

# 2N2917 • 2N2918 • 2N2976 • 2N2977

## NPN LOW-LEVEL, LOW-NOISE DIFFERENTIAL AMPLIFIERS

- BETA RATIO  $\beta_{FE1} = 20\%$  (MAX) AT 100  $\mu$ A
- $V_{BE}$  MATCH  $V_{BE1} - V_{BE2} = 5.0$  mV (MAX) AT 100  $\mu$ A  
 $V_{BE1} - V_{BE2} = 10$  mV (MAX) FROM 10  $\mu$ A TO 1.0 mA
- $V_{BE}$  TRACKING  $\Delta V_{BE} = 20$   $\mu$ V/ $^{\circ}$ C (MAX) AT 100  $\mu$ 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

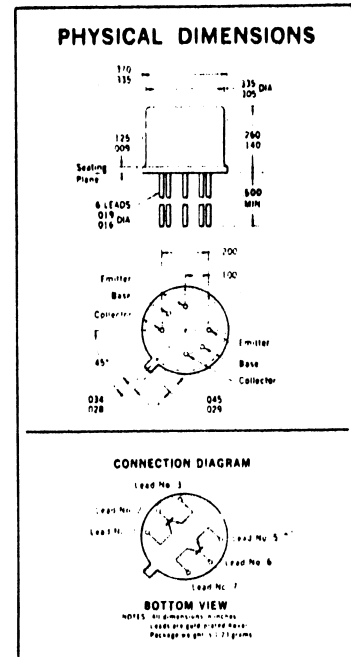
Maximum Power Dissipation (Notes 2 and 3)	2N2917	2N2917	2N2976	2N2976
	2N2918	2N2918	2N2977	2N2977
	ONE SIDE	BOTH SIDES	ONE SIDE	BOTH SIDES
Total Dissipation at 25 $^{\circ}$ C Case Temperature	0.75 Watt	1.5 Watts	0.5 Watt	0.75 Watt
at 100 $^{\circ}$ C Case Temperature	0.43 Watt	0.86 Watt	0.29 Watt	0.43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

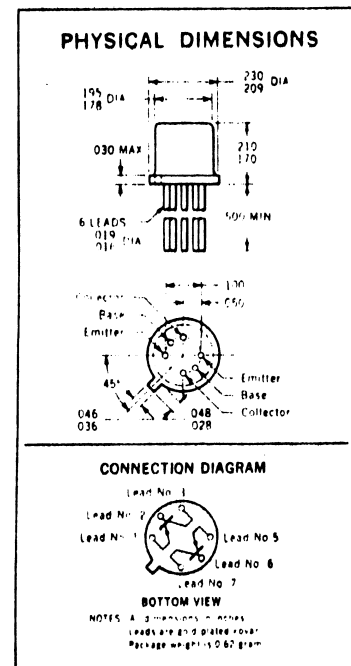
$V_{CBO}$	Collector to Base Voltage	45 Volts
$V_{CEO}$	Collector to Emitter Voltage (Note 4)	45 Volts
$V_{EBO}$	Emitter to Base Voltage	6.0 Volts
$I_C$	Collector Current	30 mA

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

SYMBOL	CHARACTERISTICS	2N2917		2N2918		UNITS	TEST CONDITIONS
		MIN.	MAX.	MIN.	MAX.		
$\beta_{FE1}$	DC Current Gain Ratio (Note 5)	0.8	1.0	0.8	1.0		$I_C = 100 \mu$ A $V_{CE} = 5.0$ V
$\beta_{FE2}$							
$ 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 $\Omega$
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 $\Omega$



2N2917 • 2N2918



2N2976 • 2N2977



**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	$\mu\text{A}$	$I_E = 0$ $V_{CB} = 45 \text{ V}$
$I_{CEO}$	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	$\Omega$	$I_C = 1.0 \text{ mA}$ $V_{CB} = 5.0 \text{ V}$
$h_{ob}$	Output Conductance ( $f = 1 \text{ kHz}$ )		1.0	$\mu\text{mhos}$	$I_C = 1.0 \text{ mA}$ $V_{CB} = 5.0 \text{ V}$
$BV_{CBO}$	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	$I_E = 10 \mu\text{A}$ $I_C = 0$