MUN5232DW1, NSBC143EDXV6, NSBC143EDP6

Dual NPN Bias Resistor Transistors R1 = 4.7 kΩ, R2 = 4.7 kΩ

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 Q_1 and Q_2, 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	$V_{IN(fwd)}$	30	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†
MUN5232DW1T1G, SMUN5232DW1T1G	SOT−363	3,000/Tape & Reel
NSBC143EDXV6T1G	SOT−563	4,000/Tape & Reel
NSBC143EDP6T5G	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.

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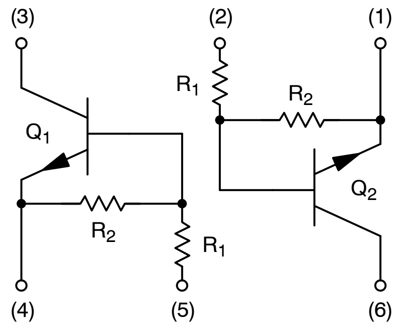
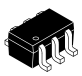
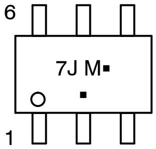
PIN CONNECTIONS

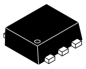


MARKING DIAGRAMS

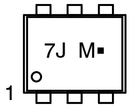


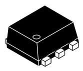
SOT−363
CASE 419B−02



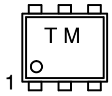


SOT−563
CASE 463A





SOT−963
CASE 527AD



7J/T = 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.

June, 2017 − Rev. 1

Publication Order Number:
DTC143ED/D

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
MUN5232DW1 (SOT−363) ONE JUNCTION HEATED			
Total Device Dissipation	P_D		
T_A = 25°C (Note 37)		187	mW
(Note 38)		256	
Derate above 25°C (Note 37)		1.5	mW/°C
(Note 38)		2.0	
Thermal Resistance, (Note 37)	$R_{\theta JA}$	670	°C/W
Junction to Ambient (Note 38)		490	
MUN5232DW1 (SOT−363) BOTH JUNCTION HEATED (Note 39)			
Total Device Dissipation	P_D		
T_A = 25°C (Note 37)		250	mW
(Note 38)		385	
Derate above 25°C (Note 37)		2.0	mW/°C
(Note 38)		3.0	
Thermal Resistance,	$R_{\theta JA}$		°C/W
Junction to Ambient (Note 37)		493	
(Note 38)		325	
Thermal Resistance,	$R_{\theta JL}$		°C/W
Junction to Lead (Note 37)		188	
(Note 38)		208	
Junction and Storage Temperature Range	T_J, T_{stg}	−55 to +150	°C
NSBC143EDXV6 (SOT−563) ONE JUNCTION HEATED			
Total Device Dissipation	P_D		
T_A = 25°C (Note 37)		357	mW
Derate above 25°C (Note 37)		2.9	mW/°C
Thermal Resistance,	$R_{\theta JA}$		°C/W
Junction to Ambient (Note 37)		350	
NSBC143EDXV6 (SOT−563) BOTH JUNCTION HEATED (Note 39)			
Total Device Dissipation	P_D		
T_A = 25°C (Note 37)		500	mW
Derate above 25°C (Note 37)		4.0	mW/°C
Thermal Resistance,	$R_{\theta JA}$		°C/W
Junction to Ambient (Note 37)		250	
Junction and Storage Temperature Range	T_J, T_{stg}	−55 to +150	°C
NSBC143EDP6 (SOT−963) ONE JUNCTION HEATED			
Total Device Dissipation	P_D		
T_A = 25°C (Note 40)		231	MW
(Note 41)		269	
Derate above 25°C (Note 40)		1.9	mW/°C
(Note 41)		2.2	
Thermal Resistance,	$R_{\theta JA}$		°C/W
Junction to Ambient (Note 40)		540	
(Note 41)		464	
NSBC143EDP6 (SOT−963) BOTH JUNCTION HEATED (Note 39)			
Total Device Dissipation	P_D		
T_A = 25°C (Note 40)		339	MW
(Note 41)		408	
Derate above 25°C (Note 40)		2.7	mW/°C
(Note 41)		3.3	
Thermal Resistance,	$R_{\theta JA}$		°C/W
Junction to Ambient (Note 40)		369	
(Note 41)		306	
Junction and Storage Temperature Range	T_J, T_{stg}	−55 to +150	°C

37. FR−4 @ Minimum Pad.
38. FR−4 @ 1.0 × 1.0 Inch Pad.
39. Both junction heated values assume total power is sum of two equally powered channels.
40. FR−4 @ 100 mm^2, 1 oz. copper traces, still air.
41. FR−4 @ 500 mm^2, 1 oz. copper traces, still air.

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

Characteristic	Symbol	Min	Typ	Max	Unit
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}	–	–	1.5	mAdc
Collector-Base Breakdown Voltage (I_C = 10 μA, I_E = 0)	$V_{(BR)CBO}$	50	–	–	Vdc
Collector-Emitter Breakdown Voltage (Note 42) (I_C = 2.0 mA, I_B = 0)	$V_{(BR)CEO}$	50	–	–	Vdc
ON CHARACTERISTICS					
DC Current Gain (Note 42) (I_C = 5.0 mA, V_{CE} = 10 V)	h_{FE}	15	30	–	
Collector-Emitter Saturation Voltage (Note 42) (I_C = 10 mA, I_B = 1.0 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 = 20 mA)	$V_{i(on)}$	–	2.4	–	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 = 0.25 V, R_L = 1.0 kΩ)	V_{OH}	4.9	–	–	Vdc
Input Resistor	R1	3.3	4.7	6.1	kΩ
Resistor Ratio	R_1/R_2	0.8	1.0	1.2	

42. Pulsed Condition: Pulse Width = 300 ms, Duty Cycle ≤ 2%.

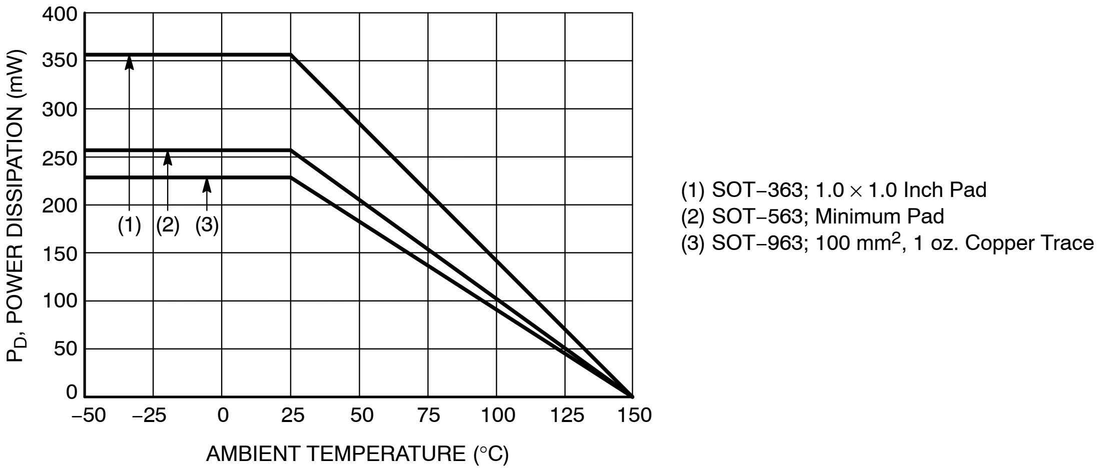


Figure 98. Derating Curve

TYPICAL CHARACTERISTICS
MUN5232DW1, NSBC143EDXV6

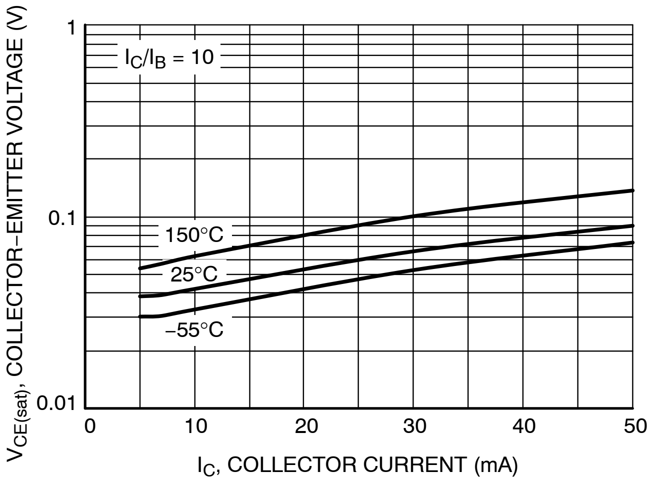


Figure 99. $V_{CE(sat)}$, vs. I_C

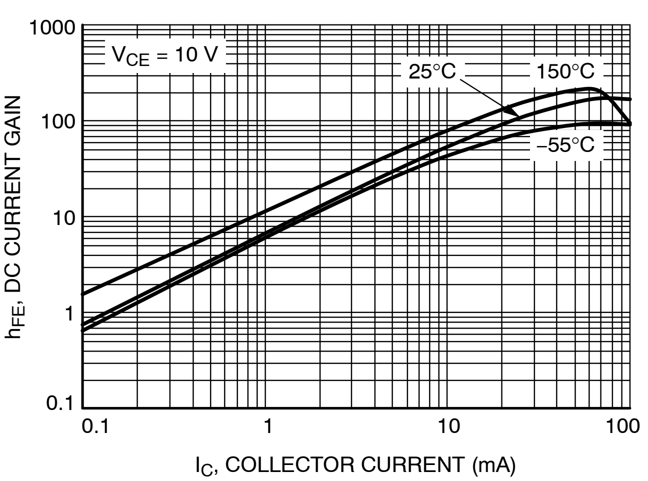


Figure 100. DC Current Gain

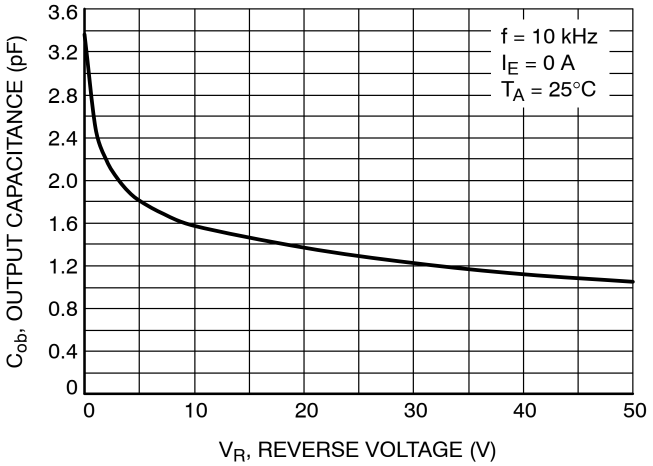


Figure 101. Output Capacitance

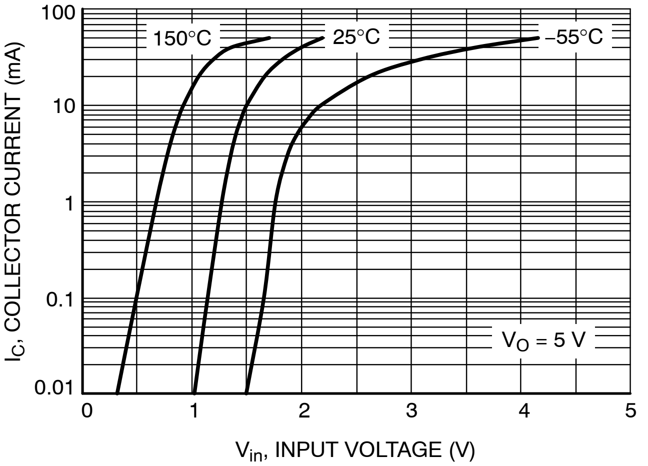


Figure 102. Output Current vs. Input Voltage

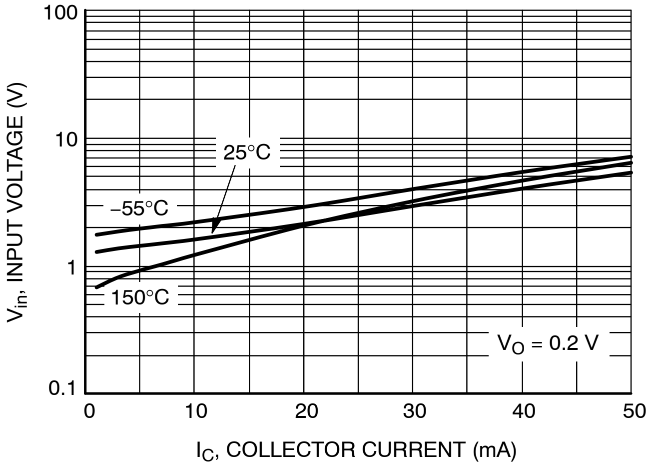


Figure 103. Input Voltage vs. Output Current

TYPICAL CHARACTERISTICS
NSBC143EDP6

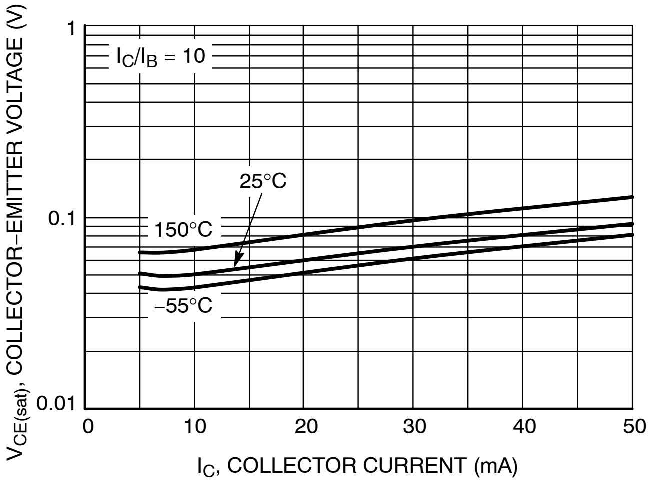


Figure 104. $V_{CE(sat)}$, vs. I_C

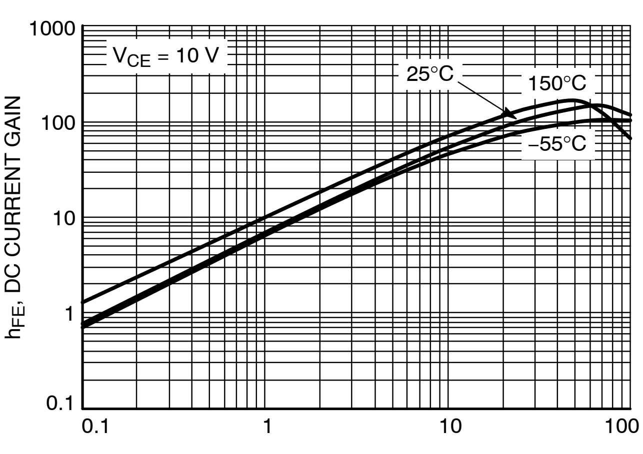


Figure 105. DC Current Gain

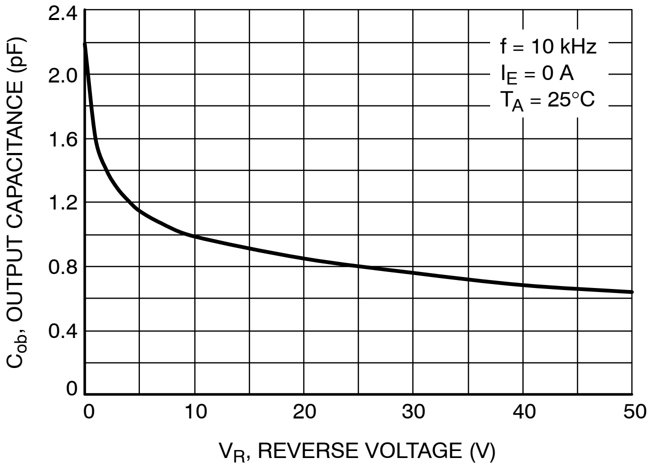


Figure 106. Output Capacitance

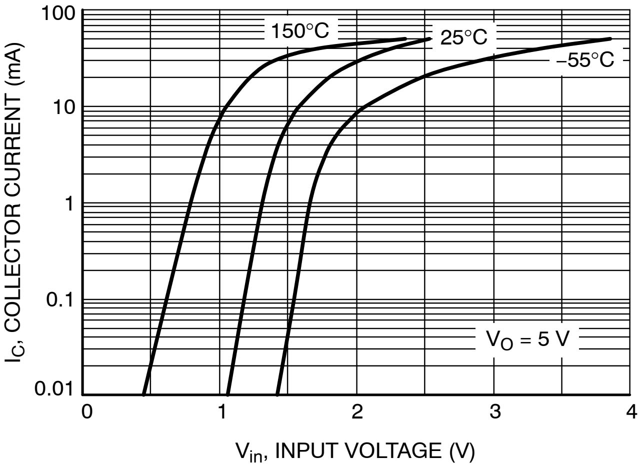


Figure 107. Output Current vs. Input Voltage

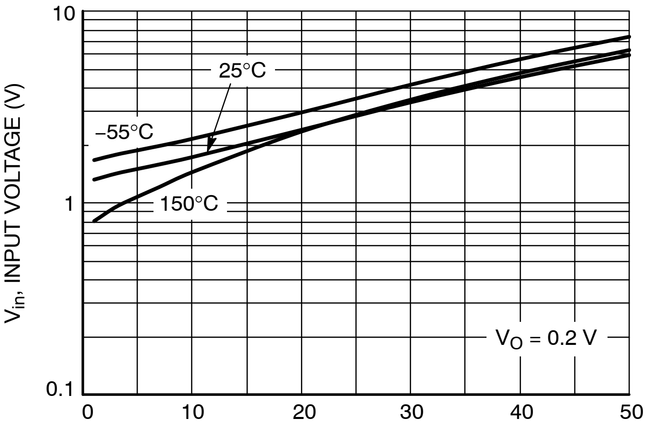
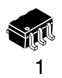


Figure 108. Input Voltage vs. Output Current

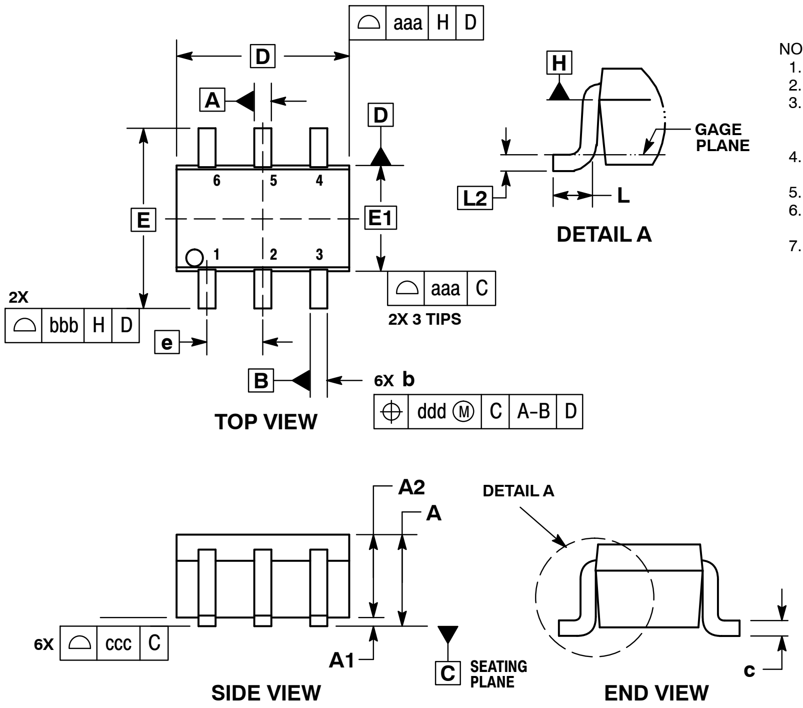
MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS



SCALE 2:1

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

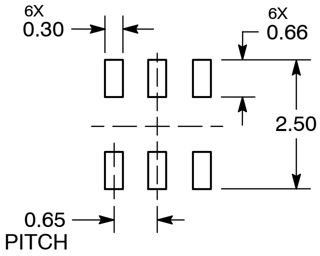
DATE 11 DEC 2012



NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. 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.
4. DIMENSIONS D AND E1 AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY AND DATUM H.
5. DATUMS A AND B ARE DETERMINED AT DATUM H.
6. DIMENSIONS b AND c APPLY TO THE FLAT SECTION OF THE LEAD BETWEEN 0.08 AND 0.15 FROM THE TIP.
7. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 TOTAL IN EXCESS OF DIMENSION b AT MAXIMUM MATERIAL CONDITION. THE DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OF THE FOOT.

	MILLIMETERS			INCHES		
DIM	MIN	NOM	MAX	MIN	NOM	MAX
A	−−−	−−−	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
C	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
e	0.65 BSC			0.026 BSC		
L	0.26	0.36	0.46	0.010	0.014	0.018
L2	0.15 BSC			0.006 BSC		
aaa	0.15			0.006		
bbb	0.30			0.012		
ccc	0.10			0.004		
ddd	0.10			0.004		

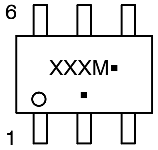
RECOMMENDED SOLDERING FOOTPRINT*



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.

GENERIC MARKING DIAGRAM*



XXX = Specific Device Code
M = 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

DOCUMENT NUMBER:	**98ASB42985B**	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped “CONTROLLED COPY” in red.
DESCRIPTION:	**SC−88/SC70−6/SOT−363**	**PAGE 1 OF 2**

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

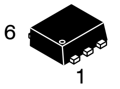
STYLE 27:
PIN 1. BASE 2
2. BASE 1
3. COLLECTOR 1
4. EMITTER 1
5. EMITTER 2
6. COLLECTOR 2

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.

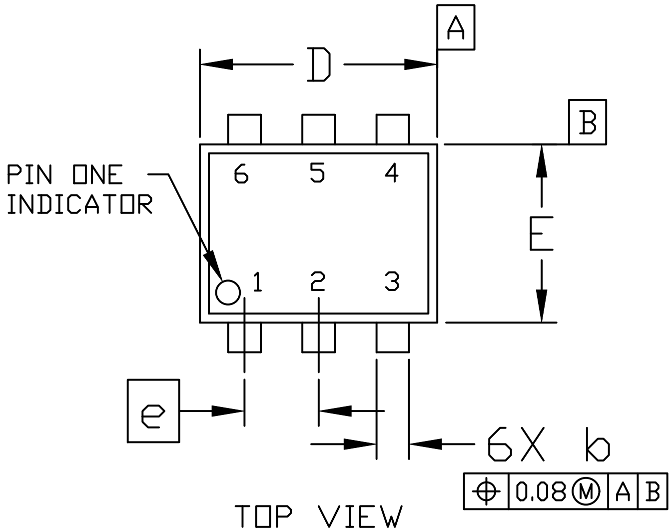


SCALE 4:1

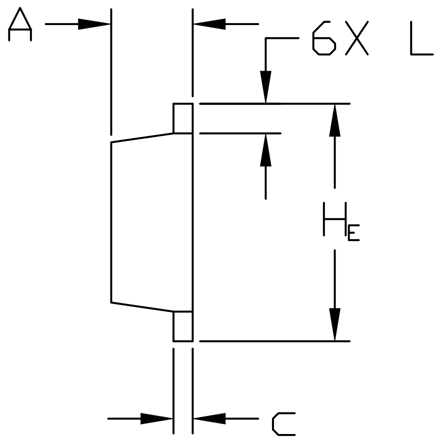
SOT−563, 6 LEAD
CASE 463A
ISSUE H

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.

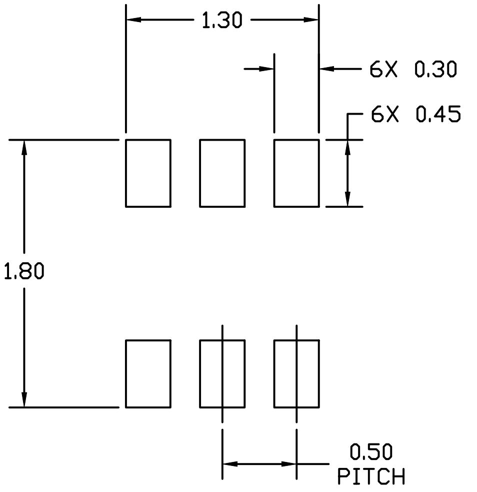


TOP VIEW



SIDE VIEW

	MILLIMETERS		
DIM	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



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.

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

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

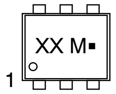
STYLE 8:
PIN 1. DRAIN
2. DRAIN
3. GATE
4. SOURCE
5. DRAIN
6. DRAIN

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.

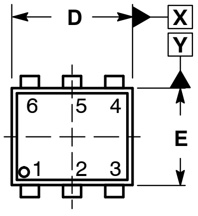
MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS

ON Semiconductor®

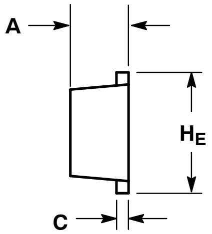
SOT−963
CASE 527AD−01
ISSUE E

SCALE 4:1

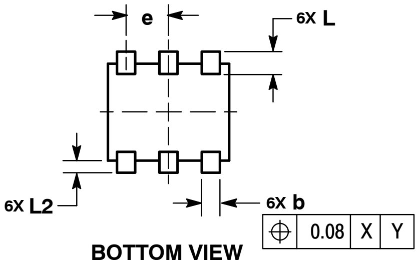
DATE 09 FEB 2010



TOP VIEW



SIDE VIEW

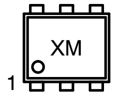


BOTTOM VIEW

NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

	MILLIMETERS		
DIM	**MIN**	**NOM**	**MAX**
A	0.34	0.37	0.40
b	0.10	0.15	0.20
C	0.07	0.12	0.17
D	0.95	1.00	1.05
E	0.75	0.80	0.85
e		0.35 BSC	
H_E	0.95	1.00	1.05
L		0.19 REF	
L2	0.05	0.10	0.15

GENERIC MARKING DIAGRAM*



X = Specific Device Code
M = Month Code

*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.

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. 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
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

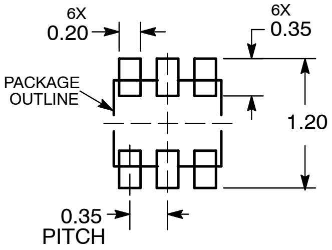
STYLE 7:
PIN 1. CATHODE
2. ANODE
3. CATHODE
4. CATHODE
5. ANODE
6. CATHODE

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

RECOMMENDED MOUNTING FOOTPRINT



DIMENSIONS: MILLIMETERS

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