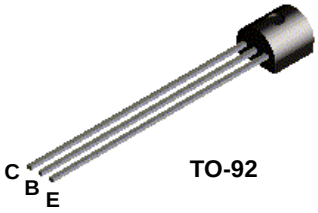
National Semiconductor™

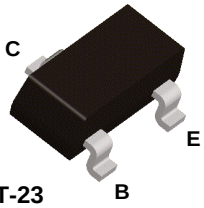
Discrete POWER & Signal Technologies

PN3640



TO-92

MMBT3640



SOT-23
Mark: 2J

PNP Switching Transistor

This device is designed for very high speed saturate switching at collector currents to 100 mA. Sourced from Process 65. See PN4258 for characteristics.

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V_{CEO}	Collector-Emitter Voltage	12	V
V_{CBO}	Collector-Base Voltage	12	V
V_{EBO}	Emitter-Base Voltage	4.0	V
I_C	Collector Current - Continuous	200	mA
T_J, T_{stg}	Operating and Storage Junction Temperature Range	-55 to +150	°C

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

NOTES:
1) These ratings are based on a maximum junction temperature of 150 degrees C.
2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

Thermal Characteristics

TA = 25°C unless otherwise noted

Symbol	Characteristic	Max		Units
		PN3640	*MMBT3640	
P_D	Total Device Dissipation Derate above 25°C	350 2.8	225 1.8	mW mW/°C
$R_{\theta JC}$	Thermal Resistance, Junction to Case	125		°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	357	556	°C/W

*Device mounted on FR-4 PCB 1.6" X 1.6" X 0.06."

PNP Switching Transistor
(continued)

Electrical Characteristics
TA = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Max	Units
OFF CHARACTERISTICS					
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage*	I_C = 10 mA, I_B = 0	12		V
$V_{(BR)CES}$	Collector-Emitter Breakdown Voltage	I_C = 100 µA, V_{BE} = 0	12		V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	I_C = 100 µA, I_E = 0	12		V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	I_E = 100 µA, I_C = 0	4.0		V
I_{CES}	Collector Cutoff Current	V_{CE} = 6.0 V, V_{BE} = 0 V_{CE} = 6.0 V, V_{BE} = 0, T_A = 65°C		0.01 1.0	µA µA
I_B	Base Current	V_{CE} = 6.0 V, V_{BE} = 0		10	nA
ON CHARACTERISTICS*					
h_{FE}	DC Current Gain	I_C = 10 mA, V_{CE} = 0.3 V I_C = 50 mA, V_{CE} = 1.0 V	30 20	120	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C = 10 mA, I_B = 0.5 mA I_C = 10 mA, I_B = 1.0 mA I_C = 50 mA, I_B = 5.0 mA I_C= 10 mA, I_B= 1.0 mA,T_A =65°C		0.3 0.2 0.6 0.25	V V V V
$V_{BE(sat)}$	Base-Emitter Saturation Voltage	I_C = 10 mA, I_B = 0.5 mA I_C = 10 mA, I_B = 1.0 mA I_C = 50 mA, I_B = 5.0 mA	0.75 0.8	0.95 1.0 1.5	V V V
SMALL SIGNAL CHARACTERISTICS					
f_T	Current Gain - Bandwidth Product	I_C = 10 mA, V_{CE} = 5.0 V, f = 100 MHz	500		MHz
C_{obo}	Output Capacitance	V_{CB} = 5.0 V, I_E = 0, f = 1.0 MHz		3.5	pF
C_{ibo}	Input Capacitance	V_{BE} = 0.5 V, I_C = 0, f = 1.0 MHz		3.5	pF
SWITCHING CHARACTERISTICS					
t_d	Delay Time	V_{CC} = 6.0 V, $V_{BE(off)}$ = 1.9 V,		10	ns
t_r	Rise Time	I_C = 50 mA, I_{B1} = 5.0 mA		20	ns
t_s	Storage Time	V_{CC} = 6.0 V, I_C = 50 mA,		20	ns
t_f	Fall Time	I_{B1} = I_{B2} = 5.0 mA		12	ns
t_{on}	Turn-On Time	V_{CC} = 6.0 V, $V_{BE(off)}$ = 1.9 V, I_C = 50 mA, I_{B1} = 5.0 mA		25	ns
		V_{CC} = 1.5 V, I_C = 10 mA, I_{B1} = I_{B2} = 0.5 mA		60	ns
t_{off}	Turn-Off Time	V_{CC} = 6.0 V, $V_{BE(off)}$ = 1.9 V, I_C = 50 mA, I_{B1} = 5.0 mA		35	ns
		V_{CC} = 1.5 V, I_C = 10 mA, I_{B1} = I_{B2} = 0.5 mA		75	ns

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