Dual NPN Bias Resistor Transistors R1 = 47 k Ω , R2 = 47 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	Ι _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 [†]
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

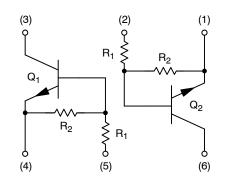
⁺For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.



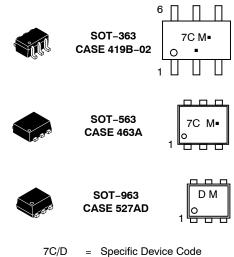
ON Semiconductor®

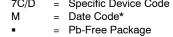
www.onsemi.com

PIN CONNECTIONS



MARKING DIAGRAMS





(Note: Microdot may be in either location)

*Date Code orientation may vary depending upon manufacturing location.

THERMAL CHARACTERISTICS

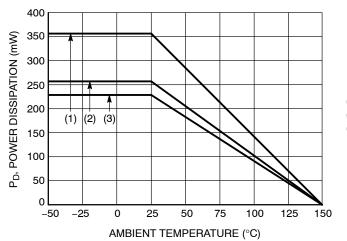
	Characteristic	Symbol	Max	Unit
MUN5213DW1 (SOT-363) ON	E JUNCTION HEATED			
$\begin{array}{l} \hline Total Device Dissipation \\ T_A = 25^\circ C & (Note 13) \\ (Note 14) \\ Derate above 25^\circ C \\ (Note 14) \end{array}$	(Note 13)	PD	187 256 1.5 2.0	mW mW/°C
	(Note 13) (Note 14)	R _{0JA}	670 490	°C/W
MUN5213DW1 (SOT-363) BO	TH JUNCTION HEATED (Note 15)			
$\begin{array}{l} \mbox{Total Device Dissipation} \\ T_A = 25^\circ C & (Note 13) \\ (Note 14) \\ \mbox{Derate above } 25^\circ C \\ (Note 14) \end{array}$	(Note 13)	PD	250 385 2.0 3.0	mW mW/°C
Thermal Resistance, Junction to Ambient (Note 14)	(Note 13)	R _{θJA}	493 325	°C/W
Thermal Resistance, Junction to Lead (Note 13) (Note 14)		R _{θJL}	188 208	°C/W
Junction and Storage Tempera	ture Range	T _J , T _{stg}	-55 to +150	°C
NSBC144EDXV6 (SOT-563) O	NE JUNCTION HEATED	·		
$\begin{array}{l} \mbox{Total Device Dissipation} \\ T_A = 25^\circ C \qquad \mbox{(Note 13)} \\ \mbox{Derate above } 25^\circ C \end{array}$	(Note 13)	PD	357 2.9	mW mW/°C
Thermal Resistance, Junction to Ambient	(Note 13)	R _{0JA}	350	°C/W
NSBC144EDXV6 (SOT-563) B	OTH JUNCTION HEATED (Note 15)			
Total Device Dissipation $T_A = 25^{\circ}C$ (Note 13) Derate above $25^{\circ}C$	(Note 13)	PD	500 4.0	mW mW/°C
Thermal Resistance, Junction to Ambient	(Note 13)	$R_{ extsf{ heta}JA}$	250	°C/W
Junction and Storage Tempera	ture Range	T _J , T _{stg}	-55 to +150	°C
NSBC144EDP6 (SOT-963) ON	E JUNCTION HEATED			
Total Device Dissipation $T_A = 25^{\circ}C$ (Note 16) (Note 17) Derate above 25^{C} (Note 17)	(Note 16)	PD	231 269 1.9 2.2	MW mW/°C
Thermal Resistance, Junction to Ambient (Note 17)	(Note 16)	R _{θJA}	540 464	°C/W
NSBC144EDP6 (SOT-963) BC	TH JUNCTION HEATED (Note 15)			
Total Device Dissipation $T_A = 25^{\circ}C$ (Note 16) (Note 17) Derate above 25^{C} (Note 17)	(Note 16)	PD	339 408 2.7 3.3	MW mW/°C
Thermal Resistance, Junction to Ambient (Note 17)	(Note 16)	R _{θJA}	369 306	°C/W
	ture Range	T _J , T _{stg}	-55 to +150	°C

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

Characteristic	Symbol	Min	Тур	Мах	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 18) $(I_{C} = 2.0 \text{ mA}, I_{B} = 0)$	V _{(BR)CEO}	50	-	-	Vdc
ON CHARACTERISTICS					
DC Current Gain (Note 18) $(I_C = 5.0 \text{ mA}, V_{CE} = 10 \text{ V})$	h _{FE}	80	140	-	
Collector-Emitter Saturation Voltage (Note 18) $(I_{C} = 10 \text{ mA}, I_{B} = 0.3 \text{ mA})$	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 k Ω)	V _{OL}	_	-	0.2	Vdc
Output Voltage (Off) (V_{CC} = 5.0 V, V_B = 0.5 V, R_L = 1.0 k Ω)	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	

ELECTRICAL CHARACTERISTICS ($T_A = 25^{\circ}C$, common for Q_1 and Q_2 , unless otherwise noted)

18. Pulsed Condition: Pulse Width = 300 ms, Duty Cycle \leq 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 33. Derating Curve

TYPICAL CHARACTERISTICS MUN5213DW1, NSBC144EDXV6

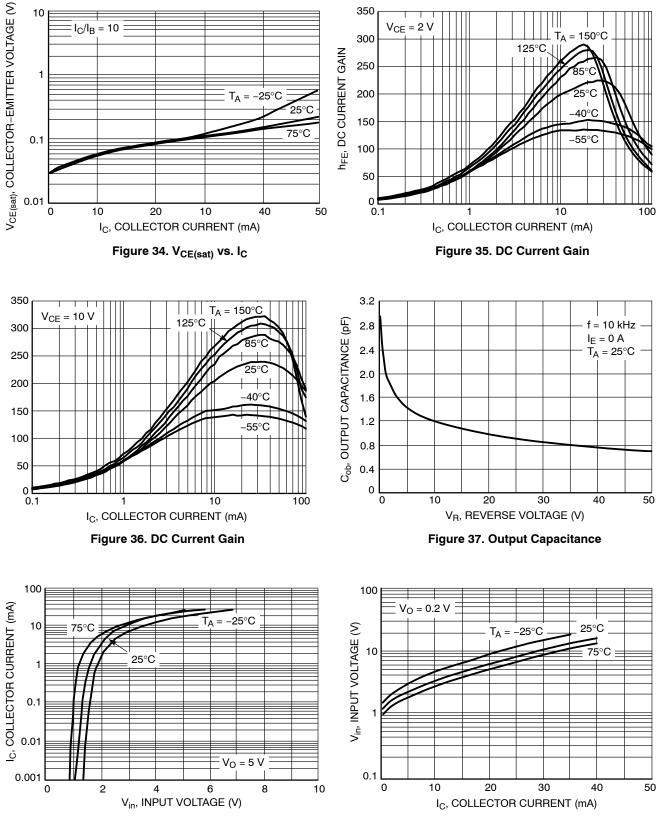
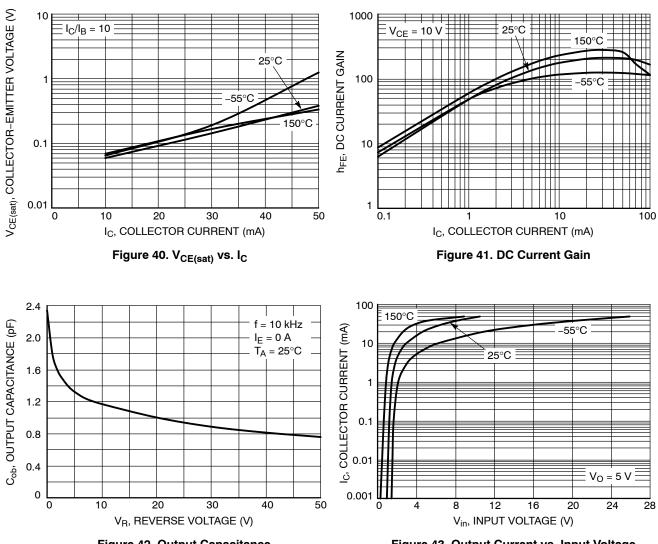
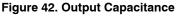




Figure 39. Input Voltage vs. Output Current



TYPICAL CHARACTERISTICS NSBC144EDP6





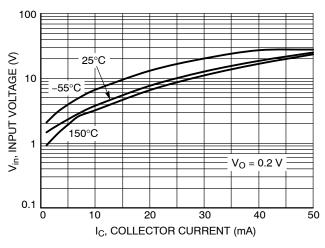


Figure 44. Input Voltage vs. Output Current

0.043

0.004





- XXX = Specific Device Code

(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.



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.

Electronic versions are uncontrolled except when accessed directly from the Document Repository. DOCUMENT NUMBER: 98ASB42985B Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red. **DESCRIPTION:** SC-88/SC70-6/SOT-363 PAGE 1 OF 2 ON Semiconductor and unarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. ON Semiconductor does not convey any license under its patent rights nor the rights of others.

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.

DOCUMENT NUMBER:	98ASB42985B Electronic versions are uncontrolled except when accessed directly from the Document Reposite Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.			
DESCRIPTION:	SC-88/SC70-6/SOT-363		PAGE 2 OF 2	
ON Semiconductor and 🕕 are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding				

ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. ON Semiconductor does not convey any license under its patent rights nor the rights of others.

6Х





SOT-563, 6 LEAD CASE 463A ISSUE H

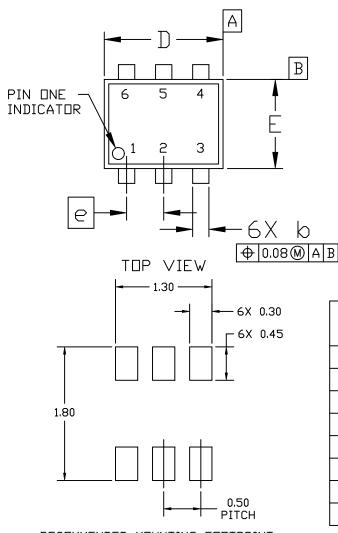
DATE 26 JAN 2021

ALE 4:1

NDTES: 1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.

А

- 1. DIMENSIONING AND TOLERANCING PER A 2. CONTROLLING DIMENSION: MILLIMETERS
- 3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS DF BASE MATERIAL.



SIDE VIEW MILLIMETERS DIM MIN. NDM. MAX. 0.50 0.55 0.60 Α 0.17 0.22 0.27 b 0.08 0.13 0.18 С 1.50 1.60 1.70 D Ε 1.10 1.20 1.30 0.50 BSC e L 0.10 0.20 0.30 H_E 1.50 1.60 1.70

(

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, SOLDERRM/D.

	ncontrolled except when stamped "CONTROLLED COPY" in red.
DESCRIPTION: SOT-563, 6 LEAD	PAGE 1 OF 2

ON Semiconductor and unarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. ON Semiconductor does not convey any license under its patent rights or the rights of others.

STYLE 1:	STYLE 2:	STYLE 3:
PIN 1. EMITTER 1	PIN 1. EMITTER 1	PIN 1. CATHIDE 1
2. BASE 1	2. EMITTER 2	2. CATHIDE 1
3. COLLECTOR 2	3. BASE 2	3. ANUDE/ANUDE 2
4. EMITTER 2	4. COLLECTOR 2	4. CATHIDE 2
5. BASE 2	5. BASE 1	5. CATHIDE 2
6. COLLECTOR 1	6. COLLECTOR 1	6. ANUDE/ANUDE 1
STYLE 4:	STYLE 5:	STYLE 6:
PIN 1. COLLECTOR	PIN 1. CATHEDE	PIN 1. CATHODE
2. COLLECTOR	2. CATHEDE	2. ANODE
3. BASE	3. ANEDE	3. CATHODE
4. EMITTER	4. ANEDE	4. CATHODE
5. COLLECTOR	5. CATHEDE	5. CATHODE
6. COLLECTOR	6. CATHEDE	6. CATHODE
STYLE 7:	STYLE 8:	STYLE 9:
PIN 1. CATHODE	PIN 1. DRAIN	PIN 1. SDURCE 1
2. ANODE	2. DRAIN	2. GATE 1
3. CATHODE	3. GATE	3. DRAIN 2
4. CATHODE	4. SDURCE	4. SDURCE 2
5. ANODE	5. DRAIN	5. GATE 2
6. CATHODE	6. DRAIN	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	

6. COLLECTOR 2

DATE 26 JAN 2021

GENERIC **MARKING DIAGRAM***



XX = Specific Device Code

M = Month Code

. = Pb-Free Package

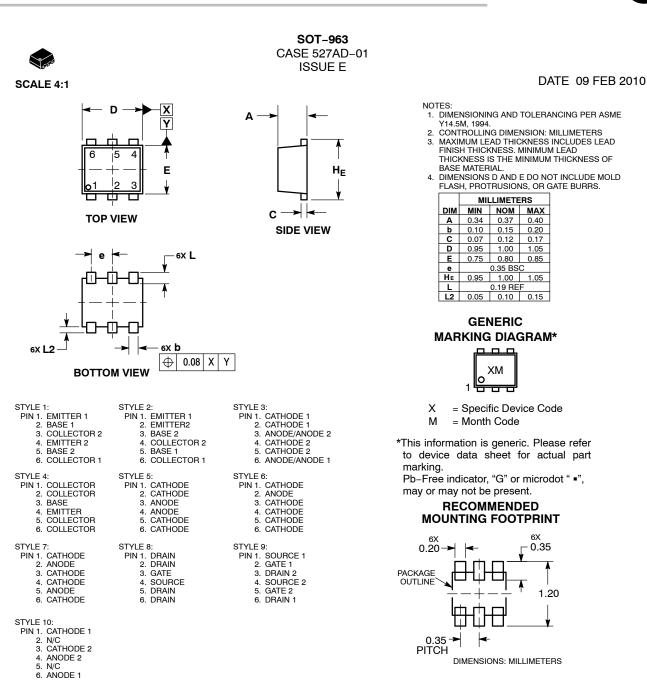
*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "•", may or may not be present. Some products may not follow the Generic Marking.

DOCUMENT NUMBER:	98AON11126D Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.		
DESCRIPTION:	SOT-563, 6 LEAD		PAGE 2 OF 2

ON Semiconductor and (III) are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. ON Semiconductor does not convey any license under its patent rights or the rights of others.

4. ANDDE 2 5. N/C 6. ANDDE 1





DOCUMENT NUMBER:	JMBER: 98AON26456D Electronic versions are uncontrolled except when accessed directly from the Document Repository Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.		
DESCRIPTION:	DESCRIPTION: SOT-963, 1X1, 0.35P PAGE 1 OF		
ON Semiconductor reserves the right the suitability of its products for any pa	to make changes without further notice to an inticular purpose, nor does ON Semiconducto	stries, LLC dba ON Semiconductor or its subsidiaries in the United States y products herein. ON Semiconductor makes no warranty, representation r assume any liability arising out of the application or use of any product or icidental damages. ON Semiconductor does not convey any license under	or guarantee regarding circuit, and specifically

rights of others.

onsemi, ONSEMI, and other names, marks, and brands are registered and/or common law trademarks of Semiconductor Components Industries, LLC dba "onsemi" or its affiliates and/or subsidiaries in the United States and/or other countries. onsemi owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of onsemi's product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. onsemi reserves the right to make changes at any time to any products or information herein, without notice. The information herein is provided "as-is" and onsemi makes no warranty, representation or guarantee regarding the accuracy of the information, product features, availability, functionality, or suitability of its products for any particular purpose, nor does **onsemi** assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using **onsemi** products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by **onsemi**. "Typical" parameters which may be provided in **onsemi** data sheets and/or specifications can and do vary in different applications and calcular performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. **onsemi** does not convey any license under any of its intellectual property rights nor the rights of others. **onsemi** products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use **onsemi** products for any such unintended or unauthorized application, Buyer shall indemnify and hold **onsemi** and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that **onsemi** was negligent regarding the design or manufacture of the part. **onsemi** is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:

TECHNICAL SUPPORT

onsemi Website: www.onsemi.com

Email Requests to: orderlit@onsemi.com

North American Technical Support: Voice Mail: 1 800-282-9855 Toll Free USA/Canada Phone: 011 421 33 790 2910

Europe, Middle East and Africa Technical Support: Phone: 00421 33 790 2910 For additional information, please contact your local Sales Representative