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MMBT4401 Silicon NPN Transistor General Purpose Amp, Surface Mount

Description:

The MMBT4401 is a silicon NPN transistor in a SOT-23 type surface mount package designed for use as a medium amplifier and switch requiring collector currents up to 500mA.

Absolute Maximum Ratings: ($T_A = +25^\circ\text{C}$, Note 1, Note 2 unless otherwise specified)

Collector-Emitter Voltage, V_{CEO}	40V
Collector-Base Voltage, V_{CBO}	60V
Emitter-Base Voltage, V_{EBO}	6V
Continuous Collector Current, I_C	600mA
Total Device Dissipation (Note 3), P_D	350mW
Derate above $+25^\circ\text{C}$	2.8mW/ $^\circ\text{C}$
Thermal Resistance, Junction-to-Ambient (Note 3), R_{thJA}	357 $^\circ\text{C}/\text{W}$
Operating Junction Temperature Range, T_J	-55° to $+150^\circ\text{C}$
Storage Temperature Range, T_{stg}	-55° to $+150^\circ\text{C}$

Note 1. Stresses exceeding the Absolute Maximum Ratings may damage the device. The device may not function or be operated above the Recommended Operating Conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the Recommended Operation Conditions may affect device reliability. The Absolute maximum ratings are stress ratings only.

Note 2. These are steady-state limits and are based on a maximum junction temperature of $+150^\circ\text{C}$.

Note 3. Device is mounted on FR-4 PCB 1.6 inch x 1.6 inch x 0.06 inch.

Electrical Characteristics: ($T_A = +25^\circ\text{C}$ unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
OFF Characteristics						
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	$I_C = 1\text{mA}$, $I_B = 0$, Note 4	40	-	-	V
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	$I_C = 0.1\text{mA}$, $I_E = 0$	60	-	-	V
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	$I_E = 0.1\text{mA}$, $I_C = 0$	6	-	-	V
Base Cut-Off Current	I_{BL}	$V_{CE} = 35\text{V}$, $V_{EB} = 400\text{mV}$	-	-	0.1	μA
Collector Cutoff Current	I_{CEX}	$V_{CE} = 35\text{V}$, $V_{EB} = 400\text{mV}$	-	-	0.1	μA
ON Characteristics (Note 4)						
DC Current Gain	h_{FE}	$V_{CE} = 1\text{V}$, $I_C = 0.1\text{mA}$	20	-	-	
		$V_{CE} = 1\text{V}$, $I_C = 1\text{mA}$	40	-	-	
		$V_{CE} = 1\text{V}$, $I_C = 10\text{mA}$	80	-	-	
		$V_{CE} = 1\text{V}$, $I_C = 150\text{mA}$	100	-	300	
		$V_{CE} = 2\text{V}$, $I_C = 500\text{mA}$	40	-	-	

Note 4. Pulse Test: Pulse Width $\leq 300\mu\text{s}$, Duty Cycle $\leq 2\%$.

Electrical Characteristics (Cont'd): ($T_A = +25^\circ\text{C}$ unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
ON Characteristics (Cont'd) (Note 4)						
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$I_C = 150\text{mA}, I_B = 15\text{mA}$	-	-	0.40	V
		$I_C = 500\text{mA}, I_B = 50\text{mA}$	-	-	0.75	V
Base-Emitter Saturation Voltage	$V_{BE(sat)}$	$I_C = 150\text{mA}, I_B = 15\text{mA}$	0.75	-	0.95	V
		$I_C = 500\text{mA}, I_B = 50\text{mA}$	-	-	1.20	V
Small-Signal Characteristics						
Current Gain-Bandwidth Product	f_T	$I_C = 10\text{mA}, V_{CE} = 20\text{V}, f = 100\text{MHz}$	250	-	-	MHz
Collector-Base Capacitance	C_{cb}	$V_{CB} = 5\text{V}, I_E = 0, f = 140\text{kHz}$	-	-	6.5	pF
Emitter-Base Capacitance	C_{eb}	$V_{BE} = 0.5\text{V}, I_C = 0, f = 140\text{kHz}$	-	-	30	pF
Input Impedance	h_{ie}	$V_{CE} = 10\text{V}, I_C = 1\text{mA}, f = 1\text{kHz}$	1	-	15	k Ω
Voltage Feedback Ratio	h_{re}		0.1	-	8.0	$\times 10^{-4}$
Small-Signal Current Gain	h_{fe}		40	-	500	
Output Admittance	h_{oe}		1	-	30	μmhos
Switching Characteristics						
Delay Time	t_d	$V_{CC} = 30\text{V}, V_{EB} = 2\text{V}, I_C = 150\text{mA}, I_{B1} = 15\text{mA}$	-	-	15	ns
Rise Time	t_r		-	-	20	ns
Storage Time	t_s	$V_{CC} = 30\text{V}, I_C = 150\text{mA}, I_{B1} = I_{B2} = 15\text{mA}$	-	-	225	ns
Fall Time	t_f		-	-	30	ns

Note 4. Pulse Test: Pulse Width $\leq 300\mu\text{s}$, Duty Cycle $\leq 2\%$.

