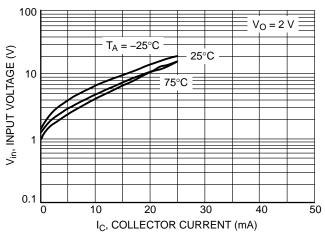
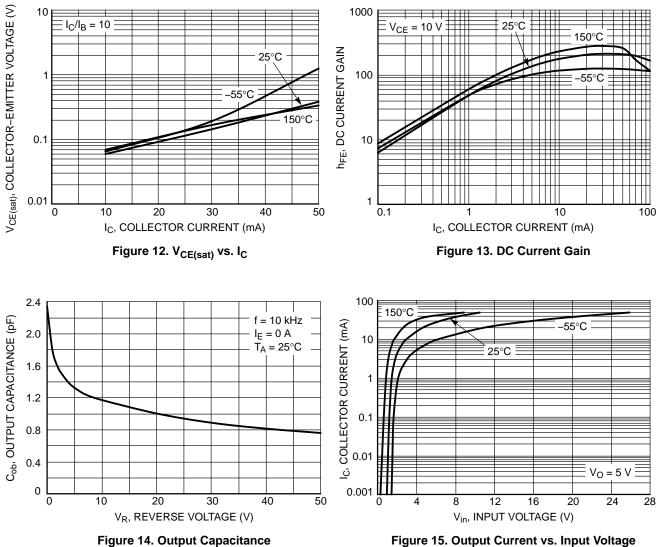


Figure 11. Input Voltage vs. Output Current



TYPICAL CHARACTERISTICS – NPN TRANSISTOR NSBC144EPDP6

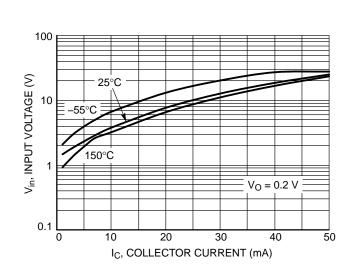
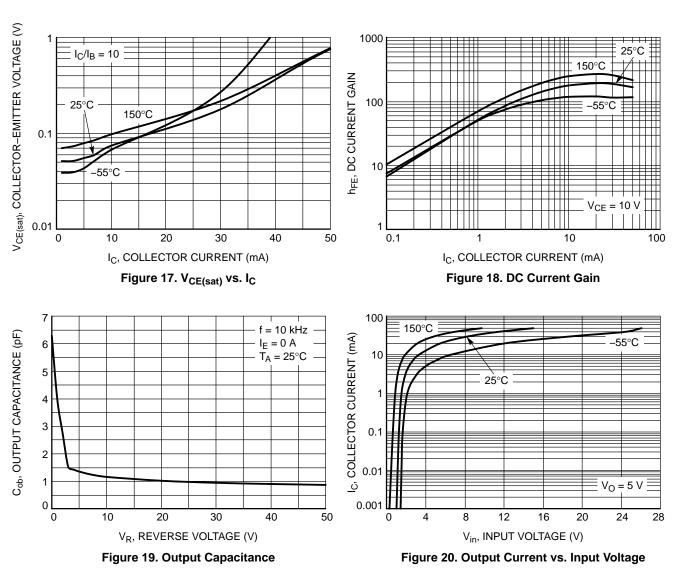


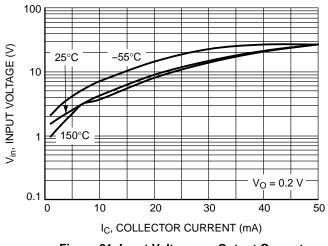
Figure 15. Output Current vs. Input Voltage

Figure 16. Input Voltage vs. Output Current

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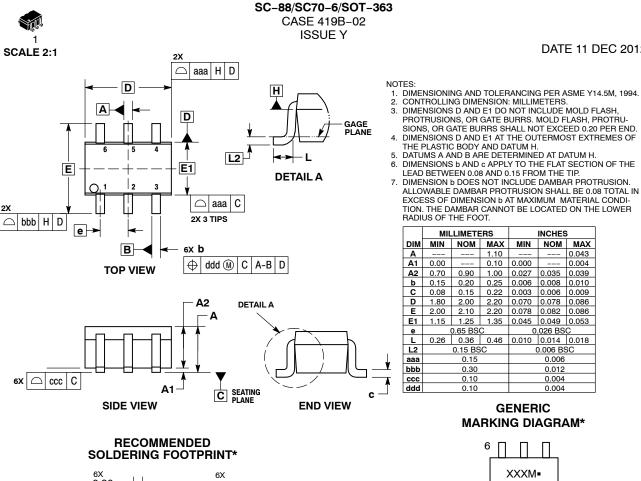
TYPICAL CHARACTERISTICS – PNP TRANSISTOR NSBC144EPDP6





nsem

DATE 11 DEC 2012



6X 0.30 0.66 2 50 0.65 PITCH DIMENSIONS: MILLIMETERS

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

DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 TOTAL IN EXCESS OF DIMENSION 6 AT MAXIMUM MATERIAL CONDI-TION. THE DAMBAR CANNOT BE LOCATED ON THE LOWER **BADIUS OF THE FOOT.**

	MILLIMETERS				INCHES	;
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
Е	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 BSC		
L	0.26	0.36	0.46	0.010	0.014	0.018
L2		0.15 BS	C	(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

- Μ = 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.

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:	STYLE 14:	STYLE 15:	STYLE 16:	STYLE 17:	STYLE 18:
PIN 1. ANODE	PIN 1. VREF	PIN 1. ANODE 1	PIN 1. BASE 1	PIN 1. BASE 1	PIN 1. VIN1
2. N/C	2. GND	2. ANODE 2	2. EMITTER 2	2. EMITTER 1	2. VCC
3. COLLECTOR	3. GND	3. ANODE 3	3. COLLECTOR 2	3. COLLECTOR 2	3. VOUT2
4. EMITTER	4. IOUT	4. CATHODE 3	4. BASE 2	4. BASE 2	4. VIN2
5. BASE	5. VEN	5. CATHODE 2	5. EMITTER 1	5. EMITTER 2	5. GND
6. CATHODE	6. VCC	6. CATHODE 1	6. COLLECTOR 1	6. COLLECTOR 1	6. VOUT1
STYLE 19:	STYLE 20:	STYLE 21:	STYLE 22:	STYLE 23:	STYLE 24:
PIN 1. I OUT	PIN 1. COLLECTOR	PIN 1. ANODE 1	PIN 1. D1 (i)	PIN 1. Vn	PIN 1. CATHODE
2. GND	2. COLLECTOR	2. N/C	2. GND	2. CH1	2. ANODE
3. GND	3. BASE	3. ANODE 2	3. D2 (i)	3. Vp	3. CATHODE
4. V CC	4. EMITTER	4. CATHODE 2	4. D2 (c)	4. N/C	4. CATHODE
5. V EN	5. COLLECTOR	5. N/C	5. VBUS	5. CH2	5. CATHODE
6. V REF	6. COLLECTOR	6. CATHODE 1	6. D1 (c)	6. N/C	6. CATHODE
STYLE 25:	STYLE 26:	STYLE 27:	STYLE 28:	STYLE 29:	STYLE 30:
PIN 1. BASE 1	PIN 1. SOURCE 1	PIN 1. BASE 2	PIN 1. DRAIN	PIN 1. ANODE	PIN 1. SOURCE 1
2. CATHODE	2. GATE 1	2. BASE 1	2. DRAIN	2. ANODE	2. DRAIN 2
3. COLLECTOR 2	3. DRAIN 2	3. COLLECTOR 1	3. GATE	3. COLLECTOR	3. DRAIN 2
4. BASE 2	4. SOURCE 2	4. EMITTER 1	4. SOURCE	4. EMITTER	4. SOURCE 2
5. EMITTER	5. GATE 2	5. EMITTER 2	5. DRAIN	5. BASE/ANODE	5. GATE 1
6. COLLECTOR 1	6. DRAIN 1	6. COLLECTOR 2	6. DRAIN	6. CATHODE	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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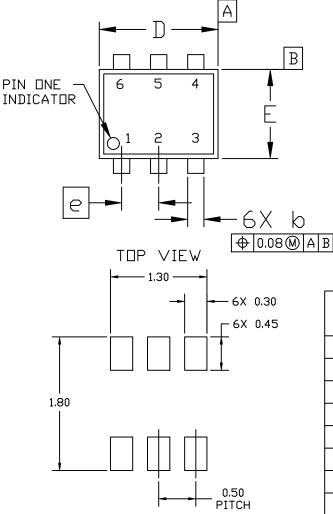
SOT-563, 6 LEAD CASE 463A ISSUE H

DATE 26 JAN 2021

SCALE 4:1

- 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.

А



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

SIDE VIEW							
	MI	LLIMETE	RS				
DIM	MIN.	NDM.	MAX.				
А	0.50	0.55	0.60				
b	0.17	0.22	0.27				
С	0.08	0.13	0.18				
D	1.50	1.60	1.70				
Е	1.10	1.20	1.30				
e	0.50 BSC						
L	0.10	0.20	0.30				

1.60

1.70

SIDE VIEW

(

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Onsemi

SOT-563, 6 LEAD CASE 463A ISSUE H

DATE 26 JAN 2021

GENERIC	
MARKING DIAGRAM*	

	XX M•		
4	0		
1			

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.

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

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DATE 09 FEB 2010



SCALE 4:1

STYLE 1:

PIN 1. EMITTER 1

STYLE 4: PIN 1. COLLECTOR 2. COLLECTOR 3. BASE 4. EMITTER

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

5. ANODE 6. CATHODE

STYLE 10: PIN 1. CATHODE 1 2. N/C

5. N/C

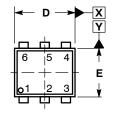
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6. ANODE 1

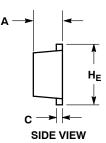
5. COLLECTOR 6. COLLECTOR

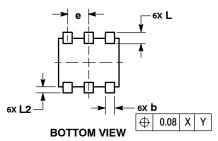
2. BASE 1 3. COLLECTOR 2 4. EMITTER 2

5. BASE 2 6. COLLECTOR 1



TOP VIEW





STYLE 2

PIN 1. EMITTER 1

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

STYLE 8: PIN 1. DRAIN

5 DRAIN

6. DRAIN

2. DRAIN

3. GATE 4. SOURCE

2. EMITTER2

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

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

STYLE 9: PIN 1. SOURCE 1 2. GATE 1

3. DRAIN 2

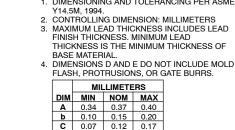
5. GATE 2 6. DRAIN 1

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4. SOURCE 2

5. CATHODE 2 6. ANODE/ANODE 1

SOT-963 CASE 527AD ISSUE E



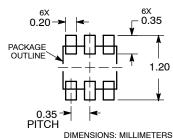
NOTES:

2. 3.

> A
> 0.34
> 0.37
> 0.40
>
>
> b
> 0.10
> 0.15
> 0.20
> С 0.07 0.12 0.17
> 0.95
> 1.00
> 1.05
>
>
> 0.75
> 0.80
> 0.85
> D 0.95 Е 0.35 BSC е ΗE 0.95 1.00 1.05 Т 0.19 REF L2 0.05 0.10 0.15

1. DIMENSIONING AND TOLERANCING PER ASME

RECOMMENDED **MOUNTING FOOTPRINT***



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



= Month Code М

*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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