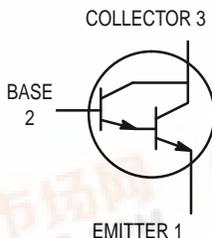


# Darlington Transistors

## NPN Silicon



**MPSA28**  
**MPSA29\***

\*Motorola Preferred Device



CASE 29-04, STYLE 1  
TO-92 (TO-226AA)

### MAXIMUM RATINGS

Rating	Symbol	MPSA28	MPSA29	Unit
Collector–Emitter Voltage	$V_{CES}$	80	100	Vdc
Collector–Base Voltage	$V_{CBO}$	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	Watts 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	$^\circ\text{C}/\text{W}$

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

Characteristic	Symbol	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS

Collector–Emitter Breakdown Voltage ( $I_C = 100 \mu\text{Adc}, V_{BE} = 0$ )	MPSA28 MPSA29	$V_{(BR)CES}$	80 100	— —	— —	Vdc
Collector–Base Breakdown Voltage ( $I_C = 100 \mu\text{Adc}, I_E = 0$ )	MPSA28 MPSA29	$V_{(BR)CBO}$	80 100	— —	— —	Vdc
Emitter–Base Breakdown Voltage ( $I_E = 10 \mu\text{Adc}, I_C = 0$ )		$V_{(BR)EBO}$	12	—	—	Vdc
Collector Cutoff Current ( $V_{CB} = 60 \text{Vdc}, I_E = 0$ ) ( $V_{CB} = 80 \text{Vdc}, I_E = 0$ )	MPSA28 MPSA29	$I_{CBO}$	— —	— —	100 100	nAdc
Collector Cutoff Current ( $V_{CE} = 60 \text{Vdc}, V_{BE} = 0$ ) ( $V_{CE} = 80 \text{Vdc}, V_{BE} = 0$ )	MPSA28 MPSA29	$I_{CES}$	— —	— —	500 500	nAdc
Emitter Cutoff Current ( $V_{EB} = 10 \text{Vdc}, I_C = 0$ )		$I_{EBO}$	—	—	100	nAdc

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



## MPSA28 MPSA29

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

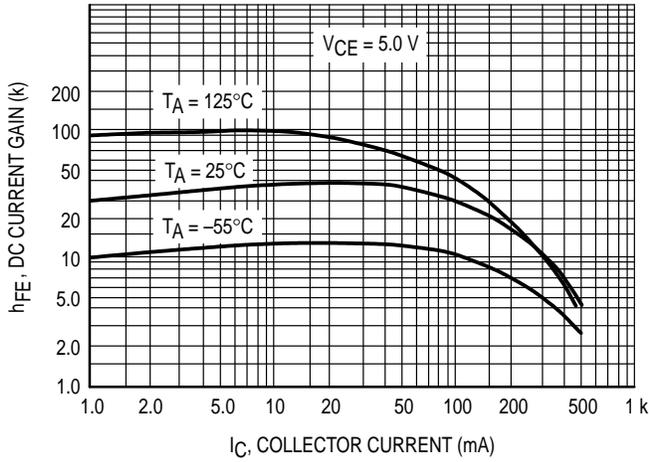
Characteristic	Symbol	Min	Typ	Max	Unit
<b>ON CHARACTERISTICS(1)</b>					
DC Current Gain ( $I_C = 10\text{ mAdc}$ , $V_{CE} = 5.0\text{ Vdc}$ ) ( $I_C = 100\text{ mAdc}$ , $V_{CE} = 5.0\text{ Vdc}$ )	$h_{FE}$	10,000 10,000	— —	— —	—
Collector–Emitter Saturation Voltage ( $I_C = 10\text{ mAdc}$ , $I_B = 0.01\text{ mAdc}$ ) ( $I_C = 100\text{ mAdc}$ , $I_B = 0.1\text{ mAdc}$ )	$V_{CE(sat)}$	— —	0.7 0.8	1.2 1.5	Vdc
Base–Emitter On Voltage ( $I_C = 100\text{ mAdc}$ , $V_{CE} = 5.0\text{ Vdc}$ )	$V_{BE(on)}$	—	1.4	2.0	Vdc

### SMALL–SIGNAL CHARACTERISTICS

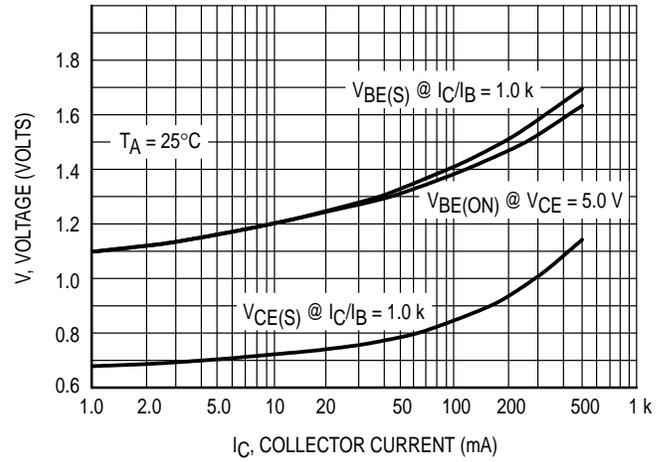
Current–Gain – Bandwidth Product(2) ( $I_C = 10\text{ mAdc}$ , $V_{CE} = 5.0\text{ Vdc}$ , $f = 100\text{ MHz}$ )	$f_T$	125	200	—	MHz
Output Capacitance ( $V_{CB} = 10\text{ Vdc}$ , $I_E = 0$ , $f = 1.0\text{ MHz}$ )	$C_{obo}$	—	5.0	8.0	pF

1. Pulse Test: Pulse Width  $\leq 300\ \mu\text{s}$ , Duty Cycle  $\leq 2.0\%$ .

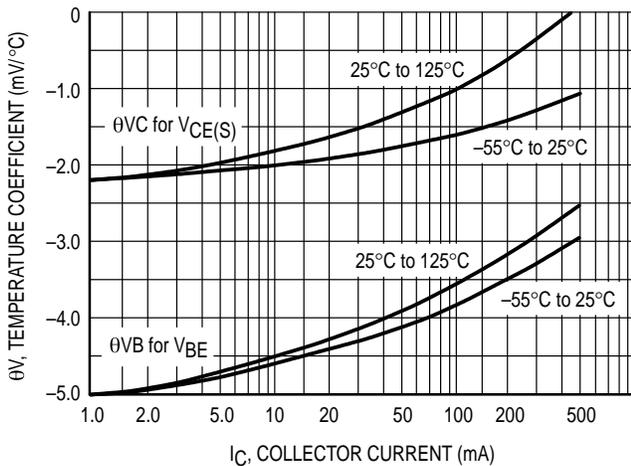
2.  $f_T = h_{fe} \cdot f_{test}$ .



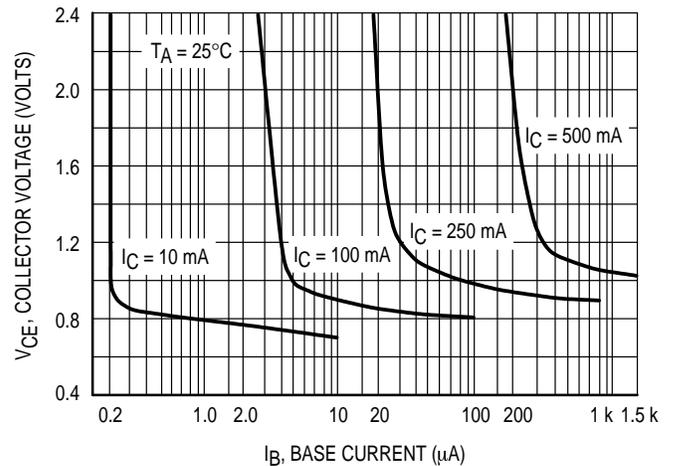
**Figure 1. DC Current Gain**



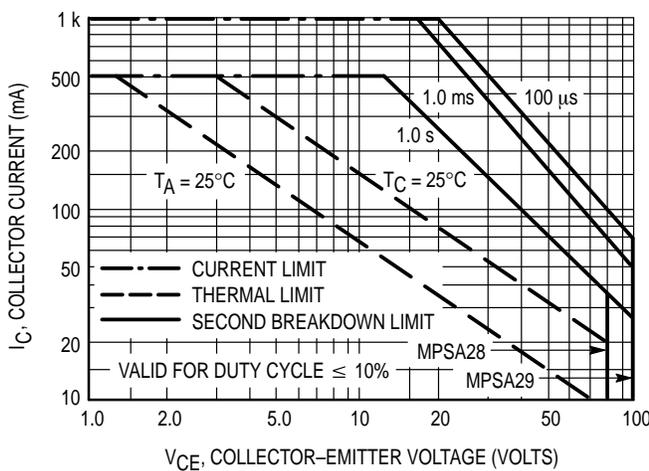
**Figure 2. "ON" Voltages**



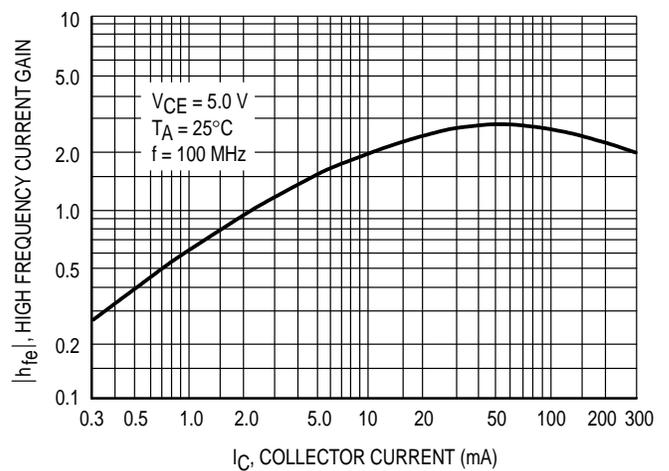
**Figure 3. Temperature Coefficients**



**Figure 4. Collector Saturation Region**



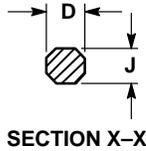
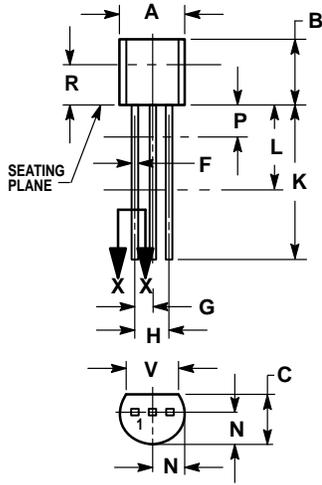
**Figure 5. Active Region — Safe Operating Area**



**Figure 6. High Frequency Current Gain**

**MPSA28 MPSA29**

**PACKAGE DIMENSIONS**



**CASE 029-04  
(TO-226AA)  
ISSUE AD**

**NOTES:**

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. CONTOUR OF PACKAGE BEYOND DIMENSION R IS UNCONTROLLED.
4. DIMENSION F APPLIES BETWEEN P AND L. DIMENSION D AND J APPLY BETWEEN L AND K MINIMUM. 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	0.022	0.41	0.55
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	0.015	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:**

- PIN 1. EMITTER
2. BASE
3. COLLECTOR

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