

2N2917 • 2N2918 • 2N2976 • 2N2977

NPN LOW-LEVEL, LOW-NOISE DIFFERENTIAL AMPLIFIERS

- BETA RATIO $\frac{h_{FE1}}{h_{FE2}} = 20\%$ (MAX) AT 100 μ A
- V_{BE} MATCH $|V_{BE1} - V_{BE2}| = 5.0$ mV (MAX) AT 100 μ A
 $|V_{BE1} - V_{BE2}| = 10$ mV (MAX) FROM 10 μ A TO 1.0 mA
- V_{BE} TRACKING $\Delta V_{BE} = 20$ μ V/ $^{\circ}$ C (MAX) AT 100 μ A
- BREAKDOWN VOLTAGE ... $V_{CEO} = 45$ V (MIN)
- LOW NOISE $NF = 3.0$ dB (MAX) WIDE BAND AND AT 1.0 kHz

ABSOLUTE MAXIMUM RATINGS (Note 1)

Maximum Temperatures	
Storage Temperature	-65 $^{\circ}$ C to +200 $^{\circ}$ C
Operating Junction Temperature	200 $^{\circ}$ C Maximum
Lead Temperature (Soldering, 60 second time limit)	300 $^{\circ}$ C Maximum

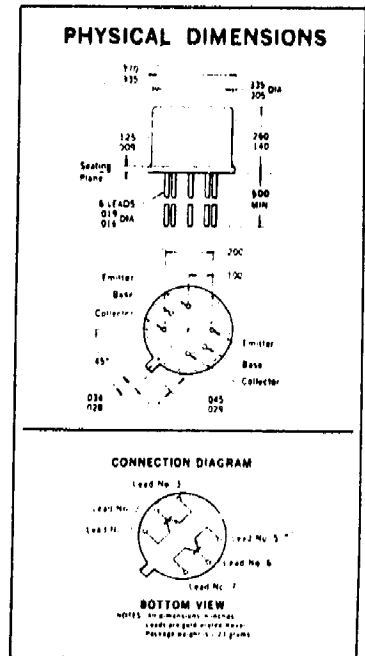
Maximum Power Dissipation (Notes 2 and 3)	2N2917	2N2918	2N2976	2N2977
	ONE SIDE	BOTH SIDES	ONE SIDE	BOTH SIDES
Total Dissipation at 25 $^{\circ}$ C Case Temperature	0.75 Watt	1.5 Watts	0.5 Watt	0.75 Watt
at 100 $^{\circ}$ C Case Temperature	0.43 Watt	0.86 Watt	0.29 Watt	0.43 Watt
at 25 $^{\circ}$ C Ambient Temperature	0.3 Watt	0.6 Watt	0.25 Watt	0.30 Watt

Maximum Voltages and Current for Each Transistor

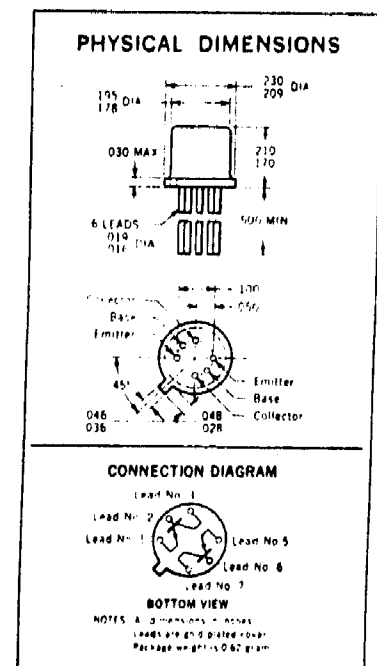
V_{CBO}	Collector to Base Voltage	45 Volts
V_{CEO}	Collector to Emitter Voltage (Note 4)	45 Volts
V_{EBO}	Emitter to Base Voltage	6.0 Volts
I_C	Collector Current	30 mA

MATCHING AND ELECTRICAL CHARACTERISTICS (25 $^{\circ}$ C Free Air Temperature unless otherwise noted)

SYMBOL	CHARACTERISTICS	2N2917		2N2918		UNITS	TEST CONDITIONS
		MIN.	MAX.	MIN.	MAX.		
$\frac{h_{FE1}}{h_{FE2}}$	DC Current Gain Ratio (Note 5)	0.8	1.0	0.8	1.0		$I_C = 100 \mu$ A $V_{CE} = 5.0$ V
$ V_{BE1} - V_{BE2} $	Base-Emitter Voltage Differential (Note 6)	10	10			mV	$I_C = 10 \mu$ A $V_{CE} = 5.0$ V to 1.0 mA
$ V_{BE1} - V_{BE2} $	Base-Emitter Voltage Differential (Note 6)	5.0	5.0			mV	$I_C = 100 \mu$ A $V_{CE} = 5.0$ V
$\Delta(V_{BE1} - V_{BE2})$	Base-Emitter Voltage Differential Change ($T_A = -55^{\circ}$ C to +25 $^{\circ}$ C)	1.6	1.6			mV	$I_C = 100 \mu$ A $V_{CE} = 5.0$ V
$\Delta(V_{BE1} - V_{BE2})$	Base-Emitter Voltage Differential Change ($T_A = +25^{\circ}$ C to +125 $^{\circ}$ C)	2.0	2.0			mV	$I_C = 100 \mu$ A $V_{CE} = 5.0$ V
NF	Narrow Band Noise Figure ($f = 1.0$ kHz)	4.0	3.0			dB	$I_C = 10 \mu$ A $V_{CE} = 5.0$ V BW = 200 Hz $R_S = 10$ k Ω
NF	Wide Band Noise Figure ($f = 15.7$ kHz)	4.0	3.0			dB	$I_C = 10 \mu$ A $V_{CE} = 5.0$ V 3 dB pts @ 25 Hz & 10 kHz $R_S = 10$ k Ω



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ELECTRICAL CHARACTERISTICS (25 °C Free Air Temperature unless otherwise noted)

SYMBOL	CHARACTERISTICS	MIN.	MAX.	UNITS	TEST CONDITIONS
h_{FE}	DC Current Gain	150			$I_C = 1.0 \text{ mA}$ $V_{CE} = 5.0 \text{ V}$
h_{FE}	DC Current Gain	100			$I_C = 100 \mu\text{A}$ $V_{CE} = 5.0 \text{ V}$
h_{FE}	DC Current Gain	60	240		$I_C = 10 \mu\text{A}$ $V_{CE} = 5.0 \text{ V}$
$h_{FE}(-55^\circ\text{C})$	DC Current Gain	15			$I_C = 10 \mu\text{A}$ $V_{CE} = 5.0 \text{ V}$
$V_{CE(sat)}$	Collector Saturation Voltage		0.35	Volts	$I_C = 1.0 \text{ mA}$ $I_B = 0.1 \text{ mA}$
$V_{BE(on)}$	Emitter-Base On Voltage		0.7	Volts	$I_C = 0.1 \text{ mA}$ $V_{CE} = 5.0 \text{ V}$
I_{CBO}	Collector Cutoff Current		10	nA	$I_E = 0$ $V_{CB} = 45 \text{ V}$
$I_{CBO}(150^\circ\text{C})$	Collector Cutoff Current		10	μA	$I_E = 0$ $V_{CB} = 45 \text{ V}$
I_{CEO}	Collector Cutoff Current		2.0	nA	$I_B = 0$ $V_{CE} = 5.0 \text{ V}$
I_{EBO}	Emitter Cutoff Current		2.0	nA	$I_C = 0$ $V_{EB} = 5.0 \text{ V}$
C_{obo}	Output Capacitance		6.0	pF	$I_E = 0$ $V_{CB} = 5.0 \text{ V}$
h_{fe}	High Frequency Current Gain ($f = 20 \text{ MHz}$)	3.0			$I_C = 0.5 \text{ mA}$ $V_{CE} = 5.0 \text{ V}$
h_{ib}	Input Resistance ($f = 1 \text{ kHz}$)	25	32	Ω	$I_C = 1.0 \text{ mA}$ $V_{CB} = 5.0 \text{ V}$
h_{ob}	Output Conductance ($f = 1 \text{ kHz}$)		1.0	μmhos	$I_C = 1.0 \text{ mA}$ $V_{CB} = 5.0 \text{ V}$
BV_{CBO}	Collector to Base Breakdown Voltage	45		Volts	$I_C = 10 \mu\text{A}$ $I_E = 0$
$V_{CEO(sust)}$	Collector to Emitter Sustaining Voltage (pulsed, notes 4 and 7)	45		Volts	$I_C = 10 \text{ mA}$ $I_B = 0$
BV_{EBO}	Emitter to Base Breakdown Voltage	6.0		Volts	$I_E = 10 \mu\text{A}$ $I_C = 0$