Complementary Bias Resistor Transistors R1 = 22 k Ω , **R2 = 22 k** Ω 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 [†]
MUN5312DW1T1G, SMUN5312DW1T1G*	SOT-363	3,000 / Tape & Reel
NSVMUN5312DW1T3G*	SOT-363	10,000 / Tape & Reel
MUN5312DW1T2G, NSVMUN5312DW1T2G*	SOT-363	3,000 / Tape & Reel
NSBC124EPDXV6T1G, NSVBC124EPDXV6T1G*	SOT-563	4,000 / Tape & Reel
NSBC124EPDXV6T5G	SOT-563	8,000 / Tape & Reel
NSBC124EPDP6T5G	SOT-963	8,000 / Tape & Reel

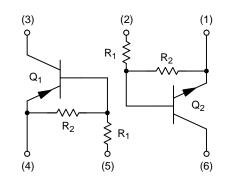
+For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.



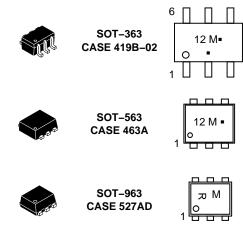
ON Semiconductor®

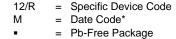
www.onsemi.com

PIN CONNECTIONS



MARKING DIAGRAMS





(Note: Microdot may be in either location)

*Date Code orientation may vary depending upon manufacturing location.

THERMAL CHARACTERISTICS

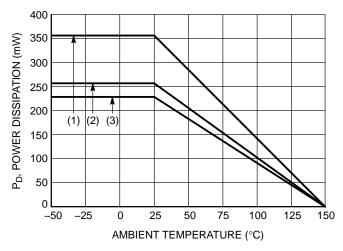
	Characteristic	Symbol	Max	Unit
MUN5312DW1 (SOT-363) ON	E JUNCTION HEATED			
Total Device Dissipation $T_A = 25^{\circ}C$ (Note 1) (Note 2) Derate above 25^{C} (Note 2)	(Note 1)	PD	187 256 1.5 2.0	mW mW/°C
Thermal Resistance, Junction to Ambient	(Note 1) (Note 2)	R _{θJA}	670 490	°C/W
MUN5312DW1 (SOT-363) BO	TH JUNCTION HEATED (Note 3)		1	
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
NSBC124EPDXV6 (SOT-563)	ONE JUNCTION HEATED		· · ·	
Total Device Dissipation $T_A = 25^{\circ}C$ (Note 1) Derate above $25^{\circ}C$	(Note 1)	PD	357 2.9	mW mW/°C
Thermal Resistance, Junction to Ambient	(Note 1)	R _{θJA}	350	°C/W
NSBC124EPDXV6 (SOT-563)	BOTH JUNCTION HEATED (Note 3)	·		
Total Device Dissipation $T_A = 25^{\circ}C$ (Note 1) Derate above 25^{\circ}C	(Note 1)	PD	500 4.0	mW mW/°C
Thermal Resistance, Junction to Ambient	(Note 1)	R _{θJA}	250	°C/W
Junction and Storage Tempera	ature Range	T _J , T _{stg}	-55 to +150	°C
NSBC124EPDP6 (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
NSBC124EPDP6 (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 _{θJA}	369 306	°C/W
Junction and Storage Tempera	atura Danga	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.

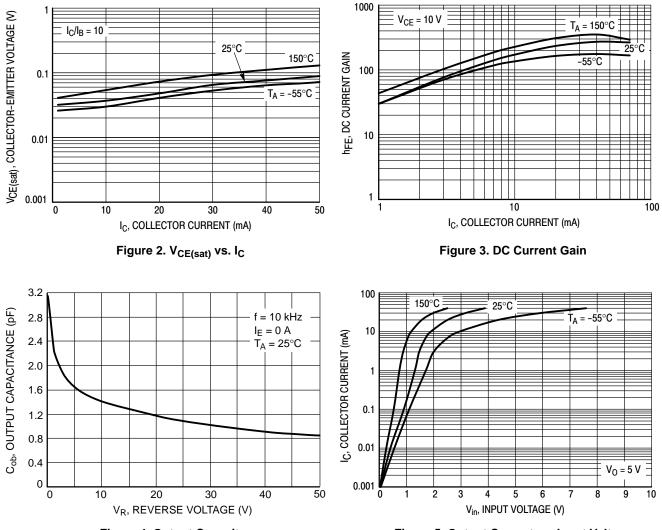
ELECTRICAL CHARACTERISTICS ($T_A = 25^{\circ}C$ both polarities Q_1 (PNP) & Q_2 (NPN), unless otherwise noted)
--

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}	-	_	0.2	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}	60	100	_	
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) ($V_{CE} = 5.0 V, I_C = 100 \mu\text{A}$) (PNP)	V _{i(off)}	-	1.2 1.2		Vdc
Input Voltage (On) ($V_{CE} = 0.2 \text{ V}, I_C = 5.0 \text{ mA}$) (NPN) ($V_{CE} = 0.2 \text{ V}, I_C = 5.0 \text{ mA}$) (PNP)	V _{i(on)}	- -	1.9 2.0		Vdc
Output Voltage (On) ($V_{CC} = 5.0 \text{ V}, \text{ V}_B = 2.5 \text{ V}, \text{ R}_L = 1.0 \text{ k}\Omega$)	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	15.4	22	28.6	kΩ
Resistor Ratio	R ₁ /R ₂	0.8	1.0	1.2	

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions. 6. Pulsed Condition: Pulse Width = 300 ms, Duty Cycle $\leq 2\%$.



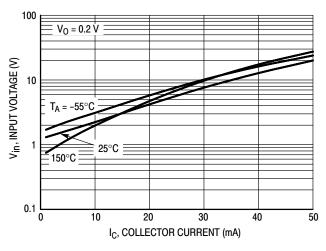
(1) SOT–363; 1.0 × 1.0 Inch Pad
(2) SOT–563; Minimum Pad
(3) SOT–963; 100 mm², 1 oz. Copper Trace



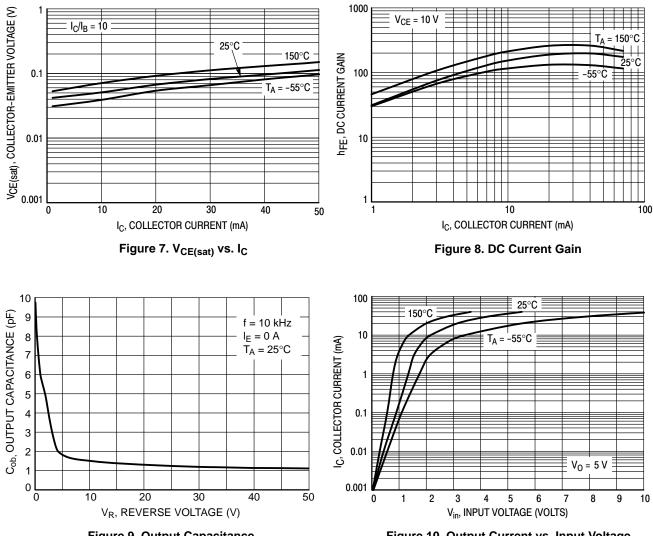
TYPICAL CHARACTERISTICS – NPN TRANSISTOR MUN5312DW1, NSBC124EPDXV6

Figure 4. Output Capacitance

Figure 5. Output Current vs. Input Voltage







TYPICAL CHARACTERISTICS – PNP TRANSISTOR MUN5312DW1, NSBC124EPDXV6

Figure 9. Output Capacitance

Figure 10. Output Current vs. Input Voltage

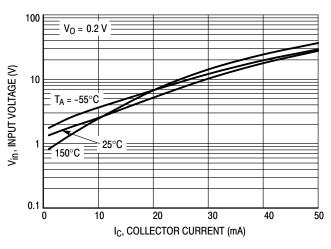
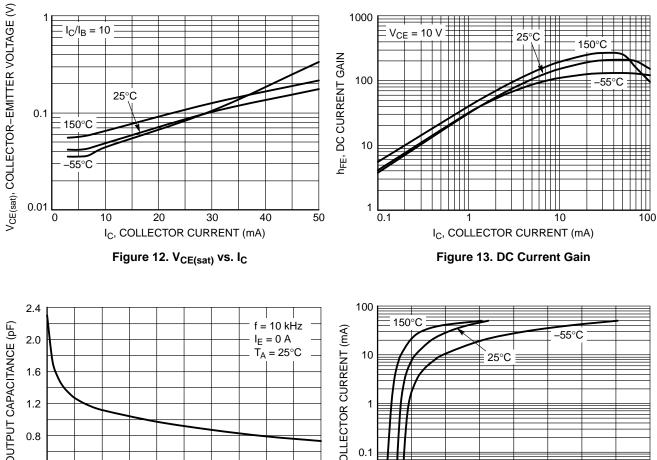
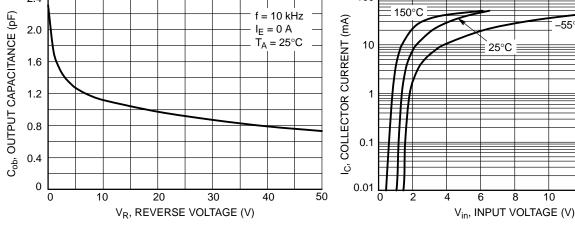


Figure 11. Input Voltage vs. Output Current



TYPICAL CHARACTERISTICS – NPN TRANSISTOR NSBC124EPDP6







8

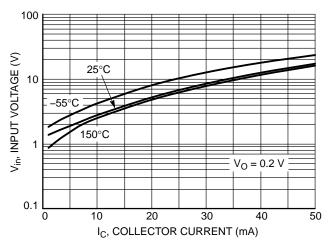
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<u>Vo</u> = 5 V

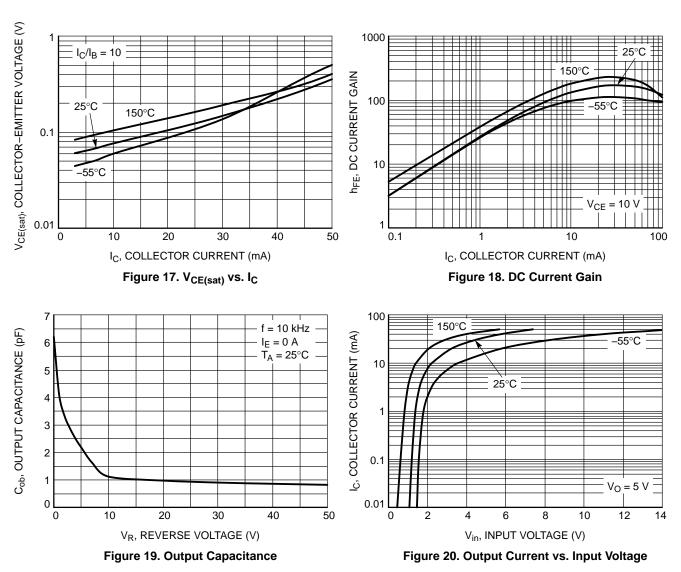
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16

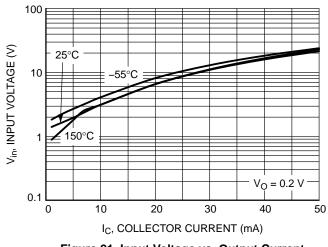
12







TYPICAL CHARACTERISTICS – PNP TRANSISTOR NSBC124EPDP6

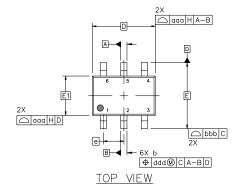




SC-88 2.00x1.25x0.90, 0.65P CASE 419B-02 **ISSUE Z**

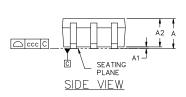
DATE 18 APR 2024

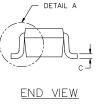
DUSEM

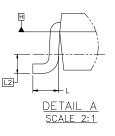


NOTES:

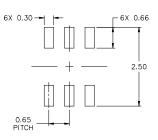
- DIMENSIONING AND TOLERANCING CONFORM TO ASME 1. Y14.5-2018.
- 2.
- ALL DIMENSION ARE IN MILLIMETERS. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.20 3. PER END.
- 4. DIMENSIONS D AND E1 AT THE OUTERMOST EXTREMES OF
- DATUMS A AND B ARE DETERMINED AT DATUM H. 5.
- DIMENSIONS & AND C APPLY TO THE FLAT SECTION OF THE LEAD BETWEEN 0.08 AND 0.15 FROM THE TIP. 6.
- DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. 7 ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 TOTAL IN EXCESS OF DIMENSION & AT MAXIMUM MATERIAL CONDITION. THE DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OF THE FOOT.







	MI	LLIMETER	S		
DIM	MIN.	NOM.	MAX.		
A			1.10		
A1	0.00		0.10		
A2	0.70	0.90	1.00		
b	0.15	0.20	0.25		
с	0.08	0.15	0.22		
D	2.00 BSC				
E	2.10 BSC				
E1	1.25 BSC				
е		0.65 BSC)		
L	0.26	0.36	0.46		
L2		0.15 BSC			
aaa	0.15				
bbb	0.30				
ccc	0.10				
ddd		0.10			



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.

XXX = Specific Device Code

XXXM-

0

GENERIC **MARKING DIAGRAM***

6

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 2.00x1.25x0.90, 0.65P CASE 419B-02 ISSUE Z

DATE 18 APR 2024

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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MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



ONSEMI

			ISSUE J				
						DA	TE 15 FEB 2024
			NOTES:				
			1. DIMENSIONING Y14.5-2018.	AND TOLE	ERANCING	CONFORM	M TO ASME
			2. ALL DIMENSIC				
			3. MAXIMUM LEA THICKNESS. N				
			THICKNESS O			(NL33 13	
 -	— D — A				м	ILLIMETE	-B2
	В	A -		DIM	MIN.		MAX.
				A	0.50	0.55	0.60
	6 5 4	-				0.33	0.27
	— + — — E		H H	b	0.17		
	01 2 3			C	0.08	0.13	0.18
		-		D	1.50	1.60	1.70
			∝ →	E	1.10	1.20	1.30
e	⊕ 0.080	MAB		e		0.50 BSC	
	TOP VIEW		<u>SIDE VIEW</u>	Н	1.50	1.60	1.70
				L	0.10	0.20	0.30
				ŀ	- 1.30 -		
				0.30	╷┝╾╷	, 6	× 0.45
					╪╌┎╪┐┥		
					$+$ $+$ \cdot	+'	
STYLE 1	STYLE 2:	STYLE 3:		1.80			
PIN 1. EMITTER 1	PIN 1. EMITTER 1	PIN 1. CATHODE		l r	╇	+1	
2. BASE 1 3. COLLECTOR 2	2. EMITTER 2 3. BASE 2	2. CATHOD 3. ANODE/	ANDDE 2		╤┓╡		
4. EMITTER 2 5. BASE 2	4. COLLECTOR 2 5. BASE 1	4. CATHOD 5. CATHOD	E 2				
6. COLLECTOR 1	6. COLLECTOR 1	6. ANDDE/					
				ECOMMENDE			
STYLE 4: PIN 1. COLLECTOR	STYLE 5: PIN 1. CATHODE	STYLE 6: PIN 1. CATHODE	- ST	ADDITIONAL RATEGY ANI) SOLDERI	NG DETAILS	S, PLEASE
2. COLLECTOR 3. BASE	2. CATHODE 3. ANODE	2. ANDDE 3. CATHOD	E	NLOAD THE			
4. EMITTER 5. COLLECTOR	4. ANDDE 5. CATHODE	4. CATHOD 5. CATHOD	E			DERRM/D.	
6. COLLECTOR	6. CATHODE	6. CATHOD	E		GENER	IC.	
				MAR			
STYLE 7: PIN 1. CATHODE	STYLE 8: PIN 1. DRAIN	STYLE 9: PIN 1. SOURCE	1			1	
2. ANDDE 3. CATHDDE	2. DRAIN 3. GATE	2. GATE 1 3. DRAIN 2	2		XXM•		
4. CATHODE 5. ANODE	4. SOURCE 5. DRAIN	4. SDURCE 5. GATE 2		1		J	
6. CATHODE	6. DRAIN	6. DRAIN 1			•	vice Code	
					lonth Cod b-Free Pa		
STYLE 10: PIN 1. CATHODE 1	STYLE 11: PIN 1. EMITTER 2		*Thi	s informatior		-	efer to
2. N/C 3. CATHODE 2	2. BASE 2 3. COLLECTOR 1		dev	vice data she	eet for ac	tual part ma	arking.
4. ANDDE 2	4. EMITTER 1			–Free indication may not be p			
5. N∕C 6. AN⊡DE 1	5. BASE 1 6. COLLECTOR 2		not	t follow the G	ieneric Ma	rking.	
DOCUMENT NUMB	ER: 98AON11126	D	Electronic versions are unc Printed versions are uncont				
DESCRIPTI	ON: SOT-563-6 1	.60x1.20x0.55	, 0.50P				PAGE 1 OF 1
	•						

SOT-563-6 1.60x1.20x0.55, 0.50P CASE 463A

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MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



SOT-963 1.00x1.00x0.37, CASE 527AD	0.35P				
ISSUE F			DATE	20 FEB 2024	
NDTES:		м	LLIMETE	RS	
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2. CONTROLLING DIMENSION: MILLIMETERS.	2018. DIM	MIN.	NDM.	MAX.	
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIM		0,34	0.37	0,40	
THICKNESS OF BASE MATERIAL.	h	0.10	0.15	0.20	
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH. PROTRUSIONS, OR GATE BURRS.	с	0.07	0.12	0.17	
	D	0.95	1.00	1.05	
	E	0.75	0.80	0.85	
	e		0.35 BSC	2	
+-+-+ Ė ⊢ Ĥ	Н	0.95	1.00	1.05	
	L		0.19 REF	-	
$T \Pi P V I F W$	L2	0.05	0.10	0.15	
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