

# ON Semiconductor

## Is Now

# onsemi™

To learn more about onsemi™, please visit our website at  
[www.onsemi.com](http://www.onsemi.com)

---

**onsemi** and **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** product/patent coverage may be accessed at [www.onsemi.com/site/pdf/Patent-Marking.pdf](http://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 actual 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. Other names and brands may be claimed as the property of others.

# MPSA28, MPSA29

MPSA29 is a Preferred Device

## Darlington Transistors

### NPN Silicon

#### Features

- Pb-Free Packages are Available\*

#### MAXIMUM RATINGS

Rating	Symbol	Value	Unit	
Collector-Emitter Voltage	MPSA28 MPSA29	$V_{CES}$	80 100	Vdc
Collector-Base Voltage	MPSA28 MPSA29	$V_{CBO}$	80 100	Vdc
Emitter-Base Voltage		$V_{EBO}$	12	Vdc
Collector Current - Continuous		$I_C$	500	mAdc
Total Device Dissipation @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$		$P_D$	625 5.0	mW mW/ $^\circ\text{C}$
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$		$P_D$	1.5 12	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	$R_{\theta JA}$	200	$^\circ\text{C}/\text{W}$
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	83.3	$^\circ\text{C}/\text{W}$

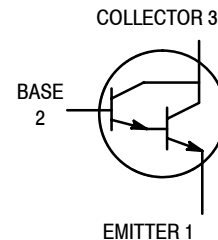
Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

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

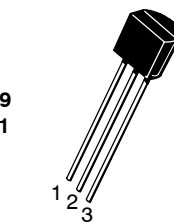


ON Semiconductor®

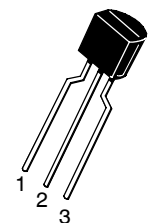
<http://onsemi.com>



TO-92  
CASE 29  
STYLE 1

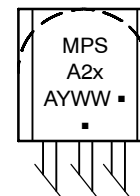


STRAIGHT LEAD  
BULK PACK



BENT LEAD  
TAPE & REEL  
AMMO PACK

#### MARKING DIAGRAM



- x = 8 or 9
- A = Assembly Location
- Y = Year
- WW = Work Week
- = Pb-Free Package

(Note: Microdot may be in either location)

#### ORDERING INFORMATION

Device	Package	Shipping
MPSA28RLRPG	TO-92 (Pb-Free)	2000/Ammo Pack
MPSA29G	TO-92 (Pb-Free)	5000 Units/Bulk
MPSA29RLRP	TO-92	2000/Ammo Pack
MPSA29RLRPG	TO-92 (Pb-Free)	2000/Ammo Pack

Preferred devices are recommended choices for future use and best overall value.

# MPSA28, MPSA29

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

Characteristic	Symbol	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>					
Collector-Emitter Breakdown Voltage (I <sub>C</sub> = 100 μAdc, V <sub>BE</sub> = 0)	MPSA28 MPSA29 V <sub>(BR)CES</sub>	80 100	- -	- -	Vdc
Collector-Base Breakdown Voltage (I <sub>C</sub> = 100 μAdc, I <sub>E</sub> = 0)	MPSA28 MPSA29 V <sub>(BR)CBO</sub>	80 100	- -	- -	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> = 60 Vdc, I <sub>E</sub> = 0) (V <sub>CB</sub> = 80 Vdc, I <sub>E</sub> = 0)	MPSA28 MPSA29 I <sub>CBO</sub>	- -	- -	100 100	nAdc
Collector Cutoff Current (V <sub>CE</sub> = 60 Vdc, V <sub>BE</sub> = 0) (V <sub>CE</sub> = 80 Vdc, V <sub>BE</sub> = 0)	MPSA28 MPSA29 I <sub>CES</sub>	- -	- -	500 500	nAdc
Emitter Cutoff Current (V <sub>EB</sub> = 10 Vdc, I <sub>C</sub> = 0)	I <sub>EBO</sub>	-	-	100	nAdc
<b>ON CHARACTERISTICS (Note 1)</b>					
DC Current Gain (I <sub>C</sub> = 10 mAdc, V <sub>CE</sub> = 5.0 Vdc) (I <sub>C</sub> = 100 mAdc, V <sub>CE</sub> = 5.0 Vdc)	h <sub>FE</sub>	10,000 10,000	- -	- -	-
Collector-Emitter Saturation Voltage (I <sub>C</sub> = 10 mAdc, I <sub>B</sub> = 0.01 mAdc) (I <sub>C</sub> = 100 mAdc, I <sub>B</sub> = 0.1 mAdc)	V <sub>CE(sat)</sub>	- -	0.7 0.8	1.2 1.5	Vdc
Base-Emitter On Voltage (I <sub>C</sub> = 100 mAdc, V <sub>CE</sub> = 5.0 Vdc)	V <sub>BE(on)</sub>	-	1.4	2.0	Vdc
<b>SMALL-SIGNAL CHARACTERISTICS</b>					
Current-Gain - Bandwidth Product (Note 2) (I <sub>C</sub> = 10 mAdc, V <sub>CE</sub> = 5.0 Vdc, f = 100 MHz)	f <sub>T</sub>	125	200	-	MHz
Output Capacitance (V <sub>CB</sub> = 10 Vdc, I <sub>E</sub> = 0, f = 1.0 MHz)	C <sub>obo</sub>	-	5.0	8.0	pF

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

2. f<sub>T</sub> = h<sub>fe</sub> • f<sub>test</sub>.

# MPSA28, MPSA29

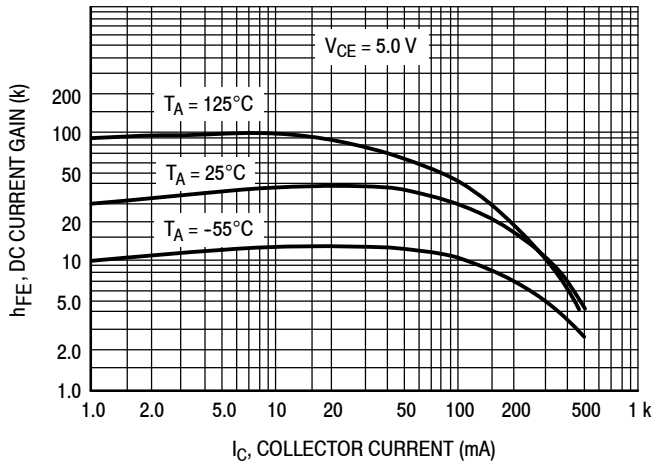


Figure 1. DC Current Gain

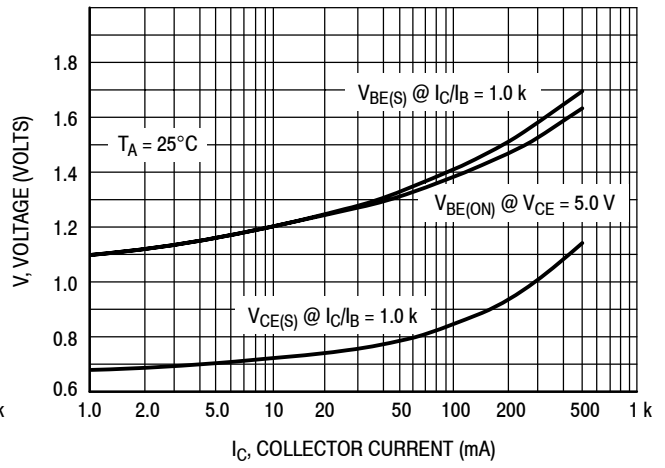


Figure 2. "ON" Voltages

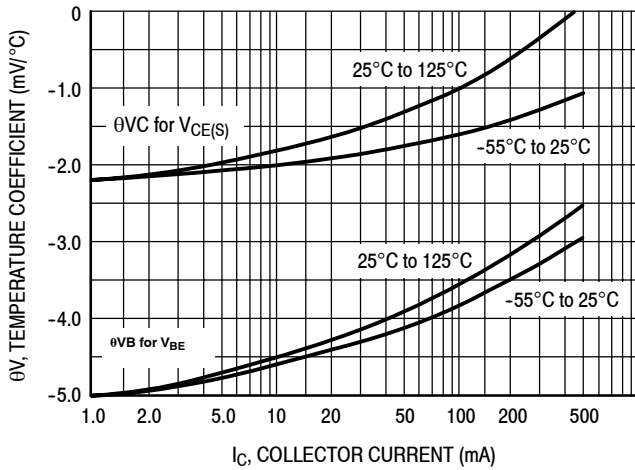


Figure 3. Temperature Coefficients

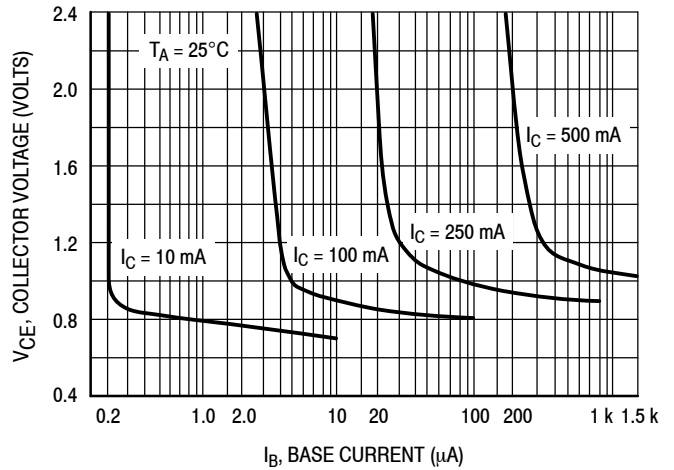


Figure 4. Collector Saturation Region

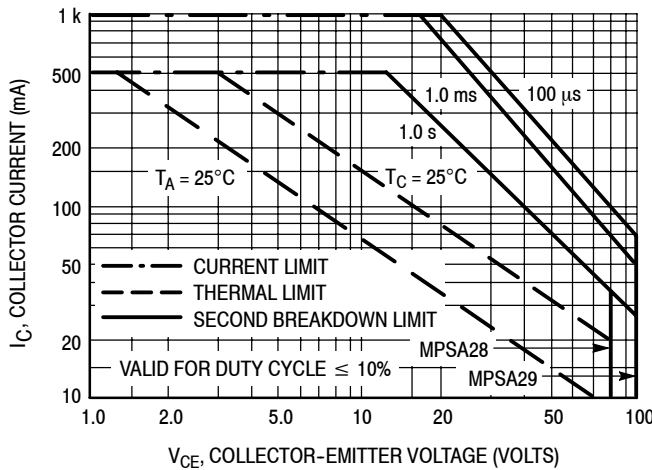


Figure 5. Active Region - Safe Operating Area

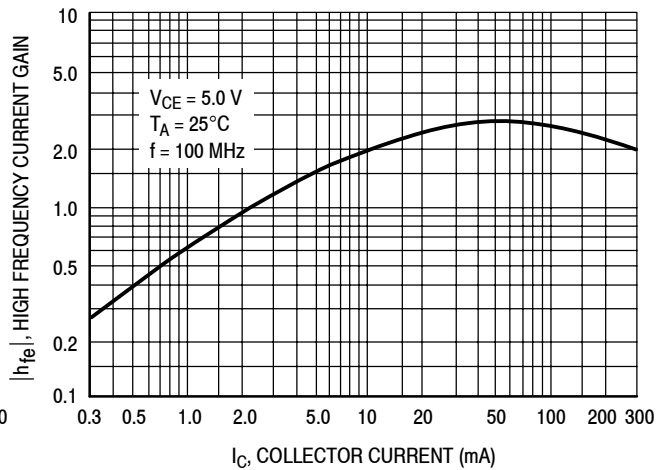
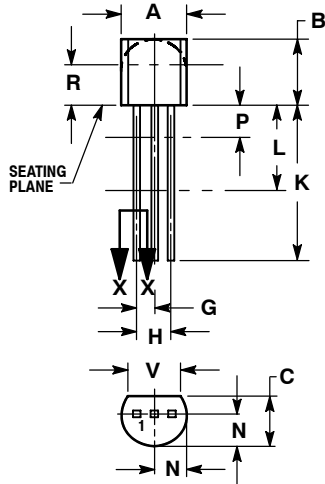


Figure 6. High Frequency Current Gain

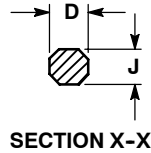
# MPSA28, MPSA29

## PACKAGE DIMENSIONS

TO-92 (TO-226)  
CASE 29-11  
ISSUE AM



STRAIGHT LEAD  
BULK PACK

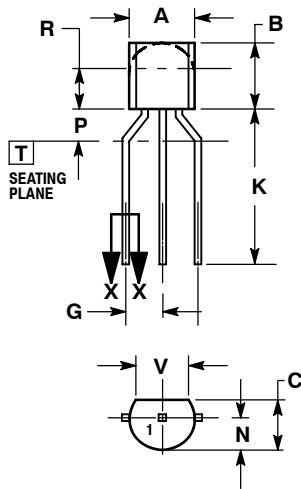


SECTION X-X

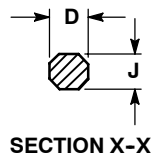
NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. CONTOUR OF PACKAGE BEYOND DIMENSION R IS UNCONTROLLED.
4. LEAD DIMENSION IS UNCONTROLLED IN P AND BEYOND DIMENSION K MINIMUM.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.175	0.205	4.45	5.20
B	0.170	0.210	4.32	5.33
C	0.125	0.165	3.18	4.19
D	0.016	0.021	0.407	0.533
G	0.045	0.055	1.15	1.39
H	0.095	0.105	2.42	2.66
J	0.015	0.020	0.39	0.50
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	0.115	---	2.93	---
V	0.135	---	3.43	---



BENT LEAD  
TAPE & REEL  
AMMO PACK



SECTION X-X

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. CONTOUR OF PACKAGE BEYOND DIMENSION R IS UNCONTROLLED.
4. LEAD DIMENSION IS UNCONTROLLED IN P AND BEYOND DIMENSION K MINIMUM.

DIM	MILLIMETERS	
	MIN	MAX
A	4.45	5.20
B	4.32	5.33
C	3.18	4.19
D	0.40	0.54
G	2.40	2.80
J	0.39	0.50
K	12.70	---
N	2.04	2.66
P	1.50	4.00
R	2.93	---
V	3.43	---

STYLE 1:

1. EMITTER
2. BASE
3. COLLECTOR

ON Semiconductor and are registered trademarks of Semiconductor Components Industries, LLC (SCILLC). SCILLC reserves the right to make changes without further notice to any products herein. SCILLC makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does SCILLC 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. "Typical" parameters which may be provided in SCILLC data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. SCILLC does not convey any license under its patent rights nor the rights of others. SCILLC products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the SCILLC product could create a situation where personal injury or death may occur. Should Buyer purchase or use SCILLC products for any such unintended or unauthorized application, Buyer shall indemnify and hold SCILLC 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 SCILLC was negligent regarding the design or manufacture of the part. SCILLC 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:

Literature Distribution Center for ON Semiconductor  
P.O. Box 5163, Denver, Colorado 80217 USA  
Phone: 303-675-2175 or 800-344-3860 Toll Free USA/Canada  
Fax: 303-675-2176 or 800-344-3867 Toll Free USA/Canada  
Email: [orderlit@onsemi.com](mailto:orderlit@onsemi.com)

N. American Technical Support: 800-282-9855 Toll Free  
USA/Canada  
Europe, Middle East and Africa Technical Support:  
Phone: 421 33 790 2910  
Japan Customer Focus Center  
Phone: 81-3-5773-3850

ON Semiconductor Website: [www.onsemi.com](http://www.onsemi.com)

Order Literature: <http://www.onsemi.com/orderlit>

For additional information, please contact your local Sales Representative