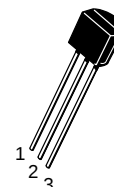
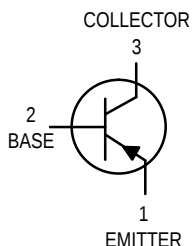


Switching Transistor

PNP Silicon

MPS3640



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

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector–Emitter Voltage	V_{CEO}	–12	Vdc
Collector–Base Voltage	V_{CBO}	–12	Vdc
Emitter–Base Voltage	V_{EBO}	–4.0	Vdc
Collector Current — Continuous	I_C	–80	mA _{dc}
Total Device Dissipation @ $T_A = 25^\circ\text{C}$ Derate above 25°C	P_D	625 5.0	mW mW/ $^\circ\text{C}$
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°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	Max	Unit
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OFF CHARACTERISTICS

Collector–Emitter Breakdown Voltage ($I_C = -100 \mu\text{A}_{dc}$, $V_{BE} = 0$)	$V_{(BR)CES}$	–12	—	Vdc
Collector–Emitter Sustaining Voltage ⁽¹⁾ ($I_C = -10 \text{ mA}_{dc}$, $I_B = 0$)	$V_{CEO(sus)}$	–12	—	Vdc
Collector–Base Breakdown Voltage ($I_C = -100 \mu\text{A}_{dc}$, $I_E = 0$)	$V_{(BR)CBO}$	–12	—	Vdc
Emitter–Base Breakdown Voltage ($I_E = -100 \mu\text{A}_{dc}$, $I_C = 0$)	$V_{(BR)EBO}$	–4.0	—	Vdc
Collector Cutoff Current ($V_{CE} = -6.0 \text{ Vdc}$, $V_{BE} = 0$) ($V_{CE} = -6.0 \text{ Vdc}$, $V_{BE} = 0$, $T_A = 65^\circ\text{C}$)	I_{CES}	— —	–0.01 –1.0	μA_{dc}
Base Current ($V_{CE} = -6.0 \text{ Vdc}$, $V_{EB} = 0$)	I_B	—	–10	nA _{dc}

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

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

Characteristic	Symbol	Min	Max	Unit
ON CHARACTERISTICS(1)				
DC Current Gain ($I_C = -10\text{ mA}$, $V_{CE} = -0.3\text{ Vdc}$) ($I_C = -50\text{ mA}$, $V_{CE} = -1.0\text{ Vdc}$)	h_{FE}	30 20	120 —	—
Collector–Emitter Saturation Voltage ($I_C = -10\text{ mA}$, $I_B = -1.0\text{ mA}$) ($I_C = -50\text{ mA}$, $I_B = -5.0\text{ mA}$) ($I_C = -10\text{ mA}$, $I_B = -1.0\text{ mA}$, $T_A = 65^\circ\text{C}$)	$V_{CE(sat)}$	— — —	— -0.2 -0.6 -0.25	Vdc
Base–Emitter Saturation Voltage ($I_C = -10\text{ mA}$, $I_B = -0.5\text{ mA}$) ($I_C = -10\text{ mA}$, $I_B = -1.0\text{ mA}$) ($I_C = -50\text{ mA}$, $I_B = -5.0\text{ mA}$)	$V_{BE(sat)}$	-0.75 -0.75 —	-0.95 -1.0 -1.5	Vdc

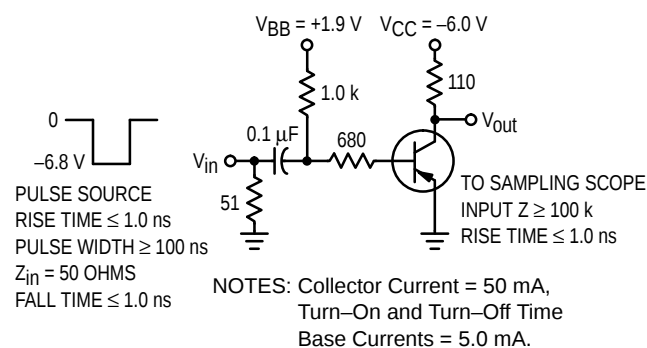
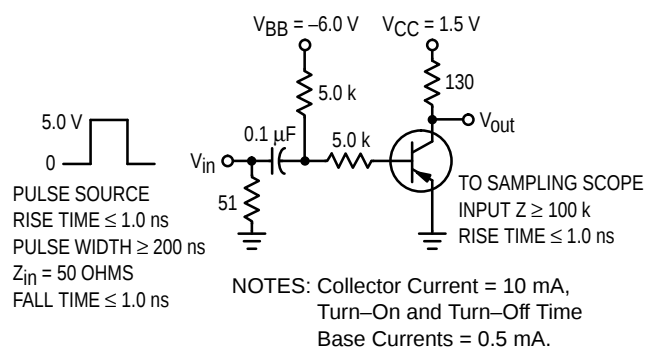
SMALL–SIGNAL CHARACTERISTICS

Current–Gain — Bandwidth Product ($I_C = -10\text{ mA}$, $V_{CE} = -5.0\text{ Vdc}$, $f = 100\text{ MHz}$)	f_T	500	—	MHz
Output Capacitance ($V_{CB} = -5.0\text{ Vdc}$, $I_E = 0$, $f = 1.0\text{ MHz}$)	C_{obo}	—	3.5	pF
Input Capacitance ($V_{EB} = -0.5\text{ Vdc}$, $I_C = 0$, $f = 1.0\text{ MHz}$)	C_{ibo}	—	3.5	pF

SWITCHING CHARACTERISTICS

Delay Time	$(V_{CC} = -6.0\text{ Vdc}$, $I_C = -50\text{ mA}$, $V_{BE(off)} = -1.9\text{ Vdc}$, $I_{B1} = -5.0\text{ mA}$)	t_d	—	10	ns
Rise Time		t_r	—	30	ns
Storage Time	$(V_{CC} = -6.0\text{ Vdc}$, $I_C = -50\text{ mA}$, $I_{B1} = I_{B2} = -5.0\text{ mA}$)	t_s	—	20	ns
Fall Time		t_f	—	12	ns
Turn–On Time ($V_{CC} = -6.0\text{ Vdc}$, $I_C = -50\text{ mA}$, $I_{B1} = -5.0\text{ mA}$) ($V_{CC} = -1.5\text{ Vdc}$, $I_C = -10\text{ mA}$, $I_{B1} = -0.5\text{ mA}$)	t_{on}	—	—	25 60	ns
Turn–Off Time ($V_{CC} = -6.0\text{ Vdc}$, $I_C = -50\text{ mA}$, $I_{B1} = I_{B2} = -5.0\text{ mA}$) ($V_{CC} = -1.5\text{ Vdc}$, $I_C = -10\text{ mA}$, $I_{B1} = I_{B2} = -0.5\text{ mA}$)		—	—	35 75	ns

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

**Figure 1.****Figure 2.**

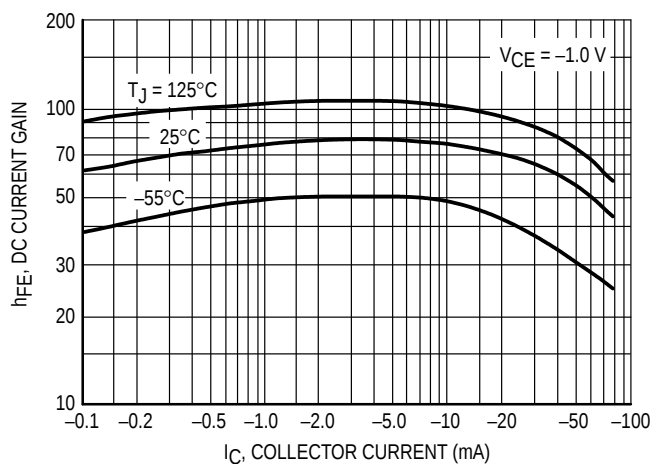


Figure 3. DC Current Gain

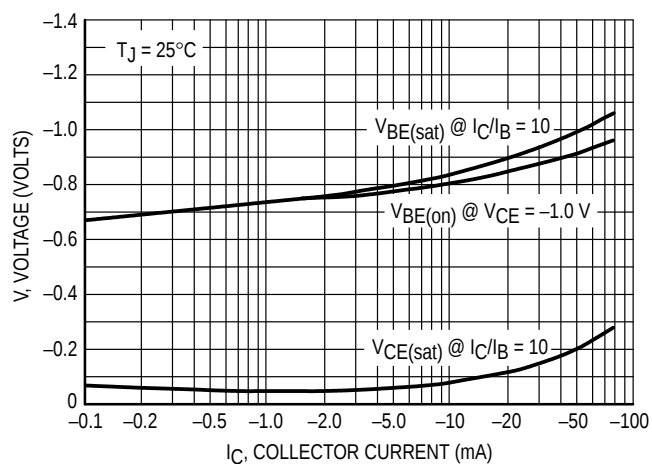


Figure 4. "On" Voltages

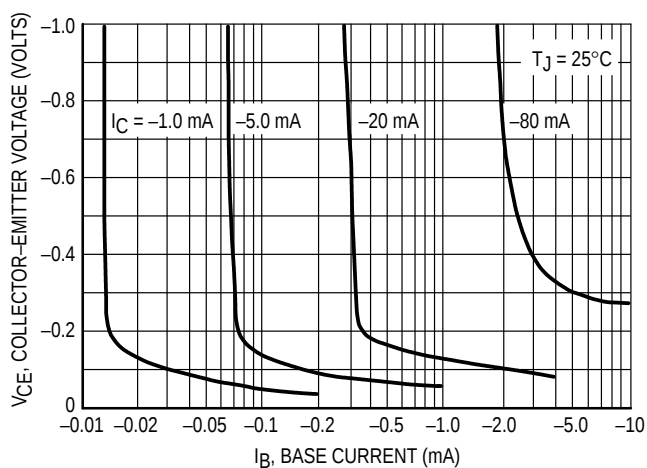


Figure 5. Collector Saturation Region

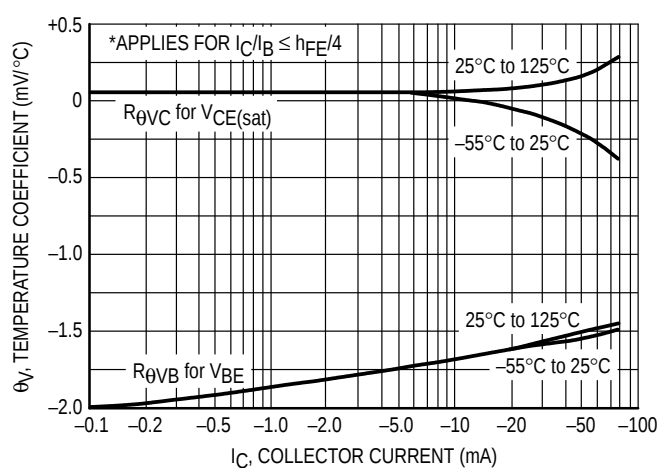


Figure 6. Temperature Coefficients

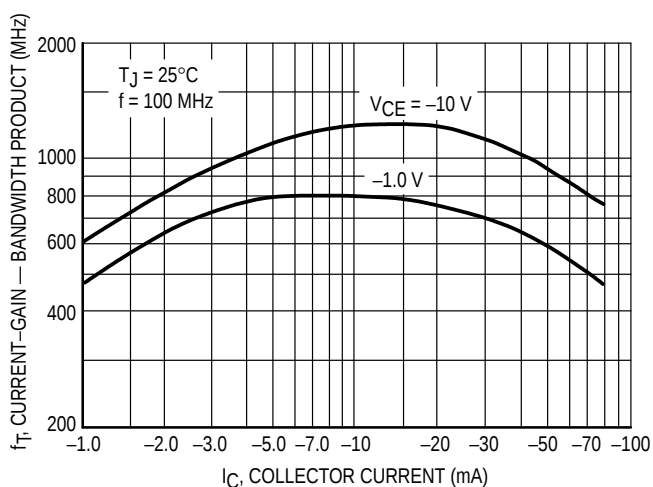


Figure 7. Current-Gain — Bandwidth Product

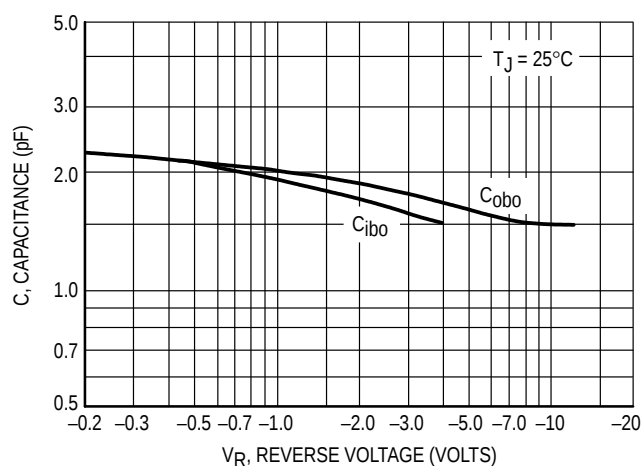
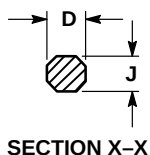
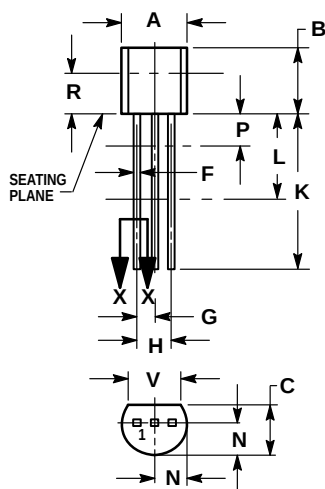


Figure 8. Capacitance

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:

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

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How to reach us:

USA/EUROPE: Motorola Literature Distribution;
P.O. Box 20912; Phoenix, Arizona 85036. 1-800-441-2447

JAPAN: Nippon Motorola Ltd.; Tatsumi-SPD-JLDC, Toshikatsu Otsuki,
6F Seibu-Butsuryu-Center, 3-14-2 Tatsumi Koto-Ku, Tokyo 135, Japan. 03-3521-8315

MFAX: RMFAX0@email.sps.mot.com - TOUCHTONE (602) 244-6609
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HONG KONG: Motorola Semiconductors H.K. Ltd.; 8B Tai Ping Industrial Park,
51 Ting Kok Road, Tai Po, N.T., Hong Kong. 852-26629298

