

# MPSA13, MPSA14

MPSA14 is a Preferred Device

## Darlington Transistors

### NPN Silicon

#### Features

- Pb-Free Packages are Available\*

#### MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector–Emitter Voltage	$V_{CES}$	30	Vdc
Collector–Base Voltage	$V_{CBO}$	30	Vdc
Emitter–Base Voltage	$V_{EBO}$	10	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	$^\circ\text{C}/\text{mW}$
Thermal Resistance, Junction-to–Case	$R_{\theta JC}$	83.3	$^\circ\text{C}/\text{mW}$

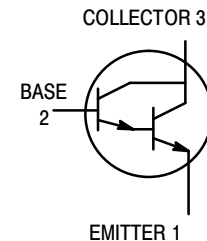
Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur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

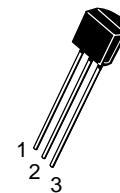


ON Semiconductor®

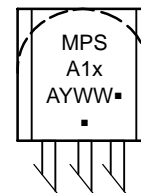
<http://onsemi.com>



#### MARKING DIAGRAM



TO-92  
(TO-226AA)  
CASE 29-11  
STYLE 1



x = 3 or 4  
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 2 of this data sheet.

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

# MPSA13, MPSA14

## ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
<b>OFF CHARACTERISTICS</b>				
Collector–Emitter Breakdown Voltage ( $I_C = 100 \mu\text{Adc}$ , $I_B = 0$ )	$V_{(BR)CES}$	30	–	Vdc
Collector Cutoff Current ( $V_{CB} = 30 \text{ Vdc}$ , $I_E = 0$ )	$I_{CBO}$	–	100	nAdc
Emitter Cutoff Current ( $V_{EB} = 10 \text{ Vdc}$ , $I_C = 0$ )	$I_{EBO}$	–	100	nAdc

## ON CHARACTERISTICS (Note 1)

DC Current Gain ( $I_C = 10 \text{ mAdc}$ , $V_{CE} = 5.0 \text{ Vdc}$ )	MPSA13 MPSA14	$h_{FE}$	5,000	–	–
( $I_C = 100 \text{ mAdc}$ , $V_{CE} = 5.0 \text{ Vdc}$ )			10,000	–	–
Collector–Emitter Saturation Voltage ( $I_C = 100 \text{ mAdc}$ , $I_B = 0.1 \text{ mAdc}$ )	MPSA13 MPSA14	$V_{CE(sat)}$	–	1.5	Vdc
Base–Emitter On Voltage ( $I_C = 100 \text{ mAdc}$ , $V_{CE} = 5.0 \text{ Vdc}$ )		$V_{BE(on)}$	–	2.0	Vdc

## SMALL–SIGNAL CHARACTERISTICS

Current–Gain – Bandwidth Product (Note 2) ( $I_C = 10 \text{ mAdc}$ , $V_{CE} = 5.0 \text{ Vdc}$ , $f = 100 \text{ MHz}$ )	$f_T$	125	–	MHz
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1. Pulse Test: Pulse Width  $\leq 300 \mu\text{s}$ ; Duty Cycle  $\leq 2.0\%$ .

2.  $f_T = |h_{fe}| \cdot f_{test}$ .

## ORDERING INFORMATION

Device	Package	Shipping†
MPSA13	TO–92	5000 Units / Box
MPSA13G	TO–92 (Pb–Free)	5000 Units / Box
MPSA13RLRA	TO–92	2000 / Tape & Reel
MPSA13RLRAG	TO–92 (Pb–Free)	2000 / Tape & Reel
MPSA13RLRM	TO–92	2000 / Ammo Pack
MPSA13RLRMG	TO–92 (Pb–Free)	2000 / Ammo Pack
MPSA13RLRP	TO–92	2000 / Ammo Pack
MPSA13RLRPG	TO–92 (Pb–Free)	2000 / Ammo Pack
MPSA13ZL1	TO–92	2000 / Ammo Pack
MPSA13ZL1G	TO–92 (Pb–Free)	2000 / Ammo Pack
MPSA14	TO–92	5000 Units / Box
MPSA14G	TO–92 (Pb–Free)	5000 Units / Box
MPSA14RLRA	TO–92	2000 / Tape & Reel
MPSA14RLRAG	TO–92 (Pb–Free)	2000 / Tape & Reel
MPSA14RLRP	TO–92	2000 / Ammo Pack
MPSA14RLRPG	TO–92 (Pb–Free)	2000 / 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.

# MPSA13, MPSA14

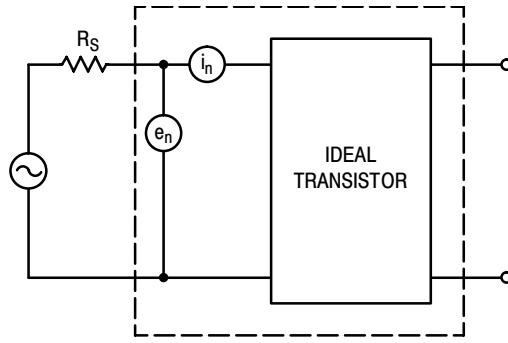


Figure 1. Transistor Noise Model

## NOISE CHARACTERISTICS

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

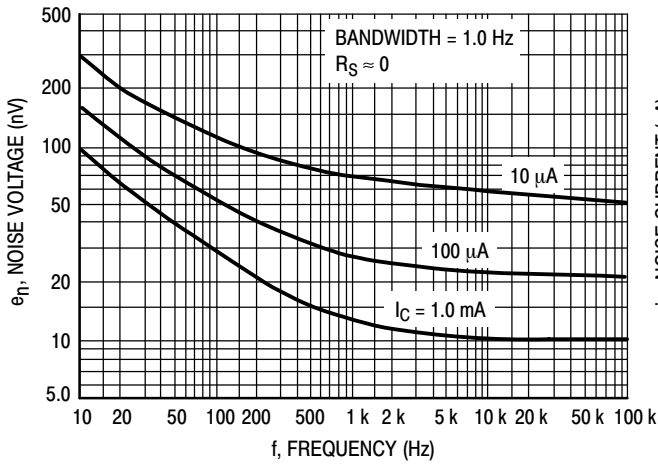


Figure 2. Noise Voltage

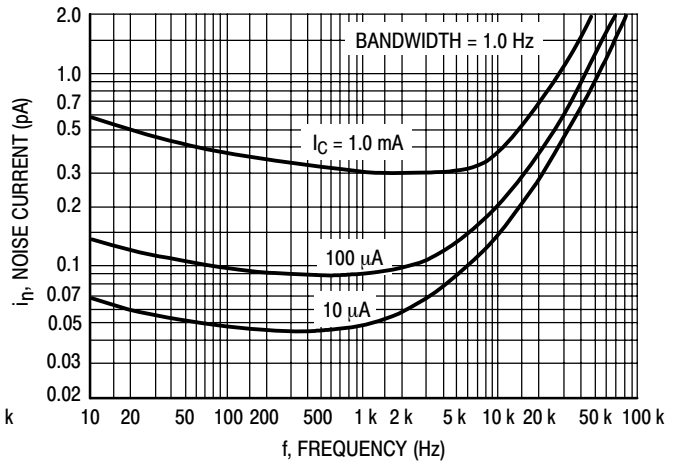


Figure 3. Noise Current

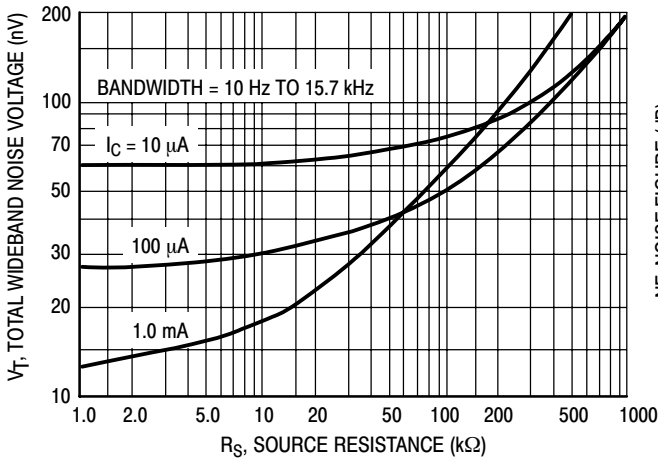


Figure 4. Total Wideband Noise Voltage

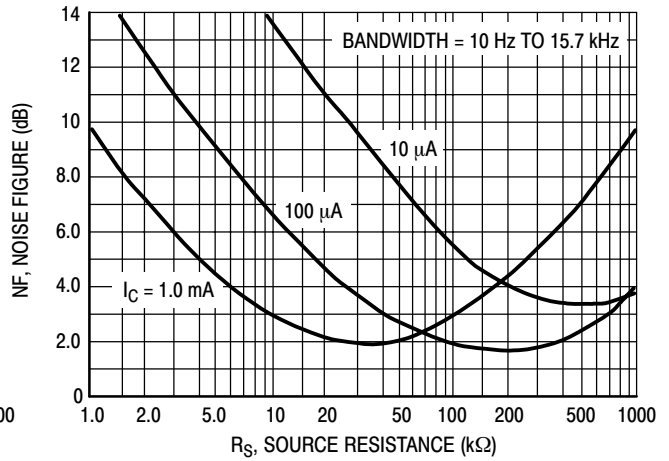


Figure 5. Wideband Noise Figure

# MPSA13, MPSA14

## SMALL-SIGNAL CHARACTERISTICS

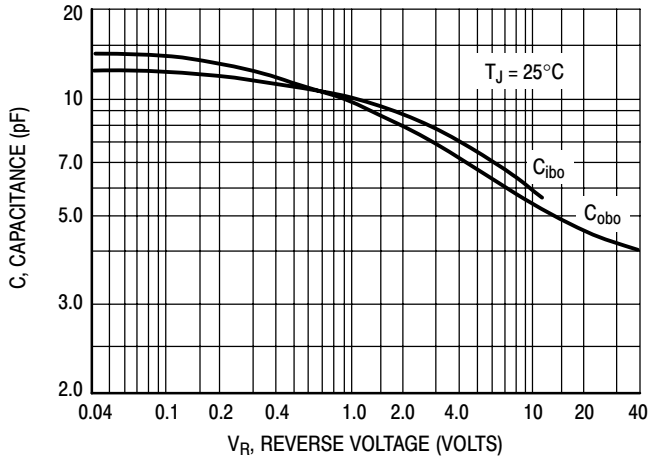


Figure 6. Capacitance

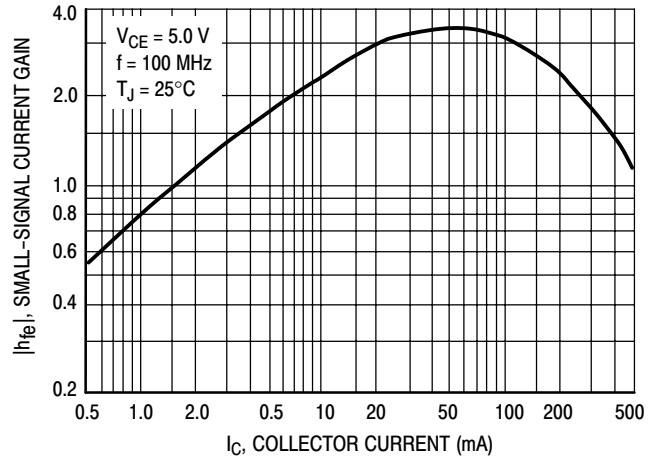


Figure 7. High Frequency Current Gain

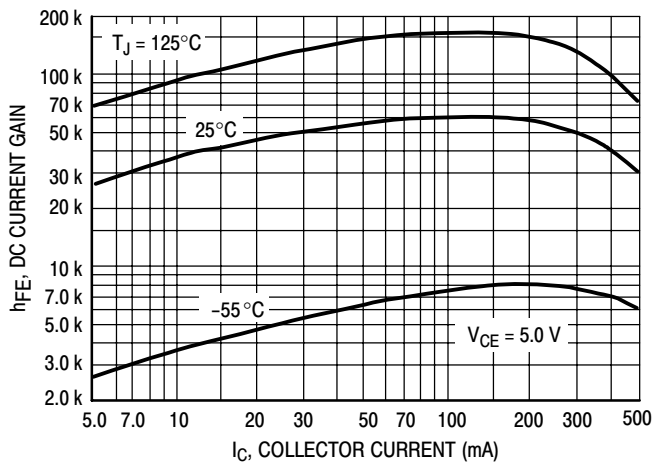


Figure 8. DC Current Gain

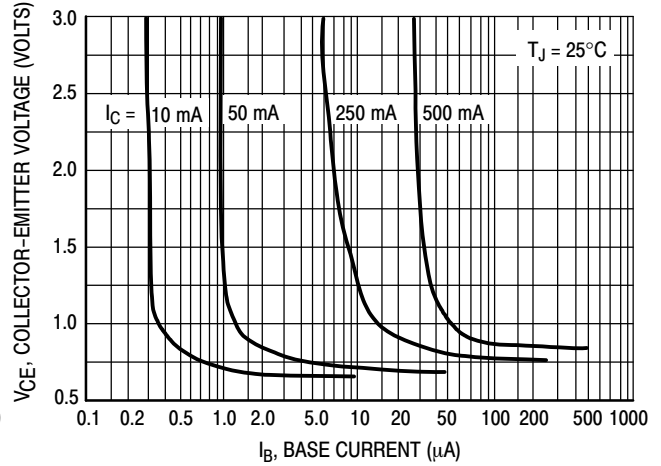


Figure 9. Collector Saturation Region

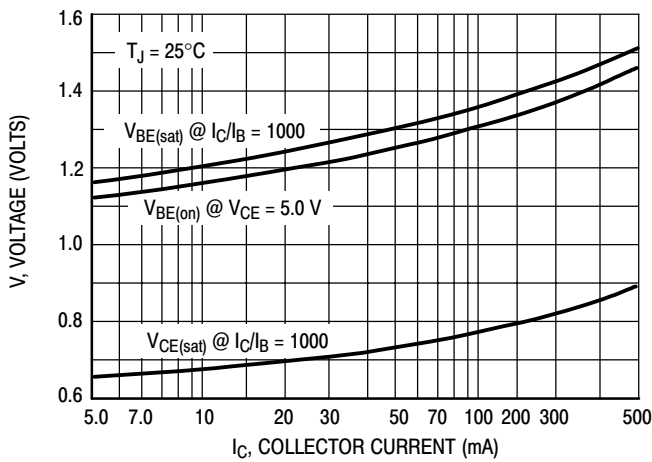


Figure 10. "On" Voltages

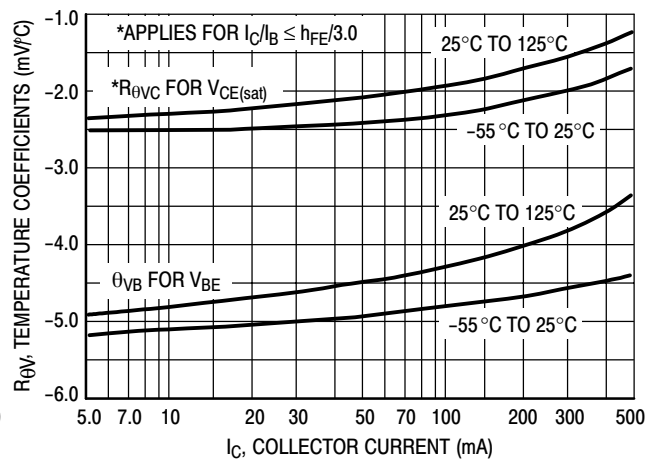


Figure 11. Temperature Coefficients

# MPSA13, MPSA14

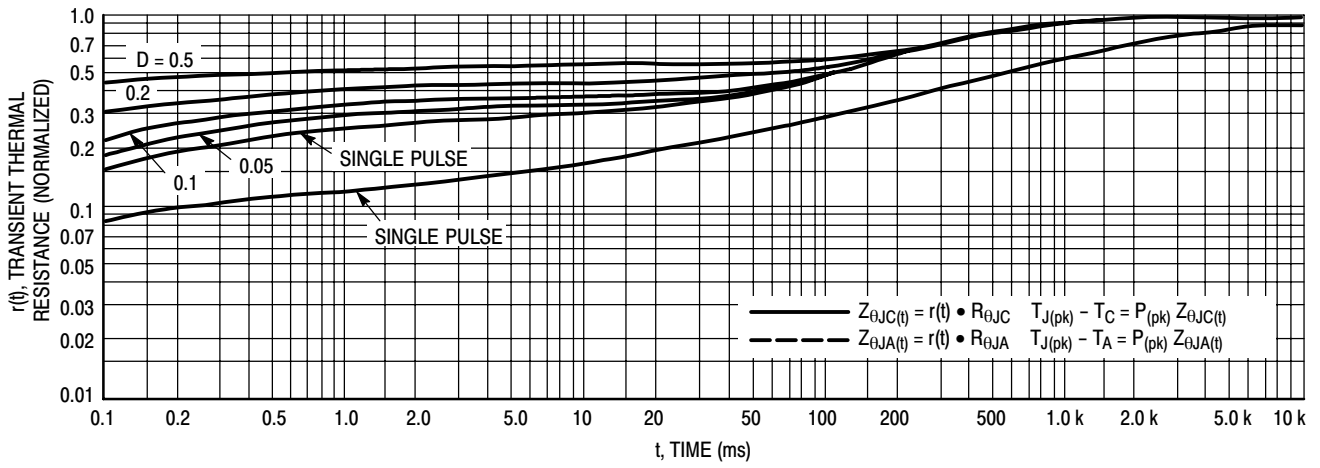


Figure 12. Thermal Response

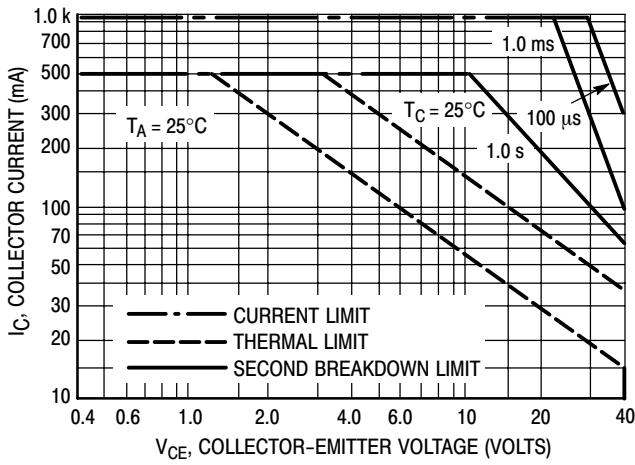
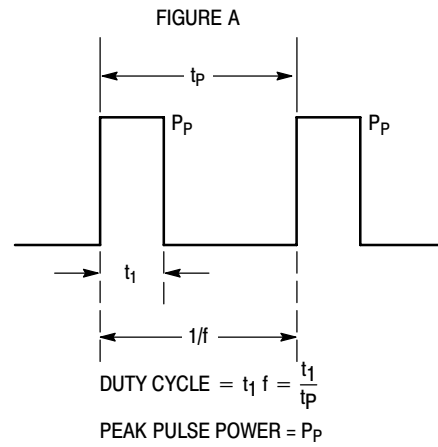


Figure 13. Active Region Safe Operating Area

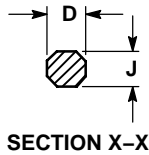
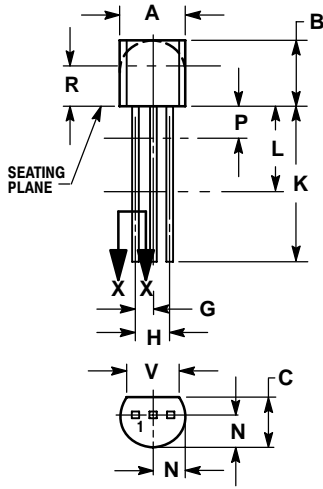


Design Note: Use of Transient Thermal Resistance Data

# MPSA13, MPSA14

## PACKAGE DIMENSIONS

TO-92  
TO-226AA  
CASE 29-11  
ISSUE AL



### 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	---

### STYLE 1:

1. EMITTER
2. BASE
3. COLLECTOR

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