

# MPSW45, MPSW45A

## One Watt Darlington Transistors

### NPN Silicon

#### Features

- Pb-Free Packages are Available\*

#### MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector - Emitter Voltage MPSW45 MPSW45A	$V_{CES}$	40 50	Vdc
Collector - Base Voltage MPSW45 MPSW45A	$V_{CBO}$	50 60	Vdc
Emitter - Base Voltage	$V_{EBO}$	12	Vdc
Collector Current - Continuous	$I_C$	1.0	Adc
Total Device Dissipation @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	1.0 8.0	W mW/ $^\circ\text{C}$
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	2.5 20	W mW/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	$T_J, T_{stg}$	-55 to +150	$^\circ\text{C}$

#### THERMAL CHARACTERISTICS

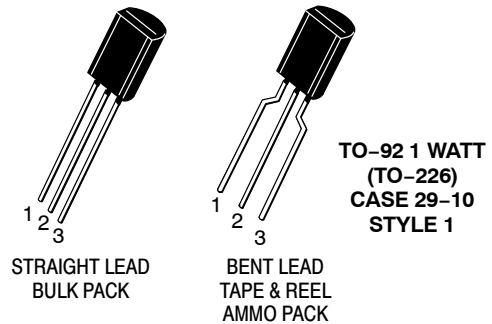
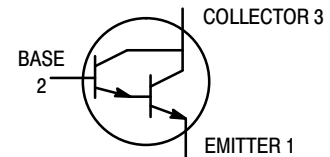
Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	125	$^\circ\text{C}/\text{W}$
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	50	$^\circ\text{C}/\text{W}$

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

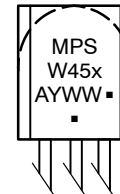


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#### MARKING DIAGRAM



MPSW45x = Device Code  
 x = 45A Devices  
 A = Assembly Location  
 Y = Year  
 WW = Work Week  
 ■ = Pb-Free Package

(Note: Microdot may be in either location)

#### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 5 of this data sheet.

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

# MPSW45, MPSW45A

## ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C unless otherwise noted)

Characteristic		Symbol	Min	Max	Unit
<b>OFF CHARACTERISTICS</b>					
Collector – Emitter Breakdown Voltage (I <sub>C</sub> = 100 μAdc, V <sub>BE</sub> = 0)	MPSW45 MPSW45A	V <sub>(BR)CES</sub>	40 50	– –	Vdc
Collector – Base Breakdown Voltage (I <sub>C</sub> = 100 μAdc, I <sub>E</sub> = 0)	MPSW45 MPSW45A	V <sub>(BR)CBO</sub>	50 60	– –	Vdc
Emitter – Base Breakdown Voltage (I <sub>E</sub> = 10 μAdc, I <sub>C</sub> = 0)		V <sub>(BR)EBO</sub>	12	–	Vdc
Collector Cutoff Current (V <sub>CB</sub> = 30 Vdc, I <sub>E</sub> = 0) (V <sub>CB</sub> = 40 Vdc, I <sub>E</sub> = 0)	MPSW45 MPSW45A	I <sub>CBO</sub>	– –	100 100	nAdc
Emitter Cutoff Current (V <sub>EB</sub> = 10 Vdc, I <sub>C</sub> = 0)		I <sub>EBO</sub>	–	100	nAdc

## ON CHARACTERISTICS (Note 1)

DC Current Gain (I <sub>C</sub> = 200 mAdc, V <sub>CE</sub> = 5.0 Vdc) (I <sub>C</sub> = 500 mAdc, V <sub>CE</sub> = 5.0 Vdc) (I <sub>C</sub> = 1.0 Adc, V <sub>CE</sub> = 5.0 Vdc)		h <sub>FE</sub>	25,000 15,000 4,000	150,000 – –	–
Collector – Emitter Saturation Voltage (I <sub>C</sub> = 1.0 Adc, I <sub>B</sub> = 2.0 mAdc)		V <sub>CE(sat)</sub>	–	1.5	Vdc
Base – Emitter Saturation Voltage (I <sub>C</sub> = 1.0 Adc, I <sub>B</sub> = 2.0 mAdc)		V <sub>BE(sat)</sub>	–	2.0	Vdc
Base – Emitter On Voltage (I <sub>C</sub> = 1.0 Adc, V <sub>CE</sub> = 5.0 Vdc)		V <sub>BE(on)</sub>	–	2.0	Vdc

## SMALL-SIGNAL CHARACTERISTICS

Current – Gain – Bandwidth Product (I <sub>C</sub> = 200 mAdc, V <sub>CE</sub> = 5.0 Vdc, f = 100 MHz)		f <sub>T</sub>	100	–	MHz
Collector – Base Capacitance (V <sub>CB</sub> = 10 Vdc, I <sub>E</sub> = 0, f = 1.0 MHz)		C <sub>cb</sub>	–	6.0	pF

1. Pulse Test: Pulse Width ≤ 300 μs; Duty Cycle ≤ 2.0%.

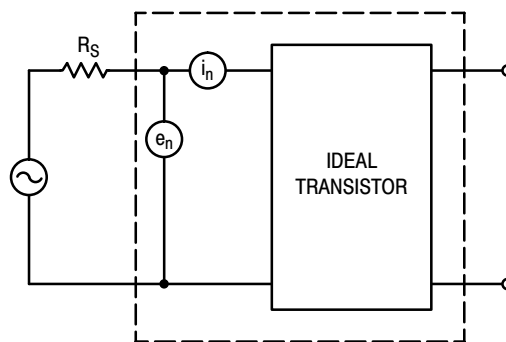


Figure 1. Transistor Noise Model

# MPSW45, MPSW45A

## NOISE CHARACTERISTICS

( $V_{CE} = 5.0 \text{ Vdc}$ ,  $T_A = 25^\circ\text{C}$ )

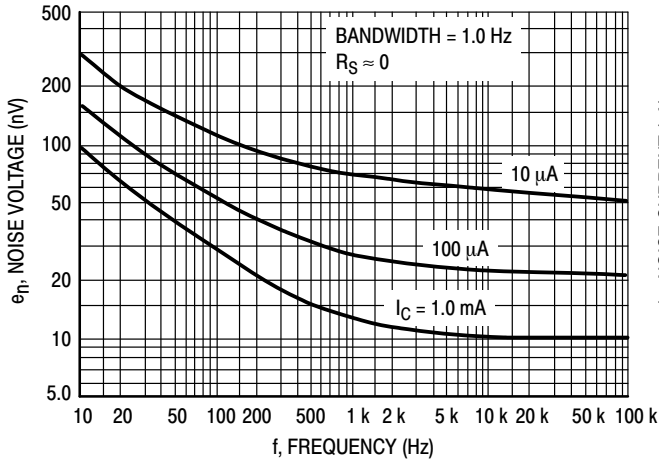


Figure 2. Noise Voltage

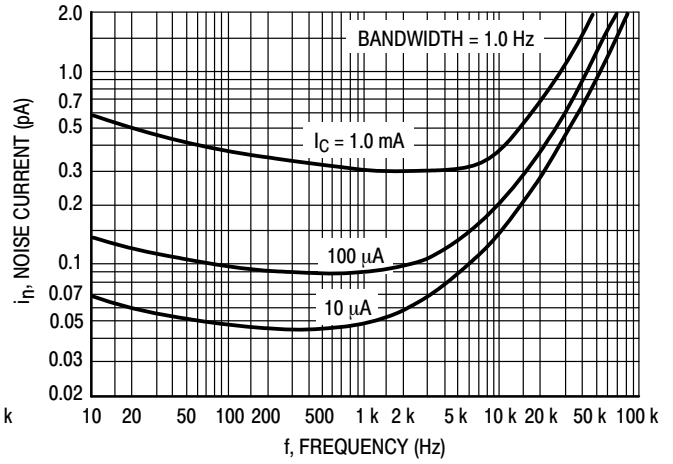


Figure 3. Noise Current

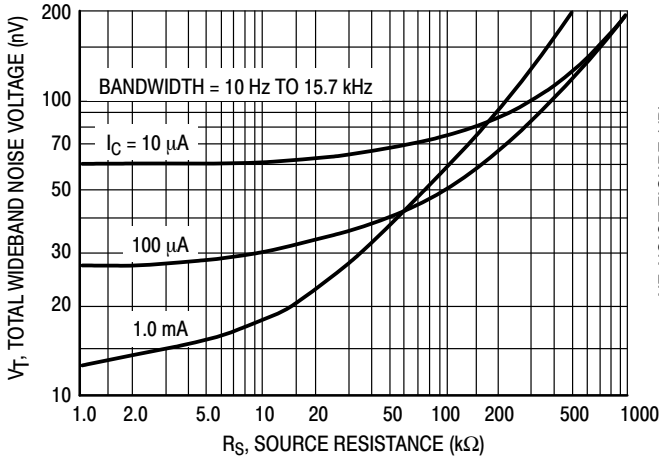


Figure 4. Total Wideband Noise Voltage

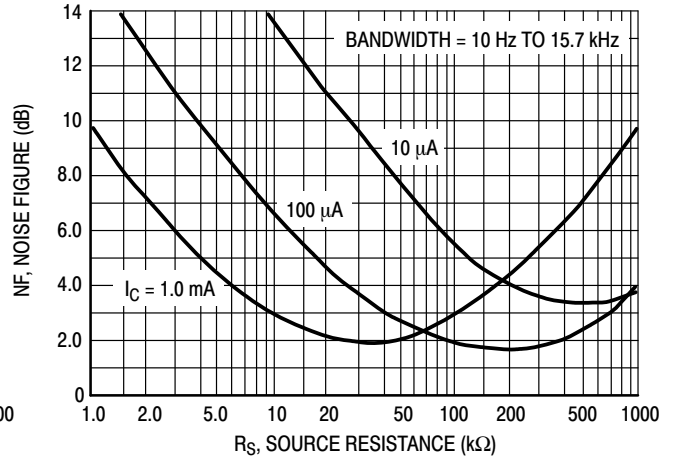


Figure 5. Wideband Noise Figure

# MPSW45, MPSW45A

## SMALL-SIGNAL CHARACTERISTICS

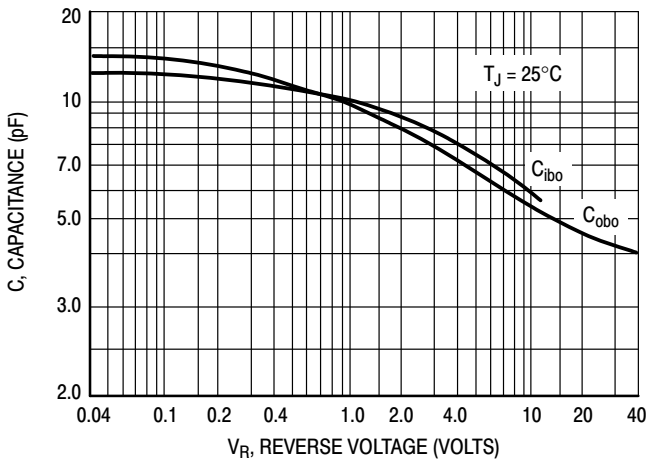


Figure 6. Capacitance

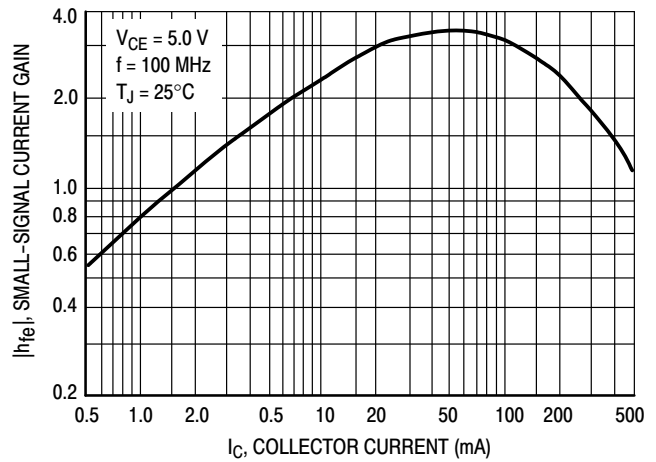


Figure 7. High Frequency Current Gain

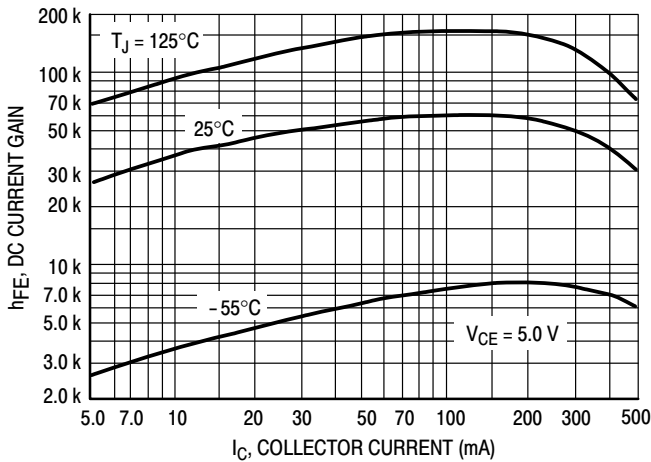


Figure 8. DC Current Gain

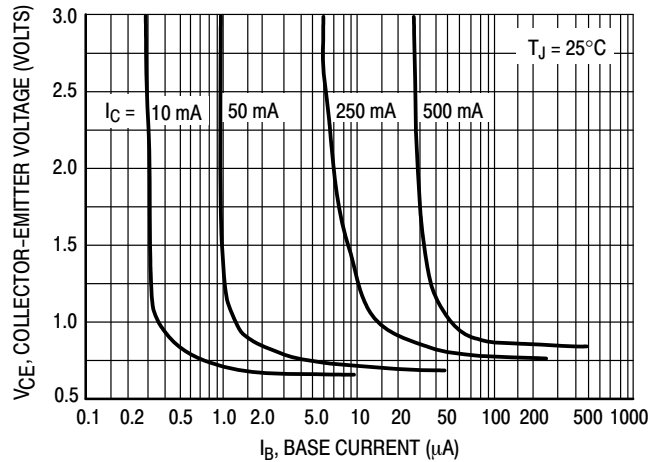


Figure 9. Collector Saturation Region

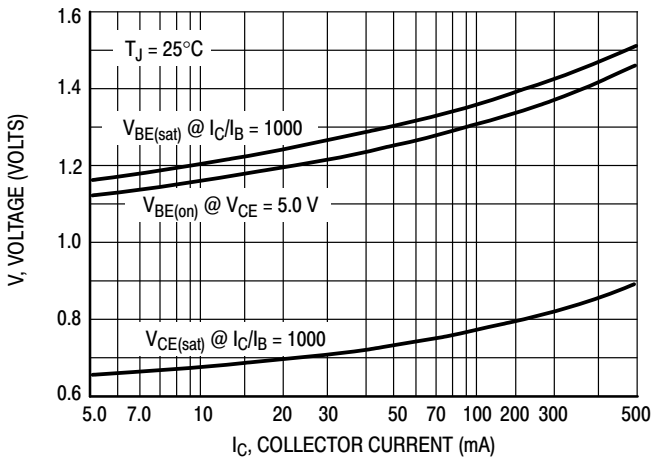


Figure 10. "On" Voltages

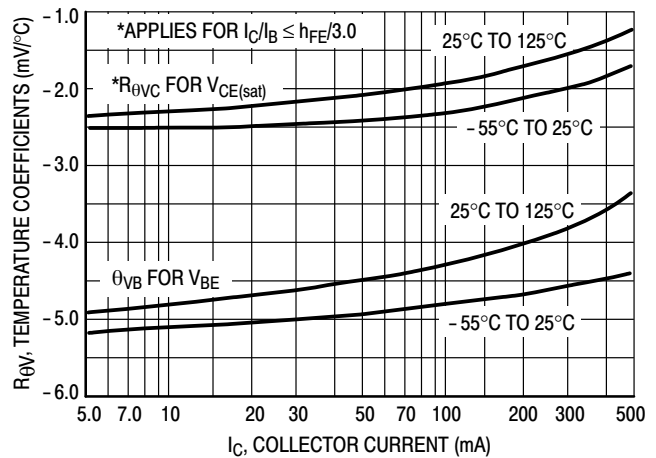


Figure 11. Temperature Coefficients

# MPSW45, MPSW45A

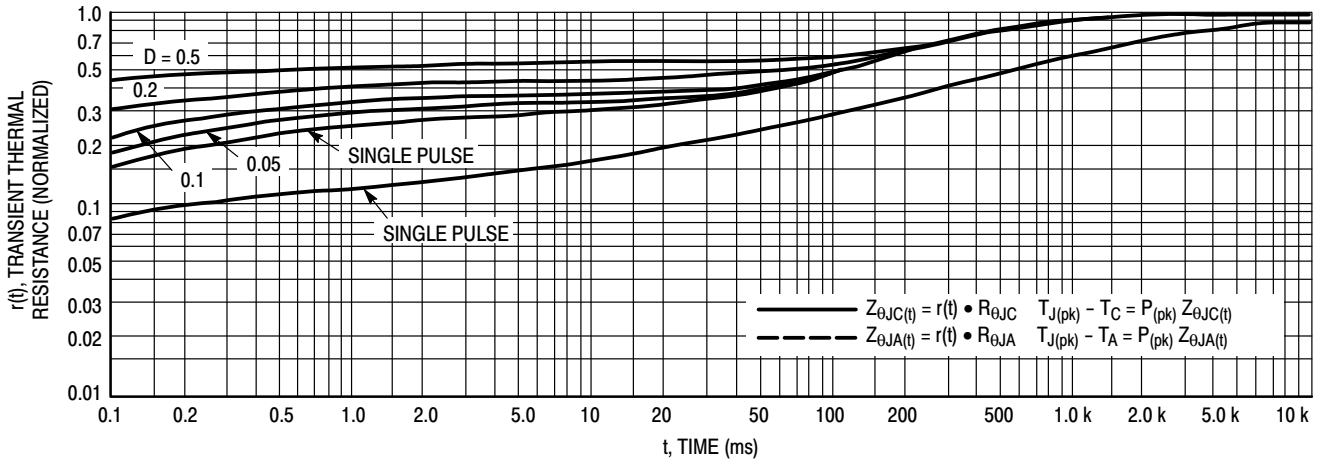


Figure 12. Thermal Response

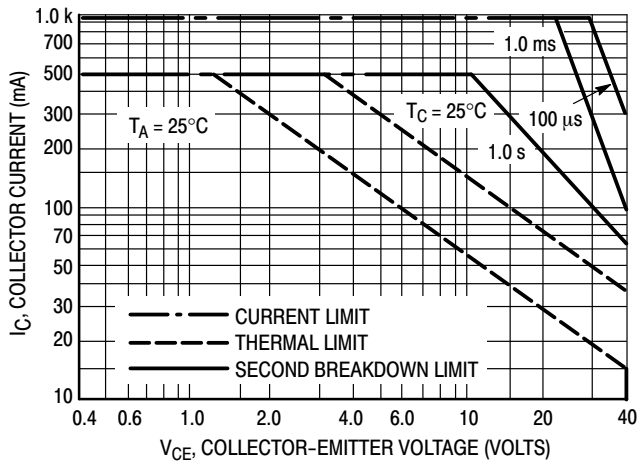
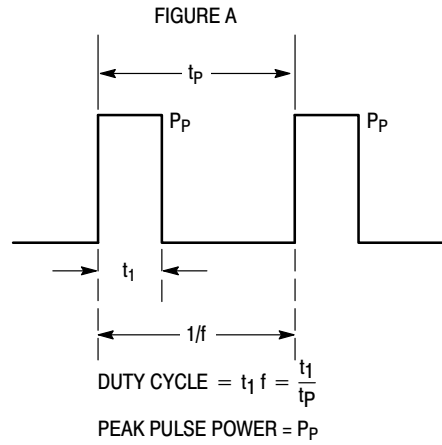


Figure 13. Active Region Safe Operating Area



Design Note: Use of Transient Thermal Resistance Data

## ORDERING INFORMATION

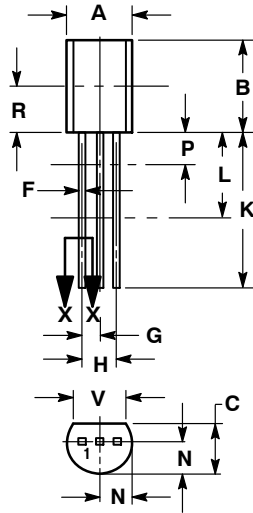
Device	Package	Shipping†
MPSW45G	TO-92 (Pb-Free)	5,000 Units / Box
MPSW45RLREG	TO-92 (Pb-Free)	2,000 / Tape & Reel
MPSW45A	TO-92	5,000 Units / Box
MPSW45AG	TO-92 (Pb-Free)	5,000 Units / Box
MPSW45ARLRA	TO-92	2,000 / Tape & Reel
MPSW45ARLRAG	TO-92 (Pb-Free)	2,000 / Tape & Reel
MPSW45AZL1	TO-92	2,000 / Ammo Pack
MPSW45AZL1G	TO-92 (Pb-Free)	2,000 / Ammo Pack

†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.

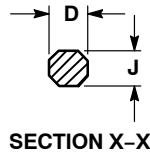
# MPSW45, MPSW45A

## PACKAGE DIMENSIONS

TO-92 (TO-226) 1 WATT  
CASE 29-10  
ISSUE O



STRAIGHT LEAD  
BULK PACK



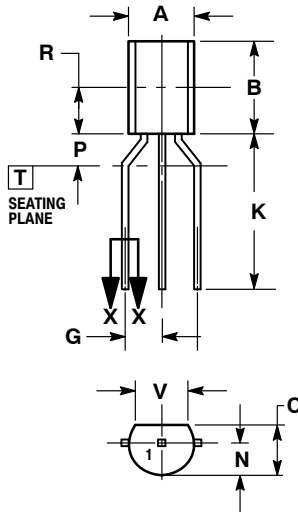
SECTION X-X

NOTES:

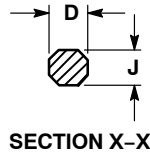
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1994.
2. CONTROLLING DIMENSION: INCHES.
3. CONTOUR OF PACKAGE BEYOND DIMENSION R IS UNCONTROLLED.
4. DIMENSION F APPLIES BETWEEN DIMENSIONS P AND L. DIMENSIONS D AND J APPLY BETWEEN DIMENSIONS L AND K MINIMUM. THE LEAD DIMENSIONS ARE UNCONTROLLED IN DIMENSION P AND BEYOND DIMENSION K MINIMUM.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.175	0.205	4.44	5.21
B	0.290	0.310	7.37	7.87
C	0.125	0.165	3.18	4.19
D	0.018	0.021	0.46	0.53
F	0.016	0.019	0.41	0.48
G	0.045	0.055	1.15	1.39
H	0.095	0.105	2.42	2.66
J	0.018	0.024	0.46	0.61
K	0.500	---	12.70	---
L	0.250	---	6.35	---
N	0.080	0.105	2.04	2.66
P	---	0.100	---	2.54
R	0.135	---	3.43	---
V	0.135	---	3.43	---

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



BENT LEAD  
TAPE & REEL  
AMMO PACK



SECTION X-X

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: INCHES.
3. CONTOUR OF PACKAGE BEYOND DIMENSION R IS UNCONTROLLED.
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DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
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B	0.290	0.310	7.37	7.87
C	0.125	0.165	3.18	4.19
D	0.018	0.021	0.46	0.53
G	0.094	0.102	2.40	2.80
J	0.018	0.024	0.46	0.61
K	0.500	---	12.70	---
N	0.080	0.105	2.04	2.66
P	---	0.100	---	2.54
R	0.135	---	3.43	---
V	0.135	---	3.43	---

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