MPS **3640** (SILICON)
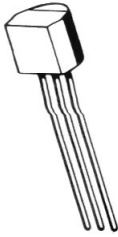
PNP silicon annular transistors designed for general-purpose low-level switching applications.

CASE 29(1)
(TO-92)

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MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	12	Vdc
Collector-Base Voltage	V_{CB}	12	Vdc
Emitter-Base Voltage	V_{EB}	4.0	Vdc
Collector Current - Continuous	I_C	80	mAdc
Total Device Dissipation @ $T_A = 25°C$ Derate above 25°C	P_D	310 2.81	mW mW/°C
Operating and Storage Junction Temperature Range	T_J, T_{stg}	−55 to +135	°C

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

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector-Emitter Sustaining Voltage* ($I_C = 10$ mAdc, $I_B = 0$)	$BV_{CEO(sus)}$*	12	-	Vdc
Collector-Emitter Breakdown Voltage ($I_C = 100$ μAdc, $V_{BE} = 0$)	BV_{CES}	12	-	Vdc
Collector-Base Breakdown Voltage ($I_C = 100$ μAdc, $I_E = 0$)	BV_{CBO}	12	-	Vdc
Emitter-Base Breakdown Voltage ($I_E = 100$ μAdc, $I_C = 0$)	BV_{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

MOTOROLA

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

Characteristic	Symbol	Min	Max	Unit
ON CHARACTERISTICS				
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 0.8 -	0.95 1.0 1.5	Vdc
DYNAMIC 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 = 140 kHz)	C_{ob}	-	3.5	pF
Input Capacitance (V_{BE} = 0.5 Vdc, I_C = 0, f = 140 kHz)	C_{ib}	-	3.5	pF
SWITCHING CHARACTERISTICS				
Turn-On Time ($V_{BE(off)}$ = 1.9 Vdc, V_{CC} = 6.0 Vdc, I_C = 50 mAdc, I_{B1} = 5.0 mAdc)(See Figure 1) (I_C = 10 mAdc, V_{CC} = 1.5 Vdc, I_{B1} = 0.5 mAdc) (See Figure 2)	t_{on}	-	25 60	ns
Delay Time (V_{CC} = 6.0 Vdc, $V_{BE(off)}$ = 1.9 Vdc,	t_d	-	10	ns
Rise Time I_C = 50 mAdc, I_{B1} = 5.0 mAdc) (See Figure 1)	t_r	-	30	ns
Turn-Off Time ($V_{BE(off)}$=1.9Vdc, V_{CC}=6.0Vdc, I_C=50mAdc, I_{B1}=I_{B2}=5.0mAdc)(See Figure 1) (I_C = 10 mAdc, V_{CC} = 1.5 Vdc, I_{B1} = I_{B2} = 0.5 mAdc) (See Figure 2)	t_{off}	-	35 75	ns
Storage Time (V_{CC} = 6.0 Vdc, I_C = 50 mAdc,	t_s	-	20	ns
Fall Time I_{B1} = I_{B2} = 5.0 mAdc) (See Figure 1)	t_f	-	12	ns

*Pulse Test: Pulse Width = 300 μs, Duty Cycle = 1.0%.

FIGURE 1 — SWITCHING TIME TEST CIRCUIT

V_{BB} = +1.9 V V_{CC} = -6.0 V

0.1 μF   0.1 μF   110
 1.0 k
 0.1 μF   680 V_{out}
 V_{in}
 51

PULSE SOURCE
 Rise Time≤ 1.0 ns
 Pulse Width ≥100 ns
 Z_{in} = 50 Ohms
 Fall Time≤ 1.0 ns

TO SAMPLING SCOPE
 Input Z ≥100 k
 Rise Time≤ 1.0 ns

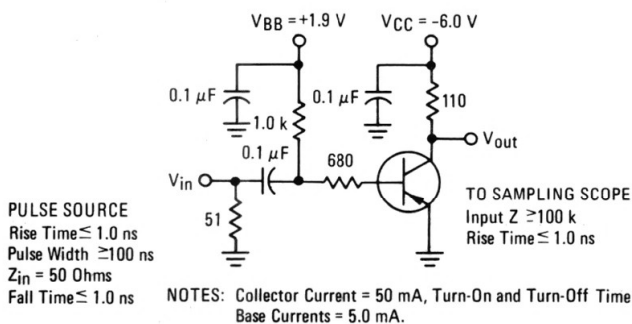NOTES: Collector Current = 50 mA, Turn-On and Turn-Off Time
 Base Currents = 5.0 mA.

FIGURE 2 — SWITCHING TIME TEST CIRCUIT

V_{BB} = -6.0 V V_{CC} = 1.5 V

0.1 μF   0.1 μF   130
 5.0 k
 0.1 μF   5.0 k V_{out}
 V_{in}
 51

PULSE SOURCE
 Rise Time≤ 1.0 ns
 Pulse Width ≥200 ns
 Z_{in} = 50 Ohms
 Fall Time≤ 1.0 ns

TO SAMPLING SCOPE
 Input Z ≥100 k
 Rise Time≤ 1.0 ns

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