



# ELECTRICAL CHARACTERISTICS

## Tr1 NPN ( $T_a=25^\circ\text{C}$ unless otherwise specified)

Parameter	Symbol	Test conditions	Min	Typ	Max	Unit
Collector-base breakdown voltage	$V_{(BR)CBO}$	$I_C=100\mu\text{A}, I_E=0$	40			V
Collector-emitter breakdown voltage	$V_{(BR)CEO}^*$	$I_C=10\text{mA}, I_B=0$	30			V
Collector-emitter breakdown voltage	$V_{(BR)CEX}$	$I_C=1\mu\text{A}, V_{BE(off)}=-0.5\text{V}$	40			V
Emitter-base breakdown voltage	$V_{(BR)EBO}$	$I_E=100\mu\text{A}, I_C=0$	7			V
Collector cut-off current	$I_{CBO}$	$V_{CB}=32\text{V}, I_E=0$			20	nA
Collector cut-off current	$I_{CER}$	$V_{CE}=16\text{V}, R\leq 1\text{k}\Omega$			20	nA
Emitter cut-off current	$I_{EBO}$	$V_{EB}=6\text{V}, I_C=0$			20	nA
DC current gain	$h_{FE}^*$	$V_{CE}=2\text{V}, I_C=100\text{mA}$	180		500	
Collector-emitter saturation voltage	$V_{CE(sat)}^*$	$I_C=750\text{mA}, I_B=15\text{mA}$			0.375	V
Base-emitter saturation voltage	$V_{BE(sat)}^*$				1.2	V

## Tr2 PNP ( $T_a=25^\circ\text{C}$ unless otherwise specified)

Parameter	Symbol	Test conditions	Min	Typ	Max	Unit
Collector-base breakdown voltage	$V_{(BR)CBO}$	$I_C=-100\mu\text{A}, I_E=0$	-40			V
Collector-emitter breakdown voltage	$V_{(BR)CEO}^*$	$I_C=-10\text{mA}, I_B=0$	-30			V
Collector-emitter breakdown voltage	$V_{(BR)CEX}$	$I_C=-1\mu\text{A}, V_{BE(off)}=0.5\text{V}$	-40			V
Emitter-base breakdown voltage	$V_{(BR)EBO}$	$I_E=-100\mu\text{A}, I_C=0$	-7			V
Collector cut-off current	$I_{CBO}$	$V_{CB}=-32\text{V}, I_E=0$			-20	nA
Collector cut-off current	$I_{CER}$	$V_{CE}=-16\text{V}, R\leq 1\text{k}\Omega$			-20	nA
Emitter cut-off current	$I_{EBO}$	$V_{EB}=-6\text{V}, I_C=0$			-20	nA
DC current gain	$h_{FE}^*$	$V_{CE}=-2\text{V}, I_C=-100\text{mA}$	180		500	
Collector-emitter saturation voltage	$V_{CE(sat)}^*$	$I_C=-750\text{mA}, I_B=-15\text{mA}$			-0.375	V
Base-emitter saturation voltage	$V_{BE(sat)}^*$				-1.2	V

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







