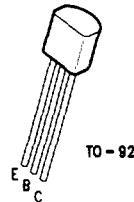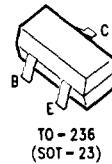# National Semiconductor

2N4403   MMBT4403

TO – 92

TO – 236
(SOT – 23)

TL/G/10100–5

E
B
C

TL/G/10100–1

PNP General Purpose Amplifier

Electrical Characteristics $T_A = 25°C$ unless otherwise noted

Symbol	Parameter	Min	Max	Units
OFF CHARACTERISTICS				
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage, (Note 1) ($I_C = 1.0$ mAdc, $I_B = 0$)	40		Vdc
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage ($I_C = 0.1$ mAdc, $I_E = 0$)	40		Vdc
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage ($I_E = 0.1$ mAdc, $I_C = 0$)	5.0		Vdc
I_L	Base Cutoff Current ($V_{CE} = 35$ Vdc, $V_{BE} = 0.4$ Vdc)		0.1	μAdc
I_{CEX}	Collector Cutoff Current ($V_{CE} = 35$ Vdc, $V_{BE} = 0.4$ Vdc)		0.1	μAdc
ON CHARACTERISTICS				
h_{FE}	DC Current Gain ($I_C = 0.1$ mAdc, $V_{CE} = 1.0$ Vdc) ($I_C = 1.0$ mAdc, $V_{CE} = 1.0$ Vdc) ($I_C = 10$ mAdc, $V_{CE} = 1.0$ Vdc) ($I_C = 150$ mAdc, $V_{CE} = 2.0$ Vdc), (Note 1) ($I_C = 500$ mAdc, $V_{CE} = 2.0$ Vdc), (Note 1)	30 60 100 100 20	300	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage, (Note 1) ($I_C = 150$ mAdc, $I_B = 15$ mAdc) ($I_C = 500$ mAdc, $I_B = 50$ mAdc)		0.4 0.75	Vdc
$V_{BE(sat)}$	Base-Emitter Saturation Voltage, (Note 1) ($I_C = 150$ mAdc, $I_B = 15$ mAdc) ($I_C = 500$ mAdc, $I_B = 50$ mAdc)	0.75	0.95 1.3	Vdc
SMALL-SIGNAL CHARACTERISTICS				
f_T	Current Gain—Bandwidth Product ($I_C = 20$ mAdc, $V_{CE} = 10$ Vdc, $f = 100$ MHz)	200		MHz
C_{cb}	Collector-Base Capacitance ($V_{CB} = 10$ Vdc, $I_E = 0$, $f = 140$ kHz)		8.5	pF
C_{eb}	Emitter-Base Capacitance ($V_{EB} = 0.5$ Vdc, $I_C = 0$, $f = 140$ kHz)		30	pF

PNP General Purpose Amplifier (Continued)

Electrical Characteristics T_A = 25°C unless otherwise noted (Continued)

Symbol	Parameter		Min	Max	Units
SWITCHING CHARACTERISTICS					
t_d	Delay Time	(V_{CC} = 30 Vdc, V_{BE} = 2.0 Vdc, I_C = 150 mAdc, I_{B1} = 15 mAdc)		15	ns
t_r	Rise Time			20	ns
t_s	Storage Time	(V_{CC} = 30 Vdc, I_C = 150 mAdc, I_{B1} = I_{B2} = 15 mAdc)		225	ns
t_f	Fall Time			30	ns

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

Note 2: For characteristics curves, see Process 63.

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