

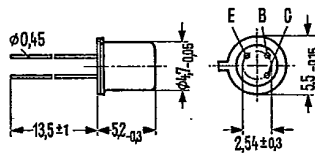
**NPN Silicon Planar Transistors**

2 N 2220  
2 N 2221  
2 N 2222

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2 N 2220, 2 N 2221, and 2 N 2222 are epitaxial NPN silicon planar transistors in TO 18 case (18 A 3 DIN 41 876). The collector is electrically connected to the case. The transistors are particularly suitable for use as high-speed switches.

Type	Ordering code
2 N 2220	Q68000-A4573
2 N 2221	Q62702-F134
2 N 2222	Q62702-F135



Approx. weight 0.33 g Dimensions in mm

**Maximum ratings**

Collector-emitter voltage  
Collector-base voltage  
Emitter-base voltage  
Collector current  
Junction temperature  
Storage temperature range  
Total power dissipation ( $T_{amb} = 25^\circ\text{C}$ )  
Total power dissipation ( $T_{case} = 25^\circ\text{C}$ )

	2 N 2220	2 N 2221	2 N 2222
$V_{CEO}$	30		V
$V_{CBO}$	60		V
$V_{EBO}$	5		V
$I_C$	0.8		A
$T_j$	175		$^\circ\text{C}$
$T_{stg}$	-65 to +200		$^\circ\text{C}$
$P_{tot}$	0.5		W
$P_{tot}$	1.8		W

**Thermal resistance**

Junction to ambient air  
Junction to case

$R_{thJA}$	$\leq 300$	K/W
$R_{thJC}$	$\leq 83$	K/W

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Static characteristics ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ )		2 N 2220	2 N 2221	2 N 2222	
Collector-base breakdown voltage ( $I_C = 10\text{ }\mu\text{A}$ )	$V_{(BR)CBO}$	> 60	> 60	> 60	V
Collector-emitter breakdown voltage ( $I_C = 10\text{ mA}$ )	$V_{(BR)CEO}$	> 30	> 30	> 30	V
Emitter-base breakdown voltage ( $I_E = 10\text{ }\mu\text{A}$ )	$V_{(BR)EBO}$	> 5	> 5	> 5	V
Collector-emitter saturation voltage ( $I_B = 15\text{ mA}$ ; $I_C = 150\text{ mA}$ )	$V_{CEsat}$	< 0.4	< 0.4	< 0.4	V
( $I_B = 50\text{ mA}$ ; $I_C = 500\text{ mA}$ )	$V_{CEsat}$	-	< 1.6	< 1.6	V
Base-emitter saturation voltage ( $I_C = 150\text{ mA}$ ; $I_B = 15\text{ mA}$ )	$V_{BEsat}$	< 1.3	< 1.3	< 1.3	V
( $I_C = 500\text{ mA}$ ; $I_B = 50\text{ mA}$ )	$V_{BEsat}$	-	< 2.6	< 2.6	V
Emitter cutoff current ( $V_{EB} = 3\text{ V}$ )	$I_{EBO}$	< 10	< 10	< 10	nA
Collector cutoff current ( $V_{CB} = 50\text{ V}$ )	$I_{CBO}$	< 10	< 10	< 10	nA
( $V_{CB} = 50\text{ V}$ ; $T_{amb} = 150\text{ }^{\circ}\text{C}$ )	$I_{CBO}$	< 10	< 10	< 10	$\mu\text{A}$
DC current gain ( $V_{CE} = 10\text{ V}$ ; $I_C = 0.1\text{ mA}$ )	$h_{FE}$	-	> 20	> 35	-
( $V_{CE} = 10\text{ V}$ ; $I_C = 1\text{ mA}$ )	$h_{FE}$	> 12	> 25	> 50	-
( $V_{CE} = 10\text{ V}$ ; $I_C = 10\text{ mA}$ )	$h_{FE}$	> 17	> 35	> 75	-
( $V_{CE} = 10\text{ V}$ ; $I_C = 150\text{ mA}$ )	$h_{FE}$	20 to 60	40 to 120	100 to 300	-
( $V_{CE} = 10\text{ V}$ ; $I_C = 500\text{ mA}$ )	$h_{FE}$	-	> 20	> 30	-
( $V_{CE} = 1\text{ V}$ ; $I_C = 150\text{ mA}$ )	$h_{FE}$	> 10	> 20	> 50	-
<b>Dynamic characteristics (<math>T_{amb} = 25\text{ }^{\circ}\text{C}</math>)</b>					
Collector base capacitance ( $V_{CB} = 10\text{ V}$ ; $f = 1\text{ MHz}$ )	$C_{CBO}$	< 8	< 8	< 8	pF
Transition frequency ( $V_{CE} = 20\text{ V}$ ; $I_C = 20\text{ mA}$ ; $f = 100\text{ MHz}$ )	$f_T$	> 250	> 250	> 250	MHz
<b>Switching times:</b> ( $V_{CC} = 20\text{ V}$ ; $I_C = 150\text{ mA}$ ; $I_{B1}$ approx. $I_{B2}$ approx. $150\text{ mA}$ )					
Delay time	$t_d$	5	5	5	ns
Rise time	$t_r$	15	15	15	ns
Storage time	$t_s$	190	190	190	ns
Fall time	$t_f$	23	23	23	ns