

Dual PNP Bias Resistor Transistors

R1 = 2.2 k Ω , R2 = 47 k Ω

PNP Transistors with Monolithic Bias Resistor Network

MUN5135DW1, NSBA123JDXV6, NSBA123JDP6

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
- 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	$V_{IN(fwd)}$	12	Vdc
Input Reverse Voltage	V _{IN(rev)}	5	Vdc

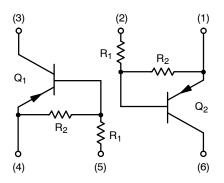
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

ORDERING INFORMATION

Device	Package	Shipping [†]
MUN5135DW1T1G, NSVMUN5135DW1T1G	SOT-363	3,000 / Tape & Reel
NSBA123JDXV6T1G	SOT-563	4,000 / Tape & Reel
NSBA123JDXV6T5G	SOT-563	8,000 / Tape & Reel
NSBA123JDP6T5G	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.

PIN CONNECTIONS



MARKING DIAGRAMS





SOT-363 CASE 419B





SOT-563 CASE 463A





SOT-963 CASE 527AD

0M/P = 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.

THERMAL CHARACTERISTICS

	Characteristic	Symbol	Max	Unit
MUN5135DW1 (SOT-363) On	e Junction Heated			
Total Device Dissipation $T_A = 25^{\circ}C \qquad \text{(Note 1)}$ (Note 2) Derate above 25°C (Note 2)	(Note 1)	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
MUN5135DW1 (SOT-363) Bo	th Junction Heated (Note 3)			
Total Device Dissipation T _A = 25°C (Note 1) (Note 2) Derate above 25°C (Note 2)	(Note 1)	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 2)	(Note 1)	$R_{ heta JL}$	188 208	°C/W
Junction and Storage Temper	ature Range	T _J , T _{stg}	-55 to +150	°C
NSBA123JDXV6 (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)	$R_{ hetaJA}$	350	°C/W
NSBA123JDXV6 (SOT-563) E	Both Junction Heated (Note 3)	•		
Total Device Dissipation T _A = 25°C (Note 1) Derate above 25°C	(Note 1)	P _D	500 4.0	mW mW/°C
Thermal Resistance, Junction to Ambient	(Note 1)	$R_{ heta JA}$	250	°C/W
Junction and Storage Temper	ature Range	T _J , T _{stg}	-55 to +150	°C
NSBA123JDP6 (SOT-963) Or	ne Junction Heated			
Total Device Dissipation T _A = 25°C (Note 4) (Note 5) Derate above 25°C (Note 5)	(Note 4)	P _D	231 269 1.9 2.2	mW mW/°C
Thermal Resistance, Junction to Ambient	(Note 4) (Note 5)	$R_{ heta JA}$	540 464	°C/W
NSBA123JDP6 (SOT-963) Bo	oth Junction Heated (Note 3)	<u> </u>	I	
Total Device Dissipation $T_A = 25^{\circ}C \qquad \text{(Note 4)}$ (Note 5) Derate above 25°C (Note 5)	(Note 4)	P _D	339 408 2.7 3.3	mW mW/°C
Thermal Resistance, Junction to Ambient	(Note 4) (Note 5)	$R_{ heta JA}$	369 306	°C/W
Junction and Storage Temper	ature 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.
 FR-4 @ 100 mm², 1 oz. copper traces, still air.
 FR-4 @ 500 mm², 1 oz. copper traces, still air.

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

Characteristic	Symbol	Min	Тур	Max	Unit
OFF CHARACTERISTICS	•	•	•	•	
Collector–Base Cutoff Current $(V_{CB} = 50 \text{ V}, I_E = 0)$	Ісво	_	_	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}	_	_	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 mA, I _B = 0)	V _(BR) CEO	50	_	-	Vdc
ON CHARACTERISTICS					
DC Current Gain (Note 6) (I _C = 5.0 mA, V _{CE} = 10 V)	h _{FE}	80	140	_	
Collector–Emitter Saturation Voltage (Note 6) (I _C = 10 mA, I _B = 0.3 mA)	V _{CE(sat)}	_	_	0.25	Vdc
Input Voltage (off) ($V_{CE} = 5.0 \text{ V}, I_{C} = 100 \mu\text{A}$)	V _{i(off)}	_	0.6	-	Vdc
Input Voltage (on) $(V_{CE} = 0.2 \text{ V, } I_{C} = 5.0 \text{ mA})$	V _{i(on)}	_	0.8	-	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) ($V_{CC} = 5.0 \text{ V}, V_B = 0.5 \text{ V}, R_L = 1.0 \text{ k}\Omega$)	V _{OH}	4.9	_	_	Vdc
Input Resistor	R1	1.5	2.2	2.9	kΩ
Resistor Ratio	R ₁ /R ₂	0.038	0.047	0.056	

^{6.} Pulsed Condition: Pulse Width = 300 msec, Duty Cycle \leq 2%.

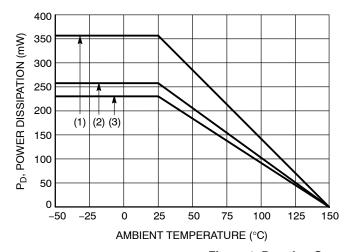
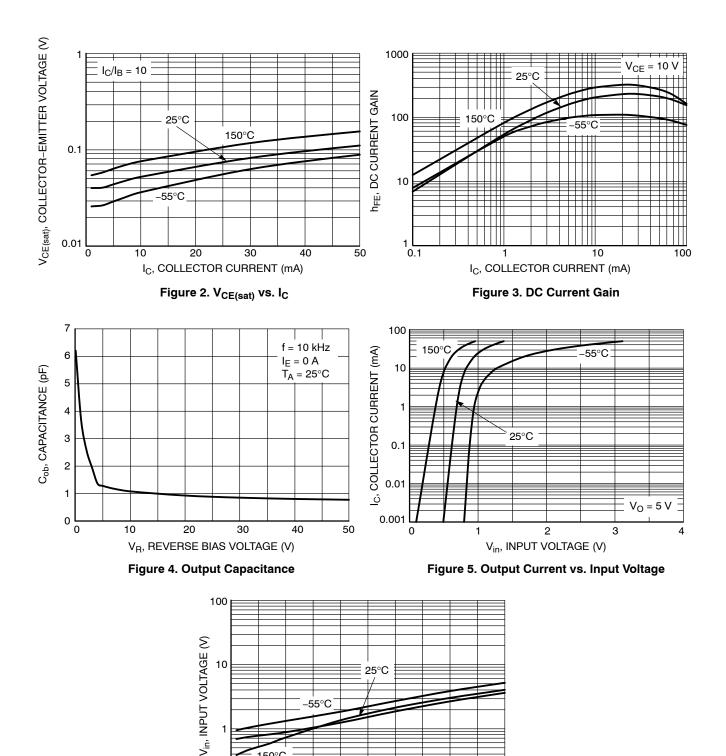


Figure 1. Derating Curve

- (1) SOT-363; 1.0 x 1.0 inch Pad
- (2) SOT-563; Minimum Pad
- (3) SOT-963; 100 mm², 1 oz. copper trace

TYPICAL CHARACTERISTICS MUN5135DW1, NSBA123JDXV6



I_C, COLLECTOR CURRENT (mA) Figure 6. Input Voltage vs. Output Current

 $V_0 = 0.2 V$

50

150°C

0.1

TYPICAL CHARACTERISTICS NSBA123JDP6

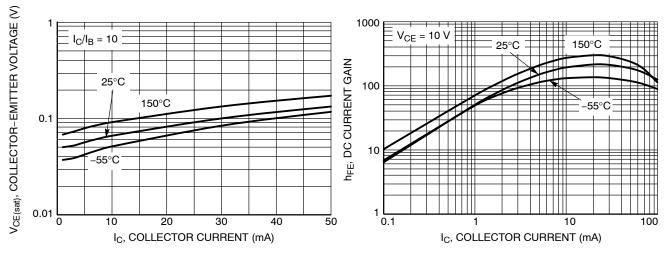


Figure 7. $V_{CE(sat)}$ vs. I_{C}

Figure 8. DC Current Gain

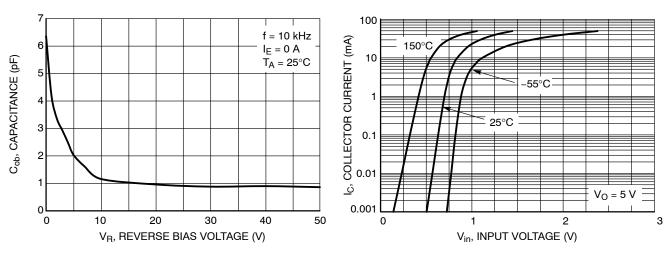


Figure 9. Output Capacitance

Figure 10. Output Current vs. Input Voltage

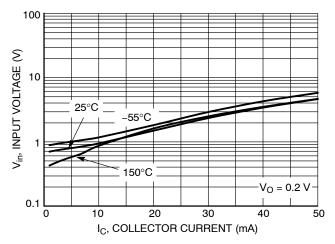
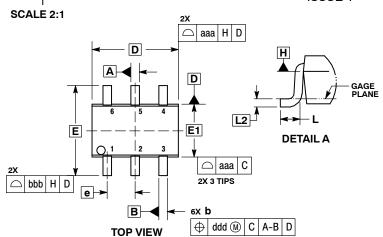


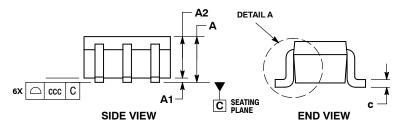
Figure 11. Input Voltage vs. Output Current



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.
- CONTROLLING DIMENSION: MILLIMETERS.
 DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH,
- 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. DIMENSIONS b AND B ARE DETERMINED AT DATUM H. DIMENSIONS b 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 6 AT MAXIMUM MATERIAL CONDITION. THE DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OF THE FOOT.

	MIL	LIMETE	ERS		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

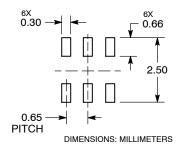
= Date Code*

= 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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DESCRIPTION:	SC-88/SC70-6/SOT-363		PAGE 1 OF 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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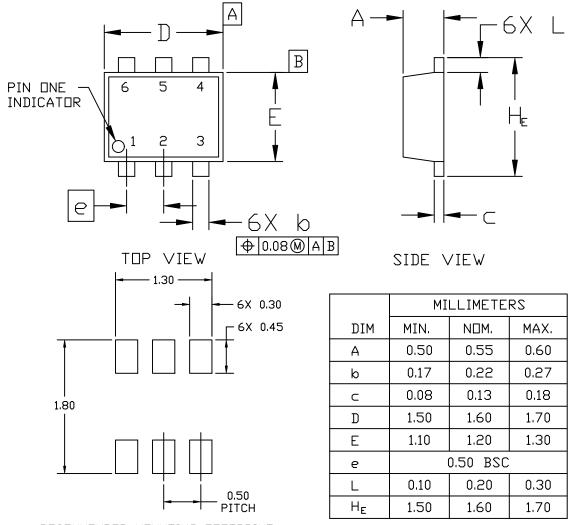


SOT-563, 6 LEAD CASE 463A ISSUE H

DATE 26 JAN 2021

NOTES:

- 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 IIN Semiconductor Soldering and Mounting Techniques Reference Manual, SILDERRM/D.

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MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



SOT-563, 6 LEAD CASE 463A

ISSUE H

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. 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 5: PIN 1. CATHODE 2. CATHODE 3. ANODE 4. ANODE 5. CATHODE 6. CATHODE	
	STYLE 8: PIN 1. DRAIN 2. DRAIN 3. GATE 4. SDURCE 5. DRAIN 6. DRAIN	
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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SCALE 4:1

SOT-963 CASE 527AD **ISSUE E**

DATE 09 FEB 2010



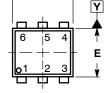
NOTES:

BASE MATERIAL.

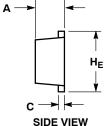
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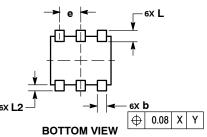
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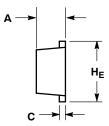
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TOP VIEW







RECOMMENDED **MOUNTING FOOTPRINT***

 DIMENSIONING AND TOLERANCING PER ASME THICKNESS MINIMUM LEAD

THICKNESS IS THE MINIMUM THICKNESS OF

DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

MILLIMETERS DIM MIN NOM MAX

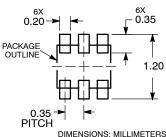
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> 0.95
> 1.00
> 1.05
>
>
> 0.75
> 0.80
> 0.85

0.35 BSC

0.95 1.00 1.05 0.19 REF **L2** 0.05 0.10 0.15

 A
 0.34
 0.37
 0.40

 b
 0.10
 0.15
 0.20



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

6X L2

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

3. BASE 4. EMITTER

3. CATHODE 2 4. ANODE 2

6. ANODE 1

2. EMITTER2 3. BASE 2 4. COLLECTOR 2 5. BASE 1 6. COLLECTOR 1

STYLE 2:

PIN 1. EMITTER 1

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

5. COLLECTOR 6. COLLECTOR STYLE 7: PIN 1. CATHODE 2. ANODE 3. CATHODE STYLE 8: PIN 1. DRAIN 2. DRAIN 3. GATE 4. CATHODE SOURCE 5. ANODE 6. CATHODE DRAIN DRAIN STYLE 10: PIN 1. CATHODE 1 2. N/C

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 4. SOURCE 2 5. GATE 2 6. DRAIN 1

STYLE 3:

PIN 1. CATHODE 1

2. CATHODE 1

3. ANODE/ANODE 2 4. CATHODE 2

5. CATHODE 2 6. ANODE/ANODE 1

GENERIC MARKING DIAGRAM*



Χ = Specific Device Code = 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. Some products may not follow the Generic Marking.

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