



## PRODUCT SPECIFICATIONS

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TYPE: 2N5109

### CASE OUTLINE: TO-205AD (TO-39)

### NPN SILICON TRANSISTOR

#### ABSOLUTE MAXIMUM RATING:

Collector to Base Voltage	$BV_{CBO}$	40	Vdc
Emitter to Base Voltage	$BV_{EBO}$	3	Vdc
Collector to Emitter Voltage	$BV_{CEO(sus)}$	20	Vdc
Collector to Emitter Voltage	$BV_{CEV}$		Vdc
Continuous Collector Current	$I_C$	.4	Adc
Peak Collector Current	$I_{CM}$		Adc
Power Dissipation $T_A = 25^\circ C$	$P_D$		Watts
Power Dissipation $T_C = 75^\circ C$	$P_D$	2.5	Watts
Storage Temperature	$T_{stg}$	-65 to +200	$^\circ C$
Operating Temperature	$T_J$	-65 to +200	$^\circ C$
Lead Temperature From Case	$T_L$		$^\circ C$

#### ELECTRICAL CHARACTERISTICS $T_A @ 25^\circ C$

PARAMETERS	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Collector to Base Voltage	$BV_{CBO}$					Vdc
Emitter to Base Voltage	$BV_{EBO}$					Vdc
Collector to Emitter Voltage	$BV_{CEO(sus)}$	$I_C = 5mA$	20			Vdc
Collector to Emitter Voltage	$BV_{CEO}$					Vdc
Collector to Emitter Voltage	$BV_{CER(sus)}$	$I_C = 5mA R_{BE} = 10\Omega$	40			Vdc
Collector Cutoff Current	$I_{CBO}$					$\mu A$
Collector Cutoff Current	$I_{CBO}$					$\mu A$
Collector Cutoff Current	$I_{CEO}$	$V_{CE} = 15V$			20	$\mu A$
Collector Cutoff Current	$I_{CEX}$	$V_{CE} = 15V V_{BE} = -1.5V T_C = 150^\circ C$			5.0	mA
Collector Cutoff Current	$I_{CEX}$	$V_{CE} = 35V V_{BE} = -1.5V$			5.0	mA
Emitter Cutoff Current	$I_{EBO}$	$V_{EB} = 3.0V$			100	$\mu A$
D.C. Current Gain Pulsed*	$h_{FE}$	$I_C = 50mA V_{CE} = 15V$	40		120	-
D.C. Current Gain Pulsed*	$h_{FE}$	$I_C = 360mA V_{CE} = 5V$	5			-
D.C. Current Gain Pulsed*	$h_{FE}$					-
D.C. Current Gain Pulsed*	$h_{FE}$					-
D.C. Current Gain Pulsed*	$h_{FE}$					-
Saturation Voltage*	$V_{CE(sat)}$					Vdc
Saturation Voltage*	$V_{CE(sat)}$					Vdc
Saturation Voltage*	$V_{CE(sat)}$					Vdc
Base Emitter Voltage*	$V_{BE(sat)}$					Vdc
Base Emitter Voltage*	$V_{BE(sat)}$					Vdc
Base Emitter Voltage*	$V_{BE(sat)}$					Vdc
Base Emitter Voltage*	$V_{BE(on)}$					Vdc

Notes: \*Pulse Width  $\leq 300\mu sec$  2% Duty Cycle



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**SMALL SIGNAL CHARACTERISTICS**

	SYMBOL	MIN	TYP	MAX	UNITS
Current Gain at F =	$h_{fe}$				-
Input Capacitance	$C_{ib}$				pF
Output Capacitance $V_{CB} = 15V$ $f = 1MHz$	$C_{ob}$			3.5	pF
Transition Frequency $I_C = 50mA$ $V_{CE} = 15V$ $f = 200MHz$	$f_T$	1200			MHz
Input Impedance					Ohms
Voltage Feedback Ratio					X10-4
Output Admittance					$\mu mhos$
Noise Figure $I_C = 10mA$ , $V_{CE} = 15V$ , $f = 200$ MHz, $R_1 = 240\Omega$	NF		3.0		dB
DC Current Gain Ratio	$h_{FE1}/h_{FE2}$				-
Base-Emitter Voltage Differential	$ V_{BE1} - V_{BE2} $				mVdc
Base-Emitter Voltage Differential Change Due to Temp	$\Delta(V_{BE1} - V_{BE2})$				$\mu V/^\circ C$
	$T_A$				

**SWITCHING CHARACTERISTICS**

	SYMBOL	MIN	TYP	MAX	UNITS
Turn-On Time	$t_{on}$				ns
Turn-Off Time	$t_{off}$				ns
Delay Time	$t_d$				ns
Rise Time	$t_r$				ns
Storage Time	$t_s$				ns
Fall Time	$t_f$				ns

**FUNCTIONAL TEST**

	SYMBOL	MIN	TYP	MAX	UNITS
Common-Emitter Amplifier Voltage Gain $I_C = 50mA$ , $V_{CC} = 15V$ , $f = 50$ to 216 MHz	$G_{ve}$	11			dB
Power Input $P_{out} = 1.26mW$ $R_S = 50\Omega$ $f = 200MHz$ $I_C = 50mA$ $V_{CC} = 15V$	$P_{in}$			0.1	mW
Collector Efficiency	$\eta$				%
Cross-Modulation Distortion $I_C = 50mA$ , $V_{CE} = 15V$ , $V_{out} = 54$ dBmV	XM		-70		dB
Second Breakdown Collector Current	$I_{S/B}$				A
Thermal-Resistance, Junction to Case	$R_{\theta JC}$				$^\circ C/W$