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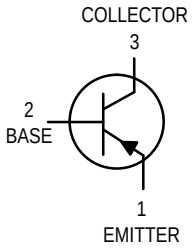
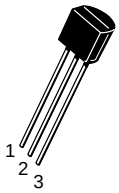
Switching Transistor
PNP Silicon

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	mAdc
Total Device Dissipation @ T_A = 25°C Derate above 25°C	P_D	625 5.0	mW mW/°C
Total Device Dissipation @ T_C = 25°C Derate above 25°C	P_D	1.5 12	Watts mW/°C
Operating and Storage Junction Temperature Range	T_J, T_{stg}	–55 to +150	°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	200	°C/W
Thermal Resistance, Junction to Case	$R_{\theta JC}$	83.3	°C/W

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector–Emitter Breakdown Voltage (I_C = –100 μAdc, V_{BE} = 0)	$V_{(BR)CES}$	–12	—	Vdc
Collector–Emitter Sustaining Voltage(1) (I_C = –10 mAdc, I_B = 0)	$V_{CEO(sus)}$	–12	—	Vdc
Collector–Base Breakdown Voltage (I_C = –100 μAdc, I_E = 0)	$V_{(BR)CBO}$	–12	—	Vdc
Emitter–Base Breakdown Voltage (I_E = –100 μAdc, I_C = 0)	$V_{(BR)EBO}$	–4.0	—	Vdc
Collector Cutoff Current (V_{CE} = –6.0 Vdc, V_{BE} = 0) (V_{CE} = –6.0 Vdc, V_{BE} = 0, T_A = 65°C)	I_{CES}	 — —	 –0.01 –1.0	μAdc
Base Current (V_{CE} = –6.0 Vdc, V_{EB} = 0)	I_B	—	–10	nAdc

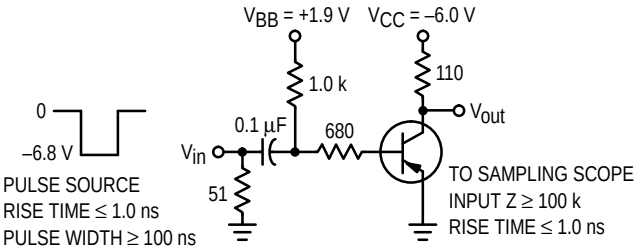
1. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%.

MOTOROLA

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted) (Continued)

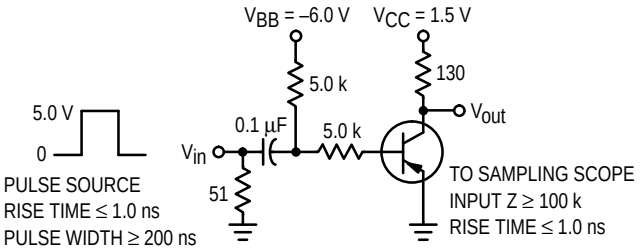
Characteristic	Symbol	Min	Max	Unit
ON CHARACTERISTICS(1)				
DC Current Gain (I_C = –10 mAdc, V_{CE} = –0.3 Vdc) (I_C = –50 mAdc, V_{CE} = –1.0 Vdc)	h_{FE}	 30 20	 120 —	—
Collector–Emitter Saturation Voltage (I_C = –10 mAdc, I_B = –1.0 mAdc) (I_C = –50 mAdc, I_B = –5.0 mAdc) (I_C = –10 mAdc, I_B = –1.0 mAdc, T_A = 65°C)	$V_{CE(sat)}$	 — — —	 –0.2 –0.6 –0.25	Vdc
Base–Emitter Saturation Voltage (I_C = –10 mAdc, I_B = –0.5 mAdc) (I_C = –10 mAdc, I_B = –1.0 mAdc) (I_C = –50 mAdc, I_B = –5.0 mAdc)	$V_{BE(sat)}$	 –0.75 –0.75 —	 –0.95 –1.0 –1.5	Vdc
SMALL–SIGNAL CHARACTERISTICS				
Current–Gain — Bandwidth Product (I_C = –10 mAdc, V_{CE} = –5.0 Vdc, f = 100 MHz)	f_T	500	—	MHz
Output Capacitance (V_{CB} = –5.0 Vdc, I_E = 0, f = 1.0 MHz)	C_{obo}	—	3.5	pF
Input Capacitance (V_{EB} = –0.5 Vdc, I_C = 0, f = 1.0 MHz)	C_{ibo}	—	3.5	pF
SWITCHING CHARACTERISTICS				
Delay Time	(V_{CC} = –6.0 Vdc, I_C = –50 mAdc, $V_{BE(off)}$ = –1.9 Vdc, I_{B1} = –5.0 mAdc)	t_d	—	10	ns
Rise Time		t_r	—	30	ns
Storage Time	(V_{CC} = –6.0 Vdc, I_C = –50 mAdc, I_{B1} = I_{B2} = –5.0 mAdc)	t_s	—	20	ns
Fall Time		t_f	—	12	ns
Turn–On Time (V_{CC} = –6.0 Vdc, I_C = –50 mAdc, I_{B1} = –5.0 mAdc) (V_{CC} = –1.5 Vdc, I_C = –10 mAdc, I_{B1} = –0.5 mAdc)	t_{on}	 — —	 25 60	ns
Turn–Off Time (V_{CC} = –6.0 Vdc, I_C = –50 mAdc, I_{B1} = I_{B2} = –5.0 mAdc) (V_{CC} = –1.5 Vdc, I_C = –10 mAdc, I_{B1} = I_{B2} = –0.5 mAdc)	t_{off}	 — —	 35 75	ns

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



NOTES: Collector Current = 50 mA,
Turn–On and Turn–Off Time
Base Currents = 5.0 mA.

Figure 1.



NOTES: Collector Current = 10 mA,
Turn–On and Turn–Off Time
Base Currents = 0.5 mA.

Figure 2.

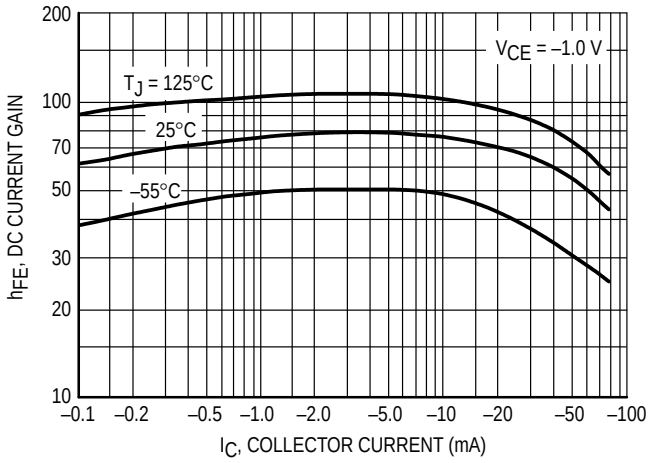


Figure 3. DC Current Gain

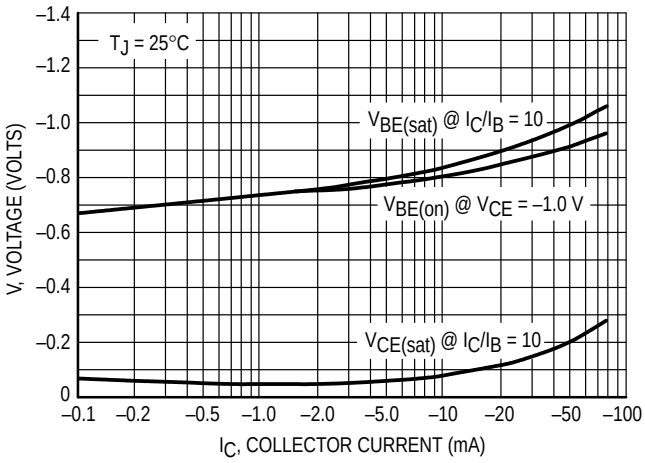


Figure 4. “On” Voltages

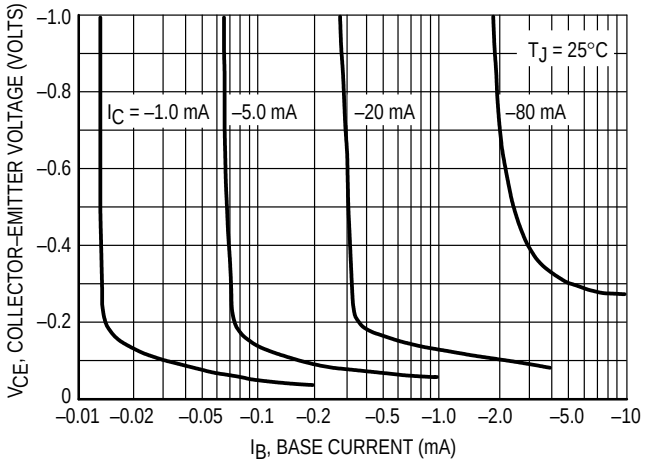


Figure 5. Collector Saturation Region

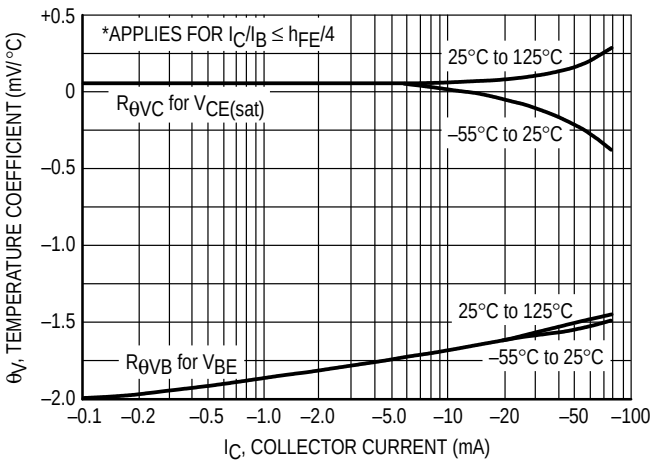


Figure 6. Temperature Coefficients

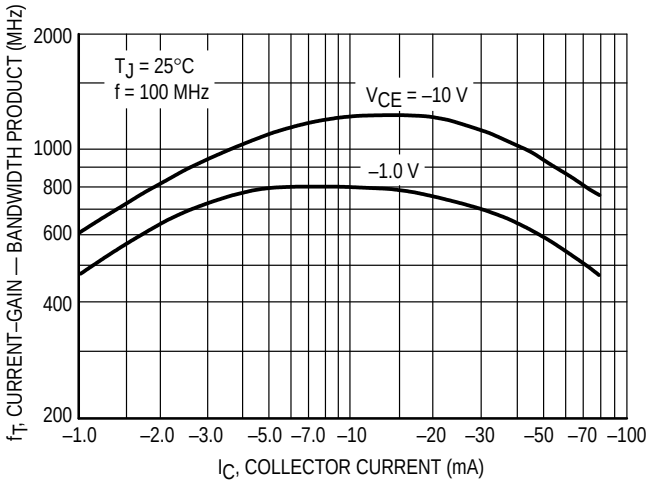


Figure 7. Current–Gain — Bandwidth Product

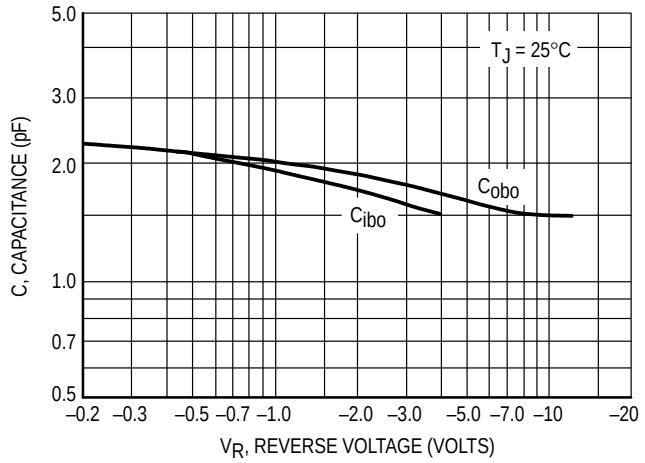
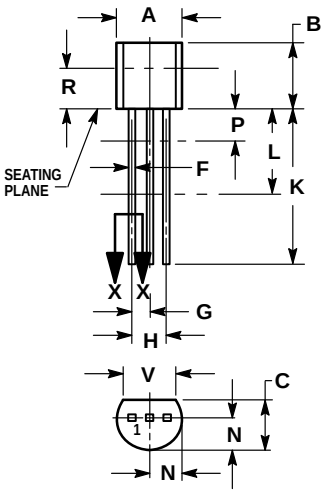
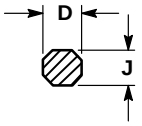


Figure 8. Capacitance

PACKAGE DIMENSIONS





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. 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.

	INCHES		MILLIMETERS	
DIM	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	—

CASE 029–04
(TO–226AA)
ISSUE AD

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

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